CITY AND COUNTY OF SAN FRANCISCO
San Francisco Municipal Transportation Agency
Request for Proposals
THE PROCUREMENT OF
30-Foot, 40-FOOT AND 60-FOOT LOW FLOOR
DIESEL HYBRID COACHES

3-H	Chassis	1) How are all engine accessories driven? 2) Describe accessibility of engine accessories and routinely serviced engine components. 3) Describe the cooling system including accessibility for radiator, charge air and oil cooler cleaning. 4) Describe all propulsion system removal procedures (engine, generator, motor, batteries, etc.). 5) What type of air actuated disc brake system is supplied? 6) Describe the operation of the parking and emergency brake and the hill holder 7) Describe the propulsion system mounting and the methods and materials used to isolate vibrations from the propulsion system. 8) Describe the hydraulic pumps and their transit experience. 9) How will the heating and ventilation system meet the specification requirements? 10) What are the components of the heating and ventilating system and how have they been designed for long operation and low maintenance? 11) Describe the driver's heater and demister. 12) Describe the design of the ramp and its integration into the bus structure 13) Describe the driver's heater and demister. 14) Describe the design of the ramp and its integration into the bus structure **NOTE: SFMTA has operational and liability concerns with ramp angles during the wheelchair loading & unloading process due to the high number of stop locations in the service area without curbs. The proposer needs to address the ramp angle and how it can be minimized to reduce the chances of wheelchair rollback / roll over.** 16) Describe the vehicle maximum load allowance. 17) Supply component manufacturers' information on required lubrication, fuel and coolant products for the following: a. Engine - oil, fuel, coolant b. Motor - lubrication and coolant c. Generator – lubrication and coolant system d. Batteries or capacitors – coolant system e. Differential - oil

NEW FLYER

XCELSIOR
BETTER BY DESIGN

CITY AND COUNTY OF SAN FRANCISCO
San Francisco Municipal Transportation Agency
Request for Proposals
THE PROCUREMENT OF
30-Foot, 40-FOOT AND 60-FOOT LOW FLOOR
DIESEL HYBRID COACHES

New Flyer is providing information as requested in Section 3-H. We are providing information on the engine accessibility and accessories including procedures on installing and removing the engine. . We are proposing the EMP electrical cooling system and information on the proposed system is attached.
We are proposing Disc brakes as provided by Knorr/MAN and we are also providing information on our parking brake and hill holder operation.
Systems that are run in hydraulics are minimized due to the electrical accessories proposed. The configuration proposed has a steering pump and a wheelchair ramp pump which have been used in all Xcelsior's produce today (over 4,500 units).
We are including on this section a complete description of the HVAC system. This includes the Thermo King unit and the driver's heater/defroster.
We are proposing our standard New Flyer ramp meeting and exceeding the ADA standards with a 1:7 slope. The slope provided in the attached drawing shows the angles in the interior entrance area that minimizes the risk of ramp rolling over.
Lastly, we are including per the request in Section 3H, a list of recommended fluids used in the proposed vehicle.

2. ENGINE & ACCESSORIES

2.1. Cummins ISL 9.0L (EPA 2013) Engine

2.1.1. Description

The Cummins ISL9 engine is an 8.9 liter, four-stroke, inline, six cylinder, diesel engine. See "Fig. 4-1: Engine Views" on page 3.

The major components and accessories of the engine are:

- ❒ Fuel System (Refer to Section 7 of this manual).
- ❒ Engine Protection System
- ❒ Air Intake System
- ❒ Exhaust System
- ❒ Engine Switch Box
- ❒ Electronic Control Module (ECM)

2.1.2. Engine Specifications

Rated Power ..... 330 HP @ 2000 RPM

Peak Torque ..... 1100 ft-lb. @ 1300 RPM

Displacement..... 8.9 liters (540 cu. in.)

Firing Order 1-5-3-6-2-4

Aspiration ..... Turbo Charge

Engine Weight (dry) ..... 1678 lb. (761 kg)

Oil Capacity (including filter) ..... 28 U.S. qt. (26.5 liters)

Coolant Capacity (engine only) ..... 13.1 U.S. qt. (12.4 liters)

Refer to the Cummins Operation & Maintenance Manual for further information on the engine.

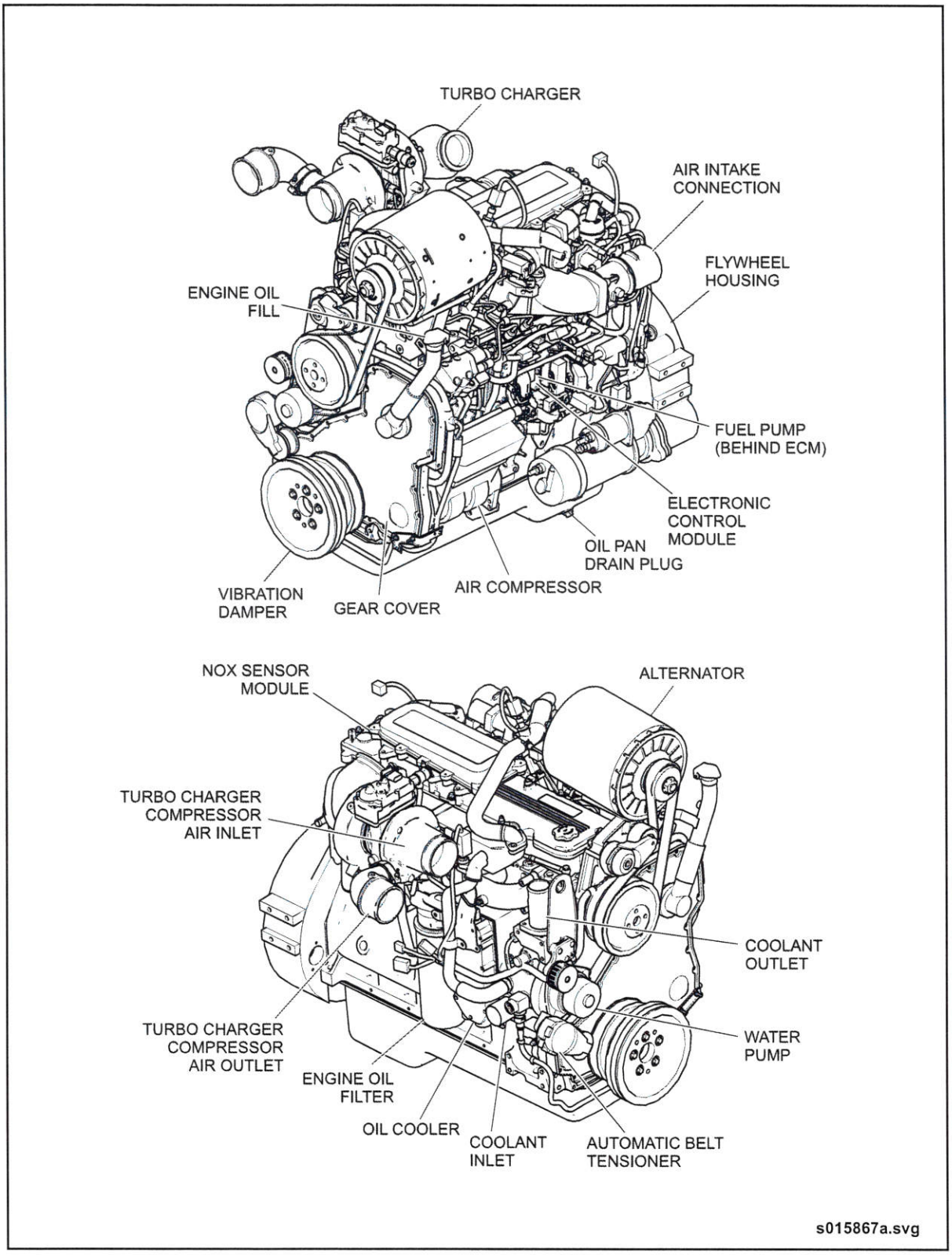


Fig. 4-1: Engine Views

2.1.3. Removal

1. Set the Battery Disconnect switch in the streetside battery compartment to the OFF position.
2. Unlatch the belt guard door and swing open. Remove cotter pins from upper and lower hinge pivots and lift off the belt guard. See "Fig. 4-2: Bumpers & Belt Guards" on page 5.
3. At the rear interior of the vehicle, raise the rear seats and set the prop rods to retain the seats in an elevated position. Remove the interior engine access door cover.

☞NOTE:

The engine can be removed from the vehicle without removing the engine struts. If struts are to be removed, Refer to 2.2. "Engine Struts" on page 9 *in this section for procedure.*

4. Remove the drain plug from the lower radiator tube and open the petcock drain valve at the bottom of the radiator. Drain the coolant using a suitable container to catch the fluid.
5. Support the bumper with a suitable lifting device, remove the 4 retaining bolts and remove the bumper.
6. Raise the vehicle. Refer to the General Information Section of this manual for procedure.
7. Drain the vehicle air tanks. Refer to the General Information Section of this manual for tank drain locations.
8. Loosen the HVAC compressor belt tightening and remove the belt from the compressor.
9. Disconnect all the wire harnesses from engine switch box.
10. Pull out the battery tray.
11. Underneath the vehicle in the transmission area, disconnect the driveshaft from the transmission. Allow the driveshaft to hang onto the rear axle bunk. See "Fig. 4-3: Disconnecting the Driveshaft" on page 6.
12. Disconnect the transmission main harness and speed sensor electrical connector.
13. Disconnect the transmission cooler hoses from the transmission. Plug ports to prevent contamination of fluid.
14. Disconnect engine air compressor and governor lines at the compressor and the inlet hose at the engine air filter elbow.
15. Disconnect charge air tube.
16. Disconnect starter motor electrical connectors.
17. Disconnect electrical harnesses from engine.
18. Disconnect electrical wires from alternator.
19. Disconnect clamps on left-hand side engine rail which support lower coolant tube.
20. Disconnect fuel line from engine.
21. Remove tube between surge tank and lower coolant tube.
22. From inside of vehicle, remove air intake clamp at turbo and separate air intake tub from turbo.
23. Loosen and remove the 2 V-band clamps retaining the exhaust elbow. Unbolt the bracket from the engine and remove the elbow.
24. Disconnect the coolant bleed line at the top of the engine.
25. Disconnect coolant lines from thermostat housing.
26. Disconnect and plug the pressure and return hoses at the hydraulic pump mounted at the rear of the engine air compressor.
27. Disconnect the output hose from the muffler tank.
28. Check to ensure that all hoses and connectors are disconnected and out of the way.
29. Remove the 3/4" bolt, snubbing washer, flat washer, and lock nut from the rear engine mounts. See "Fig. 4-4: Engine Mounts" on page 6.
30. Break loose the four 5/8" bolts that attach the front mount bracket to the main frame rails. Do not attempt to remove bolts at this time.

2.1.3. Removal

1. Set the Battery Disconnect switch in the streetside battery compartment to the OFF position.
2. Unlatch the belt guard door and swing open. Remove cotter pins from upper and lower hinge pivots and lift off the belt guard. See "Fig. 4-2: Bumpers & Belt Guards" on page 5.
3. At the rear interior of the vehicle, raise the rear seats and set the prop rods to retain the seats in an elevated position. Remove the interior engine access door cover.

☞NOTE:

The engine can be removed from the vehicle without removing the engine struts. If struts are to be removed, Refer to 2.2. "Engine Struts" on page 9 *in this section for procedure.*

4. Remove the drain plug from the lower radiator tube and open the petcock drain valve at the bottom of the radiator. Drain the coolant using a suitable container to catch the fluid.
5. Support the bumper with a suitable lifting device, remove the 4 retaining bolts and remove the bumper.
6. Raise the vehicle. Refer to the General Information Section of this manual for procedure.
7. Drain the vehicle air tanks. Refer to the General Information Section of this manual for tank drain locations.
8. Loosen the HVAC compressor belt tightening and remove the belt from the compressor.
9. Disconnect all the wire harnesses from engine switch box.
10. Pull out the battery tray.
11. Underneath the vehicle in the transmission area, disconnect the driveshaft from the transmission. Allow the driveshaft to hang onto the rear axle bunk. See "Fig. 4-3: Disconnecting the Driveshaft" on page 6.
12. Disconnect the transmission main harness and speed sensor electrical connector.
13. Disconnect the transmission cooler hoses from the transmission. Plug ports to prevent contamination of fluid.
14. Disconnect engine air compressor and governor lines at the compressor and the inlet hose at the engine air filter elbow.
15. Disconnect charge air tube.
16. Disconnect starter motor electrical connectors.
17. Disconnect electrical harnesses from engine.
18. Disconnect electrical wires from alternator.
19. Disconnect clamps on left-hand side engine rail which support lower coolant tube.
20. Disconnect fuel line from engine.
21. Remove tube between surge tank and lower coolant tube.
22. From inside of vehicle, remove air intake clamp at turbo and separate air intake tub from turbo.
23. Loosen and remove the 2 V-band clamps retaining the exhaust elbow. Unbolt the bracket from the engine and remove the elbow.
24. Disconnect the coolant bleed line at the top of the engine.
25. Disconnect coolant lines from thermostat housing.
26. Disconnect and plug the pressure and return hoses at the hydraulic pump mounted at the rear of the engine air compressor.
27. Disconnect the output hose from the muffler tank.
28. Check to ensure that all hoses and connectors are disconnected and out of the way.
29. Remove the 3/4" bolt, snubbing washer, flat washer, and lock nut from the rear engine mounts. See "Fig. 4-4: Engine Mounts" on page 6.
30. Break loose the four 5/8" bolts that attach the front mount bracket to the main frame rails. Do not attempt to remove bolts at this time.

31. Raise vehicle sufficiently to allow engine dolly to slide into position. See "Fig. 4-5: Engine Support Dolly" on page 7.

⚠ CAUTION

The following procedure requires the engine dolly to support the weight of the engine sufficiently to have the rear engine mounts and front mount support bracket in a state of neutral load.

32. Lower vehicle slowly until light contact is made equally with front mount support bracket and transmission. Adjust engine dolly as necessary to support the front mount support bracket and transmission equally.

33. Continue to lower the vehicle slightly until the front engine mount support bracket is unloaded.

☞NOTE:

The bolts on the front engine mount bracket should turn easily once the mount bracket is unloaded.

34. Remove the bolts, washers, and lock nuts from the front mount support bracket.

35. Lower the vehicle slightly and just enough to clear rear mount bracket during removal of engine dolly.

☞NOTE:

Ensure that the rear engine mounts are clear of the mount support brackets but DO NOT lower the vehicle more than necessary, otherwise clearance between the air intake tube and the engine door opening will be compromised.

36. Perform a final inspection to ensure all lines, hoses and electrical harnesses have been disconnected and safely tied out of the way.

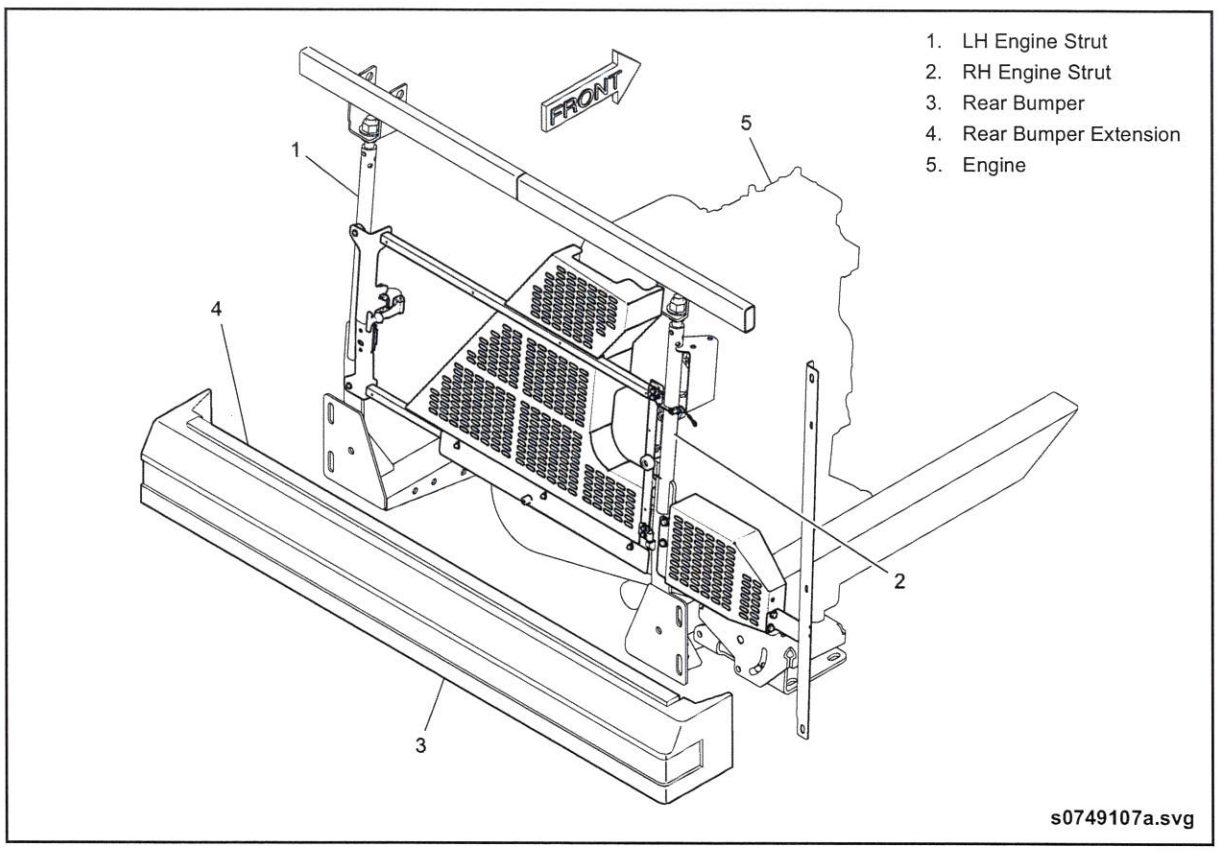


Fig. 4-2: Bumpers & Belt Guards

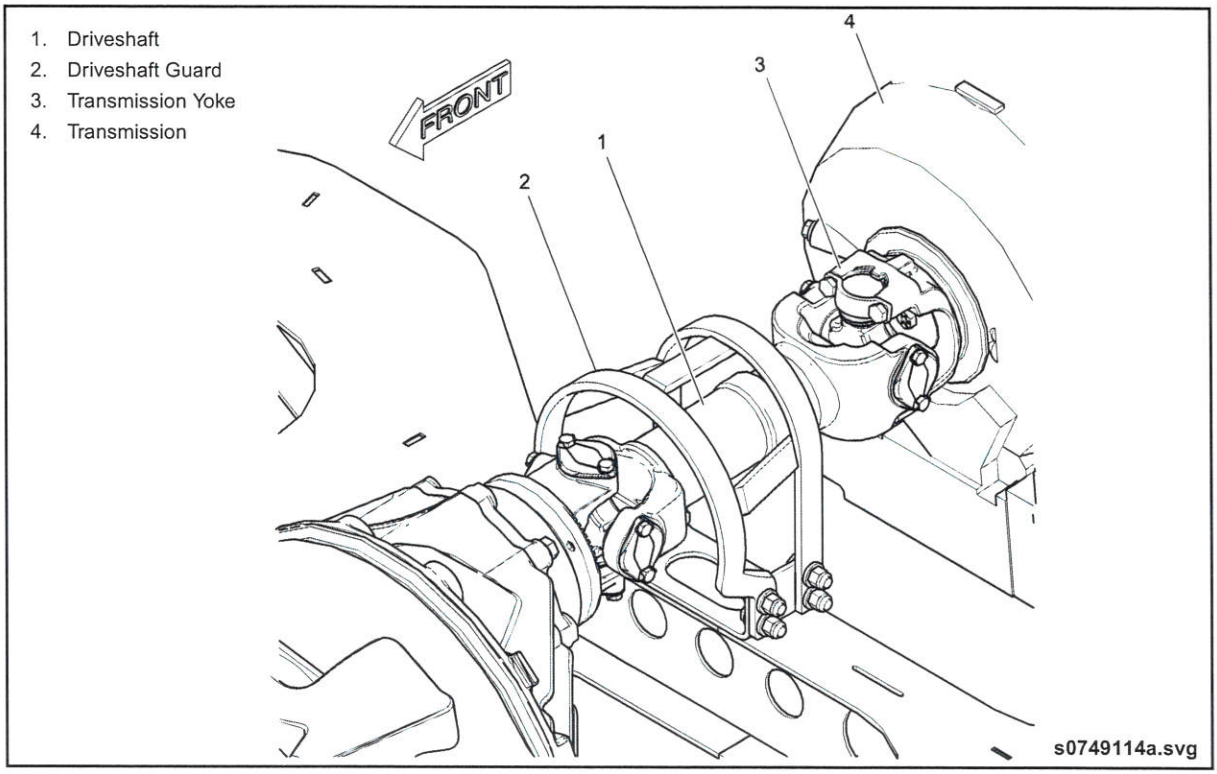


Fig. 4-3: Disconnecting the Driveshaft

37. Carefully pull the engine dolly out from the engine compartment.

⚠ CAUTION

Engine lifting brackets are required when hoisting the engine to ensure safe, secure, and properly distributed lifting points. DO NOT attempt to lift engine with brackets or lifting equipment not designed for this purpose.

38. Install lifting brackets on the engine if the engine is to be removed from the dolly. Remove the existing brackets from the engine that are used to support the CAC tubes and exhaust tubes. Install approved engine lifting brackets at these locations. Retain original brackets for reinstallation.

☞NOTE:

The original Cummins engine brackets were supplied loose with the vehicle at time of delivery.

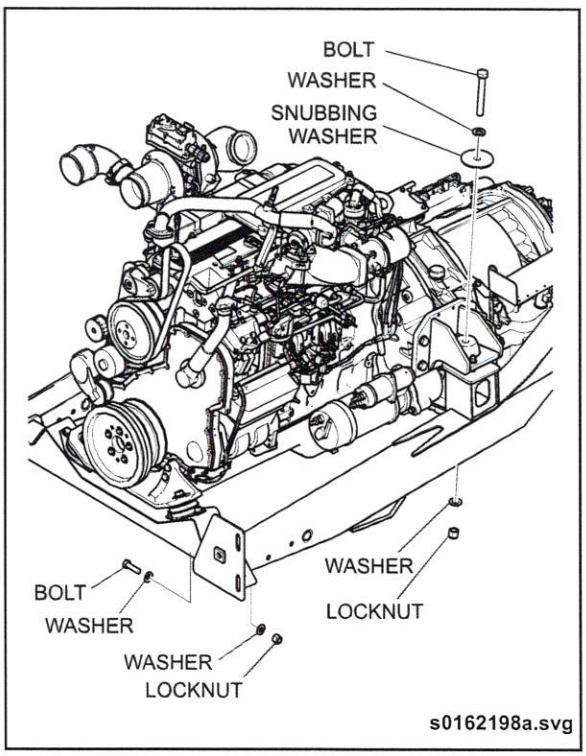


Fig. 4-4: Engine Mounts

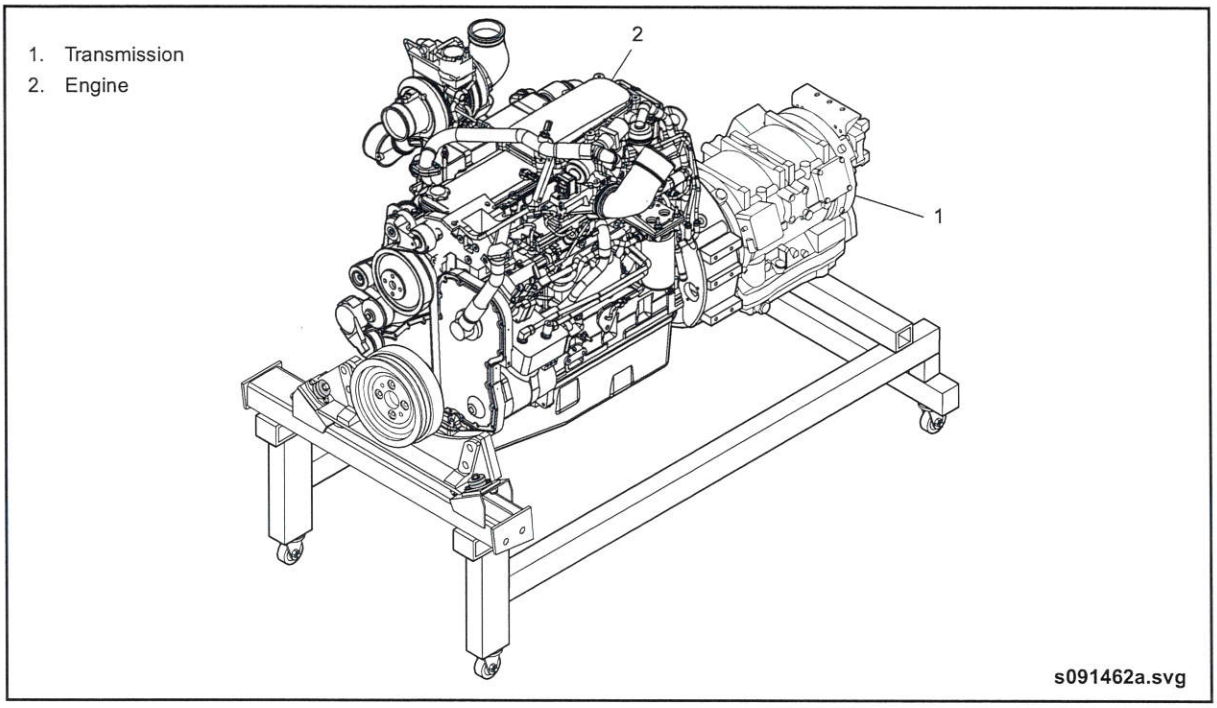


Fig. 4-5: Engine Support Dolly

2.1.4. Installation

NOTE:

If engine was fitted with lifting brackets during removal from engine dolly, then replace lifting brackets with original CAC and exhaust tube mounting brackets.

1. Slide the engine dolly into position and align the engine mounts with the chassis mounting brackets.
2. Raise the vehicle slightly to align the holes in the front mount support bracket with the corresponding holes in the vehicle frame.
3. Insert front mounting bolts.

NOTE:

Use an alignment punch, if necessary, to aid insertion of mounting bolts. DO NOT force or hammer bolts into place.

4. Use a separate wrench to hold lock nuts and torque front mounting bolts to 160 ft-lb. (215 Nm).
5. Insert rear mounting bolts with flat washer and snubbing washer.

NOTE:

Use an alignment punch, if necessary, to aid insertion of mounting bolts. DO NOT force or hammer bolts into place.

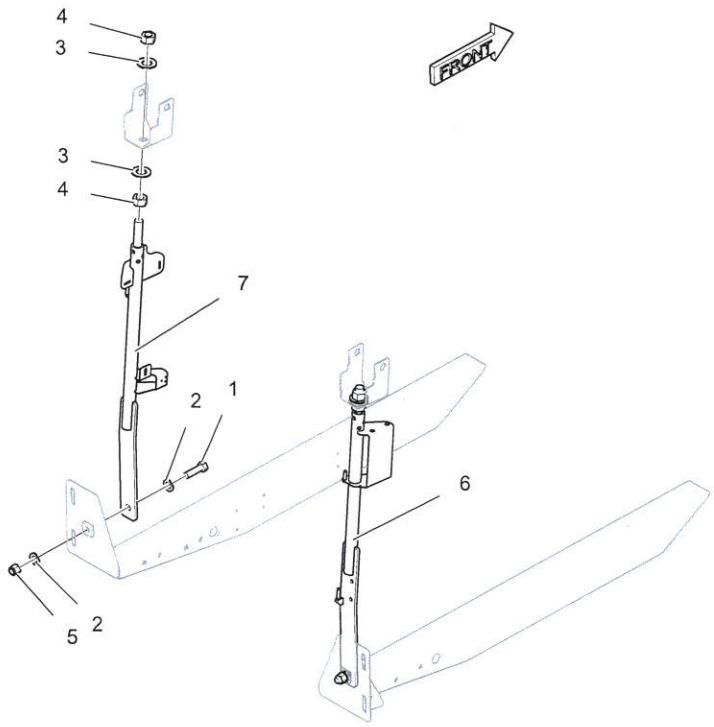
6. Install lock nuts and flat washer and tighten until snug only.
7. Raise vehicle slightly to ensure full weight of engine is taken by rear mounts.
8. Torque rear mounting bolts to 250 ft-lb. (339 Nm).
9. Raise vehicle slightly to allow removal of engine dolly.
10. Connect coolant hoses disconnected during removal.
11. Connect engine air compressor, governor pressure and air inlet hoses.
12. Connect the muffler tank outlet hose.
13. Connect wires to starter motor.
14. Connect engine ECU connectors.
15. Connect alternator electrical connections.
16. Connect hydraulic pump pressure and return hoses at the pump.

17. Install exhaust elbow to turbo and to exhaust outlet.
18. Connect fuel line to engine.
19. Install charge air intake lines.
20. Install HVAC compressor drive belt. Adjust belt tension using mounting base turnbuckle. Refer to Section 10 of this manual for further information on compressor installation.
21. Install lower radiator tube drain plug and shut radiator petcock drain valve.
22. From underneath vehicle, attach driveshaft to transmission. Install driveshaft guard.
23. Attach transmission cooler hoses to the transmission.
24. Attach transmission electrical main harness and speed sensor connector.
25. Lower the vehicle.
26. Install engine belt guard to engine struts and support tubes using 3/8" bolts, washers and lock nuts.
27. Connect all the wire harnesses to the engine switch box.
28. Check to ensure that all hoses and connectors are connected, properly routed and secured
29. Fill hydraulic reservoir.
30. Lift the bumper in place with a suitable lifting device. Install and tighten the 4 mounting bolts.
31. Top up coolant level in surge tank.
32. Check engine and transmission fluid levels.
33. Slide the battery tray back into position. Set the Battery Disconnect switch in the battery compartment to the ON position.
34. Run the engine at idle and check for leaks.

2.2. Engine Struts

2.2.1. Description

The engine struts connect the main frame rails to the vehicle structure and are used to tension the main frame rails and support the engine. See "Fig. 4-6: Engine Struts" on page 9.



1. Bolt, Hex 3/4" - 10 UNC x 2 1/2" Lg.
2. Washer, Flat Hardened 3/4"
3. Washer, Flat Hardened 1"
4. Nut, 1" - 14 UNS Grade 8
5. Nut, Lock Nylon 3/4" - 10 UNC
6. Engine Strut, Curbside
7. Engine Strut, Streetside

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Fig. 4-6: Engine Struts

2.2.2. Removal

1. Loosen the jam nut and remove the 1" upper nut on the engine strut.
2. Remove the 3/4" lock nut, bolt, and washers that attach the lower end of the engine strut to the main frame rail bracket.
3. Remove the engine strut.

2.2.3. Installation

1. Thread a 1" nut on the upper end of the strut until nearly bottomed.
2. Install threaded end of engine strut into upper mounting bracket and loosely install upper nut.
3. Align hole in lower end of strut with hole in main frame rail mounting bracket and secure engine strut to frame rail bracket with 3/4" bolt, washers, and lock nut.
4. Apply Never-Seez to bolt threads and torque lock nut to 250 ft-lb. (339 Nm).
5. Ensure lower 1" nut is backed off, then tighten upper 1" nut until contact is made with upper mounting bracket.
6. Measure the distance between the lower frame rail and upper vehicle structure. See "Fig. 4-7: Engine Strut Tensioning" on page 10.
7. Continue to tighten upper nut until the 44.84" dimension is achieved, and then tighten an additional two turns.
8. Apply Never-Seez to threaded area of engine strut and tighten lower 1" jam nut to 426 ft-lb. (576 Nm).

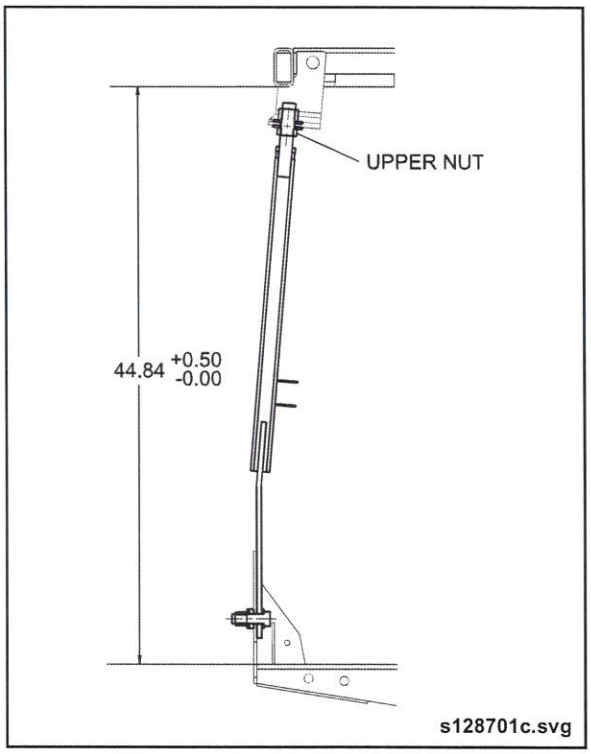


Fig. 4-7: Engine Strut Tensioning

NEW FLYER

NEW FLYER Xcelsior®

SALES INFORMATION BULLETIN

#231-005 | **Model:** Xcelsior | **Lengths:** 35', 40' & 60' | **Propulsions:** Diesel, Hybrid & CNG (Excluding 60' CNG)

EMP Electric Cooling System-XPL2

Value Proposition

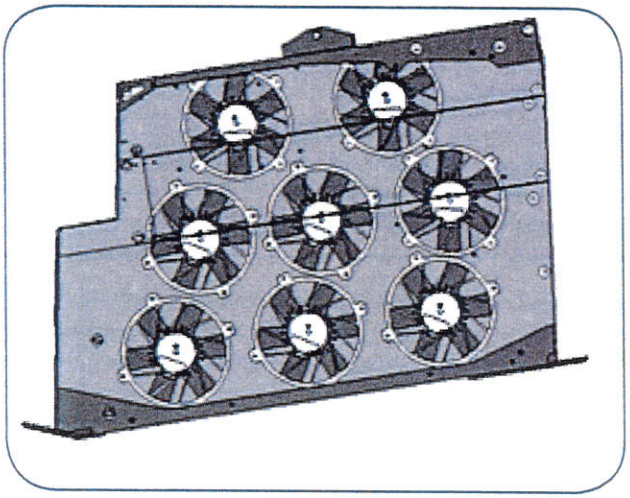
Lower Life-Cycle Costs as result of improved fuel economy, reduced maintenance and greater up-time.

Product Features

- 8 Fans and motors are maintenance free.
- One piece welded shroud assembly
- Heat exchangers are high performance, rugged aluminum bar/plate with fully machined cast and welded tanks.
- 8.5 fins per inch.
- EMP FiL. APTA specified fans with finger guard (passes IQA tests with this guard). Brushless motor with integrated controller. Robust aluminum shroud and controller body, maintenance free.
- EMP Thermal Management Controller (TMC J1939 CAN communication to vehicle, engine, transmission or hybrid drive (if equipped).
- TMC is capable of tracking 103 items for the life of the vehicle.
- EMP has service tool with full dashboard.

Benefits

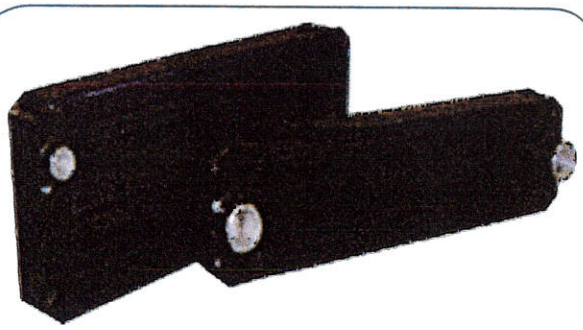
- **Better Cooling Performance:** EMP's all-electric cooling meets all performance specifications and demonstrates better cooling performance at slower engine speeds than conventional hydraulic systems.
- **Improved Fuel Economy:** Customers have reported 5%-7% reduction in fuel consumption over conventional hydraulic cooling systems.
- **Increased System Reliability:** Electric cooling systems do not have the same inherent risk of reliability concerns such as hydraulic leaks. In addition, EMP offers a lower fin count than other e-fan systems, which reduces heat exchanger clogging.
- **Ease of Maintenance:** EMP's electric cooling system incorporates brushless motor with an integrated controller that is maintenance free. In addition, the system incorporates a reverse fan feature for cleaning the radiator.



MH8 XPL2
8 fans (11")
Basic Diagnostic

Fil-11 Electric Fans

TMC Fan Controllers



Optimized Radiator and CAC

NOTE: Hybrid applications may require additional coolers depending on equipment configurations.

NEW FLYER

NEW FLYER Xcelsior®

SALES INFORMATION BULLETIN

Operations/Procedures

The electronic cooling system is an electric-only fan system that replaces the traditional hydraulic driven mechanical fan. The system is electronically controlled to cool both charged intake air and engine coolant separately.

The electric fans are divided into 3 groups:

1. Charge Air Cooler fans
2. Engine coolant fans
3. Shared fans

The fans operate at variable speeds and intervals as dictated by the Electronic Fan Controller. The system is independent of engine speed and control, is capable of providing full-load cooling at engine idle and reduces the likelihood of engine compartment fires by eliminating the hydraulic fan system.

Maintenance is easy with a manual reverse feature. The manual reverse system allows the fans to turn in the opposite direction. Instead of sucking air into the radiator, the reverse fan pushes the air from the engine compartment to the outside resulting in the removing of dirt and debris accumulated in the radiator fins.

Service/Repair

Cleaning

In the event that the engine overheats and the water level and thermostat operation have been found to be satisfactory, it may be necessary to clean and flush the entire cooling system. To do so, remove scale formation by using a reputable and safe de-scaling solvent. Immediately after using the de-scaling solvent, neutralize the system with a neutralizer.

Reverse flushing

After the radiator has been thoroughly cleaned, it should be reverse flushed. Reverse flushing is accomplished by hot water, under pressure, being forced through the cooling system in a direction opposite to the normal flow of coolant. This will loosen and force deposits out.

Miscellaneous cooling checks

In addition to the above cleaning procedures, the other components of the cooling system should be checked periodically to keep the engine operating at peak efficiency. The cooling system hoses, thermostats and surge tank pressure cap should be checked and replaced if found to be defective.

When water connection seals and hoses are installed, be sure the connecting parts are properly aligned and the seal or hose is in its proper position before tightening the clamps. All external leaks should be corrected as soon as detected.

The fan shroud must be properly positioned and tight against the radiator core to prevent recirculation of air which may lower the cooling efficiency.

Maintenance

Refer to the Preventive Maintenance Section of the New Flyer Maintenance manual for scheduled maintenance intervals and requirements (EMP Troubleshooting Manual).

Warranty

- Basic warranty is 2 year/100,000 miles
- Extended warranty packages available

NEW FLYER

XCELSIOR
BETTER BY DESIGN

SALES INFORMATION BULLETIN

#203/204-001 | **Model:** Xcelsior | **Lengths:** All | **Propulsions:** All

Disc Brakes

Product Features

The front and rear disc brake systems includes the brake caliper, brake carrier, disc pads, brake disc, and brake chamber.

Benefits

Disc brakes provide an efficient, reliable and cost-effective system for slowing and stopping a bus.

- Simple and fast maintenance; lining placement is significantly faster than on drum brakes
- Fade-free performance
- Lighter weight
- Quieter than drum brakes
- End of life wear indicator

FRONT DISC BRAKE SPECIFICATIONS & WEAR LIMITS

Manufacturer	Knorr/MAN
Model	SN 7000
Type	Air-activated sliding caliper
Pad Clearance	0.027" to 0.047" (0.7 to 1.2 mm)
Pad Thickness (min)	0.079" (2.0 mm)
Disc Thickness (min)	1.457" (37 mm)
Disc lateral run-out (max)	0.002" (0.05 mm)
Caliper Guides (max play)	0.079" (2.0 mm)

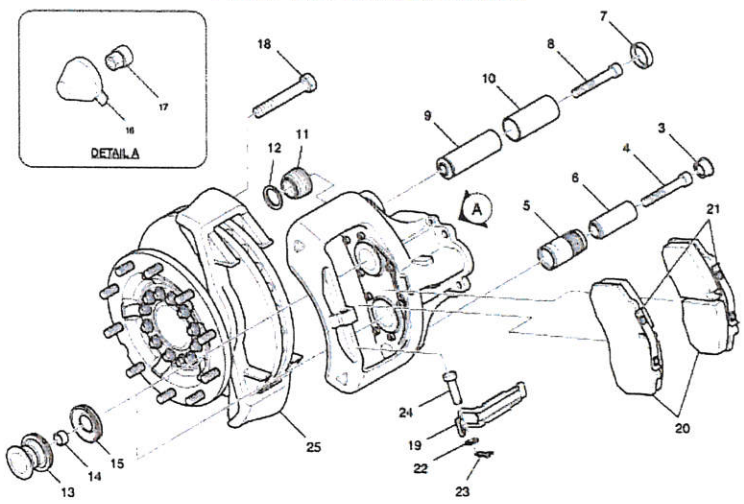
Operation

During brake application the push rod of the brake chamber extends and moves the actuator lever in the brake caliper. This input force is transferred by an eccentric roller bearing to the bridge section of the caliper. This force is then distributed by the bridge and two threaded tubes to the tappets. The tappets apply force directly to the inboard brake pad. Once the running clearance between the brake pads and brake disc has been overcome, the reaction forces are transmitted by the sliding caliper to the outboard brake pad. The clamping force of the brake pads on the brake disc generates the braking force.

When brake pressure is released, the return spring within the caliper forces the bridge section along with the threaded tubes and lever back to the starting position.

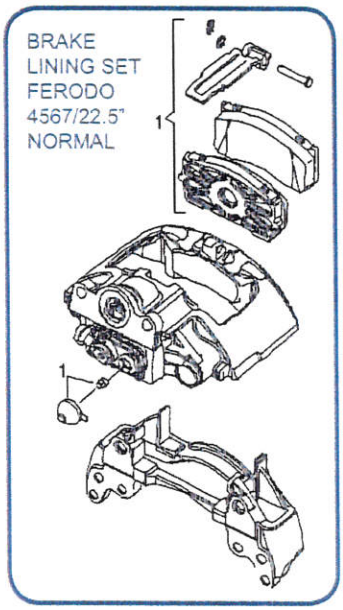
An automatic adjuster mechanism is used to ensure consistent running clearance between

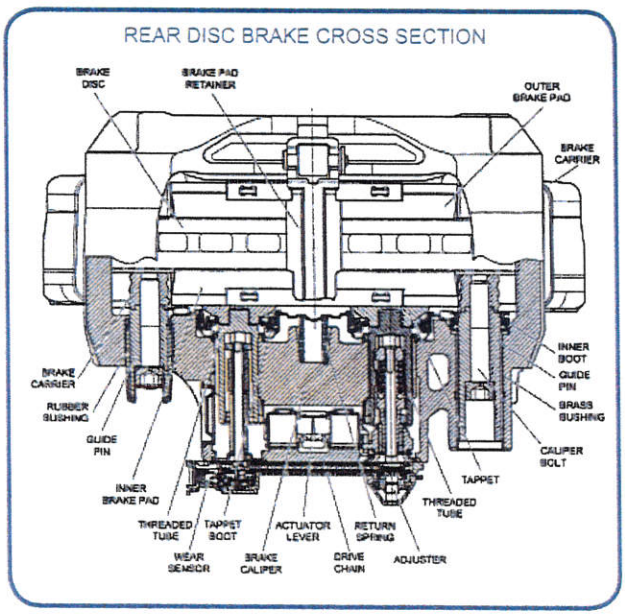
FRONT DISC BRAKE ASSEMBLY



1. Disc Brake Caliper Assembly, Streetside
2. Disc Brake Caliper Assembly, Curbside
3. Cap
4. Cap Screw, Hex Socket Head
5. Bushing, Rubber
6. Pin, Guide
7. Cover
8. Cap Screw, Hex Socket Head
9. Pin, Guide
10. Bushing, Brass
11. Boot, Inner
12. Ring
13. Tapper & Boot Assembly
14. Bushing, Toppet
15. Seal, Inner
16. Cap, Adjuster
17. Adapter, Shear
18. Bolt, Torx M18
19. Pad Retainer
20. Pad
21. Spring, Pad Retainer
22. Washer
23. Clip, Spring
24. Pin, Pad Retainer
25. Carrier

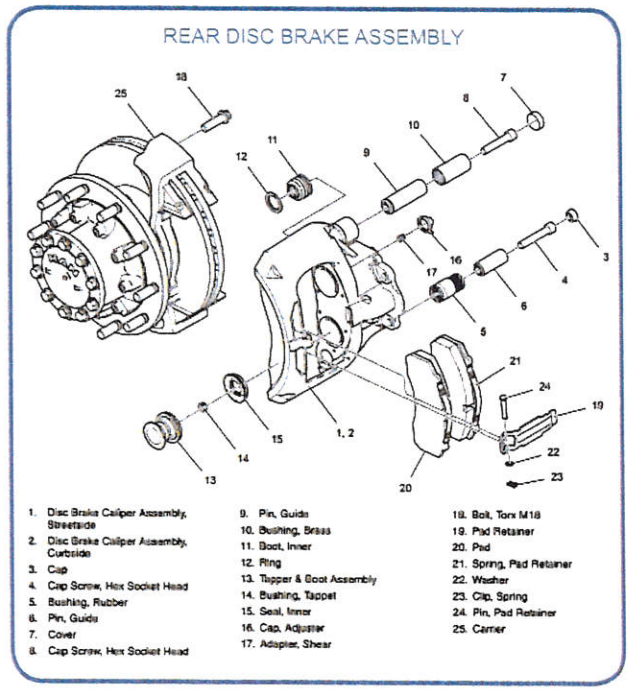
the brake pads and brake disc. The adjuster is mechanically connected to the lever and will operate each time the brakes are applied. The running clearance between the pads and brake disc increases as the brake pads wear. This increased clearance will allow the adjuster mechanism to rotate slightly. A drive chain transfers this movement to both threaded sleeves, which rotated inward equally. The rotational inward movement of the threaded sleeves and tappets effectively takes up the additional running clearance as the brake pads wear.





REAR DISC BRAKE SPECIFICATIONS & WEAR LIMITS

Brake System Manufacturer	Knorr/MAN
Chamber Manufacturer	MGM
Disc Manufacturer	MAN
Pads per caliper	2
Pad Length	7.09" (180 mm)
Thickness	0.827" (21 mm)
Total Pad Area per Axle	121.52 sq in (78400 sq mm)
Pad Clearance	0.027 to 0.047" (0.7 to 1.2 mm)
Pad Thickness (min)	0.079" (2.0 mm)
Disc Thickness (min)	1.457" (37 mm)



3.6. Emergency/Parking Brake System

(Refer to Emergency/Parking Brake System Schematic No. 5)

The rear axle is equipped with spring loaded brakes. For both parking and emergency brake operation, the brake chambers apply a predetermined spring force on the brakes.

3.6.1. Spring Loaded Brakes

The internal spring in the Rear Brake Chamber (10) will push the rod out if no air pressure is applied. Applying air pressure to the emergency port forces an internal piston to compress the spring and release the brakes.

Applying air to the service side with emergency brakes released applies the brakes in a normal manner.

The Spring Brake Modulating Valve (9) provides anti-compounding protection to the rear axle brakes. This anti-compounding protection prevents both the spring (emergency) brakes and service (normal) brakes from being applied at the same time.

3.6.2. Parking Brakes

The parking brakes are applied by pulling UP on the Parking Brake Control Valve Plunger (4) located on the driver's side console. This closes the supply (S) port on the Parking Brake Control Valve (4) and connects the delivery (D) port to exhaust (E). Air is exhausted from the park control line that signals the Spring Brake Modulating Valve (9).

Loss of air pressure at the Spring Brake Modulating Valve (9) park brake control port opens the delivery ports to exhaust. This action exhausts air from the emergency side of the Brake Chambers (10) allowing the brake chamber springs to extend and apply the parking brakes. The Parking Brake Control Valve (4) is in the APPLY position if there is no air in the system. Above 40 psi the Parking Brake Control Valve (4) can be pushed DOWN to the RELEASE position.

In the RELEASE position, (valve plunger DOWN) air flows out through the delivery (D) port and is applied to the park control (PC) port of the Spring Brake Modulating Valve (9). This activates the Pressure Switch (11), extinguishing the parking brake indicator on the dash.

The Front Brake Air Tank (1) supplies air through a Check Valve (12) to the supply (S) port of the Spring Brake Modulating Valve (9). The park control signal to the Spring Brake Modulating Valve (9) allows air from the supply (S) port to flow through the delivery (D) ports to the emergency side of the Spring Brake Chambers (10). This compresses the internal spring and releases the parking brakes.

3.6.3. Emergency Brake Application & Modulation

A sudden loss of air pressure from the Parking Brake Control Valve (4) will result in immediate application of the Emergency Brakes (10) without modulated control.

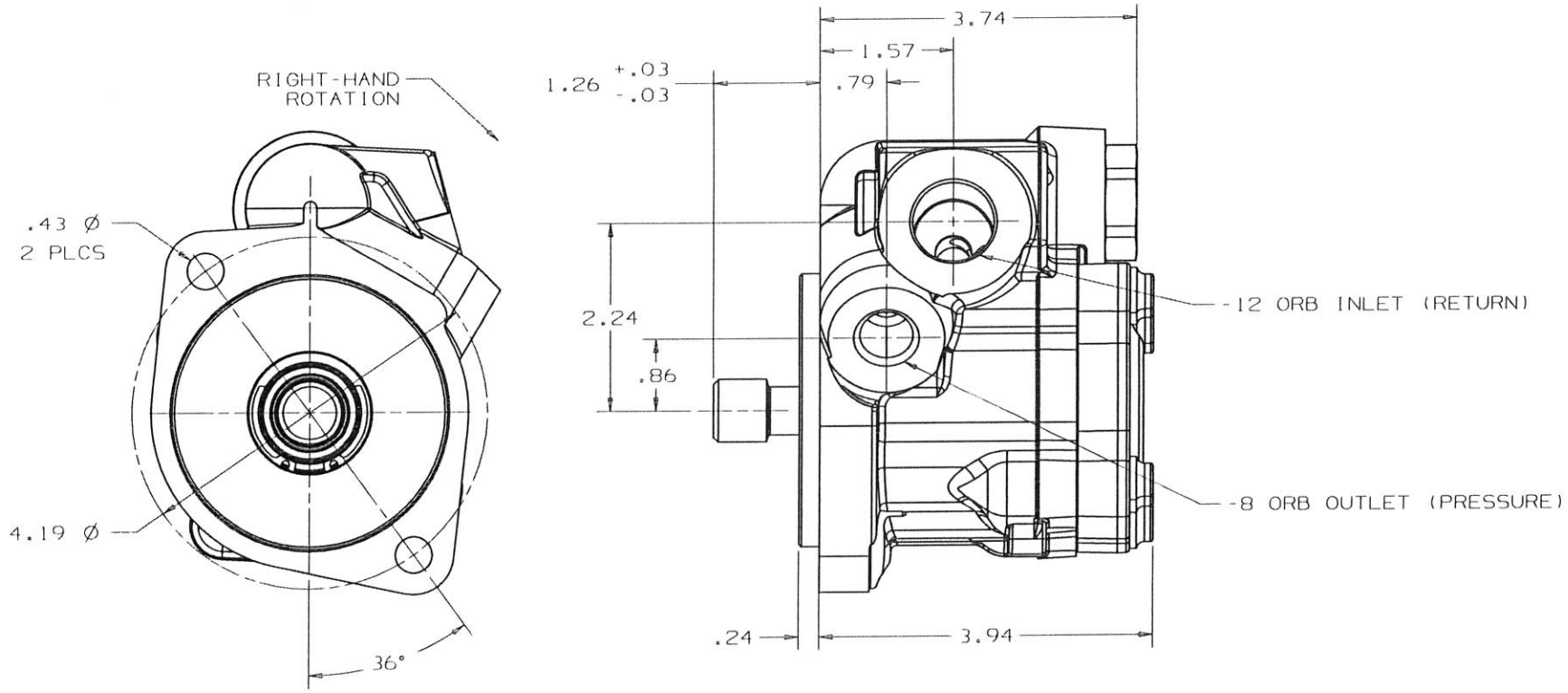
A loss of air pressure from the Rear Brake Tank (2) will disable the rear service brakes. To maintain rear brake function in this situation, the Spring Brake Modulating Valve (9) will release a modulated amount of air from the Emergency Spring Brake Chambers (10) when the brake valve treadle is applied.

☞NOTE:

The amount of air released from the Emergency Spring Brake Chambers (10) will be proportional to brake treadle application.

Lack of air pressure at the balance (B) port of the Spring Brake Modulating Valve (9) will allow the pressure sensed at the control (C) port to control the rate at which air is exhausted through the exhaust port. This action will result in controlled application of the rear spring brakes in relation to brake treadle movement.

NOTE: FOR INSTALLATION DRAWINGS PLEASE RE) ATTACHED MRP BOM SHEET FOR PARTS LISTING



MANUFACTURER:	IXETIC USA INC.
VENDOR:	HYDRAULIC SPECIALTY
MODEL:	LF183-25-16-150-R-P-U-B-38-01
MOUNT:	SAE A
DRIVE:	11 TOOTH
DISPLACEMENT:	25 CC/REV (1.53 C.I.R.)
FLOW CONTROL:	16 L/MIN (4.23 US GPM)
PRESSURE RELIEF:	150 BAR (2175 PSI)
INLET PORT:	1 1/16 - 12 (-12 ORB)
OUTLET PORT:	3/4 -16 (-8 ORB)
ROTATION:	RIGHT HAND (CW VIEWED FROM INPUT SHAFT)

NOTE: ALL DIMENSIONS ARE FOR REFERENCE ONLY

DO NOT SCALE DRAWING		
DIMENSIONS IN [ ] ARE IN m.m.		
THD ANGLE		
BY	NAME	DD-MMM-YY
DRAWN	E.Y.	12-JUN-12
CHK'D		
APP'D		

REV	DESCRIPTION	ECO
A	RELEASED TO PRODUCTION.	ECN-008051

MATERIAL N/A -	UNSPEC'D TOLS.	DEC. IN.
	.X	±.12
	.XX	±.06
	.XXX	±.03
WEIGHT -	HOLE DIA.	±.015
	BEND RADII.	±.03
	ANGLE TOL.	±1°
TREATMENT NOT REQUIRED -	SIMILAR TO -	

TITLE: PUMP-P/S IXETIC LF183

NEW FLYER

PART Nº 482842 (NX)

SCALE 1:1 | C | SHEET 1 OF 1

REPORT ALL ERRORS TO ENG. DEPT.

2.3.9. Parking Brake Control Valve

WARNING

If the air pressure is below 40 psi (276 kPa), the parking brake valve will return to the applied position.

The parking brake control valve controls the application or the release of the parking brake. Pulling up on the control knob applies the parking brake. Pushing down on the knob releases the parking brake.

2.3.10. DVR Status/Event Marker

This device is used to mark incidents on the video surveillance system for storage and subsequent playback. The green status light indicates that the system is operating normally. The red status light indicates a fault with the system.

2.3.11. LH Remote Mirror Controller

The LH remote mirror controller controls the streetside mirror assembly. Position the controller dial to the mirror requiring adjustment (upper or lower). Then use the four directional tilt function of the dial to move the mirror into the desired position.

2.3.12. RH Remote Mirror Controller

The RH remote mirror controller controls the curbside mirror assembly. Position the controller dial to the mirror requiring adjustment (upper or lower). Then use the four directional tilt function of the dial to move the mirror into the desired position.

2.3.13. Silent Alarm Button

The Silent Alarm Button is part of the Radio Provisions. Consult your Transit Authority for information on the operation of this system.

2.3.14. Hill Holder Switch

The Hill Holder switch is a momentary toggle switch that operates the vehicle's brakes. Positioning and holding the switch to ON applies the brakes. Release the switch when the drive unit system torque can move the vehicle in the desired direction. Use the switch to prevent unexpected motion when starting on a hill.

NOTE:

The Hill Hold switch applies the brakes through the Interlock System. The brake treadle drops slightly when the Interlock System applies.

2.3.15. Four-Way Hazard Lights Switch

The Hazard Lights toggle switch has an ON and OFF position. When the switch is ON, the instrument panel turn indicators and the exterior signal lights flash.

When the switch is OFF, the exterior signal lights function only as turn signals. The exterior signal lights and instrument panel turn indicators flash when the left or right turn signal foot-switch is pushed and held.

Activate the four-way hazard lights when the transit vehicle is stopped or parked in an area and may block traffic or present a possible hazard to following or approaching vehicles. Also use the four-way hazard lights when the vehicle is being towed.

NEW FLYER

NOISE/VIBRATION LEVEL REDUCTION

New Flyer Xcelsior buses are designed with consideration of noise and vibration reduction. Here are the major area design consideration for reduce noise levels.

Engine & transmission (including conventional transmission and Hybrid Drive Unit):

- Engine is installed on rubber isolator engine mounts which are analyzed by the manufacturer
- The engine compartment airborne noise minimized into the cabin by use of the perforated aluminum sheet that allows airborne noise to enter into acoustic sandwich foam with a dense rubber barrier to dampen and minimize noise transfer into the cabin area.
- The rear bulkhead and rear upper deck are incorporated with dB plywood flooring which has shown overall noise reduction in the
- To date New Flyer has reduced noise transmission from the engine compartment with improved sound insulation and sound barrier material on strategic metal surfaces. Additional sealing of the engine compartment has been incorporated to eliminate any opening that would allow noise to enter the passenger compartment

Differential

- Noise and vibration is minimized by use of a single reduction hypoid axle (no outboard planetary gear sets)

Compressor

- Ping tank dampens reciprocating compressor pulses to minimize the noise. A larger copper line between the ping tank and air dryer is stiffer and reduces lower frequency vibration, also the rubber covered p-clips aid in reducing vibration
- Addition of twin compressor means the compressor pumps half the time and at higher frequency pulses (two times per revolution versus one) – which reduces the noise level at higher, less obtrusive frequency

HVAC System

- The HVAC unit has been designed, components have been relocated and baffles have been added to redirect the airflow for quieter noise levels. Also sound absorbing materials have been added to the ductwork to reduce the overall noise levels of the unit
- The roof mounted HVAC resulted in much improved rear noise levels

Windshield Wiper

- New Flyer offers high a quality electric motor wiper system on Xcelsior as standard which is quieter that the air operated wipers

Power Steering

- Pulsations in the power steering pumps are one of the biggest contributors to the power steering noise. New Flyer provides a smooth-flowing vane pump to minimize noise coupled with smooth-bend stainless steel tubing plumbing and minimized fittings. New Flyer carried over these concepts coupled with the improved mounting from the LFR model.

Tire noise through wheel wells

- Tire noise is dependent on tire selected and vehicle speed, New Flyer continued the LFR wheel well concepts. Depending on the location (front or rear), the stiffness of the panels minimizes the transmission of road noise through the panels. A mix of curved and bent stainless steel panels is employed and is welded into the structure for added support and securement. Additionally, the panels are fully sealed from the interior of the bus. Undercoating is applied not only as a corrosion protection, but also has a dampening affect. The use of rubber or Vinyl

flooring on the interior finishes off the design which serves as further noise dampening effect in addition to its main function as finished floor

Air Discharge

- The air dryer discharge noise is related to the air dryer. On the proposed Haldex air dryer, a diffuser installed on the purge exhaust minimizes the air flow rush and serves to dampen the noise of rapid decompression of the air dryer.

Cooling System Fan

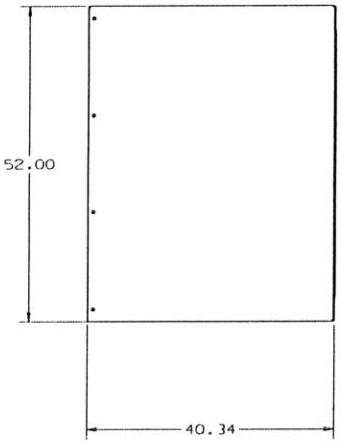
- The proposed EMP electric cooling fan system includes the Curbside Noise Abatement Feature

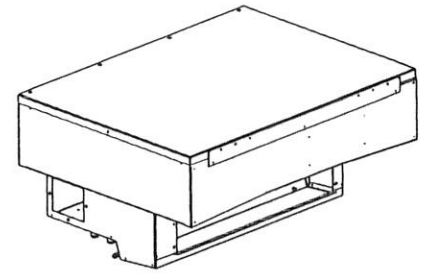
Rotating components (Driveshaft)

- Since the noise from rotating components is exacerbated by offset alignment, New Flyer has designed the engine/transmission to axle input to be in-line. Additionally, U-joint drive shafts must be assembled in phase for proper operation and thus have specified phase marks on the driveshaft for proper assembly.

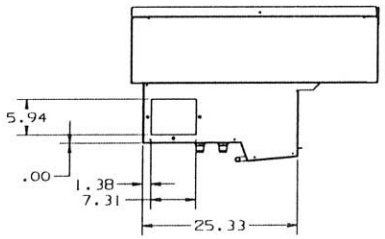
NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED WAP BOM SHEET FOR PARTS LISTING

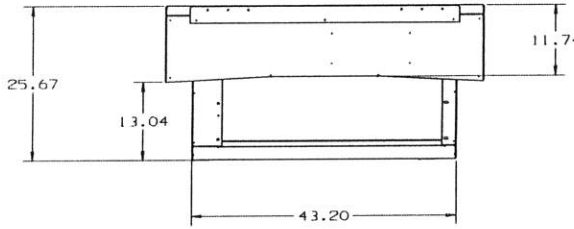
DRAWING Nº 496838

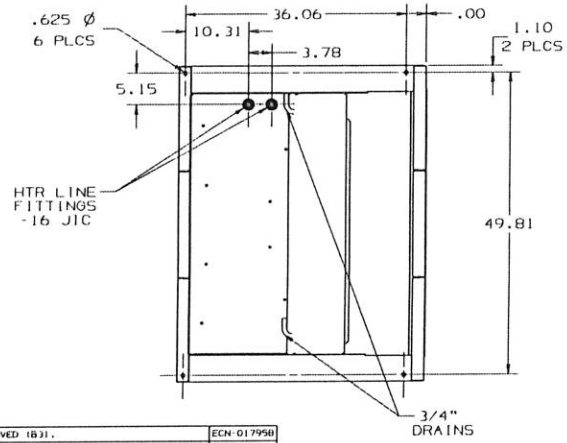




ISOMETRIC VIEW
FOR REFERENCE ONLY







DESCRIPTION: HTR INTELLIGAIRE 3 RLFH1-M2
VENDOR: THERMO KING CORP.
VENDOR PN: 013184

SPECIFICATIONS:
- RECIRCULATED
- INTELLIGAIRE 3
- HEATING CAPACITY: 105,000 BTU/HR
  AT 8GPM COOLANT FLOW
  160°F COOLANT TEMP
  60°F RETURN AIR TEMP
- 24 VDC TK BRUSHLESS MOTORS AND ELECTRONIC CONTROLS
- ADJUSTABLE ELECTRONIC SET POINT CONTROL
- CONTROLS TO INTERFACE W/NFIL MULTIPLEX SYSTEM
- UNIT WILL COME WITH DISPLAY UNIT AND RETURN AIR TEMP SENSOR ATTACHED. RELOCATE DISPLAY UNIT AND TEMP SENSOR PER 549-XXXXU INSTL

DO NOT SCALE DRAWING		
DIMENSIONS IN [ ] ARE IN m.m.		
THD ANGLE		
BY	NAME	DD-MMM-YY
DRAWN	A.B.L.	02-APR-13
CHK'D		
APP'D		

REV	DESCRIPTION	ECO
B	(1) FREEZE PROTECTION NOTE REMOVED (B3).	ECN-017950

MATERIAL N/A	UNSPEC'D TOLS. .X ±.12 .XX ±.06 .XXX ±.03 HOLE DIA. ±.015 BEND RADII ±.03 ANGLE TOL. ±1°	DEC. IN.	TITLE A/C-TK RLFH1-M2
WEIGHT APPROX. 300 LBS			PART Nº 496838
TREATMENT CORROSION PROT BY SUPPLIER	SIMILAR TO 423113		SCALE 1:10 D SHEET 1 OF 1

NEW FLYER

REPORT ALL ERRORS TO ENG. DEPT.

Heating & Ventilation System

1. SAFETY

1.1. High Voltage Safety

⚠DANGER

The BAE System uses potentially hazardous electrical energy. There is a risk of electric shock. Only trained service personnel should access components of the hybrid drive system. Failure to observe all high voltage electrical safety precautions may result in personal injury and/or death.

While servicing the vehicle, remove jewelry, wear safety glasses and safety shoes. Wear linesman's high voltage gloves (rated at 1000 VDC minimum) when working in or around the traction motor, generator or battery enclosures/ energy storage systems.

Refer to Section 5 of this manual for further information on the vehicle's high voltage system.

1.2. Safety Precautions

- ❒ DO NOT wear loose clothing when working around moving parts of an operating system.
- ❒ ALWAYS keep hands and clothing clear of the engine and belts while the engine is running.
- ❒ ALWAYS use caution when working near exposed evaporator or condenser coil fins. These fins can inflict painful cuts.
- ❒ ALWAYS set Master Run switch to STOP-ENGINE position if system needs to be de-energized for service procedure.
- ❒ ALWAYS use caution when working on electrical/electronic circuits containing capacitors. Some capacitors can shock or burn a person if accidentally discharged. Make sure capacitors are discharged before working on the circuit.

2. HEATING & VENTILATION SYSTEM

⚠CAUTION

Engine damage may occur if pressure-fill and deaeration procedures are not followed. Servicing heating system components may result in air being introduced into the system. It is necessary to completely bleed any air entrapped in the vehicle heating system and the engine cooling system before starting the engine. Refer to Section 6 of this manual for procedure.

2.1. Description

☞NOTE:

Refer to the Heating & Ventilation System Layout when reviewing this information.

The Heating & Ventilation System components include:

- ❒ Roof-mounted heating unit.
- ❒ Driver's heater/defroster unit located centrally behind the front dash panel.
- ❒ Booster pump located in the engine compartment.

2.2. Operation

2.2.1. Air Circulation

Air is circulated throughout the vehicle by the following methods:

- ❒ The driver's heater/defroster circulates air in the driver's area and to the base of the front windshields.
- ❒ Dash fans circulate air over the windshields.
- ❒ Interior vehicle air is drawn into the return air grille in the ceiling and is circulated through the filter and the heater coil. The heated air is discharged through air distribution ducts on both sides of the vehicle interior.

2.2.2. Coolant Circulation

The coolant booster pump draws coolant from the engine and delivers it to the heating unit heater coil, and driver's heater/defroster unit heater coil. Manual shutoff valves are installed in the coolant supply and return lines located in the engine compartment and beneath the driver's platform. A solenoid controlled coolant shutoff valve is located inside the heating unit and a cable-operated coolant shutoff valve is located in the defroster compartment. Cooling system drain cocks are provided at the bottom of the radiator and in the driver's heater/defroster return line.

2.3. Heating Unit

2.3.1. Description

The RLF heating unit is a one-piece assembly which is installed in an enclosure on the roof of the vehicle. See "Fig. 10-2: Heating Unit Installation" on page 5. System electrical controls (relays, circuit breakers, terminal board and return air thermostat) are located on a control panel mounted in the heater return air area. They are accessed for service by opening the access door at the front interior of the vehicle. See "Fig. 10-1: Interior HVAC Components" on page 4. Wiring harnesses are connected to the unit by connectors located on the curbside of the unit frame. The 24VDC power required for operation is supplied by the alternator through power cables attached to the positive and negative studs located on the curbside of the unit frame.

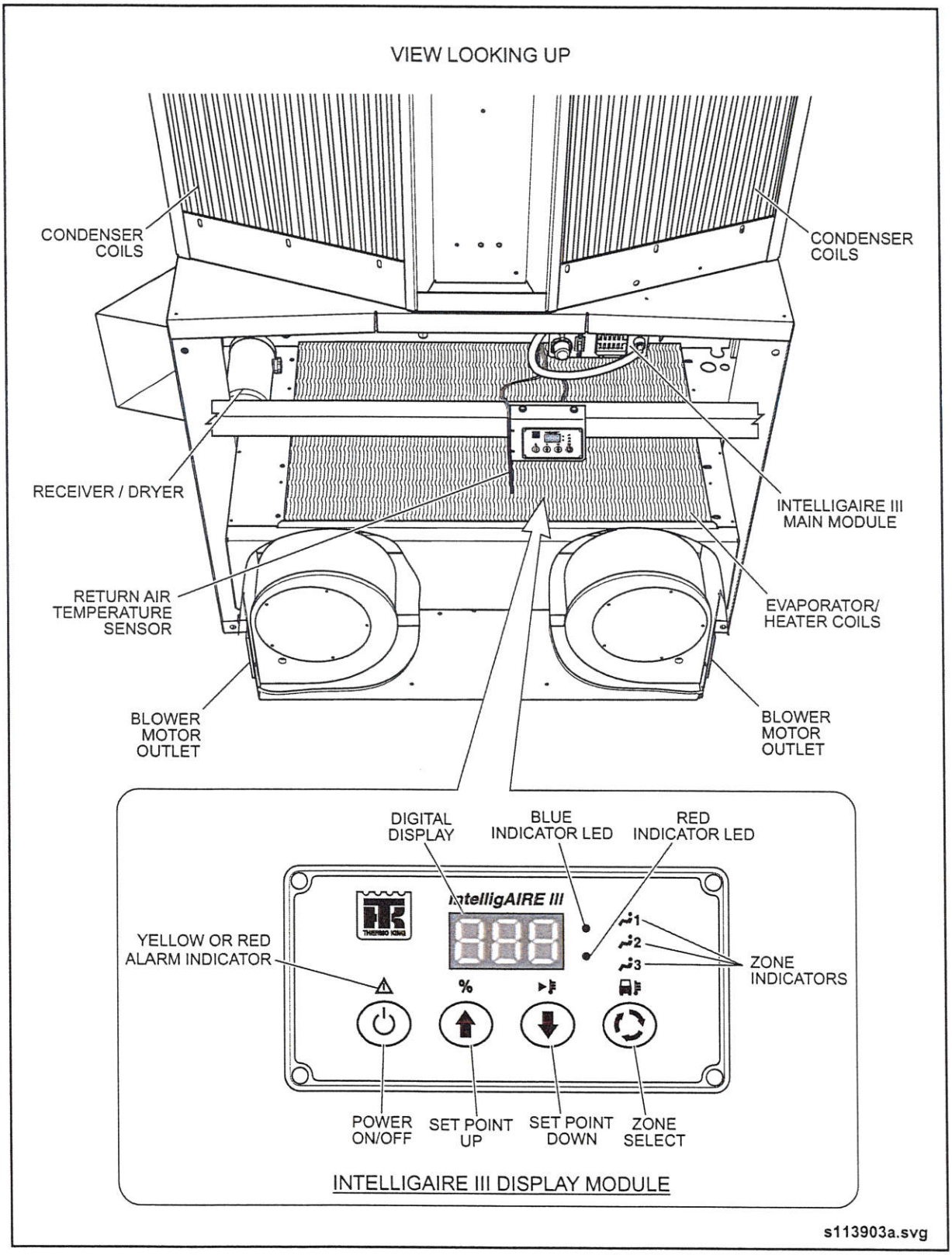
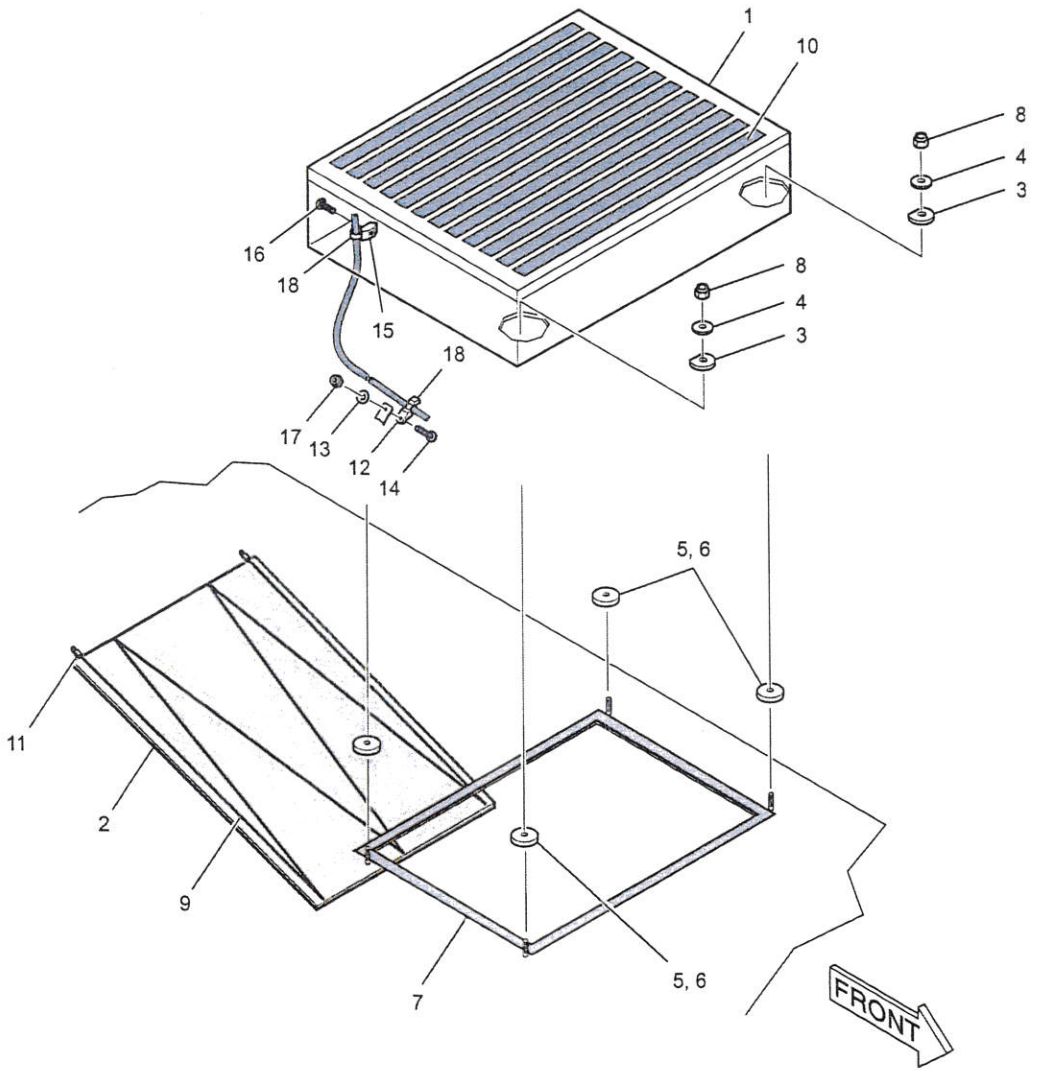


Fig. 10-1: Interior HVAC Components



1. Heating Unit, Roof Mounted
2. Filter, Polyester
3. Washer, 3/8" x .19" Thk
4. Washer, Flat 3/8"
5. Spacer, 1.750" x .38" Thk
6. Adhesive, SIKA 221 White
7. Gasket, Roof HVAC Front
8. Nut, Lock Nylon 3/8" - 16 UNC
9. Shockcord
10. Safety Walk, 2" Wide
11. Hook
12. Mount, Cable Tie 3/16" Eye
13. Washer, Flat SST #10
14. Screw, PH Cross Recess SST #10 - 24 UNC x 1" Lg.
15. Mount, Cable Tie 2-Way 1/14" Eye
16. Screw, PH Cross Recess Tpg. Type F 1/4" - 20 UNC x 1 1/4" Lg.
17. Nut, Lock Nylon #10 SST
18. Cable Tie, 4/5" W x 8 1/2" Lg.

s0358128a.svg

Fig. 10-2: Heating Unit Installation

2.4. IntelligAIRE III Control System

2.4.1. Description

The Thermo King Intelligaire III is a Controller Area Network (CAN) based climate control system. The system can be configured to operate in either automatic or driver controlled manual mode.

☞NOTE:

This vehicle is configured with a "heat-only" unit and is manually controlled with toggle switches located on the driver's side console. Refer to Section 19 of this manual for a description of switch function.

The major components of the control system include:

- ❒ Main control module -located on the heating unit control panel
- ❒ Driver's display module - bracket mounted behind the heating unit interior access door.
- ❒ Control panel with diagnostic connector and fuse panel - located on the heating unit.

2.4.2. J1939 CAN PC Interface

A diagnostic connector on the control panel provides a CAN interface to a PC for use by service technicians. This diagnostic interface allows technicians to:

- ❒ Select and download custom unit configurations
- ❒ Install automatic updates via internet
- ❒ Access and track a history of alarm codes with time/date stamps
- ❒ Display and monitor system inputs and outputs
- ❒ Test the system by means of manual or automatic cycling of system components
- ❒ Calibrate sensor inputs
- ❒ Monitor CAN messages

2.4.3. Display Module

The display module is bracket-mounted behind the heating unit interior access door See "Fig. 10-3: Display Module" on page 6.

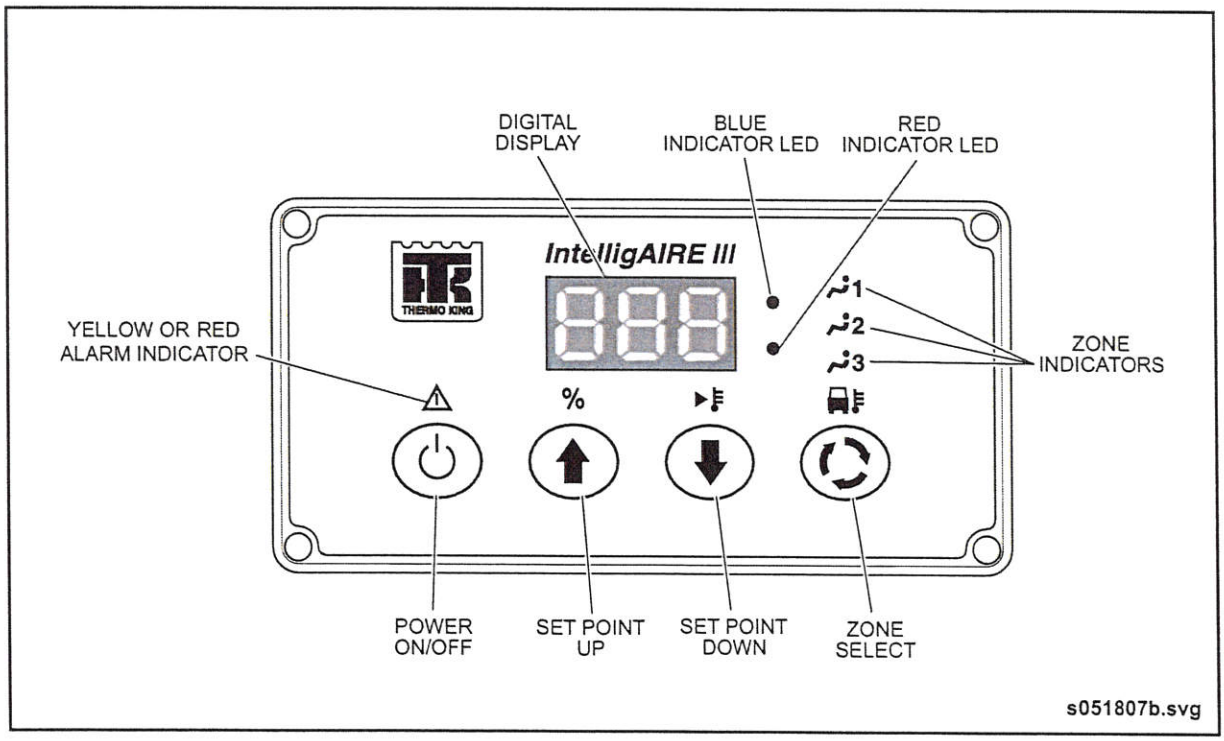


Fig. 10-3: Display Module

2.4.4. Display Screen

The 3-digit display screen displays information based on the operating mode.

2.4.4.1. Power Button

When the power button is ON, the LED indicators and the 3-digit display will be illuminated. When the power button is OFF, the LED indicators and the 3-digit display will be extinguished, but the backlighting for the buttons will remain on.

2.4.4.2. Set Point Up & Down Buttons

The temperature set point is adjusted by first selecting the zone to be configured, and then pressing the up or down button once. The set point icon will light and the 3-digit display will show the current temperature set point. Pressing the up or down button again will increment or decrement the set point by 1 degree. If no button is pressed within a 3 second timeout period, the display will return to the inside temperature for the zone selected.

2.4.4.3. Zone Select Button

The temperature set point for the three inside zones and the outside ambient temperature can be displayed. The information displayed on the 3-digit display will coincide with the zone that is selected. Pressing the zone select button will cycle through each enabled zone as well as the outside ambient temperature.

2.4.4.4. Alarm Indicators

The yellow alarm indicator will light to indicate a "check" alarm is currently active. These alarms include sensor readings out of range, open or shorted loads, etc. and may be viewed using the alarm code readout mode on the display module or by using the CAN Diag PC tool. These alarms will clear automatically when the condition is corrected.

2.4.4.5. Heating Indicator

The red LED indicator on the right hand side of the 3 digit display will illuminate whenever the heat valve is operating.

2.4.5. Diagnostics

2.4.5.1. Temperature Readout Mode

To enter the temperature readout mode, press and hold the up button for 3 seconds. The 3 digit display will show "rtS" for 1 second then will display the actual return air temperature sensor reading for 2 seconds and the cycle will repeat continuously. The reading on the display will automatically be converted to degrees C or F depending on parameter setting.

Additional temperatures may be viewed by pressing the down button (next sensor) or the up button (previous sensor). Each time a new sensor is selected, the digital readout will display the 3-character sensor name followed by the actual sensor reading as described above. The sensors are displayed in the order shown in the following table:

TEMPERATURE READOUT MODE	
DIGITAL DISPLAY	**TEMPERATURE READOUT**
rtS	Return Air Temperature
dtS	Discharge Air Temperature
AtS	Ambient Air Temperature
utS	Water Temperature
To view the sensors from another zone, press the zone select button until the desired zone icon is lit. Press the power button to return to normal operation.	

2.4.5.2. Alarm Code Readout Mode

To enter the alarm code readout mode, press and hold the zone select button for 3 seconds. The 3 digit display will show the first active alarm code. Press the up button to advance to the next alarm. Press the down button to back up to the previous alarm. If there are no alarms currently active, the display will show "- - -". Note that only currently active alarm codes are shown on the display module and will automatically clear when the fault condition is corrected. An alarm code history is stored in the main module and can only be read using the CAN Diag PC tool. Press the power button to return to normal operation.

2.4.5.3. Setup Mode

☞NOTE:

Setup Mode is disabled if the lockout bit is set in the configuration file.

To enter the setup mode, press and hold the up and down buttons for 3 seconds. The 3 digit display will show "dEg" which is the first parameter in the menu. Use the zone select button to scroll through the menu selections. The parameters appear in the order shown in the following table:

SET-UP MODE		
DIGTAL DISPLAY	**SETTINGS**	**DESCRIPTION**
dEg	- F - or - C -	Unit of Temperature (Fahrenheit or Celsius)
SPH	62-82F or 17-28C	High Set Point Limit
SPL	62-82F or 17-28C	Low Set Point Limit
Once the desired parameter has been selected, press the up or down button once to display the current setting. Then press the up or down button as required to change the setting. When all the parameters have been set, press the power button to return to normal operation.		

2.4.5.4. Service Test Mode

☞NOTE:

Service Test Mode is disabled if the lockout bit is set in the configuration file.

To enter the service test mode, press and hold the down and zone select buttons for 3 seconds. The 3 digit display will show "rt" which is the first test in the menu. Use the zone select button to scroll through the menu selections. The tests appear in the order shown in the table below:

Once the desired test has been selected, press the up or down button once to start the test. The service tests will perform as described in the following subsections. Press the power button to return to normal operation.

SERVICE TEST MODE	
DIGITAL DISPLAY	**SERVICE TEST**
rt	Relay Test
EF	Evaporator Fan Test
CU	Coolant Valve Test
dP	Damper Test
Ft	Functional Test

2.4.5.5. Relay Test

To start the relay test, select "rt" from the service test menu and press the up or down button. The display will show 'r00' which is "all relays off". Press the up button to advance to the next relay. Press the down button to back up to the previous relay.

RELAY TEST	
DIGITAL DISPLAY	**RELAY TEST**
RXX	Relay "XX" is energized, all other relays are de-energized

2.4.5.6. Evaporator Fan Test

To start the evaporator fan test, select 'EF' from the service test menu and press the up or down button. The display will show 'EH' which is "evaporator high speed". Press the up button to increase the speed. Press the down button to decrease the speed.

EVAPORATOR FAN TEST	
DIGITAL DISPLAY	**EVAPORATOR FAN TEST**
EH	Evaporator High Speed
EN	Evaporator Medium Sped
EL	Evaporator Low Speed

2.4.5.7. Coolant Valve Test

To start the coolant valve test, select 'CU' from the service test menu and press the up or down button. The display will show '0%' which is "coolant valve closed". Press the up button to increase the % open. Press the down button to decrease the% open.

2.4.5.8. Damper Test

To start the damper test, select 'dP' from the service test menu and press the up or down button. The display will show '0 %' which is "damper closed". Press the up button to increase the % open. Press the down button to decrease the % open.

2.4.5.9. Functional Test

To start the functional test, select 'Ft' from the service test menu and press the up or down button. The display will show 'CH' which is "cool high test". The unit will start operation in the selected mode. Press the up button to advance to the next test. Press the down button to back up to the previous test.

FUNCTIONAL TEST	
DIGITAL DISPLAY	**FUNCTIONAL TEST**
HH	Heat High Test
HN	Heat Medium Test
HL	Heat Low Test
UH	Vent Medium Test
UL	Vent Low Test

2.4.5.10.Pre-Trip Test

To start the pre-trip test, select 'Pt' from the service test menu and press the up or down button. The display will show 'Pt' flashing to indicate pre-trip test in process. The blue LED will light during the cooling portion of the pre-trip test and the red LED light during the heating portion of the pre-trip test. At the end of the pre-trip test the display will show 'PAS' if the test was successful or will show 'FAL' if the test failed.

2.5. Driver's Heater/Defroster

2.5.1. Description

The driver's heater/defroster is located in the driver's area in the front dash panel.

This unit is totally controlled by switches located on the defroster control panel and is not regulated by the HVAC thermostat.

2.5.2. Maintenance

⚠CAUTION

Reposition Battery Disconnect switch to OFF before servicing heater/ defroster electrical components to avoid short circuits and personal injury.

To maintain the driver's heater/defroster, periodic lubrication and adjustment of cables and switch hook-ups is required. Cable ends and switch hook-ups can be accessed by opening the defroster access door and removing the defroster cover. As well heater/defroster electrical components are available for service behind the defroster access door and cover.

Regular maintenance also includes seasonal replacement of the air filter. Access it through opening of the defroster access door and removing the defroster cover.

2.5.3. Removal

1. Set the Battery Disconnect switch to the OFF position.
2. Close the coolant supply and return shutoff valves located below the driver's side console compartment.
3. Open front defroster access door.
4. Disconnect the 6-way and 2-way wire harness plugs at curbside connectors.
5. Release the three 1/4 turn fasteners and remove the front access panel.
6. Place a suitable container beneath the defroster drain tube, open the drain cock, and drain the defroster heater coil.
7. Disconnect Bowden cables from the heater valve, lower recirculation air flapper door, and upper driver's foot heat flapper door.
8. Mark and disconnect the coolant supply and return hoses at the defroster.
9. Pull the defroster drain hose from the lower grommet.
10. Remove the four 3/8" hex bolts and washers at the bottom support brackets. Note the quantity and position of the washers for reinstallation.
11. Remove the defroster assembly from the vehicle.

☞NOTE:

Remove motor controller from curbside of defroster assembly if additional clearance is required to remove the defroster assembly from the vehicle.

2.5.4. Installation

1. Position defroster inside the front compartment under dash panel and align the four slotted holes at the base of the defroster with the vehicle mounting brackets.

   ☞NOTE:

   Unbolt motor controller temporarily if necessary to position the defroster inside front compartment. Reattach motor controller once defroster assembly is properly positioned.

2. Ensure rubber seals between air ducts for windshield and driver's foot heat are in contact to minimize air bypass.
3. Apply Loctite 242 to fastener threads and install four 3/8" hex bolts and washers. Torque bolts to 20 ft-lbs. (27 Nm).
4. Attach coolant supply and return lines to defroster and ensure coolant hoses are installed as marked during removal.
5. Attach Bowden cables to lower heater valve, lower recirculation air flapper door, and upper driver's foot heat flapper door.
6. Plug the defroster 6-way and 2-way connectors into the vehicle harness.
7. Ensure drain hose is routed through the lower grommet and to the outside of the compartment.
8. Ensure drain cock is closed at the heater coil location.
9. Open the coolant supply and return shutoff valves located beneath the driver's side console compartment.
10. Top up the surge tank with coolant.
11. Set the Battery Disconnect switch to the ON position.
12. Start engine and check for leaks.
13. Allow engine to reach operating temperature and check operation of all defroster controls.
14. Shut down engine and reinstall defroster access panel and close defroster compartment access door.

2.5.4.1. Blower Assembly Removal & Installation

1. Open front defroster access door and remove defroster access plate.
2. Disconnect electrical connections to blower assembly
3. Remove fasteners securing blower assembly and remove

   Installation is reverse of the above steps.

2.5.4.2. Heater Coil Removal

1. Close coolant supply and return valves located on the streetside of vehicle.
2. Open front defroster access door and remove defroster access plate. See "Fig. 10-4: Heater/Defroster Assembly" on page 14.
3. Disconnect coolant hoses from heater coil and collect draining coolant.
4. Remove fasteners securing heater coil and remove from vehicle.

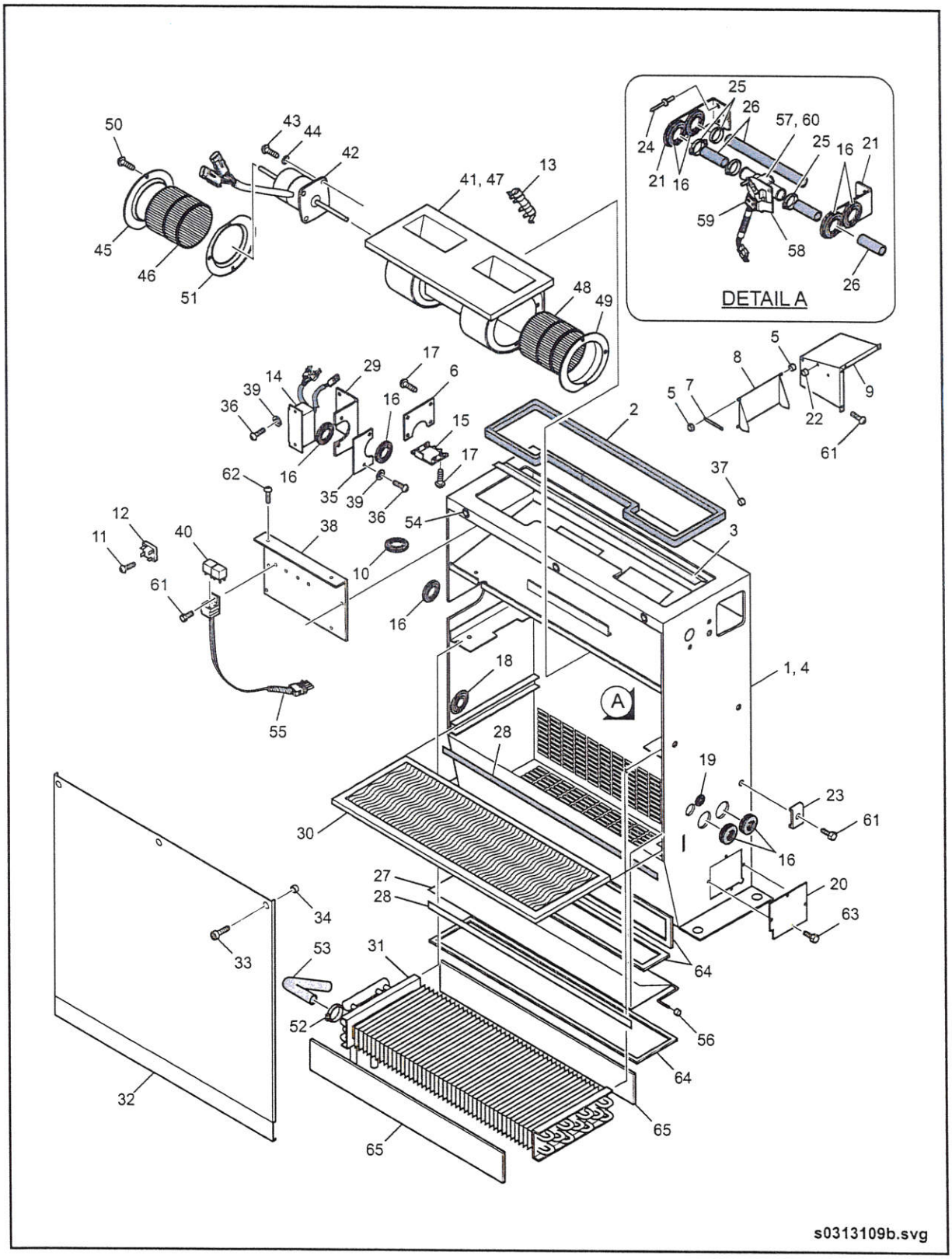


Fig. 10-4: Heater/Defroster Assembly

1. Heater/Defroster Assembly, 24V (Incl. 2...65)
2. Seal, Rubber
3. Holder, Blower
4. Casing, Heater/Defroster
5. Plate
6. Bushing
7. Holder, Door
8. Flapper, Upper Door
9. Box, Flapper
10. Grommet
11. Screw, PH #10 - 32 x 3/4" lg.
12. Rectifier
13. Resistor, 24V
14. Controller Assembly, 24V
15. Plate
16. Grommet
17. Screw, Hex Head #8 - 32 x 3/8" Lg.
18. Grommet
19. Grommet
20. Panel, Access
21. Support, Hose
22. Plug, 3/8"
23. Cable Clamp
24. Rivet
25. Clamp, Gear
26. Hose, Silicone
27. Door, Flapper
28. Seal, 3/16" x 1/2"
29. Bracket, Mounting
30. Filter, Air
31. Coil, Heater
32. Cover, Front
33. Stud, Oval Slotted SST
34. Retainer
35. Plate, Cover
36. Screw, 1/4" - 20 x 1/2" Lg.
37. Nut, Push Flatplate 3/16"
38. Plate
39. Washer, Lock 1/4"
40. Relay, 24V
41. Blower Assembly, 24V (Incl. 42...51)
42. Motor, 24V
43. Screw, Hex HD #10 - 32 x 1/2" Lg.
44. Washer, Flat
45. Venturi, Streetside
46. Wheel, Blower CW
47. Housing, Blower
48. Wheel, Blower CCW
49. Venturi, Curbside
50. Screw, Pan HD Phil #6 x 1/4"
51. Venturi, Right
52. Clip
53. Hose, Drain
54. Receptacle
55. Wiring Harness
56. Bushing, w/Set Screw
57. Heater Valve Assembly, (Incl. 58...60)
58. Bracket, Switch
59. Switch, Micro
60. Valve, Heater
61. Screw, Hex HD #10 - 32 x 1/2" Lg.
62. Screw, Hex HD #10 - 32 UNF x 3/8" Lg.
63. Screw, Hex HD #8 - 32 x 3/8" Lg.
64. Seal, Foam 103.5" Lg.
65. Seal, 3/16" x 3"

Heater/Defroster Assembly (parts list)

2.5.4.3. Heater Coil Installation

1. Position heater coil and secure with required fasteners.
2. Connect coolant hoses to coil.
3. Reinstall defroster cover plate and defroster access door.
4. Open coolant supply and return valves
5. Run engine
6. Top up coolant level and check for leaks.

2.5.5. Heater/Defroster Troubleshooting

☞NOTE:

Ensure that all electrical connections are clean and making proper contact before conducting troubleshooting procedures. Pay particular attention to the drive module and motor connections.

This troubleshooting chart provides information to diagnose the various electrical components of the heater/defroster unit including the defroster blower motor, drive module, interlock relay, variable fan speed control switch, and manual heater control valve limit switch. See "Fig. 10-5: Defroster Schematic" on page 17.

HEATER/DEFROSTER TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	RECOMMENDED ACTION
Defroster motor inoperative.	No Power.	Refer to 2.5.5.1. "Vehicle Wiring Check" on page 18 in this section for procedure.
	Faulty ground.	Check connections at cavity B on defroster 2-way connector. Verify that cavity B on the defroster 2-way connector is grounded to the vehicle.
	Motor seized.	Replace motor.
	Blower wheel obstructed or damaged	Remove obstruction.
	Motor open circuit.	Refer to 2.5.5.2. "Component Diagnosis" on page 19 in this section for procedure.
Defroster motor operates at high speed only.	Faulty resistor block (medium speed resistor and/or thermal fuse open).	Refer to 2.5.5.2. "Component Diagnosis" on page 19 in this section for procedure. Replace resistor block if defective.
Defroster motor operates at low and medium speed only.	Faulty high speed relay.	Refer to 2.5.5.2. "Component Diagnosis" on page 19 in this section for procedure. Replace high speed relay if defective.
	Faulty contact on defroster fan speed control.	Replace defroster fan speed control. Refer to Section 19 of this manual for procedure.
Defroster motor operates at low and high speed only.	Faulty medium speed relay.	Refer to 2.5.5.2. "Component Diagnosis" on page 19 in this section for procedure. Replace medium speed relay if defective.
Defroster motor operates at medium and high speeds only.	Defective rectifier.	Refer to 2.5.5.2. "Component Diagnosis" on page 19 in this section for procedure. Replace rectifier if defective.
	Faulty resistor block (low speed resistor and/or thermal fuse open).	Refer to 2.5.5.2. "Component Diagnosis" on page 19 in this section for procedure. Replace resistor block if defective.
	Faulty contact on defroster fan speed control.	Replace defroster fan speed control. Refer to Section 19 of this manual for procedure.
Frequent replacement of resistor block required.	Excessive current draw.	Test motor current draw. Replace motor if defective.

HEATER/DEFROSTER TROUBLESHOOTING		
SYMPTOM	**POSSIBLE CAUSE**	**RECOMMENDED ACTION**
Defroster motor noisy.	Defroster motor bearings worn.	Replace defroster motor as an assembly.
	Blower wheel rubbing.	Replace blower wheel if damaged.
	Abnormally high fan speed.	Test resistor pack. Refer to 2.5.5.2. "Component Diagnosis" on page 19 in this section. Replace resister pack if defective.
Insufficient heat	No demand signal from manual heat control valve limit switch.	Test manual heat control valve limit switch. Refer to 2.5.5.2. "Component Diagnosis" on page 19 in this section.

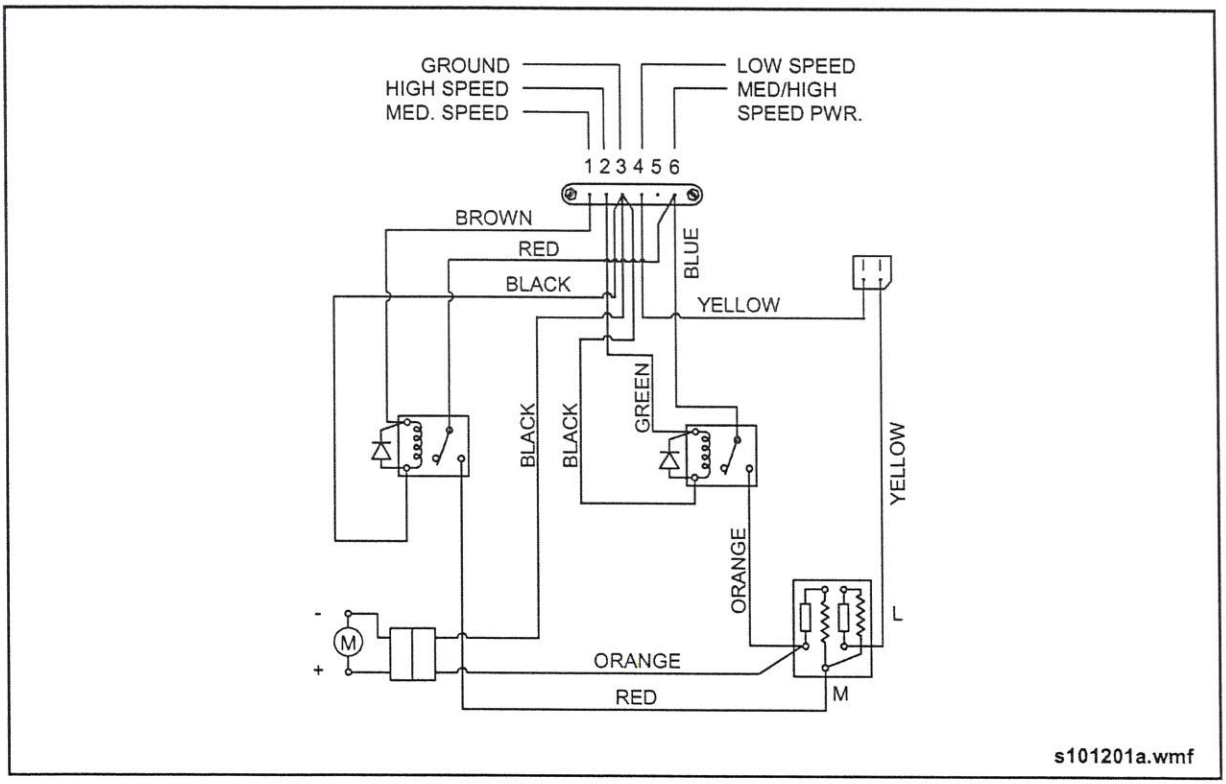


Fig. 10-5: Defroster Schematic

2.5.5.1. Vehicle Wiring Check

1. Set Master Run switch to the DAY-RUN position.
2. Open the defroster/wiper access door to gain access to the defroster power harness. See "Fig. 10-6: Defroster Components" on page 18.

   The following tests are performed with vehicle power applied to the heater/defroster unit. Use care when making test connections. Connect negative lead of voltmeter to cavity B (ground) on the 2-way electrical connector and the positive lead to the indicated connector and cavity in each of the following test steps. Refer to vehicle Electrical Schematic.
3. Set Defroster Fan Speed switch to OFF and check for 24V at cavity A of the 2-way connector.

   ☞NOTE:

   If no power is indicated at cavity A, check for a tripped circuit breaker or faulty ground circuit. Refer to vehicle electrical schematic.
4. Set Defroster Fan Speed switch to LOW and check for 24V at cavity C of the 6-way connector.
5. Set Defroster Fan Speed switch to MED and check for 24V at cavity A of the 6-way connector.
6. Set Defroster Fan Speed switch to HIGH and check for 24V at cavity B of the 6-way connector.

   ☞NOTE:

   If power is not indicated at any of the fan speed settings, remove Defroster Fan Speed control switch from instrument panel to confirm switch function.
7. Set Rotary Temperature to HOT and check for 24VDC at cavity E of the 6-way connector.

   ☞NOTE:

   If no power is indicated at cavity E check for a faulty limit switch on the defroster heater valve. Refer to 2.5.5.2. "Component Diagnosis" on page 19 *in this section for procedure.*

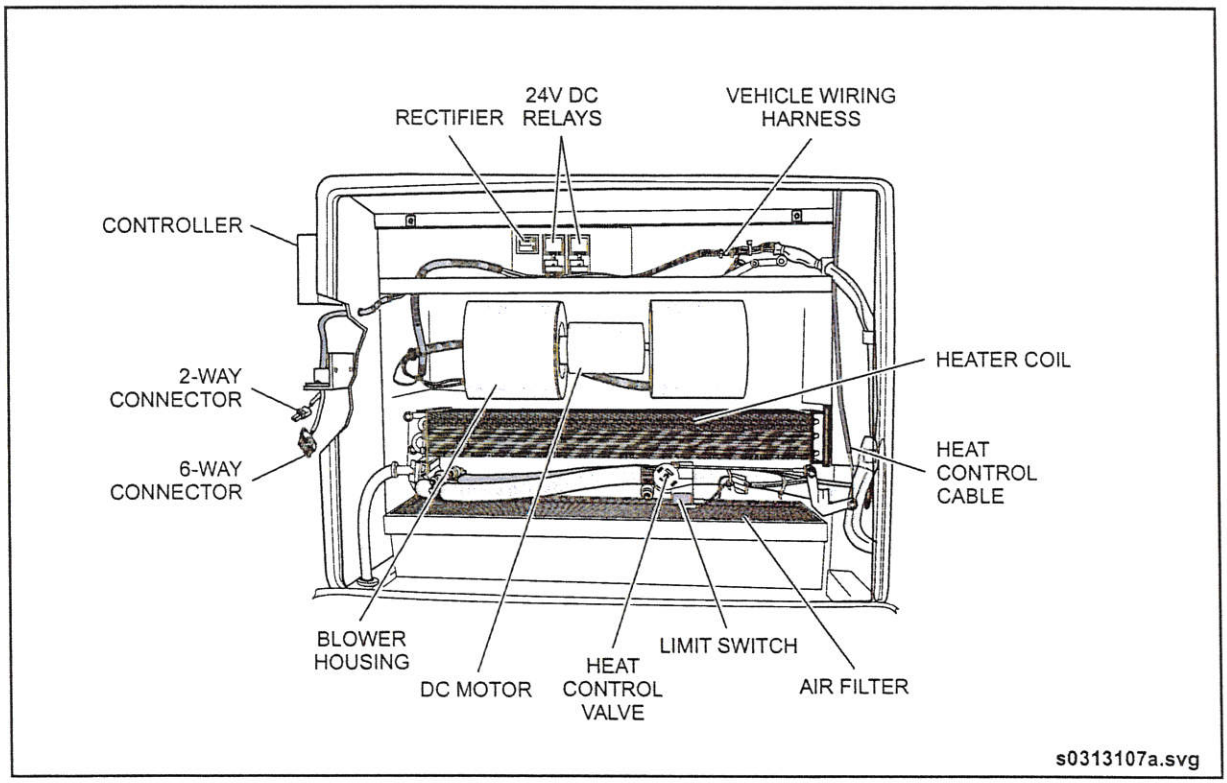


Fig. 10-6: Defroster Components

2.5.5.2. Component Diagnosis

1. Remove the resistor/fuse block from the heater/defroster unit and test as follows:
   a. Check both thermal fuses for continuity using an ohmmeter. See "Fig. 10-7: Resistor/Fuse Block" on page 20.
   b. Check the resistance of each resistor using an ohmmeter. The resistance value is for the low speed resistor is 1.8 ohms ± 10%. The resistance value is for the medium speed resistor is 2.0 ohms ± 10%.
2. Remove the two 24V relays and test as follows:
   a. Check for continuity between terminals No. 30 and No. 87A using an ohmmeter.
   b. Check resistance of coil winding by connecting an ohmmeter between terminals No. 85 and No. 86. Resistance should be 360 ohms ± 10%.
   c. Connect the positive lead from a 24V power supply to terminal No. 86.
   d. Connect the negative lead from the power supply to terminal No. 85.
   e. Turn the power supply ON. The relay should energize. Confirm that contacts are closed by checking for continuity between terminals No. 30 and No. 87, using an ohmmeter.
3. Remove the wiring connectors from the rectifier and tag wire location for reinstallation. Test as follows:
   a. Identify the negative terminal on the rectifier (chamfered corner) and connect diode tester accordingly. Diode tester should indicate current flow in this direction. See "Fig. 10-8: Rectifier Test Connections" on page 20.
   b. Reverse test leads to confirm that current flow is blocked in this direction.

☞NOTE:

Replace the drive motor if no faults were found during component diagnosis.

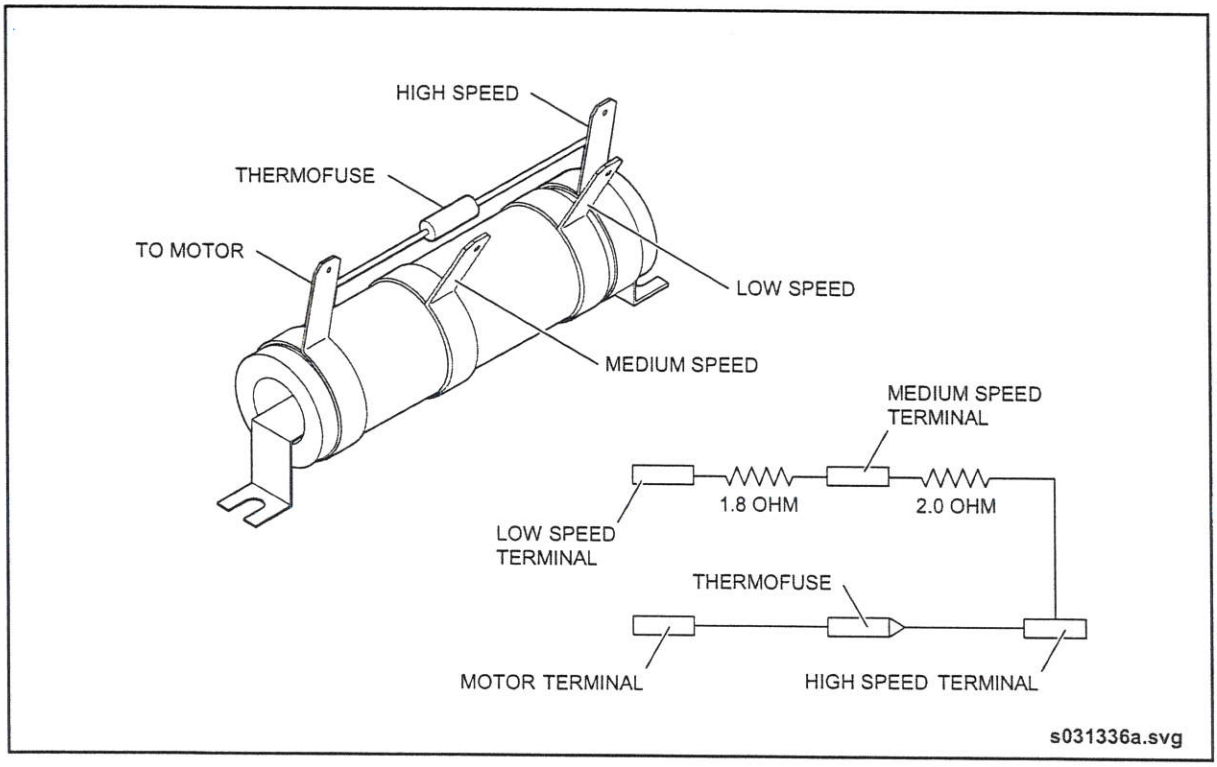


Fig. 10-7: Resistor/Fuse Block

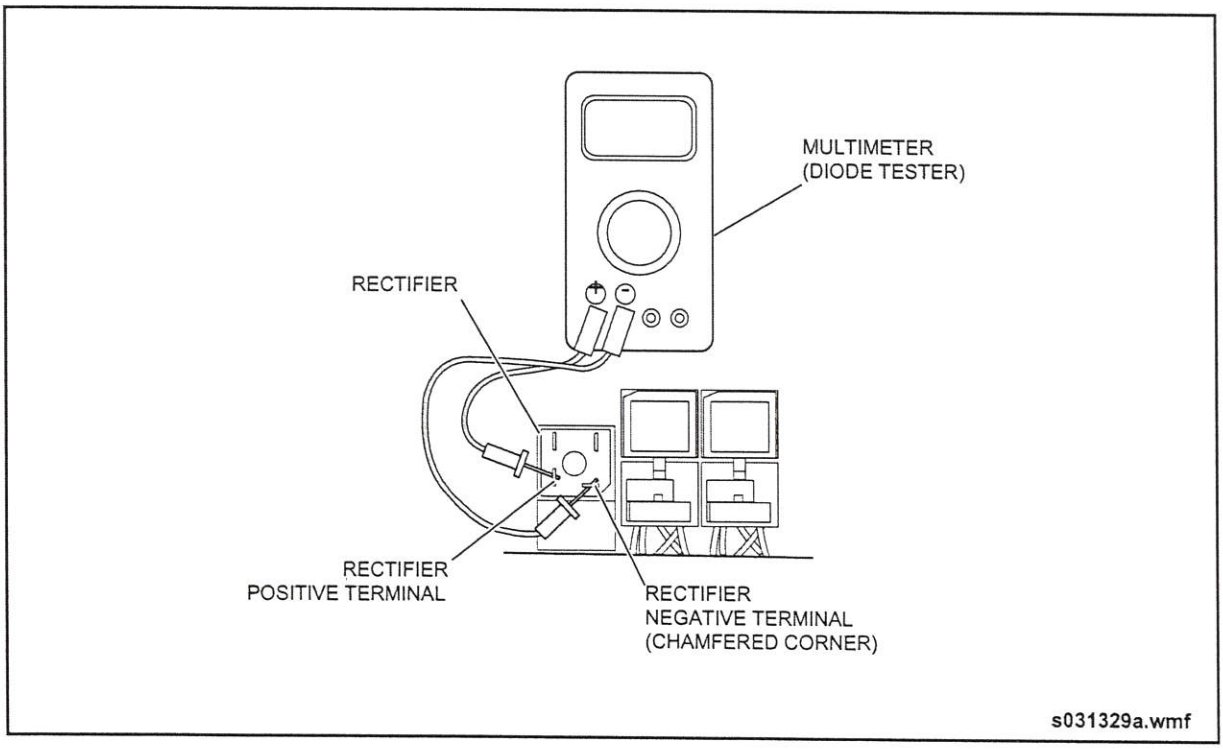


Fig. 10-8: Rectifier Test Connections

2.6. Booster Pump

2.6.1. Description

The booster pump is a unitized motor and pump assembly. The brushless, sensor-less DC motor is controlled by an integral electronic controller. The booster pump assembly is designed to be replaced as a unit and cannot be serviced. The booster pump is bracket-mounted to the frame on the curbside of the engine compartment.

2.6.2. Booster Pump Specifications

Power Supply	24 VDC
Current	20A Continuous
Controller	Intergrated
Weight	6.5 lbs.
Inlet Connection	1" Dia. (beaded)
Outlet Connection	1" Dia. (beaded)
Housing	Cast 413 Alum.
Motor	Brushless
RPM	Set to 3000

2.6.3. Operation

The booster pump receives coolant from the engine outlet hose and delivers it to the auxiliary coolant heater inlet. From the auxiliary coolant heater, the coolant is routed to the roof-mounted HVAC unit, interior heaters and also to the driver's heater/defroster unit. The booster pump is operational when the engine is running and the multiplexing system receives a heat request signal from either the HVAC unit or driver's heater/ defroster unit.

2.6.4. Booster Pump Troubleshooting

Use Pump Tool Kit software to troubleshoot the booster pump assembly. The software program allows booster pump speed, voltage, and current draw to be monitored. Contact EMP - Engineered Machined Products (906) 789-7497 for more information on Pump Tool Kit software.

2.6.5. Removal

1. Set Battery Disconnect switch to the OFF position.
2. Close coolant shut off valves on the supply and discharge lines of the pump assembly
3. Disconnect electrical connections. See "Fig. 10-9: Booster Pump & Lines Installation" on page 21.
4. Disconnect coolant lines from the pump.
5. Remove bolts from mounting bracket and remove pump assembly from vehicle.

2.6.6. Installation

Reverse removal procedure. Run engine, check for leaks, and top up coolant level as required.

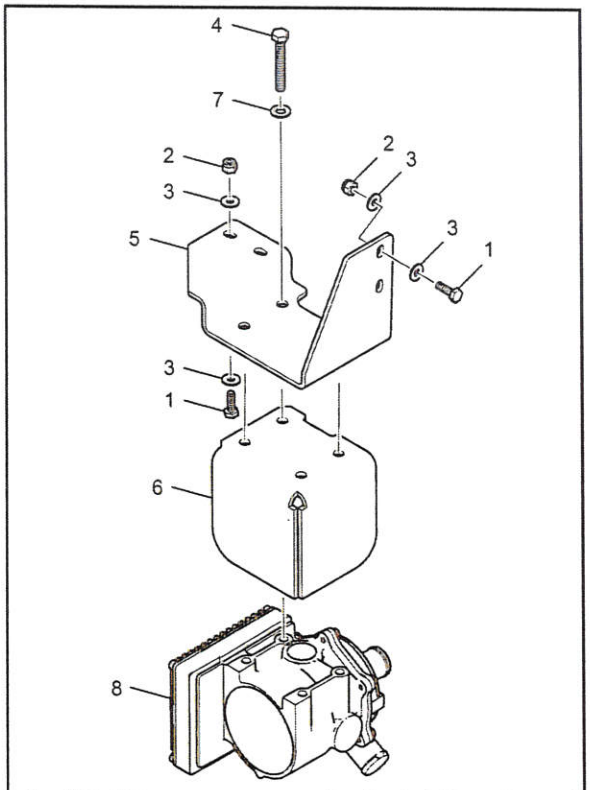


Fig. 10-9: Booster Pump & Lines Installation

NEW FLYER

XCELSIOR
BETTER BY DESIGN

SALES INFORMATION BULLETIN

#580-001 | **Model:** Xcelsior | **Lengths:** All | **Propulsions:** All

Genuine New Flyer Wheelchair Ramp

Product Features

New Flyer's patented wheelchair ramp design is a flip-out, aluminum, non-slip platform located at the entrance door of the bus. While this ramp is based on our reliable New Flyer ramp that has been in revenue service since 1993, it has been improved to now be a self-contained modular system.

The ramp system consists primarily of four components:

- Stainless steel ramp box and aluminum cover
- Hydraulic pump, reservoir and integrated manifold block
- Ramp mechanism assembly (operates entirely within stainless ramp box)
- Aluminum light-weight non-slip ramp platform

All four components operate to articulate the ramp from the stowed position in the floor to the curb or street level.

Ramp deployed at ride height street level

Benefits

- Industry-leading 1:7 slope that significantly exceeds ADA regulations
- Designed with the manual operation feature to ensure that the bus will remain in revenue service during an electrical or hydraulic ramp failure

Ramp deployed kneeled (1:7) street level

Operations

The ramp is hydraulically operated. It is completely installed within the vehicle floor and structure and is not subjected to road damage. Brake and accelerator interlocks are provided through the opening of any door. A flashing LED light and audible signal at the entrance door serve as a warning to passengers that the ramp is operating. The ramp can also be manually deployed or raised by a pull strap. The wheelchair ramp is powered by its own self-contained hydraulic power source.

NEW FLYER

XCELSIOR
BETTER BY DESIGN

SALES INFORMATION BULLETIN

Operating Procedures

Operator's control is located on the lower right side of the driver's instrument panel. A guarded three-position switch performs the following functions:

1. Deploy
This position turns the pump on and sends a flow of oil through the manifold block to the ramp mechanism assembly. The ramp then moves from the stowed position and starts through its arc until fully deployed.

2. Float
This is the normal position of the switch and, in this position, the hydraulic pump is inoperative. The ramp will float to either the DEPLOY or STOW position. Manual operation is possible in the FLOAT position.

3. Stow
This position turns the pump on and sends a flow of oil through the manifold block to the ramp mechanism assembly to move the wheelchair ramp into the stowed position (flush with the floor).

Service / Repair

The self-contained, modular design of this ramp allows for quick removal and installation of the ramp via eight mounting bolts and one electrical connector. The harness removal can only be done at the front of the bus through the service panel (or defrost service panel). To remove the harness, two ty straps need to be cut off and then the two connectors need to be disconnected. The harness conduit retaining nut needs to be removed and each of the two connectors need to be pulled through the retaining nut separately. Two p-clips will need to be removed from under the bus structure to free the harness. This allows bench servicing if a ramp system requires repair.

The stainless steel box protects the inner components from the damaging effects of being exposed to the elements.

Testing

Durability testing: This new design has been cycled 50,000 times which equates to a 12 year life span.

Warranty

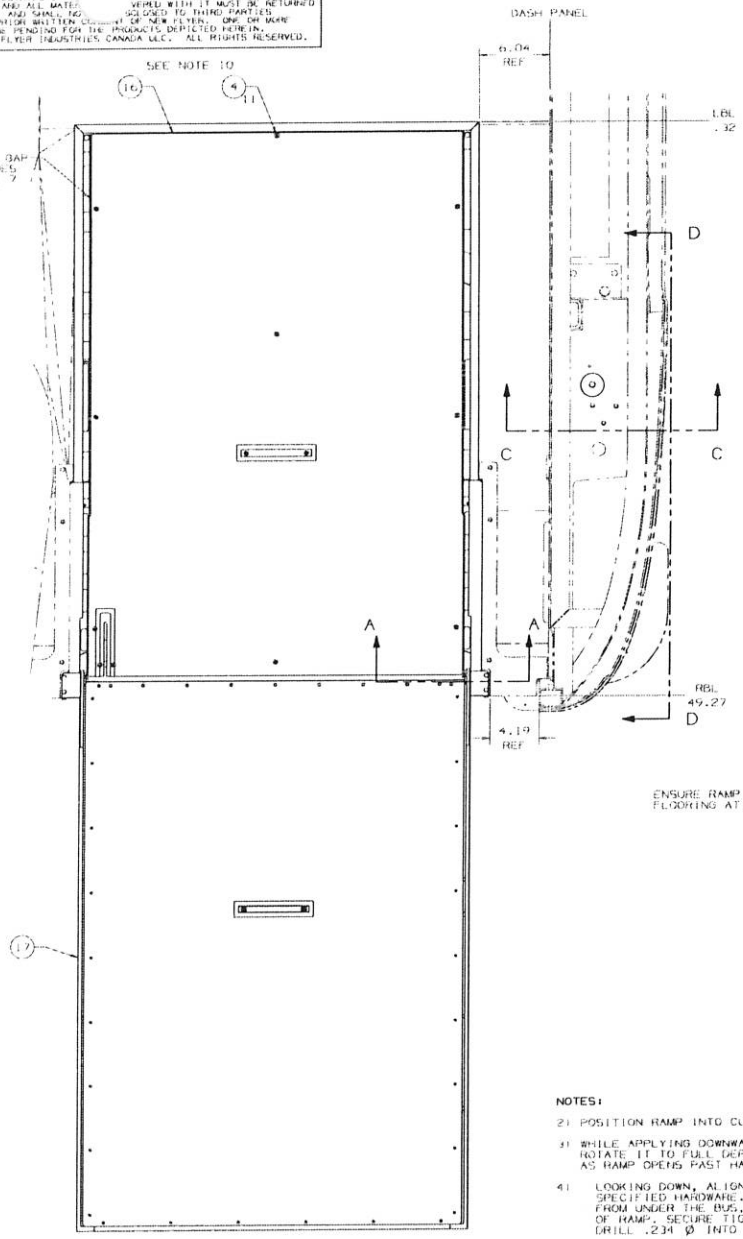
Genuine New Flyer wheelchair ramps have a warranty of one year or 50,000 miles (80,467 km).

SPECIFICATIONS

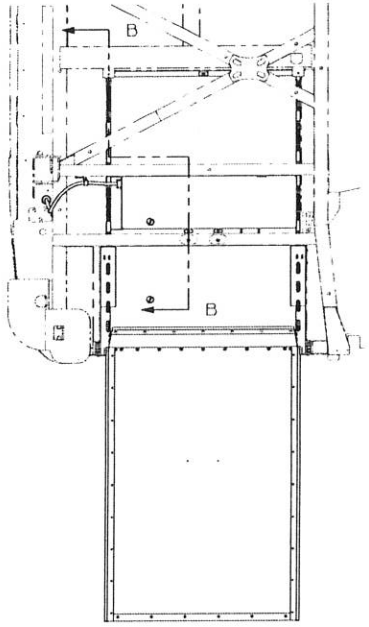
Width	32.00 inches (81.28 cm)
Length	47.50 inches (120.65 cm)
Length Beyond Bus Body	44.73 inches (113.61 cm)
Supporting Load	660 lbs. (299.40 kg)
Degree of Slope kneeling position	8° degrees to grade
Degree of Slope kneeling position (to a 6 inch curb)	2° degrees to curb
Operation Switch (3-Pole Toggle)	1. "Deploy 2. "Float" 3. "Stow"
Type	Hydraulic (electrically powered)
Cycle Times 1. Deploy 2. Stow 3. Total	 10 seconds 10 seconds 20 seconds
System Fluid Capacity	1 quart (946.35 ml)
Hydraulic System	Independent Hydraulic Power pack w/ Integrated Manifold
Hydraulic Fluid	ATF
Operating Hydraulic Pressure	1800 psi
Hydraulic Cylinder	One (deploy & stow)
Hydraulic Cylinder Size	1.5" (38.1 mm)dia. Bore x 3.5" (88.9 mm) Stroke 0.75" (19.05 mm) dia. Rod Double acting welded construction 2500 psi (working pressure rated)
Weight of Complete Lift Assembly	130 lbs (58.97 kg)

NOTE: FOR INSTALLATION DRAWINGS PLEASE REFER TO ATTACHED WIRE BOX SHEET FOR PARTS LISTING

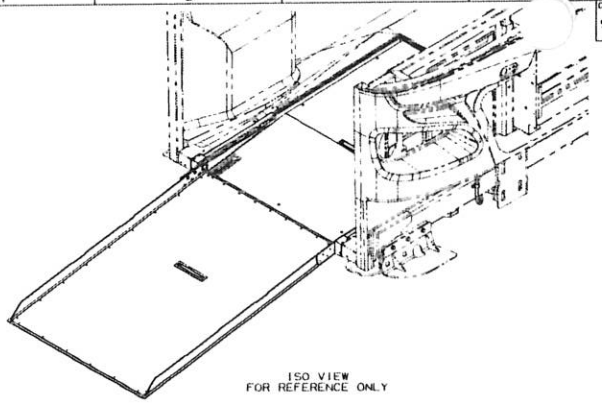
DRAWING N° 523319



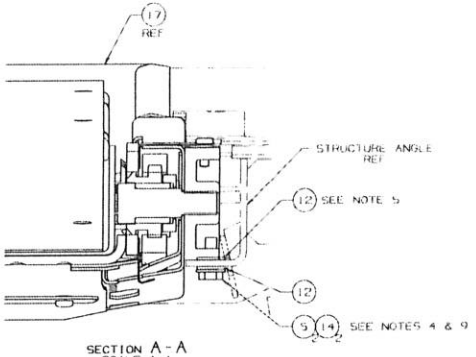
TOP VIEW
(WITH RAMP OPEN 180°)



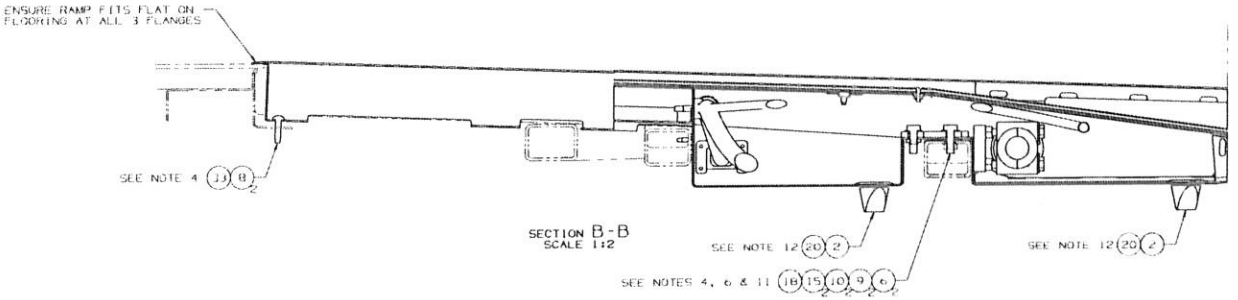
BOTTOM VIEW
(WITH RAMP OPEN 180°)
SCALE 1:8



ISO VIEW
FOR REFERENCE ONLY



SECTION A-A
SCALE 1:1
LH SHOWN, RH OPPOSITE



SECTION B-B
SCALE 1:2

NOTES:

2) POSITION RAMP INTO CUTOUT IN FLOORING AT COACH ENTRANCE DOOR.

3) WHILE APPLYING DOWNWARD PRESSURE ON THE PERIMETER FLANGE FACING DRIVER'S PLATFORM, LIFT RAMP AND ROTATE IT TO FULL DEPLOY POSITION. MAKE NOTE OF RAMP TO DOOR HANDLE CLEARANCE AS RAMP OPENS PAST HANDLES.

4) LOOKING DOWN, ALIGN OPEN SLOTS AT CENTER OF MECHANISM WITH WELD NUTS IN STRUCTURE. INSTALL SPECIFIED HARDWARE. FROM UNDER THE BUS, ALIGN RAMP (ITEM 17) TO STRUCTURE ANGLE USING BOTTOM OUTER CORNERS OF RAMP. SECURE TIGHTLY WITH SPECIFIED HARDWARE. DRILL .234 Ø INTO TABS IN STRUCTURE 2 PLCS FOR ITEM 8.

5) USE SPACERS (ITEM 12) AS NECESSARY TO CLOSE GAP BETWEEN RAMP (ITEM 17) AND STRUCTURE. RETURN EXCESS TO STOCK.

6) TORQUE ALL 5/16 BOLTS (ITEM 6) TO 17-19 FT-LBS (DO NOT EXCEED).

7) MAINTAIN MAXIMUM 5/8" GAP. COVER PLATE TO BOX OUTER CHANNEL WALL TO MEET ADA SPECIFICATION. RETURN RAMP TO STOWED POSITION.

8) INSTALL GROMMET (ITEM 1) INTO EXISTING HOLE IN FRT MASK AS SHOWN. SECURE HARNESS USING P-CLAMPS AND BRKT SEE SECTIONS C-C AND D-D ON SHEET 2.

9) TORQUE 1/4 BOLTS (ITEM 5) TO 5-6 FT-LBS DRY.

10) WITH THE RAMP IN THE DEPLOYED POSITION, INSTALL COVER PLATE (ITEM 16) WITH SPECIFIED HARDWARE (ITEM 4) ONCE RAMP HAS BEEN SECURED INTO STRUCTURE.

11) USE SPACERS (ITEM 9 & 10) AS NECESSARY TO CLOSE GAP BETWEEN RAMP (ITEM 17) AND STRUCTURE. RETURN EXCESS TO STOCK.

12) APPLY BLACK SIKA (ITEM 20) TO UNDERSIDE OF W/C BOX TO SEAL ANY GAPS BETWEEN W/C BOX AND WATER EJECTOR (ITEM 2).

QTY	U/M	ITEM	PART NO.	DESCRIPTION	WEIGHT
0.010	EA	20	055700	ADHESIVE SIKA 221 BLACK	
0.010	EA	19	081014	LOCTITE 243 MEDIUM 10ML	
0.010	EA	18	531095	LOCTITE 263 (RED) THREADLOCKER	
1	BA	17	521118	ASSY W/C RAMP ENTR 32"	132.1 LBS
1	EA	16	510169	ASSY COVER 32IN ENT	21.45 LBS
2	EA	15	50804000	WASHER FLAT SS 5/16 NOM	
4	EA	14	50804000	WASHER FLAT 1/4 NOM	
4	BA	13	50900001	WASHER FLAT SS 10	
4	EA	12	601973	SPACER W/C RAMP .063 THK	0.02 LBS
1	EA	11	377414	GRMT MTG, P-CLAMP	0.04 LBS
2	EA	10	333424	SPACER W/C RAMP INSTALL .032 THK	.1 LBS
2	EA	9	333423	SPACER W/C RAMP INSTALL .050 THK	.1 LBS
2	EA	8	241950	SCRW 1/4-20 X 1.0 SS	
4	EA	7	62911	SCRW SS PAN HD TAPPING	
2	EA	6	20803016	BOLT SS 5/16 X 1.00 LG	
4	EA	5	20804012	BOLT-HEX 1/4 UNC X 0.75	
11	EA	4	10803012	SCRW PL HD 10-24 X .75	
2	EA	3	092582	CLAMP P 0.940	
2	EA	2	426814	EJECTOR DUST, WATER	
1	EA	1	601941	GROMMET-5 X 1.510	

MATERIAL	
WEIGHT 154 LBS	
TREATMENT NONE	
UNSPEC'D TOLS. DEC.	.X ±.1 .XX ±.03 HOLE DIA ±.01 ANGLE TOL. ±1°
	SIMILAR TO SIMPEL

TITLE: INSTL-W/C RAMP ENTR 32"

NEW FLYER

SCALE 1:4

PART N° 523319

SHEET 1 OF 2

REPORT ALL ERRORS TO ENG. DEPT.

DO NOT SCALE DRAWING
DIMENSIONS IN [ ] ARE IN m.m.
THD ANGLE ⊕ ECC
DRAWN BY
DAN TANG
DATE (DD-MMM-YY)
17-MAR-14

REV	DESCRIPTION	ECN / ECM / ECO
E	1) ITEM 2 WAS P/N 372118 QTY 2 2) ADDED ITEM 20 15/0 SHT 1 01/CB 3) NOTES BETWEEN NOTE 10	

2.35. Fluid & Lubrication Guide

The following Guide is a convenient reference for the lubrication points on your New Flyer vehicle. It provides component locations, lubrication procedures and intervals, and lubricant types. Further preventive maintenance information on each component in this Guide can be found in this section of the manual under the component's specific maintenance interval. See "Fig. PM-43: Fluid & Lubrication Points" on page 86.

FLUID & LUBRICATION GUIDE

Item	Component	Procedure	Interval	Lube Type
1	Windshield Washer Bottle		Fill bottle as required	Methylene Alcohol Windshield Washer Fluid
2	Entrance Door Baseplate	Lubricate connecting rod spherical bearings (4 bearings)	Every two years	SAE 20
		Lubricate upper bracket bearing shaft	Every two years	SAE 20
3	Exit Door Baseplate	Lubricate connecting rod spherical bearings (4 bearings)	Every two years	SAE 20
		Lubricate upper bracket bearing shaft	Every two years	SAE 20
		Lubricate door shaft hinged mounting bracket at grease fitting	Every two years	High pressure, low temperature (-40°F) grease
4	Power Steering Miter Box	Refer to 2.26.9. "Power Steering Miter Box" on page 74 in this section for procedure	Every six months	Calcium sulfonate complex grease such as Petro Canada Peerless LLC or equivalent
5	Upper Steering Knuckle Bearing	Refer to 2.26.8. "Steering Knuckle" on page 74 in this section for procedure	Every 6 months or 30,000 miles (48,000 km)	Special-Purpose Grease. Refer to 2.35.2. "MAN Axle Approved Greases" on page 91 in this section for listing
6	Brake Treadle & Foot Valve Assembly	Lubricate brake valve plunger	Every 24,000 miles (38,600 km)	Barium Grease
7	Wheelchair Ramp Mechanism	Lubricate chains, teflon bearings, bronze bushings, and all sliding surfaces	Every six months	White Lithium Grease (Aerosol Spray)

FLUID & LUBRICATION GUIDE				
Item	**Component**	**Procedure**	**Interval**	**Lube Type**
8	Wheelchair Ramp Reservoir	Check fluid	Every 6,000 miles (9,600 km)	DEXRON® - III
		Change fluid	Yearly	DEXRON® - III
9	Rear Axle Carrier	Check for leaks under vehicle	Daily	Mineral-Based Extreme Pressure Gear Oil. Refer to 2.35.1. "MAN Axle Approved Mineral Oils" on page 91 in this section for listing
		Check oil level at carrier fill plug	Check at first 3,000 miles (4,800 km), thereafter every 6,000 miles (9,600 km)	
		Change Oil	Drain & change upon receipt of vehicle, and thereafter change every 36,000 miles (58,000 km) for "hot region" operation. Refer to 2.2. "Rear Axle Operating Conditions" on page 3 in this section for definition. Change every 54,000 miles (87,000 km) for "moderate region" operation. Refer to 2.2. "Rear Axle Operating Conditions" on page 3 in this section for definition.	
10	Battery Slides	Check & keep clean	Every 6,000 miles (9,600 km)	Multi-Purpose Grease
11	Battery Terminals	Check & apply lubricant as required	Every 6,000 miles (9,600 km)	Dielectric grease such as TruckLite NYK-77
12	Diesel Exhaust Fluid Filter	Change filter	Every 200,000 miles (321,000 km)	API Certified Stabilized Urea Premix meeting ISO 22241-1 standard
13	Diesel Exhaust Fluid Tank	Check fluid & fill as required using pressure fill port	Daily	API Certified Stabilized Urea Premix meeting ISO 22241-1 standard

FLUID & LUBRICATION GUIDE				
Item	**Component**	**Procedure**	**Interval**	**Lube Type**
14	Hydraulic Reservoir - For Power Steering	Check fluid level through sight glass	Daily	DEXRON®-III
		Change filter	Every 18,000 miles (29,000 km)	DEXRON®-III
		Change fluid	Every 36,000 miles (58,000 km)	DEXRON®-III
15	Engine	Check dipstick level	Daily	Chevron Delo 400 LE 15W-40 (API CJ-4)
		Drain & refill	Every 6,000 miles (9,600 km)	Chevron Delo 400 LE 15W-40 (API CJ-4)
16	Traction Motor	Check dipstick level	Daily	TranSynd™ Synthetic Transmission Fluid
		Drain & refill	Change the oil and filter after the first 6,000 miles (9,600 km) of operation and thereafter every 100,000 miles (160,000 km).	
17	Driveshaft Slip Joint	Refer to 2.10.4. "Driveshaft" on page 18 in this section for procedure	Upon receipt of vehicle, and thereafter every 6,000 miles (9,600 km)	Lithium base Extreme Pressure (EP) grease meeting AGMA Standard 9001 such as Mobil Mobilux EP-111 or equivalent
18	Driveshaft U-Joints	Refer to 2.10.4. "Driveshaft" on page 18 in this section for procedure	Upon receipt of vehicle, and thereafter every 6,000 miles (9,600 km)	Lithium base Extreme Pressure (EP) grease meeting AGMA Standard 9001 such as Mobil Mobilux EP-111 or equivalent
19	Engine Oil Filters	Replace (full-flow, spin-on)	Every 6,000 miles (9,600 km)	Chevron Delo 400 LE 15W-40 (API CJ-4)
20	Surge Tank	Check sight glass	Daily	Penray FleetCharge® with Bitrex
		Drain & fill cooling system. Flush only if required	Every two years or 80,000 miles (128,000 km)	Penray FleetCharge® with Bitrex

FLUID & LUBRICATION GUIDE				
Item	**Component**	**Procedure**	**Interval**	**Lube Type**
21	Steering Driveshafts	Purge lubricate at grease fittings. Refer to 2.10.6. "Steering Driveshafts" on page 21 in this section for procedure	Every 6,000 miles (9,600 km)	Extreme Pressure Grease meeting NLGI Grade 2 specification with operating temperature range of 325°F to -10°F (163°C to -23°C). Use CITGO Lithoplex RT-2 or equivalent
22	Rear Axle Wheel Bearing	Refer to Section 2 of this manual for lubrication procedure	Whenever rear axle bearing or seals are being serviced	Special-Purpose Grease. Refer to 2.35.2. "MAN Axle Approved Greases" on page 91 in this section for listing

☞NOTE:

Moderate regions are defined as geographic locations where the average monthly high temperature does not exceed 25°C (77°F) for any two months of the year.

Hot regions are defined as geographic locations where the average monthly high temperature exceeds 25°C (77°F) for any two months of the year.

2.35.1. MAN Axle Approved Mineral Oils

Lubricants used in the rear axle must meet MAN specifications. Oil composition and additives are critical to maintaining the designed operating life of the axle components. The use of unapproved oils has been shown to accelerate the wear rate of internal components and shorten the overall lifespan of the axle. The use of unapproved oils will void the warranty coverage on the axle. The following table provides a list of approved oils that are available in North America.

MAN AXLE APPROVED MINERAL OILS

Product Brand Name (Viscosity)	MAN Specification
Mobilube HD Plus (SAE 80W-90)	MAN 342 M1
Castrol Axle EPX 90 (SAE 80W-90)	MAN 342 M1
Shell Spirax MB 90 (SAE 80W-90)	MAN 342 M1

2.35.2. MAN Axle Approved Greases

The lubricant used on the front axle steering knuckle is a special-purpose grease that meets the requirements of this specific application and must not be substituted with alternate grease products. The following table provides a list of approved greases that are available in North America.

MAN AXLE APPROVED GREASES

Product Brand Name	MAN Specification
Fuchs Renolit LX-OTP 2	