

From the U.S. Department of Energy/EPA

### **Ultra-Low Sulfur Diesel:**

As of December 1, 2010, all diesel fuel sold in the U.S. must be ULSD, and pumps dispensing ULSD must be labeled as such (except in California).

Ultra-low sulfur diesel (ULSD) clean diesel is diesel fuel with 15 parts per million or lower sulfur content. ULSD combined with advanced emission control technologies is referred to as clean diesel. The new clean diesel technology has reduced emissions from heavy-duty diesel trucks and buses by 99 percent for nitrogen oxides (NOx) and 98 percent for particulate emissions.

US Dept. of Agriculture and Dept. of Energy states that "Biodiesel reduces net emissions of CO2 by 78.45% compared to petroleum diesel." The EPA states that "B100 reduces life cycle greenhouse gas emissions by more than 50 percent, while B20 reduces GHG emissions by at least 10 percent."

Ultra-low sulfur diesel (ULSD). This type of diesel is now the only diesel fuel used in all on-road ULSD is a cleaner-burning diesel fuel that contains 97% less sulfur than low-sulfur diesel (LSD). ULSD was developed to allow the use of improved pollution control devices that reduce diesel emissions more effectively but can be damaged by sulfur. It is also safe to use with older diesels.

The most common biodiesel blend is B20, is 20% biodiesel and 80% conventional diesel. B5 (5% biodiesel, 95% diesel) is also commonly used in fleets. High-level biodiesel blends (**blends over B20**) can have a solvency effect in engines and fuel systems that previously used petroleum diesel which may result in degraded seals and clogged fuel filters.

Model year 2010 and newer trucks and buses are experiencing an average of three to five percent improvement in fuel economy.

### Hybrid Electric Buses:

The longest running (operated) alternate heavy duty (buses or transit chassis vehicles / weight vehicles) fuel source that is a proven product is the "Electric Hybrid". However, electric requires "recharge" and the Electric Hybrid is not recommended in a stop and go environment – nor is it cost efficient with regard to recouping the upfront investment. Other agencies such as – VOTRAN, SUNTRAN, METRO DADE, agreed it would take up to ten (10) to twelve (12) years to earn back any savings relating to the upfront purchase cost for each vehicle. It is our understanding that the Sarasota County Authority Transit (SCAT) maintenance department sends their hybrid electric buses out for repair and maintenance. The Director from Star Metro in Tallahassee indicated that their Hybrid electric buses require recharging every thirty (30) to fifty (50) miles.

Typically hybrid electric buses cost around \$550,000 per bus. The Cost of hybrid electric buses does not include the cost of necessary charging stations which can be up to \$50,000 each and/or the properties needed for the multiple recharging stations which would be required or necessary changes to maintenance, training, equipment, and replacement parts.

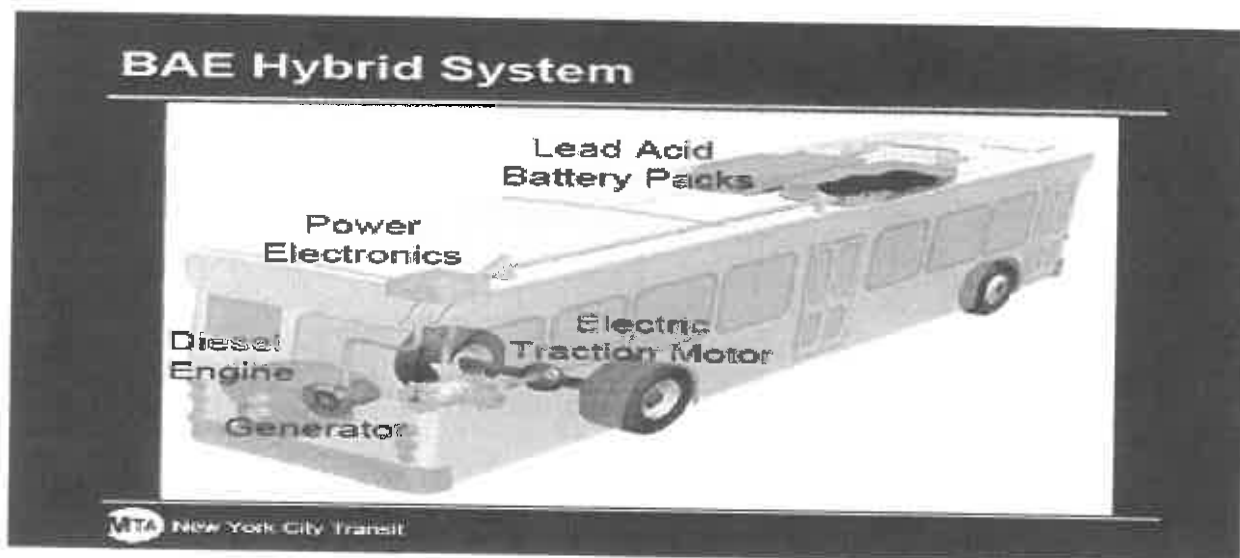
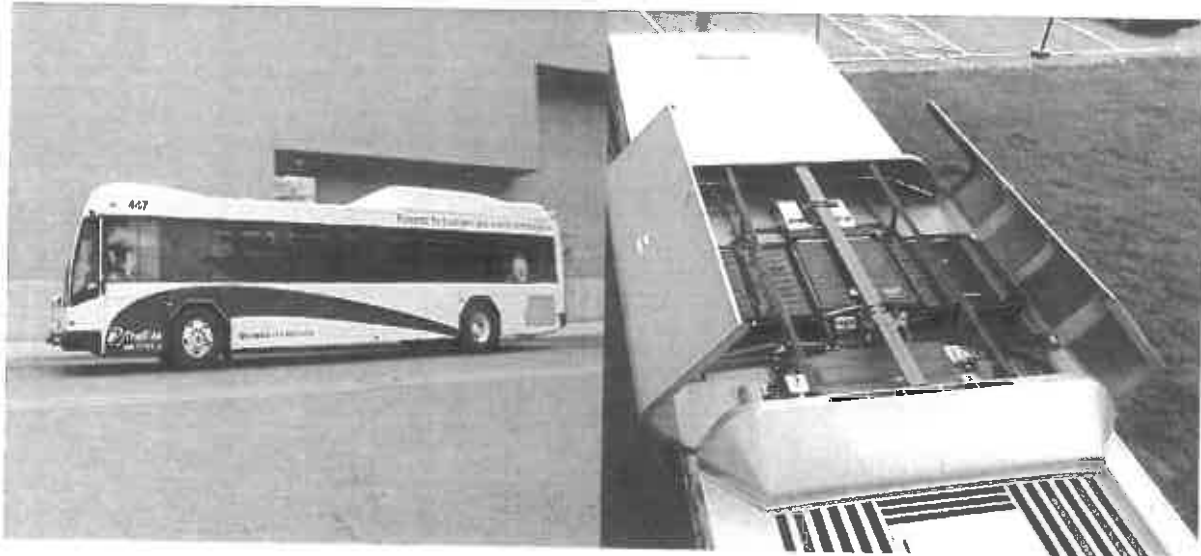
**Information obtained from a February 2012 study conducted by MJB & A in Washington D.C. for the Conrad Schneider, Clean Air Task Force.**

### **CNG/LNG transit buses:**

While the Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) are also making great strides in the industry transportation, more particularly heavy vehicles and chassis', mileage will vary greatly depending upon the route, driver, etc...but the differences between types of fuel/engine would remain about the same. Miles are approximately as follows:

- CNG: 3 mpg
- Cummins Diesel ISL: 4 mpg
- Cummins Diesel ISB: 5 mpg
- Cummins Diesel / Hybrid: 6 mpg

## Hybrid electric bus Hybrid electric bus



A hybrid electric bus combines a conventional internal combustion engine propulsion system with an electric propulsion system. These types of buses normally use a Diesel-electric powertrain and are also known as hybrid Diesel-electric buses.

Hybrid electric bus combines a conventional internal combustion engine propulsion system with an electric propulsion system. These types of buses normally use a Diesel-electric powertrain and are also known as hybrid Diesel-electric buses. The introduction of hybrid electric vehicles and other green vehicles for purposes of public transport forms a part of sustainable transport schemes.

Hybrid Diesel-Electric buses manufactured by The Gillig Corporation, are powered by GM Allison diesel engines coupled with a parallel hybrid drive technology. The electric hybrid drive uses a long life and maintenance free Nickel Metal Hydride (NiMH) battery, which captures and stores energy from the bus brakes while the bus is operating. Advanced solid state controllers manage and blend power from the diesel and electric power sources to optimize performance and efficiency.

**A report prepared by Purdue University suggests:** introducing more hybrid Diesel-electric buses and a fuel containing 20 percent biodiesel would further reduce greenhouse emissions and petroleum consumption.

**Information obtained from a February 2012 study conducted by MJB & A in Washington D.C. for the Conrad Schneider, Clean Air Task Force.**

CNG transit buses currently cost, on average, approximately \$70,000 more to purchase than equivalent diesel buses. When converting from diesel to natural gas operations, transit agencies must also invest in new CNG fueling stations, which can cost \$25,800 or more per bus.

The pay-back period on the incremental purchase cost of CNG buses and fueling infrastructure, compared to diesel buses, is between five and eight years. Life-time net savings to transit agencies that buy new CNG buses instead of new diesel buses could total \$50,000 - \$80,000 per bus over a transit bus' 12-15 year life, or an average of \$4,200 - \$5,300 per bus per year. This is equivalent to about a 14% reduction in annual fuel costs compared to diesel.

**Information obtained from a report written by Christopher MacKechnie for the Public Transport Guide, (Industry Public Transport)**

Hybrid Electric Buses:

The Cost of Electric Buses does not include the cost of necessary charging stations, which can be up to \$50,000 each.

Hybrid buses, which combine a gasoline or diesel engine with an electric motor much like a Toyota Prius, are much more expensive than either natural gas or diesel buses. Typically, they cost around \$500,000 per bus.

Electric buses still persist with batteries being unable to provide a satisfactory range. Currently, although electric buses are in operation in some niche environments such as airports they are very rare in classic public transit settings.

**From a report written by Larry O'Sullivan (Biodiesel as an Alternative Fuel):**

Biodiesel has many advantages over other biofuels, especially in its ability to be used in existing diesel autos. It is also an excellent alternative source of energy.

In the battle against global warming, automobile users feel that they are part of the problem. This feeling is reinforced by reports such as that from the U.S. EPA entitled "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006" which stated "Transportation activities accounted for 33 percent of CO2 emissions from fossil fuel combustion in 2006

What is Biodiesel?

The following definitions of the term Biodiesel are offered by the industry and government bodies overseeing energy and alternative energy sources:

- The U.S. National Biodiesel Board in the "Commonly Asked Questions" of its website defines biodiesel as "a clean burning alternative fuel produced from domestic, renewable resources. Biodiesel contains no petroleum, but it can be blended at any level with petroleum diesel to create a biodiesel blend. It can be used in compression-ignition (diesel) engines with no major

modifications. Biodiesel is simple to use, biodegradable, nontoxic, and essentially free of sulfur and aromatics.”

- The U.S. Department of Energy, in its “Biodiesel Handling and Use Guidelines” booklet says “You can blend 20% biodiesel with 80% diesel fuel (B20) for use in most applications that use diesel fuel. You can even use it in its pure form (B100) if you take proper precautions.”

#### Benefits of Biodiesel

- Biodiesel is a renewable fuel. According to the U.S. EPA fact sheet “Alternative Fuels: Biodiesel” published in October 2006, “Biodiesel is a renewable fuel produced from agricultural resources such as vegetable oils. In the United States, most biodiesel is made from soybean oil; however canola oil, sunflower oil, recycled cooking oils and animal fats are also used.”

- Biodiesel is ecofriendly. The book Life Cycle Inventory of Biodiesel and Petroleum Diesel for Use in an Urban Bus produced by the US Dept. of Agriculture and Dept. of Energy states that “Biodiesel reduces net emissions of CO<sub>2</sub> by 78.45% compared to petroleum diesel.” The EPA in its “Smartway Grow and Go” website states that “B100 reduces life cycle greenhouse gas emissions by more than 50 percent, while B20 reduces GHG emissions by at least 10 percent.”

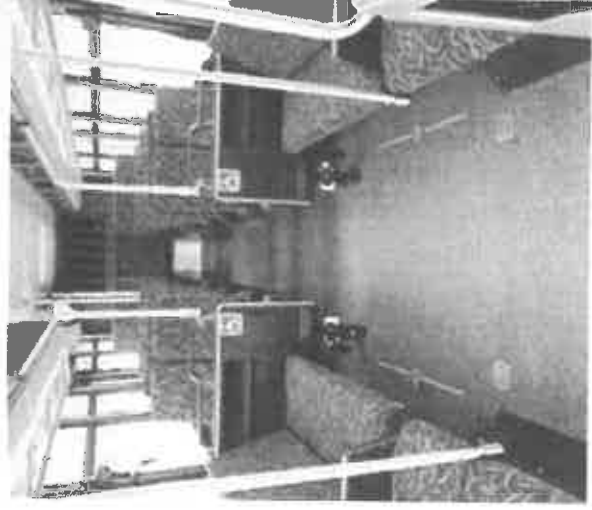
- Biodiesel gives equal or better engine performance. Biodiesel Basics and Beyond, by William H. Kemp, published by Aztex Press in 2006 states that “There are no material differences in engine performance resulting in the use of petroleum and biodiesel fuels. The only difference noted was that exhaust stack temperature ran approximately 50 degrees Celsius (90 degrees F) cooler when operating on biodiesel.”

- Biodiesel is readily available. Because it works with existing diesel engines, biodiesel offers an immediate and seamless way to transition existing diesel vehicles into a cleaner burning fleet.”

#### Alternative Source of Energy

Of course biodiesel is not just an alternative fuel, it is also a renewable source of energy for heating and generating purposes. Testing conducted by the National Oilheat Research Alliance (NORA) and published on their website found that a Bioheat blend of 80% low-sulfur heating oil and 20% biodiesel (B20) reduced sulfur oxide emissions by as much as 80% or more. Nitrogen oxide emissions were lowered by about 20%. In addition, carbon dioxide emissions can be lowered by 20%.

# Gillig Low Floor BRT Buses



Gillig Model	29 Foot Low Floor	35 Foot Low Floor
Overall Length	30'	36'
Turning Radius	29'	36'
Seating Max	23	32
Overall Height	115"	116"
Overall Width	102"	102"
Wheel Chair Ramp	31" x 47.5"	31" x 47.5"
<b>Common Features</b>		
Front Door Size	40" x 80"	40" x 80"
Rear Door Size	34" x 80"	34" x 80"
Approach/Departure Angle	9 degrees	9 degrees
Engines - Cummins	ISB/ISL/ISM Cat C9	ISB/ISL/ISM Cat C9
Transmissions	Allison, Voith, ZF	Allison, Voith, ZF
HVAC	Thermoking, Carrier,	Thermoking, Carrier
Seating	AMSECO, 4ONE (Freedman/USSC)	AMSECO, 4ONE (Freedman/USSC)
Signs	Twin Vision, Luminator	Twin Vision, Luminator
Farebox	GFI Genfare SPX	GFI Genfare SPX
<b>Optional Systems</b>		
Annunciators, Security Camera, Other IVS		



The goal of the BRT variant is to add appealing styling without compromising function, performance, reliability, and parts commonality. This variant adds noticeable styling features to the proven Low Floor base vehicle, so while appearance is dramatically enhanced, the functional and working parts of the bus are left unchanged. Suspensions, steering, propulsion, and other chassis systems are the same as in the proven and reliable Low Floor buses, as are the HVAC, doors, driver and passenger amenities. This allows most parts, training, preventative maintenance, usage, as well as vehicle dependability to be common with the rest of the GILLIG Low Floor bus fleet.

The BRT variant includes three new cosmetic styling feature packages. First, the front cap was redesigned to incorporate a one-piece sloping windshield and triangular quarter windows. A new headlight arrangement, bumper, and a new dash, along with a new rear cap and matching taillights add to the stylish look. Additionally, flush side windows can be integrated for a smooth and clean side appearance. Front and rear roof fairings can be added as an optional third element. These cosmetic changes maximize appearance impact while minimizing functional changes.

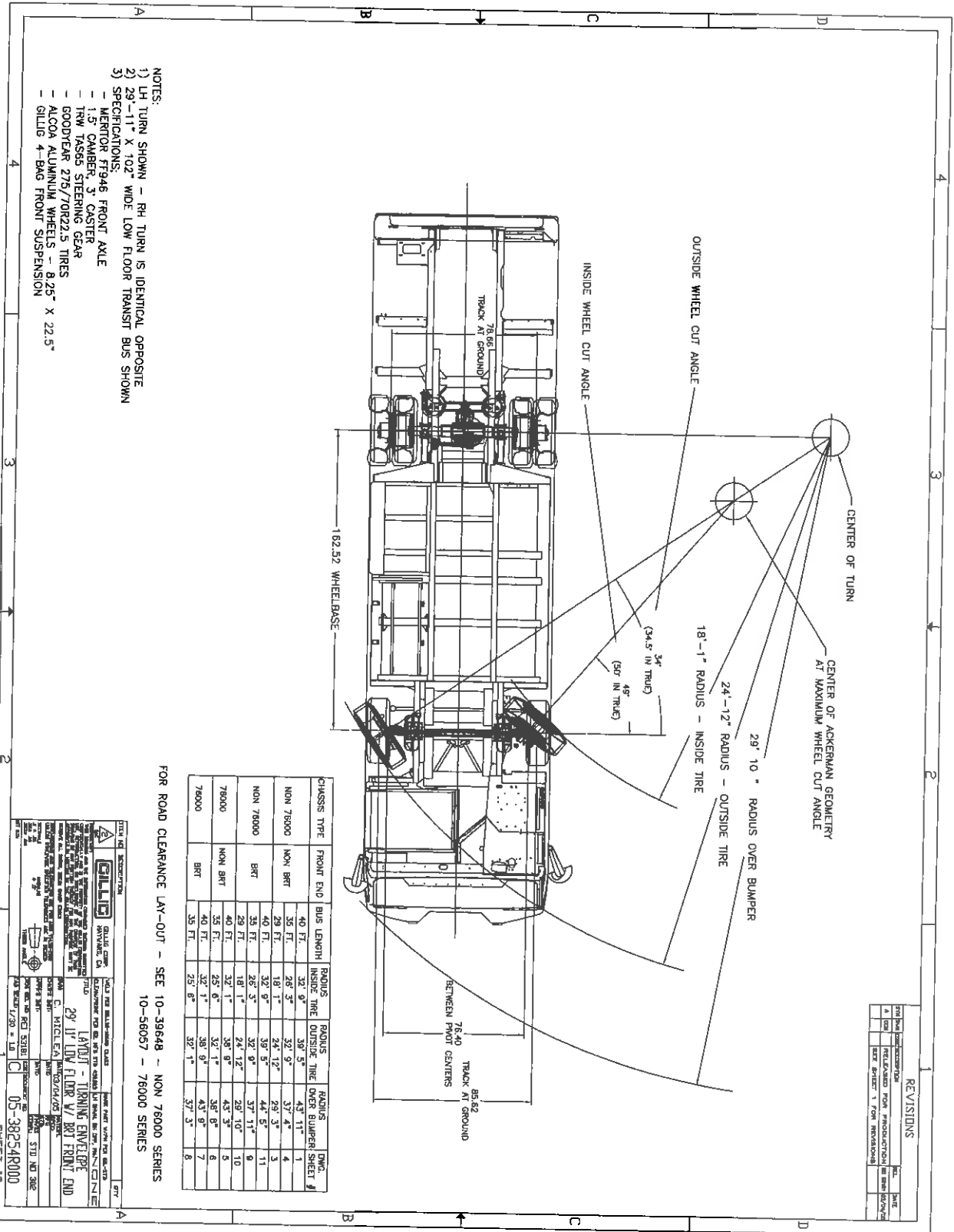
All other features, dimensions and general specifications are the same as the standard GILLIG Low Floor 30' bus.

Gillig Low Floor BRT	30'	35'
Life Cycle	12 Years / 500,000 miles	12 Years / 500,000 miles
Overall Length	31'	37'
Turning Radius	30'	36'
Seating Max	28	32
Overall Height	125"	125"
Overall Width	102"	102"
Wheel Chair Ramp	31" x 47.5"	31" x 47.5"
Step Height (Front Door)	15"	15"
Front Door Size	40" x 80"	40" x 80"
Rear Door Size	34" x 80"	34" x 80"
Approach/Departure Angle	9 Degrees	9 Degrees
Engines - Cummins	ISB/ISL/ISM Cat C9	ISB/ISL/ISM Cat C9
Transmissions	Allison, Voith, ZF	Allison, Voith, ZF
HVAC	Thermoking, Carrier	Thermoking, Carrier
Seating	AMSECO, 4ONE (Freedman/USSC)	AMSECO, 4ONE (Freedman/USSC)
Signs	Twin Vision, Luminator	Twin Vision, Luminator

City of Key West base 30' LF BRT Diesel base price \$371,469

PPI 1413 Adjustment 226.5 (Aug'13) / 217.8 (Dec'08) =  
3.99% \$14,821

City of Key West 30' LF BRT Diesel Price 9-30-13 = \$386,290



- NOTES:
- 1) LH TURN SHOWN - RH TURN IS IDENTICAL OPPOSITE
  - 2) 29"-11" X 102" WIDE LOW FLOOR TRANSIT BUS SHOWN
  - 3) SPECIFICATIONS:
    - MERITOR FF946 FRONT AXLE
    - 1.5" CAMBER, 3" CASTER
    - TRW TASS65 STEERING GEAR
    - GOODYEAR 275/70R22.5 TIRES
    - ALCOA ALUMINUM WHEELS - 8.25" X 22.5"
    - GILLES 4-BAG FRONT SUSPENSION

FOR ROAD CLEARANCE LAY-OUT - SEE 10-39648 - NON 76000 SERIES  
10-56057 - 76000 SERIES

CHASSIS TYPE	FRONT END BUS LENGTH	RADIUS		RADIUS		DIM.
		INSIDE TIRE	OUTSIDE TIRE	OVER BUMPER	SHEET #	
NON 76000	40 FT.	32' 0"	30' 5"	37' 4"	1	1
	35 FT.	26' 3"	24' 12"	29' 3"	3	4
	29 FT.	16' 1"	32' 0"	42' 8"	1	1
NON 76000	40 FT.	32' 0"	32' 0"	37' 1"	1	1
	35 FT.	26' 3"	24' 12"	29' 10"	10	10
	29 FT.	16' 1"	30' 0"	43' 3"	5	5
76000	40 FT.	32' 1"	30' 9"	38' 0"	7	7
	35 FT.	25' 1"	25' 0"	37' 3"	8	8
	29 FT.	25' 0"	32' 1"	37' 3"	8	8

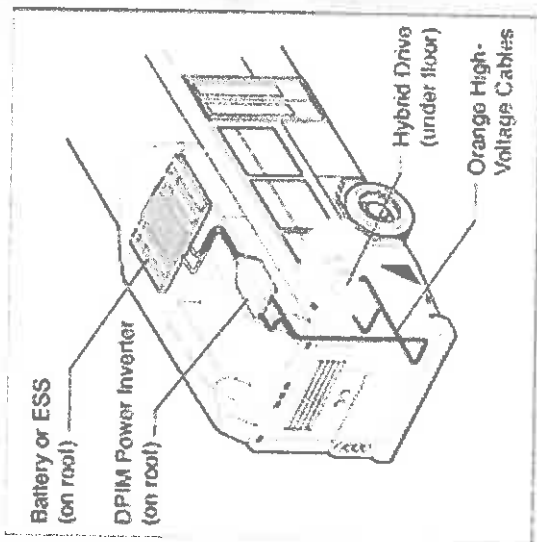
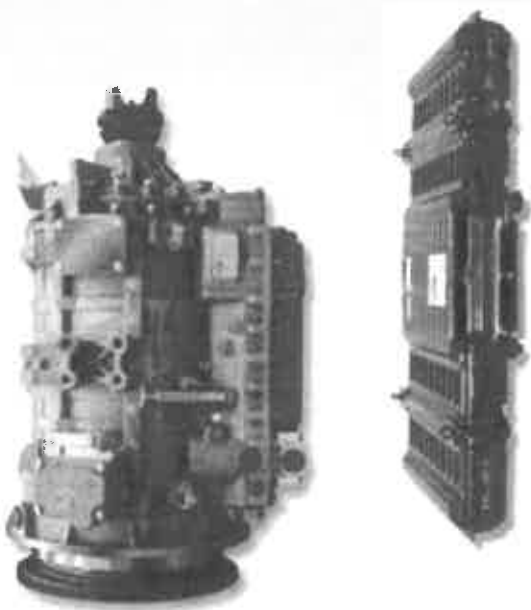
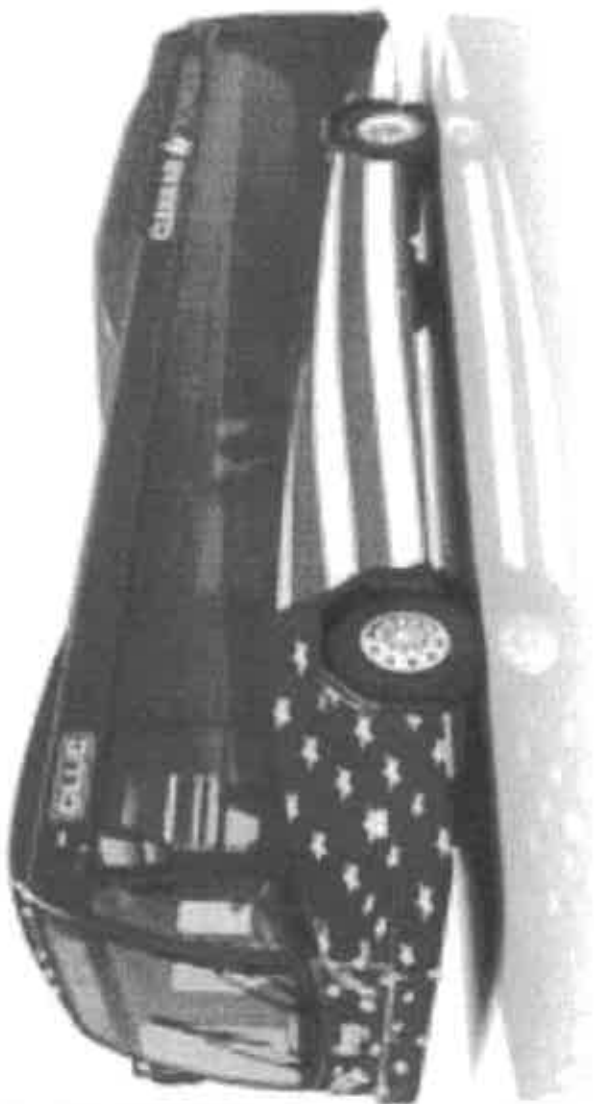
REVISIONS

NO.	DATE	DESCRIPTION
1		ISSUED FOR PRODUCTION
2		REVISED FROM PRODUCTION
3		REVISED FROM PRODUCTION

**GILLIS** TRANSPORTATION SYSTEMS, INC. 1000 W. 10TH ST. SUITE 100 DENVER, CO 80202

DATE: 10/10/07  
 DRAWN BY: C. MICHELE  
 CHECKED BY: J. BROWN  
 PROJECT NO: 05-38254R000  
 SHEET NO: 10

# Gillig Hybrid Buses



The Gillig Hybrid is a variant of the Low Floor model that is powered by a clean diesel hybrid electrical propulsion system. It reduces emissions, saves on fuel and is smoother and quieter than a conventional bus. This variant is available in 30', 35', and 40' Low Floor bus models and can be combined with the BRT styling packages for maximum community, environment and economic impact.

Just a reminder...Even though the Hybrid may save on fuel and reduce emissions, our routes in Key West are not as lengthy as other agencies on the Mainland and it is not cost efficient. Discussion with other agencies such as VOTRAN, SUNTRAN, and Metro Dade, they all agreed the cost of maintenance is higher and it would take from 10 to 12 years to earn back your saving of what the upfront purchase cost difference is for each vehicle. On a stop and go environment, the salt air, cost of recharge station(s), and staff training. Key West Transit staff does not recommend the purchase of Hybrid buses at this time.

KWT base 30' LF BRT Diesel base price \$371,469

Add Allison Hybrid Drive = \$200,000

KWT 30' LF BRT Diesel Price w/Hybrid (9-30-13) = \$571,469

Add Charging Stations (2) = \$50,000 / each

Gillig Hybrid	30'	35'
Life Cycle - Batteries	Unable to provide satisfactory range	Unable to provide satisfactory range
Over Length	30'	36'
Turning Radius	29'	36'
Seating Max	28	32
Overall Height	132"	132"
Overall Width	102"	102"
Wheel Chair Lift	31" x 47.5"	31" x 47.5"
Step Height (Front Door)	15"	15"
Front Door Size	40" x 80"	40" x 80"
Rear Door Size	34" x 80"	34" x 80"
Approach/Departure Angle	9 Degrees	9 Degrees
Engines - Cummins	ISB/ISL/ISM Cat C9	ISB/ISL/ISM Cat C9
Transmissions	Allison, Voith, ZF	Allison, Voith, ZF
HVAC	Thermoking, Carrier	Thermoking, Carrier
Seating	AMSECO, 4ONE (Freedman/USSC)	AMSECO, 4ONE (Freedman/USSC)
Signs	Twin Vision, Luminator	Twin Vision, Luminator



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## THE GILLIG LOW FLOOR BUS



The GILLIG Low Floor bus was introduced in the mid 1990's and it immediately raised the bar for competitors while lowering the floor for transit riders. It started with the experience and performance of the GILLIG Phantom and then incorporated the latest needs, requirements and technologies, to produce one of the best low floor buses of today. It's more accessible, more serviceable and more reliable, and now it too is called a fleet workhorse with a reputation of excellent customer satisfaction.

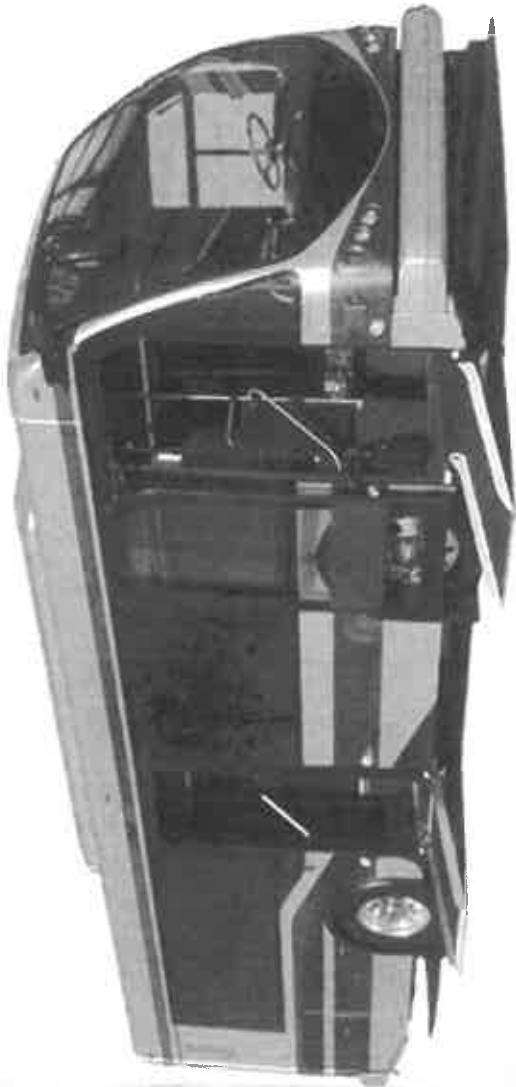
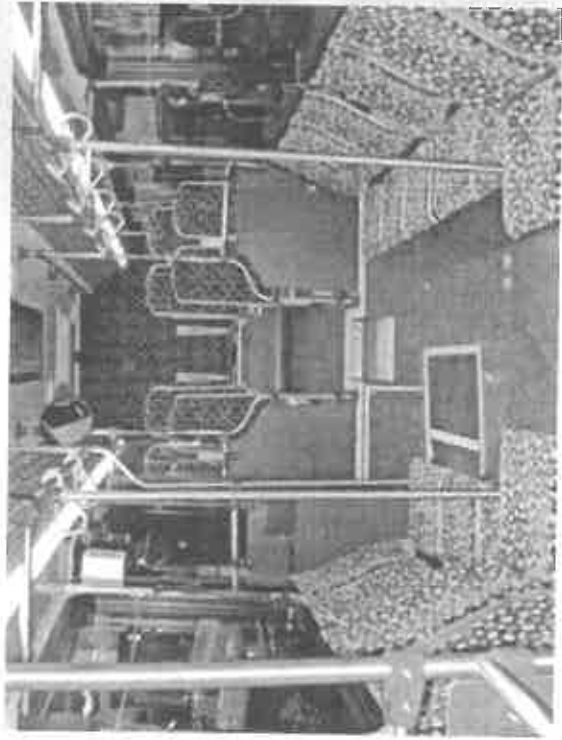
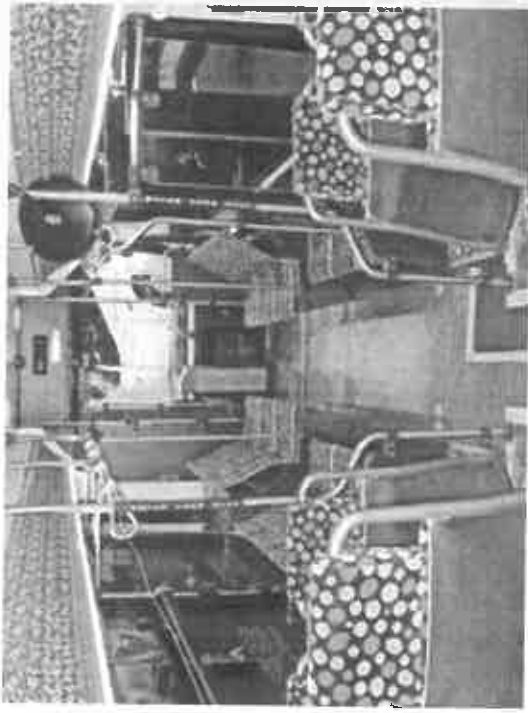
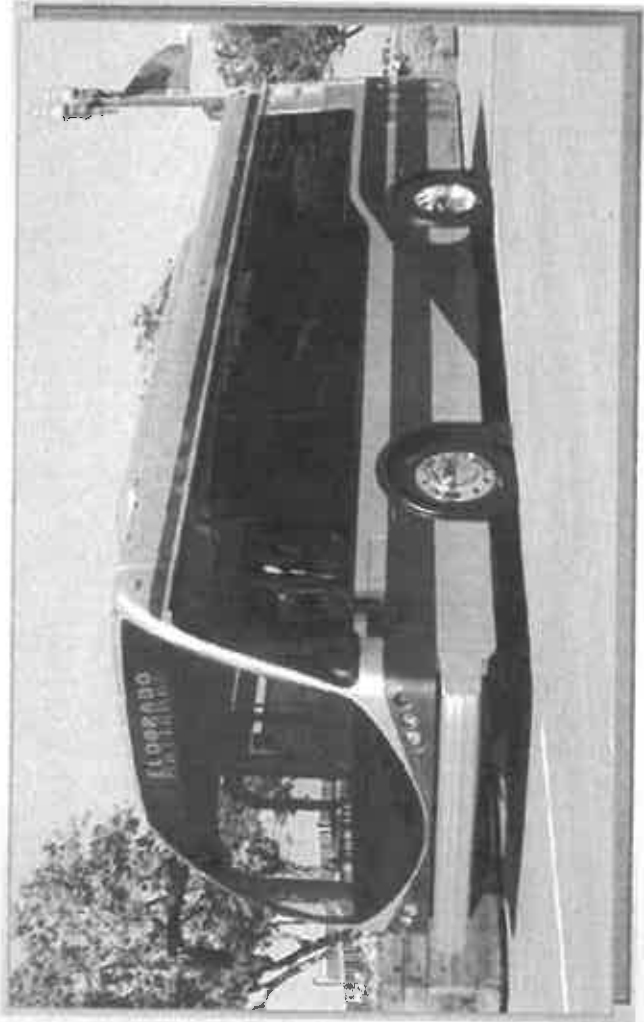
The GILLIG Low Floor bus starts with a construction grade stainless steel chassis for strength and corrosion resistance, and adds a patented aluminum body for weight reduction and additional corrosion resistance. It incorporates clever ideas such as quick change side skirt panels and side impact crash barriers for serviceability and safety, as well as the latest in electronic controls and conveniences to make it into a desirable product that performs reliably and efficiently, day after day.

The Low Floor is available in 30', 35', and 40' lengths and 102" width. It has the widest front aisle and the most wheelchair maneuvering room in the front vestibule for easy and quick entry/exit. A wide stance suspension and an ergonomic driver station pleases both passengers and operators, and large access doors and a logical layout makes the mechanics happy. Altoona tests confirm the Low Floor design to be of the highest reliability, efficiency, serviceability, and performance (e.g. gradeability, fuel economy, quietness, etc.), and explain its strong reputation of customer satisfaction.

The GILLIG Low Floor is available in various configurations such as transit, shuttle, airport and suburban, as well as in variants such as

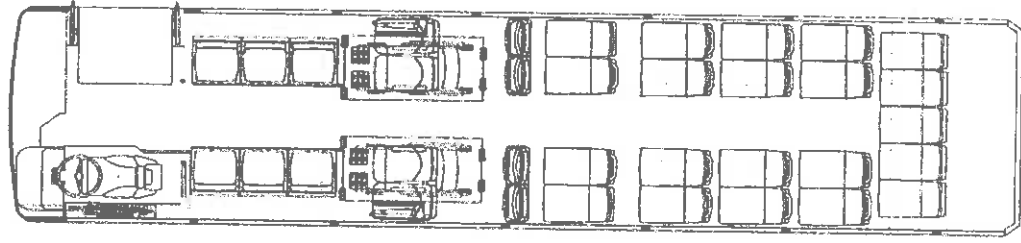


# El Dorado E-Z Rider II BRT Low Floor



Life cycle - 12 years

# El Dorado E-Z Rider II BRT Low Floor



EZR II 30'  
27 PASSENGERS WITH 2 WHEELCHAIR POSITIONS  
OR  
35 PASSENGERS

El Dorado E-Z Rider II BRT - Low Floor	30'	35'
Life Cycle	12 Years / 500,000 miles	12 Years / 500,000 miles
Over Length	30'7"	35'7"
Turning Radius	27'10"	27'10"
Seating Max	Up to 33	Up to 43
Overall Height	125" w/exhaust, 126" w/HVAC, 136" w/CNG	125" w/exhaust, 126" w/HVAC, 136" w/CNG
Overall Width	102"	102"
Wheel Chair Ramp	31" x 47.5" ADA Compliant (Front and/or center doors)	31" x 47.5" ADA Compliant (Front and/or center doors)
Step Height (Front Door & Rear/Center)	14.38"	14.38"
Turning Radius	168" wheelbase curb to curb - 27'10"	168" wheelbase curb to curb - 27'10"
Engines - Cummins	Diesel, CNG, LNG, Hybrid Electric	Diesel, CNG, LNG, Hybrid Electric
Transmissions	Allison - B300R & B400R, Voith, ZF	Allison - B300R & B400R, Voith, ZF
HVAC	Passenger - roof or rear mounted Drive - dash mounted	Passenger - roof or rear mounted Drive - dash mounted
Fuel Capacity	80 gallons (Diesel)	80 gallons (Diesel)
Tires	275 / 70R 22.5	275 / 70R 22.5
Suspension Air	2 bag per axle; trailing arm taper leaf	2 bag per axle; trailing arm taper leaf



The El Dorado E-Z Rider II is designed and manufactured in the United States. It is designed and built to take real-world punishment year after year. The El Dorado E-Z Rider II BRT Low Floor is a rear engine bus with the front door forward of the front wheels, which allows for a shorter wheelbase and better turning radius. The E-Z Rider II BRT allows for easier entry/exit for passengers with a wider entry door, lower step to ground.

The E-Z Rider II BRT is the only low-floor bus to offer dual ramps. The ramps can be available at the front door, center door, or both doors. This allows for easier entry / exit for passengers with a wider entry door and easier loading / unloading of wheelchair passengers that have the larger scooters. The center door ramp can also serve as a wheelchair emergency egress. E-Z Rider II BRT can accommodate up to 4 wheelchairs on a 30', 32' or 35' bus.

There are many features for the E-Z Rider II BRT and here are just a few of the standard features:

- Side impact crash tested and roof crush tested
- Integrally welded, monocoque body construction
- Welded steel gussets at all window posts
- Fully welded, 11 gauge, electro-galvanized steel wheelwells
- Type A rust proofing
- Heavy duty Arvin Meritor axles
- 8 - D Battery
- Engine hour meter
- Power Steering

The E-Z Rider II BRT 30' and 32' CNG buses feature four (4) roof-mounted 3,600 PSI, all composite gas cylinders equating a maximum 13,192 SCF (approximately 100 gallons, 80 usable gallons, and a conservative range estimate of 225 miles). Nine Transversely mounted (but smaller) fuel tanks are available for an approximate 30% increase in fuel capacity and range. El Dorado has a long history of CNG powered buses and while they are typically conservative in their range estimates they have proven to be fairly accurate. The maintenance costs are slightly less versus a diesel powered bus, but there are significant costs up front to accommodate CNG fueling. Propane is not an option on a heavy duty bus.

Mileage will vary greatly depending upon the route, driver, etc...but the differences between types of fuel/engine would remain about the same. Miles are approximately as follows:

- CNG: 3 mpg
- Cummins Diesel ISL: 4 mpg
- Cummins Diesel ISB: 5 mpg
- Cummins Diesel / Hybrid: 6 mpg

Report From:

Robert Frick  
Florida Transportation Systems, Inc.  
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11/13/2013

I received the information relating to the Thermal King System, you are using in your buses. It is good to they are working to correct the issues relating to board replacements. How is that progressing? Will the problem be rectified for all future new bus purchases? All new bus orders will have the revised Athenia system and I am told by ElDorado and then I asked Thermo King, the Board replacement issues will be resolved with the new version.

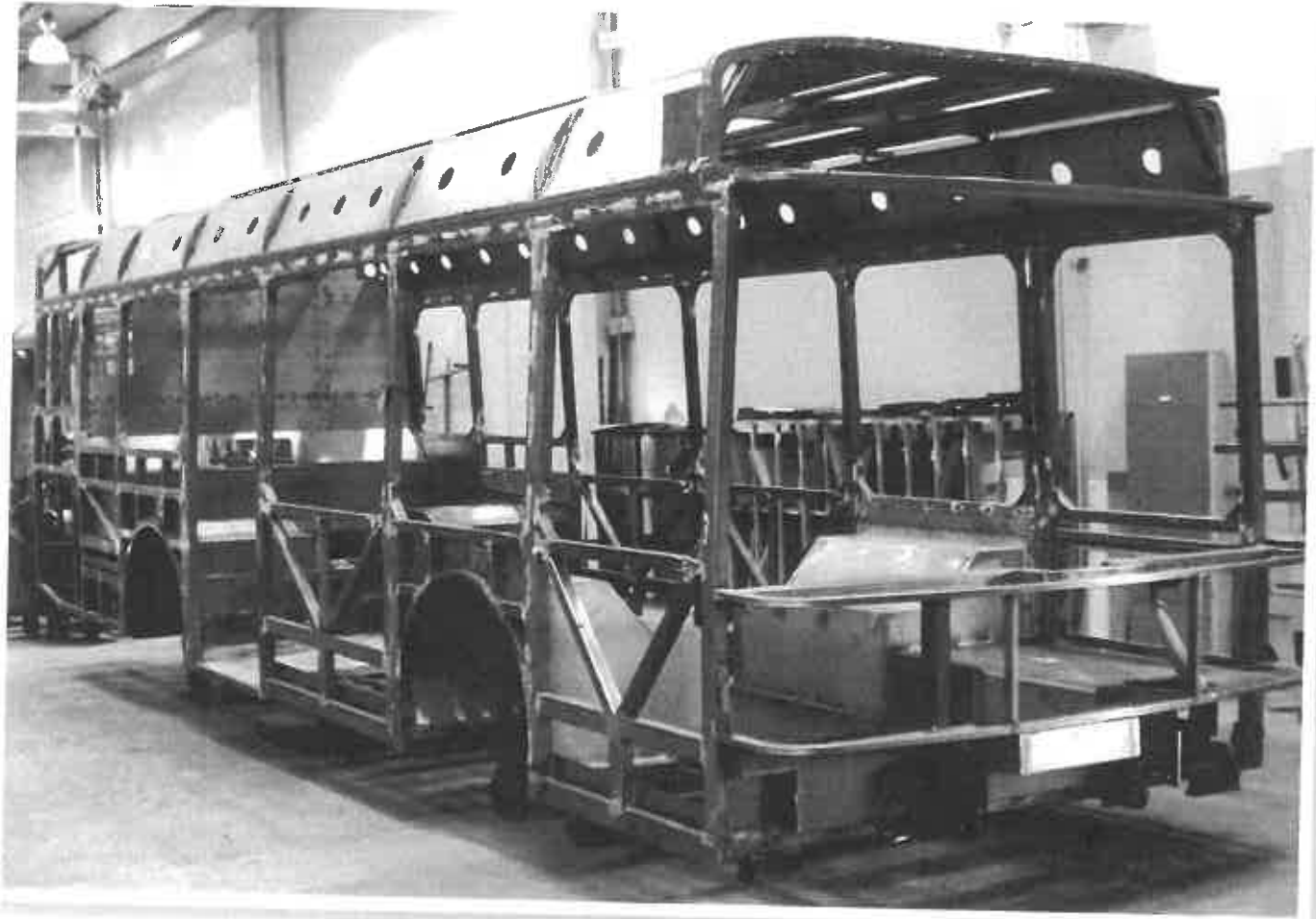
Relating to rust proofing such as type of coating issued, how often is recoating needed, where is the recoating work available, how much is the cost, and are there extended warranty options? I do not believe there are extended warranty options for this.

The Process involves:

- Prior or to frame weld assembly, the inside of all structural tubing in the floor, sidewalls and roof are sprayed with Ziebart - Formula A, rust proofing material for internal corrosion protection.
- The steel cage structure and all related metals parts are welded in to a complete frame assembly. This assembly is moved into a blast booth where it is blasted entirely with 40/50 mix of steel grit medial. This gives all steel parts a 1-mil physical profile for paint adhesion. No other corrosion protection program offers this level of metal preparation. After blasting the cage it is moved to a cross-flow paint booth. The cage is prepared and primed using PPG corrosion resistant epoxy primer/sealer #CRE 904. In critical corrosive areas (undercarriage and rear) PPG - Corashield is applied which has been ASTM tested to 1,000 hours of salt spray. The protected cage is then baked at 140° for 20 minutes to ensure proper curing. All cage and metal joints are completely sealed with Sikaflex .

ElDorado has buses operating in areas where undercoating is critical. I would imagine others we have running in Florida are not exposed quite as much as Key West and you might win the prize for salt exposure in Florida. But I will say that ElDorado has long had buses operating in harsh Northern Conditions, Canada and preparation of the undercarriage has proven to be on level at a minimum with the competition, if not superior.

*Built for safety:  
100% welded monocoque body*



Eldorado   
National  
a THOR company

## *Superior metal preparation*

All structure members are steel grit blasted as a single welded cage unit.

One mil of the exterior metal surface is removed during the blasting process.

The result is a perfectly clean surface for priming and sealing.

Environmentally friendly, steel grit is recycled and no harsh chemicals are used.

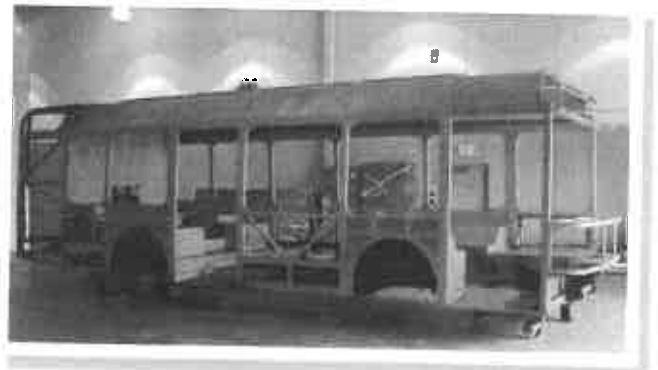
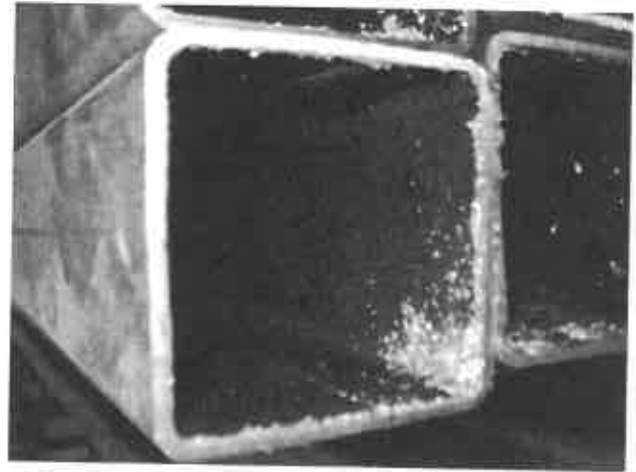


## *Best corrosion protection*

The interior of all floor, wall and roof tubing is coated with Ziebart Type-A rust proofing.

All structural members are primed/sealed with PPG #CRE904.

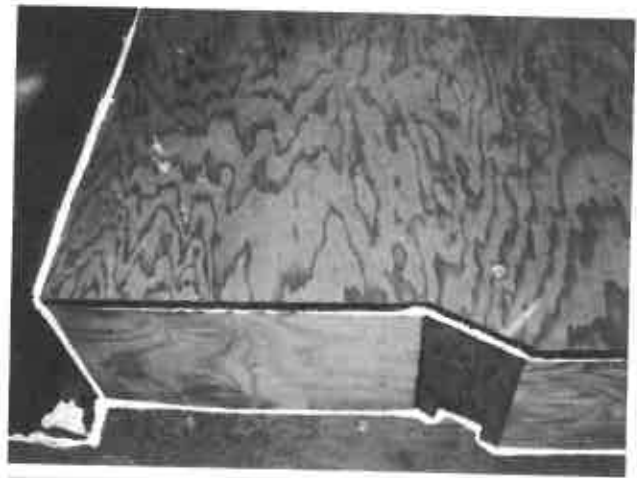
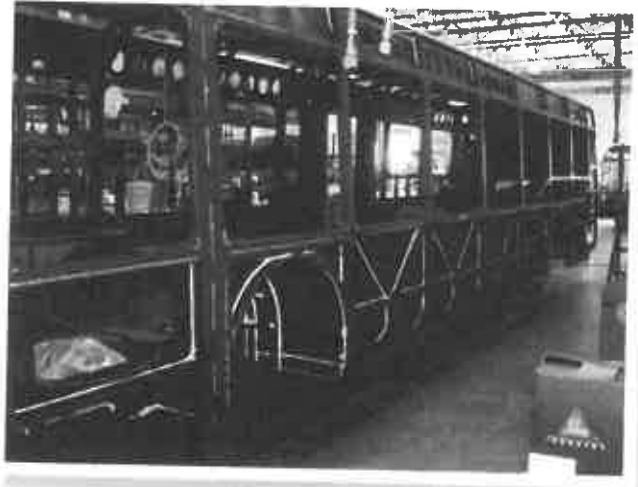
All under carriage surfaces receive a second coating of PPG Corashield for superior corrosion resistance.



## *Detailed body preparation*

Attention to the details that you cannot see are of utmost importance to a long-life bus. All cage joints are Sikaflex sealed inside and out to further eliminate the chances of leaks and corrosion.

All plywood flooring is undercoated and edge sealed prior to installation into the bus. A second coating is applied once the bus is completed.



**MOLLY TROLLEY**  
*Quality Trolleys since 1981*

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- Aluminum Construction
- Superior Design
- Low Maintenance Costs
- Many Years of Service
- Maneuverable in Traffic
- Enjoyable Transportation

ALTOONA TESTED



Molly Corporation is the only manufacturer to produce an all aluminum constructed Trolley. This process has been used since our first Trolley in 1981. As a result, MOLLY Trolleys built during the 1980's and 1990's are still in operation and maintain value for the used market.

**ALUMINUM CONSTRUCTION**

- Light weight
- Better fuel economy
- Rust resistant
- Custom options

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# CITYVIEW MOLLY TROLLEY





**The Cityview Molly Trolley has extended the open air experience to the front of the trolley. These openings can be closed with a vinyl roll up curtain in summer use and window inserts for winter use. The large openings provide unobstructed viewing for picture taking as well as an exciting open air experience for all passengers while moving along your scenic route. The Cityview Molly Trolley is manufactured with Ford's F5D chassis which is exceptional for all operations. The Cityview Molly Trolley can be equipped with a handicap lift and many other upgrades listed on our Optional Equipment list.**



**SPECIFICATIONS:**

**OVERALL LENGTH: 27' to 34'**

**OVERALL WIDTH: 96"**

**HEIGHT: 11'-6"**

**INSIDE WIDTH: 94"**

**AISLE WIDTH: 20"**

**HEADROOM: 6'-7"**

**SPEED: Normal Highway**

**PASSENGER CAPACITY: 22-38**

**WHEEL BASE: 158" to 228"**

**APPROX. CURB WEIGHT: 11,500 lbs to 16,500 lbs**



On 2/10/2014 the Key West, Fl. Transportation Director Norman Whitaker contacted

Jamie Bradish\  
Molly Corporation  
60 Willie Hill Road  
P.O. Box 1799  
Wells, ME 04090  
Tel. (207) 646-5908  
Fax. (207) 646-6497  
[jbradish@mollytrolley.com](mailto:jbradish@mollytrolley.com)

to obtain information relating to the curb to curb turning radius of a Molly Trolley.

Jamie Bradish, indicated that the Molly Corporation builds on a variety of Ford and Freightliner chassis. Mr. Brandish also indicated he could correct fit for application

Depending on engine location, chassis, and wheelbase the turning radius can range up to 54 feet.

On 2/11/2014 the Key West, Fl. Transportation Director Norman Whitaker spoke by telephone to

Joe Moyer  
Historic Tours of America®  
201 Front Street,  
Key West, Florida 33040  
Phone (305)296-3609

to obtain information relating to the curb to curb turning radius of a Molly Trolley.

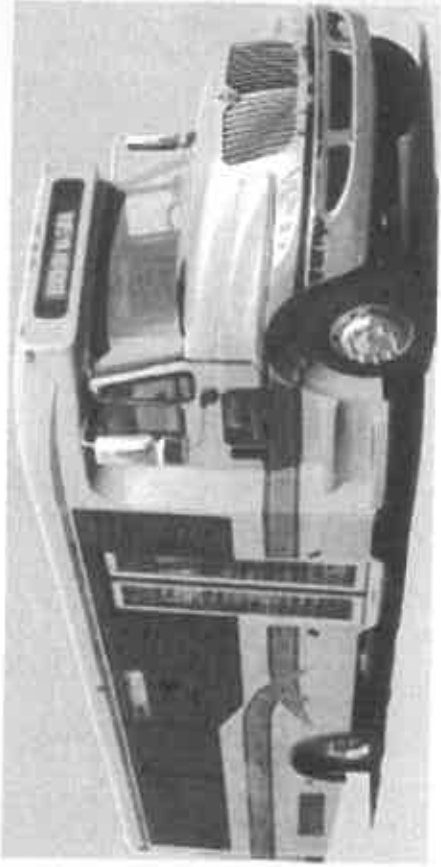
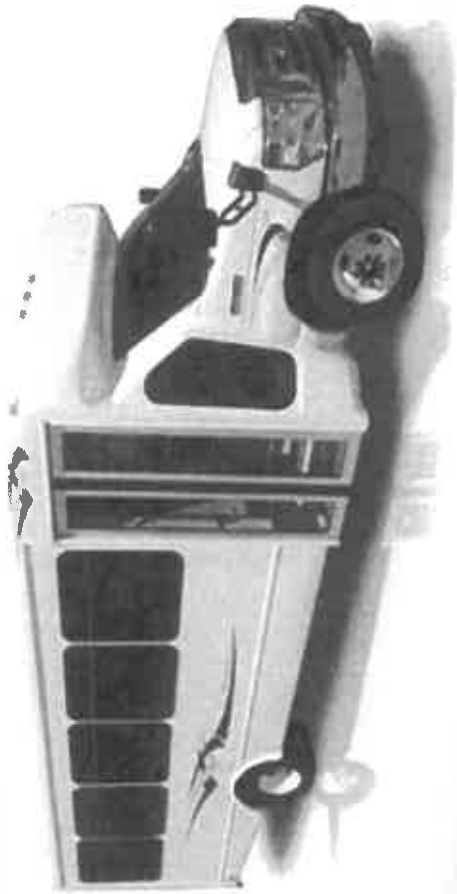
Joe Moyer, provided the following information and gave permission to include in the back documents being used as bus purchase back-up:

Joe Moyer, indicated that he assisted with the design and building of twenty five trolleys used by Historic Tours in Key West Florida. Joe Moyer stated Molly Trolleys are used as well. Joe Moyer also stated that depending on the engine location, chassis, and wheelbase length, the curb to curb turning radius could range from twenty four (24) to fifty four (54) feet.

When the Transportation Director Norman Whitaker spoke to Joe Moyer about the using trolleys on actual fixed transit routes, Joe Moyer agreed that trolleys are mainly used for tourism, beach, and downtown open air shuttle type service routes, and would not be the best vehicle to use in transit due to weaker air conditioners and because the chassis were always being changed.



# Cutaway Chassis & Shuttle



Cutaway buses / shuttles here in the Keys are used more for Para-transit services, Hotel Shuttle services, and also can be rented for personal use such as special events for weddings, birthdays, prom, etc.

Life cycle tested by Altoona is 7 years / 200,000 miles. Seating capacity can range from 14 to 32 passengers and that is not including the wheelchair passenger. If wheelchair passenger is added the seating capacity will drop about 8 seats, decreasing the highest of 32 passengers to 24 passengers.

The cutaway buses are not low floor – meaning that the driver cannot lower / kneel the cutaway bus for the passengers who need it and the cutaway is equipped with a lift instead of a ramp.



Cutaway Buses	Ford F Series	Chevrolet
Life Cycle	7 Years / 200,000 Miles	7 Years / 200,000 Miles
Overall Length	25' - 28'	25' - 28'
Wheelbase	189"	193"
Turning Radius	54.8'	62.4'
Seating Max	varies	varies
Wheel Chair Ramp	ADA Compliance	ADA Compliance
GVWR	18000 (25')	19500 (25')
Engines	Gas 5.4L V8, 6.8L V10	Gas 6.0L V8 & Diesel 6.6L V8
Transmission	5 speed automatic with overdrive	4 speed automatic with overdrive
Fuel Tank	E-350 - 40 gal E-450 - 55 gal	33 gallons





# CHAMPION BUS, INC.



s Models > Defender > DEFENDER SPECIFICATIONS

## Requirements and Dimensions for Ford F550 Series Chassis

on	DF250	DF270	DF290	DF310	DF330
Overall Length:					
Standard Bumpers	298" (24' 10")	334" (27' 10")	351.5" (29' 3.5")	370" (30' 10")	399.5" (33' 3.5")
Energy Absorbing Rear Bumper	Add 5"	Add 5"	Add 5"	Add 5"	Add 5"
Wheelbase	165"	189"	201"	213"	233"
GVW	18,000 lbs.	18,000 lbs.	19,500 lbs.	19,500 lbs.	19,500 lbs.
Height to Skin	118.5"	118.5"	118.5"	118.5"	118.5"
Flat Floor - Standard (included in exterior height)	N/A	N/A	N/A	N/A	N/A
CLOSED" Vent:	1.75" to 4.5"	1.75" to 4.5"	1.75" to 4.5"	1.75" to 4.5"	1.75" to 4.5"
OPEN" Vent	4.38" to 7.5"	4.38" to 7.5"	4.38" to 7.5"	4.38" to 7.5"	4.38" to 7.5"
Width	96"	96"	96"	96"	96"
Height at Center of Aisle (Min.)	78"	78"	78"	78"	78"
Clearance:					
Front	89.5"	89.5"	89.5"	89.5"	89.5"
Over Floor	90.5"	90.5"	90.5"	90.5"	90.5"
Passenger Door Opening	28" x 86"	28" x 86"	28" x 86"	28" x 86"	28" x 86"
Transit Door Opening	45" x 69"	45" x 69"	45" x 69"	45" x 69"	45" x 69"
Clearance to 1st Step	12"	12"	12"	12"	12"
Door Height - Max.	8"	8"	8"	8"	8"
Door Depth	9"	9"	9"	9"	9"

### S Ford F550 SERIES

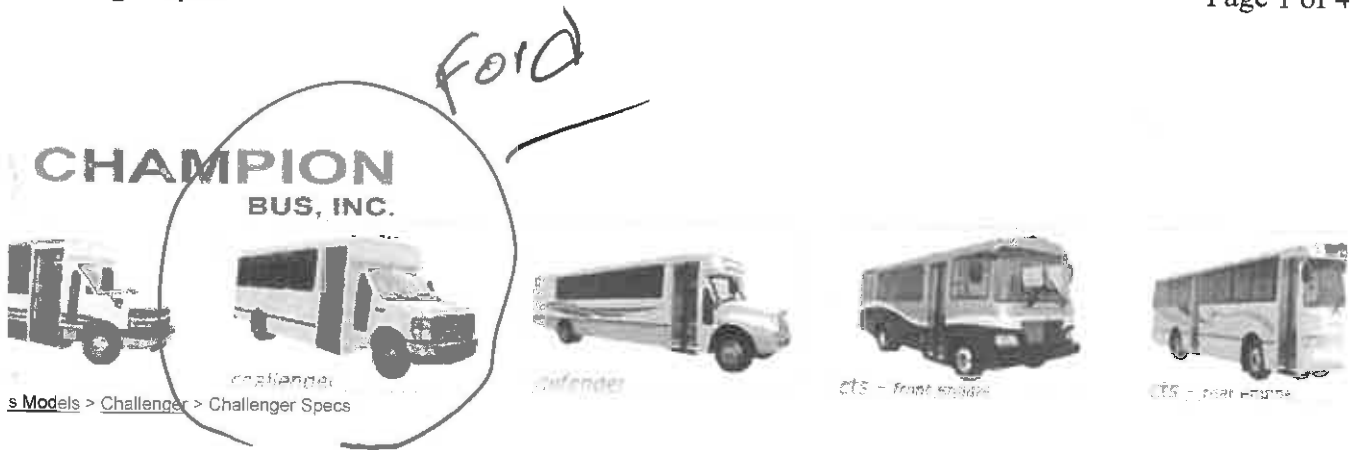
Chassis shall be a Ford F550 bus chassis with a GVWR of \*. The wheelbase shall be \*. (\*Insert appropriate information from above table).  
 Fuel tank shall have the maximum capacity available from the chassis manufacturer.  
 Brakes shall be heavy-duty disc brakes, with four-wheel anti-lock system. The parking brake shall be a transmission mounted drum type.  
 5" x 6.75" steel wheels, shall be provided. The tires shall be all-season steel belted radials, 225/70SR19.5G. Mud flaps shall be provided at the rear.  
 Engine shall be a 6.7L diesel or 6.8L V-10 gasoline engine. The cooling system shall be the highest capacity available for the specified chassis. The air filter shall be a heavy-duty dry type with a replaceable element. The oil filter shall be a full-flow, disposable type.  
 Transmission shall be a Ford 6-speed automatic with auxiliary transmission cooler.  
 Power steering shall be supplied. A tilt steering wheel and cruise control are required.  
 Exhaust pipe shall exit at the rear of the bus.

### REQUIREMENTS

Alternator shall be sized to meet the electrical load requirements and maintain a charged battery system.  
 Battery system is provided.  
 A electric horn shall be provided.

### REQUIREMENTS AND DIMENSIONS FOR INTERNATIONAL CHASSIS

OPTION	DF270	DF290	DF310	DF350	DF380
Overall Length:					
Standard Bumpers	330" (27' 6")	358" (29' 10")	378" (31' 6")	423" (35' 3")	456" (38')
Energy Absorbing Rear Bumper	Add 5"	Add 5"	Add 5"	Add 5"	Add 5"



**GENERAL REQUIREMENTS AND DIMENSIONS FOR FORD CHASSIS**

DESCRIPTION	CH210	CH230	CH250
Overall Length:			
Overall Length with bumpers	261" (21' 9")	281" (23' 5")	308" (25' 8")
Energy absorbing front	6.5"	6.5"	6.5"
Energy absorbing rear	5"	5"	5"
Wheelbase	E350/158"	E450/158"	E450/176" & 190"
GVW	12,500 lbs.	14,500 lbs.	14,500 lbs.
Height to Skin:	112"	112"	112"
Floor Height	5.63"	5.63"	5.63"
Closed" Vent	1.75" to 4.5"	1.75" to 4.5"	1.75" to 4.5"
Open" Vent	4.38 to 7.5"	4.38 to 7.5"	4.38 to 7.5"
Width:	96"	96"	96"
Height at Center of Aisle (Min.)	78"	78"	78"
Width at Floor	89.5"	89.5"	89.5"
Width at 24" about Floor	90.5"	90.5"	90.5"
Door Opening Clearance	28" x 80.5"	28" x 80.5"	28" x 80.5"
Exit Door Opening Clearance	45" x 68"	45" x 68"	45" x 68"
Step First Step Height	10.5" Max.	10.5" Max.	10.5" Max.
Step Height	8.63" Max.	8.63" Max.	8.63" Max.
Step Tread Depth	10" Min.	10" Min.	10" Min.
Step Tread Depth	10" Min.	10" Min.	10" Min.

**S**  
 Chassis shall be a Ford E-50 Shuttle bus chassis with a GVWR of \*. The wheelbase shall be \*. (\*Insert appropriate information from above table).  
 Single fuel tank shall have the maximum capacity available from the chassis manufacturer.  
 Brakes shall be heavy-duty disc brakes, with four-wheel anti-lock system. The parking brake shall be a transmission mounted drum type.  
 6" white steel wheels, shall be provided. The tires shall be all-season steel belted radials, LT225/75RX16E. Mud flaps shall be provided at the rear.  
 Engine shall be a 5.4L V-8 or 6.8L V-10 gasoline engine (E350 and E450). The cooling system shall be the highest capacity available for the specified engine.  
 Cleaner shall be a heavy-duty dry type with a replaceable element. The oil filter shall be a full-flow, disposable type.  
 Transmission shall be a Ford 5-speed automatic with auxiliary transmission cooler.  
 Power steering shall be supplied. A tilt steering wheel and cruise control are required.  
 Exhaust pipe shall exit at the rear of the bus.

**GENERAL**

Generator shall be sized to meet the electrical load requirements and maintain a charged battery system.  
 12-volt batteries with a minimum rating of 650 CCA shall be provided. Diesel engine: both batteries are located on the curbside OEM frame rails. Gasoline engine: one battery is under the hood and one on the OEM frame rail.  
 A electric horn shall be provided.

**GENERAL REQUIREMENTS AND DIMENSIONS FOR GMT 610 CHASSIS**

DESCRIPTION	CHGT210	CHGT230
Overall Length:		

