




# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL



 **WARNING:** Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to [www.P65warnings.ca.gov/diesel](http://www.P65warnings.ca.gov/diesel).

## 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](http://www.tc.gc.ca/roadsafety).

# TABLE OF CONTENTS

	SECTION
INTRODUCTION .....	1
EPA10 EXHAUST SYSTEM .....	2
OPERATOR'S COMPARTMENT .....	3
OPERATING THE VEHICLE .....	4
EMERGENCY EQUIPMENT .....	5
GENERAL INFORMATION .....	6
MAINTENANCE .....	7

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

---

---

## 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 vehicle when sold to provide the next owner with important operation and maintenance information.

## 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.

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## 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 vehicle after its purchase that violates these FMVSS and Canadian Motor Vehicle Safety Standards (CMVSS) standards.

## CALIFORNIA PROPOSITION 65 WARNING



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



**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.**

## MODIFICATIONS OR ADDITIONS TO YOUR VEHICLE

Installation of additional or non-standard components or attachments as well as alteration or removal of components can adversely affect the safety or performance of your vehicle.

Be sure to observe the limitation and specifications set forth in your Operator's Manual.

## 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 warranty.

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 configuration modification
- 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

# SAF-T-LINER® EFX OPERATOR'S 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 in effect at time of manufacture.

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


Whenever contact is made with a dealer, authorized service agent, or Thomas Built Buses concerning warranty, parts, or service, these 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 Data Plate 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.

## VEHICLE IDENTIFICATION NUMBER (VIN)

	MFD. BY: THOMAS BUILT BUSES, INC. [ 3 ] INC. VEH. MFD. BY: [ 59 ] [ 6 ]
GVWR: [ 38 ] KG ([ 12 ] LB)	
GAWR FRONT: [ 34 ] KG ([ 9 ] LB) W/ [ 20 ] RIMS, [ 22 ]	
TIRES @ [ 32 ] KPA ([ 24 ] PSI) COLD [ 36 ]	
GAWR REAR: [ 35 ] KG ([ 10 ] LB) W/ [ 21 ] RIMS, [ 23 ]	
TIRES @ [ 33 ] KPA ([ 25 ] PSI) COLD [ 37 ]	
THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON [ 3 ]	
VIN: [ 30 ]	VEH. TYPE: [ 28 ]
BODY ID: [ 2 ]	
TBB PART NUMBER - 65011847	



## VEHICLE EMISSION CONTROL INFORMATION LABEL



MANUFACTURED BY THOMAS BUILT BUSES, INC  
HIGH POINT, NORTH CAROLINA

MFD BY THOMAS BUILT BUSES, INC  
INC VEH MFD BY: [ 59 ]

DATE: [ 3 ]  
DATE: [ 6 ]

### VEHICLE EMISSION CONTROL INFORMATION

VEHICLE IDENTIFICATION NUMBER: [ 30 ]  
VEHICLE FAMILY CODE: [ 77 ]

REGULATORY SUBCATEGORY: [ 78 ]

EMISSION CONTROL IDENTIFIERS: [ 79 ]

THIS VEHICLE COMPLIES WITH U.S. EPA REGULATIONS FOR [ 3 ] HEAVY-DUTY VEHICLES  
BODY ID: [ 2 ]

SEE OWNER'S MANUAL FOR PROPER MAINTENANCE OF THIS VEHICLE

TBB PART NUMBER 176984

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## VEHICLE LOADING

The Thomas vehicle 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 vehicle 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 combined capacity of axle, brakes, tires, wheel equipment, full fuel burden included, 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, full fuel burden included, and sides of the vehicle.



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



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

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

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

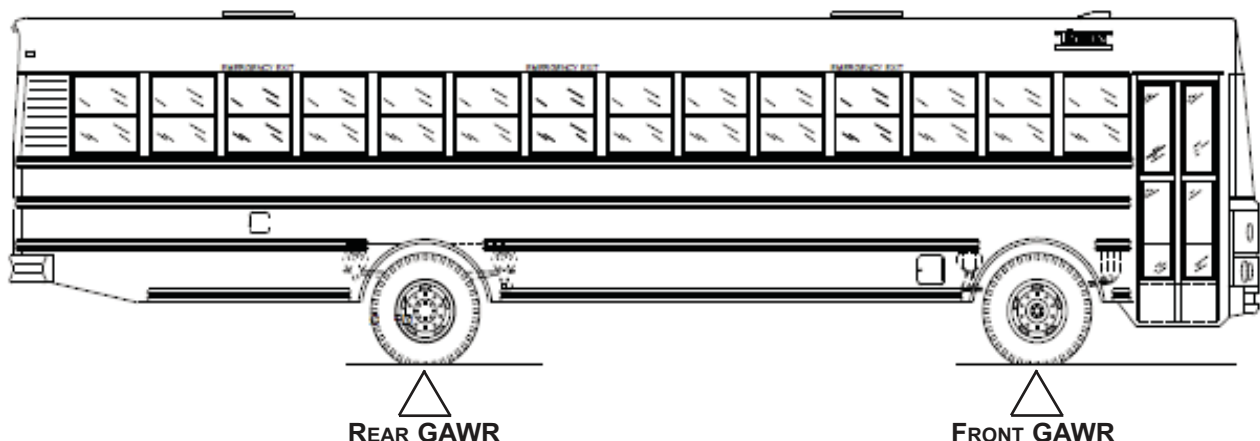
Rear GAWR	21,200 lb.	9616 kg.
Front GAWR	12,000 lb.	5479 kg.
	<hr/>	<hr/>
GVWR	33,200 lb.	15095 kg.

Rear curb weight, cargo, and passenger load cannot exceed 21,200 lb. (9616 kg.).

Front curb weight, cargo, and passenger load cannot exceed 12,000 lb. (5479 kg.).

Maximum total weight cannot exceed 33,200 lb. (15095 kg.).

*(CONTINUES ON NEXT PAGE.)*



## VEHICLE LOADING (CONT'D)



Thomas Built Buses recommends that when an EFX 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.

## DELIVERY INSPECTION - NEW VEHICLE

Each new Thomas bus has been inspected before delivery. Every precaution has been taken to provide the user with a complete and trouble-free bus.

There are certain steps that must be taken to continue the assurance of a trouble-free bus. Proper inspection and maintenance of the bus is a necessity from the time of delivery and throughout its service life.

If the bus is not processed through a dealer before delivery to the operator, the need to perform the "Delivery Inspection" is greater. Any discrepancies or omissions should be reported to the selling dealer immediately.

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## FIRST THIRTY DAYS

In addition to the Delivery Inspection, a one-time preventive maintenance inspection should be performed after the first thirty days of operation.

These are areas that should receive attention on any new vehicle.

## BODY

- Tighten all mounting clips and bolts, then retighten every six months thereafter.
- Tighten all cowl mounting bolts, then retighten every six months thereafter.
- Tighten driver's seat bolts, then retighten every six months thereafter.
- Tighten seat leg and wall rail bolts, then retighten every ninety days thereafter.
- Tighten door control mounting bracket, then retighten every six months thereafter.
- Remove heater hose covers and tighten all hose clamps.
- Wash bus only with clean water for the first thirty days.
- Wax bus with a good automotive wax after the first thirty days.

## CHASSIS

- Check toe-in. Reset if necessary.
- Check the steering operation.
- Tighten power steering items.
- Check power steering reservoir level.
- Clean and lubricate all fittings.
- Inspect front and rear engine mounts and bolt condition.
- Tighten front and rear spring U-bolts.
- Drain and refill differential lubricant.
- Check transmission oil level. Drain and refill if manual transmission.
- Change engine oil and filters per PM schedule.
- Tighten radiator hoses. Check coolant level.
- Tighten steering gear mounting to frame.
- Inspect tie rod, pitman arm, and drag link connections.
- Inspect for correct clutch adjustment, if equipped.
- Check brake master cylinder fluid level (hydraulic brakes).
- Inspect for correct brake adjustment.
- Adjust belt tension (all belts).
- **Tighten the After-Treatment Exhaust System. Inspect for any damage to the After-Treatment Device and the Mitigator Device.**
- Gauge tires for correct air pressure.
- Inspect for air leaks (air brake models).
- Tighten all lug nuts (all wheels).



# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

---

---

## AFTERTREATMENT SYSTEM (ATS) PRINCIPLES OF OPERATION - CUMMINS

### NOTICE

**EPA10 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 EPA10-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 Filter (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.



**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.

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 (NH<sub>3</sub>) gas. This mixture flows through the SCR device, where the ammonia gas reacts with the NOx in the exhaust, to produce harmless nitrogen (N<sub>2</sub>) and water vapor (H<sub>2</sub>O), 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**

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.



FIGURE 1

A slow, 10-second flashing of the Heat Exhaust System Temperature (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



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



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

The regen-inhibit switch (optional when available) provides additional control over the aftertreatment regeneration process. Depressing the regeneration-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**

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).

(CONTINUED ON NEXT PAGE.)



# EPA10 EXHAUST SYSTEM

## ATS PARKED REGENERATION (CONT'D)







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.	<b>Flashing</b> 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.	<b>Solid</b> 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.					
<b>See Engine Operator's Manual for complete Regeneration Instructions.</b>					
<small>24-01583-000B</small>					

FIGURE 2

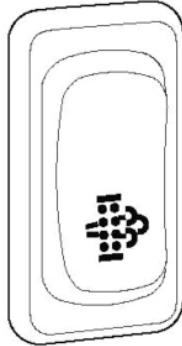


FIGURE 3

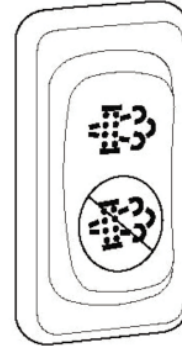


FIGURE 4

### NOTICE

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

2. Set the parking brake. If the parking brake was already set, you must release it, then set it again.
  3. Press and hold the regeneration 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 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

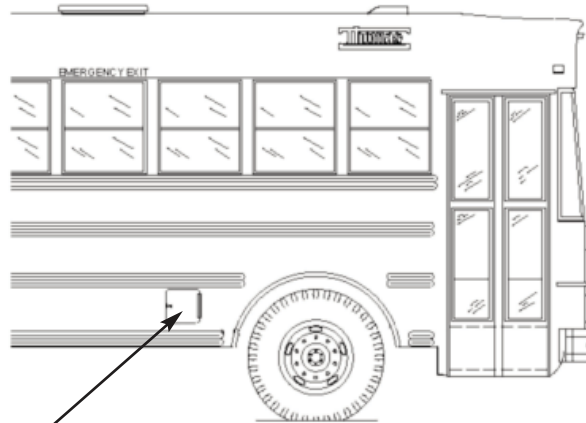
shut down. At start up, normal operation of the vehicle is not inhibited if the DEF is frozen; an immersion heater with engine coolant flowing through it will warm the DEF once the engine is running, to allow the SCR system to operate.

# EPA10 EXHAUST SYSTEM

## DEF TANK, LOCATION AND FILLING REQUIREMENTS

The tank is located on the right side, rearward of the front entrance door. 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 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.



**DEF TANK FILL ACCESS DOOR**



## 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**

*(CONTINUED ON NEXT PAGE.)*

## FUEL / DEF GAUGE (CONTINUED)

- Between 25% and 50% full, two bars are illuminated green. **Figure 7**
- Between 10% and 25% full, one bar is illuminated green. **Figure 8**



FIGURE 7



FIGURE 8

## 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 shut down 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**

When the DEF level in the tank drops to 5% full, the DEF Low Level Lamp in the gauge is illuminated



FIGURE 9

flashing (amber), and one bar of the DEF-level lightbar is illuminated flashing red. **Figure 10**

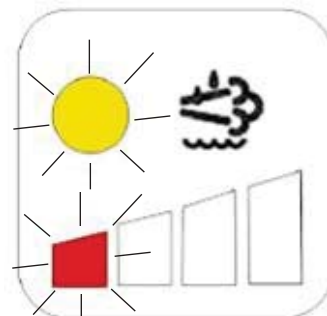
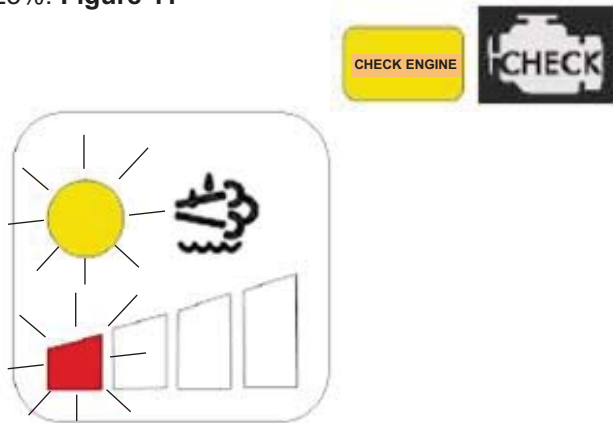


FIGURE 10

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

### DEF LEVEL—WARNING AND MINOR ENGINE DERATE

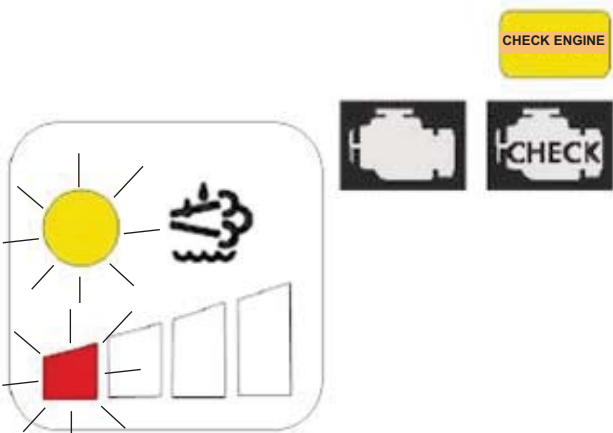
When the DEF level drops to 2.5%, the DEF warning lamp in the gauge is illuminated flashing (amber), one bar of the DEF-level lightbar flashes red and the CHECK engine lamp (amber) illuminates. The engine will perform a minor torque derate of approximately 25%. **Figure 11**



**FIGURE 11**

### DEF TANK IS EMPTY—WARNING AND MINOR ENGINE DERATE

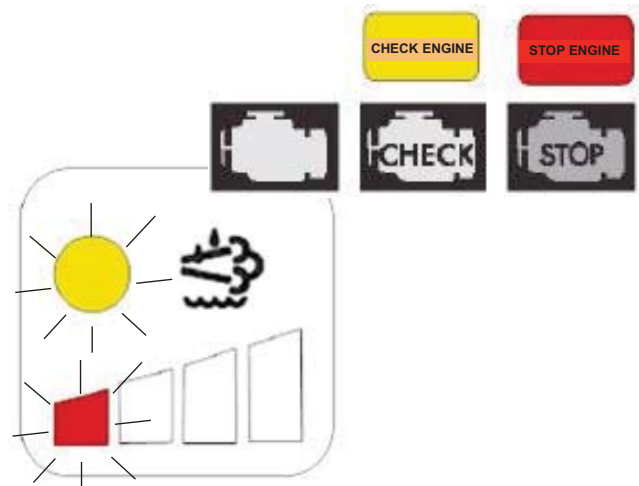
When the DEF tank registers empty, the DEF warning lamp flashes, and one bar of the DEF-level lightbar flashes red. The CHECK engine lamp illuminates, the malfunction-indicator lamp (amber) illuminates, and the engine remains at a minor derate. **Figure 12**



**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

Once a contaminant is detected in the DEF tank, your vehicle must be taken to an authorized Cummins service center to ensure no permanent damage has occurred to the SCR system, the system will function properly with the correct reducing agent and to reset the appropriate fault codes.

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

(CONTINUED ON NEXT PAGE.)

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

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

**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/Thomas 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 removes pollutants from exhaust gas after the gas leaves the combustion chamber.
- BlueTec®—Daimler's proprietary SCR technology.
- Diesel Oxidation Catalyst (DOC)—a flow-through device 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.
- Engine Derate—when the engine power is reduced by 25% to protect the engine. This warns the driver that the DEF level registers below 10% or if the DEF tank is contaminated.

## 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.



## INSPECTION

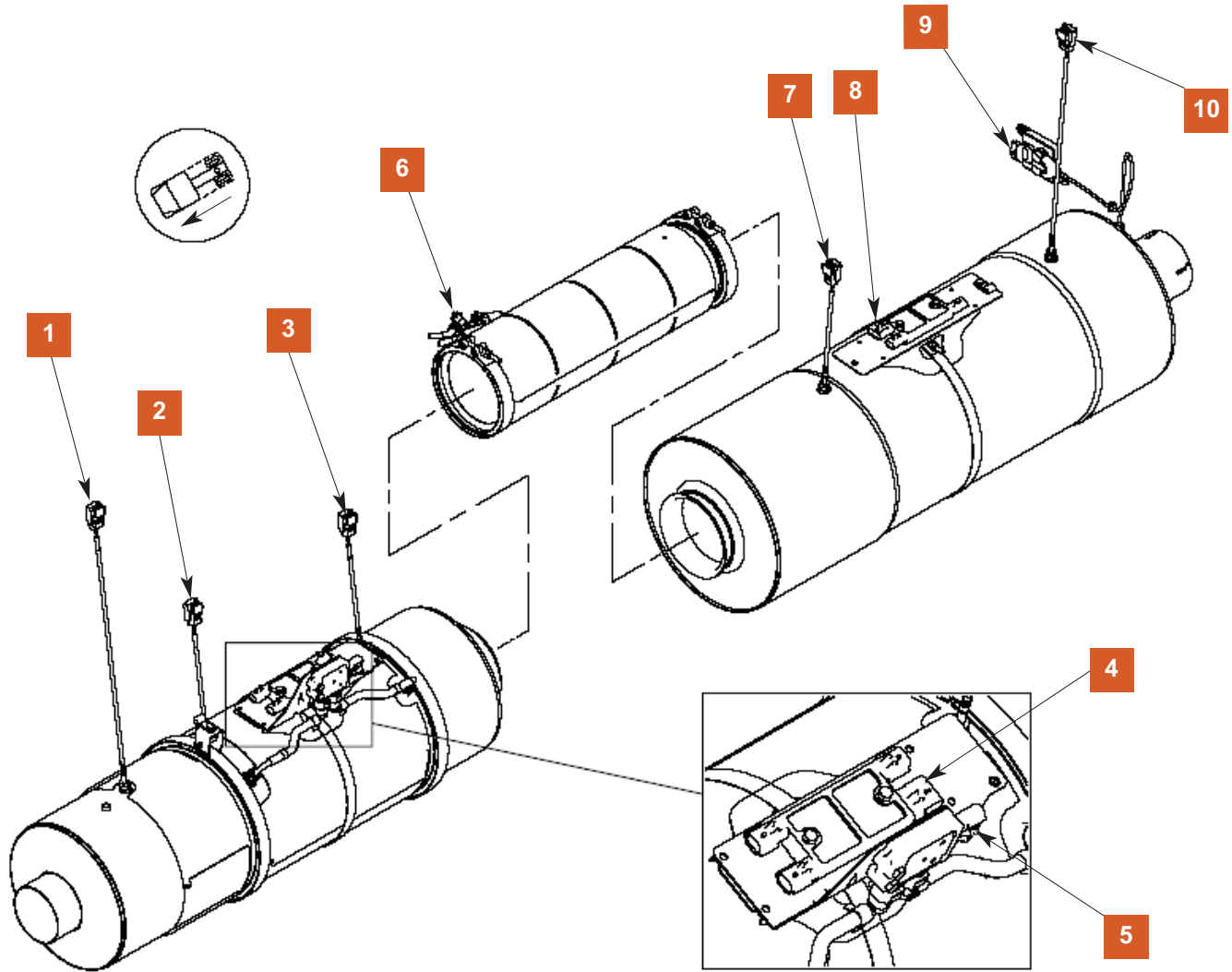


FIGURE 1 - CUMMINS ATD SENSOR LOCATIONS

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

## DIESEL EXHAUST FLUID (DEF) FILTER

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

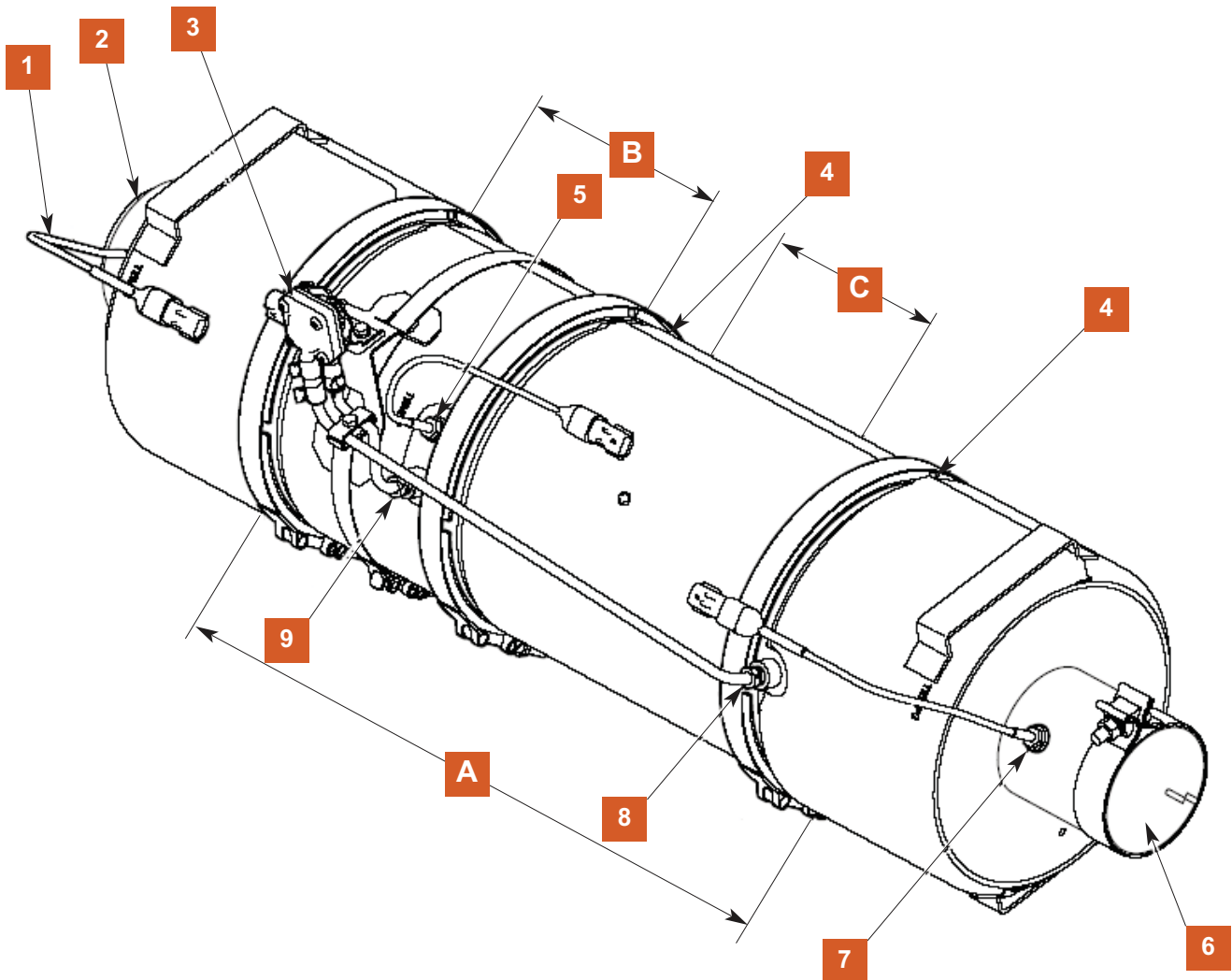
damage. Replace damage components as needed. If leakage exists at the clamp, tighten the nuts to the required torque. If leakage persists, install a new exhaust seal clamp. Do not reuse seal clamps. Once a seal clamp is loosened or removed, it must be replaced.

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 re-route as needed.



**FIGURE 2- AFTERTREATMENT DEVICE (TYPICAL)**

- |  |                                |
|--|--------------------------------|
| A. INSPECT THIS AREA OF THE CANISTER FOR DENTS | 4.. DPF V-BAND MOUNTING CLAMPS |
| B. DOC AREA                                    | 5. INLET TEMPERATURE SENSOR    |
| C. DPF AREA                                    | 6. EXHAUST OUTLET TO DIFFUSER  |
| 1. INLET TEMPERATURE SENSOR                    | 7. OUTLET TEMPERATURE SENSOR   |
| 2. MARMON FITTING AT INLET FROM TURBOCHARGER   | 8. DPF OUTLET PRESSURE SENSOR  |
| 3. SENSOR HOUSING                              | 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.

 **HIGH POINT, NORTH CAROLINA**  
**MFD. BY THOMAS BUILT BUSES, INC.**

MFD. BY THOMAS BUILT BUSES, INC. DATE MM -2021  
INC. VEH. MFD. BY: THOMAS BUILT BUSES DATE MM -2021

**VEHICLE EMISSION CONTROL INFORMATION**

VEHICLE IDENTIFICATION NUMBER: YYYYYYYYYYYYYY  
VEHICLE FAMILY CODE: MDTN2VOCV04M  
REGULATORY SUBCATEGORY:  
Compression-Ignition Medium HDV - Multi-Purpose  
EMISSION CONTROL IDENTIFIERS: LRRA

THIS VEHICLE COMPLIES WITH THE U.S. EPA AND CALIFORNIA  
REGULATIONS FOR 2021 HEAVY-DUTY VEHICLES  
BODY ID: NNNNNN-NNNNNN-NNYY  
SEE OWNER'S MANUAL FOR PROPER MAINTENANCE OF THIS VEHICLE TBB PART NUMBER: 176984

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

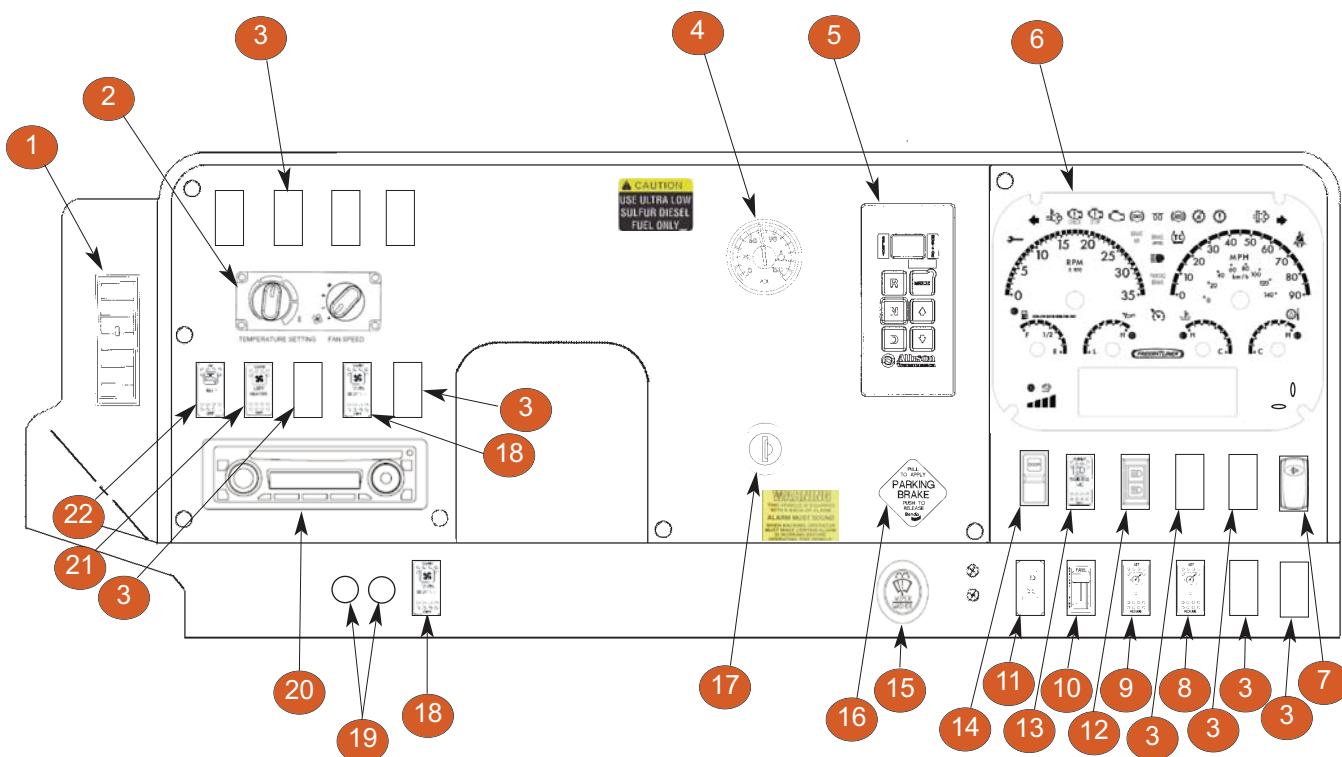


# OPERATOR'S COMPARTMENT

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 vehicle. A proper understanding of component location, function, and operation is important to the proper operation of the bus.

## INSTRUMENT CONTROL UNIT, WITH OPTIONAL 3000 PTS TRANSMISSION

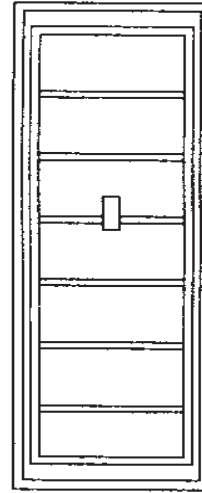


- |   |   |
|---|---|
| 1. AIR VENT                                       | 12. PILOT LIGHT, w/ WARNING LIGHT SYMBOL (OPTIONAL) |
| 2. HEATER/DEFROSTER FAN CONTROL                   | 13. WARNING SWITCH, ON-OFF-AMBER LED (OPTIONAL)     |
| 3. SWITCH BLANKS                                  | 14. DOOR SWITCH                                     |
| 4. AIR PRESSURE GAUGE                             | 15. WIPER/WASHER SWITCH                             |
| 5. 3000 TRANSMISSION KEYPAD CONTROLLER (OPTIONAL) | 16. PARK BRAKE VALVE (AIR BRAKES)                   |
| 2500 TRANSMISSION SHIFTER (OPTIONAL)              | 17. IGNITION SWITCH                                 |
| 6. EPA10 INSTRUMENT CLUSTER (DIESEL)              | 18. REAR (PASSENGER) HEATER SWITCH                  |
| 7. ATD MANUAL REGEN SWITCH (OPTIONAL)             | 19. REMOTE MIRROR CONTROLS                          |
| 8. CRUISE CONTROL SWITCH, SET/RESUME (OPTIONAL)   | 20. RADIO (OPTIONAL)                                |
| 9. CRUISE CONTROL SWITCH, ON-OFF (OPTIONAL)       | 21. LEFT HEATER SWITCH                              |
| 10. PANEL DIMMER SWITCH                           | 22. BOOSTER PUMP                                    |
| 11. HEADLIGHT SWITCH                              |   |

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

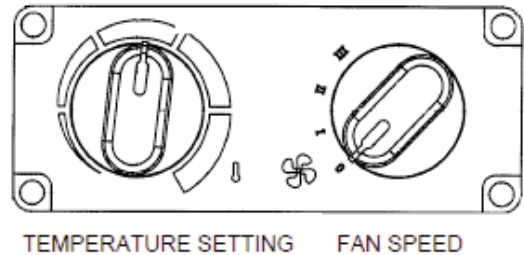
## DRIVER'S AIR VENT

Located on the dash at the driver's window and directs air from the defrosters to the driver's side glass.



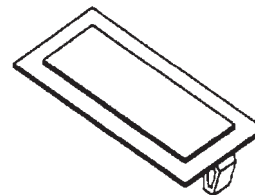
## ELECTRONIC HEATER / DEFROSTER

The heater control panel enables the operator to control the dash heating system by adjusting the temperature setting and the fan speed.



## SWITCH BLANKS

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





## AIR PRESSURE GAUGE

The air pressure gauge indicates the levels of air pressure in the primary or rear axle brake system (green needle). (An optional secondary or front axle brake system, red needle, is available.) If you have dual air pressure gauges, they should indicate the same pressure reading. Common cut-out pressures are between 105-125 psi (72-86 kPa). Common cut-in pressures are between 90-105 psi (62-72 kPa). The pressure range between cut-in and cut-out is not adjustable.

The rear brakes will gradually begin to apply when air pressure drops below 65 psi (45 kPa). At 40 psi (28 kPa) the rear brakes will automatically lock up by actuating the PP-1 valve and allowing the air in the spring brake side of the brake chamber to be released.

Determine and correct cause of pressure loss before returning vehicle to service.

## ! WARNING

In the event that a pressure loss occurs, the operator can identify the affected system by observing the gauge needles. Stop the vehicle immediately if either of the following conditions occur:

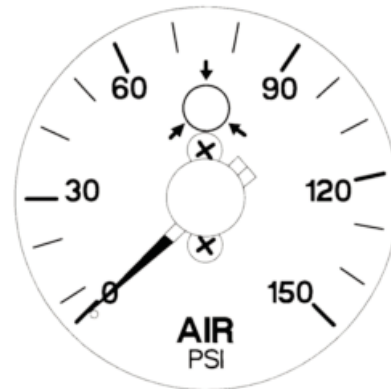
Lower air warning buzzer sounds and/or indicator light comes on when the air pressure drops below 60-72 psi (41-50 kPa).

## ! CAUTION

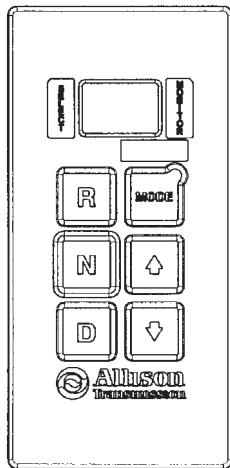
If one needle suddenly drops pressure and stays below 65 psi (448 kPa), the other system can still safely stop the vehicle, but it may take longer, stopping distances may be increased, and the brakes can only be applied a limited number of times. Have the vehicle repaired immediately if this occurs.

## NOTICE

On Hydraulics units, a single needle air gauge is installed for air-operated accessories.



## TRANSMISSION SHIFTER, WITH OPTIONAL 3000 PTS TRANSMISSION (PUSHBUTTON)



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

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

**(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) Neutral** 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.



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



**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) Drive** is selected, the transmission will initially engage the lowest gear programmed for the **(D) Drive** position, usually **(1) First** 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) Drive** to **(R) Reverse**.

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.

*(CONTINUED ON NEXT PAGE.)*

## TRANSMISSION SHIFTER, w/ OPTIONAL 3000 PTS TRANSMISSION (PUSHBUTTON) (CONT'D)

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.**

### 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.



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

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.



**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.

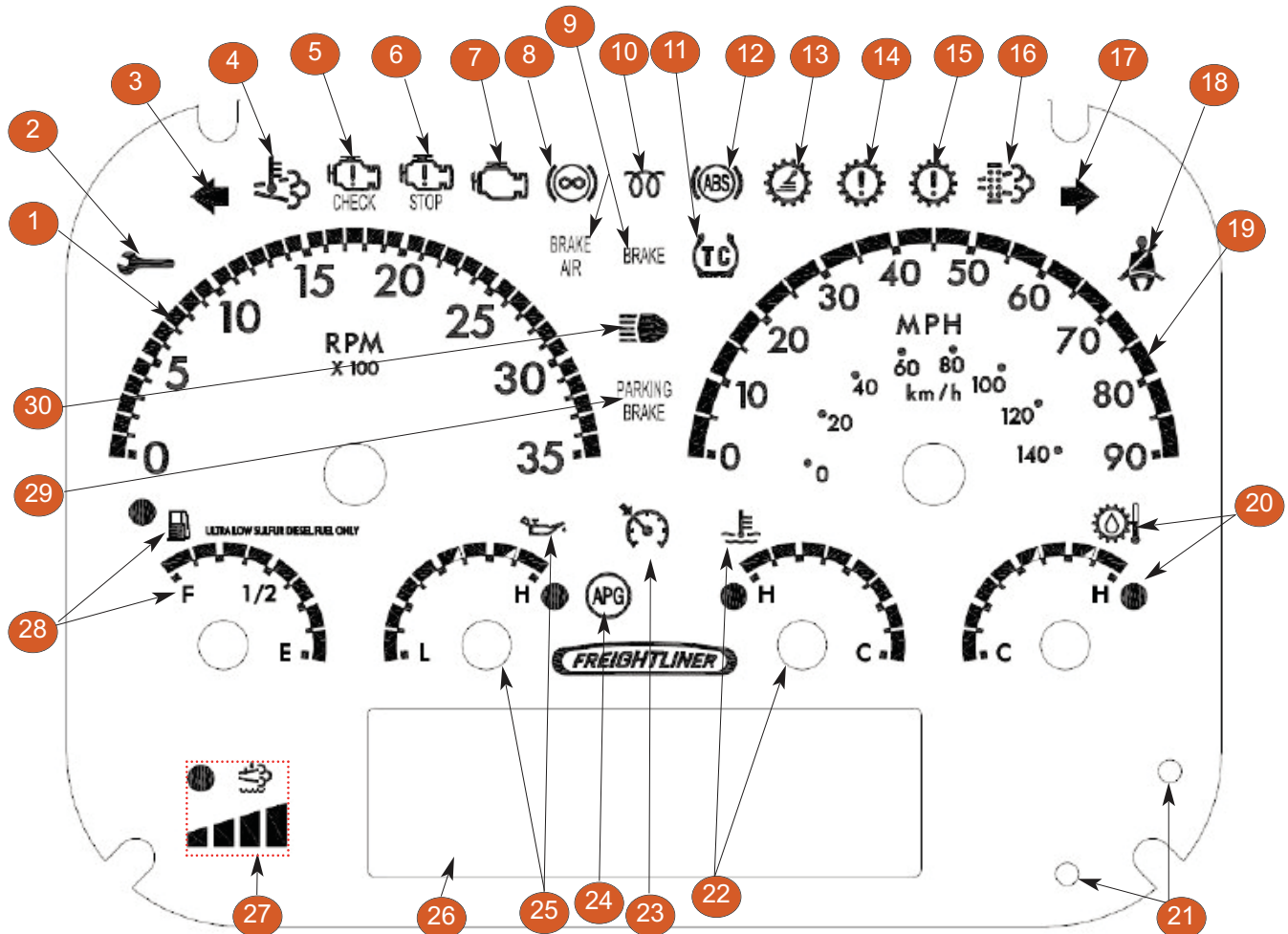
A red indicator light will illuminate if the transmission is unable to shift at the appropriate time. This indicates a failure in the transmission and should be checked by a qualified technician. Pull the bus over to a safe location and get assistance.



**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.**

# OPERATOR'S COMPARTMENT

## EPA10 INSTRUMENT CLUSTER (DIESEL)



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

(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
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 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.

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.

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

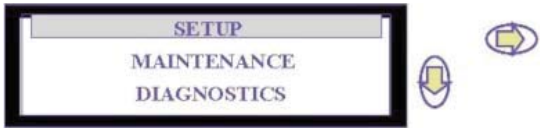
## DISPLAY MESSAGE SCREEN (OPERATING EXAMPLE FOR MAINTENANCE MENU)

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.

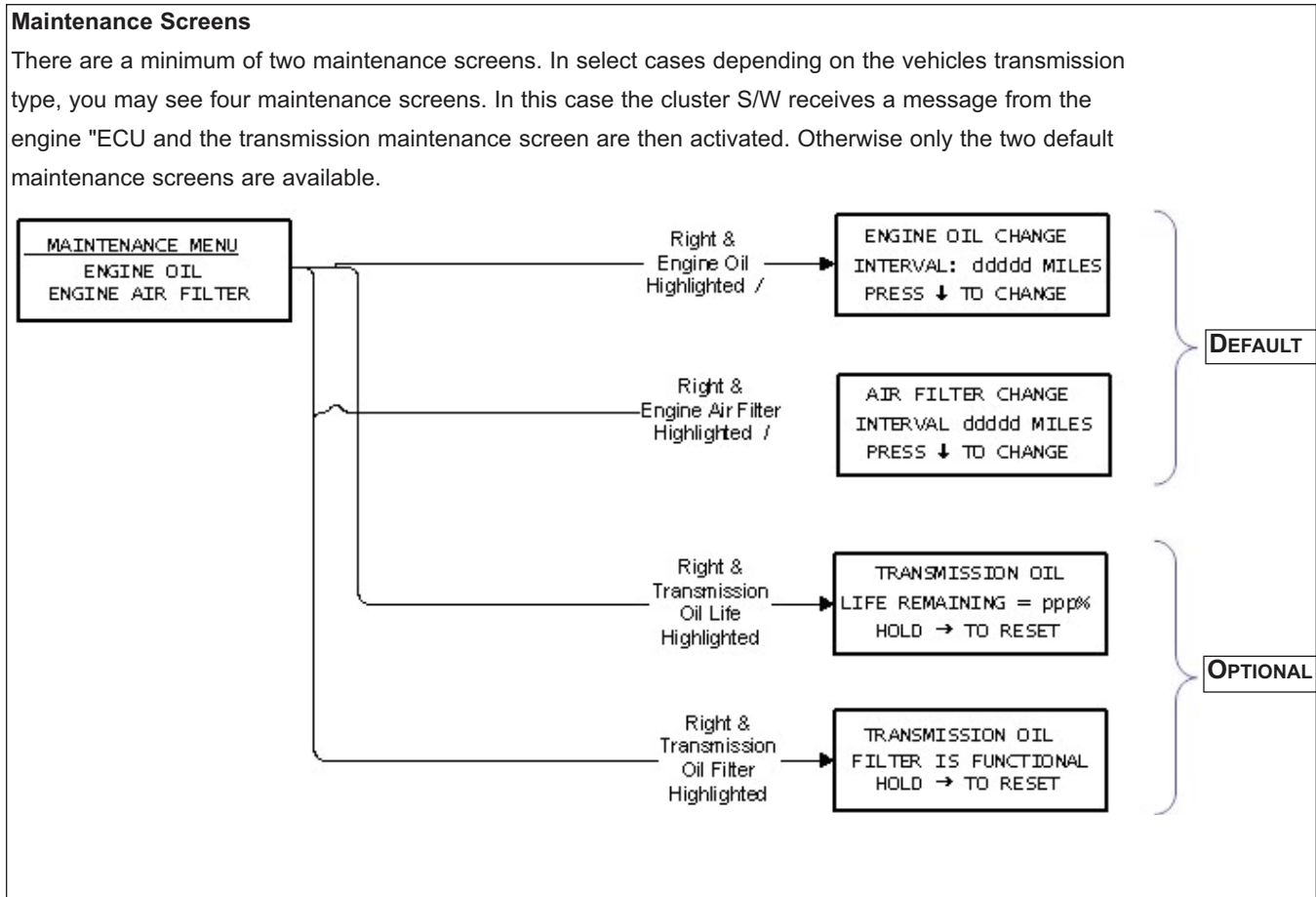
### Screen 1

**Auxiliary Screens**  
**-Maintenance**



Maintenance Screens are next.

### Screen 2



(CONTINUED ON NEXT PAGE)



## 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.

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## DPF (DIESEL PARTICULATE FILTER) MANUAL REGEN SWITCH

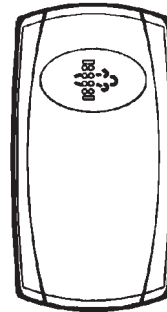
The DPF Regen Switch located on the dash, may have three selectable positions:

- 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.

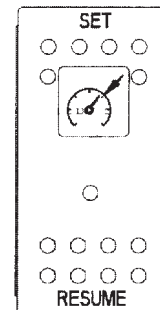


## CRUISE CONTROL SWITCH, SET/RESUME (OPT.)

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.

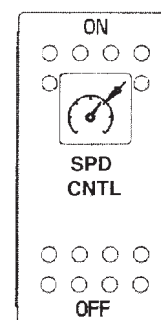
To return the vehicle to the desired speed, press the switch to the "RESUME" position. The vehicle will return to its preset speed.



## CRUISE CONTROL SWITCH, ON-OFF (OPT.)

Activates or deactivates the cruise control.

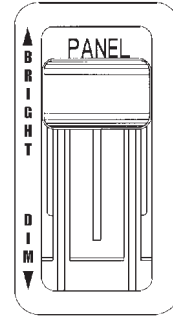
Switch must be in "ON" position for the Cruise Control Set/Resume Switch to operate.



# OPERATOR'S COMPARTMENT

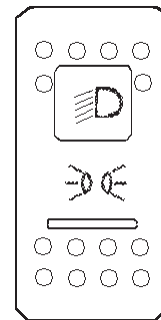
## PANEL DIMMER SWITCH (OPT.)

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



## HEADLIGHT SWITCH

The headlight switch is a three position switch that controls the main lighting circuit. Position 1, lower position is the OFF position. Position 2 center energizes the parking lights, tail lights, marker/clearance lights, instrument and panel lights. Position 3, upper position energizes the headlights.



## PILOT LIGHT, WITH WARNING LIGHT SYMBOL (OPT.)

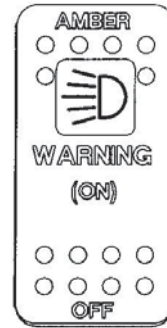
Amber and red flashing lights coordinated with eight-light warning system.



## EIGHT LIGHT WARNING

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.

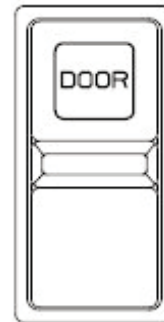


## DOOR CONTROL SWITCH

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 connected 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. If ignition key is turned off and door switch is left in open position, an alarm buzzer will sound.

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

Air doors have two or three position switches.



# OPERATOR'S COMPARTMENT

## WINDSHIELD WIPER/WASHER CONTROL AND INDICATOR

Electric windshield wiper/washer is standard. The electric windshield wiper/washer controls the wipers. The wiper knob is located on the lower right dash. The wiper control is a multi-position switch, which operates clockwise, OFF, INTERMITTENT, LOW, HIGH.

INTERMITTENT wiper control is integrated into the switch. To activate, turn the wiper knob one click or position clockwise from OFF and the wiper will operate on INTERMITTENT. The closer to the OFF position, the longer the interval. The further away from the OFF position, the shorter the interval. The next position to the right or clockwise is LOW and the last position operates the wipers on HIGH.

To deactivate, turn the knob counterclockwise to the OFF position.

To activate the windshield washers, press the wiper knob. The washers will operate on both wet arms. Wet arms provide for the washer fluid to be plumbed to the spray tips located on the wiper blades at the pivot point.



## PARK BRAKE VALVE (AIR BRAKES)

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



**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.**



# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## 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.

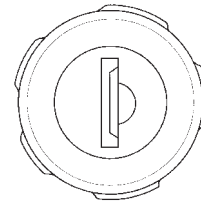
*Position 2* (one click counterclockwise) is the accessory position. This position energizes the accessory circuits only.

*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.

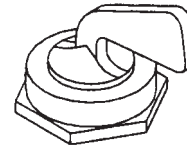
Once the switch is turned to Position 4 and released, it must be returned to Position 1 before attempting to restart the engine. The ignition switch contains an anti-restart feature to prevent engaging the starter with the engine running.

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



## KEYLESS IGNITION SWITCH (OPT.)

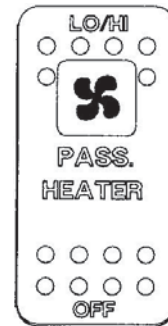
The keyless ignition switch with anti-restart is offered as an alternative to the standard keyed switch. Turn the keyless ignition switch clockwise to start vehicle engine. Release switch as engine starts.



# OPERATOR'S COMPARTMENT

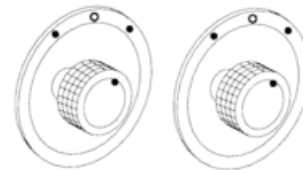
## PASSENGER HEATER SWITCH, LO/HI, OFF (OPT.)

The underseat heater fan switches enable the vehicle operator to control the fan speed of the underseat heaters. The fans operate at either Low, High speed or Off.



## REAR VIEW MIRROR CONTROL SWITCHES (OPT.)

Controls remote adjustment for both upper flat and lower convex mirrors (left side and right side) independently. Switches are located on the lower left dash.



## RADIO CONTROLS - SEE RADIO OPERATOR'S MANUAL

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

## LEFT HEATER SWITCH, LO/HI, OFF (OPT.)

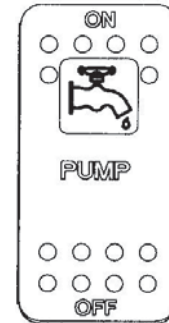
The underseat heater fan switches enable the vehicle operator to control the fan speed of the underseat heaters. The fans operate at either Low, High speed or Off.



# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## BOOSTER PUMP, ON-OFF

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.



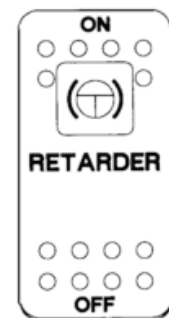
## EXHAUST COMPRESSION BRAKE, HI-LOW (OPT.)

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 (OPT.)

This switch activates retarder in the transmission. The retarder in the transmission becomes activate when the vehicle 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 vehicle operator six different levels of retardation.



## 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.)

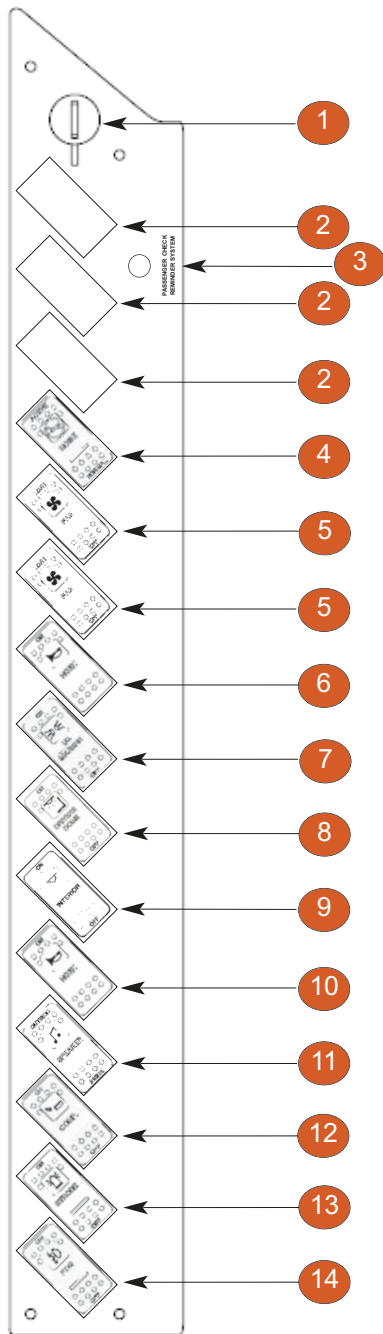
Momentary switch that allows the driver to activate the solenoid drain valve located on the primary reservoir.



## 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 vehicle specifications and selected options.



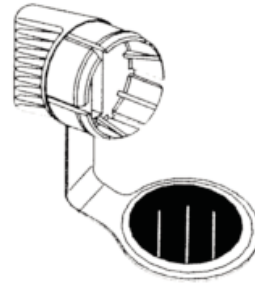
1. AUXILIARY POWER OULET,12-VOLT (OPTIONAL)
2. SWITCH BLANKS
3. PASSENGER CHECK REMINDER SYSTEM PILOT LIGHT
4. NOISE SUPPRESSION, ACTIVE-NORMAL (OPTIONAL)
5. DEFROSTER FAN, LO/HI, OFF (OPTIONAL)
6. HORN, ON-NORMAL (OPTIONAL)
7. ID MARKER, ON-OFF (OPTIONAL)
- 8, DRIVERS DOME, ON-OFF (OPTIONAL)
9. INTERIOR, ON-OFF
10. LIFT, ON-OFF (OPTIONAL)
11. SPEAKER, OUTSIDE-INSIDE (OPTIONAL)
12. COMPARTMENT (LUGGAGE), ON-OFF (OPTIONAL)
13. STROBE, ON-OFF (OPTIONAL)
14. FOG, ON-OFF (OPTIONAL)

# OPERATOR'S COMPARTMENT

## AUXILIARY POWER OUTLET, 12-VOLT (OPT.)

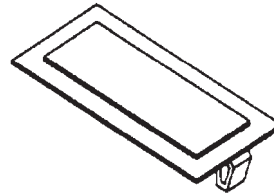
Supplies a 12-volt power supply source for driver add-on accessories, such as cellular phones and two way radios.

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



## SWITCH BLANKS

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



## PASSENGER CHECK REMINDER SYSTEM - PILOT LIGHT

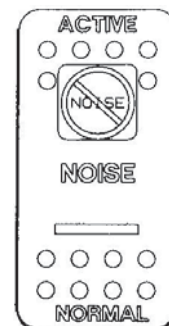
The pilot light indicates that the Child Check System is armed when illuminated.



PASSENGER CHECK  
REMINDER SYSTEM

## NOISE SUPPRESSION SWITCH (OPT.)

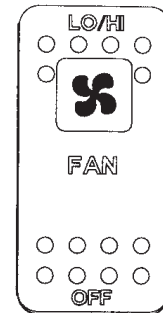
With the noise suppression switch in the active position, it enables the driver to eliminate any noise from radio, heaters and fans that may be in use when the bus is approaching railroad crossings.



# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## DEFROSTER FAN SWITCH

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



## HORN, AIR (OPT.)

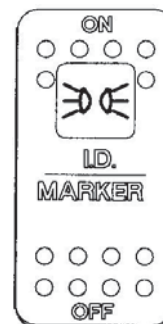
Momentary switch that activates the air horn mounted beneath the driver's vestibule floor.

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



## ID MARKER LIGHTS SWITCH (OPT.)

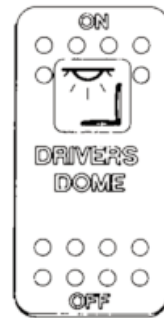
The marker light switch energizes the bus marker lights.



# OPERATOR'S COMPARTMENT

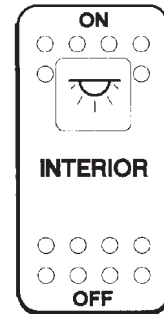
## DRIVER'S DOME LIGHT SWITCH, ON-OFF (OPT.)

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



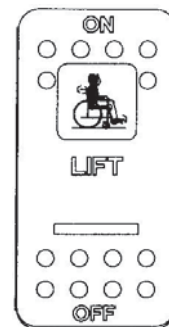
## INTERIOR LIGHT SWITCHES

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



## LIFT SWITCH, ON-OFF (OPT.)

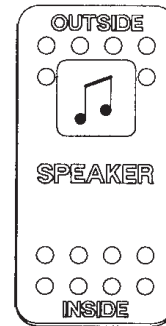
Controlled by the bus operator, switch must be **ON** to operate the lift.



# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

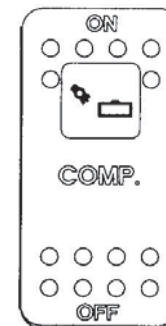
## OUTSIDE SPEAKER HORN SWITCH (OPT.)

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



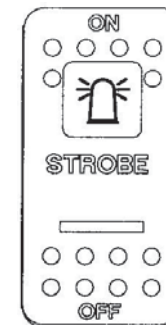
## LUGGAGE COMPARTMENT LIGHT SWITCH (OPT.)

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



## STROBE LIGHT (OPT.)

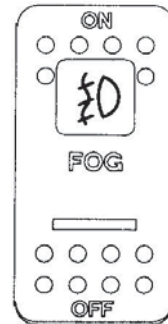
These lights are used in some eight light warning systems, some stop arm assemblies and as a separate warning light affixed to the top of the bus in various locations. These strobes improve the visibility of a stopped school bus in all driving conditions.



# OPERATOR'S COMPARTMENT

## FOG LIGHTS SWITCH, ON-OFF (OPT.)

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



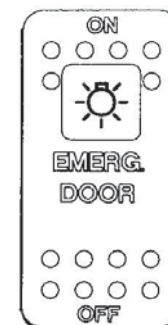
## CROSSING ARM DEACTIVATION SWITCH (OPT.)

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



## EMERGENCY DOOR LIGHT SWITCH (OPT.)

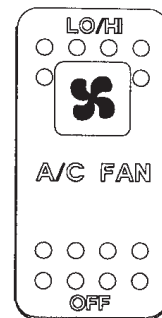
Turns on lights mounted above the emergency door and/or rear pushout hatch.



# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## AIR CONDITIONING MASTER SWITCH, OFF-LOW-HIGH (OPT.)

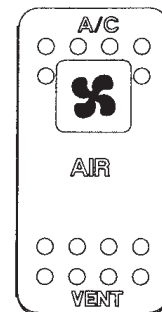
The air conditioning switch enables the bus operator to energize or de-energize the air conditioning system.



## A/C AIR 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.



## STEP/DOOR LIGHT SWITCH (OPT.)

Energizes the step/door lights without activating the door.

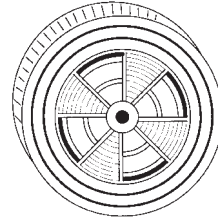




# OPERATOR'S COMPARTMENT

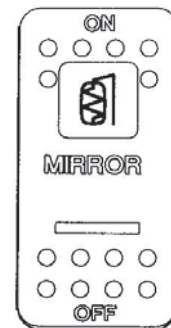
## WARNING BUZZER

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



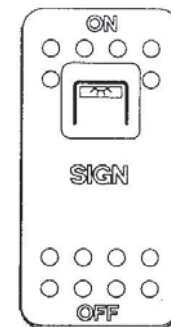
## MIRROR DEFROSTER SWITCH (OPT.)

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



## DESTINATION SIGN SWITCH (OPT.)

The destination sign switch energizes the vehicle destination sign light.



# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

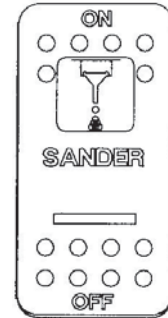
## MICROPHONE JACK (OPT.)

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



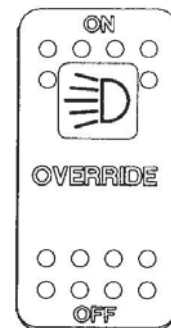
## SANDER SWITCH (OPT.)

Switch located in the driver's area, enables vehicle 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 activate / de-activate it, as required per option content. (This switch may be located on the dash as well as the side panel.)



# OPERATOR'S COMPARTMENT

## AUXILIARY RESERVE AIR TANK DRAIN (OPT.)

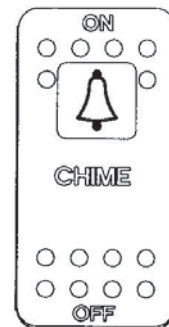
Momentary switch that allows the driver to activate the solenoid drain valve located on the auxiliary reservoir.



## CHIME, ON-OFF (OPT.)

Vehicle operator has the option of having the chime switch **ON** or **OFF**. If the 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 vehicle operator will be alerted by a single chime sound for non-mobility aid passengers; double chime sound for mobility aid passengers requesting to disembark.



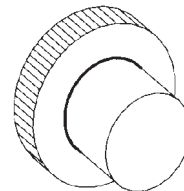
## PUSH BUTTON EIGHT-LIGHT WARNING SYSTEM (OPT.)

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

As vehicle 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.**



## HAND BRAKE - HYDRAULIC BRAKES

The driveline parking brake is designed to hold the vehicle securely in a parked position. This is accomplished by locking the driveline in place preventing its rotation. Never use the parking brake to stop a moving vehicle. The control, or hand lever, located beside the driver, is an overcenter locking type. It has an adjustment knob on the end for the operator to adjust the amount of brake application.

To apply the parking brake, depress the brake pedal and pull on the park brake lever. When properly adjusted, the lever should have an increased resistance until it passes over center to the fully applied position. To release the parking brake, depress the brake pedal and push the lever forward passing over center. Hold the lever to the end of travel.

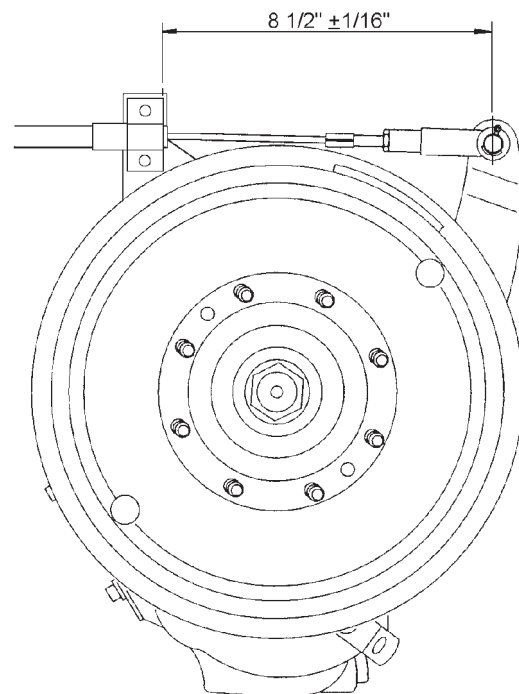
If the parking brake does not hold the vehicle securely when applied, depress the brake pedal and release the parking brake. Turn the adjustment knob clockwise, as viewed from the end of the lever, to increase the braking force. Turning the knob clockwise will also increase the resistance needed to move the lever over center.



**Do not allow the driveline park brake hand lever to snap to the release position. The operator must maintain control of the lever during its full travel. Allowing the lever to move unaided, could allow damage to the pin or cable or both, causing the brake to not hold the vehicle securely when reapplied allowing the vehicle to roll away, that could cause property damage or severe personal injury.**

To properly adjust the driveline park brake:

1. Park the bus on level ground.
2. Chock the vehicle wheels.
3. From underneath the bus, locate the transmission mounted park brake drum assembly.
4. Adjust the distance from the center of the yoke pin at the lever of the parking brake drum to the end of the cable at the face of the mounting clamp of the parking brake cable to  $8\frac{1}{2}'' \pm 1/16''$ . This will eliminate the free play of the parking brake lever. (Make sure there is no drag at this setting, if so, increase dimension until brake is just prior to brake drag.)

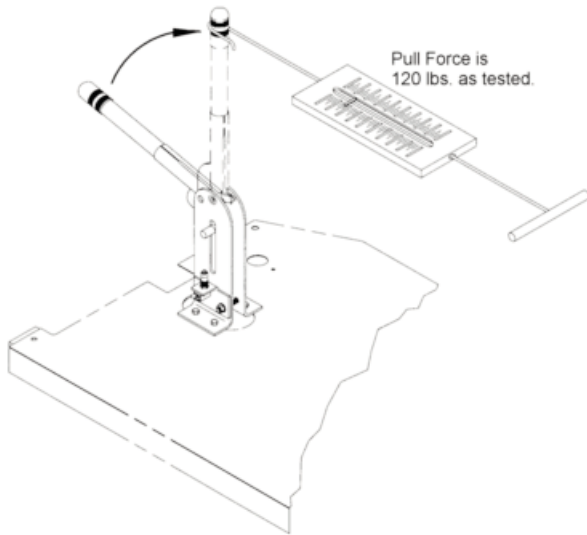


5. From the driver's seat, gradually turn the adjustment knob on the parking brake handle clockwise until resistance is felt.

*(CONTINUED ON NEXT PAGE.)*

## HAND BRAKE - HYDRAULIC BRAKES (CONT'D)

6. Use a pull scale graduated in pounds and attach it to the brake handle one inch from the end of the lever.



7. Take measurements of the force required applying the brake.
8. Release the parking brake by controlling the handle to the off position.
9. Continue to gradually turn the adjusting knob clockwise, apply the brake and take readings on the force required to apply the brake and release the brake.
10. Discontinue adjusting the knob when the scale is reading a force of 120 +/- 2 pounds to apply the hand brake. The hand brake is now adjusted correctly.
11. Remove the scale and wheel chocks; the bus is ready for service.



### WARNING

Rapid or forced release of the hand lever for the driveline park brake, could result in damage to the cable. A damaged cable could lead to cable failure resulting in the inability to apply the driveline park brake which could result in a vehicle roll away that could cause property damage or severe personal injury.

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## 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.

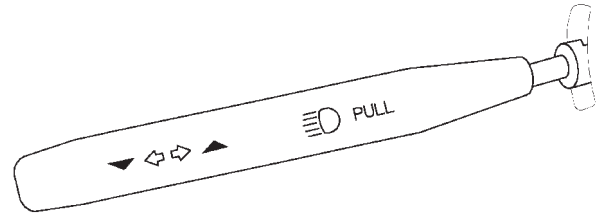
## TURN SIGNAL LEVER/DIMMER SWITCH

The turn signal lever serves the dual purpose of energizing the vehicle turn signals and changing the vehicle headlights from one setting to the other.

To activate the turn signals, move lever downward for a left-hand turn or upward for a right-hand turn. 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 and release. To return vehicle headlights to the low beam setting, pull turn signal lever upward again and release.

The vehicle's headlights have an optional high beam flash provision. With the headlight switch in the ON or OFF position, pull upward on the turn signal lever and release to flash high beams.



# OPERATOR'S COMPARTMENT

## 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.



**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

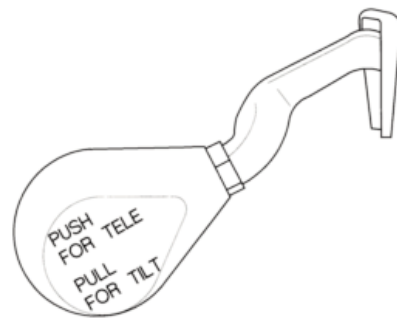
The tilt steering column enables the operator to adjust the angle and height of the steering column to a more comfortable driving position.

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.



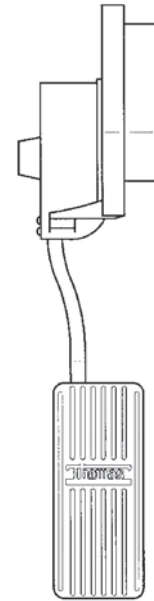
**Do not adjust while vehicle is in motion.**



# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

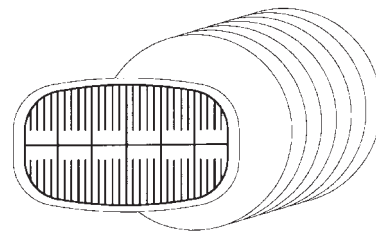
## ELECTRONIC ACCELERATOR PEDAL

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



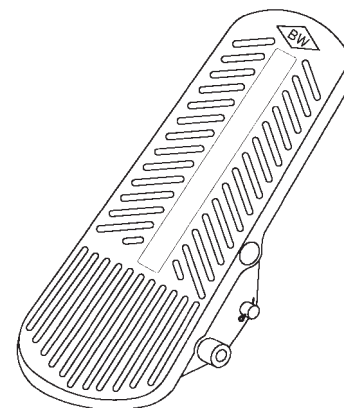
## BRAKE PEDAL (HYDRAULIC)

The brake pedal controls the application of the vehicle service brake. Downward pressure forces the movement of hydraulic fluid from a booster or master cylinder to each wheel. Anticipating the stop and using light pressure will result in increased brake pad life.



## BRAKE PEDAL (AIR)

The brake pedal controls the application of the vehicle service brake. Downward pressure on the brake pedal decreases the vehicle speed by applying air to the brake chambers at each wheel and stops the vehicle 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.



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



# OPERATOR'S COMPARTMENT

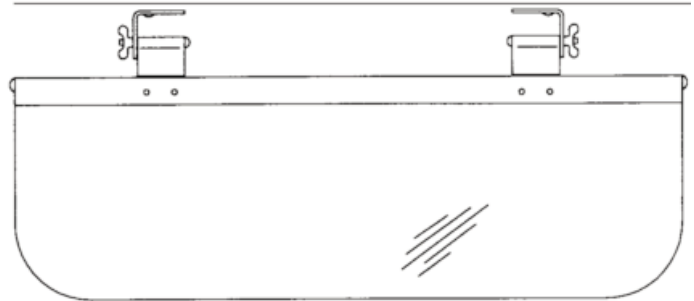
## SUN VISOR

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

Never use an abrasive cleaner. Keep mounting brackets tight.

Optional sun visor is available in three versions:

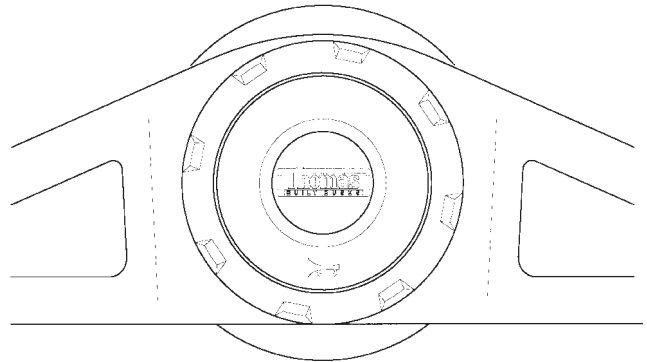
1. A plexiglass 6" x 30" with aluminum legs mounted over the driver's window and/or over the right side of windshield.
2. A 6" x 30" California sun visor, black, non-transparent, mounted in pivot brackets over the driver's window.
3. A 6" x 30" visor mounted right side of windshield in addition to standard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



Clean with plexiglass cleaner and a soft dry towel.

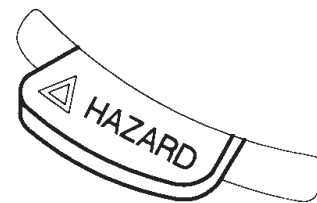
## Horn Button

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



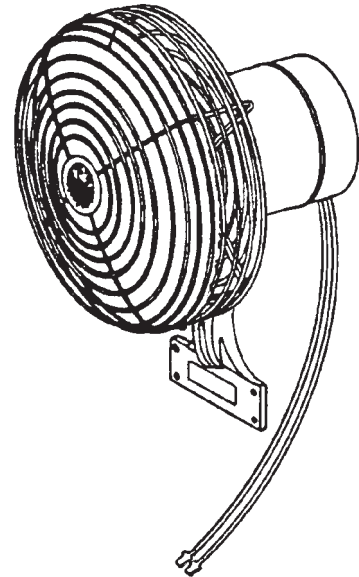
The emergency flashers enable the operator to alert other motorists of the vehicle's position in the road. Pulling the knob out activates the emergency flashers. Pushing the knob in deactivates the emergency flashers.

The emergency flashers should be activated when the vehicle is disabled in the street and obstructing traffic, stopping due to an emergency, in tow, or proceeding at very reduced speed.



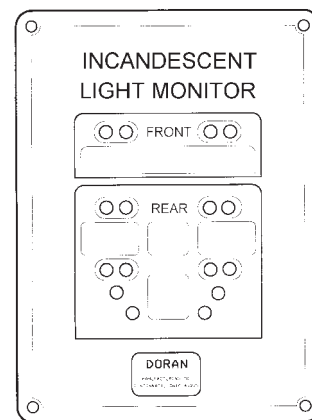
## DEFROSTER FANS (OPT.)

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



## Doran Monitor, Exterior 4 or 8 Light (Opt.)

The Doran exterior light monitoring system (4, 8, 12, 16) monitors the condition of those exterior vehicle lights identified by the type of monitor board. The monitor provides the operator with the location of any malfunctioning light. In the event that a bulb has become damaged or burned-out or the circuit is interrupted, a corresponding light on the Doran panel goes off. The Doran panel should be checked daily to verify the operation of all warning lights.



# OPERATOR'S COMPARTMENT

## DRIVER'S SEAT

The driver's seat is designed to accommodate a variety of driver builds and seating preferences. The

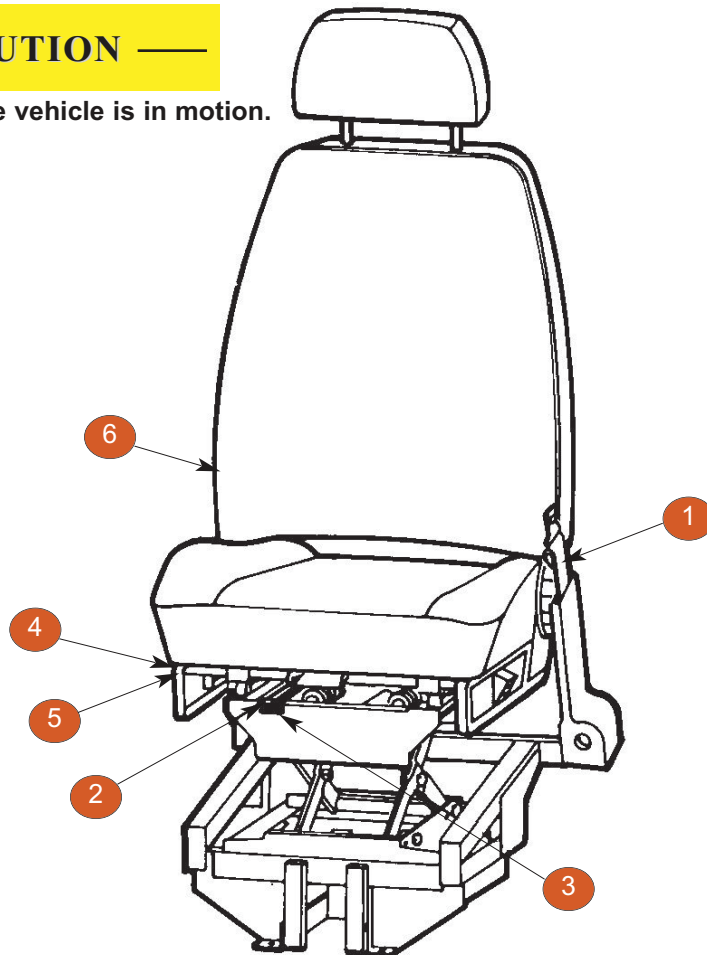
following adjustments enable the seat to be moved for maximum driver comfort:

## 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.



DO NOT adjust seat while vehicle is in motion.



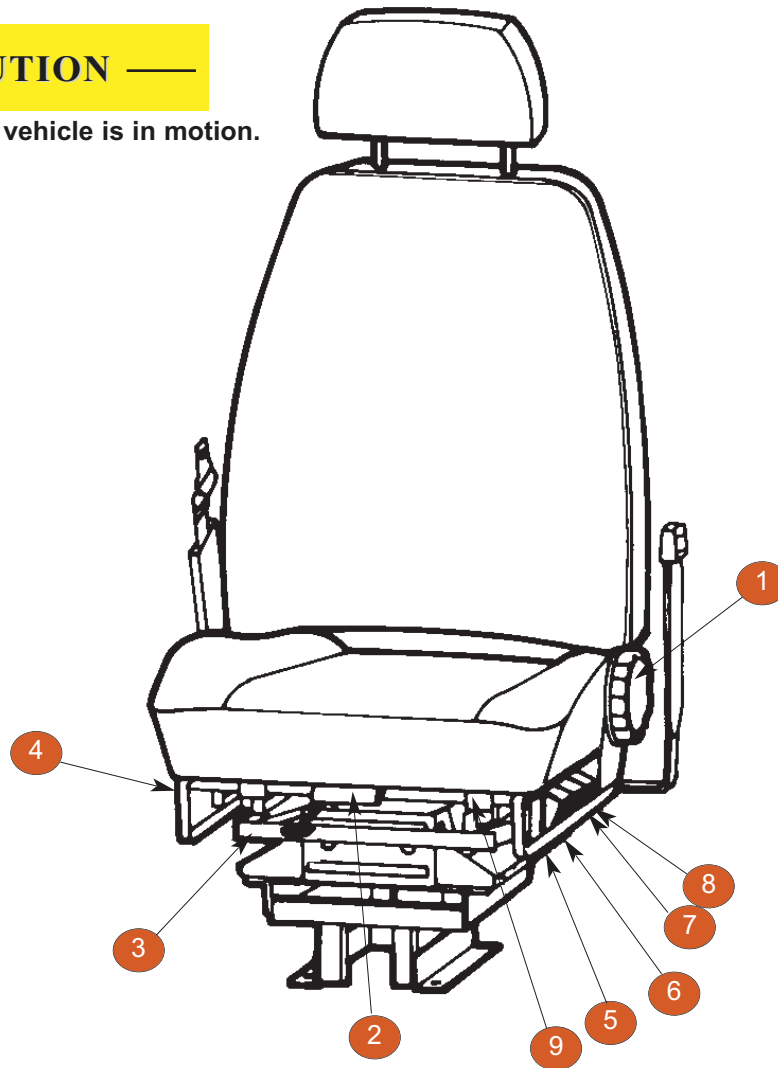
# SAF-T-LINER® EFX OPERATOR'S MANUAL

## 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.



**DO NOT** adjust seat while vehicle is in motion.

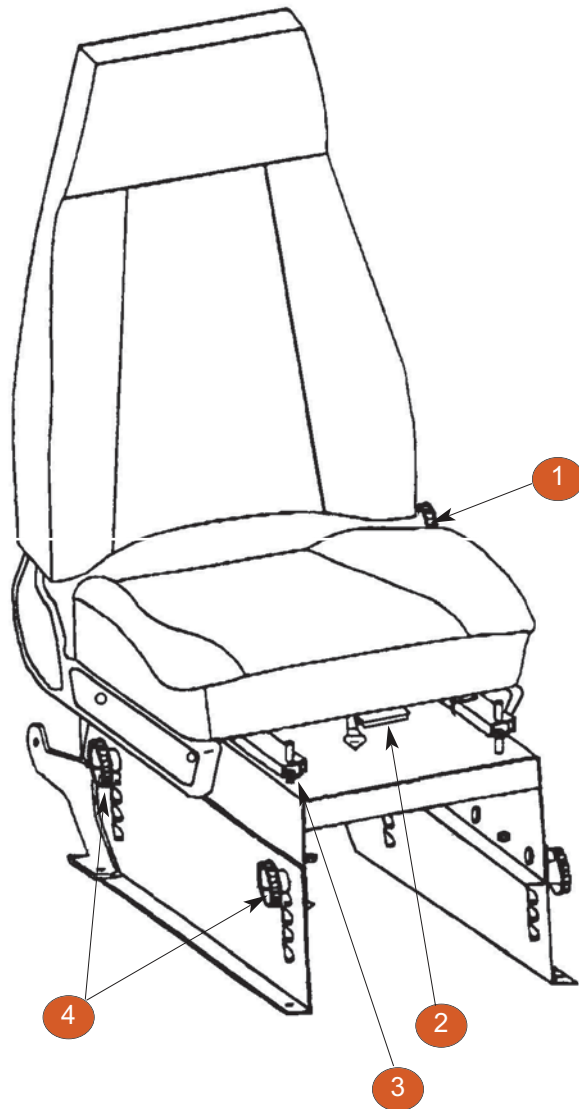


## DRIVER'S SEAT, WITH BOX PEDESTAL

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.



**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 vehicle.

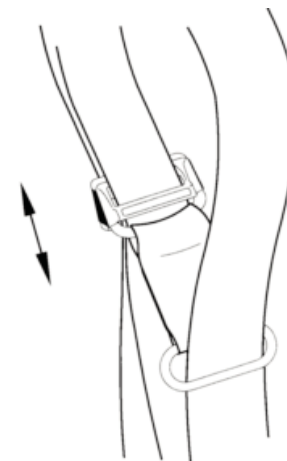
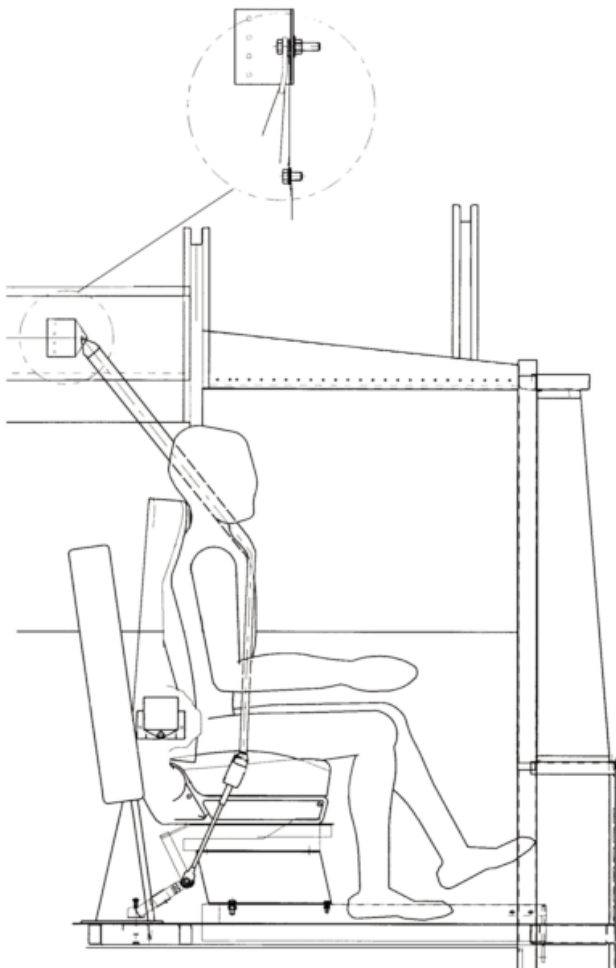
Prior to adjusting or fastening the seat belt, adjust the seat to a comfortable driving position. Refer to the *Driver's Seat* part of this section for adjustment information.

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).

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.



(CONTINUED ON NEXT PAGE.)

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

*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.



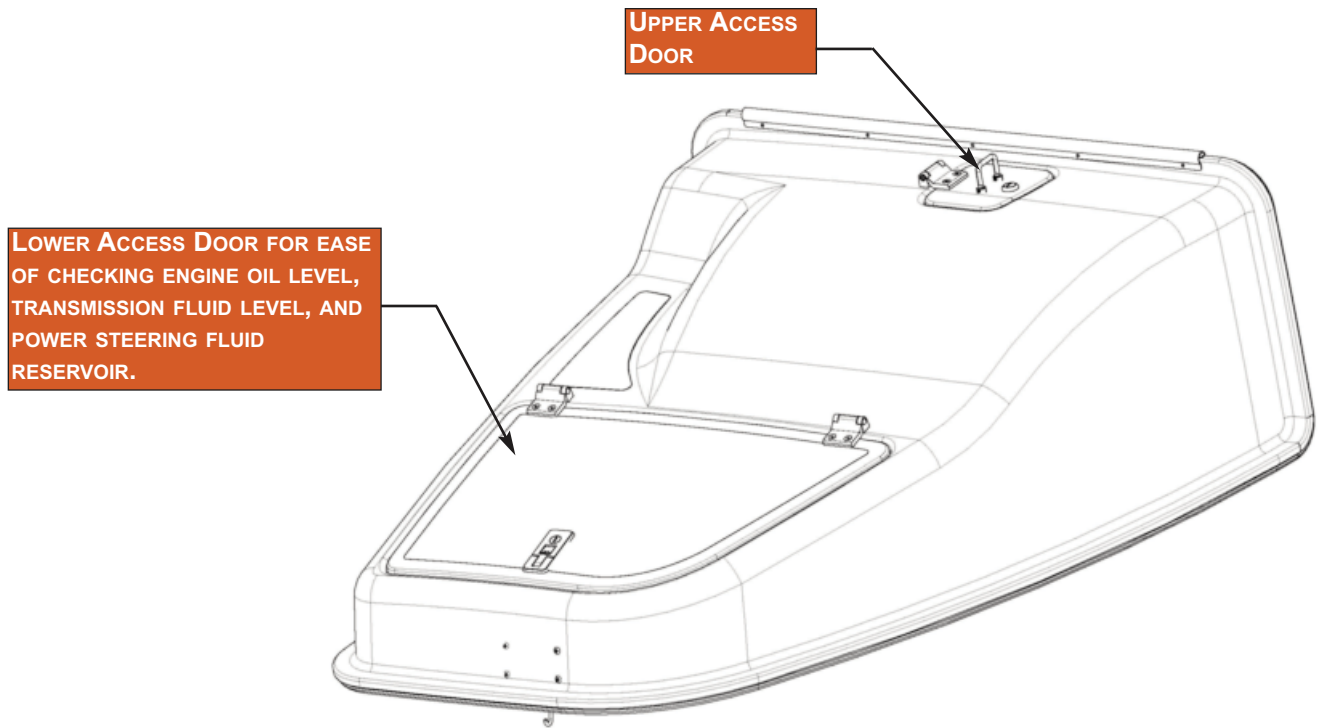
**The driver must always wear a seat belt when operating the vehicle.**

*Inspection* - Inspect the seat belts and tether belts as follows.

1. Check the web for fraying, cuts, or extreme wear, especially near the buckle latch plate and in the D-loop guide area.
2. Check the web for extreme dirt or dust, and for severe fading from exposure to sunlight.
3. Check the buckle and latch for operation and for wear or damage.
4. Check buckle cable for damage, sharp bends, kinks, frayed or exposed strands, and loose or corroded fasteners.
5. Check the Komfort Latch for function and cracks or other damage.
6. Check the web retractor for function and damage.
7. Check the mounting bolts for tightness and tighten any that are loose.

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## ENGINE ACCESS DOORS





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 vehicle. A proper

understanding of component location, function, and operation is important to the safe operation of the vehicle and the protection of all passengers.

## DAILY CHECKLIST

The vehicle 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 vehicle in service.

## EXTERIOR CHECKLIST

- Clean windshield, driver's window, door glass, mirrors, and headlights.
- Inspect vehicle exterior. Make sure all vehicle identification is clear, clean, and operates properly. Verify that all under-vehicle 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.

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## ENGINE COMPARTMENT SERVICE



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 CHECKLIST

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

- Check engine oil level before starting and when refueling.
- Check belt for cracks, breaks, frayed edges, and proper tension.
- Check coolant level (only with engine cool). As necessary, fill with a 50/50 water/antifreeze solution. **Fill to the cold max line; do not over fill.**

## 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 vehicle mirrors according to the following procedures before vehicle begins daily service:
  - 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 vehicle, while engine is running, for fluid or exhaust leaks.
  - Check operation of all exterior lights, safety equipment and signal devices.

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

*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.

## 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.

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## NORMAL STARTING

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

The following must apply before starting the vehicle:

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

To start the vehicle, use the following procedure:

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

3. Turn ignition key ON.
4. Wait until the Instrument Cluster performs self-check, then start.

**If engine fails to start within 30 seconds, wait 1 to 2 minutes and repeat step 4.**

## COLD WEATHER STARTING

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

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

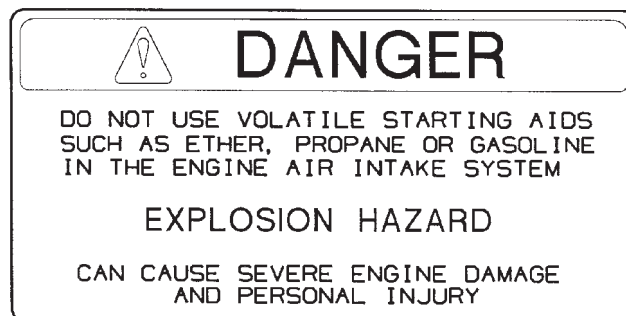
**IMPORTANT: Do not depress accelerator during step 3.**

3. Turn ignition key to ON. Wait until the Instrument Cluster performs self-check, then start.
4. On units equipped with a master control switch, turn switch to DAY and press engine start button.

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

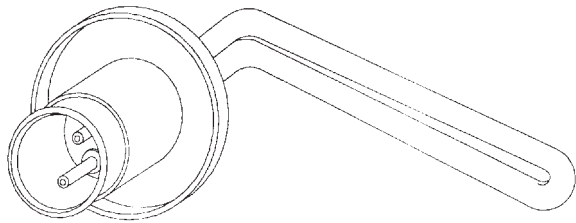
### NOTICE

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

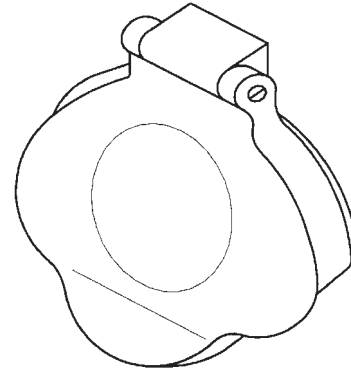


## BLOCK HEATERS

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 AC and possess a 750 watt capacity.



An optional weather proof plug-in receptacle is 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 vehicle is ready to enter service.

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## ENGINE IDLING/FAST IDLE SYSTEM

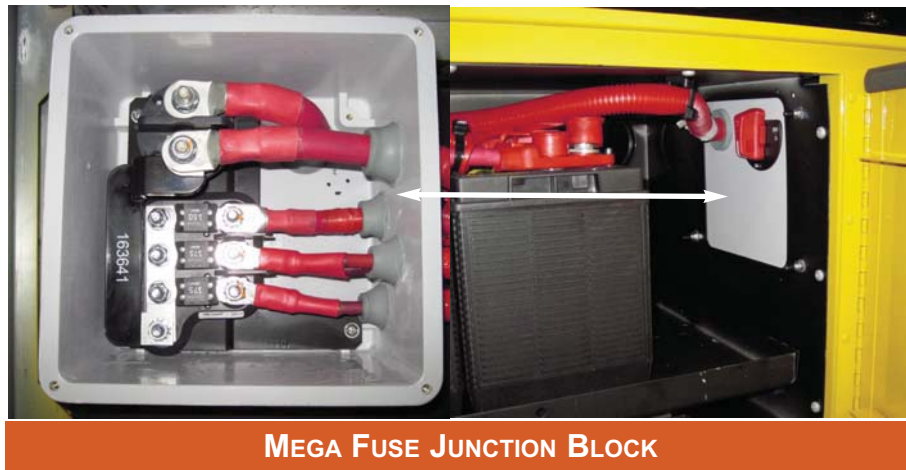
Idling the vehicle's diesel engine in cold temperatures will not result in desired engine temperature. Actually, a diesel engine cools down when left idling. The vehicle operator should activate the fast idle feature. The vehicle operator should activate the fast idle switch to automatically increase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



**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.**

## MAIN CIRCUIT BREAKER

The main body and chassis power supply cables are circuit protected by a Mega Fuse Junction Block (MFJB). The MFJB and main power disconnect switch are housed in a NEMA enclosure for protection from the environment and debris. The NEMA enclosure is mounted to the side of the battery box through which the main power disconnect switch is accessible. The main starter / alternator cable branches from inside this enclosure, keeping its terminals protected from the environment.



**MEGA FUSE JUNCTION BLOCK**

# OPERATING THE VEHICLE

## DRIVING TIPS (AUTOMATIC TRANSMISSIONS)

The vehicle 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 vehicle 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.



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

## ROCKING THE VEHICLE



"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



**Warning:** 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 gravelled surfaces, reduce speed. Avoid sharp turning maneuvers.

## PARKING

When parking the vehicle, use the following sequence:

1. Shift transmission lever to "Neutral" or "Park" with engine running. With Push Button, select the "Neutral" position while engine is running.
2. Apply parking brake. Let unit idle approximately five minutes.
3. Shut off engine.
4. Place chock blocks under at least one wheel.

**Air Brake:** 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" below.

Refer to the Operator's Compartment section of this manual for information concerning the Hydraulic Brake.

## RELEASE PARKING BRAKE - MANUALLY

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



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

Determine the type of brake chamber on the vehicle. 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 (MAINTENANCE FREE BATTERY)



### WARNING

**Batteries release explosive gas as a by-product of their chemical activity. Do not smoke when working around batteries. Put out all flames and remove any source of sparks or intense heat. Make sure the battery compartment is completely vented before disconnecting or connecting battery cables.**

**Battery acid is extremely harmful if splashed in the eyes or on the skin. Always wear a face shield and protective clothing when working around batteries.**

**Damaged, chafed, or kinked wiring can cause electrical short-circuits and lead to fires, causing property damage, injury, or death. Clean, inspect, and maintain wiring and connections carefully.**

1. Inspect the battery cables for wear, and replace as needed. Clean the cable connector terminals with a wire brush:
  - 1.1 Clean and tighten the battery ground cable, terminal, and clamps.
  - 1.2 Inspect the retainer assembly (or battery hold-downs) and the battery box. Replace worn or damaged parts. Remove any corrosion with a wire brush, and wash with a weak solution of baking soda and water. Rinse with clean water, the dry. Paint the retainer assembly, if needed, to prevent rusting.
  - 1.3 Check that foreign objects, such as stones, bolts, and nuts, are removed from the battery box.
  - 1.4 After cleaning, connect the cables to the batteries, and tighten them to the torque specifications listed on the battery, generally 10 to 15 lbf-ft (14 to 20 N-m).
  - 1.5 Coat the battery terminals with dielectric grease.

## Emergency Starting With Jumper Cables

When using jumper cables, follow the instructions below.



### WARNING

Batteries release explosive gas. Do not smoke when working around batteries. Put out all flames and remove all sources of sparks or intense heat in the vicinity of the battery. Do not allow the vehicles to touch each other. Do not lean over the batteries when making connections, and keep all other persons away from the batteries. Failure to follow these precautions could lead to severe personal injury as a result of an explosion or acid burns.

### NOTICE

Make sure that both starting systems are the same voltage. Electronic devices on both vehicles can be damaged when connected to a vehicle with a different operating voltage.

1. Apply the parking brakes and turn off all lights and other electrical devices.

**IMPORTANT:** Do not attempt to jump start a damaged battery.

2. Open the battery door (location will vary) to access the batteries. Slide the battery tray out.

### NOTICE

Always connect the batteries and jumper cables correctly (positive-to-positive and negative-to-negative). Connecting a charging device backwards (positive-to-negative) can severely damage the vehicle electrical content and cause non-warrantable failures.

3. Connect the positive (+) jumper cable to the positive terminal on the discharged battery. **See Jumper Connections diagram on next page.**
4. Connect the other end of the positive jumper cable to the positive terminal on the booster battery providing the charge.



### WARNING

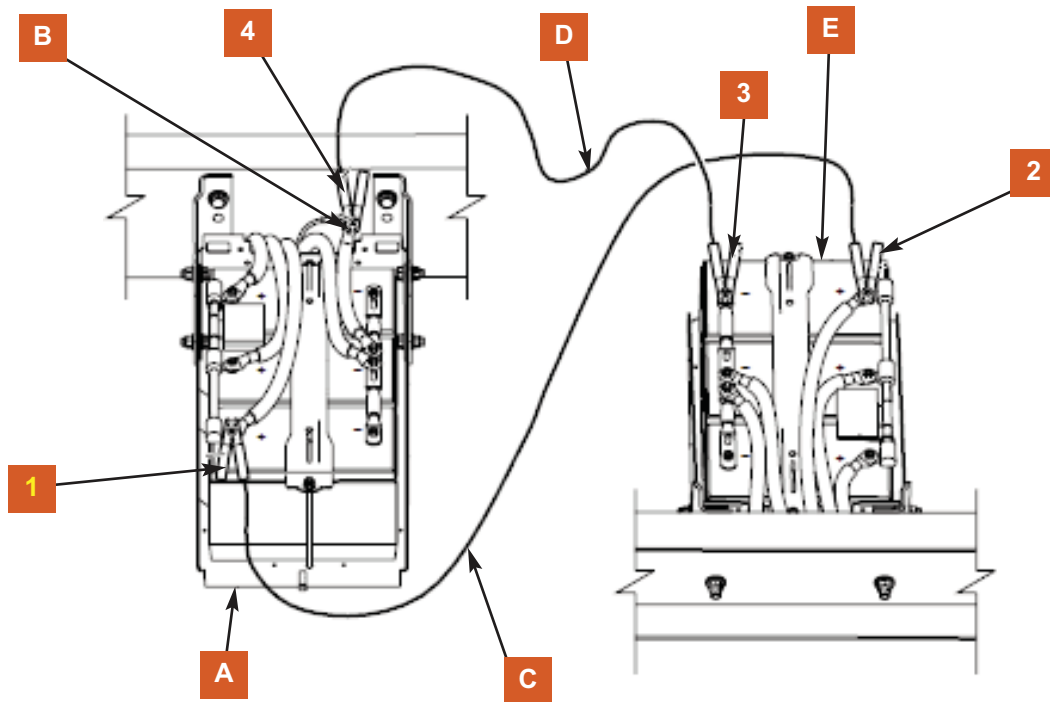
Do the next step exactly as instructed and do not allow the clamps of one cable to touch the clamps of the other cable. Otherwise, a spark could occur near a battery, possibly resulting in severe personal injury from explosion or acid burns.

5. Connect the negative (-) jumper cable to the negative terminal on the booster battery.
6. Connect the other end of the negative jumper cable to the negative ground stud on the vehicle requiring the jump start.
7. Start the engine of the vehicle providing the jump start and let the engine run for a few minutes to charge the batteries of the other vehicle.

### NOTICE

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

(Continued on next page.)



DISCONNECT JUMPER CABLES IN THE **REVERSE** ORDER THAT THEY WERE CONNECTED.

- A. DISCHARGED BATTERY
- B. NEGATIVE GROUND
- C. POSITIVE JUMPER CABLE

- D. NEGATIVE JUMPER CABLE
- E. BOOSTER BATTERY

1. 1ST CONNECTION: POSITIVE JUMPER CABLE TO DISCHARGED BATTERY
2. 2ND CONNECTION: POSITIVE JUMPER CABLE TO BOOSTER BATTERY
3. 3RD CONNECTION: NEGATIVE JUMPER CABLE TO BOOSTER BATTERY
4. 4TH CONNECTION: NEGATIVE JUMPER CABLE TO NEGATIVE GROUND STUD (DISCHARGED BATTERY)

8. Attempt to start the engine of the vehicle with the batteries receiving the charge.
9. When the engine starts, let it idle for a few minutes.

10. Disconnect the negative jumper cable from the negative cable stud on the jump started vehicle.
11. Disconnect the negative jumper cable from the booster battery.
12. Disconnect the positive cable from the booster battery.
13. Disconnect the other end of the positive jumper cable from the jump started vehicle.
14. Slide the battery tray back into position and close the battery door.



Do the next step exactly as instructed and do not allow the clamps of one cable to touch the clamps of the other cable. Otherwise, a spark could occur near a battery, possibly resulting in severe personal injury from explosion or acid burns.

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

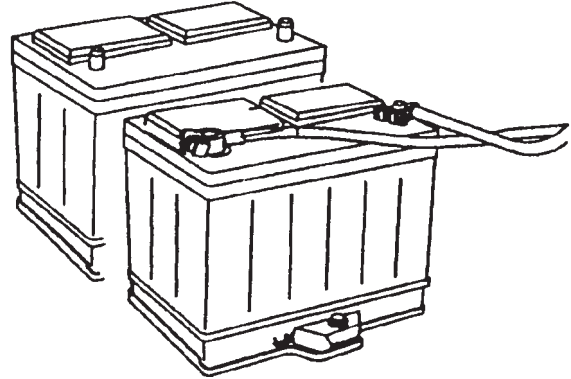
## BATTERY REPLACEMENT



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



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.

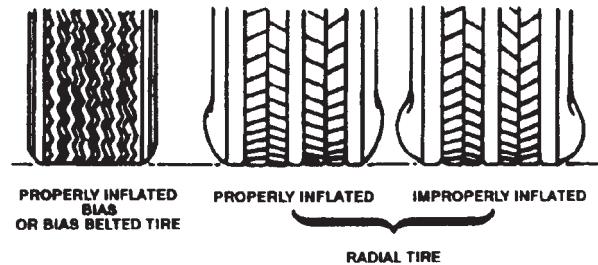


## TIRE INFLATION PRESSURE



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



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).

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## CHASSIS JACKING POINTS

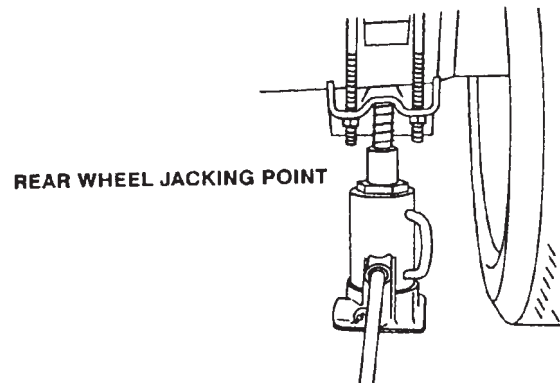
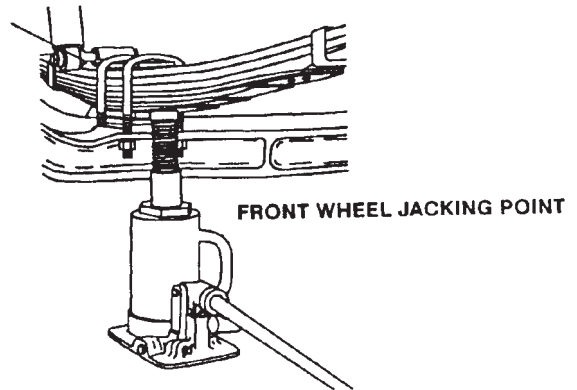


Do not raise vehicle using a bumper jack. Use only jack (or equivalent) supplied by vehicle manufacturer with your vehicle. Position jack only at prescribed jacking points.

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.

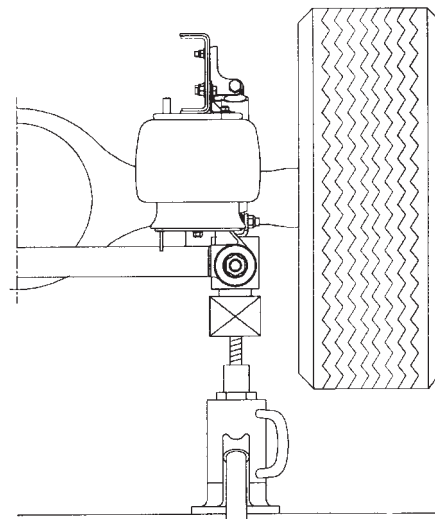
Do not put any portion of your body under the vehicle while vehicle is supported by a jack. Never start engine while vehicle is supported by a jack.



## AIR RIDE JACKING POINT

On units equipped with 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.



# OPERATING THE VEHICLE

## VEHICLE TOWING AND CONNECTING INSTRUCTIONS

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

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.



**Thomas Built Buses recommends that when an EFX 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



**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.**



**Thomas Built Buses recommends that when an EFX 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 vehicle 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 vehicle.

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

1. Block the Wheels of the disabled vehicle.
2. Release the emergency brake system by compressing the brake chamber springs as outlined under 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 vehicle for front end towing with the front wheels off the ground, the following steps are necessary:

1. Block the wheels of the disabled vehicle.
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 vehicle should ever be towed over 45 mph (70 kph).
4. Loose or protruding parts of the damaged vehicle 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 vehicle 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.

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## AFTER TOWING

After towing the vehicle, 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 - CUMMINS

Use only Ultra Low Sulfur Diesel (ULSD) fuel. ULSD is required for correct operation of the After-Treatment system, otherwise the engine may not meet emission regulations and may damage the After-Treatment System. ULSD contains 15ppm sulphur.

Refer to the Cummins Owners Manual for more information on this subject.

## RUNNING OUT OF FUEL

Diesel



Do not mix gasoline or alcohol with diesel fuel. This mixture could cause an explosion. When filling fuel tanks, do not smoke or use an open flame near the fuel tanks. Combustion of diesel fuel oil or fuel vapors could result, possibly causing personal injury or property damage.

1. If possible, stop the vehicle on a level surface, away from traffic.
2. Apply the parking brake.
3. Add fuel to the fuel tank.

Add at least 2 gallons (8 liters) of fuel to the fuel tank in order to restart the engine. If the vehicle is not level, up to 4 gallons (15 liters) of fuel may be required.

4. Prime the engine.  
See the engine manufacturer's manual for

instructions to prime the fuel system.



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

5. After adding fuel to the fuel tank, start the engine. Once the vehicle is running, let the engine idle until it operates smoothly before driving the vehicle.

## FUEL TANK FILLING



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.

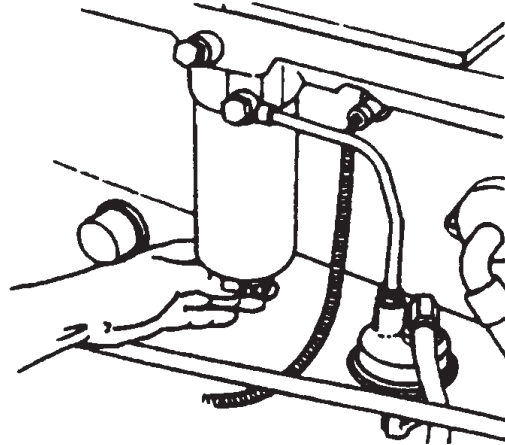
If fuel is observed overflowing from cap, remove cap with caution. Internal pressure may cause fuel expulsion.



## 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.



## 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  $-34^{\circ}\text{F}$  ( $-1^{\circ}\text{C}$ ). If colder temperatures are expected, adjust antifreeze mixture. If coolant has been in vehicle for 36 months or 30,000 miles (48,000km), 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.

## 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.

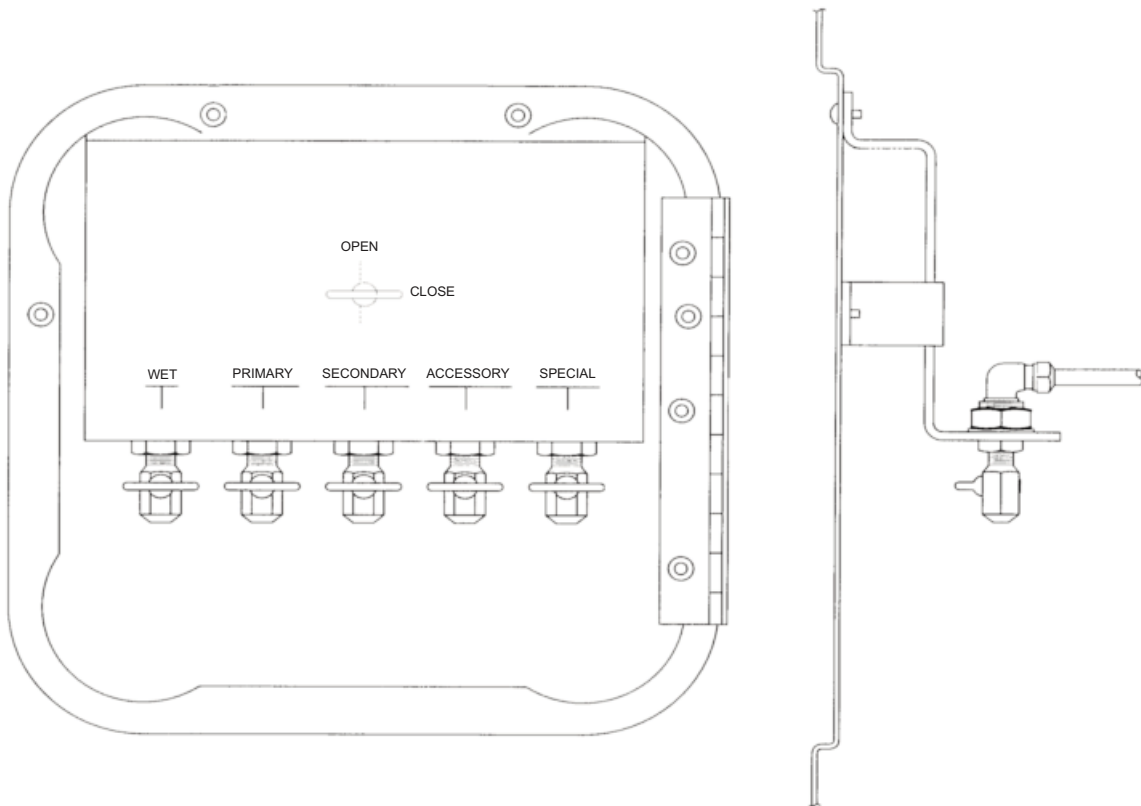
### NOTICE

**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.

## REMOTE MANUAL AIR TANK DRAIN VALVES (OPT.)

Manual Drain valves allows the driver to drain the air tanks without reaching under the unit. The access door is located left side of the unit behind the battery box.





# EMERGENCY EQUIPMENT

---

---

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

Safety equipment on the Thomas vehicle varies according to local, state, Federal, and operator requirements.

---

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

## EMERGENCY DOOR

An emergency exit door is located at the rear of the vehicle. Most doors have a locking capability in the open position to allow a clear exit from the vehicle. 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.

---

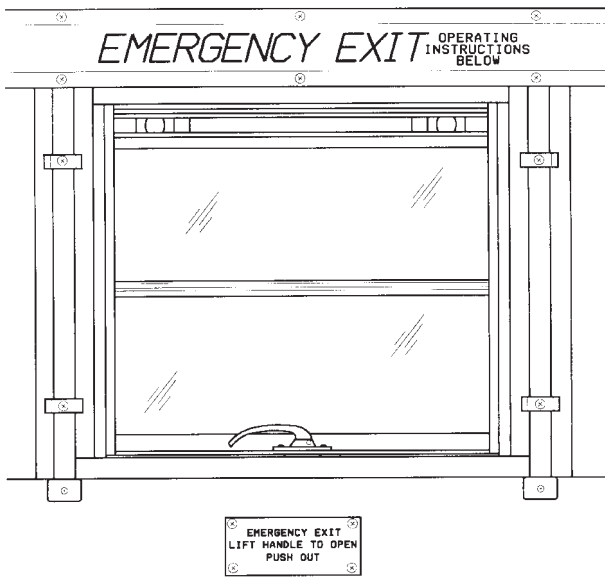
### NOTICE

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

# SAF-T-LINER® EFX OPERATOR'S MANUAL

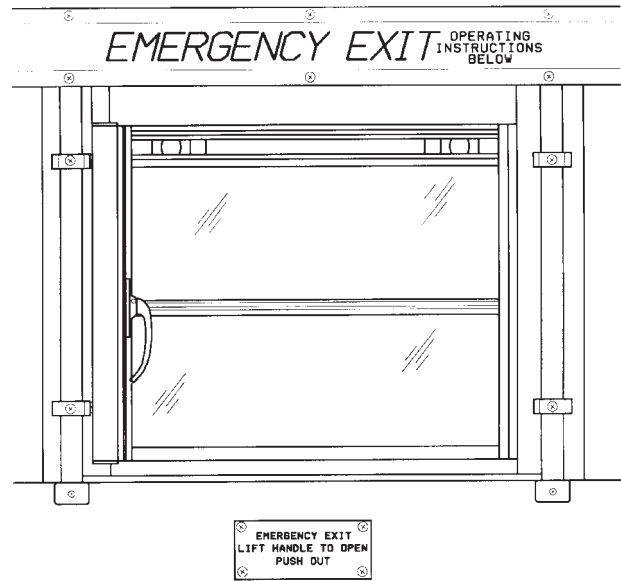
## EMERGENCY WINDOW EXITS

The vehicle'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.



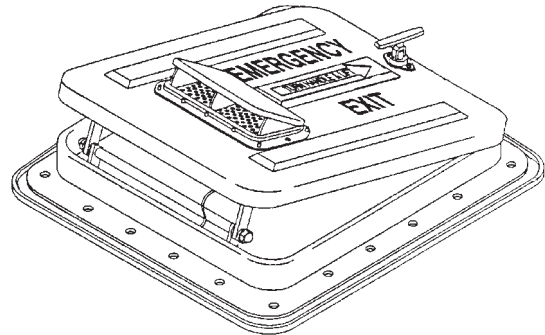
### NOTICE

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



## EMERGENCY ROOF ESCAPE HATCH (OPT.)

The vehicle may contain an emergency roof escape hatch. The location of the hatch is subject to vehicle build specifications according to Federal or State Regulations variations. On vehicles equipped with an emergency roof escape hatch, the opening instructions are clearly displayed on the hatch cover.



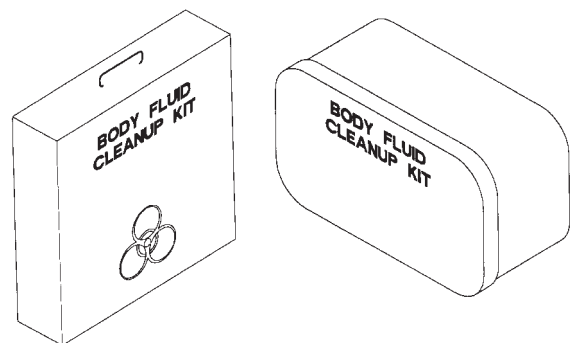
## FIRST AID KIT (OPT.)

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.)

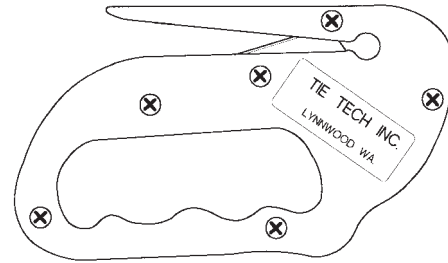
The body fluid clean-up kit is used when any type of body fluid comes in contact with the bus. It is important that this kit be maintained with the vehicle at all times. If items are used, they should be replaced immediately.



# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## SEAT BELT CUTTER (OPT.)

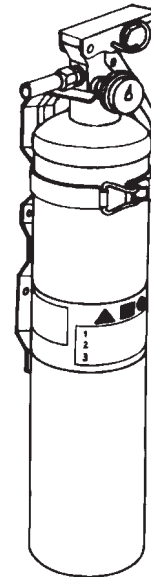
Seat belt cutting knife used for the purpose of cutting seat belt and wheelchair securement belts in emergency situations. Located with other safety equipment.



## FIRE EXTINGUISHER (OPT.)

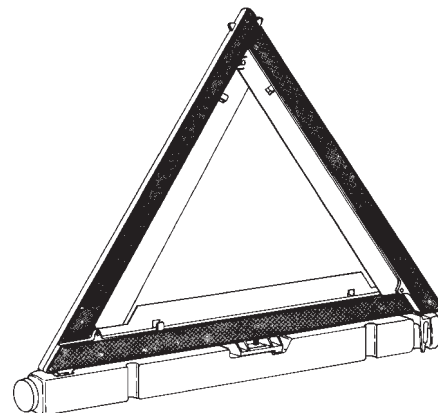
The fire extinguisher should be inspected monthly to verify that it contains sufficient charge. Observe gauge on fire extinguisher for current condition. Recharge fire extinguisher as necessary.

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.)

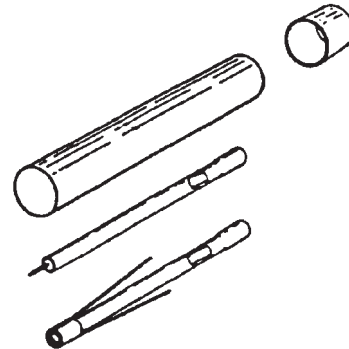
Three reflectorized triangles complete with carrying case. Triangle unfolds and locks firmly in place. Standard mounting location left side floor under first seat.



# EMERGENCY EQUIPMENT

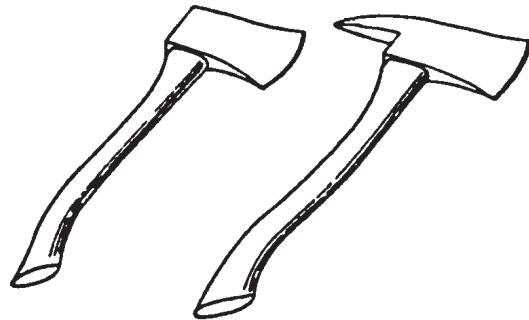
## FUSEES (FLARES) (OPT.)

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.



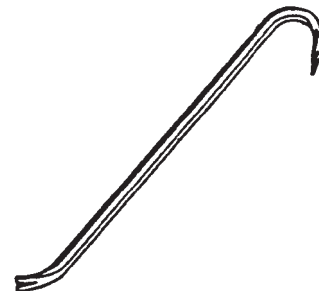
## FIRE AXES (OPT.)

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.)

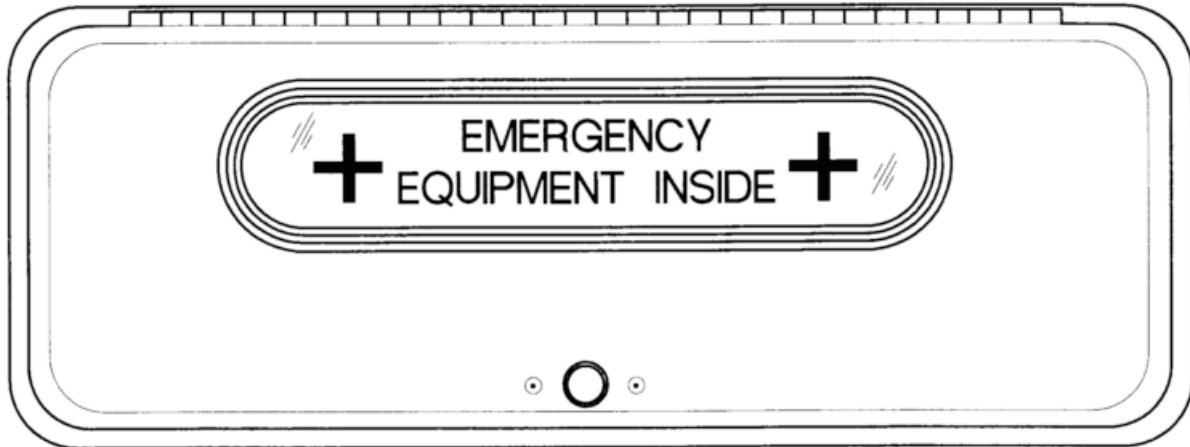
Wrecking bar is maintained with the bus for use in case of emergency. Usually located in driver's area or safety equipment compartment.



# SAF-T-LINER® EFX OPERATOR'S MANUAL

## SAFETY EQUIPMENT BOXES AND ACCESSORY COMPARTMENT

Located over windshield with glass lettered "Emergency Equipment Inside". May be equipped with lock and buzzer, if so desired. Hinge must be lubricated occasionally.



## MAINTENANCE PROCEDURE - HEHR (HEHR OFFERED AS OPTION)

1. Open the window to its maximum position (as determined by the props) so that the sides and bottom of the inner window frame are visible and accessible.
2. With a stiff fiber brush (do not use a wire brush) and/or an air hose, remove any dirt or debris from the latch area channels across the bottom of the window and back frame.
3. Spray (or otherwise apply) a solvent cleaner with dissolved oil (like WD-40), on the latch parts on the bottom of the window and back frame.
4. Cycle the latch mechanism a couple of times with the inside and outside handles to allow the lubricant to work-in.
5. Wipe down the latch area and back frame with a cloth to remove excess oil and liquid.
6. With the same cloth, wipe the seals on the sides and across the bottom of the window and around the seal contact area of the back frame so that dirt is removed and a light oil film is left on the metal and seals. (Silicone spray or graphite spray may also be used. WD-40 or silicone spray will provide better corrosion and seal protection).
7. Close and open the window to verify latch operation and force. When done, close the window.

## **MAINTENANCE INTERVALS - HEHR (HEHR OFFERED AS OPTION)**

If the vehicle is in daily use, Hehr recommends maintenance every time the bus is washed, or monthly, whichever is shorter. Proportionately longer periods may be used if the vehicle is not used every day or if it is operated only in a clean dry environment. Normal bus operating procedure is to check egress window operation at the beginning of every driver shift. If during these daily checks, the forces start to become excessive, shorter maintenance intervals may be required.

---



## OUTWARD OPENING DOOR

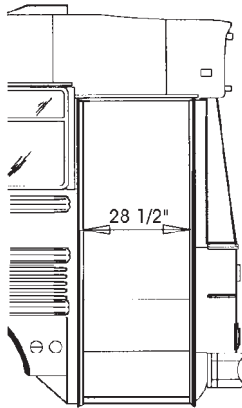
There are two (2) adjustments for the standard outward opening entrance doors:

- Door opening adjustment
- Door closure adjustment

The adjustments are pre-set and should not require adjustment for many years under normal use. However, should it become necessary to readjust, use the following procedures.

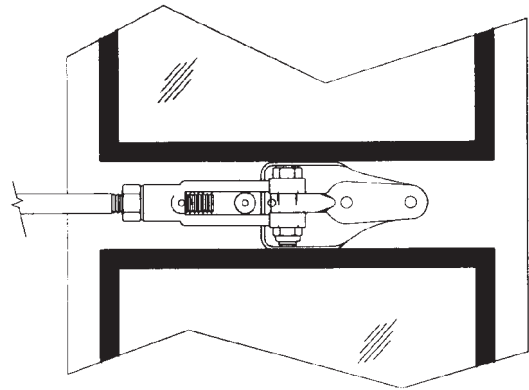
## MANUAL DOOR OPENING ADJUSTMENT

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

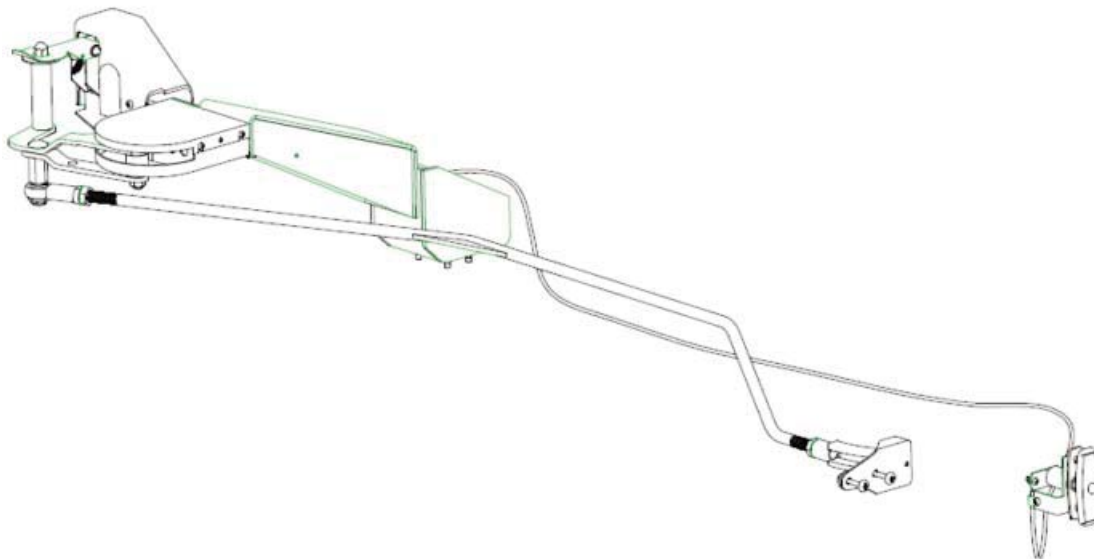


1. Remove the door control rod at the clevis.
2. Remove the access panel above the entrance door to expose the adjusting rod. An optional hinged access panel is available, Option B5015-02-000.

3. Remove the cotter pin located in the curved end of the transfer link connected to the rear door leaf. Disconnect transfer link from door cam.
4. Loosen adjustment rod jam nut and turn rod clockwise to increase door opening, or turn counterclockwise to decrease opening.



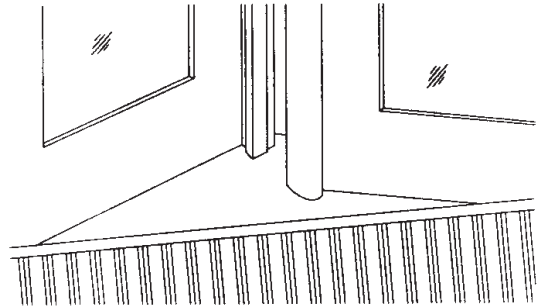
*(CONTINUED ON NEXT PAGE.)*



# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## MANUAL DOOR DOOR OPENING ADJUSTMENT (CONT'D)

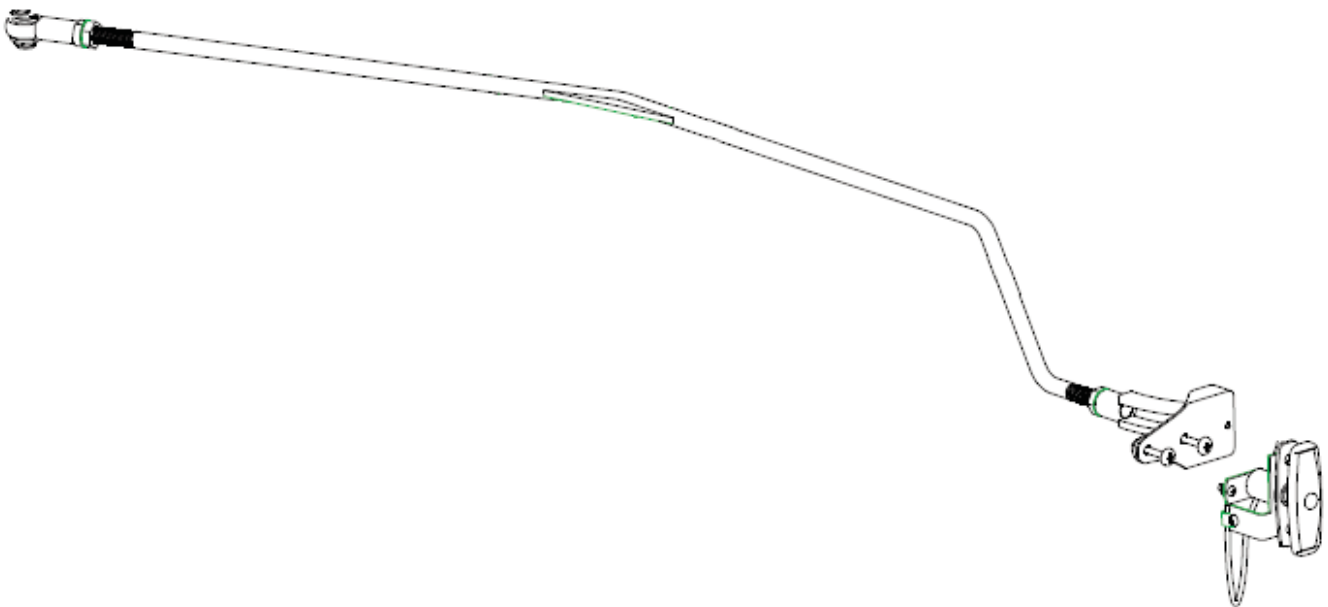
5. Do not exceed the door opening dimension of 28 1/2". This also controls the sequence of the front and rear doors closing. The rear door leaf must come in first allowing the front door leaf to overlap the rear leaf, and seal the door and stepwell opening.
6. Reinstall linkage and tighten all jam nuts.
7. Check door for proper opening and closing.



## MANUAL DOOR CLOSURE ADJUSTMENT

1. Loosen jam nuts at both ends of control rod.
2. Remove one end by removing clevis bolt/ nut or spherical rod end.
3. Adjust by turning the clevis or spherical rod end counterclockwise to lengthen and clockwise to shorten.
4. Turn the clevis clockwise to shorten or increase door opening. Turn clevis counterclockwise to lengthen or decrease opening.
5. Reinstall clevis pin and check operation. Tighten jam nuts.

The door control mounting bracket located at the approximate center of the cowl should be tightened in the first thirty (30) days and at least every six (6) months thereafter.





## DOOR MAINTENANCE

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

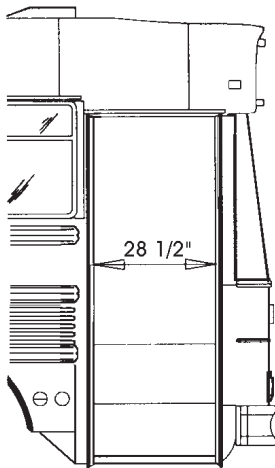
It is very important that drain holes in the bottom of the outward opening door leaves be cleaned every thirty (30) days. Use a short piece of welding rod or stiff wire for a cleaning probe.



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

## 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.
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.



## 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.



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.



**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.**



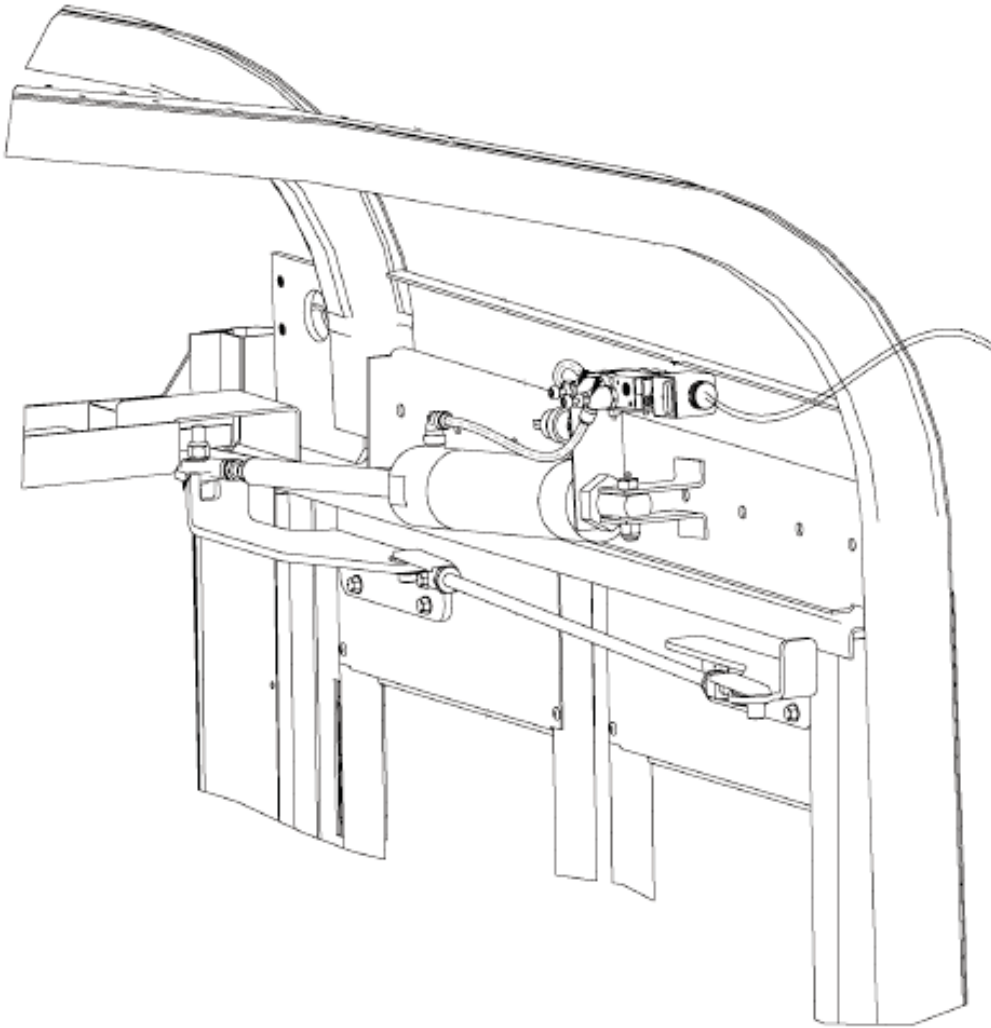
**Care should be used when operating doors while making adjustments. Keep hands clear of moving parts. Personal injury could result.**

5. Adjust Flow Control Valves by tightening clockwise until snug; back off 1 1/2 turns, counterclockwise for initial adjustment of opening and closing speed. Adjust as necessary.
6. Start engine to maintain air pressure. Cycle door several times to ensure opening and closing speed is at desired speed.
7. Reinstall access panel. Return bus to service.

### NOTICE

**Service Filter annually.**

*(CONTINUED ON NEXT PAGE.)*



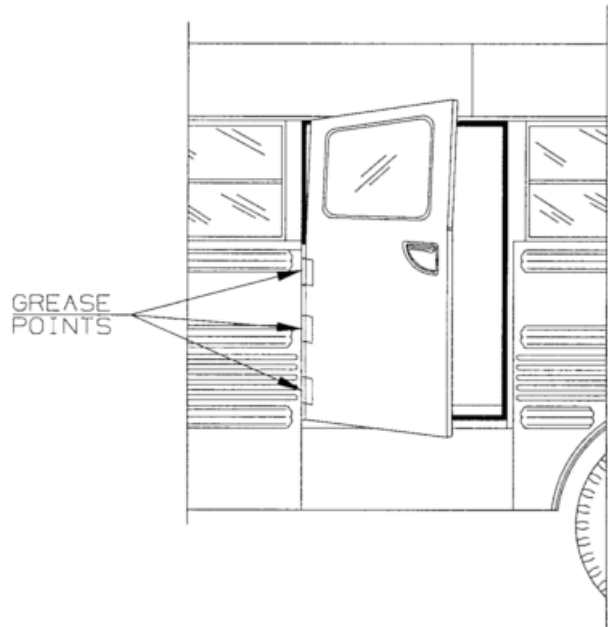
# SAF-T-LINER® EFX OPERATOR'S MANUAL

## SIDE EMERGENCY DOOR

An emergency door is usually located on the street side of the vehicle. 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.

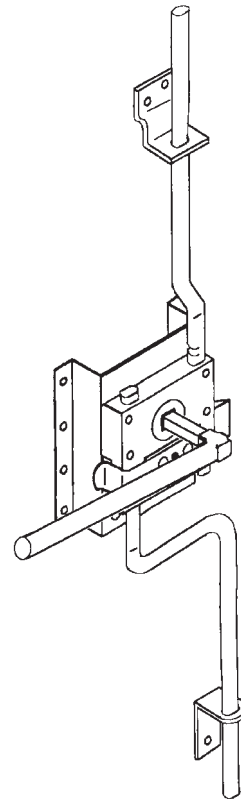
Opening the side emergency door activates a warning buzzer in the operator's compartment.



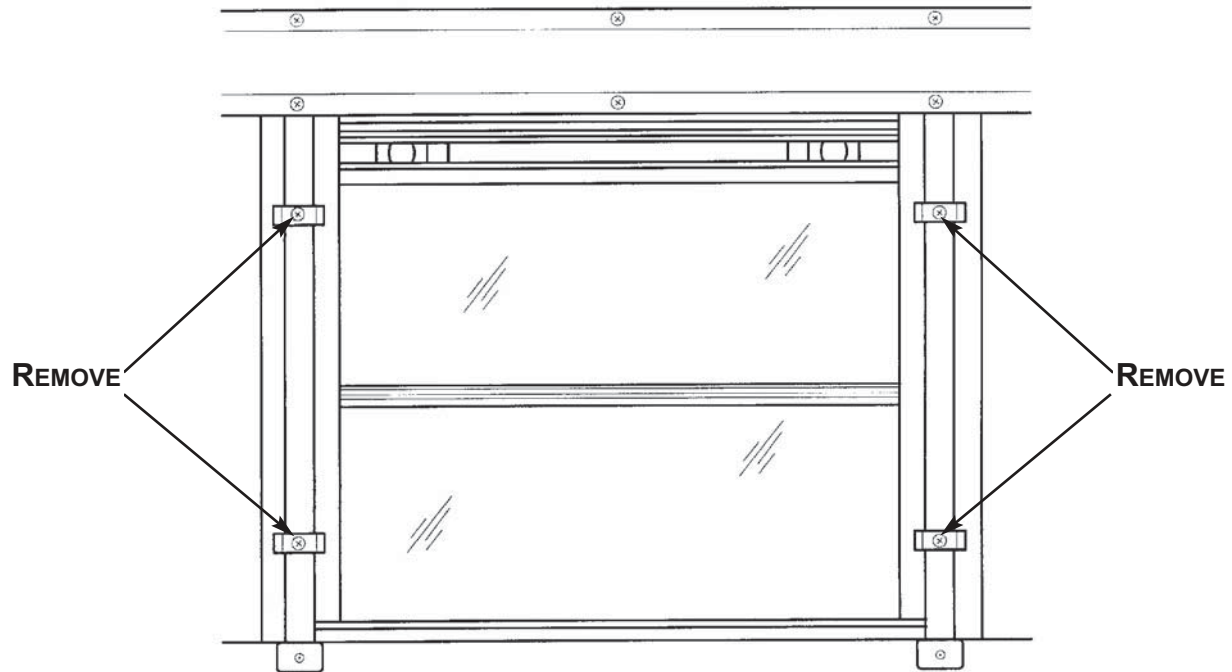
## 3-POINT LOCK INSIDE DOOR (OPT.)

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.



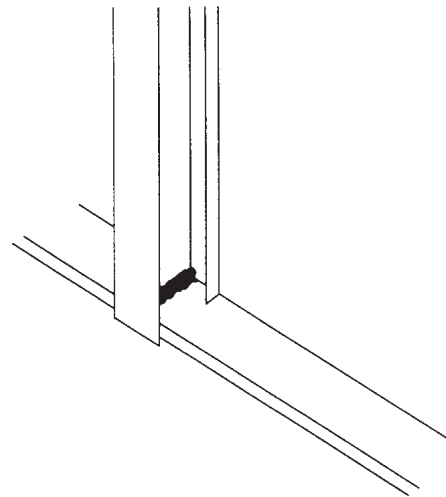
## WINDOWS - SPLIT SASH, REMOVAL AND INSTALLATION



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 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, Thomas Part #01013370 or equivalent.
5. Reassemble by reversing Steps 1-4.

6. Reseal sash, inside and outside using silicone, Thomas Part #01013370 or equivalent. This will ensure that moisture does not enter the side of the body. **Do not seal the lower outside window sash.**



## GLASS REPLACEMENT

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

1. Remove sash as per section "Sash Removal".
- 2.a 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.b Remove lower rail and slide glass out.
- 3.a To replace the upper sliding section, glass, stand window on it's side and remove three (3) screws from the sidemember.
- 3.b Remove the sidemember.
- 3.c 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 Vehicle Safety Standards. Therefore, whenever a glass is broken or must be replaced, it should be replaced with identical glass. The following instructions are for replacing glass in split sash.

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.

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

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, emergency doors, and rear stationary windows.

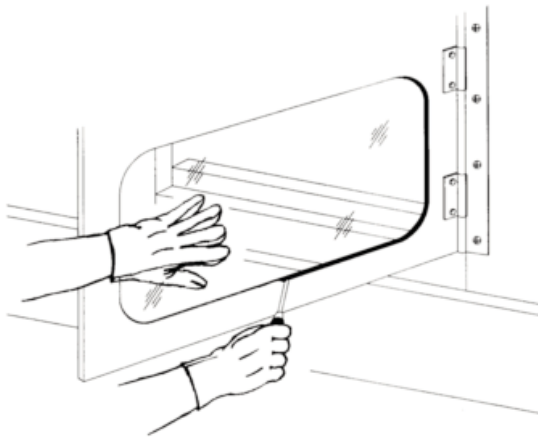


### WARNING

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

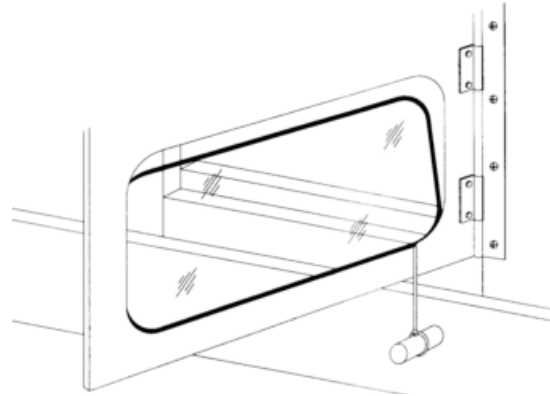
To remove the glass for replacement or structural repair, follow the steps listed below:

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.

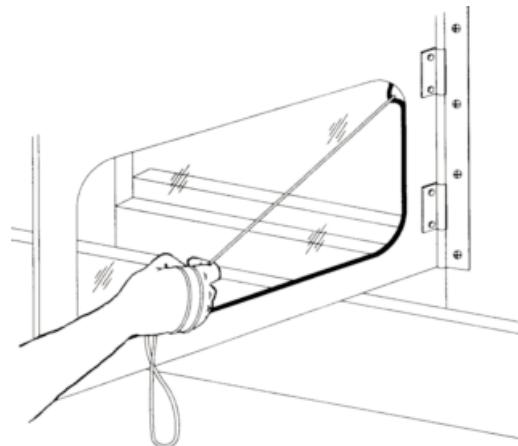


2. Remove rubber seal from glass and inspect seal for cuts and deterioration. If any are found, replace rubber seal to avoid future leaks and glass breakage.
3. Inspect metal flange for burrs and sharp edges that could cut rubber seal. Inspect flange for rust and deterioration. Repair and repaint before reinstalling glass and rubber seal.
4. Inspect new or replacement glass and install rubber seal around outer edge. **All glass used by Thomas meets FMVSS 205 requirements. Use of OM 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.
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.

---



## THOMAS SEATS AND BARRIERS

All seats and barriers used in the manufacture of bus bodies must meet many federal 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.

There are suppliers of seat backs, other than the manufacturer's dealer, that are serving the after-market. The maintenance director should check these companies for complete compliance with the Federal standards prior to purchase and installation of this material.

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.

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.)

# SAF-T-LINER® EFX OPERATOR'S MANUAL

## THOMAS 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 Swarthmore Ave.  
High Point, NC 27263  
(336) 861-9023
- IMMI  
18881 US 31 N.  
Westfield, IN 46074  
(800)-586-7839

## RESTRAINING BELTS

Restraining 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.

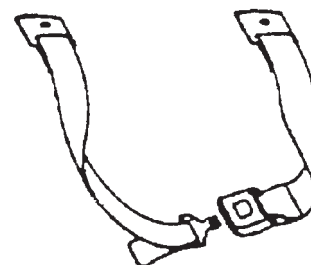
To fasten the belt, pull the belt across the occupant and insert the tongue into the buckle until it clicks. Pull to make sure it is latched, snug the belt by pulling slack out.

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.

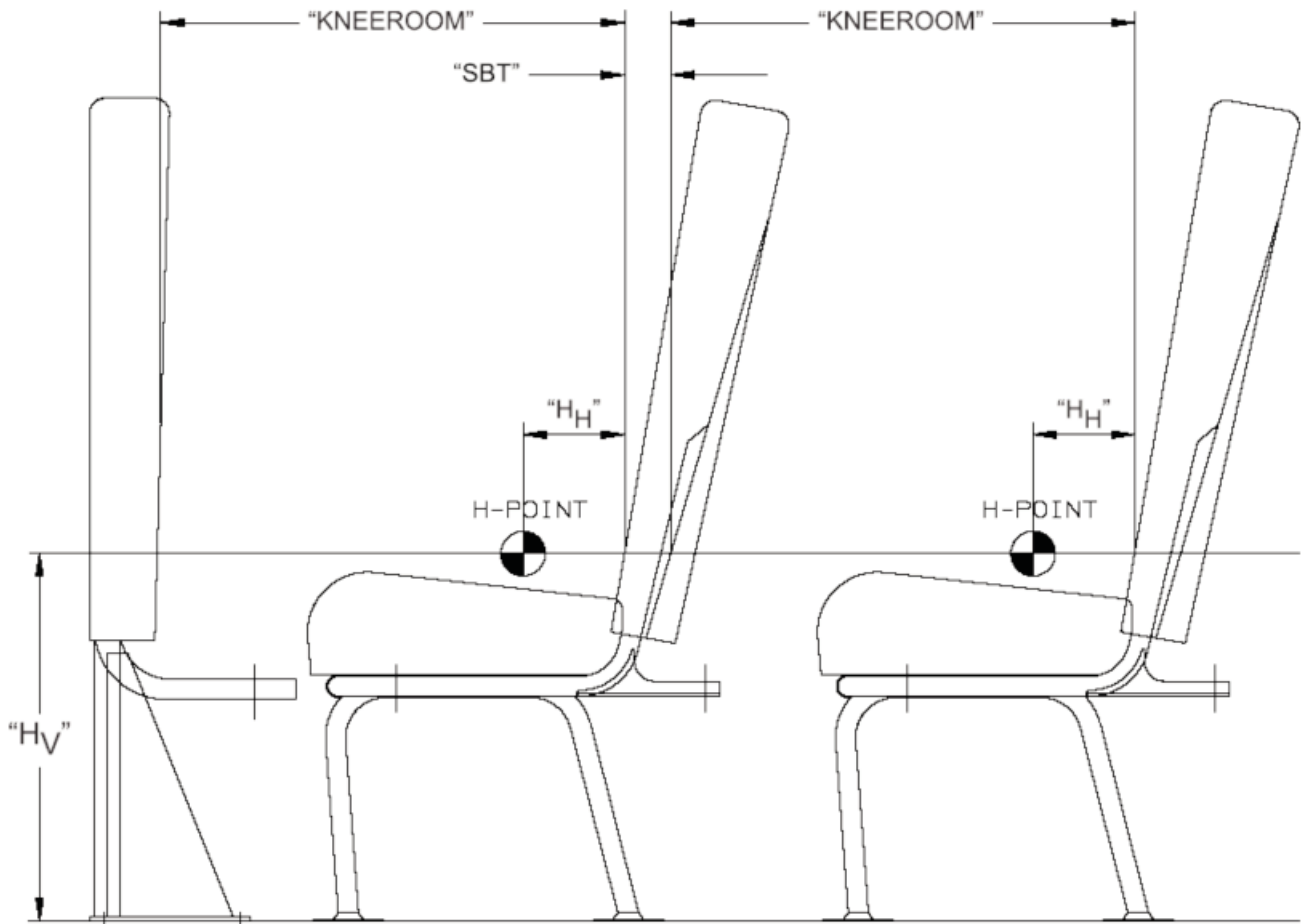
## TRACK SEATING - GENERAL INSTALLATION AND REMOVAL GUIDELINES

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.

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

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



**H<sub>H</sub>** = H-POINT HORIZONTAL  
**H<sub>V</sub>** = 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.

Track seats	H <sub>H</sub>	H <sub>V</sub>	SBT	*Min Knee room	Max Knee room = 24"+H <sub>H</sub>
	Inch	Inch		Inch	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:

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



ELLIPSOID GAUGE PASSING IN BEHIND OF SEAT BACK



ELLIPSOID GAUGE PASSING ABOVE SEAT BACK

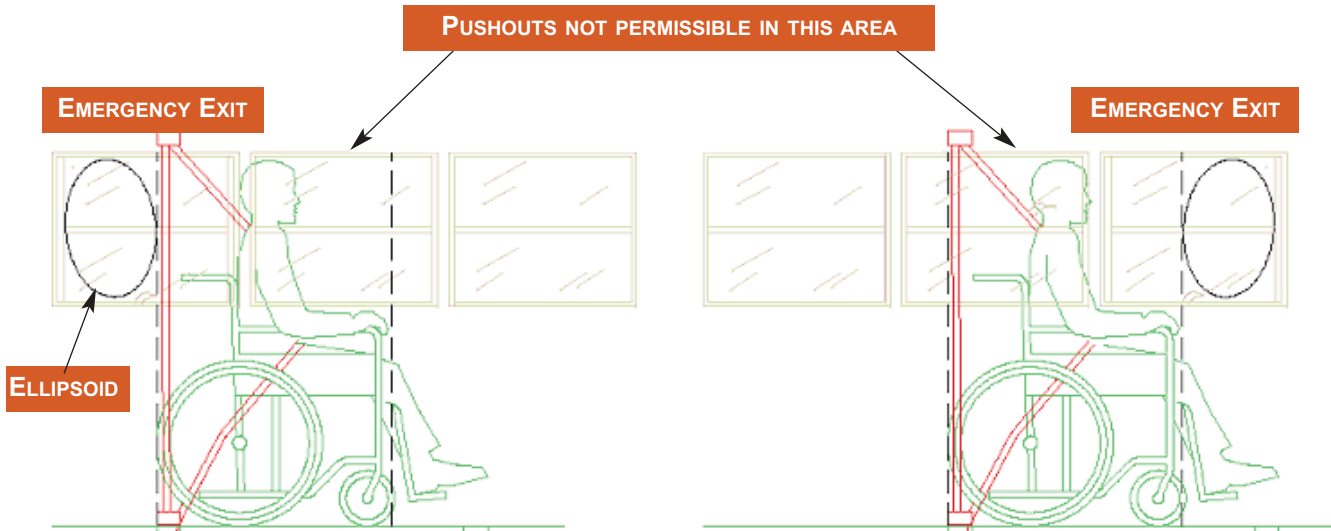


ELLIPSOID GAUGE PASSING IN FRONT OF SEAT BACK

(CONTINUED ON NEXT PAGE.)

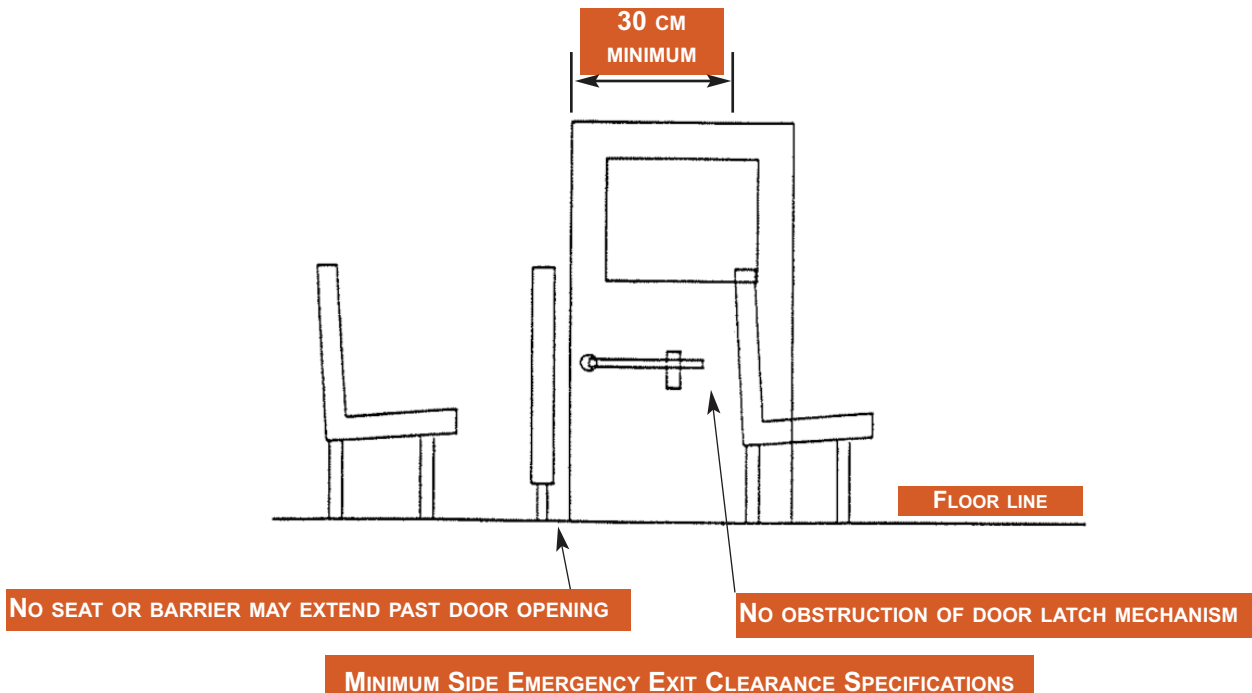
## TRACK SEATING - GENERAL INSTALLATION AND REMOVAL GUIDELINES (CONT'D)

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



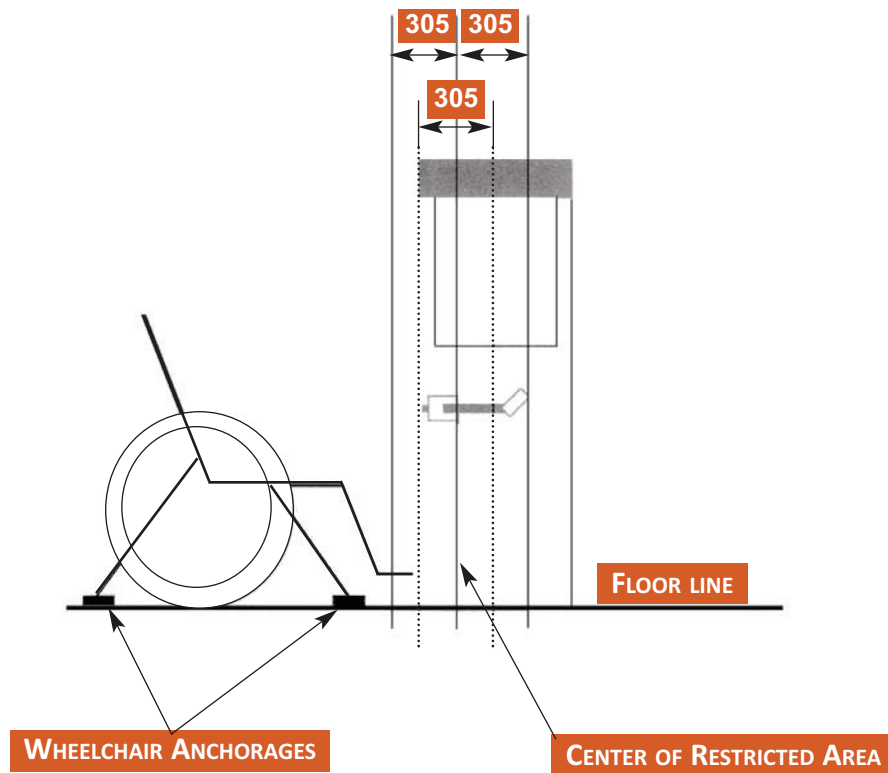
10. Removable barriers and seats should allow for a 12" clear aisle to emergency exit doors without exceeding maximum seat spacing.

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.



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

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**

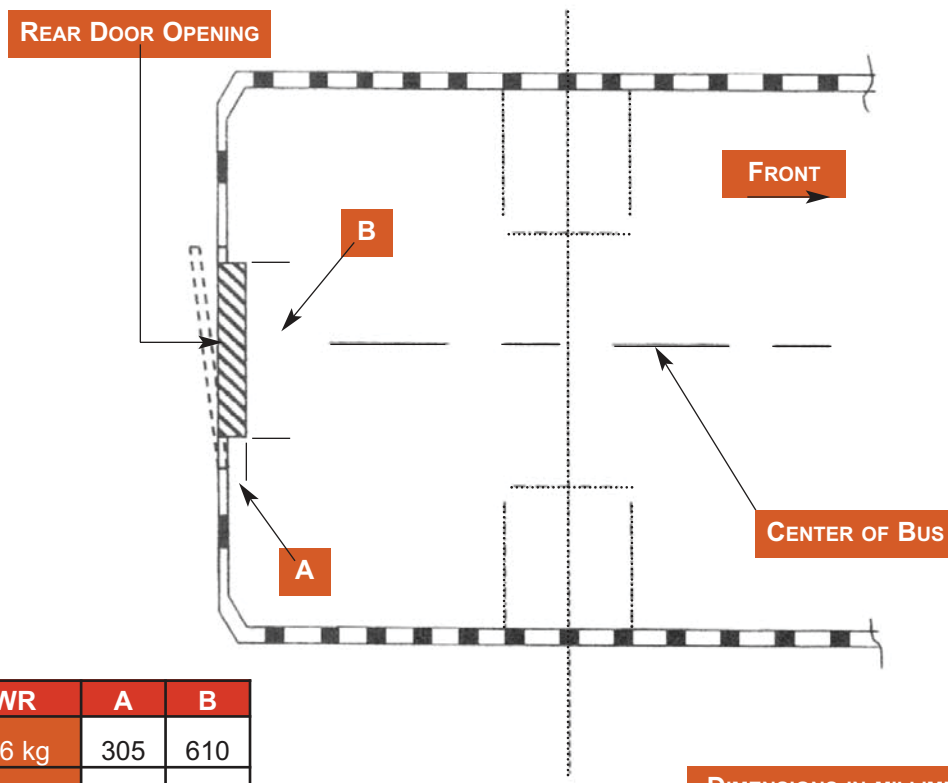


# GENERAL INFORMATION

## 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 4536 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

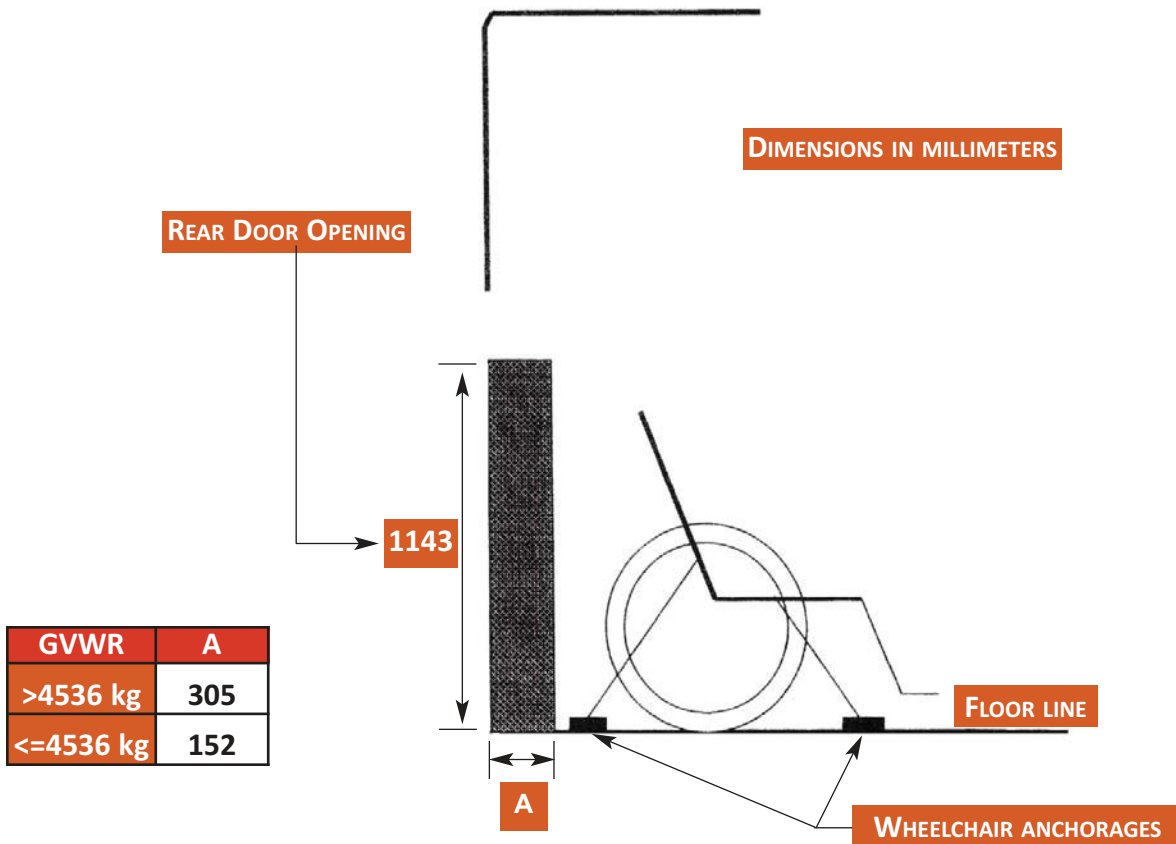
DIMENSIONS IN MILLIMETERS

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

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

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

13. Wheelchair anchorages should be excluded from this area.



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.

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## 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.

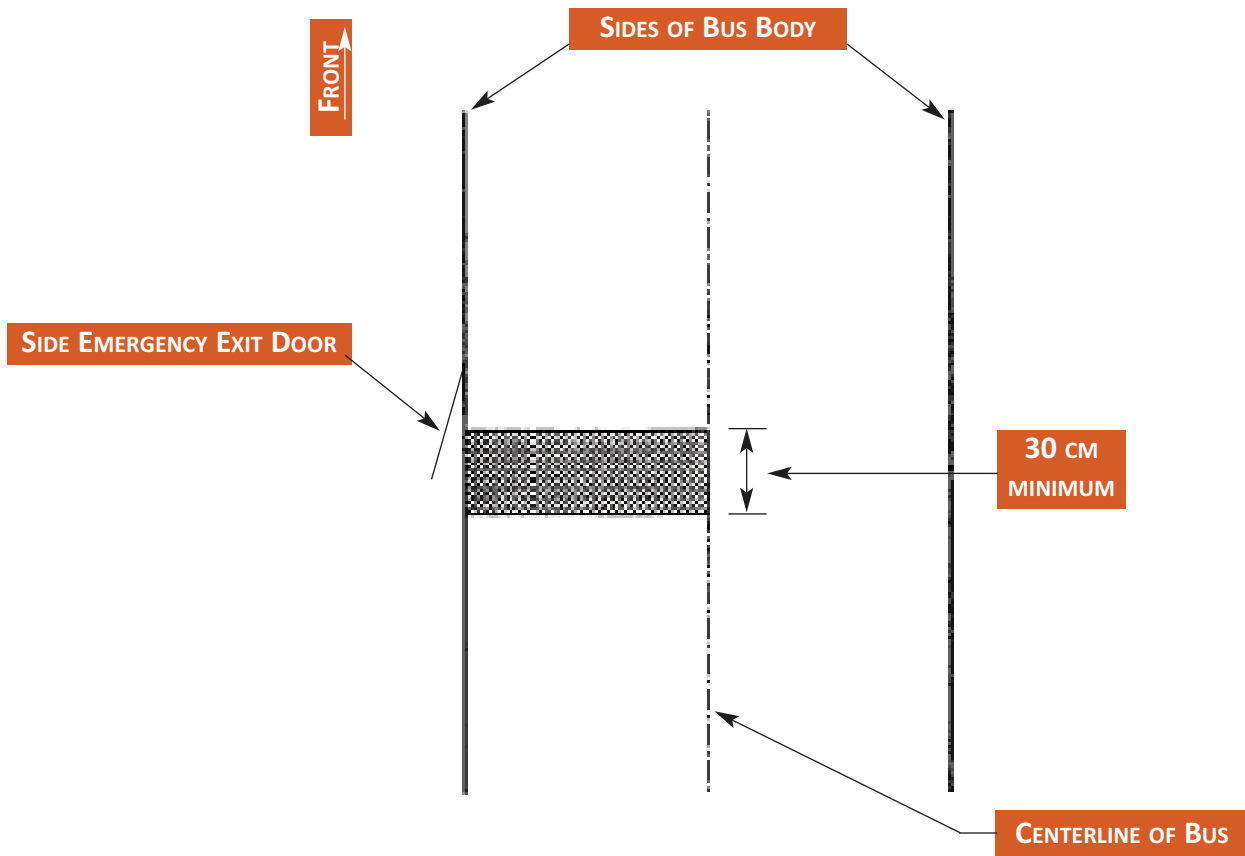
**School buses with a GVWR of 10,000 pounds or less:** In the case of a rear emergency exit door, the rectangular parallelepiped dimensions shall be 45

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.

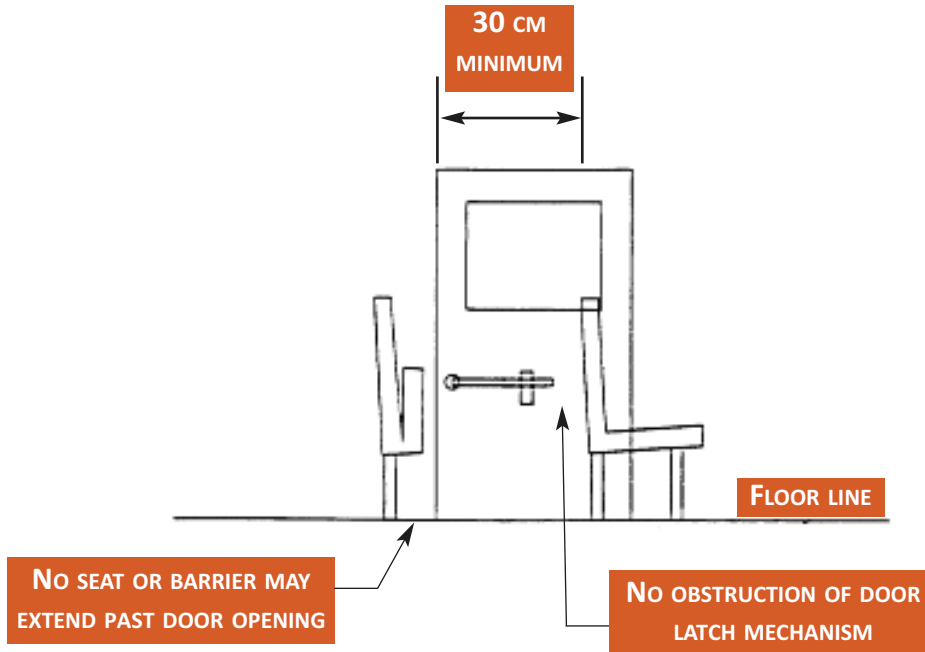
(CONTINUED ON NEXT PAGE.)



## 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.

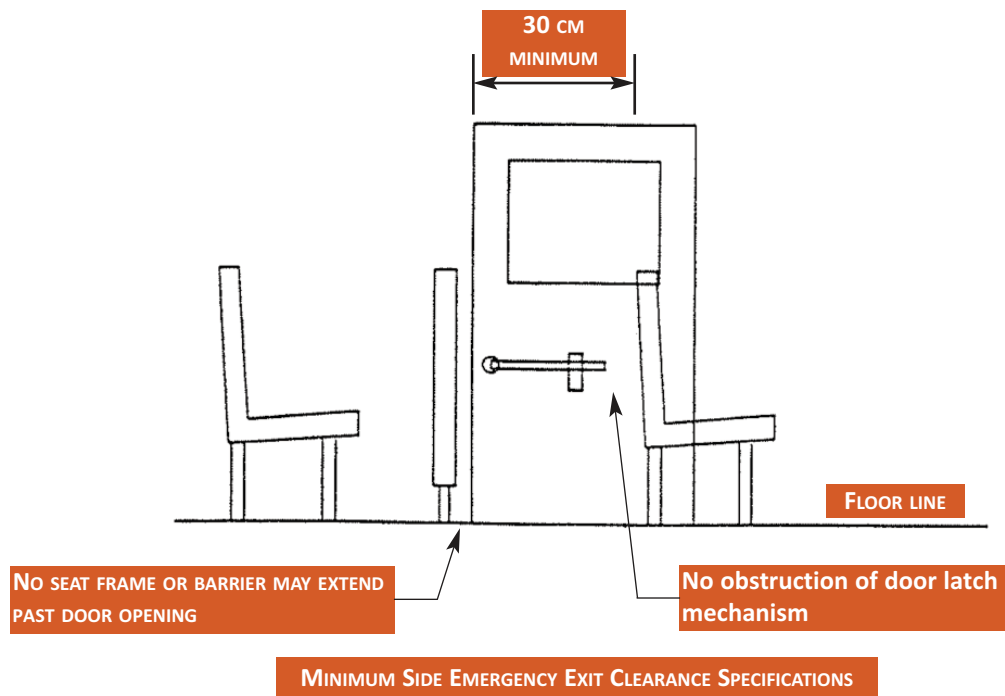


MINIMUM SIDE EMERGENCY EXIT FLIP-UP SEAT CLEARANCE SPECIFICATIONS

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## 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.



## 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.

*(CONTINUED ON NEXT PAGE.)*



**IMMI SSA SEAT (CONCAVE BACK)**



**IMMI GEN II (STRAIGHT BACK)**



## 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

## 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)



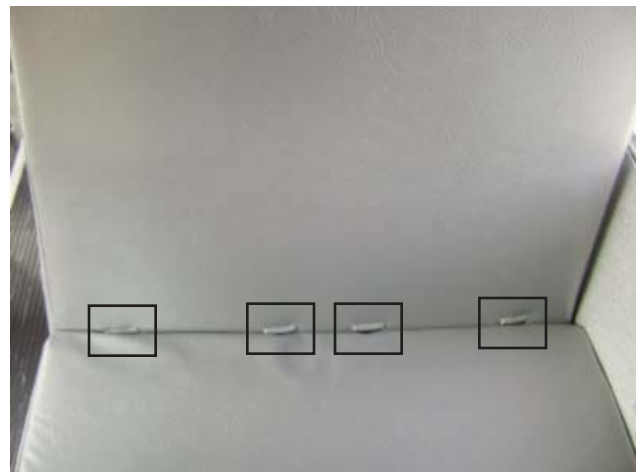
**IMMI LAP BELT (NUMBER OF BELTS MAY VARY)**



**IMMI FLEX SEAT**



**SYNTEC LAP BELT (NUMBER OF BELTS MAY VARY)**



**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. Figure 5 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.



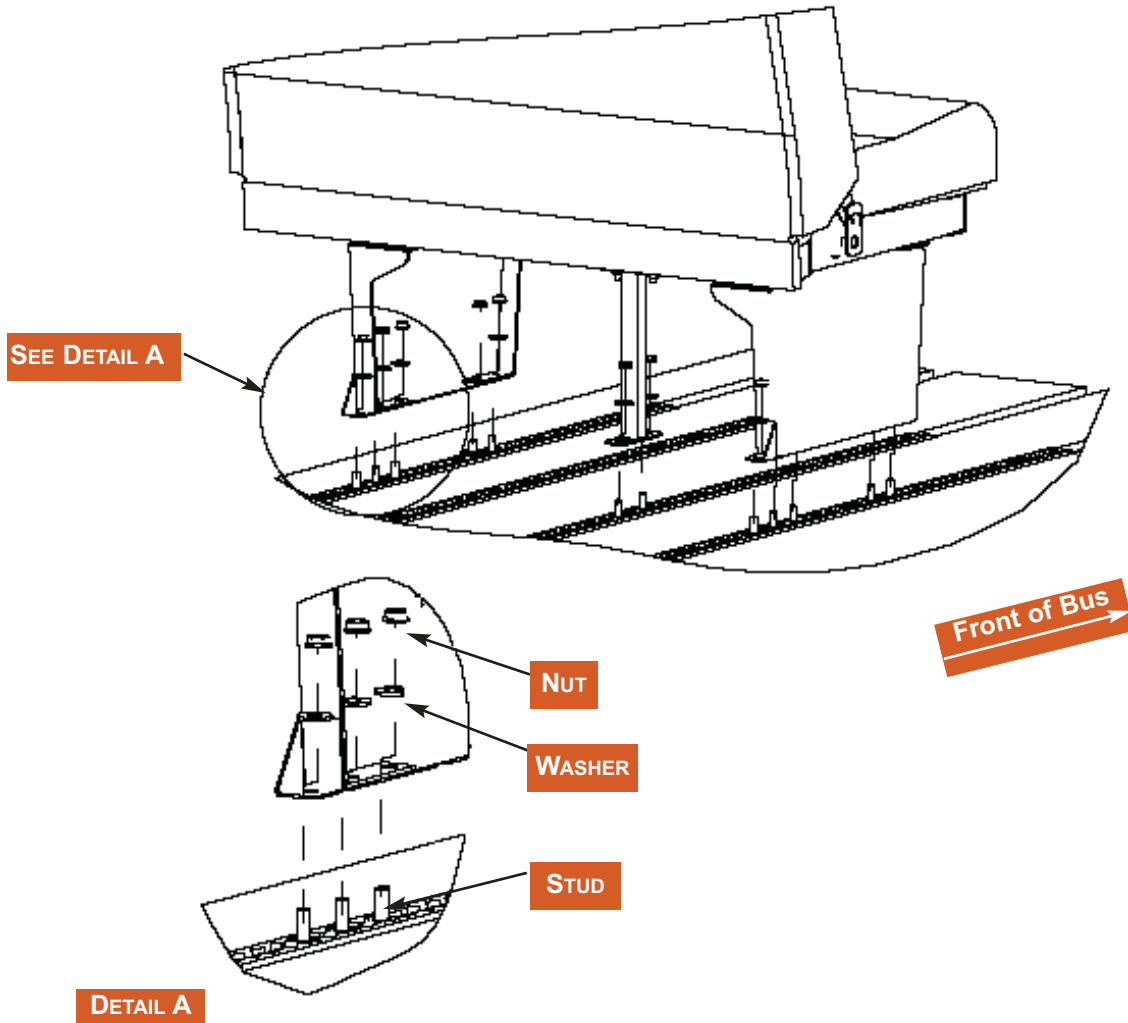
**aisle width measurement**

- 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.

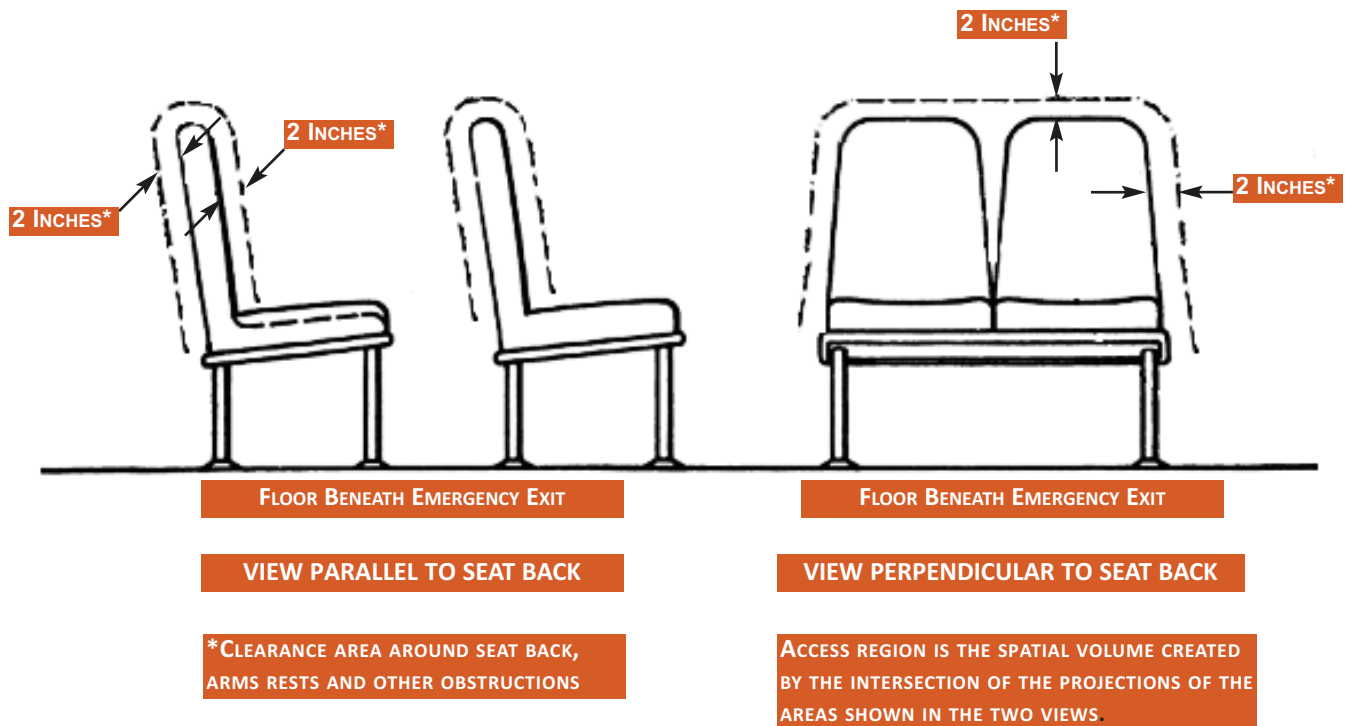
The restraint system consists of wheelchair tiedowns and occupant restraint belts. The wheelchair restraints secure the wheelchair to the floor and the occupant restraint belts secure the passenger to the wheelchair.

### 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.



## 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.

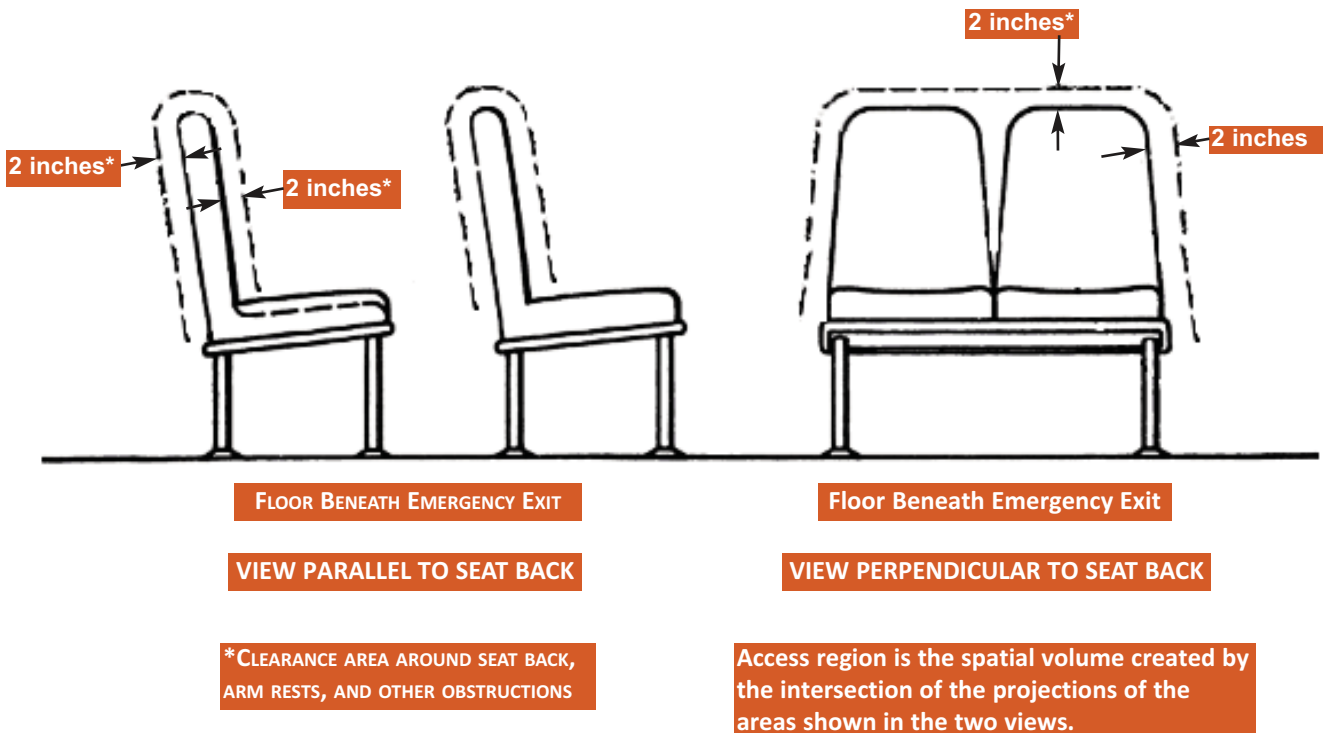
### Window Handle Clearance

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.

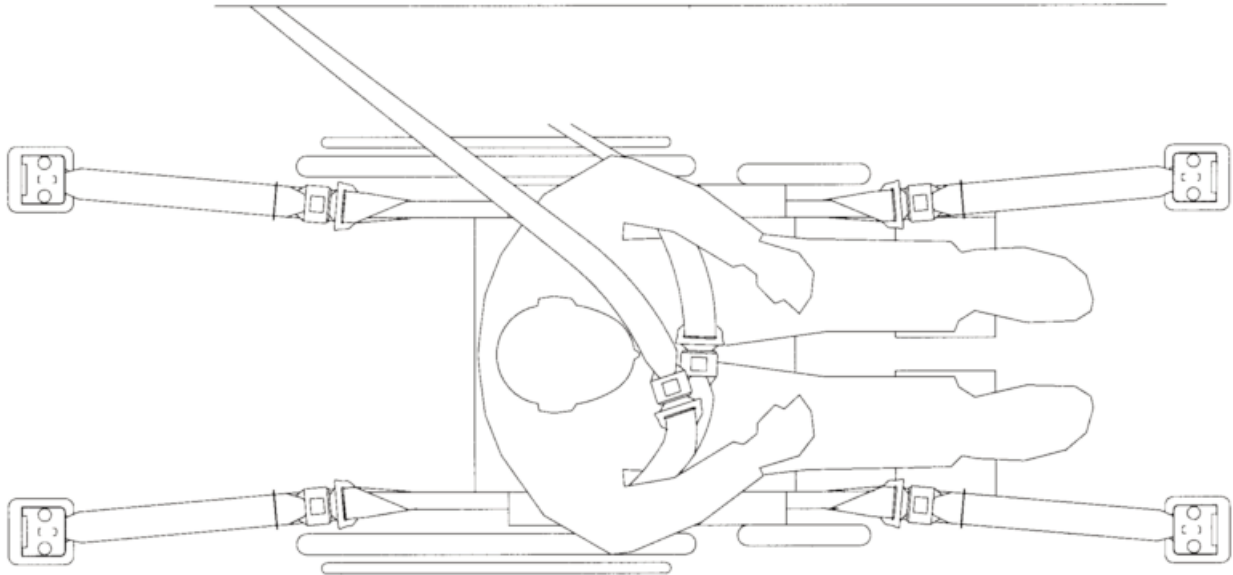




## WHEELCHAIR TIEDOWN

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.



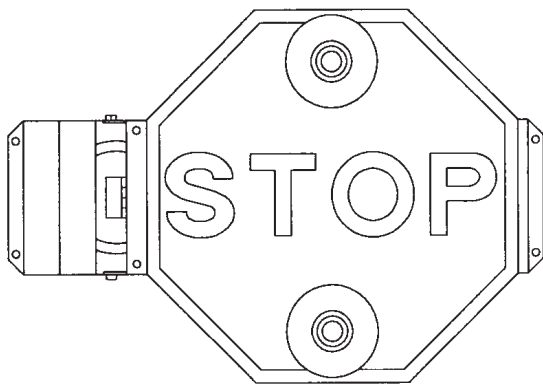
## VENDOR LIFTS

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.

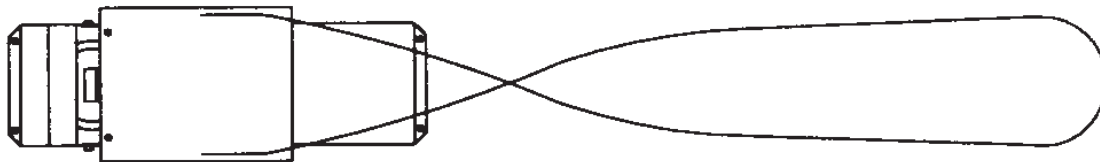
- Ricon Corporate Headquarters  
7900 Nelson Road  
Panorama City, CA 91402  
(800) 322-2884
- Maxon Lift  
11921 Slauson Avenue  
Santa Fe Springs, CA 90670-221  
(562) 464-0099
- Automotive Innovations Inc. (Braun Lifts)  
4 First Street  
Bridgewater, MA 02324  
(508) 697-8324

## AIR 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 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 manual switch activates an electric solenoid valve controlling the air flow. 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 at the entrance door.

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

## SPARE TIRE CARRIER (OPT.)

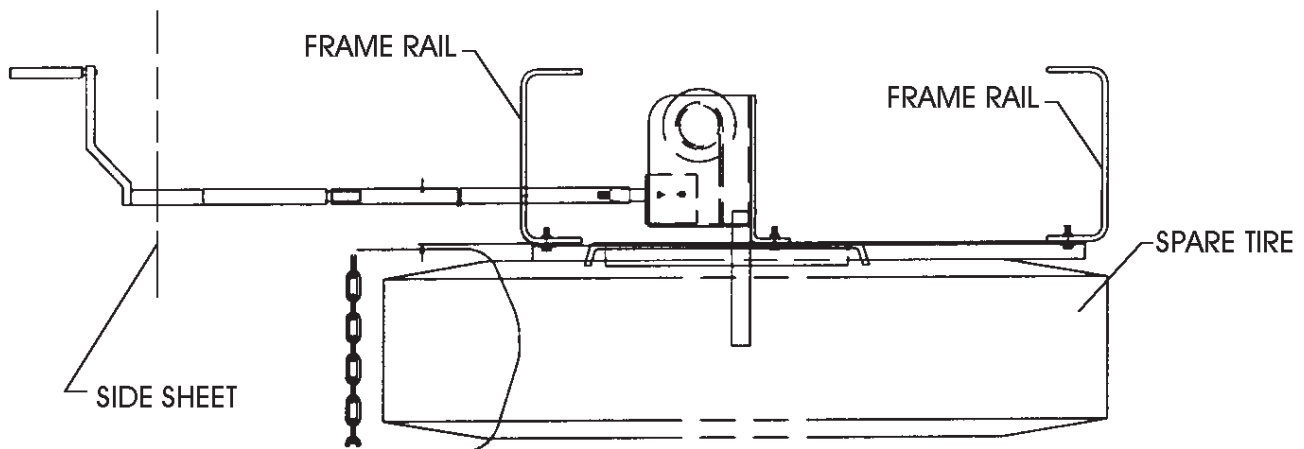
The spare tire carrier on the vehicle is located in the rear overhang of chassis on the right side.

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.

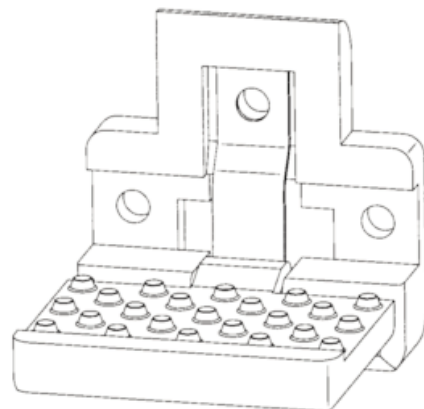
To re-install the tire onto the carrier, use the following procedure:

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.



## FOLDING STEPS ON FRONT BUMPER

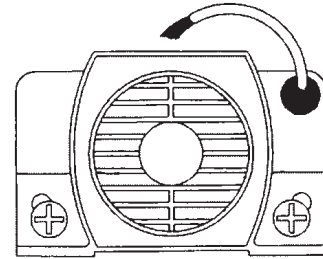
Folding steps mounted on the front bumper to assist in cleaning the windshield. The steps should be clean and lubricated.



# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

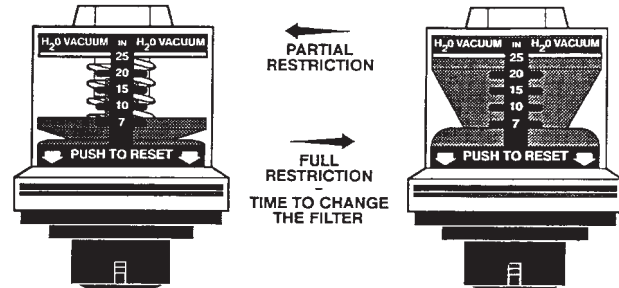
## BACKING HORN & HEAVY DUTY BACKING ALARM

The backing horn or heavy duty backing alarm is mounted at the rear underbody 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, located directly behind the grille. The air cleaner element should be changed when the maximum restriction is indicated on the gauge.



## FRONT ACCESS LATCH KEY LOCATION

The front access headlamp/wiper panel latch key is located in the dash storage compartment.

## PASSENGER ADVISORY SYSTEM - HORN ACTIVATION - OPTION B2001-19-000

Alarm system that requires the driver to deactivate it by walking through the interior of the bus to turn it off and verify that no passengers are still aboard.

- 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 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 then the horn will start blowing. When this happens the driver must go to the front and turn the Ignition back on then off and then return to rear of the bus to press button to deactivate.
- Time to alarm: N/A.
- Type of Alarm: Chassis Horn.
- System Activation: When red warning lamps are used for first time.
- Alarm Activation: When Ignition is turned off.
- Alarm Indication: Dome Lamps are turned on.
- Location of Deactivation Switch: Rear bulkhead.
- Confirmation of Deactivation: Dome lamps flash when deactivated.
- Operation without Deactivation: Chassis Horn.
- 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.

## CHILD REMINDER SYSTEM - MODEL CR2A - OPTION B2001-20-000

Alarm system that requires the driver to deactivate it by walking through the interior of the bus to turn it off and verify that no passengers are still aboard.

- System is armed after being in run for 10 minutes. It is activated when the bus Ignition is turned off. The Pilot Lamp on the dash lights as well as the Passenger Dome Lamps. For the first 60 seconds after turning the Ignition off the alarm cannot be disarmed. When the Lights flash two times then the driver can 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 within 1 minute then the horn will start blowing. When this happens the driver must go to the front and turn the Ignition back on then off and then return to rear of the bus to press button to deactivate. If driver attempts to leave through Entrance door then the horn will sound as well.

- Time to alarm: 60 seconds.
- Type of Alarm: Chassis Horn.
- System Activation: Timer- 10 minutes.
- Alarm Activation: When Ignition is turned off.
- Alarm Indication: Chassis Horn.
- Location of Deactivation Switch: Rear bulkhead.
- Confirmation of Deactivation: Interior Dome lights will flash two times.
- Operation without Deactivation: Pilot lamp and dome lights – ON. If not disarmed within 4 Minutes, chassis horn will blow.
- Dome Light: Yes.
- Pilot Light Location/Operation: LED pilot light located in switch cabinet lights steady upon system activation.
- Labeling: A) "PASSENGER CHECK REMINDER SYSTEM". Located at pilot light on switch cabinet. B) Operating instructions to be attached to compartment above driver.

## PASSENGER ADVISORY SYSTEM - HORN ACTIVATION - B2001-21-000

Alarm system that requires the driver to deactivate it by walking through the interior of the bus to turn it off and verify that no passengers are still aboard.

- 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 then the horn will start blowing. When this happens the driver must go to the front and turn the Ignition back on then 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 Activation: When Ignition is turned off.
- 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.

## CHILD REMINDER SYSTEM - B2001-22-000

Alarm system that requires the driver to deactivate it by walking through the interior of the bus to turn it off and verify that no passengers are still aboard.

- System is activated when the bus is turned on and runs for 10 minutes. 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 3 times and the Pilot Lamp cuts off. The Driver can now leave the bus. If the system is not disarmed then the horn will start blowing and headlamps will flash. When this happens the driver must go to the front and turn the Ignition back on then 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: 10 minutes after the bus is started.
- Alarm Activation: When Ignition is turned off.
- Alarm Indication: Interior Lamps are turned on.
- Location of Deactivation Switch: Last bulkhead section - Drivers side.
- Confirmation of Deactivation: Interior lamps flash when deactivated.
- Operation without Deactivation: Pilot lamp and dome lights – ON. If not disarmed within 1 Minute, chassis horn will blow and headlamps will start flashing.
- 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.



## CHILD REMINDER SYSTEM - B2001-23-000

Alarm system that requires the driver to deactivate it by walking through the interior of the bus to turn it off and verify that no passengers are still aboard.

- 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 then the horn will start blowing and headlamps will flash. When this happens the driver must go to the front and turn the Ignition back on then 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 Activation: When Ignition is turned off.
- Alarm Indication: Interior Lamps are turned on.
- Location of Deactivation Switch: Rear bulkhead.
- Confirmation of Deactivation: Interior lamps flash when deactivated.
- Operation without Deactivation: Pilot lamp and dome lights – ON. If not disarmed within 1 Minute, chassis horn will blow and headlamps will start flashing.
- 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.

## PASSENGER ADVISORY SYSTEM - BUZZER ACTIVATION - B2001-24-000

Alarm system that requires the driver to deactivate it by walking through the interior of the bus to turn it off and verify that no passengers are still aboard.

- Post Trip inspection. When the Ignition is turned off the buzzer sounds continuously and Pilot Lamp illuminates on the dash. The buzzer will continue until Driver walks back to the back of the bus and presses button in rear bulkhead. Once the button is pressed the buzzer ceases and Pilot lamp turns off.
- Time to alarm: N/A.
- Type of Alarm: Buzzer.
- System Activation: Ignition.
- Alarm Activation: Driver turns off ignition.
- Alarm Indication: Buzzer sounds upon alarm activation.
- Location of Deactivation Switch: Rear bulkhead.
- Confirmation of Deactivation: Buzzer ceases and pilot light goes out.
- Operation without Deactivation: Buzzer and pilot light - ON
- Dome Light: N/A.
- Pilot Light Location/Operation: LED pilot light located in switch cabinet flashes upon system activation.
- Labeling: "PERFORM POST-TRIP INSPECTION, DISABLE ALARM AT REAR OF BUS". Located at pilot light on switch cabinet.

## PASSENGER ADVISORY SYSTEM - BUZZER ACTIVATION - B2001-25-000

Alarm system that requires the driver to deactivate it by walking through the interior of the bus to turn it off and verify that no passengers are still aboard.

- Bus Scan - When the Ignition is turned off the buzzer sounds continuously and Active Pilot Lamp illuminates on the control unit. The buzzer will continue until Driver walks back to the back of the bus and presses button in rear bulkhead. Once the button is pressed the buzzer ceases and Pilot lamp turns off. If button is not pressed in 60 seconds the Bus horn will sound. You must turn Ignition back on then off and then press button in rear bulkhead for the horn to stop.
- Time to alarm: 60 seconds.
- Type of Alarm: Chassis Horn.
- System Activation: Ignition.
- Alarm Activation: Driver turns off ignition.
- Alarm Indication: Buzzer sounds upon alarm activation.
- Location of Deactivation Switch: Rear bulkhead.
- Confirmation of Deactivation: Buzzer ceases.
- Operation without Deactivation: Chassis horn.
- Dome Light: N/A.
- Pilot Light Location/Operation: On Bus Scan Module/Lights.
- Labeling: N/A.
- Service Mode: By key switch on unit.

## PASSENGER ADVISORY SYSTEM - HORN ACTIVATION (CHECK MATE) - B2001-26-000

Alarm system that requires the driver to deactivate it by walking through the interior of the bus to turn it off and verify that no passengers are still aboard.

- The Child Checkmate system is active when the Ignition is turned on the first time. (There will be a brief audible chirp confirming it is active) It remains “unarmed” until the Red warning lights are used the first time on a route. At the end of the route the driver turns off the ignition key and has to walk back to the rear and press the “Stop and Check” button on the rear bulkhead and hold down until the unit chirps to let the driver know it has been deactivated. If Horn starts blowing, Ignition has to be turned back on, then the button at back must be pressed again.

- Time to alarm: 60 seconds.
- Type of Alarm: Chassis Horn.
- System Activation: When red warning lamps are used for first time.
- Alarm Activation: When Ignition is turned off.
- Alarm Indication: Chirping from control unit.
- Location of Deactivation Switch: Rear bulkhead.
- Confirmation of Deactivation: Rapid chirp sound from control box.
- Operation without Deactivation: Chassis horn timed to activate after 60 seconds.
- Dome Light: N/A.
- Pilot Light Location/Operation: None.
- Labeling: N/A.

## PASSENGER ADVISORY SYSTEM - HORN ACTIVATION (CHECK MATE) - B2001-27-000

Alarm system that requires the driver to deactivate it by walking through the interior of the bus to turn it off and verify that no passengers are still aboard.

- The Child Checkmate system is active when the Ignition is turned on the first time. (There will be a brief audible chirp confirming it is active) It remains “unarmed” until the Red warning lights are used the first time on a route. At the end of the route the driver has to walk back to the rear and press the “Stop and Check” button on the rear bulkhead and hold down until the unit chirps to let the driver know it has been deactivated. If Horn starts blowing, Ignition has to be turned back on, then the button at back must be pressed again.
- In California the driver must leave the vehicle to accompany students across the road, the driver should simply turn off the engine and remove the key remembering to leave the overhead flashing lights on. The system will remain active but will not sound the alarm as long as the overhead lights remain on. Once the driver

returns to the bus, the engine should be started prior to turning off the Overhead lights. Once the lights have been turned off, the driver may repeat this procedure until the run is completed at which time the system should be deactivated following the procedures described above.

- Time to alarm: 60 seconds.
- Type of Alarm: Chassis Horn.
- System Activation: When red warning lamps are used for first time.
- Alarm Activation: When Ignition is turned off.
- Alarm Indication: Chirping from control unit.
- Location of Deactivation Switch: Rear bulkhead.
- Confirmation of Deactivation: Rapid chirp sound from control box.
- Operation without Deactivation: Chassis Horn.
- Dome Light: N/A.
- Pilot Light Location/Operation: None.
- Labeling: N/A.
- California option: Yes.

## PASSENGER ADVISORY SYSTEM - BUZZER ACTIVATION - B2001-28-000

Alarm system that requires the driver to deactivate it by walking through the interior of the bus to turn it off and verify that no passengers are still aboard.

- Bus Scan - When the Ignition is turned off the buzzer sounds continuously and Active Pilot Lamp illuminates on the control unit. The buzzer will continue until Driver walks back to the back of the bus and presses button in rear bulkhead. Once the button is pressed the buzzer ceases and Pilot lamp turns off. If button is not pressed in 60 seconds the Bus horn will sound. You must turn Ignition back on then off and then press button in rear bulkhead for the horn to stop.
- Time to alarm: 60 seconds.
- Type of Alarm: Buzzer and Chassis Horn.
- System Activation: Ignition & Warning Light activation.
- Alarm Activation: Driver turns off ignition.
- Alarm Indication: Buzzer sounds upon alarm activation.
- Location of Deactivation Switch: Rear bulkhead.
- Confirmation of Deactivation: Buzzer ceases.
- Operation without Deactivation: Buzzer and Chassis Horn.
- Dome Light: N/A.
- Pilot Light Location/Operation: On Bus Scan Module/Lights.
- Labeling: N/A.

## CHILD REMINDER SYSTEM EP2 - B2001-29-000

Alarm system that requires the driver to deactivate it by walking through the interior of the bus to turn it off and verify that no passengers are still aboard.

- When the bus is started there should be an audible chip from the EP2 module. When the Red lamps are used for the first time in route, the EP2 will emit an audible sound to let you know it is armed. When the route is over, with the door closed, you must turn key to off position for 1 second then turn it back to Ignition or Accessory. Once that is done the driver must walk back to back and push button on rear bulkhead for 3 seconds. The unit will chirp to let you know that it has been deactivated. Dome lights will then stay on for approximately 60 seconds. \*Note\* If when the bus is cut off and tone is heard from unit and the bus is not turned back to IGN or ACC then after 8 seconds the horn will start blowing.
- Theftmate section:
  - > Walk onto bus, Dome lights should come on and initial passive alarm will sound after 15 seconds.
  - > The dome lights will pulsate off and on and the EP2 will sound a loud voice.
  - > Turn the ignition key to the on position, this will silence the alarm.
  - > The EP2 system is equipped with a RF receiver to disable the alarm for a predetermined time by the mechanic for maintenance.
- Time to alarm: 8 seconds.
- Type of Alarm: Chassis horn.
- System Activation: When red warning lamps are used for first time.
- Alarm Activation: When Ignition is turned off.
- Alarm Indication: Interior Lamps are turned on.
- Location of Deactivation Switch: Rear bulkhead.

- Confirmation of Deactivation: Interior lamps flash when deactivated.
- Operation without Deactivation: Dome lights ON for approx. 1 minute. 8 second delay - Chassis horn will blow.  
**Note: After 1 minute with the bus empty, the theft mate will activate. After 30 minutes, if motion is sensed, the chassis horn will blow 5 times until system is deactivated.**
- Dome Light: Yes- Approximately 60 seconds.
- Pilot Light Location/Operation: N/A.
- Labeling: N/A



This section provides the operator with important information about vehicle maintenance. Proper vehicle maintenance is essential to ensuring vehicle 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

Your vehicle's electrical system is protected from overload damage by circuit breakers. Should an electrical component fail to operate, check the appropriate circuit breaker.



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

Circuit Breakers that open (blow) may be reset, but will continue to open until the cause of the overload condition is corrected. If a circuit breaker needs to be replaced, use only a new circuit breaker, 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 circuit breaker, could cause premature failure of electrical components. Any such addition of accessories, or modifications may affect your rights under the warranty.**

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

---

---

## TOUCH-UP

Retouch damaged areas as soon as possible to benefit vehicle appearance and control corrosion. Exposed metal quickly corrodes and repair may

develop into a major expense. Your Thomas dealer may be your paint source.

---

## WASHING

For the first 30 days, wash the vehicle 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 vehicle 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.

---

## 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 and 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 vehicle 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. The 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.

## 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.

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.

## 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.**

## TIRES - GENERAL INFORMATION

Tire size and inflation pressures are recorded on the vehicle certification plate. For greater riding comfort, prolonged tire life, and to reduce wear and tear on the vehicle, 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.

## TIRE AND WHEEL REPLACEMENT



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 size 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.

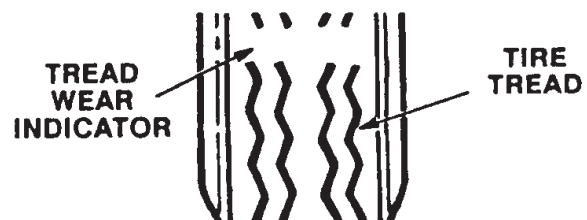
Failure to follow these precautions can adversely affect the safety and handling of your vehicle.



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



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



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 vehicle. Do not inflate a flat tire and place vehicle into service. Have the flat tire checked and repaired (or replace the tire) before placing the vehicle into service.



**Stud Pilot 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 vehicle 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 vehicle movement.
7. Slightly loosen all ten 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.



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.



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

9. Raise vehicle 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 vehicle to ground by slowly turning valve on jack counterclockwise. Do not lower vehicle until all clamps or 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.

(CONTINUED ON NEXT PAGE.)

## CHANGING TIRES (CONTINUED)

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 vehicle is parked on a level surface and is not obstructing traffic.
2. Turn on emergency flashers.
3. Place a "run-up" block in front of inside rear axle tire.
4. Drive vehicle forward until inside rear axle tire is on top of chock.
5. Block diagonally opposite wheel. Use "chocks" if possible to prevent vehicle movement.
6. Apply parking brake.
7. Place automatic transmission vehicles 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 vehicle down block. Do not drive vehicle down block until all clamps or lug nuts are tight.
13. After wheels are on ground, tighten nuts as shown in the next section, "Tightening Wheel Nuts". Follow procedure closely.

## TIGHTENING WHEEL NUTS

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

### NOTICE

**Stud Pilot 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.

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

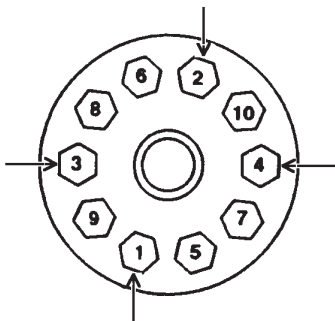
Never apply grease or oil to wheel studs or nuts.

Use a torque wrench to tighten nuts. Re-torque wheel nuts every 1,000 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.

10 BOLT DISC WHEELS



3. Torque all wheel nuts to 450-525 ft/lbs. (608-7098 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.

## WHEEL INSPECTION & MAINTENANCE

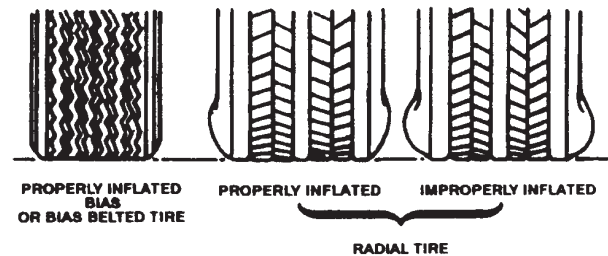


Whenever a wheel is removed and then reinstalled, always remove any corrosion that might be present on the mounting surface of the wheel and/or the surface of the hub, drum or rotor that contacts the wheel.

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

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.



## HEADLIGHT AIMING

### Preliminary Checks

Before checking or adjusting the headlight aim, do the following:

- Check headlight/turn signal access panel. 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 are 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 pages*



## HEADLIGHT AIMING (CONTINUED)

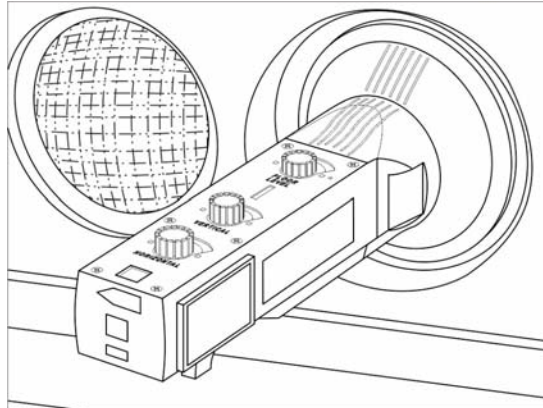


Figure 1 - Headlight Adjustment with Hoppy Tool

### 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

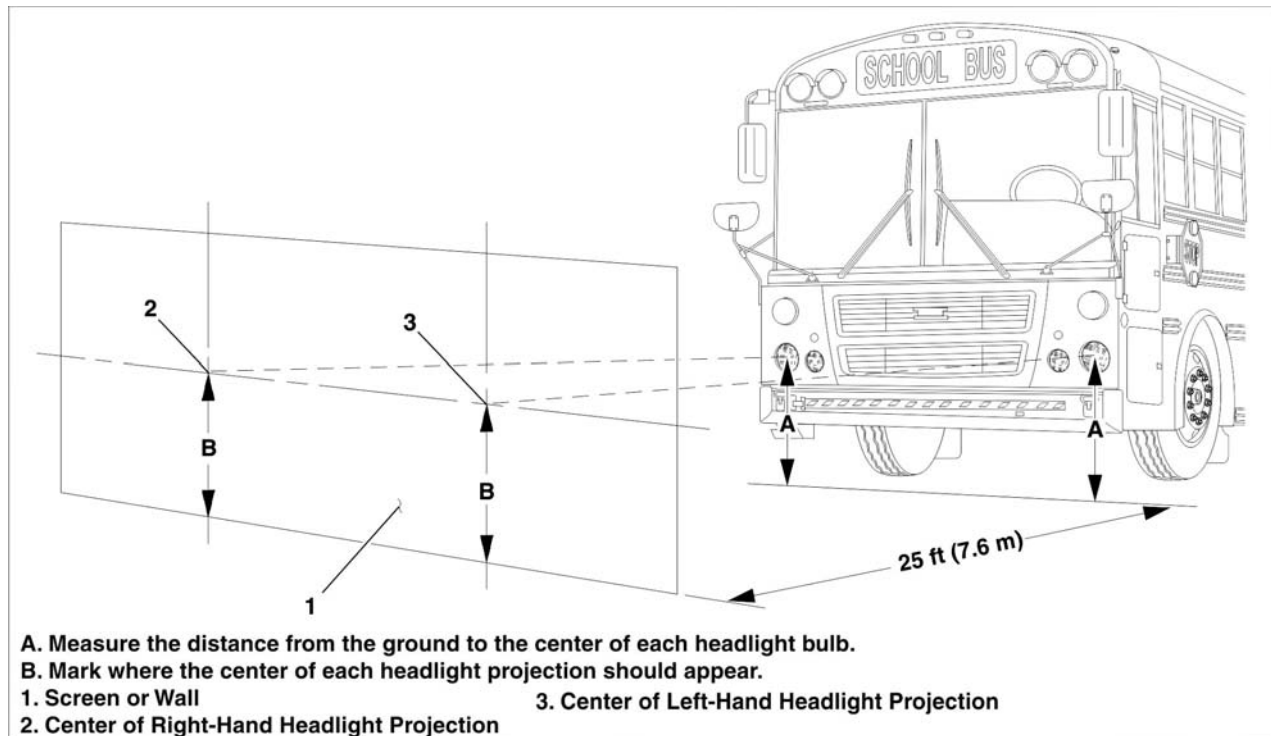


Figure 2

*Continued on next pages*

## HEADLIGHT AIMING (CONTINUED)

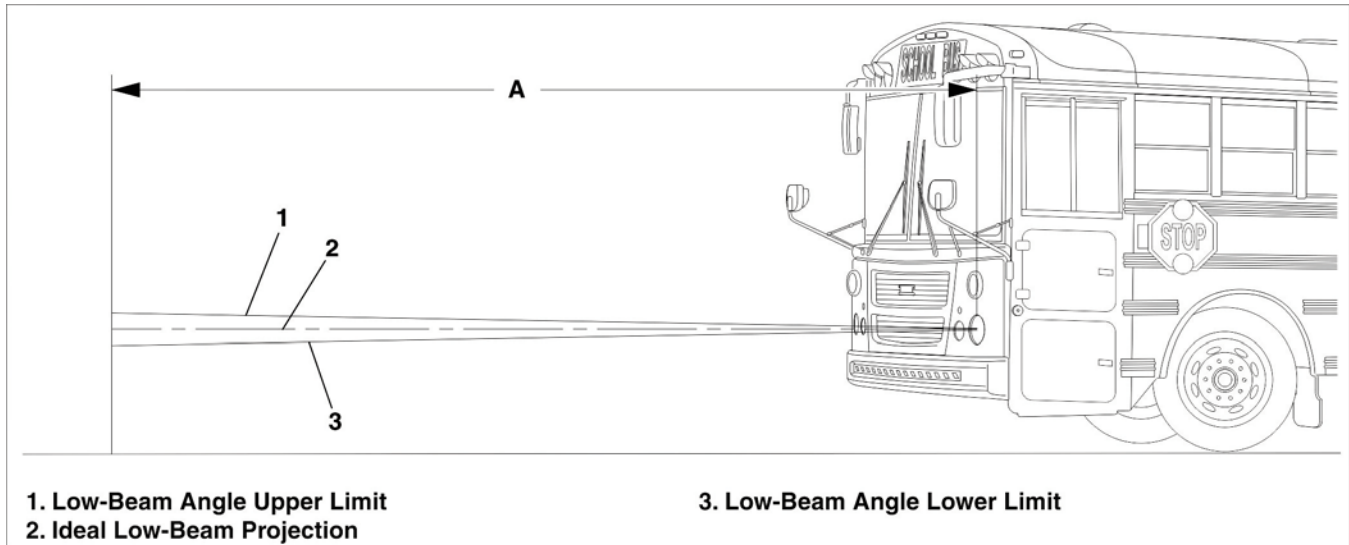


Figure 3

### Headlight Aiming

Headlight adjustment knobs are located on back side of headlight. These can be reached from underneath the chassis above the front bumper.

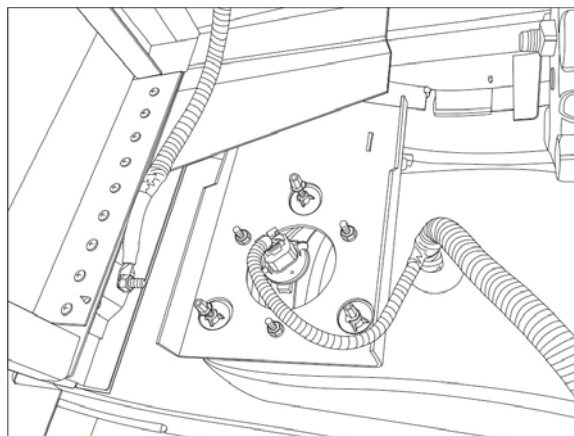


Figure 4 - Headlight Adjusting Knobs

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

## 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

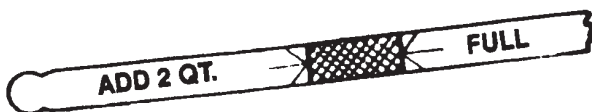
CUMMINS ENGINE	OIL CAPACITY		RECOMMENDED LUBRICANT
	DRY	REFILL	
ISB 200-260	17.6 Qts.(16.7L)	16.6 Qts. (15.7L)	See Manufacturer's recommendation for approved lubricant.

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 Maintenance Schedule.



**Do not handle a hot oil filter with bare hands.**



# SAF-T-LINER® EFX OPERATOR'S MANUAL

## ENGINE OIL AND FILTER CHANGE INTERVAL

CUMMINS ENGINE	MILEAGE INTERVAL	TIME INTERVAL
ISB 200-260	6,000 miles (9600km)	6 months or 500 hours

## ENGINE OIL VISCOSITY CHART

CUMMINS ENGINE	AMBIENT TEMPERATURE	VISCOSITY LOW ASH (SAE)
ISB 200-260	0° to 120°F (-17° to 49°C)	5w/40 or 15W/40
	-10° to 118°F (-23° to 48°C)	10W/30
	-10° to 70°F (-23° to 21°C)	10W/30
	-18° to 70°F (-28° to 21°C)	5W/30
	-20° to 32°F (-29° to 0°C)	0W/30

For temperature below -10°F (-23°C), it may be necessary to warm the oil so the engine can be cranked and the oil can circulate freely.

## GENERAL LUBRICATION NOTES

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

- Clean grease fitting (before lubricating component) with dry, clean towel.
- Lubricate at each point every 3,000 miles (4800km) or monthly with lubricant to meet MIL-L-2105.

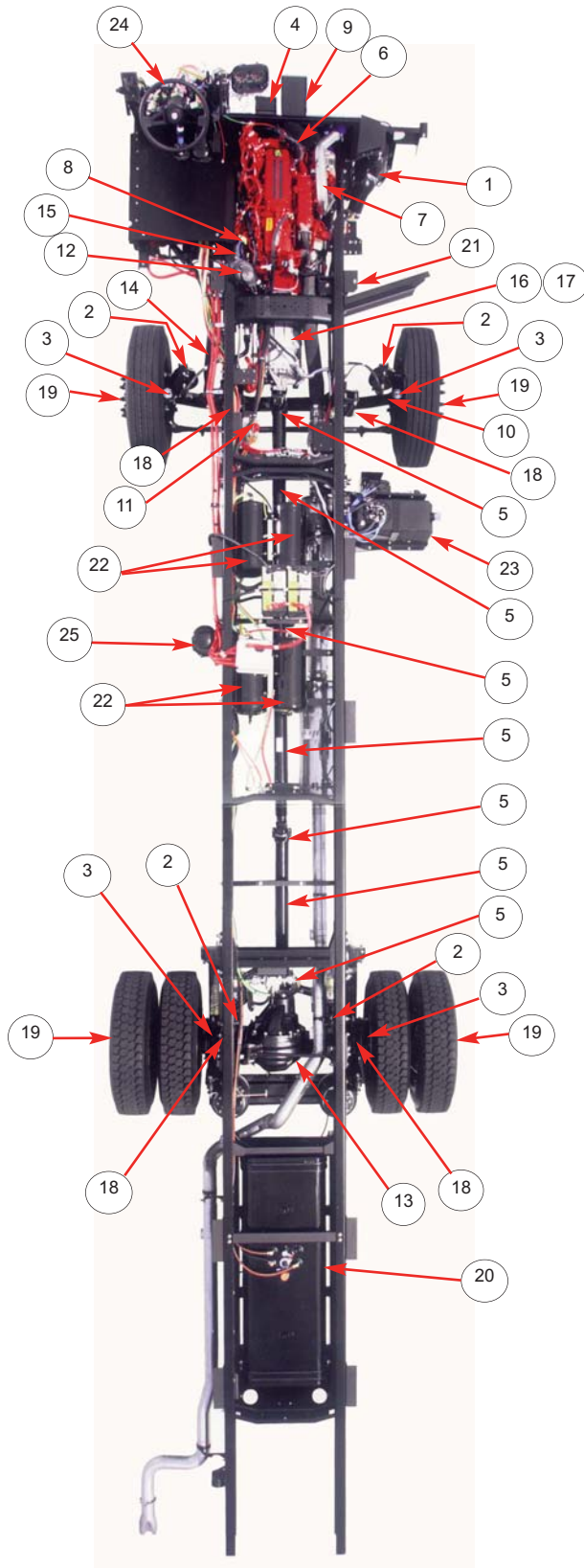
- Consult your MVP-EFX Service Manuals.
- Adjust service interval as necessary for local conditions.
- The front axle is a sealed knuckle type and does not require raising off the ground for lubrication.

## WHEEL BEARINGS - GREASE PACKED/LUBRICATED

- Lubricate every 12,000 miles (19200km)
- Soap Type - Lithium 12 Hydroxy stearate or equivalent
- Consistency - NLGII No. 1
- Corrosion and Oxidation Inhibitors
- Base Oil Solvent Refined Petroleum Oil
- Base Oil Viscosity at 210°F: 75 SUS
- Pour Point: +10°F

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.

## SERVICE/INSPECTION POINTS



Item No.	Description
1.	Air Filter
2.	Automatic Slack Adjusters (Air Brakes)
3.	Brakes
4.	Engine Coolant Reservoir
5.	Driveshafts - U-Joint & Slip Yokes
6.	Engine - Belts
7.	Engine - Oil Filter
8.	Engine - Oil Fill Tube
9.	Engine - Fan
10.	Front Axle - Wheel Bearings, King Pins, Bushings, & Ball Studs
11.	Fuel/Water Separator
12.	Power Steering Reservoir
13.	Rear Axle
14.	Steering Linkage
15.	Transmission - Fill Tube
16.	Transmission - Filter, External
17.	Transmission - Filter, Internal
18.	U-Bolts
19.	Wheel Lug Nuts
20.	Fuel Fill
21.	Engine Coolant Filter
22.	Air Tanks (4) (Air Brakes)
23.	DEF Tank
24.	Windshield Washer Reservoir
25.	Air Dryer

## OIL LUBRICATED WHEEL BEARINGS

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 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 should be check for lubrication every 3,000 miles (4800km) or monthly.

## BRAKE SYSTEM

The vehicle 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 dual brake air system gauge on dashboard. Pressure drop should not exceed 20 psi in 10 minutes.
4. Apply service brakes.
5. Observe dual 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



Care must be exercised when lubricating components near the brake linings. Over-lubrication 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.

Change oil twice a year or every 5,000 miles (8000 km). Severe service requires more 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. Change the filter element whenever the oil in the steering system is changed. Carefully clean any built up oil around the reservoir

cover. Remove the cover and filter element. Clean the inside of the reservoir with a lint-free cloth. Install a new filter element, refill the reservoir and replace its cover.

The level must be between the "MAX" and "MIN" mark on the reservoir. Do not overfill. Use DEXRON III Automatic Transmission Fluid or equivalent.

### 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.**

## 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 vehicle 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).



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



## TRANSMISSION LUBRICANT

ALLISON TRANSMISSION	CAPACITY	RECOMMENDED LUBRICANT
2500 PTS	20 Qts.*	Dexron III or C-4
3000 PTS	29 Qts.*	Dexron III or C-4

\*Dry fill, not including coolers and external filter.

## TRANSMISSION OIL AND OIL FILTER CHANGE CHART

ALLISON TRANSMISSION	MILEAGE INTERVAL	TIME INTERVAL
2500 PTS	25,000 miles*	12 months*
3000 PTS	"	"

\*Whichever occurs first.

\*\*Initial Change only.

## APPROVED ALLISON TRANSMISSION LUBRICANTS\*

TES-295 APPROVAL NUMBER	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 [www.allisontransmission.com](http://www.allisontransmission.com).

Lubricants listed in order of preference. Do not mix types of oil.

## 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 25,000 miles (40000km) or 12 months, whichever occurs first.

Draining the rear axle is best accomplished immediately after the vehicle has completed a trip. The warm lubricant will run freely, allowing full drainage in minimum time. This practice works well in cold weather.

---

## CHECK REAR DIFFERENTIAL/AXLE GEAR OIL LEVEL

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

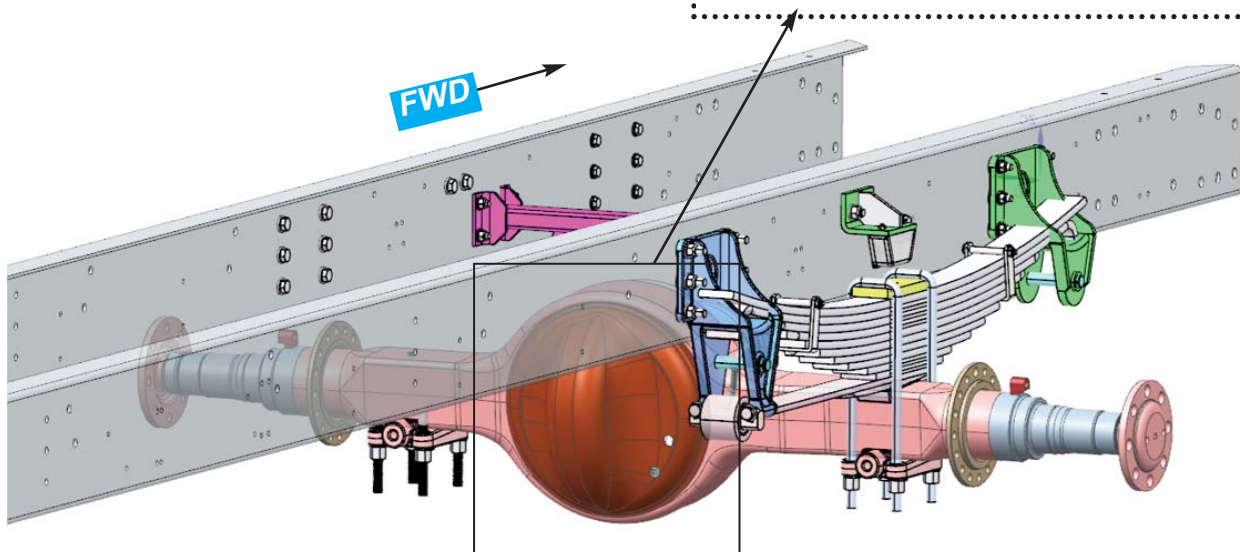
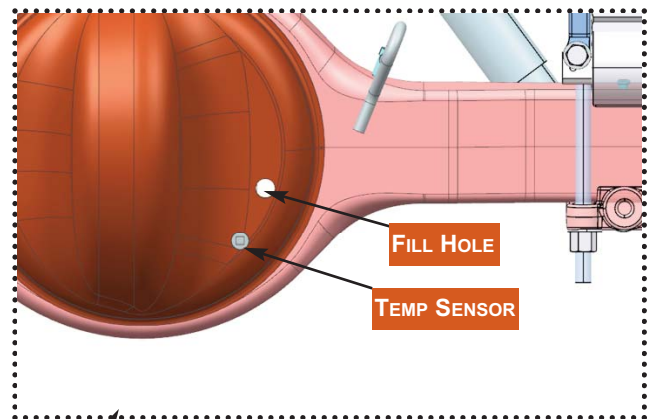
Check the gear oil level in the rear axle according to the following sequence:

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.



# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

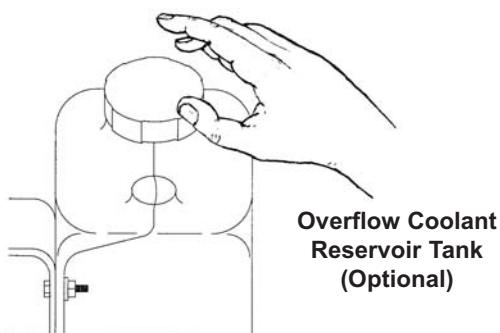
## COOLANT LEVEL

Check the cooling system daily, such as during fuel stops. You do not need to remove the radiator cap to check the coolant level. Look through the translucent coolant reservoir tank or the sight glass near the top of the radiator. When the engine is cold, the coolant level should be at or slightly above the "Full Cold" mark on the reservoir tank. When the engine has fully warmed up, the level should be at or slightly above the "Full Hot" mark on the reservoir tank.



**Do NOT remove radiator cap to check coolant level.**

If the coolant level is low, remove the cap on the coolant reservoir tank. Fill the surge tank to the MAXline with a 50/50 mixture of water and the type of antifreeze currently installed in your vehicle. If the surge tank was empty, start the engine after refilling and check the level again when the engine is at operating temperature. Put the cap back on the reservoir 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 reservoir tank. Do not overfill.



**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.**



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

## COOLANT FILTER REPLACEMENT



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



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

## 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.

### NOTICE

**Optional Extended Life Antifreeze is available which does not contain SCA. Check label on the vehicle to be sure which type is in the vehicle.**

Alliance pre-charged antifreeze, part OWI ALA003, is recommended.

### NOTICE

**Check with Engine Manufacturer for their SCA recommendations and maintenance schedule.**

Nitrate levels need to be checked and maintained every time coolant is added to the system. A Penray® Test Kit, part # PIC TS 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.**

## COOLING SYSTEM

The cooling system in the vehicle contains approximately 52 U.S. quarts (49.2L). 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 vehicle, 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. When untreated, all water is corrosive. Therefore, we recommend using de-ionized water. 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.

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. (Check with Engine Manufacturer for their recommendations.)

When treating the cooling system with chemical additives, always start clean.

### To flush the system:

1. Place a large container under the radiator.
2. Remove the surge tank cap.
3. Open the petcock at the bottom of the radiator to drain the engine coolant.
4. Disconnect the radiator inlet and outlet hose connections.
5. Attach a flushing gun nozzle to the radiator outlet.
6. Add water to the radiator until it is full.



**When flushing the radiator, do not apply more than 20 psi (138 kPa) air pressure. Excessive pressure can damage the radiator or heater core.**

7. Apply no more than 20 psi (138 kPa) air pressure intermittently to help dislodge sediment buildup in the core.
8. Drain the radiator, then flush the radiator until clean water flows from the radiator. Remove the flushing gun.
9. Close the petcock.
10. Using clamps, connect the hoses to the radiator. Torque the clamps 33 to 38 lbf-in (370 to 430 N-cm)
11. Fill the radiator with coolant. Use a mixture of 50 percent water and 50 percent corrosion-inhibiting antifreeze to protect the engine to -34°F (-37°C) year round.



**Flushing a coolant system that has ELC (Extended Life Coolant) with water will contaminate the system if all of the water is not removed. It is recommended that you flush an ELC system with ELC coolant.**

*(Continued on next page.)*

## COOLING SYSTEM (CONTINUED)

If the system is dirty, showing mineral build up, scale, rust or oil, use a heavy duty radiator cleaner following the engine 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 6.5 and 9.0 for the ELC and 8.5-11 for the Fully Formulated, anything lower is corrosive to cast iron, steel and aluminum and causes rapid depletion of additives. Anything over can cause the over concentration to precipitate from the coolant onto heat transfer surfaces, reducing the systems ability to dissipate, absorb and radiate heat.

### **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.

The vehicle 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 reservoir tank.



**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 reservoir 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 reservoir tank filler cap. A safety latch prevents complete removal of the filler cap in one operation.

*(Continued on next page.)*

# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## COOLING SYSTEM (CONTINUED)



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.



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

## 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. A procedure has been written for each engine. Use the one that best suites your particular application.



Procedure should be performed on cold engines only.

### Cummins ISB:

1. Open all gate valves.
2. Open valve on front heater using controls.
3. Remove radiator cap.

4. With engine **NOT** running, turn on booster pump.
5. Add coolant as required.
- \*6. Total volume of coolant added should be 2 to 2 1/2 gallons.
7. Start engine and add 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.

## WINDSHIELD WASHER

To add windshield washer fluid, locate the fluid reservoir behind the left windshield wiper 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 forward section ahead of the stepwell. An elastic seal is attached to the top inlet adapter, sealing the area where the air cleaner contacts the incoming air plenum.

a restriction indicator has been installed behind the grill assembly at the top of the radiator installed (viewed from the front).

Maximum restriction is 25" H<sub>2</sub>O at full load and rated engine RPM. This will occur during normal operation on the road. Replace the element every 2 years, 45,000 miles, or 25" of restriction, whichever comes first. Do not attempt to clean or reuse it.

Replacement is simple:

- Secure the vehicle.
- remove the four fasteners from the bottom, the filter drops down.
- Replace filter.

## DRAINING AIR RESERVOIR TANKS

the air reservoir tanks should be drained daily. the drain cocks should be left open until all moisture escapes.

Many operators open the drain cocks at the end of the day to permit thorough purging of the system. the drain cocks are closed prior to placing the vehicle back into service. This automatically causes the engine to be warmed-up while rebuilding air pressure in the system.



**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.**

## BERG CABLE OPERATED DRAIN VALVES

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.

## PROPER DISPOSAL OF FLUIDS



**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** - Change every three months or 3,000 miles (4800 km), whichever occurs first, if your driving habits FREQUENTLY include:

- 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.

## DRIVE BELT REPLACEMENT AND ADJUSTMENT

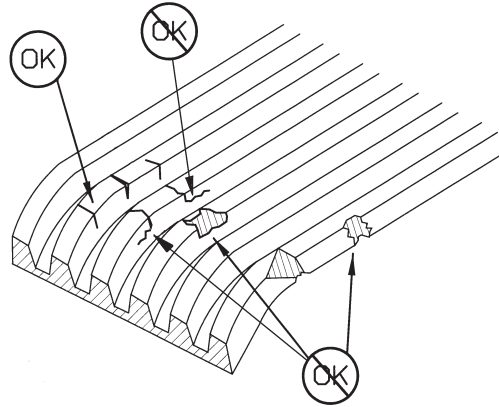
### NOTICE

Belts must be cool when tension is checked. Disconnect the negative cable from the battery when replacing belt.

Check belts for wear, cracks, and other damage.

Replace the belt if it is frayed or has pieces of material missing.

With engine stopped, check belt tension with a reliable gauge. Drive belt tension should be 80-100 ft./lbs. (360-490 N).



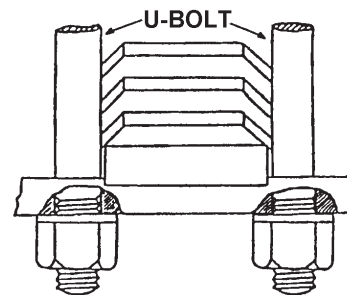
## LEAF SPRINGS

When properly tightened, the U-bolts on your vehicle's leaf springs should stretch by .003" per inch of original length.

### NOTICE

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.

The U-bolts on your vehicle's leaf springs should be checked and retightened every 5,000 miles (8000km).



# SAF-T-LINER<sup>®</sup> EFX OPERATOR'S MANUAL

## CUMMINS ENGINE OPERATING SPECIFICATIONS

*Oil Pressure - psi *(kPa)	10-30 (69-207)
**Coolant Temperature - F **(C)	180 <sup>o</sup> -212 <sup>o</sup> (82 <sup>o</sup> -100 <sup>o</sup> )
Engine Idle RPM	750
Rated Speed RPM (governed)	2500
Charging Voltage	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.

## GENERAL VEHICLE SPECIFICATIONS

### NOTICE

All height dimensions are based on an average of measurements taken.  
All measurements are based on 11R22.5 Tires (41 1/2" outside diameter).

## STANDARD

Body Model	Window Section	Wheelbase	Body Length w/ Bumpers	Body Width	<sup>1</sup> Height 73" HR	<sup>1</sup> Height 78" HR	Turning Radius	F/Axle Track	R/Axle Track
0908	9	136"	327.8"	96"	121"	123"	21' 3"	80"	72.25"
0918	9+10"	136"	337.7"	96"	121"	123"	21' 3"	80"	72.25"
1008	10	155"	356.5"	96"	121"	123"	23' 10"	80"	72.25"
1018	10+10"	155"	366.5"	96"	121"	123"	23' 10"	80"	72.25"
1108	11	174"	385.3"	96"	121"	123"	26' 5"	80"	72.25"
1118	11+10"	174"	395.3"	96"	121"	123"	26' 5"	80"	72.25"
1208	12	193"	414.0"	96"	121"	123"	29'	80"	72.25"
1218	12+10"	193"	424.0"	96"	121"	123"	29'	80"	72.25"
1308	13	212"	442.7"	96"	121"	123"	31' 7"	80"	72.25"
1318	13+10"	212"	452.7"	96"	121"	123"	33' 7"	80"	72.25"
1408	14	231"	467.0"	96"	121"	123"	34' 2"	80"	72.25"
1418	14+10"	231"	477.0"	96"	121"	123"	34' 2"	80"	72.25"

### <sup>1</sup> 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

## METRIC

Body Model	Window Section	Wheelbase	Body Length w/ Bumpers	Body Width	<sup>1</sup> Height 73" HR	<sup>1</sup> Height 78" HR	Turning Radius	F/Axle Track	R/Axle Track
0908	9	345.4	832.6	243.8	307.34	312.42	6.477	2.032	1.835
0918	9+10"	345.4	857.8	243.8	307.34	312.42	6.477	2.032	1.835
1008	10	393.7	905.5	243.8	307.34	312.42	7.264	2.032	1.835
1018	10+10"	393.7	930.9	243.8	307.34	312.42	7.264	2.032	1.835
1108	11	442.0	978.7	243.8	307.34	312.42	8.051	2.032	1.835
1118	11+10"	442.0	1004.1	243.8	307.34	312.42	8.051	2.032	1.835
1208	12	490.2	1051.6	243.8	307.34	312.42	8.839	2.032	1.835
1218	12+10"	490.2	1077.0	243.8	307.34	312.42	8.839	2.032	1.835
1308	13	538.5	1124.5	243.8	307.34	312.42	9.448	2.032	1.835
1318	13+10"	538.5	1149.9	243.8	307.34	312.42	10.236	2.032	1.835
1408	14	586.7	1186.2	243.8	307.34	312.42	10.414	2.032	1.835
1418	14+10"	586.7	1211.6	243.8	307.34	312.42	10.414	2.032	1.835

\*cm

\*\*m

**PAGE INTENTIONALLY LEFT BLANK.**

# 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 _____	_____	_____

Driver's Signature \_\_\_\_\_

**Comments:**

\_\_\_\_\_

**PAGE INTENTIONALLY LEFT BLANK.**



# 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-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 constant torque clamps (40 in/lbs) .....	_____	_____
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 .....	_____	_____

# PREVENTIVE MAINTENANCE INSPECTION #1

(CONTINUED)

**OK      Not OK**

- 22. Check coolant level, Freeze protection \_\_\_\_\_ % and SCA levels \_\_\_\_\_ ppm or units . . . \_\_\_\_\_  
**Important: Check with Engine Manufacturer for their SCA recommendations and maintenance schedule.**
- 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 fuel tank mounting brackets for cracks, security . . . . . \_\_\_\_\_
- 35. Clean fuel tank vents \_\_\_\_\_ Inspect filler cap seals \_\_\_\_\_
- 36. Jack front axle. Check tires for toe-in wear . . . . . \_\_\_\_\_  
 36.1. Grease suspension, king pin, steering linkage . . . . . \_\_\_\_\_  
 36.2 Check lube level of front wheels \_\_\_\_\_ Bearing adjustment \_\_\_\_\_  
 36.3 Check steering linkage for lost motion \_\_\_\_\_ Check king pins \_\_\_\_\_  
 36.4 Inspect front springs for broken leaves \_\_\_\_\_ Loose U-Bolts \_\_\_\_\_  
       Shackles \_\_\_\_\_  
 36.5 Adjust front brakes \_\_\_\_\_ Grease brake mechanism \_\_\_\_\_  
       Check lining wear \_\_\_\_\_
- 37. Inspect steering gear box mounting for security . . . . . \_\_\_\_\_
- 38. Inspect wheel/rim lug nuts for security . . . . . \_\_\_\_\_
- 39. Inspect wheels/rims for cracks, slipping . . . . . \_\_\_\_\_
- 40. Inspect tires for cuts, tread depth, wear . . . . . \_\_\_\_\_
- 41. Inflate tires to recommended pressure . . . . . \_\_\_\_\_
- 42. Inspect body mounting bolts and clips for security . . . . . \_\_\_\_\_
- 43. Consult repair order for following:  
 43.1 Change engine oil \_\_\_\_\_ Replace oil filters \_\_\_\_\_  
 43.2 Replace fuel filters \_\_\_\_\_ Water filter \_\_\_\_\_
- 44. Start engine. Check filters for leaks . . . . . \_\_\_\_\_
- 45. Engine idling & at operating temperature - check automatic transmission fluid level . . . . . \_\_\_\_\_
- 46. Road test. Check brake operation, unusual noises, etc. . . . . \_\_\_\_\_
- 47. Wipe grease off steering wheel and driver's seat . . . . . \_\_\_\_\_
- 48. Fill out all required work orders, forms, etc. . . . . \_\_\_\_\_

Mechanic's Signature \_\_\_\_\_

**Comments:**

## 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) . . . . .	_____	_____
<b>Important: Refer to the Engine Manufacturer's Service literature for approved coolant.</b>		
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 (40 in/lbs on constant torque clamps) . . . . .	_____	_____
15. Air cleaner element - replace every 2 years, 45,000 miles, or 25" of restriction, whichever comes first . . . . .	_____	_____
16. Check operation of restriction indicator, remove and test operation . . . . .	_____	_____
17. Service crankcase breathers . . . . .	_____	_____
18. Check exhaust system for leaks, security . . . . .	_____	_____
19. Check operation of engine protection system . . . . .	_____	_____
20. Test batteries for full charge . . . . .	_____	_____
21. Clean batteries and battery box . . . . .	_____	_____
22. Test alternator regulator setting - 14 to 14.2 (must be checked with a fully charged battery) . . . . .	_____	_____
23. Remove starter - inspect brushes (at 90,000 mile intervals) . . . . . Clean dust from magnetic switch, lever end.	_____	_____
24. Remove backing plates (if equipped), Inspect rear brakes linings (Replace if less than 1/4") . . . . .	_____	_____
25. Inspect slack adjusters for worn splines. Remove plug and grease all 4, if sealed type . . . . .	_____	_____
26. Tighten rear U-bolts ____ Torque Values ____ . . . . .	_____	_____
27. Tighten front U-bolts ____ Torque Values ____ . . . . .	_____	_____
28. Remove front wheel. Inspect lining. Replace if within 1/8" of rivet head . . . . .	_____	_____
29. Clean and repack wheel bearings, if not oil lubricated . . . . .	_____	_____
30. Drain and refill differential. Check lube for metal, chips, etc. . . . .	_____	_____
31. Drain and refill manual transmission (if equipped) - Check lube for contaminants . . . . .	_____	_____

## PREVENTIVE MAINTENANCE INSPECTION #2

(CONTINUED)

	OK	Not OK
32. Drain automatic transmission - drop pan. Replace internal filter .....	_____	_____
32.1 Renew transmission filter .....	_____	_____
32.2 Refill with ATF Dexron 111 or equal .....	_____	_____
33. Check operation of air dryer - renew filter or desiccant, if so equipped .....	_____	_____
34. Inspect rubber seals on emergency exits .....	_____	_____
35. Lubricate all access and emergency door hinges .....	_____	_____
36. Replace entrance door inline filter .....	_____	_____
37. Inspect all windows for proper latching .....	_____	_____
38. Inspect fuel tanks (by a trained inspector), every third year (CNG units) .....	_____	_____
39. Check fuel sender unit connections and renew dielectric grease, if necessary. ....	_____	_____
Check fuel fill hose for tightness .....	_____	_____

Mechanic's Signature \_\_\_\_\_

**Comments:**



**PAGE INTENTIONALLY LEFT BLANK.**

**PAGE INTENTIONALLY LEFT BLANK.**



1408 Courtesy Road  
Post Office Box 2450  
High Point, NC 27261  
(336) 889-4871

[www.thomasbus.com](http://www.thomasbus.com)

©2015 Thomas Built Buses, Inc. All rights reserved. No portion of this catalog may be reproduced by any means without express permission from the copyright holder.

**Part #TBB 176060 rev. 2021.1.26**