

#### FLORIDA ELECTRIC TRANSIT BUSES WITH CHARGING AND ASSOCIATED EQUIPMENT

RFP 21-980369 - SEPTEMBER 21, 2021

## GILLIG

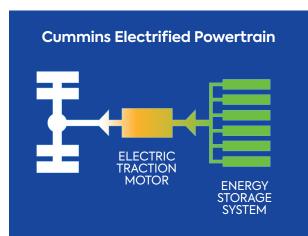
# GILLIG

## BUILDING AMERICA'S ZERO EMISSIONS FUTURE



### **Electrify Your Fleet**

Our new battery electric offering joins GILLIG's industry-leading Low Floor bus platform to bring the most comprehensive, advanced battery electric bus to the market. GILLIG's Zero-Emission Battery Electric bus incorporates the Cummins electrified powertrain, which provides the advantage of full local service support with hundreds of service centers throughout the country to provide the necessary training, warranty administration, and after-market parts. Designed, built, and supported right here in the United States.



## BATTERY ELECTRIC ZEROEMISSIONS

### **Specifications:**

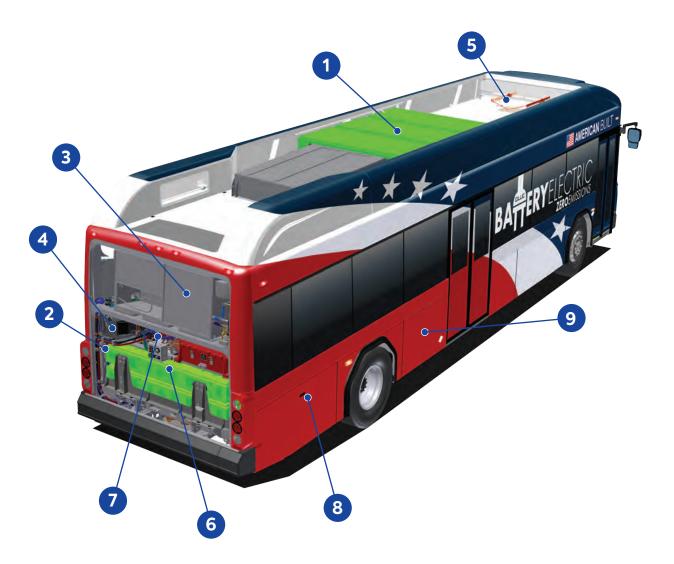
- Low Floor Battery Electric with Contoured-style Roof Fairings
- Cummins EV Drivetrain: Traction Motor and Inverter, High and Low Voltage Power Supplies, Modular Energy Storage System, Charge Controller
- Meritor 79000 Series Rear Axle
- Air Disc Brakes
- Standard Transit Size Tires
- Acceleration/Handling similar to conventional power train options
- Plug-in Charging SAE J1772 DC CCS Type 1
- Thermo King Electric HVAC with Integrated Thermal Management System
- 24V DC Power Steering Pump
- Fuel-fired Coolant Heater Option for Cold Weather Operation

## **GILLIG** LOW FLOOR BATTERY ELECTRIC Features and Benefits

#### **COMPONENT LOCATIONS:**

- 1. Roof-mounted Energy Storage System (ESS), up to 3 battery packs
- 2. Electronics Cooling Package (ECP)
- 3. Thermo-King HVAC with integrated Battery Thermal Management System
- 4. Air Compressor
- 5. Optional roof-mounted charge rails

- 6. Two battery packs mounted in the power train compartment directly above the frame rails
- 7. Power train component assembly consisting of: High-Voltage DC junction box with disconnect switch, two DC-DC convertors, and System Control Unit (SCU)
- 8. Standard Plug-in-charge location, rear curbside (optional additional locations available)
- 9. Battery pack forward of rear axle



Rear panels not shown for clarity. Specifications and features are for reference only and subject to change without notice or obligation.



## QUALITY WITHOUT COMPROMISE THE GILLIG WAY

2017

AMERICANBUILT

451

# GILLIG



## THE GILLIG WAY

GILLIG is the leading heavy-duty transit bus manufacturer and aftermarket parts supplier in the United States. From initial design through final assembly, each and every GILLIG bus is designed and built by dedicated employees who have a passion for quality and customer satisfaction.

Our industry leading Low Floor bus platform incorporates a broad range of drive systems, including clean diesel, compressed natural gas, diesel-electric hybrid, and zero-emission battery-electric.

GILLIG is committed to building buses that connect communities, eliminate congestion, and contribute to a greener environment. For over 125 years, GILLIG has been a family-owned American business with a long history of creating well-paying, dependable American jobs. Our 100% U.S. presence recycles tax dollars back into the community to further support public transportation.

To meet growing customer demand, GILLIG recently moved into our new headquarters and purpose-built production facility in Livermore, California.













#### GILLIG

#### **OUALITY WITHOUT COMPROMISE**

GILLIG believes that quality is more than a process - it is a commitment throughout our entire company to produce the most reliable, durable, and cost-effective bus in the industry and support it for life. It is a decision to never compromise on excellence and to ensure that you always receive the attention, service, and performance that you deserve. It begins with a detailed focus on your individual requirements, and culminates in a steadfast partnership that you can count on.

As demand for transit services outpaces your financial resources, you need a quality bus that minimizes your costs while providing the on-time service that your customers expect. GILLIG's industry-leading reliability has been documented at the Altoona test track and proven in daily operation throughout U.S. cities.

Our broad product offering and expertise, coupled with our customer-focused design, afford a bus platform that is customized to your specific requirements. Our modular design allows you to select the propulsion system, length, and styling package for individual service requirements while still maintaining fleet commonality.

Quality you can count on — THE GILLIG WAY.

#### AMERICANBUILT



## **Timeless Styling for Your Fleet Workhorse**

The Low Floor bus is the fleet workhorse for transit throughout the U.S., and the foundation for each of GILLIG's designs. Durable, reliable, and costeffective to maintain and operate, the stainless steel chassis and aluminum body equate to a light-weight, high-strength bus with timeless styling.

Our Low Floor is available in 29', 35', and 40' lengths, powered by Clean Diesel, Diesel-Electric Hybrid, or Compressed Natural Gas.





LOW FLOOR DIESEL







## A Stylish Evolution with Contemporary Flair





LOW FLOOR BRT HYBRID



GILLIG



Update your brand and impress your community without compromising operational performance. The modular BRT design allows you the aesthetic flexibility to select the look you desire.

Our BRT is available in 29', 35', and 40' lengths, powered by Clean Diesel, Diesel-Electric Hybrid, or Compressed Natural Gas.











## Streamlined Elegance Adds Sophisticated Style

This sleek, aerodynamic design incorporates a raised, raked-back front cap blended into a fulllength, contoured roofline. Its modern profile makes a distinguished statement to your community.

Our BRTPLUS is available in 29', 35', and 40' lengths, powered by Clean Diesel, Diesel-Electric Hybrid, or Compressed Natural Gas.





LOW FLOOR BRTPLUS DIESEL







GILLIG

## Efficient Agility & Convenience

Our 29' Low Floor is a heavy-duty, transit-proven bus with the agility and style you want in a smaller vehicle. The 29' Low Floor is designed to operate for a minimum of 12 years or over 500,000 miles. The heavy-duty components ensure you will experience the same operational and maintenance savings, durability, and support for which GILLIG has become renowned.

Our 29' Low Floor is powered by Clean Diesel, Diesel-Electric Hybrid, or Compressed Natural Gas. When combined with GILLIG's modular BRT, BRTPLUS, or Trolley designs, the 29' offers you the opportunity to build a fleet customized to your needs!





## LOW FLOOR HYBRID

## Proven Reliability, Cleaner & Quieter Technology

TRI VALLEY Rapid

AMERICAN BUILT

GILLIG has been building diesel-electric hybrid buses for nearly two decades, and we offer the best and most complete hybrid product line. Altoona test results show that the GILLIG Hybrid is quiet, reliable, and fuel efficient. Our customers attest to its smooth acceleration, quiet operation, and the ease of assimilating our Hybrids into their fleets. With rising fuel prices and increased environmental awareness, GILLIG hybrids are a smart addition to any fleet.

Our Hybrid is available in 29', 35', and 40' lengths with optional BRT, BRTPLUS, or Trolley styling.







## LOW FLOOR HYBRID Features and Benefits

#### **GIVES YOU OPTIONS**

- GILLIG Hybrid with Allison Parallel Drive and optional Vanner HBA
- GILLIG Hybrid with BAE Series Drive and Auxiliary Power System

#### **EFFICIENT STOP-AND-GO DRIVING**

- Hybrid technology is ideally suited to the demands of transit stop-and-go duty cycle. Electric motors develop maximum torque at slow speed during frequent starts, and regenerative braking converts and stores energy in the roof-mounted batteries during braking.
- Engine start/stop technology allows engine-off operation when the vehicle is stopped, and electric-only propulsion and zero emissions when the battery state of charge is sufficient.

#### SAVES ENERGY

- GILLIG Hybrids use approximately 25% less fuel than diesel buses.\*
- GILLIG Hybrids allow for the use of electric components that reduce fuel consumption.

#### **REDUCED EMISSIONS**

- GILLIG Hybrids can be approximately 90% cleaner than the 12-year-old buses they replace.
- GILLIG Hybrids can also run on domestic B20 biodiesel for greener performance.

#### **REDUCES OPERATING COSTS**

- GILLIG Hybrids help reduce fuel expense.
- GILLIG Hybrids help reduce the frequency of brake changes.
- Electric accessories reduce wear and tear on engine components and eliminate some maintenance items from the bus.

\* Results may vary depending on application.

**AMERICAN**BUILT

## LOW FLOOR CNG

## CNG is a Natural Alternative

With GILLIG's maintenaince-friendly CNG design, our CNG bus recorded the best fuel economy and reliability to date at Altoona testing. With this fuel option, you can now combine GILLIG's product reliability, corporate stability, and friendly support with the latest CNG technology.

Our CNG is available in 29', 35', and 40' lengths with optional BRT and BRTPLUS styling.





VISALIA TRANSIT

POWERED BY NATURAL GAS



### LOW FLOOR CNG Features and Benefits

#### Encapsulated Designed Enclosure



CNG Tank Valves Centrally Located for Ease of Servicing



#### Integrated CNG Fuel Management Panel



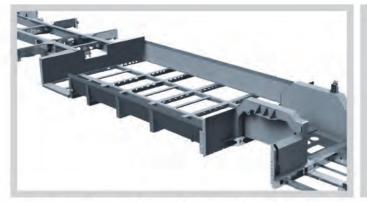
Maintenance-friendly Mounting Locations for CNG Serviceable System Components



### **AMERICAN**BUILT

## SAFETY, PERFORMANCE, AND VALUE

Quality by Design



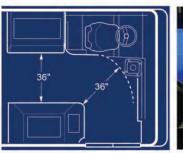
A unitized stainless steel chassis with unique side impact barrier adds strength and corrosion resistance to the Low Floor bus and protects passengers in the event of a collision.



GILLIG's Low Floor body structure of lightweight, high-strength aluminum with anodized side posts resists corrosion and greatly simplifies collision repairs. Its reduced weight saves on fuel costs and its aluminum components are recyclable.



able and ergonomic. Controls are convenient, easy-to-read, and logically located to ensure better vehicle control, ride comfort, and safety.



The Driver's Station is comfort- The Front Vestibule Area is designed for quick and easy entry and is one of the largest in the industry. A 1:6 ramp makes access even easier and reduces dwell time.



Quick-Change Skirt Panels keep the bus out of the body repair shop and back on the road for a potential collision repair savings of \$10,000/bus over 12 years.



Standard-Sized Tires last up to 60% longer than low profile tires, and their lower rolling resistance saves fuel. Coupled with a lighter body and an efficient drivetrain, the labor and fuel savings could equal \$24,000/bus over 12 years.

Bus Length - Low Floor	29'	- 35'	40'
Maximum Seating	28	34	42
Maximum Height	(D) 122", (H) 131", (C) 133"	(D) 123", (H) 133", (C) 133"	(D) 123", (H) 133", (C) 133'
Outside Turning Radius	30'	37'	44'
Maximum Fuel Capacity	75 gal / 21,600 scf	l 20 gal / 25,000 scf	120 gal / 25,000 scf
GVWR (lbs.)	34,500	39,600-41,600 *	39,600-41,600 *
	(D) = Diesel (H) =	Hybrid (C) = CNG	

\* GVWR varies with brake type: 14.5x10" Drum = 39,000 lbs., 16.5x8.625" Drum = 41,000 lbs., Disc = 41,000 lbs.

Specifications and features are for reference only and subject to change without notice or obligation.

#### **Customer Service** Our Commitment to You



Access us by phone, mail, email, or fax. Our dedicated Parts Sales Representatives are experienced, friendly, and ready to assist you with all your parts needs.

#### **Massive Parts Inventory** The Right Parts at the Right Time



Our large deicated Parts warehouse is a true "Class A" facility, stocked with a huge assortment of the right parts to keep your buses on the road.

### Non-GILLIG Bus Parts

**Full Service Parts Department** 



We stock parts for many other major brands. Call us to compare our pricing, parts availability, and our friendly, responsive service.



### SUPPORT FOR LIFE Contact Parts 800.735.1500

#### Performance **Our Core Capability**



All priority or bus-down orders ship the same day. Standard orders typically ship within 24 hours. Our state-of-the-art ERP system and dedicated team ensure that your parts ship quickly and accurately.

#### Service You Can Count on Us



Our knowledgeble and experienced service technicians are domiciled throughout the country to resolve your technical matters.

#### **Quality and Price** The Best Quality at the Right Price

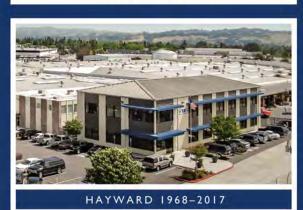


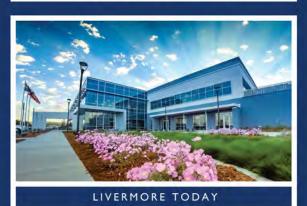
We supply only the best quality Original Equipment and Premium aftermarket parts. Our parts are competitively priced to provide you the best value.











#### SUPPORT FOR LIFE - THE GILLIG WAY

GILLIG was founded in 1890 with a commitment to customer satisfaction and value. That commitment continues today. We still have time for trust and friendships and those "old-fashioned" values of honor, integrity, and giving our best.

Our continuous improvement program is heavily influenced by customer input and our products are defined by years of experience and customer focus groups. Development programs include input from suppliers, employees, and industry trends—all so we can continue to bring you the best now and in the future.

GILLIG buses are proudly made in America by dedicated Americans—recycling your tax dollars and generating more tax revenue funding for you.

American buses are technology leaders: they have the cleanest engines and were the first to incorporate multiplexing, GPS, IVS, and hybrid technologies. Buying American buses provides you with the best product, backed by local accountability and support. Promoting domestic jobs helps to strengthen our nation. You get great buses from GILLIG and keep America working!





#### TABLE OF CONTENTS

#### SECTION 1: TECHNICAL PROPOSAL

- **TABLE OF CONTENTS TECHNICAL PROPOSAL**
- EXECUTIVE SUMMARY • CUSTOMER REFERENCES + CUSTOMER REFERENCE LETTERS
- 1. Letter of Transmittal
- 2. Technical Proposal
   O ELECTRIC BUS VEHICLE CONFIGURATION & INFORMATION
- 3. Acknowledgement of Addenda
- 4. Contractor Service and Parts Support Data
- 5. Form for Proposal Deviation (without price data)
- 6. Vehicle Questionnaires ELECTRIC BUS 40 FT. & 35 FT. models
- 7. References and Non-Priced Information
- 8. Engineering organization chart, engineering change control procedure, field modification
- 9. Manufacturing facilities plant layout, other contracts, staffing
- 10. Production and delivery schedule and other Contract commitments for the duration of this Contract
- 11. Management Plan Key personnel assigned to PSTA's account.
- 12. Quality Assurance Program

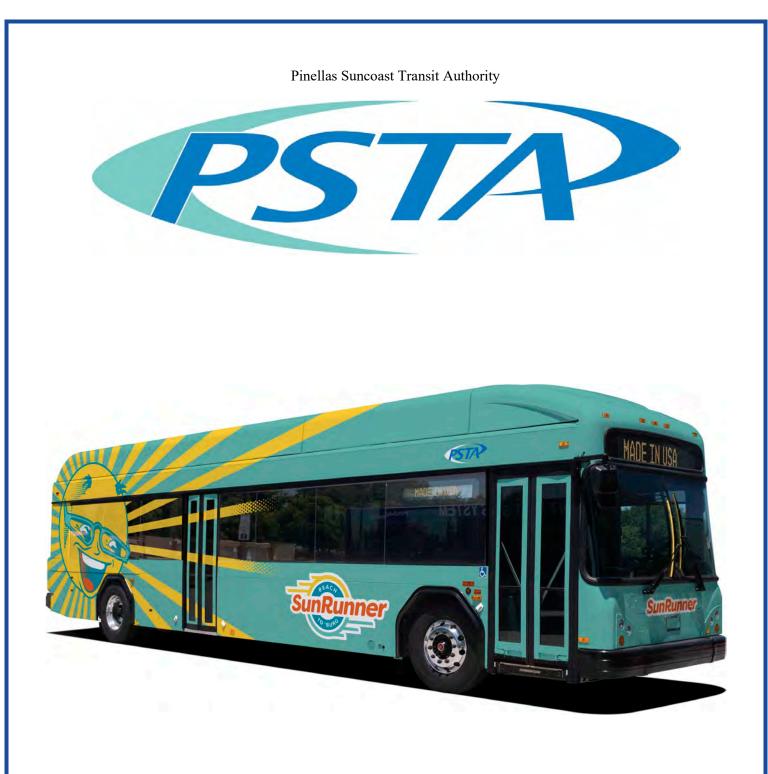
#### SECTION 2: PRICE PROPOSAL

- 1. Letter of Transmittal
- 2. Pricing Schedule
- 3. Warranty Coverage

#### SECTION 3: QUALIFICATIONS - TABLE OF CONTENTS

- 1. Pre-Award Evaluation Data Form
- 2. Financial Information & References
- 3. Letter for Insurance & Certificate
- 4. Form for Proposal Deviation, if applicable
- 5. Proposal Form signed
- 6. All Federal Certification signed

#### SECTION 4: PROPRIETARY/CONFIDENTIAL INFORMATION



## **EXECUTIVE SUMMARY**

GILLIG



GILLIG respectfully submits this Executive Summary to assist the **PSTA** in its deliberations selecting the proposal with the best overall value. We are confident **PSTA's** evaluation will identify GILLIG as the most responsive and responsible bidder in this procurement and developed a summary of salient points to highlight the key elements of our proposal.

#### BACKGROUND

Founded in San Francisco, CA in 1890, GILLIG made its start manufacturing buggies and carriages. With a 130-year legacy manufacturing transportation vehicles, we are now the largest heavy-duty bus provider of 35' and 40' transit buses to cities throughout the United States. GILLIG possesses the necessary resources and expertise to manufacture, deliver, and support **PSTA**.

GILLIG is now located in a **new, purposely build bus production facility** in Livermore, CA, where we manufacture 100% of our customers' heavy-duty transit buses from this single location. With a single production facility such as ours, all company departments (Sales, Engineering, Purchasing, Production, Publications and Service) are located at one site, which promotes a unique centralized focus to the bus production process, ensuring the manufacture of the highest quality buses. It is important to point out that GILLIG does not subcontract any work for our bus builds, so the complete responsibility for the success of your bus delivery resides at our Livermore facility. It should also be noted that the GILLIG organization, owners and key personnel remain much the same as it has been over the many GILLIG bus orders supplied to **PSTA**.

#### OUR PROPOSAL

GILLIG greatly appreciates this opportunity to submit our proposal to the **PSTA**. Our proposal is divided into four separate groups: the Technical proposal, the Price proposal, the GILLIG corporate Qualification's proposal and the Proprietary/Confidential information package requirements. For your convenience navigating the proposal, we have included a Table of Contents.

In the Technical proposal, you will identify information which defines the bus components, highlights its operation and expected performance, and details the applicable vehicle data sheets. This section also identifies our organizational project support team, which yields significant benefits to **PSTA**, namely access to our superb Engineering, Production, Service and After-Market Parts departments. Customer references and testimonials demonstrating the extraordinary preference for GILLIG are also contained in the Technical proposal.

In addition to the bus pricing, our Pricing proposal includes the costs for such items as spare parts, additional training and test equipment, if required.



Our Qualifications package includes Pre-Award evaluation data (when required at this stage), insurance coverages, all required proposal forms and federal certification documents.

Any Proprietary/Confidential information submitted with GILLIG's proposal will be inserted in a separate, clearly marked package.

#### PROVIDING LONG-TERM VALUE

We commend **PSTA**'s procurement process, which **emphasizes long term value and total cost of ownership vs the cheapest purchase price.** We maintain that a product's design and features, as well as its reliability, durability, quality and total cost of ownership are all components which comprise its overall value; with the weight of each of these factors being determined by each customer's unique requirements.

In addition to product value, the other factors critical for a satisfying purchase are **on-time delivery, training and field support, and a long-term partnership with the manufacturer**. These latter items may prove difficult to evaluate, but are as important as the initial acquisition cost, particularly for a high-cost, severe duty, purpose-built product like a transit bus. **GILLIG has the integrity, commitment, resources, stability and customer satisfaction**, to deliver on these other factors also. Consequently, we are confident our proposal offers both the **BEST product value** and the **BEST partner to ensure a successful build**, as outlined below.

#### **REDUCING THE RISK**

We believe that –

- a) Bus purchasing can be risky because **buses are a complicated**, **purpose built product and not a commodity**, so the performance of the vehicles may not be evident until the buses have been in service for some time, perhaps years after the purchase decision is made; and with the frequent failures/ownership changes in the North American bus manufacturing industry, support is not always a given.
- b) An informed buyer makes a better decision and so becomes a more satisfied customer, and an informed buyer always selects long term value and avoids unnecessary risk – which means GILLIG, because we've always maximized long term value and minimized risk; and
- c) Two thirds of BUS is us, so when buying a bus it's critical to know about the US part the company's reputation, its integrity and commitment, its capabilities and performance and its' long-term and customer strategies because this can be the riskiest aspect of a bus procurement.



#### **EVALUATION AREAS**

To facilitate the evaluation of GILLIG's proposal, we have expanded on the following areas below –

- **COMPANY HISTORY** Possessing a long-term focus with over 130 year's experience manufacturing transportation vehicles.
- **RELIABILITY AND MAINTAINABILITY** The best mean distance between failure (MDBF) in the industry.
- **PRODUCT FEATURES** Unique designs and benefits.
- DRIVER AND PASSENGER COMFORT Advanced features.
- **MILEAGE** More miles of everything.
- INITIAL AND LIFE CYCLE COSTS Lower overall cost means better value.
- **DELIVERY** Incident free and we're never late.
- **REPUTATION AND PERFORMANCE** Consistent and unbeatable.
- **FINANCIAL SECURITY** Privately held with extensive financial resources
- **MANAGEMENT PLAN** To ensure successful completion of contract.
- **SUMMARY** Value you can count on.

#### COMPANY HISTORY

GILLIG has an **unbeatable history of long-term stability, continuous improvement, state-of-the-art technology, unfaltering integrity and responsibility, great customer satisfaction** and a passion for performance. We demand and promise the highest levels of performance from our people, our products and our company -- and we have a history of converting this performance into satisfaction for our customers.

More details of our history are explained elsewhere in our submission, but the highlights are: Over 130 years of continuous success, with an impressive array of design firsts, an unblemished record of financial stability, **an unequaled record of organizational stability, the most transit experienced people and management, unquestionable integrity and trust**, and an unbeatable level of performance. The combination of this history, this experience, these skills and this performance, yields a product renowned for its reliability, durability and economy, resulting in the highest levels of customer satisfaction -- not our words -- please read the many customer testimonials included with our proposal.

GILLIG is a privately held company, with materially the same management, physical and financial resources which insured GILLIG's successful execution on previous **PSTA** contracts. Our ownership is dedicated to strengthening those capabilities, so we are confident we will exceed your expectations for this new contract.

Our history proves -- YOU CAN COUNT ON US.



#### **RELIABILITY AND MAINTAINABILITY**

These are the heart and soul of any commercial equipment and **certainly the strengths of GILLIG's transit buses**. We know that <u>your performance</u> is measured by up time and operating expense, so **our buses are designed and built to maximize up time and minimize operating expense**.

Our Low Floor bus has a proven history of excellent performance and incorporates significant features which improve its operating performance. We use this same Low Floor platform for all our power modes including our electrified power train to provide you with the standardization of parts and training on the remaining 80% of the bus that you have and already know. The foundation of the GILLIG bus starts with a robust stainlesssteel structure for strength, durability and maximum corrosion resistance. Compare that to some competitors' standard carbon steel structure and it is evident our stainless-steel chassis design is 130 times more resistant to corrosion. That stainless-steel chassis design also incorporates a clever and unique side impact barrier to enhance the safety of the passengers. The body is constructed with an all-aluminum, bolt-together structure, which (1) reduces weight significantly, (2) is easy and inexpensive to repair because of its simple bolt-together design, and (3) is corrosion resistant. The use of standard tires extends tire life and cuts replacement costs, as well as provides for traditional approach and departure angles. The use of Meritor's proven axles and brakes also reduces costs and avoids additional training for mechanics. Large access doors and simple skirt panels improve operating performance because of reduced maintenance hours and lower parts costs.

The GILLIG BEB has recently completed Altoona testing with a score of 86.3 (Report #LTI-BT-R2020-05). The final report is included in our Technical bid submission as requested.

Please read the included customer testimonials and other **reliability and maintainability data, proof that our transit bus is great and getting better**. We are proud of our products and our achievements and believe **an informed purchaser will make the right choice – GILLIG!** 



#### **PRODUCT FEATURES**

We believe this proposal will demonstrate that our vehicles have the best features and technologies to meet your requirements and that our designs result in the most reliable, durable, and cost-effective battery electric low floor bus to maintain and operate.

Our Low Floor bus uses forward-looking technology with some unique ideas to avoid the inherent compromises found in most other low floor designs.

Our Low Floor interior and exterior designs are functional and practical. Our concern for easy maintenance and lower repair or replacement costs, keeps the exteriors and interiors simple and uncluttered. Our Low Floor's exterior is pleasing, functional, practical and safe, while its interior is also pleasing, functional, safe and comfortable.

Passenger and driver safety also play a big part in our design strategy. Our Low Floor has a very robust structure, and **many customers will attest to its strength**. So, in accidents, or after hard transit usage, the driver and passengers are always safe and protected. Our unique stainless-steel side impact protection barrier provides a safe enclosure for your passengers and drivers.

GILLIG's unique bus electrification solution includes the use of the Cummins' Electrified Power System. As a result of our strategic partnership with Cummins, this electrified power system brings state of the art technology to the bus electrification industry and is supported by their local distributor network for quick response to service, warranty and training requirements.

#### DRIVER AND PASSENGER COMFORT

Ergonomics dictate the design of the driver's workstation and controls in the GILLIG bus. Our engineers went well beyond sufficient seat adjustment and a tilt/telescoping steering wheel, to include the placement of displays and controls, driver's storage box, sun visors, etc.

During the various design phases, we concentrated particularly on the driver's compartment. Visibility and comfort are key factors of our design, as is vehicle control, (which depends

a lot on the vehicles' ride and handling). GILLIG's Low Floor design incorporates a bulged, tilted-back windshield feature to further reduce reflections. Customer feedback indicates that drivers

prefer driving GILLIG electric buses, because they have better visibility and they ride and handle better, so drivers are more in control and more confident. We also provide the necessary space and comfort, along with superior heating and cooling -- **a total environment for the driver to work efficiently, safely, and comfortably**.



**Passenger safety and comfort are enhanced** by a robust welded stainless-steel understructure (torsionally rigid body ensures a smoother ride) and low floor side impact steel beams, a unique safety feature in the industry. Passenger comfort is further ensured with a **4 air bags rear suspension**, along with advanced frequency selective shock absorbers. Wide doors and aisles, and the largest windows (total square inches) and narrow window posts add to the comfort level, and large tires smooth out the bumps (they don't drop as far into potholes and have more air to cushion the bumps). Overall a great ride for the driver and passengers.

#### **INITIAL AND PROJECTED LIFE COST**

The initial price is obviously important; however, we respectfully point out that our pricing history has always been consistent and low. We do not "gouge" customers in a seller's market, as that would be unfair and irresponsible, and **our integrity and your trust are more important than a short-term profit**.

The projected life cycle cost is less definable, but we think more important, however it is more difficult to assess in this relatively new electrification industry where these buses haven't yet reached their complete life cycle. It is also more prone to abuse from irresponsible manufacturers who make inflated claims that would take years to disprove and are impossible to enforce. While we agree that duty cycle and maintenance practices greatly affect life cycle costs, we believe our other customer's experiences should still be a good guide for **PSTA**.

Our customers confirm that **GILLIG buses have lower operating costs, require fewer man-hours to maintain, and have the best road call mileage**. Also, GILLIG service parts are usually lower cost (because of vehicle design) and our stocking and administration of that department ensures quick delivery and minimizes your inventories.

#### DELIVERY

An early delivery promise is only half the story. Keeping that promise has proved impossible for our competitors -- but we always deliver on time. We have a 20+ year history of never being late and have never been required to pay any liquidated damages. Please ask around -- you will find we are the only bus manufacturer to consistently deliver on-time and we are certain you will be pleased with our proposed delivery schedule.

GILLIG is extremely proud of its delivery record. Our on-time delivery performance is exceptional and our new, purposely built, state of the art production facility in

Livermore CA will continue that reputation. This new production facility gives GILLIG the ability to schedule many difference customers' builds simultaneously so all delivery expectations can be met. Please reference the various customer testimonials and delivery documentation within our proposal to gauge our on-time delivery experience.



GILLIG's refined processes and procedures that are developed through our continuous improvement process also insure the accurate and timely delivery of our buses. From the initial documentation of the customer specifications to the final QA checks as the bus leaves our facility, GILLIG's accountability for the specific bus build and production process continues to lead the industry.

Please take our history of being the only manufacturer to consistently deliver on-time into account when evaluating all delivery proposals in this procurement.

#### MANUFACTURER'S REPUTATION AND PERFORMANCE

We believe these are very important factors because they are the main measures of how a manufacturer will perform. Without the necessary qualifications, experience, resources, and integrity, the promise of low price, specification compliant product, and statements of field support could turn into hollow promises.

GILLIG is the most respected and responsible bus manufacturer in the US and has proven our ability to consistently perform on bus manufacturing contracts time and time again. GILLIG's flat organization and single production facility provides many unique benefits in fulfilling bus contracts such as this one. With 130 years of transportation experience coupled with over four decades of FTA and heavy-duty bus building experience, GILLIG's contractual performances have far surpassed that of any competitors. Our excellent industry reputation Is documented by many customer testimonials within this proposal.

GILLIG's qualifications are based on a proven history of **Performance**, an extensive and proven **Engineering Expertise**, extensive and proven **Manufacturing Expertise**, proven **Plant Facilities**, proven **Management Expertise** and a proven **Management Plan**.

GILLIG's measure of our Quality Assurance performance is ultimately based on both short term, as well as long-term performance of our product in service. GILLIG has in place a full Quality Control Department and Quality Assurance Program to meet or exceed all customer and industry requirements. Remember, the only guarantee of quality is the manufacturer's reputation; ISO 9000 or similar certifications are only indications that a **quality system exists, NOT a measure of production quality** – output quality is best gauged by reputation, and it depends on attitude and capability.

In the end, our financial strength, our consistent delivery performance, our products' reliability, our responsive field support and most of all, our friendly customer relationships all go to **making us the best and most responsible bus manufacturer**, and we sincerely hope you agree with this conclusion.



We believe reputation is very important when making a long-term purchase decision (15 to 20 years) because products and proposals can be "doctored" to look good, but a reputation can't. Reputations of good attitude, commitment, or performance history take years to build and so, are the best gauge for a long-term decision.

#### **INTEGRITY AND EXPERIENCE**

Integrity is one of GILLIG's key core values that we focus upon and is consistently discussed at the Executive team and the Managerial team level meetings. As a privatelyowned company, GILLIG is uniquely positioned to make those right decisions that positively impact our customers and our outstanding reputation. And because we are privately held, GILLIG is not subject to questions and statements from financial analysts who are more concerned with short term gains instead of the long-term reputation. Accountability within the appropriate levels of our organization is an important ingredient to our success and we are confident that our accountability has been proven over many years of our partnership with **PSTA**.

As to experience, **GILLIG is the number one 35'/40' heavy duty bus builder** in all North America, even though we only sell buses to United States transit agencies, not Canadian. GILLIG's vast experience with small, medium and large transit agencies gives us a very unique perspective on various requirements from the agencies' side. We currently have approximately 500 cities in the US that operate GILLIG heavy duty transit buses in a wide variety of ambient temperatures, terrains, environments and operating conditions. Transit agencies from the east coast to the west coast, Alaska to Florida, Maine to California (and Hawaii) enjoy the high reliability and durability of the GILLIG design. GILLIG's experience includes the design and manufacture of clean diesel, CNG, Hybrid Electric and Battery Electric buses.

#### QUALITY OF PERFORMANCE OF PREVIOUS CONTRACTS

Over the last few decades, GILLIG has delivered many different bus contracts to **PSTA**. These contracts include diesel, CNG and Hybrid buses. The GILLIG quality of performance for each of these contracts, we believe, has been exceptional and we hope that you agree as well. Whether quality is determined on the product design, the manufacturing process, on-time delivery, service, aftermarket parts supply or overall performance of the contract, GILLIG **delivers on the entire bus supplier program**. After many multi-year procurements with **PSTA**, GILLIG is proud of our performance with you, as well as the many thousands of other contracts we successfully completed in every case over many years in business.



#### **COMPLIANCE WITH LAWS, ORDINANCES AND FTA REGULATIONS**

Compliance to existing laws, ordinances and regulations is not new to GILLIG. Over the years and through GILLIG's vast bus design and building experience, we have become experts in the understanding and execution of the regulations from EPA, ADA, FMVSS, FTA and various state laws, just name a few. GILLIG is a certified TVM with the FTA and meets all the DBE, Buy-America and other FTA requirements.

Also, GILLIG's Engineering and Compliance teams implement the **highest safety standards** and the subsequent designs into our buses to meet and exceed those regulations. This is particularly important with high voltage electrification systems and GILLIG leads the industry in the safety precautions and designs of those systems.

#### HAVING THE ESSENTIAL FINANCIAL RESOURCES

GILLIG is by far the **most financially secure bus manufacturer in North America**, and we have been so for many decades. It is important to note that GILLIG has **no long-term debt** and has the necessary cash to run a very capital-intensive manufacturing organization. GILLIG does not request, nor desire, progress payments from our customers as that financial responsibility should be placed solely on the bus builder. It would not seem prudent from a buyer's perspective to even consider a supplier that would even request progressive payments!

Additionally, a business practice in the bus industry unique to GILLIG is that we always **pay our suppliers in a timely manner**, and that is one of the important reasons why GILLIG is their preferred OEM to support.

GILLIG also has **unlimited bonding opportunities** because of our consistent ability to perform on our contracts. Even if large Performance Bonds or other types of bonds are required in contracts, our cost for those bonds are so low that such costs would not even be included in our contract/bus prices.

GILLIG's consolidated financial statements are audited by a multinational professional auditing firm that has been performing our audits for many decades. Our audited financial statements consistently **confirm GILLIG's excellent and stable financial condition** and thus ensure our capability to fully satisfy your bus manufacturing requirements.

GILLIG has been, and continues to be, in good standing with all their contracts. GILLIG has never been debarred or suspended by any governmental agency. Our **ability to consistently perform on our contracts is second to none**, and we trust the **PSTA** will positively evaluate GILLIG as the most prudent choice for this contract.

Be assured, **GILLIG is your ZERO RISK CHOICE**, with relationships you know **you can trust** — and we will stake our reputation on that!!



#### MANAGEMENT PLAN

GILLIG's proven management plan is the result of refining the sales and production processes of heavy-duty buses based upon our many years of transit experience. Directed by our highly experienced Executive Team, our **management plan stresses continuous measurable improvements in processes and procedures** to make sure our buses are delivered timely, and to the highest quality standards, to exceed our customers' expectations.

GILLIG truly understands the importance to **PSTA** of this electrification conversion and commits to the following to ensure project success. Although **PSTA** is already very familiar with the GILLIG team and the management plans that we have implemented on previous contracts,

GILLIG wishes to assure **PSTA** that similar successful management plans will be used here as well, with of course, the appropriate refinements that are necessitated for an electric bus build.

Our Executive Management Team for this PSTA project will consist of the VP Sales, VP Engineering, Executive VP Manufacturing and Customer Support, and the VP Parts. Each has a very defined role in the launch, execution and completion of the contract. Each of these executives has a team of highly skilled professionals and has the human and physical resources currently in-house that will be committed to this PSTA project. Various Directors/Managers in each group will oversee the daily activities for the project who report to the various VPs. Since GILLIG does not subcontract any work regarding the building of the buses, GILLIG has complete responsibility and control!

Our Management Plan starts with the receipt of the procurement documents that get examined thoroughly by an extremely knowledgeable Sales team and Project Sales Management team who initiate the complex process of electric bus building with you, so the contract can be precisely documented and executed to assure we exceed your expectations. A pre-production meeting occurs usually within 8-9 months prior to production start of the first bus to finalize the Sales Work Order. Upon release of the Sales Work Order internally at GILLIG, it is transferred to the highly experienced Purchasing and degreed Engineering teams to develop the proper Bills of Materials and proceed with any unique customer design requirements so the required material can be purchased. The GILLIG Production and QA teams then manufacture your buses to the exact build sheet of your specification to provide you with the high quality and reliable buses that you are accustomed to and expect from GILLIG. The production time of each bus is only about ten days and our current order backlog and order processing time results in an estimated start of delivery within 12-14 months. After delivery of the vehicle from our Livermore, CA facility, our fully qualified aftermarket Service and Parts teams help you place the buses in service quickly with a seamless PDI process and help keep them in service with timely delivery of spare parts at very competitive prices.



It should also be noted that **GILLIG embraces a unique partnering philosophy** with our customers. We believe this partnering approach allows for sincere discussions to avoid conflict and allows us to **collectively exceed our mutually agreed goals**. GILLIG has routinely demonstrated with all our customers our openness, accessibility and willingness to support our product and provide the highest level of respect.

Please see our specific **PSTA** Management Plan in the appropriate section of this proposal for your specific timeline.

#### **SUMMARY**

We believe we are the best manufacturer for **PSTA** and are confident that you will agree. Our product, our life cycle cost, our qualifications and our past performance are second to none. **PSTA** can be secure in the knowledge that a contract with GILLIG for this purchase will provide the best product and support, as well as a valued long-term partner.

Please take a moment to read the included customer testimonials -- positive statements from customers about our company, our products, and our people.

WE BELIEVE PRICE IS IMPORTANT, BUT NOT AS IMPORTANT AS TOTAL LIFE CYCLE COSTS, PERFORMANCE, RELIABILITY, EXPERIENCE AND LONG-TERM CUSTOMER SATISFACTION.

#### FOR LONG-TERM VALUE --- YOU CAN COUNT ON US.

As the leader in the US heavy-duty transit bus market, you can be assured that GILLIG is your best choice for your Electric, CNG, Hybrid and Diesel bus needs. We thank you for your consideration and hope this Summary has demonstrated that we are the BEST choice for your operation.

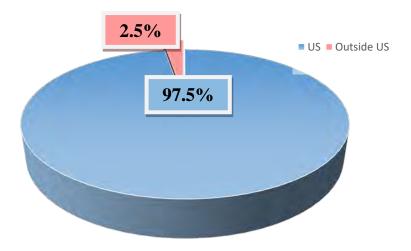


#### **GILLIG SUPPORTS AMERICAN JOBS**

GILLIG LLC is a privately owned American manufacturer of heavy duty low floor transit buses located in Livermore, CA. and is the leading supplier of heavy duty transit buses in cities throughout the United States. 100% of GILLIG's manufacturing process is completed in America by American workers, who in turn reinvest those tax dollars back into the American economy to help strengthen our nation and support American jobs. This is not a new practice for GILLIG, we have been manufacturing transportation equipment in America for over 129 years and we are proud to be part of the solution to build our nation's economy and be a strong supporter of American jobs.

- $\checkmark$  100% of GILLIG employees live in the U.S.
- ✓ 100% of GILLIG employees pay U.S. taxes
- ✓ Your tax dollars get recycled into the U.S. economy

### **GILLIG DOMESTIC SPEND ANALYSIS**





#### **CUSTOMER REFERENCE LIST (BEB)**

Our **ZERO EMISSIONS BATTERY ELECTRIC BUS (BEB)** offering joins GILLIG's industry leading Low Floor bus platform to bring the most comprehensive, advanced battery electric bus to the market.

GILLIG's Zero Emission Battery Electric bus incorporates the Cummins electrified powertrain, which provides the advantage of full local service support with hundreds of service centers throughout the country to provide the necessary training, warranty administration, and aftermarket parts. All designed, built, and supported right here in the United States.

Please see the below reference list for current Battery Electric Bus customers. GILLIG has built and delivered well over 60 Battery Electric Buses to over 25 different customers.

#### Customer: Santa Monica, CA (Big Blue Bus)

- Address: 1660 7TH Street Santa Monica, CA 90401
- Contact: Adrian H. Garcia, Transit Maintenance Vehicle Supervisor
- Phone: (310) 633-1852
- Email: adrian.garcia@smgov.net

#### Customer: Tucson, AZ (Sun Tran)

Address: 3920 N. Sun Tran Blvd. Tucson, AZ 85705

Contact: Jim Gleason, Director Maintenance

Phone: (520) 206-8891

Email: james.gleason@tucsonaz.gov

#### Customer: Honolulu, HI (The Bus)

Address: 650 South King St. Third Floor Honolulu, HI 96813

Contact: Adam Tamayoshi, VP of Maintenance

Phone: 808-768-9463

Email: adam.tamayoshi@thebus.org

#### Customer: Kansas City, MO (Kansa City Area Transit Authority)

Address: 1350 East 17TH St. Kansas City, MO 64108

Contact: Chuck Ferguson, VP, Bus Operations

Phone: (816) 346-0353

Email: <u>cferguson@kcata.org</u>

#### Customer: Kitsap, WA (Kitsap Transit)

Address: 60 Washington Ave, Ste. 200, Bremerton, WA 98337

Contact: Dennis Griffey, Vehicle & Facilities Maintenance Director

Phone: (360) 478-6229

Email: <u>dennisg@kitsaptransit.com</u>



#### **CUSTOMER REFERENCE LIST (BEB)**

Customer: Bellingham, WA (Whatcom Transportation Authority)

Address: 4111 Bakerview Spur, Bellingham, WA 98226

Contact: Michael Bozzo, Director of Fleet and Facilities

Phone: (360) 788-9351

Email: <u>mikeb@ridewta.com</u>

#### Customer: Portland, OR (Trimet)

Address: 1800 SW 1st Avenue, Suite 300, Portland, OR 97201

Contact: Samuel Rumhizha, Director, Bus Maintenance

Phone: (503) 962-5840

Email: rumhizhs@trimet.org



#### MEMORANDUM FOR RECORD

To Whom It May Concern;

Date: March 2, 2021

Letter of Reference for Gillig LLC

I have been working in various positions in the public transit industry for the last 25 years. I started as a bus mechanic, then, worked as a back –up driver, in Operations, Maintenance Management and Administration. I have been the Director of Athens-Clarke County Transit department since October of 2001.

Over the years, I have either worked on, driven, or helped facilitate the purchase more than 300+ Gillig buses. The various 30, 35, and 40-foot standard and low-floor heavy-duty transit buses, with diesel, hybrid, and/or electric propulsion systems have been reliable vehicles for this system, as well as many other transit systems across this county. Gillig's customer services from product order, though production and delivery, to their after the sale, replacement parts and repair programs, their staff and services have always been exemplary.

I believe that Gillig builds the best heavy-duty transit buses in the industry. From their sales staff, the engineers, the workers on the assembly line, to the parts department folks, they all are reliable partners to our organization and they stand behind their products as a company and as a member of the team.

I would highly recommend Gillig LLC, their staff and their products to any system in the industry.

Thank you,

Patch MEAle

Butch McDuffie Director, Athens-Clarke County Transit Department Athens, GA 30601 706-621-0667

**Transit Department** 



**Big Blue Bus** Transit Maintenance 1660 7th Street Santa Monica, CA 90401

September 14, 2020

Mr. Joe Policarpio Vice President of Sales and Marketing GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Policarpio,

Big Blue Bus (BBB) would like to thank GILLIG for helping us provide safe and reliable buses that represent the latest in bus technology and clean fuel sources. Since 2012, you have helped us maintain the highest quality fleet and become the first transit agency in Southern California to purchase buses with near-zero compressed natural gas (CNG) engines. With GILLIG, BBB crossed a historic threshold in August 2019: the in-service deployment of our first zero-emission battery-electric bus, which is performing beautifully.

Our GILLIG battery-electric bus has exceeded our expectations and those of our customers. It performs as well as our other 124 GILLIG buses. Your cutting-edge bus uses state-of-the-art battery-electric technology, design features, and power capabilities while offering an unparalleled quiet and smooth ride. Because of the incredible reliability and serviceability of our in-service GILLIG battery-electric bus, BBB will be deploying 18 additional GILLIG zero-emission battery-electric buses by 2021.

Our GILLIG battery-electric bus deployment also marks a significant step toward preserving our environment and protecting our communities as we complete the transition to a zero-emissions fleet by 2030. We can't think of a better partner to provide safe, reliable, and efficient transportation services that improve and enhance our community's quality of life. We look forward to a long, mutually beneficial partnership with GILLIG.

Sincerely,

Getty Modica Transit Maintenance Manager



September 14, 2020

Mr. Joe Policarpio Vice President of Sales and Marketing GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Policarpio,

We couldn't be prouder to partner with GILLIG on 2 FTA Lo or No Emission Grant programs as we invest in creating an innovative and smart transportation system through our in-service GILLIG zero-emission battery-electric bus.

For almost 20 years, GILLIG has provided Tucson with the most reliable buses—dieselelectric hybrid, near-zero emission compressed natural gas, and clean-diesel—all designed on the proven GILLIG Low Floor platform to maximize fleet commonality.

In April 2020, our first zero-emission electric bus from GILLIG hit the streets, and we couldn't be more impressed with its performance. Our bus performs as well as our current GILLIG fleet and now confirms our perception that GILLIG is providing the safest, highest quality, most reliable, and best-supported battery-electric bus on the market. With its advanced technology, our GILLIG electric bus also provides a quieter and more comfortable ride for our passengers. Sun Tran looks forward to receiving our 10 additional GILLIG electric buses as we build a more sustainable community and cleaner air.

Thank you for providing market-leading, dependable solutions as we begin our zeroemissions journey, electrifying our city's vehicle and transit fleet. With the help of GILLIG buses, Sun Tran is an industry leader in safe, reliable, and sustainable transportation solutions.

Sincerely,

Kevin Faulkner Director of Procurement Sun Tran



Oahu Transit Services, Inc.

811 Middle St. Honolulu, HI 96819-2316 telepbone (808) 848-4400 facsimile (808) 848-4419

www.thebus.org

The Bus The Handi-Van

June 23, 2020

Mr. Joe Policarpio Vice President of Sales and Marketing Gillig L.L.C. 451 Discovery Drive Livermore, CA 94511

Dear Mr. Policarpio,

I would like to express my eagerness on taking this momentous step towards the electrification of mass transit with Gillig. There is absolutely no other manufacturer that I would prefer to partner with on such an important endeavor. Your dependable product and outstanding customer support are the cornerstones of the strong relationship that has continued over the years between the City and County of Honolulu, Oahu Transit Services, Inc. and your Corporation.

Currently, the City and County of Honolulu operates a fleet of 367 Gillig buses. The durability and dependability of your buses are evident in our oldest fleet aged at 23 years and in our most utilized fleet having traveled over 1,000,000 miles. Impressionably, we consistently witness your revolutionary advancements with improved fuel economy and lowered operational cost. Reinforcing our reasons why we have confidence in your new electric bus. We know that it will be reliable, well-engineered and environmentally beneficial.

The only factor that surpasses your amazing product is the outstanding customer support that we consistently receive. It is obvious from working with your staff throughout the company, how strongly Gillig is dedicated to their clients and how much they believe in their product. Everyone on staff has proven to be extremely knowledgeable, courteous, and always willing to go the extra mile. Mr. Joe Policarpio June 23, 2020 Page 2

As we anxiously wait for the arrival of our first electric bus, we are anticipating that it will to be a success. I am confident that these buses will provide reliable and efficient public transportation for the people of Honolulu for many years to come. I foresee a promising future with a continued partnership between the City and County of Honolulu and Gillig.

Sincerely,

<u>C</u>.

Adam Tamayoshi Vice President of Maintenance



75 Langley Drive | Lawrenceville, GA 30046-6935 770.822.7446 www.gwinnettcounty.com | www.gctransit.com

Karen Winger AICP CCTM, Transit Division Director Gwinnett County Department of Transportation 770.822.7422 Karen.winger@gwinnettcounty.com

To Whom It May Concern,

This letter is for the recommendation of GILLIG bus manufacture. Gwinnett County purchased the first set of 28 forty-foot long local buses in 2015 as part of the Athens-Clarke County bus consortium. We have since purchased an additional 10 buses with GILLIG through this same contract, receiving our final 3 buses as recently as June of 2020.

Since our first bus arrived, GILLIG has always been prompt, professional and courteous at every step of the process. Whether it be from the presale to finalizing the order, all the way to delivery of our brand new bus, GILLIG has always been responsive to our needs and concerns, in addition to being quick to rectify any issues.

When it comes to sales and service, not only is the GILLIG product a quality and dependable product in the best of times but it is also a product that can come through when need them the most. During the height of the COVID-19 pandemic, GILLIG was able to ship us operator barriers for our entire fleet in less than a month of request.

I am happy to recommend GILLIG to anybody who is looking for a quality bus product.

Karen A Winger

Karen Winger AICP CCTM Transit Division Director, Gwinnett County



Indianapolis Public Transportation Corporation 1501 W. Washington Street Indianapolis, IN 46222 317.635.3344 www.IndyGo.net @IndyGoBus

June 9, 2020

Mr. Jim Ryan Regional Sales Manager Gillig Sales GILLIG LLC 25800 Clawiter Road Hayward, CA 94545

Dear Mr. Ryan,

I'm writing today to thank you and the Gillig team for your continued partnership and service in providing vehicles for the Indianapolis Public Transportation Corporation (IndyGo).

IndyGo currently operates a fleet of 172 Gillig buses. The Gillig team recently provided exceptional service by working with IndyGo to expedite an order of thirteen additional buses to assist with the future implementation of system changes. Gillig's dedication to customer service is evident, and felt even more so as we navigate a new environment for both businesses and transit agencies. We are proud to have partnered with Gillig for over twenty-five years.

Our Operators and riders know they can rely on Gillig's vehicles to transport them around the city. In a time when most travel is for essential trips, we know how important it is to have vehicles we can count on. The Gillig team continues to provide excellent customer service and high-quality products to our agency. We look forward to our continued partnership.

I would be happy to recommend Gillig's products and services to prospective customers.

Sincerely,

Inez Evans President and CEO IndyGo



June 2, 2020

Mr. Jim Ryan Regional Sales Manager GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Ryan;

For more than 30 years, the METRO Regional Transit Authority has been doing business with GILLIG. I have personally had the pleasure of being able to use GILLIG vehicles at all three transit properties with whom I have been associated. From the time, I was a bus operator in Akron, Ohio to overseeing the maintenance department in Nashville to managing Knoxville's transit system in Tennessee one bus company has remained the focal point of these transit systems, GILLIG.

GILLIG has an outstanding product they stand behind and a customer service driven mission that is the best in the industry. From the day the bus comes off the production line to the day the bus runs its final mile into retirement, GILLIG provides superior quality, training, service, and support to this organization. Their business model shows their passion, integrity, and quality for their customers. You are truly never alone when you have made the commitment to purchase GILLIG vehicles. You become part of the family. They seek out your input into future ideas and projects while advancing the bus technology that makes their buses the ones operators want to drive, passengers want to ride, and organizations want to buy.

Top this all off with the amazing dedication and assistance my organizations have always received from you as our sales representative and you have what I consider to be the best of the best. It is with great pleasure that I provide this letter of recommendation to perspective customers of the GILLIG Corporation.

Yours in accessible transportation,

Dawn Distler Chief Executive Officer



416 KENMORE BOULEVARD AKRON, OHIO 44301 phone: 330.762.7267 / fax: 330.762.0854

web: AKRONMETRO.ORG



Jeff Mundstock

Interim Director of Fleet and Facilities 1401 Bank Street Cincinnati, OH 45214 (513) 632-7612 PH (513) 513-632-7505 FAX jmundstock@go-metro.com

June 2, 2020

Mr. Jim Ryan Regional Sales Manager Gillig LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Ryan,

I have had the pleasure in working with Gillig for almost 10 years. SORTA/Metro as an organization has participated with Gillig in over 10 builds, totaling over 550 buses in recent decades for heavy duty transit coaches.

In my experience, Gillig has been paramount in build quality and customer service. From the preproduction meeting, to support years after the coach is in service, right down to replacement parts, Gillig has always focused on being customer-driven and has supported SORTA as an organization through the entire time we have been partners. SORTA has had other bus manufacturers in recent years, and I will personally say that Gillig well exceeds rival manufacturers in regards to customer service, support, and quality.

Within the past year, Gillig sent a team of engineers and production managers to our facility to inspect older buses that we still had in service well past their 12 year useful life. We took them out to see some of our 2004 Phantoms we still had in service at the time. The purpose of this visit was to investigate how the buses held up over time in our climate, and how that information will help them in future designs and builds. This process demonstrates Gillig's attention to detail and commitment to building a product to last well past the FTA useful life expectancy.

Our relationship with Gillig will extend well into the future of our organization, as we have recently started yet another 5 year contract for the purchase of 40' heavy duty transit buses. I am looking forward to our future endeavors as a partnership and would be pleased to recommend Gillig to any future potential customers.

Sincerely,

1

Jeff Mundstock Interim Director of Fleet and Facilities



KANAWHA VALLEY REGIONAL

P.O. Box 1188 Charleston, WV 25324 1550 Fourth Avenue Charleston, WV 25387 PHONE 304.343.3840 FAX 304.343.3877 WEB RIDEONKRT.COM

June 2, 2020

Mr. Jim Ryan Regional Sales Manager Gillig L.L.C. 451 Discovery Drive Livermore, CA 94551

Dear Mr. Ryan:

On behalf of the Kanawha Valley Regional Transportation Authority (KVRTA), I would like to take this opportunity to thank you and the entire Gillig team for the excellent service, support and buses that have been afforded to KVRTA over the past seventeen years. Our entire organization feel that the Gillig buses are the finest buses that we have ever operated at KVRTA. During my thirty-eight-year career in public transit, the relationship established with you, David Clawson and others at Gillig has been unmatched, and makes my life as Executive Director of the Authority much easier knowing I don't have to worry about our Gillig fleet.

KVRTA appreciates the fact that Gillig and its employees pride themselves on being a customer-driven organization and has always exceeded our expectations. The assistance that you, David, and others at Gillig provide not only KVRTA, but all the transit systems in West Virginia is truly unparalleled. Keeping us updated on industry trends, technological advancements and changes in the industry further demonstrates Gillig's dedication to meeting its customer needs as well as the needs of others.

Industrywide, Gillig is highly respected and undoubtably is a leader in the bus manufacturing field and is known for producing quality vehicles. Our operators, maintenance staff and passengers all reap the benefits by KVRTA purchasing quality products from Gillig.

It has been a pleasure to work with you, David and the entire Gillig team over the years. I am more than willing to recommend Gillig to any of your prospective customers.

Sincerely, J. Douglas Hartley **Executive** Director

Cc: David Clawson



June 2, 2020

Mr. Jim Ryan Regional Sales Manager Gillig LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Ryan,

I have had the pleasure of doing business with Gillig for over 30 year. During this time, I have found Gillig and its employees to be a customer-driven organization that has provided the highest levels of customer support. Gillig employees are dedicated and knowledgeable about their products, whether it is the coaches they produce or parts they provide to maintain the coaches.

Part of the success Gillig and WRTA have had is the continued support that is provided from the day a purchase order is issued until the day the coach is retired from service. The whole procurement and production process are well thought out and completed in a very effective manner. Gillig's coach manufacturing facility is one of the best examples in how to build a heavy-duty transit coach.

We appreciate the input Gillig seeks from WRTA and others in the transit industry as they continually make advancements in the design of the coach to provide a better product each year to meet the needs of its customers.

It is always a pleasure to work with you and your team. I would highly recommend Gillig to any of your prospective customers.

Sincerely,

Dean J Harris Executive Director

Carm Basile Chief Executive Officer 518-437-6840 carmb@cdta.org

May 27, 2020

Mr. Joseph Policarpio, Vice President Sales & Marketing GILLIG, LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Policarpio:

The Capital District Transportation Authority (CDTA) is in the final year of our third five-year contract with Gillig for the purchase of transit vehicles.

Gillig consistently delivers a quality product, on time and according to our specifications. The Gillig staff are professional, attentive, and top-notch representatives of your company. We know that buses will be delivered in accordance with the contract requirements, and any issues which are usually few and minor in nature, are attended to in a timely manner.

We appreciate Gillig's ability to stay at the forefront of the latest developments in transit technology and the fact that these developments are consistently communicated to us. Jerry Sheehan has been our principal contact for close to 15 years, and we appreciate his efforts on our behalf.

Cordially,

Com Brile

Carm Basile Chief Executive Officer

Jayme B. Lahut Chairman Schenectady County

Michael J. Criscione Vice Chairman Albany County

Mark Schaeffer Secretary Albany County

David M. Stackrow Treasurer Rensselaer County

Georgeanna M. Nugent Saratoga County

Jaciyn Falotico Schenectady County

Denise A. Figueroa Albany County

Patrick M. Lance Labor Representative

Carm Basile Chief Executive Officer



#### ERIE METROPOLITAN TRANSIT AUTHORITY

127 East 14th Street Erie, Pennsylvania 16503

May 21st 2020

Mr. Jerry Sheehan Regional Sales Manager GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Mr. Jerry Sheehan:

The Erie Metropolitan Transit Authority has maintained a multi-decade strong relationship with Gillig as a result of outstanding customer service, performance reliability and toughness.

If anyone knows anything about Erie, Pennsylvania is that Erie is annually in competition for snow capitol U.S.A. Despite the toughest of blizzards that have at times dropped five, six, and even seven feet of snow over a period of a few days, EMTA has been able to and will continue to rely on our fleet of Gillig buses. The Gillig bus has performed superbly under the harshest of conditions over the decades. As a result, Erie has gained a reputation as the Authority within our Commonwealth to 'never shutdown' operations despite our notorious Erie winter weather.

The Erie Metropolitan Transit Authority highly values our relationship with Gillig as we continue to expand and outfit our fleet with Gillig buses. I highly recommend the Gillig team and product to any Authority in search of reliability, performance and great service.

Sincerely Jeremy Peterson CEO

Telephone: (814) 459-4287•Fax: (814) 455-0071•www.ride-the-e.com

## CITY OF GAINESVILLE



Regional Transit System

May 21, 2020

Joe Policarpio Vice President, Sales & Marketing GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Policarpio:

I would like to express my most sincere appreciation to you and your staff for the outstanding service to the City of Gainesville Regional Transit System (RTS). I am impressed not only by the level of quality service, but also the consistency of that quality year after year. For over 20 years, RTS has done business with GILLIG because we trust the vehicles, the parts and the people who help make our operation a success.

I want also to commend your staff for the training, technical, and warranty support that has allowed our team to place a good product and service on the road. The Sales and Parts staff has been extremely responsive to our demands and needs.

It is through Gillig's performance and reliability that RTS pursued the goal to be have a 100% GILLIG fleet. Looking toward the future, GILLIG's reputation for quality vehicles and services made it easy to take the next big step and embark on a new partnership project - Electric buses. We are eager to begin our new chapter in transportation, knowing that we can trust the GILLIG brand to deliver safe, comfortable, reliable vehicles to convey our passengers.

Sincerely,

Jesus Gomez, Transit Director Regional Transit System



May 21, 2020

Mr. Derek Maunus President and CEO Gillig LLC 451 Discovery Drive Livermore, CA 94551

Derek,

I would like to take a moment to express my sincere appreciation to the entire Gillig organization for the many years of your unwavering support, highest degree of integrity, expertise and product quality that has been and continues to be provided to our agency.

Sun Tran is a small 14 bus agency providing fixed route transit service on seven routes in Ocala, Florida. Subsequently, it is of paramount importance that we have the most reliable and dependable buses available to serve our community and that's why we purchased and operate Gillig buses.

Twenty plus year ago when Sun Tran was determining the best manufacturer to supply our buses, there were several very important factors that need to be considered. Of primary importance to us was having the confidence and assurance to choose a manufacturer with the corporate stability, integrity, commitment, experience and financial capability to support us in a long-term partnership that will span far beyond the life of purchase. Gillig has demonstrated their ability to successfully meet and exceed those expectations and continue to do so.

It is very comforting to place an order with a manufacturer knowing the buses will be built to specification and delivered on time. The reliability of the Gillig Low-Floor bus has enabled us to

City of Ocala Growth Management Department

201 SE 3<sup>rd</sup> Street (2<sup>nd</sup> Floor) Ocala, FL 34471 Phone: 352-629-8287





maintain high bus availability with minimal operating costs. The high-performance standards of the Gillig Low-Floor can be attributed to Gillig's on-going commitment to product improvement.

Gillig has consistently demonstrated that you are a world class organization and we are truly honored to be your partner.

Sincerely.

Steven Neal Transportation Director Growth Management Department City of Ocala

City of Ocala Growth Management Department

201 SE 3<sup>rd</sup> Street (2<sup>nd</sup> Floor) Ocala, FL 34471 Phone: 352-629-8287





May 20, 2020

GILLIG 451 Discovery Drive Livermore, CA 94551

To whom it may concern,

The City of Albany is a long-standing customer of GILLIG. As former owners of model years 2005, 2006, 2009 to currently owning 2016 (4), 2018 (3), and 2020 (8), the customer service & support *before* and *after* delivery remains phenomenal.

I evaluate customer service delivery in both, professional and personal settings. I attest that the customer service and support statements of GILLIG are not just words written on paper; moreover, it is action willingly, or better yet, generously performed by dedicated GILLIG employees. Since 2015, I have been a witness to this action from not just the sales and administrative staff, but also the production team and upward to the President!

In sum, the overall performance and operational enhancements of a GILLIG bus meets the need of our organizational requirement.

#### Angela & Calhoun

Angela S Calhoun Superintendent Fleet Management Department

#### FLEET MANAGEMENT



## JACKSONVILLE TRANSPORTATION AUTHORITY

July 13, 2018

Mr. Joseph Policarpio, Vice President Gillig LLC 451 Discovery Drive Livermore, CA 94551

Dear Mi Policarpio:

I want to take this opportunity to thank you and your team. I have had the pleasure of doing business with Gillig over the past twenty years. Gillig is now on their fourth five-year contract for the State of Florida.

During this time, I have found Gillig and its employees to be a customer-driven organization that exceeds our expectations. Employees are dedicated, knowledgeable, and professional whether they are dealing with new bus orders or when dealing with routine matters.

I appreciate the input sought by Gillig as they continually advance in the area of technology in an effort to meet the needs of the JTA and other industry customers.

Gillig buses are highly regarded throughout the transit industry and Gillig has a solid reputation of building a quality product. The JTA is one that has certainly benefited by purchasing those quality products from Gillig. Satisfying your customers, including delivering on your promises is exemplary.

It is a pleasure to work with you and your team. I would be pleased to recommend Gillig to any of your prospective customers.

Sincerely,

isin Carmay

Lisa Darnall Vice President/CTO



#### SECTION 1: TECHNICAL PROPOSAL

#### TABLE OF CONTENTS (FROM PROPOSAL REQUIREMENTS, PAGE 19)

- 1. LETTER OF TRANSMITTAL • Authority to Sign
- 2. TECHNICAL PROPOSAL
  - 1. Battery Electric Vehicle Configuration,
    - Energy Storage System
    - High voltage battery packs
    - o Optimizing Battery Life, Battery End of Life
  - 2. Traction Motor, Invertor, Regenerative Braking
  - 3. High Voltage DC Junction Box, DC/AC Converter
    - o Electronics Cooling Package
  - 4. HVAC & Thermal Management System
    - o All-Electric Coolant Heater
    - o Dual Mode Coolant Heater
  - 5. Air System Overview, Air compressor, Air governor, Air dryer
  - 6. Steering, Hydraulic System
    - Front Axle, Front Suspension
    - o Rear Axle & Brakes, Rear Suspension
  - 7. Multi-Function Display, Telematics
  - 8. Corrosion Protection Overview, Materials, Locations
  - 9. Maintenance Access with Photos
    - Standard Repair Times
  - 10. Testing & Design Operating Profile Validation
    - o EPA Certification 2022, California Air Resources Board Certification
    - Battery Electric Testing
    - o Altoona Testing Current Information, Altoona Bus Testing Certification
    - Federal Transit Bus Test Report Altoona June 2021
  - 11. Driver Area Instrumentation
    - Dash Console drawing sample
    - Driver Seat Brochure Recaro Ergo Metro
    - o Passenger Seat Brochure American InSight
    - Passenger Seat Layouts 40 foot & 35 foot samples
  - 12. Wheelchair Ramp Information & photos
    - Lift U Brochure
  - 13. High Voltage Battery Pack information
    - o Component Layout
    - Energy Capacity & Range 5 6 7 Packs
  - 14. CHARGER OPTION AVAILABLE
    - o ABB, CHARGE POINT, MOMENTUM, WAVE, SIEMENS
  - 15. GILLIG Paint Appearance Standards



#### SECTION 1: TECHNICAL PROPOSAL

- 3. ACKNOWLEDGEMENT OF ADDENDA
- CONTRACTOR SERVICE AND PARTS SUPPORT DATA

   GILLIG CUMMINS SERVICE & SUPPORT NETWORK
   CUMMINS SUPPORT REFERENCE LETTER
   SERVICE, WARRANTY, ENGINEERING SUPPORT STAFF
   GILLIG STANDARD LIMITED WARRANTY & EXTENDED COVERAGE
   WARRANTY DEPARTMENT SUPPORT
   TRAINING OUTLINE AVAILABLE OPTIONAL TRAINING PROGRAMS
   GILLIG PARTS WAREHOUSE SUPPORT
- 5. FORM FOR PROPOSAL DEVIATION (WITHOUT PRICE DATA)
- VEHICLE QUESTIONNAIRE

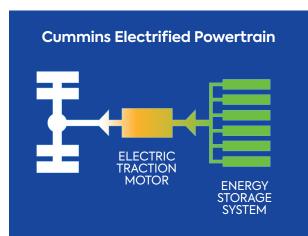
   VEHICLE TECHNICAL INFORMATION 40 FT. EBUS
   VEHICLE TECHNICAL INFORMATION 35 FT. EBUS
- 7. REFERENCES AND NON-PRICED INFORMATION • ZERO EMISSION CUSTOMER REFERENCE LIST • SUCCESSFUL BATTERY ELECTRIC BUS LAUNCH with locations • CUSTOMER REFERENCE LIST
- 8. ENGINEERING ORGANIZATION CHART, ENGINEERING CHANGE CONTROL PROCEDURE, FIELD MODIFICATION PROCESS
- 9. MANUFACTURING FACILITIES PLANT LAYOUT, OTHER CONTRACTS, STAFFING
- 10. PRODUCTION AND DELIVERY SCHEDULE AND OTHER CONTRACT COMMITMENTS FOR THE DURATION OF THIS CONTRACT
- 11. MANAGEMENT PLAN • KEY PERSONNEL ASSIGNED TO PSTA'S ACCOUNT
- 12. QUALITY ASSURANCE PROGRAM
  - o 546 QUALITY ASSURANCE CHECKS
  - o CONTINUOUS IMPROVEMENT PROGRAM
  - QUALITY ASSURANCE MANUAL
  - **o** INSPECTION RECORD

## BUILDING AMERICA'S ZERO EMISSIONS FUTURE



## **Electrify Your Fleet**

Our new battery electric offering joins GILLIG's industry-leading Low Floor bus platform to bring the most comprehensive, advanced battery electric bus to the market. GILLIG's Zero-Emission Battery Electric bus incorporates the Cummins electrified powertrain, which provides the advantage of full local service support with hundreds of service centers throughout the country to provide the necessary training, warranty administration, and after-market parts. Designed, built, and supported right here in the United States.



# BATTERY ELECTRIC ZEROEMISSIONS

## **Specifications:**

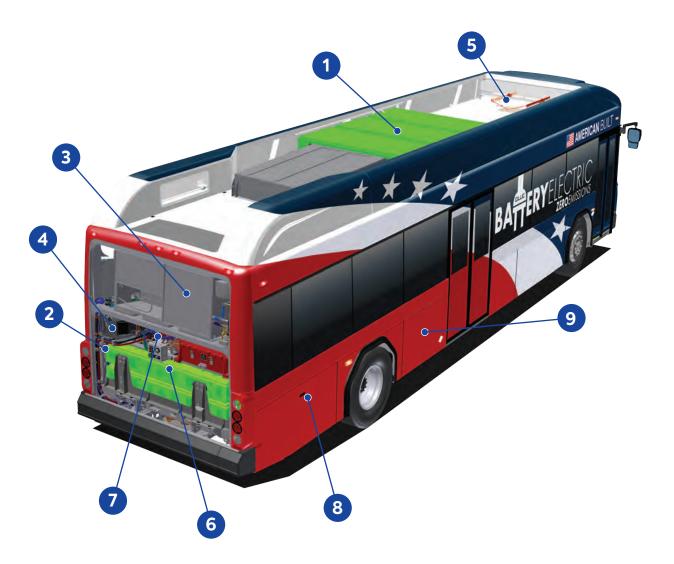
- Low Floor Battery Electric with Contoured-style Roof Fairings
- Cummins EV Drivetrain: Traction Motor and Inverter, High and Low Voltage Power Supplies, Modular Energy Storage System, Charge Controller
- Meritor 79000 Series Rear Axle
- Air Disc Brakes
- Standard Transit Size Tires
- Acceleration/Handling similar to conventional power train options
- Plug-in Charging SAE J1772 DC CCS Type 1
- Thermo King Electric HVAC with Integrated Thermal Management System
- 24V DC Power Steering Pump
- Fuel-fired Coolant Heater Option for Cold Weather Operation

## **GILLIG** LOW FLOOR BATTERY ELECTRIC Features and Benefits

#### **COMPONENT LOCATIONS:**

- 1. Roof-mounted Energy Storage System (ESS), up to 3 battery packs
- 2. Electronics Cooling Package (ECP)
- 3. Thermo-King HVAC with integrated Battery Thermal Management System
- 4. Air Compressor
- 5. Optional roof-mounted charge rails

- 6. Two battery packs mounted in the power train compartment directly above the frame rails
- 7. Power train component assembly consisting of: High-Voltage DC junction box with disconnect switch, two DC-DC convertors, and System Control Unit (SCU)
- 8. Standard Plug-in-charge location, rear curbside (optional additional locations available)
- 9. Battery pack forward of rear axle



Rear panels not shown for clarity. Specifications and features are for reference only and subject to change without notice or obligation.





September 21, 2021

ELECTRONIC SUBMISSION https://psta.bonfirehub.com/portal

PINELLAS SUNCOAST TRANSIT AUTHORITY St. Petersburg, Florida

#### RE: FLORIDA ELECTRIC TRANSIT BUSES WITH CHARGING & ASSOCIATED EQUIPMENT – RFP 21-980369

DATE DUE: September 23, 2021 at 10:00 AM EST

Gentlemen:

GILLIG is pleased to submit the enclosed documentation covering our <u>SECTION 1:</u> <u>TECHNICAL PROPOSAL</u> response to the above solicitation for your review and consideration.

Please do not hesitate to contact us if any questions about the submittal arise:

WILLIAM F. FAY, JR., VICE PRESIDENT, SALES PHONE: 800-735-1500 or 510-785-1500 EMAIL: sales@gillig.com

We appreciate this opportunity and look forward to a successful bid opening.

Very truly yours,

William F. Fay, Jr. Vice President, Sales Phone: 800-735-1500 Email: sales@gillig.com

Encs.

Cc: Arminder Dhillon, Director, Sales Operations Javier Hernandez, Jr., Director National Sales Butch Sibley, Regional Sales Manager

#### MINUTES OF A SPECIAL MEETING OF THE MANAGERS OF HCC MANAGER LLC

A special meeting of the managers of **HCC MANAGER LLC**, an Illinois limited liability company (the "<u>Company</u>"), was held at 222 N. LaSalle Street, Chicago, IL 60601, on December 15, 2020. All of the Company's managers, namely A. Steven Crown, James S. Crown and William H. Crown, and the Company's Secretary, David M. Rubin, were present either in person or by phone. William H. Crown acted as Chairman of the meeting and David M. Rubin acted as Secretary of the meeting.

The Chairman stated that the purpose of the meeting was to acknowledge the retirement of Joseph Policarpio and the appointment of William Fay, Jr. as officers of Gillig LLC, a California limited liability company (the "<u>LLC</u>"), in the Company's capacity as Manager of the LLC. Upon motion duly made, seconded and unanimously carried, the following resolutions were adopted:

**RESOLVED,** that, effective as of January 1, 2021, WILLIAM FAY, JR. shall be elected to serve as the LLC's Vice President – Sales until such further action by the Company.

**FURTHER RESOLVED,** that, effective as of January 6, 2021, and resulting from his retirement, JOSEPH POLICARPIO, shall be removed as the LLC's Vice President – Sales and Marketing.

**FURTHER RESOLVED,** that for sake of clarity, subsequent to the actions as hereinabove set forth, the officers of the LLC will be as set forth below:

DEREK MAUNUS	President and Chief Executive Officer
MICHAEL S. CANMANN	Vice President and Assistant Secretary
CHRISTOPHER TURNER	Executive Vice President – Operations
BRIAN SHEPHERD	Vice President – Finance and Chief Financial Officer
MARLA LOAR	Vice President – Human Resources
CHARLES E. O'BRIEN	Vice President – Aftermarket Parts
WILLIAM FAY, JR.	Vice President – Sales
GREG VISMARA	Vice President – Engineering
DAVID M. RUBIN	Vice President, General Counsel and Secretary
MAUREEN FLYNN	Vice President, Controller, Treasurer and Assistant
	Secretary
AMY BLUMENTHAL	Assistant Secretary
BRIAN B. GILBERT	Assistant Secretary

**FURTHER RESOLVED,** that the above named officers be, and are hereby, authorized to execute any and all instruments for and on behalf of the LLC which are required in the usual and ordinary conduct of the business, including, but not limited to, Bid Documents, Sales Contracts, Purchase Contracts, Lease Purchase Agreements, assignments to such Lease Purchase

Agreements, together with any documents which may be or become necessary to support such transactions of Gillig.

Upon motion duly made, seconded and unanimously carried, the meeting was adjourned.

Respectfully submitted,

Llovit M. anti

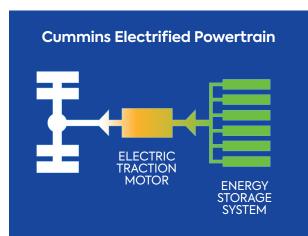
David M. Rubin Secretary of the Meeting 4850-8412-6420, v. 2

## BUILDING AMERICA'S ZERO EMISSIONS FUTURE



## **Electrify Your Fleet**

Our new battery electric offering joins GILLIG's industry-leading Low Floor bus platform to bring the most comprehensive, advanced battery electric bus to the market. GILLIG's Zero-Emission Battery Electric bus incorporates the Cummins electrified powertrain, which provides the advantage of full local service support with hundreds of service centers throughout the country to provide the necessary training, warranty administration, and after-market parts. Designed, built, and supported right here in the United States.



# BATTERY ELECTRIC ZEROEMISSIONS

## **Specifications:**

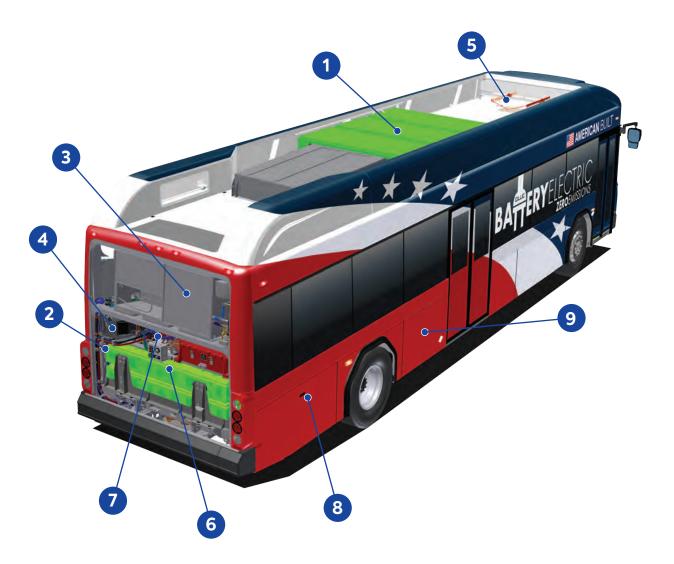
- Low Floor Battery Electric with Contoured-style Roof Fairings
- Cummins EV Drivetrain: Traction Motor and Inverter, High and Low Voltage Power Supplies, Modular Energy Storage System, Charge Controller
- Meritor 79000 Series Rear Axle
- Air Disc Brakes
- Standard Transit Size Tires
- Acceleration/Handling similar to conventional power train options
- Plug-in Charging SAE J1772 DC CCS Type 1
- Thermo King Electric HVAC with Integrated Thermal Management System
- 24V DC Power Steering Pump
- Fuel-fired Coolant Heater Option for Cold Weather Operation

## **GILLIG** LOW FLOOR BATTERY ELECTRIC Features and Benefits

#### **COMPONENT LOCATIONS:**

- 1. Roof-mounted Energy Storage System (ESS), up to 3 battery packs
- 2. Electronics Cooling Package (ECP)
- 3. Thermo-King HVAC with integrated Battery Thermal Management System
- 4. Air Compressor
- 5. Optional roof-mounted charge rails

- 6. Two battery packs mounted in the power train compartment directly above the frame rails
- 7. Power train component assembly consisting of: High-Voltage DC junction box with disconnect switch, two DC-DC convertors, and System Control Unit (SCU)
- 8. Standard Plug-in-charge location, rear curbside (optional additional locations available)
- 9. Battery pack forward of rear axle



Rear panels not shown for clarity. Specifications and features are for reference only and subject to change without notice or obligation.



#### **BATTERY ELECTRIC BUS VEHICLE CONFIGURATION**

Our Battery Electric Bus represents the culmination of years of hard work and innovation to bring the best-in-class bus to market. Offering a smooth ride and quiet acceleration, our bus enhances the customer experience while providing sustainable public transportation. Based on our proven Low Floor platform, every GILLIG Battery Electric bus is designed, built, and supported in the same facility by the same team that you've come to know and trust. As such, we can ensure parts, training, maintenance, and operations commonality with existing GILLIG fleets for seamless integration. The stainless-steel chassis and aluminum body create a lightweight, high-strength bus, while the integrated crash barrier protects riders from side impacts during a collision. In addition, Altoona testing has proven our buses to be the safest, highest quality, and most reliable bus on the market.



In developing our all-electric powertrain, GILLIG performed an exhaustive search for systems and components that maximize performance, durability, reliability, and cost-effectiveness. Additionally, we sought a partner who could provide world-class aftermarket service, support, and training for the new powertrain. We are proud to partner with

Cummins Inc. on the electrified powertrain based on their extensive experience with U.S. transit operations, their vast support infrastructure, and their cross-industry focus on developing efficient, reliable, and costeffective components.

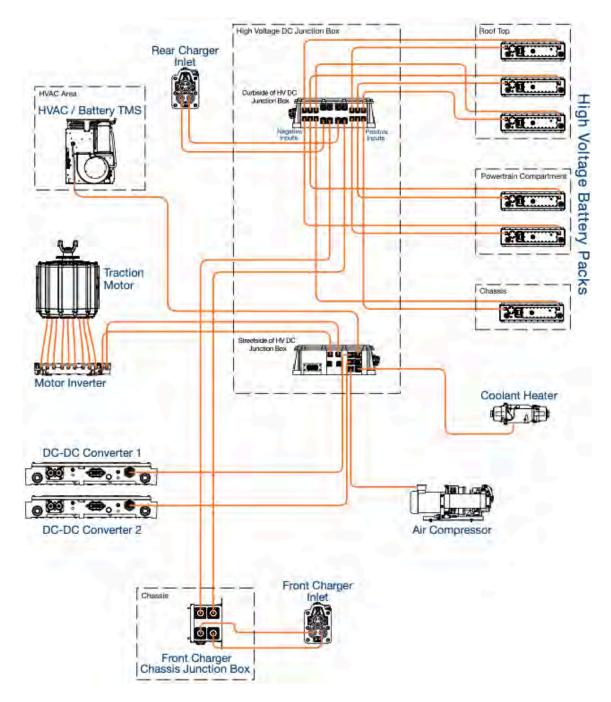


Partners you can trust.



#### **BATTERY ELECTRIC BUS VEHICLE CONFIGURATION**

Our zero-emission battery electric transit bus has an all-electric drive system with a single chassis-mounted traction motor powered by on-board high-voltage batteries. The high-voltage energy storage system consists of high-voltage battery packs connected in parallel to the high-voltage junction box. This provides power for the traction motor inverter, which in turn supplies power to the traction motor and to high-voltage DC-powered accessories.



#### **BATTERY ELECTRIC BUS VEHICLE CONFIGURATION**

The modular high-voltage battery system allows for various capacity configurations, with battery-mounting locations on the roof, in the rear powertrain compartment, and on the chassis. Depending on customer specifications, battery capacity can provide a full day of driving range on a single charge. Alternatively, high-voltage battery configurations can be set up to use opportunity charging to allow for lower capacity, cost, and weight.

Industry standard J1772-Combo Charging System (CCS), also known as CCS-Type 1, DC plug-in charging is provided on every GILLIG Battery Electric bus. Optional roofmounted charging rails and chassis-mounted inductive charging solutions are available as an option.

The system control module (SCM) controls the vehicle's motor speed, torque, and direction, depending on driver request and operating conditions. This is a low-voltage electronic module that connects to the throttle and other systems and communicates with the traction motor inverter to propel the bus.



#### **ENERGY STORAGE SYSTEM**

The energy storage system (ESS) consists of multiple high-voltage battery packs connected in parallel to achieve the required system energy storage capacity and includes the battery management system to control the discharging and charging of all the battery packs.

Up to seven battery packs can be provided, as shown below: up to four roofmounted battery packs; up to two battery packs in the powertrain compartment; up to one battery pack chassis-mounted forward of the rear axle. These batteries use a highenergy nickel-manganese-cobalt (NMC) cell chemistry, which was selected because its lifespan, specific power, and safety characteristics make it ideal for a heavy-duty application. The battery packs are liquid-cooled and kept at optimal operative temperature through the battery thermal management system, which provides both heating and cooling as necessary.



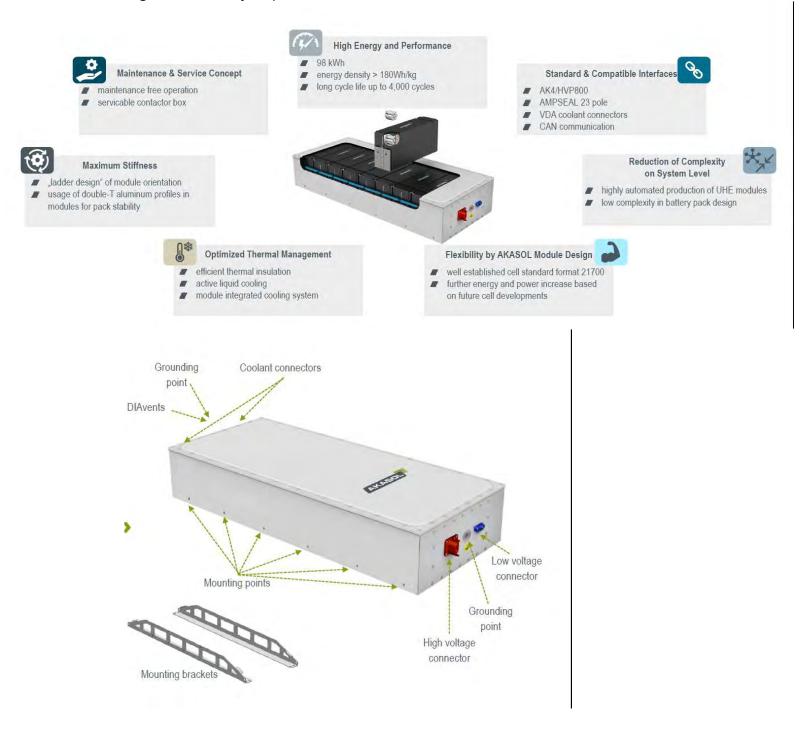
Two battery packs mounted in the powertrain compartment

The architecture of the ESS provides full system operating voltage at each battery pack and utilizes parallel battery connections. This means that the vehicle level voltage is achieved regardless of the number of packs connected and therefore each additional pack simply increases the energy storage capacity. This also means that should a single battery pack experience an issue which requires it to be taken off-line, the bus would still be able to operate on the remaining packs.

All battery packs are the same in size, capacity, and electrical connections so one common battery pack can be used in any location. This interchange-able design simplifies replacement and inventory requirements.

#### **HIGH-VOLTAGE BATTERY PACKS**

The AKASOL-designed and American-built 9AKM150CYCUHE high-voltage battery pack utilizes Li-ion technology with a high energy density and proprietary control technology to maintain a high battery performance for a longer zero emission range. A single pack design is utilized for all locations on the bus. This provides reduces the complexity of servicing and inventory requirements.



#### **HIGH-VOLTAGE BATTERY PACKS**

*Structure:* The exterior case is constructed of corrosion resistant stainless steel. Internal double 'T' aluminum crossmembers provide structural strength and stiffness. Individual battery modules are secured in place by a ladder frame of aluminum. This design balances the need for the pack to be as light as possible while also providing the strength and rigidity necessary for the harsh duty cycle of a bus. The battery packs meet an IP rating of IP67 & IP6K9K.

Safe service disconnect: In a non-operating mode, all contactors of the battery system are opened so the battery system is voltage free. Additionally, the electrical system within the battery has high voltage interlock loop (HVIL). The HVIL is a continuous low voltage circuit which passes through every high voltage connector so that if a LV or HV connector is unplugged, the circuit will be opened and the HV system will be disconnected by the battery management system. Maintenance on the battery system will be safe when the HV connector is unplugged.

*Battery cells:* The basic building block of the high-voltage battery pack is the individual cell. AKASOL has conducted a world-wide evaluation to identify the optimal battery cell for the transit duty cycle, and continues to seek out better cells as the technology improves.

*Battery module:* Cells are combined into battery modules which are connected in series within the pack. Each module also has voltage and temperature sensors that are communicated to a pack battery management module for full pack monitoring and control.

*Battery management system:* The battery management system (BMS) in each high voltage battery pack monitors all cell voltages, temperature, and other battery conditions and provides detection of any battery faults or damage. The pack BMS connects to the Multi-String Manager (MSM+), which is mounted on the powertrain compartment platform. The MSM+ monitors all the high-voltage battery packs, controls charging and discharging, and provides warnings of battery faults.

*Battery cooling system:* All high-voltage battery packs are liquid cooled or heated using ethylene glycol coolant. Coolant from the thermal management system is circulated through a cooling plate, which then cools or heats each module. The BMS monitors the battery cell temperatures and uses coolant flow control valves with the battery thermal management system to ensure all packs are maintained at the proper temperatures.

*High-power contactors:* Each high-voltage battery pack includes high-power electric contactors on both the positive and negative battery outputs. These contactors are used during normal operation to turn the high-voltage batteries on and off. In the event of a high-voltage interlock loop (HVIL) open circuit, these contactors disconnect the pack stored energy from the high-voltage system. When requested and all conditions are functioning properly, the contactors close and allow power to flow from the high-voltage battery. When the 24-volt supply is removed from the contactors—by the driver turning off the bus, by the HVIL system or high-voltage control system detecting a fault, by turning

#### **HIGH-VOLTAGE BATTERY PACKS**

off the low-voltage battery disconnect switch, or by the high-voltage emergency disconnect switch in the rear of the bus—all contactors open to disconnect the high voltage stored energy of the batteries from the system.

Specifications:	
Supplier	AKASOL, Inc.
Rated capacity	98 kWh.
Usable capacity SOL (start of life)	Duty Cycle Dependent TBD
Warranty (see warranty agreement for terms and conditions)	Standard, 6 years (300,000 miles); optional, extended to total 12 years (500,000 miles).

## GILLIG BATTERY ELECTRIC BUS NEXT GENERATION BATTERY PACK SPECIFICATIONS



Chemistry	NMC Lithium Ion
Dimensions	1720 mm x 700 mm x 300 mm (excluding connectors)
Energy Nominal Usable BoL	98 kWh 88 kWh
Time to full charge	For 6 pack setup: 150 kW Plug-In Charge, 0-100% in ~4.5 Hrs 350 kW Plug-In Charge, 0-100% in ~2.5 Hrs 450 kW Pantograph, 0-100% in ~1.5 Hr
Operating voltage	540 – 756 V
Cooling	H <sub>2</sub> O & Ethylene Glycol, 50:50
Ingress protection	IP67 / IP6K9K
Charging	Plug In, Pantograph, Inductive CONFIDENTIAL



#### GILLIG BATTERY ELECTRIC BUS AKASOL BATTERY WARRANTY

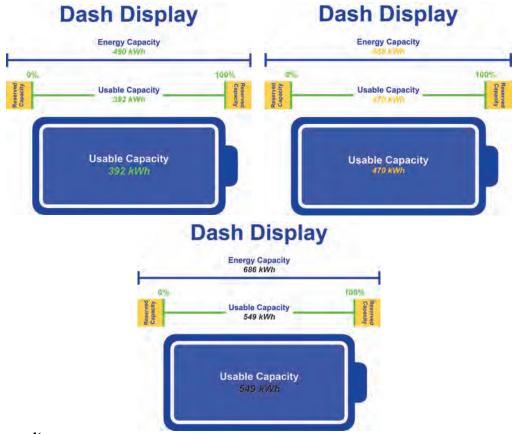
Base Warranty			
Available Depth	n of Discharge	80%	
Warrantable Er	id of Life (SOH)	80%	
Warranty Term	Time	72 Months	
(whichever occurs first)	Low Power Charging (up to 60A / pack)	200 MWh / pack	
	High Power Charging (up to 120A / pack)	115 MWh / pack	

#### **Extended Coverage**

Proactive scheduled replacement of batteries at midlife (parts and labor) to achieve same total usable capacity as originally installed. Replacement batteries to include 6-year warranty with same or better terms as above.

#### **ENERGY CAPACITY AND RANGE**

Many factors determine the real-life range of an electric vehicle, which is derived from the net usable energy (or capacity) and the rate of energy consumption.



#### **Rated Capacity**

The rated capacity of a battery is the amount of total energy that can be stored in and discharged from the battery. Battery capacity reduces over the life of the cells as the impact of charging and discharging reduces the ability for the cells to reach full charge. Battery health is monitored by the battery management system and reported via telematics. The State of Health (SOH) is communicated as a percentage of the rated capacity at the start of life.

#### **Reserved Capacity**

Battery life is negatively impacted when cells are overcharged or when the depth of discharge is too low. In order to maximize high-voltage battery life, the capacity of the battery is limited to prevent discharge below 10% and charging above 90% of rated capacity. The charge controller prevents the batteries from being charged above the top limit, and derating protocols are in place to prevent the batteries from reaching the bottom limit.

#### **Usable Capacity**

The result of reserving some high-voltage battery capacity is that 80% of the rated capacity is available to power the vehicle. This is the usable capacity, and it is used for all range calculations. The State of Charge (SOC) reported on the dashboard and via telematics represents the usable capacity remaining until a recharge is necessary.

#### ENERGY CAPACITY AND RANGE

#### **Energy Consumption**

Many factors impact the actual range of electric buses in operation. The duty cycle, route profile, and passenger loading determine how much energy is drive necessary to the traction motor and how much energy is captured through regenerative braking. Drivers can have a significant impact on energy consumption through how effectively they apply throttle and use regenerative braking to slow the bus. The HVAC system is also a significant use of energy on a bus, and settings (temperature set-points, fan speeds, etc.) can be optimized to reduce energy consumption.

Customer-specified equipment (passenger seats. windows, CAD/AVL. and video equipment, etc.) can have a large impact on total vehicle weight, which can also impact energy consumption. GILLIG has developed a Smart Spec that optimizes the range of the bus through component selection. More details are available for discussion during the pre-production meeting.

#### **Range Estimates**

Many factors determine the real-life range of an electric vehicle, consumption is derived from the net usable engery (or capacity) and the rate of energy consumption.

Configuration	High-Voltage Battery Packs, Qty	Total Rated Capacity	Range at 2.3 kWh/mile*
5 battery pack	5, each with 98 kWh	490 kWh	170 miles
6 battery pack	6, each with 98 kWh	588 kWh	205 miles
7 battery pack	7, each with 98 kWh	686 kWh	239 miles



#### Base: 5 pack 490 kWh Range & Weight



#### Vehicle Specifications:

- 40'
- 5 pack configuration 490 kWh
- 315 tires
- Gen 2.5 Design

Vehicle Weights: Curb Weight: 32,900 Seated Weight: 38,760 Gross Weight: 44,300 GVWR: 47,180

5 pack CW	Manhattan	Orange County	HD-UDDS
Ambient 110degF - HVAC On	101	145	180
Ambient 68defF - HVAC On (Minimal)	158	202	207
Ambient 60degF - HVAC Fans Only	177	216	214

5 pack SW	Manhattan	Orange County	HD-UDDS
Ambient 110degF - HVAC On	95	133	172
Ambient 68defF - HVAC On (Minimal)	141	179	200
Ambient 60degF - HVAC Fans Only	154	191	207

5 pack GW	Manhattan	Orange County	HD-UDDS
Ambient 110degF - HVAC On	88	122	161
Ambient 68defF - HVAC On (Minimal)	128	162	194
Ambient 60degF - HVAC Fans Only	140	172	202



#### Option: 6 pack 588 kWh Range & Weight



#### Vehicle Specifications:

- 40'
- 6 pack configuration 588 kWh
- 315 tires
- Gen 2.5 Design

Vehicle Weights: Curb Weight: 34,710 Seated Weight: 40,860 Gross Weight: 46,560 GVWR: 47,180

6 pack CW	Manhattan	Orange County	HD-UDDS
Ambient 110degF - HVAC On	122	175	217
Ambient 68defF - HVAC On (Minimal)	188	239	249
Ambient 60degF - HVAC Fans Only	209	257	256

6pack SW	Manhattan	Orange County	HD-UDDS
Ambient 110degF - HVAC On	113	161	198
Ambient 68defF - HVAC On (Minimal)	168	216	239
Ambient 60degF - HVAC Fans Only	184	232	249

6pack GW	Manhattan	Orange County	HD-UDDS
Ambient 110degF - HVAC On	106	147	194
Ambient 68defF - HVAC On (Minimal)	152	193	233
Ambient 60degF - HVAC Fans Only	166	205	242



#### Option: 7 pack 686 kWh Range & Weight



#### Vehicle Specifications:

- 40'
- 7 pack configuration 686 kWh
- 315 tires
- Gen 2.5 Design

Vehicle Weights: Curb Weight: 35,887 Seated Weight: 42,037 Gross Weight: 47,137 GVWR: 47,180

7 pack CW	Manhattan	Orange County	HD-UDDS
Ambient 110degF - HVAC On	139	198	248
Ambient 68defF - HVAC On (Minimal)	211	269	286
Ambient 60degF - HVAC Fans Only	235	289	295

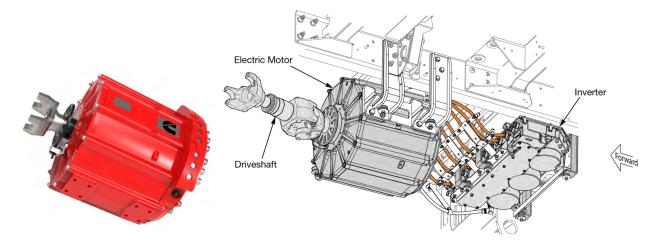
7 pack SW	Manhattan	Orange County	HD-UDDS
Ambient 110degF - HVAC On	129	181	235
Ambient 68defF - HVAC On (Minimal)	189	241	277
Ambient 60degF - HVAC Fans Only	208	258	287

7 pack GW	Manhattan	Orange County	HD-UDDS
Ambient 110degF - HVAC On	120	166	222
Ambient 68defF - HVAC On (Minimal)	171	217	269
Ambient 60degF - HVAC Fans Only	186	231	280

#### **TRACTION MOTOR**

The GILLIG Battery Electric Bus is driven by the Cummins electric traction motor. The high-torque, direct-drive, 9-phase permanent magnet alternating current (PMAC) traction motor drives a single-reduction rear axle and achieves high power density and power efficiency. The electric traction motor is coupled directly to a standard driveline and rear axle to provide traction power and regenerative braking. With the direct drive system, there is no motor-mounted gear reduction or transmission required.

The traction motor is located behind the rear axle to offer easy vertical installation/removal of motor and inverter. It is liquid-cooled by the electronics cooling package using ethylene glycol coolant. It also requires significantly less maintenance than conventional engines—this means no more oil changes, air filter changes, emissions after-treatment services.



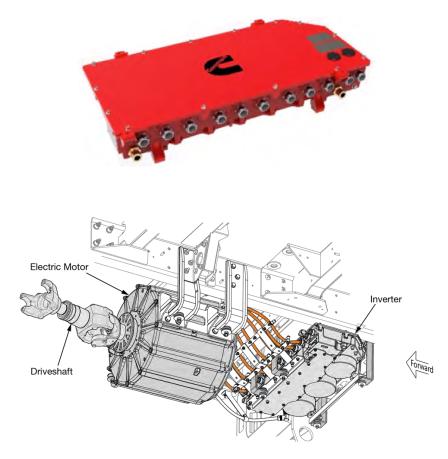
Specifications		
Supplier	Cummins.	
Motor type	9-phase permanent magnet alternating current (PMAC).	
Drive type	Direct drive.	
Operating voltage	Nominal 660 VDC; operating range 610 to 750 VDC.	
Maximum mechanical output torque	2,582 ft lb (3,500 N-m) for 30 seconds.	
Continuous output torque	1,519 ft lb (2,060 N-m).	
Maximum mechanical output power	470 hp (350 kW) for 30 seconds.	
Continuous mechanical output power	262 hp (195 kW).	
Normal operating range	0 to 3,400 rpm.	
Peak power	245 kW (328 hp).	
Derating range	3,400 to 3,600 rpm.	
Ingress protection	IP67.	
Warranty (see warranty agreement for terms and conditions)	Standard: 3 years (100,000 miles).	

#### **TRACTION MOTOR INVERTER**

The Cummins traction motor inverter controls the motor speed and power per the driver's actions. It converts high-voltage DC power from the batteries, via the junction box, into 9-phase AC power for the traction motor to drive the bus.

The traction motor inverter also works in regenerative braking mode to convert 9-phase AC from the traction motor back to high-voltage DC, which is then used to recharge the high-voltage batteries.

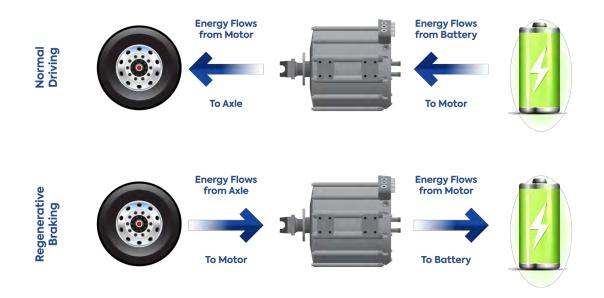
The traction motor inverter has a cast aluminum housing and is chassis-mounted directly behind the traction motor. Cooling of the traction motor inverter is provided by the electronics cooling package (ECP).





The GILLIG Battery Electric Bus uses regenerative braking (regen) to extend braking system life as well as to improve vehicle range and efficiency.

Under normal driving conditions, the high-voltage batteries provide energy to the traction motor to propel the bus. During regen, this energy flow is reversed, and the traction motor uses the vehicle's momentum when it is coasting, slowing down, or braking to recover energy. By driving the traction motor with the rear axle, the traction motor functions as a generator and recharges the high-voltage batteries.



This contrasts with conventional braking systems, where the excess kinetic energy is converted to wasted heat in the brakes, and with transmission retarders, where energy is converted to heat and immediately dissipated by the radiator.

Regen is controlled through the throttle pedal position. When the pedal is at the 10% position, the regen begins to apply. The amount of regen increases until the throttle pedal pressure is fully released and 100% of the regen is applied. As the bus coasts, the resistance created by the traction motor as it recovers the energy slows the bus. As a result of this slowing, less energy must be captured by the service brakes and, as such, the life of the braking system on a vehicle utilizing regen is longer than that of an equivalent vehicle without regen.

Regen programming is calibrated to provide the maximum amount of energy recovery while maximizing driveablity and passenger comfort. The driving practices of operators also have a significant impact on how much energy the bus can recover through regen because smooth stops and slow decelerations maximize energy recovery.



#### **Regen Disable Switch**

The regen disable switch allows the driver to deactivate regen when road conditions dictate that its use should be limited. However, use of the regen disable switch should be minimized to take full advantage of the energy recovery benefits of regen.

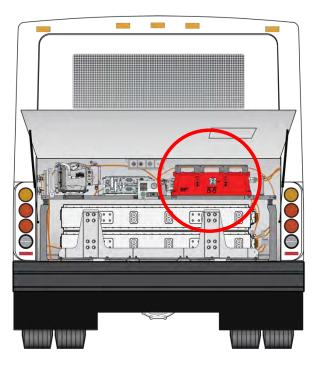
The regen disable switch is located just rear of the driver's seat on the left dash panel. It is out of the direct view of the driver, providing both ready access as well as a location that discourages use unless required. An indicator lamp on the dash is illuminated when regen is disabled and also tracked through the telematics system for additional monitoring.



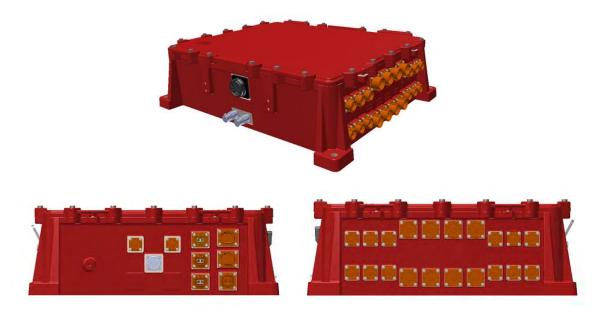
#### **HIGH-VOLTAGE DC JUNCTION BOX**

The Cummins-supplied high-voltage DC junction box connects all the high-voltage battery packs in parallel, provides connections to all the charge inlets (plugin and, if equipped, overhead or chassismounted inductive), and distributes highvoltage DC to the traction motor inverter and all high-voltage DC power accessories such as the HVAC, the air compressor, DC/DC converters, and the coolant heater. The box is located in the powertrain compartment.

The cast-aluminum housing has toolless high-voltage DC connectors, which are keyed to prevent incorrect connections. Keyed connections have keys or ribs on the receptacle on the junction box connectors that match keys or ribs on the connectors on the cable.



The high-voltage junction box has a high-voltage disconnect switch, which provides a method to manually disconnect the high-voltage batteries in case of an emergency and as part of the lockout/tagout (LOTO) procedure. If required due to an emergency, the switch can safely disconnect the high-voltage batteries under a full load condition. No personal protective equipment is required to operate this two-position rotary switch, with its ON and OFF position.



#### **DC/DC CONVERTER**

The DC/DC converter converts highvoltage direct current from the high-voltage batteries to low-voltage 24 VDC to supply the 12- and 24-volt systems, such as lowvoltage batteries, the power steering pump, and the electronics cooling package (ECP).





Two DC/DC converters are wired in parallel to provide the required low-voltage system capacity. The DC/DC converters are liquid-cooled by the ECP using ethylene glycol coolant.

The two units are located together on the powertrain compartment platform.

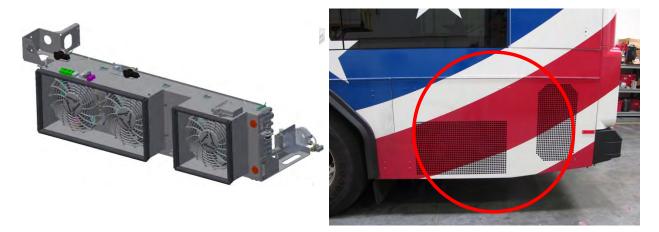
Specifications		
Supplier	Cummins.	
Input	Voltage: 450 to 750 VDC. Current: 10 A each; 20 A for both.	
Output	Voltage: Adjustable 27–29 VDC voltage from the DC/DC converters is adjustable to meet the voltage requirements of the low-voltage batteries being used. Power: Continuous, 7.5 kW per converter; 15.0 kW total. Current: 270 A per converter; 540 A total.	
Cooling	Liquid cooled by the ECP with ethylene glycol coolant.	
IP rating	IP6K9K.	
Warranty	3 years/100,000 miles.	



#### **ELECTRONICS COOLING PACKAGE**

The power electronics that convert between AC and DC and various voltages (high voltage, 12 V, 24 V) generate waste heat due to the inefficiencies of the conversion process. In order to cool these components, pressurized coolant is circulated through a streetside, rear-mounted electronics cooling package (ECP). A 24 VDC coolant pump circulates the coolant through the traction motor, traction motor inverter, and DC/DC converters.

The coolant flows through these components capturing the waste heat and is then fed into a single-pass aluminum-core, air-cooled Modine radiator. Hot coolant enters the radiator through the forward tank, circulates through the core, and returns to the pump through the rear tank. The system utilizes three 12-inch, 24 VDC variable-speed brushless electric fans to pull ambient air from outside the bus over the radiator fins to dissipate the heat as directed by the System Control Module. The use of ambient air to cool the coolant rather than via refrigerant decreases overall vehicle energy consumption as less energy is required to run the fans than would be required for an HVAC-style compressor. Furthermore, the variable fan speeds are managed carefully to provide the necessary level of cooling with the least amount of energy required.



The ECP assembly is mounted on chassis outriggers on the streetside of the bus behind the rear axle, where rubber vibration mounts isolate it from chassis vibrations. This location is consistent with the location of the radiator package utilized on GILLIG conventional engine buses and has proven to be an effective location for capturing relatively clean ambient air for this application.

The ECP is built upon Modine's vast experience with engine radiators and electronic cooling. The fans are fully sealed to prevent water intrusion, the aluminum core and body construction are designed to minimize corrosion exposure, and the system is constructed for minimal weight. Similar to conventional radiators, the ECP includes a fan reverse feature to allow for debris to be blown out of the system, and fans are programed to stay on for a minimum of 30 seconds at a time to prevent excessive thermal cycling.

A three-quart, stainless-steel surge tank located behind an access panel above the radiator is integrated into the system to maintain pressure within the system and release



#### **ELECTRONICS COOLING PACKAGE**

excess pressure as the coolant heats. A manual pressure relief valve allows for safe relief of system pressure to perform system maintenance and inspections, and the surge tank can be used to top up coolant levels when the integrated sight tube shows such a fill is necessary. The bus also includes provisions for a pressurized coolant fill when a full system fill is required.

Specifications		
Supplier	Modine.	
Radiator core	Modine louvered fin, 14 fin/in., aluminum core face area. Single pass with horizontal coolant flow. Coolant inlet at forward edge, coolant outlet at rear edge.	
Surge tank	Remote-mounted, streetside, above ECP. Stainless steel; capacity 3 quarts. Access by hinged door with square key lock.	
Coolant	Ethylene glycol.	
Electric cooling fans	Pusher type, mounted outside radiator cores, pushing air through core. Electrical specifications: 24 VDC, brushless, variable speed via CAN. Fan diameter: 12 in. Fan quantity: 3.	
Coolant fill	Bottom pressure fill. Coolant fill connector: quick coupler type.	
Warranty	3 years, parts and labor.	



#### HVAC AND THERMAL MANAGEMENT SYSTEM

During the development of the GILLIG Battery Electric Bus, we identified the HVAC and the high-voltage battery cooling as two systems requiring additional focus, given the significant impact they have on the overall energy consumption of the vehicle. We partnered with Thermo King to develop a single unit that integrates the battery thermal management and HVAC systems. Through this integration, the compressor, condenser, and heating elements can be shared for both systems, reducing redundant components and allowing more efficient use of the systems.

This system provides heating and cooling for both the passenger compartment and the high-voltage battery packs during driving and charge cycles.

The air conditioning and heating system is designed to maintain a pleasant environment in the bus by providing cooled and heated air, reducing humidity, and supplying an adequate amount of draft-free air.

The battery thermal management system is designed to automatically heat or cool the coolant that is supplied to all the high-voltage batteries as required. The coolant will warm the batteries in very cold ambient temperatures and cool the batteries in warm ambient temperatures while charging and during bus operation.



Air conditioning systems use a refrigerant that changes states between a liquid and a gas at different places in the system. The liquid refrigerant absorbs a great amount of heat when it boils and becomes a gas. When this gas is compressed and condensed back to a liquid state, the absorbed heat is given up. With the proper closed system of evaporator,



#### HVAC AND THERMAL MANAGEMENT SYSTEM

condenser, compressor, expansion valve, and temperature control, the refrigerant becomes a very effective medium for heat transfer. The system utilizes R470C refrigerant. The following are the major components of the air conditioning system.

*Evaporator and Heater Core:* Several heat exchangers are integrated in the main HVAC unit. The HVAC and battery thermal management system each have their own refrigerant evaporator and coolant heater cores to cool and heat their respective circuits (air for the passengers and coolant for the high-voltage batteries). Heated coolant is provided by the chassis-mounted coolant heater.

One evaporator transfers heat from the bus interior to the refrigerant. Interior air is drawn from the bus through the return air grille in the rear bulkhead, passed through a washable filter, then travels through the evaporator coil and heater core, where it is cooled, heated, and/or dehumidified, according to the selected mode of system operation. Dehumidification occurs when humid air is passed over the cold evaporator, so that moisture in the air condenses on its surface. This water drips off the evaporator and is channeled to drain hoses in the powertrain compartment. Conditioned air is then discharged out to the passenger area through the air ducts on both sides of the bus interior.

The other evaporator transfers heat from the battery coolant to the refrigerant, keeping the high-voltage batteries at their optimal operating temperature even in warm environments and/or high-current situations. The battery TMS has a second heat exchanger that transfers heat from the heated HVAC coolant to the battery coolant to maintain battery temperatures in cold environments. By utilizing heat from the HVAC coolant, a dedicated battery heater is not required. This saves weight, cost, and improves overall vehicle efficiency. The unit is capable of switching between cooling and heating the batteries depending on operating conditions and independently of HVAC demands.

*Condenser:* Transfers heat from the refrigerant to the outside air by drawing cool ambient air through both sides of the roof-mounted condenser and circulating the air through the condenser coil. The hot air is then exhausted out the top of the condenser unit.

The roof-mounted condenser is sized for full cooling capacity up to 120°F (49°C) ambient temperature; that is, the unit can maintain 70°F (21°C) interior temperatures and proper battery coolant temperatures simultaneously. The roof-mounted location provides unrestricted airflow through the cores, improving performance.

*Compressor:* Raises the pressure and temperature of the refrigerant and forces it into the condenser.

The electric scroll compressor supplies both the passenger and high-voltage battery cooling circuits. An integrated electric high-voltage DC/AC inverter allows the compressor output to be automatically adjusted to match the required load, which improves energy efficiency.

*Expansion Valve:* Reduces the temperature of the refrigerant and meters the flow of refrigerant to each evaporator. One expansion valve regulates the output of the HVAC evaporator, and one regulates the battery TMS evaporator.



#### HVAC AND THERMAL MANAGEMENT SYSTEM

A single variable-speed 24 VDC pump provides coolant flow to all of the high-voltage battery packs. Each battery pack can individually modulate the pack coolant flow using the flow control valve in the battery pack.

All electric fans and the blower use brushless 24 VDC motors rated at a minimum of 40,000 hours.

The HVAC system is controlled by the Thermo King IntelligAIRE III, an advanced bus climate-control system that can be programmed for either manual or automatic operation. The IntelligAIRE's modular configuration, connected via CAN to the vehicle's J1939 network, offers the user great flexibility for configuration, reduces the number of electrical connections, and significantly reduces vehicle weight.

The HVAC system is one of the largest users of energy on an electric vehicle, and agencyspecific decisions can greatly impact the energy consumption of the bus. By reducing the heating and cooling load requirements by adjusting the temperature set points closer to the outside temperature, agencies can significantly increase their operational range.

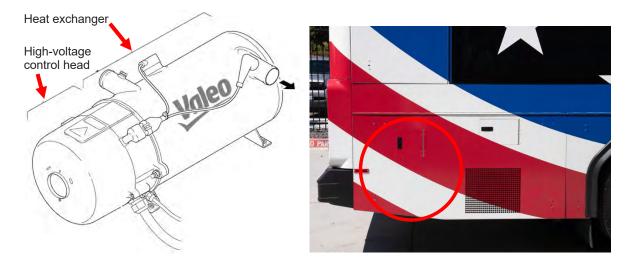
Specifications		
Supplier	Thermo King.	
Model	TE18.	
Cooling capacity	91,000 Btu/hr total system capacity (71,000 to 96,000 Btu/hr for passengers and up to 25,000 Btu/hr for batteries)	
Heat capacity	68,000 to 94,000 Btu/hr (actual output depends on coolant heater selection)	
Air flow	2,400 CFM at full speed.	
Refrigerant type	R407C.	
Warranty	3 years, parts and labor.	



#### ALL-ELECTRIC COOLANT HEATER

Early in the development of GILLIG's Battery Electric Bus, the passenger compartment and high-voltage battery heating strategy was an area of focus. As electric heating can account for a significant portion of the overall energy consumption of an electric vehicle, GILLIG wanted to ensure that the vehicle was able to deliver the level of heating performance necessary to meet transit demand in the most economical manner possible.

The battery thermal management system, the main HVAC unit, the auxiliary driver's heater, and optional floor-mounted and threshold heaters all require heat output. GILLIG weighed the relative benefits of electric, grid-based heaters in each of these applications against a heated coolant-based system with a centralized, independent heat source and determined that from a safety, efficiency, fleet commonization, cost and packaging standpoint, the coolant-based system was optimal. GILLIG selected the Valeo Thermo DC 200 all-electric heater to provide the coolant heat.



The electric head is 100% emission-free, allowing for both quiet operation and heating in enclosed spaces without exhaust fumes. The heater is suitable for heating at very low temperatures down to  $0^{\circ}F$  (-18°C).

Heating cartridges are responsible for the generation of heat by electric current flowing into the unit and are part of the heat exchanger. They are therefore integrated directly into the coolant circuit and, as a result, the generated heat can pass into the cooling circuit without loss.

This heater is located on the rear curbside of the bus, chassis-mounted below the powertrain compartment batteries. This location provides for impact protection and access for service and inspections.



### ALL-ELECTRIC COOLANT HEATER

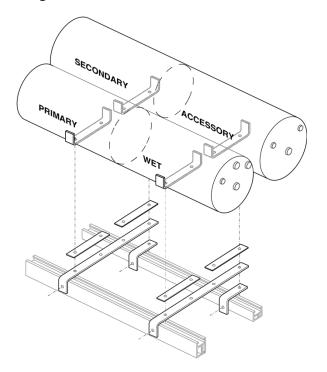
Specifications		
All-electric coolant heater	Supplier: Valeo. Model: Thermo DC 200. Heat output: 20 kW (68,280 Btu/hr). Supply voltage (HV): 600–750 VDC. Supply voltage (LV): 24 VDC.	
Warranty	2 years.	
A dual-mode electric/diesel coolant heater is also available.		



#### **AIR SYSTEM OVERVIEW**

The air system provides and maintains compressed air to operate the service brakes, emergency/parking brakes, suspension system, passenger door, and the driver's seat. The system is composed of an air compressor, air governor, air dryer, air reservoir tanks, overpressure (relief) and check valves, and the tubing, hoses, and fittings necessary to connect all the components.

The air compressor provides compressed air to the air dryer. The air governor senses the air pressure in the air reservoirs and operates to maintain pressure in the system. When the air pressure reaches a preset lower limit, the air governor turns on the air compressor until the preset upper limit is reached and the air compressor is shut off. The air dryer removes moisture from the compressed air. Accumulated moisture is regularly expelled from the air dryer onto the ground beneath the bus.



The four air reservoirs are located in a ceiling compartment in the front section of the bus. There are two tanks, each partitioned into two separate reservoirs, providing four separate reservoirs. These reservoirs are, in order of priority, the wet tank, the primary tank, the secondary tank, and the accessory tank. The primary and secondary tanks supply the rear and front brakes, respectively. Air from the accessory supply tank operates the suspension system, the passenger doors, and the driver's seat. The air reservoirs also serve to cool the air and condense water and oil vapors out of the compressed air. Most of this condensation takes place in the air dryer and the wet supply reservoir. The GILLIG air system is FMVSS 121, Air Brake Systems compliant.

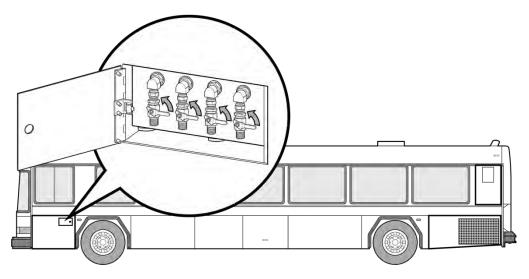
Most of the air system uses nylon air brake tubing. This tubing meets SAE J844, Nonmetalic Air Brake System Tubing and FMVSS 106, Brake Hoses, requirements and is flexible, durable, and weather resistant. GILLIG utilizes the following hose colors:



- Green indicates primary system, which supplies the rear axle brakes
- Red indicates secondary system, which supplies the front axle brakes
- Brown indicates parking brake system
- Yellow indicates air compressor governor signal
- Black indicates accessories and drain lines

GILLIG utilizes a #16 Teflon hose for the air delivery line from the air compressor to the air dryer. Nylon tubing cannot be used due to the high temperature of the air delivered by the air compressor.

Each reservoir has a check valve at the supply port to maintain pressure in that tank if other reservoirs or air lines were to leak. Each tank is also fitted with a standard manual drain valve. These quarter-turn drain valves are mounted streetside and conveniently located waist high for ease of maintenance, just below the driver's side window with access through a door located in the front streetside skirt panel. The drain lines discharge at street level below the floor of the bus.

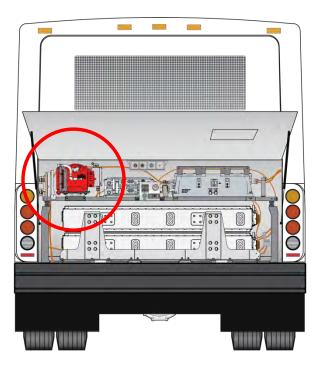


Specifications			
Air Reservoir	Purpose	Volume	
Wet	Cool and dry the air prior to filling other reservoirs	1,450 in. <sup>3</sup>	
Primary	Supplies air to rear service brakes and parking/emergency brake system	1,716 in. <sup>3</sup>	
Secondary	Supplies air to front service brakes and parking/emergency brake system2,095 in.3		
Accessory	Supplies air to the suspension system, the passenger doors and the driver's seat	1,090 in. <sup>3</sup>	



#### **AIR COMPRESSOR**

An air compressor is driven by an electric motor and provides compressed air to the air dryer. The Powerex air compressor uses an oil-less scroll compressor. A scroll compressor pushes air through increasing smaller air pockets, increasing the pressure with each successive pocket. Scroll compressors are quieter and smoother than reciprocating compressors because they have only one moving part: an orbital scroll. This also makes the scroll compressor more efficient, reliable, and durable than a reciprocating compressor. By using an oil-less compressor, the air does not become contaminated with oil or oil vapor that would have to be cleaned by the air dryer. This results in less demand on the dryer and therefore lower lifecycle costs and power consumption.



The air compressor is mounted on a vibration-dampened bracket on the powertrain compartment platform in the rear of the bus. The air compressor is supplied with high-voltage DC from the high-voltage DC junction box. A DC/AC inverter is integrated into the compressor assembly to provide 350-V three-phase power to the electric motor.



Specifications		
Supplier	Powerex	
Compressor type	Oil-less scroll	
Input voltage	600–750 VDC	
CFM capacity	12 CFM @ 120 PSIG	

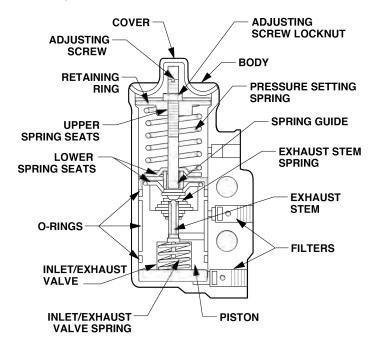


#### **AIR GOVERNOR**

The Bendix D-2 air governor, operating in conjunction with the air compressor unloading mechanism, automatically controls air pressure in the air brake or air supply system between the predetermined maximum (cut-out) and minimum (cut-in) pressures. The air compressor is controlled by the governor, which stops or starts compression when the maximum or minimum reservoir pressures are reached.

Reservoir air pressure enters the Bendix D-2 governor at one of its reservoir ports and acts on the piston and inlet/exhaust valve. As the air pressure builds up, the piston and valve move together against the resistance of the pressure-setting spring. When the reservoir air pressure reaches the cut-out setting of the governor, the exhaust stem seats on the inlet/exhaust valve, closing the exhaust passage, and then opens the inlet passage. Reservoir air pressure then flows around the inlet valve, through the passage in the piston, and then pressurizes the unloader port. A pressure switch connected to the unloader port measures this pressure; when it is pressurized, it turns off the air compressor.

As the system reservoir air pressure drops to the cut-in setting of the governor, the force exerted by the air pressure on the piston is reduced so that the pressure-setting spring moves the piston down. The inlet valve closes, and the exhaust opens. With the exhaust open, the air in the unloader line escapes back through the piston, through the exhaust stem, and out the exhaust port.





The Bendix AD-IP (Integral Purge Air Dryer) collects and removes air system contaminants in solid, liquid, and vapor form so that clean, dry air is delivered to the wet tank reservoir and then to the other three air reservoir tanks. Because clean, dry air is used through the system, component life is increased, which reduces maintenance costs.

The AD-IP Air Dryer consists of a desiccant cartridge secured to a die-cast aluminum end cover with a single, central bolt. The end cover contains a check valve assembly, safety valve, heater, and thermostat assembly; three pipe thread air connections; and the purge valve assembly. The removable purge valve assembly incorporates the purge valve mechanism. The dryer is chassis-mounted, curbside, and is accessible from either under the bus or through the hinged skirt panel; all replaceable assemblies can be replaced without removal of the air dryer from its mounting on the vehicle.

The AD-IP air dryer alternates between two operational modes or cycles during operation: the charge cycle and the purge cycle.

When the compressor is loaded (compressing air), compressed air, water, and water vapor flow through the compressor discharge line to the supply port of the air dryer body. As air travels through the end cover assembly, its direction of flow changes several times, reducing the temperature, causing contaminants to condense and drop to the bottom or sump of the air dryer end cover.

After exiting the end cover, the air flows into the desiccant cartridge. Once in the desiccant cartridge, air first flows through an oil separator located between the outer and inner shells of the cartridge. The separator removes water as well solid contaminants.

Air, along with the remaining water vapor, is further cooled as it exits the oil separator and continues to flow upward between the outer and inner shells. Upon reaching the top of the cartridge, the air reverses its direction of flow and enters the desiccant drying bed. Air flowing down through the column of desiccant becomes progressively drier as water vapor adheres to the desiccant material in a process known as adsorption. The desiccant cartridge, using the adsorption process, typically removes most of the water vapor from the pressurized air.

Dry air exits the bottom of the desiccant cartridge and flows through the center of the bolt used to secure the cartridge to the end cover. Air flows down the center of the desiccant cartridge bolt, through a cross-drilled passage, and exits the air dryer delivery port through the delivery check valve.

Dry air flowing through the center of the desiccant cartridge bolt also flows out the crossdrilled purge orifice and into the purge volume.

The air dryer remains in the charge cycle until the air system pressure builds to the governor cut-out setting.

As air system pressure reaches the cut-out setting of the governor, the governor unloads the compressor (air compression is stopped) and the purge cycle of the air dryer begins. When the governor unloads the compressor, it pressurizes the compressor unloader mechanism and the line connecting the governor unloader port to the AD-IP end cover

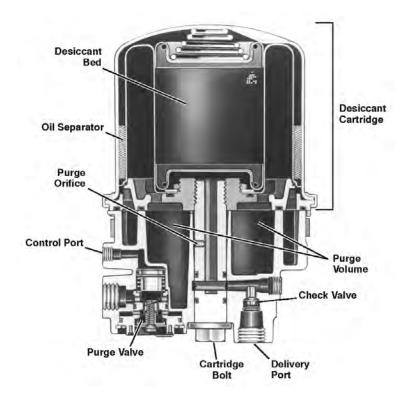


#### **AIR DRYER**

control port. The purge piston moves in response to air pressure, causing the purge valve to open to the atmosphere and the turbo cut-off valve to close off the supply of air from the compressor. Water and contaminants in the end cover sump are expelled immediately when the purge valve opens. Also, air that was flowing through the desiccant cartridge changes direction and begins to flow toward the open purge valve. Solid contaminants collected by the oil separator are removed by air flowing from the purge volume through the desiccant drying bed to the open purge valve.

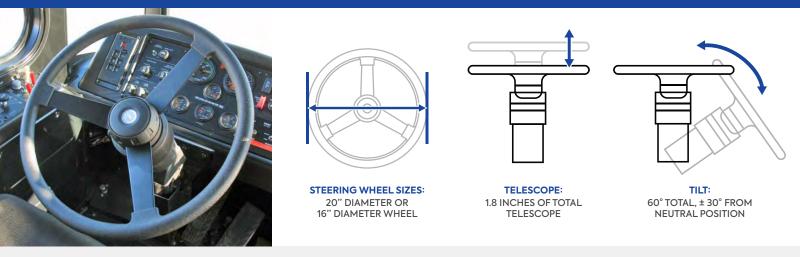
The initial purge and desiccant cartridge decompression lasts only a few seconds and is evidenced by an audible burst of air at the AD-IP exhaust.

The actual reactivation of the desiccant drying bed begins as dry air flows from the purge volume through the purge orifice in the desiccant cartridge bolt, then through the center of the bolt and into the desiccant bed. Pressurized air from the purge volume expands after passing through the purge orifice; its pressure is lowered, and its volume increased. The flow of dry air through the drying bed reactivates the desiccant material by removing the water vapor adhering to it.

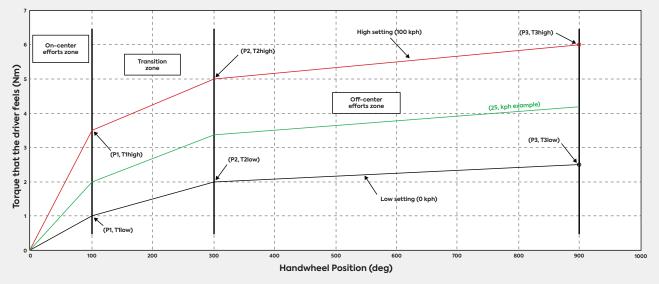




### **ZF REAX-C STEERING COLUMN**



#### **EFFORT CHART**



#### AT MIN TELESCOPIC HEIGHT ADJUSTMENT

Angle of slope	Height (20" wheel)	Height (18" wheel)	Height (16" wheel)
O°	33.4	33.1	31.8
15°	30.7	30.6	29.7
25°	28.8	28.8	28.1
35°	26.7	26.9	26.4
44° (max down tilt)	24.3	27.7	24.6

#### ACTUALS

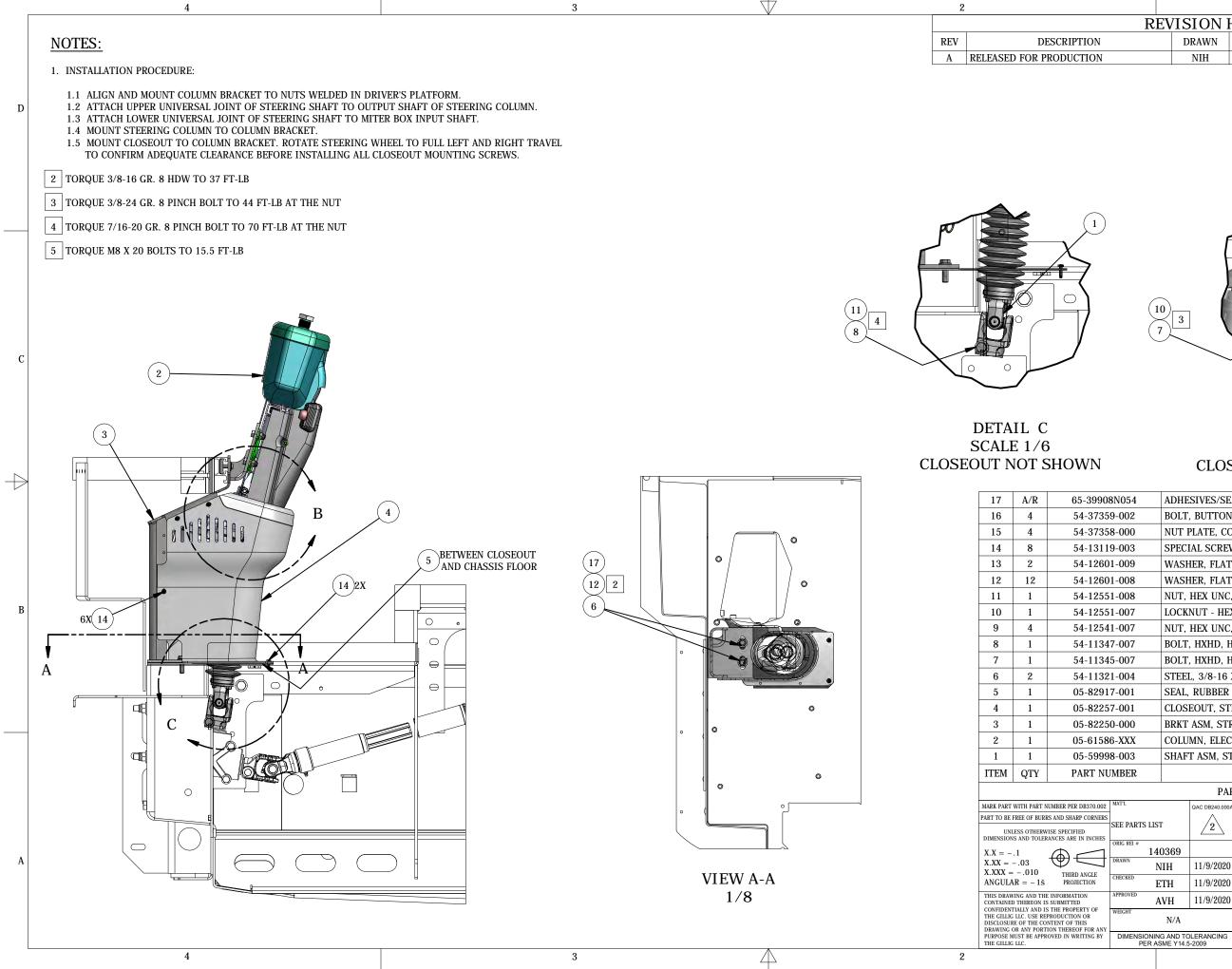
#### AT MAXIMUM TELESCOPIC HEIGHT ADJUSTMENT

Angle of slope	Height (20" wheel)	Height (18" wheel)	Height (16" wheel)
0°	35.2	33.8	33.8
15°	32.5	32.3	31.4
25°	30.5	30.5	29.8
35°	28.4	28.6	28.2
44° (max down tilt)	26.1	26.5	26.3

GILLIG

#### **APTA TARGETS**

#### AT MIN TELESCOPIC HEIGHT ADJUSTMENT (29 IN.) AT MAXIMUM TELESCOPIC HEIGHT ADJUSTMENT (5 IN.) Angle of slope Height Angle of slope Height 0° 0° 29.0 in. 34.0 in. 15° 26.2 in. 15° 31.2 in. 25° 25° 24.6 in. 29.6 in. 35° 22.5 in. 35° 27.5 in.



 $\forall 7$ 

					1				
RI	EVIS	ION F	HISTO	DRY		1 1			
	D	RAWN	CHECK	ED .	APPROVED	REI	DA	TE	
		NIH	ETH	[	AVH	140369	11/9/	2020	
				4X 15 4X 12 [ 4X 16	5	4X 12 4X 9	2		D
$\rightarrow$			DE	TAIL ALE 1	/6	ZNI			С
		CLOS	SEOU	I NO.	Г SHOW	'N			
54	ADHE	SIVES/SE	ALANTS,	LOCTIT	E 243 BLUE T	THREADLOCKER			
)2					X 20MM, CO	BALT			_
0	-	PLATE, CO							_
)3						PHCR W/CAM C	RIP		_
9		IER, FLAT			PE A SAE				-
)8 )8		IER, FLAT			INSERT GR8				-
)7		NUT - HEX		TILON	INDERI GRO				B
)7				NYLON T	NSERT GR8				-
)7	,	,			7/16-20 X 2.0	0 GR8			
)7					3/8-24 X 2.00				
)4	STEEL	., 3/8-16 X	X 1.25 LO	G UNC G	RADE 8				
)1	SEAL,	RUBBER							
)1	CLOSI	eout, sti	EERING	COLUMN					
00		ASM, STR							
X				/E STEEF	RING, SEE BO	OM FOR P/N			_
)3	SHAF	Г ASM, ST	EERING						_
ER					TITLE				_
	,		RTS LIST						
		QAC DB240.000A	`						
PARTS LIS	т	<u>_2</u>							
14 EI #	0369		TITLE						
N	VIH	11/9/2020	1	IN	STL, STEE	RING COLU	MN		A
ED	тн	11/9/2020	1		R	EAX			
VED	VH I	11/9/2020	SIZE	SCALE	DWG NO			REV	_
Т	N/A		D	SCALE		<u> </u>	,		

1

10-82924-002

Α

1 OF 1

B

N/A

1/8

#### HYDRAULIC SYSTEM

The hydraulic system furnishes hydraulic pressure to the steering gear to steer the front wheels. The system consists of a fluid reservoir, power steering hydraulic pump, steering gear, and associated hoses. These components can be accessed through the streetside battery box compartment.

Hydraulic fluid is stored in the hydraulic reservoir. The hydraulic pump provides constant flow to the steering gear at variable pressure. Fluid leaving the steering gear is returned directly to the reservoir.

The 24 V electric hydraulic power steering pump provides hydraulic pressure to the power steering gear. The hydraulic pump mounts to, and is driven from, the electric motor.

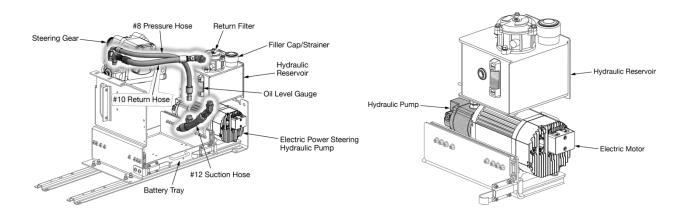
The fluid in the hydraulic system is selected to accomplish all of the various demands placed on it by the system performance parameters. Only OEM-approved fluids can be used.

The reservoir is mounted in the streetside front corner of the bus, in the battery compartment. The drop-in filter element keeps foreign matter and dirt from entering the pump and the steering gear. A protective cover is installed above the low voltage batteries to shield the top of the batteries and the exposed electrical terminals on the batteries from hydraulic fluids.

The power steering system depends on sufficient fluid pressure and flow to enable the steering gear to operate as designed. Fluid pressure reacting on a piston creates the force to cause the piston to move and assist the steering effort.

As the piston moves, it is displaced in the cylinder bore by a volume of fluid under pressure. How fast the piston can be displaced depends on adequate fluid flow and volume.

A pressure gauge that can read at least 3,000 psi (20,685 kPa) and a flow meter with a capacity of 10 GPM are needed to check pressures and flow.





Specifications				
Hydraulic reservoir	Supplier: Helgesen. Model: GILLIG-specific port. Construction: Welded steel construction with black powdercoat finish. Capacity: 5.1 quarts. Filtration: 10-micron replaceable filter element. Level measurement: Sight tube and electric low-level sensor. Drain port: Provided with SAE O ring hex head plug. Tethered fill cap with screen on fill port.			
Power steering pump	Supplier: Concentric. Model: EHS. Pump: Gear pump. Pump displacement: 11.3 cc/rev. Electric motor: 24-VDC PM, brushless. With CAN for variable speed capability and fault diagnosis. Pressure relief: 2,175 psi. Flow: 4.19 gpm. Life: 40,000-hour pump and motor. Warranty: 24 months.			



#### **FRONT AXLE**

The GILLIG Low Floor utilizes the Meritor FH-946 deep-drop front non-drive steer axle as our standard front axle. The front axle transfers the front weight of the bus to the tires, provides the pivoting mechanism to provide steering, holds the front axle brakes to provide braking, and provides the hubs to hold the wheels and allow the wheels to rotate.

The axle includes suspension rod attachment points that are integrated to the I-beam for simplified bracket design and greater bracket flexibility. The FH-946 also includes Easy Steer king pin bushings and tapered roller thrust, which permit easier steering.



Specifications	
Supplier	Meritor.
Model	FH-946.
Rating	16,000 lb (7,257 kg).
Wheel-end hardware	Hubs: cast iron. Hub lubrication: Oil lubrication, standard. Grease, optional. Wheel mounting: 10-hole bolt circle. 335-mm (13-in.) bolt circle. 281.2 hub bore. Hub pilot.
Turn angle	51 degrees.
Axle warranty	5 years or 300,000 miles.
Brakes	EX225H3 disc brakes.
Rotor diameter	434 mm (171 in.).
Brake linings	Meritor MA703.
Brake chamber	Туре 24.
Brake wear indication	Manual (standard), Electric (optional).
Brake warranty	2 years or 100,000 miles.

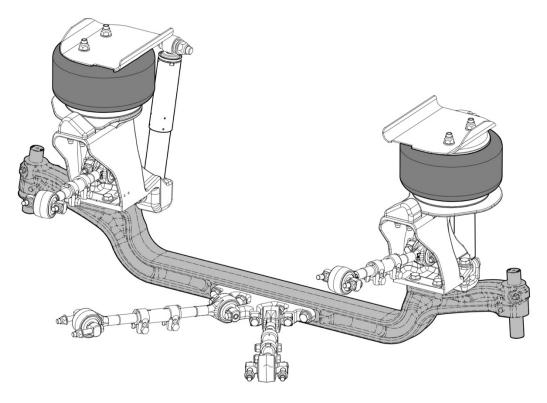
# CONFIDENTIAL

#### FRONT SUSPENSION

The front air suspension is composed of two Firestone air springs with internal bump stops for a smooth ride, shock absorbers to dampen bounce, external roll bumpers to limit suspension roll, and torque rods to maintain axle/frame geometry.

The air system operates automatically to maintain a constant ride height regardless of load or load distribution. The pressure in the air spring bellows is varied automatically by the height control valve in proportion to the bus load. As the bus is loaded, the body settles toward the axles. This movement operates the height control valve, and air is allowed into the air springs. Air pressure in the air springs increases enough to compensate for the additional load. As passengers leave the bus, the height control valves allow air to exhaust from the air springs. The air in the air springs is reduced by the valves in proportion to the weight debarking the bus, which, again, keeps the bus body at normal ride level. The height control valves are designed to operate only when the load in the bus is changed. They do not respond to the rapid relative motion between the axle and body, such as the motion caused by road bumps.

The torque rods hold the axle in a position perpendicular to the axis of the chassis so that the tires track in parallel lines when in operation.



The front suspension kneeling system allows the driver, when the bus is stopped, to override the air suspension height control system and kneel (or lower) the front air suspension. Kneeling the bus reduces the front step height and reduces the wheelchair ramp angle. Reducing the step height or ramp angle makes access into the bus easier for passengers with reduced mobility. The kneeling system allows lowering the front

#### FRONT SUSPENSION

suspension and holding it at the lowered height in any position from normal ride height to fully lowered. Brake and throttle interlock prevent movement when the bus is kneeled. To raise the bus back to normal ride height quickly, the kneeling system includes a fast fill feature. This raises the front suspension back from fully lowered to normal ride height in 3 to 5 seconds. If required to facilitate wheelchair ramp deployment, the kneeling system can also be used to over-raise the front suspension to provide a front suspension height above the normal ride height. An indicator mounted on the instrument panel illuminates during the kneeling operation and remains illuminated until the bus is raised to a height adequate for safe street travel.

Specifications			
Height Control Valve	Barksdale.		
Kneeling Valve	Parker, manifold-type valve.		
Maximum acceleration: kneel/raise	0.2 g.		
Maximum jerk: kneel/raise	0.3 g.		
Kneeling time	1.5-2.5 seconds from control activation.		
Raise time	2 seconds to permit driving, 5 seconds to return to full ride height.		



#### **REAR AXLES AND BRAKES**

GILLIG uses the Meritor 79000 series single reduction axle. The full floating rear axle has a one-piece housing with welded bowl. Power is transmitted from (and in regenerative braking to) the traction motor through a propeller shaft to the drive pinion gear and differential assembly, to the axle shafts, and then to the rear wheels. The differential assembly, drive pinion gear, and pinion cage assembly are mounted in the differential carrier. By removing the axle shafts, the carrier can be removed for inspection, adjustment, or replacement without having to remove the axle housing from the vehicle.

The differential is a conventional four-pinion type carried in a two-piece case mounted in tapered roller bearings. The drive (ring) gear is bolted to the flanged half of the differential case. Thrust washers are used between the side gears and differential case and also between the differential pinion gears and case. The case halves are secured by cap screws and hardened washers. The differential assembly provides for gear reduction to reduce the revolutions per minute and to multiply the torque from the traction motor while allowing for wheel speed differences.

The differential is supported in tapered roller bearings, which accept both thrust and radial loads. The bearings are mounted within supports in the carrier, while thrust loads are born by the adjusting rings threaded into the carrier supports and bearing caps.

The axle housing has outer end tubes that are threaded to accept wheel bearing adjusting nuts. The axle shafts are the same for left or right sides. The flange at the outer end is attached to the hub by studs, tapered dowels, and nuts. The inner end is splined to the differential side gears.



GILLIG buses use air-actuated disc brakes. The force introduced from an air chamber push rod is amplified by the mechanism within the floating caliper housing. This mechanism creates a clamping force that is applied to the inboard brake pad. Once the inboard pad has contacted the brake rotor, a reaction force acts through the floating caliper housing and bridge to pull the outboard pad onto the brake rotor. The brakes are released by reducing the input force from the air chamber, which reduces the clamping force of the brake. A return spring within the caliper housing returns the mechanism back to its starting position, leaving the pads with a defined running clearance to the rotor. The small run-out of the brake rotor and hub then creates a small clearance for the outboard pad after a few revolutions of the rotor. An automatic adjuster adjusts the brake pad



#### **REAR AXLES AND BRAKES**

clearance to compensate for pad wear. This adjuster is internal to the caliper housing and is manually readjusted back to its starting position when new brake pads are installed.

GILLIG provides an anti-lock braking system (ABS) provided by Wabco. The ABS monitors and controls wheel speed during braking. If a wheel starts to lock up during braking, the ABS reduces air pressure to that wheel's brake to keep all wheels turning at the same speed. When the wheel speed enters the stable region again, the air pressure automatically increases.

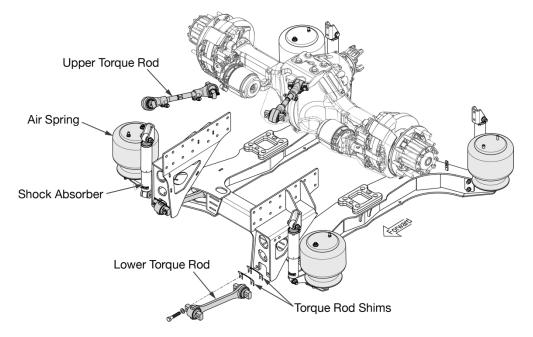
Specifications for Rear Axle		
Supplier	Meritor.	
Model	79163.	
Rating	29,000 lb (13,154 kg).	
Rear axle ratio	Standard: 6.14:1.	
Wheel-end hardware	<ul> <li>Hubs: cast iron.</li> <li>Hub lubrication: Oil lubrication, standard. Grease, optional.</li> <li>Wheel mounting: 10-hole bolt circle. 335-mm (13-in.) bolt circle.</li> <li>281.2 hub bore.</li> <li>Hub pilot only.</li> <li>Stud pilot not available.</li> </ul>	
Warranty	5 years or 300,000 miles.	

Specifications for Brakes		
Supplier	Meritor.	
Model	EX225H3.	
Rotor diameter	434 mm (17 in.).	
Linings	Meritor MA703.	
Brake chamber	Туре 24.	
Brake wear indication	Manual (standard), Electric (optional).	
Warranty	2 years or 100,000 miles.	



#### **REAR SUSPENSION**

The Hendrickson 4-bag rear suspension has an H-frame construction, which supports four air springs. The H-frame is a solid piece made up of two pairs of beams perpendicular to each other. The beams are not detachable from one another. The rear axle rests on saddles on two of the suspension beams. The air springs rest on mounting plates at each end of the other two suspension beams. The suspension is connected to the chassis frame by four torque rods. The air springs and shock absorbers form the other connecting points of the suspension and to the chassis frame. Two height control valves automatically maintain correct ride height by controlling air pressure in the air springs. Two upper and two lower torque rods are used to position the axle. The upper torque rods are attached to the suspension H-frame and the chassis frame. Each of these rods has rubber bushings with metal inserts to absorb axle deflections. Two pairs of telescoping-type shock absorbers are installed.



Air springs provide passengers with a smooth and comfortable ride. Each end of the flexible member (the air bag) has a reinforced bead that forms an air-tight seal when the spring is inflated. When in operation, the air bag folds over the piston at the bottom of the suspension so that the characteristic lobe shape is produced. The suspension bump/limit stops are located inside the air spring assemblies to support the bus if there is an air spring failure and to prevent damage to the bus understructure from large suspension deflections.

The air suspension height control valves automatically control the air pressure in the air springs to maintain the proper ride height. As the vehicle is loaded, the air springs compress slightly. The height control valve actuating arm moves up from the neutral position to the fill position. This allows air to flow from the air tanks into the air springs, increasing the pressure in the air springs, and bringing the air spring back to the proper



#### **REAR SUSPENSION**

height. When the vehicle is unloaded, the air springs slightly increase in length and the height control valve actuating arm moves from the neutral position to the exhaust position. This exhausts some of the air in the air spring until enough air has been exhausted to bring the air spring back to the proper height.



#### **MULTI-FUNCTION DISPLAY**

A touchscreen Multi-Function Display (MFD) initializes when the bus is turned on using the front run switch. This screen is the default display and displays the same operational information provided by standard gauges, such as speed, odometer reading, and voltage. There are also 16 stationary indicators along either side of the MFD. The primary and secondary screens display vehicle warning/information indicators in an easily visible way.

The indicator lamps (30 in the center and 16 on either side of the MFD) are programmed so some are turned on during normal bus function and others call attention to problems with red (for danger) and yellow (for attention/caution) warnings. Some indicators are connected to buzzers or alarms to serve as both alerts for dangerous situations or reminders during normal operations.



The primary screen is the default display for the driver while in motion. The relevant gauges and indicator lamps are displayed in a central location to allow the operator to quickly review the status while driving.

The MFD also provides a variety of secondary screens to display information during charging, maintenance, or when an alert is required.

#### Charging Screens





#### **MULTI-FUNCTION DISPLAY**

#### Sample Maintenance Menus



#### Sample Alert Screens



If the secondary screen is selected, it will automatically revert back to the primary screen when the bus is accelerated to at least 3 mph.

If equipped with a compatible camera, the MFD can serve as a back-up monitor. Whenever the bus is operational and is shifted into reverse, the MFD displays full-screen video of the area behind the bus. The MFD switches back to the primary screen when the transmission is no longer in reverse. Additionally, the MFD can display the video feed from a compatible rear door camera when the rear door is opened to allow the driver to verify there are no obstructions before closing the doors.

The MFD has two modes for driver convenience: day mode and night mode. In Night Mode, the MFD displays in inverted colors, changing from a white background to a black background, so it is more visible at night and reduces glare and reflection.



GILLIG's Battery Electric Bus telematics is a web-based system which displays live and historical data from the fleet level down to the individual bus.

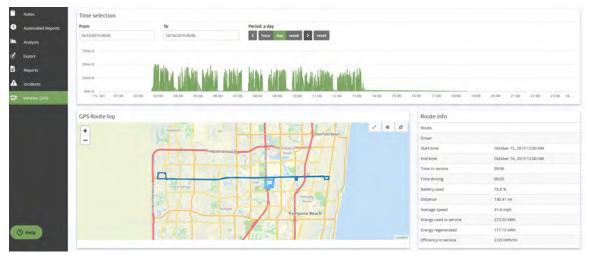
- Organizes data with graph, map, and table views to make goal-based analysis easy.
- Updates with live data every second.
- Resizes to work on both desktop and mobile.
- User-configurable automatic reporting on fleet or individual bus data.
- Report types can be saved for easy online access or emailed automatically.
- User-configurable automatic and immediate alerts such as "Low State of Charge."
- Downloadable raw data in MS Excel format for further processing.

**Fleet Dashboard** shows live data for all vehicles. There is a map view, a list sorted by battery state of charge, and a list of vehicles that are completely offline.

**Vehicle Dashboard** shows live data for one vehicle, including State of Charge, location, range remaining, and efficiency per mile that day.

*Subsystem tabs* show live data, such as HVAC use and temperature, 24 V battery information, door and ramp position, etc.

*Route Log* shows historical data for one vehicle with a map view. It allows you to see metrics of a route or time period with drag-and-drop selection. This can help with estimating the vehicle range on new routes.

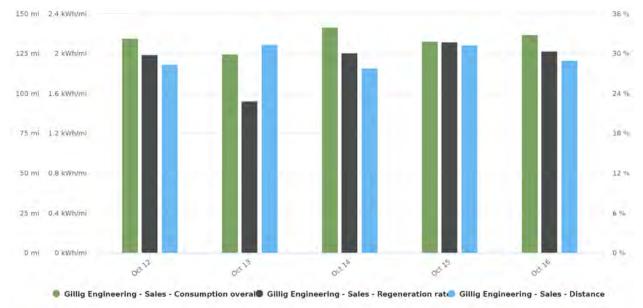


*Diagnostic Messages* shows recorded and live fault codes, with their descriptions and severity levels.

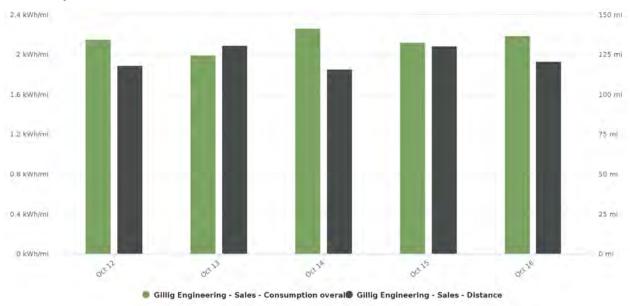


#### **TELEMATICS**

**Analysis** shows historical data for any number of vehicles with a graph view over time. It allows you to see exactly when certain events happen, such as door status, and can assist with troubleshooting.



**Reports** shows historical data for any number of vehicles with a graph view that is averaged by day/week/month/year. It allows you to see trends in average speed, efficiency, distance traveled, etc.



Portal allows administrators to configure access to different users.



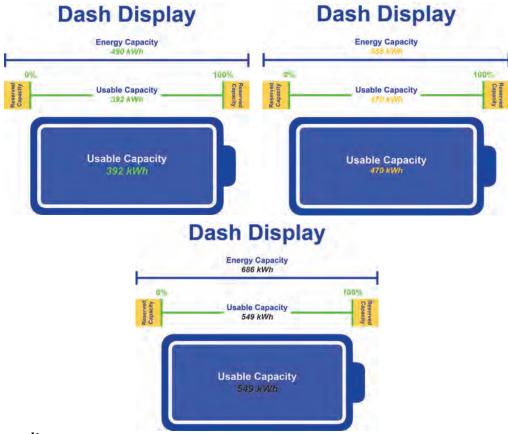
## CONFIDENTIAL

Specifications			
Interfaces, J1939 CAN	Baud rate: 500k. Number of channels: 1. Sampling rate: down to 1 ms. Data compression or loss-rate: lossless data compression allowed.		
Analog input data collection capability	Voltage input range: 0–10 VDC. Minimum resolution: 0.01 VDC. Minimum sampling rate: selective 10 ms/100 Hz. Number of channels: 6.		
Communications	Wireless LAN, 802.11ac. IR5.3.2. GSM (cellular), LTE.		
Onboard storage	8 GB minimum.		
Power requirements	Full load 5 W. Standby 1 W. Sleep 0.1 W.		
Sensors	GPS, gyro, accelerometer (3-axis), and barometric pressure.		
Other	Automatic recovery/crash resilient. Remote configuration management. Wake on CAN and I/O.		



#### **ENERGY CAPACITY AND RANGE**

Many factors determine the real-life range of an electric vehicle, which is derived from the net usable energy (or capacity) and the rate of energy consumption.



#### **Rated Capacity**

The rated capacity of a battery is the amount of total energy that can be stored in and discharged from the battery. Battery capacity reduces over the life of the cells as the impact of charging and discharging reduces the ability for the cells to reach full charge. Battery health is monitored by the battery management system and reported via telematics. The State of Health (SOH) is communicated as a percentage of the rated capacity at the start of life.

#### **Reserved Capacity**

Battery life is negatively impacted when cells are overcharged or when the depth of discharge is too low. In order to maximize high-voltage battery life, the capacity of the battery is limited to prevent discharge below 10% and charging above 90% of rated capacity. The charge controller prevents the batteries from being charged above the top limit, and derating protocols are in place to prevent the batteries from reaching the bottom limit.

#### **Usable Capacity**

The result of reserving some high-voltage battery capacity is that 80% of the rated capacity is available to power the vehicle. This is the usable capacity, and it is used for all range calculations. The State of Charge (SOC) reported on the dashboard and via telematics represents the usable capacity remaining until a recharge is necessary.

#### ENERGY CAPACITY AND RANGE

#### **Energy Consumption**

Many factors impact the actual range of electric buses in operation. The duty cycle, route profile, and passenger loading determine how much energy is drive necessary to the traction motor and how much energy is captured through regenerative braking. Drivers can have a significant impact on energy consumption through how effectively they apply throttle and use regenerative braking to slow the bus. The HVAC system is also a significant use of energy on a bus, and settings (temperature set-points, fan speeds, etc.) can be optimized to reduce energy consumption.

Customer-specified equipment (passenger seats. windows, CAD/AVL. and video equipment, etc.) can have a large impact on total vehicle weight, which can also impact energy consumption. GILLIG has developed a Smart Spec that optimizes the range of the bus through component selection. More details are available for discussion during the pre-production meeting.

#### **Range Estimates**

Many factors determine the real-life range of an electric vehicle, consumption is derived from the net usable engery (or capacity) and the rate of energy consumption.

Configuration	High-Voltage Battery Packs, Qty	Total Rated Capacity	Range at 2.3 kWh/mile*
5 battery pack	5, each with 98 kWh	490 kWh	170 miles
6 battery pack	6, each with 98 kWh	588 kWh	205 miles
7 battery pack	7, each with 98 kWh	686 kWh	239 miles

#### **CORROSION PROTECTION: OVERVIEW**

The design goal of producing a durable vehicle that would provide years of reliable service necessitated a construction that would be as corrosion resistant as possible.

All forms of corrosion were considered in the Low Floor bus designs, from basic oxidation caused by moisture and humidity to surface corrosion caused by chemical attack such as road or atmospheric salt or acid rain. Also considered was simple galvanic corrosion caused by ion transfer in contacting dissimilar metals, as well as the more complex intergranular, oxygen cell, or metallic ion corrosion.

The corrosion resistance of GILLIG's Low Floor buses continues to increase as newer, more effective materials become available and as field experience in all varieties of conditions and environments is gained. Stainless steel is used extensively in the chassis construction, fuel tank, wheel wells, access door hinges, and electrical boxes, cushion clamps, and other areas. Aluminum extrusions are employed throughout the body construction, and 0.125-in. (0.218-cm) aluminum sheet is used to form the body panels and access doors. Improved undercoating materials, applied both before and after assembly, provide a high level of corrosion resistance to the finished vehicle.

Corrosion protection is achieved by a combination of:

- Careful material selection.
- Rigid process controls.
- Standardized surface preparation before the application of high-quality protective coatings.

#### **Protective Coatings**

GILLIG has increased the use of powder coated components, especially those subassemblies with moving parts that create nooks and crannies that can hold moisture. All GILLIG manufactured parts and parts that are provided through the supply chain are required to adhere to GILLIG manufacturing standards that specify the proper cleaning, priming, and quality checks that parts must go through. These procedures are in place to reduce areas that may hold moisture and therefore be more susceptible to corrosion.

Improved undercoating materials, such as our durable latex-based anti-corrosion undercoating, which is highly sag-resistant and intended for direct to metal underbody adhesion, has passed over 1,000 hours of salt-spray resistance per ASTM B-117 as well as 100% relative humidity testing per ASTM D-1748. The film is not affected when immersed in aggressive, caustic solutions. This undercoating is environmentally safe and meets the strictest of air quality regulations.



#### **CORROSION PROTECTION: MATERIALS**

The GILLIG Low Floor bus is manufactured to a very high standard of quality and finish. Aircraft-quality materials provide high structural integrity and naturally high corrosion resistance.

- Stainless-steel chassis structure with epoxy corrosion-protective coating applied at all body connection faces
- Type 3 hard anodized aluminum body structure
- Type 2 anodized aluminum mid-rail
- Fiberglass front and rear body panels
- Corrosion-resistant aluminum body skirts
- Aluminum rear and side-skirt hinged engine access doors
- Aluminum rivets on skirt panels and skirt-panel brackets
- Stainless-steel interior trim fasteners, to withstand interior bus wash and tracked-in road salt
- Stainless-steel external body screws with non-metallic galvanic corrosion barrier
- Nylon Sprague wiper spanner lock-nuts and acorn nuts
- Stainless-steel attachment hardware for the four rubber wheel-well fenders
- Stainless-steel compartment floor sheet for HVAC
- Powder coated chassis component-mounting brackets
- Stainless-steel coolant surge tank
- Aluminum radiator to side-door baffle to exclude rear-wheel-thrown road salt and debris from the faces of the turbo-after-cooler and radiator
- Corrosion- and chemical-resistant coating on cooling fan frame
- Stainless-steel cushion hose clamps, all locations
- Stainless-steel wheel wells
- Aluminum powder coated wheel-well stress panels
- Rubber mud guard for wheel arch fenders
- Primary stainless-steel grab handles, stanchions, and fasteners. Cast aluminum pow-der coated tees, hangers, and elbows
- High-solids, aluminum-filled epoxy corrosion protective coating applied to the entire aluminum sidewall body structure before assembly onto chassis
- Specially formulated sealant coatings for all body/chassis connections
- Stainless-steel fuel tank with stainless-steel mounting straps

#### **CORROSION PROTECTION: MATERIALS**

- 7-ply treated marine-grade plywood or optional phenolic composite floor, with undersides and edges pre-sealed with undercoating
- All wheel-well joints fully sealed with high-performance sealant
- All floor joints sealed with high-performance sealant
- Stainless-steel battery compartment tray
- Stainless-steel with non-metallic battery hold downs (optional)
- Stainless-steel fuse box and seal
- Stainless-steel mounting bracket for battery disconnect and Vanner voltage equalizer
- Non-metallic, high-dielectric-strength barrier tape separates aluminum and steel materials in body and roof to prevent galvanic corrosion
- Stainless-steel rear settee enclosure and access cover
- Entire lower vehicle underbody and exposed chassis are treated with durable latexbased anti-corrosion undercoating
- Optional electrolytic "E" coating of radiator/CAC/hydraulic oil cooler.
- Corrosion-resistant ABS valves with bayonet connectors
- Exterior lamps mounted with rubber-jacketed nuts to prevent galvanic corrosion
- Stainless-steel rear bumper mounting bracket with pre-applied galvanic isolator
- Stainless-steel steel skirt panel hinges isolated with a high-dielectric-strength barrier tape

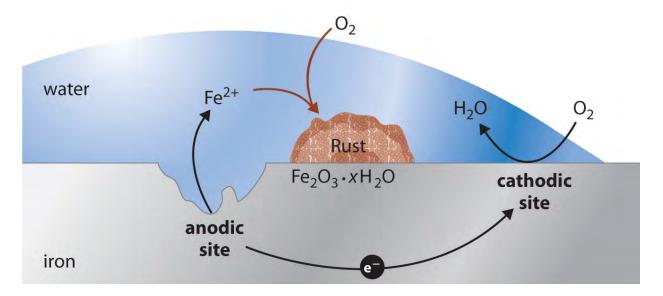


### **CORROSION PROTECTION: EXPLAINED**

#### **Corrosion of Ordinary Carbon Steel**

Corrosion is essentially an electrochemical process in which metal ions react with the surrounding environment to form an oxide. Current (electrons) naturally flow between active areas on the metals surface (anodic sites) and other areas (cathodic sites), forming the electrochemical cell. This is essentially same principle that dictates the behavior of a battery.

The figure below describes the reaction of ordinary carbon steel with oxygen ( $O_2$ ) that is present in the atmosphere. The anodic (active) areas may initially be remnants of mill scale, inclusions, discontinuities, or possibly the effect of pollutant on the oxide film. Electrons migrate away from the anodic sites, producing positively charged iron molecules. Oxygen from the water combines with iron in the steel to form iron oxide (Fe<sub>2</sub>O<sub>3</sub>), known more commonly as rust.



Typical carbon steel is approximately 98% iron (Fe). Iron oxide on carbon steel does not form a continuous layer on the steel because the iron oxide molecule has a larger volume than the underlying iron atoms. The iron oxide scale is essentially porous in nature, which allows for continued attack of the steel substrate, regardless of the thickness of the overall oxide layer.

Although the layer of iron oxide significantly slows the rate of corrosion and acts as a partial barrier for salts or other corrosive elements, the overall rate of corrosion is still unacceptably high in most applications. Thus, the only way for carbon steels to have true corrosion resistance is to surface them with some type of protective coating—e.g. paint, oil, or galvanizing.

GILLIG has elected to use 3CR12 stainless steel for their chassis instead of ordinary carbon steel.



#### Selection of 3CR12

Several factors besides corrosion resistance were considered when selecting GILLIG chassis material. The most crucial factors were strength, ease of fabrication, and toughness throughout the operating temperature range of the vehicle. 3CR12 has a generally higher fatigue and yield strength compared to typical structural grades of carbon steel. It is also easily welded and formed, without upsetting the internal grain structure of steel. 3CR12 has a greater range of temperature stability, avoiding a transition from ductile to brittle fracture behavior at low temperatures.

#### **Corrosion Behavior on 3CR12**

In contrast to carbon steel, stainless steels like 3CR12 derive their corrosion resistance from the element chromium: any steel containing at least 10.5% or more chromium is defined as a stainless steel. Chromium in stainless steel results in the formation of a passive layer, which is a thin, non-porous chromium oxide film that acts as a barrier to protect the underlying metal against further reaction with the corrosive atmosphere.

Also, chromium as an alloying element in steel fights corrosion because if the stainless steel surface is damaged and exposed to oxygen, this tightly adherent passive film on its surface reforms itself rapidly, thus maintaining its corrosion protection. This process is called re-passivation.

The chromium oxide prevents further oxidation of the stainless steel. 3CR12 contains approximately 11.5% chromium, which enables the steel to form this stable, corrosion-resistant protective film on its surface.

Quantifying these differences, general atmospheric corrosion testing of 3CR12 has given corrosion rates 115 times slower than that of exposed carbon steel under the same conditions.

#### Rusting on 3CR12

The presence of contaminants can affect corrosion resistance of stainless steels considerably. One of the most important factors is chloride concentration. If left unattended, chloride ions (from road salts and de-icing chemicals) concentrate on the surface of stainless steels enough to produce very small, local breaks in the passive layer of the stainless steel. At the site of the breaks, where the metal is temporarily unprotected, the wet, chloride-rich environment slows the rate of re-passivation, and the steel can develop micro pits. The development and dispersion of micro pits should not be confused with the general, all-over corrosion on non-alloyed carbon steels.

In practice, for low-alloyed or utility stainless steel materials like 3CR12, exposure to more aggressive or corrosive environments leads to the passive oxide layer growing thicker, forming a uniform rust-colored patina. Wetting the surface with salt water is considered to initiate corrosion, typically in localized areas, as is seen by small rust spots. Drying allows reformation of the passive layer, and subsequent wetting flushes out any remaining

#### **CORROSION PROTECTION: EXPLAINED**

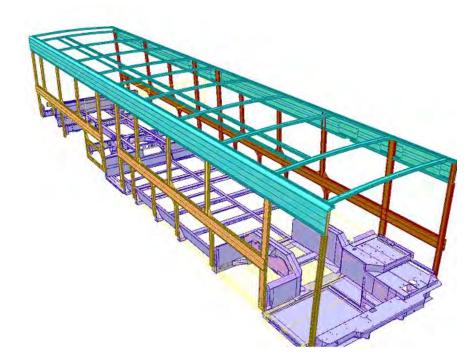
concentration of chlorides that may have resulted in active areas with micro pits. New areas of local corrosion may form with each wetting and drying cycle.

The build-up of corrosion product—i.e., red rust—covers the metal beneath. This rust layer then acts as a partial barrier to chloride ions and prevents further destruction of the metal below. Underneath the rust layer, the metal interface also has a significant chromium content due to the depletion of iron. Hence, corrosion of the underlying metal is reduced to extremely low rates. This is why it is considered that, while not aesthetically pleasing, the structural integrity of the 3CR12 steel section is not affected. 3CR12 has a proven history of maintaining structural integrity and cross-sectional consistency in corrosive and marine environments for more than 30 years, spanning several industries.

To maintain optimum appearance, frequent neutralization and washing of all chassis/undercarriage areas is important. If desired, areas with surface rust present can be treated by abrading with non-metallic or non-ferrous metal tools, which remove any unsightly surface rust and allow the clean, bare metal to naturally re-passivate.



### **CORROSION PROTECTION: LOCATIONS**



The unique chassis platform of a GILLIG Low Floor consists of a stainless-steel structure with integral side impact barriers. The three chassis modules (front, center, and rear) are constructed of both open and tubular section structural shapes that are welded together in specially designed fixtures with common tooling points to those of the body. The final chassis assembly is fastened together using a Huck bolt system.

The robust, integral side impact barrier has been designed to provide maximum collision security to passengers inside the Low Floor section of the bus. This 15-in. (38-cm) high barrier also provides a significant structural element by equipping the center section of the frame with a sturdy perimeter.

The forward chassis structure features a tubular bridge section, which includes a large stainless-steel shear panel, over the front axle. The front structure that supports the bumper and the "A"-posts is a 12-in. (30-cm) high stainless-steel channel. This channel is supported by fabricated I-beams and the stainless-steel driver's platform.

Corrosion protection is fortified with an application of a durable latex based anti-corrosion undercoating to the entire exposed underside of the completed chassis assembly.

#### **Stainless-Steel Chassis**

The GILLIG Low Floor chassis structure is manufactured from 3CR12 stainless steel. The corrosion rate of 3CR12 stainless steel is 115 times less susceptible to corrosion than that of carbon steel. Additionally, whereas carbon steel suffers from an "all over general corrosion", 3CR12 would only develop micro-pits that do not propagate, and these become passive after some time.



# GILLIG

#### **CORROSION PROTECTION: LOCATIONS**

To put this into perspective, if a plain unfabricated piece of 1/16" thick 3CR12 were left outside in a severe marine atmosphere (that is right on the coastline), it would take a minimum of 700 years to corrode through its thickness, whereas a piece of carbon steel in the same thickness would only take about 6 years to corrode through.

Such a material makes a perfect foundation for a bus chassis that's subjected to harsh, corrosive atmospheres—and that's why it was chosen for the GILLIG low floorbus.

Passenger and driver safety features are other important design criteria that have been incorporated into the design of the GILLIG Low Floor. In the Low Floor application, it should be noted that provision must be made to particularly protect the passengers from side impact, as they are located at a lower level than standard floor buses. With this in mind, the GILLIG chassis substructure incorporates a unique side impact protection barrier in the lower level. That side impact barrier combined with the driver's front protection module provides for a strong and durable structural foundation.

The front stainless steel module design also allows for better ADA accessibility. The enlarged entrance area leads to a wide aisle way between the front wheel wells. It actually provides for a 36" width in that area and allows generous room for maneuvering the larger mobility devices.





Top: Front section of the stainless-steel chassis. Bottom: Center section of the stainless-steel chassis.



#### **Aluminum Body Frame**

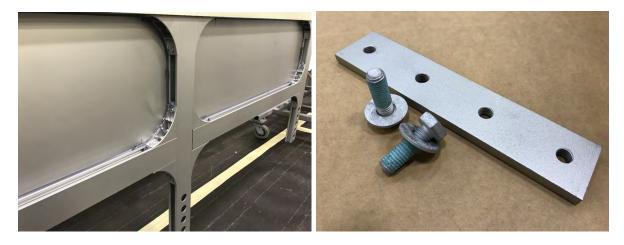
The GILLIG Low Floor body frame is assembled of aluminum extrusions, forgings, and castings. Aluminum is inherently corrosion resistant as formed since surfaces produce a barrier of oxide film within minutes of being produced. To extend this level of performance, all extrusions below the window line are treated with grades of anodizing and sealing which exceed military specifications and produce an exceptional corrosion barrier, and interior shear panels are formed of 5052 aluminum, which is one of the most corrosion-resistant grades of aluminum sheet available.

GILLIG's mid-rail extrusion receives a type 2 anodizing and sealing before assembly, after all machining is performed. The vertical body posts receive a type 3 hard anodizing and sealing. Both processes exceed military specifications.

After assembly and before exterior panel installation, in addition to anodizing, GILLIG sprays a high-solids aluminum-filled epoxy corrosion protection coating throughout the vertical sidewall body structure, from the lower edges of the structure to above the midrail extrusion.

GILLIG also uses a super durable powder coating on the major aluminum shear panels, each fastened with coated aircraft-grade structural rivets. All aluminum body extrusions are assembled with engineered corner gussets, attached with high-strength channel nuts and Geomet coated class 8.8 bolts.

There is no welding on the GILLIG Low Floor body structure.



Left: Coated Body Structure. Right: Geomet-Coated Body Attachment Hardware.

The Low Floor body structure is fastened to the chassis assembly using Geomet coated class 10.9 bolts and hardened washers. The Geomet coating offers excellent corrosion protection not only for the fasteners, but for the aluminum body structure as well. Geomet has 5 times the salt spray protection of a standard zinc-coated fastener.

The body structure/chassis connection is a heavily engineered feature on a GILLIG Low Floor bus. It provides unparalleled safety as well as ease of service, in the event of vehicle damage from a collision.

# GILLIG

### **CORROSION PROTECTION: LOCATIONS**

Before the body is connected to the chassis with Geomet hardware, a specially formulated hybrid epoxy/sealant coating is applied to the mating surfaces to add mechanical strength and seal out corrosive elements. After the connection is made, all joints are redundantly sealed.



Left: Protected & sealed body/chassis connection. Right: Sealed wheel well and stress panel arch.

The powder coated aluminum wheel arch stress panels are bonded to the side wall structure to create a weather tight seal. The stainless steel wheel wells and attachment rivets are also completely sealed to prevent water from entering the bus.

#### **Roof Structure**

The roof structure includes aluminum extrusions and sheet fiberglass-reinforced plastic (FRP), which are joined together with a two-component methacrylate adhesive, producing an incredibly strong structural bond. The FRP is chemically neutral and is not subject to corrosion. The aluminum, which is inherently resistant to corrosion, is painted with exterior paint if it will be exposed to the elements. Non-exposed interior surfaces are covered by insulating material.

#### **Front/Rear Caps**

Front and rear body caps are molded fiberglass, which are painted to match the customer's design layout. Fiberglass does not corrode. Embedded tapping plates for installing lights, etc. are 304 stainless steel, to resist any corrosion.



# GILLIG

### **CORROSION PROTECTION: LOCATIONS**

#### **Skirt Panels**

Skirt (side) panels are manufactured from 0.125-in. (0.318-cm) thick sheets of 5052-H32 aluminum. This metal has high resistance to corrosion and is of medium strength. These pieces are high in stiffness to prevent drumming or oil caning. Both sides of the panels are first treated with multiple coats of epoxy primer before being painted with Axalta topcoats per the customer's design. The interior surface edging of the panel is painted with the epoxy primer as well as GILLIG's aluminum-filled epoxy corrosion protective coating.

Each of these processes are inspected and documented. The careful selection of materials and methods ultimately result in a bus that withstands the toughest of operating environments throughout the life of the bus. This is one of the many reasons GILLIG buses have a lower lifetime cost of ownership.

#### Skirt Panels – Brackets

The lower attachment brackets for the skirt panels are manufactured from corrosionresistant 5052-H32 aluminum. Additional corrosion resistance is provided by adding a durable powder coating and edge sealing during assembly.

The brackets are installed using aircraft-grade structural aluminum rivets, avoiding any dissimilar metal contact.



Sealed & powder coated aluminum skirt panel bracket

#### Skirt Panels – Non-Hinged

The skirt panels are manufactured from 0.125-in. (0.318-cm) thick 5052-H32 aluminum. The material comes from a pre-primed aluminum coil that is treated with an epoxy paint.



### **CORROSION PROTECTION: LOCATIONS**

After receipt of the panels, GILLIG treats the shear edges and areas that will insert into the mid-rail with our high-solids aluminum-filled epoxy corrosion-protection coating.

Non-hinged skirt panels have a 2-in. (5-cm) piece of polyurethane foam tape every 12 in. (30 cm) before being inserted into the mid-rail channel. The tape eliminates road rattle and allows air flow inside the mid-rail channel which eliminates moisture saturation. The bottom edge of the skirt panel is bolted to the skirt panel brackets using Dacromet and/or Geomet coated fasteners.



Tape applied to top edge of coated skirt panel

#### Skirt Panels – Hinged

Hinged skirt panels are attached to the body with stainless steel hinges. The surface of the panel where it is attached to the hinge is coated with epoxy primer. Additionally, a continuous strip of high-dielectric-strength isolating tape is bonded between the hinge and the body attachment for added corrosion protection. These panels are locked in place with 5/16-in. (0.8-cm) stainless square key locks. The back of the stainless-steel lock is coated before being riveted to the panel with aluminum rivets. The body mounted lock catch is also treated.



Left: Isolating tape applied over primed hinged panels. Right: Stainless steel square key locks with pre-applied protective coating.

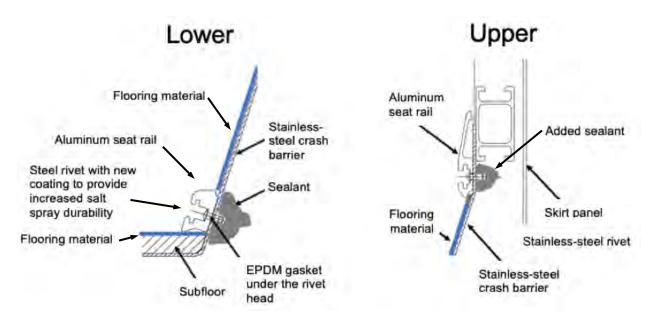


# GILLIG

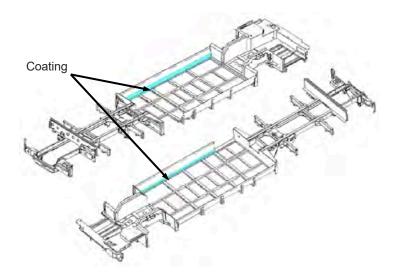
### **CORROSION PROTECTION: LOCATIONS**

#### **Seat Rail Mounting**

The seat rails are secured to the chassis with rivets. The upper seat rail is mounted to the chassis with a stainless-steel rivet. The backside of the rivet is then sealed with Manus 75AM. The lower seat rail rivet is the same rivet except the coating is zinc-nickel plated that is rated at 2,000 hours of salt-spray testing before red rust is visible. The rivet also has a washer under the head to prevent water intrusion from entering the joint from the inside of the bus.



GILLIG also provides a barrier between the lower seat rail and the crash barrier. A galvanic corrosion coating is applied to the chassis crash barrier prior to the installation of the lower seat rail. The chassis crash barrier is cleaned and primed with an epoxy coating to eliminate the direct contact between the dissimilar metals providing protection against galvanic corrosion.





GILLIG contracted with a specialty test lab to conduct an evaluation of our current corrosion protection process.

GILLIG and the test lab designed the test protocol to compare the cumulative real-world damage by corrosion, mechanical stresses, and environmental exposure with salt spray testing, which cannot replicate these other stresses.

The test protocol combined cyclic mechanical loading and exposure to an array of corrosive substances, including several common de-icing salts. Samples were also preconditioned, involving temperature shock, humidity extremes, and abrasive blasting to demonstrate resilience to real-world environmental factors.

The goal was to design a comprehensive test that is aggressive enough to provide a conservative estimate of body /chassis structure protection over a 12-year life of a GILLIG bus.

#### Summary of Results

The post-test samples showed zero structural flaws; uniform isolation; protection on the aluminum surface mating to the chassis; and significant reduction in corrosion depth and concentration inside the aluminum extrusion gusset channels.

The testing supported an estimated bus life far exceeding the requirement of 12 years.





# PREVENTIVE MAINTENANCE EST. COST: GILLIG Battery-Electric Bus

GILLIG

#### **Customer: Pinellas Suncoast Transit Authority**

Per Customers Requirements

Labor Rate per hour	\$60.00
Bus Life (years)	12
Annual Mileage	42,000
Bus Lifetime Miles	504,000



#### **Preventative Maintenance Costs**

	Service Interval	Qty of PM	Lifetime Est.	Lifetime Est.	Lifetime Est.	Lifetime Est.	Subtotal
Service Type	(miles)	Service Types	Service Events	Labor Hours	Labor Cost	Material Cost	Service
PM-A Service	1,000 - 6,000	65	5,946	576	34,578.60	28,723.89	63,302.49
PM-B Service	6,001 - 24,000	49	1,524	368	22,066.20	1,215.00	23,281.20
PM-C Service	24,001 - 36,000	20	367	162	9,698.40	3,240.00	12,938.40
PERIODIC Service	36,000+	51	459	256	15,360.60	8,337.90	23,698.50
TOTALS:		185	8,296	1,362	81,703.80	41,516.79	123,220.59

Total Scheduled Service: \$ 123,220.59

Cost Per Mile: \$

0.24

Additional Costs per Customer RFP

		Est. Cost per	Est. Labor	Lifetime Est.	Lifetime Est.	Lifetime Est.	Subtotal
Description	Expected Life	Mile (per Tire)	Hours per Set	Labor Hours	Labor Cost	Material Cost	Additional
Tire Lease (6-Tires)	45,000	0.0076	1.50	16.50	990.00	22,982.40	23,972.40

Total Scheduled Service w/Additional Costs: \$ 147,192.99

*Cost Per Mile:* \$ 0.29

One of the design goals of all GILLIG Low Floor buses was to maximize maintenance accessibility. A direct measure of this goal is the number of man-hours required to maintain the vehicle. The GILLIG Low Floor bus was designed with this in mind.

First and foremost, the bus uses the T-drive power train configuration. Leveraging the operating economies experienced with our standard floor bus, the Low Floor has been designed to capture the same benefits.

The large rear engine compartment door, large A/C exterior grill with hinges, street side radiator door, and curbside engine compartment door have been designed to reduce maintenance hours by increasing maintenance access. Large access doors are also mounted for the rear wheel wells to improve access to the suspension componentry. A large battery compartment skirt panel encloses the stainless steel slide out battery tray.

The interior destination sign door allows for quick access to the sign and window cleaning. The multiplex electrical system is also accessed from inside the bus overhead of the driver's area and at the rear bulkhead.

The bus is based on a simple design philosophy but with robust design concepts. Our goal was to duplicate the reliability, durability, and cost effectiveness already achieved with our standard floor Phantom bus. This has been achieved.

Proven transit technology was utilized to keep the bus maintenance friendly, and our simple innovative ideas solved those inherent compromises typically found in other low floor bus designs.

#### Maintenance Schedule

GILLIG's Preventative Maintenance (PM) schedule is based on intervals of 6,000 miles (except for specific major component requirements) beginning at 6,000 miles. Many properties elect to use intervals of 3,000 miles. GILLIG also recommends a daily inspection to be performed by the assigned driver. The daily inspection checklist is often times drawn from a portion of the PM program.

According to PM information gathered from GILLIG customers, the following are estimates that would apply to the following activities:

- If utilized, the 3,000-mile inspection is estimated to take 5.5 man-hours
- The 6,000-mile inspection is estimated to take 7.5 man-hours
- The 12,000-mile inspection is estimated to take 10 man-hours
- The 18,000-mile inspection is estimated to take 7 man-hours
- The 36,000-mile inspection is estimated to take 22 man-hours





Curbside Access Doors









Curbside Battery Thermal Management System (BTMS)

Curbside – Plug-In Charge Port





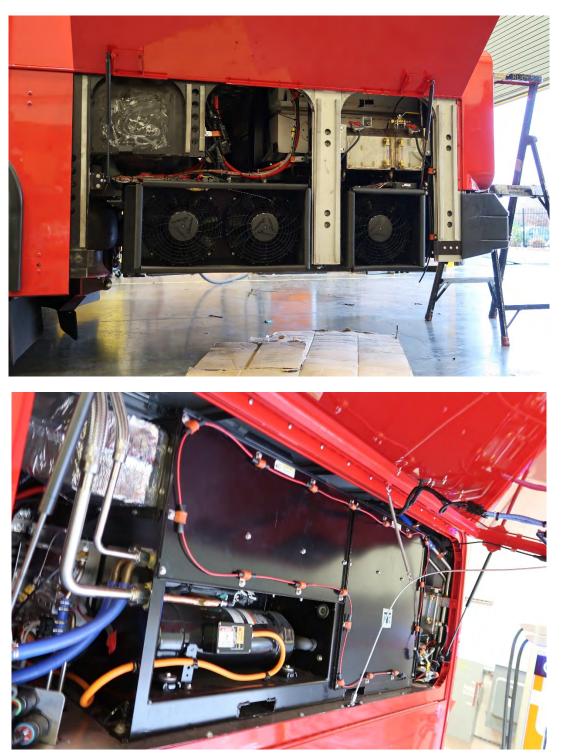


Streetside Access Doors









Streetside Access Door - Cooling System Battery Packs

HVAC Access Door







Rear HVAC and Powertrain Compartment Access Doors



Rear Compartment Access Doors - Battery System





#### Rear Wheel Skirt Panel Access



Streetside Battery Access Door

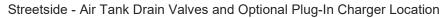








Battery Low Voltage Disconnect Switch





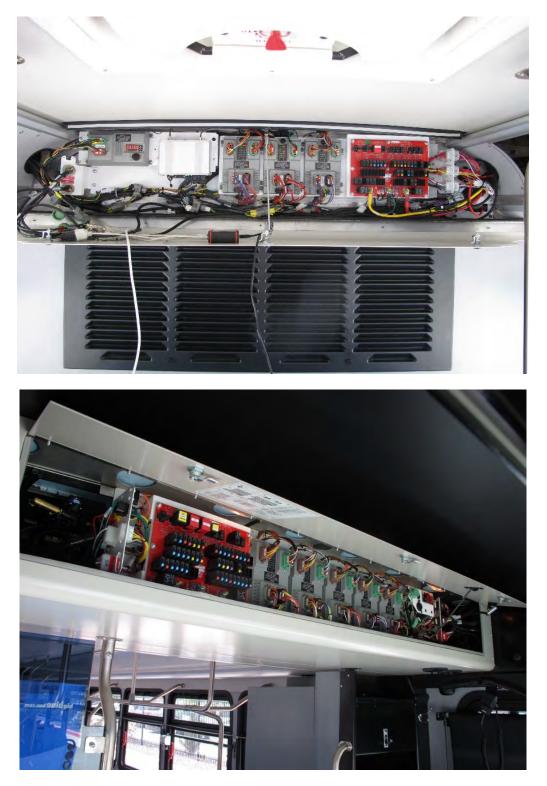




Roof Battery Installation



#### Rear Bulkhead Mounted I/O Panel



Front Air Tank Compartment Mounted I/O Panel







#### Front Door Header Access Door







Interior Destination Sign Compartment & Access Door



Interior Driver Storage Box









#### Interior Electrical Equipment Box





## **STANDARD REPAIR TIMES**

TASK DESCRIPTION	SRT
BATTERY ELECTRIC BUS MAIN COMPONENTS	
R&R ESS JUNCTION BOX	2.00
R&R HVAC JUNCTION BOX	2.00
R&R FRONT PLUG-IN CHARGER	4.00
R&R REAR PLUG-IN CHARGER	2.00
R&R HV CABLE	TIME VARIES DEPENDING ON CABLE
R&R BATTERY TMS	4.00
R&R PASSENGER ECOOLANT HEATER	6.00
R&R AIR COMPRESSOR (POWEREX)	2.00
R&R POWER STEERING PUMP	1.50
R&R ELECTRONIC COOLING PACKAGE	5.00
R&R MAIN BATTERY DISCONNECT SWITCH (KISSLING)	2.00
R&R ESS PACKS (ROOF)	1.00
R&R ESS PACK (CHASSIS)	3.00
R&R ESS PACKS (POWERTRAIN COMPARTMENT)	12.00
<b>R&amp;R TRACTION MOTOR INVERTER &amp; TRACTION MOTOR</b>	12.00
R&R DC/AC CONVERTER	4.00
R&R DC/DC CONVERTER	4.00
R&R SYSTEM CONTROL MODULE	1.00
R&R BATTERY MANAGEMENT SYSTEM	1.00
R&R CHARGE CONTROLLER	1.00
R&R PRIMARY HV JUNCTION BOX	6.00
WHEELCHAIR RAMP MECHANICAL	
REMOVE/INSTALL RAMP ASSEMBLY	2.00
CLEAN/REPLACE/ADJUST CHAIN	1.00



WHEELCHAIR RAMP ELECTRICAL	
REPLACE FLASHER FOR RAMP BEEPER	0.50
CLEAN/REPAIR/REPLACE CONTROLLER BOARD	1.00
CLEAN/REPAIR/REPLACE DUETSCH PLUG	0.60
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
REPAIR/REPLACE WIRING	2.50
FRONT AXLE	
REPLACE KING PIN/BOTH SIDES	7.90
REPLACE TIE ROD END/BOTH SIDES	1.70
ALIGN FRONT END	0.90
REPLACE TIE ROD ASSEMBLY	1.70
LUBRICATE KING PINS/DRAGLINK/TIE ROD ENDS	0.70
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.30
R&R ABS SENSOR	0.50
ABS CABLE	1.50
REAR AXLE	
REPLACE REAR AXLE	8.00
REPLACE DIFFERENTIAL	6.00
REPLACE GASKET, O-RING OR SEAL	6.00
REMOVE/INSTALL REAR AXLE FOR TOWING PURPOSES	0.70
ADD/CHANGE DIFFERENTIAL GREASE	0.40
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
PINION SEAL	2.00
R&R ABS SENSOR	1.00
ABS CABLE	1.50



AXLE HUB	
REPLACE AXLE HUB	4.20
REPLACE AXLE BEARING	0.60
REPLACE AXLE HUB SEAL	1.70
REPLACE WHEEL STUDS/NUTS	0.30
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
BRAKES	
REPLACE BRAKE SPIDER	1.80
REPLACE SLACK ADJUSTER	0.80
REPAIR/REPLACE SLACK ADJUSTER LINKAGE	0.70
LUBRICATE BRAKE PINS	0.90
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
FRONT BRAKE JOB	1.50
REAR BRAKE JOB	3.00
FULL FRONT BRAKE JOB INCLUDING WHEEL SEAL	4.00
FULL REAR BRAKE JOB INCLUDING WHEEL SEAL	4.50
R&R BRAKE CALIPERS ON DISC BRAKES	2.50
SUSPENSION	
REPLACE AIR BAG	1.50
REPLACE LEVELER VALVE/LINK	1.10 EA
ADJUST AIR BAG HEIGHT	0.60
REPLACE UPPER AND LOWER TORQUE ROD	0.80
REPLACE UPPER TORQUE ROD MOUNT/BRK	2.00
REPLACE SHOCK ABSORBER/BUSHINGS	0.90
REPLACE LOWER TORQUE ROD MOUNT/BRK	4.00
REPLACE SHOCK MOUNT	1.10
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
KNEELING VALVE	2.00



## **STANDARD REPAIR TIMES**

UTER NO	
REPLACE STEERING GEAR	3.00
REPLACE MITER BOX	1.20
REPLACE PITMAN ARM	1.10
REPLACE DRAGLINK/END	1.00
REPLACE STEERING POPPET KIT	1.50
REPLACE STEERING WHEEL	0.80
REPLACE POWER STEERING PUMP	2.00
REPAIR HORN SYSTEM	1.00
RESEAL STEERING GEAR/ANGLE BOX	2.40
REPAIR/REPLACE STEERING COLUMN	2.00
LUBRICATE STEERING COMPONENT	1.00
REPAIR/REPLACE POWER STEERING RESERVOIR	1.50
ADD OIL OR FLUSH SYSTEM	0.50
REPAIR/REPLACE PIPE/HOSE	1.30
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
R&R TRW EASY STEER COLUMN	2.00
TIRES	
REPLACE TIRES	1.50
REPAIR TIRE	1.10
BALANCE TIRES	1.00
ROTATE TIRES	1.70
EXTERIOR BODY	
REPAIR/REPLACE BODY FRAMEWORK COMPONENT	2.00
REPAIR/REPLACE BULKHEAD	1.80
REPAIR/REPLACE EXTERIOR BODY PANEL	1.00
REPAIR/REPLACE FENDER RUBBER/TRIM	1.00
REPAIR/REPLACE/INSTALL/TIGHTEN MIRROR	0.60



## **STANDARD REPAIR TIMES**

REPAIR/REPLACE/ADJUST WIPER/WASHER COMPONENT	0.80
REPAIR/REPLACE/TIGHTEN BUMPER	1.00
REPAIR/REPLACE ROOF HATCH	0.80
SAND/PAINT EXTERIOR BODY-LEFT HAND	5.10
SAND/PAINT EXTERIOR BODY-RIGHT HAND	5.10
REPAIR/REPLACE MUD FLAP	0.90
REPAIR/REPLACE RUB RAIL	0.50
SEAL WATER LEAK INTO COACH	2.00
REPAIR/REPLACE BATTERY TRAY	2.80
W/S WIPER MOTOR	1.00
FRONT CAP	20.00
INTERIOR BODY	
REPAIR/REPLACE FLOOR	22.00
REPAIR/REPLACE MODESTY PANEL	1.20
REPAIR/REPLACE INTERIOR BODY PANEL	0.90
REPAIR/REPLACE DRIVER'S SEAT/CUSHION	1.10
REPAIR/REPLACE/INSTALL/TIGHTEN MIRROR	0.30
REPAIR/REPLACE/INSTALL FAREBOX	0.80
REPAIR/REPLACE SUN VISOR	0.60
REPAIR/REPLACE WINDOW LATCH	0.80
REPAIR/REPLACE/INSTALL DRIVER'S SEAT BELT	0.60
REPAIR/REPLACE BELLCORD/GUIDE	0.70
REPAIR/REPLACE PASSENGER SEAT/COVER/CUSHION	0.30
REPAIR/REPLACE STEPWELL-FRONT 0252, REAR 0320	0.80
REPLACE COVERING FOR BRAKE/THROTTLE PEDAL	0.80
REPAIR/REPLACE STANCHION/MOUNT	0.50
REPAIR/REPLACE ENGINE HATCH COVER	1.00
REPAIR/REPLACE FLOOR COVERING	16.00



#### WINDOWS AND GLASS

WINDOWS AND GLASS	
REPLACE PASSENGER WINDOW GLASS/LOWFLOOR/BRT PER SIDE	2.00
REPLACE WINDSHIELD GLASS	2.00
REPLACE DOOR GLASS	0.80
REPLACE DESTINATION SIGN GLASS	1.00
REPAIR/REPLACE WINDOW FRAME/RUBBER	0.80
SEAL WATER LEAK INTO COACH	1.30
REPAIR/REPLACE EMERGENCY WINDOW RELEASE	0.80
REPLACE WINDSHIELD GLASS BRT 1 PC	3.00
REPLACE BRT OPERA WINDOW	1.00
PASSENGER DOORS	
REPAIR/REPLACE PASSENGER DOOR ASSEMBLY	1.90
REPLACE PASSENGER DOOR MOTOR	1.20
REPAIR/REPLACE/ADJUST PASSENGER DOOR LINKAGE	0.90
REPAIR/REPLACE TOUCH-BAR	1.40
REPAIR/REPLACE ENGINE COMPARTMENT DOOR	0.50
REPLACE LIFT-U MAT	0.60
REPAIR/REPLACE DOOR CONTROL VALVE	0.50
REPAIR/REPLACE FRONT DOOR SHUT OFF VALVE	1.00
REPLACE RELAY	0.60
REPLACE/ADJUST PROXIMITY SWITCH	0.50
REPAIR/REPLACE REAR DOOR SOLENOID	0.70
LUBRICATE DOOR LINKAGE/HINGE	0.50
REPAIR/REPLACE PIPE/HOSE	0.30
REPAIR/REPLACE SENSITIVE DOOR EDGE	1.10
REPAIR/REPLACE WIRING	0.50
RECONDITION PASSENGER DOOR ENGINE	1.50



	4 4 0
REPAIR/REPLACE ENGINE DOOR	1.10
REPAIR/REPLACE RADIATOR DOOR	0.50
REPAIR/REPLACE BATTERY DOOR	0.80
REPAIR/REPLACE FUEL DOOR	1.00
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
SPECIAL EQUIPMENT/ACCESSORIES	
REPAIR/REPLACE BIKE RACK	0.50
REPLACE/INSTALL REFLECTIVE TRIANGLES	0.30
REPLACE/INSTALL FIRE EXTINGUISHER	0.30
REPAIR/REPLACE/INSTALL ADVERTISING SIGN FRAME (PER)	0.80
REPAIR/REPLACE/INSTALL PASSENGER COUNTER	0.80
REPAIR/REPLACE/INSTALL DRIVERS BOX	0.90
REPAIR/REPLACE/INSTALL WHEELCHAIR RESTRAINTS (ALL)	1.10
INSTA CHAIN REPAIRS-SOLENOID	1.00
TWO WAY RADIO	
REPLACE RADIO/CONTROL HEAD	0.90
REPLACE RADIO CONTROL UNIT	1.30
REPAIR/REPLACE RADIO POWER UNIT	1.00
REPAIR/REPLACE ANTENNA	1.30
INSTALL COMPLETE RADIO ASSEMPLY	1.50
REPLACE HANG UP CRADLE ASSEMBLY	0.50
REPAIR/REPLACE WIRING	0.50
HEATER AND DEFROST SYSTEM	
REPLACE HEATER CORE	2.00
REPLACE MARINE PUMP	1.00
REPLACE DEFROSTER/HEATER MOTOR	1.50



**STANDARD REPAIR TIMES** 

REPLACE WATER MODULATOR VALVE	1.00
REPLACE/ADJUST THERMOSTAT/GRADUSTAT	0.30
REPAIR/REPLACE HEAT CONTROL VALVE/CABLE	1.10
CLEAN/REPLACE HEATER FILTER	0.10
REPLACE CIRCUIT BREAKER	0.20
REPLACE SWITCH	0.70
CLEAN/REPAIR/REPLACE AMPHENOL PLUG	1.00
REPLACE HEATER RESISTOR	0.80
REPAIR/REPLACE PIPE/HOSE	1.00
REPAIR LEAK	0.40
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
REPLACE RELAY, SWITCH, DIOD, ETC.	0.60
REPAIR/REPLACE WIRING	0.80
AIR COMPRESSOR AND SUPPLY SYSTEMS	
REPLACE AIR COMPRESSOR GOVERNOR	0.90
REPLACE AIR DRYER	1.50
REPLACE SAFETY VALVE	0.50
SERVICE/REPLACE PURGE VALVE	0.90
REPLACE AIR SWITCH	0.50
REPLACE CHECK VALVE	0.50
REPLACE GASKET/O-RING/SEAL	1.40
REPAIR/REPLACE PIPE/HOSE	1.40
REPAIR LEAK	0.90
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50



### **AIR BRAKE SYSTEMS**

REPLACE BRAKE TREADLE VALVE	1.50
REPLACE BRAKE RELAY VALVE	2.00
REPLACE QUICK RELEASE VALVE	0.50
REPLACE REAR BRAKE CHAMBER	1.00
REPLACE FRONT BRAKE CHAMBER	0.60
REPLACE AIR SWITCH	0.60
REPAIR/REPLACE PIPE/HOSE	0.80
REPAIR LEAK	0.80
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
REPLACE RELAY, SWITCH, DIODE, ETC.	0.50
BRAKE INTERLOCK SYSTEMS	
REPLACE/ADJUST AIR REGULATOR VALVE	0.70
SERVICE/REPLACE SOLENOID/SKINNER VALVE	1.10
REPLACE CIRCUIT BREAKER	0.30
REPLACE RELAY	0.50
REPLACE/ADJUST MICRO SWITCH/BRACKET	0.50
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
REPLACE SWITCH	0.60
REPAIR/REPLACE WIRING	0.80
ELECTRICAL ACCESSORIES	
REPAIR/REPLACE PASSENGER CHIME	0.50
REPAIR/REPLACE BACK UP BEEPER	0.50
REPLACE/INSTALL AM/FM RADIO/ANTENNA	0.90
REPAIR/REPLACE NEXT STOP COMPONENT	0.90
REPAIR/REPLACE HORN COMPONENT	0.80
REPAIR/REPLACE DRIVER'S FAN	0.70
REPAIR/REPLACE P.A. SYSTEM COMPONENT	1.00



## **STANDARD REPAIR TIMES**

REPAIR/REPLACE MIRROR SWITCH/MOTOR/WIRING	1.00
DINEX MODULES/MULTIPLEXING	0.50
W/S WIPER MOTOR	1.00
R&R AMEREX CONTROL MODULE	0.50
R&R AMEREX HEAT SENSOR(THERMISTOR)	0.50
R&R GILLIG FIRE DETECTION WIRE	1.00
CHARGING SYSTEMS	
REPLACE/ADJUST REGULATOR	0.70
REPLACE VANNER EQUALIZER	1.00
REPLACE CIRCUIT BREAKER	0.30
REPLACE RELAY	0.30
REPLACE DIODE	1.10
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
REPLACE RELAY, SWITCH, DIODE, ETC.	0.50
REPAIR/REPLACE WIRING	0.80
CHECK/TROUBLESHOOT CHARGING SYSTEM	1.50
BATTERY	
REPLACE BATTERIES	0.70
SERVICE AND CLEAN OFF BATTERIES	0.50
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.40
DISCONNECT ALL POWER BEFORE WELDING	1.50
INTERIOR LIGHTING SYSTEMS	
REPLACE FLOURESCENT TUBE/BULB/LED	0.50
REPAIR/REPLACE LENS	0.30
REPAIR/REPLACE BULB SOCKET/PIGTAIL	0.50
REPLACE LIGHT BALLAST	0.60
REPLACE CIRCUIT BREAKER	0.30



#### **STANDARD REPAIR TIMES**

REPLACE SWITCH	0.50
REPLACE/ADJUST MICRO SWITCH/BRACKET	0.50
REPLACE RELAY	0.20
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
REPLACE RELAY, SWITCH, DIODE, ETC.	0.50
REPAIR/REPLACE WIRING	0.90
EXTERIOR LIGHTING SYSTEMS	
REPLACE BULB/SEAL BEAM	0.30
REPAIR/REPLACE LENS	0.40
REPAIR/REPLACE BULB SOCKET/PIGTAIL	0.60
REPLACE CIRCUIT BREAKER	0.30
REPLACE SWITCH	0.50
REPLACE RELAY	0.30
REPLACE DIODE	0.30
CLEAN/REPAIR/REPLACE AMPHENOL PLUG	1.00
REPLACE COMPLETE LIGHT ASSEMBLY	0.90
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
REPLACE REPLAY, SWITCH, DIODE, ETC.	0.50
REPAIR/REPLACE WIRING	0.70
REMOVE AND REPLACE FRONT TURN SIGNAL ASM	0.50
REMOVE AND REPLACE LED HEADLIGHT	0.50
WARNING LIGHTS, BUZZERS, GAUGES	
REPLACE GAUGE	0.90
REPLACE LIGHT BULB OR SOCKET	0.50
REPLACE SENDING UNIT	0.90
REPAIR/REPLACE INSTRUMENT PANEL	1.00
REPAIR/REPLACE SPEEDO HEAD/TRANSDUCER/SENSOR	0.50



#### **STANDARD REPAIR TIMES**

REPAIR/REPLACE BLUB SOCKET/PIGTAIL	0.50
REPLACE CIRCUIT BREAKER	0.30
REPLACE SWITCH OR SENSOR	0.50
REPLACE RELAY	0.40
REPLACE WARNING BUZZER	0.40
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
REPLACE REPLAY, SWITCH, DIODE, ETC.	0.60
REPAIR/REPLACE WIRING	0.80
DESTINATION SIGN	
REPLACE MESSAGE MONITOR/CONTROL CONSOLE	0.50
REPLACE ENCODER	0.90
REPLACE DISPLAY BOARD	0.80
REPLACE DRIVER BOARD	0.70
REPLACE EPROM CHIP/REPROGRAM CONTROL CONSOLE	0.50
CLEAN DESTINATION SIGN/WINDOW	0.80
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50
REPLACE REPLAY, SWITCH, DIODE, ETC.	0.40
REPAIR/REPLACE WIRING	1.00
SHIFT LINKAGE AND CONTROLS	
REPLACE SHIFTER BULB OR LENS (VOITH)	0.70
REPLACE SWITCH	1.30
REPAIR/REPLACE WIRING	1.20
DRIVELINES	
REPLACE DRIVELINE	1.20
REPLACE U-JOINT	1.00
TIGHTEN/REPLACE CLAMP, FITTING OR FASTENER	0.50



#### **STANDARD REPAIR TIMES**

#### TRANSMISSION CONTROL SYSTEMS

REPAIR/REPLACE PUSH BUTTON SHIFT UNIT	0.50
REPLACE BRAKE VALVE PRESSURE SWITCH	0.50
REPAIR/REPLACE WIRING	0.90
CHASSIS	
LH FRAME REPAIR	12.00
RH FRAME REPAIR	12.00



#### **Structural Analysis Validation - Completed**

- Design Load Calculations
- Stress Calculations
- Finite Element Analysis
- Computer Simulations

#### **Code and Regulation Compliance Validation**

- Design Codes (interior lighting, driver's visibility, etc.)
- Design FMVSS Requirements

#### **Component Application Analysis - Completed**

- Component Selections
- Component Application Approvals
- Computer Simulations

#### Physical Validation Testing – Most Current Completion Date

- Optimization of Ride and Handling 2011
- Vibration Tests 2010
- Turning Radius Tests 2011
- Turning Radius Test 2020
- Engine Manufacturer Approvals
  - Cummins IQA Approvals 2007
  - o Cummins IQA Approvals 2010
  - o Cummins IQA Approvals 2013
  - o Cummins IQA Approvals 2015 EMP Radiator only
  - Cummins IQA Approvals 2017 ISB BAE Hybrid
  - o Cummins IQA Approval 2021 L9 Diesel
  - o Cummins IQA Approval 2021 B67 Hybrid
  - Cummins IQA Approval 2021 40' Electric Bus In Process
  - Cummins IQA includes engine/emission system installation approval, cooling system validation and compliance with electrical, AEB's.
- Strain Gauge Validation 2005
- Loaded Road Dynamic Stress Test 2006
- TRW Steering Geometry Test 1998
- TRW Steering Geometry Test -2018
- TRW Steering Geometry Test 2020
- Crashworthiness Test 1998
- Crashworthiness Test -2018
- Crashworthiness Test 2020
- Thermo King Performance Test T14 Unit-2010
- Thermo King Performance Test T14 High Cooling Capacity -2015
- Thermo King Performance Test E Bus HVAC-2019
- Thermo King Performance Test E Bus HVAC -2020
- Accelerated Durability Test Road simulation/shaker test 40' CNG 2012.



**TESTING & DESIGN OPERATING PROFILE VALIDATION** 

- Accelerated Durability Test Road simulation/shaker test 40' Electric Bus 2019
- Hot Weather On Road Testing (Death Valley) 40' Electric Gen 2.0 2019
- Hot Weather On Road Testing (Death Valley) 40' Electric Gen 2.5 2021
- Cold Weather Chamber and Cold Test Track Testing 40' Electric Bus 2020
- Cold Temperature Chamber testing 40' Electric bus 2021
- Vehicle Stability Testing 40' Electric Bus 2019
- Vehicle Stability Testing 40' Electric Bus 2020
- Vehicle ESC Testing 40' Electric 2019
- Vehicle Gradeability On Road Salt Lake City 40' Gen 2.0 Electric Bus 2019
- Vehicle Gradeability On Road Salt Lake City 40' Gen 2.5 Electric Bus 2021
- Altoona Style Durability Test Navistar Proving Grounds 40' Electric 2019
- Altoona Test 40' Diesel Bus Complete (ISM/Voith) December 2004
- Altoona Test 40' Hybrid Bus Complete (ISB/EV40) October 2004
- Altoona Test 29' Diesel Bus Complete (S40/B300) June 2000
- Altoona Test 40' Hybrid Bus Complete (ISL/Voith Hybrid) 2010
- Altoona Test 40' CNG Bus Complete (ISLG/B400R) May 2011
- Altoona Test 29' CNG Bus Complete (ISLG/B400R) January 2012
- Altoona Test 40' BAE Hybrid July 2012
- Altoona Test 29' ISL June 2010
- Altoona Test 40' CNG/Disc Brake June 2013
- Altoona Test 40' Hybrid Bus (330 ISL/Allison Hybrid) Feb 2019
- Altoona Test 40' Hybrid Bus (330L9/BAE Hybrid) April 2018
- Altoona Test 29' Electric Bus May 2018
- Altoona Test 40' Gen 2.0 Electric Bus- In Process April 2021
- Altoona Test 40' CNG with Hendrickson Rear Suspension 2019
- Altoona Test 29' CNG with Hendrickson Rear Suspension 2021
- Altoona Test 40' Gen 2.5 Electric Bus In Process Completion Q2 2022
- FMVSS 121 Testing Brakes
  - o 2002 29 Ft. Low Floor Drum Brakes
  - o 1999 29 Ft. Low Floor Drum Brake
  - o 1998 40 Ft. Low Floor Drum Brake
  - o 1997 40 Ft. Low Floor Drum Brake
  - o 2011 40 Ft. Low Floor Drum Brake 27,000 Rear GAWR
  - o 2013 40 Ft. Low Floor Meritor Disc Brakes
  - o 2015 29' Low Floor Meritor Disc Brakes
  - o 2016 29' Low Floor Drum Brake
  - o 2019 40' Low floor Meritor Disc Brakes Electric Bus @ 45,000 Lbs. GVWR
  - o 2020 40' Low Floor Meritor Disc Brakes Electric Bus @ 47,180 Lbs. GVWR
- Transmission Installation Approval & Cooling Tests
  - o Allison 2007, 2010, 2013
  - o Voith 2007, 2010, 2013, 2020
  - o ZF 2007, 2010, 2013,2018
  - o ZF 2021 Ecolife/L9



#### **TESTING & DESIGN OPERATING PROFILE VALIDATION**

- Hybrid Drive
  - o ISL 330 hp Allision 2018
  - $\circ$   $\,$  L9 330 hp BAE 2018  $\,$
- Amerex Fire Suppression Installation Approval 2013
- Amerex Fire Suppression Installation Approval 40' Electric Bus 2020
- Kidde Fire Suppression Installation Approval 2013
- Fogmaker Fire Suppression Installation Approval 2013
- Fire Trace Fire Suppression Installation Approval 2013
- Fire suppression installation approvals ongoing with new configurations



#### UNITED STATES ENVIRONMENTAL PROTECTION AGENCY 2022 MODEL YEAR CERTIFICATE OF CONFORMITY WITH THE CLEAN AIR ACT

#### OFFICE OF TRANSPORTATION AND AIR QUALITY ANN ARBOR, MICHIGAN 48105

0

Certificate Issued To: GILLIG LLC (U.S. Manufacturer or Importer) Certificate Number: NGLG2VOCVEV1-001	Effective Date: 01/01/2022 Expiration Date: 12/31/2022	Byron J, Bunker, Division Director Compliance Division	Issue Date: 07/12/2021 Revision Date: 07/12/2021
Model Year: 2022	СО	2 Emission Standard (g CO2/ton-mile): 300	
Vehicle Family: NGLG2VOCVEV1	Hig	hest Projected CO2 Family Emission Limit (g/ton-mile): 0	
Vehicle Regulatory Sub-category: Transit and other bus	Lov	west Projected CO2 Family Emission Limit (g/ton-mile): 0	
Averaging Set: Transit and Other bus			
This family includes advanced technologies.			

Pursuant to Section 206 of the Clean Air Act (42 U.S.C. section 7525), 40 CFR Part 1037 and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test vehicle which represents the vehicle family, and is subject to the terms and conditions prescribed in those provisions. This certificate of conformity covers only those new motor vehicles which conform in all material respects to the design specifications that applied to those vehicles described in the documentation required by 40 CFR Part 1037 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 1037.

This certificate of conformity is conditional upon compliance of said manufacturer with the averaging, banking and trading provisions of 40 CFR Part 1037, Subpart H. Failure to comply with these provisions may render this certificate void *ab initio*.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 1068. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 1068.

AL PROTES

This certificate does not cover vehicles sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

CALIFORNIA ANE RESOURCES DOARD	GILLIG LLC	EXECUTIVE ORDER A-063-0113 New On-Road Heavy-Duty Motor Vehicles
-----------------------------------	------------	---

Pursuant to the authority vested in California Air Resources Board by Health and Safety Code Divisions 25.5 and 26, Part 5, Chapter 2; and pursuant to the authority vested in the undersigned by Health and Safety Code Sections 39515 and 39516 and Executive Order G-19-095;

**IT IS ORDERED AND RESOLVED:** The following on-road motor vehicles with a manufacturer's GVWR over 10,000 pounds are certified as described below. Production vehicles shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	VEHICLE FAMILY NAME	VEHICLE TYPE	VEHICLE SERVICE CLASS	VEHICLE MAKE & MODELS
2021	MGLG2VOCVEV1	Vocational / Other Bus	Heavy HDV	GILLIG LOW FLOOR ELECTRIC (All Electric Heavy-Duty Vehicles)

EMISSION CONTROL SYSTEMS
WR, LRRA, TPMS
*=not applicable; VSL = Vehicle speed limiter; VSLS = "Soft-top" vehicle speed limiter; VSLE = Expiring vehicle speed limiter; VSLD = Vehicle speed limiter; vith both "soft-top" and expiration; IRT5 = Engine shutoff after 5 minutes or less of idling; IRTE = Expiring engine shutoff; LRRA = Low rolling resistance tires (all); LRRD = Low rolling resistance tires (steer); ATS = Aerodynamic side skrit and/or fuel tank fairing; ARF = Aerodynamic roof fairing; ARFR = Adjustable height aerodynamic roof fairing; TGR = Gap reducing tractor fairing; tractor to trailer gap); ADVH = Vehicle includes advanced hybrid technology components; ADV = Vehicle includes other advanced-technology components; (i.e., non-hybrid system); INV = Vehicle includes innovative (off-cycle) technology components; ATI = Automatic tire inflation system; TPMS = Tire pressure monitoring system; WR = Weight reduction

Shown below are: 1) The Greenhouse Gas Exhaust Emission Standard (STD) in g/ton-mile and/or the Family Emission Limit(s) (FEL) of the listed vehicle family in g/ton-mile as applicable under 17 CCR 95663; and 2) the Tire Coefficient of Rolling Resistance (CRR) STD and the corresponding CRR value of the listed vehicle family as provided under 17 CCR 95663(d):

	STD	Highest Projected FEL	Lowest Projected FEL
CO <sub>2</sub> (g/ton-mile)	300	0	0

	STD	Highest Tire CRR Value
Tire CRR (kg/metric ton)	λ.	•

**BE IT FURTHER RESOLVED:** The listed vehicle family is certified to the Optional Phase 2 Custom Chassis CO<sub>2</sub> Emissions Standards as specified in 17 CCR 95663(a)(1)4 and Section 1037.105(h) of the incorporated "California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles" (HDV Test Procedures) adopted October 21, 2014, as last amended June 27, 2019.

**BE IT FURTHER RESOLVED:** The manufacturer has demonstrated certification compliance with the Greenhouse Gas Emission Standards as specified in Title 17 CCR 95663 and the incorporated "California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles" (HDV Test Procedures) adopted October 21, 2014 as last amended June 27, 2019.

**BE IT FURTHER RESOLVED:** For the listed air conditioning platform(s) in the attachment the manufacturer has demonstrated certification compliance with the AC Leakage Standard specified in 17 CCR 95663(a)(1)(B)7 and Section 1037.115 of the incorporated "California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles" (HDV Test Procedures) adopted October 21, 2014, as last amended June 27, 2019.

**BE IT FURTHER RESOLVED:** For the listed vehicle models the manufacturer has submitted the materials to demonstrate certification compliance with 13 CCR 1965 (emission control labels), and 13 CCR 2035 et seq. (emission control warranty).

Vehicles certified under this Executive Order must conform to all applicable California emission regulations.

Executed on this 14th \_\_\_\_ day of December 2020.

Allen Zvons, Chief

Emissions Certification and Compliance Division

#### A/C PLATFORM SUMMARY TABLE

	Vehicle family	Date	EO	
	MGLG2VOCVEV	1 12/09/2020	A-063-0113	
A/C Platform ID	Refrigerant Type	Refrigerant Capacity	STD	Leak Rate
		(g)	(HFC (g/year))	(HFC (g/year))
TE 18	R407C	6350	95.2	7.41

\_\_\_\_

\_\_\_\_

# Best-in-Class Bus Endures Thorough Testing

## GILLIG buses go through rigorous testing to ensure the highest quality product for our customers.

Since March 2019, we've been testing our five 40-foot Zero-Emission Battery Electric Buses in areas such as maintainability, reliability, safety, performance, structural integrity and durability, fuel/energy consumption, noise, and emissions. Information from these tests enables us to implement constructive changes before the full production of our Zero-Emission Buses in May 2020. So far, we've driven our buses over 40,000 miles and run them through numerous vehicle level tests.

## This past year, we have performed five extensive tests on our five Zero-Emission Battery Electric Buses:



#### HOT ENVIRONMENT TESTING Death Valley, CA; Laughlin, NV; and Las Vegas, NV

**PURPOSE:** To test the Battery Thermal Management System (BTMS); Electronics Cooling Package (ECP); and Heating Ventilation and Air Conditioning (HVAC) Systems at ambient temperatures up to 118 degrees Fahrenheit over nine days in August.

- Hill Climb Testing in Death Valley and Laughlin, often climbing 4,000 feet over 13 miles at a constant 6% grade
- Stop/Start Testing in Las Vegas, to simulate a city bus route in 109 degrees Fahrenheit



#### **GRADEABILITY TESTING** Salt Lake City, UT

**PURPOSE:** To test our bus's ability to navigate steep grades and long hill climbs by driving up to 3,000-4,000 feet on grades as steep as 17% on multiple routes.





#### DURABILITY TRACK TESTING Navistar Proving Grounds New Carlisle, IN

**PURPOSE:** To test the durability of the bus by driving on an accelerated durability course with multiple road surfaces (chatter bumps, chuckholes, railroad crossings, and frame twists) for the equivalent distance of 125,000 road miles over seven months.



#### **COLD ENVIRONMENT TESTING** Automotive Enviro Testing (AET) Facility Baudette, MN

**PURPOSE:** To test the impact of snow, ice, and frigid temperatures on the performance of our electric bus by driving over 500 miles at a winter proving ground in northern Minnesota. Temperatures were well below zero Fahrenheit, and snow accumulation around the high voltage batteries confirmed that our electric bus platform is robust for operation in extreme climates.



### SHAKER (VIBRATION)/ACCELERATED DURABILITY TESTING

Element Troy, MI

**PURPOSE:** To test the structural durability of our bus by simulating an entire 500,000 miles of road testing—or four full Altoona durability tests—with a four-post hydraulic shaker system. This shaker durability test was preceded by extensive data collection from over 200 channels of critical structural data.



#### FULL ALTOONA TEST CERTIFICATION Bus Research and Testing Center Altoona, PA

**PURPOSE:** Our bus has completed the Federal Transit Administration (FTA) Bus Testing Program for Full Altoona Test Certification. FTA test categories include structural integrity, safety, maintainability, reliability, fuel consumption, emissions, noise, and performance.



#### **ALTOONA TESTING – CURRENT STATUS**



Test Track in Altoona, PA

**Completed Altoona Testing** 

**PURPOSE:** The GILLIG Battery Electric Bus has completed the Federal Transit Administration (FTA) Bus Testing Program for Full Altoona Test Certification. FTA test categories include structured integrity, safety, maintainability, reliability, fuel consumption, emissions, noise, and performance.

GILLIG's Battery Electric bus, based on GILLIG's proven Low Floor platform, has completed the Federal Transit Administration (FTA) Bus Testing Program at the Bus Research and Testing Center in Altoona, PA.

Start Date	Test Miles Completed	Percent Complete
August 18,2020	15,000	100%

GILLIG has included the final test report.

#### **CER 8.6 Certificate of Compliance with Bus Testing Requirement**

The undersigned certifies that the vehicle offered in this procurement complies and will, when delivered, comply with 49 USC § 5323(c) and FTA's implementing regulation at 49 CFR Part 665 according to the indicated one of the following three alternatives.

Mark one and only one of the three blank spaces with an "X."

- 1. X The buses offered herewith have been tested in accordance with 49 CFR Part 665 on <u>JUNE 2021</u> (date). If multiple buses are being proposed, provide additional bus testing information below or on attached sheet. The vehicles being sold should have the identical configuration and major components as the vehicle in the test report, which must be submitted with this Proposal. If the configuration or components are not identical, then the manufacturer shall provide with its Proposal a description of the change and the manufacturer's basis for concluding that it is not a major change requiring additional testing. If multiple buses are being proposed, testing data on additional buses shall be listed on the bottom of this page.
- 2. \_\_\_\_\_ The manufacturer represents that the vehicle is "grandfathered" (has been used in mass transit service in the United States before October 1, 1988, and is currently being produced without a major change in configuration or components), and submits with this Proposal the name and address of the recipient of such a vehicle and the details of that vehicle's configuration and major components.
- 3. \_\_\_\_\_ The vehicle is a new model and will be tested and the results will be submitted to the Agency prior to acceptance of the first bus.

The undersigned understands that misrepresenting the testing status of a vehicle acquired with federal financial assistance may subject the undersigned to civil penalties as outlined in the Department of Transportation's regulation on Program Fraud Civil Remedies, 49 CFR Part 31. In addition, the undersigned understands that FTA may suspend or debar a manufacturer under the procedures in 49 CFR Part 29.

Company name: GILLIG LLC Name and title of the Proposer's authorized official: WILLIAM F. FAY, JR., VICE PRESIDENT, SALES

Authorized

SEPTEMBER 17, 2021

Date

NOTE: Reference our attached certification.



#### **ALTOONA TEST CERTIFICATION**

This is to certify that the bus model proposed for your procurement complies with the bus testing regulations required by the Surface Transportation and Uniform Relocation Assistance Act of 1987 as defined in the Interim Final Rulemaking (IFR) by the FTA in the Federal Register 49 CFR Part 665, dated July 28, 1992 and the Final Rule in the Federal Register 49 CFR part 665, dated July 28, 1992 and the Final Rule in the Federal Register 49 CFR part 665, dated July 28, 1992 and the Final Rule in the Federal Register 49 CFR part 665, dated July 28, 1992 and the Final Rule in the Federal Register 49 CFR part 665, dated July 28, 1992 and the Final Rule in the Federal Register 49 CFR part 665, dated July 28, 1992 and the Final Rule in the Federal Register 49 CFR part 665, dated July 28, 1992 and the Final Rule in the Federal Register 49 CFR part 665, dated July 28, 1992 and the Final Rule in the Federal Register 49 CFR part 665, dated July 28, 1992 and the Final Rule in the Federal Register 49 CFR part 665, dated July 28, 1992 and the Final Rule in the Federal Register 49 CFR part 665, dated July 28, 1992 and the Final Rule in the Federal Register 49 CFR part 665, dated July 28, 1992 and the Final Rule in the Federal Register 49 CFR part 665, dated August 1, 2016.

This statement means that the proposed vehicle complies with one or more of the clauses below, as required by the above IFR:

- was in mass transportation service prior to September 30, 1988, or
- is the same vehicle model that has been previously tested in PTI (Altoona), and that
- any new component(s) has (have) been tested at PTI (Altoona), or
- the installation of any new component(s) did not result in significant structural modification to the vehicle; or
- the installation of the component(s) did not result in a significant change in the data obtained from previous testing of the vehicle model.
- is a new bus model or a bus produced with a major change in components or configuration and shall provide a copy of the final test report to the recipient prior to the recipient's final acceptance of the first vehicle.

**GILLIG LLC** By: WILLIAM F. FAY, JR. Title: VICE PRESIDENT, SALES Date: **SEPTEMBER 17, 2021** 



August 6, 2021

#### SUBJECT: 35' ALTOONA TESTING CRITERIA LETTER

To Whom it may concern:

The Altoona Bus Testing Regulation 49 CFR Part 665 is a requirement for FTA funded procurements. Once a 40' GILLIG bus has been tested in the 12 year/500,000 mile service life category and the report has been made available to the public then variants on this model are eligible for Partial Testing requirements. Partial Testing requirements would be deemed as those specific portions of the Altoona test where we would expect to obtain significantly different data than in the base model test.

In terms of how this would apply to the question at hand where testing was completed on a 40' eBus 444kWh model Low Floor bus, and the variant is a 35' bus, I would draw the following conclusions regarding Partial Testing:

- 1) Regarding propulsion system There is no difference in the electrified powertrain or energy storage system between the 40' and 35' variants. I would not expect testing to produce significantly different data from that obtained in previous maintainability, performance, energy consumption, range or noise testing done in a 40' GILLIG bus.
- 2) Regarding structural differences the gross vehicle weight rating and basic vehicle structure are the same between the 35' and 40' GILLIG chassis. In the 35' variant, the overall weight is reduced and the loads in the structure are either the same or less. It would not be expected to obtain significantly different data from additional structural integrity or reliability testing. In general, FTA assumes that the longest-length variant of a bus model typically represents the worst-case scenario for structural durability testing.

The GILLIG 40' Low Floor bus test results LTI-BT-R2020-05 are a very good indicator of the results that would be obtained through testing of a 35' bus. Therefore, our 35' Low Floor variant does not require testing at Altoona.

Sincerely,

Greg Vismara Vice President, Engineering Phone: 800-735-1500

## FEDERAL TRANSIT BUS TEST

Performed for the Federal Transit Administration U.S. DOT In accordance with 49 CFR, Part 665

### Manufacturer: Gillig Model: 40-Foot Low Floor Battery Electric Bus

### Tested in Service-Life Category 12 Year / 500,000 Miles

June 2021

### Report Number: LTI-BT-R2020-05

The Thomas D. Larson Pennsylvania Transportation Institute 201 Transportation Research Building The Pennsylvania State University University Park, PA 16802 (814) 865-1891

Bus Testing and Research Center 2237 Plank Road Duncansville, PA 16635 (814) 695-3404



LTI BUS RESEARCH AND TESTING CENTER

## FEDERAL TRANSIT BUS TEST

Performed for the Federal Transit Administration, U.S. DOT 1200 New Jersey Avenue, SE Washington, DC 20590

In accordance with 49 CFR Part, 665

### Manufacturer: Gillig Manufacturer's address: 451 Discover Drive Livermore, CA 94551

Model: 40-Foot Low Floor Battery Electric Bus

Tested in Service-Life Category 12 Year / 500,000 Miles

Report Number: LTI-BT-R2020-05



David Klinikowski

Quality Authorization

Director, Bus Research and Testing Center *Title* July 2, 2021 *Date* 

Page 2 of 104

#### TABLE OF CONTENTS

#### Page

E	<b>KECUTIVE SU</b>	JMMARY	4		
A	BREVIATIO	NS AND ACRONYMS	7		
BI	US CHECK-II	۱	8		
1.	MAINTAINABILITY				
	1.1 1.2	ACCESSIBILITY OF COMPONENTS AND SUBSYSTEMS SERVICING, PREVENTIVE MAINTENANCE, AND REPAIR AND			
	1.3	MAINTENANCE DURING TESTING REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS			
2.	RELIABILIT	Υ	33		
3.	SAFETY				
	3.1 3.2	DOUBLE-LANE CHANGE (OBSTACLE AVOIDANCE TEST) BUS BRAKING PERFORMANCE TEST	35 39		
4.	PERFORMA	NCE	44		
5.	STRUCTUR	AL INTEGRITY			
	5.1 5.2	STRUCTURAL SHAKEDOWN – DISCONTINUED TEST STRUCTURAL STRENGTH AND DISTORTION TESTS - STRUCTURAL DISTORTION	48		
	5.3 5.4 5.5 5.6	STRUCTURAL STRENGTH AND DISTORTION TESTS - STATIC TOWING STRUCTURAL STRENGTH AND DISTORTION TESTS - DYNAMIC TOWING STRUCTURAL STRENGTH AND DISTORTION TESTS- JACKING STRUCTURAL STRENGTH AND DISTORTION TESTS- HOISTING	60 63 66		
	5.7	STRUCTURAL DURABILITY			
6.		CONOMY	85		
7.	NOISE				
	7.1 7.2	INTERIOR NOISE AND VIBRATION TESTS EXTERIOR NOISE TESTS	-		

#### EXECUTIVE SUMMARY

#### TEST HIGHLIGHTS

The information in this report pertains only to this specific bus, as received from the manufacturer for testing.

The Check-In section of the report provides a description of the bus and specifies its major components. The following table gives the salient specifications.

Manufacturer	Gillig	
Model	40 Foot Low Floor Battery Electric Bus	
Chassis Make/Model	Gillig / Low Floor	
Chassis Modified	No	
Length	40 feet, 10 ½ inches	
Fuel	Battery - Electric	
Service Life	12 Year / 500,000 miles	
Number of Seats (including driver)	38 or 32 & 2 wheelchairs	
Manufacturer-Designated Standing Passenger Capacity	36 (34 with wheelchairs in place)	
Gross Vehicle Weight used for testing	43,630 lb.	
Manufacturer Specified Gross Vehicle Weight Rating	45,000 lb.	
Mileage at Delivery	9,856 miles	
Test Start Date	July 29, 2020	
Test Completion Date	April 26, 2021	

The measured curb weight was 10,770 lb. for the front axle and 21,720 lb. for the rear axle. These combined weights provided a total measured curb weight of 32,490 lb. There are 38 seats including the driver and free floor space for 36 standing passengers bringing the potential total passenger capacity to 74. Six seats fold away to accommodate two wheelchairs. When the wheelchairs are in place, there is free floor space for only 34 standing passengers. Utilizing the wheelchair positions in place of the seated passengers is the heaviest seated load weight configuration. Gross load weight would be the same with either the wheelchairs in place or the seats in place, due to the extra room for standing passengers. Therefore, the gross load represents 32 seated passengers, two wheelchairs and 34 standees, or 38 seated passenger and 36 standees. Gross load is calculated as  $(150 \text{ lb. x } 66) + (2 \times 600) = 11,100$ . At full declared capacity, the measured gross vehicle weight was 43,630 lb.

#### **BUS TESTING BACKGROUND**

On August 1, 2016, FTA announced a final rule for bus testing for improving the process of ensuring the safety and reliability of new transit buses. The rule satisfies requirements in MAP-21 to establish minimum performance standards, a standardized scoring system, and a pass-fail threshold based on the score.

FTA's Bus Testing Program (often referred to as "Altoona Testing" due to the location of the main testing center) tests new transit bus models for:

- Maintainability
- Reliability
- Safety
- Performance (including Braking Performance)
- Structural Integrity (including Structural Durability)
- Fuel Economy (Energy Efficiency and Range, for electric buses)
- Noise
- Emissions

Bus models that fail to meet one or more minimum performance standards will "fail" their test and thus be ineligible for purchase with FTA funds until the failures are resolved and validated through further testing. FTA will use this authority to make sure defects are corrected before a bus model can be acquired with FTA funding.

In each application to FTA for the purchase or lease of any new bus model, or any bus model with a major change in configuration or components to be acquired or leased with funds obligated by the FTA, the recipient shall certify that it has received the appropriate full Bus Testing Report and any applicable partial testing report(s) before final acceptance of the first vehicle. In dealing with a bus manufacturer or dealer, the recipient shall be responsible for determining whether a vehicle to be acquired requires full testing or partial testing or has already satisfied the requirements of this part. A bus manufacturer or recipient may request guidance from FTA in making these determinations.

The purpose of the testing is intended set a "Pass/Fail" standard and grade the performance of the buses in order to provide performance information to the transit authorities that can be used in their purchase or lease decisions. The intent of this report is to provide the grantee a relative measure of the performance of a particular model of transit bus against a standard of performance. The passing of this test should ensure a vehicle has a high probability of meeting its service life in the category it was tested.

The data included in this test report and other applicable reports should be reviewed to choose the most suitable bus for a grantee's operation. A higher scoring bus is not necessarily the best bus for a given application. For example, a bus with a powerful engine may score well because of its performance and gradeability, but another bus with a smaller and more fuel-efficient engine could be a better choice for applications in mostly flat areas. It is the responsibility of the grantee to ensure the proper test report or applicable partial report is in their possession and has been thoroughly reviewed.

The score sheet for the subject vehicle of this test report is provided below. **This bus passed the Altoona test, with an aggregate score of 86.6.** 

Top	+ rateoore	Ctandard Baro Dire	Raea Die	Based Dec Ronne Dec	Dance	Dance	Toct Data	Croro
0		oralinal u	HOL SCOOL	DUIND LTD.	ndilge	nalige	ו בזר המומ	20010
1. Maintainability	Unscheduled maint.	< 125 hours	2	14	0	125	36.15	11.95
2. Reliability	# Class 2 failures	< 2 Uncorrected	2	9	0	2	0	8.00
	Hazards	No uncorrected Class 1	10	0	Р	u.	Р	10.00
	Stability	Lane change, 45 mph?	2.5	0	٩	u.	Р	2.50
3. Safety		< 158 feet at 45mph	0.5	2	80	158	121.8	1.43
	Braking	Holds Lane, Split coeffient	2.5	0	Р	u.	Р	2.50
		Parking brake, 20% grade	2.5	0	٩	4	Р	2.50
	Acceleration 0-30 mph	less than 30 sec	1.5	0	٩	u.	Р	1.50
4. Performance	Gradeability 2.5%	more than 40 mph	1.5	0	٩	u.	Р	1.50
	Gradeability 10%	more than 10 mph	2	0	٩	ų	Р	2.00
	Distortion	Exits are operational	1	0	٩	u.	Р	1.00
	Static Towing	No significant deformation	F	0	٩	u.	Р	1.00
C++++++	Dynamic Towing	Towable with std. wrecker	Ļ	0	٩	LL.	Р	1.00
b. Structural	Jacking	Liftable with std. jack	H	0	Р	u,	Р	1.00
Annegrity	Hoisting	Stable on jacks	Ţ	0	ď	Ľ.	Р	1.00
	<b>Durability-Structural</b>	No uncorrected failures	13	0	٩	u,	Р	13.00
	Durability-Powertrain	No uncorrected failures	12	0	Р	ш	Р	12.00
	Liquid fuels	1-13mpg			1	13	NA	0.00
C Cual Concern	CNG	10-50 scf/mi	•	9	10	50	NA	0.00
	Hydrogen	15-98 cf/mi	4	þ	15	98	NA	0.00
	Electric	1-3 kWh/mi			1	e	2.467	2.60
T Michael	Int. Noise (0-35 mph)	less than 80 db	0.5	8	30	80	75.8	0.75
V. NOISE	Ext. Noise (0-35 mph)	less than 83 db	0.5	e	50	83	62.5	2.36
	c0 <sub>2</sub>	0-4000 g/mi		4	0	4000	0	5.00
	8	0-20 g/mi		0.4	0	20	0	0.40
8 Emissions	Total hydrocarbon	0-3 g/mi		0.4	0	æ	0	0.40
	NMHC	0-3 g/mi	•	0.4	0	m	0	0.40
	Nitrogen oxides	0-3 g/mi		0.4	0	2	0	0.40
	Particulates	0-0.1 g/m		0.4	0	0.1	0	0.40
Take			00	UV				

Note: The use of the scoring system is not mandatory for procurement. It is only necessary that the bus being procured has received a passing score.

#### ABBREVIATIONS AND ACRONYMS

ABS	- anti-skid braking system
_	- Altoona Bus Test Center
A/C	- air conditioner, or air conditioning
AC	- alternating current
ADA	- American Disability Act
	- chassis dynamometer test control system
CVS	- constant volume sampling
CW	<ul> <li>curb weight (bus weight including maximum fuel, oil, and coolant; but</li> </ul>
	without passengers or driver)
dB(A)	<ul> <li>decibels with reference to 0.0002 microbar as measured on the "A" scale</li> </ul>
DC	- direct current
DIR	
DR	
EPA	0 /
	– gross axle weight rating
GVL	- gross vehicle load (150 lb. for every designed passenger seating
	position, for the driver, and for each 1.5 sq ft of free floor space)
	<ul> <li>gross vehicle weight (curb weight plus gross vehicle load)</li> </ul>
	- gross vehicle weight rating
	DS – Heavy Duty-Urban Dynamometer Driving Schedule
LTI	- Larson Transportation Institute
mpg	
mph	- miles per hour
PM	- Preventive maintenance
PSTT	- Penn State Test Track
rpm	- revolutions per minute
SAE	- Society of Automotive Engineers
SCF	- Standard cubic foot
SCH	- test scheduler
SA	- staff assistant
SLW	- seated load weight (curb weight plus 150 lb. for every designed passenger seating
	position and for the driver)
TD	- test driver
TECH	- test technician
ΤM	- track manager
ТР	- test personnel
Wh	- Watt hour

#### **TEST BUS CHECK-IN**

#### I. <u>OBJECTIVE</u>

The objective of this task is to log in the test bus, assign a bus number, complete the vehicle data form, and perform a safety check.

#### II. TEST DESCRIPTION

The test consisted of assigning a bus test number to the bus, cleaning the bus, completing the vehicle data form, obtaining any special information and tools from the manufacturer, determining a testing schedule, performing an initial safety check, and performing the manufacturer's recommended preventive maintenance. The bus manufacturer certified that the bus meets all Federal regulations.

#### III. DISCUSSION

The check-in procedure is used to identify in detail the major components and configuration of the bus.

The test bus consisted of a Gillig Company, 40-Foot Low Floor Battery Electric Bus. The bus has a passenger door forward of the front axle and a passenger door between the front and rear axles. The front passenger door is equipped with a Ricon / RISSR-OH6782EY00 fold-out ramp. Power is provided by a Cummins electric traction motor.

The measured curb weight was 10,770 lb. for the front axle and 21,720 lb. for the rear axle. These combined weights provided a total measured curb weight of 32,490 lb. There are 38 seats including the driver and free floor space for 36 standing passengers bringing the *potential* total passenger capacity to 74. Six seats fold away to accommodate two wheelchairs. When the wheelchairs are in place, there is free floor space for only 34 standing passengers. Utilizing the wheelchair positions in place of the seated passengers is the heaviest seated load weight configuration. Gross load weight would be the same with either the wheelchairs in place or the seats in place, due to the extra room for standing passengers. Therefore, the gross load represents 32 seated passengers, two wheelchairs and 34 standees, or 38 seated passenger and 36 standees. Gross load is calculated as  $(150 \text{ lb. x } 66) + (2 \times 600) = 11,100$ . At full declared capacity, the measured gross vehicle weight was 43,630 lb.

Page 1 of 7

Bus Number: 2020-05	Date of Check-In: 07/29/2020
Bus Manufacturer: Gillig	Vehicle Identification Number (VIN): 15GGD2810L3189322
Model Number: 40 Foot Low Floor Battery Electric Bus	Chassis Mfr./Mod. #: Gillig / Low Floor
Personnel: E.D. & E.L.	Starting Odometer Reading: 9,856

#### WEIGHT:

Individual Wheel Reactions:

Weights	Front	Axle	Middle	e Axle	Rear	Axle
(lb.)	Curb	Street	Curb	Street	Curb	Street
CW	5,400	5,370	N/A	N/A	10,490	11,230
SLW	6,410	6,410	N/A	N/A	12,110	13,590
GVW	7,830	7,760	N/A	N/A	13,430	14,610

#### Total Weight Details:

Weight (lb.)	CW	SLW	GVW	GAWR
Front Axle	10,770	12,820	15,590	16,000
Middle Axle	N/A	N/A	N/A	N/A
Rear Axle	21,720	25,700	28,040	29,000
Total	32,490	38,520	43,630	GVWR: 45,000 (Declared by Manufacturer)

#### Dimensions:

Length (ft/in)	40 / 101⁄2
Width (in)	101 ¼
Height (in)	132 ½
Front Overhang (in)	91 ¼
Rear Overhang (in)	109 ¼
Wheelbase (in)	290
Wheel Track (in)	Front: 85.6
	Middle: N/A
	Rear: 77.7

Page 2 of 7

Bus Number: 2020-05	Date: 07/29/2020
---------------------	------------------

CLEARANCES:

Lowest Point Outside Front Axle	Location: Wheelchair rar	np frame	Clearance(in): 8.0
Lowest Point Outside Rear Axle	Location: Drive motor		Clearance(in): 9.6
Lowest Point between Axles	Location: Battery Pack		Clearance(in): 10.7
Ground Clearance at the center (in)	11.2		
Front Approach Angle (deg)*	7.5		
Rear Approach Angle (deg)*	8.8		
Ramp Clearance Angle (deg)	4.2		
Aisle Width (in)	Front: 22.3	Rear: 22	
Inside Standing Height at Center Aisle (in)	Front: 94.6	Rear: 75.9	

\*Measurements used to calculate approach and departure angles are taken from the centerline of the axles. BODY DETAILS:

Body Structural Type	Monocoque		
Frame Material	Steel		
Body Material	Aluminum		
Floor Material	Plywood		
Roof Material	Composite		
Windows Type	■ Fixed	Movable	
Window Mfg./Model No.	Arow / Five Star AR DOT 927 M300 AS5		
Number of Doors	<u>1</u> Front <u>1</u> Rear		
Mfr. / Model No.	Front: Vapor Door International / 50940245-01 (L), 5094025401 (R) Rear: Vapor Door International / 51650770-03 (L), 51650770-02 (R)		
Dimension of Each Door (in)	Front: 75.4 x 32.4	Rear: 77.4 x 4	15.9
Passenger Seat Type	■ Cantilever (Front)	■Pedestal (Rear)	□ Other (explain)
Driver Seat Type	■ Air □ Spring □ Other (explain)		
Mfr. / Model No.	Recaro / Ergo Metro	D AM80	
Number of Seats (including Driver)	38 or 32 & 2 wheelchairs		

#### Page 3 of 7

Bus Number: 2020-05	Date: 07/29/2020

BODY DETAILS (Contd.)

Free Floor Space (ft²)	55.9		
Height of Each Step at Normal	Front 1. <u>13.9</u>	2. <u>N/A</u> 3. <u>N/A</u>	4. <u>N/A</u>
Position (in)	Middle 1. <u>14.0</u>	2. <u>N/A</u> 3. <u>N/A</u>	4. <u>N/A</u>
	Rear 1. <u>N/A</u>	2. <u>N/A</u> 3. <u>N/A</u>	4. <u>N/A</u>
Step Elevation Change - Kneeling (in)	Front: 3.3	Middle: 1.1	

#### POWERTRAIN

Туре	□ C.I.	Alternate Fuel	
	□ S.I.	■ Other (Battery El	ectric)
Air Compressor Mfr. / Model No.	Powerex / SDCS05	5001PM-GG	
Maximum Capacity (ft³ / min)	16.1		
Starter Type – N/A	□ Electrical	Pneumatic	□ Other (explain)
Starter Mfr. / Model No.	N/A		

#### BATTERY SYSTEM

Maximum Rated Capacity (kWh)	444 kWh (6 battery packs combined)
Usable Capacity (kWh)	355.2
Nominal Voltage (Vdc)	750

#### PROPULSION CONTROL SYSTEM (Rear Axle)

Propulsion Control System Mfr. / Model No.	Cummins / 5572390
Traction Motor - Mfr. / Model No.	Cummins / TM4
Traction Motor Power rating (kW)	262.5-562.5

#### OTHERS

DCDC Converter Mfr. / Model No.	Cummins / 5575274
HV Distribution Box Mfr. / Model No.	Cummins / 5575655

-1

Page 4 of 7

Bus Number: 2020-05	Date: 07/29/2020

#### SUSPENSION

Number of Axles	2		
Front Axle Type	Independent	■Beam Axle	
Mfr. / Model No.	Meritor / FH946KX46		
Axle Ratio (if driven)	N/A		
Suspension Type	■ Air	□ Spring	□ Other (explain)
No. of Shock Absorbers	2		
Mfr. / Model No.	Koni / EVO 4:319		
Middle Axle Type	Independent	□ Independent □ Beam Axle	
Mfr. / Model No.	N/A		
Axle Ratio (if driven)	N/A		
Suspension Type	□ Air	□ Spring	□ Other (explain)
No. of Shock Absorbers	N/A		
Mfr. / Model No.	N/A		
Rear Axle Type	□ Independent ■ Beam Axle		
Mfr. / Model No.	Meritor / 79163KX6-614		
Axle Ratio (if driven)	6.14		
Suspension Type	■ Air	□ Spring	□ Other (explain)
No. of Shock Absorbers	4		
Mfr. / Model No.	Koni / EVO 3819		

Page 5 of 7

Bus Number: 2020-05	Date: 07/29/2020

#### WHEELS & TIRES

Front	Wheel Mfr./ Model No.	Alcoa LVL ONE / 22.5 x 8.25
	Tire Mfr./ Model No.	Michelin X Incity / 305/70R 22.5
Rear	Wheel Mfr./ Model No.	Alcoa LVL ONE / 22.5 x 8.25
	Tire Mfr./ Model No.	Michelin X Incity / 305/70R 22.5

#### BRAKES

Front Axle Brakes Type	□ Cam	■ Disc	□ Other (explain)
Mfr. / Model No.	Meritor / EX225H3		
Middle Axle Brakes Type	□ Cam	□ Disc	□ Other
Mfr. / Model No.	N/A		
Rear Axle Brakes Type	□ Cam	∎Disc	□ Other (explain)
Mfr. / Model No.	Meritor / EX225H3		

#### HVAC

Heating System Type	□ Air	Water	□ Other
Capacity (Btu/hr)	102,000		
Mfr. / Model No.	ThermoKing / TE18		
Air Conditioner	■ Yes	🗆 No	
Location	Rear		
Capacity (Btu/hr)	92,500		
A/C Compressor Mfr. / Model No.	Copeland Scroll Emerson Climate Technology / ZRHV81KTE-TX7-502		

#### STEERING

Steering Gear Box Type	Hydraulic Gea	r	
Mfr. / Model No.	TRW / TAS85		
Steering Wheel Diameter	20"		
Number of turns (lock to lock)	5 1/2		
Control Type	Electric	■ Hydraulic	□ Other (explain)

Page 6 of 7

Bus Number: 2020-05	Dete: 07/20/2020
Bus Number: 2020-05	Date: 07/29/2020

#### OTHERS

Wheelchair Ramps	Location: Front	Type: Foldout Ramp	
Wheelchair Lifts	Location: N/A	Type: N/A	
Mfr. / Model No.	Ricon / RISSR – OH6782EY00		
Emergency Exit	Location: Window	Number: 6	
	Door	2	
	Roof Hatch	1	

#### CAPACITIES

Fuel Tank Capacity (gallons)	N/A	
Engine Crankcase Capacity (gallons)	N/A	
Drive Motor Capacity (gallons)	3.5	
Differential Capacity (gallons)	5.5	
Cooling System Capacity (gallons)	Battery: 10 gallons	HVAC System: 6 gallons
Power Steering Fluid Capacity (quarts)	5.3	

Page 7 of 7

Bus Number: 2020-05	Date: 07/29/2020

#### List all spare parts, tools and manuals delivered with the bus.

Part Number	Description	Qty.
IR13-253	Airbag (Goodyear)	2
AS910C-14P 1380	Airbag (Continental)	4
08-70736-000	Bump stop	2
305/70R 22.5 Michelin X Incity	Tire	1
Alcoa LVL ONE 22.5x8.25	Wheel	1

#### **COMPONENT/SUBSYSTEM INSPECTION FORM**

Page 1 of 1

Bus Number: 2020-05

Date: 07/29/2020

Subsystem	Checked	Initials	Comments
Air Conditioning Heating and Ventilation	~	E.D.	None noted.
Body and Sheet Metal	~	E.D.	Scratch & crack on rear door & door glass
Frame	~	E.D.	None noted.
Steering	~	E.D.	None noted.
Suspension	~	E.D.	None noted.
Interior/Seating	~	E.D.	None noted.
Axles	~	E.D.	None noted.
Brakes	~	E.D.	None noted.
Tires/Wheels	~	E.D.	None noted.
Exhaust	N/A	E.D.	None noted.
Fuel System	~	E.D.	Battery Electric
Power Plant	~	E.D.	Battery
Accessories	~	E.D.	None noted.
ADA Accessible Lift System	N/A	E.D.	None noted.
ADA Accessible Ramp System	✓	E.D.	None noted.
Interior Fasteners	~	E.D.	None noted.
Batteries	~	E.D.	None noted.

## **CHECK - IN**



GILLIG 40 FOOT LOW FLOOR BATTERY ELECTRIC BUS





GILLIG 40 FOOT LOW FLOOR BATTERY ELECTRIC BUS





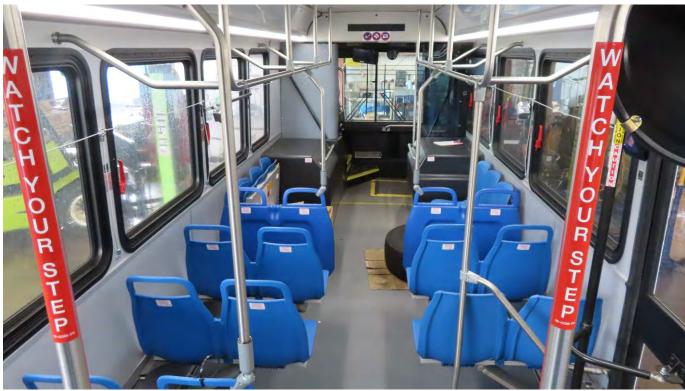
RICON / RISSR - OH6782EY00 FOLD OUT RAMP



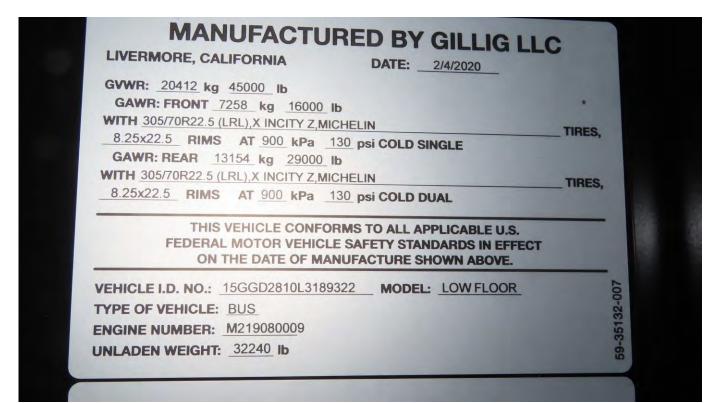
**OPERATOR'S AREA** 



**INTERIOR FROM FRONT** 



**INTERIOR FROM REAR** 



### VIN TAG



PLACARD SHOWING MAXIMUM PASSENGERS

# CHECK - IN CONT.



# **REAR COMPARTMENT**

# 1. MAINTAINABILITY

# 1.1 ACCESSIBILITY OF COMPONENTS AND SUBSYSTEMS

### 1.1-I. TEST OBJECTIVE

The objective of this test is to check the accessibility of components and subsystems.

### 1.1-II. TEST DESCRIPTION

Accessibility of components and subsystems was checked, and where accessibility was restricted the subsystem was noted along with the reason for the restriction.

### 1.1-III. DISCUSSION

Accessibility, in general, was adequate. Components covered in Section 1.3 (repair and/or replacement of selected subsystems), along with all other components encountered during testing, were found to be readily accessible and no restrictions were noted.

# ACCESSIBILITY DATA FORM

Page 1 of 2

Bus Number: 2020-05

Date: 04/01/2021

Component	Checked	Comments
ENGINE:		
Oil Dipstick	✓	N/A
Oil Filler Hole	✓	N/A
Oil Drain Plug	✓	N/A
Oil Filter	✓	N/A
Fuel Filter	✓	N/A
Air Filter	✓	N/A
Belts	✓	N/A
Coolant Level	✓	None noted.
Coolant Filler Hole	✓	None noted.
Coolant Drain	✓	None noted.
Spark / Glow Plugs	✓	N/A
Alternator	✓	N/A
Diagnostic Interface Connector	✓	None noted.
TRANSMISSION:		
Fluid Dipstick	✓	N/A
Filler Hole	✓	N/A
Drain Plug	✓	N/A
SUSPENSION:		
Bushings	✓	None noted.
Shock Absorbers	✓	None noted.
Air Springs	✓	None noted.
Leveling Valves	✓	None noted.
Grease Fittings	✓	None noted.

# ACCESSIBILITY DATA FORM

Page 2 of 2

Bus Number: 2020-05

Date: 04/01/2021

Component	Checked	Comments
HVAC:		
A/C Compressor	✓	None noted.
Filters	✓	None noted.
Fans	✓	None noted.
ELECTRICAL SYSTEM:		
Fuses	✓	None noted.
Batteries	✓	None noted.
Voltage regulator	✓	None noted.
Voltage Converters	✓	None noted.
Lighting	✓	None noted.
MISCELLANEOUS:		
Brakes	✓	None noted.
ADA Accessible Lifts/Ramps	✓	None noted.
Instruments	✓	None noted.
Axles	✓	None noted.
Exhaust	✓	N/A
Fuel System	✓	Electric
OTHERS:		

# 1.2 SERVICING, PREVENTIVE MAINTENANCE, AND REPAIR AND MAINTENANCE DURING TESTING

# 1.2-I. TEST OBJECTIVE

The objective of this test is to collect maintenance data about the servicing, preventive maintenance, and repair.

### 1.2.-II. TEST DESCRIPTION

The test was conducted by operating the bus and collecting the following data on work order forms and a driver log.

- 1. Scheduled Maintenance
  - a. Bus number
  - b. Date
  - c. Mileage
  - d. Results of scheduled inspections
  - e. Description of malfunction (if any)
  - f. Repair action and parts used (if any)
  - g. Man-hours required
- 2. Unscheduled Maintenance
  - a. Bus number
  - b. Date
  - c. Mileage
  - d. Description of malfunction
  - e. Place and time of malfunction (e.g., in service or undergoing inspection)
  - f. Repair action and parts used
  - g. Man-hours required

The bus was operated in accelerated durability service. While typical items are given below, the specific service schedule was that specified by the manufacturer.

### A. Service

- 1. Fueling
- 2. Consumable checks
- 3. Interior cleaning
- B. Preventive Maintenance
  - 1. Brake adjustments
  - 2. Lubrication
  - 3. 3,000 mi (or manufacturer recommended) inspection

- 4. Oil and filter change inspection
- 5. Major inspection
- 6. Tune-up
- C. Periodic Repairs
  - 1. Brake reline\*
  - 2. Transmission change
  - 3. Engine change\*
  - 4. Windshield wiper motor change
  - 5. Stoplight bulb change\*
  - 6. Towing operations
  - 7. Hoisting operations

\*These items are attended to if found necessary, while the others in the list are removed/replaced/tested for all buses undergoing a full test.

### 1.2-III. DISCUSSION

Servicing and preventive maintenance were performed at manufacturer-specified intervals. The following Scheduled Maintenance Form lists the mileage, items serviced, the service interval, and amount of time required to perform the maintenance.

The Unscheduled Maintenance List along with related photographs is included in Section 5.7, Structural Durability. This list supplies information related to failures that occurred during the durability portion of testing. The Unscheduled Maintenance List includes the date and mileage at which the malfunction was detected, a description of the malfunction and repair, and the time required to perform the repair.

SCHEDULED MAINTENANCE Gillig Bus# 2020-05 (Page 1 of 2)

LABOR HOURS	4.00	4.00	4.00	4.00	4.00	4.00
TIME	4.00	4.00	4.00	4.00	4.00	4.00
ACTIVITY/OBSERVATIONS	Steering linkage, tie rods, universals/u-joints all checked and lubed; all fluids checked. Inspected frame, body and suspension. Front street-side hub is leaking. (This bus has a fluid filled front axle with a visible sight glass which can leak.) Front curb-side and street-side bump stops are showing wear.	Steering linkage, tie rods, universals/u-joints all checked and lubed; all fluids checked. Inspected frame, body and suspension.	Steering linkage, tie rods, universals/u-joints all checked and lubed; all fluids checked. Inspected frame, body and suspension.	Steering linkage, tie rods, universals/u-joints all checked and lubed; all fluids checked. Inspected frame, body and suspension. Both front windshields are leaking.	Steering linkage, tie rods, universals/u-joints all checked and lubed; all fluids checked. Inspected frame, body and suspension.	Steering linkage, tie rods, universals/u-joints all checked and lubed; all fluids checked. Inspected frame, body and suspension.
SERVICE	P.M./Inspection	P.M./Inspection	P.M./Inspection	P.M./Inspection	P.M./Inspection	P.M./Inspection
TEST	1,034	2,238	3,614	4,760	6,262	7,363
DATE	08/26/20	09/25/20	10/12/20	10/26/20	11/04/20	11/20/20

SCHEDULED MAINTENANCE Gillig Bus# 2020-05 (Page 2 of 2)

LABOR HOURS	4.00	8.00	4.00	4.00	4.00	4.00
DOWN	4.00	8.00	4.00	4.00	4.00	4.00
ACTIVITY/FINDINGS	Steering linkage, tie rods, universals/u-joints all checked and lubed; all fluids checked. Inspected frame, body and suspension.	Steering linkage, tie rods, universals/u-joints all checked and lubed; all fluids checked. Inspected frame, body and suspension.	Steering linkage, tie rods, universals/u-joints all checked and lubed; all fluids checked. Inspected frame, body and suspension. Right front leveling valve was found to have a slight leak causing the bus to lean over when shut down. Rear lower radius arm bushings were found to be showing wear. Damaged curb-side and street-side bump stops were noted.	Steering linkage, tie rods, universals/u-joints all checked and lubed; all fluids checked. Inspected frame, body and suspension.	Steering linkage, tie rods, universals/u-joints all checked and lubed; all fluids checked. Inspected frame, body and suspension. It was noted that the stud which secured rooftop side panel on street-side has broken.	Steering linkage, tie rods, universals/u-joints all lubed; all fluids checked. Inspected frame, body and suspension.
SERVICE	P.M./Inspection	P.M./Inspection Energy Economy Prep	P.M./Inspection	P.M./Inspection	P.M./Inspection	P.M./Inspection
TEST	9,236	10,206	11,224	12,348	13,714	14,987
DATE	12/15/20	01/06/21	01/19/21	01/28/21	03/05/21	03/16/21

# 1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS

# 1.3-I. TEST OBJECTIVE

The objective of this test is to establish the time required to replace and/or repair selected subsystems.

### 1.3-II. TEST DESCRIPTION

The test involved components that may be expected to fail or require replacement during the service life of the bus. In addition, any component that failed during testing of the bus was added to this list. Components to be included are:

- 1. Drive Motor
- 2. DC to DC Converter
- 3. Low Voltage Batteries
- 4. High Voltage Batteries
- 5. Windshield wiper motor

### 1.3-III. DISCUSSION

At the end of the test, the items on the list were removed and replaced. The drive motor assembly took 4.50 labor-hours (1 person @ 4.50 hrs.) to remove and replace. The time required for repair/replacement of the other four components is given on the following Repair and/or Replacement Form.

# SubsystemReplacement TimeDrive Motor4.50 labor hoursWiper Motor x 20.50 labor hoursDC to DC Converter3.00 labor hoursLow Voltage Batteries0.50 labor hoursHigh Voltage Batteries10.00 labor hours

# **REPLACEMENT AND/OR REPAIR FORM**

It is noted that the battery pack replacement times may vary with the other battery packs due to the location.

During the test, additional components were removed for repair or replacement and the details are available in Section 5.7 in Unscheduled Maintenance.

# 1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS



# DRIVE MOTOR REMOVAL AND REPLACEMENT (3.50 LABOR HOURS)



WIPER MOTOR REMOVAL AND REPLACEMENT (0.50 LABOR HOURS)

# 1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS CONT.



# DC TO DC CONVERTER REMOVAL AND REPLACEMENT (3.00 LABOR HOURS)



HIGH VOLTAGE BATTERY REMOVAL AND REPLACEMENT (10.00 LABOR HOURS)

# 2. RELIABILITY - DOCUMENTATION OF BREAKDOWN AND REPAIR TIMES DURING TESTING

# 2-I. TEST OBJECTIVE

The objective of this test is to document unscheduled breakdowns, repairs, down time, and repair time that occur during testing.

### 2-II. TEST DESCRIPTION

Using the driver log and unscheduled work order forms, all significant breakdowns, repairs, labor-hours to repair, and hours out of service were recorded on the Reliability Data Form.

# **CLASS OF FAILURES**

Classes of failures are described below:

- (a) <u>Class 1: Physical Safety</u>. A failure that could lead directly to Injury, a crash and/or significant physical damage.
- (b) <u>Class 2: Road Call</u>. A failure resulting in an en-route interruption of revenue service. Service is discontinued until the bus is replaced or repaired at the point of failure.
- (c) <u>Class 3: Bus Change</u>. A failure that requires removal of the bus from service during its assignments. The bus is operable to a rendezvous point with a replacement bus.
- (d) <u>Class 4: Bad Order</u>. A failure that does not require removal of the bus from service during its assignments but does degrade coach operation. The failure shall be reported by driver, inspector, or hostler.

# 2-III. DISCUSSION

A listing of breakdowns and unscheduled repairs was accumulated during the Structural Durability Test. The following Reliability Data Form lists all unscheduled repairs under classes as defined above.

The classification of repairs according to subsystem is intended to emphasize those systems which had persistent minor or more serious problems. There were 16 reported failures during testing which occurred throughout several subsystems. Of these failures, there was one Class 4 failures, 12 Class 3 failures and three Class 2 failures. There were no Class 1 failures. These failures are available for review in the Unscheduled Maintenance List, located in Section 5.7 Structural Durability.

This bus passed the Structural and Powertrain Durability sections of the test.

### RELIABILITY DATA FORMS

Bus Number: 2020-05

Date: 05/26/21

Personnel: B.L.

		Failur	е Туре		1	
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
Subsystems	Mileage	Mileage	Mileage	Mileage	Labor Hours	Down Time
Hardware		1,034	1		0.20	0.20
Electrical		1,416			1.00	1.00
	1.	3,390	1		0.20	0.20
		1.1	12,522	1	1.00	1.00
		12,866			10.00	10.00
Body	1	2,238	1	1.0000000000000000000000000000000000000	1.00	1.00
		7,748		1	0.10	0.10
Suspension		7,363			1.00	1.00
	10,206	21.00	·	1	1.00	1.00
			11,690		8.50	8.50
	·	12,354		i	2.00	2.00
Compressed Air		7,363			2.00	2.00
	1 1 1 1 1 1 1 1 1	7,471	i		2.65	2.65
Compressed Air/Suspension		12,443			1.00	1.00
			12,481	11	4.00	4.00
HVAC		14,161			0.50	0.50

# 3.1 SAFETY - A DOUBLE-LANE CHANGE (OBSTACLE AVOIDANCE)

### 3.1-I. TEST OBJECTIVE

The objective of this test is to determine handling and stability of the bus by measuring speed through a double lane change test.

### 3.1-II. TEST DESCRIPTION

The Safety Test consisted of an obstacle avoidance maneuver to evaluate the handling and stability of the bus. The test was conducted at the LTI test track on the vehicle dynamics pad. The bus was driven through a double-lane change course at increasing speeds until the test was determined to be unsafe or a speed of 45 mph is reached. The test is determined unsafe if vehicle handling becomes unstable or if any of the tires lose contact with the pavement.

The layout of the test course was defined by placing pylons along painted guidelines that delineated the course. The guidelines marked off two 12-foot center-to-center lanes. Each lane had two 100 foot long gates with a spacing distance of 100 feet between them. The bus entered the test course in one lane, crossed over to the other lane within the 100 foot gate, traveled for 100 feet, and then returned back into the original lane within the next 100 foot gate. This maneuver was repeated from 20 mph with speed increasing in increments of 5 mph. The test was performed starting from both the right and left lanes.

A test run is considered valid if the bus is able to perform the maneuver at a constant speed without deviating from the test course or striking pylons. If the bus is not able to successfully complete the maneuver due to vehicle instability, the test will be terminated. The highest speed at which the maneuver can be successfully performed up to a maximum speed of 45 mph is recorded on the Safety Data Form.

### 3.1-III. DISCUSSION

The double-lane change was performed in both right-hand and left-hand directions. The bus was able to safely negotiate the test course in both the right-hand and left-hand directions up to the maximum test speed of 45 mph, and therefore, passed this portion of the test.

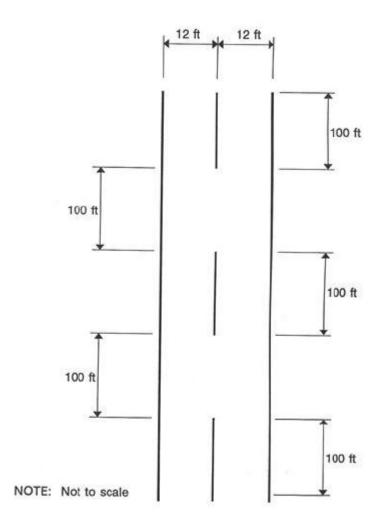


Figure 3.1. Double lane change test course

# SAFETY DATA FORM

Page 1 of 1

Bus Number: 2020-05	Date: 11/10/2020
Demonstration C.D. & M.L.	

Personnel: S.R., E.D. & M.H.

Temperature (°F): 72	Humidity (%): 53
Wind Direction: S	Wind Speed (mph): 8
Barometric Pressure (inHg): 30.05	

SAFETY TEST: DOUBLE LANE CHANGE					
Maximum safe speed tested for double-lane change to left	45 mph				
Maximum safe speed tested for double-lane change to right	45 mph				
Comments of the position of the bus during the lane change:					
The bus maintained a safe profile throughout all portions of testing.					
Comments of the tire/ground contact patch:					
The bus maintained the tire/ground patch throughout all portions of testing.					

# 3.1 SAFETY



**RIGHT - HAND APPROACH** 



# **LEFT - HAND APPROACH**

# 3.2 Safety - Braking

### 3.2 I. <u>TEST OBJECTIVE</u>

The objective of this test is to provide, for comparison purposes, braking performance data on transit buses produced by different manufacturers.

### 3.2 II. TEST DESCRIPTION

The testing was conducted at the LTI Test Track skid pad area. Brake tests were conducted after completion of the GVW portion of the vehicle durability test. At this point in testing the brakes have been subjected to a large number of braking snubs and will be considered well burnished. For buses that have not completed Durability Testing, the brakes will be burnished according to the test procedure. Testing was performed when the bus was fully loaded at its GVW. All tires on each bus were representative of the tires on the production model vehicle and inflated to the bus manufacturer's specified pressures.

The brake testing procedure is comprised of three phases:

- 1. Stopping distance tests
  - i. Dry surface (high-friction, Skid Number within the range of 70-76)
  - ii. Wet surface (low-friction, Skid Number within the range of 30-36)
- 2. Stability tests
- 3. Parking brake test

### 3.2-III. DISCUSSION

The results of the Stopping Distance phase of the Brake Test are available in table 3.2-2. There was no deviation from the test lane during the performance of the Stopping Distance phase.

During the Stability phase of Brake Testing the test bus experienced no deviation from the test lane during both approaches to the Split Friction Road surface.

The Parking Brake phase was completed with the test bus maintaining the parked position for the full five-minute period with no slip or roll observed in both the uphill and downhill positions.

This bus passed all three phases of the Safety –Braking Test.

# Table 3.2-1. Braking Test Data Forms Page 1 of 3

Bus Number: 2020-05	Date: 11/09/2020	
Personnel: S.R., E.D. & P.D.		
Amb. Temperature (°F): 70	Wind Speed (mph): 3	
Wind Direction: SW	Pavement Temp (°F) Start: 60 End: 69	

TIRE INFLATION PRESSURE (psi):						
Tire Type: Front: Michelin X Incity 305 70R 22.5 Rear: Michelin X Incity 305 70R 22.5						
	Left Tire(s) Right Tire(s)					
Front		130	130			
	Inner Outer Inner Oute					
Middle	N/A	N/A	N/A	N/A		
Rear						

AXLE LOADS (lb.)					
Left Right					
Front	7,760	7,830			
Middle	N/A N/A				
Rear	14,610	13,430			

# Table 3.2-2.Stopping Distance Test Results Form(longest stopping distance in each test condition in bold)

Vehicle Direction	CW	CW	CCW	CCW	
Speed (mph)	Stop 1	Stop 2	Stop 3	Stop 4	Average
20 (dry)	33.52	27.02	24.63	26.56	27.93
30 (dry)	55.00	54.34	49.95	53.62	53.23
40 (dry)	95.44	90.43	89.47	89.83	91.29
45 (dry)	116.95	121.88	126.47	121.91	121.80
20 (wet)	34.99	36.70	34.14	33.16	34.75

# Table 3.2-3. Stability Test Results Form

Stability Test Results (Split Friction Road surface)			
Vehicle Direction	Attempt	Did test bus stay in 12' lane? (Yes/No)	Comments
Driver side on	1	Yes	None noted.
high friction	2	Yes	None noted.
Driver side on	1	Yes	None noted.
low friction	2	Yes	None noted.

PARKING BRAKE (Fully Loaded) – GRADE HOLDING						
Vehicle Direction	Attempt	Hold Time (min)	Slide (in)	Roll (in)	Did Hold	No Hold
	1	5:00	0	0	✓	
Front up	2	N/A	N/A	N/A	N/A	N/A
	3	N/A	N/A	N/A	N/A	N/A
	1	5:00	0	0	✓	
Front down	2	N/A	N/A	N/A	N/A	N/A
	3	N/A	N/A	N/A	N/A	N/A

# Table 3.2-4. Parking Brake Test Form

# Table 3.2-5. Record of All Braking System Faults/Repairs.

Date	Fault/Repair	Description
11/09/20	None noted.	None noted.

# 3.2 Safety - Bus Braking



PARKING BRAKE TEST PARKING BRAKE HELD FOR 5 MINUTES IN BOTH 20% UP AND 20% DOWN POSITIONS



# 4. PERFORMANCE - AN ACCELERATION, GRADEABILITY, AND TOP SPEED TEST

### 4-I. TEST OBJECTIVE

The objective of this test is to determine the acceleration, gradeability, and top speed capabilities of the bus.

### 4-II. TEST DESCRIPTION

In this test, the bus was operated at SLW on a chassis dynamometer. The procedure dictates that the test bus be accelerated to a maximum "power-limited"/"governed" or maximum "safe" speed not exceeding 80 mph. The maximum power-limited/governed speed, if applicable, is the top speed as limited by the engine control system. The maximum safe speed is defined as the maximum speed that the dynamometer, the tires or other bus components are limited to. The test vehicle speed was measured using a speed encoder built in the chassis dynamometer. The time intervals between 10 mph increments were recorded using a Data Acquisitions System. Time-speed data and the top speed attained were recorded on the Performance Data Form. The recorded data was used to generate a percent grade versus speed table and a speed versus time curve. All the above are available in the following pages.

### 4-III. <u>DISCUSSION</u>

This test consisted of three runs from standstill to full throttle on the chassis dynamometer. Speed versus time data was obtained for each run and results are averaged to minimize test variability. The test was performed up to a maximum governed speed of 65.1 mph. The calculated gradeability results are attached. The average time to reach 30 mph was 6.4 seconds. The maximum gradeability at 10 mph was 52.6% and at 40 mph was 10.5%. This bus passed this section of the test.

# PERFORMANCE DATA FORM

Page 1 of 1					
Bus Number: 2020-05		Date: 01/13/2021	Date: 01/13/2021		
Personnel: J.S. & S.I.					
Temperature (°F): 71		Humidity (%): 21			
Barometric Pressure (inHg): 28.8					
			INITIALS:		
Air Conditioning - OFF	-	<u>⊀</u> Checked	J.S.		
Ventilation fans - ON I	HIGH	<u> </u>	J.S.		
Heater - OFF		<u> </u>	J.S.		
Defroster - OFF		<u> </u>	J.S.		
Exterior and interior lig	ghts - ON	<u>✓</u> Checked	J.S.		
Windows and doors - CLOSED		<u> </u>	J.S.		
ACCELERATION, GRADEABILITY, TOP SPEED					
	Recorded	Interval Times			
Speed	Run 1	Run 2	Run 3		
10 mph	1.8	1.8	1.8		
20 mph 3.5		3.4	3.5		
30 mph	6.5	6.3	6.4		
40 mph	10.0	9.7	9.9		
50 mph	15.1	14.8	15.0		
60 mph	22.8	22.5	22.7		
70 mph	N/A	N/A	N/A		

Maximum Speed (mph): 65.1 (maximum governed speed reached using chassis dynamometer)

# PERFORMANCE SUMMARY SHEET

Bus Number: 2020-05	Date: 01/13/2021		
Personnel: J.S. & S.I.			

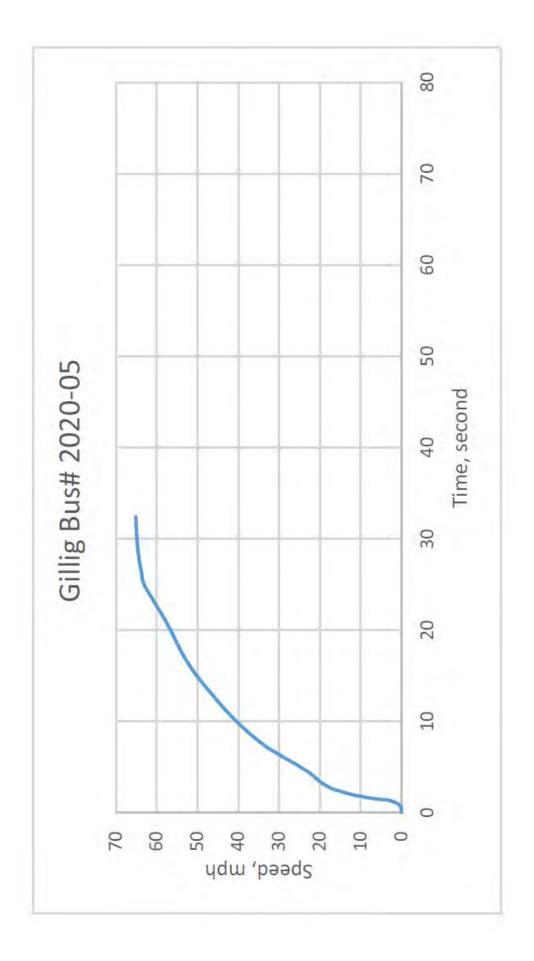
Test Conditions:

Temperature (°F): 71	Humidity (%): 21

Barometric Pressure (inHg): 28.8

Test Results:

Vehicle Speed (MPH)	Time (SEC)	Acceleration (FT/SEC^2)	Max. Grade (%)
1.0	1.0	9.04	28.1
5.0	1.5	15.79	49.1
10.0	1.8	16.94	52.6
15.0	2.4	10.38	32.3
20.0	3.5	4.32	13.4
25.0	5.1	5.45	16.9
30.0	6.4	5.57	17.3
35.0	7.9	4.18	13.0
40.0	9.9	3.39	10.5
45.0	12.2	2.79	8.7
50.0	15.0	2.48	7.7
55.0	18.6	1.61	5.0
60.0	22.7	2.00	6.2
65.0	31.2	0.19	0.6
65.1	32.4	Maximu	um Speed



# 5.2 STRUCTURAL STRENGTH AND DISTORTION TESTS - STRUCTURAL DISTORTION

# 5.2-I. TEST OBJECTIVE

The objective of this test is to observe the operation of the bus subsystems when the bus is placed in a longitudinal twist simulating operation over a curb or through a pothole.

### 5.2-II. TEST DESCRIPTION

With the bus loaded to GVW, each wheel of the bus was raised (one at a time) to simulate operation over a curb and the following were inspected:

- 1. Body
- 2. Windows
- 3. Doors
- 4. Roof vents
- 5. Special seating
- 6. Undercarriage
- 7. Engine
- 8. Service doors
- 9. Escape hatches
- 10. Steering mechanism

Each wheel was then lowered (one at a time) to simulate operation through a pothole and the same items inspected.

### 5.2-III. DISCUSSION

The test sequence was repeated ten times. The first and last test is with all wheels level. The other eight tests are with each wheel 6 inches higher and 6 inches lower than the other three wheels.

All doors, windows, escape mechanisms, engine, steering and ADA accessible devices operated normally throughout the test. The undercarriage and body indicated no deficiencies. No water leakage was observed during the test. The results of this test are indicated on the following data forms. This bus passed this section of the test.

(Note: Ten copies of this data sheet are required) Page 1 of 10

Bus Number: 2020-05	Date: 07/30/2020
Personnel: S.R., E.D., E.L., T.G. & P.D.	Temperature(°F): 77

Wheel Position: (check one)				
All wheels level	■ before	□ after		
Left front	□ 6 in higher	□ 6 in lower		
Right front	🗆 6 in higher	□ 6 in lower		
Right rear	□ 6 in higher	□ 6 in lower		
Left rear	□ 6 in higher	□ 6 in lower		
Right center	□ 6 in higher	□ 6 in lower		
Left center	□ 6 in higher	□ 6 in lower		

	Comments
Windows	No Deficiencies.
Front Doors	No Deficiencies.
Rear Doors	No Deficiencies.
Escape Mechanisms/ Roof Vents	No Deficiencies.
Engine	No Deficiencies.
ADA Accessible/ Special Seating	No Deficiencies.
Undercarriage	No Deficiencies.
Service Doors	No Deficiencies.
Body	No Deficiencies.
Windows/ Body Leakage	No Deficiencies.
Steering Mechanism	No Deficiencies.

(Note: Ten copies of this data sheet are required) Page 2 of 10

Bus Number: 2020-05	Date: 07/30/2020
Personnel: S.R., E.D., E.L., T.G. & P.D.	Temperature(°F): 77

Wheel Position: (check one)				
All wheels level	□ before	□ after		
Left front	■ 6 in higher	□ 6 in lower		
Right front	□ 6 in higher	□ 6 in lower		
Right rear	□ 6 in higher	□ 6 in lower		
Left rear	□ 6 in higher	□ 6 in lower		
Right center	□ 6 in higher	□ 6 in lower		
Left center	□ 6 in higher	□ 6 in lower		

	Comments		
Windows	No Deficiencies.		
Front Doors	No Deficiencies.		
Rear Doors	No Deficiencies.		
Escape Mechanisms/ Roof Vents	No Deficiencies.		
Engine	No Deficiencies.		
ADA Accessible/ Special Seating	No Deficiencies.		
Undercarriage	No Deficiencies.		
Service Doors	No Deficiencies.		
Body	No Deficiencies.		
Windows/ Body Leakage	No Deficiencies.		
Steering Mechanism	No Deficiencies.		

(Note: Ten copies of this data sheet are required) Page 3 of 10

Bus Number: 2020-05	Date: 07/30/2020
Personnel: S.R., E.D., E.L., T.G. & P.D.	Temperature(°F): 77

Wheel Position: (check one)			
All wheels level	□ before	□ after	
Left front	□ 6 in higher	□ 6 in lower	
Right front	■ 6 in higher	□ 6 in lower	
Right rear	□ 6 in higher	□ 6 in lower	
Left rear	□ 6 in higher	□ 6 in lower	
Right center	□ 6 in higher	□ 6 in lower	
Left center	□ 6 in higher	□ 6 in lower	

	Comments	
Windows	No Deficiencies.	
Front Doors	No Deficiencies.	
Rear Doors	No Deficiencies.	
Escape Mechanisms/ Roof Vents	No Deficiencies.	
Engine	No Deficiencies.	
ADA Accessible/ Special Seating	No Deficiencies.	
Undercarriage	No Deficiencies.	
Service Doors	No Deficiencies.	
Body	No Deficiencies.	
Windows/ Body Leakage	No Deficiencies.	
Steering Mechanism	No Deficiencies.	

(Note: Ten copies of this data sheet are required) Page 4 of 10

Bus Number: 2020-05	Date: 07/30/2020
Personnel: S.R., E.D., E.L., T.G. & P.D.	Temperature(°F): 77

Wheel Position: (check one)			
All wheels level	□ before	□ after	
Left front	□ 6 in higher	□ 6 in lower	
Right front	□ 6 in higher	□ 6 in lower	
Right rear	■ 6 in higher	□ 6 in lower	
Left rear	□ 6 in higher	□ 6 in lower	
Right center	□ 6 in higher	□ 6 in lower	
Left center	□ 6 in higher	□ 6 in lower	

	Comments	
Windows	No Deficiencies.	
Front Doors	No Deficiencies.	
Rear Doors	No Deficiencies.	
Escape Mechanisms/ Roof Vents	No Deficiencies.	
Engine	No Deficiencies.	
ADA Accessible/ Special Seating	No Deficiencies.	
Undercarriage	No Deficiencies.	
Service Doors	No Deficiencies.	
Body	No Deficiencies.	
Windows/ Body Leakage	No Deficiencies.	
Steering Mechanism	No Deficiencies.	

(Note: Ten copies of this data sheet are required) Page 5 of 10

Bus Number: 2020-05	Date: 07/30/2020
Personnel: S.R., E.D., E.L., T.G. & P.D.	Temperature(°F): 77

Wheel Position: (check one)			
All wheels level	□ before	□ after	
Left front	□ 6 in higher	□ 6 in lower	
Right front	□ 6 in higher	□ 6 in lower	
Right rear	□ 6 in higher	□ 6 in lower	
Left rear	■ 6 in higher	□ 6 in lower	
Right center	□ 6 in higher	□ 6 in lower	
Left center	□ 6 in higher	□ 6 in lower	

	Comments	
Windows	No Deficiencies.	
Front Doors	No Deficiencies.	
Rear Doors	No Deficiencies.	
Escape Mechanisms/ Roof Vents	No Deficiencies.	
Engine	No Deficiencies.	
ADA Accessible/ Special Seating	No Deficiencies.	
Undercarriage	No Deficiencies.	
Service Doors	No Deficiencies.	
Body	No Deficiencies.	
Windows/ Body Leakage	No Deficiencies.	
Steering Mechanism	No Deficiencies.	

(Note: Ten copies of this data sheet are required) Page 6 of 10

Bus Number: 2020-05	Date: 07/30/2020
Personnel: S.R., E.D., E.L., T.G. & P.D.	Temperature(°F): 77

Wheel Position: (check one)			
All wheels level	□ before	□ after	
Left front	□ 6 in higher	■ 6 in lower	
Right front	□ 6 in higher	□ 6 in lower	
Right rear	□ 6 in higher	□ 6 in lower	
Left rear	□ 6 in higher	□ 6 in lower	
Right center	□ 6 in higher	□ 6 in lower	
Left center	□ 6 in higher	□ 6 in lower	

	Comments	
Windows	No Deficiencies.	
Front Doors	No Deficiencies.	
Rear Doors	No Deficiencies.	
Escape Mechanisms/ Roof Vents	No Deficiencies.	
Engine	No Deficiencies.	
ADA Accessible/ Special Seating	No Deficiencies.	
Undercarriage	No Deficiencies.	
Service Doors	No Deficiencies.	
Body	No Deficiencies.	
Windows/ Body Leakage	No Deficiencies.	
Steering Mechanism	No Deficiencies.	

(Note: Ten copies of this data sheet are required) Page 7 of 10

Bus Number: 2020-05	Date: 07/30/2020
Personnel: S.R., E.D., E.L., T.G. & P.D.	Temperature(°F): 77

Wheel Position: (check one)		
All wheels level	□ before	□ after
Left front	□ 6 in higher	□ 6 in lower
Right front	□ 6 in higher	■ 6 in lower
Right rear	□ 6 in higher	□ 6 in lower
Left rear	□ 6 in higher	□ 6 in lower
Right center	□ 6 in higher	□ 6 in lower
Left center	□ 6 in higher	□ 6 in lower

	Comments	
Windows	No Deficiencies.	
Front Doors	No Deficiencies.	
Rear Doors	No Deficiencies.	
Escape Mechanisms/ Roof Vents	No Deficiencies.	
Engine	No Deficiencies.	
ADA Accessible/ Special Seating	No Deficiencies.	
Undercarriage	No Deficiencies.	
Service Doors	No Deficiencies.	
Body	No Deficiencies.	
Windows/ Body Leakage	No Deficiencies.	
Steering Mechanism	No Deficiencies.	

(Note: Ten copies of this data sheet are required) Page 8 of 10

Bus Number: 2020-05	Date: 07/30/2020
Personnel: S.R., E.D., E.L., T.G. & P.D.	Temperature(°F): 77

Wheel Position: (check one)		
All wheels level	□ before	□ after
Left front	□ 6 in higher	□ 6 in lower
Right front	□ 6 in higher	□ 6 in lower
Right rear	□ 6 in higher	■ 6 in lower
Left rear	□ 6 in higher	□ 6 in lower
Right center	□ 6 in higher	□ 6 in lower
Left center	□ 6 in higher	□ 6 in lower

	Comments	
Windows	No Deficiencies.	
Front Doors	No Deficiencies.	
Rear Doors	No Deficiencies.	
Escape Mechanisms/ Roof Vents	No Deficiencies.	
Engine	No Deficiencies.	
ADA Accessible/ Special Seating	No Deficiencies.	
Undercarriage	No Deficiencies.	
Service Doors	No Deficiencies.	
Body	No Deficiencies.	
Windows/ Body Leakage	No Deficiencies.	
Steering Mechanism	No Deficiencies.	

(Note: Ten copies of this data sheet are required) Page 9 of 10

Bus Number: 2020-05	Date: 07/30/2020
Personnel: S.R., E.D., E.L., T.G. & P.D.	Temperature(°F): 77

Wheel Position: (check one)		
All wheels level	□ before	□ after
Left front	□ 6 in higher	□ 6 in lower
Right front	□ 6 in higher	□ 6 in lower
Right rear	□ 6 in higher	□ 6 in lower
Left rear	□ 6 in higher	■ 6 in lower
Right center	□ 6 in higher	□ 6 in lower
Left center	□ 6 in higher	□ 6 in lower

	Comments	
Windows	No Deficiencies.	
Front Doors	No Deficiencies.	
Rear Doors	No Deficiencies.	
Escape Mechanisms/ Roof Vents	No Deficiencies.	
Engine	No Deficiencies.	
ADA Accessible/ Special Seating	No Deficiencies.	
Undercarriage	No Deficiencies.	
Service Doors	No Deficiencies.	
Body	No Deficiencies.	
Windows/ Body Leakage	No Deficiencies.	
Steering Mechanism	No Deficiencies.	

## **DISTORTION TEST INSPECTION FORM**

(Note: Ten copies of this data sheet are required) Page 10 of 10

Bus Number: 2020-05	Date: 07/30/2020
Personnel: S.R., E.D., E.L., T.G. & P.D.	Temperature(°F): 77

Wheel Position: (check one)				
All wheels level	□ before	∎ after		
Left front	□ 6 in higher	□ 6 in lower		
Right front	□ 6 in higher	□ 6 in lower		
Right rear	□ 6 in higher	□ 6 in lower		
Left rear	□ 6 in higher	□ 6 in lower		
Right center	□ 6 in higher	□ 6 in lower		
Left center	□ 6 in higher	□ 6 in lower		

	Comments	
Windows	No Deficiencies.	
Front Doors	No Deficiencies.	
Rear Doors	No Deficiencies.	
Escape Mechanisms/ Roof Vents	No Deficiencies.	
Engine	No Deficiencies.	
ADA Accessible/ Special Seating	No Deficiencies.	
Undercarriage	No Deficiencies.	
Service Doors	No Deficiencies.	
Body	No Deficiencies.	
Windows/ Body Leakage	No Deficiencies.	
Steering Mechanism	No Deficiencies.	

# **5.2 STRUCTURAL DISTORTION TEST**



**RIGHT REAR WHEEL SIX INCHES HIGHER** 



**RIGHT REAR WHEEL SIX INCHES LOWER** 

## 5.3 STRUCTURAL STRENGTH AND DISTORTION TESTS - STATIC TOWING TEST

## 5.3-I. <u>TEST OBJECTIVE</u>

The objective of this test is to determine the characteristics of the bus towing mechanisms under static loading conditions.

#### 5.3-II. TEST DESCRIPTION

Utilizing a load-distributing yoke, a hydraulic cylinder was used to apply a static tension load equal to 1.2 times the bus curb weight. The load was applied to both the front and rear, if applicable, towing fixtures at an angle of 20 degrees with the longitudinal axis of the bus, first to one side then the other in the horizontal plane, and then upward and downward in the vertical plane. Any permanent deformation or damage to the tow eyes or adjoining structure was recorded.

#### 5.3-III. DISCUSSION

The load-distributing yoke was incorporated as the interface between the Static Tow apparatus and the test bus tow hook/eyes. The test was performed to the full target test weight of 38,988 lb. ( $1.2 \times 32,490$  lb. CW). No damage or deformation was observed during all four pulls of the test.

## STATIC TOWING TEST DATA FORM

Page 1 of 1

Bus Number: 2020-05

Date: 04/26/2021

Personnel: T.S., S.R., E.L., E.D. & J.M.

Temperature (°F): 60

Inspect right front tow eye and adjoining structure.

**Comments:** No damage observed.

Check the torque of all bolts attaching tow eye and surrounding structure.

Comments: Welds inspected.

Inspect left front tow eye and adjoining structure.

Comments: No damage observed.

Check the torque of all bolts attaching tow eye and surrounding structure.

Comments: Welds inspected.

Inspect right rear tow eye and adjoining structure.

Comments: N/A

Check the torque of all bolts attaching tow eye and surrounding structure.

Comments: N/A

Inspect left rear tow eye and adjoining structure.

Comments: N/A

Check the torque of all bolts attaching tow eye and surrounding structure.

Comments: N/A

General comments of any other structure deformation or failure: All 4 pulls

were performed to the target test load of 38,988 lb. with no damage or deformation

observed.

## Page 62 of 104





**5.3 STATIC TOWING TEST** 

0 1+

## 5.4 STRUCTURAL STRENGTH AND DISTORTION TESTS -DYNAMIC TOWING TEST

## 5.4-I. TEST OBJECTIVE

The objective of this test is to verify the integrity of the towing fixtures and determine the feasibility of towing the bus under manufacturer specified procedures.

## 5.4-II. TEST DESCRIPTION

This test required the bus to be towed at curb weight using the specified equipment and instructions provided by the manufacturer and a heavy-duty wrecker. The bus was towed for 5 miles at a speed of 20 mph for each recommended towing configuration. After releasing the bus from the wrecker, the bus was visually inspected for any structural damage or permanent deformation. All doors, windows and passenger escape mechanisms were inspected for proper operation.

## 5.4-III. DISCUSSION

The bus was towed using a heavy-duty wrecker. The towing interface was accomplished by incorporating a hydraulic under-lift. A front lift tow was performed. No problems, deformation, or damage was noted during testing. This bus passed this section of the test.

## **DYNAMIC TOWING TEST DATA FORM**

Page 1 of 1

Bus Number: 2020-05	Date: 01/08/2021		
Personnel: T.S. & T.G.			
Temperature (°F): 28			
Wind Direction: Calm	Wind Speed (mph): 0		
Inspect tow equipment-bus interface.			
Comments: No problems encountered.			
Inspect tow equipment-wrecker interfac	е.		
Comments: No problems encountered.			
Towing Comments: A heavy duty hydraulic wheel lift wrecker was used to perform			
this tow test. There were no problems encountered			

Description and location of any structural damage: None noted.

General Comments: None noted.

# **5.4 DYNAMIC TOWING TEST**



**TEST BUS IN TOW** 

## 5.5 STRUCTURAL STRENGTH AND DISTORTION TESTS – JACKING TEST

## 5.5-I. TEST OBJECTIVE

The objective of this test is to inspect for damage due to the deflated tire and determine the feasibility of jacking the bus with a portable hydraulic jack to a height sufficient to replace a deflated tire.

## 5.5-II. TEST DESCRIPTION

With the bus at curb weight, the tire(s) at one corner of the bus were replaced with deflated tire(s) of the appropriate type. A portable hydraulic floor jack was then positioned in a manner and location specified by the manufacturer and used to raise the bus to a height sufficient to provide 3-in clearance between the floor and an inflated tire. The deflated tire(s) were replaced with the original tire(s) and the jack was lowered. Any structural damage or permanent deformation was recorded on the test data sheet. This procedure was repeated for each corner of the bus.

## 5.5-III. DISCUSSION

During the deflated tire portion of the test, the jacking point clearances ranged from 3.8 inches to 11.2 inches. No deformation or damage was observed during testing. A complete listing of jacking point clearances is provided in the Jacking Test Data Form. This bus passed this section of the test.

Condition	Frame Point Clearance
Front axle – one tire flat	5.4
Rear axle – one tire flat	11.0
Rear axle – two tires flat	8.1

## JACKING CLEARANCE SUMMARY

## JACKING TEST DATA FORM

Page 1 of 1

Bus Number: 2020-05	Date: 07/30/2020
Personnel: E.D. & E.L.	Temperature (°F): 81

Record any permanent deformation or damage to bus as well as any difficulty encountered during jacking procedure.

I= Inflated D= Deflated

I= Inflated D=	Deflated		
Deflated Tire	Jacking Pad Clearance Body/Frame (in)	Jacking Pad Clearance Axle/Suspension (in)	Comments
Right front	9.1"I 5.4"D	7.3"I 4.1" D	Body & Axle
Left front	11.0"I 9.7"D	7.3"I 4.7"D	Body & Axle
Right rear—outside	11.9"I 11.2"D	6.4"l 5.9"D	Body & Suspension
Right rear—both	11.9"I 8.1"D	6.4"I 3.8"D	Body & Suspension
Left rear—outside	11.7"I 11.0"D	6.4"I 6.0"D	Body & Suspension
Left rear—both	11.7"I 8.4"D	6.4"I 4.0"D	Body & Suspension
Right middle or tag—outside	N/A	N/A	N/A
Right middle or tag—both	N/A	N/A	N/A
Left middle or tag— outside	N/A	N/A	N/A
Left middle or tag— both	N/A	N/A	N/A
Additional comments of any deformation or difficulty during jacking: None noted.			

# **5.5 JACKING TEST**



**JACK IN PLACE – FRONT** 



JACK IN PLACE – REAR

## 5.6 STRUCTURAL STRENGTH AND DISTORTION TESTS - HOISTING TEST

## 5.6-I. TEST OBJECTIVE

The objective of this test is to determine possible damage or deformation caused by the jack/stands.

## 5.6-II. TEST DESCRIPTION

With the bus at curb weight, the front end of the bus was raised to a height sufficient to allow manufacturer-specified placement of jack stands under the axles or jacking pads independent of the hoist system. The bus was checked for stability on the jack stands and for any damage to the jacking pads or bulkheads. The procedure was repeated for the tag/middle axles (if equipped), and rear end of the bus. The procedure was then repeated for the front, tag/middle (if equipped) axles, and rear simultaneously.

## 5.6-III. DISCUSSION

The test was conducted using four posts of a six-post electric lift and 19-inch jack stands. The bus was hoisted from the front wheels and then from the rear wheels, and then from the front and rear wheels simultaneously and placed on jack stands.

The bus accommodated the placement of the vehicle lifts and jack stands and the procedure was performed without any instability noted. This bus passed this section of the test.

## HOISTING TEST DATA FORM

Page 1 of 1

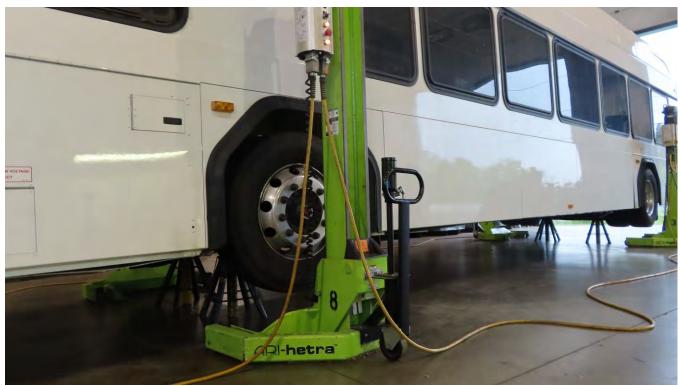
Bus Number: 2020-05	Date: 07/30/2020
Personnel: E.D. & P.D.	Temperature (°F): 75

Comments of any structural damage to the jacking pads or axles while both the front wheels are supported by the jack stands:
None noted.
Comments of any structural damage to the jacking pads or axles while both the rear wheels are supported by the jack stands:
None noted.
Comments of any structural damage to the jacking pads or axles while both the tag axle wheels are supported by the jack stands:
N/A
Comments of any structural damage to the jacking pads or axles while the front and rear wheels are supported by the jack stands:
None noted.
Comments of any problems or interference placing wheel hoists under wheels:
None noted.

# **5.6 HOISTING TEST**



JACK STANDS IN PLACE – REAR



JACK STANDS IN PLACE – FRONT AND REAR

## **5.7 STRUCTURAL DURABILITY TEST**

## 5.7-I. TEST OBJECTIVE

The objective of this test is to perform an accelerated durability test that approximates 25 percent of the service life of the vehicle.

## 5.7-II. TEST DESCRIPTION

The test vehicle was driven a total of 15,575 miles; approximately 12,500 miles on the LTI Durability Test Track and approximately 3,075 miscellaneous other miles. The test was conducted with the bus operated under three different loading conditions. The first segment consisted of approximately 6,250 miles with the bus operated at GVW. The second segment consisted of approximately 2,500 miles, was conducted with the bus loaded to CW. The loads on both axles and GVW were within their ratings with the bus loaded as specified by the manufacturer. All subsystems were running during these tests in their normal operating modes. All manufacturer-recommended servicing was followed and noted on the vehicle maintainability log. Servicing items accelerated by the durability tests were compressed by 10:1; all others were done on a 1:1 mi/mi basis. Unscheduled breakdowns and repairs were recorded on the same log as are any unusual occurrences as noted by the driver. Once a week the test vehicle was washed down and thoroughly inspected for any signs of failure.

## 5.7-III. DISCUSSION

The Structural Durability Test was started on August 18,2020 and was conducted until April 5, 2021. The first 6,250 miles were performed at a GVW of 43,630 lb. and completed on November 9, 2020. The next 2,500-mile SLW segment was performed at 38,520 lb. and completed on December 10, 2020 and the final 6,250-mile segment was performed at a CW of 32,490 lb. and completed on April 5, 2021.

The following mileage summary presents the accumulation of miles during the Structural Durability Test. The driving schedule is included, showing the operating duty cycle. A detailed plan view of the LTI Test Track Facility and Durability Test Track are attached for reference. Also, a durability element profile detail shows all the measurements of the different conditions. Finally, photographs illustrating some of the failures that were encountered during the Structural Durability Test are included. This bus passed this section of the test, as there were no uncorrected Class 1 or Class 2 failures and the unscheduled maintenance of 36.15 hours was less than 125 hours.

#### Gillig Bus# 2020-05

#### MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
08/17/20 TO 08/23/20	593.00	77.00	670.00
08/24/20 TO 08/30/20	714.00	32.00	746.00
08/31/20 TO 09/06/20	0.00	0.00	0.00
09/07/20 TO 09/13/20	0.00	0.00	0.00
09/14/20 TO 09/20/20	222.00	11.00	233.00
09/21/20 TO 09/27/20	610.00	25.00	635.00
09/28/20 TO 10/04/20	589.00	58.00	647.00
10/05/20 TO 10/11/20	490.00	133.00	623.00
10/12/20 TO 10/18/20	496.00	185.00	681.00
10/19/20 TO 10/25/20	423.00	78.00	501.00
10/26/20 TO 11/01/20	970.00	43.00	1013.00
11/02/20 TO 11/08/20	143.00	370.00	513.00
11/09/20 TO 11/15/20	762.00	95.00	857.00
11/16/20 TO 11/22/20	452.00	19.00	471.00
11/23/20 TO 11/29/20	151.00	7.00	158.00

#### Gillig Bus# 2020-05

## MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
11/30/20 TO	194.00	8.00	202.00
12/06/20			
12/07/20 TO	806.00	225.00	1031.00
12/13/20			
12/14/20 TO	401.00	18.00	419.00
12/20/20			
12/21/20 TO	345.00	15.00	360.00
12/27/20			
12/28/20 TO	0.00	0.00	0.00
01/03/21			
01/04/21 TO	593.00	123.00	716.00
01/10/21			
01/11/21 TO	270.00	349.00	619.00
01/17/21			
01/18/21 TO	642.00	29.00	671.00
01/24/21			
01/25/21 TO	585.00	124.00	709.00
01/31/21			
02/01/21 TO	39.00	2.00	41.00
02/07/21			
02/08/21 TO	0.00	0.00	0.00
02/14/21			
02/15/21 TO	0.00	0.00	0.00
02/21/21			
02/22/21 TO	400.00	16.00	416.00
02/28/21			
03/01/21 TO	837.00	37.00	874.00
03/07/21			
03/08/21 TO	773.00	33.00	806.00
03/14/21			

#### Gillig Bus# 2020-05

DATE	TOTAL	TOTAL	TOTAL
	DURABILITY	OTHER	
	TRACK	MILES	
03/15/21 TO	0.00	453.00	453.00
03/21/21			
03/22/21 TO	0.00	397.00	397.00
03/28/21			
03/29/21 TO	0.00	47.00	47.00
04/04/21			
04/05/21 TO	0.00	66.00	66.00
04/11/21			
TOTAL	12500.00	3075.00	15575.00

#### MILEAGE DRIVEN/RECORDED FROM DRIVER'S LOGS

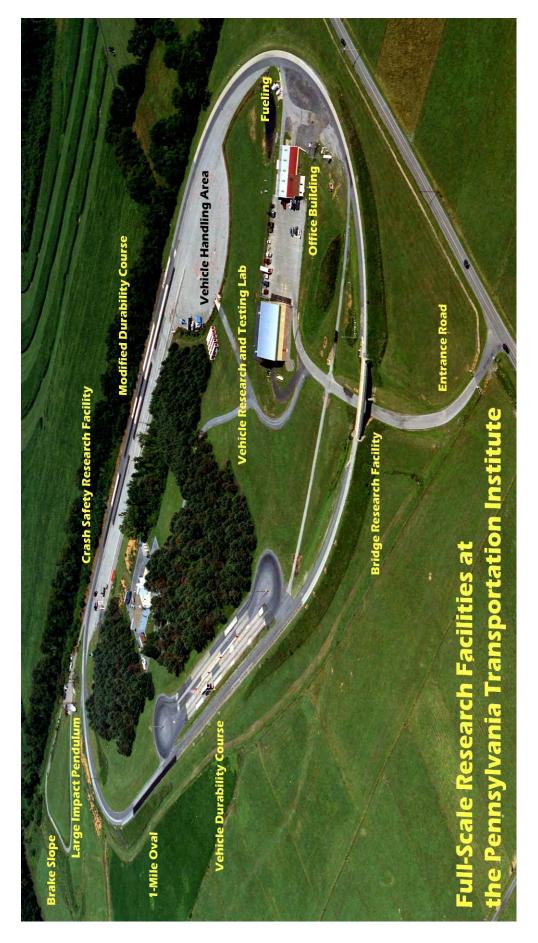
#### Driving Schedule for Bus Operation on the Durability Test Track.

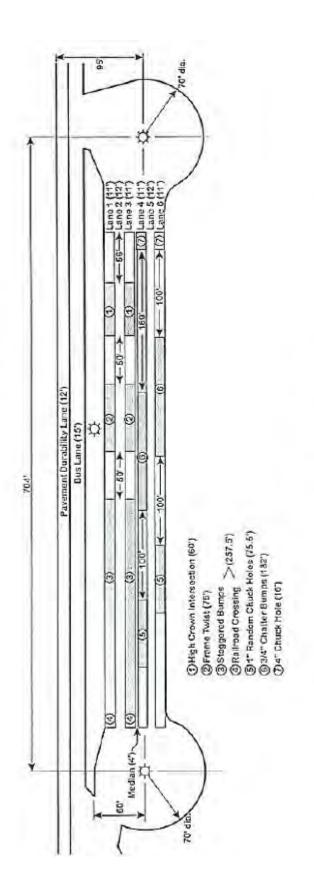
STANDARD OPERATING SCHEDULE

	HOUR	ACTION
Shift 1	midnight	D
	1:40 am	C
	1:50 am	в
	2:00 am	D
	3:35 am	G
	3:45 am	в
	4:05 am	D
	5:40 am	C
	5:50 am	В
	6:00 am	D
	7:40 am	G
	7:50 am	F
hift 2	8:00 am	D
	9:40 am	C
	9:50 am	в
	10:00 am	D
	11:35 am	C
	11:45 am	в
	12:05 pm	D
	1:40 pm	C
	1:50 pm	в
	2:00 pm	D
	3:40 pm	C
	3:50 pm	F
hift 3	4:00 pm	D
	5:40 pm	C
	5:50 pm	В
	6:00 pm	D
	7:40 pm	C
	7:50 pm	В
	8:05 pm	D
	9:40 pm	C
	9:50 pm	в
	10:00 pm	D
	11:40 pm	C
	11:50 pm	F

B-Break

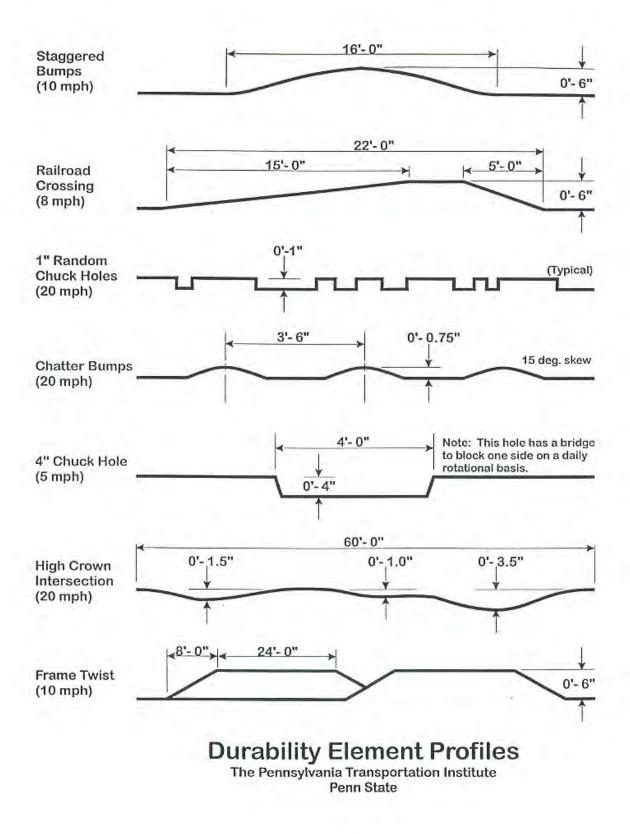
C---Cycle all systems five times, visual inspection, driver's log entries D--Drive bus as specified by procedure F----Fuel bus, complete driver's log shift entries





Plan View Vehicle Durability Test Track Track 1 (Track 2 has similar layout) The Larson Transportation Institute

Penn State



Unscheduled Maintenance Gillig Bus# 2020-05 (Page 1 of 3)

Class	3	e	e	3	s	3	ю	m
Sub-system	Hardware	Electrical	Body	Electrical	Suspension	Compressed Air	Compressed Air	Body
Hours	0.20	1.00	1.00	0.20	1.00	2.00	2.65	0.10
Action	Tightened latch bolts.	Problem was identified as communication issue between bus and charger. Bus software was updated by Cummins.	Threaded nutserts were installed in the roof for the cowling brackets. New $y_4^{n}$ bolts were installed and caulk was used to seal the area from weather.	Cycled 24v batteries three times. Bus started.	Damaged bump stops were removed and the new ones were installed by the bus manufacturer's representative.	Replaced air compressor assembly and new ground wire.	Had to cycle 24v batteries then bus built up air. This occurred on several different occasions. The air compressor unit was replaced and software was updated.	Bus manufacturer's representative replaced the sheet metal screws with (7) ½-20 screws and locknuts to secure plate.
Issue	Two bolts came loose on the ECM wiring connector latch.	Bus will not connect to charger.	The rear cowling on the curb side right rear has broken the rivets on the inside of the cowling.	Bus would not start. EV wait to start light would not go out.	The front bump stops are damaged.	Bolts broken on power box and broken ground wire on air compressor (Bolts vibrated loose).	Bus would not build air pressure.	Sheet metal/plating behind the Dynex power modules at the forward bulkhead compartment (above the driver's head) had become loose after 7 of the sheet metal screws had fallen.
Miles	1,034	1,416	2,238 to 7,363	3,390	7,363	7,363	7,471 to 10,658	7,748
Date	08/26/20	08/28/20	09/25/20 to 11/19/20	10/08/20	11/19/20	11/20/21	11/21/20 to 01/11/20	12/04/20

Unscheduled Maintenance Gillig Bus# 2020-05 (Page 2 of 3)

Test Miles	Issue	Action	Hours	Sub-system	Class
10,206	Front curb side shock is leaking.	A new front, curb side shock was installed. New bolts at the bottom were installed including a new castle nut on the bottom bolt.	1.00	Suspension	4
11,690 to 12,522	Bus not building air pressure. On 02/04/21 the air compressor on the bus stopped working due to failure within the unit itself. It was making a very loud noise before it quit working.	The manufacturer's representative replaced the failed unit with a new one. A representative from Powerex replaced the power inverter on the compressor and validated function.	8.50	Suspension	7
12,354	Lower rear torque arm bushings are worn out.	Removed and replaced both lower torque arms for rear axle assembly. Installed anti-seize to bolts and torqued to manufacturer's specifications.	2.00	Suspension	e
12,443	A 3/8" x 3" brass pipe was broken on the supply side of the air compressor causing the bus to not build air pressure.	The broken pipe was removed and a new pipe was installed.	1.00	Compressed Air / Suspension	ю
12,481	The brass nipple between the air compressor and check valve broke at the threads going into the valve.	The new brass nipple, p-clip and fabricated bracket were installed per manufacturer's instructions. The air line was attached making sure it was pointing down.	4.00	Compressed Air / Suspension	3
12,522	The bus will turn on, but the bus will not start and go into EV mode, after replacing the compressor on 02/23/2021.	The HV cable from the HV junction box to the inverter was bad. This was replaced and that resolved the problem.	1.00	Electrical	3
12,866 to 15,159	Bus is charging inconsistently and never charging to 100%. Check EV light is coming on. Sometimes the audible alarm is also coming on.	Battery pack # 3 had a bad cell in it. This battery pack was replaced on 03/16/21, but this did not resolve the issue. Cummins reprogrammed battery pack on 03/22/21 and the issue was resolved.	10.00	Electrical	n

# Unscheduled Maintenance Gillig Bus# 2020-05 (Page 3 of 3)

Date	Test Miles	Issue	Action	Labor Hours	Labor Hours Sub-system Class	Class
3/10/21	14,161	Air supply hose from the air compressor to the air cooler is leaking around one collar.	The damaged air hose was removed and replaced. The bus was started and no leaks were found.	0.50	HVAC	m

# **UNSCHEDULED MAINTENANCE**



AIR COMPRESSOR REPLACEMENT (7,748 TEST MILES)



LOWER REAR TORQUE ARM BUSHINGS ARE WORN OUT (12,354 TEST MILES)

# **UNSCHEDULED MAINTENANCE CONT.**



BRASS PIPE BROKEN ON SIDE OF AIR COMPRESSOR (12,443 TEST MILES)

## 6. ENERGY ECONOMY AND RANGE TEST – AN ENERGY CONSUMPTION AND RANGE TEST FOR BATTERY ELECTRIC BUSES USING APPROPRIATE OPERATING CYCLES

## 6-I. TEST OBJECTIVE

The objective of this test is to provide accurate comparable energy consumption data on battery electric transit buses produced by different manufacturers. This energy economy test bears no relation to the calculations done by the Environmental Protection Agency (EPA) to determine levels for the Corporate Average Fuel Economy Program. EPA's calculations are based on tests conducted under laboratory conditions intended to simulate city and highway driving. This energy economy test, as designated here, is a measurement of the energy consumed by a vehicle traveling a specified test operating profile, under specified operating conditions that are typical of transit bus operation. The results of this test will not represent actual energy usage but will provide data that can be used by FTA Grantees to compare buses tested using this procedure.

#### 6-II. TEST DESCRIPTION

This test is performed in the emissions bay of the LTI Vehicle Testing Laboratory. The Laboratory is equipped with a Schenk Pegasus 300 HP, large-roll (72 inch diameter) chassis dynamometer suitable for heavy-vehicle emissions testing. The driving cycles are the Manhattan cycle, a low average speed, highly transient urban cycle (Figure 1), the Orange County Bus Cycle which consists of urban and highway driving segments (Figure 2), and the EPA HD-UDDS Cycle (Figure 3). This test is conducted at seated load weight.

This test is conducted generally as per the methods described in the SAE standard J 1634-2017. The light-duty test cycles specified in this standard are replaced by transit bus test cycles mentioned above.

The Single-Cycle test (SCT) procedure is adopted for this bus. The end of test is determined when the bus cannot keep up with the speed trace of the test cycle, as recommended by the bus manufacturer. The battery system is recharged to full SOC at the end of the test, following procedures specified in SAE J 1634-2017. During the recharge, the DC energy (into the battery system) and the AC energy (into the charger) are recorded. From these data, the average AC energy consumption, the charger efficiency (DC Energy, kWh/AC Energy, kWh) and range (miles) for each test cycle is calculated.

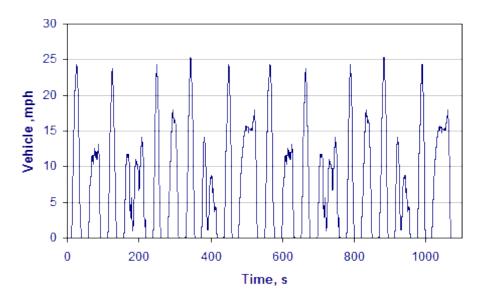


Figure 1. Manhattan Driving Cycle (duration 1089 sec, Maximum speed 25.4 mph, average speed 6.8 mph)

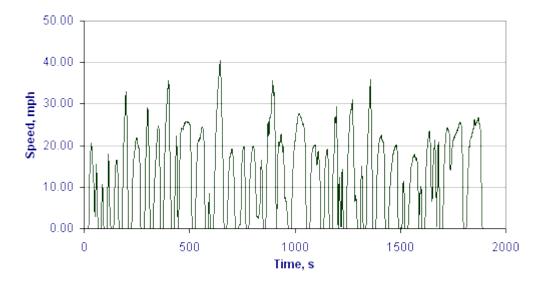


Figure 2. Orange County Bus Cycle (Duration 1909 Sec, Maximum Speed 41 mph, Average Speed 12 mph).

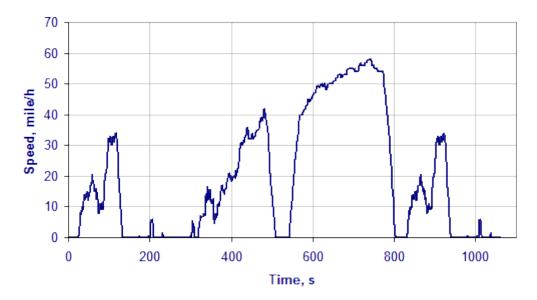


Figure 3. HD-UDDS Cycle (duration 1060 seconds, Maximum Speed 58 mph, Average Speed 18.86 mph).

#### 6-III. DISCUSSION

The driving cycle consists of three simulated transit driving cycles: Manhattan, Orange County Bus Cycle and the HD-UDDS, as described in 6-II.

An extensive pretest maintenance check is conducted including the replacement of all lubrication fluids, if applicable. The details of the pretest maintenance are given in the first three Pretest Maintenance Forms. The fourth sheet shows the Pretest Inspection Form. Finally, the summary sheet provides the average energy consumption and range of bus for the three test cycles. The test was conducted at a seated load weight of 38,520 lbs. The average AC energy consumption for the Manhattan, OCBC and the HD-UDDS were 3,039 Wh/mile, 2,269 Wh/mile and 2,093 Wh/mile respectively. The range for the three driving cycles were 129 miles, 172 miles and 187 miles respectively.

This bus was tested using the Manhattan, Orange County and UDDS driving cycles. The energy economy and range results for buses tested using these cycles are not directly comparable to buses tested under the earlier protocol that uses the CBD, Arterial and Commuter driving cycles.

## ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Page 1 of 3

Bus Number: 2020-05	Date: 03/16/2021	SLW (lb.): 38,520
Personnel: T.S., E.L. & T.G.		

ENERGY SYSTEM	ОК
Install fuel measurement system	✓
Remarks: None noted.	
BRAKES/TIRES	ОК
Inspect hoses	✓
Inspect brakes	✓
Check tire inflation pressures (mfg. specs.)	✓
Check tire wear (less than 50%)	✓
Remarks: None noted.	
BATTERY COOLING SYSTEM	ОК
Check hoses and connections	✓
Check system for coolant leaks	✓
Remarks: None noted.	

## **ENERGY ECONOMY PRE-TEST MAINTENANCE FORM**

Bus Number: 2020-05	Date: 03/16/2021
Personnel: T.S., E.L. & T.G.	
ELECTRICAL SYSTEM	ОК
Check battery	✓
Inspect wiring	✓
Inspect terminals	✓
Check lighting	✓
Remarks: None noted.	
DRIVE SYSTEM	ОК
Drain transmission fluid	N/A
Replace filter/gasket	N/A
Check hoses and connections	N/A
Replace transmission fluid	N/A
Check for fluid leaks	N/A
Remarks: Drive motor	
LUBRICATION	ОК
Lube all chassis grease fittings	✓
Lube universal joints	✓
Replace differential lube including axles	N/A
Remarks: Refer to manufacturer's mainter	ance specifications for service.

## ENERGY ECONOMY PRE-TEST MAINTENANCE FORM

Page 3 of 3	
-------------	--

Bus Number: 2020-05	Date: 03/16/2021
Personnel: T.S., E.L. & T.G.	
OTHER ITEMS	ОК
Replace air filter	N/A
Inspect air compressor and air system	✓
Inspect vacuum system, if applicable	N/A
Check and adjust all drive belts	N/A
Remarks: None noted.	
STEERING SYSTEM	ОК
Check power steering hoses and connectors	✓
Service fluid level	✓
Check power steering operation	✓
Remarks: None noted.	
	ОК
Ballast bus to seated load weight during Coa	st Down 🗸
TEST DRIVE	ОК
Check brake operation	✓
Check transmission operation	✓
Remarks: None noted.	

## ENERGY ECONOMY PRE-TEST INSPECTION FORM

Page 1 of 1

Bus Number: 2020-05	Date: 03/24/2021	
Personnel: T.S. & F.T.		
PRE WARM-UP		If OK, Initial
Fuel Economy Pre-Test Maintenance Form is	s complete	T.S.
Cold tire pressure (psi): Front <u>130</u> Middle <u>N/A</u> Rear <u>130</u>		T.S.
Energy economy instrumentation installed ar	nd working properly.	T.S.
WARM-UP		lf OK, Initial
Interior and exterior lights on, evaporator fan	on	F.T.
Air conditioner off		F.T.
Defroster off		F.T.
Windows and doors closed		F.T.
Do not drive with left foot on brake		F.T.

# **ENERGY ECONOMY DATA FORM** (Battery Electric Buses) Page 1 of 1

Bus Number: 2020-05	Manufacturer: Gillig	Date: 03/25/2021	
Fuel Type: Electric	Personnel: F.T. & S.I.		
Temperature (°F): 75.2	Humidity (%): 55 Barometric Pressure (inHg): 28.8		
SLW (lb.): 38,520	Charger: Charge Point Express 250		

	Manhattan	Orange County	UDDS
AC Energy (Wh/mile)	3039	2269	2093
Range (miles)	129	172	187

Comments: None noted.

## 6.0 ENERGY ECONOMY



BUS TESTED ON CHASSIS DYNAMOMETER FOR PERFORMANCE AND FUEL ECONOMY



CHARGE POINT CHARGER

# 7. NOISE

#### 7.1 INTERIOR NOISE AND VIBRATION TESTS

#### 7.1-I. TEST OBJECTIVE

The objective of these tests is to measure and record interior noise levels and check for audible vibration under various operating conditions.

#### 7.1-II. TEST DESCRIPTION

During this series of tests, the interior noise level was measured at several locations with the bus operating under the following three conditions:

- 1. With the bus stationary, a white noise generating system provided a uniform sound pressure level equal to 80 dB(A) on the left, exterior side of the bus. The engine and all accessories were switched off and all openings including doors and windows were closed. This test was performed at the LTI Test Track Facility.
- 2. The bus was accelerated at full throttle from a standing start to 35 mph on a level pavement. All openings were closed and all accessories were operating during the test. This test was performed on the track at the LTI Test Track Facility.
- 3. The bus was operated at various speeds from 0 to 55 mph with and without the air conditioning and accessories on. Any audible vibration or rattles were noted. This test was performed on the test segment between the LTI Test Track and the Bus Testing Center.

All tests were performed in an area free from extraneous sound-making sources or reflecting surfaces. The ambient sound level as well as the surrounding weather conditions were recorded in the test data.

#### 7.1-III. DISCUSSION

For the first part, the overall average of the six measurements was 49.4 dB(A); ranging from 48.0 dB(A) at the rear passenger seats to 50.7 dB(A) at the driver's seat. The interior ambient noise level for this test was less than 30 dB(A).

For the second part, the interior noise level ranged from 71.5 dB(A) at the middle passenger seats to 75.8 dB(A) at the driver's seat. The overall average was 73.1 dB(A). The interior ambient noise level for this test was less than 30 dB(A).

No vibrations or rattles were noted during the third part of this test. This bus passed this section of the test.

# **INTERIOR NOISE TEST DATA FORM** Test Condition 1: 80 dB(A) Stationary White Noise Page 1 of 3

Bus Number: 2020-05	Date: 12/15/2020	
Personnel: S.R., E.D., E.L. & T.G		
Temperature (°F): 34	Humidity (%): 44	
Wind Speed (mph): 7	Wind Direction: NNW	
Barometric Pressure (inHg): 30.29		
Interior Ambient Noise Level dB(A): less than 30	Exterior Ambient Noise Level dB(A): 41.3	
Microphone Height During Testing (in): 45.5		

Reading Location	Measured Sound Level dB(A)		
Driver's Seat	50.7		
Front Passenger Seats	49.5		
In Line with Front Speaker	49.1		
In Line with Middle Speaker	49.9		
In Line with Rear Speaker	49.4		
Rear Passenger Seats	48.0		

Comments: None noted.

# **INTERIOR NOISE TEST DATA FORM** Test Condition 2: 0 to 35 mph Acceleration Test Page 2 of 3

Bus Number: 2020-05	Date: 12/10/2020		
Personnel: S.R., E.L. & T.G.			
Temperature (°F): 43	Humidity (%): 60		
Wind Speed (mph): 3	Wind Direction: WNW		
Barometric Pressure (inHg): 30.13			
Interior AmbientExterior AmbientNoise Level dB(A): less than 30Noise Level dB(A): 40.3			
Microphone Height During Testing (in): 45.5			

Reading Location	Measured Sound Level dB(A)
Driver's Seat	75.8
Front Passenger Seats	73.0
Middle Passenger Seats	71.5
Rear Passenger Seats	72.1

Comments: None noted.	

#### INTERIOR NOISE TEST DATA FORM Test Condition 3: Audible Vibration Test

Page 3 of 3

Bus Number: 2020-05	Date: 12/10/2020
Personnel: S.R. & E.L.	
Temperature (°F): 45	

Describe the following possible sources of noise and give the relative location on the bus.

Source of Noise	Location	Description of Noise
Engine and Accessories	N/A	N/A
Windows and Doors	Front/ Rear Entry	Road Noise
Seats and Wheelchair lifts	N/A	N/A
Other	N/A	N/A

Comment on any other vibration or noise source which may have occurred

that is not described above: None noted.

**Comments:** More than usual road noise at highway speed, 65 mph. inside the bus.

# 7.1 INTERIOR NOISE TEST



TEST BUS SET-UP FOR 80 dB(A) INTERIOR NOISE TEST

# 7.2 EXTERIOR NOISE TESTS

#### 7.2-I. TEST OBJECTIVE

The objective of this test is to record exterior noise levels when a bus is operated under various conditions.

#### 7.2-II. TEST DESCRIPTION

In the exterior noise tests, the bus was operated at a SLW in three different conditions using a smooth, straight and level roadway:

- 1. Accelerating at full throttle from a constant speed starting from 35 mph.
- 2. Accelerating at full throttle from standstill.
- 3. Stationary, with the engine at low idle, high idle, and wide-open throttle, where applicable. In addition, the bus was tested with and without the air conditioning operating.

The test site is at the Larson Transportation Institute Test Track and the test procedures were performed in accordance with SAE Standards SAE J366b, Exterior Sound Level for Heavy Trucks and Buses. The test site is an open space free of large reflecting surfaces. A noise meter placed at a specified location outside the bus was used to measure the noise level.

During the test, special attention was paid to:

- 1. The test site characteristics regarding parked vehicles, signboards, buildings, or other sound-reflecting surfaces
- 2. Proper usage of all test equipment including set-up and calibration
- 3. The ambient sound level

#### 7.2-III. DISCUSSION

The Exterior Noise Test determines the noise level generated by the vehicle under different driving conditions and at stationary low and high idle, with and without air conditioning and accessories operating. The test site is a large, level, bituminous paved area with no reflecting surfaces nearby.

With an outside ambient noise level of 38.0 dB(A), the average of the two highest readings obtained while accelerating from a constant speed was 65.8 dB(A) on the right side and 65.8 dB(A) on the left side.

When accelerating from a standstill with an exterior ambient noise level of 42.1 dB(A), the average of the two highest readings obtained were 62.5 dB(A) on the right side and 62.3 dB(A) on the left side.

With the vehicle stationary and the engine, accessories, and air conditioning on, the measurements averaged 41.7 dB(A) at low idle. With the accessories and air conditioning off, the readings averaged 40.9 dB(A) at low idle. The exterior ambient noise level measured during this test was 41.4 dB(A). This bus passed this section of the test.

#### EXTERIOR NOISE TEST DATA FORM Accelerating from Constant Speed

Page 1 of 3				
Bus Number: 2020-05 Date: 12/10/2020				
Personnel: S.R., E.L. & T.G.				
Temperature (°F): 40 Humidity (%): 61				
Wind Speed (mph	): 5	Wind Direction: V	VNW	
Barometric Pressu	ıre (inHg): 30.15			
-	none height is 4 feet, wir ween 30°F and 90°F: ■	nd speed is less tha	in 12 mph and ambient	
Initial Sound Leve	Meter Calibration: 94.0	dB(A)		
Exterior Ambient N	Noise Level: 38.0 dB(A	4)		
<b>U</b>	om Constant Speed Right) Side	<b>U</b>	rom Constant Speed t (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)	
1	65.7	1	64.8	
2	62.1	2	65.7	
3	62.9	3	65.8	
4	65.8	4	N/A	
5	65.6	5	N/A	
6	N/A	6	N/A	
7	N/A	7	N/A	
8	8 N/A 8 N/A		N/A	
9	9 N/A 9 N/A		N/A	
10 N/A 10 N/A				
Average of two highest actual noise levels = 65.8 dB(A)Average of two highest actual noise levels = 65.8 dB(A)				
Final Sound Level Meter Calibration Check: 94.0 dB(A)				
Comments: None noted.				

#### EXTERIOR NOISE TEST DATA FORM Accelerating from Standstill

	Accelerating fi		
Bus Number: 2020-05		Date: 12/10/2020	
Personnel: S.R., E.L. &	T.G.		
Temperature (°F): 40		Humidity (%): 62	
Wind Speed (mph): 6		Wind Direction: W	
Barometric Pressure (ir	lHg): 30.15		
Verify that microphone temperature is between	•	d speed is less than 12 r	mph and ambient
Initial Sound Level Mete	er Calibration: 94.0	dB(A)	
Exterior Ambient Noise	Level: 42.1dB(A)		
Accelerating from Curb (Right		Accelerating fro Street (Lef	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	62.9	1	61.9
2	62.1	2	62.7
3	N/A	3	N/A
4	N/A	4	N/A
5	N/A	5	N/A
6	N/A	6	N/A
7	N/A	7	N/A
8	N/A	8	N/A
9	N/A	9	N/A
10	N/A	10	N/A
Average of two highest actual noise levels = 62.5 dB(A)Average of two highest actual noise levels = 62.3 dB(A)		t actual noise	
Final Sound Level Mete	er Calibration Check	: 94.0 dB(A)	

Comments: None noted.

#### **EXTERIOR NOISE TEST DATA FORM**

# Stationary Page 3 of 3

Page 3 of 3				
Bus Number: 2020-05 Date: 12/10/2020				
Personnel: S.R., E.L. & T.G.				
Temperature (°F): 41 Humidity (%): 62				
Wind Speed (mph): 8		Wind Direction: W		
Barometric Pressure (i	nHg): 30.15			
Initial Sound Level Me	ter Calibration: 94	.0 dB(A)		
Exterior Ambient Noise	e Level: 41.4 dB(A)			
	Air Conc	litioning ON		
Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side dB(A)	
		Measured	Measured	
Low Idle	N/A	42.3	41.1	
High Idle	N/A	N/A	N/A	
Wide Open Throttle	N/A	N/A	N/A	
Air Conditioning OFF				
Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side dB(A)	
		Measured	Measured	
Low Idle	N/A	41.1	40.7	
High Idle	N/A	N/A	N/A	
Wide Open Throttle	N/A	N/A	N/A	
Final Sound Level Meter Calibration Check: 94.0 dB(A)				
Comments: No high-i	dle or wide-open th	nrottle available on this	test vehicle.	
Fully battery/electric powered.				

# **7.2 EXTERIOR NOISE TESTS**

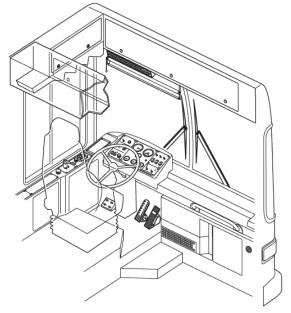


**TEST BUS UNDERGOING EXTERIOR NOISE TESTING** 

#### **OPERATORS AREA INSTRUMENTATION**

The GILLIG Low Floor bus uses forwardlooking technology combined with some unique ideas to avoid the inherent compromises found in most other low floor designs. Our concern for low cost, easy maintenance keeps the exterior and interior simple and uncluttered. This has led to an overall design that is pleasing, functional, practical, and safe.

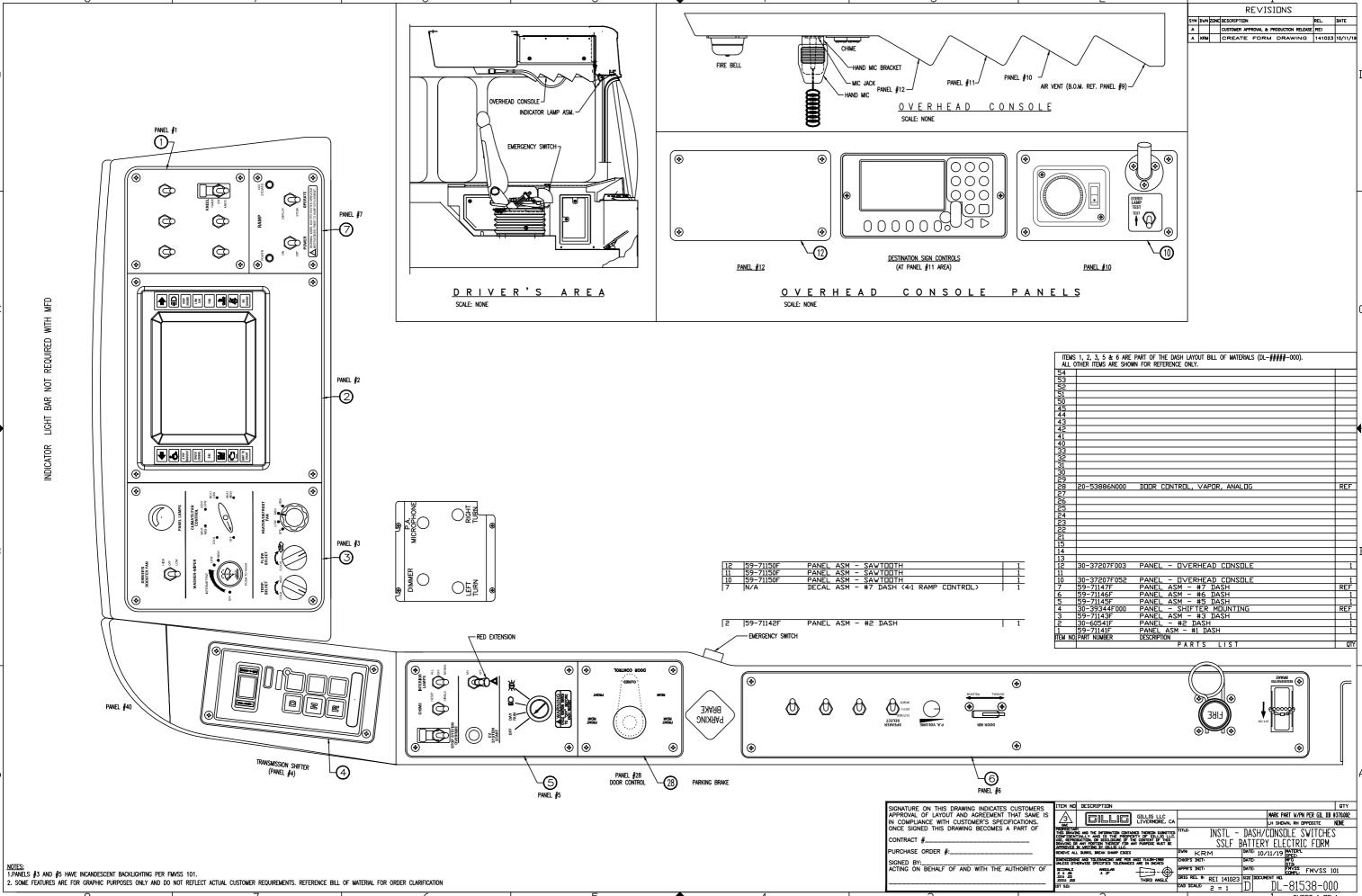
Ergonomics dictate the design of the driver's workstation. Our design group went well beyond providing only sufficient seat adjustments and a tilt/telescoping steering column. Additional features include the functional placement of displays and controls, a driver's storage box, sun visors, etc. to fit within a driver's comfortable range of motion.



The driver's position has been designed to provide maximum comfort to drivers from the 95<sup>th</sup> percentile male to the 5<sup>th</sup> percentile female. To maximize the driver's comfort, additional ventilation is provided to the driver by a booster fan that delivers air through two overhead ventilators. Additional fresh air can be allowed into the bus through the full slider type driver's window.

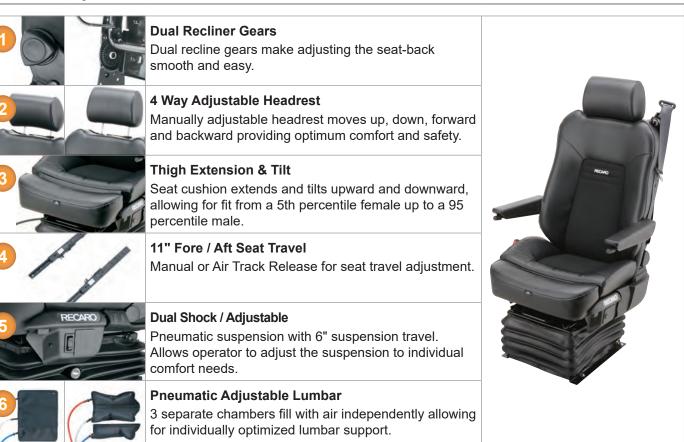
Visibility, comfort, and vehicle control are other key factors of our design. GILLIG's Low Floor design incorporates a bulged, tilted back windshield to reduce interior glare and reflection. Customer feedback indicates that drivers prefer driving our buses because the bus provides better visibility, a smoother ride, and better handling. These factors leave the driver feeling more in control and more confident. We also provide the necessary space and comfort features, including superior heating and cooling that gives the driver an efficient, safe, and comfortable environment to work in.

The attached dash layout is a typical dash layout for your review. This is intended to show basic layout configuration only and not specific details. GILLIG will provide a custom layout for the Agency's review during the preproduction meeting.



## **RECARO Ergo M**

#### **Standard Adjustment Features**



#### Standard Quality and Durability Features

	Solid Steel Back High quality solid steel ba for the best in strength an durability.
	Plastic Seat-Back Protect Plastic seat-back keeps th seat looking good for year
9	High Density Foam Quality high density foam keeps its shape over time and provides superior comfort and firm support.
	Fully Supported Seat Cushi The seat pan fully suppor the seat cushion for long lasting durability comfort.

#### d Steel Back

quality solid steel back ne best in strength and bility.

tic Seat-Back Protector tic seat-back keeps the looking good for years.

## h Density Foam

#### Supported Seat Cushion seat pan fully supports seat cushion for long

- 2 Point ALR or 3 Point ELR Seat Belt (Black or Orange Webbing)
- Full Travel Seat Belt System
- Left or Right Hand Air Controls
- Track Stop
- 12 or 25 Degree Recline Stop
- Seat Belt Alarm
- Mounting Risers (varying heights & mounting configurations)
- Two Year Warranty
- Various fabrics and vinyl seat covers
- 400 lb + Seat Capacity

## **RECARO Ergo M**

#### **Optional Features**



#### LiquiCell<sup>®</sup>

- RECARO Silicone Foam
- Adjustable Seat Belt D Ring
- FR Treated Foam for Low Smoke / Low Flame
- Seat Heat (Backrest & Seat Cushion)
- Seat Cushion Alarm Switch
- Adjustable Armrests
- RH Remote Shock
- Stainless Steel Risers
- Various treated fabrics and specialty covers available

#### **Quality & Expertise**



RECARO is the global leader in mobile seating. World renowned for our ergonomics, innovative safety technology and quality.

Our seats are built in the U.S.A. to our customers specifications. Quality ends with quality manufacturing.

Our dedicated engineering team supports our customers from the design phase through production.

Customer Service, located in Auburn Hills, Michigan supports our customers throughout the products lifecycle.



Meets "Buy America" Guidelines



Contact Us: (248) 364-3818 www.recaro-automotive.com



# Your **INSIGHT**<sup>®</sup> drives our innovation

The **INSIGHT** product offering combines lightweight design with superior strength, durability and comfort.







INSIGHT-PRIME+® Color Inserts



INSIGHT-PRIME® Textured Module



**INSIGHT-PRIME+** Color-coordinating inserts available in seven standard colors. No back panel required.

# INSIGHT-PRIME Seat module specifically engineered for cleanability.

#### INSIGHT's Construction

A large, sophisticated injection mold is able to produce a sleek, one-piece seat module made of a super-dense, composite resin with an integral grab handle. Each seat module hooks over the back side of the upper extrusion and is securely held in place by two front bolts. On two-pass transverse seats, one bolt secures the front V-filler to the back side of the upper extrusion. This five-bolt assembly simplifies any retrofit opportunities or rare cases of maintenance needs.

**INSIGHT-PRIME** and **INSIGHT-PRIME+** model types are built with a one-piece seat module, while **INSIGHT** adds a single back insert with a seat and a back cushion onserts that accept permanently bonded foam and/or upholstery. The back panel insert is held in place by six fasteners hidden by the cushion onserts. These onserts are secured to the perimeter of the seat with a quick-release system of hardware technology that does not require tools to efficiently remove and replace when required.



#### Options



	INSIGHT	PRIME	PRIME+
Cushion Onserts	•		
Back Extension	•		
Color-Coordinating Inserts			•
Drain Hole (Excludes Plush Pad)	•	•	•
Grab Rail	•	•	•
Grab Rail Cover	•	•	•
Without Grab Rail	•	•	•
Back Panel (18" only)	•		
Docket 90A	•	•	۲

(Standard Materials FMVSS 302 Compliant)

• Prime+ Module: Docket 90A, Prime+ Inserts: Small components are exempt

#### **Cushion Onsert Selection**

Standard	1/2 "	nadded	cushion	with	optional	drain hole

Plush padded cus	nion (1-1/4"	seat,	1/2 "	back)
------------------	--------------	-------	-------	-------

VR-50® Vandal-resistant cushion with optional drain hole

CR-50<sup>®</sup> Cut-resistant cushion; available on standard and plush padded

Docket 90A foam and fabric available

#### Features

#### **Contemporary Styling**

Individual sculpted seat module with integral grab rail and back panel in complementary colors, with no unsightly welds or exposed fasteners.

#### Modular Design

Replacement of a single seat or major component if necessary is quicker and more economical. The one-piece molded seat module with minimal parts is unmatched in the industry.

#### **Superior Comfort**

Ergonomic seat design features the largest personal seating area, increased spaciousness in legroom and back height, and padded seat and back cushions for enhanced comfort.

#### Superior Vandal and Corrosion Resistance

Seat module constructed of advanced technology composite resin that is colored throughout and corrosion resistant materials. Mounting design incorporates anodized aluminum.

#### Module Color Selection



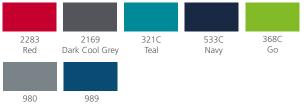
#### **Back Panel Selection**

Thermoplastic



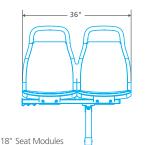
#### Insert Color Selection

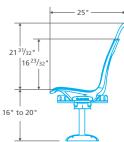
Custom colors also available, minimum order quantities and additional costs may apply

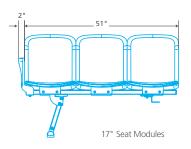


Grey Blue

#### Dimensions









#### Model Types

- Transverse
- Transverse Flip-up
- Individual (Seat) Transverse Flip-up
- Longitudinal (17" & 18")
- Longitudinal Flip-up (17" & 18")
- Back-to-back
- Rear Cross

Detailed reference document available for each model type.

#### **Our Mission**

Since 1886, American Seating has set the standard for product design, durability and comfort. Our first transportation seat was introduced in 1931, and today we remain committed to exceeding the expectations of our customers. Our achievements serve as the platform for new and innovative products that are the benchmarks of our industry.



InSight is an iF Product Design award winner



All products designed, engineered, manufactured, and tested in the USA.



American Seating is committed to lessening our impact on the planet through responsible stewardship of our environment.



801 Broadway Avenue NW, Grand Rapids, MI 49504-4499 Phone 616-732-6600 800-748-0268 FAX 616-732-6401 americanseating.com

American Seating, INSIGHT, INSIGHT-PRIME and INSIGHT-PRIME+ are registered trademarks of American Seating Company Form No. T-INSIGHT-20 ©2020 American Seating Company

TANCHION, TRVS. © 3RD STEP 2 IPNE., MODESY, 3RD STEP, C. SIDE 1 TANCHION, TRVS. © 2ND STEP 7 STANCI-CV, 10 SINCLE OFFSET FWD RD 1 TANCHION, TRVS. © 15 STEP 7 IBAR, W \COW, 46,0 2 TANCHION, W/C BARRIER 2	NOTES: 1. TO MAXIMIZE OCC TO PASSENCERS AREA, GILLIC REQ
	1.2 USE OF A GR OUTBOARD SEAT 2. ALL DIMENSIONS 3. FLOORING LAYOU 4. THIS DRAWING IS SEE BOW/ PAINT HATCH AND STAN SLAT AND RESTRAINT I 10. SLATS & RESTRA 11. ALL SLATS WITH HAVE 3.0 LONG 12. W/C BELTS AND A. Q' STRA B. SURE- 13. FOR EACH W/C I 14. HIP TO KNEE DIM
B (21.51.0.5) ASLE WIDT (21.51.0.5) ASLE WI	15. REF: FOR SEAT SPECIFICATION SP 16. FOR ADA AISLE F 8: INSIGHT F 8: INSIGHT F 18 17 17 18 13 12 12 11 10 9 9 8 8 7 6 6 7 6 13 12 12 12 12 12 12 12 12 12 12 12 12 12

- 40.C -

ELEVATION A-A

STREETSIDE

(48.0)

- 75 5

V rz

- 290.0 NOMINAL -

C VE ROT

g S - 34.0 ---



- CRASH PROTECTION AND REDUCE THE POTENTIAL FOR SIGNIFICANT INJURY S ON THE FIRST FORWARD FACING SEATS IMMEDIATELY REAWARD OF THE ADA S EITHER: 1.1 THE PLACEMENT OF A BARRIER FORWARD OF THESE SEATS. TANCHION POLE FOR THE AISLE SEAT AND WALL MOUNTED GRAB HANDLE FOR THE 3 SEAT BELTS ON BOTH THESE SEATS. IN INCHES.
- TELEBOIZENT? (FULL COMPOSITE). LEBOIZENT? (FULL COMPOSITE). BE USED FOR SEAT INSTALLATION ALL OTHER GRAPHICS ARE SHOWN FOR REFERENCE ONLY. OUT FOR EXTERIOR GRAPHICS AND GLAZING. FOR APPLICABLE O/H RALS, TRANSMISSION NS, RACKS AND HANDLES ON WHEEL WELL SEE BOM/MEETING NOTES.

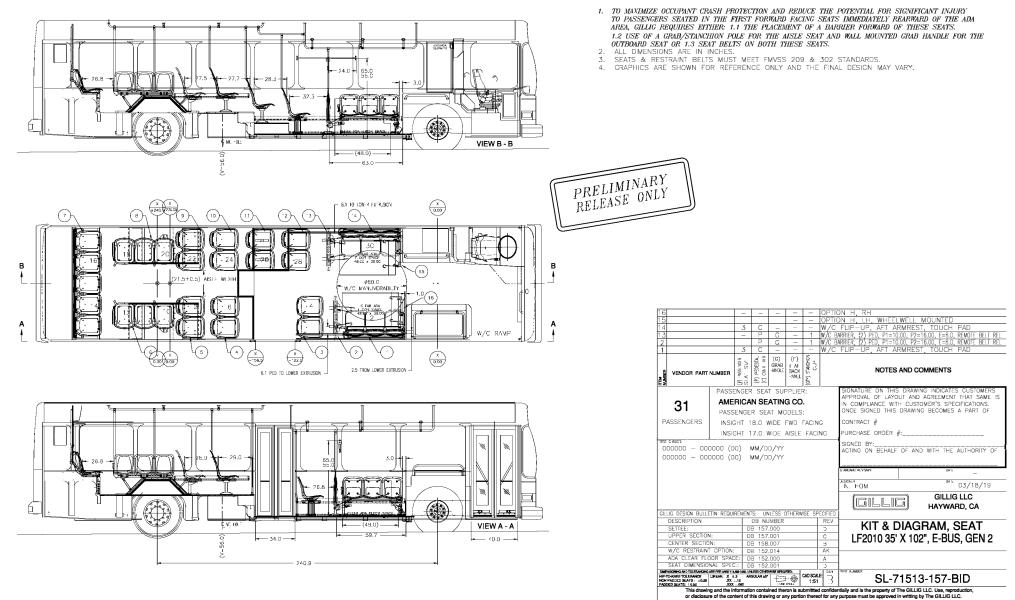
- BELTS MUST MEET FMVSS 209 & 302 STANDARDS. DESTALS SHALL HAVE AN OPEN CHANNEL DESIGN. ALL SEATS WITH DIMENSION E=6.12 SHALL TIMO SLOTS.
  - NTING SLOTS. RACTORS: SEE SPEC SHEET, ALSO AFFECTS REMOTE BELT RELEASE TYPE IF REQUIRED = 0' STRAINT PULL HANDLE LEVER = SURE-LOK DUAL AUTO LOK (NOT AVAILABLE FOR OPTION P). NTIONS WITH FLOOR ANCHORAGE DISTANCES GREATER THAN 60 INCHESSHALL INCLUDE NG LOOPS.TOTAL OTY SHIPPED LOOSE: 2 (REQUIRED FOR CURB SIDE ADA AREA) IONS SHOWN ARE NOMINAL SEATS WILL BE EQUALLY SPACED.

CIFICATION OPTIONS AND OTHER SEAT DETAILS NOT SHOWN, SEE PURCHASING ORDER

- FLIP-UP SEATS: SEE SPEC SHEET, OPTIONS ARE AS BELOW.
- NARROW OR W/O NARROW AND PRIME+ = ALWAYS NARROW

19		-		-		-	OPTION H, RH
		-	-	-	-	-	OPTION H, LH, WHEELWELL MOUNTED
8		3	С		-	-	W/C FLIP-UP, AFT ARMREST, STOP REQ.
17			Р	G		1	W/C BARRIER, (2) PED, P1=10.00, P2=16.00, E=8.0, SEE NOTE 12
16		2	С	G			
15		2	С	G	-	-	
14		2	С	G	-	1	
3		2	Ρ	G		1	(2) PED, P1=9.42, P2=16.55, E=6.12
2		2	Р	G	-	1	(1) PED, Po = 26.25, E=6.12
11		2	P	G	-	-	FLOOR AND W-WELL MTD, GRAB HANDLE ON AISLE SEAT ON.
10		3	Ρ	-		2	AFT ARMREST, E=6.12
9		5	-	_		-	SETTEE, (3) CENTER SEATS REMOVABLE
8		3	P	_	-	2	AFT ARMREST, E=6.12
7		2		G	-	-	FLOOR AND W-WELL MTD, GRAB HANDLE ON AISLE SEAT ONL
6		2	P	G		1	(1) PED, Po = 26.25, E=6.12
5		2	C	-	-	-	
4		2	C	G	-	-	W (0 BADDIED (2) DED D1 10.00 D2 16.00 E 8.0 CEE MOTE 12
3		2	C	G		1	W/C BARRIER, (2) PED, P1=10.00, P2=16.00, E=8.0, SEE NOTE 12 W/C FLIP-UP. STOP REQ. @ SEAT POSITION 3
2		2	C	-	-	_	W/C FLIP-UP, STOP REQ. @ SEAT POSITION 3 W/C FLIP-UP, AFT ARMREST, STOP REQ. @ SEAT POSITION 2
-				()	-		W/G FLIFTUF, AFT ARMIKEST, STUP KEY, W SEAT PUSHIUN 2
	NUMBER	(#) PASSENCER SEAT SIZE	(P) PEDESTAL (C) CANTLEVER	(G) GRAB HANDLE	(F) FLAT BACK PANEL	(QTY) STANCHION CUP	NOTES AND COMMENTS
<b>38</b> passengers	PASS	ENGE GHT 1	N SE	AT MO	DELS FWD	: Facin	IN COMPLIANCE WITH CUSTOMER'S SPECIFICATIONS. ONCE SIGNED THIS DRAWING BECOMES A PART OF G CONTRACT #
		oni i	17.0 \	WIDE	ADLE.		NC DURCHASE ORDER #
SEE PRODUCT		1					NG PURCHASE ORDER #: SIGNED BY: ACTING ON BEHALF OF AND WITH THE AUTHORITY OF
		1					
		1					SIGNED BY: " ACTING ON BEHALF OF AND WITH THE AUTHORITY OF
		1					SIGNED BY: ACTING ON BEHALF OF AND WITH THE AUTHORITY OF BACKNO RASCH ACTING ON THE AUTHORITY OF BACKNO ACTING ACTING AND AND ACTING ACTING AND AND ACTING ACTING AND ACTING ACTING ACTING AND ACTING A
SEE PRODUCT	ION BOM		TS: UN	ILESS (			SIGNED BY: ACTING ON BEHALF OF AND WITH THE AUTHORITY OF BRANDO RASEA A. "PATH A. "PATH GILLIG LLC LIVERMORE, CA
SEE PRODUCT	ION BOM		TS: UN DB NL				SIGNED BY: ACTING ON BEHALF OF AND WITH THE AUTHORITY OF BASHO RVSCW DAT 050VIE CONTRACT DATA 050VIE CONTRACT DATA 050VIE CONTRACT DATA 050VIE CONTRACT DATA 050VIE CONTRACT DATA 050VIE CONTRACT DATA 050VIE CONTRACT DATA 050VIE CONTRACT DATA 050VIE 05
SEE PRODUCT	ION BON	REMEN		MBER			SIGNED BY: ACTING ON BEHALF OF AND WITH THE AUTHORITY OF BRASHD RMSGY AV ACTING ON BEHALF OF AND WITH THE AUTHORITY OF BRASHD RMSGY AV COLUMN AND AND AND AND AND AND AND AND AND AN
SEE PRODUCT	ION BOW	REMEN	DB NU	MBER			SIGNED BY: ACTING ON BEHALF OF AND WITH THE AUTHORITY OF BRASHD BY BEHALF OF AND WITH THE AUTHORITY OF BRASHD BY: BRASHD
SEE PRODUCT	ION BOW	REMEN D D	DB NL B 158	015 015			SIGNED BY: ACTING ON BEHALF OF AND WITH THE AUTHORITY OF BRASHD BY BEHALF OF AND WITH THE AUTHORITY OF BRASHD BY: BRASHD
SEE PRODUCT	I BON ION BON ETIN REQUI	REMEN D D D	DB NL B 158 B 158	015 015 015			SIGNED BY: ACTING ON BEHALF OF AND WITH THE AUTHORITY OF BASHD RADER ACTING ON BEHALF OF AND WITH THE AUTHORITY OF ACTING ON AUTHORITY OF AUTHORITY OF ACTING ON AUTHORITY OF AUTHORITY OF AUTHORITY OF ACTING ON AUTHORITY OF AUTHORITY OF AUTHORITY OF AUTHORITY OF ACTING ON AUTHORITY OF AUT
SEE PRODUCT	ETIN REQUI	REMEN D D D CE: D	DB NL B 158 B 158 B 158 B 158	UMBER .015 .015 .001 .001			SIGNED BY: ACTIVE ON BEHALF OF AND WITH THE AUTHORITY OF BACATIVE ON BEHALF OF AND WITH THE AUTHORITY OF BACATIVE ON BEHALF OF AND WITH THE AUTHORITY OF BACATIVE ON OTHER OF AND OTHER OTHER OF AND OTHER OTHER OTHER OF AND OTHER OF AND OTHER OTHE
CILLIC DESIGN BULL DESCRIPTION SETTEE: UPPER SECTIO CENTER SECTION V/C RESTRAIN ADA CLEAR FL SEAT DIMENSIG	ETIN REQUI	REMEN D D D CE: D C: D	DB NL B 158 B 158 B 158 B 158 B 152 B 152 B 152	UMBER 015 015 001 001 001 000	DTHERW		SIGNED BY: ACTING ON BEHALF OF AND WITH THE AUTHORITY OF BASANS PROCE BASANS PROCES BASANS PROCES B
GILLIC DESIGN BULL DESCRIPTION SETTE: UPPER SECTIO CENTER SECTIO W/C RESTRAIN ADA CLEAR FL SEAT DIMENSIO	LIN BOW ETIN REQUI	REMEN D D CE: D C.: D C.: D C.: D C.: D	DB NL B 158 B 158 B 158 B 158 B 152 B 152 B 152	UMBER 015 015 001 001 001 000	DTHERW		SIGNED BY: ACTING ON BEHALF OF AND WITH THE AUTHORITY OF BINARD INVECTION OF AND WITH THE AUTHORITY OF BINARD INVECTION OF AND WITH THE AUTHORITY OF BINARD INFORMATION OF AND INFORMATION OF A





NOTES:

#### WHEELCHAIR RAMP DESIGN

The **Lift-U model LU-18 "Dual Mode" fold-out ramp** is provided for ease of accessibility and to meet ADA requirements.

This ramp offers an industry leading **1:8 maximum slope** and the platform area measures 30" x 49" which provides excellent on/off maneuverability.

Our 36" front aisle width allows ease of movement in and out of the bus.

The ramp controls are **all electric (no hydraulics)**, and are conveniently located on the right side of the drivers dash. The fold-out mechanism is simple and includes provisions for a manual deploy override.

The ramp is located at the front entrance door for better driver control. The GILLIG installation of the Lift-U ramp **meets all ADA slope requirements**.





# "DUAL-MODE" MODEL LU18 LOW FLOOR RAMP

LIFT-U introduces the new curb-smart "Dual-Mode Ramp".

This ramp offers a two-position interior floor, that when deployed to most curbs maintains a level entrance into the bus; and when deployed to street level a portion of the interior floor automatically lowers on an incline to offer a 1:6 slope for easier passenger boarding.

# Good to the Road .... Better to the Curb!



The LU18 "two-position" interior floor automatically lowers on an incline when the outer ramp reaches a pre-determined angle. Operator involvement is not required.

Ramp Removal is Not Required for Maintenance

Extended Length Outside the Bus is Only 48-inches

1:6 Slope When Deployed to Street Level





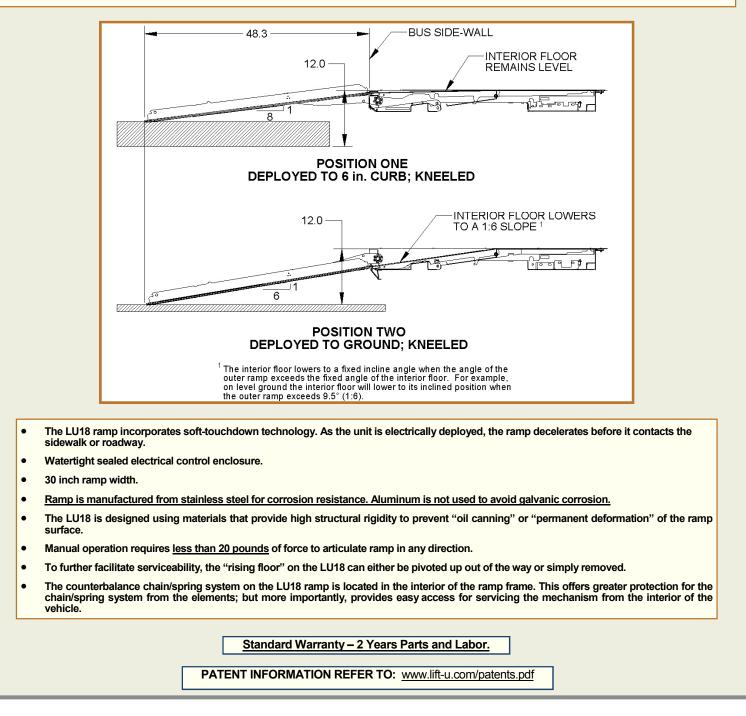
For More Information Call (209) 838-2400 or Email liftusales@lift-u.com



200114G

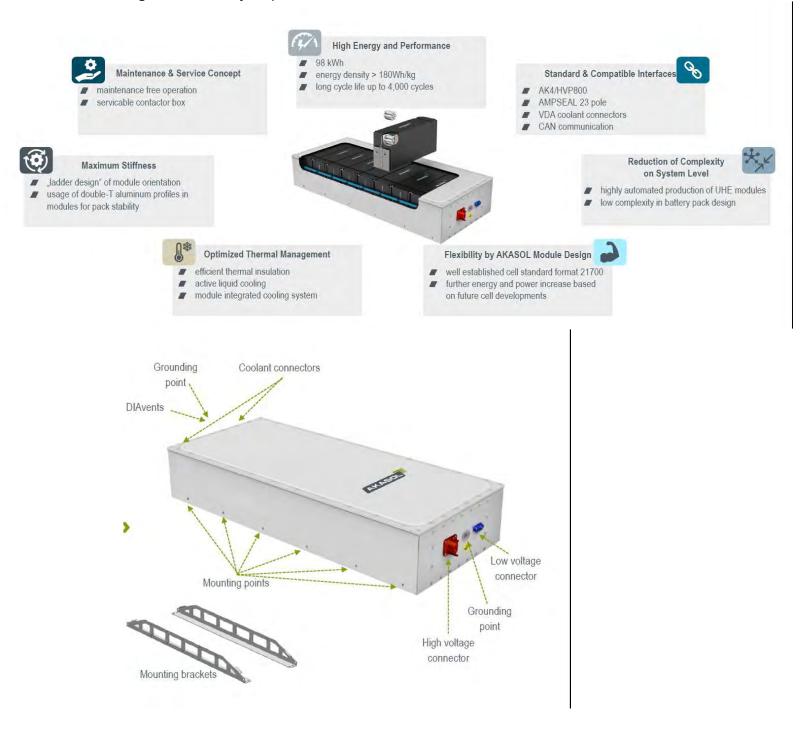


- Mechanism tray components are similar if not the same as our previous LU11 model.
- <u>Rated load capacity is 1,000 pounds.</u>
- Ramp is electrically operated and controlled. No hydraulics required.
- Ramp meets or exceeds ADA and DOT requirements.
- Self-contained module. Unit can be changed out in less than 30 minutes. No ramp components located outside of the ramp mechanism.
- Tensioned controlled to prevent "free falling" of ramp platform in any direction.
- Ramp comprises an internal "rising floor" for easier passenger transition to/from the bus aisle. No depressed pockets to negotiate.
- The LU18 includes an object detection feature. As the unit is electrically deployed or stowed, should the ramp encounter an obstruction, the drive
  motor is disabled and ramp motion stops. Simply releasing the operator switch will automatically reset functionality.



#### **HIGH-VOLTAGE BATTERY PACKS**

The AKASOL-designed and American-built 9AKM150CYCUHE high-voltage battery pack utilizes Li-ion technology with a high energy density and proprietary control technology to maintain a high battery performance for a longer zero emission range. A single pack design is utilized for all locations on the bus. This provides reduces the complexity of servicing and inventory requirements.



#### **HIGH-VOLTAGE BATTERY PACKS**

*Structure:* The exterior case is constructed of corrosion resistant stainless steel. Internal double 'T' aluminum crossmembers provide structural strength and stiffness. Individual battery modules are secured in place by a ladder frame of aluminum. This design balances the need for the pack to be as light as possible while also providing the strength and rigidity necessary for the harsh duty cycle of a bus. The battery packs meet an IP rating of IP67 & IP6K9K.

Safe service disconnect: In a non-operating mode, all contactors of the battery system are opened so the battery system is voltage free. Additionally, the electrical system within the battery has high voltage interlock loop (HVIL). The HVIL is a continuous low voltage circuit which passes through every high voltage connector so that if a LV or HV connector is unplugged, the circuit will be opened and the HV system will be disconnected by the battery management system. Maintenance on the battery system will be safe when the HV connector is unplugged.

*Battery cells:* The basic building block of the high-voltage battery pack is the individual cell. AKASOL has conducted a world-wide evaluation to identify the optimal battery cell for the transit duty cycle, and continues to seek out better cells as the technology improves.

*Battery module:* Cells are combined into battery modules which are connected in series within the pack. Each module also has voltage and temperature sensors that are communicated to a pack battery management module for full pack monitoring and control.

*Battery management system:* The battery management system (BMS) in each high voltage battery pack monitors all cell voltages, temperature, and other battery conditions and provides detection of any battery faults or damage. The pack BMS connects to the Multi-String Manager (MSM+), which is mounted on the powertrain compartment platform. The MSM+ monitors all the high-voltage battery packs, controls charging and discharging, and provides warnings of battery faults.

*Battery cooling system:* All high-voltage battery packs are liquid cooled or heated using ethylene glycol coolant. Coolant from the thermal management system is circulated through a cooling plate, which then cools or heats each module. The BMS monitors the battery cell temperatures and uses coolant flow control valves with the battery thermal management system to ensure all packs are maintained at the proper temperatures.

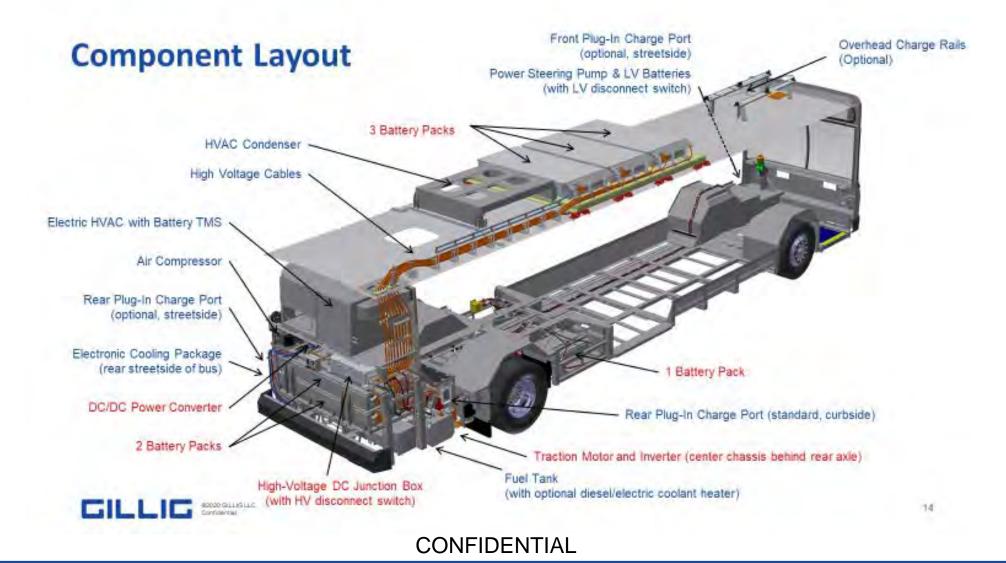
*High-power contactors:* Each high-voltage battery pack includes high-power electric contactors on both the positive and negative battery outputs. These contactors are used during normal operation to turn the high-voltage batteries on and off. In the event of a high-voltage interlock loop (HVIL) open circuit, these contactors disconnect the pack stored energy from the high-voltage system. When requested and all conditions are functioning properly, the contactors close and allow power to flow from the high-voltage battery. When the 24-volt supply is removed from the contactors—by the driver turning off the bus, by the HVIL system or high-voltage control system detecting a fault, by turning

#### **HIGH-VOLTAGE BATTERY PACKS**

off the low-voltage battery disconnect switch, or by the high-voltage emergency disconnect switch in the rear of the bus—all contactors open to disconnect the high voltage stored energy of the batteries from the system.

Specifications:	
Supplier	AKASOL, Inc.
Rated capacity	98 kWh.
Usable capacity SOL (start of life)	Duty Cycle Dependent TBD
Warranty (see warranty agreement for terms and conditions)	Standard, 6 years (300,000 miles); optional, extended to total 12 years (500,000 miles).

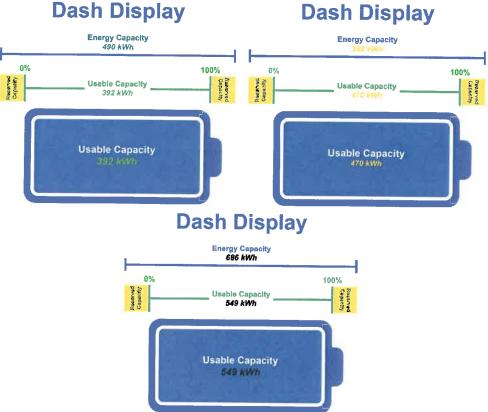
# Component Layout (General locations for illustration purposes)



GILLIG

#### **ENERGY CAPACITY AND RANGE**

Many factors determine the real-life range of an electric vehicle, which is derived from the net usable energy (or capacity) and the rate of energy consumption.



#### **Rated Capacity**

The rated capacity of a battery is the amount of total energy that can be stored in and discharged from the battery. Battery capacity reduces over the life of the cells as the impact of charging and discharging reduces the ability for the cells to reach full charge. Battery health is monitored by the battery management system and reported via telematics. The State of Health (SOH) is communicated as a percentage of the rated capacity at the start of life.

#### **Reserved Capacity**

Battery life is negatively impacted when cells are overcharged or when the depth of discharge is too low. In order to maximize high-voltage battery life, the capacity of the battery is limited to prevent discharge below 10% and charging above 90% of rated capacity. The charge controller prevents the batteries from being charged above the top limit, and derating protocols are in place to prevent the batteries from reaching the bottom limit.

#### **Usable Capacity**

The result of reserving some high-voltage battery capacity is that 80% of the rated capacity is available to power the vehicle. This is the usable capacity, and it is used for all range calculations. The State of Charge (SOC) reported on the dashboard and via telematics represents the usable capacity remaining until a recharge is necessary.

#### ENERGY CAPACITY AND RANGE

#### **Energy Consumption**

Many factors impact the actual range of electric buses in operation. The duty cycle, route profile. and passenger loading determine how much energy is necessary to drive the traction motor and how much energy is captured through regenerative braking. Drivers can have a significant impact on energy consumption through how effectively they apply throttle and use regenerative braking to slow the bus. The HVAC system is also a significant use of energy on a bus, and settings (temperature set-points, fan speeds, etc.) can be optimized to reduce energy consumption.

Customer-specified equipment (passenger seats, windows, CAD/AVL, and video equipment, etc.) can have a large impact on total vehicle weight, which can also impact energy consumption. GILLIG has developed a Smart Spec that optimizes the range of the bus through component selection. More details are available for discussion during the pre-production meeting.

#### Range Estimates

Many factors determine the real-life range of an electric vehicle, consumption is derived from the net usable engery (or capacity) and the rate of energy consumption.

Configuration	High-Voltage Battery Packs, Qty	Total Rated Capacity	Range at 2.3 kWh/mile*
5 battery pack	5, each with 98 kWh	490 kWh	170 miles
6 battery pack	6, each with 98 kWh	588 kWh	205 miles
7 battery pack	7, each with 98 kWh	686 kWh	239 miles
	*2.3 kWh is a conservative aver	rage energy consumption	rate.



# 2 Hardware overview

#### 2.1 HVC-C Overnight/Depot Charging Solutions

The HVC -C charger equipped with CCS-1 depot charge box enables charging buses with a CCS-1 connector up to 150kW DC based on the (inter)national standards IEC 61851-23 and DIN70121.

This system offers:

- Flexibility as the depot charge box can be installed up to 20 meters from the HVC -C charger and even at 150 meters with the long-distance optional package;
- Limited space in the bus parking zone. The depot charge box is small size enabling easier installation in a bus depot and preventing accidents with charging equipment;
- Future proofing. Battery capacity and charging power are expected to increase over time. The 100C cabinet can be upgraded in the field up to 150kW by adding an extra power module of 50kW

#### 2.1.1 Depot Charge Box

The Depot Charge Box is used to interface the HVC Power Cabinet with an electric vehicle using a Combo Type 1 (CCS-1) cable. The depot charge box minimalist design allies both small footprint and ease of use. The interface consists of one CCS cable, a LED indicator, an E-stop button and stop button.

- Connection standard Combo Type 1 (CCS-1)
- Weight 58 kg excl. CCS cable
- Dimensions (H x W x D) 940 x 699 x 240 mm (37.01 x 27.52 x 9.45 in)
- CCS cable length 3.5 m (11.5 ft) Optional: 7 m (23 ft)





#### 2.1.2 Heavy Vehicle Charger (HVC Power Cabinet)

The Heavy Vehicle Charger (HVC) is the heart of the charging system. It converts and provides power to the Depot Charging Box and Pantograph interfaces. The HVC offers a modular system consisting of 50kW internal building blocks that can be used to expand up to 150kW of charging power using the same cabinet.

- Dimensions:
- Weight
- Housing:
- Enclosure color

1340 kg IP54 (Type 3R) Powder-coated stainless-steel enclosure RAL 9002 (Grey white) RAL 7012 (Basalt grey) – top fan inlet GSM/2G/3G/4G Ethernet Base 10/100T

1170 x 770 x 2030 mm (W x D x H)

Approx. 46.1 x 30.3 x 82.2 in (W x D x H)

Supported Network Connection

#### 2.1.3 Depot Charging Sytem Specifications

AC Input Specifications:

- AC Connection Configuration 3-phase; L1, L2, L3, GND
- Input Voltage Range 480/277V AC ±10%
- Input Frequency Range 60Hz ±1%
- Power Factor (cos  $\phi$ )  $\geq 0.95$  (> 0.97 at full load)
- Input Current (Nominal)
  - o
     HVC-150C
     198A AC (480VAC input)
    - o HVC-100 480 VAC Input: 132A AC

DC Output Specifications:

٠	Output Power (Maximum)	HVC-100C: 100kW
		HVC-150C: 150kW
٠	Output Voltage Range	150-850VDC
٠	Output Current Range	HVC-100C: 0-166 ADC
		HVC-150C: 0-200 ADC (limited by cable)





**Environmental Specifications** 

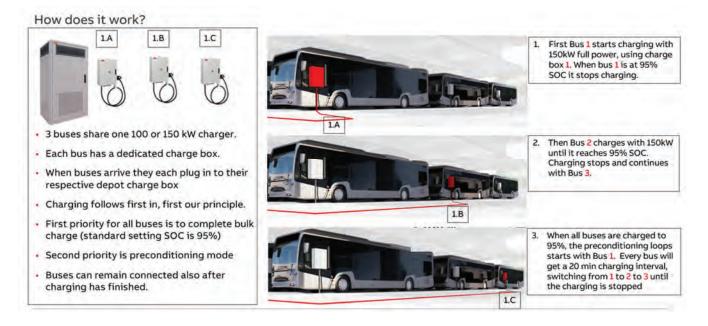
•	Ingress Protection	Depot Charge Box: IP65 (eq. NEMA 4X)
		HVC Power Cabinet: IP54 (eq. NEMA 3R)
•	Mechanical Impact Protection	IK10
•	Humidity	5-95% RH (non-condensing)
•	Altitude (Maximum)	2500 m (8202.1 ft)
•	Temperature Range (Operation)	-10°C to +45°C (14°F to +113°F)
		-35°C to +50°C (-31°F to +122°F) with Robustness package
•	Operating Conditions	Indoor/outdoor
•	Temperature Range (Storage)	-10°C to +70°C (14°F to +158°F)
•	Storage Conditions	Indoors, Dry

Standards & Certifications

•	TUV-Certified to UL2202	HVC150: Certificate No. TU 72180445
		Depot Charge Box: Certificate No CU 72182376 01
•	TUV-Certified to CSA C22.2 No. 107.1—16	HVC150 Certificate No. CA 972180446 01
		Depot Charge Box: Certificate No CU 72182376 01
٠	EMC	FCC Part 15

#### Sequential Charging

It is possible to connect 1 to 3 depot box dispensers to each HVC power cabinet. See example of how sequential charging works.





#### 2.1.4 Available Options

	To increase distance between HVC and Bus Connection interface up to max. 150 meters.					
HVC long distance support package	<ul><li>Data communication enhancer module;</li><li>Overvoltage protection system;</li></ul>					
	Cable between charger and Bus Connection not included.					
	Package to further increase robustness:					
	Redundant auxiliary power supply;					
HVC Robustness	Low temperature option: integrated Heating system for extension of the operating					
	temperature to -35 °C to +50 °C					
Package	Active temperature measurement and control;					
	Intelligent air filter system;					
	Intelligent fuse control.					
	Enables connection of up to 3 depot charge boxes per (each) HVC-100/150 Power					
Sequential Charging	Cabinet:					
Package	Full power to 1 of each depot charge boxes at a time.					
rackaye	Smart charging (sequential) software included to enable automatic switching					
	between outlets					
	Standard pedestal design to support floor-mounted					
	installations					
	Indoor/outdoor					
Depot Charge Box	Powder coated galvanized steel					
Pedestal	Integrated cable raceway to allow bottom conduit entry					
	See general layout drawing for more details					
Cable Management System (Must be ordered with pedestal)	A cable management system consists of a retractable cord reel attached to the middle of the charge cord that retracts the charging cable when not in use, thus preventing the cable from touching the ground. (Note: the cable management system is designed to fit the ABB depot charge box pedestal)					
	Standard metal frame designed to install HVC Cabinet					
	on existing concrete floor.					
	Cable raceway entry points (See "C")					
HVC-100/150 Metal						
	See fabrication drawings for more details					
HVC-100/150 Metal Support Frame Cabinet Color						
Support Frame						



#### 2.2 HVC-450PD - Opportunity Charge

The On-route Opportunity Charging System is typically used for end point opportunity charging of electric city buses, enabling zero emission public transport in cities with an attractive Total Cost of Ownership. With its automated rooftop connection and typical charge time of 3–6 minutes the system can easily be integrated in existing bus lines by installing chargers at endpoints and/or terminals. ABB`s Automated Connection Systems can be combined with up to 3 HVC power cabinets enabling a charging power of up to 450 kW.



#### 2.2.1 OppCharge interface - Standardization

In the market for charging electric passenger vehicles various IEC standards have been developed in the period from 2008 to 2014, and as such a good framework of rules and practices exists to ensure safety and compatibility (for example IEC 61851-23, ISO 15118, IEC 62196-3). ABB has been a key contributor to the aforementioned standards and continuous to be so.

In the market for charging electric busses global standardization has also begun, and several new standardization groups are being formed at the moment. ABB is part of the most important standardization initiatives to share requirements, experiences and other inputs and formulate proposal documents regarding physical interface, safety systems and communication protocols. For bus charging ABB complies with OppCharge for opportunity charging.

Until more formal standardization is in place together with 3rd party validation of compatibility ABB offers charging systems that are validated and tested with individual brands/vehicles on the standards mentioned above. This quotation assumes that the e-bus that will be charged with it has been validated by ABB. A list of validated vehicles is available upon request. If a different e-bus is selected it is possible that additional costs for integration and testing apply.

All data and information contained herein and provided by ABB is considered confidential and proprietary, and may not be reproduced, published or distributed to, or for, any third parties without the express prior written consent of ABB. This ABB proposal is non-binding and does not constitute a contract.



#### Heavy Vehicle Charger (HVC) Specifications

- Connection voltage:
- Max power system:
- System 450kW Weight:
- **Dimensions:** (inches) Housing: Enclosure color

450 kW system 8863 lbs 138.3 (W) x 30.3 (D) x 82.2 (H) IP54 (Type 3R) Powder-coated stainless-steel enclosure RAL 9002 (Grey white) RAL 7012 (Basalt grey) - top fan inlet Supported Network Connection GSM/2G/3G/4G Ethernet Base 10/100T

OppCharge SAE J3105-1\*

450 kW - 600 A

480 VAC, 3-phase, 60 Hz



Pantograph Specifications

- Connection standard
- 150-850 VDC Voltage range
- Max output power & current
  - Weight 364 kg
- Dimensions (inches) 79.1 x 35.4 x 19.3 mm (W x D x H) •



- Distance between HVC & ACM Max 20 meters. (Long range option available up to 150 m)
- Distance between ACM and pantograph shall not exceed 10m.
  - \* SAE J3105-1 standard is a work in progress



## ACM Control Module Specifications

- Weight
- Dimensions (inches)

~125 lbs 24.0 x 8.7 x 33.1 (W x D x H) RAL 9003

Color

### Ambient Conditions

The equipment being offered in this proposal is designed for the following ambient conditions without de-rating.

- Operating temperature: -10 to +50 °C (OPTIONS for -35degC)
- Humidity: 5 % to 95 %, RH non-condensing

### Customization

Stainless Steel enclosure with Pure White RAL 9010 powder coat for simple customization with decals and/or labeling to be put somewhere else.

### Standards & Certifications

- UL/CSA certified: UL 2202, UL 2231-1, UL 2231-2, CAN CSA C22.2 n. 107-1, CAN CSA C22.2 n. 281-1, CAN CSA C22.2 n. 281-2.
- DIN 70121 and OppCharge compatible.

### 2.2.2 Available Options

The following options are available on the Pantograph Charging Systems:

	To increase distance between HVC and Panto up to max. 150 meters.
LIVC long distance	Data communication enhancer module;
HVC long distance support package	Overvoltage protection system;
support package	1 package needed per cabinet;
	Cable between charger and Bus Connection not included.
	Package to further increase robustness:
	Redundant auxiliary power supply;
HVC Robustness	Low temperature option: integrated Heating system for extension of the operating
Package	temperature to -35°C to +50°C
Раскауе	Active temperature measurement and control;
	Intelligent air filter system;
	Intelligent fuse control.



## 3 Connectivity

Being the global industry leader in deploying and managing nationwide EV charging networks, ABB has made Internet connectivity a crucial part of its EV charging strategy and offering which ensures:

- Reliable & cost-effective way to connect charger to the Internet
- Minimal upfront investment and customization on customer IT infrastructure and SW solutions
- Future proof infrastructure with maximum interoperability also with latest EV models
- Optimized remote service process, reducing time to repair and minimizing need for site visits
- Smart controlled charging to reduce costly demand charges

## 3.1 Local Service Capability & Robustness

ABB proactively manages its charger network through its on-line, cloud-based monitoring platform. The proactive management and supervision of chargers throughout North America is done by a local service teams in North America. This team also handles technical support questions with short response times.

More than 75% of charger issues experienced are resolved remotely. With quick response times from ABB personnel and successful remote troubleshooting, the chargers in Canada and the US benefit from robust and greatly improved customer service satisfaction.

## 3.2 Web Tool Solutions: Operator Pro

ABB Web solution "Operator Pro" is an on-line management tool providing operators of charging infrastructure with real-time status information and usage statistics on their equipment.

Infrastructure providers can now gather detailed charge session statistics, configure HVC chargers on their sites according to their preferences and obtain valuable insights through charger usage statistics. All charge session data can be exported and managed directly from this Internet based application.

This web solution consists of several modules:

## Status

The status functionality provides viewing the real-time charger network status via a comprehensive map view. Looking up the actual status per charger or per outlet is also possible. It is even possible to see which outlets are currently charging.

## Statistics

The statistics feature is key to gain insight in the usage of the equipment. It provides you with information on the number of sessions and kWh delivered. Statistics can be viewed over the last 7 days per charger and give an excellent quick glance on how the network is being used. Discovering more details about your charging sessions over flexible time frames is provided by the export function (for example to an MS Excel file) for further processing.



## Configuration

The configuration module allows for remotely configuring settings of a charger, remote restarting if needed and disabling or enabling chargers when desired. The latest feature "off-line behavior" allows customers to define how the charger will work in case connection with the back-end system is lost.

### Access management

Access control is made easy by allowing infrastructure operators to use and manage RFID cards and PIN codes themselves. All transactions related to an RFID card or PIN code can be exported for further processing.

Cases

Cases support issue solving. This functionality helps finding an answer to a problem quickly, raising a case to trigger the service organization and tracking a case to be able to provide the end customers full insight in the progress of a problem.

### Notifications

The notifications module offers your driver care center the possibility to receive an alert by e-mail in case a charger reports a certain event, for example when the emergency button is pressed.

Please contact your ABB representative for pricing.



## 4 Commissioning & Service

## 4.1 Project Management and Engineering Support

This offer includes a Project Manager who is the main point of contact throughout the project execution.

## 4.2 Commissioning and onsite training

This system requires an onsite commissioning activity by an ABB trained and certified person.

The following activities are executed:

- Commissioning of charger system to be fully operational with the selected e-bus
- Customer to make a compatible e-bus available during commissioning
- Performance tests for each system including five (5) successful charges and continuous bulk charge
- Post-installation checking of operational correctness
- Noise measurement
- Alignment and calibration of pantograph
- Configuration of remote connectivity and remote management features
- Safety tests including emergency shutdown test
- User/operator Training (on-site training during/after commissioning)
- Travel & lodging in included

## 4.3 Service Level Agreements (SLA)

To get the most out of your charging infrastructure we recommend an SLA (Service Level Agreement) to look after your business critical assets. The exact offer may depend on the region and scope of your project. All ABB Service Level Agreements are configured for EV Charger owners that demand a network of robust, reliable equipment. Benefits include:

- 24/7 SoS call center support
- Assured warranty AND technical support response time
- 1 preventive maintenance visit per year, scheduled in 12-month cycles from start-up
  - o Includes air filter replacement

Please contact your ABB representative for pricing.

## 4.4 Recommended Spare Parts

Please contact your ABB representative for pricing.



## 4.5 Extended Warranty

Extended warranty is available when a Service Level Agreement is in place. In case of an extended warranty, the decision for extended warranty must be taken at moment of purchase of the involved fast charging system(s). Please contact your ABB representative for more details.



### PRODUCT LEAFLET

## **Electric Vehicle Infrastructure** HVC-C UL depot charging for electric fleets



ABB HVC-C UL Depot Charging systems offer a highly reliable, intelligent and cost-effective solution to charge large EV fleets such as buses, trucks and other commercial vehicles.

HVC Depot Boxes and power cabinets, lined up at a depot site.

### A practical solution for busy depots

ABB Heavy Vehicle Charger (HVC) products enable electric buses and trucks to charge at the depot ensuring flexibility and scale for every fleet operation that is transitioning to zero-emission transportation.

#### **Key Benefits**

+ Smart charging

- + Small infrastructure footprint at vehicle interface
- + Flexible design for roof and floor mounting
- + SAE J1772 CCS and OCPP 1.6 compliant
- + Remote diagnostics and management tools

### **Sequential Charging**

Improving total cost of ownership is easy using the sequential charging feature offered by ABB's depot chargers. This feature allows connection of up to three depot charge boxes with a single power cabinet and vehicles are charged sequentially over time. The system can follow an embedded, predefined charging process or remote triggers sent by a fleet management system via OCPP 1.6.

- Vehicles are charged with high power, maximizing vehicle availability
- The required grid connection is smaller, reducing upfront investments and operational costs
- The compact depot box is easy to install at sites with space constraints
- Optimal utilization of installed infrastructure meaning lower investments in charging equipment.

#### **Buy America**

ABB can offer the HVC-C Depot Charging Solution with compliance to the Buy America Act Rule 49 CFR Part 661.5.

### Future-proof modular design

Power cabinets can be upgraded from 100 or 150 kW in the field, as well as add additional depot charge boxes, allowing operators to scale their operation and to spread investments over time.

### Safe and reliable operation

ABB fast chargers are designed to the highest international electrical, safety, and quality standards, and are certified by notified bodies - guaranteeing safe and reliable operation.

### **Connectivity and remote services**

ABB chargers come with an extensive suite of connectivity features including remote services such as monitoring, management, diagnostics and software upgrades. These advanced services provide equipment owners with powerful insights into their charging operations while enabling high uptime.

### ABB is your experienced partner

ABB HVC products are based on a decade of high power experience in EV charging solutions. ABB has installed over 17,000 fast charging systems in more than 80 countries – and is the leading EV infrastructure technology supplier globally.

## Overnight charging 100 kW - 150 kW

A field upgradeable system with future proof reliability

### HVC 100C



HVC 150C



HVC 150C\*



\* 150 kW overnight charging system with three depot charge boxes; shown mounted on pedestal option.



A power upgrade can be done in the field by adding an extra power module. No groundworks, digging and disturbance to the site are required.

Configurations		HVC 100C	HVC 150C			
Maximum output power		100 kW	150 kW			
AC Input voltage		UL: 3-phase, 480Y/277 VAC +/- 10% (60 Hz) CSA: 3-phase, 600Y/347 VAC +/-10% (60 Hz)				
AC Input connection			ND (no neutral)			
Rated input power		117 kVA	170 kVA			
Rated input current		UL: 132 A / CSA: 108 A	UL: 198 A / CSA: 168 A			
Recommended upstream	circuit breaker(s)	UL: 1 x 200 A / CSA: 1 x 150 A	UL: 1 x 250 A / CSA: 1 x 250 A			
Output voltage range		150 – 850 VDC				
Maximum DC output curre	ent	166 A	200 A			
Vehicle connection interfa	ace	CCS/Combo Type 1 Connector				
Cable length		3.5 m (11.5 ft) standa	ard; 7 m (23 ft) optional			
DC connection standard		SAE J1772 - IEC 61851-2	23 / DIN 70121 - ISO 15118			
Environment		Indoor,	/Outdoor			
Operating temperature			e-rating characteristic applies) 35 °C to +50 °C			
Protection			10 (equivalent to NEMA 3R) Box: IP65 - IK10			
Network connection		GSM/3G modem   10	0/100 base-T Ethernet			
Compliance and Safety		CSA No. 107.1-16 and I	JL 2202 certified by TUV			
		BA Rule 49 CFR Pa	art 661.5 (Optional)			
Dimensions						
Power Cabinet	Dimensions (H x W x D)	2030 x 1170 x 770 mr	n / 79.9 x 46.1 x 30.3 in			
	Weight	1340 kg	/ 2954 lbs			
Depot Charge Box	Dimensions (H x W x D)	800 x 600 x 210 mm	n / 31.5 x 23.6 x 8.3 in			
(without pedestal)	Weight	61 kg / 134.5 lbs (v	vith 7 m / 23 ft cable)			
Depot Charge Box	Dimensions (H x W x D)	1914 x 600 x 400 mr	n / 75.4 x 23.6 x 16.3 in			
(with pedestal)	Weight	181 kg / 398 lbs (w	/ith 7 m / 23 ft cable)			

#### ABB Inc.

950 W Elliott Road, Suite 101 Tempe, AZ, 85284 United States Phone: 800-435-7365 E-mail: US-evci@us.abb.com

#### ABB Inc.

800 Hymus Boulevard Saint-Laurent, QC H4S 0B5 Canada Phone: 800-435-7365 E-mail: CA-evci@abb.com We reserve the right to make technical changes or modify the contents of this document without prior notice. We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB. Copyright© 2020 ABB. All rights reserved.



### PRODUCT LEAFLET

## Electric Vehicle Infrastructure

HVC-PD UL opportunity charging for electric buses



ABB's HVC-PD opportunity charging system offers high-power charging via an automated rooftop connection. With typical charge times of 3 to 6 minutes the system can be easily integrated in existing operations by installing chargers at endpoints, terminals and intermediate stops.

The HVC-PD charging system leverages an automated connection to enable extremely fast charge times.

### A practical solution for route charging

ABB's Heavy Vehicle Charger (HVC) system architecture offers an ideal solution for opportunity charging, ensuring zero-emission public transit during the day without impacting daily route operations.

### **Key Benefits**

- + Charge in 3 to 6 minutes
- + One charger serves many vehicle makes and models
- + Safe and reliable fully automated connection
- + SAE J3105-1 and OCPP 1.6 compliant
- + Remote diagnostics and management tools

### Future-proof modular design

Additional power cabinets can be installed at any time, allowing operators to scale their operation and flexibly spread out infrastructure investments as their fleet grows.

### Safe and reliable operation

ABB fast chargers are designed to the highest international electrical, safety, and quality standards, and are certified by notified bodies - ensuring safe and reliable operation.

### Interoperability

ABB HVC chargers are based on international standards for operational compatibility with multiple

vehicle types and brands. This allows operators to select vehicles from multiple vendors and not be locked into a single supplier.

### Connectivity and remote services

ABB chargers come with an extensive suite of connectivity features including remote services such as monitoring, diagnostics and software upgrades. These advanced services provide equipment owners with powerful insights into their charging operations while delivering high uptime.

### **OCPP 1.6**

ABB HVC-PD charging systems can be connected to standardized charging infrastructure management platforms using OCPP 1.6. ABB's HVC suite supports OCPP 1.6 Core and Smart Charging Profiles.

#### **Buy America**

ABB can offer the HVC-PD Depot Charging Solution with compliance to the Buy America Act, Rule 49 CFR Part 661.5.

### ABB is your experienced partner

ABB HVC products are based on a decade of highpower experience in EV charging solutions. ABB has installed over 20,000 fast charging systems in more than 85 countries – and is the leading EV infrastructure technology supplier globally.

## Opportunity charging 150 kW to 450 kW

A scalable system with future-proof reliability

### Charging on existing structure

**HVC 450PD KIT** 

### Charging on route



With ABB's flexible HVC architecture, power capability can be expanded over time, allowing operators to spread out infrastructure investments as their fleet grows.

Technical specifications				
Configurations		HVC 150PD	HVC 300PD	HVC 450PD
Maximum output power		150 kW	300 kW	450 kW
Input AC connection		UL: 3-phase, 480Y/277 VAC	+/- 10 % (60 Hz); CSA: 3-phase, 60	00Y/347 VAC +/-10% (60 Hz)
Rated input power		170 kVA	2x 170 kVA	3x 170 kVA
Rated input current		UL: 198 A	UL: 2x 198 A	UL: 3x 198 A
		CSA: 168 A	CSA: 2x 168 A	CSA: 3x 168 A
Recommended upstream circ	cuit breaker(s)	1 x 250 A	2 x 250 A	3 x 250 A
Output voltage range			150 – 850 VDC	
Maximum DC output current		250 A	500 A	600 A*
Vehicle connection interface		Inver	ted crossrail pantograph - OppCh	arge
DC connection standard		SAE	J3105-1 - IEC 61851-23-1** - ISO 1	5118
Environment			Indoor/Outdoor	
Operating temperature		Standard: -10 °C to +50 °C	(de-rating characteristic applies)	; Optional: -35 °C to +50 °C
Protection			IP54 – IK10 (NEMA 3R)	
Network connection		GSM/	3G/4G modem   10/100 base-T Etl	hernet
Compliance and safety		CSA N	o. 107.1-16 and UL 2202, certified	by TUV
		В	A Rule 49 CFR Part 661.5 (Optiona	u)
Dimensions				
Power cabinet (each)	Number of Power Cabinets	1	2	3
	Dimensions (H x W x D)	2030	x 1170 x 770 mm / 79.9" x 46.1" x	30.3"
	Weight		1340 kg / 2954 lbs	
Charge pole (includes	Dimensions (H x W x D)	5240	x 1040 x 300 mm / 206.3" x 40.9" >	< 11.8"
Pantograph & ACM)	Outreach		4670 mm / 183.9" x 30.3"	
	Weight		1706 kg / 3762 lbs	
ACM Control Module KIT	Dimensions (H x W x D)	1600	x1000 x 476.9 mm / 63" x 39.4" x	18.8"
	Weight		193 kg / 425 lbs	
Pantograph KIT	Dimensions (H x W x D)	(resting position / bolt-ho	ole pattern) 574 x 1300 x 900mm ,	/ 22.6"H x 51.2"W x 35.4"D
	Weight		387 kg / 854 lbs	

\* Limited by inverted pantograph contact ratings

\*\* IEC 61851-23-1 in draft status

### ABB Inc.

950 W Elliott Road, Suite 101 Tempe, AZ, 85284 United States Phone: 800-435-7365 E-mail: US-evci@us.abb.com

### ABB Inc.

800 Hymus Boulevard Saint-Laurent, QC H4S 0B5 Canada Phone: 800-435-7365 E-mail: CA-evci@abb.com We reserve the right to make technical changes or modify the contents of this document without prior notice. We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB. Copyright© 2021 ABB. All rights reserved.



PRODUCT PORTFOLIO

## **Electric Vehicle Infrastructure** WEBTOOLS USER GUIDE





## Notice

This document contains information about one or more ABB products and may include a description of or a reference to one or more standards that may be generally relevant to the ABB products. The presence of any such description of a standard or reference to a standard is not a representation that all the ABB products referenced in this document support all the features of the described or referenced standard. In order to determine the specific features supported by an ABB product, the reader should consult the product specifications for the ABB product.

ABB may have one or more patents or pending patent applications protecting the intellectual property in the ABB products described in this document.

The information in this document is subject to change without notice and should not be construed as a commitment by ABB. ABB assumes no responsibility for any errors that may appear in this document.

In no event shall ABB be liable for direct, indirect, special, incidental or consequential damages of any nature or kind arising from the use of this document, nor shall ABB be liable for incidental or consequential damages arising from use of any software or hardware described in this document. This document is originally written in English. Other language versions are a translation of the original document and ABB cannot be held liable for errors in the translation.

This document and parts thereof must not be reproduced or copied without written permission from ABB, and the contents there of must not be imparted to a third party nor used for any unauthorized purpose.

## Copyrights

All rights to copyrights, registered trademarks, and trademarks reside with their owners.

Copyright © 2019 ABB. All rights reserved.



## **Version Control**

Documents data	
Title	Electric Vehicle Infrastructure - WEBTOOLS USER GUIDE
Author	Zakaria Botros – ABB Montreal Campus
Version	1.0
Version Date	2020-01-16
Status	released

Version	Date	Remarks
V1.0	2020-01-16	Initial release
V1.1	2020-01-20	Enhance the image quality in the document



## Table of Contents

1	Intro	duction	5
	1.1	Intended document users	5
	1.2	Contact information	5
2	Webt	ools "Driver Care/Operator Pro"	6
	2.1	Benefit	6
	2.2	Main features	6
	2.3	Real-time monitoring	7
	2.4	EV Charger map	7
	2.6	Statistics	8
	2.7	Access management via RFID Card or PIN module	9
	2.8	Detailed information for every Charger	10
	2.9	Notifications, Solutions and Cases	12
3	Webt	ool "Charger Care"	14
	3.1	Benefit	14
	3.2	Main features	14
	3.3	Requirements	14
	3.4	Real-time monitoring / EV charger map	15
	3.5	Notifications, Solutions and Cases	15
	3.6	Advanced technical information and diagnosis tools for every charger	17
		3.6.1 EV Charger page	17
		3.6.2 Charger page	22
	3.7	Spare part	22
	3.8	Documents	23
4	Comr	munication status, Charger status and error codes list	
	4.1	Communication status list	24
	4.2	Charger status list	25
	4.3	Error codes list	26



## **1** Introduction

ABB EV Webtools are designed to secure the availability, performance and safety of your EV chargers. By connecting chargers, service solutions and people, ABB has been able to diagnose more than 90 % of the service cases remotely, solving over 60 % of these cases without any site intervention in the past two years. This results in significant savings on down-time, travelling, transportation, man-hours and resources.

There are two types of ABB Webtools: Driver Care, Charger Care, Operator Pro. The Driver Care and Operator Pro are offering the same service for both E-Cars and E-Buses respectively, the service is including but not limited to: Real time monitoring for the Chargers, statistics, EV chargers map, Card management, Pin management, Cases and Solutions.

The Charger Care Can provide real time configuration modification for the parameters of the charger, remote troubleshooting, access to advanced setting and remote actions and access to solution library and technical documentation.

## 1.1 Intended document users

This document is intended to be used by certified customers who purchased ABB webtools for EVCI or are in the process of ordering and want to know in more detail how to useand befit from ABB webtools "charger cared, Driver care, Operator pro".

Technical personnel must be certified by ABB to perform any action using charger care webtool.

## 1.2 Contact information

ABB Montreal Ca	mpus
Address	800 Boul. Hymus Saint-laurent, QC Canada H4S 0B5
E-mail	evci-caservice@ca.abb.com
Service Hotline	1-800-HELP365



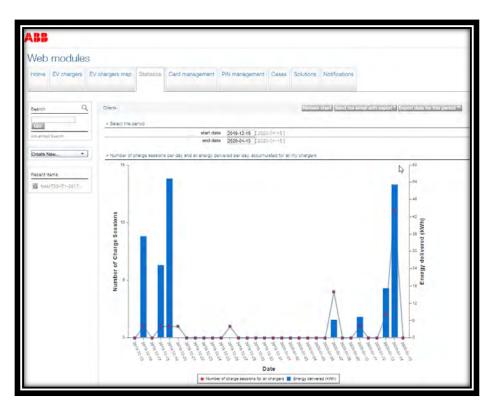
## 2 Webtools "Driver Care/Operator Pro"

## 2.1 Benefit

- Understand network status and how it is used.
- Manage access without using OCPP.
- Improved EV driver satisfaction due to a fast & competent driver support.

## 2.2 Main features

- Monitoring status of network and on EV charger level
- Gain insight by standard reports
- Customer export of complete data sets
- Access management
- PIN and RFID card management
- Solutions & Cases
- Diagnosis and repair guidelines
- Escalate cases to ABB Service in tool
- Notifications
- Works for all products (past, now and future)





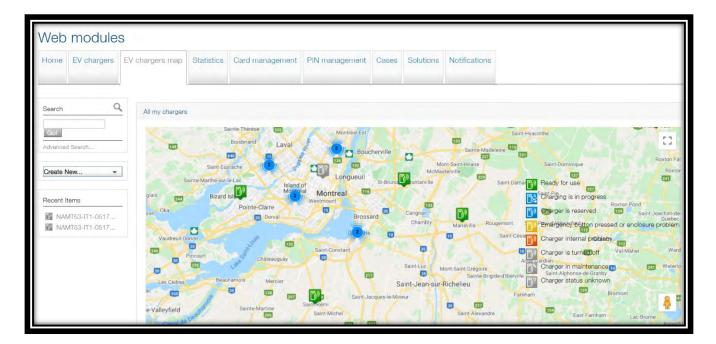
## 2.3 Real-time monitoring

For all connected chargers the communication status and the Charger status are always updated in real-time. All communication status messages and Charger status wording are included in Appendix I and II at the end of this guide.

ABB											
Web	module	s									
Home	EV chargers	EV chargers map	Statistics	Card management	PIN management	Cases	Solutions	Notifications			
-	4		-								
Search	C										
0.5		Home									
	d Simarchy	-									
		View: All Charger	5	• Gal							
Create M	New *	Recent EV char	gers								Recently Viewed
Recent 1	items	EV charger n	insi.	Location					Customer	Communication status	Charger status
	M753-IT1-0517	NAMYSCHT 1		Contraction of the second seco	C, Saint Laurent - Boule	ward Henri	-Bourassa Due	81	GAABB	Connected	Ready for use
BOB NUM	MT53-IT1-0517	NAMIT53-IT1	0517-02B	CAABB: C	C. Saint-Laurent - Bouk	evard Hymu	ă.		CAAEB	Connected	Ready for use

## 2.4 EV Charger map

Mentoring Chargers position over the map, and indication the Charger status using the icons.

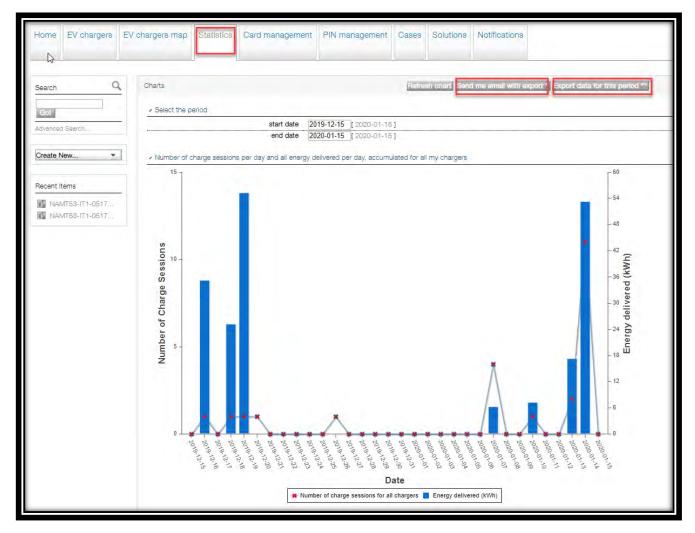




## 2.6 Statistics

A Chart demonstrating the number of Charge sessions and Energy delivered (kWh) per day. The operator can choose the start date and the end date parameters.

The statistics data can be sent by email or exported to excel sheet by clicking on one button.





## 2.7 Access management via RFID Card or PIN module

This feature is available for customer who operate Car chargers only where the charge sessions can be authenticated by using RFID membership card or PIN code.

If the user doesn't have the RFID that is registered in the Webtools the Charger will decline the charge session as this client is not authorized, the same result if wrong PIN code typed on the Charger screen.

Web	module	S							
Home	EV chargers	EV chargers map	Statistics	Card management	PIN management	Cases	Solutions	Notifications	
Search Gol Advanced		View: Acce	oted cards •					New Act	Dest Card
Recent It	ems	Action RFI	) tagʻs unique	number 🔺				Status of ca	ard
	AT53-IT1-0517	Edit   Del 3D5	72D98					Accepted	
	AT53-IT1-0517	Edit   Del 3D9	52298					Accepted	

Home	EV chargers	EV chargers map	Statistics	Card management	PIN management	Cases	Solutions	Notifications
Gol	C	PIN management	nt G			_		
Advanced	d Search	View: Accepted P	IN codes 🔻 💽	101				
Create N	Vew 🔻	Recent PIN mar	nagement		Cre	ate New Pl	IN code	
Recent I	tems	- PIN code			Status of PIN co	ode		
22 C	1 MT53-IT1-0517 MT53-IT1-0517	1511			Accepted			



## 2.8 Detailed information for every Charger

By clicking on the Charger name or serial number in the **EV chargers** tab, the Charger page will be opened where the operator can find all the details about this charger as:

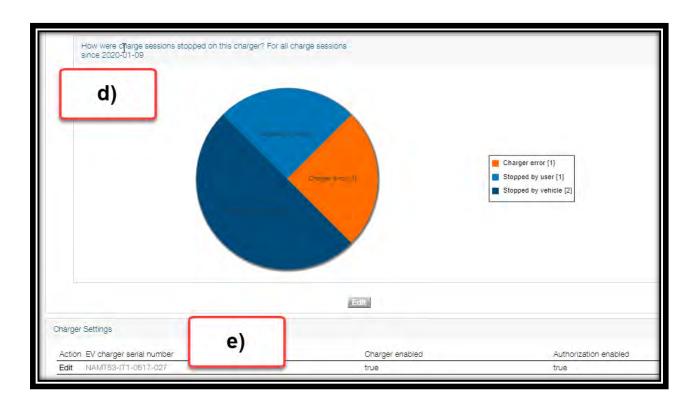
- a) Communication status for last 24 hours.
- b) Charger status for last 24 hours.
- c) Chart for last week charge sessions.
- d) Pie chart for the stop reason of the Charge sessions.
- e) Charger session page to restart the charger or disable/enable the charger.
- f) Connectors identifications.
- g) Charge sessions history that indicates start time, duration, Energy delivered, stop reason and stop reason detailed.
- h) Cases related to this specific charger.

ABB							
Web modules							
Home EV chargers	EV chargers map	Statistics	PIN management	Cases	Solutions	Notifications	
Search Q Gol Advanced Search_	All Chargers	argers	•				
Create New *							ms
Recent Items		oherger neme		ocation			
MAMT51-1013-002		MT51-1013-00				5	
		nt51-1213noli					

C, Saint Laurent - Boulevard Henri- ted	Bourassa Ouest		
ited			
			_
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	r i i i i i i i i i i i i i i i i i i i	
2 3 4 5 6		11 12 13 14 1	5 18
Connected Disturbed N	lot connected		
2 3 4 5 6	7 8 9 10	11 12 13 14 18	5 76







### ELECTRIC VEHICLE INFRASTRUCTURE - WEBTOOLS USER GUIDE



Action Collector number	f)	Connector status		Phase type	Connector type		Maximum output power (KM)	
i.		Ready for use		Three phase	CHAdeMO		60	
2		Ready for use		Three phase	Compo 2		50	
Charge Sessions	~	1						
Action Charge session ID	g)	nector number	Energy start time	Duration (min:sec)	Energy delivered (	(Wh)	Stop reason	Stop reason detailed
-\$16785615138848766			2020-01-14 13:25	143:29	52,867		Stopped by vehicle	SR_VEHICLE_STOP
-6770010679278567408	4		2020-01-14 11:06	01:18	0,291		Stopped by user	Normal Stop
2467016142396710923	1		2020-01-13 11:18	105:33	17,118		Stopped by vehicle	SR_VEHICLE_STOP
8835094344617689079	1		2020-01-13 11:08	00:00	0,000		Charger error	Invalid on Server
-5143736290609193976			2020-01-07 07:24	00:00	0,000		Charger error	Server Unreachable
Show 5 more +   Go to list (50+) +								
Cases	h)	Nov	6					
Action Case Number Owne	r Name	Charger Customer Name	Subject			Status	Date/Time Opened	Urgency
Edit   Cis 00023535 CAAE	B Quèué	CAABB	ASB Boulevard H	ienn-Bourassa Ouest - OCS Holster Is	SUB	In Progress	2018-10-02 06:22	F3 - Case not related to charging

## 2.9 Notifications, Solutions and Cases

Notifications: This to be used to configure the webtools to send automatic notifications to a certain email address if one or more events happened.

Cases: The operation can create a case to request the technical support to information related to a specific Charger, this case will be directed to the local ABB technical support team who will respond to the case to solve the technical problem remotely or plan a site visit.

Solutions: Where the Operator and the technical team on the customer side can search for similar issues occurred in the past that is fixed by certain actions that called solution. Consulting solutions tab can save time through finding the correct action to solve the problem instead of reporting the problem and waiting for a feedback from the support team.

Web	module	S								
Home	EV chargers	EV chargers map	Statistics	Card managem	nent P	IN management	Cases	Solutions	Notifications	
Search Gol Advanced	d Search	2	Notification sta	tuses Driver care	Charge	e ency button or enclos er internal problem er is turned off			hosen	
Create N	New =		Notification	email Driver care		email to receive	Save	Gençe)		



## ELECTRIC VEHICLE INFRASTRUCTURE - WEBTOOLS USER GUIDE

Veb	modules	3				
lome	EV chargers	EV chargers map	Statistics Card man	agement PIN management Cases Solutions	Notifications	
Search	Q	Case 00020965		ß		
Gol	Except	Back to List:	Cases			
Create Ne		Case Detail		Ecil Cleve Caue		
		<ul> <li>Case Inform</li> </ul>	ation			
Recent Ite	ints		Case Origin	n e-mail	Case Number	00020985
			EV charge			GAABB Queue [Change]
00020			Customer reference			F3 - Case not related to charging
	153.111.0517		Created B	CAABB- webmod, 2018-05-23 10.10		In Progress
1511	70581513884 163-111-0517 753-111-0517	< Description	Information		Last Modified By	John Savage, 2018-10-24 09:45
WW Postal	1994111-0011			t ABB Boulevard Hymus - CCS Holster Issue		
			Description			
				<ul> <li>Heplace UCS holster as needed</li> <li>10.2.18 JS: CAABB requesting replacement CCS holster.</li> </ul>		
			and the Question of the later o	2018-05-23 10.10		
		-	Date/Time Opened Date/Time Closed			
			Communicated solution			
			COMMUNICATION SCIENCE	Edit Close Case		
				Rectific Contractor		

olution Driver Care: The display (touchscreen) is not responding	
Solution Detail	
Solution Number 00000022	Applicable Charger Types Terra Smart Connect; Terra 23/53/54
Related images or screenshots	Created By Bart Buizer, 2012-05-07 03:01
₽. Alternative de la constantia de la const Constantia de la constantia	
	Last Modified By Stefano Guidotti, 2019-06-03 02:52
Zetail Information	
Solution Title Driver Care: The display (touchscreen) is not resp	bonding
Solution Details - Verify whether the user is wearing gloves. The s	screen may not respond when touched with gloves. surface, the screen might not work properly. Clean the surface with window cleaner and a soft cloth. If the problem resides.



## 3 Webtool "Charger Care"

Charger Care webtool is advance service tool for operators and service providers, which provide more technical tools to diagnose and troubleshoot the charger, in addition it is featured by the documents tab where the operator can find useful updated documents about EV charging. Spare parts are a very beneficial component of Charger Care where the certified service engineers can learn about the spare part list for any model.

## 3.1 Benefit

- Reduced time to repair  $\rightarrow$  charger uptime.
- Efficient and optimized own service operation.
- Improved service level of network due to optimized charger support.

## 3.2 Main features

- Remote monitoring and advanced diagnostics features
  - Charger network overview.
  - Status & statistics on charger level.
  - Real time insights on component level status, parameters and HW versions.
- Access to advanced settings and remote action
  - Changing parameters and configurations
  - Rebooting individual boards
- Spare part data and ordering instruction.
- Access to solution library and technical documentation.
- Case Management and automatic notifications.
- For Terra 53, Terra 54, Bus, Wallbox and HPC (not for T51).

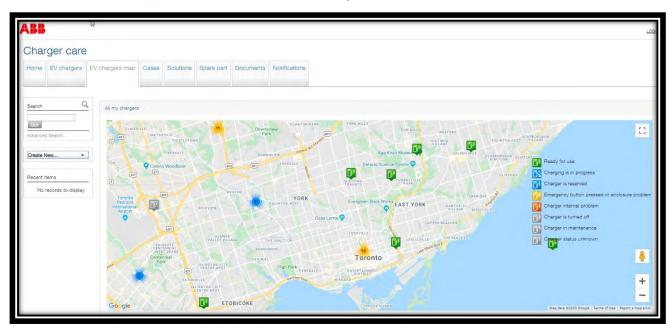
## 3.3 Requirements

• Can only be operated by certified service engineers.



## 3.4 Real-time monitoring / EV charger map

For all connected chargers the communication status and the Charger status are always updated in real-time. All communication status messages and Charger status wording are included in Appendix I and II at the end of this guide.



## 3.5 Notifications, Solutions and Cases

Notifications: This to be used to configure the webtools to send automatic notifications to a certain email address if one or more events happened.

Cases: The operation can create a case to request the technical support to information related to a specific Charger, this case will be directed to the local ABB technical support team who will respond to the case to solve the technical problem remotely or plan a site visit.

Solutions: Where the Operator and the technical team on the customer side can search for similar issues occurred in the past that is fixed by certain actions that called solution. Consulting solutions tab can save time through finding the correct action to solve the problem instead of reporting the problem and waiting for a feedback from the support team.

Jilai	rger care	)						
Home	EV chargers	EV chargers map	Cases	Solutions	Spare part	Documents	Notifications	
Search Gol Àdvance	d Search	-	n statuses Cł	narger care	Charger inte Charger is tu		save Cerrost	¢.
Create I	New 🔻	Notific	ation email Ch	narger care	Charger in n	naintenance	•	<u> </u>



ABB			
Charger care	14.4		
Home EV chargers EV charg	gers map Cases Solutions Spa	are part Documents Notifications	
Gol & Bi	e 039142 Jack to List: Cases se Detail	Edit Close Case	
	Case Information		₩ A
Recent Items	Case Origin		
11.00000110			ner CAABB Qu
LJ 00039142	Customer reference		icy F1 - Charg
	Created By		tus Awaiting S
	Description Information	Last Modified	By KSI webmo
	Subject	Unit has Power	
		Unit shows Down but has Power/heartbeat. Please Advise.	
	Case comments		
	Date/Time Opened	16/12/2019 8:40 AM	
	Date/Time Closed		
	Communicated solution	Edit Ulose Case	

Charg	ger care						
Home	EV chargers	EV chargers map	Cases Solutions	Spare part	Documents	Notifications	
Search	q	Solution Search					
Gol kovanced	Search	Enter keywords to Search for:	find matching solution		harger care • an	d Solution	
Create Ne	ew 🔻	Search Results					
Recent Ité	ems	Charger care No subcategories in	this category.				
LJ 0003	19142	Most Commonly U	sed Solutions				
		Solution Number	Solution See	iroh			Statu
		00000012	Driver Care	Display indicate	s emergency butt	an is pressed	Revie
		00000022	Driver Care:	The display (tou	chaoreen) is not re	esponding	Revie
		00000152	Power Modu	le Self-Test: #30	06 Fan failed - All	PMs	Révie
		00000155	Power Mode	le Self-Test: #20	06 Fan failed		Revie
		00000042	White and/o	r flickering scree	n on T51, T51AC	or T52	Revie
		0000013	Driver Care:	Display indicate	s "All RFID outlets	are in use" when trying to charge	Revie
		200000346	RCD on DC	oharging group	keeps tripping ran	domly - Grid voltage missing, fluotuating or imbalanced	Reve
		00000251	Stop reason	CHARGER_ER	ROR_POWER_SL	IPPLY	Revie



## 3.6 Advanced technical information and diagnosis tools for every charger

For a Charger care account holder, all the parameters are available to be modified, for both technical parameters and administrative parameters.

Technical parameters can be modified though EV charger page, where the operator modify a value for a variable and this modification takes place in the same exact moment to affect the charger in the field. Examples for that:

- Maximum input current for the charger (to control the load that a charger can apply on the electric gird).
- Language of the screen.
- Authorization method(s): OCPP, PIN, RFID.
- Payment terminal Authorization enabling/disabling.
- Fall back mode.
- Auto Charge feature.
- Monitoring the power modules status and the number of active power modules, executing self-test.
- Day summary reports.

Administrative fields can be controlled through Charger page, where the operator can modify the location parameters, customer name, attach a document or a report, setting the address and assign a location remark to this charger.

Below some images from both EV charger page and Charger page showing the different parameters that can be modified.

## 3.6.1 EV Charger page

## 3.6.1.1 EV Charger Page -> Summary

.88		Г	EV Charger Page		
Charger care			Ly onlige uge		
	Part and a second se	tin har state and the second sec			
Home EV ovärgers EV	Victorgars map Cases Solutions Spare	part Documents Notifications			
Search Q	EV charger				
	NAMT53-IT1-0517-027				
Gal	- Dack to Lat: DV chargers				
Advanced lawers.	Charge Sessions Status & History Ser	olega Sectoga hasory Day Summarika Statistica			
Create New *					
		Charger 1648/1555-IT1-CE17-CE17			
ecent teme	EV charger Detai	ED. So.	entered traditional process	inni kati (dawe sana kio)	
TUMTSOHT1-DE17_	Brd.	therper name NAMT53-IT1-0517-027		Diage platforth - Terrs 53	
154501-02219-048	-	Lossion // CAABB; CO, Sant Laurent - Boulevard Henri-Bours	ressa Cuper	Software Version 11 4.0.3.83	
07039142	-	Dutkime CAABS	2000 (0000)	INFC can be replaced	
		Country C.A.			
	> Status				
		herger status 🔐 Ready for use		Scatul Detaile	
	Convestor	ration status / To Connected		Communication failure date: / 12/01/2020 2:39	A D64
	Parriet Service	il comitinal data		Pearsent Territrial failure mation	
		aluory Status Addive			
	> Issue notification				
	> 199/ig celescario	me 0 problem state at 2020-01-07 13 27 452 (UTC)		Druie raw writington anal 10	
		www.ill.problem trate at 2020-01-07 13/27/www.jumuj		Charger care notification entail	
	- System information				
		Diversed By API API _UK41; 06/02/2017 7-32 AM	and a page distance provided discoporation	Las Model IV APLAPLUSES 16	01/2020 1 27 PM
	Connectors				
	Action Connector humber	Connector status	Connector type	Maximum output power (kM)	Phase type
	1	Repoy for upa	CHAdeMO	50	Tries prese
		Ready for Lase	Dampa 2	60	Tripe phase



## ELECTRIC VEHICLE INFRASTRUCTURE - WEBTOOLS USER GUIDE

## 3.6.1.2 EV Charger Page -> Summary -> Show Service Page

ce page for charger NAMTS			Refresh																				
<ul> <li>chärger status</li> </ul>																							
Communication	status 🕜 📑 Connected						_																
			14	15	16	17	18 19	20	21 22	23	0	1	2	3	4	5	6	7	8	9	10	11	12
Charger	status Ready for use				1. A.									1.1		1.1							
			14	15	16	17	18 19		21 22			1	2	3	4	5	6	7	8	9	10	11	12
Software V	fersion 4.0.3.63							Char	ger platform	Terra	53												
	issue 🧾 problem state at 20	20-01-07 13:27:452	(UTC)																				
<ul> <li>authorization info</li> </ul>																							
General	authorization status enable	ed																					
		tivated																					
	OCPP server mode intern OCPP server Name	al																					
authorization device par				RF	D			PIN		1.1	Remote						Paym	ent Ter	minal				
authorization device statu					ilable			disabled			not confid	hand						onfigure					
authorization method ena					bled		-	disabled			disabled						enable	_					
autorization metrica zna	Dicu			Cito	Lonco .			Character of			aiadoica						Chapte						
r outlets																							
outlet parameter	1 - CHADEMO	2 - CCS																					
outlet status	AVAILABLE	AVAILABL	E																				
last failure	Isolation test failed	No Author	ization device																				
cpi board	CPJB-1703110572	CPCB-170	03107366																				
imi board	IMI-1703110527	IMI-16481	14915																				
cable status	Connected	Not conne	cted																				
/ box checks																							
box check identifier		value	update time																				
Boards/CPIChademo0/Bo	wheele	failed	16/01/2020 1:53 PM	_																			
Boards/CPIChademo0/Bo		OutletError	16/01/2020 1:53 PM																				
boardaror ronadomotro	Acheora object circle	Seace	10/01/2020 1.001 14																				
Power modules																							
power module parameter	er.			1				2			3					4					5		
serial number				PM3F	P-0			PM3P	0		PM	13P-0				PM3	P-0				PM3P-0	j	
hardware revision				v1.2.3	5			v1.2.3			v1.	2.3				v1.2	3			-	v1.2.3		
software version				3.4.0.	97			3.4.0.9	7		.3.4	0.97				3.4.0	.97				3.4.0.97	f .	
maximum power				10 kV	/			10 kW			10	KW				10 kt	W				10 kW		
status				Ok				Ok			Ok					Ok					Ok		

## 3.6.1.3 EV Charger Page -> Summary -> Show Charger values

T	
✓ Charger parameters	
key	value
AuthorizationServiceCommon.AuthorizationMode	2
AuthorizationServiceCommon.AuthorizeForStop	false
AuthorizationServiceCommon.AutoChargeEnabled	false
AuthorizationServiceCommon.Enabled	true
AuthorizationServiceCommon.FallbackDelay	300
AuthorizationServiceCommon.FallbackMode	0
Boat.LocalWhiteListCacheEnabled	true
Boat.PinPrefix	PIN:
Boat.RemoteStartStopEnabled	false
ChargeControllerCommon[0].ChargeTimeMax	-1
ChargeControllerCommon[1].ChargeTimeMax	-1
Connectivity.XmppServerName	www401.services.abbext.com
CpiBoardCombo[1].ACS	0
CpiBoardCombo[1].Connector	4
CpiCommon[0].ConnectorType	7
CpiCommon[1].ConnectorType	3
DcbPowerBoard[0].Inhibit	1
DcbPowerBoard[1].Inhibit	1
DcbPowerBoard[2].Inhibit	1
DcbPowerBoard[3].Inhibit	1
DcbPowerBoard[4].Inhibit	1
OutletController[0].ErrorState	0



## 3.6.1.4 EV Charger Page -> Charger Sessions

Char	ger care							٢		ר	
Home	EV chargers	EV chargers	map Cases	Solutions	Spare part	Documents	Notificati	ons	EV Charger Page		
										-	
Search	Q										
		NAMTE	53-IT1-0517-0	27							
Gol		« Back	to List: EV charg	ers							
Advanced	Search				(Settings S	Settings history Da	y Summaries	Statistics			
Create Ne	ew 🔻	Summary	Charge Sessions	Status & histor	/ Settings :	settings history Da	ly Summaries	Statistics			
Croate re		1		Ch	arger NAMT53	-IT1-0517-027					
Recent Ite	ams	Conne	ctors								
	T53-IT1-0517 IT1-2219-046	Aotic	in Connector num	ber		Connector statu	s	Cor	nnector type	Maximum out	put power (kW)
0003			1			Ready for use		CH	AdeMO	50	
			2			Ready for use		Cor	mbo 2	50	
			arge Sessions								
		Aotic	n Charge session		onnector numbe	er Energy start f	ime	Duration (min:sec)	Energy delivered (kWh)	Stop reason	Stop reason detailed
			-65708619277			16/01/2020		67:16	7.478	Stopped by charger	SR_CHARGER_TIME_COMPLETED
			-68881967847	16251117 1		16/01/2020	12:13 PM	00:00	0.000	Charger error	Server Unreachable
			-71712277078			16/01/2020 -	12:11 PM	00:00	0.000	Charger error	Server Unreachable
			-81678561513	••••••		14/01/2020		143:29	52.867	Stopped by vehicle	SR_VEHICLE_STOP
		_	-67700106792	78567408 2		14/01/2020	10:06 AM	01:18	0.291	Stopped by user	Normal Stop

3.6.1.5 EV Charger Page -> Status & history

Charger care			ſ	
Home EV charget EV	chargers map Cases Solutions	Spare part Documents	Notifications	EV Charger Page
Search Q Gol Advanced Search	EV charger NAMT53-IT1-0517-027 « Back to List: EV chargers			
Create New	Summary Charge Sessions Status & history	Settings Settings history Day Charger NAMT53-IT1-0517-023	Summaries Statistics	
Recent Items           NAM/T63-IT1-0517           T54-IT1-2219-046           00039142	Communication status  Communication status for last 24 hour  Communication status for last 24 hour  14 15 16 17 18 19	20 21 22 23 0 1	2 3 4 5 Disturbed Not conner	6 7 8 9 10 11 12 13 cted
	Charger status			
	14 15 16 17 18 19	20 21 22 23 0 1 Ready for use Emergency button or end Charger internal problem Charger is turned off		n progress aintenance
	Charger status history			
	timestamp 16/01/2020 1:27 PM 16/01/2020 12:19 PM 14/01/2020 2:49 PM			charger status AVAILABLE OOCUPIED AVAILABLE
	14/01/2000 10:05:014			



## 3.6.1.6 EV Charger Page -> Settings

JAMT53-IT1-0517-027		
« Back to List: EV chargers		EV Charger Page
Summary Charge Sessions Status & hoory Settings	Settings history Day Summaries Statistics	LV Onarger Page
Charger	NAMT53-IT1-0517-027	
Charger settings overview	กะกระก	
<ul> <li>Charger settings</li> </ul>		
Charger enabled	true	edit
Authorization enabled	true	edit
Maximum charge time	-1	edit
Maximum current	125,000	edit
Power converters count	15	edit
	0	edit
Supported languages	pl,de,cn,da,tr,sl,sv,hu,fi,it,fr,nl,el,cs,no,lt,lv,es,ko,ru,en	- COILE
Active languages	fr.en	edit
Authorize for stop	false	edit
OCPP remote start-stop enabled	false	edit
Local white list cache enabled	true	edit
RFID enabled	true	
PIN enabled	false	edit. edit
Pin prefix	PIN:	eon
Do not show phone tab		a still
	true	edit
Payment Terminal installed	false	
Payment Terminal type	COV	edit
Authorization mode	2	edit
		edit
Fallback delay	300	edit
Preferred operator		edit
AutoCharge enabled	false	edit
<ul> <li>Charger actions</li> </ul>		
Restart application	r	send action
CPI reset	# 11	send action
IMI reset	).#^^~	send action
Notify hardware change on next restart	P	send action
Start self test		
DCB power board set to normal	P# 11	send action
DCB power board inhibit	#	send action
<ul> <li>Service settings</li> </ul>		
Heartbeat interval	240	
Communication timeout		
	namt53_it1_0517_027	edit
Nobil identifier		

## 3.6.1.7 EV Charger Page -> Day Summaries

immory	Charge Sessions Status & history Setting	s Settings history	Day Summ	aries Statist	ics	EV Charg	er Page			
	Charger NAMT53	-IT1-0517-027								
EV char	ger day summaries									
Action	EV charger day summary: Day	Date	Uptime	Disturbed	Not connected	Healthy	Not healthy	charge sessions	Energy delivered (kWh)	State changes
	NAMT53-IT1-0517-027#15-1-2020	15/01/2020	100.0	0.0	0.0	100.0	0.0	0		0
	NAMT53-IT1-0517-027#14-1-2020	14/01/2020	100.0	0.0	0.0	100.0	0.0	2	53.16	12
-	NAMT53 IT1 0517 027#13 1 2020	13/01/2020	100.0	0.0	0.0	100.0	0.0	2	17.12	4
	NAMT53 IT1 0517 027#12 1 2020	12/01/2020	99.9	0.1	0.0	100.0	0.0	0		2
-	NAMT53-IT1-0517-027#11-1-2020	11/01/2020	100.0	0.0	0.0	100.0	0.0	0		0



## 3.6.1.8 EV Charger Page -> Statistics





## 3.6.2 Charger page

10 X - 10			
Charger			
NAMT53-IT1-0517-027			
Charger Detail	Edit		
<ul> <li>Charger identification</li> </ul>			
Charger serial #	NAMT53-IT1-0517-027	Record Type	Terra (Change)
Material description	T53 CJ UL	Owner	
Status remarks		Customer	CAABB
		Address	ABB Inc: 10300 Boulevard Henni-Bourassa Ouest Saint-Laurent, Quebeo H4S 1N8 Canada
		Site	CAABB, QC, Saint Laurent - Boulevard Henri-Bourassa Ouest
Last Modified By	Zakana Botros, 28/09/2019 3:53 AM	City	Saint Laurent
		State	
		Country Code	
		Latitude	45.488899
		Longitude	9 -73.759781
			ABB Canada corporate office
		External fuse	0 100 A
Contraction -			
<ul> <li>Charger Life Cycle Info</li> </ul>			
Delivery Status			out of warranty.
Date SAT	04/05/2017	Next maintenance date	
		Warranty period (months)	
		Factory warranty period	0 12

## 3.7 Spare part

					10
Charger care					
Home EV chargers EV	V chargers map Ca	ses Solutions Spare part Documer	Notifications		
Search Q	753 / 723 - US - All p	arts			Printable Vie
Gol Advanced Search	View: T53 / T23 -				
Create New *	Part Material Numb 6AGC072811	er Spare part Name T5X;CP; FRONT DOOR LOCK KIT / Cylinder	Content remark This spare part has new cylinder with 3 keys	Part suitable for Tx3 CE version: Tx3 UL version:	1st line stock recommendation
	BAGC072811	and key	This spare part has new dyinder with 3 keys	HVC; HxC; HPC; Tx4; CP	
Recent Items	6AGC063757	TX3UL, INSERT PU MANCHET CCS-1; BAGC063757	For NAMT53 / NAMT23 UL (US) - CCS outlet - Insert PU manchet. Compatible with new and old CCS-1 cables: 6AGC063759; 6AGC063758; 4EPY240036R1; 4EPY240017R1	Tx3 UL version	×
NAMT53-IT1-0517	8AGC083758	TX3UL; CABLE W/ CONNECTOR CCS-1 15FT; 6AGC063758	For NAMT53 / NAMT23 UL (US) - COS outlet - Cable with connector. Length: 4.5m total / 3.9m external. NOTE: If replacing old RENA cables (28mm diameter), insert and assembling kit is needed: - Insert: 8AGC083757 - Assembling kit: 6AGC083756	Tx3 UL version	1
T54-IT1-2219-046 () 00039142	6AGC063759	TX3UL, CABLE W/ CONNECTOR CCS-1 20FT, 6AGC083759	For NAMT53 / NAMT23 UL (US) - CCS outlet - Cable with connector. Length: 6.6m total / 6.0m external. NOTE: If replacing old RENA cables (26mm diameter), insert and assembling kit is needed: - Insert: 6AGC063757 - Assembling kit: 6AGC063756	Tx3 UL version	1
	8AGC084613	TX3UL; INSERT PU CHADEMO UL SUMITOMO CONNECTOR; 6AGG084613	For NAMT53 / NAMT23 UL (US) - CHAdeMO outlet - Culf insert PU for PLASTIC and Metallic Sumitomo connector. For NAMT53 / NAMT23 UL (US) - CHAdeMO outlet - Culf insert PU for PLASTIC and Metallic Sumitomo connector.	Tx3 J; Tx3 UL version	4
	4EPY440117R2	TX3UL; CHADEMO UL CABLE W/ PLASTIC CONNECTOR 15FT; 4EPY440117R2	For NAMT53 / NAMT23 UL (US) - CHAdeMO outlet - Cable with PLASTIC connector. Length: 4.5m total / 3.9m external	Tx3 J; Tx3 UL version	1
	4EPY440154R2	TX3UL; CHADEMO UL CABLE W/ PLASTIC CONNECTOR 20PT; 4EPY440154R2	For NAMT53 / NAMT23 UL (US) - CHAdeMO outlet - Cable with PLASTIC connector. Length: 8.6m total / 6.0m external.	Tx3 J; Tx3 UL version	~
	6AGC072715	TX3; TX4; UL, GUNHOLDER CCS1 PHOENIX- REMA 125A; 8AGC072715	For NAMTX4 / NAMT53 / NAMT23 UL (US) - CCS outlet - Insert PU manchet. Compatible with new and old CCS-1 cables. eAGC053796, eAGC053756, LEPY240036811, JEPY240017R1	Tx3 UL version; Tx4	1
	4EPY140039R1	TX3: AIR FILTER INLET KIT, 4EPY140039R1	For T53 / T23 / NAMT53 / NAMT23 CE and UL (Europe and US) - Inlet filter kit (2 units). Each charger has two inlet filters.	s Tx3 CE version; Tx3 UL version	1

From the Drop down list the operator can choose the model to have all the spare parts related to this model. This is very beneficial for service team to forecast their inventory and order directly the replacement for the faulty part.



## 3.8 Documents

ABB .							1
Charger care							
Home EV chargers E	EV chargers n	nap Cases Solutions Spare part	Documents Notifications				
Search Q	Documents Serv	s vice instructions T53				E	intable V
Advanced Search	Folder	Service instructions T53					
Create New +			A B C D E F B H H J K L M N O F	9 Q R S	TUVW	si yi z	Other
	Action	Name 🔦	A B C D E F B H H J K L M N O F		E Last Modifie		
Recent Items	Action View	Name A		File Size		d Type	Autho
Recent Items		Service Report template rev. 10 SI-T53-0000 Safety instructions v1.2	Description Service Report template rev: 10 - 2018-09-29 Safety instructions to follow before performing any service in the charger.	File Size 46KB 427KB	Last Modifie 04/05/2018 08/05/2018	d Type doco pdf	Autho mniar bsbra
Recent Items  NAMT53-IT1-0517 NAMT53-IT1-0517 CECA-00005	View	Service Report template rev. 10	Description Service Report template rev. 10 - 2018-09-29	File Size 46KB 427KB	Last Modifier 04/05/2018	d Type doco pdf	Autho mnier bsbre
Recent Items NAMT53-IT1-0517 NAMT53-IT1-0517. CECA-00005 54-IT1-2219-048	View View	Service Report template rev. 10 SI-T53-0000 Safety instructions v1.2	Description Sance Report template rev: 10 - 2016-00-29 Safety instructions to follow before performing any service in the charger. Shows an overview of the TSS/TSS components and their connections.	File Size 46KB 427KB 1.31MB	Last Modifie 04/05/2018 08/05/2018	d Type doa pdf pdf	Autho mniar bsbra bsbra
Recent Items	View View View	Service Report template rev. 10 SI-T53-0000 Safety instructions v1 2 SI-T53-0001 Components overview v1.3	Description Service Report template rev. 10 - 2018-09-29 Safety instructions to follow before performing any service in the charger. Shows an overview of the T53/T23 components and their connections. Includes a view of the connectors on the CPB and CCB board.	File Size 46KB 427KB 1.31MB 3.68MB	<ul> <li>Last Modifier</li> <li>04/05/2018</li> <li>08/05/2018</li> <li>24/04/2018</li> </ul>	d Type doo pdf pdf pdf	Autho mnier bsbra bsbra
Recent Items NAMT53-IT1-0517 NAMT53-IT1-0517. CECA-00005 54-IT1-2219-048	View View View	Service Report template rev. 10 SI-TS3-0000 Safety instructions v1 2 SI-TS3-0001 Components overview v1 3 SI-TS3-0005 Preventive Meintenance v1 1 SI-TS3-0006 Connecting to a fixed LAN	Description Sense Report templateries: 10 - 2016-00-20 Safety instructions to follow before performing any service in the charger Shows an overview of the T53/T23 components and their connections. Holidate a view of the connections on the CPH and CCB board. Preventive Mantenance version 1.1	File Size 46KB 427KB 1.31MB 3.68MB 241KB	Last Modifie 04/05/2018 08/05/2018 24/04/2018 14/11/2017	d Type doop pdf pdf pdf pdf	Autho mnier bsbra bsbra bsbra JvdVo
Recent Items	View View View View View	Service Report template rev. 10 BI-TSS-0000 Sallety instructions v1.2 SI-TSS-0001 Components overview v1.3 SI-TSS-0005 Pre-entive Mandenairoe v1.1 SI-TSS-0005 Connecting to 18 Evial LAM network 3.5.0 v1.2 SI-TSS-0007 Benedie acress using a Laptop	Description Sance Report template rev: 10 - 2016-00-29 Safety instructions to follow balars performing any service in the charger: Shows an event of the TSST252 components and their connections. Includes a view of the sonreactors on the CPIs and COB board. Preventive Maintenance version 1.1 Freiventive Maintenance version 1.1 Freiventi	File Size 46KB 427KB 1.31MB 3.68MB 241KB 863KB	Lest Modifier 04/05/2018 08/05/2018 24/04/2018 14/11/2017 02/05/2018	d Type door pdf pdf pdf pdf zip	Autho mnier bsbra bsbra JvdVo JvdVo
Recent Items	View View View View View View	Service Report template rev. 10 SI-TSS-0000 Safety instructions v1.2 SI-TSS-0001 Components overview v1.3 SI-TSS-0005 Preventive Maintenance v1.1 SI-TSS-0005 Preventive Maintenance v1.1 SI-TSS-0005 Preventive Maintenance v1.1 SI-TSS-0005 Preventive Maintenance V1.1 SI-TSS-0005 Maintenance Schedule - CE (European version) v0.4	Description Service Report template rev. 10 - 2016-09-29 Safety instructions to follow before performing any service in the charger. Shows an owninker of the T537125 components and their connections Includes a view of thre connectors on the CPIs and COB board. Preventive Maintenance version 1.1 Frievall settings in case the charger is connected to a fixed LAN. This procedure makes it possible for the Service PG EVCI to temporary access the charger remotely via a laptop of a 1st line engineer on site. This chould be used if the incoder of the Service PG EVCI to temporary access the charger remotely via a laptop of a 1st line engineer on site. This chould be used if the incoder of the Commission does not work. Updated for ARM-VL	File Size 48KB 427KB 1.31MB 3.68MB 241KB 863KB 232KB	Last Modifie 04/05/2018 08/05/2018 24/04/2018 14/11/2017 02/05/2018 21/01/2019	d Type doo pdf pdf pdf pdf zip pdf	Autho mnier bsbra bsbra Jsbra JvdVo JvdVo rlolk
<ul> <li>NAMT53-IT1-0517</li> <li>CECA-00005</li> <li>T54-IT1-2219-048</li> </ul>	View View View View View View	Service Report template rev. 10 SI-755-0000 Safety instructions VI 2 SI-753-0000 Components overview VI 3 SI-753-0000 Components overview VI 3 SI-753-0000 Coméditing to a fixed LAN retirours 8.5 /VI 2 SI-755-0007 Remote acress using a Leptop V2_1-instructors-Attanhment SI-753-000 Remote acress using a Leptop V2_1-instructors-Attanhment SI-753-0007 Menthenance Scholdie - CE (European version) v0_4 SI-753-0007 Menthenance Scholdie - CE	Description Service Report template rev. 10 - 2016-09-29 Safety instructions to follow before performing any service in the charger. Shows an owning of the TS37125 components and their connections. Includes a view of the connectors on the CPIs and CCB board. Preventive Maintenance version 1.1 Freventive Maintenance version 1.1 Freventive Maintenance version 1.1 Freventive makes it possible for the Service PC EVCI to temporary access the charger remotely via e laptop of a 1st line engineer on site. This Frouds be used if the modern or fixed line internet connection does not work. Updated for ARM-XL. Maintenance Schedule for TS3 and T23 CE (European version) chargers.	File Size 48KB 427KB 1.31MB 3.88MB 241KB 863KB 232KB 248KB	<ul> <li>Last Modifie</li> <li>04/05/2018</li> <li>08/05/2018</li> <li>24/04/2018</li> <li>14/11/2017</li> <li>02/05/2018</li> <li>21/01/2019</li> <li>29/06/2018</li> </ul>	d Type doc pdf pdf pdf pdf zip pdf pdf	Autho mnian bsbra bsbra JvdVo JvdVo rlolk bsbra

ABB Charger care tool contains a lot of documents related to service and gathering technical experience we had from the field. Also, documentations about required step to perform a task to repair a specific technical problem. In addition, the service instructions is a very useful document to inform the team about finding related to the product that they might face in the field.

Example for service instruction document:

SI-T53-0107					-		1.	
Transation and advances	T53	C X	X	G	T	Pages	1 22	
Subjected chargers	153	X	X	X	X	Version	2.2	
Estimated Time						Date 15-05- Assistance 2 <sup>nd</sup> line support required? No		
sumated nime	Assistance 2 <sup>22</sup> line support required r No							
	part de	escriptio	n			Quantity		
Required parts	TX3; 3G ANTENNA; 4EPY230065R1 1							
Required tools			mm and					
Preparation	Make	sure no	water ca	an leak	into the	charger when removing the old anten	na	
turning the charger back o Contact 2 <sup>nd</sup> line support re No remote assistance by 2	ason:	port ne	eded to	comple	te this	Service Instruction		
Procedure: 1) Before performing 2) Unscrew the SMA		r on the	HMI mo	odule (A arness.	<b>()</b> .	0000 Safety instructions.		



# 4 Communication status, Charger status and error codes list

ABB webtools are using a list of words to express the status of the charger, error codes related to a charge session "stop reason" and the communication status between the charger and the server.

Error codes	Charger status	Communication status
	6	
Stop reason detailed	Charger status	
SR_VEHICLE_STOP	Ready for use	
SR_GLOBAL_INTERLOCK_FAIL		
	Ready for use	Not connected
SR_VEHICLE_STOP	<b>E</b> Ø –	
SR_GLOBAL_INTERLOCK_FAIL	· 📴 Ready for use	
	Outlet(s) turned off	n 🔀 Not connected
SR_VEHICLE_STOP		
		Connected

## 4.1 Communication status list

status	Meaning	Action to do
Connecteu	The Charger is online and well con- nected to the server.	N.A
Not connected		If the charger is powered up and show offline on the Webtool, you can reset the modem through re- booting the charger.
Disturbed		If the charger has powered the status will be connected soon. this status is usually seen when we reboot the charger.
Caracter Migrated	The charger just had a SW update and could not connect to the server	Contact ABB local support team



## 4.2 Charger status list

status	Meaning	Action to do
Ready for use	Charger is available for charging	Connect your Vehicle to the charger to start charging
Charging in progress	There is a session in pro- gress, a summary for this session will be logged into the charge sessions tab	N.A
Charger is reserved	The charger is reserved ac- cording to a schedule accord- ing to the programmed con- figuration.	Contact the opera- tor for this Charger for more info.
Unavailable - emergency button pressed	The emergency button is pressed mechanically	Release the emer- gency button if there is no emer- gency or contact the Operator for more info.
Charger in error	There is internal error in the Charger	Contact the local ABB service depart- ment.
Outlet(s) turned off	The charger is disabled	Contact the opera- tor for more info.
Charger in maintenance	If there is a current mainte- nance activity in the charger	Contact the opera- tor for more info.
Status unknown	There is no communication between the charger and the server	You can power cycle the charger if this did not help contact ABB local service point.
Dnavailable - door open		Close the door if it is not needed to be open, if the issue still the same con- tact local ABB ser- vice center.



## 4.3 Error codes list

ABB charger declare the stop reason for every single charging session occurred on ABB chargers, the stop reason columns is listed in the EV Charger page in any webtool account.

Here a list of error codes or stop reason for charge sessions with an explanation for possible reason and the action to be considered in such situation.

Error code	Meaning / reason behind	Action to do
NORMAL STOP	Normal charge session which ended by the normal behavior as expected	N.A
SR_VEHICLE_STOP	The Vehicle requested to stop the session, through the operator re- quest or internal trigger in the con- troller of the Vehicle	If the Vehicle operator requested to stop then no action required, if the vehicle stop the session unexpectedly contact the vehicle manufacturer service center. at any time you can consult local ABB ser- vice center for more details if needed.
REMOTE STOP REQUEST	The remote back end of the Charger operating company sent a stop request through the OCPP communication channel.	If this trigger to stop the session is not as expected , please con- tact your OCPP back end support.
SR_ACS_ERROR_ALIGNMENT	The Pantograph did not find the BUS rails when it full extended	The driver is required to step out of the Vehi- cle to visually check if the Bus well located under the Pole to have the Pantograph rails contact the bus rails or not. if the error repeated while the bus is well lo-
		cated under the panto- graph, contact local ABB service center.



Error code	Meaning / reason behind	Action to do
SR_ACS_ERROR_EXTENDING	Problem happened that prevent the Pantograph from Extending	Try another charging session if the error is repetitive contact local ABB service Center.
SR_ACS_EXTENDED_TIMEOUT	The time allocated to the panto- graph to extend is finished before the pantograph is fully extended, Probably an internal problem in the mechanism of the pantograph	Contact local ABB ser- vice center
SR_ACS_RETRACTED_TIMEOUT	The time allocated to the panto- graph to retract is finished before the pantograph is fully retracted, Probably an internal problem in the mechanism of the pantograph	Contact local ABB ser- vice center
SR_CHARGER_CONNECTOR_PRES ENCE_LOST		Try another charge session, if the problem repeated contact vehi- cle's service support team. at any time, you can consult local ABB ser-
SR_CHARGER_ERROR	Internal error in the charger	vice center for more details if needed. Contact local ABB ser-
	<b>-1</b> 1	vice center
SR_CHARGER_MAX_VOLTAGE	The voltage measured by the charger on the vehicle side or re- quested by the Vehicle is exceeding the max voltage value listed in the charge session log.	Contact local ABB ser- vice center or Vehicle's service support team.
SR_CHARGER_VOLTAGE_DROP	The voltage measured by the charger on the vehicle side is lower than voltage requested by the vehi- cle or delivered by the power mod- ules.	Contact local ABB ser- vice center
SR_CONNECTOR_ERROR	Problem in the connectivity be- tween the charger and the vehicle	Contact local ABB ser- vice center

#### ELECTRIC VEHICLE INFRASTRUCTURE - WEBTOOLS USER GUIDE



Error code	Meaning / reason behind	Action to do
SR_EMERGENCY_STOP	An emergency stop status raised by either the charger or the vehicle for a reason define din the internal logic of the equipment.	
SR_GLOBAL_INTERLOCK_FAIL	s=circuit of the charger like open- ing the door during the charge ses- sion or pressing the emergency stop button. in addition this may occurs if the	If no one open the door during the charge session or pressed the emergency stop butt- ing during the charger session, Contact local ABB service center
SR_ISOLATION_TEST_FAILED	The isolation monitoring mecha- nism in the charger found an isola- tion problem in the charging sys- tem overall, it could be the cable that connect the charger to the ve- hicle or the vehicle internal system.	Contact local ABB ser- vice center or Vehicle's service support team
SR_OUTLET_ERROR	Internal problem in the outlet "con- nector or cable between the vehicle the charger"	
SR_POWERPORT_POWER_ERROR	Internal problem in the charger caused by one or more faulty com- ponent	Contact local ABB ser- vice center
SR_USER_REQUESTED_STOP	stop button over the charger	If no user pressed the stop button please contact local ABB ser- vice center or Vehicle's service support team
SR_VEHICLE_NOT_CONNECTED	The connection between the charger and the vehicle is inter- rupted	Try to connect the ve- hicle again if the prob- lem repeated contact local ABB service cen- ter
SR_VEHICLE_PROTOCOL_ERROR	of charging, like change the state unexpectedly, did not reply a mes- sage with the expected way in the standards.	Try another charge session, if the problem repeated contact vehi- cle's service support team. at any time, you can consult local ABB ser- vice center for more details if needed.

#### ELECTRIC VEHICLE INFRASTRUCTURE - WEBTOOLS USER GUIDE



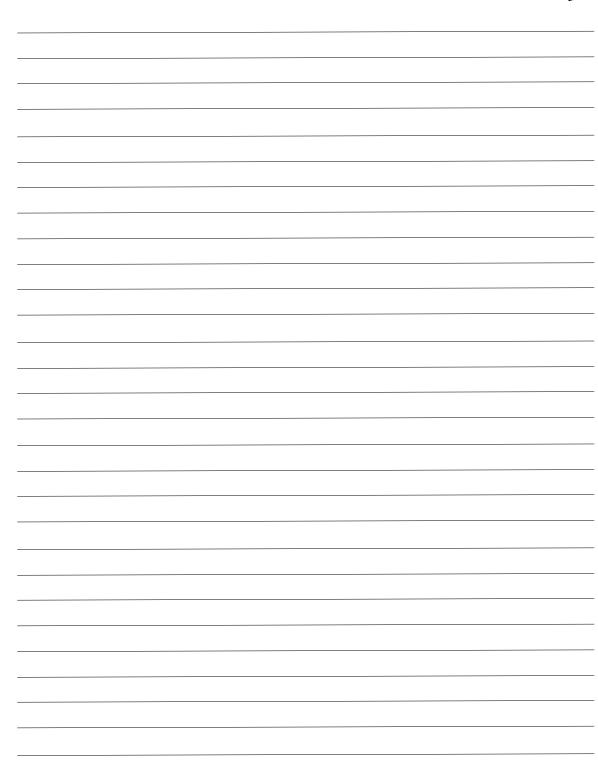
Error code	Meaning / reason behind	Action to do
SR_CHARGER_ERROR_CURRENT_ DIFFERENCE		Contact local ABB ser- vice center
SR_CHARGER_TIME_COMPLETED	charge tine parameters in the charger setting page, finished. The	Contact the charger operator for more de- tails or to change the setting
SR_VEHICLE_ERROR	havior according to the standards of charging, like change the state unexpectedly, did not reply a mes- sage with the expected way in the standards.	Try another charge session, if the problem repeated contact vehi- cle's service support team. at any time, you can consult local ABB ser- vice center for more details if needed.

X	DANSK	Elektrisk og elektronisk udstyr indsamles særskilt i overensstemmelse med direktiv om aftald af elektrisk og elektronisk udstyr (WEEE - 2012/19/EU)	Symbolet (en overstregtet affaldsspand med hjul) på produktet angiver, at produktet ikke må blan- dues med eller bortskaffes sammen med almindeligt husholdningsaffald, når det er udtjent. Produktet skal affeveres til det lokale affaldsindleve- imgssted til genburg. Kontakt venligst afdelingen for bortskaffelse af affald i din kommune angående yderligere information. Uhrensigtsmæssig bortskaffelse af affald kan have en negativ virkning på miljøet og folks helbred, da det megativ virkning på miljøet og folks helbred, da det medvirken i hensenne til forskriftsmæssig bortskaf- felse af dete produkt, kan du bldrage til genthruge, rechkulere og genindvinde produkterne og samtidigt medvirke til, at vores miljø vil blive beskyttet.	X	IMOMI	Sáhkö- ja elektroniikkalaitteet on kierrätettävä erikseen sähkö- ja elektroniikkalaiteronusta an- netun direktiivin (WEEE - 2012/19/EU) mukaisesti	Tuotteeseen merkitty symboli (yittse ruksattu jäitesäiliö) osoittaa, että tuotetta ei saa sekoittaa eikä hävittää ta- lousijätteiden kanssa. Tuote on luovutettava sopivaan tällaisten laitteiden kierrätyksestä huolehtivaan keräyspisteeseen. Pyydä lisätetoja jäiteasioista vastaavilta paikallisitta viranomasitta.	Tămăn tuotleen asiamrukaisen hävittämisen varmi- stamisella autetaan estämään sen mahdolliset ympän- stöön ja terveyeen kohdistuvat hahakikutikset tipa voi aiheutua muussa tapauksessa tämän tuot- teen epäasiamrukaisesta käsittelystä. Hävittäntä tuotteen asiamrukaisesti autat varmistamaan, että tuote uudelleenkäytettään, kiemätetään ja kerättään ja ympäristöä suojellaan.	
X	NEDERLASNDS	Elektrische en elektronische apparatuur worden alzonderlijk ingezameld in naleving van de vereisten van de Richtlijn betreffende afgedankte elektrische en elektronische apparatuur (WEEE - 2012/19/EU)	Het symbool (doorgekruisde afvalbak op wielen) op het product geeft aan dat het product aan het einde huran haar levensduur niet samen met of in de vorm van huran haar levensduur moet naar een werzamelplaats (milleu- depot) worden gebracht waar dergelijke producten worden gerecycled. Neem voor meer informatie contact op met de rele- vante overheidsafdeling voor afval/vulnins die in uw Het kan nadelige gevolgen hetben op voor mens en milleu ats afval op een verkeerde marier wordt be- handeld waardoor potentieel schadelijke stoffen vrij duct op de juiste wige wegwerpt, kunt u een bijdrage leveren aan het herstellen, hergebruken en recyclen van dit product om zo ons milieu te beschemen.	X	SVENSKA	Elektriska och elektroniska produkter ska samlas in separat i enlighet med direktivet om avfall som utgörs av eller innehåller elektrisk eller elektronisk utrustning (WEEE - 2012/19/EU)	Denna symbol (en överkorsad soptunna) på produkten innebär att produkten ej ska blandas eller slängas med ditt hushålisavfall när den är förbukkad. Produkten fsa lämnas til en lokal insamlingsplats för denna slags produkter för årevinning, kontakta kom- mukontoret för nämare detaljer om var du finner sådana insamlingsplatser.	Olämplig avfallshantlering kan få negativa effekter på miljön och på mänsklig hälsa då en produkt kan in- nehålla farliga ämnen. Vi ber om dit samanteta i bortskaffningen av denna produkt for att samanteta i li årervinning, återanvändning och en hälsosammare miljö.	
X	ESPAÑOL	Aparatos eléctricos y electrónicos recopilados de modo separado en conformidad con la Directiva sobre residuos de aparatos eléctricos y electróni- cos (WEEE - 2012/19/EU)	Los productos identificados con este simbolo (pa- pelera tachada) no deben eliminarse como residuos domésticos una vez finalizada su vida úiti. Este producto debe entregarse a un punto de reco- gida de la comunidad local para su recuperación y recicidao. Para mayor información, sirvase ponerse en contacto con el Departamento de Disposición de Desectos de su Ayuntamiento. En manejo inadecuado de los residuos suporne riegos para la salud humana o el medio ambiente. Con la reu- titización, el recicidado de los materiales u otras formas de valorización de tales productos usted contribuye de manera importante a la protección de nuestro medio ambiente.	X	PORTUGUÊS	Equipamentos Eléctricos e Electrónicos recolhi- dos seletivamente de acordo com a Diretiva re- lativa aos resíduos de equipamentos elétricos e eletrónicos (WEEE - 2012/19/EU)	O simbolo (caxiote de livo de rodas com uma limha cruzada) em seu produto indica que o produto, no fim da sua vida úñ, não deve ser misturado ou eliminado com o lixo doméstico comum. Este produto deverá ser entregue a uma estação de recolha de lixo da comunidade local para a reciciagem do produto.	Para mais informações, entre em contacto com o Departamento de Tratamento de Livo do Governo do Beu país. O tratamento de lixo incorrecto poderia provocar um efeito negativo no meio ambiente e saúde humana devido a substâncias potencialmente perigosas. Com a sua coopenação para a reutilização, correcta deste producto, contribuirá para a reutilização, correcta deste prodegido.	
X	FRANÇAIS	Équipements électriques et électroniques col- lectés séparément conformément à la Directive relative aux déchets d'équipements électriques et électroniques (MEEE - 2012/19/EU)	Ce symbole (poubelle interdite) apposé sur le produit indique qu'en fin de vie ce produit ne doit pas être traité avec les déchets méinagers. Il doit être remis à un point de collecte approprie pour le recyclage des aparelis électriques et électroniques. Pour de plus ampleis informations, veuillez contacter le senvice de collecte des déchets méinagers local Ce produit contient des substances potentiellement dangereuses qui peuvent avoir des effets néfastes sur l'environnement et la samé humaine. En veillant dangereuses qui peuvent avoir des effets néfastes sur l'environnement et la samé humaine. En veillant dangereuse assurer à assurer la savier la récupération et le recyclage de ce produit et à protéger l'environnement.	X	ITALIANO	Apparecchiatura Elettrica ed Elettronica oggetto di raccolta differenziata in conformità alla Direttiva sui Rifinti di apparecchiature Elettriche ed Elettro- niche (WEEE - 2012/19)EU)	Il simbolo (un bidone starrato da una croce) indica che il prodoto no deve essere smaltito con i rifluti dome- stici, alla fine della sua vita. Questo prodotto deve essere consegnato al punto di raccotta rifuti della propria comunità locale per il suo riciclaggio.	Per ulteriori informazioni, involgensi all'organo statale preposto allo smaltimento dei rifuti nel proprio paese. Uno smaltimento dei rifuti inappropriato può avere effetti negativi sull'ambiente e sulla salute umana a causa di sostanze potenziatmente periodiose. Coletoo- rando allo smaltimento corretto di questo prodotto, si contribuisce al riufitizzo, al ricidaggio e al recupero del prodotto, e alla protezione del nostro ambiente.	
ABB	ENGLISH	Electrical and electronic equipment to be separa- tely collected in compliance with the Directive on waste electrical and electronic equipment (NEEE - 2012/19/EU)	The symbol (crossed out wheeled bin) on your product indicates that the product shall not be mixed or disposed with your household waste, at their end of use. This product shall be handed over to your local community waste collection point for the recycling of the product. For more information, please contact your Government Waste-Disposal department in your country. Inappropriate waste handling could possibly have a pregive effect on the environment and human health due to potential hazardous substances. With your co-operation in the contect disposal of this product, you contribute to reuse, recycle and recover the product and our environment will be protected.	X	DEUTSCH	Elektro- und Elektronikgeräte sind getrennt zu sammeln in Einklang mit der Richtlinie über Elektro- und Elektronik-Attgeräte (WEEE - 2012/19/ EU)	Dieses Symbol (ausgekreuzte Mültionne) auf dem Pro- dukt bezeichnet, dass Altgeräte usw. nicht wie normaler Haushaltsabfall in den Mült gege- ben werden durfen, sondern zum Recycling an einer hierfür vorgesehenen Annahmestelle abzugeben ist. Für mätner Informationen werden Sie ab brüte an die für Mültensorunna zuständigen örtichen Behörden.	2 4 5 5 5 5 5 5	BCA.00165.0





# NOTES

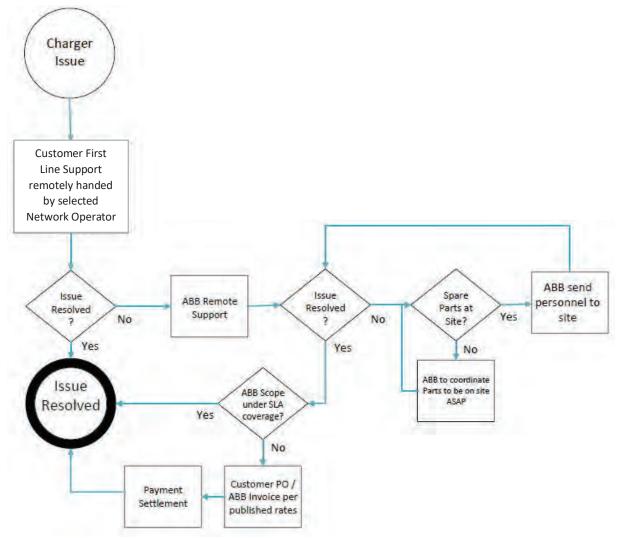


# What is the ABB Service Level Agreement?

ABB offers professional life cycle services for your installed products and systems. The solutions ABB provides will help you gain the information required for cost effective long-term decisions concerning overall system operation, maintenance, and personnel development.

# Process and Scope

All SLAs shall be governed by the following process. The below flowchart shall be amended according to the options selected in this contract and the expertise gained by the customer through training. A final revision shall be issued upon the signing of this contract.



For any service inquiry, please start by

Service Hotline: +1 (800) 825-2556 option 2

Service Email: <u>us.evci.techteam@abb.com</u>

*Note – For SLA's ABB can activate a ticketing or Email to Ticketing system as allowed by options selected below.* 

# Charger Support Request Response Time

ABB defines response time as the maximum allotted time requested for ABB to react to customer inquiries, acknowledge receipt by the EV charging service team, and begin the remote troubleshooting process. The response times mentioned below are for business hours only which is 7AM to 7PM CET Monday to Friday. Option 4 below adds a 24/7 Remote Response.

## Charger Support Request Response Time Options:

- CSRT1. Standard Twenty-four (24) hours
- CSRT2. Eight (8) hours
- CSRT3. Four (4) hours
- CSRT4. Under one (1) hour during 7AM to 7PM CET Monday to Friday; (2) hours outside operating hours. (Customer needs to call 1-800 number to enable the 1 & 2 hour response)

# Remote Diagnostics Response / Resolution

ABB defines Remote Diagnostic Response time as the maximum allotted time requested for ABB to provide a remote response after receiving a charger support request. The response times mentioned below are for business hours only which is 7AM to 7PM CET Monday to Friday. Option 4 below adds a 24/7 Remote Response. (Note, in an instance where the charger error is flagged as a level 3 issue and the support issue must be elevated to the Global Service Desk, the final response time may be delayed)

## Remote Diagnostic Response Time Options:

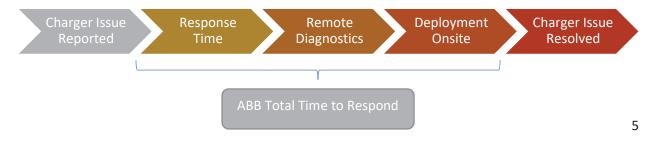
- RDRT1. Standard One Hundred and Twenty Hours (120) hours
- RDRT2. Seventy-Two (72) Hours –
- RDRT3. Twenty-Four (24) Hours

## Deployment Time of Onsite Service

ABB defines deployment time as amount of time allowed to lapse after the remote diagnostic response process is complete to the dispatching of an engineer/tech to site. If the issue cannot be resolved via remote support and it is mutually agreed that ABB support is needed onsite and spare parts are either at site or confirmed for delivery to site, then an ABB service personnel will be dispatched to be onsite. The timing of site work must be communicated and prioritized based on urgency of issue. This will need to be mutually agreed upon by parties involved. *(Note, this response may be limited by parts availability as selected in the options table in this document)* 

## Deployment Time of Onsite Service Response Time Options:

- DTOS1. Standard Ninety Six (96) hours
- DTOS2. Forty-eight (48) hours
- DTOS3. Twenty-four (24) hours (*Parts must be stored onsite or in forward stocking inventory to achieve this response time*)



# Customer Block of Time (CBOT)

ABB offers the option of pre-purchasing ABB time to provide an all-included troubleshooting service for the installed chargers, remote assistance, on site repairs, spare parts and travel time/expenses to be converted and deducted. This bank of hours is accrued annually upon the renewal of this contract. By selecting to bank hours, the customer will no longer be charged on a time and material basis and, instead, will have hours converted and deducted from their bank, as desired. If the hours consumed or converted exceed the banked time, the customer will be charged the delta.

## Customer Block of Time Options:

- CBOT1. Twenty (20) hours
- CBOT2. One hundred (100) hours
- CBOT3. Two hundred fifty (250) hours
- CBOT4. Five hundred (500) hours

(NOTE – If an SLA is purchased a minimum of 20 hours of CBOT must be purchased. The purchase of these hours is to allow ABB to quickly respond to all technical and charger support inquiries)

## Preventative Maintenance

Preventive maintenance can be scheduled at multiple intervals from the commissioning of each charger. This work shall be completed by an ABB EVCI qualified service engineering per the following maintenance schedules according to technology. The prices reflected in the pricing matrix do not include expenses and travel time, those will be charged at standard rates. The preventative maintenance includes a visual inspection of internal and external components, an air filter change, and testing. All additional necessary recommended repairs during preventative maintenance will be advised to the customer, and are not included. It is recommended that the customer follow the maintenance schedule as advised below, and replace all other parts (such as fans, power modules, etc) as per their recommended time frame at their own cost. The only spare part included in the PM price is the air filter.

## Preventative Maintenance Options:

- PM1. One (1) every two (2) years.
- PM2. One (1) per year (recommended and required if extended warranty is purchased).
- PM3. Two (2) per year.
- PM4. Site Preventive Maintenance Calculated per project

## HVC-C and HVC-PD Overview:

		1	P	С	Page	15					4						
Subjected chargers	HVC		X	Х	Vers	ion					1.2						
				1.1	Date	1					18-12-	2018		_			
Procedure:												-					
Performance of on-site work	(commissioning, test	s, mea	surem	ents or	r other	activit	ies)				P						
Replacement of component (	see related service in	struct	ion)								R						
		1						Y	ears fr	rom sta	art up		-				
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Start-up / Commissioning		P			1		1	1	1	1	1		1				
SERVICE				-													
RCD tests		-	Р	Р	Р	P	Р	Ρ	Ρ	Ρ	Р	Р	Ρ	Р	Ρ	Ρ	Р
RMS measurement (Country d	ependent)		Р	P	P	P	P	Ρ	Ρ	P	P	Р	P	Ρ	P	Ρ	P
Isolation measurements (Coun	try dependent)	-	Р	Р	P	P	P	Р	Р	Р	P	Р	Р	Р	Р	Р	Р
Grounding system measureme	nt		Р	Ρ	P	P	P	P	Р	P	P	Р	Ρ	Ρ	Ρ	P	P
Visual inspection		-	Р	Р	Р	P	Р	Р	Р	Р	P	Р	Р	P	Р	P	P
Improvements Based on Servic	e Letters			1-11	1111	1000		the triang	2014	1.000				1.00			1
MAIN CABINET																	
FILTER INLET KIT - 6AGC063809				R	12.1	R	1000	R		R		R		R		R	
FILTER OUTLET KIT - 6AGC064101	1				112		R	122.3		1		R					R
FAN POWER MODULE - 6AGC063	801				1		Ř	1000	100			R	1			12.24	R
MIDDLE FAN CABINET - 6AGC064	204				1	( (	R	ji co d		1		R					R
AC FUSE (Only for Sample A and	B) - 6AGC063799						R	1		1		R					R
CCB - 6AGC063811									1			R					1
POWER SUPPLY;24VDC;240W (2X	() - 6AGC063817						R	1-1			1-1	R	1	1			R
POWER MODULE - 6AGC063800										1		R	11.11	1		1	1.1
HVC HMI Assy 7" – 6AGC063855				-			Ŕ					R					R
DEPOT BOX - Preliminary				-			-			-							
Gunholders – As per product model					1		R	1			1	R					R
CCB – Not released											1	R	11.1			-	
CPI COMBO CCS - 6AGC072189				1	1		1	1	1	i i	1.000	R	1	1			
IMI COMBO CCS - 6AGC072311	-							1 - 1	1	1 1	1	R					17
POWER SUPPLY;24VDC;120W (2X	() - 6AGC076541				1	-	R	1		-	1	R	1	1			R

POLEACM																
	Years from start up															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fan - 6AGC063808	11.1					R	1.00	1			R	1.0	12.2	2001	1 1	R
CCB - 6AGC063811							1		1 1		R	1				1
CPI COMBO CCS - 6AGC063814				12.1			1.11				R		1	1.11		
IMI COMBO CCS - 6AGC063813			1	100				1			R				1	1
POWER SUPPLY;24VDC;480W - 6AGC063818			1 1	1		R	1		1		R				11.11	R
POWER SUPPLY;24VDC;120W - 6AGC063816				111		R	1 1		1 1		R					R
Pantograph (Stemmann)											1				-	-
							Y	ears fr	om sta	art up						
Cycles per day up to 70	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Tooth belt - 6AGC076677			1				1		R		-					
Plug-in relays - 6AGC072492			1.11				1.11	1	R						1 1	
Bridging strand - 6AGC072493			1 L.	1.1.1				1	R						11	
Connection cable set - 6AGC072494		-	1				1	1	R			-			1	
Leaf spring + plastic plate + Pin - 6AGC072495		1	1				1 1		R		-					
Electric motor – 6AGC076678			1	1			1.74		R			1				-
Contact rails – 6AGC072497		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
and the second sec							Y	ears fr	om sta	art up	1					
Cycles per day up to 140	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Tooth belt - 6AGC076677			-		R		1.1.1		R			-	R		1 1	1
Plug-in relays - 6AGC072492					-		R						R			
Bridging strand - 6AGC072493						1.00	R						R			
Connection cable set - 6AGC072494	111			1212			R	1					R		1 == 1	
Leaf spring + plastic plate + Pin - 6AGC072495							R				1		R		1 1	
Electric motor – 6AGC076678	11.	1.1		1 - 1			R					1	R	2,11	1	
Contact rails – 6AGC072497		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Overhaul / Main Inspection*								1					R		11	

\*Overhaul / Main Inspection cannot be performed on site and shall be carried out in a suitable workshop; we recommend obtaining a spare pantograph for replacement during the maintenance and/or considering redundant charging poles in the project.

The Maintenance Schedule for the HVC Power Cabinet is defined based on the following charging cycle options:

- Ambient temperature = 25°C and every day 8 consecutive hours charging at full load.
- Ambient temperature = 25 °C and cycles of 6 minutes charging at full load every 15 minutes for 8 hours a day.

Consumables are parts that will wear with the use, degrade faster based on weather, number of charging sessions and customer handling. They are not covered under warranty unless approved after RMA and are not included in the calculations. See table below for applicable consumables.

Consumables	Notes				
Cables with connectors (CCS, Chademo and AC)	Replace after 10.000 mattings				
Gunholders	Yearly inspection, replace after 5 years				
Contact rails	Inspection every 3 months / Cleaning / Replacing				

The contact rails must be replaced if one of any following condition are present:

- Minimum height of copper of 3mm over the whole length
- Deformation or damages due to arcs

## **Inspection Cycles:**

Periodic maintenance and cleaning

Pantograph:

• Removal of any accumulation on rails.

## Every 3 months

Contact rails:

- Functional testing / Visual inspection of the rail, cleaning, sanding or replacing if needed.
- Recommended interval, this may vary based on usage, weather conditions, bus design and operation.
- Failing to inspect and cleaning the Contact rails may cause additional wearing that requires an early replacement.
- Earlier need to perform this action can be monitored remotely via ABB tools by analyzing the increase in disconnection during charging sessions.
- The wear of the contact rails is expected during the operation and therefore must be monitored by the operator acc. to their operational experience.

## Every 6 months

Testing and greasing:

- Check of spring force and contact force
- Cycle time and cleaning
- Greasing as per service instruction
- Recommended interval, this may vary based on usage, weather conditions and bus design.

Environment characteristic and number of charging sessions may require additional replacement of the air filter during the lifetime of the charger.



#### ELECTRIC VEHICLE INFRASTRUCTURE USA

# **Service Level Agreements** Supporting best-in-class uptime



Charging infrastructure must operate with the highest utilization and lowest downtime. ABB's service level agreements meet that demand, incorporating a decade of experience with thousands of intelligent fast chargers deployed across the globe.

Services ensure operational excellence Operational excellence starts with reliable chargers. ABB's family of EV chargers are modularly designed to withstand heavy operation under rugged conditions.

In addition, ABB's fast chargers are the easiest in the market to service, with 24/7 connectivity for remote diagnostics, and accessible designs that expedite maintenance and field service.

ABB's EV charging infrastructure service offering includes remote and software services as well as training in addition to parts and warranty services.

## **Remote services**

- 24/7 connectivity
- Remote services
- Remote diagnostics
- Firmware upgrades
- ABB Web tools

# On-site service and parts availability

- Standard warranty execution
- Extended warranty options
- Service level agreements
- Preventive service and maintenance
- Spare parts programs

# $\checkmark$

# Custom software services

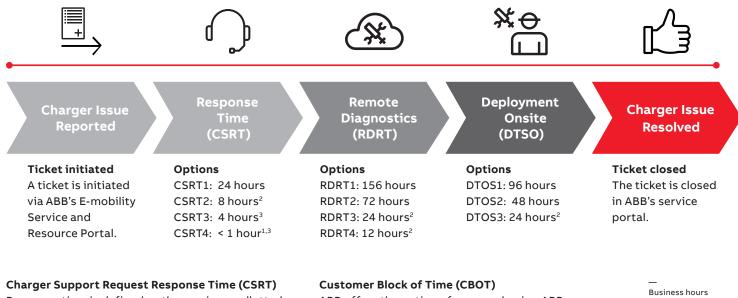
- OCPP integration
- Autocharge integration testing
- Interoperability testing and validation
- Customized software integration support

# Training

- Standardized online training
- Customized service training
- Third-party service training programs

# **E-mobility Service Level Agreements** High utilization requires maximum uptime.

ABB's service level agreements optimize charger uptime for faster remote and on-site response times, from the industry's most experienced service team – committed to customer success.



Response time is defined as the maximum allotted time requested for ABB to respond to customer inquiries, acknowledge receipt by the EV charging service team, and begin the remote troubleshooting process.

#### Remote Diagnostics Response Time (RDRT)

Remote Diagnostic Response time is defined as the maximum allotted time requested for ABB to provide remote response after receiving a charger support request. In cases where the charger error is flagged as a level 3 issue and the support issue must be elevated to the Global Service Desk, the final response time may be delayed.

#### Deployment Time of On-site Service (DTOS)

Deployment time is defined as the amount of time after the remote diagnostic response process is complete to the dispatching of an engineer/tech to site. If the issue cannot be resolved via remote support and it is mutually agreed that on site support is needed; and spare parts are either at site or confirmed for delivery to site, then ABB authorized service personnel will be dispatched to be on site. The timing of site work must also be mutually agreed upon. ABB offers the option of pre-purchasing ABB technical support time to provide an all-included troubleshooting service for ABB chargers, remote assistance, on site repairs, spare parts and travel time/expenses to be converted and deducted.

The bank of hours is accrued annually upon the renewal of this contract. By selecting to bank hours, the customer will no longer be charged on a time and material basis and instead will have hours converted and deducted from their balance, as requested. If the hours consumed or converted exceed the banked time, the customer will be billed the difference.

Customer Block of Time Options: CBOT1: 20 hours CBOT2: 100 hours CBOT3: 250 hours CBOT4: 500 hours

If an SLA is purchased, a minimum of 20 hours of CBOT must be purchased. The purchase of these hours allows ABB to quickly respond to all technical and charger support inquiries. Business hours are 7AM to 7PM CT Monday to Friday.

1) May be 2 hours outside business hours

2) Requires a 4-month ramp up from the date of SLA contract.

3) Requires a 6-month ramp up from the date of SLA contract.

4) Not suggested for high utilization sites where charging sessions may exceed recommended maintenance intervals.

5) Recommended and required if extended warranty is purchased.

6) Dependent on stock availability

# Service Level Agreement Options

A flexible menu of services

As the e-mobility market has grown, so have the needs of charging infrastructure owners and operators. To ensure that every site can reach its highest potential, ABB also offers preventive services to support proactive management business models.

#### Preventative Maintenance (PM)

Preventive maintenance (PM) can be scheduled at regular intervals from the commissioning date of every charger. This work shall be completed by an ABB E-Mobility authorized service technician per listed maintenance schedules and according to product recommendations.

ABB's E-Mobility PM includes a visual inspection of internal and external components, an air filter change and unit testing as well as advising on necessary or recommended repairs which may be additional. Travel expenses will be charged at standard rates.

Preventative Maintenance options PM1: Once every 2 years<sup>4</sup> PM2: Once per year<sup>5</sup> PM3: Twice per year PM4: Custom Site PM calculated basis project

#### Spare Parts, Storage and Availability

ABB's E-mobility Center of Excellence (CoE) in the United States manages parts order fulfillment. In addition to our CoE, ABB also has logistics, stocking and storage facilities to support sites across the country. ABB stocks a basic level of recommended spare parts for all customers with availability on a first come, first served basis.

ABB can also store customer-dedicated spare parts at our facility based on 'pallet per year' basis. Preselected spare parts in this program can be made available to ship within 24 business hours.

ABB can offer multiple options for spare parts solutions, storage and availability. We encourage our customer to carry routine and critical wear and tear parts as well as those with long lead times to ensure the highest uptime, round-the-clock availability of chargers, and lowest cost to overall operations.

#### Spare Parts List

For a list of recommended spare parts please contact your ABB sales representative.

## Storage of Customer Selected Spare Parts

CSSP1: At the customer site (recommended) CSSP2: At the ABB facility



**Availability of Replacement of Spare Parts:** ARSP1: Standard lead times - 6-8 weeks ARSP2: Shipped within 1 week from stock<sup>6</sup> ARSP3: Shipped within 24 business hours<sup>6</sup>

#### Standard and Extended Warranty Coverage

ABB offers a standard warranty for all EV charging equipment. Detailed warranty terms by product can be found in ABB's product warranty documentation. Optional extended warranties are available for purchase at the time of the charger purchase to increase coverage length and scope while securing known costs upfront. Standard preventative maintenance packages must be purchased for an extended warranty to be valid.

ABB also offers extended warranties after commissioning during the valid warranty period, which may require an updated proposal from ABB's e-mobility sales team. During the post-warranty period, a Service Contract can be purchased from ABB to enable ongoing service support.

#### **Connected Services and Web Tools**

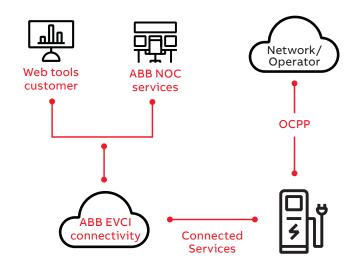
Charger connectivity enables remote service and support. Through ABB's robust platform, our customers have 60% of their service cases solved remotely resulting in very short response times and substantially reducing downtime. Connectivity allows remote software updates including charging protocols, user interface enhancements and back-end solutions for minimal field intervention as well as future-proofing software.

ABB Web Tools provide an online web interface that gives charging infrastructure operators and fleets with real-time status information and usage statistics on their equipment. Owners can gather detailed session statistics, configure chargers according to their preferences and obtain valuable insights through charger usage statistics. All charge session data can be exported and managed directly from this user-friendly application.

#### ABB Inc.

950 W Elliott Rd. Suite 101 Tempe, AZ, 85284 United States Phone: 800-435-7365 E-mail: US-evci@us.abb.com

abb.com/evcharging



We reserve the right to make technical changes or modify the contents of this document without prior notice. We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB. Copyright© 2021 ABB. All rights reserved.

# Appendix A: ABB Service Rates

# Customer support: on-demand rates

2020 Standard rate schedule for EV Charging Infrastructure (EVCI) for Field Engineer

## SAFETY FIRST!

For safety purposes, ABB reserves the right to limit continuous work of one individual to 12 hours with 8 hours of rest in a hotel prior to starting again.

Service Description	Applicable Standard Rate
EVCI Field Engineer	\$217
Office Support	\$217
Travel	\$217
Standby	\$217

Rate Terms	Multiplier
Regular	1.00 x Standard Rate
Overtime 1	1.50 x Standard Rate
Overtime 2	2.00 x Standard Rate
Night Shift Overtime	1.20 x Applicable Standard
	Rate
Less than 48 hours	1.20 x Applicable Standard
Notice	Rate

	Weekdays (Monday to Friday)	Saturday	Sunday & Holidays
Day Shift	Standard rate: First consecutive 8	Overtime 1 rate: First	Overtime 2 rate: Any
7:00 -	hours	Consecutive 8 hours	hours
19:00	Overtime 1 rate: After 8 and <12	Overtime 2 rate: Greater	
	hours	than 8 hours	
	Overtime 2 rate: Greater than 12		
	hours		
Night	Night Shift Rate: First consecutive 8	Overtime 2 rate: Any	Overtime 2 rate: Any
Shift*	hours	hours	hours
19:00 -	Overtime 1 rate: After 8 hours		
7:00			

\*Night Shift rates apply to any hours worked from 19:00 to 7:00

Other Costs	
Travel and Living Expenses: Hotel, car rental, airfare,	Actual cost + 10% administration Fee
taxi, etc	
Meal Allowance	Per Diem: \$75/Day
Car Allowance when applicable	\$0.60/Miles – minimum charge of 80Miles/day
Tools and Equipment Rental	Actual Cost + 10%

Minimum chargeable time at site 4-hour minimum charge on all service requests

Cancellation All services must be scheduled and confirmed at least 72 hours prior to travel. In the event of any cancellations in less than 72 hours prior to travel, all incurred expenses and an 8-hour cancellation fee will be charged at the applicable rate.

Standby Minimum billing of 8 hours per day at applicable hourly rate for all services provided, including standby during weekdays and weekends.

Premiums Danger pay based on regional risk, daily hardship premiums, out-of-country assignment, in-country remote area allowances, and daily offshore premiums will be applicable following ABB policies and standards.

#### 24/7/365 Technical Phone Support +1 (800) 825-2556 option 2

All the above prices are in USD currency and do not include federal, state/provincial, local or any other taxes (where applicable) and are subject to changes at any time without further notice. All services are performed under ABB Inc. Terms and Conditions of Sale. The above rates are assumed to be standard labor rates and any additional rate categories will be billed separately including prevailing and union wages.

# Appendix B: Additional Services Form

Service Request Form						
Serial Number						

Important: No Service Request will be processed without the mandatory information in red

# Appendix C: Spare Parts

# Recommended Spare Parts for HVC-C

Product	Part Number	Description	Price Per Unit (USD)	Quantity	Total (USD)
HVC-C	9601072	HVC Depot Box CCS-1 REMA Cable 200A 7.5m	\$3,462.44	1	\$3,462.44
HVC-C	6AGC063800	HxC Cabinet Power Module 50kW	\$5,150.00	1	\$5,150.00
HVC-C	6AGC063801	HxC Cabinet Power Module Fan	\$297.00	1	\$297.00
HVC-C	6AGC063809	HxC Cabinet Air Filter Inlet KIT	\$660.30	4	\$2,641.20
HVC-C	6AGC063813	HVC IMI Board	\$300.86	1	\$300.86
HVC-C	6AGC063817	HxC Cabinet 24VDC Power Supply	\$383.00	1	\$383.00
HVC-C	6AGC063854	HxC Cabinet Main AC Contactor	\$638.00	1	\$638.00
HVC-C	6AGC063855	HxC Cabinet HMI Display	\$3,549.11	1	\$3,549.11
HVC-C	6AGC064024	HxC Cabinet Middle Fan	\$122.48	1	\$122.48
HVC-C	6AGC064101	HxC Cabinet Air Filter Outlet KIT	\$311.51	2	\$623.03
HVC-C	6AGC072189	CP/DB/Tx4 CPI+Devolo Assembly	\$899.93	1	\$899.93
HVC-C	6AGC073734	HVC Cabinet Power Module Breaker KIT	\$381.63	1	\$381.63
HVC-C	6AGC076541	HVC Depot Box 24VDC Power Supply	\$561.79	1	\$561.79
HVC-C	6AGC078273	HVC Depot Box DC Contactor	\$241.40	2	\$482.80
HVC-C	6AGC078358	HVC Depot Box LED	\$324.83	1	\$324.83
HVC-C	6AGC078418	HVC Depot Box E-Stop Button	\$380.74	1	\$380.74
HVC-C	6AGC078420	HVC Depot Box Stop Button	\$380.74	1	\$380.74
HVC-C	6AGC078421	HVC Depot Box CAN to Fiber Converter	\$1,972.91	1	\$1,972.91
HVC-C	6AGC078422	HxC Ethernet to Fiber Converter	\$806.74	1	\$806.74
HVC-C	6AGC078427	HVC Fuse SPF003	\$31.95	10	\$319.50
HVC-C	6AGC078440	HVC Depot Box 120V Breaker MCB	\$167.74	10	\$167.74
HVC-C	6AGC078444	HVC Depot Box CCB board	\$1,070.33	1	\$1,070.33

# Recommended Spare Parts for HVC-PD

Product	Part Number	Description	Price Per Unit (USD)	Quantity	Total (USD)
HVC-PD	6AGC063800	HxC Cabinet Power Module 50kW	\$5,150.00	1	\$5,150.00
HVC-PD	6AGC063801	HxC Cabinet Power Module Fan	\$297.00	1	\$297.00
HVC-PD	6AGC063808	HVC ACM FAN	\$58.58	1	\$58.58
HVC-PD	6AGC063809	HxC Cabinet Air Filter Inlet KIT	\$660.30	4	\$2,641.20
HVC-PD	6AGC063810	HVC ACM DC Contactor	\$620.36	2	\$1,240.73
HVC-PD	6AGC063812	HVC ACS Control Board for CPI	\$202.35	1	\$202.35
HVC-PD	6AGC063813	HVC IMI Board	\$300.86	1	\$300.86
HVC-PD	6AGC063814	HVC ACM CPI Combo Board	\$620.36	1	\$620.36
HVC-PD	6AGC063816	HVC ACM 24VDC Power Supply 120W	\$561.79	1	\$561.79
HVC-PD	6AGC063817	HxC Cabinet 24VDC Power Supply	\$383.00	1	\$383.00
HVC-PD	6AGC063818	HVC ACM 24VDC Power Supply 480W	\$463.28	1	\$463.28
HVC-PD	6AGC063851	HVC Fiber Converters Ethernet+CAN KIT	\$2,036.81	1	\$2,036.81
HVC-PD	6AGC063854	HxC Cabinet Main AC Contactor	\$638.00	1	\$638.00
HVC-PD	6AGC063855	HxC Cabinet HMI Display	\$3,549.11	1	\$3,549.11
HVC-PD	6AGC064024	HxC Cabinet Middle Fan	\$122.48	1	\$122.48
HVC-PD	6AGC064101	HxC Cabinet Air Filter Outlet KIT	\$311.51	2	\$623.03
HVC-PD	6AGC072353	HxC ACS/Cabinet CCB Board	\$729.53	1	\$729.53
HVC-PD	6AGC072492	HVC ACS Stemmann 206.11 Plug-In Relays	\$87.86	2	\$175.73
HVC-PD	6AGC072493	HVC ACS Stemmann 206.11 Bridging Strand	\$210.34	2	\$420.68
HVC-PD	6AGC072494	HVC ACS Stemmann 206.11 Cable Connection Set	\$8,517.34	1	\$8,517.34
HVC-PD	6AGC072495	HVC ACS Stemmann 206.11 Flat Spring Plate KIT	\$290.21	2	\$580.43
HVC-PD	6AGC072497	HVC ACS Stemmann 206.11 Contact Rail	\$484.58	4	\$1,938.30
HVC-PD	6AGC073734	HVC Cabinet Power Module Breaker KIT	\$381.63	2	\$763.25
HVC-PD	6AGC076677	HVC ACS Stemmann 206.11 Tooth Belt	\$729.53	1	\$729.53
HVC-PD	6AGC076678	HVC ACS Stemmann 206.11 Electric Motor	\$5,056.09	1	\$5,056.09
HVC-PD	6AGC078427	HVC Fuse SPF003	\$31.95	10	\$319.50
HVC-PD	6AGC063819	HVC ACS Wi-Fi Modem	\$1,235.00	1	\$1235.00

# Appendix D: ABB General Terms and Conditions of Sale

## ABB GENERAL TERMS AND CONDITIONS OF SALE

1. General. The terms and conditions contained herein, together with any additional or different terms contained in ABB's Proposal, if any, submitted to Purchaser (which Proposal shall control over any conflicting terms), constitute the entire agreement (the "Agreement") between the parties with respect to the order and supersede all prior communications and agreements regarding the order. Acceptance by ABB of the order, or Purchaser's acceptance of ABB's Proposal, is expressly limited to and conditioned upon Purchaser's acceptance of these terms and conditions, payment for or acceptance of any performance by ABB being acceptance. These terms and conditions may not be changed or superseded by any different or additional terms and conditions proposed by Purchaser to which terms ABB hereby objects. Unless the context otherwise requires, the term "Equipment" as used herein means all of the equipment, parts, accessories sold, and all software and software documentation, if any, licensed to Purchaser by ABB ("Software") under the order. Unless the context otherwise requires, is expressly for the reservices, provided by ABB under the order. As used herein, the term "Purchaser" shall include the initial end use of the Equipment and/or services; provided however, that Paragraph 13(a) shall apply exclusively to the initial end user.

#### 2. Prices.

(a) Unless otherwise specified in writing, all Proposals expire thirty (30) days from the date thereof.

(b) Unless otherwise stated herein, Services prices are based on normal business hours (8 a.m. to 5 p.m. Monday through Friday). Overtime and Saturday hours will be billed at one and one-half (1 1/2) times the hourly rate; and Sunday hours will be billed at two (2) times the hourly rate; holiday hours will be billed at three (3) times the hourly rate. If a Services rate sheet is attached hereto, the applicable Services rates shall be those set forth in the rate sheet. Rates are subject to change without notice.

(c) The price does not include any federal, state or local property, license, privilege, sales, use, excise, gross receipts, or other like taxes which may now or hereafter be applicable. Purchaser agrees to pay or reimburse any such taxes which ABB or its suppliers are required to pay or collect. If Purchaser is exempt from the payment of any tax or holds a direct payment permit, Purchaser shall, upon order placement, provide ABB a copy, acceptable to the relevant governmental authorities of any such certificate or permit.

(d) The price includes customs duties and other importation or exportation fees, if any, at the rates in effect on the date of ABB's Proposal. Any change after that date in such duties, fees, or rates, shall increase the price by ABB's additional cost.

#### 3. Payment.

(a) Unless specified to the contrary in writing by ABB, payment terms are net cash, payable without offset, in United States Dollars, 30 days from date of invoice by wire transfer to the account designated by ABB in the Proposal.

(b) If in the judgment of ABB, the financial condition of Purchaser at any time prior to delivery does not justify the terms of payment specified, ABB may require payment in advance, payment security satisfactory to ABB, or may terminate the order, whereupon ABB shall be entitled to receive reasonable cancellation charges. If delivery is delayed by Purchaser, payment shall be due on the date ABB is prepared to make delivery. Delays in delivery or nonconformities in any installments delivered shall not relieve Purchaser of its obligation to accept and pay for remaining installments.

(c) Purchaser shall pay, in addition to the overdue payment, a late charge equal to the lesser of 1 1/2% per month or any part thereof or the highest applicable rate allowed by law on all such overdue amounts plus ABB's attorneys' fees and court costs incurred in connection with collection.

#### 4. Changes.

(a) Any changes requested by Purchaser affecting the ordered scope of work must be accepted by ABB and resulting adjustments to affected provisions, including price, schedule, and guarantees mutually agreed in writing prior to implementation of the change.

(b) ABB may, at its expense, make such changes in the Equipment or Services as it deems necessary, in its sole discretion, to conform the Equipment or Services to the applicable specifications. If Purchaser objects to any such changes, ABB shall be relieved of its obligation to conform to the applicable specifications to the extent that conformance may be affected by such objection.

#### 5. Delivery.

(a) All Equipment manufactured, assembled or warehoused in the continental United States is delivered F.O.B. point of shipment. Equipment shipped from outside the continental United States is delivered F.O.B. United States port of entry. Purchaser shall be responsible for any and all demurrage or detention charges.

(b) If the scheduled delivery of Equipment is delayed by Purchaser or by Force Majeure, ABB may move the Equipment to storage for the account of and at the risk of Purchaser whereupon it shall be deemed to be delivered.

(c) Shipping and delivery dates are contingent upon Purchaser's timely approvals and delivery by Purchaser of any documentation required for ABB's performance hereunder.

(d) Claims for shortages or other errors in delivery must be made in writing to ABB within ten days of delivery. Equipment may not be returned except with the prior written consent of and subject to terms specified by ABB. Claims for damage after delivery shall be made directly by Purchaser with the common carrier

6. Title & Risk of Loss. Except with respect to Software (for which title shall not pass, use being licensed) title to Equipment shall remain in ABB until fully paid for. Notwithstanding any agreement with respect to delivery terms or payment of transportation charges, risk of loss or damage shall pass to Purchaser upon delivery.

#### 7. Inspection, Testing and Acceptance.

(a) Any inspection by Purchaser of Equipment on ABB's premises shall be scheduled in advance to be performed during normal working hours.

(b) If the order provides for factory acceptance testing, ABB shall notify Purchaser when ABB will conduct such testing prior to shipment. Unless Purchaser states specific objections in writing within ten (10) days after completion of factory acceptance testing, completion of the acceptance test constitutes Purchaser's factory acceptance of the Equipment and its authorization for shipment.

(c) If the order provides for site acceptance testing, testing will be performed by ABB personnel to verify that the Equipment has arrived at site complete, without physical damage, and in good operating condition. Completion of site acceptance testing constitutes full and final acceptance of the Equipment. If, through no fault of ABB, acceptance testing is not completed within thirty (30) days after arrival of the Equipment at the site, the site acceptance test shall be deemed completed and the Equipment shall be deemed accepted.

#### 8. Warranties and Remedies.

(a) Equipment and Services Warranty. ABB warrants that Equipment (excluding Software, which is warranted as specified in paragraph (d) below) shall be delivered free of defects in material and workmanship and that Services shall be free of defects in workmanship. The Warranty Remedy Period for Equipment (excluding Software, Spare Parts and Refurbished or Repaired Parts) shall end twenty-four (24) months after installation or thirty (30) months after date of shipment, whichever first occurs. The Warranty Remedy Period for new spare parts shall end twelve (12) months after date of shipment. The Warranty Remedy Period for refurbished or repaired parts shall end ninety (90) days after date of shipment. The Warranty Remedy Period for Services shall end ninety (90) days after the date of completion of Services.

(b) Equipment and Services Remedy. If a nonconformity to the foregoing warranty is discovered in the Equipment or Services during the applicable Warranty Remedy Period, as specified above, under normal and proper use and provided the Equipment has been properly stored, installed, operated and maintained and written notice of such nonconformity is provided to ABB promptly after such discovery and within the applicable Warranty Remedy Period, ABB shall, at its option, either (i) repair or replace the nonconforming portion of the Equipment or re-perform the nonconforming Services or (ii) refund the portion of the price applicable to the nonconforming portion of Equipment or Services. If any portion of the Equipment or Services or repaired, replaced or re-performed fails to conform to the foregoing warranty, and written notice of such nonconformity is provided to ABB promptly after discovery and within the original Warranty Remedy Period applicable to such Equipment or Services or 30 days from completion of such repair, replacement or re-performance, whichever is later, ABB will repair or replace such nonconforming Equipment or re-perform the nonconforming Services. The original Warranty Remedy Period shall not otherwise be extended.

(c) <u>Exceptions</u>. ABB shall not be responsible for providing working access to the nonconforming Equipment, including disassembly and reassembly of non-ABB supplied equipment, or for providing transportation to or from any repair facility, all of which shall be at Purchaser's risk and expense. ABB shall have no obligation hereunder with respect to any Equipment which (i) has been improperly repaired or altered; (ii) has been subjected to misuse, negligence or accident; (iii) has been used in a manner contrary to ABB's instructions; (iv) is comprised of materials provided by or a design specified by Purchaser; or (v) has failed as a result of ordinary wear and tear. Equipment supplied by ABB but manufactured by others is warranted only to the extent of the manufacturer's warranty, and only the remedies, if any, provided by the manufacturer will be allowed.

(d) <u>Software Warranty and Remedies</u>. ABB warrants that, except as specified below, the Software will, when properly installed, execute in accordance with ABB's published specification. If a nonconformity to the foregoing warranty is discovered during the period ending one (1) year after the date of shipment and written notice of such nonconformity is provided to ABB promptly after such discovery and within that period, including a description of the nonconformity and complete information about the manner of its discovery, ABB shall correct the nonconformity by, at its option, either (i) modifying or making available to the Purchaser instructions for modifying the Software; or (ii) making available at ABB's facility necessary corrected or replacement programs. ABB shall have no obligation with respect to any nonconformities resulting from (i) unauthorized modification of the Software or (ii) Purchaser-supplied software or interfacing. ABB does not warrant that the functions contained in the software will operate in combinations which may be selected for use by the Purchaser, or that the software products are free from errors in the nature of what is commonly categorized by the computer industry as "bugs".

(e) THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF QUALITY AND PERFORMANCE, WHETHERWRITTEN, ORAL OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USAGE OF TRADE ARE HEREBY DISCLAIMED. THE REMEDIES STATED HEREIN CONSTITUTE PURCHASER'S EXCLUSIVE REMEDIES AND ABB'S ENTIRE LIABILITY FOR ANY BREACH OF WARRANTY.

#### 9. Patent Indemnity.

(a) ABB shall defend at its own expense any action brought against Purchaser alleging that the Equipment or the use of the Equipment to practice any process for which such Equipment is specified by ABB (a "Process") directly infringes any claim of a patent of the United States of America and to pay all damages and costs finally awarded in any such action, provided that Purchaser has given ABB prompt written notice of such action, all necessary assistance in the defense thereof and the right to control all aspects of the defense thereof including the right to settle or otherwise terminate such action in behalf of Purchaser.

(b) ABB shall have no obligation hereunder and this provision shall not apply to: (i) any other equipment or processes, including Equipment or Processes which have been modified or combined with other equipment or process not supplied by ABB; (ii) any Equipment or Process supplied according to a design, other than an ABB design, required by Purchaser; (iii) any products manufactured by the Equipment or Process; (iv) any patent issued after the date hereof; or (v) any action settled or otherwise terminated without the prior written consent of ABB.

(c) If, in any such action, the Equipment is held to constitute an infringement, or the practice of any Process using the Equipment is finally enjoined, ABB shall, at its option and its own expense, procure for Purchaser the right to continue using said Equipment; or modify or replace it with noninfringing equipment or, with Purchaser's assistance, modify the Process so that it becomes non-infringing; or remove it and refund the portion of the price allocable to the infringing Equipment. THE FOREGOING PARAGRAPHS STATE THE ENTIRE LIABILITY OF ABB AND EQUIPMENT MANUFACTURER FOR ANY PATENT INFRINGEMENT.

(d) To the extent that said Equipment or any part thereof is modified by Purchaser, or combined by Purchaser with equipment or processes not furnished hereunder(except to the extent that ABB is a contributory infringer) or said Equipment or any part thereof is used by Purchaser to perform a process not furnished hereunder by ABB or to produce an article, and by reason of said modification, combination, performance or production, an action is brought against ABB, Purchaser shall defend and indemnify ABB in the same manner and to the same extent that ABB would be obligated to indemnify Purchaser under this "Patent Indemnity" provision. 10. Limitation of Liability.

(a) In no event shall ABB, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, whether in contract, warranty, tort, negligence, strict liability or otherwise, including, but not limited to, loss of profits or revenue, loss of use of the Equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities or services, downtime costs, delays, and claims of customers of the Purchaser or other third parties for any damages. ABB's liability for any claim whether in contract, warranty, tort, negligence, strict liability, or otherwise for any loss or damage arising out of, connected with, or resulting from this Agreement or the performance or breach thereof, or from the design, manufacture, sale, delivery, resale, repair, replacement, installation, technical direction of installation, inspection, operation or use of any equipment covered by or furnished under this Agreement, or from any services rendered in connection therewith, shall in no case (except as provided in the section entitled "Patent Indemnity") exceed one-half (1/2) of the purchase price allocable to the Equipment or part thereof or Services which gives rise to the claim.

(b) All causes of action against ABB arising out of or relating to this Agreement or the performance or breach hereof shall expire unless brought within one year of the time of accrual thereof.

(c) In no event, regardless of cause, shall ABB be liable for penalties or penalty clauses of any description or for indemnification of Purchaser or others for costs, damages, or expenses arising out of or related to the Equipment and/Services.

11. Laws and Regulations. ABB does not assume any responsibility for compliance with federal, state or local laws and regulations, except as expressly set forth herein, and compliance with any laws and regulations relating to the operation or use of the Equipment or Software is the sole responsibility of the Purchaser. All laws and regulations referenced herein shall be those in effect as of the Proposal date. In the event of any subsequent revisions or changes thereto, ABB assumes no responsibility for compliance therewith. If Purchaser desires a modification as a result of any such change or revision, it shall be treated as a change per Article 4. Nothing contained herein shall be construed as imposing responsibility or liability upon ABB for obtaining any permits, licenses or approvals from any agency required in connection with the supply, erection or operation of the Equipment. This Agreement shall be governed by the laws of the State of New York, but excluding the provisions of the United Nations Convention on Contracts for the International Sale of Goods and excluding New York law with respect to conflicts of law. Purchaser agrees that all causes of action against ABB under this Agreement shall be brought in the State courts of the State of New York, or the U.S. District Court for the Southern District of New York. If any provision hereof, partly or completely, shall be held invalid or unenforceable, such invalid or unenforceable provision or portion thereof and these terms shall be construed as if such invalid or unenforceable provision or portion thereof had never existed.

12. OSHA. ABB warrants that the Equipment will comply with the relevant standards of the Occupational Safety and Health Act of 1970 ("OSHA") and the regulations promulgated thereunder as of the date of the Proposal. Upon prompt written notice from the Purchaser of a breach of this warranty, ABB will replace the affected part or modify it so that it conforms to such standard or regulation. ABB's obligation shall be limited to such replacement or modification. In no event shall ABB be responsible for liability arising out of the violation of any OSHA standards relating to or caused by Purchaser's design, location, operation, or maintenance of the Equipment, its use in association with other equipment of Purchaser, or the alteration of the Equipment by any party other than ABB.

#### 13. Software License.

(a) ABB owns all rights in or has the right to sublicense all of the Software, if any, to be delivered to Purchaser under this Agreement. As part of the sale made hereunder Purchaser hereby obtains a limited license to use the Software, subject to the following: (i) The Software may be used only in conjunction with equipment specified by ABB; (ii) The Software shall be kept strictly confidential; (iii) The Software shall not be copied, reverse engineered, or modified; (iv) The Purchaser's right to use the Software shall terminate immediately when the specified equipment is no longer used by the Purchaser or when otherwise terminated, e.g. for breach, hereunder; and (v) the rights to use the Software are non-exclusive and non-transferable, except with ABB's prior written consent.

(b) Nothing in this Agreement shall be deemed to convey to Purchaser any title to or ownership in the Software or the intellectual property contained therein in whole or in part, nor to designate the Software a "work made for hire" under the Copyright Act, nor to confer upon any person who is not a named party to this Agreement any right or remedy under or by reason of this Agreement. In the event of termination of this License, Purchaser shall immediately cease using the Software and, without retaining any copies, notes or excerpts thereof, return to ABB the Software and all copies thereof and shall remove all machine-readable Software from all of Purchaser's storage media.

14. Inventions and Information. Unless otherwise agreed in writing by ABB and Purchaser, all right, title and interest in any inventions, developments, improvements or modifications of or for Equipment and Services shall remain with ABB. Any design, manufacturing drawings or other information submitted to the Purchaser remains the exclusive property of ABB. Purchaser shall not, without ABB's prior written consent, copy or disclose such information to a third party. Such information shall be used solely for the operation or maintenance of the Equipment and not for any other purpose, including the duplication thereof in whole or in part.

15. Force Majeure. ABB shall neither be liable for loss, damage, detention or delay nor be deemed to be in default for failure to perform when prevented from doing so by causes beyond its reasonable control including but not limited to acts of war (declared or undeclared), Acts of God, fire, strike, labor difficulties, acts or omissions of any governmental authority or of Purchaser, compliance with government regulations, insurrection or riot, embargo, delays or shortages in transportation or inability to obtain necessary labor, materials, or manufacturing facilities from usual sources or from defects or delays in the performance of its suppliers or subcontractors due to any of the foregoing enumerated causes. In the event of delay due to any such cause, the date of delivery will be extended by period equal to the delay plus a reasonable time to resume production, and the price will be adjusted to compensate ABB for such delay.

16. Cancellation. Any order may be cancelled by Purchaser only upon prior written notice and payment of termination charges, including but not limited to, all costs identified to the order incurred prior to the effective date of notice of termination and all expenses incurred by ABB attributable to the termination, plus a fixed sum of ten (10) percent of the final total price to compensate for disruption in scheduling, planned production and other indirect costs.

17. Termination. No termination by Purchaser for default shall be effective unless, within fifteen (15) days after receipt by ABB of Purchaser's written notice specifying such default, ABB shall have failed to initiate and pursue with due diligence correction of such specified default.

#### 18. Export Control.

(a) Purchaser represents and warrants that the Equipment and Services provided hereunder and the "direct product" thereof are intended for civil use only and will not be used, directly or indirectly, for the production of chemical or biological weapons or of precursor chemicals for such weapons, or for any direct or indirect nuclear end use. Purchaser agrees not to disclose, use, export or re-export, directly or indirectly, any information provided by ABB or the "direct product" thereof as defined in the Export Control Regulations of the United States Department of Commerce, except in compliance with such Regulations.

(b) If applicable, ABB shall file for a U.S. export license, but only after appropriate documentation for the license application has been provided by Purchaser. Purchaser shall furnish such documentation within a reasonable time after order acceptance. Any delay in obtaining such license shall suspend performance of this Agreement by ABB. If an export license is not granted or, if once granted, is thereafter revoked or modified by the appropriate authorities, this Agreement may be canceled by ABB without liability for damages of any kind resulting from such cancellation. At ABB's request, Purchaser shall provide to ABB a Letter of Assurance and End-User Statement in a form reasonably satisfactory to ABB.

(c) Client agrees to adhere to all applicable import and export control laws, regulations, orders and requirements, including but not limited to those of the United States and the jurisdictions to or through which the purchased goods are transported.

(d) With respect to orders that have been accepted by ABB but not delivered, ABB commits (i) to full transparency in regard to the cost increases associated with any legislation or tariffs; and (ii) that any increases resulting from changes in legislation or tariffs will solely reflect the additional costs incurred as a result of legislation or tariffs and will not include any additional overhead costs or profits.

**19. Assignment.** Any assignment of this Agreement or of any rights or obligations under the Agreement without prior written consent of ABB shall be void.

20. Nuclear Insurance – Indemnity. For applications in nuclear projects, the Purchaser and/or its end user customer shall have complete insurance protection against liability and property damage resulting from a nuclear incident to and shall indemnify ABB, its subcontractors, suppliers and vendors against all claims resulting from a nuclear incident.

21. Resale. If Purchaser resells any of the Equipment, the sale terms shall limit ABB's liability to the buyer to the same extent that ABB's liability to Purchaser is limited hereunder.

22. Entire Agreement. This Agreement constitutes the entire agreement between ABB and Purchaser. There are no agreements, understandings, restrictions, warranties, or representations between ABB and Purchaser other than those set forth herein or herein provided.



## **ABB Statement of Qualifications for Low-No Emission Grant Projects**

#### **ABB Experience**

The ABB Group of companies dates back to the founding of ASEA (Sweden) in 1883 and Brown Boveri & Cie (Switzerland) in 1891. ABB's US entity, ABB Inc. was established in 1980. This means we have been in the electrical engineering field for approximately 138 years.

ABB is a publicly held corporation with global headquarters in Zurich, Switzerland and U.S. Corporate headquarters in Cary, North Carolina. The ABB group of companies is recognized as one of the world's most innovative companies, with focus on grid-edge electrification, reliable power distribution, energy efficiency and sustainable transportation. We provide thousands of products, systems, software and services for customers in the utility, automation, transportation and infrastructure segments, supporting 'source to socket' electrification for diverse industries and markets.

ABB has a solid credit rating with an <u>S&P rating of A</u>. The ABB Group annual report consists of one volume containing the corporate governance report, remuneration report and financial review. These documents are located at <u>http://new.abb.com/media/group-reports</u>.

The safety and good health of our employees and contractors are a top priority for ABB. Our safety goal is always to achieve zero incidents. Given the diversity of our global operations, across many locations, this represents a significant challenge, and why we have uniform processes and best practices in place to continuously improve our performance in health and safety. Our policy aims for excellence through Group-led programs as well as regional and business-specific initiatives. As part of these efforts, we have regular in-depth safety training, scheduled monitoring of work conditions at all manufacturing sites, and comprehensive business responsibility and accountability for our performance. Please see greater detail at <a href="http://new.abb.com/sustainability/society/health-safety-and-security">http://new.abb.com/sustainability/society/health-safety-and-security</a>

Sustainability is an integral part of ABB's corporate strategy and business success. Our sustainability policies cover how we design and manufacture products, what we offer customers, how we engage suppliers, how we assess risks and opportunities, and how we behave in the communities where we operate, while striving to ensure the health, safety and security of our employees, contractors and communities affected by our activities. Comprehensive information and sustainability reporting is available at <a href="http://new.abb.com/sustainability">http://new.abb.com/sustainability</a>

Responsible Sourcing is prioritized among ABB's sustainability objectives, committing our company to manage the social and environmental risks and impacts of sourcing practices. Through collaboration with our business partners, we aim to ensure the highest quality standards and create a sustainable supply chain. With a large and complex supply chain, this is a considerable undertaking, but we consider it central to our success. Our efforts are underpinned by governance measures such as ABB's Supplier Code of Conduct and Supplier Sustainability Development program.

As part of responsible sourcing, ABB seeks sourcing materials that do not endanger vulnerable societies or habitats, contribute to environmental degradation or lead to conflict and exploitation in the countries that produce them. In practice, this means that we have systems in place to monitor the source of certain minerals more closely and phase out the use of hazardous substances in ABB products and processes. ABB expects suppliers to actively support ongoing efforts to manage and demonstrate product compliance with regulations such as REACH, ROHS and Conflict Minerals. We encourage our suppliers and sub-contractors to adopt similar standards and to comply with regulatory requirements.

Our organization continues to support responsible minerals sourcing and industry initiatives, while working with our suppliers to facilitate conflict-free sourcing that contributes to economic growth. In addition, ABB is a member of the Responsible Minerals Initiative (RMI) and adheres to the OECD guidelines to increase the transparency of conflict minerals in our supply chain. More details can be found at: https://new.abb.com/sustainability/responsible-business/responsible-sourcing

## **Statement on Diversity and Inclusion**

At ABB, we are committed to solving some of the biggest global challenges of our time. This is only possible through our exceptional people who work every day towards this endeavor. A culture of diversity, inclusion and equal opportunity is critical to our business success and makes us stronger. At ABB we strive for a culture where individual differences are not only welcomed but celebrated. A full view of ABB's diversity and inclusion commitments can be found at <u>ABB's diversity and inclusion web portal</u>.

In the United States, ABB's Diversity & Inclusion Council focuses on employee concerns such as flexible work practices and permissive vacation to enable employees to have a greater integration between work and home life; employee resource groups like Encompass, a network of employee groups that seeks to promote an environment inclusion, equity and belonging. ABB's Encompass groups include women, young professionals, military & allies, pride, Hispanic/Latin X and black professionals; diversity organization partnerships where ABB serves as a corporate sponsor for important diversity organizations including the Society of Women Engineers (SWE), National Society of Black Engineers (NSBE), and the Society of Hispanic Professional Engineers (SHPE) and Out 4 Undergrad, an organization for LGBTQ+ early career professionals; and University partnerships to promote inclusivity in recruitment with a focus on Historically Black Colleges and Universities (HBCU) and Hispanic Serving Institutions (HSI).

#### Supplier Diversity

ABB's supplier diversity commitment means that we strive for a world where people of all backgrounds can fairly compete in business. As a public corporation, ABB is not a DBE firm, however, ABB has a proactive supply-chain program promoting diverse and DBE enterprises. ABB maintains a corporate policy and commitment to support and grow with certified minority, woman, veteran owned, and other disadvantaged business enterprises by executing an advanced supplier diversity process that is engrained into our corporate culture of sustainability. Contact ABB if a letter/statement of support for DBE is required.

### Statement on ethics and integrity

ABB sets the highest standards for integrity and ethical compliance which are expected of every employee and in every country where we do business. We have implemented a systematic approach, designed to foster a culture of integrity. This is done through leadership and business accountability, supported by strong training tools and processes, and a zero-tolerance policy for violations. ABB has stringent directives covering bribery and corruption; the use of third-party representatives; political and charitable contributions; gifts, entertainment and expenses; suppliers, subcontractors and consortium partners; mergers and acquisitions and antitrust guidance; all underscored by mandatory training for all employees with multiple reporting channels supported. In addition, ABB employs more than 440 integrity and antitrust resources globally. Please see our integrity portal for more information: <a href="http://new.abb.com/about/integrity">http://new.abb.com/about/integrity</a>

## **R&D** Investments

ABB's EV charging systems incorporate the latest in reliable and redundant power electronics, gridintelligent architectures and secure, intelligent software to support site host and driver needs. ABB spends 1.5 BUSD per year on R&D and is engaged in constant advanced development of improved software services, power delivery systems, power electronics and optimal electrical solutions for transportation and infrastructure, utility and facility customers.

ABB's EV Infrastructure team members in North America and globally have leadership positions on committees such as CharIN, NEMA, SAE, IEEE and other relevant standards development organizations.

### **ABB's E-Mobility Experience**

ABB has extensive experience with a wide portfolio of charging hardware as well as deployment in projects around the world. ABB is the global leader in DC fast charging infrastructure having deployed more high-power charging systems, over more years and in more countries than any other company. ABB's key values include our high quality, reliable and future-proof technology; our advanced connectivity services for always online charging systems; and our reputation as a committed and experienced partner in EV infrastructure deployment. The following list highlights the many values and attributes where ABB leads in the EV infrastructure market:

#### **Solution excellence**

- High quality, environmentally rugged systems built to customer needs, meeting UL/ADA compliance
- Industry-leading modular power electronics architecture for greater redundancy and uptime
- Intuitive, daytime readable touchscreen displays
- Access designs provide extremely fast and easy service and maintenance
- Low noise due to distributed fan cooling systems
- Strict Class B EMC designs, suitable for residential areas, with highest safety near medical devices
- Safety excellence, third-party testing and certifications, always to latest standards

#### **Best-in-class connectivity**

- Secure, flexible connected services supported by ABB software engineers and analysts
- Experience integrating many types of back office systems and APIs
- Remote monitoring, diagnostics and software upgrades
- Flexible user access and payment options enabled (RFiD, PIN, smart phone, credit cards and contactless payments)
- Compatible with OCPP 1.6, Autocharge, ISO 15118 and smart energy APIs
- Supporting full interoperability from hardware to software, for optimal owner, operator and host choice

#### Experienced, bankable partner

- More than a decade of deploying 20,000+ DC chargers in all regions, environments and site types
- Extensive OEM co-development, performance validated at labs and test tracks around the world
- Fast delivery times for standard products
- 24/7/365 network with support by ABB's own experienced engineers and service professionals
- Leading with high power technology, ready for the most advanced EVs coming to the market
- Focused R&D centers for power electronics and grid interconnect technologies
- Companywide mandates for safety, sustainability and OpEx
- Fully committed to e-mobility industry with a proactive roadmap for the next generation of EVs

ABB has partnered with all major car, truck and bus manufacturers for many years, ensuring that EV charging infrastructure meets the industry demand and leading new technologies and industry standards development. Evolving in a fast growing and dynamic market, ABB's charging solutions are designed to conquer time with a future proof and open-standard approach.

In the United States and Canada alone, ABB has deployed over 2500 DC fast chargers and has a robust in-house service team – all across North America – and service cloud platform to ensure quick response time and increased uptime of the chargers. Because of this global and local expertise, ABB has become the go to for bus and car manufactures as well as key stakeholders locally and worldwide.

ABB has a 24/7/365 global and local NOC (network operating center), manned by direct employees providing remote monitoring and charging system diagnostics. With remote monitoring, diagnostics and software updates, maintenance costs are minimized. For example, ABB diagnoses more than 90% of service cases remotely, while solving over 60% of these cases without any on-site intervention.

ABB's connectivity services have been engineered to support owners, operators, networks and sites to enable any chosen business model. Using ABB's web tools or OCPP network integration, notifications can be set for each charger or fleet of chargers (for example, when an e-stop is depressed). These notifications can be set as alerts via email or SMS (SMS via carrier email address protocol). Alerts can be set up to send reports, specific error messages or charging events.

## **ABB's EVCI Product Portfolio**

ABB offers passenger vehicle to heavy vehicle charging, and the charging solutions span from 20kW to 600kW opportunity charging. All are DC Fast Charging today but more is coming soon.



In 2021, ABB will release an AC Level 2 charger as shown below to help provide more options for our customers to support their various use cases:



## **ABB Transit Electrification**

Many transit projects would be utilizing ABB's Heavy Vehicle Charger (HVC), a modular fast charging solution that is equipped with either a Pantograph or satellite depot charge box(es) with CCS connector(s) to fast charge plug in hybrid- and full electric busses with high power on route or at depot. Compliant with both OppCharge, SAE J3105 and Combined Charging System (CCS) SAE J1772 standards, ABB's HVC systems are compatible with almost all major bus OEM and ensure a future-proof infrastructure development because of their systems modularity and upgradability as well as open-standard approach.

The charger and its software are built based on a modular design that gives many advantages for servicing and adding new functionality. As an example, the 150kW charging power of one power cabinet is generated from 3 internal power modules of 50kW, creating redundancy. In the event a module fails, the system can be remotely reconfigured to work with the remaining operative module(s) at any time resulting in increased system uptime. All software and all key hardware modules are developed and produced by ABB itself. This means ABB's ability to diagnose and support enhancements to the system much easier and more in depth. Spare parts and product life cycle support can be made available easier and is fully under ABB control.

ABB HVC chargers feature a robust hardware design using high quality components to provide high reliability. The chargers are designed for a functional life of at least 15 years based on normal use. The cabinets are made from stainless steel (AISI 430), and coated using powder coating. This gives an extremely durable, easy to maintain finish, with no corrosion hazards, also well suited for salty climates.

All of our charger technology is rated to handle a wide DC voltage range, 200 to 850VDC which allows customers to use this platform with cars, trucks, fleets, bus, etc. As our customer's fleet grows, the HVC charger should be able to allow charging with the new vehicles as they come on board.

ABB offers Sequential Charging for its HVC utilizing CCS protocol which are the plug in connectors as well as the Pantograph UP (SAE J3105-2). This allows the system to have more dispensers per HVC charger cabinet. With smart charging the power is distributed intelligently over a maximum of 3 dispensers (depot charge boxes or PU Charge Domes) for maximum charge rates, lower demand capacity required and space saving with less HVC cabinets which creates cost savings.

As a global EVCI supplier, ABB has been performing interoperability with all of the major bus OEM's including bus OEM's who are members of OppCharge and/or CCS for bus charging include Volvo/Nova Bus, New Flyer, Proterra, Gillig (Cummins), BYD, GreenPower Motor, MAN, Scania, Vanhool (ABC Bus), Solaris, Iveco Bus, Heuliez Bus, etc.

#### **Buy America**

ABB provides a charging infrastructure solution that meets the FTA requirements for Buy America. More specifically ABB complies with USDOT FTA Buy America Rule 49 CFR Part 661.5 – General Manufactured Products. These products are manufactured in Portland, OR.

#### **Reference experience**

This list of highlights ABB's recent and ongoing major public, transit and fleet deployment projects that serve many e-mobility applications. This list is not inclusive of the many EV Infrastructure projects ABB has been engaged with that are subject to non-disclosure agreements.

Customer Name and Location	Date started			
Southern California Edison (SCE), United States: ABB sold two 175 KW Terra HP high	2020			
power, HV systems for SCE's Irwindale, CA facility that warehouses utility equipment used				
across the region - supporting Daimler's Frieghtliner eCascadia Class 8 truck.				
NYPA, United States: ABB is supporting New York's EVolveNY program to deploy Terra HP	2020			
350 kW high power chargers across the State of New York, connecting the upstate regions	5			
to New York City.				
Taiga Motors, Global: ABB partners with Taiga Motors to electrify recreational vehicles				
with safe, reliable and compact Terra AC Wallbox and Terra DC Wallbox charging stations.				
Lion Electric, North America: In a sales and service partnership, ABB will collaborate with				
Lion Elecric, a leader in electric school buses as well as other commercial vehicles,				
to strengthen the transition to zero-emissions transport throughout North America.				
DREEV (EDF/Nuvve), Europe: ABB will provide its V2G bi-directional	2020			
charging solution, integrated with DREEV software technology, to enable V2G delivery				
of surplus power back to the grid – and accelerate V2G commercialization.				
Audi and JET Charge, Australia: Audi has selected ABB's Terra HP high power	2020			
charger for its main Audi Customer Centres in Melbourne and Sydney.				
Porsche, Saudi Arabia: ABB High Power 175 kW DC Chargers installed for Porsche	2020			
dealerships in Riyadh to serve high power charging needs of the Porsche Taycan and				
future EV models.				
Ryder, United States: Through ABB's partnership with In-Charge Energy, ABB is the	2020			
preferred DC fast charger for all Ryder sites to support their MD/HD vehicle deployments				
Daimler, United States: Deployed 20+ HVC-150's and Terra HP's to support Daimler's	2020			
pilot program for eCascadia and eM2				
Edmonton Transit, Canada: ABB has delivered 26 ABB HVC 150kW overhead charging	2020			
systems in an innovative "in depot" application for opportunity charging.				
GRIDSERVE, United Kingdom: ABB high power EV chargers selected for the company's	2020			
first 'Electric Forecourt' centered in Braintree, Essex.				
<b>ASKO, Norway:</b> ABB has will supply charging infrastructure with Norway's largest grocery	2020			
wholesaler for its growing fleet of electric trucks. Currently, ASKO has 600 trucks on the				
road each day and has a goal to achieve zero emissions distribution of groceries by 2026.				
Audi, New Zealand: ABB has supplied a range of charging systems to Audi Dealerships	2020			
which will contribute to the country's objective of becoming carbon neutral by 2050				
eMP, Japan: ABB's Terra 184 electric vehicle chargers have been selected to modernize	2020			
charging infrastructure for the country's electric vehicle market.				
Volvo, United States: Chosen as the DC fast charging supplier for the Volvo LIGHTS	2020			
project using Greenlots OCPP Network. Currently deploying DC fast chargers to support				
about 25 heavy duty trucks.				
Lane Transit / Eugene, OR, United States: multiple ABB HVC Depot chargers to	2020			
enable overnigh charging of New Flyer buses.				
Jönköping Energi, Sweden: ABB awarded 10+ 450 kW pantograph chargers for Vy Bus.	2020			
This project began in 2020 and all systems will be fully operational by mid-2021.				

Toronto Transit Commission (TTC): ABB HVC Depot chargers deployed to deliver CCS	2019			
charging for all-electric and hybrid electric buses.	2019			
ST Engineering Land Systems, Singapore: 450kW systems for port charging site				
supporting Automated Guided Vehicles (AGV) that transport heavy shipping containers at				
the port terminal. ABB grid-connected equipment also supplied.	2019			
<b>Redbus Urbano, Chile</b> : 8 HVC 150kW chargers for terminals in Nueva Bilbao and El Salto. These chargers are the first eBus chargers to be supplied in Latin America.				
<b>Qbuzz, The Netherlands</b> : ABB installed 62, 100kW high-power, high voltage charging	2019			
stations for overnight fleet charging, 38 Terra 54 HV 50kW depot-fast chargers, and six				
HVC-300 300kW pantograph on-route chargers.				
TriMet / Portland, United States: ABB HVC Depot and Overhead Pantograph charging	2019			
systems in eBus pilot; in partnership with Portland General Electric and New Flyer.				
BP, China: In cooperation with 66 iFuel, is deploying ABB DC fast chargers for its charging	2019			
network on the Yangtze River Delta and the Pearl River Delta.				
NTU, Singapore: Nanyang Technological University (NTU) and the Land Transport	2019			
Authority (LTA), along with Volvo Buses chose ABB's Heavy Vehicle Chargers (HVC) for the				
world's first fully electric, autonomous bus.				
Shell / Greenlots, Singapore: 50kW sites for public fueling locations.	2019			
Hamburger Hochbahn, Germany: ABB powers first fully electric bus depot with 44 150kW	2019			
chargers plus turnkey switchgear and transformer solution.				
Electrify America, United States: ABB deploying hundreds of 150-350kW systems				
throughout the US including the first 350kW public systems in the Americas.				
<b>Ionity, Europe</b> : Charging network with several hundred 350kW ABB high power charging				
systems to be deployed across EU over the next couple of years.				
Hydro Quebec, Canada: ABB chosen to supply DC fast charging stations for its Electric				
Circuit network of stations.				
Tide Buss / Trondheim, Norway: Eight ABB HVC 450kW overhead pantograph charging	2018			
systems to serve more than 60 electric buses from Volvo and Heuliez.				
Audi/VW/Porsche, global: VW Group dealerships equipped with hundreds of ABB 50kW	2018			
chargers across the EU and Canada				
ChargeFox, Australia: ABB 150-350kW high power charging systems.	2018			
EnBW, Germany: with 200+ DCFC systems in Germany along the Autobahn	2017			
Reykjavik Energy, Iceland: ABB 50kW systems deployed in ring formation fully connecting	2017			
the island to enable emission free transportation; ABB is sole supplier.				
Copec, Chile: ABB DC fast chargers are networked from Santiago down to the Pacific	2017			
coast.				
Vattenfall, Sweden: Ongoing partnership with 40+ DC fast chargers across Sweden with	2017			
ABB grid connected equipment supporting these systems.				
Lidl, Europe: Fast charging at Lidl's stores in multiple countries across Europe with 240+	2016			
ABB DCFC systems.				
<b>OEM bus/truck development, Global:</b> Multiple pantograph and CCS e-Bus/truck pilot				
projects with Volvo/Nova Bus, New Flyer, MAN, Scania, Proterra and other OEMs across				
Europe, Asia, and North America				
<b>E.ON, Europe</b> : ABB networked DC fast chargers across multiple EU countries: 200+ DCFC.	2015			
Grønn Kontakt, Norway: 225+ ABB 50kW networked DCFC systems.	2015			

<b>EVgo, United States</b> : 800+ public DCFC sites across the US, including collaborative work on the first CCS and 150kW public charger sites in the Americas.	2014
Fastned, Netherlands, UK and Germany: 250+ roadside fast charging stations ranging	2013
from 50kW-350kW.	
Fortum, Norway, Sweden and Finland: Networked fast chargers across EU; 320+ DCFC	2013
systems now deployed.	
ELMO, Estonia: The world's first DCFC network, 200+ ABB fast charging systems	2012
connecting the nations highways.	



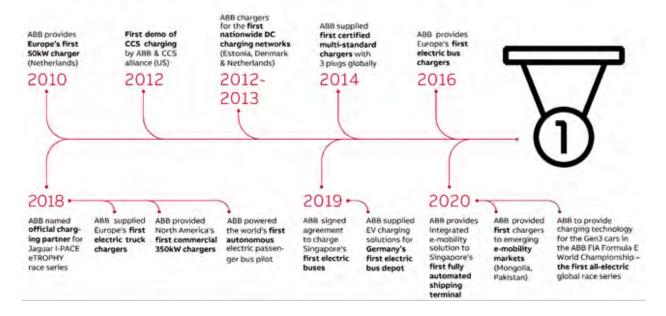
ABB is the product of choice for the world's high power charging networks and eBus/MD/HD charging sites. Above (L to R): Ionity, Electrify America and EVgo have chosen ABB Terra high power systems as the mainstay technology on their networks. Below (Clockwise from top): ABB eBus charging in Sweden, Volvo LIGHTS in California and a pilot MD/HD fleet depot charging site in the US; Fastned high power sites in the Netherlands and UK, Audi dealer deployments in Australia and Daimler's eCascadia charging at a Southern California Edison location.





# A decade of firsts in e-mobility

ABB technological leadership over the past 10 years



#### **ABB Formula E**



ABB is the title sponsor of the Formula E Championship racing series, shining a spotlight on global pioneers using technology to help create a more sustainable future. ABB leverages learnings for extreme charging usage and has worked closely with racing teams to develop EV infrastructure solutions that can be scaled commercially.

ABB has announced that it will provide the charging technology for the Gen3 cars in the ABB FIA Formula E World Championship. The new vehicles are set to debut in 2022.



#### ELECTRIC VEHICLE INFRASTRUCTURE USA

# Warranty and Services Supporting best-in-class uptime



Charging infrastructure backed by a warranty must offer the highest utilization and lowest downtime. ABB's warranty services are enhanced by remote and real-time connectivity to ensure seamless operation and longest equipment lifetime.

Services ensure operational excellence Operational excellence starts with reliable chargers. ABB's family of EV chargers are modularly designed to withstand heavy operation under rugged conditions.

In addition, ABB's fast chargers are the easiest in the market to service, with 24/7 connectivity for remote diagnostics, and accessible designs that expedite maintenance and field service.

ABB's EV charging infrastructure service offering includes remote and software services as well as training in addition to parts and warranty services.

## **Remote services**

- 24/7 connectivity
- Remote services
- Remote diagnostics
- Firmware upgrades
- ABB Web tools

# On-site service and parts availability

- Standard warranty execution
- Extended warranty options
- Service level agreements
- Preventive service and maintenance
- Spare parts programs

# Custom software services

- OCPP integration
- Autocharge integration testing
- Interoperability testing and validation
- Customized software integration support

## Training

- Standardized online training
- Customized service training
- Third-party service training programs

# Standard warranty and SLA programs

Services for every charging site

Every ABB EV charger is backed by a standard warranty and an experienced service team committed to customer success. ABB's service level agreements optimize charger uptime and ensures faster remote and on-site response times.

	Scope for USA	Standard warranty execution	Optional SLA offering		
×	Spare parts delivery	Within 7 days after diagnostics for standard parts	Next-day shipping of standard parts		
** • •	<b>Corrective Maintenance</b> Remote Support Onsite Support	Included Within 7 days Within 14 days *	Included Within 48 hours Within 96 hours		
$\bigoplus$	Preventive Maintenance	Available on demand	Included		

\* See standard warranty provisions by product, including travel and labor, on the following page of this document.

Standard Warranty vs Optional SLA ABB's standard warranty provides a foundation for operational planning. However, proactive planning should include service level agreements which significantly enhance charger reliability and uptime.



## Standard warranty

ABB Product line	Parts	Labor	Travel	Logistics	Preventive Maintenance	Extended Warranty*
Terra AC Wallbox UL	3 years	_	—	Shipping for RMA	—	_
Terra DC Wallbox UL (20-24 kW)	2 years	_	—	Shipping for RMA	Optional*	Option up to 5 years
Terra DC Fast All-in-One UL (50-180 kW)	2 years	2 years	major metros	Shipping for RMA	Optional*	Option up to 5 years
Terra DC High Power UL (175 kW, 350 kW)	2 years	2 years	major metros	Shipping for RMA	Optional*	Option up to 5 years
HVC-C Depot Fleet UL Charging Systems	2 years	2 years	major metros	Shipping for RMA	Optional*	Option up to 5 years

#### Terms and conditions

- Warranty terms outlined in ABB Standard Terms & Conditions at time of sale apply
- The standard warranty covers labor and parts as cited in the chart above
- Limited travel included for warranty claims within metro locations of 1M+ population as applicable in the chart above
- Standard parts can be available on site within 7 working days
- Standard path to ticket resolution is typically within 7 working days (service tech or part dispatched)
- Warranty response times contingent on active Charger Connect for remote connectivity

#### Warranty exclusions

- Used for purposes other than to charge an EV
- Use outside specified ambient conditions
- Acts of nature, vandalism, misuse, normal wear and tear
- Overvoltage due to lightning strike or grid imperfections; grid instability
- Unauthorized opening, demounting or moving
- ABB chargers must be maintained and/or stored according to ABB instructions; and may not be left without power for an extended period of time
- After-hours travel and labor
- Consumable parts

#### Warranty service terms

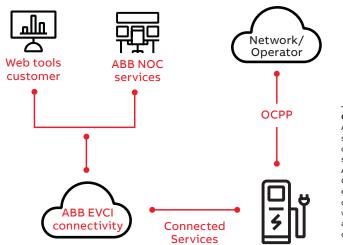
- Service personnel must be considered qualified personnel according to NFPA 70E
- Certificate of training attendance for ABB EV charging products and services must be on file for each person servicing ABB charging equipment
- Acceptable training programs include one conducted by ABB or an ABB certified trainer
- To validate warranty, equipment must be maintained and serviced by ABB approved qualified personnel

#### Warranty claim process

- Troubleshooting may be conducted by the network provider or CPO (Charge Point Operator) as applicable before submitting a warranty claim
- If the issue cannot be resolved via basic troubleshooting, ABB can be contacted via the <u>E-Mobility Service & Resource Portal</u> via the "Submit a request" ticketing function
- An ABB E-Mobility Service Team member will assist with diagnosis and validate warranty claim
- When validated, an ABB Service Provider will be assigned to visit the charger and replace any nonfunctioning parts that are under warranty; corrective maintenance may also be required

#### Preventive maintenance (PM) is required with the purchase of an extended warranty.

An extended warranty package may be purchased at the time the charger is purchased. ABB can also offer an extended warranty during the valid warranty period which would require an updated proposal.



Connected Services ABB's connectivity solutions link ABB EV chargers to back-end systems as well as ABB's service tools. Connected services are essential to networked charging, upholding warranty, enhancing an SLA and optimizing operational lifetime.



#### ABB Inc.

950 W Elliott Rd. Suite 101 Tempe, AZ, 85284 United States Phone: 800-435-7365 E-mail: US-evci@us.abb.com

abb.com/evcharging

We reserve the right to make technical changes or modify the contents of this document without prior notice. We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB. Copyright© 2021 ABB. All rights reserved.

# -chargepoint--cµsideboiut

## **Prepared for:**



August 25, 2021





#### **Table of Contents**

1	Cha	rgePoint Overview	3
2	Cha	rgePoint Cloud Services for Bus Depots	5
	2.1	Charge Management System Overview	5
	2.2	Optional Fleet Depot Optimized Charging Software:	11
3	Cha	rging Hardware	12
	3.1	ChargePoint Express Plus Charging Platform	13
	3.2	Equipment Uptime and Availability	17
	3.3	Transit Bus Interoperability	17
4	Wai	ranty and Service Information	18
5	Net	work and Security Information	20
6	Cha	rgePoint Professional Services	22

#### 1 **ChargePoint Overview**

For more than a decade, ChargePoint has been building the fueling network of the future. ChargePoint started in 2007 before electric vehicles even hit the road, and today ChargePoint is now one of the largest, "pure-play" EV charging companies with over 5,000 unique commercial customers and over 112,000 active places to charge on the ChargePoint Network. ChargePoint



provides EV charging solutions throughout North America and Europe and our 800+ employee workforce is dedicated to designing the most innovate and reliable EV charging platform.

In March of 2021, ChargePoint became the world's first publicly traded global EV charging network when we were listed on the New York Stock Exchange under the stock symbol CHPT. We are proud of our role in building the new fueling network and our ability to be 100% focused on EV charging. Since we are not part of a broader company whose interests are diversified in unrelated or even competing fueling solutions, we are able to dedicate all our efforts to our mission: to get all people and goods moving on electricity.

#### **Products & Services**

ChargePoint operates as a one-stop shop for customers by providing the complete EV charging ecosystem. Our commitment to EV charging—and only EV charging—enables us to offer the best electric fueling experience across every vertical. We have built a fully integrated portfolio of hardware, cloud services and support with the best technology in the industry. This ensures that everything works seamlessly and with enhanced functionality, which in turn results in great customer satisfaction.









Networked EV charging

Complete solution of cloud-based software and services

Mobile	app	(Android and	liOS)

24/7 Support for EV drivers in North America and Europe

#### **Charger Management Software**

Our cloud-based software solution is the heart of our EV charging solution. The intelligent and flexible platform connects all parties in the EV charging ecosystem including the driver, site hosts/station owners, fleet and depot managers, utilities and more. Station owners access the ChargePoint Network via a web portal, as well as APIs, to monitor, report, and set the operating parameters for charging stations on their property. Below are just a few of the features enabled by the ChargePoint Network:



ChargePoint, Inc. | 240 East Hacienda Avenue Campbell, CA 95008 USA +1.408.841.4500 or US toll-free +1.877.370.3802 | info@chargepoint.com | www.chargepoint.com Copyright © 2021 ChargePoint, Inc. All rights reserved. CHARGEPOINT is a U.S. registered trademark/service mark. All other products or services mentioned are the trademarks, service marks, registered trademarks, or registered service marks of their respective owners ChargePoint, Inc. - Proprietary and Confidential Page 3

#### **Charging Infrastructure**

ChargePoint is the only global EV charging solution provider that offers a complete portfolio of AC and DC charging solutions for every charging use case – from home to workplace to high power fleet charging. The figure below illustrates the broad coverage of charging levels provided by this portfolio of charging stations unified under the ChargePoint Network. Specific to this solicitation, we are proposing the ChargePoint Express line of Dc fast charging stations.



#### **Fleet Charging Solutions**

ChargePoint's global fleet solution portfolio includes everything fleets need to electrify and optimize fueling as they grow. Fleet management software combined with ChargePoint's DC fast charging solutions balance charging costs with operational readiness for transit buses to meet their complex and mission critical requirements. Expert design/build services are also available to ensure a smooth transition to full scale fleet electrification. Ongoing support and maintenance guarantee station uptime to ensure chargers are available to keep buses fully charged. Our optional Fleet Depot optimized charging software is available to help depot managers optimize charging schedules based on vehicle state of charge, assigned route length, departure times, telematic data, power constraints, and other factors.

#### **In Summary**

ChargePoint has extensive experience in delivering a complete charging ecosystem for electric fleets including transit bus operators. Only ChargePoint has the necessary experience, scale, service, and quality that will save fleet managers time and money, so you can focus on your core mission of providing public transportation.

#### 2 ChargePoint Cloud Services for Bus Depots

ChargePoint's charge management system is designed to provide operational visibility and management of the complete charging infrastructure, and to allow operators to reduce capital and operating costs while increasing operational efficiency. Our cloud-based software includes a suite of features to manage an electrified fleet, including the ability to create and manage vehicles and fleets, assign payment methods, see real-time vehicle charging status and vehicle charging session reporting. These features sit alongside the full configuration, control, and reporting of charging stations.

ChargePoint is one of the most experienced suppliers of charge management services in the electric vehicle charging segment. Providing charge management software is our core expertise and we currently support well over 112,000 active places to charge on the ChargePoint Network.

#### 2.1 Charge Management System Overview

All ChargePoint charging stations are offered with our cloud service plans to help efficiently manage station operations. ChargePoint's proposed DC chargers are paired with our Enterprise cloud-based software plan that provides a full feature set to tailor and manage all operating parameters and remotely view status and run utilization reports. Software plans are paid on an annual or pre-paid for multiple years at a discount. Access to the station management software platform is provided through a web-based portal and ChargePoint welcomes the opportunity to review the portal features in detail with your procurement and operations team.

#### Dashboard

For station operators, a web-based dashboard provides a real-time overview of the charging infrastructure, with easy-to-read tiles. Aggregated monitoring/reporting of all stations, group(s) of stations, and monitoring of individual stations is accomplished using global filters for the Dashboard page.



ChargePoint, Inc. | 240 East Hacienda Avenue Campbell, CA 95008 USA +1.408.841.4500 or US toll-free +1.877.370.3802 | info@chargepoint.com | www.chargepoint.com Copyright © 2021 ChargePoint, Inc. All rights reserved. CHARGEPOINT is a U.S. registered trademark/service mark. All other products or services mentioned are the trademarks, service marks, or registered service marks of their respective owners. ChargePoint, Inc. – Proprietary and Confidential Page 5

- + **Station Status:** Displays the real-time status of all stations.
- + Real Time Power: Displays the active load of the charging stations.
- + Energy: Indicates how much electricity was discharged by the stations on a monthly basis.
- + **Average Session Length:** Displays the breakdown between the time that vehicles take to actively charge vs. how long they are physically connected to a charging station.
- + *Environment:* estimates the emissions avoided based on the energy dispensed.

#### **Organizations and Rights Granting**

In the ChargePoint platform, all commercial charging stations are associated with an organization that is utilizing or managing the stations. These organizations determine how their EV charging stations are set up including how they are physically and logically organized, who can use them, how much it costs to use them, energy management, and more. Station operators can assign access rights to multiple individuals within the company with varying rights to align with their needs and responsibilities.

Org administration	Ability to create several layers or organizations at the parking, site, region, country and continental level
 Charger Group	Customize the group of stations to administer them by group and generate aggregated reports
Role	Assign roles with various access privileges such as a Network manager, Station Manager, and Fleet Manager

#### **Station Monitoring and Data Reports**

ChargePoint provides extensive monitoring and reporting capabilities in a user-friendly and highly flexible web interface. ChargePoint stations are continuously communicating over the ChargePoint network and status updated in real-time and available on the web-based admin interface and via push alerts. The ChargePoint web interface provides the tools necessary to actively monitor and manage all stations, including near real-time status for each port, making it easy to view important information in a clear and concise table format.

Detailed near real-time status for individual stations is available on the Station Properties page, including active charging sessions with current and voltage output levels to vehicle displayed.

#### Administrators have the ability to:

- + Get live status, including network connectivity and port status
- + Reboot the station
- View live charging sessions, including instantaneous power output
- + View a history of charging sessions

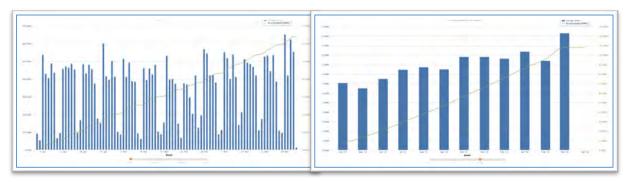


All reports may be exported to Excel or CSV format from the reports page directly. The categories of reporting available on the ChargePoint web portal include:

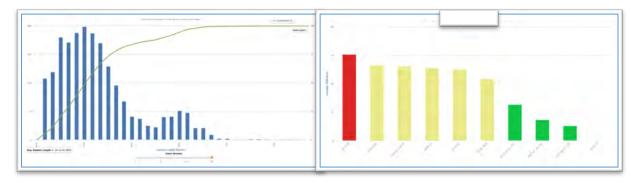
- + **Analytics:** A large collection of information, including peak occupancy, session information, energy dispensed, and GHG savings. There are several reports under Analytics including the Unique Driver Report, Session Length Histogram Report, and the Average Utilization Report.
- + *Logs:* A chronology of configuration changes and the success or failure of any attempt by the ChargePoint cloud to download information to the stations.
- + **Audit Trail:** All configuration and other actions including the user account that performed the action.
- + Alarms: A table of station events, including service-affecting faults.

A sampling of reports is provided below.

#### Energy by Day & Energy by Month

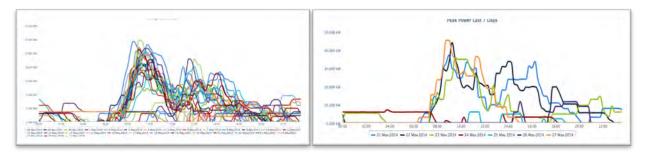


#### Session Length Histogram & Average Utilization



ChargePoint also provides for more advanced energy reporting that includes more granular 15-minute interval level data reporting down to the port level. An example of advanced analytics reporting is shown below:

#### Energy and Peak Power by Time of Day



#### **Station Alarm Reporting**

In the ChargePoint web-based portal, depot operators can quickly view overall status of charging stations, including stations in alarm state that need service, categorized by alarm type. Comprehensive alarm log reports may be exported and include listings of station status at time of alarm (in use or available), alarm type, alarm event timestamp, and station details such as location, model number, and software version. Fleet and depot managers also can enable batched email alerts to receive an hourly email containing alerts on all stations or a custom group of stations, for example alerts for stations in a particular geographical territory or customer.

#### **Station Software Updates**

ChargePoint leads the industry in innovation and new product development. Our charging stations are designed with intelligent networking capability and automated over-the-air station software upgrades to support new features and enhancements to ensure your investment is future-proofed. As new software features are developed and introduced for general availability, station software upgrades are automatically downloaded over-the-air to our installed base of commercial charging stations. The ChargePoint cloud-based services are also updated on an ongoing basis via sprint releases to support new features and integrated solutions. These ongoing innovations and software upgrades are included with the network services subscription at *no extra cost*.

#### **Power Management**

The ChargePoint EVSE charging software platform includes a wide array of options to manage energy and power at stations and groupings of stations. As fleets quickly grow, the ability to manage power among many vehicles can be critical to save on electrical infrastructure costs and ongoing energy costs:

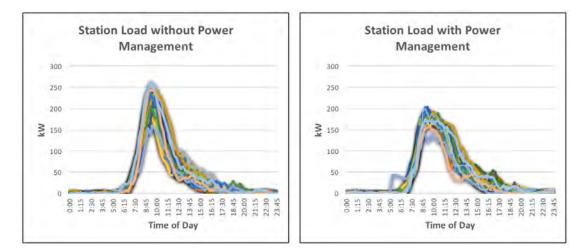
- + **Demand Response:** Although not likely to be used in a fleet depot charging environment, ChargePoint software allows for demand response signals through use of a standards based OpenADR interface or APIs. Power can be curtailed completely, by a percentage of the active power, or set to a lower power threshold.
- + **Power Limit:** Manage load via building/energy management systems, either through integration via API or installation of a ChargePoint smart meter upstream of the charging stations. This approach optimizes power use by dynamically adjusting power to the charging stations based on real-time monitoring of facility loads.
- + **Pricing-based Power Management:** ChargePoint can dynamically set the Power Share ceiling based on pricing information received from the utility. As the price increases, the aggregate

power is decreased, thus reducing consumption. This process is fully automated based on dayahead pricing information from the utility.

Power Management: Allows an aggregate maximum load to be set for a group of stations at the circuit level, panel level and/or transformer or utility service level. DC power can be managed at a site level, in conjunction with Level 2 circuit and panel level power management applications. This allows for oversubscription of electrical service and optimizes the active charging time of vehicles relative to their overall time the vehicles are parked.



ChargePoint Power Management enables efficient charging of an increased number of vehicles using available power at a site, reduces electrical infrastructure costs, and eliminates higher utility service costs associated with exceeding a peak power threshold. This software feature is extremely useful in fleet applications given the large number of vehicles and charging requirements within a single site/utility service. The following graphs illustrate the impact of using power management to significantly reduce the overall power demand at a single site:



ChargePoint, Inc. | 240 East Hacienda Avenue Campbell, CA 95008 USA +1.408.841.4500 or US toll-free +1.877.370.3802 | info@chargepoint.com | www.chargepoint.com Copyright © 2021 ChargePoint, Inc. All rights reserved. CHARGEPOINT is a U.S. registered trademark/service mark. All other products or services mentioned are the trademarks, service marks, registered trademarks, or registered service marks of their respective owners. ChargePoint, Inc. – Proprietary and Confidential Page 9

#### **Customizable Fleet Vehicle Accounts and Reports**

With the standard charging management plans, fleet operators will have the ability to create unlimited fleet subgroups to logically separate vehicles by utility or department. Within the fleet groups, fleet operators can add their electric vehicles for usage tracking and data analysis.

Fleet operators can quickly pull usage reports and individual session details from a vehicle or vehicle grouping perspective. The image above shows the energy usage of a specific fleet, filtered by department for overall usage and growth analysis. The detailed reporting table provides over a dozen individual data points collected per vehicle charging session



#### **Fleet Vehicle Dashboard**

From the fleet dashboard, fleet operators will have visibility into the real time status of all the vehicles within their fleet portfolio. The map provides the location of the charging vehicle within the depot. This dashboard can be filtered to include specific departmental or utility fleets. The display map is interactive, allowing operators to select a vehicle for additional information about the vehicle. The figure to the right is an example of a depot view of chargers and their active status.



#### **Fleet System Integration**

Fleets today already operate within a complex ecosystem and it's important that any EV charging solution fit into that existing ecosystem as much as possible. That's why ChargePoint offers a full set of Soap/XML based Application Programing Interfaces (APIs) to ensure a seamless integration with fleet systems relied upon by fleet operators today. Depot and fleet managers can use ChargePoint APIs to retrieve financial transaction data, manage charging stations, view detailed station information, real-time status, and to get a list of active station alarms.



ChargePoint has completed or initiated integration discussions with the most common platforms as highlighted above, and we continue to grow our partnerships to best serve fleet operators. We welcome the opportunity to discuss additional integrations that can best support your needs.

#### 2.2 Optional Fleet Depot Optimized Charging Software:

In addition to the standard charging station management software, ChargePoint also offers our optional Fleet Depot optimized charging software. The Fleet Depot plan is ideal for larger, mission-critical fleets at a single depot that require complex charge scheduling integration with vehicle workflow to enable operations.

The software prioritizes vehicle charging based on the vehicle state of charge, the assigned route length, and the departure time of the vehicle. The solution can also intake external data such as the vehicle telematics information and route plans from the scheduling system as well as taking into consideration power supply limitations and auxiliary loads at the depot site.



Although not included in the current proposal, we welcome the opportunity to provide additional details on the optional Fleet Depot software upon request.

#### 3 Charging Hardware

ChargePoint has designed our charging system around the needs of large fleets including electric buses. We also recognize the rapidly changing landscape of bus and truck charging capabilities and different charging standards. The sum of these needs resulted in a scalable modular design that accommodates the wide array of electric vehicle power requirements, different charging standards (CCS Type 1 for North America, CCS Type 2 for Europe), site limitations such as space and electrical capacity constraints, and designed for a 12-year life - long enough to match the average vehicle replacement cycle.

Furthermore, all ChargePoint Express charging stations use DC power which means all power conversion takes place in our wayside equipment and not on the vehicle. The savings result in lower vehicle costs (i.e., no need for larger and more expensive on-board charging systems in the vehicles as power levels increase), and a lower average charging system cost. We describe specific aspects of our charging system below.

#### **Equipment Lifespan and Spare Parts Availability**

ChargePoint DC charging stations are designed with long-term needs in mind. All major components of the platform are designed to a last a minimum of 12 years the same as the average bus replacement cycle and spare parts are supported along the same lifespan.

#### Warranty and Optional Maintenance and Service Plan

ChargePoint standard warranty is one-year parts only, but an optional extended warranty package is available that includes proactive monitoring plus parts and labor coverage that aims to leverage real time station monitoring and a comprehensive labor component to maximize charger availability and minimize downtime when issues occur.

#### **Performance Measuring**

ChargePoint's cloud services allow for remote monitoring of the stations, so the project team can quickly diagnose any issues and calibrate charging to match grid and station owner needs.

#### Safety & Standards Compliance

ChargePoint products are designed, engineered, and built to comply with industry standards and applicable international, national, and local regulations and codes.

#### 3.1 ChargePoint Express Plus Charging Platform

The proposed Express Plus (EP) charging solution is ChargePoint's latest generation DC fast charging technology that is designed to meet the rigorous, mission-critical requirements of fleet depot charging. The Express Plus distributed DC platform is based on a modular and scalable architecture that can support initial vehicle pilots while easily expanding to accommodate a full electric fleet conversion. In addition, the platform can add power capacity along the way to keep up with vehicle charging capabilities and truly futureproof fleet charging needs.

#### Key features of the Express Plus Platform:

- Performance the ability to increase power output at a later time to meet increase power demand in the future.
- + Scale the ability to add more ports in the future to charge more vehicles.
- + Reliability and Availability this is accomplished through system redundancy, design for serviceability and preventative maintenance to maximize uptime.
- + Universal Compatibility: The Express Plus supports battery packs from 200V to 1,000V, ensuring both legacy and future electric vehicles can always be charged with any standard connector.
- + Smart & Fully Supported: Remote management is easy with ChargePoint Cloud Services and built-in cellular connection. Operates on the new OCPP v2.0.1 protocol and supports 15118.
- + **Dynamic Power Sharing:** Steer available power with up to 8 connected dispensers to make the most efficient use of the investment and to charge vehicles as quickly as possible while managing site level power requirements.

The Express Plus solution is comprised of three core elements: EP Power Blocks, EP Power Modules, and EP Power Links to provide the complete charging solution.

#### **EP Power Modules**

EP Power Modules are smart AC to DC power conversion units that convert the supplied 3 phase AC power to the DC power required by many electric fleet vehicles. Power Modules are rated at 40kW each and can provide output voltages between 200 and 1,000 ensuring charging capabilities for the EVs of today and tomorrow.

ChargePoint has designed and engineered the EP Power Modules to provide high-efficiency power conversion (> 95%) which in turn reduces electricity costs and wasted energy for the depot operator. In addition, EP Power Modules are sealed and self-contained which allows for easy replacement in the field with standard tools and minimal training. And with multiple EP Power Modules contained within a system, charging stations can continue to function and provide power even in the rare instance of one module not working properly.

#### **EP Power Module Specifications:**

- + Maximum Output Power 40kW
- + Maximum Output Current 100A
- + Power Conversion Efficiency Up to 96%
- + Power Factor 99% at full load
- + Automatic blind mate connections
- + Failure of a single module does not disable the port
- + Harmonics THD < 5% (complies with IEEE 519 requirements)



- + Integrated liquid cooled cold plate normalizes temperature across all modules
- + Power Module Dimensions 430 mm (H) x 130 mm (W) x 760 mm (L) (1'5" x 5" x 2'6")
- + Power Module Weight 45 kg (98.5 lbs.)

#### **EP Power Blocks**

EP Power Blocks serve as the housing unit for EP Power Modules along with supporting infrastructure such as the liquid cooling system. EP Power Blocks can contain up to five EP Power Modules providing a total output capacity of 200kW. Multiple Power Blocks can be combined via a DC bus to increase power output up to 350 kW for ultra-fast charging applications.

EP Power Blocks provide the allocated power to dispensers using DC cabling and local data connections to enable a fully integrated system with remote diagnostics and management. EP Power Blocks intelligently provide allocated power to one or two dispensers in the base design configuration although have the capability to share power with up to 8 dispensers with the addition of a power distribution cabinet. The unique ability to intelligently charge so many vehicles from just one Power Block allows depot managers to maximize site capacity utilization and reduce the overall charge cost/vehicle.

#### **EP Power Block Specifications:**

- + AC Input 480VAC, 3-phase, 260A, 60Hz
- + Contains up to 5 Power Modules
- + Maximum Output Power 200kW (5 modules)
- + Maximum Output Current 200, 250, or 350A depending on configuration
- Network Protocol & Communications 4G/LTE communication between gateway and ChargePoint Cloud Network (Hosted by AWS).
- + Ethernet (CAT-VI) connection between Power Block and each DC Dispenser (local not cloud communication).
- Power Block Dimensions 2200 mm (H) x 1000 mm (W) x 1250 mm (L) (7'3" x 3'3" x 4'1")
- + Power Block Weight 409 kg (900 lbs.) without Power Modules

#### **EP Power Links**

The EP Power Link is the station or dispensing component of the Express Plus platform. EP Power Link stations dispense power to the vehicle via conductive charging and support up to two flexible, lightweight cables with cable management and are compatible with all standard connector types. There are multiple options for managing cables including station installed cable management or external reels for extra-long cables. EP Power Link stations have multiple mounting options to accommodate the various layouts of depots including pedestal, wall, and over-head (gantry).

Each EP Power Link can deliver up to 200kW if connected to a single Power Block, or up to 350kW when connected to two Power Blocks. The optimal Power Block to Power Link configuration is determined based on the operational profile of the fleet depot and is highly dependent on the available time to charge.

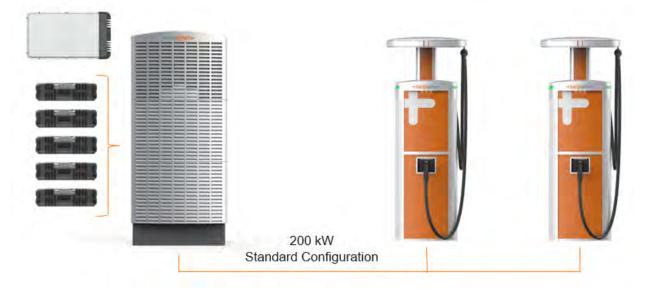


#### **Power Link Specifications:**

- Maximum Output Power 200kW, 250kW, 350kW depending on EP Power Block configuration
- Maximum Output Current 200A, 250A, or 350A depending on cable version and EP Power Block configuration
- + Output Voltage Range 200 to 1,000 VDC
- + Maximum Distance between EP Power Block to EP Power Link 300'
- + Cable length Up to 4.5 meters (15') with Cable Management Kit
- + Supported Connectors: CHAdeMO, CCS-1, and CCS-2
- Dispenser Dimensions 2400mm (H) x 700mm (W) x 330mm (D) (8' x 2'4" x 1'1")
- + Dispenser Footprint 970mm (W) 400mm (D) with Cable Management
- + Dispenser Weight 200 kg (440lbs.)

#### **System Configuration**

The Express Plus platform is capable of sharing and steering DC power from the central power conversion cabinet to up to 8 dispensers and 16 charging ports in its maximum configuration. Within a bus yard, the more typical architecture is one power conversion cabinet supplying two dispensers each with a single CCS Type 1 connector. This is based on the bus charging capabilities, workflow and parking arrangements within a depot, and the typical bus downtime within which to fully charge before the next trip. The following illustration depicts the Express Plus architecture in a typical depot layout

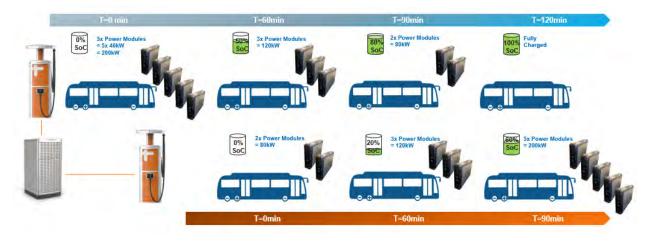


#### **Power Sharing and Steering**

The maximum power output for each EP Power Link can be set dynamically based on a combination of the total available input power from the Power Block and the actual power requested by each vehicle. Each EP Power Module can supply power to two isolated outputs. Load is managed on a "per module" (40kW) basis and each EP Power Module can vary its output to achieve intermediary power levels. As charging tapers on one vehicle, more power is available to the other actively charging vehicle.



The following diagram illustrates the progression and dynamic power allocation charging two electric vehicles arriving at different times using a simple configuration of one EP Power Block with 200kW of capacity shared across two EP Power Links:



- + At t = 0 there is a single electric bus charging, and it receives its maximum supported charging rate of the vehicle (200kW) with all 5 EP Power Modules allocated.
- At t = 60 minutes (for illustration only) a second electric bus has arrived and begins charging. Based on a configurable charging algorithm, in this example we reduce the power to the first vehicle to 120kW (3 EP Power Modules) and allocate the remaining EP Power Modules to the second vehicle and it charges at 80kW.
- At t = 60 minutes the first bus reaches 60% state of charge and the charging rate has dropped to 80kW based on the vehicle battery management system, freeing up one of the EP Power Modules which is then switched to the second bus. The second bus now receives 120kW.
- + At t > 120 minutes, as the charging rate continues to drop on the first bus, EP Power Modules are automatically switched to the second bus as they free up. Eventually the first bus will be finished charging and the total available power of 200kW may be used by the second vehicle.

The Express Plus system is also designed to transfer power capacity across up to eight EP Power Links connected to the same EP Power Block. At the start of a charging event power is delivered from an EP Power Block to two connected vehicles. However, after both vehicles have been charged to their target, the total available capacity of the EP Power Block can be transferred by dynamic switching to another set of connected vehicles. This process can be completed multiple times up to the limit of time available and physical cabling between the charging cabinet and dispensers.

Intelligent communication between EP Power Blocks at a site, enabled through ChargePoint's cloud services, ensures that the total input power from the grid is never exceeded and the available input power is managed appropriately to accommodate vehicle charging load. Reducing overall site demand results in lower capital costs for supporting electrical infrastructure and allows depot managers to mitigate demand chargers which can be a major operating expense. To maximize the benefit of power sharing and dynamic switching, ChargePoint provides a comprehensive range of modelling and system configuration services.

#### 3.2 Equipment Uptime and Availability

ChargePoint's DC fast charging equipment is highly modular with minimal Field Replaceable Units (FRU) for ease of installation, service, and operations. Redundancy is built into the system architecture. Each unit is wired via an independent set of power conductors such that a failure of one station or its wiring path does not impact other stations. Low system failure rates significantly reduce the number of FRUs required on site. ChargePoint manages spare parts via its support and operations teams and can discuss our Spares Management Service offering as needed.

Each charging station contains multiple Power Modules, meaning if one were to fail the remaining power module(s) will continue delivering power. Each charging cabinet also has its own cellular modem for independent cellular connection to the ChargePoint Cloud Network. To ensure continued operations, stations will default to their prime directive in the event of a network wide outage.

ChargePoint's cloud connection is enabled through a 4G/LTE communication between the stations and the ChargePoint Cloud Network that is hosted by Amazon Web Services. No connection to the transit operator LAN or data network is required. This reduces the complexity, cost, and security concerns otherwise associated with connecting to local IT infrastructure.

#### 3.3 Transit Bus Interoperability

ChargePoint is an electric vehicle agnostic company and design our solutions to be compatible with all major transit bus manufacturers. ChargePoint's DC charging solutions have been rigorously tested and validated to work with the major bus OEMs in North America including GILLIG, New Flyer, BYD and Proterra.



ChargePoint operates a robust vehicle compatibility program whereby vehicles are brought into the engineering lab for periodic

testing. ChargePoint also provides charging stations to select vehicle OEM partners such as GILLIG, New Flyer, and Proterra for ongoing product and engineering testing.

In addition, a future software update will enable support for Plug & Charge on DC stations featuring the IEC/ISO 15118 standard. This element of 15118 prescribes how a charger and network can identify and authenticate a specific vehicle to allow for a charging session to automatically initiate by simply "plugging in".

#### 4 Warranty and Service Information

ChargePoint EV charging stations are some of the most advanced and reliable in the world, but site conditions can change, wear and tear occurs, and accidents or equipment failures can happen. That is why it is so important that mission-critical applications choose a solution that provides rigorously tested hardware designed for reliability and uptime along with integrated software and services that can quickly identify and proactively resolve issues.

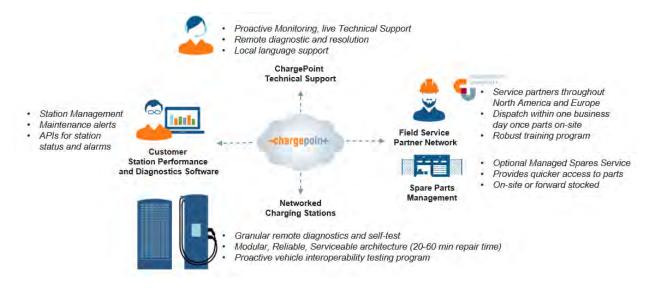
#### **Standard Warranty**

Standard warranty for all ChargePoint commercial charging stations is one-year parts only. ChargePoint warrants the charging solution shall be free from defects and related defects under this warranty beginning 90 days post shipment. Given the mission-critical nature of many fleet applications, we recommend ChargePoint Assure for a comprehensive, turnkey, hassle-free station ownership experience.

#### **ChargePoint Assure**

ChargePoint's Assure offering is the most comprehensive EV station maintenance and management program in the industry. Assure enhances your standard parts warranty with dispatched labor at committed service levels to perform on-site repairs, as well as a long list of additional features. With Assure, ChargePoint takes responsibility for fixing hardware issues by conducting proactive monitoring, identifying potential issues, and coordination of any necessary repairs by expert support specialists.

ChargePoint's vertically integrated hardware and software offering allows our Customer Support group to proactively monitor stations to detect and remotely diagnose issues or faults at the earliest possible moment. Many issues can be resolved remotely, but when necessary ChargePoint will promptly dispatch on our trained and qualified Operations and Maintenance partners to conduct any repairs along with supplied parts. Since the ChargePoint hardware is designed to be easily field replaceable, technicians can quickly replace the necessary components to return the station back to service.



ChargePoint, Inc. | 240 East Hacienda Avenue Campbell, CA 95008 USA +1.408.841.4500 or US toll-free +1.877.370.3802 | info@chargepoint.com | www.chargepoint.com Copyright © 2021 ChargePoint, Inc. All rights reserved. CHARGEPOINT is a U.S. registered trademark/service mark. All other products or services mentioned are the trademarks, service marks, registered trademarks, or registered service marks of their respective owners. ChargePoint, Inc. – Proprietary and Confidential Page 18

#### Additional Assure features include:

- + 24x7 proactive station health monitoring
- + Dispatch of repair technicians when required
- + Next business-day, on-site response after parts are delivered
- + Unlimited software configuration changes
- + 98% annual uptime guarantee with financial penalties for non-performance
- + Monthly reports and detailed quarterly reports of your station's performance metrics
- + Coverage of labor for repairs typically not covered under standard warranty such as vandalism, abuse, and accidents

All ChargePoint Assure offerings include the costs associated for the monitoring, parts, dispatch coordination and the labor to complete all affected warranty repair work. Assure is available for a recurring annual fee or in multiyear packages for a greater discount and ChargePoint welcomes the opportunity to provide additional information and specific costs upon request.

#### **ChargePoint Assure Pro and Spares Management Service**

Assure Pro is an enhanced Assure offering specifically designed for mission critical support with general availability expected in late 2021. Assure Pro provides similar monitoring and full-service repairs although on an elevated level compared to Assure. This includes a 1-hour issue acknowledgement time, 24-hour issue resolution time, 24/7 remote technical support, and prioritization of customer support inquiries.

To enable the fastest possible field service and avoid delays due to shipment of spares, ChargePoint offers our Spares Management Service which is required Assure Pro. Through this offering, spare parts will be stored on-site or forward stocked within 1-2 hours of any site with covered charging equipment. ChargePoint will track and manage spare parts inventory as repairs are made over the term of the program.

Although not included in this proposal, we welcome the opportunity to share additional details of both Assure Pro and Spares Management Service upon request.

#### 5 Network and Security Information

ChargePoint is dedicated to enabling the future of e-mobility by seeking to provide the most open, secure, and robust network anywhere. As such we support and work closely to develop open standards that enable a secure, robust, and easy-to-integrate EV charging ecosystem.

#### OCPP

The ChargePoint Network supports the OCPP v1.6 and 2.0.1 protocol governing communications between a cloud-based charge point operating network and charging stations in the field. Although the vast majority of charging stations on the ChargePoint Network are also manufactured and designed by ChargePoint, we have over seven years of experience with integrating EVSEs from other manufactures onto our network. This includes vendors such as Schneider Electric, Efacec, Eaton, ABL, ABB, Delta, Tritium, IES, Nissan/Sumitomo, Fuji, and more. Since our charging network is based on OCPP, it is possible to integrate any OCPP 1.6 capable charging station onto our network. ChargePoint has developed a robust "OnRamp" program with a dedicated team of more than 15 engineers to facilitate this process in order to adequately conduct integration and certification to ensure the station works as expected.

#### **Utility System Interface**

ChargePoint was one of the first charging networks to be certified as OpenADR 2.0b compliant to help support the broadcasting of price signals and demand response events from utilities to charging station operators. Our advanced set of SOAP/xml-based application programming interfaces are also available to support integration with utility back-office systems.

#### **PCI Compliance**

ChargePoint maintains PCI compliance and is audited on an annual basis by Coalfire, an independent 3rd party Qualified Security Assessor (QSA). Coalfire has more than 17 years' experience in IT security and compliance, serving thousands of client organizations across the United States and Europe. Their client list includes 3M, AWS, Azure, Orion Health, Concur, InstaMed, and many more.

#### **Information Security Policy**

Our Information Security Policy is based on the PCI-DSS 3.2.1 information security standard. We review our policy at least annually. The PCI DSS standard requires a comprehensive information security policy that is used throughout the organization and is distributed to all system users, including contractors, vendors, and business partners. ChargePoint uses this chapter of its policies, Requirement 12, as a stand-alone security policy for that purpose, in addition to Requirement 12's other functions within the PCI standard.

ChargePoint believes that security measures taken should meet or exceed published standards, but that a public, precise description of measures is actually more likely to lead to a breach of cardholder data. ChargePoint strives to, and believes it does, meet or exceed the PCI-DSS standards, including those standards outside the realm of strict data security.

#### **ChargePoint Services**

ChargePoint provides services to thousands of customers through a cloud-based platform that is hosted at Amazon AWS. The IT infrastructure that AWS provides to its customers is designed and managed in alignment with security best practices and a variety of IT security standards, including: SOC 1/SSAE

16/ISAE 3402 (formerly SAS70), SOC2, SOC3, FISMA, DIACAP, and FedRAMP, DOD CSM Levels1-5, PCI DSS Level1, ISO 9001 / ISO27001, ITAR, FIPS140-2, and MTCS Level3.

The production environment at AWS is isolated from the ChargePoint corporate network. ChargePoint also has no connect to any of our partner networks. The charging stations all communicate over the cellular network, bypassing the need for any local IT connectivity. Access to the cloud-based platform is via standard web browser with no plugins required.

#### 6 ChargePoint Professional Services

ChargePoint has deep experience working to understand fleet operations and incorporate the depot workflow into a charging plan, as well as training depot managers to use ChargePoint's tools effectively for their depot needs. In support of this project, ChargePoint is able to offer the following professional services as requested.

#### **Preliminary Engineering Support**

As part of the preliminary site design services, ChargePoint will provide labor and resources to support preliminary site planning and design. This includes hosting discussions with project partners to ensure architects, engineers, contractors, etc. are up to speed on the technical aspects of the product. ChargePoint will also provide preliminary layouts of the proposed configuration and a sample single line diagram.

For larger projects ChargePoint works closely with transit agencies, consultants, and vehicle manufacturers to perform site workflow analyses to develop a customized site design, including power management configuration. This process includes multi-faceted engagement with the customer and involved parties as directed by the customer. ChargePoint will provide all required technical documentation including design specifications, systems drawings, installation instructions and drawings, and operations and maintenance manuals within the timeframe required.

#### **Project Technical Support**

Large scale electric vehicle supply equipment projects require dedicated technical and commercial project management staff. These team members are the backbone of the internal and external teams and provide the driving support required to keep all aspects of the project moving in unison.

ChargePoint allocates senior and experienced project management personnel that have deployed several electric vehicles supply equipment projects including many for transit agencies in North America and Europe. Members from this dedicated team will be tasked to work in parallel with customer consultants and project managers to ensure deliverables are managed according to the budget and timeline of the project.

In addition, ChargePoint can assign a Senior Project Manager who will manage all aspects of ChargePoint deliverables and high-level engagements with the transit operator, the local utility, general and electrical contractors, and any other party involved with this project. Additional fees may apply for such services and will be further refined in a subsequent scope of work.

#### **Onsite Support to Validate and Commission**

ChargePoint can provide onsite labor support during installation and commissioning of the charging infrastructure. This person will be responsible for day-to-day site level interface with the transit operator, the local utility, electrical contractors, and other parties that may be involved with this project. This person will shepherd the installers, perform cable checks, and overall ensure charging solution comes online, is functional and operates according to specification. At the time of testing and commissioning, a written report shall be submitted to the customer by ChargePoint listing all incidents and unusual system performance issues.

#### **Training Program**

ChargePoint is also able to provide onsite training based on the operation of the Express DC solution, as applicable, and remote training on the ChargePoint Network. Both trainings can be coordinated during the same timeline as the hardware commissioning. Additional training if requested can be provided. ChargePoint's Training proposal will accommodate 10 personnel per session. The training will include a summary description of the content, suggested attendees and suggested length and timing.

The local fleet operator will need to provide a training room close to installation site for such proposed training, along with internet connection and a screen for presentation.

- + Hardware Overview
- + Installation Overview
- + Network Operations Training
- + Safety Requirements
- + Equipment Check
- + Common Installation Issues
- + Operational Best Practices

This typical training confirms the trainee has satisfactory completed ChargePoint training program, which describes in detail how to use the provided hardware and the operator dashboard. The certification is not an attestation of the applicant's professional education or competency. It is not intended to, and does not, replace local and federal license requirements. Additional fees will apply for such services and will be further refined in a subsequent scope of work.



CONTINUOUS HIGH POWER AUTONOMOUS

# HIGH POWER WIRELESS CHARGING SYSTEMS

**Electric Buses** 



### Modular Wireless Charging System

The Momentum charging system is an inductive wireless charging system designed for all types of electric vehicles. This automatic charging system is ideal for en-route and in-depot charging of electric municipal buses providing 50 to over 300 kW of power while a bus is loading and unloading passengers. Using our modular system, the same vehicle equipment is interoperable with both en-route and in-depot charging stations. From the moment the vehicle stops over the charger until the vehicle starts to pull away, Momentum's wireless charger is adding energy to the battery—with no driver engagement required.

Wireless charging works in all kinds of weather, is not affected by rain, sleet or snow and is more efficient than most plug-in chargers. The Momentum charging system is simple to use, easy to install, and intrinsically safe with no moving parts. The total cost of ownership of a wireless charging system is lower than overhead chargers.

COILS UNDER BUS WIRELESS TRANSMISSION OF ENERGY

VEHICLE ASSEMBLY

ELECTRIC BUS

MOMENTUM

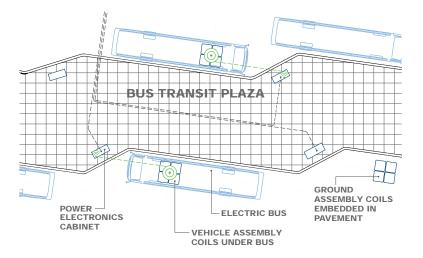
GROUND ASSEMBLY COILS EMBEDDED IN PAVEMENT

info@momentumdynamics.com

## HIGH POWER WIRELESS CHARGING SYSTEMS Electric Buses



The plan view to the right shows a bus plaza. Because Momentum's inductive chargers are immune to weather, they can be installed within existing pavement. Each charging pad can service multiple buses with each making 5 to 10 minute scheduled stops. When a bus parks over a charger, charging commences automatically. Operators receive confirmation of the charging and no further action is required to start or stop the process. Extended warranty and service support contracts are available, which include constant monitoring of data, logging, and predictive fault analysis.



#### **SPECIFICATIONS**

REQUIREMENT	SPECIFICATION		
Input Power	50/60 Hz three phase 400/480 VAC		
Power Levels	One to four or more 75 kW modules (300+ kW)		
Power Factor	>0.99		
Power Transfer Efficiency	>90% peak (measured from power supply to battery)		
Operational Frequency	85 kHz nominal		
Logging	Remote monitoring		
Physical Requirements	No mechanical movement on ground or on vehicle—system is 100% solid state		
Alignment Window	20 cm (8")		
Air Gap	Up to 18 cm (7")		
Ambient Temperature Range	-25 to +50 degrees C (-13 to +140 degrees F)		
Compliance	UL, CE, FCC, IEEE C95, ICNIRP		
Foreign Object Detection (FOD)	Provided		
Living Object Protection (LOP)	Available		
Warranty	2 years with option for extended warranty coverage		
OPTIONS			
System Management	Admin dashboard for limiting output power and vehicle authorization		
Advanced Power Management	Load balancing of chargers based on SOC, time of day, and system usage profiles		
Installation	Project management, design, and installation services available		
Route Planning	Optimized en-route charging location analysis		

Copyright Momentum Dynamics 2018, Patent Pending, All Rights Reserved.

**Momentum Dynamics** is pioneering high power wireless charging solutions to enable the rapid growth of electric vehicles and to promote a cleaner environment. We offer a portfolio of advanced charging solutions across multiple markets. The company's U.S. headquarters is located at 3 Pennsylvania Avenue, Malvern, Pennsylvania 19355. Contact us for more information.

info@momentumdynamics.com



# Cybersecurity@Siemens

Unrestricted © Siemens 2020

siemens.com/cybersecurity



# Driving Security – Our holistic cybersecurity approach



## We are one of the first companies to take a holistic approach on Cybersecurity

Protection of our IT and OT infrastructure Protection of our products, solutions and services Enable cyber Solutions for our business

SIEMENS

Ingenuity for life

**Unrestricted © Siemens 2020** 

**Our vision** 



# For our society, customers and Siemens, we are the trusted partner in the digital world by providing industry leading cybersecurity

# Together we make cybersecurity real – because it matters

**Restricted © Siemens 2020** 

# Derived from our vision and holistic approach, we pursue four strategic objectives





We enable our business to protect against cyber risk and support them to create market opportunities We develop and adopt leading technologies and leverage our ecosystem

We continuously improve resilience through clear and holistic accountability and ownership We drive a culture of ownership for cybersecurity and attract, develop and retain best talent

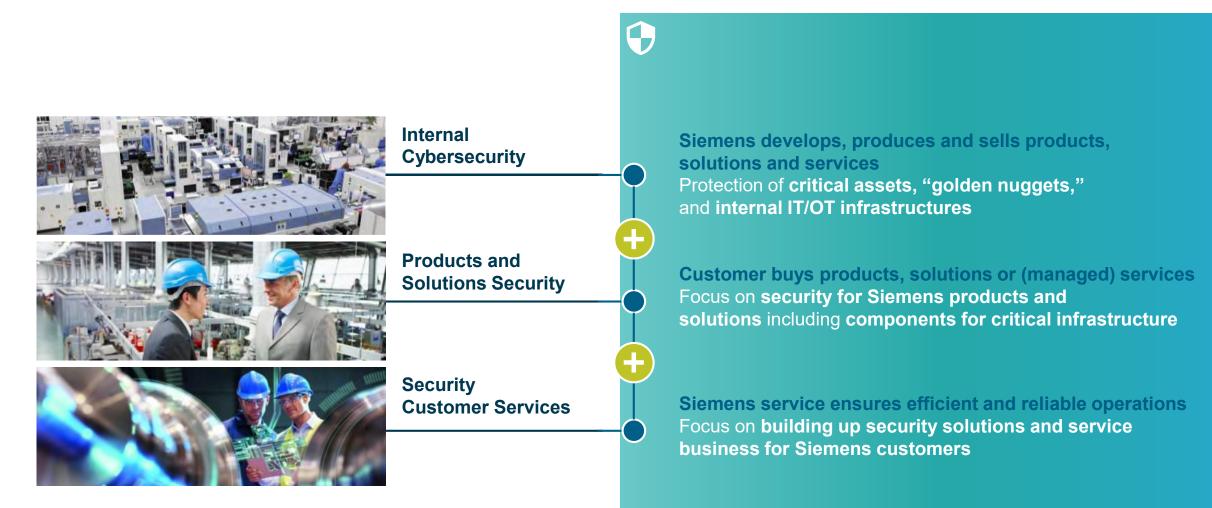
## We have four clear distinguishing features that set us apart from the competition



# Global player in digitalization Domain know how of verticals and cybersecurity Initiator and driver Charter of Trust

## We offer a holistic concept to secure products, solutions and services as well as our own IT infrastructure





## Our current and long-term innovation topics in Cybersecurity





Note: "Long term" means "7 years range" of radar

# Evolving threats, technology and regulation due to digitalization create new opportunities and challenges for cybersecurity

# Increasing market for digitalization

Market for cybersecurity services

Interconnection of devices

Demand new business models

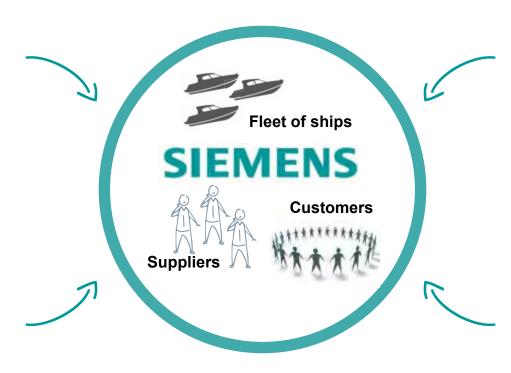
**Technological** 

change

IT / OT convergence

Connectivity and cloud

**Big data** 



SIEMENS Ingenuity for life

## Emerging threat landscape

Political motivation Industrial espionage Bringing down critical infrastructure

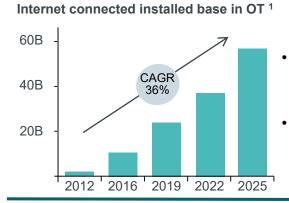
## Tightened regulations

Chinese cybersecurity law EU regulations: GDPR & NIS US regulations

## **Cybersecurity landscape**

Frequency and impact of cyber crime continue to increase – leading to further growing risks and increasing opportunities

#### **Business Priorities**



- Threat Landscape
- Losses caused by Cyberattacks (USD) <sup>3</sup>
- Increasing incidents at Siemens<sup>4</sup>

The OT cybersecurity market

CAGR) and has no established

Advancing digitization levels

Cvber attack resilience is

becoming a key issue for

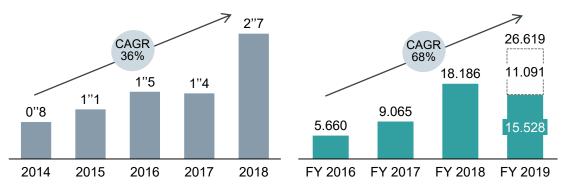
is rapidly growing (18%

critical infrastructures

front-runner yet <sup>2</sup>

IT and OT

are blurring the lines between



Source: 1) Gartner 2) Siemens 3) FBI, 4) Siemens Cybersecurity Unrestricted © Siemens 2020

#### Technology

- No passwords! Technology will become widely adopted which does not require passwords as a means of authentication
- Self authentication for IoT devices is established technology
- Quantum computing / AI provides new means to protect digital environment but compromises e.g. encryption

#### Laws and Regulations

- > 70 laws & regulations already affecting Siemens on Cybersecurity > strong growth in last years > further intensification expected esp. in IoT, digital products/solutions/services and critical infrastructures
- Major governments issue regulations requiring backdoors for all OEMs with master keys available for their 3-letter-agencies
- Increasing high fines for non-compliance (e.g. up to 4 % of overall revenues according to BSI IT-SiG 2.0) and product liabilities requiring certification (e.g. EU Cybersecurity Act, Chinese Cybersecurity Law)
- Requirements reg. Security by Design / Default, e.g. equip software / device with appropriate or specific security features (e.g. California SB327) affecting our product portfolio globally



#### EXHIBIT G-4A 40-FT: IT SECURITY VENDOR ASSESSMENT FORM

EXHIBIT G-4A: 40-ft Buses Required Technical Submittal – IT Security Vendor Assessment Form

### **New Cloud Vendor Assessment Form**

This form is intended to be used by internal customer personnel who are intending to onboard a new cloud-based (data, app, service stored or hosted off-premise) vendor.

#### Part 1.1 Data Backup & Recovery

This section covers standard data backup and recovery concerns.

This section covers standard data backup and recovery concerns.		
	Vendor Response	IT Assessment of Acceptability
Question	(respond to questions that are applicable to the	(responses may include acceptable, more
	application or service provided)	information needed, or N/A not applicable)
Do you have a documented process for how system, application and data backups are		
performed? Describe routine for backups (full, incremental, differential; continuous,	available for 30 days for	
daily, weekly, etc.).	resotation	
How do you verify that the backup process is functional and that restores work? How often is this done?	Through internal system Diagnostic	CS
Are all backup media (onsite, offsite, full and/or incremental), rendered unreadable at the end of their useful life? If yes, please describe the method used to render this media unreadable.	NA	
Are procedures in place to fully destroy data contained on back-up media before they	Not enough time to answer but	
are reused? If so, how?	will provide post bid	
Are the backups protected from unauthorized access and tampering? If Yes, describe	Yes Secure Encryption only internal	1
how they are protected.	Siemens Enggineers have access	
Is backup media containing confidential information encrypted and stored in a locked	YES	
container during transport? Please describe encryption method.		
Do you store backups offsite?	This is all done in Siemens Secu	
a. How do you secure access to offsite media? Please specify the name of any 3rd		Le
party service providers.	AES256 Mindsphere platform	
b. How do you secure access to media in transit? Please specify the name of any 3rd		
party service providers.		
Will any Internet-accessible systems contain data? If so, how is the data on thoses	Secure communications TSL 1.2	
systems protected? Is the data encrypted at rest?	validated by X.509 certs	
What type of data will you be exchanging with customer? What type of data will you be processing and/or storing FROM customer? How is data transfer secured?	Bus and charging data typical	
	for depot operations	

EXHIBIT G-4A 40-FT: IT SECURITY VENDOR ASSESSMENT FORM

What is your SLA? What are the actual results / metrics vs the SLA for the last 12 months?	Service Level Agreement?	
How many outages or failures have you experienced in the past 12 months? What were the shortest and longest durations? What were the fastest and slowest times to recover?	Siemens is Global company that is difficult to answer	
For each outage or failure in the past 12 months, provide the following: -Type of outage or failure -What time of day it occurred -Duration -Time to recover -Number of customers impacted	This information is not readily available. We need a more speci request and can investigate	
Describe the different operating environments for storing and processing customer data. This list of systems names and purposes will help customer with initial evaluation and possible incident response.	We use Tier 3 Datacenters intern and External	al
How is your environment architected with respect to fault tolerance and high availability?	Tier 3	
Will any additional third party vendors have access to customer data via our relationship with your organization? Please include backup and recovery vendors, application and service providers, software and hardware support vendors, etc.	no	
Is sensitive data (i.e. PII or cardholder) securely disposed of when no longer needed?	By Customer request and guidance	e
Is it prohibited to store the full contents of any track from the magnetic stripe (on the back of the card, in a chip, etc.) in the database, log files, or point-of-sale products?	NA	
Is it prohibited to store the card-validation code (three-digit value printed on the signature panel of a card) in the database, log files, or point-of-sale products?	NA	
If credit card data is used, are all but the last four digits of the account number masked when displaying cardholder data?	NA	
If credit card data is used, are account numbers (in databases, logs, files, backup media, etc.) stored securely— for example, by means of encryption or truncation?	NA	
If credit card data is used, are account numbers sanitized before being logged in the audit log?	NA	

#### CAPITAL METROPOLITAN TRANSPORTATION AUTHORITY

#### EXHIBIT G-4A 40-FT: IT SECURITY VENDOR ASSESSMENT FORM

Part 1.2 Security Policy and Administration			
This section covers standard information security policy concerns.			
Question	Vendor Response (respond to questions that are applicable to the application or service provided)	IT Assessment of Acceptability (responses may include acceptable, more information needed, or N/A not applicable)	
Is there one person assigned to lead, manage and be accountable for security?	Siemens has a Global security Chi	eÍ	
Is that person at least at a director level?	C level executive		
Does your company have a dedicated security team? If so, roughly how many people are on it.	1000's		
Does your company have a corporate security policy?			
Are each of the following areas covered in your security policy? -Information Classification -Data privacy -Data-handling (including use, storage and destruction) -Email use and retention -Encryption -Security configuration for network, operating systems, applications and desktops -Change control -Network and User system access -Security incident management -Physical access -External communication -Asset management	Yes we can provide a security Overview with our documentation package		
Are your systems subjected to penetration testing? Is testing performed by internal personnel or outsourced? When was the last penetration test? What were the results?	Yes for this depot Software Using TRA, at teh beginning of eac and we integrate SAST throughout t	-	
Which of the policies above have been substantially modified in the past year?	All are evaluated ongoing		
Are information security policies and other relevant security information disseminated to all system users (including vendors, contractors, and business partners)?	YES		
Are the policies communicated in a way that requires employees to certify their understanding and compliance at least annually?	Internally yes twice each FY		
Do the security policies apply to contract employees (offsite and onsite), dependent Service Providers, etc.?	Yes, but limited access is given to this personnel, very limited		

EXHIBIT G-4A 40-FT: IT SECURITY VENDOR ASSESSMENT FORM

Is there a security training and awareness program in place for all employees (new, existing, permanent, temporary or contract staff) ? If yes, describe the program and frequency of re-certification or re-education.	Yes Rigirous	
Is there a formal procedure for reporting a suspected security violation?	YES	
Is the identity and background of all your staff servicing customer known based on security background checks? If yes, describe the screening activities performed on job applicants (e.g., credit, drug screening, references, and criminal background checks) and provide a copy of the policy, procedure or checklist.	Not sure this applies as Siemens commission this site and then leaves standard proceedures for onboardin	ve, but these are
Are employees with access to sensitive information prevented from working prior to completion of the background checks?	YES	
Are re-investigations conducted on employees based on job function or length of employment? If yes, describe the re-investigations process performed (e.g., credit, drug screening, references, and criminal background checks).	NA	
Is there a process in place to screen your outside contractors such as security guards, janitorial services, etc.? If yes, describe the process used to screen these individuals (e.g., credit, drug screening, references, and criminal background checks).	NA	
Part 1.3 Secure Software Engineering & Vulnerability Sca This section covers vulnerabilitiy identification and remediation, vulnerabilitiy scans, and		cation Security Project seeks to make software security
Question	Vendor Response (respond to questions that are applicable to the application or service provided)	IT Assessment of Acceptability (responses may include acceptable, more information needed, or N/A not applicable)
Does your organization scan and/or test for vulnerabilities in your service / application, and if so, how quickly are any identified vulnerabilities remediated? Please provide as much detail in your answer as possible.	Yes	
Does your organization embrace and incorporate the best practices and recommendations provided in the OWASP Developer's Guide and OWASP Cheat Sheet Series to implement or enhance your secure software engineering? Please provide as much detail in your answer as possible.	See attached documentation	
Does your organization utilize the OWASP Testing Guide and/or OWASP Code Review Guide to effectively find vulnerabilities in your service / application (with the intent of remediating identified vulnerabilities)? Please provide as much detail in your answer as possible.	See Attached documentation	
Can you provide a copy of your most recent vulnerability scan results?	this is restricted material	

#### CAPITAL METROPOLITAN TRANSPORTATION AUTHORITY

EXHIBIT G-4A 40-FT: IT SECURITY VENDOR ASSESSMENT FORM

Can you provide a scan that identified issue(s), and provide the follow-up scan that shows the issue(s) resolved? Please ensure that dates are clearly listed on each report.	NA	
If you don't scan for vulnerabilities, how do you identify and remediate vulnerabilities? Please provide as much detail in your answer as possible.	See attached documetation	
What concerns or considerations would you have, if any, to customer conducting periodic vulnerability scans of your service / application?	Licensing agreement would have to that activity	permit
Who can we contact with results of vulnerability scans run against your service / application? Please provide their name, title / role, and contact information.	Once awarded we could have sessi wit Siemens cyber security offic	
Part 1.4 Physical Security of Data	I cannot give out company persor	
This section covers standard physical security concerns where customer data is proce		
Question	Vendor Response (respond to questions that are applicable to the application or service provided)	IT Assessment of Acceptability (responses may include acceptable, more information needed, or N/A not applicable)
How do you secure access to your data facilities where customer data will be stored?	Tier 3 datacenter	
Are there multiple physical security controls (such as badges, escorts, or mantraps) in place that would prevent unauthorized individuals from gaining access to the facility?	yes	
How are these security controls monitored?	NA	
Are the vendor premises separated into different control areas such as server / computer room, operation areas, loading / delivery areas and others? Please specify how the access controls are in place in each separate area.	these are internal datacenters external are Azure facilities	
Are multiple tenants occupying this facility? If Yes, please specify how tenants are separated	NO	
Is access to areas where work is performed for customer physically separated from that of other clients? If Yes, describe the separation.	It is a datacenter	
Is access to the facility controlled by the use of a token-based card access control system? If Yes, describe the authorization process for requesting access, including changes.	highest security avaialble	
Are visitors required to sign-in, receive ID badge and escorted while on premises?	yes	
Is the facility equipped with surveillance camera(s) 24/7/365?	yes	
Do security cameras cover inside and outside doors and confidential areas?	yes	

EXHIBIT G-4A 40-FT: IT SECURITY VENDOR ASSESSMENT FORM

Are precautions taken to prevent the removing of customer information or related assets (checks, credit card information, storage media, hardware) from the premises? Please give details of these precautions.	Secure Datacenter yes	
Are controls or safeguards in place to prevent unauthorized interception or damage to network, power or telecommunications cabling (e.g., wiring and router closets, etc.)?	these are restricted areas in a datacenter	
Please describe whether security guards are required to patrol areas that contain network, power or telecommunications cabling (e.g., wiring and router closets, etc.).	not sure	
How do you secure access to conduits (e.g., wire, fiber, etc.)?	restricted	
How do you secure access to wire closets?	restricted	
Has a clear desk, clear screen policy been implemented where necessary to protect information in shared environments?	no shared environments	
How do you secure access to consoles that may display customer or cardholder information?	restrict access,we do not hand	e financial
	transactions	
Part 1.5 Single Sign-On Integration (SAML 2.0 connector)		
	Vendor Response	IT Assessment of Acceptability
Question	(respond to questions that are applicable to the	(responses may include acceptable, more
	application or service provided)	information needed, or N/A not applicable)
Do you support SAML 2.0 for user authentication?		
<ul> <li>If Yes:</li> <li>1) Have you previously partnered with an SSO provider to have your SAML connector added to their catalog?</li> <li>2) Does your SAML implementation support IdP-initiated or SP-initiated?</li> <li>3) Do you have a link or document you can provide that explains the setup process to</li> </ul>	NA	
SAML-enable your application?		
	NA	

#### CAPITAL METROPOLITAN TRANSPORTATION AUTHORITY

#### EXHIBIT G-4A 40-FT: IT SECURITY VENDOR ASSESSMENT FORM

Please provide a URL or other means by which we can access your automated user provisioning documentation.		
Part 1.6 Application & Data Dependencies & Requirement	S	
In this section we are interested in understanding the logical and functional dependence	es and relationships introduced by the addition of a serv	ice organization application to customer's internal
Question	Vendor Response (respond to questions that are applicable to the application or service provided)	IT Assessment of Acceptability (responses may include acceptable, more information needed, or N/A not applicable)
Approximately, how often do you upgrade your application? Will these upgrades impact my use of the application, and if so what time of day and for how long will I be affected?	Quarterly depends on functionalit the customer based on the operati	
How and when will you notify me about any scheduled maintenance? How can I contact you to get more information about unscheduled or extended downtime? Does application or service's data need to query or update existing customer systems in real-time?	we will have an active Quartly se inplace to handle this with perso no, these are unique installati	nal visits to the site
Does the application or service log logical access and system events, and provide the ability to generate standard reporting on this data?	yes	
What is your permissioning scheme – do all users have access to the entire application or can you customize who has access to what on an individual and by role basis?	no only selected users	
Does the application or service provide appropriate role-based access? (E.g., can date viewing/editing/deleting data, or approving/rejecting changes be restricted or enabled based on a user's role or profile?)	yes, and yes we can restrict and authenticate access	
Does the application or service provide adequate monitoring and escalation via dashboard alerts, email, or other auditable system of communication?	yes	
Does the application or service require additional infrastructure (hardware/software) to be obtained in order to implement the desired functionality?	no	
If the application or service is intended to run on the Force.com platform, has a Salesforce AppExchance Security Review been completed, and what were the results?	no	
Is supported integration, or prebuilt integration, available with any other systems?	API	
Do you offer API access? Are there any extra charges to access API? What form do the APIs take?	API integration is custom and w separate resources outside this	_
Can you verify that *all* API unit calls are both 1) authenticated (by managed key or OAuth) and 2) encrypted (by 128-bit or greater encryption)?	yes yes	

EXHIBIT G-4A 40-FT: IT SECURITY VENDOR ASSESSMENT FORM

Can I readily export my data in a usable, non-proprietary format? If not, what provisions are in place to quickly gain access to data in a usable, non-proprietary format?	yes	
What are your terms when it comes to ownership of data? How about any metadata I generate while using the application?	it's the customers data they own it	
How easy is it to export data from your service when moving to a new service? Do you offer an option to export the data in one of the open data formats like XML or JSON? Are there any extra charges for exporting the data?	easy and yes	
Is data deleted completely when deleted from the application?	yes, but backups have to be de	leted.
What happens to my data if I discontinue your service – do you delete it immediately? Can I retain access to a read only copy for a fee?	the customer owns the data we can provide it via media	
Part 1.7 Service Organization Controls (SOC) Reports		
The OOO4 Development was the standard OAO70 meet and in the sine and find		
The SOC1 Report replaces the standard SAS70 report, regarding design and effective		
Question	Vendor Response (respond to questions that are applicable to the	IT Assessment of Acceptability (responses may include acceptable, more
	Vendor Response	IT Assessment of Acceptability

#### EXHIBIT G-4A 40-FT: IT SECURITY VENDOR ASSESSMENT FORM

Please provide links, description of available technical and customer support resourc	s	
Question	Vendor Response (respond to questions that are applicable to the application or service provided)	IT Assessment of Acceptability (responses may include acceptable, more information needed, or N/A not applicable)
Is free customer (tier 1) support included in your standard license agreement?	YES	
What is the customer (tier1) support desk's days / hours of operation?	Part of service agreement	
Is technical support (tier 2) included in your standard license agreement?	not sure this customer will have	this need
What is the technical (tier 2) support desk's days / hours of operation?	NA	
Does the application or service include a web-based support site, for answers to technical questions?	Yes	
In the event of an interruption of your service, what is your process for notifying customer operations of the circumstances of the interruption or outage and the expected recovery time	We personally call, notify VIA phone, email text	
Do you have a transparent, public site where you publish any system issues or outages for everyone to see?	No this is a private installation	
Is there a disaster recovery strategy in place? How frequently is it tested?	Yes, need to find out.	

# Depot CONTROL



### The general idea

#### CONNECT

#### **Reporting & Monitoring** View Dashboards of your system status

- Historical reporting and statistics
- Troubleshooting and detailed views

#### **Notifications and Remote Reset**

Stay informed about status and events

- In App and email event driven notifications
- remote charger reset

#### **Smart Charging**

Control your chargers to manage the load

- Assign control groups power constraints (hourly, daily and weekly basis)
- Control the charging in a group according to prioritization strategies e.g. First-In-First-Out, First-In-Last-Out or SPLIT



### CHARGE

Coming soon

### Vehicle-based reporting & billing

- Vehicle centric dashboards/reporting
- Charge Authorization (RFID/MACID)
- Aggregation of CDRs to cost centers

### CONTROL

#### Coming soon

#### Robust energy optimization

Optimized charging based on bus/route scheduling, power constraints, energy prices

- Live monitoring of planned versus actual
- Adaptive optimization to deviations

### **Why Depot Control**

### CONNECT

#### **Smart Charging**

Control your chargers to manage the load

- Assign control groups power constraints (hourly, daily and weekly basis)
- Control the charging in a group according to prioritization strategies e.g. First-In-First-Out, First-In-Last-Out or SPLIT
- This works well for pilot depots



### CONTROL

**Robust energy optimization** Optimized charging based on bus/route scheduling, power constraints, energy prices

Live monitoring of planned versus actual

Adaptive optimization to deviations

Use AI to ensure all vehicles leave on time, at the right state of charge whilst delivering the lowest possible electricity cost for the fleet and the lowest possible power connection for the depot

### **Typical Benefits for a Depot**



#### Reducing your energy costs

- Charging at the optimal time
- Manage demand charges
- Configurable strategy

### Efficient usage of grid connection

- Infrastructure protection
- Reduce power requirements
- Variable constraints

### Up to 40% reduction of energy costs Up to 50% reduction in demand charges

Typically 40 – 60% lower grid capacity e.g. 1MW  $\rightarrow$  500 kW = CAPEX

### **Optimized Charging Operations**

- Automated daily planning
- Operations tracking and reporting
- Integration with existing depot management

#### **Remove human error from operations**

## How can we reduce operating costs by 40 – 50% and still maintain the schedule?





### Use Case #1: Demand Charges Uncontrolled Charging Plan High demand charges for uncontrolled charging due to power peaks



1.) Demand charges based on Con Edison Service Classicifcation No.9 2021 - https://www.coned.com/\_external/cerates/historical-PSC10.asp

### Use Case #1: Optimized Charging Plan with Depot CONTROL Reduce demand charges by 50%



1.) Demand charges based on Con Edison Service Classicifcation No.9 2021 - https://www.coned.com/\_external/cerates/historical-PSC10.asp

### **Use Case #1: Total Demand Charge savings through the year**

#### Summer (June – September)<sup>1</sup>

Mon – Fri, 8am – 6pm 9.15 \$/kW Mon – Fri, 8am – 10pm 18.44 \$/kW All hours all days 16.66 \$/kW Rest of Year<sup>1</sup>

Mon – Fri, 8am – 10pm 13.96 \$/kW All hours all days 4.21 \$/kW

Savings (150 buses)

\$81,923 per month \$54,311 per month

Total savings (150 buses) = \$762,180 per year

Savings per bus = \$5,081 per year

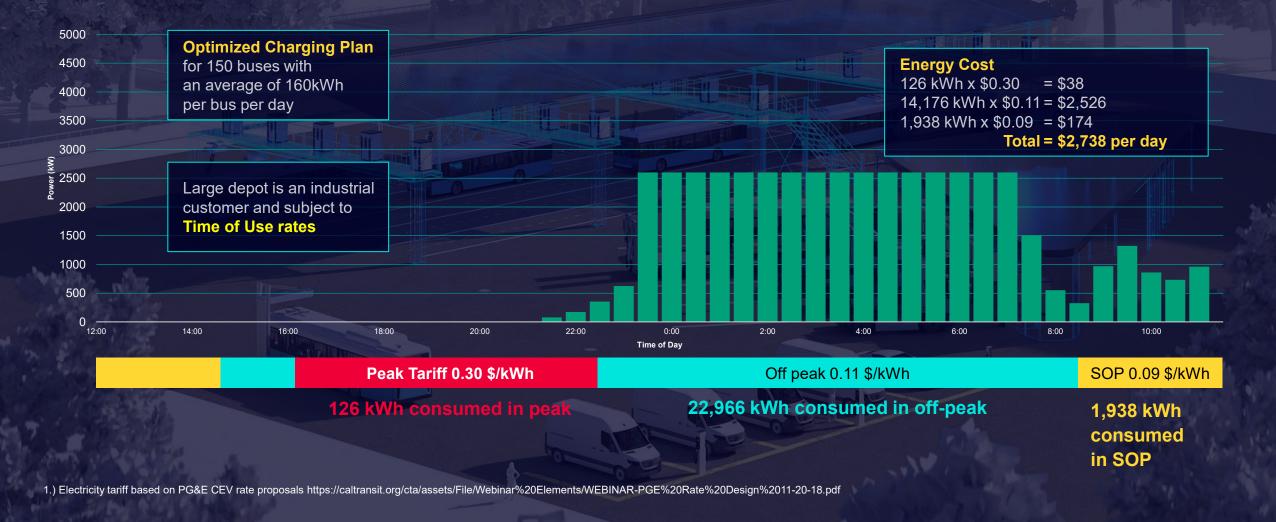
1.) Demand charges based on Con Edison Service Classicifcation No.9 2021 - https://www.coned.com/ external/cerates/historical-PSC10.asp

## Use Case #2: Time of Use Energy price with Uncontrolled Charging High energy costs for uncontrolled charging



1.) Electricity tariff based on PG&E CEV rate proposals https://caltransit.org/cta/assets/File/Webinar%20Elements/WEBINAR-PGE%20Rate%20Design%2011-20-18.pdf

### Use Case #2: Optimized Charging Plan with Depot CONTROL Reduce electricity costs by 40%



### Use Case #2: Total Demand Charge savings through the year

#### **CEV Rates EV-Large S**

Peak, 4-10pm all days 0.30 \$/kWh

Off-peak, 10am-9pm, 2-4pm 0.11 \$/kWh

SOP, 9am-2pm 0.09 \$/kWh

Savings (150 buses)

\$2,076 per day

Total savings (150 buses) = \$622,800 per year

Savings per bus = \$4,152 per year

1.) Demand charges based on Con Edison Service Classicifcation No.9 2021 - https://www.coned.com/\_external/cerates/historical-PSC10.asp

### **Optimized Charging Plan with Depot CONTROL** Leave on time, at the right SOC, with the lowest power demand



• Without SMART CHARGING the charging operations are uncontrolled and start whenever buses are plugged.

This results in power peaks

 Depot CONTROL delivers the required charging energy at the required charging time with reduced power demand

**Use Case #3: Decrease CAPEX required per vehicle** 

#### Typical power reduction 40 – 60%

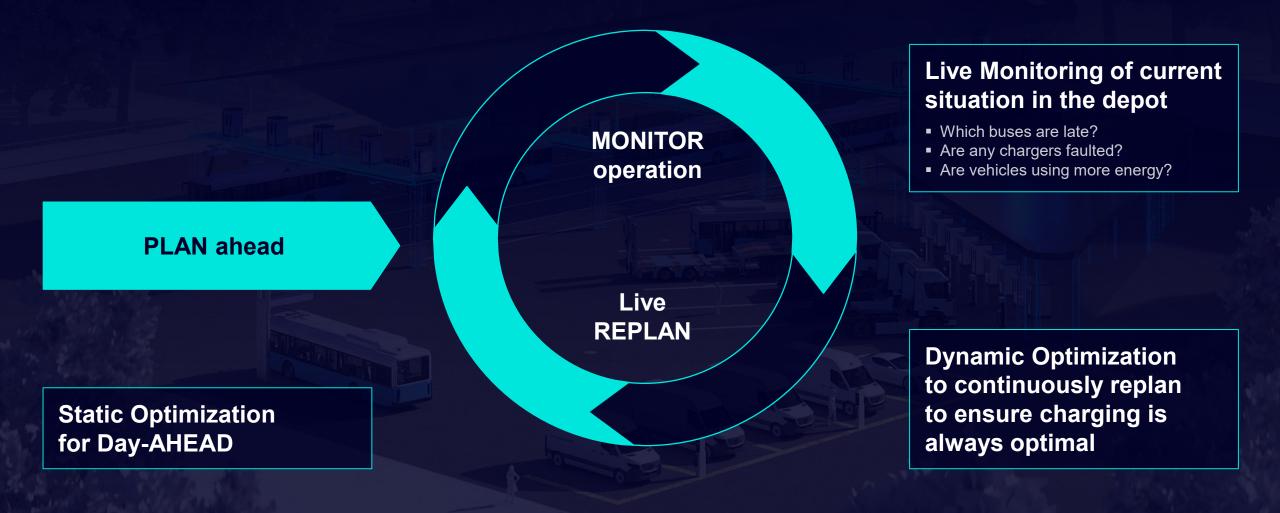
## Charge double the number of vehicles with the same power

CAPEX per vehicle is halved.

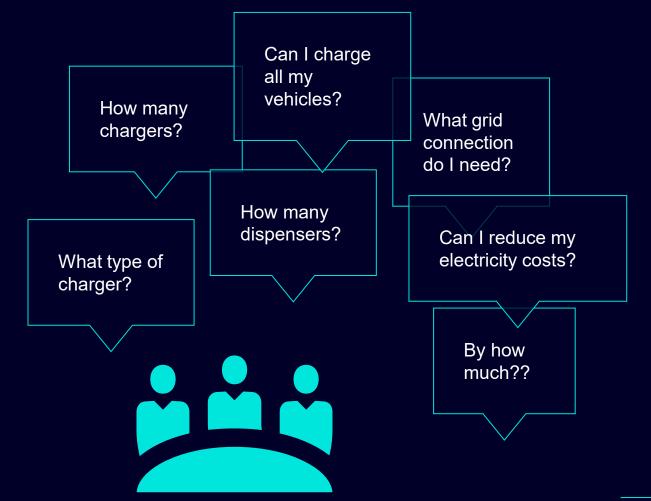


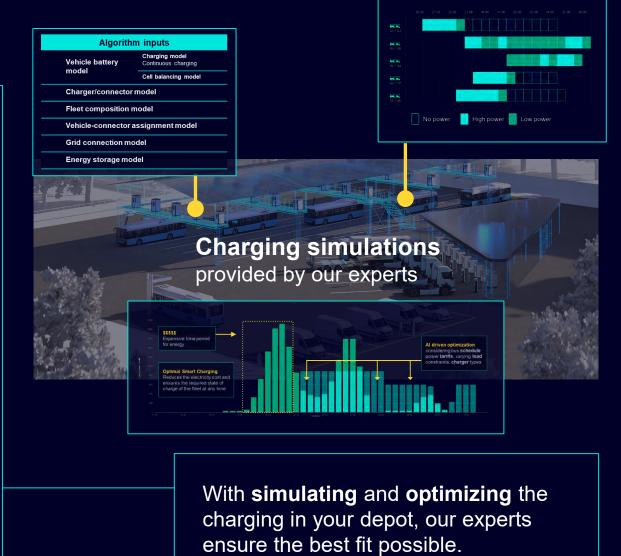
Page 13 Restricted | © Siemens 2020 | Author | Department | YYYY-MM-DD

Innovative Dynamic Optimization ensures that the charging is not only optimized but is constantly updated according to local conditions



### You need help to plan your depot? – Come and talk with our experts!





### Robust Optimized Smart Charging "Optimized Charging in the real world"

• Objective: Leave on time, at the right state of charge with the optimal energy at the lowest cost

#### **Algorithm inputs Optimization engine** Stage 1 – PLAN – DAY AHEAD **Charging model** Mixed integer linear programming Charger/connector data Vehicle battery E-vehicle schedule/trip Continuous charging Charger type (sequential/split) model Arrival time Flexible constraint functions Cell balancing model Number of connectors Departure time Charger/connector model Weighted objective functions Max power out Trip energy Charging efficiency Fleet composition model **Energy Prices** Vehicle-connector assignment model E-vehicle battery data Time of use tariffs Battery cap Grid connection model C-rate (Max power in) Energy storage model Battery cell balancing requirements **INITIAL charging strategy**

### Robust Optimized Smart Charging "Optimized Charging in the real world"

#### Stage 2 – Live MONITORing of current situation

Are the vehicles running according to schedule? Are the vehicles returning with expected SOC? Are all chargers up and running? Have the energy prices changed? Have the power constraints changed? Have the vehicles parked correctly? Stage 3 – REPLAN based on current situation

Live replanning based on current knowledge of operations Adaptive self learning approach Charging plan continuously updated

#### **Changing algorithm inputs**

- Fleet composition model
- Vehicle-connector assignment model

Actual charger status

Actual vehicle SoC

Actual vehicle arrival time

#### SIEMENS

Adjusted charging strategy

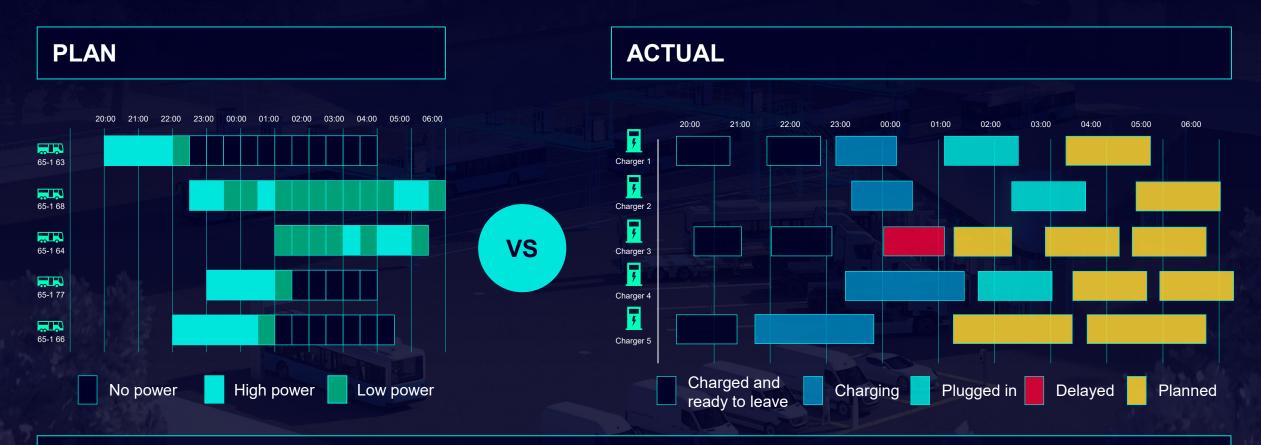
### Deep Dive – PLAN phase The optimization gives the ideal charging profile for each bus and charger



Individual charging profiles are optimized

So when combined the profiles deliver the **best possible power point** and/or energy cost

### Deep Dive – MONITOR phase The current local situation at the depot is continuously monitored



#### MONITOR the delta between PLANNED and ACTUAL situation

### Deep Dive – REPLAN phase Live optimization to replan charger schedules to keep lowest energy costs

#### **RE-PLAN** 06:00 20:00 21:00 22:00 23:00 00:00 01:00 02:00 03:00 04:00 05:00 2000 1800 But vehicle can be replanned Late vehicle means 65-1 63 less power needed to keep power limits and 1600 vehicle mission needs 1400 65-1 68 1200 Replanned charger schedule 65-1 64 1000 800 65-177 600 400 65-1 66 200 No power High power Low power 0 22:00 0:00 2:00 4:00 6:00 10:00 8:00

**Continuously Optimize** based on the current situation so that the depot is always operating at the lowest costs/power no matter what

Innovative Dynamic Optimization ensures that the charging is not only optimized but is constantly monitored

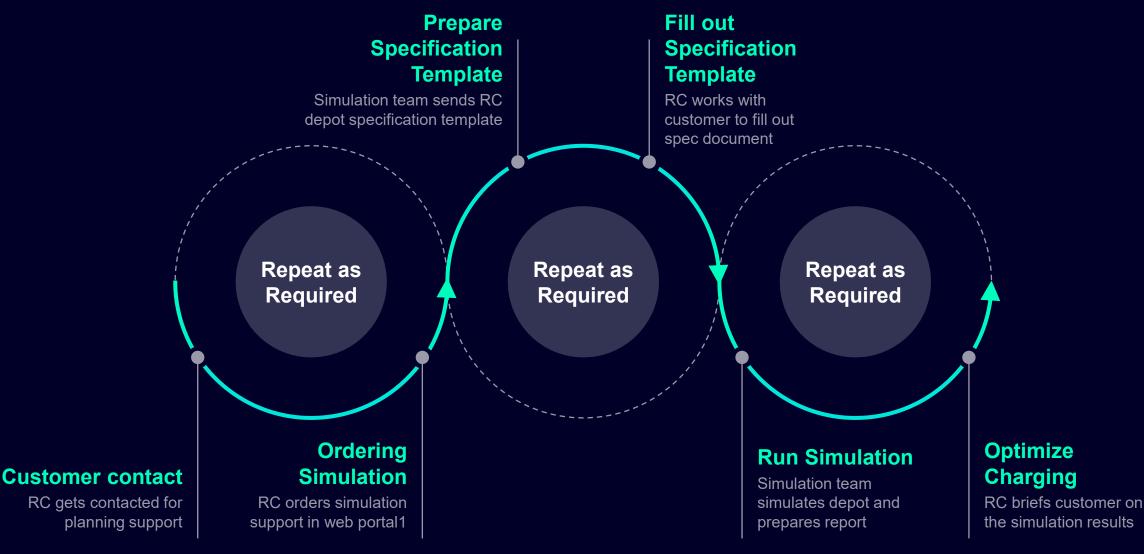


### **Customer Support**

2nd and 3rd level support for the regions Simulation Support to help the customer plan their depots



### **Simulation Support Process**



## SIEMENS

Overview	2
Monitor Chargers	3
Onboarding Chargers and EVs	4
Smart Charging	5
Reports	6
Frequently Asked Questions (FAQs)	7
Error Codes	Α

Introduction to EVC3 Depot

1

EVC3 Depot 2.0

**Operating Manual** 

#### Legal information

#### Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

#### A DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

#### 🛕 WARNING

indicates that death or severe personal injury may result if proper precautions are not taken.

#### 

indicates that minor personal injury can result if proper precautions are not taken.

#### NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

#### **Qualified Personnel**

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

#### **Proper use of Siemens products**

Note the following:

#### 

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

#### Trademarks

All names identified by <sup>®</sup> are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

#### **Disclaimer of Liability**

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

### Table of contents

1	Introducti	Introduction to EVC3 Depot	
	1.1	Security information	5
	1.2	System Requirements	6
	1.3	Logging In and Out of EVC3 Depot	6
	1.4	EVC3 Depot Architecture	
2	Overview	·	
	2.1	Grid View	
	2.2	Map View	
	2.3	List View	
	2.4	Charger Information	
3		Chargers	
	3.1 3.1.1 3.1.2 3.1.3 3.1.3.1 3.1.3.2 3.1.3.3 3.2 3.2.1 3.2.2 3.2.3 3.2.4 3.2.5 3.2.6 3.2.7	Monitor Chargers from Overview All Charger Status All Connector Status Charger Information Connectors Statistics Variables Notifications User Notifications Device Notification Delivery Groups System Notifications Desktop Notifications. Create a Notification Edit Notifications	17 18 19 20 21 22 22 22 22 22 23 22 23 24 24 24 24 25 26 26 26
	3.3 3.3.1	Remote Control of Chargers Remote Control of Chargers	
4	Onboardi	ng Chargers and EVs	
	4.1 4.1.1 4.1.2 4.2 4.2.1 4.2.2 4.2.2 4.2.3	Onboarding Chargers Add a Charger Edit and Delete Chargers Onboarding EVs Onboard an EV Add Multiple Electric Vehicles Edit and Delete Electric Vehicle.	
	4.2.4	Unregistered EVs	

5	Smart C	harging	41
	5.1	First In First Out Chargers	42
	5.2	First In Last Out Chargers	42
	5.3	SPLIT Chargers	42
	5.4	Add Charger Group	43
	5.5	Add Charger to Group	44
	5.6	Add Charger Group Events	46
6	Reports.		49
	6.1	Reporting	
	6.2	Transactions	
	6.3 6.3.1	Smart Charge Report Depot Status	
	6.3.2	Available Chargers	
	6.3.3 6.3.4	Smart Transactions	
	6.3.4 6.3.5	Energy Usage Soonest Charged EV	
	6.3.6	Energy Delivered Graph	
	6.3.7	Power Consumed Graph	
7	Frequently Asked Questions (FAQs)		
	7.1	How do I Change the Language of the EVC3 Depot Application?	55
	7.2	How do I Check the Version of the EVC3 Depot Application?	55
Α	Error Co	des	57
	A.1	Error Codes	57
	A.1.1	DC Plug-in Charger Error Codes	
	A.1.2	AC Plug-in Charger Error Codes	
	A.1.3 A.1.4	Pantograph Charger Error Codes Charger Connector Error Codes	
	A.2	Vendor-specific Code	
	A.2 A.2.1	RAVE Plug-In Charger Error Codes	
	A.2.1 A.2.2	SICHARGE UC Plug-In Charger Error Codes	
	A.2.3	Siemens HPC Pantograph Connector Error Codes	
	A.2.4	VersiCharge SG Connector Fault Error Codes	
	Glossary	/	67

# **Introduction to EVC3 Depot**

EVC<sup>3</sup> (Electric Vehicle Connect Charge & Control) Depot is a depot management application that provides the following features:

- Monitor the charging operations in an electric vehicle depot
- Generate and View reports on the charging operations
- Diagnostics and load management

The electric vehicle depot is made up of several hardware elements - power distribution systems, the charging infrastructure, and Distributed Energy Systems. The depot might be connected to several different data streams, some internal to the depot like charger data, energy system data, depot operations, and some external to the system like energy markets and city data.

This complexity needs to be managed and this can be accomplished within the Siemens EVC<sup>3</sup> Depot solution, a cloud offering to manage the charging operations within a depot. Developed on the Siemens secure, open IoT platform – MindSphere, this cloud solution monitors, reports, optimizes, and controls the individual components within the electric vehicle depot to deliver the customer business requirements with reduced CAPEX, reduced energy costs, and increased uptime.

The software is supplied as Software as a Service and differs from licensing-in of software in the following key respects:

- Siemens allows access to its software through the internet, rather than providing the software to the customer electronically or on a CD
- The software runs on servers owned or rented by Siemens rather than on on-premise customer servers
- Siemens is responsible for operating and maintaining the software. As a result, there is no separate maintenance agreement, but a service level agreement governing availability and response and reaction times for technical problems.

The system is charger agnostic and uses open source protocols (OCPP 1.6) to allow integration of Third party chargers.

## 1.1 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

1.3 Logging In and Out of EVC3 Depot

For additional information on industrial security measures that may be implemented, please visit (<u>https://www.siemens.com/industrialsecurity</u>).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customers' exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed visit (<u>https://www.siemens.com/industrialsecurity</u>).

## 1.2 System Requirements

EVC<sup>3</sup> Depot is a cloud-based application that you can access with a web browser.

The following browsers are supported:

- Google Chrome
- Microsoft Edge (based on Chromium)
- Mozilla Firefox

#### Note

EVC<sup>3</sup> Depot does not support Internet Explorer.

# 1.3 Logging In and Out of EVC3 Depot

EVC<sup>3</sup> Depot is fully managed by Siemens. The EVC<sup>3</sup> Depot user interface requires a unique user name and password combination for access.

The EVC<sup>3</sup> Depot user interface is accessed through a URL, such as:

https://ebus-chargerapp-ebus.eul.mindsphere.io/App

The specific URL information, as well as user names and passwords, are provided to users by your administrator.

### Log in to EVC<sup>3</sup> Depot

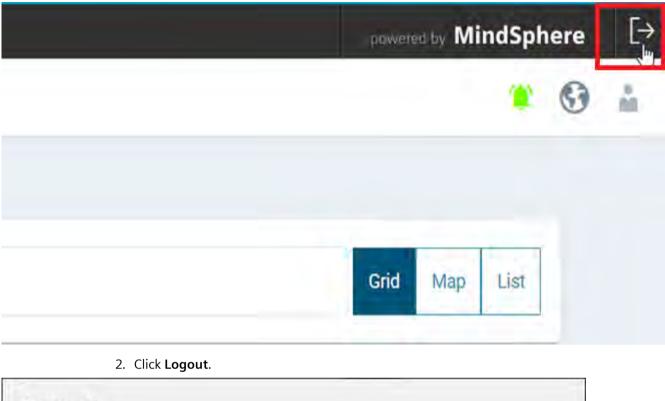
1. Go to the EVC<sup>3</sup> Depot URL and enter your login credentials to log in to the application.

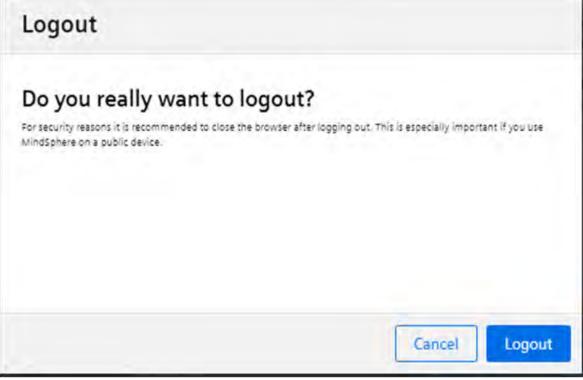
Sign In	
or create an account	
Sign In has changed. If you previous username, please use your email. Nee	
Email	
user@domain.com	
Password	Show
Enter your password	
	Forgot your password
Sign In	

1.3 Logging In and Out of EVC3 Depot

### Log out from EVC<sup>3</sup> Depot

1. Click the logout button on the EVC<sup>3</sup> Depot.





For added security, close the browser after you log out.

# 1.4 EVC3 Depot Architecture

MindSphere is the secure and open integration platform on which EVC<sup>3</sup> Depot is based – with a modular architecture to allow the flexible realization of customer-specific needs.

The application uses open protocols to connect to the assets within the depot and to the wider world outside the depot. Examples of such protocols are the OCPP protocols and ISO 15118 protocols which govern the exchange of data between the EV and the charger, the IEC 63110 protocols which govern the data exchange between the charger and the cloud or IEC 104 which is used for communication with power equipment.

#### Security

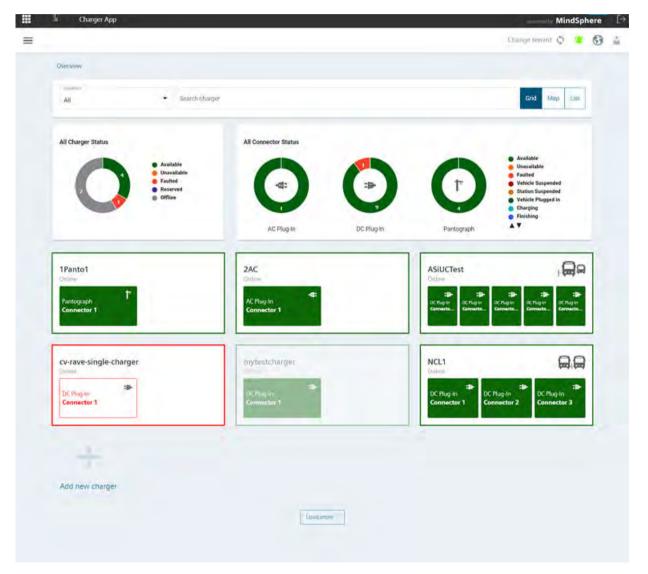
The application has been designed from the ground up to provide the security standards required when connecting critical infrastructure:

- Stringent security features safeguard the successful transfer of sensitive industrial data
- · Encrypted communications protect connectivity from devices to MindSphere
- Siemens has dedicated Product and Solutions Security (PSS) and Information
- Security (I-Sec) organizations to advise on security topics Security measures in line with industry standards IEC 62443 and ISO/IEC 27001

1.4 EVC3 Depot Architecture

# Overview

The Overview screen of the EVC<sup>3</sup> Depot is the centralized location to analyze the overall health of the system. It provides information on the status and health of the chargers and their connectors. It also shows the status of the electric vehicle charging. Error messages and other notifications are also shown.



The information on the Overview page is divided in the form of charts and panes and they can be categorized by the following widgets:

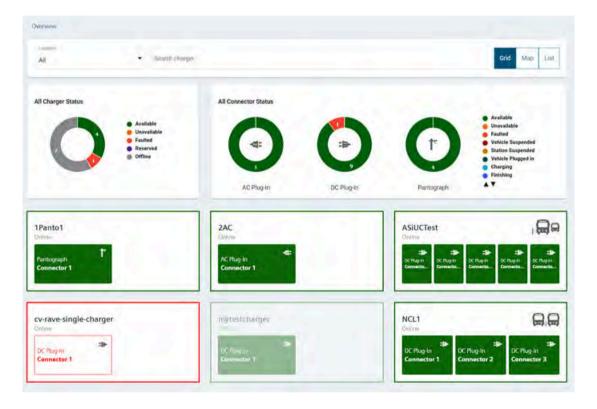
- All Charger Status
- All Connector Status

#### 2.1 Grid View

Information on each charger is shown on individual panes. Each pane shows the status of each connector and the status of charging when it is connected. You can filter the chargers by the preconfigured locations. You can also search for a charger. You can click on the charger to see charging information and charge detail records. These chargers can be viewed in a grid, list, or on a map.

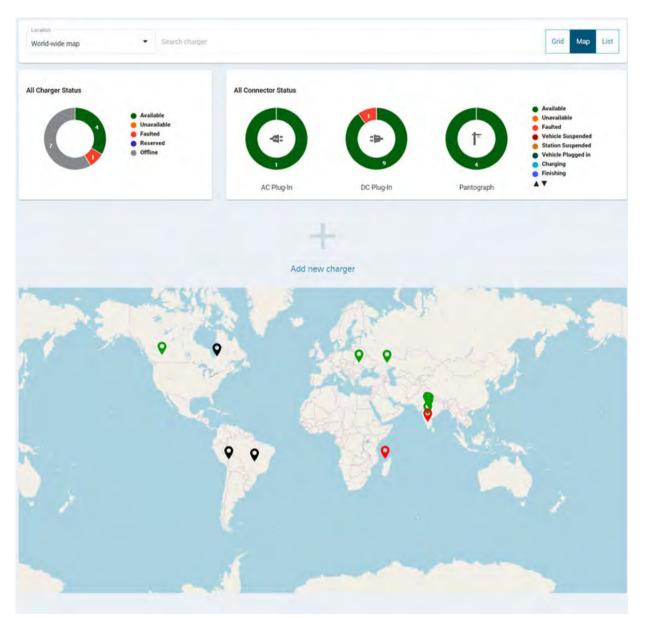
## 2.1 Grid View

The chargers are arranged in the form of a three-column grid. This is the default view.



# 2.2 Map View

The chargers are displayed on a map. This allows you to view chargers in different locations easily.



2.3 List View

# 2.3 List View

The chargers are arranged in the form of a list.

Aji	<ul> <li>Search chan</li> </ul>	364			Dr	id Map Li
I Charger Status	Available Unavailable Faulted Reserved Offline	All Connector	Status	agin Part	Station	ilable d e Suspended n Suspended e Plugged in ing
dd new charger +						
Charger Name	Charging Mode	Power	Location		Connectors	
1Panto1	Standard	450 kW	World-wide map	Pantograph Connector T		
2AC	Standard	4.8 kW	World-wide map	AC Plug-In Connector 1		
ASiUCTest	Sequentiat	150 KW	World-wide map	DC Plug-In Connector 1 DC Plug-In Connector 3	DC Plug-In Connector 2	A A
				Connector 5		
cv-rave-single-charger	Standard	60 KW	World-wide map	DC Plug-In Connector 1	Þ	
mubedaloarger	Denner	-0704	lantifuquefe mage	CC Plug in Comunitor 1	>	
NCL1	Standard	150 kW	World-wide map	DC Plug-in Connector 1	DC Plug-In Connector 2	*

# 2.4 Charger Information

The Charger Information screen provides information on its statistics, variables, status and lists the connectors and their status. It also allows you to edit the charger details such as its name, location type, coordinates, and charger connection to the cloud. The charging behavior depends on the type of charger.

Overview

2.4 Charger Information

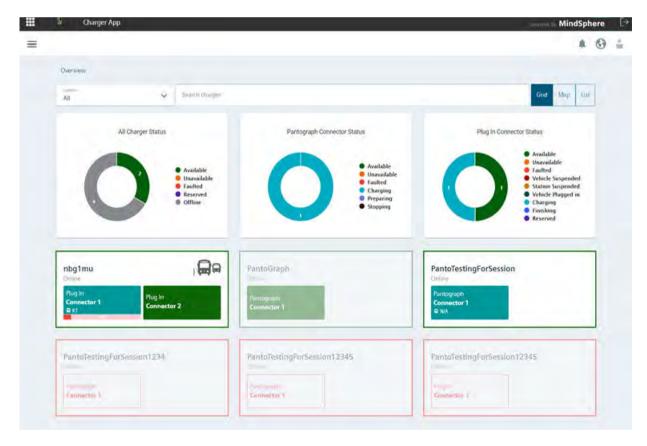
# **Monitor Chargers**

The following sections provide information on monitoring chargers, controlling chargers, connectors, and how notifications work.

- Monitor Chargers from Overview (Page 17)
- Notifications (Page 22)
- Remote Control of Chargers (Page 31)

# 3.1 Monitor Chargers from Overview

The Overview screen allows you to monitor the status of the chargers and connectors. These charts provide a status overview of all the configured chargers and connectors. You can view the details of the individual chargers.

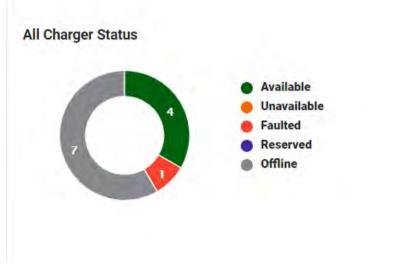


#### **Monitor Chargers**

3.1 Monitor Chargers from Overview

#### 3.1.1 All Charger Status

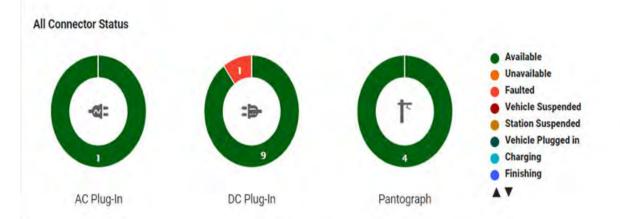
The All Charger Status widget provides information on the status of all the chargers configured on the system.



- Available: The charger is online and available for charging.
- Unavailable: The charger is online and but not available for charging. This Unavailable state is set by the user using the EVC<sup>3</sup> Depot application and once set, will propagate to all the connectors (all connectors of the charger will become unavailable).
- **Faulted:** The charger is online but there is a fault and not available for charging.
- **Reserved:** The charger is online but not available for charging as it is in reserved ·mode for a certain RFID tag or user.
- Offline: The charger is offline and not available for charging.

### 3.1.2 All Connector Status

The All Connector Status widget provides information on the status of all the connectors configured on the system.

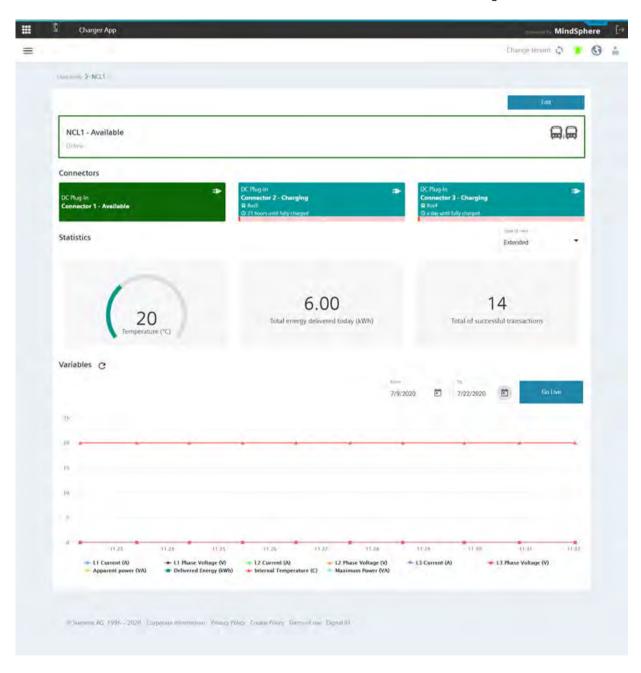


- Available: The connector is online and available for charging.
- Unavailable: The connector is online and but not available for charging. This Unavailable state is set by the user using the EVC<sup>3</sup> Depot application and once set, will propagate to all the connectors (all connectors of the charger will become unavailable).
- Faulted: The connector is online but there is a fault and not available for charging.
- Vehicle Suspended: The connector is online and there is a transaction occurring but the vehicle is suspended and not taking any power.
- **Station Suspended:** The connector is online and there is a transaction occurring but the station is suspended and not delivering any power due to Smart Charging.
- Vehicle Plugged in: The connector is online and the vehicle is ready for charging but currently not being charged. The plug is inserted in the vehicle but there is no active transaction.
- Charging: The connector is online and is charging.
- **Finishing:** The connector is online and the plug inserted but the transaction is already finished.
- **Reserved:** The connector is online but not available for charging as it is in reserved ·mode for a certain RFID tag or user.
- **Preparing:** The connector is online and is being prepared for charging as the plug is inserted in the vehicle but there is no active transaction.
- **Stopping:** The connector is online and charging is being stopped.
- Offline: The connector is offline and not available for charging.

3.1 Monitor Chargers from Overview

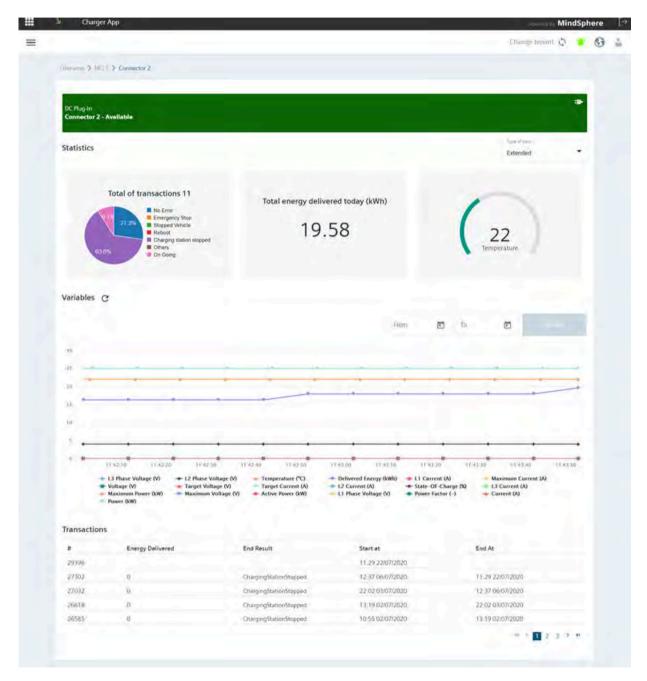
### 3.1.3 Charger Information

You can click on the charger to view more information on the charger. The charger information screen provides information on the status of the connectors, vital statistics of the charger, and the values of the different variables. You can also edit the charger information.



#### 3.1.3.1 Connectors

This section shows the status of all the connectors of the charger. You can click the individual connectors to see information on the statistics, variables, total transactions, and the transaction details for the connector.



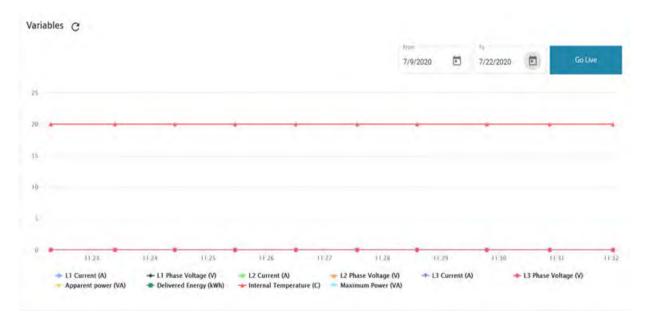
3.2 Notifications

#### 3.1.3.2 Statistics

This section shows the temperature, the total energy delivered on the day, and the total number of successful transactions. You can switch the type of view between extended and light to increase or decrease the statistics visible.

#### 3.1.3.3 Variables

This section displays the status of the different parameters of the charger over a period of time.



# 3.2 Notifications

The Notifications screen allows you to configure the type of notifications to send or receive. Notifications can be sent to emails and can also be displayed on the user interface.

You can also enable desktop notifications to appear based on the browser that you use.

Overview				Notifications	•
All	×	Search charger		Testme	. 13 days ago
	All Charger Status		Pantograph Connector Status	Test	.5 months ago
1		Available	Available	Test	5 months age
		Unavailable     Faulted     Reserved     Offline	Faulted     Faulted     Charging     Preparing     Stopping	Test	5 months ego-

### 3.2.1 User Notifications

You can configure notifications with various variables that are being monitored and notify a delivery group. You can also edit or delete existing user notifications from the Notifications screen.

Charger App	MindSphere	e [⇒
	A 6	3 4
Notifications		
	+	
Name		13
Tost	Edit Delete	
nearly ready	Eide Delate	
Error	Edit Delate	
ab	EdR Delete	
ConnectorReadiness	Edit Dolete	
ExceedPowerLimit	Edit Delete	
Tesome	Edit Delete	
7 total		

3.2 Notifications

### 3.2.2 Device Notification

These are displayed on the user interface as a popup when there is a device error. The person notified on the user interface can click the notification to view detailed information such as the charger Id, connector Id, and the error code. For more information on the error codes, see Error Codes (Page 57).

NUMBER	. device-emors					
Search						Mark All As Read
	.Jeslan	Chapper 10	Comment of 10.	line one	Departured Tama	
9 -	Connector	stcp4	- C	OtherEniol	Mar 27, 2020, 11:55:24 AM.	Mark As Read
4	Connector	strip6	2	InternalEnna	Mar 27, 2020, 11:55:24 AM	Mark As Read
÷.,	Connector	step4	3	OtherEnde	May 27, 2020, 11:55:24 AM	Mark As Read
£						

#### 3.2.3 Delivery Groups

Delivery groups are a set of users that are notified for a configured notification. You can set the delivery groups to receive specific notifications when creating or editing a notification. Click "+" to create a new delivery group, add names and the emails of the people to notify in the group.

Charger App		MindSphere
		4 6 🕯
2 delivery-management		
	141	
Name	Туре	
Operations Team	Email	Edit Delete
Markus	Emuli	Edit Delete
Churger Maintenunce	Ephan	Edit Delete
I SCOL		

### 3.2.4 System Notifications

ter	m Notifications				South
	All Error	Warning Info			
	Date & Time	Message Source *	Message Type	Message	
Ð	18:08 10:09/2020	User Action	Control Charger	Hard reset for c1 is successful	⊕ douglas, delabrida, ext⊕sisorie
9	18:05 10/09/2020	User Action	Control Charger	Soft reset for c1 is successful	⊕ douglas.delabrida.ext©sieme.
9	18-01 10/09/2020	User Action	Control Charger	Soft reset for c1 is successful	e ronit pal@semens.com
Ð	17:32 10/09/2020	User Action	Control Charger	Soft resist for c1 is successful	e rohit pal@semens.com
D	17.27 10/09/2020	User Action	Control Charger	Soft reset for cit is successful	· ronit pal@slemens.com
0	22-03-10/07/2020	User Action	Control Charger	Hard reset for resetcharger is successful	🐵 douglas delabrida, ext Øsleme
0	22.02 10/07/2020	User Action	Control Charger	Hard reset for c1 could not be sent due to internal error	😐 döuglas delabrida eid@sieme
9	22:00 10/07/2020	User Action	Control Charger	Solt reset for c1 could not be sent due to internal error	🙍 douglas delatrida ext®sieme_
9	21:12 10/07/2020	User Action	Control Charger	Soft reset for c1 could not be sent due to internal error	🐵 douglas, delabrida, ext@sieme

Important events from the EVC3 Depot system are shown under System Notifications.

The following information is available in system notifications.

- Notification Type: Notifications can be of the type Error, Warning, or Informational. You can filter the notifications based on the type.
- Date & Time: The timestamp of the notification.
- Message Source: The source of the notification like User action, Smart charging, and Optimal charging.
- Message Type: The type of the message.
- Message: The details of the message.
- Action/Action By: If the notification needs an action, options to take the action are available here. After a user takes the action, the details of the user who took the action is available.

You can filter notifications by the notification type (Error, Warning, Info) using the buttons. Notifications can also be filtered by Message source using the drop-down filter.

When new notifications are available while the user is working on the System Notification page, the refresh button will be enabled. User can click on the refresh button to get the latest notifications.

3.2 Notifications

### 3.2.5 Desktop Notifications

Desktop notifications allow you to be notified of any errors in the chargers even if you are not viewing the application. The error notification on the desktop is accompanied by a sound. When you click on the notification, the Device Errors screen appears.

Desktop notifications are dependent on the web browser being used. When you first open the application, it asks you if you would like to receive browser notifications. Click Allow to receive notifications. You can configure and modify notification permissions from the settings of your browser.

#### Note

Your operating system (such as Windows 10) must be configured to show notifications from other applications.

#### 3.2.6 Create a Notification

You can configure a notification to deliver a notification for an asset that is being monitored. Notifications can be configured for three different assets: chargers, connectors, and EVs. Perform the following steps to create and configure a new notification.

- 1. Navigate to left navigation menu > Notifications screen. The Notifications screen appears.
- 2. Click "+" on the screen to create a new notification. The Create a New Notification screen appears.

 Select the type of asset for the notification and specify if you want to apply the notification for all assets or specific assets.
 If you select the specific assets option, you must specify the assets for which the notification

Create a new notification × Asset .. 2 Variable to 3 Notification 4 Deliver/ 5 Notificatio. Review C\_ ര Select An Asset ţį, O bi Charger O Connector Would like this notification to apply to a specific asset or all assets of the selected type? Apply notification to all assets or a specific one-Next

must be applied.



### Monitor Chargers

### 3.2 Notifications

4. Select the variable to monitor, specify the trigger condition, and set the triggering condition.

Asset _ 2 Variable	To _ 3 Notification	- A Delivery -	5 Notificatio	6 Review C
Select A Variable and Con	dition			
leved + mind+ * ChargerS(atus	• Is	*		
West & Misperine Condition Faulted	-			¢.
Baex		-	Next	-

Enter the text to be sent as the notification message. You can also add dynamic variables such as {{ChargerID}}, {{ConnectorrID}}, {{Time}}, and so on as part of the message.

eate a new notification				×
🖉 Asset _ 🕜 Variable To _	3 Notification m_	4 Delivery	5 Notification	6 Review C.
Enter a Notification Message				0
Notification Message {{ChargerID}} has a fault				,
			15	
Back			Next	

#### **Monitor Chargers**

#### 3.2 Notifications

6. Select the delivery group to send the notification. See Delivery Groups for more information.

				×
🖉 Asset 🕜 Variable To	Notification _	Delivery	S Notificatio	6 Review C.
Select a Delivery Group to notify				
Select a Delivery Group *				
Avers in the delivery group Markus		Ŀ.		
•		i≱ Email		

7. Enter a name for the notification topic, review the notification, and submit to create the notification.

#### 3.2.7 Edit Notifications

You can edit existing notifications by clicking Edit next to the desired notification on the Notifications screen. The Edit Notification screen appears which allows you to change the parameters of the notification.

Notification Title			
OtherError error message topic			
Asset type to monitor			
Q EA	Charger	O Connector	
Variable and triggering con	dition		
AlamCode	* Equal to	- OtherError	- 1
Notification Message			
and a second			
Sav	Ne	Cancel	

# 3.3 Remote Control of Chargers

#### 3.3.1 Remote Control of Chargers

A Service Engineer can send control commands to chargers.

To control a charger remotely, click Remote charger command in the Charger Details page.

You can send the following commands to the charger:

- Soft reset: Sends a "Soft reset" command to the charger
- Hard reset: Sends a "Hard reset" command to the charger.

Soft and Hard reset strategy is specific to the charger type. Refer to the charger documentation for information on how soft and hard reset commands execute for a specific charger.

### Monitor Chargers

# 3.3 Remote Control of Chargers

Remote charger command						
DC Plug-In - CCS Connector 1 - Available	<b>:</b> ₩	DC Pagrin+D(S Connector 2 - Unavailable	- <b>B-</b> 100 kW	DC Flug-in+ CCS Connector 3 - Unavailable	100 KW	
Successful transactions		Remote charger command C Soft Reset Restarts the charger software. F C Hard Reset Restarts the charger hardware.			Temperature (°0	

# **Onboarding Chargers and EVs**

You must onboard chargers and EVs in the EVC<sup>3</sup> Depot application before you can configure charging strategies and monitor the activities.

The following sections provide information on onboarding chargers and electric vehicles.

- Onboarding Chargers (Page 33)
- Onboarding EVs (Page 35)

# 4.1 Onboarding Chargers

You can add new chargers in the EVC<sup>3</sup> Depot application and edit the information of existing chargers.

#### Note

Some features and screens are restricted by permissions assigned for roles. Contact your administrator for more information on your roles and permissions.

4.1 Onboarding Chargers

#### 4.1.1 Add a Charger

Perform the following steps to add a new charger.

- 1. Navigate to the Overview screen in EVC<sup>3</sup> Depot.
- 2. Click Add new charger. The Add new charger screen appears.

harger				
Draige care -		[ <sup>10</sup>		
Test		throdm		
			Generate unique ID	
Type of charges		6.0		Ties of location
Siemens Charger	-	Model	•	Custom map
Map	-			
	Add new map			
onnectors (0)				
Connect to cloud				
CPP authentication 💧 Passw	ord is not saved in s	ystem. Copy credentials for further use		
Jam Nama		Passanni		Originating LTR
liveder				was //ebusciev-chargerepp-ebusciev.eu ( mindephere io/Char-

- 3. Enter the Charger Name.
- 4. Enter the unique ID of the charger. You can also click Generate an unique ID to generate a unique ID for the charger in the system.
- Select the type of charger. Both Siemens chargers and non-Siemens chargers are supported. Charger power and the connector information are automatically filled in if you select a Siemens charger. For more information on supported models of Siemens chargers, see "Supported Models of SiemensChargers". If you select a non-Siemens charger, you must enter the charger power. You must also enter
- the connector information number of connectors, efficiency, and power factor.If the charger has more than one connector, you must choose the charging mode for the
- 7. Select the type map from the Type of Location field. You can either select custom map or world map.

charger. It can be either segential or standard.

- 8. If you select custom map, select the map from the Map dropdown and pin the location on the map. If you select world map, pin the location of the charger on the world map. If you want to add a new custom map, click Add new map, select the map file, and click Create.
- 9. Select whether the charger can connect to the cloud.

10. Click Copy all credentials to copy the authentication credentials.

The credentials are copied to the clipboard. You should paste it in a note for safe keeping. These credentials has to be send to the team that maintains the charger and has to be updated in the charger. The Chargers should authenticate with the Central System(EVC3) using Basic Authentication scheme according to OCCP V1.6 Standard. The User Name is same as the Charger ID. As soon as the charger ID is generated or entered, the User Name and Onboarding URL field are auto-generated. The password is auto-generated and you cannot customize the password.

11. Click Create.

#### **Supported Models of Siemens Chargers**

The following models of Siemens Chargers are supported:

- RAVEGBT ( 60 kW single, 80 kW single, 30 kW twin, and 60 kW twin)
- RAVECCS ( 50 kW single, 60 kW single, 80 kW single, 100 kW single, 150 kW single, 150 kW cascade twin, and 150 kW cascade triple)
- MECCCS (20 kW single and 80 kW twin)
- HPC Pantograph (150 kW, 300 kW, 450 kW, and 600 kW)
- VERSI (4.8 kW single, 5.75 kW single, 7.4 kW single, and 22 kW single)
- VERSI Smart Charger (3.84 kW single and 11.5 kW single)
- Sicharge UC (100kW, 150 kW, 225 kW, 300 kW, 450 kW, and 600 kW)

For SiCharge UC, you can add up to 5 connectors. Each connector can have the following plug types: CCS, CHAdeMO, GB/T, and Schunk hood.

#### 4.1.2 Edit and Delete Chargers

In the Overview screen, select the charger, and click Edit to edit the details of a charger. You can edit the name, location, map, and coordinates of the charger. However, you cannot edit the unique ID. You can also auto-generate and change the password in the edit mode. For those chargers that are already onboarded, you can enable authentication in the edit mode. After you edit the credentials, click Copy all credentials to copy the authentication credentials. The credentials are copied to the clipboard. You should paste it in a note for safe keeping. These credentials has to be send to the team that maintains the charger and has to be updated in the charger.

In the Overview screen, select the charger, click Edit, and then click Delete Charger to remove the charger from the system.

## 4.2 Onboarding EVs

You must onboard the electric vehicle in the system before you can use EVC<sup>3</sup> Depot to monitor and report charging activities.

You can manage electric vehicle in the EV Management screen of the EVC<sup>3</sup> Depot.

nboarded ve	hicles								Search
E Vehicle ID	VIN	EVCC ID	Battery Capacity (kWh)	Balancing Duration (minutes)	Balancing Power (XW)	Start Balancing at SoC (%)	Max Charging Power (kW)	Connector Type	Action
Test	Test	Test1	100	5.	5	50	so	DC Rug-m	
bus1	bast	20057	11	0	- 11-	0	10	AC Mug-in	1
dv¥	ev)	avī	100	5	3	80	90	DC Plug-in	1.
Divis	avior	duto	100	5.	5	80.	100	DC Plug-m	1.
pw11	dutt		100	5	5	80	80	D¢ Nug-m	1
5412	dy12		100	5	5	80	80	DC Rug-In	1
ðv14	ð(13	000102030405	100	5	5	80	80	DC Rug-In	1
6-2	dv2	gv2.	10	4		D'	1a	AC Plugan	1
óvä	őv3	#v3.1	100.	*	3	BIC .	50	DC Rugers	1
dv4	d/4	#v41	100:	4	5	80	100	DC Rug-In	1

### 4.2.1 Onboard an EV

- 1. Click E Vehicle Management in the left navigation menu. The E Vehicle Management screen appears.
- 2. Click Onboard new EV. The Onboard EV screen appears.

3. Enter the unique ID of the electric vehicle, VIN of the electric vehicle, battery capacity (in kWh), the connector type, the maximum charging power (in kW), the percentage of state of charge at which to start the balancing, the time duration for the balancing in minutes, and the power to be supplied for balancing for the electric vehicle.

The connector type can be Plug In or Pantograph. If the maximum charging power for the electric vehicle is not provided, the connector maximum power is used as an upper limit.

D of EV (Unique) *		VIN *	
Bus01		JT6HT00W4Y0093462	
Connector Type		Battery Capacity (kWh) *	
DC Plug-In	*	150	
Max Charging Power(kW) *		- Start Balancing at SoC(%)*	
100		0	0
Long Long Long Long Long Long Long Long		Channel Street Street	
0	0	1	

4. Click the Onboard to add the configured electric vehicle into the system.

#### 4.2.2 Add Multiple Electric Vehicles

You can also add multiple electric vehicles with a single operation.

You must create a CSV file with the following details for each electric vehicle in a commaseparated format - unique ID of the electric vehicle, name of the electric vehicle, battery capacity (in Wh), and the connector type, and the maximum charging power (in kW) for the electric vehicle. If the maximum charging power for the electric vehicle is not provided, the connector maximum power is used as an upper limit.

- 1. Click E Vehicle Management in the left navigation menu. The E Vehicle Management screen appears.
- 2. Click Import.
- 3. Select the CSV file that contains the electric vehicle information and click Ok.

### 4.2.3 Edit and Delete Electric Vehicle

In the E Vehicle Management screen, click Edit against an electric vehicle to edit the details of an electric vehicle. You cannot edit the unique ID of an electric vehicle.

In the E Vehicle Management screen, click Delete to delete an electric vehicle from the system.

	VIN
fus01	JT6HT00W4Y0093462
Connector Type	Battery Capacity (kWh) *
DC Plug-In	150
Max Charging Power(kW) *	Start Balancing at SoC(%)*
100	0
0	1

### 4.2.4 Unregistered EVs

The charger can identify an electric vehicle by the Mac ID of the plugin connector. The E Vehicle Management screen shows the EVCC ID of unregistered vehicles that were connected to the charger.

Click Onboard to onboard the electric vehicle into the system.

👌 Import Onboard new E
Action
Link Onboard
Link Onboard
Link Onboard
Ink Onboard

If the electric vehicle already exists in the system, click Link to link the EVCC ID to the existing electric vehicle.

whice 0		
80516	_	
lus1	- 8	•
SUS11		
Bus123		
lus2		0

After you link or onboard the EVCC ID of the unregistered vehicle, future transactions for the vehicle reflects the E Vehicle ID.

### **Smart Charging**

The electrical grid infrastructure of depots is not designed for the load and power demands of charging infrastructure. Therefore, there is a need for smart mechanisms to utilize the charging infrastructure without overloading the grid connection. The EVC<sup>3</sup> Depot application allows you to charge all assets overnight in the depot without exceeding the grid power limits. You can also see a report of the smart charging status of the depot. For more information on the report, see Smart Charge Report (Page 53).

The basic charging algorithms are an easy way to organize the charging of electric vehicles based on simple prioritization rules. Additionally, the algorithms assure that a given maximum power (For example, maximum grid connection power) is never exceeded. The algorithms are invoked live and dynamically distribute the available power to connected electric vehicles. Each time an electric vehicle that requires charging is connected or a connected electric vehicle finishes charging, the algorithms redistribute the allocated power setpoints for each charger or connector in order to provide optimal usage of the available power bandwidth.

Depots have different parking arrangements. In some depots there are separate entrance and exits, thus the electric vehicles are parked with a First In First Out methodology. In some depots there is only a single combined entrance/exit and a First In Last Out methodology is used.

There are three basic algorithms that serve slightly different requirements and objectives.

- First In First Out (FIFO)
- First In Last Out (FILO)
- SPLIT

The basic smart charging algorithms are the simplest method of controlling chargers. Typically used when only a simple objective of limiting the maximum power for a group of chargers is needed or if multiple groups in the depot are needed.

#### Note

Some features and screens are restricted by permissions assigned for roles. Contact your administrator for more information on your roles and permissions.

The basic smart charging algorithms also implement a basic balancing model which allows,

- enabling of active electric vehicle battery balancing to ensure error-free operations
- constraining effectively the overall charging duration and reduced power allocation during balancing, which in turn allows for a more efficient use of the overall available power

Balancing allows the user to define a balancing duration, balancing power, and state of charge at which bulk charging concludes and balancing is started. The basic smart charging algorithms implement the balancing parameters and control the transition from bulk charging to balancing, prioritize vehicles during balancing, and finish the charging session after the balancing duration expires.

#### 5.1 First In First Out Chargers

The First In First Out (FIFO) strategy organizes charging of electric vehicles with the strategy to first fully charge the electric vehicles that entered the depot first. The motivation behind this strategy often is the depot layout being a one-way lane so it is a requirement that the first electric vehicle coming into the depot is also the first one leaving the depot.

FIFO strategy is a "live" strategy that sets the PowerSetPoint of each charger depending on the following conditions.

- Is the charger connected to an electric vehicle that is not yet finished charging?
- When was the charger connected to the electric vehicle?
- What is the available maximum power for the electric vehicle / charger / charging\_group / depot?

#### 5.2 First In Last Out Chargers

The First In Last Out (FILO) strategy that organizes charging of electric vehicles with the strategy to first fully charge the electric vehicle that entered the depot most recently. The motivation behind this strategy often is the depot layout being a dead-end one-way lane so it is a requirement that the last electric vehicle coming into the depot is also the first one leaving the depot.

FILO strategy is a "live" strategy that sets the PowerSetPoint of each charger depending on the following conditions.

- Is the charger connected to an electric vehicle that is not yet finished charging?
- When was the charger connected to the electric vehicle?
- What is the available maximum power for the electric vehicle / charger / charging group / depot?

#### Note

For sequential chargers, a First In First Out (FIFO) strategy is used at the connector level. Hence, the electric vehicle which was connected first to the charger will finish charging before the next electric vehicle is charged even if a FILO strategy is used for the chargers.

#### 5.3 SPLIT Chargers

SPLIT is a basic strategy that organizes the charging of electric vehicles to equally distribute the available charging power of the charging\_group or depot to all connected (and not yet fully charged electric vehicles). This is useful if there are no constraints to the inbound and outbound movement of the electric vehicles. SPLIT also reduces stress on the equipment / electric vehicles due to lower PowerSetPoints. SPLIT strategy can be used if there are no significant time constraints on charging individual electric vehicles.

SPLIT strategy is a "live" strategy that sets the PowerSetPoint of each charger depending on the following conditions.

- Is the charger connected to an electric vehicle that is not yet finished charging?
- What is the available maximum power for the charger or charging group?
- What is the available maximum power for the electric vehicle / charger / charging group / depot?

If there are two chargers that have different charging rates, the EVC<sup>3</sup> Depot application calculates how much power needs to be sent for each charger based on the maximum power limit configured.

The SPLIT strategy works based on the following parameters.

- The power distribution is weighed on the charger, connector, and vehicle maximum power parameters
- Balancing is always prioritized when bulk charging is ongoing
- For sequential chargers, a First In First Out (FIFO) strategy is used at the connector level. Hence, the electric vehicle which was connected first to the charger will finish charging before the next electric vehicle is charged even if a FILO strategy is used for the chargers.

#### 5.4 Add Charger Group

You must create charger groups to allow EVC<sup>3</sup>Depot to monitor smart charging.

- 1. Click Smart Charging Config in the left navigation menu. The Configuration screen appears.
- 2. Click Smart Charging Configuration to open the Charger Groups screen. The Charger Groups screen allows you to add, edit, or delete charger groups and also set te depot operating time.
- 3. Click the Add Group button. The Add group popup appears.

	2 Okinger Omups						
Depot configuration		Add group			×		
Operating time 21:00	- 10 ()	Humer SplitBLR1					
Charger Group		Misr power(WII)* 500					Add group
-Semicity in a addo		Algorithm Mode SPLIT			•		
Name /- township	Smart charge	1	b.	Cancel	Add	6 In groups	Edit Delete
594	InActive	SPLIT	0/250	kw/	Ţ		Edit Doloto

4. Enter the name for the group in the Name field.

5.5 Add Charger to Group

- 5. Enter the maximum power in kW for the charging group in the Max Power field.
- 6. Select the smart charging algorithm mode to be used for the charger group and click Add. For more information on the smart charging algorithms, see Smart Charging.

#### 5.5 Add Charger to Group

You must add chargers to a charger group. Only chargers that are connected to the cloud and have a Plug-in connector can be added to the group.

- 1. Click Smart Charging Config in the left navigation menu. The Configuration screen appears.
- 2. Click Smart Charging Configuration to open the Charger Groups screen. The Charger Groups screen allows you to add, edit, or delete charger groups.

	or configuration	• to 2100	•			
	arger Group					Add grou
hart	cti in table					
	Name	Smart charging status	Algorithm	Allocated Power	No. of chargers in groups	
	ORTest	InActive	FILO	0/120 kW	0	Edit Delete
	RT-test	InActive	FIFO	0/1000 kW	0	Edit Delete
				0/100 kW	3	-
	NewPowerGroup	InActive	FIFO	W INDIAN	3	Edit Delete
	NewPowerGroup testing	InActive	FIFO	0/20000 kW	0	Edit: Delete

3. Click Edit on the charger group you want to edit. The Charger Group information screen appears.

	- 3 (Inc. 1993) 3 903					
Allocated power ISIS0 kW					Save	Cance
SPUT			SPUT			¥
Maximum Power						
			٩			
	Charger max power	Charging mode	Q No of connectors	Cloud connection	Actions	
Add chargens 0	Charger max power 150kW				Actions	

4. Click Add chargers to select the chargers to add to the group. The Charger Selection popup screen appears.

ype to filter the table			
Charger name	Charger max power	Charging mode	Number of connectors
TestingForTransaction	30kW	Sequential	2
B selected / 1 total			

5. Select the chargers to add and click Add.

#### 5.6 Add Charger Group Events

Smart charging allows you to specify the maximum power that can be delivered for a charger group. In addition to the default maximum power, EVC<sup>3</sup>Depot allows you to specify a different maximum value for a specific time period. This allows you to manage your charging in for different times of the day and take advantage of different energy pricing at different times of the day.

- 1. Click Smart Charging Config in the left navigation menu. The Configuration screen appears
- 2. Click Smart Charging Configuration to open the Charger Groups screen. The Charger Groups screen allows you to add, edit, or delete charger groups.
- 3. Click Edit on the charger group you want to edit. The Charger Group information screen appears.

A CONTRACT OF A					The second se
Allocated power					Save Can
SPUT			SPLIT		~
Maximum Power					
Maximum Power					
Maximum Power Add ottangens				_	
	Charger max power	Charging mode	Q No of connectors	Cloud connection	Actions
Add chargens 0	Charger max power 150kW				Actions

#### 4. Click Maximum Power on the information screen. A grid corresponding to 24 hours and seven days appears.

cated po	wer			-			Save Cancel
o fateresi O				Aparticia da ana			×
taximum P	ower						
00	Face (64)						
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
12am	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1am	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1am 2am	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
lam 2am 3am	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
lam 2am 3am 4am	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
lam Cam Sam Sam Sam	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
am Cam Jam Jam Jam Jam	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
lam 2am	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

5. Click the cell which corresponds to the day and time at which you want to specify a maximum power which is different from the default. The Edit event popup appears.

Monday	Tue Edit event	Saturday	Sunday
12am			
Tam	May Faure (100)		
2am	60 0		
3am			
4am	04.00 AM Wednesday • 05:00 AM Wednesday •		
Sam	\$		
6am		-	
7am	Cancel Save		
Bam			
9am			
10am			
11am			
12pm			
1pm			
2pm			
3pm			
4pm	/8		
5pm			
6pm			

5.6 Add Charger Group Events

- 6. Enter the maximum power in kW, the start time and day, and the end time and day for the event and click Save. The event time duration can be as short as 15 minutes.
- 7. Click Save on the Charger Group information screen to apply the changes to the charger group.

### Reports

The EVC<sup>3</sup> Depot application allows you to generate reports to view information on the energy consumption, billing, availability status of connectors and chargers, comparison of daily and monthly usage. The following topics provide more information on the transactions and reports.

- Reporting (Page 49)
- Transactions (Page 51)
- Smart Charge Report (Page 53)

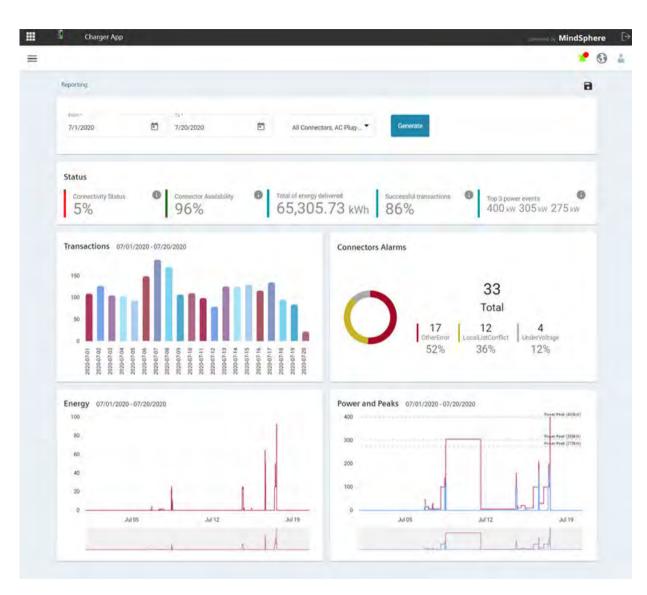
#### 6.1 Reporting

The Reporting screen provides visualization and download capability for depot KPI's such as connectivity status, connector availability, transactions, alarms, energy consumed and so on. The main reporting screen displays a few KPI's as in widgets to provide a quick understanding of the status of depot operation. It also provides information on the top three power events. This information allows you to the highest power consumption (peak power) from which you can determine your power profile. Select Reporting on the left navigation menu to view the Reportings screen. You must specify the time period, the type of report and the types of chargers for which to generate the report. Also, you can download the generated reports in a CSV format by clicking the save icon.

The report provides information on the connectivity status, availability of chargers and connectors, and the transaction made during the specified time period. You can also view the different types of errors, such as caused by chargers, caused by the electric vehicle, or caused by a person in this report.

#### Reports

#### 6.1 Reporting



#### 6.2 Transactions

The Transaction screen shows all the billing-related information. It also shows some statistics on usage. You can set the period for which to view the transactions and also search for individual transactions. You can view the transactions are also represented in the form of charts. The charts allow you to understand the usage characteristics at a glance. You can select Transactions on the left navigation menu to view this screen. The grid provides information on the connector type, the energy transferred, the end result and the transaction start and end times.

Transactio	ni						
- Taxaarin						B (10/21/2020 E)	Traday T Days
		120	igmicy 38op Gen Vikiliae onf ging station strapped Reset Fased	n yang janggang ang sang sang sang sang sang san	1		-
	AC huge D0 hug Panuadion (D Not7	Charger Name	Connector Type (10) Plantograph (1)	Energy Detwered 108.831 ante	Fod Beauty No Error	Start A1 06 50:20 10:22:2020	Faid At + 07:06:01 10:22/3
	51540	lametroun-latentist	Partograph (1)	91.465 kWs	No Emai	05-60.00 16/22/2020	05/04/53 10/22/
$(T, \cdot)$	siols	lametro-up laxehter)	Pantograph [1]	97.869 8399	No.Enoi	04/92/14 10/22/2020	05.07.99 10(22)
	SIGAL	Jamétro-up-lawntw/	Partograph(1)	97.17 kut	No Emd	12.48 19 10/22/2020	S40407.10/22/
	5568	byg-de-benzh-hahn-	Partograph(1)	ARETT KWH	No Error	09/17/18/10/22/2020	083934 10/22
197	58041	In an our-laxeling	Partogradi [1]	Volument with	NO EPOP	01/08/19 10/22/2020	02/08/05 10/22/
÷.,	58041	Nigdebeimhann	Partograph(r)	16.252 kWh	No Emp	01 47 12 10/22/2020	91.54 23 10/22/
	58042	by acterimitation	Pantograph [1]	18.822 kwW	No Emp	01/28/43 (0/22/2020	01/43/18 10/220
+	68039	trypieberin/tain.	Partoposit (1)	18-424 KW6	No Excu	01/00/15/05/20/2020	11 22 32 10/22/
	10039	lametro-up lasinitied	Partograph [1]	15.952 kittle	other	01-07-09-10/22/0020	01.10 OF 10/22/2
1	54077	iametroublakemic)	Pantograph())	S0.667 kinn	No Error	00.43.47 10/22/2020	08:52:01 10:22/
	58036	bypdeberin-bath	Wastograph (1)	21-673-6Wh	No Enci	00/23/27 10/22/2020	00:410210/22/0
	58035	Lamorosas-taxofied	(hetographi))	66.397 kate	Other.	00:31 55 10/22/2026	00.42,95 10/22/0
-		fametrous.investment	Partograph [1]	140.083 kWh	No.Enter	23/47/13 10/27/2020	6010.0010.220
	58004						

Click on the arrow to view more details about a transaction.

The following figure shows a transaction from the AC Plugin charger.

*	14960	versichargen	AC Flug-In [1]	0.02 kWh	No Error	11 28 14 09/27/2020	11 28.44 09/27/2020
	nitial SoC(%) 7		End SoC(%) 3	initiator 12345678			

The following figure shows a transaction from the DC Plugin charger.

4	15076	New K.	DC Plug-In (1)	0 166 kWm	No Error	13:14:47 09/29/2020	13 15 23 09/29/2020
	Initial SoC(	(6)	End SoC(%)	initiator	vehicleID		
	9		3	smulator	gv14		

#### Reports

#### 6.2 Transactions

For transactions from Pantograph charger, following additional details are available – Initial SoC %, End SoC %, Vehicle ID, Maximum Current, Average Current, Communication Start time, Communication End time, Charge Duration, Docking duration, and Undocking duration.

- Communication Start time: The time at which the vehicle connected to the depot Wi-Fi.
- **Communication End time:** The time at which the vehicle disconnected from the depot Wi-Fi.
- **Docking duration:** The time taken for vehicle to connect to Pantograph and start charging. It is calculated as the difference between the transaction start time and the communication start time.
- **Undocking duration:** The time taken for the vehicle to disconnect the vehicle after charging. It is calculated as the difference between the communication end time and the transaction end time.
- **Charge duration:** The time taken for the charging activity. It is calculated as the difference between the transaction end time and the transaction start time.

The following figure shows a transaction from the Pantograph charger.

÷	15115	Amua-Panto2	Pantograph [1]	14.497 KWh	No Error	09.30.07.09/30/2020	09-34-28 09:30/2020
	Initial SoC( 90	%) E	nd SoC(%) S	Vehicle ID 0000000	Maximum 496.00		verage Current(A) 85 84
	Communika 09/29/58/09		ommunication End Time 9:34:47 09:30/2020	Charge Duration 4m 21s	Docking D 9s		indocking Duration

#### **Transactions End Results**

The following transaction end results can be seen on the UI.

- **NoError:** The transaction ended with a normal procedure. The vehicle requested to end the transaction (100% SoC), the user clicked on charger HMI to stop, or the user requested at the vehicle side to end transaction
- **EmergencyStop:** Emergency stop on the charging station was hit by the user which resulted at the end of the transaction.
- VehicleStopped: The vehicle stopped the transaction due to a non-critical error.
- **ChargingStationStopped:** Transaction ended because of the charging station request. Triggers for this request are user not authorized to charge and non-critical error on the charging station.
- **Reboot:** The transaction ended because of the reboot of the station.
- Soft reset: Transaction was stopped due to soft reset of charger
- Hard reset: Transaction was stopped due to hard reset of charger
- **Other:** If the backend system (MindSphere Application) can not determine exactly the reason for stop (multiple reasons or very specific vehicle errors) then this is used.

#### 6.3 Smart Charge Report

The Smart Charge Report captures events all relating to smart charging of electric vehicles. It allows you to see the overall status of the depot, available chargers, which chargers are smart charging, smart chargers which will finish charging soon, and power and energy consumption graphs. The graphs also allow you to print or download the information in multiple formats.

				Change tenant 🧔 🌾
Smart Durging > Reporting				
Depot Status Fully Operation	at 🤡	Available Chargers	Smart Transactions 3/3 Transactions	Energy Usage 42.65 kWh
Soonest Charped EV	Charging ETC: 5 minutes	F 1% Charging ETC: 6 minutes BUS14	ETC: 6 minutes	5% Balancing ETC: 13 minutes BUS2
Connector 2 Charger: ABCD Power: 60KW	2	Connector 1 Charger; ABCD5 Power: DKW	Connector 2 Charger, ABCD5 Power, DKW	-Connector 2 Charger: ABC03 Power: 1kW
Power Group: All		ас.		
Power Group: All		Delivered	Proved Core	sumed Graph
		(Dalivered	Power Core	sumed Graph
10 10 10 10	Every		Power Core	

#### 6.3.1 Depot Status

This widget shows the overall status of all the chargers in the depot. The following depot statuses are shown.

- Fully Operational: When 100% of the assets in the depot are working and connected to the cloud.
- Warning: When 35% to 99% of the assets have faulted or not connected to the cloud.
- Error: When less than 35% of the assets in the depot are connected to the cloud.

6.3 Smart Charge Report

#### 6.3.2 Available Chargers

The report shows the chargers that are connected to the cloud and available for charging. This includes the chargers that have been created on the system but do not have an active connection.

#### 6.3.3 Smart Transactions

The report shows how many of the charging transactions have been completed using smart charging in the time period set as the depot operating time. The total number of charging transactions done in the depot is also shown.

#### 6.3.4 Energy Usage

The report shows the energy used in the time period set as the depot operating time.

#### 6.3.5 Soonest Charged EV

This widget shows the EVs that are part of a smart charger group that are currently being charged and are expected to finish charging soon. The following information is also shown on the widget.

- Status of Charge: Charging or Balancing
- ETC: Expected time for completion of the charging
- Current charge: The current charge of the electric vehicle (in percentage)
- Electric vehicle name
- Charger name
- Connector ID
- Power

#### 6.3.6 Energy Delivered Graph

This widget shows the energy delivered in a depot configured operation time period. By default, it shows the energy delivered for all chargers in the depot. You, can select your configured charger groups from the drop down to see the energy delivered for each charger group.

#### 6.3.7 Power Consumed Graph

This widget shows the power delivered in a depot configured operation time period.

### **Frequently Asked Questions (FAQs)**

#### 7.1 How do I Change the Language of the EVC3 Depot Application?

On the top banner, click the globe icon. This opens the language menu. Select the required language from the menu.



### 7.2 How do I Check the Version of the EVC3 Depot Application?

On the MindSphere banner, click the ChargerApp to view the version of the EVC<sup>3</sup> Depot.

	1	Charger App		
=	Estado	Charger App 0.7.2 © Siemens 2019		
	Location All		~	Search charger

7.2 How do I Check the Version of the EVC3 Depot Application?

### **Error Codes**

Error codes can be seen on the Error Notifications screen. An error has the following information tags.

- Error Code: This is split into Charger Errors codes and Connector error codes. OCPP only supports a few standard error codes but uses the "Other" classification for vendor-specific codes
- Vendor-specific Code: This is usually denoted by a digit.

The error codes and vendor-specific codes vary based on the platform and hardware used.

#### A.1 Error Codes

#### A.1.1 DC Plug-in Charger Error Codes

- GroundFailure: Ground fault circuit interrupter has been activated.
- HighTemperature: Temperature inside charge is too high.
- InternalError: Error in internal hard- or software component.
- NoError: No error to report.
- OtherError: Not defined error. Check VendorAlarm and ExtendedAlarmDescription
- **OverCurrentFailure:** Over current protection device has tripped.
- OverVoltage: Voltage has risen above an acceptable level.
- **PowerMeterFailure:** Failure to read electrical/energy/power meter.
- PowerSwitchFailure: Failure to control the power switch.
- **ResetFailure:** Unable to perform a reset.
- **UnderVoltage:** Voltage has dropped below an acceptable level.
- WeakSignal: Wireless communication device reports a weak signal.

#### A.1.2 AC Plug-in Charger Error Codes

- ConnectorLockFailure: Failure to lock or unlock connector.
- **EVCommunicationError:** Communication failure with the vehicle might be Mode 3 or other communication protocol problem. This is not a real error in the sense that the Charge Point does not need to go to the faulted state. Instead, it should go to the SuspendedEVSE state.
- GroundFailure: Ground fault circuit interrupter has been activated.

#### Error Codes

A.1 Error Codes

- **HighTemperature:** Temperature inside Charge Point is too high.
- InternalError: Error in internal hard or software component.
- LocalListConflict: The authorization information received from the Central System is in conflict with the LocalAuthorizationList.
- NoError: No error to report.
- **OtherError:** Other type of error.
- **OverCurrentFailure:** Over current protection device has tripped.
- OverVoltage: Voltage has risen above an acceptable level.
- **PowerMeterFailure:** Failure to read electrical/energy/power meter.
- **PowerSwitchFailure:** Failure to control power switch.
- **ReaderFailure:** Failure with idTag reader.
- **ResetFailure:** Unable to perform a reset.
- UnderVoltage: Voltage has dropped below an acceptable level.
- WeakSignal: Wireless communication device reports a weak signal.

#### A.1.3 Pantograph Charger Error Codes

- **EVCommunicationError:** Communication failure with the vehicle, might be Mode 3 or other communication protocol problem. This is not a real error in the sense that the Charge Point doesn't need to go to the faulted state. Instead, it should go to the SuspendedEVSE state.
- **GroundFailure:** Ground fault circuit interrupter has been activated.
- HighTemperature: Temperature inside Charge Point is too high.
- InternalError: Error in internal hard or software component.
- **NoError:** No error to report.
- **OtherError:** Other type of error. See Siemens HPC Pantograph Connector Error Codes for more information.
- WeakSignalWifi: Wifi connection between the electric vehicle and charge point is weak.
- WeakSignalGsm: GSM connection of the charge point is weak
- **OverCurrentFailure:** Over current protection device has tripped.
- OverVoltage: Voltage has risen above an acceptable level.
- **PowerMeterFailure:** Failure to read power meter.
- **PowerSwitchFailure:** Failure to control power switch. Inverter DC Breaker Error. This is a fatal error, that causes charge process termination and requires service.
- **ReaderFailure:** Failure with idTag reader. Might signal an association sensor error in the future
- **ResetFailure:** Unable to perform a reset.

- UnderVoltage: Voltage has dropped below an acceptable level.
- WeakSignal: Wireless communication device reports a weak signal.

#### A.1.4 Charger Connector Error Codes

- **ConnectorLockFailure:** Failure to lock or unlock the connector.
- **EVCommunicationError:** Communication failure with the vehicle.
- **GroundFailure:** Ground fault circuit interrupter has been activated.
- HighTemperature: Temperature of Plug is too high.
- InternalError: Error in internal hard- or software component.
- NoError: No error to report.
- OtherError: Not defined error. Check VendorAlarm and ExtendedAlarmDescription
- **OverCurrentFailure:** Over current protection device has tripped.
- **OverVoltage:** Voltage has risen above an acceptable level.
- PowerMeterFailure: Failure to read electrical/energy/power meter.
- PowerSwitchFailure: Failure to control the power switch.
- **ResetFailure:** Unable to perform a reset.
- UnderVoltage: Voltage has dropped below an acceptable level.

#### A.2 Vendor-specific Code

The following topics describe the vendor codes.

- RAVE Plug-In Charger Error Codes (Page 59)
- SICHARGE UC Plug-In Charger Error Codes (Page 61)
- Siemens HPC Pantograph Connector Error Codes (Page 64)
- VersiCharge SG Connector Fault Error Codes (Page 65)

#### A.2.1 RAVE Plug-In Charger Error Codes

The following error codes are published for Siemens RAVE Plug-in Heavy Duty charging stations.

Vendor Code	Description	Recommended Action
1	Emergency button pressed	Un-press the emergency button and reconnect.
2	Cabinet Power open	Confirm that door is closed properly.
3	Output Fuse blown	Check if the output fuse (FO1, FO2) is blown.
4	Filter fuse blown	Check if the filter fuse is blown.

#### Error Codes

#### A.2 Vendor-specific Code

5	Isolation values between DC and Ground are	Check whether the plug is damp or wet.
	below recommended values.	Check whether the vehicle also has an isolation fault when in Drive Mode.
		If neither of these contacts qualified personnel.
6	Surge Arrester on	Check if the surge arrester is red. If yes then replace.
		The surge arrester is can be found to the left of the main switch.
7	Power reduction active	Charing will continue. The transformer temperature is too high and therefore the power reduction is active.
8	AC input voltage is too high	Guarantee that AC input values are according to specifica- tion on the product manual.
9	DC output voltage is too high	Reconnect. If failure remains, contact assistance.
10	DC output current is too high	Reconnect. If failure remains, contact assistance
11	High temperature	Check if the cooling air filter needs to be changed.
		Check whether the cooling is active during charging.
12	Low input voltage	Guarantee that AC input values are according to specifica- tion on the product manual.
13	Low temperature	Measure ambient temperature. The charging station is de- signed for -25C, if the ambient temperature is less than this warning is normal. If not then contact qualified personnel.
14	CAN Comms lost	Check whether the CCS communications equipment is ac- tive.
15	No Preload target value	This message only comes when no target value for Preload is available. Check whether the CCS communication equip- ment of the vehicle is active.
16	Battery Temperature	Check the battery status.
17	Vehicle moved	Check the vehicle has not moved during charging.
18	Plug faulty	Check the status of the CCS socket on the vehicle.
19	Battery fault	Check battery status.
20	Current deviation	The charging station cant obeys the current target value set by the Vehicle. Contact qualifies personnel.
21	Voltage out of range	The charging station cant obeys the voltage target value set by the vehicle. Contact qualified personnel.
22	System incompatibility	The communication protocol of the vehicle is not compati- ble with the charging station protocol.
23	Charging finished	No action required.
24	Session adjustment timeout	Restart charging procedure. If the problem persists contact qualifies personnel
25	Main protection timeout	Set a charger in manual mode and click the mains protec- tion switch.
		If the main protection switch does not close the relay RL1 must be manually triggered.
		If the main protection still does not close then please con- tact qualified personnel.
27	Discharge circuit protection time out	Check the status of the Discharge circuit protection.
28	High DC+ temperature	Plug temperature in DC+ contactor is over 90C. Contact qualified personnel.

29	High DC- temperature	Plug temperature in DC- contactor is over 90C. Contact qualified personnel.
30	Auxiliary switch fault	Check whether the axillary switch has been triggered.
31	Rectifier fuse is blown	Check whether the rectifier fuse has blown.

#### A.2.2 SICHARGE UC Plug-In Charger Error Codes

The following error codes are published for Siemens charging stations.

Code	Alarm	Alarm Map- ping	Details	Suggested Actions
0	NO_ERROR			
1	EMERGENCY	Other Error	Emergency button pressed	Un-press the emergency button and reconnect.
2	DOOR	Other Error	Cabinet door open	Confirm that door is closed properly.
3	ISOLATION_FAULT	Groun d Fail- ure	Isolation values between DC and Ground are below recom- mended values	Guarantee if the fault is coming from the vehicle or the charger. Re- connect
4	TEMPERATURE_OUT_OF_RANGE	Inter- nal Er- ror	Internal temperature is out- side of the permitted range	Wait for the temperature to go back to the permissible range.
5	DC_PLUS_TEMPERATURE	High Tem- pera- ture	The temperature at DC + con- tact of the plug is too high	Overheating can be caused by bad contact or degradation/damages to the plug.
6	DC_MINUS_TEMPERATURE	High Tem- pera- ture	The temperature at DC - con- tact of the plug is too high	Overheating can be caused by bad contact or degradation/damages to the plug.
7	INPUT_VOLTAGE_OUT_OF_RANGE	Inter- nal Er- ror	AC input voltage is outside the permissible range	Guarantee that AC input values are according to specification on the product manual
8	INPUT_CURRENT_OUT_OF_RANGE	Inter- nal Er- ror	AC input current is outside the permissible range	Guarantee that AC input values are according to specification on the product manual.
9	HIGH_OUTPUT_VOLTAGE	Over Volt- age	DC output voltage is too high	Reconnect. If failure remains, con- tact assistance.
10	HIGH_OUTPUT_CURRENT	Over Cur- rent Failure	DC output current is too high	Reconnect. If failure remains, con- tact assistance.
11	CAN_COMMUNICATION_LOST(AURO- NIK)	EV Com- muni- cation Error	Internal communication error	Reconnect. If failure remains, con- tact assistance.

#### Error Codes

#### A.2 Vendor-specific Code

12	CAN_COMMUNICATION_LOST(GI)	Inter- nal Er- ror	Internal communication error	Reconnect. If failure remains, con- tact assistance.
13	AC_CONTACTOR_TIMEOUT	Power Switch Failure	AC contactor is not closing/ opening	Check AC contactors for damages or possible welding.
14	DC_CONTACTOR_TIMEOUT	Power Switch Failure	DC contactor is not closing/ opening	Check DC contactors for damages or possible welding.
15	CP_STATE_FAULT	EV Com- muni- cation Error	Control pilot state is not ac- cording to IEC61851	Check plug integrity. Reconnect. If failure remains, contact assistance.
16	FREQUENCY_OUT_OF_RANGE	Inter- nal Er- ror	AC input frequency is outside the permissible range	Guarantee that AC input values are according to specification on the product manual.
18	RESS_TEMPERATURE_INHIBIT	Other Error		Vehicle generated error
19	EV_SHIFT_POSITION	Other Error		Vehicle generated error
20	CHARGER_CONNECTOR_LOCK_FAULT	Con- nector Lock Failure		Vehicle generated error
21	EVRESS_MALFUNCTION	Other Error		Vehicle generated error
22	CHARGING_CURRENT_DIFF	Other Error		Vehicle generated error
23	CHARGING_VOLT- AGE_OUT_OF_RANGE	Other Error		Vehicle generated error
24	CHARGING_SYSTEM_INCOMPATIBILI- TY	Other Error		Vehicle generated error
25	DC_LINK_UNDER_BALANCE	Inter- nal Er- ror	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
26	DC_LINK_OVER_VOLTAGE	Over Volt- age	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
27	DC_LINK_UNDER_VOLTAGE	Under Volt- age	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
28	FREQUENCY_DEVIATION	Inter- nal Er- ror	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
29	INVERTER_IGBT_DESATURATION	Inter- nal Er- ror	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance
30	INPUT_MAINS_HIGH	Over Volt- age	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.

31	INPUT_MAINS_LOW	Under Volt- age	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
32	INPUT_MAINS_CURRENT	Over Cur- rent Failure	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
33	RECTIFIER_IGBT_DESATURATION	Inter- nal Er- ror	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
34	START_TIMEOUT	Power Switch Failure	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance
35	SHUTDOWN_RETIFIER	Inter- nal Er- ror	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
36	OUTPUT_SHORT_CIRCUIT	Other Error	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
37	OUTPUT_OVERLOAD	Power Con- verter	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
38	OUTPUT_OVER_VOLTAGE	Over Volt- age	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
39	OUTPUT_UNDER_VOLTAGE	Under Volt- age	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
40	CAN_COMMUNICATION_TIMEOUT	Inter- nal Er- ror	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
41	INPUT_CONTACTOR_OFF	Power Switch Failure	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
42	DC_BUS_PRECHARGE_TIMEOUT	Inter- nal Er- ror	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
43	OVER_TEMPERATURE	High Tem- pera- ture	Internal Power Converter error	Reconnect. If failure remains, con- tact assistance.
44	FRONTEND_DOOR	Other Error	Front End door is open	Confirm that door is closed properly.
45	OUTPUT_FUSE_PLUS_BLOWN	Power Switch Failure	Front End fuse is blown	Replace fuse
46	OUTPUT_FUSE_MINUS_BLOWN	Power Switch Failure	Front End fuse is blown	Replace fuse
47	OUTPUT_CONTACTOR_PLUS_TIME- OUT	Power Switch Failure	Contactor is not closing/open- ing	Check contactors for damages or possible welding.

#### Error Codes

#### A.2 Vendor-specific Code

48	OUTPUT_CONTACTOR_MINUS_TIME- OUT	Power Switch Failure	Contactor is not closing/open- ing	Check contactors for damages or possible welding.
49	MODBUS_COMMUNICA- TION_LOST(CLIENT)	Inter- nal Er- ror	Communication between Charger and Front End lost	Check connection
50	MODBUS_COMMUNICA- TION_LOST(SERVER)	Inter- nal Er- ror	Communication between Charger and Front End lost	Check connection
51	AC_CONTACTOR_ERROR	Power Switch Failure	Contactor changed state unexpectedly	Check contactors for damages or possible welding.
52	DC_CONTACTOR_ERROR	Power Switch Failure	Contactor changed state unexpectedly	Check contactors for damages or possible welding.
53	RESERVED	Other Error	Error reserved for local emer- gency button (project specific)	Un-press the emergency button and reconnect.
54	FRONTEND_TEMPERATURE	Inter- nal Er- ror	Internal Front End tempera- ture is outside of permitted range	Wait for the temperature to go back to the permissible range.
55	IOTDISCONNECTED	Inter- nal Er- ror		
56	OCPPDISABLED	Other Error		
57	SESSIONSETUPFAILURE	EV Com- muni- cation Error		

#### A.2.3 Siemens HPC Pantograph Connector Error Codes

The following error codes are published for Siemens HPC Pantograph Connector.

Vendor Code	Alarm mapping	Description	
lOSystem	Internal Error	The IO system is not operational or causes the system not to be operational.	
ChargerStopStation	Other Error	The Charge Stop button has been pressed.	
SafetyRelay	Power Switch Failure	The Power Switch is not operational or causes the system not to be operational.	
IsolationMonitor	Ground Failure	The Isolation Monitor is not operational or causes the system not to be opera- tional.	
DCBreaker	Internal Error	The DC Breaker is not operational or causes the system not to be operational.	
Pantograpth	Internal Error	The Pantograph is not operational or causes the system not to be operational.	
ControlPilot	EV Communication Error	The Control Pilot is not operational or causes the system not to be operational.	
TrafoTemperature	High Temperature	The Trafo Temperature is not operational or causes the system not to be operational.	
KeyswitchMainte- nance	Other Error	Indicates that the keyswitch in the charge station is in position "maintenance".	

KeyswitchPantoma- nual	Other Error	Indicates whether the keyswitch in the charge station is in position "panto manual down".
SmokeAlarm	Internal Error	The Smoke Alarm is not operational or causes the system not to be operational.
HPCCTemperature- Fault	High temperature	Indicates that the HPCC (Converter) has a temperature fault.
ChargeStopPole	Other Error	Indicates whether the charge stop button at the pole is pressed.
ElectricalFault	Internal Error	Indicates whether one of the fuses indicates an electric fault. Contact qualified personnel.
StationTemperature	High Temperature	Indicates whether the temperature inside the station is too high.
UPSPowerFailure	Internal Error	Indicates whether the UPS module has a power failure.

#### A.2.4 VersiCharge SG Connector Fault Error Codes

The following fault error codes are published for Siemens VersiCharge SG Connector.

Fault Type	Equivalent OCPP Error code
FAULT_TYPE.ANY_LINE_PHASE_UNDER_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.LINE_PHASE_A_UNDER_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.LINE_PHASE_B_UNDER_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.LINE_PHASE_C_UNDER_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.LINE_ANY_PHASE_OVER_V	ChargePointErrorCode.OverVoltage
FAULT_TYPE.LINE_PHASE_A_OVER_V	ChargePointErrorCode.OverVoltage
FAULT_TYPE.LINE_PHASE_B_OVER_V	ChargePointErrorCode.OverVoltage
FAULT_TYPE.LINE_PHASE_C_OVER_V	ChargePointErrorCode.OverVoltage
FAULT_TYPE.LINE_ANY_PHASE_ZERO_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.LINE_PHASE_A_ZERO_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.LINE_PHASE_B_ZERO_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.LINE_PHASE_C_ZERO_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.ANY_LOAD_PHASE_UNDER_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.LOAD_PHASE_A_UNDER_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.LOAD_PHASE_B_UNDER_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.LOAD_PHASE_C_UNDER_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.LOAD_ANY_PHASE_OVER_V	ChargePointErrorCode.OverVoltage
FAULT_TYPE.LOAD_PHASE_A_OVER_V	ChargePointErrorCode.OverVoltage
FAULT_TYPE.LOAD_PHASE_B_OVER_V	ChargePointErrorCode.OverVoltage
FAULT_TYPE.LOAD_PHASE_C_OVER_V	ChargePointErrorCode.OverVoltage
FAULT_TYPE.LOAD_ANY_PHASE_ZERO_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.LOAD_PHASE_A_ZERO_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.LOAD_PHASE_B_ZERO_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.LOAD_PHASE_C_ZERO_V	ChargePointErrorCode.UnderVoltage
FAULT_TYPE.BAD_PILOT_VOLTAGE	ChargePointErrorCode.OtherError
FAULT_TYPE.BAD_AMP_SWITCH_POSITION	ChargePointErrorCode.OtherError
FAULT_TYPE.ADC_FAULT	ChargePointErrorCode.OtherError
FAULT_TYPE.STATIC_MEMORY_FAULT	ChargePointErrorCode.OtherError

#### Error Codes

#### A.2 Vendor-specific Code

Fault Type	Equivalent OCPP Error code
FAULT_TYPE.CCID_FAULT	ChargePointErrorCode.GroundFailure
FAULT_TYPE.CCID_SELFTEST_FAULT	ChargePointErrorCode.GroundFailure
FAULT_TYPE.CONTACTOR_OPEN_FAULT	ChargePointErrorCode.PowerSwitchFailure
FAULT_TYPE.OVER_TEMPERATURE	ChargePointErrorCode.HighTemperature
FAULT_TYPE.J1772_COMM_FAULT	ChargePointErrorCode.OtherError
FAULT_TYPE.SGD_COMM_FAULT	ChargePointErrorCode.OtherError

### Glossary

Available	The charger or connector is available to charge.
Offline	The charger or connector is not connected to the cloud.
Online	The charger or connector is connected to the cloud.
SoC	State of charge



# Security and Privacy in EVC<sup>3</sup> Depot

Version 2.0.0

Enabling customers to confidently operate in a secure cloud environment.

### **Executive Summary**

As a world-leader in automation and connected devices, Siemens understands the importance of in-depth, proactive cybersecurity policies. Therefore, Siemens EVC<sup>3</sup> Depot Software-as-a-Service (SaaS) operates over the Siemens MindSphere platform, which is designed for secure Industrial Internet of Things (IIoT) applications. Security is a practice of continuous improvement and EVC<sup>3</sup> Depot has commenced the practice on sound footing.

## Contents

- 3 Abstract
- 4 Governance, Principles, and Guidelines
- 4 Privacy of Customer Data
- 5 Secure Cloud Environment
- 6 Frequently Asked Questions (FAQs)
- 6 Summary
- 7 Terms and Abbreviations

# Abstract

Electrification is an industrial megatrend that is in its nascent stages. The megatrend holds great promise for reducing noise and air pollution while improving customer comfort and operator profitability. EVC<sup>3</sup> Depot aims to be at the forefront of fulfilling the promise by providing a secure, robust and standards-compliant cloud software for monitoring and controlling geographically distributed charging stations located in electric-bus depots. Siemens realizes that data and computing security are a lynchpin for the success of its EVC<sup>3</sup> Depot software. This document describes the security measures that protect customers' interests and information in the EVC<sup>3</sup> Depot software.



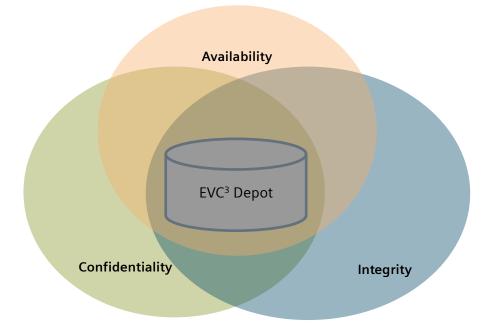
# Governance, Principles, and Guidelines

We aim to protect the confidentiality, integrity, and availability of the operational data of electrified bus depots. We understand that our customers' success and competitive advantage is decided by their operational data, which includes charging strategies & plans, charging station usage patterns, bus itinerary, and resource allocation information. Therefore, confidentiality, integrity, and availability of customer operational data needs to be protected.

The availability of the operational data ensures that all charge points at the customer premises are fully monitored and utilized on demand. Confidentiality of the data ensures that the customers' intellectual property is available only to the customer – customers' intellectual property may be their strategies and plans for charging and operating their buses. Integrity ensures that the customer can fully depend on the veracity of their data, which are collected and reported by EVC<sup>3</sup> Depot.

Security is an on-going process of improvement. The value of information security is proportional to the value of the operational data. Siemens's information security principles are well tempered and evolved. Siemens EVC<sup>3</sup> Depot software inherits the same Siemens principles. Data is the oil in the new megatrend of electrification and data security literally protects wealth.

Thus, Siemens EVC<sup>3</sup> Depot software accurately implements the Siemens Information Security guidelines so that the value of the Siemens brand can be fully utilized by our customers.



## **Privacy of Customer Data**

Siemens takes its responsibility for protecting and using customer information very seriously. The strict access control mechanisms implemented in the service ensures that customers can only view data belonging to their organization.

Also, the only customer data that is collected by the EVC<sup>3</sup> Depot service is the official email addresses of designated employees in customer organizations. The collected email addresses are only used to send information about charging operations in that employee's organization. The email address is not shared with any other business of Siemens nor is it used to send any marketing information

# Secure Cloud Environment

The information security measures adopted by EVC<sup>3</sup> Depot to protect customer data are listed in this section. The information is intended to help our customers be fully informed about the safety and security of their data in Siemens' custody.

#### **Identity & Access Management**

To control end-user access, EVC<sup>3</sup> Depot reuses the MindSphere IAM. MindSphere IAM is an aggregation of state-of-the-art, rule-based and role-based rights models. To control access to the depot IT systems, Siemens ID and industry standard OAuth protocol are used for IAM.

Every charge point has a unique identity and an associated secret credential, which is known only to Siemens engineers. EVC<sup>3</sup> Depot securely authenticates the charge point and its associated tenant depot before interacting with the device.

The EVC<sup>3</sup> Depot MindSphere IAM conforms to the recommendations from the National Institute for Standards and Technology (NIST). Consistent authentication and unambiguous access control mechanisms protect sensitive customer operational data and prevent unauthorized disclosure. EVC<sup>3</sup> Depot customizes the fine-grained access control model of MindSphere IAM to suit the needs of electrified Bus Depot operations.

#### **Secure Communications**

The TLS v1.2 secure communication protocol protects all communications between devices (charge points and employees' computers) in the customers' premises and the cloud service. The protocol is configured to use perfect forward secrecy and globally valid X.509 certificates. The charge points are bootstrapped to the EVC<sup>3</sup> Depot software on the cloud by trained Siemens field engineers. This mechanism and operation ensure secure communication between Siemens EVC<sup>3</sup> Depot and the geographically distributed charging points.

#### **Secure Cloud Storage**

All customer operational data are stored in encrypted databases provisioned by Siemens MindSphere platform. AES256, which provides industry-grade, future-proof encryption, is used to encrypt the databases. This ensures



that only EVC<sup>3</sup> Depot software can access sensitive customer data.

#### Secure Software Development Process

Systematic Threat and Risk Analysis (TRA) is performed at the beginning of each release cycle to prevent design flaws that may result in security issues. Automated Static Application Security Testing (SAST) is integrated into the continuous development process of the software development lifecycle. This prevents the introduction of any security vulnerability in the software system. Additionally, penetration testing is performed by an independent security team. The findings of the penetration testing activity are used by the development team to improve the security of the software system.

#### **Secure Backup**

Data is backed up securely daily and the backed-up data is available for 30 days for restoration.

# Frequently Asked Questions (FAQs)

- Is education/training given to provide staff with an awareness of information security? Yes, all Siemens employees undergo periodic information security awareness training.
- How is the privacy of customer data protected?

The privacy contract for the service is available in the EVC<sup>3</sup> Depot - Fact Sheet document. Only the official email address of designated employees in customer organization is collected and stored by the service. The email addresses are used only to communicate customer organization specific charging information. The customer organization can modify the email address of the designated employee.

• How is the customer information protected by the service?

Operational information which belongs to a customer organization in accessible only to authenticated and authorized employees in the customer organization. All information collected from the customer premises and shared with the customer organization is protected using the industry standard TLS 2.0 protocol. Customer operational information is stored in encrypted databases in the cloud.

- Are all communications between the customers' devices and cloud service encrypted? Yes, all communications with the cloud service are protected using TLS v1.2 protocol with globally valid public key certificate for the service.
- Is customer data stored in the cloud encrypted? Yes, all customer data, including backed-up data, stored in the cloud is encrypted.

# Summary

The EVC<sup>3</sup> Depot service provides robust mechanisms for Identity & Access Management (IAM), Secure Communications, Secure Cloud Storage, and Secure Backup to ensure Confidentiality, Integrity, and Availability to secure and safeguard customers operational data. Siemens fully understands that security is an ongoing process of improvement and has put in place organizational structures to ensure that security evolves with the subsequent versions of the service.

The EVC<sup>3</sup> Depot Service ensures the privacy of customer data in two ways.

- The service enforces strict access control such that a customer's employee can only access information belong to that customer's organization.
- The service only collects the official email address belong to the customer's organization. This email address is only used to send relevant charging operation information.

# **Terms and Abbreviations**

IAM	Identity and access management (IAM) is a central console to control access to assets as a unique solution
lloT	Industrial Internet of Things
SaaS	Software-as-a-Service
EVC <sup>3</sup>	Electric Vehicle Connect Charge & Control
MindSphere	Cloud-based open operating system from Siemens

#### © 2020 Siemens AG. Siemens, the Siemens logo, MindSphere, MindAccess, MindConnect, MindApps and MindServices are trademarks or registered trademarks of Siemens AG

All other trademarks, registered trademarks or service marks belong to their respective holders

#### General disclaimer

This document is provided for informational purposes only and is subject to change without notice. It represents Siemens' current products and solutions as of the date of issue of this document. Customers are responsible for making their own independent assessment of the information in this document and any use of Siemens' products or solutions. This document does not create any warranties, representations, contractual commitments, conditions or assurances from Siemens, its affiliates, suppliers or licensors. The responsibilities and liabilities of Siemens to its customers are controlled by Siemens agreements, which this document is neither part nor modification of.

#### Security disclaimer

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks. In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement - and continuously maintain - a holistic, state-of-the-art industrial security concept. Siemens' products and solutions only form one element of such a concept. Customer is responsible to prevent unauthorized access to its plants, systems, machines and networks. Systems, machines and components should only be connected to the enterprise network or the internet if and to the extent necessary and with appropriate security measures (e.g. use of firewalls and network segmentation) in place. Additionally, Siemens' guidance on appropriate security measures should be taken into account. For more information about industrial security, please visit http://www.siemens.com/industrialsecurity. Siemens' products and solutions



# Smart Charging with Depot Connect

Version 1.0

### **Executive Summary**

The Depot Connect package delivers the ability to control chargers and to conduct Smart Charging. The basic charging algorithms provided as part of Depot Connect are an easy way to organize charging of electric vehicles based on simple prioritization rules. These control algorithms can be configured for either "load shaving" or "load shifting" use cases.

## Contents

- 3 Abstract
- 4 FIFO (= First In First Out)
- 4 FIFO with Sequential Charging
- 5 FILO
- 5 FILO with Cell Balancing
- 6 FILO with Sequential Charging
- 6 SPLIT

## Abstract

The basic charging algorithms are an easy way to organize charging of electric vehicles based on simple prioritization rules. Additionally, the algorithms assure that a given maximum power (e.g. maximum grid connection power) is never exceeded. The algorithms are invoked live and dynamically distribute the available power to connected buses. Each time a bus that requires charging is connected or a connected bus is finished charging the algorithms redistribute the allocated power set points for each charger *I* connector in order to provide optimal usage of the available power bandwidth.

There are four algorithms that serve slightly different requirements and objectives.

# FIFO (= First In First Out)

FIFO is a basic strategy that organises charging of buses with the strategy to first fully charge the buses that entered the depot first. The motivation behind this strategy often is the depot layout being a one-way lane so it is a requirement that the first bus coming into the depot is also the first one leaving the depot. FIFO strategy is a "live" strategy that sets the power set point of each charger depending on

- Is the charger connected to a bus that is not yet finished charging?
- When was the charger connected to the bus?

 What is the available maximum power for the charger / charging group / depot?

The algorithm sets the power set point of all active connectors to the maximum power however constraint by charger maximum power and maximum available power. It prioritizes the buses that were connected first. This can be seen in the detailed workflow in the following figure.

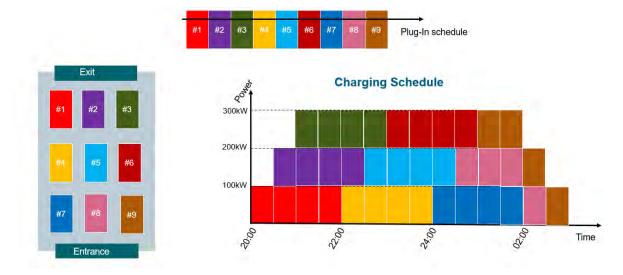


Figure 1. Charging schedule and parking layout for FIFO

- 1. Consider a depot that has a separate entrance and exit.
- 2. There are 9 buses and these buses return to the depot, in the order  $1 \rightarrow 9$  every 30 mins
- 3. Each bus requires 200kWh of energy during charging
- There are 9 chargers and each charger can deliver 100kW

   therefore each bus needs 4 x 1/2hour slots to fully charge
- 5. As the buses return to base they are plugged into a charger.
- 6. The chargers are grouped together and assigned a maximum power for the whole group of 300kW.

Now when EVC<sup>3</sup> Depot CONNECT controls the chargers according to FIFO the following sequence happens

### **FIFO with Sequential Charging**

Sequential charging will follow the following structure

(1) The chargers will be prioritised according to FIFO

- 7. As the buses are plugged in they start to charge until the maximum group power is reached (at around 21:00).
- 8. At this point buses #1 #3 are charging
- 9. When new buses are plugged in they are not charged and are waiting.
- 10. When the first bus (#1) is fully charged at 22:00, Bus #4 can start charging.
- 11. The same logic applies for all the subsequent buses
- 12. This ensures that the early buses are charged before the later buses e.g. the first bus in (FI) is the first bus out (FO) = FIFO
- (2) The connectors on the chargers will also be prioritised according to FIFO.

# FILO (= First In Last Out)

FILO is a basic strategy that organises charging of buses with the strategy to first fully charge the buses that entered the depot most recently. The motivation behind this strategy often isthe depot layout being a dead-end one-way lane so it is a requirement that the last bus coming into the depot is also the first one leaving the depot. FILO strategy is a "live" strategy that sets the power set point of each charger depending on

 Is the charger connected to a bus that is not yet finished charging? • When was the charger connected to the bus?

The algorithm sets the power set point of all active connectors to the maximum power as defined by the charger maximum power and the maximum available power. It prioritises the buses that were connected last. This can be seen in the detailed workflow in the following figure.

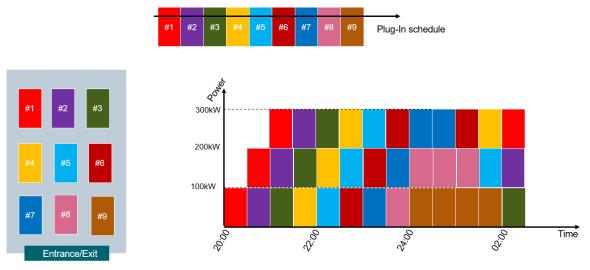


Figure 2. Charging schedule and parking layout for FILO

- (1) Consider a depot that has a separate entrance and exit.
- (2) There are 9 buses and these buses return to the depot, in the order  $1\rightarrow 9$  every 30 mins
- (3) Each bus requires 200kWh of energy during charging
- (4) There are 9 chargers and each charger can deliver 100kW – therefore each bus needs 4 x 1/2hour slots to fully charge
- (5) As the buses return to base they are plugged into a charger.
- (6) The chargers are grouped together and assigned a maximum power for the whole group of 300kW.

Now when EVC<sup>3</sup> Depot CONNECT controls the chargers according to FILO the following sequence happens

## **FILO with Cell Balancing**

On a charger level balancing is prioritized (first all chargers in balancing will receive balancing power, then follows bulk charging), but on a connector level again strictly FIFO is

- (7) As the buses are plugged in they start to charge until the maximum group power is reached (at around 21:00).
- (8) At this point buses #1 #3 are charging
- (9) When bus #4 is plugged in (at around 21:30), bus #1 stops charging so that #4 can start charging. Bus #1 is now waiting.
- (10) Similarly when bus #5 is plugged in, bus #2 stops and waits. And so on.
- (11) When the later buses have been charged the earlier buses can finish their charging
- (12) This ensures that the early buses are charged after the later buses e.g. the first bus in (FI) is the last bus out (LO)=FILO

applied no matter if the connected vehicles are in charging or balancing mode.

(1) The chargers will be prioritised according to FIFO

(2) The connectors on the chargers will also be

prioritised according to FIFO.

## FILO with Sequential Charging

Sequential charging will enact in the following manner: (a) The chargers will be prioritised according to FILO and (b) the connectors on the chargers will be prioritised according to FIFO.

Sequential charging will follow the following structure:

# SPLIT

SPLIT is a basic strategy that organises charging of buses with the strategy to equally distribute the available charging power of the charging group to all connected (and not yet fully charged) buses. This strategy is useful if there are no constraints to the in- and out-bound movement of the buses and there is no timetable available.

SPLIT strategy is a "live" strategy that sets the power set point of each charger depending on

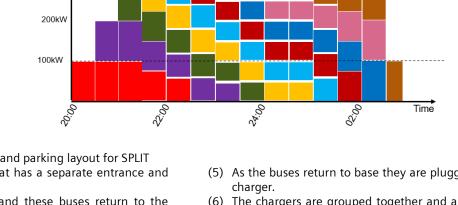
- Is the charger connected to a bus that is not yet finished charging?
- What is the available maximum power for the charger / charging group?

#3

থ<sup>ই</sup> 300kW The algorithm sets the power set point of each active connector to the same fraction of its maximum power (constraint by charger maximum power and maximum available power)

- -00:02 Entrance/Exit Figure 3. Charging schedule and parking layout for SPLIT
  - (1) Consider a depot that has a separate entrance and exit.
  - (2) There are 9 buses and these buses return to the depot, in the order  $1 \rightarrow 9$  every 30 mins
  - (3) Each bus requires 200kWh of energy during charging
  - (4) There are 9 chargers and each charger can deliver 100kW - therefore each bus needs 4 x 1/2hour slots to fully charge
- (5) As the buses return to base they are plugged into a charger.
- (6) The chargers are grouped together and assigned a maximum power for the whole group of 300kW.

Now when EVC<sup>3</sup> Depot CONNECT controls the chargers according to SPLIT the following sequence happens

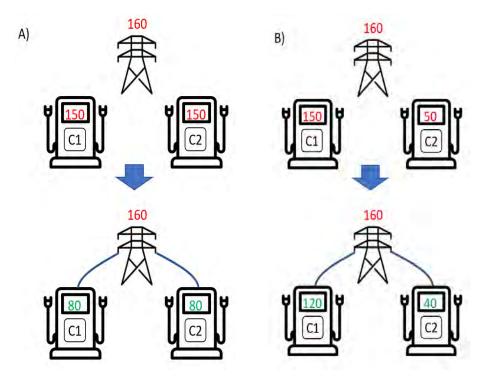


Plug-In schedule

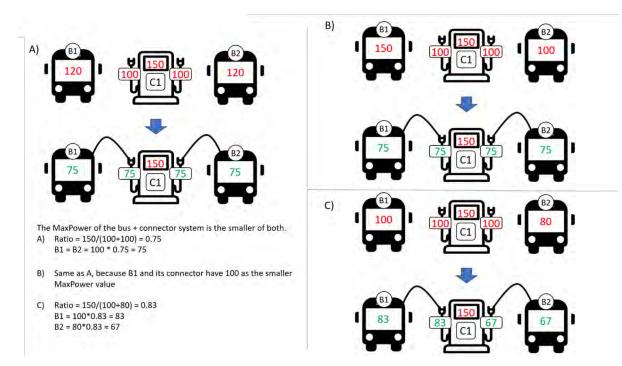
- (7) As the buses are plugged in they start to charge until the maximum group power is reached (at around 21:00).
- (8) At this point buses #1 #3 are charging
- (9) When bus #4 is plugged in (at around 21:30), The power is now shared between the 4 chargers
- (10) Similarly when bus #5 is plugged in, the power is now shared amongst 5 chargers

For EVC<sup>3</sup> Depot CONNECT the SPLIT strategy has been modified to ensure that the charging is as efficient as possible and takes into account variations in Charger, Connector and Vehicle power.

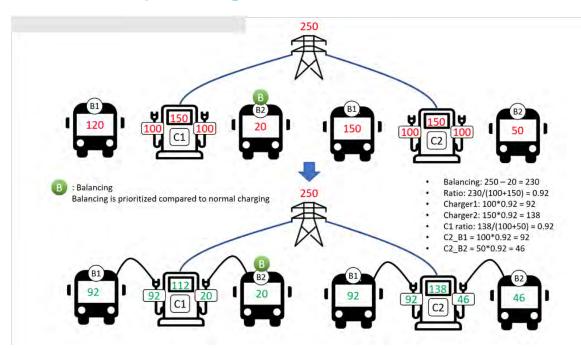
## How is Power Split Amongst Chargers?



The power is distributed such that the distribution is weighted by the maximum power of the charger.

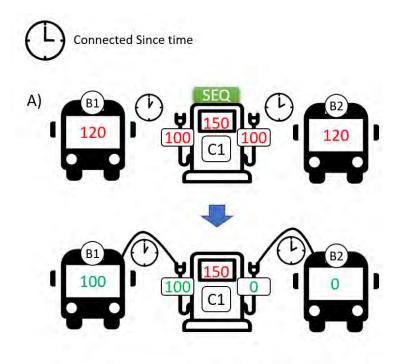


## How is Power Split Amongst Connectors?

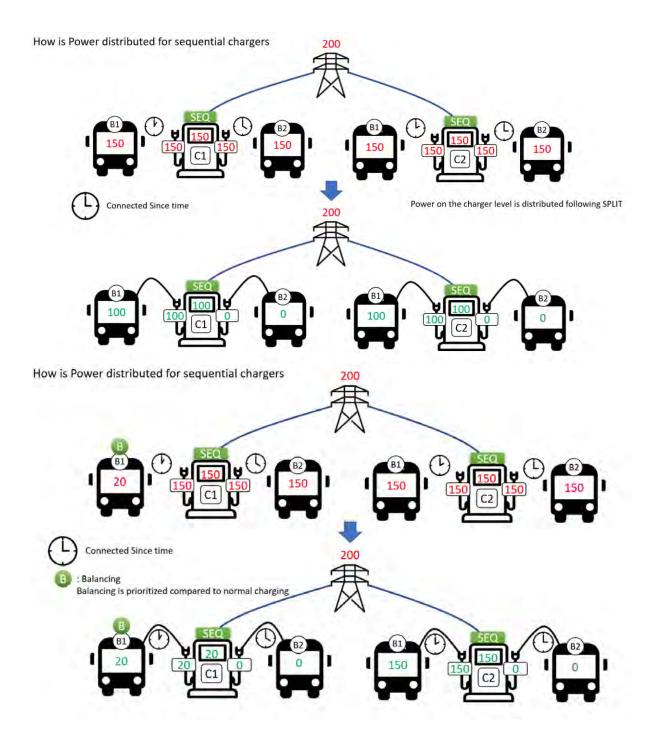


## How is Power Split Amongst Connectors?

## How is Power Split for Sequential Chargers?



Power on the connector level is distributed following FIFO



#### **General disclaimer**

This document is provided for informational purposes only and is subject to change without notice. It represents Siemens' current products and solutions as of the date of issue of this document. Customers are responsible for making their own independent assessment of the information in this document and any use of Siemens' products or solutions. This document does not create any warranties, representations, contractual commitments, conditions or assurances from Siemens, its affiliates, suppliers or licensors. The responsibilities and liabilities of Siemens to its customers are controlled by Siemens agreements, which this document is neither part nor modification of.

#### Security disclaimer

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks. In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement - and continuously maintain - a holistic, state-of-the-art industrial security concept. Siemens' products and solutions only form one element of such a concept. Customer is responsible to prevent unauthorized access to its plants, systems, machines and networks. Systems, machines and components should only be connected to the enterprise network or the internet if and to the extent necessary and with appropriate security measures (e.g. use of firewalls and network segmentation) in place. Additionally, Siemens' guidance on appropriate security measures should be taken into account. For more information about industrial security, please visit http://www.siemens.com/industrialsecurity. Siemens' products and solutions

© 2020 Siemens AG. Siemens, the Siemens logo, MindSphere, MindAccess, MindConnect, MindApps and MindServices are trademarks or registered trademarks of Siemens AG

# SIEMENS

Google BEB RFQ

Name Mobile E-mail Our reference Date Ross C. Mueller 949-273-9374 ross.mueller@siemens.com Spokane Transit Authority 8/19/2020

# 5 year Warranty and Preventative Maintenance For SiCharge UC200 150Kw and SiCharge UC 600 450Kw W Pantographs All Facilities total 5 Years

Siemens Industry Inc. is pleased to provide the following Spokane Transit Authority 2020-10495 project.

## **1.0 Depot Charger description**

Each 150kW depot charger included in this offer has the following specifications:

Rated output power	Max <b>160kW</b> (for batteries in voltage range 200850V DC*)				
Rated output current	200A continuous through voltage range				
Supply voltage (phase to phase)	3 phase, 480V AC Supply, 3 wires + PE Ground				
Frequency	57-63 Hz				
Input current	220 A				
Harmonics	<5% at full power, according to IEEE519				
Type of installation	Outdoor, IP54/NEMA3R compatible enclosure,				
(indoor/outdoor)	-25degC 50degC, 5%-95% humidity				
Applicable Standards (UL, IEC, CSA)	UL Certified, SAE J-1772/CCS Type 1				
Dimensions main charging unit	55 in x 47 in x 75 in				
Grounding system	PE Grounded AC input / Isolated DC output				
Weight	Approx. 4800lbs.				
Frontend / dispensers	QTY 2 dispensers per charger. Can accommodate up to 4 remote dispensers.				
Connector Type / length	QTY. 1 per dispenser / CCS Type 1 / max. 25ft. / UL certified				
Remote access (by Siemens)	VPN access via Router with SIM Card				
Backend capability	Fully compatible with OCPP v1.6 (JSON)				

The DC Charging Station is composed by two parts: a **Power Module** and a **Pole Mount Satellite** / **Dispenser**. Up to four Dispensers can be coupled to the Power Module in a radial configuration – each dispenser having its own set of power and communication cables. The distance between the Power Module and each Dispenser is limited by the communication method outlined below.

Chargers with multiple dispenser's support a sequential charging concept.

Communication to be considered					
Distance	Communication Method				
1m – 100m	Ethernet*				
100m – 200m	Fiber Optic*				

\*Solutions under review and still require additional testing.

The maximum cable distance between main cabinet and each satellite is 200m. The distance should always be measured radially.

The Dispenser is equipped with a Siemens HMI Display Panel which is found on the cabinet's door. A Siemens PLC manages the charging procedure and all the station's actions. The Siemens HMI Display Panel on the door has a user-friendly functions and graphics to support the charging process.

The charging station is designed considering the standard IEC 61851, namely charging mode 4. Charging mode 4 is a fast charging method for battery electric vehicles of high-voltage direct current via a special electrical connector.



### 2.0 Preventative Maintenance Services

Preventative Maintenance Schedule (Per Year):

- Qty. (4) Preventative Maintenance (PMs) per year. Once every 3 months.
- Work will be performed Monday through Friday (non-holidays) during normal working hours (8a – 5p).
- Four mobilizations per year.
- Each mobilization per year will provide preventative maintenance on four (4) VersiCharge MaxxHP chargers / associated (10) dispensers.
- A vehicle for charging purposes will be needed for a preventative maintenance functional testing. If a vehicle is not provided delays and possible additional service charges may apply.

#### Preventative Maintenance Scope of Services:

External Visual Inspection

- Check visible damages (holes or corrosion) in the cabinet
- Check if plug support and cable holding are in the correct position
- Clean and check if the ventilation system is not obstructed
- Check if the charging plug shows and signs of humidity, dust or corrosion
- Cleaning the HMI with microfiber cloth and check if is correctly responding to the touch and cleaning.
- Clean all dust and/or dirt accumulations from the charger cabinets.

Internal Visual Inspection

- Check charging plug and any signs of humidity, dust or corrosion.
- Check if the capacitors are leaking out liquid or are damaged.
- Check all relays, lights, and other indicating devices for proper operation

Mechanical Inspection

- Check if the side panels are correctly tightened.
- Check if the cabinet's fixing points to the ground are correctly tightened.
- Check if the input connections are correctly tightened (L1, L2, L3, PE)
- Check if the main output connections are correctly tightened (DC+, DC-, PE, CP)
- Check if the main transformer fixing points are correctly tightened.
- Check if the main base plate (behind the main transformer) is correctly tightened.

Other Inspections

- Check for abnormal sounds from the running fans and power units.
- Check for abnormal smells, changes of inner materials, corrosion

Functional Tests

- Measure the line voltages (L1-PE, L2-PE, L3-PE) and compare with the values on the HMI.
- Measure the output voltage (DC+, DC-) and compare with the values on the HMI
- Measure the output current and compare with the values on the HMI
- Opening doors while charging (Safety Check)
- Press E-Stop button while charging (Safety Check)
- Check Functionality of Manual Mode. (HMI Check)
- Charging Procedure\*\*: Functional check of the charging procedure of the charger. Confirm charging procedure goes through the phases: Vehicle Connected/ Cable Check/ Pre-Charge/ Charging.

\*\*Will need the use of a vehicle for charging purposes for this procedure. If a vehicle is not provided delays and possible additional service charges may apply.

Maintenance / Service Clarifications:

Siemens is providing a preventative maintenance plan, each year each charger will be provided with two preventative maintenance visits. Siemens cannot guarantee any performance up-time due to preventative maintenance at this time. Siemens will strive to respond to service requests at our best possible response time but cannot at this time guarantee or stipulate any given response time.

Siemens will not provide services on vehicle battery systems or other third-party equipment that is not discussed in this proposal. All vehicle related maintenance and battery system maintenance or services are the responsibility of others. Siemens also does not guarantee any performance up-time due to regular preventative maintenance.

### 3.0 Documentation

The following documents may be provided. The documents will be provided at the time of acknowledging the PO. Drawings and documentation are as follows (when applicable):

- Product Manual
- Standard product drawings
- Certified test reports (upon completion)
- Any requirements for project specific drawing set is an additional cost.
- Any requirement for PE stamped drawings is an additional cost.

#### **Quality Assurance**

Siemens' quality management program is the basis of our outstanding reputation on the world market. Relentless efforts and unwavering commitment enable us to satisfy our customers, employees, and stakeholders.

#### **Project Execution Schedule**

The final schedule will be based upon available manufacturing slots at the time of order receipt.

Manufacturing completion is expected to be 16 weeks after receipt of order for depot chargers.

## 4.0 Clarifications

The following are clarifications to our proposal:

- Siemens is quoting our standard VersiCharge MaxxHP 150kW depot charger with two dispensers each on two Power Cabinets and (3) Dispensers each on two more Power Cabinets for (10) total dispensers Boone Garage.
- Siemens has successfully charged Proterra, New Flyer and Gillig electric buses with MaxxHP technology. Anticipate compatibility with BYD and Novabus CCS1 DC charged buses.
- Sequential charging is possible and has been proven but must be coordinated with bus supplier. Bus side charge control unit must be capable of supporting a sequential charge.
- The VersiCharge MaxxHP is OCPP V1.6
- Siemens requires either an internet connection with VPN tunnel (firewall arrangement to allow for outside traffic to access chargers) or customer supplied LTE SIM card and data plan to enable any remote connectivity.
- All MaxxHP chargers use identical IP addresses on components from charger to charger. Customer will require additional components with VLAN capabilities to accommodate LAN connection.
- In the event shipment is delayed for any reason that is beyond the control of Siemens a storage fee in the amount of 1.5% of the equipment value shall be charged per month on the first day of the month.
- Dimensions of equipment and enclosures included in this proposal are approximate.
- All site works including installation field wiring and interconnection are done by others
- Commissioning will require that a bus is available during the entire commissioning period.
- Documentation, labels, nameplates, user interfaces, displays, training, signage, etc. for the equipment and subsystems will be provided in English only.
- Siemens excludes any onsite installation activities including but not limited to cabling outside the enclosures and external switchgear, concrete pads and equipment installation.
- Any requirements for project specific drawing set is an additional cost.
- Any requirement for PE stamped drawings is an additional cost.

## Slecharge UC 600 450Kw Charge Center & Pantograph

# **Technical data**



#### SICHARGE UC Charging Center

The Charging Center is delivered 100-percent factory-tested, including controllers, the device as a whole and, optionally, communication with the Frontend

			I data Sieme					
SICHARGE UC	50	100	200	300	400	600	800	
Vehicle interface	-		_					
CCS cable on Charging Center	*	×	*	1.104		100 million 11	1	
Frontend or Charging Center with GB/T cable	я,	×	1.642.7	1.811	(1+d)	1.3401	4	
Frontend with CCS cable	×	*	×				()+);	
Frontend with cooled CCS cable with max 500 A	×	×	*	× .	×	up to 15 min	1	
Mast mounted Hood	×	× .	×	×	*	×	×	
Mast mounted (inverted) Pantograph	×	×	×	×	*	×	×	
Nominal Input								
Voltage	_		400 V	ac (3ph + PE)	± 10 %			
Current at nominal voltage per phase, A	76	152	228	342	456	683	911	
Frequency, Hz				50/60				
Power factor (cos phi)				> 0.98				
DC output*								
Peak power, kW	63	125	200	300	400	600	800	
Rated power, kW	50	100	150	225	300	450	600	
Current (max.), A	63	125	200	300	400	600	800	
Voltage (range), V <sub>dc</sub>								
Efficiency factor n (at load 100%)				96% 97%				
Environmental conditions								
Operating Temperature			-25 °C +45	°C (extended	upon request)			
Mechanical specifications								
Operational environment			Inc	door and outd	opr			
Protection enclosure				IP54, IK10				
Casing material			Galvani	ized steel, pair	nted, C3			
Color	Main ho	using: RAL 900	6 - White alun	ninium; roof a	nd base: RAL 9	017 - Traffic b	ack matt	
Overall dimensions W x D x H (mm)	700 × 8	00 × 1800	915 × 1000 × 2000	1400 × 10	000 × 2000	2400 × 1000 × 2000	2800 > 1000 > 2000	
Approx. weight, kg	700	1000	1400	2000	2600	4000	5200	
General specifications					-		-	
Charge control unit			Sie	mens SIMATIC	\$7			
Local user interface			Sieme	ns SIPLUS HMI	TP700			
Network connection	Ethernet interface / 3G and 4G / WLAN							
Communications protocol			0	CPP 1.6 (J-SO	N)			
Charging standards		E	N 61851-1/23	24, ISO 15118	B (DIN 70121)*			
EMC standards		EN 5	5016-2-1 & -3;	EN 61000-4-2	28-38-48-	5 & -6		
Compliance				CE declaration				

\*\* Complies with ISO15118-1 standard use cases, further use cases being implemented



#### SICHARGE UC Frontend

Cooled cables as an option can be installed in the same Frontend housing, increasing charging power up to 400 A continuous (500 A for 15 min)

#### SICHARGE UC Inverted Pantograph

Inverted Pantograph is a plug-and-play solution for top-down Pantograph charging – each mast arrives fully preinstalled, electrically checked and equipped with the Pantograph.

#### SICHARGE UC Mast mounted Hood

61.6

The mast mounted Hood is designed for the efficient connection of any ISO 15118 bottom-up Pantograph system. Each mast arrives fully preinstalled, electrically checked and equipped with the contact Hood.

And and a second se		Technical	data Sieme	ns eBus / eUti	lity Charging			
Frontend & masts	SIGHARGE UC		SICHARGE U	SICHARGE UC				
	Frontend	inve	rted Pantug	raph	Mast mou	nted Hood		
Design variants		UD Urban design	ID Industrial design	ID-E Industrial design- extended	ID Industrial design	ID-T Industria design, T-shape		
Connectur		_						
Frontend with CCS or GB/T cable	*	-		1	×			
Mast mounted Hood		-		· · · · · · ·	× .			
Mast mounted (inverted) Pantograph	· · · ·		×	- x				
DC output*				-	_			
Peak power, standard, kW	200		800		8	00		
Peak power, liquid-cooled cable (option), kW	500		nía		n	/a		
Rated power, standard, kW	150	600			6	00		
Current (max.) standard, A	200		800		8	00		
Current (max.) liquid-cooled cable (option), A	500		nla	1	n/a			
Voltage (range), V <sub>dc</sub>	-		10	1000				
Mechanical specifications								
Protection			LP5	54, IK10				
Height, installed (mm)	1765	5805	6573	6573	5000	5000		
Road clearance (mm)	n/a	1.1	4550 to 4650		4635	4635		
Cantilever length (mm)	n/a	3955	4200	5200	3500	7000		
Approx. distance mast to curb (mm)	n/a	1400	1400	2400	1900	1900		
Footprint on sidewalk (mm)	600 × 300	940 × 315	1300 × 330	1300 × 330	$350 \times 300$	350 × 300		
Operating range Pantograph (mm)	n/a		900		n	/a		
Approx. weight, kg	100/150**	1975	1870	2300	900	1100		
Color	Main housing: RAL 9006 - White aluminium; roof and base: RAL 9017 - Traffic black matt		RAL 9006 - White aluminium					
Material	Galvanized powder coated steel	Galvanized steel with fiber glass panel						
General specifications				_				
Communication standard	PLC	W	iFi IEEE 802.1	la	PI	LC		
Number of possible connectors (sequential charging)	up to 5		1		4	2		

## **Preventative Maintenance Services**

Preventative Maintenance Schedule - Five Year: Siecharge UC 600 Inverted and Gantry mounted

- Four (4) Preventative Maintenance (PMs) per year, once every three months, for (4) chargers with gantry mounted pantographs at one facility.
- Four (4) Preventative Maintenance (PMs) per year, once every three months, for four (2) chargers with mast / pantographs at two remote facilities.
- Work schedule: Monday through Friday (non-holidays)
- A vehicle for charging purposes will be needed for a preventative maintenance functional testing. If a vehicle is not provided delays and possible additional service charges may apply.

Preventative Maintenance Sample Scope of Services:

#### Every 3 months:

Area	Maintenance Task
Main Power Cabinet	<ul> <li>Check function of all access doors</li> <li>Check door locks and hinges</li> <li>Check indoor lighting system</li> <li>Inspect main disconnect switch</li> <li>Energy meter (if installed): Check MID approval/calibration validity, replace before the expiry date, or after 8 - 10 years, record the meter reading!</li> <li>Check E-Stop button</li> <li>Check all filter mats and replace if dirty</li> <li>Visual inspection of the cabinet</li> <li>Operation lamp test</li> </ul>
Charger mast (if supplied)	<ul> <li>Check Stop charge button</li> <li>Visual inspection of the panel for external damage</li> <li>Inspect locks</li> <li>Inspect hinges</li> </ul>
Y-Sensor	<ul> <li>Proceed with functional check of correct positioning</li> <li>Check the set distance according to the Y-sensor setting instruction [R12]</li> </ul>
WLAN antenna	<ul> <li>Check level using app "WLAN Analyzer" (min. &lt; -80 dBm)</li> </ul>
Wind sensor	<ul> <li>Visual inspection for external damage of the rotor</li> <li>Remove leaves and any other coarse dirt</li> </ul>
Pantograph	<ul> <li>Visual inspection of the pantograph</li> <li>Visual inspection of the collector head</li> <li>Visual inspection of the jumper leads</li> <li>Visual inspection of the connector cables</li> <li>Visual inspection of the contact bars</li> <li>Use emery paper to sand contact bars</li> <li>Function test</li> </ul>

Main Power Cabinet	<ul> <li>Check the Operating Status and Charging Active functions</li> <li>Inspect and clean indoor fans [-M72] and [-M73]</li> <li>Check insulation monitor [-T35]</li> </ul>
-----------------------	--

Main Power Cabinet	<ul> <li>Inspect charger housing, check ceiling, doors, grating, and cable bushings</li> <li>Clean grilles of fans and air intakes</li> <li>Check and clean the rainwater drains</li> <li>Ensure the earthing straps are complete and check for damage and tightness</li> <li>Measure the earth resistance at the earthing stations in accordance with the floor plan</li> <li>Check output contactors [-Q31] and [-Q32]</li> <li>Clean air intake grill, magnetic components, and main fan</li> <li>Press the "Reset Charging station" button [-S4]</li> </ul>
Isolation transformer	<ul> <li>Inspection of fans</li> <li>Cleaning the transformer</li> <li>Cleaning the main fans</li> </ul>
Charger mast	Check earthing connection of the mast
Pantograph	<ul> <li>Check proper function of the heating circuit</li> <li>Check contact force</li> <li>Measuring the lowering and lifting times</li> <li>Cleaning and lubricating the set screw on the spring balancer and the chain strand</li> <li>Check the spring force of the spring balancer</li> </ul>

Isolating transformer	<ul> <li>Checking the tightening torques</li> <li>Periodic inspection according to IEEE C57.94</li> </ul>
Pantograph	<ul> <li>Replace plug-in relays in the pantograph control box</li> </ul>

Main Power Cabinet	Replace UPS battery module
Pantograph	<ul> <li>Replace the jumper leads and connector cables</li> </ul>

Maintenance Service Clarifications:

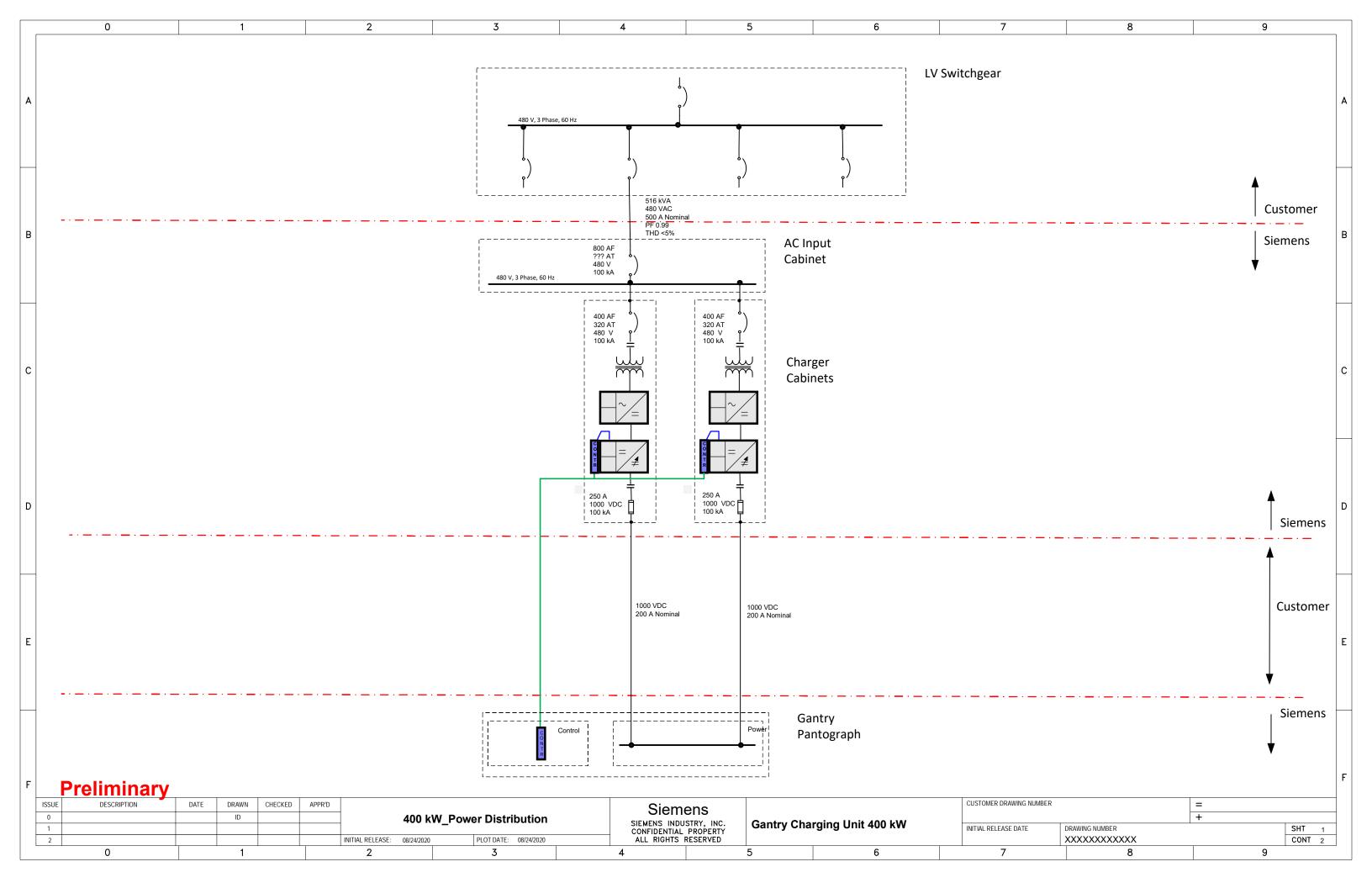
- 1. Siemens will strive to respond to service requests at our best possible response time but cannot guarantee or stipulate any given response time.
- 2. Siemens is providing a preventative maintenance plan, each year each charger will be provided with two preventative maintenance visits. Siemens cannot guarantee any performance up-time due to preventative maintenance.
- 3. Siemens will not provide services on vehicle battery systems or other third-party equipment that is not discussed in this proposal. All vehicle related maintenance and battery system maintenance or services are the responsibility of others.

	0 1	2 3	4 5	6	7 8	9
A						A
В						В
с			5,150			c
D				1,000		D
	_					
E						E
F	Freinniary	I_Layout           INITIAL RELEASE:         08/17/2020         PLOT DATE:         08/20/           2         3	CONFIDENTIAL PROPERTY	CHARGE-UC Single Line Diagram		F + <u>SHT 5</u> CONT 9

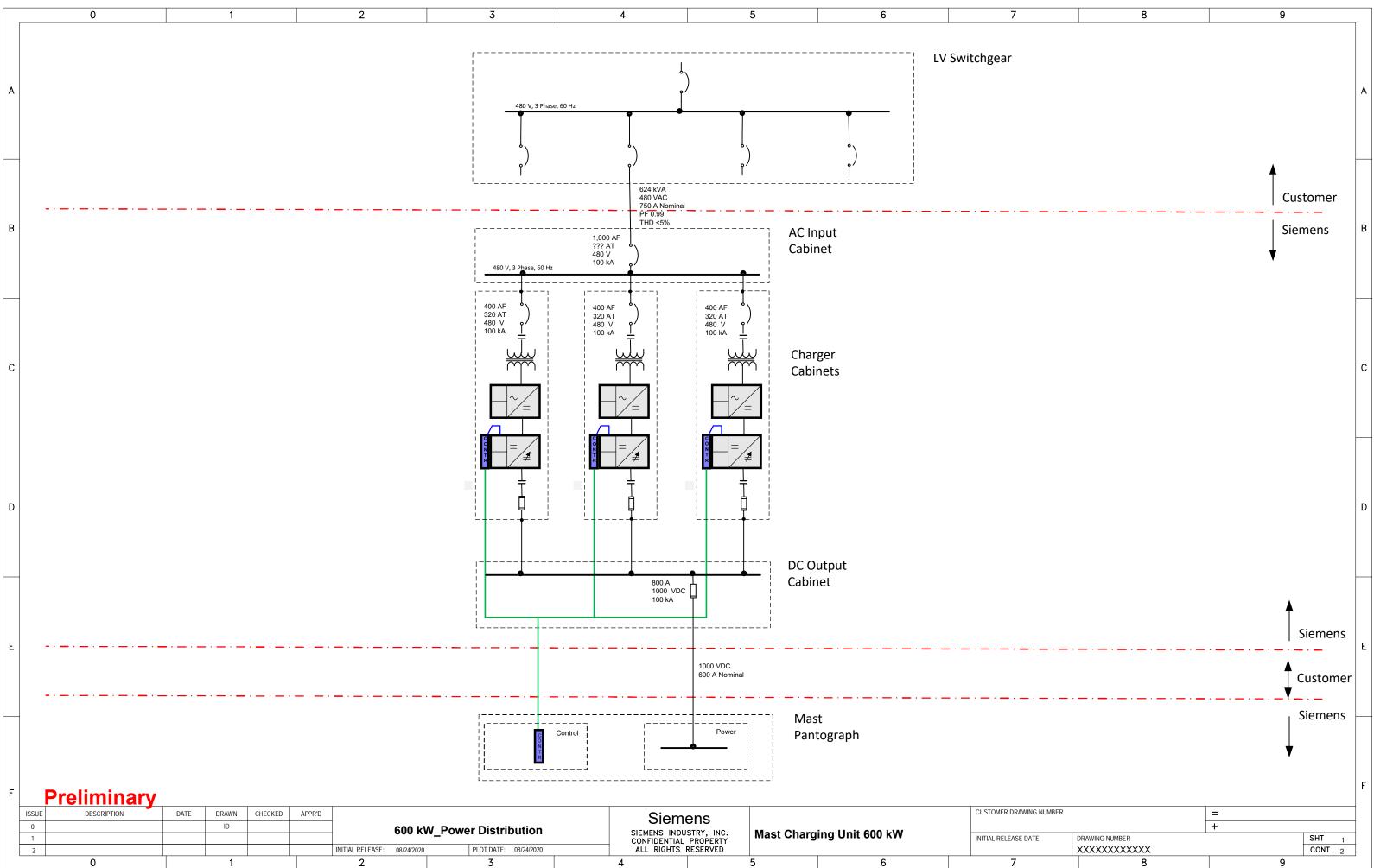
ISSUE	DESCRIPTION	DATE	DRAWN	CHECKED	APPR'D		1_Layout			1_Layout Siemens					CUSTOMER DRAWIN
0	Initial draft	08/17/2020	ID	ID			) • at		SIEMENS INDU			Single Line Diagram			
1									CONFIDENTIAL		SICHARGE-UC		INITIAL RELEASE DA		
2						INITIAL RELEASE: 08/17/2020	PLOT DATE: 08/20/2020		ALL RIGHTS	RESERVED					
	0		1			2	3		4		5	6	7		

0	1	2	3	4	5 6	7	8	9	]
в				o [] o					В
		2,150							
		6							
			500						с
			400 1,100		<b>1,000</b>				
					]				
D									D
_			•	3,000					
E									E
_									
F Preliminary									F
ISSUE DESCRIPTION		APPR'D	2_Layout	Siemens		CUSTOMER DRAWING NUMBER	2	=	
0 Initial draft	08/17/2020 ID ID			SIEMENS INDUSTRY, CONFIDENTIAL PROPE ALL RIGHTS RESERV	NC. SICHARGE-UC Single Line Diagram	INITIAL RELEASE DATE	DRAWING NUMBER	+ SHT	6
2		INITIAL RELEASE: 08/17/2020	PLOT DATE: 08/20/2020		ED		XXXXXXXXXXXX	CONT	
0	1	2	3	4	5 6	7	8	9	

	0	1	2	3	4	5	6	7	8	9
										, ( <sup>*</sup>
			_ ⊢							
						0				
в										1
			2,150							
										-
c			-	400 1,100	1,100	100	<b>1</b> ,	000		0
						,				
D										]
					4,100		>			
	_									
F	Preliminary           ISSUE         DESCRIPTION	DATE DRAWN CHECKED	APPR'D					CUSTOMER DRAWING NUMBER		=
	0 Initial draft	08/17/2020 ID ID		3_Layout	Sien	DUSTRY, INC.	SICHARGE-UC Single Line Diagram			+
	1 2		INITIAL RELEASE: 08/17/20					INITIAL RELEASE DATE	DRAWING NUMBER	SHT 7 CONT
	0	1	2	3	4	5	6	7	8	9



		0 1	2	3	4		5 6	7	8	9	
0         0	,	λ									A
c		3			o [] o						В
B         →											c
E         2,600           Image: start back back back back back back back back							1,000				D
F <u>A80 VAC Feeder</u> <u>480 VAC Feeder</u> <u>1000 VDC Feeder</u>				<b>└</b>	2,600						
F       Signers       Customer Description       Date       Drawing Number       Hour Description       E         1<									LEGEND:		E
		ISSUE     DESCRIPTION     DATE     DRAWN     CHECKED     AP       0     ID     ID     ID     ID     ID       1     ID     ID     ID     ID     ID	40		Siemens Indu SIEMENS INDU CONFIDENTIAL	ONS STRY, INC. PROPERTY	Gantry Charging Unit 400 kW		DRAWING NUMBER	1000 VDC Feeder = + SHT	F
			INITIAL RELEASE: 08/24/2020 2	PLOT DATE: 08/24/2020 3	ALL RIGHTS		5 6	7	8	CON' 9	T



	0		1		2	3		4	5 6		7	8	9	
														A
					_									
В					2,150									В
						i <b></b>				1.000				
С						400 1,100	1,100	1,100		1,000				с
					AC Input Cabinet				DC Output Cabinet					
					Cabinet									
D														D
						-	4,100							
E														E
												LEGEND:	480 VAC Feeder	
													HOU VAC FEEUER	
													1000 VDC Feeder	F
	Preliminary ISUE DESCRIPTION	DATE	DRAWN CHEC	KED APPR'D		000 1347 1		Siemens			CUSTOMER DRAWING NUME	ER	=	
	0		ID		INITIAL RELEASE: 08	600 kW_Layout		SIEMENS INDUSTRY, INC. CONFIDENTIAL PROPERTY ALL RIGHTS RESERVED	Mast Charging Unit 600 k	W	INITIAL RELEASE DATE	DRAWING NUMBER	+	SHT 2 CONT
	0		1		2	3		4	5 6		7	8	9	

## **SIEMENS**



Transport and Installation

# Urban Design Mast

Siemens Industry, Inc.

#### © Siemens Industry, Inc, 2020.

Transmittal, reproduction, dissemination and/or editing of this document as well as utilization of its contents and communication thereof to others without express authorization are prohibited. Any breach or infringement will result in liability for damages. All rights, including rights created by patent grant or registration of a utility model or design patent, are reserved. In case the contractual agreement allows the customer to change the document, such changes shall be clearly highlighted and shall name the person changing the document. In any case, Siemens AG is not liable for any amendments or changes to the document and any possible consequences therefrom.

All trademarks and registered trademarks are the property of the respective owners. The mention of utility names, brands, product names, etc. in this documentation shall, even without special identification, by no means give rise to the assumption that such names are free in the sense of the laws on trademarks and intellectual property and can be used by anyone.

Original operating instructions

Responsible for the content:	Name: Karsten Lösch <mark>(MO TI EB)</mark>
	Tel.: +49 (173) 2526456
	Email: Karsten.Loesch@siemens.com

Siemens AG Rudower Chaussee 29 12489 Berlin, Germany

E-mail: EB-EN.support.mobility@siemens.com

SCC\_003enTM\_V0-1 Date: 20.04.2018 File name: R32-S0 V0.1 Restricted Released

R32-SCC2-0-DesMast\_enTM\_V0-1.docx

## Table of content

1	Introduction	4
1.1	Content of the Document	4
1.2	Additionally Applicable Documents	4
1.2.1	Definition of the Charger Mast Position	
1.2.2	Fastening Points on Charger Mast	6
2	Transport	7
2.1	Transport Units	7
2.2	Transport	
3	Requirements for the Place of Installation	9
3.1	Documents	9
3.2	Foundation	9
3.3	Cable Laying	9
4	Installation	10
-	installation	10
4.1	Preparation	
-	Preparation Setting Up Charger Mast, Extending and Attaching Car	10 ntilever
4.1	Preparation Setting Up Charger Mast, Extending and Attaching Car Arm	10 ntilever 11
4.1 4.2	Preparation Setting Up Charger Mast, Extending and Attaching Car	10 ntilever 11
4.1 4.2 4.3	Preparation Setting Up Charger Mast, Extending and Attaching Car Arm Check polarity of the Pantographs contact rails	ntilever 11 11 11 18 18 18 18
4.1 4.2 4.3 4.4	Preparation Setting Up Charger Mast, Extending and Attaching Car Arm Check polarity of the Pantographs contact rails Wind Sensor <b>Error! Bookmark ne</b>	
4.1 4.2 4.3 4.4 4.5	Preparation Setting Up Charger Mast, Extending and Attaching Car Arm Check polarity of the Pantographs contact rails Wind Sensor	10 ntilever 11 18 0t defined. 19 
4.1 4.2 4.3 4.4 4.5 4.6	Preparation Setting Up Charger Mast, Extending and Attaching Car Arm Check polarity of the Pantographs contact rails Wind Sensor	10 ntilever 11 18 0t defined. 19 
4.1 4.2 4.3 4.4 4.5 4.6 4.7	Preparation Setting Up Charger Mast, Extending and Attaching Car Arm Check polarity of the Pantographs contact rails Wind Sensor	10 ntilever 11 
4.1 4.2 4.3 4.4 4.5 4.6 4.7 5	Preparation Setting Up Charger Mast, Extending and Attaching Car Arm Check polarity of the Pantographs contact rails Wind Sensor <b>Error! Bookmark no</b> Aligning the WLAN Antenna Connecting the Charger Mast Fitting the Mast Panels <b>Initial Tests and First Commissioning</b>	10 ntilever 11 

i

## Table of figures

Fig. 1	Sample image: Definition of the charger mast position	. 5
Fig. 2	Sample image: Charger mast from below (dimensioned fastenin holes)	•
Fig. 3	Sample image: Transport units	. 7
Fig. 4	Sample image: Foundation, template and cable ducts	.11
Fig. 5	Sample image: Leveling the charger mast	.12
Fig. 6	Schematic diagram: Attaching the charger mast to a crane	13
Fig. 7	Sample image: Attachment point on the crossbeam (pantograp not mounted)	
Fig. 8	Sample image: Securing the charger mast	.15
Fig. 9	Sample image: Extending and securing cantilever arm	.16
Fig. 10	Sample image: Securing the cantilever arm	.17
Fig. 11	Sample image: Aligning the WLAN antenna	.19
Fig. 12	Sample image: Connecting the cable to the terminal boxes	20
Fig. 13	Sample image: Mast panel and functional elements	23

## List of tables

Table 1	Additionally applicable documents	. 4
Table 2	Dimension dependencies	. 6

## 1 Introduction

### 1.1 Content of the Document

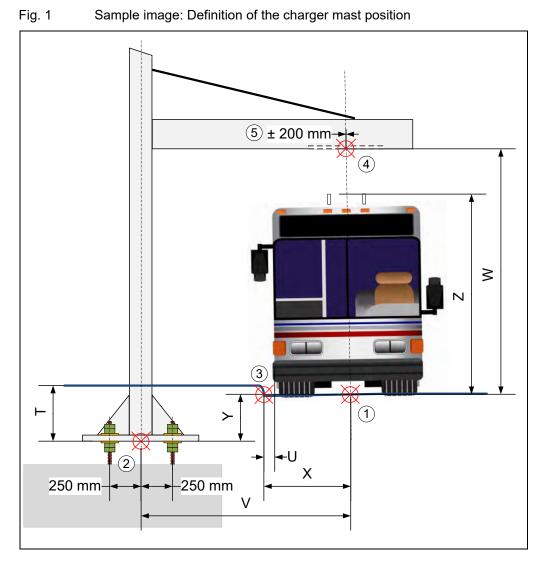
This document is an annex of the "Transport and Installation Instruction" [R30] for the transport and installation of the Urban Design Mast [R11]. All information within this document are design specific deviations of the Urban Design Mast compared to the Standard Mast variants described in [R30]. Please mind and observe all important information such as proper use, safety notices, regulations and guidelines as described in the main document [R30].

### 1.2 Additionally Applicable Documents

#### Table 1 Additionally applicable documents

Reference	Assembly	Siemens part number
[R01]	Description of construction, civil works	A2V00002719973
[R11]	Design charger mast	A2V00002727735
[R30]	Transport and Installation Instruction	A6Z00042601002

## 1.2.1 Definition of the Charger Mast Position



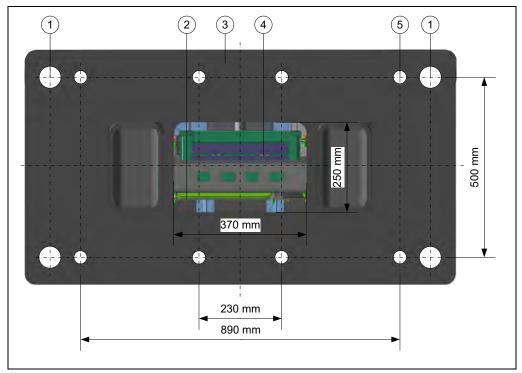
- 1 Measuring point **X** = 1250 ± 10 mm + **U**
- 2 Reference point mast bottom
- 3 Reference point curb
- 4 Reference point pantograph/e-bus center line
- 5 Vertical adjustment range of the pantograph
- T Urban Design Mast **T** ≤ 900 mm
- U Distance e-bus to curb  $\mathbf{U} = 0 \dots \le 100 \text{ mm}$
- V Urban Design Mast **V** = 2650 mm
- W Required mast clearance
- Y Level difference
- Z Height of the e-bus

Y	W (clearance)	Z <sub>min</sub>	Z <sub>max</sub>
480 mm	4850 mm (max.)	3350 mm	4450 mm
530 mm	4800 mm	3300 mm	4400 mm
580 mm	4750 mm	3250 mm	4350 mm
630 mm	4700 mm	3200 mm	4300 mm
680 mm	4650 mm	3150 mm	4250 mm
730 mm	4600 mm	3100 mm	4200 mm
	4550 mm (min.)	3050 mm	4150 mm

Table 2 Dimension dependencies

## 1.2.2 Fastening Points on Charger Mast

Fig. 2 Sample image: Charger mast from below (dimensioned fastening holes)

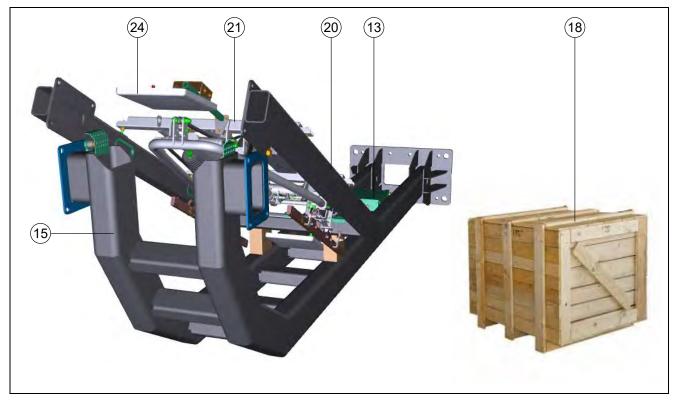


- 1 Attachment points for lifting straps
- 2 Connection point of the signal and control cables
- 3 Baseplate
- 4 Connection point of the power supply
- 5 Fastening holes

## 2 Transport

## 2.1 Transport Units

Fig. 3 Sample image: Transport units



13 Terminal box
 15 Charger mast

18 Panels20 Cantilever arm

- 21 Pantograph
- 24 WLAN antenna

The Urban Design Mast is transported in a pre-assembled condition and consists of the following transport units:

- 1. Charger mast (15)
  - Cantilever arm (20)
  - Cable harness for the cantilever arm (20) retracted
  - All built-in equipment cabled and connected
  - Pantograph (21) mounted in cantilever arm (20) and connected
  - WLAN antenna (24) mounted in the cantilever arm (20) and connected
  - Accessory pack: Fixing elements on the cantilever arm, corrosion prevention colour and spray and fixing material on the terminal box (13)

**INFO** Load carrying capacity approx. 1,800 kg Unit dimensions approx. 6,000 mm x 1,500 mm x 1,700 mm (length x width x height)

2. Cable harnesses for connecting the charger housing to the charger mast and fixing material.

**INFO** The cables are supplied by the respective Siemens local company and are laid in the cable ducts in the course of civil work.

- 3. Panels (18, sample image can vary in different packing units), delivered separately consisting of
  - demounted panels of the charger mast (15)
  - panels of the cantilever arm (20)
  - fixing materials for these assemblies

**INFO** Load carrying capacity approx. 200 kg

### 2.2 Transport

The Urban Design Mast can be transported by ship, rail or road. To prevent damage during transportation, all components must be secured with shipping stops in accordance with the CTU Code and designed for the incurring forces (shock resistance: 3 g).

Ideally, the Urban Design Mast shall be transported to the construction site on a 20 ton truck that has its own loading crane (e.g. Palfinger). See main document [R30].

NOTICE	Damage to the charger mast during transport	
	Store and secure the charger mast in such a way that it is not damaged during transport. If possible, use a transport frame.	
	Do not use a forklift w/o additional supporting structure in order to prevent damages on coating and covers mounted!	

### **3** Requirements for the Place of Installation

### 3.1 Documents

The following documents must be present before assembly start:

• Soil survey, structural analysis, including that of the contracting company, see e.g. [R01]

### 3.2 Foundation

The foundation must fulfill the following requirements:

- Load carrying capacity approx. 2,000 kg
- Maximum distance from charger housing foundation (maximum length of signal cables): 100 m
- Foundation ground compliant local requirements. Grounding wire D10.
- 8 x M30 fixing bolts, for position see section 1.2.2
- 32 x M30 nuts and 16 washers for fastening the mast
- 2 bushings Ø = 120 mm for the cable ducts from charger housing, see section 1.2.2

### 3.3 Cable Laying

### Output from charger housing to charger mast

Over their entire length the power cables must maintain a distance of  $\geq$ 20 cm to the signal and control cables to avoid interference.

- Foundation interface according to [R01]
- The outgoing supply cables must protrude at least 1.5 m from the foundation.
- The outgoing signal and control cables must protrude at least 2 m from the foundation.
- For the position of the cable entries to the charger mast foundation, see section 1.2.2

### 4 Installation

### 4.1 Preparation

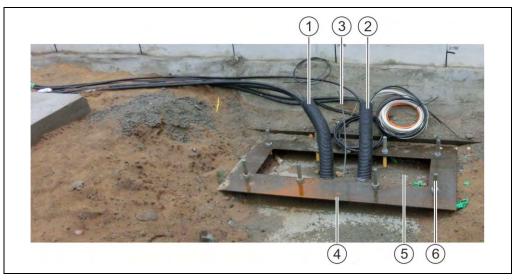
Tools and working equipment see main document [R30]	Barrier material, padlock, cleaning material
--	--

Danger of death or serious injury!		
Possible electric shock from applied mains voltage.		
Ensure that the external voltage supply is switched off and secured against reconnection.		
Lock the circuit breaker with a personal padlock.		
Secure the working area.		
Clean all impurities from the foundations for charger housing and charger mast.		
Ensure that all fixing bolts in the foundations are undamaged.		
Ensure that all cables in the flexible tubes of the charger housing and charger mast foundations are undamaged.		
Ensure that the flexible tubes protrude 200 mm from the foundation for the charger housing and shorten them if necessary.		
Ensure that the flexible tubes protrude 850 mm from the foundation for the charger mast and shorten them if necessary.		

### 4.2 Setting Up Charger Mast, Extending and Attaching Cantilever Arm

Tools and working equipment	Crane, mobile telescopic working platform, 4 lifting straps, safety rope, 32 x M30 nuts and 16
	Washers, torque wrench, spirit level, folding rule, laser leveler

### Fig. 4 Sample image: Foundation, template and cable ducts



1 Cable duct power cable

# 3 Foundation ground electrode4 Template

# 5 Foundation6 Anchor bolts

<sup>C</sup> Lay out the cable harnesses.

2 Cable duct for signal/control lines

- Remove the locknuts from the template (4) and remove the template (4).
- Clean the foundation (5) and all 8 anchor bolts (6).

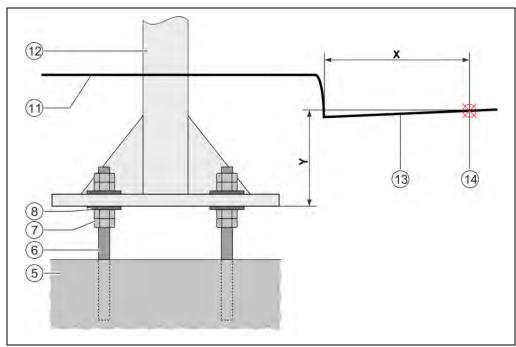


Fig. 5 Sample image: Leveling the charger mast

- 5 Foundation
- 6 Anchor bolts
- 7 Lower nut with locknut
- 8 Washer

- 11 Footpath, for example
- 12 Charger mast
- 13 Upper edge of street level
- 14 Measuring point, **X** = 1.250 ± 10 mm + **U** (see Fig. 1 in section 1.2.1)
- Define the zero point of the floor level with a laser leveler at the measuring point (14).
- Use the nuts (7) to align the upper edge of the washer (8) to the measuring point (14) considering the level difference Y (which depends on the required mast clearance, see Fig. 1 in section 1.2.1).
- Align the remaining 7 washers (8) to the same value.
- Tighten all 8 locknuts (7) to a torque of 220 Nm.
- Check the alignment of the 8 washers (8) against each other with a spirit level. Adjust them if necessary.

12

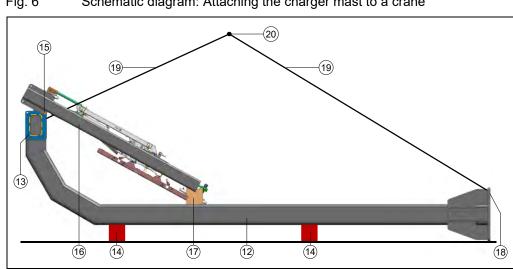


Fig. 6 Schematic diagram: Attaching the charger mast to a crane

- 12 Charger mast
- 13 2 attachment points of tensioning rods
- 14 Support
- 15 Fastening screw (pivot point)
- 16 Retracted cantilever arm with pantograph
- 17 Transport stop
- 18 2 attachment points for lifting straps
- 19 4 lifting straps
- 20 Attachment point on the crane
- P Attach 2 lifting straps to the attachment points (18).
- P Attach 2 lifting straps to the attachment points (13).
- Ŧ Attach all 4 lifting straps (19) securely to the crane (20).
- P Attach safety rope to the charger mast.
- P Ensure that all 4 lifting straps (19) are correctly attached. If necessary, reattach them.
- P Position the supports ready for the charger mast.

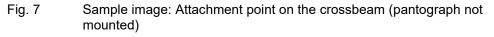
#### \Lambda DANGER Danger of death or serious injury!

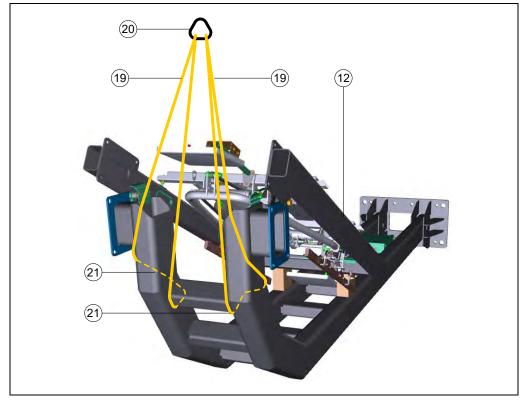
Danger of death or serious injury from falling suspended loads.

- ¢, Observe all safety regulations for suspended loads.
- P Only use lifting straps in perfect condition for lifting.
- P Do not enter the hazardous area beneath a suspended load.
- Ŧ Secure the suspended load with a rope to prevent it from swinging to and fro.

NOTICE	Before lifting the charger mast for installation		
	Remove all packing material and supporting frames before lifting the charger mast!		
	Remove all loose cover parts and accessory packs before lifting the charger mast!		

- Raise the charger mast slowly and unload it from the truck.
- <sup>C</sup> Carefully lower the charger mast onto the supports.
- Remove all 4 lifting straps.





- 12 Charger mast 21 Attachment point on the crossbeam (mind note below)
- Attach the lifting strap to the attachment point (21) of the upper cross beam. Mind note below!

**A** DANGER Danger of death or serious injury!

Danger of death or serious injury from falling suspended loads.

Attach the lifting straps securely to the steel frame of the charger mast!

- Ensure that the lifting strap is correctly attached. If necessary, re-attach it.
- <sup>(37)</sup> Raise the charger mast slowly and swing it over the foundation.
- Align the charger mast with the cable harnesses and lower it slowly.
- As soon as the cable harnesses can be fed through, stop the lowering and thread the cables through.
- Ensure not to damage the fixing bolts (6) and cable harnesses while lowering the mast.
- Continue lowering the charger mast (12), align it with the fixing bolts (6), and set it down.
- Ensure that the charger mast (12) is positioned correctly. If necessary, raise it slightly and align it again.

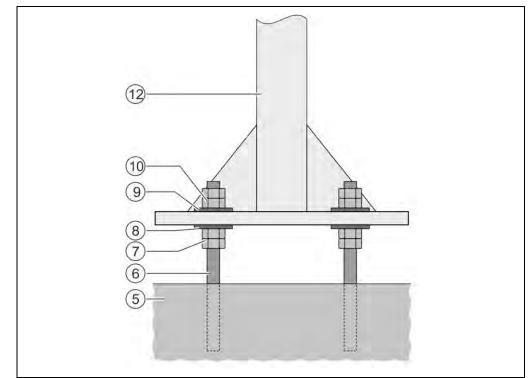


Fig. 8 Sample image: Securing the charger mast

5 Foundation6 Anchor bolts

- 9 Washer
- 10 Upper fixing nut with locknut
- 12 Charger mast
- 8 Washer

7 Lower fixing nut with locknut

- Place the washers (9) on the fixing bolts (6) and secure the charger mast (12) with 8x M30 fixing nuts (10).
- Tighten all 8 M30 fixing nuts (10) to a torque of 220 Nm.
- Secure the 8 fixing nuts with M30 locknuts (10) and tighten them to a torque of 220 Nm.

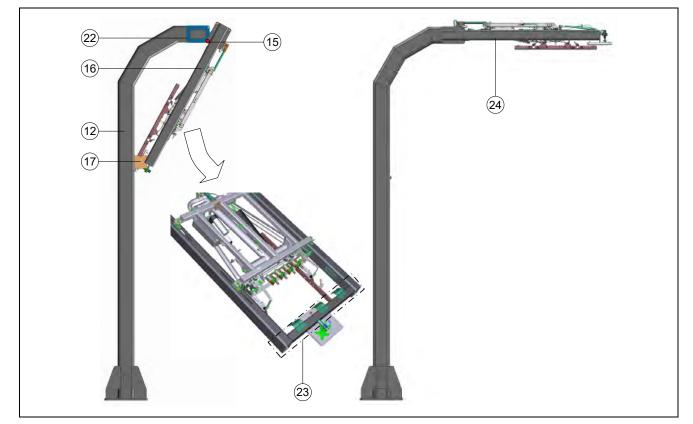


Fig. 9 Sample image: Extending and securing cantilever arm

- 12 Mast
- 15 Fixing screw with lock washer (pivot point)
- 16 Retracted cantilever arm
- 17 Shipping stop

- 22 Fixing bracket on the mast
- 23 Attachment points for lifting straps
- 24 Cantilever arm
- Coat all threads of fixing material with the corrosion prevention spray out of the accessory kit.
- Attach 2 lifting straps to the attachment points (23) and to the crane.
- Move mobile telescopic working platform into position.

**INFO** On the telescopic working platform you will need all materials required for 2 persons to securely attach the cantilever arm to the mast.

### 

### Danger of serious injury!

Risk of falling when working at great heights.

- Observe all safety regulations about working at great heights.
- Secure the fall arrester to one of the specially marked points on the telescopic working platform.
- If necessary, loosen the fixing bolts (15, pivot point) until the retracted cantilever arm (16) can be extended (24).

### **MARNING** Risk of injury from sudden movement of the cantilever arm

Severing, pinching or crushing of extremities.

- © Only use lifting straps in perfect condition for lifting.
- <sup>C</sup> Do not reach into the hazardous area when extending the cantilever arm.
- <sup>C</sup> Carry out the work in a coordinated manner.
- Slowly raise the cantilever arm (16) to its extended position with the crane. Note the following points:
  - While extending the cantilever arm (16), pay attention to the cables running from the cantilever arm (16) into the tube of the charger mast (12).
  - If necessary, stop the raising and feed the cables by hand before continuing.

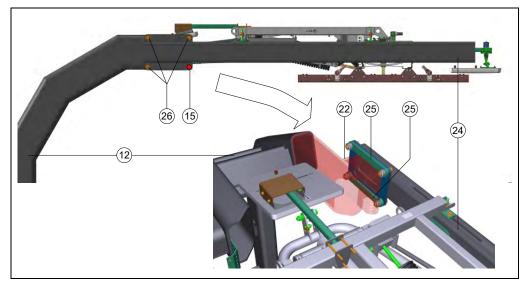


Fig. 10 Sample image: Securing the cantilever arm

- 12 Charger mast
- 22 Mounting bracket

15 Fixing screws (pivot point)

- 26 Fixing screws with lock washers
- 25 Fixing elements
- 24 Cantilever arm, correct position
- As soon as the cantilever arm is positioned correctly (24), proceed as follows:
  - Fix the cantilever arm (24) with the fixing screws (15) and (26) including the lock washers and the fixing elements (25) to the mounting brackets (22) on both sides.
  - Slightly tighten the fixing screws (15) and (26).
  - Remove the shipping stop (17, Fig. 9) from the charger mast (12).

### 4.3 Check polarity of the Pantographs contact rails

<b>Tools and working</b> equipment see main document [R30]	Mobile telescopic working platform
	Heat shrink tube "POSITIVE POLE", 4FB206.03.93.1.92, 35 mm, Manufacturer part No. 1219558
	Heat shrink tube "NEGATIVE POLE", 4FB206.03.93.2.93, 35 mm, Manufacturer part No. 1219560
	Heat shrink tube "CONTROL PILOT", 4FB206.03.93.3.94, 35 mm, Manufacturer part No. 1219561
	Heat shrink tube "PE", 4FB206.03.93.4.95, 35 mm, Manufacturer part No. 1219562

### 

### Danger of serious injury!

Risk of falling when working at great heights.

- <sup>CP</sup> Observe all safety regulations regarding working at great heights.
- Secure the fall arrester (PPE) to one of the specially marked points on the telescopic working platform.
- Check that all labels of the Pantographs contact rail cables are correct according driving direction (see main document [R30]).
- In case of wrong marked polarity labels exchange attached labels against the right ones.

### 4.4 Aligning the WLAN Antenna

Tools and working equipment	Mobile telescopic working platform, protractor
see main document [R30]	

### 

### Danger of serious injury!

Risk of falling when working at great heights.

- Observe all safety regulations regarding working at great heights.
- Secure the fall arrester to one of the specially marked points on the telescopic working platform.

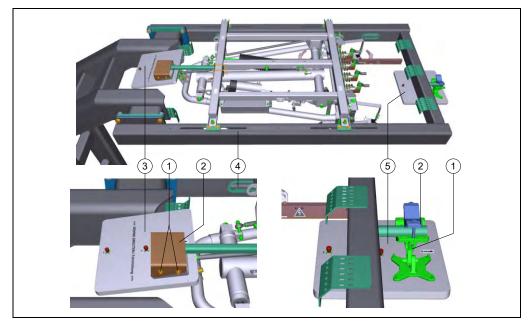


Fig. 11 Sample image: Aligning the WLAN antenna

- 1 Adjusting screws
- 2 Holding bracket
- 3 WLAN antenna (standard position)
- 4 Cantilever arm
- 5 WLAN antenna (alternative position)
- Adjust the WLAN antenna (3):
  - Loosen all 4 adjusting screws (1).
  - Adjust the WLAN antenna (3) to an angle of 20° ±1°.
  - Tighten all 4 adjusting screws (1).

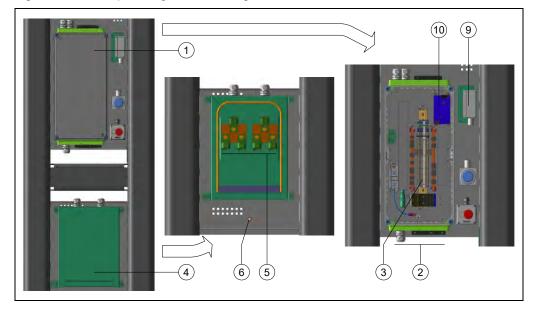
Adjust the WLAN antenna (5):

- Loosen all 4 adjusting screws (1).
- Adjust WLAN antenna (5) to an angle of 2° ±2°.
- Tighten all 4 adjusting screws (1).

### 4.5 Connecting the Charger Mast

Tools and working equipment see main document [R30]	Torque wrench
[R30]	

### Fig. 12 Sample image: Connecting the cable to the terminal boxes



- 1 Terminal box cover
- 2 Control and signal cables
- 3 Shield rail
- 4 Power supply cover
- 5 Power supply
- 6 Potential terminal for foundation ground
- 9 Temperature controller -KF01
- 10 24V power supply -TA01
- Remove terminal box cover (1).
- Remove power supply cover (4).
- Before connecting the foundation ground cable, trim it to the required length.
- Attach the foundation ground to the specially marked potential terminal (6).
- Connect the cable harness, comprising power cables (5), signal and control lines (2), to the power and PE cable terminals (see the following table). Observe the circuit diagram A6Z00042647933 [R11] and the torque settings.
- Install and connect the wifi cable according to the ECOFLEX<sup>®</sup> 15 mounting instruction.

Туре	Cables	Connecting terminals	Description
Power cables	=CDT1-WD30 (50 Nm)	=PCN1+40-UC42-XD43	+600kW pantograph – e.g. 600kcmil 2kV rated
	=CDT1-WD31 (50 Nm)		-600kW pantograph – e.g. 600kcmil 2kV rated
	=CDT1-WD34	=PCN1+40-UC41-XD42	230 V e.g. 2 #10 AWG, 1 – #10 AWG GND
	=CDT1-WD35		230 V e.g. 2 #10 AWG, 1 – #10 AWG GND
Signal and control	=CDT2-WG32	=PCN1+40-UC41-XD41	Control
cables	=CDT2-WG33		Control
	=CDT2-WE30 (20 Nm)	=PCN1+40-UC41-XE42	PE e.g. #3/0 AWG GND
	=CDT2-WE31	=PCN1+40-UC41-XD41	CP cable e.g. 2/C #20 AWG Twisted Pair
	=CDT2-WG31 from =CDB1+12-UC12-XD22:SH31	=PCN1+40-UC41-XE41	Shield terminals from -WG31
	=CDT2-WG36	=PCN1+40-UC41-XG46	WLAN cable direct from the HPCC (N-male/female connector)
	=CDT2-WG37	=PCN1+40-UC41-XD41	Charging indicator (red/green/blue)

Check that all cables are laid correctly according to the cable laying plan [R11]. If necessary, secure them accordingly.

### Charging Indicator (red/green/blue)

### Wiring of charging indicator

Risk of damages.

- Incorrect wiring could damage the LED lights or other parts.
- Only electrical skilled personnel may perform the wiring.
- <sup>C</sup> Observe the circuit diagram A6Z00042647933 [R11].
- The colour of the operating status lamp (7, Fig. 13) and the charging status lamp (8, Fig. 13) can be aligned and combined between red, green and blue (two colours each).
- The alignment and combination of the colours can be done by electrical wiring at the terminals -WG43 for operating status lamp and -WG44 for the charging status lamp.
- To switch over between two colours can be done by electrical wiring at the terminals -KF43 for operating status lamp and -KF44 for the charging status lamp.

NOTICE

### Final steps

- $\bigcirc$  Secure the power supply cover (4) with 4 screws.
- Secure terminal box cover (1) with 4 screws.

### 4.6 Fitting the Mast Panels

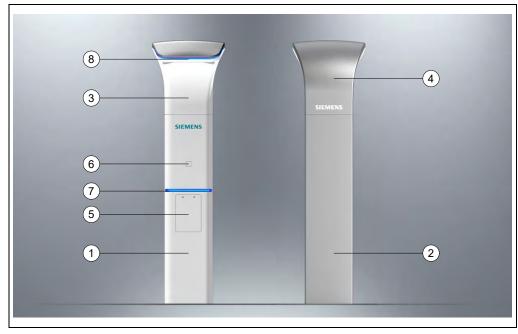
<b>Tools and working</b> equipment see main document [R30]	Mobile telescopic working platform	
OEM equipment	panel kit A2V00002722109 and Mounting Instructions [R11]	

### **MARNING** Danger of serious injury!

Risk of falling when working at great heights.

- <sup>C</sup> Observe all safety regulations regarding working at great heights.
- Secure the fall arrester to one of the specially marked points on the telescopic working platform.

Fig. 13 Sample image: Mast panel and functional elements



- 1 Lower panel front side
- 2 Lower panel back side
- 3 Upper panel front side (2 parts)
- 4 Upper panel back side (2 parts)
- 5 Hatch to terminal box
- 6 Y-sensor
- 7 Operating status lamp (red/green/blue)
- 8 Charging status lamp (red/green/blue)
- Secure all panels according to the panel kit A2V00002722109 and Mounting Instructions [R11].
- Make sure that no pantograph cable rubs against the panels.

### 5 Initial Tests and First Commissioning

### 5.1 Insulation Test

Prior to commissioning, perform an insulation test for the following cable connections from the charger housing to the charger mast:

Туре	Cables	Connecting terminals	Description
Power cables	=CDT1-WD30	=PCN1+40-UC42-XD43	+600 V pantograph
	=CDT1-WD31		-600 V pantograph
	=CDT1-WD34	=PCN1+40-UC41-XD42	230 V
	=CDT1-WD35		230 V

### 5.2 Signal Check

Prior to commissioning, perform a signal check in accordance with the circuit diagram A6Z00042647933 [R11]. Do the following cable connections from the charger housing to the charger mast function correctly:

Туре	Cables	Connecting terminals	Description
Signal and control	=CDT2-WG32	=PCN1+40-UC41-XD41	Control
cables	=CDT2-WG33		Control
	=CDT2-WE31	=PCN1+40-UC41-XD41	CP cable
	=CDT2-WG37	=PCN1+40-UC41-XD41	Charging indicator (red/green/blue)

### 5.3 First Commissioning

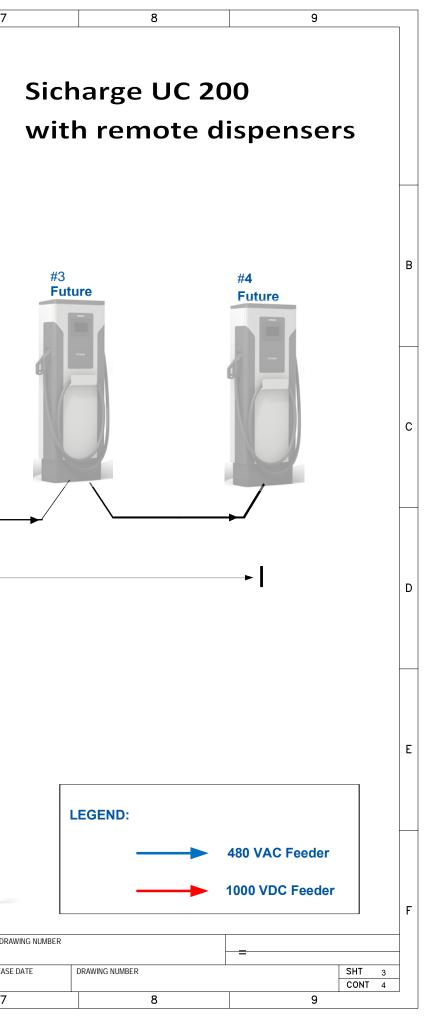
Proceed with first commissioning according to the main document [R30].

Siemens AG Rudower Chaussee 29 12489 Berlin, Germany

E-mail: EB-EN.support.mobility@siemens.com

[	0	1			2	3		1		5	6	7
A		<u> </u> 1			2	S		4	<u> </u>	5	0	/
В		Side	)		F	o			#1 Rei Dispe		#2 Remote Dispenser	
с		1,000		2,150 200			1.0v / Coms / Pov	wer cables				
D										200 me	ters maximum distance	
E					T	Гор					_	
F	Preliminary ISSUE DESCRIPTION Initial draft	DATE DRAWN	CHECKED	APPR'D		200 kW_Layout		Siemens INDU		Sichargo II	C Charging Unit 200 kW	CUSTOMER DRA

	Initial draft	 	 	200 kW_Layout		SIEMENS SIEMENS INDUSTRY, INC.		Sichanna IIC Channing IInit 200 kW		
	1.					CONFIDENTIAL		Sicharge L	JC Charging Unit 200 kW	INITIAL RELEAS
	2			INITIAL RELEASE: XXXXXXXX	PLOT DATE: XXXXXXX	ALL RIGHTS	RESERVED			
-	0	1		2	3	4		5	6	7



Γ	0	1	2	3	4		5	6	7
				1,765 mm					Gene Protect Weight Height Width: Depth: Peak P Rated Curren Voltag Cable:
				<u>_</u>		<u> </u>	<b>→</b>		
	Ξ				-	600 ►			
	Preliminary		4000/0						
	ISSUE         DESCRIPTION           0         Initial draft           1         2	DATE DRAWN CHECKED	APPR'D IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	200 kW Dispenser General D		Siemens Siemens industry, inc. Confidential property All rights reserved	Dispenser Un	it 200 kW	CUSTOMER DRAW
	0	1	2	7	4		5	6	7

4

3

2

1

0

# Sicharge UC 200 **Remote dispenser**

8

9

B

| C |

D

E

# neral Specifications

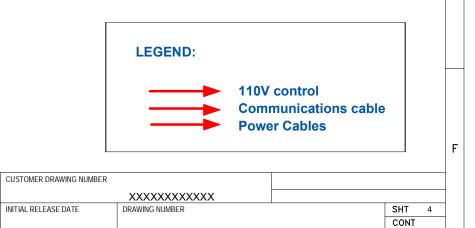
ection: ht: nt: h: h: Power: Power: ent (max): ige Range: ::

7

6

5

IP54 / IK10 . 100kg / 220 Lbs 1,765mm / 69.5 in 600mm / 23.6 in 300mm / 11.8 in 200kW 150kW 200A 10-1,000Vdc CCS



8

9

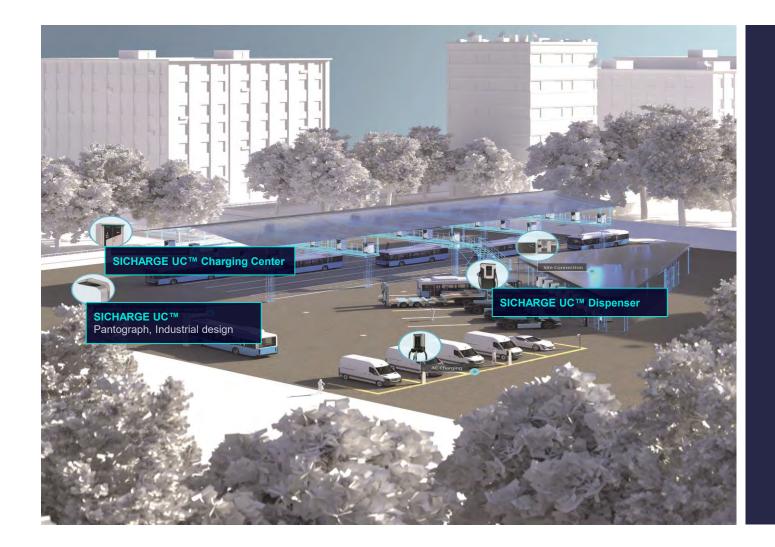


Modular charging solution for your electric fleet

# SICHARGE UC<sup>TM</sup>

Unrestricted | © Siemens 2020 | eMobility | 2020-12

# Electrical public charging concepts – High power for your electric fleet



### The future-oriented charging setup

- Best fitting hardware and software for your specific needs
- Freely choose from components of the SICHARGE UC family in various power classes
- Core of the system: One or multiple Charging Centers
- Charging Center contains AC grid connection and DC power electronics for your charging purposes
- The whole system provides various connection options for your highest flexibility

# SICHARGE UC<sup>™</sup> High power for your electric fleet



# Interoperability and future proof up to 950 V Ensure flexibility while electrifying

your fleet – today & tomorrow

### Flexible and space-saving

Easily integrate into the existing depot with constraints in HW, SW or layout





Page 3

# Robust, durable, and outdoor designed Ensure longevity of equipment and the

highest fleet availability

# Optimized CAPEX and OPEX

Possess the most competitive solution and efficiently manage your daily operation



### Unrestricted | © Siemens 2020 | eMobility | 2020-12

# SICHARGE UC<sup>™</sup> - Tailored to your needs Flexible configuration options

### Sequential charging

SICHARGE UC<sup>™</sup> connects to four J3105 pantographs, or CCS1 dispensers and allows for dynamic sequential charging.

# Up to four devices

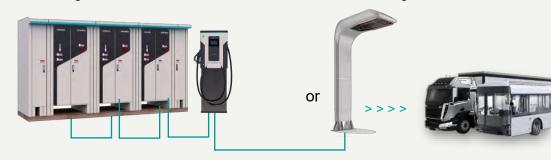
### **Ultra high-power charging** Connect to liquid-cooled dispensers with up to 500A or J3105

compatible pantograph connections with up to 800A .



### Charging flexibility – project specific

The SICHARGE UC<sup>™</sup> family can adapt to your individual needs through a flexible combination of hardware in a switching matrix.





# SICHARGE UC™ Compact charging center



SICHARGE UC™

High degree of protection NEMA 3R against dust and spray water



### **Charging Center**

The Charging Center is the core of your system. Several other vehicle connections like the cable-based dispenser, or inverted Pantograph can be powered by this unit. Combine power cabinets to achieve up to 600 kW of DC power. AC Incoming and DC outgoing cabinets dramatically reduces the installation cost. This feature reduces infrastructure costs by limiting the number of AC input feeds required for multiple cabinets.

# SICHARGE UC<sup>™</sup> Vehicle interface front view – Dispenser

Inclined rain protection Hood directs water to the rear Covered plug holder High degree of protection NEMA 3R against dust and moisture Multiple options for floor, wall or roof mounting Cable optionally cooled for up to 500 A



# Charging status indication by 360° LED light

Multilingual 7" outdoor touchscreen display at an ergonomic height, accessible and easy to read – also in bright sunlight (optional)

Cable holder for convenient and clean operation

Power cable for application in congested environments with comfortable length

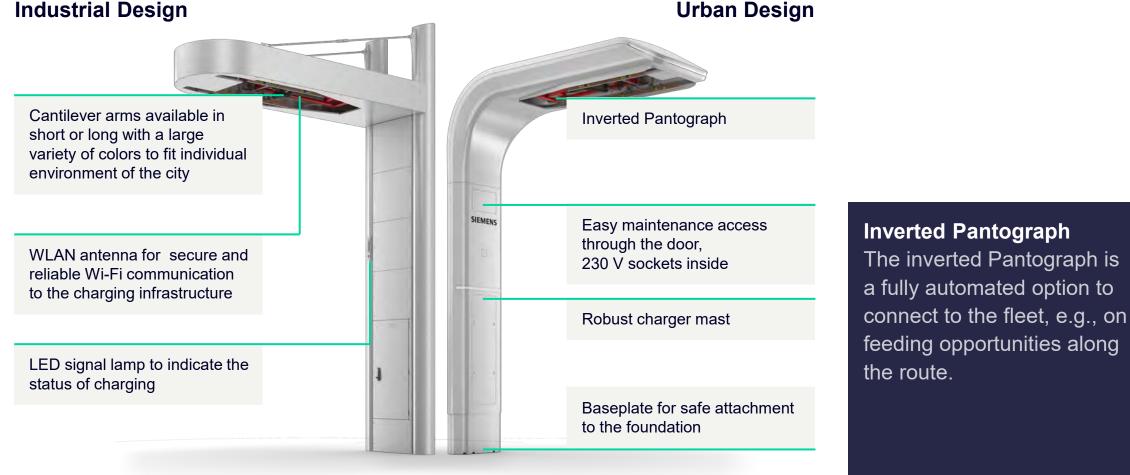
Air ventilation slots for the liquid cooled cable



### Dispenser

The cable connected dispenser of the UC family is installed close to the vehicle's connection with a small footprint and elegant design. For investment and space optimization, several dispensers can be powered in sequence by a single Charging Center.

# SICHARGE UC<sup>™</sup> Vehicle interface front view – **Inverted Pantograph**



### **Urban Design**

Unrestricted | © Siemens 2020 | eMobility | 2020-12 Page 7

# SIFMFN

# SICHARGE UC<sup>™</sup> Plug-in connection

### **Siemens products**





**Dispenser 500A** 

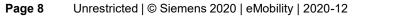
**Dispenser 200A** Standard for up to 200 A no cooled cable application available





**Charging Center** 150 kW (or up to 600 kW) **Partner solutions** 





# SICHARGE UC<sup>™</sup> Benefits at-a-glance



### **Future proof**

- Upgradable to latest standards
- Highest voltage up to 950 V
- Proven interoperability

**Robust and reliable** 

Long-life components

Indoor and outdoor use

Superior product quality

# Flexibility

- A variety of charging opportunities for depot charging
- Power range from 100 to 800 kW
- Various connectivity options

# Efficiency

- Best-in-class efficiency
- Smart charging option
- Smooth operation





### Lean architecture

- Seamless design
- High reliability
- Small footprint

# **Smart charging**

- High availability
- Fast and easy installation
- Excellent serviceability





# **Cloud-based services** Taking care of your investment



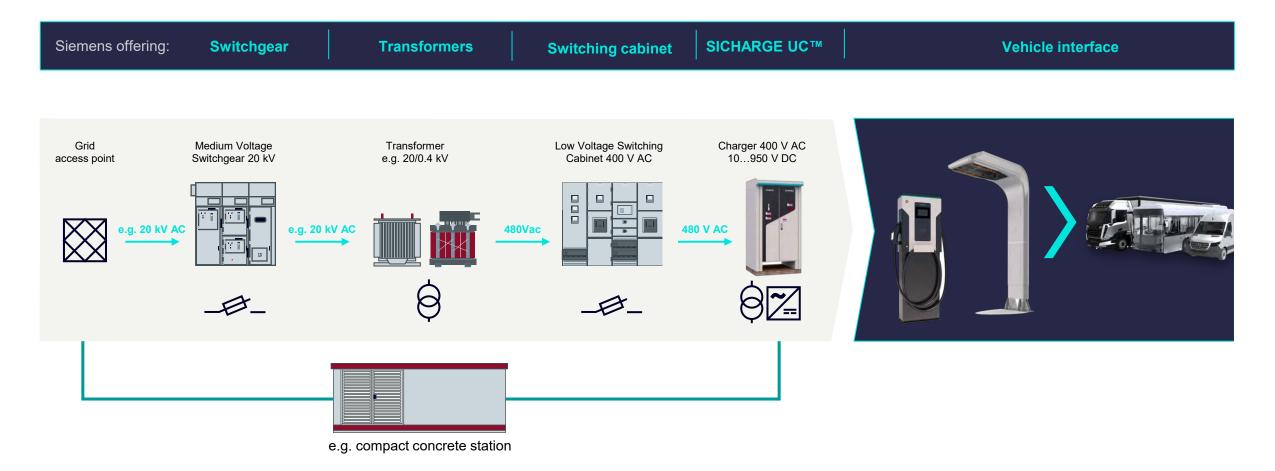
Our basic Care package includes:

- Connectivity independent of the OCPP channel
- On-demand remote analysis and diagnostics
- Firmware updates
- · Included in the warranty period

Easily manage your charging infrastructure from remote diagnostics to detailed reporting and operational planning and scheduling with one, simple user interface.

**Choose** your level of advanced management with our **Connect, Charge, and Control packages** - from device connectivity management, reporting functions, smart charging, route and power optimization and data analytics.

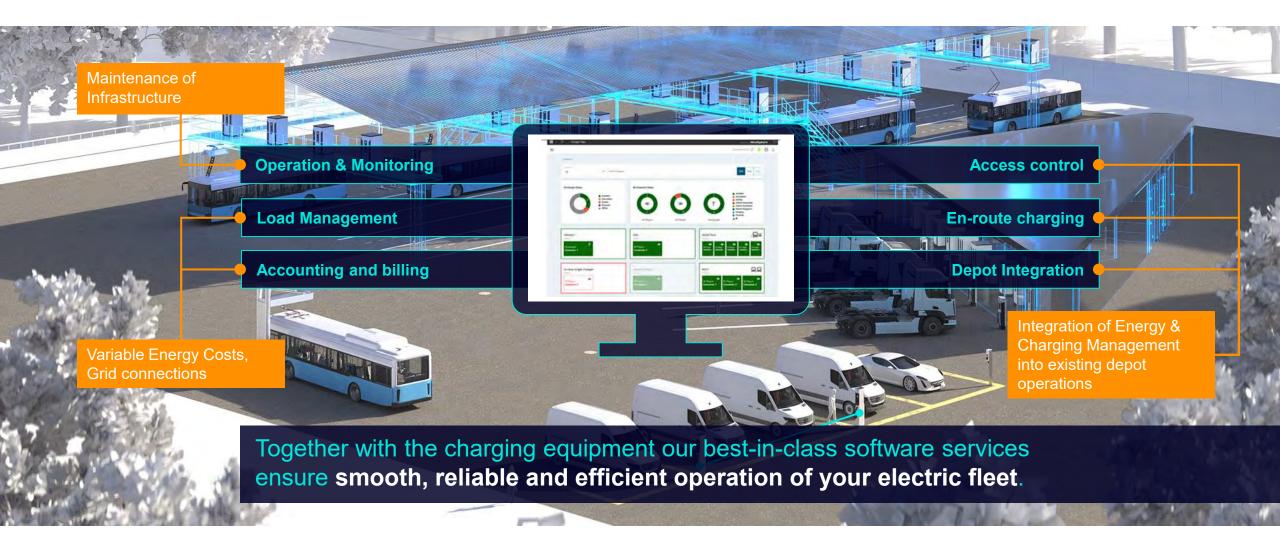
# End-to-end solution for your eFleet Grid connection



Siemens offering: Digital solutions to manage the operations of your eFleet



# Managing charging of your fleet Benefit from Siemens software services



# The general idea

## CONNECT

### **Reporting & Monitoring** View Dashboards of your system status

- Historical reporting and statistics
- Troubleshooting and detailed views

### **Notifications and Remote Reset**

Stay informed about status and events

- In App and email event driven notifications
- remote charger reset

### **Smart Charging**

Control your chargers to manage the load

- Assign control groups power constraints (hourly, daily and weekly basis)
- Control the charging in a group according to prioritization strategies e.g. First-In-First-Out, First-In-Last-Out or SPLIT



# CHARGE

U

Vehicle-based reporting & billing

- Vehicle centric dashboards/reporting
- Charge Authorization (RFID/MACID)
- Aggregation of CDRs to cost centers

# CONTROL

### **Robust energy optimization**

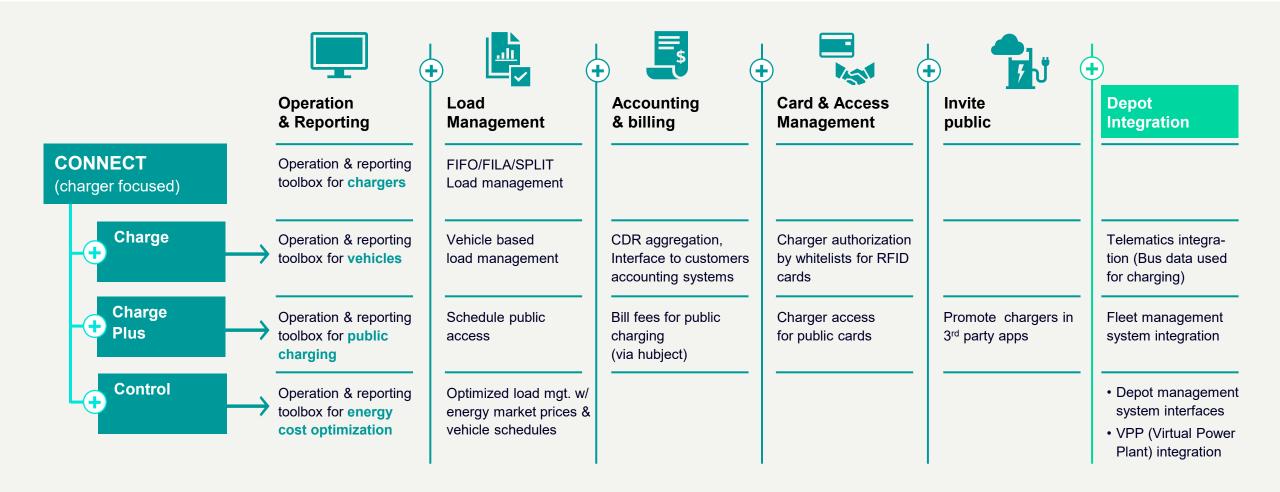
Optimized charging based on bus/route scheduling, power constraints, energy prices

- Live monitoring of planned versus actual
- Adaptive optimization to deviations



# **Depot Charging Management**

Page 9



# SICHARGE UC Core of the system





SICHCHARGE UC	200	400	600	800			
Vehicle interface							
Air-cooled CCS Dispenser	X	-	-	-			
Liquid-cooled CCS Dispenser	-	Х	Х	-			
Mast-mounted inverted Pantograph	X	Х	Х	Х			
Nominal input							
Voltage	480 and 600 V AC (3ph + PE) ± 10 %						
Frequency, Hz	60						
Power factor COS phi	>0.98						
DC output*							
Rated power, kW	150	300	450	600			
Current max., A	200	400	600	800			
Voltage (range), V DC	10 950						
Efficiency factor (at load 100%)	96% 97%						
Environmental Conditions							
Operating temperature	-13°F +113°F (Upon request)						

\* Details available in the technical manual.

# SICHARGE UC Core of the system







SICHARGE UC	200		400	600	800				
Mechanical specifications									
Operational environment	Indoor and outdoor								
Protection enclosure	IP54, IK10 for housing								
Casing material			Galvanized steel, painted, C3						
Color		Main housing: RAL 9006 -	- White aluminium; roof and base	: RAL 9017 – Traffic black ma	tt				
Overall dimensions W x D x H, mm	43x39x87	87x39x87	130x39x87	173x3	39x87				
Approx. weight, lbs. (without combiner cabinets)	3,307	6,614	9,921	13,228					
General specifications									
Charge control unit	Siemens SIMATIC S7								
User authentication	RFID (optional)								
Network connection	Ethernet interface / 3G and 4G / WLAN								
Electric safety device	RCD B-type (optional)								
Communications protocol	OCPP 1.6 (J-SON)								
Charging standards	EN 61851-1/23/24, ISO 15118 (DIN 70121)*								
EMC standards	EN 55016-2-1 & -3; EN 61000-4-2 & -3 & -4 & -5 & -6								
Compliance	UL2202; UL2231								

\* Complies with ISO15118-1 standard use-cases, further use-cases being implemented

# SICHARGE UC Core of the system





DC Output*						
Connection standard	CCS type 1		OPPCharge			
Rated power, kW	150	300		600		
Current, A	200	500		800		
Voltage (range), V DC			10950			
Environmental Conditions						
Operating Temperature			-13° F+113° F			
Mechanical Specifications						
Protection		IP54, IK	K10 for housing, IK 09 for HMI			
Height, installed (in)	79 (36 for wall n	nounting)	223	259	259	
Road clearance (in)			179 to 183			
Cantilever length (in)	n/a		156	165	205	
Approx. distance mast to curb (in)			55	55	95	
Footprint on sidewalk (in)	24 x 12		37 × 12	51 × 13	51 × 13	
Operating range Pantograph (in)	n/a		35			
Approx. weight, (lb)	209 (132 for wall mounting)	397	4,354	4,123	5,071	
Color	Main housing: RAL 9006 – White aluminum; roof and base: RAL 9017 – Traffic black matt					
Material	Galvanized powder coated steel		Galvanized steel with fiber glass panel			

\* eVehicle under the Mast Hood will be given priority in charging sequence

# **SIEMENS**

# SICHARGE UC Core of the system



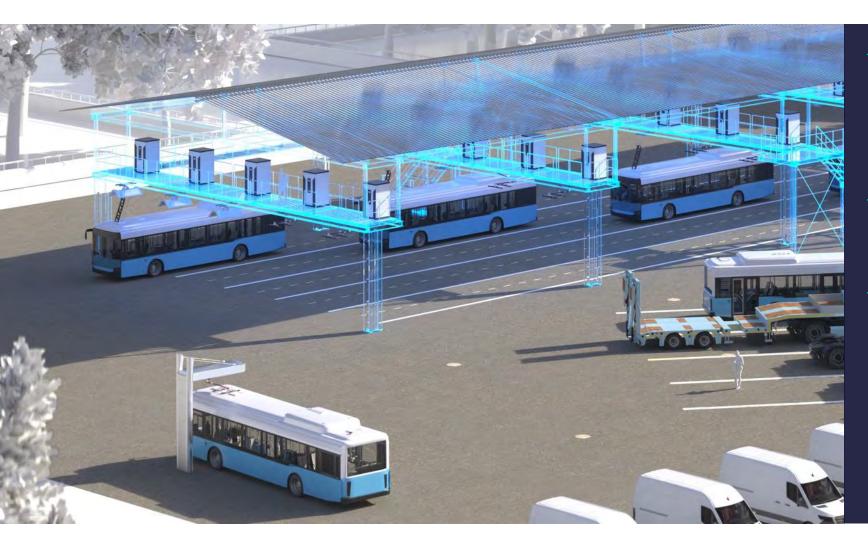


Connection Options	Dispenser Inverted Pantogr			Inverted Pantograph	1
Design Variants	Air-Cooled Cabinets	Liquid-Cooled Cabinets	UD Urban Design	ID Industrial Design	ID-E Industrial Design- Extended
General Specifications			·		
Communication standard	PLC			Wi-Fi IEEE 802.11	a
Number of possible connectors (sequential charging)	up to 4		4		
User authentication	RFID (optio	onal)	RFID (optional)		
Cable lengths (ft)	11.5 / 20 / 33	11.5 / 16	n/a		
Compliance	UL				
Network connection	Ethernet interface / 3G / 4G / WLAN				
Local user interface	7" touchscreen HMI n/a				
Charging status indication	LED	ED LED			

\* eVehicle under the Mast Hood will be given priority in charging sequence



# **SICHARGE UC** Best fitting charging setup for **public transport operators & municipalities**

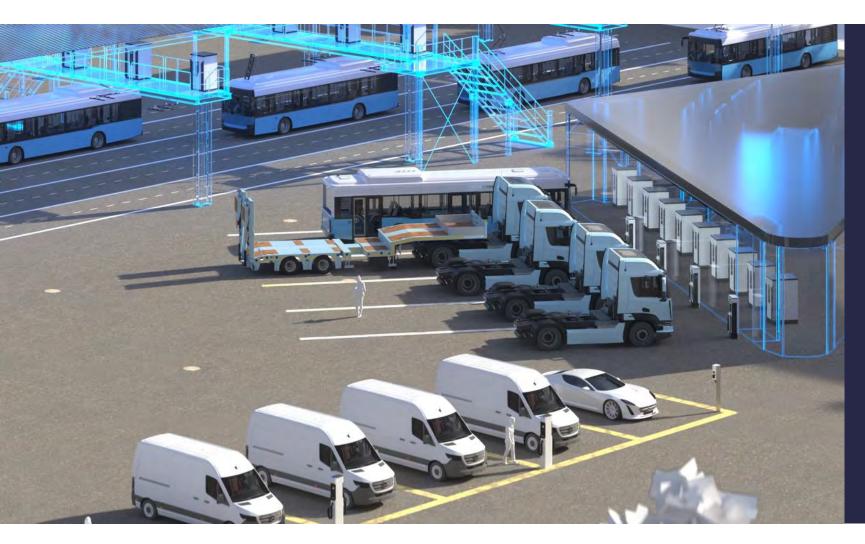


- eBus & duty vehicle depots charge at low-power levels overnight and at high-power levels in terminals or during on-route opportunity charging
- This requires technical solutions fitting your specific needs and ensuring the highest fleet availability

Our solution includes **sequentially connected Dispensers** and **highpower, automated charging** with Pantographs (which even fit into depots with space limitations)

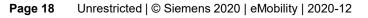


# SICHARGE UC A comprehensive solution for **commercial applications**



- Keeping tight delivery schedules is one of the biggest challenges for commercial fleet operators
- Parking, loading and unloading scenarios need to be considered when planning charging infrastructure
- Direct charging from a compact charger overnight may be the best depot solution.
  - A liquid-cooled CCS plug can
- deliver a quick charge during the day.

SIEMENS



**SICHARGE Product Family overview – the Siemens 4x4** 

4x 200A Power Cabinet



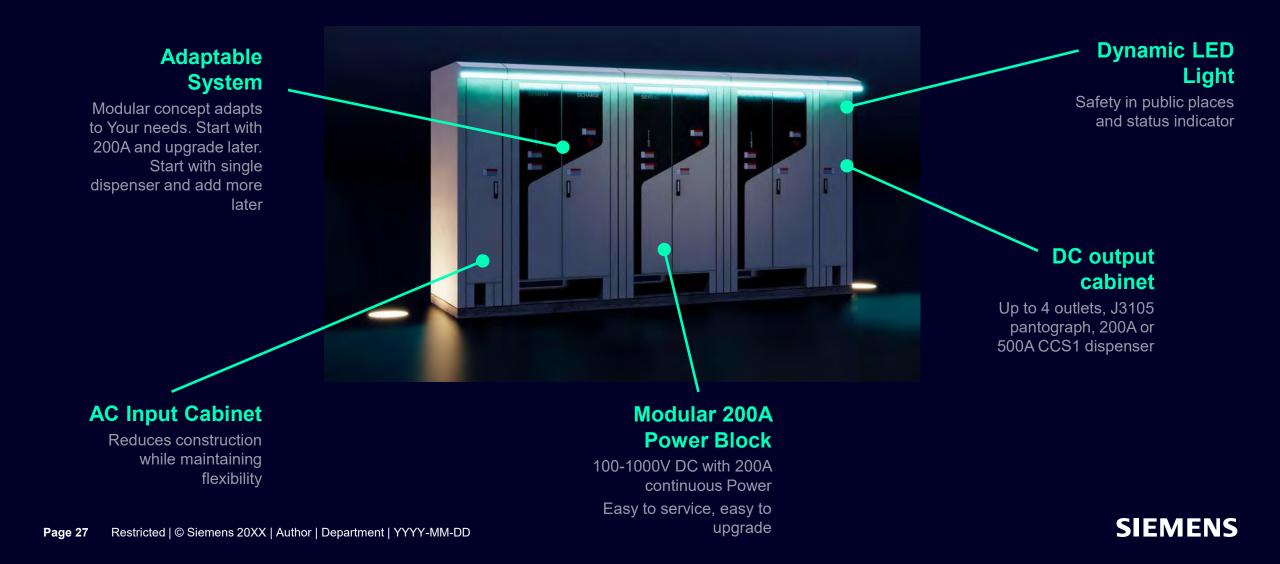


4x Outlets, sequential operation and interchangeable

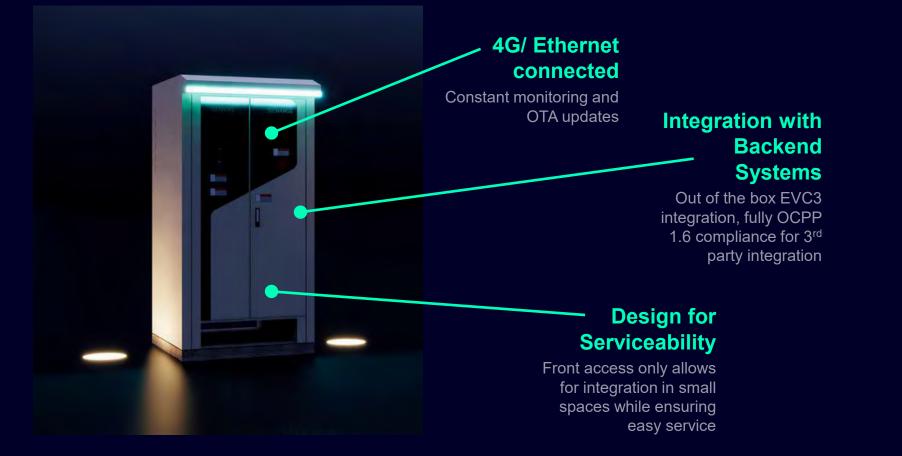




# **SICHARGE** Product Family – Designed for You



# **SICHARGE UC Features**





# **SIEMENS**

# SICHARGE UC<sup>™</sup>

Modular charging system

usa.siemens.com/sichargeuc

SICHARGE UC offers 150 kW (or up to 600 kW) of flexible charging solutions for buses, trucks, and heavy-duty vehicles, whether charging at a depot or en route.

SIEMEN

- Fast, secure charging
- Design flexibility
- Sleek, compact dispenser size
- Easily upgradeable
- Low installation costs with one power cable needed
- Customizable: Connect up to four cabinets together to achieve 600kW of power
- Compatible with the Combined Charging System (CCS) charging standard and OCPP compliant.
- Interoperability

### Designed with flexibility in mind

SICHARGE's sleek, compact design fits into a variety of configurations making the best use of limited space. Each SiCharge UC cabinet can power up to four charging dispensers with easy installation. With SICHARGE UC you can combine power cabinets to achieve up to 600 kW of DC power. AC incoming and DC outgoing cabinets dramatically reduces the installation cost. This feature reduces infrastructure costs by limiting the number of AC input feeds required for multiple cabinets.

Optimize your SICHARGE UC charging with sequential charging and easily manage your sequential charging with Siemens cloud-based services.

## Choosing the right set up for you

Whether needing plug-in charging, en route charging, or overhead charging, SICHARGE UC offers a variety of charging configuration options to choose from.

# Charging setup tailored to your needs

# **Flexible configuration options**

# Sequential charging

SICHARGE UC connects up to four J3105 pantographs, or CCS1 dispensers and allows for dynamic sequential charging.



# Ultra-high-power charging

SICHARGE UC can be connected to liquid cooled dispensers with up to 500A or J3105 compatible pantograph connections with up to 800A.





### **Beyond the chargers**

A variety of cloud service packages designed to effectively manage your depot and eFleet are available to help you best manage your charging infrastructure. Our solutions combined with our ecosystem of partners offers remote diagnostics to detailed reporting and operational planning and scheduling with one, simple user interface.

Siemens offers PlugtoGrid<sup>™</sup>, an end-to-end set of solutions for EV charging infrastructure. Easily connect your chargers to the grid with Siemens' eMobility open protocol technology and electrical power distribution solutions, as well as flexible options like energy storage, renewable power integration, and managed cloud services.

### **Technical data**

SICHARGE UC Charging center



SICHARGE UC Charging center and combiner cabinet



SICHARGE UC High-power charger



SICHARGE UC	200	400	600	800	
Vehicle interface					
Air-cooled CCS cable Dispenser	×	-	-	-	
Liquid-cooled CCS cable Dispenser	-	×	×	-	
Mast mounted (inverted) Pantograph	x	×	×	×	
Nominal input					
Voltage		480 and 600 V AC	(3ph + PE) ± 10 %		
Frequency, Hz		6	C		
Power factor (cos phi)		> 0	.98		
DC output*					
Rated power, kW	150	300	450	600	
Current (cont.), A	200	400	600	800	
Voltage (range), V DC		10	950		
Efficiency factor η (at load 100%)		96%	. 97%		
Environmental conditions					
Operating temperature		-13 °F	+113°F		
Mechanical specifications					
Operational environment		Indoor and	d outdoor		
Protection enclosure		IP54, IK10 f	or housing		
Casing material		Galvanized ste	el, painted, C3		
Color	Main housing: RAL	9006 – White aluminium;	roof and base: RAL 9017	– Traffic black matt	
Overall dimensions W x D x H (in) without combiner cabinets (in side-by- side arrangement)	43x39x87	87x39x87	130x39x87	173x39x87	
Approx. weight (lbs) without combiner cabinets	3,307	6,614	9,921	13,228	
General specifications					
Charge control unit		Siemens S	IMATIC S7		
Jser authentication		RFID (op	otional)		
Network connection		Ethernet interface	/ 3G / 4G / WLAN		
Electric safety device		RCD B-type	(optional)		
Communications protocol	OCPP 1.6 (J-SON)				
Charging standards	EN 61851-1/23/24, ISO 15118 (DIN 70121)**				
EMC standards	EN 55016-2-1 & -3; EN 61000-4-2 & -3 & -4 & -5 & -6				
Compliance		UL2202;	UL2231		

\* Details available in the technical manual

\*\* Complies with ISO15118-1 standard use-cases, further use-cases being implemented

## SICHARGE UC Dispenser Air-cooled Liquid-cooled



## SICHARGE UC Inverted Pantograph



Connection options	Disp	enser	In	verted Pantogra	ph	
Design variants	Air-cooled cables	Liquid-cooled cables	UD Urban design	ID Industrial design	ID-E Industrial design- extended	
DC output*						
Connection standard	CCS	type 1	OPPCharge			
Rated power, kW	150	300		600		
Current, A	200	500		800		
Voltage (range), V DC		10950				
Environmental conditions						
Operating temperature		-13 °F+	113 °F			
Mechanical specifications						
Protection		IP54, IK10 for housi	ng, IK 09 for HMI			
Height, installed (in)	79 (36 for wa	all mounting)	229	259	259	
Road clearance (in)			179 to 183			
Cantilever length (in)	n	la	156	165	205	
Approx. distance mast to curb (in)			55	55	95	
Footprint on sidewalk (in)	24	x 12	37 × 12	51 × 13	51 × 13	
Operating range Pantograph (in)	n	/a	35			
Approx. weight, (lb)	209 (132 for wall mounting)	397	4,354	4,123	5,071	
Color		06 – White aluminium; 117 – Traffic black matt				
Material	Galvanized pow	Galvanized powder coated steel			ed steel, min. C3	
General specifications						
Communication standard	P	LC	\\	<i>W</i> iFi IEEE 802.11a	1	
Number of possible connectors (sequential charging)	up to 4		4			
User authentication	RFID (o	RFID (optional)		RFID (optional)		
Cable lengths (ft)	11.5 / 20 / 33	11.5 / 16	n/a			
Compliance		UL				
Network connection		Ethernet interface / 3G	/ 4G / WLAN			
Local user interface	7" touchs	creen HMI		n/a		
Charging status indication	LI	LED				

\* eVehicle under the Mast Hood will be given priority in charging sequence.

Published by Siemens Industry, Inc. 2021

Siemens Industry, Inc. 3617 Parkway Ln Peachtree Corners, GA 30092

Phone: +1 (800) 333-7421 helpline.sii@siemens.com usa.siemens.com/sichargeuc Article No. SIDS-T40104-004AUS Printed in USA All Rights Reserved © 2021, Siemens Industry, Inc. The technical data presented in this document is based on an actual case or on as-designed parameters and, therefore, should not be relied upon for any specific application and does not constitute a performance guarantee for any projects. Actual results are dependent on variable conditions. Accordingly, Siemens does not make representations, warranties, or assurances as to the accuracy, currency or completeness of the content contained herein. If requested, we will provide specific technical data or specifications with respect to any customer's particular applications. Our company is constantly involved in engineering and development. For that reason, we reserve the right to modify, at any time, the technology and product specifications contained herein.



# 250kW Wireless Charging System

# Heavy-duty, high-power EV charging made easy

WAVE's 250-kilowatt wireless electric vehicle charging system enables the battery-electric vehicles used in mass transit, seaports, and warehouse and distribution operations to achieve the same operational range and duty cycles as their diesel counterparts.

- Hands-free and safe; just park and charge
- High-efficiency performance (92%+)
- Nearly invisible; minimal space required
- Interoperable with leading vehicle OEMs
- Industry-leading commercial deployments

# Extending the operational range of electric vehicles

For medium and heavy-duty transit and commercial vehicles to match the operational range of their diesel counterparts, high-power charging must be readily accessible and initiate quickly.



Unlike unsightly and cumbersome plug-in and overhead systems, WAVE delivers near-instantaneous high power from charging pads embedded in the roadway. Automated and hands-free, the "park and charge" simplicity makes EV adoption easier for fleet operators of all types.



# WAVE'S 250KW WIRELESS CHARGING SYSTEM:

- Initiates in seconds during scheduled stops or natural dwell times
- Eliminates the need to handle high-voltage cables and connectors for improved safety
- No moving parts, connectors, or cables
- Minimal impact on existing operations
- Removes the collision risks and unsightly presence of legacy chargers

WAREHOUSE + DISTRIBUTION OPERATIONS





# Lower ownership costs, more peace of mind

Hands-free, wireless charging eliminates the labor costs, maintenance issues and safety risks associated with legacy plug-in and overhead charging solutions. The result? Lower total cost of ownership and efficient, safe operation every day.

3

6

# WAVE depot charging

In a depot configuration, WAVE's 250kW system can be equipped with multiple pads for the simultaneous, automated charging of multiple vehicles. Drivers simply park the vehicle and walk away, improving depot traffic flow and reducing labor costs associated with manual charging.

 Primary power electronics
 Primary power supply with cooling unit
 Charging pad

# **Specifications**

Certification: UL Field Evaluation

### System Input to Power Supply

- Connections: Single grid connection
- Voltage: 480V Three Phase
- Protection: Requires UL listed 500A overcurrent protection in upstream switchgear

### System Output to Vehicle

· Up to 250kW to vehicle battery

# **Range Extension**

3

Bus Size	Battery Consump. (kWhr/mi)	Miles added in five-minute charge	Miles added in ten-minute charge
40-foot*	1.5-2.0	10-14	20-25
60-foot	2.4-2.6	8-10	16-18

3

\* Power delivered can be less than 250kW and is subject to control by the bus battery management system.

# Learn more by contacting us at gowireless@waveipt.com.

WAVE | 4752 WEST CALIFORNIA AVENUE | SUITE B-400 | SALT LAKE CITY, UT 84104 | 801.935.8650

#### 1. Purpose

1.1 The purpose of this document is to identify the steps required to inspect the exterior surface of a painted bus.

## 2. Scope

2.1 This standard describes the painted surface appearance requirements of exterior body panels. These requirements, with regard to appearance attributes and surface blemishes, are outlined in the following standards to ensure the paint finish of GILLIG buses will meet or exceed customer expectations.

#### 3. Responsibilities

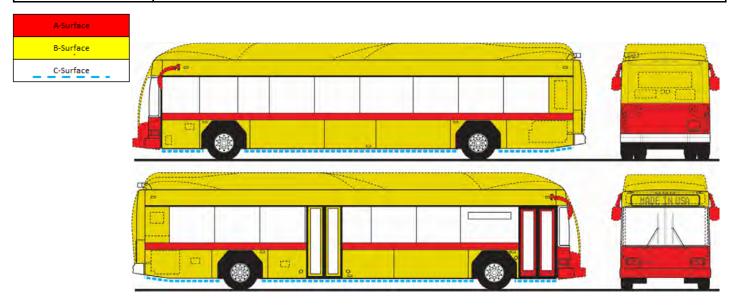
- 3.1 All exterior finished surfaces shall adhere to the appropriate ASTM standard for resistance to diesel fuel, gasoline and common cleaning agents. Use of any chemicals on painted surfaces shall be verified for acceptance with the paint manufacturer before use, approval of which shall be maintained by the paint department supervisor.
- 3.2 Proper adhesion between the basic surface and successive coats of the original paint shall be measured using ASTM D3359, Method B.

#### 4. Procedure

### 4.1 Appearance Zones - Exterior Body

The body of a bus is divided into different appearance zones (A through C) to set the Appearance Quality Requirements of each zone separately. The Appearance Quality Requirements are detailed in Section 4.2.

Zone	Description
	Sides - Horizontal mid-rail extrusion along length of bus.
А	Front - From bottom edge of windshield down.
	Rear - From the bottom edge of AC access door down.
	Sides - From the bottom edge of the horizontal mid-rail extrusion down and from the top edge the horizontal mid-rail upward.
В	Front - From the top of the windshield upward (including all roof cowlings).
	Rear - From the bottom of the AC access door upward (including all roof cowlings).
с	All surfaces of the lower bottom edge of skirt panels, interior side of all panels, and access doors.



			Surface Area (sqft)			Inspection Duration (min)	
Location	Rate (sqft/min)	29'	35'	40'	29'	35'	40'
Front	24	40	40	40	2	2	2
Curb Side	24	165	198	210	7	8	9
Rear	24	80	80	80	3	3	3
Street Side	24	180	213	220	8	9	9
			Tot	al Inspection Time	19	22	23

Note: The vehicle must be viewed in a normal run operation condition and from ground level or equivalent. The use of flashlights is prohibited. Visual inspection is performed at a distance of 36" from painted surface.



#### 4.2 Paint Audit Procedure

### 4.2.1 Quality Requirements for Appearance Attributes

#### 4.2.1.1 Method of Taking readings

Visual inspection shall be completed in compliance with the above stated criteria. As defects are identified they will be marked/highlighted using a contrasting grease pen. After the inspection is completed, the results shall be tallied on either the Hard Card, or the In Process Inspection sheet (depending on where the inspection is completed).

All identified issues shall be reworked/reprocessed to achieve an acceptable level. Panel repair is an approved option if GILLIG determines a good repair can be achieved.

#### 4.2.1.2 Orange Peel

Wavy appearance of the painted surfaces, poor flow, poor leveling, and pebbling.

<u>Description</u>: Uneven surface formation - much like that of the skin of an orange - which results from poor coalescence of atomized paint droplets. Paint droplets dry out before they can flow out and level smoothly together.

Method of Inspection: Optical evaluation utilizing a BYK Gardner Micro-Wave-Scan and associated software.

The scale used in the software is "Rating" from ACT Laboratories Inc. This scale rates orange peel from 1 to 10. 1 being a rough textured finish and 10 being a glass finish.

The micro-wave-scan evaluates structure size as well as the brilliance of the surface. Orange peel is rated from 1 to 10. 1 being the lowest and equivalent to the surface of an orange and 10 is the highest and equivalent to a glass surface. The industry average for this reading is a finish of 3.5 to 4. Use of the Micro-Wave-Scan is performed on a random sample basis or upon request. Measurements are taken on the bus mid-rail: front, middle, rear, and center of engine door.

Appearance Zone Requirements:

Table 2 - Orange Peel

Zone	Requirements
А	≥ 4.5
В	≥ 4.0
С	≥ 3.5

Note: Wet sand and polish is an acceptable repair method.





#### 4.2.1.3 Gloss

Shininess of the painted surfaces.

Method of Inspection: Gloss meter (60°) as referenced in ASTM D523.

Optical evaluations utilizing a BYK Gardner Micro-Gloss 60° meter and associated software.

Note: Gloss measurements should not be taken on non-metallic or contoured surfaces due to resultant false or inaccurate readings. Readings will only be taken as the bus exits the paint booth.

Appearance Zone Requirements:

Table 3 - Solids Gloss - Using BTK Gardener Micro-Gloss Meter

Zone	Requirements
А	80 units +
В	80 units +
С	80 units +

Note: Wet sand and polish is an acceptable repair method.

#### 4.2.1.4 Uniformity

Appearance is consistent over entire bus, both within individual panels and between adjacent panels within a zone. <u>Axalta Coating Systems Approved Film Build Specification:</u>

Single Stage - EX:

Axalta Coating System "Dry Film Thickness" specifications for the total primer/topcoat system for GILLIG is 3.0 mils minimum. The 3.0 mils for GILLIG has been approved by Axalta Coating System technical group.

\* 920S primer "Dry Film Thickness" specification is 1.2 – 1.5 mils minimum.

\* Imron Elite EX topcoat "Dry Film Thickness" specification is 1.8 – 2.2 mils minimum.

Axalta Coating System will continue to warranty units produced at GILLIG provided they meet minimum dry film thickness of 3.0 mils for single stage EX.

Basecoat/Clearcoat - EW/EB:

Axalta Coating System "Dry Film Thickness" specifications for the total primer/topcoat system for GILLIG is 4.0 mils minimum. The 4.0 mils for GILLIG has been approved by Axalta Coating System technical group.

- \* 920S primer "Dry Film Thickness" specification is 1.2 1.5 mils minimum.
- \* Imron Elite EW/EB topcoat "Dry Film Thickness" specification is 1.0 mils minimum.
- \* 8831S clearcoat "Dry Film Thickness" specification is 1.8 2.2 mils minimum.

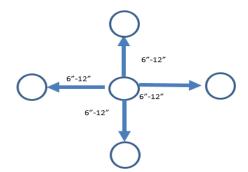
Axalta Coating System will continue to warranty units produced at GILLIG provided they meet minimum dry film thickness of 4.0 mils for basecoat/clearcoat EW/EB.

#### GILLIG Film Build Measurement Process:

\* If at any given point on the vehicle, total dry film thickness (DFT) is less than 3.0 mils for single stage or 4.0 mils for basecoat/clearcoat the following steps should be followed:

\* Measurement should be taken 6" – 12" inches above, below, and on each side of that low reading (see below diagram for reference).

\* If three (3) of the four (4) readings are within acceptable range for DFT, the area does not require paint repair for low film build and the current warranty will be honored.



#### 4.2.1.5 Bubbles/Craters - Fish Eyes

Small round depressions in the paint film which may or may not expose the underlying surface.

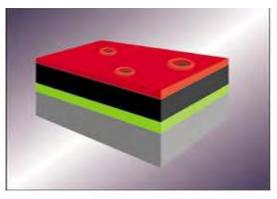
Method of Inspection:

Visual evaluation and comparison to zone table 4. Table 4 - Bubbles /Craters

Zone	ОК	Qty Per Panel Per	Max Size / Diameter	Description
А	No			
В	Yes	2 within 2 ft square (No Cluster)	0.059 in (1.5mm)	Primer Not Exposed
с	Yes	No More than 3 per panel	0.059 in (1.5mm)	Primer Not Exposed

Note: Wet sand and polish is an acceptable repair as long as the mil thickness is not compromised or repaint.







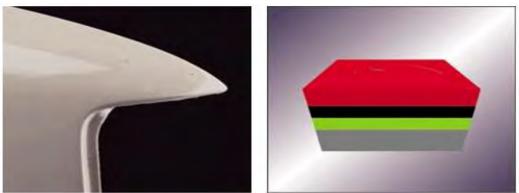
.1.6 Dirt Inclusion

Foreign matter in, on, or under the paint film surface (i.e.: lint, fibers, sanding dust, etc...).

### Method of Inspection:

Standard/Metric scale with visual evaluation and comparison to zone table 5.

Tuble 5 Dire			
Zone	ОК	Qty Per Panel Per Zone	Max Size / Diameter
A Yes		No more than 2 more in 2 ft caption but not in a ductor	0.059 in
		No more than 2 spec. in 2 ft section but not in a cluster	(1.5mm)
		No more than 3 spec. in 2 ft section but not in a cluster	0.059 in
B Yes	No more than 3 spec. In 2 it section but not in a cluster	(1.5mm)	
		No more than 5 spec. on any panel, should not be in a	0.059 in
C Yes	Yes	cluster	(1.5mm)



Note: Wet sand and polish is an acceptable repair as long as the mil thickness is not compromised.

### 4.2.1.7 Ding

A localized depression or protrusion in the metal surface or substrate, which is visible after paint. <u>Method of Inspection:</u>

Visual evaluation and comparison to zone table 6.

Table 6 - Ding in Paint Coating

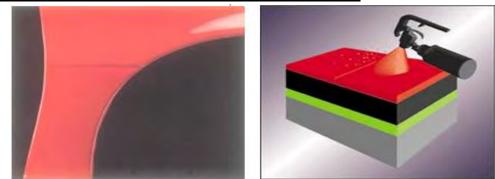
Zone	ОК	Description
Α	No	
В	No	
С	Yes	Slight (less than 2 mm)

Note: Wet sand and polish is an acceptable repair as long as the mil thickness is not compromised or repaint.

### 4.2.1.8 Overspray/Dry Spray

Rough or gritty texture on paint film surface. <u>Method of Inspection:</u> Visual evaluation and comparison to zone table 7. Table 7 - Overspray/Dry Spray

Zone	ОК	Description
A	No	
В	No	
С	Yes	Only on inside of flange



Note 1: Wet sand and polish is an acceptable repair.

Note 2: Acceptable on underside of chassis, engine compartment, and inside of wheel wells.



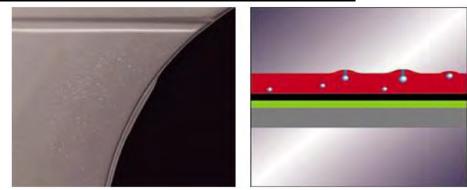
## 4.2.1.9 Solvent Pop

Small holes in a paint film usually caused by trapped solvent or porosity. Solvent boils are small, clustered, raised but unbroken bubbles in a paint film surface.

#### Method of Inspection:

Visual evaluation and comparison to zone table 8.

Zone	ОК	Description
А	Yes	Pinhole type solvent pops, which are visible only when
В	Yes	viewed at an angle or small random pops not visible from
С	Yes	3 ft away.



Note: Wet sand and polish is an acceptable repair as long as the mil thickness is not compromised or repaint.

### 4.2.1.10 Polish Marks

Visible swirl marks or hazy marks, which are caused by polishing techniques viewed in reflected or non-reflected lighting. Method of Inspection:

#### Table 9 - Polish Marks

Zone	ОК	Description
А	Yes	Provided the gloss meets the Paint Appearance Standards.
В	Yes	Provided the gloss meets the Paint Appearance Standards.
С	Yes	Provided the gloss meets the Paint Appearance Standards.

## 4.2.1.11 Sags and Runs

Method of Inspection:

Visual evaluation and comparison to zone table 10.

Table 10 - Sa	gs and Runs	
Zone OK Description		Description
А	Yes	Slightly below punched/hole, rivets, and screws in panels.
В	Yes	Slightly below punched/hole, rivets, and screws in panels.
С	Yes	Slightly below punched/hole, rivets, and screws in panels.



Note: Wet sand and polish is an acceptable repair.

### 4.2.1.12 Scratches

Scratches on surface of paint film.

Method of Inspection:

Visual evaluation and comparison to zone table 11. Table 11 - Scratches

Table II - Sc					
Zone	ОК	Length	Description		
А	No				
В	Yes	Not >5 mm	On Non-Metallic		
С	Yes	Not >5 mm	On Non-Metallic		

Note: Touch-ups with a brush with primer and paint acceptable repairs.

# 4.2.1.13 Sand Marks

# **Paint Appearance Standard**

Cuts in the surface metal caused by poor sand technique or improper repair, only visible after paint. <u>Method of Inspection:</u>

Visual evaluation and comparison to zone table 12.

Table 12 - Sand Marks after Paint

Zone	ОК	Description
А	No	
В	No	
С	Yes	Minor

Note: Touch-ups with a brush with primer and paint acceptable repairs.

## 4.2.1.14 Pinholes

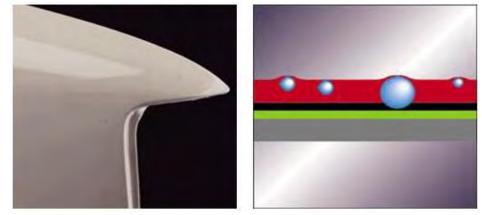
Small holes in a paint film, usually in the area of fiberglass gelcoat parts (i.e. porosity).

Method of Inspection:

Visual evaluation and comparison to zone table 13.

Table 13 - Pinholes

Zone	ОК	Qty per	Description
А	No		
В	Yes	2	Not in a cluster 2 sqft area
С	Yes	2	Not in a cluster 2 sqft area



Note: Wet sand and polish is an acceptable repair as long as the mil thickness is not compromised or repaint.

#### 4.2.1.15 Paint Chips

The absence of a small portion of the paint film.

Method of Inspection:

Visual evaluation and comparison to zone table 14.

Table 14 - Paint Chips

Zone	ОК	Qty per	Description
A			
В	No	0	Not Allowed
С			

Note: Touch-ups with a brush on panel-edge is acceptable if no color change.



# **SECTION 1: TECHNICAL**

# 4. GILLIG SERVICE AND PARTS SUPPORT DATA

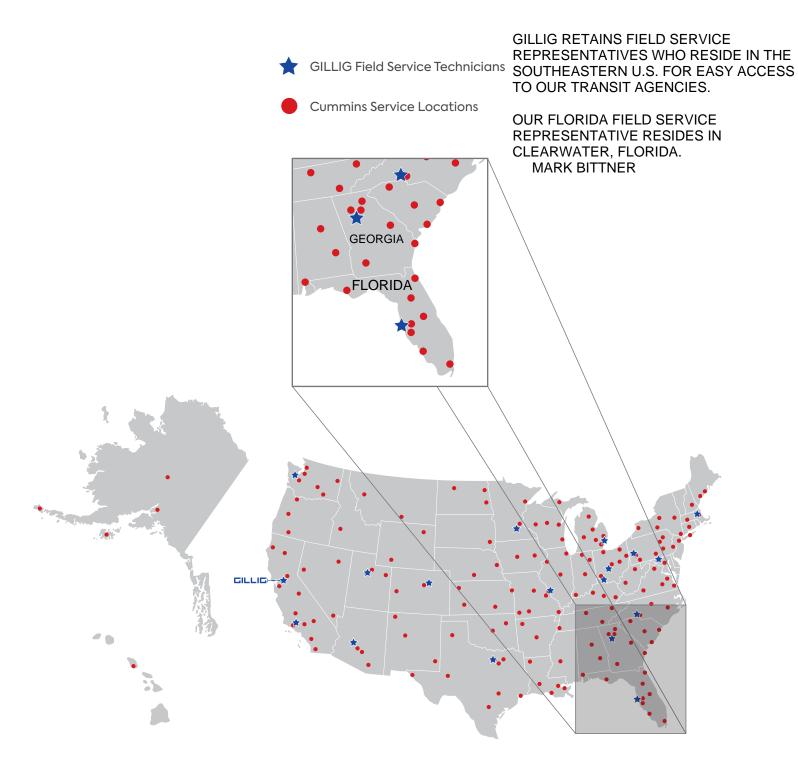
GILLIG has included the following documents confirming our ongoing support to transit agencies in the State of Florida, as follows:

- GILLIG CUMMINS SERVICE & SUPPORT NETWORK MAP
- CUMMINS SUPPORT REFERENCE LETTER
- SERVICE, WARRANTY & ENGINEERING SUPPORT
   SUPPORT STAFF
- GILLIG STANDARD LIMITED WARRANTY & EXTENDED COVERAGE
- WARRANTY DEPARTMENT SUPPORT
- TRAINING OUTLINE
  - AVAILABLE OPTIONAL TRAINING PROGRAMS
- GILLIG AFTERMARKET PARTS WAREHOUSE
  - SUPPORT STAFF

# Unmatched service and support network across the US



# Partners you can trust.



September 21, 2021



Gillig 451 Discovery Drive Livermore, CA 94551

Subject: Cummins Sales and Service support for Gillig Electric Buses throughout the state of Florida

Cummins Sales and Service Branches are fully prepared to support Transit Authority Customers throughout the state of Florida. Cummins Sales and Service has 7 branch service locations in Florida. The service centers are in Jacksonville, Ocala, Tampa, Orlando, Ft. Myers, West Palm Beach and Miami. All branches will have both field and in-shop trained technicians to service Gillig Battery Electric Buses. The standard branch hours are 7:30 a.m. to 4:30 p.m. Monday through Friday with 24/7 on call technician support. We provide full Cummins warranty and after warranty support.

For additional technical support, we have Customer Field Service Engineers that support all our Florida facilities. We also have dedicated Bus Account Executives and a Florida based Technical Support Manager to support PDI and familiarization activities upon bus arrival at each Transit Authority.

Parts for repairs will be available either at the branch or at the regional distribution center located in Atlanta, Georgia or at the main distribution center located in Memphis, Tennessee. We will also be able to obtain parts from Gillig if needed.

We are excited to support this endeavor and look forward to working with Gillig to ensure their electric buses are available to support the tens of thousands of travelers that will move through the State of Florida.

Please contact me directly if you have any questions.

Sincerely,

Jim Cress Area Vice President | Southern US Cummins Inc. dba Cummins Sales and Service Tel: (470) 484 1074 Email: james.cress@cummins.com

Corporate Office 5125 Highway 85 Atlanta, GA 30349-5976 404 763 0151

Service Locations: Albany, Atlanta, Augusta, Gainesville, Savannah – GA; Fort Myers Jacksonville, Miami, Ocala, Orlando, Tampa, West Palm Beach – FL; Charlotte, Greensboro, Kenly – NC; Columbia, Loris, Spartanburg, Summerville – SC; Chattanooga, Knoxville, Nashville – TN; Chesapeake, Manassas, Richmond, Roanoke, Winchester – VA; Regional Learning Center: Tampa, FL

www.salesandservice.cummins.com



## SERVICE DEPARTMENT

GILLIG maintains a fully qualified, trained Service Department to respond to the procuring Agency's request for assistance after delivery of equipment.

The Field Service Trainers and Field Service Representatives have extensive "hands-on" experience on our coaches. The Field Service Trainers are available to provide training to your staff on the proper operation and maintenance of the equipment. The Field Service Representatives are fully qualified to assist the procuring Agency in the maintenance of equipment, including, but not limited to major component replacement and repair, electrical troubleshooting, suspension and frame repair, as well as repair of all ancillary components and systems.

In-house qualified Field Service Representatives are available to troubleshoot questions by phone, Monday through Friday, 5:00 a.m. to 2:00 p.m. (PST).

## WARRANTY DEPARTMENT

The Warranty Department is available to assist the procuring Agency processing warranty claims as required. The Warranty Processing Specialist will assist the procuring agency in the proper procedure for obtaining warranty parts, completion of the warranty forms, and the handling of parts for warranty claims processing.

## ENGINEERING DEPARTMENT

We also maintain a fully experienced, qualified Engineering Department, directed by the Vice President of Engineering, Quality Control and Customer Service. The Engineering staff are available on request to assist in the resolution of engineering or design problems that may arise within the scope of the specifications during the warranty period.

The GILLIG Engineering Department is located at the manufacturing plant in Livermore, CA, and is continually available to assist the manufacturing process. The integrated staff performs all vehicle engineering, including the research and development of all systems integrated on our vehicles.

All current products were designed and developed by GILLIG Engineering. The entire GILLIG Low Floor transit bus is manufactured in the United States at this one location in Livermore, CA.



# CUSTOMER CARE SUPPORT NETWORK

## CUSTOMER CARE SUPPORT NETWORK

## **EXECUTIVE DIRECTOR, CUSTOMER CARE**

Victor Doran

## SERVICE MANAGER

Eric Ocampo

## WARRANTY MANAGER

Micah Denecour

## **TECHNICAL ADVISOR**

Bo Vongamath

## **TECHNICAL TRAINERS**

-	Seattle, WA
-	St. Paul, MN
-	Baltimore, MD
-	Charlotte, NC
-	Columbus, OH
	- - -

## FIELD SERVICE REPRESENTATIVES \*

FIELD SERVICE REPRESEN	TATIVES *	BASED:
Mark Bittner	-	Clearwater, FL
Rob Bolog	-	Detroit, MI
Cody Campeau	-	St. Paul, MN
Jason Fairclough*	-	Salt Lake City, UT
Jose Garcia	-	San Francisco, CA
Dave Hagopian*	-	St. Louis, MO
Scott Kovaly	-	Pittsburgh, PA
Tim Lopez	-	San Francisco, CA
Sam Nicoara	-	Atlanta, GA
Paul Oden, Jr.		Cincinnati, OH
Joe Rhea*	-	Dallas, TX
Richard Salas*	-	San Francisco, CA
Steven Sayne*	-	Seattle, WA
Jason Schwalbert	-	Phoenix, AZ
Thomas Seymour	-	Denver, CO
Joy Sisouvanthong	-	Boston, MA
Sang Tran*	-	Los Angeles, CA

Based:

## FIELD SERVICE & WARRANTY

FIELD SERVICE & WARRANTY		Phone - 800-735-1500 Fax- 510-785-1348
Victor Doran	Exec.Director, CustomerCare	victor.doran@gillig.com
Eric Ocampo	Service Manager	eocampo@GILLIG.com (call to schedule training)
Micah Denecour	Warranty Operations Manager	micah.denecour@GILLIG.com
Johnny Phothipanya	Warranty Processing Specialist	jphothipanya@GILLIG.com
Bo Vongamath	Technical Advisor	bvongamath@GILLIG.com
Dominic Nava	Warranty Parts Specialist	dnava@GILLIG.com (call to order warranty parts)
Vy Vu	Field Service Coordinator	vvu@GILLIG.com
Kristina Aldana	Administrative Assistant	kaldana@GILLIG.com

Training instructors employed by GILLIG are fully qualified service personnel with extensive "hands on" experience on our coaches. They have been trained in all phases of coach repair including, but not limited to major component replacement and repair, electrical troubleshooting, suspension and frame repair as well as repair of all ancillary components and systems.

\* Performs pre-delivery service at the customer site, as well as ongoing field product support services.

\*\* ASE Certified Mechanic



# FIELD SERVICE QUALIFICATIONS

## VICTOR DORAN - Executive Director, Customer Care

Executive Director of Customer Care is responsible for supporting customers post delivery service needs including warranty, field service and training. Victor's 30+ years' experience includes Diesel Technician, Service Department Management, Custom Engineering and broad OEM Customer Service Support functions primarily in the Commercial Truck and School Bus market. In addition, Victor earned a Diesel Technician Certification from Ohio Diesel Tech. and a BSMET from Kent State University and joined GILLIG in 2020.

## **ERIC OCAMPO** – Service Manager

Eric has been with GILLIG since January 1987. He came to GILLIG from A.C. Transit where he worked for 2 ½ years involved in special projects. He has 1 year in R.O.C. diesel technology and electrical and 5 years as an automotive technician. He also received training on DDEC, Allison, Lift-U wheelchair lifts and Luminator destination signs for troubleshooting and repair. Eric spent 10 years as a Field Service Representative and was a Field Service Trainer from 1996-2013. In April 2002, he completed training with Cummins I.S.L. troubleshooting and familiarization, and in November 2004, he completed training with Allison Hybrid electric drives. Since 1999, he has received numerous extensive training classes from I.O. Controls Multiplex Systems covering the T-1, T-2, G-3 and the latest G-4 systems.

## **MICAH DENECOUR** – Warranty Manager

Micah has been with GILLIG since October 2016. He has worked in the Industrial Engineering, Supply Chain, and Warehousing teams at GILLIG. Micah holds a BS and MS in Industrial Engineering from Cal Poly. Prior to GILLIG he worked in the medical device industry.

## **RUSS ANDO** - Trainer

Russ resides in Washington State and covers the Pacific Northwest Region. Russ Joined GILLIG in March 2001 and worked in several areas on the production line, including line foreman. In July 2002, Russ joined the Field Service Department. He has done classic auto restoration since 1979 and has completed several body-off, frame-up restorations. Along with his knowledge of mechanics and hands on approach to his job, he earned a BFA with honors in illustration from California College of Arts and Crafts.

## LYLE ARCHAMBEAU - Trainer

Lyle lives in St. Paul, MN and covers the Midwest region. He has been employed at GILLIG since 1989. He has three years' experience in Heavy vehicle Maintenance while stationed in the U.S. Army. Also, Lyle has five years' experience in the Automotive Maintenance Industry. He is ASE Certified in Auto Electric, Brakes, Suspension, Engine Performance and Engine Rebuilding. He has attended classes at Auto tech for Air Conditioning, and Engine Electronics Controls and Diagnosing.



# MARK BITTNER – Senior Field Service Representative

Mark joined our GILLIG family in 2019. He brings extensive knowledge and experience in transit bus maintenance and troubleshooting. He grew up in Pittsburgh, PA and is a graduate of Steel Center Technical School and Ohio Diesel Technical Institute. He began his career in 1986 with a Pittsburgh based Detroit Diesel Allison distributor. There he served in troubleshooting, repair and overhaul of all Detroit Diesel Allison Propulsion systems. From 1993 through 2018 Mark worked for the Port Authority of Allegheny County in Pittsburgh, PA. There he performed all aspects of transit bus maintenance, troubleshooting and repairs. While there he became a bus maintenance technical support. Since 2005 Mark has been working with GILLIG busses at the Pittsburgh Port Authority of Allegheny county. Mark also enjoyed owning a business in Pittsburgh, PA with his two sons where they design and build racing engines and offer field service repairs for a diesel propulsion systems. Mark and his family now reside in the Florida.

# **ROB BOLOG** – Senior Field Service Representative

Rob graduated from Michigan State University where he completed a Power Equip. Technology program. Rob started in the heavy equipment and consumer products business (chainsaws to excavators) in 1978 before moving to the Ann Arbor Transit as a technician in 1984. He was a maintenance supervisor and warranty administrator at the time he retired in 2018 to join the GILLIG Field Service Team.

## **<u>CODY CAMPEAU</u>** – Field Service Representative

Cody lives in New Richmond, WI and covers the Midwest region, he joined the GILLIG family in 2019 after working as a contractor for GILLIG since 2010. During that time he gained experience from many hands on repairs and projects he was involved with.

## **BEN BRAUN** – Trainer

Ben lives in Street, MD and covers the Eastern Region. He has been employed with GILLIG since 1995 and has been in the motorcycle, automotive, truck and bus industry full time since 1971. He has experience in all areas of fabrication, welding, manual machining, repair, welding and diagnostic work. He previously was a GM Buick Master certified technician and held ASE Master Technician certification from 1985 to 2000.



# **BLAINE FAGEL** – Trainer

Blaine joined GILLIG as an FSR in 2006 and moved to Trainer in 2010. He began in the trucking industry in 1990. He has been in the transit industry since 1995. He has fueled trucks/buses and performed preventative maintenance. He has also been a technician, union officer, shop supervisor, technical spec writer and QA officer. He worked for Lynx Orlando from 1995-2003 and Charlotte CATS from 2003-2006. He has been ASE Certified for heavy truck steering and suspension, A/C refrigerant recovery and recycle, as well as for bus/truck air brakes. Blaine is also a Type I & II Certified A/C Technician. He has taken many classes for electrical, preventative maintenance, suspension, hydraulics, brakes, A/C, wheelchair lift (Lift-U), Cummins, Detroit Diesel, Allison, Amerex as well as many managerial courses in people skills, time management, computer software for transit specific products, Excel, Word, Outlook, Adobe Professional, and PowerPoint.

# JASON FAIRCLOUGH - Senior Field Service Representative

Jason has been employed with GILLIG since March 2001. He has 3 years' experience as a Quality Engineering Technician for Nova Bus Inc. Where he had taken several classes: Kizan, Metrology, Paint and Body. Jason also has a certificate from the National Fire Academy, for Hazardous Materials Incident Analysis, Hydraulics and Fluidics. While at GILLIG, Jason has taken classes in I/O, Air Systems, Allison Electric Drive, and Service Training. In addition, Jason has been building and racing vehicles since 1989.

## JOSE GARCIA - Field Service Representative

Jose joined GILLIG in the Production Department in 2015. He started in second shift and became a lead after four months. After one year, he moved to first shift labor pool and worked various departments before joining Field Service. Before GILLIG, Jose worked for 15 years as an auto mechanic. He started as a lube mechanic as a tech 1, then became a tech 4 master mechanic. He attended De Anza College and completed the automotive program. He also completed 3 ASE certified tests.

## **DAVID HAGOPIAN** – Senior Field Service Representative

Dave lives in southern Illinois and covers the Midwest region. He has been employed with GILLIG since November 2000. Dave came to GILLIG with 19 years of experience as manager, service writer and mechanic in the automotive industry. He has been ASE certified in heating, air conditioning, and electrical/electronic systems. He is trained in industrial electronics at Southwestern Illinois College.



# **SCOTT KOVALY** – Field Service Representative

Scott was born and raised in Pittsburgh PA where he currently live with his wife, son and daughter. He graduated from Rosedale Technical College in 1988. After Rosedale he worked for GM, VW and Ford as the transmission and drive-ability specialist until 1994. He began his transit career with the Port Authority of Allegheny County in 1993 where he held various positions to include, hourly technician, materials control specialist, maintenance technical trainer, assistant manager of maintenance, manager of maintenance and bus procurement specialist. Scott holds ASE Master Technician status in Transit, Automotive and Heavy disciplines. He joined the GILLIG family in October of 2019 with the Field Service Department.

## KEVIN HARDESTY - Trainer

Kevin has been a technical coach trainer since 1987. He has been a field service trainer for GILLIG since 2005. Prior to being employed as a field service trainer for GILLIG, Kevin operated his own technical training company for 9 years. Kevin started as a technical trainer for the Flxible Corporation in 1987. He also spent 2 years at the Central Ohio Transit Authority as the Training Supervisor. During his time at these positions, he has performed technical writing and created numerous training classes using PowerPoint software. His other duties have included various field service tasks as required.

# TIMOTHY LOPEZ – Field Service Representative

Tim has been employed with GILLIG since January 2007. He worked in Labor Pool for five years and three years in Ready Row. Two of the three years in Ready Row he obtained his Commercial Driving License. While working in Ready Row he took customers on test drives on their new buses and explained the functionality of the bus. He studied Automotive Maintenance and Repair along with Machine Shop in High School Regional Occupation Center (R.O.C.). He received an Associate of Occupational Studies degree from Universal Technical Institute.

# **SAMUEL MAC NICOARA** - Field Service Representative

Sam was born in Romania and immigrated to the US in 1980. In 1994, he graduated Sierra Academy of Aeronautics in Oakland, CA and received an aeronautical degree in Airframe & Powerplant as well as flight engineering. He applied his training in the aviation field and helped expand a superconducting magnet fabricating plant that he managed for over 10 years. In 2014, he joined GILLIG and worked as a troubleshooter in the Electrical Department. In 2016, he joined Field Service as a field service representative, servicing customers nationwide.

# **PAUL ODEN, JR.** – Field Service Representative

Paul has in-depth experience working on GILLIG buses. For 19 years, he has served as a mechanic for the South Western Ohio Regional Transit Authority in Cincinnati, maintaining GILLIG buses and Cummins powertrains. He particularly enjoyed working on schematics and using his problem-solving skills. Paul joined GILLIG in October of 2019.



# JOE RHEA - Senior Field Service Representative

Joe has been employed with GILLIG since 1988 and has had training in Voith, Transmission troubleshooting, & Lift-U Wheelchair lifts and Luminator Electric Destination Signs. He has also attended training classes by the GILLIG trainer in the Electrical System, Air System and Hydraulic systems on the GILLIG buses. Joe lives in Central Texas and covers the Southern Region.

# **RICHARD SALAS** – Senior Field Service Representative

Richard has been employed with GILLIG since 1998. He worked in Labor Pool for one year and worked 4 years as a Working Foreman in the Trim department. He was also the Working Foreman for the Maintenance Department on 3rd shift. He has attended training courses for the Dinex and Air systems. He is based out of the San Francisco area.

## **STEVEN SAYNE** – Field Service Representative

Steven has been employed with GILLIG since June 2003. He worked with 1st shift Maintenance Department for 3 years. He was also the Working Foreman for the Maintenance Department on 2nd shift for 5 years. He has 10+ years of automotive and machine service and repair experience. He also has 10+ years of electrical and electronics service and repair experience. He has attended training courses for the Dinex and Air systems. He resides in Washington State and covers the Pacific Northwest Region.

## JASON SCHWALBERT – Field Service Representative

Jason has been employed with GILLIG since December of 2017. Prior to that, he worked in the Phoenix Transit System for over 17 years as a Project Lead performing duties ranging from Transit Bus Maintenance to Shop Management. Jason has accumulated many Certifications and Licensing over the years including 3 ASE Master Certifications, Both A/C Section 608 Universal, & Section 609 certifications, and a Class B CDL w/Passenger Endorsement. He has earned an Associate Degree in Automotive, Diesel, and Industrial Technologies from Universal Technical Institute. Jason lives just outside Phoenix in Goodyear AZ.

## **THOMAS SEYMOUR** – Field Service Representative

Tom has been with GILLIG since November of 2018. Prior to joining GILLIG, he worked at the Kansas City Area Transportation Authority. He spent 13 years as a Class A Mechanic, and 1 year as the Maintenance trainer. He has multiple ASE certifications, HVAC Type II certification, and is a Certified CNG fuel Cylinder and Systems inspector. He holds a Class A CDL w/passenger endorsement. He has been trained on Voith transmissions, Allison transmissions, Cummins engines, Agility fuel systems, Lift-U, Thermo King Intelligaire I & II, Dinex T2/G3/&G4, J1939, and Amerex fire suppression. He has competed and won multiple awards at the APTA International Bus Roadeo.



# JOY SISOUVANTHONG - Field Service Representative

Joy started working at GILLIG in 2015. He worked in the Labor Pool Department then transferred to 03 Electrical Department until 2016 when he became a Field Service Rep. He worked various jobs on the line and did pick up work for all departments. His main focus became programming buses on Engine Transmission and downloading the I/O program along with troubleshooting.

# **SANG TRAN** – Senior Field Service Representative

Sang joined GILLIG in March 1997. He first started out in Dept. 04 for a few months then transferred to the Labor Pool in late 1998. For the following years, he worked throughout most departments, and spent most of his time in Dept. 03 (Electrical), performing work duties such as front dash harnesses/main electrical panel installations, engine power trouble shooting for buses to start before they get into Rack area (Dept.09). In mid-2001, Sang became a Field Service Representative and relocated to Fairfax County in State of Virginia. During his service years, he had attended training courses for Dinex and Air Systems. Before joining GILLIG, Sang worked for Morehouse Foods Co. in Emeryville, CA as a lead machinist and oversaw the high volume of bottling, labeling, capping machines, and performed electrical trouble shooting problems as required. Upon CNG market demand in Southern California, Sang lives in Orange County, CA in and covers the Pacific Southwest region.

# **BO VONGAMATH** – Technical Service Advisor

Bo has been with GILLIG since January of 1999. He worked 2 years in the Labor Pool, 3 years in the Electrical Department and 4 years as a Quality Inspector in the Field Service Department. He also received training on Allison Electric Drive, Certified ASE Refrigerant Recovery and Recycling. Before GILLIG, Bo worked at Chuck E. Cheese as their Electronic Technician for 10 years.



GILLIG maintains a fully experienced and qualified Engineering Department directed by the Vice President of Engineering. The Engineering staff is involved in all design requests and is also made available to the customer on request to assist in the resolution of engineering or design problems that may arise within the scope of the specifications during the production and/or warranty period.

The GILLIG Engineering Department is located in the manufacturing plant in Livermore, CA and is available to assist the manufacturing process. The integrated staff performs all vehicle engineering including the research and development of all systems integrated on our vehicles.

All current products were designed and developed by GILLIG Engineering. Attached is our staff description and organization.



# **GILLIG ENGINEERING ORGANIZATION**

<u>Name</u> G. Vismara	<u>Function</u> Vice President, Engineering	Education BSME	<u>Background</u> 32 yrs. industry experience at Peterbilt, Loral Space Systems & GILLIG
T. Meagher	Director, Design Engineering	9 BSME, BSEE	33 yrs. industry experience at Ford, Caterpillar, Case New Holland & GILLIG
D. Jayasinghe	Program Mgmt.	BSAE & MSME	16 yrs. industry experience at CAT, Cummins & GILLIG
R. Quebbeman	Manager, Specifications & Bill of Material	AS Mech. Engr.	51 yrs. industry experience bus and truck design - Mack, International & GILLIG
S. Vanderlip	Manager, Mechanical Engineering Systems	BSETME,PE	34 yrs. industry experience at Peterbilt & GILLIG
C. Ababseh	Manager, Mechanical Engr Body & Interior	BSME	14 yrs. industry experience at GILLIG
K. Vorsatz	Manager, Mechanical Engineering Powertrain	BSME	14 yrs. industry experience at BAE & GILLIG
J. Abrew	Bill of Material Order Technician	H.S.	31 yrs. industry experience at GILLIG
T. Agawa	Bill of Material Order Technician	BSIT	29 yrs. industry experience at GILLIG & Peerless Lighting
F. Andrade	Supervisor, Controls	BSEE	7 yrs. industry experience at E-N-G Mobile & GILLIG
D. Aranovich	Mechanical Designer	BS Engr Tech	19 yrs. industry experience at Metaldyne, Ford, LightSail Energy & GILLIG
M. Banwait	Mechanical Design Engineer	r BS	2 yrs. industry experience at GILLIG
R. Brar	Mechanical Design Engineer	MS Aerospace Engineering	9 yrs. industry experience at Int'l Cars & Motors, Heil Trailer & GILLIG
B. Burdick	CAD Designer	HS	44 yrs. industry experience at Altamont Mfgr, Lawrence Livermore Lab & GILLIG



L. Bush	Electrical Engineer	BSIT	20 yrs. industry experience at Compass, Autocam, TPI, Dow Jones & GILLIG
N. Clopton	Supervisor, Body	BSME	14 yrs. industry experience Parker Hannifin, Racor Division
F. Cruz	Bill of Material Technician	BSC-Mgmt.	20 yrs. industry experience at GILLIG
J. Dalmeida	Sr. Mechanical Engineer	BSME	8 yrs. industry experience at New Flyer & GILLIG
B. Den Hollandar	Electrical Engineer	BSEE	8 yrs. industry experience at Proficient Machining, Optimal & GILLIG
S. Dunbar	Electrical Engineer	BSEE	4 yrs. industry experience at GILLIG
J. Edmondson	Bill of Material Order Technician	H.S.	41 yrs. industry experience Peterbilt & GILLIG
C. Espinosa	Supervisor, Passenger Compartment	MSME	9 yrs. industry experience at Lawrence Livermore Lab, SFMTA & GILLIG
G. Estantino	Mechanical Engineer I	BSME	4 yrs. industry experience at ICON Aircraft & GILLIG
S. Faria	Bill of Material Technician	BSBA	27 yrs. industry experience Mack, Xerox & GILLIG
K. Fernandez	Bill of Material Technician	H.S.	9 yrs. industry experience at GILLIG
S. Finley	Supervisor, Power Distribution	BSEE	28 yrs. industry experience at Georgia-Pacific, Walk- Haydel & GILLIG
J. Fisher	Mechanical Designer	HS	23 yrs. industry experience at Burke Porter Machinery, Stewart & Stevenson & GILLIG
F. Fotos	Electrical Engineer I	BSEE, MEM	6 yrs. industry experience at Northrop Grumman & GILLIG
A. Frey	Engineer 2, Powertrain	BSME	12 yrs. industry experience at Cummins & GILLIG



D. Garcia	Bill of Material Technician	H.S.	7 yrs. industry experience at GILLIG
M. Genova	Mngr. Product Safety & Compliance	MSAE	19 yrs. industry experience at AVL, Fiat, Landirenzo-Baytech USA, & GILLIG
J. Graves	Bill of Material Order Technician	BSCJ/S	11 yrs. industry experience at GILLIG
J. Hackney	Electrical Engineer II	BSEE	13 yrs. industry experience at IoT, Davis Instruments & GILLIG
D. Haiduk	CAD Designer	BS	16 yrs. industry experience at AGAT, Yo-Engineering, RenyMed & GILLIG
B. Haley	Mechanical Engineer	BSME	6 yrs. industry experience Product development
N. Henderson	Mechanical Design Engineer	BSME	7 yrs. industry experience at Zodiac Aerospace & GILLIG
E. Hughes	Assoc. Mechanical Engineer	BS	2 yrs. industry experience at GILLIG
M. Itanna	Sr. Electrical Engineer	MSc. EE	7 yrs. industry experience at Vertiv & GILLIG
T. Jones	Mechanical Drafter Design	AA Mechanical	18 yrs. industry experience NABI & GILLIG
T. Junge	Mechanical Engineer	BSME	5 yrs. industry experience at Durst-field, Cessna Aircraft- Interior & GILLIG
S. Loyd	Supervisor, ITS & Surveillance	eB.S. Physics	10 yrs. industry experience at Areias Systems
EJ Mariscal	Bill of Material Technician	HS	21 yrs. industry experience at GILLIG
M. Mohammedkair	Power Distribution Engineer	BSEE	10 yrs. industry experience at GILLIG
A. Monserret	Associate Mech Engineer	BSME	2 yrs. industry experience at GILLIG



G. Mortazavi	Electrical Engineer	MSEE	3 yrs. industry experience at Chicago Transit Authority & GILLIG
W. Nairn	Liaison Engineer	College	20 yrs. industry experience at GILLIG
B. Nguyen	Design Engineer, Electrical	BSEE	13 yrs. industry at HP, Kla-Tencor & GILLIG
L. Nguyen	Supervisor, Drivers Area	BSEE	14 yrs. industry experience Panasonic Automotive & GILLIG
J. Ocampo	Bill of Materials Technician	College	31 yrs. industry experience at GILLIG
M. Ortega	Associate Electrical Enginee	rBSEE	2 yrs. industry experience at GILLIG
H. Perez	Production Support Tech	H.S	5 yrs. industry experience at GILLIG
M Pinto	Program Manager CPI	BSME, MSME, MSPM and PMP	17 yrs. industry experience at Ford, Volkswagen & GILLIG
P. Pruscha	Industrial Designer	BS Industrial Design	35 yrs. industry experience at Peterbilt, Jacuzzi & GILLIG
M. Rands	Bill of Material Technician	H.S.	8 yrs. industry experience at GILLIG
J. Reekie	Sr. Mechanical Engineer	MSME	9 yrs. industry experience at Caterpillar & Castrol
M. Roberts	Mechanical Design Engineer	r MSME	7 yrs. industry experience at BHJ Dynamics & GILLIG
G. Roderick	Supervisor, Order Processing	AA	36 yrs. industry experience at GILLIG
M. Ruth	Powertrain Systems Engineer	BS EMET	19 yrs. industry experience at Harley Davidson, Voith & GILLIG.
H. Sanchez	Mechanical Engineer	BSME	7 yrs. industry experience GCM & GILLIG



T. Scheumann	Sr. Mechanical Design Engr	MSME	8 yrs. industry experience at Hyster-Yale, Mizuho OSI & GILLIG
J. Seei	Bill of Material Technician	HS	23 yrs. experience at GILLIG
M. Shaieb	Project Engineer Technician	BSME	38 yrs. industry experience at BAE Systems & GILLIG
C. Silva	Bill of Material Technician	HS	34 yrs. industry experience at GILLIG
H. Tuft	Supervisor, Powertrain	BSME	14 yrs. experience at Electroglas Inc & AutoCat USA Inc.
J. Turner	Electrical Design Engineer	BSEE	5 yrs. industry exp at GILLIG
A.vanHaeften	Supervisor, Chassis	BSME, PE	14 yrs. industry experience at Westinghouse, Park Hannifin & GILLIG
D. Williamson	Proj. Mngr./Mechanical Engineer I	BSME	4 yrs. industry experience at Kratos Unmanned Aerial Sys. & GILLIG
R. Williamson	Sr. Design Engineer	MS, MEng ME	11 yrs. industry experience GE, Tesla & GILLIG
B. Wu	Design Engineer Electrical Systems	BSEE EIT	21 yrs. industry experience at Pulver Genau & GILLIG
C. Xue	Program Manager NPI	BSME	7 yrs. industry experience at BYD & GILLIG
J. Yang	Electrical Engineer	MSEE	12 yrs. industry experience at Auto, Commercial Avionics, BAE & GILLIG





### TRAINING OVERVIEW

GILLIG wishes to advise the AGENCY that all training programs presented by GILLIG instructors are individually tailored to be representative of the vehicle specifications and equipment supplied on the buses at the time of delivery. These programs may also be modified further to meet the needs and/or time constraints of the customer at the preproduction meeting, if GILLIG is the successful bidder.

GILLIG's field service technicians and trainers are GILLIG employees with the experience and knowledge to provide the AGENCY with training customized to your bus. Operator and Maintenance orientation and familiarization training will be provided during the post-delivery inspection, which generally takes place within the week following delivery of the units to your location. This training will be customized to your buses, is provided in addition to the training requirements specified in the RFP and is provided at no additional cost. As well, the field service technicians who perform the post-delivery inspection typically will work with the maintenance staff as they perform any necessary repairs in order to provide further training contemporaneously with the repair.

More in-depth training will be scheduled and provided by GILLIG trainers on a mutually agreed upon schedule based upon the AGENCY's needs. These training classes are specified in the GILLIG bid and class descriptions are provided therein. However, as it is GILLIG's desire to provide the best and most effective training for our customers, we encourage the AGENCY's training coordinators to contact the GILLIG Training Department prior to the class start dates, to pass along any items or issues that you wish to be elaborated on, or items that need not be covered. This allows the trainer to further tailor the class to best meet the needs of the AGENCY personnel.

GILLIG strives to go above and beyond all minimum requirements to ensure that we provide the best customer service in the industry. Providing the tailored training that our customers need to make them as efficient as possible is just another example of our commitment to this philosophy.

The GILLIG proposal includes the training modules as outlined below.

- 1. GILLIG Basic Bus Training provided at Post Delivery Inspection
- 2. Operator Orientation provided at PDI
- 3. GILLIG will provide a complete set of Low Floor training video's on USB

Additional Training may be purchased separately and can be quoted upon request.

Attached is our **AVAILABLE OPTIONAL – TRAINING PROGRAM** with additional information on training that is available.



### TRAINING

### CUSTOMER CARE SUPPORT NETWORK

#### **EXECUTIVE DIRECTOR, CUSTOMER CARE**

Victor Doran

#### SERVICE MANAGER

Eric Ocampo

#### WARRANTY MANAGER

Micah Denecour

#### **TECHNICAL ADVISOR**

Bo Vongamath

### **TECHNICAL TRAINERS**

Russ Ando	-	Seattle, WA
Lyle Archambeau**	-	St. Paul, MN
Ben Braun	-	Baltimore, MD
Blaine Fagel	-	Charlotte, NC
Kevin Hardesty	-	Columbus, OH

### FIFI D SERVICE REPRESENTATIVES \*

FIELD SERVICE REPRESENT	TATIVES *	BASED:
Mark Bittner	-	Clearwater, FL
Rob Bolog	-	Detroit, MI
Cody Campeau	-	St. Paul, MN
Jason Fairclough*	-	Salt Lake City, UT
Jose Garcia	-	San Francisco, CA
Dave Hagopian*	-	St. Louis, MO
Scott Kovaly	-	Pittsburgh, PA
Tim Lopez	-	San Francisco, CA
Sam Nicoara	-	Atlanta, GA
Paul Oden, Jr.		Cincinnati, OH
Joe Rhea*	-	Dallas, TX
Richard Salas*	-	San Francisco, CA
Steven Sayne*	-	Seattle, WA
Jason Schwalbert	-	Phoenix, AZ
Thomas Seymour	-	Denver, CO
Joy Sisouvanthong	-	Boston, MA
Sang Tran*	-	Los Angeles, CA

Based:

### FIELD SERVICE & WARRANTY

FIELD SERVICE & WA	ARRANTY	Phone - 800-735-1500 Fax- 510-785-1348
Victor Doran	Exec.Director, Customer Care	victor.doran@gillig.com
Eric Ocampo	Service Manager	eocampo@GILLIG.com (call to schedule training)
Micah Denecour	Warranty Operations Manager	micah.denecour@GILLIG.com
Johnny Phothipanya	Warranty Processing Specialist	jphothipanya@GILLIG.com
Bo Vongamath	Technical Advisor	bvongamath@GILLIG.com
Dominic Nava	Warranty Parts Specialist	dnava@GILLIG.com (call to order warranty parts)
Vy Vu	Field Service Coordinator	vvu@GILLIG.com
Kristina Aldana	Administrative Assistant	kaldana@GILLIG.com

Training instructors employed by GILLIG are fully qualified service personnel with extensive "hands on" experience on our coaches. They have been trained in all phases of coach repair including, but not limited to major component replacement and repair, electrical troubleshooting, suspension and frame repair as well as repair of all ancillary components and systems.

\* Performs pre-delivery service at the customer site, as well as ongoing field product support services.

\*\* ASE Certified Mechanic



### FIELD SERVICE QUALIFICATIONS

### VICTOR DORAN - Executive Director, Customer Care

Victor is responsible for all areas of Field Service, Warranty, Customer Acceptance, and coordinates the efforts of the entire department. Victor utilizes his many years of experience with heavy-duty motor vehicle production to lead a team of more than 30 on site and field-based representatives ensuring 100% customer satisfaction. Victor earned a Bachelor of Science in Mechanical Engineering Technology from Kent State University in Ohio.

### **ERIC OCAMPO** – Service Manager

Eric has been with GILLIG since January 1987. He came to GILLIG from A.C. Transit where he worked for 2 ½ years involved in special projects. He has 1 year in R.O.C. diesel technology and electrical and 5 years as an automotive technician. He also received training on DDEC, Allison, Lift-U wheelchair lifts and Luminator destination signs for troubleshooting and repair. Eric spent 10 years as a Field Service Representative and was a Field Service Trainer from 1996-2013. In April 2002, he completed training with Cummins I.S.L. troubleshooting and familiarization, and in November 2004, he completed training with Allison Hybrid electric drives. Since 1999, he has received numerous extensive training classes from I.O. Controls Multiplex Systems covering the T-1, T-2, G-3 and the latest G-4 systems. In 2013, he became the Warranty Administrator.

### MICAH DENECOUR – Warranty Manager

Micah has been with GILLIG since October 2016. He has worked in the Industrial Engineering, Supply Chain, and Warehousing teams at GILLIG. Micah holds a BS and MS in Industrial Engineering from Cal Poly. Prior to GILLIG he worked in the medical device industry.

### RUSS ANDO - Trainer

Russ resides in Washington State and covers the Pacific Northwest Region. Russ Joined GILLIG in March 2001 and worked in several areas on the production line, including line foreman. In July 2002, Russ joined the Field Service Department. He has done classic auto restoration since 1979 and has completed several body-off, frame-up restorations. Along with his knowledge of mechanics and hands on approach to his job, he earned a BFA with honors in illustration from California College of Arts and Crafts.

### LYLE ARCHAMBEAU – Trainer

Lyle lives in St. Paul, MN and covers the Midwest region. He has been employed at GILLIG since 1989. He has three years' experience in Heavy vehicle Maintenance while stationed in the U.S. Army. Also, Lyle has five years' experience in the Automotive Maintenance Industry. He is ASE Certified in Auto Electric, Brakes, Suspension, Engine Performance and Engine Rebuilding. He has attended classes at Auto tech for Air Conditioning, and Engine Electronics Controls and Diagnosing.



### MARK BITTNER - Senior Field Service Representative

Mark joined our GILLIG family in 2019. He brings extensive knowledge and experience in transit bus maintenance and troubleshooting. He grew up in Pittsburgh, PA and is a graduate of Steel Center Technical School and Ohio Diesel Technical Institute. He began his career in 1986 with a Pittsburgh based Detroit Diesel Allison distributor. There he served in troubleshooting, repair and overhaul of all Detroit Diesel Allison Propulsion systems. From 1993 through 2018 Mark worked for the Port Authority of Allegheny County in Pittsburgh, PA. There he performed all aspects of transit bus maintenance, troubleshooting and repairs. While there he became a bus maintenance technical support. Since 2005 Mark has been working with GILLIG busses at the Pittsburgh Port Authority of Allegheny county. Mark also enjoyed owning a business in Pittsburgh, PA with his two sons where they design and build racing engines and offer field service repairs for a diesel propulsion systems. Mark and his family now reside in the Florida.

### **ROB BOLOG** – Senior Field Service Representative

Rob graduated from Michigan State University where he completed a Power Equip. Technology program. Rob started in the heavy equipment and consumer products business (chainsaws to excavators) in 1978 before moving to the Ann Arbor Transit as a technician in 1984. He was a maintenance supervisor and warranty administrator at the time he retired in 2018 to join the GILLIG Field Service Team.

### **<u>CODY CAMPEAU</u>** – Field Service Representative

Cody lives in New Richmond, WI and covers the Midwest region, he joined the GILLIG family in 2019 after working as a contractor for GILLIG since 2010. During that time he gained experience from many hands on repairs and projects he was involved with.

### **BEN BRAUN** – Trainer

Ben lives in Street, MD and covers the Eastern Region. He has been employed with GILLIG since 1995 and has been in the motorcycle, automotive, truck and bus industry full time since 1971. He has experience in all areas of fabrication, welding, manual machining, repair, welding and diagnostic work. He previously was a GM Buick Master certified technician and held ASE Master Technician certification from 1985 to 2000.

TRAINING



### **BLAINE FAGEL** – Trainer

Blaine joined GILLIG as an FSR in 2006 and moved to Trainer in 2010. He began in the trucking industry in 1990. He has been in the transit industry since 1995. He has fueled trucks/buses and performed preventative maintenance. He has also been a technician, union officer, shop supervisor, technical spec writer and QA officer. He worked for Lynx Orlando from 1995-2003 and Charlotte CATS from 2003-2006. He has been ASE Certified for heavy truck steering and suspension, A/C refrigerant recovery and recycle, as well as for bus/truck air brakes. Blaine is also a Type I & II Certified A/C Technician. He has taken many classes for electrical, preventative maintenance, suspension, hydraulics, brakes, A/C, wheelchair lift (Lift-U), Cummins, Detroit Diesel, Allison, Amerex as well as many managerial courses in people skills, time management, computer software for transit specific products, Excel, Word, Outlook, Adobe Professional, and PowerPoint.

### JASON FAIRCLOUGH - Senior Field Service Representative

Jason has been employed with GILLIG since March 2001. He has 3 years' experience as a Quality Engineering Technician for Nova Bus Inc. Where he had taken several classes: Kizan, Metrology, Paint and Body. Jason also has a certificate from the National Fire Academy, for Hazardous Materials Incident Analysis, Hydraulics and Fluidics. While at GILLIG, Jason has taken classes in I/O, Air Systems, Allison Electric Drive, and Service Training. In addition, Jason has been building and racing vehicles since 1989.

### JOSE GARCIA - Field Service Representative

Jose joined GILLIG in the Production Department in 2015. He started in second shift and became a lead after four months. After one year, he moved to first shift labor pool and worked various departments before joining Field Service. Before GILLIG, Jose worked for 15 years as an auto mechanic. He started as a lube mechanic as a tech 1, then became a tech 4 master mechanic. He attended De Anza College and completed the automotive program. He also completed 3 ASE certified tests.

### **DAVID HAGOPIAN** – Senior Field Service Representative

Dave lives in southern Illinois and covers the Midwest region. He has been employed with GILLIG since November 2000. Dave came to GILLIG with 19 years of experience as manager, service writer and mechanic in the automotive industry. He has been ASE certified in heating, air conditioning, and electrical/electronic systems. He is trained in industrial electronics at Southwestern Illinois College.



### **SCOTT KOVALY** – Field Service Representative

Scott was born and raised in Pittsburgh PA where he currently live with his wife, son and daughter. He graduated from Rosedale Technical College in 1988. After Rosedale he worked for GM, VW and Ford as the transmission and drive-ability specialist until 1994. He began his transit career with the Port Authority of Allegheny County in 1993 where he held various positions to include, hourly technician, materials control specialist, maintenance technical trainer, assistant manager of maintenance, manager of maintenance and bus procurement specialist. Scott holds ASE Master Technician status in Transit, Automotive and Heavy disciplines. He joined the GILLIG family in October of 2019 with the Field Service Department.

### KEVIN HARDESTY - Trainer

Kevin has been a technical coach trainer since 1987. He has been a field service trainer for GILLIG since 2005. Prior to being employed as a field service trainer for GILLIG, Kevin operated his own technical training company for 9 years. Kevin started as a technical trainer for the Flxible Corporation in 1987. He also spent 2 years at the Central Ohio Transit Authority as the Training Supervisor. During his time at these positions, he has performed technical writing and created numerous training classes using PowerPoint software. His other duties have included various field service tasks as required.

### TIMOTHY LOPEZ – Field Service Representative

Tim has been employed with GILLIG since January 2007. He worked in Labor Pool for five years and three years in Ready Row. Two of the three years in Ready Row he obtained his Commercial Driving License. While working in Ready Row he took customers on test drives on their new buses and explained the functionality of the bus. He studied Automotive Maintenance and Repair along with Machine Shop in High School Regional Occupation Center (R.O.C.). He received an Associate of Occupational Studies degree from Universal Technical Institute.

### **SAMUEL MAC NICOARA** - Field Service Representative

Sam was born in Romania and immigrated to the US in 1980. In 1994, he graduated Sierra Academy of Aeronautics in Oakland, CA and received an aeronautical degree in Airframe & Powerplant as well as flight engineering. He applied his training in the aviation field and helped expand a superconducting magnet fabricating plant that he managed for over 10 years. In 2014, he joined GILLIG and worked as a troubleshooter in the Electrical Department. In 2016, he joined Field Service as a field service representative, servicing customers nationwide.

### **PAUL ODEN, JR.** – Field Service Representative

Paul has in-depth experience working on GILLIG buses. For 19 years, he has served as a mechanic for the South Western Ohio Regional Transit Authority in Cincinnati, maintaining GILLIG buses and Cummins powertrains. He particularly enjoyed working on schematics and using his problem-solving skills. Paul joined GILLIG in October of 2019.



### JOE RHEA - Senior Field Service Representative

Joe has been employed with GILLIG since 1988 and has had training in Voith, Transmission troubleshooting, & Lift-U Wheelchair lifts and Luminator Electric Destination Signs. He has also attended training classes by the GILLIG trainer in the Electrical System, Air System and Hydraulic systems on the GILLIG buses. Joe lives in Central Texas and covers the Southern Region.

### **<u>RICHARD SALAS</u>** – Senior Field Service Representative

Richard has been employed with GILLIG since 1998. He worked in Labor Pool for one year and worked 4 years as a Working Foreman in the Trim department. He was also the Working Foreman for the Maintenance Department on 3rd shift. He has attended training courses for the Dinex and Air systems. He is based out of the San Francisco area.

### **STEVEN SAYNE** – Field Service Representative

Steven has been employed with GILLIG since June 2003. He worked with 1st shift Maintenance Department for 3 years. He was also the Working Foreman for the Maintenance Department on 2nd shift for 5 years. He has 10+ years of automotive and machine service and repair experience. He also has 10+ years of electrical and electronics service and repair experience. He has attended training courses for the Dinex and Air systems. He resides in Washington State and covers the Pacific Northwest Region.

### JASON SCHWALBERT – Field Service Representative

Jason has been employed with GILLIG since December of 2017. Prior to that, he worked in the Phoenix Transit System for over 17 years as a Project Lead performing duties ranging from Transit Bus Maintenance to Shop Management. Jason has accumulated many Certifications and Licensing over the years including 3 ASE Master Certifications, Both A/C Section 608 Universal, & Section 609 certifications, and a Class B CDL w/Passenger Endorsement. He has earned an Associate Degree in Automotive, Diesel, and Industrial Technologies from Universal Technical Institute. Jason lives just outside Phoenix in Goodyear AZ.

### **THOMAS SEYMOUR** – Field Service Representative

Tom has been with GILLIG since November of 2018. Prior to joining GILLIG, he worked at the Kansas City Area Transportation Authority. He spent 13 years as a Class A Mechanic, and 1 year as the Maintenance trainer. He has multiple ASE certifications, HVAC Type II certification, and is a Certified CNG fuel Cylinder and Systems inspector. He holds a Class A CDL w/passenger endorsement. He has been trained on Voith transmissions, Allison transmissions, Cummins engines, Agility fuel systems, Lift-U, Thermo King Intelligaire I & II, Dinex T2/G3/&G4, J1939, and Amerex fire suppression. He has competed and won multiple awards at the APTA International Bus Roadeo.



### JOY SISOUVANTHONG - Field Service Representative

Joy started working at GILLIG in 2015. He worked in the Labor Pool Department then transferred to 03 Electrical Department until 2016 when he became a Field Service Rep. He worked various jobs on the line and did pick up work for all departments. His main focus became programming buses on Engine Transmission and downloading the I/O program along with troubleshooting.

### **SANG TRAN** – Senior Field Service Representative

Sang joined GILLIG in March 1997. He first started out in Dept. 04 for a few months then transferred to the Labor Pool in late 1998. For the following years, he worked throughout most departments, and spent most of his time in Dept. 03 (Electrical), performing work duties such as front dash harnesses/main electrical panel installations, engine power trouble shooting for buses to start before they get into Rack area (Dept.09). In mid-2001, Sang became a Field Service Representative and relocated to Fairfax County in State of Virginia. During his service years, he had attended training courses for Dinex and Air Systems. Before joining GILLIG, Sang worked for Morehouse Foods Co. in Emeryville, CA as a lead machinist and oversaw the high volume of bottling, labeling, capping machines, and performed electrical trouble shooting problems as required. Upon CNG market demand in Southern California, Sang lives in Orange County, CA in and covers the Pacific Southwest region.

### **BO VONGAMATH** – Technical Service Advisor

Bo has been with GILLIG since January of 1999. He worked 2 years in the Labor Pool, 3 years in the Electrical Department and 4 years as a Quality Inspector in the Field Service Department. He also received training on Allison Electric Drive, Certified ASE Refrigerant Recovery and Recycling. Before GILLIG, Bo worked at Chuck E. Cheese as their Electronic Technician for 10 years.



# **AVAILABLE OPTIONAL - TRAINING PROGRAMS**

All training programs presented by GILLIG are individually tailored to be representative of the vehicle specifications and equipment supplied on the buses at the time of delivery. These programs may also be modified further to meet the needs and/or time constraints of the customer at the pre-production meeting. GILLIG's training program is designed to instruct your transportation and maintenance personnel in the proper methods of operating, maintaining, and servicing the buses. Your training program has been specifically addressed in the appropriate section of this proposal and we are certain it will exceed your expectations.

Our training programs have been well accepted by other transit agencies as described in the attached customer testimonials.

You will also note that our technical trainers have extensive Mechanical Maintenance experience and hold numerous training certifications.

To further aid in the training of your maintenance group, GILLIG will supply a set of bus training DVD's.



# **GILLIG FIELD SERVICE TRAINING PROGRAM**

### **OBJECTIVE:**

Our training programs are specifically designed to acquaint our customers with their new GILLIG transit bus and to ensure their understanding for proper operation, maintenance, diagnosis and repair of their coach, which employs the latest in "state of the art" bus technology.

These programs will help our customers maximize the potential of the GILLIG transit bus throughout its life.

All training programs presented by GILLIG instructors are individually tailored to be representative of the vehicle specifications and equipment supplied on the buses at the time of delivery. These programs may also be modified further to meet the needs and/or time constraints of the customer.

### PROGRAM PLAN(S):

The basic programs shall be presented as follows:

- Operator Instruction
- Maintenance Department General Vehicle Orientation
- Air Systems and Brake
- Basic Bus Electrical System
- Multiplex Electrical System
- Hydraulic System
- E-FAN System
- Gillig Battery Electric Bus Safety & Familiarization
- Entrance/Exit Door Systems



### **OPERATOR INSTRUCTION**

### **OBJECTIVE:**

This class will take approximately four hours and class size should not exceed six drivers. This is a "hands-on" program to familiarize the driver in the proper operation of the GILLIG transit bus and requires that a coach be made available by the customer for this instruction. Topics included in this program are:

- A. Seat and Seat Belt Operation and Adjustments
- B. Steering Column Adjustments
- C. Switches and Controls
  - 1. Location
  - 2. Proper Operation
  - 3. Function
- D. Instrumentation and Warning Lights
- E. Entrance and Exit Door Operation
- F. Wheelchair Ramp Operations 1. Safety Precautions
- G. Brake Interlock
  - 1. Safety Precautions
- H. Speed Switch Circuit
  - 1. Verbal Explanation
  - 2. Demonstration
  - 3. Safety Precautions
- I. Engine Protection System
  - 1. Controlling Functions
  - 2. Shut Down Sequence
  - 3. E.P.M. Override
    - a. Purpose
    - b. Proper Usage
- J. Gillig Battery Electric Bus Operation



### TRAINING PROGRAM MAINTENANCE DEPARTMENT GENERAL VEHICLE ORIENTATION

### **OBJECTIVE:**

This is an on-vehicle instruction program to acquaint the mechanic with the operational aspects of the GILLIG transit bus, as well as the components employed in its operation and their locations. It also provides brief explanations and demonstrations of how and when various systems interface with each other. These explanations and demonstrations are designed to provide the mechanic with a better understanding of the system logic employed and ultimately result in more rapid and accurate diagnosis and repair. Other areas covered in this orientation program are maintenance items and can be tailored for in-depth instruction on the door system, hydraulic system, steering system, suspension systems, and propulsion systems.

This class will take approximately eight hours to complete with a maximum class size of twelve mechanics. A coach must be made available for this instruction by the customer. Please be aware that any identified system can be expanded on and discussed more indepth in subsequent classes. Topics included in this program are:

- A. Seat and Seat Belt Operation and Adjustments
- B. Steering Column
  - 1. Adjustments
  - 2. Maintenance
- C. Switches and Controls
  - 1. Location
  - 2. Proper Operation
  - 3. Function
  - 4. System Interfacing
  - 5. Diagnostic Tips on the More Complex Systems
- D. Instrumentation and Warning Lights
- E. Engine Protection System
  - 1. Controlling Functions
  - 2. Shut Down Sequence
  - 3. E.P.M. Override
    - a. Purpose
    - b. Proper Usage
- F. Brake Interlock
  - 1. Components
  - 2. Operational Description
  - 3. Explanation of Circuits that Apply Interlock
  - 4. Interlock Air Pressure Adjustment



5. Override

# **TRAINING PROGRAM**

- 6. Safety Precautions
- G. Under 3 MPH Speed Switch Circuit
  - 1. Operational Description
  - 2. Diagnosis of Circuit
  - 3. Safety Precautions
- H. Wheelchair Ramp
  - 1. Components and Component Location
  - 2. Operation
  - 3. Safety Device
  - 4. Safety Precautions
- I. Entrance Door
  - 1. Components and Component Location
  - 2. Operation
  - 3. Door Panel Adjustment
  - 4. Door Motor Adjustments
  - 5. Proximity Switch Adjustments
- J. Exit Door
  - 1. Components and Component Location
  - 2. Operation
  - 3. Door Panel Adjustments
  - 4. Door Motor Adjustments
  - 5. Micro/Proximity Switch Adjustments

K. Compartment by Compartment Tour of Bus

- 1. Components and Component Location
- 2. Operational Descriptions of Systems Viewed
- 3. Maintenance Information
- 4. Diagnostic Tips and Test Procedures
- 5. Safety Precautions
- L. Vanner Equalizers
  - 1. Component Location
  - 2. Operational Description
  - 3. Test Procedures
- M. Hydraulic System
  - 1. Component and Component Location
  - 2. Description of Components and Maintenance Required
  - 3. Explanation of Fan Drive Circuit and Its Function
  - 4. Explanation of Steering Circuit and Its Function
  - 5. Presentation of Flow and Pressure Specifications for Fan Drive and Steering Circuits



- 6. Description and Explanation of Test Equipment Needed to Properly Diagnose Hydraulic System Problems
- 7. Safety Precautions
- N. E-FAN System
  - 1. Individual Fan Location and Function
  - 2. Location and Function of the EFAN Controller
  - 3. Use of EFAN Controller LED's for Diagnostics
  - 4. Location and Function of EFAN Fuses Panel
  - 5. Reverse Fan Operation
  - 6. Safety Precautions
- O. Fire Alarm System
  - 1. Components and Component Location
  - 2. Operational Description
  - 3. Test Procedures
- P. Steering and Front Suspension
  - 1. Explanation of Front Ride Height Adjustment and Specifications
  - 2. Explanation of Adjustment Points for Front End Alignment
  - 3. Explanation of Front Shock Absorber
  - 4. Explanation of Steering and Suspension Maintenance Requirements
- Q. Rear Suspension
  - 1. Components and Component Location
  - 2. Discuss Inspection of Welds
  - 3. Discuss Inspection of Suspension Components
  - 4. Discuss Bushing Wear and Bushing Replacement
  - 5. Explanation of Rear Ride Height Adjustment and Specifications
  - 6. Explanation of Adjustment Points for Rear End Alignment
- R. Engine Cooling System
  - 1. Components and Component Location
  - 2. Explanation of Cooling System Maintenance Requirements
  - 3. Safety Precautions
- S. Gillig Battery Electric Bus
  - 1. System Components and Component Location
  - 2. Drive System Theory of Operation
  - 3. High Voltage Safety
  - 4. LOTO Discussion



### AIR SYSTEM AND BRAKES

### SCOPE:

This is a sixteen hour program of which approximately the first thirteen hours of instruction will take place in a classroom setting utilizing a color coded air system drawing projected from a laptop with a projector. Each student will have a copy of the drawing and a detailed power point handout to follow along through the air system circuits. The remaining time will be spent applying the classroom information to the vehicle in "hands-on" tests and adjustments.

The customer shall make available a suitable room for training that is appropriately equipped, keeping in mind the class size shall not exceed twelve mechanics, and a bus for the last segment of the training program.

### **OBJECTIVE:**

This program will focus primarily on providing the mechanic with a better understanding of the air system, its components, and their operation under various operating conditions. The class participants accomplish this by viewing and following along with the colored air flow charts for normal brake operation, brake operation with loss of primary air, brake operation with loss of secondary air, brake interlock, and anti- compounding circuits to facilitate diagnosis of air leaks. Presentation of a comprehensive systematic air system test procedure will also be included in this program. The air flow charts, when used in conjunction with these air system tests, will aid the mechanic in determining if the components in the air and braking systems are operating properly and may also be used as a tool in the diagnosis and isolation of a problem or air leak in the system.

The secondary focus of this program is on the mechanical aspects of the braking system such as but not limited to the operational principles of the Haldex slack adjuster, initial set up and adjustments of the Haldex slack adjuster, maximum push rod travel, and push rod angles, air dryer operation and compressor troubleshooting. Additional topics will be covered upon request by the customer based on their particular need or desire. ABS and Traction control systems will also be discussed.

Brief overview of disc brake system including wheel end overview and differences to air system.

### BASIC BUS ELECTRICAL SYSTEM

### SCOPE:

This is a twenty-four hour program for a maximum of twelve mechanics. The program will take place in both the classroom setting utilizing the supplied power point handout and on the coach for practical application of the classroom material. The customer shall make available a suitable room for training that is appropriately equipped. The customer will also make available for training the schematics for the bus that the class is training on.



### **OBJECTIVE:**

### TRAINING PROGRAM

This program is designed to help the mechanic utilize the GILLIG electrical diagrams and schematics to the fullest extent possible. This will promote a better understanding of the system logic, resulting in less time consuming and more accurate diagnosis. Topics included in this program are:

- A. Review of Basic Electrical Principles
  - 1. Use of Digital VOM
  - 2. Open Circuits
  - 3. Completed Circuits
  - 4. Shorted Circuits
    - a. Dead Short
    - b. Cross Short
  - 5. Series Battery Connections
    - a. Results
    - b. Benefits
  - 6. Parallel Battery Connections
    - a. Results
    - b. Benefits
  - 7. Series Circuits
    - a. Benefits
  - 8. Parallel Circuits
    - a. Benefits
  - 9. Voltage Drop
    - a. Demonstration of How to Use Voltage Drop for Diagnostic Purposes
- B. Relays Used in GILLIG busses
  - 1. Description of Internal Operation
  - 2. Symbols as Represented on Drawings
  - 3. Functional Diagrams
- C. Diodes
  - 1. Explanation of Operational Principles
  - 2. Uses
  - 3. Symbols and How to Determine Directional Flow
  - 4. Test Procedures
- D. Transistors
  - 1. PNP's
  - 2. NPN's
  - 3. Test Procedures
- E. General Electrical Symbols
  - 1. Fuses
  - 2. Circuit Breakers



- 3. Resistors
  - a. Fixed Resistors
  - b. Variable Resistors
- 4. Coils
- 5. Normally Open Contacts
- 6. Normally Closed Contacts
- 7. Pressure Switches

### F. Information Supplied on GILLIG Electrical Diagrams

- 1. Print Number
- 2. Revision
- 3. Part Numbers
- 4. Torque Specifications
- 5. Drawing Size
- 6. Component Location
- 7. Wiring Connector Locations
- 8. Wiring Numbering System
- 9. Wiring Color Coding

### G. Typical Electrical Diagrams or Schematics Used to Determine System Logic

- 1. Battery Cables with Cut Off Switch
  - a. For Charging System Diagnosis
  - b. For Vanner Equalizer System Diagnostic
- 2. Ignition, Start, Fast Idle
  - a. For Front Run Diagnosis
  - b. For Rear Run Diagnosis
  - c. For Fast Idle Diagnosis
- 3. Wheelchair Ramp
  - a. For Wheelchair Ramp Interface Diagnosis
- 4. Kneeling
  - a. For Kneeling Diagnosis
  - b. For Raise Diagnosis
- 5. Stop Request
- 6. Fire Alarm
  - a. For Engine Fan Circuit Diagnosis
  - b. For Fire Alarm Diagnosis
- 7. Rear Door
  - a. For rear Door Operation Diagnosis
  - b. For sensitive Edge Diagnosis
  - c. For Door Alarm Diagnosis
- 8. Interlock
  - a. For Under 3 MPH Circuit Diagnosis
  - b. For Interlock Diagnosis

H. Different or additional circuits will be covered upon the customer's request.



### SCOPE:

This is a twenty-four hour program for a maximum of twelve technicians. The program will be split between a classroom setting and on the bus. The classroom portion will use the supplied handout and the specific vehicle schematics. Using a digital projector the instructor will cover the supplied handout. The customer shall make available a suitable room for training that is appropriately equipped.

### **OBJECTIVE:**

This program is designed to help the technician utilize the GILLIG electrical schematics and ladder diagrams to the fullest extent possible. This will promote a better understanding of the system logic, resulting in less time consuming and more accurate diagnosis. Topics included in this program are:

- A. General Information Supplied in the Gillig Electrical Schematics
  - 1. Vehicle Identification Numbers and Bus (Fleet) Numbers
  - 2. Safety Precautions
  - 3. Print Numbers
  - 4. Part Numbers
  - 5. Torque Specifications
  - 6. Welding Precautions
  - 7. Component Locations
  - 8. Wire Circuit Identification
  - 9. Power Cables and Wire Color Coding
  - 10. Different Types of Wire Connectors that Gillig uses
  - 11. Wire Connector Location Guide

B. General Electrical Symbols Used in the Gillig Electrical Schematics

- 1. Ground Symbols and How to Identify and their Locations on the bus
- 2. Fuses and Locations of the Main Power Fuses
- 3. Circuit Breakers, Circuit Breaker Numbers, and Locations
- 4. Resistors
- 5. Different Types of Switches (Toggle, Push Button, Rotary, Proximity, Pressure Type)
- 6. Wire Connector Symbol and How to use the Information Provided Inside the Symbol
- 7. Normally Open Contacts
- 8. Normally Closes Contacts
- 9. L.E.D. (Light Emitting Diode) Benefits and where we use them
- 10. Diodes and Diode Pack Test Procedures, Locations, Where Used
- C. Review of Basic Electrical Principles
  - 1. Open Circuits and How to Troubleshoot
  - 2. Shorted Circuits (Direct Short and Cross Short) and how to Troubleshoot



- 3. Completed Circuits
- 4. Series Battery Connections
- 5. Results
- 6. Benefits
- 7. Parallel Battery Connections
- 8. Results
- 9. Benefits
- 10. Series Circuits and their Benefits
- 11. Parallel Circuits and their Benefits
- 12. Voltage Drop Demonstrations to use for Diagnostic Purposes.
- D. Introduction to Multiplex
  - 1. What is and Why Multiplex
  - 2. Why Gillig uses Multiplexing Systems
  - 3. How Multiplex Works in a bus
  - 4. Benefits of having a Multiplex system
- E. Coach Zone Concept
  - 1. Zone Layout
  - 2. Zone Function
  - 3. View of Each Zone
  - 4. Communication Process of each Zone
  - 5. Communication Harness and Location
  - 6. Diagnostic Fault Codes for Communication
- F. I/O Controls Corporation "Dinex" Components
  - 1. Power Management Module(PMS)
  - 2. High Speed Cell Network Control Module (D2)
  - 3. Main Bus Controller (MBC)
  - 4. Digital Input/Output Module (A1,B2,B3,B4,C1,D3,D4)
  - 5. 816 Modules
  - 6. 16/16 Modules
  - 7. Digital 32 Input Module (A2)
- G. I/O Controls Corporation "Dinex" Components (cont.)
  - 1. The "Smart" Indicator Light Bar (B1)
  - 2. Digital 24 Output Module (B5) if Applicable
  - 3. Multi-Function Display (MFD)
  - 4. Explanation of the module I.D.'s
  - 5. Explanation of each Different Colored L.E.D.'s on each Module
  - 6. Component Function and Location
  - 7. System Interface Using the Multiplex Inputs and Outputs Chart
- H. Ladder Logic Diagrams
  - 1. Why we use Ladder Logic Diagrams
  - 2. How to read a Ladder Logic Diagram
  - 3. How to use a Ladder Logic Diagram for Troubleshooting the System



- I. Electrical System Interface
  - 1. Multiplex System Power
  - 2. Starting System
  - 3. Charging System with Vanner Equalizer
  - 4. Tail and Marker Lights
  - 5. Turn Signals
  - 6. Kneeling System
  - 7. Wheelchair Ramp Power
  - 8. Fast Idle
  - 9. Brake and Throttle Interlock System
  - 10. Senders and Switches and Engine Shutdown System

### J. J1939 Controller Area Network

- 1. J1939 Theory
- 2. Gateway Function
- 3. Backbone Construction and Troubleshooting
- 4. Stub and Extension Cable Troubleshooting
- 5. Complete Network Troubleshooting
- K. Diagnostics and Troubleshooting
  - 1. Using the L.E.D.'s for Circuit Integrity
  - 2. Using the Ladder Logic Diagrams
  - 3. Using the Gillig Electrical Schematics
  - 4. Using the "Dinex" Diagnostic Tools
    - a. G3-MK-TEST KIT
    - b. G3-MK-ID-WRITER
    - c. G3-MK-PROGRAM KIT
    - d. Real Time Logic (RTML)
  - 5. Create Defects in the bus Multiplex Electrical Systems for the Technicians to Locate and Repair.
- L. Different or Additional Circuits will be covered upon Customers Request.

### HYDRAULIC SYSTEM

### SCOPE:

This is an eight hour program of which approximately the first four hours of instruction will take place in a classroom setting utilizing a hydraulic system drawing projected from a laptop with a projector. Each student will have a copy of the drawing and a detailed power point handout to follow along through the hydraulic system. The remaining time will be spent applying the classroom information to the vehicle in "hands-on" tests and adjustments.

The customer shall make available a suitable room for training that is appropriately equipped, keeping in mind the class size shall not exceed twelve mechanics, and a bus for the last segment of the training program.



### **OBJECTIVE:**

This program will focus primarily on providing the mechanic with a better understanding of the hydraulic system, its components, and their operation under various operating conditions. The class participants accomplish this by viewing and following along with the hydraulic system

drawing. The hydraulic flow charts will aid the mechanic in determining if the components in the hydraulic system are operating properly and may also be used as a tool in the diagnosis and isolation of a problem in the system. Safety precautions, maintenance, and troubleshooting will also be discussed.

- A. Hydraulic Safety
- B. Hydraulic Reservoir
  - 1. System/Reservoir Capacity
  - 2. Fluid type
  - 3. Filter/Fluid Change Intervals
- C. Hydraulic Pump
  - 1. Type
  - 2. Flow Rates
  - 3. Inspection
- D. Hydraulic Manifold
  - 1. Valve Identification/Ratings
  - 2. Flow through The Valves
  - 3. Inspection
- E. Steering Gear Box
  - 1. Flow Through the Box
  - 2. Inspection
  - 3. Flow Rates Needed
  - 4. Gear Box Bleeding Procedures
- F. Fan Drive Motor
  - 1. Motor Operation
  - 2. Motor Inspection
  - 3. Required Motor Speeds
- G. Fan Drive Controller
  - 1. Required Wiring
  - 2. J1939 Interface
  - 3. Controller Logic
  - 4. Verification of Operation
- H. Hydraulic Cooler
  - 1. Location



2. Maintenance

3. Cooler Pressure Relief Valve

TRAINING PROGRAM

### E-FAN SYSTEM

### SCOPE:

This is a four to six hour program of which approximately the first four hours of instruction will take place in a classroom setting utilizing a detailed system handout. The handout material will be projected from a laptop and projector while each student follows along. The remaining time will be spent applying the classroom information to the vehicle in "hands-on" tests and adjustments.

The customer shall make available a suitable room for training that is appropriately equipped, keeping in mind the class size shall not exceed twelve mechanics, and a bus for the last segment of the training program.

### **OBJECTIVE:**

This program will focus primarily on providing the mechanic with a better understanding of the EFAN systems, their components, and operation under various operating conditions. While Gillig utilizes two different EFAN systems, the scope and objective for each system is the same. The class participants accomplish system understanding by viewing and following along with the system handouts. Presentation of a comprehensive EFAN system test procedure will also be included in this program. The handout, when used in conjunction with the system tests, will aid the mechanic in determining if the components in the EFAN system are operating properly and may also be used as a tool in the diagnosis and isolation of a problem in the system. Safety precautions, maintenance, and troubleshooting will also be discussed.

- A. E-FAN Safety
  - 1. System Do's and Don'ts
- B. Cooling Module
  - 1. Engine Radiator
    - a. Radiator Construction and Airflow
    - b. Inspection and Maintenance
  - 2. Charge Air Cooler
    - a. Construction and Airflow
    - b. Inspection and Maintenance
  - 3. Hybrid Cooler (If Equipped)
    - c. Construction and Airflow
    - d. Inspection and Maintenance
- C. Physical Description Cooling Module
  - 1. Electric Motor Fan Banks



- a. Fan Make and Model
- b. Fan Wiring
- c. Fan Operation and Speeds
- d. Fan Inspection/Maintenance/Reverse
- e. Fan Troubleshooting
- D. EFAN Controllers
  - 1. Controller Overview
  - 2. Controller Logic
  - 3. Controller Wiring
  - 4. Controller Protection Features
- E. Overall System Maintenance and Troubleshooting
- F. Diagnostic Software (If Applicable)

### **GILLIG BATTERY ELECTRIC BUS SAFETY AND FAMILIARIZATION**

### SCOPE:

This is a twelve hour program for a maximum of twelve technicians. The program will be split between a classroom setting and on the bus. The classroom portion will include using a digital projector to cover a PowerPoint handout that will be supplied to the technicians. The projector will also be used to cover all applicable schematics for the Battery Electric Bus system. The on hands portion will cover component location, function and operation. The customer shall make available a suitable room for training that is appropriately equipped.

### **OBJECTIVE:**

After completion of the GILLIG Battery Electric Bus Safety and Familiarization program, each mechanic will be familiar with BEB system component identification, location and operation. We will also cover electrical accessory systems and their operation. Safety precautions and troubleshooting will also be discussed with focus on High Voltage Safety. This will promote a better understanding of the BEB system components and their operation resulting in less time consuming and more accurate diagnosis. High voltage safety will also be discussed.

- A. History of High Voltage Vehicles Used in Transportation
- B. System Operating Voltages and Safety
- C. Importance of Arc Flash, Lock Out Tag Out, and Fall Protection Training
- D. First Responders Card and Emergency Shutdown Procedures
- E. Gillig/Cummins Parts
- F. Discuss PPE in Detail

The Following Components Will Be Covered in Detail



- A. ESS
  - 1. Battery Composition
  - 2. MSD's
  - 3. Battery CAN
  - 4. Battery ID's
  - 5. Power and Ground
  - 6. Battery Isolation
- B. ESS Junction Box
  - 1. High Voltage Disconnect Switch
  - 2. High Voltage Contactors
  - 3. Fuses
- C. High Voltage Junction Box
  - 1. Fuses
- D. Propulsion Invertor and Wiring
- E. Traction Motor and Wiring
  - 1. Speed Sensor and Tone Wheel
- F. DC To DC Convertors and Wiring
- G. DC to AC Convertors and Wiring
- H. System Controllers and Wiring
  - 1. SCM (System Control Module)
  - 2. Charger Control Unit
  - 3. BMS (Battery Management Controller)
- I. Charging receptacles and charging procedures
- J. Ebus Specific Indicator Lights
- K. Kissling Battery Saver Function
- L. High Voltage cabling and Inspection
- M. High Voltage Shut Down and Verification Using Meter
- N. High Voltage Safety Equipment (PPE)
- O. HVIL (High Voltage Interlock)
- P. Battery Thermo Management System
  - 1. Operation and Components
  - 2. Maintenance



3. Fill Procedures

- Q. Air Compressor and Maintenance
- R. Power Steering Maintenance
- S. Electronics Cooling Package (ECP)
  - 1. Operation and Components
  - 2. Maintenance

### ENTRANCE/EXIT DOOR SYSTEM

### SCOPE:

This is a four to eight hour program for a maximum of twelve technicians. The program will be conducted entirely on the bus. The customer shall make available a suitable bus for training that is appropriately equipped.

### **OBJECTIVE**:

This program is designed to help the technician be familiar with and understand the mechanical, pneumatic, and electrical componentry of the entrance and exit door systems. This will promote a better understanding of the system, resulting in less time consuming and more accurate diagnosis. Topics included in this program are:

- A. Entrance Door Motor Operation of Both Pneumatic and Electric Doors.
  - 1. Differential/Electric Door Motor Discussion
  - 2. Opening, Closing and Cushioning Speed Adjustments (Pneumatic Motor)
  - 3. Opening, Closing and Cushioning Speed Adjustments (Electric Motor)
  - 4. Emergency Dump/Unlock Valve
- B. Entrance Door Mechanical Adjustments
  - 1. Door Rods
  - 2. Door Centering
  - 3. Roller Brackets
  - 4. Checking Door Opening for Square
  - 5. Door Lubrication
- C. Entrance Door Electrical Adjustments
  - 1. Door Open Solenoid
  - 2. Door Air Switch Location and Function
  - 3. Proximity Switches
  - 4. Electric Door Motor Adjustments and Speed Programing
- D. Exit Door Pneumatics



1. Door Motor

### **TRAINING PROGRAM**

- 2. Opening, Closing and Cushioning Speed Adjustments
- E. Exit Door Mechanical Adjustments
  - 1. Door Stops
  - 2. Door Motor Shaft
  - 3. Door Rods
  - 4. Door Unlock Solenoid
  - 5. Emergency Release System Maintenance
  - 6. Door Closing Spring
  - 7. Door Lubrication
- F. Exit Door Electrical Adjustments
  - 1. Micro/Proximity Switch Adjustments
  - 2. Electric Motor Speed Adjustments and Software
  - 3. Door Open Solenoid

### PSTA - CLEARWATER, FLORIDA FLORIDA ELECTRIC TRANSIT BUSES BID - RFP 21-980369 – SEPTEMBER 23, 2021

GILLIG LLC warrants to the original purchaser, that its transit coaches, save and except for those major component assemblies and other parts described below which are separately warranted by their respective manufacturer's (OEM's), will be **FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP UNDER NORMAL USE AND SERVICE**, for the distance or time periods specified in the attached, and agrees to REPAIR or REPLACE the defective parts AT NO COST TO THE PURCHASER. This is a limited warranty subject to the provisions stated below and is referred to as GILLIG's Standard Limited Warranty.

This warranty **DOES NOT COVER** malfunction or failure resulting from the purchaser's or its agents or employees alteration, misuse, abuse, accident, neglect or failure to perform normal preventive maintenance as outlined in GILLIG's Service Manual, nor does it cover components or assemblies not originally provided by GILLIG. Further, this warranty **DOES NOT APPLY** to normal replacement items such as light bulbs, seals, filters or bushings, nor to consumable items such as belts, tires, brake linings or drums.

PURCHASER'S SOLE REMEDIES FOR LIABILITY OF ANY KIND WITH RESPECT TO THE PRODUCTS FURNISHED UNDER THIS WARRANTY AND ANY OTHER PERFORMANCE BY GILLIG UNDER OR PURSUANT TO THIS WARRANTY, OR WITH RESPECT TO PURCHASER'S USE THEREOF, INCLUDING NEGLIGENCE, SHALL BE LIMITED TO THE REMEDIES PROVIDED IN THIS WARRANTY AND SHALL IN NO EVENT INCLUDE ANY INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OR LOSS OF USE, REVENUE OR PROFIT. IN NO EVENT SHALL GILLIG'S LIABILITY FOR DAMAGES WITH RESPECT TO ANY OF THE PRODUCTS COVERED UNDER THIS WARRANTY EXCEED THE AMOUNT PAID BY THE PURCHASER TO GILLIG FOR SUCH PRODUCTS.

GILLIG **DOES NOT WARRANT** some major component assemblies (such as the engines, transmissions and air conditioning systems) which are warranted by their respective manufacturers (OEM's) and identified as Category 3 items on page three (3) of this Warranty. **Warranty coverage for these items is as defined in those manufacturer's own warranty documents** and per their terms and conditions, and as administered by their own support networks.

**GILLIG** makes **NO OTHER WARRANTIES**, except as stated herein, and GILLIG's obligation under this warranty is **LIMITED AND FULLY DESCRIBED HEREIN**. Determination of warrantable defects is at GILLIG's (or the OEM's) discretion and will require inspection of failed components. Correction or compensation under this warranty for Category 1 and Category 2 items cannot be made unless requested on a GILLIG Application for Warranty Claim form and in accordance with the claim procedure established by GILLIG.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTY EXPRESSED OR IMPLIED, but if such has legal status, it CANNOT EXCEED THE DURATIONS STATED HEREIN. This warranty gives the purchaser specific legal rights and some state statutes may include other rights.

This is GILLIG's sole warranty with respect to its transit coaches. GILLIG MAKES NO OTHER WARRANTY OF ANY KIND WHATEVER, EXPRESS OR IMPLIED; AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEED THE AFORESAID OBLIGATION ARE HEREBY DISCLAIMED BY GILLIG AND EXCLUDED FROM THIS AGREEMENT.

Standard & Extended Warranty Revised: 06/29/2021 Page 1 of 4



### PSTA - CLEARWATER, FLORIDA FLORIDA ELECTRIC TRANSIT BUSES BID - RFP 21-980369 – SEPTEMBER 23, 2021

GILLIG's Standard Limited Warranty which covers Category 1 and Category 2 parts, components and assemblies, covers the following systems, components or assemblies for the period specified, and includes 100% PARTS AND LABOR to repair or replace the defective components as determined by GILLIG. (See Page 3 for explanation of notes (1)-(7).)

### **CATEGORY 1**

Includes GILLIG manufactured or assembled components and systems as well as some purchased assemblies. Warranty and warranty claims administration provided by GILLIG.

	Coverage Peric <u>Months</u>	od <sup>(1)</sup> <u>Miles</u>
FULL COACH WARRANTY <sup>(2) (3) (7)</sup>	12	50,000
BODY STRUCTURE WARRANTY <sup>(4)</sup>	36	150,000
CORROSION & STRUCTURAL INTEGRITY WARRANTY <sup>(5)</sup>	144	500,000

### **CATEGORY 2**

Includes major components purchased and installed by GILLIG. Warranty provided by component OEM's. Warranty claims administration provided by GILLIG.

AXLE		
Meritor Front Steering	60	300,000
Meritor Rear Driving	60	300,000
BRAKE SYSTEM		
(Excludes Friction Material)		
Bendix Valves	24	100,000
Meritor Brakes	24	100,000
ELECTRONIC COOLING PACKAGE		
Modine System	36	Unlimited
-		



### PSTA - CLEARWATER, FLORIDA FLORIDA ELECTRIC TRANSIT BUSES BID - RFP 21-980369 – SEPTEMBER 23, 2021

Major components listed below under "Category 3" are covered by warranties or extended coverages<sup>(6)</sup>, for the miles and/or months indicated, provided by the manufacturer (OEM's) of those components. Purchasers should refer to specific OEM warranty documents for details. Warranty claims are and will be administered by the respective manufacturers (OEM's) and all warranty claims must be made directly to said manufacturers. GILLIG will assist purchasers in dealing with these OEM's and warranty issues that may arise from time to time.

### CATEGORY 3

	Covera	ge Period <sup>(1)</sup>
	Months	Miles
POWERTRAIN <sup>(7)</sup>		
CUMMINS	36	100,000
Energy Storage System	72	300,000 (80% of original capacity)
<u>Extended Warranty</u> – If Selected Energy Storage System	72	200,000 (Proactive scheduled
replacement of batteries at mid		achieve same total usable capacity as -year warranty with same or better terms as
AIR CONDITIONING SYSTEM Thermo King TE18 All electric	24	Unlimited
WHEELCHAIR RAMP Lift-U LU18	24	Unlimited
DOOR SYSTEM <sup>(7)</sup> Vapor	36	150,000
INTERIOR LIGHTING I/O Controls	144	500,000

#### Low Floor Transit Coach Emission Warranty

GILLIG warrants to the ultimate purchaser and each subsequent purchaser that the new vehicle is designed, built and equipped so it conforms at the time of sale to the ultimate purchaser with all U.S. federal emissions regulations applicable at the time of manufacture and that it is free from defects in materials or workmanship which would cause the vehicle to fail to not meet these regulations within five years or 100,000 miles of operation, whichever occurs first, as measured from the date the vehicle is placed into service. In no case may this period be less than the Standard Limited Warranty where applicable to emission warrantable parts. If the ultimate purchaser registers the vehicle in the state of California (or any other state following the applicable California Air Resources Board regulations) a separate California Emissions Warranty applies.

Standard & Extended Warranty Revised: 06/29/2021 Page 3 of 4



### PSTA - CLEARWATER, FLORIDA FLORIDA ELECTRIC TRANSIT BUSES BID - RFP 21-980369 – SEPTEMBER 23, 2021

GILLIG warrants to the ultimate purchaser that registers the vehicle in the state of California (or any other state following the applicable California Air Resources Board regulations), and each subsequent purchaser, that the new vehicle is designed, built and equipped so it conforms at the time of sale to the ultimate purchaser with all applicable regulations adopted by the California Air Resources Board at the time of manufacture and that it is free from defects in materials or workmanship which would cause the vehicle to fail to not meet these regulations within five years, 100,000 miles or 3000 hours of operation, whichever occurs first, as measured from the date the vehicle is placed into service. In no case may this period be less than the basic mechanical warranty provided to the purchaser of the engine.

GILLIG warrants to the ultimate purchaser and each subsequent purchaser that the tires on this vehicle conform at the time of sale to the ultimate purchaser with all U.S federal emissions regulations and all applicable regulations adopted by the California Air Resources Board at the time of manufacture and are free from defects in materials or workmanship which would cause the vehicle to fail to not meet these regulations for a period of 2 years or 24,000 miles, whichever occurs first.

This list of emission control parts may be covered by the Emission Warranty under certain failure modes.

- Ambient Air Temperature Sensor
- Wire harness circuits connected at both ends to emissions warrantable components
- On-Board Diagnostic (OBD) Malfunction Indicator Lamp (MIL)
- OBD Connector

#### **NOTES**

- 1) Coverage ceases at the first expiration of the time or distance noted.
- 2) Full coach warranty includes and applies to electrical, doors, seats, flooring, roof hatches, destination signs, wheelchair ramp, handrails, radio, P.A., etc., but not to IVS systems or special options.
- 3) Fleet defect coverage is for a maximum of 12 months or 50,000 miles and includes all warrantable components and assemblies on the vehicle.
- 4) Basic body structure warranty includes and applies to structural members in the body and undercarriage including the structural members in the suspensions.
- 5) The corrosion and structural integrity guarantee covers against a significant loss of structural integrity of the assembly or its functional performance, resulting from a pertinent loss of cross-section due to corrosion caused by normal environmental elements but <u>excludes</u> corrosion caused by aggressive road de-icers such as Magnesium Chloride or equivalents, unless Gillig approved preventative measures are taken (see Service Manual).
- 6) Extended coverage may not duplicate Standard Limited warranty coverage. Note: Please refer to OEM warranty documents for details.
- 7) For consumable components like brushes, seals, air wave switches and related wear items a one year parts and labor warranty applies.

Standard & Extended Warranty Revised: 06/29/2021 Page 4 of 4





GILLIG stands behind the quality of our products and we have selected supplier partners who share this belief as well. We have provided our GILLIG APPLICATION FOR WARRANTY PROCEDURE which describes the process by which GILLIG handles warranty claims. Normal warranty work (other than that work required to be performed by sub-suppliers as discussed below) will be performed by the Agency's maintenance department and reimbursed by GILLIG at the documented warranty labor rate. In the unlikely event that abnormal warranty is required, GILLIG will work with the Agency to resolve any such warranty projects which Agency believes should be repaired directly by GILLIG.

Due to the nature of some components and the associated warranties, GILLIG believes that warranty work on the following should initially be managed by the sub-suppliers:

- Powertrain
- Air Conditioning Unit
- Axles

- Destination Signs
- Surveillance Systems
- Intelligent Transit Systems
- Batteries

GILLIG routinely assists customers in resolving warranty matters when local vendors are unable or unwilling to provide necessary support by involving GILLIG's contacts either at the local service facilities or through the component manufacturer's corporate levels.

Feel free to contact our Field Service Department for assistance or if you have questions:

Vy Vu Field Service Coordinator (510) 264-5073 Email: vvu@GILLIG.com

GILLIG Service Department 451 Discovery Drive Livermore, CA 94551



### Warranty Department

The Field Service Department is available to assist the procuring Agency in processing warranty claims as required. GILLIG's Field Service Representatives will assist the procuring agency in the proper procedure for obtaining warranty parts, completion of the warranty forms, and the handling of parts for warranty claims processing. In-house qualified Field Service Representatives are available to troubleshoot questions by phone Monday through Friday, 5:00 a.m. to 2:00 p.m. and have direct access to GILLIG's Engineering Department in order to provide quick turnaround should additional technical assistance be required.

- EXECUTIVE DIRECTOR, CUSTOMER CARE VICTOR DORAN
- WARRANTY MANAGER
   Micah Denecour
- SERVICE MANAGER
   Eric Ocampo
- WARRANTY PARTS SPECIALIST
   Dominic Nava
- TECHNICAL ADVISOR Bo Vongamath
- WARRANTY PROCESSING SPECIALISTS
   Johnny Phothipanya
- FIELD SERVICE COORDINATOR Vy Vu

<u>Our Warranty</u> group essentially deals with repair, replacement, or reimbursement for product failures during the warranty period of a particular product. A warranty claim, describing the failure (and other relevant details) must be filed in order to start the process of getting the failure fixed.

The warranty claim is reviewed by the Warranty Processing Specialist and a determination on its status (accept, accept with adjustments, or reject) is made, often after discussions with GILLIG's Q.A., Manufacturing, or Engineering Departments, or with vendor OEMs. The claim response is then sent back to the customer, as well as being relayed to relevant GILLIG departments for corrective action, including as necessary, reimbursement or replacement for the customer, design or manufacturing review at GILLIG, reporting to and recovery from the vendor, as well as additional information collection, testing and/or redesign for GILLIG or the vendor, when needed. We usually ask for failed parts to be returned to help with failure analysis and vendor recovery.

If you disagree with a warranty claim decision, you can resubmit the claim along with additional justification supporting your position, to the Service Manager for reconsideration. Your claim will be reviewed and you will be notified of the review decision within a week or two.



# **GILLIG INSTRUCTIONS**

# FOR COMPLETING APPLICATION FOR WARRANTY CLAIM

GILLIG requires only one failure per claim. A single claim can be for multiple buses as long as they're for the same failure, and have identical labor claimed. The VIN and mileage of each bus on the claim should accompany the Application for Warranty.

GILLIG uses the information on the Application for Warranty to detect failure trends and make improvements, failure descriptions such as "B.O.", "Inop" or "Found Bad" will not suffice. The reason for removal and any troubleshooting procedures should be included to help expedite claims. GILLIG prefers the Repair Order be included with the claim.

Warranty repairs exceeding "Standard Repair Times", (SRT), should have prior authorization to prevent large cuts in reimbursement. To obtain prior authorization, please contact your Warranty Processing Specialist by calling GILLILG Field Service or emailing <u>WarrantyClaims@gillig.com</u>.

Claims for normal replacement items, such as light bulbs, and mechanical adjustments, such as doors or alignments, are not normally approved unless their failure was caused by a warrantable defect. In addition, consumables, such as belts, tires and brake linings, are not warrantable, unless their failure was caused by a warrantable defect of another component.

Warranty claims should be submitted to GILLIG within 30 days of the date of failure. Claims can be emailed to <u>WarrantyClaims@gillig.com</u>.

Claims need to have unique claim numbers assigned. Each property should have a unique prefix, and then whatever number best suits your operation, (such as the Repair Order number). If you do not have or do not know your unique prefix, please contact your Warranty Processing Specialist.

GILLIG will pay at the direction of the bus owner, not the hired contractor or repair shop, until and unless the bus owner directs it.

GILLIG cannot pay an invoice not made out to GILLIG, unless it's listed as a sublet bill on an Application for Warranty Claim.



It is not necessary to use GILLIG pre-printed forms, but any form used will need the following information:

- 1. Unique Claim Number (must be pre-approved by GILLIG Warranty).
- 2. Date claim is being filled out
- 3. Unit Serial # (Last six digits of the VIN)
- 4. Coach Number
- 5. Bus Owner, or Bus Property Name
- 6. Date bus placed in Revenue Service
- 7. Odometer or Hub mileage at time of failure
- 8. Date of Failure
- 9. Where Repaired (if not at the owner's property)
- 10. If Claim concerns the Engine, the Engine Serial Number
- 11. If Claim concerns the HVAC, the Air Conditioning Unit Serial Number
- 12. If Claim concerns the Transmission, the Transmission Serial Number
- 13. Complete description of failure, (Repair Order preferred)
- 14. Were any parts used? (Yes or No)
- 15. Description of parts used with the GILLIG Part Number
- 16. Original Part Number (If replacement Part Number differs Original Part Number)
- 17. Price of the part(s) unless provided by GILLIG
- 18. Number of parts used
- 19. Provide subtotal for each part
- 20. Total all the parts used for this claim
- 21. Provide contractual warranty labor rate
- 22. Number of hours worked
- 23. Multiply number of hours by the labor rate for the total labor claimed
- 24. Work done by outside firm or tow to be entered and copy of invoice attached
- 25. Total Sublet cost(s)
- 26. Total amount for the claim
- 27. If bus is in California and claim is emission-related, Engine Hours (from ECM or hourmeter)
- 28 Name & Contact Information of warranty person to answer any questions of claim
- 29. Email or Phone Number for person having knowledge of claim
- 30. Name & Contact Information of person who submitted claim
- 31. Email or Phone Number for person who submitted claim
- 32. Address of where to send reimbursement or parts credit.

See attached copy of claim with corresponding numbers to indicate where to put the above information.



# **GILLIG APPLICATION FOR WARRANTY**

		-	Required fields a	are marked with an asterisk (*)	
APPLICATION		*CLAIM	NUMBER:	#1 "DATE: #2	
WARRANT	(	MAIN (510) 785-1500   FAX (510) 785-134			
UNIT SERIAL # #3		*OWNER	#5	ALL ALL CALLERING	
BUS OR COACH # #4			E AT FAIL	URE #7	
IN SERVICE DATE #6			REPAIRED		
DATE OF FAILURE #8			SERIAL #	1 A 1 A 1 A	
A/C SERIAL # #11		TRANSM	AISSION S	ERIAL ##12	
#13					
IF REPLACEMENT PART NUMBER DIFFERS FROM ORIGINAL PA INF MORE SPACE IS NEEDED. PLEASE USE SEPARATE BHEET AND REPLACEMENT PART NUMBERS PARTS USED: YES NO #15	PRICE EACH	PRICE OTY. USED #18	SUBTOTAL	##16	
IF MORE SPACE IS NEEDED. PLEASE USE SEPARATE SHEET AND REPLACEMENT PART NUMBERS PARTS USED: YES NO	PRICE EACH	PRICE OTY, USED	SUBTOTAL	PARTS TOTAL \$ #20 *LABOR TOTAL \$ #23 SUBLET TOTAL \$ #25	
IF MORE SPACE IS NEEDED. PLEASE USE SEPARATE SHEET AND REPLACEMENT PART NUMBERS PARTS USED: YES NO " #15 *LABOR RATE #21 / "HR. SUBLET (ATTACHED INVOICE COPIES) 1. #24 2.	PRICE EACH #17 #22 PARTS	PRICE OTY. USED #18	SUBTOTAL #19 TOTAL	PARTS TOTAL \$ #20 *LABOR TOTAL \$ #23 SUBLET TOTAL \$ #25 *GRAND TOTAL \$ #26	
IP MORE SPACE IS NEEDED. PLEASE USE SEPARATE SHEET AND         REPLACEMENT PART NUMBERS         PARTS USED:       YES         #15         *LABOR RATE       #21         / "HR         SUBLET (ATTACHED INVOICE COPIES)         1.       #24         2.         NOTE: IF CALIFORNIA BUS, NEED ENGINE HO         NAME/PHONE OF CONTACT FOR ADDITIONAL INFO	PRICE EACH #17 #22 PARTS URS FROM HOL	PRICE OTY. USED #18	SUBTOTAL #19 TOTAL	PARTS TOTAL \$ #20 *LABOR TOTAL \$ #23 SUBLET TOTAL \$ #25 *GRAND TOTAL \$ #26	
IP MORE SPACE IS NEEDED. PLEASE USE SEPARATE SHEET AND REPLACEMENT PART NUMBERS PARTS USED: YES NO #15 *LABOR RATE	PRICE EACH #17 #22 PARTS URS FROM HOL #22	PRICE OTY. USED #18	SUBTOTAL #19 TOTAL ECM_#	PARTS TOTAL \$ #20 *LABOR TOTAL \$ #23 SUBLET TOTAL \$ #25 *GRAND TOTAL \$ #26	
IF MORE SPACE IS NEEDED. PLEASE USE SEPARATE SHEET AND REPLACEMENT PART NUMBERS PARTS USED: YES NO #15 *LABOR RATE	PRICE EACH #17 #22 PARTS URS FROM HOL #2	PRICE OTY. USED #18	SUBTOTAL #19 TOTAL ECM_#	PARTS TOTAL \$ #20 *LABOR TOTAL \$ #23 SUBLET TOTAL \$ #25 *GRAND TOTAL \$ #26	



# WARRANTY PARTS ORDERING PROCEDURE

- 1. Determine part(s) being ordered by referring to the parts manual for the specific bus in question. If the part can't be found or isn't listed, you can call GILLIG's Warranty Parts Specialist at 510-264-4433 or WarrantyParts@gillig.com.
- 2. The information needed:
  - a. GILLIG part number
  - b. Quantity
  - c. Description of part (pump, motor, etc.)
  - d. VIN, (Last 6 digits of VIN)
  - e. Description of Failure
  - f. Mileage at failure
  - g. Instructions on where to send parts, (if applicable)
- 3. If bus is within the base bus warranty, GILLIG will ship the warranty part(s) to your location. Parts will be sent prepaid, best way, (normally second day). If the part is needed there the next day, it can be sent overnight and the difference of shipping cost will be charged back.
- 4. Normally, GILLIG will want the failed part returned. If so, then we will email an RGA. The defective part should be returned to:

### GILLIG, LLC ATTN: RGA #\_\_\_\_\_ 1100 Voyager Street, Dock B Livermore, CA 94551

### PARTS THAT ARE REQUESTED TO BE RETURNED SHOULD BE SENT WITHIN 30 DAYS. IF THE PARTS ARE NOT RETURNED WITHIN THAT TIME, THE COST WILL BE INVOICED BACK.

5. If the bus is outside the base bus warranty, but the failed component still has warranty coverage from the supplier, the part will have to be purchased from GILLIG's Parts Department, which can then be claimed on an Application for Warranty Claim. GILLIG will roll that over to the supplier, and whatever reimbursement the supplier makes will then be forwarded to the end user.



# PARTS RETURN PROCEDURE

Defective part should be returned to GILLIG within 30 days of receipt of GILLIG's Return Goods Authorization, (RGA).

All parts should be capped or plugged to prevent leakage, if applicable. Excess dirt or grease should be removed to facilitate handling.

Removed part should be handled/packed as if new.

Parts should never be sent "COD". GILLIG may provide a call tag, or the shipping cost can be included on the Application for Warranty.

Call tags are only utilized when the bus is still covered by the base bus warranty. If a call tag is being requested, we will need to know 1) RGA # & 2) Total weight of package.

Part(s) must be tagged with the following information:

- A. Last 6 digits of VIN
- B. Date bus went into Service & Mileage at Failure
- C. Concise reason for removal
- D. Bus owner's name/name of transit agency



GILLIG's change control process involves several departments within the organization and working with our component suppliers as their products reach end of life. GILLIG believes in a constant improvement process, this is controlled thru an Engineering Production Change (EPC) process managed by our Materials Department. A meeting is scheduled once a month with Materials, Purchasing, Engineering, Manufacturing, Sales and Parts, to discuss product improvements/new design and supplier end of life notifications.

Once a change has been identified the subject matter is reviewed by Engineering for design, Purchasing for cost, Manufacturing for production impact, Parts for aftermarket support and Materials/Sales for customer implications. Once approved by all departments, Engineering and the Bill of Material group will release the component details (parts, installation drawings, customer, dates) and production implementation plan thru our documented EPC control process.



GILLIG's focus on designing and building the most reliable and cost effective bus in the industry necessitates selecting supplier partners who share our philosophies on quality and reliability. As a result of this focus, GILLIG has no major fleet defects (grounded fleet), a minor number of vendor defects and the lowest warranty claim experience in the industry.

Over the past five years, GILLIG has sent out a number of Field Service Bulletins which communicate suggested maintenance procedures, clarifications of previously released procedures and supplier or GILLIG proposed repairs. Seven of these bulletins were minor field repairs resulting from design improvements intended to prevent future failures.

We have provided a sample for your reference.

#### FIELD SERVICE BULLETIN

#### FS-2019-02: Product Alert - FS 300 Hose Identification

Date:	May 6, 2019
Model:	All
Model Years:	1997 – 2019

Because of a supply issue with the blue hose covering, Eaton is temporarily making FC-300 hose using black covering. FC-300 hose assemblies made between October 2018 to May 2019 will be affected by this change.

To avoid being mistaken for FC-350 hose, Eaton has applied the following unique identifiers to the FC-300 hose assemblies:

- 1. Yellow ink markings to the hose identifying it as FC-300. Note: White ink markings are used on FC-350 hose assemblies.
- 2. Blue stripe around the hose identifying it as FC-300.
  - a. Hoses 2-ft and shorter will have a blue stripe located in the center of the hose length.
  - b. Hoses longer than 2-ft, up to 4-ft in length have a blue stripe located at each end, adjacent to the fitting.
  - c. Hoses longer than 4-ft have a blue stripe located at each end, adjacent to the fitting, and an additional stripe located in the center of the hose length.

In addition, the hose will still have a foil tag with the Gillig part number.

*Note:* FC-300 and FC-350 have different pressure ratings, so it's important to not mix them.

Approved:

Robert L. Birdwell, Executive Director Quality Control & Field Service

# GILLIG

FS-2019-02 Page 2

# **Product Alert**

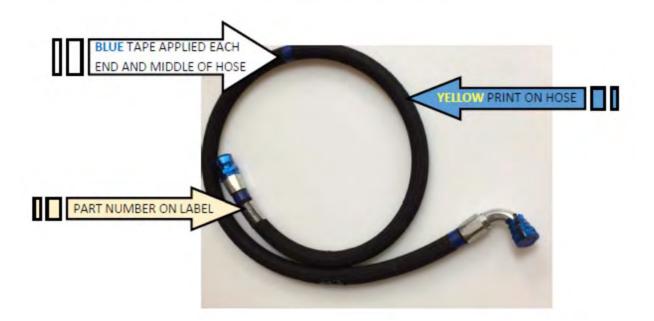
Affected products: Gillig hose assemblies part numbers 46-xxBxxxx-xxxx

Gillig hose assemblies made with Eaton FC300 hose, which typically have a blue yarn cover will temporarily have a black cover.

Due to a supply issue with blue yarn Eaton is temporarily making FC300 hose with black colored yarn and applying yellow print instead of white print. The hose is otherwise identical to what has always been supplied and meets all specifications for use.

#### HOW TO IDENTIFY THIS HOSE AS CORRECT

- 1. BLUE TAPE IS BEING APPLIED TO EACH ASSEMBLY AS A QUICK CHECK THAT IT IS FC300 HOSE
- 2. HOSE WILL HAVE YELLOW PRINTING INSTEAD OF WHITE
- 3. PART NUMBER ON LABEL WILL IDENTIFY THE CORRECT HOSE ASSEMBLY



# GILLIG

FS-2019-02 Page 3

Original blue FC-300





# **GILLIG AFTERMARKET PARTS WAREHOUSE**

#### Our larger facility allows us to better serve our aftermarket customers via this more efficient warehouse.

GILLIG recently made a significant investment in our Parts business with the purchase of the 108,000 sq ft warehouse and office building located in Hayward, California. This is a true "class A" facility, with eight docks, 35' clear height, and a two-level small parts mezzanine.





## PARTS SERVICE DEPARTMENT

GILLIG supplies service parts to customers through our Parts Division, located in Hayward, California. All parts are produced to our original vehicle specifications and are either manufactured in-house or purchased to our drawings from OEM's.

GILLIG is proud to advise that all parts (100%) are stocked in the U.S. in our Hayward facility. We do not stock parts in other countries.

All in-stock bus-down orders received by 3:00 p.m. PST are shipped the same day (2nd day air freight at no charge or next day air, at your expense).

All backordered requirements are shipped within 24 hours of receipt from the vendor.

All orders are shipped UPS 2nd day air, freight prepaid at no charge to you (subject to UPS size and weight limitations).

Our current order response is - 92% of all transit bus orders received are shipped within 48 hours and the percentage rises to 96% in an additional 72 hours (excluding weekends) and 99% within 3 working days.

GILLIG's simple bus designs, as well as our parts service programs, help you control your parts cost. Common industry parts, flat skirt panels, and American supplied components, such as Meritor axles, help reduce your parts costs. Our increased warehouse stocking levels in Hayward and our second day air shipments at no charge help you reduce your inventory costs as well.



## PARTS SUPPORT REFERENCE LIST

GILLIG's Part Division is committed to the same GILLIG mission and goal of customer satisfaction and friendly service. We are proud of our on time delivery at competitive pricing. GILLIG's customers are not only impressed with the performance and quality of our buses but they are also pleased with our overall parts support and our quick and accurate parts deliveries. We request that you call the following representative customers and ask about our unmatched performance.

Hampton (Hampton Roads Trans.), VA Anita Brown Buyer 757-222-6000 x 6325 abrown@hrtransit.org

St. Louis (Bi-State Develop. Agency), MO Diana Hill Director of Purchasing 314-923-3084 <u>dhill@metrostlouis.org</u>

Salt Lake City (Utah Transit Authority), UT Jolene Higgins Sr Buyer 801-237-1925 Jhiggins@rideuta.com

St. Petersburg (PSTA), FL Jody Sibley Storeroom Superintendent 727-540-1884 jsibley@psta.net

Jacksonville Transportation Authority (FL) Michael West Manager of Inventory Control & Stores 904-630-3179 mwest@jtafla.com Youngstown (WRTA), OH Becky Koenig Maintenance Director 330-744-8431 rkoenig@wrtaonline.com

Ft. Wright (TANK), KY Wayne Bey Purchasing Agent 859-814-2142 wbey@tankbus.org

Inter-City Transit (Olympia, WA) Steve Krueger Procurement Manager 360-705-5833 skreuger@intercitytransit.com

Richmond (GRTC), VA Mark Donavon Purchasing Manager 804-358-3871 x 352 mark.donavon@ridegrtc.com



## PARTS SERVICE DEPARTMENT

In order to provide the most comprehensive and most economical service possible, GILLIG uses a central warehouse and compensates for distance by shipping second day air. Consequently, the nearest parts warehouse to supply your service parts needs is:

Central Location:	GILLIG 25972 Eden Landing Road Hayward, CA 94545 Phone: 510-264-5160 Email: parts-sales@gillig.com
Central Contact:	Chuck O'Brien - Vice President, Parts Divisi

Central Contact: Chuck O'Brien - Vice President, Parts Division Eiji Kinoshita - Director of Sales - Parts Division

**Regional Contacts:** 

Northwest Region: Lee Petersen - Regional Sales Manager Cell Phone: 510-867-5108 Email: Lee.Petersen@gillig.com

Western Region: Sean Solis – Regional Sales Manager Cell Phone: 510-512-2638 Email: Sean.Solis@gillig.com

Hawaii: John Lum, Manager Parts Sales Phone: 510-264-5125 Email: John.Lum@gillig.com

Southwest Region: Joe Saldana – Regional Sales Manager Cell Phone: 510-303-0202 Email: Joe.Saldana@gillig.com

Central Region: Tom Wagner - Regional Sales Manager Cell Phone: 510-737-2283 Email: Tom.Wagner@gillig.com South Central Region: Randy Brewer – Regional Sales Manager Cell Phone: 925-409-6585 Email: Randy.Brewer@gillig.com

Northeast Region: Jerry Sheehan – Regional Sales Manager Cell Phone: 510-329-0320 Email: Jerry.Sheehan@gillig.com

Mid-West Region: Jenna Van Harpen – Regional Sales Manager Cell Phone: 510-512-2856 Email: Jenna.Vanharpen@gillig.com

Southeast Region: Butch Sibley - Regional Sales Manager Cell Phone: 510-589-9430 Email: Butch.Sibley@gillig.com



Parts Availability:	Over 92% of all regular parts orders are shipped within 48 hours of ordering and almost 97% within 3 days.
Freight Policy:	Regular parts orders are shipped freight free and normal shipments to Central and Eastern locations are shipped 2nd day air, at no charge.
Availability Life:	Replacement parts will be available for a period of twelve (12) years after the date of purchase of your coaches.

#### **CUSTOMER SATISFACTION**

The GILLIG Service Parts Division is committed to the same GILLIG mission and goals of customer satisfaction and friendly service with reliable and durable products that are also economical to use.

To justify the district's purchase of GILLIG products and to assist the district in attaining its own goals, the Parts Division has established the following programs and objectives.

#### Unit Down

Our objective is to expedite these orders and ship them within 24 hours. Unit down orders receive the highest priority throughout our manufacturing, purchasing, and shipping organizations, and can be accepted up to as late as 3:00 p.m. (Pacific time) and shipped same day if in stock. If the customer chooses, these orders can be shipped overnight at customer's cost.

#### Inventory

GILLIG maintains an extensive, continually growing, inventory of genuine GILLIG and OEM parts, in our central warehouse. All locations and parts are bar coded for accuracy and quick response. Computer programs monitor usage and minimum stocking levels in real time to maximize parts availabilities. We also stock or can get, common non-GILLIG parts.

#### **Parts Lists**

We can prepare, on request, a recommended initial stocking list of expected high usage or long lead-time parts for the vehicles proposed. A detailed price list is also available with the recommended initial stocking list.



#### Hot Line

GILLIG has a toll-free telephone number to enable customers to contact us at no charge for advice, explanations, recommendations or orders.

#### **Personalized Service**

To provide better service, representatives are assigned to specific accounts so that they can provide personal service while also providing account familiarity, history and consistency.

#### **Regional Coverage**

Regional Sales Managers are available to visit customers to assist in all facets of this business, including problem solving, introducing new kit and parts availabilities and making recommendations.

#### Troubleshooting

We also provide a troubleshooting service; if you can't find a part, call your representative and we'll find it for you, if possible, and even stock it in the future if your demand warrants it.



GILLIG

#### GILLIG PARTS | 25972 EDEN LANDING ROAD | HAYWARD, CALIFORNIA 94545 | 800.735.1500

# **CER 5. Form for Proposal Deviation**

This form shall be completed for each condition, exception, reservation or understanding (i.e., Deviation) in the Proposal according to "Conditions, Exceptions, Reservations or Understandings." One copy without any price/cost information is to be placed in the Technical Proposal as specified in "Technical Proposal Requirements," and a separate copy with any price/cost information placed in the Price Proposal as specified in "Price Proposal Requirements."

#### PSTA [RFP 21-980369]

Deviation No.: 1	Contractor:	GILLIG	RFP section: CER 6 PRICING SCHEDULI	Page:	216
Complete description of De	viation:				
	he base bus and o	options for years	shall be fixed for ONE (1) year fr 2-5 shall be adjusted using the E WPU Truck and Bus Bodies.		n
Rationale (pros and cons):					
, ,	industry to adjust	the price of futur	Category 1413 WPU Truck and e orders (years 2, 3, 4, and 5), be he option order is placed.		
	by increasing the	total cost to the	trary inflation estimates which ur Procuring Agency. This price adji		

# **CER 10. Vehicle Technical Information**

This form must be completed and included in the Technical Proposal. NOTE—one form must be completed for each type of bus submitted in response to this RFP

GENERAL COACH DATA SHEET												
			Ι									
Bus manufacturer:			GILLIG LLC									
Bus model:			40 Floor Low Floor All Elec	ctric								
Understructure mar	ufacturer		GILLIG LLC									
Model number:			G28D102H4									
Size/Type of Bus			40 Floor Low Floor All Elec	ctric								
Basic Body Constru	iction											
Туре:			Extruded Aluminum									
Tubing or frame me	mber thic	kness ai	nd dimensions									
Overstructure			Aluminum ASTM 6061-T6,	6063-1	6 TI	nickne	ess .118in					
Understructure			3CR12 Stainless Steel AST									
Skin thickness and	material		·									
Roof			Fiberglass .12in									
Sidewall			Aluminum .118in	-								
Skirt panel			Aluminum .118in									
Front end			Fiberglass .125in									
Rear end			Fiberglass .125in									
Dimensions												
Overall length	Over bun	npers		40	ft	11	in.					
	Over bod	-		40	ft	1	in.					
Overall width			ing mirrors		ft	102	in.					
	Over bod	ly includi	ng mirrors-driving position		ft	120	in.					
	Over tires	s front a	kles		ft	100	in.					
	Over tires	s center	axle		ft	N/A	in.					
	Over tires	s rear ax	les		ft	100						
				I		1.00						
Overall height (max	imum)			11	ft	0.3	in.					
Overall height (mair	n roof line)	)		9	ft	8	in.					
Angle of approach		8.6	deg									
Breakover angle		9.9	deg									
Breakover angle (re	ar)	n/a	deg									
Angle of departure		9.7	deg	deg								

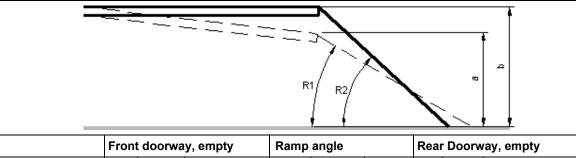
Doorway Dimensions	Front		Rear	
Width between door posts	40	in.	34	
Door width between panels	35.7	in.	30	
Clear door width	32.3	in.	24.8	
Doorway height	75	in.	77	
Knuckle clearance	1.5	in.	1.5	

Step height from ground measured at center of doorway

At rear door

17

in.



					-	-				•
Kneeled	а.	11.7	in.	R	1	9.3	deg	a.	14.1	in.
Unkneeled	b.	15.3	in.	Rź	2	13.6	deg	b.	15.2	in.
Interior head roo	m (cente	r of aisle	e)							
Front axle location	95	in.								
Center axle location	n/a	a in.								
Rear axle location	76.5	5 in.								
Aisle width between	transvers	e seats	24	in.						
Floor height abov	ve groun	d (cente	rline of	bus)						
At front door	15.9	in.								
At front axle	15.9	in.								
At drive axle	35.6	in.								
	1									

Minimum ground clearance (between bus and ground, with bus unkneeled)								
Excluding axles	11.2	in.						
Including axles	7.03	in.						

Weight		No. of	F	ront ax	le		Center a	xle		Rea	r axle	)	Total bus
Weight													
1													
Minimum foo	ot room		14	in.									
Minimum hip		room	26.8	in.									
Standee cap			37										
Total maxim		ing	38	<u> </u>									
Passenger			1	T									
Maximum in	terior floo	or slope (fr	om horiz	ontal)	4	deg							
					Cen	ter	n/a	in.					
					Rea	r	36.1	in.					
Minimum dis	stance be	etween whe	eelhouse	s:	Fror	nt	36.1	in.					
Total stande	ee area (a	approximat	ely)		40	sq ft							
Interior width	h (exclud	ing coving)	)		7	ft	4	in.					
Interior lengt	th				33	ft	1	in.					
Floor													
	110.4	1											
Rear	110.4	in. in.											
Overhang, Front	, <b>center</b> 90.1	line of ax	ie over	pumpe	ər								
<u> </u>													
Rear	n/a	in.											
Front	290	in.											
Wheel bas	e												
							/ /						
						/	/ /						
								7/					
								_					
							R3	$\checkmark$					
							$\rightarrow$	$\rightarrow$					
Inside Body	Turning	Radius inn	ermost p	oint, Th	4 (Inclue		nper)	23	п	9	in.		
Front wheel		-			A (in also	alia ar la ru		40	ft ft	6	in.		
Front wheel		-						34	ft	1	in.		
	Front inner corner radius, TR1								ft	6	in.		
Outside bod			R0 (incluc	ding bun	nper)			44 39	ft	9	in.		
Horizontal				-					Ι.	1	1.		

Empty bus, full fuel and farebox	0	6335	6335	12670	n/a	n/a	n/a	10115	10115	20,230	32,900
Fully seated, full fuel and farebox	39	7461	7461	14922	n/a	n/a	n/a	11,914	11,914	23,828	38,750
Fully loaded standee and fully seated, full fuel and farebox	76	8530	8530	17060	n/a	n/a	n/a	13,620	13,620	27,240	44,300
Crush load (1.5x fully loaded)	114	9627	9627	19254	n/a	n/a	n/a	15,373	15,373	30,746	50,000
GVWR											47,180
GAWR				18,180						29,000	47,180

## Energy Storage

#### Batteries – low voltage

Manufacturer

Туре

Model number

Cold Cranking Amps

Odyssey	
Group 31 AGM	
PC2150	

1150 Amps

Cranking Amps	1150	Amps
Reserve Capacity	n/a	Amps

Manufacturer	AKASOL Inc.						
Туре	Lithium Ion NMC						
Model Number	9AKM150CYCUHE						
Total Battery Capacity (kWh)	98 kWh per pack (5 Packs per bus = 490 kWh)						
Standard Charge Time	Variable: 102 - 195 minutes (based on current available market chargers)						
Charging Capacity	Variable on charger used. rated to meet beyond current top charger in marke						
Operating Temperature Range	-40F to 136F (Normal Operating Temp range: 68F to 118F)						
Cooling/Heating System	Liquid-to-air (Thermo King)						
Performance							
Fuel Economy (w/full passenger load, HVAC, and all electric	kWh						
accessories in use)	2.29kWh per mile Orange County route						
Fuel Economy (w/full passenger	MPGE						
load, HVAC, and all electric accessories in use)	N/A, same answer as above						
Max Gradeability	8 %						
Top Speed	65 MPH						
Battery Range	160 Miles						
Acceleration (20 MPH)	7.4 Seconds						
Acceleration (40 MPH)	16.5 Seconds						
Top Speed (stated above)	33.4 Seconds						

Top Speed (Stated above)	33.4 Seconds	

Performance information/graphs to be attached with this form:

Energy consumption vs. Vehicle speed

Vehicle speed vs. time (both loaded and unloaded)

Vehicle speed vs. grade (both loaded and unloaded)

Acceleration vs. time

Change of acceleration vs. time

#### Traction Motor/Drive Motor

Manufacturer	Cummins							
Туре	Permanent M	Permanent Magnet Alternating Current (PMAC)						
Speeds	3500 N-m ma	3500 N-m max torque up to 30 seconds						
Traction motor horsepower rating	2060N-m continuous torque							
Type ventilation/cooling	liquid-to-air c	liquid-to-air cooling						
Gear ratios	Forward:	n/a	Reverse:	n/a				

Vanner						
Vann-Bus 85-CAN						
(120/240)						
Cummins						
n/a						
DC to 9 phase AC						
n/a						
	Vanner Vann-Bus 85-CAN (120/240) Cummins n/a DC to 9 phase AC					

Traction/Drive Mo	tor						
Manufacturer	See ab	See above in previous Traction/Drive Motor section					
Туре							
Model							
Quantity							
Torque Rating							
kWh Rating							
Air compressor							
Manufacturer	Powere	ex					
Туре	Scroll (	Compress	or				
Rated capacity			13.3	CFM			
Capacity at idle (appr	oximately	)	n/a	CFM			
Capacity at maximum			n/a	CFM			
Maximum warranted		0 /	n/a	rpm			
Speed idle	•		n/a	rpm			
Drive type	Direct [	Drive Elec	tric	_ ·			
Governor:							
Cut-in pressure	120	n li	osi				
Cut-out pressure	130	-	psi				
Axles	I.	I.					
First							
Manufacturer	Meritor	(Rockwe	II)				
Туре	Deep [	•	,				
Model number	FH946						
Gross axle weight rat		180 lb					
Axle load	- /	180 lb					
	,						
Second							
Manufacturer							
Туре	/						
Model number							
Gross axle weight rat	ing	1b					
Axle load		lb					
		•					
Rear							
Manufacturer	Meritor	(Rockwe	ll)				
Туре	Single I	Reductior					
Model number	79163						
Gross axle weight rating 29,000 lb							

Avda la!										
Axle load	2	9,000 lb								
Axle ratio		6.14:1								
Suspension sys										
Manufacturer		Gillig Front / Hendrickson Rear								
Туре:	First:		Air Suspension							
	Second:	n/a	a							
	Third:	Air S	Suspe	nsion						
Springs:	First:	4 Ba	ag							
	Second:	n/a								
	Third:	4 B	ag							
Joint										
Manufacturer										
Туре										
Model number										
Wheels and tir	es									
Wheels										
Make	Alcoa A	luminum								
Size	front: 22	2.5" x 9.0	" , Re	ear: 22.5" x 8.25"						
Capacity	Front: 9	<u>090 lbs p</u>	er wh	neel, Rear: 8050 lbs per wheel						
Material	Full Pol	ished								
Tires										
Manufacturer	Agency	Supplie	d							
Туре		/ Supplie	d							
Size	315/80	R22.5	T							
Load range/air pr	essure	TBD	psi							
Steering, powe	er									
Pump			1							
Manufacturer and	I model numb	ber		ncentric - EHS						
Туре			Electric Motor-driven hydraulic pump							
Relief pressure			217	5 psi						
Booster/gear bo										
Manufacturer and	I model numb	ber	ZF							
Туре			Hydraulic Assist steering gear							
Ratio			23.3	3:1 (6.2 wheel turns to 95 degree rotation)						
Power steering flu	uid capacity		1.5	gal						
		eel	10	b (unloaded stationary coach on dry asphalt pavement)						
Maximum effort at steering wheel Steering wheel diameter			18	in.						

Make of fun	damental brake syst	em	Meritor / EX225H3 (Disc)					
Brake cham	bers vendor size an	d part number:	First:	MGM Type 24				
			Second:	n/a				
			Third:	MGM MJB 3030ET				
Brake opera	ation effort 6	1 Pressure Rat	io					
Slack adjus	ster's vendor's type							
First:	Right:	Integral to						
	Left:	Integral to	Brake					
Second:	Right:	n/a						
	Left:	n/a						
Third:	Right:	Integral to	Brake					
	Left:	Integral to	Brake					
Length:	First take-up:	n/a						
	Second take-up							
	Third take-up:	n/a	n/a					
Brake	_DrumsDis	cs (Place X den	oting type)					
First:	Manufacturer	Meritor / R	Meritor / Rotors					
	Part number	231236470	23123647098					
	Diameter	17	in.					
Second:	Manufacturer	n/a						
	Part number	n/a						
	Diameter	n/a	in.					
Third:	Manufacturer	Meritor / R	Meritor / Rotors					
	Part number	231236470	23123647098					
	Diameter	17	17 in.					
<b>D</b> I I I I	/pad manufacturer	Meritor						
Brake lining		MA703	MA703					
•								
Вгаке IIning Туре								
Туре	g/pad identification	I						
Type Brake lining	g/pad identification	n/a						
Type Brake lining	-							
Туре	Forward	n/a						
Type <b>Brake linin</b> g First:	Forward Reverse	n/a n/a						
Type <b>Brake linin</b> g First:	Forward Reverse Forward	n/a n/a n/a						

First	2 -	ade por	brako									
Second	∠p n/a	ads per l	JIAKE									
Third												
	2 pads per brake											
Brake lining wi	dthe											
First		Iths in.										
Second	n/a		in.									
Third	n/a		in.									
Third	n/a											
Brake lining/pa	d lei	naths										
First	n/a	_	in.									
Second	n/a n/a		in.									
Third	n/a		in.									
Brake lining thic	knes	s/pad	56	in.								
Ŭ Ŭ			50									
Brake lining/pa	d pe	r axle										
First	11	2	sq. in.									
Second	n/		sq. in.	. in.								
Third	11	2	sq. in.	sq. in.								
Cooling syste	m											
Radiator												
Manufacturer		Modine										
Туре		E-Fan S	System									
Model number		IA0217										
Number of tubes	6		105									
Tubes outer diar	nete	r	2.5	in.	./	0.75 in.						
Fins per inch		14	fins			•						
Fin thickness		0.004	in.									
Total cooling and	d he	ating syste	em capaci	ity		3.5	gal					
Radiator fan spe	ed c	ontrol	Variat	ole S	Speed	Pluse Wi	dth Modulati	ion (PW	M)			
Surge tank capa	city		1									
Thermostat tem	perat	ture settin	g:		Initial o	opening (fu	lly closed)	n/a	°F			
					Fully c	pen		n/a	°F			
Overheat alarm	temp	perature s	ending un	it se	etting		<sup>°F</sup> Cummins	s Set				
Shutdown tempe	eratu	re setting			°F Cu	immins Se	et					
Air reservoir o	capa	acity										
Supply reservoir	-	-	1000		cu in.							
Primary reservoi			1516	-	cu in.							
Secondary reser			2095		cu in.							
2												

	n/a	cu in.								
bir	1090	cu in.								
be	n/a	cu in.								
<i></i>										
ition and a	ir conditio	oning e	quipn	nent						
apacity	68,280	BTU/h	r							
pacity	92,500	BTU								
y	2400	CFM								
Thermo	King									
Horizon	tal Scroll (	Compre	ssor							
rs	n/a									
	n/a									
ed speed	90 H	z		rpm						
	25-90	) Hz		rpm (reco	ommended	)				
	109			lb						
Dry	n/a		gal							
Wet	0.71		gal							
Туре		С		14	lb					
	•				•					
Thermo Ki	ing									
Microchan	nel Brazec	d Alumii	านm							
	23									
tube	n/a	in.								
	0.003	in.								
Thermo k	Kina									
	12	in.								
		rpm								
ım)	Variable		-							
Thermo K	ina									
	···· 51									
4.0	lb									
-	_1									
rive motors										
Thermo Ki	ina									
	apacity apacity apacity ty ty Thermo Type Type Type Thermo Ki Microchan tube Thermo Ki Axial im) Thermo K n/a 4.0	pir I 090 pe I 0,/a apacity 68,280 apacity 92,500 by 2400 by 2400 by I 2400 by I 2400 by I 2400 by I 109 Dry 10,2 Crrs	jir       1090       cu in.         n/a       cu in.         n/a       cu in.         apacity       68,280       BTU/h         apacity       92,500       BTU         apacity       n/a       CFM         ty       109       CFM         apacity       n/a       n/a         Horizontal Scroll Compresion       n/a       109         rs       n/a       109       In/a         apacity       n/a       109       In/a         Dry       n/a       109       In/a         Dry       n/a       In.       In.         Thermo King       n/a       in.       In.         12       n/a       in.       In.         Itube       n/a       in.       In.         12       in.       in.       In.         immov       Variable       GFM       GFM         immov       Variable       GFM       GFM <td>pir I 090 cu in. apa I 090 cu in. apa I cu in. apa I or I cu in. Thermo King Nicrochan I cu in. I or I cu in. I or</td> <td>in/a       cu in.         in/a       BTU/hr         in/a       BTU/hr         in/a       CFM         in/a       CFM         in/a       In/a       In/a         in/a       in/a       in/a         in/a       in/a       in/a         in/a       gal       in/a         in/a       gal       in/a         in/a       gal       in/a         in/a       in.       in.         <t< td=""><td>ir 1090 cu in. pe n/a cu in. tion and air conditioning equipment apacity 68,280 BTU/hr pacity 92,500 BTU y 2400 CFM Thermo King Horizontal Scroll Compressor rs n/a ria n/a ria n/a ria 109 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 109 Ib Dry n/a gal Wet 0.71 gal Type R407C 114 Ib Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 21 in. 3300 pm m) Variable GFM_</td><td>ir I 090 cu in. n/a cu in. tion and air conditions equipment apacity 68,280 BTU/hr apacity 92,500 BTU y 2400 CFM Thermo King Horizontal Scroll Compressor rs n/a n/a n/a rn/a n/a rpm 25-90 Hz rpm 25-90 Hz rpm (recommended) 109 lb Dry n/a gal Wet 0,71 gal Type R407C 14 lb Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Axial 12 in. 3300 rpm Im Variable CFM_ Thermo King Axial Thermo King Axial</td><td>ir 1090 cu in. r/a cu in.</td><td>bir     1090     cu in.       pacity     68,280     BTU/hr       pacity     92,500     BTU       y     2400     CFM         Thermo King       Horizontal Scoll Compressor       rs     n/a       n/a     n/a   ed speed       90 Hz     rpm       25-90 Hz     rpm (recommended)       109     lb   Dry       n/a     gal   Thermo King Microchannel Brazed Aluminum       23   Thermo King       Microchannel Brazed Aluminum       23   Thermo King       Axial   Thermo King       n/a   Thermo King       n/a   Axial       12   in.       3300   rpm.       y   Variable       oFM</td><td>bir       1090       cu in.         ace       n/a       cu in.         tition and air conditioning equipment         apacity       68,280       BTU/hr         apacity       92,500       BTU         yy       2400       CFM         Thermo King         Horizontal Scroll Compressor         rs       n/a         n/a       n/a         25-90 Hz       rpm (recommended)         109       Ib         Dry       n/a         gal       gal         Thermo King       gal         Microchannel Brazed Aluminum       23         23       in.         12       in.         3300       rpm         min)       Variable         GFM         Thermo King         n/a       i         12       in.         3300       rpm         min)       Variable         GFM         Thermo King         Axial       i         12       in.         3300       rpm         GFM      &lt;</td></t<></td>	pir I 090 cu in. apa I 090 cu in. apa I cu in. apa I or I cu in. Thermo King Nicrochan I cu in. I or	in/a       cu in.         in/a       BTU/hr         in/a       BTU/hr         in/a       CFM         in/a       CFM         in/a       In/a       In/a         in/a       in/a       in/a         in/a       in/a       in/a         in/a       gal       in/a         in/a       gal       in/a         in/a       gal       in/a         in/a       in.       in.         in/a       in.       in. <t< td=""><td>ir 1090 cu in. pe n/a cu in. tion and air conditioning equipment apacity 68,280 BTU/hr pacity 92,500 BTU y 2400 CFM Thermo King Horizontal Scroll Compressor rs n/a ria n/a ria n/a ria 109 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 109 Ib Dry n/a gal Wet 0.71 gal Type R407C 114 Ib Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 21 in. 3300 pm m) Variable GFM_</td><td>ir I 090 cu in. n/a cu in. tion and air conditions equipment apacity 68,280 BTU/hr apacity 92,500 BTU y 2400 CFM Thermo King Horizontal Scroll Compressor rs n/a n/a n/a rn/a n/a rpm 25-90 Hz rpm 25-90 Hz rpm (recommended) 109 lb Dry n/a gal Wet 0,71 gal Type R407C 14 lb Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Axial 12 in. 3300 rpm Im Variable CFM_ Thermo King Axial Thermo King Axial</td><td>ir 1090 cu in. r/a cu in.</td><td>bir     1090     cu in.       pacity     68,280     BTU/hr       pacity     92,500     BTU       y     2400     CFM         Thermo King       Horizontal Scoll Compressor       rs     n/a       n/a     n/a   ed speed       90 Hz     rpm       25-90 Hz     rpm (recommended)       109     lb   Dry       n/a     gal   Thermo King Microchannel Brazed Aluminum       23   Thermo King       Microchannel Brazed Aluminum       23   Thermo King       Axial   Thermo King       n/a   Thermo King       n/a   Axial       12   in.       3300   rpm.       y   Variable       oFM</td><td>bir       1090       cu in.         ace       n/a       cu in.         tition and air conditioning equipment         apacity       68,280       BTU/hr         apacity       92,500       BTU         yy       2400       CFM         Thermo King         Horizontal Scroll Compressor         rs       n/a         n/a       n/a         25-90 Hz       rpm (recommended)         109       Ib         Dry       n/a         gal       gal         Thermo King       gal         Microchannel Brazed Aluminum       23         23       in.         12       in.         3300       rpm         min)       Variable         GFM         Thermo King         n/a       i         12       in.         3300       rpm         min)       Variable         GFM         Thermo King         Axial       i         12       in.         3300       rpm         GFM      &lt;</td></t<>	ir 1090 cu in. pe n/a cu in. tion and air conditioning equipment apacity 68,280 BTU/hr pacity 92,500 BTU y 2400 CFM Thermo King Horizontal Scroll Compressor rs n/a ria n/a ria n/a ria 109 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 109 Ib Dry n/a gal Wet 0.71 gal Type R407C 114 Ib Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 21 in. 3300 pm m) Variable GFM_	ir I 090 cu in. n/a cu in. tion and air conditions equipment apacity 68,280 BTU/hr apacity 92,500 BTU y 2400 CFM Thermo King Horizontal Scroll Compressor rs n/a n/a n/a rn/a n/a rpm 25-90 Hz rpm 25-90 Hz rpm (recommended) 109 lb Dry n/a gal Wet 0,71 gal Type R407C 14 lb Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Axial 12 in. 3300 rpm Im Variable CFM_ Thermo King Axial Thermo King Axial	ir 1090 cu in. r/a cu in.	bir     1090     cu in.       pacity     68,280     BTU/hr       pacity     92,500     BTU       y     2400     CFM         Thermo King       Horizontal Scoll Compressor       rs     n/a       n/a     n/a   ed speed       90 Hz     rpm       25-90 Hz     rpm (recommended)       109     lb   Dry       n/a     gal   Thermo King Microchannel Brazed Aluminum       23   Thermo King       Microchannel Brazed Aluminum       23   Thermo King       Axial   Thermo King       n/a   Thermo King       n/a   Axial       12   in.       3300   rpm.       y   Variable       oFM	bir       1090       cu in.         ace       n/a       cu in.         tition and air conditioning equipment         apacity       68,280       BTU/hr         apacity       92,500       BTU         yy       2400       CFM         Thermo King         Horizontal Scroll Compressor         rs       n/a         n/a       n/a         25-90 Hz       rpm (recommended)         109       Ib         Dry       n/a         gal       gal         Thermo King       gal         Microchannel Brazed Aluminum       23         23       in.         12       in.         3300       rpm         min)       Variable         GFM         Thermo King         n/a       i         12       in.         3300       rpm         min)       Variable         GFM         Thermo King         Axial       i         12       in.         3300       rpm         GFM      <

Model	Integral Fan / Motor					
Туре	Brushless					
Horsepower		0.30	hp			
Operating speed		3300	rpm			
Evaporator fan d	rive motors					
Manufacturer	Thermo Ki	ng				
Model	Integral Fa	an / Motor				
Туре	Brushless	6				
Horsepower		Variable	hp			
Operating speed		Variable	rpm			
Evaporator(s)						
Manufacturer	Thermo Kir	ng				
Model	TE18		1			
Number of rows		5				
Number of fins/in.		9				
Outer diameter of	tube	3/8	in.			
Fin thickness		0.008	in.			
Number of evapor	ators	1				
Expansion valve						
Manufacturer	Thermo Ki	ng				
Model	Thermal E	-	Equalized			
Filter-drier						
Manufacturer	Thermo Ki	ng				
Model	n/a					
Heater cores						
Manufacturer	Thermo Ki	ng				
Model	TE18					
Capacity		102,000	Btu/hr			
Number of rows		2				
Number of fins/in.		8				
Outer diameter of	tube	3/8	in.			
Fin thickness		0.008	in.			
Number of heater	cores	1				
Floor heater blow	vers					
Front	n/a					
Rear	n/a					

Controls									
Manufacturer	Therm	Thermo King							
Model	Intellig								
Driver's heater	,								
Manufacturer	Mobile	Clima	te Cont	rol					
Model	Brushl	ess Mo	otors						
Capacity	64,000	)	Btu/hr						
Ventilation sys	tem								
Туре	Doors	& Hato	hes						
Coolant heater									
Make	Valeo								
Model	Therm	no DC2	00						
Capacity	68,300		Btu g	21 kW c	onsumption				
Interior lightin	ng								
Manufacturer			ontrols	Corpora	ation				
Туре		LED							
Number of fixtur	es	10							
Size of fixtures		12 ft							
Power pack		24 Vo	olt						
Deere									
Doors									
Front									
Manufacturer of	operating	equipm	ent	Vapor					
Type of door					Slide-Glide				
Type of operatir	ig equipme	ent		Air Op	en / Air Close				
Rear				1					
Manufacturer of	operating	equipm	ent	Vapor					
Type of door		4		Swing					
Type of operatir	ig equipme	ent			ben / Air Close				
Passenger wi	ndows								
Front									
Manufacturer	Arow	Global							
Model		e Fram	e						
Туре	Full Fi								
Number:	Side		14						

	Rear	n/a								
Sizes:	(10) 4			(2) 5	6"	(1) 34"				
	(1) 3			(2) 0		(1) 34				
Glazing:	Туре	0		Welded Spline						
- 5	Thickne									
	Color of			Gray						
		insmission		28%						
	5			2070						
Mirrors										
		Size	9	Туре	Manufacture	er Part no.	Model no.			
Right side exterior		10" x 11	"	FF/CVX	Safe Fleet	M20A13AE				
Left side exterior		10" x 1	1"	FF/CVX	Safe Fleet	M20A12AA				
Center rearview		8.25"x1	6"	Flat Face	Safe Fleet	53-35868-000				
Front entrance are	а	6" Rour	nd	Flat Face	Safe Fleet	50-02104-007				
Upper-right corner		n/a								
Rear exit area		12"		Convex	Safe Fleet	50-11574-002				
Seats		·	·		·					
Passenger										
Manufacturer		American Seating Company								
Model		nsight Prime		ompany						
Туре	Molded Thermoformed Plastic Seats									
1900										
Operator										
Manufacturer	R	ecaro								
Model and part nur		rgo Metro A	M80							
Туре		Point Belt s								
	I <sup></sup>									
Paint										
Manufacturer	A	xalta								
Туре	l	mron Elite L	ow VO	C 2.8						
Wheelchair ram		ent								
Manufacturer										
Model number										
Capacity		1000	lb							
Width of platform		30	in.							
Length of platform 48 in.										
System fluid capacity n/a qt			qt							
Type of fluid used		n/a								
Operating hydrauli		n/a	psi							
Hydraulic cylinders: n/a Size										

		Number									
		Number									
Wheelchair se	curement e	quipmen	t								
Manufacturer	AMSECO	AMSECO / Q'Straint									
Model number		n Q'Straint									
Destination sig	gns										
Manufacturer	Twin Visi	on									
Туре	Smart Se	eries 3 Silv	er Signs								
Character lengt	h										
Front destination		4.5	in.								
Front route		n/a	in.								
Curbside destina	tion	2.8	in.								
Rear route		n/a	in.								
Character heigh	t	1									
Front destination		8.0	in.								
Front route	Front route			in.							
Curbside destination 4		4.3	in.								
Rear route	n/a	in.									
Number of chara	acters										
Front destination		13									
Front route		n/a									
Curbside destina	tion	11									
Rear route		n/a									
Message width											
Front destination		64.8	in.								
Front route		n/a	in.								
Curbside destina		42.3 in.									
Rear route		n/a	in.								
<b>Flant</b> sic - I											
Electrical											
Multiplex system		O Control	Correret								
Manufacturer			s Corporati	UII							
Model number		Dinex G5									
Batteries											
Manufacturer	0	dyssey									
Manufacturer Odyssey Model number PC2150S											

e Group 31 AGM Maintenance Free							
tem							
n/a							
	Manufa	acturer	Model number	Number			
	REI		710438A				
	Soundvi	ew	SVA505F				
	Proline		80HM				
	Midwes	t	#1180				
		hium Ion					
	5 packs	X					
je 94 🔨 kWh per pack							
	1260	lb per pack					
I							
n/;	a						
m							
Manufacturer Amerex							
Model number V25							
ire detectors 3							
Type (thermal or optical) (2) Linear & (1) Spot Sensor							
	3						
nuncia		m					
	n/a						
	n/a						
	stem n/a n/a	n/a Manufa REI Soundvi REI Soundvi Proline Midwes MNC Littl 5 packs 94 1260 stem n/a n/a n/a n/a n/a n/a n/a	n/a          n/a         Manufacturer         REI         Soundview         Proline         Midwest         MNC Lithium Ion         5 packs       X         94       X       kWh per         1260       Ib per pack         stem       n/a         n/a       Image: Comparison of the second	n/a         Manufacturer       Model number         REI       710438A         Soundview       SVA505F         Proline       80HM         Midwest       #1180         MNC Lithium Ion       5 packs         5 packs       V         94       V         94       V         1260       Ib per pack         stem       n/a         n/a			

Annunciator LED sign				
Number of signs		n/a		
Housing dimensions				
Character length			in.	
Character height			in.	
Character width			in.	
GPS antenna				
Manufacturer		n/a		
Model and part number				
Automatic passenger co	ounte	r		
Manufacturer		n/a		
Model and part number	a.			
	b.			
	C.			
Sensor type				
Poal-timo bus arrival	orodi	iction eve	tom	
Real-time bus arrival	pred	iction sys		Model number
	pred	iction sys	Manufacturer	Model number
Router	pred	iction sys	Manufacturer n/a	Model number
Router Cellular modem	pred	iction sys	Manufacturer n/a n/a	Model number
Router	pred	iction sys	Manufacturer n/a	Model number
Router Cellular modem	pred	iction sys	Manufacturer n/a n/a	Model number
Router Cellular modem	pred	iction sys	Manufacturer n/a n/a	Model number
Router Cellular modem	pred	iction sys	Manufacturer n/a n/a	Model number
Router Cellular modem	pred	iction sys	Manufacturer n/a n/a	Model number
Router Cellular modem	pred	iction sys	Manufacturer n/a n/a	Model number
Router Cellular modem	pred	iction sys	Manufacturer n/a n/a	Model number
Router Cellular modem	predi	iction sys	Manufacturer n/a n/a	Model number
Router Cellular modem	pred	iction sys	Manufacturer n/a n/a	Model number
Router Cellular modem Charge protection	matio	n above is a	Manufacturer n/a n/a n/a	ission. The Agency reserves the
Router Cellular modem Charge protection	matio	n above is a	Manufacturer n/a n/a	ission. The Agency reserves the

# **CER 10. Vehicle Technical Information**

This form must be completed and included in the Technical Proposal. NOTE—one form must be completed for each type of bus submitted in response to this RFP

GENERAL COACH DATA SHEET										
Bus manufacturer:			GILLIG LLC							
Bus model:			35 Floor Low Floor All Elec	ctric						
Understructure man	ufacturer		GILLIG LLC							
Model number:			G28B102H4							
Size/Type of Bus			35 Floor Low Floor All Elec	tric						
Basic Body Constru	iction									
Туре:			Extruded Aluminum							
Tubing or frame me	mber thicl	kness ar	d dimensions							
Overstructure			Aluminum ASTM 6061-T6,	6063-1	[6 TI	nickne	ss .118in			
Understructure			3CR12 Stainless Steel AST							
Skin thickness and	material									
Roof			Fiberglass .12in							
Sidewall			Aluminum .118in							
Skirt panel			Aluminum .118in							
Front end			Fiberglass .125in							
Rear end			Fiberglass .125in							
Dimensions										
Overall length	Over bun	npers		36	ft	9	in.			
	Over bod	-		35	ft	11	in.			
Overall width	Over bod	ly exclud	ing mirrors		ft	102	in.			
	Over bod	ly includi	ng mirrors-driving position		ft	120	in.			
	Over tires	s front ax	les		ft	100	in.			
	Over tires	s center a	axle		ft	N/A	in.			
	Over tires	s rear axl	es		ft	100	in.			
				•						
Overall height (maxi	imum)			11	ft	0.3	in.			
Overall height (main	n roof line)			in.						
Angle of approach		8.5	deg							
Breakover angle		11.9	deg							
Breakover angle (rea	ar)	n/a	deg							
Angle of departure		10.5	deg							

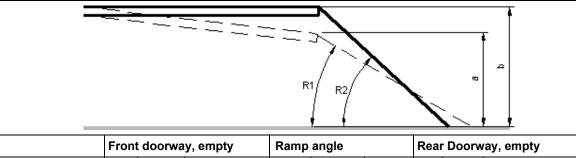
Doorway Dimensions	Front		Rear	
Width between door posts	40	in.	34	
Door width between panels	35.7	in.	30	
Clear door width	32.3	in.	24.8	
Doorway height	75	in.	77	
Knuckle clearance	1.5	in.	1.5	

Step height from ground measured at center of doorway

At rear door

17

in.



					-	-				•
Kneeled	а.	11.7	in.	R	1	9.3	deg	a.	14.1	in.
Unkneeled	b.	15.3	in.	Rź	2	13.6	deg	b.	15.2	in.
Interior head roo	m (cente	r of aisle	e)							
Front axle location	95	in.								
Center axle location	n/a	a in.								
Rear axle location	76.5	5 in.								
Aisle width between	transvers	e seats	24	in.						
Floor height abov	ve groun	d (cente	rline of	bus)						
At front door	15.9	in.								
At front axle	15.9	in.								
At drive axle	35.6	in.								
	1									

Minimum groun	d cleara	nce (between bus and ground, with bus unkneeled)	
Excluding axles	11.2	in.	
Including axles	7.03	in.	

Outside body turning radius, TR0 (including bumper)       34       ft       7       in.         Front inner corner radius, TR1       33       ft       7       in.         Front wheel inner turning radius, TR2       28       ft       1       in.         Front wheel outer turning radius, TR3       34       ft       6       in.         Inside Body Turning Radius innermost point, TR4 (including bumper)       19       ft       5       in.         Wheel base       In.       In.       In.       In.       In.       In.       In.         Rear       n/a       in.       In.       In.       In.       In.       In.       In.       In.         Rear       n/a       in.	
Front wheel inner turning radius, TR2       28       ft       1       in.         Front wheel outer turning radius, TR3       34       ft       6       in.         Inside Body Turning Radius innermost point, TR4 (including bumper)       19       ft       5       in.         Wheel base       Image: state sta	
Front wheel outer turning radius, TR3       34       ft       6       in.         Inside Body Turning Radius innermost point, TR4 (including bumper)       19       ft       5       in.         Inside Body Turning Radius innermost point, TR4 (including bumper)       19       ft       6       in.         Inside Body Turning Radius innermost point, TR4 (including bumper)       19       ft       5       in.         Inside Body Turning Radius innermost point, TR4 (including bumper)       19       ft       5       in.         Inside Body Turning Radius innermost point, TR4 (including bumper)       19       ft       5       in.         Inside Body Turning Radius innermost point, TR4 (including bumper)         Inside Body Turning Radius innermost point, TR4 (including bumper)         Inside Body Turning Radius innermost point, TR4 (including bumper)         Interior Info         Interior Info         Interior Info       Interior Info         Interior Info       Interior Info         Interior Info       Interior Info         Interior Info       Interior Info         Interior Info       Interior Info	
Inside Body Turning Radius innermost point, TR4 (including bumper)         19         ft         5         in.           Inside Body Turning Radius innermost point, TR4 (including bumper)         19         ft         5         in.           Inside Body Turning Radius innermost point, TR4 (including bumper)         19         ft         5         in.           Inside Body Turning Radius innermost point, TR4 (including bumper)           Inside Dase           Front         241         in.           Rear         n/a           Interior Inne           Goverhang, centerline of axle over bumper           Front         90.1         in.           Rear         110.4         in.           Interior length         Interior width (excluding coving)         7         ft         4         in.           Total standee area (approximately)         35         sq ft         in.           Maine Maine Maine Maine Mainum interior floor slope (from horizontal)         4         deg           Passenger capacity provided           Total maximum seating         31           Standee capacity         31           <	
Wheel base         Front         241         in.           Rear         n/a         in.           Overhang, centerline of axle over bumper         Front         90.1         in.           Front         90.1         in.         Rear         110.4         in.           Floor         Interior length         29         ft         0         in.           Floor         Interior length         29         ft         4         in.           Total standee area (approximately)         35         sq ft         in.         Interior floor slope (from horizontal)         4         deg           Passenger capacity provided         Total maximum seating         31         Standee capacity         31           Minimum hip to knee room         26.5         in.         Interior         Interior         Interior	
The set of t	
Front       241       in.         Rear       n/a       in.         Overhang, centerline of axle over bumper         Front       90.1       in.         Rear       110.4       in.         Floor       Interior length       29       ft       0       in.         Floor       Interior length       29       ft       0       in.         Interior width (excluding coving)       7       ft       4       in.       10         Total standee area (approximately)       35       sq ft       in.         Minimum distance between wheelhouses:       Front       36.1       in.         Rear       36.1       in.       in.         Maximum interior floor slope (from horizontal)       4       deg         Passenger capacity provided       31       Standee capacity       31         Minimum hip to knee room       26.5       in.       In.       In.	
Rear         n/a         in.           Overhang, centerline of axle over bumper	
Overhang, centerline of axle over bumper         Front       90.1       in.         Rear       110.4       in.         Floor       29       ft       0       in.         Interior length       29       ft       0       in.         Interior width (excluding coving)       7       ft       4       in.         Total standee area (approximately)       35       sq ft       in.         Minimum distance between wheelhouses:       Front       36.1       in.         Rear       36.1       in.         Maximum interior floor slope (from horizontal)       4       deg         Passenger capacity provided       31       Standee capacity       31         Minimum hip to knee room       26.5       in.       In.	
Front       90.1       in.         Rear       110.4       in.         Floor       Interior length       29       ft       0       in.         Interior width (excluding coving)       7       ft       4       in.         Total standee area (approximately)       35       sq ft       in.         Minimum distance between wheelhouses:       Front       36.1       in.         Center       n/a       in.       in.         Maximum interior floor slope (from horizontal)       4       deg         Passenger capacity provided       31       Standee capacity       31         Minimum hip to knee room       26.5       in.       in.       in.	
Front       90.1       in.         Rear       110.4       in.         Floor       Interior length       29       ft       0       in.         Interior width (excluding coving)       7       ft       4       in.         Total standee area (approximately)       35       sq ft       in.         Minimum distance between wheelhouses:       Front       36.1       in.         Center       n/a       in.       in.         Maximum interior floor slope (from horizontal)       4       deg         Passenger capacity provided       31       Standee capacity       31         Minimum hip to knee room       26.5       in.       in.       in.	
Rear       110.4       in.         Floor       29       ft       0       in.         Interior length       29       ft       0       in.         Interior width (excluding coving)       7       ft       4       in.         Total standee area (approximately)       35       sq ft          Minimum distance between wheelhouses:       Front       36.1       in.         Rear       36.1       in.         Rear       36.1       in.         Maximum interior floor slope (from horizontal)       4       deg         Passenger capacity provided       31          Standee capacity       31          Minimum hip to knee room       26.5       in.	
Floor         Interior length       29       ft       0       in.         Interior width (excluding coving)       7       ft       4       in.         Total standee area (approximately)       35       sq ft          Minimum distance between wheelhouses:       Front       36.1       in.         Rear       36.1       in.          Maximum interior floor slope (from horizontal)       4       deg         Passenger capacity provided       31          Standee capacity       31	
Interior length       29       ft       0       in.         Interior width (excluding coving)       7       ft       4       in.         Total standee area (approximately)       35       sq ft       sq ft         Minimum distance between wheelhouses:       Front       36.1       in.         Rear       36.1       in.         Center       n/a       in.         Maximum interior floor slope (from horizontal)       4       deg         Passenger capacity provided         Total maximum seating       31         Standee capacity       31         Minimum hip to knee room       26.5	
Interior width (excluding coving)       7       ft       4       in.         Total standee area (approximately)       35       sq ft       sq ft         Minimum distance between wheelhouses:       Front       36.1       in.         Rear       36.1       in.       in.         Center       n/a       in.         Maximum interior floor slope (from horizontal)       4       deg         Passenger capacity provided         Total maximum seating       31         Standee capacity       31         Minimum hip to knee room       26.5	
Interior width (excluding coving)       7       ft       4       in.         Total standee area (approximately)       35       sq ft       sq ft         Minimum distance between wheelhouses:       Front       36.1       in.         Rear       36.1       in.       center       n/a       in.         Maximum interior floor slope (from horizontal)       4       deg       deg         Passenger capacity provided         Total maximum seating       31       standee capacity       31         Minimum hip to knee room       26.5       in.       standee       standee       standee	
Minimum distance between wheelhouses:       Front       36.1       in.         Rear       36.1       in.         Center       n/a       in.         Maximum interior floor slope (from horizontal)       4       deg         Passenger capacity provided         Total maximum seating       31         Standee capacity       31         Minimum hip to knee room       26.5	
30.1       Rear       36.1       In/a       in.   Passenger capacity provided Total maximum seating       31       Standee capacity     31       Minimum hip to knee room     26.5	
Rear36.1in.Maximum interior floor slope (from horizontal)4degImage: colspan="6">degPassenger capacity providedTotal maximum seating31Image: colspan="6">Standee capacity31Standee capacity31Image: colspan="6">Standee capacityMinimum hip to knee room26.5in.Image: colspan="6">Image: colspan="6" Image: colspan="6" I	
Maximum interior floor slope (from horizontal)     4     deg       Passenger capacity provided     4     deg       Total maximum seating     31       Standee capacity     31       Minimum hip to knee room     26.5	
Passenger capacity provided       Total maximum seating     31       Standee capacity     31       Minimum hip to knee room     26.5	
Passenger capacity provided         Total maximum seating       31         Standee capacity       31         Minimum hip to knee room       26.5       in.	
Standee capacity     31       Minimum hip to knee room     26.5	
Minimum hip to knee room 26.5 in.	
Minimum foot room 14 in.	
Weight	
No. of Front axle Center axle Rear axle	
people Left Right Total Left Right Total Left Right Total	tal bus

Empty bus, full fuel and farebox	0	6169	6169	12338	n/a	n/a	n/a	9851	9851	19702	32,040
Fully seated, full fuel and farebox	32	7094	7094	14187	n/a	n/a	n/a	11,326	11,326	22,652	36,840
Fully loaded standee and fully seated, full fuel and farebox	63	7989	7989	15977	n/a	n/a	n/a	12,756	12,756	25,513	41,490
Crush load (1.5x fully loaded)	94	8884	8884	17768	n/a	n/a	n/a	14,186	14,186	28,372	46,140
GVWR											47,180
GAWR				18,180						29,000	47,180

## Energy Storage

#### Batteries – low voltage

Manufacturer

Туре

Model number

Cold Cranking Amps

Odyssey	
Group 31 AGM	
PC2150	

1150 Amps

Cranking Amps	1150	Amps
Reserve Capacity	n/a	Amps

Batteries – high voltage				
Manufacturer	AKAS	AKASOL Inc.		
Туре	Lithiu	Lithium Ion NMC		
Model Number		9AKM150CYCUHE		
Total Battery Capacity (kWh) Standard Charge Time Charging Capacity Operating Temperature Range Cooling/Heating System	Varia Varia -40F	Vh per pack (5 Packs per bus = 490 kWh) ble: 102 - 195 minutes (based on current available market chargers) ble on charger used. rated to meet beyond current top charger in mark to 136F (Normal Operating Temp range: 68F to 118F) d-to-air (Thermo King)		
Performance				
Fuel Economy (w/full passenger load, HVAC, and all electric accessories in use)	2.29k\	kWh Vh per mile Orange County route		
Fuel Economy (w/full passenger load, HVAC, and all electric accessories in use)	N/A, s	MPGE ame answer as above		
Max Gradeability	8	%		
Top Speed	65	МРН		
Battery Range	160	Miles		
Acceleration (20 MPH)	7.4	Seconds		
	10.5	Casanda		
Acceleration (40 MPH)	16.5	Seconds		

Performance information/graphs to be attached with this form:

Energy consumption vs. Vehicle speed

Vehicle speed vs. time (both loaded and unloaded)

Vehicle speed vs. grade (both loaded and unloaded)

Acceleration vs. time

Change of acceleration vs. time

# Traction Motor/Drive Motor

Manufacturer	Cummins								
Туре	Permanent M	Permanent Magnet Alternating Current (PMAC)							
Speeds	3500 N-m ma	3500 N-m max torque up to 30 seconds							
Traction motor horsepower rating	2060N-m co	2060N-m continuous torque							
Type ventilation/cooling	liquid-to-air c	ooling							
Gear ratios	Forward: n/a Reverse: n/a								

Vanner							
Vann-Bus 85-CAN							
(120/240)							
Cummins							
n/a							
DC to 9 phase AC							
n/a							
	Vanner Vann-Bus 85-CAN (120/240) Cummins n/a DC to 9 phase AC						

Traction/Drive Mo	tor								
Manufacturer	See ab	ove in pr	evious 7	Fraction/Drive Motor section					
Туре									
Model									
Quantity									
Torque Rating									
kWh Rating									
Air compressor									
Manufacturer	Powere	ex							
Туре	Scroll (	Compress	or						
Rated capacity			13.3	CFM					
Capacity at idle (appr	oximately	)	n/a	CFM					
Capacity at maximum			n/a	CFM					
Maximum warranted		0 /	n/a	rpm					
Speed idle	•		n/a	rpm					
Drive type	Direct [	Drive Elec	tric	_ ·					
Governor:									
Cut-in pressure	120	n li	osi						
Cut-out pressure	130	-	osi						
Axles	I.	I.							
First									
Manufacturer	Meritor	(Rockwe	II)						
Туре	Deep [	•	,						
Model number	FH946								
Gross axle weight rat		180 lb							
Axle load	- /	180 lb							
	,								
Second									
Manufacturer									
Туре	/								
Model number									
Gross axle weight rat	ing	1b							
Axle load		lb							
		•							
Rear									
Manufacturer	Meritor	(Rockwe	ll)						
Туре	Single I	Reductior							
Model number	79163								
Gross axle weight rating 29,000 lb									

Avda la!									
Axle load	2	9,000 lb							
Axle ratio		6.14:1							
Suspension sys									
Manufacturer				rson Rear					
Туре:	First:		ir Suspension						
	Second:	n/a							
	Third:	Air S	Suspension						
Springs:	First:	4 Ba	ag						
	Second:	n/a	ί						
	Third:	4 B	ag						
Joint									
Manufacturer									
Туре									
Model number									
Wheels and tir	es								
Wheels									
Make	Alcoa A	luminum							
Size	front: 22	2.5" x 9.0	" , Re	ear: 22.5" x 8.25"					
Capacity	Front: 9	<u>090 lbs p</u>	er wh	neel, Rear: 8050 lbs per wheel					
Material	Full Pol	ished							
Tires									
Manufacturer	Agency	/ Supplie	d						
Туре		/ Supplie	d						
Size	315/80	R22.5	T						
Load range/air pr	essure	TBD	psi						
Steering, powe	er								
Pump			1						
Manufacturer and	I model numb	ber		ncentric - EHS					
Туре				ctric Motor-driven hydraulic pump					
Relief pressure			217	5 psi					
Booster/gear bo									
Manufacturer and	I model numb	ber	ZF						
Туре			-	Iraulic Assist steering gear					
Ratio			23.3	3:1 (6.2 wheel turns to 95 degree rotation)					
Power steering flu	uid capacity		1.5	gal					
Maximum effort a		eel	10						
Steering wheel di	-		18	in.					

Make of fun	damental brake syst	em	Meritor / E	Meritor / EX225H3 (Disc)						
Brake cham	bers vendor size an	d part number:	First:	First: MGM Type 24						
			Second:	n/a						
			Third:	MGM MJB 3030ET						
Brake opera	ation effort 6	1 Pressure Rat	io							
Slack adjus	ster's vendor's type									
First:	Right:	Integral to								
	Left:	Integral to	Brake							
Second:	Right:	n/a								
	Left:	n/a								
Third:	Right:	Integral to	Brake							
	Left:	Integral to	Brake							
Length:	First take-up:	n/a								
	Second take-up									
	Third take-up:	n/a	n/a							
Brake	_DrumsDis	cs (Place X den	oting type)							
First:	Manufacturer	Meritor / R	otors							
	Part number	231236470	23647098							
	Diameter	17	in.							
Second:	Manufacturer	n/a								
	Part number	n/a	n/a							
	Diameter	n/a	in.							
Third:	Manufacturer	Meritor / R	leritor / Rotors							
	Part number	231236470	23123647098							
	Diameter	17	in.							
<b>D</b> I I I I	/pad manufacturer	Meritor								
Brake lining	Union technic			/A703						
•										
Вгаке IIning Туре										
Туре	g/pad identification	I								
Type Brake lining	g/pad identification	n/a								
Type Brake lining	-									
Туре	Forward	n/a								
Type <b>Brake linin</b> g First:	Forward Reverse	n/a n/a								
Type <b>Brake linin</b> g First:	Forward Reverse Forward	n/a n/a n/a								

First	2 -	ade por	brako								
Second	∠p n/a	ads per l	JIAKE								
Third											
	∠ p	ads per l	ыаке								
Brake lining wi	dthe										
First	in										
Second	n/a		in.								
Third	n/a		in.								
Third	n/a										
Brake lining/pa	d lei	naths									
First	n/a	_	in.								
Second	n/a n/a		in.								
Third	n/a		in.								
Brake lining thic	knes	s/pad	56	in.							
Ŭ Ŭ			50								
Brake lining/pa	d pe	r axle									
First	11	2	sq. in.								
Second	n/		sq. in.	q. in.							
Third	11	2	sq. in.								
Cooling syste	m										
Radiator											
Manufacturer		Modine									
Туре		E-Fan S	System								
Model number		IA0217									
Number of tubes	6		105								
Tubes outer diar	nete	r	2.5	in.	./	0.75 in.					
Fins per inch		14	fins			•					
Fin thickness		0.004	in.								
Total cooling and	d he	ating syste	em capaci	ity		3.5	gal				
Radiator fan spe	ed c	ontrol	Variat	ole S	Speed	Pluse Wi	dth Modulati	ion (PW	M)		
Surge tank capa	city		1	qt							
Thermostat tem	perat	ture settin	g:		Initial o	opening (fu	lly closed)	n/a	°F		
					Fully c	pen		n/a	°F		
Overheat alarm	temp	perature s	ending un	it se	etting		<sup>°F</sup> Cummins	s Set			
Shutdown tempe	eratu	re setting			°F Cu	immins Se	et				
Air reservoir o	capa	acity									
Supply reservoir	-	-	1000	cu in.							
Primary reservoi			1516	-	cu in.						
Secondary reser			2095		cu in.						
2	1										

	n/a	cu in.								
bir	1090	cu in.								
be	n/a	cu in.								
ition and a	ir conditio	oning e	quipn	nent						
apacity	68,280	BTU/hr								
pacity	92,500	BTU								
y	2400	CFM								
Thermo	King									
Horizon	tal Scroll (	Compre	ssor							
rs	n/a									
	n/a									
ed speed	90 H	z		rpm						
	25-90	) Hz		rpm (reco	ommended	)				
	109			lb						
Dry	n/a		gal							
Wet	0.71		gal							
Туре		С		14	lb					
	•				•					
Thermo Ki	ing									
Microchan	nel Brazec	d Alumii	านm							
	23									
tube	n/a	in.								
	0.003	in.								
Thermo k	Kina									
	12	in.								
		rpm								
ım)	Variable		-							
Thermo K	ina									
	···· 51									
4.0	lb									
-	_1									
rive motors										
Thermo Ki	ina									
	apacity apacity apacity ty ty Thermo Type Type Type Thermo Ki Microchan tube Thermo Ki Axial im) Thermo K n/a 4.0	pir I 090 pe I 0,/a apacity 68,280 apacity 92,500 by 2400 by 2400 by I 2400 by I 2400 by I 2400 by I 109 Dry 10,2 Crrs	jir       1090       cu in.         n/a       cu in.         n/a       cu in.         apacity       68,280       BTU/h         apacity       92,500       BTU         apacity       90 Hz       n/a         Horizontal Scroll Compresion       n/a       109         rrs       n/a       109       109         Dry       n/a       10,003       in.         12       n/a       in.       10,003       in.         Thermo King       n/a       in.       12,003       in.         12       3300       rpm       in.       12,004       in.         imacity       Variable       GFM       GFM       G	pir I 090 cu in. apa I 090 cu in. apa I cu in. apa I or I cu in. Thermo King Nicrochan I cu in. I or	in/a       cu in.         in/a       BTU/hr         in/a       BTU/hr         in/a       CFM         in/a       CFM         in/a       In/a       In/a         in/a       in/a       in/a         in/a       in/a       in/a         in/a       gal       in/a         in/a       gal       in/a         in/a       gal       in/a         in/a       in.       in.         in/a       in.       in. <t< td=""><td>ir 1090 cu in. pe n/a cu in. tion and air conditioning equipment apacity 68,280 BTU/hr pacity 92,500 BTU y 2400 CFM Thermo King Horizontal Scroll Compressor rs n/a ria n/a ria n/a ria 109 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 109 Ib Dry n/a gal Wet 0.71 gal Type R407C 114 Ib Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 21 in. 3300 pm m) Variable GFM_</td><td>ir I 090 cu in. n/a cu in. tion and air conditions equipment apacity 68,280 BTU/hr apacity 92,500 BTU y 2400 CFM Thermo King Horizontal Scroll Compressor rs n/a n/a n/a rn/a n/a rpm 25-90 Hz rpm 25-90 Hz rpm (recommended) 109 lb Dry n/a gal Wet 0,71 gal Type R407C 14 lb Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Axial 12 in. 3300 rpm Im Variable CFM_ Thermo King Axial Thermo King Axial</td><td>ir 1090 cu in. r/a cu in.</td><td>bir     1090     cu in.       pacity     68,280     BTU/hr       pacity     92,500     BTU       y     2400     CFM         Thermo King       Horizontal Scoll Compressor       rs     n/a       n/a     n/a       ed speed     90 Hz       rpm (recommended)       109     lb         Dry     n/a         gal         Thermo King         main         again         Thermo King         microchannel Brazed Aluminum         23         Thermo King         Thermo King         n/a         n/a         aj300         rpm         y         12         in.         aj300         rpm         aj300         rpm         y         aj300         rpm         rpm         rpm         aj300         rpm         rpm         rpm       &lt;</td><td>bir       1090       cu in.         ace       n/a       cu in.         tition and air conditioning equipment         apacity       68,280       BTU/hr         apacity       92,500       BTU         yy       2400       CFM         Thermo King         Horizontal Scroll Compressor         rs       n/a         n/a       n/a         25-90 Hz       rpm (recommended)         109       Ib         Dry       n/a         gal       gal         Thermo King       gal         Microchannel Brazed Aluminum       23         23       in.         12       in.         3300       rpm         min)       Variable         GFM         Thermo King         n/a       i         12       in.         3300       rpm         min)       Variable         GFM         Thermo King         Axial       i         12       in.         3300       rpm         GFM      &lt;</td></t<>	ir 1090 cu in. pe n/a cu in. tion and air conditioning equipment apacity 68,280 BTU/hr pacity 92,500 BTU y 2400 CFM Thermo King Horizontal Scroll Compressor rs n/a ria n/a ria n/a ria 109 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 25-90 Hz rpm 109 Ib Dry n/a gal Wet 0.71 gal Type R407C 114 Ib Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 21 in. 3300 pm m) Variable GFM_	ir I 090 cu in. n/a cu in. tion and air conditions equipment apacity 68,280 BTU/hr apacity 92,500 BTU y 2400 CFM Thermo King Horizontal Scroll Compressor rs n/a n/a n/a rn/a n/a rpm 25-90 Hz rpm 25-90 Hz rpm (recommended) 109 lb Dry n/a gal Wet 0,71 gal Type R407C 14 lb Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Microchannel Brazed Aluminum 23 in. Thermo King Axial 12 in. 3300 rpm Im Variable CFM_ Thermo King Axial Thermo King Axial	ir 1090 cu in. r/a cu in.	bir     1090     cu in.       pacity     68,280     BTU/hr       pacity     92,500     BTU       y     2400     CFM         Thermo King       Horizontal Scoll Compressor       rs     n/a       n/a     n/a       ed speed     90 Hz       rpm (recommended)       109     lb         Dry     n/a         gal         Thermo King         main         again         Thermo King         microchannel Brazed Aluminum         23         Thermo King         Thermo King         n/a         n/a         aj300         rpm         y         12         in.         aj300         rpm         aj300         rpm         y         aj300         rpm         rpm         rpm         aj300         rpm         rpm         rpm       <	bir       1090       cu in.         ace       n/a       cu in.         tition and air conditioning equipment         apacity       68,280       BTU/hr         apacity       92,500       BTU         yy       2400       CFM         Thermo King         Horizontal Scroll Compressor         rs       n/a         n/a       n/a         25-90 Hz       rpm (recommended)         109       Ib         Dry       n/a         gal       gal         Thermo King       gal         Microchannel Brazed Aluminum       23         23       in.         12       in.         3300       rpm         min)       Variable         GFM         Thermo King         n/a       i         12       in.         3300       rpm         min)       Variable         GFM         Thermo King         Axial       i         12       in.         3300       rpm         GFM      <

Model	Integral Fan / Motor						
Туре	Brushless						
Horsepower		0.30	hp				
Operating speed		3300	rpm				
Evaporator fan d	rive motors						
Manufacturer	Thermo Ki	ng					
Model	del Integral Fan / Motor						
Туре	Brushless	6					
Horsepower		Variable	hp				
Operating speed		Variable	rpm				
Evaporator(s)							
Manufacturer	Thermo Kir	ng					
Model	TE18		1				
Number of rows		5					
Number of fins/in.		9					
Outer diameter of	tube	3/8	in.				
Fin thickness		0.008	in.				
Number of evapor	ators	1					
Expansion valve							
Manufacturer	Thermo Ki	ng					
Model	Thermal E	-	Equalized				
Filter-drier							
Manufacturer	Thermo Ki	ing					
Model	n/a						
Heater cores							
Manufacturer	Thermo Ki	ng					
Model	TE18						
Capacity		102,000	Btu/hr				
Number of rows		2					
Number of fins/in.		8					
Outer diameter of	tube	3/8	in.				
Fin thickness		0.008	in.				
Number of heater	cores	1					
Floor heater blow	vers						
Front	n/a						
Rear	n/a						

Controls					
Manufacturer	Therm	o Kina			
Model	Intellig				
Driver's heater	,				
Manufacturer	Mobile	Clima	te Cont	rol	
Model	Brushl	ess Mo	otors		
Capacity	64,000	)	Btu/hr		
Ventilation sys	tem				
Туре	Doors	& Hato	hes		
Coolant heater					
Make	Valeo				
Model	Therm	no DC2	00		
Capacity	68,300		Btu g	21 kW c	onsumption
Interior lightin	ng				
Manufacturer			ontrols	Corpora	ation
Туре		LED			
Number of fixtur	es	10			
Size of fixtures		12 ft			
Power pack		24 Vo	olt		
Deere					
Doors					
Front					
Manufacturer of	operating	equipm	ent	Vapor	
Type of door				Slide-0	
Type of operatir	ig equipme	ent		Air Op	en / Air Close
Rear				1	
Manufacturer of	operating	equipm	ent	Vapor	
Type of door		4		Swing	
Type of operatir	ig equipme	ent			ben / Air Close
Passenger wi	ndows				
Front					
Manufacturer	Arow	Global			
Model		e Fram	e		
Туре	Full Fi				
Number:	Side		14		

	Rear	n/a								
Sizes:	(10) 4			(2) 5	6"	(1) 34"				
	(1) 3			(2) 0		(1) 34				
Glazing:	Туре	0		Welded Spline						
- 5	Thickne	SS		6mm						
	Color of			Gray						
		insmission		28%						
	5			2070						
Mirrors										
		Size	9	Туре	Manufacture	er Part no.	Model no.			
Right side exterior		10" x 11	"	FF/CVX	Safe Fleet	M20A13AE				
Left side exterior		10" x 1	1"	FF/CVX	Safe Fleet	M20A12AA				
Center rearview		8.25"x1	6"	Flat Face	Safe Fleet	53-35868-000				
Front entrance are	а	6" Rour	nd	Flat Face	Safe Fleet	50-02104-007				
Upper-right corner		n/a								
Rear exit area		12"		Convex	Safe Fleet	50-11574-002				
Seats		·	·		·					
Passenger										
Manufacturer		morioon Sc	oting C	ompony						
Model		merican Se Sight Prime		ompany						
Туре		-		ed Plastic S	Ceats					
1900										
Operator										
Manufacturer	R	ecaro								
Model and part nur		rgo Metro A	M80							
Туре		Point Belt s								
	I <sup></sup>									
Paint										
Manufacturer	A	xalta								
Туре	l	mron Elite L	ow VO	C 2.8						
Wheelchair ram		ent								
Manufacturer	Lift-U									
Model number	LU18									
Capacity		1000	lb							
Width of platform		30	in.							
Length of platform		48	in.							
System fluid capac	ity	n/a	qt							
Type of fluid used		n/a								
Operating hydrauli		n/a	psi							
Hydraulic cylinders: <sub>n/a</sub> Size										

		Number								
		Number								
Wheelchair se	curement e	quipmen	t							
Manufacturer	AMSECO	AMSECO / Q'Straint								
Model number		ARM with Q'Straint Belts								
Destination sig	gns									
Manufacturer	Twin Visi	win Vision								
Туре	Smart Se	eries 3 Silv	er Signs							
Character lengt	h									
Front destination		4.5	in.							
Front route		n/a	in.							
Curbside destina	tion	2.8	in.							
Rear route		n/a	in.							
Character heigh	t	1								
Front destination		8.0								
Front route		n/a	in.							
Curbside destina	tion	4.3	in.							
Rear route		n/a	in.							
Number of chara	acters									
Front destination		13								
Front route		n/a								
Curbside destina	tion	11								
Rear route		n/a								
Message width										
Front destination		64.8	in.							
Front route		n/a	in.							
Curbside destina	tion	42.3	in.							
Rear route		n/a	in.							
<b>Flant</b> sic - I										
Electrical										
Multiplex system		O Control	Correret							
Manufacturer										
Model number		Dinex G5								
Batteries										
Manufacturer	0	dyssey								
Model number		C2150S								
Model number FO21000										

Туре	G	Group 31 AGM Maintenance Free					
Communication sys	tem						
GPS							
Manufacturer	n/a						
Model number							
PA system							
		Manufacturer		Model number	Number		
Amplifier		REI		710438A			
Microphone		Soundvi	ew	SVA505F			
Internal speakers		Proline		80HM			
External speaker		Midwes	t	#1180			
Energy storage		1					
Туре		MNC Lit					
Number of cells		5 packs	X				
Battery pack voltage		94	🔨 kWh pe				
Weight		1260	lb per pack				
Security camera sys	stem						
Manufacturer	n/a	ı/a					
Model number							
Number of cameras							
Storage capacity							
Bike racks							
Manufacturer	n/a	а					
Model number							
	1						
Fire detection syste	m						
Manufacturer		Amerex					
Model number		V25					
Fire detectors 3							
Type (thermal or optical) (2) Li		(2) Line	2) Linear & (1) Spot Sensor				
Number of detectors 3							
Automatic voice anr	nuncia		m				
Manufacturer	iuncia	n/a					
Model and part number		n/a					
		]					

Annunciator LED sign						
Number of signs		n/a				
Housing dimensions						
Character length			in.			
Character height			in.			
Character width			in.			
GPS antenna						
Manufacturer		n/a				
Model and part number						
Automatic passenger co	ounte	r				
Manufacturer		n/a				
Model and part number	a.					
	b.					
	C.					
Sensor type						
			<b>4</b>			
Real-time bus arrival <b>j</b>	oredi	ction sys		· · · · ·		
	oredi	ction sys	Manufacturer	Model number		
Router	oredi	ction sys	Manufacturer n/a	Model number		
Router Cellular modem	oredi	ction sys	Manufacturer n/a n/a	Model number		
Router	predi	ction sys	Manufacturer n/a	Model number		
Router Cellular modem	oredi	ction sys	Manufacturer n/a n/a	Model number		
Router Cellular modem	predi	ction sys	Manufacturer n/a n/a	Model number		
Router Cellular modem	predi	ction sys	Manufacturer n/a n/a	Model number		
Router Cellular modem	predi	ction sys	Manufacturer n/a n/a	Model number		
Router Cellular modem	predi	ction sys	Manufacturer n/a n/a	Model number		
Router Cellular modem	predi	ction sys	Manufacturer n/a n/a	Model number		
Router Cellular modem	predi	ction sys	Manufacturer n/a n/a	Model number		
Router Cellular modem	oredi	ction sys	Manufacturer n/a n/a	Model number		
Router Cellular modem Charge protection			Manufacturer n/a n/a			
Router Cellular modem Charge protection	matio	n above is a	Manufacturer n/a n/a	ission. The Agency reserves the		

BIR -00271 Customer Request Please provide this info for the bid:

Performance Information/Graphs to be include with Proposal submittal shall include:

- Energy Consumption vs. Road Speed
- Torque vs. Road Speed
- Energy consumption vs. torque.
- Vehicle speed vs. time (both loaded and unloaded)
- Vehicle speed vs. grade (both loaded and unloaded)
- Acceleration vs. time
- Change of acceleration vs. time

Supply a computer simulation of bus performance, utilizing the physical and mechanical characteristics of a specific bus, for each type of bus offered. Performance simulation data to be prepared with 130% passenger load and all accessories on. Supply a performance summary for the exact bus(es) to be built, utilizing a 130% passenger load. Data to show AT LEAST the following: time to speed on flat ground, 5%, 7%, 10% and maximum grade for speeds of 5, 10, 15, 25, 35 mph (or maximum for each grade). Describe to what extent and in what manner software controlled load shedding will be utilized to achieve the desired performance. Include a list of parameter set points that can be adjusted to suite operating environment and performance requirements of transit buses in the State of Florida.

Nominal conditions

- Ambient temperature: 90 °F
- Bus weight: SLW

Worst-case conditions

• Ambient temperature: Worst-case heating and cooling loads when operating in State of Florida environmental conditions as defined by <u>NOAA.com</u>, or other website.

• Bus weight: GVWR

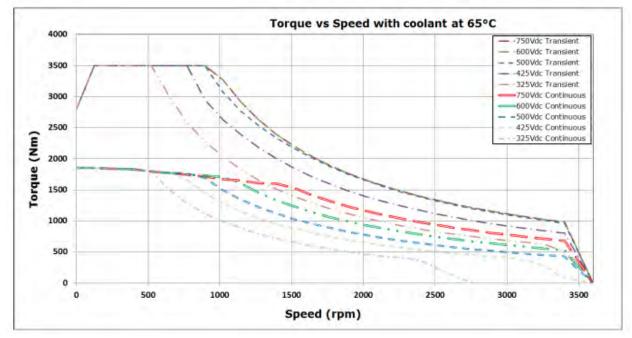
# **Bus Specification**

- 40' Gen 2.5
- 6 pack
- Typical configuration (w/o overhead or inductive charging)
- Curb Weight: 34,240 Lbs.
- Seated Weight: 40,090 Lbs.
- GVWR: 47,180 Lbs.

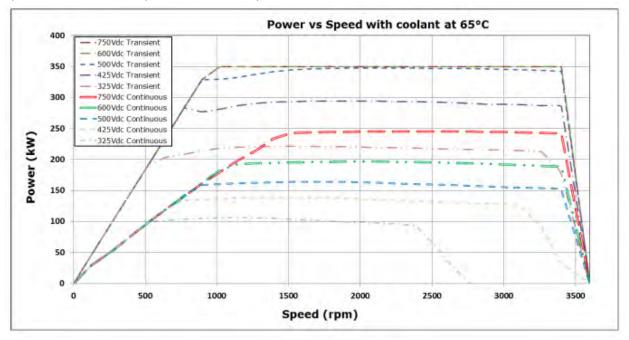
## **Engineering Responses**

1. Energy Consumption Vs Road speed. Provide standard values per Altoona cycles Waiting for Cummins (Colby table)

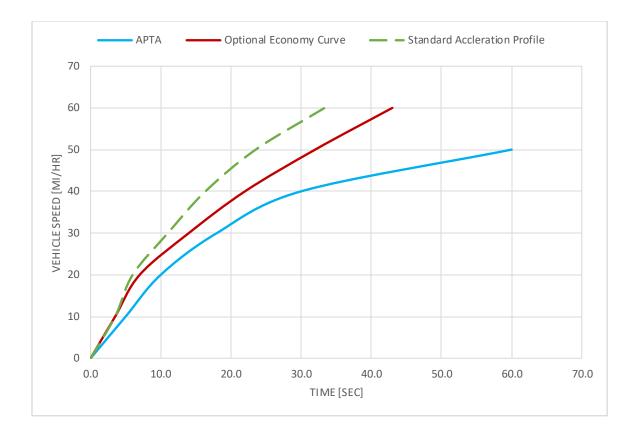
2. Torque vs road speed. Curve below provides the motor torque curve showing available motor torque vs motor speed. Torque vs road speed is a function of vehicle grade, driver determined road speed, current rate of acceleration. The curve defines what the motor is capable of.



3. Energy Consumption vs torque. Curve below provides motor power consumption vs motor speed at maximum torque at that motor speed



4. Vehicle speed vs time. The curves below define the standard acceleration curve, optional reduced acceleration curve and the curve per APTA.



- 5. Vehicle speed vs grade Not sure yet
- 6. Acceleration vs time. Currently provide time to a speed in 10 mph increments. Could add to this table avg acceleration rate in each 10 mph bracket to show change in acceleration time as the speed increases.
- 7. Change of acceleration over time use response 6

<u>130% Crush load.</u> Gillig does not provide performance data at a 130% crush load. Gillig designs the vehicle GVWR to allow for full seated and standee load without exceeding any GAWR. Standee load is determined by 1.5 square feet per passenger. Per standard use of crush load the practical limit for crush load is 6 passengers per 1.2 square yards or 1.75 square feel per passenger. Gillig already uses 1.5 square foot per passenger which is 17% above this practical limit. Vehicle use above GVWR is not approved and performance above GVWR is not defined to prevent implying vehicle operation above GVWR is approved. Performance data can be provided at curb, seated or GVWR.

## Temperature

- Average Low is 55F use 50 F
- Average high is 88F use 90 F

Performance Table Build with help from Cummins

## Load Shedding

No load shedding is done to achieve this performance. This ensures vehicle performance will remain constant and predicable. Some load shedding of non-propulsion features such as HVAC is employed at very low SoC to maximize remaining range, but vehicle performance will remain constant.

#### Adjustable Parameter Set Points

- Regen curves are not adjustable. Regen curves are set to provide the maximum possible regen while ensuring passenger comfort and meet the requirements of the axle manufacturer.
- A reduced acceleration curve for a slightly slower rate of acceleration is available. This can either be confirmed before delivery or changed using Cummins software.
- No other propulsion system parameters are adjustable.

#### Performance

Tires		Goodyear Metro Miler G652 B315 80R 22.5 RPM 485 SLR 19.9" Crr 6.5			LR 19.9" Crr 6.5	
Rear axle	ratio	6.14		GVWR	47,180 Lbs.	
Operating	g voltage	660 V				
Motor coolant temp		65 C				
		Continuous	30 Seconds	1 Minute	2 Minutes	4 Minutes
	Grade %	MPH at GVWR				
	0	70.56	70.56	70.56	70.56	70.56
	1	68.40	69.81	69.81	69.81	69.81
	2	65.85	69.04	69.06	69.06	69.06
	3	62.54	63.29	65.03	66.10	66.35
	4	55.09	57.04	58.16	58.77	58.87
	5	48.80	51.38	52.05	52.35	52.39
	6	43.47	46.35	46.71	46.84	46.85
	7	38.95	41.93	42.12	42.16	42.17
	8	31.74	38.10	38.19	38.20	38.20
	9	0.00	34.67	34.73	34.74	34.74
	10	0.00	31.75	31.77	31.78	31.78
	11	0.00	28.93	28.94	28.94	28.94
	12	0.00	26.63	26.63	26.63	1.75
	13	0.00	25.04	25.04	25.04	0.00
	14	0.00	23.45	23.45	2.41	0.00
	15	0.00	21.87	19.78	0.00	0.00
	16	0.00	20.03	0.00	0.00	0.00
	17	0.00	9.10	0.00	0.00	0.00
	18	0.00	0.00	0.00	0.00	0.00
	19	0.00	0.00	0.00	0.00	0.00
	20	0.00	0.00	0.00	0.00	0.00

		Maximum Time in Seconds			
Speed					
mph	0% Grade	5% Grade	7% Grade	10% Grade	
10	4.6	6.6	7.9	11.4	
20	7.4	10.6	12.7	18.2	
30	11	16.5	20.9	39.2	
40	16.5	29.5	50.5	-	
50	23.5	60	-	-	
60	33.4	-	-	-	

# Time to Speed: Standard Acceleration Curve at GVWR

Acceleration Curve, Acceleration Rate and Change in Acceleration Rate

Maximum Time In Seconds		
Speed	Standard Acceleration	Average Acceleration Rate From Previous Speed
mph	Seconds	Ft/Sec Sq
10	4.6	3.19
20	7.4	5.24
30	11	4.075
40	16.5	2.67
50	23.5	2.096
60	33.4	1.48

#### Response Reference Information. Not to be included in response to customer.

#### **Crush Load Definition**

In the context of <u>transport economics</u> and <u>planning</u>, crush load refers to the maximum level of passenger load for a particular vehicle or rail carriage. Crush loads are calculated for the number of passengers per unit area, standing up.

Crush loads are not an issue for passengers that are seated, as passengers will not normally sit on one another.

Crush loads are most common on city buses and <u>rail metro systems</u>, where passenger loading is high, and most passengers stand. Airlines almost never have crush loads, nor do high speed and/or long-distance rail or long-distance bus routes, where all passengers are generally seated.

Crush loads are normally measured using number of standing passengers per 1 square metre (1.2 sq yd).<sup>[2]</sup> Six passengers per square metre is often considered the practical limit on what can be accepted without serious discomfort to passengers. However, severe crush loads can be much in excess of this.<sup>[2]</sup>

6 passenger in 1.2 sq yard = 10.8 square feet = 1.75 square feet per passenger APTA standard is 1.5 square feet per passenger which is



# **SECTION 1: TECHNICAL PROPOSAL**

# 7. REFERENCES AND NON-PRICED INFORMATION

GILLIG is a <u>100% U. S. owned and operated</u> manufacturing company located in Livermore, California. All our transit bus models are manufactured at this one (1) location only, on the same production line.

We have manufactured and delivered our LOW FLOOR heavy-duty ZERO EMISSION BATTERY ELECTRIC, DIESEL, HYBRID-ELECTRIC, and CNG model transit buses throughout the United States, in all climates (including Alaska and Hawaii).

We operate 12 months of the year and employ over 850 full-time qualified and experienced employees in all departments to meet our production requirements.

References attached are:

- ZERO EMISSION CUSTOMER REFERENCE LIST
- SUCCESSFUL BATTERY ELECTRIC BUS LAUNCH CUSTOMER LIST
- CUSTOMER REFERENCE LETTERS
- Reference the aerial photo of our Livermore location.





# **CUSTOMER REFERENCE LIST (BEB)**

Our **ZERO EMISSIONS BATTERY ELECTRIC BUS (BEB)** offering joins GILLIG's industry leading Low Floor bus platform to bring the most comprehensive, advanced battery electric bus to the market.

GILLIG's Zero Emission Battery Electric bus incorporates the Cummins electrified powertrain, which provides the advantage of full local service support with hundreds of service centers throughout the country to provide the necessary training, warranty administration, and aftermarket parts. All designed, built, and supported right here in the United States.

Please see the below reference list for current Battery Electric Bus customers. GILLIG has built and delivered well over 60 Battery Electric Buses to over 25 different customers.

# Customer: Santa Monica, CA (Big Blue Bus)

- Address: 1660 7TH Street Santa Monica, CA 90401
- Contact: Adrian H. Garcia, Transit Maintenance Vehicle Supervisor
- Phone: (310) 633-1852
- Email: adrian.garcia@smgov.net

# Customer: Tucson, AZ (Sun Tran)

Address: 3920 N. Sun Tran Blvd. Tucson, AZ 85705

Contact: Jim Gleason, Director Maintenance

Phone: (520) 206-8891

Email: james.gleason@tucsonaz.gov

## Customer: Honolulu, HI (The Bus)

Address: 650 South King St. Third Floor Honolulu, HI 96813

Contact: Adam Tamayoshi, VP of Maintenance

Phone: 808-768-9463

Email: adam.tamayoshi@thebus.org

# Customer: Kansas City, MO (Kansa City Area Transit Authority)

Address: 1350 East 17TH St. Kansas City, MO 64108

Contact: Chuck Ferguson, VP, Bus Operations

Phone: (816) 346-0353

Email: <u>cferguson@kcata.org</u>

# Customer: Kitsap, WA (Kitsap Transit)

Address: 60 Washington Ave, Ste. 200, Bremerton, WA 98337

Contact: Dennis Griffey, Vehicle & Facilities Maintenance Director

Phone: (360) 478-6229

Email: <u>dennisg@kitsaptransit.com</u>



# **CUSTOMER REFERENCE LIST (BEB)**

Customer: Bellingham, WA (Whatcom Transportation Authority)

Address: 4111 Bakerview Spur, Bellingham, WA 98226

Contact: Michael Bozzo, Director of Fleet and Facilities

Phone: (360) 788-9351

Email: <u>mikeb@ridewta.com</u>

## Customer: Portland, OR (Trimet)

Address: 1800 SW 1st Avenue, Suite 300, Portland, OR 97201

Contact: Samuel Rumhizha, Director, Bus Maintenance

Phone: (503) 962-5840

Email: rumhizhs@trimet.org



# Successful Battery Electric Bus Launch

Over the past 20 years, GILLIG has manufactured 3,500 electrified drivetrain buses leading up to our current generation of BEB offerings. In 2017, GILLIG partnered with Cummins to announce the next generation of battery electric buses. GILLIG commenced production of the current generation of Battery Electric buses in September 2020. As of September 18, 2021, GILLIG has delivered 95 of the current generation of Battery Electric Buses. Current Battery Electric bus production starts are set at 3 per week and GILLIG anticipates delivering 150+ Battery Electric Buses in 2021. The excitement about the GILLIG Battery Electric Low Floor has resulted in over 64 unique customer orders to over the last 15 months.





# MEMORANDUM FOR RECORD

To Whom It May Concern;

Date: March 2, 2021

Letter of Reference for Gillig LLC

I have been working in various positions in the public transit industry for the last 25 years. I started as a bus mechanic, then, worked as a back –up driver, in Operations, Maintenance Management and Administration. I have been the Director of Athens-Clarke County Transit department since October of 2001.

Over the years, I have either worked on, driven, or helped facilitate the purchase more than 300+ Gillig buses. The various 30, 35, and 40-foot standard and low-floor heavy-duty transit buses, with diesel, hybrid, and/or electric propulsion systems have been reliable vehicles for this system, as well as many other transit systems across this county. Gillig's customer services from product order, though production and delivery, to their after the sale, replacement parts and repair programs, their staff and services have always been exemplary.

I believe that Gillig builds the best heavy-duty transit buses in the industry. From their sales staff, the engineers, the workers on the assembly line, to the parts department folks, they all are reliable partners to our organization and they stand behind their products as a company and as a member of the team.

I would highly recommend Gillig LLC, their staff and their products to any system in the industry.

Thank you,

Patch MEAle

Butch McDuffie Director, Athens-Clarke County Transit Department Athens, GA 30601 706-621-0667

**Transit Department** 



**Big Blue Bus** Transit Maintenance 1660 7th Street Santa Monica, CA 90401

September 14, 2020

Mr. Joe Policarpio Vice President of Sales and Marketing GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Policarpio,

Big Blue Bus (BBB) would like to thank GILLIG for helping us provide safe and reliable buses that represent the latest in bus technology and clean fuel sources. Since 2012, you have helped us maintain the highest quality fleet and become the first transit agency in Southern California to purchase buses with near-zero compressed natural gas (CNG) engines. With GILLIG, BBB crossed a historic threshold in August 2019: the in-service deployment of our first zero-emission battery-electric bus, which is performing beautifully.

Our GILLIG battery-electric bus has exceeded our expectations and those of our customers. It performs as well as our other 124 GILLIG buses. Your cutting-edge bus uses state-of-the-art battery-electric technology, design features, and power capabilities while offering an unparalleled quiet and smooth ride. Because of the incredible reliability and serviceability of our in-service GILLIG battery-electric bus, BBB will be deploying 18 additional GILLIG zero-emission battery-electric buses by 2021.

Our GILLIG battery-electric bus deployment also marks a significant step toward preserving our environment and protecting our communities as we complete the transition to a zero-emissions fleet by 2030. We can't think of a better partner to provide safe, reliable, and efficient transportation services that improve and enhance our community's quality of life. We look forward to a long, mutually beneficial partnership with GILLIG.

Sincerely,

Getty Modica Transit Maintenance Manager



September 14, 2020

Mr. Joe Policarpio Vice President of Sales and Marketing GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Policarpio,

We couldn't be prouder to partner with GILLIG on 2 FTA Lo or No Emission Grant programs as we invest in creating an innovative and smart transportation system through our in-service GILLIG zero-emission battery-electric bus.

For almost 20 years, GILLIG has provided Tucson with the most reliable buses—dieselelectric hybrid, near-zero emission compressed natural gas, and clean-diesel—all designed on the proven GILLIG Low Floor platform to maximize fleet commonality.

In April 2020, our first zero-emission electric bus from GILLIG hit the streets, and we couldn't be more impressed with its performance. Our bus performs as well as our current GILLIG fleet and now confirms our perception that GILLIG is providing the safest, highest quality, most reliable, and best-supported battery-electric bus on the market. With its advanced technology, our GILLIG electric bus also provides a quieter and more comfortable ride for our passengers. Sun Tran looks forward to receiving our 10 additional GILLIG electric buses as we build a more sustainable community and cleaner air.

Thank you for providing market-leading, dependable solutions as we begin our zeroemissions journey, electrifying our city's vehicle and transit fleet. With the help of GILLIG buses, Sun Tran is an industry leader in safe, reliable, and sustainable transportation solutions.

Sincerely,

Kevin Faulkner Director of Procurement Sun Tran



Oahu Transit Services, Inc.

811 Middle St. Honolulu, HI 96819-2316 telepbone (808) 848-4400 facsimile (808) 848-4419

www.thebus.org

The Bus The Handi-Van

June 23, 2020

Mr. Joe Policarpio Vice President of Sales and Marketing Gillig L.L.C. 451 Discovery Drive Livermore, CA 94511

Dear Mr. Policarpio,

I would like to express my eagerness on taking this momentous step towards the electrification of mass transit with Gillig. There is absolutely no other manufacturer that I would prefer to partner with on such an important endeavor. Your dependable product and outstanding customer support are the cornerstones of the strong relationship that has continued over the years between the City and County of Honolulu, Oahu Transit Services, Inc. and your Corporation.

Currently, the City and County of Honolulu operates a fleet of 367 Gillig buses. The durability and dependability of your buses are evident in our oldest fleet aged at 23 years and in our most utilized fleet having traveled over 1,000,000 miles. Impressionably, we consistently witness your revolutionary advancements with improved fuel economy and lowered operational cost. Reinforcing our reasons why we have confidence in your new electric bus. We know that it will be reliable, well-engineered and environmentally beneficial.

The only factor that surpasses your amazing product is the outstanding customer support that we consistently receive. It is obvious from working with your staff throughout the company, how strongly Gillig is dedicated to their clients and how much they believe in their product. Everyone on staff has proven to be extremely knowledgeable, courteous, and always willing to go the extra mile. Mr. Joe Policarpio June 23, 2020 Page 2

As we anxiously wait for the arrival of our first electric bus, we are anticipating that it will to be a success. I am confident that these buses will provide reliable and efficient public transportation for the people of Honolulu for many years to come. I foresee a promising future with a continued partnership between the City and County of Honolulu and Gillig.

Sincerely,

<u>C</u>.

Adam Tamayoshi Vice President of Maintenance



75 Langley Drive | Lawrenceville, GA 30046-6935 770.822.7446 www.gwinnettcounty.com | www.gctransit.com

Karen Winger AICP CCTM, Transit Division Director Gwinnett County Department of Transportation 770.822.7422 Karen.winger@gwinnettcounty.com

To Whom It May Concern,

This letter is for the recommendation of GILLIG bus manufacture. Gwinnett County purchased the first set of 28 forty-foot long local buses in 2015 as part of the Athens-Clarke County bus consortium. We have since purchased an additional 10 buses with GILLIG through this same contract, receiving our final 3 buses as recently as June of 2020.

Since our first bus arrived, GILLIG has always been prompt, professional and courteous at every step of the process. Whether it be from the presale to finalizing the order, all the way to delivery of our brand new bus, GILLIG has always been responsive to our needs and concerns, in addition to being quick to rectify any issues.

When it comes to sales and service, not only is the GILLIG product a quality and dependable product in the best of times but it is also a product that can come through when need them the most. During the height of the COVID-19 pandemic, GILLIG was able to ship us operator barriers for our entire fleet in less than a month of request.

I am happy to recommend GILLIG to anybody who is looking for a quality bus product.

Karen A Winger

Karen Winger AICP CCTM Transit Division Director, Gwinnett County



Indianapolis Public Transportation Corporation 1501 W. Washington Street Indianapolis, IN 46222 317.635.3344 www.IndyGo.net @IndyGoBus

June 9, 2020

Mr. Jim Ryan Regional Sales Manager Gillig Sales GILLIG LLC 25800 Clawiter Road Hayward, CA 94545

Dear Mr. Ryan,

I'm writing today to thank you and the Gillig team for your continued partnership and service in providing vehicles for the Indianapolis Public Transportation Corporation (IndyGo).

IndyGo currently operates a fleet of 172 Gillig buses. The Gillig team recently provided exceptional service by working with IndyGo to expedite an order of thirteen additional buses to assist with the future implementation of system changes. Gillig's dedication to customer service is evident, and felt even more so as we navigate a new environment for both businesses and transit agencies. We are proud to have partnered with Gillig for over twenty-five years.

Our Operators and riders know they can rely on Gillig's vehicles to transport them around the city. In a time when most travel is for essential trips, we know how important it is to have vehicles we can count on. The Gillig team continues to provide excellent customer service and high-quality products to our agency. We look forward to our continued partnership.

I would be happy to recommend Gillig's products and services to prospective customers.

Sincerely,

Inez Evans President and CEO IndyGo



June 2, 2020

Mr. Jim Ryan Regional Sales Manager GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Ryan;

For more than 30 years, the METRO Regional Transit Authority has been doing business with GILLIG. I have personally had the pleasure of being able to use GILLIG vehicles at all three transit properties with whom I have been associated. From the time, I was a bus operator in Akron, Ohio to overseeing the maintenance department in Nashville to managing Knoxville's transit system in Tennessee one bus company has remained the focal point of these transit systems, GILLIG.

GILLIG has an outstanding product they stand behind and a customer service driven mission that is the best in the industry. From the day the bus comes off the production line to the day the bus runs its final mile into retirement, GILLIG provides superior quality, training, service, and support to this organization. Their business model shows their passion, integrity, and quality for their customers. You are truly never alone when you have made the commitment to purchase GILLIG vehicles. You become part of the family. They seek out your input into future ideas and projects while advancing the bus technology that makes their buses the ones operators want to drive, passengers want to ride, and organizations want to buy.

Top this all off with the amazing dedication and assistance my organizations have always received from you as our sales representative and you have what I consider to be the best of the best. It is with great pleasure that I provide this letter of recommendation to perspective customers of the GILLIG Corporation.

Yours in accessible transportation,

Dawn Distler Chief Executive Officer



416 KENMORE BOULEVARD AKRON, OHIO 44301 phone: 330.762.7267 / fax: 330.762.0854

web: AKRONMETRO.ORG



Jeff Mundstock

Interim Director of Fleet and Facilities 1401 Bank Street Cincinnati, OH 45214 (513) 632-7612 PH (513) 513-632-7505 FAX jmundstock@go-metro.com

June 2, 2020

Mr. Jim Ryan Regional Sales Manager Gillig LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Ryan,

I have had the pleasure in working with Gillig for almost 10 years. SORTA/Metro as an organization has participated with Gillig in over 10 builds, totaling over 550 buses in recent decades for heavy duty transit coaches.

In my experience, Gillig has been paramount in build quality and customer service. From the preproduction meeting, to support years after the coach is in service, right down to replacement parts, Gillig has always focused on being customer-driven and has supported SORTA as an organization through the entire time we have been partners. SORTA has had other bus manufacturers in recent years, and I will personally say that Gillig well exceeds rival manufacturers in regards to customer service, support, and quality.

Within the past year, Gillig sent a team of engineers and production managers to our facility to inspect older buses that we still had in service well past their 12 year useful life. We took them out to see some of our 2004 Phantoms we still had in service at the time. The purpose of this visit was to investigate how the buses held up over time in our climate, and how that information will help them in future designs and builds. This process demonstrates Gillig's attention to detail and commitment to building a product to last well past the FTA useful life expectancy.

Our relationship with Gillig will extend well into the future of our organization, as we have recently started yet another 5 year contract for the purchase of 40' heavy duty transit buses. I am looking forward to our future endeavors as a partnership and would be pleased to recommend Gillig to any future potential customers.

Sincerely,

1

Jeff Mundstock Interim Director of Fleet and Facilities



KANAWHA VALLEY REGIONAL

P.O. Box 1188 Charleston, WV 25324 1550 Fourth Avenue Charleston, WV 25387 PHONE 304.343.3840 FAX 304.343.3877 WEB RIDEONKRT.COM

June 2, 2020

Mr. Jim Ryan Regional Sales Manager Gillig L.L.C. 451 Discovery Drive Livermore, CA 94551

Dear Mr. Ryan:

On behalf of the Kanawha Valley Regional Transportation Authority (KVRTA), I would like to take this opportunity to thank you and the entire Gillig team for the excellent service, support and buses that have been afforded to KVRTA over the past seventeen years. Our entire organization feel that the Gillig buses are the finest buses that we have ever operated at KVRTA. During my thirty-eight-year career in public transit, the relationship established with you, David Clawson and others at Gillig has been unmatched, and makes my life as Executive Director of the Authority much easier knowing I don't have to worry about our Gillig fleet.

KVRTA appreciates the fact that Gillig and its employees pride themselves on being a customer-driven organization and has always exceeded our expectations. The assistance that you, David, and others at Gillig provide not only KVRTA, but all the transit systems in West Virginia is truly unparalleled. Keeping us updated on industry trends, technological advancements and changes in the industry further demonstrates Gillig's dedication to meeting its customer needs as well as the needs of others.

Industrywide, Gillig is highly respected and undoubtably is a leader in the bus manufacturing field and is known for producing quality vehicles. Our operators, maintenance staff and passengers all reap the benefits by KVRTA purchasing quality products from Gillig.

It has been a pleasure to work with you, David and the entire Gillig team over the years. I am more than willing to recommend Gillig to any of your prospective customers.

Sincerely, J. Douglas Hartley **Executive** Director

Cc: David Clawson



June 2, 2020

Mr. Jim Ryan Regional Sales Manager Gillig LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Ryan,

I have had the pleasure of doing business with Gillig for over 30 year. During this time, I have found Gillig and its employees to be a customer-driven organization that has provided the highest levels of customer support. Gillig employees are dedicated and knowledgeable about their products, whether it is the coaches they produce or parts they provide to maintain the coaches.

Part of the success Gillig and WRTA have had is the continued support that is provided from the day a purchase order is issued until the day the coach is retired from service. The whole procurement and production process are well thought out and completed in a very effective manner. Gillig's coach manufacturing facility is one of the best examples in how to build a heavy-duty transit coach.

We appreciate the input Gillig seeks from WRTA and others in the transit industry as they continually make advancements in the design of the coach to provide a better product each year to meet the needs of its customers.

It is always a pleasure to work with you and your team. I would highly recommend Gillig to any of your prospective customers.

Sincerely,

Dean J Harris Executive Director

Carm Basile Chief Executive Officer 518-437-6840 carmb@cdta.org

May 27, 2020

Mr. Joseph Policarpio, Vice President Sales & Marketing GILLIG, LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Policarpio:

The Capital District Transportation Authority (CDTA) is in the final year of our third five-year contract with Gillig for the purchase of transit vehicles.

Gillig consistently delivers a quality product, on time and according to our specifications. The Gillig staff are professional, attentive, and top-notch representatives of your company. We know that buses will be delivered in accordance with the contract requirements, and any issues which are usually few and minor in nature, are attended to in a timely manner.

We appreciate Gillig's ability to stay at the forefront of the latest developments in transit technology and the fact that these developments are consistently communicated to us. Jerry Sheehan has been our principal contact for close to 15 years, and we appreciate his efforts on our behalf.

Cordially,

Com Brile

Carm Basile Chief Executive Officer

Jayme B. Lahut Chairman Schenectady County

Michael J. Criscione Vice Chairman Albany County

Mark Schaeffer Secretary Albany County

David M. Stackrow Treasurer Rensselaer County

Georgeanna M. Nugent Saratoga County

Jaciyn Falotico Schenectady County

Denise A. Figueroa Albany County

Patrick M. Lance Labor Representative

Carm Basile Chief Executive Officer



# ERIE METROPOLITAN TRANSIT AUTHORITY

127 East 14th Street Erie, Pennsylvania 16503

May 21st 2020

Mr. Jerry Sheehan Regional Sales Manager GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Mr. Jerry Sheehan:

The Erie Metropolitan Transit Authority has maintained a multi-decade strong relationship with Gillig as a result of outstanding customer service, performance reliability and toughness.

If anyone knows anything about Erie, Pennsylvania is that Erie is annually in competition for snow capitol U.S.A. Despite the toughest of blizzards that have at times dropped five, six, and even seven feet of snow over a period of a few days, EMTA has been able to and will continue to rely on our fleet of Gillig buses. The Gillig bus has performed superbly under the harshest of conditions over the decades. As a result, Erie has gained a reputation as the Authority within our Commonwealth to 'never shutdown' operations despite our notorious Erie winter weather.

The Erie Metropolitan Transit Authority highly values our relationship with Gillig as we continue to expand and outfit our fleet with Gillig buses. I highly recommend the Gillig team and product to any Authority in search of reliability, performance and great service.

Sincerely Jeremy Peterson CEO

Telephone: (814) 459-4287•Fax: (814) 455-0071•www.ride-the-e.com

# CITY OF GAINESVILLE



Regional Transit System

May 21, 2020

Joe Policarpio Vice President, Sales & Marketing GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Policarpio:

I would like to express my most sincere appreciation to you and your staff for the outstanding service to the City of Gainesville Regional Transit System (RTS). I am impressed not only by the level of quality service, but also the consistency of that quality year after year. For over 20 years, RTS has done business with GILLIG because we trust the vehicles, the parts and the people who help make our operation a success.

I want also to commend your staff for the training, technical, and warranty support that has allowed our team to place a good product and service on the road. The Sales and Parts staff has been extremely responsive to our demands and needs.

It is through Gillig's performance and reliability that RTS pursued the goal to be have a 100% GILLIG fleet. Looking toward the future, GILLIG's reputation for quality vehicles and services made it easy to take the next big step and embark on a new partnership project - Electric buses. We are eager to begin our new chapter in transportation, knowing that we can trust the GILLIG brand to deliver safe, comfortable, reliable vehicles to convey our passengers.

Sincerely,

Jesus Gomez, Transit Director Regional Transit System



May 21, 2020

Mr. Derek Maunus President and CEO Gillig LLC 451 Discovery Drive Livermore, CA 94551

Derek,

I would like to take a moment to express my sincere appreciation to the entire Gillig organization for the many years of your unwavering support, highest degree of integrity, expertise and product quality that has been and continues to be provided to our agency.

Sun Tran is a small 14 bus agency providing fixed route transit service on seven routes in Ocala, Florida. Subsequently, it is of paramount importance that we have the most reliable and dependable buses available to serve our community and that's why we purchased and operate Gillig buses.

Twenty plus year ago when Sun Tran was determining the best manufacturer to supply our buses, there were several very important factors that need to be considered. Of primary importance to us was having the confidence and assurance to choose a manufacturer with the corporate stability, integrity, commitment, experience and financial capability to support us in a long-term partnership that will span far beyond the life of purchase. Gillig has demonstrated their ability to successfully meet and exceed those expectations and continue to do so.

It is very comforting to place an order with a manufacturer knowing the buses will be built to specification and delivered on time. The reliability of the Gillig Low-Floor bus has enabled us to

City of Ocala Growth Management Department

201 SE 3<sup>rd</sup> Street (2<sup>nd</sup> Floor) Ocala, FL 34471 Phone: 352-629-8287





maintain high bus availability with minimal operating costs. The high-performance standards of the Gillig Low-Floor can be attributed to Gillig's on-going commitment to product improvement.

Gillig has consistently demonstrated that you are a world class organization and we are truly honored to be your partner.

Sincerely.

Steven Neal Transportation Director Growth Management Department City of Ocala

City of Ocala Growth Management Department

201 SE 3<sup>rd</sup> Street (2<sup>nd</sup> Floor) Ocala, FL 34471 Phone: 352-629-8287





May 20, 2020

GILLIG 451 Discovery Drive Livermore, CA 94551

To whom it may concern,

The City of Albany is a long-standing customer of GILLIG. As former owners of model years 2005, 2006, 2009 to currently owning 2016 (4), 2018 (3), and 2020 (8), the customer service & support *before* and *after* delivery remains phenomenal.

I evaluate customer service delivery in both, professional and personal settings. I attest that the customer service and support statements of GILLIG are not just words written on paper; moreover, it is action willingly, or better yet, generously performed by dedicated GILLIG employees. Since 2015, I have been a witness to this action from not just the sales and administrative staff, but also the production team and upward to the President!

In sum, the overall performance and operational enhancements of a GILLIG bus meets the need of our organizational requirement.

#### Angela & Calhoun

Angela S Calhoun Superintendent Fleet Management Department

#### FLEET MANAGEMENT



## JACKSONVILLE TRANSPORTATION AUTHORITY

July 13, 2018

Mr. Joseph Policarpio, Vice President Gillig LLC 451 Discovery Drive Livermore, CA 94551

Dear Mi Policarpio:

I want to take this opportunity to thank you and your team. I have had the pleasure of doing business with Gillig over the past twenty years. Gillig is now on their fourth five-year contract for the State of Florida.

During this time, I have found Gillig and its employees to be a customer-driven organization that exceeds our expectations. Employees are dedicated, knowledgeable, and professional whether they are dealing with new bus orders or when dealing with routine matters.

I appreciate the input sought by Gillig as they continually advance in the area of technology in an effort to meet the needs of the JTA and other industry customers.

Gillig buses are highly regarded throughout the transit industry and Gillig has a solid reputation of building a quality product. The JTA is one that has certainly benefited by purchasing those quality products from Gillig. Satisfying your customers, including delivering on your promises is exemplary.

It is a pleasure to work with you and your team. I would be pleased to recommend Gillig to any of your prospective customers.

Sincerely,

isin Carmay

Lisa Darnall Vice President/CTO



#### 8. ENGINEERING ORGANIZATION CHART, ENGINEERING CHANGE CONTROL PROCEDURE, FIELD MODIFICATION PROCESS

#### ENGINEERING DEPARTMENT

We maintain a fully experienced, qualified Engineering Department, directed by the Vice President of Engineering. The Engineering staff are available on request to assist in the resolution of engineering or design problems that may arise within the scope of the specifications during the warranty period.

The GILLIG Engineering Department is located at the manufacturing plant in Livermore, CA, and is continually available to assist the manufacturing process. The integrated staff performs all vehicle engineering, including the research and development of all systems integrated on our vehicles.

All current products were designed and developed by GILLIG Engineering. The entire GILLIG Low Floor transit bus is manufactured in the United States at this one location in Livermore, CA.

#### ENGINEERING CHANGE CONTROL PROCEDURE

Reference following item 12. QUALITY ASSURANCE PROGRAM for detailed information on the Engineering Department change control procedure.

GILLIG's change control process involves several departments within the organization and working with our component suppliers as their products reach end of life. GILLIG believes in a constant improvement process, this is controlled thru an Engineering Production Change (EPC) process managed by our Materials Department. A meeting is scheduled once a month with Materials, Purchasing, Engineering, Manufacturing, Sales and Parts, to discuss product improvements/new design and supplier end of life notifications.

Once a change has been identified the subject matter is reviewed by Engineering for design, Purchasing for cost, Manufacturing for production impact, Parts for aftermarket support and Materials/Sales for customer implications. Once approved by all departments, Engineering and the Bill of Material group will release the component details (parts, installation drawings, customer, dates) and production implementation plan thru our documented EPC control process.



## PACKAGE 1: TECHNICAL PROPOSAL

#### FIELD MODIFICATION PROCESS

Our FIELD SERVICE DEPARTMENT is responsible for the proper functioning of your buses after they leave our plant in Livermore.

GILLIG's focus on designing and building the most reliable and cost effective bus in the industry necessitates selecting supplier partners who share our philosophies on quality and reliability. As a result of this focus, GILLIG has no major fleet defects (grounded fleet), a minor number of vendor defects and the lowest warranty claim experience in the industry.

Over the past five years, GILLIG has sent out several Field Service Bulletins which communicate suggested maintenance procedures, clarifications of previously released procedures and supplier or GILLIG proposed repairs. Seven of these bulletins were minor field repairs resulting from design improvements intended to prevent future failures.



## **GILLIG ENGINEERING ORGANIZATION**

<u>Name</u> G. Vismara	<u>Function</u> Vice President, Engineering	Education BSME	<u>Background</u> 32 yrs. industry experience at Peterbilt, Loral Space Systems & GILLIG
T. Meagher	Director, Design Engineering	9 BSME, BSEE	33 yrs. industry experience at Ford, Caterpillar, Case New Holland & GILLIG
D. Jayasinghe	Program Mgmt.	BSAE & MSME	16 yrs. industry experience at CAT, Cummins & GILLIG
R. Quebbeman	Manager, Specifications & Bill of Material	AS Mech. Engr.	51 yrs. industry experience bus and truck design - Mack, International & GILLIG
S. Vanderlip	Manager, Mechanical Engineering Systems	BSETME,PE	34 yrs. industry experience at Peterbilt & GILLIG
C. Ababseh	Manager, Mechanical Engr Body & Interior	BSME	14 yrs. industry experience at GILLIG
K. Vorsatz	Manager, Mechanical Engineering Powertrain	BSME	14 yrs. industry experience at BAE & GILLIG
J. Abrew	Bill of Material Order Technician	H.S.	31 yrs. industry experience at GILLIG
T. Agawa	Bill of Material Order Technician	BSIT	29 yrs. industry experience at GILLIG & Peerless Lighting
F. Andrade	Supervisor, Controls	BSEE	7 yrs. industry experience at E-N-G Mobile & GILLIG
D. Aranovich	Mechanical Designer	BS Engr Tech	19 yrs. industry experience at Metaldyne, Ford, LightSail Energy & GILLIG
M. Banwait	Mechanical Design Engineer	r BS	2 yrs. industry experience at GILLIG
R. Brar	Mechanical Design Engineer	MS Aerospace Engineering	9 yrs. industry experience at Int'l Cars & Motors, Heil Trailer & GILLIG
B. Burdick	CAD Designer	HS	44 yrs. industry experience at Altamont Mfgr, Lawrence Livermore Lab & GILLIG



L. Bush	Electrical Engineer	BSIT	20 yrs. industry experience at Compass, Autocam, TPI, Dow Jones & GILLIG
N. Clopton	Supervisor, Body	BSME	14 yrs. industry experience Parker Hannifin, Racor Division
F. Cruz	Bill of Material Technician	BSC-Mgmt.	20 yrs. industry experience at GILLIG
J. Dalmeida	Sr. Mechanical Engineer	BSME	8 yrs. industry experience at New Flyer & GILLIG
B. Den Hollandar	Electrical Engineer	BSEE	8 yrs. industry experience at Proficient Machining, Optimal & GILLIG
S. Dunbar	Electrical Engineer	BSEE	4 yrs. industry experience at GILLIG
J. Edmondson	Bill of Material Order Technician	H.S.	41 yrs. industry experience Peterbilt & GILLIG
C. Espinosa	Supervisor, Passenger Compartment	MSME	9 yrs. industry experience at Lawrence Livermore Lab, SFMTA & GILLIG
G. Estantino	Mechanical Engineer I	BSME	4 yrs. industry experience at ICON Aircraft & GILLIG
S. Faria	Bill of Material Technician	BSBA	27 yrs. industry experience Mack, Xerox & GILLIG
K. Fernandez	Bill of Material Technician	H.S.	9 yrs. industry experience at GILLIG
S. Finley	Supervisor, Power Distribution	BSEE	28 yrs. industry experience at Georgia-Pacific, Walk- Haydel & GILLIG
J. Fisher	Mechanical Designer	HS	23 yrs. industry experience at Burke Porter Machinery, Stewart & Stevenson & GILLIG
F. Fotos	Electrical Engineer I	BSEE, MEM	6 yrs. industry experience at Northrop Grumman & GILLIG
A. Frey	Engineer 2, Powertrain	BSME	12 yrs. industry experience at Cummins & GILLIG



D. Garcia	Bill of Material Technician	H.S.	7 yrs. industry experience at GILLIG
M. Genova	Mngr. Product Safety & Compliance	MSAE	19 yrs. industry experience at AVL, Fiat, Landirenzo-Baytech USA, & GILLIG
J. Graves	Bill of Material Order Technician	BSCJ/S	11 yrs. industry experience at GILLIG
J. Hackney	Electrical Engineer II	BSEE	13 yrs. industry experience at IoT, Davis Instruments & GILLIG
D. Haiduk	CAD Designer	BS	16 yrs. industry experience at AGAT, Yo-Engineering, RenyMed & GILLIG
B. Haley	Mechanical Engineer	BSME	6 yrs. industry experience Product development
N. Henderson	Mechanical Design Engineer	BSME	7 yrs. industry experience at Zodiac Aerospace & GILLIG
E. Hughes	Assoc. Mechanical Engineer	BS	2 yrs. industry experience at GILLIG
M. Itanna	Sr. Electrical Engineer	MSc. EE	7 yrs. industry experience at Vertiv & GILLIG
T. Jones	Mechanical Drafter Design	AA Mechanical	18 yrs. industry experience NABI & GILLIG
T. Junge	Mechanical Engineer	BSME	5 yrs. industry experience at Durst-field, Cessna Aircraft- Interior & GILLIG
S. Loyd	Supervisor, ITS & Surveillance	eB.S. Physics	10 yrs. industry experience at Areias Systems
EJ Mariscal	Bill of Material Technician	HS	21 yrs. industry experience at GILLIG
M. Mohammedkair	Power Distribution Engineer	BSEE	10 yrs. industry experience at GILLIG
A. Monserret	Associate Mech Engineer	BSME	2 yrs. industry experience at GILLIG



G. Mortazavi	Electrical Engineer	MSEE	3 yrs. industry experience at Chicago Transit Authority & GILLIG
W. Nairn	Liaison Engineer	College	20 yrs. industry experience at GILLIG
B. Nguyen	Design Engineer, Electrical	BSEE	13 yrs. industry at HP, Kla-Tencor & GILLIG
L. Nguyen	Supervisor, Drivers Area	BSEE	14 yrs. industry experience Panasonic Automotive & GILLIG
J. Ocampo	Bill of Materials Technician	College	31 yrs. industry experience at GILLIG
M. Ortega	Associate Electrical Enginee	rBSEE	2 yrs. industry experience at GILLIG
H. Perez	Production Support Tech	H.S	5 yrs. industry experience at GILLIG
M Pinto	Program Manager CPI	BSME, MSME, MSPM and PMP	17 yrs. industry experience at Ford, Volkswagen & GILLIG
P. Pruscha	Industrial Designer	BS Industrial Design	35 yrs. industry experience at Peterbilt, Jacuzzi & GILLIG
M. Rands	Bill of Material Technician	H.S.	8 yrs. industry experience at GILLIG
J. Reekie	Sr. Mechanical Engineer	MSME	9 yrs. industry experience at Caterpillar & Castrol
M. Roberts	Mechanical Design Engineer	r MSME	7 yrs. industry experience at BHJ Dynamics & GILLIG
G. Roderick	Supervisor, Order Processing	AA	36 yrs. industry experience at GILLIG
M. Ruth	Powertrain Systems Engineer	BS EMET	19 yrs. industry experience at Harley Davidson, Voith & GILLIG.
H. Sanchez	Mechanical Engineer	BSME	7 yrs. industry experience GCM & GILLIG



T. Scheumann	Sr. Mechanical Design Engr	MSME	8 yrs. industry experience at Hyster-Yale, Mizuho OSI & GILLIG
J. Seei	Bill of Material Technician	HS	23 yrs. experience at GILLIG
M. Shaieb	Project Engineer Technician	BSME	38 yrs. industry experience at BAE Systems & GILLIG
C. Silva	Bill of Material Technician	HS	34 yrs. industry experience at GILLIG
H. Tuft	Supervisor, Powertrain	BSME	14 yrs. experience at Electroglas Inc & AutoCat USA Inc.
J. Turner	Electrical Design Engineer	BSEE	5 yrs. industry exp at GILLIG
A.vanHaeften	Supervisor, Chassis	BSME, PE	14 yrs. industry experience at Westinghouse, Park Hannifin & GILLIG
D. Williamson	Proj. Mngr./Mechanical Engineer l	BSME	4 yrs. industry experience at Kratos Unmanned Aerial Sys. & GILLIG
R. Williamson	Sr. Design Engineer	MS, MEng ME	11 yrs. industry experience GE, Tesla & GILLIG
B. Wu	Design Engineer Electrical Systems	BSEE EIT	21 yrs. industry experience at Pulver Genau & GILLIG
C. Xue	Program Manager NPI	BSME	7 yrs. industry experience at BYD & GILLIG
J. Yang	Electrical Engineer	MSEE	12 yrs. industry experience at Auto, Commercial Avionics, BAE & GILLIG



**TECHNICAL PROPOSAL** 

#### 9. MANUFACTURING FACILITIES PLANT LAYOUT, OTHER CONTRACTS, STAFFING.

- GILLIG is a **100% U.S. owned and operated** manufacturing company.
- GILLIG was founded over 130 years ago (in 1890) in San Francisco, California, and is now located 40 miles southeast of San Francisco in Livermore, California. In the 1930's we moved to Hayward and were located there until the move to our current state of the art manufacturing plant in 2017, located at the following address:

GILLIG LLC 451 Discovery Drive, Livermore, CA 94551 Phone: 800-735-1500 Email: sales@gillig.com Web Site: <u>www.gillig.com</u>

- The Manufacturing plant and entire office staff (Executive, Sales, Purchasing, Engineering, Service/Warranty and Finance) are located at this one (1) location only on 41 acres. We do not sub-contract the manufacture of our vehicles.
- We manufacture all of our vehicles at this one (1) location on the same production line, using the same qualified, experienced staff -- this includes our ZERO EMISSION BATTERY ELECTRIC transit bus, DIESEL LOW FLOOR transit bus, CNG LOW FLOOR transit bus, HYBRID LOW FLOOR transit bus, and BRT (Bus Rapid Transit) custom model buses. Vehicles Manufactured are Low Floor 29 foot, 35 foot and 40 foot by 102 inch heavy duty transit models.
- We employ over 850 qualified and experienced employees, and the factory operates 12 months of the year to manufacture our vehicles on time to meet promised delivery dates, and to provide Service and Support to our customers.
- Additional information can be provided on request.

## New State-of-the-Art Manufacturing Plant









## **TECHNICAL PROPOSAL**

#### 9. OTHER CONTRACTS

GILLIG confirms we have received other contracts awarding the purchase of our heavy duty Low Floor transit bus models for delivery throughout the U.S. The vehicles are scheduled for manufacture during the coming years to meet the transit agencies requirements.

GILLIG confirms that we can bid, manufacture, and deliver the vehicles proposed for this procurement on schedule to meet the requirements of your specifications.

Additional information can be provided on request.



#### 10. PRODUCTION & DELIVERY SCHEDULE

DELIVERY SCHEDULE - 40 FOOT MODEL or 35 FOOT MODEL:

Deliveries of orders up to 10 buses will be delivered within fifteen (15) months after receipt of order.

Deliveries of orders over 10 buses will be negotiated a time of order placement.

Delivery shall occur on Monday – Friday, except State and Federal holidays, between the hours of 8:00AM and 4:00PM, unless otherwise agreed to by both parties.



## 10. PRODUCTION SCHEDULE AND OTHER CONTRACT COMMITMENTS FOR THE DURATION OF THIS CONTRACT

- A. GILLIG's current production rate is 35 buses per week. GILLIG's firm orders and option orders will require us to maintain this production rate or increase that production rate in the future. Every day seven buses are entered into our production line, every day seven buses come off our production line and every day seven buses are bought off by our customers for delivery to their agencies. GILLIG has the necessary processes and procedures to consistently perform on our promised delivery schedules.
- B. GILLIG's success has been a result of our disciplined approach to growth and production. GILLIG has established a moderate production growth rate over the years and even with a large firm order backlog, GILLIG's business philosophy is to include small periodic production increases. This allows for the proper hiring and training of workers, proper implementation of quality control and avoidance of large production swings (either up or down). GILLIG avoids increases to our production rate on a temporary basis because it eventually leads back to production rate reductions which tend to create company and job instability.

GILLIG delivered 100% of the proposed vehicles within the contractual delivery requirements that the customers ordered in the last three years.

- C. To support your transit agency production throughout the 5 years of this contract, as well as other current and planned customer contracts, GILLIG has built a new, ground-up, state of the art bus production facility in Livermore, CA which was fully operational in May 2017 and provides for 100% of our production. This will allow us to increase our planned growth to a sustainable level and reduce the lead time of our buses. Your bus order would be an integral part of our plans for this sustainable growth.
- D. GILLIG has not been late on any delivery schedule commitments in the past three years, or for that fact, in recent history. GILLIG has not paid any liquidated damages for late delivery.

#### OTHER CONTRACT COMMITMENTS

GILLIG is the manufacturer of heavy-duty Low Floor transit buses proposed for this procurement and we currently have other contract commitments to transit agencies throughout the United States that are scheduled to be manufactured and delivered during the next few years.

GILLIG confirms that the current contract commitments will not impact the proposed delivery schedule for your procurement.

GILLIG'S history of on-time contract performance is unmatched in the industry because we believe it is the responsibility of the bus manufacturer to deliver to the customer a cost-effective yet quality-built bus on time, every time. GILLIG's high degree of conformance to the customer



bus specifications (as indicated elsewhere in this proposal) guarantees that you have and will continue to receive the bus that you want within the time frame in which you need it.

Our unsurpassed record of on-time deliveries demonstrates our ability to satisfy commitments made to our customers. This is evidenced by the fact that, unlike most other bus manufacturers, GILLIG has never been required to pay liquidated damages because of a late delivery. It is our goal to not only deliver on time but to improve upon the quoted delivery.

#### We have NEVER been late on a promised delivery date.



#### 11. MANAGEMENT PLAN



GILLIG is a 100% U. S. owned and operated manufacturing company. All vehicles will be manufactured at one (1) location only – 451 Discovery Drive, Livermore, California 94551. All our staff will be located at this same location – this includes our manufacturing plant, engineering, service/warranty, sales, purchasing, executives, and accounting.

The **GILLIG Sales Department** will manage the project from initial award through manufacture and delivery.

#### **RESUME KEY PERSONNEL**

GILLIG assigns one (1) PROJECT SALES MANAGER to accounts from bid award through manufacture, factory inspection and delivery to assure compliance with your specifications.

#### Timothy McCunney, Project Sales Manager

Tim joined GILLIG in 2006 and has served as a Cost Accountant, Senior Buyer & Production Supervisor as part of a Management Training Program to learn the various operations of the company before becoming a Project Manager in Sales starting in 2010. As a Project Sales Manager, Tim is responsible for processing customer orders from RFP's through delivery of our buses to the customer. Prior to joining GILLIG, Tim earned a Bachelor's degree in Finance from California State University Fresno.

Below is information on the Sales Department Key Personnel and Key Contacts:

#### William F. Fay, Jr., Vice President Sales

Bill joined GILLIG in August of 2016 and brings nearly 30 years' industry experience. During his tenure, Bill has held multiple executive level management positions with a proven track record for leading sales, operations and service organizations at both the OEM and supplier levels. As the Director of National Sales, Bill manages the Company's Regional Sales Managers and is responsible for the customer relationship management and overall customer satisfaction. Bill earned a Bachelor of Science degree in Mechanical Engineering from the University of Lowell. As Vice President, Bill is responsible for all sales functions at GILLIG.

#### Greg Vismara, Vice President Engineering

Greg has nearly 31 years of industry experience having previously worked for Peterbilt Motors Company, and Space Systems Loral. Since joining GILLIG in 1998, Greg has overseen the development of new systems and models including the launch of the GILLIG Low Floor, CNG, BAE Hybrid, and Allison Hybrid models. As Vice President, Greg is responsible for all aspects of GILLIG's engineering. Greg earned a Bachelor of Science Degree in Mechanical Engineering from Santa Clara University. Greg is very involved with the day to day project engineering that is focused on providing the highest degree of quality possible.



#### Chris Turner, Executive Vice President of Operations

Chris joined GILLIG in 2013 as Vice President of Supply Chain after working for Abbott Laboratories, a global healthcare leader, for the previous 15 years. At Abbott, Chris served in multiple controllership functions around the globe with responsibilities in sales, marketing, supply chain and manufacturing. As Executive Vice President of Operations at GILLIG, Chris is responsible for Production, Purchasing, Receiving, Warehousing, Freight, Quality and Field Service. Chris has a fantastic management support team consisting of veteran GILLIG employees and consistently emphasizes quality, execution and continuous improvement. Chris earned a Bachelor of Science Degree in Finance from the University of Illinois.

#### Arminder Dhillon, Director Sales Operations

Arminder has over 20 years of GILLIG product and customer experience, including various Supply Chain roles and leading the Publications group. As the Director Sales Operations, he is responsible for all areas of Project Sales Management and Contract Administration. Arminder and his group have dozens of cumulative years successfully building customer relationships, processing hundreds of customer orders from RFP through delivery, and working diligently and tirelessly to exceed our customer's expectations. Arminder earned a Bachelor of Science Degree in Finance from San Jose State University.

#### Javier Hernandez Jr., Director of National Sales

Javier is responsible for all areas of Project Sales Management and Contract Administration. His department is directly responsible for processing customer orders from RFP's through delivery of our buses to the customer. Javier has over 25 years of GILLIG experience where he has served as a Working Foreman, Production Supervisor, Sales Engineer, Regional Sales Manager, Director of Project Sales Management and recently as a Production Superintendent. Javier and his group have successfully processed hundreds of orders and work diligently to exceed our customer's expectations.

#### ACCOUNT REPRESENTATIVE (FLORIDA)

Butch Sibley - Regional Sales Manager Cell Phone: 510-589-9430 Email: Butch.Sibley@gillig.com

#### WARRANTY ADMINISTRATOR

Victor Doran, Executive Director, Customer Care Phone: 800-735-1500 or 510-264-5075 Email: victor.doran@gillig.com

Field Service Coordinator Phone: (510) 264-5073 Email: FieldService@gillig.com

#### PARTS SUPPORT MANAGER

Butch Sibley - Regional Sales Manager Cell Phone: 510-589-9430 Email: Butch.Sibley@gillig.com



GILLIG understands the requirements of this solicitation, and is confident we have the expertise, resources and capabilities to fully meet your requirements in this and future purchases. This management plan, which is organized in the following categories -- past experience, current build program and future build and support plan is intended to assure you that we can.

#### PAST EXPERIENCE AND QUALIFICATIONS

GILLIG LLC is a 130 year old company that is a Federal Transit Administration (FTA) qualified Transit Vehicle Manufacturer (TVM), and as such meets all FTA requirements imposed on grantees of Federal funding, including DBE goals, Buy America provisions and Bus Test requirements.

GILLIG has designed, built and delivered over 25,000 transit buses to transit properties around the U.S.A. over the past 20 years. GILLIG has also **never been late on a contracted or promised delivery** in the past decade and all buses have been accepted and used in transit service (some with over 2 million miles) without a major problem or recall. Consequently, GILLIG is familiar with and can fully satisfy all the terms, conditions and requirements of building and selling transit buses that are safe, effective, comfortable and suitable for revenue service in a transit application, and purchased with FTA and local funding. In addition, we are proud of our vehicles' reputation for reliability and operating economy.

The vehicle proposed in this submission is a heavy duty, purpose-built transit bus, designed specifically for revenue service in a transit application. It is designed to exceed FTA requirements of a 12 year or 500,000 mile service life. The vehicle will also meet all applicable FMVSS requirements and all applicable EPA emission standards.

In addition, it will be capable of safe operation at legal freeway speeds, have industry acceptable acceleration and gradeability exceeding 15%, while fully complying with the specifications of this solicitation and any applicable modifications or addenda approved by your agency and made part of this solicitation.

#### GILLIG's qualifications are based on:

- A proven history of **Product and Company Performance**
- Extensive and Proven Engineering Expertise
- Extensive and Proven Manufacturing Expertise
- Extensive and Proven Management Expertise
- Appropriate and Proven Engineering, Manufacturing and Support Facilities
- Abundant Financial Strength and Organizational Stability
- An excellent history of **Customer Testimonials**

Some of our buses are still in active service after 17 years and 2 million miles of transit duty service, an excellent testimonial to our **Experience and Qualifications**.

GILLIG's history and experience relevant to your needs include delivering multi-year contracts of hundreds of buses to Seattle, St. Paul, Cincinnati, Richmond, Hampton and Lynx - Orlando, to name a few. All of these buses were of similar complexity to your order, had similar costs and



were built and managed by most of the same people in the GILLIG organization. A complete customer list with all details is included in our submission.

#### CURRENT BUILD PROGRAM

GILLIG's management plan for this current build includes the appropriate commitment of resources, expertise and time to fulfill your build requirements as covered in the following:

- Specification compliance
- Build capability and delivery plan
- Support structure and plan
- Employee and management experience
- Organizational stability

<u>Specification Compliance</u> is ensured by our experience and ability in exceeding other larger and smaller transit agencies' transit bus needs. In addition, GILLIG has certified in this submission that it completely understands the procurement's specifications and expectations and will fully comply with them.

<u>Build Capability</u> is ensured by our Engineering expertise (meeting design requirements), which includes 37 degreed and experienced engineers supported by 14 additional engineers with transit bus experience and other clerical support exclusively for bus programs. Our financial strength also ensures build capability (allows purchase of inventory and supplies), and our existing plant and facilities have been proven to support our current build rate, which is also the build rate we plan to operate at while building the proposed buses. Additionally, our management, manufacturing and quality programs have been proven over the years and are responsible for our excellent reputation in the industry.

Our <u>Delivery Plan</u> is enclosed and is based on our proven and practical timing schedule, which includes a proposed delivery of about 5 buses per week to suit your preferred acceptance and commissioning rate. Our proposed delivery schedule is submitted in the appropriate section of this proposal. Subsequent builds will be achieved in less than current industry lead time; and noteworthy at this time, is our unblemished record of on-time deliveries, ensuring that these commitments will and can be met.

Our <u>Support Structure and Support Plan</u> includes competent and experienced field service technicians (most are ASE or MACS certified), customized in-class and video training programs supplemented with appropriate service and parts manuals, a toll-free over-the-phone troubleshooting system and appropriate in-house and contracted engineering support and test capabilities. We also have a fully staffed Parts Division, with extensive inventory stocks and no-charge 2nd day air delivery of parts orders (under 150 lbs. each).

Our <u>Employee and Management Experience</u> includes an extremely competent and stable workforce with an average of well over 12 years of GILLIG experience, and many more industryexperience years. our top fourteen senior executives have over 400 years of combined vehicle manufacturing experience (that's 32 years each).



GILLIG's employees represent a superbly experienced and solidly entrenched team of people committed to satisfying customers by manufacturing quality buses.

Our <u>Organization Stability</u> is an industry landmark and ensures consistency in build and performance which ultimately results in customer satisfaction. A seasoned company with seasoned people is your best assurance of an outstanding procurement.

#### FUTURE BUILD AND SUPPORT PLAN

GILLIG ensures your future needs will be met by making you a partner in our business venture and thus including your requirements into our philosophy, commitments and plans.

GILLIG's philosophy is that we have 4 partners in our business venture -- our customers, our owners, our employees and our suppliers -- and it is management's responsibility to ensure that each partners' interests are addressed and appropriately served.

Consequently, **our customers are our partners** and so our customers' future interests must be included in our future plans. Therefore, GILLIG is committed to continuous improvement and continuous technological advancements, without compromising our goals of reliable, durable, and economical products or complete customer satisfaction.

GILLIG's 3-year and 20-year future plans include gradual and limited growth (to ensure quality and employee stability) along with practical research and new product development. **GILLIG is committed to long-term relationships and to supporting our customer-partners future changing needs**.

Your future build requirements are incorporated into GILLIG's build plans which ensures timely delivery of subsequent orders. GILLIG has followed the same procedure in the past with other transit agencies with multi-year contracts and has performed satisfactorily and on-time, on every procurement -- thus ensuring similar performance on future orders in this procurement.

However, perhaps the strongest indicator of GILLIG's ability to support your future vehicle needs in our uncompromising performance history of product improvement, financial strength, and customer satisfaction.

We believe GILLIG is uniquely capable and qualified, to satisfy your current and future needs, and we believe our proven management plan ensures complete customer satisfaction if we win this award. Your trust in us has been earned and is without compromise.

#### YOU CAN COUNT ON US!

**QUALITY ASSURANCE CHECKS** 

Specific Checks:	
<ul> <li>Chassis (4a, 4b, 4c)</li> </ul>	103 checks
Body Dept. (5a, 5b)	57 checks
Sheet Metal Dept.(6)	39 checks
Rack Dept. (9)	61 checks
Paint Dept. (7)	36 checks
Trim Dept. (8a, 8b)	60 checks
Electrical Dept. (3)	91 checks
Final Line Dept. (11)	20 checks
Final Delivery Dept. (10, Ready Row)	26 checks
<ul> <li>Alignment, Dyno, Road Test (10, Ready Row)</li> </ul>	53 checks

Total Documented QA Checks = 546



GILLIG's Quality Assurance Program effectively ensures only the highest quality products and services reach our customers. Due to GILLIG's unique management and operating style, we rely more on total commitment to satisfying our customers, than to conforming to documented standards that fall short of assuring quality. We feel continual process and product improvement, and increased customer satisfaction meets our main focus of attention.

The following is an overview of GILLIG'S Quality Assurance Program that has a proven track record of ensuring that customer satisfaction and product reliability remain at the highest possible levels.

#### **Design Review Participation**

The Director of Quality & Service participates in meetings and other communication forms on design and customer issues pertaining to the quality performance and acceptance of GILLIG'S product and services. Quality is designed in.

#### Manufacturing and Vendor Qualification

Manufacturing procedures are reviewed to ensure achievement of quality goals. Vendors are pre-qualified to ensure their products meet GILLIG'S standards, and periodic reviews ensure standards are maintained, as needed.

#### **Receiving Inspection**

Inspection of the majority of incoming materials takes place at the actual location of assembly by Production associates. Any concerns of material quality are directed to the designated Area Quality Inspector, or to the Quality Manager for investigation. When deemed appropriate, certain incoming parts, components, assemblies, or materials are reviewed prior to acceptance into storage or delivery to the assembly line. All rejected material is identified and held from further use until proper disposition is resolved. Disposition is coordinated in a timely manner with Purchasing and Production to eliminate line shortages.

#### **In-Process Inspection**

Fourteen Quality Inspectors, with a combined GILLIG experience of over 230 years, are assigned to monitor and verify compliance to specifications, including specific customer requirements. Customers' Resident Inspectors are also encouraged to work closely with Production and Quality personnel throughout all phases of assembly. Their knowledge is continually passed on to the assemblers in the form of instructions and information to ensure compliance. Any discrepancies found during in-process inspection that cannot be corrected in-station are recorded on the Green Inspection Report that accompanies each bus throughout production. Production Management reviews each discrepancy, and the appropriate production associate is assigned to correct the discrepancy. Communication of discrepancies caused by previous operations is also accomplished in real time to help eliminate error redundancy. Production and Quality personnel utilize direct feedback from Post Delivery Inspection reports in an ongoing effort to improve assembly quality.



#### Final, Inspection & Acceptance

Each bus is inspected after final assembly for completeness, conformance to specifications and customer requirements. When it is deemed ready, a road test is performed to check for operational quality, often with the customer's inspectors present. After road testing, all open issues are reviewed by Quality and Production personnel, along with Resident Inspector/s if present, and resolved. Upon acceptance, the Resident Inspector signs the Green Sheet, authorizing delivery to the customer's property. Final acceptance occurs when all Post Delivery Inspection issues are amended by GILLIG'S Field Service Department. All inspection and test records are maintained for the life of the bus.

Enclosed please find a copy of our Quality Assurance Manual and the individual bus Inspection Record for your review. Note that the GILLIG Inspection Record includes (527) independent and documented checks on each bus. These documents are used to ensure the highest quality buses and assist GILLIG with meeting and exceeding customer expectations.

#### **Continuous Improvement**

Customer, Field Service, Sales, and Warranty data are used to provide feedback of the performance of the buses and components. This feedback is utilized to bring about product improvements on a continuous basis through weekly management meetings.



#### CONTINUOUS IMPROVEMENT PROGRAM

GILLIG continuous to enhance our manufacturing process through our Continuous Improvement (CI) Program. Using Lean methods, our CI Program employs metrics and specific tools, like 5S (Sort, Set in order, Shine, Standardize, and Sustain), to streamline our manufacturing process, increasing efficiency and reducing waste. Armed with tools like 5S, our team ensures GILLIG Excellence by working together to identify, devise, implement, and sustain CI solutions.

#### 5S Rollout

We've rolled out 5S in all areas of our manufacturing process with great success, including improved material workflow, storage location, and rack consolidation. Other accomplishments include:

- Increased efficiency
- Enhanced use of space
- Inventory control
- Improved safety
- Advanced kitting





#### **Team-led Solutions**

Team-led solutions are central to our GILLIG Excellence CI Program. Visual management tools, like our Team Huddle Boards, enhance team-led problem-solving by helping our team identify, implement, and sustain their solutions. All production department teams devise questions about how to improve the workplace while empowering team members to come up with answers to these questions. Our "Camp Kaizen" work area is designed for collaboration. On any given day, multiple team members are working together on CI projects in different areas of our production facility. Every production employee takes ownership of the Continuous Improvement program.

GILLIG will always make the pursuit of excellence and the practice of Continuous Improvement a priority and a shared experience. The end goal of all of our efforts is to continue building the highest-quality, lowest cost, safest, and most reliable buses in the United States.

# Quality Assurance Manual





## **QUALITY ASSURANCE MANUAL**

#### CONTENTS

Introduction	2
Strategies for Success	2
Quality Control	3
Quality Assurance	3
Supplier Quality Management	3
Standards and Requirements	4
Contract Review and Change Authorization	4
Engineering Design and Specification Controls	5
Engineering Drawings	5
Engineering Design Bulletins	5
Bill of Materials (BOM)	5
Regulations	5
Build Process	6
Inspection Process	7
Documentation	8
GILLIG Inspection Record - "Hardcard"	8
Authorization to Ship – "Greensheet"	9
Part Control	a
	3
SREA – Supplier Request for Engineering Approval	
SREA – Supplier Request for Engineering Approval Receiving Inspection	9
	9 0
Receiving Inspection1	9 0
Receiving Inspection	9 0 1
Receiving Inspection	9 0 1 1
Receiving Inspection	9  0  1  1  2  3

#### **QUALITY ASSURANCE MANUAL**

#### Introduction

The GILLIG Quality Manual describes the quality system that assures conformance to customer requirements during the bid process, product definition, product design, supplier procurement, assembly testing, and shipment of the GILLIG Bus. This manual documents the general quality policies, procedures and practices of GILLIG LLC.

The quality philosophy of GILLIG stresses continuous measurable improvements in the quality of products, services, and processes at our Livermore design and assembly facility as well as at our suppliers. Our goal is to produce durable, reliable, cost-effective vehicles which satisfy our customer's expectations.

Our customer is an integral part our quality focus. We carefully review contract specifications, elicit continuous improvement recommendations, and drive back quality issues into our designs and assembly processes. We understand timely and accurate communications leads to customer confidence and satisfaction.

Each GILLIG employee is also a customer of a preceding assembler, designer, supplier, sales specialist, warranty administrator or field service representative. GILLIG's quality focus requires a continuous feedback loop to recommend, validate, document, and incorporate improvements.

There has been a revised emphasis within GILLIG to have Quality Assurance provide real time feedback to Sales with respect to potential suppliers. In an environment where much of the critical supply base is chosen by the customer, GILLIG is committed through internal communications through Sales, to ensuring that the customer is well informed regarding supplier's quality, and potential design limitations; thus, helping to create a realistic customer expectation. With an overall goal being "customer satisfaction".

GILLIG performs minimal machining and stamping. Much of the dollar content of our product are customer specified major components including the engine, transmission, mobility impaired lift, wheelchair positions, seating, axles, tires, wheels, air conditioner, windows, filters, coolers, floor cover, destination signs, and ITS systems. It is GILLIG Quality's responsibility to reliably and safely integrate these components to meet the supplier's application requirements, American Disability Act Laws, National Highway Traffic Safety Laws, State Codes, FTA Specifications, Maintenance Accessibility Criteria, and the Customers Expectations.

#### Strategies for Success

- Standardization
  - o Inspection standards based on Engineering designs, rules, and regulations.
  - o Revise GILLIG Quality Manual & update GILLIG Supplier Quality Manual.
  - o GILLIG PPAP education and guidelines.
- Continuous Improvement
  - In station quality through error proofing.

#### QUALITY ASSURANCE MANUAL

- o Lean methodology creates more enablers through elimination of waste.
- o Be Effective by doing the right thing.
- Be Efficient by doing things right.
- o Supplier Quality Management focused on defect prevention.
- Teamwork
  - o Champion Quality culture.
  - Communication and feedback loop.
  - o Respect.
  - Strong partnerships with other departments to enable future activity successes.

#### Quality Control

- Develops and maintains quality standards and inspections.
- Confirm functionality.
- Confirm installed components.
- Identify defects.
- Identify process errors.
- Driving correction action using Practical Problem-Solving techniques.

#### Quality Assurance

- Quality issues management.
- Assistance in field troubleshoot at customer site.
- Analytics and reporting.
- Focusing on the process, building it Right First Time (RFT).
- Driving quality issue throughout the GILLIG organization (re-affirming ownership).
- Driving design recommendations on new and existing products based on field performance/reliability.

#### Supplier Quality Management

- Supplier Quality Management and Development.
- Works closely with Supply Chain and QAE/QCE.
- Travels ~50%.
- Compliance to SQAM determines level of involvement of SQE at supplier.

#### **QUALITY ASSURANCE MANUAL**

- Zero compliance, business decision on stability of supplier.
- Compliance with some improvement needed.
- Complete error proof process, role model supplier.
- Component inspections.
- First Article review and scheduled part inspections.
- Supplier Quality audits, inspections, and evaluations.

#### **Standards and Requirements**

#### Contract Review and Change Authorization

The purpose of this section is to document how we coordinate activities related to defining and documenting of customer requirements, resolving issues, and determining the capability of GILLIG to meet customer requirements.

GILLIG produces a heavy-duty transit bus of 102" width and 29', 35', or 40' length. These are FTA defined standard lengths and widths and Federal and State mandated compliance features.

The customer bid document offered to multiple U.S., Canadian and Off-shore heavy duty transit bus builders, details the standard and non-standard major components and design variations that the specific transit district customer expects on their bus order. GILLIG, in their bid response has the option of accepting the bus property bid features or proposing an "approved equal."

It is the responsibility of GILLIG Sales to inform the bus property, in writing why an "approved equal" is preferred for durability, reliability, safety, federal compliance, standardization, or cost control reasons. The customer then has the option of approving or disapproving the "approved equal" proposal. GILLIG Sales reviews all approved equals requests, updates the internal documentation and prepares the bid submission package.

The sales contract for a bus may be hundreds of pages. There will be one or multiple prebuild meetings to help with the customer and GILLIG Sales reviews the contract for final definition of the customer's specifications. These GILLIG/customer pre-bid meetings will be documented by the GILLIG Sales with a copy forwarded to the GILLIG affected departments, a copy maintained in the contract file for that order, and a copy forwarded to the customer. This will contain the agreed-on interpretation and modifications of the specifications.

As the bus is built, the customer may assign a "Resident Inspector" to review the contract and document revised specifications. As the bus is built the Inspector sometimes has personal specification preferences that vary from the contract. The Inspector may observe a singular or multiple frequency quality control concern.

If the Inspector requests a <u>Contract Change</u>, the change cannot be made Manufacturing until it is approved in writing by GILLIG Sales through issue of a Production Change Order

#### **QUALITY ASSURANCE MANUAL**

(PCO) to Engineering to document the design change for future service parts support. Without a PCO there can be no Engineering change documentation.

#### Engineering Design and Specification Controls

All production material shall be designed to specifications established by the Engineering Department and controlled by supplier drawings, GILLIG proprietary drawings, and part number databases. In addition to ANSI standard dimensions and specification requirements, drawings shall specify materials and test processes where applicable.

Customer contract requirements shall be converted to GILLIG specifications and drawings by the Engineering Department who is also responsible for maintaining and distributing all drawings to the latest revisions.

#### Engineering Drawings

Identify the requirements for the supplier, and aide manufacturing. New component drawings may have Critical To Quality (CTQ) dimensions to assure suppliers can meet First Article requirements.

#### Engineering Design Bulletins

- Quality Assurance Codes (QAC) Bulletin 240.000
- Quality Assurance Codes Appendix Bulletin 240.000A

#### Bill of Materials (BOM)

- All documentation requirements for manufacturing
- Customer Meeting Notes
- Customer requirements from By Design

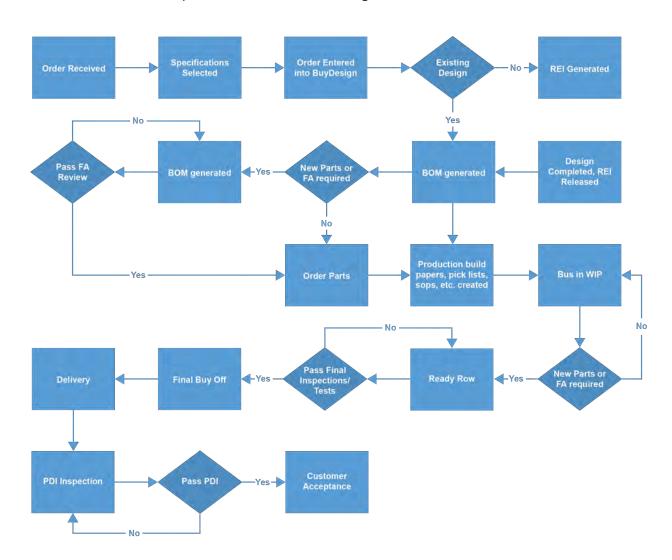
#### Regulations

Engineering is responsible for reviewing the applicable bus Federal Motor Vehicle Safety Standards and State Regulations, designing for compliance to the FMVSS and State Regulations, and auditing compliance to the attached FVMSS list.

## **QUALITY ASSURANCE MANUAL**

#### **Build Process**

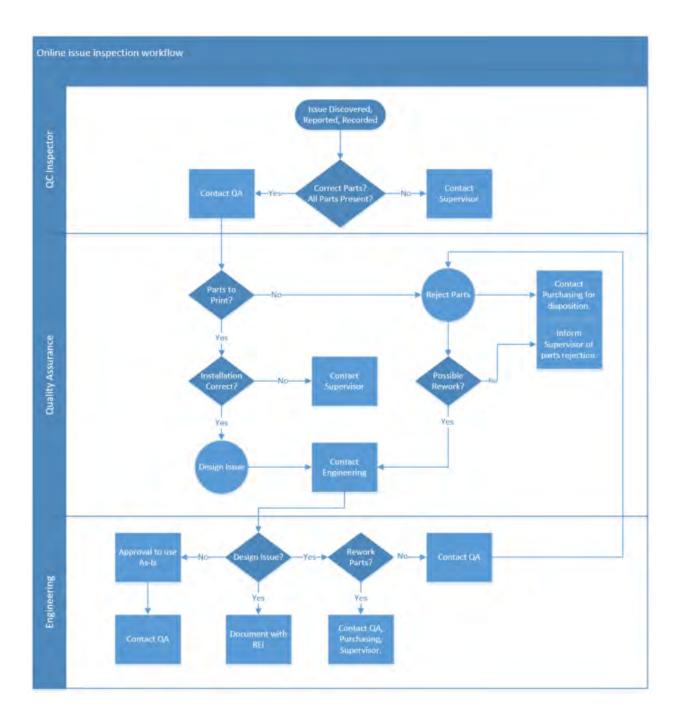
The GILLIG bus build process uses the following workflow.



## **QUALITY ASSURANCE MANUAL**

#### **Inspection Process**

The standard GILLIG inspection process uses the following workflow.



## **QUALITY ASSURANCE MANUAL**

#### Documentation

#### GILLIG Inspection Record - "Hardcard"

All bus inspections are documented and recorded on the Hardcard.

CUSTOMER	t	COACH NO.	СН	ASSIS SEI	rial no
Air Condition	ning System PDI C	hassis Start [	Date / Cor	nplete Dat	e
Coach Weigl	nt - Unladen F	ront Axle Wei	ght		
Odometer / H	lub Odometer	O Program			
1	Attachment Check List		PROD	QC	
	1. Weigh Slip / Green Sheet				
	2. Final Bus Parking & Walk Thr	ough Sheet			
	3. CNG Agility Packet				
	4. BAE Health Check Packet				
	5. ITS ATP				
	6. ITS Prewire Acceptance Shee	rt			
	7. Camera View Sheet	-			
	8. Day-Wireless 2-Way Radio AT	P			
	9. Customer Discrepancy Sheet				
	1 /				
	10.				
	10. 11.				
	10. 11. 12.				
	10. 11.				

SUBCTORIES .		- Sell	RTMENT (04A & C)		
04A OPERATIONS	PROD	l oc	04C OPERATIONS	I PROD	Toc
1. Chasse Longth Rode, Wheelthair, Deer Opl	111111	1 40	1. Flag Panni intti & Torque 140 in Lt	11100	
Fine Suppression Cable Residing			2. AC Compressor landstation	-	-
Front S/S + C/S Wheat House		-	1 DAC Installation & Compiling	-	-
8. Chavelo Model + 15			A. Tarbo Figure & Cleansing	1	
Classic Frg. Mounts + Custy Finals	1		8. Exhaust Test Parts and Plugs		1
Chevra Rosk Botts			8. An Restruction autoration		
AC Plattore + Pullby Brit	_	_	3. An Congressor Parra		
Elachair Bonding a that Pain to AP of Chasals		-	B Arr Intern System		
Rear Brake lines Rivaling & Clamping			B. Surge Tank & Hotes	1	-
S. Air Gyslem Install. Air Dryst, Fing Tank			16. Electrical Harnisses & Clamps	-	+
Mulpe Tonk, Kneeling + Leveling Valves		-	11. 2-1890 Generations		-
1. E/S Whotlwell Prog. Piping, & Mitter Box		-	12. Fuel fani Instaliation	-	-
2. Hydrari Lines Routing & Clauped Apart 3. DEF Tonk Instaliator			13. Fuel Lines Realing & Clamping Tangan 14. Tanga & Wheels Vesitication		-
		-		-	-
14. Heather Lines + Champs & Insolation		-	16. Rear Whitel Lug Torgas 18. Front Wheel Lug Torgas	-	+
<ol> <li>Front Brake lises Routing &amp; Classing</li> <li>Streeting Goar &amp; Phreae Arm Install &amp; Targer</li> </ol>		-	17. Pawer Cables & Varmer Tarque		
<ol> <li>Steering Gran &amp; Prinab and Install &amp; Torque</li> <li>Steering Shaft &amp; Torque</li> </ol>	_	-	17. Power Labers & Varmer songue	-	-
17. Steering Stiett & Torque			18. Puter Data Month	+	+
15. Shis Plate, Harry Value		-	18. Power Cables & Cal-ort Since Torque	-	+
19. Front & Real Shop Air + Tow Consection		-	21. Battery Fuse Installation	1	1
21. Taw Dentection Tax Switches			22. Engine Oil Type & Level		_
22. Theorem & Brake Pecale		-	22. Transmission Oil-Type & Lovel		+
22. Trans Rulatúre PE- Berechun			24. Restinitiv Contant	1	-
pt. Ave but		-	25. HYDridatic Flaid Type & Lavel		1
1. (FRONT) Asia ASM Varification		-	26. Engine Startup	-	-
A Territor Rod Install & Tortee		-	27. Abs initial Cherk.		
B. Towers, AM Bags, Blocks blocks & Toopse			SP. All That (Not Yest)		
2. (HEAR) Aste Able Venin atom			29. Coolined Hinty Louis Tent	1	
A. Asta Dir Tygen			28. Issisting Contanti Hose Routing & Clamping		
B. Oil Hule - Oil Arusseni		· · ·	23. Verify Brege Table Contact Sensor Level Location		-
C. Denase Hull - De Level		-	12 FR.RR Asle Pasts, Cape Balts, & Lock Clips		
O. Air Bags, Shieks Install & Treque			\$8. Hybrid Sub Bistion Comp. Inst. 5 Tonput	1	
28. PERRAile Pods, Cage Bolis, Statks, & Lock Class			34. PR/MR Brake Hose Cleanance to Sump Stops	-	-
25. Frank Suspinisien install & Tompic			28. RH Brake Hose Clearance, Raised		
27. Draglink installation				-	
24. Rear Suspension Inetal & Fanjur	_	_			-
23. Cattat Reat Ace (MET)					
N. Pinion Augle	_	-			
11. Bettery Box	5	-		-	-
22. myterid Cable Continuity Test 31. No Dielectric Grease at Hybrid Transducer		-		-	-
	_	-		1	-
DEPT DC BS		DISCR	EPANCIES	PROD	QC
1.					-
3					-+
4					-
				_	
					-+
					-
					-
10.					_
1.					-
12			-		
13					-
14					-
15					- 11
		_		_	
6		CIL	LIG	fysionalia	e Record
		-			

Serial numbers required for tracking, warranty and service are also recorded in the Hardcard.

	SERIAL NUMBER		
ON POWER OF ISSN 10			
DESCRIPTION	SERIAL NUMBER	REMARKS	
5. SCM			
6. Master BMS			
7. Charger Controller			
A			
B.			
8. HVDC Junction Box			
9. TMS			
10. Kissling Switch Box			
11. Battery Pack			
1.			
2			
5.			
4			
5			
A.			
. Chassis			
A. Front			
B. Center			
¢.			
Suspension			
A. Front Towers			
1. 5/3			
2. C/S			
B. H-Frame			
Alternator			
Starter Motor			
Hydraulic Pump			
0. Air Compressor			
1. Trans Oil Cooler			
2. Threshold Heator			
3. Pro Heater			
4. Webasto Heater			
5. Heater Booster Pump			
Α.			
8.			
6. DEF Tank			
7. Voltage Regulator			
8. Rediator			
9. Fuel Tank			
0. Air Cond. Compressor			
1. Equalizer / Vanner			
2. Muttler-DPF			
A. SCR			
4	GILLIG	Inco	

	SERIAL NUMBE	R			
145 FE \$1 \$1 \$1 \$1 \$1 \$1					
DESCRIPTION	SERIAL NUMBER	REMA	RKS		
23. Fire Bottle					
24. Air Cond. Condenser	A				
25. Front Door Motor					
26. Front Base Plate					
27 Rear Door Motor					
28. Rear Base Plate					
29. DC-DC Converter					
30. Transmission ECU					
31. Driver's Heater			_		
32 MFD					
33. Driver's Seat					
34. Farebox Vault					
35. Farebox					
36. Front Dest, Sign					
37. Side Dest. Sign			_		
38. Rear Route No. Sign					
39. 2-Way Radio					
40. Dest. Sign Controller					
41. Keypad Display ITS 42. Wheelchair Ramp					
43. Annunciator					
44. Interior Info Sign					
45. Video Recorder A.					
8					
C.					
46. Farebox Keypad			1.00		
47. Camera					
1.					
2.					
3.					
4.		DED	T SA		
5.			UCDA		
6.		LABEL	HERE		
7.					
8,					
9.					
10.					
48. Rear View Camera		2.4.4.4.4	1.001.04		
40, Real view Camera					
07 13 2020	GILLIG				

#### Authorization to Ship - "Greensheet"

The Greensheet requires customer sign off (or their designated inspector representative) in order to ship/invoice the bus. Normally customers will have their inspectors on site. However, there are times, the customer does not designate a representative or the inspectors have already left and there are buses still to ship. In those cases, a written document (letter, e-mail, etc.) from the customer stating the buses can ship with GILLIG QC approval or GILLIG Sales can be the voice of the customer by providing the same written documentation on behalf of the customer.

#### Part Control

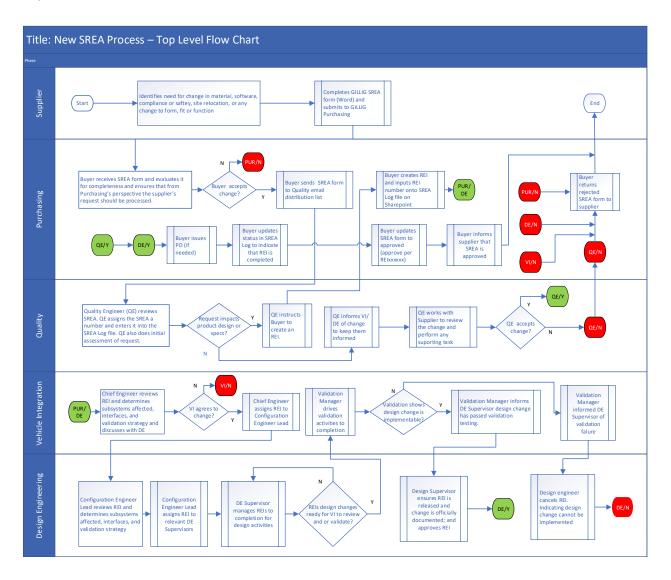
#### SREA – Supplier Request for Engineering Approval

As the name implies, SREA is a request from a supplier for a change to GILLIG Engineering Drawing, or for Supplier to inform GILLIG of a critical process change.

- Plant Move: The supplier is notifying GILLIG of a move of their manufacturing site from one location to another. GILLIG is not in control of the supplier's plant move, but GILLIG does control the decision to use product that is coming out of the new plant. Hence GILLIG will decide what steps GILLIG and "potentially" the supplier will take, in order for GILLIG to feel confident that the product coming out the new location is as good or better that product coming out of the old location.
- Change In Products Form, Fit or Function: The supplier is asking GILLIG to make a change to a released drawing that may affect their product's form, fit, or function (FFF) and would like GILLIG to evaluate samples of their changed part (a "new" part). This type of change would involve GILLIG's Quality, Design Engineering, and Purchasing Department's involvement; in order to determine if the new part would be acceptable to use.
- Significant Change In Their Manufacturing Process: The supplier is making a significant change to the process that may or may not impact its' performance/reliability in GILLIG's bus (as in a system or subsystem's performance). An example of this change is the supplier has a "burn-in" process when their product is running a series of test at an elevated temperature; and now the supplier is going to eliminate the burn in process for this specific product. This type of change would also involve GILLIG's Quality, Vehicle Integration, Design Engineering, and Purchasing Department's involvement; in order to determine if the new part would be acceptable to use.

#### **QUALITY ASSURANCE MANUAL**

GILLIG will follow the process details identified in the below flowchart to ensure that GILLIG always ships buses that are reliable and meet the customer's quality expectations.



#### Receiving Inspection

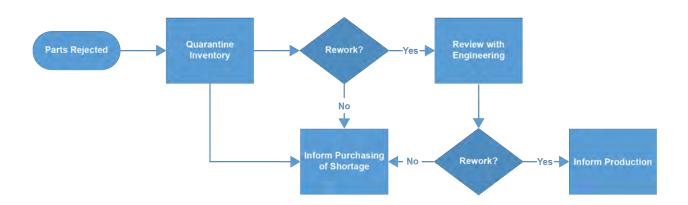
GILLIG performs receiving inspection (RI) in manufacturing as a standard practice. As GILLIG moves into e-Bus manufacturing, RI will occur on complex electronic subassemblies (batteries, junction boxes, etc). The RI for the e-Bus subassemblies is based on corrective action recommendations from historical quality issues and GILLIG's Design Engineering recommendations. Each subassembly selected for inspection has inspection procedures with well-defined pass/fail criteria and disposition instructions for any failures identified during the RI process.

### GILLIG

### **QUALITY ASSURANCE MANUAL**

#### Non-conformance

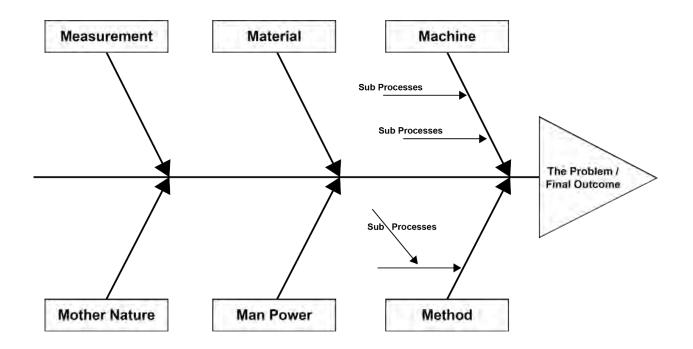
Parts that are rejected are processed with the following workflow.



#### **Problem Solving and Resolution**

GILLIG Quality Control (QC) and Quality Assurance (QA) are trained in Practical Problem-Solving techniques aiding the Quality Management System. GILLIG QA/QC leverages standard Six Sigma Quality practices and tools, such as Fishbone Diagrams, 5 Whys, Lean Manufacturing, 8D Problem Resolution, and DMAIC principles.

#### Fishbone Diagram



### **QUALITY ASSURANCE MANUAL**

### 8D Problem Resolution

The 8D approach is used to resolve problems, establishes a permanent corrective action by determining the root causes.

WHO IS EFFECTED BY THE PROBLEM? Company:		rt		
Company	Date Open:	8D No.:	_	
oompuny.	Initial Response:	and the second s		
Address:	Target Close Date:			
Float	Revision Date(s):			
Fleet: Part No.	8D Initiator: Actual Close Date:			
1 TEAM MEMBER NAMES/TITLES:	D2 PROBLEM STATEMENT/DES	CRIPTION (quantify)	(one defe	rt ner 8D)
hampion:		oran more (quartery)	fone dere	er per ob/
eam Leader: eam Members:				
3 CHOOSE AND VERIFY INTERIM CONT	TAINMENT ACTION(S) (ICA):	% Effective:	Target Date:	Actual Date:
IOW DID YOU VERIFY THE EFFECTIVEN	ESS OF THE ICA?			
D4 DEFINE AND VERIFY ROOT CAUSE(S	5):		% Cor	ntribution
D5 CHOOSE AND VERIFY PERMANENT (	CORRECTIVE ACTION(S) (PCA):	i i	<mark>888 888 888 888 888 888 888 888 888 88</mark>	ffective:
			% E	ffective:
IOW DID YOU VERIFY THE EFFECTIVEN	ESS OF THE PCA?:			
IOW DID YOU VERIFY THE EFFECTIVEN	ESS OF THE PCA?:		% E Target Date:	Actual Date:
25 CHOOSE AND VERIFY PERMANENT C HOW DID YOU VERIFY THE EFFECTIVEN	ESS OF THE PCA?:		Target	Actual
IOW DID YOU VERIFY THE EFFECTIVEN	ESS OF THE PCA?:		Target	Actual
IOW DID YOU VERIFY THE EFFECTIVEN	ESS OF THE PCA?: NENT CORRECTIVE ACTION(S) (PCA):		Target	Actual
IOW DID YOU VERIFY THE EFFECTIVEN	ESS OF THE PCA?: NENT CORRECTIVE ACTION(S) (PCA):		Target Date:	Actual Date:
NOW DID YOU VERIFY THE EFFECTIVEN 16 IMPLEMENT AND VALIDATE PERMAN NOW WILL YOU VALIDATE THE PCA? 107 SYSTEM PREVENTION ACTIONS TO F	ESS OF THE PCA?: NENT CORRECTIVE ACTION(S) (PCA):		Target Date:	Actual Date:

### Acceptable Quality Level (AQL)

Acceptable Quality Level for sample inspections should follow MIL-STD-105E sampling plan. GILLIG's supplier minimum AQL requirement level is 2.5 at general inspection level C sample size 5.

#### MIL-STD-105E Sampling Plan

. . . . . . . .

	Lot/Batch Size			Special insp	ection levels		Gen	eral inspection l	evels
	Lot Batch Size		S-1	S-2	S-3	S-4	I	п	ш
2	to	8	A	A	A	A	A	A	В
9	to	15	A	A	A	A	A	в	С
16	to	25	A	À	в	В	в	С	D
26	to	50	A	В	в	с	С	D	E
51	to	90	В	В	с	с	С	E	F
91	to	150	в	В	с	D	D	F	G
151	to	280	В	С	D	E	E	G	H
281	to	500	В	С	D	E	F	H	J
501	to	1200	С	С	E	F	G	J	K
1201	to	3200	С	D	E	G	H	K	L
3201	to	10000	С	D	F	G	J	L	М
10001	to	35000	С	D	F	н	K	м	N
35001	to	150000	D	E	G	J	L	N	P
150001	to	500000	D	E	G	J	м	P	Q
500001	and	over	D	E	H	K	N	Q	R

Samula	1.6.1			1							Acc	eptal	ble Ç	uali	y Le	vels	(Dou	ble-n	orm	al in	spec	tion)							
Sample size code	Sample	Sample size	Cumu- lative sample	***	####	#####	####	****	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000
letter				Ac R	e Ac R	e Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac R	Ac Re	Ac Re	Ac Re	Ac R	e Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac R
A	124	11.7	1.11					-									+	*		Ţ	*	*	*	*	*	*	*	*	*
в	First Second	2	2 4														*	1		02	03	1445	25	3789	5 9 12 13	7 11 18 19		17 22	
с	First Second	3	3													*	1		02	03	1445	25	37	5 9	7 11	11 16	17 22	25 31 56 57	1
D	First	5	5												*	1		0 2	03	14	2 5	37	59	7 11	11 16	17 22	25 31	1	
Е	Second First Second	8	8 16											*	1		0 2	03	14	45	67 37 89	8 9 5 9 12 13	12 1 7 11 18 19	11 16	26 27 17 22 37 38	37 38	1		
F	First Second	13 13	13 26										*	1		0 2	0334	1445	25	3789	59	7 11 18 19	11 10	5 1	1	1			
G	First	20	20									*	1		0.2	0.3	1 4	2 5	3 7	59	7 11	11 16	1	11					
н	Second First	20 32	40 32								*	1		0 2	1 2 0 3	34 14	4 5	67	8 9 5 9	12 13	11 16		1						
J	Second First	32 50	64 50							*	1		0 2	12	34	4 5	67	8 9 5 9	12 13	11 16	26 27								
K	Second First	50 80	100 80						*	1		0 2	1 2 0 3	34	4 5	67 37	8 9 5 9		11 16										
L	Second First	80 125	160 125					*	1		0 2	1 2 0 3	34	4 5	67 37	59	7 11	18 19 11 16	26 27										
M	Second First	125 200	250 200				*	1		0 2	1 2	34	4 5	67 37	8 9 5 9	7 11	11 16	26 27											
N	Second First	200 315	400 315			*	1		0 2	1 2 0 3	3 4 1 4	4 5 2 5	67 37	8 9 5 9	12 13 7 11	18 19 11 16													
P	Second First	315 500	630 500		*	1		0 2	1 2 0 3	3 4 1 4	4 5	67 37	8 9 5 9	12 13 7 11	11 16	26 27													
Q	Second First	500 800	1000 800	*	1		0 2	1 2 0 3	34 14	4 5	67 37	89 59	59	18 19 11 16															
	Second First	800 1250	1600 1250	1		0 2	1 2	34	4 5	67 37	59	7 11	18 19 11 16																
R	Second	1250	2500	1		1 2	3 4	4 5	67		12 13			1														1.	

🗼 😑 Use first sampling plan below arrow. If sample size equals, or exceeds, lot or batch size, do 100 percent inspection.

- ↑ = Use first sampling plan above arrow.
- Ac = Acceptance number.
- Re = Rejection number. \* = Use corresponding single sampling plan (or alternatively, use double sampling plan below, where available).

### **QUALITY ASSURANCE MANUAL**

#### PPAP Guidance for Suppliers

#### Introduction

The GILLIG Production Part Approval Process (PPAP) defines the approval process of new or revised parts, or parts that are from new or significantly revised production process. As a supplier to GILLIG, it is your responsibility to ensure that only parts are shipped that have been approved to meet GILLIG's specifications.

If supplier has any questions regarding the contents or process described in this document, please contact the GILLIG Quality Department.

For further information about the contents of this guide, please refer to the Automotive Industry Action Groups (AIAG) Production Part Approval Process (PPAP) 4th edition.

#### Purpose

The purpose of the Production Part Approval Process (PPAP) is:

- To provide evidence that all GILLIG engineering design records and specification requirements are properly understood and fulfilled by the supplier.
- To demonstrate that the established manufacturing process produces product that consistently meets all requirements during an actual production run.

#### PPAP Submission Guideline

In general, PPAP is use as a guideline anytime a new part or a change to an existing part or process is being implemented. GILLIG retains the right to determine whether a PPAP will be required. See the below PPAP Process Flow Chart between GILLIG and the supplier for PPAP submission workflow.

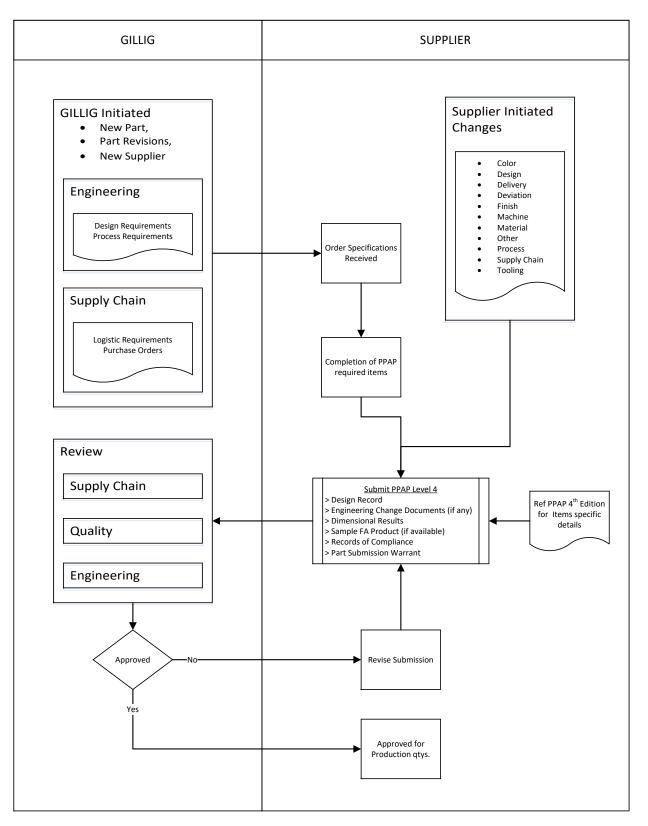
As a supplier to GILLIG, your quality system should be capable of meeting the requirements of the PPAP submission regardless of whether a submission has been requested.

The GILLIG PPAP submission follows the AIAG standard Level 2 with the following required items for submission:

- 1. Design Record
- 2. Engineering Change Documents (if any)
- 3. Dimensional Results
- 4. Sample FA Product (if available)
- 5. Records of Compliance
- 6. Part Submission Warrant (PSW)

GILLIG

### **QUALITY ASSURANCE MANUAL**



#### QUALITY ASSURANCE MANUAL

Request to waive specific requirements in the PPAP submission must be submitted to GILLIG within a timely manner prior to the application of the part in production. The approved waiver document/correspondence must be submitted in lieu of original PPAP requirement as part of PPAP submission package. If part of the waiver request is a deviation to the part specifications, the GILLIG Part Deviation Form must be submitted as part of the PPAP submission package.

#### **PPAP Forms**

Please ask your GILLIG buyer or QA contact for the PPAP forms. Supplier PPAP forms that follow the PPAP standard are acceptable.

#### PPAP Submissions Timing

PPAP submissions are required minimum 4 months prior to the application in GILLIG production. Submission timing will vary depending on the complexity and manufacturing lead time of the Supplier. In general, the Supplier must submit the PPAP with enough time for approval and any unforeseen changes.

#### Forever Requirements

In addition to the PPAP process all suppliers are to adhere to the Forever Requirements.

The Forever Requirements are terms used in the industry to denote requirements that apply forever (i.e. throughout the life of the contract with the suppliers). Suppliers shall proactively communicate with GILLIG any plan to change something in the product or process or sub-suppliers.

#### **Deviation Requests**

In the event a part deviation is requested, the supplier shall submit this request using the Part Deviation Request Form shown below. Please ask your GILLIG buyer or QA contact for a copy of this form.

### **QUALITY ASSURANCE MANUAL**



### Part Deviation Request Form

SUPPLIER NAME:	REQUEST DATE:	
ORIGINATOR:	EMAIL: PHONE#:	

	TO BE COMPLETED	BY GILLIG	
	DURATION OF	DISTRIBUTION:	DATE:
APPROVED	APPROVAL:	SUPPLY CHAIN:	
	EXPRIRATION DATE:	QUALITY:	
	EAPRICATION DATE:	ENGINEERING:	
DISAPPROVED		COLOR DE COLOR	

# GILLIG INSPECTION RECORD

CUSTOMER	COACH NO.	CHASSIS SERIAL N	10.
Air Conditioning System PDI	Chassis Start Date	e / Complete Date	
Coach Weight - Unladen	Front Axle Weight		
Odometer / Hub Odometer	I/O Program		

Attachment Check List	PROD	QC
1. Weigh Slip / Green Sheet		
2. Final Bus Parking & Walk Through Sheet		
3. CNG Agility Packet		
4. BAE Health Check Packet		
5. ITS ATP		
6. ITS Prewire Acceptance Sheet		
7. Camera View Sheet		
8. Day-Wireless 2-Way Radio ATP		
9. Customer Discrepancy Sheet		
10.		
11.		
12.		
13.		
14.		

### DATA PLATE INFORMATION VERIFICATION

	DEFECT CODES	
10 - Leak	30 - Workmanship	80 - Rubbing
11 - Air	40 - Loose	90 - Voids
12 - Fuel	41 - Flooring	100 - Damaged
13 - Hydraulic	42 - Component	101 - Online
14 - Coolant	43 - Securement	102 - Vendor
15 - Oil	50 - Bubble	110 - Wrong Part Installed
16 - Water	60 - Routing	111 - Online
20 - Incomplete	70 - Nonfunctional	112 - Vendor
21 - Shortage	71 - Vendor	
22 - Engineering	72 - Engineering Design	
23 - Production	73 - Programming	
24 - Vendor	74 - Production Error	

QC	INITIAL
STAMP	INITIAL
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	
19.	
20.	
21.	
22.	
23.	
24.	





d

### SERIAL REGISTER FOR FEDERAL REQUIREMENTS

CUSTOMER \_\_\_\_\_\_ CHASSIS SERIAL NO. \_\_\_\_\_

COACH MODEL NO.\_\_\_\_\_ DATE COMPLETED. \_\_\_\_\_

DESCRIPTION	MODEL NO.	SERIAL NO.	QC
FRONT AXLE			
REAR AXLE			
TRANSMISSION			
TRANS A-R NO.			
STEER. GEAR			
ENGINE			

TIRES	SERIAL NO.	MANUFACTURER	SIZE/PLY RATING	BRAND	PSI	PROD
LF						
LI						
LO						
RI						
RO						
RF						
SPARE						

### SERIAL NUMBER LOG

DESCRIPTION	SERIAL NUMBER	REMARKS
1. Hybrid		
A. ESS (Battery)		
A. ECP		
C. Drive Unit		
D. DPIM		
2. CNG Tank ASM		
3. BAE Systems		
1. ECP		
2. APS		
3. PCS		
4. ESS		
5. ACTM		
6. ISG		
7. SCU		
4. E-Bus		
1. Traction Motor		
2. Traction Motor Inverter		
3. DC-DC Converter		
Α.		
В.		
4. DataHub		

### SERIAL NUMBER

	CHA	ASSIS SERIAL NO.
DESCRIPTION	SERIAL NUMBER	REMARKS
5. SCM		
6. Master BMS		
7. Charger Controller		
A.		

7. Charger Controller         A.         B.         8. HVDC Junction Box         9. TMS         10. Kissling Switch Box         11. Battery Pack	
B.8. HVDC Junction Box9. TMS10. Kissling Switch Box	
8. HVDC Junction Box 9. TMS 10. Kissling Switch Box	
9. TMS 10. Kissling Switch Box	
10. Kissling Switch Box	
1.	
2.	
3.	
4.	
5.	
6.	
5. Chassis	
A. Front	
B. Center	
C	
6. Suspension	
A. Front Towers	
1. S/S	
2. C/S	
B. H-Frame	
7. Alternator	
8. Starter Motor	
9. Hydraulic Pump	
10. Air Compressor	
11. Trans Oil Cooler	
12. Threshold Heater	
13. Pro Heater	
14. Webasto Heater	
15. Heater Booster Pump	
A	
В.	
16. DEF Tank	
17. Voltage Regulator	
18. Radiator	
19. Fuel Tank	
20. Air Cond. Compressor	
21. Equalizer / Vanner	
22. Muffler-DPF	
A. SCR	

### SERIAL NUMBER

CUSTOMER

	DESCRIPTION	SERIAL NUMBER	REMARKS
23.	Fire Bottle		
24.	Air Cond. Condenser		
25.	Front Door Motor		
26.	Front Base Plate		
27.	Rear Door Motor		
28.	Rear Base Plate		
29.	DC-DC Converter		
30.	Transmission ECU		
31.			
32.			
	Driver's Seat		
	Farebox Vault		
	Farebox		
	Front Dest. Sign		
37.	•		
	Rear Route No. Sign		
	2-Way Radio		
40.	Dest. Sign Controller		
41.	Keypad Display ITS		
42.	Wheelchair Ramp		
43.	Annunciator		
	Interior Info Sign		
45.	Video Recorder		
	A.		
	B.		
4.0	C.		
46.	Farebox Keypad		
47.			-
	1.		
	2.		
	3.		-
	4.		DEPT 5A
	5.		LABEL HERE
	6.		
	7.		
	8.		1
	9.		
	10.		-
40	11. Rear View Comerce		
48.	Rear View Camera		



### CHASSIS DEPARTMENT (04A & C)

#### **CUSTOMER**

04A OPERATIONS	PROD	QC	04C OPERATIONS	PROD	QC
1. Chassis Length, Brake, Wheelchair, Door Opt			1. Flag Panel Instl. & Torque 140 In-Lb		
2. Fire Suppression Cable Routing			2. A/C Compressor Installation		
3. Front S/S + C/S Wheel House			3. CAC Installation & Clamping		
4. Chassis Model + ID			4. Turbo Piping & Clamping		
5. Chassis Eng. Mounts + Cushy Floats			5. Exhaust Test Ports and Plugs		
6. Chassis Huck Bolts			6. Air Restriction Indicator		
7. AC Platform + Pulley Brkt			7. Air Compressor Piping		
8. Elect/Air Routing + Inst Fwd to Aft of Chassis			8. Air Intake System		
9. Rear Brake lines Routing & Clamping			9. Surge Tank & Hoses		
10. Air System Install, Air Dryer, Ping Tank,			10. Electrical Harnesses & Clamps		
Purge Tank, Kneeling + Leveling Valves			11. J-1939 Connections		
11. S/S Wheelwell Prep, Piping, & Miter Box			12. Fuel Tank Installation		
12. Hyd/Fuel Lines Routing & Clamped Apart			13. Fuel Lines Routing & Clamping Torque		
13. DEF Tank Installation			14. Tires & Wheels Verification		
14. Heater Lines + Clamps & Insulation			15. Rear Wheel Lug Torque		
15. Front Brake lines Routing & Clamping			16. Front Wheel Lug Torque		
16. Steering Gear & Pitman Arm Install & Torque			17. Power Cables & Vanner Torque		
17. Steering Shaft & Torque			18. Fuse Box Install		
18. Insulation / Corrosion Package			19. Power Cables & Cut-off Switch Torque		
19. Skid Plate, Heater Valve			20. Batt. Cables Clearance		
20. Front & Rear Shop Air + Tow Connection			21. Battery Fuse Installation		
21. Tow Connection, Toe Switches			22. Engine Oil Type & Level		
22. Throttle & Brake Pedals			23. Transmission Oil Type & Level		
23. Trans Retarder PSI Switches			24. Radiator Coolant		
24. Axle Sub			25. Hydrualic Fluid Type & Level		
1. (FRONT) Axle ASM Verification			26. Engine Startup		
A. Torque Rod Install & Torque			27. ABS Initial Check		
B. Towers, Air Bags, Shocks Install & Torque			28. Air Test (Wet Test)		
2. (REAR) Axle ASM Verification			29. Coolant Hose Leak Test		
A. Axle Oil Type			30. Isoloop Coolant Hose Routing & Clamping		
B. Oil Hub - Oil Amount			31. Verify Surge Tank Coolant Sensor-Level Location		
C. Grease Hub - Oil Level			32. FR/RR Axle Pods, Cage Bolts, & Lock Clips		
D. Air Bags, Shocks Install & Torque			33. Hybrid Sub Station Comp. Instl. & Torque		
25. FR/RR Axle Pods, Cage Bolts, Slacks, & Lock Clips			34. FR/RR Brake Hose Clearance on Bump Stops		
26. Front Suspension Install & Torque			35. RR Brake Hose Clearance, Raised		
27. Draglink Installation					
28. Rear Suspension Install & Torque					
29. Center Rear Axle (1/8")					
30. Pinion Angle °					
31. Battery Box					
32. Hybrid Cable Continuity Test					
33. No Dielectric Grease at Hybrid Transducer					

DEF	ΡT	DC	BS	DISCREPANCIES	PROD	QC	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							

### DEPT 04B LABEL HERE

		ENGINE	LINE & D	EPT, 4B OPERATIONS		
Op	erations	PROD	QC	Operations	PROD	QC
1. Trans Install & To	rque			8. Tans. Dipstick Tube Install		
a. Allison	b. Voith			9. Hyd. Pump Install / Torque		
1. Turn Bolts	1. Inner Ring	1		10. Coolant Hose / Filter Install		1
2. Flex Plate	2. Hydrodamp			11. Starter Install / Torque		
3. Outer Housing	3. Intermediate Ring			12. Fuel Hose Install		
4. Flywheel	4. Outer Housing			a. Top fuel Hose Torque		
5. Damper (Hybrid)				b. Bottom fuel Hose Torque		
c. BAE	d. ZF			13. Starter Cable Torque		
1. Generator	1. Inner Ring			14. Air Compressor Hose		
a. Inner Bolts	2. Outer Ring			15. DeAiration Hose Routing Inst.		
b. Cover plate	3. Turn Bolts			16. Radiator Power Cable Inst.		_
2. Outer Housing		1.000		17. Alt. Cable Clamp / Torque		
2. BAE or Allison Hyl	brid Cable Inst.			18. Aux Coolant Heater Piping		
a. Ring Terminal I	nstall / Torque			19. Trans. Cooler Hose Install		_
b. Connector Insta	all / Torque			20. Engine Installation & Torque		
c. Cover Plate Inst	all / Torque			21. Air Piping: RR IvI/Ping/Purge/Dryer/Gov		
3. Engine Fill Tube Ir	nstallation			22. Hydraulic Reservior Hoses		
4. Alternator Install				23. DEF Coolant Piping & Clamping		
5. Crank Case Filter	Install			24. Radiator Mounting & Hoses		
6. Motor Mount Ins	t/Torque			25. Booster Pump Piping & Clamping		
7. Drive Shaft Install	/Torque			26. Settee Installation / Drive Shaft Greased		

DE	PT	DC	BS	DISCREPANCIES	PROD	QC	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							
16.							
17.							
18.							
19.							
20.							
21.							
22.							
23.							
24.							
25.							
26.							
27.							



### **BODY DEPARTMENT (05)**

CUSTOMER

\_ \_ \_ \_ \_ \_ \_ \_ \_ \_

#### CHASSIS SERIAL NO.

\_ \_ \_ \_ \_

					Body Depa	artment (05A)			
	Operations		PROD S/S	PROD C/S	QC	Operations	PROD S/S	PROD C/S	QC
. Roof Fra	aming Install	ation				14. Roof Harness			
. RoofGu	ssets Assy. (1	L5Ft-Lb)				15. Destination Sign Harness			
. Roof Ski	n Installatio	n				16. APC Cables			
. Emerger	ncy Hatch In	stall				17. Grab Rails			
5. Hyb/CN	G/Ebus Roof	Comp.				18. Grab Straps / Ad Panels			
5. Insulatio	on					19. Camera Installation			
7. Int. Pass	senger Ceilin	g Panels				20. DPF & SCR / Record Serial #			
. Int. Driv	ver Ceiling Pa	anel				21. Bulkhead Inst. / Frame			
. Antenna	a Locations					22. Fire Suppression Inst. @ A/C			
.0. Air Tank	Installatior	n & Piping				23. A/C Inst. / Record Serial #			
1. Antenn	a Cable Rout	ing				24. Fire Wire Inst. @ A/C			
	al Panel Inst					25. Fire Bottle / Record Serial #			
.3. Interior	<sup>-</sup> Light Kit					26. Bulkhead Int. Panel / Sealer			
DEPT	BS	DC				Discrepancies		PROD	QC
CU	STOME	2				CHASSIS SERIAL N	NO.		
CU	STOME	{			Podu Don	CHASSIS SERIAL N	١0		
CU		<pre> { </pre>		1		artment (05B)			
	Operations		PROD S/S	PROD C/S	Body Depa QC	operations	NO PROD S/S	PROD C/S	QC
A/C & Si	Operations de Frame Ins	stall	PROD S/S	1		Operations 16. Body Squareness		PROD C/S	QC
. A/C & Si . Window	Operations de Frame In: v Post Instal	stall	PROD S/S	1		Operations 16. Body Squareness 18. Exit Door Header Install		PROD C/S	
A/C & Si 2. Window 3. Settee F	Operations de Frame In: v Post Instal rame / Seal	stall lation	PROD S/S	1		Operations Operations 16. Body Squareness 18. Exit Door Header Install 19. Steering Column Brkt.		PROD C/S	QC
. A/C & Si . Window . Settee F . Rear Fra	Operations de Frame In: v Post Instal rame / Seal me Installat	stall ation	PROD S/S	1		Artment (05B) Operations 16. Body Squareness 18. Exit Door Header Install 19. Steering Column Brkt. 20. Rear Wheel Well Install		PROD C/S	
A/C & Si 2. Window 3. Settee F 4. Rear Fra 5. Destinat	Operations de Frame Ins v Post Instal rame / Seal me Installat tion Sign Co	stall lation ion mp.	PROD S/S	1		Artment (05B) Operations 16. Body Squareness 18. Exit Door Header Install 19. Steering Column Brkt. 20. Rear Wheel Well Install 21. Front Wheel Well Install		PROD C/S	
. A/C & Si . Window . Settee F . Rear Fra . Destinat	Operations de Frame Ins v Post Instal rame / Seal me Installat tion Sign Co R Door Stre	stall lation ion mp.	PROD S/S	1		Artment (05B) Operations 16. Body Squareness 18. Exit Door Header Install 19. Steering Column Brkt. 20. Rear Wheel Well Install 21. Front Wheel Well Install 22. CNG Component Installation		PROD C/S	
. A/C & Si . Window . Settee F . Rear Fra . Destinat . Frnt & R . Interior	Operations de Frame In: v Post Instal rame / Seal me Installat tion Sign Co R Door Stre Post Caps	stall lation ion mp.	PROD S/S	1		Artment (05B) Operations 16. Body Squareness 18. Exit Door Header Install 19. Steering Column Brkt. 20. Rear Wheel Well Install 21. Front Wheel Well Install 22. CNG Component Installation 23. Hybrid Comp. Roof Install		PROD C/S	
A/C & Si 2. Window 3. Settee F 4. Rear Fra 5. Destinat 5. Frnt & R 7. Interior 8. Speaker	Operations de Frame Ins v Post Instal rame / Seal me Installat tion Sign Co R Door Stres Post Caps Panels	stall lation ion mp.	PROD S/S	1		Artment (05B) Operations 16. Body Squareness 18. Exit Door Header Install 19. Steering Column Brkt. 20. Rear Wheel Well Install 21. Front Wheel Well Install 22. CNG Component Installation 23. Hybrid Comp. Roof Install 24. Hybrid High Voltage Cables		PROD C/S	QC
<ol> <li>A/C &amp; Si</li> <li>Window</li> <li>Settee F</li> <li>Rear Fra</li> <li>Destinat</li> <li>Frnt &amp; R</li> <li>Frnt &amp; R</li> <li>Interior</li> <li>Speaker</li> <li>Exterior</li> </ol>	Operations de Frame Ins v Post Instal rame / Seal me Installat tion Sign Co R Door Stree Post Caps Panels Post Caps	stall lation ion mp. ss Panels	PROD S/S  PROD S/S	1		OperationsOperations16. Body Squareness18. Exit Door Header Install19. Steering Column Brkt.20. Rear Wheel Well Install21. Front Wheel Well Install22. CNG Component Installation23. Hybrid Comp. Roof Install24. Hybrid High Voltage Cables25. Hyb Roof Comp Connections		PROD C/S	
A/C & Si 2. Window 3. Settee F 4. Rear Fra 5. Destinat 5. Frnt & R 7. Interior 8. Speaker 9. Exterior 0. Side Fra	Operations de Frame Ins v Post Instal rame / Seal me Installat tion Sign Co R Door Stres Post Caps Panels Post Caps ame Stress Pa	stall lation ion mp. ss Panels anels	PROD S/S  PROD S/S	1		OperationsOperations16. Body Squareness18. Exit Door Header Install19. Steering Column Brkt.20. Rear Wheel Well Install21. Front Wheel Well Install22. CNG Component Installation23. Hybrid Comp. Roof Install24. Hybrid High Voltage Cables25. Hyb Roof Comp Connections26. 12 / 24V Connections @ Flag		PROD C/S PRO	
A/C & Si 2. Window 3. Settee F 4. Rear Fra 5. Destinat 5. Frnt & R 7. Interior 8. Speaker 9. Exterior 1. Side Fra 1. Side Fra	Operations de Frame Ins v Post Instal rame / Seal me Installat tion Sign Co R Door Stres Post Caps Panels Post Caps ame Stress Pa ame Gusset (	stall lation ion mp. ss Panels anels	PROD S/S           Image: Second seco	1		artment (05B)Operations16. Body Squareness18. Exit Door Header Install19. Steering Column Brkt.20. Rear Wheel Well Install21. Front Wheel Well Install22. CNG Component Installation23. Hybrid Comp. Roof Install24. Hybrid High Voltage Cables25. Hyb Roof Comp Connections26. 12 / 24V Connections @ Flag27. AC Power Cable @ Flag		PROD C/S PRO	
. A/C & Si 2. Window 3. Settee F 4. Rear Fra 5. Destinat 5. Frnt & R 7. Interior 8. Speaker 9. Exterior 10. Side Fra 11. Side Fra 2. Air Filte	Operations de Frame Ins v Post Install rame / Seal me Installat tion Sign Co R Door Stres Post Caps Post Caps Post Caps ame Stress Pa ame Gusset ( er	stall lation mp. ss Panels anels 15 FT-LB)	PROD S/S           Image: Second seco	1		Artment (05B) Operations 16. Body Squareness 18. Exit Door Header Install 19. Steering Column Brkt. 20. Rear Wheel Well Install 21. Front Wheel Well Install 22. CNG Component Installation 23. Hybrid Comp. Roof Install 24. Hybrid High Voltage Cables 25. Hyb Roof Comp Connections 26. 12 / 24V Connections @ Flag 27. AC Power Cable @ Flag 28. Floor Installation		PROD C/S PROD C/S PROD C/S	
. A/C & Si . Window . Settee F . Rear Fra . Destinat . Destinat . Frnt & R . Interior . Speaker . Exterior . Side Fra 1. Side Fra 2. Air Filte 3. Flex Pip	Operations de Frame Ins v Post Instal rame / Seal me Installat tion Sign Co R Door Stree Post Caps Panels Post Caps ame Stress Pa ame Gusset ( er pe / Surge Tap	stall lation mp. ss Panels anels 15 FT-LB) nk Install	PROD S/S           Image: Second seco	1		artment (05B)Operations16. Body Squareness18. Exit Door Header Install19. Steering Column Brkt.20. Rear Wheel Well Install21. Front Wheel Well Install22. CNG Component Installation23. Hybrid Comp. Roof Install24. Hybrid High Voltage Cables25. Hyb Roof Comp Connections26. 12 / 24V Connections @ Flag27. AC Power Cable @ Flag		PROD C/S PRO	QC
. A/C & Si . Window . Settee F . Rear Fra . Destinat . Therior . Speaker . Speaker . Side Fra 1. Side Fra 2. Air Filte 3. Flex Pip 4. Body to	Operations de Frame Ins v Post Instal rame / Seal ime Installat tion Sign Co R Door Stree Post Caps Panels Post Caps ame Stress Pa ame Gusset ( er oe / Surge Tap Ochassis Coa	stall lation ion mp. ss Panels anels 15 FT-LB) nk Install ting	PROD S/S           Image: Second seco	1		OperationsOperations16. Body Squareness18. Exit Door Header Install19. Steering Column Brkt.20. Rear Wheel Well Install21. Front Wheel Well Install22. CNG Component Installation23. Hybrid Comp. Roof Install24. Hybrid High Voltage Cables25. Hyb Roof Comp Connections26. 12 / 24V Connections @ Flag27. AC Power Cable @ Flag28. Floor Installation29. Floor Sealer30. Fire Wire Routing		PROD C/S PROD C/S PROD C/S	
<ol> <li>A/C &amp; Si</li> <li>Window</li> <li>Settee F</li> <li>Rear Fra</li> <li>Destinat</li> <li>Frnt &amp; R</li> <li>Frnt &amp; R</li> <li>Interior</li> <li>Speaker</li> <li>Speaker</li> <li>Side Fra</li> <li>Side Fra</li></ol>	Operations de Frame Ins v Post Instal rame / Seal me Installat tion Sign Co R Door Stree Post Caps Panels Post Caps ame Stress Pa ame Gusset ( er pe / Surge Tap	stall lation ion mp. ss Panels anels 15 FT-LB) nk Install ting	PROD S/S           Image: Second seco	1		OperationsOperations16. Body Squareness18. Exit Door Header Install19. Steering Column Brkt.20. Rear Wheel Well Install21. Front Wheel Well Install22. CNG Component Installation23. Hybrid Comp. Roof Install24. Hybrid High Voltage Cables25. Hyb Roof Comp Connections26. 12 / 24V Connections @ Flag27. AC Power Cable @ Flag28. Floor Installation29. Floor Sealer		PROD C/S PROD C/S PROD C/S	
<ol> <li>A/C &amp; Si</li> <li>Window</li> <li>Settee F</li> <li>Rear Fra</li> <li>Destinat</li> <li>Frnt &amp; R</li> <li>Interior</li> <li>Speaker</li> <li>Speaker</li> <li>Exterior</li> <li>Side Fra</li> <li>Side Fra</li></ol>	Operations de Frame Ins v Post Instal rame / Seal ime Installat tion Sign Co R Door Stree Post Caps Panels Post Caps ame Stress Pa ame Gusset ( er oe / Surge Tap Ochassis Coa	stall lation ion mp. ss Panels anels 15 FT-LB) nk Install ting	PROD S/S           Image: Second seco	1	QC	OperationsOperations16. Body Squareness18. Exit Door Header Install19. Steering Column Brkt.20. Rear Wheel Well Install21. Front Wheel Well Install22. CNG Component Installation23. Hybrid Comp. Roof Install24. Hybrid High Voltage Cables25. Hyb Roof Comp Connections26. 12 / 24V Connections @ Flag27. AC Power Cable @ Flag28. Floor Installation29. Floor Sealer30. Fire Wire Routing		PROD C/S PROD C/S PROD C/S PROD C/S PROD C/S PROD C/S PROD	

### SHEET METAL DEPARTMENT (06)

#### CUSTOMER \_\_\_\_\_

06 OPERATIONS	PROD	QC	06 OPERATIONS	PROD	QC
1. HVAC Deaeration Hose Routing			21. Qpod Harness Routing		
2. Dest. Sign Compt/HVAC Piping & Clamping			22. Chime Harness Routing		
3. Fire Suppression System Installation			23. Front Cap Prep		
4. Engine Compt Harn/Hose Routing & Clamping			24. Front Cap Installation		
5. Skirt Panel Brkt Installation			25. BRT Windshield Opening		
6. Front Door Harness Interference			26. BRT Windshield Squareness		
7. Front Door Header Installation			27. Driver's Side Console Installation		
8. Front Door Installation			28. Dash Prep & Installation		
9. Air Piping @ Driver's Platform			29. Rear Cap Prep		
10. Air Tank Closeout Installation			30. Rear Cap & HVAC Door Installation		
11. Rear Electrical Panel Installation			31. Tail Pipe Installation		
12. Elec.Panel Closeout & Side Access Door Instl.			32. Driver's Barrier Installation		
13. 12/24v Cable Torque Frt Panel			33. Elec. Equipment Box Verification		
14. 12/24v Cable Torque Rear Panel			34. Side Overhead Grabrail Installation		
15. Engine Compt Routing @ Settee Hatch			35. Engine Door & Light Corner Installation		
16. Skirt Panel Prep, Locks, Latches & Primer			36. Engine Belt Guard Installation		
17. Skirt Panel Installation			37. Drivers Heater/Washer Bottle Installation		
18. Exit Door & Nosing Installation			38. Sawtooth/ B Post Closeout Installation		
19. Wheel Tub Prep			39. Headlamp Installation		
20. Wheel Tub Installation					

DE	PT	DC	BS	DISCREPANCIES	PROD	QC	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							
16. 17.							
17.							
18.							
19.							
20.							
21.							
22.							
23.							
24.							
25.							
26.							
27.							
28.							
29.							
30.							
31.							
32.							
33.							
34.							
35.							
36.							



### ROCKWELL/WABCO D VERSION ANTI-LOCK BRAKE SYSTEM CHECKLIST

CUSTOMER

CHASSIS SERIAL NO.

Step 1. Clear stored faults with Pro-Link STORED FAULT menu.

Step 2. Record the following ECU information from Pro-Link PROGRAM ID menu.

ECU Rev.\_\_\_\_\_ ECU Part Number\_\_\_\_\_

ECU MFG Date Code ECU Serial Number\_\_\_\_\_

Valve Function Tests	Identification	OK	Not OK	N/A
Modulator Valve Cycle	Left Front (A) Steer Axle			
Modulator Valve Cycle	Right Front (B) Steer Axle			
Modulator Valve Cycle	Left Rear (C) Drive Axle			
Modulator Valve Cycle	Right Rear (D) Drive Axle			

Step 3. Component test for Sensors. Check the location and voltage output of each sensor. The AC voltage output should be greater than .5 volts @ 30 rpm.

Sensor Function Tests	Identification	OK	Not OK	N/A
Sensor Output	Left Front Wheel (A) Steer Axle			
Sensor Output	Right Front Wheel (B) Steer Axle			
Sensor Output	Left Rear (C) Drive Axle			
Sensor Output	Right Rear (D) Drive Axle			

#### Step 4: Miscellaneous Component Testing

Other Function Tests	Identification	OK	Not OK	N/A
ATC Modulator Valve	Full System Only			
ATC Lamp (Wheel Spin)	Full System Only			
ABS Lamp (Tractor ABS)	D Basic and Full			
ABS Check Switch, Disable ATC	D Full. Hold switch for just over 3 sec.			
Engine Datalink (Eng Torque) ATC	D Full			
Retarder Datalink	D Basic and Full (when equipped)			
Retarder Relay	D Basic and Full (when equipped)			

#### Step 5: Air System Function and Leak Test

Air System End of Line Test	Required	Fail	Pass	Corrected By	Retested By
0 psi in tanks, LPS on, Dash gauge low	Confirm				
Both needles rise together, max 5 psi diff.	Confirm				
LPS off above 60 psi below 80 psi	Confirm				
Build-up time 25 seconds or less	Confirm				
Compressor Cut-out psi	125–135 psi				
Supply System Leakage test	Not to exceed 4 psi in 2 minutes				
Service Brake Leakage test	Not to exceed 6 psi in 2 minutes				
Pull up PP-1	Confirm spring brakes apply				
Push in PP-1	Confirm spring brakes release				
Wet Tank Drain Down	No drop on either gauge				
Secondary Tank Drain Down	Red needle drop, max 2 psi drop in green needle				
Service Brake Application	Rear brakes apply, front brakes do not apply, stop light lights				
Primary Tank Drain Down	Green needle drops				
Primary Tank Drain Down	PP-1 pops at 35–45 psi				
Primary Tank Drain Down	Green needle drops, red drops 2 psi max				
Primary Tank at 0 psi	Front brakes apply, Rear brakes apply with spring brake, stop lights light				
Drain Accessory Tank	Verify flow from accessory tank drain				
Front Brake Interlock	Verify operation				
Rear Brake Interlock	Verify operation				



### RACK DEPARTMENT (09)

### CUSTOMER \_\_\_\_\_

OPERATIONS	PROD	QC	OPERATIONS	PROD	QC
1. J1939 Ohms Verifcation			1. ABS Test		
2. Charging System Voltage			2. ATC Test		
3. Dash Panel Install & Function			3. Air Tank Drain Test		
4. Rear Run Box Function			4. Low Air Alarm		
5. Rear Throttle			5. Parking Brake Alarm 9-10-10		
6. Fan Control Static Test			w/ Ignition Off & Park		
7. Engine Comp. Lights			6. Check Air System / Wet Test		
8. Ignition Start - Front			7. Engine Oil Level		
9. Lamp Indicator			8. Transmission Fluid Level		
10. Booster Fan Low/High			9. Radiator Coolant Level		
11. Check Fast Idle/Interlock			10. Hydraulic Fluid Level		
12. Driver's Defroster			11. Rear Run Box Installation		
13. Hazard Lights			12. Retardent Seal @ Eng. Cmpt		
14. Headlight Function			13. Fire Wire Alarm Test		
15. Turn Signals			14. Fire Suppression System Inst.		
16. Retarder On/Off Light			15. Wiper Motor Installation		
17. Interior Lights			16. Air Dryer		
18. Windshield Washers			17. Check Speedometer		
19. Wiper Function			18. Transmission Shifter		
20. Engine Test Switch			19. Interior Lights - Reverse		
21. Front Stepwell Heater			20. Seal Exterior Wheelwells		
22. Yield Sign Switch			21. Verify Skirt Panel Hardware		
23. Engine Shutdown w/ Fire Test			22. Hose/Wire Routing Underside		
24. Engine Programming			23. FR/RR Axle Pods, Cage Bolts, & Clips		
25. Transmission Program			24. Clevis & Cotter Pins - FR & RR Axles		
26. Program Rev			25. Front Brake Line Clearance		
27. Brake Interlock Operation			26. Steering Column Installation		
28. Kneeling System			27. Driver Foot Area For Clearance		
29. Kneeling Interlock Warning			28. Farebox Gnd Strap		
30. Retarder - Brake Activation			29. Farebox Harness Routing		
31. Dept. 9 Elect. Comp/Harn Routing & Inst.			30. Settee Installation		
32.			31.		

DEP	D T	DC	BS	DISCREPANCIES	PROD	QC	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							
16.							
17.							
18.							
19.							
20.							
21.							
22.							
23.							
24.							



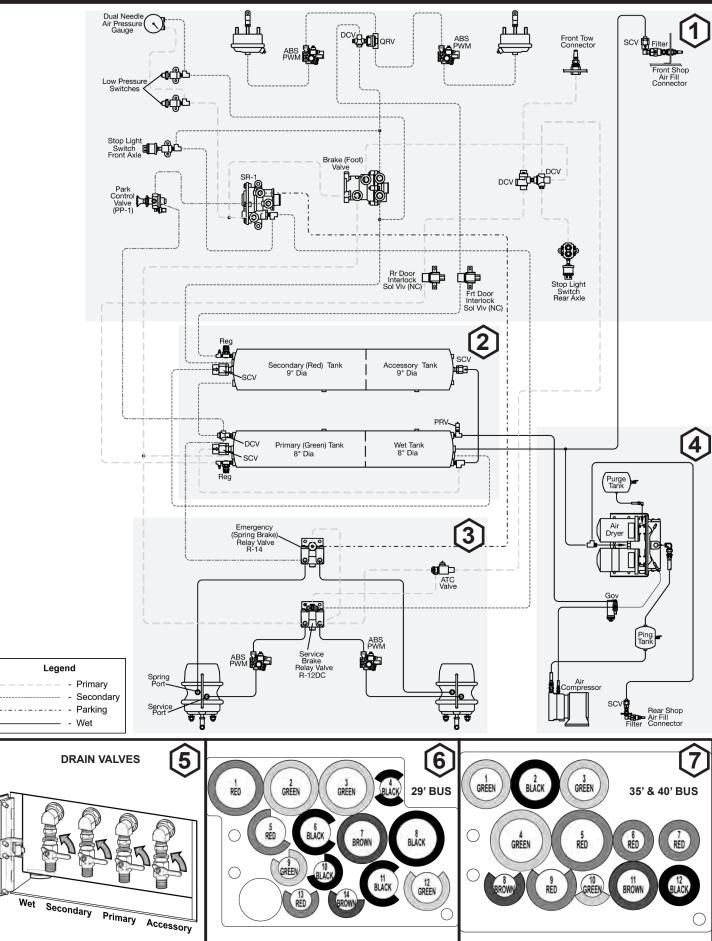
### AIR LEAK TRACKER SHEET

CUSTOMER \_\_\_\_\_

Dept. Air Leak Found In	Section #	<sup>n</sup> Commodity	Criteria		Details		PROD	QC	
			Air	Leak Insp	ection Criteria				
Commod	lity	A. Indication of an air bubble	r leak by a few air		steady release of small bubbles C. Roaring boil, Rapid release of bu and/or foaming. Hear air release or one Large Bub			e of bubble ge Bubble	€S,
Valves		No Act	ion		No Action Action Needed				
Push to Cor Fittings		No Act	ion	No Action A			Action Needed		
NTA / JIC / S NPT Fittir		Action Ne	eeded	Action Needed A		Action Needed			
Solenoid Entrance Door Motor Open Close Cylinder Driver's Door Control Valve Pressure Protection Valve Accessory Air Tank Exit Door Motor Close Spring WWWW Open Cylinder Cylinder Solenoid (Optional) Extern Door Open Valve (ocated at windsh washer fill reco					LH Air Bags Height Control Valve Supply From Accessory Air T High Volume Kneeling Valve Supply From Accessory Air T	Ma essure Protection Valv Mounted at Air Tank Line Iank Fank	A U H U`s	s single heck lalve	



### AIR LEAK TRACKER SHEET



GILLIG

### NEW PRODUCTION INSPECTION CHECK SHEET DIWA.5 TRANSMISSION SHEET 1

CUSTOMER \_\_\_\_\_

CHASSIS SERIAL NO.

### VOITH

Transmission Serial Number		Transmission Design Pattern #	
End User Name		ECU Serial Number.	
Vehicle Manufacturer		ECU Part Number	
Vehicle Model	GILLIG LLC	Engine Manufacturer / Type	Cummins L9 / L9N
Type of Vehicle	Bus	Engine Max HP / @RPM	
Chassis No.		Oil Manufacturer / Oil Type	

Item #	Description of Test / Description of Check	Yes / OK	Remarks / Notes
1.0	At Standstill, Engine is not running.		
1.1	All cable connections properly fitted and connected.	0	
1.2	Cables installed correctly (Min Bend radius, no rubbing, 100mm		
	away from heat source)	0	
1.3	Transmission Accessibility:		
	- Transmission periphery	0	
	- Diagnostic Port	0	
	- Top cover / Solenoid Valves	0	
	- Measuring oil level	0	
	- Measuring Ports	0	
	- Oil pan / Draining oil	0	
	- Filling transmission fluid	0	
1.4	No vehicle components secured to the transmission	0	
1.5	Electronic Control unit location approved & protected from splash	0	
2.0	At Standstill, Engine is not running.		
2.1	Verify that oil level on Voith dipstick (@ transmission) matches the	0	
	level indicated on OEM dipstick (@ engine compartment)		
2.2	Inspect for leaks	0	
3.0	Test Drive		
3.1	Functional Check		
	- Starter Inhibitor while button is pressed	0	
	- Gear Guard Function (Gear should not engage		
	without depressing floor brake)	0	
	- ANS Function If Installed	0	
	- Retarder Off Switch (If Installed)	0	
3.2	Retarder Operation: Verify Retarder inputs FB1, FB2 & FB3 activate		
	in the correct order and that FB1 & FB2 are active before shoe to		
	drum or pad to disc contact is made.	0	
3.3	Read Fault Memory, rectify fault and clear memory if applicable	0	
3.4	Stall Speed n1 [1/min]	0	
3.5	Check oil level at operating temp (~175°F), top off if necessary	0	
3.6	Inspect for leaks	0	
4.0	Results of Commissioning		
	Complaints eliminated	0	
	•		

Notes:

Date:

Inspected By:

GILLIG

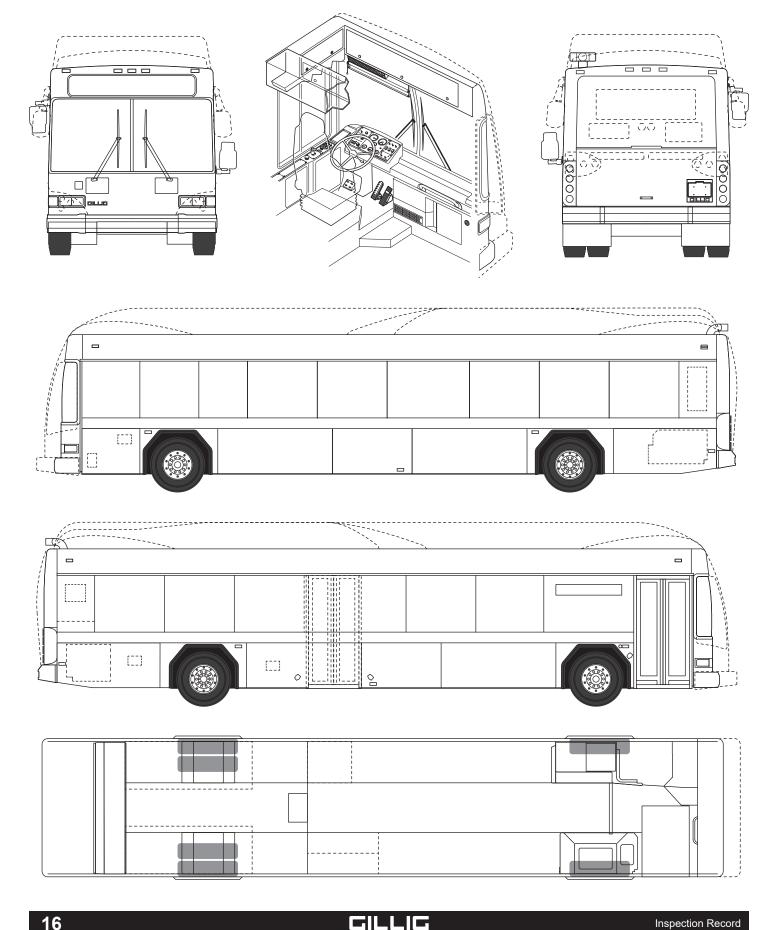
### ACCEPTANCE TEST PROCEDURE WORKSHEET (MFD 2)

### CUSTOMER \_\_\_\_\_

Line #	Description	Pass/Fail	Tested By	Comments
1	General Functions			
	Verify Primary Screen gauges match Programming Spec and display proper values.			
	Verify Secondary Screen gauges match Programming Spec and display proper values.			
	Verify Engine Test switch triggers Check Engine indicator			
	Verify ABS test switch (if applicable) triggers ABS indicator momentarily.			
	Verify Lamp Test switch illuminates all on-screen and physical telltale indicators for 10 seconds (or as noted).			
2	Day Run / Night Run Modes			
	Ensure Day Run shows a white background with colored graphics			
	Ensure Night Run shows a black background with colored graphics			
	Verify screen toggles properly with specified screen control (i.e. run sw or ambient light sensor)			
3	Camera viewing (if applicable)			
	Verify Rear door camera image appears when rear door open is triggered.			
	Verify Back-up camera image appears when transmission is set to reverse. Ensure image displays the curb side on the right and street side on the left (i.e. mirrored)			
	When interlock is ACTIVATED, verify that the REAR DOOR camera image appears, when BOTH rear door open and reverse signals are active.			
	When interlock is DEACTIVATED, verify that the BACK-UP camera image appears, when BOTH rear door open and reverse signals are active.			
4	Seat Cushion Alarm (if applicable)			
	Verify that the "Set Parking Brake" image functions as described.			
5	Seat Belt Alarm (if applicable)			
	Verify that the "Check Seatbelt" image functions as described.			
6	Maintenance / Driver mode			
	Verify that the Maintenance/Driver mode switch toggles the screen between Maintenance Mode and Driver mode.			
	In Maintenance Mode			
	Verify J1939 button displays J1939 signals.			
	Ensure "System Status" button displays all I/O modules on bus and show as "Online"			
	Verify that the screen remains on the current screen while the bus is moving more than 3 mph.			
	In Driver Mode			
	Verify Diag. Menu button does not appear on the Primary Screen.			
	Verify that the screen returns to the Primary Screen when the bus is moving more than 3 mph.			
7	Shutdown			
	Turn Ignition off, and Verify screen remains on while I/O multiples system is on.			
	Set the Maintenance/Driver mode switch to "Driver" before leaving the bus.			

### PAINT DEPARTMENT (07)

CUSTOMER



### PAINT DEPARTMENT (07)

### CUSTOMER \_\_\_\_\_

DEFECT LIST							
160 - Bondo Sore	210 - Overspray	260 - Chips	310 - Low Mils - Single Stage 3.5 - 4.5				
170 - Dents	220 - Water Marks	270 - Dirt	320 - Low Mils - Two Stage 4.5 - 5.5				
180- Sand Marks	230 - Runs / Sag	280 - Pinholes	330 - Buffing Compound Residue				
190 - Fish Eye	240 - Dry Spray	290 - Bad Repair	340 - Orange Peel				
200 - Scratch	250- Peeling	300 - Solvent Pop	350 - Incomplete Repair				

EX	TERIOR INSPECTION CHECK LIST	PROD	QC
1.	Layout		
2.	Skirt Panels Lower Edge		
3.	Front Door Rubber		
4.	Rear Door Rubber		
5.	Hubs Painted		
6.	Roof Numbers		
7.	Battery Compartment		

ER	IOR INSPECTION CHECK LIST	PROD	QC
٥V	ERSPRAY @		
Α.	Post Caps		
В.	Kick Panels		
C.	Side Console		
D.	Dash		
E.	Below Driver's Window		
F.	Entrance Doors		
G.	Exit Doors		
H.	Electrical Box / Wheel Tubs		
I.	Entry Threshold Panels		
	OV A. B. C. D. E. F. G.	OVERSPRAY @ A. Post Caps B. Kick Panels C. Side Console D. Dash E. Below Driver's Window F. Entrance Doors G. Exit Doors H. Electrical Box / Wheel Tubs	OVERSPRAY @         A. Post Caps         B. Kick Panels         C. Side Console         D. Dash         E. Below Driver's Window         F. Entrance Doors         G. Exit Doors         H. Electrical Box / Wheel Tubs

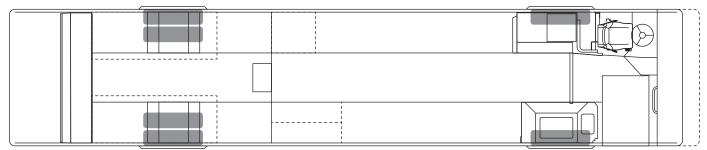
DEP	ΤD	C BS	DISCREPANCIES	PROD	QC	
1.						
2.						
3.						
4.						
5. 6.						
6.						
7.						
8. 9.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20. 21.						
21.						
22.						
22. 23. 24.						
24.						
25.						
26.						
27.						
28.						
29.						$\square$
30.						
31.						$\square$
32.						$\square$
33.						$\square$
34. 35.						
35.						
36.						
37.						
38.						
39.						



### TRIM DEPARTMENT (08A & 08B)

### 

08A OPERATIONS	PROD	QC	08B OPERATIONS	PROD	QC
1. Flooring Installation			1. Sun Screens / Driver		
2. Tail Lights & Installaiton			2. Modesty Panels		
3. Interior Panels			3. Passenger Windows		
4. Turn Signals & Installation			4. Driver's Window		
5. Marker Lights & Installation			5. BRT Dash Trim		
6. Rear Mudflaps			6. Exterior Mirrors		
7. Front Mudflaps			7. Driver's Seat & Serial #		
8. Rear Bumper Installation			8. Side Destination Sign(s) & Serial #		
9. Stepwell Lights & Installation			9. Passenger Signals		
10. Front Bumper			10. Interior Mirrors		
11. Fender Installation			11. Interior Ad Frames		
12. Farebox Platform			12. Grab Handles @ Wheelwells		
13. Cowling Installation			13. Entrance Grab Handles		
14. Door Seals			14. Fire Extinguisher		
15. Door Glazing & Seal			15. First Aid Kit		
16. Seat Rail Installation/ T-Bolts			16. Road Warning Kit		
17. Exhaust Diffuser Installation			17. Window Bars		
18. Rear Run Sign			18. Farebox & Serial #		
19. Front Destination Sign & Serial #			19. Farebox Guard		
20. Windshield Installation			20. Exterior Side Ad Frames		
21. Passenger Heater(s)			21. Drip Rail Installation		
22. Wiper Arm Asm			22. Exterior Ad Frames		
23. Front License Plate			23. Ext. Foam Tape, Reflectors & Latches		
24. Coolant ISO-Loop			24. Check Floor Sealer		
25. A/C Belt Alignment Verification			25. ADA Spacing		
26. Bike Rike Installation			26. Shoulder Belt & Floor		
27. Torque Wheel Lug Nuts			27. Stanchion Location & Torque		
28. Tire Air Pressure			28. Seat Location / Hip to Knee		
29.			29. Seat Mounting Torque		
30.			30. Hubodometer		
31.			31. Exterior Graphics		
32.			32. Driver Shield		



DE	PT	DC	BS	DISCREPANCIES	PROD	QC	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							

### **ELECTRICAL DEPARTMENT (03)**

#### CUSTOMER \_\_\_\_\_

OPERATIONS	PROD	QC	OPERATIONS	PROD	QC
1. Rear Start & Reverse Fan Check			32. Crime Alarm		
2. Fire Suppression Sys Components			33. Interior Destination Sign		
3. Fire Alarm / With AC Shutdown			34. Dash Mounted Front Run Sign		
4. Front & RR Electrical Panel / Wiring			35. Front Destination Sign		
5. Kneeling System			36. Rear Route Sign		
6. Interlock Test / Verification			37. Side Sign(s)		
7. Entrance Door Lights & Switches			38. Heated Destination Sign Glazing		
8. Clearance @ Entry Door Linkage			39. Heated Mirrors		
9. Exit Door Harness Route & Securement			40. Remote Mirrors		
10. Exit Door Sensitive Edge Operation			41. Headlamps		
11. Exit Door Lights & Switches			42. Turn Signal / Hazard Lights		
12. Driver's Fan - Low & High			43. Brake Lights		
13. Stepwell Heater			44. Tail Lights		
14. Underseat Pass. Heaters			45. Reverse Lights & Beeper		
15. Driver Seat Belt Alarm			46. Roof Marker Lights		
16. Driver Seat Cushion Alarm			47. License Plate Light		
17. Passenger Signals			48. Yield Sign		
18. ADA Seat Touch Pads			49. Engine Comparment Lights		
19. Voice/Data Radio			50. Passenger Lights w/ Front Door		
20. Annunciator Type			51. Video Surveillance System;		
21. ITS GPS/WLAN			A. Number Of Cameras		
22. Aux ITS Module(s)			B. Camera Location		
23. Covert Mic / Ambient Mic			C. Event Switch & LED		
24. Passenger Counter			D. GPS / WLAN		
25. Dash Panel Layout Verification			52. Ohms (Ω) Data Port		
26. EEB Tray Layout Verification			53. Data Port Power		
27. EEB Trays Deploy w/o Interference			54. Voltage Regulator Test		
28. Heel Switch			55. 2-Way Radio		
29. Farebox Connection;			56. Super Cap Function		
A. GFI			Additional Options		
B. Odyssey					
30. Farebox OCU Location					
31. Farebox Lamp					
-		1			

1.		DISCREPANCIES	PROD	QC	
<u> </u>					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					

### **DEPARTMENT (11)**

### CUSTOMER \_\_\_\_\_

### CHASSIS SERIAL NO.

OPERATIONS	PROD	QC	OPERATIONS	PROD	QC
1. Driver's Seat Functions			12. Entrance Door Operation		
2. Check Wiper Operation			A. Open		
3. Check Windshield Washer Operation			B. Close		
4. Bike Rack & Sensor			C. Sensitive Edge		
5. Interior Detail			13. Exit Door Operation		
A. Paint			A. Open		
B. Floor			B. Close		
C. Ceiling			C. Sensitive Edge		
D. Foam Tape Int. Compt. Doors					
6. Interior & Exterior Gillig Decals					
7. AC Return Grill					
8. Ship Loose Items					
9. Clear Open items On Inspection Card					
10. Air System Function & Leak Test					
11. Electrical Function Check					

### FINAL DEPARTMENT (10)

UNDERSIDE OPERATIONS	PROD	QC	UNDERSIDE OPERATIONS	PROD	QC
1. Check Torque Seal All Hardware			15. Under Seal Complete		
2. Eng. Comp. Wire & Hose Routing			16. Check Front Hub Oil Level		
3. Engine Comp. Clearances			17 Cleanliness		
4. Check Fuel Leaks			18. RAMP INSTALLATION		
5. Check Hydraulic Leaks			A. Ramp Hardware Torqued		
6. Check Coolant Leaks			B. Ramp Trim		
7. Check Oil Leaks			C. Ramp Nosing		
8. Proper Clamps & Hanger			D. Ramp Beeper		
9. Brake Hose Routing			E. Interlock Works w/ Ramp Deployed		
10. Slack Adjuster Angle			F. Interlock w/ Ramp Manually Deployed		
11. Clevis & Cotter Pins – Front			G. Cycle Ramp Minimum 6 Times		
12. Clevis & Cotter Pins – Rear			19. Aisle Lamps		
13. Underside Wire & Hose Routing			20. Stanchion Chime / Function		
14. Susp. Hardware Torque & Seal					

DE	PT	DC	BS	DISCREPANCIES	PROD	QC	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							
16.							
17.							
18.							
19.							
20.							
21.							
22.							
23.							
24.							
25.							
26.							

GILLIG

### ALIGNMENT & DYNO / ROAD TEST

#### CUSTOMER \_\_\_\_\_

#### CHASSIS SERIAL NO.

ALIGNMENT	PROD	QC	DYNAMOMETER / ROAD TEST	PROD	QC
1. Alignment To Specificaitons			1. Max Water Temp: Degrees		
2. Set Turn Angle			2. HVAC System Function		
3. Bleed Steering Gear			3. Heater/Defroster Function		
4. Adjust Draglink			4. Aux. Coolant Heater Function		
5. Torque Draglink & Key			5. Engine Performance		
6. Rear Suspension Air Bag Height			6. Transmission Shifting		
7. Headlight Adjustment			7. Full Brake Retarder		
8. Check Horn Operation			8. 1/3 Throttle & 2/3 Brake Retarder		
9. Torque Steering Wheel & Stake			9. Aux Brake Test		
10. Step Height			10. Speedometer Accuracy		
11. Clear Front Brake Lines			11. Maximum Speed: MPH		
12. Front Air Bags Clearance			12. Test Interlock		
13. Snow Chain Adjustment & Angles			13. Hydraulic Leaks		
14.			14. Coolant Leaks		
15.			15. Check For Codes		
16.			16. Check Engine Oil Level		
17.			17. Check Transmission Oil Level		
18.			18. Check Engine Coolant Level		
19.			19. Check Hydraulic Fluid Level		
20.			20. Axle Oil Level		
21.			21. Fire Suppression System Armed		
22.			22. A/C Belt Tension		
23.			23. CNG Methane Leak Check		
24.			24. Eng. Shut Down w/ Methane Leak		
25.			25. Start / Stop		
			26. Depot Mode		
			27. Water Test		
			28. E-Bus 1,000 Mile Road Test		

DEPT	DC	BS	DISCREPANCIES	PROD	QC
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					

FINAL ACCEPTANCE						
OPERATION	INSPECTOR					
1. VIN Plate Installed						
2. All Shortages Addressed						
3. All Write-Ups Completed						
4. All Final Operations Completed						
5. All Safety Gear Installed						
6. All Interior Doors Secured						
7. All Exterior Doors Secured						
8. Ship Loose Items (Noted On Green Sheet)						
9. Function Check Complete						
10. Fire Suppression Sys. Activated						
11. End-Of-Line Air System Test						
12. Attachment Check Off List Complete						

### **RED TAG**



### **MISCELLANEOUS DISCREPANCIES**

#### CUSTOMER

DEP	νT	DC	BS	DISCREPANCIES	OK	Q	С
1.						1	
2.							
3.						<u> </u>	
4.						<u> </u>	<u> </u>
5.							
6. 7.							-
<i>1</i> .						+	-
8. 9.							+
10.						+	+
11.						+	$\vdash$
12.							
13.							
14.							
15.							
16.							
17.						<u> </u>	<u> </u>
18.						+	-
19.							-
20. 21.						+	$\vdash$
21.						+	-
23.							-
24.						+	+
25.							+
26.							
26. 27.							
28.							
29.							
30.						$\square$	
31.						<u> </u>	<u> </u>
32.							_
33.						+	-
34. 35.						+	+
36						+	-
36. 37.							-
38.							+
39.							+
40.							
41.							
42.							
43.						$\square$	
44.						<u> </u>	<u> </u>
45.						<u> </u>	<u> </u>
46.						<del> </del>	-
47.							-
48.						+	+-
49. 50.						+	$\vdash$
50. 51.						+	$\vdash$
52.						+	$\vdash$
53.						1	$\vdash$
54.						1	$\square$
55.						1	
56.							
57.							
58.							

### FLUIDS

CUSTOMER \_\_\_\_\_

### CHASSIS SERIAL NO.

TYPE	SPEC	04	09	FINAL	READY ROW
Coolant					
Hydraulic					
Transmission					
Engine					
Fuel					

### SHORTAGES

DEPT	PART NO.	P.O. #	DESCRIPTION	QTY REQ'D	DUE DATE	INSTALLED BY	DATE



### **BACK COVER**

CUSTOMER \_\_\_\_\_



### **SECTION 3: QUALIFICATIONS**

#### TABLE OF CONTENTS

- 1. PRE-AWARD EVALUATION DATA FORM o GILLIG HISTORICAL OVERVIEW o CUSTOMER REFERENCE LIST – ELECTRIC BUSES o SUCCESSFUL BATTERY ELECTRIC BUS LAUNCH o CUSTOMER REFERENCE LETTERS o CUSTOMER LISTS – DIESEL, CNG, HYBRID-ELECTRIC
- A statement from the Proposer regarding how financial information may be reviewed by the Agency.

   FINANCIAL RESPONSIBILITY

• FINANCIAL REFERENCES

- Letter for insurance, indicating the Proposer's ability to obtain the insurance coverage in accordance with the RFP requirements

   LETTER + CERTIFICATE OF LIABILITY INSURANCE
- 4. Form for Proposal Deviation, if applicable (without price data)
- 5. Proposal Form signed
- 6. ALL FEDERAL CERTIFICATIONS CER 8 signed:
  - Buy America Certification
  - o Debarment and Suspension Certification for Prospective Contractor
  - Debarment and Suspension Certification (Lower-Tier Covered Transaction)
  - o Non-Collusion Affidavit notarized
  - Lobbying Certification
  - Certificate of Compliance with Bus Testing Requirement (Altoona)
  - DBE Approval Certification
  - o Federal Motor Vehicle Safety Standards
  - PRE-AWARD BUY AMERICA DATA

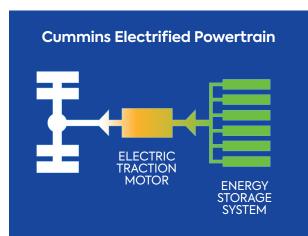
# GILLIG

## BUILDING AMERICA'S ZERO EMISSIONS FUTURE



### **Electrify Your Fleet**

Our new battery electric offering joins GILLIG's industry-leading Low Floor bus platform to bring the most comprehensive, advanced battery electric bus to the market. GILLIG's Zero-Emission Battery Electric bus incorporates the Cummins electrified powertrain, which provides the advantage of full local service support with hundreds of service centers throughout the country to provide the necessary training, warranty administration, and after-market parts. Designed, built, and supported right here in the United States.



# BATTERY ELECTRIC ZEROEMISSIONS

### **Specifications:**

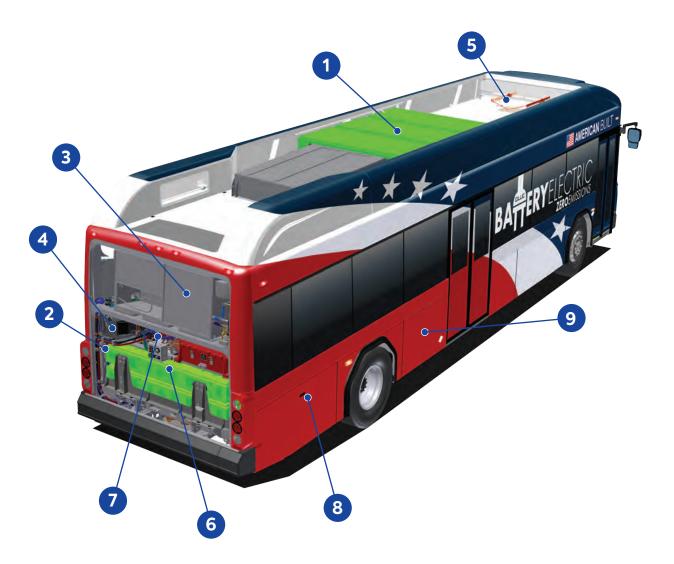
- Low Floor Battery Electric with Contoured-style Roof Fairings
- Cummins EV Drivetrain: Traction Motor and Inverter, High and Low Voltage Power Supplies, Modular Energy Storage System, Charge Controller
- Meritor 79000 Series Rear Axle
- Air Disc Brakes
- Standard Transit Size Tires
- Acceleration/Handling similar to conventional power train options
- Plug-in Charging SAE J1772 DC CCS Type 1
- Thermo King Electric HVAC with Integrated Thermal Management System
- 24V DC Power Steering Pump
- Fuel-fired Coolant Heater Option for Cold Weather Operation

### **GILLIG** LOW FLOOR BATTERY ELECTRIC Features and Benefits

#### **COMPONENT LOCATIONS:**

- 1. Roof-mounted Energy Storage System (ESS), up to 3 battery packs
- 2. Electronics Cooling Package (ECP)
- 3. Thermo-King HVAC with integrated Battery Thermal Management System
- 4. Air Compressor
- 5. Optional roof-mounted charge rails

- 6. Two battery packs mounted in the power train compartment directly above the frame rails
- 7. Power train component assembly consisting of: High-Voltage DC junction box with disconnect switch, two DC-DC convertors, and System Control Unit (SCU)
- 8. Standard Plug-in-charge location, rear curbside (optional additional locations available)
- 9. Battery pack forward of rear axle



Rear panels not shown for clarity. Specifications and features are for reference only and subject to change without notice or obligation.





September 21, 2021

ELECTRONIC SUBMISSION https://psta.bonfirehub.com/portal

PINELLAS SUNCOAST TRANSIT AUTHORITY St. Petersburg, Florida

#### RE: FLORIDA ELECTRIC TRANSIT BUSES WITH CHARGING & ASSOCIATED EQUIPMENT – RFP 21-980369

#### DATE DUE: September 23, 2021 at 10:00 AM EST

Gentlemen:

GILLIG is pleased to submit the enclosed documentation covering our **<u>SECTION 3</u>**: **<u>QUALIFICATIONS</u>** response to the above solicitation for your review and consideration.

Please do not hesitate to contact us if any questions about the submittal arise:

#### WILLIAM F. FAY, JR., VICE PRESIDENT, SALES PHONE: 800-735-1500 or 510-785-1500 EMAIL: sales@gillig.com

We appreciate this opportunity and look forward to a successful bid opening.

Very truly yours,

William F. Fay, Jr. Vice President, Sales Phone: 800-735-1500 Email: sales@gillig.com

Encs.

Cc: Arminder Dhillon, Director, Sales Operations Javier Hernandez, Jr., Director National Sales Butch Sibley, Regional Sales Manager

#### MINUTES OF A SPECIAL MEETING OF THE MANAGERS OF HCC MANAGER LLC

A special meeting of the managers of **HCC MANAGER LLC**, an Illinois limited liability company (the "<u>Company</u>"), was held at 222 N. LaSalle Street, Chicago, IL 60601, on December 15, 2020. All of the Company's managers, namely A. Steven Crown, James S. Crown and William H. Crown, and the Company's Secretary, David M. Rubin, were present either in person or by phone. William H. Crown acted as Chairman of the meeting and David M. Rubin acted as Secretary of the meeting.

The Chairman stated that the purpose of the meeting was to acknowledge the retirement of Joseph Policarpio and the appointment of William Fay, Jr. as officers of Gillig LLC, a California limited liability company (the "<u>LLC</u>"), in the Company's capacity as Manager of the LLC. Upon motion duly made, seconded and unanimously carried, the following resolutions were adopted:

**RESOLVED,** that, effective as of January 1, 2021, WILLIAM FAY, JR. shall be elected to serve as the LLC's Vice President – Sales until such further action by the Company.

**FURTHER RESOLVED,** that, effective as of January 6, 2021, and resulting from his retirement, JOSEPH POLICARPIO, shall be removed as the LLC's Vice President – Sales and Marketing.

**FURTHER RESOLVED,** that for sake of clarity, subsequent to the actions as hereinabove set forth, the officers of the LLC will be as set forth below:

DEREK MAUNUS	President and Chief Executive Officer
MICHAEL S. CANMANN	Vice President and Assistant Secretary
CHRISTOPHER TURNER	Executive Vice President – Operations
BRIAN SHEPHERD	Vice President – Finance and Chief Financial Officer
MARLA LOAR	Vice President – Human Resources
CHARLES E. O'BRIEN	Vice President – Aftermarket Parts
WILLIAM FAY, JR.	Vice President – Sales
GREG VISMARA	Vice President – Engineering
DAVID M. RUBIN	Vice President, General Counsel and Secretary
MAUREEN FLYNN	Vice President, Controller, Treasurer and Assistant
	Secretary
AMY BLUMENTHAL	Assistant Secretary
BRIAN B. GILBERT	Assistant Secretary

**FURTHER RESOLVED,** that the above named officers be, and are hereby, authorized to execute any and all instruments for and on behalf of the LLC which are required in the usual and ordinary conduct of the business, including, but not limited to, Bid Documents, Sales Contracts, Purchase Contracts, Lease Purchase Agreements, assignments to such Lease Purchase

Agreements, together with any documents which may be or become necessary to support such transactions of Gillig.

Upon motion duly made, seconded and unanimously carried, the meeting was adjourned.

Respectfully submitted,

Llovit M. anti

David M. Rubin Secretary of the Meeting 4850-8412-6420, v. 2

# GILLIG

# **HISTORICAL OVERVIEW**

## Privately held company

- Started in San Francisco in 1890
- Rebuilt after 1906 earthquake
- Always in the transportation business
- (2) Owners in last (40) years

## New location in Livermore, CA

- Purpose Built for GILLIG Bus Production
- 600,000 sq. ft. on 41 acres
- All work done in USA

## Employs (850+) US Citizens

- 2 Unions, (600+) Members
- 72% minorities and women
- Takes pride in
  - 130 year US heritage
  - Happy Customers/Partners
  - Ongoing business success

# **PROUDLY MADE IN THE USA**







#### **CER 7. Pre-Award Evaluation Data Form**

**NOTE:** This form is to be completed and included in the Qualification Package. Attach additional pages if required.

PSTA RFP 21-980369

1. Name of firm: GILLIG LLC	
2. Address: 451 DISCOVERY DRIVE, LIVERMORE, CA 94551	
3.  □ Individual  □ Partnership  □ Corporation  □ Joint Venture (X) Limited [	_iability Company
4. Date organized: 1890 - SAN FRANCISCO, CA State in which incorporated: CALIFORNIA	
<ul> <li>5. Names of officers or partners: <ul> <li>a. DEREK MAUNUS, PRESIDENT &amp; CEO</li> <li>b. CHRIS TURNER, EXECUTIVE VICE PRESIDENT OPERATIONS</li> <li>c. WILLIAM F. FAY, JR., VICE PRESIDENT - SALES</li> <li>d. MARLA LOAR, VICE PRESIDENT - HUMAN RESOURCES</li> <li>e. GREG VISMARA, VICE PRESIDENT - ENGINEERING</li> <li>6. How long has your firm been in business under its present name? GILLIG</li> </ul> </li> </ul>	LLC - 13 years*
7. Attach as <b>SCHEDULE ONE</b> a list of similar current contracts that demonstrates ye including the quantity and type of bus, name of contracting party, percentage complet date.	our available capacity, eted and expected completion
8. Attach as <b>SCHEDULE TWO</b> a list of at least three similar contracts that demonstr proficiency, each with the name of the contracting party and number and they type of last five years.	ates your technical f buses completed within the
<ul> <li>9. Have you been terminated or defaulted, in the past five years, on any Contra</li> <li>□ Yes XNo</li> <li>If yes, then attach as SCHEDULE THREE the full particulars regarding each occurred</li> </ul>	-
10. Attach as <b>SCHEDULE FOUR</b> Proposer's last three (3) financial statements prep generally accepted accounting principles of the jurisdiction in which the Proposer is l independent certified public accountant; or a statement from the Proposer regarding be reviewed by the Agency (This may require execution of an acceptable nondisclos Agency and the Proposer.)	ocated, and audited by an how financial information may
11. Attach as <b>SCHEDULE FIVE</b> a list of all principal Subcontractors and the percent (Contract amount) that each will perform on this Contract.	age and character of Work
12. If the Contractor or Subcontractor is a joint venture, submit <b>PRE-AWARD EVAL</b> member of the joint venture.	UATION DATA forms for each
The above information is confidential and will not be divulged to any unau	ithorized personnel.
The undersigned certifies to the accuracy of all information: Name and title: WILLIAM F. FAY JR., VICE PRESIDENT, SALES Company: GILLIG LLC	
Le fulling Then 12	September 17, 2021
Authorized signature	Date

GILLIG LLC - 2008 TO DATE GILLIG CORPORATION - 1978-2008 GILLIG BROS. - 1890-1978



- GILLIG is a **<u>100%</u>** *U.S. owned and operated* manufacturing company.
- GILLIG was founded over 130 years ago (in 1890) in San Francisco, California, and is now located 40 miles southeast of San Francisco in Livermore, California. In the 1930's we moved to Hayward and were located there until the move to our current state of the art manufacturing plant in 2017, located at the following address:

GILLIG LLC 451 Discovery Drive, Livermore, CA 94551 Phone: 800-735-1500 Email: sales@gillig.com Web Site: <u>www.gillig.com</u>

- The Manufacturing plant and entire office staff (Executive, Sales, Purchasing, Engineering, Service/Warranty and Finance) are located at this one (1) location only on 41 acres. We do not sub-contract the manufacture of our vehicles.
- We manufacture all of our vehicles at this one (1) location on the same production line, using the same qualified, experienced staff -- this includes our DIESEL LOW FLOOR transit bus, CNG LOW FLOOR transit bus, HYBRID LOW FLOOR transit bus, ZERO EMISSION BATTERY ELECTRIC transit bus, and BRT (Bus Rapid Transit) custom model buses. Vehicles Manufactured are Low Floor 29 foot, 35 foot and 40 foot by 102 inch heavy duty transit models.
- We employ over 850 qualified and experienced employees, and the factory operates 12 months of the year to manufacture our vehicles on time to meet promised delivery dates, and to provide Service and Support to our customers.
- Additional information can be provided on request.

### New State-of-the-Art Manufacturing Plant









#### **PRE-AWARD EVALUATION DATA - CONTINUED**

• **GILLIG is a** <u>100% U. S. owned and operated</u> manufacturing company. We are located 40 miles southeast of San Francisco in Livermore, California. GILLIG is now located at our new state-of-the-art production facility.

#### GILLIG LLC 451 Discovery Drive, Livermore, CA 94551 PHONE: 800-735-1500 FAX: 510-785-6819

- GILLIG is the manufacturer of the heavy-duty ZERO EMISSION ELECTRIC LOW FLOOR model buses in 35 foot and 40 foot lengths proposed for this procurement. We also manufacture LOW FLOOR heavy-duty transit buses in 29 foot, 35 foot and 40 foot lengths by 102 inch widths in CNG, DIESEL, HYBRID/ELECTRIC, and BRT model vehicles on the same production line with the same qualified, trained, and experienced employees.
- GILLIG LLC is a Limited Liability Company a California company, located at one (1) location only. We build the entire transit vehicle at this one(1) location.

#### 7. & 8. SCHEDULE ONE AND TWO

In response to SCHEDULE ONE AND SCHEDULE TWO, attached are:

- CUSTOMER REFERENCE LIST
- SUCCESSFUL BATTERY ELECTRIC BUS LAUNCH CUSTOMERS
- CUSTOMER TESTIMONIAL LETTERS
- DIESEL LOW FLOOR CUSTOMER LIST
- CNG LOW FLOOR CUSTOMER LIST
- HYBRID-ELECTRIC CUSTOMER LIST

#### 9. <u>SCHEDULE THREE</u>

NOT APPLICABLE.

#### 10. <u>SCHEDULE FOUR</u>

FINANCIAL INFORMATION is provided in section 2 following. If required, GILLIG can discuss our "CONFIDENTIAL" Financial Statement during a separate financial meeting. Please advise if this will be required.

#### 11. <u>SCHEDULE FIVE</u>

GILLIG does not subcontract the manufacture of our transit buses. We manufacture the entire vehicle at one (1) location only.

#### 12. PRE-AWARD EVALUATION DATA FOR EACH JOINT VENTURE NOT APPLICABLE



#### **PRE-AWARD EVALUATION DATA - CONTINUED**

#### ADDITIONAL INFORMATION REQUESTED

#### Judgments & Liens

GILLIG is involved in various legal actions arising in the normal course of business as both plaintiff and defendant. Outside auditors have confirmed that the outcome of these actions either individually or in aggregate will not have any adverse financial impact, and no prior judgments or liens have been significant to require financial disclosure.

#### **Fleet Defects History**

GILLIG has experienced a minor number of vendor fleet defects which have been addressed and resolved by Gillig and its vendors. There have been no major fleet defects contributed to a grounded fleet.

#### Warranty Claims

Warranty claims are handled by our Field Service Department. We have dedicated warranty claims specialists, and a complete Customer Care Department. The GILLIG Field Service Department and Aftermarket Parts Sales Representatives are available to assist the agency during scheduled visits.



#### **CUSTOMER REFERENCE LIST (BEB)**

Our **ZERO EMISSIONS BATTERY ELECTRIC BUS (BEB)** offering joins GILLIG's industry leading Low Floor bus platform to bring the most comprehensive, advanced battery electric bus to the market.

GILLIG's Zero Emission Battery Electric bus incorporates the Cummins electrified powertrain, which provides the advantage of full local service support with hundreds of service centers throughout the country to provide the necessary training, warranty administration, and aftermarket parts. All designed, built, and supported right here in the United States.

Please see the below reference list for current Battery Electric Bus customers. GILLIG has built and delivered well over 60 Battery Electric Buses to over 25 different customers.

#### Customer: Santa Monica, CA (Big Blue Bus)

- Address: 1660 7TH Street Santa Monica, CA 90401
- Contact: Adrian H. Garcia, Transit Maintenance Vehicle Supervisor
- Phone: (310) 633-1852
- Email: adrian.garcia@smgov.net

#### Customer: Tucson, AZ (Sun Tran)

Address: 3920 N. Sun Tran Blvd. Tucson, AZ 85705

Contact: Jim Gleason, Director Maintenance

Phone: (520) 206-8891

Email: james.gleason@tucsonaz.gov

#### Customer: Honolulu, HI (The Bus)

Address: 650 South King St. Third Floor Honolulu, HI 96813

Contact: Adam Tamayoshi, VP of Maintenance

Phone: 808-768-9463

Email: adam.tamayoshi@thebus.org

#### Customer: Kansas City, MO (Kansa City Area Transit Authority)

Address: 1350 East 17TH St. Kansas City, MO 64108

Contact: Chuck Ferguson, VP, Bus Operations

Phone: (816) 346-0353

Email: <u>cferguson@kcata.org</u>

#### Customer: Kitsap, WA (Kitsap Transit)

Address: 60 Washington Ave, Ste. 200, Bremerton, WA 98337

Contact: Dennis Griffey, Vehicle & Facilities Maintenance Director

Phone: (360) 478-6229

Email: <u>dennisg@kitsaptransit.com</u>



#### **CUSTOMER REFERENCE LIST (BEB)**

Customer: Bellingham, WA (Whatcom Transportation Authority)

Address: 4111 Bakerview Spur, Bellingham, WA 98226

Contact: Michael Bozzo, Director of Fleet and Facilities

Phone: (360) 788-9351

Email: <u>mikeb@ridewta.com</u>

#### Customer: Portland, OR (Trimet)

Address: 1800 SW 1st Avenue, Suite 300, Portland, OR 97201

Contact: Samuel Rumhizha, Director, Bus Maintenance

Phone: (503) 962-5840

Email: rumhizhs@trimet.org



#### Successful Battery Electric Bus Launch

Over the past 20 years, GILLIG has manufactured 3,500 electrified drivetrain buses leading up to our current generation of BEB offerings. In 2017, GILLIG partnered with Cummins to announce the next generation of battery electric buses. GILLIG commenced production of the current generation of Battery Electric buses in September 2020. As of September 18, 2021, GILLIG has delivered 95 of the current generation of Battery Electric Buses. Current Battery Electric bus production starts are set at 3 per week and GILLIG anticipates delivering 150+ Battery Electric Buses in 2021. The excitement about the GILLIG Battery Electric Low Floor has resulted in over 64 unique customer orders to over the last 15 months.





#### MEMORANDUM FOR RECORD

To Whom It May Concern;

Date: March 2, 2021

Letter of Reference for Gillig LLC

I have been working in various positions in the public transit industry for the last 25 years. I started as a bus mechanic, then, worked as a back –up driver, in Operations, Maintenance Management and Administration. I have been the Director of Athens-Clarke County Transit department since October of 2001.

Over the years, I have either worked on, driven, or helped facilitate the purchase more than 300+ Gillig buses. The various 30, 35, and 40-foot standard and low-floor heavy-duty transit buses, with diesel, hybrid, and/or electric propulsion systems have been reliable vehicles for this system, as well as many other transit systems across this county. Gillig's customer services from product order, though production and delivery, to their after the sale, replacement parts and repair programs, their staff and services have always been exemplary.

I believe that Gillig builds the best heavy-duty transit buses in the industry. From their sales staff, the engineers, the workers on the assembly line, to the parts department folks, they all are reliable partners to our organization and they stand behind their products as a company and as a member of the team.

I would highly recommend Gillig LLC, their staff and their products to any system in the industry.

Thank you,

Patch MEAle

Butch McDuffie Director, Athens-Clarke County Transit Department Athens, GA 30601 706-621-0667

**Transit Department** 



**Big Blue Bus** Transit Maintenance 1660 7th Street Santa Monica, CA 90401

September 14, 2020

Mr. Joe Policarpio Vice President of Sales and Marketing GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Policarpio,

Big Blue Bus (BBB) would like to thank GILLIG for helping us provide safe and reliable buses that represent the latest in bus technology and clean fuel sources. Since 2012, you have helped us maintain the highest quality fleet and become the first transit agency in Southern California to purchase buses with near-zero compressed natural gas (CNG) engines. With GILLIG, BBB crossed a historic threshold in August 2019: the in-service deployment of our first zero-emission battery-electric bus, which is performing beautifully.

Our GILLIG battery-electric bus has exceeded our expectations and those of our customers. It performs as well as our other 124 GILLIG buses. Your cutting-edge bus uses state-of-the-art battery-electric technology, design features, and power capabilities while offering an unparalleled quiet and smooth ride. Because of the incredible reliability and serviceability of our in-service GILLIG battery-electric bus, BBB will be deploying 18 additional GILLIG zero-emission battery-electric buses by 2021.

Our GILLIG battery-electric bus deployment also marks a significant step toward preserving our environment and protecting our communities as we complete the transition to a zero-emissions fleet by 2030. We can't think of a better partner to provide safe, reliable, and efficient transportation services that improve and enhance our community's quality of life. We look forward to a long, mutually beneficial partnership with GILLIG.

Sincerely,

Getty Modica Transit Maintenance Manager



September 14, 2020

Mr. Joe Policarpio Vice President of Sales and Marketing GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Policarpio,

We couldn't be prouder to partner with GILLIG on 2 FTA Lo or No Emission Grant programs as we invest in creating an innovative and smart transportation system through our in-service GILLIG zero-emission battery-electric bus.

For almost 20 years, GILLIG has provided Tucson with the most reliable buses—dieselelectric hybrid, near-zero emission compressed natural gas, and clean-diesel—all designed on the proven GILLIG Low Floor platform to maximize fleet commonality.

In April 2020, our first zero-emission electric bus from GILLIG hit the streets, and we couldn't be more impressed with its performance. Our bus performs as well as our current GILLIG fleet and now confirms our perception that GILLIG is providing the safest, highest quality, most reliable, and best-supported battery-electric bus on the market. With its advanced technology, our GILLIG electric bus also provides a quieter and more comfortable ride for our passengers. Sun Tran looks forward to receiving our 10 additional GILLIG electric buses as we build a more sustainable community and cleaner air.

Thank you for providing market-leading, dependable solutions as we begin our zeroemissions journey, electrifying our city's vehicle and transit fleet. With the help of GILLIG buses, Sun Tran is an industry leader in safe, reliable, and sustainable transportation solutions.

Sincerely,

Kevin Faulkner Director of Procurement Sun Tran



Oahu Transit Services, Inc.

811 Middle St. Honolulu, HI 96819-2316 telepbone (808) 848-4400 facsimile (808) 848-4419

www.thebus.org

The Bus The Handi-Van

June 23, 2020

Mr. Joe Policarpio Vice President of Sales and Marketing Gillig L.L.C. 451 Discovery Drive Livermore, CA 94511

Dear Mr. Policarpio,

I would like to express my eagerness on taking this momentous step towards the electrification of mass transit with Gillig. There is absolutely no other manufacturer that I would prefer to partner with on such an important endeavor. Your dependable product and outstanding customer support are the cornerstones of the strong relationship that has continued over the years between the City and County of Honolulu, Oahu Transit Services, Inc. and your Corporation.

Currently, the City and County of Honolulu operates a fleet of 367 Gillig buses. The durability and dependability of your buses are evident in our oldest fleet aged at 23 years and in our most utilized fleet having traveled over 1,000,000 miles. Impressionably, we consistently witness your revolutionary advancements with improved fuel economy and lowered operational cost. Reinforcing our reasons why we have confidence in your new electric bus. We know that it will be reliable, well-engineered and environmentally beneficial.

The only factor that surpasses your amazing product is the outstanding customer support that we consistently receive. It is obvious from working with your staff throughout the company, how strongly Gillig is dedicated to their clients and how much they believe in their product. Everyone on staff has proven to be extremely knowledgeable, courteous, and always willing to go the extra mile. Mr. Joe Policarpio June 23, 2020 Page 2

As we anxiously wait for the arrival of our first electric bus, we are anticipating that it will to be a success. I am confident that these buses will provide reliable and efficient public transportation for the people of Honolulu for many years to come. I foresee a promising future with a continued partnership between the City and County of Honolulu and Gillig.

Sincerely,

<u>C</u>.

Adam Tamayoshi Vice President of Maintenance



75 Langley Drive | Lawrenceville, GA 30046-6935 770.822.7446 www.gwinnettcounty.com | www.gctransit.com

Karen Winger AICP CCTM, Transit Division Director Gwinnett County Department of Transportation 770.822.7422 Karen.winger@gwinnettcounty.com

To Whom It May Concern,

This letter is for the recommendation of GILLIG bus manufacture. Gwinnett County purchased the first set of 28 forty-foot long local buses in 2015 as part of the Athens-Clarke County bus consortium. We have since purchased an additional 10 buses with GILLIG through this same contract, receiving our final 3 buses as recently as June of 2020.

Since our first bus arrived, GILLIG has always been prompt, professional and courteous at every step of the process. Whether it be from the presale to finalizing the order, all the way to delivery of our brand new bus, GILLIG has always been responsive to our needs and concerns, in addition to being quick to rectify any issues.

When it comes to sales and service, not only is the GILLIG product a quality and dependable product in the best of times but it is also a product that can come through when need them the most. During the height of the COVID-19 pandemic, GILLIG was able to ship us operator barriers for our entire fleet in less than a month of request.

I am happy to recommend GILLIG to anybody who is looking for a quality bus product.

Karen A Winger

Karen Winger AICP CCTM Transit Division Director, Gwinnett County



Indianapolis Public Transportation Corporation 1501 W. Washington Street Indianapolis, IN 46222 317.635.3344 www.IndyGo.net @IndyGoBus

June 9, 2020

Mr. Jim Ryan Regional Sales Manager Gillig Sales GILLIG LLC 25800 Clawiter Road Hayward, CA 94545

Dear Mr. Ryan,

I'm writing today to thank you and the Gillig team for your continued partnership and service in providing vehicles for the Indianapolis Public Transportation Corporation (IndyGo).

IndyGo currently operates a fleet of 172 Gillig buses. The Gillig team recently provided exceptional service by working with IndyGo to expedite an order of thirteen additional buses to assist with the future implementation of system changes. Gillig's dedication to customer service is evident, and felt even more so as we navigate a new environment for both businesses and transit agencies. We are proud to have partnered with Gillig for over twenty-five years.

Our Operators and riders know they can rely on Gillig's vehicles to transport them around the city. In a time when most travel is for essential trips, we know how important it is to have vehicles we can count on. The Gillig team continues to provide excellent customer service and high-quality products to our agency. We look forward to our continued partnership.

I would be happy to recommend Gillig's products and services to prospective customers.

Sincerely,

Inez Evans President and CEO IndyGo



June 2, 2020

Mr. Jim Ryan Regional Sales Manager GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Ryan;

For more than 30 years, the METRO Regional Transit Authority has been doing business with GILLIG. I have personally had the pleasure of being able to use GILLIG vehicles at all three transit properties with whom I have been associated. From the time, I was a bus operator in Akron, Ohio to overseeing the maintenance department in Nashville to managing Knoxville's transit system in Tennessee one bus company has remained the focal point of these transit systems, GILLIG.

GILLIG has an outstanding product they stand behind and a customer service driven mission that is the best in the industry. From the day the bus comes off the production line to the day the bus runs its final mile into retirement, GILLIG provides superior quality, training, service, and support to this organization. Their business model shows their passion, integrity, and quality for their customers. You are truly never alone when you have made the commitment to purchase GILLIG vehicles. You become part of the family. They seek out your input into future ideas and projects while advancing the bus technology that makes their buses the ones operators want to drive, passengers want to ride, and organizations want to buy.

Top this all off with the amazing dedication and assistance my organizations have always received from you as our sales representative and you have what I consider to be the best of the best. It is with great pleasure that I provide this letter of recommendation to perspective customers of the GILLIG Corporation.

Yours in accessible transportation,

Dawn Distler Chief Executive Officer



416 KENMORE BOULEVARD AKRON, OHIO 44301 phone: 330.762.7267 / fax: 330.762.0854

web: AKRONMETRO.ORG



Jeff Mundstock

Interim Director of Fleet and Facilities 1401 Bank Street Cincinnati, OH 45214 (513) 632-7612 PH (513) 513-632-7505 FAX jmundstock@go-metro.com

June 2, 2020

Mr. Jim Ryan Regional Sales Manager Gillig LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Ryan,

I have had the pleasure in working with Gillig for almost 10 years. SORTA/Metro as an organization has participated with Gillig in over 10 builds, totaling over 550 buses in recent decades for heavy duty transit coaches.

In my experience, Gillig has been paramount in build quality and customer service. From the preproduction meeting, to support years after the coach is in service, right down to replacement parts, Gillig has always focused on being customer-driven and has supported SORTA as an organization through the entire time we have been partners. SORTA has had other bus manufacturers in recent years, and I will personally say that Gillig well exceeds rival manufacturers in regards to customer service, support, and quality.

Within the past year, Gillig sent a team of engineers and production managers to our facility to inspect older buses that we still had in service well past their 12 year useful life. We took them out to see some of our 2004 Phantoms we still had in service at the time. The purpose of this visit was to investigate how the buses held up over time in our climate, and how that information will help them in future designs and builds. This process demonstrates Gillig's attention to detail and commitment to building a product to last well past the FTA useful life expectancy.

Our relationship with Gillig will extend well into the future of our organization, as we have recently started yet another 5 year contract for the purchase of 40' heavy duty transit buses. I am looking forward to our future endeavors as a partnership and would be pleased to recommend Gillig to any future potential customers.

Sincerely,

1

Jeff Mundstock Interim Director of Fleet and Facilities



KANAWHA VALLEY REGIONAL

P.O. Box 1188 Charleston, WV 25324 1550 Fourth Avenue Charleston, WV 25387 PHONE 304.343.3840 FAX 304.343.3877 WEB RIDEONKRT.COM

June 2, 2020

Mr. Jim Ryan Regional Sales Manager Gillig L.L.C. 451 Discovery Drive Livermore, CA 94551

Dear Mr. Ryan:

On behalf of the Kanawha Valley Regional Transportation Authority (KVRTA), I would like to take this opportunity to thank you and the entire Gillig team for the excellent service, support and buses that have been afforded to KVRTA over the past seventeen years. Our entire organization feel that the Gillig buses are the finest buses that we have ever operated at KVRTA. During my thirty-eight-year career in public transit, the relationship established with you, David Clawson and others at Gillig has been unmatched, and makes my life as Executive Director of the Authority much easier knowing I don't have to worry about our Gillig fleet.

KVRTA appreciates the fact that Gillig and its employees pride themselves on being a customer-driven organization and has always exceeded our expectations. The assistance that you, David, and others at Gillig provide not only KVRTA, but all the transit systems in West Virginia is truly unparalleled. Keeping us updated on industry trends, technological advancements and changes in the industry further demonstrates Gillig's dedication to meeting its customer needs as well as the needs of others.

Industrywide, Gillig is highly respected and undoubtably is a leader in the bus manufacturing field and is known for producing quality vehicles. Our operators, maintenance staff and passengers all reap the benefits by KVRTA purchasing quality products from Gillig.

It has been a pleasure to work with you, David and the entire Gillig team over the years. I am more than willing to recommend Gillig to any of your prospective customers.

Sincerely, J. Douglas Hartley **Executive** Director

Cc: David Clawson



June 2, 2020

Mr. Jim Ryan Regional Sales Manager Gillig LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Ryan,

I have had the pleasure of doing business with Gillig for over 30 year. During this time, I have found Gillig and its employees to be a customer-driven organization that has provided the highest levels of customer support. Gillig employees are dedicated and knowledgeable about their products, whether it is the coaches they produce or parts they provide to maintain the coaches.

Part of the success Gillig and WRTA have had is the continued support that is provided from the day a purchase order is issued until the day the coach is retired from service. The whole procurement and production process are well thought out and completed in a very effective manner. Gillig's coach manufacturing facility is one of the best examples in how to build a heavy-duty transit coach.

We appreciate the input Gillig seeks from WRTA and others in the transit industry as they continually make advancements in the design of the coach to provide a better product each year to meet the needs of its customers.

It is always a pleasure to work with you and your team. I would highly recommend Gillig to any of your prospective customers.

Sincerely,

Dean J Harris Executive Director

Carm Basile Chief Executive Officer 518-437-6840 carmb@cdta.org

May 27, 2020

Mr. Joseph Policarpio, Vice President Sales & Marketing GILLIG, LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Policarpio:

The Capital District Transportation Authority (CDTA) is in the final year of our third five-year contract with Gillig for the purchase of transit vehicles.

Gillig consistently delivers a quality product, on time and according to our specifications. The Gillig staff are professional, attentive, and top-notch representatives of your company. We know that buses will be delivered in accordance with the contract requirements, and any issues which are usually few and minor in nature, are attended to in a timely manner.

We appreciate Gillig's ability to stay at the forefront of the latest developments in transit technology and the fact that these developments are consistently communicated to us. Jerry Sheehan has been our principal contact for close to 15 years, and we appreciate his efforts on our behalf.

Cordially,

Com Brile

Carm Basile Chief Executive Officer

Jayme B. Lahut Chairman Schenectady County

Michael J. Criscione Vice Chairman Albany County

Mark Schaeffer Secretary Albany County

David M. Stackrow Treasurer Rensselaer County

Georgeanna M. Nugent Saratoga County

Jaciyn Falotico Schenectady County

Denise A. Figueroa Albany County

Patrick M. Lance Labor Representative

Carm Basile Chief Executive Officer



#### ERIE METROPOLITAN TRANSIT AUTHORITY

127 East 14th Street Erie, Pennsylvania 16503

May 21st 2020

Mr. Jerry Sheehan Regional Sales Manager GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Mr. Jerry Sheehan:

The Erie Metropolitan Transit Authority has maintained a multi-decade strong relationship with Gillig as a result of outstanding customer service, performance reliability and toughness.

If anyone knows anything about Erie, Pennsylvania is that Erie is annually in competition for snow capitol U.S.A. Despite the toughest of blizzards that have at times dropped five, six, and even seven feet of snow over a period of a few days, EMTA has been able to and will continue to rely on our fleet of Gillig buses. The Gillig bus has performed superbly under the harshest of conditions over the decades. As a result, Erie has gained a reputation as the Authority within our Commonwealth to 'never shutdown' operations despite our notorious Erie winter weather.

The Erie Metropolitan Transit Authority highly values our relationship with Gillig as we continue to expand and outfit our fleet with Gillig buses. I highly recommend the Gillig team and product to any Authority in search of reliability, performance and great service.

Sincerely Jeremy Peterson CEO

Telephone: (814) 459-4287•Fax: (814) 455-0071•www.ride-the-e.com

### CITY OF GAINESVILLE



Regional Transit System

May 21, 2020

Joe Policarpio Vice President, Sales & Marketing GILLIG LLC 451 Discovery Drive Livermore, CA 94551

Dear Mr. Policarpio:

I would like to express my most sincere appreciation to you and your staff for the outstanding service to the City of Gainesville Regional Transit System (RTS). I am impressed not only by the level of quality service, but also the consistency of that quality year after year. For over 20 years, RTS has done business with GILLIG because we trust the vehicles, the parts and the people who help make our operation a success.

I want also to commend your staff for the training, technical, and warranty support that has allowed our team to place a good product and service on the road. The Sales and Parts staff has been extremely responsive to our demands and needs.

It is through Gillig's performance and reliability that RTS pursued the goal to be have a 100% GILLIG fleet. Looking toward the future, GILLIG's reputation for quality vehicles and services made it easy to take the next big step and embark on a new partnership project - Electric buses. We are eager to begin our new chapter in transportation, knowing that we can trust the GILLIG brand to deliver safe, comfortable, reliable vehicles to convey our passengers.

Sincerely,

Jesus Gomez, Transit Director Regional Transit System



May 21, 2020

Mr. Derek Maunus President and CEO Gillig LLC 451 Discovery Drive Livermore, CA 94551

Derek,

I would like to take a moment to express my sincere appreciation to the entire Gillig organization for the many years of your unwavering support, highest degree of integrity, expertise and product quality that has been and continues to be provided to our agency.

Sun Tran is a small 14 bus agency providing fixed route transit service on seven routes in Ocala, Florida. Subsequently, it is of paramount importance that we have the most reliable and dependable buses available to serve our community and that's why we purchased and operate Gillig buses.

Twenty plus year ago when Sun Tran was determining the best manufacturer to supply our buses, there were several very important factors that need to be considered. Of primary importance to us was having the confidence and assurance to choose a manufacturer with the corporate stability, integrity, commitment, experience and financial capability to support us in a long-term partnership that will span far beyond the life of purchase. Gillig has demonstrated their ability to successfully meet and exceed those expectations and continue to do so.

It is very comforting to place an order with a manufacturer knowing the buses will be built to specification and delivered on time. The reliability of the Gillig Low-Floor bus has enabled us to

City of Ocala Growth Management Department

201 SE 3<sup>rd</sup> Street (2<sup>nd</sup> Floor) Ocala, FL 34471 Phone: 352-629-8287





maintain high bus availability with minimal operating costs. The high-performance standards of the Gillig Low-Floor can be attributed to Gillig's on-going commitment to product improvement.

Gillig has consistently demonstrated that you are a world class organization and we are truly honored to be your partner.

Sincerely.

Steven Neal Transportation Director Growth Management Department City of Ocala

City of Ocala Growth Management Department

201 SE 3<sup>rd</sup> Street (2<sup>nd</sup> Floor) Ocala, FL 34471 Phone: 352-629-8287





May 20, 2020

GILLIG 451 Discovery Drive Livermore, CA 94551

To whom it may concern,

The City of Albany is a long-standing customer of GILLIG. As former owners of model years 2005, 2006, 2009 to currently owning 2016 (4), 2018 (3), and 2020 (8), the customer service & support *before* and *after* delivery remains phenomenal.

I evaluate customer service delivery in both, professional and personal settings. I attest that the customer service and support statements of GILLIG are not just words written on paper; moreover, it is action willingly, or better yet, generously performed by dedicated GILLIG employees. Since 2015, I have been a witness to this action from not just the sales and administrative staff, but also the production team and upward to the President!

In sum, the overall performance and operational enhancements of a GILLIG bus meets the need of our organizational requirement.

#### Angela & Calhoun

Angela S Calhoun Superintendent Fleet Management Department

#### FLEET MANAGEMENT



### JACKSONVILLE TRANSPORTATION AUTHORITY

July 13, 2018

Mr. Joseph Policarpio, Vice President Gillig LLC 451 Discovery Drive Livermore, CA 94551

Dear Mi Policarpio:

I want to take this opportunity to thank you and your team. I have had the pleasure of doing business with Gillig over the past twenty years. Gillig is now on their fourth five-year contract for the State of Florida.

During this time, I have found Gillig and its employees to be a customer-driven organization that exceeds our expectations. Employees are dedicated, knowledgeable, and professional whether they are dealing with new bus orders or when dealing with routine matters.

I appreciate the input sought by Gillig as they continually advance in the area of technology in an effort to meet the needs of the JTA and other industry customers.

Gillig buses are highly regarded throughout the transit industry and Gillig has a solid reputation of building a quality product. The JTA is one that has certainly benefited by purchasing those quality products from Gillig. Satisfying your customers, including delivering on your promises is exemplary.

It is a pleasure to work with you and your team. I would be pleased to recommend Gillig to any of your prospective customers.

Sincerely,

isin Carmay

Lisa Darnall Vice President/CTO

CUSTOMER	<u>QTY</u>	SIZE	<u>DELIVERY DATE /</u> SERIAL NUMBERS
<u>AC TRANSIT</u> 10626 INTERNATIONAL BLVD.	37	40X102	APRIL 2013 182154-182190
OAKLAND, CA 94603 JAMES PACHEN	27	40X102	MAY 2013 182191-182217
510-891-7215	16	40X102	OCT. 2013 183351-183366
	38	40X102	MARCH 2014 183367-183404
	68	40X102	AUG 2014 183405-183472 NOVEMBER 2015
	16	40X102	186745-186760 DECEMBER 2015
	15	40X102	186690-186704 JANUARY 2016
	40	40X102	186705-186744 MAY 2016
	25	40X102	186761-186785 FEB 2017
	10	40X102	189923-189932 MAR. 2019
	35	40X102	192101-192135
ADVANCE TRANSIT, INC. PO BOX 1027	8	35X102	JULY 2004 73695-73702 DEC. 2007
WILDER, VT 05088 VAN CHESNUT, EXEC. DIR. 802-295-1824 X 16	3	35X102	DEC. 2007 78667-78669 DEC. 2016
002-230-1024 X 10	1	35X102	187034 APRIL. 2018
	5	35X102	188752-188756 JULY. 2018
	2	29X102	93417-93418 JAN. 2019
	2	29X102	93555-93556 MAY. 2019
	4	29X102	93512-93515 JULY. 2019
CITY OF ALBANY	2	29X102	93516-93517 APRIL 2005
PO BOX 480 ALBANY, OR 97321	1	40X102	73313 DEC 2014
BARRY HOFFMAN, TRANSIT PROGRAMS COORDINATOR	1	40X102	183019
541-917-7606	1	35X102	183109
			OCTOBER 2017
	2	40X102	190683-190684
ALBANY TRANSIT SYSTEM	-		NOV. 2006
1312 BLAYLOCK STREET ALBANY, GA 31705	2	29X102	91171-91172 JAN. 2008
ANGELA S. CALHOUN, MBA, CPPB, FLEET SUPERINTENDENT 229-302-1204	2	29X102	91476-91477 SEPT. 2009
ACalhoun@albanyga.gov	1	29X102	91798 AUGUST 2016
	4	35X102	188927-188930 OCT. 2011
ALEXANDRIA TRANSIT CO. 3000 BUSINESS CENTER DR	7	35X102	179943-179949
ALEXANDRIA, VA 22314	3	40X102	179943-179949
SANDY MODELL, GM	5	40/102	DEC. 2011
703-746-5642	5	29X102	92346-92350

CUSTOMER	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
	5	35X102	OCT. 2012 181515-181519 OCT 2014
	2	40X102	184872-184873
	5	35X102	OCT 2014 184874-184878 APRIL 2015
	13	35X102	184951-184963 JUNE 2015
	1	35X102	184964
	12	35X102	OCT. 2018 188489-188500
	2	35X102	SEPT. 2018 188487-188488
		00)//00	JULY 2009
200 E. HIGH ST., STE 2A LIMA, OH 45801	1 2	29X102 35X102	91430 176678-679
SHEILA SCHMITT, GM	2	337102	MARCH 2013
419-222-5745	2	35X102	182478-182479 AUG 2014
	1	35X102	182079
	1	29X102	92750 AUGUST 2016
	1	29X102	93082 JANUARY 2017
	1	35X102	186204-186204 MARCH 2018
	2	35X102	191489-191490
<u>ALLISON TRANSMISSION DIVISION</u> PO BOX 7120 INDIANAPOLIS, IN	1	40X102	DEC. 2001 72257 MAY 2004
CHRIS COLLIER, SALES MGR 317-915-2764	1	40X102	73449 JULY 2006
517-915-2704	1	40X102	77533
ALTOONA METRO TRANSIT 3301 FIFTH AVE. ALTOONA, PA 16602-1801 ERIC WOLF, GM 814-944-4074	4	35X102	APRIL 2000 71033-71036
AMERICAN UNIVERSITY 4400 MASSACHUSETTS AVE. NW	1	35X102	MARCH 2010 177639
WASHINGTON, DC 20016-8057 ALFEF WORKU, SHUTTLE OPS & MAINT MGR	1	35X102	JANUARY 2013 181543
202-885-2650	2	35X102	AUGUST 2016 187380-187381
	3	40X102	187382-187384
<u>AMES, CITY OF</u> 1706 W. 6TH ST. AMES, IA 50010	4	40X102	JANUARY 1999 70335-70338 JULY 2008
SHERI KYRAS, TRANSIT DIRECTOR	4	40X102	176085-176088
515-239-5563	5	40X102	JANUARY 2012 180452-180456 OCT 2012
	5	40X102	180754-180758
	6	40X102	MAY 2015 183974-183979 MARCH 2018
	3	40X102	189979-189981

DIESEE EOW FEOOR COSTOMER EIST					
CUSTOMER	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS		
	1	40X102	FEB. 2019 193055		
ANN ARBOR TRANSPORTATION AUTHORITY 2700 S. INDUSTRIAL HWY	4	40X102	AUG 1999 70689-70692		
ANN ARBOR, MI 48104 CANDACE MOORE, DIRECTOR OF FLEET SERVICES	7	35X102	SEP 1999 70693-70699		
734-794-1752	6	35X102	APRIL 2000 70680-70685		
	1	35X102	JULY 2000 71849		
	1		JULY 2003 73506		
		40X102	SEP - OCT 2003		
	5	35X102	73501-73505		
	13	40X102	73507-73519 MAR 2013		
	5	40X102	181322-181326 JULY 2015		
	4	40X102	187125-187128		
	4	35X102	187129-187132 OCT 2015		
	3	40X102	187115-187117		
	4	35X102	187118-187121		
	9	40X102	APR 2016 187683-187691 JULY 2017		
	7	40X102	187759-187765 SEP 2018		
	2	40X102	187766-187767		
	2	40X102	190562-190563		
	2	40X102	192591-192592		
<u>ANNAPOLIS DOT</u> 308 CHINQUAPIN ROUND RD	4	29X102	DEC. 2009 91976-91979		
ANNAPOLIS, MD 21401 KWAKY AGYEMANG-DUAH, SR. TRANSPORTATION PLANNER	5	29X102	MAY 2011 92176-92180		
410-260-3411 X 6001					
ANTELOPE VALLEY TRANSIT AUTHORITY			MARCH 2004		
42210 6TH ST. WEST LANCASTER, CA 93534	10	40X102	74363-74375 JUNE 2015		
MARK PERRY, FLEET MGR	3	40X102	185610-185612		
661-609-5364	Ū.				
APPALCART			OCT 2012		
PO BOX 2357	2	40X102	181249-181250		
BOONE, NC 28607 CRAIG HUGHES, TRANSPORTATION DIRECTOR	3	35X102	FEB. 2015 183057-183059		
828-264-2280	10	35X102	JAN. 2018 191353-191362		
	2	35X102	MARCH 2019 191106-191107		
	2	29X102	MARCH 2019 93487-93488		
ARCATA, CITY OF 736 "F" ST.	2	35X102	OCT. 2009 177352-177353		
ARCATA, CA 95521 LARRY PARDI, TRANSIT MANAGER	2	35X102	MAY 2014 183291-183292		
707-822-3775					
AREA TRANSPORTATION OF N. CENTRAL PENNSYLVANIA	6	29X102	MARCH 2005 90105-90110		
4/0004					

DIESEE EOW I EOOK COSTOMER EIST					
CUSTOMER	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS		
44 TRANSPORTATION CENTER JOHNSONBURG, PA 15845	11	29X102	MAY 2008 91502-91512		
814-965-2111 X 218 CHARLIE SHILK, MAINT. DIRECTOR 814-965-2111 X 218	11	29X102	JAN. 2009 91652-91662 39814		
014-305-2111 / 210	2	35X102	79688-79689 MAY 2010		
	1	35X102	178187 SEPT 2015		
	1	29X102	93014 JUNE 2017		
	3	29X102	93131-93133		
CITY OF ASHEVILLE 360 W. HAYWARD ST.	7	29X102	NOV 2012 92451-92457		
ASHEVILLE, NC 28801 ROSE CHRISTIAN, GENERAL MANAGER (828) 251-4060	2	29X102	MARCH 2014 92793-92794		
ATHENS CLARK COUNTY			FEB 2004		
325 POUND ST.	3	29X102	90858-90860		
ATHENS, GA 30601	4	35X102	73425-73428		
DERICK GANDY, TRANSIT MAINTENANCE ADMINISTRATOR 706-410-6261	2	35X102	SEPT. 2004 73088-73089		
100-410-0201	2	40X102	JUNE 2005 74116-74117		
	-		FEB. 2006		
	2	35X102	76054-76055		
	3	29X102	91018-91020 JAN. 2008		
	2	40X102	79575-79576 JULY 2009		
	1	40X102	177013		
	2	29X102	91769-91770 JULY 2011		
	4	40X102	178540-178543 MAR. 2013		
	4	40X102	181722-181725 OCT. 2015		
	2	40X102	186567-186568		
ATRANS 2021 INDUSTRIAL BLVD	4	35X102	MARCH 2012 179419-179422		
ALEXANDRIA, LA 71303 KAREN KELLY, GM 318-441-6090	1	35X102	OCTOBER 2017 187771 42005		
510-441-0030	1	35X102	183023 MARCH 2018		
	1	35X102	190533		
<u>AUGUSTA PUBLIC TRANSIT</u> 1535 FENWICK STREET AUGUSTA, GA 30904	1	40X102	AUGUST 2016 189666-189668		
PATRICK G. STEPHENS, TRANSIT DIRECTOR 706-823-30904					
<u>CITY OF AUSTIN, TX</u> 624 N. PLEASANT VALLEY RD. AUSTIN, TX 78702	1	40X102	OCT. 2015 187446 FEB 2016		
ANDREW MURPHY, COORDINATOR Q&A/PROJECT MANAGER 512-389-7566	30	40X102	187447-187476 AUGUST 2016		
	46	40X102	187493-187538 AUGUST 2018		
	34	40X102	190698-190731		

<u>c</u>	USTOMER	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
AVIS RENT-A-CAR SYSTEM, I 900 OLD COUNTRY RD GARDEN CITY, NY 11530 JERRY BERNACKI, VP 516-222-6663	<u>NC.</u>			
	<u>AVIS-ATLANTA, GA</u>	3	40X102	APRIL 2002
		13	40X102	72321-72323 APRIL 2002 72324-72336
	AVIS-BOSTON, MA	10	35X102	FEB-MAR 2001 71394-71403
		3	35X102	JULY 2001
		2	35X102	72297-72299 SEP 2001 72300-72301
	AVIS-DENVER, CO	5	40X102	AUG 2000 71197-71201
		2	40X102	JANUARY 2001
		2	40X102	71224-71225 FEB 2001 71226-71227
		4	40X102	FEB 2001 71228-71231
		1	40X102	AUG 2000 71488
		2	40X102	FEB 2001 71758-71759
		8	40X102	JAN-FEB 2016 186474-186481
		7	40x102	42736 186482-186488
		1	40x102	FEB 2017 186489 JANUARY 2017
		7	40X102	186482-186488
		1	40X102	186489-186489
	AVIS-DETROIT, MI	5	40X102	42005 186444-186448
		11	40X102	NOV-DEC 2015 186449-186459
	AVIS-DULLES, VA	8	40X102	APR-MAY 2004 74291-74298
		4	40X102	NOV 2012 181601-181604
		4	40X102	FEB 2016 186490-186493
	<u>AVIS-LA GUARDIA, NY</u>	7	29X102	NOV-DEC 1999 90268-90274
		5	29X102	DEC 1999 90275-90279
		10	29X102	JANUARY 2013 92474-92483
	<u>AVIS-LAX, CA</u>	5	40X102	FEB 2000 71202-71206
		3	40X102	JUL 2000 71214-71216
		6	40X102	JUL 2000 71217-71222

DIESEE LOW FLOOR COSTOMER LIST					
CUSTOMER	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS		
		1	40X102	SEP 2000	
		1	40X102	71382 SEP 2000	
		5	40X102	71383 SEP 2000	
		3	40X102	71384-71388 OCT 2000	
		2	40X102	71389-1391 OCT 2000	
		2	40X102	71392-71393 AUG 2001	
				72303-72304	
	AVIS-PHILADELPHIA, PA	16	40X102	MAY-JUL 2002 72305-72320	
		3	40X102	NOV 2012 181597-181599	
		2	40X102	42005 186460-186461	
		5	40X102	DEC 2015 186462-186466	
		7	40X102	42370 186467-186473	
		_			
	<u>AVIS-PHOENIX, AZ</u>	9	40X102	MAR 2003 72365-72373	
		11	40X102	DEC 2003-JANUARY 2004 74171-74181	
	AVIS-RALEIGH, NC	8	35X102	FEB 2003	
				73052-73059	
	AVIS-WEST PALM, FL	9	29X102	JANUARY 2004 73600-73608	
AVON, TOWN OF		1	35X102	DEC. 2007	
PO BOX 975 AVON, CO 81620 JANE BURDEN, TRANSIT MGR		1	35X102	77855 MARCH 2008 77578	
970-748-4111		1	29X102	NOV. 2011	
		1	29X102	91935 SEPT 2012 91936	
		1	29X102	MARCH 2017 93122-93122	
BANGOR, ME (CITY OF BANGOR)				AUGUST 2017	
481 MAINE AVE BANGOR, ME 04401		2	29X102	93243-93244 NOVERMBER 2018	
LAURIE LINSCOTT 207-992-4672		2	29X102	93458-93459 APRIL 2019	
<u>BARTA</u>		1	29X104	93460	
1700 N. ELEVENTH ST.					
READING, PA 19604 DAVE KILMER (610) 921-0605		17	35X102	DEC. 2005 76744-76760	
		7	35X102	FEB. 2007 77700-77706	
				OCT. 2008	
		7 2	35X102 40X102	79717-79722 79723-79724	
		5	40X102	APRIL 2009 177004-177008	
				SEPT. 2009	

DIESEE LOW FLOOR COSTOMER LIST					
CUSTOMER	<u>QTY</u> 4	<b>SIZE</b> 40X102	DELIVERY DATE / SERIAL NUMBERS 177869-177872		
	2	40X102	JUNE 2012 177325-177326 OCT, 2015		
	3	40X102	186237-186239		
BATTLE CREEK TRANSIT			JUNE 2008		
339 W. MICHIGAN BATTLE CREEK, MI 49017 BICHARD WERNER, TRANSIT MANACER	2 2	29X102 35X102	91235-91236 78896-78897 JUNE 2018		
RICHARD WERNER, TRANSIT MANAGER 269-966-3477	2	35X102	189485-189486		
BASIN TRANSIT SERVICE			JUNE 2000		
1130 ADAMS ST KLAMATH FALLS, OR 97601	6	35X102	71809-71811 FEB 2016		
ERNEST L. PALMER, GM 541-883-2877	2	35X102	187261-187262		
<u>BAY METRO TRANSIT</u> 1510 N. JOHNSON ST.	7	29X102	APRIL 2002 90509-90514+90631		
BAY CITY, MI 48708 DOUG GASTA	3	40X102	72556-72558 JANUARY 2011		
989-894-2900 X 219	4	29X102	92217-92220 JUNE 2015		
	9	29X102	92938-92946		
BEAVER CO. TRANSIT AUTHORITY 131 PLEASANT DR., STE 7	6	35X102	OCT. 2007 78163-78168		
ALIQUIPPA, PA, 15001 ROSE SUTTER, MAINT SUPERV 724-728-4255	3	40X102	AUGUST 2017 189626-189628		
124 120 4200					
BEAVER CREEK METROPOLITAN DISTRICT 28 SECOND ST., STE 213	2	40X102	NOV. 2008 79690-79691		
EDWARDS, CO 81623 BILL SIMMONS, GENERAL MANAGER	2	40X102	OCT. 2009 177582-177583		
970-748-9174	1	40X102	NOV. 2011 179466 OCT. 2012		
	1	40X102	181835 SEP 2014		
	1	40X102	183079 NOVEMBER 2015		
	2	40X102	188229-188230 OCTOBER 2017		
	2	35X102	190954-190955 OCTOBER 2018		
	1	40X102	193168 OCTOBER 2018		
	2	40X102	193169-193170		
<u>BELLE URBAN SYSTEM</u> 1900 KENTUCKY ST. RACINE, WI 53405	3	35X102	SEPTEMBER 2009 79708-79710 FEB. 2011		
WILLIE MCDONALD, GENERAL MANAGER 262-619-2443	5	35X102	178772-178776 SEPTEMBER 2012		
	3	35X102	180510-180512 MARCH 2013		
	14	35X102	181583-181596		
<u>BELOIT TRANSIT</u> 1225 WILLOW BROOK RD	4	35X102	JUNE 2002 72726-72729		

	071/	0.75	DELIVERY DATE /
CUSTOMER DELOIT MULTOFAL	<u>QTY</u>	<u>SIZE</u>	SERIAL NUMBERS
BELOIT, WI 53511 MICHELLE GAVIN, DIR. OF TRANSIT	2	35X102	JAN. 2006 76382-76383
608-364-2870 X 12	2	357102	JUNE 2007
000-004-2070 X 12	3	35X102	77575-77577
	0	00/(102	JANUARY 2011
	1	35X102	176327
			FEB. 2014
	2	35X102	182985-182986
			MAY 2019
	1	35X102	192908-192909
BEN FRANKLIN TRANSIT	2	402400	DEC. 1998
1000 COLUMBIA PARK TRAIL RICHLAND, WA 99352	3	40X102	70365-70367 APRIL 2005
JERRY OTTO, DIRECTOR OF MAINTENANCE	6	40X102	75139-75144
509-734-5125	0	40/102	APR 2006
	3	40X102	76056-76058
			AUG 2007
	5	29x102	91342-91346
			OCT - NOV 2009
	9	40X102	177354-177362
			JUNE 2013
	4	40X102	181955-181958
	4	40X102	DEC. 2013 183171-183174
	4	407102	AUG 2014
	2	40X102	184206-184207
	-	10/(102	JAN 2015
	4	40X102	184601-184604
			SEP - OCT 2015
	7	40X102	185575-185581
			SEP 2016
	3	35X102	187385-187387
	0	001/400	MARCH 2018
	3	29X102	93323-93325 MARCH 2018
	10	35X102	190992-191001
	10	00/(102	OCT 2018
	3	29X102	93402-93404
	3	35X102	191445-191447
BEND, OR (CENTRAL OREGON INTERGOVERNMENTAL COUNCIL)	)		
343 E. ANTLER AVE	_		OCT 2017
BEND, OR 97701	3	35X102	189409-189411
MARTY HOPPER	1	35X102	JUNE 2018 191110
541-923-3189	I	357102	191110
BERKSHIRE RTA			JUNE 2007
ONE COLUMBUS AVENUE, SUITE 201	3	35X102	77779-77781
PITTSFIELD, MA 01201	C C	00/1102	JAN. 2018
ROBERT MALNATI, ADMINISTRATOR	1	35X102	187250
413-499-2782 ext 2871			JUNE 2018
ROBERT.MALNATI@BERKSHIRERTA.COM	1	35X102	191460
			OCTOBER 2019
	2	35X102	194059-194060
<u>BISMAN TRANSIT</u> 3750 E. ROSSER AVE.			MARCH 2004
BISMARCK, ND 58501	3	29X102	90845-90847
ROY PENTIN, EXECUTIVE DIRECTOR	5	LONIOL	APRIL 2006
	2	29X102	91122-91123
			JANUARY 2015
	2	35X102	183080-183081
BI-STATE DEVELOPMENT AGENCY			
		0.5.4.5.5	NOV. 2008
707 N. FIRST ST.	25	35X102	79895-79919

DIESEE EOW I EOOK CO			
<u>CUSTOMER</u>	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
ST. LOUIS, MO 63102-2595 DIANA HILL, DIR. PURCHASING	4	40X102	AUG. 2009 176538-176541
314-923-3084			MARCH 2011
	7	40X102	178630-178636
	14	35X102	179622-179635
			APRIL 2012
	20	35X102	179659-179678
			DEC 2013
	21	35X102	184171-184193
	26	402400	OCT 2014
	26	40X102	184451-184476 NOVEMBER 2016
	30	40X102	189629-189658
	50	40/102	APRIL 2017
	4	40X102	189655-189658
		10/1102	MARCH 2018
	28	40X102	190964-190991
			NOVEMBER 2018
	20	40X102	191403-191422
BLOOMINGTON PTC			
130 WEST GRIMES LN			OCT. 2002
BLOOMINGTON, IN 47403	3	40X102	72496-72498
LEWIS MAY , GM 812-332-5688	0	201/102	DEC. 2003
812-332-5088	2 5	29X102 40X102	90712-90713 73664-73668
	5	407102	APRIL 2005
	5	40X102	74358-74362
	4	35X102	78482-78485
			NOV. 2008
	3	35X102	79452-79454
			NOV. 2015
	1	40X102	184150
			NOVEMBER 2016
	2	40X102	187731-187732
	5	40X102	DEC. 2017 188176-188180
	5	407102	AUGUST 2018
	4	40X102	190677-190680
		10/1102	JUNE 2019
	3	40X102	192909-192911
BLOOMINGTON-NORMAL PUBLIC TRANSIT SYSTEM CONNECT TRANSIT	4	40X102	APR 2009 79404-79409
351 WYLIE DRIVE	4	407102	MAY 2010
NORMAL, IL 61761	1	35X102	177589
ISAAC THORNE, GM	•	00/(102	AUG 2011
309-828-9833	4	35X102	178879-178882
BOSTON COACH			
69 NORMAN ST.			MAY 2011
EVERETT, MA 02149	3	35X102	176469-176471
TODD BERTOLAMI, DIRECTOR, OPERATIONS			JANUARY 2012
617-545-6486	3	35X102	180146-180148
	2	251102	JANUARY 2013 180750-180751
	Z	35X102	AUG 2014
	2	35X102	184386-184387
BRADENTON, FL -			
1100 26TH AVENUE EAST	F	251400	SEPT. 2011
BRADENTON, FL 34208 RON KENNEDY	5	35X102	180141-180145 MARCH - APRIL 2015
941-708-7458 X 7373	6	35X102	185604-185609
	0	00/102	100007 100000

DIESEE EOW I EOOK			
CUSTOMER	QTY	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS
	4	35X102	NOVEMBER 2015 188232-188235
BROCKTON AREA TRANSIT AUTHORITY			JUNE - AUG 2005
1442 MAIN STREET BROCKTON, MA 02301	11	35X102	75077-75087 JUNE 2006
MICHAEL BLONDIN, GENERAL MANAGER 508-638-5985	8	35X102	76875-76882 AUG 2007
MBLONDIN@RIDEBAT.COM	6	40X102	78239-78244 MAY 2010
	3	40X102	177924-177926 SEP 2010
	2 1	35X102 40X102	178323-178324 178407
	4	40X102	JUNE 2012 179690-179693
	2	40X102	OCT 2013 183286-183287
	4	35X102	APRIL 2017 189770-189773
	4	40X102	189774-189777 MAY - JUNE 2018
	6	35X102	191470-191475
	4	40X102	191478-191481
	1	29X102	93594
BROOME COUNTY TRANSIT			NOV 2014
413 OLD MILL ROAD VESTAL, NY 13850	7	40X102	184376-184382 JULY-AUG 2017
BRIAN J. KEEFER, DIRECTOR OF MAINT. 607-763-4930	7	40X102	189829-189835 DEC 2018 - JAN 2019
	8	40X102	192555-192562 DEC 2019
	5	40X102	194013-194017
BROWARD COUNTY			
3201 W. COPANS RD POMPANO BEACH, FL 33069	20	40X102	JANUARY 1999 70635-70654
TIM GARLING, DIRECTOR 954-347-8423	15	40X102	OCT. 1999 70655-70669
	30	40X102	OCT. 2000 71454-71480 & 71821-71823
	21	40X102	OCT. 2001 71244-71264
	30	40X102	DEC. 2002 73187-73216
	25	40X102	SEPT. 2003 73670-73694
	30	40X102	MAY 20108 191803-191832
BROWNSVILLE, CITY OF 755 INTERNATIONAL BLVD	5	35X102	DECEMBER 2000 71824 - 71828
BROWNSVILLE, TX 78520 ANDREW MUNOZ, ASSISTANT DIRECTOR	1	35X102	JANUARY 2001 71829 - 71829
956-541-4881	4	35X102	JUNE 2001 71830 - 71833 JULY 2008
	3	35X102	79410 - 79412 DECEMBER 2010
	6	35X102	179392 - 179397 JULY 2014

DIESEE LOW I LOOK COST		•	
			DELIVERY DATE /
CUSTOMER	<u>QTY</u>	<u>SIZE</u>	SERIAL NUMBERS
	1	35X102	184264 - 184264
	1	35X102	184265 - 184265
			FEBRYARY 2016
	2	35X102	184810 - 184811
	2	357102	
			DECEMBER 2016
	1	35X102	184260 - 184260
			DECEMBER 2018
	4	40X102	191304-191307
BUTTE CO. ASSOCIATION OF GOVMTS			FEB, 2011
2580 SIERRA SUNRISE TERR., STE 100	2	40X102	178566-178567
	4		
CHICO, CA 95928	4	35X102	178568-178571
MICHAEL ROSSON, SR. PLANNER			SEP 2014
530-879-2468	6	40X102	184111-184116
			MARCH 2017
	1	40X102	188856-188856
	4	40X102	188857-188860
	5	35X102	188861-188865
	3	40X102	188866-188868
	3	40/102	100000-100000
BWI AIRPORT (MARYLAND AVIATION ADMIN)	50	40X102	OCT-DEC 2004
7003 AVIATION BLVD.			76084-76133
GLEN BOURNE, MD 21061			
RALIGN WELLS, DIRECTOR, OFFICE & TRANSPORTATION			
410-859-7125			
410-000-1120			
	•	051/400	MAN/ 0004
CACHE VALLEY TRANSIT DISTRICT	2	35X102	MAY 2004
754 WEST 600 NORTH			74401-74402
LOGAN, UT 84321	3	35X102	76664-76666
TODD BEULTER, GM			JUNE 2008
435-716-9695	5	35X102	79416-79420
			NOV. 2010
	3	40X102	178428-178430
	5	40/102	
	_		AUGUST 2015
	5	40X102	182646-182650
			MARCH 2017
	2	40X102	186231-186232
			MAY 2019
	4	40X102	191612-191615
	-	40/(102	
		052400	
CAMBRIA COUNTY TRANSIT	11	35X102	APRIL 2000
726 CENTRAL AVE.			70852-70862
JOHNSTOWN, PA 15902-2996	2	35X102	JUNE 2000
ROSE LUCY-KNOLL			71031-71032
814-535-5526 X 202	8	29X102	APRIL 2007
			91253-91257
	2	29X102	MAY 2008
	2	29/102	
	_		91481-91482
	7	35X102	SEPT. 2011
			180065-180071
	1	29X102	MAY 2015
			92937
			MARCH 2017
	3	35X102	188321-188323
	5	337102	100321-100323
		401/422	
CAMPUS BUS SERVICE	1	40X102	FEB. 2008
2100 STANTONSBURG RD			79413
GREENVILLE, NC 27835	12	40X102	JUNE 2008
SCOTT ALFORD, MANAGER			78636-78647
252-847-7886			
	0	251400	
CANBY AREA TRANSIT	2	35X102	OCT 2013
PO BOX 930			182065-182066
CANBY, OR 97013			
JULIE WEHLING, TRANSIT DIRECTOR			

	QTY	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
503-266-0751			
CAPE ANN TRANSPORTATION AUTHORITY 3 REAR POND RD	2	29X102	AUG 2010 91427-91428
GLOUCESTER, MA 01930 ROBERT RYAN, PRESIDENT & GENERAL MANAGER	1	29X102	JANUARY 2012 91778
978-281-8315 EXT 124 RYANR@CANNTRAN.COM	3	29X102	MARCH - APR 2017 93182-93184
	2	35X102	JUNE 2018 189348-189349
<u>CAPE COD RTA</u> 40 AMERICAN WAY SO. DENNIS, MA 02660	12	29X102	JAN - MAR 2006 91107-91118 FEB 2008
JOHN KENNEDY, GENERAL MANAGER	3	35X102	78898-78900
508-385-1430 X 102 JKENNEDY@CAPECODRTA.ORG	4	29X102	FEB 2008 91560-91563 FEB 2010
	4	29X102	91855-91858 JUNE 2013
	3	29X102	92670-92672 MAY 2018
	3	29X102	93369-93371 JAN. 2019
	3	29X102	93372-93374 OCT - NOV 2019
	3	35X102	194148-194150
<u>CAPE FEAR PTA</u> PO BOX 2258	1	35X102	SEPT. 2007 78162
WILMINGTON, NC 28402 ALBERT EBY, DIRECTOR 910-202-2035	2	35X102	MAY 2015 184949-184950
<u>CAPITAL AREA TRANSIT</u> 901 N. CAMERON ST. HARRISBURG, PA 17105-1571	4	40X102	AUG 2004 72176-72179 FEB. 2005
MARK MITCHELL, MGR. OF MAINTENANCE 717-233-5657 X 120	9	40X102	75175-75183 FEB. 2007
111-200-0001 X 120	25	40X102	77451-77475 DEC. 2008
	6	40X102	79955-79960 JULY 2011
	1	29X102	92222 JANUARY 2012
	7	35X102	179017-179023 JUNE 2013
	7	40X102	181737-181743 JANUARY 2014
	4	40X102	183069-183072 JULY 2016
	4	40X102	186233-186236 AUGUST 2017
	9	40X102	189913-189921 JUNE 2019
	9	35X102	192912-192920 AUGUST 2019
	5	40X102	192921-192925
<u>CAPITAL DISTRICT TRANSIT AUTHORITY</u> 110 WATERVLIET AVE. ALBANY, NY 12206-2077	8	40X102	FEB - APR 2007 77813-77820 APRIL 2007
CARM BASILE, CEO 518-437-8310	8	40X102	91274-91281 JUNE 2010

DIEGEE EOW I EOOK COSTO			
<u>CUSTOMER</u>	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
	17	40X102	177840-177856
			JUNE - SEP 2012
	20	40X102	181076-181095
			JUNE - AUG 2013
	16	40X102	182551-182556
	0	402400	JUNE - JULY 2014
	9	40X102	183856-183864 JULY 2014
	6	40X102	183865-183870
	Ũ	10/1102	MAY 2015
	5	40C102	186786-186790
			JULY 2015
	7	40X102	186791-186797
			SEP - OCT 2016
	10	40X102	186875-186884
	2	40×102	OCT 2016 186885-186886
	Z	40X102	MAY 2017
	1	40X102	190180
	•		MAY - JUNE 2017
	11	40X102	190181-190191
			OCT 2017
	1	40X102	191234
			OCT - NOV 2017
	9	40X102	191235-191243
	12	40X102	JAN - FEB 2018 191244-191255
	12	40/102	FEB - MAR 2019
	12	40X102	193075-193086
			MAR - MAY 2020
	12	40X102	194716-194727
			AUG - SEP 2020
	20	40X102	195096-195115
CAPITAL METRO			AUG 1999
2910 E. FIFTH ST.	20	40X102	70873-70892
AUSTIN, TX 78702			JULY 2000
ANDREW MURPHY, COORDINATOR Q&A/PROJECT MANAGER	55	40X102	70903-70957
512-389-7566			JULY 2001
	77	40X102	70958-71034
	23	40X102	NOV. 2001 71939-71961
	23	407102	FEB 2016
	30	40X102	187447-187476
		10/1102	AUGUST 2016
	46	40X102	187493-187538
			OCTOBER 2017
	34	40X102	190698-190731
	0	251/400	DECEMBER 2017
	6	35X102	190732-190737 MARCH 2019
	20	35X102	193269-193288
	20	00/(102	100200 100200
CAPITAL TRANSPORTATION CORP.	4	35X102	FEB. 2003
2250 FLORIDA BLVD.	~	051465	73560-73563
BATON ROUGE, LA 70802	6	35X102	OCT. 2011
ROBERT MIRABITO, GM 225-389-8920	1	35X102	179587-179592 MARCH 2013
	I	00/102	181576
	12	35X102	JAN. 2014
			183339-183350
	5	35X102	MAY 2015
			184970-184974

CUSTOMER	<u>QTY</u> 4	<u>SIZE</u> 35X102	DELIVERY DATE / SERIAL NUMBERS AUGUST 2016 187093-187096
	8	35x102	NOVEMBER 2016 189862-189869 MARCH 2017
	12	35X102	190000-190011 DECEMBER 2018
	8	35X102	190849-190856
CARTA			JUNE 2009
Chattanooga Area Regional Transit Authority 1617 WILCOX BLVD. CHATTANOOGA, TN 37406	2	35X102	79711-79712
LISA MARAGNANO, EXECUTIVE DIRECTOR 423-629-1411	4	35X102	MARCH 2014 183542-183545
CCCTA 2477 ARNOLD INDUSTRIAL WAY	10	40X102	APRIL 1998 70325-70334
CONCORD, CA 94520 SCOTT MITCHELL, CHIEF OPERATING OFFICER 925-676-1976 X 2909	10	40X102	NOV. 2000 71429-71438
925-010-1970 X 2909	18	29X102	MAY 2002 90556-90565 90632-90639
	14	40X102	APRIL 2002 73314-73327
	13	35X102	JULY 2002 73328-73340
	31	40X102	DEC. 09-FEB. 10 177259-177289
	10	40X102	APRIL 2013 182480-182489 NOVEMBER 2015
	13	40X102	186411
	1	40X102	186410 DECEMBER 2015
	19	40X102	186424-186442 JANUARY 2016
	1	29X102	92982 JULY 2016
	3	29X102	92983-92985 APRIL-MAY 2017
	13	35X102	188684-188696
<u>C-TRAN</u>	14	29X102	93212-93225
<u>CLARK COUNTY PUBLIC TRANSP. BENEFIT AREA TRANSIT</u> 2425 NE 65TH AVENUE VANCOUVER, WA 98661	2	40X102	JULY 1998 70268-70269 MAY 2008
CELIA SHERBECK, DIRECTOR OF MAINTENANCE	5	29X102	91301-91305
360-906-7358	5	35X102	78742-78746 SEP 2010
	4	35X102	177070-177073 DECEMBER 2015
	2	29X102	93019-93020

DIESEE LOW I LOOK COST			
CUSTOMER	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
CENTRAL NEW YORK RTA			
200 CORTLAND AVE.			SEPT. 2007
SYRACUSE, NY 13205-0820	2	35X102	78172-78173
E.J. MOSES, MANAGER OF GRANT ADMINSTRATION			AUG 2008
315-442-3368	3	40X102	79672-79674
	3	29X102	NOV. 2008 91639-91641
	3	297102	MAY 2009
	3	40X102	176993-176995
			JUNE 2009
	4	35X102	176797-176800
	_	403/400	JUNE 2009
	5	40X102	176792-176796 FEB - APRIL 2017
	10	29X102	93185-93194
	10	20/(102	AUGUST 2018
	10	40X102	189819-189828
			JULY 2019
	2	35X102	193105-193106
CENTRAL OKLAHOMA TRANSPORTATION <u>&amp; PARKING AUTHORITY</u>			DEC. 2008
2000 S. MAY AVE.	3	29X102	91434-91436
OKLAHOMA CITY, OK 73108	Ũ	20/(102	JUNE 2009
ERICK ZAAGE, FLEET MGR	2	40X102	176281-176282
405-297-2521	13	35X102	176268-176280
			DEC. 2012
	4 6	35X102 29X102	180563-180566 92363-92368
CHAMPAIGN-URBANA MASS TRANSIT	0	297102	92303-92308
803 E. UNIVERSITY AVE.			JUNE 2009
URBANA, IL 61802	5	29X102	91734-91738
KARL GNADT, DIR. MARKET DEVELOPMENT			
217-384-8188			
CHARLESTON AREA REGIONAL			
TRANSPORTATION AUTHORITY			DECEMBER 2018
1362 MCMILLAN AVE. STE 100	1	40X102	192815
N. CHARLESTON, SC 29405			JAN. 2019
JASON MCGARRY, CONTRACT/ PROCUREMENT ADMIN.	15	40X102	192816-192830
843-529-0400			
CHARLOTTE AREA TRANSIT			
600 EAST 4TH STREET			OCT 2002
CHARLOTTE, NC 28202	1	40x102	73610
JOHN LARSON, SENIOR PROCUREMENT OFFICER	10	40×402	DEC 2002 - JAN 2003
704-432-0458	13	40X102	73611-73623 MAY 2003
	3	29X102	90756-90758
	-		JUNE 2003
	2	40X102	73727-73728
			JULY - AUG. 2004
	21	40X102	74322-74342
	1	29X102	AUG 2004 90731
		29/102	JULY 2005
	4	29X102	90993-90996
			JUNE - JULY 2006
	7	29X102	91140-91146
	40	202400	JULY - AUG 2007
	19	29X102	91306-91324 AUG - SEP 2007
	8	40X102	78231-78238
	-		DEC 2008 - JAN 2009

DIESEL LOW FLOOR C	USI DIVIER LIST		
CUSTOMER	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
	13	40X102	79920-79932
			JAN 2009
	3	29X102	91663-91665
			NOV - DEC 2009
	18	40X102	176520-176537
			JULY - AUG 2011
	11	40X102	178145-178155
			OCT - NOV 2011
	12	40X102	180217-180228
			MAY 2012
	2	40X102	180718-180719
	10	29X102	92390-92399
			MAY - JULY 2012
	26	40X102	180720-180745
			JANUARY 2014
	2	40X102	182783-182784
			JUNE - JULY 2015
	10	40X102	186205-186214
			MAR 2017
	3	40X102	188951-188953
			MARCH 2017
	1	29X102	93158
			AUG 2017
	8	40X102	190407-190414
			FEBRUARY 2018
	2	40X102	191461-191462
			DEC 2019 - JAN 2020
	3	40X102	193122-193124
			JAN 2020
	4	29X102	93521-93524
CHARLOTTESVILLE TRANSIT SERVICE			
315 4TH ST. NW			JUNE 2008
CHARLOTTESVILLE, VA 22903	1	29X102	91590
TERRY YEAGER, DIR OF MAINTENANCE	8	35X102	79390-79397
434-970-3872			MARCH 2010
	4	35X102	177564-177567
	0	251402	FEB 2014
	2	35X102	182793-182794
	0	251402	JANUARY 2015
	2	35X102	184251-184252
	4	251402	MARCH 2014
	1	35X102	182795
	2	35X102	DECEMBER 2014 184251-184252
	2	357102	OCTOBER 2015
	2	35X102	186273-186274
	2	337102	APRIL 2019
	1	35X102	191172
	·	00/102	131172
CHATHAM AREA TRANSIT			
PO BOX 9118			MARCH 2003
SAVANNAH, GA 31412-9118	31	35X102	73624-73654
CHAD REESE, EXEC. DIR.	0.	00/1102	JUNE 2006
912-401-9854	5	29X102	90939-90943
			MAY 2016
	2	29X102	93101-93102
			APRIL 2018
	16	35X102	190907 - 190922
			MAY 2019
	2	29X102	93272 - 93273
			AUGUST 2018
	2	35X102	190923 - 190924
CHEMUNG CO. TRANSIT SYSTEM			
1201 CLEMENS CENTER PKWY	4	40X102	NOV. 2011
ELMIRA, NY 14901			179545-179548

			DELIVERY DATE /
CUSTOMER	<u>QTY</u>	SIZE	SERIAL NUMBERS
TINA HAGER, TRANSIT SPECIALIST	7	29X102	JANUARY 2014
607-737-5560			92587-92593
		40)/400	JUNE 2015
	1	40X102	184888
<u>GREEN MOUNTAIN TRANSIT</u> 15 INDUSTRIAL PKWY			JUNE 2007
BURLINGTON, VT 05401	3	35X102	77191-77199
KAREN WALTON, GENERAL MANAGER	5	40X102	77194-77199
802-540-0308 ext 16	0	40/(102	JAN. 2008
	1	35X102	79379
			AUG 2008
	2	40X102	79414-79415
			DEC. 2008
	1	35X102	176407
			FEB. 2009
	8	40X102	176289-176293
	_		OCT. 2009
	5	35X102	177445-177449
	1	35X102	JANUARY 2010 92065-92069
	I	357102	92065-92069 MAY 2012
	5	35X102	179976-179980
	0	00/(102	FEB 2013
	1	40X102	180766
			NOVEMBER 2017
	3	35X102	190674-190676
	9	40X102	190945-190953
			MAY 2019
	2	40X102	192941 - 192942
CITIBUS	1	35X102	192943 - 192943
801 TEXAS AVE.			NOV 0004
LUBBOCK, TX 79401 SCOTT DRAINVILLE, DIRECTOR OF MAINTENANCE	6	35X102	NOV. 2004 74753-74758
(801) 712-2006	0	357102	JAN. 2006
(001) 112-2000	7	35X102	76727-76733
		00,1102	OCT. 2009
	6	29X102	91919-91924
			FEB. 2010
	5	29X102	92065-92069
			FEB-MARCH 2017
	2	35X102	188157-188158
	2	40X102	188159-188160
	0	408400	JAN. 2018
	2 2	40X102 35X102	189783-189784 189785-189786
CITY & BOROUGH OF JUNEAU CAPITAL TRANSIT	2	357102	189785-189786
10099 BENTWOOD PL			
JUNEAU, AK 99801			DEC. 2009
JOHN KERN, TRANSIT MANAGER	5	35X102	177717-177721
907-789-6903			MAY 2010
	2	35X102	178551-178552
			SEPTEMBER 2016
	4	35X102	187755-187758
	6	252400	JULY 2018
<u>CITY OF CEDAR RAPIDS</u> 427 8TH ST. NW	6	35X102	191100-191105
427 8TH ST. NW CEDAR RAPIDS, IA 52405			JUNE 2009
BRAD DeBROWER, TRANSIT MGR	2	35X102	176147-168
319-286-5560	-	00.110L	JUNE 2010
	4	35X102	177920-177923
			SEPT. 2011
	5	35X102	179504-179508
			AUG 2012
	5	35X102	179509-179513
			NOV 2014

CUSTOMER	<u>QTY</u> 4	<u>SIZE</u> 35X102	DELIVERY DATE / SERIAL NUMBERS 182408-182411
	2	35X102	OCTOBER 2017 187266-187267 NOVERMBER 2018
	3	35X102	190096-190098 MAY 2019
	3	35X102	193157-193159
<u>CITY OF CLINTON</u> 1320 SO. SECOND ST.			
CLINTON, IA 52732 DENNIS HART, SUPER. OF TRANSIT 563-242-3721	2	35X102	MAY 2009 176603-176604 NOV. 2010
	2	35X102	178468-178469 MARCH 2012
	1	29X102	92340 JULY 2013
	1	29X102	182080
	1	29X102	MARCH 2015 92799
<u>CITY OF COLUMBIA</u> 701 E. BROADWAY			AUG 2007
COLUMBIA, MO 65205-6015 DREW BROOKS, GM	2	40X102	78198-78199 MARCH 2010
573-874-6281	2	40X102	177783-177784 FEBRUARY 2015
	2	40X102	184197-184198
<u>CITY OF COLUMBUS</u> 123 WASHINGTON ST.			JULY 2005
COLUMBUS, IN 47201 SHERI CHRISTMAN, OPS MGR	1	29X102	90999 APRIL 2007
812-376-2506	5	29X102	91242-91246 JUNE 2018
	4	29X102	93342-93345
<u>CITY OF LONG BEACH</u> 1 WEST CHESTER ST LONG BEACH, NY 11561	4	35X102	JANUARY 2014 183925-183928
MICHAEL ROBINSON, DIR OF COMM DEVEL 516-431-1001	1	29X102	SEPT. 2010 91914
	1	29X102	MARCH 2015 92927
	1	29x102	APRIL 2015 92927
CLARKSVILLE TRANSIT SYSTEM			
430 BOILLIN LN CLARKSVILLE, TN 37040	2	29X102	FEB. 2010 91884-81885
ARTHUR BING, GENERAL MANAGER 931-553-2430	3	29X102	DEC. 2010 92238-92240
501-000-2400	2	40X102	JUNE 2011
	3	29X102	178931-178932 JULY 2015 93015-93017
	1	29X102	JULY 2015 93018 APRIL 2017
	3	29X102	93163-93165
CLERMONT TRANSPORTATION CONN			
4003 FILAGER RD BATAVIA, OH 45103 LISA GATWOOD, DIRECTOR 513-732-7577	12	29X102	SEPT. 2013 92526-92537
CLEVELAND, OH - GCRTA			

CLEVELAND, OH - GCRTA 2500 WOODHILL RD

DIESEE EOW I EOOK CO			
CUSTOMER	QTY	SIZE	DELIVERY DATE / SERIAL NUMBERS
CLEVELAND, OH 44104 RON BARON, DIRECTOR OF FLEET MANAGEMENT 216-421-2160+A57	1 59	40X102 40X102	185101 FEB - MAR 185102-185160
	30	40X102	JULY - AUG 2015 185661-185690
	1	35X102	OCTOBER 2015 188580
	25	40X102	MARCH 2017 189831-189831
	29	40X102	AUGUST 2017 191314-191342 JULY 2018
	4	29X102	93420-93423 OCTOBER 2018
	24	40X102	192944-192967 MAY 2019
CITY OF CORALVILLE	17	40X102	193569-193585
PO BOX 5127 CORALVILLE, IA 52241 VICKY ROBROCK, DIR. OF TRANSIT	20	40X102	DEC. 2009 177425-177444 JULY 2017
319-248-1790	4	40X102	189877-189880
<u>CITY OF DURHAM</u> 1907 FAY ST. DURHAM, NC 27704	7	35X102	JAN. 2008 78191-78197
SEAN SMITH, TRANSIT ADMIN 919-560-1545 X 32609	3	29X102	MARCH 2011 91891-91893
	12	40X102	JUNE 2017 189881-189892 FEBRUARY 2018
	3	40X102	189990-189992 APRIL 2019
	2	40X102	190859-190860 JULY 2019
CITY OF FAIRFIELD	2	40X102	193464-193465
420 GREGORY ST. FAIRFIELD, CA 94533 DAVID RENSCHLER, TRANSIT MGR	4	35X102	OCT. 2008 79501-79504
707-428-7768	1	35X102	APRIL 2010 177591
CITY OF LAS CRUCES PO BOX 2000	4	35X102	MARCH 2007
LAS CRUCES, NM 88004 MICHAEL BARTHOLOMEW	4	29X102	77482-77485 APRIL 2011
575-541-2500	1	35X102	92152-92155 JULY 2016 186215
<u>CITY OF PETALUMA</u> PUBLIC WORKS DEPT.	3	40X102	FEB. 2008
555 N. MCDOWELL BLVD. PETALUMA, CA 94952	1	40X102	78625-78626 NOV. 2010
JOSEPH RYE, TRANSIT MANAGER 707-778-4421	2	40X102	176931 MARCH 2011 176472-176473
	А	402400	JULY 2016
CITY OF SANTA MARIA	1 2	40X102 35X102	186798 186799-186800
110 S. PINE ST., STE 221 SANTA MARIA, CA 93458-5082	10	40X102	DEC. 2014 182522-182531
AUSTIN O'DELL, TRANSIT MGR 805-925-0951 X 225	2	29X102	FEB. 2008 91564-91565
	1	29X102	NOV. 2011

CUSTOMER	ΩΤΥ	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS 92291
<u>CITY OF ST. GEORGE</u>	2	40X102	MARCH 2017 187281-187282
931 E. RED HILLS PKWY ST. GEORGE, UT 84770	1	29X102	FEB 2008 91564-91565
COURTNEY STEPHENS, FLEET MGR 435-627-4040	1	29X102	NOV 2011 92291
	1	29X102	FEB 2014 92673
	3	35X102	DEC 2014 184792-184794 NOVEMBER 2017
CITY OF STEVENS POINT	4	35X102	189383-189386
1515 STRONGS AVE. STEVENS POINT, WI 54481-3594	2	29X102	JUNE 2001 90504-90505
SUSAN LEMKE, TRANSIT MGR 715-341-4490	3	29X102	APRIL 2002 90506-90508
	1	29X102	MARCH 2003 90759
	1	29X102	APRIL 2007 91168 JAN. 2019
CITY UTILITIES OF SPRINGFIELD	5	29X102	93453-93457
301 E. CENTRAL SPRINGFIELD, MO 65802 TODD PATTERSON, FLEET MANAGER	2	29X102	JUNE 2005 90097-90098 MAY 2013
417-831-8481	5	29X102	92679-92683 MAY 2013
	5	29X102	92674-92678 JAN. 2018
CLALLAM TRANSIT SYSTEM	11	35X102	190336-190346
830 W. LAURIDSEN BLVD. PORT ANGELES, WA 98363 KEVIN GALLACCI	1	35X102	DEC 2008 79599-79602 MAY 2011
360-452-4511	5	35X102	178764-178768 MARCH 2013
	2	40X102	181951-181952 MARCH 2013
	2 40	40X102 40X102	180746-180747 MAY 2006 76006-76045
CLARK COUNTY DEPT. OF AVIATION	2	40X102	JUNE 2006 76322-76323
5757 WAYNE NEWTON BLVD. LAS VEGAS, NV 89119	3	29X102	DEC. 2001 90515-90517
MIKE SEED, PURCH. ANALYST 702-261-5176	3	29X102	JAN. 2008 91384-91386
<u>COAST</u> 42 SUMMER DR.	4	40X102	OCT. 2008 79951-79954
DOVER, NH 03820 RAD NICOLS, EXEC. DIR.	2	35X102	JANUARY 2011 177927-177928
603-743-5777 X 100	4	35X102	OCT 2012 180568-180571
	2 1	29X102 29X102	92449-92450 DEC. 2005
	4	29X102	90999 JUNE 2006 91164-91167
	3	40X102	AUGUST 2016

			0175	DELIVERY DATE /
COBB COUNTY, GA	<u> </u>	<u>2TY</u>	<u>SIZE</u>	SERIAL NUMBERS 186330-186332
463 SE COMMERCE PARK DRIVE, SUITE 112 MARIETTA, GA 30060		1	40X102	JANUARY 2016 188547
JORGE PUBILLONES, BUSINESS ANALYST 770-528-1612		32	40X102	MARCH 2016 188547-188578
		2	40X102	MAY 2016 187834-187835 JANUARY 2017
		2	40X102	189173-189174
		3	40X102	189176-189178 AGUGUST 2017
		1	40X102	189175-189175 AUGUST 2018
		14	40X102	192421-192434
COMMUNITY TRANSIT				JUNE 2013
7000 HARDESON RD EVERETT, WA 98203		1	29X102	92525 AUG - SEP 2013
FRED WORTHEN, DIR OF TRANSPORTATION 425-438-6132		12	29X102	92526-92537 MAY - JUNE 2017
420-430-0132	:	26	40X102	190372-190397
	:	24	40X102	NOV - DEC 2019 194428-194451
COMMUNITY URBAN BUS SERVICE				
254 OREGON WAY LONGVIEW, WA 98632		2	35X102	JUNE 2008 78869-78870 SEP 2014
BRAD WINDLER, OPERATIONS SUPERVISOR 360-442-5661		1	35X102	183068
<u>CONCORD, CITY OF</u> 850 WARREN C. BLVD.		1	40X102	JULY 2009
CONCORD, NC 28025 LJ WESLOWSKI		4	40X102	176264 JUNE 2010
704- 920-5878		4	40×102	177498-177501
COLLIER AREA TRANSIT 2901 COUNTRY BARN RD.				
NAPLES, FL 34102 YOUSI CARDESO, OPERATIONS ANALYST 239-252-5886		3	35X102	JUNE 2012 180347-180349 NOV. 2012
209-202-0000		2	35X102	180752-180753 NOV DEC 2012
		1	35X102	180509 MAY 2007
		5	29X102	91242-91246 APRIL 2014
		2	40X102	184199-184200 MARCH 2010
		3	35X102	177671-177673 JUNE 2010
		2	35X102	178484-178485 AUGUST 2015
		1	40X102	184208 SEPTEMBER 2016
		2	35X102	186275-186276 OCTOBER 2017
		4	29X102	93319-93322 JULY 2018
		1	29X102	93449
	o			

DIESEE LOW I LOOK CO.			
CUSTOMER	QTY	SIZE	DELIVERY DATE / SERIAL NUMBERS APRIL 2019
	1	29X102	93424
COLUMBUS TRANSIT			
2250 KREUTZER DR			
COLUMBUS, IN 47201	3	29X102	AUG 2010
GREG NOEL, MAINTENANCE			92133-92135
812-376-2506			
COLUMBUS CONSOLIDATED GOVERNMENT			
100 10TH ST.			JUNE 2009
COLUMBUS, GA 31901-27365	2	35X102	78591-78592
THOMAS TAYLOR, MAINT. MGR	4	003/400	OCTOBER 2017
706-653-4410	1	29X102	93277-93277
COLTS			
NORTH SOUTH RD	3	35x102	JANUARY 2015
SCRANTON, PA 18504			184582-184584
ROBERT FIUME, EXEC DIRECTOR	2	35X102	NOVEMBER 2015 184596-184597
570-346-1259			184390-184397
COMMUNITY DEVELOPMENT TRANSIT			
820 E. MILLER ST.			
JEFFERSON CITY, MO 65101	8	35X102	FEB. 2004
RICHARD TURNER SR., TRANSIT DIR 573-634-6599 X 3			72620-72627
575-054-0533 X 5			
CONCORD, CITY OF			
PO BOX 308			
CONCORD, NC 28026 L.J. WESLOWSKI, DIR. OF FLEET SERVICES	1	40X102	FEB. 2010 177012
704-920-5878	I	40×102	FEB. 2011
	1	40X102	176663
			AUG 2012
	1	35X102	180048
<u>CONN DOT</u> 2800 BERLIN TURNPIKE			OCT 2014
NEWINGTON, CT 06111	1	29X102	92751
PHILIP SCAROZZO, MANAGER			
860-594-2007 PHILLIP.SCARROZZO@CT.GOV			42005
	8	29X102	92752-92759
	3	29X102	MAY 2015 93010-93012
CONNECTICUT RIVER TRANSIT	5	20/102	00010-00012
706 ROCKINGHAM RD			
ROCKINGHAM, VT 05101	2	051/400	DEC. 2001
ART SMITH, FLEET MGR 802-460-4433 X 218	2	35X102	72508-72509 MAY 2005
802-400-4433 X 210	1	35X102	74899
		00,1102	MAY 2007
	1	35X102	91242-91246
CORVALLIS, CITY OF			
PO BOX 1083			
CORVALLIS, OR 97339			MARCH 2009
TIM BATES, TRANSIT COORDINATOR	14	40X102	176224-176237
541-754-1761	7 3	29X102 29X102	91672-91678 91669-91671
	5	LUNIUL	MAY 2009
	3	35X102	176206-176207
			APRIL 2010
	3	35X102	177955-177957
	2	35X102	SEPT. 2012 180298-180299
	-		FEB 2014

		0175	<u>DELIVERY DATE /</u> SERIAL NUMBERS
CUSTOMER	<u>QTY</u> 2	<u>SIZE</u> 35X102	182549-182550
	1	35X102	MAY 2015 183479
	2	35X102	MARCH 2017 187268-187269 JAN. 2018
<u>COTA</u>	1	35X102	188761
1600 MCKINLEY AVE. COLUMBUS, OH 43222 KEVIN CHRISTOPHER, DIRECTOR SUPPLY MGMT	12	35X102	OCT 2004 - JANUARY 2005 74822-74833 APR-JULY 2007
614-275-5903 CHRISTOPHERK@COTA.COM	11	35X102	77180-77190 AUG-SEP 2007
	21	35X102	78205-78225 JUNE-AUG 2008
	30	40X102	79545-79574 AUG 2008
	10	29X102	91550-91559 FEB-MAR 2009
	30	40X102	176208-176237 MAR 2009
	10	29X102	91669-91678 FEB 2010
	6	40X102	178075-178080 FEB-APR 2010
	37	40X102	178038-178074 APR 2010
	3	29X102	91972-91974 MAR-APR 2011
	37	40X102	178781-178817 APR 2011
	3	29X102	92110-92112 MAR-APR 2012
	12	40X102	180409-180420 APR 2012
	6	40X102	180421-180426
	5	40X102	180427-180431 FEB-MAY 2013
	18	40X102	182123-182140
	12	35X102	182141-182152 FEB 2014
	8	29X102	92780-92787 FEB - MAR 2014
	7	35X102	183776-183782 MAR - JULY 2014
	21	40X102	183753-183773 FEBRUARY 2015
	5	35X102	186280-186284 MAR-APR 2015
	33	40X102	186285-186317 MAR-APR 2016
	14	40X102	187661-187674 APR 2016
	4	35'X102	187657-187660 OCT 2016
	2	40'X102	187655-187656 FEBRUARY 2017
	3	29X102	93206-93208
	1	29X102	93209-93209
	2	29X102	93210-93211 MARCH 2017
	4	35X102	188135-188138
	4	35X102 35X102	188139-188139
	2	35X102 35X102	188140-188141 JULY 2017

DIEGEE EOW I EOOK CO			
CUSTOMER	<u>QTY</u> 6	<b>SIZE</b> 40X102	DELIVERY DATE / SERIAL NUMBERS 188142-188147
	2 5	40X102 40X102	AUG 2017 188148-188149 188150-188154
CONNECTICUT RIVER TRANSIT, INC. 300 CLINTON ST. SPRINGFIELD, VT 05156 REBECCA GAGNON, GENERAL MGR 802-460-1195 ext 201	1	40X102	DEC. 2008 176197
<u>COUNCIL ON AGING OF ST. LUCIE INC</u> 1505 ORANGE AVE. FT. PIERCE, FL 34950			JULY 2012
DARRELL DRUMMOND, CRO	12	29X102	92436-92447 JUNE 2019
CRAWFORD AREA TRANSPORTATION AUTHORITY 231 CHESTNUT ST. STE 210	2	40X102	190039-190040
MEADVILLE, PA 16335 TIMOTHY GEIBEL, EXEC. DIRECTOR 814-336-5600	3	29X102	OCT. 2008 91629-91631 SEPTEMBER 2017
DFW AIRPORT STANDARD PARKING CORP.	3	29X102	93139-93141
2425 RENTAL CAR DALLAS FT. WORTH, TX 75261 DAVID ROBBINS, GM 972-574-7878 X 13	6	40X102	JAN. 2006 76859-76864
<u>DANVILLE MASS TRANSIT</u> 101 N. JACKSON DANVILLE, IL 61832	3	29X102	MAY 2004
ROBERT MCNEIL, OPERATIONS MANAGER 217-431-0653	2	29X102	90728-90730 FEB. 2008
	1	35X102	91513-91514 77442
	3	35X102	MARCH 2011 179555-179557
	2	35X102	MARCH 2016 185399-185400 MAY 2019
DART	2	35X102	192196-192197
400 S. MADISON ST. WILMINGTON, DE 19801 RICK WALTERS, MAINT ENG & TECH MGRE	7	40X102	MAY 2000 71481 - 71487 JULY 2004
302-576-6164	2	40X102	73348 - 73349 AUGUST 2004
	2	29X102	90724 - 90725
	2	29X102	90726 - 90727 AUGUST 2006
	7	40X102	77225 - 77231 SEPTEMBER 2006
	1	40X102	76897 - 76897
	3	29X102	91199 - 91201 AUGUST 2007
	1	40X102	76898 - 76898 DECEMBER 2007
	10	40X102	79331 - 79340 FEBRUARY 2008
	10 38	29X102 40X102	91451 - 91460 79341 - 79378
	1	40X102	MAY 2008 76899 - 76899 SEPTEMBER 2008

<u>BILOEE LOW TEOOK OOOT</u>			
<u>CUSTOMER</u>	οτν	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
COSTOMER	<u>QТҮ</u> 8	40X102	79463 - 79470
	0	40/(102	OCTOBER 2008
	2	40X102	79471 - 79472
	3	29X102	91591 - 91593
			APRIL 2009
	19	29X102	91594 - 91612
	_		AUGUST 2009
	7	35X102	177514 - 177520
	22	29X102	MARCH 2010 91830 - 91851
	22	237102	APRIL 2012
	7	40X102	180785 - 180791
			MAY 2012
	1	35X102	180797 - 180797
			MARCH 2014
	35	40X102	183783 - 183817
			MAY 2014
	8	40X102	184864 - 184871
	29	40×102	JUNE 2014 184759 - 184787
	29	40X102	MAY 2015
	2	40X102	185588 - 185589
	4	29X102	92997 - 93000
	2	29X102	93001 - 93002
			MAY 2017
	2	29X102	93301 - 93302
	2	29X102	93303 - 93304
	0	001/100	APRIL 2019
	3	29X102	93591-93593
DFW RENTAL CAR PO DRAWER 609428			
DFW AIRPORT, TX 75261-9428	23	40X102	NOV-DEC 1999
GARY COLLINS, GM	20	10/1102	70991-71013
972-574-7878 X 13	17	40X102	DEC 1999-JANUARY 2000
			71014-71030
CITY OF DAVENPORT			
300 W. RIVER DR.	-	00)/400	
DAVENPORT, IA 52801 KURT SCHEIBLE, GM	5	29X102	FEB. 2003 90760-90764
563-888-2150	6	35X102	JUNE 2004
303-000-z 130	0	357102	73397-73402
	6	35X102	JULY 2011
			179573-179578
			AUGUST 2017
	5	35X102	188655-188659
DECATUR PTS			
555 E. WOOD ST.	13	29X102	NOV. 2001
DECATUR, IL 62523 JEROME PARKER, GENERAL MANAGER	13	297102	90432-90444
217-424-2817	5	29X102	JULY 2009
	Ū	20/1102	91748-91752
	4	35X102	JULY 2010
			177320-177323
DELAWARE AREA TRANSIT			
119 HENDERSON CT.			MAY 2019
DELAWARE, OH	1	29X102	93550
ED PIERSON, FACILITIES, ASSETS & TECHNOLOGY MAN. 740-368-9383			
1 70-000-0000			
DENTON CO. TRANSPORTATION AUTHORITY			
1660 S. STEMMONS, STE 250			
LEWISVILLE, TX 75067	12	35X102	MARCH 2006
JEFF BENNETT, TRANSIT DIRECTOR			76715-76726
972.966.5103	5	35X102	AUG 2007
			78265-78269

		0.75	DELIVERY DATE /
CUSTOMER	<u>QTY</u> 5	<u>SIZE</u> 35X102	SERIAL NUMBERS JANUARY 2011
	4	35X102	177641-177645 MAY 2016 184883-184886 APRIL 2017
DES MOINES MTA	3	35X102	188876-188878
1100 MTA LANE DES MOINES, IA 50265 ELIZABETH PRESUTTI, EXEC. DIRECTOR	4	40X102	AUG 1998 70360-70363
515-283-8115	11	40X102	DEC. 2000 71495-71505
	14	40X102	NOV. 2002 72739-72752
	7	40X102	FEB 2003 72882-72888
	2	29X102	MARCH 2012 91775-91776
1301 E. WARREN AVE DETROI, MI 48207 DAN HODGES, SUPERVISOR 313-833-7676	42	40X102	MARCH 2012 180151-180192
DUFAST TRANSIT 178 SPIDER LAKE RD DUBOIS, PA 15801 KRISTEN VIDA, EXEC. DIRECTOR 814-371-3940	2	29X102	APRIL 2007 91180-91181
DULUTH TRANSIT AUTHORITY 2402 W. MICHIGAN ST. DULUTH, NN 55806	1	40X102	MAR 1999 70399
PHIL PUMPHREY, GM 218-722-4426	9	40X102	MAY - JUNE 1999 70400-70408
	2	40X102	JUNE 1999 70409-70410
	3	40X102	70460-70462 JUNE 2002
	10	29X102	90589-90598 DEC 2003
	1	35X102	74376 MAY 2004
	1	35X102	74377-74385 SEP 2006
	10	40X102	76734-76743 AUG 2007
	8	35X102	78305-78312 SEP 2008
	2	35X102	176178-176179 JUNE 2009
	2	35X102	78591-78592 SEP - OCT 2009
	4	40X102	176698-176701 AUG 2010
	10	40X102	178663-178672 OCT 2013
	5 5	40X102 40X102	181356-181360 181361-181365
	10	40X102	NOV - DEC 2014 185901-185910
	6	40X102	AUG 2016 187774-187779
	10	40X102	JULY - AUG 2018 191679-191688 MAY 2020

DIEGEL LOW I LO	OK COSTOWLK LIST		
CUSTOMER	<u>QTY</u> 1 5 3 1	<b>SIZE</b> 35X102 40X102 35X102 40X102	DELIVERY DATE / SERIAL NUMBERS 194979 JUNE 2020 194973-194977 194980-194982 194978
DUNN TRANSIT 1322 N. MCCLINTOCK DR TEMPE, AZ 85281 MARGARET DUNN 480-970-8130	5 4	35X192 29X102	OCT. 2013 182871-182875 92430-92433
DURHAM, NC 224 HOOVER RD DURHAM, NC 27703	31	40X102	MAY 2003 73946-73977
SEAN SMITH, GM 919-957-7336	1	40X102	MARCH 2005 73977
	5	40X102	FEB. 2008 78979-78984
EAGLE COUNTY RTA PO BOX 1070 GYPSUM, CO 81637 CHRIS LUBBERS 970.328.3521	2 5 3 4 3 2 1 4 2 3 3 2	40X102 40X102 40X102 40X102 40X102 40X102 40X102 40X102 40X102 40X102	AUG 2006 77548-77549 OCT. 2007 78103-78107 MAY 2008 78169-78171 DEC. 2008 78857-78860 OCT. 2009 177009-177011 OCT. 2010 177756-177757 OCT. 2012 179953 OCT 2013 183048-183051 OCT 2014 183077-183078 JULY 2017 188873-188875 JUNE 2018 191428-191429 JUNE 2019
EAST CAROLINA UNIVERSITY 18 MENDENHALL ST., STUDENT CENTER GREENVILLE, NC 27858 WOOD DAVIDSON, GM 252-328-5391	3 4 2 2 1 6	40X102 40X102 40X102 40X102 35X102 40X102	192497-192499 JUNE 2005 74460-74463 JAN. 2006 76405-76406 JUNE 2007 77835-77836 OCT. 2007 78190 JUNE 2009 176947-176952
	2 2	40X102 40X102	JULY 2011 178191-178192 JULY 2011 178191-178192

<u>DECEL LOW PEODR OUT</u>			
CUSTOMER	QTY	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
OUTOMER	1	35X102	NOV. 2011
			180016
	1	29X102	FEB. 2013
	8	29X102	91928 APRIL 2002
<u>CITY OF EAU CLAIRE</u> 910 FOREST ST.	0	29/102	
EAU CLAIRE, WI 54703			MARCH 2011
MIKE BRANCO, GM	1	40X102	178345
715-839-5120	4	35X102	178346-178349
ECCTA			
801 WILBUR AVE			MAY 2013
ANTIOCH, CA 94509	24	40X102	182007-182031
ANN HUTCHINSON DIR OF ADMIN SERVICES			OCTOBER 2016
925-754-6622	20	40X102	187711-187730 MAY 2018
	5	40X102	189107-189111
EL DORADO TRANSIT	Ū.		
6565 COMMERCE WAY			DECEMBER 2016
DIAMOND SPRINGS, CA 95619	1	35X102	187677
SCOTT OUSLEY, OPERATIONS MANAGER (530) 642-5383 X 211	5	35X102	JANUARY 2017 187678-187682
(330) 042-3303 X 211	5	337102	107070-107002
EL METRO			
401 SCOTT ST.			
LAREDO, TX 78040	0	251400	DEC. 2008
JOE JACKSON, TRANSIT OPS DIRECTOR 956-795-2288 X 211	9	35X102	176090-176098 APRIL 2011
330-730-2200 X 2 1 1	6	40X102	178156-178161
	6	35X102	178162-178167
	_		JUNE 2015
	9	40X102	185890-185898
	2	40X102	MARCH 2017 189179-189180
	2	40/(102	OCTOBER 2017
	1	40X102	184261-184261
ENTERPRISE - LAX			
8734 BELLANCA AVE. LOS ANGELES. CA 90045	2	35X102	OCT. 2010 176518-176519
HENRY SINGH, BUS OPERATIONS MGR	2	357102	FEB. 2011
415-760-0075 HARJEET.SINGH@EHI.COM	1	35X102	177513
			MAY 2012
	2	35X102	180407-180408
	3	35X102	DEC 2014 183963-183965
	5	357102	DEC 2014
	2	40X102	183972-183973
ENTERPRISE/SAN DIEGO			
2942 KETTNER DRIVE	4	251400	JUL 2012
SAN DIEGO, CA 92101 HENRY SINGH, BUS OPERATIONS MGR	1	35X102	181906 JUL 2012
415-760-0075 HARJEET.SINGH@EHI.COM	1	35X102	181950
C C			AUG 2012
	2	35X102	181526-181527
ENTERPRISE RENT-A-CAR 7201 S. FULTON ST.			
CENTENNIAL, CO 80112			NOV. 2008
KERRI TIERNAN, VEHICLE ACQUISITION MGR	2	40X102	79715-79716
720-875-9916			
ENTERPRISE NATIONAL ALAMO 24530 E. 78TH AVE.			
DENVER, CO 80249			OCT. 2011
DOMINIC JIRON, MAINTENANCE MANAGER	3	40X102	180574-180576

DIESEE EOW I EOOR CO			
CUSTOMER 303.342.7373	QTY	SIZE	<u>DELIVERY DATE /</u> SERIAL NUMBERS
<u>ERIE MTA</u> 127 E. 14TH ST.			
ERIE, PA 16503 MICHAEL TANN, EXEC. DIRECTOR 814-459-4287	6	35X102	AUG. 2005 76327-76332 NOV. 2005
814-439-4287	1	29X102	91099
			MARCH 2006
	5	35X102	76470-76474 SEPT. 2007
	4	35X102	78301-78304 JAN. 2009
	5	35X102	176080-176084 JUNE 2010
	3 4	29X102	91746-91747
	4	35X102	178299-178302 MARCH 2017
	5	29X102	93083-93087
ESCAMBIA COUNTY AREA TRANSIT 1515 W. FAIRFIELD DR.			
PENSACOLA, FL 32501			JULY 2006
MATT CRITTENDEN, GENERAL MANAGER 850-595-3228	6	29X102	90830-90835 JUNE 2007
	6	29X102	91282-91287
ESCOT BUS SALES 6890 142ND AVE N			
LARGO, FL 33771			JANUARY 2014
BRIAN SCOTT, PRESIDENT	5	40X102	183510-183514
727-545-2088			
ESTUARY TRANSIT DISTRICT			
JOSEPH COMERFORD, EXECUTIVE DIRECTOR	3	001/400	JANUARY 2019
860-510-0429 EXT 101	3	29X102	93446-93448
EUREKA, CITY OF			
133 "V" ST. EUREKA. CA 95501-0844			MAY 2014
GREGG PRATT, GM	2	35X102	183297-183298
707-443-0826			
EVERETT, CITY OF			
3225 CEDAR ST.			
EVERETT, WA 98201	8	35X102	APRIL 2006
GEORGE BAXTER, OPERATIONS MGR 425-257-8935	4	40X102	76823-76831 DEC. 2007
			78486-78489
FAIRBANKS NORTH STAR BOROUGH	2	40X102	JUNE 2012 180449-180450
3175 PEGER RD	Z	40/102	100449-100450
FAIRBANKS, AK 99709	6	29X102	JUNE 2007
ROBERT WELLS, TRANSP. SHOP FOREMAN 907-459-1001	4	35X102	91023-91028 76385-76388
307-433-1001	-	337102	FEB 2014
FAIRFAX, VA	3	35X102	183901-183903
10455 ARMSTRONG STREET	6	35X102	JULY 2015
FAIRFAX, VA 22030			185355-185360
WENDY BLOCK SANFORD, DIRECTOR OF TRANSPORTATI 703-385-7889	UN		
FAIRFIELD TRANSPORTATION CENTER 2000 CADENASSO DR.			
FAIRFIELD, CA 94533	2	35X102	JULY 2001

<u>CUSTOMER</u> NATHANIEL ATHERSTONE, TRANSIT MGR 707-434-3804	<u>QT</u> 3	<u>Y SIZE</u> 35X102	DELIVERY DATE / SERIAL NUMBERS 72552-72553 JUNE 2009 176426-176428
<u>FAYETTE COUNTY</u> 825 AIRPORT RD LAMONT FURNACE, PA 15456 LORI GROOBER-SMITH, DIRECTOR (724) 628-7532 Ext. 104	6	29X102	MAY 2008 91494-91499
<u>FAYETTEVILLE, CITY OF</u> 455 GROVE ST. FAYETTEVILLE, NC 28301-0998	4	35X102	JUNE 2008
RANDY HUME, DIRECTOR 910-433-1011	3	40X102	78825-78828 JULY 2009
	3	35X102	176680-176682 JUNE 2012 180798-180800
FIRST TRANSIT 3204 COMO AVENUE MINNEAPOLIS, MN 55414 JOE KRAUS, SERVICE MGR 612-306-2086	8	40X102	MAY 2008 78971-78978
<u>FIRST TRANSIT</u> 1200 W. INDUSTRIAL AVE., UNIT 4 BOYNTON BEACH, FL DAVID KNOTT, GM 561-738-6008	5	29X102 35X102	JULY 2005 90100-90104 MARCH 2007
FIRST TRANSIT DBA	3	40X102	76407-76408 SEPT. 2009 177568-177570
IMPERIAL VALLEY TRANSIT 792 N. ROSS AVE. EL CENTRO, CA 92243	9	40X102	OCT. 2012 180552-180560
DAVID SALGADO, TRANSIT PLANNER 760-592-4494	6	29X102	JUNE 2015 183695-183700
FIRST TRANSIT INC. 1200 BUSTLETON PIKE, STE 12 FEASTERVILLE, PA 19053 ROBERT JONES, VP 215-942-9212	25	40X102	MAY 2006 77200-77224
<u>FIRST TRANSIT CHICAGO MIDWAY</u> 5028 WEST 67TH STREET BEFORD PARK, IL 60638 MANSOOR SYED, GENERAL MANAGER 708-924-4017	12	35X102	JANUARY 2013 181674-181677 181679-181685
FIRST TRANSIT PUERTO RICO 1550 CARR 28 STE 2 PUERTO NUEVO PR 00920 JULIO BADIS, MANAGER 787-622-6161 X 1000	19	40X102	SEPT. 2009 176896-176914
FLINT, MI - MASS TRANSPORTATION AUTHORITY 1404 S. DORT HIGHWAY			JULY 2017

CUSTOMER	<u>QTY</u>	SIZE	<u>DELIVERY DATE /</u> SERIAL NUMBERS
FLINT, MI 48503 ERIC CHENOWETH, DIRECTOR OF FLEET & FACILITIES 810-780-8865	2	40X102	187018-187019
FOND DU LAC AREA TRANSIT 530 N. DOTY ST.			
FOND DU LAC, WI 54935 TERRY BURNETT, FLEET MANAGER	4	29X102	MARCH 2011 92156-92159
920-322-3650	1	29X102	OCT. 2012 92330
FOOTHILL TRANSIT ZONE 100 S. VINCENT AVE., STE 200	2	29X102	APRIL 2013 92507-92508
W. COVINA, CA 91790 ROLAND CORDERO, DIRECTOR OF MAINT & VEHICLE TECH.	77	40X102	AUG 2000 71120-71196
626-931-7236	7	29X102	SEPT. 2000 90280-90286
<u>FT. WAYNE PTC</u> 801 LEESBURG RD	4	29X102	JUNE - JULY 2002 90518-90521
FT. WAYNE, IN 46808 MAURICE PEARL, GENERAL MANAGER	4	35X102	SEPT. 2002 72499-72502
260-432-4977	2	35xX102	JULY 2006 76883-76884
	6	35X102	FEB. 2008 78836-78841
	2	40X102	APRIL 2019 187105-187106
<u>FORT WORTH, TX - THE T</u> 1600 E. LANCASTER			
FORT WORTH, TX 76102 SERGIO RODRIGUEZ	1	40X102	FEBRUARY 2015 186805
817-215-8752	7	40X102	MARCH 2015 186806-186812
	4	40X102 29X102	MARCH 2015 186801-186804 APRIL 2015
	3	30X102	92992-92995 NOV. 2006
	1	40X102	76347-76349 JULY 2007
	3	40X102	78316 DEC. 2008
	23	40X102	79599-79601 FEBRUARY 2016
	36	40X102	186813-186835 AUGUST 2016 187937-187972
FRANKLIN REGIONAL TRANSIT AUTHORITY 12 OLIVE STREET GREENFIELD, MA 01301	1	35X102	APR 2017 188318
MICHAEL PERREAULT, ASSISTANT DIRECTOR 413-774-2262 EXT 105	2	35X102	JULY - AUG 2017 188319-188320
MICHAEL@FRTA.ORG	-	C. COL	
FRANKLIN TRANSIT AUTHORITY 708 COLUMBIA AVE.			
FRANKLIN, TN 37065 DIANE THORNE, EXEC. DIRECTOR 615-790-4005	1	35X102	AUG 2007 77799
FREDERICK COUNTY BOARD OF COMM 1040 ROCK SPRINGS			

CUSTOMER FREDERICK MD 21702	<u>QTY</u> 6	<u>SIZE</u> 29X102	DELIVERY DATE / SERIAL NUMBERS FEB. 2010
NANCY NORRIS, DIRECTOR 301- 600-2062			91800-91805
<u>FREE ENTERPRISE SYSTEM</u> 2345 SUMMER STREET			
HAMMOND, IN 46320 WES BLOCKER, SHOP MANAGER	9	40X102	AUG 2011 180473-180481
708-277-3773	5 2	40X102 29X102	FEBRUARY 2018 93248-93249
<u>FRESNO AREA EXPRESS</u> 2223 "G" ST.	2	23/102	33240-33243
FRESNO, CA 93706 BRIAN MARSHALL, DIR OF TRANSPORTATION	10	40X102	JUNE 1999 70583-70591 & 70602
559-621-1454	1	40X102	JUNE 2016 188530 AUGUST 2016
	6	40x102	188531-188536
	10	40X102	188537-188546 JANUARY-FEBRUARY 2017
	8	40X102	188513-188520
	9	40X102	188521-188529 AUGUST 2017
	9	40X102	189476-189484
<u>WASHINGTON RIDES</u> 50 EAST CHEsTNUT STREET WASHINGTON, PA 15301			FEB 2012
SHEILA GOMBITA, EXECUTIVE DIRECTOR 724-229-2502	2	35X102	179464-179465 MAY 2013
	2	29X102	91925-91926 JANUARY 2018
	2	29X102	93298-93299 APRIL 2019
	1	35X102	188317
	1	29X102	93419
<u>CITY OF GAINESVILLE</u> REGIONAL TRANSIT SERVICE PO BOX 490 STATION 32			NOV. 2007
GAINESVILLE, FL 32601 JESUS GOMEZ, TRANSIT DIRECTOR	12	40X102	78081-78092 MAY 2009
352-334-2609	4	40X102	177014-177017 MARCH 2011
	1	40X102	178435 DEC 2011
	5	40X102	179558-179562 MAY 2012
	6	40X102	180336-180341 DEC 2014
	3	40X102	183998-184000 MAY 2015
	2	40X102	184594-184595 NOVEMBER 2016
GALESBURG, CITY OF	7	40X102	188886-188892
55 W. TOMPKINS GALESBURG, IL 61401 KRAIG MCKLUSKIE, TRANSIT MGR	3	29X102	APRIL 2004 90783-90785
309-342-4242	1	29X102	JULY 2011 92323
	1	29X102	FEB. 2013 92273
GALLOPING GOOSE TRANSIT	2	29X102	AUGUST 2017 93123-93124

GALLOPING GOOSE TRANSIT 1370 BLACK BEAN RD

CUSTO	MER		<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS
TELURIDE, CO 81435 JASON WHITE, TRANSIT MGR 970-728-2179		1	2 <mark>9X10</mark> 2	APRIL 2009 91426
GARY PUBLIC TRANSP. CORP 100 W. 4TH AVE., 3RD FLOOR				
GARY, IN 46402		_		AUG 2007
DARYL LAMPKINS, GM 219-885-7555		5 3	35X102 40X102	78245-78249 78250-78252 FEB. 2010
		9	35X102	176550-176558 SEP 2014
		3	35X102	184383-184385 MARCH 2017
GASTONIA TRANSIT		1	35X102	186846-186846
PO BOX 1748 GASTONIA, NC 28053-1748 STEPHANIE BARNETT, MAINTEN 704-866-6854	ANCE MANAGER	7	35X102	JUNE 2004 72636-72642 APRIL 2011
704-000-0034		5	35X102	179148-179152 FEBRUARY 2019
GLENN TRANSIT SERVICE		2	35X102	189169-189170
777 N. COLUSA ST. WILLOWS, CA 95988		2	40X102	DEC. 2012
MARDY THOMAS, SR. PLANNER 530-934-6540		2	40X102	180215-180216 JULY 2016
<u>GOLDSBORO WAYNE TRANSP. AU</u> PO BOX 227	THORITY			184889-184890
GOLDSBORO, NC 27533 YOKISHA WRIGHT, GENERAL MA	ANAGER	1	35X102	OCT. 2009 176954
919-736-1374		2	35X102	SEPT. 2010 177074-177075
<u>GOLINE INDIAN RIVER TRANSIT</u> 694 14TH ST				
VERO BEACH, FL 32960				MARCH 2013
KAREN DEIGL, PRESIDENT/CEO 772-569-0760 X 104		1 2	29X102 35X102	92339 180870-180871
772-309-0700 X 104		2	29X102	JANUARY 2015 92928-92929 JANUARY 2016
<u>GOOD EARTH TRANSIT</u> PO BOX 70631		1	29X102	92986
HOUMA, LA 70631 WENDELL J. VOISIN, PUBLIC TRA	ANSIT ADMIN	8	35X102	MARCH 2008 78796-78803
985-850-4616		4	29X102	AUG 2011 92113-92116
<u>GRAND FORKS CITY BUS</u> 867 S. 48TH ST.				
GRAND FORKS, ND 58201 DALE BERGMAN, SUPERINTEND	ENT	1	29X102	MARCH 2003 90574
701-746-2590		1	29X102	AUG. 2004 90925
GRAND RAPIDS-DASH				
50 OTTAWA NW GRAND RAPIDS, MI 49503 BARBARA SINGLETON, DASH PF 616-4563755	ROGRAM MGR	5	29X102	MARCH 2011 92160-92164 MARCH 2017
<u>GRANT TRANSIT AUTHORITY</u> PO BOX 10		5	35X102	189353-189357

DIESEE LOW TEOOR			
<u>CUSTOMER</u> EPHRATA, WA 98823 GREG WRIGHT, TRANSIT MGR	<b>QTY</b> 1	<u>SIZE</u> 35X102	DELIVERY DATE / SERIAL NUMBERS JUNE 2007 77688
509-754-1075			
GRAYS HARBOR TRANSPORTATION AUTH.			APRIL 2002
705 30TH ST.	4	35x102	72527-72530
HOQUIAM, WA 98530	1	35x102	72277
MARK CARLIN, OPER. SUPERVISOR	0	05)(100	SEPT. 2006
360-532-2770	3	35X102	77430-77432 FEB 2012
	2	35X102	176328-176329
	4	251/400	APRIL 2012
	1	35X102	181557 FEB 2016
	1	35X102	185621
	3	40X102	185622-185624
	6	35X102	JANUARY 2019 193188-193193
	Ŭ	00/(102	MAY 2021
	2	40X102	195129-195130
GREAT FALLS TRANSIT DISTRICT			MARCH 2003
3905 NORTH STAR BLVD. GREAT FALLS, MT 59405	4	35X102	73445-73448 APRIL 2009
JIM HELGESON, GM	2	29X102	91644-91645
406-727-0382			AUG 2010
	4	29X102	92058-92061
	4	35X102	MARCH 2013 180309-180312
			AUGUST 2018
	5	35X102	192624-192628
<u>GREATER ATTLEBORO TAUNTON RTA</u> 10 OAK STREET			MAR - MAY 2006
TAUNTON, MA 02780	6	29X102	91153-91158
FRANK GAY, ADMINISTRATOR	4	00)/400	FEB 2010
508-823-8828 ext 220 FGAY@GATRA.ORG	4	29X102	91875-91878 DEC 2015
	2	29X102	93047-93048
		051(100	MAR 2018
	2	35X102	190681-190682 JUNE 2019
	2	35X102	192927-192928
GREATER DAYTONA RTA			
600 LONGWORTH ST.			
DAYTON, OH 45401 TOM HODGE, MAINT. MGR	5	40X102	JUNE 2007 77850-77854
937-425-8637	Ũ	10/1102	OCT. 2008
	13	40X102	79675-79687
	12	40X102	APRIL 2009 177247-177258
	12	40/102	APRIL 2010
	10	40X102	177968-177977
	24	40X102	FEB. 2016 187224-187247
	24	TUNIUZ	DAYTON, OH
GREATER GLENS FALLS TRANSIT	25	40X102	189837-189861
495 QUEENSBURY AVE. QUEENSBURY, NY 12804			SEPT. 2009
SCOTT SOPCZYK, TRANSP. DIRECTOR	4	29X102	91806-91809
518-792-1086			

CUSTOMER	QTY	SIZE	<u>DELIVERY DATE /</u> SERIAL NUMBERS
			SEPT. 1998
<u>GREATER LAFAYETTE PTC</u> 1250 CANAL RD	5	40X102	70165-70169
LAFAYETTE, IN 47902	5 4	40X102 40X102	70347-70350
MARTY SENNETT, GENERAL MANAGER	4	40/102	NOV. 1999
765-423-2666	3	40X102	70686-70688
100 420 2000	Ŭ	40/(102	NOV. 2002
	6	40X102	72870-72875
	-		FEB. 2003
	3	40X102	72879-72881
			NOV. 2005
	4	40X102	76486-76489
			JAN. 2007
	4	40X102	77696-77699
			DEC. 2007
	1	40X102	78313
		403/400	MAY 2009
	1	40X102	176027 MAX 2014
	1	251100	MAY 2014 184580
	I	35X102	184380
GREATER LYNCHBURG TRANSIT			
419 BRADLEY DRIVE			DEC 2008
LYNCHBURG, VA 24501	6	35X102	79939-79944
ALLEN ROBEY, TRANSPORTATION MANAGER			DEC. 2009
434-455-5092	4	35X102	177477-177480
<u>GREATER ORLANDO AVIATION AUTHORITY</u> 1 AIRPORT BLVD. ORLANDO, FL 32827 THOMAS ODAY, CONTRACTS MGR 407 825-2375	3	40X102	MAY 2012 180792-180794
GREATER PEORIA MASS TRANSIT			
2105 NE JEFFERSON	5	35X102	JUNE 2004
PEORIA, IL 61603			73217-73221
JOHN ANDERSON, DIR. OF FLEET & FAC.	7	40X102	73174-73180
309-339-2766			MAY 2011
	20	35X102	179995-180015
	-	051/400	NOV. 2011
	5	35X102	180126-180130 AUG 2012
	5	35X102	180229-180233
	0	00/(102	JANUARY 2013
	15	35X102	180234-180248
GREATER RICHMOND TRANSIT			
101 S. DAVIS AVE.			
RICHMOND, VA 23220	18	40X102	SEPT. 2008
DAVID GREEN, GENERAL MANAGER			79475-79492
804-474-9366	8	40X102	SEPT. 2012
			180993-181100
			JANUARY - FEBRUARY 2017
	9	40X102	187575-187583
	5	40X102	188811-188815
	5 4	40X102 29X102	188816-188820 93142-93145
	4	35X102	188807-188810
	4	00/102	AUGUST 2017
	3	40X102	190607-190609
GREATER ROANOKE TRANSIT COMPANY	0		
1108 CAMPBELL AVE., SE			
ROANOKE, VA 24013			JUNE 2014
JOHN THOMPSON, DIRECTOR OF MAINT. 540-982-0303 EXT 128	9	35X102	183912-183920

DIESEL LOW FLOOR COSTOMER LIST					
CUSTOMER	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS		
<u>GREELEY EVANS TRANSIT</u> 1200 A STREET GREELEY, CO 80634	2	35X102	JUNE 2016 188101-188102		
WILL JONES, TRANSIT MANAGER 970-350-9751	4	35X102	APRIL 2017 188651-188654		
<u>GREEN BAY METRO</u> 901 UNIVERSITY GREEN BAY, WI 54302 PATRICIA KIEWIZ, GENERAL MANAGER	10	35X102	JUNE 2011 180265-180274		
920-448-3454 <u>GREENFIELD MONTAGUE TRANSPORTATION AREA</u>	4	40x102	SEPTEMBER 2015 187388-187391		
TINA COTE, ADMINISTRATOR 417-774-2262	1	35X102	APRIL 2017 188318		
GREEN LINK TRANSIT	2	35X102	JULY 2017 188319-188320		
1021 S. MAIN ST.					
GREENVILLE, SC 29601 JAMES KEEL, DIRECTOR OF PUBLIC TRANSPORTATION 864-467-5000	2	35X102	JUNE 2010 177562-177563 JULY 2011		
004 407-0000	7	35X102	179398-179404 SEPT. 2012		
GREEN MOUNTAIN TRANSIT	3	35X102	180457-180459		
6088 VT ROUTE 12 BERLIN, VT 05602 RON WILD, MARKETING MANAGER 802-223-2882 X 208	1	35X102	JULY 2007 77199		
GREENSBORO TRANSIT AUTHORITY 320 E. FRIENDLY AVE.					
GREENSBORO, NC 27401 BRUCE ADAMS, SR. TRANSIT PLANNER 336-412-6237	10	35X102	DEC. 2006 77123-77132 JAN. 2009		
	4	35X102	176180-176183		
	5	35X102	APRIL 2009 176184-176188 JUNE 2015		
GREENVILLE, NC	2	40X102	181372-181373		
PUBLIC WORKS DEPT. 1500 BEATTY ST. GREENVILLE, NC 27834 STEPHEN MANCUSO, TRANSIT MANAGER	4	35X102	MAY 2003 73421-73424 MAY 2005		
252-329-4047	1	35X102	74118		
	2	35X102	MARCH 2006 76948-76949 OCT. 2008		
	2	35X102	79505-79506 AUG 2014		
	2	35X102	183929-183930 JANUARY 2019		
<u>GULFPORT, MS</u>	4	35X102	189615-189618		
333 DEBUYS RD. GULFPORT, MS 39507 KEVIN COGGIN, EXECUTIVE DIRECTOR	1	40x102	JULY 201 185587 AUGUST 2015		
228-296-8080 X 212	5	29X102	93055-93059		

DIESEE EOW I EOOR C			
CUSTOMER	QTY	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS
		051/100	AUGUST 2015
	1	35X102	184969
<u>GWINNETT COUNTY, GA</u>			
LAWRENCEVILLE, GA 30045 SYRIL MELVIN, OPERATIONS MANAGER	1	40X102	MARCH 2016 188779
770-822-7401	I	407102	MAY 2016
770-822-7401	27	40X102	188780-188806
	21	40/102	FEBRUARY 2018
	5	40X102	190651-190655
CITY OF GUADALUPE	0	10/1102	
918 OBISPO ST.			
GUADALUPE, CA 93434			APRIL 2005
JIM TALBOTT, EXEC. DIRECTOR	1	29X102	90992
805-922-8476	4	001/400	MAY 2007
	1	29X102	91298 DEC. 2010
	1	40X102	176481
		40/(102	MAY 2016
	1	40X102	186240
HAMILTON, OH			
BUTLER COUNTY RTA			
3045 MOSER CRT			
HAMILTON, OH 45011 MATTHEW DUTKEVICZ	12	35X102	JANUARY -FEB 2015 184832-184843
513-785-5246	12	357102	JULY 2016
010-700-02-40	3	35X102	186351-186353
	C C	00/1102	MARCH 2019
	2	35X102	192194-192195
HAMPTON ROADS TRANSIT			
3400 VICTORIA BLVD.			
HAMPTON, VA 23661	22,00	251400	APRIL 1999
MIKE PEREZ, DIR ROLLING STOCK 757-222-6000 X 6014	22+90	35X102	70607-70634 JUNE 2000
737-222-0000 × 0014	4	29X102	90294-90297
			JUNE 2002
	16	35X102	72510-72525
			OCT. 2002
	15	29X102	90540-90554
	10	40X102	AUG 2004 74425-74434
	10	407102	FEB. 2007
	40	40X102	77621-77660
			JAN. 2008
	29	40X102	78514-78542
			AUG 2008
	7	40X102	79963-79969
	3	40×102	DEC. 2008 79974-79976
	5	40X102	DEC. 2007
	10	29X102	91538-91547
			MAY 2008
	14	29X102	91566-91578
			AUGUST 2009
	2	29X102	91580-91581
	11	29X102	MAY 2011 92246-92256
	11	297102	DEC. 2011
	9	35X102	180021-180029
	· ·		SEPTEMBER 2015
	2	35X102	186898-186899
			NOVEMBER 2015
	29	40X102	188324-188352

CUSTOMER	<u>c</u>	<u>)TY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
		3	35X102	FEBRUARY 2016 188353-188355 NOVERMBER 2017
		1	40X102	187260 JUNE 2018
		3	40X102	191452-191454 JUNE 2018
		5	40X102	191455-191459
		7	35X102	188703-188709
		13	29X102	93230-93242
<u>HARRISONBURG, VA</u> 475 E. WASHINGTON ST. HARRISONBURG, VA 22802				OCT. 2003
REGGIE SMITH, DIR. OF PUBLIC TRANSP 540-432-0496		2	35X102	71691-71692 AUG. 2004
540-452-0490		6	35X102	74281-74286
		6	35X102	AUG 2008 79829-79834
		8	35X102	MARCH 2009 176368-176375
		4	35X102	JUNE 2011 179981-179984
		2	35X102	MARCH 2013 181285-181286
		3	35X102	JANUARY 2015 182412-182414
		1	35X102	JUNE 2015 184563
		8	35X102	AUGUST 2016 187637
<u>CITY OF HATTIESBURG</u> 1001 TIPTON ST. HATTIESBUR, MS 39401 VINCENT NELMS, DIVISION MGR 601-545-4670		2	29X102	SEPT. 2007 91394-91395
<u>HAZLETON PUBLIC TRANSIT</u> 126 W. MINE STREET HAZLETON, PA 18201 RALPH SHARP, DIRECTOR		2	29X102	OCT. 2006 90947-90948
570-459-5414		1	29X102	NOV. 2009 91810
		2	29X102	MARCH 2012 92361-92362
		2	29X102	JULY 2015 92950-92951
HERNANDO COUNTY BOARD OF COUNTY COMMISSIONERS 20 N. MAIN ST.				
BROOKSVILLE, FL 34601 RONALD F. PLANTA 352-754-4057		1	29X102	JANUARY 2015 92952 AUGUST 2016
552-154-4051		2	29X102	93155-93156 MAY 2017
		1	29X102	93205-93205 JANUARY 2018
		1	29X102	93350 MAY 2019
		2	29X102	93289-93290
<u>HERTZ CORPORATION</u> 225 BRAE BLVD. PARK RIDGE, NJ 07656-0713 RON PIA, MGR. BUS PROGRAMS 201-307-2142	1	149	40X102	SEP 1997-MAR 1999 70003-70151
	HERTZ AZ			

<u>HERTZ, AZ</u>

CUSTOMER	<u>QTY</u>	SIZE	DELIVERY DATE / SERIAL NUMBERS
	2	40X102	MAR 1999 70419-70420 JUL-AUG 1999
HERTZ.	3	40X102	70499-70501
	4	40X102	MAR 1999 70421-70424
	4	40×102	AUG 1999 70436-70437
	2	40×102	JUNE 1999 70449
	5	40×102	JUL-SEP 1999
			70502-70506 JULY 2012
	2	40X102	181895-181896 JUNE 2013
	3	40X102	182878-182880 FEB 2014
<u>HERTZ,</u>	1 <u>CO</u>	40X102	182881
	2	40X102	MAY 1999 70417-70418
	2	40X102	APR 1999 70434-70435
	4	40X102	JUNE 1999 70445-70448
	2	40X102	SEP 1999 70483-70484
	1	40X102	AUG 1999 70491
	20	40X102	FEB-SEP 2011 179204-179223
<u>HERTZ,</u>			MAR 1999
	2	40X102	70413-70414 APR 1999
	2	40X102	70428-70429 MAY 1999
	1	40X102	70441 JUNE 1999
	1	40X102	70455 JUL 1999
	1	40X102	70516
	7	40X102	OCT 1999 70524-70530
	11	40X102	AUG-SEP 1999 71232-71242
	1	40X102	MAR 2011 179258
	3	40X102	SEP 2011 179259-179261
<u>HERTZ,</u>	2	40X102	AUG 1999 70520-70521
<u>HERTZ</u>	<u>., IL</u> 1	40X102	APR 1999 70416
	2	40X102	APR 1999 70432-70433
	- 1	40X102	JUNE 1999 70444
	1	40×102	JULY 1999
	1	40X102	70458 MAY 1999 70482
30 of 103	I	407102	10482

<u>CUSTOMER</u>		<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
				DEC 2010-SEP 2011
	<u>HERTZ, MA</u>	19	40X102	179281-179299
		2	40X102	AUG 1999 70522-70523
				MAR-AUG 2011
	HERTZ, MI	16	40X102	179224-179239
	<u>,</u>			JULY 1999
		1	40X102	70456 JUNE 1999
		2	40X102	70496-70497 SEP 2001
		3	40X102	72991-72993 NOV 2010-JULY 2011
		14	40X102	179262-179275
	<u>HERTZ, NC</u>			FEB 2005
		5	40X102	74607-74611
		_		APR-JULY 2011
	HERTZ, NV	5	40X102	179253-179257
	<u>,</u>			APR 1999
		1	40X102	70431
		2	40X102	JUNE 1999 70450-70451
		2	40/(102	JULY 1999
	HERTZ, NY	1	40X102	70487
	<u>1121(12,111</u>			APR 1999
		2	40X102	70411-70412
		1	40X102	APR 1999 70425
		I	40/102	APR 1999
		1	40X102	70427
		2	40X102	JUNE 1999 70439-70440
				JUNE 1999
		3	40X102	70452-70454 AUG 1999
		1	40X102	70459
				JUNE 1999
		2	40X102	70494-70495 JULY-SEP 1999
		6	40X102	70507-70510
				SEP-OCT 1999
	<u>HERTZ, PA</u>	3	40X102	70513-70515
	<u>112(12,17</u>			DEC 2010-JULY 2011
	<u>HERTZ, TN</u>	13	40X102	179240-179252
			40)/400	APR 1999
		1	40X102	70426 MAY 1999
		1	40X102	70438
		2	40X102	JUNE 1999 70492-70493
	<u>HERTZ, TX</u>	2		10432-10433
				APR 1999
		1	40X102	70415 APR 1999
		1	40X102	70430
				MAY 1999
		1	40X102	70443 SEP 1999

DIESEL LOW I				
<u>CUSTOMER</u>		<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
	<u>HERTZ, VA</u>	1	40X102	70485 MAY 1999
		1	40X102	70442 JULY 1999
		1	40X102	70486
HILLSBOROUGH AREA REGIONAL TRANSIT 4305 E. 21ST. AVE.				
TAMPA, FL 33605 JAMES FETZER, DIR. OF MAINTENANCE 813-623-5835 X 196		16	35X102	FEB. 1999 70468-70481 70631-70632 JULY 2000
		17	29X102	90252-90266 90292-90293
		20	40X102	NOV. 2000 90387-90403 MARCH 2002
		11	40X102	73025-73033 & 73098
		10	29X102	MARCH 2003 90765-90774 JUNE 2003
		13	40X102	73570-73582
		11	40X102	APRIL 2004 74386-74397 NOV. 2004
		5	40X102	74848-74752 NOV. 2005
		12	40X102	76490-76501 APRIL 2006
		12	40X102	76886-76896 JUNE 2007
		5	29X102	91258-91262
		30	40X102	SEPT. 2009 177170-177199 MARCH 2010
		29	40X102	178008-178036
		12	40X102	SEPT. 2013 182720-182731 FEBRUARY 2015
		22	40X102	185631-185652 JULY 2016
		13	40X102	188835-1888347 JULY 2017
		15	40X102	189137-189151 OCTOBER 2017
CITY OF HOT SPRINGS		10	40X1102	190100-190109
100 BROADWAY TERR HOT SPRINGS, AR 71901				JAN. 2009
RICHARD CRANDON, RESIDENT ADVISOR 501-321-6954		1	29X102	91667 AUG 2010
HOUSATONIC AREA REG. TRANSIT		2	29X102	91999
62 FEDERAL RD				0.07.0007
DANBURY, CT 78408-417 ERIC BERGSTRAESSER, CEO 203-744-4070 X 132		10	35X102	OCT. 2007 78408-78417 SEP 2014
		10 2	35X102 35X102	182389-182398 182399-182400
		5	35X102	JANUARY 2017 187746-187750
<u>HOUSTON AIRPORT SYSTEM</u> 16930 JOHN F. KENNEDY BLVD.		5	334102	10//40-10//30
HOUSTON, TX 77032			10:115-	SEP 2002-JANUARY 2003
DAVE DAVENPORT, GM 713-233-1019		26	40X102	72150-72175

CUSTOMER	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
HOUSTON RAC 17340 RENTAL CAR AVE HOUSTON, TX 77032 DAVE DAVENPORT, GM (FIRST TRANSIT) 281-233-1019	28	40X102	SEP 2014 - JANUARY 2015 184660-184687
HOWARD CO. GOVERNMENT 8800 CORRIDOR ROAD ANNAPOLIS JUNCTION, MD MARK PRITCHARD, REGIONAL MANAGER 410-796-6589	3	35X102	JANUARY 2011 178500-178502
HUMBOLDT TRANSIT AUTHORITY 133 "V" ST.			
EUREKA, CA 95501-0844 GREG PRATT, GM 707-443-0826	2	40X102	MARCH 2011 176323 APRIL 2014
	2	40X102	183020-183022 NOVEMBER 2015
	2	40X102	184879-184880
	1	40X102	184881
	1	40X102	184882
	1	40X102	FEBRUARY 2017 184887-184887
IDM 30022 BEVERLY RD ROMULUS, MI 48174 CHUCK COVINGTON, PRES. & CEO 734-467-7000	6	40X102	FEB. 2005 74931-74937
INDIANA UNIVERSITY 120 W. GRIMES LANE BLOOMINGTON, IN 47401	18+8	40X102	DEC. 1998 70236-70253
PERRY MAULL, OPS MGR 812-855-8384			JUNE 2002
	2	40X102	71694-71694 JUNE 2005
	4	40X102	75043-75046 JUNE 2015
	5	35x102	185825-185829 MAY 2016
	2	35x102	183501-183502 MARCH 2017
	2	35X102	183503-183504 MARCH 2018
	6 2	35x102 40X102	191981-191986 191491-191492
INDIANA COUNTY TRANSIT AUTHORITY	2	40/102	191491-191492
1657 SALTSBURG AVE. INDIANA, PA 15701	2	29X102	MARCH 2013 92284-92285
JOHN KANYAN, EXEC DIRECTOR 724-465-2140 X 106     JKANYAN@INDIGOBUS.COM	2	29X102	APRIL 92649-92650
	3	29X102	SEPTEMBER 2015 93007-93009
INDIANAPOLIS PTC 1501 W. WASHINGTON ST.			
INDIANAPOLIS, IN 46222 VICKI LEARN, DIRECTOR OF MAINTENANCE 317-614-309	25	29X102	MAR - JUNE 2000 90362-90386 OCT - DEC 2000
	25	35X102	72340-72634 FEB - MAR 2001
	25	40X102	72559-72583
	24	40X102	SEPT. 2003 72594-72617

DIESEE EOW I	ECON COSTOMEN LIST		
CUSTOMER	QTY	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS
	10	40X102	JAN. 2008 79380-79389
	11	40X102	DEC 2010 178436-178446 AUG 2014
	3	40X102	184551-184553 DEC 2014 - JANUARY 2015
	10	40X102	184564-184573 JULY- AUG 2015
	13	40X102	186657-186669 JUNE-JULY 2016
	13	40X102	187353-187365 FEBRUARY 2017
	8	40X102	190016-190023 MAY 2017
	8	40X102	190024-190031 JUNE 2018
	8	40X102	192171-192178 OCTOBER 2018
	9	40X102	192179-192187 MAY 2019
INTERCITY TRANSIT	16	40X102	193172-193187
526 S. PATTISON ST. OLYMPIA, WA 98507-0659 ANN FREEMAN-MANZANARES, GM	12	40X102	JULY 1998 701170-70181
360-705-5838	8	35X102	JULY 2004 70833-70840
	4	35X102	FEB. 2005 75106-75109
	4	35X102	JULY 2005 75256-75259
	4	29X102	NOV. 2005 91095-91098
	5	35X102	DEC. 2005 76509-76513
	5	40X102	DEC. 2007 78390-78394
	8	29X102	91376-91383 AUG 2012
	23 2	40X102 40X102	181052-181072 182005-182006
	8	35x102	APRIL 2019 192483-192490
INTERURBAN TRANSIT PARTNERSHIP 300 ELLSWORTH SW			
GRAND RAPIDS, MI 49503 STEVE SCHIPPER, Chief Operating Officer	13	40X102	OCT. 2004 74850-74862
616-774-1216 email: sschipper@ridethe rapid.org	9	40X102	AUG. 2005 76477-76485
	14	40X102	AUG 2006 77133-77146 MARCH 2007
	2	40X102	77595-77596 AUG 2007
	7	40X102	78093-78099 FEB. 2008
	7	40X102	78781-78787 JAN. 2009
	8	40X102	78788-78795 AUGUST 2009
	7	40X102	176827-176833 SEPT. 2009

CUSTOMER	<u>QTY</u>	SIZE	<u>DELIVERY DATE /</u> SERIAL NUMBERS
	25	35X102	176834-176858
	12	40X102	NOV. 2011 180089-18100
	21	40X102	JULY 2012 181052-181072
	21	40/102	SEPT. 2012
	2	40X102	182005 & 182006 JANUARY 2017
	21	40X102	188725-188745
	1	40X102	APRIL 2017 188751-188751
	_	10)(100	JUNE 2017
	5	40X102	188746-188750

IOWA CITY TRANSIT 1200 S. RIVERSIDE DR.			
IOWA CITY, IA 52245			JUNE 2007
CHRIS O'BRIAN, TRANSIT MGR	6	40X102	77476-77481
319-356-5154	Ũ	10/1102	JAN FEB. 2016
	13	40X102	184898-184910
	10	40/(102	DECEMBER 2017
	4	40X102	190078-190081
	4	40X102 40X102	190082-190085
	4	407102	JUNE 2018
	3	402400	
	3	40X102	189694-189696
ISABELLA COUNTY TRANSPORTATION			
2700 E. TRANSPORTATION DR.			
MT. PLEASANT, MI 48858	_		MARCH 2004
JANICE L. BAUMAN, GM	3	29X102	90740-90742
989-773-2913			AUG. 2004
	1	29X102	90743
ISE CORP.			
12302 KERRAN ST.			JAN. 2007
POWAY, CA 92064	1	40X102	77499
GARY WILLMS			
858-413-1736			
ISLAND TRANSIT			APRIL 2009
19758 SR 20	2	40X102	79441-79442
COUPEVILLE, WA 98239			JAN 2011
KEN RILEY, MAINT. MGR	4	40X102	178545-178548
360-678-9570			MAR 2019
	2	29X102	93485-93486
			JUNE 2021
	2	29X102	93873-93874
JACKSON PUBLIC TRANSPORTATION CO.			FEB. 2006
1025 TERRY RD.	4	40X102	76677-76680
JACKSON, MS 39207-2809			OCT. 2006
NATE ROBINSON, DIR OF MAINT	8	35X102	77414-77421
601-948-7140			FEBRUARY 2017
	2	29X102	93161-93162
			SEPTEMBER 2018
	2	35X102	191938-191939
	- 1	40X102	191895
	•	10/1102	MARCH 2019
	2	35X102	192481-192482
	2	00/102	102401-102402

	QTY	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
	<u></u>		
JACKSON, TOWN OF PO BOX 1687			
JACKSON, WY 83001			JUNE 2009
TOM GUHEEN, TRANSIT OPERATIONS MGR 307-733-4521	2	29X102	91424-91425 OCT. 2009
001 100 4021	5	40X102	176955-176959
	2	29X102	MAY 2011 92196-92197
			OCT. 2012
	1	40X102	180507 SEP 2014
	1	40X102	183550
	3	40X102	NOVEMBER 2015 186847
JACKSON TRANSIT AUTHORITY			
241 E. DEADRICK ST. JACKSON, TN 38301			JUNE 2009
BRAD CHARKOWSKE, EXECUTIVE DIRECTOR	1	29X102	91431
517-780-3790	1	29X102	JUNE 2010 91932
			APRIL 2012
	1	29X102	92400 NOV 2014
	1	29X102	92646-92647
	2	29X102	OCTOBER 2017 93137-93138
JACKSON TRANSPORTATION AUTHORITY			
2350 E. HIGH ST. JACKSON, MI 49203	1	35X102	SEPT. 2008 79455
BRAD CHARKOWSKE, EXECUTIVE DIRECTOR			AUGUST 2008
517-780-3790	1 5	40X102 29X102	77893 91636-91640
	Ū	20/(102	JUNE 2010
	4	35X102	177316-177319 MARCH 2012
	2	35X102	178137-178138
JACKSONVILLE TRANSPORTATION AUTHORITY 100 N. MYRTLE AVE.			
JACKSONVILLE, FL 32203			MARCH 2004
LISA DARNALL, COO	25	35X102	73476-73500
904-630-3181	21	40X102	74790-74810 JUNE 2007
	22	40X102	77551-77572
	3	29X102	JAN. 2008 91478-91480
			APRIL 2009
	6	40X102	79398-79403 APRIL 2010
	14	40X102	177785-177798
	3	40X102	APRIL 2011 180101-180103
			SEPT. 2011
	13	40X102	179447-179459 JUNE 2013
	6	40X102	181751-181756
	7	40X102	JULY 2013 181757-18181
			OCT 2014
	10	40X102	183988-183997 SEPTEMBER 2015
	11	40X102	188261-188271
	1	40X102	SEPTOCT. 2015 188272
	-		OCT 2015

DIEGEL LOW I LOOK C		,	
CUSTOMER	<b>QTY</b> 11	<u>SIZE</u> 40X102	DELIVERY DATE / SERIAL NUMBERS 188273-188283
	16	40X102	SEPTEMBER 2017 189537-189552
<u>JAMES MADISON UNIVERSITY</u> 1603 S. MAIN ST. HARRISONBURG, VA 22807			JUNE 2019
	2	35X102	193025-193026
<u>JEFFERSON CITY</u> 820 E. MILLER ST. JEFFERSON CITY, MO 65101 RICHARD TURNER SR., TRANSIT DIV. DIR. 573-634-6599	5	35X102	JUNE 2005 74542-74546 SEPT. 2006
	3	35X102	76413-76415
	2	29X102	JANUARY 2011 91980-91981 FEB. 2012
	2	29X102	92117-92118
JEFFERSON TRANSIT			MAY 2011
1615 W. SIMS WAY PORT TOWNSEND, WA 98368 PEGGY HANSON, GM	2	29X102	92208-92209 JULY 2018
360-385-3020 X 113	2	35X102	189104-189105
	2	29X102	NOVEMBER 2018 93415-93416
JEFFERSON PARISH	-	20,002	
90 FIRST ST.	4	001/400	MAY 2010
GRETNA, LA 70053 ORLANDO PIERRE, GM	1 17	29X102 40X102	91938 177934-177950
504-367-0519			AUG 2012
	8	40X102	181173-181180 APRIL 2013
	4	29X102	92426-92429 APRIL 2019
	11	40X102	193586-193596
<u>JOHNSON CO. TRANSIT</u> 1701 WEST 56 HWY OLATHE, KS 66061			AUG 2007
PETE HENSCHKE, OPERATIONS MANAGER 913-715-8348	3	40X102	78260-78262 AUG 2009
	9	40X102	176922-176930 JUNE 2011
	4	40X102	179432-179435 JANUARY 2013
	6	29X102	92420-92425 FEB. 2013
	4	40X102	181855-181858 AUGUST 2015
	3	29X102	92977-92979 AUGUST 2015
	2	29X102	92980-92981 SEPTEMBER 2015
	3	40X102	184912-184914 MAY 2018
KALAMAZOO, CITY OF	3	29X102	93269-93271
241 W. SOUTH ST.			
KALAMAZOO, MI 49007-4796 ROB BRANCH, MAINT DIRECTOR	6	35X102	OCT. 1998 70339-70344
616-337-8020	5	40X102	JUNE 2000 71076-71080
	3	35X102	JUNE 2000 71081-71083
	5	35X102	AUG 2003 73655-73659 MARCH 2006

MARCH 2006

			DELIVERY DATE /
CUSTOMER	QTY	SIZE	SERIAL NUMBERS
	4	40X102	76681-76684 FEB. 2008
	4	35X102	78438-78441
		00/1102	MARCH 2009
	7	35X102	78442-78448
	2	251400	MARCH 2015
	2	35X102	182076-182077 SEPTEMBER 2017
	3	40X102	189034-189036
			JUNE 2018
	2	40X102	189613-189614 MARCH 2019
	2	40X102	192903-192904
	3	29X102	93472-93474
1550 FOURTH AVE. CHARLESTON, WV 25324	2	29X102	SEPT. 2009
DENNIS DAWSON, GM	-	20/(102	91753-91754
304-343-3840	8	35X102	176971-176978
	-	001/400	JANUARY 2014
	5 6	29X102 35X102	92582-92586 181972-181977
	0	00/(102	FEBRUARY 2015
	2	35X102	185365-185366
	3	29X102	NOVEMBER 2016 93067-93069
	3	297102	MARCH 2018
			188634-188641
			MARCH 2019
			93450 JUNE 2019
			192773-192778
			93587-93590
K.C.A.T.A.			
1200 E. 18TH ST. KANSAS CITY, MO 64108	1	40X102	MARCH 2000
WALT WOODWARD, DIR. OF MAINT	I	40/102	70346
816-346-0308	1	29X102	AUG 1999
	47	40,400	90281
	17	40x102	SEPT. 2002 73367-73383
	26	40x102	APRIL 2003
			73105-73130
	19	40x102	JUNE 2004 73994-74012
	12	40x102	JUNE 2005
	12	40x102	76072-76083
	1	40x102	DEC. 2005
	19	40x102	76326 FEB. 2006
	19	402102	76538-76556
	8	40x102	MARCH 2007
			78073-78080
	10	29X102	MARCH 2007
	17	29X102	91332-91341 MAY 2008
			91521-91537
	7	40X102	FEB. 2010
	6	40¥400	176165-176171 177521-177526
	0	40X102	MARCH 3011
	6	40X102	180042-180047
	~~	001//02	APRIL 2011
	22	29X102	92301-92322 SEPT. 2012
			SEF 1. 2012

DIESEE EOW I EOOK G			
CUSTOMER	<u>QTY</u> 12	<u>SIZE</u> 29X102	DELIVERY DATE / SERIAL NUMBERS 92551-92562
	5	40X102	JUNE 2015 186185-186189 JUNE-JULY 2015
	10	40X102	186190-186199 MARCH 2016
	2	40X102	186200-186201
	2	40X102	186202-1862013
	10	40X102	MARCH 2017 189117-189126 JULY 2017
	10	40X102	189127-189136
KANSAS CITY INT'L AIRPORT			
936 TEL AVIV AVE. KANSAS CITY, MO 64153 ED MURPHY, CHAIRMAN	20	40X102	MARCH 2007 77063-77082
<u>KENOSHA TRANSIT</u> 3735 65TH ST.			
KENOSHA, WI 53142 RON IWEN, GM	8	29X102	AUG. 2004 90917-90924
262-653-4291	4	35X102	74129-74132 MARCH 2005
	9	35X102	74900-74908 JULY 2009
	4	40X102	177000-177003 JULY 2010
	5	35X102	178535-178539 JANUARY 2012
	3	40X102	179308-179310
KETCHIKAN GATEWAY BOROUGH 344 FRONT ST.			
KETCHIKAN, AK 99901 KYAN REEVE, TRANSIT MANAGER	4	29X102	MARCH 2008 91446-91449
907-228-6623	2	29X102	DEC. 2011 92351-92352
THE JULE TRANSIT	1	35x102	MAY 2015 183082
2401 CENTRAL AVE. DUBUQUE, IA 52001 CANDACE EUDALEY, DIR OF TRANSIT OPS 563-589-4341	4	35X102	JUNE 2011 179460-179463
KEY WEST PO BOX 1078			
KEY WEST, FL 33040 NORMAN WITTICKER, GENERAL MANAGER	4	29X102	JUNE 2001 90408-90411
305-809-3918	7	29X102	JULY 2003 90684-90690
	2	35X102	JUNE 2008 78331-78332
	3	29X102	APRIL 2015 92920-92922
	1	29x102	92925 JANUARY 2016
	1	40X102	188779 FEBRUARY 2016
	1	29X102	93054 FEBRUARY 2016
	1	35X102	184634 NOVERMBER 2017

DIESEE EOW TEOOR COS			
			DELIVERY DATE /
CUSTOMER	<u>QTY</u>	SIZE	SERIAL NUMBERS
	2	29X102	93291-93292
		001/100	MARCH 2018
	2	29X102	93351-93352
	1	35X102	186333
<u>CITY &amp; COUNTY OF HONOLULU</u> 811 MIDDLE ST.			OCT 1998
HONOLULU, HI 96819	3	40X102	70604-70606
ADAM TAMAYOSHI, VP, MAINTENANCE	0	40/102	DEC. 2003-FEB. 2004
808-768-9463	55	40X102	74182-74236
			DEC. 2010
	10	35X102	179174-179183
			MAY - JULY 2012
	8	35X102	181341-181348
	40	40X102	181451-181490
	10	40X102	OCT 2012 181491-181500
	10	407102	JULY - AUG 2013
	18	40X102	182081-182098
	10	40/(102	JUNE - JULY 2014
	29	40X102	184401-184429
			JULY - AUG 2015
	29	40X102	186241-186269
			AUGUST 2015
	5	40X102	186685-186689
	_		AUG 2016
	5	40X102	188115-188119
	4	29X102	AUG - SEP 2016 93151-93154
	4	40X102	187256-187259
	4	40/102	MAY 2017
	4	40X102	189159-189162
			MAR 2018
	8	40X102	189412-189419
			APR - JULY 2019
	8	40X102	193456-193463
		001/100	JULY 2020
	8	29X102	93896-93903
CITY OF KINGSTON	0	251402	
17 HOFFMAN ST.	2	35X102	AUG 2007
KINGSTON, NY 12401	0	35X102	78317-78318
TONI ROSER, TRANSP. SUPERINTENDENT	2	357102	JUNE 2011
845-331-3725			178405-178406
KITSAP TRANSIT	0	051/400	
200 CHARLESTON BLVD.	2	35X102	JUNE 2003
BREMERTON, WA 98312 HAYWARD SEYMORE, DIRECTOR OF MAINTENANCE			73522-73523 JULY 2004
360-478-6229	10	35X102	74091-74100
000 410 0220	5	40X102	74106-74110
	5	40X102	JUNE 2005
			74111-74115
	4	35X102	74101-74105
			JULY 2016
	3	29X102	92962-92964
	5	29X102	93092-93096
	2	201/102	MAY 2017
	2	29X102	93088-93089
CITY OF KNOXVILLE			AUG - OCT 2008
301 CHURCH AVENUE	4	35X102	79725-79728
KNOXVILLE, TN 37915			JUNE 2009
SI MCMURRAY, CHIEF PROCUREMENT OFFICER	3	35X102	176689-176691
865-215-7803	6	40X102	176692-176697

DIESEE LOW	LOOK COSTOMEN LIST		
CUSTOMER	QTY	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS 40544
	6	35X102	179524-179529
	6	35X102	JULY 2011 179530-179535
	6	35X102	JUNE 2012 180433-180438
	2	40X102	FEB 2013 181712-181713
	3	35X102	FEB - MAR 2013 181715-181717
	5	35X102	JANUARY - FEB 2013 181729-181733
LA CROSSE MUNICIPAL TRANSIT UTILITY			
2000 MARCO DR.	4	35X102	AUG 2001
LA CROSSE, WI 54601 KEITH CARLSON, MANAGER 608-789-7350	7	35X102	72548-72551 APRIL 2002 72270-72276
	5	35X102	JULY 2007 78154-78158
<u>LA DOT</u> 100 S. MAIN ST.			42005
10TH FLOOR LOS ANGELES, CA 90012	1	29X102	92866
MIKE PASCUAL, TRANSP, PLANNING ASSOC. 11 213-928-9750 MICHAEL.PASCUAL@LACITY.OF		29X102	APR. 2015 - JUN. 2015 92867-92919
LAFAYETTE TRANSIT SYTEM			
100 LEE AVE. LAFAYETTE, LA 70502	4	35X102	SEPT. 2004 74013-74016
MIKE MITCHELL, TRANSIT SUPERVISOR 337-291-8571	4	35X102	JUNE 2005 75235-75238
	1	35X102	SEPT. 2007 78449
	3	35X102	NOV. 2008 79725-79728
	6		FEBRUARY 2015 183689-183694
CITY OF LAKE CHARLES		051/100	AUGUST 2010
4331 EAST BROAD ST. LAKE CHARLES, LA 70615	4 1	35X102 35X102	178340-178343 178344
ALECIA COMEAUX 337-491-1263	2	35X102	FEB. 2018 190012-190013
LAKE COUNTY, FL 2440 US HIGHWAY 441/27 FRUITLAND PARK, FL 34731 KENNETH HARLEY, TRANSP. MANAGER	3	35X102	JUNE 2015 184635-184637
352-323-5733			
<u>LAKE ERIE TRANSIT</u> 105 W. SEVENTH ST. MONROE, MI 48161	3	29X102	JANUARY 2009 91437-91439 42005
PAUL VAJCNER, MGR OF MAINTENANCE 734-242-6672 X 209	5	29X102	92823-92827 OCTOBER 2017
1 34-242-0012 1 203	2	29X102	93118-93119
LAKELAND AREA MASS TRANSIT DISTRICT 1212 GEORGE JENKINS BLVD.			MARCH 1999
LAKELAND, FL 33801	5+5	35X102	70463-70467
2021	50 of 103		

DIESEL LOW I LOOK CO.			
	QTY	SIZE	DELIVERY DATE / SERIAL NUMBERS
TOM PHILLIPS, TRANSIT DIRECTOR 941-688-7433	1	35X102	JAN. 2012 178142
	1	35X102	DEC 2014 183846 APRIL 2017
	5	35X102	189378-189382 OCTOBER 2018
	1 2	35X102 29X102	193226 93470-93471
LAKETRAN 555 LAKESHORE BLVD. PAINESVILLE, OH 44077 TERRI GOODSON, PROCUREMENT/GRANTS 440-350-1007	4	29X102	JUNE 2010 92054-92057
LANE TRANSIT DISTRICT PO BOX 7070	14+50	40X102	AUG 1998 70254-70267
EUGENE, OR 97402 GEORGE TRAUGER 541-682-6163	5	40X102	AUG 1999 70597-70601
041 002 0100	18	40X102	MAY 2003 73060-73077
	4	40X102	AUG 2002 73441-73444
	1	40X102	JULY 2005 75244
	20	40X102	JAN. 2007 77500-77519
<u>LANTA</u> 1060 LEHIGH ST. ALLENTOWN, PA 18103	4	40X102	OCT. 2006 77119-77122
RANDY FLYTE, MATERIALS & MAINT. SUP. 610-435-5739	4	35X102	77115-77118 JANUARY 2016
	3	35X102	186277-186279 JUNE 2017
	6	35X102	188103-188108
	3	35X102	188721-188723
	7	40X102	188714-188720
LARSEN COUNTY TRANSIT AUTHORITY 701-980 JOHNSTONVILLE RD SUSANVILLE, CA 96130 DAN DOUGLAS, TRANSPORTATION PLANNER 530-251-8305	1	40X102	JUNE 2010 177581
LASSEN CO. TRANSIT AUTHORITY 707 NEVADA ST., STE 4 SUSANVILLE, CA 96130 DAN DOUGLAS, TRANSIT PLANNER 530-251-8306	1	40X102	AUG 2012 181600
<u>LAVTA</u> 1362 RUTAN CRT, SUITE 100 LIVERMORE, CA 94551	4	40X102	AUG. 2002 73441-73444
MICHAEL TREE, EXECUTIVE DIRECTOR 925-455-7564	10	29X102	NOV. 2003 90746-90755
	24	40X102	SEPT. 2003 73703-73726
	7	35X102	JUNE 2016 187554-187560
	3	35X102	187561-187563 JULY 2016
	4 6	40X102 40X102	187564-187567 187568-187573

			DELIVERY DATE /
CUSTOMER	<u>QTY</u>	<u>SIZE</u>	SERIAL NUMBERS JULY 2017
	8 9	40X102 29X102	189360-189367 93305-93313 AUGUST 2017
	1	40X102	189368-189368
LAWRENCE, KS PO BOX 708 LAWRENCE, KS 66044 ROBERT A. NUGENT 785-832-3464	2	29X102	FEBRUARY 2015 92947-92948
LAWRENCE TRANSIT SYSTEM 933 NEW HAMPSIRE	3	40X102	JULY 2011 178402-178404
LAWRENCE, KS 66044 ROBERT NUGENT, PUBLIC TRANSIT AMIN 785-832-3464	1	29X102	FEBRUARY 2015 92949
<u>LAWTON AREA TRANSIT SYSTEM</u> 611 SW BISHOP AVE. LAWTON, OK 73501	2	29X102	DEC. 2011 92292-92293
RYAN LANDERS, GENERAL MANAGER 580-248-5252 X 101	1	29X102	OCT. 2012 92326
	4	29X102	AUG 2010 92241-92244 MAY 2017
	3	29X102	93250-93252
<u>LEBANON, COUNTY OF</u> 200 WILLOW ST. LEBANON, PA 17046	1	29X102	AUG 2007 91375
THERESA GIURINTANO, EXEC. DIRECTOR 717-274-3664 X 120	2	29X102	APRIL 2009 91642-91643 JUNE 2010
	2 2	40X102 29X102	177534-177535 92025-92026
	-	29X102	OCT. 2010 92207
<u>LEE COUNTY TRANSIT</u> 10715 E. AIRPORT RD.	7	35X102	MAY 2002
FT. MYERS, FL 33907 STEVE MYERS, GM	2	35X102	73341-73347 JAN. 2007
941-277-5008	3	35X102	77096-770979 JAN. 2010
	7	35X102	176749-176751 APRIL 2010
	6	40X102	177759-177765 AUGUST 2016 188912-188917
	4	35X102	184800-184803
LEXTRAN Transit Authority of Lexington-Fayette Urban County Government			
200 W. LOUDEN AVENUE LEXINGTON, KY 40508 JIM BARRETT, DIRECTOR OF MAINTENANCE	5	40X102	NOV. 2005 74642-74647 NOV. 2005
859- 255-7756, EXT. 404 jim.barrett@lextran.com	5	40X102	76462-76466 AUG 2007
J	9	40X102	78176-78184 DEC 2007
	8	40X102	78861-78868 NOV 2009
	1	29X102	91854 MAY 2011
	5	29X102	92141-92145

<u>CUSTOMER</u>	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
	1	40X102	SEP 2012 181246
	1	40X102	APR 2014 184243
	2	40X102	DEC 2014 185099-185100
<u>LINK TRANSIT</u> 2700 EUCLID AVE. WENATCHEE, WA 98801	4	29X102	NOV. 2004 90611-90614
TODD DANIEL, MAINT. MGR. 509-663-1342	4	29X102	JULY 2005 91030-91033
	3	40X102	APRIL 2007 78270-78272
	8	40X102	SEPT. 2008 78543-78550
	3	35X102	78551-78553
LOUDOUN COUNTY			
1 HARRISON ST LEESBURG, VA 20177-7000	5	40X102	FEB 2014 184124-184128
STEVEN ANGULO, TRANSIT OPERATIONS MANAGER 703-777-0119	5	40X102	MARCH 2016 186325-186329 NOVEMBER 2016
	4	40X102	186227-186230
CITY OF LOVELAND 410 E. FIFTH ST.	1	35X102	APRIL 2009
LOVELAND, CO 80537 STEVE KIBLER, FLEET MANAGER (970) 962-3343	2	35X102	78338 DEC. 2010 176330-176331
LOWELL RTA			
100 HALE ST. LOWELL, MA 01852 JIM SCANLON, ADMININISTRATOR	8	29X102	JAN 2005 90964-90971 OCT - NOV 2005
978-459-0164	1	29X102	91121
	2	29X102	91100-91102 FEB - MARCH 2007
	7	35X102	77534-77540 SEP 2007
	5	35X102	78200-78204 DEC 2008
	6	35X102	79321-79326 JUNE-JULY 2015
	6	29X102	93040-93045 AUG 2016
	12	29X102	93070-93081 AUG 2019
	3	35X102	191343-191345 FEB 2019
	7	35X102	191346-191352 SEP - OCT 2019
	5	35X102	191423-191427
<u>LUZERNE COUNTY</u> 315 NORTHAMPTON ST. KINGSTON, PA 18704	5	35X102	DEC. 1998 70351-70355
NORM GAVLIK, EXEC. DIR. 570-288-9356 x218	2	35X102	OCT. 2009 176623-176624
LYNX	2	35X102	DEC. 2009 176623-176624

<u>LYNX</u> 445 W. AMELIA ST., STE 800

**CUSTOMER** 

QTY	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
5	29X102	JULY 2005
-		90113-90117
5	35X102	SEPT. 2006
		77380-77384
30	40X102	77350-77379
3	29X102	MAY 2007
		91239-91240
2	35X102	78174-78175
4	40X102	JUNE 2007
		77929-77932
16	40X102	AUG 2007 77933-77948
5	35X102	77979-77983
5	337102	OCT. 2007
9	29X102	91462-91470
5	40X102	78185-78189
C C		JULY 2008
22	40X102	78901-78922
		AUG 2008
9	35X102	78923-78931
1	29X102	91623
		JUNE 2009
5	40X102	176573-176577
		JULY 2009
20	35X102	176578-176597
		177889-177897
		NOV. 2010
10	40X102	177907-177916
9	40X102	177898-177906
0	252400	AUGUST 2013
6	35X102	182998-183003
11	40X102	OCT. 2012 179679-179689
11	40/102	OCT. 2013
1	35X102	183004
I	337102	JULY 2013
11	40X102	182987-182997
		FEBRUARY 2014
7	40X102	183532-183538
		183539-183541
		MARCH 2014
5	40X102	183014-183018
9	35X102	183005-183013
		JANUARY 2015
20	40X102	184812 - 184831
		AUG - SEPT 2015
35	40X102	186976-187010
4	201402	
4	29X102	MAY 2010
4	29X102	91942-91945 FEBRUARY 2016
4	297102	
		93003-93006
3	35X102	MARCH 2004
0	40X102	73741-73743
3	407102	73744-73746 MARCH 2010

MARCH 2010

176602

ORLANDO, FL 32801 SUSAN BLACK 407-463-2279

MACATAWA AREA EXPRESS TRANSPORTATION AUTHORITY

LINDA LEFEBRE, TRANSIT MANAGER

MACOMB, IL (GO WEST TRANSIT)

171 LINCOLN, STE 20 HOLLAND, MI 49423

1 UNIVERSITY CIRCLE MACOMB, IL 61455 VACANT, DIRECTOR

309-298-1931

616-928-2486

1

35X102

CUSTOMER	<u>QTY</u>	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS
MADISON COUNTY TRANSIT ONE TRANSIT WAY	1	29X102	JULY 2010 92001
GRANITE CITY. IL	I	23/102	AUG 2010
JERRY KANE, EXEC DIRECTOR	1	40X102	177607
618-874-7433			NOV 2010
	12	29X102	92002-92003
	4 21	35X102	178105-178108
	21	40X102	177608-177628 DEC 2010
	11	29X102	92014-92024
			OCT-NOV 2012
	13	40X102	182110-182113
			NOV-DEC 2012
	13	29X102	92460-92472
MADISON TRANSIT			
1101 E. WASHINGTON ST.	15	40X102	MARCH 2004
MADISON, WI 58703			74408-74422
CHUCK KAMP, TRANSIT MGR.	3	40X102	FEB. 2005
608-266-4739			74765-74767
	00	40)/400	MARCH 2009
	22	40X102	176032-176053 JUNE 2009
	11	40X102	176112-176122
			OCT. 2011
	14	40X102	180104-180117
			DEC. 2012
	13	40X102	182110-182122
	13	29X102	92420-92472 JANUARY 2014
	18	40X102	183871-183881
			FEB 2014
	2	40X102	183889-183890
			APRIL - MAY 2015
	15	40X102	184986-185000
	15	40X102	MAY 2016 187539-187553
	15	40/102	MAY 2017
	15	40X102	187854-187868
MANCHESTER TRANSIT AUTHORITY	_		
110 ELM ST.	6	29X102	JUNE 2006
MANCHESTER, NH 03101-2799 MICHAEL WHITTEN, EXEC. DIRECTOR	3	29X102	91147-91152 JULY 2007
603-623-8801 ext 612	0	20/102	91351-91353
	3	29X102	AUG 2008
			91613-91615
MANKATO, CITY OF			
	4	402400	MARCH 2009
MANKATO, MN 56001 CRAIG REMPP, SUPERINTENDENT OF TRANSIT	1	40X102	176572 FEB. 2010
507-387-8655	3	35X102	177766-177768
			JUNE 2012
	1	35X102	180483
			DEC 2013
	1	35X102	180772
	3	40X102	SEP 2014 185396-185398
	5		FEB 2017
	1	40X102	188778
			MAY 2019
	1	40X102	192167

CUSTOMER	<u>QTY</u>	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS
MAPLE GROVE, CITY OF			
PO BOX 1180 MAPLE GROVE, MN 55311	3	40X102	MARCH 2013 181509-181511
MICHAEL OPATZ, TRANSP. COORDINATOR 763-494-6005	5	40X102	JUNE 2019 192585-192589
MARBLE VALLEY RTD			
158 SPRUCE ST. RUTLAND, VT 05701 BENNY HUGHES, FLEET MGR	4	35X102	MAY 2007 77889-77892 AUG 2008
802-773-3244 EXT 119 BENNY@THEBUS.COM	3	29X102	91626-91628 AUG 2009
	2	29X102	91766-91767 MAR 2011
	4	29X102	92228-92231
	1	29X102	92232 MAR 2014
	8	29X102	92662-92669 SEP 2015
	2	29X102	92990-92991 JULY 2019
	2	29X102	93287-93288
	2	35X102	190032-190033
MARIN COUNTY 711 GRAND AVE, SUITE 110	1	40X102	NOVEMER 2015 181501
SAN RAFAEL, CA 94901 ANNA PENOYAR, CAPITAL ANALYST	6	40X102	FEBRUARY 2016 181502-181507
415-226-0867	4	29X102	92953 OCTOBER 2017
MARITIME METRO TRANSIT	10	40X102	188166-188175
2655 S. 35TH ST. MANITOWOC, WI 54220	5	29X102	JUNE 2004 90640-90655
RANDY JUNK, OPERATIONS MANAGER 920-686-6550	4	35X102	JUNE 2005 74621-74624
MARSHALLTOWN MUNICIPAL TRANSIT 905 E. MAIN ST.	1	29X102	MARCH 2009
MARSHALLTOWN, IA 50158	1	29×102	91423 MAY 2010
RICHARD STONE, TRANSIT ADMIN 641-754-5719			91968
	1	29X102	FEB 2012 92388
	1	29X102	AUG 2013 92418
MARTA 2424 PIEDMONT ROAD NORTHEAST ATLANTA, GA 30324 NICHOLAS WATERS 404-848-4119	55	40X102	OCTOBER '17 - FEBRUARY '18 191622-191676
MARTIN COUNTY, FL			AUGUST 2015
2401 SE MONTEREY ROAD STUART, FL 34996	1	29X102	92419 JULY 2016
CLAUDETTE MAHAN, TRANSIT PROJECT MANAGER 772-419-4081	1	29X102	93146 OCTOBER 2016
	1	29X102	93168 MARCH 2017
	1	29X102	93245-93245 OCTOBER 2017
	3	29X102	93173-93175

DIESEE LOW TEOOR OC			
CUSTOMER MASON CO. TRANSPORTION AUTHORITY	QTY	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
790 E JOHNS PRAIRIE RD. SHELTON, WA 98584	3	35X102	JANUARY 2011 176683-176685
MARSHALL KRIER, MAINT. MANGER 360-426-9434 X 132	1	35X102	MARCH 2013 181880 MARCH 2017
	3	35X102	186344-186346
<u>CITY OF MCALLEN TRANSIT</u> 1501 W. BUSINESS HWY 83, STE 100 MCALLEN, TX 78501	7	35X102	JANUARY 2011 176482-176488
MARIO DELGADO, TRANSIT MANAGER 956-681-3501	3	35X102	MARCH 2014 183301-183303
550-061-5501	2	35X102	JANUARY 2013 180626-180627
	2	35X102	MARCH 2015 184798-184799
McCARRAN INT'L AIRPORT PO BOX 11005 LAS VEGAS, NV 89111-1005 JERRY TRAYLOR, RENT-A-CAR CENTER MANAGER 702-261-5506	10	40X102	DEC 2007-JANUARY 2008 78593-78602
MEDFORD, OR ROGUE VALLEY TRANSPORTATION DISTRICT	2	35X102	APRIL 2015 185625-185626
3200 CRATER LAKE AVE	3	35x102	APRIL 2015 185628-185630
MEDFORD, OR 97504-9075 TIM D'ALESSANDRO, OPERATIONS MANAGER 541-608-2436			183028-183030
<u>MEMPHIS ATA</u> 1370 LEVEE RD	20	40X102	OCT. 2003
MEMPHIS, TN 38108-1011 RON GARRISON, GENERAL MANAGER	4	29X102	73154-73173 AUG 2007
901-722-7111	8	29X102	90836-90839 JUNE 2010 91957-91964
	20	40X102	SEPT. 2010 178377-178396
	3	40X102	NOVEMBER 2015 184631-184633 MARCH 2017
	15	40X102	190063-190077
MENDOCINO TRANSIT AUTHORITY 241 PLANT RD UKIAH, CA 95482 DAN BAXTER, TRANSP. MANAGER 707-234-6446	3	40X102	NOV 2013 182780-182782
MERCED COUNTY TRANSIT	7	00)/400	
369 W. 18TH ST. MERCED, CA 95340	7	29X102	MARCH 2011 92165-92171
RICHARD GREEN, PROGRAM MANAGER	7 7	40X102 40X102	JAN. 2013 181558-181564 JANU JABX 2012
	6	40×102 35X102	JANUARY 2013 181558-181564 JULY - AUG 2015 187313-187318
	4	35X102	OCTOBER 2017 189944-189947
MERRILL, CITY OF 1004 E. FIRST ST.	3	29X102	JULY 2004

			DELIVERY DATE /
CUSTOMER MERRILL, WI 54452	<u>QTY</u>	<u>SIZE</u>	SERIAL NUMBERS 90861-90863
RICHARD GRENFELL, TRANSIT ADMIN. 715-536-7112	2	29X102	JUNE 2005 90864-90865
85 RAILROAD AVE. HAVERHILL, MA 01835 JOSEPH J. COSTANZO, ADMINISTRATOR	3	35X102	JUNE 2007 78159-78161 MAY 2009
978-469-2151	7	35X102	177646-177652 MAY - JUNE 2011
	8	35X102	180201-180208 JANUARY 2012
	5 3	35X102 29X102	180209-180213 92298-92300
	5	35X102	SEPTEMBER 2015 186615-186619
	5	35X102	MAY 2016 186496-186500 MARCH 2017
	1	35X102	187751
	2	29X102	93166-93167 MAY 2018
	5	35X102	191465-191469
<u>MET COUNCIL - ANOKA</u> 390 ROBERT ST. NORTH			DEC. 2009
ST. PAUL, MN 55101-1805 ALEX CURTISS	15	40X102	177450-177464 AUG 2010
651-602-1487	31	40X102	79088-79118 JANUARY 2011
	8 1	29X102 40X102	91898-91905 APRIL 2015
	Ι	40X102	185208 JULY 2015
	4	40X102	185209-185212 NOVEMBER 2015
	12	40X102	92987-92998 MARCH 2016
	37	40X102	187585-187621
<u>MET COUNCIL-BLAINE</u> 515 N. CLEVELAND AVE.	5	40X102	JANUARY 2013
ST. PAUL, MN 55114-1878 ALEX CURTIS, MGR FLEET SERVICES	5	40/102	181096-181100
651-602-1487			
<u>MET COUNCIL - PLYMOUTH</u> 3204 COMO AVE.	2	40.2400	MARCH 2011
MINNEAPOLIS, MN 55414		40X102	79233-79234
ALEX CURTISS 651-602-1487	2	40X102	SEPT. 2013 183169-183170
	1	40X102	MAY 2016 184598
MET COUNCIL - ST. PAUL	2	001//00	MAX 2000
390 NORTH ROBERT STREET ST. PAUL, MN 55101-1805 ALEX CURTISS	8	29X102	MAY 2009 91822-91829 JULY 2014
651-602-1487	16	29X102	92701-92716 APRIL 2015 - MAY 2015
			185161-185195 MAY 2016
	6	40X102	187275-187279
	7	29X102	93021-93027 JULY 2016

CUSTOMER	<u>QTY</u> 1 6	<u>SIZE</u> 40X102 29X102	DELIVERY DATE / SERIAL NUMBERS 187584 93028-93033
<u>MET TRANSIT</u> PO BOX 1178 BILLINGS, MT 59103 RONALD WENGER, TRANSIT MGR 406-657-8221	2	35X102	MAY 2011 177064-177065
<u>METRA</u> PO BOX 1340 COLUMBUS, GA 31902-1340 THOMAS TAYLOR, MAINT. MANAGER 706-653-4409	3 3	35X102 35X102	MAY 2008 76350-76352 MAY 2009 176429-176431
<u>METRO AREA TRANSIT</u> 650 23RD ST. N FARGO, ND 58102 JULIE BOMMELMAN, FARGO TRANSIT DIRECTOR 701-476-6737	3 4	29X102 29X102	MARCH 2002 90482-90484 MAY 2004 90680-90683
<u>METRO AREA TRANSIT (MAT)</u> 2222 CUMING ST. OMAHA, NE 68102 CURT SIMON, DIR. OF OPERATIONS	19 18	35X102 40X102	DEC. 2000 71695-71713 AUG 2000
	8	40X102	71715-71732 OCT. 2009 176752-176759
<u>METROPOLITAN COUNCIL</u> ( <u>TWIN CITIES</u> ) 390 ROBERT STREET ST. PAUL, MN 55101	13 5	29X102 40X102	DEC. 2002 90665-90677 FEB. 2004
PAUL COLTON, FLEET MANAGER 651-602-1668	6	40X102 29X102	74270-74274 AUG 2004 90926-90931
<u>METRO RTA</u> 416 KENMORE BLVD. AKRON, OH 44301	9	40X102	JAN. 2006 76832-76840
DEAN HARRIS, CPA, DIR. OF FINANCE 330-564-2264	5 2	35X102 35X102	FEB. 2007 77056-77060 MAY 2007
	2	35X102	78263-78264 DEC. 2007 78891-788892
	4 10	40X102 40X102	MAY 2009 176819-176820 APRIL 2010
	6	40X102	177661-177670 MARCH 2011 179467-1769472
	10	40X102	SEPTEMBER 2012 181265-181264
	10	40X102	JUNE 2013 181870-181879 JUNE 2015
	8 8	40X102 35X102	186145-186152 MARCH 2016 188919-188926
	3	40X102	MARCH - APRIL 2016 184257-184259
<u>METRO TRANSIT</u> 2000 S. MAY AVE OKLAHOMA CITY, OK 73108	2	40X102	MAY 2013 180986-180987

<b>CUSTOMER</b>	QTY	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
ERIC ZAAGE, FLEET MANAGER	<u></u>	<u></u>	<u></u>
(405) 297-2521			
METROPOLITAN COUNCIL			
515 N. CLEVELAND AVE.			SEPT. 2003
ST. PAUL, MN 55114	3	40X102	73595-73597
ROB MILLESON, DIR. OF MAINTENANCE 612-349-5008	87	40X102	MAR-NOV 2008 79001-79087
	01	40/(102	AUG 2010
	30	40X102	791191-79148
	F	40×402	DEC. 2011
	5	40X102	179127-179131 MAY 2012
	23	40X102	179636-179658
			JUNE 2012
	17	40X102	180648-180664 JULY 2012
	13	40X102	180698-180710
			MAY 2013
	30	40X102	182571-182600
	21	40X102	JULY 2013 182601-182621
	21	40×102	NOV 2013
	24	40X102	182622-182645
			DEC 2013 - JULY 2014
	75	40X102	184301-184375 APRIL 2017
	1	40X102	189612-189612
	10	40X102	189601-189610
METROPOLITAN EVANSVILLE TRANSIT SYSTEM		001/100	
601 JOHN ST. EVANSVILLE, IN 47113	4	29X102	JUNE 2006 91159-91162
JONATHAN SIEBEKING	1	29X102	APRIL 2014
812-435-6168			92547
	0	00)(400	AUGUST 2016
	2	29X102	93060-93061 MARCH 2017
	2	29X102	93135-93136
METROPOLITAN TRANSIT AUTHORITY	25	40X102	
130 NESTOR ST. NASHVILLE, TN 37210	25	402102	MAY 2004 74245-74269
BRUCE BUCK, DIRECTOR OF MAINTENANCE	24	40X102	JUNE 2006
614-862-5944	_		76557-76580
	2	40X102	DEC. 2009 177506-177507
	2	35X102	AUG 2010
			178143-178144
	25	40X102	FEB. 2011
	4	40X102	179751-179775 JANUARY 2015
	-	40/102	185821-185824
			JULY 2017
	4	40X102	189697-189700
METROPOLITAN TRANSIT AUTHORITY			
OF BLACK HAWK COUNTY			APRIL 2009
1515 BLACK HAWK ST.	1	35X102	176953
WATERLOO, IA 50702 MARK LITTLE, GM	2	29X102	91685-91686 MARCH 2012
319-234-5714	3	29X102	92372-92374
	2		FEB 2013
	1	29X102	92448

DIESEE EOW TEOOR COS			
CUSTOMER METROPOLITAN TULSA TRANSIT	QTY	SIZE	<u>DELIVERY DATE /</u> SERIAL NUMBERS
510 S. ROCKFORD TULSA, OK 74120	3	35X102	JUNE 2005 74914-74916
RANDY CLOUD, DIR. OF MAINT. 918-560-5619	10	35X102	JUNE 2005 76441-76450
910-300-3019	15	40X102	76426-76440 JANUARY 2016
	2	40X102	185585-185586
<u>METROPOLITAN WASHINGTON AIRPORTS</u> <u>AUTHORITY</u> RONALD REGAN WASH NAT'L AP MA-420	10	29X102	FEB. 2005 90972-90981
WASHINGTON, DC 20001-6000 MIKE QUINN, FLEET MAINT. MGR. 703-572-3960	8	29X102	SEPT. 2007 91386-91393
<u>MIAMI DADE AVIATION DEPT.</u> 4300 NW 14TH ST. MIAMI, FL 33126	3	40X102	JAN. 2009 176175-176177
FRED SHILEDS, SPECIAL PROJECTS ADMINISTRATOR 305-637-3741	3	40X102	SEP 2013 182002-182004 FEBRUARY 2017
	5	40X102	186180-186184 OCTOBER 2017
MID MON TRANSIT AUTHORITY	3	40X102	189948-189950
1300 MCKEAN AVE. CHARLEROI, PA 15022	2	35X102	JUNE 2004 112453-112454
BOB SMITH 724-489-0880	6	40X102	APRIL 2009 79404-79409
	4	40X102	NOVEMBER 2015 185653-185656
MIDDLETOWN AREA TRANSIT	4	35X102	NOV-DEC 2015 185657-185660
340 MAIN ST. MIDDLETOWN, CT 06475	4	29X102	OCT. 2002 90585-90588
ANDREW CHIARAVALLO, ADMINISTRATOR 860-346-0212	3	35X102	DEC. 2003 71265-71267 JULY 2015
	4	29X102	92776-92779 SEPTEMBER 2016
	3	35X102	187098-187100
MIDDLETOWN TRANSIT			
1219 HOOK DR MIDDLETOWN, OH 45042-1901	6	29X102	JULY 2002 90489-90494
REX HOLT, GARAGE MANAGER 513-425-7984	3	29X102	JUNE 2012 92263-92265
	5	35X102	AUGUST 2016 186354-186358
<u>MILWAUKEE COUNTY TRANSIT SYSTEM</u> <u>COUNCIL TRANSIT OPERATIONS</u> 515 N. CLEVELAND AVE. ST. PAUL, MN 55114 VINCE PELLIGRIN, DIR. OF MAINTENANCE 612-349-5000	5	40X102	APRIL 2002 72850-72854
MILWAUKEE COUNTY TRANSIT SYSTEM 1525 W. VINE STREET MILWAUKEE, WISCONSIN 53205	26	40 X 102	APRIL 2019 193466-193493

CUSTOMER RON McCORKEL, DIRECTOR OF MAINTENANCE	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
PHONE: 414-937-3238 EMAIL: rmccorkel@mcts.org	23	40 X 102	MARCH 2020 194667-194689
MINNESOTA VALLEY TRANSIT AUTHORITY			
11550 RUPP DRIVE BURNSVILLE, MN 55337 DAN RUDIGER, TRANSIT FLEET MAINT. MANAGER	12	40X102	MAY - JUNE 2003 73764-73775 JUNE 2005
952-746-5635	5	40X102	75184-75188 DEC. 2007
	9	40X102	78399-78407 MAR 2009
	6	35X102	79702-79707 JULY 2009
	5	40X102	176869-176873 AUG 2010
	2	40X102	177659-177660 MARCH 2012
	2	40X102	179694-179695 FEB - MAR 2013
	6	40X102	182040-182045 JANUARY 2015
	4	40X102	185551-185554 MAY - JUNE 2015
	18	40X102	185555-185572 MAR - APR 2017
	19	40X102	189701-189719 AUG - SEP 2018
	13	40X102	192033-192045 MAY 2019
	4	40X102	192937-192940 JAN 2021
	2	40X102	194415-194416 FEB 2021
	11	40X102	194821-194831
MISSOULA URBAN TRANSPORTATION			
1221 SHAKESPEARE MISSOULA, MT 59802	10	29X102	DEC. 2009 91946-91955
MICHAEL TREE, GM 406-543-8386	3	35X102	SEP 2014 184191-184196
MOBILE, THE WAVE TRANSIT			
1224 WEST I-65 SERVICE ROAD S MOBILE, AL 36609	14	29X102	OCT - DEC 2004 90950-90963
VINCE MCCARROLL, DIRECTOR OF MAINTENANCE 251-344-6600	6	29X102	MAY - JUNE 2010 91985-91990
	4	35X102	MAY 2010 177558-177561
	2	35X102	MAR 2014 183293-183294
	4	29X102	NOV 2018 93394-93397
MODESTO, CITY OF	4	35X102	177558-177561
MODESTO, CITY OF PO BOX 642 MODESTO, CA 95353	3	40X102	DEC. 2001 72278-72280
FREDERICK CAVANNAH 209-577-5298	6	40×102	SEPT. 2003 73978-73983
203-011-0230	8	40X102 35X102	74083-74090 DEC. 2009
	7	40X102	177465-177471

DIEGEE EOW I EOOK CO			
CUSTOMER	<u>QTY</u>	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS DEC 2014
	8	40X102	184638-184645 MAY - JUNE 2015
	11	40X102	184646-184656 JUNE 2015
	3	35x102	184657-184659 MARCH 2017
	4	40X102	188302-188305
MONROE CO. TRANSP. AUTHORITY PO BOX 339 MONROE, PA 18355	3	35X102	NOV. 2002 72478-72480
WALTER QUADARELLA, DIR. OF OPERATIONS	1	29X102	90495
610-899-6082	2	29X102	MAY 2007
	2	20/(102	91247-91248
	2	29X102	OCT. 2009 91782-91783
	8	35X102	OCT 2013 182751-182758
			102101 102100
MONROE TRANSIT SYSTEM	0	403/400	
700 WASHINGTON ST. MONROE, LA 71201	3	40X102	FEB. 2008 78833-78835
MONROE, LA 71201 MARC KEENAN, GENERAL MANAGER			APRIL 2009
318-329-2206	1	40X102	176152
010-020-2200	4	35X102	176154-176157
MONTACHUSETT RTA			
1427 WATER ST.			AUG 2007
FITCHBURG, MA 01420	5	35X102	78054-78058
MOHAMMED KHAN, ADMINISTRATOR			JUNE 2013
978-345-7111 X 2223	1	40X102	182420
MKHAN@MRTA.US	5	35X102	182421-182425
	2	29X102	MAY 2016 93090-93091
	2	297102	92090-92091
MONTANA DOT			
2960 PROSPECT AVE	5	29X102	DEC 2013
HELENA, MT 59620		001//00	92684-92688
ADAM KRAFT	2	29X102	MAY 2016
406-444-6120			93052-93053
MONTEBELLO BUS LINES	7	402/400	14.11 4000
400 SOUTH TAYLOR AVE. MONTEBELLO, CA 90640	7	40X102	JAN. 1999 70286-70292
AURORA JACKSON, DIR. OF TRANSPORTATION	5	40X102	FEB. 2000
323-887-4604			71490-71494
MONTEREY SALINAS TRANSIT ONE RYAN RANCH RD	12	40X102	OCT. 2002
MONTEREY,CA 93940-5795			73429-73440
MIKE HERNANDEZ, AGM/COO 831-393-8132	12	40X102	JAN. 2004 77301-73312
	10	35X102	SEPT. 2007 78291-78300
	5	40X102	JAN. 2008 78286-78290
	1	40X102	JUNE 2013 180771
	3	40X102	FEBRUARY 2015 186318-186320
	4	40X102	MARCH 2015 186321-186324
	11	35X102	MAY - JUNE 2015 186887-186897

CUSTOMER	QTY	SIZE	<u>DELIVERY DATE /</u> SERIAL NUMBERS
MONTGOMERY COUNTY			
16630 CRABBS BRANCH WAY ROCKVILLE, MD 20855	5	40X102	JUNE 2008 79426-79430
KATHLEEN HYNES, FLEET ASSETS MGR 240-777-5625	6	29X102	NOV. 2008 91646-91651
	16	40X102	NOV - DEC 2008 176054-176069 JUNE - JULY 2009
	11	40X102	176667-176677 AUG - SEPT 2009
	25	29X102	91687-91711 SEPT. 2011
	1	40X102	179503 AUG 2013
	12	40X102	182279-182290 AUG - OCT 2013
	28	29X102	92601-92628 JULY - AUG 2014
	32	29X102	92717-92748 NOV 2014
	1	29X102	93013 FEB - MAR 2016
	27	40X102	188356-188382 MAR - APR 2016
	13	40X102	188383-188395 APR 2016
	1	29X102	93103 JULY 2017
	17	40X102	190508-190524 JULY - AUG 2017
	8	40X102	190525-190532 APR 2019
	3	40X102	192617-192619 JAN - FEB 2020
	19	29X102	93784-93802 JAN - MAR 2020
	9	40X102	195079-195087
MOUNTAIN LINE TRANSIT AUTHORITY			
420 DUPONT RD MORGANTOWN, WV 26501 DAVID BRUFFY, GM	7	35X102	SEPT. 2009 176986-176992 JULY 2010
304-296-3680	3	29X102	91996-91998 FEB 2014
	3	35X102	184213
	1	29X102	92749
	3	35X102	184605-184607
MOUNTAIN METROPOLITAN TRANSIT	2	40X102	DEC. 2002 73662-73663
1015 TRANSIT DR. COLORADO SPRINGS, CO 80403	4	35X102	JULY 2005 75266-75269
BOB SCHWANZ, OPERATIONS SUPERVISOR	3	40X102	75232-75234
	10	40X102	AUG 2006 77609-77618
	19	40X102	JULY 2007 78319-78337
	7	35X102	OCT. 2007 78951-78957
	6	35X102	SEPT. 2008 176376-176381

DIEGLE LOW I LOOK OUT			
CUSTOMER	<u>QTY</u>	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS OCTOBER 2015
	4	35X102	187928-187931 NOVEMBER
	2	29X102	92987-92988 JANUARY 2016
	5	35X102	187932-187936 FEBRUARY 2016
	3	29X102	93049-93051 JUNE 2017
	10	35X102	189760-189769
MUNCIE INDIANA TRANSIT SYSTEM	11	35X102	OCT - NOV 2005 76451-76461
1300 E. SEYMOUR ST. MUNCIE, IN 47302	5	35X102	39083 77579-77583
TROY DENISON. DIR OF MAINT 765-282-2762			
MUSKEGON AREA TRANSIT SYSTEM	4	35X102	DEC. 2006 76851-76854
2624 SIXTH ST. MUSKEGON HEIGHTS, MI 49444 JAMES KOENS, TRANSIT SYSTEMS MGR.	5	35X102	MARCH 2009 78554-78558
231-724-6420	2	29X102	OCTOBER 2015 93065-93066
<u>MV TRANSPORTATION - CARY, NC</u> 1107 TRINITY RD. RALEIGH, NC 27607			
ANGEL KAMLER, FLEET AND PROCUREMENT MANAGER 972-391-4647	1	40X102	OCT 2011 180577
NATIONAL/ALAMO - DENVER DENVER INTERNATIONAL AIRPORT 24530 E. 78TH AVENUE DENVER, CO 80249 HENRY SINGH, BUS OPERATIONS MGR 415-760-0075 HARJEET.SINGH@EHI.COM	1	40X102	AUG 2012 181904
NATIONAL - SAN DIEGO SAN DIEGO INTERNATIONAL AIRPORT 3280 N. HARBOR DRIVE SAN DIEGO, CA 92101 HENRY SINGH, BUS OPERATIONS MGR 415-760-0075 HARJEET.SINGH@EHI.COM			APRIL 2014
<u>NATIONAL/ALAMO - WEST PALM BEACH</u> 2121 BELVEDERE RD	3	40X102	183054-183056 AUGUST 2017
WEST PALM BEACH, FL 33406 HENRY SINGH, BUS OPERATIONS MGR 415-760-0075 HARJEET.SINGH@EHI.COM	14	40X102	190623-190636
NEW CASTLE TRANSIT AUTHORITY	12	35X102	OCT. 1999 70821-70832
311 MAHONING AVE. NEW CASTLE, PA 16101	16	40X102	JUNE 2002 73405-73420
LEONARD LASTORIA 724-654-3130	3	29X102	JUNE 2005 90709-90711
	2	29X102	OCT. 2008 91624-91625
	3	40X102	JUNE 2010 178303-178305 AUGUST 2015
	5	35X102	184244-184248

DILGEL LOW I LOOK C		i	
CUSTOMER	<u>QTY</u> 21	<u>SIZE</u> 40X102	DELIVERY DATE / SERIAL NUMBERS NOV. 2001
NIAGARA FRONTIER TRANSIT AUTHORITY 1581 MICHIGAN AVE.	16	40×102 40×102	72200-72220 JUNE 2002
BUFFALO, NY 14209 DAVE RUGG, MANAGER, BUS MAINTENANCE	26	40X102	73405-73420 OCT. 2002
716-881-4705	22	29X1012	72699-72722 & 72998-72999 MAY 2004
	54	40X102	90866-90887 NOV. 2010 178193-1782465
NAIPTA	2	35X102	FEB. 2008 77857-77858
3773 N. KASPAR DR FLAGSTAFF, AZ 86004	1	35X102	OCT. 2009 176017
GEORGE GILLETTE, FLEET MGR 928-679-8914	2	35X102	JUNE 2015 184790-184791
	2	35X102	MAY 2016 185573
NO. ILLINOIS UNIVERSITY ATC/VANCOM OF ILLINOIS	2	35X102	AUG 2004 73660-73661 JUNE 2005
1825 PLEASANT ST. DEKALB, IL 60115	2	35X102	74119-74120 JULY 2007
MARCUS COX, GENERAL MANAGER 815-758-6900	2	35X102	78148-78149 JUNE 2009
	4	35X102	176736-176739 AUG 2010
	4	35X102	177530-177533 JULY 2011
	3	35X102	178139-178141 JUNE 2014
	1	35X102	184581 OCTOBER 2015
	1	35X102	185550 MARCH 2017
	1	35X102	182883-182883 MAY 2017
	1	35X102	182884-182884
	2	35X102	JUNE 2006
<u>NORTHWESTERN INDIANA REGIONAL</u> <u>PLANNING COMMISSION</u> 6100 SOUTHPORT RD	2	35X102	76416-76417 MARCH 2007 77681-77682
PORTAGE, IN 46368 EMELIO RODRIGUEZ 219-391-8465	1	35X102	JAN. 2010 177200
		40X102	JAN. 1998
<u>NORWALK, CITY OF</u> 12700 NORWALK BLVD NORWALK, CA 90650	4	40X102	70000 DEC. 1998 70356-70359
JAMES C. PARKER 562-929-5533	2	40X102	DEC. 2003 73944-73945
	8	40X102	OCT. 1999 70982-70989
	2	40X102	DEC. 2001 72764-72765
	4	40X102	SEPT. 2002 73564-73567

DIEGEL LOW I LOOK C			
CUSTOMER	<u>QTY</u> 2	<u>SIZE</u> 40X102	DELIVERY DATE / SERIAL NUMBERS DEC. 2003
	1	40X102	73944-73945 JAN. 2010 177557
	14	40X102	JANUARY 2013 182490-182503
	4	35X102	MAY 2016 184883-184886
NORWALK TRANSIT DISTRICT	3	29X102	MARCH 2004 90706-90709
275 WILSON AVE. NORWALK, CT 06854	3	35X102	NOV. 2006 77147-77149
KIMBERLEE MORTON, CEO 203-299-5163	4	35X102	SEPT. 2008 79456-79459 SEPT. 2008
	2	29X102	91620-91621 SEPT. 2008
	1	29X102	91622 FEBRUARY 2010
	1	29X102	91890 SEPT. 2015
	12	15X29	92965-92976
OAKLAND INT'L AIRPORT	5	40X102	MAY 1998 70293-70297
ONE AIRPORT DR., BOX 45 OAKLAND, CA 94621 NOEL PINTO-CORREIA, AIRPORT OPS 510-577-4909	15	35X102	MAR 1999 70298-70312
OHIO VALLEY RTA 21 S. HURON ST.	3	29X102	FEB. 2010 92062-92064
WHEELING, WV 26003 THOMAS HVIZDOS, EXEC. DIRECTOR 304-232-2190			
OHIO STATE UNIV	6	40X102	AUG 2013 182456-182461
2578 KENNY RD COLUMBUS, OH 43210	4	40X102	MARCH 2015 183681-183684
TOM HOLMAN, TRANSP & TRAFFIC MGMT 614-292-9113	6	40X102	JUNE 2017 187012-187017
ORANGE COUNTY	9	29X102	JUNE 2013 92438-19546
124 MAIN ST. GOSHEN, NY 10924 ROB PARRINGTON, TRANSIT PLANNER 845-615-3852	6	35X102	182516-182521
	-	00)/400	
<u>∘MONROE/KIRYAS JOEL/HARRIMAN AREA</u> 150 SCHUNNEMUNK RD, MONROE, NY <u>TOWN OF WARWICK</u>	5 1	29X102 29X102	92538-92542 92546
132 KINGS HWY, WARWICK, NY 10990 MIDDLETOWN TRANSIT	3	29X102	92543-92545
518 STATE ROUTE 17M, MIDDLETON, NY <u>NEWBURGH BEACON BUS CORP</u> 24 WINDSOR HWY, NEW WINDOR, NY	6	35X102	182516-182521
CITY OF OWENSBORO	1	29X102	FEB. 2009 91668

			DELIVERY DATE /
<u>CUSTOMER</u> 1314 W. 5TH ST.	<u>QTY</u>	<u>SIZE</u>	SERIAL NUMBERS APRIL 2010
OWENSBORO, KY 42301 LISA FULKERSON, TRANSIT MANAGER	3	29X102	91965-91967 JANUARY 2013
270-687-8571	2	29X102	92324-92325
	2	40X102	APRIL 2017 187772-187773
OXFORD UNIVERSITY TRANSIT 409 MCELROY DRIVE OXFORD, MS 38655			
RON BIGGS, MANAGER 662-234-3540	1	40x102	JUNE 2015
OXNARD, CA - GOLD COAST TRANSIT	7	40X102	186216 JULY - AUG 2015
301 E. THIRD STREET OXNARD, CA 93030 ROBERT LURIE	5	40x102	186217-186223 184119-184123
<u>OZAUKEE CO. TRANSIT SERVICE</u> 121 WEST MAIN ST.	5	40X102	APRIL 2002 72850-72854
PORT WASHINGTON, WI 53074 SHARON GILMAN, TRANSIT SERV. DIR. 262-284-8121			
PACIFIC TRANSIT SYSTEM	4	29X102	APRIL 2011 92148-92151
216 N. 2ND ST. RAYMOND, WA 98577 TIM RUSS, DIRECTOR 360-875-9418	2	29X102	OCT. 2011 92274-92275
PADUCAH TRANSIT AUTHORITY	3	29X102	FEB. 2003 90600-90602
850 HARRISON ST. PADUCAH, KY 42001 ARTHUR BOYKIN, GM	1	29X102	DEC. 2003 90555
270-444-8700			JAN. 1999
PALMTRAN SURFACE TRANSPORTATION DEPT. 3201 ELECTRONICS WAY WEST PALM BEACH, FL 33407-4618 JON KAVALUINAS, DIR. OF MAINTENANCE	6+50 12	35X102 40X102	70533-70538 70368-70372 70675-70676 70868-70872 NOV. 2003
407-233-1145	8	29X102	90775-90782 DEC. 2004
	1	40X102	76000 AUG 2006
	20	40X102	76918-76937 MAY 2007
	4	40X102	77809-77812 SEPT. 2007
	13	40X102	78108-78120
	6	40X102	78142-78147 DEC. 2008
	3	40X102	79669-79671 OCT. 2009
	5	35X102	176618-176622 FEB. 2011
	9	40X102	178368-178376 AUG 2011
	5	40X102	180439-180443 NOV. 2011
	11	40X102	178883-178893 SEPT 2012
	14	40X102	180051-180064 AUG 2013

			DELIVERY DATE /
<u>CUSTOMER</u>	<u>QTY</u>	<u>SIZE</u>	SERIAL NUMBERS
	5	40X102	183556-183560
			MARCH 2015
	13	40X102	186396-186409
	5	40X102	MARCH 2015 186391-186395
	Ũ	10/(102	JAN. 2018
	14	40X102	190623-190636
	4	35X102	SEPT. 2002
PARK CITY MUNICIPAL CORP.			72237-72240
1053 IRON HORSE DR. (PO.O BOX 1480) PARK CITY, UT 84060-1480	4	35X102	JUNE 2005 74464-74467
BLAKE FONNESBECK, PUBLIC WORKS DIRECTOR	4	35X102	JULY 2008
435-615-5311			79214-79217
	8	40X102	OCT. 2008
	4	35X102	78130-78137 JAN. 2010
	т.	00/(102	176514-176517
			JULY 2016
	12	35X102	188931-188942 SEPTEMBER 2016
	1	29X102	93157
			OCTOBER 2017
	3	35X102	190565-190567
	3	40X102	MAY 2014 184201-184203
PASCO COUNTY, FL	2	40X102	JUNE 2014
8620 GALEN WILSON BLVD			184204-184205
PORT RICHEY, FL 34668 PHILIP PUMPHREY, TRANSPORTATION MANAGER	2	40X102	JANUARY 2016 185351-185352
727-834-3200	1	40X102	JANUARY 2016
			186359
			NOVEMBER 2016
	2	29X102	AUGUST 2017 93285-93286
	-	20/(102	
		00)//00	
PETERSBURG, CITY OF	1	29X102	DEC. 2001 90568
309 FAIRGROUNDS RD	9	29X102	JUNE 2007
PETERSBURG, VA 23803			91265-91273
DIRONNA BELTON, GENERAL MANAGER 80733-2461	4	35X102	JULY 2013 182504-182507
00.700 2401			102004 102001
PHILADELPHIA AIRPORT	25	40X102	MAR 2006-MAY 2006 77200-77224
8220 BARTRAM AVE.			
PHILADELPHIA, PA 19153			
PETER DONNER 215-365-3477			
215-305-3477	1	40X102	MARCH 2006
PHILADELPHIA TROLLEY WORKS			76337
1350 SCHUYLKILL AVE.			
PHILADELPHIA, PA 19146 JOHN ROMANO, FLEET MANAGER			
267-767-0257			APRIL 2018
	12	40X102	190895-190906
<u>PHOENIX, AZ</u> 302 N 1ST STREET, SUITE 900	13	40X102	JAN. 2019 192456-192468
PHOENIX, AZ 85003	10		102700-102700
JESUS SAPIEN			
602-261-8997	2	35X102	APRIL 2006
	£	CONTOL	, 1 1 1 L 2000

<u>CUSTOMER</u> <u>PIEDMONT WAGON TRANSIT</u> PO BOX 398 HICKORY, NC 28603 CAMILLE STERLING, TRANSIT MGR 828-465-7642	QTY	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS 76938-76939
<u>PINE BLUFF, CITY OF</u> 2300 E. HARDING AVE. PINE BLUFF, AR 71601 LARRY REYNOLDS, MANAGER 870-543-5130	4	29X102	SEPT. 2011 92224-92227
<u>PINELLAS SUNCOAST TRANSIT</u> 3201 SCHERER DR.	8	40X102	JUNE 1999 70373-70374
ST. PETERSBURG, FL 33716 BRAD MILLER, EXECUTIVE DIRECTOR	15	40X102	OCT. 2000 71294-71308
727-530-9921	10	40X102	NOV. 2002 72768-72777
	2	29X102	90702-90705
	8	40X102	MARCH 2005-JUNE 2005 74880-74887
	5	29X102	90982-90986
	8	35X102	74872-74879
	12	35X102	APRIL 2006 76622-76633
	36	40X102	MARCH 2006 76586-76621
	11	40X102	MAY 2007 77584-77594
	7	35X102	JUNE 2007 77599-77608
	6	35X102	MARCH 2008 78849-78854
	2	35X102	JUNE 2009 176133-176134 JUNE 2015
	13	40X102	185383-185395
PIONEER VALLEY TRANSIT AUTHORITY	10	29X102	MARCH - MAY 2006 91130-91139
665 COTTAGE STREET SPRINGFIELD, MA 01104	10	35X102	MAY 2006 76803-76812
JOSEPH VARLEY, DIRECTOR OF MAINTENANCE 413-732-2161	5	40X102	JUNE 2006 76813-76817
JVARLEY@PVTRANSIT.COM			FEB 2007
	8	40X102	77520-77527 JAN - FEB 2008
	10	40X102	78700-78709 AUG - SEP 2008
	15	35X102	78715-78729 AUG - SEP 2010
	15	40X102	178251-178265
	15	35X102	178266-178281 MAY 2018
	4	40X102	191296-191299
<u>PLACER COUNTY</u> 3091 COUNTY CENTER DRIVE, SUITE 220	1	35X102	SEP 2015 187645 DEC 2015
AUBURN, CA 95603 WILL GARNER	5	35X102	187646-187650 APR-JUNE 2017

CUST	OMER	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
530-745-7582		3	35X102	187270-187272 DEC 2015
	PLACER COUNTY - TAHOE	2 2	40X102 40X102	187651-187652 187653-187654
		2	40X102	MAY 2017 187273-187274
POCATELLO, CITY OF 215 W. BONNEVILLE POCATELLO, ID 83205 RON BINGGELI, PUBLIC TRANSI 208-232-5057	IT DIR	1	29X102	JAN. 2008 91450
POINT MANAGEMENT INC. 700 W. ATLANTIC AVE.		2	40X102	AUG 2002 70850-70851
DELRAY BEACH, FL 33446 MICHAEL HYMAN, PRESIDENT 561-499-3335		4	35X102	71277-71280
PORTAGE AREA RTA (PARTA)		3	35X102	APRIL 2005
2000 SUMMIT STREET KENT, OH 44240 BRIAN TRAUTMAN, CHIEF OPEF	RATIONS OFFICER	4	35X102	75047-75049 SEPT 2007 78361-78364
330-678-1287 email: btrautman@partaonline.or		3	35X102	DEC 2009 177474-177476
	9	4	35X102 STD	MARCH 2007 112415-112418
PORT AUTHORITY OF ALLEGHEN 345 SIXT AVENUE, 3RD FLOOR	Y COUNTY			
PITTSBURGH, PA 15222 DON RIVETTI, CHIEF OPERATIN 412-566-5139	G OFFICER OF MAINTENANCE	165	40X102	MAR 2003 - FEB. 2004 73776-73940 OCT 2004
DRIVETTI@PORTAUTHORITY.O	RG	1	40X102	74482 FEB - APR 2005
		59	40X102	74483-74541 JULY 2006 - JAN 2007
		90	40X102	76950-77039 OCT 2008 - JAN 2009
		26	40X102	79729-79754 JAN - APR 2009
		54	40X102	177363-177416 MAY - SEP 2011
		24	40X102	179881-179904 SEP - NOV 2012
		45	40X102	181201-181245 SEP - DEC 2014
		60	40X102	184051-184110 AUG - SEP 2015
		30	35X102	185791-185820 OCT - DEC 2015
		60 65	40X102 40X102	185731-185790 OCT 2016 - MAR 2017 188412-188476
		10	40X102 40X102	FEB 2017 188477-188486
		70	40X102	SEP 2017 - JAN 2018 190110-190179
		69	40X102	SEP - DEC 2018 191703-191771 OCT 2019 - JAN 2020

DIEGEL LOW I LOOK			
CUSTOMER	<b>QTY</b> 59	<u>SIZE</u> 40X102	DELIVERY DATE / SERIAL NUMBERS 193329-193387 OCT 2020 - JAN 2021
	54	40X102	194607-194660
		10/(102	
POTOMAC & RAPPAHA TRANSIT (OMNILINK) 14700 POTOMAC MILLS RD.	16	29X102	OCT. 2004 90888-90903
WOODBRIDGE, VA 22091 ERIC MARX, EXECUTIVE DIRECTOR	2	29X102	JULY 2005 90904-90905
703-580-6117	4	29X102	JUNE 2006 91103-91106
	1	29X102	JUNE 2010 91909
	4	40X102	JUNE 2012 180578-180581
	7	40X102	180576-180581 180584-180590 NOV. 2013
	5	29X102	92484-92488
	11	29X102	92565-92575
		20/102	MARCH 2016
	7	40X102	187217-187223 MARCH 2016
	6	29X102	93034-93039
POTTSTOWN URBAN TRANSIT INC. 902 FARMINGTON AVE. POTTSTOWN, PA 19464	5	35X102	JUNE 2007 77865-77869
CHARLIE DICKINSON, PRESIDENT 610-326-5413			
PRINCE GEORGE CO. GOVERNMENT 9400 PEPPERCORN PL., STE 320	12	35X102	JULY 2008 79986-79997
LARGO, MD 20774 GERALYN BRUCE, CHIEF DIV OF TRANSIT	8	35X102	JAN. 2010 177536-177543
301-883-5621	2	35X102	MARCH 2010 177653-177654 NOV, 2010
	22	35X102	178109-178130
	2	40X102	178479-178480
	2	35X102	178481-178482
			NOV. 2011
	6	29X102	92267-92272 DEC. 2011
	4	29X102	92276-92279
	6	35X102	178131-178136
	6	35X102	179011-179016 JAN. 2012
	14	35X102	181251-181264
<u>PUEBLO, CITY OF</u> 350 S. GRAND AVE.	3	35X102	SEPT. 2010 176664-176666
PUEBLO, CO 81003 BRENDA BROYLES, TRANSIT MGR 719-553-2725			
PULLMAN TRANSIT			JUNE 2005
775 NW GUY ST. PULLMAN, WA 99163	5	35x102	76001-76005 SEPT. 2010
WAYNE THOMPSON, TRANSIT MANAGER	1	35X102	177693
509-338-3249	4	40X102	177689-177692 MAY 2013
QUINCY REGIONAL AIRPORT 1645 HWY 104	1	35X102	DEC. 2010 177076

DIESEE EOW TEOOR COST			
	QTY	SIZE	DELIVERY DATE / SERIAL NUMBERS
QUINCY, IL 62305 MARTY STEGEMAN, AIRPORT DIRECTOR 217-885-3262			
<u>RACINE, CITY OF</u> <u>BELLE URBAN SYSTEM</u>	10	35X102	JULY 2004 74582-74591
1900 KENTUCKY ST. RACINE, WI 53405	3	35X102	OCT. 2009 79708-79710
AL STANEK, TRANSIT MGR 262-636-9480	3	35X102	AUG 2012 180510-180512
	14	35X102	FEB 2013 181583-181594
RALEIGH, CITY OF			FEB. 2008
222 W. HARGETT ST., STE 400	13	40X102	78812-78824
RALEIGH, NC 27602-0590 DAVID EATMAN, PLANNER	2	40X102	79473-79474 JUNE 2009
919-833-3823	19	40X102	176717-176735 JUNE 2011
	7	40X102	179301-179307 OCT 2012
	2	40X102	180716-180717 OCT 2014
	11	40X102	184728-184738 DEC 2014
	10	40X102	185089-185098 SETPEMBER 2016
	8	40X102	188898-188905
	3	29X102	93179-93181 OCTOBER 2017
	4	40X102	189472-189475
RALEIGH DURHAM AIRPORT AUTHORITY 1000 TRADE DR.	4	40X102	DEC. 2008 176403-176406
RDU AIRPORT, NC 27623-0001 ANDY THOMPSON	2	40X102	DEC. 2010 178954-178955
919-840-7811	4	40X102	SEPT. 2013 182106-182109
	4	40X102	MAY 2014 184215-184218
	2	40X102	NOVEMBER 2016 188164-188165
<u>RAZORBACK TRANSIT (UNIV. OF ARKANSAS, AR)</u> 155 RAZORBACK ROAD FAYETTEVILLE, AR 72701			SEP 2007
ADAM WADDELL, DIRECTOR OF RAZORBACK TRANSIT 479-575-6292 EWADDEL@UARK.EDU	2	40	78339-78340 NOV 2008
	2	40	79998-79999 FEB 2010
	2	40	177593-177594 FEB 2012
	2	40	178433-178434 AUG 2012
	2	40	179188-179189 SEP 2015
	2	40	184788-184789 DEC 2017
	3	40	187998-188000 DEC 2017 - JAN 2018
	3	40	187031-187033 FEBRUARY 2019
	2	40	190422-194023

			DELIVERY DATE /
CUSTOMER	<u>QTY</u>	<u>SIZE</u>	SERIAL NUMBERS JULY - AUG 2020
RED ROSE TRANSIT	2	40	194126-194127
45 ERICK RD LANCASTER, PA 17602 DAVID KILMER, EXECUTIVE DIRECTOR 717-397-5613	2	29X102	DEC. 2006 91263-91264 FEB. 2009
	2	29X102	91548-91549
	1	35X102	79861
	1	35X102	JUNE 2010 176932 JANUARY 2012
	1	40X102	180795 MAY 2012
	1	35X102	180796 JANUARY 2013
	1	35X102	181529 SEPTEMBEER 2013
	2	35X102	183949-183950 SEPTEMBEER 2015
	10	35X102	187894-187903 MAY 2016
	3	35X102	188110-188112
	1	35X102	188109
REDDING AREA BUS AUTHORITY 777 CYPRESS AVE.	1	40X102	JULY 2009 176960
REDDING, CA 96001 SARAH GRANT, TRANSP. PLANNER	3	40X102	JULY 2010 177951-177953
530-245-7116	3	35X102	JULY 2013 182046-182048 JANUARY 2015
	2	35X102	184577-184578 AUGUST 2017
	3	35X102	189951-189953
REGIONAL TRANSPORTATION COMM 2050 VILLANOVA DR.	2	40X102	OCT. 2003 73568-73569
RENO, NV 89502 DAVID CARR, TRANSIT MANAGER	7	40X102	JULY 2004 74343-74349
775-332-2161	1	40X102	DEC. 2004 73609
	8	40X102	OCT. 2006 77088-77095
	14	40X102	DEC. 2007 78468-78481
	13	29X102	JULY 2008 91401-91413
	4	40X102	176099-176102 JAN. 2009
	12	40X102	79835-79846
REGIONAL TRANSPORTATION AUTHORITY 5658 BEAR LN	13	35X102	JUNE 2009 176388-176400
CORPUS CHRISTI, TX 78405 JOSE TOVAR, DIR OF MAINT	2	35X102	MARCH 2009 176401-176402
361-289-2712	3	35X102	JANUARY 2011 177686-177688 OCT. 2012
	5 5	40X102 35X102	181275-181279 181280-181284 APRIL 2015

DIESEE LOW TEOOR COST			
CUSTOMER	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
	19	40X102	186575-186593 MAY 2015
	10	35X102	186594-186603 APRIL 2017
	11	35X102	186604-186614
<u>REGIONAL TRANSPORTATION DISTRICT</u> 1900 31ST STREET DENVER, CO 80216-4909	133	40X102	AUG. 2005 - FEB. 2006 76164-76296 9/06 - 3/07
WILLIAM WEIDENAAR, TECHNICAL SERVICES MANAGER	103	40X102	77247-77349
303-299-6265 EMAIL: william.weidenaar@rtd-denver.com	13	29X102	MARCH 2007 91183-91195 JUNE 2008
	13	29X102	91401-91413
	25	40X102	JULY 2008 79515-79539
	20	40X102	MAY 2014 - AUG 2014 185222-185241 AUG - OCT 2014
	65	40X102	185242-185306 SEPT 2014
	40	40X104	185307-185346 MARCH - JULY 2015
	88	40X102	185401-185488 JULY 2015
	3	40X102	185489-185491 JULY - AUG 2015
	19	40X102	185492-185510 AUG - OCT 2015
	59	40X102	186051-186109 OCTOBER 2015
	5	40X2015	186110-186114 APRIL 2017
	40	40X102	188593-188632 JANUARY 2018
	15	40X102	189720-189734 AUGUST 2018
	1	40X102	192267 NOVEMBER 2018
	59	40X102	192268-192326 AUGUST 2020
	2	40X102	194775 & 194776 SEPT 2020
	5	40X102	194792-194796 NOV - DEC 2020
	34	40X102	195502-195535 SEPT 2020
	24	40X102	194797-194820 SEPT 2020
	15	40X102	194777-194791
<u>RESEARCH TRIANGLE REGIONAL PTA</u> PO BOX 13787	6	35X102	MARCH 2008 78885-78890
RESEARCH TRIANGLE PARK, NC 27709 SCOTT LANSING, DIR OPERATIONS 919-475-3023	12	40X102	MAY 2009 176135-176146 APRIL 2010
	8	40X102	178411-178418 JUNE 2017
	10	40X102	189933-189942
<u>RICHLAND CO. TRANSIT</u> 35 N. PARK ST.	1	29X102	JUNE 2005 91354-91355
MANSFIELD, OH 44903 JAY MICKAM, MAINT MGR	2	29X102	JULY 2007 91354-91355

<u>CUSTOMER</u>	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
419-522-4355			
<u>RIDER TRANSIT</u> 2030 WILSHIRE CRT CONCORD, NC 28025 L.J. WESLOWSKI, TRANSIT MGR 704-920-5878	8	35X102	FEB 2014 181994-182001
RIPON, CITY OF	1	35X102	OCT. 2012 181815
259 N. WILMA AVE. RIPON, CA 95366 KEVIN WERNER, CITY ENGINEER 209-599-2108	1	35X102	
<u>RIVERCITIES TRANSIT</u> 254 OREGON WAY LONGVIEW, WA 98632-1134	1	35X102	OCT 2009 176151 JUNE 2013
KEITH WALLING	5	35X102	181774-181778
360-442-5601	1	35X102	OCT 2014 183068
	2	35X102	JAN 2020 194116-194117
<u>RIVERSIDE TRANSIT AGENCY</u> 1825 THIRD ST	80	40X102	JANUARY 2014 182902-182981
RIVERSIDE, CA 92507 BOB BACH, DIRECTOR OF MAINTENANCE 951-565-5032	16	407102	FEB 2014 182885-182900 JANUARY - FEB 2016
951-505-5052	13	40X102	184898-184910
	1	4X102	184911 SEPTEMBER 2016
	16	40X102	186852-186867
RIVER VALLEY METRO MASS TRANSIT DISTRICT	3	29X102	AUG. 2004 90737-90739
288 W. SOUTH TEC DR., SUITE C KANKAKEE, IL 60901 BOB HOFFMAN, MANAGING DIRECTOR 815-929-0936	50	29X102	MAY 2006 91039-91088
RIVER VALLEY TRANSIT			NOV. 2005
1500 WEST THIRD ST. WILLIAMSPORT, PA 17701	3 2	35X102 40X102	76532-76534 76535-76536
JOHN KIEHL, JR., ASST. GM 570-326-2500	1	40X102	DEC. 2008 78153
	2	35X102	79507-79508 JULY 2017
	2 2	35X102 40X102	189420-189421 189424-189425
RHODE ISLAND PTA 265 MELROSE ST.	20	40X102	MAY 2005 76297-76316
PROVIDENCE, RI 02907 MIKE MCGRANE, CONTRACT MGR.	16	40X102	OCT. 2005 76645-76660
401-784-9500 X 214	24	40X102	DEC. 2009 176768-176791
	10	35X102	FEB. 2011 179382-179391 JANUARY 2013

DIEGEE EOW I EOOK G			
CUSTOMER	<u>QTY</u> 30	<b>SIZE</b> 40X102	DELIVERY DATE / SERIAL NUMBERS 181605-181634
	20	40X102	APRIL 2013 181635-181654 DEC. 2015 - JAN. 2016
	18	40X102	186162-186179 AUGUST 2016
	17	40X102	187904-187920
ROARING FORK TRANSP. AUTHORITY (RFTA) 51 SERVICE CENTER DRIVE			
ASPEN, CO 81611 KENNY OSIER, DIRECTOR OF MAINTENANCE	1	35X102	DEC.2011 180985
970-384-4965 kosier@rfta.com	10	40x102	NOV 2019 194203-194212
	5	40x102	JAN 202 195451-195455
	10	40x102	MAY 2021 195456-195465
ROCKLAND COUNTY, NY			
ROBERT L. YAEGER HEALTH CENTER			NOV. 2009
50 SANATORIUM RD., BLDG T	6	35X102	176811-176816
POMONA, NY 10970 MICHAEL D'ANGELO, DEPUTY COMMISSIONER	2 2	40X102 35X102	176817-176818 177887-177888
845-364-3439	6	29X102	91740-91745
dangelom@co.rockland.ny.us	0	20/102	SEPT. 2010
	3	40X102	178777-178779
	3	35X102	179171-179173
			JULY 2015
	2	29X102	92960-92961 JULY-AUG 2015
	2	35X102	184844-184845 FEBRUARY 2018
	1	40X102	190690
	5	35X102	190685-190689 APRIL 2018
	7	40X102	190691-190697
ROCHESTER, CITY OF 4300 EAST RIVER ROAD			
ROCHESTER, MN 55906		051/100	JULY 1999
ANTHONY KNAUER, TRANSIT MANAGER 507-328-2424	4	35X102	70395-70398 MAR 2000
	4	35X102	71037-71040 FEB. 2003
	8	40X102	73464-73471 JAN. 2004
	6	40X102	73010-73015 JAN. 2005
	6	40X102	74888-74893 JULY 2005
	4	40X102	76333-76336 APRIL 2007
	4	40X102	76865-76868 NOV. 2010
	4	40X102	179166-179169 AUG 2011
	1	40X102 40X102	179170 JAN 2014 183480-183483
	4 7	40X102	SEPT 2015 185614-185620
	5	40X102	MARCH 2017 188221-188225
	-	-	MAY - AUG 2018

DIEGEL LOW I LOOK COS			
CUSTOMER	<b>QTY</b> 17	<u>SIZE</u> 40X102	DELIVERY DATE / SERIAL NUMBERS 191375-191391
<u>ROCHESTER-GENESSEE RTA</u> 1372 E. MAIN ST.	22	40X102	MAY 2004 74435-74456
ROCHESTER, NY 14609 JAY COREY, DEPUTY DIRECTOR MAINTENANCE	4	40X102	JULY 2005 76333-76336
585-654-0291	19	40X102	JAN. 2006 76353-76368 76379-76381 JULY 2007
	20	40X102	77900-77921 SEPT, 2009
		40X102	176408-176424 AUG 2011
	21	40X102	178858-178878
<u>ROCKFORD MASS TRANSIT DISTRICT</u> 520 MULBERRY ST. ROCKFORD, IL 61101	12	35X102	SEPT. 2009 177221-177231
DAN ENGELKES, MAINT. MANAGER 815-961-2240	1	29X102	JANUARY 2017 93195-93195
ROCK REGION METRO 901 MAPLE STREET			
NORTH LITTLE ROCK, AR 72114			APR 2001
TIM BISBEE, DIR. OF MAINTENANCE	8	35X102	71813-71820
501-375-6717 TBISBEE@RRMETRO.ORG	1	35X102	72526 MAY - JUNE 2003
	9	35X102	73455-73463 NOV 2004
	7	29X102	90848-90854 JAN 2007
	5	40X102	77542-77546 FEB 2007
	1	35X102	77547 SEP 2008
	5	40X102	79589-79593 SEP - OCT 2008
	5	35X102	79584-79588 MARCH 2010
	4	40X102	177598-177601
	3	35X102	177595-177597 JUNE - JULY 2010
	4	40X102	177800-177803 JULY 2010
<u>CITY OF ROCKY MOUNT/TAR RIVER TRANSIT</u> 331 SOUTH FRANKLIN STREET	8	35X102	177804-177811
ROCKY MOUNT, NC 27802 TODD GARDNER, TRANSIT ADMINISTRATOR 252-972-1596	6	29X102	MARCH 2017 93196-93201
CITY OF ROSEVILLE			MAY 2009
2005 HILLTOP CIRCULE	6	29X102	91717-91422
ROSEVILLE, CA 95747	5	40X102	79979-79983
MICHAEL WIXON			FEB 2014
916-774-5293	4	35X102	184209-184212
SACRAMENTO RTD	30	40X102	JANUARY 2015 184915-184944
1323 28TH ST SACRAMENTO, CA 95812	66	40X102	FEB 2016 186501-186566

DIESEE EOW TEOOR			
CUSTOMER	QTY	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS
DAVID HARBOUR, DIR. BUS MAINTENANCE 916-321-2839 DHARBOUR@SACRT.COM	33	40X102	JULY 2016 186534-186566
SALEM AREA MASS TRANSIT			FEB. 2008
555 COURT ST. NE	1	40X102	79451
SALEM, OR 97301	3	40X102	78737-78739
GREGG THOMPSON, DIR. OF MAINT	16	35X102	79448-79450
503-361-7562			FEB. 2011
	8	40X102	178325-178332
	4	35X102	178333-178336
			FEB 2012
	4	35X102	179405-179408
SALISBURY, CITY OF 300 W. FRANKLIN ST. SALISBURY, NC 28144 RODNEY HARRISON, TRANSIT DIV. MGR 704-638-5253	2	35X102	SEPT. 2008 79961-79962
CANTRANC			
SAMTRANS 1250 SAN CARLOS AVE	60	408400	JAN. 2004
1250 SAN CARLOS AVE. SAN CARLOS, CA 94070-1306	60	40X102	74019-74078 DEC.2009
DAVID OLMEDA, MANAGER BUS MAINT. 650-508-6252	4	29X102	91771-91774 OCT 09 - MARCH 10
000 000 0202	70	40X102	177078-177168
	40	35X102	177018-177057
			DEC 2013
	4	29X102	92626-92632 JULY - SEP 2014
	12	29X102	92633-92644
	21	40X102	183145-183165
			APRIL 2017
	50	40X102	187784-187833
SAN DIEGO METROPOLITAN TRANSIT SYSTEM	26	40X102	JULY - NOV 2013 183201-183226
100 16TH ST. SAN DIEGO, CA 92101	24	40X102	DECEMBER 2013 183227-183250
JULIO ORTIZ, DIR. OF MAINTENANCE 619-238-0100 X 6500	12	40X102	SEP - DEC 2014 184001-184012
	38	40X102	NOVEMBER 2014 184013-184051
	24	40X102	JANUARY 2015 183227-184050
	24	40X102	AUG - SEPT 185968-185990
	23	40X102	NOVEMBER 2015 185991-186017
	10	40X102	MAY 2016 187366-1873675
	28	40X102	JUNE 2016 187283-187310
	10	40X102	AUGUST 2017 189487-189496
	36	40×102 40×102	189497-189532
		10/1102	100101 100002
SFO SHUTTLE BUS CO.			DEC. 2012
7801 EARHART RD OAKLAND, CA 94621	12	40X102	181843-181854
BOB GRAF, DIRECTOR OF MAINTENANCE			

<u>CUSTOMER</u> 415 -915-9733	QTY	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
415-915-9755			
<u>SAN JOAQUIN RTD</u> 2849 E. MYRTLE ST STOCKTON, CA 95201	2	40X102	JULY 2004 73093-73094 MAY 2007
BRAD MENIL, MAINT SUPT 209-467-6606	11	29X102	91202-91212 MAY 2013
203-407-0000	8	40X102	182435-182442 JUNE 2013
	12	40X102	182532-182543
SAN JOSE INT'L AIRPORT 1661 AIRPORT BLVD. C-205 SAN JOSE, CA 95110-1285 DAVE GOTSCHALL, AIRPORT OPS MGR. 408-277-5249	20	40X102	APRIL 2000 70801-70820
<u>SAN LUIS OBISPO CO. RTA</u> 179 CROSS ST. SAN LUIS OBISPO, CA 93401	3	40X102	JUNE 2001 70768-70770 JUNE 2013
DAVID ROESSLER, MGR. MAINT & FAC 805-781-4835	1	40X102	182291 AUG 2013
003-701-4033	6	40X102	182292-182297 AUG 2013
	3	35X102	182298-182300 MARCH 2015
	1	40X102	184847-184854 MARCH 2015
	1	35X102	184855
CITY OF SAN LUIS OBISPO PUBLIC WORKS DEPT 919 PALM ST. SAN LUIS OBISPO, CA 93401 GAMALIEL ANGUIANO, TRANSIT MGR 805-781-7121 OR 805-431-0001 (CELL)	2 2 4 1 2	29X102 35X102 40X102 40X102 40X102	OCT. 2007 91169-91170 DEC. 2008 176110-176111 176106-176109 MAY 2012 179686 FEB 2013 180508 & 181949 FEBRUARY 2017
	2	40X102	187851-187852
	1	40X102	187853-187853
<u>SANDY, CITY OF</u> 16610 CHAMPION WAY SANDY, OR 97055	1	35X102	DEC. 2011 178555 JANUARY 2017
JULIE STEPHENS, TRANSIT MGR 503-489-0925	1	35X102	186916-186916
<u>S.M.A.R.T.</u> 660 WOODWARD AVE. DETROIT, MI 48226-3315	40 12	35X102	MAY-SEPT. 2001 72379-72418 MARCH 2002 72258-72296
KEITH TAYLOR, DIRECTOF OF MAINTENANCE 248-419-7915	48	40X102 35X102	72236-72296 DEC. 2001-FEB. 2002 72419-72466
	40 55	40X102	AUG 2002 72936-72990
	45	35X102	OCTDEC. 2002 72891-72935
	40	JJA 102	JUNE-AUG 2003

CUSTOMER	QTY	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
	57	40X102	73223-73278 NOV. 2003
	30	29X102	90788-90817 OCT 2014
	2	40X102	184502-184503 APRIL 2016
	59	40X102	186917-186975
SANTA BARBARA MTD			MAY 2004
550 OLIVE ST.	11	29X102	90906-90916
SANTA BARBARA, CA 93101	15	40X102	74592-74602
STEVE HAHN, SPECIAL PROJECTS	2	201/102	NOV. 2006
805-963-3364	3	29X102	90994-90946 JUNE 2009
	3	29X102	91440-91442
	-	40)/400	JUNE 2011
	7	40X102	178923-178929 OCT. 2013
	13	40X102	182759-182771
	_		JANUARY 2016
	5	40X102	187625-187629 APRIL 2017
	3	40X102	188306-188308
<u>SANTA CLARA VTA</u> 3331 NORTH FIRST ST.	3	40X102	JUNE 1999 70677-70679
SAN JOSE, CA 95134-1906	Ũ	40/(102	DEC. 2001-MARCH 2002
JAMES WILHELM	61	40X102	72040-72100
408-546-7447	23	35X102	APRIL 2002 72101-72123
	20	00/102	JULY-SEPT. 2002
	56	40X102	72643-72699
	3	40X102	JULY 2004 73941-73943
	0	40/102	NOVEMBER 2016
	4	40X102	188001-188004
	13	40X102	NOVEMBER 2016 188005-188017
	10	10/(102	SEPTEMBER 2017
	56	40X102	188045-188100
<u>SANTA CLARITA, CITY OF</u> 28250 CONSTELLATION RD. SANTA CLARITA, 91355 ADRIAN AGUILAR, TRANSIT MNGR.	10	40X102	MAY 2013 181764-181773
661-295-6305			
SANTA FE TRAILS			MAY 2012
2931 RUFINA ST.	1	29X102	92266
SANTA FE, NM 87507 JON BULTHUIS, DIRECTOR	5	35X102	SEP 2014 184289-184293
505-955-2006 JRBULTHUIS@CI.SANTA-FE.NM.US	0	00/102	OCTOBER 2015
	7	35X102	184556-184562
SANTA MARIA AREA TRANSIT			JAN. 2004
110 S. PINE ST., STE 221 (MAIL STE 101)	3	35X102	72489-72491
SANTA MARIA, CA 93454	-	101/100	NOV. 2009
AUSTIN O'DELL, MGR 805-925-0951 X 225	3	40X102	78627-78629 NOV. 2010
000 020-0001 A 220	1	40X102	176931
			MARCH 2016

DIESEE LOW TEOOR COST			
CUSTOMER	<u>QTY</u> 16	<b><u>SIZE</u></b> 35X102	DELIVERY DATE / SERIAL NUMBERS 187477-187492
SANTA MONICA - BIG BLUE BUS	20	40X102	DECEMBER 2012 182218-182237
1660 7TH STREET SANTA MONICA, CA 90401 PATRICK CAMPBELL, COO	25	40X102	AUGUST 2013 182238-182262 FEB 2014
310-458-1975 EXT 6349 PATRICK.CAMPBELL@SMGOV.NET	13	40X102	182263-182275 JULY - AUG 2015
	11	40X102	185367-185377 NOVEMBER 2015
	4	29X102	93097-93100
<u>SCOTTSDALE, AZ (CIT OF SCOTTSDALE)</u> 7447 E. INDIAN SCHOOL ROAD MESA, AZ 85203 PERDO RODRIGUEZ 480-312-7626	4	35X102	AUGUST 2017 188893-188896
ST. CLOUD MTC 665 FRANKLIN AVE. NE ST. CLOUD, MN 56304 ED YOREK, DIR OF MAINT 320-251-1499	1 17	35X102 35X102	DEC 2001 73034 FEB - MAR 2004 73035-73051
	5	35X102	JAN. 2003 73100-73104
ST. JOSEPH TRANSIT 702 S. 5TH ST. ST. JOSEPH, MO 64501 SCOTT BUTCHER, MAIN. MANAGER 816-271-5367	2 5 7 6 2 9	29X102 29X102 29X102 29X102 29X102 29X102	MARCH 2002 90487-90488 JAN. 2003 90569-90573 MARCH 2004 90714-90723 FEB. 2005 90932-90937 JULY 2012 92358-92359 FEB. 2019 93526-93534
ST. LOUIS METRO 707 N. FIRST ST. ST. LOUIS, MO 63102-6819 DARREN CURRY, DIR OF MAINT 314-982-1400	2 3 21 5 4 14 7 29	29X102 40X102 35X102 35X102 40X102 35X102 40X102 40X102	JUNE 2001 90485-90486 MAY 2002 72531-72533 JULY - NOV 2008 79894-79914 NOV 2008 79915-79919 AUG 2009 176538-176541 FEB. 2011 179622-179635 MARCH 2011 178630-178636 OCT - NOV 2011 179593-179621
	20	35X102	MAR - APRIL 2012 179659-179678

CUSTOMER	<u>QTY</u>	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS APRIL - MAY 2012
	23	40X102	179636-179658 OCT 2013
	8	40X102	182369-182376 OCT - NOV 2013
	22	35X102	184151-184172 NOV - DEC 2013
	21	35X102	184173-184193
	26	40X102	SEP - OCT 2014 184451-184476
	25	40X102	NOV - DEC 2014 184477-184501
	16	40X102	SEPT - OCT 2015 185921-185936
	16	40X102	OCTOBER 2015 185937-185952
	18	40X102	NOVEMBER 2015 185950- 185967
SANTA ROSA, CITY OF			DEC. 2002
100 SANTA ROSA AVE.	1	29X102	90693
SANTA ROSA, CA A90693	5	40X102	73000-73004
DAVE ELLIS, TRANSIT PLANNER 707-543-3335			
SARASOTA CO. TRANSPORTATION AUTHORITY			APRIL 2004
5303 PINKNEY AVE.	5	35X102	73450-73454
SARASOTA, FL 34232	0	051/400	JULY 2006
ROCKY BURKE, GM 941-202-4124	2	35X102	76662-76663 MARCH 2007
941-202-4124	9	35X102	77405-77413
	5	00/102	FEB. 2011
	6	40X102	179968-179973
	18	25102	MARCH 2014 183931-183948
	10	35X102	MAY 2016
	10	35X102	187073-187082
	20	35X102	APRIL 2017 189954-189973
	20	00/(102	100004 100010
SCHUYLKILL TRANSPORTATION SYSTEM			APRIL 2007
PO BOX 67, 252 INDUSTRIAL PARK ROAD	4	29X102	91294-91297
ST. CLAIR, PA 17970-0067			NOV. 2010
JOHN BOWMAN, MAINTENANCE & EQUIPMENT MANAGER 570-429-2701	1	35X102	176158 AUG 2012
570-428-2701	1	35X102	179988
	1	29X102	92375
			OCT 2004
SHENANGO VALLEY SHUTTLE SERVICE 2495 HIGHLAND RD.	3	29X102	OCT. 2001 90429-90431
HERMITAGE, PA 16148	0	20/102	JAN. 2008
TOM TULIP, ADMINISTRATOR	1	29X102	91300
724-981-1561			MARCH 2012
	1	29X102	92389 APRIL 2013
	1	29X102	92473
			42005
	1	29X102	92795
			OCT. 2003
SHORELINE METRO TRANSIT			73587
608 S. COMMERCE ST.	1	35X102	
10004 00 of 100			

DIESEL LOW I LOOK CO			
CUSTOMER	QTY	SIZE	<u>DELIVERY DATE /</u> SERIAL NUMBERS
SHEBOYGAN, WI 53081 DEREK MUENCH, DIRECTOR 920-459-3140	6	35X102	NOV. 2003 73587-83592 JUNE 2005
920-439-3140	6	40X102	76157-76162 DEC. 2005
	5	29X102	91034-91038 SEPT. 2010
	5	35X102	177751-177755
SHREVEPORT, CITY OF 1115 JACK WELLS BLVD.	12	40X102	MARCH 2003 73729-73740
SHREVEPORT, LA 71107 DINERO WASHINGTON, GENERAL MANAGER 318-673-7406	10	35X102	AUG 2008 77040-77049
<u>SIOUX CITY TRANSIT</u> 2505 FOURTH ST.	4	35X102	JAN. 2004 73131-73134
SIOUX CITY, IA 51101 MIKE COLET, TRANSIT DIRECTOR	3	35X102	AUG 2004 73135-73137
712-279-6408	1	35X102	JUNE 2006 76418
	1	35X102	JUNE 2007 77098
	2	35X102	MAY 2009 78932-78933
	16	29X102	JULY 2009 91718-91733
	1	29X102	91975 AUG 2010
	2	35X102	177769-17770 AUG 2012
	1	40X102	180354 AUGUST 2017
	1	35X102	187327-187327 OCTOBER 2017
	1	35X102	188592-188592
<u>SIOUX AREA METRO</u> 500 EAST 6TH STREET			
SIOUX FALLS, SD 57103-7016 RANDY HARTMAN, GM	8	29X102	JAN. 2002 90532-90539
605-367-6902	16	29X102	JULY 2009 91718-91733
	1	29X102	91975 DEC 2015
	5	35X102	184856-184860 MAR 2018
SISKIYOU COUNTY	4	35X102	189622-189625
411 4TH ST. YREKA, CA 96097	F	252400	AUG 2013
MELISSA CUMMINS, TRANSP. SERV MGR 530-842-8295	5	35X102	183505-183509
<u>SKAGIT TRANSIT SYSTEM</u> 380 PEASE RD.	2	40X102	JUNE 1998 70284-70285
BURLINGAME, WA 98233-3118 AL SCHANER, MAINTENACE MANAGER	1	40X102	JUNE 1999 70592
360-757-8801	4	40X102	MAY 2000 71064-71075
	1	35X102	NOV. 2011 178544
			AUGUST 2016

DIESEE LOW TEOOR COS			
CUSTOMER	<b>QTY</b> 1	<b>SIZE</b> 35X102	DELIVERY DATE / SERIAL NUMBERS 186443
	2 2	35X102 29X102	APRIL 2017 187378-187379 93126-93127
SMART TRANSIT			AUG 2012
8455 ELLIGSEN RD WILSONVILLE, OR 97070	1	40X102	180354 NOV 2013
STEVEN ALLEN, OPS MGR 503-570-1577	1	40X102	182078 SEPTEMBER 2016
	2	35X102	185590-185591 APRIL 2017
	80	40X102	189242-189321
SNOWMASS VILLAGE			JUNE 2011
100 DALY LANE SNOWMASS VILLAGE, CO 81615	7	29X102	92210-92216 AUG 2012
CHIP FOSTER, OPS SUPERVISOR 970-923-2543	2	29X102	92353-92354 JUNE 2013
	2	29X102	92416-92417 AUG 2014
	2	29X102	92689-92690 AUG 2015
	3	29X102	93062-93064 APRIL 2017
	3	29X102	93128-93130
<u>SORTA</u> 1401-B BANK ST.	40	40X102	AUG 2006 76763-76802
CINCINNATI, OH 45214-1782 CARLOS ROWLAND, DIR OF MAINT	1	40X102	NOV. 2008 79978
513-632-7514	44	40X102	MAY 2012 181102-181145
	10	40X102	MARCH 2013 181937-181946
	37	40X102	FEBRUARY 2015 186620-186656
	22	40X102	AUGUST 2016 189387-189408
<u>SOUND TRANIST</u> 401 S. JACKSON ST. SEATTLE, WA 98104	2	40X102	MAR 2012 180613-180614 MARCH 2015
TIM WAGNER, BUS MAINTENANCE SUPERINTENDENT 206-398-5420	3	40X102	MARCH 2015 184861-184863
SOUTHEAST AREA TRANSIT			SEPT. 2004
260 MILITARY HWY PRESTON, CT 06365	2	29X102	90289-90290 MARCH 2006
MICHAELCARROLL , GM 860-886-2631 X 116	2	29X102	91128-91129 APRIL 2013
	1	40X102	181441 APRIL 2013
	1	35X102	181442
<u>SOUTH EAST AREA TRANSIT</u> 375 FAIRBANKS ST.	1	35X102	JULY 2004 72555
ZANESVILLE, OH 43701			

DIESEE EOW I EOOK COST			
CUSTOMER RICH WOOD, MAINTENANCE MANAGER	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
740-454-8573			
SOUTHEASTERN REGIONAL TRANSIT AUTHORITY	7	35X102	MARCH 2008 78842-78848 MAY 2010
700 PLEASANT STREET, SUITE 320 NEW BEDFORD, MA 02740	10	29X102	92032-92041 OCT - NOV 2010
ERIK ROUSSEAU, ADMINISTRATOR 508-999-5211 EROUSSEAU@SRTABUS.COM	12	29X102	92042-92053 MAR 2012
EROUSSEAU@SRTADUS.COM	9	29X102	92376-92384 MAY 2013
	2	35X102	182049-182050 OCT 2013
	6	35X102	182051-182056 MARCH 2016
	3	35X102	187020-187022
	3		
	3	40X102	187027-187029
	4	35X102	SEP 2016 187023-187026 OCT 2016
	1	40X102	187030 FEB 2018
	5	35X102	190398-1-0402
STEAMBOAT SPRINGS TRANSIT	1	29X102	NOV. 2008 91666
137 10TH ST. STEAMBOAT SPRINGS, CO 80487	2	29X102	JUNE 2010 91994-91995
JONATHAN FLINT, OPS. MGR 970-879-3717	1	35X102	NOV. 2012 180301
	2	35X102	SEPT. 2013 180302-180303
	1	35X102	JANUARY 2015 183478
	12 9	29X102 29X102	92042-92053 MARCH 2012 92376-92384
	9	35X102	92376-92384 NOVEMBER 2015 181371
	3	40X102	JANUARY 2015 187324-187326
	0	40/(102	107024 107020
<u>SOUTHWEST METRO TRANSIT</u> 14405 WEST 62ND STREET			
EDEN PRAIRIE, MN 55346			MAY 2006
DAVE SIMANEAU, OPS & MAINT. MGR	6	40X102	76912-76917
952-974-3133	4	40X102	76908-76911 APR - MAY 2015
	2	29X102	92923-92924
SPACE COAST AREA TRANSIT			OCT. 2007
401 S. VARN AVE.	6	35X102	78460-78465
COCOA, FL 32922	2	40X102	78466-78467
LANCE PARKER, MANAGER OF OPERATIONS & MAINTENANCE			JUNE 2011
321-635-7815 X 52952	8	35X102	179917-179924 DEC. 2011
	6	35X102	180118-180123 NOV 2013
	2	40X102	182772-182773 JANUARY 2015

DIEGEE EOW I EOOK COS			
CUSTOMER	<u>QTY</u> 3	<u>SIZE</u> 40X102	DELIVERY DATE / SERIAL NUMBERS 185347-185349
	1	35X102	JANUARY 2015 185350 AUGUST 2016
	5	35X102	189187-189191
<u>SPARTANBURG, CITY OF</u> 150 AIRFLOW DR. SPARTANBURG, SC 29306	2	35X102	MARCH 2012 178625-178626 42736
LUIS GONZALEZ, GM 864-595-2710	3	35X102	187090-187092
			NUO 0004
<u>SPECIAL TRANSIT</u> 4880 PEARL ST. BOULDER, CO 80301	3	29X102	AUG 2004 90721-90723 DEC. 2009
RICH BURNS, DIR OF OPERATIONS 303-447-2848	4	29X102	91880-91883 AUGUST 2017
	3	29X102	93202-93204
<u>SPOKANE TRANSIT AUTHORITY</u> 1229 W. BOONE AVE. SPOKANE, WA 99201	1	35X102	OCT 2002 73384 JAN. 2003
JACQUELINE TJARDS, PURCHASING MANAGER	5	35X102	73385-73389
509-325-6032	4	35X102	73390-73393 JAN 2003
	3	35X102	73016-73018 JULY 2003
	4	29X102	90818-90821
	6	29X102	90822-90827 JULY 2005
	10	35X102	74550-74559 JUL - SEP 2006
	19	40X102	77750-77768 SEP - OCT 2007
	14	40X102	78148-78431 OCT. 2007
	3	35X102	78435-78437 NOV - DEC 2008
	14 9	40X102 40X102	79603-79616 NOV. 2009 176245-176253
	9	40X102	MAR 2014 183561-183568
	7	40X102	OCT 2016 187083-187089
	6	40X102	DEC 2017 188311-188316
	6	40X102	AUG 2019 192931-192936
	8	40X102	MAR 2021 195822-195829
	8	40X102	195830-195837
SPRINGFIELD CITY AREA TRANSIT 100 JEFFERSON ST. SPRINGFIELD, OH 45501 RON MACALUSO, GM 937-433-2883	5	29X102	SEPT. 2004 90732-90736
<u>SPRINGFIELD MASS TRANSIT DISTRICT</u> 928 S. NINTH ST. SPRINGFIELD, IL 62703	4	35X102	JULY 2008 78663-78666 AUG 2011
19994			

			DELIVERY DATE /
CUSTOMER	QTY	SIZE	SERIAL NUMBERS
FRANK SQUIRES, MANAGING DIRECTOR	10	35X102	179514-179523
217-522-6087	7	35X102	JUNE 2013 183061-183067 JUNE 2013
	5	29X102	92502-92506 JANUARY 2014
	7	35X102	183061-183067
<u>STANFORD UNIVERSITY</u> 315 BONAIR SIDING	14	35X102	AUG 2003 73750-73763
STANFORD, CA 94305-7270 WARD THOMAS	2	40X102	DEC. 2011 180363-180364
650-725-5997			
STAR METRO			MARCH 2007
400 DUPREE ST.	1	29X102	91299
TALLAHASSEE, FL 32304 RALPH WILDER, SUPER OF TRANSIT MAINT.	3	35X102	DEC. 2011 180198-180200
850-891-5217	2	40X102	183052-183053
	2	201/102	MAY 2015
	3	29X102	92957-92959 JUNE-JULY 2017
	5	35X102	190668-190672
	1	35X102	190673-190673
<u>STARK AREA RTA</u> 1600 GATEWAY BLVD., SE	5	29X102	MARCH 2004 90840-90844
CANTON, OH 44707	D	29X102	90840-90844 MARCH 2008
MARK FINNICUM, COO	4	29X102	91397-91400
330-477-2782 EXT 524	6	35X102	JUNE 2010 178590-178595
	6	35X102	FEB. 2011 178596-178601
	1	40X102	NOVEMBER 2015 187319
			SEPTEMBER 2016
	4	40X102	187320-187323
<u>STARTRAN</u> 710 "J" STREET	20	35X102	DEC. 2001 71409-71428
LINCOLN, NE 68508			JULY 2004
GLENN KNUST, SUPER. OF MAINT. 402-441-8317	10	35X102	74632-74641 NOV. 2006
102 111 0011	15	35X102	77100-77104
	13	29X102	MARCH 2011 92120-92132
	10	20/102	52120-52152
STATE OF MAINE			FEB. 2011
SH5, 1 CHILD ST.	17	35X102	178607-178623
DANIEL ROLFE, PLANNER/SCHEDULER 207-441-2352			
<u>STEVENS POINT</u> 1515 STRONGS AVE.	2	29X102	AUG 2001 90504-90505
STEVENS POINT, WI 54481			APRIL 2002
SUSAN LEMKE, TRANSIT MGR. 715-341-4490	3	29X102	90506-90508 APRIL 2003
	1	29X102	90759
	4	40X102	OCT. 2008

DIEGEE EOW I EOOK CO			
CUSTOMER SUFFOLK COUNTY	<u>QTY</u>	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS 79580-79583
335 YAPHANK AVE. YAPHANK, NY 11980-9744 GARRY LENBERGER, FLEET SERVICE MGR 631-852-4872			
<u>SUMMIT STAGE</u> PO BOX 2179 FRISCO, CO 80443	3	29X102	JAN. 2008 78028-78030 APRIL 2009
LEN WISE 970-668-4162	2	40X102	79692-79693 FEB 2014
	2	40X102	182776-182777
<u>SUNTRAN</u> PO BOX 1270 OCALA, FL 34478-1270	2	29X102	JULY 2002 90566-90567 JUNE 2007
GREG SLAY, DIRECTOR TPO 352-629-8297	7	35X102	78253-78259 APRIL 2008
	18	40X102	78751-78768 DEC. 2011
	19	40X102	180313-180331 OCT. 2012
	22	40X102	181151-181172 AUG 2013
	1	35X102	182070 JUNE 2017
	1	35X102	186850-186850
SUN TRAN			SEPT. 2005
3920 N. SUN TRAN BLVD. TUCSON, AZ 85705	38	40X102	75189-75226 FEB. 2007
KEVIN FAULKNER, PROJECT MGR 520-206-8805	12	40X102	77486-77497 OCT. 2008
	11	40X102	176000-176010 NOV. 2008
	36	40X102	176332-176367 JAN. 2010
	24	40X102	178899-178922 MARCH 2011
	1	40X102	178572 NOV. 2012
	15	40X102	181391-181405 MAY - JUNE 2014
	25	40X102	188526-185549 JANUARY 2015
	5	35X102	184754-184758 JULY - AUG 2015
	16	40X102	
SUN VALLEY TRANSIT PO BOX 3091	2	29X102	187041-187056 JULY 2002 90288-90289
KETCHUM, ID 83340	2	29X102	FEB. 2006
JASON MILLER, EXECUTIVE DIRECTOR 208-806-0053	1	35X102	91124-91125 JAN. 2007 77671
	1	35X102	JANUARY 2014 182419
	1	35X102	NOVEMBER 2015 181508
<u>TALTRAN</u> 555 APPLEYARD DR.	2	35X102	MARCH 2003 73520-73521

DIESEE EOW TEOOR CO			
<b>CUSTOMER</b>	QTY	SIZE	<u>DELIVERY DATE /</u> SERIAL NUMBERS
TALLAHASSEE, FL 32304 RALPH WILDER, MAINT. MGR 850-891-5197	9 5	35X102 40X102	FEB. 2005 74863-74871 MARCH 2007
	4	40X102	77242-77246 DEC. 2007
	4	35X102	78395-78398 JUNE 2009
	12	40X102	176706-176709 MAY 2010 177857-177868 MAY 2012
	2	40X102	180405-180406
<u>TCAT</u> 737 WILLOW AVE.	8	40X102	AUG 2006 77422-77429
ITHACA, NY 14850 DAN TOME, PURCHASING AND PROJECT MANAGER	2	40X102	NOV. 2009 177472-177473
607-277-9388 X 540	6	40X102	AUG 2011 176760-176765
	2	40X102	42005 184442-18443
TEXAS A&M UNIVERISTY	5	40X102	FEB 2016 187251-187256
1373 TAMU BLDG 969 AGRONOMY RD COLLEGE STATION, TX 77843-1373 MADELINE DILLARD			JANUARY-FEB 2015
ASST. DIRECTOR FOR TRANSPORTATION 979-847-8817 mdillard@tamu.edu	10	40x102	185911-185920
<u>TOLEDO AREA REGIONAL TRANSIT</u> 1127 W. CENTRAL AVE.	13	40X102	OCT. 1998 70152-70164
TOLEDO, OH 43697-0792 JIM GEE, GM	20	40X102	SEPT. 1999 71044-71063
419-245-5222	8	35X102	DEC. 2004 72481-72488
	3	40X102	74398-74400 DEC. 2012
	8	35X102	181443-181450
TOPEKA TRANSIT			MARCH 2011
201 N. KANSAS AVE. TOPEKA, KS 66603-3622	16	35X102	180249-180264 DEC 2014
SUSAN DUFFY, CEO/GM 785-233-2011 X 102	10	35X102	184266-184275
TORRANCE, CITY OF 201500 MADRONA AVE. TORRANCE, CA 90503-3690 KIM TURNER, TRANSIT DIRECTOR 310-618-6245	8	40X102	APRIL 2000 70553-70560 JULY 2002 72753-72763
<u>TOWN OF BRECKENRIDGE</u> 1105 AIRPORT RD BRECKENRIDGE, CO	1	29X102	AUG 2013 91929 JUNE 2016
JIM BENKELMAN, TRANSIT/PARKING/FLEET MGR	1	29X102	93169
970-547-3153	1	29X102	93170 MARCH 2018
	1	29X102	93300
TOWN OF CHAPEL HILL 6900 MILLHOUSE RD	13	40X102	JULY 2007 78341-78353

		0175	DELIVERY DATE /
<u>CUSTOMER</u> CHAPEL HILL, NC 27516 ROGER CHAPIN, ASST. TRANSP. DIRECTOR	<u>QTY</u> 8	<u>SIZE</u> 40X102	<u>SERIAL NUMBERS</u> JUNE 2009 176564-176571
919-968-2755	4	40X102	JANUARY 2012 179184-179187
	2	40X102	42736 189893-189894 APRIL - MAY 2017
	14	40X102	189895-189908 APRIL 2018
	6	40X102	191274-191279 43466
	6	40X102	191857-191862
<u>TOWN OF HUNTINGTON</u> 144 E. 2ND ST. HUNTINGTON STATION, NY 11746 STEPHEN MCGLOIN, DIRECTOR 631-351-3053	3	29X102	JULY 2011 92257-92259
TRACER - CITY OF TRACY 333 CIVIC CENTER PLAZA TRACY, CA 95376 ED LOVELL, MANAGEMENT ANALYST II 209-831-6204	5	35X102	FEBRUARY 2017 187741-187745
<u>TRANSIT AUTHORITY OF N. KENTUCKY</u> (TANK)			
3375 MADISON PIKE FORT WRIGHT, KY 41017 ANDY AIELLO, GM	12	40X102	FEB. 2000 71064-71075 OCT. 2000
859-814-2123	15	40X102	71365-71381 DEC. 2002
	5 8	40X102 29X102	73005-73009 90603-90610
			OCT. 2004
	11	40X102	74811-74821 DEC. 2005
	10	40X102	76667-76676 NOV. 2006
	10	40X102	77232-77241 OCT. 2007
	4	40X102	78452-78455 AUGUST 2007
	9	40X102	78176-78184 DEC. 2007
	8	40X102	78861-78868 OCT. 2008
	7	40X102	176190-176196 OCT. 2009
	8	40X102	177417-177424 APRIL 2012
	8	40X102	181545-181552 MARCH 2013
	8	40X102	181704-181711 MARCH 2014
	8	40X102	182462-182469 FEBRUARY 2015
	9	40X102	186153-186161 FEBRUARY 2016
	10	40X102	186836-186845 FEBRUARY 2017
	6	40X102	189659-189664 FEBRUARY 2019
	5	40X102	191886-191890 DECEMBER 2019

CUSTOMER	<u>QTY</u> 5	<u>SIZE</u> 40X102	DELIVERY DATE / SERIAL NUMBERS 193746-193750
TRANSIT AUTHORITY OF RIVER CITY (TARC) 1000 W. BROADWAY	5	40X102	MARCH 2021 195391-195395
LOUISVILLE, KY 40203 CARRIE BUTLER, EXECUTIVE DIRECTOR 502-561-5100	53	40X102	NOV 1998 & JAN. 1999 70182-70235 OCT. 1999
EMAIL: cbutler@ridetarc.org	37	40X102	71084-71119 & 71243 AUG 1999
	20	40X102	70375-70394 JAN. 2002
	17	29X102	90465-90481 DEC. 2001
	11	40X102	72467-72477 FEB. 2003
	20	40X102	72778-72797 APRIL 2005
	16	40X102	76141-76156 MAY 2008
	6	40X102	78684-78689 OCT. 2009
	17	40X102	176874-176890 FEB 2013
	15	40X102	181817-181831
	1	40X102	181711 JULY 2013
	21	40X102	183701-183721 AUG 2014
	12	40X102	183722-183733 MAY 2016
	12	40X102	187328-187339
	13	40X102	NOVEMBER 2016 187340-187352
SOUTH BEND TRANSIT TRANSPO			AUG - SEP 2002
1401 SOUTH LAFAYETTE BLVD. SOUTH BEND, IN 46624	10	35X102	72584-72593 JAN - FEB 2003
AMY HILL, GENERAL MANAGER & CEO 574-239-2305	10	35X102	73078-73087 FEB, APR, AUG 2004
51+205-2000	11	35X102	74133-74143 MAY 2004
	10	35X102	74144-74153
<u>TRANSIT MANAGEMENT OF NASHUA</u> 11 RIVERSIDE STREET	7	29X102	DEC. 2001 90616-90622
NASHUA, NH 03063 RAY BLETHEN, GM	1	35X102	APRIL 2005 76163
603-821-2032			SEPTEMBER 2017
	4	29X102	93258-93261
	4	35X102	189986-189989
<u>TRANSTAR TRANSPORTATION GROUP INC.</u> 404 ZELL DR. ORLANDO, FL 32824 ROBERT GAYE, CEO 408-888-5530	6	40X102	MAY 2014 184294-184299
TRIANGLE TRANSIT AUTHORITY			AUG 2011
5201 NELSON RD MORRISVILLE, NC 27560	10	40X102	179001-179010 OCT. 2011
SCOTT LANSING, DIR OF BUS OPS 919-475-3023	6	40X102	180522-180527 JULY 2017

DIEGEL LOW I LOOK			
CUSTOMER	<b>QTY</b> 10	<u>SIZE</u> 40X102	DELIVERY DATE / SERIAL NUMBERS 189933-189942
<u>TRI MET</u> 4412 SE 17TH AVE. PORTLAND, OR 97202	51	40X102	JULY-SEPT 2012 181001-181051 JUNE-AUG 2013
GREG HALEY, MAINT. MGR 503-962-3327	69	40X102	182802-182870 APR - AUG 2014
	90	40X102	183579-183668 JAN-FEB 2015
	21	29X102	92802-92822 FEBRUARY 2015
	8	40X102	183669-183676 SEPT. 2013
	4	40X102	181290-181293 MARCH 2015
	4	40X102	183677-183680
	20	40X102	NOVEMBER 2015 185001-185021
	57	40X102	JANUARY 2016 185021-185077
	50	40X102	SEPTEMBER 2016 189192-189241
	57	40X102	AUGUST 2017 188977-189033
TRI-STATE TRANSIT AUTHORITY 1120 VIRGINIA AVE.	4	29X102	MARCH 2007 91229-91232
HUNTINGTON, WV 25704 PAUL DAVIS, GM	2	35X102	MARCH 2008 78999-79000
305-529-6094			MARCH 2003
	6	29X102	90652-90657
	3	35X102	73747-73749
			JANUARY 2015
	3	35X102	184608-184610
			AUG - SEPT 2015
<u>CITY OF TULARE, CA</u> 411 EAST KERN AVE TULARE, CA 93274 DARLENE THOMPSON, FINANCE DIRECTOR 559-684-4255	4	35X102	183908-183911
TULSA TRANSIT AUTHORITY			OCT. 2000
PO BOX 52488	8	35X102	71508-71515
TULSA, OK 74152 RANDY CLOUD, DIR. OF MAINT	5	40X102	OCT. 2000 71516-71520
918-585-1195	8	35X102	MARCH 2004 72481-72488
	2	29X102	JAN. 2009 91414-91416
	3 3	35X102	JUNE 2005 74914-74916
	10	35X102	JUNE 2005 76441-76450
	15	40X102	76426-76440 JANUARY 2016
	2	40X102	185585-185586 JANYARY 2017
	8	35X102	188848-188855

DIESEE LOW TEOOR CO			
CUSTOMER 212 E. LOCUST CENTRALIA, WA 98531	<u>QTY</u> 2	<u>SIZE</u> 29X102	DELIVERY DATE / SERIAL NUMBERS 91119-91120 JULY 2011
ROB LAFONTAINE, GM 360-330-2072	1	29X102	92223 FEB 2019
	1	29X102	191312
<u>ULSTER CO. AREA TRANSIT</u> 1 DANNY CIRCLE KINGSTON, NY 12401 ROBERT DIBELLA, DIR. PUBLIC TRANSIT 845-340-3335	2	29X102	JAN. 2012 92092-92093
UNIVERSITY OF CONNECTICUT 3 N. HILLSIDE RD., UNIT 6199	2	35X102	OCT. 2005 76582-76583
STORRS, CT 06269 JANET FRENIERE, TRANSP. SERVICES ADMIN	4	35X102	JUNE 2008 79210-79213
860-486-4804	3	35X102	JULY 2011 177510-177512
UNIVERSITY OF DELAWARE 403 WYOMING RD	7	35X102	APRIL 2011 178962-178968
NEWARK, DE 49716 SHEAREE MOORE, MGR OF TRANSP 302-831-3198	2	35X102	JULY 2016 187248-187249
UNIVERSITY OF IOWA, CAMBUS MGR 100 CAMBUS OFFICE	3	40X102	JULY 2009 176200-176202
IOWA CITY, IA 52242-1000 BRIAN MCCLATCHEY	8	40X102	JULY 2011 179315-179322
319-335-8632	0	402400	SEPT. 2013
	2 3	40X102 29X102	183295-183296 92594-92596 JUNE 2018
	1	40X102	188697
<u>UNIVERSITY OF KANSAS</u> 1501 IRVING HILL RD LAWRENCE, KS 66045	5	40X102	MARCH 2008 79443-79447 JUNE 2009
DANNY KAISER, DIR. PARKING & TRANSIT 785-864-7275	4	35X102	176823-176826 JAN. 2012
	6	40X102	180036-180041 AUG 2013
	3	40X102	183096-183098 JUNE 2014
	3	40X102	183475-183477 JUNE 2015
	3 3	40X102 40X102	184807-184809 JUNE 2016 184804
	3	40X102	JULY 2017 188226-188228
	0	40/(102	100220-100220
UNIVERSITY OF MARYLAND BUILDING 013, GREENHOUSE RD	8	35X102	MARCH 2005 76046-76053
COLLEGE PARK, MD 20742 DON ST. ARMAND, FLEET MGR.	8	35X102	JULY 2006 76685-76692
301-314-7264	4	40X102	MAY 2010 178956-178959 JANUARY 2013
	6	40X102	181565-181570
	5	35X102	181571-181575 JUNE 2016

CUSTOMER	<u>QTY</u> 2	<u>SIZE</u> 29X102	DELIVERY DATE / SERIAL NUMBERS 93149-93150
	_		JULY 2016
	4	40X102	188908-188911
UNIVERSITY OF MARYLAND BALTIMORE COUNTY 1000 HILLTOP CIRCULE BALTIMORE, MD 21250	3	35X102	APRIL 2007 77746-77748
JOE REGIER, COMMONS DIRECTOR 410-455-3870			
UNIV. OF MASS TRANSIT SERVICES 255 GOVERNORS DR.	5	40X102	JUNE 2006 76818-76822
AMHERST, MA 01003-9266 CLAUDE CURTIS, SUP. OF MAINTENANCE	5	40X102	MARCH 2007 77528-77532
413-545-0217	3	40X102	MAY 2009 176996-176998
UNIV. OF MICHIGAN	6+30	40X102	DEC. 2000
1213 KIPKE DR ANN ARBOR, MI 48109 BILL MCAUSTER MANACER, CARACE OPERATIONS	6	40X102	71114-71119 FEB. 2002 71971-71976
BILL MCALISTER, MANAGER, GARAGE OPERATIONS 734-764-4723	6	40X102	JAN. 2003 73019-73024
	8	40X102	AUG 2004 74237-74244
	6	40X102	AUG. 2005 76338-76343
	6	40X102	JULY 2007 78038-78043
	3	40X102	FEB. 2008 78893-78895
	4	40X102	DEC. 2011 180165-180168
	3	40X102	AUG 2013 180988-180990 APR 2014
	3	40X102	184388-184390 MAR - APR 2014
	3	29X102	92790-92792 APRIL 2015
	3	40X102	183686-183688 APRIL 2015
	1	29X102	92796 NOVEMBER 2015
	1 3	29X102 40x102	93046 187133-187135
	1	29X102	DECEMBER 2015 92989
	1	29X102	JULY 2017 93134-93134
<u>UNIV. OF MINNESOTA</u> 300 TRANSPORTATION & SAFETY BLDG.	1	40X102	OCT. 2008 176189
511 WASHINGTON AVE. SE MINNEAPOLIS, MN 55455	1	40X102	FEB. 2010 176322
WILLIAM STAHLMANN, TRANSIT MANAGER\ 651-808-1404	1	29X102	JUNE 2012 92355
	1	29X102	JANUARY 2015 92800
	2	35X102	JULY 2015

CUSTOMER	<u>QTY</u>	0175	<b>DELIVERY DATE /</b>
UNIVERSITY OF OKLAHOMA, OK		<u>SIZE</u>	SERIAL NUMBERS 184249-184250
510 E. CHESAPEAKE NORMAN, OK 73019 SUSAN COLDWATER, CART MANAGER OF OPERATIONS 405-325-3322			
UNIVERSITY OF VIRGINIA 1101MILLMONT ST.	3	35X102	DEC. 2007 77897-77899
CHARLOTTESVILLE, VA 22904	3	357102	SEPT. 2009
ANDY MANSFIELD, ASST. DIRECTOR 434-962-2090	2	35X102	177722-177723 FEB 2012
	6	35X102	180537-180542 SEP 2014
	5	35X102	184444-184448 FEBRUARY 2017
	7	35X102	188762-188768
UNION CITY, CA, CITY OF	1	35X102	SEPTEMBER 2012 180531
34009 ALVARADO NILES ROAD UNION CITY, CA 94587	5	35X102	NOVEMBER 2012 180531-185035
ROBERT SAUNDERS, GENERAL MANAGER 510-453-6043	4	35X102	MARCH 2016 184965-184968
UTAH TRANSIT AUTHORITY			NOV. 1999
3600 SOUTH 700 WEST	67	40X102	70700-70766
SALT LAKE CITY, UT 84119			MAY - AUG 1999
KURT BURNINGHAM, FLEET ENGINEER	28	35X102	70772-70799
801-287-3040	46	40X102	APR - JUNE 2001 71621-71666
	11	35X102	JUL 2001 72127-72137
	5	40X102	JUNE 2001 72138-72142
	31	40X102	AUG - NOV 2006 77707-77737
	1	35X102	AUG. 2007 78691
			OCT 2007 - JANUARY 2008
	34	40X102	77989-78027 JAN. 2008
	5	40X102	78023-78027 JANUARY - MAR 2009
	47	40X102	79847-79893 JUNE 2010
	1	40X102	176432 JUNE - NOV 2010
	36	40X102	176433-176468 OCT - DEC 2011
	20	35X102	179822-179851 JANUARY - MAR 2012
	30	40X102	179782-179811 JUNE 2012
	1	40X102	179812
	10	40X102	APR - JULY 2013 182345-182354
	2	35X102	JUNE 2013 182748-182749 NOV 2013
	14	40X102	182651-182664 NOV - DEC 2014
	20	40X102	184611-184630 JULY-AUG 2015
	23	40X102	186360-186382 SEPTEMBER 2017

DILGLE LOW I LOOK COSTON			
CUSTOMER	<b>QTY</b> 24 1 7 46	SIZE 40X102 40X102 35X102 40X102	DELIVERY DATE / SERIAL NUMBERS 191568-191591 191175-191175 191539-191545 OCTOBER 2017 191176-191221
<u>VAIL, TOWN OF</u> 75 S. FRONTAGE RD VAIL, CO 81657 TODD SCHOLL, FLEET MGR	1	40X102 40X102	OCT. 2006 76514 AUGUST 2017 190047-190054
970-479-2162	1	40X102	MARCH 2016
<u>VALLEY METRO - PHOENIX</u> 3320 N. GREENFIELD RD. MESA, AZ 85215	8	40X102	188826 JULY 2016 188827-188834
LARRY JOYNER 480-990-5450	12	40X102	AUGUST 2017 190656-190667
<u>VALLEY RIDE</u> 4788 S. ORCHARD BOISE, ID 83705	3 8	40X102 35X102	AUGUST 2011 180351-180353 180355-180362 DECEMBER 2013
BRUCE SACKRON, TRANSPPORTATION SERV MGR 208-846-8547 X 4226 BSACKRON@VALLEYRIDE.ORG	4	35X102	183486-183489 JULY 2016
	3	35X102	186270-186272
<u>VALLEY TRANSIT</u> 1401 W. ROSE ST. WALLA WALLA, WA 99362 DICK FONDAHN, GM 509-525-9140	1 3	40X102 29X102	183904-183907 90987-90991 AUG 2006 91011-91012 & 91021
<u>VANGUARD CAR RENTAL USA</u> 6929 N. LAKEWOOD AVE., SUITE 100 TULSA, OK 74117-1808 ROBERT STAFF, VP FLEET MAINT. 954-320-6075			FEB 2005
VANGUARD - ATLANTA	2	35X102	74995-74996 FEB 2005
	3	35X102	75015-75017 AUG-SEP 2008
	4	40X102	79639-79642 DEC 2006
	3	40X102	77840-77842
<u>VANGUARD - BOSTON</u>	4 4 3 1	40X102 40X102 40X102 40X102	38353 75002-75005 38353 75006-75009 DEC 2006 77837-77839 DEC 2006 77845
VANGUARD - CHICAGO	1	35X102	DEC 2004 74982
	3	35X102	38353 74983-74985
	1	40X102	DEC 2006 77844
	1 3	40X102 40X102	NOV 2007 77864 NOV 2007
	5	40/102	1101 2001

CUSTOMER	<u>QTY</u>	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS 78033-78035
	8	40X102	NOV 2007
<u>VANGUARD - DENVER</u>	8	40X102	78804-78811 SEP 2008
	0	40×102	79660-79667
VANGUARD - DETROIT	6	35X102	APR-MAY 2005 74989-74994
	5	40X102	DEC 2004-JANUARY 2005 75010-75014
	4	40X102	AUG-SEP 2008 79643-79646
	1	40X102	DEC 2006 77843
	2	40X102	NOV 2007 77862-77863
VANGUARD - HONOLULU	1	35X102	DEC 2004 74999
<u></u>	1	35X102	FEB 2005 75075
	3	40X102	AUG 2008 79653-79655
	2	40X102	NOV 2007 78747-78748
VANGUARD - LAS VEGAS	2	40X102	DEC 2004-FEB 2005 75020-75021
VANGUARD - LOS ANGELES	3	40X102	38353 75022-75024
	3	40X102	38353 75025-75027
	4	40X102	APR 2005 75028-75031
VANGUARD - MAUI	2	40X102	DEC 2004 75018-75019
<u></u>	1	40X102	MAR 2005 75078
	1	40X102	AUG 2008 79656
VANGUARD - RALEIGH	1	40X102	AUG 2008 79652
<u></u>	1	40X102	NOV 2007 77785
	1	40X102	DEC 2007 78037
VANGUARD - RALEIGH/DURHAM	1	35X102	DEC 2004 75000
VANGUARD - SAN DIEGO	3	35X102	38353 74986-74988
· · · · · · · · · · · · · · · ·	2	40X102	AUG 2008 79634-9635
	1	40X102	AUG 2008 79668
VANGUARD - WEST PALM BEACH	3	40X102	SEP 2008 79657-79659

CUSTOMER	QTY	SIZE	<u>DELIVERY DATE /</u> SERIAL NUMBERS
TRANSDEV TRANSPORTATION SERVICES HUSKIE LINE	3	35X102	AUG 2006 76855-76858 APRIL 2017
1825 PLEASANT ST	1	35X102	182883
DEKALB, IL 60115 TIM LYON, MAINTENANCE MANAGER 815-758-6900	1	35X102	182884
<u>VIDANT HEALTH</u> 2100 STANTONSBURG	1	40X102	JUNE 2009 79977
GREENVILLE, NC 27835			JULY 2010
SCOTT ALFORD, MANAGER 252-847-7886	2	40X102	177932-177933 AUG 2012
	1	40X102	180350 OCT 2013
	1	40X102	180749
<u>VISALIA, CA 93291</u> 525 N. CAIN ST.	3	40X102	JUNE 2004 73090-73092
VISALIA, CA 93291 MONTY COX, TRANSIT MGR 559-713-4100	2	40X102	MAY 2016 187630-187631 AUGUST 2016
	5	40X102	187632-187636
<u>VOITH TURBO INC.</u> 25 WINSHIP RD YORK, PA 17406	1	40X102	FEB. 2008 77749 JUNE 2017
ROB WISS, VP ROAD DIVISION	1	35X102	186874-186874
717-767-3224	7	29X102	93111-93117
<u>VOLUSIA COUNTY TRANSIT</u> 905 BIG TREE RD.	8	29X102	JAN. 2003 90694-90701
SO. DAYTONA, FL 32119 RICK KAZAWITCH, DIR. OF MAINTENANCE	2	29X102	AUG 2008 78654-78662
386-756-7476 X 121	45	40X1012	JUNE 2004 74678-74722
	45	40X1012	NOVDEC. 2004 74678-74722
	6	35X102	SEPT. 2006 76845-76850
	9	35X102	MAY 2014 184141-184149
	11	35X102	APRIL 2015 - MAY 2015 185853-185863
	4	35X102	NOVEMBER 2016 188660-188663
WALT DISNEY WORLD PO BOX 10000	22	40X102	DEC. 2005 76693-76714
BUENA VISTA, FL 32830 CURT HALL, MAINT MGR	21	40X102	DEC. 2007 78603-78623
407-824-6039	15	40X102	JAN. 2009 176294-176308
	13	40X102	MAY 2010 176309-176321
	47	40X102	JUNE 2011 179700-179746
	23	40X102	MARCH 2012 180801-118127
	28	40X102	MAY 2012 180824-180851
	24	40	MAY 2013

<u>CUSTOMER</u>	QTY	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
	1	40X102	183024-183047 JULY 2015
	48	40X102	187392 SEPTEMBER 2015 187393-187440 MARCH 2017
	5	40X102	187441-187445
WARREN COUNTY TRANSIT AUTHORITY 42 CLARK ST. WARREN, PA 16365 JOHN ALDRICH, EXEC. DIRECTOR 814-723-1874	5	29X102	APRIL 2009 91471-91475
WAUKESHA TRANSIT SYSTEM	14	35X102	OCT. 1998
2311 BADGER DR. WAUKESHA, WI 53187-0063 BRIAN ENGELKING, TRANSIT COORDINATOR	7	35X102	70270-70283 MARCH 2004 72855-72861
262-524-3594	2	35X102	SEPT. 2002 73403-73404
	3	35X102	MAY 2008 79493-79495
	3	35X102	FEBRUARY 2015 184574-184576
CITY OF WAUSAU	9	35X102	FEB. 2009
420 PLUMER ST. WAUSAU, WI 54403 GREG SEUBERT, TRANSIT DIRECTOR 715-842-9287	6	35X102	176070-176078 OCT. 2011 179323-179328
<u>WESTCAT</u> 601 WALTER AVE.	3	40X102	JULY 2005 73294-73296
PINOLE, CA 94565 CHARLES ANDERSON, GM	5	35X102	AUG 2007 78064-78068
510-724-3331	6	35X102	AUG 2008 79509-79514
	5 12	35X102 40X102	JULY 2013 182544-182548 FEB 2014
	12	40/102	183304-183315
<u>WESTERN KENTUCKY UNIV.</u> 1 BIG RED WAY	2	40X102	MAY 2006 76468-76469
BOWLING GREEN, KY 42101-3576 JENNIFER TOUGAS, PHD, DIRECTOR	1	40X102	NOV. 2012 181750
270-745-8746	3	40X102	AUG 2013 182415-182417
<u>WESTERN RESERVE TRANSIT AUTHORITY</u> 604 MAHONING AVE. YOUNGSTOWN, OH 44802	19	35X102	OCT. 2000 71873-71891 JAN. 2005
MATTHEW KOTANCHEK, DIR. OF MAINT 330-744-8431	7	35X102	75050-75056 OCT 2014
	8	35X102	184219-184226 APRIL 2015
	5	35X102	185378-185382 MARCH 2016
	11	35X102	187700-187710 MARCH 2017
	9	35X102	188664-188672

DIESEE EOW I EOOK CO			
CUSTOMER	<u>QTY</u>	<u>SIZE</u>	DELIVERY DATE / SERIAL NUMBERS
WHATCOM TRANSPORTATOIN AUTH.			SEPT. 2004
4111 BAKERVIEW SPUR RD	1	29X102	90659
BELLINGHAM, WA 98226	5	29X102	90660-90664
PETE STARK, GENERAL MANAGER			APR 2007
360-738-4580	2	35X102	77573-77574
			APR 2007
	5	40X102	78226-78230
			<b>JUNE 2008</b>
	3	29X102	91483-91485
			JULY 2009
	14	40X102	176933-176946
			MAY 2010
	6	40X102	177629-177634
	5	35X102	177812-177816
			NOV. 2011
	8	40X102	179954-179961
			AUG 2016
	4	40X102	188128-188131
	3	40X102	188132-188134
			MAR 2019
	5	40X102	191898-191902
	2	35X102	191896-191897
			SEP 2020
	3	35X102	196760-193762
<u>WICHITA, CITY OF</u> 777 E. WATERMAN ST.	9	35X102	JUNE 2002 72730-72738
WICHITA, KS 67202-4615		403/400	JULY 2009
GREGG RINGOLD, PROJECT MANAGER	14	40X102	176933-176946
316-352-4806	0	052400	JAN. 2010
	8	35X102	176542-176549 FEB. 2013
	4	35X102	180084-180087
	4	357102	APR 2014
	10	35X102	184131-184140
	10	337102	MARCH 2015
	6	35X102	186334-186339
	4	40X102	APRIL 2015
	-	40/102	186340-186343
WICHITA FALLS TRANSIT			JUNE 2012
2100 SEYMOUR HWY	2	35X102	180334-180335
WICHITA FALLS, TX 76301			NOVEMBER 2015
DENNIS BURKETT, PUBLIC TRANSIT ADMIN	1	35X102	18891
940-761-7642			DECEMBER 2018
	3	35X102	191363-191365
			DEC 2014
WILLIAMSBURG AREA TRANSIT AUTHORITY	5	35X102	184688-184692
7239 POCAHONTAS TRAIL			JANUARY 2017
WILLIAMSBURG, VA 23185	1	35X102	188161-188161
BILL PORTER, DEPUTY EXECUTIVE DIRECTOR	2	40X102	188162-188163
(757) 220-5493	2	29X102	93147-93148
WILMINGTON, CITY OF	16	35X102	JUNE 2003
1110 CASTLE ST.	10	00/102	73138-73153
WILMINGTON, NC 28401	2	35X102	JAN. 2005
ALBERTY EBY, GM	£	00/102	74423-74424
910-343-0106			JAN. 2016
	4	35X102	184945-184948

CUSTOMER	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
<u>WINDHAM RTD</u> 968 MAIN ST.	2	29X102	MARCH 2006 91126-91127
WILLIMANTIC, CT 06226 ROSE KURCINIK, TRANSIT ADMIN 860-456-1462	3	29X102	OCT. 2008 91633-91635
WINSTON-SALEM TRANSIT AUTHORITY 1060 N. TRADE ST.	10	35X102	JAN. 2010 176801-176810
WINSTON SALEM, NC 27102 ART BARNES, GM 336-727-2648	10	35X102	JAN. 2011 178458-178467
WOOBURN CITY 270 MONTGOMERY ST WOODBURN, OR 97071 JIM ROW, COMMUNITY SERV. DIRECTOR 503-982-5265 JIM.ROW@CI.WOODBURN.OR.US	1	40X102	JAN 2015 184579
WORCESTER RTA			MAY - AUG 2008
42 QUINSIGAMOND AVENUE	2	29X102	91500-91501
WORCESTER, MA 01610	6	40X102	79315-79320
JIM PARKER, GENERAL MANAGER 508-453-3415	8	40X102	FEB - MAR 2010 177571-177578
JPARKER@THERTA.COM	о З	29X102	91909-91911 FEB 2012
	1	40X102	180777
	4	35X102	180779-180782 OCT. 2013
	5 2	35X102 35X102	181966-181970 DEB 2019 191173-191174
	L	00/102	101110-101114
WYNN LAS VEGAS 3131 LAS VEGAS BLVD. LAS VEGAS, NV 89109 RICHARD MOSKAL, MAINT. MGR. 702-770-2901	4	40X102	APRIL 2005 74928-74931
YAKIMA TRANSIT			SEPT. 2004
2301 FRUITVALE BLVD. YAKIMA, WA 98902	3	35X102	73095-73097 JUNE 2006
RICHARD WONNER, FLEET & FACILITIES MGR	3	35X102	78050-78052
509-576-6412	3	40X102	77053-77055 SEPT. 2010
	5	35X102	178505-178509 MAY 2014
	3	35X102	183166-183168 MAR 2016
	3	40X102	186224-186226 FEB 2017
	4	35X102	188869-188872
YORK CO. TRANSPORTATION AUTHORITY 1230 ROOSEVELT AVE.	1	40X102	SEPT. 2013 183299

<u>CUSTOMER</u>	<u>QTY</u>	<u>SIZE</u>	<u>DELIVERY DATE /</u> SERIAL NUMBERS
YORK, PA 17404			
RICHARD FARR, EXEC DIRECTOR			
717-846-5562			
	18	40X102	MAY. 2005
YOSEMITE NATIONAL PARK			75057-75074
5083 FORESTA RD., BLVD. 759			
EL PORTAL, CA 95318			
GARY ROSENFELD, TRANSPORTATION OPS MGR. 209-372-8331			
209-372-0331			
YUBA-SUTTER TRANSIT AUTHORITY	11	35X102	JANUARY 2014
2100 B ST			183490-183500
MARYSVILLE, CA 95901			
KEITH MARTIN, TRANSIT MGR			
530-634-6880			
	2	40X102	MAY 2016
YUMA, AZ			185353-185354
2715 E. 14TH STREET			
YUMA, AZ 85365			

SHELLY KREGER, TRANSIT DIRECTOR

<u>CUSTOMER</u> AC TRANSIT 10626 INTERNATIONAL BLVD. OAKLAND, CA 94603 CHRIS DURANT, MAINTENANCE SUPERINTENDENT 510-577-8887 CDURANT@ACTRANSIT.ORG	<u># UNITS</u> 25 1	MODE/SIZE BAE HYB 40X102 BAE HYB 40X102	DELIVERY DATE/ SERIAL NUMBERS MAY 2016 186761-186785 OCT. 2019 190034
ADVANCE TRANSIT INC. PO BOX 1027 WILDER, VT 05088 VAN CHESNUT, EXEC. DIRECTOR 802-295-1824 X 16 VCHESNUT@ADVANCETRANSIT.COM	2 1	ALLISON HYB 35X102 ALLISON HYB 35X102	MARCH 2011 176560-176561 DEC. 2012 180088
ALEXANDRIA TRANSIT SYSTEM 3000 BUSINESS CENTER DR ALEXANDRIA, VA 22314 JOSH BAKER, GENERAL MANAGER 703-746-5642 JOSH.BAKER@ALEXANDRIAVA.GOV	7 3 5 5 2 5 13 1 4 2	ALLISON HYB 35X102 40X102 ALLISON HYB 29X102 ALLISON HYB 35X102 ALLISON HYB 40X102 ALLISON HYB 35X102 ALLISON HYB 35X102 ALLISON HYB 35X102 ALLISON HYB 35X102 ALLISON HYB 35X102	OCT. 2011 179943-179949 179950-179952 NOV-DEC. 2011 92346-92350 OCT. 2012 181515-181519 181520-181524 OCT-NOV 2014 184872-184873 NOV 2014 184874-184878 APR-MAY 2015 184951-184963 JUNE 2015 184964 FEB-MAR 2017 188643-188646 188647-188648
ALLISON TRANSMISSION DIVISION PO BOX 7120 INDIANAPOLIS, IN CHRIS COLLIER, SALES MGR 317-915-2764	1 1	ALLISON HYB 40X102 ALLISON HYB 40X102	JAN. 2009 176079 SEPT. 2009 176563
ALTOONA METRO TRANSIT 3301 FIFTH AVE. ALTOONA, PA 16602 ERIC WOLF, GENERAL MANAGER 814-330-9184	3	ALLISON HYB 35X102	AUGUST 2012 182426-182428

CUSTOMER	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
ERICWOLF@AMTRAN.ORG			
ANNAPOLIS DOT 308 CHINQUAPIN ROUND RD ANNAPOLIS, MD 21401 KWAKU AGYEMANG-DUAH, DEPUTY DIRECTOR 410-260-3411 X 6001 TRANSIT@ANNAPOLIX.GOV	1	ALLISON HYB 29X102	JULY 2011 92245
ANTELOPE VALLEY TRANSIT AUTHORITY 42210 6TH ST. WEST LANCASTER, CA 93534 MACY NESHATI, EXECUTIVE DIRECTOR 661-729-2229	1 14	ALLISON HYB 40X102 ALLISON HYB 40X102	JUNE 2012 181376 SEPT. 2012 181377-181390
APPALCART 305 NC HIGHWAY 105 BYPASS BOONE, NC 28607 CRAIG HUGHES, TRANSPORTATION DIRECTOR 828-297-1300 DIRECTOR@APPALCART.COM	2 1	ALLISON HYB 35X102 ALLISON HYB 40X102	JUNE 2011 178628-178629 AUGUST 2013 181528
ATHENS CLARK COUNTY 325 POUND ST. ATHENS, GA 30601 DERICK GANDY, TRANSIT MAINT. ADMINISTRATOR 706-410-6261 DERICK.GANDY@ACCGOV.COM	2 10 3 2 2 2	ALLISON HYB 40X102 40X102 ALLISON HYB 40X102 ALLISON HYB 35X102 ALLISON HYB 35X102	FEB 2018 189676-189677 189678-189687 MAR 2019 192198-192200 JAN 2020 194049-194050 JULY 2020 194121-194122 MAR 2021 195343-195344
ANN ARBOR AREA TRANSPORTATION AUTHORITY 2700 S. INDUSTRIAL HIGHWAY ANN ARBOR, MI 48104 CANDACE MOORE, MAINTENANCE MANAGER 734-794-1752 CMOORE@THERIDE.ORG	15 5 7 4 10 6 5	ALLISON HYB 40X102 ALLISON HYB 40X102 ALLISON HYB 40X102 ALLISON HYB 35X102 ALLISON HYB 40X102 ALLISON HYB 40X102 40X102	SEP - OCT 2007 78365-78379 MAR 2008 78380-78384 APR 2009 176238-176244 MAY 2010 176598-176601 NOV - DEC 2011 180072-180081 MAR 2013 181327-181332 181351-181355

CUSTOMER	<u># UNITS</u> 3 3	MODE/SIZE ALLISON HYB 40X102 ALLISON HYB 40X102	DELIVERY DATE/ SERIAL NUMBERS OCT 2015 187122-187124 JUNE 2017 187768-187770
ASHEVILLE, CITY OF 360 W. HAYWARD ST. ASHEVILLE, NC 28801 ROSE CHRISTIAN, GENERAL MANAGER 828-251-4060	5 2 3 2	ALLISON HYB 29X102 ALLISON HYB 29X102 ALLISON HYB 29X102 ALLISON HYB 29X102	JAN. 2011 92136-92140 NOV 2012 92459-92459 OCT 2020 93667-93669 JUNE-JULY 2021 93883-93884
<u>BARTA</u> 1700 N. ELEVENTH ST. READING, PA 19604	5	ALLISON HYB 40X102 ALLISON HYB	APRIL 2009 177004-177008 JUNE 2010
DAVE KILMER, EXECUTIVE DIRECTOR 717-358-1920 DKILMER@SCTAPA.COM	4 3	40X102 BAE HYB 40X102	177869-177872 OCT. 2015 186237-186239
	4	BAE HYB 40X102 BAE HYB	NOV 2016 187037-187040 MAY-JUNE 2018
	2 5	40X102 35X102 BAE HYB	190420-190421 190415-190419 DEC 2019 - JAN 2019
	5 5	35X102 BAE HYB 35X102	190434-190438 MAY 2019 190439-190443
	7	BAE HYB 35X102 BAE HYB	AUG-SEP 2019 190435-190441 MAR-APR 2020
	2 4	40X102 BAE HYB 35X102	195214-195215 MAR 2020 195219-195219
BLOOMINGTON PUBLIC TRANSPORTATION CORP		ALLISON HYB	OCT 2006
130 W. GRIMES LN BLOOMINGTON, IN 47403 LEWIS MAY, GENERAL MANAGER	2 4	29X102 ALLISON HYB 35X102	91173-91174 DEC. 2009 177481-177484
812-961-0522 MAYL@BLOOMINGTONTRANSIT.COM	2	ALLISON HYB 35X102	JAN 2013 181810-181811
BROCKTON AREA TRANSIT AUTHORITY		ALLISON HYB	SEP 2010

CUSTOMER 1442 MAIN STREET BROCKTON, MA 02301 MICHAEL DAMON, GENERAL MANAGER 508-638-5915 MDAMON@RIDEBAT.COM	<u># UNITS</u> 3 3 2	MODE/SIZE 35X102 ALLISON HYB 35X102 ALLISON HYB 35X102	DELIVERY DATE/ SERIAL NUMBERS 178282-178284 NOV 2013 183288-183290 JUNE 2018 191476-191477
BROOME COUNTY TRANSIT 413 OLD MILL ROAD VESTAL, NY 13850 BRIAN J. KEEFER, DIRECTOR OF MAINT. 607-763-4930 BKEEFER@CO.BROOME.NY.US	3	BAE HYB 40X102	DEC 2019 194018-194020
BROWNSVILLE, CITY OF 755 INTERNATIONAL BLVD BROWNSVILLE, TX 78520 ANDREW MUNOZ, ASSISTANT DIRECTOR 956-541-4881	1 4	ALLISON HYB 35X102 ALLISON HYB 35X102	DEC 2019 189338 DEC 2019 - JAN 2020 189334-189337
<u>C-TRAN</u> PO BOX 2529 VANCOUVER, WA 98668-2529 CELIA SHERBECK, CHIEF MAINTENANCE OFFICER 360-906-7358 CELIAS@C-TRAN.ORG	12 4 1 15 4 10 4 4 4	ALLISON HYB 40X102 ALLISON HYB 40X102 BAE HYB 40X102 BAE HYB 40X102 BAE HYB 40X102 BAE HYB 40X102 BAE HYB 40X102 BAE HYB 40X102	FEB-MAY 2008 78769-78780 SEP-OCT 2010 177066-177069 SEPT 2015 187057 DEC 2015 - JAN 2016 187058-187072 JAN 2017 185600-185603 APR 2018 190568-190577 AUG 2018 189533-189536 JULY-AUG 2019 193222-193225
<u>CACHE VALLEY TRANSIT DISTRICT</u> 754 WEST 600 NORTH LOGAN, UT 84321 TODD BEUTLER, GENERAL MANAGER/CE0 435-713-6968 TBEUTLER@CVTDBUS.ORG	2 1	ALLISON HYB 35X102 ALLISON HYB 35X102	DEC 2010 178431-178432 AUG 2011 178780
<u>CAMTRAN</u> 728 CENTRAL AVE. JOHNSTOWN, PA 15902-2996 ROSE LUCY-NOLL, EXECUTIVE DIRECTOR	1	ALLISON HYB 35X102	MAY 2010 177077

	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
814-535-5526 X 202 RLNOLL@CAMTRANBUS.COM			
CAPE FEAR PTA 1110 CASTLE ST. WILMINGTON, NC 28401 MEGAN MATHENY, DIRECTOR 910-202-2057 MMATHENY@WAVETRANSIT.COM	2	ALLISON HYB 35X102	NOV 2010 176867-176868
CAPITAL AREA TRANSIT 901 N. CAMERON ST. HARRISBURG, PA 17105-1571 MARK MITCHELL, MAINTENANCE MANAGER 717-233-5657 X 5120 MMITCHELL@CATTRANSIT.COM	11	ALLISON HYB 40X102	APR-MAY 2011 178933-178943
CAPITAL DISTRICT TRANSIT AUTHORITY 110 WATERVLIET AVE. ALBANY, NY 12206-2077 CARM BASILE, CHIEF EXECUTIVE OFFICER 518-437-8310 CARM@CDTA.ORG	6 1 8 6 8 1	ALLISON HYB 40X102 ALLISON HYB 40X102 ALLISON HYB 40X102 40X102 ALLISON HYB 29X102 ALLISON HYB 40X102 ALLISON HYB	APR 2007 77829-77834 NOV. 2007 78690 APRIL 2008 78985-78992 78993-78998 APR - MAY 2008 91486-91493 APR 2009 176493 APR - MAY 2009
	20 15 8 4	40X102 ALLISON HYB 40X102 ALLISON HYB 40X102 ALLISON HYB 40X102	176494-176513 MAY 2010 177817-177831 JUNE 2010 177832-177839 AUG 2013 182567-182570
CARTA CHATTANOGA AREA REGIONAL TRANSIT AUTHORITY 1617 WILCOX BLVD. CHATTANOOGA, TN 37406 LISA MARAGNANO, EXECUTIVE DIRECTOR 423-629-1411 LISAMARAGNANO@GOCARTA.ORG	2 4	ALLISON HYB 35X102 ALLISON HYB 35X102	MAY 2009 79713-79714 MAR 2014 183546-183549
CENTRAL CONTRA COSTA TRANSIT AUTHORITY		VOITH HYB	APRIL 2009

CUSTOMER	# UNITS	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
2477 ARNOLD INDUSTRIAL WAY	1	40X102	177290
CONCORD, CA 94520		VOITH HYB	APRIL 2010
SCOTT MITCHELL, CHIEF OPERATING OFFICER	8	40X102	177291-177298
925-676-1976 X 2090			
MITCHELL@CCCTA.ORG			
CENTRAL NEW YORK RTA		ALLISON HYB	DEC 2006
200 CORTLAND AVE.	1	40X102	77800
SYRACUSE, NY 13205-0820		ALLISON HYB	FEB. 2007
E.J. MOSES, DIRECTOR OF FACILITIES	8	40X102	77801-77808
315-442-3368			
EJMOSES@CENTRO.ORG			
CENTRAL OKLAHOMA TRANSP & PARKING		ALLISON HYB	JAN. 2011
2000 S. MAY AVE.	1	35X102	177743
OKLAHOMA CITY, OK 73108		ALLISON HYB	JAN 2014
DENNIS FRY, FLEET MGR	5	35X102	183515-183519
405-297-2521			
DENNIS.FRY@OKC.GOV			
CHAMPAIGN-URBANA MASS TRANSIT	-	ALLISON HYB	JUNE 2009
1101 EAST UNIVERISTY AVENUE URBANA, IL 61802	5	29X102	91734-91738
KARL GNADT, MANAGING DIRECTOR			
217-384-8188			
KGNADT@CUMTD.COM			
CHARLOTTE AREA TRANSIT SYSTEM		ALLISON HYB	JULY 2005
600 EAST 4TH STREET	2	40X102	74476-74477
CHARLOTTE, NC 28202		ALLISON HYB	FEB. 2009
JOHN LARSON, SENIOR PROCUREMENT OFFICER	5	40X102	79933-79937
704-432-0458	0	ALLISON HYB	AUGUST 2011
JOHN.LARSON@CI.CHARLOTTE.NC.US	6	40X102	180030-180035
	4	ALLISON HYB 40X102	DEC 2013 182785-182788
	4	ALLISON HYB	DEC 2013 - JAN 2014
	11	29X102	92651-92661
		ALLISON HYB	MAR 2017
	8	40X102	188943-188950
	-	ALLISON HYB	AUG 2017
	4	40X102	190403-190406
		ALLISON HYB	MAY 2018
	12	40X102	192251-192262
		ALLISON HYB	JAN 2020
	6	40X102	193125-193130
	~	ALLISON HYB	DEC 2020 - JAN 2021
	6	40X102	195692-195701

<u>CUSTOMER</u> <u>CHARLOTTESVILLE TRANSIT</u> 1547 AVON STREET EXTENDED CHARLOTTESVILLE, VA 22902 GARLAND WILLIAMS 434-970-3844 WILLIAMSGA@CHARLOTTESVILLE.ORG	<u># UNITS</u> 2 4 3 1	MODE/SIZE ALLISON HYB 29X102 ALLISON HYB 29X102 ALLISON HYB 29X102 ALLISON HYB 29X102	DELIVERY DATE/ SERIAL NUMBERS DEC. 2010 92095-92096 SEPT. 2011 92233-92236 MAY 2012 92385-92387 FEB 2014 92650
<u>CHATHAM AREA TRANSIT AUTHORITY</u> PO BOX 9118 SAVANNAH, GA 31412-9118 CHAD REESE, EXEC. DIR. 912-401-9854	2 9 9 5	ALLISON HYB 29X102 35X102 ALLISON HYB 35X102 ALLISON HYB 40X102	DEC. 2009 91432-91433 176740-176748 JAN-FEB 2011 178526-178534 SEP-OCT 2011 179568-179572
<u>CITY OF KNOXVILLE</u> 301 E. CHURCH AVENUE KNOXVILLE, TN 37915 SI MCMURRAY, CHIEF PROCUREMENT OFFICER 865-215-7803 SMCMURRAY@KATBUS.COM	3 3 7 4 3 3	ALLSON HYB 40X102 ALLSON HYB 35X102 ALLSON HYB 35X102 ALLSON HYB 29X102 ALLSON HYB 29X102	JAN 2014 182470-182472 FEB - MAR 2014 182473-182475 JUNE 2017 189669-189675 APR 2018 191292-191295 DEC 2019 93622-93624 FEB 2021 94039-94041
<u>CITIBUS</u> 801 TEXAS AVE. LUBBOCK, TX 79401 SCOTT DRAINVILLE, DIRECTOR OF MAINTENANCE (801) 712-2006	2 4	35X102 35X102	NOV. 2011 177694-177695 MARCH 2013 177696-177699
CLARKSVILLE TRANSIT SYSTEM 430 BOILLIN LN CLARKSVILLE, TN 37040 PAUL NELSON, DIRECTOR OF TRANSPORTATION 831-553-2430 PAUL.NELSON@CITYOFCLARKSVILLE.COM	3 3 3 5 3	ALLISON HYB 29X102 ALLISON HYB 29X102 ALLISON HYB 29X102 ALLISON HYB 29X102 ALLISON HYB 29X102	DEC. 2010 92238-92240 JULY 2015 93015-93017 MAY 2017 93163-93165 FEB 2018 93337-93341 JAN 2020 93630-93632

<u>CUSTOMER</u>	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
COLLIER AREA TRANSIT 8300 RADIO ROAD NAPLES, FL 34104 YOUSI CARDESO, OPERATIONS ANALYST 239-252-5886 YOUSICARDESO@COLLIERGOV.NET	2	ALLISON HYB 35X102	JUNE 2010 178484-178485
<u>COLTS</u> NORTH SOUTH RD SCRANTON, PA 18504 ROBERT FIUME, EXEC. DIRECTOR 570-346-2061 X 1259 RFIUME@COLTSBUS.COM	4 9	ALLISON HYB 35X102 ALLISON HYB 35X102	MARCH 2011 176489-176492 JULY-AUG 2012 180360-180368
<u>CONN DOT</u> 2800 BERLIN TURNPIKE NEWINGTON, CT 06111 PHILIP SCAROZZO, MANAGER 860-594-2007 PHILLIP.SCARROZZO@CT.GOV	1 8 3	ALLISON HYB 29X102 ALLISON HYB 29X102 ALLISON HYB 29X102	OCT 2014 92751 JAN 2015 92752-92759 MAY-JUNE 2015 93010-93012
<u>COTA</u> 33 N. HIGH STREET COLUMBUS, OH 43215 JOSH TRAENKLE, DIR SUPPLY MANAGEMENT 614-275-5934	6	40X102	FEB. 2010 178075-178080
COMMUNITY URBAN BUS SERVICE 254 OREGON WAY LONGVIEW, WA 98632 AMY ASHER, TRANSIT MANAGER 360-442-5661 AMY@RCTRANSIT.ORG	1	ALLISON HYB 35X102	JULY 2011 176766
DELAWARE TRANSIT CORPORATION 119 LOWER BEECH STREET WILMINGTON, DE 19805	2	40X102	AUG 2004 73348 - 73349 SEP 2006
BILL THATCHER, DEPUTY CHIEF OPERATING OFFICER 302-576-6138 BILL.THATCHER@STATE.DE.US	1 1 1 8	40X102 ALLISON HYB 40X102 ALLISON HYB 40X102 ALLISON HYB 40X102	76897 SEP 2007 76898 MAY 2008 76899 OCT-NOV 2008 79463 - 79470

CUSTOMER	<u># UNITS</u> 2 7 7 1	MODE/SIZE ALLISON HYB 40X102 ALLISON HYB 35X102 ALLISON HYB 40X102 ALLISON HYB 35X102	DELIVERY DATE/ SERIAL NUMBERS NOV 2008 79471 - 79472 AUG-SEP 2009 177514 - 177520 MAY 2012 180785 - 180791 MAY 2012 180797
DETROIT DEPARTMENT OF TRANSPORTATION 1301 E. WARREN AVE DETROI, MI 48207 DAN HODGES, SUPERVISOR 313-833-7676 DANHOD@DETROITMI.GOV	4	ALLISON HYB 40X102	MARCH 2012 180193-180196
<u>CITY OF SCOTTSDALE</u> 1322 N. MCCLINTOCK DR TEMPE, AZ 85281 MARGARET DUNN 480-970-8130	5 4	35X192 29X102	OCT. 2013 182871-182875 92430-92433
<u>CITY OF DURHAM</u> 1907 FAY ST. DURHAM, NC 27704 SEAN SMITH, TRANSIT ADMIN 919-560-1545 X 32609	5	40X102	FEB. 2012 180444-180448
DULUTH TRANSIT AUTHORITY 2402 W. MICHIGAN ST. DULUTH, MN 55806 PHIL PUMPHREY, GM 218-722-4426	2 4	35X102 40X102	AUG 2007 78450-78451 OCT. 2009 176891-176894
EAST CAROLINA UNIV 1501 N. MEMORIAL DR. GREENVILLE, NC 27834 WOOD DAVIDSON, GM 252-328-5390	1	40X102	NOV. 2011 180017
EAU CLAIRE TRANSIT 910 FOREST STREET EAU CLAIRE, WI 54703 TOM WAGENER, TRANSIT MANAGER 715-839-5111	2 3	BAE HYB 35X102 BAE HYB 40X102	JULY 2019 193120-193121 JUNE 2020 195093-195095
<u>EL METRO</u> 401 SCOTT STREET	1	BAE HYB 35X102	MAR 2021 195905

CUSTOMER	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ <u>SERIAL NUMBERS</u>
LAREDO, TX 78040 JUAN MORALES, MAINTENANCE MANAGER 956-795-2250 JMORALES@CI.LAREDO.TX.US			
<u>EUREKA, CITY OF</u> 133 "V" ST. EUREKA, CA 95501-0844 GREGG PRATT, GM 707-443-0826	2	40X102	MARCH 2007 77692-77693
EVANSVILLE (METROPOLITAN EVANSVILLE TRANSIT SYSTEM) 601 JOHN ST. EVANSVILLE, IN 47713 JONATHAN SIEBEKING 812-435-6168	4	29X102	JUNE 2006 91159-91163
<u>EVERETT TRANSIT</u> 3225 CEDAR ST.	3	40X102	FEB.2009 176265-176267
EVERETT, WA 98201 GEORGE BAXTER, OPERATIONS MGR 425-257-8935	7	40X102	MARCH 2013 181836-181842
<u>CITY &amp; COUNTY OF HONOLULU</u> 811 MIDDLE ST. HONOLULU, HI 96819	8	40X102	SEPTEMBER 2015 186677-186684 JULY - AUG 2016
ADAM TAMAYOSHI, VP, MAINTENANCE 808-768-9463	8	40X102	188120-188127
<u>CITY OF FAIRFAX</u> 10455 ARMSTRONG STREET FAIRFAX, VA 22030	6	35X102	JULY 2009 176011-176016
WENDY BLOCK SANFORD, DIRECTOR OF TRANSPORTATIO 703-385-7889	JN		
<u>CITY OF FAIRFIELD</u> 2000 CADENASSO DR.	1	29X102	MAY 2009 91768
FAIRFIELD, CA 94533 NATHANIEL ATHERSTONE, TRANSIT MGR 707-434-3804	6	40X102	APRIL 2013 182429-182434
<u>CITY OF FAYETTEVILLE</u> 455 GROVE ST. FAYETTEVILLE, NC 28301-0990 RANDY HUME, GM 910-433-1011	5	35X102	NOV. 2010 178834-178838
<u>FT. WAYNE PTC</u> 801 LEESBURG RD FT. WAYNE, IN 46808	7	ALLISON HYB 35X102 ALLISON HYB	MAY 2010 177873-177879 FEB 2012

CUSTOMER JOHN METZINGER, GENERAL MANAGER 260-408-0035 JKM@FWCITILINK.COM	<u># UNITS</u> 21 1 4 1 1 1 2	MODE/SIZE 35X102 ALLISON HYB 35X102 ALLISON HYB 35X102 ALLISON HYB 40X102 ALLISON HYB 40X102 ALLISON HYB 40X102 ALLISON HYB 40X102	DELIVERY DATE/ SERIAL NUMBERS 177880-17881 OCT 2012 180711 JAN 2013 180712-180715 FEBRUARY 2015 184253-184256 MAY 2016 184846 MAY 2017 185848 MAY 2018 185849-185850
<u>CITY OF GAINESVILLE</u> REGIONAL TRANSIT SERVICE PO BOX 490 STATION 32 GAINESVILLE, FL 32601 JESUS GOMEZ, TRANSIT DIRECTOR 352-334-2609	2 3	40X102 40X102	MAY 2012 180342-180343 FEB. 2013 181859-181861
<u>GALESBURG, CITY OF</u> 55 W. TOMPKINS GALESBURG, IL 61401 KRAIG MCKLUSKIE, TRANSIT MGR 309-342-4242	2	29X102	AUG 2017 93123-93124
<u>GOLDEN GATE TRANSIT</u> 1011 ANDERSEN DRIVE SAN RAFAEL, CA 94901 KEITH NUNN, DIRECTOR OF MAINTENANCE 415-247-4459 KNUNN@GOLDENGATE.ORG	1 66	ALLISON HYB 40X102 ALLISON HYB 40X102	FEB 2019 189037 APR - JULY 2019 189038-189103
<u>GREATER ATTLEBORO TAUNTON RTA</u> 10 OAK STREET TAUNTON, MA 02780 FRANK GAY, ADMINISTRATOR 508-823-8828 ext 220 FGAY@GATRA.ORG	2	29X102	FEB 2008 91292-91293
<u>GREATER DAYTON RTA</u> 600 LONGWORTH ST.	10	40X102	MARCH 2010 177958-177967
DAYTON, OH 45401 TOM HODGE MAINT. MGR 937-425-8637	10 4	40X102 29X102	NOV. 2010 177998-178007 FEB 2012
GREATER GLENS FALLS TRANSIT	1	29X102	92342-92345 FEBRUARY 2011

CUSTOMER	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
495 QUEENSBURY AVE. QUEENSBURY, NY 12804 SCOTT SOPCZYK, TRANSPORATION DIRECTOR 518-792-1086			91937
<u>GREATER LAFAYETTE PTC</u> 1250 CANAL RD LAFAYETTE, IN 47902	2	35X102	JAN. 2007 77694-77695 DEC. 2007
MARTY SENNETT, GENERAL MANAGER 765-423-2666	2	40X102	78031-78032 APR - MAY 2009
	5	40X102	176022-176026 JUNE 2010
	4	40X102	179162-179165 OCT. 2011
	2	40X102	179313-179314 MAY 2014
	2	35X102	184599-184600
<u>GREATER LYNCHBURG TRANSIT CO.</u> PO BOX 797	8	35X102	JAN. 2008 77821-77828
LYNCHBURG, VA 24505 GARY PARIS, DIR OF MAINT	3	40X102	JULY 2010 178337-178339
434-455-5094	7	29X102	JULY 2010 92073-92079
<u>GREENSBORO TRANSIT AUTHORITY</u> 320 E. FRIENDLY AVE.	3	40X102	JAN. 2011 178602-178604
GREENSBORO, NC 27401 BRUCE ADAMS, SR. TRANSIT PLANNER	1	40X102	FEB 2012 179312
336-412-6237	2	40X102	JUNE 2015 181372-181373
<u>GULFPORT, MS</u> 333 DEBUYS RD.	5	29X102	AUGUST 2015 93055-93059
GULFPORT, MS 39507 KEVIN COGGIN, EXECUTIVE DIRECTOR 228-296-8080 X 212	1	35X102	AUGUST 2015 184969
HAMPTON ROADS TRANSIT 3400 VICTORIA BLVD.	10	29X102	DEC. 2007 91538-91547
HAMPTON, VA 23661 MIKE PEREZ, DIR ROLLING STOCK 757-222-6000	14	29X102	MAY 2008 91566-91578 AUGUST 2009
	2 11	29X102 29X102	91580-91581 MAY 2011
			92246-92256

CUSTOMER	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
HILLSBOROUGH AREA REGIONAL TRANSIT 4305 E. 21ST. AVE. TAMPA, FL 33605 JAMES FETZER, DIR. OF MAINTENANCE 813-623-5835 X 196	3	40X102	DEC. 2004 72337-72339
HOWARD CO., DEPT. OF PLANNING & ZONING 3430 COURTHOUSE DR. HOWARD BLDG., 1ST FLOOR ELLICOTT CITY, MD 21043 RON SKOTZ, GRANTS AND PROCUREMENT ADMINISTRATO 410-313-3360	1 DR	35X102	JAN. 2010 177590
<u>HUMBOLDT TRANSIT AUTHORITY</u> 133 "V" ST. EUREKA, CA 95501-0844 GREG PRATT, GM 707-443-0826	4	40X102	FEB. 2007 77439-77442
INDIANAPOLIS PTC	5	ALLISON HYB	OCT. 2004
1501 W. WASHINGTON ST. INDIANAPOLIS, IN 46222	2	40X102 ALLISON HYB	72889-72890 JAN. 2011
VICKI LEARN, DIRECTOR OF MAINTENANCE	11	40X102	178579-178589
317-614-309	4	ALLISON HYB 40X102	APRIL 2013 182452-182455
INTERCITY TRANSIT			JULY 2010
526 S. PATTISON ST.	6	40X102	177058-177063
OLYMPIA, WA 98507-0659 ANN FREEMAN-MANZANARES, GM 360-705-5838	7	40X102	JULY 2012 180619-180625
INTERURBAN TRANSIT PARTNERSHIP			MARCH 2007
300 ELLSWORTH AVE., SW	2	40X102	77061-77062
GRAND RAPIDS, MI 49503-4005 STEVE SCHIPPER, Chief Operating Officer 616-774-1216	3	40X102	AUGUST 2007 78100-78102 MAY 2014
SSCHIPPER@RIDETHERAPID.ORG	10	40X102	183110-183119
ISLAND TRANSIT 19758 STATE ROAD 20 COUPEVILLE, WA 98239 TODD MORROW, EXECUTIVE DIRECTOR 360-678-7771 MORROW@ISLANDTRANSIT.ORG	3	BAE HYB 35X102	OCT 2020 195355-195357

CUSTOMER	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
<u>ISE CORP.</u> 12302 KERRAN ST. POWAY, CA 92064 GARY WILLMS 858-413-1736	1	40X102	JAN. 2007 77499
JACKSON PUBLIC TRANSPORTATION COMPANY 1785 HIGHWAY 80 WEST JACKSON, MS 39205 CHRISTINE WELCH, DEPUTY DIRECTOR TRANSPORTATION 601-960-1909 CWELCH@JACKSONMS.GOV	1 3 N	ALLISON HYB 40X102 35X102	OCT 2020 195278 194661-194663
JEFFERSON TRANSIT 1615 W. SIMS WAY PORT TOWNSEND, WA 98368 PEGGY HANSON, GM 360-385-3020 X 113	2	29X102	92208-92209 MAY 2011
AREA TRANSPORTATION OF N. CENTRAL <u>PENNSYLVANIA</u> 44 TRANSPORTATION CENTER JOHNSONBURG, PA 15845 814-965-2111 X 218 CHARLIE SHILK, MAINT. DIRECTOR 814-965-2111 X 218	1	35X102	MAY 2010 178187
<u>KALAMAZOO, CITY OF</u> 241 W. SOUTH ST.	5	35X102	DEC.2011 179563-179567
KALAMAZOO, MI 49007-4796 ROB BRANCH, MAINT DIRECTOR	3	35X102	MAY 2013 180774-180776
616-337-8020	3	35X102	FEB 2014 182075-182077
	2	35X102	MARCH 2015 182076-182077
KANAWHA VALLEY RTA 1550 FOURTH AVE. CHARLESTON, WV 25324 DENNIS DAWSON, GM 304-343-3840	2	29X102	SEPT. 2009 91755-91756
<u>K.C.A.T.A.</u> 1350 E. 17TH ST. KANSAS CITY, MO 64108	4	40X102	FEB. 2010 176159-176161

CUSTOMER WALT WOODWARD, DIR OF MAINTENANCE 816-346-0308	<b># UNITS</b> 1	<u>MODE/SIZE</u> 40X102	DELIVERY DATE/ SERIAL NUMBERS 176326 MARCH 2011 178930
KING COUNTY METRO 12200 EAST MARGINAL WAY SOUTH SEATTLE, WA 98168 BILL THON, CONTRACT ADMINISTRATOR 206-477-5890 BILL.THON@KINGCOUNTY.GOV	1 129 65 1	BAE HYB 40X102 BAE HYB 40X102 BAE HYB 40X102 BAE HYB 40X102	MAR 2018 190192 APR-OCT 2018 190193-190321 FEB 2019 - MAY 2019 193389-193453 MAY 2019 189836
KEY WEST DOT, CITY OF PO BOX 1078 KEY WEST, FL 33040 ROGELIO HERNANDEZ, TRANSIT MANAGER 305-809-3915 RHERNANDEZ@CITYOFKEYWEST-FL.GOV	1 1	ALLISON HYB 29X102 ALLISON HYB 29x102	APRIL 92925 4/12/2018 93362
LA CROSSE MTU 2000 MARCO DR. LA CROSSE, WI 54601 KEITH CARLSON, TRANSIT MANAGER 608-789-7350	3	35X102	JAN. 2013 180873-180875
LAKE ERIE TRANSIT 105 W. SEVENTH ST. MONROE, MI 48161 PAUL VAJCNER, MAINTENANCE MANAGER 734-242-6672 X 209 PAUL@LETBUS.COM	3 5 2 2 1	ALLISON HYB 29X102 ALLISON HYB 29X102 ALLISON HYB 29X102 ALLISON HYB 29X102 ALLISON HYB 29X102	JAN 2009 91437-91439 JAN 2015 92823-92827 JAN 2017 93104-93105 NOV 2017 93118-93118 MAR 2018 93349
LANE TRANSIT DISTRICT 3500 E. 17TH AVE. EUGENE, OR 97403 GEORGE TRAUGER, DIR. OF MAINTENANCE 541-682-6163	15 9 2	40X102 40X102 29X102	SEPT. 2011 180372-180385 JAN 2012 180387-180395 OCTOBER 2017 93118-93119
<u>LANTA</u> 1060 LEHIGH ST. ALLENTOWN, PA 18103	3 2	35X102 40X102	MAY 2010 177602-177604 177605-177606

<u>CUSTOMER</u> RANDY FLYTE, MATERIALS & MAINT. SUPER	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS JAN 2013
610-435-5739	5	35X102	181691-18695 JANUARY 2016
	3	35X102	186277-186279
<u>LAVTA</u> 1362 RUTAN CRT, SUITE 100	2	29X102	JUNE 2007 91288-91289
LIVERMORE, CA 94551 MICHAEL TREE, EXECUTIVE DIRECTOR	2	29X102	OCT. 2009 91784-91785
925-455-7564	12	40X102	78670-78681 MAY 2011
	4	29X102	92287-92290 JUNE 2016
	7 3	35X102 35X102	187554-187560 187561-187563
	5	00/102	JULY 2016
	4	40X102	187564-187567
	6	40X102	187568-187573 JULY 2017
	8	40X102	189360-189367
	9	29X102	93305-93313 AUGUST 2017
	1	40X102	189368-189368
LAWRENCE TRANSIT SYSTEM 933 NEW HAMPSIRE	3	40X102	JULY 2011 178402-178404
LAWRENCE, KS 66044 ROBERT NUGENT, PUBLIC TRANSIT AMIN 785-832-3464	1	29X102	FEBRUARY 2015 92949
LEBANON, COUNTY OF 200 WILLOW ST	1	29X102	DEC. 2007 91396
LEBANON, PA 17046 THERESA GIURINTANO, CCM 717-274-3664 X 311	3	29X102	MARCH 2012 92369-92379
<u>LEE COUNTY TRANSIT</u> 6035 IDLEWOOD RD FORT MYERS, FL 33907	2	40X102	JUNE 2011 178549-178550 MARCH 2013
STEVE MYERS, TRANSIT DIRECTOR	11	35X102	181797-181807
239-533-0335	5	29X102	92497-92501
<u>LEXTRAN</u> Transit Authority of Lexington-Fayette Urban County Government	2	29X102	OCTOBER 2009 91852-91853
200 W. LOUDON AVENUE			MAY 2011
LEXINGTON, KY 40508 JIM BARRETT, DIRECTOR OF MAINTENANCE	2	35X102	180049-180050 SEP 2012
859- 255-7756, EXT. 404 EMAIL: jim.barrett@lextran.com	2	40X102	181247-181248

CUSTOMER	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
LONG BEACH, CITY OF 1 WEST CHESTER ST	3	29X102	JAN. 2010
LONG BEACH, NY 11561 MICHAEL ROBINSON, DIR OF COMM DEVEL 516-431-1001	1	29X102	91887-91889 SEPT 2010 91914
LOWELL RTA 100 HALE ST.			DEC. 2008
LOWELL, MA 01852 JIM SCANLON, ADMININISTRATOR	2	35X102	79327-79328 FEB. 2010
978-337-7516	2	35X102	177544-177545 JAN 2012
LUZERNE COUNTY TRANSP. AUTHORITY	1	35X102	178037
315 NORTHAMPTON ST.			OCT. 2010
KINGSTON, PA 18704	3	35X102	178408-178410
NORM GAVLIK, EXEC. DIR. 570-288-9356 x218	2	29X102	92090-92091 DEC. 2012
	7	35X102	181294-181300
<u>LYNX</u> 445 W. AMELIA ST., STE 800			AUGUST 2010
ORLANDO, FL 32801 SUSAN BLACK	9	35X102	177889-177897 OCTOBER 2013
407-463-2279	1	35X102	183004 NOV 2010
	9	40X102	178350-178358 OCT. 2013
	7	35X102	182998-182304 FEB 2014
	3	40X102	183539-183541 MARCH 2014
	9	35X102	183005-183013
NASHUA TRANSIT SYSTEM 11 RIVERSIDE STREET NASHUA , NH 03063 GREG GILLETTE 603-821-2037	2	BAE HYB 35X102	SEP 2019 193039-193040
GILLETTEG@NASHUANH.GOV			
MADISON TRANSIT SYSTEM 1101 E. WASHINGTON ST.	3	40X102	AUGUST 2007 77083-77085
MADISON, WI 58703 CHUCK KAMP, TRANSIT MGR.	10	40X102	JULY 2010 178289-178298
608-266-4739	2	40X102	JAN. 2014 183889-183890

CUSTOMER	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
<u>MANATEE CO. AREA TRANSIT</u> 1100 26TH AVENUE EAST BRADENTON, FL 34208	3	40X102	APRIL 2009 78937-78939
RON KENNEDY 941-708-7458 X 7373	4	29X102	SEPT. 2010 92198-92201
	2	35X102	AUGUST 2011 178605-178606
MEMPHIS AREA TRANSIT AUTHORITY 1370 LEVEE RD	4	29X102	JULY 2006
MEMPHIS, TN 38108-1011 RON GARRISON, GENERAL MANAGER 901-722-7111	15	40X102	90836-90839 SEPT. 2012 181307-181321
<u>MARIN TRANSIT</u> 711 GRAND AVE, SUITE 110	1	ALLISON HYB 40X102	DEC 2015 181501
SAN RAFAEL, CA 94901	•	ALLISON HYB	JAN 2016
ANNA PENOYAR, CAPITAL ANALYST	4	29X102	92953-92956
	6	ALLISON HYB 40X102	JAN-FEB 2016 181502-181507
APENOYAR@MARINTRANSIT.ORG	0	ALLISON HYB	NOV-DEC 2017
	10	40X102	188166-188175
			DEC 2019 - JAN 2020
	11	40X102	195002-195012
MERRIMACK VALLEY RTA		ALLISON HYB	MAY 2009
85 RAILROAD AVE.	2	35X102	176605-176606
HAVERHILL, MA 01835 JOSEPH J. COSTANZO, ADMINISTRATOR	3	ALLISON HYB 35X102	APRIL 2017 187752-187754
978-469-1251	Ū	ALLISON HYB	MAY 2018
JCONSTANZO@MVRTA.COM	1	35X102	191464
	3	ALLISON HYB 35X102	FEB 2020 187780-187782
	3	357102	107700-107702
METRO RTA			
416 KENMORE BLVD. AKRON, OH 44301	3	40X102	APRIL 2011
DEAN HARRIS, DIR. OF FINANCE 330-564-2264	3	40×102	179541-179543
METROPOLITAN COUNCIL			
560 SOUTH AVE.	1	40X102	AUGUST 2002
MINNEAPOLIS, MN 55411-4398 ALEX CURTISS	2	40X102	73595 JULY 2003
651-602-1487	2	TONIOL	73595-73596

CUSTOMER	<u><b># UNITS</b></u> 19	<u>MODE/SIZE</u> 40X102	DELIVERY DATE/ SERIAL NUMBERS OCT. 2007 77870-77888
	45	40X102	JULY 2008 79165-79209
	33	40X102	OCT 2012 180665-180697
<u>METROPOLITAN EVANSVILLE TRANSIT SYSTEM</u> 601 JOHN ST. EVANSVILLE, IN 47113	1	29X102	JAN. 2008 91461
JONATHAN SIEBEKING 812-435-6168	6	29X102	APRIL 2010 91712-91717
012-433-0100	2	29X102	MARCH 2012 92282-92283
<u>NASHVILLE MTA</u> 130 NESTOR ST.	4	ALLISON HYB 40X102	DEC. 2009 177506-177509
NASHVILLE, TN 37210 CARL.ROKOS, DIRECTOR OF MAINTENANCE	4	ALLISON HYB 40X102	JANUARY 2015 185821-185824
615-308-1674		ALLISON HYB	DEC. 2012
CARL.ROKOS@NASHVILLE.GOV	12	40X102 BAE HYB	181531-181542 AUG 2017
	4	40X102	189697-189700
	31	BAE HYB 40X102	JULY-AUG 2018 191004-191034
	10	BAE HYB 40X102	DEC 2018-JAN 2019 191773-191782
	10	BAE HYB	AUG-SEP 2019
	10	40X102	191783-191792
MIAMI DADE COUNTY			
701 NW 1ST COURT	_	101/100	DEC. 2010
MIAMI, FL 33136 CARLOS DELGADO, FIELD ENGINEER	5	40X102	176474-176478 AUG - NOV 2014
305-637-3709	30	40X102	184516-184545
MODESTO, CA (LAIDLAW TRANSIT SERVICES) 1010 10TH ST ST., SUITE 450 MODESTO, CA 95353 FRED CAVANNAH, TRANSIT MGR. 209-577-5295	1	40X102	NOV. 2006 76384
MONROE CO. TRANSP. AUTHORITY PO BOX 339 MONROE, PA 18355 WALTER QUADARELLA, DIR. OF OPERATIONS 610-899-6082	2	29X102	NOV. 2009 91780-91781

	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
MONROE TRANSIT SYSTEM 700 WASHINGTON ST.	1	40X102	APRIL 2009
MONROE, LA 71201 MARC KEENAN, GENERAL MANAGER 318-329-2206	1	35X102	176153 MAY 2013 181544
MONTGOMERY AREA TRANSIT 2318 W. FAIRVIEW AVE. MONTOMGERY, AL 36108 KELVIN MILLER, GM 334-240-4898	8	35X102	JULY 2011 179411-179418
MONTGOMERY COUNTY			
16630 CRABBS BRANCH WAY ROCKVILLE, MD 20855 KATHLEEN HYNES, FLEET ASSETS MGR	5	40X102	FEB - MAR 2006 76870-76874 JUNE 2007
240-777-5625	9	40X102	78121-78129 JULY - AUG 2009
	35	40X102	176628-176662 AUG - SEPT 2011
	12	40X102	179491-179502 MAY 2012
MUNCIE INDIANA TRANSIT SYSTEM	7	40X102	180893-180899
1300 E. SEYMOUR ST. MUNCIE, IN 47302 TROY DENISON. DIR OF MAINT 765-282-2762	5	35X102	FEB. 2010 177584-177588
NAIPTA			
3373 N. KASPER DR FLAGSTAFF, AZ 86004	2	35X102	DEC. 2007 77857-77858
GEORGE GILLETTE, FLEET MANAGER 928-679-8914	1	35X102	OCT. 2009 176017
	7	35X102	JULY 2011 179579-179585
	6	35X102	FEB 2013 181744-181749
	2	35X102	JUNE 2015 184790-184791
	2	35X102	MAY 2016 185573
<u>NIAGARA FRONTIER TRANSIT AUTHORITY</u> 1581 MICHIGAN AVE. BUFFALO, NY 14209	30	40X102	AUGUST 2006 77150-77179
DAVE RUGG, MANAGER, BUS MAINTENANCE 716-881-4705	13	40X102	JULY 2007 77786-77798
	11	40X102	FEB. 2010 78958-78968
	1	40X102	MAY 2011 178998

CUSTOMER	<u># UNITS</u> 5 24	<u>MODE/SIZE</u> 40X102 40X102	DELIVERY DATE/ SERIAL NUMBERS APRIL 2011 178993-178997 178969-178992
	14	40X102	APRIL 2012 181181-181194 MARCH 2013
	5	35X102	181366-181370
<u>NEW CASTLE ATA</u> 311 MAHONING AVE. NEW CASTLE, PA 16102	2	40X102	OCT. 2008 79700-79701
LEONARD LASTERIA, GM 724-654-3130	5	35X102	AUGUST 2015 184244-184248
<u>CITY OF NORWALK</u> 12700 NORWALK BLVD NORWALK, CA 90650 JAMES PARKER, DIR OF TRANSPORTATION 562-929-5533	2	40X102	DEC. 2003 73944-73945
OHIO STATE UNIVERISTY 2578 KENNY RD COLUMBUS, OH 43210 TOM HOLMAN, TRANSIT MGR 614-292-9113	2	40X102	JUNE 2011 1788828-178829
<u>PALMTRAN</u> 3201 ELECTRONICS WAY WEST PALM BEACH, FL 33407-4618	3	40X102	DEC. 2008 79669-79671
JON KAVALUINAS, DIR. OF MAINTENANCE 407-233-1145	9	40X102	NOV. 2010 178350-178358
+01-200-11+0	9	40X102	DEC.2010 178359-178367
	5	40X102	DEC. 2011 178894-178898
	5	40X102	MARCH 2015 186391-186395
<u>CITY OF PETALUMA</u> PUBLIC WORKS DEPT. 555 N. MCDOWELL BLVD.	1	40X102	JULY 2016 186798
PETALUMA, CA 94952 JOSEPH RYE, TRANSIT MANAGER 707-778-4421	2	35X102	186799-186800
<u>PIEDMONT WAGON TRANSIT</u> PO BOX 398 HICKORY, NC 28603 CAMILLE STERLING, TRANSIT MGR 828-465-7642	1	35X102	JUNE 2011 177505

PIERCE TRANSIT

CUSTOMER 3701 98TH ST.	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS NOV 2010
LAKEWOOD, WA 98499 BILL SPIES, SR. MANAGER OF MAINT	9	40X102	178470-178478 MARCH 2012
253-589-6896	22	40X102	180591-180612 SEP 2014
	6	40X102	183848-183853
PINELLAS SUNCOAST TRANSIT 3201 SCHERER DR.	7	ALLISON HYB 35X102	APR - JUNE 2009 176123-176129
ST. PETERSBURG, FL 33716 BRAD MILLER, CEO	3	ALLISON HYB 35X102	APRIL 2009 176130-176132
727-540-1807 BMILLER@PSTA.NET	14	ALLISON HYB 35X102	JULY 2010 178486-1781499
	8	ALLISON HYB 40X102 ALLISON HYB	NOV. 2012 181333-181340 SEPT. 2013
	8	40X102 ALLISON HYB	181978-181985 NOV 2014
	8	40X102 ALLISON HYB	183980-183987 JUNE - JULY 2015
	13	40X102 BAE HYB	185383-185395 DEC 2016 - JAN 2017
	7	40X102 BAE HYB	188879-188885 JULY - AUG 2017
	7	35X102 BAE HYB	189997-189999 OCT 2018
	9	35X102 BAE HYB	191256-191264 JAN 2019
	9	35X102	192719-192727
BERKSHIRE RTA ONE COLUMBUS AVENUE, SUITE 201 PITTSFIELD, MA 01201 ROBERT MALNATI, ADMINISTRATOR 413-499-2782 ext 2871 ROBERT.MALNATI@BERKSHIRERTA.COM	1	35X102	JUNE 2007 77782
PORT AUTHORITY OF ALLEGHENY COUNTY	6	408103	
2235 ALLEGHENY PITTSBURGH, PA 15233	6 20	40X102 40X102	JUNE 2005 74723-74725 OCT. 2009
DON RIVETTI, DIRECTOR OF MAIN SHOPS 412-237-7247	20	40X102 40X102	177201-1717220 JUNE 2010
	4	40X102	178553-178554 SEPT. 2011
			179905-179908

CUSTOMER POUGHKEEPSIE, CITY OF	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
26 HOWARD ST.			OCT. 2008
POUGHKEEPSIE, NY 12601	1	40X102	79422
KAREN SORRELL, DEPUTY COMMISSIONER	3	35X102	79423-79425
845-451-4211			NOV. 2011
	1	35X102	178250
<u>PUEBLO TRANSIT</u> 350 S. GRAND AVE.	1	ALLISON HYB 35X102	NOV. 2010 178483
PUEBLO, CO 81003	I	ALLISON HYB	OCT 2019
BEN VALDEZ, TRANSIT DIRECTOR	1	35X102	193054
719-553-2725		ALLISON HYB	FEB 2021
	1	35X102	195586
PULLMAN TRANSIT			
775 NW GUY ST.		BAE HYB	MAY 2013
PULLMAN, WA 99163	3	35X102	180867-180869
WAYNE THOMPSON, TRANSIT MANAGER		BAE HYB	APR 2014
509-338-3248	1	40X102	183847
WAYNE.THOMPSON@PULLMANTRANSIT.COM	_	BAE HYB	SEP 2017
	2	40X102	188309-188310
	4	BAE HYB	OCT 2019
	1	40x102	191847
RED ROSE TRANSIT AUTHORITY	4	BAE HYB	JUNE 2012
45 ERICK RD	1	35X102	180796
	1	BAE HYB	JULY 2012 180795
DAVID KILMER, EXECUTIVE DIRECTOR 717-358-1920	I	40X102 BAE HYB	JANUARY 2013
DKILMER@SCTAPA.COM	1	35X102	181529
DRIEMENWOOTAFA.COM	I	BAE HYB	OCT 2013
	2	35X102	183949-183950
	2	BAE HYB	SEP-OCT 2015
	10	35X102	187894-187903
		BAE HYB	MAY 2016
	3	35X102	188110-188112
	1	35X102	188109
		BAE HYB	JULY 2017
	5	35X102	190055-190059
	3	40X102	190060-190062
		BAE HYB	DEC 2018
	2	35X102	192629-192630
		BAE HYB	JULY 2019
	6	35X102	192442-192447
		BAE HYB	MAR 2021
	3	35X102	195749-195751

CUSTOMER	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
REGIONAL TRANSPORTATION COMM 2050 VILLANOVA DR. RENO, NV 89502	2	40X102	MAY 2007 78314-78315 APRIL 2013
DAVID CARR, TRANSIT MANAGER 775-332-2161	8	40X102	182057-182064
<u>REGIONAL TRANSPORTATION DISTRICT</u> 1900 31ST ST. DENVER, CO 80216	4	40X`102	FEB. 2006 76841-76844
LOU HA, MGR. OF TECHNICAL SERVICES 303-299-5265	5	40X102	JULY 2008 79540-79544
<u>RIPON, CITY OF</u> 259 N. WILMA AVE. RIPON, CA 95366	1	35X102	OCT. 2012 181815
KEVIN WERNER, CITY ENGINEER 209-599-2108	1	35X102	
<u>RIVER VALLEY TRANSIT</u> 1500 WEST THIRD ST. WILLIAMSPORT, PA 17701	2	40×102	FEB. 2011 180344-180345
JOHN KIEHL, JR., ASST. GM 570-326-2500	2 1	40X102 35X102	180346 JAN 2012
	1 2	40X102 35X102	180214 180018-180019 NOVEMBER 2016
	2	35X102	187264
ROCKFORD MASS TRANSIT DISTRICT 520 MULBERRY STREET	5	BAE HYBRID 35X102	JAN 2020 189339-189343
ROCKFORD, IL 61101 DAN ENGELKES, DIRECTOR OF OPERATIONS 815-490-5016 DENGELKES@RMTD.ORG	5	35x102	DEC 2020 - JAN 2021 195757-195761
ROCKLAND COUNTY DR. ROBERT L. YAEGER HEALTH	6	35X102	NOV. 2009
50 SANATORIUM RD., BLDG T POMONA, NY 10970	2	40X102	176811-176816 176817-176818
MICHAEL D'ANGELO, TRANSIT ADMINI	2	35X102	177887-177888
845-364-3473	6	29X102	91740-91745 SEPT. 2010
	3 3	40X102 35X102	178777-178779 179171-179173

DELIVERY DATE/

			DELIVERT DATE/
CUSTOMER	# UNITS	MODE/SIZE	SERIAL NUMBERS
SAN JOAQUIN RTD		ALLISON HYB	JULY 2004
2849 E. MYRTLE ST	2	40X102	73093-73094
	2		
STOCKTON, CA 95201		ALLISON HYB	JUNE-JULY 2008
BRAD MENIL, OPERATIONS SUPERINTENDENT - MAINT.	6	40X102	77433-77438
209-467-6606		ALLISON HYB	JULY-AUG 2006
BMENIL@SANJOAQUINRTD.COM	4	40X102	77443-77446
		ALLISON HYB	NOV-DEC 2006
	4	40X102	77661-77664
		ALLISON HYB	APR-MAY 2007
	6	35X102	77665-77670
	0	ALLISON HYB	MAY 2007
	11		
	11	29X102	91202-91212
	-	ALLISON HYB	JUNE 2009
	3	40X102	78934-78936
		ALLISON HYB	MAR 2010
	6	40X102	177308-177313
		ALLISON HYB	MAR 2010
	2	40X102	177314-177315
		ALLISON HYB	APRIL 2011
	2	40X102	180082-180083
	2	ALLISON HYB	APRIL 2012
	0		
	6	40X102	181301-181306
		ALLISON HYB	MAY 2013
	8	40X102	182435-182442
		ALLISON HYB	JUNE 2013
	12	40X102	188532-188543
		BAE HYBRID	JULY-AUG 2018
	12	40X102	192573-192584
CITY OF SANDY			
16610 CHAMPION WAY	2	251102	SEDT 2009
	Z	35X102	SEPT. 2008
SANDY, OR 97055			176198-176199
JULIE STEPHENS, TRANSIT MGR			
503-489-0925			
SANTA BARBARA MTD			
550 OLIVE ST	8	40X102	MARCH 2007
SANTA BARBARA, CA 93101			77738-77745
STEVE HAHN, MATERIALS MANAGEMENT	3	29X102	JUNE 2009
805-963-3364 X 229	U	20/(102	91440-91442
000 000 0004 // 220	7	40X102	JUNE 2011
	I	40/102	
			179197-179203
SANTA CLARA VTA			
3331 NORTH FIRST ST.			SEPT 2010-JAN 2011
SAN JOSE, CA 95134-1906	70	40X102	178673-178742
ART DOUWES, SR. ENGINEER			JAN. 2012
408-321-7027	20	40X102	178743-178762
			AUG - OCT 2014
	15	40X102	184693-184707
			OCT 2014
			0012014

CUSTOMER	<u><b># UNITS</b></u> 20	<u>MODE/SIZE</u> 40X102	<b>DELIVERY DATE</b> / <u>SERIAL NUMBERS</u> 184708-184727 JUNE - DEC 2014
	38	29X102	92828-92865 NOVEMBER 2016
	4	40X102	188001-188004 NOVEMBER 2016
	13	40X102	188005-188017 SEPTEMBER 2017
	56	40X102	188045-188100
SANTA ROSA CITYBUS 100 SANTA ROSA AVE. SANTA ROSA, CA A90693 DAVE ELLIS, TRANSIT PLANNER 707-543-3335	3	29X102	APRIL 2008 91616-91618
5303 PINKNEY AVE. SARASOTA, FL 34232 ROCKY BURKE, GM	10	35X102	JAN. 2007 77404-77413 MAY 2009
941-202-4124	4	29X102	91582-91585 JUNE 2011
SOUND TRANIST	3	35X102	179024-179026
401 S. JACKSON ST. SEATTLE, WA 98104 MICHAEL PERRY 206-398-5388	1	40X102	AUGUST 2017 190192-190192
SHREVEPORT, CITY OF			
1115 JACK WELLS BLVD. SHREVEPORT, LA 71107	1	40X102	MARCH 2005 73099
DINERO WASHINGTON, GENERAL MANAGER 318-673-7406	1	35X102	AUGUST 2008 77099
<u>SMART</u> 660 WOODWARD AVE. DETROIT, MI 48226-3315	3	40X102	JUNE 2011 178769-178771
KEITH TAYLOR, DIRECTOF OF MAINTENANCE 248-419-7915	3	40x102	MARCH 2013 181734-181736
	10	40X102	OCT 2014 184504-184513
<u>SMART TRANSIT</u> 8455 ELLIGSEN RD WILSONVILLE, OR 97070 STEVEN ALLEN, OPS MGR 503-570-1577	2	40X102	DEC 2014 184514-184515
<u>SPARTANBURG, CITY OF</u> 150 AIRFLOW DR. SPARTANBURG, SC 29306	1	35X102	MARCH 2012 178627

<u>CUSTOMER</u>	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ <u>SERIAL NUMBERS</u>
LUIS GONZALEZ, GM 864-595-2710	1	35X102	MAY 2013 182071
<u>SPOKANE TRANSIT AUTHORITY</u> 1230 W. BOONE AVE.	3	40X102	OCT 2007
SPOKANE, WA 99201			OCT. 2007 78432-78434
JACQUELIN TJARDS 509-325-6032	8	40X102	DEC. 2008 79617-79622
	3	29X102	NOV. 2009 91443-91445
	10	40X102	JAN. 2010 176254-176263
	6	40X102	SEPT. 2012 180543-180548
<u>PIONEER VALLEY TRANSIT AUTHORITY</u> 665 COTTAGE STREET			JUNE 2005
SPRINGFIELD, MA 01104 JOSEPH VARLEY, DIRECTOR OF MAINTENANCE	1	40X102	72877
413-732-2161			
JVARLEY@PVTRANSIT.COM			
MET COUNCIL - ST. PAUL 390 NORTH ROBERT STREET	1	40X102	APRIL 2015
ST. PAUL, MN 55101-1805 ALEX CURTISS			185208-185212 JULY 2015
651-602-1487	4	40X102	185209-185212
SOUTH CENTRAL REGIONAL TRANSIT 830 ANTHONY DRIVE	2	ALLISON HYB 35X102	DEC 2020 195358-195359
ANTHONY, NM 88021 DAVID ARMIJO, EXECUTIVE DIRECTOR			
949-322-9881 DARMIJO@SCRTD.ORG			
SOUTHEASTERN REGIONAL TRANSIT AUTHORITY			
700 PLEASANT STREET, SUITE 320	0	251/400	MARCH 20018
NEW BEDFORD, MA 02740 ERIK ROUSSEAU, ADMINISTRATOR	2	35X102	78855-78856
508-999-5211 EROUSSEAU@SRTABUS.COM			
			JUNE-JULY 2021
<u>SPACECOAST AREA TRANSIT</u> 401 S. VARR AVE.	2	BAE HYB 35X102	195971-195972
COCOA, FL 32922 LANCE PARKER, MANAGER OF OPERATIONS & MAINT			
321-635-7815 EXT 52952 LANCE PARKER@BREVARDFL.GOV			

CUSTOMER STANFORD UNIVERSITY	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
315 BONAIR SIDING STANFORD, CA 94305-7270 WARD THOMAS 650-725-5997	3	40X102	176687-176688 AUGUST 2012 181512-1811514
<u>STARK AREA RTA</u> 1600 GATEWAY BLVD. CANTON, OH 44707	2	40X102	SEPT. 2009 176173-176174
MARK FINNICUM, DIR. OF MAINTENANCE 330-454-6132 X 524	1	29X102	SEPT. 2009 91821
	1	40X102	JUNE 2010 177592
<u>STEAMBOAT SPRINGS TRANSIT</u> 137 10TH ST. STEAMBOAT SPRINGS, CO 80487	1	ALLISON HYB 29X102	NOV. 2008 91666
JONATHAN FLINT, OPERATIONS MANAGER 970-879-3717 JFLINT@STEAMBOATSPRINGS.NET	2	ALLISON HYB 29X102	JUNE 2010 91994-91995 NOV. 2012
STOC	1	35X102 BAE HYB	180301 SEPT. 2013
	2	35X102 BAE HYB	180302-180303 JAN 2015
	1	35X102 BAE HYB	183478 DEC 2015
	1	35X102 BAE HYB	181371 DEC 2017
	1	35X102 BAE HYB	187101 SEP - OCT 2020
	2	35X102	194736-194737
STEVENS POINT TRANSIT 102 6TH AVE. STEVENS POINT, WI 54481 SUSAN LEMKE, TRANSIT MGR 715-341-4490	3	29X102	JAN 2011 92193-92195
<u>SUFFOLK COUNTY</u> 335 YAPHANK AVE. YAPHANK, NY 11980-9744 GARRY LENBERGER, FLEET SERVICE MGR 631-852-4872	4	40X102	OCT. 2008 79580-79583
TANK 3375 MADISON PIKE	4	ALLISON HYB 35X102	NOV 2007 78456-78459 MAX 2012
FORT WRIGHT, KY 41017 ANDY AIELLO, GENERAL MANAGER 859-814-2123	3	ALLISON HYB 40X102 ALLISON HYB	MAY 2012 181553-181555 FEBRUARY 2017
AAIELLO@TANKBUS.ORG	3	40X102 ALLISON HYB	187888-187890 APR 2018

CUSTOMER	<u># UNITS</u> 54 4 4 4	MODE/SIZE 40X102 ALLISON HYB 40X102 ALLISON HYB 40X102 BAE HYB 40X102	DELIVERY DATE/ SERIAL NUMBERS 189974-189978 FEBRUARY 2019 191891-191894 NOV 2019 193751-193754 MAR-APR 2021 195396-195399
TRANSIT AUTHORITY OF RIVER CITY (TARC) 1000 W. BROADWAY	5	40X102	SEPT. 2004
LOUISVILLE, KY 40203 CARRIE BUTLER, EXECUTIVE DIRECTOR	4	40X102	74403-74407 JUNE 2007
502-561-5100			77846-77849
EMAIL: cbutler@ridetarc.org	3	40X102	MAY 2009 176203-176205
	9	40X102	MAY 2010 177674-177682 FEB 2014
	11	40X102	181780-181790
TOLEDO AREA RTA 1127 W. CENTRAL AVE. TOLEDO, OH 43610 JAMES GEE, GM 419-245-5222	2	35X102	DEC. 2012 181349-181350
TOMPKINS CONSOLIDATED AREA TRANSIT 737 WILLOW AVE. ITHACA, NY 14850 DAN TOME, PURCHASING AND PROJECT MANAGER 607-277-9388 X 540	2	40X102	NOV. 2009 177472-177473
TOWN OF BRECKENRIDGE 1095 AIRPORT RD BRECKENRIDGE, CO 80421 JIM BENKELMAN, TRANSIT FLEET MGR 970-547-3153	2	35X102	FEB. 2008 79496-79497
<u>TOWN OF CHAPEL HILL</u> 6900 MILLHOUSE RD CHAPEL HILL, NC 27516	3	40X102	JULY 2007 78354-78356
ROGER CHAPIN, ASST. TRANSP. DIRECTOR	9	40X102	NOV. 2009
919-968-2755 TOWN OF NO. HEMPSTEAD	15	40X102	177299-177307 DEC 2012 - JAN 2013 181655-181669
802 W. SHORE RD. PORT WASHINGTON, NY MIKE WEHR, DIRECTOR OF MAINTENANCE 414-937-3238	2	29X102	JULY 2011 92260-92261

CUSTOMER	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
<u>TOWN OF VAIL</u> 75 SO. FRONTAGE RD VAIL, CO 81657	7	40X102	MARCH 3008 79431-79437
TODD SCHOLL, FLEET MANAGER 970-479-2162	2	40X102	SEPT. 2012 180332-180333
TRANSIT SERVICES OF FREDERICK CO. 1040 ROCKY SPRINGS RD FREDERICK, MD 21702 JOE OTEGA, DIRECTOR OF OPERATIONS 301-600-2065	2	35X102	AUGUST 2011 180891-180892
<u>TRI MET</u> 4412 SE 17TH AVE.	4	40X102	SEPT. 2013
PORTLAND, OR 97202 GREG HALEY, MAINT. MGR 503-962-3327	4	40X102	181290-181293 MARCH 2015 183677-183680
<u>TRI-STATE TRANSIT</u> 1120 VIRGINIA AVE. WEST HUNTINGTON, WV 25705 PAUL E. DAVIS, GM 304-529-6094	3	35X102	OCT. 2009 176983-176985
<u>TULSA TRANSIT AUTHORITY</u> 510 S. ROCKFORD TULSA, OK 74120 RANDY CLOUD, DIR. OF MAINTENANCE 918-699-0219	1	35X102	FEB. 2006 76467
UNIVERSITY OF MARYLAND BLDG 013 GREENHOUSE RD COLLEGE PARK, MD 20742 DON ST. ARMOND, FLEET OPS MGR 301-314-7267	4	40X102	MAY 2010 177635-177638
UNIVERSITY OF MICHIGAN 1213 KIPKE DRIVE	4	40X102	DECEMBER 2011
ANN ARBOR, MI 48109 BILL McALISTER, GENERAL MANAGER	3	40X102	180615-180618 JULY 2012 180306-180308
734-764-2491 bjom@umich.edu	3	40X102	AUGUST 2013 180988-180990
	3	29x102	APRIL 2014 92790-92792
	3	40X102	APRIL 2014 184388-184390
	3	40X102	APRIL 2015 183686-183688

CUSTOMER	<u><b># UNITS</b></u> 1	MODE/SIZE 29X102	DELIVERY DATE/ SERIAL NUMBERS APRIL 2015 92796
	1	29X102	92790 DECEMBER 2015 93046
	3	40x102	Dec-15 187133-187135
	1	29X102	DECEMBER 2015 92989
	3	40X102	Aug-17 188758-188760
	1	29X102	AUGUST 2017 93134
<u>UNIV. OF MINNESOTA</u> 300 TRANSPORTATION & SAFETY BLDG. 511 WASHINGTON AVE. SE MINNEAPOLIS, MN 55455			
WILLIAM STAHLMANN, TRANSIT MANAGER\ 651-808-1404	1	40X102	OCT. 2008 176189
	1	40X102	FEB. 2010 176322
UNIVERSITY OF WISCONSIN	1	29X102	JUNE 2012 92355
1101 E. WASHINGTON AVE. MADISON, WI 53703 JEFF BUTLER, MAINTENANCE MGR	1	29X102	JANUARY 2015 92800
608-266-4739 UTAH TRANSIT AUTHORITY	2	40X102	AUGUST 2007 77086-77087
3600 SOUTH 700 WEST SALT LAKE CITY, UT 84119			
KURT BURNINGHAM, FLEET ENGINEER 801-287-3040	20	40X102	MAY - NOV. 2010 17637-178656 MAR - JUNE 2012
VALLEJO CITIZENS TRANSIT 1850 BROADWAY CORP VALLEJO, CA 94589	9	40X102	179813-179821
DERIK CALHOUN, GM 707-648-4671	21	40X102	JUNE 2011 180275-180295
<u>VISALIA, CITY OF</u> 425 E. OAK AVE., STE 101 VISALIA, CA 93291	2	ALLISON HYB 29X102 ALLISON HYB	MAR 2012 92356-92357 APR 2012
ANGELINA SOPER, TRANSIT MANAGER 559-713-4591	2	35X102 ALLISON HYB	179190-179193 MAR 2018
ANGELINA.SOPER@VISALIA.CITY	2	29X102	93295-93296

VOTRAN 850 BIG TREE RD SO. DAYTONA, FL 32119

CUSTOMER	<u># UNITS</u>	MODE/SIZE	DELIVERY DATE/ SERIAL NUMBERS
RICK KAZAWITCH, DIR. OF MAINTENANCE 386-756-7492 X 4121	9	35X102	APRIL 2010 178419-178427
300-730-7492 × 4121	6	35X102	NOV. 2012 181577-181586
<u>WHATCOM TRANSPORTATION AUTHORITY</u> 4111 BAKERVIEW SPUR RD BELLINGHAM, WA 98226	4	35X102	JULY 2013 181670-181673
PETE START, DIR. OF FLEET FACILITIES 360-738-4580	3	40X102	NOV. 2012 182276-182278
<u>WILMINGTON, DE</u> 400 S. MADISON ST. WILMINGTON, DE 19801			
STEVE OVERTURF, MAINT. ENG. & TECHNOLOGY MGR. 302-760-2863	2	40X102	AUGUST 2004 73348-73349
<u>WINSTON-SALEM TRANSIT</u> 1060 N. TRADE ST. WINSTON SALEM, NC 27102			
ART BARNES, GM 336-727-2648	5	35X102	SEPT. 2013 181986-181990
<u>WORCESTER RTA</u> 42 QUINSIGAMOND AVENUE WORCESTER, MA 01610			
JIM PARKER, GENERAL MANAGER	_		MARCH 2010
508-453-3415 JPARKER@THERTA.COM	2 2	40X102 29X102	177579-177580 91907-91908 FEB 2012
	1	40X102	180778
	2	35X102	180783-180784 SEP 2013
	3	40X102	181963-181965 OCT 2013
	1	35X102	181971 NOV - DEC 2013
	3	40X102	183101-183103
	3	35X102	183104-183106 JUNE 2014
YORK CO. TRANSPORTATION AUTHORITY 1230 ROOSEVELT AVE.	1	40X102	184300
YORK, PA 17404 RICHARD FARR, EXEC DIRECTOR 717-846-5562	3	40X102	JAN 2013 181726-181728
<u>YOSEMITE NATIONAL PARK</u> 5083 FORESTA RD., BLVD. 759 EL PORTAL, CA 95318			
GARY ROSENFELD, TRANSPORTATION OPS MGR. 209-372-8331	18	40X102	MAY. 2005 75057-75074

CUSTOMER	<u># UNITS</u>	SIZE	DELIVERY DATE/ SERIAL NUMBERS
<u>ALBANY TRANSIT SYSTEM</u> 712 FLINT AVE. ALBANY, GA 31701	4	35X102	AUGUST 2016 188927-188930
KEN JOHNSON, FLEET MAINTENANCE SUPERINTENDENT 229-430-5272	1	29x102	MARCH 2018 93366
	2	29X102	MARCH 2018 93367-93368
	1	35X102	Feb-20 195226
	7	35X102	Mar-20 195227-195233
ALTOONA METRO TRANSIT (AMTRAN) 3301 FIFTH AVENUE	1	29X102	MARCH 2012 92262
ALTOONA, PA 16602 ERIC WOLF, GENERAL MANAGER	1	40X102	Jul-11 176562
814-944-4074 ERIC.WOLF@AMTRAN.ORG	6	35X102	May-18 189372-189377
	9	35X102	Sep-18 192563-192571
	1	35X102	Oct-18 192572
	7	35X102	Pending JULY 2021 195403-195409
ANN ARBOR TRANSPORTATION AUTHORITY 2700 S. INDUSTRIAL HWY ANN ARBOR, MI 48104 CANDACE MOORE, DIRECTOR OF FLEET SERVICES 734-794-1752	3	40X120	JUNE 2017 187768-187770
BEAVER CO. TRANSIT AUTHORITY 131 PLEASANT DR., STE 7 ALIQUIPPA, PA, 15001 ROSE SUTTER, MAINT SUPERV 724-728-4255	3	40X102	AUGUST 2017 189626-189628
<u>CAMBRIA COUNTY TRANSIT</u> 726 CENTRAL AVE.	1	29X102	MAY 2015 92937
JOHNSTOWN, PA 15902-2996 ROSE LUCY-KNOLL 814-535-5526 X 202	3	35X120	MARCH 2017 188321-188323
CENTRE AREA TRANSPORTATION AUTHORITY (CATA) 2081 WEST WHITEHALL ROAD STATE COLLEGE, PA 16801 LOUWANA S. OLIVA, GENERAL MANAGER 814- 238-2282 EMAIL: loliva@catabus.com	15	40x102	Feb-19 191863 - 191877

CUSTOMER	<u># UNITS</u>	<u>SIZE</u>	SERIAL NUMBERS
CHARLEROI - MID MON TRANSIT AUTHORITY	4	40X102	NOVEMBER 2015
1300 MCKEAN AVE.			185653-185656
CHARLEROI, PA 15022	4	35X102	NOV-DEC 2015
BOB SMITH			185657-185660
724-489-0880			
CITY OF FRESNO			SEP 2011
2223 "G" ST.	9	40X102	180131-180139
FRESNO, CA 93706			FEB. 2012
BRIAN MARSHALL, DIR OF TRANSPORTATION	3	29X102	92294-92296
559-621-1454			SEP 2014
	8	40X102	185882-185889
			JUNE 2016
	1	40X102	188530
			AUGUST 2016
	6	40X102	188531-188536
			SEPTEMBER 2016
	10	40X102	188537-188546
			JANUARY-FEBRUARY 2017
	8	40X120	188513-188520
	9	40X120	188521-188529
			AUGUST 2017
	9	40X102	189476-189484

CLARKSWILLE TRANSIT SYSTEM	<u># UNITS</u>	<u>SIZE</u>	SERIAL NUMBERS
CLARKSVILLE TRANSIT SYSTEM 430 BOILLIN LN	3	29X120	APRIL 2017 93163-93165
CLARKSVILLE, TN 37040 ARTHUR BING, GENERAL MANAGER 931-553-2430			
<u>COBB COUNTY, GA</u> 463 SE COMMERCE PARK DRIVE, SUITE 112 MARIETTA, GA 30060 JORGE PUBILLONES, BUSINESS ANALYST 770-528-1612	2	40X102	MAY 2016 187834-187835
COTA - CENTRAL OHIO TRANSIT AUTHORITY			FEB-MAY 2013
1600 MCKINLEY AVE.	18	40X102	182123-182140
COLUMBUS, OH 43222	12	35X102	182141-182152
KEVIN CHRISTOPHER, DIRECTOR SUPPLY MGMT			FEB 2014
614-275-5934	8	29X102	92780-92787
christopherk@cota.com			FEB - MAR 2014
1 💛	7	35X102	183776-183782
			MAR - JULY 2014
	21	40X102	183753-183773
			FEBRUARY 2015
	5	35X102	186280-186284
			MAR 2017
	4	35X120	188135-188138
			MAR-APR 2015
	33	40X102	186285-186317
			MAR-APR 2016
	14	40X102	187661-187674
			APR 2016
	4	35'X102	187657-187660
			OCT 2016
	2	40'X102	187655-187656
			FEBRUARY 2017
	3	29X120	93206-93208
	1	29X120	93209
	2	29X120	93210-93211
			MARCH 2017
	1	35X120	188139
	2	35X120	188140-188141
			JULY 2017
	6	40X120	188142-188147
			AUG 2017
	2	40X120	188148-188149
	5	40X120	188150-188154
			AUGUST 2018
	2	40x102	188148-188149
			APRIL 2017
	2	29X102	93210 - 93211
			APRIL 2017
	3	29X102	93206-93208
			APRIL 2017
	1	29X102	93209

CITY OF COLUMBIA

CUSTOMER	<u># UNITS</u>	SIZE	SERIAL NUMBERS
701 E. BROADWAY	2	40X102	FEBRUARY 2015
COLUMBIA, MO 65205-6015			184197-184198
DREW BROOKS, MULTI MODEL MANAGER	1	40x102	NOVEMBER 2020
573-874-7282 drew.brooks@como.gov	2	35x102	195441 Pending OCTOBER 2021
diew.brooks@conto.gov	2	558102	195331-195332
CLEVELAND, OH - Greater Cleveland RTA			
2500 WOODHILL RD	1	40X102	OCTOBER 2014
CLEVELAND, OH 44104 RON BARON, DIRECTOR MANAGEMENT	59	40X102	185101 FEBRUARY-MAY 2015
216-421-2160	57	10/1102	185102-185160
rbaron@gcrta.org	30	40X102	JULY - AUG 2015
			185661-185690
	16	40X102	FEBRUARY 2017
	33	40X102	189585-189600 AUGUST 2018
	55	40/102	192677-192709
	6	40X102	JUNE 2020
			192783-192788
	19	40X102	DECEMBER 2020
			192789-192807
ENTERPRISE - LAX			OCT. 2010
8734 BELLANCA AVE.	2	35X102	176518-176519
LOS ANGELES, CA 90045			FEB. 2011
HENRY SINGH, BUS OPERATIONS MGR	1	35X102	177513
415-760-0075 HARJEET.SINGH@EHI.COM	2	25 ¥ 102	MAY 2012 180407-180498
	2	35X102	DEC 2014
	2	40X102	183972-183973
ENTERDRICE (CAN DIECO			ALICHET 2012
ENTERPRISE/SAN DIEGO 2942 KETTNER DRIVE	2	35X102	AUGUST 2012 181526-181527
SAN DIEGO, CA 92101	2	5571102	101520 101527
HENRY SINGH, BUS OPERATIONS MGR			
415-760-0075 HARJEET.SINGH@EHI.COM			
ERIE MTA	10	40X102	JAN 2014
127 E. 14TH ST.	10	40/1102	183175-183184
ERIE, PA 16503			MARCH 2017
MICHAEL TANN, EXEC. DIRECTOR	5	29X120	93083-93087
814-459-4287			
FLINT, MI - MASS TRANSPORTATION AUTHORITY			JULY 2017
1404 S. DORT HIGHWAY	2	40X120	187018-187019
FLINT, MI 48503			
ERIC CHENOWETH, DIRECTOR OF FLEET & FACILITIES 810-780-8865			
010-700-0000			
FORT WAYNE PTC			MARCH 2017

<b>CUSTOMER</b>	<u># UNITS</u>	SIZE	SERIAL NUMBERS
801 LEESBURG RD	1	40X120	185848-185848
FT. WAYNE, IN 46808			
KEN HOUSDEN, GM 219-432-4977			
FORT WORTH, TX - THE T	1	40X102	EEDDIADV 2015
1600 E. LANCASTER FORT WORTH, TX 76102	1	40X102	FEBRUARY 2015 186805
SERGIO RODRIGUEZ	7	40X102	MARCH 2015
817-215-8752	1	40/1102	186806-186812
	4	40X102	MARCH 2015
			186801-186804
	4	29X102	APRIL 2015
	36	40X102	92992-92995 AUGUST 2016
	50	40/1102	187937-187972
GRAND RAPIDS-DASH			MARCH 2017
50 OTTAWA NW	5	35X120	189353-189357
GRAND RAPIDS, MI 49503			
BARBARA SINGLETON, DASH PROGRAM MGR 616-4563755			
010-4303755			
GREATER RICHMOND TRANSIT CO			MARCH 2013
301 E. BELT BLVD.	8	40X102	182301-182308
RICHMOND, VA 23224	0	403/120	JANUARY - FEBRUARY 2017
DAVID GREEN, GENERAL MANAGER 804-474-9366	9 5	40X120 40X120	187575-187583 188811-188815
0011717500	5	40X120	188816-188820
	4	29X120	93142-93145
	4	35X120	188807-188810
	2	1031100	AUGUST 2017
	3	40X102	190607-190609
GREELEY EVANS TRANSIT	2	35X102	JUNE 2016
1200 A STREET			188101-188102
GREELEY, CO 80634 WILL JONES, TRANSIT MANAGER	4	35X120	APRIL 2017 188651-188654
970-350-9751	I.	5571120	100051 100051
HAMILTON OH			
HAMILTON, OH BUTLER COUNTY RTA			
3045 MOSER CRT			SEPTERMBER 2017
HAMILTON, OH 45011	1	29X102	93125-93125
MATTHEW DUTKEVICZ	2	29X102	93246-93247
513-785-5246			
HDMD HOUSTON			MAY 2012
909 FANNIN, STE 1650	7	29X102	92332-92340
HOUSTON, TX 77010			
BRYAN BROWN, SENIRO ASSOCIATE			
713-650-1470 BBROWN@THEGOODMANCORP.COM			

9/21/2021

CUSTOMER	<u># UNITS</u>	SIZE	SERIAL NUMBERS
INDIANA COUNTY TRANSIT AUTHORITY 1657 SALTSBURG AVE.	2	29X102	MARCH 2013 92284-92285
INDIANA, PA 15701 JOHN KANYAN, EXEC DIRECTOR 724-465-2140 X 106 JKANYAN@INDIGOBUS.COM	2	29X102	APRIL 92649-92650 SEPTEMBER 2015
724-405-2140 X 100 JKAN TAN@INDIGOBOS.COM	3	29X102	93007-93009
INTERURBAN TRANSIT PARTNERSHIP 300 ELLSWORTH SW	1	40X102	NOVEMBER 2016 188724
GRAND RAPIDS, MI 49503 STEVE SCHIPPER, Chief Operating Officer 616-774-1216	21	40X120	FEBRUARY 2017 188725-188745 May 17
email: sschipper@ridetherapid.org	1	40X120	May-17 188751-188751 JULY 2017
	5	40X120	188746-188750 Nov-18
	20	40X102	193249-193268 AUGUST 2020
	10	40X102	193920-193929 Pending AUGUST 2021
	15	40X102	195536-195550
JOHNSON CO. TRANSIT 1701 WEST 56 HWY OLATHE, KS 66061	3	29X102	AUGUST 2015 92977-92979
PETE HENSCHKE, OPERATIONS MANAGER 913-715-8348			
JACKSONVILLE TRANSPORTATION AUTHORITY 100 N. MYRTLE AVE. JACKSONVILLE, FL 32203	23	40X102	SEP - NOV 2015 188261-188283 OCT - DEC 2016
LISA DARNALL, VICE PRESIDENT TRANSIT OPERATIONS 904-630-3129 LDARNALL@JTAFLA.COM	23	40X102	188954-188976 OCT 2017
Jor oso orzy Ezrika (nez @srini Erikeo) ki	16	40X102	189537-189552 OCT - NOV 2018
	26	40X102	191946-191971 SEP - OCT 2019
	8	40X102	194002-194009
<u>K.C.A.T.A.</u> 1200 E. 18TH ST. KANSAS CITY, MO 64108	2	29X1023	FEB. 2013 92563-92564 SEP 2014
WALT WOODWARD, DIR. OF MAINT 816-346-0308	8	29X102	92768-92775 JUNE 2015
816-346-0308	5	40X102	186185-186189 JUNE-JULY 2015
	10	40X102	186190-186199 MARCH 2016
	2 2	40X102 40X102	186200-186201 186202-1862013
	10	40X102	MARCH 2017 189117-189126

<u># UNITS</u>	SIZE	SERIAL NUMBERS
10	40X120	JULY 2017 189127-189136
		JUNE 2011
	35X102	178944-178948 JANUARY 2013
2	35X102	180991-180992 AUGUST 2013
3	35X102	182798-182800 FEBRUARY 2015
6		183689-183694
C	403/102	FEB 2015
0	40X102	183689-183694 DEC 2015
6	40X102	186569-186574
		MARCH 2016
5	35X102	187733-187737 APRIL 2016
2	40X102	186494-186495
5	40X102	Nov-17 191095-191099
3	40X102	AUGUST 2019 194213-194215
5	10/1102	SEPT 2019
3	40X102	194216-194218 pending - JAN 2021
4	40X102	195797-195800
		OCT 2011, APR - AUG 2012
33	40X102	180901-180933 NOV DEC 2012
31	40X102	180934-180964
8	40X102	JAN - FEB 2015 186033-186040
1	29X102	JAN 2015 92866
53	29X102	APR. 2015 - JUN. 2015
		92867-92919
		JUNE 2015
9	40X102	185890-185898 MARCH 2017
2	40X120	189179-189180
1	40X102	OCTOBER 2017 184261-184261
	10 5 2 3 6 6 6 6 5 2 5 3 3 4 3 3 4 3 3 1 8 1 5 3 9 2	1040X120535X102235X102335X102640X102640X102535X102240X102540X102340X102340X102340X102340X102340X102340X102329X102529X102940X102240X102

CUSTOMER	<u># UNITS</u>	<u>SIZE</u>	SERIAL NUMBERS
LANTA (LEHIGH & NORTHHAMPTON)			JULY 2017
1060 LEHIGH ST.	6	35X102	188103-188108
ALLENTOWN, PA 18103	3	35X102	188721-188723
RANDY FLYTE, MATERIALS & MAINT. SUP. 610-435-5739	7	40X102	188714-188720
	5	35X102	APRIL 2018 190956-190960
	3	40X102	MAY 2018 190960-190963
	6	40X102	DECEMBER 2018 191907-191912
	4	35X102	JANUARY 2019 191903-191906
	5	40X102	AUGUST 2019 193910-193914
	5	35X102	SEPTEMBER 2019 193915-193919
	5	35X102	AUGUST 2020 195188-195192
	5	40X102	AUGUST 2020 195193-195197
	7	40x102	Pending 2022 197135-197141
	3	40x102	FEBRUARY 2021 195929-195931
CRAWFORD AREA TRANSPORTATION AUTHORITY 231 CHESTNUT ST. STE 210			
MEADVILLE, PA 16335	3	29X102	SEPTEMBER 2017
TIMOTHY GEIBEL, EXEC. DIRECTOR 814-336-5600	5	29/1102	93139-93141
MEDFORD, OR			
ROGUE VALLEY TRANSPORTATION DISTRICT			
3200 CRATER LAKE AVE	3	35x102	APRIL 2015
MEDFORD, OR 97504-9075			185628-185630
TIM D'ALESSANDRO, OPERATIONS MANAGER			
541-608-2436			MARCH 2017
	3	35X120	187752-187754
MERRIMACK VALLEY RTA 85 RAILROAD AVE.			
HAVERHILL, MA 01835 JOSEPH COSTANZO, ADMINISTRATOR			
978-469-1251	5	3	JAN 2014 183185-183189
<u>METRO - GREATER PORTLAND TRANSIT</u> 114 VALLEY ST			
PORTLAND, ME 04102			
JOHN JACQUES, DIRECTOR OF MAINTENANCE			
207-517-3038			JUNE 2011
	2	40X102	180296-180297
METRO RTA 416 KENMORE BLVD.	1	40X102	JULY 2011 176562
AKRON, OH 44301			DEC. 2011

CUSTOMER DEAN HARRIS, DIRECTOR OF FINANCE	<u># UNITS</u> 23	<u>SIZE</u> 40X102	SERIAL NUMBERS 180484-180506
330-762-7267 X 3140 DEAN.HARRIS@AKRONMETRO.ORG	10	40X102	OCT. 2012 181265-181274
	10	40X102	JULY 2013 181870-181879 AUG 2014
	6	40X102	183891-183896 JUNE 2015
	8	40X102	186145-186152 MARCH 2016
	8	35X102	188919-188926 MARCH - APRIL 2016
	3	40X102	184257-184259 JAN 2017
	8	40X102	188294-188301 JUNE 2018
	8	40X102	187107-187114
MONTGOMERY COUNTY	19	40X102	FEB - MAR 2014 183734-183752 APR - MAY 206
16630 CRABBS BRANCH WAY ROCKVILLE, MD 20855	16	40X102	188396-188411 AUG - OCT 2017
KATHLEEN HYNES, FLEET ASSETS MGR 240-777-5625	34	40X102	194065-194098 JAN - FEB 2018
	4	40X102	189993-189996 MAR 2019
	1	40X102	192594-192594 MAR - APR 2019
	22	40X102	192595-192616
			NOV. 2011
	3	35X102	180528-180530 JULY 2012
	1	35X102	180567 AUG 2014
MUSKEGON AREA TRANSIT SYSTEM	3	35X102	182405-182407
2624 SIXTH ST. MUSKEGON HEIGHTS, MI 49444 JAMES KOENS, TRANSIT SYSTEM MANAGER	1	40X102	MAY 2012 181556 JULY 2012
231-724-6420 KOENSJ@CO.MUSKEGON.MI.US	1	40X102	181903 AUG 2014
NATIONAL/ALAMO-LAX	5	40X102	183951-183955 DEC 2014
9020 AVIATION BLVD. INGLEWOOD, CA 90301	8	40X102	186383-186390 JULY 2016
HENRY SINGH, BUS OPERATIONS MGR 415-760-0075 HARJEET.SINGH@EHI.COM	3	40X102	187622-187624
			SEPTEMBER 2017

SEPTEMBER 2017

CUSTOMER	<u># UNITS</u> 4 4	<u>SIZE</u> 29X102 35X102	<u>SERIAL NUMBERS</u> 93258-93261 189986-189989
NASHUA, NH (TRANSIT MANAGEMENT OF NASHUA) 11 RIVERSIDE STREET NASHUA, NH 03063 RAY BLETHEN, GM 603-821-2032	1	40X102	AUGUST 2012 181525
NATIONAL SAN DIEGO 3280 N. HARBOR DR. SAN DIEGO, CA 92101 HENRY SINGH 415-760-0075 HARJEET.SINGH@EHI.COM	14 4	40X102 35X102	NOVEMBER 2012 182490-182503 MAY 2016 184883-184886
NORWALK, CITY OF 12700 NORWALK BLVD NORWALK, CA 90650 JAMES C. PARKER 562-929-5533	6	40X120	JUNE 2017 187012-187017
<u>OHIO STATE UNIV</u> 2578 KENNY RD COLUMBUS, OH 43210 TOM HOLMAN, TRANSP & TRAFFIC MGMT 614-292-9113	35	40X102	AUG - SEPT 2015 186976-187010
<u>ORLANDO, FL - LYNX</u> 445 W. AMELIA ST., STE 800	35	40x102	SEPT - OCT 2015 186976-187010
ORLANDO, FL 32801 ELVIS DOVALES, DIRECTOR OF MAINTENANCE	5	40x102	OCTOBER 2020 189560-189564
407-254-6239 EMAIL: edovales@golynx.com	1	40X102	FEBRUARY 2019 190424
	7	40x102	NOVEMBER 2020 189578-189584
	8	40x102	NOVEMBER 2020 189570-189577
	5	40x102	OCTOBER 2020 189565- 189569
	4	40x102	JAN 2021 195783-195786
	2	40x102	FEBRUARY 2021 195790-195791
	3	40x102	FEBRUARY 2021 195787-195789
	25	40x102	Pending April 2022 197192-197216

CUSTOMER	<u># UNITS</u>	<u>SIZE</u>	SERIAL NUMBERS
OXNARD, CA - GOLD COAST TRANSIT 301 E. THIRD STREET OXNARD, CA 93030 ROBERT LURIE, DIRECTOR FLEET & FACILITIES	5	40X102	OCTOBER 2016 184119-184123
	1	40X102	JUNE 2015 186216
805-487-5336, EXT. 134 EMAIL: rlurie@goldcoasttransit.org	7	40X102	AUGUST 2015 186217 - 186223
	1	40X102	Aug-19 192968
	3	40X102	Aug-19 192970-192972
	1	40X102	Aug-19 Apr-28
	3	40X102	Apr-21 195328-195330
	9	40X102	PENDING 3-22 197126-197134
<u>PHOENIX, AZ (CITY OF)</u> 302 N 1ST STREET, SUITE 900	1	40X102	Aug-15 187137
PHOENIX, AZ 85003 JESUS SAPIEN, PUBLIC TRANSIT DIRECTOR	79	40X102	MARCH APRIL 2016 187138-187216
602-261-8997 EMAIL: jesus.sapien@phoenix.gov	40	40X120	FEB-MARCH 2017 188181-188220
	34	40X102	APRIL 2018 190861-190894
<u>PIERCE TRANSIT - LAKEWOOD, WA</u>	10	40X102	AUGUST 2016 188284-188293
3701 96th STREET S.W. LAKEWOOD, WA 98499-0070	10	40X102	MARCH 2015 186041-186050
ADAM DAVIS, FLEET MANAGER 253-983-3319	7	40X120	MARCH 2017 187881-187887
EMAIL: addavis@piercetransit.org	23	40X102	NOVEMBER 2018 191987-192009
	20	40X102	FEBRUARY 2019 192231-192250
	27	40X102	FEBRUARY 2021 196219-196245
PLACER COUNTY TRANSIT			
3091 COUNTY CENTER DRIVE, SUITE 220 AUBURN, CA 95603	3	35X102	MAY 2017 187270-187272
WILL GARNER, DEPUTY DIRECTOR, PUBLIC WORKS 530-745-7582	1	35X102	OCT 2015 187645
EMAIL: wgarner@placer.ca.gov	5	35X102	DECEMBER 2015 187646-187650
	2	40X102	PENDING FEB 2022 194400-194401
PLACER COUNTY - TAHOE AREA REGIONAL TRANSIT	2	40X102	DEC 2015

<u>CUSTOMER</u> AUBURN, CA	<u># UNITS</u>	<u>SIZE</u>	SERIAL NUMBERS 187651-187552
WILL GARNER, DEPUTY DIRECTOR, PUBLIC WORKS 530-745-7582	2	40X102	MAY 2017 187273 - 187274
EMAIL: wgarner@placer.ca.gov	3	40X102	NOV 2019 194161-194163
	1	40X102	NOV 2019 194164
	1	40X102	NOV 2020 195672
PORT OF SEATTLE			
PO BOX 68727			AUG - SEP 2018
SEATTLE, WA 68727	17	40X102	192857-192873
PETER LINDSAY, AVIATION DEVELOPMENT MGR			JULY - AUG 2019
206-787-4002 LINDSAY.P@PORTSEATTLE.ORG	19	40X102	193494-193512
			AUG 2019
RALEIGH, NC	4	29X102	93614-93617
4101 POOLE ROAD			
RALEIGH, NC 27610			
MICHAEL GORMAN, DIRECTOR OF MAINTENANCE	-	1077100	OCT. 2012
919-996-3898 MICHAEL.GORMAN@RALEIGHNC.GOV	5	40X102	181275-181279
	5	35X102	181280-181284
	19	403/102	APRIL 2015
	19	40X102	186575-186593 MAY 2015
DECIONAL TRANSPORTATION ALITHORITY	10	35X102	186594-186603
<u>REGIONAL TRANSPORTATIOIN AUTHORITY</u> 5658 BEAR LN	10	33A102	APRIL 2017
CORPUS CHRISTI, TX 78405	11	35X120	186604-186614
JOSE TOVAR, MAINTENANCE MGR	11	55 <b>X</b> 120	100004-100014
361-903-3550 JTOVAR@CCRTA.ORG			
sor you been the time geometric	1	35X102	NOVEMBER 2012
			181815
	1	35X102	FEB 2018
			188897

CUSTOMER RIPON, CITY OF	<u># UNITS</u>	<u>SIZE</u>	SERIAL NUMBERS AUGUST 2012
259 N. WILMA AVENUE RIPON, CA 95366	1	40X102	180872 NOVEMBER 2016
KEVIN M. WERNER, CITY ENGINEER 209-599-2108 KWERNER@CITYOFRIPON.ORG	2	35X102	187264 JULY 2017
	2	35X120	189420-189421
<u>RIVER VALLEY TRANSIT</u> 1500 WEST THIRD ST.	2	40X120	189424-189425
WILLIAMSPORT, PA, 17701 JOHN KIEHL, JR., ASSISTANT GENERAL MANAGER	80	40X102	JAN 2014 182902-182981
570-326-2500 JKIEHL@CITYBUS.ORG	16		FEB 2014 182885-182900
RIVERSIDE TRANSIT AGENCY			DEC 2013
1825 THIRD ST RIVERSIDE, CA 92507	1	4X102	182885 AUGUST 2013
ROBERT FERNANDEZ, DIRECTOR OF MAINTENANCE 951-565-5032	1	40x102	182901 SEP 2013 - JAN 2014
RFERNANDEZ@RIVERSIDETRANSIT.COM	80	40x102	182902-182981 DEC 2014
	2	40x102	184975 & 184976 DEC 2014
	9	40x102	184977 & 184985 JAN - FEB 2014
	15	40x102	182886-182900 FEB - MAR 2016
	13	40X102	184898-184910 MARCH 2016
	1	40x102	184911 OCT - DEC 2016
	16	40x102	186852-186867 DEC 2016 - JAN 2017
	6	40x102	186868-186873 JAN 2017
	1	40x102	186851
ROARING FORK TRANSPORTATION AUTHORITY	4	40X102	JAN. 2013
51 SERVICE CENTER DRIVE ASPEN, CO 81611 KENNIX OSTER, DIRECTOR OF MADITENANCE	18	40X102	181416-181419 JUNE 2013
KENNY OSIER, DIRECTOR OF MAINTENANCE 970-384-4965 kosier@rfta.com	2	40X102	181420-181437 FEB 2018 190578-190579
ROCK REGION METRO	15	253/102	MAY - JULY 2015
901 MAPLE STREET NORTH LITTLE ROCK, AR 72114	15	35X102	186018-186032 SEP 2017
TIM BISBEE, DIR. OF MAINTENANCE	3	35X102	189870-189872
501-375-6717 TBISBEE@RRMETRO.ORG	4	40X102	189873-189876 JULY 2018

<b><u>CUSTOMER</u></b>	<u># UNITS</u>	SIZE	SERIAL NUMBERS
	1	40X102	187891
SACRAMENTO RTD			
1323 28TH ST			JULY - NOV 2013
SACRAMENTO, CA 95812	26	40X102	183201-183226
DAVID HARBOUR, DIR. BUS MAINTENANCE			DECEMBER 2013
916-321-2839 DHARBOUR@SACRT.COM	24	40X102	183227-183250
			SEP - DEC 2014
	12	40X102	184001-184012
			JAN 2015
	30	40X102	184915-184944
			FEB 2016
	66	40X102	186501-186566
			JULY 2016
	33	40X102	186534

CUSTOMER	<u># UNITS</u>	SIZE	SERIAL NUMBERS
SAN DIEGO METROPOLITAN TRANSIT SYSTEM 100 16TH ST. SAN DIEGO, CA 92101	24	40X102	JAN 2015 183227-184050 AUG - SEPT
JULIO ORTIZ, DIR. OF MAINTENANCE 619-238-0100 X 6500	23	40X102	185968-185990 NOVEMBER 2014
	38	40X102	184013-184050
	11	40X102	JULY - AUG 2015 185367-185377
	27	40X102	NOVEMBER 2015 185991-186017 MAY 2016
	10	40X102	187366-1873675 AUGUST 2017
	10	40X102	189487-189496
	36	40X102	189497-189532
CITY OF SANTA CLARITA 28250 CONSTELLATION ROAD	10	40X102	MARCH 2013
SANTA CLARITA, CA 91355 ADRIAN AGUILAR, TRANSIT MANAGER 661-295-6305 AAGUILAR@SANTA-CLARITA.COM	11	40x102	181764-181773 FEB 2014 183190-183200
CITY OF SANTA MONICA - BIG BLUE BUS			
1660 7TH STREET SANTA MONICA, CA 90401	20	40X102	DECEMBER 2012 182218-182237
GETTY MODICA, MAINTENANCE SUPT. 310-458-1975 EXT 5009	25	40X102	AUGUST 2013 182238-182262
getty.modica@smgov.net	13	40X102	FEB 2014 182263-182275
	25	40X102	MARCH 2017 188236-188260
	4	29X102	JANUARY 2016 93097-93100
	13	40X102	JANUARY 2014 182263-182275
	11	40X102	SEPTEMBER 2015 185367-185377
	19	40X102	SEPTEMBER 2018 191035-191053
<u>SANTA FE TRAILS</u> 2931 RUFINA ST.	1	29X102	MAY 2012 92266
SANTA FE, NM 87507 JON BULTHUIS, DIRECTOR	5	35X102	SEP 2014 184289-184293
505-955-2006 JRBULTHUIS@CI.SANTA-FE.NM.US	7	35X102	OCTOBER 2015

184556-184562

CUSTOMER	<u># UNITS</u>	<u>SIZE</u>	SERIAL NUMBERS
SARASOTA CO. TRANSPORTATION AUTHORITY 5303 PINKNEY AVE. SARASOTA, FL 34232 ROCKY BURKE, GM 941-202-4124	10	35X102	MAY 2016 187073-187082
<u>SARTA</u> 1600 GATEWAY BLVD., SE	6	35X102	FEBRUARY 2012
CANTON, OH 44707 MARK FINNICUM, COO	3	35X102	179962-179967 JUNE 2012
330-477-2782 EXT 524	4	40 X 102	181073-181075 AUG 2014 183897-183900
	1	40X102	NOVEMBER 2015 187319
	4	40 X 102	Sep-16 187320-187323
	1	30X102	Apr-19 93502
SCOTTSDALE, AZ (CITY OF SCOTTSDALE) 7447 E. INDIAN SCHOOL ROAD MESA, AZ 85203 PERDO RODRIGUEZ 480-312-7626	4	35X102	AUGUST 2017 188893-188896
<u>SOUND TRANIST</u> 401 S. JACKSON ST. SEATTLE, WA 98104	25	40X102	MAY - JUNE 2014 188526-185549
MICHAEL PERRY 206-398-5388	5	35X102	JANUARY 2015 184754-184758
SUN TRAN	16	40X102	JULY - AUG 2015 187041-187056
3920 N. SUN TRAN BLVD. TUCSON, AZ 85705	1	40X102	MAY 2018 192010
KEVIN FAULKNER, PROJECT MGR 520-206-8805	22	40X102	JULY 2018 192011-192032
	3	29X102	MAY 2015 92957-92959
<u>STAR METRO</u> 400 DUPREE ST.	1	40x102	AUGUST 2015
TALLAHASSEE, FL 32304 RALPH WILDER, SUPER OF TRANSIT MAINT.	1	40X102	185865 AUGUST - SEPTEMBER 2015

850-891-5217	<u>CUSTOMER</u>	<u># UNITS</u>	<u>SIZE</u>	SERIAL NUMBERS 185866-185881
SOUND TRANIST				JUNE 2016
401 S. JACKSON ST.		1	40X102	187692
SEATTLE, WA 98104				JULY - AUG 2016
MICHAEL PERRY		6	40X102	187693-187698

CUSTOMER	<u># UNITS</u>	<u>SIZE</u>	SERIAL NUMBERS
206-398-5388	32	40X102	NOV 2017 - JAN 2018 189787-189818
CENTRAL NEW YORK RTA 200 CORTLAND AVE.	12	40X102	JUNE 2019 - JULY 2019 193093-193104
SYRACUSE, NY 13205-0820 E.J. MOSES, GRANT ADMINSTRATOR 315-442-3368	2	40X102	AUG 2019 192541-192542
	2	29X102	DEC 2014 92797-92798
<u>CITY OF THOUSAND OAKS</u> 1993 RANCHO CONEJO BLVD	22	40X102	FEBRUARY 2015
THOUSAND OAKS, CA 91320 MIKE HOUSER, TRANSIT MANAGER 805-376-5063	13	40X102	185631-185652 JULY 2016 188835-188847
TAMPA, FL - HILLBOROUGH TRANSIT AUTHORITY 4305 E. 21ST. AVE.	<u> </u>	40X120	JULY 2017 189137-189151 October 2017
TAMPA, FL 33605 JAMES FETZER, DIR. OF MAINTENANCE	10	40X1102	190100-190109
813-623-5835 X 196	4	35X102	AUG - SEPT 2015 183908-183911
<u>CITY OF TULARE, CA</u>			
411 EAST KERN AVE TULARE, CA 93274 DARLENE THOMPSON, FINANCE DIRECTOR	11	35X102	AUGUST 2011 179925-179935 AUGUST 2011
559-684-4255	4	40X102	179939-179942 FEB. 2013
<u>TULSA TRANSIT</u> 510 SO. ROCKFORD	5	35X102	181907-181912 OCTOBER 2013
TULSA, OK 74152	1	40X102	182078
BILL CARTWRIGHT, GENERAL MANAGER 918-560-5603 BCARTWRIGHT@TULSATRANSIT.ORG	CORG 3	35X102 35X102	182079 OCTOBER 2013 182002 182005
	2	40X102	183093-183095 JANUARY 2016 185585-185586
	8	35X120	JANYARY 2017 188848-188855
			OCT. 2012
	6	35X102	180531-180536
<u>UNION CITY TRANSIT</u> 34650 7TH ST.	1	35X102	October 2012 180531
UNION CITY, CA 94587 STEVE ADAMS, TRANSIT MANAGER	5	35x102	DECEMBER 2012 180532-180336

CUSTOMER 510-675-5446 sadams@unioncity.org	<u># UNITS</u> 4	<u>SIZE</u> 35X102	<u>SERIAL NUMBERS</u> APRIL 2016 184965-184968
<u>UNIVERSITY OF OKLAHOMA, OK</u> 510 E. CHESAPEAKE NORMAN, OK 73019 SUSAN COLDWATER, CART MANAGER OF OPERATIONS	2	35X102	JULY 2016 184249 & 184250
405-325-3153 Email: s_coldwater@ou.edu	2	35X102	JUNE 2019 193155 & 193156
<u>UNION CITY, CA, CITY OF</u> 34009 ALVARADO NILES ROAD UNION CITY, CA 94587 ROBERT SAUNDERS, GENERAL MANAGER 510-453-6043	10	40X102	JULY 2013 182345-182354
	23	40X102	JULY-AUG 2015 186360-186382
<u>UTAH TRANSIT AUTHORITY</u> 3600 SOUTH 700 WEST SALT LAKE CITY, UT 84119	8	40X102	JULY 2016 188827-188834 AUGUST 2017
KURT BURNINGHAM, FLEET ENGINEER 801-287-3040	12 40	40X102 40X102	190656-190667 MAY 2018 192809- 192848
<u>VALLEY METRO - PHOENIX</u> 3320 N. GREENFIELD RD.	8	40x102	AUGUST 2016 188827-188834
MESA, AZ 85215 LARRY JOYNER, FLEET & FACILITY SUPERVISOR	1	40X102	MAY 2016 188826
480-990-5450 ljoyner@valleymetro.org	12	40X102	SEPTEMBER 2017 190656-190667
	40	40X102	MARCH-APRIL 2018 190809-190848
	12	29X102	FEBRUARY 2021 94006-94017
	5	29X102	PENDING JUNE 2021 94100-94104
VALLEY REGIONAL TRANSIT			
830 NORTH MAIN ST., STE 230 MERIDIAN, ID 83642 BRUCE SACKRON, TRANSPORTATION DIRECTOR 208-258-2726 bsaackron@valleyregionaltransit.org	3 8	40x102 35x102	March 2012 180351-180353 March 2012
	2	40X102	180355-180362 DECEMBER 2013
	4	35x102	183484-183485 DECEMBER 2013
	1	40x102	183486-183489 JULY 2015

CUSTOMER	<u># UNITS</u>	<u>SIZE</u>	SERIAL NUMBERS 183904
	3	34X102	JULY 2015 183905-183907
3	3	35X102	SEPTEMBER 2016 186270-186272
	_		AUGUST 2011
	3	40X102	180351-180353
VALLEY REGIONAL TRANSIT	8	35X102	180355-180362
4788 S. ORCHARD	4	253/102	DECEMBER 2013
BOISE, ID 83705	4	35X102	183486-183489
BRUCE SACKRON, TRANSPORTATION SERV MGR	2	40X102	183484 & 183485
208-846-8547 X 4226 BSACKRON@VALLEYRIDE.ORG	1	403/102	JULY 2015
	1	40X102	183904-183907
	2	253/102	JULY 2016 186270-186272
	3	35X102	1862/0-1862/2
	3	35X102	MAY 2013
	5	5571102	181371-18373
	4	40X102	MAY 2013
		1011102	183073-183076
	5	40X102	AUGUST 2016
	5	1011102	187632-187636
VISALIA, CITY OF			
525 N. CAIN ST.			MAY 2015
VISALIA, CA 93291	2	35X102	184949-184950
MONTY COX, TRANSIT MGR	-	0011102	JAN. 2016
559-713-4100	4	35X102	184945-184948
			MAY - JUNE 2018
	2	35X102	191537-191538
WILMINGTON TRANSIT AUTHORITY			JUNE - SEP 2019
505 CANDO STREET	7	35X102	193001-193007
WILMINGTON, NC 28405			
ALBERT EBY, DIRECTOR			
910-202-2035 AEBY@WAVETRANSIT.COM			JUNE 2017
	1	35X120	186874-186874
	7	29X120	93111-93117



2. A copy of the three (3) most recent financial statements audited by an independent third party or a statement from the Proposer regarding how financial information may be reviewed by the Agency.

### **FINANCIAL GUARANTEE**

GILLIG has provided our **FINANCIAL RESPONSIBILITY** overview and **FINANCIAL REFERENCE LIST** for your information.

GILLIG confirms we have the financial resources to bid, manufacture, and deliver on schedule, the vehicles proposed for this procurement.

The proposal <u>excludes</u> the requirement for a Performance Bond to be provided by the successful bidder. However, GILLIG submits a reference letter from our surety showing our ability to obtain financial guarantees due to our financial ability.

GILLIG confirms we can supply the "Confidential" financial reports on request. Please contact:

WILLIAM F. FAY, JR., VICE PRESIDENT, SALES PHONE: 800-735-1500 EMAIL: sales@gillig.com



### FINANCIAL RESPONSIBILITY

**GILLIG's financial strength and stability is renowned** in our industry, and is openly acknowledged by our competitors, our suppliers, and business experts.

#### **CUSTOMER BENEFITS:**

GILLIG's financial strength is obviously good for Gillig but it is even better for our customers because they benefit from our strength and stability. Our customers know they can count on us, through thick and thin, to support them; to be there for them, to always deliver the best quality and value, because they know we will still be in business and we have the resources to do what is needed. **We do not need to compromise or cut corners** to save a dollar because the strength of our balance sheet allows us to make the best decision for our customers. Customers also appreciate and enjoy the confidence and security our financial strengths and stability bring.

#### **INDUSTRY FAILURES:**

The last 20 years have been devastating for North American bus manufacturers, except GILLIG. **Every other bus manufacturer has failed, closed down, been sold off or forced to** "**refinance**" **in that period, some 3 or 4 times, yet GILLIG has remained intact.** <u>Gone are</u> Orion, MAN, Volvo, Scania, Flxible, GM Truck & Bus, S&S, TMC, Neoplan, etc., and <u>forced sales, closures or refinancing has happened</u> to NABI (Crown Ikarus, Ikarus USA, American Ikarus, First Hungarian Fund, Cerberus Capt. M'ment.), New Flyer (Western Flyer, Manitoba Dev. Corp., Den Ousten, KPS, Harvest Partners), Bluebird (Luce Bros., MBO, Volvo/Henlys, bankruptcy and restructuring.) Except for GILLIG, <u>**the average life** of a bus manufacturer in North America has only been about **4 to 5 years**, yet **you** are still expected to keep those buses running for 12 to 15 years!</u>

Most of GILLIG's current competitors have been taken over in the last few years and are now owned or controlled by investment companies, and their current CEO's have only 4 or 5 years of industry experience. Whereas GILLIG is still privately held and family owned (3<sup>rd</sup> generation Chicago family) — and has had two (2) CEO's over 42 years - partially explaining our long-term focus, our consistency, our industry commitment, our depth of experience and our ability to know what our transit customers need.



#### **IMPORTANCE OF FINANCIAL STRENGTH:**

The dismal performance of other bus manufacturers, contrasted against the stunning performance of GILLIG, proves our financial responsibility and should be one of the most compelling reasons to select GILLIG — <u>you need a partner with a solid track record</u>, <u>because you'll need their support for the next 15 years</u>.

GILLIG is profitable and has been for the last 30 years. We have no external long-term debt, and sufficient assets to run our business. Our payment history is clean, just ask our suppliers "which bus OEM pays them the best" (see our vendor references). We virtually have no bonding limit and an untarnished record with our surety (see letter attached). We do not need progress payments and have more than enough cash to run our operations and successfully complete your contract.

#### LONG TERM VIABILITY IS CRITICAL:

When buying a 15 year product, it is always important to consider the long-term viability of the manufacturer. However, in these uncertain times, it is critical that the financial viability of the bidders is evaluated properly and weighted appropriately in the final decision. All the promised product features or quick deliveries, all the contractual terms and liquidated damages, all the warranty agreements or low prices **are worth very little if the company goes bankrupt**, is liquidated or forced to sell off; and as indicated above, that happens too often in our industry (about 1/year). **Bonding ability is a good gauge of financial strength and past performance**. A bidder that has trouble bonding, or has poor financials, should be considered too risky and disqualified as not responsible (or at least severely penalized in their financial evaluation).

#### SATISFACTION AND FINANCIAL STRENGTH:

Long term customer satisfaction is directly linked to the seller's financial strength and performance. A company in financial trouble cannot afford the time and resources to do things properly; its managers are always looking for corners to cut and its good employees are always looking elsewhere for better jobs, leaving below-average employees to build below-average products that achieve below-average customer satisfaction. Whereas a financially strong company can weather the storms, can keep the best people and can afford the little extras to guarantee customer satisfaction. Strong companies can focus on products and customers --- weak companies have to focus on cutting corners and paying banks interest.

### SATISFACTION GUARANTEE:

GILLIG's financial responsibility, our financial stability, performance and strength are your best guarantee of long-term customer satisfaction and support.



# QUALIFICATIONS

GILLIG's fiscal responsibility is unmatched in the industry: no external debt, no claims against us and an on time payment record to our suppliers that is unequaled. Our proven financial strength represents an enormous advantage to our customers, our suppliers, our owners and our employees. Below is a list of several of the industries' major suppliers along with our Bonding and Bank references that can attest to GILLIG's payment history, reliability and consistency. We encourage you to call any of these references and ask if we are creditworthy, if we make our payments on time, if we give our suppliers proper lead time, if we refrain from making last minute changes in the specifications and if we keep our delivery requests consistent.

#### **BONDING REFERENCES**

Lockton Companies Gregory Morin, Senior Vice President Phone: (816) 960-9875 lockton.com

#### **SUPPLIER REFERENCES**

American Seating Company David McLaughlin VP and General Sales Manager Phone: (616) 732-6671 Email: dave.mclaughlin@amseco.com

Arvin Meritor John Wolf Manager, Sales Phone: (248) 435-1519 Email: john.wolf@meritor.com

Cummins Engine Company Michelle Curry OEM Account Manager - Bus Phone: (812) 377-3747 Email: michelle.curry@cummins.com

Freedman Seating Company Dan Cohen, VP Sales/Marketing Phone: (800) 443-4540 Email: danc@freedmanseat.com

R.C.A. Rubber Company Don Bullock, VP Sales Phone: (330) 784-1291 Email: bullockd@rcarubber.com

#### **BANKING REFERENCES**

Union Bank Julie McAfee, Account Manager Phone: (925) 947-2489 email: julie.mcafee@unionbank.com

Thermo King Corporation Dennis Hubbard Regional Sales Manager Phone: (719) 836-7076 Email: dennis hubbard@irco.com

Lift-U (Division of Hogan Mfg Inc) John Fusco President Phone: (209) 552-8638 Email: johnfusco@hoganmfg.com

Luminator Dan Kelleher VP, Sales & Marketing Phone: (972) 516-3073 Email: dkelleher@luminatorusa.com

Voith Transmissions Inc. Robert Wiss, VP Road Products Phone: (717) 767-3224 Email: robert.wiss@voith.com

Altro Transflor Dan Lee, Manager – The Americas Phone: (562) 944-8292 x3500 Email: dlee@altrofloors.com



March 4, 2021

Re: Gillig LLC

To Whom It May Concern:

It is our pleasure to provide you with this reference letter outlining the current surety program for Gillig LLC.

The surety for Gillig LLC is Liberty Mutual Insurance Company which is listed in the Federal Register Circular 570, rated "A" by the Best Guide. Gillig LLC has been a valued client of Liberty Mutual Insurance Company for more than forty years. The company is highly regarded in the bus manufacturing industry for its experienced personnel, excellent workmanship, and ability to complete contracts on schedule and within budget.

Liberty Mutual Insurance Company looks favorably on supporting single projects for Gillig LLC in the \$50,000,000.00 range, with an aggregate program of \$200,000,000.00. We would look favorably on supporting bonds at the request of our client; however, our support is conditioned upon completion of the underwriting process, including satisfactory review of contract documents, confirmation of financing and our ongoing review of the operational and financial capacity of Gillig LLC.

Please understand, this letter is not to be construed as an agreement to provide bonds for any particular project, but it is offered as an indication of our past experience and confidence in Gillig LLC. Any arrangement to provide final bonds is a matter between Liberty Mutual Insurance Company and Gillig LLC, and we assume no liability to third parties if we do not execute said bonds.

We highly recommend Gillig LLC to you. They are well managed, financed, and truly capable of meeting your requirements. If you have any questions in regards to this letter do not hesitate to call.

Yours truly,

KANSAS CITY SERIES OF LOCKTON COMPANIES, LLC

Keberrad Jeal

Rebecca S. Leal Assistant Vice President / Senior Surety Specialist Surety Operations