Jefferson Parish
State of Louisiana

GILLIG HEAVY DUTY TRANSIT BUS
40' LOW FLOOR DIESEL **BRT PLUS**

**** The BRT Plus body styling shown above is for illustration purposes only.***
This styling is NOT included in the base price of the bus.
This styling is available as part of GILLIG's option pricing.

JEFFERSON PARISH, LOUISIANA
INVITATION TO BID
BID NO.: 50-00145018 - JUNE 4, 2024

GILLIG

GILLIG

May 28, 2024

Donna Evans
Jefferson Parish Purchasing Department
200 Derbigny Street
General Government Building, Suite 4400
Gretna, LA 70053

RE: **IFB NO.: 50-00145018, FIVE (5) YEAR CONTRACT TO PROVIDE AND DELIVER ONE (1) – TEN (10) HEAVY DUTY TRANSIT BUSES**

DATE DUE: **Tuesday, June 4, 2024 @ 2:00 P.M. CDT**

Dear Donna Evans,

GILLIG, LLC is pleased to submit the enclosed documentation covering our proposal response to the above solicitation for your review and consideration.

GILLIG agrees to be bound by the submitted bid without modifications, unless mutually agreed upon further negotiations between Jefferson Parish and the bidder.

This bid is valid for not less than ninety (90) calendar days from the bid due date.

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

Very truly yours,

William F. Fay, Jr.,
Vice President, Sales
GILLIG, LLC
Phone: (800) 735-1500
Facsimile: (510) 785-6819
Email: sales@gillig.com

Cc: Javier Hernandez, Jr., Director National Sales
Holly Piper, Director Sales Operations
Randy Brewer, Regional Sales Manager

GILLIG

May 28, 2024

Donna Evans
Jefferson Parish Purchasing Department
200 Derbigny Street
General Government Building, Suite 4400
Gretna, LA 70053

RE: **IFB NO.: 50-00145018, FIVE (5) YEAR CONTRACT TO PROVIDE AND DELIVER ONE (1) – TEN (10) HEAVY DUTY TRANSIT BUSES**

DATE DUE: **Tuesday, June 4, 2024 @ 2:00 P.M. CDT**

Dear Donna Evans,

GILLIG, LLC is pleased to submit the enclosed documentation covering our Proprietary/Confidential Information Package Requirements to the above solicitation for your review and consideration.

We believe that Jefferson Parish shall employ sound business practices to protect the confidentiality of all intellectual property, licensed technology, software, documentation, drawings, schematics, manuals, data, and other information and material provided by GILLIG pursuant to the contract that contain confidential commercial or financial information, trade secrets, or propriety information as defined in or pursuant to the Federal, State, and Local laws against disclosure of such information and material to third parties.

Due to the nature of bid submittal requirements, we have included "Proprietary/Confidential" information directly in the requested bid location, rather than separately sealed or marked.

Items that GILLIG considers "Proprietary/Confidential" may include, but are not limited to, the following:

-GILLIG systematic processes such as Quality Manual & Inspection Record.
-Engineering drawings, schematics, & layouts.
-Corrosion protection package.
-Sales Bid Documents (Cut Sheets).

GILLIG requires and reserves the right to review any information prior to its disclosure, as "Proprietary/Confidential" information is included throughout our proposal.

GILLIG

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

Very truly yours,

William F. Fay, Jr.,
Vice President, Sales
GILLIG, LLC
Phone: (800) 735-1500
Facsimile: (510) 785-6819
Email: sales@gillig.com

Cc: Javier Hernandez, Jr., Director National Sales
Holly Piper, Director Sales Operations
Randy Brewer, Regional Sales Manager

GILLIG

TABLE OF CONTENTS

GILLIG

TABLE OF CONTENTS

GILLIG

AMERICANBUILT

PRODUCT BROCHURE

Contents

About GILLIG

GILLIG is the leading heavy-duty transit bus manufacturer in the United States. We build the highest quality, safest, and most durable transit buses in industry. Because our products last as expected, they are the most cost-effective to own, operate and maintain. We're focused on delivering transformative transit solutions that provide lasting value, while planning for the technologies of tomorrow.

Our buses are powered by environmentally friendly propulsion systems, including zero-emission battery electric, diesel-electric hybrid, near-zero emission compressed natural gas, and clean-diesel built on our industry-proven Low Floor Platform. With 29-foot, 35-foot, and 40-foot configurations, a variety of styling alternatives, and a robust option portfolio, GILLIG buses can be configured to meet the needs of any fleet.

From initial design through final assembly, each and every GILLIG bus is designed and built by our dedicated and passionate team in Livermore, California. From here we operate one of the most modern high-volume manufacturing operations in the industry. Decades of innovative products have rolled off our assembly lines – products that are made to last and 100% American built.

We rigorously test our products to ensure we only deliver proven designs. But our commitment to excellence doesn't stop there. Because all buses will need product support sometime during their service life, we provide comprehensive aftermarket support, including parts, training, and warranty assistance. Our Customer Care organization is staffed with experienced and responsive professionals dedicated to keeping your buses on the road.

The more than 27,000 GILLIG buses in service throughout the U.S. today are a testament to the engineering prowess and manufacturing excellence that goes into our buses. GILLIG's reliability is unmatched. We welcome the opportunity to tell you more about why our buses are the best choice for all your transit needs.

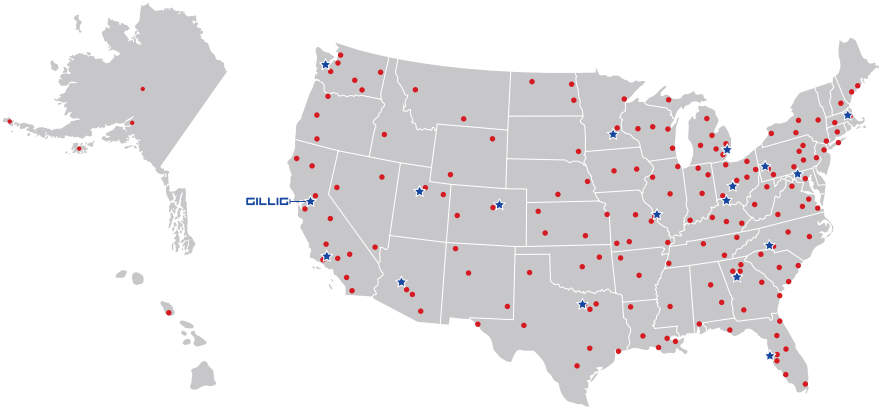
BATTERY ELECTRIC

Built On Experience
Engineered For Performance

The Standard in Zero-Emission Excellence

Cummins Powertrain +

- High-efficiency motor provides **smooth, quiet, and powerful performance**
- Powertrain is backed by **unmatched service and support network**
- Direct drive permanent magnet motor requires **no reoccurring maintenance**
- Motor and inverter proven through **millions of global in-service miles**



GILLIG Field Service Technicians

Cummins service locations

Energy Storage System +

- GILLIG's next-generation energy storage system provides a **32% increase** in on-board energy capacity
- Energy-dense cells from a global technology leader provide **longer range**
- **Maximum fleet flexibility** afforded through modular energy storage design

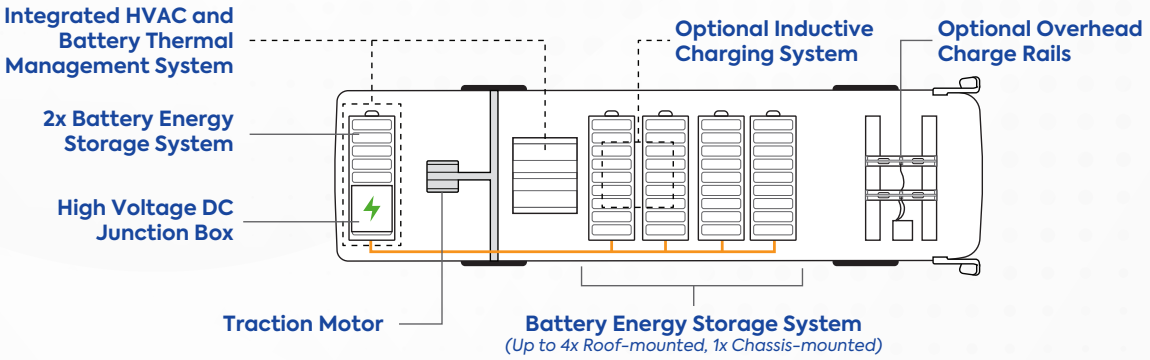
Proven Platform +

- Commonality with existing GILLIG buses affords greater **operator and technician familiarity**
- Standard electronic stability control and engineered weight balancing provide **superior ride quality and handling**
- **Best-in-class** braking performance

Highly Efficient Accessories +

- ThermoKing electric HVAC with integrated thermal management system ensures **passenger comfort** without sacrificing range
- Power management controls provide **optimal performance** and long battery life
- Optional cold weather package for **increased performance in extreme environments**

GILLIG Battery Electric Bus Components



Charging

- GILLIG's experts can provide **full turnkey infrastructure support**, including consulting, project management, and streamlined equipment procurement to support your transition to electric buses
- We offer broad access to state-of-the-art charging technology and expedited lead times from the leading U.S. manufacturers for **plug-in, overhead conductive, and inductive charging solutions**
- Our rigorous testing of non-proprietary chargers assures compatibility and performance, while providing **maximum flexibility to operators**

Bus Length	35'	40'
Battery Capacity	490 kWh, 588 kWh, 686 kWh	
Motor	Cummins Direct Drive, Permanent Magnet Motor	
Passenger Capacity (Seated / Total)*	31 / 62	38 / 75
Gross Vehicle Weight Rating	48,200 lbs.	48,200 lbs.
Maximum Height	135"	135"

** subject to seating configurations and option selections*

DIESEL

Powerful, Durable, And Reliable

Environmentally Friendly Fleet Workhorse

GILLIG Diesel buses have set the standard for reliability for decades and are the **workhorse of America's transit systems** with higher mean distance between failures and quicker repair times. GILLIG Diesel buses provide consistently high uptimes. The latest Cummins engine provides cleaner operations through lower NOx and particulate matter emissions.

A powerful addition to any fleet, GILLIG Clean Diesel buses are available in 29', 35', and 40' lengths with optional BRT, BRTPLUS, Low Floor Plus, and Trolley styling.

Clean-Diesel Performance

- Advancements in Cummins engine and emissions technology have made the L9 engine the **cleanest diesel engine on the market**
- Cummins 2021 EPA engine provides **2-4% fuel efficiency improvement** over prior engines*
- Engine maintenance intervals have been extended by up to 50%* **greatly reducing cost of ownership**

**Results may vary depending on application*

Designed For Your Fleet

- Built for **Reliability, Durability and Cost-Effective Ownership**
- **Robust option portfolio** provides flexibility to customize for your fleet requirements
- Large service accesses, easily sourced components and limited custom tools ensure **simple and cost-effective maintenance**

CNG

A Natural Choice

A Near-Zero Emission Alternative

The GILLIG CNG bus is a combination of the latest CNG technology and GILLIG's well-known reliability, safety, and efficiency. The proven design of our CNG bus recorded the **highest reliability and the best fuel economy** of any CNG bus tested at the Altoona Bus Research and Testing Center.

A natural addition to any fleet, GILLIG CNG buses are available in 29', 35', and 40' lengths with optional BRT, BRTPLUS, Low Floor Plus, and Trolley styling.

Engineered Better

- Suspension and weight balancing designed to provide **optimal ride quality, high-speed and low-speed maneuverability**
- Advanced composite fuel storage cylinders are **70% lighter** than steel, improving range, capacity and vehicle dynamics
- Integrated fuel management panel incorporates critical features including pressure regulation, fuel filtration and filling connections into a **single, reliable, serviceable package**

Decreased Carbon Footprint

- Cummins L9N Engine reduces smog forming NOx emissions by 90% vs. EPA NOx Standard for **near zero-emission operation**
- Abundant domestic availability of natural gas helps reduce reliance on internationally sourced and transported fuel, **lowering overall well-to-wheel carbon footprint**
- Significant additional **greenhouse gas emission reduction** opportunities are available through the use of renewable natural gas (RNG)

HYBRID

Proven, Reliable Hybrid Technology

Clean and Quiet Mobility Solutions

BAE SYSTEMS

Allison eGEN™

GILLIG hybrid buses are ideally suited to the demands of transit stop-and-go duty cycles. We offer two different propulsion systems – the Allison eGen Flex and BAE Series Drive – with components that make hybrids **cost-efficient to own and operate**, including regenerative braking that extends brake life, and engine-off capability for zero-emission operation. The buses also feature electric accessories that reduce wear and tear on engine components and eliminate some maintenance items from the bus.

Our Hybrid bus is available in 35', and 40' lengths with optional BRT, BRT Plus, Low Floor Plus, or Trolley styling.

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 emissions**
- Engine start-stop operation provides for environmental sustainability and **less greenhouse gases**

Saves Energy

- GILLIG Hybrids use up to **25% less fuel** than diesel buses*
- GILLIG Hybrids allow for the use of electric components that **reduce fuel-consumption emissions**
- Lightweight design and structure optimization results in **greater efficiencies**

**Results may vary depending on application*

STYLING

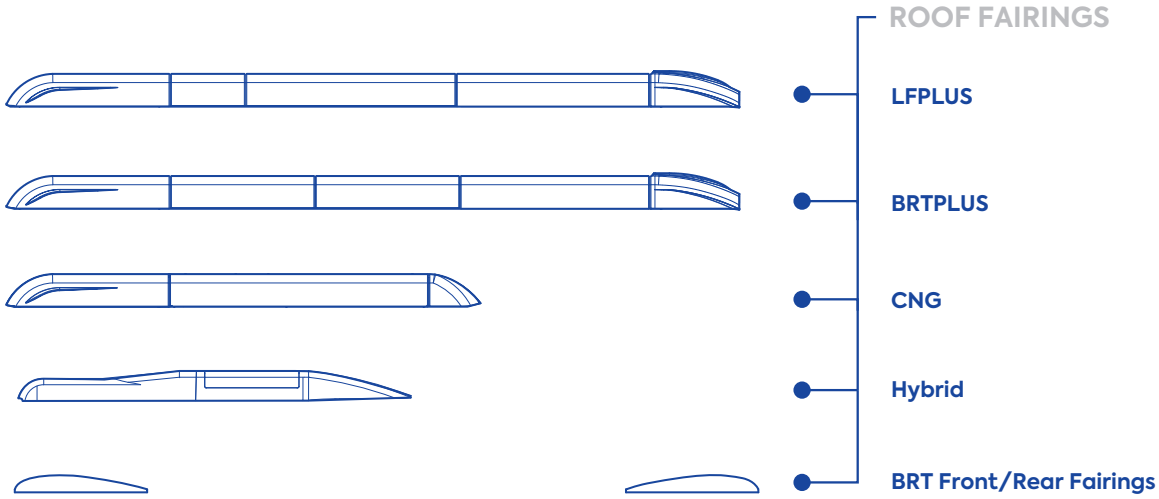
Modular Options For All Your Transit Needs

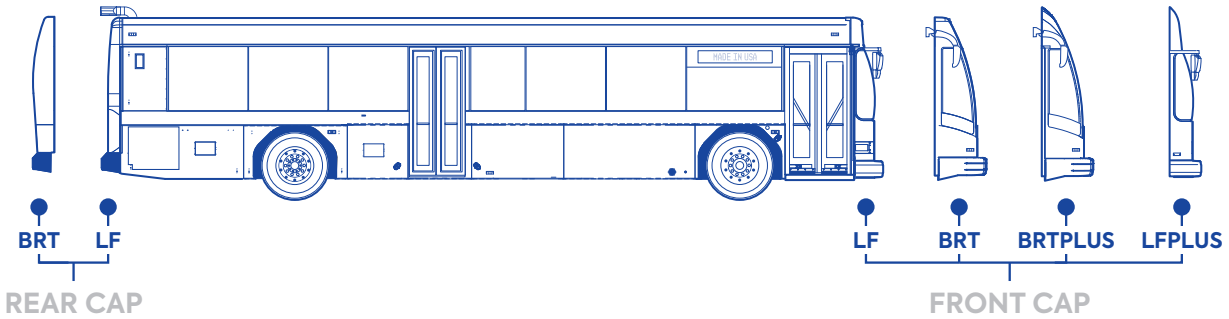
Our modular design allows operators to select the propulsion system and styling package that best meet the needs of their service while maintaining fleet commonality, as well as the reliability, durability, and cost-effectiveness for which GILLIG buses are renowned.

Styling options include Low Floor, Low Floor Plus, BRT, and BRT Plus.

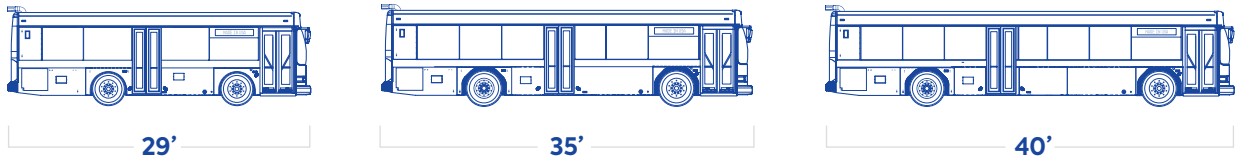
GILLIG also offers a Trolley replica package which combines classic trolley appeal with the quality and contemporary features of our standard transit bus.

Available In 5 Distinct Styling Options

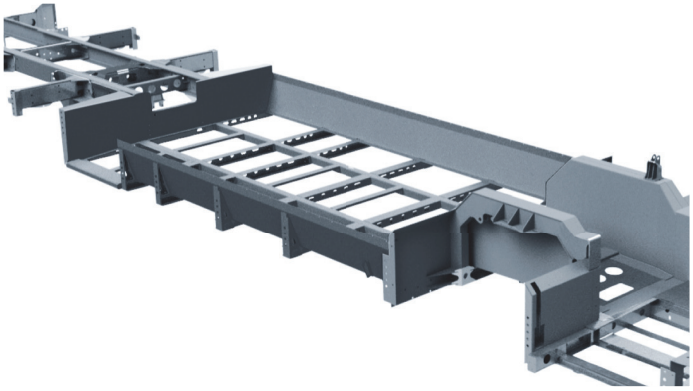




Available In 3 Lengths



LOW FLOOR PLATFORM



Engineered To Last

- Designed to **exceed FTA 12-year / 500,000-mile minimum life** requirements
- Stainless steel chassis **resists corrosion, increases life and requires less maintenance**
- Lightweight, high-strength aluminum body with anodized side posts resists corrosion and greatly **simplifies collision repairs**

Safe To Operate

- Ergonomically designed driver's workstation built on stainless steel chassis for **greater driver safety**
- Molded wraparound driver's barrier, with optional hinged enclosure, creates **added safety and comfort**
- Integrated side-impact beams provide **increased passenger protection** as well as reduced accident damage

Maintenance Friendly

- Large doors make **servicing components easier through ready access**
- Quick-change skirt panels **make repairs easy and help ensure operational readiness**
- Standard-size tires **last 65% longer, deliver better ground clearance and experience less rim damage**

Comfortable To Ride

- 36" wide front aisle for **maximum ADA maneuverability**
- Large HVAC capacity and insulated air ducts distribute **increased air flow**
- Tuned suspension provides **better ride comfort** for passengers and drivers

SUPPORT FOR LIFE

Support For Life

- GILLIG's Customer Care department is staffed by **well-trained, caring professionals**, most of which are factory trained
- **Customized tech manuals** created on as-built documentation
- GILLIG's commitment to long-term relationships and **supporting our customer's future** changing needs is unwavering

Consistent Performance

- GILLIG's unmatched history of providing **state-of-the-art technology, great customer satisfaction and reliable performance**
- Continuous excellence programs focused on **streamlining manufacturing and reducing waste**
- Organizational stability ensuring **consistency in product build and performance**

Service Parts

- Dedicated "Class A" warehouse with **extensive inventory**
- Supply only **proven original equipment and premium aftermarket parts**
- Dedicated, knowledgeable, customer service team focused on **keeping your buses on the road**

Training

- **Experienced and proficient GILLIG employees** providing customized training
- Curriculum and materials **customized to individual customer and their students**
- **Class flexibility** for day or evening schedules

Quality

We believe that quality must be the cornerstone of everything that we do, which relies on a team of great people focused on excellence each and every day. From proper initial design, supplier and component selection, robust validation, in-plant inspection and continuous improvement, we maintain a steadfast emphasis on ensuring ultimate product quality. That detailed and disciplined focus has enabled us to deliver consistently reliable products.

GILLIG

www.GILLIG.com

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 Taxpayers

- 2 Unions, (600+) Members
- 72% minorities and women

Takes pride in

- 131-year US heritage
- Happy Customers/Partners
- Ongoing business success

PROUDLY MADE IN THE USA

MANUFACTURING PLANT AND HEADQUARTERS

GILLIG, LLC was founded in San Francisco, CA in 1890 (as GILLIG BROS), moved to Hayward, CA in 1937 to expand the facilities, and in May 2017 relocated to our current state of the art manufacturing plant in Livermore, CA for further expansion. The purpose-built Livermore plant is 600,000 sq. ft. on 41 acres.

MAIN OFFICE & HEADQUARTERS – FRONT LOBBY VIEW

MAIN OFFICE , HEADQUARTERS, & PLANT LAYOUT - AERIAL VIEW

New State-of-the-Art Manufacturing Plant
"Sustainability Accomplishments"

- ✓ Rooftop Solar- 3 megawatts SunPower Helix Solar system- 7800 panels and 2 Tesla Battery Electric Storage Systems- Operational Early 2021- Offset 40% of the facilities power consumption
- ✓ 100% Renewable Natural Gas (RNG) used in CNG filling station
- ✓ Install 30 EV Chargers for employees- preferred parking and 100% Company subsidized
- ✓ Installation for both ChargePoint Plug-In Chargers and ABB Overhead chargers
- ✓ Launched company-wide recycling programs (wooden pallets, refillable bottles, returnable dunnage, etc.) and additional energy efficiency programs (LED lights, smart lighting, etc.)

GILLIG EXCELLENCE

GILLIG

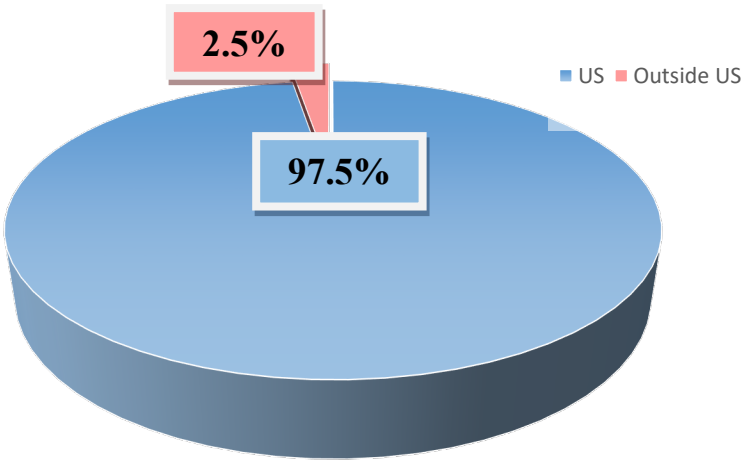
GILLIG

SUPPORTING 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 130 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.

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

GILLIG DOMESTIC SPEND ANALYSIS

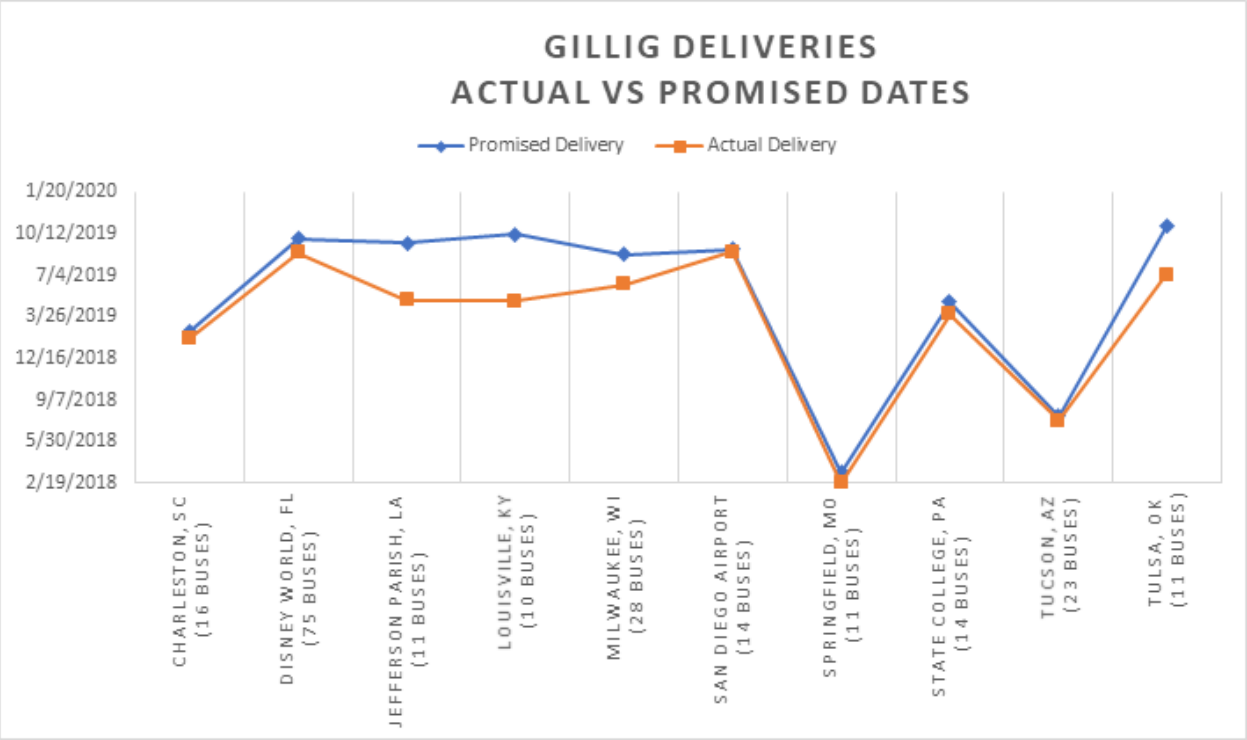


DELIVERY COMMITMENT

GILLIG, LLC has a long history of on-time contract performance. This 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 guarantees that you will receive the bus that you want within the time frame in which you need it.

GILLIG's 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.

While GILLIG does have other additional contract commitments for the duration of this contract, we are extremely confident that they will not impact the proposed delivery schedule for your new vehicles.



GILLIG

CUSTOMER REFERENCE LIST
DIESEL

Our best reference is our reputation for satisfying our customers with excellent products and services. We have listed below several of our customers, as representative references to our company's experience and capabilities and who can attest to GILLIG's commitment to customer satisfaction and support.

Albany, NY (CDTA)
Carm Basile
Chief Executive Officer
518-437-8310
carm@cdta.org

Bellingham, WA (WTA)
Andy Bowler
Director of Fleet and Facilities
360-788-9351
andy.bowler1@gmail.com

Honolulu, HI (OTS)
Adam Tamayoshi
Vice President Maintenance
808-768-9463
adam.tamayoshi@thebus.org

Phoenix, AZ (Valley Metro)
Darren Curry
Chief Maintenance Officer
602-652-5033
dcurry@valleymetro.org

San Mateo County, CA (SamTrans)
David Olmeda
Chief Operating Officer
650-508-6252
olmedad@samtrans.com

AC Transit, CA (AC Transit)
Salvador Llamas
Chief Operating Officer
510-891-7215
sllamas@actransit.org

Dayton, OH (RTA)
Daron Brown
Chief Deputy Maintenance Officer
937-425-8630
dbrown@greaterdaytonrta.org

Contra Costa County, CA (CCCTA)
Scott Mitchell
Chief Operating Officer
925-676-1976, ext. 2090
mitchell@cccta.org

GILLIG

CUSTOMER REFERENCE LIST
ALLISON HYBRID

Our best reference is our reputation of satisfying our customers with excellent products and services. We have listed below several of our customers, as representative references to our company's experience and capabilities and who can attest to GILLIG's commitment to customer satisfaction and support.

Livermore, CA (LAVTA)
Christy Wegener
Executive Director
925-455-7560
cwegener@lavta.org

Lubbock, TX (Citibus)
Chris Mandrell
General Manager
806-775-3435
cmandrell@citibus.com

Stockton, CA (San Joaquin RTD)
John Van Camp
Maintenance Superintendent
209-467-6656
jvancamp@SJRTD.com

Cincinnati, OH (SORTA)
Joseph Vilvens
Sr. Technical Operations Manager
513-632-7514
jvilvens@go-metro.com

Indianapolis, IN (IndyGo)
Aaron Vogel
Chief Operations Officer
317-614-9286
avogel@indygo.net

Pueblo, CO (Pueblo Transit)
Ben Valdez
Transit Director
719-553-2706
bvaldez@pueblo.us

ATHENS CLARKE COUNTY

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,

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

City of
Santa Monica®

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

tel: 310 458-1975 • fax: 310 399-6275 • e-mail: TransitMaintenance@smgov.net

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—diesel-electric 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 zero-emissions 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
telephone (808) 848-4400 facsimile (808) 848-4419
www.thebus.org

TheBus
TheHandi-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.

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,

Adam Tamayoshi
Vice President of Maintenance

GWINNETT COUNTY
DEPARTMENT OF TRANSPORTATION
GWINNETT COUNTY TRANSIT DIVISION

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

METRO
METRO REGIONAL TRANSIT AUTHORITY

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,

Jeff Mundstock
Interim Director of Fleet and Facilities

KRT KANAWHA VALLEY REGIONAL TRANSPORTATION AUTHORITY
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

Western Reserve Transit Authority
WRTA
People On The Move.

Phone 330•744•8431 Fax 330•744•7611

604 Mahoning Avenue • Youngstown, Ohio 44502

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,

Carm Basile

Carm Basile
Chief Executive Officer

Jeremy Peterson
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

P.O. Box 490, Station 5, Gainesville, Florida 32627 www.go-rts.com (352) 334.2600

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 3rd Street (2nd 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 3rd Street (2nd 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 S Calhoun
Angela S Calhoun
Superintendent
Fleet Management Department

FLEET MANAGEMENT

1312 Blaylock St. Albany, GA 31705 / Phone: 229.430.5272 / Fax: 229.439.1059 / www.albanyga.gov

JACKSONVILLE TRANSPORTATION AUTHORITY

July 13, 2018

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

Dear Mr. 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,

Lisa Darnall
Vice President/CTO

Administration
121 West Forsyth St.,Suite 200
Jacksonville, Fl 32202

Main: (904) 630-3181
www.jtafla.com

Operations
P.O. Drawer "O" 100 N. Myrtle Ave.
Jacksonville, FL 32203

DATE: 5/07/2024

BID NO.: 50-00145018

BID FORM
Non Public Works

All Public Work Projects are required to use the Louisiana Uniform Public Work Bid Form

All prices must be held firm unless an escalation provision is requested in this bid. Jefferson Parish will allow one escalation during the term of the contract, which may not exceed the U.S. Bureau of Labor Statistics National Index for all Urban Consumers, unadjusted 12 month figure. The most recently published figure issued at the time an adjustment is requested will be used. A request must be made in writing by the vendor, and the escalation will only be applied to purchases made after the request is made.

Are you requesting an escalation provision?

YES X NO _____

MAXIMUM ESCALATION PERCENTAGE REQUESTED *PPI 1413 %

*Beyond the initial one year firm/fixed price period, Price will be quoted with Base Order Prices + Escalation based on PPI 1413

INITIAL BID PRICES WILL REMAIN FIRM THROUGH THE DATE OF 45 days after award date.

For the purposes of comparison of bids when an escalation provision is requested, Jefferson Parish will apply the maximum escalation percentage quoted by the bidder to the period to which it is applied in the bid. The initial price and the escalation will be used to calculate the total bid price. It will be assumed,for comparison of prices only, that an equal amount of material or labor is purchased each month throughout the entire contract.

DELIVERY: FOB JEFFERSON PARISH

INDICATE DELIVERY DATE ON EQUIPMENT AND SUPPLIES 420 calendar days

LOUISIANA CONTRACTOR'S LICENSE NO.: (if applicable) MN-2024-00130
SV-2024-00111
SV-2024-00022
FR-2024-00115

THIS SECTION MUST BE COMPLETED BY BIDDER:

FIRM NAME: GILLIG, LLC

ADDRESS: 451 Discovery Drive

CITY, STATE: Livermore, CA ZIP: 94551

TELEPHONE: (800)735-1500 FAX: (510)785-6819

EMAIL ADDRESS: sales@gillig.com

In the event that addenda are issued with this bid, bidders MUST acknowledge all addenda on the bid form.Bidder must acknowledge receipt of an addendum on the bid form by placing the addendum number as indicated. Failure to acknowledge any addendum on the bid form will result in bid rejection.

Acknowledge Receipt of Addenda: NUMBER: None

NUMBER: _____

NUMBER: _____

NUMBER: _____

TOTAL PRICE OF ALL BID ITEMS: $ 31,293,500.00

AUTHORIZED SIGNATURE: Brian Shepherd

Brian Shepherd
Printed Name

TITLE: Chief Financial Officer

SIGNING INDICATES YOU HAVE READ AND COMPLY WITH THE INSTRUCTIONS AND CONDITIONS.

NOTE: All bids should be returned with the BID NUMBER and BID OPENING DATE indicated on the outside of the envelope submitted to the Purchasing Department.

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00145018

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
			FIVE YEAR CONTRACT TO FURNISH LABOR, MATERIALS TO PROVIDE AND DELIVER ONE TO TEN HEAVY DUTY TRANSIT BUSES FOR THE DEPARTMENT OF TRANSIT ADMINISTRATION		
1	10.00	EA	0010 BUS, DIESEL, 35 FOOT LOW FLOOR 102" WIDE SECTION 1.2.3	$ 607,584.00	$ 6,075,840.00
			FIVE YEAR CONTRACT TO FURNISH LABOR, MATERIAL AND EQUIPMENT NECESSARY TO PROVIDE AND DELIVER ONE (1) TO TEN (10) 35' AND OR 40' HEAVY DUTY TRANSIT BUSES WITH AN OPTION TO PURCHASE UP TO AN ADDITIONAL THIRTY (30) AS PER THE FOLLOWING TECHNICAL SPECIFICATIONS TO THE JEFFERSON PARISH DEPARTMENT OF TRANSIT ADMINISTRATION		
2	10.00	EA	0011 BUS, DIESEL, 40 FOOT LOW FLOOR 102" WIDE SECTION 1.2.3	$ 611,784.00	$ 6,117,840.00
3	10.00	EA	0012 BUS, HYBRID, 35 FOOT LOW FLOOR 102"WIDE SECTION 1.2.3	$ 911,207.00	$ 9,112,070.00
4	10.00	EA	0013 BUS, HYBRID 40 FOOT LOW FLOOR 102" WIDE SECTION 1.2.3	$ 915,407.00	$ 9,154,070.00
5	10.00	EA	0014 WEIGHTED DELIVERY CHARGE FOR YOUR LOUISIANA AGENCIES	$ Included in Base	$ Included in Base
6	10.00	EA	0015 OPTION 1:-BODY STYLING-BRT SECTION 1.2.2	$ 13,950.00	$ 139,500.00
7	10.00	EA	0016 OPTION 2: BODY STYLING-BRT PLUS SECTION 1.2.2	$ 18,950.00	$ 189,500.00
8	10.00	EA	0017 OPTION 3: BODY STYLING TROLLEY PACKAGE SECTION 1.2.2	$ Quote	$ Quote
9	10.00 ~~40.00~~	EA	0018 OPERATIONS-ELECTRICAL ASSISTED STEERING SECTION 1.16.1	$ 3,050.00	$ 30,500.00
10	10.00	EA	0019 OPTIONS-FIRE SUPPRESION DELETE SECTION 1.7.5	$ (2,096.00)	$ (20,960.00)

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00145018

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
11	10.00	EA	0020 OPTIONS-THERMO KING TK 14 SECTION 1.32.1 (Diesel Only)	$ (205.00)	$ (2,050.00)
12	10.00	EA	0021 OPTIONS-THERMO KING S391 COMPRESSOR SECTION 1.32.1 (Diesel Only)	$ Included w TK 14	$ Included w TK 14
13	10.00	EA	0022 OPTIONS-THERMO KING X430 COMPRESSOR SECTION 1.32.1 (Diesel Only)	$ (917.00)	$ (9,170.00)
14	10.00	EA	0023 OPTIONS-THERMO KING ALL ELECTRIC SECTION 1.32.1 (Diesel Only, Included with eGen Flex Base)	$ 20,651.00	$ 206,510.00
15	10.00	EA	0024 OPTIONS-QUANTUM GEN II SECTION 1.41.4	$ 14,775.00	$ 147,750.00
16	10.00	EA	0025 OPTIONS-2 POSITION STAINLESS STEEL BIKE RACK SECTION 1.36.2	$ 1,805.00	$ 18,050.00
17	10.00	EA	0026 OPTIONS-2 POSITION BLACK POWDER BIKE RACK SECTION 1.36.2	$ 1,850.00	$ 18,500.00
18	10.00	EA	0027 OPTIONS-DASH MOUNTED BIKE DEPLOYED LAMP SECTION 1.36.2	$ 250.00	$ 2,500.00
19	10.00	EA	0028 OPTIONS-CLEVER DEVICES ITS SYSTEM	$ Quote	$ Quote
20	10.00	EA	0029 OPTIONS-NIEHOFF 803 ALTERNATOR SECTION 1.22.6	$ Included in Base	$ Included in Base
21	10.00	EA	0030 OPTIONS-DELCO 450 DN ALTERNATOR SECTION 1.22.6	$ Not Available	$ Not Available
22	10.00	EA	0031 OPTIONS-ADJUSTABLE BRAKE/ ACCELERATOR PEDALS SECTION 1.25.7	$ 1,234.00	$ 12,340.00
23	10.00	EA	0032 OPTION-FRAMELESS BONDED WINDOWS SECTION 1.31.4	$ 3,882.00	$ 38,820.00

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00145018

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
24	10.00	EA	0033 OPTIONS-FAST FARE FAREBOX SECTION 1.43.10	$ Included in Base	$ Included in Base
25	10.00	EA	0034 OPTIONS-ALCOA FULL POLISH ALUMINUM WHEELS SECTION 1.15.2 (Diesel Only, Included with eGen Flex Base)	$ 2,250.00	$ 22,500.00
26	10.00	EA	0035 OPTIONS-Q-POD RESTRAINT SYSTEM SECTION 1.41.4	$ 3,469.00	$ 34,690.00
27	10.00	EA	0036 OPTIONS-OIL SEALS SECTION 1.16.2	$ 100.00	$ 1,000.00
28	10.00	EA	0037 OPTIONS-WEIGHTED DELIVERY CHARGE FOR YOUR LOUISIANA AGENCIES	$ Included in Base	$ Included in Base
29	10.00	EA	0038 OPTIONS-FOUR(4) GROUP 31 BATTERIES SECTION 1.22.1	$ 370.00	$ 3,700.00

GILLIG

Jefferson Parish, LA
#50-00145018

2024 GILLIG Option Pricing Page – Diesel, eGen Flex

DESCRIPTION	PRICE
Tri-Lingual Decals on Interior	$750.00
Drivers Barrier - ArowGuard Driver Protection Shield w/Extended Glass	$6,683.00
Training Options Below:	
Training - Operator Orientation (2-4 hour sessions, up to 8 students per session)	$3,200.00
Training - Maintenance Orientation (1-8 hour session, up to 12 students per session)	$3,200.00
Training - Body and Chassis (1-16 hour session, up to 12 students per session)	$6,400.00
Training - Electrical and Electronics (1-24 hour session, up to 12 students per session)	$9,600.00
Training - Air and Brake System (1-16 hour session, up to 12 students per session)	$6,400.00
Training - HVAC Thermo King (1-16 hour session, up to 10 students per session)	$7,000.00
Training - Engine Familiarization Cummins (1-8 hour session, up to 10 students per session)	$4,500.00
Training - Engine Diagnostics Cummins (1-16 hour session, up to 10 students per session)	$9,000.00
Training - Engine Overhaul Cummins (1-16 hour session, up to 10 students per session)	$9,000.00
Training - Transmission Familiarization Allison (1-8 hour session, up to 10 students per session)	$4,500.00
Training - Transmission Diagnostics Allison (1-16 hour session, up to 10 students per session)	$9,000.00
Training - Transmission Overhaul Allison (1-16 hour session, up to 10 students per session)	$9,000.00
Training - Wheelchair Ramp Sytem Lift-U (1-4 hour session, up to 10 students per session)	No Charge
Training - Destination Signs Luminator (1-4 hour session, up to 10 students per session)	No Charge
Training - Doors Vapor (1-4 hour session, up to 10 students per session)	$3,100.00
Training - Fire Suppression Amerex (1-4 hour session, up to 10 students per session)	$6,000.00
OEM Training - Engine Cummins (1-40 hour session, up to 2 students per session Tuition Only)	$5,200.00
OEM Training - Transmission Allison (1-40 hour session, up to 2 students per session Tuition Only)	$5,200.00

*Pricing beyond Year 1 will be subject to PPI-1413 Index each year

GILLIG

PRICING CLARIFICATION

All the following general comments and clarifications may not apply to your specific procurement, but they are included so as to avoid misunderstandings, so they should not be construed as making this a conditional bid. These comments do not change the quoted pricing for the initial order and build.

TAX/FEE STATEMENT

The prices quoted for this procurement are for the specified deliverables only and **exclude** (unless specifically noted by buyer or seller) any Local, City, County, State, Franchise or Income or Value Added(VAT) taxes, tariffs, fees, business licenses, or other licenses, that may need to be paid as part of the performance of this contract, or any option of it. If any additional fees are required, they will be noted and added to the appropriate invoice.

PAYMENT

All prices are in U.S. Dollars and payments are only accepted on U.S. bank checks or via electronic funds transfers, (no credit, debit or bank cards) and any applicable transaction fees would be the responsibility of the buyer.

EMISSIONS AND OTHER REGULATED OR MANDATED CHANGES

The prices quoted for the initial build quantity are for vehicles meeting all applicable Federal and State regulations (including EPA, CARB, or NHTSA requirements) **currently known to be in effect at the time of delivery of those vehicles.** Changes caused by or related to future regulations, any subsequently enacted regulations, or technologies necessitating revisions from the currently proposed vehicle configuration (e.g. component change/availability due to emission or other regulations, requirements or mandates), may require a price adjustment, which would be subject to negotiation and agreement by both GILLIG and the buyer. This latter statement applies to future builds only that may need to use different components or currently unknown or unavailable technology, to meet regulations or requirements in effect at the time(s) of those optional deliveries.

OPTIONAL BUILD PRICING

Most bids include a PPI adjuster to determine pricing for future builds, and this is to clarify that bus pricing for such future build quantities may be different from the PPI adjusted price because of the above regulated/mandated changes and/or due to customer initiated change notices.

GILLIG LLC

By: _____

WILLIAM F. FAY, JR.

Title: VICE PRESIDENT, SALES

Date: 5/28/2024

GILLIG LLC

LOW FLOOR TRANSIT COACH

STANDARD LIMITED WARRANTY & EXTENDED COVERAGE FOR

JEFFERSON PARISH, LOUISIANA
ITB# 50-00145018 – JUNE 4, 2024

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.**

GILLIG LLC
LOW FLOOR TRANSIT COACH
STANDARD LIMITED WARRANTY & EXTENDED COVERAGE FOR

JEFFERSON PARISH, LOUISIANA
ITB# 50-00145018 – JUNE 4, 2024

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 Period [1]	
	Months	Miles
FULL COACH WARRANTY [2] [3] [7]	12	50,000
BODY STRUCTURE WARRANTY [4]	36	150,000
CORROSION & STRUCTURAL INTEGRITY WARRANTY [5]	84	350,000

CATEGORY 2
Includes major components purchased and installed by GILLIG. Warranty provided by component OEM's. Warranty claims administration provided by GILLIG.

	Coverage Period [1]	
	Months	Miles
AXLE		
Meritor Front Steering	60	300,000
Meritor Rear Driving	84	350,000
BRAKE SYSTEM		
(Excludes Friction Material)		
Meritor Brakes	24	100,000
RADIATOR & CHARGE AIR COOLER		
Modine	36	Unlimited

GILLIG LLC
LOW FLOOR TRANSIT COACH
STANDARD LIMITED WARRANTY & EXTENDED COVERAGE FOR

JEFFERSON PARISH, LOUISIANA
ITB# 50-00145018 – JUNE 4, 2024

CATEGORY 3

Major components listed below under "Category 3" are covered by warranties or extended coverages[6], 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.

	Coverage Period [1]	
	Months	Miles
ENGINE [7]		
Cummins L9	60	300,000
Cummins B6.7	60	300,000
ENGINE ACCESSORIES		
Delco Starter (L9)	36	350,000
Niehoff Alternator (L9)	24	Unlimited
Vanner Hybrid Beltless Alternator (B67)	36	Unlimited
Wabco Air Compressor Engine Driven (L9)	24	Unlimited
Powerex Air Compressor Electric Driven (B67)	12	5,000 Hours
TRANSMISSION		
Allison B400R (L9)	24	Unlimited
Allison eGen Flex (B67)	24	Unlimited
AIR CONDITIONING SYSTEM		
Mobile Climate Controls (L9)	36	Unlimited
Thermo King TE14 (B6.7)	36	Unlimited
WHEELCHAIR RAMP		
Lift-U LU18	24	Unlimited
DOOR SYSTEM [8]		
Vapor	36	150,000
INTERIOR LIGHTING		
I/O Controls	144	500,000
FIRE SUPPRESSION		
Amerex	36	Unlimited

LOW FLOOR TRANSIT COACH
STANDARD LIMITED WARRANTY & EXTENDED COVERAGE FOR

JEFFERSON PARISH, LOUISIANA
ITB# 50-00145018 – JUNE 4, 2024

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.

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
- Charge Air Cooler and associated plumbing
- Wire harness circuits connected at both ends to emissions warrantable components
- Exhaust gas pipes from turbocharger out to the last after treatment device
- Urea quality sensor
- Urea tank, heating element, level sensor, temperature sensor, coolant control valve
- Urea lines and line heater controls
- On-Board Diagnostic (OBD) Malfunction Indicator Lamp (MIL)
- Diesel Exhaust Fluid (DEF) Lamp
- 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.

GILLIG LLC
LOW FLOOR TRANSIT COACH

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 excludes 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) Use of non-ASTM biodiesel blends from non-BQ9000 suppliers in excess of B20 may void the engine manufacturer's warranty on fuel related components, and also may void warranties of hoses, seals and fittings in contact with the fuel.
8) For consumable components like brushes, seals, air wave switches and related wear items a one year parts and labor warranty applies.

Non-Public Works Bid

AFFIDAVIT

STATE OF California

PARISH/COUNTY OF Alameda

BEFORE ME, the undersigned authority, personally came and appeared: Brian Shepherd _____, (Affiant) who after being by me duly sworn, deposed and said that he/she is the fully authorized Chief Financial Officer of GILLIG, LLC (Entity), the party who submitted a bid in response to Bid Number 50-00145018, to the Parish of Jefferson.

Affiant further said:

Campaign Contribution Disclosures

(Choose A or B, if option A is indicated please include the required attachment):

Choice A _____ Attached hereto is a list of all campaign contributions, including the date and amount of each contribution, made to current or former elected officials of the Parish of Jefferson by Entity, Affiant, and/or officers, directors and owners, including employees, owning 25% or more of the Entity during the two-year period immediately preceding the date of this affidavit or the current term of the elected official, whichever is greater. Further, Entity, Affiant, and/or Entity Owners have not made any contributions to or in support of current or former members of the Jefferson Parish Council or the Jefferson Parish President through or in the name of another person or legal entity, either directly or indirectly.

Choice B X there are **NO** campaign contributions made which would require disclosure under Choice A of this section.

Debt Disclosures

(Choose A or B, if option A is indicated please include the required attachment):

Choice A _____ Attached hereto is a list of all debts owed by the affiant to any elected or appointed official of the Parish of Jefferson, and any and all debts owed by any elected or appointed official of the Parish to the Affiant.

Choice B X _____ There are **NO** debts which would require disclosure under Choice A of this section.

Affiant further said:

That Affiant has employed no person, corporation, firm, association, or other organization, either directly or indirectly, to secure the public contract under which he received payment, other than persons regularly employed by the Affiant whose services in connection with the construction, alteration or demolition of the public building or project or in securing the public contract were in the regular course of their duties for Affiant; and

[*The remainder of this page is intentionally left blank.*]

That no part of the contract price received by Affiant was paid or will be paid to any person, corporation, firm, association, or other organization for soliciting the contract, other than the payment of their normal compensation to persons regularly employed by the Affiant whose services in connection with the construction, alteration or demolition of the public building or project were in the regular course of their duties for Affiant.

Signature of Affiant

Brian Shepherd, Chief Financial Officer

Printed Name of Affiant

SWORN AND SUBSCRIBED TO BEFORE ME

ON THE _____ DAY OF _____, 20___.

_____

Notary Public

_____

Printed Name of Notary

_____

Notary/Bar Roll Number

My commission expires _____.

See Attached

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Alameda

Subscribed and sworn to (or affirmed) before me on this 4th day of June, 2024, by Brian shepherd, proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.

ALEXIS MICHELLE GEE
Notary Public - California
Alameda County
Commission # 2488871
My Comm. Expires Apr 30, 2028

(Seal)

Signature

APPENDIX A
RETURN WITH YOUR BID

Acknowledgement of Required Federal Clauses and Certifications

The Agreement between the Jefferson Parish Department of Transit Administration and the Federal Transportation Administration (FTA) has specific provisions that are passed on to all third-party contractors including, but not limited to, Civil Rights, Nondiscrimination, Affirmative Action/Equal Employment Opportunities, Disadvantaged Business Enterprise, Debarment and Suspension, and all applicable federal regulations. These provisions and all applicable appendices of the Agreement are herein incorporated by reference and made a part of this contract.

Signed:

William F. Fay, Jr., Vice President, Sales
Authorized Signing Official

5/28/2024
Date

APPENDIX B

CERTIFICATION REGARDING DEBARMENT
RETURN WITH YOUR BID

The prospective Contractor certifies, by submission of this bid or proposal, that neither it nor its "principals" as defined at 49 C.F.R. 29.995, or affiliates, as defined at 49 C.F.R. 29.905, are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any governmental department or agency.

Signature of Contractor's Authorized Official

William F. Fay, Jr., Vice President, Sales

Name and Title of Contractor's Authorized Official

5/28/2024

Date

APPENDIX C
LOBBYING
Certification for Contracts, Grants, Loans, and Cooperative Agreements
RETURN WITH YOUR BID

The undersigned [Contractor] certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for making lobbying contacts to an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form--LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions [as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96). Note: Language in paragraph (2) herein has been modified in accordance with Section 10 of the Lobbying Disclosure Act of 1995 (P.L. 104-65, to be codified at 2 U.S.C. § 1601, *et seq.*)]

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, U.S.C. § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

[Note: Pursuant to 31 U.S.C. § 1352(c)(1)-(2)(A), any person who makes a prohibited expenditure or fails to file or amend a required certification or disclosure form shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such expenditure or failure.]

The Contractor certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. § 3801, *et seq.*, apply to this certification and disclosure, if any.

Signature of Contractor's Authorized Official: _____

Name and Title of Contractor's Authorized Official: William F. Fay, Jr., Vice President, Sales

Date: 5/28/2024

APPENDIX D

BUY AMERICA CERTIFICATE OF COMPLIANCE WITH FTA REQUIREMENTS FOR BUSES, OTHER ROLLING STOCK, OR ASSOCIATED EQUIPMENT RETURN WITH YOUR BID

Certificate of Compliance with 49 U.S.C. § 5323(j) (2) (C).

The bidder or offeror hereby certifies that it will comply with the requirements of 49 U.S.C. § 5323(j)(2)(C) and the regulations at 49 C.F.R. Part 661.

Date 5/28/2024

Signature _____
William F. Fay, Jr.,

Company Name GILLIG, LLC

Title Vice President, Sales

Certificate of Non-Compliance with 49 U.S.C. § 5323(j)(2)(C)

The bidder or offeror hereby certifies that it cannot comply with the requirements of 49 U.S.C. § 5323(j)(2)(C), but may qualify for an exception pursuant to 49 U.S.C. § 5323(j)(2)(B) or (j)(2)(D) and the regulations in 49 C.F.R. 661.7.

Date _____

Signature _____

Company Name _____

Title _____

APPENDIX E

CERTIFICATION OF COMPLIANCE WITH FTA'S BUS TESTING REQUIREMENTS RETURN WITH YOUR BID

The undersigned [Contractor/Manufacturer] certifies that the vehicle offered in this procurement complies with 49 U.S.C. § 5323(c) and FTA's implementing regulation at 49 C.F.R. Part 665.

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 C.F.R. Part 31. In addition, the undersigned understands that FTA may suspend or debar a manufacturer under the procedures in 49 C.F.R. Part 29.

Date: 5/28/2024

Signature: _____
William F. Fay, Jr.,

Company Name: GILLIG, LLC

Title: Vice President, Sales

APPENDIX F
BUS TESTING PROGRAM
BUS TESTING PROGRAM CERTIFICATION
RETURN WITH YOUR BID

William F. Fay, Jr., Vice President, Sales GILLIG, LLC
Here by certifies that the model of bus being offered in this bid has met the requirements imposed by 49 C.F.R. Part 665, Bus Testing, including the following two (2) conditions:

1) A model of the bus has been tested at the bus testing facility in Altoona, Pennsylvania; and

2) The bid includes a copy of the Test Report prepared on the bus modeling offered.

Authorized Signee: _____
William F. Fay, Jr.

Title: Vice President, Sales

Company: GILLIG, LLC

APPENDIX G
TRANSIT VEHICLE MANUFACTURER CERTIFICATION
(Bus or Rail Car Purchases Only)
RETURN WITH YOUR BID

CERTIFICATION OF DISADVANTAGED BUSINESS ENTERPRISES (DBE) COMPLIANCE

The responder, a Primary Transit Vehicle Manufacturer, hereby certifies that it has complied with the requirements of 49 C.F.R. Section 26.49, as amended, by submitting an annual DBE goal, as amended, to the Federal Transit Administration (FTA). The goal has either been approved or not disapproved by the FTA.

SIGNATURE: _____

PRINT NAME: William F. Fay, Jr.,

TITLE: Vice President, Sales

COMPANY: GILLIG, LLC

DATE: 5/28/2024

APPENDIX H
NON-COLLUSION FORM
RETURN WITH YOUR BID

By submission of this proposal, the Offeror Brian Shepherd, certifies
Name of Offeror

that (s)he is Chief Financial Officer of GILLIG, LLC
Title Name of Firm

under penalty of perjury, affirms:

1. The prices in this proposal have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other Offeror or with any competitor;

2. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the Offeror and will not knowingly be disclosed by the Offeror prior to opening, directly or indirectly, to any other Offeror or to any competitor; and

3. No attempt has been made or will be made by the Offeror to induce any other person, partnership or corporation to submit or not submit a proposal for the purpose of restricting competition.

4. The proposal was not made in the interest of or on behalf of any undisclosed person, partnership, company, organization or corporation.

5. Each person signing the proposal certifies that:

   a. He is the person in the Consultant's organization responsible within that organization for the decision as to prices being offered in the proposal and that he has not participated and will not participate in any action contrary to (1-4] above; or

   b. He is not the person in the Consultant's organization responsible within that organization for the decision as to prices being offered in the proposal but that he has been authorized in writing to act as agent for the persons responsible for such decisions in certifying that such

persons have not participated, and will not participate, in any action contrary to (1-4) above, and that as their agent, does hereby so certify; and that he has not participated, and will not participate in any action contrary to (1- 4) above.

That no part of the contract price received by Affiant was paid or will be paid to any person, corporation, firm, association, or other organization for soliciting the contract, other than the payment of their normal compensation to persons regularly employed by the Affiant whose services in connection with the construction, alteration or demolition of the public building or project were in the regular course of their duties for Affiant.

Signature of Affiant

Brian Shepherd, Chief Financial Officer

Printed Name of Affiant

SWORN AND SUBSCRIBED TO BEFORE ME

ON THE _____ DAY OF _____, 20___.

Notary Public

Printed Name of Notary

Notary/Bar Roll Number

My commission expires _____.

See Attached

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Alameda

Subscribed and sworn to (or affirmed) before me on this 4th day of June, 2024, by Brian Shepherd, proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.

ALEXIS MICHELLE GEE
Notary Public - California
Alameda County
Commission # 2488871
My Comm. Expires Apr 30, 2028

(Seal)

Signature Alexis Gee

APPENDIX I

CONTRACTOR GENERAL CERTIFICATIONS
RETURN WITH YOUR BID

The undersigned [Contractor] certifies, to the best of his or her knowledge and belief, that:

(1) The Bidder and its Subcontractors are not in arrears to the Jefferson Parish Department of Transit Administration and or any of the named Procuring Agencies upon debt or contract and are not a defaulter, as surety or otherwise, upon any obligation to the Jefferson Parish Department of Transit Administration and or any of the named Procuring Agencies.

(2) No officer or employee or person whose salary or compensation for services is or has been payable in the past two (2) years in whole or in part from the Jefferson Parish Department of Transit Administration is or shall be or become interested directly or indirectly in this proposal or in the award or performance of the contract for the supplying of the aforesaid, and other related items, or in any portion of the profits or price therefore.

(3) The Bidder complies with mandatory standards and polices relating to energy efficiency in compliance with the Federal Energy Policy and Conservation Act (42 U.S.C. § 6321 *et seq.*).

The Contractor, GILLIG, LLC, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any.

Signature of Contractor's Authorized Official: _____

Name and Title of Contractor's Authorized Official: William F. Fay, Jr., Vice President, Sales

Date: 5/28/2024

GILLIG

FEDERAL MOTOR VEHICLE SAFETY STANDARDS CERTIFICATION

GILLIG, LLC, 451 Discovery Drive, Livermore California 94551, hereby certifies that GILLIG, LLC has complied with all applicable requirements of the Federal Motor Vehicle Safety Standard (FMVSS) as required by the Federal Transit Administration (FTA) and the Department of Transportation (DOT), and described in Title 49 CFR Chapter V, part 571-FMVSS, last revised on October 1, 1998.

GILLIG LLC

By: _____

WILLIAM F. FAY, JR.

Title: VICE PRESIDENT, SALES

Date: 5/28/2024

GILLIG

DBE/MBE CERTIFICATION OF COMPLIANCE

DISADVANTAGED/MINORITY BUSINESS ENTERPRISE (DBE/MBE)

GILLIG LLC, 451 Discovery Drive, Livermore California 94551, hereby certifies that GILLIG LLC has complied with the requirements of 49 CFR Part 26 of the Transportation Assistance Act of 1982, and submitted the required documents to the Federal Transit Administration (FTA).

The FTA advised that GILLIG has obtained 49 C.F.R. Part 26.49 certification, and we are eligible to bid on federally funded contracts in FY2024. Transit customers may call the FTA DBE Team for verification.

The list of eligible Transit Vehicle Manufacturers may be viewed at https://www.transit.dot.gov/regulations-and-guidance/civil-rights-ada/eligible-transit-vehicle-manufacturers

FEDERAL TRANSIT ADMINISTRATION
Office of Civil Rights
1200 New Jersey Avenue SE
Washington, DC 20590
Phone: 888-446-4511
E-mail: FTATVMSubmissions@dot.gov

GILLIG LLC

By: _____

WILLIAM F. FAY, JR.

Title: VICE PRESIDENT, SALES

Date: 5/28/2024

U.S. Department
Of Transportation
Federal Transit
Administration

Headquarters
East Building, 5th Floor, TCR
1200 New Jersey Avenue, SE
Washington, DC 20590

January 17, 2024

Chris Turner
Gillig LLC
451 Discovery Drive
Livermore, California 94551

Re: Notice of Eligibility to Bid on FTA-Assisted Transit Vehicle Procurements in FY 2024

Dear Mr. Turner:

This letter is to inform you that the Federal Transit Administration's (FTA) Office of Civil Rights has received Gillig LLC FY2024 Disadvantaged Business Enterprise (DBE) goal and methodology for the period of October 1, 2023–September 30, 2024. This goal submission is required by the U.S. Department of Transportation's DBE regulations at 49 CFR Part 26 and must be implemented in good faith.

FTA is currently reviewing your firm's DBE goal methodology and anticipates completing its review by late March 2024. You will be notified when our review is complete. Pursuant to 49 CFR 26.49(a)(1), your firm is eligible to bid on FTA-assisted transit vehicle procurements in FY 2024 pending FTA's review. During the review process you must continue to implement your DBE program in good faith.

You may provide this letter to certify compliance with 49 CFR Part 26 for purposes of bidding on FTA-assisted transit vehicle procurements in FY 2024. FTA has also included your firm in the Eligible TVMs List on its website. If you have any questions, please contact the FTA DBE Team via email at *FTATVMSubmissions@dot.gov*.

Sincerely,

Andrew Mertens

Andrew Mertens
Program Manager
FTA Office of Civil Rights

GILLIG

BUY AMERICA CERTIFICATION OF COMPLIANCE WITH FTA REQUIREMENTS FOR BUSES, OTHER ROLLING STOCK, OR ASSOCIATED EQUIPMENT

GILLIG LLC, 451 Discovery Drive, Livermore California 94551, hereby certifies that GILLIG LLC will comply with the "Buy America" requirements of 49 United States Code (USC) §5323(j)(2)(C) and 49 Code of Federal Regulation (CFR) Part §661.11.

GILLIG LLC

By: _____

WILLIAM F. FAY, JR.

Title: VICE PRESIDENT, SALES

Date: 5/28/2024

JEFFERSON PARISH TRANSIT
JEFFERSON PARISH, LA
PRE-AWARD BUY AMERICA CERTIFICATE
FOURTY FOOT LOW FLOOR TRANSIT BUS (QTY: 1, OPTION: TBD, BID/CONTRACT# JEFFERSON PARISH, LA- 50-00145018)
31-May-24

GILLIG IS ONE OF THE MOST "AMERICAN" BUS MANUFACTURERS IN THE WORLD. Gillig is 100% U.S. owned and operated. ALL OF OUR FACILITIES are located in the U.S.A. ALL OF OUR MANUFACTURING is done in the U.S.A. and we have a policy that stresses the use of products produced in the U.S.A.

We certify full compliance with the FTA's "Buy America" regulations (Section 49 CFR Part 663) and submit the following abbreviated listing as evidence of this compliance.

COMPONENT	MANUFACTURER	COUNTRY OF ORIGIN	PERCENT OF TOTAL COST
A/C TRANSITION DUCTS	THERMAL STRUCTURES, INC	U.S.A.	0.11%
AIR CONDITIONING SYSTEM	THERMO-KING CORPORATION	U.S.A.	6.56%
AIR DRYER ASSEMBLY	SKF USA, INC	U.S.A.	0.16%
ALTERNATOR	C.E. NIEHOFF & CO.	U.S.A.	0.81%
BULKHEAD ASSEMBLY	ALVA-GWYN INC	U.S.A.	0.16%
CEILING PANELS	WILSONART INTERNATIONAL	U.S.A.	0.34%
COMPOSITE FLOORING	MILWAUKEE COMPOSITES	U.S.A.	0.42%
DESTINATION SIGNS	LUMINATOR TECHNOLOGY GROUP, INC	U.S.A.	1.64%
DOOR CONTROLS & PANELS - FRONT	VAPOR BUS INTERNATIONAL	U.S.A.	0.76%
DOOR CONTROLS & PANELS - REAR	VAPOR BUS INTERNATIONAL	U.S.A.	0.66%
DRIVER'S SEAT	RECARO NORTH AMERICA	U.S.A.	0.49%
ELECTRICAL HARNESSES, CABLES & PANELS	COMPASS COMPONENTS, INC.	U.S.A.	0.90%
ELECTRICAL HARNESSES, CABLES & PANELS	RESQ MANUFACTURING	U.S.A.	3.87%
ENGINE & AFTERTREATMENT SYSTEM	CUMMINS, INC	U.S.A.	14.79%
EXTERIOR MIRRORS	SAFE FLEET	U.S.A.	0.26%
EXTRUSIONS	HYDRO EXTRUSION USA, LLC	U.S.A.	0.99%
FABRICATIONS	BAYFAB METALS INC	U.S.A.	0.18%
FABRICATIONS	DETENTION DEVICE SYSTEMS	U.S.A.	0.14%
FABRICATIONS	DIE & TOOL PRODUCTS, INC	U.S.A.	1.27%
FABRICATIONS	EAST BAY MACHINE	U.S.A.	0.74%
FABRICATIONS	G C M	U.S.A.	0.97%
FABRICATIONS	GOLDEN PLASTICS CORP	U.S.A.	0.27%
FABRICATIONS	HOGAN MFG. INC.	U.S.A.	2.04%
FABRICATIONS	IMPERIAL FABRICATORS	U.S.A.	4.38%
FABRICATIONS	MASTER METAL PRODUCTS CO.	U.S.A.	0.42%
FABRICATIONS	RON NUNES ENTERPRISES	U.S.A.	0.50%
FRONT AND REAR AXLE ASSEMBLIES	MERITOR AUTOMOTIVE	U.S.A.	4.59%
FRONT AND REAR BUMPER ASSEMBLIES	DYNATECT - RO-LAB	U.S.A.	0.77%
FRONT CAP	MC CLARIN PLASTICS LLC	U.S.A.	0.59%
HEATER ASSEMBLIES	MOBILE CLIMATE CONTROL	U.S.A.	0.54%
INTERIOR LIGHTING KIT	I/O CONTROLS - LIGHTS	U.S.A.	1.19%
MISCELLANEOUS-I/O CONTROL	I/O CONTROLS - LIGHTS	U.S.A.	0.42%
PASSENGER SEAT ASSEMBLIES	AMERICAN SEATING	U.S.A.	5.76%
PIPING & TUBING	S.F. TUBE	U.S.A.	1.33%
RADIATOR PACKAGE	MODINE MFG CO	U.S.A.	1.61%
REAR CAP ASSEMBLY	PERFORMANCE COMPOSTIES	U.S.A.	0.21%
REAR SUSPENSION	HENDRICKSON USA L.L.C.	U.S.A.	0.48%
ROOF HATCH	SPECIALTY MANUFACTURING INC	U.S.A.	0.13%
ROOF SKIN	CRANE COMPOSITES	U.S.A.	0.14%
TIRES	THE GOODYEAR TIRE & RUBBER COMPANY	U.S.A.	1.05%
TRANSMISSION	ALLISON TRANSMISSION	U.S.A.	4.95%
VOLTAGE REGULATOR	VANNER, INC.	U.S.A.	0.14%
WHEELCHAIR RAMP	LIFT-U DIVISION OF HOGAN MFG.,INC	U.S.A.	2.06%
WHEELS	ADVANCED WHEELS SALES	U.S.A.	0.76%
WINDOW ASSEMBLIES	AROW GLOBAL	U.S.A.	3.88%
SPECIFICALLY IDENTIFIED U.S. COMPONENTS AS A % OF TOTAL MATERIALS			74.45% *
FINAL ASSEMBLY - ALL VEHICLE ASSEMBLY OPERATIONS, STARTING WITH THE UNDERSTRUCTURE THROUGH TO FINAL ROAD TEST ARE DONE IN LIVERMORE, CA	GILLIG	U.S.A.	100.00%

JEFFERSON PARISH TRANSIT
JEFFERSON PARISH, LA
PRE-AWARD BUY AMERICA CERTIFICATE
THIRTY FIVE FOOT LOW FLOOR TRANSIT BUS (QTY: 1, OPTION: TBD, BID/CONTRACT# JEFFERSON PARISH, LA- 50-00145018)
31-May-24

GILLIG IS ONE OF THE MOST "AMERICAN" BUS MANUFACTURERS IN THE WORLD. Gillig is 100% U.S. owned and operated. ALL OF OUR FACILITIES are located in the U.S.A. ALL OF OUR MANUFACTURING is done in the U.S.A. and we have a policy that stresses the use of products produced in the U.S.A.

We certify full compliance with the FTA's "Buy America" regulations (Section 49 CFR Part 663) and submit the following abbreviated listing as evidence of this compliance.

COMPONENT	MANUFACTURER	COUNTRY OF ORIGIN	PERCENT OF TOTAL COST
A/C TRANSITION DUCTS	THERMAL STRUCTURES, INC	U.S.A.	0.11%
AIR CONDITIONING SYSTEM	THERMO-KING CORPORATION	U.S.A.	6.61%
AIR DRYER ASSEMBLY	SKF USA, INC	U.S.A.	0.17%
ALTERNATOR	C.E. NIEHOFF & CO.	U.S.A.	0.86%
BULKHEAD ASSEMBLY	ALVA-GWYN INC	U.S.A.	0.17%
CEILING PANELS	WILSONART INTERNATIONAL	U.S.A.	0.32%
COMPOSITE FLOORING	MILWAUKEE COMPOSITES	U.S.A.	0.44%
DESTINATION SIGNS	LUMINATOR TECHNOLOGY GROUP, INC	U.S.A.	1.17%
DOOR CONTROLS & PANELS - FRONT	VAPOR BUS INTERNATIONAL	U.S.A.	0.81%
DOOR CONTROLS & PANELS - REAR	VAPOR BUS INTERNATIONAL	U.S.A.	0.70%
DRIVER'S SEAT	RECARO NORTH AMERICA	U.S.A.	0.62%
ELECTRICAL HARNESSES, CABLES & PANELS	COMPASS COMPONENTS, INC.	U.S.A.	0.35%
ELECTRICAL HARNESSES, CABLES & PANELS	RESQ MANUFACTURING	U.S.A.	3.81%
ENGINE & AFTERTREATMENT SYSTEM	CUMMINS, INC	U.S.A.	13.56%
EXTERIOR MIRRORS	SAFE FLEET	U.S.A.	0.34%
EXTRUSIONS	HYDRO EXTRUSION USA, LLC	U.S.A.	0.96%
FABRICATIONS	BAYFAB METALS INC	U.S.A.	0.21%
FABRICATIONS	DETENTION DEVICE SYSTEMS	U.S.A.	0.22%
FABRICATIONS	DIE & TOOL PRODUCTS, INC	U.S.A.	1.33%
FABRICATIONS	EAST BAY MACHINE	U.S.A.	0.82%
FABRICATIONS	G C M	U.S.A.	1.38%
FABRICATIONS	GOLDEN PLASTICS CORP	U.S.A.	0.26%
FABRICATIONS	HOGAN MFG. INC.	U.S.A.	0.36%
FABRICATIONS	IMPERIAL FABRICATORS	U.S.A.	6.12%
FABRICATIONS	MASTER METAL PRODUCTS CO.	U.S.A.	0.47%
FABRICATIONS	RON NUNES ENTERPRISES	U.S.A.	0.58%
FRONT AND REAR AXLE ASSEMBLIES	MERITOR AUTOMOTIVE	U.S.A.	4.81%
FRONT AND REAR BUMPER ASSEMBLIES	DYNATECT - RO-LAB	U.S.A.	0.81%
FRONT CAP	MC CLARIN PLASTICS LLC	U.S.A.	0.63%
HEATER ASSEMBLIES	MOBILE CLIMATE CONTROL	U.S.A.	0.58%
INTERIOR LIGHTING KIT	I/O CONTROLS - LIGHTS	U.S.A.	1.08%
MISCELLANEOUS-I/O CONTROL	I/O CONTROLS - LIGHTS	U.S.A.	0.24%
PASSENGER SEAT ASSEMBLIES	AMERICAN SEATING	U.S.A.	5.19%
PIPING & TUBING	S.F. TUBE	U.S.A.	1.30%
RADIATOR PACKAGE	MODINE MFG CO	U.S.A.	1.70%
REAR CAP ASSEMBLY	PERFORMANCE COMPOSTIES	U.S.A.	0.22%
REAR SUSPENSION	HENDRICKSON USA L.L.C.	U.S.A.	0.51%
ROOF HATCH	SPECIALTY MANUFACTURING INC	U.S.A.	0.13%
ROOF SKIN	CRANE COMPOSITES	U.S.A.	0.15%
TIRES	THE GOODYEAR TIRE & RUBBER COMPANY	U.S.A.	1.30%
TRANSMISSION	ALLISON TRANSMISSION	U.S.A.	5.24%
VOLTAGE REGULATOR	VANNER, INC.	U.S.A.	0.15%
WHEELCHAIR RAMP	LIFT-U DIVISION OF HOGAN MFG.,INC	U.S.A.	2.18%
WHEELS	ADVANCED WHEELS SALES	U.S.A.	0.38%
WINDOW ASSEMBLIES	AROW GLOBAL	U.S.A.	2.79%
SPECIFICALLY IDENTIFIED U.S. COMPONENTS AS A % OF TOTAL MATERIALS			72.13% *
FINAL ASSEMBLY - ALL VEHICLE ASSEMBLY OPERATIONS, STARTING WITH THE UNDERSTRUCTURE THROUGH TO FINAL ROAD TEST ARE DONE IN LIVERMORE, CA	GILLIG	U.S.A.	100.00%

JEFFERSON PARISH TRANSIT
JEFFERSON PARISH, LA
PRE-AWARD BUY AMERICA CERTIFICATE
THIRTY-FIVE FOOT ALLISON HYBRID LOW FLOOR TRANSIT BUS (QTY: 1, OPTION: TBD, BID/CONTRACT# JEFFERSON PARISH, LA- 50-00145018)
31-May-24

GILLIG IS ONE OF THE MOST "AMERICAN" BUS MANUFACTURERS IN THE WORLD. Gillig is 100% U.S. owned and operated. ALL OF OUR FACILITIES are located in the U.S.A. ALL OF OUR MANUFACTURING is done in the U.S.A. and we have a policy that stresses the use of products produced in the U.S.A.

We certify full compliance with the FTA's "Buy America" regulations (Section 49 CFR Part 663) and submit the following abbreviated listing as evidence of this compliance.

COMPONENT	MANUFACTURER	COUNTRY OF ORIGIN	PERCENT OF TOTAL COST
AIR CONDITIONING SYSTEM	THERMO-KING CORPORATION	U.S.A.	4.22%
COMPOSITE FLOORING	MILWAUKEE COMPOSITES	U.S.A.	0.29%
DESTINATION SIGNS	LUMINATOR TECHNOLOGY GROUP, INC	U.S.A.	0.67%
DOOR CONTROLS & PANELS - FRONT	VAPOR BUS INTERNATIONAL	U.S.A.	0.47%
DOOR CONTROLS & PANELS - REAR	VAPOR BUS INTERNATIONAL	U.S.A.	0.40%
DRIVER'S SEAT	RECARO NORTH AMERICA	U.S.A.	0.34%
ELECTRIC DRIVE HYBIRD PROPULSION SYSTEM	ALLISON TRANSMISSION	U.S.A.	30.04%
ELECTRICAL HARNESSES, CABLES & PANELS	COMPASS COMPONENTS, INC.	U.S.A.	0.28%
ELECTRICAL HARNESSES, CABLES & PANELS	RESQ MANUFACTURING	U.S.A.	2.89%
ENGINE & AFTERTREATMENT SYSTEM	CUMMINS, INC	U.S.A.	5.17%
EXTERIOR MIRRORS	SAFE FLEET	U.S.A.	0.22%
EXTRUSIONS	HYDRO EXTRUSION USA, LLC	U.S.A.	0.57%
FABRICATIONS	BAYFAB METALS INC	U.S.A.	0.33%
FABRICATIONS	DETENTION DEVICE SYSTEMS	U.S.A.	0.30%
FABRICATIONS	DIE & TOOL PRODUCTS, INC	U.S.A.	0.81%
FABRICATIONS	EAST BAY MACHINE	U.S.A.	0.67%
FABRICATIONS	G C M	U.S.A.	0.92%
FABRICATIONS	GOLDEN PLASTICS CORP	U.S.A.	0.17%
FABRICATIONS	HOGAN MFG. INC.	U.S.A.	0.98%
FABRICATIONS	IMPERIAL FABRICATORS	U.S.A.	3.47%
FABRICATIONS	MASTER METAL PRODUCTS CO.	U.S.A.	0.57%
FABRICATIONS	RON NUNES ENTERPRISES	U.S.A.	0.55%
FRONT AND REAR AXLE ASSEMBLIES	MERITOR AUTOMOTIVE	U.S.A.	2.79%
FRONT AND REAR BUMPER ASSEMBLIES	DYNATECT - RO-LAB	U.S.A.	0.51%
HEATER ASSEMBLIES	MOBILE CLIMATE CONTROL	U.S.A.	0.41%
INTERIOR LIGHTING KIT	I/O CONTROLS - LIGHTS	U.S.A.	0.65%
PASSENGER SEAT ASSEMBLIES	AMERICAN SEATING	U.S.A.	3.25%
PIPING & TUBING	S.F. TUBE	U.S.A.	0.92%
RADIATOR PACKAGE	MODINE MFG CO	U.S.A.	1.68%
REAR SUSPENSION	HENDRICKSON USA L.L.C.	U.S.A.	0.30%
TIRES	THE GOODYEAR TIRE & RUBBER COMPANY	U.S.A.	0.61%
TRANSMISSION	ALLISON TRANSMISSION	U.S.A.	3.03%
WHEELCHAIR RAMP	LIFT-U DIVISION OF HOGAN MFG.,INC	U.S.A.	1.26%
WHEELS	ADVANCED WHEELS SALES	U.S.A.	0.45%
WINDOW ASSEMBLIES	AROW GLOBAL	U.S.A.	1.26%
SPECIFICALLY IDENTIFIED U.S. COMPONENTS AS A % OF TOTAL MATERIALS			71.45% *
FINAL ASSEMBLY - ALL VEHICLE ASSEMBLY OPERATIONS, STARTING WITH THE UNDERSTRUCTURE THROUGH TO FINAL ROAD TEST ARE DONE IN LIVERMORE, CA	GILLIG	U.S.A.	100.00%

JEFFERSON PARISH TRANSIT
JEFFERSON PARISH, LA
PRE-AWARD BUY AMERICA CERTIFICATE
FORTY FOOT ALLISON HYBRID LOW FLOOR TRANSIT BUS (QTY: 1, OPTION: TBD, BID/CONTRACT# JEFFERSON PARISH, LA- 50-00145018)
31-May-24

GILLIG IS ONE OF THE MOST "AMERICAN" BUS MANUFACTURERS IN THE WORLD. Gillig is 100% U.S. owned and operated. ALL OF OUR FACILITIES are located in the U.S.A. ALL OF OUR MANUFACTURING is done in the U.S.A. and we have a policy that stresses the use of products produced in the U.S.A.

We certify full compliance with the FTA's "Buy America" regulations (Section 49 CFR Part 663) and submit the following abbreviated listing as evidence of this compliance.

COMPONENT	MANUFACTURER	COUNTRY OF ORIGIN	PERCENT OF TOTAL COST
AIR CONDITIONING SYSTEM	THERMO-KING CORPORATION	U.S.A.	4.39%
COMPOSITE FLOORING	MILWAUKEE COMPOSITES	U.S.A.	0.30%
DESTINATION SIGNS	LUMINATOR TECHNOLOGY GROUP, INC	U.S.A.	1.05%
DOOR CONTROLS & PANELS - FRONT	VAPOR BUS INTERNATIONAL	U.S.A.	0.49%
DOOR CONTROLS & PANELS - REAR	VAPOR BUS INTERNATIONAL	U.S.A.	0.42%
DRIVER'S SEAT	RECARO NORTH AMERICA	U.S.A.	0.32%
ELECTRIC DRIVE HYBIRD PROPULSION SYSTEM	ALLISON TRANSMISSION	U.S.A.	31.50%
ELECTRICAL HARNESSES, CABLES & PANELS	COMPASS COMPONENTS, INC.	U.S.A.	0.47%
ELECTRICAL HARNESSES, CABLES & PANELS	RESQ MANUFACTURING	U.S.A.	3.16%
ENGINE & AFTERTREATMENT SYSTEM	CUMMINS, INC	U.S.A.	5.89%
EXTERIOR MIRRORS	SAFE FLEET	U.S.A.	0.02%
EXTRUSIONS	HYDRO EXTRUSION USA, LLC	U.S.A.	0.63%
FABRICATIONS	BAYFAB METALS INC	U.S.A.	0.31%
FABRICATIONS	DETENTION DEVICE SYSTEMS	U.S.A.	0.18%
FABRICATIONS	DIE & TOOL PRODUCTS, INC	U.S.A.	0.84%
FABRICATIONS	EAST BAY MACHINE	U.S.A.	0.66%
FABRICATIONS	G C M	U.S.A.	0.73%
FABRICATIONS	GOLDEN PLASTICS CORP	U.S.A.	0.17%
FABRICATIONS	HOGAN MFG. INC.	U.S.A.	2.03%
FABRICATIONS	IMPERIAL FABRICATORS	U.S.A.	2.68%
FABRICATIONS	MASTER METAL PRODUCTS CO.	U.S.A.	0.57%
FABRICATIONS	RON NUNES ENTERPRISES	U.S.A.	0.50%
FRONT AND REAR AXLE ASSEMBLIES	MERITOR AUTOMOTIVE	U.S.A.	2.94%
FRONT AND REAR BUMPER ASSEMBLIES	DYNATECT - RO-LAB	U.S.A.	0.49%
HEATER ASSEMBLIES	MOBILE CLIMATE CONTROL	U.S.A.	0.30%
PASSENGER SEAT ASSEMBLIES	AMERICAN SEATING	U.S.A.	3.69%
PIPING & TUBING	S.F. TUBE	U.S.A.	0.84%
REAR SUSPENSION	HENDRICKSON USA L.L.C.	U.S.A.	0.31%
TIRES	THE GOODYEAR TIRE & RUBBER COMPANY	U.S.A.	0.64%
TRANSMISSION	ALLISON TRANSMISSION	U.S.A.	3.18%
WHEELCHAIR RAMP	LIFT-U DIVISION OF HOGAN MFG.,INC	U.S.A.	1.48%
WHEELS	ADVANCED WHEELS SALES	U.S.A.	0.49%
WINDOW ASSEMBLIES	AROW GLOBAL	U.S.A.	2.49%
SPECIFICALLY IDENTIFIED U.S. COMPONENTS AS A % OF TOTAL MATERIALS			74.14% *
FINAL ASSEMBLY - ALL VEHICLE ASSEMBLY OPERATIONS, STARTING WITH THE UNDERSTRUCTURE THROUGH TO FINAL ROAD TEST ARE DONE IN LIVERMORE, CA	GILLIG	U.S.A.	100.00%

GILLIG

CRASHWORTHINESS (CRASH TEST)

GILLIG LLC, 451 Discovery Drive, Livermore California 94551, hereby certifies that GILLIG LLC will comply with the side impact crash test requirements that are detailed in the FTA Urban Mass Transportation Administration (UMTA) "Baseline Advanced Design Transit Coach Specifications" paragraph 2.1.2.10 Crashworthiness.

Complete crash test report(s) can be provided upon request. These report findings highlight GILLIG's superior design knowledge and technology, as well as our unmatched vehicle structural integrity and durability. Agencies are highly encouraged to request and read the full reports.

GILLIG LLC

By: _____

WILLIAM F. FAY, JR.

Title: VICE PRESIDENT, SALES

Date: 5/28/2024

GILLIG

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 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: 5/28/2024

DIESEL 40FT.

STURAA TEST

12 YEAR

500,000 MILE BUS

from

GILLIG CORPORATION

MODEL LOWFLOOR

DECEMBER 2004

PTI-BT-R0410

PENNSTATE

The Pennsylvania Transportation Institute

201 Research Office Building (814) 865-1891
The Pennsylvania State University
University Park, PA 16802

Bus Testing and Research Center

2237 Old Rt 220 N. (814) 695-3404
Duncansville, PA 16635

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Gillig Corporation submitted a model Lowfloor, diesel-powered 36 seat (including the driver) 40-foot bus, for a 12 yr/500,000 mile STURAA test. The odometer reading at the time of delivery was 4,127 miles. Testing started on May 26, 2004 and was completed on December 3, 2004. The Check-In section of the report provides a description of the bus and specifies its major components.

The primary part of the test program is the Structural Durability Test, which also provides the information for the Maintainability and Reliability results. The Structural Durability Test was started on June 21, 2004 and was completed on November 5, 2004.

The interior of the bus is configured with seating for 36 passengers including the driver. Free floor space will accommodate 39 standing passengers resulting in a potential capacity of 75 persons. At 150 lbs per person, this load results in a measured gross vehicle weight of 37,950 lbs. The first segment of the Structural Durability Test was performed with the bus loaded to a GVW of 37,950 lbs. The middle segment was performed at a seated load weight of 32,540 lbs and the final segment was performed at a curb weight of 27,240 lbs. Durability driving resulted in unscheduled maintenance and failures that involved a variety of subsystems. A description of failures, and a complete and detailed listing of scheduled and unscheduled maintenance is provided in the Maintainability section of this report.

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.

The Reliability section compiles failures that occurred during Structural Durability Testing. Breakdowns are classified according to subsystems. The data in this section are arranged so that those subsystems with more frequent problems are apparent. The problems are also listed by class as defined in Section 2. The test bus encountered no Class 1 or Class 2 failures. Of the 24 reported failures, nine were Class 3 and 15 were Class 4.

The Safety Test, (a double-lane change, obstacle avoidance test) was safely performed in both right-hand and left-hand directions up to a maximum test speed of 45 mph. The performance of the bus is illustrated by a speed vs. time plot. Acceleration and gradeability test data are provided in Section 4, Performance. The average time to obtain 50 mph was 30.82 seconds.

The Shakedown Test produced a maximum final loaded deflection of 0.183 inches with a permanent set ranging between 0.001 to 0.006 inches under a distributed static load of 28,125 lbs. The Distortion Test was completed with all subsystems, doors and escape mechanisms operating properly. No water leakage was observed throughout the test. All subsystems operated properly.

The Static Towing Test was performed using a target load (towing force) of 32,688 lbs. All four front pulls were completed to the full test load with no damage or deformation observed. The Dynamic Towing Test was performed by means of a front-lift tow. The towing interface was accomplished using a hydraulic under-lift wrecker. The bus was towed without incident and no damage resulted from the test. The manufacturer does not recommend towing the bus from the rear, therefore, a rear test was not performed. The Jacking and Hoisting Tests were also performed without incident. The bus was found to be stable on the jack stands, and the minimum jacking clearance observed with a tire deflated was 5.1 inches.

A Fuel Economy Test was run on simulated central business district, arterial, and commuter courses. The results were 3.50 mpg, 4.41 mpg, and 7.40 mpg respectively; with an overall average of 4.43 mpg.

A series of Interior and Exterior Noise Tests was performed. These data are listed in Section 7.1 and 7.2 respectively.

ABBREVIATIONS

ABTC	-	Altoona Bus Test Center
A/C	-	air conditioner
ADB	-	advance design bus
ATA-MC	-	The Maintenance Council of the American Trucking Association
CBD	-	central business district
CW	-	curb weight (bus weight including maximum fuel, oil, and coolant; but without passengers or driver)
dB(A)	-	decibels with reference to 0.0002 microbar as measured on the "A" scale
DIR	-	test director
DR	-	bus driver
EPA	-	Environmental Protection Agency
FFS	-	free floor space (floor area available to standees, excluding ingress/egress areas, area under seats, area occupied by feet of seated passengers, and the vestibule area)
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)
GVW	-	gross vehicle weight (curb weight plus gross vehicle load)
GVWR	-	gross vehicle weight rating
MECH	-	bus mechanic
mpg	-	miles per gallon
mph	-	miles per hour
PM	-	Preventive maintenance
PSBRTF	-	Penn State Bus Research and Testing Facility
PTI	-	Pennsylvania Transportation Institute
rpm	-	revolutions per minute
SAE	-	Society of Automotive Engineers
SCH	-	test scheduler
SEC	-	secretary
SLW	-	seated load weight (curb weight plus 150 lb for every designed passenger seating position and for the driver)
STURAA	-	Surface Transportation and Uniform Relocation Assistance Act
TD	-	test driver
TECH	-	test technician
TM	-	track manager
TP	-	test personnel

TEST BUS CHECK-IN

I. OBJECTIVE

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 consists 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 must certify 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 consists of a Gillig Corporation, model Lowfloor. The bus has a front door equipped with a Lift-U model LU6 03.-03 handicap ramp, located forward of the front axle and a rear door forward of the rear axle. Power is provided by a diesel-fueled, Cummins Motors model ISM 280 engine coupled to a Voith model A4VTOR2-8.5E transmission.

The measured curb weight is 8,300 lbs for the front axle and 18,940 lbs for the rear axle. These combined weights provide a total measured curb weight of 27,240 lbs. There are 36 seats including the driver and room for 39 standing passengers bringing the total passenger capacity to 75. Gross load is 150 lb x 75 = 11,250 lbs. At full capacity, the measured gross vehicle weight is 37,950 lbs.

VEHICLE DATA FORM

Bus Number: 0410	Arrival Date: 5-26-04
Bus Manufacturer: Gillig	Vehicle Identification Number (VIN): 15GGD211641076000
Model Number: Lowfloor	Date: 5-26-04
Personnel: T.S. & S.C.	

WEIGHT:

Individual Wheel Reactions:

Weights (lb)	Front Axle		Middle Axle		Rear Axle	
	Right	Left	Right	Left	Right	Left
CW	4,110	4,190	N/A	N/A	8,940	10,000
SLW	4,850	4,970	N/A	N/A	10,920	11,800
GVW	6,320	6,470	N/A	N/A	12,220	12,940

Total Weight Details:

Weight (lb)	CW	SLW	GVW	GAWR
Front Axle	8,300	9,820	12,790	14,600
Middle Axle	N/A	N/A	N/A	N/A
Rear Axle	18,940	22,720	25,160	25,000
Total	27,240	32,540	37,950	GVWR: 39,600

Dimensions:

Length (ft/in)	40 / 10.0
Width (in)	101.0
Height (in)	121.0 (exhaust pipe)
Front Overhang (in)	89.5
Rear Overhang (in)	122.0
Wheel Base (in)	278.5
Wheel Track (in)	Front: 85.7
	Rear: 77.7

Bus Number: 0410	Date: 5-26-04

CLEARANCES:

Lowest Point Outside Front Axle	Location: Skid plate Clearance(in): 9.0
Lowest Point Outside Rear Axle	Location: Transmission coolant pipe Clearance(in): 10.4
Lowest Point between Axles	Location: Frame Clearance(in): 12.8
Ground Clearance at the center (in)	12.8
Front Approach Angle (deg)	8.1
Rear Approach Angle (deg)	9.1
Ramp Clearance Angle (deg)	5.3
Aisle Width (in)	Front – 17.5 Rear – 23.0
Inside Standing Height at Center Aisle (in)	Front – 94.6 Rear – 76.2

BODY DETAILS:

Body Structural Type	Monocoque		
Frame Material	Steel		
Body Material	Aluminum & fiberglass		
Floor Material	Plywood		
Roof Material	Aluminum & fiberglass		
Windows Type	□ Fixed	■ Movable	
Window Mfg./Model No.	Excel / AS3 M14 G DOT 573		
Number of Doors	1 Front	1 Rear	
Mfr. / Model No.	Gillig / Vapor controllers		
Dimension of Each Door (in)	Front – 32.6 x 77.0	Rear – 29.8 x 77.7	
Passenger Seat Type	□ Cantilever	■ Pedestal	□ Other (explain)
Mfr. / Model No.	American Seating / Metropolitan		
Driver Seat Type	■ Air	□ Spring	□ Other (explain)
Mfr. / Model No.	Recaro / Ergo AM80/72		
Number of Seats (including Driver)	36 (2 w/c positions with 4 seats folded away)		

Bus Number: 0410	Date: 5/26/04

BODY DETAILS (Contd..)

Free Floor Space (ft^2)	58.8			
Height of Each Step at Normal Position (in)	Front	1. 15.2	2. N/A	3. N/A	4. N/A
	Middle	1. N/A	2. N/A	3. N/A	4. N/A
	Rear	1. 15.8	2. N/A	3. N/A	4. N/A
Step Elevation Change - Kneeling (in)	3.4			

ENGINE

Type	■ C.I.	□ Alternate Fuel	
	□ S.I.	□ Other (explain)	
Mfr. / Model No.	Cummins Motors / ISM 280		
Location	□ Front	■ Rear	□ Other (explain)
Fuel Type	□ Gasoline	□ CNG	□ Methanol
	■ Diesel	□ LNG	□ Other (explain)
Fuel Tank Capacity (indicate units)	120 gals		
Fuel Induction Type	■ Injected	□ Carburetion	
Fuel Injector Mfr. / Model No.	Cummins Motors / ISM 280		
Carburetor Mfr. / Model No.	N/A		
Fuel Pump Mfr. / Model No.	Cummins Motors / ISM 280		
Alternator (Generator) Mfr. / Model No.	C.E.Nichoff & Co.		
Maximum Rated Output (Volts / Amps)	26 / 300		
Air Compressor Mfr. / Model No.	Cummins / 18.7		
Maximum Capacity (ft^3 / min)	18.7		
Starter Type	■ Electrical	□ Pneumatic	□ Other (explain)
Starter Mfr. / Model No.	Delco-Remy / 10479130		

Bus Number: 0410	Date: 5-26-04

TRANSMISSION

Transmission Type	□ Manual	■ Automatic	
Mfr. / Model No.	Voith / A4VT0R2-8.5 E		
Control Type	□ Mechanical	■ Electrical	□ Other
Torque Convertor Mfr. / Model No.	Voith / A4VT0R2-8.5 E		
Integral Retarder Mfr. / Model No.	Voith / A4VT0R2-8.5 E		

SUSPENSION

Number of Axles	2		
Front Axle Type	□ Independent	■ Beam Axle	
Mfr. / Model No.	Meritor / FH946 RK		
Axle Ratio (if driven)	N/A		
Suspension Type	■ Air	□ Spring	□ Other (explain)
No. of Shock Absorbers	2		
Mfr. / Model No.	Koni / 902423		
Middle Axle Type	□ 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 / 71163WX		
Axle Ratio (if driven)	5.38		
Suspension Type	■ Air	□ Spring	□ Other (explain)
No. of Shock Absorbers	4		
Mfr. / Model No.	Koni / 902626		

Bus Number: 0410	Date: 5-26-04

WHEELS & TIRES

Front	Wheel Mfr./ Model No.	Alcoa / 22.56 x 8.25
	Tire Mfr./ Model No.	Goodyear G159 / 12R 22.5
Rear	Wheel Mfr./ Model No.	Alcoa / 22.56 x 8.25
	Tire Mfr./ Model No.	Goodyear G159 / 12R 22.5

BRAKES

Front Axle Brakes Type	■ Cam	□ Disc	□ Other (explain)
Mfr. / Model No.	Meritor / 16.5x6 Cost plus		
Middle Axle Brakes Type	□ Cam	□ Disc	□ Other (explain)
Mfr. / Model No.	N/A		
Rear Axle Brakes Type	■ Cam	□ Disc	□ Other (explain)
Mfr. / Model No.	Meritor / 14.5x10W		
Retarder Type	Integral hydraulic transmission		
Mfr. / Model No.	Voith / A4VT0R2-8.5 E		

HVAC

Heating System Type	□ Air	■ Water	□ Other
Capacity (Btu/hr)	94,000		
Mfr. / Model No.	Thermo King / T1		
Air Conditioner	■ Yes	□ No	
Location	Rear, above engine compartment		
Capacity (Btu/hr)	104,000		
A/C Compressor Mfr. / Model No.	Thermo King Corp. / X426		

STEERING

Steering Gear Box Type	Hydraulic gear
Mfr. / Model No.	TRW / Ross
Steering Wheel Diameter	20.0
Number of turns (lock to lock)	4.75

Bus Number: 0410	Date: 5-26-04

OTHERS

Wheel Chair Ramps	Location: Front door	Type: Hinged ramp
Wheel Chair Lifts	Location: N/A	Type: N/A
Mfr. / Model No.	Lift-U / LU6 03-03	
Emergency Exit	Location: Windows Doors Roof hatch	Number: 6 2 2

CAPACITIES

Fuel Tank Capacity (units)	120 gals
Engine Crankcase Capacity (gallons)	8.675
Transmission Capacity (gallons)	Dry: 7.4 Refill: 6.6
Differential Capacity (gallons)	5.5
Cooling System Capacity (quarts)	50
Power Steering Fluid Capacity (gallons)	3.6

VEHICLE DATA FORM

Bus Number: 0410	Date: 5-26-04

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

Part Number	Description	Qty.
G159 12R 22.5	Goodyear tires	6
FA. Voith 59.3355.10	Transmission filter	3
Donaldson P151097	Engine air filter	1
5298	Airbags	4
LF9001	Engine oil filter	1
102011	Engine fuel filter	1
Koni 902423	Shock	1
WF2071	Coolant	1
Koni 902626	Shock	1
Na	Radius rod (front)	2
Na	Radius rod (rear)	2

COMPONENT/SUBSYSTEM INSPECTION FORM

Bus Number: 0410	Date: 5-26-04

Subsystem	Checked	Comments
Air Conditioning Heating and Ventilation	√	
Body and Sheet Metal	√	
Frame	√	
Steering	√	
Suspension	√	
Interior/Seating	√	
Axles	√	
Brakes	√	
Tires/Wheels	√	
Exhaust	√	
Fuel System	√	Diesel
Power Plant	√	
Accessories	√	
Lift System	√	Hinged ramp.
Interior Fasteners	√	
Batteries	√	

CHECK - IN

GILLIG CORPORATION'S MODEL LOWFLOOR

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 is checked, and where accessibility is restricted the subsystem is 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

Bus Number: 0410	Date: 12-3-04

Component	Checked	Comments
ENGINE :	√	
Oil Dipstick	√	
Oil Filler Hole	√	
Oil Drain Plug	√	
Oil Filter	√	
Fuel Filter	√	
Air Filter	√	
Belts	√	
Coolant Level	√	
Coolant Filler Hole	√	
Coolant Drain	√	
Spark / Glow Plugs	√	
Alternator	√	
Diagnostic Interface Connector	√	
TRANSMISSION :		
Fluid Dip-Stick	√	
Filler Hole	√	
Drain Plug	√	
SUSPENSION :		
Bushings	√	
Shock Absorbers	√	
Air Springs	√	
Leveling Valves	√	
Grease Fittings	√	

ACCESSIBILITY DATA FORM

Bus Number: 0410	Date: 12-3-04

Component	Checked	Comments
HVAC :		
A/C Compressor	√	
Filters	√	
Fans	√	
ELECTRICAL SYSTEM :		
Fuses	√	
Batteries	√	
Voltage regulator	√	
Voltage Convertors	√	
Lighting	√	
MISCELLANEOUS :		
Brakes	√	
Handicap Lifts/Ramps	√	
Instruments	√	
Axles	√	
Exhaust	√	
Fuel System	√	
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 will be conducted by operating the NBM and collecting the following data on work order forms and a driver log.

1. Unscheduled Maintenance
    a. Bus number
    b. Date
    c. Mileage
    d. Description of malfunction
    e. Location of malfunction (e.g., in service or undergoing inspection)
    f. Repair action and parts used
    g. Man-hours required

2. Scheduled Maintenance
    a. Bus number
    b. Date
    c. Mileage
    d. Engine running time (if available)
    e. Results of scheduled inspections
    f. Description of malfunction (if any)
    g. Repair action and parts used (if any)
    h. Man-hours required

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

A. Service
    1. Fueling
    2. Consumable checks
    3. Interior cleaning

B. Preventive Maintenance
    4. Brake adjustments
    5. Lubrication
    6. 3,000 mi (or equivalent) inspection

7. Oil and filter change inspection
8. Major inspection
9. 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

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. Table 1 is a list of the lubricating products used in servicing. Finally, the Unscheduled Maintenance List along with Unscheduled Maintenance-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 occurred, a description of the malfunction and repair, and the time required to perform the repair.

SCHEDULED MAINTENANCE

Gillig #0410

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
07-01-04	1,194	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
07-16-04	1,555	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
07-23-04	1,993	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
08-04-04	2,585	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
08-13-04	3,305	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
08-19-04	3,759	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
08-26-04	4,808	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
09-01-04	5,551	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
09-08-04	6,651	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00

SCHEDULED MAINTENANCE

Gillig #0410

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
09-15-04	7,822	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
09-21-04	8,929	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
09-28-04	9,852	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
10-04-04	10,767	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
10-18-04	12,743	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
10-27-04	13,816	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
11-01-04	14,567	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
11-08-04	15,000	P.M. / Inspection Fuel Economy Prep.	Linkage, tie rods, universals/u-joints all lubed. Oil changed. Oil, fuel, and air filters changed. Transmission oil and filter changed.	8.00	8.00

Table 1. STANDARD LUBRICANTS

The following is a list of Texaco lubricant products used in bus testing conducted by the Penn State University Altoona Bus Testing Center:

ITEM	PRODUCT CODE	TEXACO DESCRIPTION
Engine oil	#2112	URSA Super Plus SAE 30
Transmission oil	#1866	Automatic Trans Fluid Mercon/Dexron II Multipurpose
Gear oil	#2316	Multigear Lubricant EP SAE 80W90
Wheel bearing & Chassis grease	#1935	Starplex II

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 will involve components that may be expected to fail or require replacement during the service life of the bus. In addition, any component that fails during the NBM testing is added to this list. Components to be included are:

1. Transmission
2. Alternator
3. Starter
4. Batteries
5. Windshield wiper motor

1.3-III. DISCUSSION

During the test, several additional components were removed for repair or replacement. Following is a list of components and total repair/replacement time.

	MAN HOURS
Left front bump stop.	0.50
Left front slack adjuster snap ring & spacers.	0.50
A/C Belt.	0.50
Right front bump stop.	0.50
Left rear, front axle air bag.	1.00
Left front shock.	1.00
Hydraulic fluid reservoir.	2.00
Right front shock.	0.25

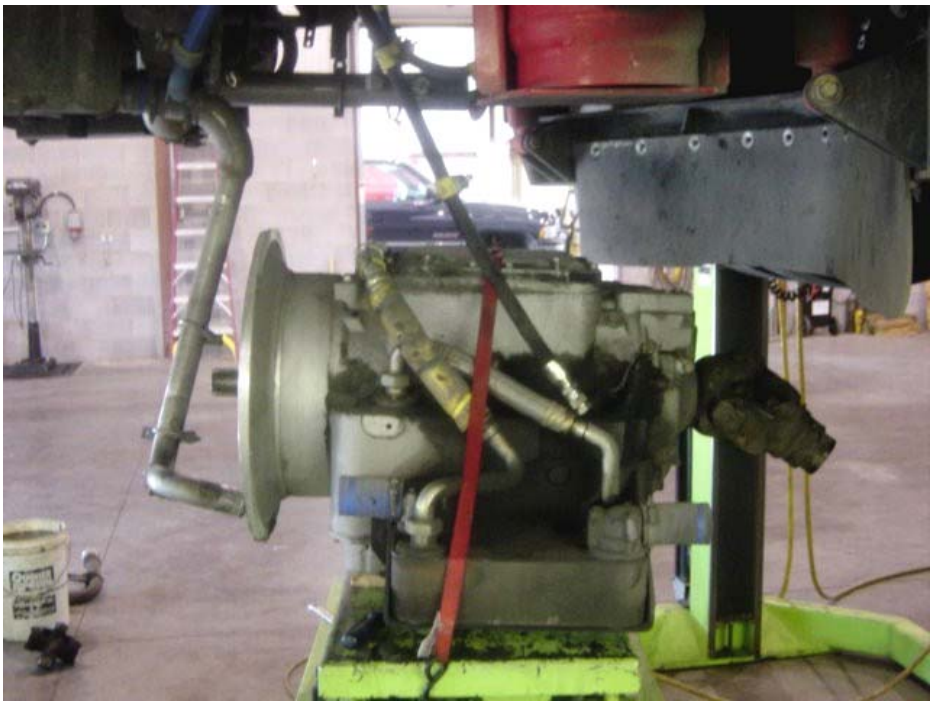
At the end of the test, the remaining items on the list were removed and replaced. The transmission assembly took 8.0 man-hours (two men 4.0 hrs) to remove and

replace. The time required for repair/replacement of the four remaining components is given on the following Repair and/or Replacement Form.

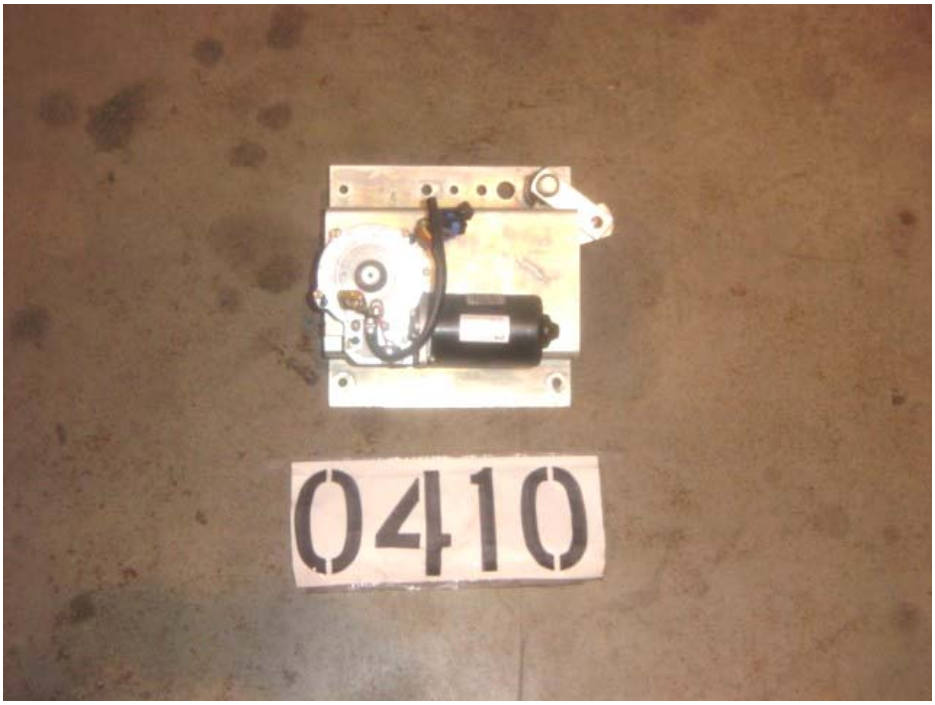
REPLACEMENT AND/OR REPAIR FORM

Subsystem	Replacement Time
Transmission	8.00 man hours
Wiper Motor	0.50 man hours
Starter	0.75 man hours
Alternator	0.75 man hours
Batteries	0.50 man hours

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS



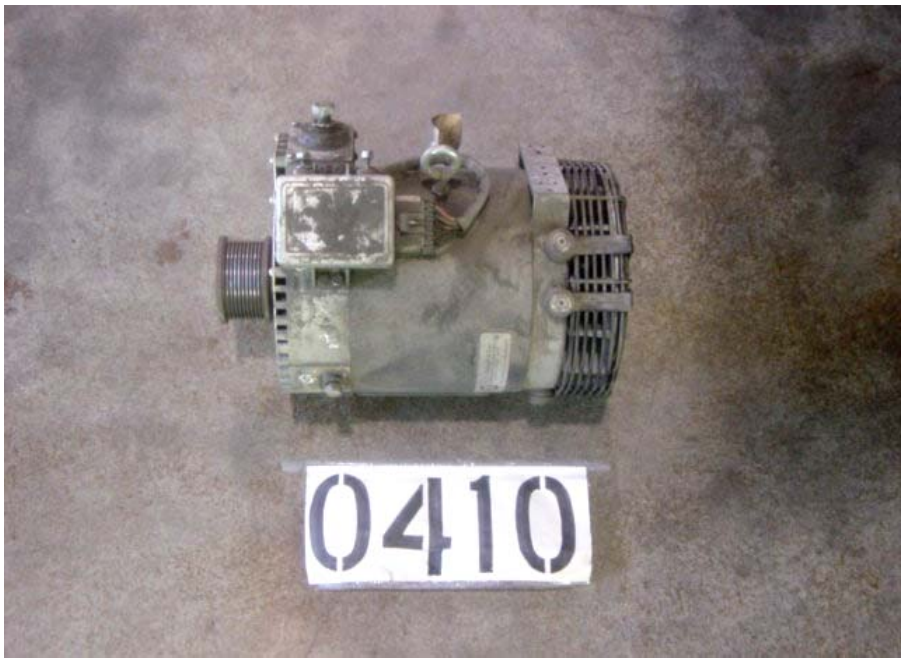
TRANSMISSION REMOVAL AND REPLACEMENT (8.00 MAN HOURS)



WIPER MOTOR REMOVAL AND REPLACEMENT (0.50 MAN HOURS)

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS CONT.

STARTER REMOVAL AND REPLACEMENT (0.75 MAN HOURS)



ALTERNATOR REMOVAL AND REPLACEMENT (0.75 MAN 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, man-hours to repair, and hours out of service are recorded on the Reliability Data Form.

CLASS OF FAILURES

Classes of failures are described below:

(a) Class 1: Physical Safety. A failure that could lead directly to passenger or driver injury and represents a severe crash situation.

(b) Class 2: Road Call. 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) Class 3: Bus Change. 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) Class 4: Bad Order. 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 is accumulated during the Structural Durability Test. The following Reliability Data Form lists all unscheduled repairs under classes as defined above. These classifications are somewhat subjective as the test is performed on a test track with careful inspections every two hours. However, even on the road, there is considerable latitude on deciding how to handle many failures.

The Unscheduled Repair List is also attached to provide a reference for the repairs that are included in the Reliability Data Forms.

The classification of repairs according to subsystem is intended to emphasize those systems which had persistent minor or more serious problems. There were no Class 1 or 2 failures. Of the nine Class 3 failures, seven involved the suspension system and one each to the brakes and engine/transmission. These, and the remaining 15 Class 4 failures are available for review in the Unscheduled Maintenance List, located in Section 5.7 Structural Durability.

RELIABILITY DATA FORMS

Bus Number: 0410	Date: 11/5/04
Personnel: Bob Reifsteck	

	Failure Type					
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
Subsystems	Mileage	Mileage	Mileage	Mileage	Man Hours	Down Time
Suspension	1,346				0.50	24.00
	1,483				0.50	8.00
	2,464				0.50	8.00
		2,534			0.50	8.00
	2,534				0.50	0.50
	2,708				0.50	8.00
	3,147				0.50	8.00
	3,363				0.50	8.00
		3,419			1.00	1.00
	3,836				0.50	8.00
	5,201				0.50	8.00
		5,288			1.00	8.00
		7,307			1.00	8.00
		9,974			1.00	10.00
		12,743			0.25	3.00
		12,743			1.00	48.00
Seats/Compartment	2,095				0.50	8.00
	5,500				0.25	0.25
	5,500				0.25	0.25

RELIABILITY DATA FORMS

Bus Number: 0410	Date: 11/5/04
Personnel: Bob Reifsteck	

Failure Type			
Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety

Subsystems	Mileage	Mileage	Mileage	Mileage	Man Hours	Down Time
Air Conditioning	445				0.50	2.00
	729				1.00	4.00
Brakes		445			0.50	2.00
Engine/Transmission		12,487			2.00	2.00
Fuel System	729				0.50	8.00

3. SAFETY - A DOUBLE-LANE CHANGE (OBSTACLE AVOIDANCE)

3-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-II. TEST DESCRIPTION

The Safety Test is a vehicle handling and stability test. The bus will be operated at SLW on a smooth and level test track. The bus will be driven through a double lane change course at increasing speed until the test is considered unsafe or a speed of 45 mph is reached. The lane change course will be set up using pylons to mark off two 12 foot center to center lanes with two 100 foot lane change areas 100 feet apart. The bus will begin in one lane, change to the other lane in a 100 foot span, travel 100 feet, and return to the original lane in another 100 foot span. This procedure will be repeated, starting first in the right-hand and then in the left-hand lane.

3-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.

SAFETY DATA FORM

Bus Number: 0410	Date: 11-11-04
Personnel: R.C., T.S. & S.C.	

Temperature (°F): 56	Humidity (%): 45
Wind Direction: SW	Wind Speed (mph): 8
Barometric Pressure (in.Hg): 30.10	

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: A safe profile was maintained through all portions of testing.	
Comments of the tire/ground contact patch: Tire/ground contact was maintained through all portions of testing.	

3. SAFETY

RIGHT - HAND APPROACH

LEFT - HAND APPROACH

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 will be operated at SLW on the skid pad at the PSBRTF. The bus will be accelerated at full throttle from a standstill to a maximum "geared" or "safe" speed as determined by the test driver. The vehicle speed is measured using a Correvit non-contacting speed sensor. The times to reach speed between ten mile per hour increments are measured and recorded using a stopwatch with a lap timer. The time to speed data will be recorded on the Performance Data Form and later used to generate a speed vs time plot and gradeability calculations.

4-III. DISCUSSION

This test consists of three runs in both the clockwise and counterclockwise directions on the Test Track. Velocity versus time data is obtained for each run and results are averaged together to minimize any test variability which might be introduced by wind or other external factors. The test was performed up to a maximum speed of 50 mph. The fitted curve of velocity vs time is attached, followed by the calculated gradeability results. The average time to obtain 50 mph was 30.82 seconds.

PERFORMANCE DATA FORM

Bus Number: 0410	Date: 11-11-04
Personnel: R.C., T.S. & S.C.	

Temperature (°F): 56	Humidity (%): 45
Wind Direction: SW	Wind Speed (mph): 8
Barometric Pressure (in.Hg): 30.10	

Air Conditioning compressor-OFF	√_ Checked
Ventilation fans-ON HIGH	√_ Checked
Heater pump motor-Off	√_ Checked
Defroster-OFF	√_ Checked
Exterior and interior lights-ON	√_ Checked
Windows and doors-CLOSED	√_ Checked

ACCELERATION, GRADEABILITY, TOP SPEED

Counter Clockwise Recorded Interval Times

Speed	Run 1	Run 2	Run 3
10 mph	4.86	5.05	4.65
20 mph	8.24	8.42	8.15
30 mph	12.33	12.71	12.36
40 mph	20.39	20.36	19.83
Top Test Speed(mph) 50	33.00	32.37	32.03

Clockwise Recorded Interval Times

Speed	Run 1	Run 2	Run 3
10 mph	4.37	5.02	5.34
20 mph	7.71	8.34	8.62
30 mph	11.68	12.40	12.84
40 mph	18.27	18.99	19.81
Top Test Speed(mph) 50	28.35	29.02	30.16

0410.ACC

PERFORMANCE SUMMARY SHEET

BUS MANUFACTURER :Gillig
BUS MODEL :LowFloor

BUS NUMBER :0410
TEST DATE :11/11/04

TEST CONDITIONS :

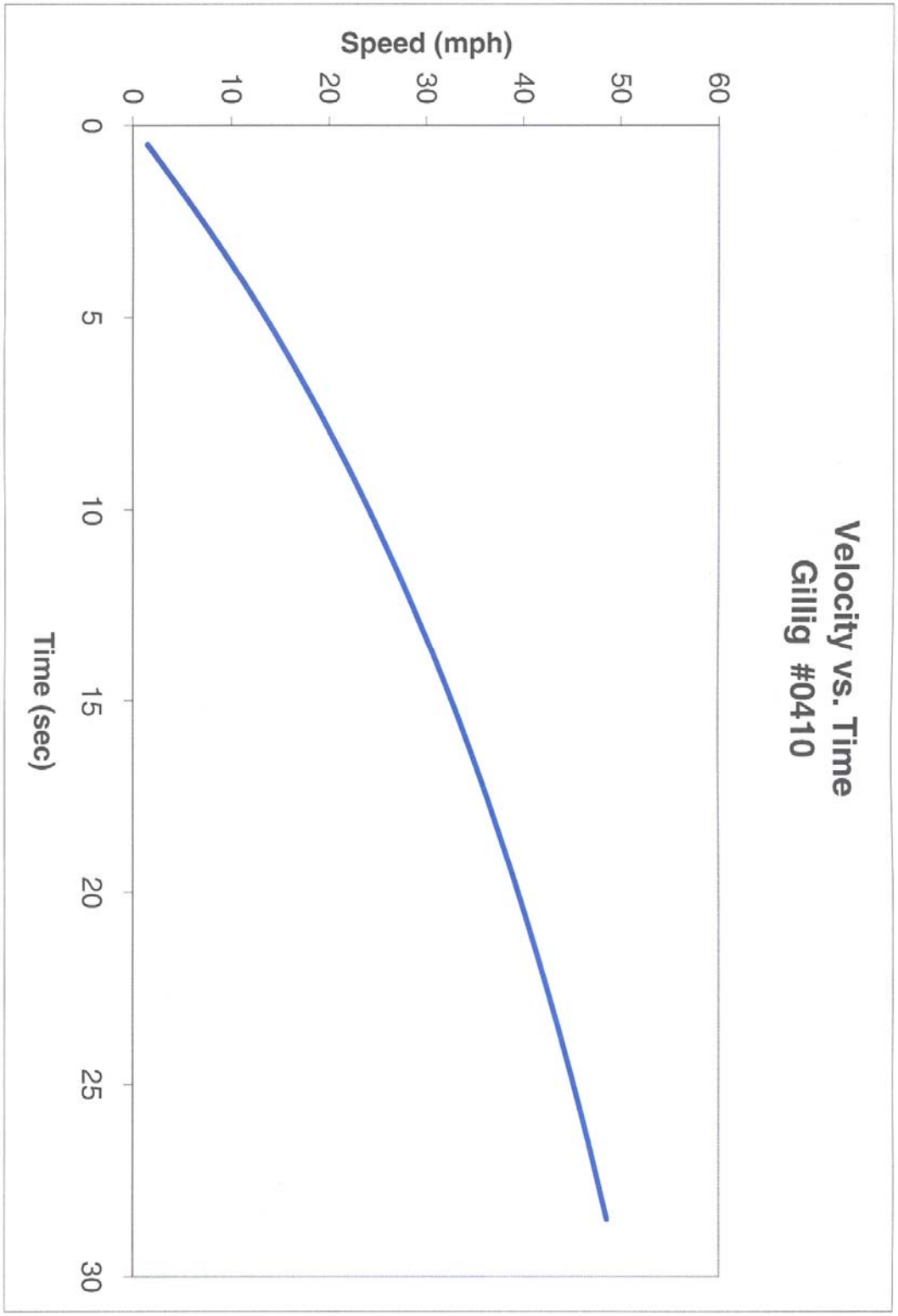
TEMPERATURE (DEG F) : 56.0
WIND DIRECTION : SW
WIND SPEED (MPH) : 8.0
HUMIDITY (%) : 45
BAROMETRIC PRESSURE (IN. HG) : 30.1

VEHICLE SPEED (MPH)	AVERAGE TIME (SEC) CCW DIRECTION	CW DIRECTION	TOTAL
10.0	4.85	4.91	4.88
20.0	8.27	8.22	8.25
30.0	12.47	12.31	12.39
40.0	20.19	19.02	19.61
50.0	32.47	29.18	30.82

TEST SUMMARY :

VEHICLE SPEED (MPH)	TIME (SEC)	ACCELERATION (FT/SEC^2)	MAX. GRADE (%)
1.0	.33	4.4	13.7
5.0	1.71	4.1	12.8
10.0	3.59	3.7	11.7
15.0	5.65	3.4	10.6
20.0	7.93	3.0	9.5
25.0	10.49	2.7	8.4
30.0	13.38	2.4	7.4
35.0	16.66	2.1	6.5
40.0	20.45	1.8	5.6
45.0	24.87	1.5	4.8
50.0	30.12	1.3	4.0

NOTE : Gradeability results were calculated from performance test data. Actual sustained gradeability performance for vehicles equipped with auto transmission may be lower than the values indicated here.


Velocity vs. Time
Gillig #0410
Speed (mph)
60
50
40
30
20
10
0
0
5
10
15
20
25
30
Time (sec)

5. STRUCTURAL INTEGRITY

5.1 STRUCTURAL STRENGTH AND DISTORTION TESTS - STRUCTURAL SHAKEDOWN TEST

5.1-I. DISCUSSION

The objective of this test is to determine certain static characteristics (e.g., bus floor deflection, permanent structural deformation, etc.) under static loading conditions.

5.1-II. TEST DESCRIPTION

In this test, the bus will be isolated from the suspension by blocking the vehicle under the suspension points. The bus will then be loaded and unloaded up to a maximum of three times with a distributed load equal to 2.5 times gross load. Gross load is 150 lb for every designed passenger seating position, for the driver, and for each 1.5 sq ft of free floor space. For a distributed load equal to 2.5 times gross load, place a 375-lb load on each seat and on every 1.5 sq ft of free floor space. The first loading and unloading sequence will "settle" the structure. Bus deflection will be measured at several locations during the loading sequences.

5.1-III. DISCUSSION

This test was performed based on a maximum passenger capacity of 75 people including the driver. The resulting test load is (75 x 375 lb) = 28,125 lb. The load is distributed evenly over the passenger space. Deflection data before and after each loading and unloading sequence is provided on the Structural Shakedown Data Form.

The unloaded height after each test becomes the original height for the next test. Some initial settling is expected due to undercoat compression, etc. After each loading cycle, the deflection of each reference point is determined. The bus is then unloaded and the residual (permanent) deflection is recorded. On the final test, the maximum loaded deflection was 0.183 inches at reference point 10. The maximum permanent deflection after the final loading sequence ranged from 0.001 inches at reference points 1, 6, and 7 to 0.006 inches at reference point 8.

STRUCTURAL SHAKEDOWN DATA FORM

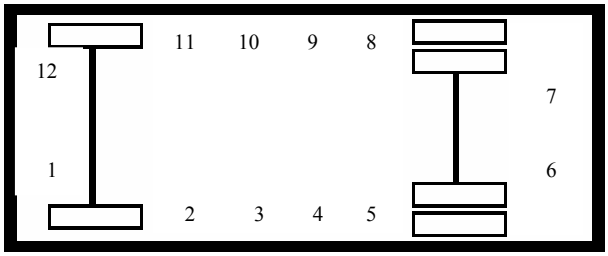
Bus Number: 0410	Date: 6-10-04
Personnel: D.L., M.H. T.S. & E.L.	Temperature (°F): 74
Loading Sequence: ■ 1 □ 2 □ 3 (check one) Test Load (lbs): 28,125	

Indicate Approximate Location of Each Reference Point

Right

Front of Bus

Left



Top View

Reference Point No.	A (in) Original Height	B (in) Loaded Height	B-A (in) Loaded Deflection	C (in) Unloaded Height	C-A (in) Permanent Deflection
1	0	.036	.036	.033	.033
2	0	.128	.128	.029	.029
3	0	.186	.186	.045	.045
4	0	.181	.181	.038	.038
5	0	.158	.158	.035	.035
6	0	.009	.009	.004	.004
7	0	.010	.010	.001	.001
8	0	.183	.183	.035	.035
9	0	.212	.212	.039	.039
10	0	.214	.214	.036	.036
11	0	.135	.135	.023	.023
12	0	.011	.011	.036	.036

STRUCTURAL SHAKEDOWN DATA FORM

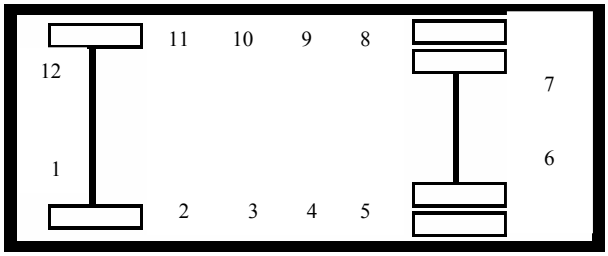
Bus Number: 0410	Date: 6-10-04
Personnel: D.L., M.H., T.S. & E.L.	Temperature (°F): 78
Loading Sequence: □ 1 ■ 2 □ 3 (check one) Test Load (lbs): 28,125	

Indicate Approximate Location of Each Reference Point

Right

Front of Bus

Left



Top View

Reference Point No.	A (in) Original Height	B (in) Loaded Height	B-A (in) Loaded Deflection	C (in) Unloaded Height	C-A (in) Permanent Deflection
1	.033	.045	.012	.034	.001
2	.029	.140	.111	.032	.003
3	.045	.204	.159	.050	.005
4	.038	.200	.162	.043	.005
5	.035	.175	.140	.040	.005
6	.004	.006	.002	.005	.001
7	.001	.000	-.001	.002	.001
8	.035	.185	.150	.041	.006
9	.039	.219	.180	.044	.005
10	.036	.219	.183	.041	.005
11	.023	.139	.116	.026	.003
12	.036	.012	-.024	.040	.004

5.1 STRUCTURAL SHAKEDOWN TEST

BUS LOADED TO 2.5 TIMES GVL
(28,125 LBS)

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 GVWR, each wheel of the bus will be raised (one at a time) to simulate operation over a curb and the following will be 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 will then be 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 handicapped 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.

DISTORTION TEST INSPECTION FORM
(Note: Ten copies of this data sheet are required)

Bus Number: 0410	Date: 6-17-04
Personnel: T.S., M.H., E.L. & E.D.	Temperature(°F): 78

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.
■ Handicapped Device/ 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)

Bus Number: 0410	Date: 6-17-04
Personnel: T.S., M.H., E.L. & E.D.	Temperature(°F): 78

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.
■ Handicapped Device/ 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)

Bus Number: 0410	Date: 6-17-04
Personnel: T.S., M.H., E.L. & E.D.	Temperature(°F): 78

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.
■ Handicapped Device/ 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)

Bus Number: 0410	Date: 6-17-04
Personnel: T.S., M.H., E.L. & E.D.	Temperature(°F): 78

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.
■ Handicapped Device/ 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)

Bus Number: 0410	Date: 6-17-04
Personnel: T.S., M.H., E.L. & E.D.	Temperature(°F): 78

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.
■ Handicapped Device/ 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)

Bus Number: 0410	Date: 6-17-04
Personnel: T.S., M.H., E.L. & E.D.	Temperature(°F): 78

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.
■ Handicapped Device/ 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)

Bus Number: 0410	Date: 6-17-04
Personnel: T.S., M.H., E.L. & E.D.	Temperature(°F): 78

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.
■ Handicapped Device/ 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)

Bus Number: 0410	Date: 6-17-04
Personnel: T.S., M.H., E.L. & E.D.	Temperature(°F): 78

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.
■ Handicapped Device/ 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)

Bus Number: 0410	Date: 6-17-04
Personnel: T.S., M.H., E.L. & E.D.	Temperature(°F): 78

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.
■ Handicapped Device/ 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)

Bus Number: 0410	Date: 6-17-04
Personnel: T.S., M.H., E.L. & E.D.	Temperature(°F): 78

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.
■ Handicapped Device/ 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 FRONT WHEEL SIX INCHES HIGHER

RIGHT REAR WHEEL SIX INCHES LOWER

5.3 STRUCTURAL STRENGTH AND DISTORTION TESTS - STATIC TOWING TEST

5.3-I. TEST OBJECTIVE

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 is used to apply a static tension load equal to 1.2 times the bus curb weight. The load will be 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 will be 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 32,688 lbs (1.2 x 27,240 lbs CW). All four front pulls were completed with no damage or deformation observed. The manufacturer does not recommend towing from the rear, therefore, no rear test was performed.

STATIC TOWING TEST DATA FORM

Bus Number: 0410	Date: 11-23-04
Personnel: R.C., T.S., M.H. & S.C.	Temperature (°F): 49

Inspect right front tow eye and adjoining structure.
Comments: No damage or deformation observed.
Check the torque/welds of all bolts attaching tow eye and surrounding structure.
Comments: Welds verified.
Inspect left tow eye and adjoining structure.
Comments: No damage or deformation observed.
Check the torque/welds of all bolts attaching tow eye and surrounding structure.
Comments: Welds verified.
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 four front
pulls were completed to the full target test load of 32,688 lbs (1.2 x 27,240 lbs) with
no damage or deformation observed. The manufacturer does not recommend rear
towing, therefore, a rear test was not performed.

5.3 STATIC TOWING TEST

FRONT 20° UPWARD PULL

FRONT 20° DOWNWARD PULL

5.3 STATIC TOWING TEST CONT.

FRONT 20° LEFT PULL

FRONT 20° RIGHT PULL

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 requires the bus be towed at curb weight using the specified equipment and instructions provided by the manufacturer and a heavy-duty wrecker. The bus will be towed for 5 miles at a speed of 20 mph for each recommended towing configuration. After releasing the bus from the wrecker, the bus will be visually inspected for any structural damage or permanent deformation. All doors, windows and passenger escape mechanisms will be 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. Rear towing is not recommended. No problems, deformation, or damage was noted during testing.

DYNAMIC TOWING TEST DATA FORM

Bus Number: 0410	Date: 12-2-04
Personnel: S.C. & M.H.	

Temperature (°F): 41	Humidity (%): 60
Wind Direction: Calm	Wind Speed (mph): Calm
Barometric Pressure (in.Hg): 30.12	

Inspect tow equipment-bus interface.
Comments: A safe and adequate connection was made between the tow equipment and the bus.
Inspect tow equipment-wrecker interface.
Comments: A safe and adequate connection was made between the tow equipment and the wrecker.
Towing Comments: A front lift tow was performed incorporating a hydraulic under lift wrecker.
Description and location of any structural damage: None noted.
General Comments: The manufacturer does not recommend towing from the rear; therefore, a rear tow was not performed.

5.4 DYNAMIC TOWING TEST

TOWING INTERFACE

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 are replaced with deflated tire(s) of the appropriate type. A portable hydraulic floor jack is 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) are replaced with the original tire(s) and the hack is lowered. Any structural damage or permanent deformation is recorded on the test data sheet. This procedure is repeated for each corner of the bus.

5.5-III. DISCUSSION

The jack used for this test has a minimum height of 8.75 inches. During the deflated portion of the test, the jacking point clearances ranged from 5.1 inches to 24.0 inches. No deformation or damage was observed during testing. A complete listing of jacking point clearances is provided in the Jacking Test Data Form.

JACKING CLEARANCE SUMMARY

Condition	Frame Point Clearance
Front axle – one tire flat	8.2”
Rear axle – one tire flat	23.9”
Rear axle – two tires flat	21.7”

JACKING TEST DATA FORM

Bus Number: 0410	Date: 6-8-04
Personnel: S.C.	Temperature (°F): 70

Record any permanent deformation or damage to bus as well as any difficulty encountered during jacking procedure.

Deflated Tire	Jacking Pad Clearance Body/Frame (in)	Jacking Pad Clearance Axle/Suspension (in)	Comments
Right front	11.4 " I 8.2 " D	8.6 " I 5.3 " D	
Left front	11.3 " I 8.2 " D	8.6 " I 5.1 " D	
Right rear—outside	27.0 " I 24.0 " D	10.3 " I 9.5 " D	
Right rear—both	27.0 " I 21.8 " D	10.3 " I 8.1 " D	
Left rear—outside	26.8 " I 23.9 " D	10.3 " I 9.6 " D	
Left rear—both	26.8 " I 21.7 " D	10.3 " I 8.0 " D	
Right middle or tag—outside	NA	NA	
Right middle or tag—both	NA	NA	
Left middle or tag—outside	NA	NA	
Left middle or tag—both	NA	NA	

Additional comments of any deformation or difficulty during jacking:

none

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 is 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 will be checked for stability on the jack stands and for any damage to the jacking pads or bulkheads. The procedure is repeated for the rear end of the bus. The procedure is then repeated for the front and rear simultaneously.

5.6-III. DISCUSSION

The test was conducted using four posts of a six-post electric lift and standard 19 inch jack stands. The bus was hoisted from the front wheel, rear wheel, and then the front and rear wheels simultaneously and placed on jack stands.

The bus easily accommodated the placement of the vehicle lifts and jack stands and the procedure was performed without any instability noted.

HOISTING TEST DATA FORM

Bus Number: 0410	Date: 6-8-04
Personnel: S.C.	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 front and rear wheels are supported by the jack stands:
None noted.

5.7 STRUCTURAL DURABILITY TEST

5.7-I. TEST OBJECTIVE

The objective of this test is to perform an accelerated durability test that approximates up to 25 percent of the service life of the vehicle.

5.7-II. TEST DESCRIPTION

The test vehicle is driven a total of 15,000 miles; approximately 12,500 miles on the PSBRTF Durability Test Track and approximately 2,500 miscellaneous other miles. The test will be conducted with the bus operated under three different loading conditions. The first segment will consist of approximately 6,250 miles with the bus operated at GVW. The second segment will consist of approximately 2,500 miles with the bus operated at SLW. The remainder of the test, approximately 6,250 miles, will be conducted with the bus loaded to CW. If GVW exceeds the axle design weights, then the load will be adjusted to the axle design weights and the change will be recorded. All subsystems are run during these tests in their normal operating modes. All recommended manufacturers servicing is to be followed and noted on the vehicle maintainability log. Servicing items accelerated by the durability tests will be compressed by 10:1; all others will be done on a 1:1 mi/mi basis. Unscheduled breakdowns and repairs are recorded on the same log as are any unusual occurrences as noted by the driver. Once a week the test vehicle shall be washed down and thoroughly inspected for any signs of failure.

5.7-III. DISCUSSION

The Structural Durability Test was started on June 21, 2004 and was conducted until November 5, 2004. The first 6,250 miles were performed at a GVW of 37,950 lbs. and completed on September 8, 2004. The next 2,500 mile SLW segment was performed at 32,540 lbs and completed on September 22, 2004, and the final 6,250 mile segment was performed at a CW of 27,240 lbs and completed on November 5, 2004.

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 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.

GILLIG - TEST BUS #0410
MILEAGE DRIVEN/RECORDED FROM DRIVERS' LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
06/21/04 TO 06/27/04	511.00	75.00	586.00
06/28/04 TO 07/04/04	485.00	175.00	660.00
07/05/04 TO 07/11/04	95.00	5.00	100.00
07/12/04 TO 07/18/04	158.00	112.00	270.00
07/19/04 TO 07/25/04	358.00	121.00	479.00
07/26/04 TO 08/01/04	419.00	20.00	439.00
08/02/04 TO 08/08/04	184.00	109.00	293.00
08/09/04 TO 08/15/04	409.00	127.00	536.00
08/16/04 TO 08/22/04	504.00	127.00	631.00
08/23/04 TO 08/29/04	1155.00	52.00	1207.00
08/30/04 TO 09/05/04	790.00	130.00	920.00
09/06/04 TO 09/12/04	701.00	485.00	1186.00
09/13/04 TO 09/19/04	1118.00	51.00	1169.00
09/20/04 TO 09/26/04	920.00	187.00	1107.00
09/27/04 TO 10/03/04	994.00	49.00	1043.00
10/04/04 TO 10/10/04	1162.00	154.00	1316.00
10/11/04 TO 10/17/04	625.00	29.00	654.00

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
10/18/04 TO 10/24/04	403.00	123.00	526.00
10/25/04 TO 10/31/04	1196.00	156.00	1352.00
11/01/04 TO 11/07/04	304.00	222.00	526.00
TOTAL	12491.00	2509.00	15000.00

Table 4. Driving Schedule for Bus Operation on the Durability Test Track.

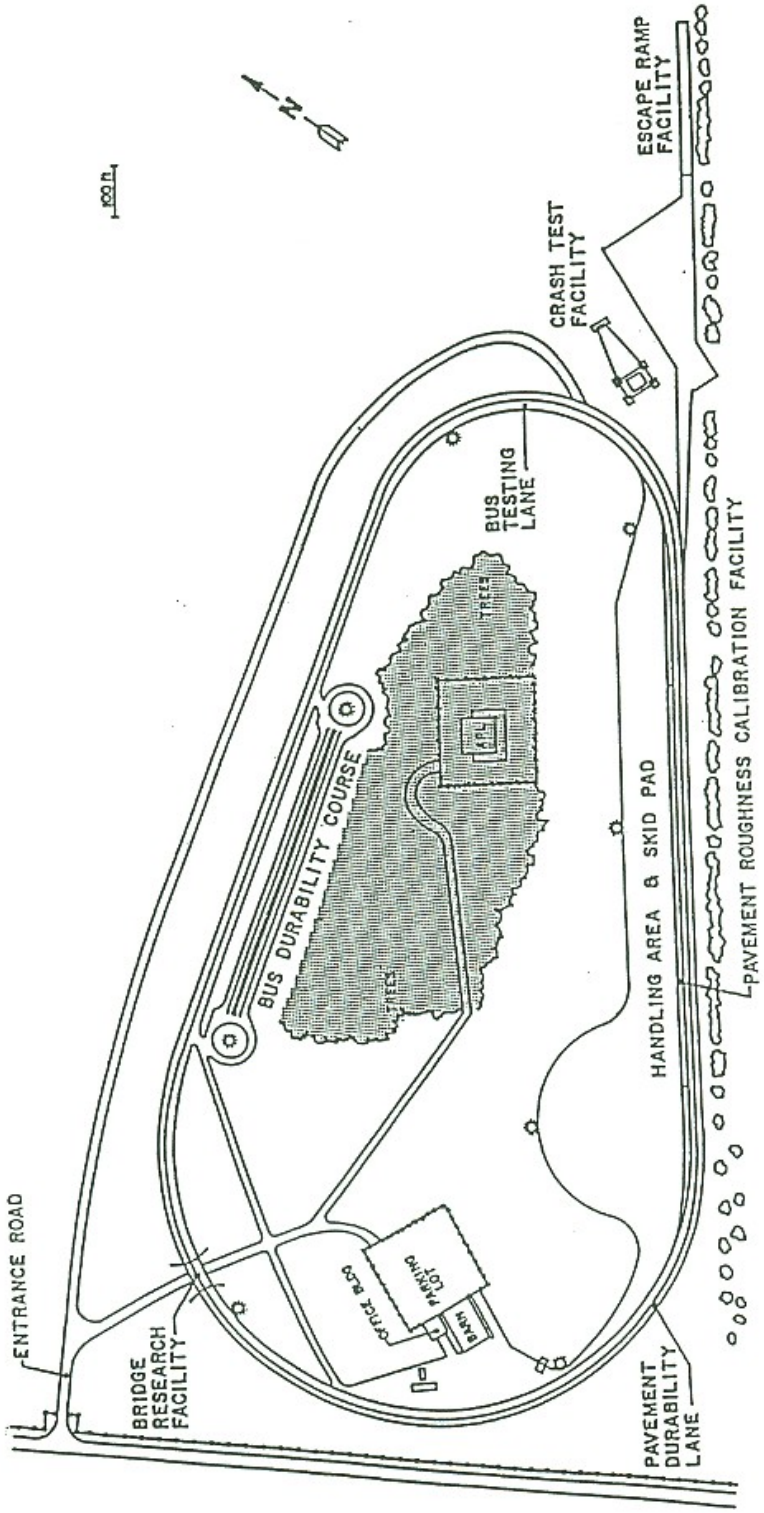
STANDARD OPERATING SCHEDULE

Monday through Friday

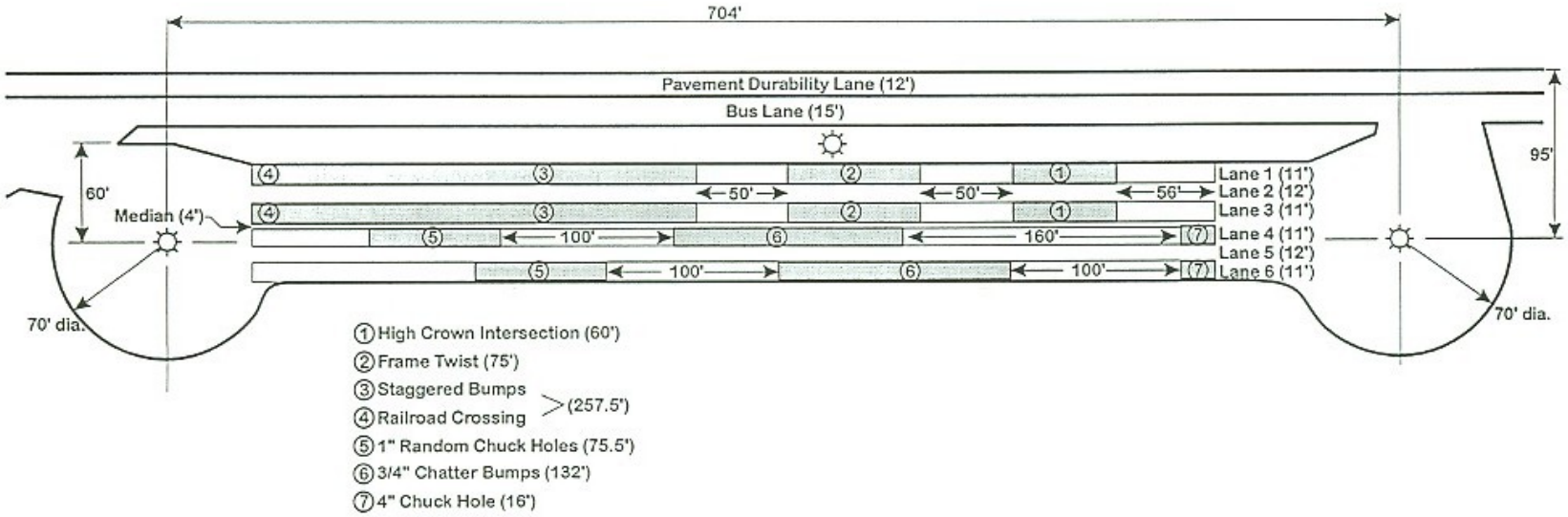
	HOUR	ACTION
Shift 1	midnight	D
	1:40 am	C
	1:50 am	B
	2:00 am	D
	3:35 am	C
	3:45 am	B
	4:05 am	D
	5:40 am	C
	5:50 am	B
	6:00 am	D
	7:40 am	C
	7:50 am	F
Shift 2	8:00 am	D
	9:40 am	C
	9:50 am	B
	10:00 am	D
	11:35 am	C
	11:45 am	B
	12:05 pm	D
	1:40 pm	C
	1:50 pm	B
	2:00 pm	D
	3:40 pm	C
	3:50 pm	F
Shift 3	4:00 pm	D
	5:40 pm	C
	5:50 pm	B
	6:00 pm	D
	7:40 pm	C
	7:50 pm	B
	8:05 pm	D
	9:40 pm	C
	9:50 pm	B
	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 OF PENN STATE BUS TESTING AND RESEARCH FACILITY"



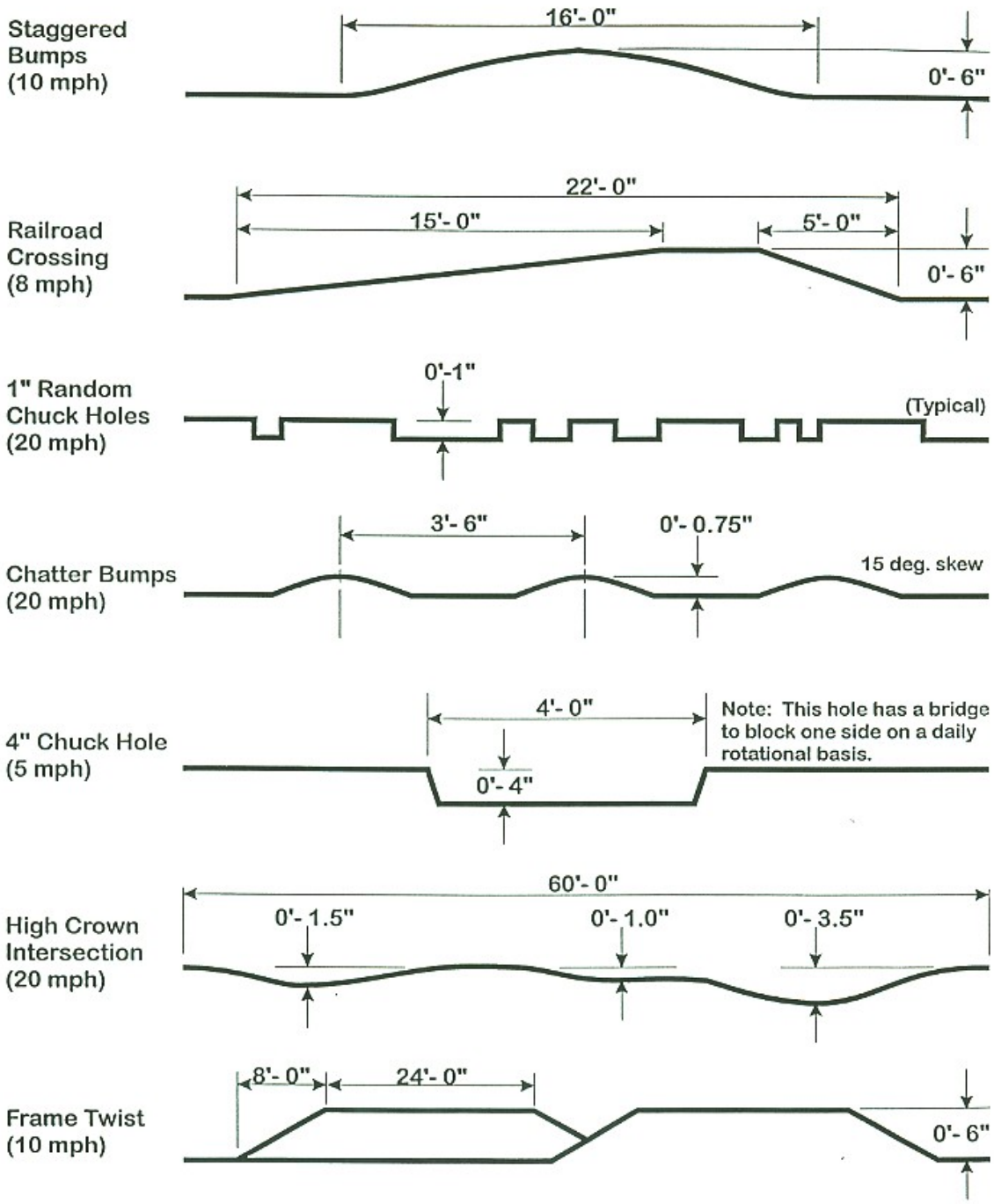
BUS TESTING AND RESEARCH TEST TRACK
UNIVERSITY PARK, PA



Plan View

Vehicle Durability Test Track

The Pennsylvania Transportation Institute
Penn State



Durability Element Profiles

The Pennsylvania Transportation Institute
Penn State

UNSCHEDULED MAINTENANCE

Gillig 0410

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
06/25/04	445	The snap ring and spacers are missing from the front left slack adjuster. Part found on the test track undamaged.	Snap ring and spacers installed in slack adjuster.	2.00	0.50
06/25/04	445	The A/C belt came off.	Undamaged A/C belt reinstalled.	2.00	0.50
06/29/04	729	Fuel is splashing out of the filler cap.	Hinged rubber cap replaced with a lock-on metal cap.	8.00	0.50
06/29/04	729	The A/C belt is riding half way off the pulleys.	A/C compressor repositioned and belt reinstalled.	4.00	1.00
07/13/04	1,346	The left front bump stop is broken.	Left front bump stop replaced.	24.00	0.50
07/15/04	1,483	The right front bump stop is broken.	Right front bump stop replaced.	8.00	0.50
07/26/04	2,095	The driver's seat will not hold air.	Leaking air supply line repaired.	8.00	0.50
07/28/04	2,464	The right front bump stop is broken.	Right front bump stop replaced.	8.00	0.50

UNSCHEDULED MAINTENANCE

Gillig 0410

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
07/30/04	2,534	The front leveling valve link is disconnected.	Front leveling valve link reconnected.	8.00	0.50
08/04/04	2,534	Both front bump stops are broken.	Both front bump stops replaced.	0.50	0.50
08/06/04	2,708	The right front bump stop is broken.	Right front bump stop replaced.	8.00	0.50
08/12/04	3,147	The right front bump stop is broken.	Right front bump stop replaced.	8.00	0.50
08/16/04	3,363	The right front bump stop is broken.	Right front bump stop replaced.	8.00	0.50
08/17/04	3,419	The left rear, front axle air bag has failed.	Air bag replaced.	1.00	1.00
08/20/04	3,836	The left front bump stop is broken.	Left front bump stop replaced.	8.00	0.50
08/30/04	5,201	The right front bump stop is broken.	Right front bump stop replaced.	8.00	0.50
08/31/04	5,288	The left front, front axle air bag is leaking air.	Air bag replaced.	8.00	1.00

UNSCHEDULED MAINTENANCE

Gillig 0410

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
09/01/04	5,500	The 3rd seat on the right side has a broken frame.	Seat removed.	0.25	0.25
09/01/04	5,500	The slide tracks on the battery tray are loose.	Screws tightened.	0.25	0.25
09/13/04	7,307	The “T” fitting for the left front, front axle air bag is leaking air.	“T” fitting replaced.	8.00	1.00
09/29/04	9,974	The left front shock is broken.	Left front shock replaced.	10.00	1.00
10/14/04	12,487	The hydraulic fluid reservoir is cracked at the inlet hose connection.	New reservoir installed.	2.00	2.00
10/20/04	12,743	The right front shock is worn and leaking oil.	Right front shock replaced.	3.00	0.25
10/20/04	12,743	The H-beam anchor point is cracked.	Crack welded/repaired.	48.00	1.00

UNSCHEDULED MAINTENANCE

BROKEN SEAT FRAME
(5,500 TEST MILES)

BROKEN LEFT FRONT SHOCK
(9,974 TEST MILES)

UNSCHEDULED MAINTENANCE CONT.

CRACKED HYDRAULIC RESERVOIR
(12,487 TEST MILES)

CRACKED H-BEAM ANCHOR POINT
(12,743 TEST MILES)

6. FUEL ECONOMY TEST - A FUEL CONSUMPTION TEST USING AN APPROPRIATE OPERATING CYCLE

6-I. TEST OBJECTIVE

The objective of this test is to provide accurate comparable fuel consumption data on transit buses produced by different manufacturers. This fuel 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 fuel economy test, as designated here, is a measurement of the fuel expended by a vehicle traveling a specified test loop under specified operating conditions. The results of this test will not represent actual mileage but will provide data that can be used by recipients to compare buses tested by this procedure.

6-II. TEST DESCRIPTION

This test requires operation of the bus over a course based on the Transit Coach Operating Duty Cycle (ADB Cycle) at seated load weight using a procedure based on the Fuel Economy Measurement Test (Engineering Type) For Trucks and Buses: SAE 1376 July 82. The procedure has been modified by elimination of the control vehicle and by modifications as described below. The inherent uncertainty and expense of utilizing a control vehicle over the operating life of the facility is impractical.

The fuel economy test will be performed as soon as possible (weather permitting) after the completion of the GVW portion of the structural durability test. It will be conducted on the bus test lane at the Penn State Test Facility. Signs are erected at carefully measured points which delineate the test course. A test run will comprise 3 CBD phases, 2 Arterial phases, and 1 Commuter phase. An electronic fuel measuring system will indicate the amount of fuel consumed during each phase of the test. The test runs will be repeated until there are at least two runs in both the clockwise and counterclockwise directions in which the fuel consumed for each run is within $\pm$ 4 percent of the average total fuel used over the 4 runs. A 20-minute idle consumption test is performed just prior to and immediately after the driven portion of the fuel economy test. The amount of fuel consumed while operating at normal/low idle is recorded on the Fuel Economy Data Form. This set of four valid runs along with idle consumption data comprise a valid test.

The test procedure is the ADB cycle with the following four modifications:

1. The ADB cycle is structured as a set number of miles in a fixed time in the following order: CBD, Arterial, CBD, Arterial, CBD, Commuter. A separate idle fuel consumption measurement is performed at the beginning and end of the fuel economy test. This phase sequence permits the reporting of fuel consumption for each of these phases separately, making the data more useful to bus manufacturers and transit properties.

2. The operating profile for testing purposes shall consist of simulated transit type service at seated load weight. The three test phases (figure 6-1) are: a central business district (CBD) phase of 2 miles with 7 stops per mile and a top speed of 20 mph; an arterial phase of 2 miles with 2 stops per mile and a top speed of 40 mph; and a commuter phase of 4 miles with 1 stop and a maximum speed of 40 mph. At each designated stop the bus will remain stationary for seven seconds. During this time, the passenger doors shall be opened and closed.

3. The individual ADB phases remain unaltered with the exception that 1 mile has been changed to 1 lap on the Penn State Test Track track. One lap is equal to 5,042 feet. This change is accommodated by adjusting the cruise distance and time.

4. The acceleration profile, for practical purposes and to achieve better repeatability, has been changed to "full throttle acceleration to cruise speed".

Several changes were made to the Fuel Economy Measurement Test (Engineering Type) For Trucks and Buses: SAE 1376 July 82:

1. Sections 1.1, and 1.2 only apply to diesel, gasoline, methanol, and any other fuel in the liquid state (excluding cryogenic fuels).

1.1 SAE 1376 July 82 requires the use of at least a 16-gal fuel tank. Such a fuel tank when full would weigh approximately 160 lb. It is judged that a 12-gal tank weighing approximately 120 lb will be sufficient for this test and much easier for the technician and test personnel to handle.

1.2 SAE 1376 July 82 mentions the use of a mechanical scale or a flowmeter system. This test procedure uses a load cell readout combination that provides an accuracy of 0.5 percent in weight and permits on-board weighing of the gravimetric tanks at the end of each phase. This modification permits the determination of a fuel economy value for each phase as well as the overall cycle.

2. Section 2.1 applies to compressed natural gas (CNG), liquified natural gas (LNG), cryogenic fuels, and other fuels in the vapor state.

2.1 A laminar type flowmeter will be used to determine the fuel consumption. The pressure and temperature across the flow element will be monitored by the flow computer. The flow computer will use this data to calculate the gas flow rate. The flow computer will also display the flow rate (scfm) as well as the total fuel used (scf). The total fuel used (scf) for each phase will be recorded on the Fuel Economy Data Form.

3. Use both Sections 1 and 2 for dual fuel systems.

FUEL ECONOMY CALCULATION PROCEDURE

A. For diesel, gasoline, methanol and fuels in the liquid state.

The reported fuel economy is based on the following: measured test quantities--distance traveled (miles) and fuel consumed (pounds); standard reference values--density of water at 60°F (8.3373 lbs/gal) and volumetric heating value of standard fuel; and test fuel specific gravity (unitless) and volumetric heating value (BTU/gal). These combine to give a fuel economy in miles per gallon (mpg) which is corrected to a standard gallon of fuel referenced to water at 60°F. This eliminates fluctuations in fuel economy due to fluctuations in fuel quality. This calculation has been programmed into a computer and the data processing is performed automatically.

The fuel economy correction consists of three steps:

1.) Divide the number of miles of the phase by the number of pounds of fuel consumed

phase	miles per phase	total miles per run
CBD	1.9097	5.7291
ART	1.9097	3.8193
COM	3.8193	3.8193

$$\mathbf{FEo_{mi/lb}} = \text{Observed fuel economy} = \frac{\text{miles}}{\text{lb of fuel}}$$

2.) Convert the observed fuel economy to miles per gallon [mpg] by multiplying by the specific gravity of the test fuel Gs (referred to water) at 60°F and multiply by the density of water at 60°F

$$\mathbf{FEo_{mpg}} = \mathbf{FEc_{mi/lb}} \times Gs \times Gw$$

where **Gs** = Specific gravity of test fuel at 60°F (referred to water)
Gw = 8.3373 lb/gal

3.) Correct to a standard gallon of fuel by dividing by the volumetric heating value of the test fuel (H) and multiplying by the volumetric heating value of standard reference fuel (Q). Both heating values must have the same units.

$$\mathbf{FEc} = \mathbf{FEo_{mpg}} \times \frac{Q}{H}$$

where

H = Volumetric heating value of test fuel [BTU/gal]
Q = Volumetric heating value of standard reference fuel

Combining steps 1-3 yields

$$\Longrightarrow \; FEc = \frac{\text{miles}}{\text{lbs}} \times (Gs \times Gw) \times \frac{Q}{H}$$

4.) Covert the fuel economy from mpg to an energy equivalent of miles per BTU. Since the number would be extremely small in magnitude, the energy equivalent will be represented as miles/BTUx10^6.

Eq = Energy equivalent of converting mpg to mile/BTUx10^6.

$$Eq = ((mpg)/(H))\times 10^6$$

B. CNG, LNG, cryogenic and other fuels in the vapor state.

The reported fuel economy is based on the following: measured test quantities--distance traveled (miles) and fuel consumed (scf); density of test fuel, and volumetric heating value (BTU/lb) of test fuel at standard conditions (P=14.73 psia and T=60 °F).

These combine to give a fuel economy in miles per lb. The energy equivalent (mile/BTUx10^6) will also be provided so that the results can be compared to buses that use other fuels.

1.) Divide the number of miles of the phase by the number of standard cubic feet (scf) of fuel consumed.

phase	miles per phase	total miles per run
CBD	1.9097	5.7291
ART	1.9097	3.8193
COM	3.8193	3.8193

$$\mathbf{FEo_{mi/scf}} = \text{Observed fuel economy} = \frac{\text{miles}}{\text{scf of fuel}}$$

2.) Convert the observed fuel economy to miles per lb by dividing FEo by the density of the test fuel at standard conditions (Lb/ft^3).

Note: The density of test fuel must be determined at standard conditions as described above. If the density is not defined at the above standard conditions, then a correction will be needed before the fuel economy can be calculated.

$$\mathbf{FEo_{mi/lb}} = FEo / Gm$$

where Gm = Density of test fuel at standard conditions

3.) Convert the observed fuel economy (FEomi/lb) to an energy equivalent of (miles/BTUx10^6) by dividing the observed fuel economy (FEomi/lb) by the heating value of the test fuel at standard conditions.

$$Eq = ((FEomi/lb)/H)x10^6$$

where

Eq = Energy equivalent of miles/lb to mile/BTUx10^6
H = Volumetric heating value of test fuel at standard conditions

6-III. DISCUSSION

This is a comparative test of fuel economy using diesel fuel with a heating value of 20,214.0 btu/lb. The driving cycle consists of Central Business District (CBD), Arterial (ART), and Commuter (COM) phases as described in 6-II. The fuel consumption for each driving cycle and for idle is measured separately. The results are corrected to a reference fuel with a volumetric heating value of 127,700.0 btu/gal.

An extensive pretest maintenance check is made including the replacement of all lubrication fluids. The details of the pretest maintenance are given in the first three Pretest Maintenance Forms. The fourth sheet shows the Pretest Inspection. The next sheet shows the correction calculation for the test fuel. The next four Fuel Economy Forms provide the data from the four test runs. Finally, the summary sheet provides the average fuel consumption. The overall average is based on total fuel and total mileage for each phase. The overall average fuel consumption values were; CBD – 3.50 mpg, ART – 4.41 mpg, and COM – 7.40 mpg. Average fuel consumption at idle was 7.88 lb/hr (1.26 gph).

FUEL ECONOMY PRE-TEST MAINTENANCE FORM

Bus Number: 0410	Date: 11-4-04	SLW (lbs): 32,540
Personnel: E.D., E.L. & S.C.		

FUEL SYSTEM	OK	Date	Initials
Install fuel measurement system	√	11/4/04	S.C.
Replace fuel filter	√	11/4/04	S.C.
Check for fuel leaks	√	11/4/04	S.C.
Specify fuel type (refer to fuel analysis)	Diesel		
Remarks: none			
BRAKES/TIRES	OK	Date	Initials
Inspect hoses	√	11/4/04	E.D.
Inspect brakes	√	11/4/04	E.D.
Relube wheel bearings	√	11/4/04	E.D.
Check tire inflation pressures (mfg. specs.)	√	11/4/04	E.D.
Remarks: none			
COOLING SYSTEM	OK	Date	Initials
Check hoses and connections	√	11/4/04	T.S.
Check system for coolant leaks	√	11/4/04	T.S.
Remarks: none			

FUEL ECONOMY PRE-TEST MAINTENANCE FORM (page 2)

Bus Number: 0410	Date: 11-4-04
Personnel: E.D., T.S. & S.C.	

ELECTRICAL SYSTEMS	OK	Date	Initials
Check battery	√	11/4/04	S.C.
Inspect wiring	√	11/4/04	S.C.
Inspect terminals	√	11/4/04	S.C.
Check lighting	√	11/4/04	S.C.
Remarks: none			

DRIVE SYSTEM	OK	Date	Initials
Drain transmission fluid	√	11/4/04	T.S.
Replace filter/gasket	√	11/4/04	T.S.
Check hoses and connections	√	11/4/04	T.S.
Replace transmission fluid	√	11/4/04	T.S.
Check for fluid leaks	√	11/4/04	T.S.
Remarks: none			

LUBRICATION	OK	Date	Initials
Drain crankcase oil	√	11/4/04	E.D.
Replace filters	√	11/4/04	E.D.
Replace crankcase oil	√	11/4/04	E.D.
Check for oil leaks	√	11/4/04	E.D.
Check oil level	√	11/4/04	E.D.
Lube all chassis grease fittings	√	11/4/04	E.D.
Lube universal joints	√	11/4/04	E.D.
Replace differential lube including axles	√	11/4/04	E.D.
Remarks: none			

FUEL ECONOMY PRE-TEST MAINTENANCE FORM (page 3)

Bus Number: 0410	Date: 11-4-04
Personnel: E.D., T.S. & S.C.	

EXHAUST/EMISSION SYSTEM	OK	Date	Initials
Check for exhaust leaks	√	11/4/04	S.C.
Remarks: none			

ENGINE	OK	Date	Initials
Replace air filter	√	11/4/04	T.S.
Inspect air compressor and air system	√	11/4/04	T.S.
Inspect vacuum system, if applicable	√	11/4/04	T.S.
Check and adjust all drive belts	√	11/4/04	T.S.
Check cold start assist, if applicable	√	11/4/04	T.S.
Remarks: none			

STEERING SYSTEM	OK	Date	Initials
Check power steering hoses and connectors	√	11/4/04	S.C.
Service fluid level	√	11/4/04	S.C.
Check power steering operation	√	11/4/04	S.C.
Remarks: none			

	OK	Date	Initials
Ballast bus to seated load weight	√	11/4/04	S.C.

TEST DRIVE	OK	Date	Initials
Check brake operation	√	11/4/04	S.C.
Check transmission operation	√	11/4/04	S.C.
Remarks: none			

FUEL ECONOMY PRE-TEST INSPECTION FORM

Bus Number: 0410	Date: 11-9-04
Personnel: S.C.	

PRE WARM-UP	If OK, Initial
Fuel Economy Pre-Test Maintenance Form is complete	S.C.
Cold tire pressure (psi): Front 120 Middle N/A Rear 120	S.C.
Tire wear:	S.C.
Engine oil level	S.C.
Engine coolant level	S.C.
Interior and exterior lights on, evaporator fan on	S.C.
Fuel economy instrumentation installed and working properly.	S.C.
Fuel line -- no leaks or kinks	S.C.
Speed measuring system installed on bus. Speed indicator installed in front of bus and accessible to TECH and Driver.	S.C.
Bus is loaded to SLW	S.C.
WARM-UP	**If OK, Initial**
Bus driven for at least one hour warm-up	S.C.
No extensive or black smoke from exhaust	S.C.
POST WARM-UP	**If OK, Initial**
Warm tire pressure (psi): Front 121 Middle N/A Rear 122	S.C.
Environmental conditions Average wind speed <12 mph and maximum gusts <15 mph Ambient temperature between 30°F(-1C°) and 90°F(32°C) Track surface is dry Track is free of extraneous material and clear of interfering traffic	S.C.

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 0410	Manufacturer: Gillig	Date: 11/8/04
Run Number: 1	Personnel: R.C., T.S. & S.C.	
Test Direction: □CW or ■CCW	Temperature (°F): 43	Humidity (%): 39
SLW (lbs): 32,540	Wind Speed (mph) & Direction: 10 / NW	Barometric Pressure (in.Hg): 30.18

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	8:51	8:51	37.0	87.85	84.10	3.75
ART #1	0	4:06	4:06	37.5	84.10	81.30	2.80
CBD #2	0	8:45	8:45	38.6	81.30	78.20	3.10
ART #2	0	4:05	4:05	39.8	78.20	75.80	2.40
CBD #3	0	8:49	8:49	42.0	75.80	72.50	3.30
COMMUTER	0	6:06	6:06	42.4	72.50	69.10	3.40
							Total Fuel = 18.75 lbs

20 minute idle : Total Fuel Used = 2.65 lbs

Heating Value = 20,214.0 BTU/LB

Comments: none

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 0410	Manufacturer: Gillig	Date: 11-8-04
Run Number: 2	Personnel: R.C., T.S. & S.C.	
Test Direction: ■CW or □CCW	Temperature (°F): 43	Humidity (%): 39
SLW (lbs): 32,540	Wind Speed (mph) & Direction: 10 / W	Barometric Pressure (in.Hg): 30.21

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	8:47	8:47	42.8	65.75	62.45	3.30
ART #1	0	4:05	4:05	43.0	62.45	59.70	2.75
CBD #2	0	8:45	8:45	43.1	59.70	56.05	3.65
ART #2	0	4:03	4:03	43.1	56.05	53.15	2.90
CBD #3	0	8:48	8:48	43.4	53.15	49.95	3.20
COMMUTER	0	6:03	6:03	43.3	49.95	46.80	3.15
							Total Fuel = 18.95 lbs

20 minute idle : Total Fuel Used = N/A lbs

Heating Value = 20,214.0 BTU/LB

Comments: none

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 0410	Manufacturer: Gillig	Date: 11-9-04
Run Number: 3	Personnel: R.C., T.S. & S.C.	
Test Direction: □CW or ■CCW	Temperature (°F): 360	Humidity (%): 55
SLW (lbs): 32,540	Wind Speed (mph) & Direction:10/NNW	Barometric Pressure (in.Hg): 30.45

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	8:57	8:57	35.3	89.35	85.90	3.45
ART #1	0	4:05	4:05	36.0	85.90	82.90	3.00
CBD #2	0	8:48	8:48	36.7	82.90	79.20	3.70
ART #2	0	4:03	4:03	37.5	79.20	76.70	2.50
CBD #3	0	8:51	8:51	39.2	76.70	73.10	3.60
COMMUTER	0	6:03	6:03	41.1	73.10	69.95	3.15
							Total Fuel = 19.40 lbs

20 minute idle : Total Fuel Used = N/A lbs

Heating Value = 20,214.0 BTU/LB

Comments: none

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 0410	Manufacturer: Gillig	Date: 11-9-04
Run Number: 4	Personnel: R.C., T.S. & S.C.	
Test Direction: ■CW or □CCW	Temperature (°F): 38	Humidity (%): 55
SLW (lbs): 32,540	Wind Speed (mph) & Direction:10/NNW	Barometric Pressure (in.Hg): 30.45

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	8:48	8:48	41.5	69.95	66.50	3.45
ART #1	0	4:03	4:03	41.9	66.50	63.80	2.70
CBD #2	0	8:47	8:47	42.8	63.80	60.70	3.10
ART #2	0	4:03	4:03	42.8	60.70	58.00	2.70
CBD #3	0	8:47	8:47	42.9	58.00	54.55	3.45
COMMUTER	0	6:04	6:04	42.9	54.55	51.30	3.25
							Total Fuel = 18.65 lbs

20 minute idle : Total Fuel Used = 2.6 lbs

Heating Value = 20,214.0 BTU/LB

Comments: none

0410.FUL
FUEL ECONOMY SUMMARY SHEET

BUS MANUFACTURER :Gillig
BUS MODEL :LowFloor
BUS NUMBER :0410
TEST DATE :11/8/04

FUEL TYPE : DIESEL
SP. GRAVITY : .8095
HEATING VALUE : 20214.00 BTU/Lb
Standard Conditions : 60 deg F and 14.7 psi
Density of Water : 8.3373 lb/gallon at 60 deg F

CYCLE	TOTAL FUEL USED (Lb)	TOTAL MILES	FUEL ECONOMY M/Lb(Measured)	FUEL ECONOMY MPG(Corrected)
Run # :1, CCW				
CBD	10.15	5.73	.56	3.54
ART	5.20	3.82	.73	4.60
COM	3.40	3.82	1.12	7.04
TOTAL	18.75	13.37	.71	4.47
Run # :2, CW				
CBD	10.15	5.73	.56	3.54
ART	5.65	3.82	.68	4.24
COM	3.15	3.82	1.21	7.60
TOTAL	18.95	13.37	.71	4.42
Run # :3, CCW				
CBD	10.75	5.73	.53	3.34
ART	5.50	3.82	.69	4.35
COM	3.15	3.82	1.21	7.60
TOTAL	19.40	13.37	.69	4.32
Run # :4, CW				
CBD	10.00	5.73	.57	3.59
ART	5.40	3.82	.71	4.43
COM	3.25	3.82	1.18	7.37
TOTAL	18.65	13.37	.72	4.49

IDLE CONSUMPTION

First 20 Minutes Data : 2.65 Lb Last 20 Minutes Data : 2.60 Lb
Average Idle Consumption : 7.88 Lb/Hr

RUN CONSISTENCY: % Difference from overall average of total fuel used

Run 1 : 1.0 Run 2 : -.1 Run 3 : -2.4 Run 4 : 1.5

SUMMARY

Average Idle Consumption : 1.26 G/Hr
Average CBD Phase Consumption : 3.50 MPG
Average Arterial Phase Consumption : 4.41 MPG
Average Commuter Phase Consumption : 7.40 MPG
Overall Average Fuel Consumption : 4.43 MPG
Overall Average Fuel Consumption : 32.44 Miles/ Million BTU

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 will be measured at several locations with the bus operating under the following three conditions:

1. With the bus stationary, a white noise generating system shall provide a uniform sound pressure level equal to 80 dB(A) on the left, exterior side of the bus. The engine and all accessories will be switched off and all openings including doors and windows will be closed. This test will be performed at the ABTC.

2. The bus accelerating at full throttle from a standing start to 35 mph on a level pavement. All openings will be closed and all accessories will be operating during the test. This test will be performed on the track at the Test Track Facility.

3. The bus will be operated at various speeds from 0 to 55 mph with and without the air conditioning and accessories on. Any audible vibration or rattles will be noted. This test will be performed on the test segment between the Test Track and the Bus Testing Center.

All tests will be performed in an area free from extraneous sound-making sources or reflecting surfaces. The ambient sound level as well as the surrounding weather conditions will be recorded in the test data.

7.1-III. DISCUSSION

This test is performed in three parts. The first part exposes the exterior of the vehicle to 80.0 dB(A) on the left side of the bus and the noise transmitted to the interior is measured. The overall average of the six measurements was 60.8 dB(A); ranging from 59.4 dB(A) at the rear passenger seats to 63.2 dB(A) at he driver's seat. The interior ambient noise level for this test was 41.9 dB(A).

The second test measures interior noise during acceleration from 0 to 35 mph. This noise level ranged from 72.5 dB(A) at the front passenger seats to 76.1 dB(A) at the rear passenger seats. The overall average was 74.2 dB(A). The interior ambient noise level for this test was 34.2 dB(A).

The third part of the test is to listen for resonant vibrations, rattles, and other noise sources while operating over the road. No vibrations or rattles were noted.

INTERIOR NOISE TEST DATA FORM
Test Condition 1: 80 dB(A) Stationary White Noise

Bus Number: 0410	Date: 5-26-04
Personnel: T.S. & S.C.	
Temperature (°F): 73	Humidity (%): 86
Wind Speed (mph): Calm	Wind Direction: Calm
Barometric Pressure (in.Hg): 30.14	
Initial Sound Level Meter Calibration: ■ checked by: S.C.	
Interior Ambient Noise Level dB(A): 41.9	Exterior Ambient Noise Level dB(A): 47.1
Microphone Height During Testing (in): 48.0	

Measurement Location	Measured Sound Level dB(A)
Driver's Seat	63.2
Front Passenger Seats	61.0
In Line with Front Speaker	60.9
In Line with Middle Speaker	60.7
In Line with Rear Speaker	59.5
Rear Passenger Seats	59.4

Final Sound Level Meter Calibration: ■ checked by: S.C.

Comments: All readings taken in the center aisle.

INTERIOR NOISE TEST DATA FORM
Test Condition 2: 0 to 35 mph Acceleration Test

Bus Number: 0410	Date: 11-11-04
Personnel: T.S. & R.C.	
Temperature (°F): 56	Humidity (%): 45
Wind Speed (mph): 8	Wind Direction: SW
Barometric Pressure (in.Hg): 30.10	
Initial Sound Level Meter Calibration: ■ checked by: S.C.	
Interior Ambient Noise Level dB(A): 34.2	Exterior Ambient Noise Level dB(A): 40.3
Microphone Height During Testing (in): 48.0	

Measurement Location	Measured Sound Level dB(A)
Driver's Seat	75.3
Front Passenger Seats	72.5
Middle Passenger Seats	72.8
Rear Passenger Seats	76.1

Final Sound Level Meter Calibration: ■ checked by: S.C.

Comments: All readings taken in the center aisle.

INTERIOR NOISE TEST DATA FORM
Test Condition 3: Audible Vibration Test

Bus Number: 0410	Date: 11-11-04
Personnel: T.S. & R.C.	
Temperature (°F): 56	Humidity (%): 45
Wind Speed (mph): 8	Wind Direction: SW
Barometric Pressure (in.Hg): 30.10	

Describe the following possible sources of noise and give the relative location on the bus.

Source of Noise	Location
Engine and Accessories	None noted.
Windows and Doors	None noted.
Seats and Wheel Chair lifts	None noted.

Comment on any other vibration or noise source which may have occurred
that is not described above: none noted

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 will be operated at a SLW in three different conditions using a smooth, straight and level roadway:

1. Accelerating at full throttle from a constant speed at or below 35 mph and just prior to transmission up shift.
2. Accelerating at full throttle from standstill.
3. Stationary, with the engine at low idle, high idle, and wide open throttle.

In addition, the buses will be tested with and without the air conditioning and all accessories operating. The exterior noise levels will be recorded.

The test site is at the PSBRTF and the test procedures will be 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 will measure the noise level.

During the test, special attention should be 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 exterior ambient noise level of 41.8 dB(A), the average test result obtained while accelerating from a constant speed was 71.4 dB(A) on the right side and 72.6 dB(A) on the left side.

When accelerating from a standstill with an exterior ambient noise level of 42.5 dB(A), the average of the results obtained were 71.0 dB(A) on the right side and 71.6 dB(A) on the left side.

With the vehicle stationary and the engine, accessories, and air conditioning on, the measurements averaged 62.6 dB(A) at low idle, 64.3 dB(A) at high idle, and 74.8 dB(A) at wide open throttle. With the accessories and air conditioning off, the readings averaged 0.9 dB(A) higher at low idle, 1.3 dB(A) higher at high idle, and 1.2 dB(A) higher at wide open throttle. The exterior ambient noise level measured during this test was 42.4 dB(A).

EXTERIOR NOISE TEST DATA FORM
Accelerating from Constant Speed

Bus Number: 0410	Date: 11-11-04
Personnel: T.S. & R.C.	
Temperature (°F): 56	Humidity (%): 45
Wind Speed (mph): 8	Wind Direction: SW
Barometric Pressure (in.Hg): 30.10	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ■ checked by: S.C.	
Initial Sound Level Meter Calibration: ■ checked by: S.C.	
Exterior Ambient Noise Level dB(A): 41.8	

Accelerating from Constant Speed Curb (Right) Side		Accelerating from Constant Speed Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	71.6	1	71.9
2	70.7	2	72.2
3	71.1	3	72.0
4	71.1	4	72.7
5	71.0	5	72.4
Average of two highest actual noise levels = 71.4 dB(A)		Average of two highest actual noise levels = 72.6 dB(A)	

Final Sound Level Meter Calibration Check: ■ checked by: S.C.
Comments: None

EXTERIOR NOISE TEST DATA FORM
Accelerating from Standstill

Bus Number: 0410	Date: 11-11-04
Personnel: R.C. & T.S.	
Temperature (°F): 56	Humidity (%): 45
Wind Speed (mph): 8	Wind Direction: SW
Barometric Pressure (in.Hg): 30.10	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ■ checked by: S.C.	
Initial Sound Level Meter Calibration: ■ checked by: S.C.	
Exterior Ambient Noise Level dB(A): 42.5	

Accelerating from Standstill Curb (Right) Side		Accelerating from Standstill Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	71.2	1	71.8
2	70.3	2	70.5
3	70.6	3	71.3
4	70.8	4	70.9
5	70.8	5	70.4
Average of two highest actual noise levels = 71.0 dB(A)		Average of two highest actual noise levels = 71.6 dB(A)	

Final Sound Level Meter Calibration Check: ■ checked by: S.C.

Comments: None

EXTERIOR NOISE TEST DATA FORM
Stationary

Bus Number: 0410	Date: 11-11-04
Personnel: T.S. & R.C.	
Temperature (°F): 56	Humidity (%): 45
Wind Speed (mph): 8	Wind Direction: SW
Barometric Pressure (in.Hg): 30.10	

Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ■ checked by: S.C.

Initial Sound Level Meter Calibration: ■ checked by: S.C.

Exterior Ambient Noise Level dB(A): 42.4

Accessories and Air Conditioning ON

Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	700	62.3	62.0
High Idle	998	63.5	65.0
Wide Open Throttle	2,335	73.7	75.8

Accessories and Air Conditioning OFF

Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	702	64.0.	62.9
High Idle	1,001	66.5	64.6
Wide Open Throttle	2,333	74.7	76.2

Final Sound Level Meter Calibration Check: ■ checked by: S.C.

Comments: None

7.2 EXTERIOR NOISE TEST

TEST BUS UNDERGOING EXTERIOR NOISE TESTING

STURAA TEST

12 YEAR

500,000 MILE BUS

from

GILLIG CORPORATION

MODEL LOWFLOOR/HYBRID

OCTOBER 2004

PTI-BT-R0405

PENNSTATE

The Pennsylvania Transportation Institute

201 Research Office Building (814) 865-1891
The Pennsylvania State University
University Park, PA 16802

Bus Testing and Research Center

2237Old Route 220 North (814) 695-3404
Duncansville, PA 16635

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Gillig Corporation submitted a model Lowfloor/Hybrid, diesel-powered 41 seat (including the driver) 40-foot bus, for a 12 yr/500,000 mile STURAA test. The odometer reading at the time of delivery was 5,879.0 miles. Testing started on March 10, 2004 and was completed on October 1, 2004. The Check-In section of the report provides a description of the bus and specifies its major components.

The primary part of the test program is the Structural Durability Test, which also provides the information for the Maintainability and Reliability results. The Structural Durability Test was started on April 6, 2004 and was completed on September 7, 2004.

The interior of the bus is configured with seating for 41 passengers including the driver. Free floor space will accommodate 37 standing passengers resulting in a potential capacity of 78 persons. At 150 lbs per person, this load results in a measured gross vehicle weight of 39,650 lbs. In order to avoid exceeding the GAWR (25,000 lbs) of the rear axle, ballast for five standing passengers was eliminated. This reduction from full capacity resulted in an adjusted measured gross vehicle weight of 38,940 lbs and was used for all dynamic testing. The middle segment was performed at a seated load weight of 34,210 lbs and the final segment was performed at a curb weight of 28,180 lbs. Durability driving resulted in unscheduled maintenance and failures that involved a variety of subsystems. A description of failures, and a complete and detailed listing of scheduled and unscheduled maintenance is provided in the Maintainability section of this report.

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.

The Reliability section compiles failures that occurred during Structural Durability Testing. Breakdowns are classified according to subsystems. The data in this section are arranged so that those subsystems with more frequent problems are apparent. The problems are also listed by class as defined in Section 2. The test bus encountered no Class 1 failures. The one Class 2 failure was the result of a broken shock puncturing an air bag which in turn blew it out. Of the remaining 56 reported failures, 13 were Class 3 and 43 were Class 4.

The Safety Test, (a double-lane change, obstacle avoidance test) was safely performed in both right-hand and left-hand directions up to a maximum test speed of 45 mph. The performance of the bus is illustrated by a speed vs. time plot. Acceleration and gradeability test data are provided in Section 4, Performance. The average time to obtain 50 mph was 30.39 seconds.

The Shakedown Test produced a maximum final loaded deflection of 0.227 inches with a permanent set ranging between -.005 to 0.005 inches under a distributed static load of 29,250 lbs. The Distortion Test was completed with all subsystems, doors

and escape mechanisms operating properly. No water leakage was observed throughout the test. All subsystems operated properly.

The Static Towing Test was performed using a target load (towing force) of 33,816 lbs. All four front pulls were completed to the full test load with no damage or deformation observed. The Dynamic Towing Test was performed by means of a front-lift tow. The towing interface was accomplished using a hydraulic under-lift wrecker. The bus was towed without incident and no damage resulted from the test. The manufacturer does not recommend towing the bus from the rear, therefore, a rear test was not performed. The Jacking and Hoisting Tests were also performed without incident. The bus was found to be stable on the jack stands, and the minimum jacking clearance observed with a tire deflated was 5.3 inches.

A Fuel Economy Test was run on simulated central business district, arterial, and commuter courses. The results were 5.26 mpg, 4.86 mpg, and 8.16 mpg respectively; with an overall average of 5.64 mpg.

A series of Interior and Exterior Noise Tests was performed. These data are listed in Section 7.1 and 7.2 respectively.

ABBREVIATIONS

ABTC	-	Altoona Bus Test Center
A/C	-	air conditioner
ADB	-	advance design bus
ATA-MC	-	The Maintenance Council of the American Trucking Association
CBD	-	central business district
CW	-	curb weight (bus weight including maximum fuel, oil, and coolant; but without passengers or driver)
dB(A)	-	decibels with reference to 0.0002 microbar as measured on the "A" scale
DIR	-	test director
DR	-	bus driver
EPA	-	Environmental Protection Agency
FFS	-	free floor space (floor area available to standees, excluding ingress/egress areas, area under seats, area occupied by feet of seated passengers, and the vestibule area)
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)
GVW	-	gross vehicle weight (curb weight plus gross vehicle load)
GVWR	-	gross vehicle weight rating
MECH	-	bus mechanic
mpg	-	miles per gallon
mph	-	miles per hour
PM	-	Preventive maintenance
PSBRTF	-	Penn State Bus Research and Testing Facility
PTI	-	Pennsylvania Transportation Institute
rpm	-	revolutions per minute
SAE	-	Society of Automotive Engineers
SCH	-	test scheduler
SEC	-	secretary
SLW	-	seated load weight (curb weight plus 150 lb for every designed passenger seating position and for the driver)
STURAA	-	Surface Transportation and Uniform Relocation Assistance Act
TD	-	test driver
TECH	-	test technician
TM	-	track manager
TP	-	test personnel

TEST BUS CHECK-IN

I. OBJECTIVE

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 consists 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 must certify 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 consists of a Gillig Corporation’s, model Lowfloor / Hybrid. The bus has a front door, equipped with a Lift-U model LU6 foldout handicap ramp located forward of the front axle, and a rear door located forward of the rear axle. Power is provided by a diesel-fueled, Cummins Inc. model ISB 260 H engine coupled to an Allison Electric Drive model EV40 transmission.

The measured curb weight is 9,120 lbs for the front axle and 19,060 lbs for the rear axle. These combined weights provide a total measured curb weight of 28,180 lbs. There are 41 seats including the driver and room for 37 standing passengers bringing the total passenger capacity to 78. Gross load is 150 lb x 78 = 11,700 lbs. At full capacity, the measured gross vehicle weight is 39,650 lbs. This value was used for all static tests. In order to avoid exceeding the GAWR (25,000 lbs) of the rear axle, ballast for five standing passengers was eliminated. This reduction from full capacity resulted in an adjusted measured gross vehicle weight of 38,940 lbs and was used for all dynamic testing.

VEHICLE DATA FORM

Bus Number: 0405	Arrival Date: 3-10-04
Bus Manufacturer: Gillig Corporation	Vehicle Identification Number (VIN): 15GGD191941074403
Model Number: Lowfloor/Hybrid	Date: 3-10-04
Personnel: S.C. & T.S.	

WEIGHT: *Values in parenthesis indicate the adjusted weights necessary to avoid exceeding the GAWR. These values were used for all dynamic testing.

Individual Wheel Reactions:

Weights (lb)	Front Axle		Middle Axle		Rear Axle	
	Right	Left	Right	Left	Right	Left
CW	4,630	4,490	N/A	N/A	9,130	9,930
SLW	5,570	5,410	N/A	N/A	11,070	12,160
GVW	7,060 (7,050)	6,830 (6,830)	N/A	N/A	12,340 (12,010)	13,420 (13,050)

Total Weight Details:

Weight (lb)	CW	SLW	GVW	GAWR
Front Axle	9,120	10,980	13,890 (13,880)	14,600
Middle Axle	N/A	N/A	N/A	N/A
Rear Axle	19,060	23,230	25,760 (25,060)	25,000
Total	28,180	34,210	39,650 (38,940)	GVWR: 39,600

Dimensions:

Length (ft/in)	40 / 9.0
Width (in)	101.0
Height (in)	133.0
Front Overhang (in)	88.0
Rear Overhang (in)	117.0
Wheel Base (in)	284.0
Wheel Track (in)	Front: 85.5
	Rear: 77.4

Bus Number: 0405	Date: 3-10-04

CLEARANCES:

Lowest Point Outside Front Axle	Location: Frame	Clearance(in): 9.2
Lowest Point Outside Rear Axle	Location: Transmission	Clearance(in): 12.1
Lowest Point between Axles	Location: Frame	Clearance(in): 13.3
Ground Clearance at the center (in)	13.3	
Front Approach Angle (deg)	8.5	
Rear Approach Angle (deg)	8.2	
Ramp Clearance Angle (deg)	5.4	
Aisle Width (in)	23.0	
Inside Standing Height at Center Aisle (in)	Front – 94.7 Rear – 78.1	

BODY DETAILS:

Body Structural Type	Monocoque		
Frame Material	Steel		
Body Material	Aluminum & fiberglass		
Floor Material	Plywood		
Roof Material	Aluminum & fiberglass		
Windows Type	☐ Fixed	■ Movable	
Window Mfg./Model No.	Excel / AS3 M14 DOT 573		
Number of Doors	_1_ Front	_1_ Rear	
Mfr. / Model No.	Vapor / front: slide glide rear: push out		
Dimension of Each Door (in)	Front - 32.0 x 75.5	Rear – 24.8 x 77.7	
Passenger Seat Type	■ Cantilever	☐ Pedestal	☐ Other (explain)
Mfr. / Model No.	American Seating / Metropolitan		
Driver Seat Type	■ Air	☐ Spring	☐ Other (explain)
Mfr. / Model No.	Recaro / Ergo-Metro		
Number of Seats (including Driver)	41		

Bus Number: 0405	Date: 3-10-04

BODY DETAILS (Contd..)

Free Floor Space (ft^2)	55.7			
Height of Each Step at Normal Position (in)	Front	1. 16.3	2. N/A	3. N/A	4. N/A
	Middle	1. N/A	2. N/A	3. N/A	4. N/A
	Rear	1. 16.5	2. N/A	3. N/A	4. N/A
Step Elevation Change - Kneeling (in)	3.8			

ENGINE

Type	■ C.I.	☐ Alternate Fuel	
	☐ S.I.	☐ Other (explain)	
Mfr. / Model No.	Cummins Inc. / ISB 260 H		
Location	☐ Front	■ Rear	☐ Other (explain)
Fuel Type	☐ Gasoline	☐ CNG	☐ Methanol
	■ Diesel	☐ LNG	☐ Other (explain)
Fuel Tank Capacity (indicate units)	120 gallons		
Fuel Induction Type	■ Injected	☐ Carburetion	
Fuel Injector Mfr. / Model No.	Cummins Inc. / ISB 260 H		
Carburetor Mfr. / Model No.	N/A		
Fuel Pump Mfr. / Model No.	Cummins Inc. / ISB 260 H		
Alternator (Generator) Mfr. / Model No.	C.E.Nichoff & Co. / 0700		
Maximum Rated Output (Volts / Amps)	28 / 300		
Air Compressor Mfr. / Model No.	Wabco / 15.2		
Maximum Capacity (ft^3 / min)	15.2		
Starter Type	☐ Electrical	☐ Pneumatic	■ Other (Transmission start)
Starter Mfr. / Model No.	Allison Electric Drive / EV40		

Bus Number: 0405	Date: 3-10-04

TRANSMISSION

Transmission Type	☐ Manual	■ Automatic	
Mfr. / Model No.	Allison Electric Drive / EV40		
Control Type	☐ Mechanical	■ Electrical	☐ Other
Torque Convertor Mfr. / Model No.	Allison Electric Drive / EV40		
Integral Retarder Mfr. / Model No.	Allison Electric Drive / EV40 & Cummins Engine Brake		

SUSPENSION

Number of Axles	2		
Front Axle Type	☐ Independent	■ Beam Axle	
Mfr. / Model No.	Meritor / FH946RK145		
Axle Ratio (if driven)	N/A		
Suspension Type	■ Air	☐ Spring	☐ Other (explain)
No. of Shock Absorbers	2		
Mfr. / Model No.	Koni / 902423		
Middle Axle Type	☐ 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 / 71163WX		
Axle Ratio (if driven)	5.38		
Suspension Type	■ Air	☐ Spring	☐ Other (explain)
No. of Shock Absorbers	4		
Mfr. / Model No.	Koni / 902626		

Bus Number: 0405	Date: 3-10-04

WHEELS & TIRES

Front	Wheel Mfr./ Model No.	Alcoa / 22.5 x 8.25
	Tire Mfr./ Model No.	Firestone City Transit Radial / 12R 22.5
Rear	Wheel Mfr./ Model No.	Alcoa / 22.5 x 8.25
	Tire Mfr./ Model No.	Firestone City Transit Radial / 12R 22.5

BRAKES

Front Axle Brakes Type	■ Cam	☐ Disc	☐ Other (explain)
Mfr. / Model No.	Meritor / 16.5X6 Cost Plus		
Middle Axle Brakes Type	☐ Cam	☐ Disc	☐ Other (explain)
Mfr. / Model No.	N/A		
Rear Axle Brakes Type	■ Cam	☐ Disc	☐ Other (explain)
Mfr. / Model No.	Meritor / 14.5X10 W		
Retarder Type	Regen & engine braking		
Mfr. / Model No.	Allison Electric Drive / EV40 & Cummins Engine Brake		

HVAC

Heating System Type	☐ Air	■ Water	☐ Other
Capacity (Btu/hr)	95,000		
Mfr. / Model No.	Thermo-King / T11-M40		
Air Conditioner	■ Yes	☐ No	
Location	Rear, above engine compartment		
Capacity (Btu/hr)	80,000		
A/C Compressor Mfr. / Model No.	Thermo King / S391LS		

STEERING

Steering Gear Box Type	Hydraulic gear
Mfr. / Model No.	TRW / TAS-65
Steering Wheel Diameter	20.0
Number of turns (lock to lock)	4.75

Bus Number: 0405	Date: 3-10-04

OTHERS

Wheel Chair Ramps	Location: Front door	Type: fold out ramp
Wheel Chair Lifts	Location: N/A	Type: N/A
Mfr. / Model No.	Lift-U / LU6	
Emergency Exit	Location: Windows Doors Roof hatch	Number: 6 2 1

OTHER

Battery Packs Mfr./ Mod.#	Allison Energy Storage System / Panasonic ; E.D. Energy Co., Ltd., Japan
Electric Drive Mfr./ Mod.#	Allison Dual Power Inverter Module / DPIM

CAPACITIES

Fuel Tank Capacity (units)	120 gallons
Engine Crankcase Capacity (gallons)	4.25
Transmission Capacity (gallons)	Trans only – 2.25 Complete electric drive – 5.5
Differential Capacity (gallons)	5.5
Cooling System Capacity (quarts)	2.5
Power Steering Fluid Capacity (gallons)	3.6

VEHICLE DATA FORM

Bus Number: 0405	Date: 3-10-04

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

Part Number	Description	Qty.
A-931	Air filter	1
90-2423	Shock	1
90-2626	Shock	1
5298	Air bag	4
8203	Air bag	1
na	Fuel filters	2
na	Oil filter	1
na	Leveling valve	1
12R 22.5	Tire & rim	1
na	Drain plug	1
na	Safety pins	10
na	Tow hooks & pins	2
na	Rubber gasket	2
na	Clamps	2
na	Intercom mic	1

COMPONENT/SUBSYSTEM INSPECTION FORM

Bus Number: 0405	Date: 3-12-04

Subsystem	Checked	Comments
Air Conditioning Heating and Ventilation	✓	
Body and Sheet Metal	✓	
Frame	✓	
Steering	✓	
Suspension	✓	
Interior/Seating	✓	
Axles	✓	
Brakes	✓	
Tires/Wheels	✓	
Exhaust	✓	
Fuel System	✓	Diesel
Power Plant	✓	Diesel / Hybrid Electric
Accessories	✓	Fold out ramp
Lift System	✓	
Interior Fasteners	✓	
Batteries	✓	

CHECK - IN

GILLIG CORPORATION
MODEL LOWFLOOR/HYBRID

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 is checked, and where accessibility is restricted the subsystem is 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

Bus Number: 0405	Date: 3-12-04

Component	Checked	Comments
ENGINE :		
Oil Dipstick	✓	
Oil Filler Hole	✓	
Oil Drain Plug	✓	
Oil Filter	✓	
Fuel Filter	✓	
Air Filter	✓	
Belts	✓	
Coolant Level	✓	
Coolant Filler Hole	✓	
Coolant Drain	✓	
Spark / Glow Plugs	✓	
Alternator	✓	
Diagnostic Interface Connector	✓	
TRANSMISSION :		
Fluid Dip-Stick	✓	
Filler Hole	✓	
Drain Plug	✓	
SUSPENSION :		
Bushings	✓	
Shock Absorbers	✓	
Air Springs	✓	
Leveling Valves	✓	
Grease Fittings	✓	

ACCESSIBILITY DATA FORM

Bus Number: 0405	Date: 3-12-04

Component	Checked	Comments
HVAC :		
A/C Compressor	✓	
Filters	✓	
Fans	✓	
ELECTRICAL SYSTEM :		
Fuses	✓	
Batteries	✓	
Voltage regulator	✓	
Voltage Convertors	✓	
Lighting	✓	
MISCELLANEOUS :		
Brakes	✓	
Handicap Lifts/Ramps	✓	
Instruments	✓	
Axles	✓	
Exhaust	✓	
Fuel System	✓	
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 will be conducted by operating the NBM and collecting the following data on work order forms and a driver log.

1. Unscheduled Maintenance
    a. Bus number
    b. Date
    c. Mileage
    d. Description of malfunction
    e. Location of malfunction (e.g., in service or undergoing inspection)
    f. Repair action and parts used
    g. Man-hours required

2. Scheduled Maintenance
    a. Bus number
    b. Date
    c. Mileage
    d. Engine running time (if available)
    e. Results of scheduled inspections
    f. Description of malfunction (if any)
    g. Repair action and parts used (if any)
    h. Man-hours required

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

A. Service
    1. Fueling
    2. Consumable checks
    3. Interior cleaning

B. Preventive Maintenance
    4. Brake adjustments
    5. Lubrication
    6. 3,000 mi (or equivalent) inspection

7. Oil and filter change inspection
8. Major inspection
9. 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

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. Table 1 is a list of the lubricating products used in servicing. Finally, the Unscheduled Maintenance List along with Unscheduled Maintenance 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 occurred, a description of the malfunction and repair, and the time required to perform the repair.

SCHEDULED MAINTENANCE

Gillig 0405

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
04-15-04	623	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
04-29-04	2,409	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
05-06-04	3,242	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
05-11-04	3,879	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
05-26-04	4,750	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
06-02-04	5,337	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
06-11-04	6,204	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00

SCHEDULED MAINTENANCE

Gillig 0405

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
07-01-04	7,651	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
07-09-04	8,505	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
07-20-04	9,450	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
07-29-04	10,699	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
08-02-04	11,062	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
08-12-04	12,063	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
08-19-04	13,180	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00

SCHEDULED MAINTENANCE

Gillig 0405

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
08-26-04	14,253	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed; all fluids checked.	4.00	4.00
09-07-04	Complete	P.M. / Inspection	Linkage, tie rods, universals/u-joints all lubed. Oil changed. Oil, fuel, and air filters changed. Transmission oil and filter changed.	8.00	8.00

Table 1. STANDARD LUBRICANTS

The following is a list of Texaco lubricant products used in bus testing conducted by the Penn State University Altoona Bus Testing Center:

ITEM	PRODUCT CODE	TEXACO DESCRIPTION
Engine oil	#2112	URSA Super Plus SAE 30
Transmission oil	#1866	Automatic Trans Fluid Mercon/Dexron II Multipurpose
Gear oil	#2316	Multigear Lubricant EP SAE 80W90
Wheel bearing & Chassis grease	#1935	Starplex II

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 will involve components that may be expected to fail or require replacement during the service life of the bus. In addition, any component that fails during the NBM testing is added to this list. Components to be included are:

1. Transmission
2. Alternator
3. Starter
4. Batteries
5. Windshield wiper motor

1.3-III. DISCUSSION

During the test, several additional components were removed for repair or replacement. Following is a list of components and total repair/replacement time.

	MAN HOURS
Right front, front axle air bag.	1.0
Left front, front axle air bag.	1.0
Both front suspension bump stops.	1.0
Left rear, front axle air bag.	1.0
Right rear, front axle air bag.	1.0
Both front air bag towers & upper mounting plates.	4.0
Left rear, rear axle shock.	1.0
Both front shocks.	0.5
Left front brake air line.	0.5

Heat shield for exhaust line off the turbo.	0.5
Three passenger seats.	2.0
Both front tires.	1.0

At the end of the test, the remaining items on the list were removed and replaced. The transmission assembly took 10.0 man-hours (two men 5.0 hrs) to remove and replace. The time required for repair/replacement of the four remaining components is given on the following Repair and/or Replacement Form.

REPLACEMENT AND/OR REPAIR FORM

Subsystem	Replacement Time
Transmission	10.00 man hours
Dual Power Inverter Module	8.00 man hours
Wiper Motor	0.50 man hours
Generator	1.00 man hours
Batteries	0.50 man hours

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS

TRANSMISSION REMOVAL AND REPLACEMENT (10.00 MAN HOURS)

WIPER MOTOR REMOVAL AND REPLACEMENT (0.50 MAN HOURS)

1.3 REPLACEMENT AND/OR REPAIR OF SELECTED SUBSYSTEMS CONT.

GENERATOR REMOVAL AND REPLACEMENT (1.00 MAN 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, man-hours to repair, and hours out of service are recorded on the Reliability Data Form.

CLASS OF FAILURES

Classes of failures are described below:

(a) Class 1: Physical Safety. A failure that could lead directly to passenger or driver injury and represents a severe crash situation.

(b) Class 2: Road Call. A failure resulting in an enroute interruption of revenue service. Service is discontinued until the bus is replaced or repaired at the point of failure.

(c) Class 3: Bus Change. 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) Class 4: Bad Order. 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 is accumulated during the Structural Durability Test. The following Reliability Data Form lists all unscheduled repairs under classes as defined above. These classifications are somewhat subjective as the test is performed on a test track with careful inspections every two hours. However, even on the road, there is considerable latitude on deciding how to handle many failures.

The Unscheduled Repair List is also attached to provide a reference for the repairs that are included in the Reliability Data Forms.

The classification of repairs according to subsystem is intended to emphasize those systems which had persistent minor or more serious problems. There were no Class 1 failures. The one Class 2 failure was the result of a broken shock which in turn punctured and blew out an air bag. Of the 13 Class 3 failures, 11 involved the suspension system, and one each occurred with the engine and brakes. These, and the remaining 43 Class 4 failures are available for review in the Unscheduled Maintenance List, located in Section 5.7 Structural Durability.

RELIABILITY DATA FORMS

Bus Number: 0405	Date: 09/07/04
Personnel: Bob Reifsteck	

	Failure Type					
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
Subsystems	Mileage	Mileage	Mileage	Mileage	Man Hours	Down Time
Suspension	420				1.00	12.00
	483				1.00	16.00
	764				1.00	8.00
	1,140				0.50	8.00
	1,685				1.00	8.00
		1,685			1.00	8.00
		1,841			1.00	10.00
		2,183			1.00	4.00
		2,494			1.50	10.00
	2,867				0.50	8.00
		3,242			1.00	8.00
	3,461				1.50	6.00
		3,627			1.50	3.00
	3,879				1.00	1.00
		4,080			3.00	5.00
	4,265				1.00	8.00
	4,316				1.00	8.00
	4,323				1.00	8.00
	4,323				0.50	0.50
	4,375				1.00	1.00

RELIABILITY DATA FORMS

Bus Number: 0405	Date: 09/07/04
Personnel: Bob Reifsteck	

	Failure Type					
	Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety		
Subsystems	Mileage	Mileage	Mileage	Mileage	Man Hours	Down Time
Suspension (continued)	4,468				1.00	8.00
	4,593				1.00	8.00
	4,621				1.00	10.00
	4,750				4.00	32.00
	5,197				1.00	5.00
	5,337				1.00	1.00
	5,337				1.00	8.00
			5,571		2.00	6.00
		5,652			0.50	0.50
	5,652				0.50	4.00
		5,971			0.50	4.00
	6,331				0.50	0.50
	7,134				0.50	0.50
	7,228				1.00	8.00
	7,228				0.50	0.50
	7,309				1.00	8.00
	8,358				1.00	4.00
	8,726				0.50	0.50
	9,450				1.50	1.50
	9,560				0.50	8.00

RELIABILITY DATA FORMS

Bus Number: 0405	Date: 09/07/04
Personnel: Bob Reifsteck	

Failure Type			
Class 4 Bad Order	Class 3 Bus Change	Class 2 Road Call	Class 1 Physical Safety

Subsystems	Mileage	Mileage	Mileage	Mileage	Man Hours	Down Time
Suspension (continued)		10,078			1.00	8.00
	10,155				1.00	8.00
	10,690				0.50	0.50
	11,331				0.50	8.00
	12,011				0.50	8.00
	12,416				0.50	0.50
	13,667				0.50	0.50
Body/Seats/Compartments		14,445			1.00	8.00
	5,337				0.50	0.50
	5,709				1.50	1.50
	7,576				2.00	2.00
	9,480				3.00	3.00
Engine	11,331				0.50	0.50
	7,228				0.50	0.50
Brakes		8,782			2.00	8.00
Wheels/Tires		6,331			0.50	10.00
	8,453				1.00	1.00

3. SAFETY - A DOUBLE-LANE CHANGE (OBSTACLE AVOIDANCE)

3-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-II. TEST DESCRIPTION

The Safety Test is a vehicle handling and stability test. The bus will be operated at SLW on a smooth and level test track. The bus will be driven through a double lane change course at increasing speed until the test is considered unsafe or a speed of 45 mph is reached. The lane change course will be set up using pylons to mark off two 12 foot center to center lanes with two 100 foot lane change areas 100 feet apart. The bus will begin in one lane, change to the other lane in a 100 foot span, travel 100 feet, and return to the original lane in another 100 foot span. This procedure will be repeated, starting first in the right-hand and then in the left-hand lane.

3-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.

SAFETY DATA FORM

Bus Number: 0405	Date: 8-4-04
Personnel: G.M., M.H. & S.C.	

Temperature (°F): 77	Humidity (%): 65
Wind Direction: SW	Wind Speed (mph): 5
Barometric Pressure (in.Hg): 29.83	

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: A safe profile was maintained through all portions of testing.	
Comments of the tire/ground contact patch: Tire/ground contact was maintained through all portions of testing.	

3. SAFETY

RIGHT - HAND APPROACH

LEFT - HAND APPROACH

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 will be operated at SLW on the skid pad at the PSBRTF. The bus will be accelerated at full throttle from a standstill to a maximum "geared" or "safe" speed as determined by the test driver. The vehicle speed is measured using a Correvit non-contacting speed sensor. The times to reach speed between ten mile per hour increments are measured and recorded using a stopwatch with a lap timer. The time to speed data will be recorded on the Performance Data Form and later used to generate a speed vs time plot and gradeability calculations.

4-III. DISCUSSION

This test consists of three runs in both the clockwise and counterclockwise directions on the Test Track. Velocity versus time data is obtained for each run and results are averaged together to minimize any test variability which might be introduced by wind or other external factors. The test was performed up to a maximum speed of 50 mph. The fitted curve of velocity vs time is attached, followed by the calculated gradeability results. The average time to obtain 50 mph was 30.39 seconds.

PERFORMANCE DATA FORM

Bus Number: 0405	Date: 8-4-04
Personnel: S.C., M.H. & G.M.	

Temperature (°F): 77	Humidity (%): 65
Wind Direction: SW	Wind Speed (mph): 5
Barometric Pressure (in.Hg): 29.83	

Air Conditioning compressor-OFF	✓ Checked
Ventilation fans-ON HIGH	✓ Checked
Heater pump motor-Off	✓ Checked
Defroster-OFF	✓ Checked
Exterior and interior lights-ON	✓ Checked
Windows and doors-CLOSED	✓ Checked

ACCELERATION, GRADEABILITY, TOP SPEED

Counter Clockwise Recorded Interval Times

Speed	Run 1	Run 2	Run 3
10 mph	3.55	3.49	3.74
20 mph	7.05	6.90	7.24
30 mph	11.24	11.15	11.15
40 mph	19.49	18.90	19.40
Top Test Speed(mph) 50	32.41	31.69	31.78

Clockwise Recorded Interval Times

Speed	Run 1	Run 2	Run 3
10 mph	3.90	3.92	3.99
20 mph	7.08	7.52	7.39
30 mph	11.36	11.80	11.27
40 mph	17.68	18.39	18.14
Top Test Speed(mph) 50	28.72	29.00	28.75

0405.ACC

PERFORMANCE SUMMARY SHEET

BUS MANUFACTURER :Gillig
BUS MODEL :Lowfloor/Hybrid
BUS NUMBER :0405
TEST DATE :8/4/04

TEST CONDITIONS :

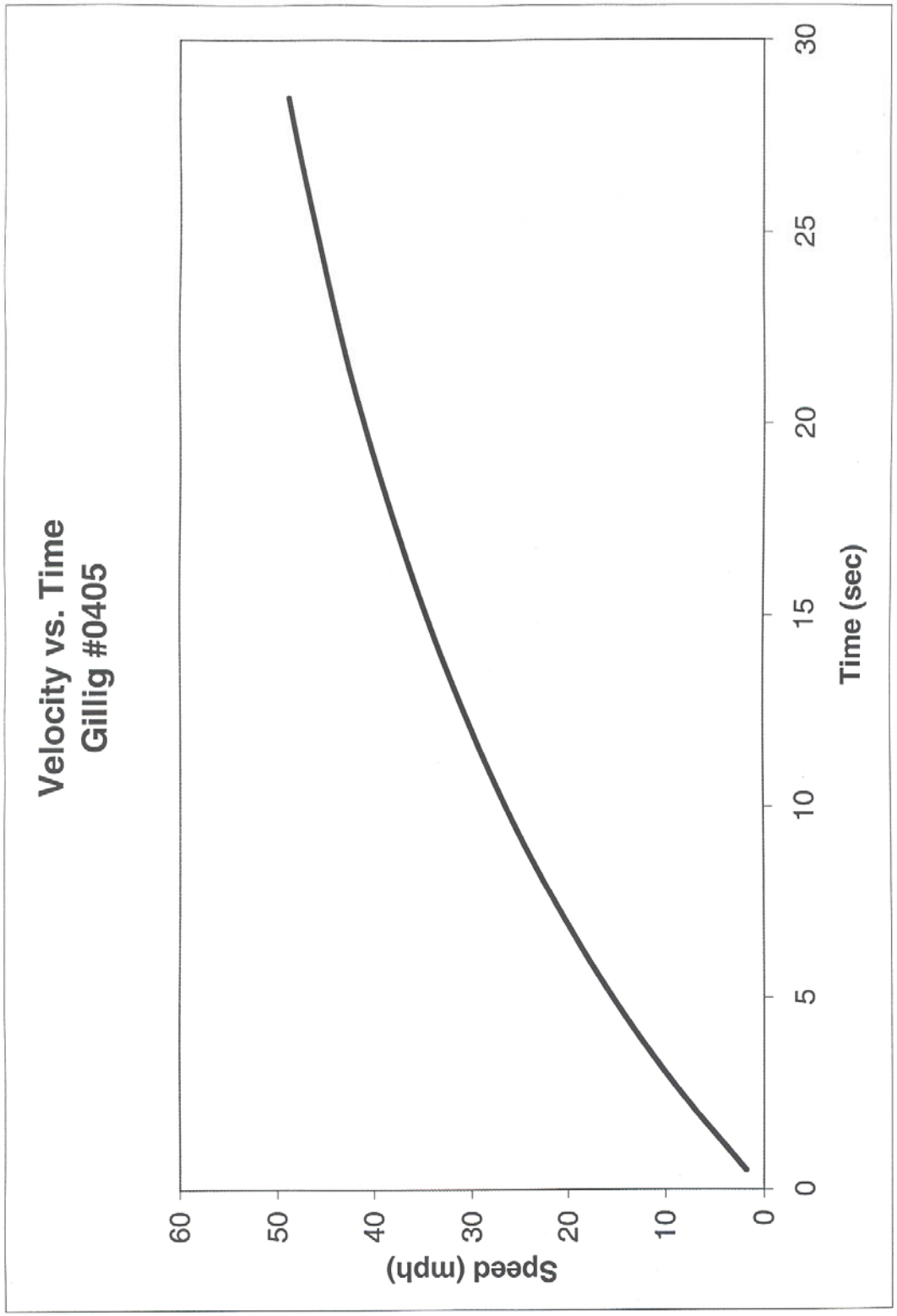
TEMPERATURE (DEG F) : 77.0
WIND DIRECTION : SW
WIND SPEED (MPH) : 5.0
HUMIDITY (%) : 65
BAROMETRIC PRESSURE (IN. HG) : 29.8

VEHICLE SPEED	AVERAGE TIME (SEC)		
(MPH)	CCW DIRECTION	CW DIRECTION	TOTAL
10.0	3.59	3.94	3.77
20.0	7.06	7.33	7.20
30.0	11.18	11.48	11.33
40.0	19.26	18.07	18.67
50.0	31.96	28.82	30.39

TEST SUMMARY :

VEHICLE SPEED (MPH)	TIME (SEC)	ACCELERATION (FT/SEC^2)	MAX. GRADE (%)
1.0	.28	5.2	16.5
5.0	1.44	4.8	15.2
10.0	3.05	4.3	13.6
15.0	4.85	3.8	12.0
20.0	6.89	3.4	10.5
25.0	9.24	2.9	9.1
30.0	11.97	2.5	7.7
35.0	15.20	2.1	6.5
40.0	19.09	1.7	5.3
45.0	23.89	1.4	4.2
50.0	30.00	1.1	3.3

NOTE : Gradeability results were calculated from performance test data. Actual sustained gradeability performance for vehicles equipped with auto transmission may be lower than the values indicated here.


Velocity vs. Time
Gillig #0405
Speed (mph)
60
50
40
30
20
10
0
0
5
10
15
20
25
30
Time (sec)

5. STRUCTURAL INTEGRITY

5.1 STRUCTURAL STRENGTH AND DISTORTION TESTS - STRUCTURAL SHAKEDOWN TEST

5.1-I. DISCUSSION

The objective of this test is to determine certain static characteristics (e.g., bus floor deflection, permanent structural deformation, etc.) under static loading conditions.

5.1-II. TEST DESCRIPTION

In this test, the bus will be isolated from the suspension by blocking the vehicle under the suspension points. The bus will then be loaded and unloaded up to a maximum of three times with a distributed load equal to 2.5 times gross load. Gross load is 150 lb for every designed passenger seating position, for the driver, and for each 1.5 sq ft of free floor space. For a distributed load equal to 2.5 times gross load, place a 375-lb load on each seat and on every 1.5 sq ft of free floor space. The first loading and unloading sequence will "settle" the structure. Bus deflection will be measured at several locations during the loading sequences.

5.1-III. DISCUSSION

This test was performed based on a maximum passenger capacity of 78 people including the driver. The resulting test load is (78 x 375 lb) = 29,250 lb. The load is distributed evenly over the passenger space. Deflection data before and after each loading and unloading sequence is provided on the Structural Shakedown Data Form.

The unloaded height after each test becomes the original height for the next test. Some initial settling is expected due to undercoat compression, etc. After each loading cycle, the deflection of each reference point is determined. The bus is then unloaded and the residual (permanent) deflection is recorded. On the final test, the maximum loaded deflection was 0.227 inches at reference point 9. The maximum permanent deflection after the final loading sequence ranged from –.005 inches at reference point 12 to 0.005 inches at reference points 8 and 9.

STRUCTURAL SHAKEDOWN DATA FORM

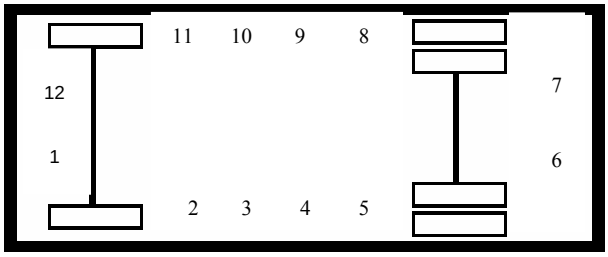
Bus Number: 0405	Date: 3-18-04
Personnel: T.S., E.D., E.L. & S.C.	Temperature (°F): 65
Loading Sequence: ■ 1 □ 2 ☐ 3 (check one) Test Load (lbs): 29,250	

Indicate Approximate Location of Each Reference Point

Right

Front of Bus

Left



Top View

Reference Point No.	A (in) Original Height	B (in) Loaded Height	B-A (in) Loaded Deflection	C (in) Unloaded Height	C-A (in) Permanent Deflection
1	0	.042	.042	.047	.047
2	0	.163	.163	.057	.057
3	0	.195	.195	.066	.066
4	0	.240	.240	.078	.078
5	0	.238	.238	.076	.076
6	0	.016	.016	.010	.010
7	0	.012	.012	.011	.011
8	0	.260	.260	.089	.089
9	0	.314	.314	.095	.095
10	0	.246	.246	.077	.077
11	0	.179	.179	.059	.059
12	0	.015	.015	.043	.043

STRUCTURAL SHAKEDOWN DATA FORM

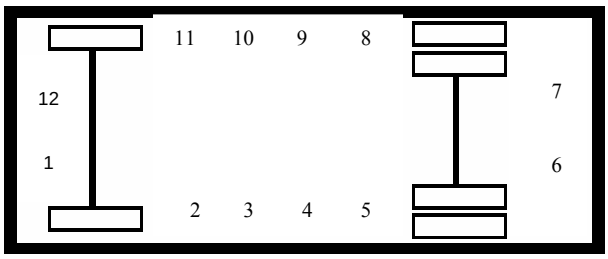
Bus Number: 0405	Date: 3-19-04
Personnel: E.L., E.D. & D.L.	Temperature (°F): 65
Loading Sequence: ☐ 1 ■ 2 ☐ 3 (check one) Test Load (lbs): 29,250	

Indicate Approximate Location of Each Reference Point

Right

Front of Bus

Left



Top View

Reference Point No.	A (in) Original Height	B (in) Loaded Height	B-A (in) Loaded Deflection	C (in) Unloaded Height	C-A (in) Permanent Deflection
1	.047	.050	.003	.045	-.002
2	.057	.180	.123	.061	.004
3	.066	.215	.149	.068	.002
4	.078	.265	.187	.082	.004
5	.076	.261	.185	.079	.003
6	.010	.013	.003	.011	.001
7	.011	.006	-.005	.011	.000
8	.089	.270	.181	.094	.005
9	.095	.322	.227	.100	.005
10	.077	.255	.178	.080	.003
11	.059	.187	.128	.062	.003
12	.043	.018	-.025	.038	-.005

5.1 STRUCTURAL SHAKEDOWN TEST

DIAL INDICATORS IN POSITION

BUS LOADED TO 2.5 TIMES GVL (29,250 LBS)

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 GVWR, each wheel of the bus will be raised (one at a time) to simulate operation over a curb and the following will be 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 will then be 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 handicapped 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.

DISTORTION TEST INSPECTION FORM
(Note: Ten copies of this data sheet are required)

Bus Number: 0405	Date: 3-25-04
Personnel: J.P., G.F., E.L., E.D. & D.L.	Temperature(°F): 60

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.
☒ Handicapped Device/ 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)

Bus Number: 0405	Date: 3-25-04
Personnel: J.P., G.F., E.L., E.D. & D.L.	Temperature(°F): 60

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.
☒ Handicapped Device/ 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)

Bus Number: 0405	Date: 3-25-04
Personnel: J.P., G.F., E.L., E.D. & D.L.	Temperature(°F): 60

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.
☒ Handicapped Device/ 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)

Bus Number: 0405	Date: 3-25-04
Personnel: J.P., G.F., E.L., E.D. & D.L.	Temperature(°F): 60

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.
☒ Handicapped Device/ 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)

Bus Number: 0405	Date: 3-25-04
Personnel: J.P., G.F., E.L., E.D. & D.L.	Temperature(°F): 60

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.
☒ Handicapped Device/ 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)

Bus Number: 0405	Date: 3-25-04
Personnel: J.P., G.F., E.L., E.D. & D.L.	Temperature(°F): 60

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.
☒ Handicapped Device/ 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)

Bus Number: 0405	Date: 3-25-04
Personnel: J.P., G.F., E.L., E.D. & D.L.	Temperature(°F): 60

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.
☒ Handicapped Device/ 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)

Bus Number: 0405	Date: 3-25-04
Personnel: J.P., G.F., E.L., E.D. & D.L.	Temperature(°F): 60

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.
☒ Handicapped Device/ 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)

Bus Number: 0405	Date: 3-25-04
Personnel: J.P., G.F., E.L., E.D. & D.L.	Temperature(°F): 60

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.
☒ Handicapped Device/ 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)

Bus Number: 0405	Date: 3-25-04
Personnel: J.P., G.F., E.L., E.D. & D.L.	Temperature(°F): 60

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.
☒ Handicapped Device/ 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 FRONT WHEEL SIX INCHES HIGHER

LEFT FRONT WHEEL SIX INCHES LOWER

5.3 STRUCTURAL STRENGTH AND DISTORTION TESTS - STATIC TOWING TEST

5.3-I. TEST OBJECTIVE

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 is used to apply a static tension load equal to 1.2 times the bus curb weight. The load will be 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 will be 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 front test was performed to the full target test weight of 33,816 lbs (1.2 x 28,180 lbs CW). No damage or deformation was observed during all four pulls of the test. The pin for the towing attachment interferes with the brass fitting on the heater unit, which does not allow for installation of the cotter pin. No problems were encountered without use of the cotter pin.

STATIC TOWING TEST DATA FORM

Bus Number: 0405	Date: 8-26-04
Personnel: D.L., E.L., E.D. & K.D.	Temperature (°F): 77

Inspect right front tow eye and adjoining structure.
Comments: No damage or deformation observed.
Check the torque of all bolts attaching tow eye and surrounding structure.
Comments: Torques verified.
Inspect left tow eye and adjoining structure.
Comments: No damage or deformation observed.
Check the torque of all bolts attaching tow eye and surrounding structure.
Comments: Torques verified.
Inspect right rear tow eye and adjoining structure.
Comments: The test bus was not equipped with rear tow eyes or tow hooks, therefore, a rear test was not performed.
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 four front pulls were completed to the full target test load of 33,816 lbs with no damage or deformation observed. The pin for the towing attachment interferes with the brass fitting on the heater unit which does not allow for installation of the cotter pin. No problems were encountered without use of the cotter pin.

5.3 STATIC TOWING TEST

FRONT 20° UPWARD PULL

FRONT 20° DOWN PULL

5.3 STATIC TOWING TEST CONT.

FRONT 20° LEFT PULL

FRONT 20° RIGHT PULL

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 requires the bus be towed at curb weight using the specified equipment and instructions provided by the manufacturer and a heavy-duty wrecker. The bus will be towed for 5 miles at a speed of 20 mph for each recommended towing configuration. After releasing the bus from the wrecker, the bus will be visually inspected for any structural damage or permanent deformation. All doors, windows and passenger escape mechanisms will be 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. Rear towing is not recommended. No problems, deformation, or damage was noted during testing.

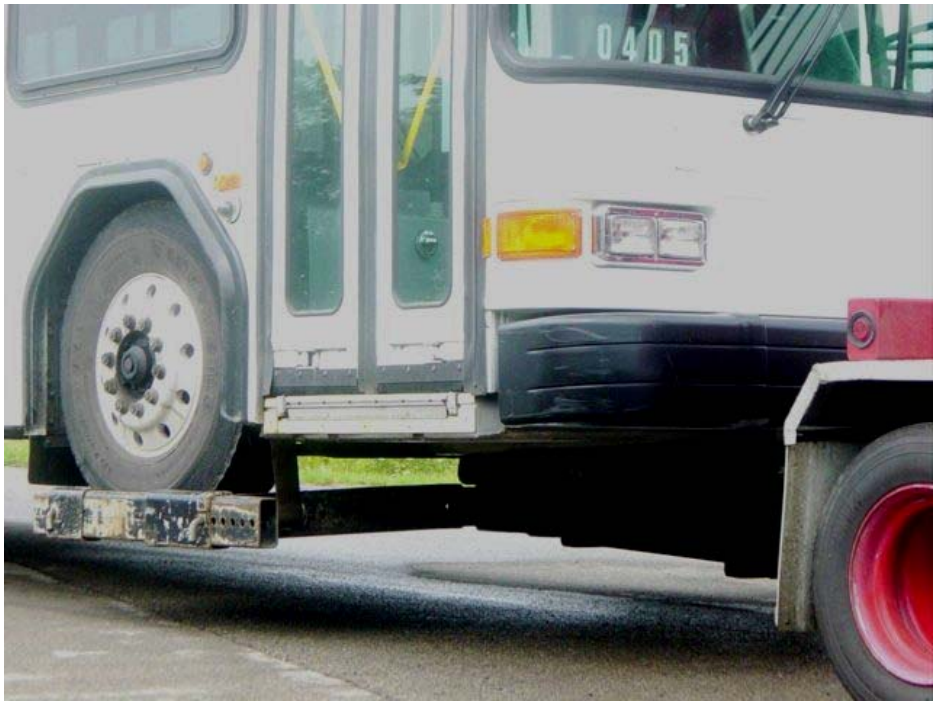
DYNAMIC TOWING TEST DATA FORM

Bus Number: 0405	Date: 8-19-04
Personnel: S.C. & T.S.	

Temperature (°F): 73	Humidity (%): 83
Wind Direction: WSW	Wind Speed (mph): 8
Barometric Pressure (in.Hg): 30.00	

Inspect tow equipment-bus interface.
Comments: A safe and adequate connection was made between the tow equipment and the bus.
Inspect tow equipment-wrecker interface.
Comments: A safe and adequate connection was made between the tow equipment and the wrecker.
Towing Comments: A front lift tow was performed incorporating a hydraulic under lift wrecker.
Description and location of any structural damage: None noted.
General Comments: No problems with the tow or towing interface were encountered.

5.4 DYNAMIC TOWING TEST



TOWING INTERFACE

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 are replaced with deflated tire(s) of the appropriate type. A portable hydraulic floor jack is 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) are replaced with the original tire(s) and the jack is lowered. Any structural damage or permanent deformation is recorded on the test data sheet. This procedure is repeated for each corner of the bus.

5.5-III. DISCUSSION

The jack used for this test has a minimum height of 8.75 inches. During the deflated portion of the test, the jacking point clearances ranged from 5.3 inches to 13.3 inches. No deformation or damage was observed during testing. A complete listing of jacking point clearances is provided in the Jacking Test Data Form.

JACKING CLEARANCE SUMMARY

Condition	Frame Point Clearance
Front axle – one tire flat	9.5”
Rear axle – one tire flat	13.2”
Rear axle – two tires flat	10.4”

JACKING TEST DATA FORM

Bus Number: 0405	Date: 3-11-04
Personnel: T.S. & D.L.	Temperature: 62

Record any permanent deformation or damage to bus as well as any difficulty encountered during jacking procedure.

Deflated Tire	Jacking Pad Clearance Body/Frame (in)	Jacking Pad Clearance Axle/Suspension (in)	Comments
Right front	13.0 “ I 9.5 “ D	9.2 “ I 5.3 “ D	
Left front	13.2 “ I 9.7 “ D	9.3 “ I 5.4 “ D	
Right rear—outside	14.1 “ I 13.2 “ D	9.4 “ I 9.1 “ D	
Right rear—both	14.1 “ I 10.4 “ D	9.4 “ I 7.2 “ D	
Left rear—outside	14.2 “ I 13.3 “ D	9.5 “ I 9.0 “ D	
Left rear—both	14.2 “ I 10.5 “ D	9.5 “ I 7.3 “ D	
Right middle or tag—outside	NA	NA	
Right middle or tag—both	NA	NA	
Left middle or tag—outside	NA	NA	
Left middle or tag—both	NA	NA	

Additional comments of any deformation or difficulty during jacking:

None

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 is 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 will be checked for stability on the jack stands and for any damage to the jacking pads or bulkheads. The procedure is repeated for the rear end of the bus. The procedure is then repeated for the front and rear simultaneously.

5.6-III. DISCUSSION

The test was conducted using four posts of a six-post electric lift and standard 19 inch jack stands. The bus was hoisted from the front wheel, rear wheel, and then the front and rear wheels simultaneously and placed on jack stands.

The bus easily accommodated the placement of the vehicle lifts and jack stands and the procedure was performed without any instability noted.

HOISTING TEST DATA FORM

Bus Number: 0405	Date: 3-11-04
Personnel: T.S. & D.L.	Temperature (°F): 62

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 front and rear wheels are supported by the jack stands:
None noted.

5.7 STRUCTURAL DURABILITY TEST

5.7-I. TEST OBJECTIVE

The objective of this test is to perform an accelerated durability test that approximates up to 25 percent of the service life of the vehicle.

5.7-II. TEST DESCRIPTION

The test vehicle is driven a total of 15,000 miles; approximately 12,500 miles on the PSBRTF Durability Test Track and approximately 2,500 miscellaneous other miles. The test will be conducted with the bus operated under three different loading conditions. The first segment will consist of approximately 6,250 miles with the bus operated at GVW. The second segment will consist of approximately 2,500 miles with the bus operated at SLW. The remainder of the test, approximately 6,250 miles, will be conducted with the bus loaded to CW. If GVW exceeds the axle design weights, then the load will be adjusted to the axle design weights and the change will be recorded. All subsystems are run during these tests in their normal operating modes. All recommended manufacturers servicing is to be followed and noted on the vehicle maintainability log. Servicing items accelerated by the durability tests will be compressed by 10:1; all others will be done on a 1:1 mi/mi basis. Unscheduled breakdowns and repairs are recorded on the same log as are any unusual occurrences as noted by the driver. Once a week the test vehicle shall be washed down and thoroughly inspected for any signs of failure.

5.7-III. DISCUSSION

The Structural Durability Test was started on April 6, 2004 and was conducted until September 7, 2004. The first 6,250 miles were performed at a GVW of 38,940 lbs. The number of standing passengers was reduced from 37 to 32. The ballast for five standing passengers was eliminated. This reduction in passenger weight was necessary to avoid exceeding the GAWR (25,000 lbs) of the rear axle. The GVW segment was completed on June 11, 2004. The next 2,500 mile SLW segment was performed at 34,210 lbs. and was completed on July 8, 2004 and the final 6,250 mile segment was performed at a CW of 28,180 lbs and was completed on September 7, 2004.

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 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.

GILLIG - TEST BUS #0405
MILEAGE DRIVEN/RECORDED FROM DRIVERS' LOGS

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
04/05//04 TO 04/11/04	286.00	64.00	350.00
04/12/04 TO 04/18/04	457.00	124.00	581.00
04/19/04 TO 04/25/04	870.00	40.00	910.00
04/26/04 TO 05/02/04	657.00	132.00	789.00
05/03/04 TO 05/09/04	779.00	136.00	915.00
05/10/04 TO 05/16/04	642.00	129.00	771.00
05/17/04 TO 05/23/04	291.00	14.00	305.00
05/24/04 TO 05/30/04	419.00	123.00	542.00
05/31/04 TO 06/06/04	369.00	120.00	489.00
06/07/04 TO 06/13/04	552.00	127.00	679.00
06/14/04 TO 06/20/04	442.00	23.00	465.00
06/21/04 TO 06/27/04	413.00	19.00	432.00
06/28/04 TO 07/04/04	462.00	124.00	586.00
07/05/04 TO 07/11/04	611.00	132.00	743.00
07/12/04 TO 07/18/04	651.00	29.00	680.00
07/19/04 TO 07/25/04	707.00	134.00	841.00
07/26/04 TO 08/01/04	791.00	141.00	932.00

DATE	TOTAL DURABILITY TRACK	TOTAL OTHER MILES	TOTAL
08/02/04 TO 08/08/04	139.00	228.00	367.00
08/09/04 TO 08/15/04	893.00	146.00	1039.00
08/16/04 TO 08/22/04	1049.00	47.00	1096.00
08/23/04 TO 08/29/04	891.00	42.00	933.00
08/30/04 TO 09/05/04	129.00	331.00	460.00
09/06/04 TO 09/12/04	0.00	97.00	97.00
TOTAL	12500.00	2502.00	15002.00

Table 4. Driving Schedule for Bus Operation on the Durability Test Track.

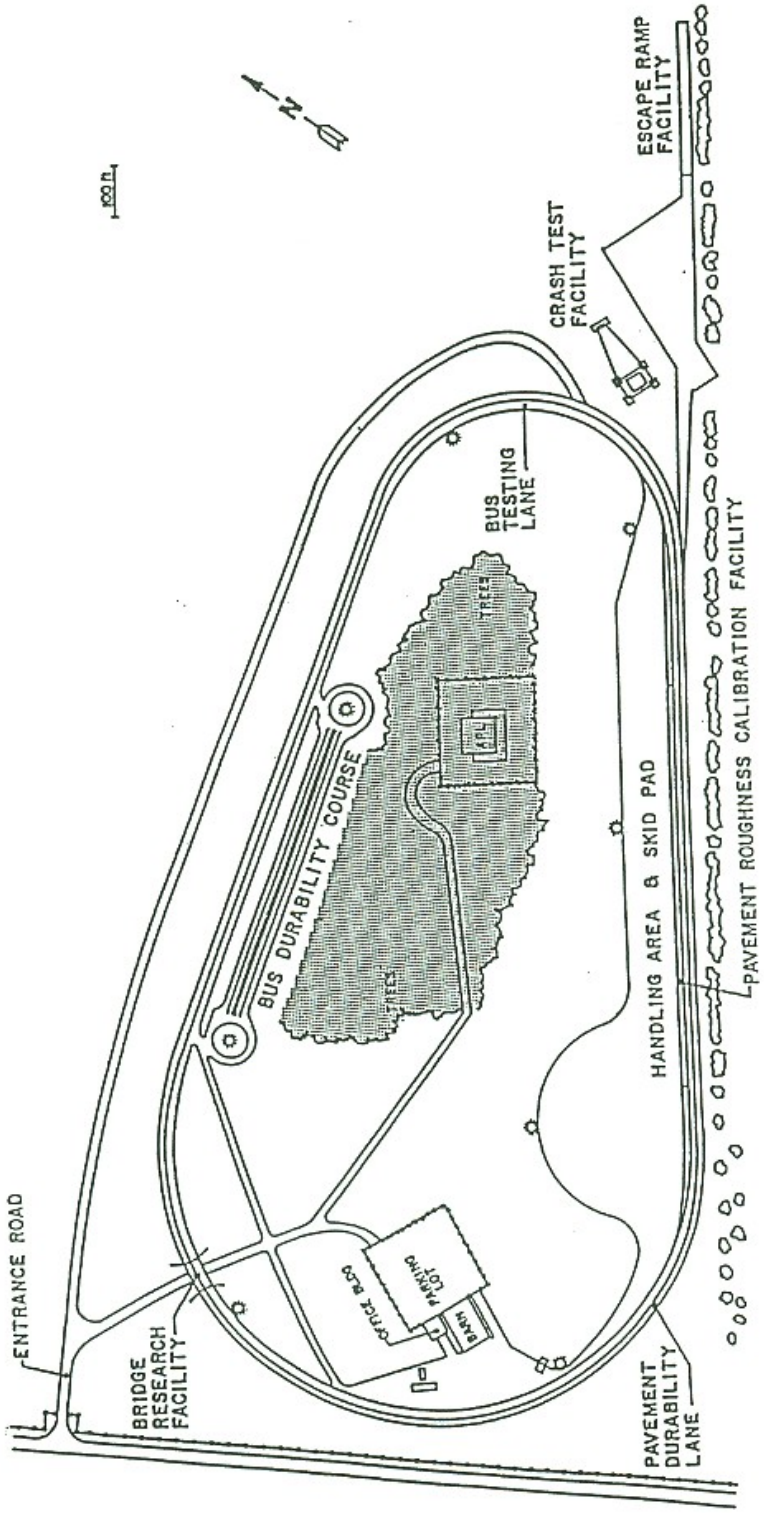
STANDARD OPERATING SCHEDULE

Monday through Friday

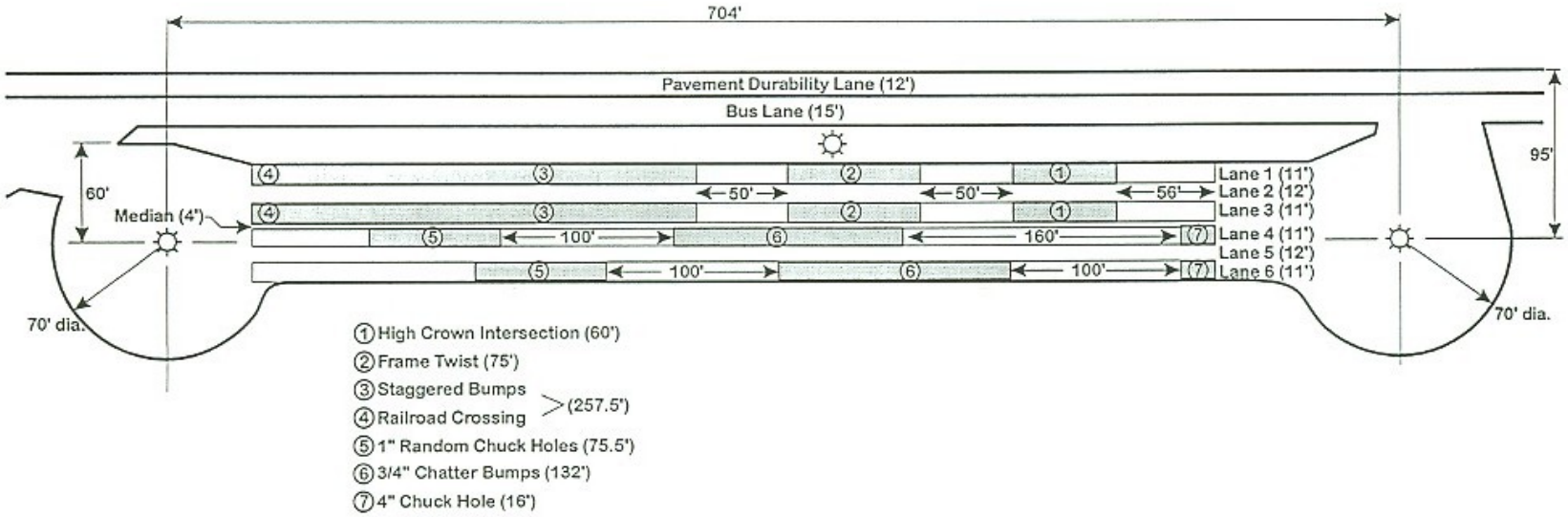
	HOUR	ACTION
Shift 1	midnight	D
	1:40 am	C
	1:50 am	B
	2:00 am	D
	3:35 am	C
	3:45 am	B
	4:05 am	D
	5:40 am	C
	5:50 am	B
	6:00 am	D
	7:40 am	C
	7:50 am	F
Shift 2	8:00 am	D
	9:40 am	C
	9:50 am	B
	10:00 am	D
	11:35 am	C
	11:45 am	B
	12:05 pm	D
	1:40 pm	C
	1:50 pm	B
	2:00 pm	D
	3:40 pm	C
	3:50 pm	F
Shift 3	4:00 pm	D
	5:40 pm	C
	5:50 pm	B
	6:00 pm	D
	7:40 pm	C
	7:50 pm	B
	8:05 pm	D
	9:40 pm	C
	9:50 pm	B
	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 OF PENN STATE BUS TESTING AND RESEARCH FACILITY"



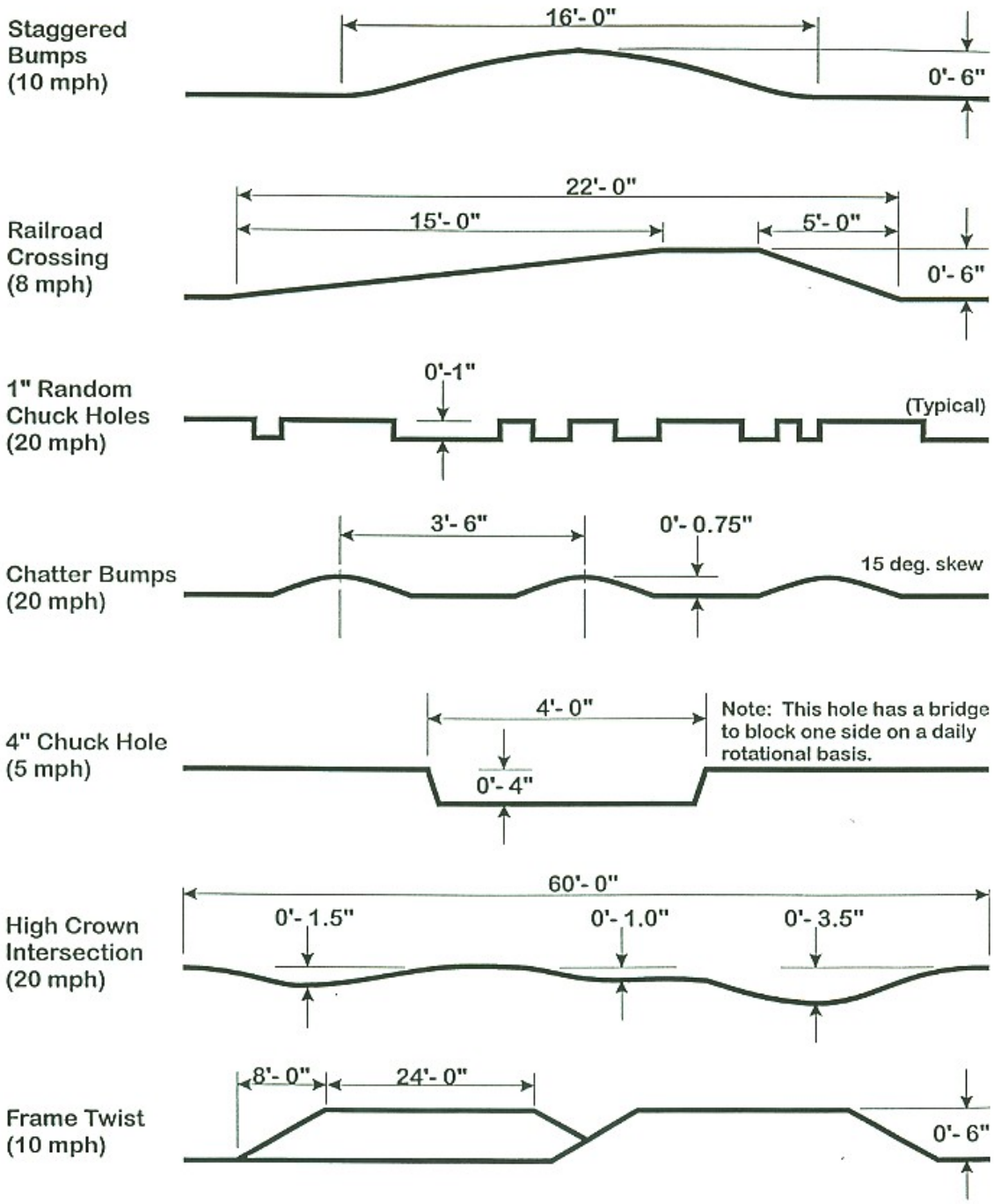
BUS TESTING AND RESEARCH TEST TRACK
UNIVERSITY PARK, PA



Plan View

Vehicle Durability Test Track

The Pennsylvania Transportation Institute
Penn State



Durability Element Profiles

The Pennsylvania Transportation Institute
Penn State

UNSCHEDULED MAINTENANCE

Gillig 0405

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
04-13-04	420	The right front, forward air bag has a hole at the top.	Right front forward air bag replaced.	12.00	1.00
04-14-04	483	The left front, forward air bag is leaking air.	Left front, forward air bag replaced.	16.00	1.00
04-16-04	764	Both front suspension bump stops are worn.	Both front suspension bump stops replaced.	8.00	1.00
04-20-04	1,140	The left front suspension bump stop is worn.	Bump stop replaced.	8.00	.50
04-23-04	1,685	The left rear, front axle air bag is leaking air.	Left front, rear air bag replaced.	8.00	1.00
04-23-04	1,685	The right rear, front axle air bag blew out.	Right rear, front axle air bag replaced.	8.00	1.00
04-26-04	1,841	The left front, forward air bag is blown out and the left front suspension bump stop is worn.	Left front forward air bag and bump stop replaced.	10.00	1.00
04-28-04	2,183	The right front air bag and front rubber bump stop have failed.	Air bag and bump stop replaced.	4.00	1.00

UNSCHEDULED MAINTENANCE

Gillig 0405

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
04-30-04	2,494	The left rear, front axle air bag is split in the middle and the left front suspension bump stop is broken.	Air bag and bump stop replaced. Suspension air pressure increased from 125 psi to 130 psi.	10.00	1.50
05-04-04	2,867	The left, front suspension bump stop is broken.	Left front suspension bump stop replaced.	8.00	0.50
05-06-04	3,242	The left rear, front axle air bag is blown out.	Left rear, front axle air bag replaced.	8.00	1.00
05-07-04	3,461	Both left side, front axle air bags are leaking.	Both left side, front axle air bags replaced.	6.00	1.50
05-10-04	3,627	The left rear, front axle air bag is blown. Both left and right front air bags are out of alignment.	Left rear, front axle air bag replaced. Both front air bags realigned.	3.00	1.50
05-11-04	3,879	The left front suspension bump stop is worn.	Left front suspension bump stop replaced.	1.00	1.00
05-12-04	4,080	Both left front axle air bags are blown and the left, front axle suspension bump stop is broken.	Both left front axle air bags and the left front axle bump stop replaced.	5.00	3.00

UNSCHEDULED MAINTENANCE

Gillig 0405

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
05-14-04	4,265	The right, front axle bump stop is broken.	Right front axle bump stop replaced.	8.00	1.00
05-17-04	4,316	The left front air bag is leaking.	Left front air bag replaced.	8.00	1.00
05-18-04	4,323	The right front air bag is leaking air.	Right front air bag replaced.	8.00	1.00
05-18-04	4,323	The left, front axle suspension bump stop is broken.	Left front axle bump stop replaced.	0.50	0.50
05-19-04	4,375	Manufacturer requests both front suspension bumps stops be replaced.	Both front suspension bump stops replaced.	1.00	1.00
05-20-04	4,468	The right front air bag is leaking.	Right front air bag replaced.	8.00	1.00
05-21-04	4,593	The left rear, front axle air bag is leaking.	Left rear front axle air bag replaced.	8.00	1.00
05-24-04	4,621	The right rear, front axle air bag is leaking.	Right rear, front axle air bag replaced.	10.00	1.00
05-27-04	4,750	Manufacturer requests both front air bag towers and upper mounting plates be replaced with new design.	New designed front air bag towers and upper mounting plates installed.	32.00	4.00
06-01-04	4,750	The left rear, front axle air bag is leaking.	Left rear front axle air bag replaced.	5.00	1.00

UNSCHEDULED MAINTENANCE

Gillig 0405

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
06-03-04	5,337	Both front suspension bump stops are worn.	Both front suspension bump stops replaced.	1.00	1.00
06-03-04	5,337	Manufacturer requests all four front air bags be replaced.	All four front air bags replaced.	8.00	1.00
06-03-04	5,337	The roof compartment is missing eight screws.	Eight screws replaced in the roof compartment.	0.50	0.50
06-04-04	5,571	The left rear, rear axle shock broke puncturing the left rear air bag.	Left rear, rear axle shock and left rear air bag replaced.	6.00	2.00
06-07-04	5,652	“No Air” in the front suspension. The front leveling valve link is disconnected.	Inspect linkage, linkage, ok, reconnect linkage.	0.50	0.50
06-07-04	5,652	The threads on the left front shock are stripped.	Left front shock replaced.	4.00	0.50
06-07-04	5,652	The right rear, front axle air bag is leaking.	Right rear, front axle air bag replaced.	4.00	1.00
06-08-084	5,709	Three left side passenger seats, forward of the rear door have pulled away from the wall.	Seats removed from the bus.	1.50	1.50

UNSCHEDULED MAINTENANCE

Gillig 0405

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
06-09-04	5,971	The left rear, front axle air bag is blown out.	Left rear, front axle air bag replaced.	4.00	0.50
06-14-04	6,331	The left front air brake air line to the ABS solenoid is leaking.	Air brake line replaced.	10.00	0.50
06-14-04	6,331	The left front suspension bump stop is broken.	Left, front suspension bump stop replaced.	0.50	0.50
06-25-04	7,134	The left front suspension bump stop is broken.	Left front suspension bump stop replaced.	0.50	0.50
06-28-04	7,228	The left front air bag is leaking.	Left front air bag replaced.	8.00	1.00
06-28-04	7,228	The right front suspension bump stop is broken.	Left front suspension bump stop replaced.	0.50	0.50
06-28-04	7,228	The heat shield is coming off the exhaust line off the turbo.	Heat shield rewired in place.	0.50	0.50
06-29-04	7,309	Both front suspension bump stops are broken.	Left front suspension bump stops replaced.	8.00	1.00
07-01-04	7,576	Seats removed on 6/8/04	Passenger seats reinstalled with increase fastener anchors as per manufacturer. Anchors increased from every 3 inches to every 1 ½ inches.	2.00	2.00

UNSCHEDULED MAINTENANCE

Gillig 0405

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
07-08-04	8,358	Both suspension bump stops are broken on the front axle.	Both bump stops replaced.	4.00	1.00
07-09-04	8,453	Both front tires are worn.	Both front tires replaced.	1.00	1.00
07-13-04	8,726	The right front suspension bump stop is broken.	Left front suspension bump stop replaced.	0.50	0.50
07-14-04	8,782	The “Check Engine” light and warning chimes are on. Troubleshooting found a broken connection on the “Water in Fuel” sensor.	Broken connection repaired.	8.00	2.00
07-20-04	9,450	Three seats on the left side are broken from the wall mounts.	Seats refastened to wall mounts with ¼” rivets.	3.00	3.00
07-20-04	9,450	The bushings are worn on both left rear shocks.	Both left rear shocks replaced.	1.50	1.50
07-21-04	9,560	The left front suspension bump stop is broken.	Left front suspension bump stop replaced.	8.00	0.50
07-26-04	10,078	The right rear, rear shock is broken at the bottom eye.	Right rear, rear shock replaced.	10.00	0.50
07-27-04	10,155	Both suspension bump stops are broken on the front axle.	Both bump stops replaced.	8.00	1.00

UNSCHEDULED MAINTENANCE

Gillig 0405

DATE	TEST MILES	SERVICE	ACTIVITY	DOWN TIME	HOURS
07-29-04	10,690	Both front shocks are leaking oil.	Both front shocks replaced.	0.50	0.50
08-06-04	11,331	The left front suspension bump stop is broken.	Left front suspension bump stop replaced.	8.00	0.50
08-06-04	11,331	The latch anchors for the inside, rear electrical panel are loose.	Angle with mounted latch anchors reinstalled.	0.50	0.50
08-12-04	12,011	The right front suspension bump stop is broken.	Right front suspension bump stop replaced.	8.00	0.50
08-16-04	12,416	The left front suspension bump stop is broken.	Left front suspension bump stop replaced.	0.50	0.50
08-24-04	13,667	The right front suspension bump stop is broken.	Right front suspension bump stop replaced.	0.50	0.50
08-30-04	14,445	The front leveling valve linkage is disconnected, the left rear, front axle air bag is leaking, and the left front suspension bump stop is broken.	Leveling valve link reconnected and air bag and bump stop replaced.	8.00	1.00

UNSCHEDULED MAINTENANCE

BROKEN FRONT AXLE BUMP STOPS (764 TEST MILES)

BROKEN SHOCK PUNCTURED AIR BAG (5,571 TEST MILES)

6. FUEL ECONOMY TEST - A FUEL CONSUMPTION TEST USING AN APPROPRIATE OPERATING CYCLE

6-I. TEST OBJECTIVE

The objective of this test is to provide accurate comparable fuel consumption data on transit buses produced by different manufacturers. This fuel 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 fuel economy test, as designated here, is a measurement of the fuel expended by a vehicle traveling a specified test loop under specified operating conditions. The results of this test will not represent actual mileage but will provide data that can be used by recipients to compare buses tested by this procedure.

6-II. TEST DESCRIPTION

This test requires operation of the bus over a course based on the Transit Coach Operating Duty Cycle (ADB Cycle) at seated load weight using a procedure based on the Fuel Economy Measurement Test (Engineering Type) For Trucks and Buses: SAE 1376 July 82. The procedure has been modified by elimination of the control vehicle and by modifications as described below. The inherent uncertainty and expense of utilizing a control vehicle over the operating life of the facility is impractical.

The fuel economy test will be performed as soon as possible (weather permitting) after the completion of the GVW portion of the structural durability test. It will be conducted on the bus test lane at the Penn State Test Facility. Signs are erected at carefully measured points which delineate the test course. A test run will comprise 3 CBD phases, 2 Arterial phases, and 1 Commuter phase. An electronic fuel measuring system will indicate the amount of fuel consumed during each phase of the test. The test runs will be repeated until there are at least two runs in both the clockwise and counterclockwise directions in which the fuel consumed for each run is within $\pm$ 4 percent of the average total fuel used over the 4 runs. A 20-minute idle consumption test is performed just prior to and immediately after the driven portion of the fuel economy test. The amount of fuel consumed while operating at normal/low idle is recorded on the Fuel Economy Data Form. This set of four valid runs along with idle consumption data comprise a valid test.

The test procedure is the ADB cycle with the following four modifications:

1. The ADB cycle is structured as a set number of miles in a fixed time in the following order: CBD, Arterial, CBD, Arterial, CBD, Commuter. A separate idle fuel consumption measurement is performed at the beginning and end of the fuel economy test. This phase sequence permits the reporting of fuel consumption for each of these phases separately, making the data more useful to bus manufacturers and transit properties.

2. The operating profile for testing purposes shall consist of simulated transit type service at seated load weight. The three test phases (figure 6-1) are: a central business district (CBD) phase of 2 miles with 7 stops per mile and a top speed of 20 mph; an arterial phase of 2 miles with 2 stops per mile and a top speed of 40 mph; and a commuter phase of 4 miles with 1 stop and a maximum speed of 40 mph. At each designated stop the bus will remain stationary for seven seconds. During this time, the passenger doors shall be opened and closed.

3. The individual ADB phases remain unaltered with the exception that 1 mile has been changed to 1 lap on the Penn State Test Track track. One lap is equal to 5,042 feet. This change is accommodated by adjusting the cruise distance and time.

4. The acceleration profile, for practical purposes and to achieve better repeatability, has been changed to "full throttle acceleration to cruise speed".

Several changes were made to the Fuel Economy Measurement Test (Engineering Type) For Trucks and Buses: SAE 1376 July 82:

1. Sections 1.1, and 1.2 only apply to diesel, gasoline, methanol, and any other fuel in the liquid state (excluding cryogenic fuels).

1.1 SAE 1376 July 82 requires the use of at least a 16-gal fuel tank. Such a fuel tank when full would weigh approximately 160 lb. It is judged that a 12-gal tank weighing approximately 120 lb will be sufficient for this test and much easier for the technician and test personnel to handle.

1.2 SAE 1376 July 82 mentions the use of a mechanical scale or a flowmeter system. This test procedure uses a load cell readout combination that provides an accuracy of 0.5 percent in weight and permits on-board weighing of the gravimetric tanks at the end of each phase. This modification permits the determination of a fuel economy value for each phase as well as the overall cycle.

2. Section 2.1 applies to compressed natural gas (CNG), liquified natural gas (LNG), cryogenic fuels, and other fuels in the vapor state.

2.1 A laminar type flowmeter will be used to determine the fuel consumption. The pressure and temperature across the flow element will be monitored by the flow computer. The flow computer will use this data to calculate the gas flow rate. The flow computer will also display the flow rate (scfm) as well as the total fuel used (scf). The total fuel used (scf) for each phase will be recorded on the Fuel Economy Data Form.

3. Use both Sections 1 and 2 for dual fuel systems.

FUEL ECONOMY CALCULATION PROCEDURE

A. For diesel, gasoline, methanol and fuels in the liquid state.

The reported fuel economy is based on the following: measured test quantities--distance traveled (miles) and fuel consumed (pounds); standard reference values--density of water at 60°F (8.3373 lbs/gal) and volumetric heating value of standard fuel; and test fuel specific gravity (unitless) and volumetric heating value (BTU/gal). These combine to give a fuel economy in miles per gallon (mpg) which is corrected to a standard gallon of fuel referenced to water at 60°F. This eliminates fluctuations in fuel economy due to fluctuations in fuel quality. This calculation has been programmed into a computer and the data processing is performed automatically.

The fuel economy correction consists of three steps:

1.) Divide the number of miles of the phase by the number of pounds of fuel consumed

phase	miles per phase	total miles per run
CBD	1.9097	5.7291
ART	1.9097	3.8193
COM	3.8193	3.8193

$$\mathbf{FEo_{mi/lb}} = \text{Observed fuel economy} = \frac{\text{miles}}{\text{lb of fuel}}$$

2.) Convert the observed fuel economy to miles per gallon [mpg] by multiplying by the specific gravity of the test fuel Gs (referred to water) at 60°F and multiply by the density of water at 60°F

$$\mathbf{FEo_{mpg} = FEc_{mi/lb}} \times Gs \times Gw$$

where **Gs** = Specific gravity of test fuel at 60°F (referred to water)
Gw = 8.3373 lb/gal

3.) Correct to a standard gallon of fuel by dividing by the volumetric heating value of the test fuel (H) and multiplying by the volumetric heating value of standard reference fuel (Q). Both heating values must have the same units.

$$\mathbf{FEc = FEo_{mpg}} \times \frac{Q}{H}$$

where

H = Volumetric heating value of test fuel [BTU/gal]
Q = Volumetric heating value of standard reference fuel

Combining steps 1-3 yields

$$\Longrightarrow \; FEc = \frac{\text{miles}}{\text{lbs}} \times (Gs \times Gw) \times \frac{Q}{H}$$

4.) Covert the fuel economy from mpg to an energy equivalent of miles per BTU. Since the number would be extremely small in magnitude, the energy equivalent will be represented as miles/BTUx10^6.

Eq = Energy equivalent of converting mpg to mile/BTUx10^6.

$$Eq = ((mpg)/(H))\times 10^6$$

B. CNG, LNG, cryogenic and other fuels in the vapor state.

The reported fuel economy is based on the following: measured test quantities--distance traveled (miles) and fuel consumed (scf); density of test fuel, and volumetric heating value (BTU/lb) of test fuel at standard conditions (P=14.73 psia and T=60 °F).

These combine to give a fuel economy in miles per lb. The energy equivalent (mile/BTUx10^6) will also be provided so that the results can be compared to buses that use other fuels.

1.) Divide the number of miles of the phase by the number of standard cubic feet (scf) of fuel consumed.

phase	miles per phase	total miles per run
CBD	1.9097	5.7291
ART	1.9097	3.8193
COM	3.8193	3.8193

$$\mathbf{FEo_{mi/scf}} = \text{Observed fuel economy} = \frac{\text{miles}}{\text{scf of fuel}}$$

2.) Convert the observed fuel economy to miles per lb by dividing FEo by the density of the test fuel at standard conditions (Lb/ft^3).

Note: The density of test fuel must be determined at standard conditions as described above. If the density is not defined at the above standard conditions, then a correction will be needed before the fuel economy can be calculated.

$$\mathbf{FEo_{mi/lb}} = FEo / Gm$$

where Gm = Density of test fuel at standard conditions

3.) Convert the observed fuel economy (FEomi/lb) to an energy equivalent of (miles/BTUx10^6) by dividing the observed fuel economy (FEomi/lb) by the heating value of the test fuel at standard conditions.

$$Eq = ((FEomi/lb)/H)x10^6$$

where

Eq = Energy equivalent of miles/lb to mile/BTUx10^6
H = Volumetric heating value of test fuel at standard conditions

6-III. DISCUSSION

This is a comparative test of fuel economy using diesel fuel with a heating value of 20,214.0 btu/lb. The driving cycle consists of Central Business District (CBD), Arterial (ART), and Commuter (COM) phases as described in 6-II. The fuel consumption for each driving cycle and for idle is measured separately. The results are corrected to a reference fuel with a volumetric heating value of 127,700.0 btu/gal.

An extensive pretest maintenance check is made including the replacement of all lubrication fluids. The details of the pretest maintenance are given in the first three Pretest Maintenance Forms. The fourth sheet shows the Pretest Inspection. The next sheet shows the correction calculation for the test fuel. The next four Fuel Economy Forms provide the data from the four test runs. Finally, the summary sheet provides the average fuel consumption. The overall average is based on total fuel and total mileage for each phase. The overall average fuel consumption values were; CBD – 5.26 mpg, ART – 4.86 mpg, and COM – 8.16 mpg. Average fuel consumption at idle was 5.18 lb/hr (0.83 gph).

FUEL ECONOMY PRE-TEST MAINTENANCE FORM

Bus Number: 0405	Date: 8-2-04	SLW (lbs): 34,210
Personnel: S.C. & T.S.		

FUEL SYSTEM	OK	Date	Initials
Install fuel measurement system	✓	8-2-04	S.C.
Replace fuel filter	✓	8-2-04	S.C.
Check for fuel leaks	✓	8-2-04	S.C.
Specify fuel type (refer to fuel analysis)	Diesel (Hybrid)		
Remarks: None			
BRAKES/TIRES	OK	Date	Initials
Inspect hoses	✓	8-2-04	T.S.
Inspect brakes	✓	8-2-04	T.S.
Relube wheel bearings	✓	8-2-04	T.S.
Check tire inflation pressures (mfg. specs.)	✓	8-2-04	T.S.
Remarks: None			
COOLING SYSTEM	OK	Date	Initials
Check hoses and connections	✓	8-2-04	T.S.
Check system for coolant leaks	✓	8-2-04	T.S.
Remarks: None			

FUEL ECONOMY PRE-TEST MAINTENANCE FORM (page 2)

Bus Number: 0405	Date: 8-2-04
Personnel:	

ELECTRICAL SYSTEMS	OK	Date	Initials
Check battery	✓	8-2-04	S.C.
Inspect wiring	✓	8-2-04	S.C.
Inspect terminals	✓	8-2-04	S.C.
Check lighting	✓	8-2-04	S.C.
Remarks: None			
DRIVE SYSTEM	OK	Date	Initials
Drain transmission fluid	✓	8-2-04	T.S.
Replace filter/gasket	✓	8-2-04	T.S.
Check hoses and connections	✓	8-2-04	T.S.
Replace transmission fluid	✓	8-2-04	T.S.
Check for fluid leaks	✓	8-2-04	T.S.
Remarks: None			
LUBRICATION	OK	Date	Initials
Drain crankcase oil	✓	8-2-04	T.S.
Replace filters	✓	8-2-04	T.S.
Replace crankcase oil	✓	8-2-04	T.S.
Check for oil leaks	✓	8-2-04	T.S.
Check oil level	✓	8-2-04	T.S.
Lube all chassis grease fittings	✓	8-2-04	T.S.
Lube universal joints	✓	8-2-04	T.S.
Replace differential lube including axles	✓	8-2-04	T.S.
Remarks: None			

FUEL ECONOMY PRE-TEST MAINTENANCE FORM (page 3)

Bus Number: 0405	Date: 8-2-04
Personnel: S.C. & T.S>	

EXHAUST/EMISSION SYSTEM	OK	Date	Initials
Check for exhaust leaks	✓	8-2-04	S.C.
Remarks: None			

ENGINE	OK	Date	Initials
Replace air filter	✓	8-2-04	S.C.
Inspect air compressor and air system	✓	8-2-04	S.C.
Inspect vacuum system, if applicable	N/A	8-2-04	S.C.
Check and adjust all drive belts	✓	8-2-04	S.C.
Check cold start assist, if applicable	✓	8-2-04	S.C.
Remarks: None			

STEERING SYSTEM	OK	Date	Initials
Check power steering hoses and connectors	✓	8-2-04	S.C.
Service fluid level	✓	8-2-04	S.C.
Check power steering operation	✓	8-2-04	S.C.
Remarks: None			

	OK	Date	Initials
Ballast bus to seated load weight	✓	8-2-04	S.C.

TEST DRIVE	OK	Date	Initials
Check brake operation	✓	8-2-04	S.C.
Check transmission operation	✓	8-2-04	S.C.
Remarks: None			

FUEL ECONOMY PRE-TEST INSPECTION FORM

Bus Number: 0405	Date: 9-7-04
Personnel: S.C.	

PRE WARM-UP	If OK, Initial
Fuel Economy Pre-Test Maintenance Form is complete	S.C.
Cold tire pressure (psi): Front 120 Middle N/A Rear 120	S.C.
Tire wear:	S.C.
Engine oil level	S.C.
Engine coolant level	S.C.
Interior and exterior lights on, evaporator fan on	S.C.
Fuel economy instrumentation installed and working properly.	S.C.
Fuel line -- no leaks or kinks	S.C.
Speed measuring system installed on bus. Speed indicator installed in front of bus and accessible to TECH and Driver.	S.C.
Bus is loaded to SLW	S.C.
WARM-UP	**If OK, Initial**
Bus driven for at least one hour warm-up	S.C.
No extensive or black smoke from exhaust	S.C.
POST WARM-UP	**If OK, Initial**
Warm tire pressure (psi): Front 122 Middle N/A Rear 124	S.C.
Environmental conditions Average wind speed <12 mph and maximum gusts <15 mph Ambient temperature between 30°(-1°) and 90°F(32°C) Track surface is dry Track is free of extraneous material and clear of interfering traffic	S.C.

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 0405	Manufacturer: Gillig	Date: 9-7-04
Run Number: 1	Personnel: R.C., T.S. & S.C.	
Test Direction: □CW or ■CCW	Temperature (°F): 68	Humidity (%): 80
SLW (lbs): 34,210	Wind Speed (mph) & Direction: Calm	Barometric Pressure (in.Hg): 30.09

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	8:57	8:57	26.8	97.15	94.95	2.20
ART #1	0	4:02	4:02	27.5	94.95	92.20	2.75
CBD #2	0	8:53	8:53	29.9	92.20	89.95	2.25
ART #2	0	4:00	4:00	30.3	89.95	87.25	2.70
CBD #3	0	8:52	8:52	31.0	87.25	85.85	1.60
COMMUTER	0	6:04	6:04	30.9	85.85	82.55	3.30
							Total Fuel = 14.80 lbs

20 minute idle : Total Fuel Used = 1.60 lbs

Heating Value = 20,214.0 BTU/LB

Comments: None

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 0405	Manufacturer: Gillig	Date: 9-7-04
Run Number: 2	Personnel: R.C., T.S. & S.C.	
Test Direction: ■CW or □CCW	Temperature (°F): 70	Humidity (%): 80
SLW (lbs): 34,210	Wind Speed (mph) & Direction: Calm	Barometric Pressure (in.Hg): 30.09

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	8:53	8:53	30.9	82.85	80.55	2.30
ART #1	0	4:00	4:00	31.2	80.55	77.45	3.10
CBD #2	0	8:47	8:47	31.4	77.45	75.05	2.40
ART #2	0	3:59	3:59	31.7	75.05	73.55	1.50
CBD #3	0	8:44	8:44	31.5	73.55	71.15	2.40
COMMUTER	0	6:01	6:01	31.4	71.15	68.35	2.80
							Total Fuel = 14.50 lbs

20 minute idle : Total Fuel Used = N/A lbs

Heating Value = 20,214.0 BTU/LB

Comments: None

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 0405	Manufacturer: Gillig	Date: 9-7-04
Run Number: 3	Personnel: R.C., T.S. & S.C.	
Test Direction: □CW or ■CCW	Temperature (°F): 72	Humidity (%): 78
SLW (lbs): 34,210	Wind Speed (mph) & Direction: 8 / SSW	Barometric Pressure (in.Hg): 30.09

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	8:54	8:54	32.1	65.55	63.75	1.80
ART #1	0	4:08	4:08	32.3	63.75	60.75	3.00
CBD #2	0	8:44	8:44	32.0	60.75	58.55	2.20
ART #2	0	4:08	4:08	32.1	58.55	56.25	2.30
CBD #3	0	8:42	8:42	32.4	56.25	53.85	2.40
COMMUTER	0	6:14	6:14	32.4	53.85	50.35	3.50
							Total Fuel =15.20 lbs

20 minute idle : Total Fuel Used = N/A lbs

Heating Value = 20,214.0 BTU/LB

Comments: None

FUEL ECONOMY DATA FORM (Liquid Fuels)

Bus Number: 0405	Manufacturer: Gillig	Date: 9-7-04
Run Number: 4	Personnel: R.C., T.S. & S.C.	
Test Direction: ■CW or □CCW	Temperature (°F): 73	Humidity (%): 72
SLW (lbs): 34,210	Wind Speed (mph) & Direction: 5 / SW	Barometric Pressure (in.Hg): 30.09

Cycle Type	Time (min:sec)		Cycle Time (min:sec)	Fuel Temperature (°C)	Load Cell Reading (lb)		Fuel Used (lbs)
	Start	Finish		Start	Start	Finish	
CBD #1	0	8:42	8:42	32.5	50.35	47.35	3.00
ART #1	0	4:06	4:06	32.4	47.35	45.15	2.20
CBD #2	0	8:40	8:40	32.4	45.15	42.65	2.50
ART #2	0	4:06	4:06	32.6	42.65	40.35	2.30
CBD #3	0	8:46	8:46	32.5	40.35	37.75	2.60
COMMUTER	0	6:12	6:12	32.5	37.75	35.35	2.40
							Total Fuel = 15.00 lbs

20 minute idle : Total Fuel Used = 1.85 lbs

Heating Value = 20.214.0 BTU/LB

Comments: None

0405.FUL
FUEL ECONOMY SUMMARY SHEET

BUS MANUFACTURER :Gillig
BUS MODEL :Lowfloor/Hybrid
BUS NUMBER :0405
TEST DATE :9/7/04

FUEL TYPE : DIESEL
SP. GRAVITY : .8095
HEATING VALUE : 20214.00 BTU/Lb
Standard Conditions : 60 deg F and 14.7 psi
Density of Water : 8.3373 lb/gallon at 60 deg F

CYCLE	TOTAL FUEL USED (Lb)	TOTAL MILES	FUEL ECONOMY M/Lb(Measured)	FUEL ECONOMY MPG(Corrected)
Run # :1, CCW				
CBD	6.05	5.73	.95	5.94
ART	5.45	3.82	.70	4.39
COM	3.30	3.82	1.16	7.26
TOTAL	14.80	13.37	.90	5.66
Run # :2, CW				
CBD	7.10	5.73	.81	5.06
ART	4.60	3.82	.83	5.21
COM	2.80	3.82	1.36	8.55
TOTAL	14.50	13.37	.92	5.78
Run # :3, CCW				
CBD	6.40	5.73	.90	5.61
ART	5.30	3.82	.72	4.52
COM	3.50	3.82	1.09	6.84
TOTAL	15.20	13.37	.88	5.51
Run # :4, CW				
CBD	8.10	5.73	.71	4.43
ART	4.50	3.82	.85	5.32
COM	2.40	3.82	1.59	9.98
TOTAL	15.00	13.37	.89	5.59

IDLE CONSUMPTION

First 20 Minutes Data : 1.60 Lb Last 20 Minutes Data : 1.85 Lb
Average Idle Consumption : 5.18 Lb/Hr

RUN CONSISTENCY: % Difference from overall average of total fuel used

Run 1 : .5 Run 2 : 2.5 Run 3 : -2.2 Run 4 : -.8

SUMMARY

Average Idle Consumption : .83 G/Hr
Average CBD Phase Consumption : 5.26 MPG
Average Arterial Phase Consumption : 4.86 MPG
Average Commuter Phase Consumption : 8.16 MPG
Overall Average Fuel Consumption : 5.64 MPG
Overall Average Fuel Consumption : 41.31 Miles/ Million BTU

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 will be measured at several locations with the bus operating under the following three conditions:

1. With the bus stationary, a white noise generating system shall provide a uniform sound pressure level equal to 80 dB(A) on the left, exterior side of the bus. The engine and all accessories will be switched off and all openings including doors and windows will be closed. This test will be performed at the ABTC.

2. The bus accelerating at full throttle from a standing start to 35 mph on a level pavement. All openings will be closed and all accessories will be operating during the test. This test will be performed on the track at the Test Track Facility.

3. The bus will be operated at various speeds from 0 to 55 mph with and without the air conditioning and accessories on. Any audible vibration or rattles will be noted. This test will be performed on the test segment between the Test Track and the Bus Testing Center.

All tests will be performed in an area free from extraneous sound-making sources or reflecting surfaces. The ambient sound level as well as the surrounding weather conditions will be recorded in the test data.

7.1-III. DISCUSSION

This test is performed in three parts. The first part exposes the exterior of the vehicle to 80.0 dB(A) on the left side of the bus and the noise transmitted to the interior is measured. The overall average of the six measurements was 56.7 dB(A); ranging from 53.0 dB(A) at the rear passenger seats 59.4 dB(A) at the front passenger seats. The interior ambient noise level for this test was 36.7 dB(A).

The second test measures interior noise during acceleration from 0 to 35 mph. This noise level ranged from 74.7 dB(A) at the driver's seat to 77.0 dB(A) at the rear passenger seats. The overall average was 75.7 dB(A). The interior ambient noise level for this test was 34.0 dB(A).

The third part of the test is to listen for resonant vibrations, rattles, and other noise sources while operating over the road. No vibrations or rattles were noted.

INTERIOR NOISE TEST DATA FORM
Test Condition 1: 80 dB(A) Stationary White Noise

Bus Number: 0405	Date: 3-10-04
Personnel: S.C.	
Temperature (°F): 40	Humidity (%): 58
Wind Speed (mph): Calm	Wind Direction: Calm
Barometric Pressure (in.Hg): 30.11	
Initial Sound Level Meter Calibration: ⊠ checked by: S.C.	
Interior Ambient Noise Level dB(A): 36.7	Exterior Ambient Noise Level dB(A): 40.5
Microphone Height During Testing (in): 48	

Measurement Location	Measured Sound Level dB(A)
Driver's Seat	56.2
Front Passenger Seats	59.4
In Line with Front Speaker	58.6
In Line with Middle Speaker	57.6
In Line with Rear Speaker	55.4
Rear Passenger Seats	53.0

Final Sound Level Meter Calibration: ⊠ checked by: S.C.

Comments: All readings taken in the center aisle.

INTERIOR NOISE TEST DATA FORM
Test Condition 2: 0 to 35 mph Acceleration Test

Bus Number: 0405	Date: 8-4-04
Personnel: S.C. & M.H.	
Temperature (°F): 80	Humidity (%): 65
Wind Speed (mph): Calm	Wind Direction: Calm
Barometric Pressure (in.Hg): 29.83	
Initial Sound Level Meter Calibration: ☒ checked by: S.C.	
Interior Ambient Noise Level dB(A): 34.0	Exterior Ambient Noise Level dB(A): 43.5
Microphone Height During Testing (in): 48	

Measurement Location	Measured Sound Level dB(A)
Driver's Seat	74.7
Front Passenger Seats	75.5
Middle Passenger Seats	75.6
Rear Passenger Seats	77.0

Final Sound Level Meter Calibration: ☒ checked by: S.C.

Comments**:** All readings taken in the center aisle.

INTERIOR NOISE TEST DATA FORM
Test Condition 3: Audible Vibration Test

Bus Number: 0405	Date: 8-4-04
Personnel: G.M., M.H. & S.C.	
Temperature (°F): 80	Humidity (%): 65
Wind Speed (mph): Calm	Wind Direction: Calm
Barometric Pressure (in.Hg): 29.83	

Describe the following possible sources of noise and give the relative location on the bus.

Source of Noise	Location
Engine and Accessories	None noted.
Windows and Doors	None noted.
Seats and Wheel Chair lifts	None noted.

Comment on any other vibration or noise source which may have occurred
that is not described above: None

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 will be operated at a SLW in three different conditions using a smooth, straight and level roadway:

1. Accelerating at full throttle from a constant speed at or below 35 mph and just prior to transmission upshift.
2. Accelerating at full throttle from standstill.
3. Stationary, with the engine at low idle, high idle, and wide open throttle.

In addition, the buses will be tested with and without the air conditioning and all accessories operating. The exterior noise levels will be recorded.

The test site is at the PSBRTF and the test procedures will be 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 will measure the noise level.

During the test, special attention should be 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 exterior ambient noise level of 45.6 dB(A), the average test result obtained while accelerating from a constant speed was 71.2 dB(A) on the right side and 72.4 dB(A) on the left side.

When accelerating from a standstill with an exterior ambient noise level of 44.7 dB(A), the average of the results obtained were 73.2 dB(A) on the right side and 72.8 dB(A) on the left side.

With the vehicle stationary and the engine, accessories, and air conditioning on, the measurements averaged 63.2 dB(A) at low idle, 63.9 dB(A) at high idle, and 68.3 dB(A) at wide open throttle. With the accessories and air conditioning off, the readings averaged 1.2 dB(A) higher at low idle, the same 63.9 dB(A) at high idle, and 1.2 dB(A) higher at wide open throttle. The exterior ambient noise level measured during this test was 44.6 dB(A).

EXTERIOR NOISE TEST DATA FORM
Accelerating from Constant Speed

Bus Number: 0405	Date: 8-4-04
Personnel: G.M., M.H. & S.C.	
Temperature (°F): 80	Humidity (%): 65
Wind Speed (mph): 6	Wind Direction: SW
Barometric Pressure (in.Hg): 29.83	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ⊠ checked by: S.C.	
Initial Sound Level Meter Calibration: ⊠ checked by: S.C.	
Exterior Ambient Noise Level dB(A): 45.6	

Accelerating from Constant Speed Curb (Right) Side		Accelerating from Constant Speed Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	71.2	1	71.6
2	70.4	2	72.3
3	71.1	3	72.4
4	70.3	4	72.2
5	71.0	5	72.3
Average of two highest actual noise levels = 71.2 dB(A)		Average of two highest actual noise levels = 72.4 dB(A)	

Final Sound Level Meter Calibration Check: ⊠ checked by: S.C.

Comments: None

EXTERIOR NOISE TEST DATA FORM
Accelerating from Standstill

Bus Number: 0405	Date: 8-4-04
Personnel: G.M., M.H. & S.C.	
Temperature (°F): 80	Humidity (%): 65
Wind Speed (mph): 6	Wind Direction: SW
Barometric Pressure (in.Hg): 29.83	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ⊠ checked by: S.C.	
Initial Sound Level Meter Calibration: ⊠ checked by: S.C.	
Exterior Ambient Noise Level dB(A): 44.7	

Accelerating from Standstill Curb (Right) Side		Accelerating from Standstill Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	72.9	1	73.1
2	72.1	2	72.2
3	73.4	3	72.4
4	72.7	4	72.0
5	72.4	5	72.3
Average of two highest actual noise levels = 73.2 dB(A)		Average of two highest actual noise levels = 72.8 dB(A)	

Final Sound Level Meter Calibration Check: ⊠ checked by: S.C.

Comments: None

EXTERIOR NOISE TEST DATA FORM
Stationary

Bus Number: 0405	Date: 8-4-04
Personnel: G.M., M.H. & S.C.	
Temperature (°F): 80	Humidity (%): 65
Wind Speed (mph): 6	Wind Direction: SW
Barometric Pressure (in.Hg): 29.83	

Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ⊠ checked by: S.C.

Initial Sound Level Meter Calibration: ⊠ checked by: S.C.

Exterior Ambient Noise Level dB(A): 44.6

Accessories and Air Conditioning ON

Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	901	60.9	65.4
High Idle	1,208	61.8	66.0
Wide Open Throttle	1,980	67.3	69.3

Accessories and Air Conditioning OFF

Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	780	61.3	67.4
High Idle	1,205	64.1	63.6
Wide Open Throttle	1,982	68.7	70.2

Final Sound Level Meter Calibration Check: ⊠ checked by: S.C.

Comments: None

7.2 EXTERIOR NOISE TESTS

TEST BUS UNDER GOING EXTERIOR NOISE TESTS

FEDERAL TRANSIT BUS TEST

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

Manufacturer: Gillig LLC
Model: Low Floor

Partial Test

August 2022

Report Number: LTI-BT-R2022-06-P

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

PennState
College of Engineering

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 LLC
Manufacturer's address: 451 Discovery Drive
Livermore, CA 94551

Model: Low Floor

Partial Test

Report Number: LTI-BT-R2022-06-P

ACCREDITED
Mechanical Testing Certificate 3172.01

David Klinikowski	Director, Bus Research and Testing Center	August 16th, 2022
Quality Authorization	*Title*	*Date*

TABLE OF CONTENTS

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 LLC
Model	Low Floor
Chassis Make/Model	Gillig / Low Floor
Chassis Modified	No
Length	41 feet / 9.9 inches
Fuel	Diesel – Electric Hybrid
Service Life	12 Year / 500,000 Miles - Partial
Number of Seats (including driver)	39 or 32 and 2 wheelchairs
Manufacturer-Designated Standing Passenger Capacity	34
Gross Vehicle Weight used for testing	42,380 lb.
Gross Vehicle Weight Rating	44,300 lb.
Mileage at Delivery	2,956 miles
Test Start Date	May 02, 2022
Test Completion Date	June 10, 2022
Report Issuance Date	August 16, 2022

The measured curb weight was 11,220 lb. for the front axle and 20,170 lb. for the rear axle. These combined weights provided a total measured curb weight of 31,390 lb. There are 39 seats including the driver (7 seats stow away for two wheelchair positions) and free floor space for 36 standing passengers bringing the potential total passenger capacity to 75. However, a placard shows the maximum number of standing passengers as 34, therefore, the gross load represents a total of 73 passengers. Gross load is calculated as 150 lb. x 73 = 10,950 lb. The wheelchair positions are not used for gross load because 34 standees can only be achieved when the wheelchair positions are not in use and utilizing the space for standees yields a higher gross load for testing. At full declared capacity, the measured gross vehicle weight was 42,380 lb. The heaviest seated load weight is achieved using the two wheelchair positions with 32 seated passengers, including the driver. Seated load is calculated as (32 x 150 lb.) + (2 x 600 lb.) = 6,000 lb. There is a potential to overload this bus with the available floor space for standing passengers.

The FTA determined that this bus be tested for check in, safety-braking, performance (EV and hybrid mode), fuel/energy economy (EV and hybrid mode), interior noise (EV and hybrid mode), exterior noise (EV and hybrid mode) and emissions (hybrid mode); the baseline full Bus Testing report for this test is PTI-BT-R0405.

During testing, it was noticed that the castle nut on the drag link, where it connects to the pitman arm, was on upside down. The pitman arm and drag link were replaced. In addition, the battery thermal management system (BTMS) control module was replaced as it was found defective, and a new auto breathing valve was installed on the cooling system.

ABBREVIATIONS AND ACRONYMS

ABS - anti-skid braking system
ABTC - Altoona Bus Test Center
A/C - air conditioner, or air conditioning
AC - alternating current
ADA - American Disability Act
Ah - Ampere hours
CDCTS - chassis dynamometer test control system
CVS - constant volume sampling
CW - curb weight (bus weight including maximum fuel, oil, and coolant; but without passengers or driver)
dB(A) - decibels with reference to 0.0002 microbar as measured on the "A" scale
DC - direct current
DIR - test director
DR - bus driver
EPA - Environmental Protection Agency
GAWR – 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)
GVW - gross vehicle weight (curb weight plus gross vehicle load)
GVWR - gross vehicle weight rating
HD-UDDS – Heavy Duty-Urban Dynamometer Driving Schedule
LTI - Larson Transportation Institute
mpg - miles per gallon
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
TM - track manager
TP - test personnel
Wh - Watt hour

TEST BUS CHECK-IN

I. OBJECTIVE

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 LLC, Low Floor model. The bus has a front passenger door forward of the front axle and a rear passenger door forward of the rear axle. The front passenger door is equipped with a Lift-U LU18-02-12 electric bi-fold ramp. This is a diesel electric hybrid bus. Power is provided by a diesel fueled, Cummins B6.7 280 hp engine coupled to an Allison / eGen Flex transmission and an Allison VCM TCM HGM 29566342 motor control system.

The measured curb weight was 11,220 lb. for the front axle and 20,170 lb. for the rear axle. These combined weights provided a total measured curb weight of 31,390 lb. There are 39 seats including the driver (7 seats stow away for two wheelchair positions) and free floor space for 36 standing passengers bringing the potential total passenger capacity to 75. However, a placard shows the maximum number of standing passengers as 34, therefore, the gross load represents a total of 73 passengers. Gross load is calculated as 150 lb. x 73 = 10,950 lb. The wheelchair positions are not used for gross load because 34 standees can only be achieved when the wheelchair positions are not in use and utilizing the space for standees yields a higher gross load for testing. At full declared capacity, the measured gross vehicle weight was 42,380 lb. The heaviest seated load weight is achieved using the two wheelchair positions with 32 seated passengers, including the driver. Seated load is calculated as (32 x 150 lb.) + (2 x 600 lb.) = 6,000 lb. There is a potential to overload this bus with the available floor space for standing passengers.

VEHICLE DATA FORM

Bus Number: 2022-06-P	Date of Check-In: 05/02/22 to 05/05/22
Bus Manufacturer: Gillig LLC	Vehicle Identification Number (VIN): 15GGD3013N3197144
Model Name: Low Floor	Chassis Mfr./Mod. #: Gillig / Low Floor
Personnel: S.R., E.D., F.T., T.G., J.M. & M.R.	Starting Odometer Reading: 2,956 miles

WEIGHT:

Individual Wheel Reactions:

Weights (lb.)	Front Axle		Middle Axle		Rear Axle	
	Curb	Street	Curb	Street	Curb	Street
CW	5,610	5,610	N/A	N/A	9,420	10,750
SLW	6,530	6,540	N/A	N/A	11,210	13,100
GVW	7,820	7,750	N/A	N/A	12,480	14,330

Total Weight Details:

Weight (lb.)	CW	SLW	GVW	GAWR
Front Axle	11,220	13,070	15,570	15,660
Middle Axle	N/A	N/A	N/A	N/A
Rear Axle	20,170	24,310	26,810	28,640
Total	31,390	37,380	42,380	GVWR: 44,300 (Declared by Manufacturer)

Dimensions:

Length (ft/in)	41 / 4.8
Length Over Bumpers (ft/in)	41 / 9.9
Overall Length with Add-ons (ft/in)	42 / 8 (with bike rack)
Width (in)	100.4 (without mirrors) 132.5 (with mirrors)
Height of bus (in)	110.1
Overall Height (in)	130.1
Front Overhang (in)	100.3
Rear Overhang (in)	122.1
Wheelbase (in)	279.5
Wheel Track (in)	Front: 85.5
	Middle: N/A
	Rear: 78.0

Bus Number: 2022-06-P	Date:05/02/22 to 05/05/22

CLEARANCES:

Lowest Point Outside Front Axle	Location: Framework beam	Clearance(in): 9.1
Lowest Point Outside Rear Axle	Location: Tube steel radiator guard on rear streetside	Clearance(in): 9.4
Lowest Point between Axles	Location: Bolt on coolant line clamp	Clearance(in): 12.3
Front Bumper Height (in)	14.8	
Rear Bumper Height (in)	20.2	
Ground Clearance at the center (in)	13.2	
Front Approach Angle (deg)*	8.4	
Rear Approach Angle (deg)*	8.3	
Ramp Clearance Angle (deg)	5.4	
Aisle Width (in)	23.9	
Inside Standing Height at Center Aisle (in)	95.2	

*measurements used to calculate approach and departure angles are taken from the centerline of the axles.

BODY DETAILS:

Body Structural Type	Semi-monocoque		
Frame Material	Stainless steel		
Body Material	Aluminum		
Floor Material	Plywood		
Roof Material	Composite		
Windows Type	■ Fixed	☐ Movable	
Window Mfg./Model No.	Ricon / 56725		
Number of Doors	_1_ Front (curbside)	_1_ Rear (curbside)	
Mfr. / Model No.	Front- Vapor Ameriview / 50940254-00 Rear- Vapor Ameriview / 50940254-01		
Dimension of Each Door (in)	Front- 32 x 75.1	Rear- 28.3 x 77.9	
Passenger Seat Type	■ Cantilever	■ Pedestal	☐ Other
Passenger Seat Mfg./ Model No.	USSC Gemini / SL81012-194690		
Driver Seat Type	■ Air	☐ Spring	☐ Other
Mfr. / Model No.	USSC / G2A		
Number of Seats (including Driver)	39 or 32 with two wheelchair positions		

Bus Number: 2022-06-P	Date: 05/02/22 to 05/05/22

BODY DETAILS (Contd.)

Free Floor Space (ft^2)	59.0 with seats 48.2 with wheelchairs
Height of Each Step at Normal Position (in)	Front 1. 16.1 2. N/A 3. N/A 4. N/A
	Rear 1. 15.4 2. N/A 3. N/A 4. N/A
Step Elevation Change - Kneeling (in)	Front: 3.6 Rear: 1.1

ENGINE

Type	■ C.I.	☐ Alternate Fuel	
	☐ S.I.	☐ Other (explain)	
Mfr. / Model No.	Cummins / B6.7 280hp		
Engine Power	280 hp @ 2400 rpm		
Engine Power	Max torque 910 ft. lb. @ 2300 rpm		
Location	☐ Front	■ Rear	☐ Other (explain)
Fuel Type	☐ Gasoline	☐ CNG	☐ Methanol
	■ Diesel	☐ LNG	☐ Other (explain)
Alternator (Generator) Mfr./Model No.	N/A*		
Maximum Rated Output (Volts / Amps)	N/A		
Air Compressor Mfr. / Model No.	Powerex-Iwata Air Technology, Inc. / SBBHS050020GG09		
Maximum Capacity (ft^3 / min)	12.5 cfm @ 145 PSIG		
Starter Type	☐ Electrical	☐ Pneumatic	■ Other *see below
Starter Mfr. / Model No.	Mopar / 428000-7202 / 04801839AD		

*Conventional alternator and starter have been replaced by the Allison eGEN FLEX hybrid transmission components. Hybrid drive generator is used to start engine.

TRANSMISSION

Transmission Type	☐ Manual	■ Automatic	☐ Load Sensing Adaptive
Mfr. / Model No.	Allison / eGEN Flex 40 Max		
Control Type	☐ Mechanical	■ Electrical	☐ Other
Integral Retarder Mfr. / Model No.	☐ Yes	■ No	

Bus Number: 2022-06-P	Date: 05/02/22 to 05/05/22

ELECTRIC DRIVE SYSTEM

Type	☐ Series Battery Electric	■ Parallel Electric Hybrid
Number of Traction Motors	1	
Mfr. / Model No.	Allison / eGEN Flex 40 Max, PN 29563868	
Location of Traction Motor(s)	Rear	
Type	Electric	
Motor Control System Mfr./Model No.	Allison VCM TCM HGM / 29566342	
Location	Rear electrical panel (with access door open)	
Max Rated Power Output (kW)	209	
Nominal Voltage (volts)	644	
Drive Battery Mfr./ Model No.	Allison / eGEN Flex Max 29564244	
Number of Battery Packs	1	
Location of Battery Packs	Rooftop / Middle Streetside	
Individual Battery Capacity (kWh)	26	
Total Nominal Battery Capacity (kWh)	26	
Total Usable Battery Capacity (kWh)	20	
Total Nominal Battery Capacity (Ah)	31	
Battery Type (Chemistry)	Lithium Titanate	
Low Voltage Battery	■ 12 Volt ☐ 24 Volt	
Low Voltage Battery Mfr./Model No.	Deka / DP31CS	

Bus Number: 2022-06-P	Date: 05/02/22 to 05/05/22

SUSPENSION

Number of Axles	2		
Front Axle Type	☐ Independent	■ Beam Axle	
Mfr. / Model No.	Meritor / FH946KX75		
GAWR (lb.)	15,660		
Axle Ratio (if driven)	N/A		
Suspension Type	■ Air	☐ Spring	☐ Other
No. of Shock Absorbers	2		
Mfr. / Model No.	Koni (Holland) / 99B 3202SPI		
Sway Bar Equipped	Not sway bar equipped		
Middle Axle Type	☐ Independent	☐ Beam Axle	
Mfr. / Model No.	N/A		
GAWR (lb.)	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 / 79163KX28-538		
GAWR (lb.)	28,640		
Axle Ratio (if driven)	5.38		
Suspension Type	■ Air	☐ Spring	☐ Other
No. of Shock Absorbers	4		
Mfr. / Model No.	Koni (Holland) / 1 73703000 / 99B 3203		

Bus Number: 2022-06-P	Date: 05/02/22 to 05/05/22

WHEELS & TIRES

Front	Wheel Mfr./ Model No.	Alcoa / Durabright EVO 22.5 x 8.25
	Wheel Weight Rating	8,050 lb.
	Tire Mfr./ Model No.	Michelin / XIncity 305/80R 22.5
	Tire Weight Rating	7,830 lb. (Single tire)
Rear	Wheel Mfr./ Model No.	Alcoa / Durabright EVO 22.5 x 8.25
	Wheel Weight Rating	8,050 lb.
	Tire Mfr./ Model No.	Michelin / XIncity 305/80R 22.5
	Tire Weight Rating	7,160 (Dual tire)

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		
External Parking Brake Mfr. / Model No.	N/A		

HVAC

Driver Heating System Type	■ Engine Coolant ☐ Electric
Capacity (Btu/hr)	62,000
Mfr./Model No.	Mobile Climate Control / 12-8530
Passenger Heating System Type	■ Engine Coolant ☐ Electric
Capacity (Btu/hr)	Under seat heaters 34,000 Front threshold 12,000
Mfr./Model No.	Mobile Climate Control / 12-11382 (under seat) Mobile Climate Control / 12-4482 (front threshold)
Auxiliary Heater	■Yes – Type: Diesel ☐ No
Mfr./Model No.	Proheat / PH9310/10-31K BTU
Driver Air Conditioner	■ Yes ☐ No
Location	Rear – Part of passenger air conditioning system
Capacity (Btu/hr)	Not available
A/C Compressor Mfr./Model Number	Part of passenger air conditioning system
Passenger Air Conditioner	■ Yes ☐ No

Bus Number: 2022-06-P	Date: 05/02/22 to 05/05/22

HVAC (cont.)

Passenger Air Conditioner	☐ Engine Driven ■ Electric ☐ Other
Location	Rear
Capacity (Btu/hr)	62,000
A/C Compressor Mfr./Model No.	Copeland Scroll Emerson / ZR48K3E-TF5-130

STEERING

Steering Gear Box Type	Hydraulic		
Mfr. / Model No.	TRW / PBR110FAA		
Steering Wheel Diameter	20”		
Number of turns (lock to lock)	4 ¾		
Control Type	☐ Electric	■Hydraulic	☐Other (explain)

OTHERS

ADA Ramps	Location: Front Entry Door	Type: Bi-fold Electric
ADA Lifts	Location: N/A	Type: N/A
Mfr. / Model No.	Lift-U / LU18-02-12	
Emergency Exit	Location: Window Door Roof Hatch	Number: 6 2 2
Type	N/A	
Fire Suppression System Type	Amerex 17K CTRL	
Mfr./Model No.	Amerex / V25 ABC (Located in rear top curbside)	

*Additional handheld fire extinguisher on top of front curbside wheel well

CAPACITIES

Fuel Tank Capacity (gallons)	120 usable (127)
Engine Crankcase Capacity (gallons)	6.5
Transmission Capacity (gallons)	2.12
Differential Capacity (quarts)	18.8 – 20.8
Engine Cooling System Capacity (gallons)	14
Battery Cooling System Capacity (gallons)	4 (BTMS)
Electronic Cooling System Capacity (gallons)	1.7 (Electronic Cooling Package- ECP)
Drive Motor Cooling System (gallons)	2.12 (Combined with Transmission)
Power Steering Fluid Capacity (gallons)	1.5

VEHICLE DATA FORM

Bus Number: 2022-06-P	Date: 05/02/22 to 05/05/22

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

Part Number	Description	Qty.
	DEF Fluid	2
	Interior intercom equipment	1

COMPONENT/SUBSYSTEM INSPECTION FORM

Bus Number: 2022-06-P	Date: 05/04/22

Subsystem	Checked	Initials	Comments
Air Conditioning Heating and Ventilation	✓	E.D.	None noted.
Body and Sheet Metal	✓	E.D.	None noted.
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	✓	E.D.	None noted.
Fuel System	✓	E.D.	Hybrid Bus – Diesel & Electric
Transmission	✓	E.D.	None noted.
Drive Motor/Axle	✓	E.D.	Built into transmission
Engine	✓	E.D.	None noted.
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.
Emergency Exits	✓	E.D.	None noted.
Fire Suppression System	✓	E.D.	None noted.

CHECK - IN

GILLIG LLC
LOW FLOOR

CHECK - IN CONT.

GILLIG LLC
LOW FLOOR

CHECK - IN CONT.

LIFT-U / LU18-02-12 ELECTRIC BI-FOLD RAMP

OPERATOR'S AREA

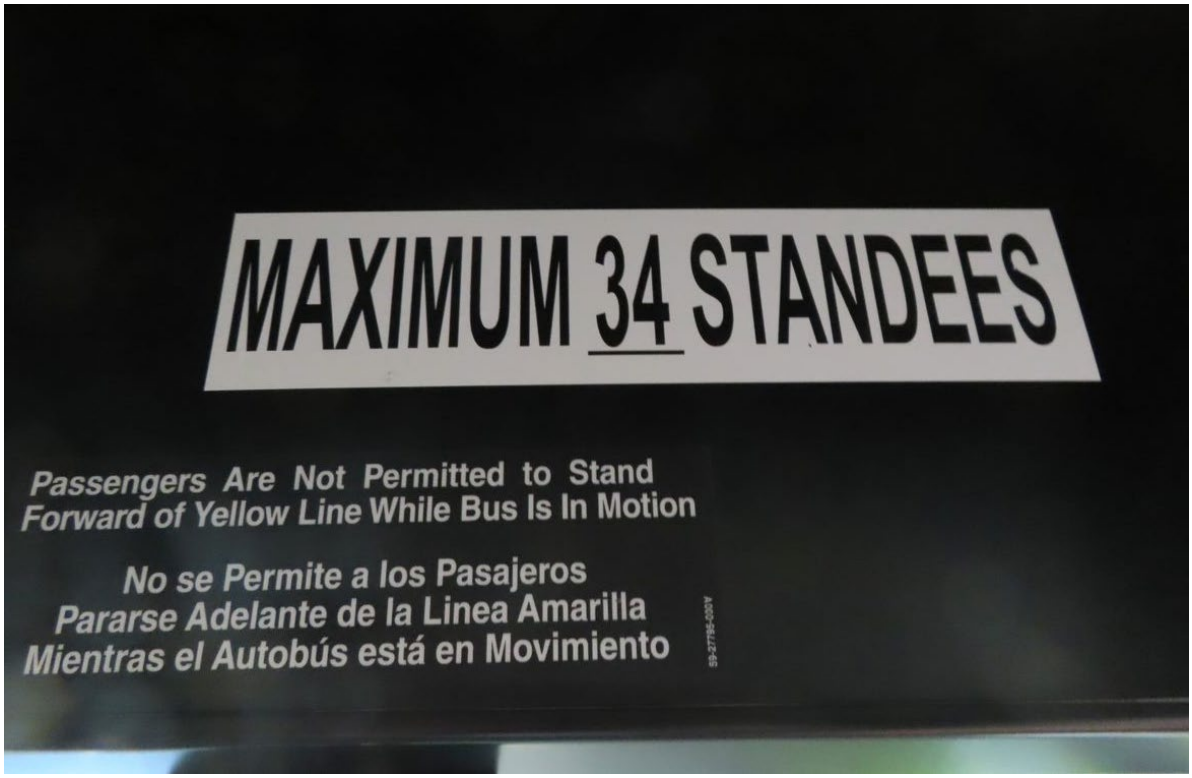
CHECK - IN CONT.

INTERIOR FROM FRONT

INTERIOR FROM REAR

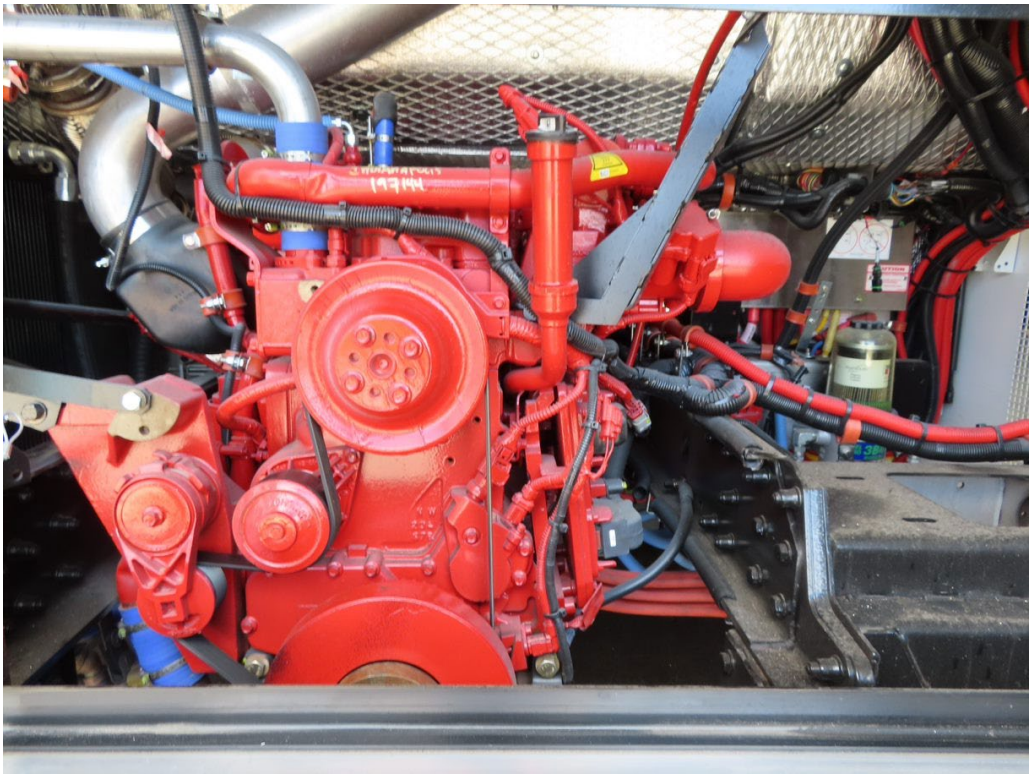
CHECK - IN CONT.

VIN TAG

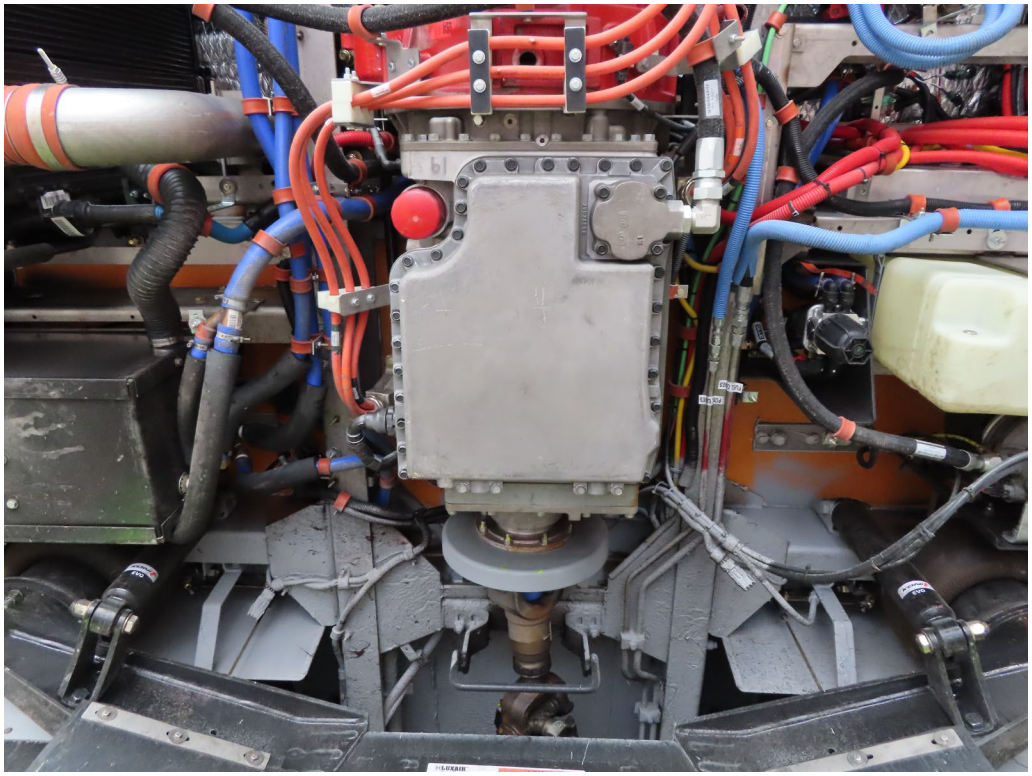


PLACARD SHOWING MAXIMUM STANDING PASSENGERS

CHECK - IN CONT.



REAR ENGINE COMPARTMENT



ALLISON E-GEN FLEX TRANSMISSION

CHECK - IN CONT.

UNDERSIDE OF BUS

3.2 Safety - Braking

3.2 I. TEST OBJECTIVE

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.

Table 3.2-1. Braking Test Data Forms

Bus Number: 2022-06-P	Date: 05/25/22
Personnel: F.T., S.R., T.G., M.R. & J.S.	
Amb. Temperature (ºF): 65	Wind Speed (mph): 8
Wind Direction: SE	Pavement Temp (°F) Start: 88 End:94

TIRE INFLATION PRESSURE (psi):				
Tire Type: Front & Rear: Michelin XIncity 305 85R 22.5				
	Left Tire(s)		Right Tire(s)	
Front	120		120	
	Inner	Outer	Inner	Outer
Middle	N/A	N/A	N/A	N/A
Rear	120	120	120	120

AXLE LOADS (lb.)		
	Left	Right
Front	7,750	7,820
Middle	N/A	N/A
Rear	14,330	12,480

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

Stopping Distance (ft)					
Vehicle Direction	CW	CW	CCW	CCW	
Speed (mph)	Stop 1	Stop 2	Stop 3	Stop 4	**Average**
20 (dry)	**28.63**	26.89	**28.63**	26.69	27.71
30 (dry)	50.90	**53.30**	51.72	52.05	51.99
40 (dry)	88.06	87.51	**91.64**	89.01	89.06
45 (dry)	109.02	112.76	111.55	**116.44**	112.44
20 (wet)	33.52	**34.11**	33.09	33.25	33.49

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 high friction	1	Yes	None noted.
	2	Yes	None noted.
Driver side on low friction	1	Yes	None noted.
	2	Yes	None noted.

Table 3.2-4. Parking Brake Test Form

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

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

Date	Fault/Repair	Description
05/11/22	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. DISCUSSION

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.

In hybrid mode, the test was performed up to a maximum governed speed of 59.1 mph. The calculated gradeability results are attached. The average time to reach 30 mph was 14.3 seconds. The maximum gradeablity at 10 mph was 21.02% and at 40 mph was 4.29%.

In EV mode, the test was performed up to a maximum governed speed of 34.3 mph. The calculated gradeability results are attached. The average time to reach 30 mph was 17.1 seconds. The maximum gradeablity at 10 mph was 17.61%. The bus did not reach 40 mph in EV mode. Therefore, there are no gradeability results at 40 mph.

Although the bus did not meet passing requirements in EV mode, it did meet the passing requirements while in hybrid mode. The manufacturer represented that the bus did not meet passing requirements in EV mode due to the vehicle EV functionality governing vehicle speed.

PERFORMANCE DATA FORM

Bus Number: 2022-06-P – Hybrid Mode	Date: 06/02/22
Personnel: S.I. & D.B.	

Temperature (°F): 79.6	Humidity (%): 89.3
Barometric Pressure (inHg): 28.6	

		INITIALS:
Air Conditioning - OFF	✓Checked	D.B.
Heater pump motor - OFF	✓Checked	D.B.
Defroster - OFF	✓ Checked	D.B.
Exterior and interior lights - ON	✓ Checked	D.B.
Windows and doors - CLOSED	✓ Checked	D.B.

ACCELERATION, GRADEABILITY, TOP SPEED

	Recorded Interval Times		
Speed	Run 1	Run 2	Run 3
10 mph	3.3	3.6	3.4
20 mph	7.3	7.6	7.5
30 mph	14.2	14.4	14.2
40 mph	22.8	22.9	22.7
50 mph	35.5	35.3	35.1
60 mph	N/A	N/A	N/A
70 mph	N/A	N/A	N/A

Maximum Speed (mph): 59.1 (maximum governed speed)

PERFORMANCE SUMMARY SHEET

Bus Number: 2022-06-P – Hybrid Mode	Date: 06/02/22
Personnel: S.I. & D.B.	

Test Conditions:

Temperature (°F): 79.6	Humidity (%): 89.3
Barometric Pressure (inHg): 28.6	

Test Results:

Vehicle Speed (MPH)	Time (SEC)	Acceleration (FT/SEC^2)	Max. Grade (%)
1.0	1.2	2.72	8.45
5.0	2.4	7.02	21.80
10.0	3.4	6.77	21.02
15.0	4.8	3.94	12.24
20.0	7.4	2.25	6.99
25.0	10.8	2.17	6.74
30.0	14.3	2.03	6.30
35.0	18.1	1.72	5.34
40.0	22.8	1.38	4.29
45.0	28.6	1.19	3.70
50.0	35.3	1.00	3.11
55.0	43.2	0.84	2.61
59.1	54.7	Maximum Speed	

PERFORMANCE DATA FORM

Bus Number: 2022-06-P – EV Mode	Date: 06/02/22
Personnel: S.I. & D.B.	

Temperature (°F): 88.4	Humidity (%): 78.2
Barometric Pressure (inHg): 28.6	

		INITIALS:
Air Conditioning - OFF	✓Checked	D.B.
Heater pump motor - OFF	✓Checked	D.B.
Defroster - OFF	✓ Checked	D.B.
Exterior and interior lights - ON	✓ Checked	D.B.
Windows and doors - CLOSED	✓ Checked	D.B.

ACCELERATION, GRADEABILITY, TOP SPEED

Recorded Interval Times			
Speed	Run 1	Run 2	Run 3
10 mph	3.9	3.9	4.2
20 mph	8.9	8.8	9.1
30 mph	17.0	17.0	17.2
40 mph	--	--	--
50 mph	--	--	--
60 mph	--	--	--
70 mph	--	--	--

Maximum Speed (mph): 34.3 (maximum governed speed)

PERFORMANCE SUMMARY SHEET

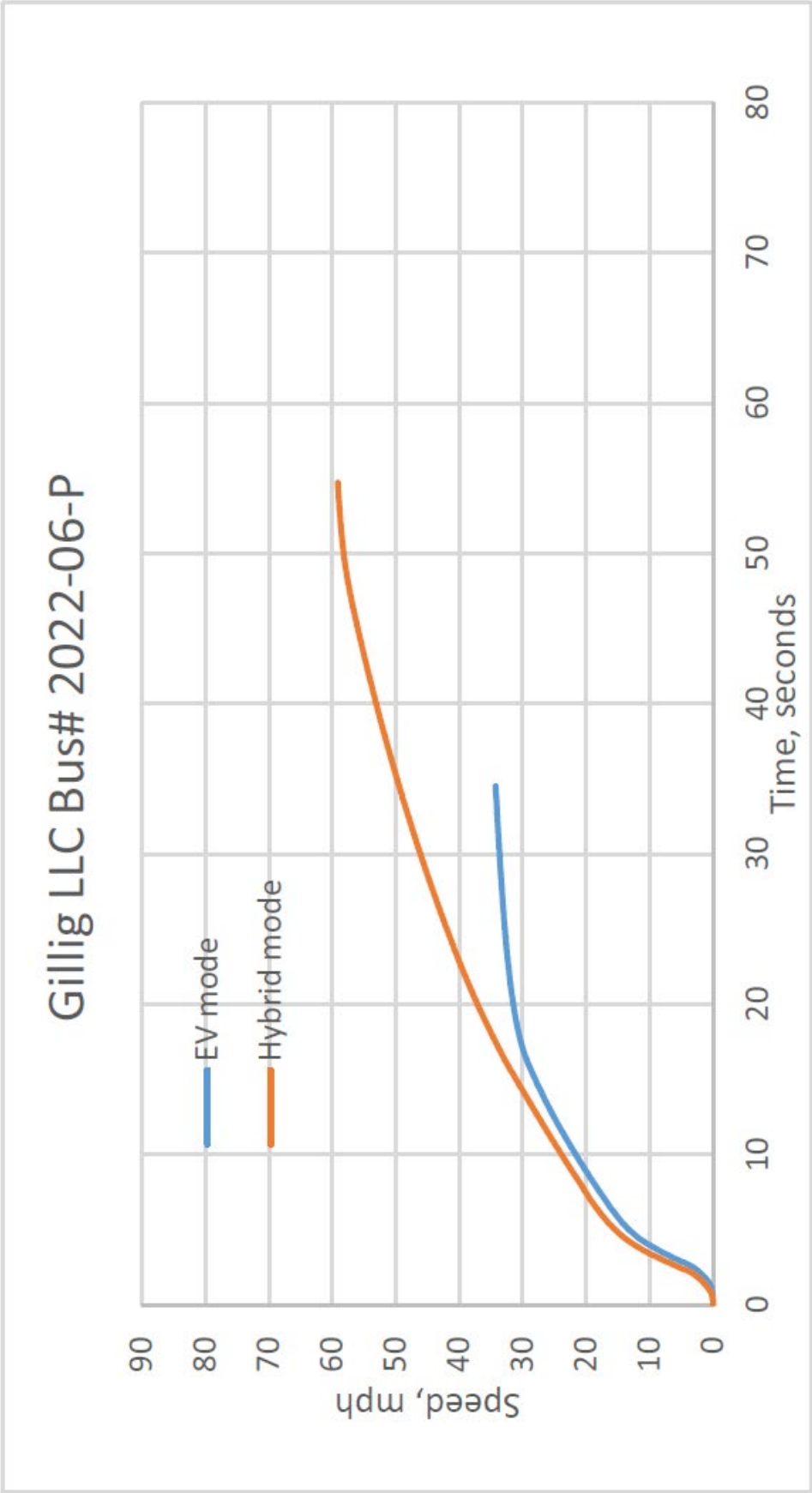
Bus Number: 2022-06 – EV Mode	Date: 06/02/22
Personnel: S.I. & D.B.	

Test Conditions:

Temperature (°F): 88.4	Humidity (%): 78.2
Barometric Pressure (inHg): 28.6	

Test Results:

Vehicle Speed (MPH)	Time (SEC)	Acceleration (FT/SEC^2)	Max. Grade (%)
1.0	1.7	2.79	8.66
5.0	2.9	6.87	21.34
10.0	4.0	5.67	17.61
15.0	5.8	2.84	8.82
20.0	8.9	2.22	6.89
25.0	12.4	1.89	5.87
30.0	17.1	1.05	3.26
34.3	34.5	Maximum Speed	


Gillig LLC Bus# 2022-06-P
EV mode
Hybrid mode
Speed, mph
0
10
20
30
40
50
60
70
80
90
Time, seconds
0
10
20
30
40
50
60
70
80

6. FUEL ECONOMY TEST - A FUEL CONSUMPTION TEST USING AN APPROPRIATE OPERATING CYCLE – HYBRID MODE

6-I. TEST OBJECTIVE

The objective of this test is to provide accurate comparable fuel consumption data on transit buses produced by different manufacturers. This fuel 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 fuel economy test, as designated here, is a measurement of the fuel expended 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 may not represent actual mileage in transit service but will provide data that can be used by FTA Grantees to compare the efficiency of buses tested using this procedure.

6-II. TEST DESCRIPTION

This test was 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, a medium average speed transient urban cycle (Figure 2), and the EPA HD-UDDS Cycle, which consists of urban and highway driving segments (Figure 3). A fuel economy test was comprised of two runs for the three different driving cycles, and the average value was reported.

The test procedure for liquid-fueled buses such as this one uses a calibrated flowmeter system and/or a calibrated fuel weighing scale. The flowmeter system utilizes a precise four-piston positive displacement flow meter. The weighing scale system includes heat exchangers to maintain temperature in diesel and common-rail injection systems.

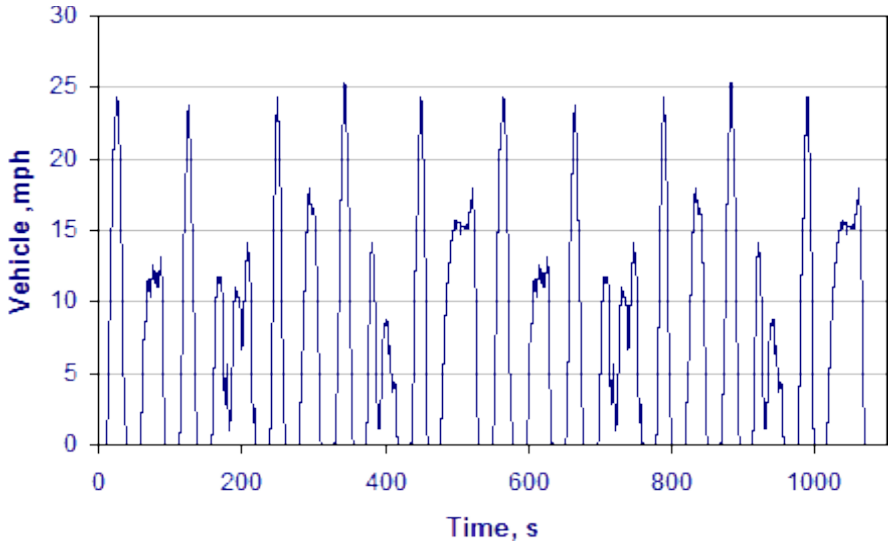


Figure 1. Manhattan Driving Cycle (duration 1089 sec, Maximum speed 25.4 mph, average speed 6.8 mph)

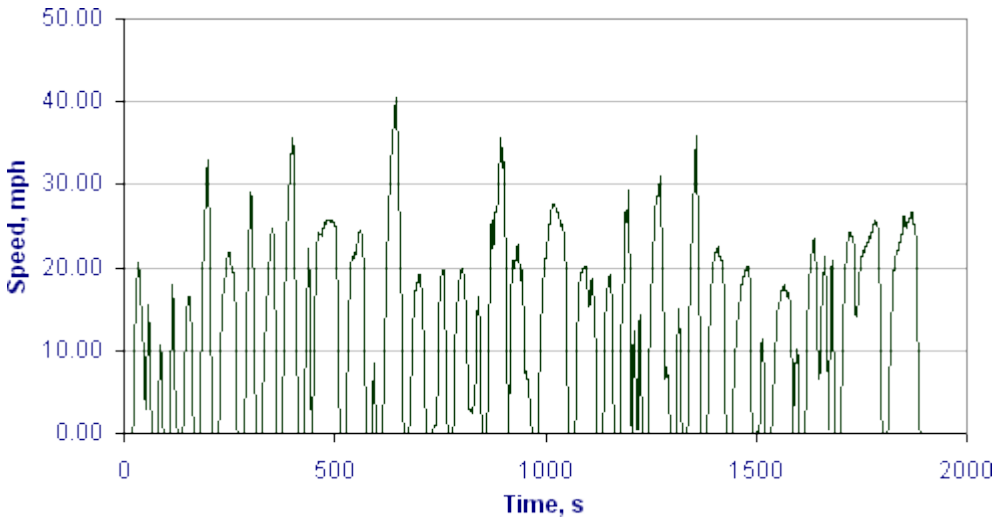


Figure 2. Orange County Bus Cycle (Duration 1909 Sec, Maximum Speed 41 mph, Average Speed 12 mph).

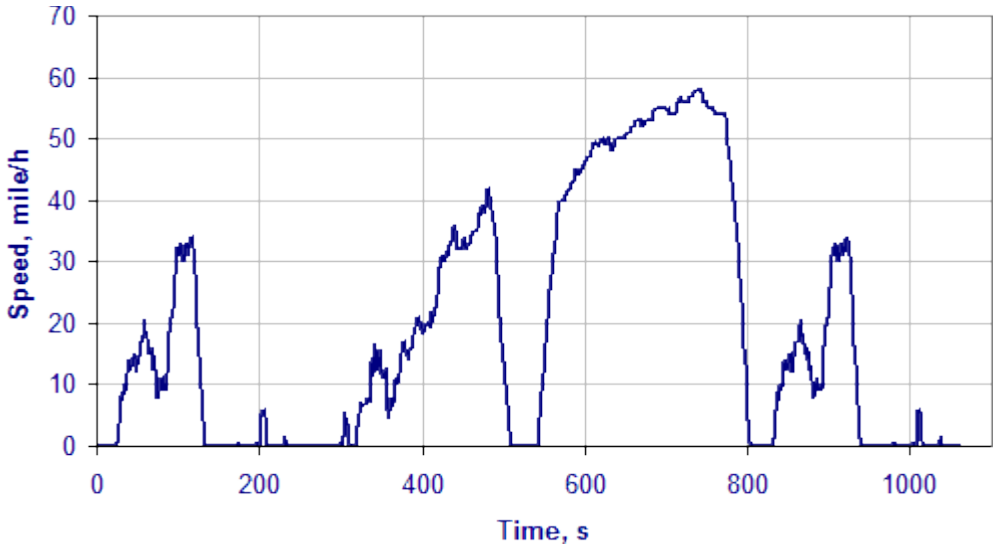


Figure 3. HD-UDDS Cycle (duration 1060 seconds, Maximum Speed 58 mph, Average Speed 18.86 mph).

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. The fuel consumption for each driving cycle and idle was measured.

An extensive pretest maintenance check was made including the replacement of all lubrication fluids. 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 fuel consumption for the three test cycles and for a 20-minute idle. **The average fuel consumption for the Manhattan, OCBC and the HD-UDDS were 4.32 mpg, 6.29 mpg and 6.43 mpg respectively. For idle, the fuel consumption was 0.52 gal/hr**.

FUEL ECONOMY/ENERGY ECONOMY
PRE-TEST MAINTENANCE FORM

Bus Number: 2022-06-P	Date: 05/31/22	SLW (lb.): 37,380
Personnel: R.M., S.R., F.T. & E.L.		

FUEL SYSTEM	OK
Install fuel measurement system	✓
Replace fuel filter	N/A
Check for fuel leaks	✓
Specify fuel type (Diesel)	✓
Remarks: None noted.	
BRAKES/TIRES	OK
Inspect hoses	✓
Inspect brakes	✓
Check tire inflation pressures (mfg. specs.)	✓
Check tire wear (less than 50%)	✓
Remarks: None noted.	
COOLING SYSTEM	OK
Check hoses and connections	✓
Check system for coolant leaks	✓
Remarks: None noted.	

FUEL ECONOMY/ENERGY ECONOMY
PRE-TEST MAINTENANCE FORM

Bus Number: 2022-06-P	Date: 05/31/22
Personnel: R.M., S.R., F.T. & E.L.	

ELECTRICAL SYSTEMS	OK
Check battery	✓
Inspect wiring	✓
Inspect terminals	✓
Check lighting	✓
Remarks: None noted.	

DRIVE SYSTEM	OK
Drain transmission fluid	N/A
Replace filter/gasket	N/A
Check hoses and connections	✓
Replace transmission fluid	N/A
Check for fluid leaks	✓
Remarks: Interval for transmission fluid change not reached.	

LUBRICATION	OK
Drain crankcase oil	N/A
Replace filters	N/A
Replace crankcase oil	N/A
Check for oil leaks	✓
Check oil level	✓
Lube all chassis grease fittings	✓
Lube universal joints	✓
Replace differential lube including axles	N/A
Remarks: Interval for oil/filter change not reached.	

FUEL ECONOMY/ENERGY ECONOMY
PRE-TEST MAINTENANCE FORM

Bus Number: 2022-06-P	Date: 05/31/22
Personnel: R.M., S.R., F.T. & E.L.	

EXHAUST/EMISSION SYSTEM	OK
Check for exhaust leaks	✓
Remarks: None noted.	
ENGINE	OK
Replace air filter	N/A
Inspect air compressor and air system	✓
Inspect vacuum system, if applicable	N/A
Check and adjust all drive belts	✓
Check cold start assist, if applicable	N/A
Remarks: None noted.	
STEERING SYSTEM	OK
Check power steering hoses and connectors	✓
Service fluid level	✓
Check power steering operation	✓
Remarks: None noted.	
	OK
Ballast bus to seated load weight	✓
TEST DRIVE	OK
Check brake operation	✓
Check transmission operation	✓
Remarks: None noted.	

FUEL ECONOMY/ENERGY ECONOMY
PRE-TEST INSPECTION FORM

Bus Number: 2022-06-P	Date: 05/31/22
Personnel: S.R, R.M. & F.T.	

PRE-WARM-UP	If OK, Initial
Fuel Economy Pre-Test Maintenance Form is complete	S.R./F.T.
Cold tire pressure (psi): Front 120 Middle N/A Rear 120	F.T./R.M.
Engine oil level	F.T./R.M.
Engine coolant level	F.T./R.M.
Fuel economy instrumentation installed and working properly.	R.M./F.T.
Fuel line -- no leaks or kinks	R.M.
Bus is loaded to SLW during coast down	F.T.
WARM-UP	**If OK, Initial**
Air conditioning off	D.B.
Interior and exterior lights on	D.B.
Defroster off	D.B.
Windows and doors closed	D.B.
Do not drive with left foot on brake	D.B.

FUEL ECONOMY DATA FORM
(Gaseous and Liquid fuels)

Bus Number: 2022-06-P	Manufacturer: Gillig	Date: 06/01/22
Fuel Type: Diesel	Personnel: S.I. & D.B.	
Temperature (°F): 93.5	Humidity (%): 76.8	Barometric Pressure (inHg): 28.6
SLW (lb.): 37,380		

Cycle	Manhattan	Orange County	HD-UDDS	Idle
Fuel Consumption (mpg)	4.32	6.29	6.43	0.52 G/hr

Comments: Hybrid mode.

6. ENERGY ECONOMY AND RANGE TEST – AN ENERGY CONSUMPTION AND RANGE TEST FOR BATTERY ELECTRIC BUSES USING APPROPRIATE OPERATING CYCLES – EV MODE

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 Multi-Cycle test (MCT) procedure is adopted for this bus. The end of test is determined when the bus cannot maintain 50 miles per hour or earlier, 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 range (miles) and the charger efficiency for each test cycle are reported.

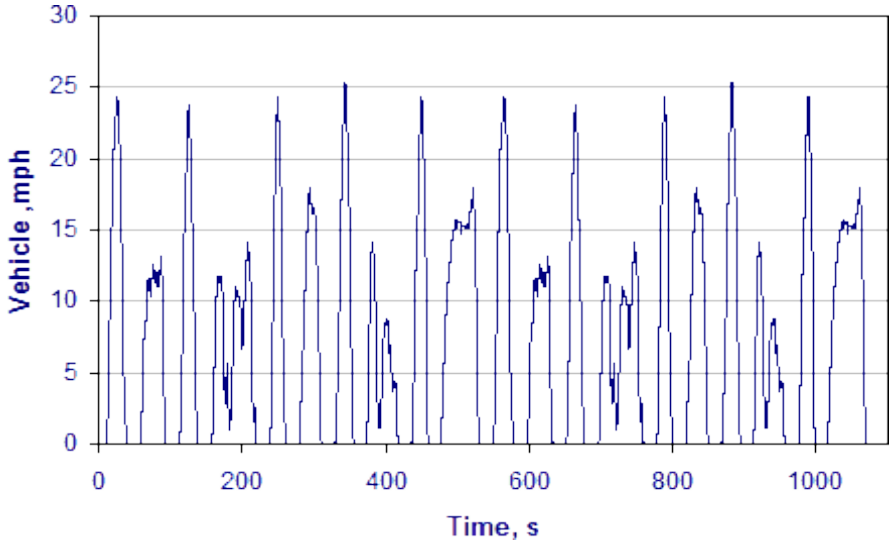


Figure 1. Manhattan Driving Cycle (duration 1089 sec, Maximum speed 25.4 mph, average speed 6.8 mph)

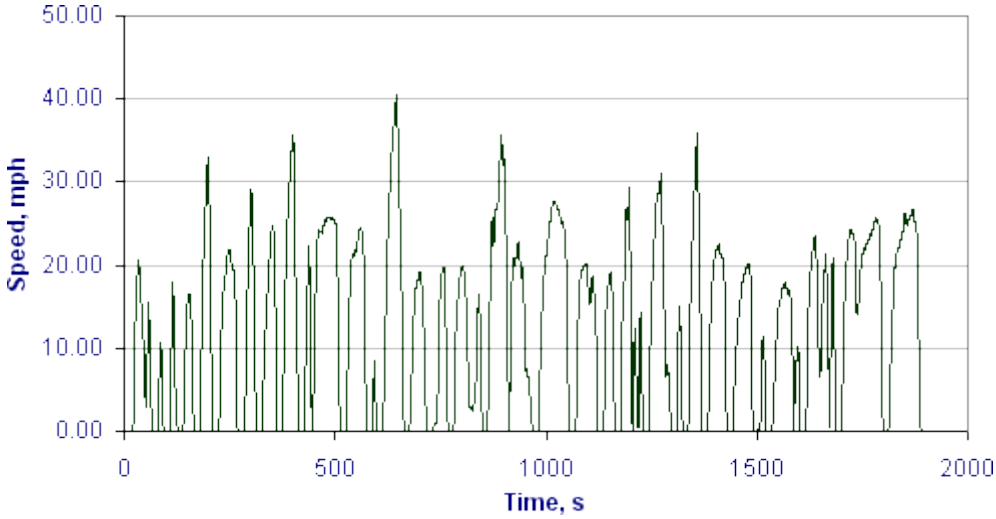


Figure 2. Orange County Bus Cycle (Duration 1909 Sec, Maximum Speed 41 mph, Average Speed 12 mph).

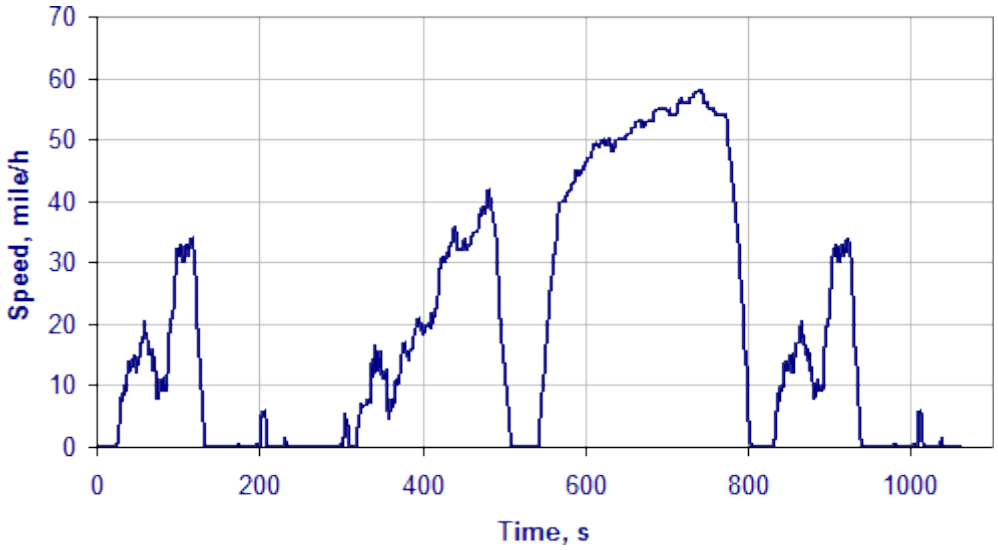


Figure 3. HD-UDDS Cycle (duration 1060 seconds, Maximum Speed 58 mph, Average Speed 18.86 mph).

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. 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.

An extensive pretest maintenance check is conducted including the replacement of all lubrication fluids, if applicable. The details of the pretest maintenance and inspection are given in the previous section – 6.0 Fuel economy – Hybrid Mode. 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 37,380 lbs. The average DC energy consumption for the Manhattan and OCBC were 3,675 Wh/mile and 2,807 Wh/mile. The range for those driving cycles were 2.49 miles and 3.27miles respectively. The maximum speed was 34.3 mph., therefore, the bus was not tested for the HD-UDDS cycle. This bus does not use an external (A/C) charger. The battery pack is internally charged by its diesel engine. Hence, AC energy measurements were not conducted.

ENERGY ECONOMY DATA FORM
(Battery Electric Buses)

Bus Number: 2022-06-P	Manufacturer: Gillig	Date: 06/02/22
Fuel Type: Electric	Personnel: S.I. & D.B.	
Temperature (°F): 83.9	Humidity (%): 91	Barometric Pressure (inHg): 28.5
SLW (lb.): 37,380	Charger: N/A (Bus operated on EV mode)	

	Manhattan	**Orange County**	**HD-UDDS**
DC Energy (Wh/mile)	3,675	2,807	N/A
AC Energy (Wh/mile)	N/A	N/A	N/A
Range (miles)	2.49	3.27	N/A

Comments: 1. The maximum speed of the bus in EV mode was 34.3 mph. The bus was not tested for the HD-UDDS cycle, as a significant part of the test cycle comprised of speeds above the capability of the bus in EV mode.

2. The bus does not use an external (AC) charger. The battery pack is internally charged by its diesel engine. Hence, AC measurements were not conducted.

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, with the bus in hybrid mode, the overall average of the six measurements was 51.0 dB(A); ranging from 50.4 dB(A) in line with the front speaker and at the rear passenger seats to 53.0 dB(A) at the driver's seat. With the bus in EV mode, the overall average of the six measurements was 50.0 dB(A); ranging from 49.5 dB(A) in line with the rear speaker and at the rear passenger seats to 51.6 dB(A) at the driver's seat. The interior ambient noise level for these tests was less than 30 dB(A).

For the second part, with the bus in hybrid mode, the interior noise level ranged from 75.5 dB(A) at the front passenger seats to 78.3 dB(A) at the rear passenger seats. The overall average was 76.8 dB(A). With the bus in EV mode, the interior noise level ranged from 66.6 dB(A) at the driver's seat to 67.7 dB(A) at the rear passenger seats. The overall average was 67.0 dB(A). The interior ambient noise level for these tests was less than 30 dB(A).

No vibrations or rattles were noted during the third part of this test in either hybrid mode or EV mode.

INTERIOR NOISE TEST DATA FORM
Test Condition 1: 80 dB(A) Stationary White Noise – Hybrid Mode

Bus Number: 2022-06-P – Hybrid Mode	Date: 06/10/22
Personnel: F.T. & R.M.	
Temperature (°F): 58	Humidity (%): 81
Wind Speed (mph): 5	Wind Direction: WSW
Barometric Pressure (inHg): 29.92	
Interior Ambient Noise Level dB(A): less than 30	Exterior Ambient Noise Level dB(A): 35.2
Microphone Height During Testing (in): 46.2	

Reading Location	Measured Sound Level dB(A)
Driver's Seat	53.0
Front Passenger Seats	51.1
In Line with Front Speaker	50.4
In Line with Middle Speaker	50.8
In Line with Rear Speaker	50.5
Rear Passenger Seats	50.4

Comments: None noted.

INTERIOR NOISE TEST DATA FORM
Test Condition 2: 0 to 35 mph Acceleration Test – Hybrid Mode

Bus Number: 2022-06-P – Hybrid Mode	Date: 06/06/22
Personnel: S.R., F.T. & T.G.	
Temperature (°F): 75	Humidity (%): 50
Wind Speed (mph): 10	Wind Direction: S
Barometric Pressure (inHg): 29.98	
Interior Ambient Noise Level dB(A): Less than 30	Exterior Ambient Noise Level dB(A): 40.0
Microphone Height During Testing (in): 46.2	

Reading Location	Measured Sound Level dB(A)
Driver's Seat	77.9
Front Passenger Seats	75.5
Middle Passenger Seats	75.6
Rear Passenger Seats	78.3

Comments: None noted.

INTERIOR NOISE TEST DATA FORM
Test Condition 3: Audible Vibration Test – Hybrid Mode

Bus Number: 2022-06-P – Hybrid Mode	Date: 05/26/22
Personnel: S.R., F.T., T.G. & G.C.	
Temperature (°F): 70	

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	N/A	N/A
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: None noted.

INTERIOR NOISE TEST DATA FORM
Test Condition 1: 80 dB(A) Stationary White Noise – EV Mode

Bus Number: 2022-06-P – EV Mode	Date: 06/08/22
Personnel: F.T., E.L. & R.M.	
Temperature (°F): 63	Humidity (%): 76
Wind Speed (mph): 6	Wind Direction: N
Barometric Pressure (inHg): 29.97	
Interior Ambient Noise Level dB(A): less than 30	Exterior Ambient Noise Level dB(A): 34.8
Microphone Height During Testing (in): 46.2	

Reading Location	Measured Sound Level dB(A)
Driver's Seat	51.6
Front Passenger Seats	49.4
In Line with Front Speaker	49.7
In Line with Middle Speaker	50.3
In Line with Rear Speaker	49.5
Rear Passenger Seats	49.5

Comments: None noted.

INTERIOR NOISE TEST DATA FORM
Test Condition 2: 0 to 35 mph Acceleration Test – EV Mode

Bus Number: 2022-06-P – EV Mode	Date: 06/07/22
Personnel: F.T. & E.L.	
Temperature (°F): 63	Humidity (%): 71
Wind Speed (mph): 9	Wind Direction: SSW
Barometric Pressure (inHg): 29.92	
Interior Ambient Noise Level dB(A): less than 30	Exterior Ambient Noise Level dB(A): 40.7
Microphone Height During Testing (in): 46.2	

Reading Location	Measured Sound Level dB(A)
Driver's Seat	66.6
Front Passenger Seats	66.8
Middle Passenger Seats	67.0
Rear Passenger Seats	67.7

Comments: Needed to regen on S mode, three times to complete test. Nothing Noted during test. Test was completed in electric mode.

INTERIOR NOISE TEST DATA FORM
Test Condition 3: Audible Vibration Test – EV Mode

Bus Number: 2022-06-P – EV Mode	Date: 06/16/22
Personnel: F.T., R.M. & A.Z.	
Temperature (°F): 79	

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	None noted.
Windows and Doors	N/A	None noted.
Seats and Wheelchair lifts	N/A	None noted.
Other	N/A	None noted.

Comment on any other vibration or noise source which may have occurred
that is not described above: None noted.
Comments: In EV mode, but only reached 35 mph for a short distance before
switching back to hybrid mode. Odometer does not read mileage on EV Mode.

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 38.9 dB(A), the average of the two highest readings obtained while accelerating from a constant speed was 68.1 dB(A) on the right side and 72.1 dB(A) on the left side while operating in hybrid mode. While operating in EV mode, with an outside ambient noise level of 46.1 dB(A), the average of the two highest readings obtained while accelerating from a constant speed was 62.1 dB(A) on the right side and 63.5 dB(A) on the left side.

When accelerating from a standstill with an exterior ambient noise level of 39.9dB(A), the average of the two highest readings obtained were 68.2 dB(A) on the right side and 68.9 dB(A) on the left side while in hybrid mode. When in EV mode, with an exterior ambient noise level of 46.0 dB(A), the average of the two highest readings obtained were 63.2 dB(A) on the right side and 63.0 dB(A) on the left side.

While in hybrid mode, with the vehicle stationary and the engine, accessories, and air conditioning on, the measurements averaged 58.4 dB(A) at low idle, 61.1 dB(A) at high idle and 69.0 dB(A) at wide open throttle. With the accessories and air conditioning off, the readings averaged 57.4 dB(A) at low idle, 61.0 dB(A) at high idle and 68.9 dB(A) at wide open throttle. The exterior ambient noise level measured during this test was 39.6 dB(A). With the bus in EV mode, the vehicle stationary and the engine, accessories, and air conditioning on, the measurements averaged 48.4 dB(A). With the accessories and air conditioning off, the readings averaged 47.2 dB(A). There is no high idle or wide open throttle in EV mode. The exterior ambient noise level was 45.8 dB(A) while the bus was undergoing this test in EV mode.

EXTERIOR NOISE TEST DATA FORM
Accelerating from Constant Speed - Hybrid Mode

Bus Number: 2022-06-P – Hybrid Mode	Date: 06/06/22
Personnel: S.R., F.T. & T.G.	
Temperature (°F): 70	Humidity (%): 50
Wind Speed (mph): 7	Wind Direction: S
Barometric Pressure (inHg): 30.00	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ■	
Initial Sound Level Meter Calibration: 93.9 dB(A)	
Exterior Ambient Noise Level: 38.9 dB(A)	

Accelerating from Constant Speed Curb (Right) Side		Accelerating from Constant Speed Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	66.5	1	68.5
2	67.7	2	69.7
3	68.4	3	71.8
4	N/A	4	72.3
5	N/A	5	71.8
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 = 68.1 dB(A)		Average of two highest actual noise levels = 72.1 dB(A)	

Final Sound Level Meter Calibration Check: 93.9 dB(A)

Comments: None noted.

EXTERIOR NOISE TEST DATA FORM
Accelerating from Standstill – Hybrid Mode

Bus Number: 2022-06-P – Hybrid Mode	Date: 06/06/22
Personnel: S.R., F.T. & T.G.	
Temperature (°F): 72	Humidity (%): 51
Wind Speed (mph): 9	Wind Direction: S
Barometric Pressure (inHg): 30.00	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ■	
Initial Sound Level Meter Calibration: 93.9 dB(A)	
Exterior Ambient Noise Level: 39.9 dB(A)	

Accelerating from Standstill Curb (Right) Side		Accelerating from Standstill Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	68.0	1	68.7
2	68.3	2	69.0
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 = 68.2 dB(A)		Average of two highest actual noise levels = 68.9 dB(A)	

Final Sound Level Meter Calibration Check: 93.9 dB(A)

Comments: None noted.

EXTERIOR NOISE TEST DATA FORM
Stationary – Hybrid Mode

Bus Number: 2022-06-P – Hybrid Mode	Date: 06/06/22
Personnel: S.R., F.T., T.G. & A.Z.	
Temperature (°F): 72	Humidity (%): 51
Wind Speed (mph): 9	Wind Direction: S
Barometric Pressure (inHg): 30.00	
Initial Sound Level Meter Calibration: 93.9 dB(A)	
Exterior Ambient Noise Level: 39.6 dB(A)	

Air Conditioning ON

Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	720	58.0	58.8
High Idle	1000	60.3	61.8
Wide Open Throttle	2000	70.7	68.9

Air Conditioning OFF

Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	720	59.0	55.7
High Idle	1000	64.1	57.8
Wide Open Throttle	2000	70.4	67.4

Final Sound Level Meter Calibration Check: 93.9 dB(A)

Comments: None noted.

EXTERIOR NOISE TEST DATA FORM
Accelerating from Constant Speed - EV Mode

Bus Number: 2022-06-P – EV Mode	Date: 06/07/22
Personnel: F.T. & E.L.	
Temperature (°F): 64	Humidity (%): 62
Wind Speed (mph): 7	Wind Direction: SSW
Barometric Pressure (inHg): 29.93	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ■	
Initial Sound Level Meter Calibration: 94.0 dB(A)	
Exterior Ambient Noise Level: 46.1 dB(A)	

Accelerating from Constant Speed Curb (Right) Side		Accelerating from Constant Speed Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	61.5	1	62.4
2	61.4	2	63.7
3	62.7	3	63.3
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 = 62.1 dB(A)		Average of two highest actual noise levels = 63.5 dB(A)	

Final Sound Level Meter Calibration Check: 94.0 dB(A)

Comments: None noted.

EXTERIOR NOISE TEST DATA FORM
Accelerating from Standstill – EV Mode

Bus Number: 2022-06-P – EV Mode	Date: 06/07/22
Personnel: F.T. & E.L.	
Temperature (°F): 64	Humidity (%): 65
Wind Speed (mph): 7	Wind Direction: SW
Barometric Pressure (inHg): 29.96	
Verify that microphone height is 4 feet, wind speed is less than 12 mph and ambient temperature is between 30°F and 90°F: ■	
Initial Sound Level Meter Calibration: 94.0 dB(A)	
Exterior Ambient Noise Level: 46.0 dB(A)	

Accelerating from Standstill Curb (Right) Side		Accelerating from Standstill Street (Left) Side	
Run #	Measured Noise Level dB(A)	Run #	Measured Noise Level dB(A)
1	63.0	1	62.8
2	63.4	2	63.2
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 = 63.2 dB(A)		Average of two highest actual noise levels = 63.5 dB(A)	

Final Sound Level Meter Calibration Check: 94.0 dB(A)

Comments: None noted.

EXTERIOR NOISE TEST DATA FORM
Stationary – EV Mode

Bus Number: 2022-06-P- EV Mode	Date: 06/07/22
Personnel: F.T. & E.L.	
Temperature (°F): 64	Humidity (%): 71
Wind Speed (mph): 9	Wind Direction: SSW
Barometric Pressure (inHg): 29.95	
Initial Sound Level Meter Calibration: 94.0dB(A)	
Exterior Ambient Noise Level: 45.8 dB(A)	

Air Conditioning ON

Throttle Position	Engine RPM	Curb (Right) Side dB(A)	Street (Left) Side db(A)
		Measured	Measured
Low Idle	N/A	48.3	48.5
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	47.5	46.8
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: Bus ran in electric mode only one reading due to no high idle and/or wide open throttle.

7.2 EXTERIOR NOISE TESTS

TEST BUS UNDERGOING EXTERIOR NOISE TESTING

8.0 EMISSIONS TEST – DYNAMOMETER-BASED EMISSIONS TEST USING TRANSIT DRIVING CYCLES

8-I. TEST OBJECTIVE

The objective of this test is to provide comparable emissions data on transit buses produced by different manufacturers. This chassis-based emissions test bears no relation to engine certification testing performed for compliance with the Environmental Protection Agency (EPA) regulation. EPA's certification tests are performed on an engine by itself on a dynamometer operating under the Federal Test Protocol.

The Bus Testing Center emissions test is a measurement of the gaseous engine emissions CO, CO2, NOx, HC and particulates (diesel vehicles) produced by a complete vehicle operating on a large-roll chassis dynamometer. The test is performed for three differed driving cycles intended to simulate a range of transit operating environments. The test is performed under laboratory conditions in compliance with EPA 1065 and SAE J2711. The results of this test may not represent actual in-service vehicle emissions but will provide data that can be used by recipients to compare the emissions of buses tested under a range of consistent operating conditions.

8-II. TEST DESCRIPTION

This test was 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 emissions laboratory provides capability for testing heavy-duty diesel, gasoline, and alternative-fueled buses for a variety of tailpipe emissions including particulate matter, oxides of nitrogen, carbon monoxide, carbon dioxide, and hydrocarbons. It is equipped with a Horiba full-scale dilution tunnel and a constant volume sampling (CVS) emissions measurement system. The system includes Horiba Mexa 7400 Series gas analyzers and a Horiba HF47 Particulate Sampling System. Test operation is automated using Horiba CDTCS software. The computer-controlled dynamometer is capable of simulating over-the-road operation for a variety of vehicles and driving cycles.

The driving cycles are the Manhattan cycle, a low average speed, highly transient urban cycle (Figure 1), the Orange County Bus Cycle, a medium average speed transient urban cycle (Figure 2), and the EPA HD-UDDS Cycle, which consists of urban and highway driving segments (Figure 3). An emissions test was comprised of two runs for each of the three different driving cycles, and the average values were reported. Test results reported include the average grams per mile value for each of the gaseous emissions of carbon dioxide, carbon monoxide, oxides of nitrogen, total hydrocarbons and non-methane hydrocarbons. In addition, emissions of particulate matter will also be reported for diesel fuel buses. Testing is performed in accordance with EPA CFR49, Part 1065 and SAE J2711 as practically determined by the FTA Emissions Testing Protocol developed by West Virginia University and Penn State University.

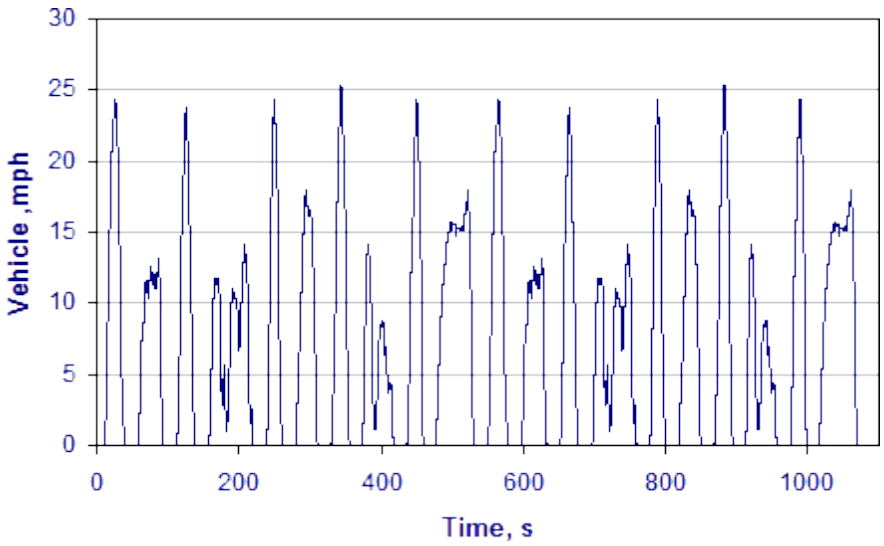


***Figure 8.1**. Manhattan Driving Cycle (Duration 1089 sec, Maximum Speed 25.4 mph, Average Speed 6.8 mph)*

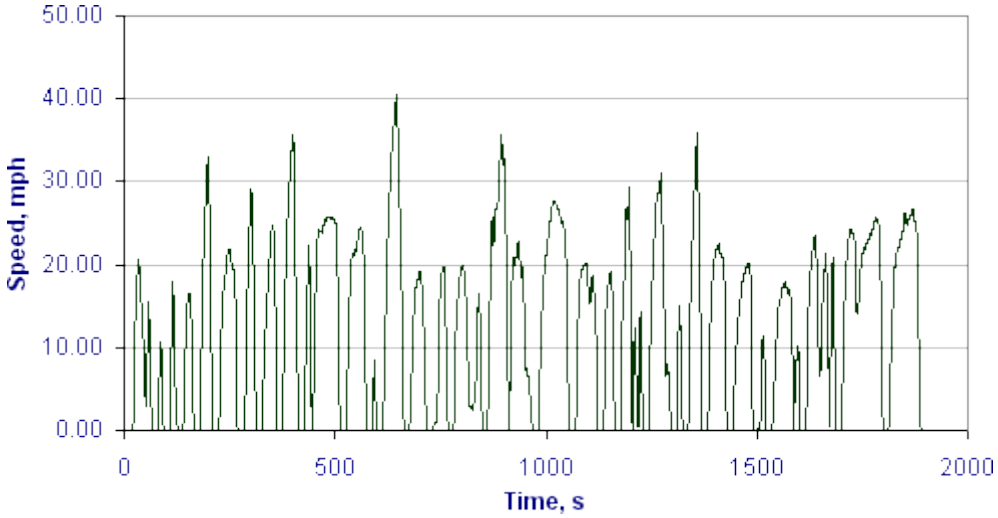


***Figure 8.2**. Orange County Bus Cycle (Duration 1909 Sec, Maximum Speed 41 mph, Average Speed 12 mph)*

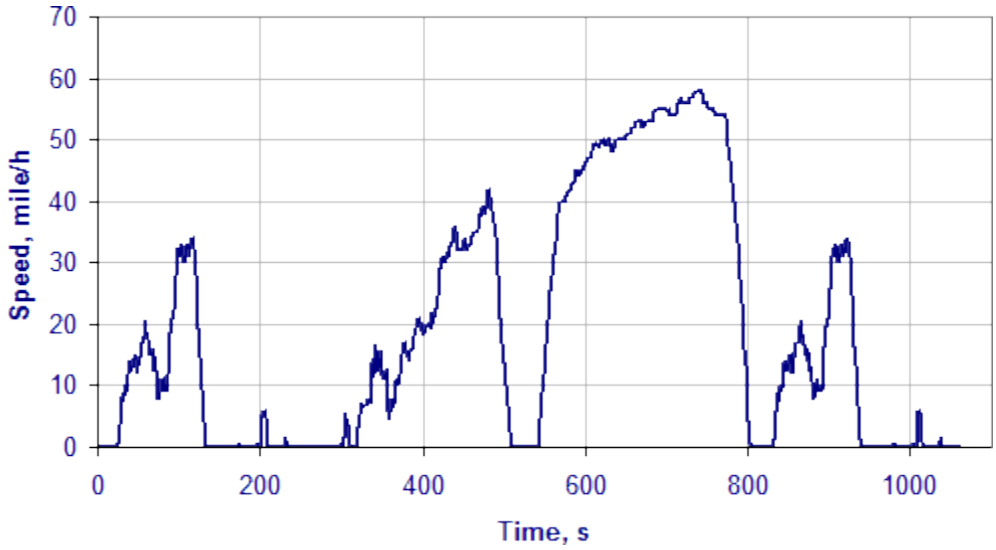


***Figure 8.3**. HD-UDDS Cycle (Duration 1060 seconds, Maximum Speed 58 mph, Average Speed 18.86 mph)*

8-III. TEST ARTICLE

The test article is a Gillig LLC Low Floor model transit bus equipped with a diesel fueled Cummins B6.7 280 hp engine. The bus was tested on June 1, 2022 with the odometer reading 3,286 miles.

8-IV. TEST EQUIPMENT

Testing was performed in the LTI Vehicle Testing Laboratory emissions testing bay. The test bay is equipped with a Schenk Pegasus 72-inch, large-roll chassis dynamometer. The dynamometer is electronically controlled to account for vehicle road-load characteristics and for simulating the inertia characteristics of the vehicle. Power to the roller is supplied and absorbed through an electronically controlled 3-phase ac motor. Absorbed power is returned to the electrical grid.

Vehicle exhaust is collected by a Horiba CVS, full-flow dilution tunnel. The system has separate tunnels for diesel and gasoline/natural gas fueled vehicles. In the case of diesel vehicles, particulate emissions are measured gravimetrically using 47mm Teflon filters. These filters are housed in a Horiba HF47 particulate sampler, per EPA 1065 test procedures. Heated gaseous emissions of hydrocarbons and NOx are sampled by Horiba heated oven analyzers.

Gaseous emissions for CO, CO2 and cold NOx are measured using a Horiba Mexa 7400 series gas analyzer. System operation, including the operation of the chassis dynamometer, and all calculations are controlled by a Dell workstation running Horiba CDCTS test control software. Particulate Filters are weighed in a glove box using a Sartorius microbalance accurate to 1 microgram.

8-V. TEST PREPARATION AND PROCEDURES

The test bus was prepared for emissions testing in accordance with the Fuel Economy Pre-Test Maintenance Form. (In the event that fuel economy test was performed immediately prior to emissions testing this step does not have to be repeated.) This is done to ensure that the bus is tested in optimum operating condition. The manufacturer-specified preventive maintenance shall be performed before this test. The ABS system is disabled for operation on the chassis dynamometer. Any manufacturer-recommended changes to the pre-test maintenance procedure must be noted on the revision sheet. The Fuel Economy Pre-Test Inspection Form will also be completed before performing the Emissions test. Both the Fuel Economy Pre-Test Maintenance Form and the Fuel Economy Pre-Test Inspection Form are found in section 6, Fuel Economy Test.

Prior to performing the emissions test, each bus is evaluated to determine its road-load characteristics using coast-down techniques in accordance with SAE J1263. This data is used to program the chassis dynamometer to accurately simulate over-the-road operation of the bus.

Warm-up consisted of driving the bus for 20 minutes at approximately 40 mph on the chassis dynamometer. During emissions testing, the test driver followed the prescribed driving cycle by watching the speed trace and instructions on the Horiba Drivers-Aid monitor which is placed in front of the windshield. The CDCTS computer monitored the test and collected data for calculation of emissions at the end of the test.

This bus was tested for emissions at seated load weight. The emissions data was obtained at the following conditions:

1. Air conditioning off
2. Heater off
3. Defroster off
4. Exterior and interior lights on
5. Windows and Doors closed
6. Seated load weight

The test tanks or the bus fuel tank(s) were filled prior to the fuel economy test with diesel fuel.

8-VI. DISCUSSION

Table 8.1 provides the emissions testing results on a grams per mile basis for each of the exhaust constituents measured and for each driving cycle performed.

TABLE 8.1 Emissions Test Results

Test Completed at SLW: 37,380 lb.			
Driving Cycle	**Manhattan**	**Orange County Bus**	**UDDS**
CO_2, gm/mi	2,333	1,728	1,357
CO, gm/mi	0.19	0.10	0.06
THC, gm/mi	0.17	0.01	0.01
NMHC, gm/mi	0.06	0.01	0.01
NO_x, gm/mi	1.34	0.22	0.03
Particulates. gm/mi	0.02	0.03	0.03

8. EMISSIONS TEST

BUS TESTED ON CHASSIS DYNAMOMETER FOR PERFORMANCE, FUEL/ENERGY ECONOMY AND EMISSIONS

GILLIG

February 16, 2023

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' model Low Floor bus, and the variant is a 35' bus, I would draw the following conclusions regarding Partial Testing:

1) Regarding propulsion system options - Diesel, Diesel Hybrid and CNG variations of the 40' GILLIG bus have been tested. When these propulsion systems are installed in a 35' GILLIG bus it would not be expected to produce significantly different data from that obtained in previous maintainability, performance, fuel economy 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 bending moments in the structure are either the same or less and 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 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

Cc:
Marco Genova, Product Safety and Compliance Manager

	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY **2024 MODEL YEAR** **CERTIFICATE OF CONFORMITY** **WITH THE CLEAN AIR ACT**	**OFFICE OF TRANSPORTATION** **AND AIR QUALITY** **ANN ARBOR, MICHIGAN 48105**

Certificate Issued To: GILLIG LLC (U.S. Manufacturer or Importer) **Certificate Number: RGLG2VOCVHHD-002**	**Effective Date:** **05/23/2023** **Expiration Date:** **12/31/2024**	**Byron J. Bunker, Division Director** **Compliance Division**	**Issue Date:** **05/23/2023** **Revision Date:** **N/A**

Model Year: 2024 **Vehicle Family:** RGLG2VOCVHHD **Vehicle Regulatory Sub-category:** Transit and other bus **Averaging Set:** Transit and Other bus	**CO2 Emission Standard (g CO2/ton-mile):** 300 **Highest Projected CO2 Family Emission Limit (g/ton-mile):** 330 **Lowest Projected CO2 Family Emission Limit (g/ton-mile):** 283

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.

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.

CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY)
09/20/2023

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Aon Risk Services Northeast, Inc.
Cincinnati OH Office
8044 Montgomery Road
Suite 405
Cincinnati OH 45236-2919 USA

CONTACT NAME:
PHONE (A/C. No. Ext): (866) 283-7122 **FAX (A/C. No.):** (800) 363-0105
E-MAIL ADDRESS:

INSURER(S) AFFORDING COVERAGE		NAIC #
INSURER A:	Zurich American Ins Co	16535
INSURER B:		
INSURER C:		
INSURER D:		
INSURER E:		
INSURER F:		

INSURED
GILLIG LLC
451 Discovery Drive
Livermore CA 94551 USA

COVERAGES **CERTIFICATE NUMBER:** 570101589987 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

Limits shown are as requested

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: X POLICY PRO-JECT LOC OTHER:			GL0819847400	10/01/2023	10/01/2024	EACH OCCURRENCE	$1,000,000
							DAMAGE TO RENTED PREMISES (Ea occurrence)	$500,000
							MED EXP (Any one person)	Excluded
							PERSONAL & ADV INJURY	$1,000,000
							GENERAL AGGREGATE	$1,000,000
							PRODUCTS - COMP/OP AGG	$1,000,000
A	AUTOMOBILE LIABILITY X ANY AUTO OWNED AUTOS ONLY HIRED AUTOS ONLY SCHEDULED AUTOS NON-OWNED AUTOS ONLY			BAP 8198475 00	10/01/2023	10/01/2024	COMBINED SINGLE LIMIT (Ea accident)	$3,000,000
							BODILY INJURY (Per person)	
							BODILY INJURY (Per accident)	
							PROPERTY DAMAGE (Per accident)	
	UMBRELLA LIAB OCCUR EXCESS LIAB CLAIMS-MADE DED RETENTION						EACH OCCURRENCE	
							AGGREGATE	
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N: N (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		EWS819847200 Excess SIR applies per policy terms & conditions	10/01/2023	10/01/2024	X PER STATUTE OTH-ER	
							E.L. EACH ACCIDENT	$1,000,000
							E.L. DISEASE-EA EMPLOYEE	$1,000,000
							E.L. DISEASE-POLICY LIMIT	$1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

General Liability is excess of SIR. RE: Jefferson Parish Bid No. 50-00121992 - Amendment No. 2 For The Purchase of (5) 40' Diesel BRT Plus and (3) 35' Diesel BRT Plus Buses. Jefferson Parish, its Districts Departments and Agencies under the direction of the Parish President and the Parish Council are included as Additional Insured in accordance with the policy provisions of the General Liability and Automobile Liability policies.

CERTIFICATE HOLDER

Jefferson Parish
Jefferson Transit Administration
21 West Bank Expressway
Gretna LA 70053 USA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Aon Risk Services Northeast, Inc.

Holder Identifier :

Certificate No : 570101589987

Form **W-9**
(Rev. March 2024)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

Go to *www.irs.gov/FormW9* for instructions and the latest information.

Give form to the requester. Do not send to the IRS.

Before you begin. For guidance related to the purpose of Form W-9, see *Purpose of Form*, below.

Print or type. See *Specific Instructions* on page 3.

1 Name of entity/individual. An entry is required. (For a sole proprietor or disregarded entity, enter the owner's name on line 1, and enter the business/disregarded entity's name on line 2.)

GILLIG LLC

2 Business name/disregarded entity name, if different from above.

3a Check the appropriate box for federal tax classification of the entity/individual whose name is entered on line 1. Check only **one** of the following seven boxes.

☐ Individual/sole proprietor ☐ C corporation ☐ S corporation ☐ Partnership ☐ Trust/estate

☑ LLC. Enter the tax classification (C = C corporation, S = S corporation, P = Partnership) . . . . P

Note: Check the "LLC" box above and, in the entry space, enter the appropriate code (C, S, or P) for the tax classification of the LLC, unless it is a disregarded entity. A disregarded entity should instead check the appropriate box for the tax classification of its owner.

☐ Other (see instructions)

3b If on line 3a you checked "Partnership" or "Trust/estate," or checked "LLC" and entered "P" as its tax classification, and you are providing this form to a partnership, trust, or estate in which you have an ownership interest, check this box if you have any foreign partners, owners, or beneficiaries. See instructions . . . . . ☐

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any)

Exemption from Foreign Account Tax Compliance Act (FATCA) reporting code (if any)

(Applies to accounts maintained outside the United States.)

5 Address (number, street, and apt. or suite no.). See instructions.

451 Discovery Drive

Requester's name and address (optional)

6 City, state, and ZIP code

Livermore, CA 94551

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN*, later.

Note: If the account is in more than one name, see the instructions for line 1. See also *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number

☐☐☐ – ☐☐ – ☐☐☐☐

or

Employer identification number

2 6 – 3 0 8 5 3 6 4

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and, generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here **Signature of U.S. person** G. ARAIZA **Date** 5/15/2024

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to *www.irs.gov/FormW9*.

What's New

Line 3a has been modified to clarify how a disregarded entity completes this line. An LLC that is a disregarded entity should check the appropriate box for the tax classification of its owner. Otherwise, it should check the "LLC" box and enter its appropriate tax classification.

New line 3b has been added to this form. A flow-through entity is required to complete this line to indicate that it has direct or indirect foreign partners, owners, or beneficiaries when it provides the Form W-9 to another flow-through entity in which it has an ownership interest. This change is intended to provide a flow-through entity with information regarding the status of its indirect foreign partners, owners, or beneficiaries, so that it can satisfy any applicable reporting requirements. For example, a partnership that has any indirect foreign partners may be required to complete Schedules K-2 and K-3. See the Partnership Instructions for Schedules K-2 and K-3 (Form 1065).

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS is giving you this form because they

License No. SV-2024-00111 2024

DPS Code: SLGH

Not Transferable
Valid Only at Address Below

Louisiana Motor Vehicle Commission

This Certifies that

Gillig, LLC
451 Discovery Drive
Livermore, CA 94551
Derk Maunus,President & CEO - Dealer Operator

is duly licensed as a

Specialty Vehicle Dealer

of the following

Gillig Bus

For the period ending December 31, 2024, unless license is sooner revoked.

In Witness whereof, **LOUISIANA MOTOR VEHICLE COMMISSION,** under and by virtue of the authority vested in it by the laws of the **State of Louisiana,** has caused this license to be issued with its seal imprinted hereon.

LOUISIANA MOTOR VEHICLE COMMISSSION
Dated January 1, 2024
Signed, Sealed and Attested

Executive Director

(To be prominently displayed in place of business)

LMVC-DL (R2/20)

License No. MN-2024-00130 2024

Not Transferable
Valid Only at Address Below

Louisiana Motor Vehicle Commission

This Certifies that

Gillig, LLC
451 Discovery Drive
Livermore, CA 94551

is duly licensed as a

Manufacturer

of the following make or makes of new motor vehicles

Gillig Bus (Low Floor Diesel Bus, Low Floor CNG Bus, Low Floor Hybrid Bus Low Floor Electric)

For the period ending December 31, 2024, unless license is sooner revoked.

In Witness whereof, **LOUISIANA MOTOR VEHICLE COMMISSION,** under and by virtue of the authority vested in it by the laws of the **State of Louisiana,** has caused this license to be issued with its seal imprinted hereon.

LOUISIANA MOTOR VEHICLE COMMISSSION
Dated January 1, 2024
Signed, Sealed and Attested

Executive Director

(To be prominently displayed in place of business)

LMVC-DL (R2/20)

License No. FR-2024-00115 2024 Not Transferable

Louisiana Motor Vehicle Commission

This Certifies that

Randall Brewer of Gallatinille, TN

has been licensed by this Commission as a

FACTORY REPRESENTATIVE

MN-2024-00130
Gillig, LLC
451 Discovery Drive
Livermore, CA 94551

pursuant to the laws of the State of Louisiana for the period ending December 31, 2024.

Louisiana Motor Vehicle Commission

Dated January 1, 2024

Executive Director

NOTE: This Certificate is to be retained by the Employer. It is to be returned by the Employer to the Commission Office at 3017 Kingman Street, Metairie, LA 70006, within ten days of the termination of the Salesman's employment.

Termination Date:

Louisiana Motor Vehicle Commission

License No. FR-2024-00115 2024

This is to Certify that

Randall Brewer of Gallatinille, TN

has been duly licensed by this Commission as a

FACTORY REPRESENTATIVE

MN-2024-00130 Gillig, LLC

Livermore, CA 94551

For the period ending 12/31/2024.

Louisiana Motor Vehicle Commission

Executive Director

Dated: 1/01/2024 (OVER)

LMVC-SL (R1/21)

License No. SV-2024-00022 2024 Not Transferable

Louisiana Motor Vehicle Commission

This Certifies that

Randall Brewer of Gallatin, TN

has been licensed by this Commission as a

MOTOR VEHICLE SALESMAN, AUTHORIZED TO SELL SPECIALTY VEHICLES ONLY

Employed by Specialty Vehicle Dealer Licensee

SV-2024-00111

Gillig, LLC

451 Discovery Drive

Livermore, CA 94551

pursuant to the laws of the State of Louisiana for the period ending December 31, 2024.

Louisiana Motor Vehicle Commission

Dated January 1, 2024

Executive Director

NOTE: This Certificate is to be retained by the Employer. It is to be returned by the Employer to the Commission Office at 3017 Kingman Street, Metairie, LA 70006, within ten days of the termination of the Salesman's employment.

Termination Date:

Louisiana Motor Vehicle Commission

License No. SV-2024-00022 2024

This is to Certify that

Randall Brewer of Gallatin, TN

has been duly licensed by this Commission as a

MOTOR VEHICLE SALESMAN,

AUTHORIZED TO SELL SPECIALTY VEHICLES ONLY

Employed by Specialty Vehicle Dealer Licensee

SV-2024-00111 Gillig, LLC

Livermore, CA 94551

For the period ending 12/31/2024.

Louisiana Motor Vehicle Commission

Executive Director

Dated: 1/01/2024 (OVER)

LMVC-SL (R1/21)

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 "Company"), was held at 222 N. LaSalle Street, Chicago, IL 60601, on August 1, 2023. All of the Company's managers, namely A. Steven 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 the appointment of officers for (a) Gillig LLC, a California limited liability company ("Gillig"); (b) Arkay Acquisition LLC, a Delaware limited liability company ("Acquisition"); (c) Arkay Land LLC, a California limited liability company ("Land"); (d) Arkay Properties LLC, a California limited liability company ("Properties"); (e) RK Acquisition S LLC, a Delaware limited liability company ("RK"); and (f) G Randolph LLC, an Illinois limited liability company ("G Randolph" and, together with Gillig, Acquisition, Land, Properties and RK the "LLCs"), in the Company's capacity as Manager of the LLCs. Upon motion duly made, seconded and unanimously carried, the following resolutions were adopted:

Gillig

RESOLVED, that the officers of Gillig are set forth below and such persons shall serve in the capacities set forth opposite their names until the earlier of their removal, replacement, or resignation:

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
KURT VORSATZ	Vice President – Engineering[1]
DAVID M. RUBIN	Vice President, General Counsel and Secretary
NICK MATTHIS	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 Gillig which are required in the usual and ordinary conduct of the business, including, but not limited to, Bid Documents, Sales Contracts,

[1] Effective July 1, 2023

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.

Acquisition

RESOLVED, that the officers of Acquisition are set forth below and such persons shall serve in the capacities set forth opposite their names until the earlier of their removal, replacement, or resignation:

WILLIAM H. CROWN	President
A. STEVEN CROWN	Vice President and Assistant Secretary
MICHAEL S. CANMANN	Vice President, Treasurer and Assistant Secretary
DAVID M. RUBIN	Vice President, General Counsel and Secretary
NICK MATTHIS	Vice President, Controller and Assistant Secretary
DEREK MAUNUS	Vice President
BRIAN SHEPHERD	Vice President
AMY BLUMENTHAL	Assistant Secretary
BRIAN B. GILBERT	Assistant Secretary

Land and Properties

RESOLVED, that the officers of Land and Properties are set forth below and such persons shall serve in the capacities set forth opposite their names until the earlier of their removal, replacement, or resignation:

WILLIAM H. CROWN	President
MICHAEL S. CANMANN	Vice President, Treasurer, and Assistant Secretary
NICK MATTHIS	Vice President, Controller and Assistant Secretary
DEREK MAUNUS	Vice President
DAVID M. RUBIN	Vice President, General Counsel and Secretary
AMY BLUMENTHAL	Assistant Secretary
BRIAN B. GILBERT	Assistant Secretary

RK

RESOLVED, that the officers of RK are set forth below and such persons shall serve in the capacities set forth opposite their names until the earlier of their removal, replacement, or resignation:

WILLIAM H. CROWN	President
A. STEVEN CROWN	Vice President and Assistant Secretary
MICHAEL S. CANMANN	Vice President, Treasurer and Assistant Secretary
DAVID M. RUBIN	Vice President and Secretary
NICK MATTHIS	Vice President
BRIAN B. GILBERT	Assistant Secretary

G Randolph

RESOLVED, that the officers of G Randolph are set forth below and such persons shall serve in the capacities set forth opposite their names until the earlier of their removal, replacement, or resignation:

WILLIAM H. CROWN	President
MICHAEL S. CANMANN	Vice President, Treasurer, and Assistant Secretary
RAHUL DANAK	Vice President
NICK MATTHIS	Vice President
DAVID M. RUBIN	Vice President, General Counsel and Secretary
AMY BLUMENTHAL	Assistant Secretary
BRIAN B. GILBERT	Assistant Secretary

Omnibus Resolution

RESOLVED, that any person previously serving the LLCs in the capacity of an officer and not otherwise appointed pursuant to the foregoing resolutions be, and hereby is, removed from such office with immediate effect.

FURTHER RESOLVED, that all of the acts and doings of the aforementioned officers of the LLCs be, and the same hereby are, ratified, confirmed and approved in all respects.

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

Respectfully submitted,

David M. Rubin
Secretary of the Meeting

ATTACHMENT A – VEHICLE AND CONTRACTOR INFORMATION QUESTIONNAIRE

RETURN WITH YOUR BID

Contractor will attach to this form:

1. A listing of staff that will be assigned to the contract (sales, customer service, technical assistance), along with information demonstrating their experience and capabilities.
2. The address of the manufacturing facilities where the buses will be constructed
3. The technical sheets below for each size / model bus proposed.

Bus Manufacturer: _____

Bus Model Number: _____

Basic Body Construction Type: _____

General Dimensions

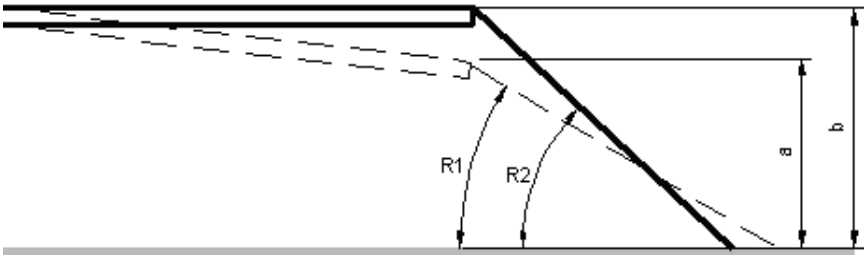
Overall length	Over bumpers		feet		inches
	Over body		feet		inches
Overall width	Over body excluding mirrors and lights		feet		inches
	Over body including mirrors		feet		inches
	Over tires		feet		inches
Overall height (maximum)			feet		inches

Angle of approach		degrees
Angle of departure		degrees
Breakover angle 1		degrees
Breakover angle 2		degrees

Doorway clear opening (at widest point) _____ inches

	Width with grab handles		**Width** without grab handles		**Height**	
Front door		inches		inches		inches
Center door (1)		inches		inches		inches
Center door (2)		inches		inches		inches
Rear door		inches		inches		inches

Front axle floor height above ground (centerline of bus)		inches
Center axle floor height above ground (centerline of bus)		inches
Rear axle floor height above ground (centerline of bus)		inches
Step height from ground (measured at center of doorway)		inches



	Front doorway		Center doorway		Ramp angle		Rear doorway	
Kneeled		inches (a)		inches (a)		degrees (R1)		inches (a)
Unkneeled		inches (b)		inches (b)		degrees (R2)		inches (b)

Interior head room (floor to ceiling at center of aisle)

First axle location		inches
Center of articulation		inches
Rear axle location		inches
Rear settee (in front of seat)		inches

Aisle width

Minimum width on floor between first axle wheel housings		inches
Minimum width on floor between center axle (1) wheel housings		inches
Minimum width on floor between center axle (2) wheel housings		inches
Minimum width on floor between rear axle wheel housings		inches

Minimum ground clearance

Outside axles zones		inches
Inside axles zones		inches

Horizontal turning envelope (see diagram below)

Outside body turning radius, TR0 (including bumper)		feet		inches
Inside Body Turning Radius innermost point, TR4 (including bumper)		feet		inches

Wheel base

First axle to center/rear axle		inches
Center axle to rear axle		inches

Overhang, centerline of axle over bumper

Front		inches
Rear		inches

Floor

Maximum interior floor slope (from horizontal)		degrees

Capacity

Total number of passenger sittings		
Passenger seating manufacturer/model number		
Total number of standing passengers (1 per 1.5 sq. ft.)		
Minimum hip to knee space		inches
Maximum hip to knee space		inches
Restraint system type and model number		

Bus weight

	Curb weight		**Curb weight plus seated load***		**GVWR**	
First axle		lbs		lbs		lbs
Center axle		lbs		lbs		lbs
Rear axle		lbs		lbs		lbs
Total		lbs		lbs		lbs

* Including operator and passengers at 150 lbs per person

Steering Axles

Manufacturer	
Type and weight rating	
Model number	

Drive axle (□ Center □ Rear)

Manufacturer	
Type and weight rating	
Model number	

Drive axle ratio

Differential ratio	
Hub reduction ratio (if used)	
Final axle ratio (if hub reduction is used)	

Brake system

Make/type of fundamental system	
First axle brake chamber model	
Center axle brake chamber model	
Rear axle brake chamber model	

First axle slack adjuster

Manufacturer	
Model number	

Center axle slack adjuster

Manufacturer	
Model number	

Rear axle slack adjuster

Manufacturer	
Model number	

First axle brake drum/rotor

Manufacturer	

Center axle brake drum/rotor

Manufacturer	

Rear axle brake drum/rotor

Manufacturer	

Air compressor

Manufacturer		
Type		
Model number		
Rated capacity		cfm

Capacity at idle		cfm
Maximum warranted speed		rpm
Idle speed		rpm
Drive type		
Governor cut-in pressure		psi
Governor cut-out pressure		psi

Air Reservoir Capacity

Manufacturer				
Supply reservoir number and size		/		cubic inches total
Primary reservoir number and size		/		cubic inches total
Secondary reservoir number and size		/		cubic inches total
Parking reservoir number and size		/		cubic inches total
Accessory reservoir number and size		/		cubic inches total
Other reservoir number and size		/		cubic inches total

Cooling System

	Radiator	Charge air cooler
Manufacturer		
Type		
Model number		
Number of tubes		
Fins per inch		
Fin thickness (inches)		
Fin construction		

Total cooling system capacity (gallons)		gallons
Radiator fan manufacturer		
Fan speed/control type (mech/elect/hyb)	/	
Surge tank capacity		gallons
Surge tank material		
Overheat alarm temperature		degrees F
Shutdown temperature settings		degrees F

Electrical

Primary interior lighting system

Manufacturer	
Type	
Model number	

Alternator

Manufacturer		
Type		
Model number		
Output at idle		amps

Voltage regulator

Manufacturer	
Model number	

Voltage equalizer

Manufacturer	
Model number	

Auxiliary inverter (120/240)

Manufacturer	
Model number	
Inverter technology	
Output voltage(s)	

Starter motor

Manufacturer	
Voltage	
Model number	

Batteries/energy storage – low voltage

Manufacturer	
Type	
Model number	
Cold cranking amps	

Batteries/energy storage – high voltage

Manufacturer	
Type	
Model number	
Energy density	
Specific power	
Operating temperature range	
Cooling/heating system	

Engine

Manufacturer	
Model number/version	
Horsepower/torque rating	

Fire Suppression/Methane Detection System

Manufacturer				
Model number				
Number of detectors		fire		methane
Type of detector	□ Thermal □ Optical			
Battery backup	□ Yes □ No			

Bumpers

Manufacturer	
Type	

Fuel and Exhaust System

Fuel type	
Operating range and route profile	

Fuel tanks (liquid fuels)

Manufacturer				
Capacity (total and usable)		Gallons /		Gallons
Construction material				
Quantity and location of tanks				

Fuel tanks (gaseous fuels)

Manufacturer				
Capacity (total and usable)		SCF /		SCF
Construction material				

Quantity and location of tanks	

Exhaust system

Diesel particulate filter manufacturer	
Describe DPF electronic interface	
Muffler manufacturer (if applicable)	

Air Suspension	Front	Rear
Air spring manufacturer		
Air spring quantity per axle		
Shock absorber manufacturer		
Shock absorber quantity per axle		

Steering

Pump manufacturer		
Pump model number		
Steering gear manufacturer		
Steering gear model number		
Steering gear type		
Steering wheel diameter		inches
Maximum effort at steering wheel*		

* Unloaded stationary coach on dry asphalt pavement

Hybrid

Manufacturer	
Type	
Model number	
Type ventilation / cooling	

Transmission

Manufacturer	
Type	
Model number	
Number of forward speeds	
Traction motor horsepower rating	
Type ventilation/cooling	

Propshaft

Manufacturer	

Wheels

Manufacturer	
Type	
Size	
Mounting type	
Bolt circle diameter	
Protective coating	

Tires

Manufacturer	
Type	
Size	
Load range/air pressure	

Door System

Door panels	**Manufacturer**	**Type**
Front door		
Center door (1)		
Center door (2)		
Rear door		

Heating and Ventilating Equipment

Heating system capacity		Btu
Air conditioning system capacity		Btu
Ventilating capacity		CFM per passenger
Manufacturer and model		
Refrigerant type		

Driving heater

Manufacturer	
Type	
Model number	
Capacity	

Auxiliary heater

Manufacturer	
Type	
Model number	
Capacity	

Floor heaters

Manufacturer	
Type/number	
Model number	
Capacity	

Passenger Loading System

Manufacturer	
Type (hydraulic, electric or both)	
Model number	
Capacity (lbs.)	

Dimensions

Width of ramp		inches
Length of ramp		inches

Cycle times	**Normal idle**		**Fast idle**	
Stowed to ground		seconds		seconds
Ground to stow		seconds		seconds

Electronics

Video system manufacturer	
Video system model number	
Number of cameras	
Multiplex system manufacturer	
Multiplex system model number	
Automatic passenger counter system manufacturer	
Automatic passenger counter system model number	
Destination sign manufacturer	
Destination sign model number	
AVL/AVM system manufacturer	
AVL/AVM system model number	
Passenger information system manufacturer	
Passenger information system model number	

Coach Body Fittings

Passenger windows manufacturer	

Exterior/interior mirrors

Size	
Manufacturer	
Model number	
Manufacturer part numbers	

Bicycle racks

Manufacturer	
Model number	

Paint system

Manufacturer	
Type	

ATTACHMENT A – VEHICLE AND CONTRACTOR INFORMATION QUESTIONNAIRE

RETURN WITH YOUR BID

Contractor will attach to this form:

1. A listing of staff that will be assigned to the contract (sales, customer service, technical assistance), along with information demonstrating their experience and capabilities.
2. The address of the manufacturing facilities where the buses will be constructed
3. The technical sheets below for each size / model bus proposed.

Bus Manufacturer: GILLIG LLC

Bus Model Number: G27D102H4

Basic Body Construction Type: 40' Low Floor Diesel

General Dimensions

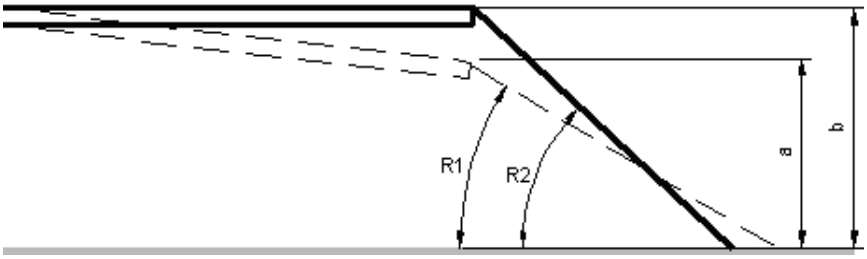
Overall length	Over bumpers	40	feet	11.4	inches
	Over body	40	feet	1.1	inches
Overall width	Over body excluding mirrors and lights		feet	102	inches
	Over body including mirrors		feet	120	inches
	Over tires		feet	102	inches
Overall height (maximum)			feet	122.8	inches

Angle of approach	8.6	degrees
Angle of departure	8.8	degrees
Breakover angle 1	10.7	degrees
Breakover angle 2	n/a	degrees

Doorway clear opening (at widest point) 40 inches

	Width with grab handles		**Width** without grab handles		**Height**	
Front door	32.4	inches	36.4	inches	75	inches
Center door (1)	n/a	inches	n/a	inches	n/a	inches
Center door (2)	n/a	inches	n/a	inches	n/a	inches
Rear door	24.8	inches	25	inches	77.6	inches

Front axle floor height above ground (centerline of bus)	16	inches
Center axle floor height above ground (centerline of bus)	n/a	inches
Rear axle floor height above ground (centerline of bus)	35.4	inches
Step height from ground (measured at center of doorway)	16	inches



	Front doorway		Center doorway		Ramp angle		Rear doorway	
Kneeled	11.9	inches (a)	n/a	inches (a)	9.3	degrees (R1)	14.4	inches (a)
Unkneeled	15.3	inches (b)	n/a	inches (b)	13.6	degrees (R2)	15.7	inches (b)

Interior head room (floor to ceiling at center of aisle)

First axle location	95.4	inches
Center of articulation	n/a	inches
Rear axle location	76.5	inches
Rear settee (in front of seat)	76.5	inches

Aisle width

Minimum width on floor between first axle wheel housings	36.1	inches
Minimum width on floor between center axle (1) wheel housings	n/a	inches
Minimum width on floor between center axle (2) wheel housings	n/a	inches
Minimum width on floor between rear axle wheel housings	32	inches

Minimum ground clearance

Outside axles zones	13.06	inches
Inside axles zones	8.04	inches

Horizontal turning envelope (see diagram below)

Outside body turning radius, TR0 (including bumper)	44	feet	2	inches
Inside Body Turning Radius innermost point, TR4 (including bumper)	23	feet	8	inches

Wheel base

First axle to center/rear axle	279	inches
Center axle to rear axle	n/a	inches

Overhang, centerline of axle over bumper

Front	90.2	inches
Rear	121.2	inches

Floor

Maximum interior floor slope (from horizontal)	4	degrees

Capacity

Total number of passenger sittings	38	
Passenger seating manufacturer/model number	American Seating / Insight Classic	
Total number of standing passengers (1 per 1.5 sq. ft.)	40	
Minimum hip to knee space	27	inches
Maximum hip to knee space	29	inches
Restraint system type and model number	A.R.M. with Q'Straint Belts	

Bus weight

	Curb weight		Curb weight plus seated load*		GVWR	
First axle	9961	lbs	11961	lbs	14600	lbs
Center axle	n/a	lbs	n/a	lbs	n/a	lbs
Rear axle	18419	lbs	22119	lbs	27000	lbs
Total	38380	lbs	34080	lbs	41600	lbs

* Including operator and passengers at 150 lbs per person

Steering Axles

Manufacturer	Meritor
Type and weight rating	Deep Drop / 14,600
Model number	FH946

Drive axle (□ Center ☑ Rear)

Manufacturer	Meritor
Type and weight rating	Single Reduction
Model number	79163

Drive axle ratio

Differential ratio	5.38:1
Hub reduction ratio (if used)	n/a
Final axle ratio (if hub reduction is used)	5.38:1

Brake system

Make/type of fundamental system	Meritor / EX225 Disc
First axle brake chamber model	MGM Type 24
Center axle brake chamber model	n/a
Rear axle brake chamber model	MGM MJB 2430ET

First axle slack adjuster

Manufacturer	n/a
Model number	n/a

Center axle slack adjuster

Manufacturer	n/a
Model number	n/a

Rear axle slack adjuster

Manufacturer	n/a
Model number	n/a

First axle brake drum/rotor

Manufacturer	Meritor

Center axle brake drum/rotor

Manufacturer	n/a

Rear axle brake drum/rotor

Manufacturer	Meritor

Air compressor

Manufacturer	Cummins (Wabco)	
Type	Reciprocating Piston-Twin Cylinder	
Model number	Wabco 30.4	
Rated capacity	30.4	cfm

Capacity at idle	6.5	cfm
Maximum warranted speed	3000	rpm
Idle speed	700	rpm
Drive type	Gear Driven	
Governor cut-in pressure	110	psi
Governor cut-out pressure	130	psi

Air Reservoir Capacity

Manufacturer				
Supply reservoir number and size		/	1000	cubic inches total
Primary reservoir number and size		/	1516	cubic inches total
Secondary reservoir number and size		/	2095	cubic inches total
Parking reservoir number and size		/	n/a	cubic inches total
Accessory reservoir number and size		/	1090	cubic inches total
Other reservoir number and size		/	n/a	cubic inches total

Cooling System

	Radiator	Charge air cooler
Manufacturer	Modine	Modine
Type	Side by Side	Side by Side
Model number	EPR0239690002	EPS0239700002
Number of tubes	276	22
Fins per inch	.076 x .625	.313x3.0
Fin thickness (inches)	10	12
Fin construction	.003	.006

Total cooling system capacity (gallons)	23	gallons
Radiator fan manufacturer	Modine	
Fan speed/control type (mech/elect/hyb)	Modulated /	
Surge tank capacity	2.7	gallons
Surge tank material		
Overheat alarm temperature	215	degrees F
Shutdown temperature settings	235	degrees F

Electrical

Primary interior lighting system

Manufacturer	I/O Controls
Type	LED
Model number	I/O Controls LED

Alternator

Manufacturer	Niehoff	
Type	A2-336	
Model number	V803	
Output at idle	325	amps

Voltage regulator

Manufacturer	Delco Remy
Model number	HD Electric 24 Volt

Voltage equalizer

Manufacturer	Vanner
Model number	60 Series (60 Amp)

Auxiliary inverter (120/240)

Manufacturer	n/a
Model number	
Inverter technology	
Output voltage(s)	

Starter motor

Manufacturer	Delco Remy
Voltage	HD Electric 24 Volt
Model number	42 MT Type 400

Batteries/energy storage – low voltage

Manufacturer	Deka
Type	8D
Model number	908DFT716
Cold cranking amps	1425

Batteries/energy storage – high voltage

Manufacturer	n/a
Type	
Model number	
Energy density	
Specific power	
Operating temperature range	
Cooling/heating system	

Engine

Manufacturer	Cummins
Model number/version	L9
Horsepower/torque rating	280HP 900 lb/ft

Fire Suppression/Methane Detection System

Manufacturer	Amerex			
Model number	V25			
Number of detectors	3	fire		methane
Type of detector	☑ Thermal □ Optical			
Battery backup	☑ Yes □ No			

Bumpers

Manufacturer	Romeo
Type	Energy Absorbing

Fuel and Exhaust System

Fuel type	Diesel
Operating range and route profile	Varies 400-500 Miles

Fuel tanks (liquid fuels)

Manufacturer	Hogan MFG			
Capacity (total and usable)	127	Gallons /	120	Gallons
Construction material	3CR12 Stainless Steel			
Quantity and location of tanks	1 located under bus fwd of rear axle			

Fuel tanks (gaseous fuels)

Manufacturer	n/a			
Capacity (total and usable)		SCF /		SCF
Construction material				

Quantity and location of tanks	

Exhaust system

Diesel particulate filter manufacturer	Cummins
Describe DPF electronic interface	Cummins interface
Muffler manufacturer (if applicable)	n/a

Air Suspension	Front	Rear
Air spring manufacturer	Hendrickson	Hendrickson
Air spring quantity per axle		
Shock absorber manufacturer	Koni	Koni
Shock absorber quantity per axle	2	4

Steering

Pump manufacturer	Parker	
Pump model number	PGP330	
Steering gear manufacturer	TRW	
Steering gear model number	TAS6505	
Steering gear type	Power Integral	
Steering wheel diameter	20	inches
Maximum effort at steering wheel*	10 Pounds	

* Unloaded stationary coach on dry asphalt pavement

Hybrid

Manufacturer	n/a
Type	
Model number	
Type ventilation / cooling	

Transmission

Manufacturer	Allison
Type	Automatic
Model number	B400R-6
Number of forward speeds	6
Traction motor horsepower rating	280
Type ventilation/cooling	Electric Fan System

Propshaft

Manufacturer	n/a

Wheels

Manufacturer	Accuride
Type	Powder Coated Steel
Size	22.5" x 8.25"
Mounting type	Hub Pilotes
Bolt circle diameter	335mm
Protective coating	Powder Coating #28440-PK

Tires

Manufacturer	Goodyear
Type	Intercity Cruiser
Size	B315/80R22.5
Load range/air pressure	J / 120 psi

Door System

Door panels	**Manufacturer**	**Type**
Front door	Vapor	Slide Glide
Center door (1)	n/a	
Center door (2)	n/a	
Rear door	Vapor	Swing Out

Heating and Ventilating Equipment

Heating system capacity	94000	Btu
Air conditioning system capacity	101,000	Btu
Ventilating capacity	2250	CFM ~~per passenger~~ dependent on # of passengers
Manufacturer and model	Mobile Climate Control	
Refrigerant type	R134A	

Driving heater

Manufacturer	Mobile Climate Controls
Type	Brushless
Model number	62,000 BTU
Capacity	62,000 BTU

Auxiliary heater

Manufacturer	N/A
Type	
Model number	
Capacity	

Floor heaters

Manufacturer	N/A
Type/number	
Model number	
Capacity	

Passenger Loading System

Manufacturer	Lift-U
Type (hydraulic, electric or both)	Electric
Model number	LU18
Capacity (lbs.)	950 lbs

Dimensions

Width of ramp	30	inches
Length of ramp	48	inches

Cycle times	**Normal idle**		**Fast idle**	
Stowed to ground	6	seconds	n/a	seconds
Ground to stow	6	seconds	n/a	seconds

Electronics

Video system manufacturer	Angel Trax
Video system model number	Vulcan V1202HC
Number of cameras	10
Multiplex system manufacturer	I/O Controls
Multiplex system model number	G4
Automatic passenger counter system manufacturer	n/a
Automatic passenger counter system model number	
Destination sign manufacturer	Luminator / Twin Vision
Destination sign model number	Smart Series 3 (Amber signs)
AVL/AVM system manufacturer	n/a
AVL/AVM system model number	
Passenger information system manufacturer	n/a
Passenger information system model number	

Coach Body Fittings

Passenger windows manufacturer	Arow Global

Exterior/interior mirrors

Size	8x15
Manufacturer	Safe Fleet
Model number	G4
Manufacturer part numbers	M20B12CB / M20B13CE

Bicycle racks

Manufacturer	n/a
Model number	

Paint system

Manufacturer	Axalta
Type	Imron Elite Low VOC 2.8

ATTACHMENT A – VEHICLE AND CONTRACTOR INFORMATION QUESTIONNAIRE

RETURN WITH YOUR BID

Contractor will attach to this form:

1. A listing of staff that will be assigned to the contract (sales, customer service, technical assistance), along with information demonstrating their experience and capabilities.
2. The address of the manufacturing facilities where the buses will be constructed
3. The technical sheets below for each size / model bus proposed.

Bus Manufacturer: GILLIG LLC

Bus Model Number: G30D102H4

Basic Body Construction Type: 40' Low Floor Diesel Electric Hybrid

General Dimensions

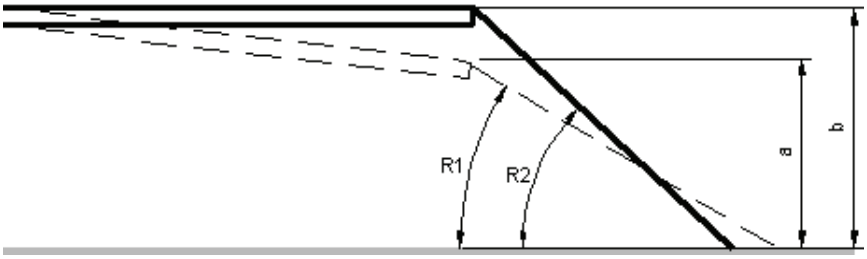
Overall length	Over bumpers	40	feet	11.4	inches
	Over body	40	feet	1.1	inches
Overall width	Over body excluding mirrors and lights		feet	102	inches
	Over body including mirrors		feet	120	inches
	Over tires		feet	102	inches
Overall height (maximum)			feet	133.3	inches

Angle of approach	8.6	degrees
Angle of departure	8.8	degrees
Breakover angle 1	10.7	degrees
Breakover angle 2	n/a	degrees

Doorway clear opening (at widest point) 40 inches

	Width with grab handles		**Width** without grab handles		**Height**	
Front door	32.4	inches	36.4	inches	75	inches
Center door (1)	n/a	inches	n/a	inches	n/a	inches
Center door (2)	n/a	inches	n/a	inches	n/a	inches
Rear door	24.8	inches	25	inches	77.6	inches

Front axle floor height above ground (centerline of bus)	16	inches
Center axle floor height above ground (centerline of bus)	n/a	inches
Rear axle floor height above ground (centerline of bus)	35.4	inches
Step height from ground (measured at center of doorway)	16	inches



	Front doorway		Center doorway		Ramp angle		Rear doorway	
Kneeled	11.9	inches (a)	n/a	inches (a)	9.3	degrees (R1)	14.4	inches (a)
Unkneeled	15.3	inches (b)	n/a	inches (b)	13.6	degrees (R2)	15.7	inches (b)

Interior head room (floor to ceiling at center of aisle)

First axle location	95.4	inches
Center of articulation	n/a	inches
Rear axle location	76.5	inches
Rear settee (in front of seat)	76.5	inches

Aisle width

Minimum width on floor between first axle wheel housings	36.1	inches
Minimum width on floor between center axle (1) wheel housings	n/a	inches
Minimum width on floor between center axle (2) wheel housings	n/a	inches
Minimum width on floor between rear axle wheel housings	32	inches

Minimum ground clearance

Outside axles zones	13.06	inches
Inside axles zones	8.04	inches

Horizontal turning envelope (see diagram below)

Outside body turning radius, TR0 (including bumper)	44	feet	2	inches
Inside Body Turning Radius innermost point, TR4 (including bumper)	23	feet	8	inches

Wheel base

First axle to center/rear axle	297	inches
Center axle to rear axle	n/a	inches

Overhang, centerline of axle over bumper

Front	90.2	inches
Rear	121.2	inches

Floor

Maximum interior floor slope (from horizontal)	4	degrees

Capacity

Total number of passenger sittings	38	
Passenger seating manufacturer/model number	American Seating / Insight Classic	
Total number of standing passengers (1 per 1.5 sq. ft.)	40	
Minimum hip to knee space	27	inches
Maximum hip to knee space	29	inches
Restraint system type and model number	A.R.M. with Q'Straint Belts	

Bus weight

	Curb weight		Curb weight plus seated load*		GVWR	
First axle	11289	lbs	13369	lbs	16000	lbs
Center axle	n/a	lbs	n/a	lbs	n/a	lbs
Rear axle	20461	lbs	24231	lbs	29000	lbs
Total	31750	lbs	37600	lbs	45000	lbs

* Including operator and passengers at 150 lbs per person

Steering Axles

Manufacturer	Meritor
Type and weight rating	Deep Drop / 14,600
Model number	FH946

Drive axle (□ Center ☑ Rear)

Manufacturer	Meritor
Type and weight rating	Single Reduction
Model number	79163

Drive axle ratio

Differential ratio	5.38:1
Hub reduction ratio (if used)	n/a
Final axle ratio (if hub reduction is used)	5.38:1

Brake system

Make/type of fundamental system	Meritor / EX225 Disc
First axle brake chamber model	MGM Type 24
Center axle brake chamber model	n/a
Rear axle brake chamber model	MGM MJB 2430ET

First axle slack adjuster

Manufacturer	n/a
Model number	n/a

Center axle slack adjuster

Manufacturer	n/a
Model number	n/a

Rear axle slack adjuster

Manufacturer	n/a
Model number	n/a

First axle brake drum/rotor

Manufacturer	Meritor

Center axle brake drum/rotor

Manufacturer	n/a

Rear axle brake drum/rotor

Manufacturer	Meritor

Air compressor

Manufacturer	Cummins (Wabco)	
Type	Reciprocating Piston-Twin Cylinder	
Model number	Wabco 30.4	
Rated capacity	30.4	cfm

Capacity at idle	6.5	cfm
Maximum warranted speed	3000	rpm
Idle speed	700	rpm
Drive type	Gear Driven	
Governor cut-in pressure	110	psi
Governor cut-out pressure	130	psi

Air Reservoir Capacity

Manufacturer				
Supply reservoir number and size		/	1000	cubic inches total
Primary reservoir number and size		/	1516	cubic inches total
Secondary reservoir number and size		/	2095	cubic inches total
Parking reservoir number and size		/	n/a	cubic inches total
Accessory reservoir number and size		/	1090	cubic inches total
Other reservoir number and size		/	n/a	cubic inches total

Cooling System

	Radiator	Charge air cooler
Manufacturer	Modine	Modine
Type	Side by Side	Side by Side
Model number	EPR0239690002	EPS0239700002
Number of tubes	276	22
Fins per inch	.076 x .625	.313x3.0
Fin thickness (inches)	10	12
Fin construction	.003	.006

Total cooling system capacity (gallons)	23	gallons
Radiator fan manufacturer	Modine	
Fan speed/control type (mech/elect/hyb)	Modulated /	
Surge tank capacity	2.7	gallons
Surge tank material		
Overheat alarm temperature	215	degrees F
Shutdown temperature settings	235	degrees F

Electrical

Primary interior lighting system

Manufacturer	I/O Controls
Type	LED
Model number	I/O Controls LED

Alternator

Manufacturer	Vanner	
Type	DCDC Convertor	
Model number	HBA (Hybrid Beltless Alternator)	
Output at idle	400	amps

Voltage regulator

Manufacturer	n/a
Model number	

Voltage equalizer

Manufacturer	Vanner
Model number	85 Series (60 amp)

Auxiliary inverter (120/240)

Manufacturer	n/a
Model number	
Inverter technology	
Output voltage(s)	

Starter motor

Manufacturer	Allison
Voltage	Part of Main Hybrid HV system
Model number	n/a

Batteries/energy storage – low voltage

Manufacturer	Deka
Type	Group 31
Model number	DP31CS
Cold cranking amps	700

Batteries/energy storage – high voltage

Manufacturer	Allison
Type	Rechargeable Energy Storage System
Model number	ESS3
Energy density	Lithium Titanate
Specific power	Lithium Titanate
Operating temperature range	Thermal Management System
Cooling/heating system	ThermoKing

Engine

Manufacturer	Cummins
Model number/version	B6.7
Horsepower/torque rating	280HP 660 lb/ft

Fire Suppression/Methane Detection System

Manufacturer	Amerex			
Model number	V25			
Number of detectors	3	fire		methane
Type of detector	☑ Thermal □ Optical			
Battery backup	☑ Yes □ No			

Bumpers

Manufacturer	Romeo
Type	Energy Absorbing

Fuel and Exhaust System

Fuel type	Diesel/electric
Operating range and route profile	Varies 400-500 Miles

Fuel tanks (liquid fuels)

Manufacturer	Hogan MFG			
Capacity (total and usable)	127	Gallons /	120	Gallons
Construction material	3CR12 Stainless Steel			
Quantity and location of tanks	1 located under bus fwd of rear axle			

Fuel tanks (gaseous fuels)

Manufacturer	n/a			
Capacity (total and usable)		SCF /		SCF
Construction material				

Quantity and location of tanks	

Exhaust system

Diesel particulate filter manufacturer	Cummins
Describe DPF electronic interface	Cummins interface
Muffler manufacturer (if applicable)	n/a

Air Suspension	Front	Rear
Air spring manufacturer	Hendrickson	Hendrickson
Air spring quantity per axle		
Shock absorber manufacturer	Koni	Koni
Shock absorber quantity per axle	2	4

Steering

Pump manufacturer	Parker	
Pump model number	PGP330	
Steering gear manufacturer	TRW	
Steering gear model number	TAS6505	
Steering gear type	Power Integral	
Steering wheel diameter	20	inches
Maximum effort at steering wheel*	10 Pounds	

* Unloaded stationary coach on dry asphalt pavement

Hybrid

Manufacturer	Allison
Type	Diesel Electric Hybrid
Model number	eGen Flex 40Max
Type ventilation / cooling	Thermo King

Transmission

Manufacturer	n/a
Type	
Model number	
Number of forward speeds	
Traction motor horsepower rating	
Type ventilation/cooling	

Propshaft

Manufacturer	n/a

Wheels

Manufacturer	Alcoa
Type	Polished Aluminum
Size	22.5" x 8.25"
Mounting type	Hub Piloted
Bolt circle diameter	335mm
Protective coating	n/a

Tires

Manufacturer	Goodyear
Type	Intercity Cruiser
Size	B315/80R22.5
Load range/air pressure	J / 120 psi

Door System

Door panels	**Manufacturer**	**Type**
Front door	Vapor	Slide Glide
Center door (1)	n/a	
Center door (2)	n/a	
Rear door	Vapor	Swing Out

Heating and Ventilating Equipment

Heating system capacity	94000	Btu
Air conditioning system capacity	101,000	Btu
Ventilating capacity	2250	CFM ~~per passenger~~ dependent on # of passengers
Manufacturer and model	Mobile Climate Control	
Refrigerant type	R134A	

Driving heater

Manufacturer	Mobile Climate Controls
Type	Brushless
Model number	62,000 BTU
Capacity	62,000 BTU

Auxiliary heater

Manufacturer	N/A
Type	
Model number	
Capacity	

Floor heaters

Manufacturer	N/A
Type/number	
Model number	
Capacity	

Passenger Loading System

Manufacturer	Lift-U
Type (hydraulic, electric or both)	Electric
Model number	LU18
Capacity (lbs.)	950 lbs

Dimensions

Width of ramp	30	inches
Length of ramp	48	inches

Cycle times	**Normal idle**		**Fast idle**	
Stowed to ground	6	seconds	n/a	seconds
Ground to stow	6	seconds	n/a	seconds

Electronics

Video system manufacturer	Angel Trax
Video system model number	Vulcan V1202HC
Number of cameras	7
Multiplex system manufacturer	I/O Controls
Multiplex system model number	G4
Automatic passenger counter system manufacturer	n/a
Automatic passenger counter system model number	
Destination sign manufacturer	Luminator / Twin Vision
Destination sign model number	Smart Series 3 (Amber signs)
AVL/AVM system manufacturer	n/a
AVL/AVM system model number	
Passenger information system manufacturer	n/a
Passenger information system model number	

Coach Body Fittings

Passenger windows manufacturer	Arow Global

Exterior/interior mirrors

Size	8x15
Manufacturer	Safe Fleet
Model number	G4
Manufacturer part numbers	M20B12CB / M20B13CE

Bicycle racks

Manufacturer	n/a
Model number	

Paint system

Manufacturer	Axalta
Type	Imron Elite Low VOC 2.8

ATTACHMENT A – VEHICLE AND CONTRACTOR INFORMATION QUESTIONNAIRE

RETURN WITH YOUR BID

Contractor will attach to this form:

1. A listing of staff that will be assigned to the contract (sales, customer service, technical assistance), along with information demonstrating their experience and capabilities.
2. The address of the manufacturing facilities where the buses will be constructed
3. The technical sheets below for each size / model bus proposed.

Bus Manufacturer: GILLIG LLC

Bus Model Number: G27B102H4

Basic Body Construction Type: 35' Low Floor Diesel

General Dimensions

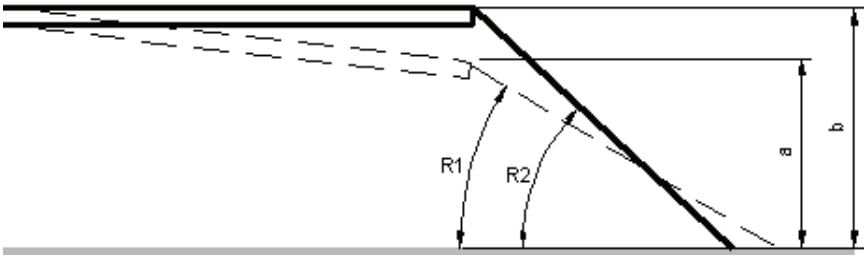
Overall length	Over bumpers	36	feet	10	inches
	Over body	36	feet	0.1	inches
Overall width	Over body excluding mirrors and lights		feet	102	inches
	Over body including mirrors		feet	120	inches
	Over tires		feet	102	inches
Overall height (maximum)			feet	122.8	inches

Angle of approach	8.5	degrees
Angle of departure	8.9	degrees
Breakover angle 1	12.8	degrees
Breakover angle 2	n/a	degrees

Doorway clear opening (at widest point) 40 inches

	Width with grab handles		**Width** without grab handles		**Height**	
Front door	32.4	inches	36.4	inches	75	inches
Center door (1)	n/a	inches	n/a	inches	n/a	inches
Center door (2)	n/a	inches	n/a	inches	n/a	inches
Rear door	24.8	inches	25	inches	77.6	inches

Front axle floor height above ground (centerline of bus)	16	inches
Center axle floor height above ground (centerline of bus)	n/a	inches
Rear axle floor height above ground (centerline of bus)	35.4	inches
Step height from ground (measured at center of doorway)	16	inches



	Front doorway		Center doorway		Ramp angle		Rear doorway	
Kneeled	11.9	inches (a)	n/a	inches (a)	9.3	degrees (R1)	14.4	inches (a)
Unkneeled	15.3	inches (b)	n/a	inches (b)	13.6	degrees (R2)	15.7	inches (b)

Interior head room (floor to ceiling at center of aisle)

First axle location	95.4	inches
Center of articulation	n/a	inches
Rear axle location	76.5	inches
Rear settee (in front of seat)	76.5	inches

Aisle width

Minimum width on floor between first axle wheel housings	36.1	inches
Minimum width on floor between center axle (1) wheel housings	n/a	inches
Minimum width on floor between center axle (2) wheel housings	n/a	inches
Minimum width on floor between rear axle wheel housings	32	inches

Minimum ground clearance

Outside axles zones	13.06	inches
Inside axles zones	8.04	inches

Horizontal turning envelope (see diagram below)

Outside body turning radius, TR0 (including bumper)	37	feet	4	inches
Inside Body Turning Radius innermost point, TR4 (including bumper)	18	feet	2	inches

Wheel base

First axle to center/rear axle	230	inches
Center axle to rear axle	n/a	inches

Overhang, centerline of axle over bumper

Front	90.2	inches
Rear	121.2	inches

Floor

Maximum interior floor slope (from horizontal)	4	degrees

Capacity

Total number of passenger sittings	31	
Passenger seating manufacturer/model number	American Seating / Insight Classic	
Total number of standing passengers (1 per 1.5 sq. ft.)	32	
Minimum hip to knee space	27	inches
Maximum hip to knee space	29	inches
Restraint system type and model number	A.R.M. with Q'Straint Belts	

Bus weight

	Curb weight		Curb weight plus seated load*		GVWR	
First axle	9427	lbs	11112	lbs	14600	lbs
Center axle	n/a	lbs	n/a	lbs	n/a	lbs
Rear axle	17433	lbs	20548	lbs	27000	lbs
Total	26860	lbs	31660	lbs	41600	lbs

* Including operator and passengers at 150 lbs per person

Steering Axles

Manufacturer	Meritor
Type and weight rating	Deep Drop / 14,600
Model number	FH946

Drive axle (□ Center ☑ Rear)

Manufacturer	Meritor
Type and weight rating	Single Reduction
Model number	79163

Drive axle ratio

Differential ratio	5.38:1
Hub reduction ratio (if used)	n/a
Final axle ratio (if hub reduction is used)	5.38:1

Brake system

Make/type of fundamental system	Meritor / EX225 Disc
First axle brake chamber model	MGM Type 24
Center axle brake chamber model	n/a
Rear axle brake chamber model	MGM MJB 2430ET

First axle slack adjuster

Manufacturer	n/a
Model number	n/a

Center axle slack adjuster

Manufacturer	n/a
Model number	n/a

Rear axle slack adjuster

Manufacturer	n/a
Model number	n/a

First axle brake drum/rotor

Manufacturer	Meritor

Center axle brake drum/rotor

Manufacturer	n/a

Rear axle brake drum/rotor

Manufacturer	Meritor

Air compressor

Manufacturer	Cummins (Wabco)	
Type	Reciprocating Piston-Twin Cylinder	
Model number	Wabco 30.4	
Rated capacity	30.4	cfm

Capacity at idle	6.5	cfm
Maximum warranted speed	3000	rpm
Idle speed	700	rpm
Drive type	Gear Driven	
Governor cut-in pressure	110	psi
Governor cut-out pressure	130	psi

Air Reservoir Capacity

Manufacturer				
Supply reservoir number and size		/	1000	cubic inches total
Primary reservoir number and size		/	1516	cubic inches total
Secondary reservoir number and size		/	2095	cubic inches total
Parking reservoir number and size		/	n/a	cubic inches total
Accessory reservoir number and size		/	1090	cubic inches total
Other reservoir number and size		/	n/a	cubic inches total

Cooling System

	Radiator	Charge air cooler
Manufacturer	Modine	Modine
Type	Side by Side	Side by Side
Model number	EPR0239690002	EPS0239700002
Number of tubes	276	22
Fins per inch	.076 x .625	.313x3.0
Fin thickness (inches)	10	12
Fin construction	.003	.006

Total cooling system capacity (gallons)	23	gallons
Radiator fan manufacturer	Modine	
Fan speed/control type (mech/elect/hyb)	Modulated /	
Surge tank capacity	2.7	gallons
Surge tank material		
Overheat alarm temperature	215	degrees F
Shutdown temperature settings	235	degrees F

Electrical

Primary interior lighting system

Manufacturer	I/O Controls
Type	LED
Model number	I/O Controls LED

Alternator

Manufacturer	Niehoff	
Type	A2-336	
Model number	V803	
Output at idle	325	amps

Voltage regulator

Manufacturer	Delco Remy
Model number	HD Electric 24 Volt

Voltage equalizer

Manufacturer	Vanner
Model number	60 Series (60 Amp)

Auxiliary inverter (120/240)

Manufacturer	n/a
Model number	
Inverter technology	
Output voltage(s)	

Starter motor

Manufacturer	Delco Remy
Voltage	HD Electric 24 Volt
Model number	42 MT Type 400

Batteries/energy storage – low voltage

Manufacturer	Deka
Type	8D
Model number	908DFT716
Cold cranking amps	1425

Batteries/energy storage – high voltage

Manufacturer	n/a
Type	
Model number	
Energy density	
Specific power	
Operating temperature range	
Cooling/heating system	

Engine

Manufacturer	Cummins
Model number/version	L9
Horsepower/torque rating	280HP 900 lb/ft

Fire Suppression/Methane Detection System

Manufacturer	Amerex			
Model number	V25			
Number of detectors	3	fire		methane
Type of detector	☑ Thermal □ Optical			
Battery backup	☑ Yes □ No			

Bumpers

Manufacturer	Romeo
Type	Energy Absorbing

Fuel and Exhaust System

Fuel type	Diesel
Operating range and route profile	Varies 400-500 Miles

Fuel tanks (liquid fuels)

Manufacturer	Hogan MFG			
Capacity (total and usable)	127	Gallons /	120	Gallons
Construction material	3CR12 Stainless Steel			
Quantity and location of tanks	1 located under bus fwd of rear axle			

Fuel tanks (gaseous fuels)

Manufacturer	n/a			
Capacity (total and usable)		SCF /		SCF
Construction material				

Quantity and location of tanks	

Exhaust system

Diesel particulate filter manufacturer	Cummins
Describe DPF electronic interface	Cummins interface
Muffler manufacturer (if applicable)	n/a

Air Suspension	Front	Rear
Air spring manufacturer	Hendrickson	Hendrickson
Air spring quantity per axle		
Shock absorber manufacturer	Koni	Koni
Shock absorber quantity per axle	2	4

Steering

Pump manufacturer	Parker	
Pump model number	PGP330	
Steering gear manufacturer	TRW	
Steering gear model number	TAS6505	
Steering gear type	Power Integral	
Steering wheel diameter	20	inches
Maximum effort at steering wheel*	10 Pounds	

* Unloaded stationary coach on dry asphalt pavement

Hybrid

Manufacturer	n/a
Type	
Model number	
Type ventilation / cooling	

Transmission

Manufacturer	Allison
Type	Automatic
Model number	B400R-6
Number of forward speeds	6
Traction motor horsepower rating	280
Type ventilation/cooling	Electric Fan System

Propshaft

Manufacturer	n/a

Wheels

Manufacturer	Accuride
Type	Powder Coated Steel
Size	22.5" x 8.25"
Mounting type	Hub Pilotes
Bolt circle diameter	335mm
Protective coating	Powder Coating #28440-PK

Tires

Manufacturer	Goodyear
Type	Intercity Cruiser
Size	B315/80R22.5
Load range/air pressure	J / 120 psi

Door System

Door panels	**Manufacturer**	**Type**
Front door	Vapor	Slide Glide
Center door (1)	n/a	
Center door (2)	n/a	
Rear door	Vapor	Swing Out

Heating and Ventilating Equipment

Heating system capacity	94000	Btu
Air conditioning system capacity	101,000	Btu
Ventilating capacity	2250	CFM ~~per passenger~~ dependent on # of passengers
Manufacturer and model	Mobile Climate Control	
Refrigerant type	R134A	

Driving heater

Manufacturer	Mobile Climate Controls
Type	Brushless
Model number	62,000 BTU
Capacity	62,000 BTU

Auxiliary heater

Manufacturer	N/A
Type	
Model number	
Capacity	

Floor heaters

Manufacturer	N/A
Type/number	
Model number	
Capacity	

Passenger Loading System

Manufacturer	Lift-U
Type (hydraulic, electric or both)	Electric
Model number	LU18
Capacity (lbs.)	950 lbs

Dimensions

Width of ramp	30	inches
Length of ramp	48	inches

Cycle times	**Normal idle**		**Fast idle**	
Stowed to ground	6	seconds	n/a	seconds
Ground to stow	6	seconds	n/a	seconds

Electronics

Video system manufacturer	Angel Trax
Video system model number	Vulcan V1202HC
Number of cameras	10
Multiplex system manufacturer	I/O Controls
Multiplex system model number	G4
Automatic passenger counter system manufacturer	n/a
Automatic passenger counter system model number	
Destination sign manufacturer	Luminator / Twin Vision
Destination sign model number	Smart Series 3 (Amber signs)
AVL/AVM system manufacturer	n/a
AVL/AVM system model number	
Passenger information system manufacturer	n/a
Passenger information system model number	

Coach Body Fittings

Passenger windows manufacturer	Arow Global

Exterior/interior mirrors

Size	8x15
Manufacturer	Safe Fleet
Model number	G4
Manufacturer part numbers	M20B12CB / M20B13CE

Bicycle racks

Manufacturer	n/a
Model number	

Paint system

Manufacturer	Axalta
Type	Imron Elite Low VOC 2.8

ATTACHMENT A – VEHICLE AND CONTRACTOR INFORMATION QUESTIONNAIRE

RETURN WITH YOUR BID

Contractor will attach to this form:

1. A listing of staff that will be assigned to the contract (sales, customer service, technical assistance), along with information demonstrating their experience and capabilities.
2. The address of the manufacturing facilities where the buses will be constructed
3. The technical sheets below for each size / model bus proposed.

Bus Manufacturer: GILLIG LLC

Bus Model Number: G30B102H4

Basic Body Construction Type: 35' Low Floor Diesel Electric Hybrid

General Dimensions

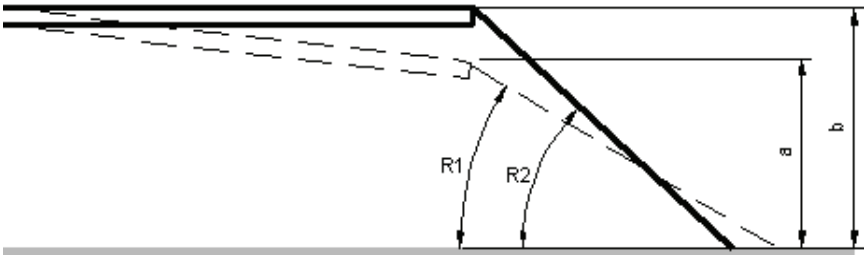
Overall length	Over bumpers	36	feet	10	inches
	Over body	36	feet	0.1	inches
Overall width	Over body excluding mirrors and lights		feet	102	inches
	Over body including mirrors		feet	120	inches
	Over tires		feet	102	inches
Overall height (maximum)			feet	133.3	inches

Angle of approach	8.5	degrees
Angle of departure	8.9	degrees
Breakover angle 1	12.8	degrees
Breakover angle 2	n/a	degrees

Doorway clear opening (at widest point) 40 inches

	Width with grab handles		**Width** without grab handles		**Height**	
Front door	32.4	inches	36.4	inches	75	inches
Center door (1)	n/a	inches	n/a	inches	n/a	inches
Center door (2)	n/a	inches	n/a	inches	n/a	inches
Rear door	24.8	inches	25	inches	77.6	inches

Front axle floor height above ground (centerline of bus)	16	inches
Center axle floor height above ground (centerline of bus)	n/a	inches
Rear axle floor height above ground (centerline of bus)	35.4	inches
Step height from ground (measured at center of doorway)	16	inches



	Front doorway		Center doorway		Ramp angle		Rear doorway	
Kneeled	11.9	inches (a)	n/a	inches (a)	9.3	degrees (R1)	14.4	inches (a)
Unkneeled	15.3	inches (b)	n/a	inches (b)	13.6	degrees (R2)	15.7	inches (b)

Interior head room (floor to ceiling at center of aisle)

First axle location	95.4	inches
Center of articulation	n/a	inches
Rear axle location	76.5	inches
Rear settee (in front of seat)	76.5	inches

Aisle width

Minimum width on floor between first axle wheel housings	36.1	inches
Minimum width on floor between center axle (1) wheel housings	n/a	inches
Minimum width on floor between center axle (2) wheel housings	n/a	inches
Minimum width on floor between rear axle wheel housings	32	inches

Minimum ground clearance

Outside axles zones	13.06	inches
Inside axles zones	8.04	inches

Horizontal turning envelope (see diagram below)

Outside body turning radius, TR0 (including bumper)	37	feet	4	inches
Inside Body Turning Radius innermost point, TR4 (including bumper)	18	feet	2	inches

Wheel base

First axle to center/rear axle	230	inches
Center axle to rear axle	n/a	inches

Overhang, centerline of axle over bumper

Front	90.2	inches
Rear	121.2	inches

Floor

Maximum interior floor slope (from horizontal)	4	degrees

Capacity

Total number of passenger sittings	31	
Passenger seating manufacturer/model number	American Seating / Insight Classic	
Total number of standing passengers (1 per 1.5 sq. ft.)	32	
Minimum hip to knee space	27	inches
Maximum hip to knee space	29	inches
Restraint system type and model number	A.R.M. with Q'Straint Belts	

Bus weight

	Curb weight		Curb weight plus seated load*		GVWR	
First axle	10383	lbs	12089	lbs	16000	lbs
Center axle	n/a	lbs	n/a	lbs	n/a	lbs
Rear axle	18817	lbs	21911	lbs	29000	lbs
Total	29200	lbs	34000	lbs	45000	lbs

* Including operator and passengers at 150 lbs per person

Steering Axles

Manufacturer	Meritor
Type and weight rating	Deep Drop / 14,600
Model number	FH946

Drive axle (□ Center ☑ Rear)

Manufacturer	Meritor
Type and weight rating	Single Reduction
Model number	79163

Drive axle ratio

Differential ratio	5.38:1
Hub reduction ratio (if used)	n/a
Final axle ratio (if hub reduction is used)	5.38:1

Brake system

Make/type of fundamental system	Meritor / EX225 Disc
First axle brake chamber model	MGM Type 24
Center axle brake chamber model	n/a
Rear axle brake chamber model	MGM MJB 2430ET

First axle slack adjuster

Manufacturer	n/a
Model number	n/a

Center axle slack adjuster

Manufacturer	n/a
Model number	n/a

Rear axle slack adjuster

Manufacturer	n/a
Model number	n/a

First axle brake drum/rotor

Manufacturer	Meritor

Center axle brake drum/rotor

Manufacturer	n/a

Rear axle brake drum/rotor

Manufacturer	Meritor

Air compressor

Manufacturer	Cummins (Wabco)	
Type	Reciprocating Piston-Twin Cylinder	
Model number	Wabco 30.4	
Rated capacity	30.4	cfm

Capacity at idle	6.5	cfm
Maximum warranted speed	3000	rpm
Idle speed	700	rpm
Drive type	Gear Driven	
Governor cut-in pressure	110	psi
Governor cut-out pressure	130	psi

Air Reservoir Capacity

Manufacturer				
Supply reservoir number and size		/	1000	cubic inches total
Primary reservoir number and size		/	1516	cubic inches total
Secondary reservoir number and size		/	2095	cubic inches total
Parking reservoir number and size		/	n/a	cubic inches total
Accessory reservoir number and size		/	1090	cubic inches total
Other reservoir number and size		/	n/a	cubic inches total

Cooling System

	Radiator	Charge air cooler
Manufacturer	Modine	Modine
Type	Side by Side	Side by Side
Model number	EPR0239690002	EPS0239700002
Number of tubes	276	22
Fins per inch	.076 x .625	.313x3.0
Fin thickness (inches)	10	12
Fin construction	.003	.006

Total cooling system capacity (gallons)	23	gallons
Radiator fan manufacturer	Modine	
Fan speed/control type (mech/elect/hyb)	Modulated /	
Surge tank capacity	2.7	gallons
Surge tank material		
Overheat alarm temperature	215	degrees F
Shutdown temperature settings	235	degrees F

Electrical

Primary interior lighting system

Manufacturer	I/O Controls
Type	LED
Model number	I/O Controls LED

Alternator

Manufacturer	Vanner	
Type	DCDC Convertor	
Model number	HBA (Hybrid Beltless Alternator)	
Output at idle	400	amps

Voltage regulator

Manufacturer	n/a
Model number	

Voltage equalizer

Manufacturer	Vanner
Model number	85 Series (60 amp)

Auxiliary inverter (120/240)

Manufacturer	n/a
Model number	
Inverter technology	
Output voltage(s)	

Starter motor

Manufacturer	Allison
Voltage	Part of Main Hybrid HV system
Model number	n/a

Batteries/energy storage – low voltage

Manufacturer	Deka
Type	Group 31
Model number	DP31CS
Cold cranking amps	700

Batteries/energy storage – high voltage

Manufacturer	Allison
Type	Rechargeable Energy Storage System
Model number	ESS3
Energy density	Lithium Titanate
Specific power	Lithium Titanate
Operating temperature range	Thermal Management System
Cooling/heating system	ThermoKing

Engine

Manufacturer	Cummins
Model number/version	B6.7
Horsepower/torque rating	280HP 660 lb/ft

Fire Suppression/Methane Detection System

Manufacturer	Amerex			
Model number	V25			
Number of detectors	3	fire		methane
Type of detector	☑ Thermal □ Optical			
Battery backup	☑ Yes □ No			

Bumpers

Manufacturer	Romeo
Type	Energy Absorbing

Fuel and Exhaust System

Fuel type	Diesel/electric
Operating range and route profile	Varies 400-500 Miles

Fuel tanks (liquid fuels)

Manufacturer	Hogan MFG			
Capacity (total and usable)	127	Gallons /	120	Gallons
Construction material	3CR12 Stainless Steel			
Quantity and location of tanks	1 located under bus fwd of rear axle			

Fuel tanks (gaseous fuels)

Manufacturer	n/a			
Capacity (total and usable)		SCF /		SCF
Construction material				

Quantity and location of tanks	

Exhaust system

Diesel particulate filter manufacturer	Cummins
Describe DPF electronic interface	Cummins interface
Muffler manufacturer (if applicable)	n/a

Air Suspension	Front	Rear
Air spring manufacturer	Hendrickson	Hendrickson
Air spring quantity per axle		
Shock absorber manufacturer	Koni	Koni
Shock absorber quantity per axle	2	4

Steering

Pump manufacturer	Parker	
Pump model number	PGP330	
Steering gear manufacturer	TRW	
Steering gear model number	TAS6505	
Steering gear type	Power Integral	
Steering wheel diameter	20	inches
Maximum effort at steering wheel*	10 Pounds	

* Unloaded stationary coach on dry asphalt pavement

Hybrid

Manufacturer	Allison
Type	Diesel Electric Hybrid
Model number	eGen Flex 40Max
Type ventilation / cooling	Thermo King

Transmission

Manufacturer	n/a
Type	
Model number	
Number of forward speeds	
Traction motor horsepower rating	
Type ventilation/cooling	

Propshaft

Manufacturer	n/a

Wheels

Manufacturer	Alcoa
Type	Polished Aluminum
Size	22.5" x 8.25"
Mounting type	Hub Piloted
Bolt circle diameter	335mm
Protective coating	n/a

Tires

Manufacturer	Goodyear
Type	Intercity Cruiser
Size	B315/80R22.5
Load range/air pressure	J / 120 psi

Door System

Door panels	**Manufacturer**	**Type**
Front door	Vapor	Slide Glide
Center door (1)	n/a	
Center door (2)	n/a	
Rear door	Vapor	Swing Out

Heating and Ventilating Equipment

Heating system capacity	94000	Btu
Air conditioning system capacity	101,000	Btu
Ventilating capacity	2250	CFM ~~per passenger~~ dependent on # of passengers
Manufacturer and model	Mobile Climate Control	
Refrigerant type	R134A	

Driving heater

Manufacturer	Mobile Climate Controls
Type	Brushless
Model number	62,000 BTU
Capacity	62,000 BTU

Auxiliary heater

Manufacturer	N/A
Type	
Model number	
Capacity	

Floor heaters

Manufacturer	N/A
Type/number	
Model number	
Capacity	

Passenger Loading System

Manufacturer	Lift-U
Type (hydraulic, electric or both)	Electric
Model number	LU18
Capacity (lbs.)	950 lbs

Dimensions

Width of ramp	30	inches
Length of ramp	48	inches

Cycle times	**Normal idle**		**Fast idle**	
Stowed to ground	6	seconds	n/a	seconds
Ground to stow	6	seconds	n/a	seconds

Electronics

Video system manufacturer	Angel Trax
Video system model number	Vulcan V1202HC
Number of cameras	7
Multiplex system manufacturer	I/O Controls
Multiplex system model number	G4
Automatic passenger counter system manufacturer	n/a
Automatic passenger counter system model number	
Destination sign manufacturer	Luminator / Twin Vision
Destination sign model number	Smart Series 3 (Amber signs)
AVL/AVM system manufacturer	n/a
AVL/AVM system model number	
Passenger information system manufacturer	n/a
Passenger information system model number	

Coach Body Fittings

Passenger windows manufacturer	Arow Global

Exterior/interior mirrors

Size	8x15
Manufacturer	Safe Fleet
Model number	G4
Manufacturer part numbers	M20B12CB / M20B13CE

Bicycle racks

Manufacturer	n/a
Model number	

Paint system

Manufacturer	Axalta
Type	Imron Elite Low VOC 2.8

2021 B6.7™ AND L9™ TRANSIT AND SHUTTLE BUS ENGINES

B6.7™

GOING TO TOWN WITH ADVANCED TECHNOLOGY

With more than 12-million Cummins B6.7 engines produced over nearly 40 years and billions of miles driven, this tried and true innovation is one of the most durable and reliable medium-duty engines available. These figures are milestone achievements that represent years of experience learning and optimizing the product into what we produce today - the most reliable B-Series Cummins has ever built. Cummins proudly powers more buses in operation across North America than any other engine manufacturer.

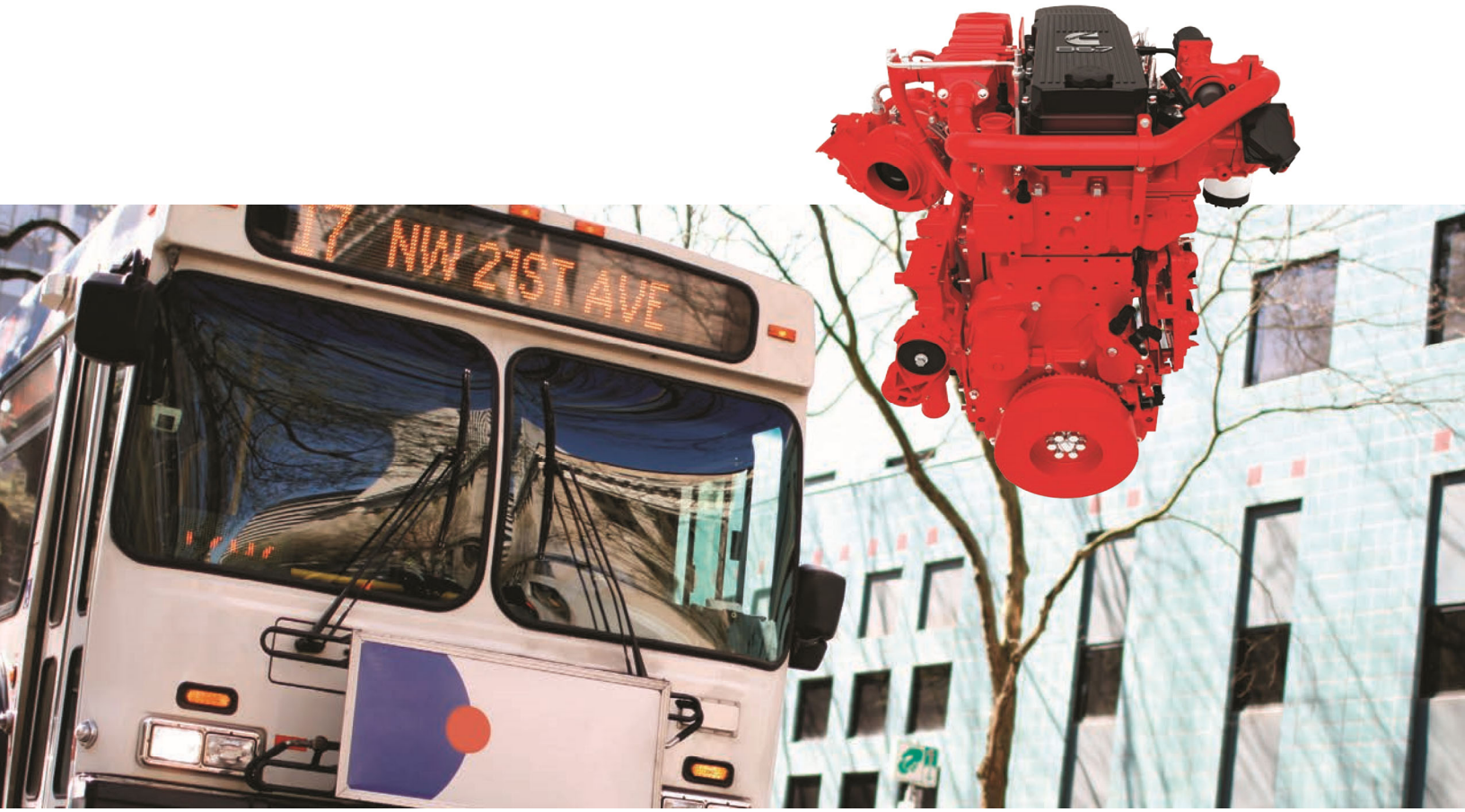
REDUCED OPERATING COSTS

We know total cost of operation (TCO) is important to our customers, which is why we focused on enhancing reliability and durability while also lowering the TCO.

New for EPA 2021, the B6.7 features upgrades that allow for extended engine maintenance intervals, including longer oil drain intervals, more time between fuel filter changes and a completely maintenance-free crankcase ventilation filter. Also new for 2021, the B6.7 offers advancements in connectivity to find, prevent and resolve issues quickly and efficiently.

B6.7 HYBRID

Cummins B6.7 Hybrid is a diesel-electric propulsion system custom designed to work in 40-foot transit buses. It operates at a more consistent engine speed and temperature, providing a perfect match for the Single Module™ aftertreatment. Cummins B6.7 Hybrid has proven to be both sustainable and reliable, with millions of real world miles of operation across North America.



L9™

ON TIME AND ON BUDGET

Cummins L9 diesel delivers outstanding productivity with the best power-to-weight ratio in its class. Heavy-duty features such as a replaceable wet liner, bypass oil filtration and targeted-piston cooling add years of engine life. Furthermore, transit fleet managers can expect a fuel economy improvement of up to 15 percent compared to buses purchased 10 years ago.

INNOVATION BEYOND THE ENGINE

An isolated coolant loop for transit buses improves reliability and reduces downtime. A water-to-water heat exchanger provides heat to the passenger compartments as needed, while providing a self-contained coolant flow to the engine compartment area. This reduces potential coolant leakage and air infiltration so the Exhaust Gas Recirculation (EGR) cooler operates with greater reliability and durability.

L9 HYBRID

Cummins L9 Hybrid is designed for 60-foot transit bus hybrid diesel-electric propulsion systems. Already in use within dozens of cities, transit fleet managers can depend on the L9 Hybrid to deliver the excellent performance and reliability they've come to expect from Cummins.

L9 & B6.7: A SUPPORT STAFF THAT'S ALWAYS ON

No matter what Cummins power solution you choose, you also get world-class support from Cummins. At Cummins, our mission is to provide a whole new level of customer service that delivers faster attention with rapid results. From the moment you engage Cummins Care, you will have access to a Cummins expert with the specialized skill set, experience and in-depth knowledge to take care of your transit bus needs. Visit our new and improved parts ordering site, parts.cummins.com, for all of your Cummins Genuine Parts needs.

Cummins Care is on call 24/7/365 at 1-800-CUMMINS™ (1-800-286-6467) to respond to your needs.

B6.7 2021 MAINTENANCE INTERVALS

Maintenance Event	EPA 2021 B6.7*
Oil and Filter	30K miles/ 1000 hours / 18 months (duty cycle dependent)
Fuel Filter	60K miles 2000 hours / 18 months
Crankcase Ventilation Filter ("Breather")	MAINTENANCE FREE
Valve Lash Adjust	150K miles / 5000 hours
Diesel Particulate Filter**	200K miles / 6500 hours
DEF Filter	200K miles / 6500 hours

*All maintenance intervals should be considered as UP TO whichever numbers occur FIRST in the table.

** Maintenance lamp will illuminate when DPF maintenance is needed. Cummins recommends replacing the DPF with a Genuine Cummins DPF at the time of ash maintenance interval.

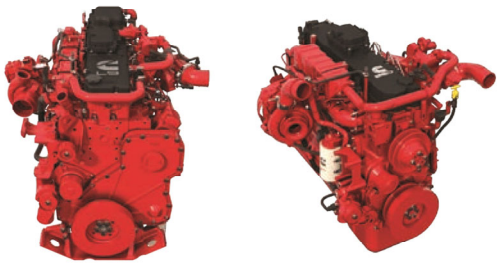
L9 2021 MAINTENANCE INTERVALS

Maintenance Event	EPA 2021 L9*
Oil and Filter	50K miles/ 1500 hours / 18 months (duty cycle dependent)
Fuel Filter	50K miles / 1500 hours / 18 months
Crankcase Ventilation Filter ("Breather")	MAINTENANCE FREE
Valve Lash Adjust	22K miles / 2000 hours
Diesel Particulate Filter**	5000 hours
DEF Filter	60K miles / 6500 hours
Air Intake Connection	150K miles / 4500 hours

*All maintenance intervals should be considered as UP TO whichever numbers occur FIRST in the table.

** Maintenance lamp will illuminate when DPF maintenance is needed. Cummins recommends replacing the DPF with a Genuine Cummins DPF at the time of ash

Choosing the correct rating for your application is important. When choosing between transit versus shuttle ratings, there are multiple factors to consider, such as: total distance and number of stops per trip, average vehicle speed, percent idle time and more. To ensure you are choosing the right rating for your operation, contact your Cummins representative or your local Cummins distributor.



HYBRID TRANSIT BUS RATINGS

Engine Model	Advertised HP (kW)	Peak Torque LB-FT (N•m) @ RPM	Governed Speed
B6.7 280	280 (209)	660 (896) @ 1600	2600
L9 330	330(245)	1100 (1491) @ 1200	1900

B6.7 SHUTTLE BUS RATINGS

Engine Model	Advertised HP (kW)	Peak Torque LB-FT (N•m) @ RPM	Governed Speed
B6.7 200	200 (149)	520 (706) @ 1600	2600
B6.7 220	220 (164)	520 (706) @ 1600	2600
B6.7 220	220 (164)	600 (814) @ 1600	2600
B6.7 240	240 (179)	560 (760) @ 1600	2600
B6.7 250	250 (187)	660 (896) @ 1600	2600
B6.7 260	260 (194)	660 (896) @ 1600	2600
B6.7 280	280 (209)	660 (896) @ 1600	2600
B6.7 300	300 (224)	660 (896) @ 1600	2600

L9 TRANSIT BUS RATINGS

Engine Model	Advertised HP (kW)	Peak Torque LB-FT (N•m) @ RPM	Governed Speed
L9 280	280 (209)	925 (1254) @ 1200	1900
L9 350	350 (261)	1150 (1559) @ 1200	1900

L9 SHUTTLE BUS RATINGS

Engine Model	Advertised HP (kW)	Peak Torque LB-FT (N•m) @ RPM	Governed Speed
L9 260	260 (194)	860 (1165) @ 1200	2200
L9 270	270 (201)	860 (1166) @ 1200	2200
L9 300	300 (224)	860 (1166) @ 1200	2200
L9 330	330 (245)	1000 (1356) @ 1200	2200
L9 350	350 (261)	1050 (1424) @ 1200	2200
L9 360	360 (268)	1150 (1559) @ 1200	2200
L9 370	370 (276)	1250 (1695) @ 1200	2100
L9 380	380 (283)	1250 (1695) @ 1200	2100

Cummins Inc.
Box 3005
Columbus, IN 47202-3005
U.S.A.

1-800-CUMMINS™ (1-800-286-6467)
cummins.com

Bulletin 5676558 Produced in U.S.A. 7/21

January 23rd, 2023

To Whom It May Concern,

Cummins is excited to continue collaborating with transit OEMs to offer a lineup of powertrain offerings to transit agencies. We recognize many of our customers may have questions about our plan to meet changing EPA and CARB requirements, and we look forward to announcing a complete lineup of products designed to meet these emissions standards sometime in early 2023.

Our mission of powering a more prosperous world through our Destination Zero strategy guides everything we do. We are focused on achieving real-world NOx and greenhouse gas reductions and have designed our product plan to serve our customers' needs and meet those goals, as well as regulatory requirements.

In 2026, we will launch an exciting new mid-bore 10-liter diesel powertrain that will meet 2024 CARB Low NOx standards and EPA's upcoming 2027 Low NOx standards. This engine will replace our current L9 Heavy-Duty diesel offering for the transit market. We are confident that focusing our attention on next generation products will provide the most benefit for the environment and our customers, while reducing the total quantity of integrations required of our OEM customers throughout the decade.

It is recommended that you work with your OEM counterparts to understand engines that will be available as we move forward. The table below is intended to provide clarity on what will be offered per 2024 regulatory requirements:

Engine Model	2024	2025	2026	Comments
10-LT Diesel			X	New transit diesel engine to replace L9
L9 Diesel	X	X		L9 Diesel to end production Dec. 31, 2025
L9 Natural Gas	X	X	X	
B6.7 Diesel	X	X	X	
B6.7 Hybrid	X	X	X	
B6.7 Natural Gas	X	X	X	

Sincerely,

Francisco Lagunas

General Manager - North America Bus

Cummins Inc.
500 Jackson St.
Columbus Indiana
812-341-8808
francisco.lagunas@cummins.com

The World's Leading Bus Transmission Series

Around The Corner And Around The Globe

Bus Series™

Allison Transmission®

Allison Bus Series™ Models Are Now Available
With FuelSense® and xFE Technology

FUELSENSE® 2.0
with DynActive™ Shifting

More Fuel Efficient With xFE

We've designed our transmission models with xFE to lock up at lower speeds specifically for the constant shifting and lower average speeds of city and transit buses. This means lock up happens significantly earlier and buses run longer where they are most efficient, improving fuel economy by up to seven percent in xFE-equipped vehicles[1].

This seven percent improvement in fuel economy is in addition to the already greater efficiency created by Allison's FuelSense® technology, a unique package of software and electronic controls that supports an advanced array of features. The combination of these packages provides a substantial fuel economy advantage.

Features

FuelSense® 2.0 presents new and upgraded FuelSense® features to provide even more precise balancing of fuel economy and performance:

DynActive™ Shifting—This new innovative shift scheduling uses an algorithm to choose the most efficient shift point, based on your specifications, vehicle and environmental parameters. Older shifting technologies use shift schedules with fixed shift points.

Neutral at Stop—This feature trims fuel consumption and emissions by reducing or eliminating the load on the engine when the vehicle is stopped. There are two versions of Neutral at Stop:

- **Standard** – Provides partial (first-level) neutral at stop.
- **Premium** – Provides full neutral at stop and a new, low-speed coasting capability.

Both versions lock the output while stopped to prevent rollback.

Acceleration Rate Management—A feature that mitigates aggressive driving by automatically controlling engine torque. Newly updated, in addition to five levels of control, it provides more precision by limiting vehicle acceleration to a customized calibrated rate.

1 Available in FuelSense® 2.0 Max only.

Proven Realiability
And Durability

Allison fully automatic transmissions are built to last and require minimal service—meaning not only lower maintenance costs, but also more time on the road. Our commercial-duty automatic transmissions are designed for durability to handle the frequent starts, stops and high mileage demands that buses place on components.

Making Natural Gas
More Efficient

Allison Automatics are perfectly suited to natural gas engines in the heavy start-stop cycle of city and transit buses. The inherent benefits of Allison's Continuous Power Technology™, featuring full-power shifts and a patented torque converter, realize the best performance and most efficient use of fuel from buses. Natural gas engines are more responsive when joined to an Allison Automatic.

Proven Dependable
And Efficient Hybrid Systems

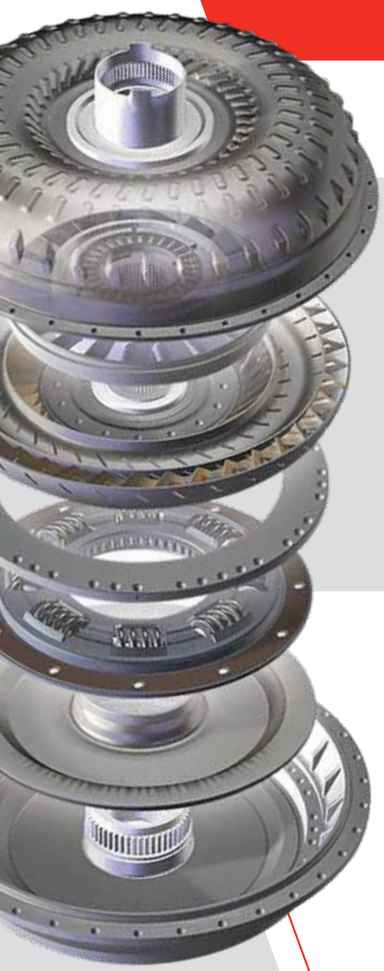
The Allison Hybrid EP system dramatically reduces both diesel fuel consumption and CO2 emissions. An Allison Hybrid System improves fuel consumption up to 25 percent over a typical bus[2]. Additionally, its regenerative braking capability can significantly extend the brake change interval by as much as 350 percent.

2 Results can vary depending on the duty-cycles.

Driven To Exceed

Our commitment to understand and satisfy your needs drives us to constantly analyze, refine and improve our products and their features. Nothing else delivers the durability, productivity and fuel economy of an Allison fully automatic transmission.

When it comes to transit and charter bus applications, Allison Bus Series™ transmissions help keep your vehicles and your business on schedule with maximum efficiency, improved vehicle performance, safer driver operation and better passenger comfort.



The Power Of The Torque Converter

Allison's torque converter smoothly multiplies engine torque, delivering more power to the wheels. By multiplying the engine power, drivers get increased performance, faster acceleration and greater operational flexibility. An Allison Automatic eliminates power interrupts so you can accomplish more, even with a smaller engine.

B 210, B 220, B 295

B 300, B 400, B 3400 xFE

B 500

Increased Safety

Since gear shifting is automatic, drivers are better able to concentrate on the task at hand… getting riders safely to the next stop.

Comprehensive Coverage

All Allison Bus Series™ models offer comprehensive coverage with 100% parts and labor. Coverage may vary by model and application. Contact your local Allison representative for details.

Easy Maintenance

A fully automatic transmission from Allison, a trusted brand around the world, is the best way to keep your fleet on the road while reducing total cost of ownership. With extended periods between scheduled maintenance and a proven track record of reliability, Allison puts you in control of your fleet and your budget.

Prognostics	Calibrated to the vehicle's particular operating requirements, Allison prognostics monitor various operating parameters to determine and alert when service is due. This eliminates unnecessary oil and filter changes and provides maximum transmission protection.
Retarder Benefits	Allison's integral hydraulic retarder complements and enhances vehicle service brake performance. It reduces braking distance, while offering full integration with the Anti-Lock Braking System, Engine Braking Systems and cruise control systems. In stop-and-go driving, the transmission retarder may be automatically activated at various levels, each time the vehicle brakes are in use, extending service brake life.
Secondary Shift Schedule	Allows driver to select between two pre-programmed shift patterns, quickly and easily, to match driving conditions.
Direction Change Enabled	Prohibits shifts from Neutral to Drive or Reverse without first pressing a dash switch or applying the service brakes.
Auxiliary Function Range Inhibit	Will not allow transmission to shift into forward or reverse unless the service brakes are applied.

Ratings And Specifications — Bus Series™

RATINGS

MODEL	SERIAL NUMBER	RATIO	PARK PAWL	MAX INPUT POWER[1] w/o SEM hp (kW)	MAX INPUT POWER w/SEM TORQUE LIMITING[1,2] hp (kW)	MAX INPUT TORQUE[1] w/o SEM lb-ft (N•m)	MAX INPUT TORQUE w/SEM TORQUE LIMITING[1,2] lb-ft (N•m)	MAX TURBINE TORQUE[3] lb-ft (N•m)	MAX GVW lbs (kg)	MAX GCW lbs (kg)
B 210	6310									
– Transit		Close Ratio	No	230 (172)	270 (201)	520 (705)	575 (780)	850 (1152)	29,000 (13,150)	29,000 (13,150)
– xFE		Close Ratio	No	230 (172)	270 (201)	520 (705)	575 (780)	850 (1152)	29,000 (13,150)	29,000 (13,150)
B 220	6310									
– Transit		Close Ratio	Yes	230 (172)	270 (201)	520 (705)	575 (780)	850 (1152)	29,000 (13,150)	29,000 (13,150)
– xFE		Close Ratio	Yes	230 (172)	270 (201)	520 (705)	575 (780)	850 (1152)	29,000 (13,150)	29,000 (13,150)
B 295	6510									
– Transit		Close Ratio	N/A	230 (172)	N/A	620 (841)	N/A	1370 (1857)	33,000 (14,968)	33,000 (14,968)
B 300	6510									
– Transit		Close Ratio	N/A	280 (209)	N/A	735 (997)	N/A	1370 (1857)	38,000 (17,236)	38,000 (17,236)
B 400	6510									
– Transit		Close Ratio	N/A	300 (224)	N/A	925 (1254)	N/A	1370 (1857)	45,000 (20,412)	45,000 (20,412)
– Tour Coach		Close Ratio	N/A	330 (246)	N/A	1000 (1356)	N/A	1600 (2170)	45,000 (20,412)	45,000 (20,412)
B 3400 XFE	6510									
– Transit		Close Ratio	N/A	300 (224)	N/A	925 (1254)	N/A	1370 (1857)	45,000 (20,412)	45,000 (20,412)
B 500	6610									
– Transit		Close Ratio	N/A	420 (313)	N/A	1300 (1763)	N/A	2450 (3322)	—	—
– Intercity Coach		Close Ratio	N/A	550 (410)	N/A	1700 (2305)	N/A	2450 (3322)	—	—

1 Gross ratings as defined by ISO 1585 or SAE J1995. 2 SEM = engine controls with Shift Energy Management. 3 Turbine torque limit based on iSCAAN standard deductions.

TORQUE CONVERTER SPECIFICATIONS

MODEL	TORQUE CONVERTER	NOMINAL STALL TORQUE
B 210/220	TC-210	2.05
	TC-211	1.91
	TC-221	1.73
	TC-222	1.58
B 300/400 B 3400 xFE	TC-411	2.71
	TC-413	2.44
	TC-415	2.35
	TC-417	2.20
	TC-418	1.98
	TC-419	2.02
	TC-421	1.77
B 500	TC-521	2.42
	TC-531	2.34
	TC-541	1.90
	TC-551	1.79
	TC-561	1.58
	TC-571	1.62

STANDARD POWER TAKEOFF – CONTINUOUS OPERATION

MODEL	MOUNTING PAD POSITIONS VIEWED FROM REAR	DRIVE GEAR RATING WITH ONE PTO lb-ft (N•m)	DRIVE GEAR RATING WITH TWO PTOs lb-ft (N•m)	DRIVE
B 210[1]	3 and 9 o'clock	250 (339)	200[2] (271)[2]	Turbine
B 220[1]	3 and 9 o'clock	250 (339)	200[2] (271)[2]	Turbine
B 300[1]	4 and 8 o'clock	485 (660)	685[3] (930)[3]	Engine
B 3400 xFE[1]	4 and 8 o'clock	485 (660)	685[3] (930)[3]	Engine
B 400[1]	4 and 8 o'clock	485 (660)	685[3] (930)[3]	Engine
B 500[1]	1 and 8 o'clock	685 (930)	1175 (1595)	Engine

1 PTO-delete option available. 2 Rating per PTO. 3 Total on the drive gear.

GEAR RATIOS – TORQUE CONVERTER MULTIPLICATION NOT INCLUDED

MODEL	FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH	SEVENTH	REVERSE
B 210	3.10:1	1.81:1	1.41:1	1.00:1	0.71:1	0.61:1	—	-4.49:1
B 220	3.10:1	1.81:1	1.41:1	1.00:1	0.71:1	0.61:1	—	-4.49:1
B 295	3.49:1	1.86:1	1.41:1	1.00:1	0.75:1	—	—	-5.03:1
B 300	3.49:1	1.86:1	1.41:1	1.00:1	0.75:1	0.65:1	—	-5.03:1
B 400	3.49:1	1.86:1	1.41:1	1.00:1	0.75:1	0.65:1	—	-5.03:1
B 3400 xFE	3.49:1	2.03:1	1.47:1	1.00:1	0.69:1	0.59:1	—	-3.80:1
B 500	3.51:1	1.91:1	1.43:1	1.00:1	0.74:1	0.64:1	—	-4.80:1

ENGINE SPEEDS

MODEL	FULL LOAD GOVERNED SPEED Min-Max (rpm)	IDLE SPEED IN DRIVE Min-Max (rpm)	OUTPUT SHAFT SPEED (rpm)
B 210/220	2200-3800	500-820	4500
B 295	2200-5000	500-820	5000
B 300/400	1950-2800	500-800	3600[1]
B 3400 xFE	1950-2800	500-800	3600[1]
B 500	1700-2300	500-800	—

1 Retarder-equipped models only.

OPTIONAL RETARDER PROVISION – INTEGRAL, HYDRAULIC TYPE

MODEL	TORQUE CAPACITY lb-ft (N•m)	POWER CAPACITY hp (Kw)
B 300/400		
– High	1600 (2170)	600 (447)
– Medium	1300 (1763)	500 (373)
– Low	1100 (1490)	400 (298)
– Very Low	811 (1100)	—
– Ultra Low	533 (750)	—
B 3400 xFE		
– High	1600 (2170)	600 (447)
– Medium	1300 (1763)	500 (373)
– Low	1100 (1490)	400 (298)
– Very Low	811 (1100)	—
– Ultra Low	533 (750)	—
B 500		
– High	2000 (2712)	600 (447)
– Medium	1600 (2170)	600 (447)
– Low	1300 (1763)	500 (373)

OIL SYSTEM

MODEL	CAPACITY[1] quarts (liters)	MAIN CIRCUIT FILTER	LUBE CIRCUIT FILTER	ELECTRONIC OIL LEVEL SENSOR (OLS)
B 210/220		Spin-On Canister	—	—
– Standard Oil Sump	13.7[2] (13.0)[2]			
– Shallow Oil Sump	11.6[2] (11.0)[2]			
B 300/400		Integral	Integral	Standard
– Deep Oil Sump w/ PTO	29.75[2] (28.1)[2]			
– Deep Oil Sump w/o PTO	29[2] (27.4)[2]			
– Shallow Sump w/o PTO	26.75[2] (25.3)[2]			
– Shallow Oil Sump w/o PTO	26[2] (24.6)[2]			
B 3400 xFE		Integral	Integral	Standard
– Deep Oil Sump w/ PTO	29.75[2] (28.1)[2]			
– Deep Oil Sump w/o PTO	29[2] (27.4)[2]			
– Shallow Sump w/o PTO	26.75[2] (25.3)[2]			
– Shallow Oil Sump w/o PTO	26[2] (24.6)[2]			
B 500		Integral	Integral	Standard
– Deep Oil Sump and PTO	51[2] (48)[2]			
– Deep Oil Sump	48[2] (45)[2]			
– Shallow Oil Sump and PTO	43[2] (41)[2]			
– Shallow Oil Sump	40[2] (38)[2]			

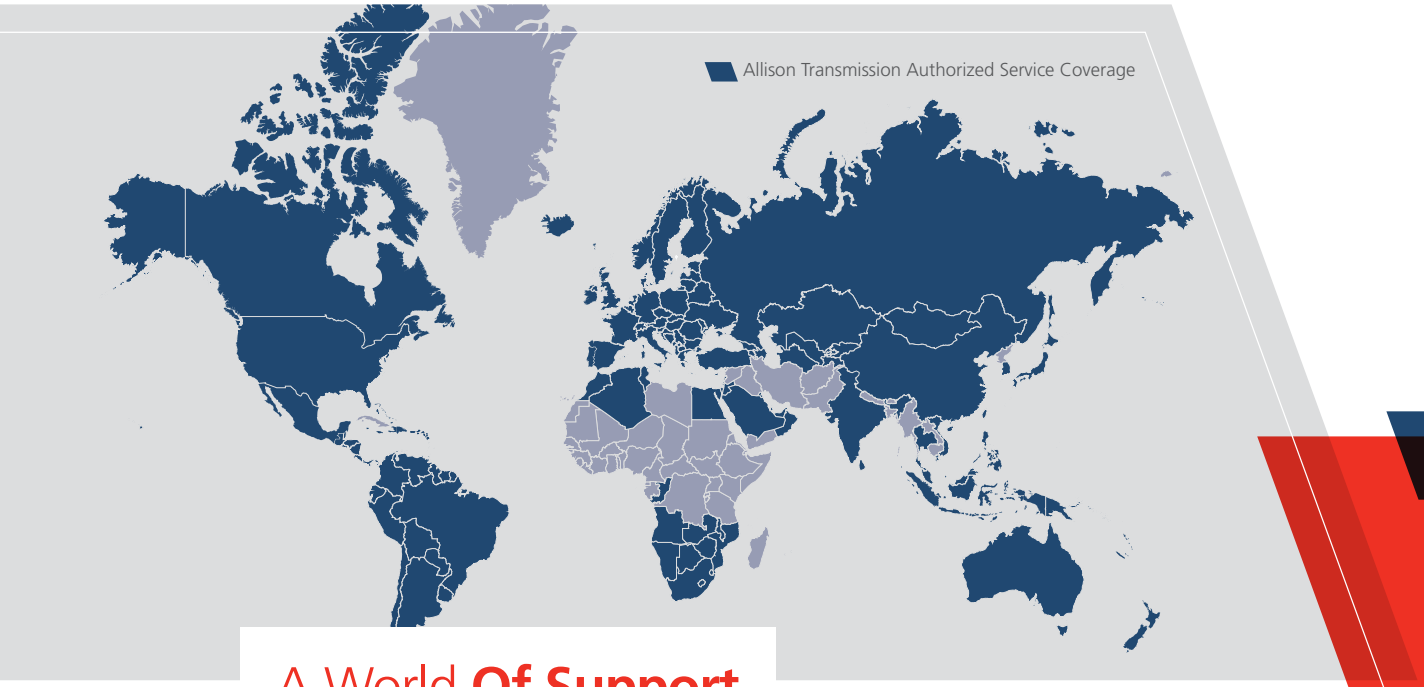
Recommended oil types for all models are Allison Approved TES 295® transmission fluid.

1 Transmission only. Does not include cooler, hoses or fittings. 2 Amount of oil necessary to fill a dry transmission.

PHYSICAL DESCRIPTION

MODEL	LENGTH[1] in (mm)	DEPTH[2] w/DEEP OIL PAN/SUMP in (mm)	DEPTH[2] w/SHALLOW OIL PAN/SUMP in (mm)	DRY WEIGHT lbs (kg)
B 210/220				
– SAE No. 3 mounting	28.01 (711.4)	11.22 (285.1)	10.71 (272.0)	323 (146.5)
– SAE No. 2 mounting	28.39 (721.1)	11.22 (285.1)	10.71 (272.0)	323 (146.5)
B 300/400				
– Basic model	28.3 (718.7)	12.90 (327.7)	11.14 (283.1)	535 (243)
– With PTO only	32.5 (825.4)	12.90 (327.7)	11.14 (283.1)	575 (261)
– With retarder only	28.29 (718.5)	12.90 (327.7)	11.14 (283.1)	615 (279)
– With PTO & retarder	32.49 (825.4)	12.90 (327.7)	11.14 (283.1)	655 (298)
B 3400 xFE				
– Basic model	28.3 (718.7)	12.90 (327.7)	11.14 (283.1)	535 (243)
– With PTO only	32.5 (825.4)	12.90 (327.7)	11.14 (283.1)	575 (261)
– With retarder only	28.29 (718.5)	12.90 (327.7)	11.14 (283.1)	615 (279)
– With PTO & retarder	32.49 (825.4)	12.90 (327.7)	11.14 (283.1)	655 (298)
B 500				
– Basic model	30.54 (775.8)	14.75 (374.7)	13.29 (337.6)	831 (377)
– With PTO only	33.41 (848.7)	14.75 (374.7)	13.29 (337.6)	893 (405)
– With retarder only	33.54 (775.7)	14.75 (374.7)	13.29 (337.6)	906 (411)
– With PTO & retarder	33.41 (848.7)	14.75 (374.7)	13.29 (337.6)	968 (439)

1 Length measured from flywheel housing to end of output shaft. 2 Depth measured below transmission centerline.



A World **Of Support**

From our headquarters in Indianapolis, Indiana, USA, to our manufacturing plants in Hungary and India, to approximately 1,400 Allison Authorized Distributors and Dealers around the globe, you are never far from the products, training, service and support you demand.

Our support starts from the moment an Allison transmission is specified. We work with you to ensure that the model and ratings fit your engine to create a tailored package of powerful performance and reliable efficiency. When you need parts or service, you can count on global access to factory-trained specialists and Allison Genuine Parts™.

One Allison Way
Indianapolis, Indiana USA 46222-3271

Information or specifications subject to change without notice or obligation.

allisontransmission.com

SA8675EN (2020/04)

Allison Transmission®

eGen Flex™

Electrify Your Fleet with Allison's Revolutionary Electric Hybrid – eGen Flex™

Up to 10-Mile EV Range With No Additional Infrastructure Investment Required

Allison eGEN™

The Next Step on the Road to Full Electrification

Allison Transmission is leading the charge in innovative propulsion solutions. Now we're taking our proven H 40/50 EP™ electric hybrid propulsion systems to the next level with the eGen Flex™ electric hybrid, which provides revolutionary capabilities and fully electric propulsion when you need it, without the added infrastructure requirements of full EV.

Our electric hybrid systems continue to demonstrate bottom-line operating benefits for municipalities and fleets all over the world while delivering industry-leading performance, reliability and durability.

eGen Flex.™ Delivering the flexibility to meet your changing needs.

We're always developing new hardware and technologies that will lead to a cleaner future. As community requirements change, so do our products. Allison is committed to zero-emission technologies, so we've evolved our electric hybrid propulsion solution to use geofencing to automatically switch to full electric drive in designated Zero Emission Zones and depot zones. We're not slowing down on the road to full electrification and cleaner, quieter communities.

Reduce Dependence on Fossil Fuels at the Pump

- Improved fuel economy up to 25% versus conventional diesel bus
- Operate accessories such as air conditioning and heat at their optimal efficiency with clean and quiet electric power

Enhance Quality of Life

- No engine emissions or noise while loading and unloading passengers and in dense pedestrian areas

Protect the Environment

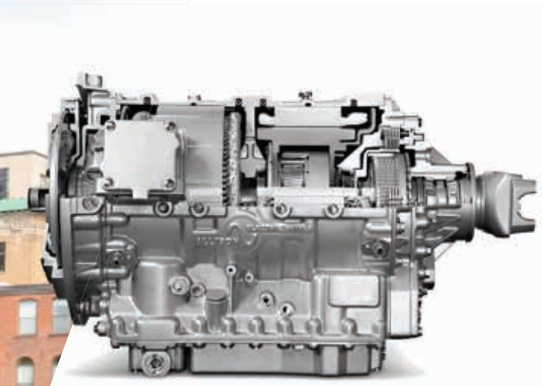
- Electric vehicle operation in Zero Emission Zones and bus depots with geofencing capability
- Up to 10 miles electric range, duty-cycle and axle-ratio dependent
- Reduced CO_2 emissions

Reduce Downtime and Maintenance Costs

- Eliminate inefficient belt-driven accessories and reduce the load on the engine
- Reduced brake wear through electric hybrid regenerative braking
- Industry's most reliable name in electric hybrid propulsion

Proven Solution. Enhanced Value.

Revolutionary Components Provide Enhanced Capability



Drive Unit

- Same proven industry-leading reliability
- Disconnect clutch added to enable disengaging input shaft from the engine
- Provides propulsion while the engine is at zero speed, enabling full engine-off propulsion capability

Inverter

- Improved efficiency
- Improved packaging – one-third the size and 50 lbs lighter than the current component
- WEG cooling – no oil-coolant lines from drive unit, reducing installation complexity and maintenance costs

Rechargeable Energy Storage System

- Lithium Titanate (LTO) chemistry that is ideal for electric hybrid operation
- Increased energy capacity – industry-leading 10-mile electric range capable
- Industry-leading battery design life of eight years
- Faster charging than other chemistries

A Global Leader in Transit Electric Hybrid Propulsion Solutions

- First to launch an electric hybrid solution for both articulated and non-articulated buses
- 9,000 hybrid propulsion systems delivered globally
- Serving 230 cities
- 2.6 billion miles of reliable operation
- 305 million gallons of fuel saved
- 3 million metric tons of CO_2 emissions prevented
- Only propulsion partner with solutions available for diesel, natural gas and electric hybrid buses

Power into the future of propulsion.
Visit allisontransmission.com/egen-flex today to get started.

Allison Transmission eGen Flex™

Ratings

Model	Continuous	Rated Input Torque	Rated Input Speed	Dry Weight	Wet Weight
	hp (kW)	lb-ft (N•m)	rpm	lbs (kg)	lbs (kg)
eGen Flex 40 Drive Unit - Transit Bus[1]	280 (209)	910 (1234)	2300	913 (414)	938 (425)
eGen Flex 50 Drive Unit - Suburban Coach/ Articulated Bus[2]	330 (246)	1050 (1424)	2300	913 (414)	938 (425)
H 40 - Transit Bus	280 (209)	910 (1234)	2300	913 (414)	938 (425)
H 50 - Transit/Coach	330 (246)	1050 (1424)	2300	913 (414)	938 (425)
Rechargeable Energy Storage System (RESS)				1201.5 (545)	
Dual Traction Inverter (DTI)	260 kW continuous 3-phase AC			48 (22)	

1 Applicable for H 40 EP, eGen Flex 40, eGen Flex 40 CertPlus, eGen Flex 40 Max, eGen Flex 40 Max CertPlus 2 Applicable for H 50 EP, eGen Flex 50, eGen Flex 50CertPlus, eGen Flex 50 Max, eGen Flex 50 Max CertPlus

Features

	eGen Flex™ 40/50	eGen Flex™ 40/50 CertPlus	eGen Flex™ 40/50 Max	eGen Flex™ 40/50 Max CertPlus
Allison Drive Unit with disconnect clutch	✓	✓	✓	✓
Allison 26 kWh Lithium Titanate (LTO) Rechargeable Energy Storage System (RESS)	✓	✓	✓	✓
Allison Dual-Tracked Inverter (DTI)	✓	✓	✓	✓
Allison 5th Generation Controls	✓	✓	✓	✓
Acceleration Rate Management	✓	✓	✓	✓
Hybrid Mode	✓	✓	✓	✓
Increased Accessory Power 2 (IAP2) - Accessory electrification capability	✓	✓	✓	✓
Engine Start-Stop	✓	✓	✓	✓
EV Mode	Not Available	Not Available	✓	✓
Pre-Charge Mode	Not Available	Not Available	✓	✓
Depot Mode	Not Available	Not Available	✓	✓
Zero-Emission Zone Mode	Not Available	Not Available	✓	✓
Up to 10-mile EV Mode operation	Not Available	Not Available	✓	✓
Geofencing (to support Zero Emission Zones, Pre-Charge Mode, and Depot Mode)	Not Available	Not Available	✓	✓
California Air Resources Board (CARB) Certified	No	✓	No	✓

A World of Support

From our headquarters in Indianapolis, Indiana, USA, to our plants in Hungary and India, to approximately 1,500 Allison Authorized Distributors and Dealers around the globe, you are never far from the products, training, service and support you demand.

Our support starts from the moment an Allison transmission is specified. We work with you to ensure that the model and ratings fit your engine to create a tailored package of powerful performance and reliable efficiency. When you need parts or service, you can count on global access to factory-trained specialists and Allison Genuine Parts.™

One Allison Way
Indianapolis, Indiana USA 46222-3271

Information or specifications subject to change without notice or obligation.

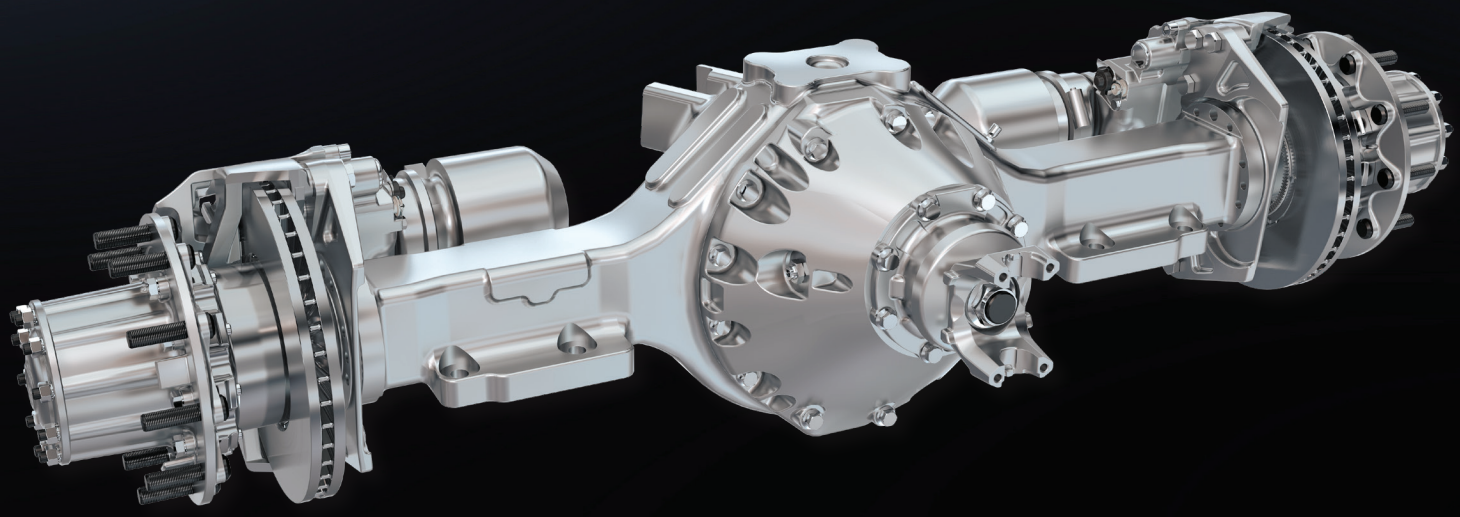
allisontransmission.com

SA8830EN (2021/03)

Allison Transmission®

MERITOR® TRANSIT BUS AND COACH AXLES

THE SMART ROUTE TO PERFORMANCE



MERITOR®
RUN WITH THE BULL

THE INDUSTRY'S AXLE LEADER

With more than a century of axle-manufacturing experience, Meritor® is one of the world's largest independent manufacturers of commercial vehicle axles for a broad range of applications. In the North American transit bus and motorcoach markets, Meritor has been a leading axle supplier for decades.

That's because we engineer outstanding reliability, unmatched durability and low cost of operation into every axle we make. Our specific axle solutions for the transit bus and motorcoach markets mean a more enjoyable and comfortable ride for passengers – and a real competitive edge for you.

We offer a full line of front steer, center, tag and rear drive axles that deliver the performance you demand – backed by the unequaled service and support you expect from a global axle leader.

Total Axle Solutions

With Meritor, you know you're getting an axle solution that delivers the reliability, durability, ease-of-maintenance, economy and all-out performance your transit bus or motorcoach operation demands. But what's underneath your vehicle is only part of the story. You'll be equally pleased with what's behind it – world-class service and support.

Our representatives have the experience, expertise and global support network to provide the assistance you need to get the exact axle systems and components to maintain your competitive edge. With unmatched consultation and follow-through, we can provide you with the guidance needed to optimize your spec based on your vehicle operating environment and operational goals.

Every Meritor axle comes with unsurpassed global service and support, with distribution centers strategically located to reduce downtime and provide timely and complete aftermarket support. In other words, everything you'd expect from an industry leader. For more information, call **866-668-7221** or visit **meritor.com** today.

FRONT STEER AXLES

Meritor® offers the exact front steer axle your transit bus or motorcoach operation requires. Low-floor bus design? The Meritor Easy Steer™ FH-946 deep drop front non-drive steer axle answers the call.

Ideal for 35-, 40- and 60-foot transit buses and motorcoaches, the FH-946 allows the bus floor to drop up to 20 inches (508 mm) below conventional bus designs – eliminating the need for steps and allowing easier passenger accessibility. Passengers also appreciate how the wide spring mountings maximize aisle width.

Here's what you'll appreciate: robust design features like I-beam construction that make Meritor axles the industry standard in reliability, durability and performance.

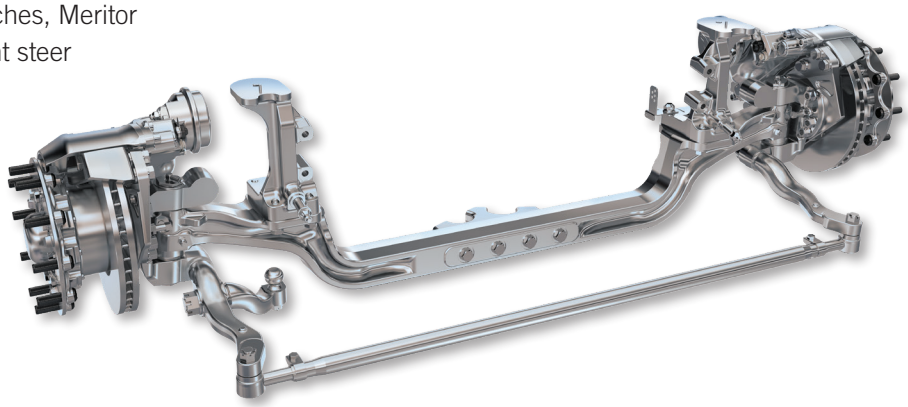
FH-946 Deep Drop Front Non-Drive Steer Axle Features and Benefits

- Spring mounts are integral to the I-beam for simplified and flexible suspension bracket design
- Easy steer king pin bushings and tapered roller thrust bearing permit easier steering
- A 51-degree turn angle delivers outstanding maneuverability
- Available with either Meritor Cast Plus™ cam brakes or EX+™ H severe service air disc brake
- Meritor Cast Plus cam brakes offer added durability and reliability with a single-piece, cast shoe and extended-life brake linings that provide super resistance to heat-related wear.
- EX+ H severe service air disc brakes provide reduced stopping distance, lower maintenance and maximum corrosion protection

FH-946 SPECIFICATIONS
GAWR Rating*
16,500 lbs. (7.5 metric tons)
Brakes and Sizes
Cast Plus Cam Brake EX+ H Air Disc Brake 16.5 in. x 6 in. (419 mm x 152 mm)
Hubs and Drums Bolt Circle Diameter
10-Stud – 11.25 in. (286 mm) 10-Stud – 13.19 in. (335 mm)
Turn Angle
51 degrees

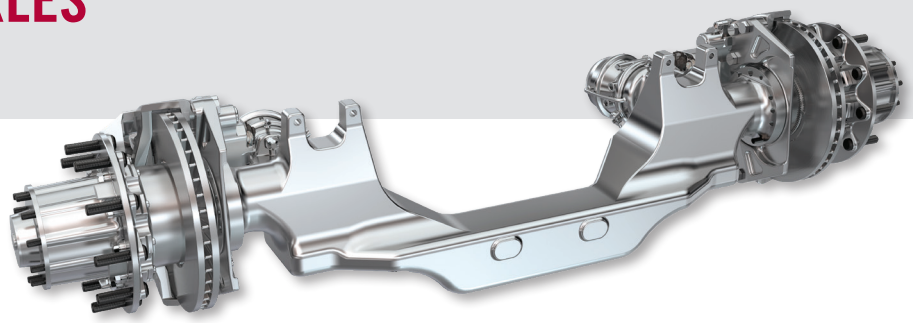
MFS-12-155 and FH-941 Front Steer Axles

For standard floor buses and motorcoaches, Meritor offers the MFS-12-155 and FH-941 front steer axles. These axles deliver the same durability, performance, reliability and ease of maintenance that have made Meritor axles an industry standard.



*Permitted uses of axles and components, including capacity ratings where stated, vary with application and service. Applications must be approved by Meritor Specialty Products and Brake Engineering Departments. Approved ratings may be higher or lower than indicated, dependent upon review.

CENTER AND TAG AXLES



Whether you are building a transit bus or motorcoach, there's a high-performance Meritor® center or tag axle to meet your needs.

MC-26000 Center Non-Drive Axle

For low-floor 60-foot articulated transit buses, the Meritor MC-26000 center non-drive axle features a center drop, no-weld design with integral suspension brackets. The result: increased carrying capacity, comfortable passengers and a more profitable operation.

Brake options include Meritor EX+™ H air disc brakes and Cast Plus™ cam brakes featuring a single-piece cast shoe, extended-life brake linings and an integral return spring mount for unmatched durability, longer life, easy assembly, less maintenance and reduced downtime.

MC-14000 and MC-16000 Rigid Tag Axles

For motorcoaches, Meritor also has a full lineup of tag axles specifically designed for these applications. The MC-14000 and MC-16000 rigid tag axles are custom-designed for the motorcoach market with integrated suspension connection points directly into the axle. They provide a GAWR from 14,000 to 16,000 lbs. (6.4 to 7.3 tons) and offer both drum and EX+ H disc brake options.

FH-946 Steer Tag Axle

If your motorcoach application requires a steerable tag axle, Meritor offers the proven FH-946 steer axle that features the capacities and options your vehicles require.

MC-26000 SPECIFICATIONS
GAWR Rating*
16,000 lbs. (7.5 metric tons)
Brakes and Sizes
Cast Plus Cam Brake EX+ H Air Disc Brake 16.5 in. x 6 in. (419 mm x 152 mm)
Hubs and Drums Bolt Circle Diameter
10-Stud – 11.25 in. (286 mm) 10-Stud – 13.19 in. (335 mm)
Suspension Mounting
Integral To Center Beam

REAR DRIVE AXLES

The Meritor® 79000 Series axle is the next-generation single reduction drive axle for 35- to 60-foot transit bus applications and motorcoach vehicles. Performance-engineered, it's the perfect choice for high stop-and-start duty cycles, demanding regenerative loads and periodic axle-overload applications.

79000 Rear Drive Axle Features and Benefits

- 28,660-lb. gross axle weight rating offers increased capacity for demanding transit bus and motorcoach applications
- More economical, efficient and lower weight than double reduction axles
- One-piece cast iron housing with integral suspension bracket pads and "bolt-on" torque rod brackets for extra strength and durability
- Uses the innovative and futuristic MS197 carrier featuring the most power dense gearing and robust bearings for handling the demanding duty cycle loads of transit/coach operations
- Bolted differential case and ring gear for easier and more efficient assembly and service
- Quiet Ride™ gearing provides a more relaxing ride experience
- Industry-leading Cast Plus™ S-Cam brakes or EX+™ H air disc brakes come standard
- 5-year/unlimited-mile warranty based on application approval
- Robustness of the gearing and carrier makes product ideal for diesel, CNG, hybrid-electric and electric drivetrains.

79000 SPECIFICATIONS
GAWR Rating*
28,660 lbs. (13 metric tons)
Ratios
4.56 - 6.14
Brakes and Sizes
Cast Plus S-Cam Brake (Standard) 16.5 in. x 8.625 in. (419 mm x 219 mm) EX+ H Air Disc Brake (Standard)
Hubs and Drums Bolt Circle Diameter
10-Stud – 11.25 in. (286 mm) Cast Plus S-Cam Brake (Hub and Stud Pilot) 10-Stud – 13.19 in. (335 mm) Cast Plus S-Cam Brake (Hub Pilot Only)

R160 Series Rear Drive Axle

For smaller transit buses and motorcoaches, the Meritor R160 series axle provides the same proven durability, performance, reliability and ease of maintenance that has made Meritor axles an industry standard. The R160 axle for transit buses and coaches includes upgrades, such as Quiet Ride gearing that passenger-carrying services demand.

MERITOR®
RUN WITH THE BULL

Meritor Heavy Vehicle Systems, LLC
2135 West Maple Road
Troy, Michigan 48084 USA

Call 1-866-668-7221
or visit meritor.com

Litho in USA, SP-11149
Revised 5/21

MERITOR® EX+™ AIR DISC BRAKES

A Superior Level of Performance

Meritor has optimized EX+ air disc brakes to meet the tough challenges faced by heavy-duty tractors, trucks and trailers. Today's commercial vehicle market demands superior performance and lower lifecycle costs, and Meritor EX+ air disc brakes deliver every time.

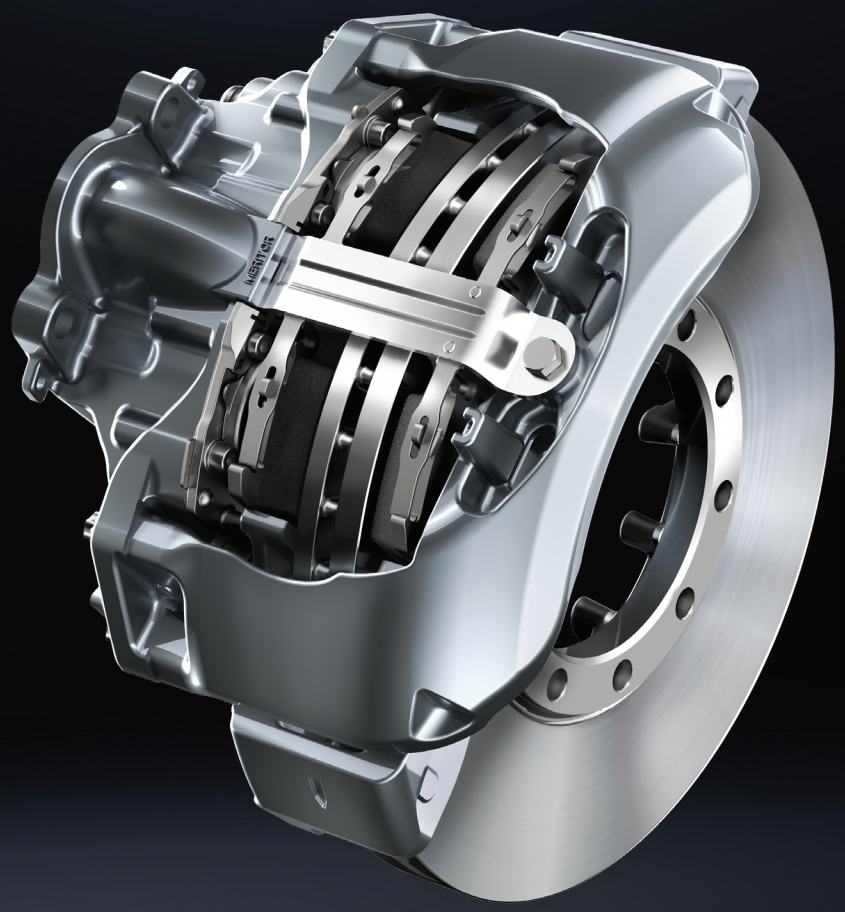
REDUCED LIFECYCLE COSTS

SAFER SMOOTHER STOPPING

SUPERIOR BRAKING POWER

EX+ Air Disc Brake Advantages:

- 10 lb weight savings compared to previous EX+ design
- Exceptional braking power that meets federal FMVSS 121 reduced stopping distance (RSD) regulations
- Increased brake fade resistance for high-demand applications
- In-line braking stability for safer, smoother stops
- Reduced maintenance time and lower maintenance costs

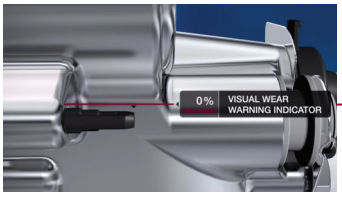


MERITOR®
RUN WITH THE BULL

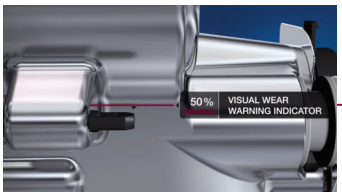
Meritor EX+ Air Disc Brakes

Proven in the most severe work conditions, Meritor EX+ air disc brakes are the ultimate choice for safety, reliability and performance, and are ideal for all applications including linehaul and vocational.

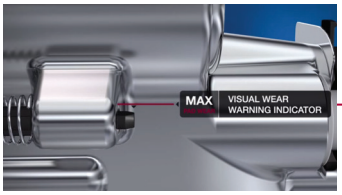
The standard mechanical visual wear indicator gives fleets quick-check capability of remaining pad life without removing the wheel.



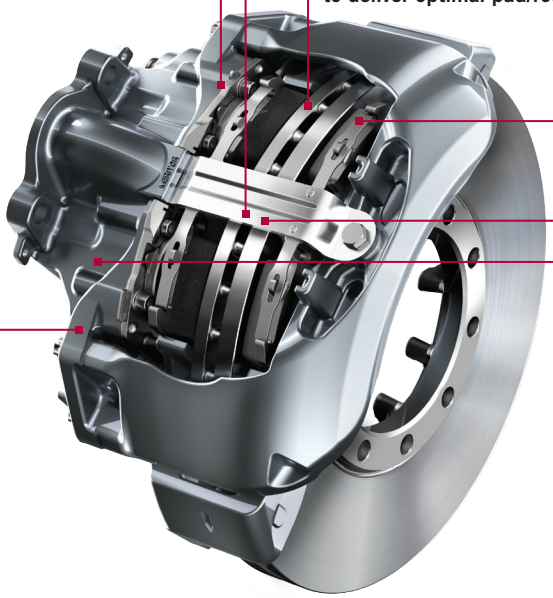
New Pad



50% Life



Max Wear



Robust gear driven adjuster mechanism to maintain proper running clearance

Gear synchronized twin piston design to deliver optimal pad/rotor wear

Engineered to allow for a faster pad change and reduced brake inspection time

Unique tri-lobal piston shape and double-sealing provides superior environmental protection

Tri-lobal piston smooth-sealing surface

Double-sealing technology

Exclusive caliper design delivers minimal ingress points and together with the redundant air chamber sealing, helps prevent contamination

EX+ Air Disc Brakes Specifications

EX+ Model	GAWR lbs	Carrier Mount	Air Chamber Orientation	Air Chamber Size	Rotor Size
EX+ L	26,000	Axial	4 Degree / 12 Degree	Type 16	410 mm
		Radial		Type 20	430 mm
				Type 24	434 mm
EX+ H	29,000	Axial	0 Degree / 12 Degree	Type 16 Type 20	434 mm
		Radial		Type 24 Type 27 Type 30	

Unmatched Customer Support

Every Meritor EX+ air disc brake is backed by unsurpassed service and support, with Meritor DriveForce™ – Meritor's North American sales and service organization – and the OnTrac™ technical support center available to assist customers with solutions before, during and after the sale. For more information, call 866-668-7221 or visit meritor.com today.

MERITOR
RUN WITH THE BULL

Meritor Heavy Vehicle Systems, LLC
2135 West Maple Road
Troy, Michigan 48084 USA

Call 1-866-668-7221
or visit meritor.com

Litho in USA, SP-13107
Revised 1/21

LIFT-U®

Division of Hogan Manufacturing, Inc.

"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!

1:8 Slope When Deployed to a 6-inch Curb; Maintaining a Level Entrance

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

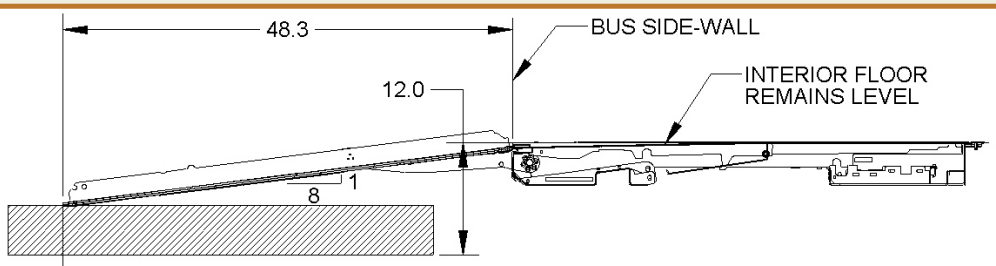
For More Information Call (209) 838-2400
or Email liftusales@lift-u.com

200114G

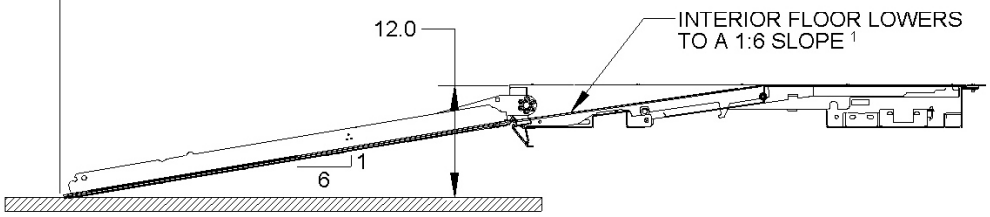
LIFT-U®

Division of Hogan Manufacturing, Inc.

- **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.**



POSITION ONE
DEPLOYED TO 6 in. CURB; KNEELED



POSITION TWO
DEPLOYED TO GROUND; KNEELED

[1] The interior floor lowers to a fixed incline angle when the angle of the outer ramp exceeds the fixed angle of the interior floor. For example, on level ground the interior floor will lower to its inclined position when the outer ramp exceeds 9.5° (1:6).

- **The LU18 ramp incorporates soft-touchdown technology. As the unit is electrically deployed, the ramp decelerates before it contacts the sidewalk or roadway.**
- **Watertight sealed electrical control enclosure.**
- **30 inch ramp width.**
- **<u>Ramp is manufactured from stainless steel for corrosion resistance. Aluminum is not used to avoid galvanic corrosion.</u>**
- **The LU18 is designed using materials that provide high structural rigidity to prevent "oil canning" or "permanent deformation" of the ramp surface.**
- **Manual operation requires <u>less than 20 pounds</u> of force to articulate ramp in any direction.**
- **To further facilitate serviceability, the "rising floor" on the LU18 can either be pivoted up out of the way or simply removed.**
- **The counterbalance chain/spring system on the LU18 ramp is located in the interior of the ramp frame. This offers greater protection for the chain/spring system from the elements; but more importantly, provides easy access for servicing the mechanism from the interior of the vehicle.**

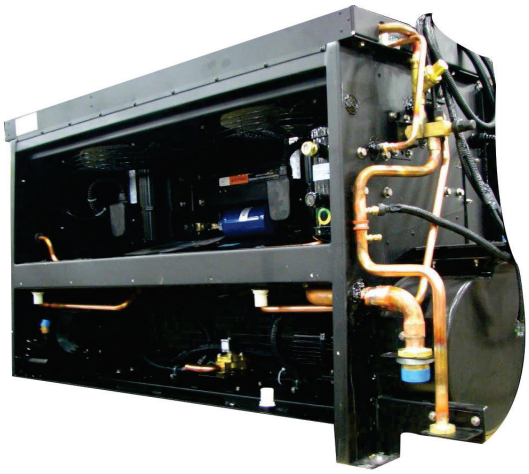
<u>Standard Warranty – 2 Years Parts and Labor.</u>

PATENT INFORMATION REFER TO: www.lift-u.com/patents.pdf

Rearmount Air Conditioning System **Eco RM 35**

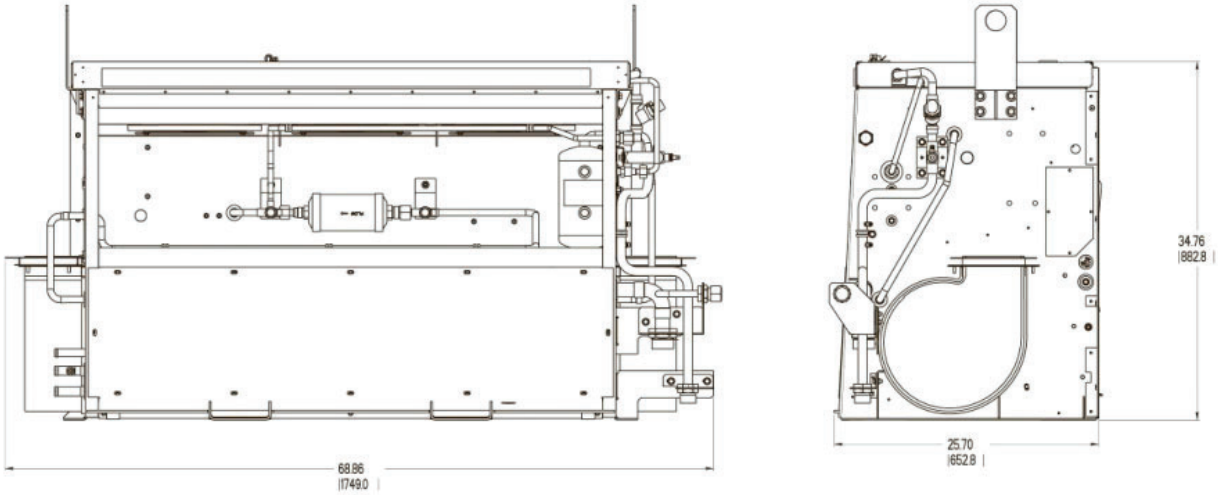
Capacity, Reliability, and Serviceability

MCC Eco RM 35 unit, selected as preferred equipment by leading bus manufacturers, delivers signicantly higher operating capacity and eciency, less maintenance, longer system life, and reduced engine loads and fuel consumption. Meets or exceeds all industryrecognized specications in both the heating and cooling modes.



Features	Benefits
• Heavy duty fan motors	• Lower life cycle costs
• Aluminium microchannel condenser	• Reduces weight, improves performance
• Optimized for R134a refrigerant	• Best suited for high ambient and operates at lower pressure
• Solid-state electronic controls	• Longer service life
• Aluminum frame	• Rugged and lightweight
• Six-cylinder 41-CID (672 cm3) 05G compressor with housing-mounted clutch	• Exclusive 05G six-cylinder compressors with standard unloading for fuel saving

Rearmount Air Conditioning System **Eco RM 35**



Technical Data

Cooling capacity	108000 Btu/hr (32 kW) ARI [1]
Heating capacity	95000 Btu/hr (28 kW) assumes coolant flow rate at 8.0 GPM (1817 l/h) and 100°F
Weight	380 lbs (172 kg)
Refrigerant	R134a
Air flow rate	High 2400 CFM (4078 m3/h) Low 1350 CFM (2294 m3/h)
Current	105 A @ 24 V dc
Dimensions (W x D x H)	68.86” (1749.0 mm) x 25.7” (653 mm) x 34.76” (8 82.8 mm)

[1] ARI: 95°F (35°C) / 80°F (27°C) / 50% RH

Mobile Climate Control

THERMO KING

T Series

The most reliable HVAC system for transit is now better than ever.

TRANE TECHNOLOGIES

High performance and reliability for more than 30 years.

T-Series: The HVAC design that changed an industry.

Low life cycle costs

Performance proven components provide long service life and minimum maintenance for low life cycle costs.

Lightweight

Lightweight all aluminum frame, blowers, coil headers and compressor reduce bus stress and fuel consumption.

Easy to service

Convenient service access to all major components. Simplified electrical troubleshooting with microprocessor controls. Removable access panels and a convenient rear window location provide easy access to unit components for repairs or maintenance.

Same major components and options across platform.

T Series units have many of the same internal components in the electrical and refrigeration systems, assuring a readily available supply of parts and parts interchangeability to lower costs and minimize downtime.

Easy to install

T Series units are easy to install and service because of the compact, one-piece design.

Proven dependability

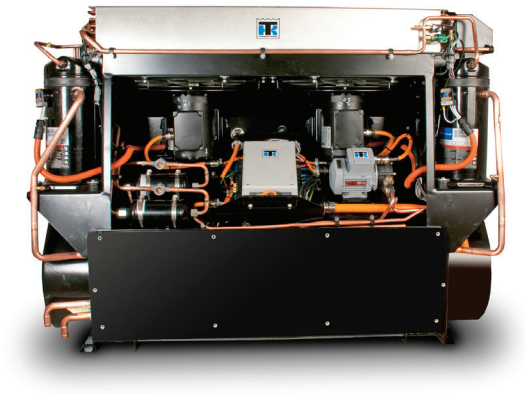
You know you're getting a dependable, reliable bus air conditioning and heating system that can lower your operating and maintenance costs and keep your bus riders cool.

Best Value, Best Performance.

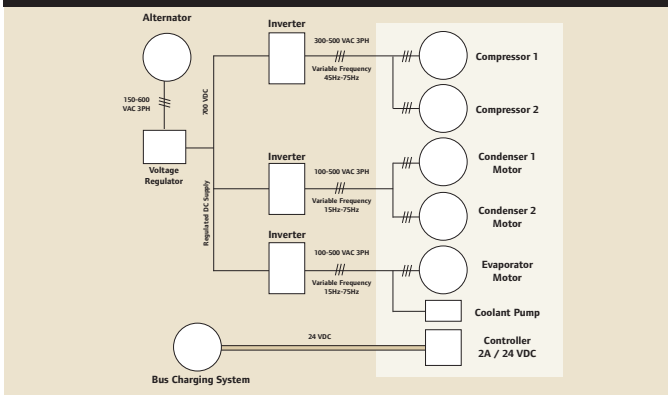
T-Series All-Electric HVAC Options

Help drive energy efficiency and Sustainability in your organization.

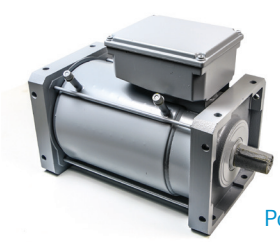
TEA Series



Power Circuit - Alternator Powered Electric Unit



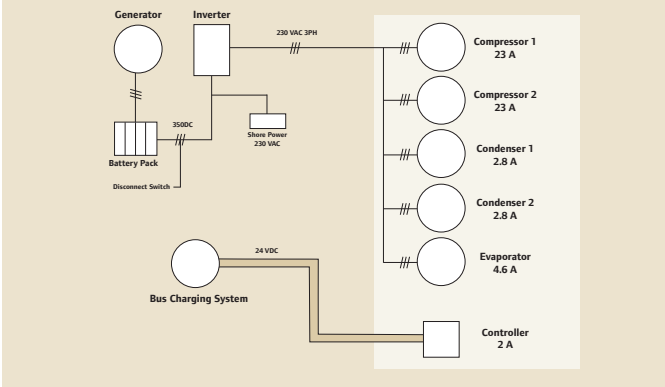
For use on standard diesel engine-driven buses.



Power Electronics for Alternator Powered All-Electric HVAC

TE Series

Power Circuit - Typical Hybrid Electric



For use on hybrid electric and all-electric buses.

For complete All-Electric specifications, see your local Thermo King dealer or call 952-887-2241

T Series Specifications

Evaporator Airflow* *

0 mm (0 in.) water column
external static pressure
High speed fan
-3814 m^3/hr (2250 cfm)
Low speed fan
-2366 m^3/hr (1400 cfm)
* *Consult factory for optional airflow on high speed or low speed fan operation.

Performance Data

System net cooling capacity with 35°C (95°F) ambient, and 26.7°C (80°F) db, 19.5°C (67°F) wb evaporator return air (50% RH):

Refrigerant HFC R-407c*

Compressor RPM	Net System Capacity Btu/hr	KCal/hr	HP
1000	66,700	16,808	7
1800	88,400	22,277	15
2400	97,300	24,520	21
2800	101,000	25,452	24

Refrigerant HFC-134a*

Compressor RPM	Net System Capacity Btu/hr	KCal/hr	HP
1000	45,700	11,516	6
1800	73,600	18,547	12
2400	83,900	21,143	15
2800	86,000	21,672	18

* Nominal cooling system capacities shown above may vary depending upon the specific T Series unit model (frame size) selected. Consult factory for more specific performance data for your application.

System Heating Capacity

24,696 KCal/hr (98,000 Btu/hr)
@ 8 GPM & 160°F water

Electric Power Requirements

AT 27V dc
High speed fan: 106 amps (high speed evaporator and condenser fans)
Power source: Bus alternator or Thermo King batteryless alternator (options below)

Unit Operation W/Driver Mode Switch

Reheat: Compressor clutch continuously engaged, boost pump and water control valve cycling is controlled by thermostat.

Cool: Compressor clutch cycles On/Off on demand of thermostat.

Vent: Evaporator fan operation only.

Heat: Boost pump and water control valve cycle on demand of thermostat.

Compressor clutch off.

Add Thermo King's T-Series HVAC system to your specification today.

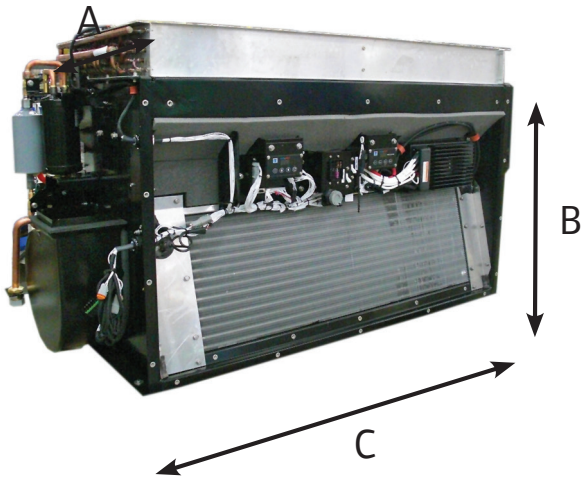
Thermo King offers system diversity to fit your individual requirements.

Unmatched versatility to meet customer specifications.

2 Refrigerant Options
- R134a
- R407C

3 Motor Options
- Brushless
- Wound Field
- Permanent Magnet

3 Compressor Options
- X426/X430
- S391 Screw
- S616 Screw



Unit	A (Depth)	B (Height)	C (Width)	Weight
T 14	683 mm (26.9″)	902 mm (35.5″)	1636 mm (64.4″)	168 KG (370 lbs)
T 15	658 mm (25.9″)	963 mm (37.9″)	1618 mm (64.4″)	173 KG (380 lbs)

The best solution available for CNG Rear Mount applications.

T-Series Standard Features

Why pay for more than you want. Thermo King provides standard features designed to meet your needs.

Thermo King's IntelligAIRE III Control System Delivers Industry-Leading Capability with Unmatched Ease-of-Use

- ✓ Multiple zones can be controlled using identical expansion modules via CAN network and interconnected software
- ✓ Expanded CAN communication capability to plug directly into the vehicle's J1939 network
- ✓ Operator-friendly display and pressure modules for improved control and diagnostics

Four simple modules remove complexity for operators and technicians.

Display Module

Pressure Display Module

Main Module

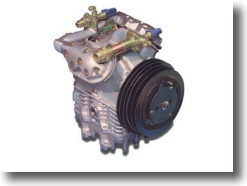
IO Module

High Performance R-407C

- Environmentally safe alternative that provides more BTUs of cooling per HP used

R-134a Refrigerant

- Environmentally-friendly solution



The Thermo King X430 Compressor

- Engineered exclusively for transport applications
- Built for extended service life
- Field repairable

Additional Standard Features

Evaporator fan motor

- Heavy-duty, double shafted industrial permanent magnetic motor with replaceable bearings and brushes
- 27V, 1.15 hp, 1700 rpm (high speed)
- Drives two large, high airflow, forward curved, centrifugal blowers

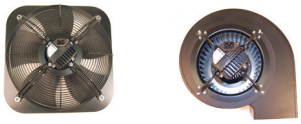
Condenser fan motors

- Two, heavy-duty, industrial permanent magnet motors with replaceable bearings and brushes
- 27V, .75 hp, 1900 rpm (high speed)
- Each motor drives a 457 mm (18 in.) diameter axial flow fan

T-Series Optional Features

Take control of your operating costs with these cost-saving options available only from Thermo King.

Thermo King Brushless Motors



114-LB. WEIGHT REDUCTION FOR IMPROVED FUEL ECONOMY!

Designed Specifically for Mobile Air Conditioning

Lower Your Operating Costs

- Eliminates High Brush Maintenance Costs
- Fewer Parts to Maintain and Replace - Electronic Package is Integral to Motors, Eliminating External Controllers, Harnesses, Terminals and Studs for Lower Costs
- Advanced Diagnostics Provide Failure Mode Indication

IntelligAIRE III® Electronic Pressure Display Module

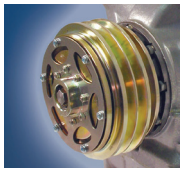
- Touchpad displays four different pressure readings
- Simplifies problem diagnosis and pre-trip inspections

S391/S616 Screw Compressors

- Exclusive oil management system for increased reliability
- Fewer moving parts than reciprocating compressors
- Lower noise levels and vibration than reciprocating compressors
- Programmable capacity control for fuel savings

Electronic Energy Management System

- Provides fuel savings with X426, X430 and X640 reciprocating compressors
- Programmable electronic capacity control reduces the parasitic load on the engine



High Performance Clutch

- Long-life sealed bearing
- More torque for heavy-duty applications
- Extended maintenance intervals

Additional Optional Features

- Wound field condenser & evaporator fan motors
- Modulating water valve
- 125 amp, 27V dc batteryless alternator (independently powers fan motors and controls)

THERMO KING

Thermo King – by Trane Technologies (NYSE: TT), a global climate innovator – is a worldwide leader in sustainable transport temperature control solutions. Thermo King has been providing transport temperature control solutions for a variety of applications, including trailers, truck bodies, buses, air, shipboard containers and railway cars since 1938. For more information, visit *thermoking.com* or *tranetechnologies.com*.

TK 30274-3-PL (08-17)

BUS DOOR SYSTEMS

Vapor Bus International
A Wabtec company

Vapor Profile

Founded in 1903 as a supplier of steam heating equipment for railroad passenger cars, Vapor Bus International has evolved to a leader in the design and manufacture of passenger door systems and other products for buses, rail passenger cars and locomotives. As a division of the Wabtec Corporation, Vapor is a part of a financially sound organization that is totally committed to the transportation industry.

Vapor's approach to product design is based upon a thorough understanding of the physical environment and the operating needs of its customers. Experienced engineers employ advanced design tools and thorough testing to assure reliable products having long life and low life cycle costs in the demanding bus environment.

Ongoing development and improvement programs enhance product performance and value. Specific Vapor door systems are integrated on a custom basis to suit the requirements of both the vehicle OEM and the end user.

Vapor's offices and manufacturing facilities are located in Buffalo Grove, Illinois. Continuous investments in equipment, employee training, and process improvement enable Vapor to satisfy the evolving needs of the global transportation industry.

Supply Scope

Vapor offers a complete line of door systems for buses including actuators, controls, door panels, seals and accessory items. Vapor can engineer a complete system, or provide specific components for integration by the bus manufacturer.

The selection of a door system for a bus depends upon the type of vehicle and upon its total operating environment. Vapor is experienced in the entire range of buses including urban transit buses,commuter buses, intercity and tour coaches and commercial vehicles. Vapor can provide the optimum door system for any vehicle. Through our sister company, Ricon Corporation, we can offer compatible access ramps and lifts as well as window systems.

Transit Bus

Intercity/Tour Coach

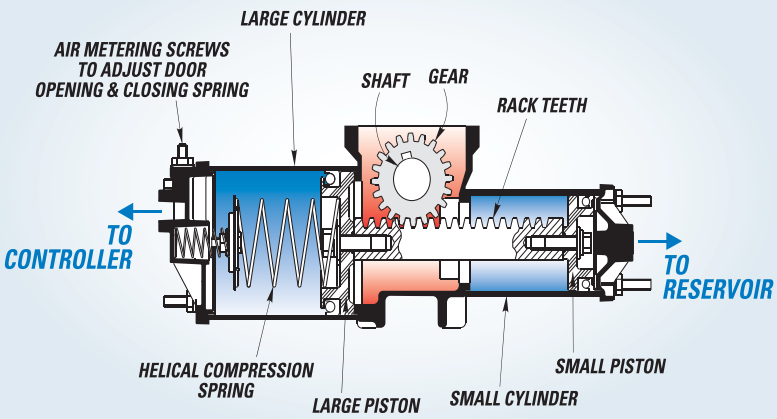
Commercial Vehicle

Pneumatic Differential Engine

Simplicity, reliability and suitability for the task–these fundamentals of application engineering excellence concisely describe the Vapor Pneumatic Differential Engine.

The compact differential engine consists of two opposed cylinders of different diameters with pistons connected by a rack. The rack meshes with a gear converting the straight line motion of the pistons into the rotary motion required for operation of the door linkage.

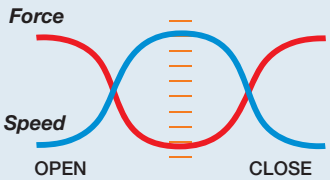
Air pressure is maintained in the smaller cylinder at all times, permitting the use of a 3-way rather than the conventional 4-way valve. Operation is controlled by applying air to, or venting air from, the larger cylinder.



When air is exhausted from the large cylinder, the doors open; admitting air to the large cylinder reverses the direction of the rack and gear causing the doors to close. Toward the end of either the opening or closing stroke, the driven piston encounters an opposing pressure buildup which slows the piston and cushions the opening or closing the door.

Air metering screws permit adjustment of the opening or closing speed of the doors as well as the opening cushioning effect. The differential engine provides effective door operation at air supply pressures between 90 and 120 psi.

Force versus Speed Curves



Vapor's transit-tested pneumatic differential engine provides maximum velocity and minimum force in the mid-point of its range of motion, and maximum force and minimum speed at the extremes of its motion.

Activair® Differential Engine

The Vapor Activair Differential Engine incorporates innovative features for improved performance, easier, less costly maintenance, greater reliability and enhanced passenger security.

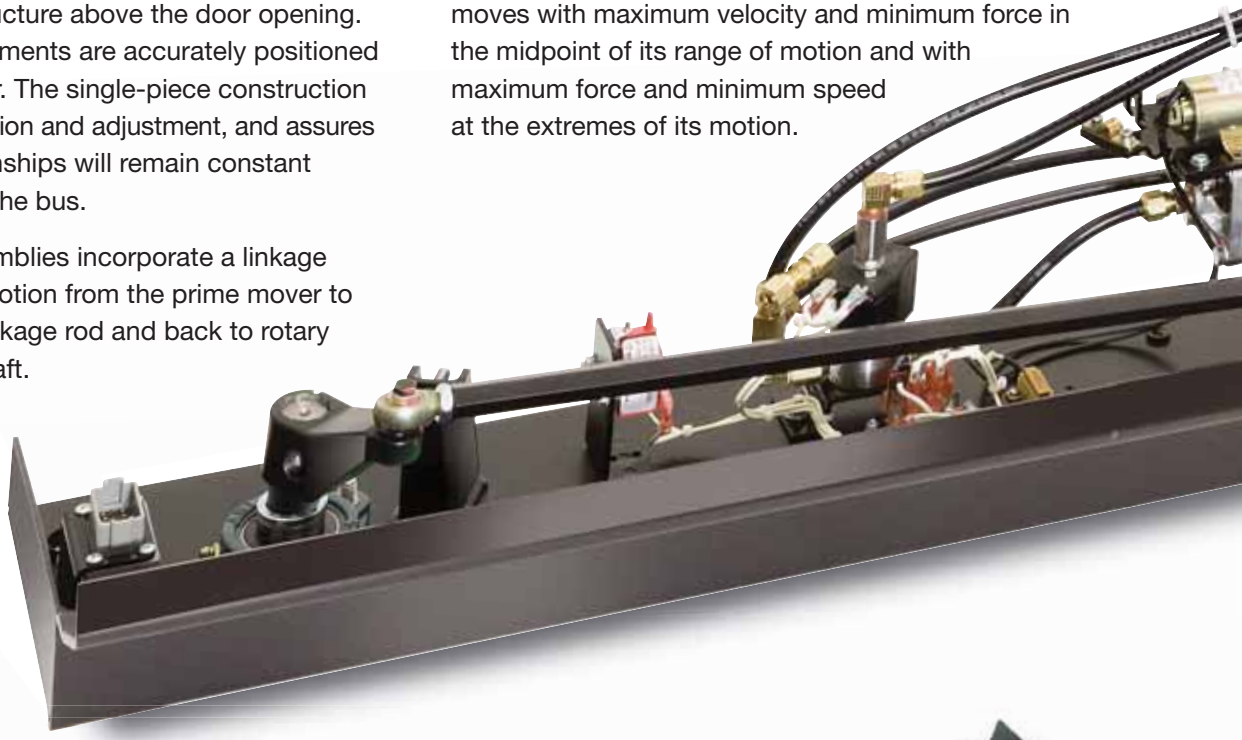
- Finger screws for door speed adjustments – no tools needed
- Adjustable cushioning onset for precise door open speed adjustment
- Solid-state, non-contact proximity switches
- Single engine for all door configurations reduces parts inventory
- Optional locking mechanism secures engine, even if air pressure is lost

Baseplate Assemblies

Most Vapor bus door actuators are delivered as baseplate assemblies. The baseplate combines the prime mover, linkage, and door suspension into a single pre-assembled and tested unit that mounts directly to the bus structure above the door opening. The key geometric elements are accurately positioned relative to one another. The single-piece construction simplifies door installation and adjustment, and assures that geometric relationships will remain constant throughout the life of the bus.

Vapor baseplate assemblies incorporate a linkage that converts rotary motion from the prime mover to linear motion of the linkage rod and back to rotary motion of the door shaft.

By proper arrangement of the relative positions of the output plate on the prime mover, and the door shaft lever on the door shaft, the speed of the door and the actuating force can be optimized so that the door moves with maximum velocity and minimum force in the midpoint of its range of motion and with maximum force and minimum speed at the extremes of its motion.



Air Assisted Open–Spring Close Actuator

This is the most popular configuration for operating exit swing doors on transit buses. The driver unlocks the doors electrically which allows air to be fed into the check cylinder and the doors to open automatically in response to a passenger activating a touch bar or other switch. Once the passengers have alighted, air in the check cylinder is dicharged through adjustable ports, allowing the spring to close the door with a cushioning effect for “soft closing”.

Push Open–Spring Close Actuator

This alternate configuration for swing type exit doors gives passengers complete control of door operation and the highest level of safety. The bus driver controls the door locking mechanism, enabling passengers to push the doors open and step out. The doors automatically close through spring action working against the check cylinder, thereby providing a cushioned cycle. Once closed, a pawl is engaged for positive mechanical locking.

Vapor Bus International
A Wabtec company

Plug Door Actuators

Vapor Locking Electric Plug Door Actuator

Vapor's premier plug door actuator combines the reliability and simplicity of electric operation with the security of an electrically-actuated positive locking mechanism. Designed and tested for demanding applications, the Locking Electric Actuator delivers maximum performance while requiring minimal maintenance.

Vapor Electric Lift-to-Latch Actuator

The lift-to-latch actuator uses wedges mounted to the door frame and door jamb with a lifting motion of the closed door panel to retain the door in the closed position. The Vapor electric Lift-to-Latch actuator combines this feature with electric operation and a compact package.

Vapor Pneumatic Rotary Actuator

The Vapor pneumatic rotary actuator employs a unique helical cam motion converter to provide high holding torque and positive sealing in the door closed position. As the door moves in only one plane, the need for door alignment adjustments is greatly reduced.

Vapor Pneumatic Lift-to-Latch Actuator

This Vapor pneumatic actuator provides the Lift-to-Latch function with pneumatic operation.

Door Panels

Vapor door panels are fabricated from aluminum alloys to provide strength, light weight and corrosion resistance. Available finishes include paint, anodized, paintable E-Coat and custom finishes. Optional accessories include: vTouch™ Electronic Touch Bar, Universal Passenger Assist, and brushes and seals. All door panels are compatible with the CLASS® Sensing System. All panels satisfy industry standard deflection requirements and applicable FMVSS standards.

Classic™

The standard Vapor door panel has a single exterior skin. Options include interior skins, kick plates and the provision of fully assembled doors with windows installed and all brackets and mounting fasteners attached prior to shipment.

Ameriview®

The Vapor Ameriview door panel combines contemporay appearance with up to 25% glass area.

The unique glazing system requires no fasteners and enables quick glazing replacement.

The Ameriview panel is available in multiple glazing configurations

Compliments Ricon CityView™ Windows

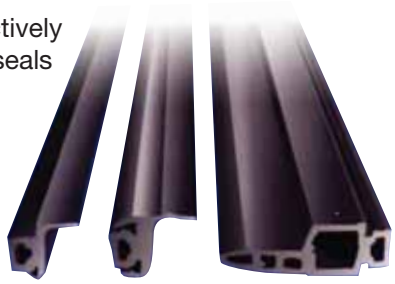
CityView™

Vapor's fully-glazed door panel provides the sleek visual impact desired by appearance-conscious transit agencies.

Aluminum frame construction meets all industry requirements, while the quick change glazing uses no fasteners and needs just minutes for glazing replacement.

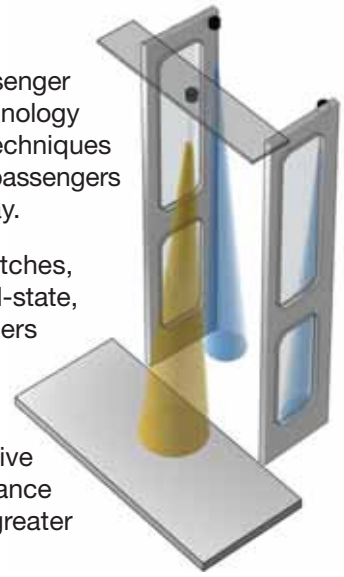
Optional Glass Guard™ sacrificial inner liner is available.

Door Edges and Seals



Vapor door edges and seals are designed to weatherproof the bus simply and effectively and are configured for compatability with the door design and geometry. Elastomer seals are extruded from a neoprene compound and incorporate a "box" or "T" section for mounting into the door panel or door jamb. Articulating door bottom seals including the Vapor ActiveBrush™ are available for slide-glide (inswinging) doors operating over sloped entry floors. All seals, whether elastomer or brushes, meet applicable flammability, smoke and toxic emissions standards.The Vapor air wave "Sensitive Edge" seals between door panels, offering maximum passenger protection with high reliability and minimum maintenance. It incorporates a sealed cavity connected to a highly sensitive pressure wave switch actuated by any change in air volume within the cavity. An object caught between the doors will depress the rubber edge, creating a pulse of air that will activate the switch and reopen the doors or sound an alarm. Other sensitive edge technologies can be provided upon request.

CLASS®
Contact-Less Acoustic Sensing System



CLASS, the next generation in passenger protection, combines acoustic technology with advanced signal processing techniques to provide contact-less sensing of passengers and their belongings in the doorway.

CLASS replaces tape and mat switches, touch bars and push buttons. Solid-state, ultrasonic sensors enable passengers to initiate door opening, provide a "hold open" request for a stream of existing passengers, and enhance the function of sensitive edges. ***The results:*** lower maintenance costs, decreased dwell time, and greater rider satisfaction.

Door Annunciator

The Door Annunciator can provide short audio messages in the exit door area. Digitally recorded messages are delivered in response to inputs from the CLASS controller or other compatible inputs. The messages may be warnings, greetings or service announcements.

This compact, rugged unit is easily installed in the door header space or mounted adjacent to the doorway.

Door Accessories

vTouch® Electronic Touch Bar

The Vapor vTouch features solid-state circuitry that eliminates switch failures and permits vertical or diagonal mounting.

The low profile design reduces intrusion into the door opening, while the universal housings simplify installation and electrical connections.

The vTouch is ADA compliant, meets industry strength standards, and satisfies the NHTSA Drop and Drag Test. The bar element is available in powder coated silver gray or high-visibility safety yellow. vTouch direct replacements are available for conventional touch bars.

Universal Passenger Assist

The Vapor Universal Passenger Assist is worthy of the modern bus. Sleek contours compliment the vehicle's appearance. Low profile design minimizes intrusion into the clear opening, while the two point mounting maximizes flexibility in positioning the assist.

The Universal Passenger Assist is ADA compliant, meets industry strength standards and satisfies the NHTSA Drop and Drag Test. Standard bar element finishes are powder coated safety yellow and stainless steel. Other colors can be provided as options.

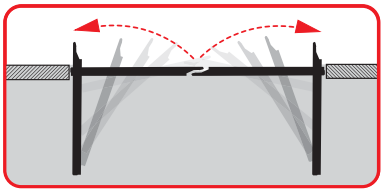
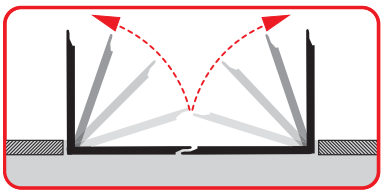
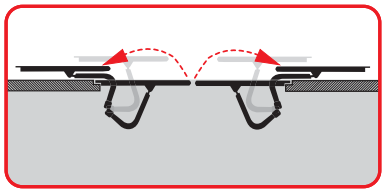
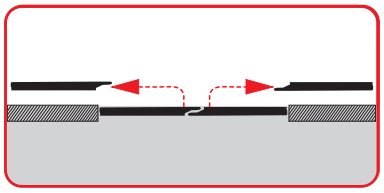
Door System Controls

Controls for Vapor bus door systems can be configured to meet the needs of the vehicle manufacturer. The simplest configuration employs a direct connection between a pneumatic actuator and a pneumatic driver's door controller. Common configurations interface with the vehicle PLC system to accomodate passenger actuation devices and/or sensitive edges.The microcontroller-based Vapor Control Module is available for complex door systems that require interface with multiple sensors and vehicle systems.

Driver's Door Controller

Designed to be mounted on the driver's side console, Vapor driver's door controllers are available in pneumatic, electric and combination configurations. The basic design has the industry-standard five positions, while optional stops permit setting the number of positions 2, 3, or 4. Controller handles can be provided in several sizes. Most utilize a 5/16 inch square shank that can be used as a key for industry-standard cover latches.

Door Geometries

	Geometry	Attributes	Common Applications
	**Slide Glide**	• Smooth, rapid operation • Limited protrusion outside of vehicle • Door panels may be flat or moderately contoured • Clear passenger path • May require step cutouts	• Transit bus entrance and exit doors
	**Swing**	• Simple geometry • May be spring-closed • Wide doors may protrude outside vehicle • Simple operation in emergency situations	• Transit bus exit doors • Commercial buses and shuttles.
	**Parallelogram Plug**	• Panels can be flat or contoured • Can be made flush with vehicle sidewall • More complex mechanism and adjustments • Requires clear path to front and rear sides of door of opening • Overlaps door opening when open	• Transit bus entrance and exit doors • Intercity and tour coach doors (frequently single panel)
	**Outside Sliding Plug**	• Panels can be flat or contoured • Can be made flush with vehicle sidewall • More complex mechanism and adjustments • Requires clear path to front and rear sides of door of opening • Overlaps door opening when open • May be single panel or bi-parting	• Transit bus mid and rear doors • Single panel may be used in front door if adequate clearance is available aft of opening

Service and Support

Vapor sales and service representatives can assist in maintaining Vapor door systems throughout the life of the vehicle with maintenance training and suggestions for overhaul and upgrade programs.

Genuine Vapor parts, as well as rebuild and upgrade parts kits are available from our authorized distributors and directly from Vapor. Overhaul of Vapor components to factory standards can be provide upon request.

Further information, including brochures for specific Vapor products, is available on our website, www.vapordoors.com, from your Vapor sales and service representative or from our Customer Service Department.

Vapor Bus International®
A **Wabtec** company

1010 Johnson Drive
Buffalo Grove, Illinois 60089 USA
Phone: 847.777.6400
Fax: 847.520.2222
Email: vaporbusinfo@wabtec.com
www.vapordoors.com

Bulletin No. 53-2002 05-2009 Printed in U.S.A.

INSIGHT®

AMERICAN SEATING

Your **INSIGHT**® drives our innovation

The **INSIGHT** product offering combines lightweight design with superior strength, durability and comfort.

INSIGHT®
Cushion Onserts

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


Cushion Onserts


Back Extension


Textured Seat Module


Color Inserts


Grab Rail Cover


Without Grab Rail


Plastic Back Panel


Stainless-Steel Back Panel

	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	•	•	◉

(Standard Materials FMVSS 302 Compliant)

◉ *Prime+ Module: Docket 90A, Prime+ Inserts: Small components are exempt*

Cushion Onsert Selection

Standard 1/2" padded cushion with optional drain hole

Plush padded cushion (1-1/4" seat, 1/2" back)

VR-50® Vandal-resistant cushion with optional drain hole

CR-50® 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

1471 Charcoal | 980 Grey | 989 Blue

Back Panel Selection

Thermoplastic

1471C Charcoal | 980C Grey | 989C Blue | Textured Stainless Steel

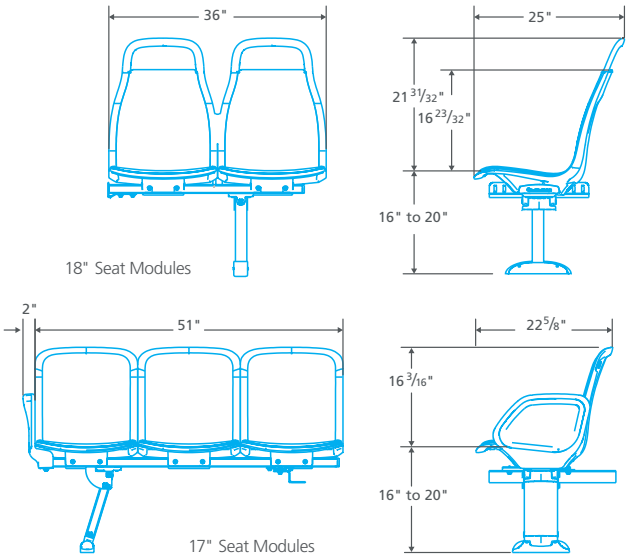
Insert Color Selection

Custom colors also available, minimum order quantities and additional costs may apply

2283 Red | 2169 Dark Cool Grey | 321C Teal | 533C Navy | 368C Go

980 Grey | 989 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

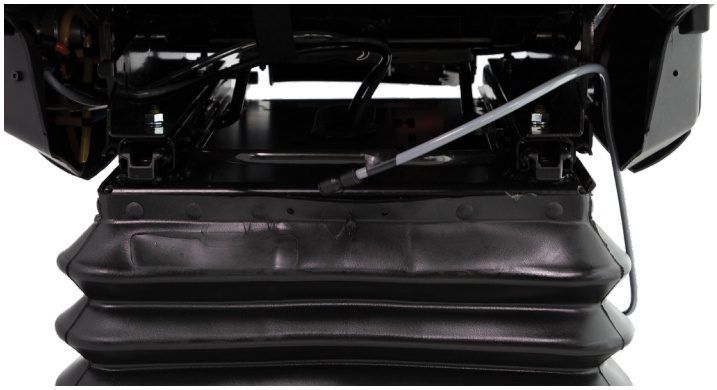
All products designed, engineered, manufactured, and tested in the USA.

American Seating is committed to lessening our impact on the planet through responsible stewardship of our environment.

AMERICAN SEATING

801 Broadway Avenue NW, Grand Rapids, MI 49504-4499
Phone 616-732-6600 800-748-0268 FAX 616-732-6401
americanseating.com

RECARO ERGO M (AM80)



RECARO Automotive is the global leader in mobile seating. World renowned for our ergonomics, innovative safety technology and quality.

Our seats are built in the USA 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 Michigan supports our customers throughout the products life cycle. Assembled in the U.S.A.

Contact us: 1.800.8.RECARO

STANDARD FEATURES

- 5th to 95th percent profile for better fit and comfort
- High Density Foam
- Crepe Fabric with FreshPer4mance
- Dual Recliner Gears
- 3-point Seat Belt Presenter for enhanced comfort (standard on all 3 point seats with standard D-Ring)

OPTIONAL FEATURES

- LiquiCell®
- RECARO Silicone Foam
- Adjustable Seat Belt D Ring
- FR Treated Foam for Low Smoke / Low Flame
- Adjustable Armrests
- Seat Heat (Backrest & Seat Cushion)
- Seat Cushion Alarm Switch
- RH Remote Shock
- Various treated fabrics and specialty covers available

www.recaro-automotive.com

ADJUSTMENT FEATURES

Thigh Extension & Tilt
Seat cushion extends and tilts upward and downward, allowing for fit from a 5th percentile female up to a 95 percentile male.

4 Way Adjustable Headrest
Manually adjustable headrest moves up, down, forward and backward providing optimum comfort and safety.

Suspension w/ Adjustable Shock
Pneumatic suspension with 6" suspension travel. Allows operator to adjust the suspension to individual comfort needs.

Pneumatic Adjustable Lumbar
3 separate chambers fill with air independently allowing for individually optimized lumbar support.

3-point Seatbelt Presenter
Allows for a more comfortable range of fitment for occupant.

STANDARD QUALITY AND DURABILITY FEATURES

Solid Steel Back
High quality solid steel back for the best in strength and durability.

Plastic Seat-Back Protector
Plastic seat-back keeps the seat looking good for years.

High Density Foam
Quality high density foam keeps its shape over time and provides superior comfort and firm support.

Fully Supported Seat Cushion
The seat pan fully supports the seat cushion for long lasting durability comfort.

OVERVIEW OF SEAT OPTIONS

		Ergo M (AM80)
COMFORT	9.45 or 11" Fore / Aft Seat Travel	●
	4 Way Adjustable Headrest	○
	12 or 25 Degree Recline Stop	●
	3-point seatbelt with RECARO Seatbelt Extender	●
	Adjustable Armrests	○
	Suspension w/ Adjustable Shock	●
	Crepe Fabric with FreshPer4mance	●
	High Density Foam	●
	Dual Recliner Gears	●
	5th to 95th percent profile for better fit and comfort	●
	Fixed Seat Back Bolsters	●
	Full Travel Seat Belt System	●
	Fully Supported Seat Cushion	●
	Left or Right Hand Controls	●
	LiquiCell®	○
	Pneumatic 3 Cell adjustable lumbar	●
	Plastic Seat-Back Protector	●
	Seat Cushion Tilt	●
	Seat Heat (Backrest & Seat Cushion)	○
	Silicone Foam Cushion	○
	Solid Steel Back	●
	Various treated fabrics and specialty covers available	○
SAFETY	3 Point ELR Seat Belt	○
	Black or Orange Webbing	○
	2 Point ALR seat belt	●
	Adjustable D-Ring with out RECARO seatbelt Extender	○
	FR Treated Foam - Docket90a for Low Smoke / Low Flame	○
	Seat Belt Alarm	○
	Seat Cushion Alarm Switch	○

● Standard features, ○ Option / accessories

SMART SERIES III DISPLAYS

PASSENGER INFORMATION SYSTEM

FEATURES

- Available in white and amber, delivering the highest readability - even from long distances
- LED, surface-mount technology delivers superior readability, high intensity and long service life
- 150 degree viewing angle provides improved visibility
- Multiple discrete inputs are supported to trigger emergency alerts or automatically update messages based on current status of the vehicle

HIGH IMPACT AND READABILITY

Luminator Technology Group's Smart Series III displays deliver destination, route, and other ad hoc messages to the front, side, rear or dash of the transit vehicle.

Available in white or amber options, Smart Series III displays are optimized for readabllity at long distances, with the use of high intensity LED technology.

INTEGRATED FOR OPTIMAL PERFORMANCE

Paired with the Multi-System Controller, the Smart Series III display solution supports automatic updates over wireless, via Ethernet or USB, and features on-board touch screen controls and diagnostics.

Add an optional integrated rear-camera to the rear sign, which can be viewed and controlled on-board via the Multi-System Controller. This integrated solution will enhance safety while supporting the display of high-quality passenger information.

SMART SERIES III DISPLAYS

PASSENGER INFORMATION SYSTEM

Luminator's Multi-system Controller provides complete control and diagnostics of all on-board display systems.

ON-BOARD CONTROL AND DIAGNOSTICS

- Diagnostics are supported at the system level and for individual display components
- Controller alerts the operator of any maintenance required and provides current status of all connected displays
- Reports can be easily offloaded for further evaluation and easily added to maintenance work orders

INTELLIGENCE, SAFETY AND EFFICIENCY IN TRANSIT

OPTIONAL INTEGRATED BACK-UP CAMERA

By providing an enhanced view of the rear of the vehicle, operators can avoid collisions and hazards

- Easy to install
- Cameras can be integrated into the rear Smart Series III display, or installed independently.

SMART SERIES III DISPLAYS

PASSENGER INFORMATION SYSTEMS

DISPLAY FEATURES

- Brightness automatically adjusts for current lighting conditions, ensuring the best visibility for changing environments
- Front, side, rear and dash mounting options
- Designed for various modes, with 12v and 24v capability
- Supports ADA compliant fonts
- Compatible with RS232, J1708, RS485 and Ethernet to support data integration
- Modular solid-state design provides the highest reliability with no moving parts
- Positive heat displacement eliminates the need for cooling fans and filters

INTELLIGENCE, SAFETY AND EFFICIENCY IN TRANSIT

Features and Specifications are Subject to Change without Notice BOPIS2003R01

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 inter-granular, 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 sub-assemblies 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 under-coating, 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.

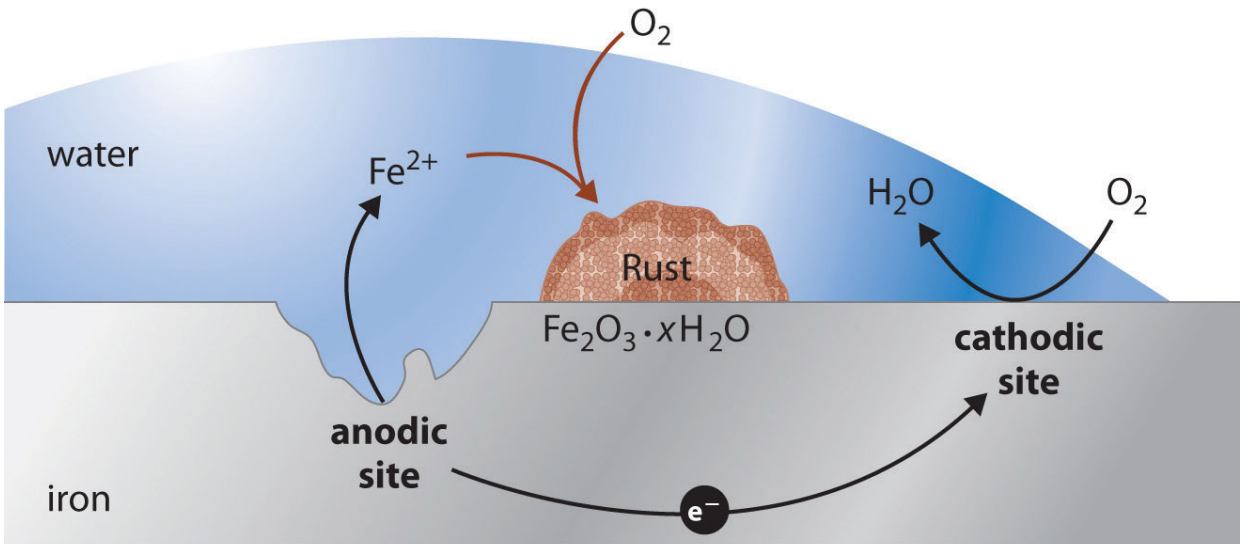
- Stainless-steel chassis structure with epoxy corrosion-protective coating applied at all body connection faces
- Type 3 hard anodized aluminum body structure
- Type 2 anodized aluminum mid-rail
- Fiberglass front and rear body panels
- Corrosion-resistant aluminum body skirts
- Aluminum rear and side-skirt 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

- 7-ply treated marine-grade plywood or optional phenolic composite floor, with under-sides 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 latex-based 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 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_2O_3), 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

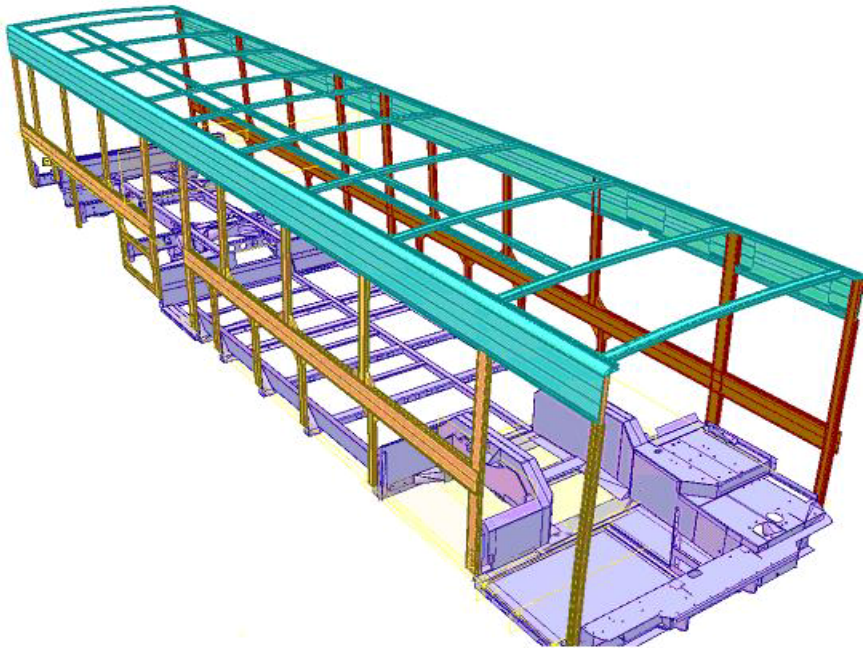
The presence of contaminants can affect corrosion resistance of stainless steels considerably. One of the most important factors is chloride concentration. If left unattended, chloride ions (from road salts and de-icing chemicals) concentrate on the surface of stainless steels enough to produce very 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

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.



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.

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

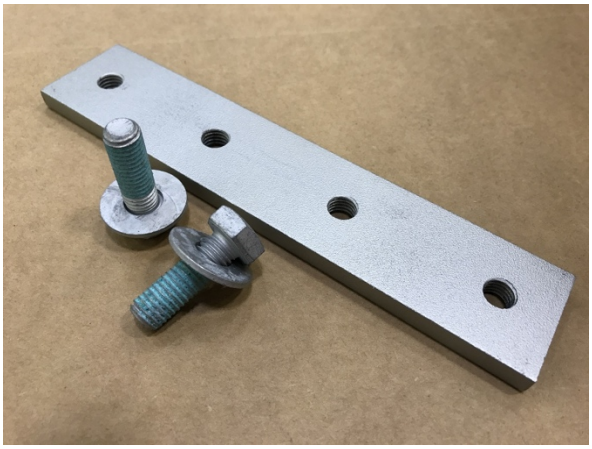
The GILLIG Low Floor body frame is assembled of aluminum extrusions, forgings, and castings. Aluminum is inherently corrosion resistant as formed since surfaces produce a barrier of oxide film within minutes of being produced. To extend this level of performance, all extrusions below the window line 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.

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.

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 corrosion-resistant 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.

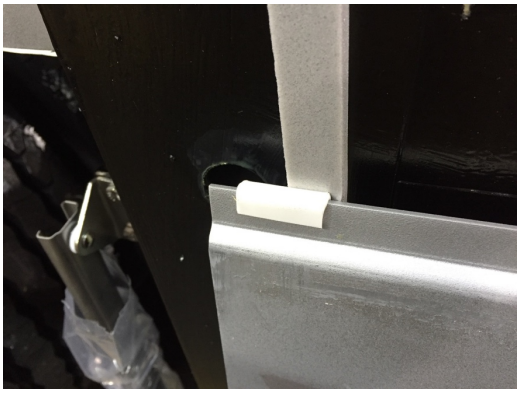
Sealed & powder coated aluminum skirt panel bracket

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.

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.

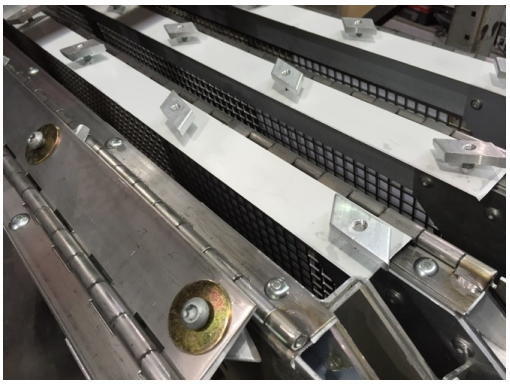
Non-hinged skirt panels have a 2-in. (5-cm) piece of polyurethane foam tape every 12 in. (30 cm) before being inserted into the mid-rail channel. The tape eliminates road rattle and allows air flow inside the mid-rail channel which eliminates moisture saturation. The bottom edge of the skirt panel is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

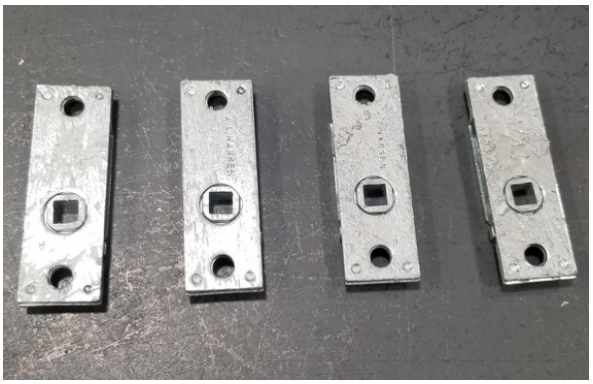


Tape applied to top edge of coated skirt panel

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.

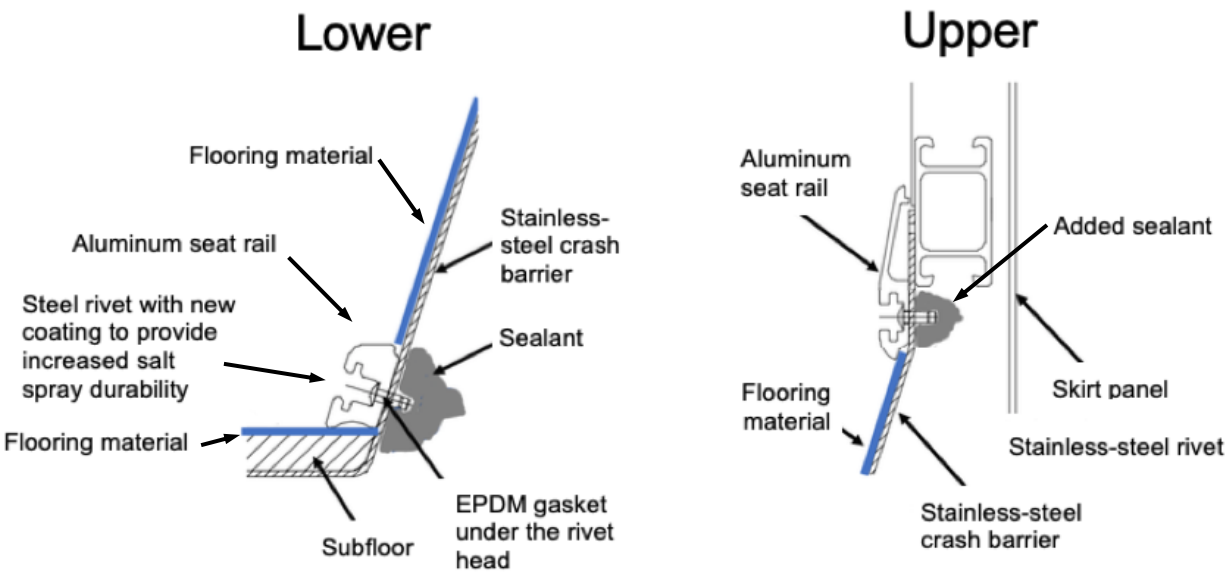




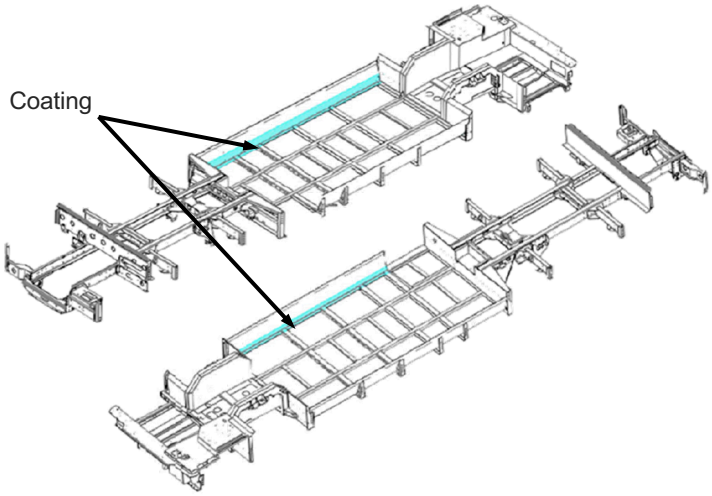
Left: Isolating tape applied over primed hinged panels.
Right: Stainless steel square key locks with pre-applied protective coating.

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.



CORROSION PROTECTION: TESTING

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.

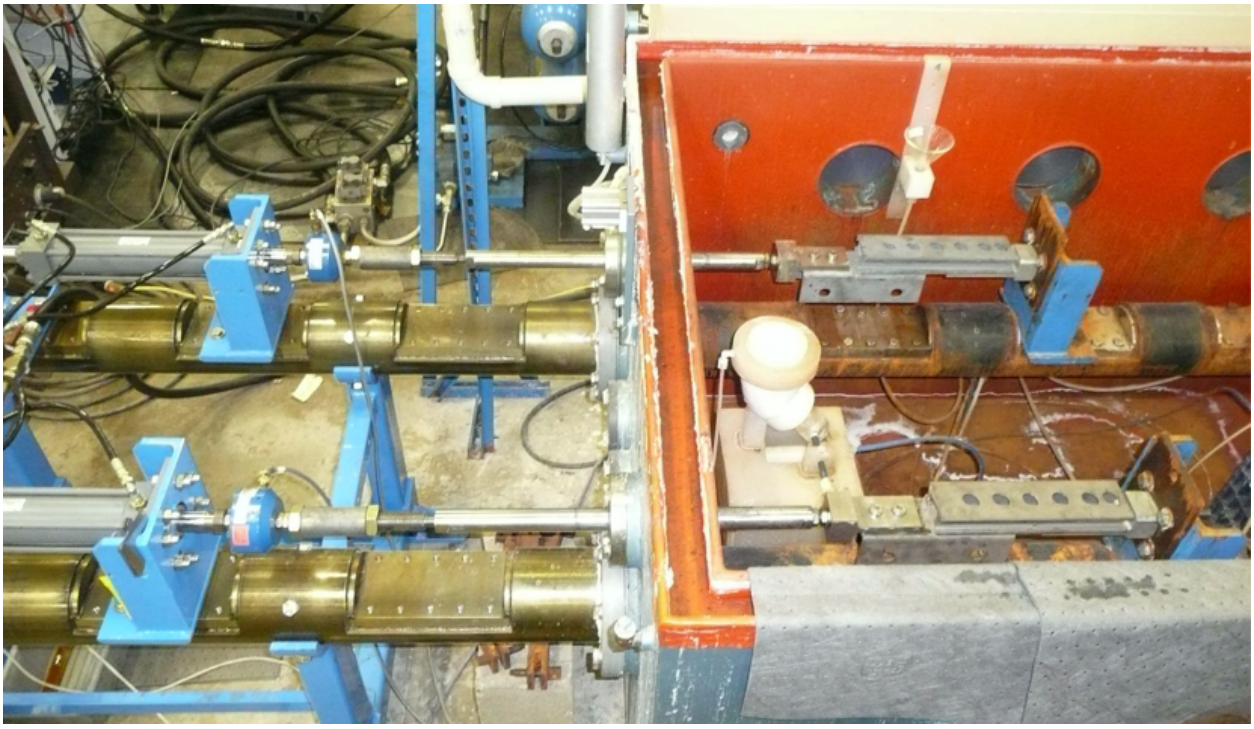
The test protocol combined cyclic mechanical loading and exposure to an array of corrosive substances, including several common de-icing salts. Samples were also pre-conditioned, involving temperature shock, humidity extremes, and abrasive blasting to demonstrate resilience to real-world environmental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

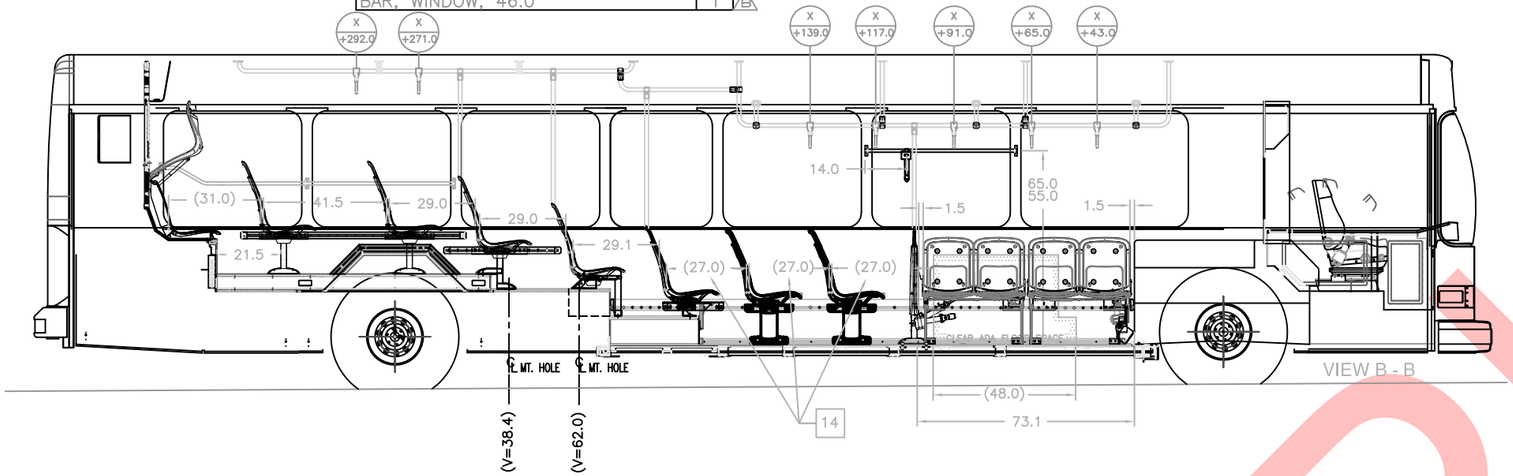


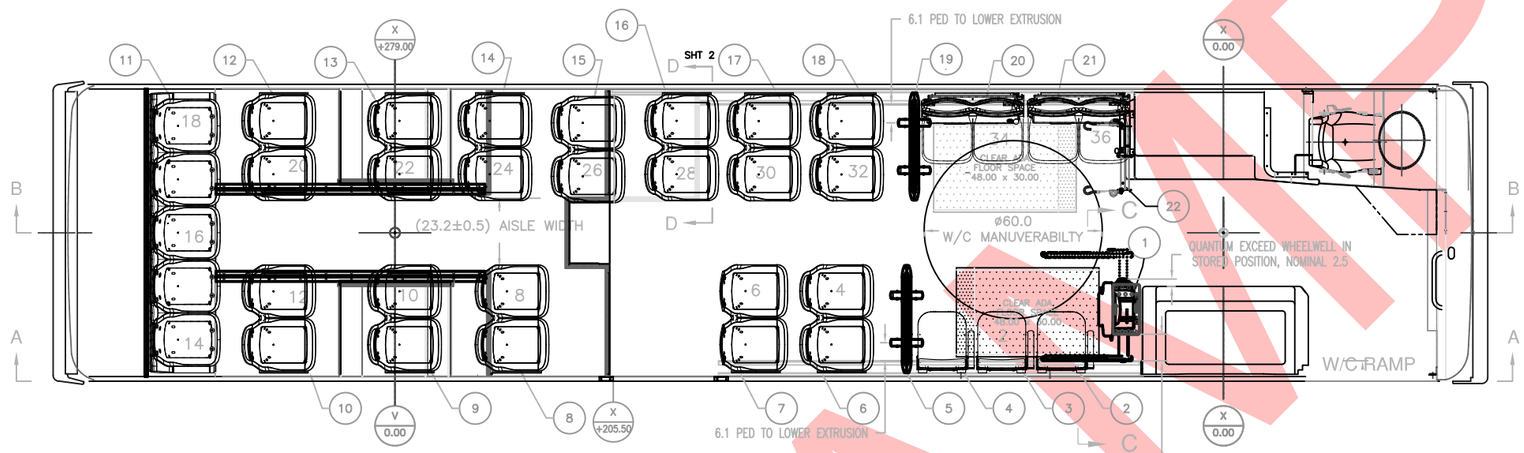
GILLIG PARTS	QTY	GILLIG PARTS	QTY
STRAPS, O/H GRAB	14	STANCHION, TRVS. @ 3RD STEP	2
STANCHION, TRVS. SHORT MT @ 2ND STEP	1	STANCHION, TRVS. SHORT MT @ 3RD STEP	1
STANCHION, W/C BARRIER	2	PANEL, MODESTY, 3RD STEP, C. SIDE	1
SIDEWALL, CS, FRAME/STRESS PANEL, REF: REI 133755	1	CHASSIS, CENTER, C. SIDE QUANTUM	1
STANCHION, 1.0 SINGLE OFFSET FWD RD	1	QUANTUM, GEN 2, 15-75222-004R2	1
		BAR, WINDOW, 46.0	1

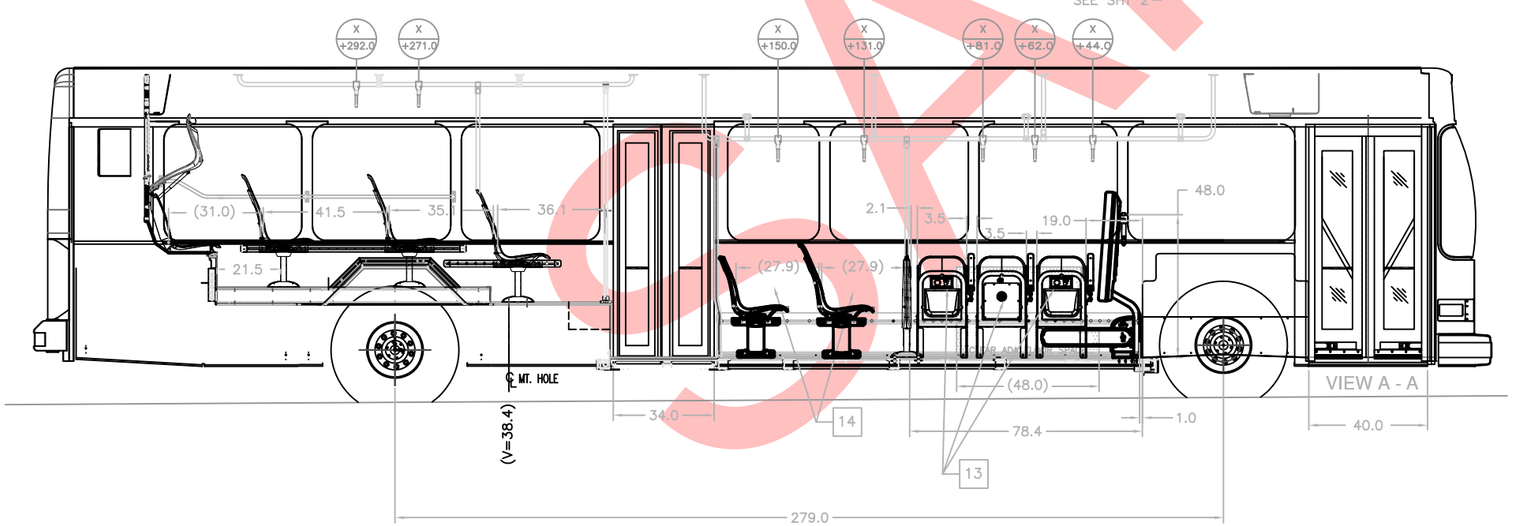
B	KMS		ADDED WINDOW BAR IN GILLIG PART LIST	178762	11/21/23

REVISIONS

SYM	DWN	ZONE	DESCRIPTION	REL.	DATE
A	APP		RELEASED FOR PRODUCTION	156393	07/21/21







NOTES:

1. *TO MAXIMIZE OCCUPANT CRASH PROTECTION AND REDUCE THE POTENTIAL FOR SIGNIFICANT INJURY TO PASSENGERS SEATED IN THE FIRST FORWARD FACING SEATS IMMEDIATELY REARWARD OF THE ADA AREA, GILLIG REQUIRES EITHER: 1.1 THE PLACEMENT OF A BARRIER FORWARD OF THESE SEATS. 1.2 USE OF A GRAB/STANCHION POLE FOR THE AISLE SEAT AND WALL MOUNTED GRAB HANDLE FOR THE OUTBOARD SEAT OR 1.3 SEAT BELTS ON BOTH THESE SEATS.*
2. ALL DIMENSIONS ARE IN INCHES.
3. FLOORING LAYOUT: SEE FL-67836R007 (ALLISON). SEE FL-67836R012 (VOITH)
4. THIS DRAWING IS TO BE USED FOR SEAT INSTALLATION. ALL OTHER GRAPHICS ARE SHOWN FOR REFERENCE ONLY. SEE BOM/ PAINT LAYOUT FOR EXTERIOR GRAPHICS AND GLAZING. FOR APPLICABLE O/H RAILS, TRANSMISSION HATCH, AND STANCHIONS, RACKS AND HANDLES ON WHEEL WELL SEE BOM/MEETING NOTES.

SEAT AND RESTRAINT NOTES:

10. SEATS & RESTRAINT BELTS MUST MEET FMVSS 209 & 302 STANDARDS.
11. ALL SEATS WITH T-PEDESTALS SHALL HAVE AN OPEN CHANNEL DESIGN. ALL SEATS WITH DIMENSION E=6.12 SHALL HAVE 3.0 LONG MOUNTING SLOTS.
12. W/C BELTS AND RETRACTORS: SEE SPEC SHEET, ALSO AFFECTS REMOTE BELT RELEASE TYPE IF REQUIRED:
    A. Q'STRAINT = Q'STRAINT PULL HANDLE LEVER
    B. SURE-LOK = SURE-LOK DUAL AUTO LOK (NOT AVAILABLE FOR OPTION P)
13. SEAT VENDOR TO INSTALL UNDER SEAT: SEE SPEC SHEET
    A: TOUCH PAD, QUANTUM BUTTON SWITCH, BELT CLIP AND PLACARD (THIS OPTION SHOWN)
    B: 12" TAPE SWITCH, QUANTUM BUTTON SWITCH, BELT CLIP AND PLACARD.
14. HIP TO KNEE DIMENSIONS SHOWN ARE NOMINAL. SEATS WILL BE EQUALLY SPACED.
15. FOR EACH W/C LOCATIONS WITH RESTRAINT MOUNTING DISTANCES GREATER THAN 60 INCHES SHALL INCLUDE (2) WEBBING LOOPS. TOTAL QTY SHIPPED LOOSE: 2 (REQUIRED FOR STREETSIDE ADA AREA)
16. REF: FOR SEAT SPECIFICATION OPTIONS AND OTHER SEAT DETAILS NOT SHOWN, SEE PURCHASING ORDER SPECIFICATION SHEET.
17. FOR ADA AISLE FACING FLIP-UP SEATS: SEE SPEC SHEET, OPTIONS ARE AS BELOW.
    A: INSIGHT = W/NARROW OR W/O NARROW
    B: INSIGHT PRIME AND PRIME+ = ALWAYS NARROW.
18. FOR ADA BC55/BC55NU WALL MTD FLIP UP SEATS: SEE SPEC SHEET FOR LIFT ASSIST OR AUTO RISE OPTION.

ITEM NUMBER	VENDOR PART NUMBER	(#) PASSENGER SEAT SIZE	(P) PEDESTAL (C) CANTILEVER	(G) GRAB HANDLE	(F) FLAT BACK PANEL	(QTY) STANCHION CLIP	NOTES AND COMMENTS
22		–	–	–	–	–	OPTION H, LH, WHEEL WELL MOUNTED
21		2	C	–	–	–	W/C FLIP-UP, STOP REQ.
20		2	C	–	–	–	W/C FLIP-UP, STOP REQ.
19		–	P	G	–	1	W/C BARRIER, (2) PED, P1=10.00, P2=16.00, E=8.0, SEE NOTE 12
18		2	C	G	–	–	
17		2	C	G	–	–	
16		2	P	G	–	1	(1) PED, Po=26.5, LOW MOUNT, ±1.5 TRAVEL
15		2	P	G	–	1	(2) PED, P1=5.90, P2=17.55, LOW MOUNT, ±1.5 TRAVEL
14		2	P	G	–	1	(1) PED, Po = 26.25, FLOOR & RISER MTD, ±1.5 TRAVEL
13		2	P	G	–	–	(1) PED, Po = 32.25, E=8.0
12		2	P	G	–	–	(1) PED, Po = 32.25, E=8.0
11		5	–	–	–	–	HINGED SETTEE, 1-3-1, GAS SPRINGS W/ SINGLE LOCKING PIN
10		2	P	G	–	–	(1) PED, Po = 32.25, E=8.0
9		2	P	G	–	–	(1) PED, Po = 32.25, E=8.0
8		2	P	G	–	1	(1) PED, Po = 26.25, E=6.12
7		2	C	–	–	–	
6		2	C	G	–	–	
5		–	P	G	–	1	W/C BARRIER, (2) PED, P1=10.00, P2=16.00, E=6.12, NO BELTS
4		1	C	–	–	–	BC55, W/C FLIP UP, FWD ARMREST, TOUCH PAD
3		1	C	–	–	–	BC55, W/C FLIP UP, FWD ARMREST, BELT CLIP & QUANTUM SWITCH
2		1	C	–	–	–	BC55, W/C FLIP UP, FWD ARMREST, TOUCH PAD
1		–	P	–	–	–	QUANTUM WITH LAP AND SHOULDER BELTS, PLACARD & SWITCHES (SEE GILLIG PARTS TABLE)

36 PASSENGERS

PASSENGER SEAT SUPPLIER:
AMERICAN SEATING CO.
PASSENGER SEAT MODELS:
INSIGHT 18.0 WIDE FWD FACING
INSIGHT 17.0 WIDE AISLE FACING, BC55 (CS ADA AREA)

FIRST CHASSIS
SEE PRODUCTION BOM

SIGNATURE ON THIS DRAWING INDICATES CUSTOMERS APPROVAL OF LAYOUT AND AGREEMENT THAT SAME IS IN COMPLIANCE WITH CUSTOMER'S SPECIFICATIONS. ONCE SIGNED THIS DRAWING BECOMES A PART OF

CONTRACT #_____

PURCHASE ORDER #:_____

SIGNED BY:_____
ACTING ON BEHALF OF AND WITH THE AUTHORITY OF

_____

STANDARD REVISION | DATE

DESIGNER: A. PATIL | DATE: 07/21/21

GILLIG
GILLIG LLC
LIVERMORE, CA

GILLIG DESIGN BULLETIN REQUIREMENTS: UNLESS OTHERWISE SPECIFIED

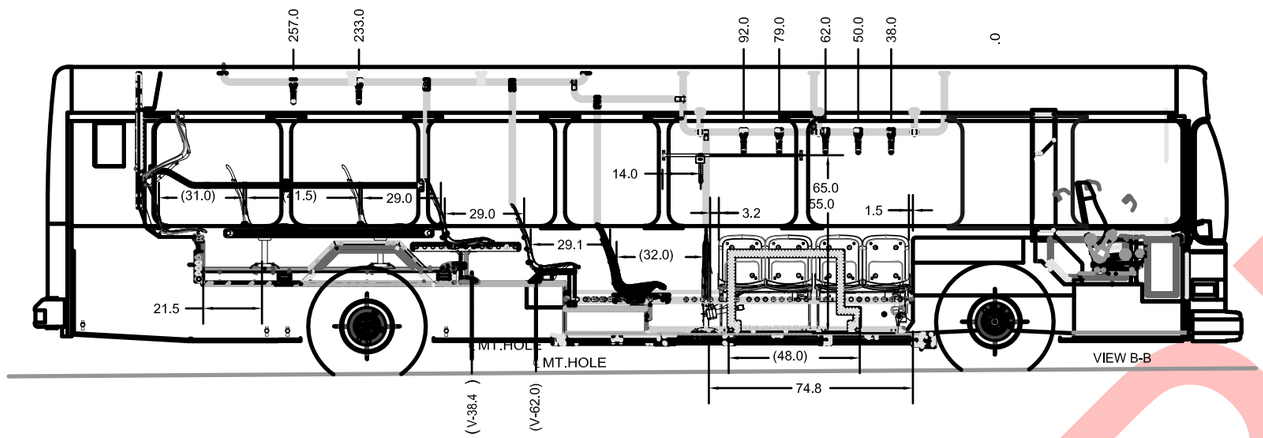
DESCRIPTION	DB NUMBER	REV
SETTEE:	DB 157.000	D
UPPER SECTION:	DB 157.001	C
CENTER SECTION:	DB 158.001	C
W/C RESTRAINT OPTION:	DB 152.014	AN
ADA CLEAR FLOOR SPACE:	DB 152.000	A
SEAT DIMENSIONAL SPEC.:	DB 152.001	D

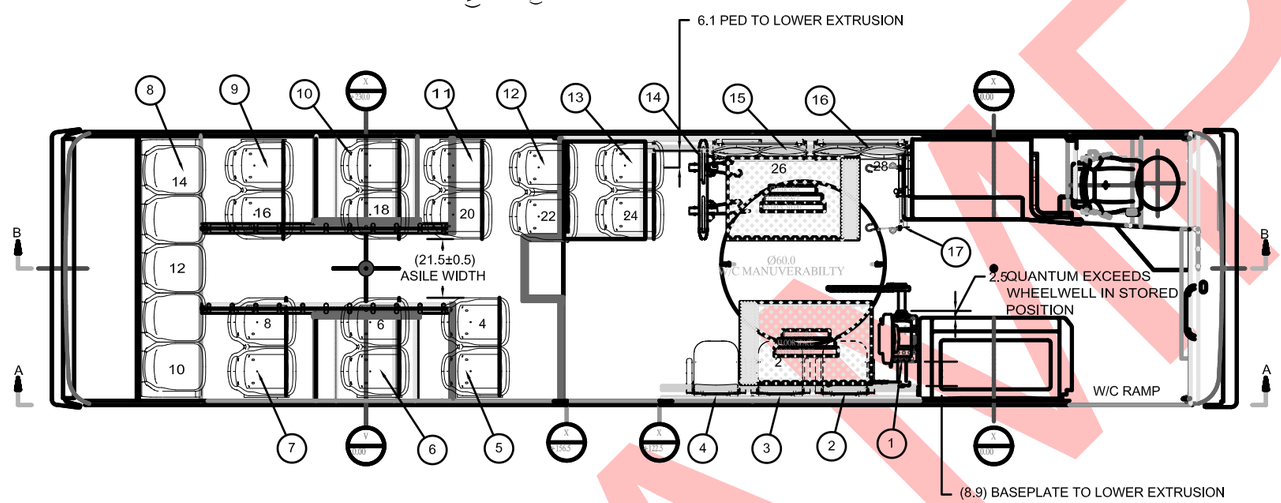
DIMENSIONING AND TOLERANCING ARE PER ANSI Y14.5M-1982. UNLESS OTHERWISE SPECIFIED:
HIP-TO-KNEE TOLERANCE NON PADDED SEATS: ±0.25 PADDED SEATS: ±0.50
LINEAR: .X ±.3 .XX ±.12 .XXX ±.060
ANGULAR ±5°
THIRD ANGLE
CAD SCALE: 1:51
SIZE B

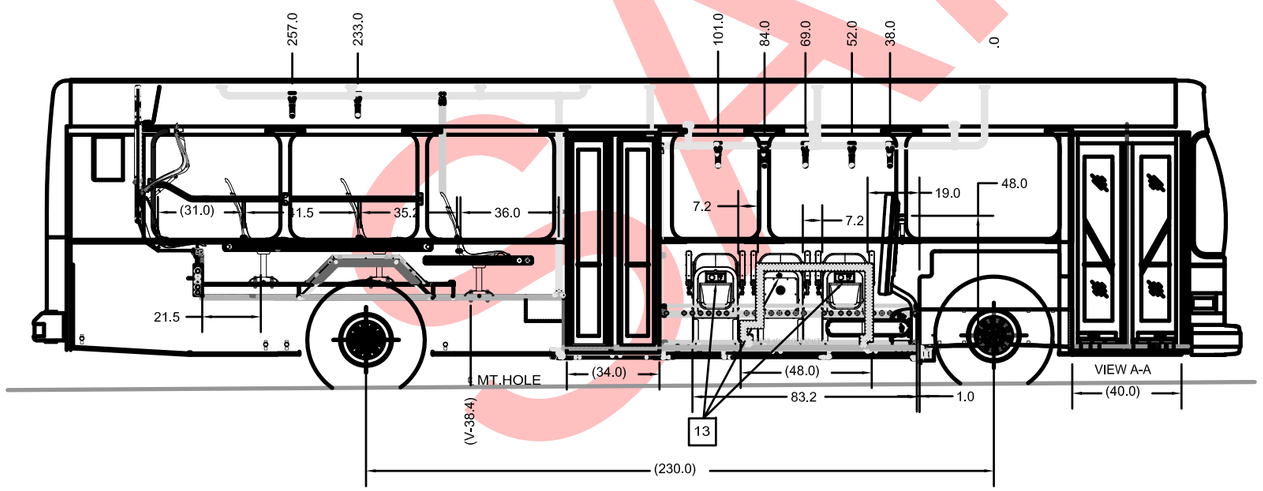
KIT & DIAGRAM, SEAT
LF2010 40' X 102"

JEFFERSON PARISH, LA

PART NUMBER
SL-83748-197023







ITEM NO	VENDOR PART NO	(#) PASSENGER SEAT SIZE	(F) PENETRALIC CANTILEVER	(G) GRAB HANDLE	(F) FLAT BACK PANEL	(QTY) STANCHION CUP	NOTES AND COMMENTS
17		-	-	-	-	-	QP-1 ION-H, LH, WHEEL WELL MOUNTED
16		2	G	-	-	-	W/C FLIP-UP, STOP REQ.
15		2	G	-	-	-	W/C FLIP-UP, STOP REQ.
14		-	P	G	-	1	W/C BARRIER, (2) PED, P1=16.00, P2=16.00, E=8.0, SEE NOTE 12
13		2	P	G	-	1	(1) PED, P=26.25, LOW MOUNT, ±1.5 TRAVEL
12		2	P	G	-	1	(2) PED, P1=5.80, P2=17.55, LOW MOUNT, ±1.5 TRAVEL
11		2	P	G	-	1	(1) PED, Po = 26.25, FLOOR & RISER MTD, ±1.5 TRAVEL
10		2	P	G	-	-	(1) PED, Po = 32.25, E=8.0
9		2	P	G	-	-	(1) PED, Po = 32.25, E=8.0
8		3	-	-	-	-	HINGED SETTEE, 1-2-1, GAS SPRINGS W/ SINGLE LOCKING PIN
7		2	P	G	-	-	(1) PED, Po = 32.25, E=8.0
6		2	P	G	-	-	(1) PED, Po = 32.25, E=8.0
5		2	P	G	-	1	(1) PED, Po = 26.25, E=8.12
4		1	G	-	-	-	BC55, W/C FLIP UP, 2X ARMREST, STOP REQ.
3		1	G	-	-	-	BC55, W/C FLIP UP, 2X ARMREST, BELT CLIP & QUANTUM SWITCH
2		1	G	-	-	-	BC55, W/C FLIP UP, 2X ARMREST, STOP REQ., SEE NOTE 13
1		-	P	-	-	-	QUANTUM WITH LAP AND SHOULDER BELTS, PLACARD & SWITCHES (SEE GILLIG PARTS TABLE)

B

28

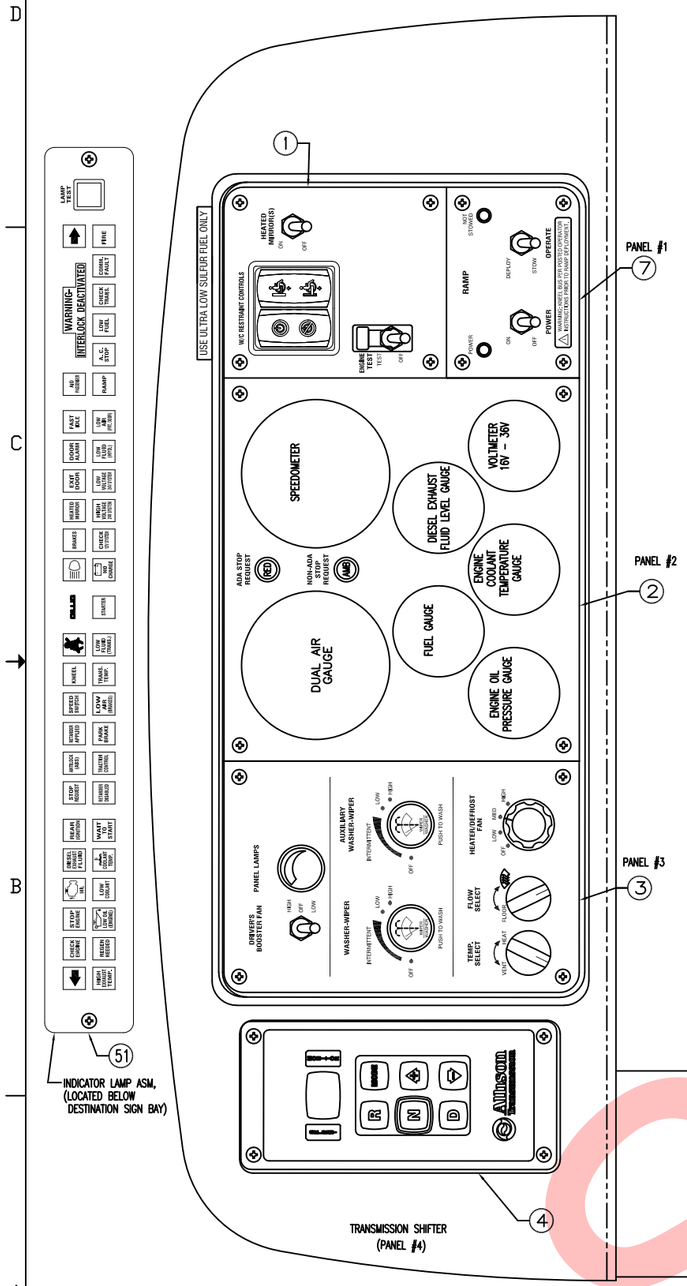
PASSENGERS

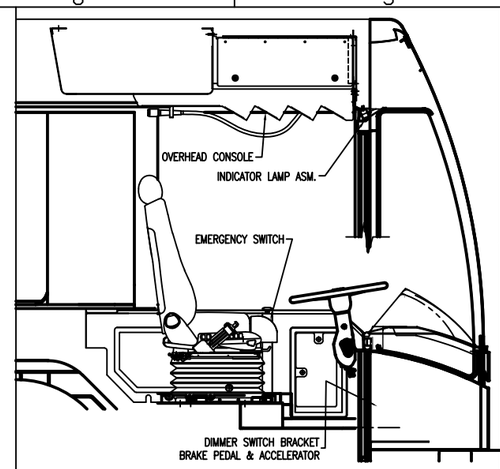
PASSENGER SEAT SUPPLIER:
AMERICAN SEATING CO.
-

PASSENGER SEAT MODELS:
INSIGHT 18.0 WIDE
FORWARD FACING
INSIGHT 17.0 WIDE AISLE
FACING, NARROW ADA AREA

GILLIG LLC
451 DISCOVERY DRIVE
LIVERMORE, CA 94551

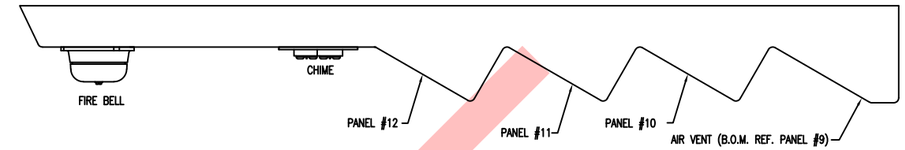
DWG NO SL-86299-199507
REV B
SIZE D
SCALE NONE
SHEET 2 OF 2





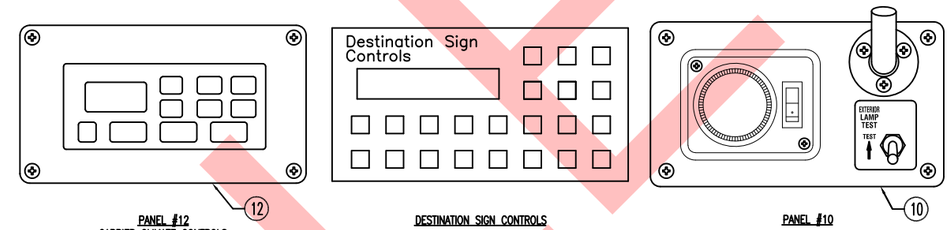
DRIVER'S AREA

SCALE: NONE



OVERHEAD CONSOLE

SCALE: NONE



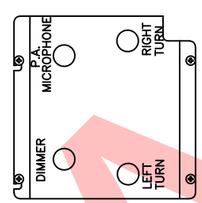
PANEL #12
CARRIER CLIMATE CONTROLS

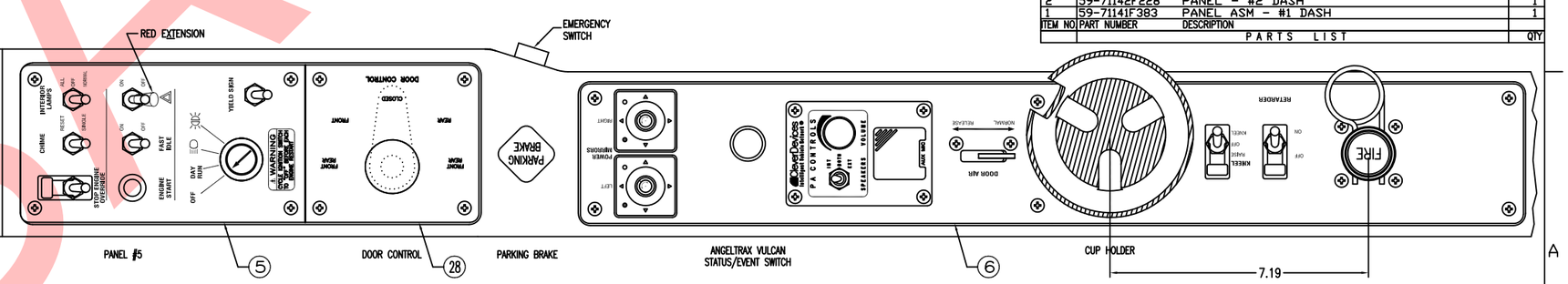
DESTINATION SIGN CONTROLS
(AT PANEL #11 AREA)

PANEL #10

OVERHEAD CONSOLE PANELS

SCALE: NONE





PANEL #5

DOOR CONTROL

PARKING BRAKE

ANGELTRAX VULCAN STATUS/EVENT SWITCH

CUP HOLDER

REVISIONS

SYM	DWN	ZONE	DESCRIPTION	REL.	DATE
A	RGS		CUSTOMER APPROVAL & PRODUCTION RELEASE	174906	08/01/23

ITEMS 1, 2, 3, 5, & 6 ARE PART OF THE DASH LAYOUT BILL OF MATERIALS (DL-#####-000).
ALL OTHER ITEMS ARE SHOWN FOR REFERENCE ONLY.

ITEM NO	PART NUMBER	DESCRIPTION	QTY
54			
53			
52			
51	SEE B.O.M.	LAMP ASM., INDICATOR	1
50			
45			
44			
43			
42			
41			
40			
33			
32			
31			
30			
29			
28	53-21754-035	DECAL, DOOR CONTROL	REF
27			
26			
25			
24			
23			
22			
21			
15			
14			
13			
12	30-37207F006	PANEL - OVERHEAD CONSOLE	1
11			
10	30-37207F052	PANEL - OVERHEAD CONSOLE	1
7	59-71147F000	PANEL ASM - #7 DASH	REF
6	59-83746F250	PANEL ASM - #6 DASH	1
5	59-71145F103	PANEL ASM - #5 DASH	1
4	30-39344F000	PANEL - SHIFTER MOUNTING	REF
3	59-71143F058	PANEL ASM - #3 DASH	1
2	59-71142F228	PANEL - #2 DASH	1
1	59-71141F383	PANEL ASM - #1 DASH	1

PARTS LIST

NOTES:
1.PANELS #3 AND #5 HAVE INCANDESCENT BACKLIGHTING PER FMVSS 101.
2. SOME FEATURES ARE FOR GRAPHIC PURPOSES ONLY AND DO NOT REFLECT ACTUAL CUSTOMER REQUIREMENTS. REFERENCE BILL OF MATERIAL FOR ORDER CLARIFICATION

SIGNATURE ON THIS DRAWING INDICATES CUSTOMERS APPROVAL OF LAYOUT AND AGREEMENT THAT SAME IS IN COMPLIANCE WITH CUSTOMER'S SPECIFICATIONS. ONCE SIGNED THIS DRAWING BECOMES A PART OF

CONTRACT #_____

PURCHASE ORDER #:_____

SIGNED BY:_____
ACTING ON BEHALF OF AND WITH THE AUTHORITY OF

_____

REMOVE ALL BURRS, BREAK SHARP EDGES

DIMENSIONING AND TOLERANCING ARE PER ANSI Y14.5M-1982 UNLESS OTHERWISE SPECIFIED TOLERANCES ARE IN INCHES

DECIMALS X ± .06 XXX ± .03 XXXX ± .030
ANGULAR ± .5°
1ST S.D.
THIRD ANGLE

GILLIG LLC
LIVERMORE, CA

MARK PART W/PN PER GIL DB #370.002
LH SHOWN, RH OPPOSITE — NONE

TITLE: INSTL- DASH/CONSOLE SWITCHES BRT

DWN: RGS	DATE: 08/01/23	MATER'L SPEC	
CHK'S INIT: RVS	DATE: 08/01/23	MFG STD	
APPR'S INIT: JBD	DATE: 08/01/23	PAVES COMPL.	STD NO 302
DRIG REL #: REI 174906	SIZE: D	DOCUMENT NO: DL-71493-002	
CAD SCALE: 1/2 = 1.0			

SHEET 1 OF 1

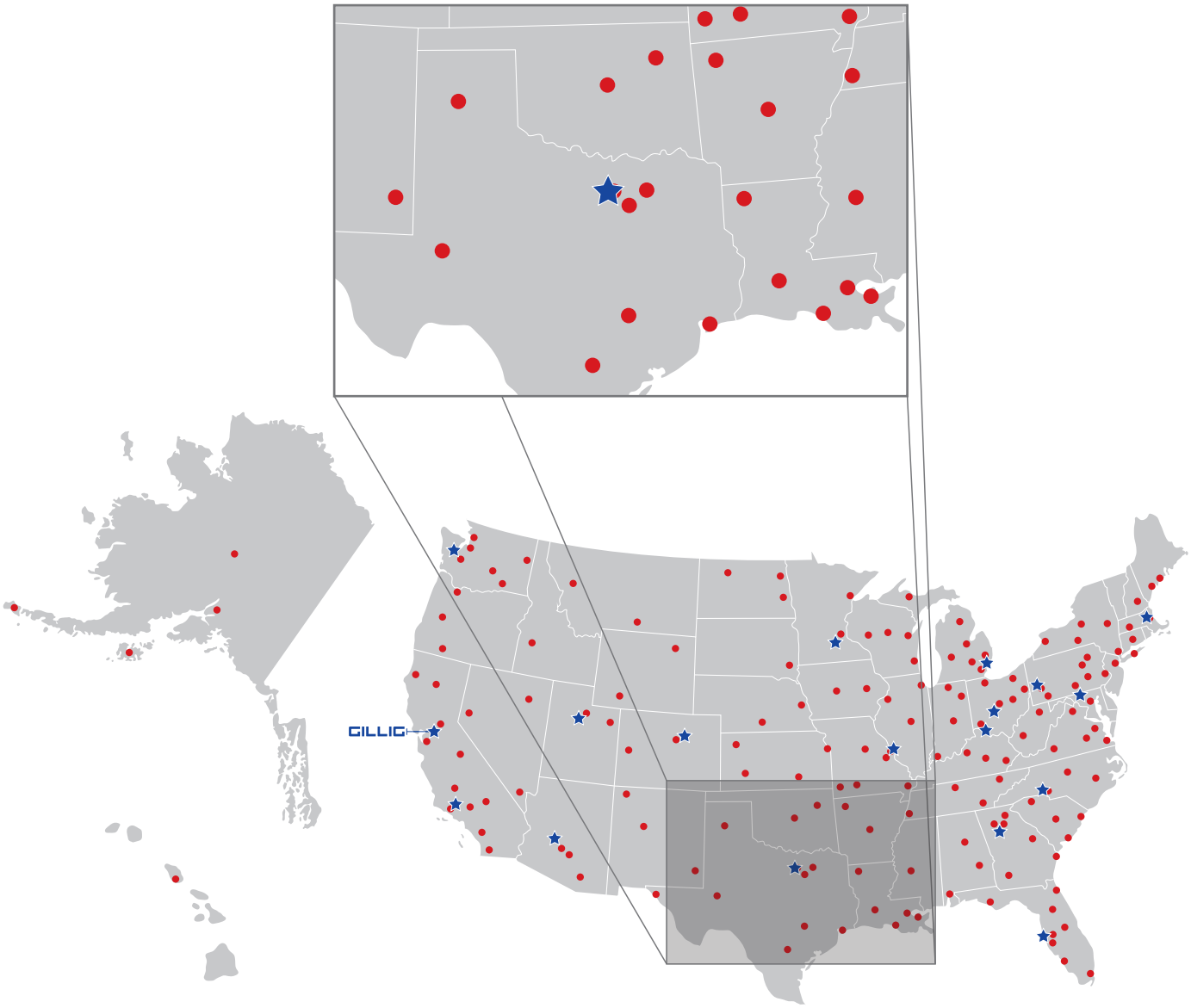
Unmatched service and support network across the US

GILLIG | Cummins

Partners you can trust.

★ GILLIG Field Service Technicians

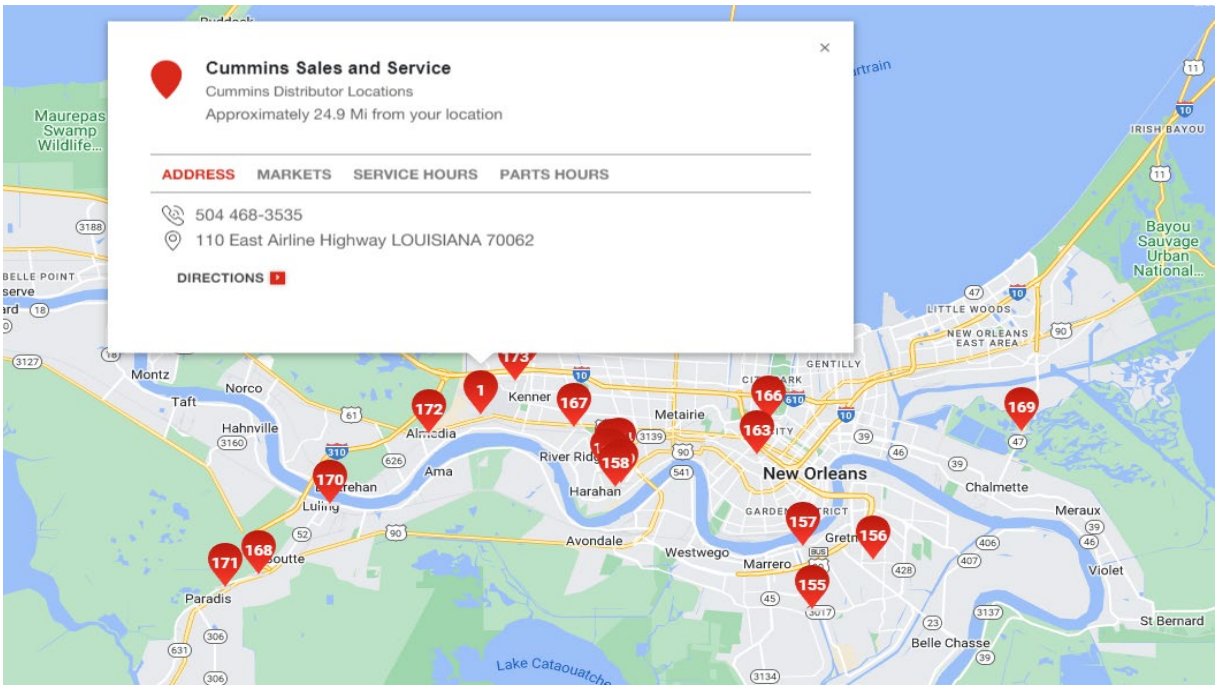
● Cummins Service Locations



GILLIG would like to advise Jefferson Parish, LA that GILLIG has an extensive Customer Care department to address issues that may arise after delivery. GILLIG maintains a staff of highly qualified neighboring Field Service Representatives throughout the country that can assist as needed. GILLIG also has dedicated troubleshooters that are available via phone or email should any issues arise, to include Field Service Managers and Engineers. Please see our Service and Support Package included with our bid for additional details.

GILLIG customers are highly encouraged to perform their own warranty and service work and bill GILIG accordingly at the agreed upon labor rate. GILLIG maintains a high-level staff of warranty professionals to include a Warranty Manager, Parts Specialist, and Processing Specialist. All of whom work diligently in getting your claim resolved efficiently. Please see our Warranty package included with our bid for additional details.

GILLIG also utilizes a network of partners to service their buses &/or specific components. Many of our major components prefer to perform their own warranty for these components. Cummins is a great partner to GILLIG, and has a vast network of service & support locations throughout the country. In most cases, this will be your main servicing location. Cummins has service center locations nearby Jefferson Parish, LA. Please see the below information regarding the specific service center location, and feel free to browse the Cummins website at https://www.cummins.com/locations for additional details.



GILLIG

CUSTOMER SUPPORT

OUR CORE VALUES

FAMILY

Our people matter

We consider each other to be the family that we have chosen, and we provide a caring work environment where every person is a valued, contributing team member.

QUALITY

Dedicated to excellence

We believe that quality must be the cornerstone of everything that we do, which relies on a team of great people focused on excellence each and every day.

SAFETY

Our top priority

We understand that nothing is more important than the well-being of our employees, our customers, and their customers; therefore, we make safety a top priority.

PASSION

Buses built with pride

We have a deep-seated pride for building the best buses on the market, and our passion fuels our urgency in the present and our commitment to the future.

INTEGRITY

Doing the right thing

We hold ourselves accountable to do the right thing with the right intentions every time, make fair and realistic commitments, and deliver faithfully on our promises.

VISION

To improve quality of life through transformative mass transit solutions.

MISSION

To design, build, and support the safest and most reliable transit buses in the United States. Our products help reduce congestion, contribute to a cleaner environment, and provide mobility to all.

(This page intentionally left blank)

OVERVIEW

This document is intended to give **an overview of the many types, levels, and categories of support you can expect from GILLIG**. Much of what is covered here is also described and explained elsewhere, but we thought a summarizing overview would help you understand what support is available and where to get it.

The information provided here is for your guidance and reference only. It is provided at GILLIG's discretion and does not necessarily imply any guarantees or contractual obligation (beyond your specific contract).

Some information may be proprietary or confidential, so we request you please maintain our trust and confidentiality.

CONTACT

We have also included contact information. For efficiency, we would prefer you contact the person/department associated with your need/request directly, but if you are uncertain or unsatisfied, please mention your concern to your Regional Sales Manager or e-mail Arminder.Dhillon@gillig.com.

BUS BUILD

GILLIG builds the entire bus at our new state-of-the-art facility in Livermore, California. The new expanded plant is now located 40 miles southeast of San Francisco (e-mail **sales@gillig.com** for directions and maps). The plant hours are from 5:00 a.m. to 1:30 p.m., and office hours are from 7:00 a.m. to 4:00 p.m. For safety reasons, safety glasses are required during plant operation and open-toed shoes, shorts, or loose/baggy clothes are not permitted.

A bus takes about **2 weeks to be built**. At the end of the production process, the bus spends a day or two in final inspection and road testing, after which it is authorized for delivery. Delivery can take from a day to a week or so, depending on the final destination (naturally Alaska and Hawaii deliveries take longer). GILLIG generally only delivers your bus at a rate of about one per day (see explanation below) or as otherwise agreed.

Raw material, purchased components, and fabrications are scheduled to arrive at or be completed in the plant around the start-of-production date for each build. **The date the first "chassis" starts at the beginning of the assembly line is a key date for our factory, and you will be notified of this date so you can plan your inspection visits.** We build to a just-in-time system so all parts are received/made to match each order's build schedule.

One of GILLIG's core quality strategies is to build in-station, because this ensures that we have the proper tools, fixtures, and expertise at a particular station for a particular build function; it also ensures that the components/parts are being assembled in the correct and optimized build

sequence (everything is there and nothing is in the way). This means that we must have everything scheduled precisely and everything must be on time. Consequently, we must have the build properly and completely defined and released well ahead of time. Our Bills of Material must be complete and everything fully organized and sequenced. Executed properly, the build is smooth and **the bus comes off the line complete and ready for delivery**. Historically, our execution has been almost flawless, and in fact **we've never been late on any delivery promise**. Accordingly, please plan to have your inspectors here as requested and plan to receive your buses as scheduled.

We have essentially 5 stages of production:

1. Chassis/undercarriage assembly

2. Body assembly

3. Paint

4. Trim

5. Final

GILLIG does not batch build, so your buses will not be scheduled one after the other, but rather in a sequence that separates each of your buses with 3, 4, or 5 other customer buses, so your buses may be scheduled as every 4th or 5th bus on our line. This is done for a number of reasons , including **providing enough time for your inspector to inspect and road test each bus**, as well as **ensuring a manageable delivery rate to your facility**. This build scheduling also ensures higher quality buses, helps our continuous improvement program, and assists our vendors in optimizing their quality, workload, and delivery programs.

GILLIG believes in strong mutual partnerships based on trust and respect, and this includes open and friendly communications at all times, including when your bus is in the build process. **You (and your inspectors) are welcome to go anywhere in our facility and talk to anyone while observing standard safety and privacy rules.** Our commitment to partnerships means we intend to build you the highest quality and most reliable buses, and deliver them on-time, and we appreciate your help in accomplishing these goals. Any input you have during our build process will be sincerely appreciated.

We look forward, with your help, to an on-time and successful build. Because we have a success rate of over 99.9%, **we can assure you of a smooth and trouble-free build process, a friendly and satisfying experience, and great buses, delivered when promised**.

CONTACT

Any comments or concerns during your build should be addressed to Plant Superintendents Christian Bartonico, Delio Vaz or our Plant Manager, Michah Denecour. They can be contacted by asking anyone in the plant or calling (510) 785-1500 and paging them.

(This page intentionally left blank)

DELIVERY

Buses are authorized for delivery after a road test and final inspection by both our Q.A. personnel and your inspector. Once buses are "green sheeted," our sales administrator schedules them for delivery with our drive-away service, and they usually leave our factory that evening or the next day. Sometimes buses may be held over for an extra day to avoid arriving at your facility during the weekend.

Our buses are generally delivered to your facility by road using a drive-away service (Alaska and Hawaii deliveries go by land and sea). The drivers usually drive at night (cooler and less traffic) and carefully observe tire, road, and vehicle speed limits and any other operating guidelines. They also report any unusual conditions or malfunctions to our Field Service Department. This road delivery is beneficial because it serves as a vehicle run-in and additional road test.

Deliveries can take from a day to a week, depending on the distance and travel conditions (road work, snow in the mountains, etc.). The delivery rate depends on your prearranged schedule, but is usually around 1 or 2 buses per day. **Upon arrival, your people should check out the bus, note any delivery damage, and sign for the bus**, which is then considered conditionally accepted. **This also triggers our Finance Department to implement invoicing, insurance switch over, etc. and our Field Service Department to schedule a service technician to conduct a post-delivery inspection (PDI) and provide vehicle familiarization to members of your staff.**

The buses may arrive with a ship-loose package (spare tire, bike rack, mud flaps, etc.). Please keep these with the bus as they could be needed to complete the PDI work.

Our deliveries are usually uneventful, but in the case of any problems or damage (stone chips, etc.) these should be noted on the delivery sheet to be fixed during our PDI. **Deliveries are on-time as promised and the buses are complete and functional**, and generally are finally accepted for service within a day or two.

CONTACT

Any delivery timing questions should be directed to our Sales Operations Coordinator at (510) 264-5015. Any issues or concerns about the bus condition/operation after delivery should be directed to our Field Service office at (510) 264-5077 or e-mailed to FieldService@gillig.com.

FIELD SERVICE

GILLIG's Field Service Department (FSD) is staffed by well-trained, caring professionals and many of the service technicians are ASE certified. **The department is divided into 3 main groups (explained below) that handle (1) field service, (2) warranty, and (3) training.** So if you have any questions or concerns in these areas, call our FSD office at (510) 785-1500, and they will help you to quickly resolve your issue.

Our FSD is responsible for the proper functioning (as designed and manufactured) of your buses after they leave our plant in Livermore. (Naturally it is your responsibility to properly service and maintain the buses.) Field Service personnel **conduct the PDI** and ensure the buses are **functioning properly** and are **signed off** (final acceptance) and put **into service** (warranty start date). They also conduct **vehicle familiarization** and take care of any initial **start-up issues** and any **warranty repairs**. They issue any necessary Service Bulletins and conduct any necessary **Vehicle Recall Campaigns**. They also schedule and conduct your specified **Product Training**. Each group's responsibilities are explained more fully below.

Field Service is responsible for ensuring that our buses operate as designed. Our service technicians are located around the country, and their activities are coordinated and scheduled out of the FSD office in Livermore, California. If you are having a functional or warranty problem with one of our buses, a call to our FSD office will start the process to get your problem fixed quickly.

Your maintenance staff can call (510) 264-5077 or (800) 735-1500 for immediate over-the-phone troubleshooting. If this doesn't resolve the issue, our FSD office staff will schedule a visit by one of our service technicians for hands-on troubleshooting. If the problem area is a GILLIG assembly, our service technician will provide the quickest resolution course; however, if a vendor component appears to be at fault, the vendor's local dealer will usually provide the quickest resolution. We may suggest you call and schedule a visit by a dealer technician, or we may ask for the bus to be taken to the dealer. We have found that it is generally better if you contact the dealer or manufacturer's representative directly as this eliminates the middle man (us) and ensures that the best description of the problem is provided. **Be assured that GILLIG will utilize the best resources to get you problem fixed as soon as possible, and that regardless of which method is used, we are still ultimately responsible for getting things resolved.**

Our Warranty 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 Administrator 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 and relayed to the 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 Director of Field Service for reconsideration. Your claim will be reviewed, and you will be notified of the review decision within a week or two.

GILLIG Training is also **scheduled through our FSD office**, and we do our best to accommodate your needs within overall budget/resource limits. **Our service technicians generally conduct vehicle familiarization training (if needed)** during PDI, just after your buses are delivered. **Mechanic training needs to be scheduled** ahead of time. Our trainers can hold classes in the day or evening to suit your needs. We can also shuffle or exchange training topics (e.g., more electrical and less doors) to suit your needs. Vendor training is also scheduled at this time. We can also split up or delay some training for months or a year or so, if you need to spread your training out.

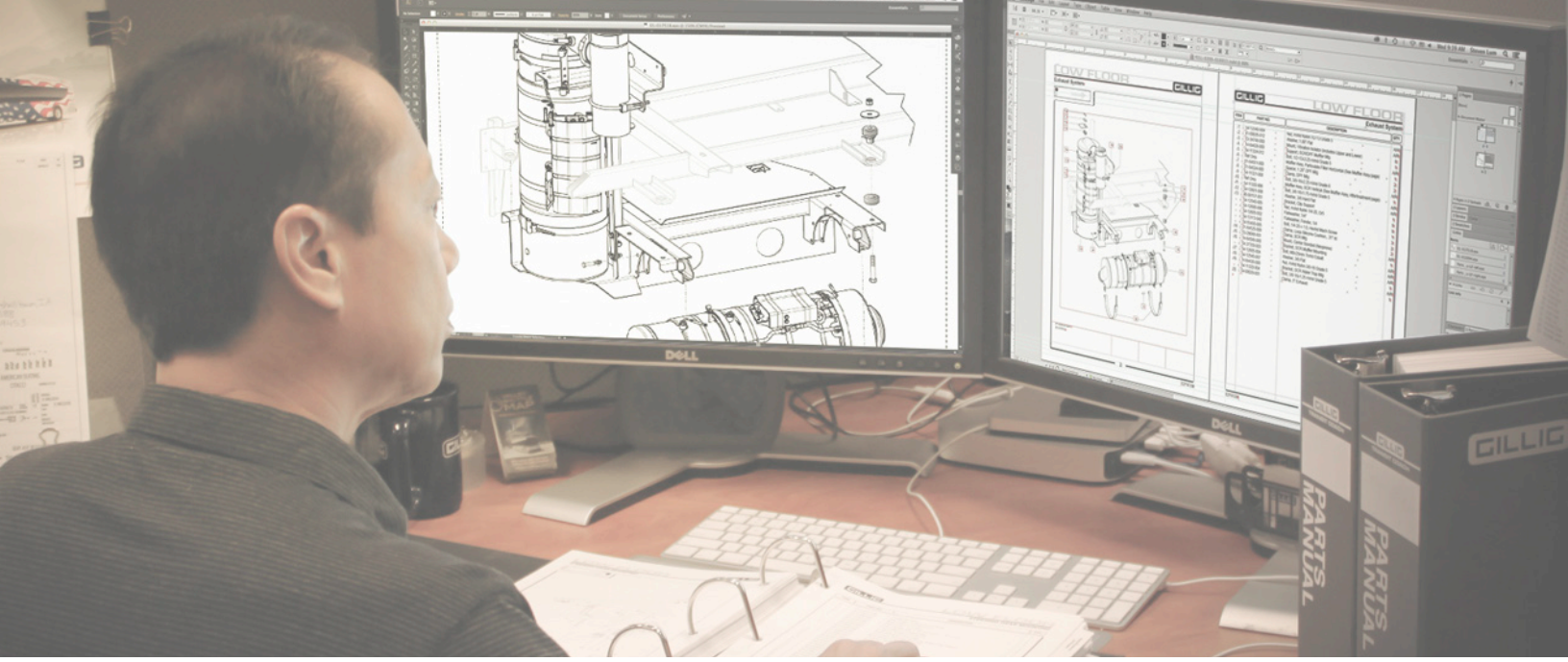
We will work with you and do our best to meet your training needs. We will also ship you a free set of DVD's containing training videos when we send you your GILLIG Service Manuals.

CONTACT

Feel free to contact our Field Service Department for assistance or if you have questions:

Field Service Coordinator
FieldService@gillig.com
Phone (800) 735-1500
Fax (510) 785-1348

GILLIG Service Department
451 Discovery Drive
Livermore, CA 94551



MANUALS

GILLIG's Publications Department produces a variety of different manuals for your buses. In addition, we send you a number of vendor manuals. In total, a set of manuals contains about 30 to 35 different manuals, which **will help you operate, maintain, service, and troubleshoot your buses** so that you can maximize their usefulness.

Each set of manuals is customized as far as possible for your particular build, down to component assembly levels. The manuals may contain some generic text (especially the vendor manuals) covering some non-specific details, but the basic parameters of size and configuration, as well as major components, drive train, major options, etc., will be customized to your build.

The GILLIG manuals are identified by the vehicle serial numbers that they cover, including a picture of your bus (and your bus number, if available), on the manual cover or inside cover page. So **please make sure that your people refer to the correct manuals by matching serial numbers** of the buses being worked on to those on the manual cover.

The manuals will be shipped to you automatically in the quantities specified or agreed upon in the pre-production meeting. The first group of manuals consists of the GILLIG *Driver's Handbook*, *Service Manual*, and *Electrical Schematics Manual;* OEM vendor manuals; and a transmittal letter listing all manuals sent or coming. This first group should arrive about 2 weeks after the delivery of first production bus. The last manual to be shipped is the GILLIG Parts Manual, intentionally delayed so that we can capture all last-minute production changes and Bill of Material updates, etc. This manual will usually arrive 4 weeks after the delivery of the first production bus. However, you should not need this manual for the first few months because any problem on your new buses should be covered by warranty; but if you do need parts in the interim, you can find part numbers on the Recommended Stocking List mailed to you before your bus deliveries start (explained in the Service Parts section). For warranty parts, our Warranty Department will find and order the right parts for you, and you can always call your GILLIG parts representative who will find the part numbers for the parts you need.

The ***Driver's Handbook*** is designed to acquaint drivers with the controls, features, and operating requirements of your buses. It is divided into 4 sections. Chapter 1 covers the driver's compartment and controls; Chapter 2 explains the passenger area seating, equipment, and exits; Chapter 3 describes the start-up and operating procedures; and Chapter 4 covers the wheelchair ramp operation and related egress/exit features for disabled passengers.

The ***Service Manual*** contains general servicing information for each specific build of the buses. It has over 500 pages of text, line drawings, and illustrations dealing with specifications, general information, and preventive maintenance requirements, as well as chapters describing the servicing and operation of the bus's major systems such as engine, suspensions, electrical, etc. This manual is supplemented by vendor manuals (described later), covering certain major components.

The ***Electrical Schematics Manual*** comes in two parts. The first part contains schematic drawings of various vehicle circuit systems. The second part shows the multiplex systems schematics with descriptions of the multiplex modules, complete with their input/outputs and related ladder diagrams. These manuals contain the circuit, harness, and device details that are explained more generally in the Service Manual's electrical section.

The ***Parts Manual*** consists of lists of serviceable parts, with illustrations and breakdowns to help you order replacement parts for your buses. The left-hand page contains the illustration and the facing right-hand page lists the part numbers. The illustration page features a small diagram of a bus in the top corner with a large dot showing where the components pictured on that page are located in the bus. A table of contents in the front and part number and description indexes at the back help locate the page and part you are interested in finding/identifying.

Electronic versions of GILLIG manuals are provided on CDs. These PDF documents are hyperlinked from the table of contents and index to help you find a particular part or page, and they are easily searchable by keyword or number. For proprietary and liability reasons, they are read/copy-only, password protected documents.

The **OEM vendor manuals** are produced by the manufacturers of major components (e.g., engine, axle, HVAC, etc.), and they describe these component assemblies along with servicing requirements, troubleshooting guides, and sometimes serviceable parts listings. GILLIG collects the relevant vendor manuals for your build and ships them in the appropriate quantities as part of the first manual shipment. Some important OEM vendor documentation is also included for your convenience on the GILLIG manual CDs.

General questions regarding manuals can be directed to your Regional Sales Manager. Questions or suggestions on content should be directed to GILLIG's Publications Department. And if you did not receive your manuals as promised (quantity, damaged, or not in the time frame noted above), you should call or e-mail the contact below.

CONTACT

Feel free to contact our Publications Department for assistance or if you have questions:

Heather Baron, Publications Manager
Heather.Baron@gillig.com
(510) 264-5184

GILLIG Publications Department
451 Discovery Drive
Livermore, CA 94551

(This page intentionally left blank)

SERVICE PARTS

Our Parts Department will take care of your service parts needs. We have a good reputation for fast, friendly, and responsive service, and we can generally fill about 92% of parts orders within 48 hours. Additionally, our West Coast location means we are still open even when it's late in the day for most of our Midwestern and Eastern customers.

GILLIG's parts representatives are assigned to specific customers, so your parts representative will know your people and your fleet (if you need a part and don't know the number, you can describe it to your parts representative who will get the number and fill the order for you). We maintain a huge inventory of parts in our warehouses; parts and locations are bar coded and tracked in real time to increase the accuracy and speed of filling parts orders. We also stock parts "in-process" at our suppliers, so they can be quickly finished to your specifications. Another benefit is that East Coast customers can order parts at 5:00 p.m. (their time) and still have them ship out the same day.

All parts ordered by eastern customers (east of the Rockies) are shipped freight paid, second-day air. Western customers get their parts freight paid, best way. We also have a "**Bus Down" expedited service that ships parts the same day** (order receipt by 3:00 p.m. PST, and if in stock), via next-day air (for this service, you pay the freight).

Before your buses arrive, you will receive a **Recommended Stocking List for frequently used parts for your particular buses**. Purchasing these parts for your stockroom will ensure that you have the commonly needed parts in your inventory, thus reducing downtime for your new fleet. The list contains both consumable parts and frequently damaged repair parts, and is based on our past experience with other customers.

You will find that the people in our Parts Department, like everyone at GILLIG, are friendly, efficient, on-time, and reliable. **And they will be more than happy to help you with parts for your non-GILLIG buses as well.**

During the pre-production meeting, you will meet our Parts Department people and your assigned parts representative, who will explain their service and terms as well as provide specific sales contacts.

CONTACT

Feel free to contact our Parts Department for assistance or if you have questions:

Eiji Kinoshita, Sales Director
Eiji.Kinoshita@gillig.com
(510) 264-5129

GILLIG Parts Department
25972 Eden Landing Rd.
Hayward, CA 94545

(This page intentionally left blank)

SERVICE BULLETINS

Our Field Service Department issues **Service Bulletins** when necessary, and these are mailed to the Maintenance Managers on record for impacted customers.

Our FSD also issues any **Recall Notices** as required. In addition, the Sales Department sometimes issues **Advisories** (e.g., on biodiesel use), and these are mailed to the General Manager or Maintenance Manager, as appropriate.

These notices are intended to keep our customers informed and assist in the proper maintenance and safe operation of our buses.

CONTACT

Contact our Field Service Department at (510) 264-5075 or e-mail FieldService@gillig.com for assistance.

YOUR HELP LINE

Our Field Service Department provides a good help line for product issues. They routinely involve our Engineering Department as well as our vendors to help resolve issues. One way or another, they will get you an answer or resolution to your concern or problem.

CONTACT

In addition, you can call your Regional Sales Manager or Project Sales Manager for help, or if you are unsatisfied with the responses or treatment from other GILLIG departments. **The Sales Department is ultimately responsible for your satisfaction**, so if other avenues fail, call Sales at (510) 264-5010 or e-mail Sales@gillig.com and someone will get back to you right away.

FUTURE TRENDS

GILLIG is committed to continuous improvement. This requires us to keep up with future trends in product features and designs as well as future technologies and better products.

GILLIG has a 3-phase research program. The first phase, "Futuring," comprises thinking of and assessing things that can shape our future. Phase 2 is "Visioning," which involves making ideas into things that will create the future we envision. "Development," or Phase 3, consists of transforming the "things" identified in Phase 2 into practical products with customer benefits. So while most of our research is applied research, it does contain elements of post-pure and pre-applied research.

We are always evaluating new ideas and researching new products to ensure that we offer you the right products at the right time, without compromising reliability or value. For example, we researched and developed the hybrid drive technology for 8 years and then introduced the world's first parallel hybrid bus in 2001. We then field tested it to ensure its reliability and finally released it for production in 2005.

So you can rely on GILLIG to bring you cutting-edge products, but save you from being on the bleeding-edge of new technology introductions.

CONTACT

If you have an interest in any future trends or technologies, contact your Regional Sales Manager and we will give you the latest status on various technologies and advise you on which trends/technologies are promising and which are not.

FUTURE ORDERS

GILLIG wants to become your long-term bus manufacturer. We want your repeat business, and we are committed to earning your future business by ensuring satisfaction with your current order.

Discuss your probable future orders with your Regional Sales Manager, so he can help you with timing, options, and potential new features and technologies. If you plan on exercising quantity options, he can help you schedule these buses into our production backlog and can inform you of the necessary lead times, so you can plan bus purchase order dates based on when you would like to receive your new buses.

Our Regional Sales Managers can also inform you about new features or options we will be offering in the near future, as well as when new regulations (e.g., emissions) become effective, so you can decide on your new bus configuration and timing, and program your funding and purchase orders accordingly.

If you let us know your future bus purchasing plans, we can also shorten your lead times by plugging your planned order into our build schedule and thus hold build slots while you are getting the paperwork sorted out. We can also assist with piggyback options if needed.

CONTACT

Please feel free to discuss your likely future orders with your Regional Sales Manager or at the pre-production meeting, and **let us help expedite and smooth out the process of getting your next buses**.

SUMMARY

We hope this overview of our customer support helps you understand what we can do to help you get the most satisfaction from your GILLIG buses. Thank you for your business. Please let us know if you have any issues or concerns. We want to satisfy you on this order, and we want to continue to earn your future business.

CONTACT

If you have any questions, suggestions, or ideas to improve our service or products, please send them to Sales@gillig.com or contact Arminder Dhillon, at (510) 264-5129 or Arminder.Dhillon@gillig.com.


www.samtrans.com
samTrans
616

GILLIG

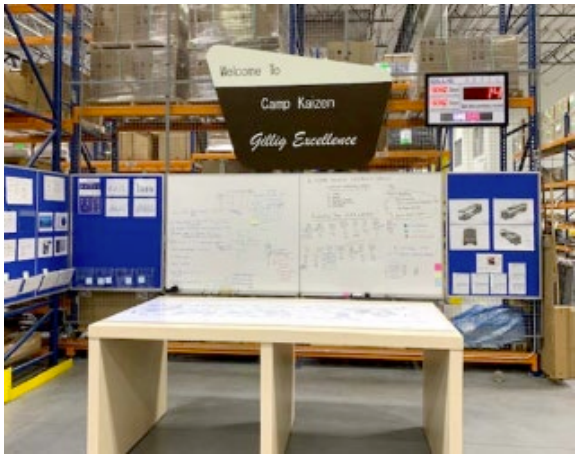
CONTINUOUS IMPROVEMENT PROGRAM

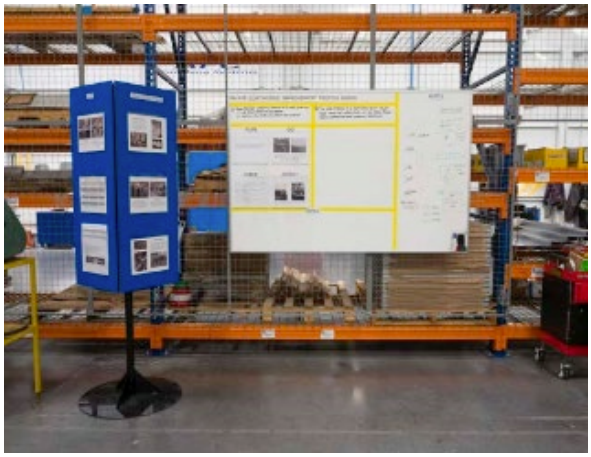
GILLIG continues to enhance our manufacturing process through our Continuous Improvement (CI) Program. Using Lean methods, our CI Program employs metrics and specific tools, like 5S (Sort, Set in order, Shine, Standardize, and Sustain), to streamline our manufacturing process, increasing efficiency and 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 OVERVIEW

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 constantly 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 (546) 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.

- Specific Checks:
  - Chassis (4a, 4b, 4c) 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
  - Alignment, Dyno, Road Test (10, Ready Row) 53 checks
- Total Documented QA Checks = 546

Quality Manual

Approved by Director of Quality: Michael Stacy

CONTENTS

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.

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".

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.

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
  - Inspection standards based on Engineering designs, rules, and regulations.
  - Revise GILLIG Quality Manual & update GILLIG Supplier Quality Manual.
  - GILLIG PPAP education and guidelines.
- Continuous Improvement
  - In station quality through error proofing.
  - Lean methodology creates more enablers through elimination of waste.
  - Be Effective by doing the right thing.
  - Be Efficient by doing things right.
  - Supplier Quality Management focused on defect prevention.
- Teamwork
  - Champion Quality culture.
  - Communication and feedback loop.
  - 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.
- 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 pre-build 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 Contract Change, the change cannot be made Manufacturing until it is approved in writing by GILLIG Sales through issue of a Production Change Order (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

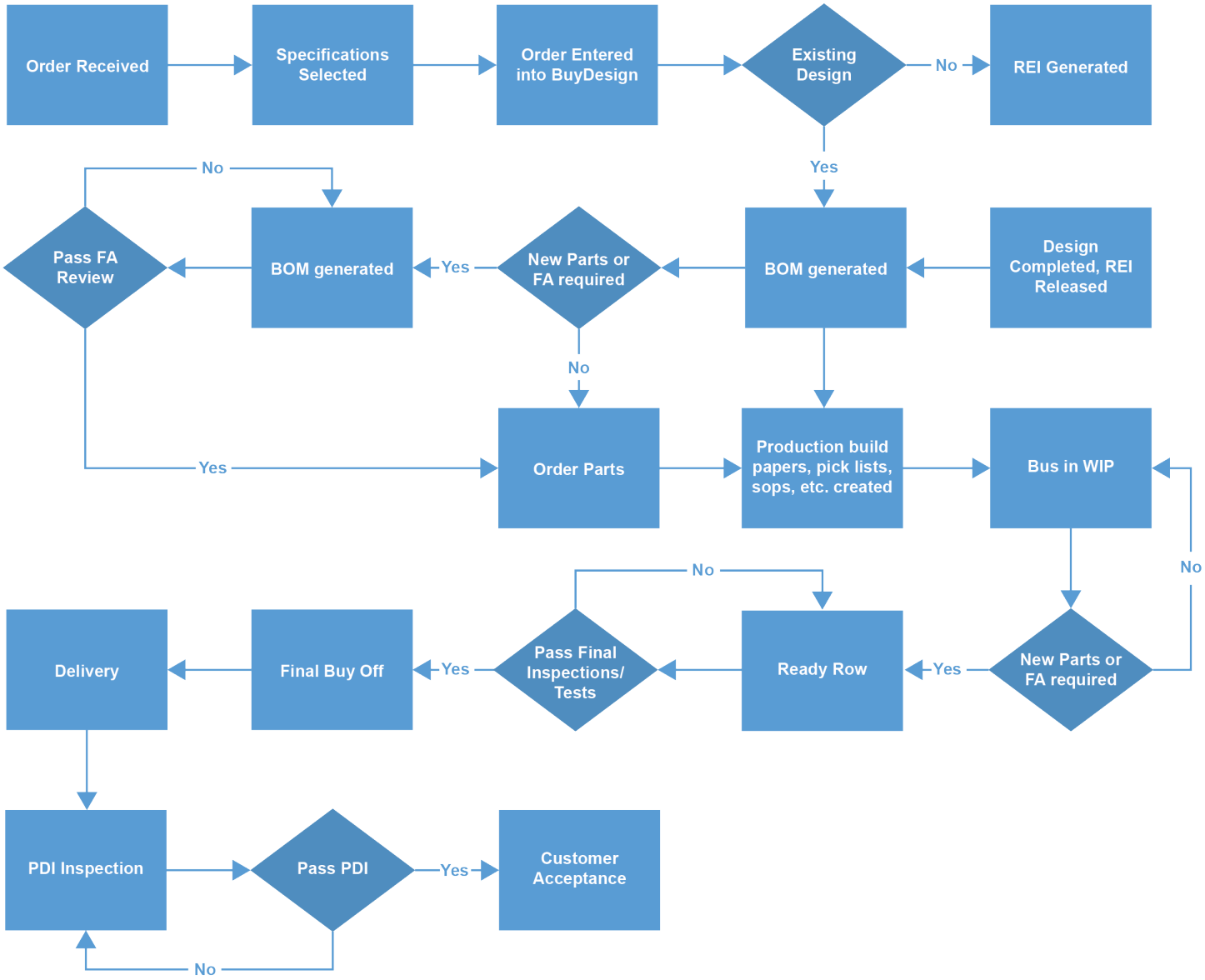
Customer requirements from By Design

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.

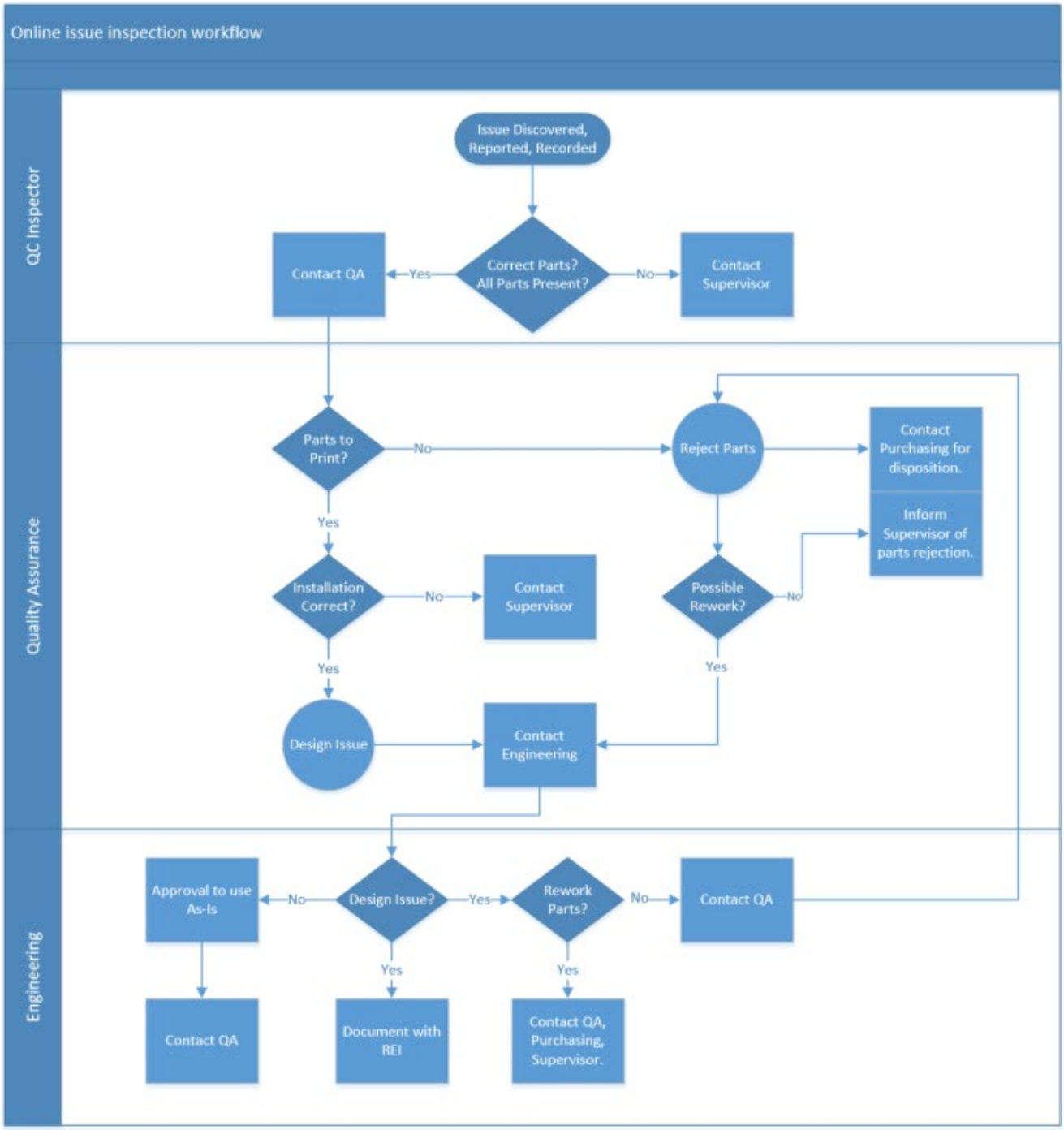
Build Process

The GILLIG bus build process uses the following workflow.



Inspection Process

The standard GILLIG inspection process uses the following workflow.



Documentation

GILLIG Inspection Record - “Hardcard”

All bus inspections are documented and recorded on the Hardcard.

GILLIG INSPECTION RECORD

CUSTOMER	COACH NO.	CHASSIS SERIAL NO.
Air Conditioning System PDI	Chassis Start Date / 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.		

CHASSIS DEPARTMENT (04A & C)

CUSTOMER _____ CHASSIS SERIAL NO. _____

04A OPERATIONS	PROD	QC	04C OPERATIONS	PROD	QC
1. Chassis Length, Brake, Wheelchair, Door Opt			1. Flag Panel Install & 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 + Gushy Floats			5. Exhaust Test Ports and Plugs		
6. Chassis Hack 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, Purge Tank, Kneeling + Leveling Valves			10. Electrical Harnesses & Clamps		
			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. Hydraulic 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, Stacks, & 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					

DEPT	DC	BS	DISCREPANCIES	PROD	QC
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					

6 GILLIG Inspection Record

Serial numbers required for tracking, warranty and service are also recorded in the Hardcard.

SERIAL NUMBER

CUSTOMER _____ CHASSIS SERIAL NO. _____

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.		
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.		
B.		
16. DEF Tank		
17. Voltage Regulator		
18. Radiator		
19. Fuel Tank		
20. Air Cond. Compressor		
21. Equalizer / Vanner		
22. Muffler-DPF		
A. SCR		

4 GILLIG Inspection Record

SERIAL NUMBER

CUSTOMER _____ CHASSIS SERIAL NO. _____

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. 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.		
B.		
C.		
46. Farebox Keypad		
47. Camera		
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
48. Rear View Camera		

DEPT 5A LABEL HERE

07.13.2020 GILLIG 5

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.

CUSTOMER PICK-UP INFORMATION

TO: SALES DEPARTMENT

DATE COMPLETED _____

CUSTOMER: _____ SERIAL NO. _____

☐ LOW FLOOR MODEL _____ ☐ SERVICE DEPT REPAIR WORK # _____

☐ HYBRID MODEL _____ ☐ OTHER _____

BUS MILEAGE _____

ALL ITEMS SHIPPED LOOSE INSIDE BUS OR ITEMS MISSING FROM BUS MUST BE RECORDED:

SHIP LOOSE ITEMS						SHIP SHORT ITEMS
☐	TIRE/WHEEL	☐	WHEEL CHOCKS	☐	TRIANGLE SET	
☐	TRANS FILTER	☐	WEB BELT CUTTER	☐	FIRST AID KT	
☐	HVAC FILTER	☐	FAREBOX VAULT	☐	POPPIT VALVE	
☐	ADD FRAME	☐	BIKE RACK	☐	_____	
☐	SCHED. RACK	☐	KEY SET	☐	_____	
☐	FAREBOX GUARD	☐	FIRE EXT.	☐	_____	

GILLIG Q.C. APPROVED: _____
DATE _____

RESIDENT INSPECTOR APPROVED: _____
DATE _____

(FOR ALL VEHICLES – ATTACH WEIGHT CERTIFICATE AND FEDERAL SERIAL REGISTER)

TO: SERVICE/ACCOUNTING/PUBLICATION DEPTS.
+ copy of Serial Register

ESTIMATED DELIVERY DATE BUS: _____

SALES DEPARTMENT

☐ DELIVERY SLIP
☐
☐ DMV LICENSE (CA ONLY)

OUT OF STATE:
☐ M.S.O./WEIGHT CERT TO ACCOUNTING

NOTE: _____

DATE LEAVES FACTORY _____ DELIVERY BY _____

REQUESTED BY _____

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.

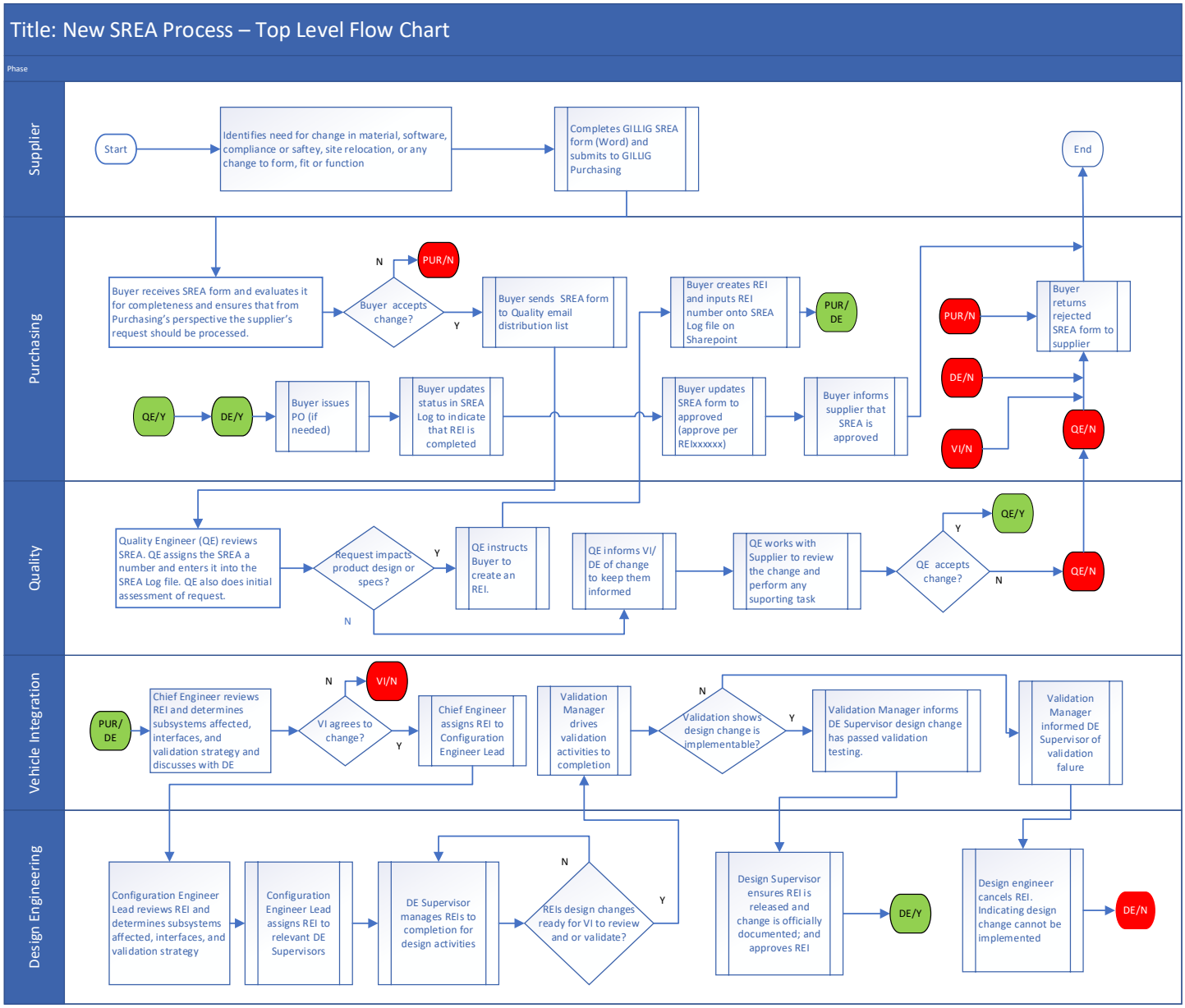
Change In Products Form, Fit or Function*:*

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.

GILLIG will follow the process details identified on the flowchart on the next page to ensure that GILLIG is always shipping buses that are reliable and meet the customer's quality expectations.

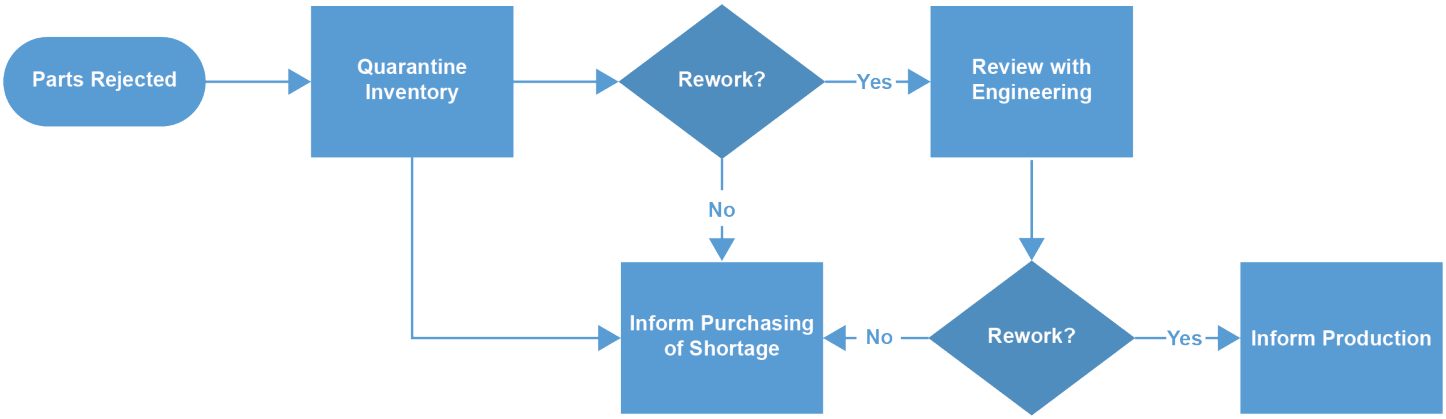

Title: New SREA Process – Top Level Flow Chart
Phase
Supplier
Purchasing
Quality
Vehicle Integration
Design Engineering
Start
Identifies need for change in material, software, compliance or saftey, site relocation, or any change to form, fit or function
Completes GILLIG SREA form (Word) and submits to GILLIG Purchasing
End
Buyer receives SREA form and evaluates it for completeness and ensures that from Purchasing's perspective the supplier's request should be processed.
Buyer accepts change?
N
PUR/N
Y
Buyer sends SREA form to Quality email distribution list
Buyer creates REI and inputs REI number onto SREA Log file on Sharepoint
PUR/ DE
PUR/N
Buyer returns rejected SREA form to supplier
DE/N
VI/N
QE/N
QE/Y
DE/Y
Buyer issues PO (if needed)
Buyer updates status in SREA Log to indicate that REI is completed
Buyer updates SREA form to approved (approve per REIxxxxxx)
Buyer informs supplier that SREA is approved
Quality Engineer (QE) reviews SREA. QE assigns the SREA a number and enters it into the SREA Log file. QE also does initial assessment of request.
Request impacts product design or specs?
Y
N
QE instructs Buyer to create an REI.
QE informs VI/ DE of change to keep them informed
QE works with Supplier to review the change and perform any suporting task
QE accepts change?
Y
N
QE/Y
QE/N
PUR/ DE
Chief Engineer reviews REI and determines subsystems affected, interfaces, and validation strategy and discusses with DE
VI agrees to change?
N
VI/N
Y
Chief Engineer assigns REI to Configuration Engineer Lead
Validation Manager drives validation activities to completion
Validation shows design change is implementable?
N
Y
Validation Manager informs DE Supervisor design change has passed validation testing.
Validation Manager informed DE Supervisor of validation falure
Configuration Engineer Lead reviews REI and determines subsystems affected, interfaces, and validation strategy
Configuration Engineer Lead assigns REI to relevant DE Supervisors
DE Supervisor manages REIs to completion for design activities
REIs design changes ready for VI to review and or validate?
N
Y
Design Supervisor ensures REI is released and change is officially documented; and approves REI
DE/Y
Design engineer cancels REI. Indicating design change cannot be implemented
DE/N

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.

Non-conformance

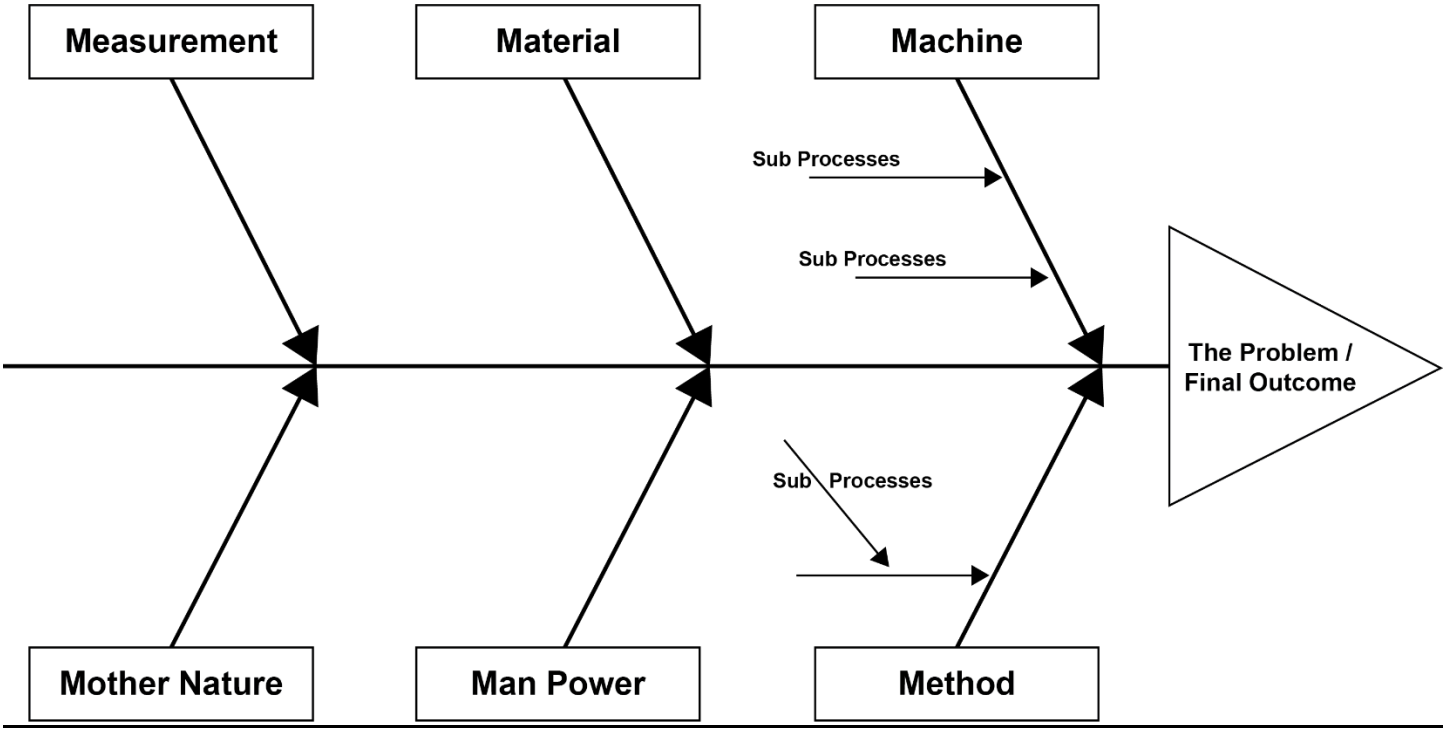
Parts that are rejected are processed with the following workflow.



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. Tools such as fix bone diagrams, 5 Whys, Lean Manufacturing, 8-D Problem Resolution, and DMAIC principles.

Fishbone Diagram



8D

The 8D approach is used to resolve problems, establishes a permanent corrective action by determining the root causes.

Gillig - 8D Response Report

WHO IS EFFECTED BY THE PROBLEM?		Date Open:		8D No.:	
Company:		Initial Response:			
Address:		Target Close Date:			
		Revision Date(s):			
Fleet:		8D Initiator:			
Part No.		Actual Close Date:			
D1 TEAM MEMBER NAMES/TITLES:		**D2 PROBLEM STATEMENT/DESCRIPTION (quantify) (one defect per 8D)**			
Champion:					
Team Leader:					
Team Members:					

D3 CHOOSE AND VERIFY INTERIM CONTAINMENT ACTION(S) (ICA):	% Effective:	Target Date:	Actual Date:
HOW DID YOU VERIFY THE EFFECTIVENESS OF THE ICA?			

D4 DEFINE AND VERIFY ROOT CAUSE(S):					**% Contribution:**
HOW DID YOU VERIFY THE ROOT CAUSE(S)?					

D5 CHOOSE AND VERIFY PERMANENT CORRECTIVE ACTION(S) (PCA):			**% Effective:**
HOW DID YOU VERIFY THE EFFECTIVENESS OF THE PCA?:			

D6 IMPLEMENT AND VALIDATE PERMANENT CORRECTIVE ACTION(S) (PCA):			Target Date:	Actual Date:
HOW WILL YOU VALIDATE THE PCA?				

D7 SYSTEM PREVENTION ACTIONS TO PREVENT RECURRENCE: **Mistake Proofing:** How are you going to ensure it can't happen again?	Target Date:	Actual Date:

D8 TEAM AND INDIVIDUAL RECOGNITION: Recognize the collective efforts of the team.

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

Sample Size Code Letters

Lot/Batch Size			Special inspection levels				General inspection levels		
			S-1	S-2	S-3	S-4	I	II	III
2	to	8	A	A	A	A	A	A	B
9	to	15	A	A	A	A	A	B	C
16	to	25	A	A	B	B	B	C	D
26	to	50	A	B	B	C	C	D	E
51	to	90	B	B	C	C	C	E	F
91	to	150	B	B	C	D	D	F	G
151	to	280	B	C	D	E	E	G	H
281	to	500	B	C	D	E	F	H	J
501	to	1200	C	C	E	F	G	J	K
1201	to	3200	C	D	E	G	H	K	L
3201	to	10000	C	D	F	G	J	L	M
10001	to	35000	C	D	F	H	K	M	N
35001	to	150000	D	E	G	J	L	N	P
150001	to	500000	D	E	G	J	M	P	Q
500001	and	over	D	E	H	K	N	Q	R

Sample size code letter	Sample	Sample size	Cumu-lative sample size	Acceptable Quality Levels (Double-normal inspection)																									
				####	####	####	####	####	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
				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 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
A				↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	*	↓	↓	*	*	*	*	*	*	*	*	*
B	First	2	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	*	↑	↓	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	17 22	25 31
	Second	2	4	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	37 38	56 57
C	First	3	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	*	↑	↓	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	17 22	25 31	↑
	Second	3	6	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	37 38	56 57	↑
D	First	5	5	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	*	↑	↑	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	17 22	25 31	↑	↑
	Second	5	10	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↑	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	37 38	56 57	↑	↑
E	First	8	8	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	*	↑	↑	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	17 22	25 31	↑	↑	↑
	Second	8	16	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	37 38	56 57	↑	↑	↑
F	First	13	13	↓	↓	↓	↓	↓	↓	↓	↓	↓	*	↑	↑	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↑	↑	↑	↑	↑	↑
	Second	13	26	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	↑	↑	↑	↑	↑	↑
G	First	20	20	↓	↓	↓	↓	↓	↓	↓	↓	*	↑	↑	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↑	↑	↑	↑	↑	↑	↑
	Second	20	40	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	↑	↑	↑	↑	↑	↑	↑
H	First	32	32	↓	↓	↓	↓	↓	↓	↓	*	↑	↑	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↑	↑	↑	↑	↑	↑	↑	↑
	Second	32	64	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	↑	↑	↑	↑	↑	↑	↑
J	First	50	50	↓	↓	↓	↓	↓	↓	*	↑	↑	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	50	100	↓	↓	↓	↓	↓	↓	↓	↓	↓	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	↑	↑	↑	↑	↑	↑	↑	↑	↑
K	First	80	80	↓	↓	↓	↓	↓	*	↑	↑	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	80	160	↓	↓	↓	↓	↓	↓	↓	↓	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
L	First	125	125	↓	↓	↓	↓	*	↑	↑	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	125	250	↓	↓	↓	↓	↓	↓	↓	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
M	First	200	200	↓	↓	↓	*	↑	↑	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	200	400	↓	↓	↓	↓	↓	↓	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
N	First	315	315	↓	↓	*	↑	↑	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	315	630	↓	↓	↓	↓	↓	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
P	First	500	500	↓	*	↑	↑	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	500	1000	↓	↓	↓	↓	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Q	First	800	800	*	↑	↑	0 2	0 3	1 4	2 5	3 7	5 9	5 9	11 16	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	800	1600	↓	↓	↓	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
R	First	1250	1250	↑	↑	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	1250	2500	↑	↑	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑

↓ = 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).

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.

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.

See PPAP Process Flow Chart between GILLIG and the supplier for PPAP submission workflow.

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)

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.

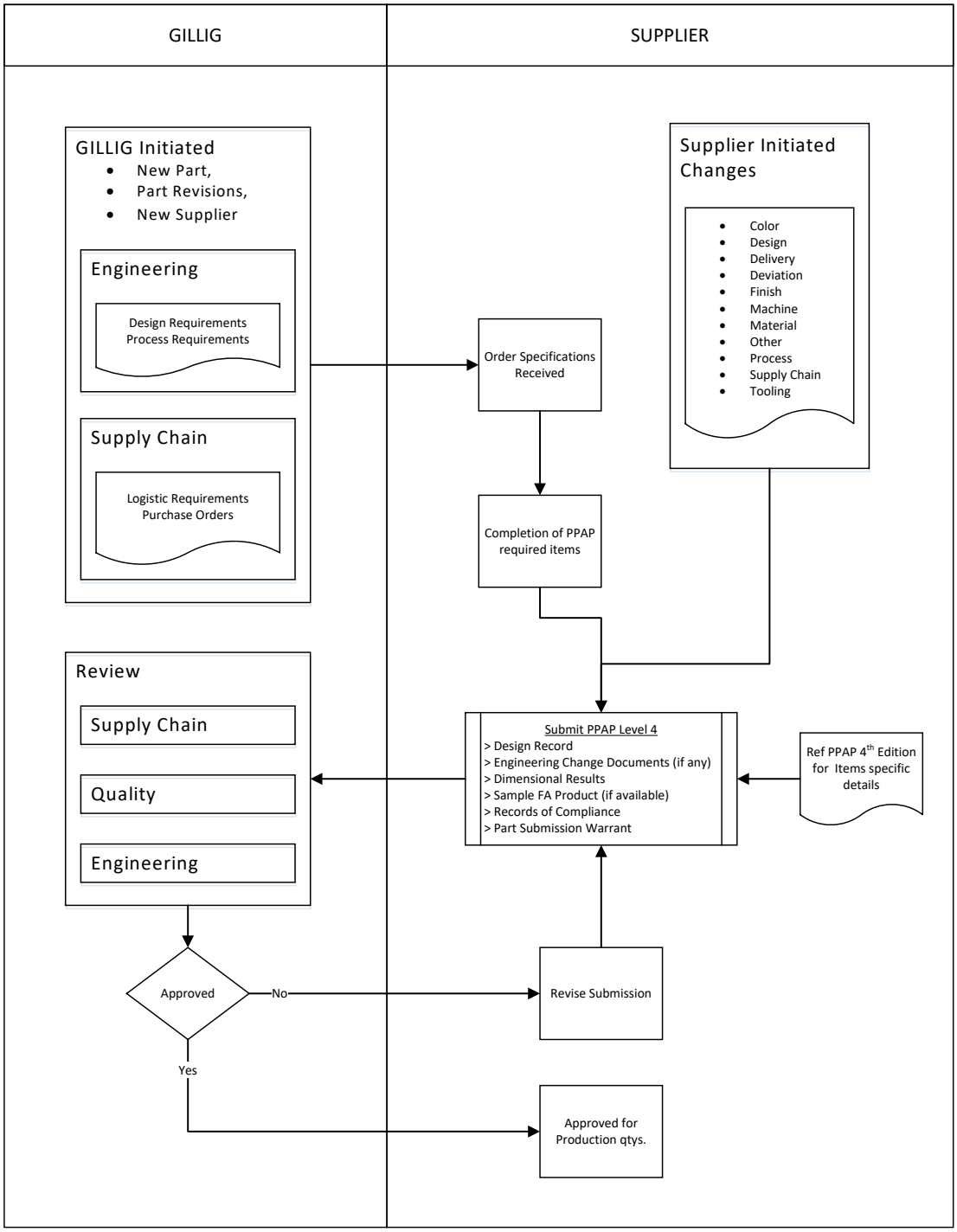
PPAP Forms

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.

PPAP Process Flow Chart



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. Please ask your GILLIG buyer or QA contact for a copy of this form.

Part Deviation Request Form

SUPPLIER NAME:		REQUEST DATE:	
ORIGINATOR:		EMAIL:	
		PHONE#:	

GILLIG PART#:		REVISION:	
SUPPLIER PART#:			
PART DESCRIPTION:			

DEVIATION AND REASON:

ENGINEERING APPROVAL/COMMENTS:

TO BE COMPLETED BY GILLIG			
☑ APPROVED	DURATION OF APPROVAL:	DISTRIBUTION:	DATE:
		SUPPLY CHAIN:	
☐ APPROVED W/REWORK	EXPRIRATION DATE:	QUALITY:	
☐ DISAPPROVED		ENGINEERING:	

GILLIG

INSPECTION RECORD

ECARD DETAILS

CUSTOMER	**COACH NO**
CHASSIS SERIAL NO Bxxxxxxx	**Air Conditioning System PDI**
Chassis Start Date	**Complete Date**
Coach Weight Unladen	**Front Axle Weight**
Odometer	**I/O Program**
VIN	**EMISSIONS**

ATTACHMENT CHECK LIST

Title	QC	PASS/FAIL

ECARD ATTACHMENT(S)

SERIAL NUMBER

Part No	Part Name	Serial Number	Remarks

SERIAL NUMBER ATTACHMENT(S)

01 - FAB SHOP

WC-BS	Operations	Prod	QC	Status
0580-580.645	CUT MODESTY PNL MELAMINE			
0580-580.647	CUT 29' DRIVERS BARRIER MELAMINE			
0580-580.530	CUT ROOF INSULATION			
0580-580.533	CUT CEILING PNL MELAMINE			
0580-580	MELAMINE FOR ROUTING			
0580-580.5835	CUT PLYWOOD FLOOR PNLS			
0580-580.8140	CUT LWR INTERIOR SIDEWALL PNL MELAMINE			
0580-580.5805	CUT INTERIOR FWD SIDEWALL PNL MELAMINE			
0580-580.5105	CUT INTERIOR POST CAPS			

01 - FAB SHOP [ATTACHMENT(S)]

01 - FAB SHOP [PICTURE VALIDATION]

WC-BS	Target	Actual

01 - FAB SHOP [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

01 - FAB SHOP [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

01 - FAB SHOP [OPERATION CHECK]

Operation Check	Value	Status	Verified By

02 - MOTOR HOME DEPT

WC-BS	Operations	Prod	QC	Status

02 - MOTOR HOME DEPT [ATTACHMENT(S)]

02 - MOTOR HOME DEPT [PICTURE VALIDATION]

WC-BS	Target	Actual

02 - MOTOR HOME DEPT [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

02 - MOTOR HOME DEPT [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

02 - MOTOR HOME DEPT [OPERATION CHECK]

Operation Check	Value	Status	Verified By

03 - ELECTRICAL

WC-BS	Operations	Prod	QC	Status
0327-327.5050	SUB ENGINE COMPT LAMPS			
0327-327.6210	SUB RR RUN BOX LAMP			
0327-327.6800	SUB DASH PNL #2 AND #5			

0329-329.6605	SUB EE BOX TRAY ASSY			
0330-330.6605	SUB EE BOX ASSEMBLY			
0332-332.1000	SUB B-POST COVER			
0332-332.6605	SUB SAWTOOTH CONSOLE			
0333-333.6040	SUB DASH HARN			
0334-334.6800	SUB DASH PANEL #1, #3, AND DOOR CONTROL			
0335-335.540	SUB FRT IO PNL			
0335-335.550	SUB INT COMPT LAMPS			
0335-335.5805	SUB REAR I/O PANEL			
0335-335.8060	SUB EXTERIOR SPEAKER			
0336-336.4090	SUB TOE SW BRKT			
0336-336.6800	SUB DRIVERS SIDE CONSOLE PNL #6			
0336-336.8250	SUB DASH FANS EXT. HARN.			
0337-337.5800	SUB INT / EXT COMPT TILT SW'S			
0337-337.8055	SUB EXT ELECT			
0337-337.8060	SUB ROOF RAIL LAMPS / CURB LAMPS			
0337-337.8065	SUB BATT COMPT STRIP LAMP / PANEL LAMP			

03 - ELECTRICAL [ATTACHMENT(S)]

03 - ELECTRICAL [PICTURE VALIDATION]

WC-BS	Target	Actual

03 - ELECTRICAL [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

03 - ELECTRICAL [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

03 - ELECTRICAL [OPERATION CHECK]			
Operation Check	**Value**	**Status**	**Verified By**
test Pocatello 94143 25-03-2022		NOT VERIFIED	
test OP-ck 194930		NOT VERIFIED	
test wayne 196710		NOT VERIFIED	
94143 poxtell elect test		NOT VERIFIED	
E.L. Testing on missing x on the verified icon.		NOT VERIFIED	
Rear Start & Reverse Fan Check (testing)		NOT VERIFIED	
Testing adding a discrepancy to a build station that is static, If a Build station analyst deletes a build station all i have to do is move the OP-CK to a New Build Station. and record the changes.		NOT VERIFIED	

03A - ELECTRICAL

WC-BS	Operations	Prod	QC	Status

03A - ELECTRICAL [ATTACHMENT(S)]

03A - ELECTRICAL [PICTURE VALIDATION]		
WC-BS	**Target**	**Actual**

03A - ELECTRICAL [DISCREPANCY]						
Id	**Defect Code**	**BS**	**Description**	**Prod**	**QC**	**Status**

ATTACHMENT(S)

03A - ELECTRICAL [SHORTAGES]						
Part No	**P.O.**	**Description**	**Quantity**	**Prod**	**QC**	**Status**

03A - ELECTRICAL [OPERATION CHECK]			
Operation Check	**Value**	**Status**	**Verified By**

03B - ELECTRICAL- ONLINE INSTALL

WC-BS	Operations	Prod	QC	Status

03B - ELECTRICAL- ONLINE INSTALL [ATTACHMENT(S)]

03B - ELECTRICAL- ONLINE INSTALL [PICTURE VALIDATION]

WC-BS	Target	Actual

03B - ELECTRICAL- ONLINE INSTALL [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

03B - ELECTRICAL- ONLINE INSTALL [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

03B - ELECTRICAL- ONLINE INSTALL [OPERATION CHECK]

Operation Check	Value	Status	Verified By

04A - CHASSIS

WC-BS	Operations	Prod	QC	Status
0407-407.4075	SUB DEF Tank			
4000-4001	CHASSIS KIT			
4000-4002	COPPER PIPE KIT			
4000-4003	CHASSIS HARN KIT			
4000-4005	CHASSIS CENTER SECTION ASSEMBLY			
4015-4007	CHASSIS STUD WELD			
4015-4010	CHASSIS ASSEMBLY & RESERVOIR INSTL			
4015-4020	FRT CHASSIS SECTION PREP			
4035-4015	INSTL BRAKE VLV, TRANS COOLER & AIR DRYR			
4055-4056	COPPER PIPING			
4055-4058	CHASSIS ELECT & AIR ROUTING			

4055-4070	WHEEL WELL PIPING			
4055-4080	CHASSIS HARN INSTL			
4075-4065	INSTL FRT THRESHOLD HEATER			
4075-4075	INSTL STEERING GEAR			
4075-4085	CHASSIS HYDRAULIC PIPING			
4095-4090	INSTL DRIVERS PLATFORM COMPONENTS			
4100-4105	SUB FRT AXLE			
4100-4110	SUB RR AXLE			
4100-4160	INSTL RR AXLE			
4100-4165	INSTL FRT AXLE			

04A - CHASSIS [ATTACHMENT(S)]

04A - CHASSIS [PICTURE VALIDATION]

WC-BS	Target	Actual

04A - CHASSIS [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

04A - CHASSIS [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

04A - CHASSIS [OPERATION CHECK]

Operation Check	Value	Status	Verified By
CB - 05-10-2022 B196987 - BS 4001		NOT VERIFIED	
CB BS 4001 - Add		NOT VERIFIED	
CB BS 4002 Only (no customer/bus/bus mode/transmission)		NOT VERIFIED	
CB BS 4002 Only #2 (no customer/bus/ busmode/transmission)		NOT VERIFIED	

CB BS 4002 BUS B196988 ONLY. No mode or trans		NOT VERIFIED	
CB 04A/bs 4003/seq 2		NOT VERIFIED	
Fire Suppression Cable Routing		NOT VERIFIED	
CB - Individual bus test 197654		NOT VERIFIED	
CB - Change BS to 4002 and change description		NOT VERIFIED	
CB - Add bus-specific op-chk - B197287		NOT VERIFIED	
CB BS 4007 + Allison B400R-6 Transmission		NOT VERIFIED	
Chassis Eng. Mounts + Cushy Floats		NOT VERIFIED	
All cape code bus opck		NOT VERIFIED	
Chassis test 195602		NOT VERIFIED	
Air System Install, Air Dryer, Ping Tank, Purge Tank, Kneeling + Leveling Valves		NOT VERIFIED	
Front S/S + C/S Wheel House		NOT VERIFIED	
Chassis Model + ID		NOT VERIFIED	
Chassis Huck Bolts		NOT VERIFIED	
Heater Lines + Clamps & Insulation		NOT VERIFIED	
Elect/Air Routing + Inst Fwd to Aft of Chassis		NOT VERIFIED	
Insulation / Corrosion Package		NOT VERIFIED	
DEF Tank Installation		NOT VERIFIED	
Skid Plate, Heater Valve		NOT VERIFIED	
S/S Wheelwell Prep, Piping, & Miter Box		NOT VERIFIED	
Hyd/Fuel Lines Routing & Clamped Apart		NOT VERIFIED	
Front Brake lines Routing & Clamping		NOT VERIFIED	
Steering Gear & Pitman Arm Install & Torque		NOT VERIFIED	
Steering Shaft & Torque		NOT VERIFIED	
Front & Rear Shop Air + Tow Connection		NOT VERIFIED	
Tow Connection, Toe Switches		NOT VERIFIED	

Throttle & Brake Pedals		NOT VERIFIED	
Trans Retarder PSI Switches		NOT VERIFIED	
No Dielectric Grease at Hybrid Transducer		NOT VERIFIED	
No Dielectric Grease at Hybrid Transducer		NOT VERIFIED	
(FRONT) Axle ASM Verification - Torque Rod Install & Torque		NOT VERIFIED	
(FRONT) Axle ASM Verification - Towers, Air Bags, Shocks Install & Torque		NOT VERIFIED	
(REAR) Axle ASM Verification - Axle Oil Type		NOT VERIFIED	
(REAR) Axle ASM Verification - Air Bags, Shocks Install & Torque		NOT VERIFIED	
(REAR) Axle ASM Verification - Grease Hub - Oil Level		NOT VERIFIED	
FR/RR Axle Pods, Cage Bolts, Slacks, & Lock Clips		NOT VERIFIED	
Rear Suspension Install & Torque		NOT VERIFIED	
Center Rear Axle (1/8")		NOT VERIFIED	
Pinion Angle		NOT VERIFIED	
Front Suspension Install & Torque		NOT VERIFIED	
Draglink Installation		NOT VERIFIED	

04B - CHASSIS

WC-BS	Operations	Prod	QC	Status
0450-450.4065	SUB DRIVERS HEATER 1/4 TURN VALVES			
0450-450.4255	PIPE KIT			
0455-455.4225	ENGINE LINE HOSE KIT			
4102-4125	RR BRAKE VALVE PIPING			
4102-4150	FRT & RR AXLE BRAKE PIPING			
4102-4170	CONNECT AIR DRYER & AIR SYS PIPING			
4200-4201	ENGINE LINE - SUB ASM			
4200-4205	ENGINE LINE - ALTERNATORS			

4200-4210	ENGINE LINE - TRANSMISSIONS			
4200-4215	ENGINE LINE - FUEL FILTERS			
4200-4220	ENGINE LINE - HYDRAULIC PUMPS			
4200-4230	ENGINE LINE - ELECTRICAL			
4200-4235	ENGINE LINE- TRANS PIPING			
4200-4245	ENGINE LINE - FUEL AND HYDRUALIC LINES			
4200-4255	SETTEE INSTL & DEF ROUTING			
4200-4260	TRANS PIPING - ON LINE			
4200-4265	AIR PIPING			
4200-4280	INSTL BATTERY BOXES			
4300-4305	AUX HTR / DEF TANK / ELECT RAD WIRING			
4300-4310	INSTL BATTERIES & FUSE BOX			
4300-4330	SUB RADIATOR & RADIATOR BAFFLE			
4300-4350	INSTL RADIATOR & HYD PIPING			

04B - CHASSIS [ATTACHMENT(S)]

04B - CHASSIS [PICTURE VALIDATION]

WC-BS	Target	Actual

04B - CHASSIS [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

04B - CHASSIS [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

04B - CHASSIS [OPERATION CHECK]

Operation Check	Value	Status	Verified By
Rear Brake lines Routing & Clamping		NOT VERIFIED	

CB BS 4170 - Account only - Cape Cod, MA		NOT VERIFIED	
Engine Installation & Torque		NOT VERIFIED	
Starter Cable Torque		NOT VERIFIED	
Alt. Cable Clamp / Torque		NOT VERIFIED	
Alternator Install		NOT VERIFIED	
Starter Install / Torque		NOT VERIFIED	
Trans Install & Torque - Turn Bolts, Flex Plate, Outer Housing, Flywheel		NOT VERIFIED	
Trans Install & Torque - Turn Bolts, Flex Plate, Outer Housing, Flywheel		NOT VERIFIED	
Trans Install & Torque - Turn Bolts, Flex Plate, Outer Housing, Flywheel		NOT VERIFIED	
Trans Install & Torque - Turn Bolts, Flex Plate, Outer Housing, Flywheel		NOT VERIFIED	
Trans Install & Torque - Turn Bolts, Flex Plate, Outer Housing, Flywheel, Damper		NOT VERIFIED	
Trans Install & Torque - Inner Ring, Hydrodamp, Intermediate Ring, Outer Housing		NOT VERIFIED	
Trans Install & Torque - Inner Ring, Hydrodamp, Intermediate Ring, Outer Housing		NOT VERIFIED	
Trans Install & Torque - Inner Bolts, Cover Plate, Outer Housing		NOT VERIFIED	
Trans Install & Torque - Inner Ring, Outer Ring, Turn Bolts		NOT VERIFIED	
Engine Fill Tube Installation		NOT VERIFIED	
Hydralic Pump Install / Torque		NOT VERIFIED	
Hybrid Cable Continuity Test		NOT VERIFIED	
Ring Terminal Install / Torque		NOT VERIFIED	
Ring Terminal Install / Torque		NOT VERIFIED	
Connector Install / Torque		NOT VERIFIED	
Connector Install / Torque		NOT VERIFIED	

Hybrid Cable Continuity Test		NOT VERIFIED	
Cover Plate Install / Torque		NOT VERIFIED	
Cover Plate Install / Torque		NOT VERIFIED	
Coolant Hose / Filter Install		NOT VERIFIED	
DeAiration Hose Routing Install		NOT VERIFIED	
Transmission Cooler Hose Install		NOT VERIFIED	
Hydraulic Reservior Hoses		NOT VERIFIED	
Fuel Hose Install		NOT VERIFIED	
Fuel Hose Install, Top fuel Hose Torque		NOT VERIFIED	
Fuel Hose Install, Bottom fuel Hose Torque		NOT VERIFIED	
Air Compressor Hose		NOT VERIFIED	
Settee Installation / Drive shaft greased		NOT VERIFIED	
Booster Pump Piping & Clamping		NOT VERIFIED	
Air Piping: RR lvl / Ping /Purge / Dryer / Gov		NOT VERIFIED	
Battery Box		NOT VERIFIED	
Radiator Power Cable Install		NOT VERIFIED	
Aux Coolant Heater Piping		NOT VERIFIED	
DEF Coolant Piping & Clamping		NOT VERIFIED	
Radiator Mounting & Hoses		NOT VERIFIED	

04C - CHASSIS

WC-BS	Operations	Prod	QC	Status
0405-405.4310	SUB BATTERY & FUSE BOX			
0410-410.4235	SUB BOOSTER PUMP W/O AUX HTR			
0410-410.4305	SUB AMETEK BOOSTER PUMPS			
0410-410.4510	SUB SURGE TANK			
0415-415.4395	SUB RR FLAG ASSY			
0415-415.6050	SUB RR RUN BOX			

0420-420.4005	SUB AIR VALVES & FRT SHOP AIR CONN			
0420-420.4105	SUB DISC BRAKE BULKHEAD FITTINGS			
0420-420.4510	SUB ISO LOOP TANK			
0425-425.4005	SUB RR SHOP AIR ASSY			
0425-425.4015	SUB PURGE TANK & AIR DRYER			
0440-440.4005	SUB PARKING BRAKE ASSY			
0440-440.4090	SUB BRAKE RETARDER PRESS SWS & THROTTLE			
0445-445.4056	SUB AUX & U'SEAT HTR VALVES & SOLENOID			
0445-445.4060	SUB AUX COOLANT HEATER			
0460-460.4005	SUB BULKHEAD PLATE & AIR GOV			
0460-460.4010	SUB HYDRUALIC RESERVOIR			
0460-460.4015	SUB PING TANK			
0480-480.1800	SPARE TIRE & WHEEL			
0480-480.4610	SUB WHEELS - TIRE SHED			
4302-4395	INSTL RR FLAG ELECT			
4500-4501	SUB & INSTL FUEL TANK			
4500-4505	INSTL AC COMPRESSOR			
4500-4510	ENGINE PIPING			
4600-4605	CHASSIS START-UP			
4600-4610	INSTL WHEELS & FUEL TANKS			
4800-4805	CHASSIS UNDERSIDE & PICK UP			

04C - CHASSIS [ATTACHMENT(S)]

04C - CHASSIS [PICTURE VALIDATION]

WC-BS	Target	Actual

04C - CHASSIS [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

04C - CHASSIS [SHORTAGES]						
Part No	**P.O.**	**Description**	**Quantity**	**Prod**	**QC**	**Status**

04C - CHASSIS [OPERATION CHECK]			
Operation Check	**Value**	**Status**	**Verified By**
Flag Panel Instl. & Torque 140 In-Lb		NOT VERIFIED	
Battery Fuse Installation		NOT VERIFIED	
Electrical Harnesses & Clamps		NOT VERIFIED	
J-1939 Connections		NOT VERIFIED	
Power Cables & Vanner Torque		NOT VERIFIED	
Fuse Box Install		NOT VERIFIED	
Power Cables & Cut-off Switch Torque		NOT VERIFIED	
Battery Cables Clearance		NOT VERIFIED	
Fuel Tank Installation		NOT VERIFIED	
Fuel Lines Routing & Clamping Torque		NOT VERIFIED	
A/C Compressor Installation		NOT VERIFIED	
Air Compressor Piping		NOT VERIFIED	
Air Intake System		NOT VERIFIED	
Surge Tank & Hoses		NOT VERIFIED	
CAC Installation & Clamping		NOT VERIFIED	
TEST TEST TEST TEST		NOT VERIFIED	
Turbo Piping & Clamping		NOT VERIFIED	
Exhaust Test Ports and Plugs		NOT VERIFIED	
Air Restriction Indicator		NOT VERIFIED	
Isoloop Coolant Hose Routing & Clamping		NOT VERIFIED	
Verify Surge Tank Coolant Sensor-Level Location		NOT VERIFIED	

Engine Oil Type & Level		NOT VERIFIED	
Transmission Oil Type & Level		NOT VERIFIED	
Radiator Coolant		NOT VERIFIED	
Hydrualic Fluid Type & Level		NOT VERIFIED	
Engine Startup		NOT VERIFIED	
Tires & Wheels Verification		NOT VERIFIED	
Rear Wheel Lug Torque		NOT VERIFIED	
Front Wheel Lug Torque		NOT VERIFIED	
Air Test (Wet Test)		NOT VERIFIED	
Coolant Hose Leak Test		NOT VERIFIED	
FR/RR Axle Pods, Cage Bolts, & Lock Clips		NOT VERIFIED	
Hybrid Sub Station Comp. Instl. & Torque		NOT VERIFIED	
Hybrid Sub Station Comp. Instl. & Torque		NOT VERIFIED	
FR/RR Brake Hose Clearance on Bump Stops		NOT VERIFIED	
RR Brake Hose Clearance, Raised		NOT VERIFIED	

04F - CHASSIS - OUTSIDE

WC-BS	Operations	Prod	QC	Status

04F - CHASSIS - OUTSIDE [ATTACHMENT(S)]

04F - CHASSIS - OUTSIDE [PICTURE VALIDATION]

WC-BS	Target	Actual

04F - CHASSIS - OUTSIDE [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

04F - CHASSIS - OUTSIDE [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

04F - CHASSIS - OUTSIDE [OPERATION CHECK]

Operation Check	Value	Status	Verified By

05 - ROOF/SIDEWALL

WC-BS	Operations	Prod	QC	Status

05 - ROOF/SIDEWALL [ATTACHMENT(S)]

05 - ROOF/SIDEWALL [PICTURE VALIDATION]

WC-BS	Target	Actual

05 - ROOF/SIDEWALL [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

05 - ROOF/SIDEWALL [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

05 - ROOF/SIDEWALL [OPERATION CHECK]

Operation Check	Value	Status	Verified By

05A - ROOF

WC-BS	Operations	Prod	QC	Status
0500-500.5000	ROOF FRAMING			
0510-510.5000	ROOF SKIN			
0521-521.5000	SUB ANTENNA & CAMERA CABLES			
0525-525.5000	ROOF INTERIOR #1			
0530-530.5000	ROOF INTERIOR #2 & AIR TANK INSTL			
0540-540.5000	ROOF INTERIOR #3			

0540-545.5000	LAMP KIT & LAMP DUCT & HARN PREP			
0550-550.5000	INSTL CAMERAS & MICS			
0550-555.5000	ROOF INSPECTION			
0560-560.5000	SUB MUFFLER / AFTERTREATMENT ASSY			
0562-562.5000	SUB HVAC BULKHEAD & FRAME ASSY			
0564-564.5000	SUB HVAC PLATFORM ASSY			
0566-566.5000	SUB HVAC ASSY			
0568-568.5000	SUB BULKHEAD HARN			

05A - ROOF [ATTACHMENT(S)]

05A - ROOF [PICTURE VALIDATION]

WC-BS	Target	Actual

05A - ROOF [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

05A - ROOF [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

05A - ROOF [OPERATION CHECK]

Operation Check	Value	Status	Verified By
CB 05A/BS 500.5000/Seq 3		NOT VERIFIED	
CB - 197439 Bus Only - 500.5000		NOT VERIFIED	
CB B094193 - Bus Only 500.5000		NOT VERIFIED	

05AS - ROOF - SUB

WC-BS	Operations	Prod	QC	Status

05AS - ROOF - SUB [ATTACHMENT(S)]

05AS - ROOF - SUB [PICTURE VALIDATION]		
WC-BS	**Target**	**Actual**

05AS - ROOF - SUB [DISCREPANCY]						
Id	**Defect Code**	**BS**	**Description**	**Prod**	**QC**	**Status**

ATTACHMENT(S)

05AS - ROOF - SUB [SHORTAGES]						
Part No	**P.O.**	**Description**	**Quantity**	**Prod**	**QC**	**Status**

05AS - ROOF - SUB [OPERATION CHECK]			
Operation Check	**Value**	**Status**	**Verified By**

05B - UNIBODY/SIDEWALL

WC-BS	Operations	Prod	QC	Status
5000-5005	LAND SIDE FRAME @ UNIBODY			
5000-5015	INSTL SETTEE ASSY @ UNIBODY			
5000-5020	INSTL RR FRAME ASSY @ UNIBODY			
5100-5110	INSTL WINDOW POSTS @ UNIBODY			
5100-5115	INSTL FRT FRAME & DEST SIGN BRKTS			
5100-5120	INSTL STRESS PNLS @ UNIBODY			
5100-5125	RR DOOR STRESS PNL & UPR POSTS @U'BODY			
5200-5205	INSTL SPEAKER PNL			
5200-5215	INSTL EXTERIOR POST CAPS			
5200-5220	UNIBODY CORROSION COATING			
5400-5405	CONNECT ENGINE COMPARTMENT PIPING			
5400-5410	INSTL TAPPING PLATES			
5400-5415	LAND UNIBODY ON CHASSIS			

5400-5420	INSTL FRT HOOP & STEERING BRKT			
5400-5615	INSTL RR WHEEL WELLS			
5600-5605	INSTL FRT WHEEL WELLS			
5600-5610	INSTL CNG & HYB ROOF MOUNTED COMPONENTS			
5600-5620	INSTL THEATER STEP			
5802-5835	FLOOR PNL & PLATFORM INSTL			

05B - UNIBODY/SIDEWALL [ATTACHMENT(S)]

05B - UNIBODY/SIDEWALL [PICTURE VALIDATION]

WC-BS	Target	Actual

05B - UNIBODY/SIDEWALL [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

05B - UNIBODY/SIDEWALL [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

05B - UNIBODY/SIDEWALL [OPERATION CHECK]

Operation Check	Value	Status	Verified By
Settee Frame / Seal		NOT VERIFIED	
A/C & Side Frame Install		NOT VERIFIED	
Rear Frame Installation		NOT VERIFIED	
Exit Door Header Install		NOT VERIFIED	
Window Post Installation		NOT VERIFIED	
Destination Sign Compartment		NOT VERIFIED	
Side Frame Gusset (15 FT-LB)		NOT VERIFIED	
Front & Rear Door Stress Panels		NOT VERIFIED	
Side Frame Stress Panels		NOT VERIFIED	

Speaker Panels		NOT VERIFIED	
Exterior Post Caps		NOT VERIFIED	
Air Filter		NOT VERIFIED	
Flex Pipe / Surge Tank Install		NOT VERIFIED	
Body to Chassis Coating		NOT VERIFIED	
Body to Chassis Assembly		NOT VERIFIED	
Body Squareness		NOT VERIFIED	
Steering Column Bracket		NOT VERIFIED	
Front Wheel Well Install		NOT VERIFIED	
CNG Component Installation		NOT VERIFIED	
Hybrid Component Roof Installation		NOT VERIFIED	
Hybrid Component Roof Installation		NOT VERIFIED	
High Voltage Cable Roof Installation		NOT VERIFIED	
High Voltage Cable Roof Installation - Allison Hybrid		NOT VERIFIED	
High Voltage Cable Roof Installation- Electric		NOT VERIFIED	
High Voltage Cable Roof Installation		NOT VERIFIED	
High Voltage Cable Roof Installation		NOT VERIFIED	
High Voltage Cable Roof Installation - BAE Hybrid		NOT VERIFIED	
Rear Wheel Well Install		NOT VERIFIED	
Floor Installation		NOT VERIFIED	
Floor Sealer		NOT VERIFIED	

05BS - ROOF - SUB

WC-BS	Operations	Prod	QC	Status

05BS - ROOF - SUB [ATTACHMENT(S)]

05BS - ROOF - SUB [PICTURE VALIDATION]

WC-BS	Target	Actual

05BS - ROOF - SUB [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

05BS - ROOF - SUB [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

05BS - ROOF - SUB [OPERATION CHECK]

Operation Check	Value	Status	Verified By

06 - BODY/PANELING

WC-BS	Operations	Prod	QC	Status
0608-608.6205	SUB FRT W/WELL TUBS			
0610-610.6410	SUB FRT CAP			
5800-5805	INSTL AIR TANK COMPT CLOSEOUT			
5800-5815	INSTL FRT DR HEADER			
5800-5820	ENGINE & HVAC COMPT PIPING			
5800-5825	INSTL SKIRT PNL BRKTS			
6000-6015	INSTL EXTERIOR SKIRT PNLS			
6000-6020	INSTL FRT & RR DOORS			
6200-6205	INSTL FRT W/WELL TUBS			
6400-6410	INSTL FRT CAP			
6400-6405	DRIVERS BARRIER & EE BOX INSTL			
6600-6600	INSTL DRIVERS DASH POD & SIDE CONSOLE			
6600-6610	INSTL RR CAP			
6600-6605	INSTL HEADLAMPS & SAWTOOT CONSOLE			
6800-6810	INSTL DRIVERS HEATER & W/S WASHER BOTTLE			

6800-6815	INSTL RR ENGINE DOOR & RR CORNER PNLS			
6800-6833	AC COMPRESSOR HOSES (2nd SHIFT)			

06 - BODY/PANELING [ATTACHMENT(S)]

06 - BODY/PANELING [PICTURE VALIDATION]

WC-BS	Target	Actual

06 - BODY/PANELING [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

06 - BODY/PANELING [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

06 - BODY/PANELING [OPERATION CHECK]

Operation Check	Value	Status	Verified By
Rear Electrical Panel Installation		NOT VERIFIED	
Air Tank Closeout Installation		NOT VERIFIED	
CB Cape Cod, MA Only bs 5805		NOT VERIFIED	
CB BS 5820 Bus Mode ONLY - Diesel		NOT VERIFIED	
Skirt Panel Brkt Installation		NOT VERIFIED	
Skirt Panel Installation		NOT VERIFIED	
Skirt Panel Prep, Locks, Latches & Primer		NOT VERIFIED	
Front Door Harness Interference		NOT VERIFIED	
Front Door Header Installation		NOT VERIFIED	
Electrical Panel Closeout & Side Access Door Installation		NOT VERIFIED	
Front Door Installation		NOT VERIFIED	
Exit Door & Nosing Installation		NOT VERIFIED	

Wheel Tub Installation		NOT VERIFIED	
Qpod Harness Routing		NOT VERIFIED	
Chime Harness Routing		NOT VERIFIED	
Driver's Side Console Installation		NOT VERIFIED	
Driver's Barrier Installation		NOT VERIFIED	
Electrical Equipment Box Verification		NOT VERIFIED	
Side Overhead Grabrail Installation		NOT VERIFIED	
Front Cap Installation		NOT VERIFIED	
Rear Cap & HVAC Door Installation		NOT VERIFIED	
Tail Pipe Installation		NOT VERIFIED	
Windshield Opening		NOT VERIFIED	
BRT Windshield Squareness		NOT VERIFIED	
Drivers Heater / Washer Bottle Installation		NOT VERIFIED	
Sawtooth / B-Post Closeout Installation		NOT VERIFIED	
Fire Suppression System Installation		NOT VERIFIED	
Engine Compartment Harness / Hose Routing & Clamping		NOT VERIFIED	
12/24v Cable Torque Frt Panel		NOT VERIFIED	
12/24v Cable Torque Rear Panel		NOT VERIFIED	
Engine Compt Routing @ Settee Hatch		NOT VERIFIED	
Dash Prep & Installation		NOT VERIFIED	
Engine Door & Light Corner Installation		NOT VERIFIED	
Engine Belt Guard Installation		NOT VERIFIED	
Headlamp Installation		NOT VERIFIED	

06S - BODY/PANELING - SUB

WC-BS	Operations	Prod	QC	Status
0570-570.5000	SUB AIR TANKS			
0590-590.5000	SUB CURB SIDE FRAME ASM			

0590-591.5000	SUB STREET SIDE FRAME ASM			
0590-592.5000	SUB & INSTL AIR TANK DRAIN VALVES			
0595-595.5000	SUB RR FRAME ASSY			
0601-601.6015	SUB BATTERY DOOR			
0601-601.6020	SUB UPR ACCESS DOORS			
0602-602.5805	SUB AIRTANK COMPT CLOSEOUT & RR BULKHEAD			
0603-603.6610	SUB HVAC DOOR			
0604-604.6815	SUB ENGINE DOOR			
0605-605.6015	SUB EXTERIOR SKIRT PNLS			
0606-606.5820	SUB DEST SIGN COMPT DOOR			
0606-606.6600	SUB DRIVERS DOOR DUMP VALVE			
0606-606.6815	SUB ENGINE BELT GUARD			
0606-606.8715	SUB HVAC RETURN AIR GRILL			
0607-607.525	SUB BSTR FN/SAWTOOTH/FRT DR HDR CMPT DRS			
0607-607.540	SUB DEST SIGN COMPT DOOR BRACKETS			
0607-607.5805	SUB CABLES FOR AIR TANK COMPT C/O			
0607-607.5825	SUB GAS SPRING BRKT			
0607-607.6810	SUB 29' FUEL FILL CLOSEOUT			
0609-609.5205	SUB RR DOOR BASEPLATE			
0609-609.6600	SUB DRIVERS SIDE CONSOLE			
0645-645.8305	SUB MODESTY PNL SUB-ASSY			
0646-646.8410	SUB CHIME SW, PULL CORD & TOUCH TAPE			
0646-646.8570	SUB TRANSFER CUTTER SUB-ASSY			
0646-646.8640	SUB WIPER BOTTLE ACCESS DOOR SUB-ASSY			
0647-647.6605	SUB 29' DRIVER BARRIER			
0647-647.8135	SUB FRT MODESTY PANEL			
0647-647.8160	FRT DEST SIGN GLAZING MASKING			
0647-647.8315	SUB DRIVER'S STORAGE BOX SUB-ASSY			

0647-647.8510	SUB BLKHD CORNER TRIM ASSY			
0647-647.8565	SUB 29' W/WELL F/U FOOT REST SUB-ASSY			

06S - BODY/PANELING - SUB [ATTACHMENT(S)]

06S - BODY/PANELING - SUB [PICTURE VALIDATION]

WC-BS	Target	Actual

06S - BODY/PANELING - SUB [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

06S - BODY/PANELING - SUB [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

06S - BODY/PANELING - SUB [OPERATION CHECK]

Operation Check	Value	Status	Verified By
Air tank drain valves		NOT VERIFIED	

07 - PAINT

WC-BS	Operations	Prod	QC	Status
0700-700	SIDE FRAME PREP/PRIMER			
0730-730	PAINT - SMALL PARTS			
0770-770	INTERIOR DETAIL			
Pnt001-Pnt001	09 RACK MASKING			
Pnt002-Pnt002	BODY SHOP			
Pnt003-Pnt003	PREP STALL			
Pnt004-Pnt004	SIDE FRAME WASH / SKIRT PANELS			
Pnt005-Pnt005	BACK WALL TAPE / ETCH AND WASH			
Pnt006-Pnt006	MAIN MIXING ROOM			

Pnt007-Pnt007	DRYING STATION			
Pnt008-Pnt008	COMPLETES TEAM 1			
Pnt009-Pnt009	COMPLETES TEAM 2			
Pnt010-Pnt010	COMPLETES TEAM 3			
Pnt011-Pnt011	LAYOUT 1			
Pnt012-Pnt012	LAYOUT SANDING			
Pnt013-Pnt013	STRIPES TEAM 1			
Pnt014-Pnt014	STRIPES TEAM 2			
Pnt015-Pnt015	SATELLITE MIXING ROOM 1			
Pnt016-Pnt016	STRIP/COMPARTMENTS			
Pnt017-Pnt017	REPAIR TEAM 1			
Pnt018-Pnt018	REPAIR TEAM 2			
Pnt019-Pnt019	HUBS, ROOF #'S, FINAL			
Pnt020-Pnt020	UNDERSEAL BUS			
Pnt021-Pnt021	LIFT RACK / UNDERSIDE			
Pnt022-Pnt022	FINAL LINE / GRILLS			
Pnt023-Pnt023	READY ROW			
Pnt024-Pnt024	UNDERSEAL BOARDS			
Pnt025-Pnt025	POWDER COAT			

07 - PAINT [ATTACHMENT(S)]

07 - PAINT [PICTURE VALIDATION]

WC-BS	Target	Actual

07 - PAINT [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

07 - PAINT [SHORTAGES]						
Part No	**P.O.**	**Description**	**Quantity**	**Prod**	**QC**	**Status**

07 - PAINT [OPERATION CHECK]			
Operation Check	**Value**	**Status**	**Verified By**
Layout		NOT VERIFIED	
Skirt Panels Lower Edge		NOT VERIFIED	
Front Door Rubber		NOT VERIFIED	
Rear Door Rubber		NOT VERIFIED	
Front cap pinhole and scratch free E.L. 05/16		NOT VERIFIED	
Hubs Painted		NOT VERIFIED	
Roof Numbers		NOT VERIFIED	
Overspray, Kick Panels		NOT VERIFIED	
Overspray, Side Console		NOT VERIFIED	
Overspray, Dash		NOT VERIFIED	
Overspray, Below Driver's Window		NOT VERIFIED	
Overspray, Entrance Doors		NOT VERIFIED	
Overspray, Exit Doors		NOT VERIFIED	
Overspray, Post Caps, Electrical Box / Wheel Tubs		NOT VERIFIED	
Overspray, Entry Threshold Panels		NOT VERIFIED	
Mid rail mills should be above 1.8 CB		NOT VERIFIED	
CB - Test Albany NY account for PNT001		NOT VERIFIED	

08 - TRIM

WC-BS	Operations	Prod	QC	Status

08 - TRIM [ATTACHMENT(S)]

08 - TRIM [PICTURE VALIDATION]		
WC-BS	**Target**	**Actual**

08 - TRIM [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

08 - TRIM [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

08 - TRIM [OPERATION CHECK]

Operation Check	Value	Status	Verified By

08A - TRIM - A

WC-BS	Operations	Prod	QC	Status
0820-820.8105	SUB INTERIOR STEP TRIM			
8000-8000	FLOORING INSTL			
8050-8055	WELD FLOORING			
8100-8101	FRONT BUMPER INSTL			
8100-8102	REAR BUMPER INSTL			
8100-8105	INTERIOR EDGE TRIM & STEP LAMP			
8100-8120	INSTALL COWLINGS			
8100-8135	FAREBOX PLATFORM			
8100-8140	INSTL LWR INTERIOR SIDEWALL PNL MELAMINE			
8150-8155	RR SEAT RAILS & TRACKS			
8150-8160	DEST SIGN & FRT DOOR GLAZING			
8150-8165	RR DOOR RUBBER & GLAZING			
8200-8200	WINDSHIELD INSTL			
8200-8205	UNDERSEAT HEATER INSTL			
8200-8215	INT SEAT RAIL RIVET INSTL			
8200-8220	FRT & RR DEST SIGN INSTL			

08A - TRIM - A [ATTACHMENT(S)]

08A - TRIM - A [PICTURE VALIDATION]

WC-BS	Target	Actual

08A - TRIM - A [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

08A - TRIM - A [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

08A - TRIM - A [OPERATION CHECK]

Operation Check	Value	Status	Verified By
Flooring Installation		NOT VERIFIED	
Front Mudflaps		NOT VERIFIED	
Front Bumper		NOT VERIFIED	
Fender Installation		NOT VERIFIED	
Rear Mudflaps		NOT VERIFIED	
Rear Bumper Installation		NOT VERIFIED	
Farebox Platform		NOT VERIFIED	
Interior Panels		NOT VERIFIED	
Seat Rail Installation / T-Bolts		NOT VERIFIED	
Door Seals		NOT VERIFIED	
Door Glazing & Seal		NOT VERIFIED	
Windshield Installation		NOT VERIFIED	
Passenger Heater(s)		NOT VERIFIED	
Alignment to specifications T2		NOT VERIFIED	
Verify Alignment Sheet upload T2		NOT VERIFIED	

Set turn Angle T3		NOT VERIFIED	
Add OPCK to ok OPCK and Verified Operation. T5		NOT VERIFIED	
Side Destination Sign(s) & Serial Numbers		NOT VERIFIED	
Exhaust Diffuser Installation		NOT VERIFIED	
Rear Run Sign		NOT VERIFIED	
Front Destination Sign & Serial Numbers		NOT VERIFIED	

08AS - TRIM - A SUB

WC-BS	Operations	Prod	QC	Status

08AS - TRIM - A SUB [ATTACHMENT(S)]

08AS - TRIM - A SUB [PICTURE VALIDATION]

WC-BS	Target	Actual

08AS - TRIM - A SUB [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

08AS - TRIM - A SUB [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

08AS - TRIM - A SUB [OPERATION CHECK]

Operation Check	Value	Status	Verified By

08B - TRIM - B

WC-BS	Operations	Prod	QC	Status
0870-870	LOAD SEAT CARTS			
8250-8250	FRONT DASH			
8250-8255	FRONT EXTERIOR TRIM			

8300-8305	MODESTY PNL INSTL			
8300-8310	WINDOW INSTL			
8300-8315	SAFETY EQUIPMENT & DRIVERS SEAT			
8300-8320	EXTERIOR MIRRORS			
8400-8410	PULL CORDS & TOUCH TAPES			
8400-8425	INTERIOR MIRRORS			
8500-8501	FRONT PASSENGER SEATS			
8500-8510	SETTEE SEATS			
8550-8565	MID PASSENGER SEATS			
8550-8570	DASH COMPONENTS & FAREBOX			
8600-8615	VERT STANCHION INSTL			
8600-8655	UPPER EXTERIOR TRIM			

08B - TRIM - B [ATTACHMENT(S)]

08B - TRIM - B [PICTURE VALIDATION]

WC-BS	Target	Actual

08B - TRIM - B [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

08B - TRIM - B [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

08B - TRIM - B [OPERATION CHECK]

Operation Check	Value	Status	Verified By
Sun Screens / Driver		NOT VERIFIED	
Entrance Grab Handles		NOT VERIFIED	
BRT Dash Trim		NOT VERIFIED	

Fire Extinguisher		NOT VERIFIED	
First Aid Kit		NOT VERIFIED	
Road Warning Kit		NOT VERIFIED	
Driver Shield		NOT VERIFIED	
Wiper Arm Asm		NOT VERIFIED	
Exterior Side Ad Frames		NOT VERIFIED	
Drip Rail Installation		NOT VERIFIED	
Front License Plate		NOT VERIFIED	
Exterior Ad Frames		NOT VERIFIED	
Exterior Foam Tape, Reflectors and Latches		NOT VERIFIED	
Hubodometer		NOT VERIFIED	
Exterior Graphics		NOT VERIFIED	
Modesty Panels		NOT VERIFIED	
Interior Ad Frames		NOT VERIFIED	
Passenger Windows		NOT VERIFIED	
Driver's Window		NOT VERIFIED	
Driver's Seat and Serial Numbers		NOT VERIFIED	
Exterior Mirrors		NOT VERIFIED	
Passenger Signals		NOT VERIFIED	
Passenger Signals		NOT VERIFIED	
Interior Mirrors		NOT VERIFIED	
ADA Spacing		NOT VERIFIED	
Shoulder Belt & Floor		NOT VERIFIED	
Stanchion Location & Torque		NOT VERIFIED	
Seat Location / Hip to Knee		NOT VERIFIED	
Seat Mounting Torque		NOT VERIFIED	
Window Bars		NOT VERIFIED	
Farebox & Serial Numbers		NOT VERIFIED	

Farebox Guard		NOT VERIFIED	
Grab Handles at Wheelwells		NOT VERIFIED	
Check Floor Sealer		NOT VERIFIED	

09 - BODY ELECTRICAL

WC-BS	Operations	Prod	QC	Status
0920-920.6910	SUB AIR INTAKE CLOSEOUT			
0920-920.9220	SUB STEERING COLUMN			
5001-900.5050	INSTL FIRE WIRES & ENGINE COMPT LAMPS			
5101-900.5155	INSTL RR DOOR IO & VAPOR MODULES			
5601-900.5650	RR FLAG PNL PREP			
5601-900.5655	DASH BRKT PREP			
6001-900.6040	INSTL DASH HARN			
6001-900.6050	INSTL RR RUN BOX			
6001-900.6055	CAMERA CABLE PREP			
6202-900.6205	FRT IO ELECT COMPT & FLEETWATCH TX55			
6202-900.6210	INSTL RR FLAG PNL COVER & RR IO WIRING			
6803-900.6800	INSTL DASH PNLS			
6803-900.6855	INSTL RR AXLE MUD FLAPS			
6901-900.6905	PROG STATION			
9200-9210	SEAL UNDERSIDE & FLUIDS			
9200-9220	INSTL STEERING COLUMN			

09 - BODY ELECTRICAL [ATTACHMENT(S)]

09 - BODY ELECTRICAL [PICTURE VALIDATION]

WC-BS	Target	Actual

09 - BODY ELECTRICAL [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

09 - BODY ELECTRICAL [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

09 - BODY ELECTRICAL [OPERATION CHECK]

Operation Check	Value	Status	Verified By
Fire Wire Routing		NOT VERIFIED	
Engine Comparment Harness & Hose Routing		NOT VERIFIED	
12 / 24V Connections at Flag		NOT VERIFIED	
Alex and CB's op-check test		NOT VERIFIED	
AC Power Cable at Flag		NOT VERIFIED	

09S - BODY ELECTRICAL - SUB

WC-BS	Operations	Prod	QC	Status

09S - BODY ELECTRICAL - SUB [ATTACHMENT(S)]

09S - BODY ELECTRICAL - SUB [PICTURE VALIDATION]

WC-BS	Target	Actual

09S - BODY ELECTRICAL - SUB [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

09S - BODY ELECTRICAL - SUB [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

09S - BODY ELECTRICAL - SUB [OPERATION CHECK]

Operation Check	Value	Status	Verified By

10 - READY ROW

WC-BS	Operations	Prod	QC	Status
1600-1600	ALIGNMENT& STEERING WHEELS			
1700-1700	DYNO			
1700-1750	ROAD TEST DRIVE			
1800-1800	READY ROW			
1800-1850	UNDERSIDE INSPECTION			

10 - READY ROW [ATTACHMENT(S)]

10 - READY ROW [PICTURE VALIDATION]

WC-BS	Target	Actual

10 - READY ROW [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

10 - READY ROW [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

10 - READY ROW [OPERATION CHECK]

Operation Check	Value	Status	Verified By
Adjust Draglink		NOT VERIFIED	
Torque Draglink & Key		NOT VERIFIED	
Rear Suspension Air Bag Height		NOT VERIFIED	
Check Horn Operation		NOT VERIFIED	
Torque Steering Wheel & Stake		NOT VERIFIED	
Step Height		NOT VERIFIED	
Clear Front Brake Lines		NOT VERIFIED	
Front Air Bags Clearance		NOT VERIFIED	

Snow Chain Adjustment & Angles		NOT VERIFIED	
CB BS change to 1700 from 1600 Syracuse NY ONLY, no bus mode/bus/transmission		NOT VERIFIED	
Max Water Temp: Degrees		NOT VERIFIED	
Headlight Adjustment		NOT VERIFIED	
A/C Belt Tension		NOT VERIFIED	
HVAC System Function		NOT VERIFIED	
Heater/Defroster Function		NOT VERIFIED	
Aux. Coolant Heater Function		NOT VERIFIED	
Engine Performance		NOT VERIFIED	
Transmission Shifting		NOT VERIFIED	
Full Brake Retarder		NOT VERIFIED	
1/3 Throttle & 2/3 Brake Retarder		NOT VERIFIED	
Aux Brake Test		NOT VERIFIED	
Aux Brake Test		NOT VERIFIED	
Speedometer Accuracy		NOT VERIFIED	
Maximum Speed: MPH		NOT VERIFIED	
Verify Dyno Sheet Upload		NOT VERIFIED	
Test Interlock		NOT VERIFIED	
Hydraulic Leaks		NOT VERIFIED	
Coolant Leaks		NOT VERIFIED	
Check For Codes		NOT VERIFIED	
Check Engine Oil Level		NOT VERIFIED	
Check Transmission Oil Level		NOT VERIFIED	
Check Engine Coolant Level		NOT VERIFIED	
Check Hydraulic Fluid Level		NOT VERIFIED	
Axle Oil Level		NOT VERIFIED	
Fire Suppression System Armed		NOT VERIFIED	

Start / Stop		NOT VERIFIED	
Depot Mode		NOT VERIFIED	
Water Test		NOT VERIFIED	
1,000 Mile Road Test		NOT VERIFIED	
Brake Test Results From Road Test		NOT VERIFIED	
CNG Methane Leak Check		NOT VERIFIED	
Eng. Shut Down w/ Methane Leak		NOT VERIFIED	

11 - FINAL TESTING/DETAILING

WC-BS	Operations	Prod	QC	Status
1000-1001	INSTALL DECALS			
1000-1002	INSTL EXT DECALS/ KITTING/ SHIP LOOSE			
1000-300.1000	ELECT COMPONENT INSTL & DEST SIGN FUNCT			
1000-300.900	VIDEO SYSTEM CONFIGURATION			
1400-1410	LIFT RACK UNDERSIDE			
1400-1420	ADA RAMP INSTALL			
8051-300.8055	INSTL EXT ELECT			
8051-300.8060	EXT. VIDEO / ROOF RAIL LAMP INSTL			
8051-300.8065	INT. VIDEO / PANEL LAMP INSTL			
8251-300.8250	ISOLATION LOOP			
8251-300.8255	ELECT DOOR INSTL			
8601-300.8635	INTERIOR ELECTRICAL INSTALL #1			
8601-300.8640	INTERIOR ELECTRICAL INSTALL #2			
8700-120	EXTERIOR GRAPHICS - CIS INSTL			
8701-300.8715	DOOR ADJUSTMENTS			
8701-300.8720	VIDEO SYSTEM INTEGRATION			

11 - FINAL TESTING/DETAILING [ATTACHMENT(S)]

11 - FINAL TESTING/DETAILING [PICTURE VALIDATION]		
WC-BS	**Target**	**Actual**

11 - FINAL TESTING/DETAILING [DISCREPANCY]						
Id	**Defect Code**	**BS**	**Description**	**Prod**	**QC**	**Status**

ATTACHMENT(S)

11 - FINAL TESTING/DETAILING [SHORTAGES]						
Part No	**P.O.**	**Description**	**Quantity**	**Prod**	**QC**	**Status**

11 - FINAL TESTING/DETAILING [OPERATION CHECK]			
Operation Check	**Value**	**Status**	**Verified By**
CB BS 1001 Customer only - Worcester, Ma		NOT VERIFIED	
Interior & Exterior Gillig Decals		NOT VERIFIED	
Ship Loose Items		NOT VERIFIED	
CB Hi Alex !!! new OPCk		NOT VERIFIED	
CB operation_check_master test V2		NOT VERIFIED	
Check Torque Seal All Hardware		NOT VERIFIED	
Engine Compartment Wiring and Hose Routing		NOT VERIFIED	
Engine Compartment Clearances		NOT VERIFIED	
Check Fuel Leaks		NOT VERIFIED	
Check Hydraulic Leaks		NOT VERIFIED	
Check Coolant Leaks		NOT VERIFIED	
Check Oil Leaks		NOT VERIFIED	
Proper Clamps and Hanger		NOT VERIFIED	
Brake Hose Routing		NOT VERIFIED	
Slack Adjuster Angle		NOT VERIFIED	
Clevis and Cotter Pins – Front		NOT VERIFIED	

Clevis and Cotter Pins – Rear		NOT VERIFIED	
Underside Wiring and Hose Routing		NOT VERIFIED	
Susp. Hardware Torque and Seal		NOT VERIFIED	
Under Seal Complete		NOT VERIFIED	
Check Front Hub Oil Level		NOT VERIFIED	
Cleanliness		NOT VERIFIED	
Ramp Hardware Torqued		NOT VERIFIED	
Ramp Trim		NOT VERIFIED	
Ramp Nosing		NOT VERIFIED	
Ramp Beeper		NOT VERIFIED	
Interlock Works w/ Ramp Deployed		NOT VERIFIED	
Interlock w/ Ramp Manually Deployed		NOT VERIFIED	
Cycle Ramp Minimum 6 Times		NOT VERIFIED	
Aisle Lamps		NOT VERIFIED	
Stanchion Chime / Function		NOT VERIFIED	
Electrical Function Check		NOT VERIFIED	
Coolant ISO-Loop		NOT VERIFIED	
A/C Belt Alignment Verification		NOT VERIFIED	
Bike Rike Installation		NOT VERIFIED	
Torque Wheel Lug Nuts		NOT VERIFIED	
Tire Air Pressure		NOT VERIFIED	
Tail light installation T1		NOT VERIFIED	
A/C Belt Alignment Verification		NOT VERIFIED	
Turn signal at installation.		NOT VERIFIED	
Marker Lights		NOT VERIFIED	
Stepwell lights		NOT VERIFIED	
Entrance Door Operation - Close		NOT VERIFIED	
Entrance Door Operation - Sensitive Edge		NOT VERIFIED	

Exit Door Operation - Open		NOT VERIFIED	
Exit Door Operation - Close		NOT VERIFIED	
Exit Door Operation - Sensitive Edge		NOT VERIFIED	

20-04B - TIRE SHED

WC-BS	Operations	Prod	QC	Status

20-04B - TIRE SHED [ATTACHMENT(S)]

20-04B - TIRE SHED [PICTURE VALIDATION]

WC-BS	Target	Actual

20-04B - TIRE SHED [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

20-04B - TIRE SHED [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

20-04B - TIRE SHED [OPERATION CHECK]

Operation Check	Value	Status	Verified By

20S - TIRE SHED

WC-BS	Operations	Prod	QC	Status

20S - TIRE SHED [ATTACHMENT(S)]

20S - TIRE SHED [PICTURE VALIDATION]

WC-BS	Target	Actual

20S - TIRE SHED [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

20S - TIRE SHED [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

20S - TIRE SHED [OPERATION CHECK]

Operation Check	Value	Status	Verified By

33 - 3RD SHIFT - A/C COMPRESSOR

WC-BS	Operations	Prod	QC	Status

33 - 3RD SHIFT - A/C COMPRESSOR [ATTACHMENT(S)]

33 - 3RD SHIFT - A/C COMPRESSOR [PICTURE VALIDATION]

WC-BS	Target	Actual

33 - 3RD SHIFT - A/C COMPRESSOR [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

33 - 3RD SHIFT - A/C COMPRESSOR [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

33 - 3RD SHIFT - A/C COMPRESSOR [OPERATION CHECK]

Operation Check	Value	Status	Verified By

33S - ROUTER - INSULATION

WC-BS	Operations	Prod	QC	Status

33S - ROUTER - INSULATION [ATTACHMENT(S)]

33S - ROUTER - INSULATION [PICTURE VALIDATION]

WC-BS	Target	Actual

33S - ROUTER - INSULATION [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

33S - ROUTER - INSULATION [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

33S - ROUTER - INSULATION [OPERATION CHECK]

Operation Check	Value	Status	Verified By

AA - GENERIC B/M

WC-BS	Operations	Prod	QC	Status

AA - GENERIC B/M [ATTACHMENT(S)]

AA - GENERIC B/M [PICTURE VALIDATION]

WC-BS	Target	Actual

AA - GENERIC B/M [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

AA - GENERIC B/M [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

AA - GENERIC B/M [OPERATION CHECK]

Operation Check	Value	Status	Verified By

OE - FIBERGLASS / CAP AREA

WC-BS	Operations	Prod	QC	Status

OE - FIBERGLASS / CAP AREA [ATTACHMENT(S)]

OE - FIBERGLASS / CAP AREA [PICTURE VALIDATION]

WC-BS	Target	Actual

OE - FIBERGLASS / CAP AREA [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

OE - FIBERGLASS / CAP AREA [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

OE - FIBERGLASS / CAP AREA [OPERATION CHECK]

Operation Check	Value	Status	Verified By

OS - GENERIC OUTSIDE SERV

WC-BS	Operations	Prod	QC	Status

OS - GENERIC OUTSIDE SERV [ATTACHMENT(S)]

OS - GENERIC OUTSIDE SERV [PICTURE VALIDATION]

WC-BS	Target	Actual

OS - GENERIC OUTSIDE SERV [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

OS - GENERIC OUTSIDE SERV [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

OS - GENERIC OUTSIDE SERV [OPERATION CHECK]

Operation Check	Value	Status	Verified By

PD - GENERIC PURCHASING

WC-BS	Operations	Prod	QC	Status

PD - GENERIC PURCHASING [ATTACHMENT(S)]

PD - GENERIC PURCHASING [PICTURE VALIDATION]

WC-BS	Target	Actual

PD - GENERIC PURCHASING [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

PD - GENERIC PURCHASING [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

PD - GENERIC PURCHASING [OPERATION CHECK]

Operation Check	Value	Status	Verified By

SP - SPARE PARTS

WC-BS	Operations	Prod	QC	Status

SP - SPARE PARTS [ATTACHMENT(S)]

SP - SPARE PARTS [PICTURE VALIDATION]

WC-BS	Target	Actual

SP - SPARE PARTS [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

SP - SPARE PARTS [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

SP - SPARE PARTS [OPERATION CHECK]

Operation Check	Value	Status	Verified By

VEND - VENDOR

WC-BS	Operations	Prod	QC	Status
1501-1505	2-WAY RADIO INSTL - DAY WIRELESS			

VEND - VENDOR [ATTACHMENT(S)]

VEND - VENDOR [PICTURE VALIDATION]

WC-BS	Target	Actual

VEND - VENDOR [DISCREPANCY]

Id	Defect Code	BS	Description	Prod	QC	Status

ATTACHMENT(S)

VEND - VENDOR [SHORTAGES]

Part No	P.O.	Description	Quantity	Prod	QC	Status

VEND - VENDOR [OPERATION CHECK]

Operation Check	Value	Status	Verified By

ROCKWELL/WABCO D VERSION ANTI-LOCK BRAKE SYSTEM CHECKLIST

Step 1. Clear stored faults with Pro-Link STORED FAULT menu

Step 2. Record the following ECU information from Pro-Link PROGRAM ID menu.

Valve Function Test: Identification	QC	PASS/FAIL
Modulator Valve Cycle : Left Front (A) Steer Axle		NOT VERIFIED
Modulator Valve Cycle : Right Front (B) Steer Axle		NOT VERIFIED

Modulator Valve Cycle : Left Rear (C) Drive Axle		NOT VERIFIED
Modulator Valve Cycle: Right Rear (D) Drive Axle		NOT VERIFIED

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 Test : Identification	**QC**	**PASS/FAIL**
Sensor Output: Left Front Wheel (A) Steer Axle		NOT VERIFIED
Sensor Output: Right Front Wheel (B) Steer Axle		NOT VERIFIED
Sensor Output: Left Rear (C) Drive Axle		NOT VERIFIED
Sensor Output: Right Rear (D) Drive Axle		NOT VERIFIED

Step 4: Miscellaneous Component Testing

Other Function Test: Identification	**QC**	**PASS/FAIL**
ATC Modulator Valve: Full System Only		NOT VERIFIED
ATC Lamp (Wheel Spin): Full System Only		NOT VERIFIED
ABS Lamp (Tractor ABS): D Basic and Full		NOT VERIFIED
ABS Check Switch, Disable ATC: D Full. Hold switch for just over 3 sec.		NOT VERIFIED
Engine Datalink (Eng Torque) ATC: D Full		NOT VERIFIED
Retarder Datalink: D Basic and Full (when equipped)		NOT VERIFIED
Retarder Relay: D Basic and Full (when equipped)		NOT VERIFIED

Step 5: Air System Function and Leak Test

Air System End of Line Test : Required	**QC**	**PASS/FAIL**
0 psi in tanks, LPS on, Dash gauge low: Confirm		NOT VERIFIED
Both needles rise together, max 5 psi diff: Confirm		NOT VERIFIED
LPS off above 60 psi below 80 psi: Confirm		NOT VERIFIED
Build-up time 25 seconds or less: Confirm		NOT VERIFIED
Compressor Cut-out psi: 125–135 psi		NOT VERIFIED

Supply System Leakage test: Not to exceed 4 psi in 2 minutes		NOT VERIFIED
Service Brake Leakage test: Not to exceed 6 psi in 2 minutes		NOT VERIFIED
Pull up PP-1: Confirm spring brakes apply		NOT VERIFIED
Push in PP-1: Confirm spring brakes release		NOT VERIFIED
Wet Tank Drain Down: No drop on either gauge		NOT VERIFIED
Secondary Tank Drain Down: Red needle drop, max 2 psi drop in green needle		NOT VERIFIED
Service Brake Application: Rear brakes apply, front brakes do not apply, stop light lights		NOT VERIFIED
Primary Tank Drain Down: Green needle drops		NOT VERIFIED
Primary Tank Drain Down: PP-1 pops at 35–45 psi		NOT VERIFIED
Primary Tank Drain Down: Green needle drops, red drops 2 psi max		NOT VERIFIED
Primary Tank at 0 psi: Front brakes apply, Rear brakes apply with spring brake,stop lights light		NOT VERIFIED
Drain Accessory Tank: Verify flow from accessory tank drain		NOT VERIFIED
Front Brake Interlock: Verify operation		NOT VERIFIED
Rear Brake Interlock: Verify operation		NOT VERIFIED

MFD TEST PROCEDURE WORKSHEET

General Functions	**QC**	**PASS/FAIL**
Verify Primary Screen gauges match Programming Spec and display proper values.		NOT VERIFIED
Verify Secondary Screen gauges match Programming Spec and display proper values.		NOT VERIFIED
Verify Engine Test switch triggers Check Engine indicator		NOT VERIFIED
Verify ABS test switch (if applicable) triggers ABS indicator momentarily.		NOT VERIFIED
Verify Lamp Test switch illuminates all on-screen and physical telltale indicators for 10 seconds (or as noted).		NOT VERIFIED

Day Run / Night Run Modes	QC	PASS/FAIL
Ensure Day Run shows a white background with colored graphics		NOT VERIFIED
Ensure Night Run shows a black background with colored graphics		NOT VERIFIED
Verify screen toggles properly with specified screen control (i.e. run sw or ambient light sensor)		NOT VERIFIED
Camera viewing	**QC**	**PASS/FAIL**
Verify Rear door camera image appears when rear door open is triggered.		NOT VERIFIED
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)		NOT VERIFIED
When interlock is ACTIVATED, verify that the REAR DOOR camera image appears, when BOTH rear door open and reverse signals are active.		NOT VERIFIED
When interlock is DEACTIVATED, verify that the BACK-UP camera image appears, when BOTH rear door open and reverse signals are active.		NOT VERIFIED
Seat Cushion Alarm	**QC**	**PASS/FAIL**
Verify that the “Set Parking Brake” image functions as described.		NOT VERIFIED
Seat Belt Alarm	**QC**	**PASS/FAIL**
Verify that the “Check Seatbelt” image functions as described.		NOT VERIFIED
Maintenance / Driver mode	**QC**	**PASS/FAIL**
Verify that the Maintenance/Driver mode switch toggles the screen between Maintenance Mode and Driver mode.		NOT VERIFIED
In Maintenance Mode, Verify J1939 button displays J1939 signals.		NOT VERIFIED
In Maintenance Mode, Ensure “System Status” button displays all I/O modules on bus and show as “Online”		NOT VERIFIED
In Maintenance Mode, Verify that the screen remains on the current screen while the bus is moving more than 3 mph.		NOT VERIFIED
In Driver Mode, Verify Diag. Menu button does not appear on the Primary Screen.		NOT VERIFIED

In Driver Mode, Verify that the screen returns to the Primary Screen when the bus is moving more than 3 mph.		NOT VERIFIED
Shutdown	**QC**	**PASS/FAIL**
Turn Ignition off, and Verify screen remains on while I/O multiples system is on.		NOT VERIFIED
Set the Maintenance/Driver mode switch to “Driver” before leaving the bus.		NOT VERIFIED

FINAL ACCEPTANCE

OPERATION	**QC**	**PASS/FAIL**
VIN Plate Installed		NOT VERIFIED
All Shortages Addressed		NOT VERIFIED
All Write-Ups Completed		NOT VERIFIED
All Final Operations Completed		NOT VERIFIED
All Safety Gear Installed		NOT VERIFIED
All Interior Doors Secured		NOT VERIFIED
All Exterior Doors Secured		NOT VERIFIED
Ship Loose Items (Noted On Green Sheet)		NOT VERIFIED
Function Check Complete		NOT VERIFIED
Fire Suppression Sys. Activated		NOT VERIFIED
End-Of-Line Air System Test		NOT VERIFIED
Attachment Check Off List Complete		NOT VERIFIED

DEPARTMENT DISCREPANCY

Defect Code	**Description**	**Prod**	**QC**	**Status**

GILLIG

RIGHT TIME, FIRST TIME APP

GILLIG has instituted our Right Time, First Time APP for customers to monitor the progress of their fleet down the production line. This digital inspection card gives customers real-time access during the entire production of their fleet!

Build better with more efficiency and productivity.

The Right First Time app, it's a digital tool that enables tracking of the build status of each bus. The app enhances our collaboration with its capabilities such as picture sharing of current issues and their status.

Transparent and informative in real time.

The app allows our customers to stay in the know at all times, by offering visibility into location of the bus, discrepancies, shortages, and their status, all in real time.

Real time data on shortages.

Inspection records & Serial numbers.

Data collected can be made available via PDF format, history of each transaction (discrepancies, shortages) are captured, and serial numbers for critical components recorded. (Right First-Time data is also Excel friendly.)

Easy to use.

An iPad and training are provided upon our customer inspection visit, the iOS interface makes this app an intuitive and unique user experience.

Practical benefits.

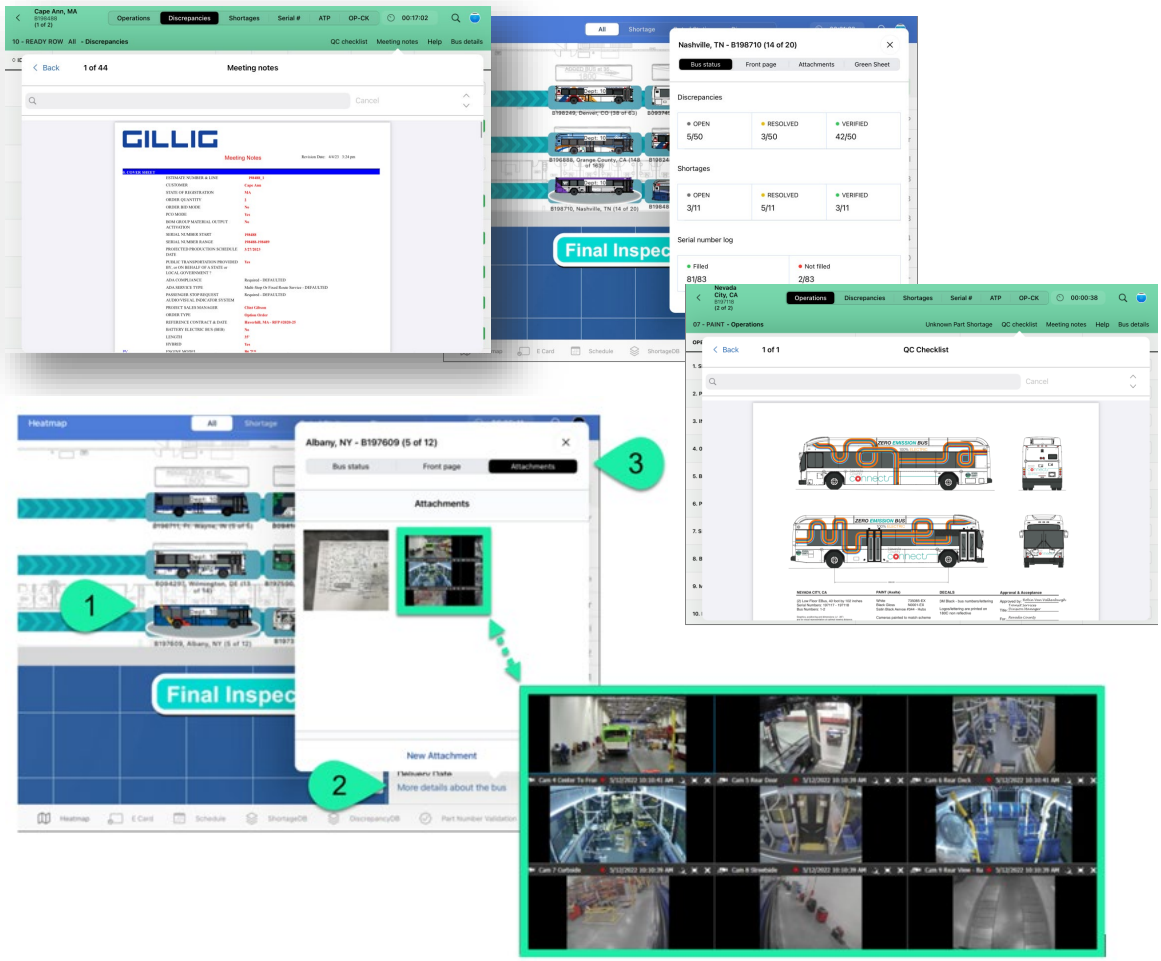
Utilize the Heat map to track the exact location of each bus. Paint layout location and specification meeting notes at the customer's fingertips.

GILLIG

RIGHT TIME, FIRST TIME APP

Benefits of the Digital Inspection Card

- Heat-map. Digital representation of the production floor.
- Transparency. see your data in real time. Shortage DB & Discrepancy DB
- Actionable Insights: see ETA on shortages.
- Serial Number database.
- Dashboard “Bus Details” Discrepancies and Shortages.
- PDF available. Inspection record.
- Assembly Schedule: Bus start date.
- Info overview & attachments: VIN, Emissions Label, Camera views.
- Meeting notes & Paint layout.



AFTERMARKET PARTS
STRATEGY & ACCESSIBILITY

AFTERMARKET PARTS FACILITIES

105K sqft Parts Facility in Hayward, CA

35k+ sqft Warehouse Facility in Hebron, KY

IN STOCK IN THE STATES:

Over 20,000 SKUs on-hand, in two warehouses (~$15 million in inventory)

RAPID PROCESSING:

Same-Day Order Processing

Until 4pm EST (1pm PST)

2-DAY SHIPPING:

Standard 2-Day Shipping to the East Coast

(Depending on size and weight restrictions)

GILLIG Aftermarket Parts Department provides service parts to all our customers throughout the country. All parts are produced to our original vehicle specifications and are either manufactured in-house or purchased to our drawings from OEM's.

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.

GILLIG is proud to advise that all parts (100%) are stocked in the U.S. in our Hayward, CA 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 almost 97% within 72 hours (excluding weekends).

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.

Customer Satisfaction

The GILLIG Parts Service Department 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.

AFTERMARKET PARTS CONTACTS

GILLIG uses a centralized warehouse to provide the most comprehensive and economical service possible to its customers. GILLIG compensates for distance by shipping second day air. Consequently, the nearest parts warehouse to supply your service parts needs is:

Central Location:
GILLIG, LLC
25972 Eden Landing Road
Hayward, CA 94545
Phone: 510-264-5160
Email: parts-sales@gillig.com

Central Contacts:
Chuck O'Brien - Vice President, Aftermarket Parts Division
Eiji Kinoshita - Director of Sales, Aftermarket Parts Division

Regional Contacts:

Northwest Region
Richard Bissel
Regional Sales Manager
Cell Phone: 510-325-6958
Email: Richard.Bissell@gillig.com

Northeast Region
Jerry Sheehan
Regional Sales Manager
Cell Phone: 510-329-0320
Email: Jerry.Sheehan@gillig.com

Western Region
Sean Solis
Regional Sales Manager
Cell Phone: 510-512-2638
Email: Sean.Solis@gillig.com

Mid-West Region
Dan Rudiger
Regional Sales Manager
Cell Phone: 510-876-6100
Email: Dan.Rudiger@gillig.com

Central Region
Kevin Hardesty
Regional Sales Manager
Cell Phone: 510-737-2283
Email: Kevin.Hardesty@gillig.com

South Central Region
Randy Brewer
Regional Sales Manager
Cell Phone: 925-409-6585
Email: Randy.Brewer@gillig.com

Southwest Region
Joe Saldana
Regional Sales Manager
Cell Phone: 510-303-0202
Email: Joe.Saldana@gillig.com

Southeast Region
Butch Sibley
Regional Sales Manager
Cell Phone: 510-589-9430
Email: Butch.Sibley@gillig.com

National Accounts
Tyler Davis
National Accounts Sales Manager
Phone: 317-590-1833
Email: Tyler.Davis@gillig.com

Hawaii
John Lum
Manager, Parts Sales
Phone: 264-5125
Email: John.Lum@gillig.com

GILLIG

AFTERMARKET PARTS REFERENCES

GILLIG's Aftermarket Parts Department 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.

St. Louis, MO (Bi-State Development Agency)
Deborah Rowey
Director of Contracts & Strategic Sourcing
314-982-1400
procurement@bistatedev.org

Salt Lake City, UT (Utah Transit Authority)
Jolene Higgins
Sr Buyer
801-237-1925
Jhiggins@rideuta.com

St. Petersburg, FL (PSTA)
Jody Sibley
Storeroom Superintendent
727-540-1884
jsibley@psta.net

Jacksonville, FL (JTA)
Michael West
Manager of Inventory Control & Stores
904-630-3179
mwest@jtafla.com

Hampton Roads, VA (HRT)
Anita Brown
Buyer
757-222-6000 x 6325
abrown@hrtransit.org

Youngstown, OH (WRTA)
Becky Koenig
Maintenance Director
330-744-8431
rkoenig@wrtaonline.com

Ft. Wright, KY (TANK)
Wayne Bey
Purchasing Agent
859-814-2142
wbey@tankbus.org

Olympia, WA (Inter-City Transit)
Johnathon Yee
Director of Fleet & Facilities
360-705-5884
jyee@intercitytransit.com

Richmond, VA (GRTC)
Mark Donavon
Purchasing Manager
804-358-3871 x 352
mark.donavon@ridegrtc.com

GILLIG

25972 Eden Landing Road, Hayward CA 94545 | www.gillig.com | 800.735.1500

TERRITORIES OF PARTS SALES REPS

WEST COAST	EAST COAST
Linda Omaque	Todd Nunnally
Amanda Ghali	Gabriel Avila
Shamil Mohammed	Carlos Gonzales
Sue Baer	Ramiro Becerra
Mark Roth	Michael Warren
Nigel Hill	Pranesh Ram
Rick Dominquez	Desmond Davis
John Edmondson Jr.	Rodrigo Mendoza
Hung Le	Blane Matus

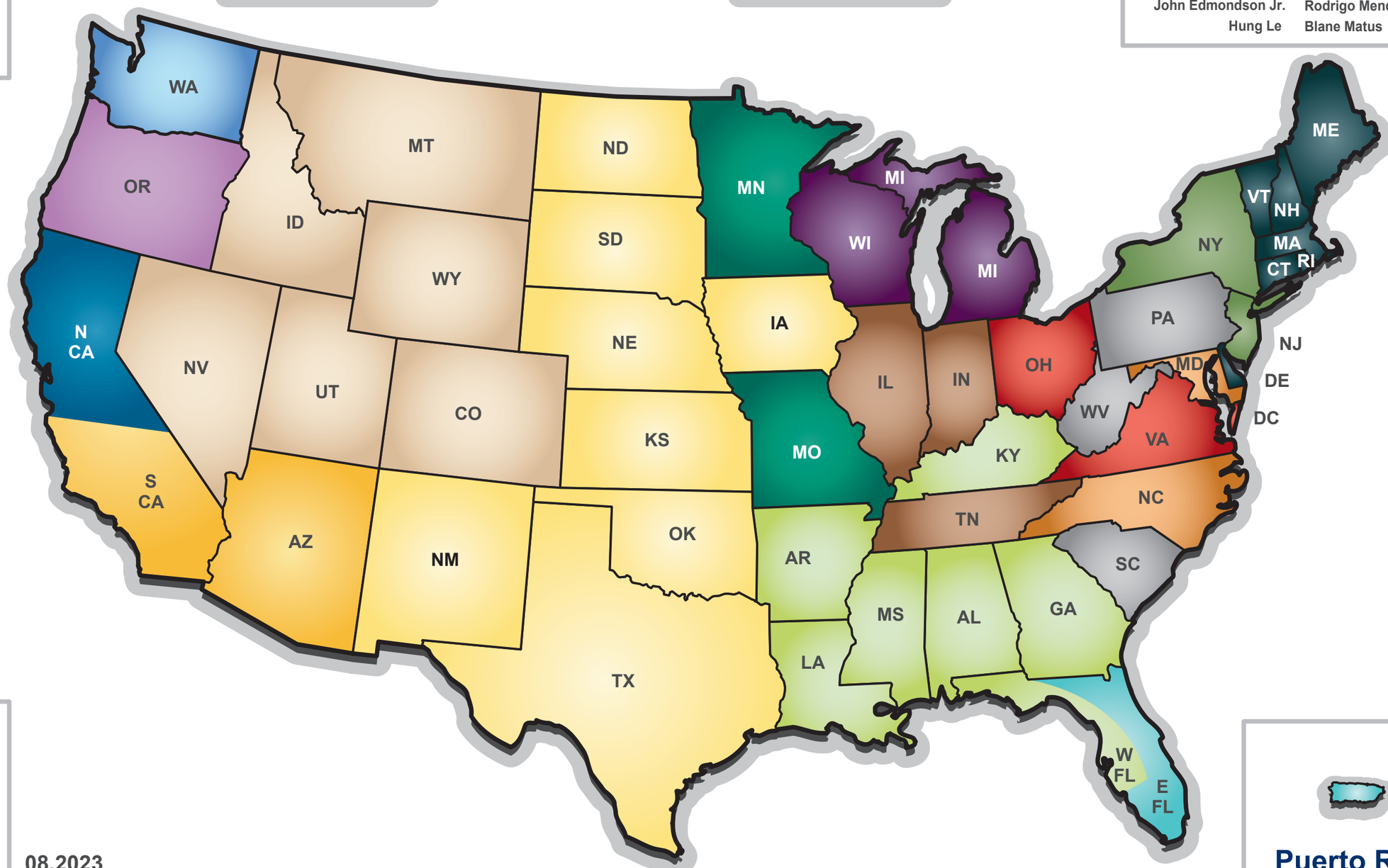
Alaska

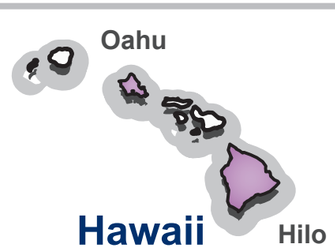
British Columbia | Calgary

Canada

Ontario | Quebec

- Amanda Ghali
- Linda Omaque
- Nigel Hill
- Rick Dominquez
- Shamil Mohammed
- Sue Baer
- Mark Roth
- John Edmondson Jr
- Rodrigo Mendoza
- Michael Warren
- Ramiro Becerra
- Carlos Gonzales
- Desmond Davis
- Pranesh Ram
- Todd Nunnally
- Gabriel Avila





Hawaii

08.2023

Puerto Rico

WARRANTY SUPPORT

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:

- Engine
- Transmission
- Axles
- Air Conditioning Unit
- Batteries
- Destination Signs
- Video Surveillance Systems
- Intelligent Transit Systems
- Agility CNG Fuel System

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:

Field Service Coordinator
GILLIG Service Department
451 Discovery Drive
Livermore, CA 94551
(510) 264-5073
FieldService@GILLIG.com

GILLIG

WARRANTY SERVICE STAFF

The Customer Care 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
Ashley Mitchell

REGIONAL SERVICE MANAGERS
Matt Boegler (West)
Mark Bittner (East)
Thomas Seymour (Central)

TECHNICAL ADVISOR WARRANTY
Bo Vongamath

WARRANTY PARTS SPECIALIST
Dominic Nava

WARRANTY PROCESSING SPECIALISTS
Johnny Phothipanya

FIELD SERVICE COORDINATOR

Our Warranty 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 WarrantyClaims@gillig.com.

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 WarrantyClaims@gillig.com.

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 are marked with an asterisk (*)

*CLAIM NUMBER: #1 *DATE: #2

MAIN (510) 785-1500 | FAX (510) 785-1348

*UNIT SERIAL # #3

BUS OR COACH # #4

*IN SERVICE DATE #6

*DATE OF FAILURE #8

A/C SERIAL # #11

*OWNER #5

*MILEAGE AT FAILURE #7

WHERE REPAIRED #9

ENGINE SERIAL # #10

TRANSMISSION SERIAL #12

*DESCRIBE SPECIFIC (COMPLAINT, CAUSE, CORRECTION) REPAIRS REQUIRED AND ATTACH COPY OF REPAIR ORDER

#13

IF REPLACEMENT PART NUMBER DIFFERS FROM ORIGINAL PART NUMBER, LIST THE ORIGINAL PART NUMBER HERE: #16
(IF MORE SPACE IS NEEDED, PLEASE USE SEPARATE SHEET AND ATTACH TO BACK OF CLAIM)

#14

REPLACEMENT PART NUMBERS	PRICE		
PARTS USED: YES ☐ NO ☐	PRICE EACH	QTY. USED	SUBTOTAL
#15	#17	#18	#19
*LABOR RATE #21 / *HR. #22			
SUBLET (ATTACHED INVOICE COPIES)	PARTS	LABOR	TOTAL
1. #24			
2.			

PARTS TOTAL $ #20

*LABOR TOTAL $ #23

SUBLET TOTAL $ #25

*GRAND TOTAL $ #26

NOTE: IF CALIFORNIA BUS, NEED ENGINE HOURS FROM HOURMETER OR ECM #27

*NAME/PHONE OF CONTACT FOR ADDITIONAL INFO #28 //

//

E-MAIL ADDRESS(ES) #29

*SUBMITTED BY / PROPERTY NAME & ADDRESS #30

E-MAIL ADDRESS(ES) #31

*REIMBURSEMENT NAME AND ADDRESS (IF DIFFERENT FROM ABOVE) #32

E-MAIL ADDRESS(ES)

NOTE: Warranty will be denied if the defective material is not received by GILLIG within 30 days of the failure date.

GILLIG | 451 DISCOVERY DRIVE | LIVERMORE, CALIFORNIA 94551 | 800.735.1500

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

<u>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.</u>

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

CHANGE CONTROL

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

FIELD SERVICE MODIFICATIONS

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.

We have provided a sample for your reference.

GILLIG

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

Product Alert

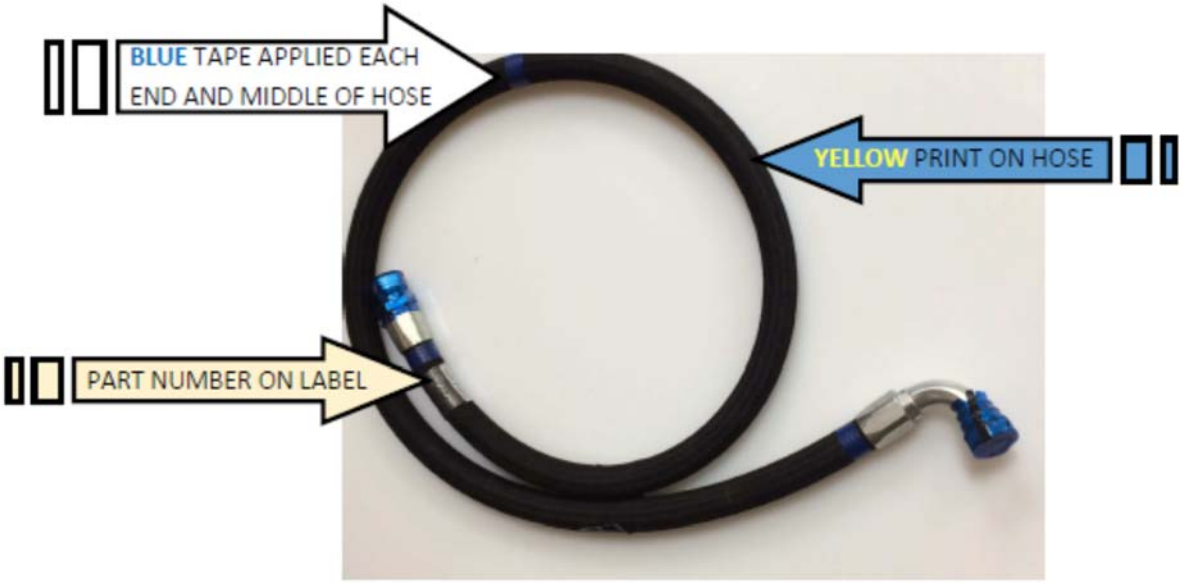
Affected products: Gillig hose assemblies part numbers 46-xx**B**xxxx-xxxx

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**



Original blue FC-300

SERVICE DEPARTMENT

GILLIG maintains a fully qualified, trained Service Department to support 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).

GILLIG

CUSTOMER CARE SUPPORT NETWORK

EXECUTIVE DIRECTOR, CUSTOMER CARE
Victor Doran

REGIONAL SERVICE MANAGERS
Matt Boegler (West)
Mark Bittner (East)
Thomas Seymour (Central)
Ashley Mitchell (Warranty Operations)

TECHNICAL SERVICE ADVISOR
Bo Vongamath

TECHNICAL TRAINERS	BASED
David Mattke	Palmdale, CA
Eric Ocampo	Livermore, CA
Russ Ando	Seattle, WA
Lyle Archambeau**	St. Paul, MN
Blaine Fagel	Charlotte, NC

FIELD SERVICE REPRESENTATIVES *	BASED
Cody Campeau	St. Paul, MN
Max Camper	Columbus, OH
Jason Fairclough*	Salt Lake City, UT
Jose Garcia	San Francisco, CA
Armando Garibay	Southern California
Matthew Gerbasi	Lowell, MA
Thomas Johnson	Phoenix, AZ
Scott Kovaly	Pittsburgh, PA
Tim Lopez	San Francisco, CA
William Lovelady	Jackson, TN
Sam Nicoara	Atlanta, GA
Paul Oden, Jr.	Cincinnati, OH
Joe Rhea*	Dallas, TX
Ken Riley	Charlotte, NC
Richard Salas*	San Francisco, CA
Steven Sayne*	Seattle, WA
Jason Schwalbert	Phoenix, AZ
Matthew Sharp	San Antonio, TX
Sang Tran*	Los Angeles, CA
Ricardo Diaz	Riverside, CA

GILLIG

CUSTOMER CARE SUPPORT NETWORK

FIELD SERVICE & WARRANTY
Phone - 800-735-1500
Fax- 510-785-1348

Victor Doran	Exec. Director, Customer Care	victor.doran@gillig.com
Matt Boegler	Regional Service Manager	Matt.boegler@gillig.com
David Mattke	Training / Sales Demo Support	David.mattke@gillig.com
Ashley Mitchell	Warranty Operations Manager	Ashley.mitchell@gillig.com
Eric Ocampo	Training Dept. Lead	eocampo@gillig.com
Mark Bittner	Regional Service Manager	mark.bittner@gillig.com
Thomas Seymour	Regional Service Manager	Thomas.seymour@gillig.com
Branden Andersen	Supervisor Service Engineering	branden.andersen@gillig.com
Steve Finley	Field Service Engineer	steve.finley@gillig.com
Johnny Phothipanya	Warranty Processing Specialist	johnny.phothipanya@gillig.com
Bo Vongamath	Technical Advisor Warranty	bo.vongamath@gillig.com
Dominic Nava	Parts Specialist	dominic.nava@gillig.com
Field Service	Customer Care Coordinator	FieldService@gillig.com
Warranty Claims	Warranty Admin	WarrantyClaims@gillig.com
Warranty Parts	Parts Specialist	WarrantyParts@gillig.com
Kristina Aldana	Administrative Assistant	kristina.aldana@gillig.com
Jacqueline Hernandez	Customer Care Admin	jacqueline.hernandez@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
The 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 – Regional 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.

MARK BITTNER – Regional Service Manager
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 trainer and developed many vehicle maintenance overhaul programs and provided technical support. Since 2005 Mark has been working with GILLIG buses 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 diesel propulsion systems. Mark and his family now reside in Florida.

MATT BOEGLER – Regional Service Manager
Matt recently joined the Customer Care team as the Manager of Regional Field Service (West). In this role, he will oversee the field service representatives in the Western region with the goal of ensuring customer satisfaction, waste reduction, and service revenue maximization. Matt holds a Bachelor of Science degree in Automotive Engineering Technology from Southern Illinois State University in Carbondale. Prior to joining GILLIG, he dedicated his career to automotive OEM management, working for companies such as Nissan Motors, FCA Fiat Chrysler Automobiles, and Stellantis.

THOMAS SEYMOUR – Regional Service Manager
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.

ASHLEY MITCHELL – Manager, Warranty Operations
Joined the GILLIG family in August 2023, bringing 15+ years of transportation and logistics experience including project management, lean processing, system implementation, and continued customer service. Six Sigma Green Belt certified. Ashley spent the last 10 years managing multiple operations with teams of over 30+ people across California and Colorado. Currently, responsible for process improvement through the implementation of the new warranty management system, developing new standards and measurable KPI's, while staying focused on proactive communication and maintaining customer relationships.

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.

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.

DAVID MATTKE - Trainer
David has recently joined the Customer Care team as a Field Service Trainer – Sales Support. In this role, he will provide training for sales staff, develop training programs, and work on LMS development to assist in company growth and strengthen our training programs David is currently pursuing a bachelor's degree in Global Supply Chain Management with a specialization in technical management. He brings to GILLIG a robust technical background, having worked as a technician for various fleets and municipalities for over 13 years. In his previous role as Director of Fleet Maintenance, he trained fleet managers, technicians, and parts clerks, with a specialization in BEB and high-voltage systems.

CODY CAMPEAU – 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 Field Service Technician contractor for GILLIG since 2010. During that time he gained experience performing retrofits to buses, checking in new buses and processing warranty issues.

MAX CAMPER – Field Service Representative
Max joined GILLIG in July 2022. He came from the Central Ohio Transit Authority where he spent nearly 30 years as a Diesel and Hybrid Technician, Supervisor, Warranty Compliance Coordinator and Senior Technical Trainer. Max started his career in the United States Army, receiving training in the United States Army Ordnance Center and School, Track Vehicle Repair. Max has participated in the APTA International Bus Roadeo and holds a Class B CDL with passenger endorsement. He is a certified CNG Fuel System Inspector, obtained his Universal 608 and has received factory training from Cummins, Detroit Diesel, International, Bendix, TK and more. Max is located in Columbus, OH.

RICARDO DIAZ – Field Service Representative
Ricardo joined GILLIG in the Customer Care department in 2023. He spent 7 1/2 years with Riverside Transit agency as a mechanic and most recently as a maintenance supervisor. All of Jose's transit experience comes from working on GILLIG buses. In 2019 he completed Orange County Transit Authorities' heavy-duty bus certification class where he learned about major components of the buses such as Cummins CNG engines, Allison transmissions, Thermo King HVAC and more.

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.

ARMANDO GARIBAY – Field Service Representative
Armando joined the GILLIG family in September 2022. He brings with him 12 years of experience in the commercial bus manufacturing industry, 7 of those years were leading a production line specializing in transit HVAC systems installation, other 5 years were spent overseeing the acceptance process of large volume fleet deliveries throughout the country as Field Service Repesenative. Certifications include a Universal Type HVAC certification through Mt. San Antonio Community college in Walnut California and CNG fuel cylinder and systems certification though NGVi, the leading provider of CNG technical training.

MATTHEW GERBASI – Field Service Representative
Matt joined GILLIG in 2021 as Field Service Representative for the Northeast. Prior to joining GILLIG he worked at Transport of Rockland in Rockland County, NY. He started as a technician then worked his way up to Maintenance Manager. Matt has multiple ASE certifications and is trained in multiple systems such as Cummins, Allision Hybrid, Detroit Diesel, Amerex, Lift-U, Ricon, Dinex and Thermoking. Matt studied at Lincoln Technical Institute and has 11 years of heavy-duty experience.

THOMAS JOHNSON – Field Service Representative
Thomas obtained his A.S. degree in Automotive Technology from Pima Community College. Before joining GILLIG, he spent 15 years as a Maintenance Mechanic at SunTran Transportation in Tucson, AZ performing repairs and diagnostics on their transit fleet.

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.

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.

WILLIAM LOVELADY – Field Service Representative
Bill joined GILLIG After spending 24 years at the Jacksonville Transportation Authority as a bus operator, technician, and trainer, he has hundreds of transit training hours under his belt. His key responsibilities include the post-delivery inspection, repair, and maintenance of all GILLIG buses deployed to the South Atlantic area. Bill prides himself in delivering exceptional customer service and always puts our customer's needs first.

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 Southwestern 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.

KENNETH RILEY – Field Service Representative
Ken joined the Marine Corps in the early 1990's where he learned how to purify water and repair equipment. He went to work for Walmart logistics in 2000 where he eventually worked as a trailer and tractor mechanic working on Detroit series 60 and Cummins N14 engines on International Semi-trucks. He learned Cummins Insite and earned Detroit, Cummins and International certifications. In 2005 he earned certifications in Level 1,2,3, Out of Service and hazmat inspections as a Commercial Vehicle Officer for the State of Washington. Ken started working in Transit in 2005 at Island Transit in Whidbey Island Washington as a Journeyman Mechanic. He was promoted to Lead Mechanic in 2010 then Maintenance Supervisor in 2012 and Maintenance and Facilities Manager in 2014. Ken led his team to be recognized at the Washington State Transit Association for the Spirit Award on both Fleet Technicians and Facility Technicians. Ken joined GILLIG in January 2022.

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 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.

MATTHEW SHARP – Field Service Representative
Matt sharp worked 4 years at KCATA in Kansas City, MO as a class mechanic and was certified in facilities. Prior to being a transit mechanic, Matt had 20 years experience in the heavy equipment industry as a mechanic and operator, working 3 years for Murphy tractor and equipment as a heavy equipment field mechanic. Matt has vast knowledge in heavy repair and electrical diagnostics from working on Caterpillar heavy equipment specializing on 953 track loaders. Working at KCATA he diagnosed and repaired all aspects of GILLIG diesel and CNG buses.

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.

TASK DESCRIPTION	SRT
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

STEERING

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
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

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

COMPARTMENT DOORS (EXTERIOR)

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

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

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

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

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

TRANSMISSION CONTROL SYSTEMS

REPAIR/REPLACE PUSH BUTTON SHIFT UNIT	0.50
REPLACE BRAKE VALVE PRESSURE SWITCH	0.50
REPAIR/REPLACE WIRING	0.90

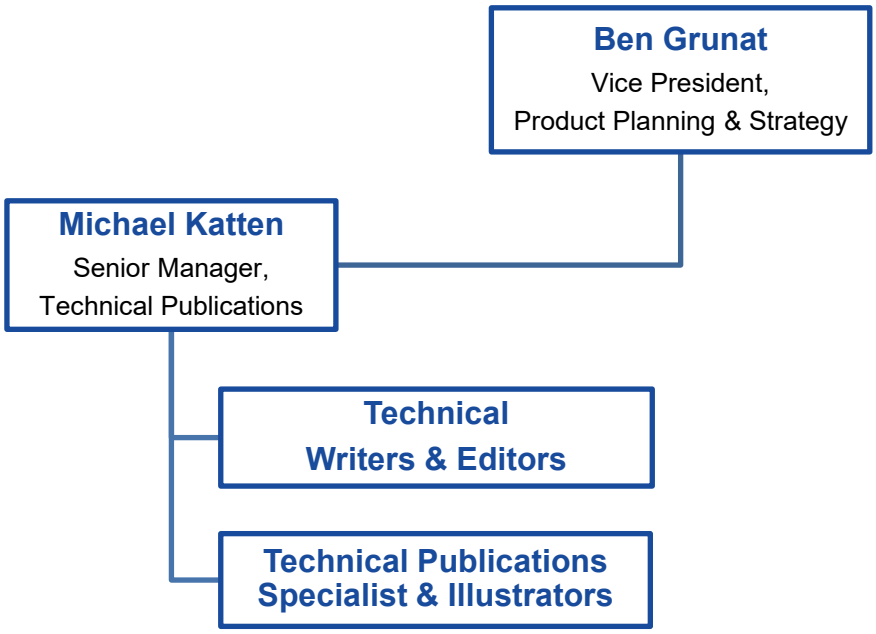
CHASSIS

LH FRAME REPAIR	12.00
RH FRAME REPAIR	12.00

TECHNICAL PUBLICATIONS

The GILLIG Technical Publications Department publishes custom-made Driver's, Service, Parts, and Electrical Schematics manuals specific to each customer order.

The Technical Publications Manager, technical writers, technical editors, illustrators, and publications specialists are all experienced and highly qualified in their professions. They are equipped with state-of-the-art computers and industry-standard publishing software. GILLIG has the resources available to consistently provide high quality, accurate, and timely manuals.



Custom Published Manuals

GILLIG is committed to providing outstanding documentation for your buses and our 130+ year legacy attests to the success of our approach and method.

GILLIG Technical Manuals are organized into sections and subsections, grouping related subjects and components together in an accessible tabbed, indexed, and cross-referenced format. Manuals are optimized for ease of use with customized as-built content matching your bus, locational indicators and 3D component views, detailed serviceable parts and assembly breakdown drawings, and highly legible labeling allowing for simple and accurate identification of parts, components, and procedures.

GILLIG Parts Manuals and Electrical Schematics Manuals are based on as-built computer-generated Bills of Material and drawings, which ensures timely assembly of highly detailed and custom information by reusing existing content modules. Our Engineering and Quality Assurance Departments conduct audits to ensure the as-built bus matches the Bills of Material, and this assists GILLIG in the goal of providing a perfect correlation between manuals and the completed bus.

TECHNICAL PUBLICATIONS

GILLIG Service Manuals are organized by vehicle system to support the hands-on, detailed approach necessary for maintenance procedures. The manuals thoroughly cover a wide range of critical safety information, with particular attention to PPE and LOTO requirements for work with and around high-voltage systems and components. All topics are presented for mechanics in language that simplifies each process and assists technicians in understanding and performing selected tasks with efficiency.

GILLIG Driver's Handbooks are organized to facilitate training and to acquaint the driver with key vehicle features and operating techniques. An extensive pre-trip vehicle and safety inspection is outlined, with additional cautions and safety warnings included as they apply to specific procedures. It is conveniently bound in a pocket-sized format suitable for quick reference and storage on the bus.

Manual Timeline

GILLIG's Technical Publications timeline carefully balances the need for timeliness with the availability of accurate source documentation from GILLIG and our many vendor partners. In order to ensure that the most complete and current information goes into the manuals, work in Publications begins once the first bus of an order is complete and shipped. This allows GILLIG to capture on-line order modifications or late-stage paperwork processing.

Digital Driver's, Service, and Schematics manuals are supplied in PDF format and delivered within two weeks of the first bus shipping, while the Parts Manual PDFs are delivered within four weeks of the first bus shipping. Hard copy manuals, if specified, are shipped within four weeks of PDF delivery. USBs, if specified, include all FTP-provided technical manual documentation and are provided within four weeks of completion of all technical manuals.

Immediate Digital Delivery

By default, GILLIG Technical Manual PDFs are delivered directly to the customer via an emailed, secure, direct FTP link as soon as each manual completes. This ensures immediate access to the PDFs for viewing and download, keyword-searchable access to critical vehicle information via any computer or device, and an environmentally friendly solution for delivering this large volume of technical documentation.

GILLIG is also pleased to offer digital OEM Manuals as part of our standard digital delivery, with OEM Manuals also provided in PDF format via FTP delivery. Supplementing this is the robust Cummins QuickServe Online portal, which provides online, digital access to current manuals, parts, service bulletins, updates, and more. Cummins offers various levels of online access, including a free account option.

TECHNICAL PUBLICATIONS

Using the industry-standard Adobe PDF format, GILLIG provides a quick and easy method of accessing key information in a manner that is both familiar and interactive. PDFs are keyword searchable using Adobe Acrobat software, which is available for free online. Additionally, GILLIG digital manuals are published with several types of links to further facilitate navigation within the PDF manuals. Thus, users can find what they need quickly and easily via keyword searches, bookmarked links to chapters and sections, and direct content links in the Table of Contents and Index.

GILLIG Technical Manual PDFs are also issued password-free to enable users to print manuals or pages as-needed, on-site, without the degradation of legibility and quality associated with photocopying. The password-free PDF manuals also allow users to annotate their personal digital copies with notes for internal use.

Hard Copy Options

GILLIG recognizes the variety of customer needs for conventional hard copy paper or laminated GILLIG Technical Manuals. As such, in addition to the default digital deliverables, each order contract may specify a required quantity and format for hard copy GILLIG Technical Manuals.

Service, Support, and Updates

Our objective is to provide you with the most comprehensive, user-friendly manuals possible. As such, GILLIG provides support and updates for our manuals, with manual updates sent directly to each customer at the time of updating.

The GILLIG Technical Publications department has a variety of methods to capture changes or updates, including early-stage internal review, cross-departmental communication with the Aftermarket Parts team and Field Service representatives, and formal review with Engineering subject matter experts. Feedback from customers is also welcome, as GILLIG highly values the partnerships we have with our customers.

GILLIG’s Customer Care organization provides superior and personal technical and field support, facilitates GILLIG’s specialized training program, and supplies complementary training videos that provide the knowledge necessary to operate and maintain your buses.

GILLIG’s Aftermarket Parts organization also provides world-class customer support, counsel on replacement parts and purchasing strategy, and an ever-expanding selection of aftermarket parts and customer-focused solutions.

Jefferson Parish
State of Louisiana

GILLIG HEAVY DUTY TRANSIT BUS
40' LOW FLOOR DIESEL **BRT PLUS**

**** The BRT Plus body styling shown above is for illustration purposes only.***
This styling is NOT included in the base price of the bus.
This styling is available as part of GILLIG's option pricing.

GILLIG would like to sincerely thank Jefferson Parish for an amazing partnership. We look forward to a successful bid opening and the opportunity to continue our partnership!

GILLIG