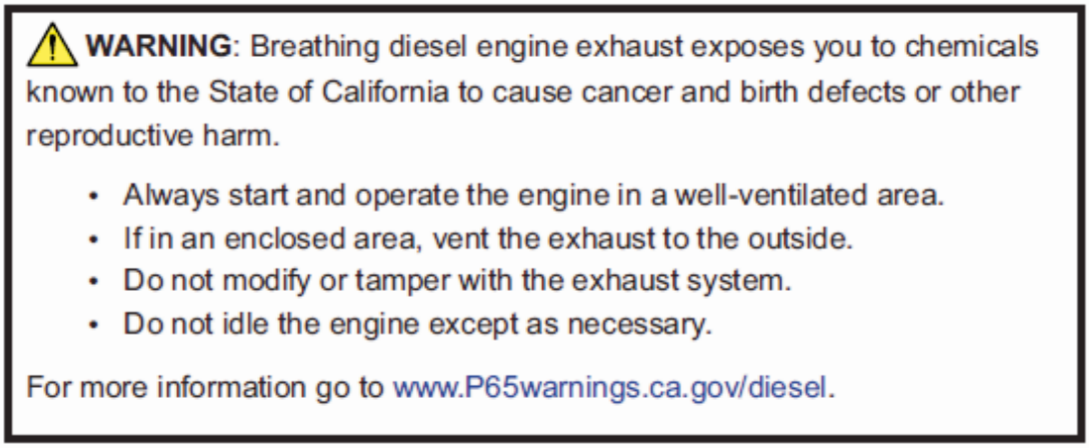
Thomas BUILT BUSES

SAF-T-LINER® HDX OPERATOR'S MANUAL



Reporting Safety Defects

If you believe that your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately submit a complaint to the Administrator, National Traffic Safety Administration, 400 Seventh Street, SW., Washington, DC 20590, or call the toll-free Vehicle Safety Hotline at 1-888-327-4236 (TTY: 1-800-424-9153); or go to http://www.safercar.gov, in addition to notifying THOMAS BUILT BUSES, INC.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or THOMAS BUILT BUSES, INC.

Canadian customers who wish to report a safety related defect to Transport Canada, Defect Investigations and Recalls, may telephone the toll-free hotline 1-800-333-0510, or contact Transport Canada by mail at: transport Canada, ASFAD, Place de Ville Tower C, 330 Sparks Street, Ottawa, Ontario, Canada K1A 0N5. For additional road safety information, please visit the Road Safety website at: www.tc.gc.ca/roadsafety.

Table Of Contents

Section

To The Operator

This manual has been prepared to acquaint you with the necessary information for the proper operation of your Thomas Bus body and chassis.

A thorough knowledge of the operating controls is essential to the proper transit and comfort of passengers.

The information and illustrations contained in this manual are based on the latest product information available at the time of publication. Some procedures and illustrations will pertain to optional equipment.

Thomas Built Buses, Inc. reserves the right to make changes at any time without notice.

We would like to say "Thank You" for choosing the Thomas product line to fill your transportation needs.

This manual should remain with the coach when sold to provide the next owner with important operation and maintenance information.

Customer Assistance Center

Having trouble finding service? Call the Thomas Customer Assistance Center, 1-855-243-0419 with assistance in locating the Thomas dealer in your area.

General Information - Hazard Alert Types & Uses

Service literature includes a new type of hazard alert: the **NOTICE**. This new hazard type allows a distinction between potential injury, and property or component damage, which were formerly grouped under **CAUTION**. The use of **DANGER** and **WARNING** hazard alerts are the same as before. For more information, see each definition below.

DANGER indicates an immediately hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE indicates a procedure that could cause property and / or equipment damage.

CALIFORNIA PROPOSITION 65 WARNING

! WARNING

This product contains or emits chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

! WARNING

Engine Exhaust, some of its constituents, and certain vehicle components contain or emit chemicals known to State of California to cause cancer and birth defects or other reproductive harm.

NOTICE

Your Thomas Built Bus has been manufactured in strict compliance with all the applicable Federal Motor Vehicle Safety Standards (FMVSS) and Canadian Motor Vehicle Safety Standards (CMVSS). We strongly advise against making any changes or modifications that will in any way violate this compliance.

Thomas Built Buses will not be responsible for any change or modification occurring to the coach after its purchase that violates these FMVSS and Canadian Motor Vehicle Safety Standards (CMVSS) standards.

VEHICLE MODIFICATION DISCLAIMER POLICY

Thomas Built Buses, Inc. is not responsible for any direct or indirect consequence of any modification or alteration made to its products by anyone other than the **Thomas** factory. Please be advised that such modifications may VOID the Federal and/or State Certification, and the Thomas Body and Chassis.

The limited warranties of Thomas exclude:

> "Components or systems which have been altered or modified without the express prior, written authorization of the company."

Examples of such modifications are, but are not limited to, the following:

- After-market alternate-fuel conversions,
- Chassis wheelbase changes,
- Mounting a Thomas body on a different chassis than the original,
- Mounting a different body (than original) on a Thomas chassis,
- Any component alteration that affects GAWRF, GAWRR, and/or GVWR,
- Any component alteration that affects any FMVSS certification,
- Power train replacement or alteration other than original specification,
- Steering, braking, or suspension alteration other than original specification,
- Seating capacity or configurationmodification,
- Addition or deletion of any passenger entrance or exit,
- Basic body structural alteration,
- Modification of the body-to-chassis mounting system,
- Exhaust system alteration or replacement other than original specification,
- Use of un-approved fluids, fuels, or lubricants,
- Electrical system/component alteration,
- Addition of after-market components, such as:
  - Retarder
  - Air conditioning
  - Battery disconnect
  - Traction devices

ENGINE EMISSIONS - CUMMINS

For information pertaining to Engine Emissions, refer to the EPA Exhaust System section of this manual.

CERTIFICATION AND DATA PLATE

The computer generated Certification and Data Plates are attached to the inside roof liner above the driver's window or on the front bulkhead.

The Certification Plate certifies compliance with all Federal Motor Vehicle Safety Standards and Canadian Motor Vehicle Safety Standards (CMVSS) in effect at time of manufacture.

Other information included are Date of Manufacture, GAWR Front, GAWR Rear, GVWR, Tire Data, VIN, Vehicle Type, Body ID, and Capacity.

Whenever contact is made with a dealer, authorized service agent, or Thomas Built Buses concerning warranty, parts, or service, the following numbers must be given to identify the unit; the three sets of numbers are:

1. Chassis Identification Number - When concerning the chassis of a Thomas product.

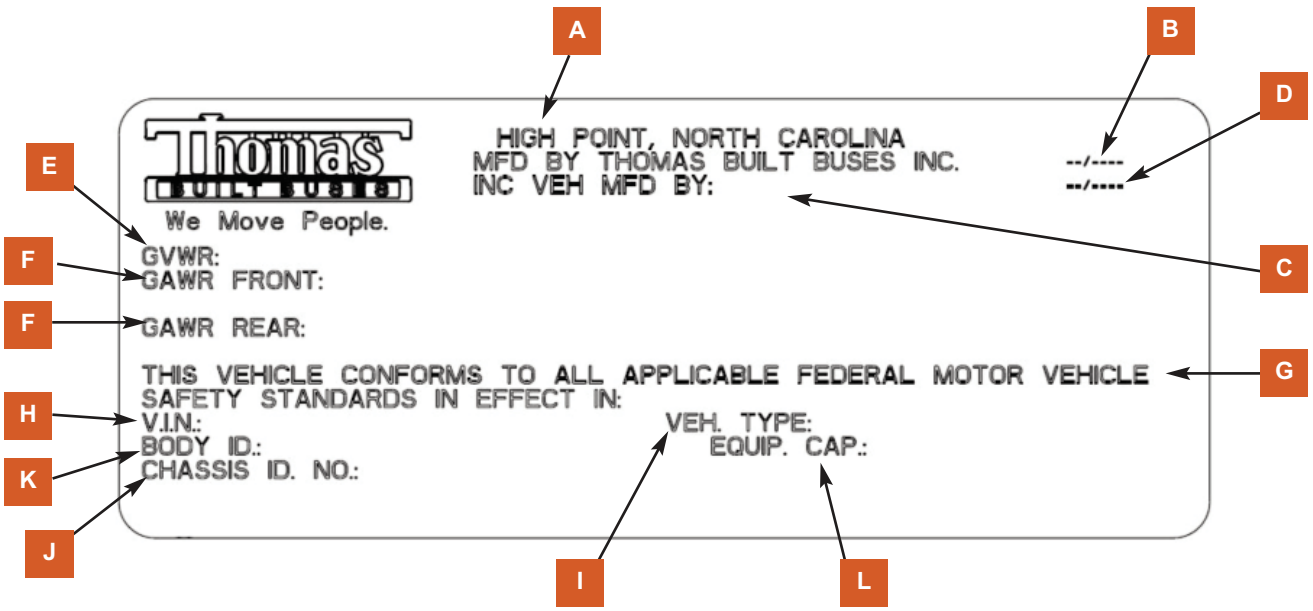
2. Order Number - The first five-digit number in the Body Identification number.

3. Body Number - The last seven-digit number in the body Identification number.

The Chassis Data Plate shown on the next page, lists items such as Chassis Yard Number, Model Year, Engine and Serial Number, Transmission and Serial Number, Axles and Model Numbers.

The VIN (Vehicle Identification Number) is assigned by the chassis manufacturer, and contains information such as manufacturer, engine type, body style, and order number.

DATA LABEL



ITEM	DESCRIPTION
A	NAME OF MANUFACTURER
B	2-DIGIT MONTH AND 4-DIGIT YEAR OF MANUFACTURER. BODY START DATE: EXAMPLE (XX/XXXX)
C	INC VEH MFD BY: (CHASSIS MANUFACTURER). (INCLUDED ONLY WHEN UNIT IS BUILT IN TWO OR MORE STAGES SEE CFR 44 SEC. 564.5)
D	2-DIGIT MONTH AND 4-DIGIT YEAR OF INC VEH MANUFACTURED: EXAMPLE (XX/XXXX)
E	GROSS VEHICLE WEIGHT RATING. (WEIGHT IN KG AND LB.)
F	GROSS VEHICLE AXLE RATING (FRONT AND REAR). WEIGHT IN KG AND LB., RIM SIZE, TIRE SIZE, COLD AIR PRESSURE IN (KPA, PSI), LOAD RATING, SINGLE OR DUAL WHEEL.
G	THE STATEMENT: "THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT IN (2-DIGIT MONTH AND 4-DIGIT YEAR OF MANUFACTURE): EXAMPLE (XX/XXXX)
H	VEHICLE IDENTIFICATION NUMBER
I	VEHICLE TYPE
J	CHASSIS ID. NUMBER
K	BODY ID. NUMBERS (ORDER NO., BODY NO., MODEL).
L	EQUIP. CAP. SHALL INCLUDE (PLUS DRIVER) FOLLOWING THE RATED CAPACITY: EXAMPLE XX PLUS DRIVER.

COACH LOADING

he Thomas coach is designed to provide excellent service if not loaded in excess of either the Gross Vehicle Weight Rating (GVWR) or the maximum front and rear Gross Axle Weight Rating (GAWR). These ratings are listed on the coach certification plate with the tires required to obtain these ratings.

GAWR (Gross Axle Weight Rating) is the maximum weight the axle can carry and reflects the lesser capacity of any one of the following equipment: axle, brakes, tires, wheels, and suspension.

GVWR (Gross Vehicle Weight Rating) is the maximum loaded weight of the vehicle. Passenger and cargo loads should be distributed proportionately over both the front and rear axles, and sides of the coach.

CAUTION

Actual loads at the front and rear axles can only be determined by weighing the coach at highway weigh stations or other similar facilities.

WARNING

Overloading can create the potential for serious safety hazards and places excessive loads on vehicle components.

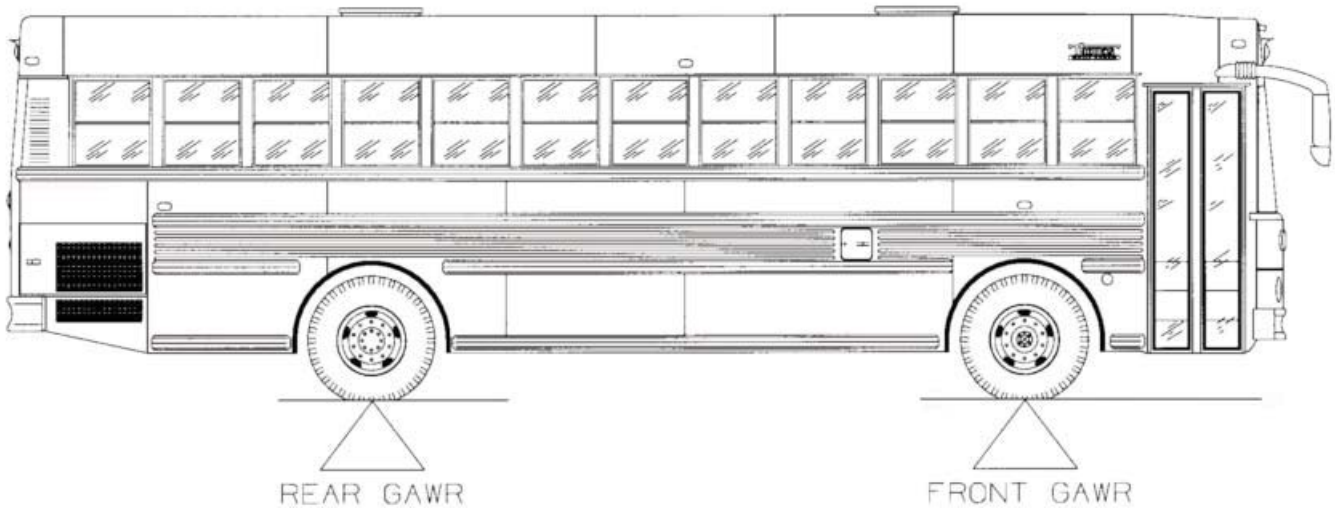
Coach warranty is void on any vehicle which has been subject to misuse. Overloading the vehicle is misuse.

Coach Loading Example: Coach equipped with standard axles and suspension, 10:00 x 20, Load Range G or 11R22.5, Load Range G.

Rear GAWR	23000 lb.	10432.8 kg.
Front GAWR	13200 lb.	5987.52 kg.
GVWR	36200 lb.	16420.32 kg.

Rear curb weight, cargo, and passenger load cannot exceed 23000 lb. (10432.8 kg.).

Front curb weight, cargo, and passenger load cannot exceed 13200 lb. (5987.52 kg.).



AFTERTREATMENT SYSTEM (ATS) PRINCIPLES OF OPERATION - CUMMINS

NOTICE

EPA13 emissions regulations apply to vehicles domiciled in Canada and the USA at the time of printing this manual. Vehicles that are domiciled outside of the USA and Canada may not have EPA13-compliant engines with an emission aftertreatment system, depending upon local statutory emissions guidelines.

The EPA mandates that all engines built after December 31, 2009 must reduce the level of emissions exhausted by the engine to the following levels:

Nitrogen Oxides (NOx) – 0.2 g/bhp-hr
Particulate Matter (PM) – .01 g/bhp-hr

To meet EPA guidelines, diesel engines installed in Thomas Built Buses, Inc. chassis for domicile in Canada and the USA use an Aftertreatment System (ATS) with an Aftertreatment Device (ATD) and Selective Catalytic Reduction (SCR) technology to reduce NOx downstream of the engine.

CAUTION

Using non-specification fluids can result in serious damage to the ATS. It is extremely important that the following guidelines be followed for vehicles with EPA10-compliant engines, or damage may occur to the ATD, and the warranty may be compromised.

- Use ultralow-sulfur diesel with 15 ppm sulfur content or less.
- Do not use fuel blended with used engine lube oil or kerosene.
- Engine lube oil must have a sulfated ash level less than 1.0 wt %; currently referred to as CJ-4 oil.
- Use only certified diesel exhaust fluid (DEF) in the DEF tank.

After exhaust gasses leave the engine, they flow into the ATS. First they flow into a two-part ATD, comprised of a diesel oxidation catalyst (DOC), and a Diesel Particulate FIter (DPF). The DPF traps soot particles, then exhaust heat converts the soot to ash in the DPF, in a process called regeneration (regen). The harder an engine works, the better it disposes of soot. When the engine is running under load and regen occurs without input, it is called passive regen. If the engine isn't running hot enough, the electronic controls may initiate an active regen, whereby extra fuel is injected into the exhaust stream before the diesel particulate filter, to superheat the soot trapped in the filter and burn it to ash. Both types of regen occur without driver input.

DANGER

Active regeneration can occur automatically any time the vehicle is moving. The exhaust gas temperature could reach 1500°F (800°C), which is hot enough to ignite or melt common materials, and to burn people. The exhaust can remain hot after the vehicle has stopped moving.

Operating at reduced engine load will allow soot to accumulate in the DPF. When this occurs, the DPF lamp illuminates, indicating that a regen must be performed, and the driver must either bring the vehicle up to highway speed to increase the load, or park the vehicle and initiate a parked regen. See Parked Regen, later in this chapter for instructions.

(CONTINUED ON NEXT PAGE.)

AFTERTREATMENT SYSTEM (ATS) PRINCIPLES OF OPERATION - CUMMINS *(CONT'D)*

After the exhaust stream passes through the ATD, it flows through another canister housing, the SCR device. A controlled quantity of diesel exhaust fluid (DEF) is injected into the exhaust stream, where heat converts it to ammonia (NH3) gas. This mixture flows through the SCR device, where the ammonia gas reacts with the NOx in the exhaust, to produce harm-less nitrogen (N2) and water vapor (H2O), which then exits out of the tailpipe.

ATS WARNING LAMPS

The Malfunction Indicator Lamp (MIL) illuminates to indicate a fault that affects the emissions. **Figure 1**

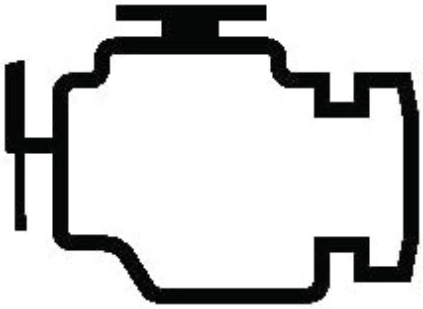


FIGURE 1

Warning lamps in the driver's message center alert the driver of situations with the aftertreatment system. An illuminated DPF lamp indicates a regen is needed.

A slow, 10-second flashing of the HEST lamp alerts the driver that a parked regen is in progress, but the exhaust temperatures are still relatively cool. It also indicates that the high-idle speed is being controlled by the engine software, not the driver.

A steadily illuminated HEST lamp alerts the operator of high exhaust temperatures when vehicle speed is below 5 mph (8 km/h) while it is performing an automatic regen, and during a parked regen.

An illuminated DEF warning lamp in the gauge, indicates that the DEF tank should be refilled at the next opportunity.

ATS PARKED REGENERATION

DANGER

During parked regeneration, exhaust temperatures are very high, and could cause a fire, heat damage to objects or materials, or personal injury to persons near the exhaust outlet.

Before initiating a parked regeneration, make certain the exhaust outlets are directed away from structures, trees, vegetation, flammable materials, and anything else that may be damaged or injured by prolonged exposure to high heat.

A reference label is included with the driver's documentation package that explains the ATS warnings, and actions required to avoid further engine protection sequences. **Figure 2**

The optional regen switch, located on the dash, is used to initiate a parked regen of the aftertreatment device. **Figure 3**

NOTICE

The regen switch can initiate a parked regen only when the DPF lamp is illuminated (because the engine software is signaling for a parked regen.)

ATS PARKED REGENERATION *(CONT'D)*

The regen-inhibit switch (optional when available) provides additional control over the aftertreatment regeneration process. Depressing the regen-inhibit switch will prevent a regen from occurring during a drive cycle. After the vehicle has been shut down and restarted, regens will occur normally unless the inhibit switch is pressed again. **Figure 4**

2. Set the parking brake. If the parking brake was already set, you must release it, then set it again.

NOTICE

The driver must remain with the vehicle during the entire regen cycle.

EXHAUST AFTERTREATMENT SYSTEM INFORMATION

INDICATOR LAMP(S)	(Solid) Level 1	(Flashing) Level 2	(Flashing) CHECK Level 3	(Flashing) CHECK STOP Level 4	WARNING
Indicator Lamp Message(s)	Filter Regeneration Recommended	Filter Regeneration Necessary	Parked Regeneration Required – Engine Derate	Parked Regeneration Required – Engine Shut Down	HEST (High Exhaust System Temperature)
Diesel Particulate Filter Condition	Filter is reaching capacity.	Filter is now reaching maximum capacity.	Filter has reached maximum capacity.	Filter has exceeded maximum capacity.	**Flashing** A regeneration is in progress.
Required Action	Bring vehicle to highway speeds to allow for an Automatic Regeneration or perform a Parked Regeneration.	To avoid engine derate bring vehicle to highway speeds to allow for an Automatic Regeneration or perform a Parked Regeneration as soon as possible.	Vehicle must be parked and a Parked Regeneration must be performed – engine will begin derate.	Vehicle must be parked and a Parked Regeneration or Service Regeneration must be performed. Check engine operator's manual for details –engine will shut down.	**Solid** Exhaust Components and exhaust gas are at high temperature. When stationary, keep away from people and flammable materials or vapors.

For a driver performed Parked Regeneration, vehicle must be equipped with a dash mounted Regeneration Switch.

See Engine Operator's Manual for complete Regeneration Instructions.

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FIGURE 2

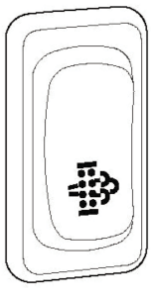


FIGURE 3

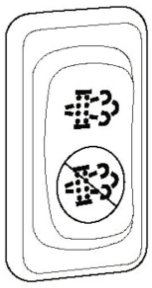


FIGURE 4

To initiate a parked regeneration, perform the following steps:

1. Park the vehicle away from all combustible and flammable materials. Chock the tires. Start and warm the engine until the coolant temperature is at least 150°F (66°C).
3. Press and hold the regen switch for 4 seconds. The engine will increase rpm and initiate the regen process.

3.1 After the parked regen has run for 20 to 40 minutes, the regen cycle is completed. The engine idle speed will drop to normal, and the vehicle may be driven normally. The HEST lamp may be illuminated, but will go out when the vehicle speed exceeds 5 mph (8 km/h), or the system has cooled to normal operating temperature.

3.2 To stop a parked regen at any time during the process, engage the clutch, brake, or throttle pedal, or turn off the engine.

ATS DIESEL PARTICULATE FILTER (DPF) MAINTENANCE

Eventually ash will accumulate in the DPF and the filter will require servicing. DPF servicing must be performed by an authorized technician, following the engine manufacturer's instructions. A record must be maintained for warranty purposes, that includes:

- date of cleaning or replacement;
- vehicle mileage;
- particulate filter part number and serial number.

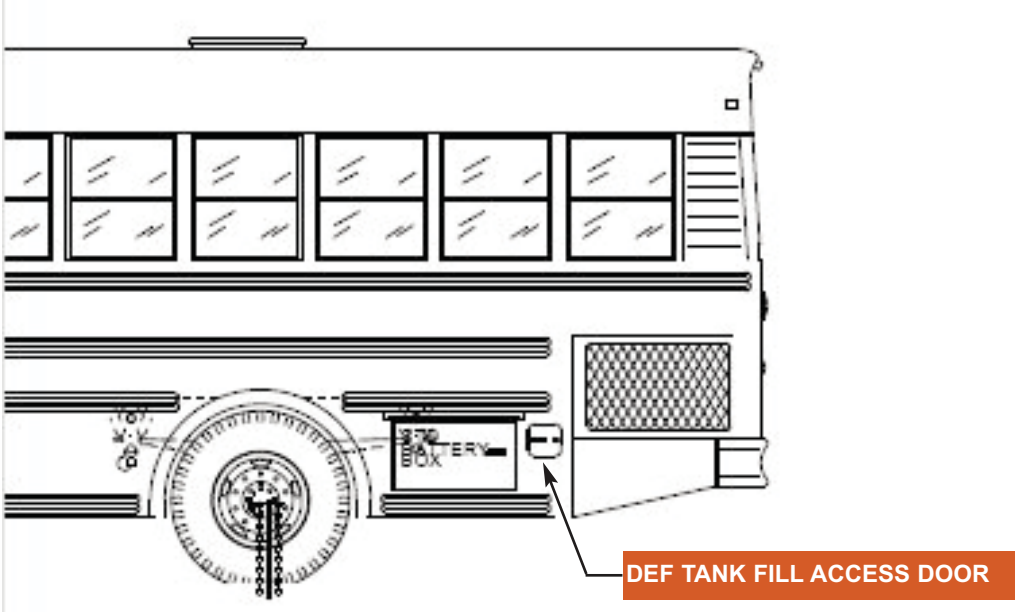
DIESEL EXHAUST FLUID (DEF) - CUMMINS

DEF is used in the aftertreatment system to lower NOx in the exhaust stream. DEF is colorless and close to odorless. (It may have a slightly pungent odor similar to ammonia.) It is nontoxic, non-flammable and biodegradable. It is mildly corrosive to aluminum, but it will not affect the strength or structure of the aluminum. Constant DEF contact will result in a white powder residue. Around 12°F (-11°C) DEF freezes to slush, but is not damaged or destroyed if frozen, and is fully usable when thawed. The DEF supply lines are electrically heated and are purged when the engine is shut down. The DEF in the tank is allowed to freeze while the vehicle is non-operational. At start up, normal operation of the vehicle is not inhibited if the DEF is frozen; an immersion heater with engine coolant flowing through it will warm the DEF once the engine is running, to allow the SCR system to operate.

DEF TANK, LOCATION AND FILLING REQUIREMENTS

On the HDX, the tank is located on the left side, between the battery compartment and the radiator. The DEF tank has a 19 mm filler neck inlet that prevents the hose from a diesel outlet from being inserted, and has a blue cap for easy identification.

The HDX School Bus has a 10-gallon tank capacity. DEF consumption is approximately 2% of fuel consumption, dependent on vehicle operation. For every 50 gallons of diesel fuel consumed, approximately 1 gallon of DEF will be consumed.



FUEL / DEF GAUGE

The DEF levels are measured by a gauge consisting of a four segment LED bar graph.

- Between 75% and 100% full, four bars are illuminated green. **Figure 5**

FIGURE 5

- Between 50% and 75% full, three bars are illuminated green. **Figure 6**

FIGURE 6

- Between 25% and 50% full, two bars are illuminated green. **Figure 7**

FIGURE 7

- Between 10% and 25% full, one bar is illuminated green. **Figure 8**

FIGURE 8

There are safety controls that warn the driver and derate the engine when the DEF level registers below 10%, or if the DEF tank is contaminated.

NOTICE

Under no circumstances will the engine be suddenly shutdown due to running the vehicle out of DEF, or putting the improper fluid in the DEF tank.

NOTICE

Tampering with any portion of the DEF system, or diluting the fluid, will result in a system fault detection, and a possible major engine derate.

(CONTINUED ON NEXT PAGE.)

DEF Warnings and Engine Derates

There are safety controls that warn the driver and derate the engine when the DEF level registers below 10%, or if the DEF tank is contaminated.

NOTICE

Under no circumstances will the engine be suddenly shutdown due to running the vehicle out of DEF, or putting the improper fluid in the DEF tank.

NOTICE

Tampering with any portion of the DEF system, or diluting the fluid, will result in a system fault detection, and a possible major engine derate.

DEF Level—Warning

When the DEF level in the tank drops to 10% full, the DEF Low Level Lamp in the gauge is illuminated solid (amber), and one bar of the DEF-level lightbar is illuminated solid amber. **Figure 9**

Figure 9

When the DEF level in the tank drops to 5% full, the DEF Low Level Lamp in the gauge is illuminated flashing (amber), and one bar of the DEF-level lightbar is illuminated flashing red. **Figure 10**

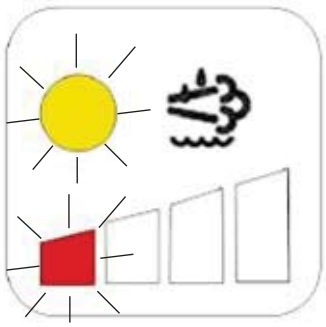


Figure 10

DEF Level—Warning and Minor Engine Derate

When the DEF level drops to 2.5%, the DEF warning lamp in the gauge is illuminated solid (amber), one bar of the DEF-level lightbar flashes red and the CHECK engine lamp (amber) illuminates. The engine will perform a minor derate of approximately 25%. **Figure 11**

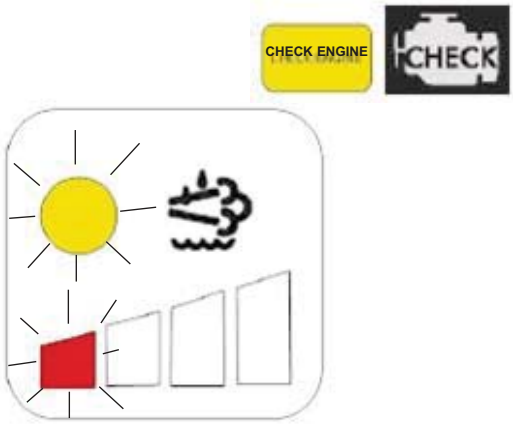


Figure 11

DEF WARNINGS AND ENGINE DERATES *(CONT'D)*

DEF TANK IS EMPTY—WARNING AND MINOR ENGINE DERATE

When the DEF tank registers empty, the DEF Low Level Lamp illuminates, and one bar of the DEF-level lightbar flashes red. The CHECK engine lamp illuminates, the malfunction-indicator lamp (amber) illuminates, and the engine remains at a minor derate. **Figure 12**

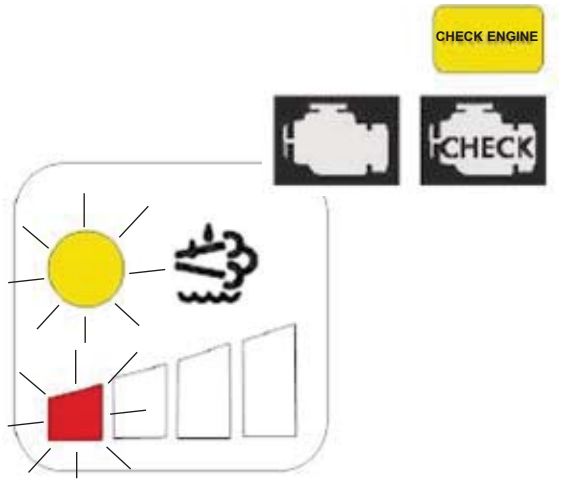


FIGURE 12

DEF TANK-EMPTY WARNING IGNORED—WARNING AND MAJOR ENGINE DERATE

After the DEF tank registers empty, if the DEF is not refilled after a fuel fill or engine stop, the CHECK engine lamp, malfunction-indicator lamp, and the STOP engine lamp (red) will be illuminated. The engine remains at a minor derate until the electronic sensors indicate a safe situation, then a major engine derate will occur. (Vehicle speed may be limited to 5 mph /8 km/h.) **Figure 13**

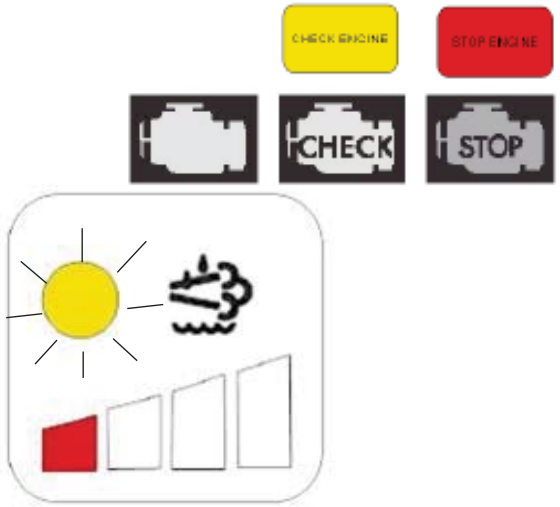


FIGURE 13

DEF CONTAMINATED—WARNING AND MAJOR ENGINE DERATE

If a contaminant is detected in the DEF tank, the NOx sensors in the SCR system will activate the DEF warning lamp, the CHECK engine lamp, and the malfunction-indicator lamp, and a minor engine derate will occur. After driving 20 hours or 1000 miles (1600 km) without remedy, the STOP engine lamp will illuminate, and a major engine derate will occur as soon as the electronic sensors indicate a safe situation. The warnings and sequence of derates will be the same as if the DEF tank is empty **(Figure 12)**, or empty and ignored **(Figure 13).**

After the DEF tank is refilled with DEF, and the SCR system senses proper NOx levels, the engine will return to normal operation.

EXHAUST SYSTEM INSPECTING (NOISE EMISSION CONTROL)

The exhaust system must be free of leaks, binding, grounding, and excessive vibrations. In addition to inspecting the exhaust system at the scheduled maintenance interval, inspect the exhaust system if the noise level of the vehicle has increased. Replace parts that show leakage, wear, or damage, with genuine Freightliner parts. These conditions are usually caused by loose, broken, or misaligned clamps, brackets, or pipes.

EPA10 EXHAUST SYSTEM - DEFINITIONS OF AFTERTREATMENT SYSTEM (ATS) TERMS

Refer to the following list of definitions of ATS terms and components.

- Aftertreatment System (ATS)—the entire exhaust system from the turbocharger to the tail pipe, including the Selective Catalytic Reduction (SCR) components.
- Aftertreatment Device (ATD)—a device that re¬moves pollutants from exhaust gas after the gas leaves the combustion chamber.
- BlueTec®—Daimler's proprietary SCR technology.
- Diesel Oxidation Catalyst (DOC)—a flow-through devise that enhances the oxidation of hydrocarbons in the ATD.
- Diesel Particulate Filter (DPF)—a component in the ATD that traps particulate matter from the exhaust gas.
- Diesel Exhaust Fluid (DEF)—the chemical agent that reacts with the exhaust gases in the SCR to reduce NOx.
- DEF Pump—filters and supplies DEF to the DEF metering unit.
- DEF Tank—holds DEF and regulates its temperature.
- DEF Metering Unit—mixes DEF with compressed air, and meters this mixture into the exhaust flow via an injection nozzle.
- SCR Catalyst—the housing containing a treated ceramic flow-through block where the DEF and exhaust gases undergo selective catalytic reduction.
- Selective Catalytic Reduction (SCR)—a process used to reduce NOx emissions.

INSPECTION

NOTICE

The Environmental Protection Agency's 2010 regulations mandate lowered exhaust emissions, thus requiring exhaust system components that reduce emissions. In particular the aftertreatment device (ATD), which is part of the aftertreatment system (ATS), requires special attention during regularly scheduled maintenance inspections. See Figure 1 for Cummins ATD sensor locations. If any discrepancies are discovered, refer to the engine manufacturer's service literature for repair instructions.

1. Check for leakage at the clamp that attaches the exhaust pipe to the turbocharger exhaust outlet. If leakage exists, tighten the nut on the clamp to the required torque. If leakage persists, install a new clamp.
2. Check the exhaust pipe, bellows, and each exhaust seal clamp for leakage, wear, cracks, or damage. Replace damaged components as needed. If leakage exists at a clamp, tighten the nuts to the required torque. If leakage persists, install a new exhaust seal clamp. Do not reuse seal clamps. Once a seal clamp is loosened or removed, it must be replaced.
3. If present, check the condition of the insulation material around the exhaust pipe between the turbocharger and the ATD.
4. Check the ATD mounting bands for tightness. Tighten to 30 lbf•ft (41 N•m) if needed. Do not overtighten.
5. Check for leaks around the clamps that attach the ATD in the ATS, and around the clamps that retain the DPF in the ATD. No leaks are allowed anywhere in the system.
6. Check all sensors attached to the ATD for leaks or damaged wires. No leaks are allowed.
7. Check the DPF exterior surface for dents or other damage. A dent over 3 inches (76 mm) in diameter and 1/4-inch (6-mm) deep could cause internal damage to the DPF, causing it to malfunction.
8. Check the SCR catalyst for dents and other damage.
9. Check for heat discoloration on the surface of the ATD. Heat discoloration may indicate internal damage; especially around the DPF.

NOTICE

Diesel exhaust fluid creeps, causing white crystals to form around the line fittings.

The presence of crystals does not mean the system has a leak. Replacing the fittings or troubleshooting the components is not necessary unless there is a system failure or a fault code.

10. Check the DEF tank, pump, metering unit, and lines for leaks.
11. Check any wires, lines, or hoses within 4 inches (10 cm) of the exhaust system for heat damage. Repair or reroute as needed.

(CONTINUED ON NEXT PAGE.)

INSPECTION *(CONT'D)*

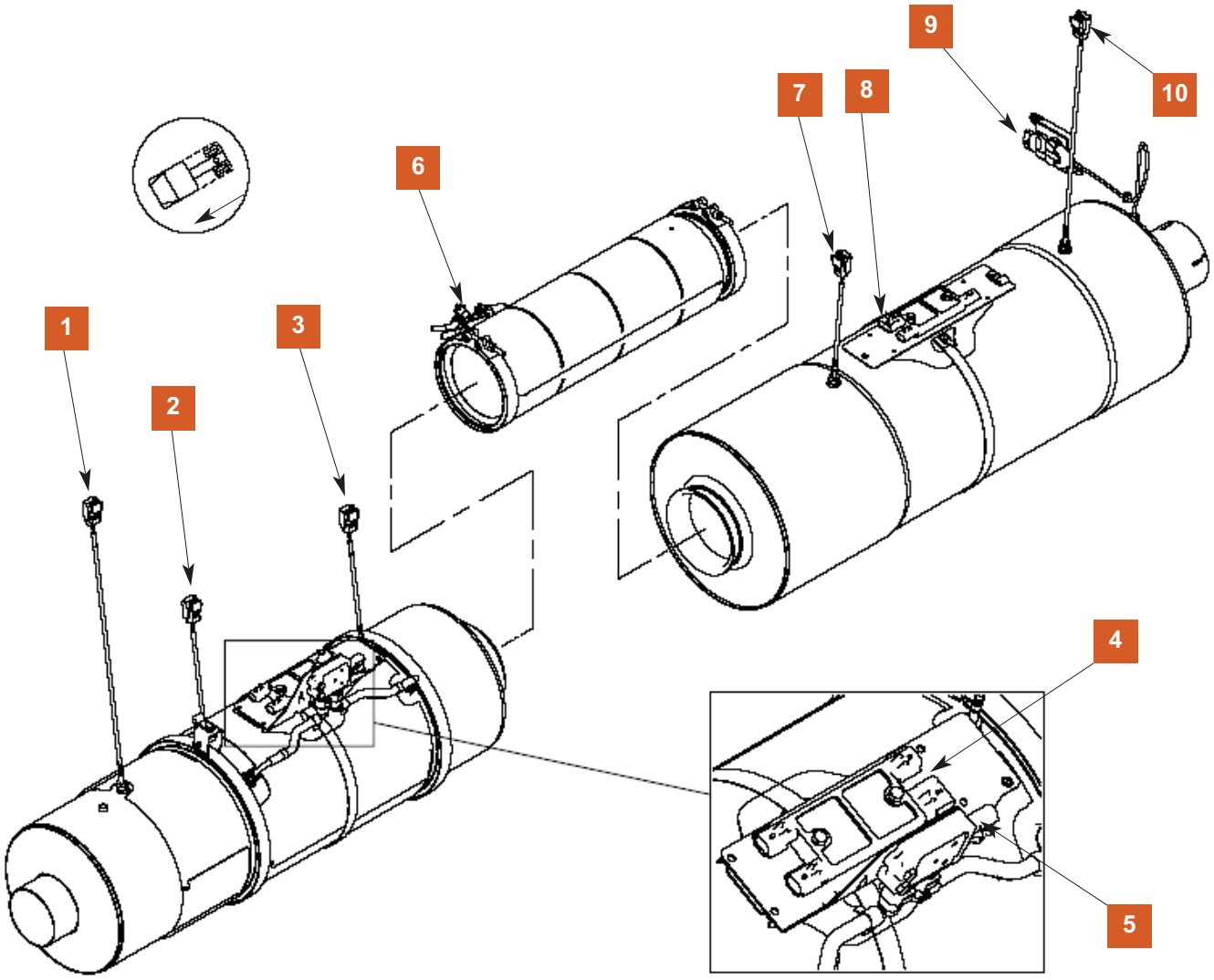


FIGURE 1 - CUMMINS ATD SENSOR LOCATIONS

1. DOC INLET TEMPERATURE SENSOR
2. DOC OUTLET TEMPERATURE SENSOR
3. DPF OUTLET TEMPERATURE SENSOR
4. DPF TEMPERATURE SENSOR INTERFACE
5. DPF PRESSURE SENSOR INTERFACE
6. DOSER INTERFACE
7. SCR INLET TEMPERATURE SENSOR
8. SCR TEMPERATURE SENSOR
9. OUTLET NOX SENSOR
10. SCR OUTLET TEMPERATURE SENSOR

DIESEL EXHAUST FLUID (DEF) FILTER REPLACEMENT

The Environmental Protection Agency's 2010 regulations require lower nitrogen oxide (NOx) exhaust emissions. Selective catalytic reduction (SCR) uses diesel exhaust fluid (DEF) to lower NOx emissions in the vehicle exhaust. A filter in the DEF pump prevents clogging of the DEF metering unit injection nozzle.

EPA07 EXHAUST SYSTEM - DEFINITIONS OF ATS COMPONENTS

Refer to the following list of definitions of ATS terms and components.

- Aftertreatment System (ATS)—the entire exhaust system from the turbocharger to the exhaust stack or tail pipe.
- Aftertreatment Device (ATD)—the muffler-like canister that houses a DPF and sensors.
- Diesel Particulate Filter (DPF)—a filter that collects and holds particulate matter (soot and ash).
- Diesel Oxidation Catalyst (DOC)—oxidizes hydrocarbons and reduces NOx.
- Sensors—detect temperatures and pressure within the ATS.

INSPECTION

NOTICE

The Environmental Protection Agency's 2007 regulations require lower exhaust emissions, thus requiring new exhaust system components. (See Figure 2.) In particular, the aftertreatment device (ATD), which is part of the aftertreatment system (ATS), requires special attention during regularly scheduled maintenance inspections. If any discrepancies are discovered, refer to the engine manufacturer's service literature for repair instructions, or take the vehicle to an authorized Freightliner or Thomas Built Bus service facility for repair.

1. Check for leakage at the clamp that attaches the exhaust pipe to the turbocharger exhaust outlet. If leakage exists, tighten the nut on the clamp to the required torque. If leakage persists, install a new clamp.
2. Check the exhaust pipe and each exhaust seal clamp for leakage, wear, cracks, or damage. Replace damage components as needed. If leakage exists at the clamp, tighten the nuts to the required torque. If leakage persists, install a new exhaust seal clamp. Do not reuse seal clamps. Once a seal clamp is loosened or removed, it must be replaced.
3. If present, check the condition of the insulation material around the exhaust pipe between the turbocharger and the ATD.
4. Check the ATD mounting bands for tightness. Tighten to 30 lbf-ft (41 M-m) if needed. Do not overtighten.
5. Check for leaks around the clamps that attach the ATD in the ATS, and around the clamps that retain the DPF in the ATD. No leaks are allowed anywhere in the system.

(CONTINUED ON NEXT PAGE.)

INSPECTION *(CONT'D)*

6. Check all sensors attached to the ATD for leaks or damaged wires. No leaks are allowed.
7. Check the DPF exterior surface for dents or other damage. **(See Figure 2, Reference A)**. A dent over 3 inches (76 mm)in diameter and 1/4-inch (6-mm) deep could cause internal damage to the DPF, causing it to malfunction.
8. Check for heat discoloration on the surface of the ATD. Heat discoloration may indicate internal damage; especially around the DPF.
9. Check any wires, lines, or hoses within 4 inches (10 cm) of the exhaust system for heat damage. Repair or reroute as needed.

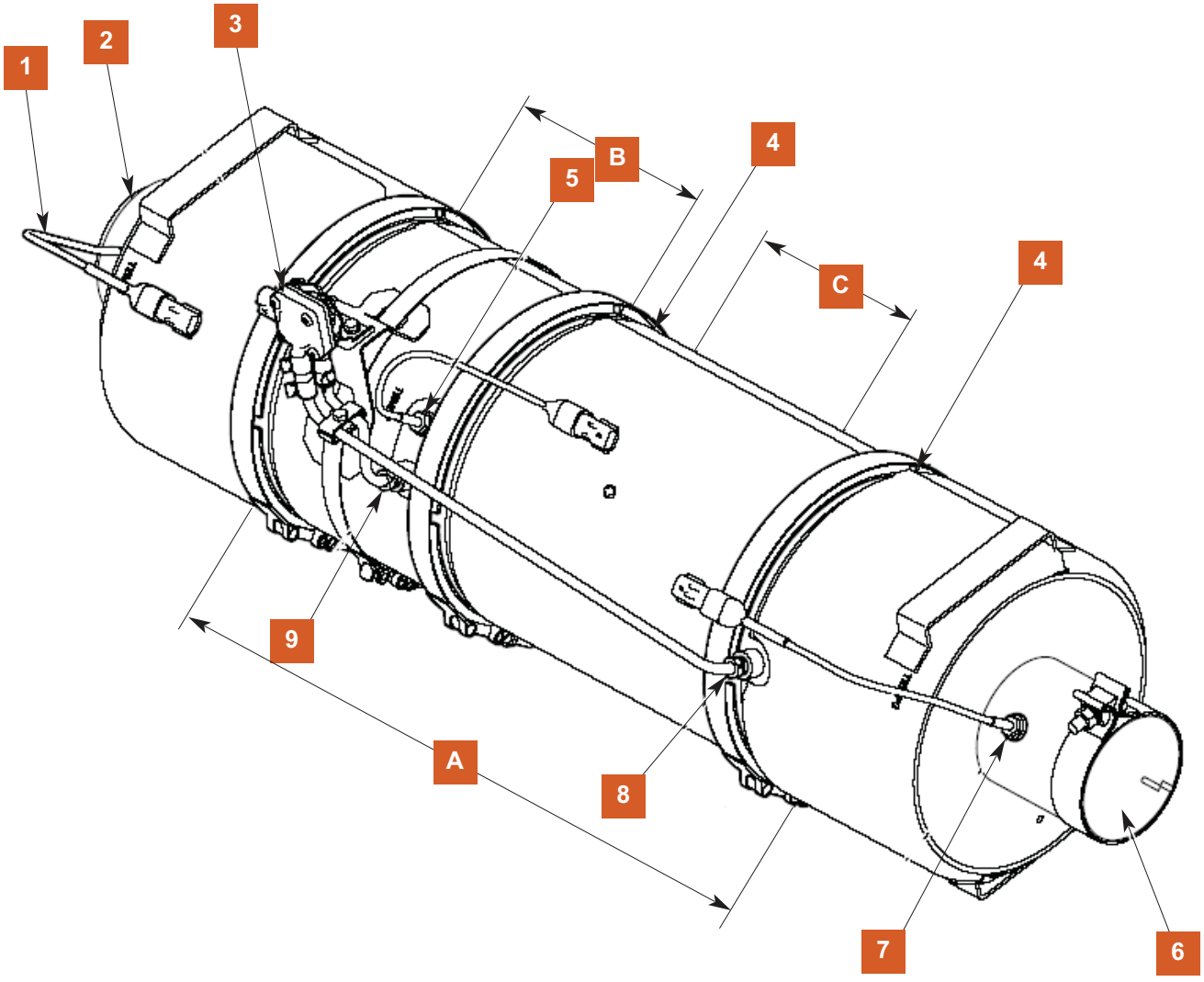


FIGURE 2- AFTERTREATMENT DEVICE (TYPICAL)

A. INSPECT THIS AREA OF THE CANISTER FOR DENTS.
B. DOC AREA
C. DPF AREA

1. INLET TEMPERATURE SENSOR
2. MARMON FITTING AT INLET FROM TURBOCHARGER
3. SENSOR HOUSING
4. DPF V-BAND MOUNTING CLAMPS
5. INLET TEMPERATURE SENSOR
6. EXHAUST OUTLET TO DIFFUSER
7. OUTLET TEMPERATURE SENSOR
8. DPF OUTLET PRESSURE SENSOR
9. DPF INTAKE PRESSURE SENSOR

Emission and Fuel Efficiency Compliance

This vehicle must be regularly inspected and maintained as indicated in this owner's manual and in the Pre- and Post-Trip Inspections and Maintenance chapter in this manual, in order to continue satisfactory performance and ensure coverage of the vehicle under the manufacturer's warranty. Many maintenance procedures ensure that the vehicle and engine continue to comply with applicable emissions standards. Maintenance procedures, using components engineered to comply with greenhouse gas emissions and fuel efficiency regulations, may be performed by an authorized Thomas Built Buses dealer, an independent outlet, or the vehicle owner or operator.

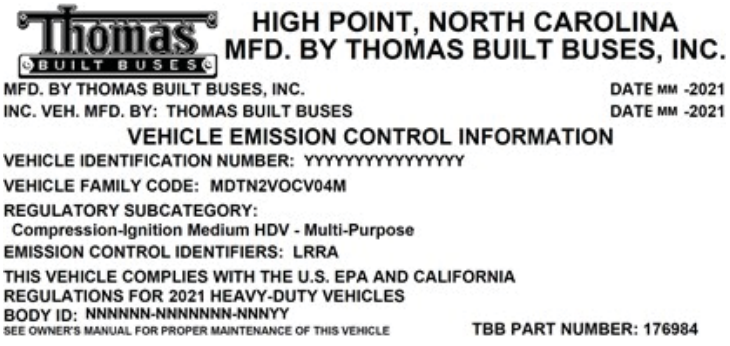
The vehicle owner is responsible for determining the suitability of replacement components to maintain compliance with federal and local jurisdictional regulations. Components including, but not limited to, tires, chassis bumper, hood, vehicle speed limiters, and idle shut down timers are specifically designed and manufactured to exacting standards for regulatory fuel efficiency and greenhouse gas emissions compliance. It is important that these components are always replaced with components that meet or exceed the performance of the originally installed components.

For proper GHG performance, please undergo all normal scheduled maintenance per manufacturer instructions for all engine and vehicle components. If replacement of any GHG related component is required, the replacement component must meet or exceed the GHG reduction performance of the originally installed component in order to maintain compliance with GHG14, GHG17 and GHG21 requirements.

Vehicle Emission Control Information Label

Model year 2013 and later vehicles meet requirements as specified by GHG14, GHG17 and GHG21 regulations, respectively. These vehicles are equipped with components that increase fuel efficiency and reduce greenhouse gas (GHG) emissions. (Components may include, but are not limited to, low-rolling resistance tires; aerodynamic components; vehicle speed limiters; and idle shutdown timers.)

A Vehicle Emission Control Information Label is located on the left side of the front bulkhead. Among other GHG relevant information the label indicates the emission model year of the vehicle. It is the owner's responsibility to maintain the vehicle so that it conforms to EPA and NHTSA regulations.



Vehicle Emission Control Information Label

Criteria Pollutant Standards and Greenhouse Gas Emissions/Fuel Consumption Standards

Model year 2007 and later vehicles and/or engines domiciled in the U.S. or Canada are designed to meet Emission and Fuel Efficiency Standards of the U.S. (Federal) Environmental Protection Agency (EPA), the National Highway Traffic Safety Administration (NHTSA), Emission Regulations under the Canada Motor Vehicle Safety Act in Canada, and the California Air Resources Board (CARB) effective as per the applicable emission model year. To determine an engine's or vehicle's emission model year, refer to the respective EPA/CARB certification label.

Table of Regulations:

Regulation	**Emission Components**
EPA07 (Reduction of nitrogen oxides (NOx) emissions to 1.1 g/bhp-hr, and particulate matter emissions to 0.01 g/bhp-hr)	After treatment device (ATD) containing a diesel particulate filter that traps soot and ash.*
EPA10 (Reduction of NOx emissions to 0.2 g/bhp- hr):	EPA07-type ATD, with additional selective catalyst reduction (SCR) technology that utilizes diesel exhaust fluid (DEF) to convert NOx to nitrogen and water vapor.
GHG14 (Reduction of Greenhouse Gas Emissions)	Fuel efficiency components including, but not limited to, engines, tires, aerodynamic components, vehicle speed limiters, and idle shut down timers specifically designed to meet regulatory fuel efficiency and greenhouse gas emissions standards.
GHG17	
GHG21	GHG14/17 components plus additional components including, but not limited to, transmissions, axles, predictive technologies, idle reduction technologies for vocational vehicles, tire pressure monitoring systems.

* Cummins, Detroit, and Mercedes-Benz ATD's are also equipped with a diesel oxidation catalyst to break down pollutants.

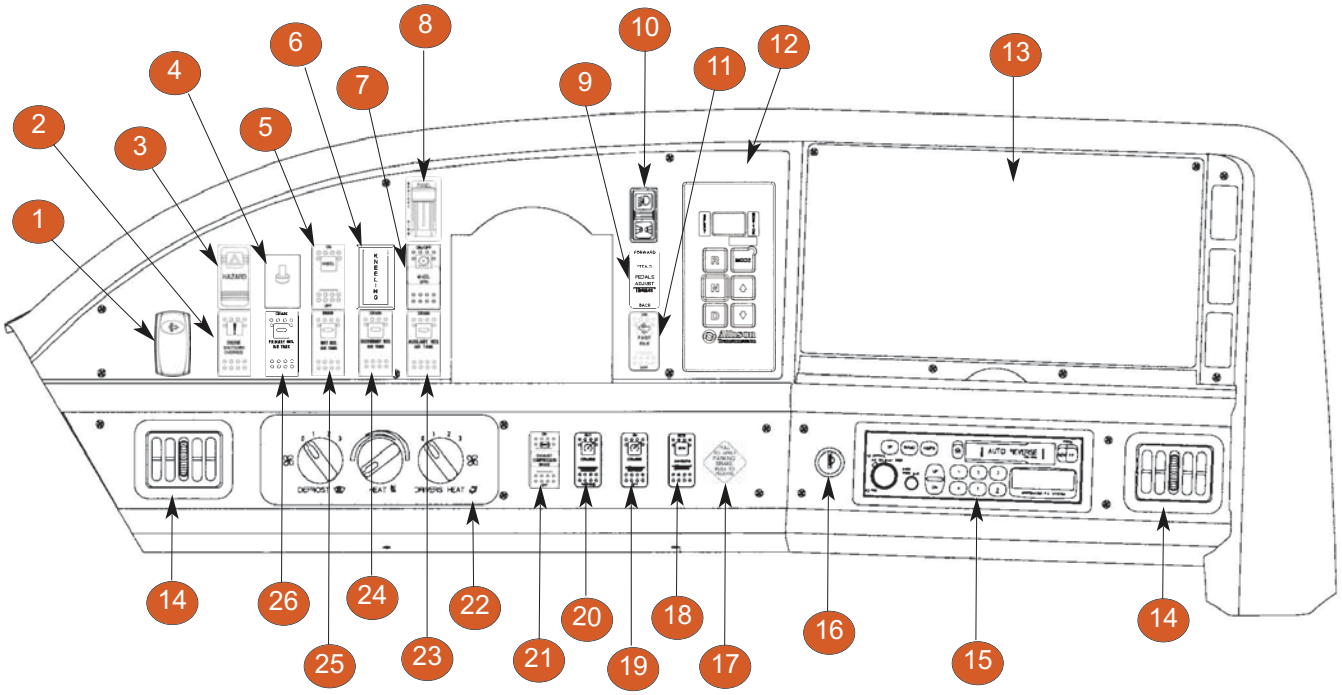
Table Applicable Emission Regulations

Emission Model Year	**Applicable Emission Regulations**	
	Engine	Vehicle
2007-2009	EPA07	N/A
2010-2012	EPA10	
2013-2015	EPA10, GHG14	GHG14
2016	EPA10, GHG17	GHG14
2017-2020	EPA10, GHG17	GHG17
2021 and later	EPA10, GHG21	GHG21

This section provides the operator with important operational and general information. The following divides the Operator's Compartment into four major parts. The first part of this section covers the *Instrument Panel,* the second part covers the *Side Console Switch Panel,* the *Operator's Compartment Controls* forms the third part, and information about the *Driver's Seat* completes the section.

It is important to carefully read and understand the following pages before operating the coach. A proper understanding of component location, function, and operation is important to the proper operation of the coach.

INSTRUMENT CONTROL UNIT, WITH OPTIONAL 3000 PTS TRANSMISSION

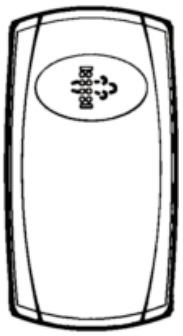


1. ATD MANUAL REGEN SWITCH (OPTIONAL)
2. ENGINE SHUTDOWN OVERRIDE (CUMMINS)
   ENGINE WARNING LAMP
3. REMOTE HAZARD SWITCH
4. AUTOMATIC SNOW CHAINS SWITCH (OPTIONAL)
5. KNEELING SWITCH (OPTIONAL)
6. KNEELING WARNING LAMP (OPTIONAL)
7. WHEEL SPIN SWITCH (OPTIONAL)
8. PANEL DIMMER SWITCH
9. ADJUSTABLE PEDALS (OPTIONAL)
10. HEADLIGHT SWITCH
11. FAST IDLE (OPTIONAL)
12. 3000 TRANSMISSION KEYPAD CONTROLLER (OPTIONAL)
    2500 TRANSMISSION SHIFTER (OPTIONAL)
13. EPA10 INSTRUMENT CLUSTER (DIESEL)
14. DIFFUSER
15. RADIO (OPTIONAL)
16. IGNITION SWITCH
17. PARK BRAKE VALVE (AIR BRAKES)
18. CRUISE CONTROL SWITCH, SET / RESUME (OPTIONAL)
19. CRUISE CONTROL SWITCH, ON / OFF (OPTIONAL)
20. EXHAUST COMPRESSION BRAKE, HI-LO
21. EXHAUST COMPRESSION BRAKE, ON-OFF (OPTIONAL)
    TRANSMISSION RETARDER, ON-OFF (OPTIONAL)
22. HEATER CONTROL PANEL (OPTIONAL)
23. AUXILIARY AIR TANK DRAIN (OPTIONAL)
24. SECONDARY AIR TANK DRAIN (OPTIONAL)
25. WET AIR TANK DRAIN (OPTIONAL)
26. PRIMARY AIR TANK DRAIN (OPTIONAL)

ATD MANUAL REGEN SWITCH (OPTIONAL)

The DPF Regen Switch located on the dash, may have three selectable positions:

- Request Regeneration
- Default (can include appropriate normal state condition, either in an automatic regeneration or inhibit state.
- Inhibit regeneration (optional when available)



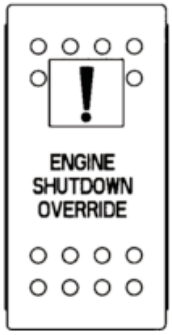
NOTICE

The DPF Regen Switch is standard. An optional, Omit Exhaust System Regeneration Switch (shorting connector) is installed under the left dash next to the diagnostic port that performs this function.

ENGINE SHUTDOWN OVERRIDE (OPT.)

This switch will reset the Engine Shutdown Timer and restores engine power to the level when the Red Stop Engine Lamp illuminates when it is pressed and released.

This switch must be recycled after 5 seconds to obtain a subsequent override.



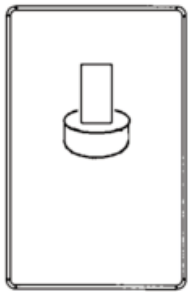
HAZARD LIGHT SWITCH (FOUR-WAY FLASHER)

The Hazard Light Switch illuminates when in ON position. This dash-mounted hazard light switch is in lieu of the column-mounted switch.

The four-way flasher should be activated when the coach is disabled in the street and obstructing traffic, stopped due to an emergency, in low, or proceeding at very reduced speed.

AUTOMATIC SNOW CHAIN SWITCH (OPTIONAL)

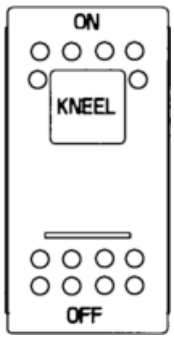
The switch is dash-mounted and when activated, provides traction and braking in all weather conditions.



KNEELING SWITCH, ON-OFF (OPTIONAL)

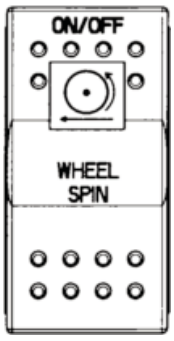
Activated by the coach operator to lower curb side of bus for easy access by expelling air from the front air bags. The switch contains a pilot light.

When coach operator selects the **OFF** position, the air bags will inflate; returning the bus back to its original position.



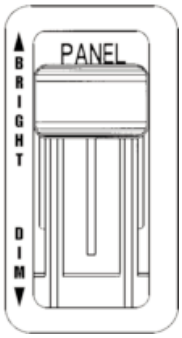
WHEEL SPIN (OPT.)

Illuminates when the ABS goes into Automatic Traction Control.



PANEL DIMMER SWITCH (OPT.)

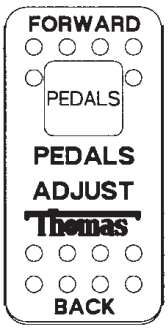
Enables the driver to dim or brighten the light on the dash panel by sliding the button to the desired brightness.



PEDALS ADJUSTMENT SWITCH (OPT.)

Enables the driver to adjust the position of the accelerator and brake pedals for a more comfortable drive.

The "BACK" position moves the pedals closer to the operator and the "FORWARD" position moves them further away.



HEADLIGHT SWITCH

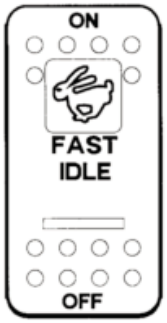
The headlight switch is a three position switch that controls the main lighting circuit. Position 1 paddle in lower position (completely in) is the OFF position. Position 2 center (first click) energizes the parking lights, tail lights, marker/clearance lights, instrument and panel lights. Position 3 paddle in upper position (completely out or second click) energizes the headlights.

NOTICE

If Light switch is left on, key off, an audible alarm will sound a warning to driver to turn light switch off.

FAST IDLE SWITCH

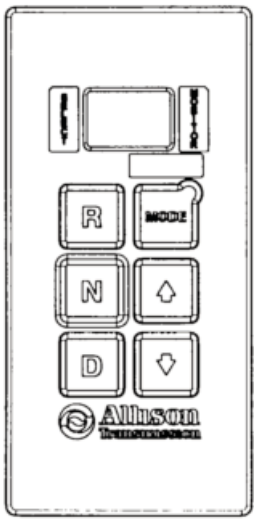
The operator may elect to engage the "FAST IDLE" throttle on the dash. The fast idle will continue to operate until the gear selector is moved to either a forward or reverse position. The system is designed to turn off when the transmission gear selector is moved from the neutral position.



Allowing the engine to "warm up" before the normal route will cause less stress on "cold components" in the power train. This "warm up" time should range from 3-5 minutes, depending on the ambient temperature.

The Fast Idle will also disengage when the vehicle service brakes are applied and will remain disengaged while the vehicle is in any Forward and Reverse gear.

TRANSMISSION SHIFTER, WITH OPTIONAL 3000 PTV TRANSMISSION (PUSHBUTTON)



The pushbutton shift selector has **R**, **N**, **D**, **Up Arrow**, **Down Arrow**, **Mode Button,** and a digital display.

Select ***(R) R**everse to back the vehicle. The vehicle must come to a complete stop before shifting from **(R) R**everse to **(D) D**rive.

(N) Neutral is selected when starting the engine, for extended periods of engine idle operation, and when checking vehicle accessories. With the pushbutton selector **(N) N**eutral is selected by the ECU at start-up, unlike the lever shifter. This button has a raised edge to enable the driver to touch without looking at the display.

CAUTION

Do not race the engine when shifting from Neutral into another gear.

CAUTION

Set the gear selector to Neutral, engage the parking brake, and turn off the ignition, even momentarily. Never leave the vehicle unattended while the engine is running. Unexpected sudden vehicle movement may occur if these precautions are not taken. Do not allow the vehicle to coast in Neutral.

When ***(D) D**rive is selected, the transmission will initially engage the lowest gear programmed for the **(D) D**rive position, usually **(1) F**irst gear. As the speed increases, it will automatically upshift. As the vehicle slows down, the transmission will downshift. The vehicle must come to a complete stop before shifting from **(D) D**rive to **(R) R**everse.

Occasionally there will be a need to limit the transmission to the lower gears. To do this, utilize the **Up Arrow** and **Down Arrow** buttons to select a specific range. The digital display will Indicator your choice. This will not change until vehicle speed is reduced sufficiently to allow the transmission to downshift.

The Display Mode button allows the driver to enable a secondary shift schedule.

To access the Diagnostic Codes, press the up and down arrows at the same time. To clear active fault codes, hold the mode button three seconds until mode LED flashes.

Never depend on the transmission as an engine brake. The transmission will upshift, no matter what gear is selected when the internal pressure reaches a certain level. A shift point will be created by high engine rpm.

(CONTINUED ON NEXT PAGE.)

TRANSMISSION SHIFTER, WITH OPTIONAL 3000 PTV TRANSMISSION (PUSHBUTTON) *(CONT'D)*

NOTICE

***(R) Reverse or (D) Drive position may be prevented when a damaging or undesirable range engagement would occur due to a vehicle logic or engine speed condition.

For more information, refer to your Allison Transmission Operator's Manual.

TRANSMISSION SHIFTER, WITH OPTIONAL 2500 PTS TRANSMISSION (LEVER)

To put the transmission into gear, move the selector lever from Neutral to the desired drive position.

CAUTION

Do not race the engine when shifting from Neutral into another gear.

NOTICE

Transmission will not go into any gear unless the service brake is applied.

The available gears are:
(R) Reverse - Vehicle must be completely stopped before engaging this gear.

(N) Neutral - Use when vehicle is standing for prolonged periods with engine running. Set the parking brake if you leave the vehicle. Engine may be started in this gear.

CAUTION

Set the gear selector to Neutral, engage the parking brake and turn off the ignition, even momentarily. Never leave the vehicle unattended while the engine is running. Unexpected sudden vehicle movement may occur if these precautions are not taken. Do not allow the vehicle to coast in Neutral.

(D) **Overdrive -** For most highway driving.

(D) Drive - For most city driving.

(2) Second - For driving slowly in heavy city traffic or on mountain roads where more precise speed control is desirable, and for climbing and descending long grades.

To prevent excess engine speed, do not exceed 45 mph (72 kph) in this gear.

(1) First - For driving up very steep hills and engine braking at low speeds - 25 mph (40 kph) or less - when going downhill.

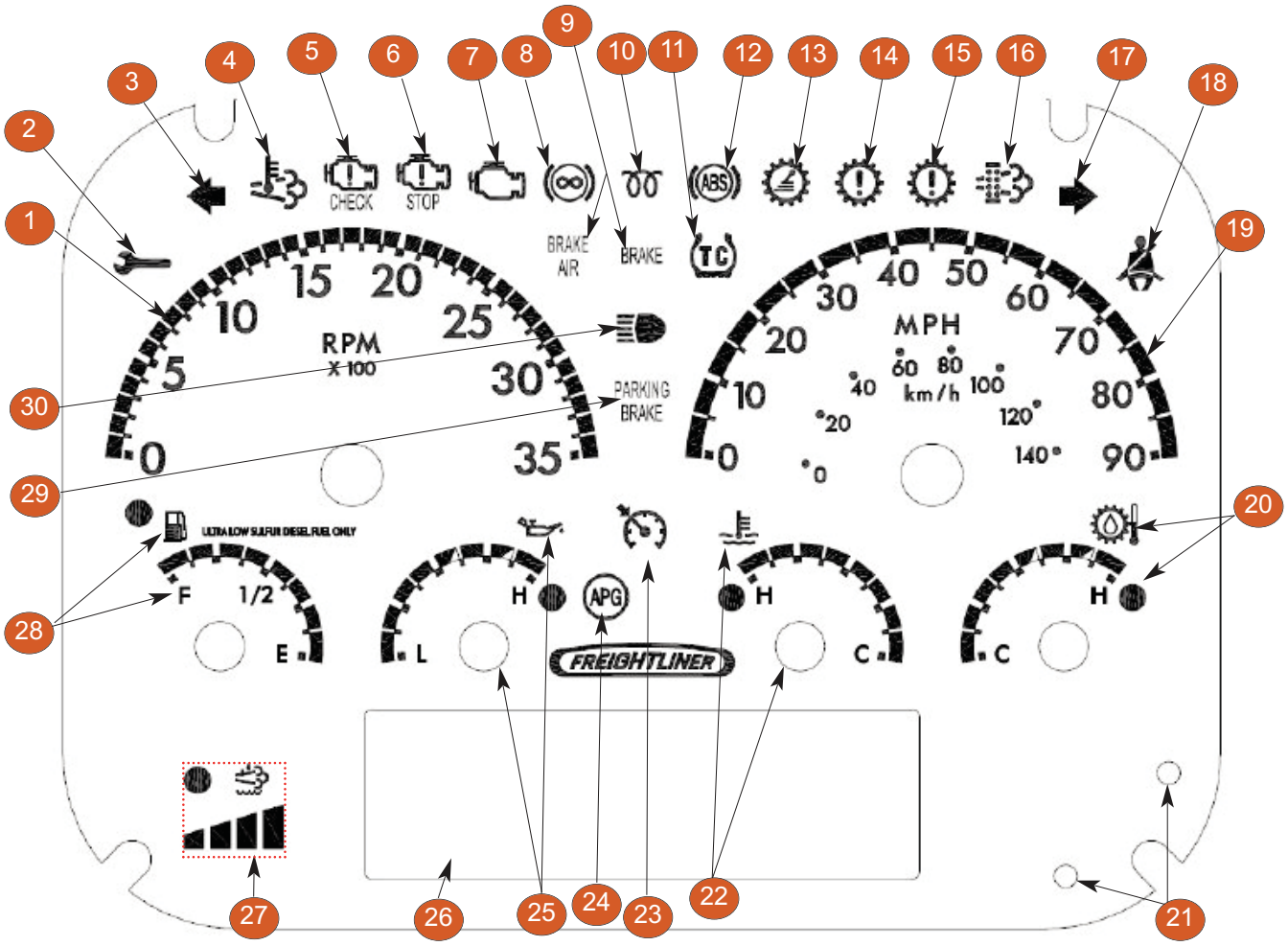
To prevent excessive engine speed, do not exceed 25 mph (40 kph) in this gear.

A red indicator light will illuminate if the transmission is unable to shift at the appropriate time. This indicates a failure in the transmission and should be checked by a qualified technician. Pull the bus over to a safe location and get assistance.

CAUTION

Never depend on the transmission as an engine brake. The transmission will upshift, no mater what gear is selected when the internal pressure reaches a certain level. A shift point will be created by high engine rpm.

EPA10 INSTRUMENT CLUSTER (DIESEL)



1. TACHOMETER (OPTIONAL)
2. MAINTENANCE
3. LEFT TURN SIGNAL
4. HIGH EXHAUST SYSTEM TEMPERATURE
5. CHECK ENGINE
6. STOP ENGINE
7. MALFUNCTION INDICATOR LAMP
8. TRANSMISSION RETARDER ACTIVE
9. AIR BRAKE
   HYDRAULIC BRAKE (DEPENDING ON UNIT CONFIGURATION)
10. WAIT TO START
11. TRACTION CONTROL
12. ABS WARNING
13 SHIFT INHIBIT
14. CHECK TRANSMISSION
15. STOP TRANSMISSION (HYBRID ONLY)
16. DIESEL PARTICULATE FILTER REGENERATION
17. RIGHT TURN SIGNAL
18. FASTEN SEAT BELT WARNING
19. SPEEDOMETER (MPH & METRIC)
20. HIGH TRANSMISSION TEMP INDICATOR & GAUGE
21. MAINTENANCE MENU
22. HIGH COOLANT TEMP INDICATOR & GAUGE
23. CRUISE CONTROL ON
24. APG (AUX, POWER GENERATOR-HYBRID ONLY)
25. LOW OIL PRESSURE INDICATOR & GAUGE
26. DASH DRIVER DISPLAY SCREEN
27. DIESEL EXHAUST FLUID (DEF) GAUGE
28. LOW FUEL INDICATOR & FUEL LEVEL GAUGE (ULTRA-LOW SULFUR DIESEL FUEL ONLY)
29. PARKING BRAKE
30. HIGH BEAM HEADLIGHT INDICATOR

(CONTINUED ON NEXT PAGE)

EPA10 INSTRUMENT CLUSTER *(CONT'D)*

1. ***Tachometer*** - Indicates engine speed in revolutions per minute (rpm).
2. ***Maintenance Intervals Indicator*** *(Yellow)* - Will activate when either of the following conditions have been met: The oil change interval has been met and the "change air filter" input has been set low. This menu allows the driver to set the change intervals. The maintenance warnings must be disabled if the intervals are set to zero.
3. ***Left Turn Signal Indicator Lamp*** *(Green)* - Indicates that the driver intends to turn left and flashes at a rate determined by the flasher module.
4. ***High Exhaust System Temperature (HEST)*** - Alerts the driver that the exhaust temperature is out of the desired range.
5. ***Check Engine ("CHECK ENGINE")*** - When a problem is detected by the engine's electronic system, a diagnostic code is generated and the "Check Engine" lamp is turned ON.
6. ***Stop Engine ("STOP ENGINE")*** - (This acts as the "Engine Warning" Lamp.) - The bus will shut down in 30 seconds after light illuminates.
7. ***Malfunction Indicator Lamp (MIL)*** - The indicator is illuminated for all active engine emission related faults including but not limited to after-treatment devices.
8. ***Retarder Active Lamp*** - Lamp illuminates when the transmission retarder is engaged. It serves to slow vehicles or maintain a steady speed on declines, and help prevent the vehicle from running away on downhill declines.
9. ***Hydraulic Brake Fault*** - Warning indicator is used to indicate that hydraulic brake fluid pressure is low.
10. ***Wait to Start*** *(Optional)* - Indicates to the driver turning the ignition key, he needs to wait a few moments with the key in the accessory position before cranking the ignition.
11. ***Traction Control*** - Prevents the drive wheels from spinning when on slippery roads.
12. ***A.B.S. Warning*** - The warning lamp blinks once, then goes OFF and stays OFF, unless the system detects a problem. For more information refer to the service manual.
13. ***Shift Inhibit ("SHIFT INHIBIT")*** *(Yellow)* - The indicator and message will be activated by the ICU if a message is received from the transmission.
14. ***Check Trans ("CHECK TRANSMISSION")*** *(Amber)* - Transmission Fault indicator. When a problem is detected by the transmission's electronic system, a diagnostic code is generated.
15. ***Stop Trans - ("STOP TRANSMISSION")*** *(Red)* - Transmission Fault indicator. Indicator acts as the warning lamp and will affect shifting performance. Stop vehicle when safe to do so. This indicator is used for **Hybrid only**.
16. ***Diesel Particulate Filter (DPF)*** *(Yellow)* - Lamp indicates that a manual regen is required soon, and should be scheduled for the earliest convenient time.
17 ***Right Turn Signal Indicator Lamps*** *(Green)*- Indicates that the driver intends to turn right and flashes at a rate determined by the flasher module.
18. ***Fasten Seat Belt Warning*** *(Red)* -The warning light (seat belt icon) illuminates for 15 seconds after the ignition switch is turned on.
19. ***Speedometer*** - Indicates vehicle speed in miles per hour (mph) and kilometers per hour (kph).
20. ***Transmission Fluid Temperature*** *(Optional)* - Indicates the temperature of oil in the transmission.
21. ***Maintenance Menu - Contains three sub-menus:*** Maintenance Intervals, Transmission Oil Life Remaining and Transmission Oil Filter Lift Monitor.

(Continued on next page.)

EPA10 INSTRUMENT CLUSTER *(CONT'D)*

22. ***High Coolant Temperature Gauge*** *(Red)* - The warning light (thermometer icon) and emergency buzzer activate whenever the coolant temperature goes above a preset maximum specified by the engine manufacturer.
24. ***APG ("Aux, Power Generator")*** - This indicator is used for **Hybrid only**.
23. ***Cruise Control ("CRUISE ON")*** *(Green)* - The indicator (or message) will be activated by the ICU when the associated input is activated.
25. ***Low Engine Oil Pressure ("LOW OIL PRESSURE")*** - Indicates the oil pressure in the engine is low.
26. ***Display Message Menu Screen*** - The display messages menu should contain the following configurable categories:
    - Odometer
    - Chassis Battery Voltage
    - Instantaneous Fuel Economy
    - Average Fuel Economy
    - Gear Attained Status
    - Transmission Temperature
    - Hour Meter
    - Trip Odometer 1
    - Trip Odometer 2
    - Boost Pressure
    - Engine RPM
    - Percent Engine Load
    - Fuel Level
    - Coolant Temperature
    - Engine Oil Pressure

The display messages menu has three visible lines. The top line displays the odometer and chassis battery voltage, while the second and third lines display other driver selectable parameters. The lines can be adjusted to show any of the optional display messages. The menu configuration will be stored in the EE-prom upon key off.

27. ***Diesel Exhaust Fluid (DEF)*** *Gauge* - Refer to EPA10 Exhaust System section for operation.
28. ***Low Fuel Level Gauge ("LOW FUEL")*** *(Ultra-Low Sulfur Diesel Fuel only)* - Indicates the amount of fuel in the tank.
29. ***Park Brake On Indicator*** *(Red)* - The warning/parking brake on indicator light (BRAKE legend) activates whenever the parking brake is is engaged. If the vehicle is moving at a speed of 2 mph (3 km/h) or more, the emergency buzzer will sound until the parking brake is released.
30. ***High Beam Headlight Indicator*** *(Blue)* - Indicator light (sideways beam icon) illuminates when the headlight high beams are on.

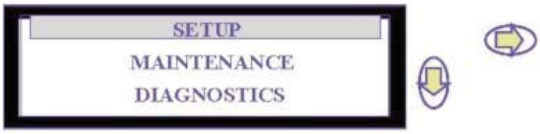
DISPLAY MESSAGE SCREEN (OPERATING EXAMPLE FOR MAINTENANCE MENU)

The maintenance menu shall contain three sub menus. These three sub menus are maintenance intervals, transmission oil life remaining, and transmission oil filter life monitor. A fourth sub menu is needed for older, pre-2010 service version clusters.

The maintenance intervals menu allows the driver to set the change intervals of the Engine Oil and Engine Air Filter. The maintenance warnings must be disabled if the intervals are set to zero.

Screen 1

Auxiliary Screens
-Maintenance

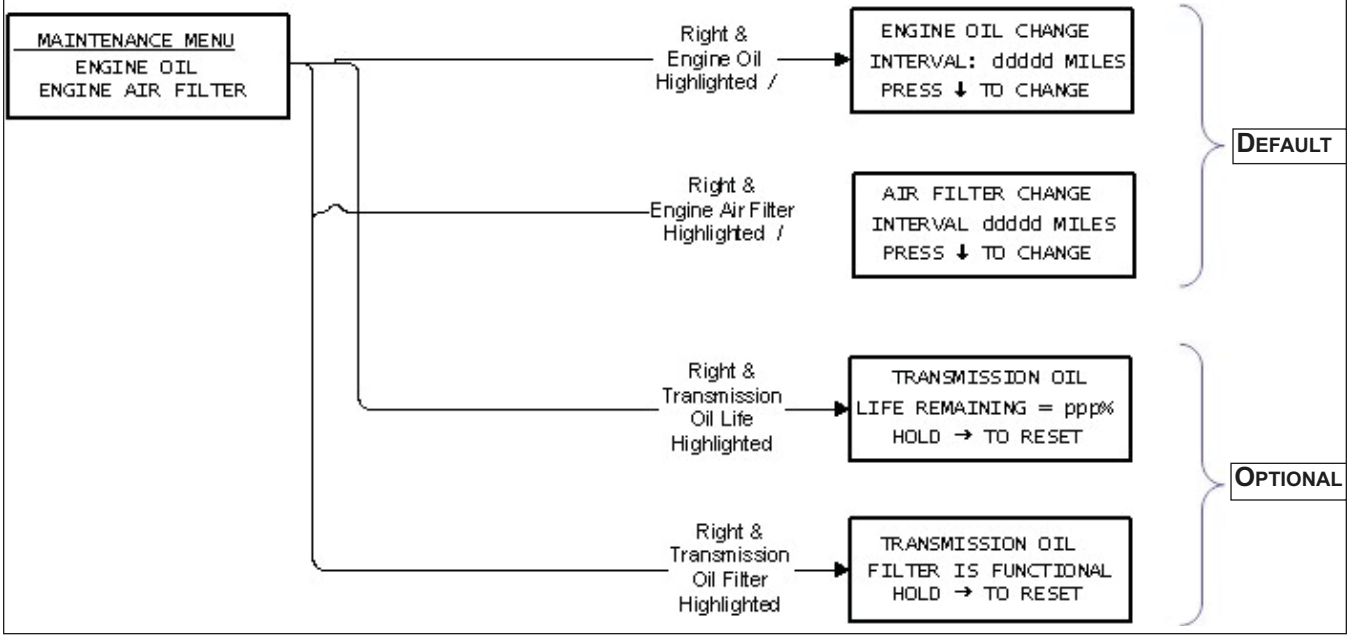


Maintenance Screens are next.

Screen 2

Maintenance Screens

There are a minimum of two maintenance screens. In select cases depending on the vehicles transmission type, you may see four maintenance screens. In this case the cluster S/W receives a message from the engine "ECU and the transmission maintenance screen are then activated. Otherwise only the two default maintenance screens are available.



DISPLAY MESSAGE SCREEN (OPERATING EXAMPLE FOR MAINTENANCE MENU) *(CONT'D)*

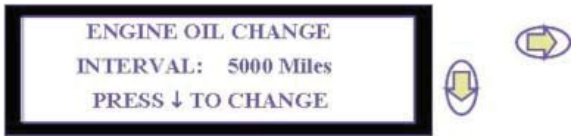
Screen 3

Auxiliary Screens
-Maintenance.....Engine Oil

To set the interval for engine oil changes, use the down button to scroll to ENGINE OIL in the maintenance menu. to select ENGINE OIL, press the **Right button**.

Screen 4

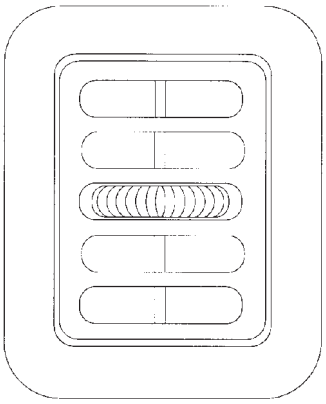
Auxiliary Screens
-Maintenance.....Engine Oil



To change the interval to 6000 miles, continue to press the **Down button**.until 6000 miles is selected.

DIFFUSER

The diffuser is located on the lower dash to either side of the driver. Controls the flow of heated air around the driver, and is adjustable by moving the button located in the center.



RADIO CONTROLS - SEE RADIO OPERATOR'S MANUAL

A separate operator's manual is supplied when vehicle is equipped with Radio or PA.

Ignition Switch, with Anti-Restart Feature

The ignition switch is a four position key switch that controls the cold ignition circuits. The four positions are as follows:

Position 1 (vertical) is the **OFF** position. The key can be removed only at this position.

Position 2 (one click counterclockwise) is the accessory position. This position energizes the accessory circuits only.

Position 3 (one click clockwise from off) is the **ON** or RUN position. This position energizes the ignition, alarm, and accessory circuits.

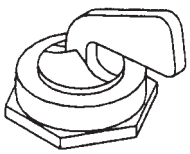
Position 4 energizes the engine starter. This position is spring-loaded. The switch automatically returns to Position 3 upon release.

Once the switch is turned to Position 4 and released, it must be returned to Position 1 before attempting to restart the engine. The ignition switch contains an anti-restart feature to prevent engaging the starter with the engine running.

Ignition switch keys have numbers. Record your key number for reference if lost.

KEYLESS IGNITION SWITCH (OPT.)

The keyless ignition switch with anti-restart is offered as an alternative to the standard keyed switch. Turn the keyless ignition switch clockwise to start coach engine. Release switch as engine starts.



PARK BRAKE VALVE (AIR BRAKES)

The parking brake applies or releases the coach parking brake. Pulling out on the parking brake knob applies the parking brake. Pushing the handle in releases the parking brake.

CAUTION

Whenever the vehicle is put in to neutral, the parking brake should be applied or the vehicle could begin to move and cause bodily harm.

NOTICE

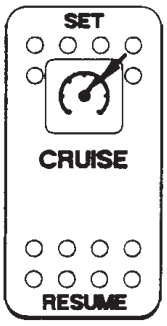
If the Parking brake has not been set and ignition if off, driver will be alerted with an audible alarm.

CRUISE CONTROL SWITCH, SET/RESUME (OPT.)

Momentary switch that allows the driver to set the desired vehicle speed. When this speed is reached, it is maintained by pressing the switch to the "SET" position to lock in.

Touching the brake or accelerator pedal will override the "SET" function.

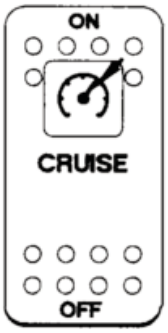
To return the vehicle to the desired speed, press the switch to the "RESUME" position. The vehicle will return to its preset speed.



CRUISE CONTROL SWITCH, ON-OFF (OPT.)

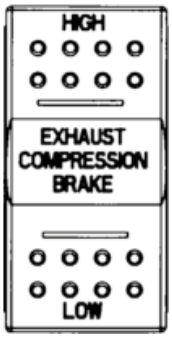
Activates or deactivates the cruise control.

Switch must be in "ON" position for the Cruise Control Set/Resume Switch to operate.



EXHAUST COMPRESSION BRAKE, HI-LOW (OPT.)

When switch is set to LOW position, exhaust brake is active. When set to HIGH position, both exhaust brake and compression brake are active.



RETARDER SWITCH, ON-OFF (OPTIONAL)

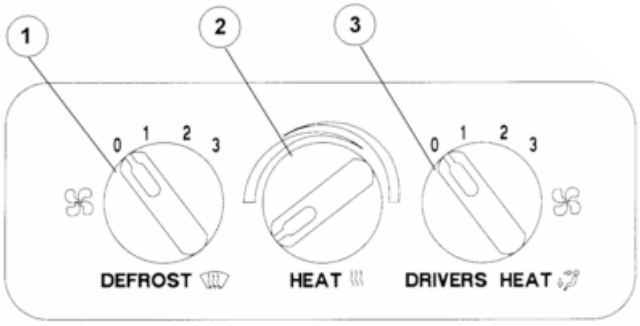
This switch activates retarder in the transmission. The retarder in the transmission becomes activate when the coach operator applies pressure to the brake treadle. There are three switches that control the amount of retarder capacity used. Light pressure on the brake treadle will activate one-third braking capacity of the retarder, while a moderate amount of pressure will utilize two-thirds of the breaking capacity of the retarder. Heavy brake application will use all retarder capacity to slow and stop the vehicle.

A hand control is also available on some models which gives the coach operator six different levels of retardation.

HEATER CONTROL PANEL ASSEMBLY

When heater master switch is activated by the coach operator, the fan, fresh air circulation, and defroster can be adjusted by turning the knobs on this panel to the desired position.

1. Controls the amount of air that is sent to the windshield area.
2. This knob controls the temperature of air flowing from the heater.
3. Controls the fan speed supplying heated air to the driver, aisle, and stepwell.



AUXILIARY RESERVE AIR TANK DRAIN (OPT.)

Momentary switch that allows the driver to activate the solenoid drain valve located on the auxiliary reservoir.

SECONDARY RESERVE AIR TANK DRAIN (OPT.)

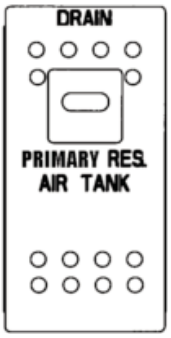
Momentary switch that allows the driver to activate the solenoid drain valve located on the secondary reservoir.

WET RESERVE AIR TANK DRAIN (OPT.)

Momentary switch that allows the driver to activate the solenoid drain valve located on the wet tank reservoir.

PRIMARY RESERVE AIR TANK DRAIN (OPT.)

Momentary switch that allows the driver to activate the solenoid drain valve located on the primary reservoir.

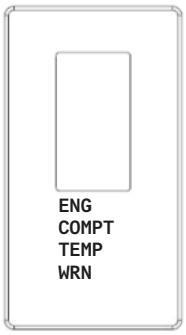


ENGINE COMPARTMENT TEMPERATURE WARNING LAMP (OPT.)

Pilot light for engine compartment temperature warning.

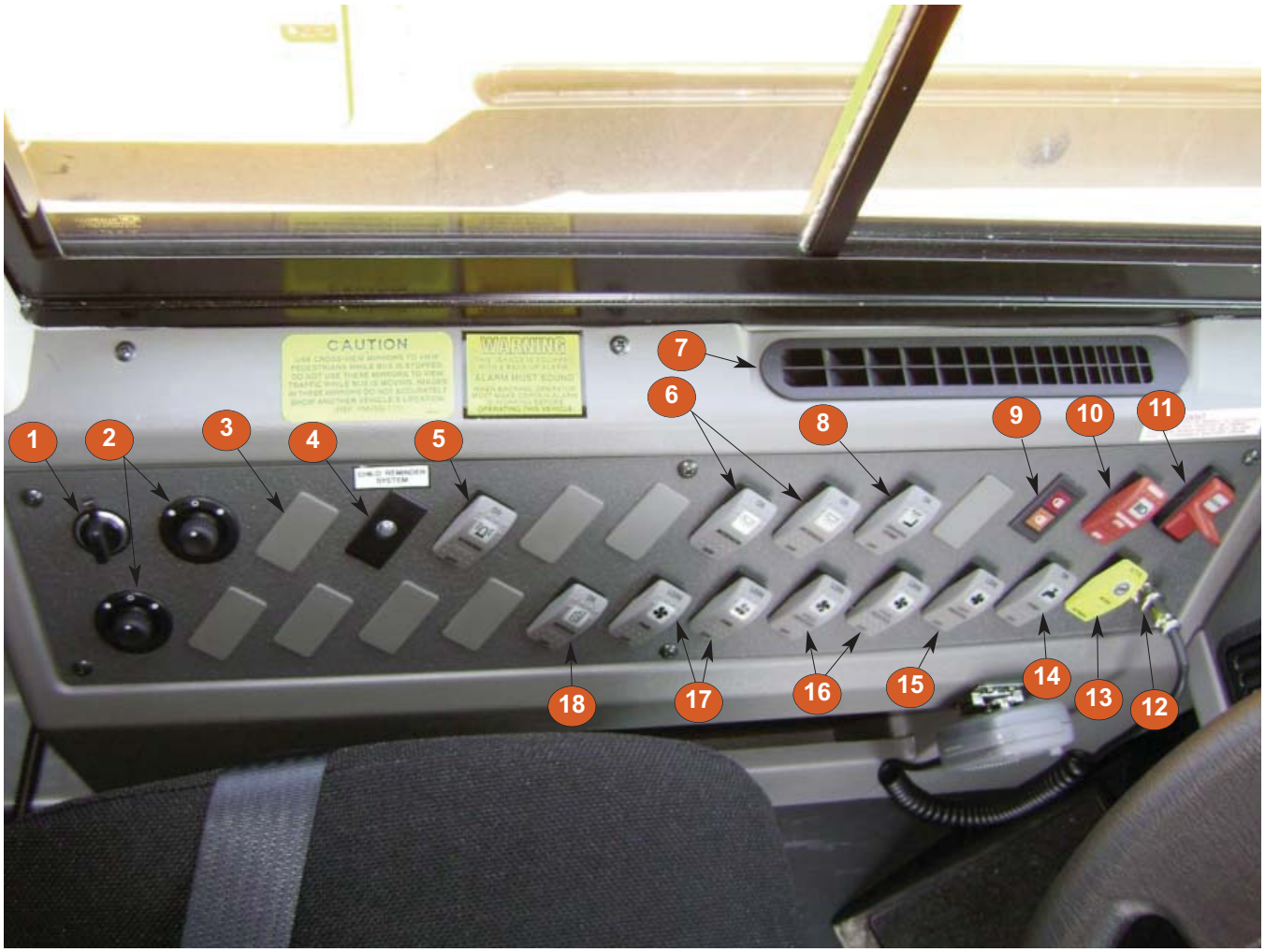
NOTICE

On CNG units only, the temperature sensor actuates a warning light on the instrument panel when the engine compartment temperature reaches 350° F.



Side Console Switch Panel

The *Side Console Switch Panel* contains the controls for bus heaters and defrosters, destination sign lights, and other standard and optional body group controls. All switches are easily accessed by the operator. A typical side console switch panel is shown below. The layout of your side console switch panel may differ slightly due to bus specifications and selected options.

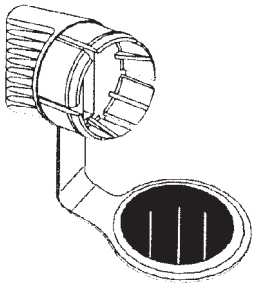


1. 12-Volt Power Outlet (Optional)
2. Rear View Mirror Control Switches (Optional)
3. Blank Switch
4. Child Reminder System (Optional)
5. Strobe Light Switch (Optional)
6. Interior Light Switches
7. Driver's Defroster Vent
8. Driver's Dome Light Switch (Optional)
9. Warning Light System Pilot Light
10. Warning Light Switch
11. Door Switch (Optional)
12. Remote Microphone Jack (Optional)
13. Noise Suppression Switch (Optional)
14. Booster Pump Switch (Optional)
15. Driver's Heater Fan Switch
16. Passenger Heater Fan Switches (Optional)
17. Fan Switches
18. Heated Mirror Switch (Optional)

POWER OUTLET, 12-VOLT (OPT.)

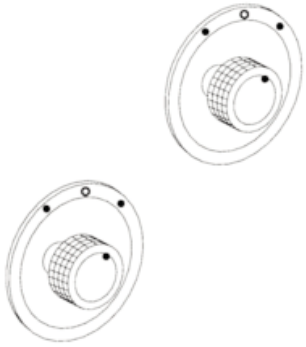
Supplies a 12-volt power supply source for driver add-on accessories, such as cellular phones and two way radios.

Located on the switch cabinet, the outlet is wired hot through the battery with a 10 amp in-line fuse.



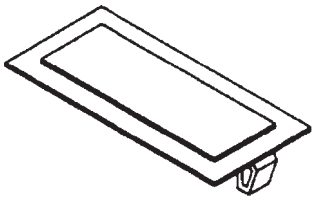
REAR VIEW MIRROR CONTROL SWITCHES (OPT.)

Located on the driver's switch cabinet. Controls remote adjustment for both upper flat and lower convex mirrors (left side and right side) independently.



BLANK SWITCHES

Blank panels are used to fill in openings in the switch panel where switches are not used.

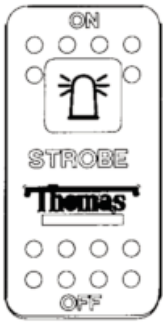


CHILD REMINDER SYSTEM (OPT.)

See the **"General Information"** section of this manual for information concerning the function of these options.

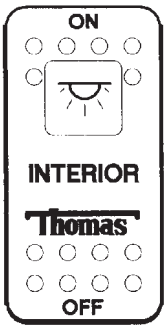
STROBE LIGHT (OPT.)

These lights are used in some eight-light warning systems, some stop arm assemblies and as a separate warning light affixed to the top of the bus in various locations. These strobes improve the visibility of a stopped school bus in all driving conditions.



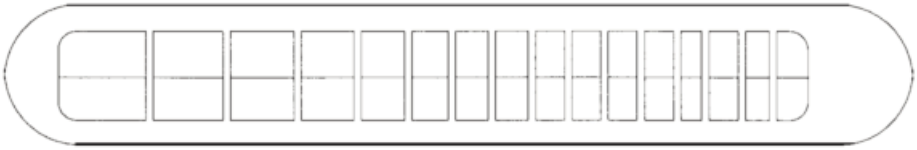
INTERIOR LIGHT SWITCHES

The interior light switches energize all the coach interior dome lights except the one directly above the driver.



DRIVER'S DEFROSTER VENT

Located on top side of the side console switch panel and directs air from the defrosters to the driver's side glass.



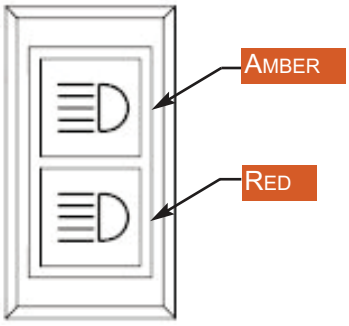
DRIVER'S DOME LIGHT SWITCH, ON-OFF (OPT.)

The driver's dome light switch enables the coach operator to energize the dome light above the operator's compartment.

EIGHT-LIGHT WARNING PILOT LIGHT (OPT.)

Eight-light warning system controls the amber and red warning lights mounted on the four corners of the exterior of the vehicle. These lights are activated at various times by the driver as necessary.

This system requirements vary from state to state. Follow your state requirements for proper operation.



WARNING LIGHT SWITCH

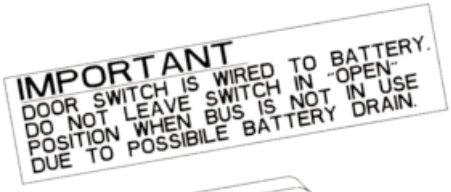
Eight-light warning system controls the amber and red warning lights mounted on the four corners of the exterior of the vehicle. These lights are activated at various times by the driver as necessary.

This system requirements vary from state to state. Follow your state requirements for proper operation.

DOOR CONTROL SWITCH

The electric door control switch controls the operation of the front door. In the lower position the entrance door is closed. In the upper position the door will open. This switch is wired directly to the battery allowing entrance and exit of the vehicle at all times. The operator should ensure that the door is closed when shutting down the vehicle and leaving it parked.

An emergency release valve is mounted over the windshield beside the door which allows the door to be opened without air pressure.

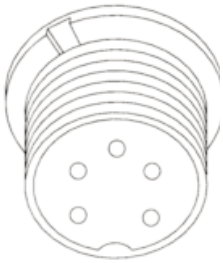


NOTICE

An audible alarm will alert the driver that door switch is energized when key is off.

MICROPHONE JACK (OPT.)

When a remote mounted microphone is ordered. Hole will be plugged when not ordered.

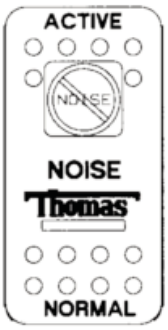


NOISE SUPPRESSION SWITCH (OPT.)

With the noise suppression switch in the active position, it enables the driver to eliminate any noise from heaters and fans, AC or radio that may be in use when the bus is approaching railroad crossings.

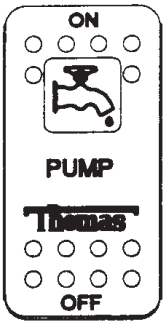
NOTICE

Factory installed component only.



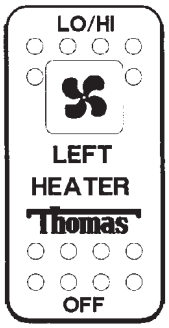
BOOSTER PUMP, ON-OFF (OPT.)

The booster pump switch energizes an auxiliary coolant booster pump to circulate coolant to the heaters when engine is idling or when stop and go driving conditions reduce coolant flow due to low engine rpm.



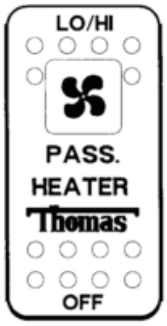
DRIVER'S HEATER FAN SWITCH

The driver's heater fan switch enables the coach operator to control the fan speed of the driver's heater. The fan runs at either low or high speed.



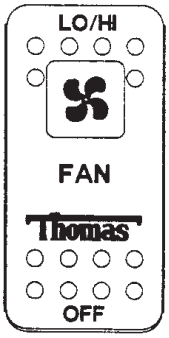
PASSENGER HEATER FAN SWITCHES (OPT.)

The passenger heater fan switches enable the coach operator to control the fan speed of the heaters. The fans operate at either **LOW** or **HIGH** speed.



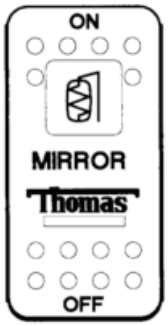
FAN SWITCH

Enables the defroster fan for windshield cleaning. The fans run at either low or high speed.



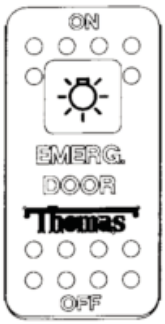
HEATED MIRROR DEFROSTER SWITCH (OPT.)

The mirror defroster switch energizes the defroster strips in the exterior mirrors.



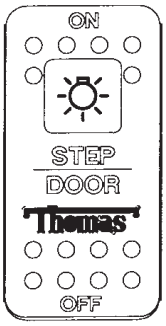
EMERGENCY DOOR LIGHT SWITCH (OPT.)

Turns on lights mounted above the emergency door and/or rear pushout hatch.



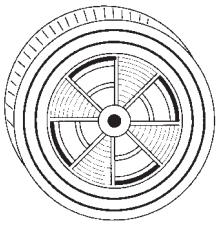
Step/Door Light Switch (Opt.)

Energizes the step/door lights without activating the door.



EIGHT-LIGHT WARNING BUZZER (OPT.)

Mounted on the driver's switch cabinet to alert the driver when the door is opened.

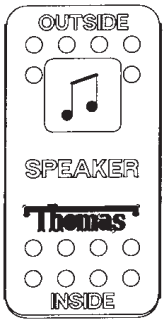


Defrost Heater, LO/HI/OFF

Switch enables the coach operator to control fan speed of the windshield defrosters. Fan blows warm air across the windshield to remove moisture which causes windshield fogging.

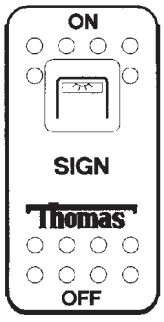
Outside Speaker Horn Switch (Opt.)

Outside speaker horn mounted beneath front area of bus. Located on left side rear of the inner bumper. Enables the outside speaker horn.



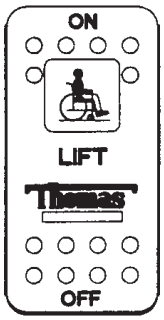
Destination Sign Switch (Opt.)

The destination sign switch energizes the coach destination sign light.



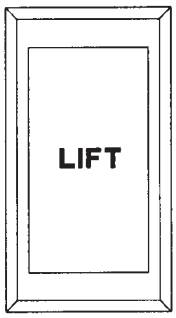
LIFT SWITCH, ON-OFF (OPT.)

Controlled by the coach operator, must be **ON** to operate the lift.



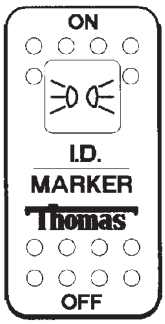
LIFT, (WARNING) GREEN (OPT.)

With the "Lift Switch" enabled, and the green warning light on; lift has been activated. This will activate the brake interlock system and the lift door light.



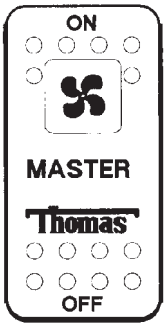
Marker Lights Switch (Opt.)

The marker light switch energizes the coach marker lights.



HEATER MASTER SWITCH (OPT.)

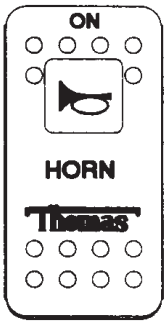
Separate switch enabling power to all heater motors and defroster motors to be cut off simultaneously.



HORN, AIR (OPT.)

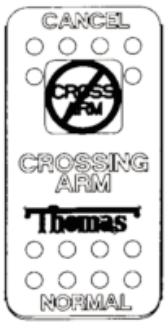
Momentary switch that activates the air horn mounted beneath the driver's vestibule floor.

When switch is released, it returns to the off position.



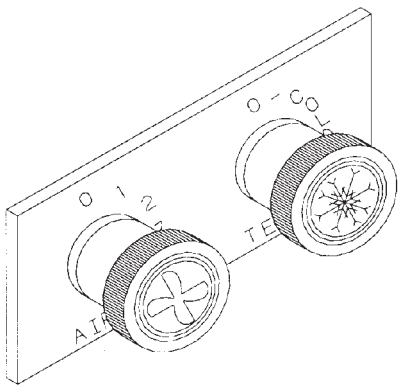
Crossing Arm Deactivation Switch (Opt.)

Switch deactivates the crossing control arm after warning lights have been activated.



AIR CONDITIONING MASTER SWITCH (OPT,)

The switch on the left controls the fan speed for the air conditioning while the switch on the right controls the temperature or amount of cooling as the air passes through the system.



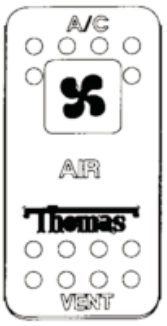
AIR CONDITIONING MASTER SWITCH, ON-OFF (OPT.)

The air conditioning master switch enables the coach operator to energize or de-energize the air conditioning system.

AIR CONDITIONING VENT SWITCH, ON-OFF (OPT.)

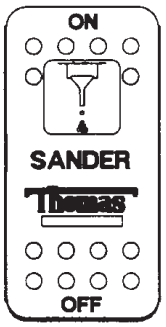
In A/C position, air conditioning system operates and cold air is available.

In vent position, air conditioning system is OFF and outside air is available.



SANDER SWITCH (OPT.)

Switch located in the driver's area, enables coach operator to energize the wheel sanders that mount forward of the rear wheels. Sand is released onto the street to increase traction.



OVERRIDE SWITCH, ON-OFF (OPT.)

Will override the eight-light warning system and de-activate it.

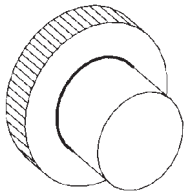
PUSH BUTTON EIGHT-LIGHT WARNING SYSTEM (OPT.)

Used as part of an eight-light warning system that controls the entrance door.

As coach approaches stop, this switch energizes amber warning lights when pressed.

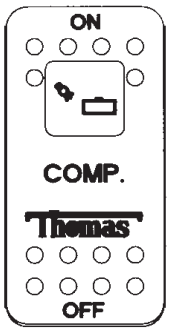
Amber lights remain on until red lights are energized.

A decal with operating instructions is mounted below the switch.



LUGGAGE COMPARTMENT LIGHT SWITCH (OPT.)

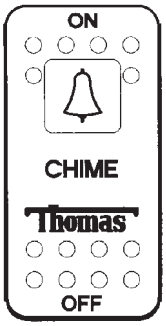
Located on the side panel, enables driver to activate the light in the luggage compartment.



CHIME, ON-OFF (OPTIONAL)

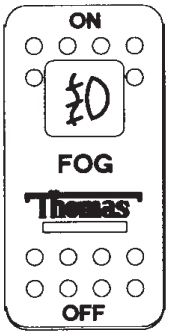
Coach operator has the option of having the chime switch **ON** or **OFF**. If coach operator chooses to have the chime **OFF**, a Passenger "Stop Request" Sign, mounted facing passengers under the bulkhead above the windshield, will light up.

If the chime is **ON**, the coach operator will be alerted by a single chime sound for non-mobility aid passengers; double chime sound for mobility aid passengers requesting to disembark.



Fog Lights Switch, ON-OFF (Opt.)

Controlled by the coach operator and activates fog lights for better visibility in inclement weather.

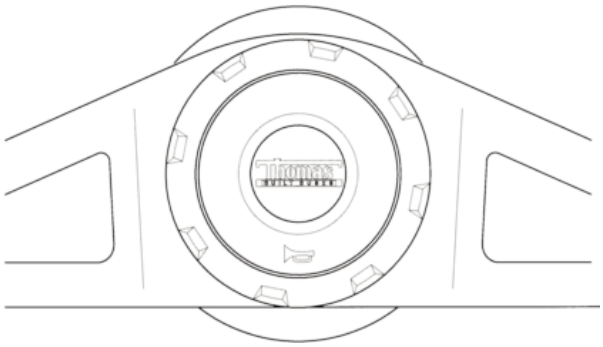


OPERATOR'S COMPARTMENT CONTROLS

The following pages provide information on the controls in the operator's compartment. The design, location, and mounting position of these controls enable the operator to perform a variety of tasks without moving from the driver's seat.

HORN, (ELECTRIC) BUTTON

The electric horn alerts other motorists, pedestrians and waiting passengers of coach presence. Push down on center part of steering wheel to activate horn. Release pressure to deactivate horn.



MULTI-FUNCTIONAL DIRECTIONAL SWITCH

The turn signal lever serves the dual purpose of energizing the coach turn signals, and changing the coach headlights from one setting to the other. It also controls all wiper functions.

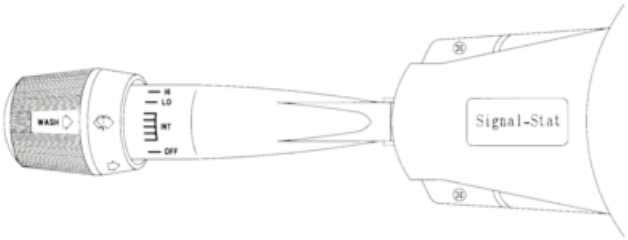
To activate the turn signals, move lever downward for a left-hand turn or upward for a right-hand turn until it clicks into position. Turn signal lever automatically cancels after turn is complete.

To switch headlights from the low beam setting to the high beam setting, pull the turn signal lever upward until it clicks into position and release. To return headlights to the low beam setting, pull turn signal lever upward again and release.

A flash provision operates with headlight switch in the ON or OFF position.

The wipers and washers are operated by a switch in the control lever. Turn the knob at the end of the lever to select the desired wiper speed. The washer is activated by pressing in and holding the knob. Releasing the knob will deactivate the washer feature.

The intermittent feature of this system was designed for using a single wiping cycle, with a variable pause between cycles, desirable when the weather conditions require it.



POWER STEERING

Power steering uses energy from your engine to assist you in steering the vehicle. When the engine is off, or if the power system becomes inoperative, the vehicle can still be manually steered, but requires increased driver effort.

Should you notice any change in effort required to steer during normal vehicle operation, have the power steering system checked. A hissing sound at full left or full right steering wheel position is normal.

CAUTION

Never hold the steering wheel against the stops (extreme right or left) for more than five seconds. If you hold the wheel against the stops longer than five seconds, the power steering pump could be damaged.

NOTICE

After any severe impact such as striking large potholes, inadvertent sliding into curbs on icy roads, or a collision involving the front end, observe the steering wheel alignment. If the spokes of the wheel seem to be in a different position while driving, have the front suspension and steering checked for possible damage.

TILT/TELESCOPING STEERING COLUMN

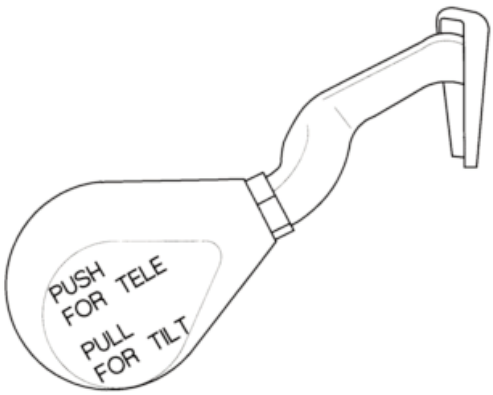
The tilt steering column enables the operator to adjust the angle and height of the steering column to a more comfortable driving position.

To adjust the *angle* of the steering column, locate the small lever underneath the turn signal lever. Pull lever towards steering wheel and hold while tilting the steering wheel at a comfortable position. Release lever to lock column in position.

To adjust the *height* of the steering column, locate the small lever underneath the turn signal lever. Push the lever and hold while telescoping the steering wheel to the desired position. Release lever to lock column in position.

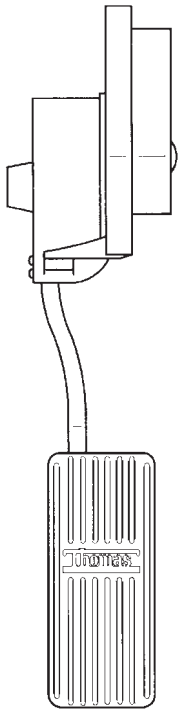
CAUTION

Do not adjust while vehicle is in motion.



SUB-TITLE TEMPLATE

The accelerator pedal is an electric rheostat type control that sends a gradually increased current to the engine to control engine rpm and coach speed.

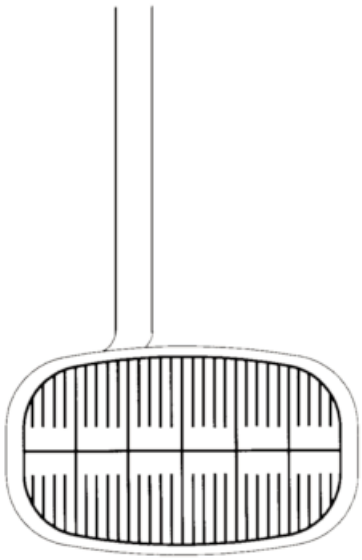


BRAKE PEDAL

The brake pedal controls the application of the coach service brake. Downward pressure on the brake pedal decreases the coach speed by applying air to the brake chambers at each wheel and stops the coach when desired by the operator. Anticipating the stop and using light application of the brakes will result in increased life of brake linings and drums. Continuous heavy applications result in premature wear due to excess heat.

CAUTION

Overheating the brakes may increase the distance required to stop the vehicle.

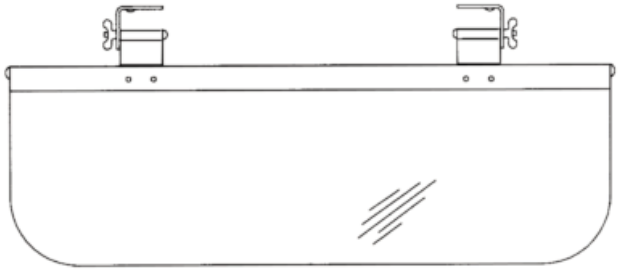


SUN VISOR

Six inches x 30" plastic with finished edge mounted to windshield header.

Optional sun visor is available in three versions:

1. A plexiglass 6" x 30" with aluminum legs mounted over the driver's window and/or over the right side of windshield.
2. A 6" x 30" California sun visor, black, non-transparent, mounted in pivot brackets over the driver's window.
3. A 6" x 30" visor mounted right side of windshield in addition to standard left side visor.



Clean with plexiglass cleaner and a soft dry towel. Never use an abrasive cleaner. Keep mounting brackets tight.

DRIVER'S SEAT

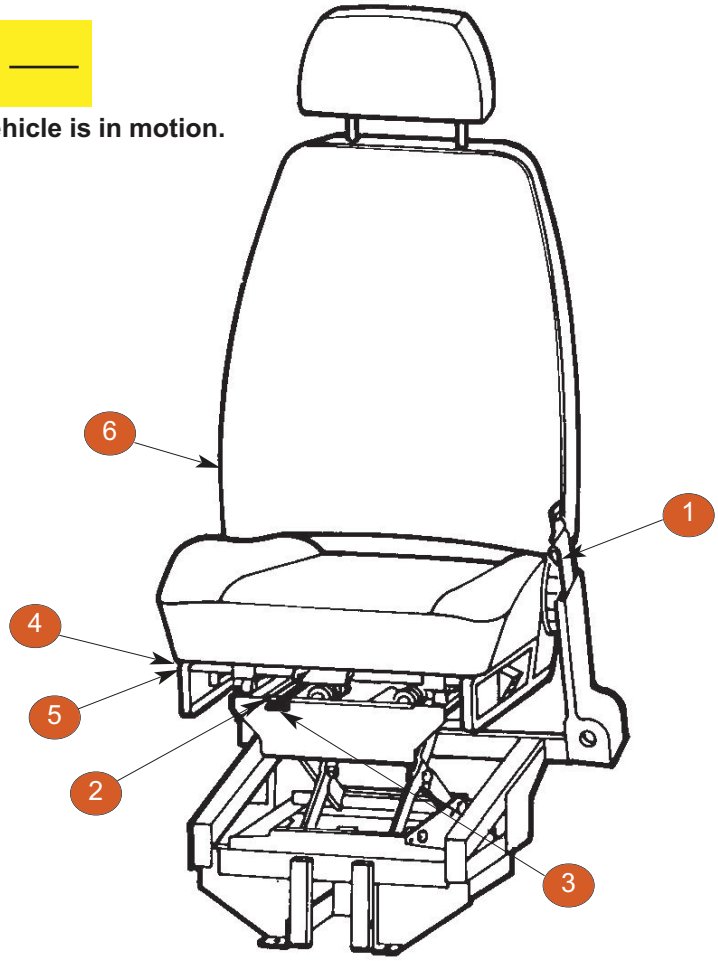
The driver's seat is designed to accommodate a variety of driver builds and seating preferences. The following adjustments enable the seat to be moved for maximum driver comfort:

MECHANICAL BASE SEAT

1. *Backrest Tilt* - Rotate the knob for infinite selection of settings.
2. *Cushion Height Front* - Lift handle, pull up and forward. Choice of two settings.
3. *Seat Fore-and Aft* - Move the lever left and slide seat. Provided for locked-in settings in 1/2" increments.
4. *Rear Cushion Adjuster* - Rotate lever to adjust height. Choice of three settings.
5. *Seat Height Adjustment* - Pull paddle rearward to adjust height. To raise seat, pull handle while body weight is removed from seat. To lower seat, pull handle while sitting in seat. Release handle at desired height - infinite selection of settings.
6. *Lumbar Adjustment* - To fully inflate lumbar, depress valve button while all body weight is removed from seat back. To deflate lumbar, depress valve button while maintaining desired seating position.

CAUTION

DO NOT adjust seat while vehicle is in motion.

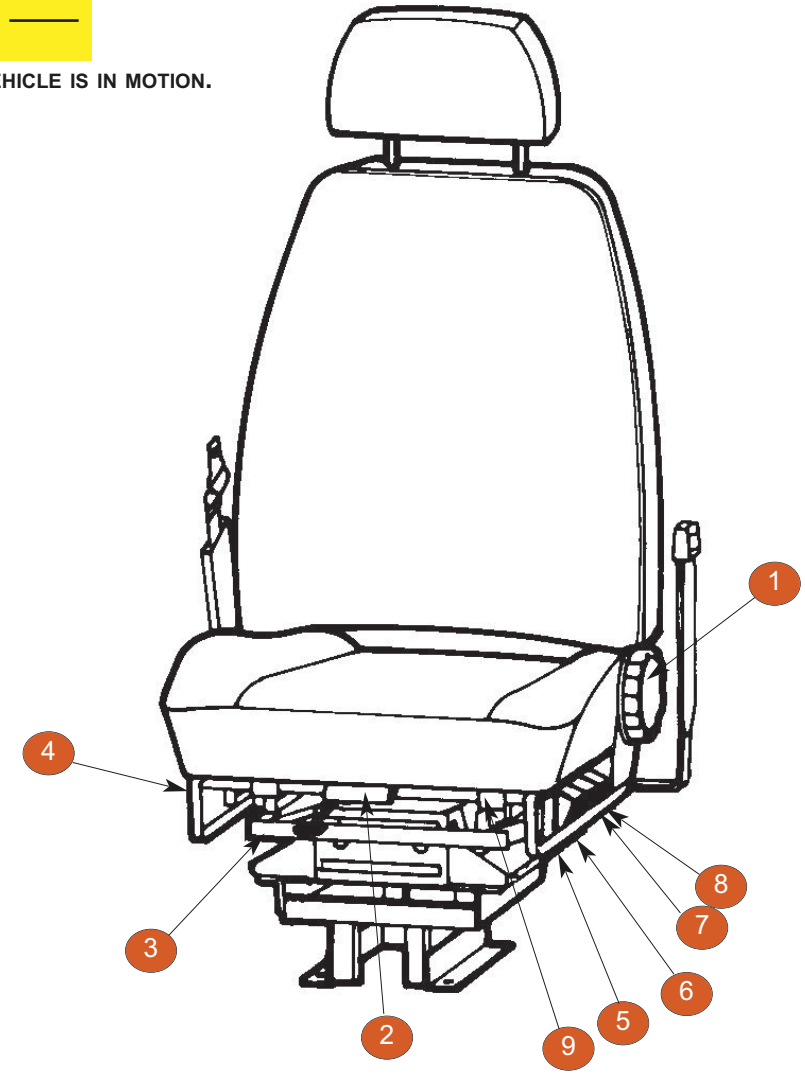


AIR BASE SEAT

1. *Backrest Tilt* - Rotate knob for infinite selection of settings.
2. *Cushion Height Front* - Lift handle, pull up and forward. Choice of two settings.
3. *Seat Fore-and-Aft* - Move lever left and slide seat. Provided for locked-in settings in 1/2" increments.
4. *Rear Cushion Adjuster* - Rotate lever to adjust height. Choice of three settings.
5. *Seat Height Adjustment* - Push rocker up to inflate. Push rocker down to deflate. Infinite height and weight selection.
6. *Lumbar Adjustment* - Push rocker up to inflate lumbar. Push rocker down to deflate lumbar.
7. *Optional Triple Chamber Air Lumbar* - Lower, middle and upper chambers individually adjustable.
8. *Optional Air Bolsters* - Cushion and back individually adjustable.
9. *Optional Height Adjuster with Memory* - Rotate lever to select desired ride height - infinite selection.

CAUTION

DO NOT ADJUST SEAT WHILE VEHICLE IS IN MOTION.

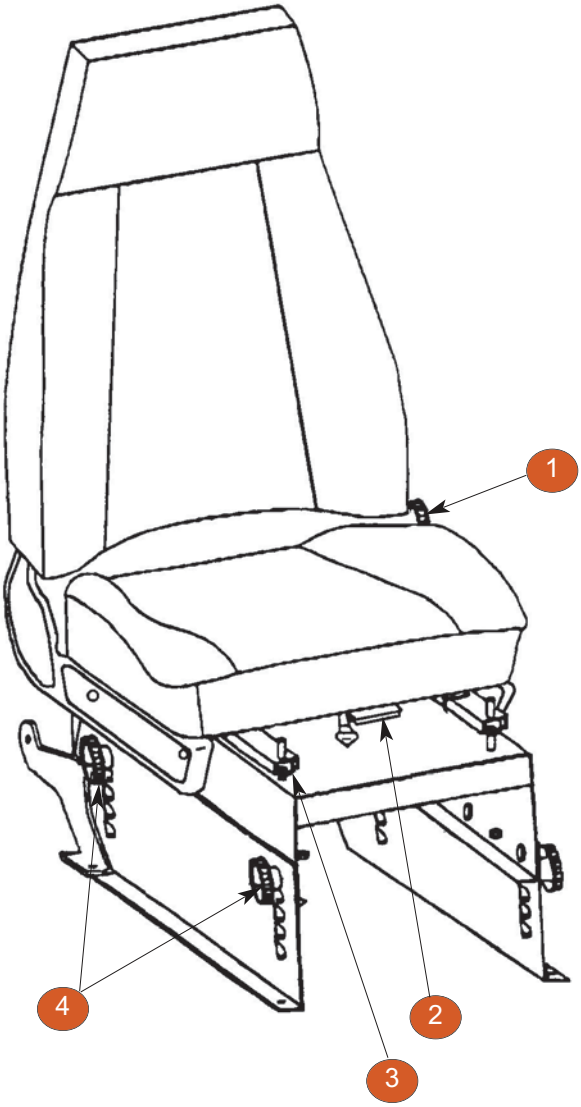


DRIVER'S SEAT, WITH BOX PEDESTAL

1. *Backrest Tilt* - Rotate the knob for infinite selection of settings.
2. *Cushion Height Front* - Lift handle, pull up and forward. Choice of two settings.
3. *Seat Fore-and Aft* - Move the lever left and slide seat. Provided for locked-in settings in 1/2" increments.
4. *Seat Height Adjustment* - Rotate the four (4) knobs on the box pedestal (two on each side) to loosen and select slot for desired height. Tighten knobs to secure in position.

CAUTION

DO NOT ADJUST SEAT WHILE VEHICLE IS IN MOTION.



DRIVER'S SEAT BELT

The driver's seat belt should be worn at all times when operating the coach.

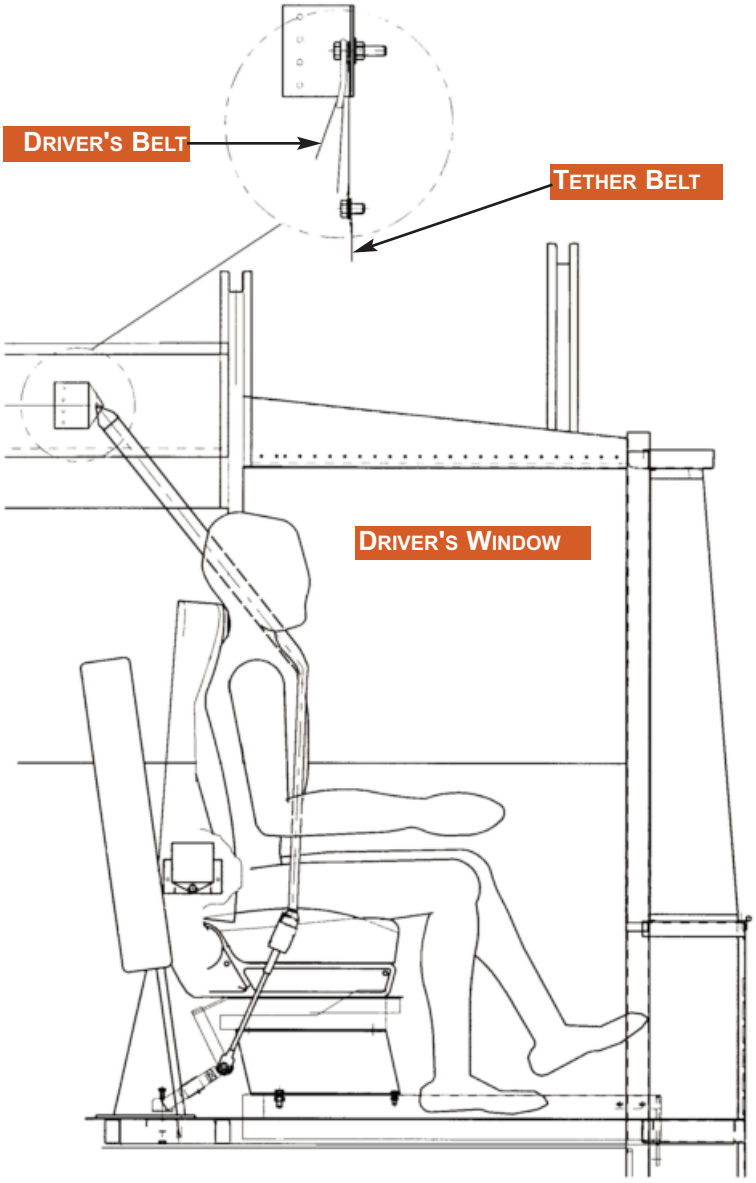
Prior to adjusting or fastening the seat belt, adjust the seat to a comfortable driving position. Refer to the *Driver's Seat* part of this section for adjustment information.

The driver's seat belt has a wall mounted retractor with a single belt that runs through a bracket located over the window and back down to the driver's seat.

The buckle should slide freely on the belt as the driver pulls the belt across his body to the push button latch on the door side of the seat.

Application - Hold buckle in one hand and pull connector belt across pelvic region (hip bone).

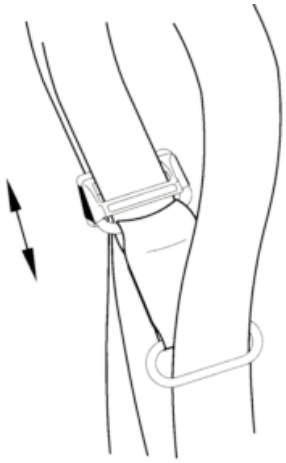
(CONTINUED ON NEXT PAGE.)



DRIVER'S SEAT BELT *(CONT'D)*

Make sure neither belt is twisted. Insert connector belt into open end of buckle. A "snap" sound indicates the connector belt is properly engaged with the buckle. However, tug on the belt to ensure that the connector belt is properly engaged with the buckle. The belt retractor automatically eliminates belt slack for a snug but comfortable fit.

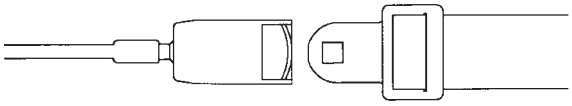
A shoulder adjustment strap is incorporated into the belt. It consists of a sleeve that slides on the belt close to the overhead bracket. (See illustration.) The sleeve is connected to a loop that limits the movement of the seat belt as it crosses the driver's shoulder.



Release - The seat belts contain a push button located on the buckle. To release the belt push in on the button and the latch will disconnect from the buckle.

CAUTION

The driver must always wear a seat belt when operating the vehicle.



This section provides the operator with important operational information. The following pages contain helpful driving tips, information for daily operation, and procedures for operation in emergency or inclement weather conditions.

It is important to carefully read and understand the following pages before operating the bus. A proper understanding of component location, function, and operation is important to the safe operation of the bus and the protection of all passengers.

DAILY CHECKLIST

The bus should be inspected daily (prior to operation) to ensure safe operation and reliable service. The following is a minimum daily checklist. Additional checklist items may be added according to local operating conditions. Any items that fail to meet the checklist should be reported immediately to the maintenance supervisor and repaired, as necessary, before placing bus in service.

EXTERIOR CHECKLIST

- Clean windshield, driver's window, door glass, mirrors, and headlights.
- Inspect bus exterior. Make sure all bus identification is clear, clean, and operates properly. Verify that all under-bus compartments are secure.
- Inspect tires for sidewall or tread damage, excessive or uneven tread wear and proper inflation. Inspect wheels and rims for cracks, etc. Check lug nuts for tightness.
- Drain moisture from air reservoir tanks. Check for oil, fuel, coolant, and power steering fluid leaks.
- Unplug block heater and oil heater, if so equipped.
- Inspect steering mechanism for proper operation.
- **Inspect for any damage to the After-Treatment Device and the Mitigation Device.**

ENGINE COMPARTMENT SERVICE

CAUTION

Do not service the engine until the transmission gear shift selector lever is in "N" (Neutral) and the parking brake is engaged.

Unless the particular procedure requires you to run the engine while working in the engine compartment, you should always turn off the ignition and remove the key, avoiding the possibility of personal injury.

Avoid touching fan blades with hands.

ENGINE COMPARTMENT WARNING LABEL

Keep hands clear of all moving parts when engine is running.

ENGINE COMPARTMENT CHECKLIST

Make sure the bus engine is off and parking brake is engaged before performing the following tasks.

- Check engine oil level before starting and when refueling.
- Check belts for cracks, breaks, frayed edges, and proper tension.
- Check coolant level (only with engine cool). As necessary, fill surge tank to level of sight glass with a 50/50 water/antifreeze solution.

INTERIOR CHECKLIST

People sometimes damage unattended buses.

- Aisles and stepwells must always be clear of objects.
- Emergency exit handles must be in safe working condition.
- Check all emergency exits for proper operation.
- The "Emergency Exit" sign on an emergency door must be clearly visible.
- You may lock some emergency roof hatches in a partly open position for fresh air. Do not leave them open as a regular practice. Keep in mind the bus' higher clearance while driving with them open.

FINAL CHECK

- Adjust driver's seat and steering wheel.
- Start engine; look and listen for signs of trouble.
- Check all gauges and warning lights.
- Check and adjust mirrors. Adjust the bus mirrors according to the following procedures before bus begins daily service:

Crossview Mirrors - Swivel the mirror head to give a clear view of area directly in front of the bus.

Interior Rearview Mirrors - Adjust mirror to provide a clear view of passenger area and roadway.

Convex Mirrors (Optional) - These mirrors provide a wider view of the adjacent lane. However, cars and other objects will appear smaller and further away than when viewed from a flat mirror. Use care when judging distances with this type of mirror.

- Verify parking brake is applied and check operation of doors, emergency escape hatches and emergency exits.
- Check operation of interior lights and stepwell lights.
- Visually inspect bus, while engine is running, for fluid or exhaust leaks.
- Check operation of all exterior lights, safety equipment and signal devices.

BEFORE DRIVING OFF

- Secure all doors.
- Check operation of defroster and heater blowers, windshield wipers/washers and horn.
- Fasten seat belt.
- Check air pressure gauges for maximum pressure.
- Check operation of service brake and parking brake.
- Visually check all gauges for normal operation readings.

NORMAL STARTING

It is important that the bus operator be familiar with all operating controls and indicators before attempting to operate the bus.

The following must apply before starting the bus:

- All vandalocks, if applicable, must be in "unlatched position".

To start the bus, use the following procedure:

1. Apply parking brake if not already applied.
2. Place transmission shift control in neutral (N).
3. Turn ignition key to start. (On buses equipped with a master control switch, turn switch to DAY and turn engine start switch.)

NOTICE

If engine fails to start within 30 seconds, wait 1 to 2 minutes and repeat step 3.

COLD WEATHER STARTING AID (OPTIONAL)

A sensor located in the engine will determine when fluid is added, if your vehicle is equipped with cold weather starting aid. Only when the engine temperature is less than 100°F (37.7°C) will fluid be injected into the engine.

To start the bus during cold weather, use the following procedure:

1. Apply parking brake if not already applied.
2. Place transmission shift control in neutral (N).

Do not depress accelerator during step 3.

3. Turn ignition key to start. (On buses equipped with a master control switch, turn switch to DAY and press engine start button.)

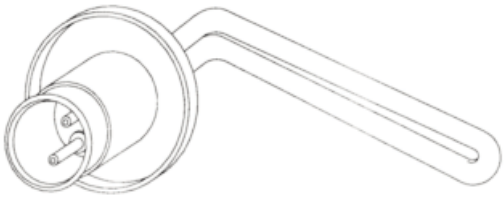
NOTICE

After starting a turbocharged engine, do not accelerate engine above 1000 rpm until oil pressure gauge indicates normal.

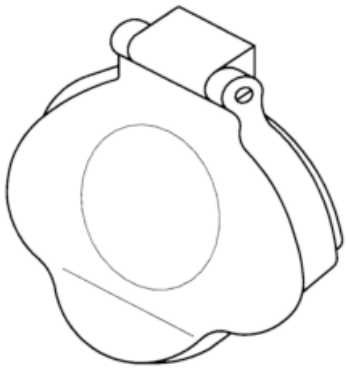
When engine starts, increase engine speed to fast idle rpm. Do not apply load or increase engine speed until oil pressure gauge indicates normal (approximately 15 seconds).

BLOCK HEATERS (OPTIONAL)

Block heaters are heating elements installed in the engine water jacket to aid in cold starting by keeping the engine coolant warm while the engine is not operating. The heater should be plugged in anytime the ambient temperature is expected to be 40°F (4°C) or below. The heater must be connected to an external source of electrical current. Heaters are available for 120 or 220 volts AC and possess a 1500 watt capacity.



Option B3805-03-000 is for a weather proof plug-in receptacle mounted in the exterior panel above the front bumper. Make sure that cover stays closed to prevent damage to connection.



Engine Warm-Up

After the engine starts, time is needed for an oil film to re-establish between moving parts. Operate the engine at low load until all systems reach normal operating temperature. Observe all gauges during warm-up period to verify that bus is ready to enter service.

ENGINE IDLING/FAST IDLE SYSTEM

Idling the bus's diesel engine in cold temperatures will not result in desired engine temperature. Actually, a diesel engine cools down when left idling. The bus operator should activate the fast idle feature. The bus operator should activate the fast idle switch to automatically increase engine idle speed to 950 rpm. This higher idle speed aids bus warm-up and air pressure build-up.

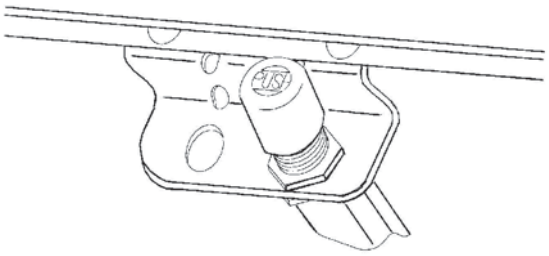
CAUTION

Avoid extended or unnecessary idling. Extended idling of the engine (ten minutes or more), particularly at "high" engine speeds could produce excessive system temperatures that could damage your vehicle.

STARTER INTERLOCK

Switch is mounted in the frame of the rear engine compartment door.

If the engine compartment door is open and switch is not depressed, the driver cannot start the vehicle. The switch must be depressed before the vehicle will start.



ENGINE COMPARTMENT CONTROL PANEL

This panel has a rocker switch to control the lights in the engine compartment.

It allows the operator to start the vehicle from the rear of the bus. With the dash ignition switch ON, the rocker switch marked "Start/Stop" must be turned ON, and the starter interlock switch in the door frame must be depressed. While depressing the starter interlock switch with one hand, push and hold the start button on the panel until the engine cranks. Once the engine cranks, release the starter interlock switch.

DANGER

Make sure that the engine and belts are clear before cranking. Moving engine components could cause serious injury.

DRIVING TIPS (AUTOMATIC TRANSMISSIONS)

The bus operator should use care when accelerating or downshifting on slippery road surfaces. Sudden acceleration or engine braking, caused by shifting to a lower gear range, can result in a loss of vehicle control. This is very important on snow or ice covered roads.

If the bus is stuck in sand or mud, do not attempt to pull the bus out under its own power; it will only mire itself deeper. Request professional towing assistance. See detailed towing instructions in this section.

CAUTION

Do not coast the bus in neutral. Severe transmission damage may result and bus will not have benefits of engine braking.

ROCKING THE VEHICLE

CAUTION

"Rocking" the vehicle is moving it forward and backwards in a steady rhythm. If the vehicle is stuck, have it pulled out. Do not attempt to "rock" the vehicle.

If rocking the vehicle is necessary, even at low speeds, it may cause engine overheating, axle damage, transmission damage or failure, or tire damage.

SPECIAL DRIVING INSTRUCTIONS

DANGER

To reduce the risk of personal injury, before going down a steep or long grade, reduce speed and down shift the transmission. Do not hold the brake pedal down too long or too often while going down a steep or long grade. This could cause the brakes to overheat, reducing their effectiveness. As a result, the vehicle will not slow down at the usual rate. Failure to take these steps could result in the loss of vehicle control.

To avoid skidding on slippery roads, do not down shift into "1" (Low) at speeds above 20 mph (32 kph).

On slippery surfaces, avoid quick movements of steering wheel. Decrease your speed and allow for extra stopping distance required by these conditions. Apply the brakes by pumping the pedal steadily and evenly to avoid wheel lock-up and loss of vehicle control.

Avoid driving through flooded areas unless you are sure the water is no higher than the bottom of the wheel rims. Drive through slowly. Allow adequate stopping distance since wet brakes do not grip well. After driving through water, gently apply the brakes several times while the vehicle is moving slowly to dry the brakes.

When driving on icy or graveled surfaces, reduce speed. Avoid sharp turning maneuvers.

PARKING

When parking the bus, use the following sequence:

1. Shift transmission lever to neutral with engine running.
2. Apply parking brake.
3. Shut off engine.
4. Place chock blocks under at least one wheel.

The parking brakes are mechanically applied via the action of a heavy coil spring against the service brake push rod assembly on the rear axle brakes only.

Air pressure within the spring brakes chamber holds the parking brake in the released position. Pulling the parking brake control valve out releases the pressure within the chamber, allowing the spring to set the brakes.

In the event the air system is below 60 psi, the parking brakes cannot be released until the air system is recharged either by the running engine to charge the system with the engine-driven air compressor or by charging system from an external source, such as a shop air supply. If this is not possible, the spring (parking) brakes must be released manually before moving the bus. Refer to *Release Parking Brake - Manually*.

RELEASE PARKING BRAKE - MANUALLY

The following procedure is provided for manually releasing the parking brake.

! WARNING

Block the wheels before beginning this procedure. The bus will roll when the parking brake is manually released.

Determine the type of brake chamber on the bus. Certain types have release rods that are permanently installed in the rear of the chamber housing. Others have the rod stored on the side of the chamber housing.

For either application, make sure rod is installed in center of brake chamber. Turn rod 1/4 turn clockwise and install nut on rod. Turn nut clockwise on either chamber to "cage" or release the spring parking brake.

BATTERY CARE (LOW MAINTENANCE BATTERY)

CAUTION

Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing and cause blindness if splashed into the eyes.

Avoid the hazard by:

- filling batteries in a well-ventilated area.
- wearing eye protection and rubber gloves.
- avoiding breathing fumes.
- avoiding spilling or dripping electrolyte.
- using proper jump start procedures.

If acid contacts your skin:

- flush your skin with water.
- apply baking soda or lime to help neutralize the acid.

If acid contacts your eyes:

- flush your eyes with water for 10-15 minutes.
- get medical attention immediately.

If acid is swallowed:

- drink large amounts of water or milk.
- then drink milk of magnesia, beaten eggs or vegetable oil.
- get medical attention immediately.

CAUTION

Batteries normally produce explosive gases which can cause personal injury. Therefore, do not allow flames, sparks, or lighted tobacco to come near the battery. Always provide ventilation.

CAUTION

Keep batteries out of reach of children. Batteries contain sulfuric acid.

When lifting a plastic-cased battery, excessive pressure on the end walls could cause acid to spew through the vent caps, resulting in personal injury. Lift with a battery carrier or with your hands on opposite corners.

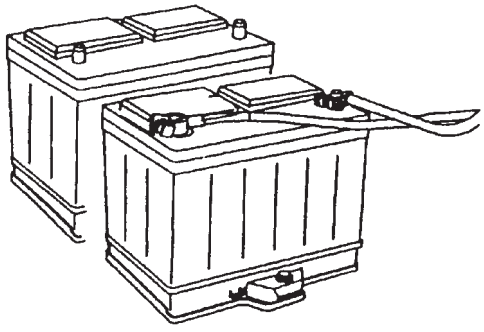
BATTERY REPLACEMENT

CAUTION

Wiring batteries backwards can cause serious damage to the electrical system.

WARNING

Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.



JUMPER CABLES

CAUTION

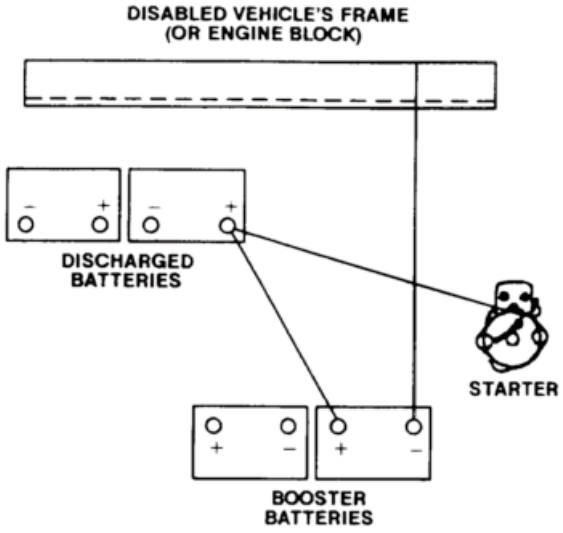
Battery gas can explode. Keep sparks and flames away from batteries. Use a flashlight to check battery electrolyte level.

Battery fluid is a corrosive acid solution; do not allow it to contact skin, eyes or clothing. If acid splashes in eyes or on skin, immediately flush contaminated area with large quantities of water. Contact a physician immediately.

Never check battery charge by placing a metal object across the post. Use a voltmeter or hydrometer.

Remove any metal jewelry such as watches, bracelets or rings that might make inadvertent contact with battery terminals.

Always remove grounded (-) battery clamp first and replace it last. If a metal object, such as a wrench, touches the the ungrounded battery post and the bus chassis at the same time, the heavy flow of current will produce a dangerous spark. To avoid harm to yourself or damage to your vehicle or battery, follow these suggestions. If in doubt, call for road service.

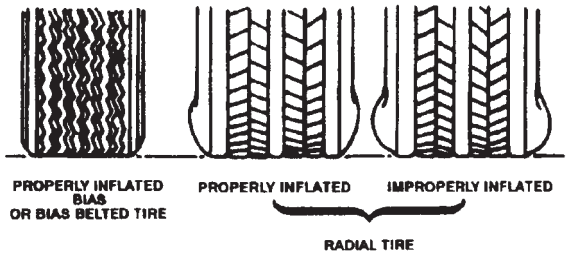


TIRE INFLATION PRESSURE

CAUTION

Over or underinflated tires can affect vehicle handling. Pressure can fall suddenly, resulting in loss of vehicle control.

Do not drive over posted speed limits or at excessive speeds. This vehicle is not equipped with high speed capability tires and should never be operated in excess of 74 mph (119 kph) for even a short time. Doing so can result in tire failure, loss of control and possible injury.



IF YOU GET A FLAT TIRE

WARNING

To minimize the risk of personal injury, do not put any portion of your body under the vehicle while the vehicle is on the jack. A jack is for emergency wheel and tire changing only. If you wish to service the vehicle, use jack stands. Never start the engine while the vehicle is on the jack.

To prevent inadvertent vehicle movement while changing a tire, always block the wheels diagonally opposite the wheel being changed. Be sure the park brake is engaged.

Do not raise the vehicle using a bumper jack. Bumper components can be damaged and the bumper jack can slip, resulting in personal injury. Make sure the jack is on a solid surface. Brace up the vehicle with jack stands, or equivalent, at jacking points so that the jack cannot fail.

When a wheel is changed, or any time the wheel lug nuts have been loosened, the lug nuts should be properly torqued. (Refer to the *Maintenance* section for proper torque value.) Retighten at 100 miles (160 km) and at 500 miles (800 km).

CHASSIS JACKING POINTS

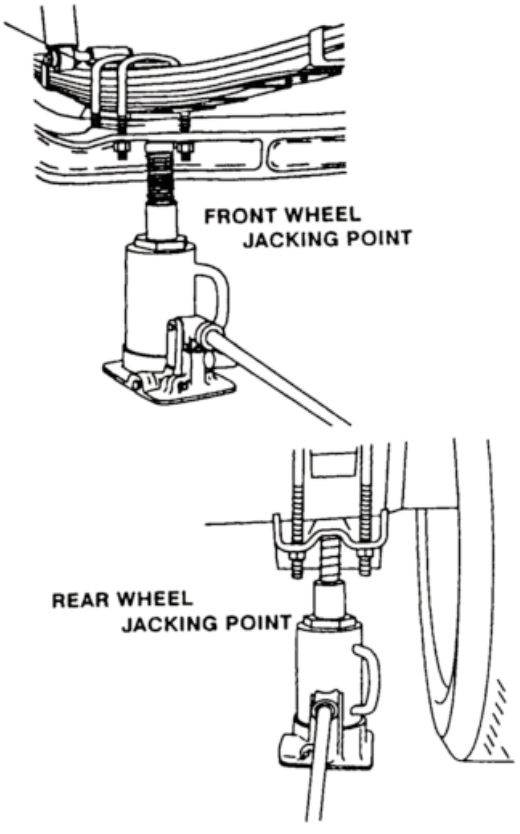
CAUTION

Do not raise vehicle using a bumper jack. Use only jack (or equivalent) supplied by vehicle manufacturer with your vehicle. Position jack only at prescribed jacking points.

If you must raise the vehicle for servicing, use adequate jack stands. Never service a vehicle while it is supported only by a jack.

To prevent inadvertent vehicle movement while changing a tire, always block the wheel diagonally opposite the wheel being changed. Be sure the park brake is engaged.

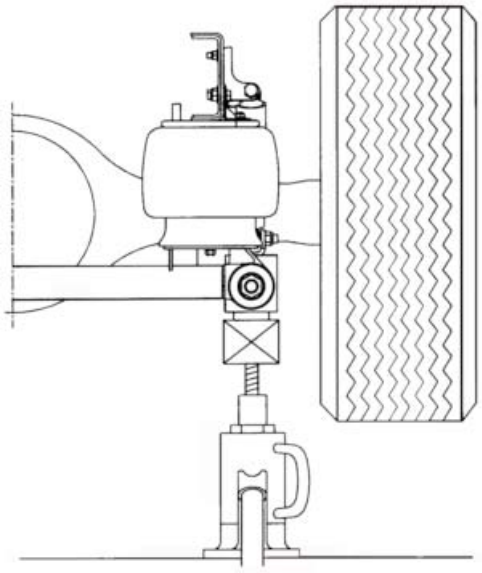
Do not put any portion of your body under the vehicle while vehicle is supported by a jack. Never start engine while vehicle is supported by a jack.



AIR RIDE JACKING POINT

On units equipped with Neway or Ridewell Rear Air Suspension, one should use a minimum of a 4" x 4" block of wood or steel on top of the jack and locate the jack beneath the beam directly below axle housing.

To prevent inadvertent movement while jacking the vehicle, always block the wheel diagonally opposite the wheel being raised. Be sure the park brake is engaged.



BUS TOWING AND CONNECTING INSTRUCTIONS

Towing rules and regulations vary from federal, state, local, and transit authority. These laws must be followed when towing the bus.

Proper equipment must be used to prevent damage to vehicles during the towing procedure. Use a safety chain that is completely independent of the primary towing attachment.

Climatic conditions, road conditions, equipment, wrecker operator experience, etc., will dictate towing speed; however, it should never exceed 45 mph.

Connect the towing equipment to the main structural parts of the vehicle chassis. The chain should be hooked around the front axle outboard of the springs. **Do not attach to bumpers, tow hooks, or brackets.** Use only equipment designed for this purpose, following directions of the wrecker manufacturer.

CAUTION

Thomas Built Buses recommends that when an HDX requires towing, that it be towed from the front whenever possible.

If the need arises for the unit to be towed from the rear, the towing operator should make sure the steer axle tires are rated high enough to support the unit weight when towing from the rear. It is also recommended that when towing from the rear the distance towed is less than 30 miles at 45 mph.

TOWING

WARNING

Block the disabled vehicle's wheels with chock blocks before preparing it for towing. Failure to do so will result in a hazardous condition where the vehicle could roll uncontrollably.

Either removal of the driveshaft or removal of the axle shafts are acceptable procedures prior to towing.

Do not use the two tow hooks under the front of the vehicle to lift it off the ground. The tow hooks are designed to tow the vehicle with all of its wheels on the ground.

CAUTION

Thomas Built Buses recommends that when an HDX requires towing, that it be towed from the front whenever possible.

If the need arises for the unit to be towed from the rear, the towing operator should make sure the steer axle tires are rated high enough to support the unit weight when towing from the rear. It is also recommended that when towing from the rear the distance towed is less than 30 miles at 45 mph.

FRONT END TOWING - ALL WHEELS ON GROUND

This is the preferred way of towing. The bus may be towed on all wheels provided the steering is operating normally. Remember that the power steering will not have power assist, and the air brakes are disabled. There must be an appropriate tow bar installed between the towing vehicle and the disabled bus.

To prepare a disabled bus for front end towing with all wheels on the ground, the following steps are necessary:

1. Block the wheels of the disabled bus.
2. Release the emergency brake system by compressing the brake chamber springs as outlined earlier in this section, entitled *Release Parking Brake - Manually*.

NOTICE

This is to prevent the possibility of the emergency brake being applied during towing.

3. Remove the drive shaft from the unit.

Care should be taken to ensure the U-Joint bearings are not lost.

NOTICE

If the unit is to be towed more than 10 miles the rear axle shafts should be removed instead of the drive shaft.

4. If axle shafts are removed, cover the hub openings to prevent the loss of lubricant or entry of dirt or foreign objects.

FRONT END TOWING - FRONT WHEELS OFF GROUND

Proper equipment must be used to prevent damage to the vehicle during the towing procedure. Connect the towing equipment to the main structural parts of the vehicle chassis. The chain should be hooked around the front axle outboard of the springs. **DO NOT attach to bumpers, tow hooks, or brackets.** Use only equipment designed for this purpose following directions of the wrecker manufacturer. A safety chair that is completely independent of the primary towing attachment must be used.

To prepare a disabled bus for front end towing with the front wheels off the ground, the following steps are necessary:

1. Block the wheels of the disabled bus.
2. Release the emergency brake system by compressing the brake chamber springs as outlined earlier in this section, entitled *Release Parking Brake - Manually*.

NOTICE

This is to prevent the possibility of the emergency brake being applied during towing.

3. Remove the drive shaft from the unit.

Care should be taken to ensure the U-Joint bearings are not lost.

NOTICE

***If* the unit is to be towed more than 10 miles the rear axle shafts should be removed instead of the drive shaft.**

4. If axle shafts are removed, cover the hub openings to prevent the loss of lubricant or entry of dirt or foreign objects.

SPECIAL TOWING INSTRUCTIONS

1. All federal, state, and local laws regarding such items as warning signals, night illumination speed, etc., must be followed.
2. Safety chains must be used.
3. No bus should ever be towed over 45 mph (70 kph).
4. Loose or protruding parts of the damaged bus should be secured prior to moving.
5. A safety chain system completely independent of the primary lifting and towing attachment must be used.
6. Operators should refrain from going under a bus which is being lifted by the towing equipment unless the vehicle is adequately supported by safety stands.
7. No towing operation which for any reason jeopardizes the safety of the wrecker operator, other motorists or bystanders should be attempted.

AFTER TOWING

After towing the bus, block the rear wheels, Remove the covers from the hub openings and install the axle shafts. Apply the emergency brake system before disconnecting the towing vehicle. Check and fill rear axle with oil as described in the lubrication chart.

DIESEL FUEL SPECIFICATIONS AND FUEL SYSTEM

Cummins: Use only Ultra Low Sulfur Diesel (ULSD) fuel.ULSD is required for correct operation of theAfter-Treatment system, otherwise the engine maynot meet emission regulations and may damagethe After-Treatment System.

ULSD contains15ppm sulphur. Diesel Fuel with high sulfur content can result in an acid build-up in the engine lubricating oil. This acid build-up can result in excessive cylinder wear. Attention should be given to using fuel that meets the engine manufacturer's specifications.

Refer to the Manufacturers' Owners Manuals for more information on this subject.

FUEL TANK FILLING

CAUTION

Handle fuel with care; it is highly flammable. Do not refuel the vehicle while smoking or when near open flames or sparks.

Always stop engine before refueling vehicle.

Fill fuel tank outdoors.

Prevent fires by keeping vehicle clean of accumulated trash, grease and other debris. Always clean up spilled fuel.

If fuel is observed overflowing from cap, remove cap with caution. Internal pressure may cause fuel expulsion.

NOTICE

Some vehicles are equipped with a fuel door interlock option. When the fuel door is open, the vehicle will not start.

CNG FUEL TANK FILLING

The fueling of a CNG equipped vehicle should only be at an approved refueling station and by personnel trained to operate it. This vehicle will accept either a slow-fill or fast-fill. Slow-fill will usually be done overnight and is less costly than a fast-fill. Fast-fill takes slightly longer than gasoline refueling time.

There is a supply hose and connector, supplied at the refueling station, which shall be properly connected to the vehicle's receptacle. This supply line should be regulated and contain a purge valve for decoupling from the filler.

On the vehicle, a one-way check valve is located directly behind the filler connection. The fuel passing through this check valve will then enter a common fuel line connecting the fuel tanks together, allowing the fuel to fill all tanks simultaneously.

NOTICE

Each tank has a shutoff valve which allows that tank to be closed off from the others. Only open tanks will receive fuel.

WARNING

When fueling the vehicle, the engine shall be turned off.

WARNING

When fueling the vehicle, the emergency brake shall be set, and chock blocks shall be used to prevent the vehicle from rolling.

CAUTION

Refueling must be done in a well ventilated area to prevent accumulation of gas vapor.

NOTICE

Some vehicles are equipped with a fuel door interlock option. When the fuel door is open, the vehicle will not start.

RUNNING OUT OF FUEL

Compressed Natural Gas (CNG) Engines

WARNING

Compressed natural gas is highly flammable. When inspecting or servicing a vehicle, avoid causing sparks or using arcing switches and equipment. Extinguish cigarettes, pilot lights, flames, or other sources of ignition of the natural gas, which could cause serious bodily injury, death, or severe property damage.

If the vehicle runs out of fuel, park on al level location away from traffic. Restart the engine after adding fuel.

NOTICE

Do not crank the engine for more than 30 seconds at a time. Wait two minutes after each try to allow the starter to cool. Failure to do so could cause starter damage.

CNG FUEL CYLINDERS

CNG Fuel Cylinders must comply with FMVSS 304 and meet NGV-2 specifications required by the Natural Gas Vehicle Coalition.

CNG fuel cylinders must be inspected every three (3) years for external damage and deterioration. This must be done by a certified inspector.

CNG fuel cylinders involved in a vehicular crash shall be inspected for external damage by the same guidelines as above.

CNG fuel cylinders involved in a fire shall be condemned and destroyed.

Inspector's reports shall be retained for fifteen (15) years from the original test date.

It is also required that the fuel cylinders be replaced after fifteen (15) years from the manufacturers original test date. Replace with OEM fuel cylinders.

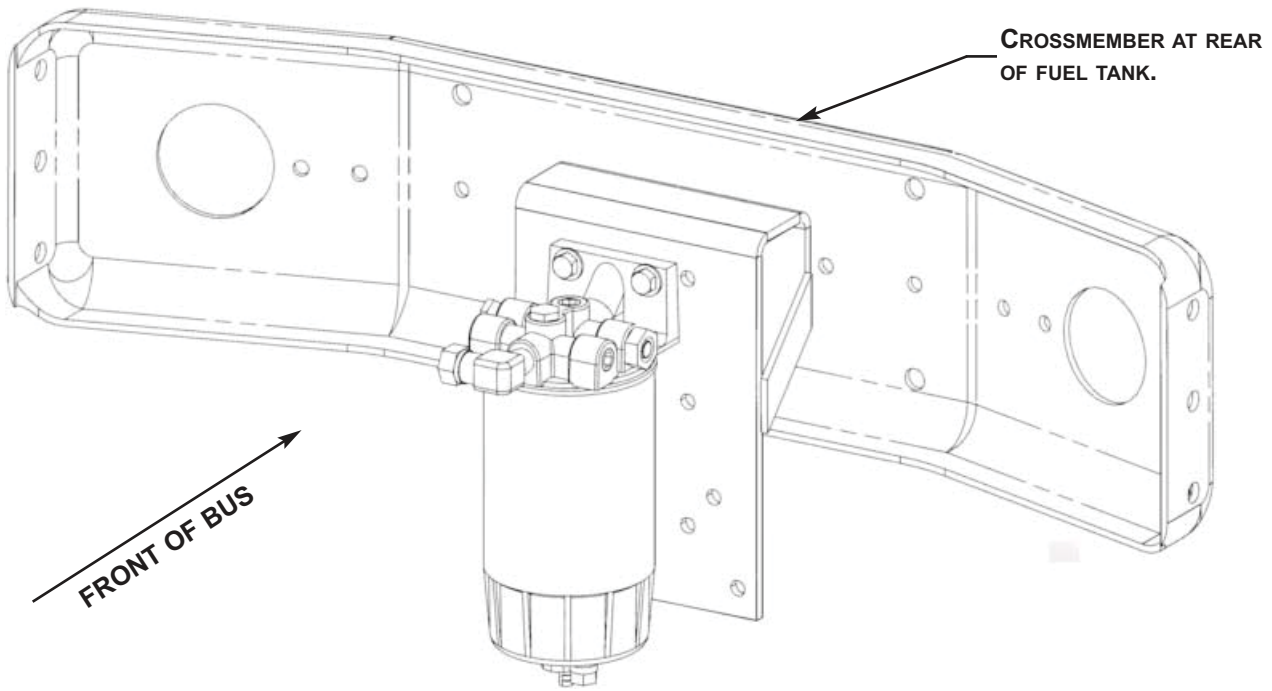
! WARNING

Do NOT overfill CNG fuel cylinders. Cylinders are designed to withstand specific pressures and no more.

WATER IN FUEL

During refueling, it is possible for water and other contaminants to be pumped into your fuel tank along with fuel. Fuel that is contaminated by water or dirt can cause severe damage to engine.

Drain water from separator until clear fuel is observed.



INSPECTING FOR ROAD DAMAGE

The suspension and steering linkage in your vehicle should be inspected periodically for abnormal looseness and damaged seals. Also be alert for any changes in steering action. Hard steering, excessive free play or unusual sounds when turning or parking indicate a need for inspection or servicing.

NOTICE

After any severe impact such as striking large potholes, inadvertent sliding into curbs on icy roads, or a collision involving the front end, observe the steering wheel alignment. If the steering wheel spokes seem to be in a different position while going down the road, have the front suspension and steering checked for possible damage.

Periodically, check for broken springs or shock absorber mounts.

EXTENDED VEHICLE STORAGE

Any time vehicle will be out of use over an extended period of time (60 days or more), the following steps should be taken to give it maximum protection:

1. Change engine oil. Used oil does not give adequate protection.
2. Service air cleaner.
3. Cooling system was initially protected with antifreeze to -34ºF (-37ºC). If colder temperatures are expected, adjust antifreeze mixture. If coolant has been in vehicle for 36 months or 30000 miles (48000km), flush cooling system. Fill system with mixture of antifreeze and softened water, and be sure coolant contains a rust inhibitor. Do not use additional rust inhibitors or anti-rust products, as they may not be compatible with a radiator coolant that already contains rust inhibitors.
4. Remove and clean battery. Store in a cool, dry place, and keep it charged.
5. Cover dash with opaque material.
6. Check and maintain recommended tire pressure. Protect tires from heat and sunlight.
7. Thoroughly clean vehicle. Touch up any painted surfaces that are scratched or chipped.
8. Lubricate all grease fittings.
9. Add a commercially available fuel stabilizer to the fuel tank, following manufacturer's instructions, then idle the engine long enough to ensure complete circulation of the fuel stabilizer throughout the fuel system.

This section provides the operator with important information about the coach's emergency equipment.

Safety equipment on the Thomas coach varies according to local, state, federal, and operator requirements. Every Thomas coach complies with all FMVSS requirements at time of manufacture.

It is important to carefully read and understand the following pages before operating the coach. A proper understanding of component location, function and operation is important to the competent operation of the coach and the protection of all passengers.

EMERGENCY DOOR

An emergency exit door is located on the side of the coach. Most doors have a locking capability in the open position to allow a clear exit from the coach. The opening hardware for the emergency exit door is protected to prevent accidental opening. Instructions for opening the emergency exit door are clearly displayed on the door face.

Opening of the emergency exit activates a warning buzzer in the operator's compartment.

NOTICE

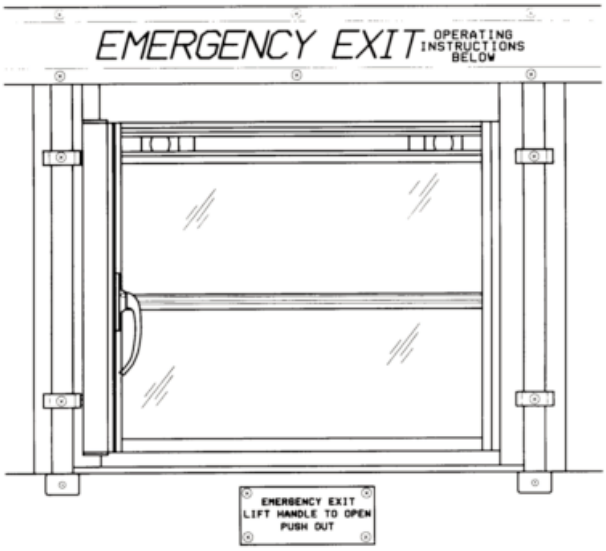
The vehicle should not be driven if an emergency exit buzzer is sounding.

EMERGENCY WINDOW EXITS

The coach's emergency push-out windows also function as emergency exits. To open the windows in emergency situations, follow the instructions that are clearly displayed on the window frame.

NOTICE

Some states require that operating instructions be located on glass.



NOTICE

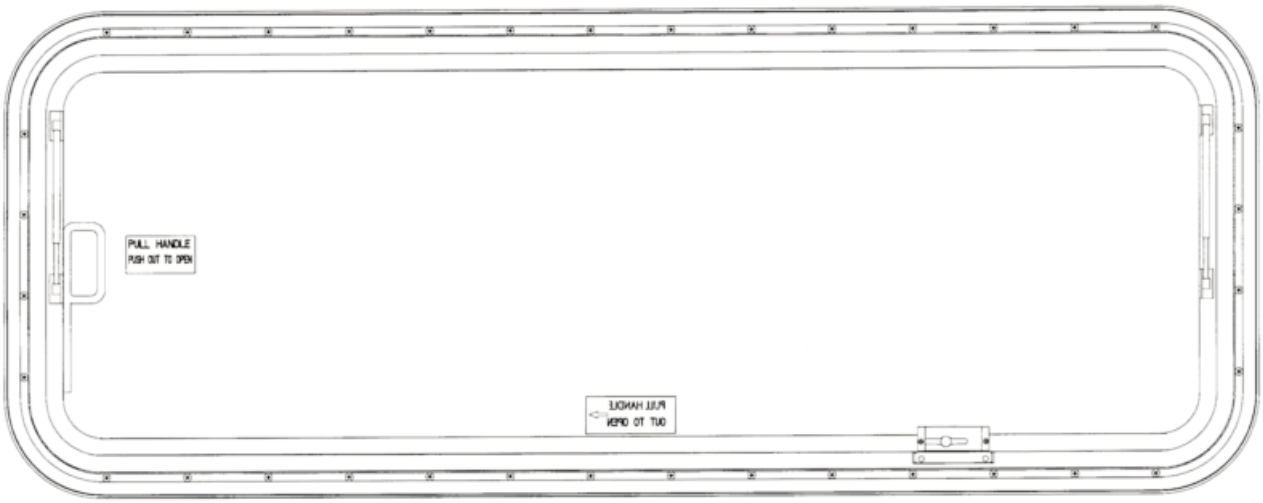
The vehicle should not be driven if an emergency exit buzzer is sounding.

REAR EMERGENCY EXIT

The rear emergency exit on the coach will allow exit from the rear of the vehicle. The instructions are on the exit. The opening of the exit will activate the alarm.

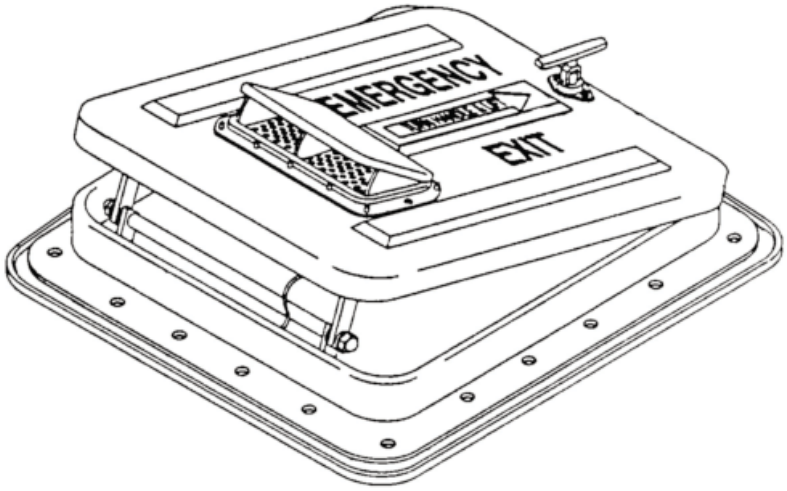
NOTICE

The vehicle should not be driven if an emergency exit buzzer is sounding.



EMERGENCY ROOF ESCAPE HATCH (OPT.)

The coach may contain an emergency roof escape hatch. The location of the hatch is subject to coach build specifications according to federal or state regulations variations. On coaches equipped with an emergency roof escape hatch, the opening instructions are clearly displayed on the hatch cover.

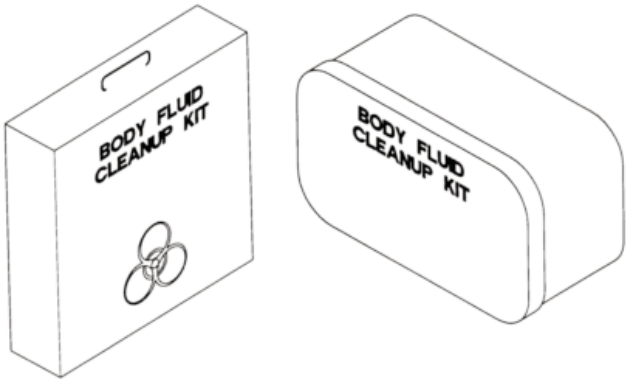


FIRST AID KIT (OPT.)

It is important that a first aid kit is maintained with the vehicle. If items or components are used, they should be replaced immediately. A need cannot be predicted; thus, be prepared at all times.

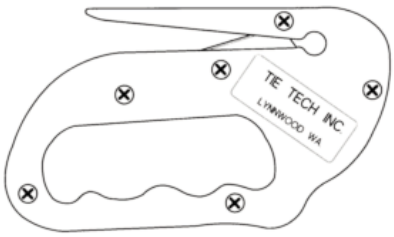
BODY FLUID CLEAN-UP KIT (OPT.)

The body fluid clean-up kit is used when any type of body fluid comes in contact with the bus. It is important that this kit be maintained with the vehicle at all times. If items are used, they should be replaced immediately.



SEAT BELT CUTTER (OPT.)

Seat belt cutting knife used for the purpose of cutting seat belt and wheelchair securement belts in emergency situations. Located with other safety equipment.



FIRE EXTINGUISHER (OPT.)

The fire extinguisher should be inspected monthly to verify that it contains sufficient charge. Observe gauge on fire extinguisher for current condition. Recharge fire extinguisher as necessary.

The chemical content of the fire extinguisher can be corrosive to any metal it contacts. Excess chemical from the fire extinguisher must be brushed or vacuumed off. Washing the chemical off will cause a severe corrosion problem.

TRIANGLES (OPT.)

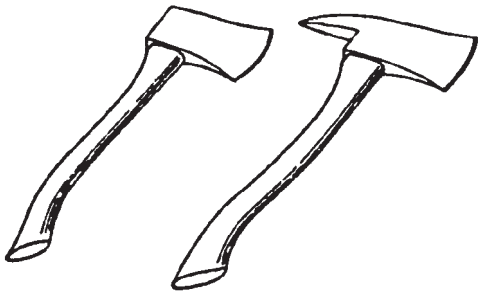
Three reflectorized triangles complete with carrying case. Triangle unfolds and locks firmly in place. Standard mounting location left side floor under first seat.

FUSEES (FLARES) (OPT.)

Three 30 minute fusees in a cylindrical container mounted with easy access by the driver. Operator should be familiar with the proper use of the fusees.

FIRE AXES (OPT.)

Fire axes are maintained with the bus for use in case of emergency. Usually located in driver's area or safety equipment compartment.

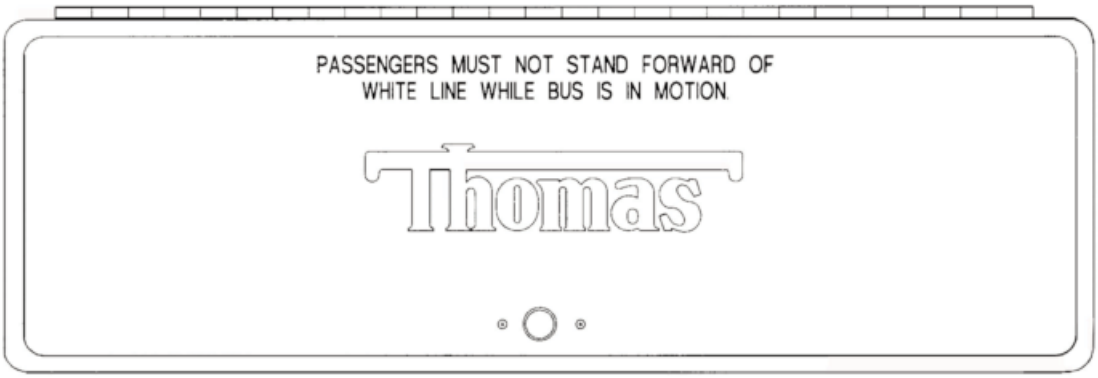


WRECKING BAR (OPT.)

Wrecking bar is maintained with the bus for use in case of emergency. Usually located in driver's area or safety equipment compartment.

SAFETY EQUIPMENT BOXES AND ACCESSORY COMPARTMENT

Located over windshield, may be equipped with lock and buzzer, if so desired. Hinge must be lubricated occasionally.



OUTWARD OPENING DOOR

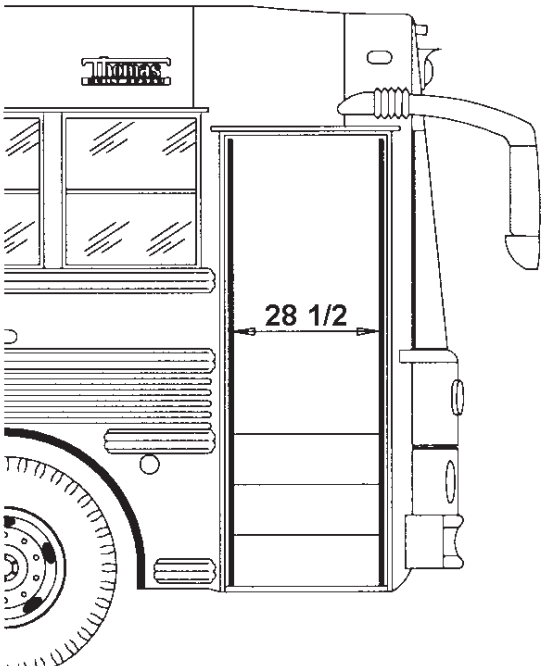
There are two (2) adjustments for the standard outward opening entrance doors:

Door opening adjustment

Door closure adjustment

The adjustments are factory set and should not require adjustment for many years under normal use. However, should it become necessary to readjust, follow these steps.

AIR OPERATED DOOR OPENING ADJUSTMENT



Open the doors fully and check the measurement across the opening. It should be 28 1/2". If this is incorrect, adjust as follows:

1. Bleed air from system by activating the emergency air release rocker switch located above the door. Check that air is absent by moving door control valve back and forth several times before proceeding.

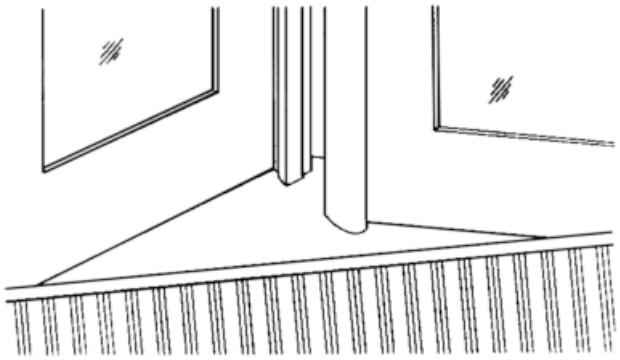
NOTICE

Some states use a push/pull-type emergency valve instead of 1/4 turn.

2. Remove the access panel above the entrance door to expose the adjusting rod.
3. Loosen the two (2) jam nuts that secure the turn buckle in place.
4. Rotating the turn buckle will lengthen or shorten the arm, thus increasing or decreasing the door opening.
5. Do not exceed the door opening. This also controls the sequence of the front and rear doors closing. The rear door leaf must come in first allowing the front door leaf to contact and seal the door and stepwell opening and upper door stop/seal.
6. Tighten both jam nuts.
7. Check door for proper opening and closing.

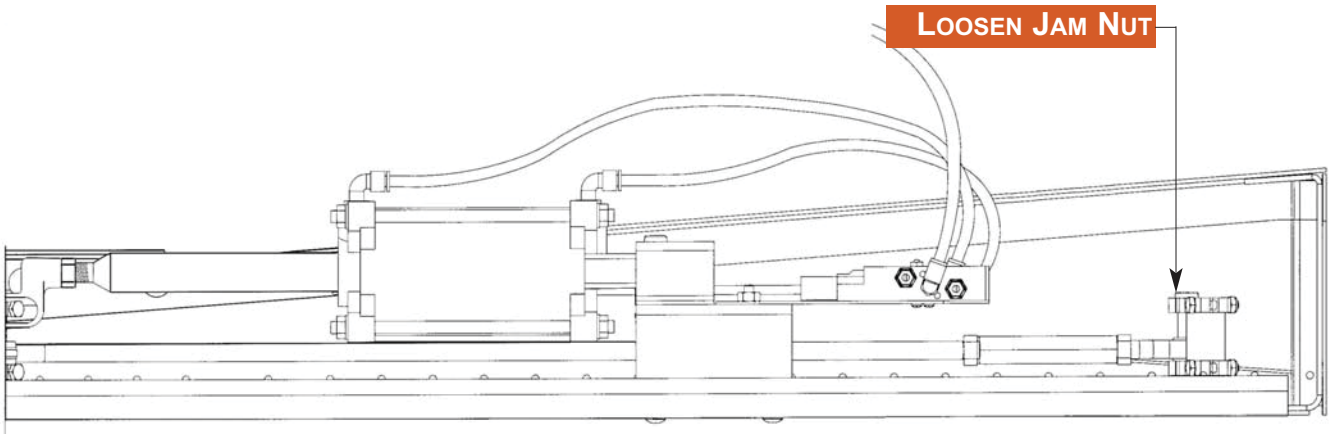
(CONTINUED ON NEXT PAGE.)

AIR OPERATED DOOR OPENING ADJUSTMENT *(CONT'D)*



CAUTION

Care should be used when operating doors while making adjustments. Keep hands clear of moving parts. Personal injury could result.



AIR OPERATED DOOR CLOSURE ADJUSTMENT

1. Bleed air from system by activating the emergency air release rocker switch located above the door. Check that air is absent by moving door control valve back and forth several times before proceeding.

NOTICE

Some states use a push/pull-type emergency valve instead of 1/4 turn.

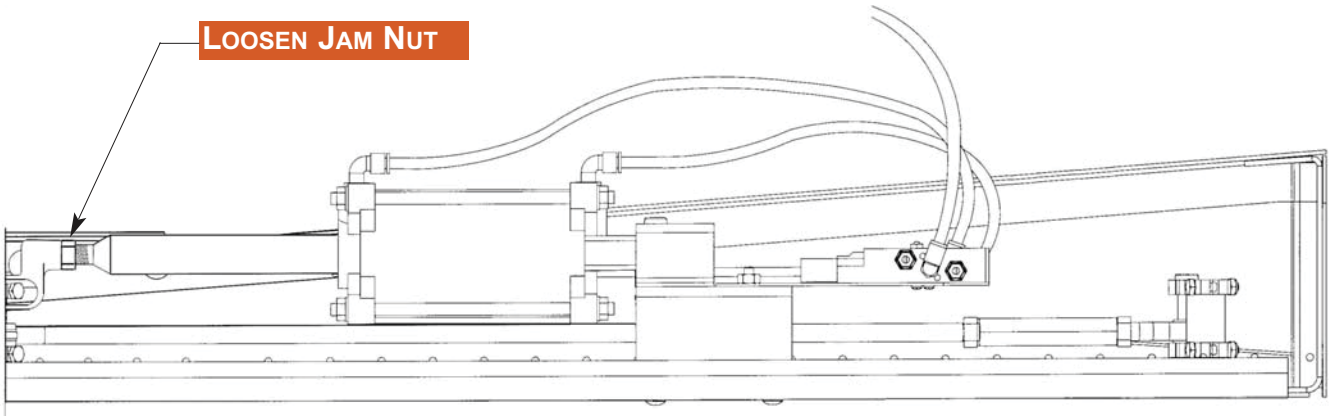
2. Remove the access panel above the entrance door to expose the adjusting rod.
3. With the door in the open position, put a wrench on the flats of the air cylinder output shaft and rotate as necessary. Facing the shaft end of the cylinder, clockwise rotation will lengthen the rod or decrease opening. Counterclockwise rotation will shorten the rod or increase door opening.
4. Remove and check operation.

CAUTION

Use appropriate size wrench on flat part of shaft only. Do not use any other tool on the air cylinder shaft. This will cause damage to the cylinder and may cause failure.

CAUTION

Care should be used when operating doors while making adjustments. Keep hands clear of moving parts. Personal injury could result.

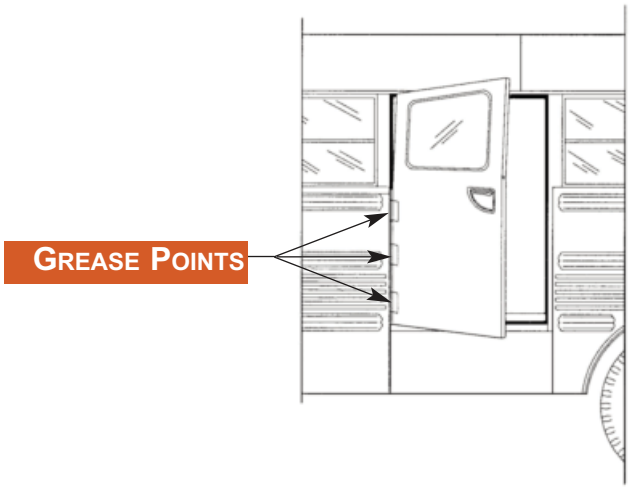


SIDE EMERGENCY DOOR

An emergency door is usually located on the street side of the coach. The opening hardware for the emergency door is protected to prevent accidental opening. Instructions for opening the emergency door are clearly displayed on the door face.

This door should be opened daily to ensure that it will open freely when it is needed. Grease hinge as necessary. You should also examine the door seal and ensure that it is not damaged or obstructed with any foreign material.

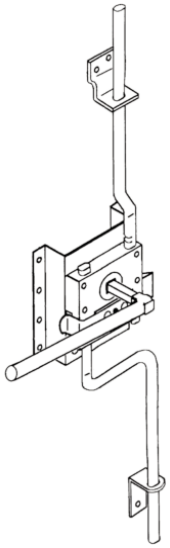
Opening the side emergency door activates a warning buzzer in the operator's compartment.



3-POINT LOCK INSIDE DOOR (OPT.)

Lock for center or side emergency door. Required by some states. A single handle, when turned, secures the door at top, bottom, and center.

Check operation at maintenance intervals.



DOOR MAINTENANCE

The door hinge fasteners should be tightened periodically to ensure proper door operation.

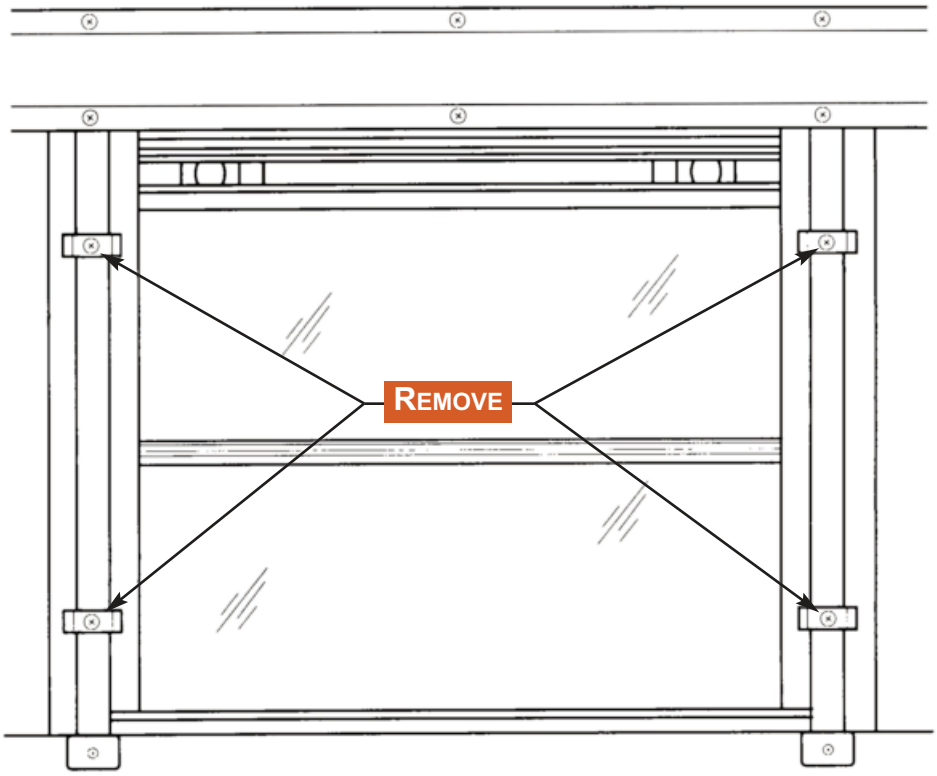
It is very important that drain holes in the bottom of the outward opening and the jackknife door leaves be cleaned every thirty (30) days. Use a short piece of welding rod or stiff wire for a cleaning probe.

Apply a graphite base oil to all door controls and grease hinge every thirty (30) days. Remove all excess oil and grease to avoid accumulation of foreign elements.

CAUTION

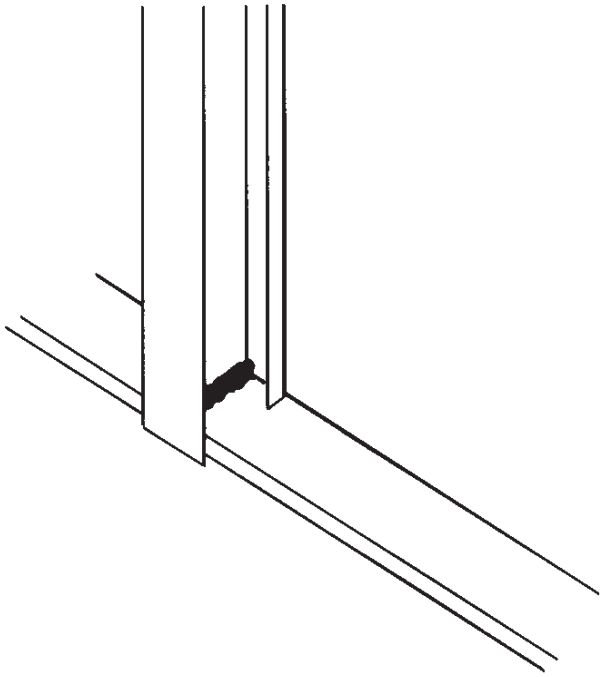
Care should be used when operating doors while making adjustments. Keep hands clear of moving parts. Personal injury could result.

WINDOWS - SPLIT SASH, REMOVAL AND INSTALLATION



The sash is installed in the window opening and is securely anchored on both sides to the one piece bow frames with four (4) clips, two (2) on either side of the window.

1. Remove four (4) screws, two on each side of the window, and remove the clips. Interior and/or exterior caulking will have to be cut.
2. Pull the top of the sash to the interior of the bus body.
3. Disassembly of the sash for glass replacement will be covered in the next section "Glass Replacement".
4. Prior to reinstalling sash in opening, seal both lower corners of the window opening. This will assist in keeping moisture out of the body sidewalls. Use silicone, part # TBB 01013370 or equivalent.
5. Reassemble by reversing Steps 1-4.
6. Reseal sash, inside and outside using silicone, part # TBB 01013370 or equivalent. This will ensure that moisture does not enter the side of the body.



GLASS REPLACEMENT

The glass used in your bus must meet certain Federal Motor Vehicle Safety Standards, such as FMVSS 217. Therefore, whenever a glass is broken or must be replaced, it should be replaced with identical OEM glass. The following instructions are for replacing glass in split sash:

1. Remove sash as per section "Sash Removal".

2.1 To replace the lower stationary glass, loosen the center screw on each end of the center rail. Remove the screw on each end of the lower rail.

2.2 Remove lower rail and slide glass out.

3.1 To replace the upper sliding section, glass, stand window on it's side and remove three (3) screws from the sidemember.

3.2 Remove the sidemember.

3.3 Remove the screw on each end of the lower rail of the sliding section and slide glass out.

! WARNING

Always wear heavy gloves and eye protection when handling glass to minimize the risk of injury.

4. Check the glazing rubber. If the seal is damaged or has deteriorated, replace the one-piece rubber seal available from your Thomas Dealer.
5. Check the new glass to be installed. Sharp corners will cut the glazing rubber seal and lead to glass breakage due to glass contacting metal. The corners should be ground to a smooth radius of 1/8".
6. Reverse Steps 1-5 to reassemble sash. Be careful not to twist or cut the gasket as you slide it into place.

WINDOWS - SPLIT SASH, PUSHOUT - GLASS REPLACEMENT

The glass used in your bus must meet certain Federal Motor Vehicles Safety Standards, such as FMVSS 217. Therefore, whenever a glass is broken or must be replaced, it should be replaced with identical OEM glass. The following instructions are for replacing glass in split sash.

NOTICE

It is suggested that you remove only one section of glass at a time. It is more difficult to replace if both are removed.

1. Open the sash approximately 15 to 20 degrees and secure in that position. A rubber tie down works well in holding the sash out.
2. Remove the screws in the bottom rail and remove the stationary lower rail and glass.
3. Remove the screws in the center rail and remove the center rail.
4. Release both window latches and lower the sliding glass and frame out the bottom of the rails.
5. Check the glazing rubber. If it is damaged or has deteriorated, replace it with the one-piece rubber seal available from your Thomas Dealer.
6. Check the new glass to be installed. Sharp corners will cut the glazing rubber seal and lead to glass breakage due to glass contacting metal. The corners should be ground to a smooth radius of 1/8".
7. Reverse procedure to reassemble sash.

STATIONARY GLASS

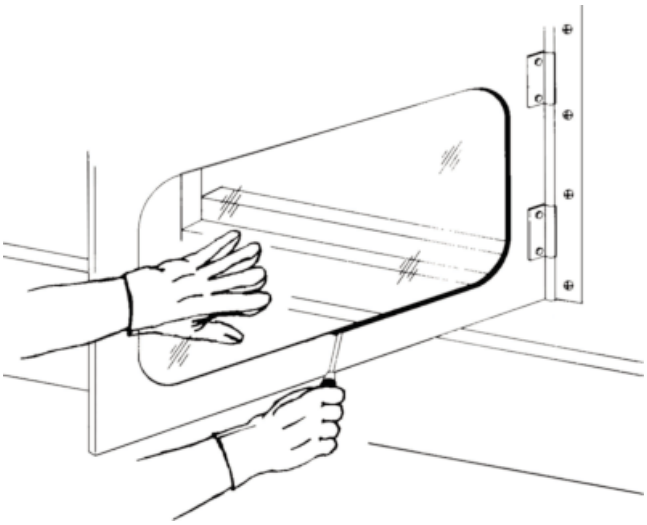
This section applies to entrance doors and emergency doors.

! WARNING

Always wear heavy gloves and eye protection when handling glass to minimize the risk of injury.

To remove the glass for replacement or structural repair, follow the steps listed below:

1. Apply pressure against the glass from the outside of the body. Start at one top corner and work your way around outer edge of rubber seal pushing glass and seal together off the metal flange. Remove the glass and rubber seal intact.

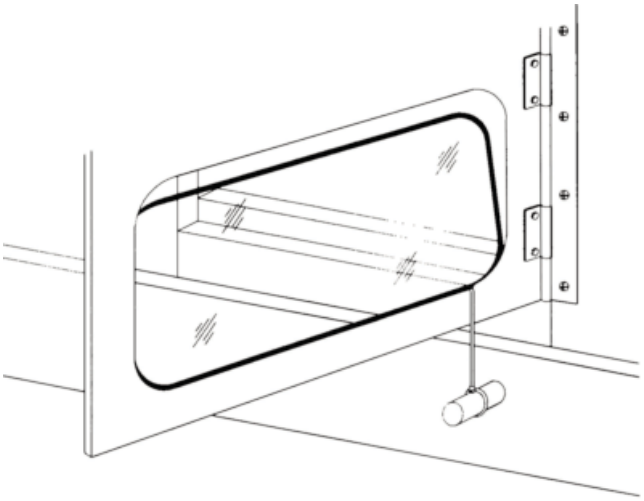


2. Remove rubber seal from glass and inspect seal for cuts and deterioration. If any are found, replace rubber seal to avoid future leaks and glass breakage.
3. Inspect metal flange for burrs and sharp edges that could cut rubber seal. Inspect flange for rust and deterioration. Repair and repaint before reinstalling glass and rubber seal.
4. Inspect new or replacement glass and install rubber seal around outer edge.

NOTICE

All glass used by Thomas meets FMVSS 205 requirements. Use of OEM glass is recommended when replacing any glass on the bus.

5. Apply a soapy solution, silicone, or rubber lubricant to the outside diameter of the seal. This will aid in installation of the glass and seal.

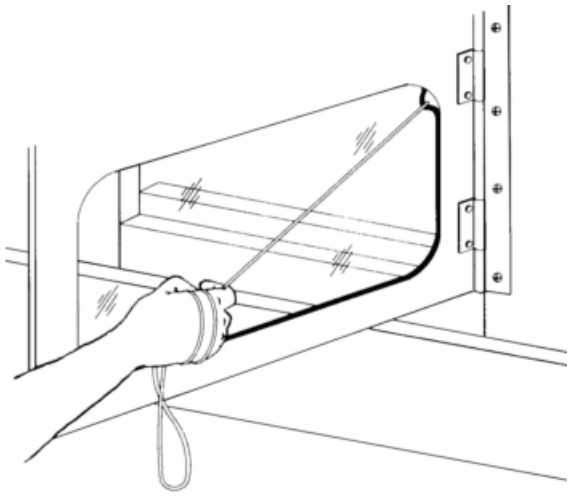


6. Using a nylon cord approximately 2' longer than the total circumference of the rubber seal, wrap the cord around the seal and glass. Rest the assembly on the bottom flange of the window opening, from the inside of the bus.

(CONTINUED ON NEXT PAGE.)

STATIONARY GLASS *(CONT'D)*

7. Pull the cord slowly from the outside of bus while an assistant applies light pressure to the glass from inside the bus. Work rubber seal onto the metal flange.
8. Apply even pressure to the edge of the rubber seal from inside the bus to seat the seal and position the assembly on the metal flange. This will ensure a proper seal.



WINDSHIELD REPLACEMENT

The windshield is installed by a bonded process. This requires no maintenance by the operator. If problems arise requiring the replacement of the windshield, the vehicle should be taken to a professional glass installer.

SEATS AND BARRIERS

All seats and barriers used in the manufacture of bus bodies must meet many Federal and State requirements. One requirement commonly overlooked is the seat back foam for impact energy absorption. This is directed primarily where the head and knees will strike the seat back in the event of an accident.

Styrofoam is used in this critical area where its impact resistance is determined by its density and thickness. The seat back is designed so that the styrofoam will crunch or collapse under a predetermined force. This absorbs much of the force generated by the child's head or knees when he is thrown into the seat.

Once this occurs, the styrofoam is damaged and the seat back would not serve the same purpose for which it was designed. Unless you removed the upholstery, you would not know whether the foam should be replaced or not.

Only OEM seat back foam should be used to ensure FMVSS compliance.

To remove seat backs for inspection and/or replacement of the cover or foam, the following should be performed:

1. Pull the staples from the vinyl fabric under the plate.
2. Slide the cover and foam envelope up and off the frame.
3. Inspect and replace as necessary.
4. Reverse procedure to reinstall.

There are many types of tape and vinyl repair materials on the after-market for minor cuts and seat cover repair. Torn seams in the cushion or back covers can be easily repaired by removing the covers, re-sewing the seams, and reinstalling. If covers are not repairable, they should be replaced with new OEM covers.

Seat cleaning and care recommendations are from the Chemical Fabrics and Film Association.

"Chemical Fabrics and Film are made to withstand scuffing, cracking, peeling and hard use. They will come up fresh and sparkling after a mild soap-and-water bath, a clear water rinse. However, certain stains, if allowed to remain, may become set, making removal more difficult. It is important to remove these stains as soon as possible."

Day to Day Soil - Most stains can be removed with a neutral soap, warm water and, if necessary, a good, stiff brush. Fabric should be thoroughly rinsed with clear water, then blotted dry.

Paint or Enamel - Remove immediately with a sponge or cloth dampened with turpentine or kerosene. Rinse.

Nail Polish or Lacquer - Remove immediately for best results. Pick up as much as possible with dry cloth, taking care not to spread stain. Go over quickly and lightly with non-flammable cleaning fluid. Rinse thoroughly.

Tar, Asphalt - Remove immediately. Lengthy contact will cause a permanent stain. Using cloth dampened with kerosene, rub gently from outside edge of stain to center. This will prevent stain from spreading. Rinse.

Chewing Gum, Car Grease, Shoe Polish - Scrape off as much as possible (chewing gum will come off more easily if rubbed with ice cube) and go over lightly with cleaning fluid to remove remainder. No time should be lost in removing shoe polish as it contains dye which can cause permanent staining. Rinse thoroughly.

(CONTINUED ON NEXT PAGE.)

SEATS AND BARRIERS *(CONT'D)*

Ball Point Ink - Remove immediately to avoid permanent staining. Use cloth dampened with alcohol. Rinse thoroughly.

Powdered abrasives, steel wool and strong cleaning preparations are not recommended. They usually cause dulling, especially of glossy finishes.

Wax should only be used on Chemical Coated Fabrics and Film if manufacturer recommends its use. Many waxes contain dyes, and dyes will stain.

The main thing to remember is to use good judgement when choosing any cleaning substance other than soap and water.

VENDOR SEATS

If your bus is equipped with passenger seats other than Thomas, you can contact them direct for information on care and maintenance. Below is a list of these manufacturers.

- American Seating Company
  401 American Seating Center
  Grand Rapid, MI 49504
  (616) 732-6600

- Freedman Seating Company
  4043 N. Ravenswood
  Chicago, IL 60613
  (773) 929-6100

- The C. E. White Company
  P. O. Box 308
  New Washington, OH 44854
  (419) 492-2157

- Transportation Seating
  P. O. Box 595
  Montezuma, GA 31063
  (616) 732-6600

- SynTec, Inc.
  200 Swathmore Ave.
  High Point, NC 27263
  (336) 861-9023

- IMMI
  18881 US 31 N.
  Westfield, IN 46074
  (800)-586-7839

SEAT BELTS (OPT.)

Seat belts are only available on seats specifically designed for their use.

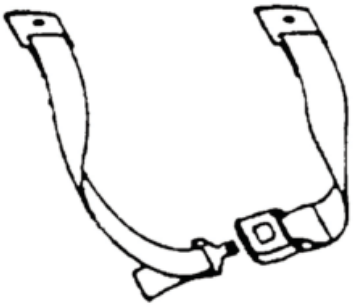
All should be checked for proper operation daily and fasteners should be checked monthly.

To fasten the belt, pull the belt across the occupant and insert the tongue into the buckle until it clicks. Pull to make sure it is latched, snug the belt by pulling slack out.

Press the button on the buckle to release.

! WARNING

Seat belts must only be used on seat assemblies designed for their use.



IMMI SEAT CUSHION LATCHES

NOTICE

Some buses are equipped with latchable seat cushions:

1. **Always lock seat cushions in place after lifting.**
2. **Always place seat belts on top of the seat cushions before latching.**

TRACK SEATING - GENERAL INSTALLATION AND REMOVAL GUIDELINES

Removal and installation of track seating in school buses is the responsibility of the school bus operator and maintenance staff; these guidelines are provided by Thomas Built Buses to assist owners and operators to help insure safe and compliant seating arrangements. Because the number of variations and combinations of removable seating in a school bus is almost limitless, these recommendations and guidelines are not intended to cover every possible configuration that might be required in service. If there is any doubt as to the safety and/or compliance of a particular seating configuration, please ask TBB to help at 336 841 5911.

1. Thomas Built Buses (TBB) recommends that units be ordered with maximum seating capacity installed at the factory to ensure that gross axle weight ratings (GAWR) and gross vehicle weight ratings (GVWR) are not exceeded. If seating is added to a school bus that was not ordered or delivered on the bus as configured by Thomas Built Buses, care should be taken to ensure that axle weight ratings and gross vehicle weight ratings are not exceeded. Actual weight of the unit with full fluid capacities (full of fuel) with 120 lb. per seating position for all seats on the vehicle and 150 lb. for driver and each wheelchair position should not be greater than the GAWR or GVWR printed on the vehicle federal data label. For capacity calculations, the full passenger load should be added to the rear axle of the vehicle. If there is any doubt as to the capacity of the vehicle and allowable weight loading, please contact the Thomas Built Buses, Inc. Engineering Services staff for help at 336 841 5911.
2. All TBB tracked school bus seat options are designed for forward facing orientation on the vehicle.
3. All wheelchairs should be secured in the forward facing orientation on the vehicle and secured per the wheelchair restraint manufacturer's instructions.
4. All knee room measurements should be referenced at the center of the seat and at the seat reference point height which is typically .25" above the seat cushion's highest point.

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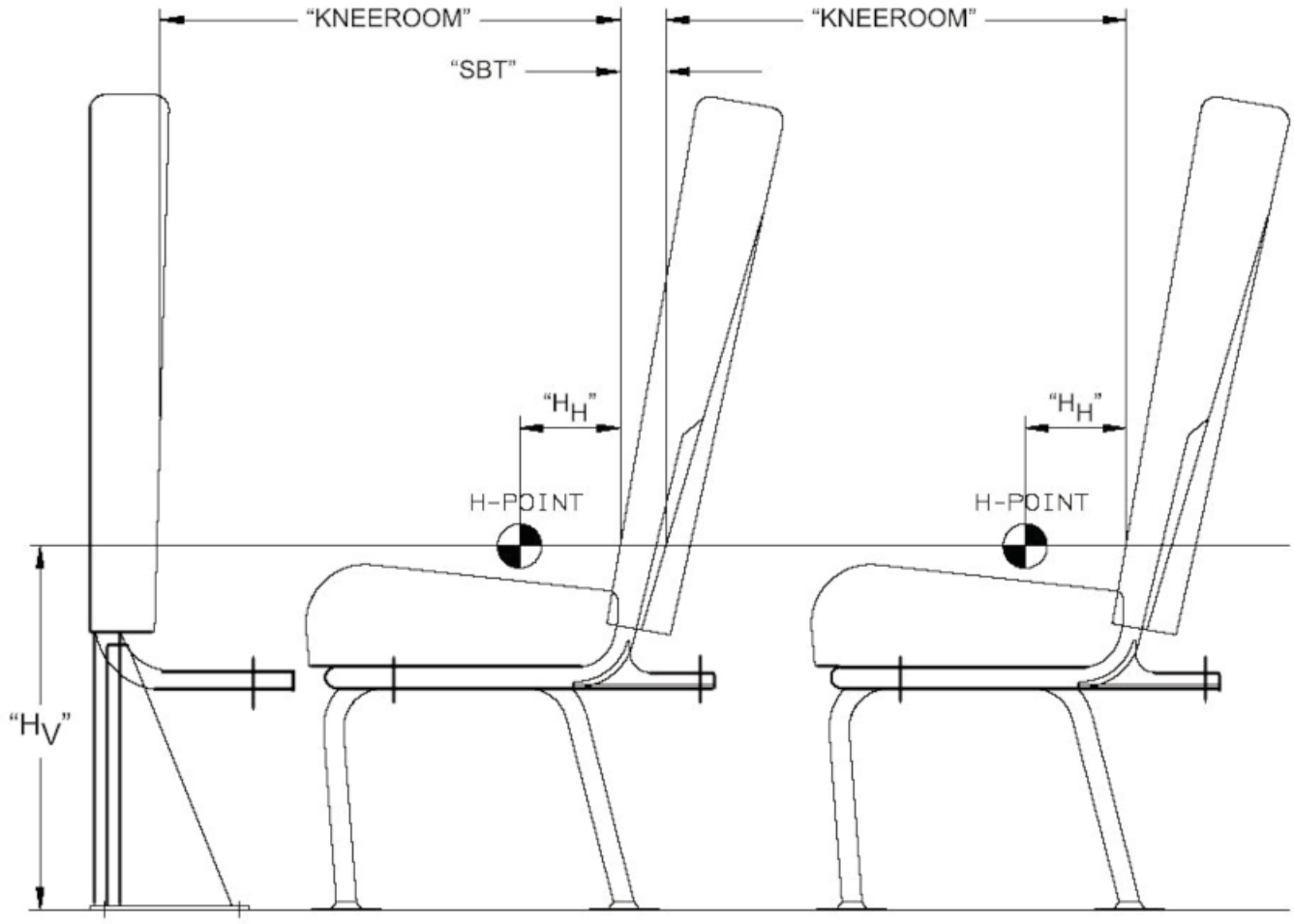
TRACK SEATING - GENERAL INSTALLATION AND REMOVAL GUIDELINES *(CONT'D)*



H_H = H-POINT HORIZONTAL

H_V = H-POINT VERTICAL

SBT = SEAT BACK THICKNESS

H-POINT = HIP POINT

(CONTINUED ON NEXT PAGE.)

TRACK SEATING - GENERAL INSTALLATION AND REMOVAL GUIDELINES *(CONT'D)*

5. School bus seating is designed to accommodate student encapsulation for primary crash protection. Encapsulation uses the seat backs and barriers as a passive restraint system to absorb kinetic energy in a crash situation and protect passengers. Seat spacing is critical to passive encapsulation to protect passengers in the event of vehicle impacts. It is essential that removable seats be installed to maintain spacing that ensures safe configurations. The minimum seat spacing is limited to protect occupants from rear end collisions and ensures that there is adequate room for rearward seat back deflection in the knee area, and to facilitate ingress and exit from the seat row. The maximum seat spacing is limited to protect occupants from front end collisions and ensures that there is sufficient forward deflection to absorb collision energy. TBB recommends that seats be marked or mapped when removed from a school bus and reinstalled exactly where removed. When this is not possible and to support the numerous configurations often allowed by removable seat options, care should be taken to make sure seats are within minimum and maximum spacing, as shown below.

(CONTINUED ON NEXT PAGE.)

TRACK SEATS	H_H INCH	H_V INCH	SBT	*MIN KNEE ROOM INCH	MIN KNEE ROOM = 24" + H_H INCH
SYNTEC STANDARD	5.3	18.75	1.4	24	29.3
** SYNTEC ISO	5.3	18.75	1.4	26.8	29.3
IMMI GEN II	5.5	19	5.5	24	29.5
**IMMI GEN II ISO	5.5	19	5.5	26.8	29.5
IMMI GEN II ICS	5.5	19	5.5	24	29.5
**IMMI GEN II ISO/ICS	5.5	19	5.5	26.8	29.5
IMMI SSA	5.43	19	2.25	24	29.43
**IMMI SSA ISO	5.43	19	2.25	26.8	29.43
IMMI SSA ICS	5.43	19	3.38	24	29.43
**IMMI SSA ISO/ICS	5.43	19	3.38	26.8	29.43

*Each seat has a unique absolute minimum knee room spacing per FMVSS 222. Generally this minimum is less than recommended. Most states require a minimum knee room of 24". It is also recommended by Thomas Built Buses that a minimum knee room of 24" be maintained. If you require a knee room of less than 24", contact Thomas Built Buses to get the seats absolute minimum spacing.

**All ISO seats should have a minimum knee room of 26.8".

Notes for measuring:

1. Track seats must be spaced in 1" increments. Measurements should be rounded up for minimum knee room and rounded down for maximum knee room.
2. Check your state and local guidelines for how to measure the knee room.
3. Seat back thickness (SBT) is measured at H-point when all air is compressed from the seat back.
4. Seat spacing is the Seat Back Thickness plus knee room.

TRACK SEATING - GENERAL INSTALLATION AND REMOVAL GUIDELINES *(CONT'D)*

6. All seats in a school bus should have another seat or a barrier installed immediately in front above minimum seat spacing and below maximum seat spacing. In no circumstances should seats be removed from the middle of a seat row. In general, seats should be removed from the rear of the bus in school buses with a rear lift door position and from the front of the bus in vehicles configured with a front lift door location. When seats are removed from the front of a seat row, a track mounted barrier should be moved rearward to allow above the minimum knee room and above the maximum knee room between the barrier and the first seat. Seat rows should be removed to allow at least a 46" clear space for the addition of a wheelchair passenger.
7. Track options that allow for different seat widths in the same seat row should always have the wider seats located in front of narrower seats. Never install a narrow seat in front of a wider seat.
8. Care should be used to install seating to allow clear access to emergency exits, especially push out window exits and emergency exit doors. Seat backs must allow for a 2" clearance for emergency exit handle access and the seat back should not obstruct the clear opening of the emergency exit such that an ellipsoid with major axis of 50 centimeters and minor axis of 33 centimeters, keeping a major axis horizontal at all times can pass through the opening without contact with the seat back.

ELLIPSOID GAGE PASSING IN FRONT OF SEAT

ELLIPSOID GAGE PASSING IN BEHIND OF SEAT

ELLIPSOID GAGE PASSING ABOVE SEAT BACK

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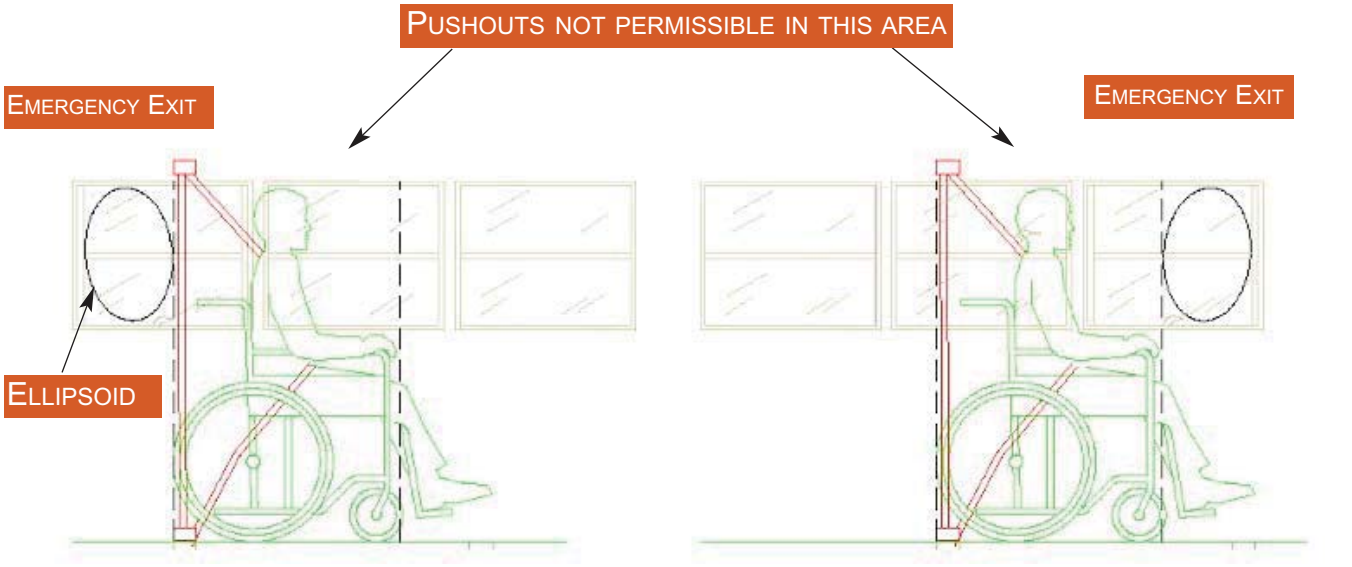
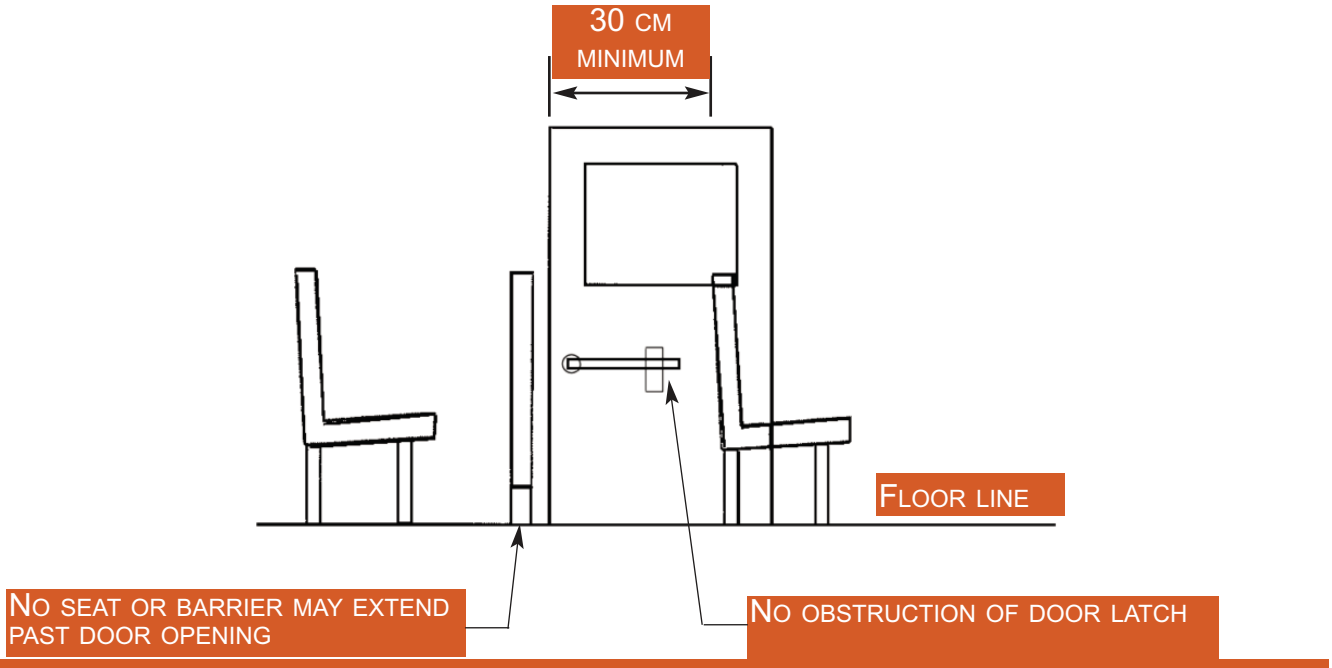
Track Seating - General Installation and Removal

9. Wheelchair anchorages should allow passage of the ellipsoid in front of the torso or behind the shoulder belt attachment as shown below.



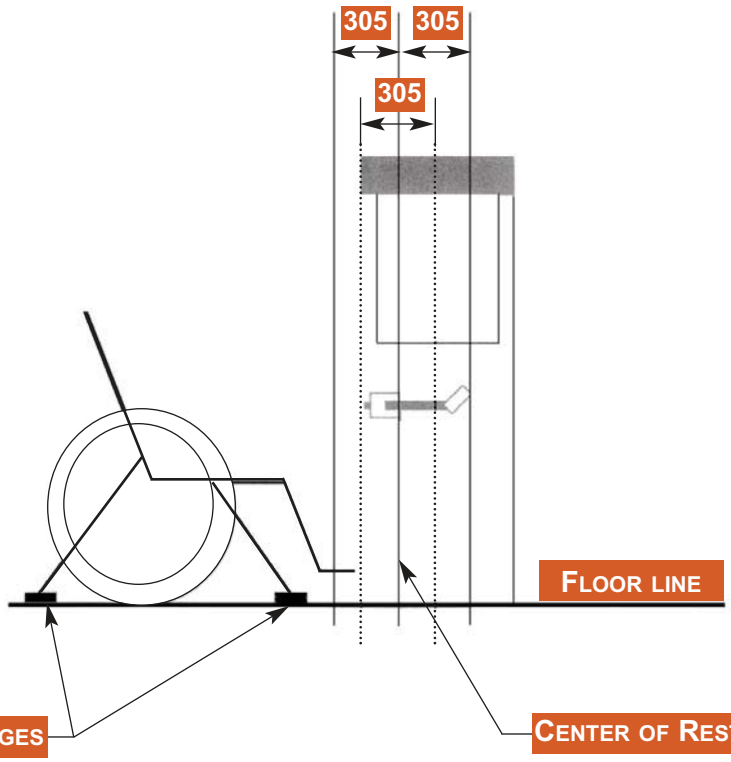
10. Removable barriers and seats should allow for a 12” clear aisle to emergency exit doors without exceeding maximum seat spacing. This is typically achieved by the position of a barrier immediately at the door opening and far enough behind the forward seat to allow a 12” clear aisle for side emergency doors.



Minimum Side Emergency Exit Clearance Specifications

TRACK SEATING - GENERAL INSTALLATION AND REMOVAL GUIDELINES

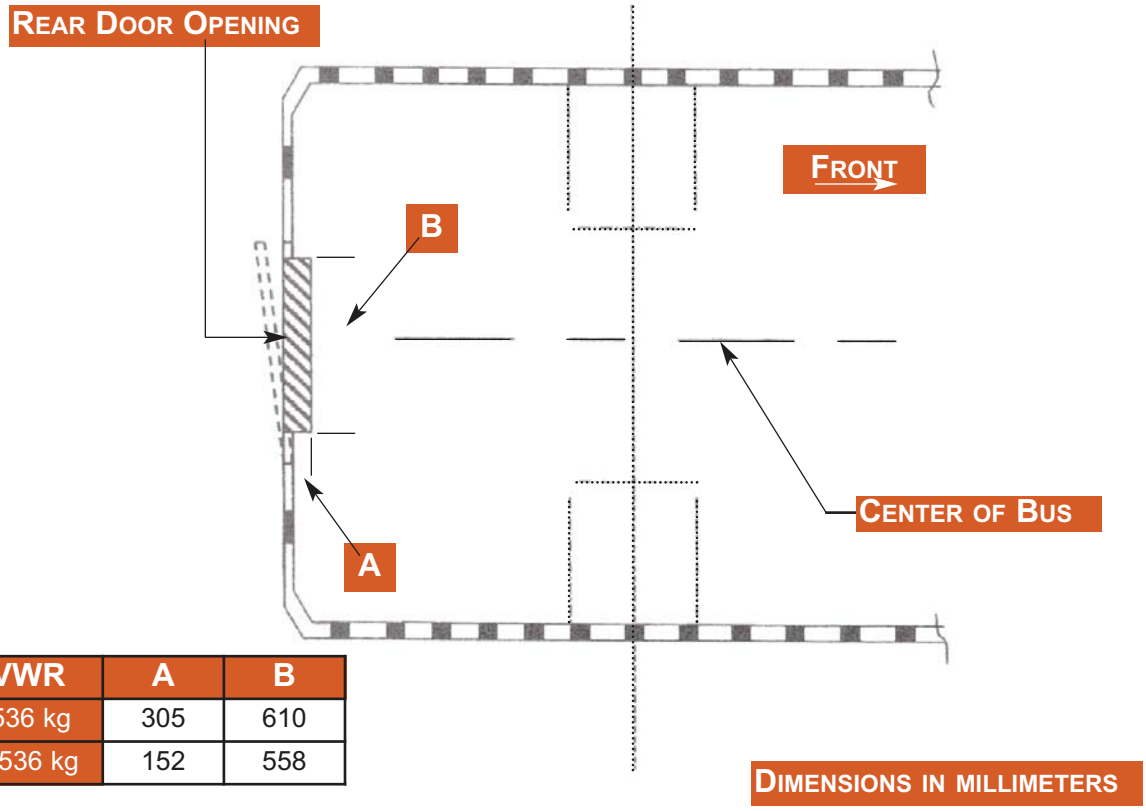
11. Wheelchair anchorages should be kept well away from the exit aisle to side emergency exit doors. No anchorages are allowed within 12” of the centerline of the exit aisle.



SIDE EMERGENCY EXIT - NO WHEELCHAIR ANCHORAGES WITHIN THE INDICATED REGION

TRACK SEATING - GENERAL INSTALLATION AND REMOVAL GUIDELINES *(CONT'D)*

12. The rear exit door deserves special attention in a school bus. Fully tracked units with removable seats adjacent to the rear exit door must allow enough clear area in the door opening to accommodate a 305 mm deep x 610 mm wide, x 1143 mm high volume for vehicles with a GVWR greater than 4336 kg (10,000 lb). For vehicles with a GVWR of less than 45336 kg, the opening should accommodate a volume of 152 mm deep x 558 mm wide x 1143 mm high. These dimensions are measured from the top of floor to the outside of the rear bus wall at floor level with the rear emergency door open.



GVWR	A	B
>4536 kg	305	610
<=4536 kg	152	558

REAR DOOR EMERGENCY EXIT - NO WHEELCHAIR ANCHORAGES WITHIN THE SHADED REGION

TRACK SEATING - GENERAL INSTALLATION AND REMOVAL GUIDELINES *(CONT'D)*

13. Wheelchair anchorages should be excluded from this area.

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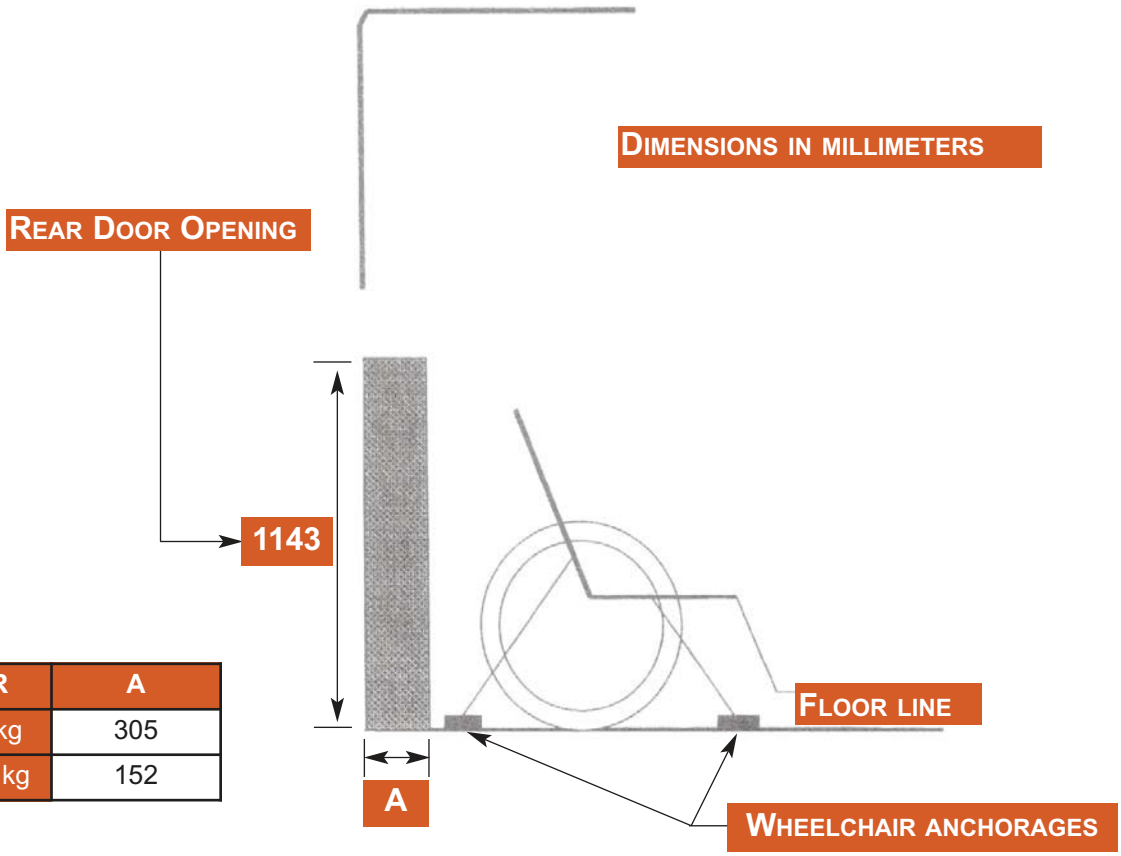


GVWR	A
>4536 kg	305
<=4536 kg	152

REAR DOOR EMERGENCY EXIT - NO WHEELCHAIR ANCHORAGES WITHIN THE SHADED REGION

TRACK SEATING - GENERAL INSTALLATION AND REMOVAL GUIDELINES *(CONT'D)*

14. Different seat types and/or styles have different installation criteria. Care should be taken to identify the specific seat style and type per the seat installation section of this manual.
15. Seats equipped with ISO Latch infant carrier attachment options should be located in the first row of a school bus. If more than two seats have been ISO Latch equipped, they may be located anywhere behind the first rows and the rear most row on the vehicle.
16. Tests have shown infant carriers with the infant secured rearward facing is the safest way to transport infants.
17. ISO Latch equipped tracked seats (infant carrier capable) should be spaced at 27” minimum regardless of seat type and minimum spacing allowed by the seat type chart. This minimum spacing is to protect the infant from contacting the seat back or barrier due to infant carrier belt stretch in a frontal collision.
18. If one seat is installed in a TBB product with seat belt option, all seats in the vehicle should be equipped with seat belts.
19. Again, Thomas Built Buses is dedicated to helping our customers operate our products in the safest way possible and is ready to assist them in any way we can. If there is any doubt as to the safety and/or compliance of a particular seating configuration or track seat removal/install, please ask a TBB expert to help at 336 841 5911.

DOOR IMPACT ZONE

NOTICE

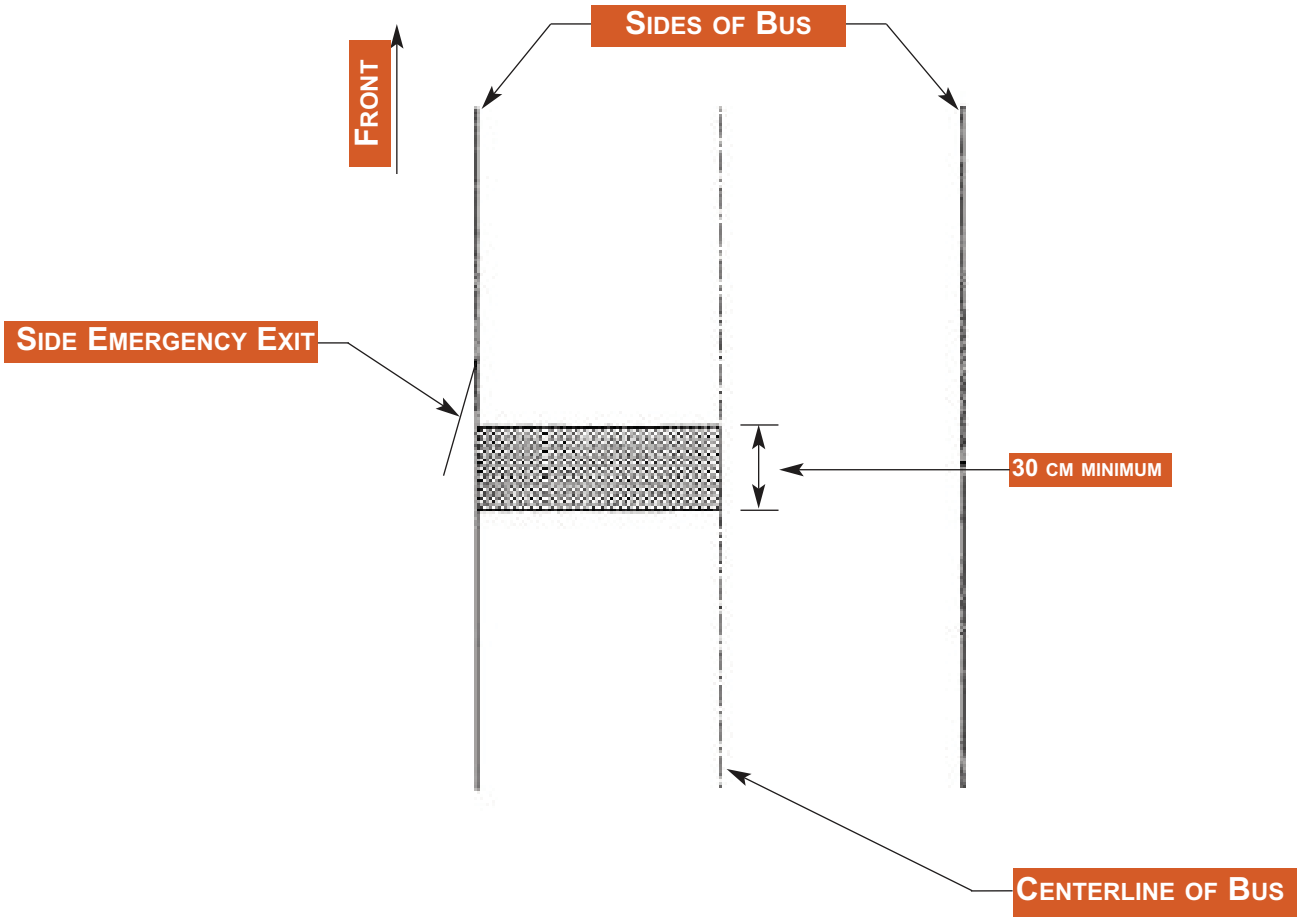
Refer to FMVSS 217 for additional Information.

School buses with a GVWR of more than 10,000 pounds: In the case of a rear emergency exit door, an opening large enough to permit unobstructed passage of a rectangular parallelepiped 114 centimeters high, 61 centimeters wide, and 30 centimeters deep, keeping the 114 centimeter dimension vertical, the 61 centimeter dimension parallel to the opening, and the lower surface in contact with the floor of the bus at all times.

School buses with a GVWR of 10,000 pounds or less: In the case of a rear emergency exit door, the rectangular parallelepiped dimensions shall be 45 inches high, 22 inches wide, and six inches deep.

Disregarding the GVWR of School buses: In case of a side emergency exit door, an opening of at least 114 centimeters high and 61 centimeters wide is required.

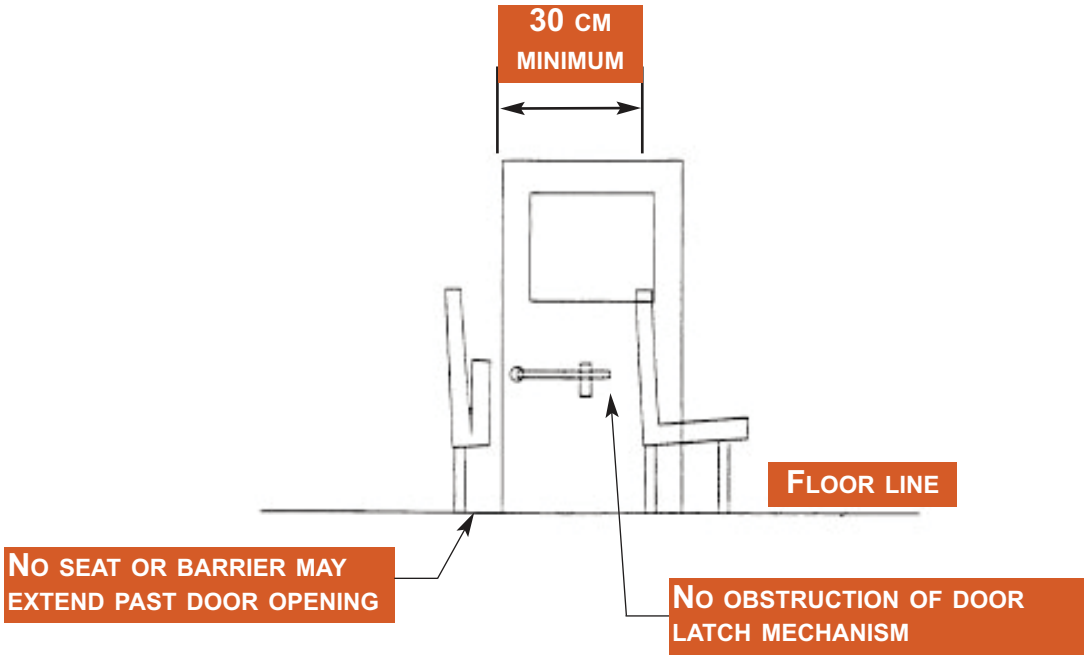
No portion of a seat or a restraining barrier shall be installed within the area bounded by the opening of a side emergency exit door, a vertical transverse plane tangent to the rearward edge of the door opening frame, a vertical transverse plane parallel to that plane at a distance of 30 centimeters forward of that plane, and a longitudinal vertical plane passing through the longitudinal centerline of the bus.



MINIMUM SIDE EMERGENCY EXIT CLEARANCE SPECIFICATIONS (PLAN VIEW)

DOOR IMPACT ZONE *(CONT'D)*

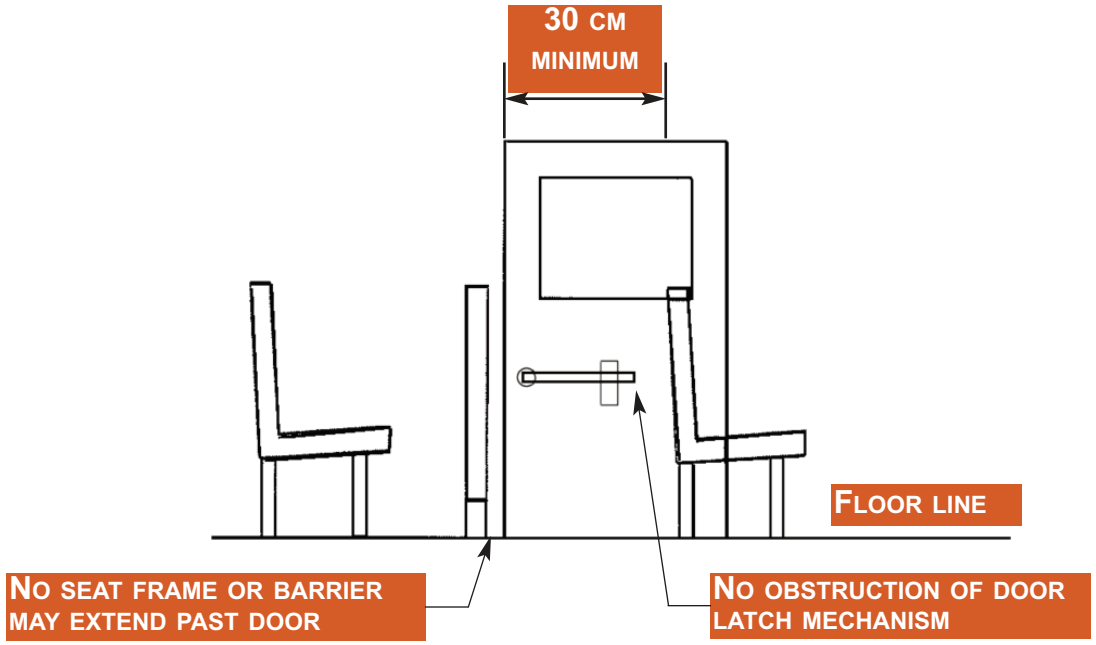
However, a seat bottom may be located within the area as described if the seat bottom pivots and automatically assumes and retains a vertical position when not in use, so that no portion of the seat bottom is within the area as described above. When the seat bottom is vertical, see below.



MINIMUM SIDE EMERGENCY EXIT FLIP-UP SEAT CLEARANCE SPECIFICATIONS

DOOR IMPACT ZONE *(CONT'D)*

No portion of a seat or restraining barrier located forward of the area described above and between the door opening and a longitudinal vertical plane passing through the longitudinal centerline of the bus shall extend rearward of a vertical transverse plane tangent to the forward most portion of a latch mechanism on the door.



MINIMUM SIDE EMERGENCY EXIT CLEARANCE SPECIFICATIONS

DEFINITIONS

Compartmentalization: The concept of protecting each child within the passenger compartment of a school bus with a padded barrier that would prevent injury.

H point: Also known as the SRP or Seating Reference Point. It is the calculated location of a point that would be the hip pivot point of a test dummy designed for this purpose. This point will vary between seat design and manufacturers.

Knee room: The distance measured from the front of the seat back to the rear side of the seat back in front, passing through the H point. Also the same as seat spacing minus the seat back thickness.

Seat spacing: The distance measured from the same point on two adjacent seats.

Track seating: Seats that are installed on a track in the floor to allow for flexibility in mounting locations.

FMVSS: Federal Motor Vehicle Safety Standards.

CMVSS: Canadian Motor Vehicle Safety Standards.

ICS: Integrated Child Seat

This section of the manual will provide important information for installing and reinstalling track seats. It is important that each seat be properly installed to comply with state and federal law. Each step is important to follow the laws set forth to keep each passenger safe. By following the outline of this section you will be better able to identify your seat, learn seat installation requirements, and determine proper seat spacing for each seat. It is always recommended that you only re-install the seats that were originally installed in the vehicle and that they be installed in the same location as they were removed. If you are unsure of any step in installing track seating, please contact Thomas Built Buses.

TRACK SEAT IDENTIFICATION

When installing a track mounted seat, it is important that you know what seat you are installing. You must be able to identify each seat being installed to maintain the proper seat spacing. A seat can be identified by following these three steps:

1. Determine the make of the seat.
2. Determine the type of seat
3. Determine what options, if any, are on the seat

1. Determine the make of the seat:

Track seating is offered in two makes, IMMI and SynTec. The easiest way to distinguish between the two is the distinct outer perimeters.

Example of IMMI Seat

All IMMI seats will have a similar appearance. The IMMI seat has two different variations, the Gen II and SSA. The difference between the Gen II and the SSA are the seat backs. The SSA has a concave back and the Gen II has a straight back.

IMMI SSA SEAT (CONCAVE BACK)

IMMI GEN II (STRAIGHT BACK)

(CONTINUED ON NEXT PAGE.)

TRACK SEAT IDENTIFICATION *(CONT'D)*

The SynTec seat can be seen below. All SynTec seats will be similar in shape. Another difference between the two is the SynTec frame. All SynTec seats will be constructed with round tubing, unlike the IMMI seats.

EXAMPLE OF SYNTEC SEAT

2. Determine the type of seat:

To identify the seat types you must measure the length of the seat cushion. Listed below are the measurements of each type of seat. The seat cushion is measured across the width of the cushion. The following picture shows how to measure the seat cushion. Both the SynTec and IMMI seat can be identified using the same method.

IMMI track seats are offered in 5 types: 30", 36", 39", FLEX, and 45".

SynTec track seats are offered in 3 types: 30", 36", and 39".

30" seat will have an approximate seat cushion width of 30".

36" seat will have an approximate seat cushion width of 36".

39" seat will have an approximate seat cushion width of 39". The 39" seat will not have three lap and shoulder belts.

FLEX seat will have an approximate seat cushion width of 39". The FLEX seat will also have three lap and shoulder belts.

45" seat will have an approximate seat cushion width of 45".

MEASURING CUSHION WIDTH

(CONTINUED ON NEXT PAGE.)

TRACK SEAT IDENTIFICATION *(CONT'D)*

3. Determine what options, if any, are on the seat:

Review each option in the manual to determine what options, if any, are on the seat. It is important that you determine what options are present to install the seat properly. The IMMI track seat is offered with ISO latch, ICS, lap and shoulder belts, and lap belts. Each seat can have one, none, or a combination of these options. The SynTec track seat is offered in low back, high back, ISO latch, and lap belts. The following pictures show each individual option with each make of seat. If you are unsure or can not find the option in this manual, please contact Thomas Built Bus for assistance.

IMMI LAP/SHOULDER BELT (NUMBER OF BELTS MAY VARY)

IMMI ICS (NUMBER OF ICS MAY VARY)

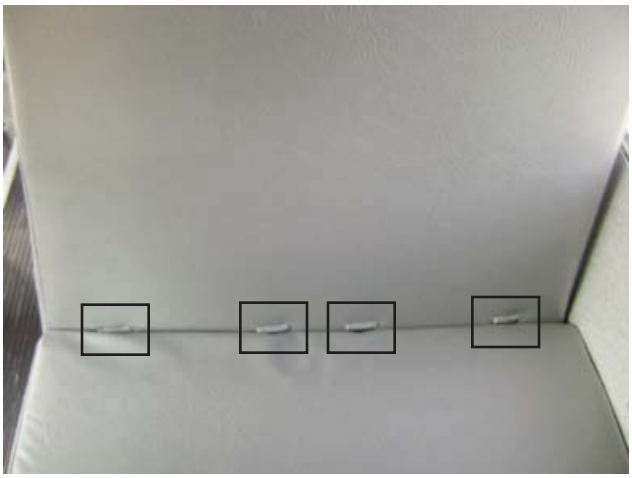
(CONTINUES ON NEXT PAGE)

Track Seat Identification *(cont'd)*

IMMI Lap Belt (number of belts may vary)

IMMI FLEX Seat

SynTec Lap Belt (number of belts may



SynTec ISO Seat
(number of ISO latches may vary)

INSTALLING TRACK SEATING

It is important that you follow each bullet point listed below to insure that the seat is installed in a safe manner. When installing track seating, all federal regulations must be followed. Any information that contradicts federal regulation please disregard and contact Thomas Built Bus.

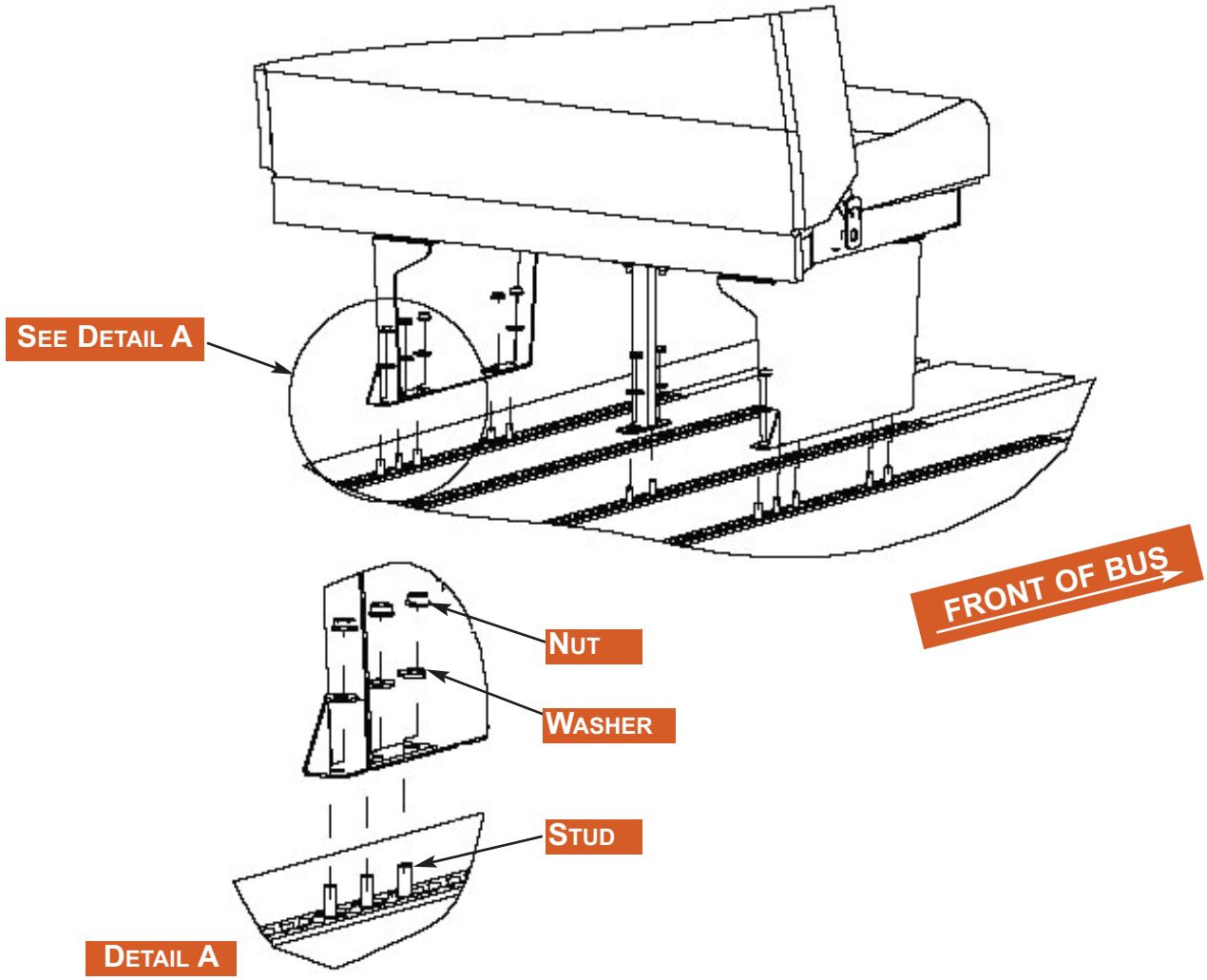
- When installing track seating all federal regulations must be followed.
- Each seat must be installed behind another seat or barrier of matching or greater width. For example, a 30” seat can be installed behind a 39” seat, but a 39” seat cannot be installed behind a 30” seat.
- When installing seats a minimum 12” clear aisle must be maintained. Photo below shows an example of measuring aisle space. Typically two 39” seats, side by side, are the largest two seats that can be placed beside one another and still allow for a 12” clear aisle.

AISLE WIDTH MEASUREMENT

- All track seats must be mounted forward facing.
- When reinstalling a track mounted seat, it is recommended that it is installed in the same location, with the same hardware as it was originally installed. Seats must conform to the allowable knee room spacing for each particular seat. Please refer to the knee room section of the manual. If you are unsure of the knee room required, please contact the manufacturer.
- Not all track seats are installed with the same number of fasteners. Please contact the manufacturer if you are unsure of how many fasteners are required.
- Track mounted fasteners are required to be torque to 20-25 ft/lbs to insure proper installation.
- Track seats will be installed in 1” increments.
- Seat Spacing will be determined Federal and State specifications.
- Most seats will have a Min knee room of 24” and a Max knee room of 24” plus H-point.

See example of an IMMI seat track installation on the next page.

INSTALLING TRACK SEATING *(CONT'D)*



IMMI SEAT TRACK INSTALLATION

MEASURING KNEE ROOM

It is very important that each seat be placed in the location for which it was designed. By not properly placing the seat in its correct location, you may be in violation of state and/or federal regulations and could cause injury to a passenger in the event of an accident.

Seat Spacing

If both seats are identical, seat spacing should be measured to determine the proper seat placement. Seat spacing can be measured by measuring the distance between two seats using the same reference point. A good place to measure the seat spacing is the forward most seat bolt pictured below.

Measuring Seat Spacing

NOTICE

When measuring seat spacing both seats must be identical.

Knee Room

Knee room should be used in seat placement when the two seats are not identical. Knee room is measured from the front of the seat back to the rear of the seat back of the next seat in front of it, passing through the H point. This is also the same as seat spacing minus the seat back thickness.

For the most common spacing measurements, please refer to the “Seat Spacing Chart”. If you do not see the combination of seats you have or are unsure of the proper seat spacing, please contact Thomas Built Buses for proper seat spacing.

WHEELCHAIR RESTRAINTS

General information

If this unit is equipped with wheelchair placements, each wheelchair placement will have two or four track segments in the floor and one track segment above the window. This track is designed for use with securement equipment supplied by TBB approved vendors, Q'Straint and Sure-Lok. Use with any other straps or tiedowns is not recommended.

The restraint system consists of wheelchair tiedowns and occupant restraint belts. The wheelchair restraints secure the wheelchair to the floor and the occupant restraint belts secure the passenger to the wheelchair.

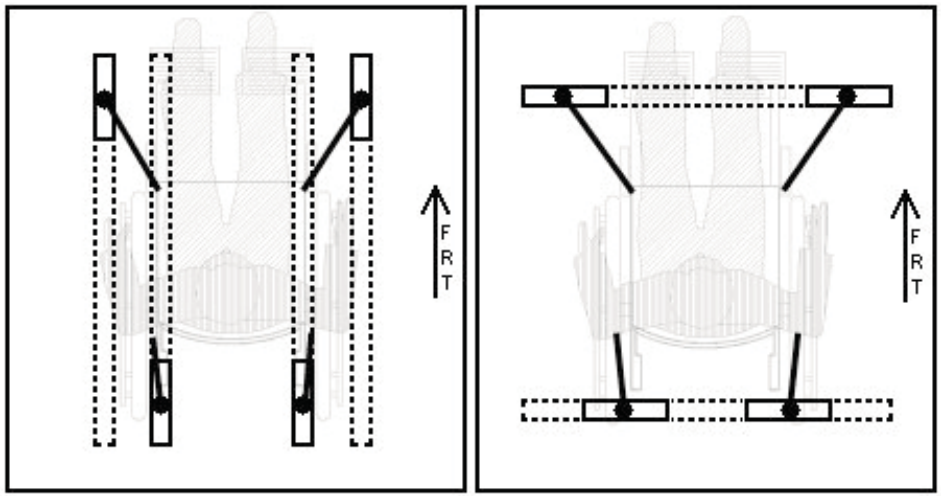
NOTICE

Refer to the operation instructions supplied with the restraint system for proper use and safety information.

Securing the Wheelchair

The wheelchair must be forward facing. It should be centered between the four attachment points on the floor track. The wheelchair must be secured with two front and two rear tiedowns. If there are more than two track segments in front of the wheelchair, use the outer two tracks. If there are more than two track segments behind the wheelchair, use the inner two tracks. It is important to refer to the instructions provided by the manufacturer of the tiedowns for use and safety information.

(CONTINUED ON NEXT PAGE.)



WHEELCHAIR RESTRAINTS *(CONT'D)*

Securing the Occupant

The occupant must be secured with an upper torso belt occupant tiedown and pelvic belt occupant tiedown. The torso occupant tiedown must be secured to the overhead track above the window. It is important to refer to the instructions provided by the manufacturer of the occupant restraints for use and safety information.

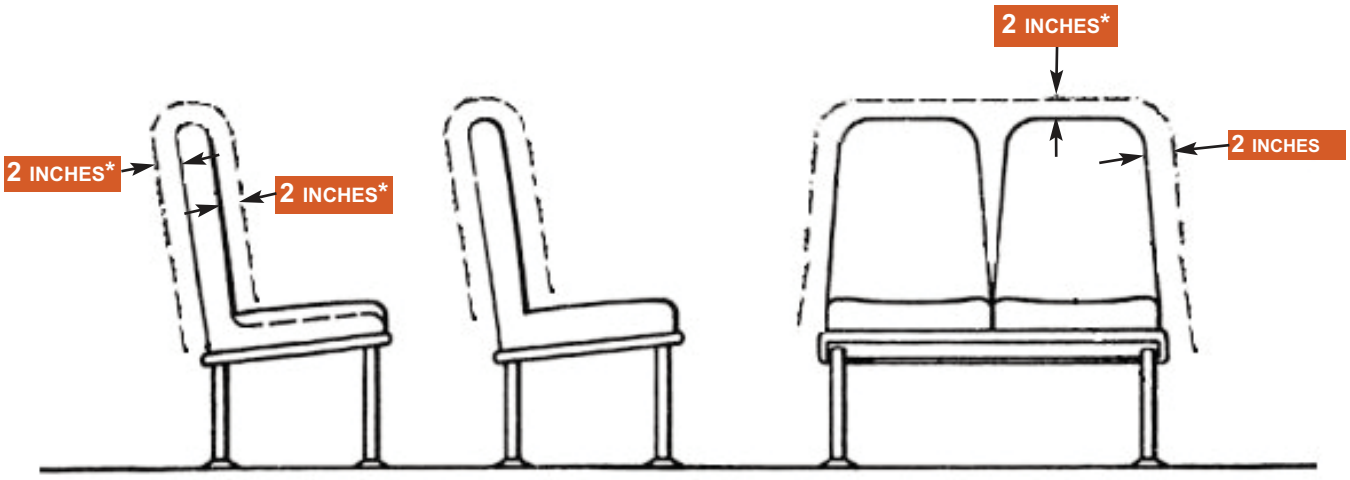
Window Handle Clearance

All emergency window release handles must have a two-inch minimum clearance to allow unobstructed access in the event of an emergency. This is especially important when positioning track seats.

NOTICE

Refer to FMVSS 217 for additional information.

Seats must be positioned so that emergency window release handles are located outside the 2" clear zone shown below.



VIEW PARALLEL TO SEAT BACK

VIEW PERPENDICULAR TO SEAT BACK

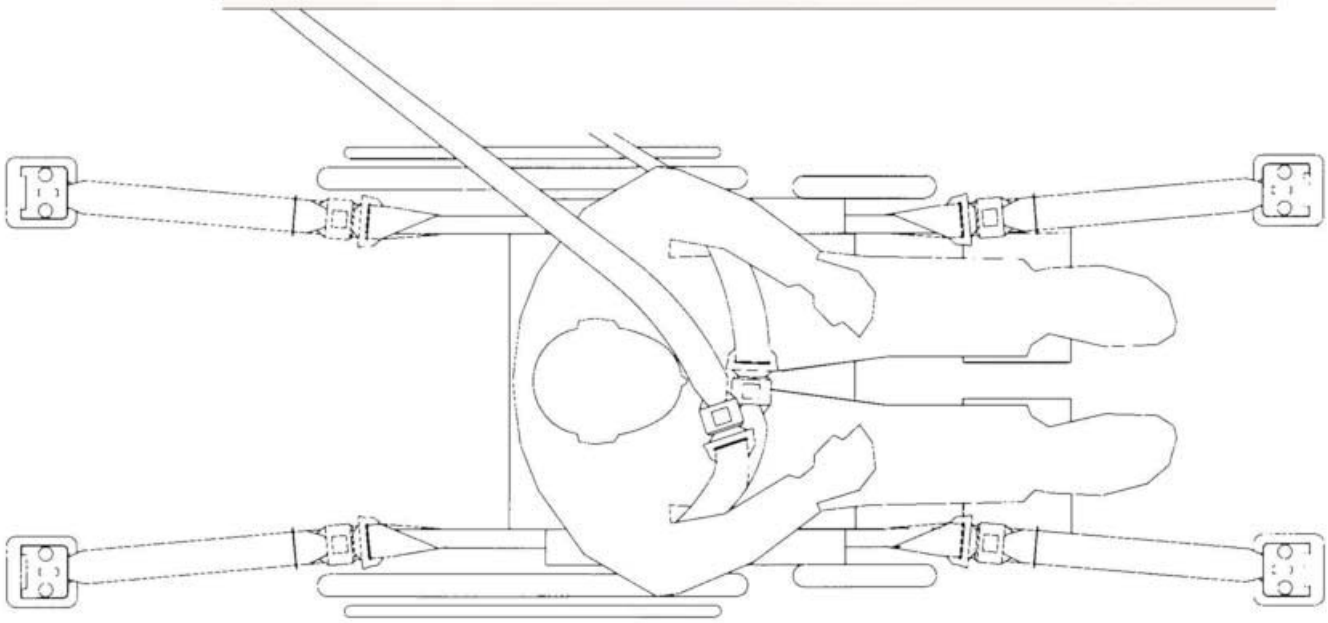
*CLEARANCE AREA AROUND SEAT BACK, ARM RESTS, AND OTHER OBSTRUCTIONS.

ACCESS REGION IS THE SPATIAL VOLUME CREATED BY THE INTERSECTION OF THE PROJECTIONS OF THE AREAS SHOWN IN THE TWO VIEWS.

WHEELCHAIR TIEDOWN

Several combinations of wheelchair securement systems are available through Thomas. Each one has unique characteristics while accomplishing the same goal.

For information on the proper use and care of the specific setup on your vehicle, consult the manufacturer's Instruction Guide supplied with the vehicle.



VENDOR LIFTS

For information on the proper use and care of the specific setup on your vehicle, consult the manufacturer's Instruction Guide supplied with the vehicle. Below is a list of these manufacturers.

- Ricon Corporate Headquarters
  7900 Nelson Road
  Panorama City, CA 91402
  (800) 322-2884

- Maxon Lift
  11921 Slauson Avenue
  Santa Fe Springs, CA 90670-221
  (562) 464-0099

- Automotive Innovations Inc. (Braun Lifts)
  4 First Street
  Bridgewater, MA 02324
  (508) 697-8324

SHEET METAL

The section provides a method for repairing and replacing damaged epoxy bonded body panels.

REMOVAL

1. Remove all rivets, screws, and other mechanical fasteners from all edges of the damaged panel or panels using the same drilling, cold chisel, or other procedure.
2. Wear approved safety glasses. Use an air chisel or hammer and chisel to fracture the bonded, damaged area at the glue line. Remove the panel or panels and grind or sand to remove the cured adhesive. It is not necessary to remove all the cured adhesive. Only remove enough to allow the new panel or panels a good fit.
3. Use a mild solvent and clean rag to wipe the area to be bonded so that it is free from dirt and other contaminants.

INSTALLATION

1. Get the new panel(s) ready. Drill all holes and fit the pieces to the damaged area.
2. Mix Thomas epoxy per instructions.

   Note: Epoxy is available in three sizes.
   P/N TBB 68000241 - 39 Linear ft.
   P/N TBB 68000242 - 85 Linear ft.
   P/N TBB 68000243 - 152 Linear ft.

   As part of the accepted industrial hygiene practices, protective gloves are recommended when working with adhesive. Overexposure can result in skin sensitization.

3. Apply a 1/4" to 3/8" bead of the epoxy on all previously bonded areas of the replacement piece.
4. Insert replacement piece and fasten in place with rivets or screws. This should also squeeze out a small bead of epoxy, about 1/8" in diameter, along each edge of the new bonded joint. When all riveting is completed, remove this excess by running the corner of the putty knife along the joint edge. Remove the remaining adhesive while wet with suitable solvent. Discard all unused epoxy in a safe receptacle. Wash your hands with a good waterless skin cleanser and keep the epoxy away from the eyes and face.
5. Prime and paint the new panels using your regular procedures. Allow the epoxy to "set up" overnight before driving the bus any distance or subjecting the new joints to any force or vibration.

Air or Electric Stop Arms/Crossing Arms

All stop arms and crossing arms, air or electric, draw from the on-board chassis air or electrical system. The connection to the chassis system should never be changed since it is located so that a defective stop arm/crossing arm could never deplete an air brake, brake system, or short the electrical system. The plumbing or wiring varies widely for different makes of chassis. Problems may occur with leaks or shorts in this plumbing or wiring.

Stop arm/crossing arm assemblies are purchased as a kit, with many different kits available with blades to meet all state requirements. The assembly is attached to the outside of the body or bumper with sheet metal screws. This assembly requires occasional cleaning and lubrication of moving parts.

Stop arms/crossing arms are most commonly operated by a manual switch mounted in the switch panel.

For air controlled arms, the switch activates an electric solenoid valve controlling the flow of air. Optionally, the solenoid valve may be activated by the warning lamp system or a switch in the header above the entrance door.

Electrically controlled arms are completely self-contained. They may be activated by the warning lamp system, a switch in the driver's area or a switch in the entrance door.

Drivers should be familiar with the function and proper operation of the stop sign arm.

Spare Tire Carrier (Opt.)

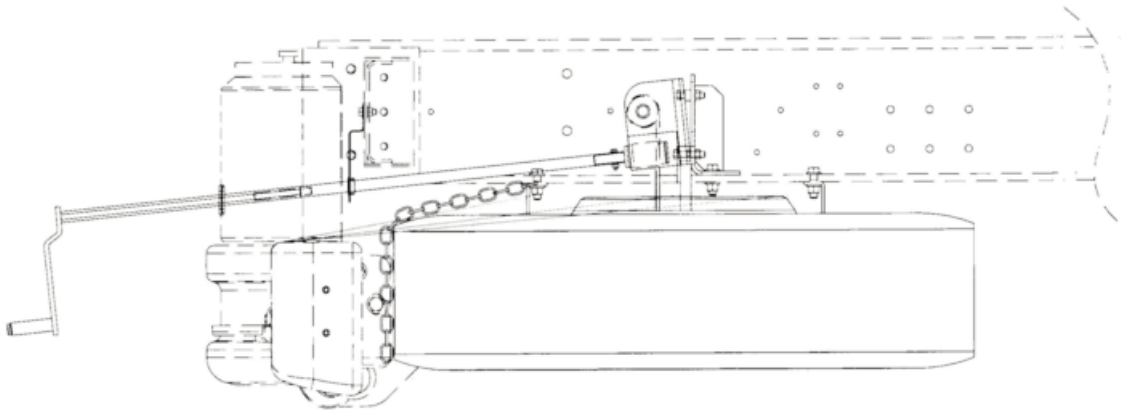
The spare tire carrier on the coach is located behind the front bumper. There is a hole located in the front body panel for the crank handle to be inserted through.

Use the following procedure to remove the spare tire from the carrier:

1. Locate crank handle in the operator's compartment.
2. Remove safety/security chain and remove safety pins from rods.
3. Place crank handle on crank rod.
4. Release and hold safety latch while cranking counterclockwise to lower tire to ground.
5. Remove tire from carrier bracket.

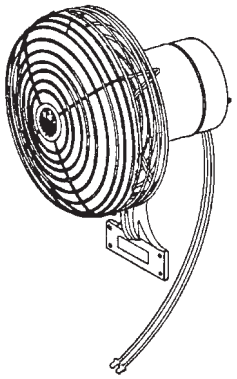
To reinstall the tire onto the carrier, use the following procedure:

1. Load tire onto carrier bracket.
2. Turn crank handle clockwise to raise tire. It may be necessary to "back-off" crank handle to engage safety latch.
3. Reinstall safety/security chain and safety pins. Verify security of safety/security chain.



DEFROSTER FANS (OPT.)

The defroster fans are used to help clear the windshield and driver's window. The fans run at either low or high speed. The fans must be cleaned and the fasteners tightened occasionally.



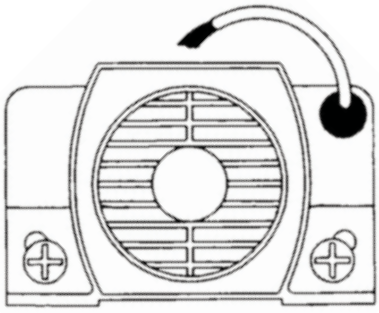
HUBODOMETER (OPT.)

Mounted right rear wheel. A mechanical and more accurate measure of miles traveled.

Calibrated to match diameter of tire. If changing tire size, unit may need to be changed.

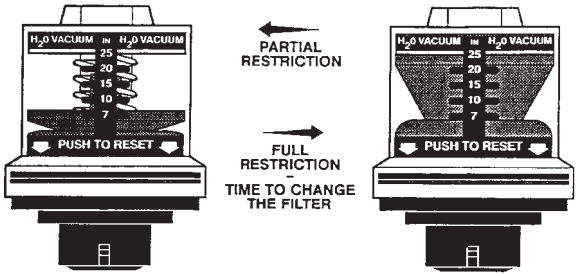
BACKING HORN & HEAVY DUTY BACKING ALARM (OPT.)

The backing horn or heavy duty backing alarm is mounted in the rear engine compartment and signals automatically when chassis transmission is placed in reverse. It is wired into the back up lights.



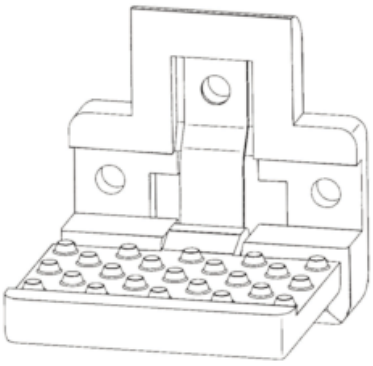
AIR RESTRICTION INDICATOR

The restriction indicator is a progressive locking type, mounted in the engine compartment. The air cleaner element should be changed when the maximum restriction is indicated on the gauge.



FOLDING STEPS ON FRONT BUMPER

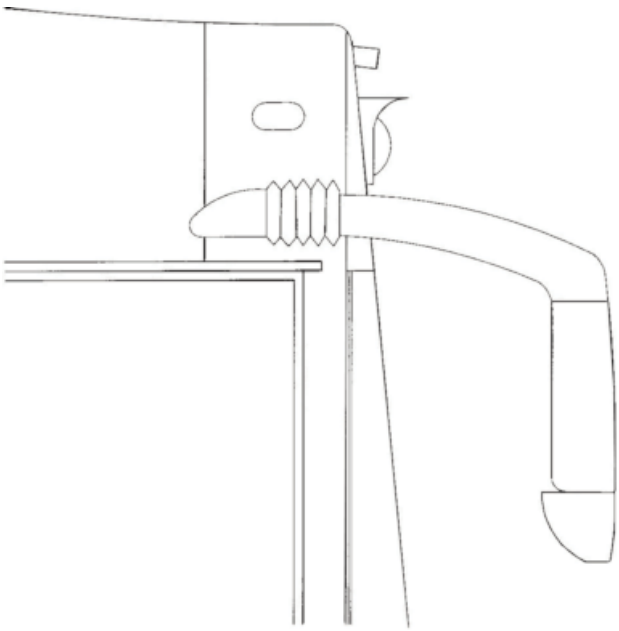
Folding steps mounted on the front bumper to assist in cleaning the windshield. The steps should be clean and lubricated.



ROSCO INTEGRATED STYLE MIRRORS, HEATED OR NON-HEATED

Rearview and crossview mirrors contained in a single assembly mounted from a single point on overhanging arms.

Heated lenses are activated by an ON/OFF switch located on the driver's switch panel.



COMPRESSED NATURAL GAS FUEL SYSTEM

General Description

NOTICE

The compressed natural gas (CNG) fuel system should be routinely inspected for gas leakage. Use a natural gas detector to check fuel cylinders, fuel filtering and regulating mechanisms, and fuel lines. Replace leaking fuel cylinders; repair or replace any lines, devices, or connections that are leaking.

CNG is made by compressing natural gas to less than 1% of its volume at standard atmospheric pressure. When vaporized at ambient temperatures, natural gas is less dense than air, and it will rise and disperse. Cold atmospheric conditions may prevent natural gas from disbursing quickly when released in large amounts.

Natural gas is nontoxic, but can cause asphyxiation at high enough concentrations simply by excluding adequate oxygen to sustain life.

Commercial CNG normally contains an odor-producing chemical. However, a natural gas detector is recommended for leak checking.

For natural gas to burn, it must first vaporize, then mix with air in the proper proportions (flammable range is 5 to 15% by volume in air), and then be ignited.

The CNG fuel system consists of:

- Fuel cylinders that store CNG at high pressure
- Pressure relief and manual fuel shutoff valves
- A filling connection with a check valve that prevents the gas from flowing back out of the fuel filling line
- a high-pressure fuel filter
- A pressure control regulator that reduces the high fuel cylinder pressure to the lower pressure needed for the engine
- A gas-air mixer to produce a flammable mixture for the engine
- A dash-mounted fuel gauge that indicates the available fuel supply in the cylinders

Related Information and Websites

Information about Cummins CNG engines can be accessed at: Cummins Westport-
http://www.cumminswestport.com

The following documents and websites provide additional information about CNG and CNG fuel systems:

- NFPA 52 *Vehicular Gaseous Fuel Systems Code, 2010*: **www.nfpa.org**

- Society of Automotive Engineers *recommended Practice for Compressed Natural Gas Vehicle Fuel:* **standards.sae.org/j1616_199402/**

- Compressed Gas Association:
www.cganet.com

COMPRESSED NATURAL GAS FUEL SYSTEM (CONT'D)

Safety Precautions

WARNING

Compressed natural gas is highly flammable. Failure to observe the following precautions could lead to the igintion of the natural gas, which could cause severe bodily injury, death, or property damage.

Whenever gas is smelled, immediately shut off all engines and ignition sources. Avoid causing sparks, and stay away from arcing switches and equipment. Extinguish cigarettes, pilot lights, flames, and other sources of ignition in the area and adjacent areas. Immediately provide extra ventilation to the area. Do not start any equipment until the gas leak is corrected and the area cleared of natural gas.

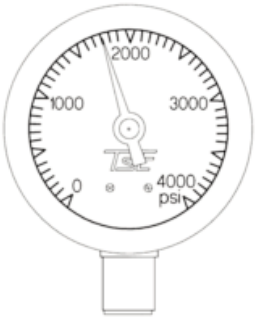
Periodic inspections of the compressed natural gas (CNG) fuel cylinders are required by law to ensure continued safety. Each fuel cylinder should be visually inspected at specified intervals for external damage and deterioration. See the Saf-T-Liner HDX Service Manual for inspection schedule information.

If a cylinder receives an impact or has deep scratches or gouges, it should be inspected before refilling. The inspection should be performed by a qualified person, in accordance with the manufacturer's established inspection criteria and Compressed Gas Association procedures.

Always us a natural gas detector to check for leaks.

FUEL PRESSURE GAUGE - ENGINE COMPARTMENT (CNG)

High pressure gauge (0-4000 PSI) installed in the fuel line upstream from the regulator. Located to be visible when the fuel fill door is open.

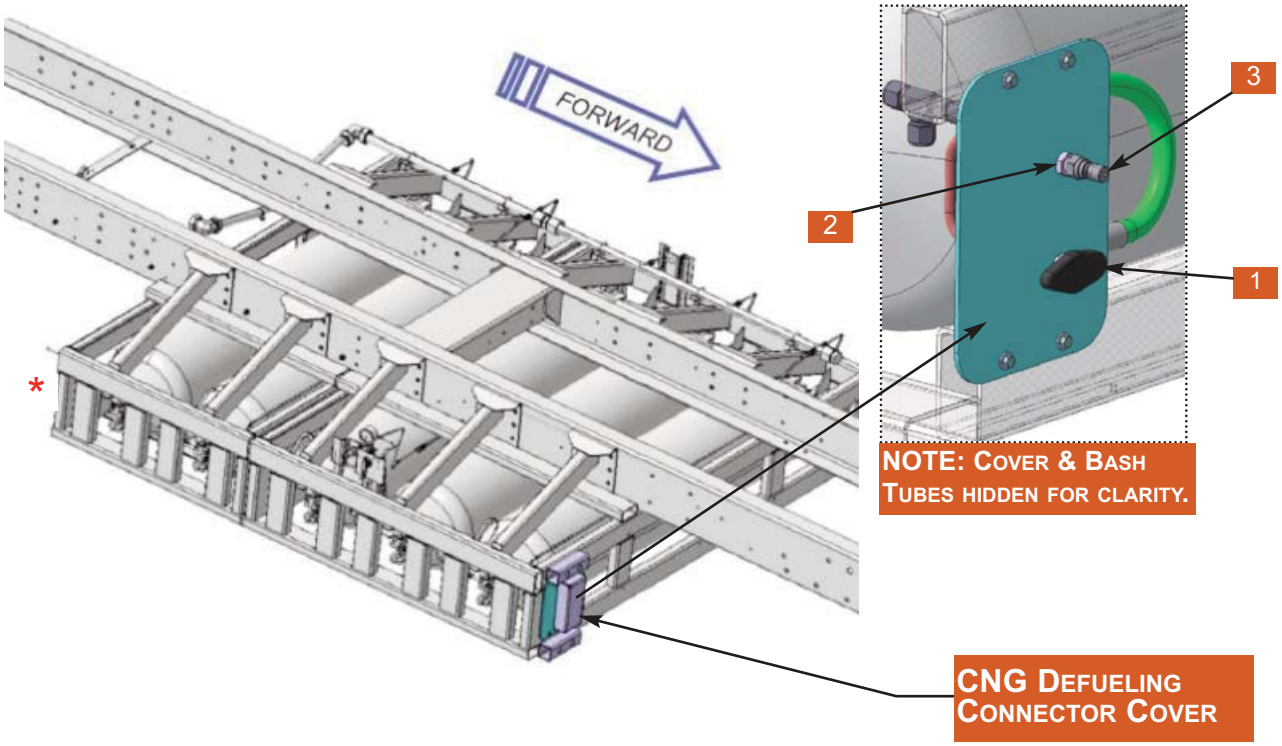


CNG DEFUELING CONNECTOR COVER CNG FUEL WITH AN AGILITY FUEL SYSTEM

The CNG Defueling Connector Cover is located front of the fuel tanks, right side of the fuel cage.

NOTICE

The defueling port on the 4-tank system is backside of the fuel tank on the passenger side. *



1. BALL VALVE, 3-WAY
2. BULKHEAD CONNECTOR
3. QUICK COUPLING NIPPLE

INSTRUCTION LABEL FOR TRANSFERRING/DEFUELING CNG

Transfer fuel:

A. Block the wheels on vehicles.
B. Shut off engine.
C. Turn off battery disconnect switches.
D. Note fuel pressure on high pressure gauge. (CNG tank pressure)
E. Turn the 3-way defueling valve handle to the "Vent" position.
F. Connect the CNG fuel transfer hose to vehicle.

1. Carefully attach the transfer hose to the fuel connections on the receiving tank. You are now ready to transfer gas out of the vehicle.
2. Slowly turn the 3-way valve from the "Vent" position to "Defuel" position.
3. Adjust this flow to a steady flow rate. Too fast of a flow rate will cause the system to freeze up.
4. When the gas starts flowing, verify the gas pressure gauges of both vehicles and receiving tanks. Both CNG tank pressure gauges should equalize.
5. Turn the 3-way valve on the vehicle from the "Defuel" position to the "Vent" position and disconnect the hose from the fuel connection on the receiving tank.

CAUTION

Fuel pressure in hose will vent through the defuel valve on vehicle.

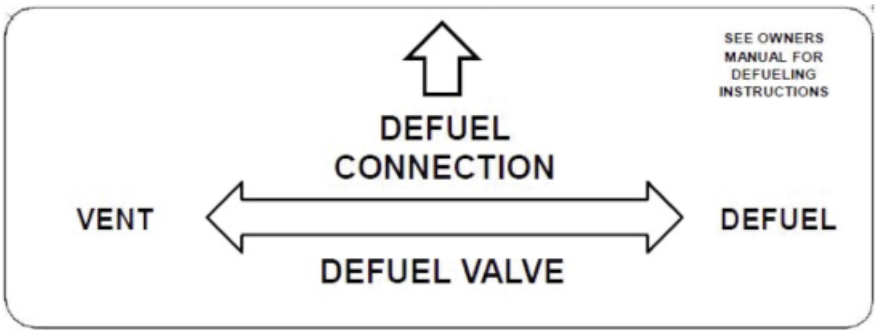
6. Disconnect fuel hose from vehicle.

Removing all fuel from a vehicle (without using facility defuel stack):

7. Repeat steps 1-6 above with multiple tanks until CNG tank pressure is below 500 PSI on the vehicle. (Approximately 7 gallons of fuel remains at 500 PSI.)
8. Keep wheels blocked, turn on battery disconnect switch and start engine.
9. Operate engine at high idle until the engine stalls (may take several hours). Verify that the CNG tank pressure gauge reads zero after engine stalls. Ensure that engine will only crank but not start.
10. Turn off battery disconnect switch.

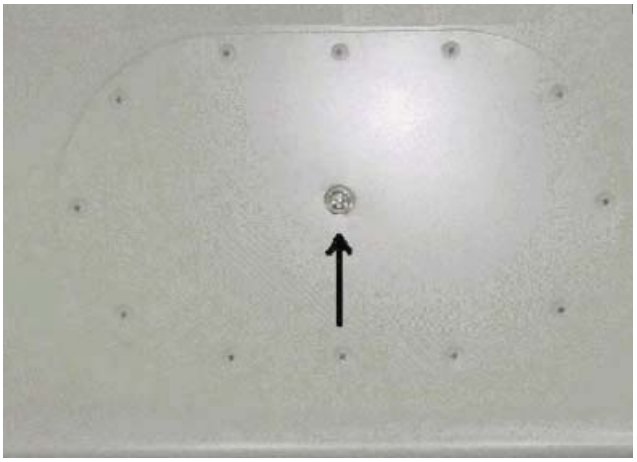
WARNING

The CNG fuel system operates at pressures up to 3600 psi (24831 KPa). A sudden release of Compressed Natural Gas can cause serious injuries if it contacts the skin or eyes. Always wear protective clothing, gloves and eye protection when handling Compressed Natural Gas.



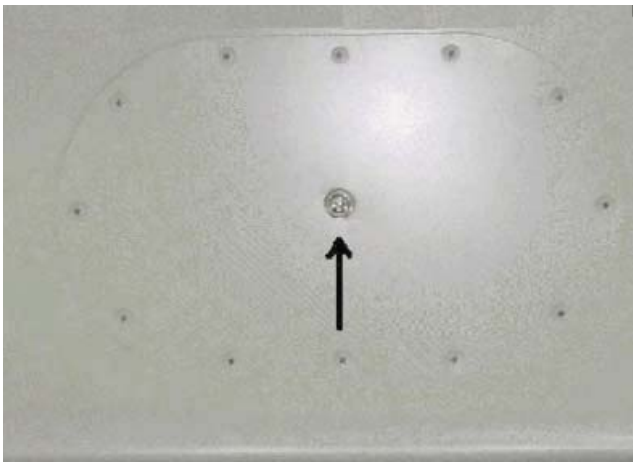
Passenger Advisory System - Buzzer Activation - Option B2001-00-000

- Control module mounted in driver's area activates emergency exit buzzer after driver shuts off ignition switch.
- Includes pilot light on the switch cabinet with an information label with the following wording, "PERFORM POST-TRIP INSPECTION, DISABLE ALARM AT REAR OF BUS".
- Buzzer sounds in drivers switch cabinet area when driver shuts off ignition switch.
- When buzzer sounds a pilot light labeled "POST TRIP INSPECTION", will flash on switch panel.
- To deactivate system driver must walk to back of bus and press reset switch mounted on rear interior hood.
- Montgomery County, Maryland specification



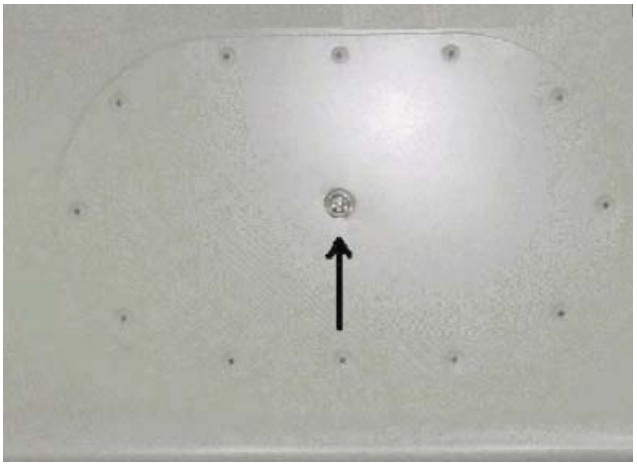
Passenger Advisory System - Horn Activation - Option B2001-02-000

- System is activated when warning light system has been activated and driver shuts off ignition switch.
- The interior lights will come on at this time for added visibility.
- If driver attempts to open front door (manual or air) without deactivating system the horn will sound.
- On air doors, horn will sound even if driver turns air door emergency release valve to Emergency Exit.
- To deactivate system, driver has to make sure front door switch is in the closed position. If it's an air door, make sure "Door Switch" on electrical panel is off and the release valve is in the "Normal" operating position.
- With the ignition key off, driver must then walk to the back of the bus and press reset switch mounted on rear interior hood. When you press switch, hold in until you see the dome lights flicker off and on.
- The dome lights will stay on for about 30 seconds and then go off.
- Driver is then able to exit the bus.
- LED light on the switch panel indicates when the system is armed.
- West Virginia specification



Passenger Advisory System - Buzzer Activation - Option B2001-03-000

- Bus scan child reminder system.
- Buzzer on control module will sound when the driver shuts off the ignition switch.
- The driver has 60 seconds to walk to the rear of the bus and press the reset button mounted on the rear interior hood, or the horn will activate.
- The system is deactivated when reset switch is pressed.
- Control module has a LED light to indicate when the system is armed.
- The driver is able to exit the bus after deactivating the system.



Passenger Advisory System - Horn Activation (Check Mate) - Option B2001-04-000

- System is activated when driver turns on ignition and starts the vehicle.
- An audible alarm buzzer will sound for a few seconds, and then the horn sounds, alerting that the system is activated.
- Control module mounted in driver's area activates when the warning light system has been activated and driver shuts off ignition switch.
- The driver must then turn the ignition key back on, walk to the back of the vehicle, and press the deactivation switch for at least one (1) second for the system to deactivate properly. This switch is mounted on the rear interior hood, above rear door.
- A deactivation signal (a rapid chirping noise) will sound, indicating that the system has been successfully deactivated.

Passenger Advisory System - Horn Activation (Check Mate) - Option B2001-05-000

- System is activated when driver turns on ignition and starts the vehicle.
- An audible alarm buzzer will sound for a few seconds, and then the horn sounds, alerting that the system is activated.
- Control module mounted in driver's area activates when the warning light system has been activated and driver shuts off ignition switch.
- The driver must then turn the ignition key back on, walk to the back of the vehicle, and press the deactivation switch for at least one (1) second for the system to deactivate properly. This switch is mounted on the rear interior hood, above rear door.
- A deactivation signal (a rapid chirping noise) will sound, indicating that the system has been successfully deactivated.
- LED light on switch panel indicates when the system is armed.
- System configured to conform to California's escort law:
  - Allows driver to engage warning lights without depressing the child reminder button at rear of the bus.

Passenger Advisory System - Buzzer Activation - Option B2001-07-000

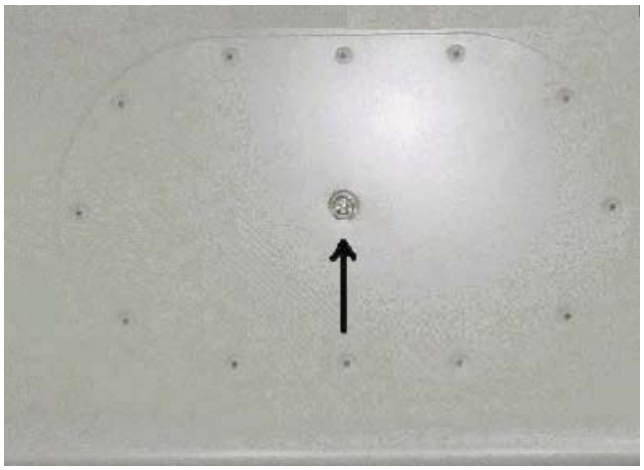
- Bus scan child reminder system.
- Control module mounted in driver's area is activated after warning have been activated.
- Buzzer on control module will sound when the driver shuts off the ignition switch.
- The driver has thirty (30) seconds to walk to the rear of the bus and press the reset button mounted on the rear interior hood, or the horn will activate.
- The system is deactivated when reset switch is pressed.
- Control module has a LED light to indicate when the system is armed.
- The driver is able to exit the bus after deactivating the system.
- Michigan SBO/APT Aggregate specification
- Model BS-100SA

Passenger Advisory System (Horn Activation) Option B2001-12-000

- Passenger Advisory System is activated when the Red Warning Lamps are used the first time. Once the route is complete, and the ignition is turned off, the Pilot Lamp on the dash lights as well as the Passenger Dome Lamps. The driver then has 60 seconds to check the bus for passengers and press the button at the back of the bus. When the button is pressed, the passenger dome lamps flash 2 times and the Pilot Lamp cuts off. The driver can now leave the bus. If the system is not disarmed than the horn will start blowing. When this happens the driver must go to the front and turn the ignition back on, the off and then return to rear of the bus to press button to deactivate.
- **Time to alarm:** 60 seconds.
- **Type of alarm:** Chassis horn.
- **System Activation:** When Red Warning Lamps are used for first time.
- **Alarm Indication:** Interior Lamps are turned ON.
- **Location of Deactivation Switch:** Rear bulkhead.
- **Confirmation of Deactivation:** Pilot Lamp and Dome Lights - ON. If not disarmed within 1 minute, chassis horn will blow.
- **Operation without Deactivation:** Buzzer and Pilot Light - ON.
- **Dome Light:** Yes - Approximately 30 seconds.
- **Pilot Light Location/Operation:** LED Pilot Light located in switch cabinet lights steady upon system activation.
- **Labeling:**
  "PASSENGER CHECK REMINDER SYSTEM". Located at Pilot Light on switch cabinet.
- **Air or Electric Door:** Covers the Air Door or Electric Door.

NOTICE

Must also order option: B5020-00-000 Air Entrance Door Wired to Ignition.



This section provides the operator with important information about bus maintenance. Proper bus maintenance is essential to ensuring bus reliability and dependability. Proper maintenance should start with a good preventive maintenance program. Periodic inspections by qualified personnel are the key to eliminating costly and expensive failures and downtime.

The following are minimum preventive maintenance inspections that should be performed as shown on the forms or more often as operational and climatic conditions dictate.

ELECTRICAL CIRCUIT PROTECTION

The electrical system is protected from overload damage by fuses. Should an electrical component fail to operate, check the appropriate fuse.

⚠ WARNING

Always replace a fuse with the same rating as specified. Never replace with a higher amperage rating because severe wiring damage and possible fire can result.

Fuses that open (blow) must be replaced. They will continue to blow until the cause of the overload condition is corrected. If a fuse needs to be replaced, use only a new fuse, rated according to specifications.

⚠ WARNING

Any addition of accessories which exceed the capacity of the electrical system, or any modification of the system - such as bypassing a fuse, could cause premature failure of electrical components. Any such addition of accessories, or modifications may affect your rights under the warranty.

ELECTRICAL WIRING SCHEMATIC

A wiring schematic for the vehicle is mounted to the inside surface of the electrical compartment door located below the driver's window. this shows the basic wiring for the vehicle.

HEATING SYSTEM

All heaters have removable aluminum filters. These filters prevent debris from accumulating on the heater core and causing inefficient heat transfer. Use an air hose to remove all foreign material from the filters every 30 days.

NOTICE

The fan motors and heater core are on slide-out trays which are serviceable from the front center exterior access panel. The filter is located behind the filter cover plate, directly below the heater core.

Check the condition of all hoses to the heaters as well as the tightness of the hose clamps. The heater hoses should not be kinked.

All heater hose clamps should be tightened after 30 days.

When system coolant is replaced, it is important to bleed all air from the heater units.

NOTICE

Silicone hoses require special constant torque clamps.

For fill procedures see *Heater/Coolant Fill Procedures* in this section.

WASHING

For the first 30 days, wash the bus only with clean water. Do not use a high pressure hose or detergent during this period. Operating conditions will dictate washing frequency. Special attention must be given to removing salt deposits when bus is operated in areas that use salt. Failure to do so may cause serious damage to sheet metal and painted surfaces, which could invalidate your warranty.

NOTICE

When cleaning areas containing electrical components and connections, take care to protect these items from water instrusion. When using a pressure washer to clean these areas, use the lowest possible setting.

WAXING

Waxing is recommended to eliminate any weathered appearance. A good automotive wax may be applied after the first 30 days of service. Annual waxing should be standard procedure for additional corrosion protection, longer paint life, and to maintain your current warranty status.

FLOOR COVERING

Cleanliness is important to you and your passengers, and will give you longer floor life. Allowing dirt and other abrasive materials to accumulate on the floor will shorten the life of the bus floor covering. Daily sweeping and cleaning is recommended. Do not use floor sweeping compounds as it may cause floor covering to separate or lift from the floor. The recommended sweeping procedure is to start in the front of the body and sweep toward the rear and side emergency door. This method ensures a check of emergency door operations and ensures removal of dirt, pencils, etc., which cause the emergency door to improperly seal. Do not use harsh detergents and excessive amounts of water. Mop with a mild soap solution, then remove excess water.

Oil and grease quickly deteriorate the floor covering. Remove as soon as possible.

Wax floor occasionally for best appearance and floor life. Use of a non-skid-type floor wax is suggested.

To renew the luster and close the pores of the floor covering after extended use, mix 10% Clorox or commercial bleach to 90% water and mop the floor.

FLOOR (UNDERNEATH BUS)

Accumulations of mud, snow and road salts should be removed with a high pressure hose. Follow this procedure at intervals of 30 days to 6 months, depending upon your operation and environmental conditions.

This cleaning procedure will also give you the opportunity to make an efficient check of your mounting clips and bolts. Mounting clips and bolts should be inspected for secure fit every thirty days.

Excessive amounts of chemicals, salt and other snow and ice controls materials add to the deterioration of metal on all vehicles on our highways and roads today. We suggest using the guidelines in our service manual relating to preventive maintenance of the underside of the floor.

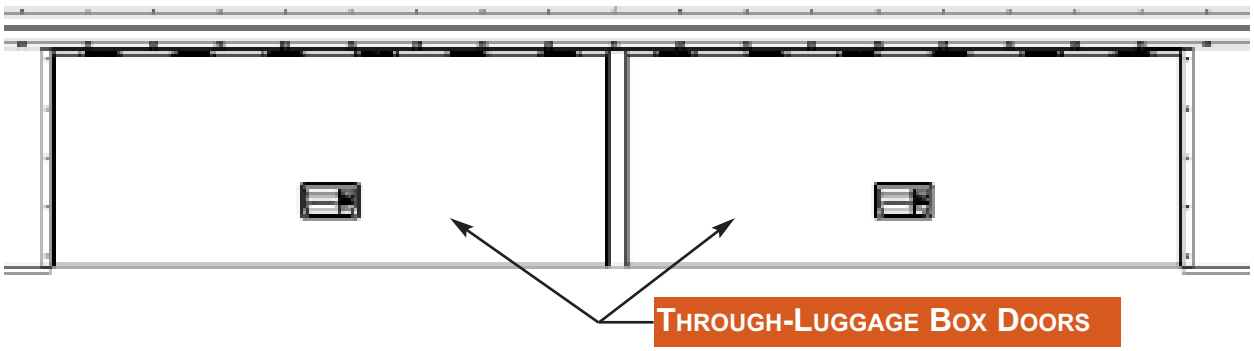
As an added method, you should clean the entire underside of the floor of all foreign elements annually and re-undercoat if chemical action is apparent, or separation of undercoat to body floor is visible. Climatic and operating conditions should dictate if underfloor inspection should be performed more often.

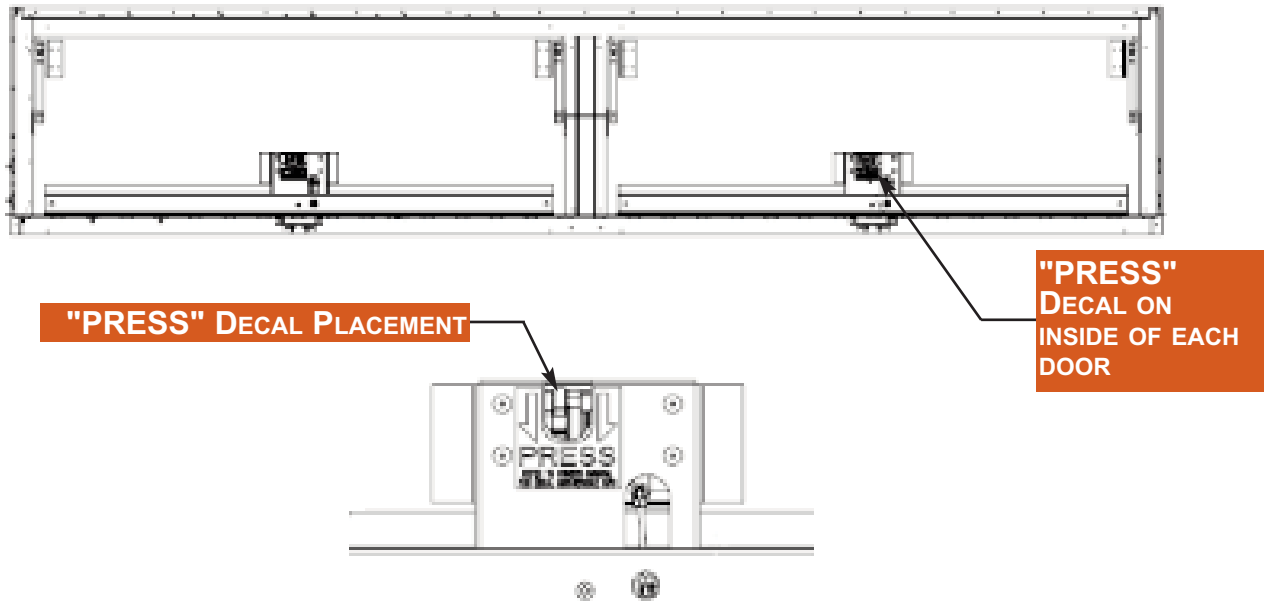
NOTICE

When cleaning areas containing electrical components and connections, take care to protect these items from water intrusion. When using a pressure washer to clean these areas, use the lowest possible pressure setting.

LUGGAGE BOXES

Through-luggage boxes on the HDX will include the following photoluminescent "PRESS" decal. This decall should be replaced every ***five years***.





TOUCH-UP

Retouch damaged areas as soon as possible to benefit bus appearance and control corrosion. Exposed metal quickly corrodes and repair may develop into a major expense. Your Thomas dealer may be your paint source.

TIRES - GENERAL INFORMATION

Tire size and inflation pressures are recorded on the bus certification plate. For greater riding comfort, prolonged tire life, and to reduce wear and tear on the bus, the tires should be inflated as specified.

When checking tire inflation pressure, it is important to use an accurate gauge and check the pressure when the tires are cold. Cold inflation pressures must not exceed the recommended pressure specification. Exceeding this pressure specification will exceed the design capability of the tire.

Before driving each day, glance at all tires. If one looks lower than the others, have the pressure of all tires checked. Otherwise, check pressure every few weeks. Check spare tire regularly.

When loading your vehicle, the weight on each axle should be evenly distributed so that the weight on any wheel does not exceed 1/2 the GAWR (Gross Axle Weight Rating) for the axle on which that wheel is mounted.

Inspect the tire side walls for cuts, bruises, and other damage. If internal damage to the tire is suspected, have the tire dismounted and inspected for need to repair or replace.

NOTICE

Post break-in alignment, check should be done between 15,000 - 30,000 miles, but no later than 90 days after first in-service and again 12-18 months.

TIRE AND WHEEL REPLACEMENT

DANGER

When working on the vehicle, shut down the engine, set the parking brake, and chock the tires. Before working under the vehicle, always place jack stands under the frame rails to ensure the vehicle, always place jack stands under the frame rails to ensure the vehicle can not drop. Failure to follow these steps could result in serious personal injury or death.

CAUTION

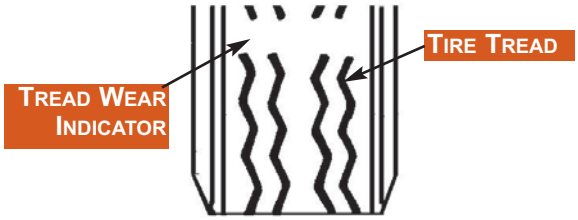
When you replace tires, use only tire and wheel combinations as recommended on the Certification Plate in the driver's area. Refer to this plate to help determine what type of tires your vehicle has. Make sure that all tires and wheels are of the same make, size, type, and load-carrying capacity. Never mix radial, bias belted, or bias type tires. Use only wheels recommended for the tire size selected. Replacement of tires with specifications (size, load ranges), and in some cases brands, other than what is specified, may result in a reduction of GAWR and GVWR.

Failure to follow these precautions can adversely affect the safety and handling of your vehicle.

CAUTION

Use of after-market wheel assemblies may not be compatible with your vehicle and may result in equipment failure and possible injury. A wheel of the wrong size or type may adversely affect load carrying capacity, wheel and bearing life, brake cooling, speedometer / odometer calibration, stopping ability, headlight aim, bumper height, vehicle ground clearance, steering stops, and tire or tire chain clearance to the body and chassis. Replacement with used wheels is not advised.

The use of wheels and/or tires with load carrying limits higher than the limits of the wheels/tires originally installed on your vehicle does not in itself increase the GAWR or the GVWR of the vehicle. Only wheel assemblies approved and released for your vehicle model should be used. Alterations to the vehicle suspension or steering can adversely affect vehicle handling and may lead to loss of vehicle control.



CHANGING TIRES

CAUTION

To avoid personal injury and/or property and equipment damage, call for expert tire service.

NOTICE

Use a clip-on chuck, and stand to one side of any tire you are inflating. Always use a tire inflation cage when inflating a tire that is not mounted on the bus. Do not inflate a flat tire and place bus into service. Have the flat tire checked and repaired (or replace the tire) before placing the bus into service.

NOTICE

***(For Stud Mounted Disc Wheels)* Lug nuts on the right side of the vehicle have right-hand (turn clockwise to tighten) threads and on the left side of the vehicle have left-hand (turn counterclockwise to tighten) threads.**

Use the following procedure for changing front tires:

1. Make sure bus is parked on a level surface if possible, and is not obstructing traffic.
2. Apply parking brake.
3. Place automatic transmission gear selector in neutral.
4. Shut down engine.
5. Turn on emergency flashers.
6. Block diagonally opposite wheel. Use "chocks" if possible to prevent bus movement.
7. Slightly loosen all 10 lug nuts.
8. Place jack underneath axle at spring pad. Make absolutely sure that jack sits on a firm, level surface. Close valve on jack by turning it clockwise.

WARNING

To minimize the risk of personal injury, do not put any portion of your body under the vehicle while the vehicle is supported by a jack. The jack is for emergency wheel and tire changing only.

CAUTION

***If* you wish to service the vehicle, use jack stands. Never start the engine while the vehicle is on the jack.**

9. Raise bus only to a height that permits tire removal.
10. Remove all 10 lug nuts.
11. Remove wheel and tire.
12. Install replacement wheel and tire by reversing steps 1-10. Reinstall lug nuts, hand tightening until snug.
13. Lower bus to ground by slowing turning valve on jack counterclockwise. Do not lower bus until all lug nuts are tight.
14. After wheels are on ground, tighten nuts as shown in the section entitled "Tightening Wheel Nuts", following procedure closely.
15. Return jack and all equipment to tool box.

Use the following procedure for changing the outside rear axle tire. A qualified tire service center should be contacted to change an inside rear axle tire due to the safety hazards involved.

1. Make sure bus is parked on a level surface and is not obstructing traffic.
2. Turn on emergency flashers.

(CONTINUED ON NEXT PAGE)

CHANGING TIRES *(CONT'D)*

3. Place a "run-up" block in front of inside rear axle tire.
4. Drive bus forward until inside rear axle tire is on top of chock.
5. Block diagonally opposite wheel. Use "chocks" if possible to prevent bus move-ment.
6. Apply parking brake.
7. Place automatic transmission buses in NEUTRAL.
8. Shut down engine.
9. Remove all 10 lug nuts.
10. Remove wheel and tire.
11. Install replacement wheel and tire by reversing steps 1-9. Reinstall lug nuts, hand tightening until snug.
12. Drive bus down block. Do not drive bus down block until all lug nuts are tight.
13. After wheels are on ground, tighten nuts as shown in the next section, "Tightening Wheel Nuts". Follow procedure closely.

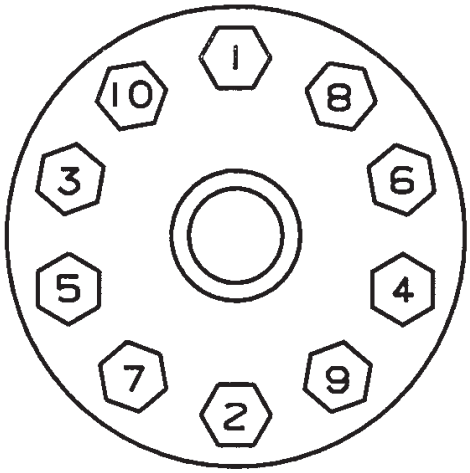
Hub Mounted Disc Wheels

Mounting Instructions:

CAUTION

All parts must be clean, free of rust, dirt or excessive paint.

1. Position the inner wheel over the studs being careful not to damage the threads.
2. Position the outer wheel over the studs being careful not to damage the threads.
3. Install the flange nuts and tighten to 50 ft/lbs. in the sequence shown. Then tighten to full torque using the same sequence.



Thread Size	Torque
Flange Nuts M22 x 1.5	450-500 ft/lbs.

4. On two piece flange nuts, apply a drop of oil between the nut and the washer and on the threads of the nut. Do not get lubricant on the mounting face of the drum or wheel.

CAUTION

Insufficient torque can cause stud breakage and damage. Over torque can over stress the studs and strip the threads.

NOTICE

5. **After the first 50 to 100 miles of service the flange nut torque should be retightened to 450-500 ft/lbs.**
6. Make sure the surface on the disc wheel, which is contacted by the flange nut, is flat.
7. Disc wheel mounting surfaces should not have more than 1 1/2 Mil. thickness of paint. Excessive paint thickness can cause loose disc wheels.

TIGHTENING WHEEL NUTS

Before tightening the wheel nuts, the following points should be understood:

NOTICE

(For Disc Wheels) **Lug nuts on the right side of the bus have right-hand (turn clockwise to tighten) threads and on the left side of the vehicle have left-hand (turn counterclockwise to tighten) threads.**

For rear axle wheels, make sure the valve stems are 180° apart (1/2 turn) to facilitate inflating and checking tires.

Never apply grease or oil to wheel studs or nuts.

Use a torque wrench to tighten nuts. Re-torque wheel nuts every 1000 miles (1600km).

Use the following procedure for tightening disc type wheels:

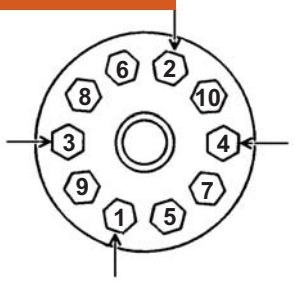
1. Install all 10 wheel nuts loosely.
2. Finger tighten only the nuts indicated by arrows in the illustration below.
3. Torque all wheel nuts to 450-525 ft/lbs. (608-798 Nm).

CAUTION

The presence of rust streaks emanating from the lug nuts is evidence of the lug nuts not being torqued to specification. Failure to correct this condition will lead to damaged wheels or rims, and can result in the loss of wheels involved if permitted to operate in this condition for any extended period of operation.

If your vehicle is equipped with a spare tire, check the spare tire inflation pressure at the same time as the other tires. The spare tire and wheel should be of the same size and quality as the others on your vehicle.

10 BOLT DISC WHEELS



WHEEL INSPECTION AND MAINTENANCE

CAUTION

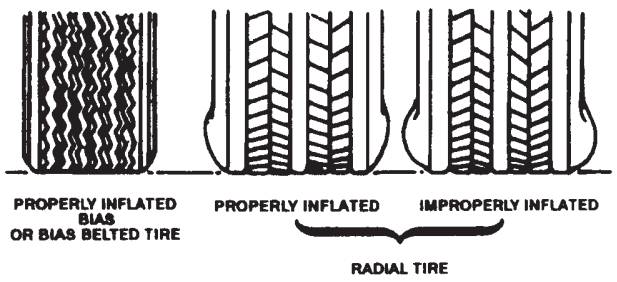
Whenever a wheel is removed and then reinstalled, always remove any corrosion that might be present on the mounting surface of the wheel and/or the surface of the hub, drum or rotor that contacts the wheel.

Installing wheels without good metal-to-metal contact at the wheel mounting surface can cause the wheel lug nuts to loosen and could allow the wheel to come off while the vehicle is in motion, causing loss of control.

MOUNTING & DISMOUNTING TIRE

CAUTION

When remounting and inflating a tire, use only appropriate equipment and adhere to prescribed safety precautions to avoid damage to the tire and possible injury to yourself. If you are not properly equipped or experienced in this work, take the tire to a tire repair shop.



LUBRICATION CHARTS

The following information has been extracted from the service manuals of manufacturers providing components for Thomas Built Buses. All manuals supplied with the Thomas Maintenance Manual should be studied as they contain additional lubrication and maintenance information.

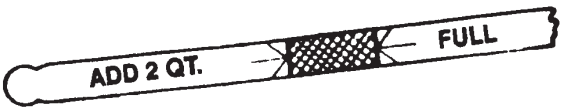
ENGINE OIL CAPACITY AND CLASSIFICATION		
ENGINE	OIL CAPACITY	RECOMMENDED LUBRICANT
	WITH FILTER ONLY	SEE MANUFACTURER'S RECOMMENDATIONS FOR APPROVED LUBRICANT AND VISCOSITY.
CUMMINS ISB	16 QTS. (15.1 L)	
CUMMINS ISL	26 QTS. (24.6 L)	
CUMMINS ISLG	*25 QTS. (23.8 L)	
DD8	16 QTS. (15.1 L)	

*** MUST MEET CUMMINS CES 20074**

ENGINE OIL

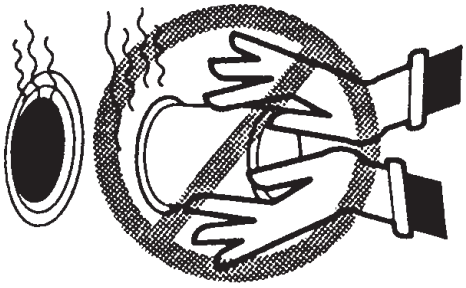
It is normal to add some oil between oil changes. Check your engine oil level before start-up or while refueling, or at least every 500 miles (800km). To check the engine oil level, park your vehicle on level ground and turn engine off. Wait a few minutes for oil to drain back to oil pan. Protect yourself from engine heat, then pull out the dipstick. Wipe it clean and reinsert fully. Pull the dipstick out and check level. Keep the oil level above the ADD mark on the dipstick by adding oil as required. DO NOT OVERFILL.

Change engine oil and filter according to the Engine Manufacturing Maintenance Schedule.



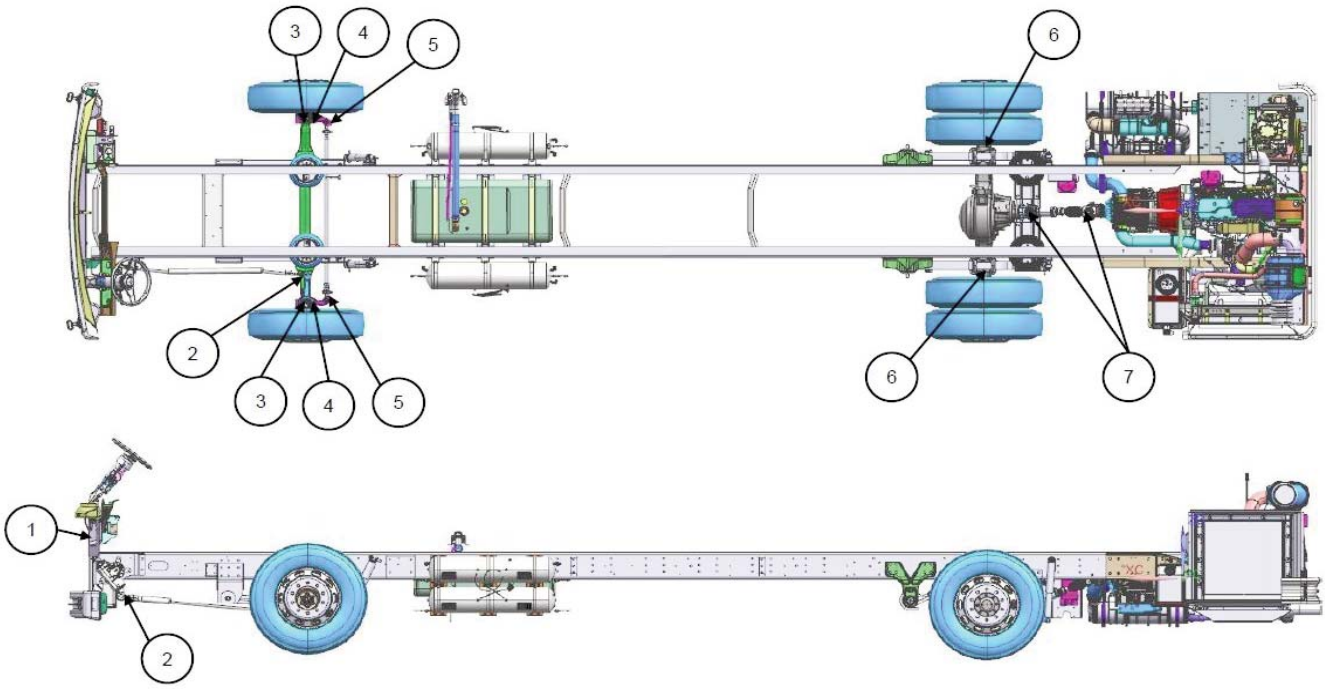
CAUTION

Do not handle a hot oil filter with bare hands.



Refer to the Engine Manufacturing Maintenance schedule for Changing Engine Oil and Filter and Engine Oil Viscosity.

LUBRICATION POINTS



ITEM NO.	DESCRIPTION	QUANTITY	LOCATION
1	STEERING COLUMN	2	SLIDE SHAFT & BOTTOM UNIVERSALS
2	DRAG LINK	1	EACH END
3	FRONT AXLE AUTOMATIC SLACK ADJUSTER	2	EACH SIDE OF CHASSIS
4	KING PINS	2	EACH SIDE OF CHASSIS
5	TIE ROD	1	EACH END
6	REAR AXLE AUTOMATIC SLACK ADJUSTER	2	EACH SIDE OF CHASSIS
7	DRIVE SHAFT	1	EACH END & SLIP JOINT
NOT SHOWN	CLUTCH RELEASE BEARING (OPT.)	1	WITH MANUAL TRANSMISSION (OPT.)
NOT SHOWN	MECHANICAL FAN FLUID (MOBILE DELVAC SYNTHETIC 75W-90, 14OZ.)	1	ENGINE COMPARTMENT

GENERAL LUBRICATION NOTES

The following notes are helpful when performing lubrication procedures on the bus. These notes apply to the Lubrication Location Chart.

- Clean grease fitting (before lubricating component) with dry, clean towel.
- Lubricate at each point every 3000 miles (4800km) or monthly with lubricant to meet MIL-L-2105.
- Adjust service interval as necessary for local conditions.
- The front axle is a sealed knuckle type. However, it is recommended that the vehicle be lifted, taking the weight off the front axle.

Wheel Bearings - Grease Packed/Lubricated

- Lubricate every 12000 miles (19200km)
- Soap Type - Calcium Sulfonate
- Consistency - NLGII No. 2
- Corrosion and Oxidation Inhibitors
- Base Oil Solvent Refined Petroleum Oil
- Base Oil Viscosity at 210°F (99°C): 75 SUS
- Pour Point: +10°F (-12°C)

Pack the grease by hand, forcing the grease into the cavities between the rollers and cage from the large end of the cone. Pack the wheel or hub cavity between the bearing cups with grease to the level of the smallest diameter of the cups.

WHEEL BEARINGS - OIL LUBRICATED

Use only gear type oil.

- Base stock from solvent refined, high viscosity-index petroleum oil
- Corrosion and oxidation inhibitors
- Extreme pressure (EP) additive
- Pour Point -10°C (14°F) Maximum

Generally use SAE 90 viscosity oil which meets or exceeds API GL-5 requirements.

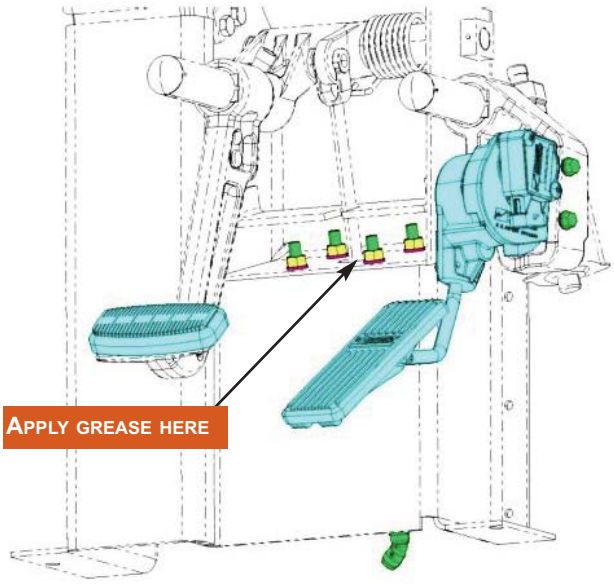
For extreme cold weather use SAE 80W and for hot climates use SAE 140.

Oil lubricated bearing in lieu of grease packed wheel bearing used with Stemco brand hubcaps should be checked for lubrication every 3000 miles (4800km) or monthly.

AXLE	CAPACITY (EACH WHEEL)	LUBRICATION TYPE
AAC/DANA		
13.3K & 14.7K	4 OZ.	GREASE: RETINAX LC 2. NLGI 32
13.3K & 14.7K	1 PT.	SYNTHETIC SAE 75W - 90
13.3K & 14.7K	1 PT.	SYNTHETIC SAE 80W - 140
13.3K & 14.7K	1 PT.	ORGANIC SAE 80W - 90, MIL-L 2105D, API GL-5 & MT -1

BRAKE PEDAL PLUNGER

Apply Lithium Grease (TBB 61391010) or equal between brake and valve plungers, as well as light coating in steering shaft insulation hole, annually.



BRAKE SYSTEM

The bus is equipped with a dual brake system that consists of separate systems for the front axle and rear axle service brakes. The complete brake system should be checked at regular intervals for valve leaks, condition of air lines, compressor governor adjustment and brake adjustment.

Check the brake system for leaks according to the following procedure:

1. Run engine to build up system pressure to governor cut-off of 115-125 psi (79-86 kPa).
2. Shut down engine and release service brakes.
3. Observe brake air system gauge on dashboard. Pressure drop should not exceed 20 psi in 10 minutes.
4. Apply service brakes.
5. Observe brake air system gauge on dashboard. Pressure drop should not exceed 3 psi per minute.
6. Leakage above limits requires a complete system inspection and immediate correction of cause.

BRAKE LUBRICATION

CAUTION

Care must be exercised when lubricating components near the brake lining. Overlubrication could cause the brake linings to become saturated with lubricant and impair their ability to properly stop the vehicle.

AUTOMATIC SLACK ADJUSTERS

WARNING

Manually adjusting an automatic slack adjuster to bring the pushrod stroke within legal limits is likely masking a mechanical problem. Adjustment is not repairing. Before adjusting an automatic slack adjuster, troubleshoot the foundation brake system and inspect it for worn or damaged components. Improperly maintaining the vehicle braking system may lead to brake failure, resulting in property damage, personal injury, or death.

POWER STEERING LUBRICATION

The lubricant used in this vehicle's power steering system is the medium by which hydraulic pressures are applied and relieved, under control, to effect steering assist. In addition, the oil lubricates moving parts and dissipates heat which reduces efficiency and accelerates wear.

Dexron III Oil is recommended. Change oil in the reservoir annually. Severe service requires mor frequent intervals.

! WARNING

Block the rear tires and apply the parking brake when filling the reservoir while the engine is running.

The power steering pump reservoir must be kept full and free of air. Run the engine and turn the steering wheel from side to side while filling the reservoir to its proper level.

A replaceable filter element is located in the power steering reservoir, which in the engine compartment. Change the filter element once a year or every 5000 miles.

Do not overfill. Make sure the iginition switch is OFF before checking the fluid level.

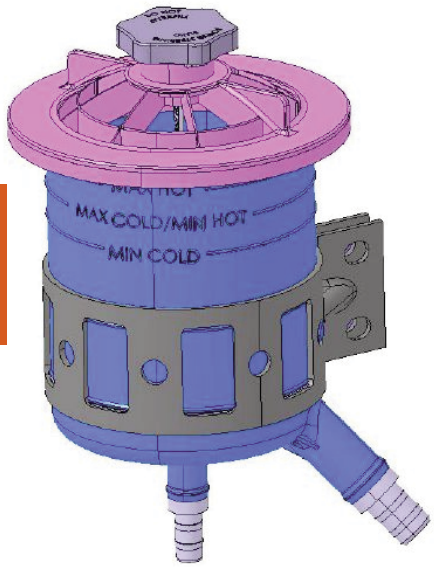
NOTICE

To avoid loss of reservoir cap and/or loss or contamination of fluid, be sure that the cap is properly installed

NOTICE

Flush the system with recommended fluids only. Do not mix oil types. Using mixed oils or any unapproved oil could lead to seal deterioration and leaks, which could ultimately result in the loss of power steering assist.

The level must be between the MIN COLD/MIN HOT, and never above MAX HOT.



TRANSMISSION FLUID - AUTOMATIC TRANSMISSIONS

The following procedure should be used when checking the transmission fluid in the automatic transmission:

1. Operate the transmission in a drive range until transmission oil reaches normal operating temperature of 160°-200°F (71°-93°C). The transmission oil must be warm to ensure a proper reading.
2. Shift through all drive ranges to fill the clutches and oil passages.
3. Park the bus on a level surface, shift transmission to NEUTRAL, and apply the parking brake. Allow engine to run at idle speed.
4. Wipe the dipstick clean and check oil level. The safe operating level is any level within the "add" and "full" range on the dipstick.
5. If oil is not within the range indicated in step 4, add or drain oil as necessary to bring the level near the full mark. Do not overfill - severe transmission damage results.

Overfilling - results in oil breakdown due to excessive heat and aeration from the churning action of the gears. Early breakdown of the oil will result in heavy varnish and sludge deposits that plug oil ports and build up on splines and bearings. Under these conditions, the transmission will overheat and severe damage will result.

Overheating - Extended operation at low road speeds with engine at full throttle can cause excessively high oil temperatures in the transmission.

If overheating is encountered, shift transmission to NEUTRAL and accelerate the engine to 1200-1500 rpm. This should reduce the sump temperature to normal operating range of 160°-220°F (71°-93°C).

⚠ CAUTION

The engine should never be operated for more than 30 seconds at full throttle with transmission in any gear and output stalled.

Oil Specifications - Use only TranSynd synthetic automatic transmission fluid. It is absolutely necessary that the oil is clean to prevent foreign material from entering the transmission.

Decal, TBB 61391004 to be installed on dipstick gauge.

THIS TRANSMISSION USES TRANSYND SYNTHETIC AUTOMATIC TRANSMISSION FLUID.

TO MAINTAIN OPTIUM TRANSMISSION PERFORMANCE REFILL WITH TRANSYND.

Approved Allison Transmission Lubricants*		
TES-295 Approval #	**Company**	**Product Brand Name**
AN-051005	ExxonMobil Lubricants and Petroleum Specialties Company	Mobil Delvac Synthetic ATF
AN-011001	Castrol Heavy Duty Lubricants	TranSynd
AN-031002	BP	Autran Syn 295
AN-031003	Cognis Corporation	Emgard 2805
AN-031004	International Truck & Engine Company	Fleetrite Synthetic ATF
AN-071006	John Deere & Company	HD SynTran

*To check the latest Allison-approved fluids, go to ww.allisontransmission.com. Lubricants listed in order of preference. Do not mix types of oil.

Transmission Oil and Oil Filter Change Chart		
Allison Transmission	**Mileage Interval**	**Time Interval**
2500 PTS	25000 miles*	12 months*
3000 PTS	25000 miles*	12 months*
3000R PTS	12000 miles*	6 months
B400	25000 miles*	12 months*
B400R	12,000 miles*	6 months
*Whichever occurs first		

MD3060

AD2000

REAR AXLE FLUID

Check the lubricant every 3000 miles (4800km) or once a month.

Check the lubricant level in the rear axle according to the following sequence:

1. Locate rear filler plug on rear axle.
2. Remove filler plug and check lubricant level. Lubricant should be level with plug opening.
3. Add lubricant as necessary to level of filler plug opening. Install rear filler plug.

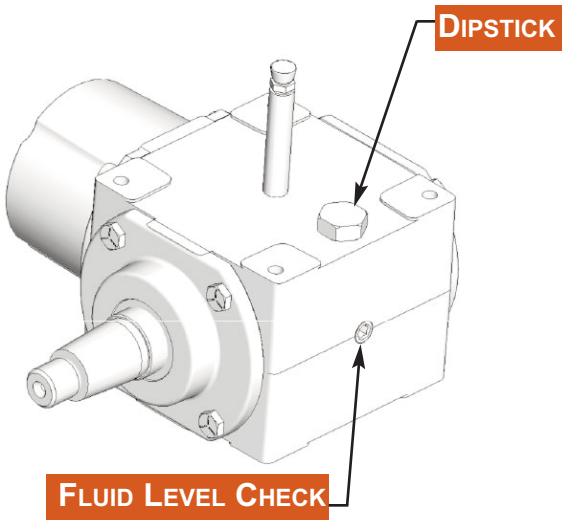
Drain and refill axle housing at 25000 miles (40000km) or 12 months, whichever occurs first.

Draining the rear axle is best accomplished immediately after the bus has completed a trip. The warm lubricant will run freely, allowing full drainage in minimum time. This practice works well in cold weather. Refer to Dana Maintenance Manual supplied with the bus service manual for complete information.

AAC AXLE	CAPACITY (EACH WHEEL)	LUBRICATION TYPE
R19-2N	7 1/2 - 8 QTS.	SYNTHETIC SAE 75W - 90
R19-2N	7 1/2 - 8 QTS.	SYNTHETIC SAE 80W - 140
R19-2N	7 1/2 - 8 QTS.	ORGANIC SAE 80W - 90, MIL-L 2105D, API GL-5 & MT -1
R23-2N	12 1/2 - 13 QTS.	SYNTHETIC SAE 75W - 90
R23-2N	12 1/2 - 13 QTS.	SYNTHETIC SAE 80W - 140
R23-2N	12 1/2 - 13 QTS.	ORGANIC SAE 80W - 90, MIL-L 2105D, API GL-5 & MT -1

MECHANICAL FAN DRIVE GEAR BOX

Oil should be changed after first 500 hours and every twelve (12) months thereafter, using Mobile Delvac Synthetic 75W-90 (14oz.).



CHECK REAR DIFFERENTIAL/AXLE GEAR OIL LEVEL

Check the lubricant every 3000 miles (4800km) or once a month.

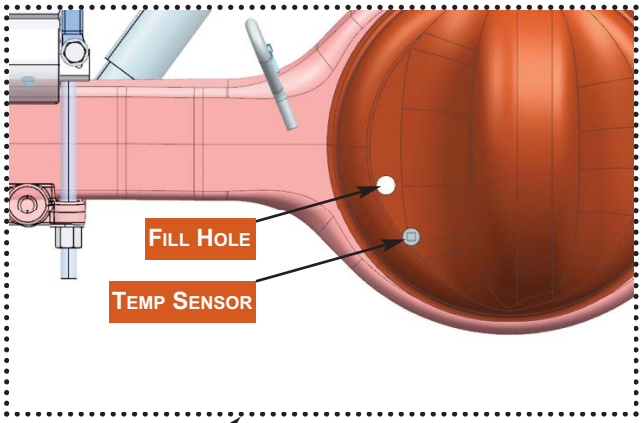
Check the gear oil level in the rear axle according to the following sequence:

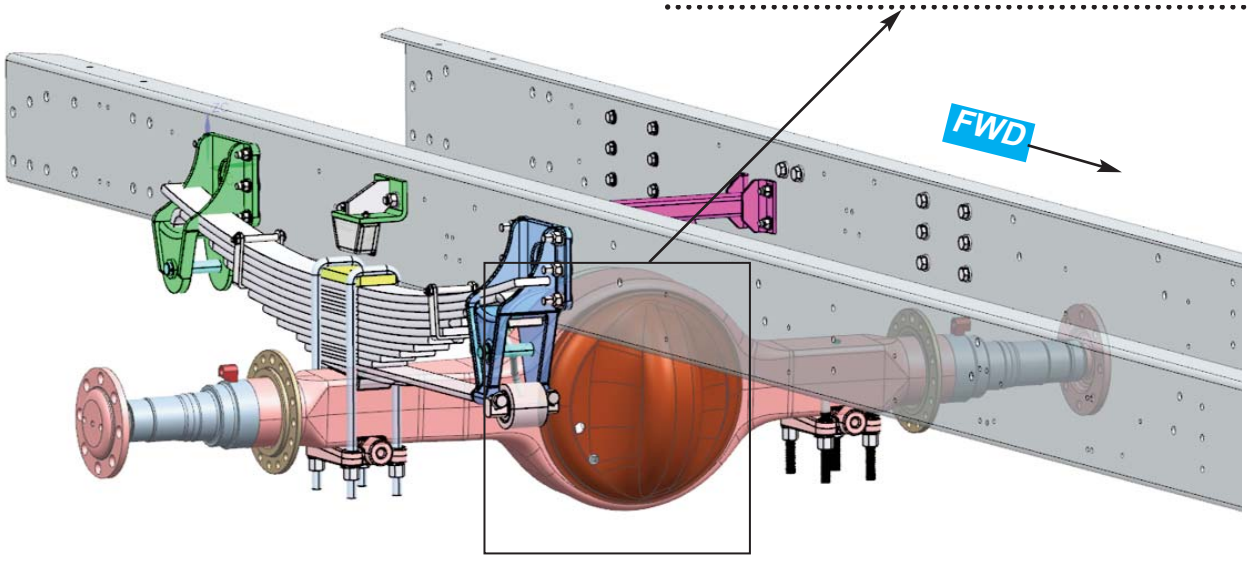
1. With the vehicle on level ground, remove the Oil Fill Hole Plug. (Viewing the axle from the rear, this plug is located on the far right of the cover nearest the center line of the axle.
2. With the oil fill plug removed, the oil level should be setting at the bottom of the threads of the oil fill hole.
3. If the oil fill is low, add oil into the oil fill hole until it just starts to trickle out.
4. Reinstall the Oil Fill Hole Plug and tighten to **40-60 lbf-ft (54-81 N-m).**

NOTICE

Dana Axle has removed the Lower Drain plug. The drain and fill plug are located on the lower right side of the drive axle. The upper hole is the fill hole and the oil temperature sensor is the lower hole, if applicable. Both are threaded.

To replace/service the axle, refer to Dana Mfg.





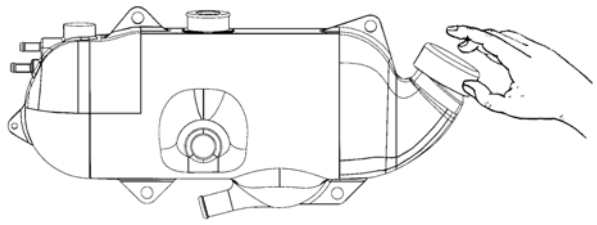
COOLANT LEVEL

Check the cooling system at regular intervals, such as during fuel stops. You do not need to remove the radiator cap to check the coolant level. Look through the translucent surge tank. When the engine is cold, the coolant level should be at or slightly above the "Min" mark on the surge. When the engine has fully warmed up, the level should be at or slightly above the "Max" mark on the surge.

If the coolant level is low, remove the cap on the surge tank. Using Alliance or Fleetcharge™ antifreeze, add to the surge enough of a 50/50 mixture of water and antifreeze to bring the level up to the proper mark. Check SCA additive levels any time you are adding antifreeze. Put the cap back on the recovery tank.

If you have to add coolant more than four times a year, see your dealer for a cooling system check.

When additional coolant is needed, add the recommended concentration of antifreeze to the surge tank. Do not overfill.

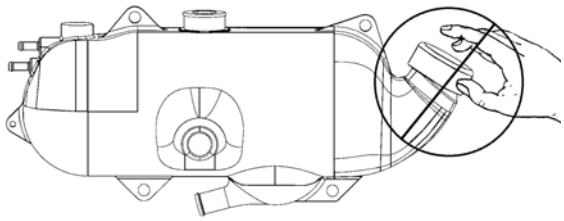


PLASTIC SURGE TANK

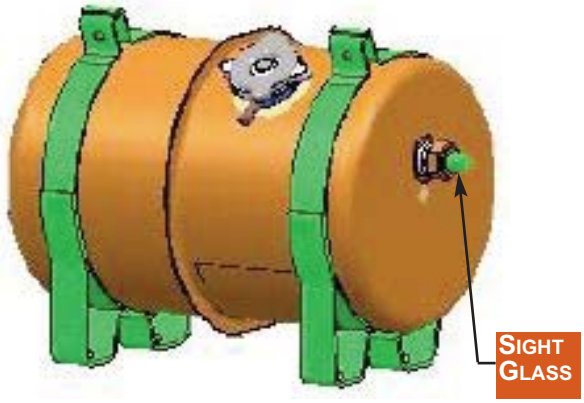
CAUTION

Never add coolant to radiator when engine is overheating. Do not loosen or remove radiator cap to cool overheating engine.

The radiator cap should not be removed while the system is hot/under pressure. When the cooling system gets hot, pressure builds up inside the system. Suddenly removing the cap will allow scalding steam or coolant spray to escape, possibly resulting in painful injuries.



DO NOT REMOVE RADIATOR CAP TO CHECK COOLANT LEVEL.



METAL SURGE TANK W/ SIGHT GLASS

COOLANT FILTER REPLACEMENT

CAUTION

Mechanical over-tightening of the water filter during replacement may destroy the threads or damage the filter head.

NOTICE

To ensure the proper level of cooling system additive is maintained, refer to Engine Manual.

COOLING SYSTEM

CAUTION

During filling, air must be vented from the engine coolant passages. (Some engines are equipped with a vent to allow the air to escape.) The system must be filled slowly to prevent air locks. Wait 2 to 3 minutes to allow air to be vented, then add mixture to bring the level to the bottom of the filler neck or sight glass.

NOTICE

Refer to the Engine Manufacturer's Service literature for approved coolant.

COOLING SYSTEM

The cooling system in the bus contains approximately 38 U.S. quarts (36.1L). The antifreeze is an SCA pre-charged heavy duty coolant/antifreeze which is a blend of ethylene glycol and a specially formulated inhibitor package designed for heavy duty cooling system applications. It meets or exceeds all requirements of RP-329 Truck Maintenance Council. The original factory installed solution of antifreeze and water protects the engine, cooling system and vehicle heating system to -34°F (-37°C). The cooling system is pre-charged to the correct SCA level upon leaving the factory.

When adding coolant to the bus, a 50% ethylene glycol antifreeze and 50% water solution is recommended. A 50/50 antifreeze to water ratio will protect the engine, cooling system, and heating system to -34°F (-37°C). The coolant must be checked before driving in a colder climate or season. The quality of the "make-up" water also affects the efficiency of the coolant additives and components. Therefore, we recommend de-ionized water when untreated, all water is corrosive. Water with an extremely high mineral content is unfit for cooling system use. If water hardness registers in excess of 200 PPM (part per million) or if chloride and sulfate register 100 PPM or more, use an alternate water source or have your water supply professionally treated, therefore we recommend de-ionized water.

The cooling system should not be operated without antifreeze (even in hot weather conditions). In addition to antifreeze and good quality make-up water, the diesel cooling system requires the use of supplemental coolant additives and filters to protect the system from oil fouling, corrosion products, scale, rust and dirt.

NOTICE

Refer to the Engine Manufacturer's Service literature for approved coolant.

When treating the cooling system with chemical additives, always start clean. To clean the system, flush with clear water. If the system is dirty, showing mineral build up, scale, rust or oil, use a heavy duty radiator cleaner following the manufacturer's directions. Maintaining the correct coolant additive concentration level requires an initial charge after cleaning and a service charge at the scheduled maintenance interval.

There are two methods for charging a diesel cooling system when performing maintenance. (1) The filter change method (if equipped) that uses an initial charge filter containing a pre-measured amount of dry additives. (2) Pouring a pre-measured amount of liquid additive into the radiator and adding a service filter (if equipped).

There are various test kits available to check SCA concentration levels. They are used to check the nitrite level of the chemical. Nitrite is the additive that aids in the prevention of corrosion and cavitation.The Penray® Kit, part # PIC TS 100 is recommended. The instructions are included with the kit and are printed in the engine operation and maintenance manuals. The pH balance should be maintained between 7.5 and 11. Lower than 7.5 is corrosive to cast iron, steel and aluminum, and causes rapid depletion of the additives. Over 11 can cause the over concentration to precipitate from the coolant onto heat transfer surfaces, reducing the systems ability to dissipate, absorb and radiate heat.

(CONTINUED ON NEXT PAGE)

COOLING SYSTEM *(CONT'D)*

Use the following guidelines when adding or refilling the cooling system:

- Do not use methoxy propanol base antifreeze as it may damage engine seals.
- Never exceed 65% antifreeze in any coolant solution.
- If engine overheats, do not add water or coolant until engine has cooled. Add coolant with engine running.
- The use of a permanent antifreeze with a high silicate content should be avoided to prevent radiator and cooling system plugging. This can lead to overheating with resulting engine damage.
- Always top-off the cooling system after operating the engine for 15 minutes when the cooling system has been drained.
- If the cooling system must be drained to service or repair the engine, close the heater shut-off valves to prevent draining the entire system.
- Use the sight glass mounted on the reservoir as a gauge for coolant level. Coolant should be visible in the sight glass at all times to ensure adequate coolant in the system.

The bus is equipped with a surge tank to store coolant that would normally overflow when the cooling system is hot. Coolant is also added to the system through the surge tank.

CAUTION

Do not open the surge tank filler cap when the engine and radiator are hot. Cooling system pressure may force extremely hot coolant by the filler cap opening and cause serious personal injury.

Allow engine and radiator to cool, and release system pressure at pressure release cap before opening cooling system.

The surge tank contains a pressure release valve that is designed to safely release cooling system pressure. Lift the pressure release valve to discharge any remaining cooling system pressure or steam before attempting to open the surge tank filler cap. A safety latch prevents complete removal of the filler cap in one operation.

CAUTION

During filling, air must be vented from the engine coolant passages. (Some engines are equipped with a vent to allow the air to escape.) The system must be filled slowly to prevent air locks. Wait 2 to 3 minutes to allow air to be vented, then add mixture to bring the level to the bottom of the filler neck or sight glass.

HEATER/COOLANT FILL PROCEDURES

The following procedures have been established to help improve the purging of air from the heater system and engine when cooling system repairs are performed.

NOTICE

Procedure should be performed on cold engines only.

Fill procedure for engine:

1. Remove radiator cap.
2. Close all heater valves on engine.
3. With engine **NOT** running, add coolant until full.
4. Close bleeder valve.
5. Start engine, vary engine rpm several times from idle to governed rpm for two (2) minutes and then turn off.
6. Add coolant as necessary.
7. Install radiator cap.

Fill procedure for heater:

1. Open all gate valves in engine compartment.
2. Open valve on front heater using controls.
3. Remove radiator cap.
4. With engine **NOT** running, turn on booster pump. Let run for five (5) minutes. Keep fluid level in surge tank.
5. Add coolant as required.

*6. Total volume of coolant added should be 2 to 2 1/2 gallons.

7. Start engine, vary engine rpm several times from idle to governed rpm for two (2) minutes and turn off. Add any coolant as required.
8. Install radiator cap.

***Two (2) to 2 1/2 gallons is an average required to fill a dry heater system after the engine is already filled. When performing heater or engine maintenance, the volume of coolant required to fill the system will vary.**

ANTIFREEZE

Your bus is equipped with a 50/50 solution of antifreeze and water. The antifreeze is an SCA pre-charged heavy duty coolant/antifreeze which is a blend of ethylene glycol and a specially formulated inhibitor package designed for heavy duty cooling system applications. It meets or exceeds all requirements of RP-329 Truck Maintenance Council. This mixture protects the bus to -34°F (-37°C). Prior to taking the bus into a cold climate, the driver should check the antifreeze. For protection to -62°F (-52°C) and below, the mixture should be 60% antifreeze and 40% water. Never have more than 65% antifreeze in the system. Freeze point protection and cooling capabilities are dependent on the correct mixture.

Antifreeze should be used in the cooling system all year to assist in corrosion control. Rust, scale and solder bloom are typical examples of problems normally associated with cooling systems utilizing water only during the summer months.

Alliance pre-charged antifreeze, part OWI ALA003, is recommended.

Nitrate levels need to be checked and maintained every time coolant is added to the system or every 4 months/6000 miles. A Penray® Test Kit, part # PIC TA 100 is recommended to check with. The ideal level is 1200 ppm (parts per million).

CAUTION

"Anti-leak" antifreezes are not recommended for use in Cummins engines. Although these antifreezes are chemically compatible with DCA water treatment, the "anti-leak" agents may clog the coolant filters.

ORGANIC ACID TECHNOLOGY (OAT) - ENGINE COOLANT

Organic Coolant Analysis is specifically designed for testing Extended Life Coolants and their organic additive formulations. This type of testing is significantly different from Conventional Coolant testing. With respect to the additive chemistry, here the testing includes the percent of specific organic additives in the engine coolant ensures you have not mixed the fluid with conventional coolant, along with monitoring the other essential parameters mentioned above. Be sure to select the appropriate test kit for your Extended Life Coolants.

OAT - REQUIREMENTS / TEST KIT

Requirements:

1. This coolant must meet the requirements of the following specifications:
   a. ASTM D6210
   b. Detroit 93K217
   c. Cummins 14603
2. The supplier is responsible for meeting all DTNA Engine Supplier Coolant Reqirements and providing documentation of formulation tolerances. This includes formulation specifications and periodic auditing of batch tolerances.
3. The coolant must be dyed Red.

Test Kit:

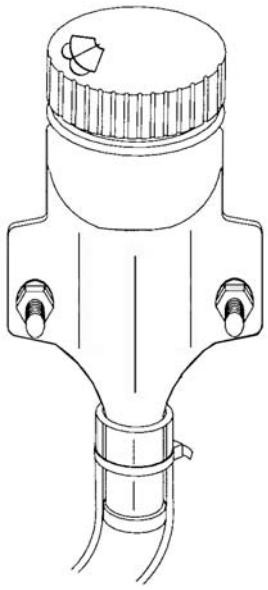
1. The minimum service life guarantee is 600K miles without addition of extender.
2. The coolant includes Bittermant.
3. The following must be available to brand as Detroit Genuine and Alliance for Aftermarket Sales:
   a. Extended Life (OAT) Product,
   b. Conversion Product: Used to convert conventional coolant to extend/long life coolant,
   c. Correction Fluid Product: Used to correct cases of contamination with conventional coolant, and
   d. Detroit Approved Test Kit: Used to determine OAT concentration.
4. Approved Suppliers: Shell Rotella ELC Nitrite-Free.

COOLANT SPECIFICATIONS

DESCRIPTION	FREEZING POINT PROTECTION	UNIT OF MEASURE	ONE GALLON CONSISTS OF:			DTNA MATERIAL SPECIFICATIONS
			MATERIAL	DESCRIPTION	QUANTITY	
EXTENDED LIFE (OAT) 50/50 PREMIX	-34°F	GALLON	48-26091-000	CONCENTRATE	0.5 GALLONS	48-26091-050
			48-26145-000	WATER	0.5 GALLONS	

WINDSHIELD WASHER

To add windshield washer fluid, locate the fluid reservoir behind the center access panel below the windshield. Use a suitable washer fluid (not water) and fill to the cap.



AIR CLEANER

The air cleaner is located in the rear of the bus in the engine compartment on the left side (driver's side) of the vehicle. Fresh air is picked up through a louvered panel rear of the last window.

The filter element should be removed and replaced every two years, 45,000 miles, or 25" of restriction, whichever comes first. While the element is out, check for traces of dust that may have past the filter. It is important that dust does not get past the filter element. This could lead to major engine repairs.

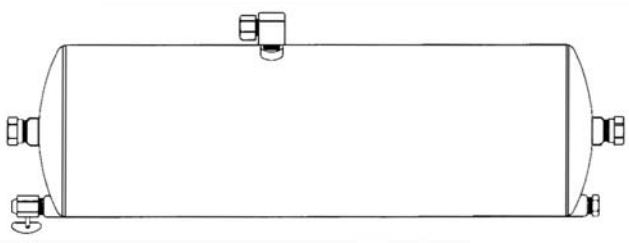
BERG CABLE OPERATED DRAIN VALVES (OPT.)

Cable operated Berg drain valves mounted on all air reservoir tanks. Remote mounted cables are located on the right side of the body. To drain the tanks, pull on cables below the side sheet. Tanks should be drained daily.

DRAINING AIR RESERVOIR TANKS

The air reservoir tanks should be drained daily. The draincocks should be left open until all moisture escapes.

Many operators open the draincocks at the end of the day to permit thorough purging of the system. The draincocks are closed prior to placing the bus back into service. This automatically causes the engine to be warmed-up while rebuilding air pressure in the system.



CAUTION

Failure to maintain air tanks properly can result in excessive water, sludge and other contaminants entering the air brake system. This can clog air passages, which can result in slower brake operation or brake failure.

PROPER DISPOSAL OF FLUIDS

CAUTION

Be mindful of the environment and ecology. Before you drain any fluids, find out the proper way to dispose of the fluid.

Do not pour oil onto the ground, down a drain, or into a stream, pond or lake. Consult local ordinances that govern the disposal of wastes.

UNIQUE DRIVING CONDITIONS

Engine Oil & Oil Filter - Refer to Engine Manufactuer for Oil Drain/Filter Change Intervals.

- Operating when outside temperature remains below freezing and most trips are less than 5 miles (8km).
- Operating during hot weather (above 90°F, 32°C) and:
  - making frequent stops.
  - driving in stop-and-go "rush hour" traffic.
  - continuously driving above normal highway speeds.
  - operating in dusty conditions.
  - carrying maximum loads.
  - extensive idling and/or low speed operation.

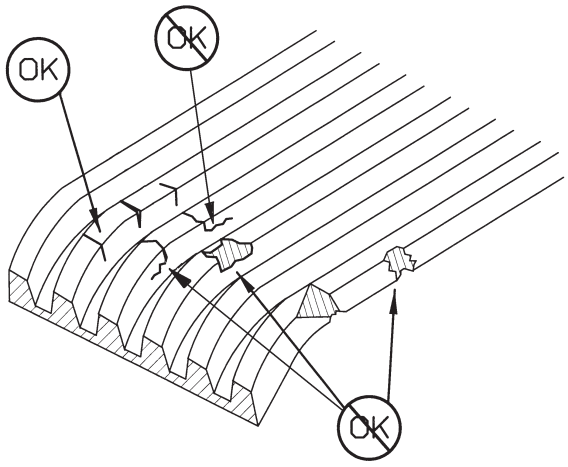
Air Cleaner - If operating in severe dust conditions, ask your dealer for proper replacement intervals.

Automatic Transmission Lubricant - Must be changed whenever there is evidence of dirt, contamination, or high temperature condition indicated by discoloration or strong odor.

BELT REPLACEMENT AND ADJUSTMENT

Check belts for wear, cracks, and other damage. Replace the belts if they are frayed or have pieces of material missing.

For more information, refer to the Service Manual.



TURNING RADIUS CHART - STANDARD

BODY MODEL	WINDOW SECTIONS	WHEELBASE*	BODY LENGTH	[1]HEIGHT 73" HR*	[1]HEIGHT 78" HR*	CURB CLEARANCE*	TURNING RADIUS*	SWEEP RADIUS*	REAR SWEEP*
110Y	11	181"	383"	121"	123 3/8"	27' 10"	27' 4"	32' 2"	1' 9"
120Y	12	209"	411"	121"	123 3/8"	31' 8"	31' 3"	36' 3"	1' 7"
130Y	13	238"	440"	121"	123 3/8"	35' 7"	35' 2"	40' 4"	1' 5"
140Y	14	267"	469"	121"	123 3/8"	39' 6"	39' 1"	44' 5"	1' 3"
141Y	14+10"	277"	479"	121"	123 3/8"	41' 0"	40' 10"	45' 7"	1' 1"

[1] **ROOF MOUNTED ITEMS THAT REQUIRE ADDITIONAL HEIGHT**

Static Vent - 2 1/32" or 5.159 cm
Roof Hatch - Low Profile 2 1/4" or 5.715 cm
Strobe Light - 4 1/2" or 11.43 cm
Roof Hatch - 5 1/4" or 13.335 cm

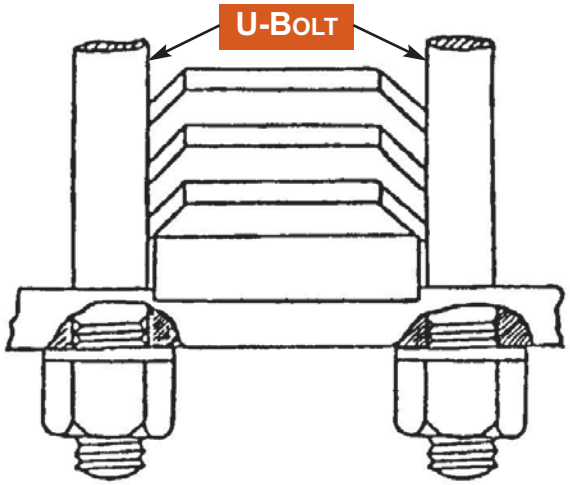
LEAF SPRINGS

When properly tightened, the U-bolts on your vehicle's leaf springs should stretch by .003" per inch of original length.

CAUTION

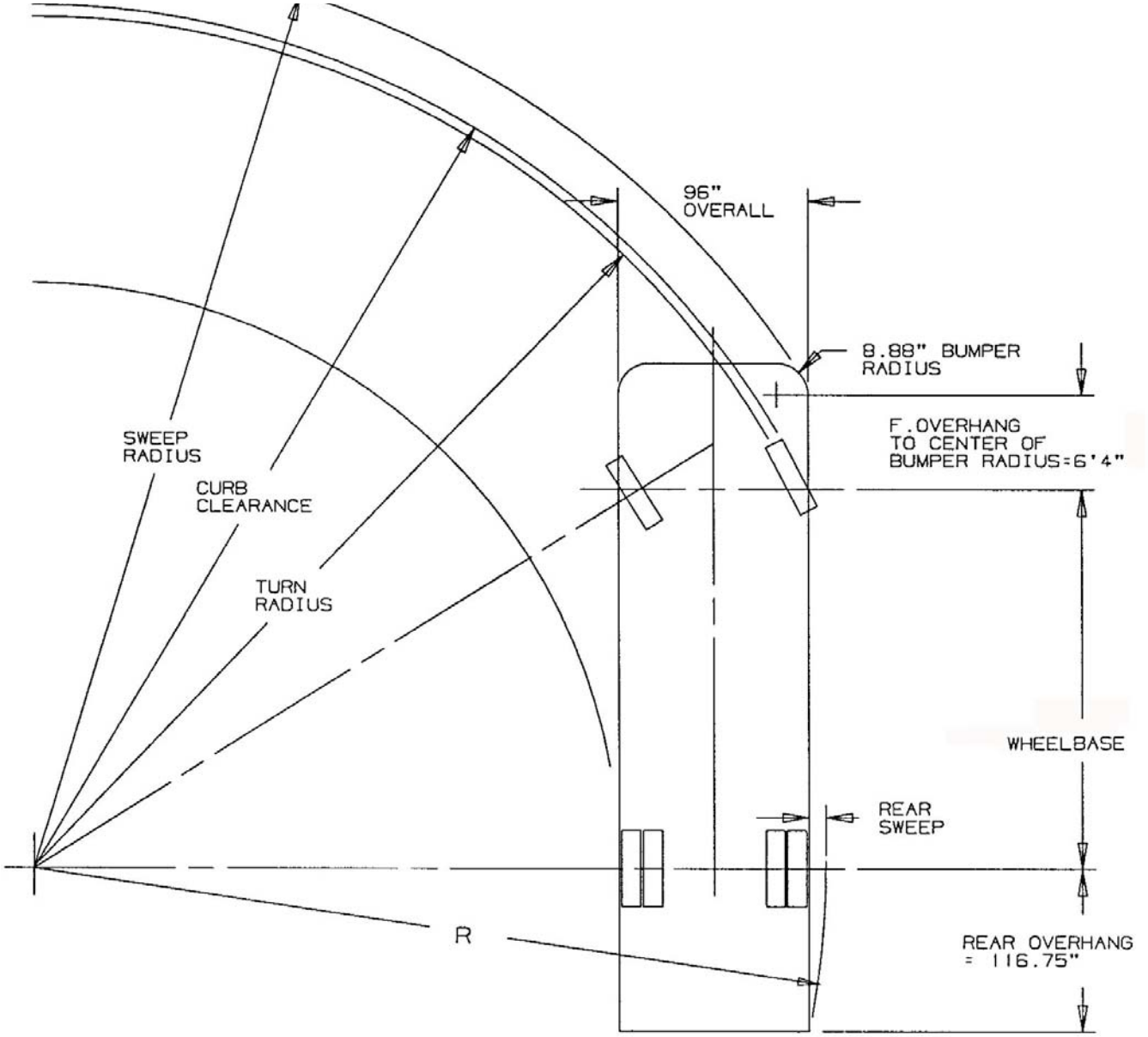
Since the U-bolts have stretched during installation, they should not be re-used for repairs. The very act of removing their fastening nuts will cut the stretched threads with cross-threading and lower their ability to hold a specific torque.

Nuts on the U-bolts for the front axle should be torqued to 350 ft/lbs. and 450 ft/lbs. for the rear axle. The values should be checked and retightened every 5000 miles (8000km).



GENERAL SPECIFICATIONS

NOTE: All height dimensions are based on an average of measurements taken.
All measurements are based on 11R22.5 Tires, 22.5 x 8.25 wheels and 79 7/8 track (front).



ENGINE OPERATING SPECIFICATIONS

SPECIFICATION	ENGINE		
	CUMMINS ISB	CUMMINS ISC	DD8
*OIL PRESSURE - PSI *(KPA)	10-30 (69-207)	10-30 (69-207)	16-58 (110-400)
**COOLANT TEMPERATURE - F **(C)	160°-212° (71°-107°)	180°-225° (82°-100°)	181°-203° (83°-95°)
ENGINE IDLE RPM	600-1000	TYPICALLY 700 PROGRAMMABLE FROM 600 TO 875	700
RATED SPEED RPM (GOVERNED)	2500	2200 OR 2400	2600
CHARGING VOLTAGE	13-14 VOLTS	13-14 VOLTS	13-14 Volts

*LOWER OIL PRESSURE IS NORMAL AT IDLING SPEED.

HIGHER THAN NORMAL OIL PRESSURE AT START-UP WITH ENGINE COLD IS ACCEPTABLE.

IF NO OIL PRESSURE IS INDICATED, WARNING LIGHT AND BUZZER WILL ACTIVATE. SHUT DOWN ENGINE IMMEDIATELY AND DETERMINE CAUSE.

**COOLANT TEMPERATURE WILL VARY WITH AIR TEMPERATURE AND CONDITIONS.

Engine Coolant Packages

Coolant Testing is essential to having a well maintained engine. Engine coolants are generally classified by their additive chemistry into two primary types. Conventional or Fully Formulated engine coolants are produced with additives designed to last a specific period of time, and then be routinely replenished with Supplemental Coolant Additives (SCA's). Extended Life Coolants are formulated using organic acid technology (OAT) and are designed to last almost the lifetime of the engine.

Genuine Fluids Analysis has a test package designed for Conventional Coolants. This laboratory testing monitors the freeze point protection, the effectiveness of our additive chemistry, detects contaminants, corrosion metals and ensures the water is the correct type for use in engine coolants. This testing does not check for the levels of Organic Acids which are the primary additives in Extended Life Coolants.

Organic Coolant Analysis is specifically designed for testing Extended Life Coolants and their organic additive formulations. This type of testing is significantly different from Conventional Coolant testing. With respect to the additive chemistry, here the testing includes the percent of specific organic additives in the engine coolant ensures you have not mixed the fluid with conventional coolant, along with monitoring the other essential parameters mentioned above. Be sure to select the appropriate test kit for your Extended Life Coolants.

Coolant Analysis Kits - United States		
Part Number	**Part Description**	**Test Package Includes**
23516921	Conventional Coolant Analysis- 10 Pack	pH, Conductivity, Freeze Point, Sulfates, Chlorides, Baron, Nitrite, Nitrate, Silicon, Phosphorus, Molybdenum, Iron, Copper, Lead, Aluminum
23539088	Universal Coolant Analysis- 10 Pack	Organic Acids by UPLC, pH, Conductivity, Freeze Point, Sulfates, Chlorides, Boron, Nitrite, Nitrate, Silicon, Phosphorus, Molybdenum, Iron Copper, Lead, Aluminum

HEADLIGHT AIMING

Preliminary Checks

Before checking or adjusting the headlight aim, do the following:

- Check the suspension for proper functioning of the leveling mechanism. On buses with air suspensions, make sure that the height is properly adjusted.
- Remove any large amounts of mud or ice from the underside of the fenders.
- Check the springs for sagging or broken leaves.
- Clean the headlight lenses. Use a soft cloth with mild, non-caustic soap or detergent, and water.
- With the vehicle unloaded, check that the tires are inflated to the recommended air pressure.

Checking Headlight Aim

1. Park the vehicle on a level surface, 25 ft (7.6 m) away from, and perpendicular to, a vertical screen or wall. Shut down the engine and set the parking brake. Chock the tires.
2. Attach unit A headlight aimer to the left headlamp (driver's side). Align the adaptor to the three headlamp aiming pads. **NOTE: One aiming pad will be located at the top of the headlamp and the remaining two aiming pads will be located at the bottom of the headlamp.** After aligning aimer to the three pads, push the piston handle forward, engaging the rubber suction cup. Immediately pull back piston handle until it locks in place. The piston handle is located underneath the aimer. Attach unit B headlight aimer to the right headlamp by using the same process.
3. You now ready to aim the headlamps for both the horizontal (side to side) and the vertical (up and down). **Note: It is good practice to check the FLOOR LEVEL DIALS for proper setting prior to aiming headlamps. The horizontal dial should be set at zero.**
4. Check to see that the split image target lines are visible in the viewing port. If necessary, rotate each aimer slightly to locate the target.
5. Turn horizontal adjusting screw at side of headlamp until split image of target line appears in mirrors as one solid line. To remove "backlash", make final adjustment by turning screw in a clock-wise direction.
6. Repeat the last three steps with opposite aimer and headlamp.
7. To make vertical adjustment, the vertical dial on each aimer must be set at zero. Turn vertical adjusting screw at top of headlamp until the level bubble is centered between the lines. To remove "backlash", make final adjustment by turning screw in a clockwise direction.
8. Repeat last step with opposite aimer and headlamp.
9. Recheck target alignment on both aimers and readjust horizontal aim, if necessary.
10. Remove aimer by holding aimer securely and pressing "Vacuum Release" button located on the piston handle.

Quality Requirements

Ensure that the headlamp lenses and aiming pads are cleaned using only a dry cloth.

To ensure accuracy of aimers, it is recommended that the functions of the headlamp aimers be checked and the aimers be recalibrated at least every 30 days or after aiming headlamps on 60 units, whichever comes first. **Figure 1**

(CONTINUED ON NEXT PAGE)

HEADLIGHT AIMING *(CONTINUED)*

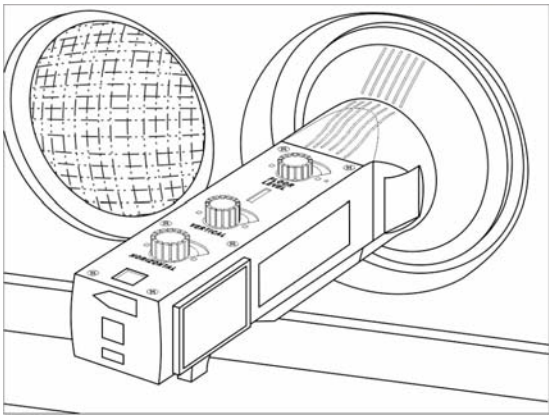
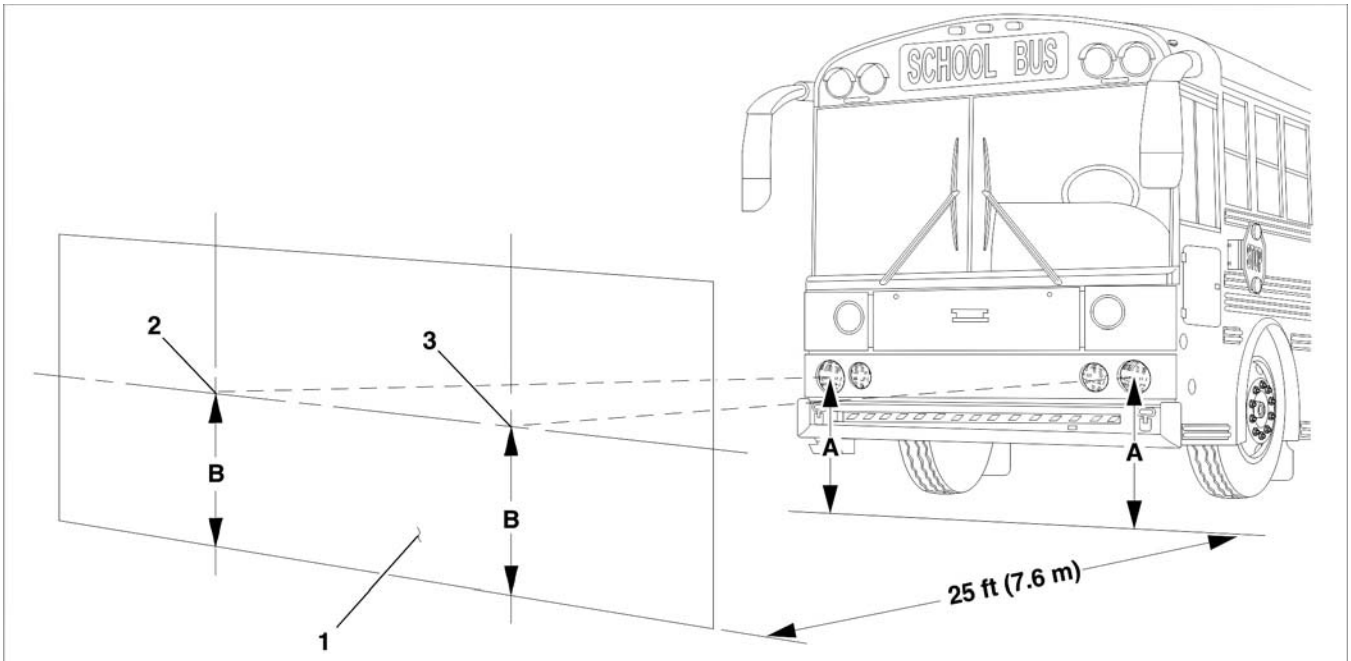


Figure 1 - Headlight Adjustment with Hoppy Tool

Adjusting Headlight Aim

NOTE: Because of the various headlight assembly options offered, the location of adjustment screws on the vehicle's headlight assembly may vary from what is shown here. Figure 2 & 3

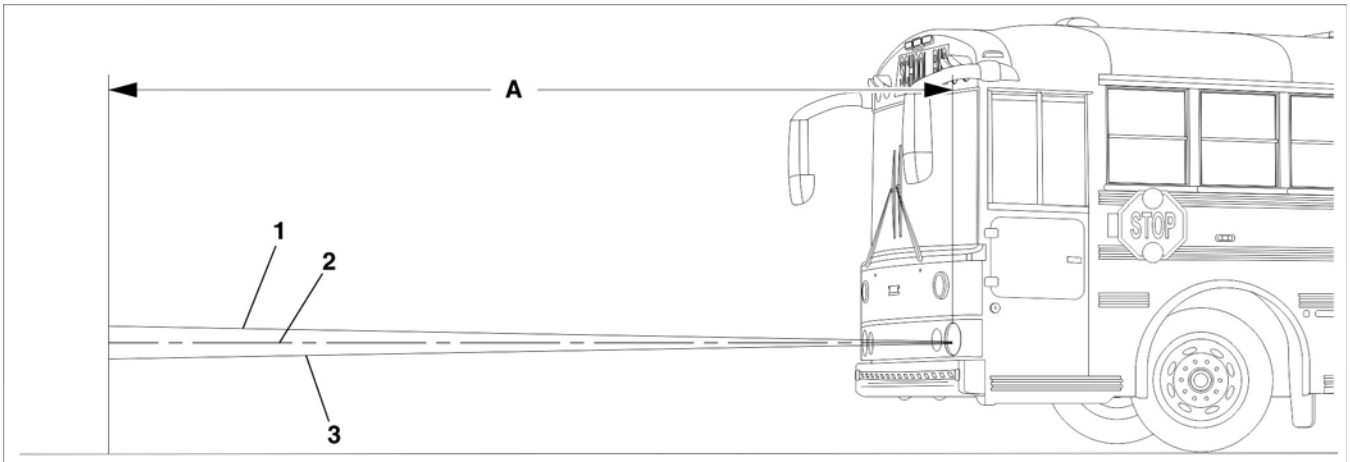


A. Measure the distance from the ground to the center of each headlight bulb.
B. Mark where the center of each headlight projection should appear.
1. Screen or Wall
2. Center of Right-Hand Headlight Projection
3. Center of Left-Hand Headlight Projection

Figure 2

(CONTINUED ON NEXT PAGE)

HEADLIGHT AIMING *(CONTINUED)*



1. Low-Beam Angle Upper Limit
2. Ideal Low-Beam Projection
3. Low-Beam Angle Lower Limit

Figure 3

Headlight Aiming

Headlight adjustment knobs are located on back side of headlight. These can be reached from underneath the chassis above the front bumper.

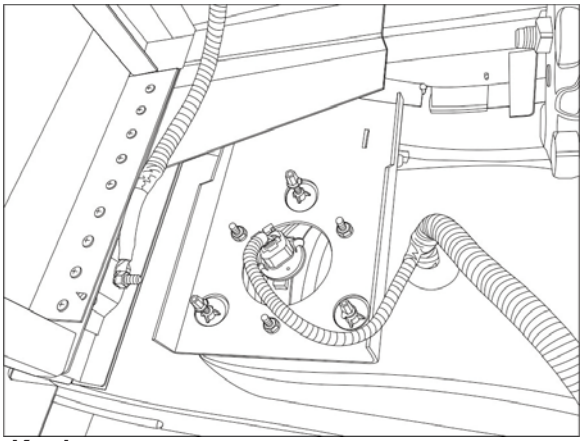


Figure 4 - Headlight Adjusting Knobs

VERTICAL LOW-BEAM HEADLIGHT VARIATION LIMITS			
DISTANCE BETWEEN GROUND AND HEADLIGHT: IN (MM)	DESIRED VARIATION (FIG. 3, ITEM 2): IN (MM)	UPPER LIMIT (FIG. 3, ITEM 1): IN (MM) UP	LOWER LIMIT (FIG. 3, ITEM 3): IN (MM) DOWN
22-36 (560-900)	0	3.9 (100)	3.9 (100)
36-48 (900-1200)	2 (50) down	2 (50)	6 (150)
48-54 (1200-1400)	2.5 (64) down	1.6 (40)	6.5 (165)

TABLE 1, VERTICAL LOW-BEAM HEADLIGHT VARIATION LIMITS

Form #1

Driver's Daily Inspection & Condition Report

Bus Number _____ **Date/Time**_____

Mileage_____ **Location** _____

Maintenance Department

		OK	Not OK
1.	Fill fuel tank - Gallons/Liters ____	____	_____
2.	Check engine oil level - Quarts/Liters added ____	____	_____
3.	Inspect engine for oil, coolant, and fuel leaks	____	_____
4.	Check fuel/water separator for water	____	_____
5.	Check coolant level	____	_____
6.	Fill windshield washer container	____	_____
7.	Inspect tires for cuts, damage, inflation, wear	____	_____
8.	Visual inspection of exterior for damage	____	_____
9.	Drain air tanks	____	_____
10.	Inspect engine belts for proper tension	____	_____
11.	Visual inspection of engine compartment	____	_____
12.	Start engine. Check operation of the following:	____	_____
	12.1 Check engine light	____	_____
	12.2 Starter	____	_____
	12.3 Sound of engine - noise, knock, miss, squeal, etc.	____	_____
	12.4 All instruments	____	_____
	12.5 Heater/Air conditioner	____	_____
	12.6 Windshield wiper and washer	____	_____
	12.7 All interior lights	____	_____
	12.8 Turn signals, stop lamps	____	_____
	12.9 Headlights, clearance lights	____	_____
	12.10 All warning devices - warning lights, horn	____	_____
	12.11 Maximum air system pressure (110-120 psi)	____	_____
	12.12 Door controls	____	_____
13.	Depress brake pedal (check for leaks while depressed)	____	_____
14.	Check operation of parking/spring brakes	____	_____
15.	Inspect seat backs and cushions for cuts, rips	____	_____
16.	Check condition of all rear view mirrors, adjust mirrors as necessary	____	_____
17.	Move bus to ready line. En route, check operation of brakes and steering	____	_____
18.	Check to make sure all exterior doors are closed securely	____	_____
19.	Inspect driver's seat belt for condition and operation	____	_____
20.	The DPF exterior surface, including Mitigation Device for dents or other damage	____	_____

IMPORTANT: A dent over 3" (76 mm) in diameter and 1/4" (6 mm) deep could cause internal damage to the DPF, causing it to malfunction.

Driver's Signature _____

Comments:

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Preventive Maintenance Inspection #1

4,000 Miles (6,400 Km) - 60 Days (whichever occurs first)

Unit Number_____
Mileage _____
Repair Order #_____
Date/Time _____
Location_____

Check = OK
X = Attention Required
R = Repair
N/A = Not Applicable

		OK	Not OK
1.	Check driver's reports for problems previously reported	____	_____
2.	Ignition switch "On" - air pressure warning signals	____	_____
3.	Start engine. Check operation of the following:		
	3.1 Starter operation	____	_____
	3.2 Check operation of Intake Air Heater	____	_____
	3.3 All gauges: Oil pressure ____ Temp ____ Trans Temp ____Tach ____	____	_____
	Voltmeter ____ Ammeter ____ Air pressure ____ Speedometer ____	____	_____
	3.4 Check interior lights ____ Dash lights ____ Ceiling lights ____	____	_____
	3.5 Check exterior lights ____ Headlights ____ High beam indicator ____	____	_____
	Tail ____ Stop ____ Stepwell ____ Clearance ____	____	_____
	3.6 Check turn signals ____ 4-way flashers	____	_____
	3.7 Check 4-light warning system ____ 8-light warning system____	____	_____
	3.8 Check Windshield wiper operation ____ Washer ____	____	_____
	3.9 Check max air pressure (should be 110-120 psi)	____	_____
	3.10 Check heater operation ____ Air conditioner ____	____	_____
	3.11 Check alternator output on voltmeter ____	____	_____
	3.12 Check operation of parking/spring brakes ___ Park brake warning light ____	____	_____
	3.13 Check hydraulic fluid level.	____	_____
4.	Depress brake pedal - check for leaks in brake system	____	_____
5.	Inspect condition of windshield ____ Side glasses ____ Mirrors ____	____	_____
6.	Inspect condition of wiper blades ____ Fill washer container ____	____	_____
7.	Inspect front door assembly hinges ____ Controls ____ Adjustments ____ Inline Filter ____	____	_____
8.	Inspect seat back and cushion for damage ____ Check frames ____	____	_____
9.	Inspect condition of floor covering ____ Upholstery ____	____	_____
10.	Inspect and operate all emergency exits "opening/locking'	____	_____
11.	Check operation of all door and window warning buzzers	____	_____
12.	Check operation of all roof hatches and warning buzzers	____	_____
13.	Inspect exterior sheet metal for damage: Corrosion ____ Paint Condition ____	____	_____
14.	Inspect lock condition, all external access doors	____	_____
15.	Check condition and adjust all Belts ____ Alternator ____ Air conditioner ____	____	_____
16.	Inspect condition of throttle for proper operation	____	_____
17.	Inspect engine mounts - condition and security	____	_____
18.	Inspect air intake ducts, hoses for condition & for chafing ____ Loose clamps ____	____	_____
19.	Check air cleaner restriction indicator. Service filter if necessary	____	_____
20.	Inspect cooling system for leaks - Radiator ____ Hoses ____	____	_____
21.	Inspect fan assembly - Mounting ____ Fan blades ____	____	_____
22.	Check coolant level, Freeze protection_____% and SCA levels_____ppm or units	____	_____

IMPORTANT: Refer to the Engine Manufacturer's Service literature for approved coolant.

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Preventive Maintenance Inspection #1
(continued)

		OK	Not OK
23.	Check Hydraulic fluid level	____	_____
24.	Grease rear suspension ____ Drive shaft ____ Brake mechanism ____	____	_____
25.	Check lube level - Rear axle ____ Trans. (std.) ____	____	_____
26.	Adjust rear brakes ____ Inspect lining wear ____	____	_____
27.	Clean rear axle vent	____	_____
28.	Inspect rear springs, broken leaves ____ Loose U-bolts ____	____	_____
29.	Inspect air suspension for cracks ____ Wear ____ Hangers ____ Leaks ____	____	_____
30.	Bleed air tanks ____ Check moisture ejector ____ Heat operation ____	____	_____
31.	Inspect battery installation, hold-down clamps security, clean as required	____	_____
	31.1 Torque hold-down clamps: 13 to 16 ft. lbs.	____	_____
32.	Inspect battery cables for corrosion, chafing	____	_____
33.	Check state of charge in batteries. Fill, if applicable. Battery voltage ____	____	_____
34.	Inspect wiring inside the Electrical Panel ____, Engine Compartment ____ for loose connections/rubbing of wires	____	_____
35.	Check condition of convoluted tubing and harness supports	____	_____
36.	Inspect fuel tank mounting brackets for cracks, security	____	_____
37.	Clean fuel tank vents ____ Inspect filler cap seals ____	____	_____
38.	Jack front axle. Check tires for toe-in wear	____	_____
	38.1 Grease suspension, king pin, steering linkage	____	_____
	38.2 Check lube level of front wheels ____ Bearing adjustment ____	____	_____
	38.3 Check steering linkage for lost motion ____ Check king pins ____	____	_____
	38.4 Inspect front springs for broken leaves ___ Loose U-Bolts ___ Shackles ___	____	_____
	38.5 Adjust front brakes ___Grease brake mechanism ___Check lining wear ____	____	_____
39.	Inspect steering gear box mounting for security	____	_____
40.	Inspect wheel/rim lug nuts for security	____	_____
41.	Inspect wheels/rims for cracks, slipping	____	_____
42.	Inspect tires for cuts, tread depth, wear	____	_____
43.	Inflate tires to recommended pressure	____	_____
44.	Inspect body mounting bolts and clips for security	____	_____
45.	Consult repair order for following: ____ _____		
	45.1 Change engine oil ____ Replace oil filters ____	____	_____
	45.2 Replace fuel filters ____ Water filter ____	____	_____
	IMPORTANT: Refer to the Engine Mfg's service literature for approved oil, lubrication change, & filter.		
46.	Start engine. Check filters for leaks	____	_____
47.	Engine idling & at operating temperature - check automatic transmission fluid level	____	_____
48.	Road test. Check brake operation, unusual noises, etc.	____	_____
49.	Wipe grease off steering wheel and driver's seat	____	_____
50.	Fill out all required work orders, forms, etc.	____	_____
51.	Cooling Fan Gear Box: Drain, Flush, Replace Oil after first 500 hours or 4 weeks of operation:	____	_____
	Every 5,000 operating hours or every 12 months (whichever occurs first)	____	_____
	Synthetic Oil 10,000 or 24 months (whichever occurs first)	____	_____
52.	CNG Fuel Filter Element Replacement	____	_____
53.	CNG Fuel System Inspection	____	_____

Mechanic's Signature _____

Comments:

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Preventive Maintenance Inspection #2

45,000 Miles, 75,000 Km - Annual

Unit Number_____
Mileage _____
Repair Order #_____
Date/Time _____
Location_____

Check = OK
X = Attention Required
R = Repair
N/A = Not Applicable

		OK	Not OK
1.	Steam clean engine compartment, if necessary	____	_____
2.	Perform #1 Inspection	____	_____
3.	Inspect hoses for deterioration - replace as required	____	_____
4.	Check condition of antifreeze - replace as required - set for -30°F (-34°C)	____	_____
	4.1 Replace coolant every 2 years. (Management decision)	____	_____
	IMPORTANT: Refer to the Engine Manufacturer's Service literature for approved coolant.		
5.	Check shutters for opening and closing fully, if so equipped	____	_____
6.	Service shutter system filter, if so equipped	____	_____
7.	Clean front of radiator module (mud, dirt, debris)	____	_____
8.	Remove covers, all heaters - clean cores, clean filters	____	_____
9.	Check operation of all heater motors, defrosters	____	_____
10.	Replace power steering filter in reservoir	____	_____
11.	Replace water filter, if not done previously	____	_____
12.	Check operation - block/oil heaters, if applicable	____	_____
13.	Check operation of ether start device	____	_____
14.	Tighten all hose clamps - air intake system	____	_____
15.	Air cleaner element; replace every 2 years, 45,000 miles, or 25" of restriction, which ever occurs first	____	_____
16.	Check operation of restriction indicator, remove and test operation	____	_____
17.	Service crankcase breathers	____	_____
18.	Check EPA07 Exhaust System for:	____	_____
	18.1 leaks at clamps attaching exhaust pipe to turbocharger exhaust outlet	____	_____
	18.2 wear, cracks, damage in exhaust pipe, bellows, seal clamps	____	_____
	18.3 if present, the condition of the insulation material around pipe between turbocharger and the ATD	____	_____
	18.4 ATD mounting bands for tightness (30 ft/lbs. [41 N-m])	____	_____
	18.5 leaks around clamps retaining the After-Treatment Device in the After-Treatment System	____	_____
	18.6 leaks around the clamps that retain the Diesel Particulate Filter in the After-Treatment Device	____	_____
	18.7 sensors attached to the ATD for leaks or damaged wires.	____	_____
	18.8 DPF exterior surface for dents or other damage	____	_____
	18.9 heat discoloration on surface of the ATD	____	_____
	18.10 any wires, lines, or hoses within 4" (10 cm) of the exhaust system for heat damage	____	_____
19.	Adjust valves	____	_____
	Cummins - adjust every 2 years or 100,000 miles	____	_____
	19.1 Inspect crankshaft vibration damper	____	_____
20.	Check operation of engine protection system	____	_____

Preventive Maintenance Inspection #2

(continued)

		OK	Not OK
21.	Test batteries for full charge	____	_____
22.	Clean batteries and battery box	____	_____
23.	Test alternator regulator setting - 14 to 14.2 (must be checked with a fully charged battery)	____	_____
24.	Remove starter - inspect brushes (at 90,000 mile intervals) Clean dust from magnetic switch, lever end.	____	_____
25.	Remove backing plates (if equipped), Inspect rear brakes linings (Replace if less than 1/4")	____	_____
26.	Inspect slack adjusters for worn splines. Remove plug and grease all 4, if sealed type	____	_____
27.	Tighten rear U-bolts ____ Torque Values ____	____	_____
28.	Tighten front U-bolts ____ Torque Values ____	____	_____
29.	Remove front wheel. Inspect lining. Replace if within 1/8" of rivet head	____	_____
30.	Clean and repack wheel bearings, if not oil lubricated	____	_____
31.	Drain and refill differential. Check lube for metal, chips, etc.	____	_____
32.	Drain and refill manual transmission (if equipped) - Check lube for contaminants	____	_____
33.	Drain automatic transmission - drop pan. Replace internal filter	____	_____
	Renew transmission filter	____	_____
	Refill with ATF Dexron 111 or equal	____	_____
34.	Check operation of air dryer - renew filter or desiccant, if so equipped	____	_____
35.	Inspect rubber seals on emergency exits	____	_____
36.	Lubricate all access and emergency door hinges	____	_____
37.	Replace entrance door inline filter	____	_____
38.	Inspect all windows for proper latching	____	_____
39.	Inspect fuel tanks (by a trained inspector), every third year (CNG units)	____	_____
40.	Check fuel sender unit connections and renew dielectric grease, if necessary.	____	_____
	Check fuel fill hose for tightness	____	_____
41.	Drain and fill Fan Drive Gear Box	____	_____

Mechanic's Signature _____

Comments:

Form #4

Maintenance General

Maintenance Records

The maintenance service record is for your convenience. Record the services performed on your vehicle in the record log. You should retain copies of your receipts for the services. You also should keep records of any emission systems maintenance services performed on your vehicle. This record log should remain with the vehicle at all times.

Maintenance Performed	date	Mileage/KM	Shop Name and Address

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