Fuel System

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Fuel System

Safety

The purpose of this safety summary is twofold. First, it is to help ensure the safety and health of individuals performing service on, or operation of, the Blue Bird All American Series bus. Second, it is to help protect equipment. Before performing any service or operating procedure on the All American bus, individuals should read and adhere to the applicable warnings, cautions and notes located throughout this Blue Bird Service Manual.

Only professional mechanics, qualified by training and experience, should undertake repair of the fuel system. The fuel system on your Blue Bird bus has been carefully engineered and manufactured to meet or exceed all safety regulations as required by applicable standards, including FMVSS 301.

Blue Bird Body Product Engineering does not approve any modifications to the system. The fuel system is designed to meet all government regulations and engine manufacturer's guidelines. Anyone making modifications to the fuel system on a Blue Bird bus assumes full responsibility for the entire fuel system, the engine, and the continued safe operation of the vehicle. Repair and maintenance, as outlined in this section of the All American Series Service Manual, may be performed as necessary.

Warnings

Warnings apply to a procedure or practice that, if not correctly adhered to, could result in injury or death. Particular attention should be paid to sections of this manual where warnings appear.

Cautions

Cautions apply to a procedure or practice that, if not correctly adhered to, could result in damage to or destruction of equipment.

Notes

Notes are used to explain, clarify or otherwise give additional insight for a given subject, product or procedure. Please note that on occasion, notes, too, may advise of potential safety issues.

Introduction

This manual was written with the professional mechanic in mind. The vehicle used as the standard is an All American bus with a Cummins ISB engine and an Allison AT 545 transmission. Vehicles with other power plant and/or transmission options will vary in some detail, but will be very similar to the procedures outlined herein.

Maintenance

Fuel Filter/Water Separator Cartridge Replacement

The fuel filter/water separator is located on the inside left frame rail. Periodically (daily) check the fuel filter/water separator for an accumulation of water and other contaminants. The device holds only about ½ cup (114 ml) of water before reaching the bottom of the cartridge. The device must be drained before the contaminant level reaches the bottom of the cartridge in order to maintain its effectiveness.

If there is water present in the bottom of the device, open the drain cock. Operate the primer pump at the top of the fuel filter/water separator until all the water is purged and clean fuel is discharged.

Caution

Be sure to close the drain before putting the vehicle back in service.

The cartridge filter in the separator must be monitored and changed, as needed, to continue to function properly. The exact time for a filter cartridge change is determined by the amount of vacuum

required to pull fuel from the tank. The most practical method is to routinely change the cartridge at every other (second) engine oil change. At least once each year, change the fuel filter/water separator cartridge.

Note
Just one tank of fuel with heavy contamination can clog the fuel filter/water separator cartridge.

Warning
Fuel is flammable, toxic and an irritant to the skin, eyes and lungs. Appropriate protective gear should be worn when working with this material, including eye protection and gloves. Avoid prolonged or repeated contact with diesel fuel. Work only in a well ventilated area.

Wipe the fuel filter/water separator clean of dirt and debris before continuing.

Note
The Packard connector is secured to the wiring harness with a nylon cable tie at the time of manufacture. This cable tie must be removed before continuing.

1. Disconnect the Packard (electrical) connector (1). **Figure 1**.
2. Remove the cartridge by turning the bottom cap and the cartridge (12) counter clockwise, as an assembly.
3. Separate the bottom cap and the cartridge.
4. Lightly coat the new cartridge "O" ring with clean fuel or engine oil.
5. Replace the cartridge end cap. Install hand tight only.
6. Lightly coat the fuel filter/water separator "O" ring at the top thread with clean fuel or engine oil.
7. Install the new fuel filter/water separator cartridge/bottom cap assembly into the pump body. Install hand tight only.
8. Press the primer pump as necessary to fill the fuel filter/water separator with fuel.
9. Connect the Packard (electrical) connector.
10. Using a nylon cable tie, secure the Packard connector to the wiring harness.

Fuel Filter/Water Separator Assembly Removal

1. Wipe the fuel filter/water separator clean before continuing.
2. Disconnect the Packard (electrical) connector (1). **Figure 1**. See "Note" on same subject in Step 1 in "Fuel Filter/Water Separator Cartridge Replacement".

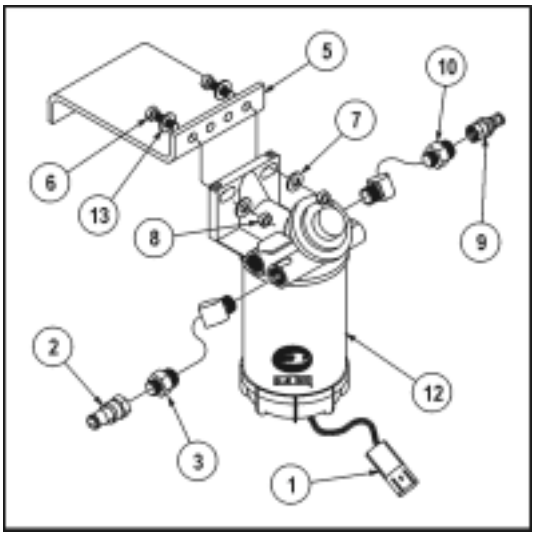

Figure 1—Fuel/Water Separator Assembly

3. Remove the fuel filter/water separator cartridge as an assembly.
4. Disconnect the fuel lines at the swivel connectors ((2) and (9)) from the separator assembly.

Note
Be prepared for fuel spill during this operation. Always handle and dispose of

fuel in accordance with all applicable local, state and federal laws.

Note
The plugs in the unused ports of the fuel filter/water separator should be removed and set aside for use during installation of a new device.

5. Remove nut (8), flat washer (7), flat washer (13) and capscrew (6) from two places to remove the separator from its mounting bracket (5).

Installation of Fuel Filter/Water Separator
The new fuel filter/water separator must be fitted with the proper connectors and fittings before installation on your Blue Bird bus.

Caution
Be sure to install the fittings in the proper port in the following instructions. The remaining ports should be plugged using the plugs from the old fuel filter/water separator.

1. Install 45° elbow fittings ((4) and (11)). **Figure 1**. Install the components finger tight, and then apply a bead of Perma Lok™ LH 150 thread sealant. Tighten the fitting 1½ turns, observing that the openings are properly oriented. Both openings should point toward the frame rail. The remaining ports should be plugged at this time, using the plugs from the old unit. Tighten the plugs hand tight, apply a bead of Perma Lok™ LH 150 and then tighten 1½ turns.

Caution
Do not use thread sealer tape on the fittings in the fuel lines. Small particles could break off and cause serious engine problems.

2. Install the adapter fittings ((3) and (10)) into the 45° elbows at each side. Tighten the adapter fittings finger tight, and then apply a bead of Perma Lok™ LH 150 thread sealer. Tighten the adapters 1½ flats.
3. Install the fuel filter/water separator body on the mounting bracket (5). The threads of the capscrews (6) should be at the fuel filter/water separator. Install the flat washers (7) on the capscrew. Install the capscrew through the mounting bracket and through the mounting holes in the fuel filter/water separator.
4. Install flat washers (13) and nuts (8). Torque the nuts (8) to the proper value as listed in the Introduction section.
5. Install the fuel line swivel fittings ((2) and (9)) on the adapters finger tight. Using a wrench of the appropriate size, tighten the swivel fittings 1½ flats.

Removal of Side Mount Fuel Tank
The manufactured fuel system is certified by Blue Bird Body Company to meet regulation FMVSS 301. Any deviation or modification to the fuel system causes Blue Bird Body Company to withdraw its certification, and places the responsibility for the safety of the entire fuel system on the entity making the modification.

Warning
Blue Bird Body Company Product Engineering does not approve any additions, modifications or changes of any kind in the fuel system, except routine maintenance, repair and/or replacement of components.

1. Park the vehicle on a flat, level surface, set the park brake, and chock the wheels.
2. Remove the negative (-) battery cable.
3. A lift of sufficient strength will make the work much easier.
4. If jacks are to be used, be sure to use jack stands.

5. Observe that the vehicle is stable before moving under it.
6. Use a floor jack, with a cradle designed for the purpose, to support and lower the fuel tank assembly from the top frame. See **Figure 2** for the assembly details of the side-mounted tank.

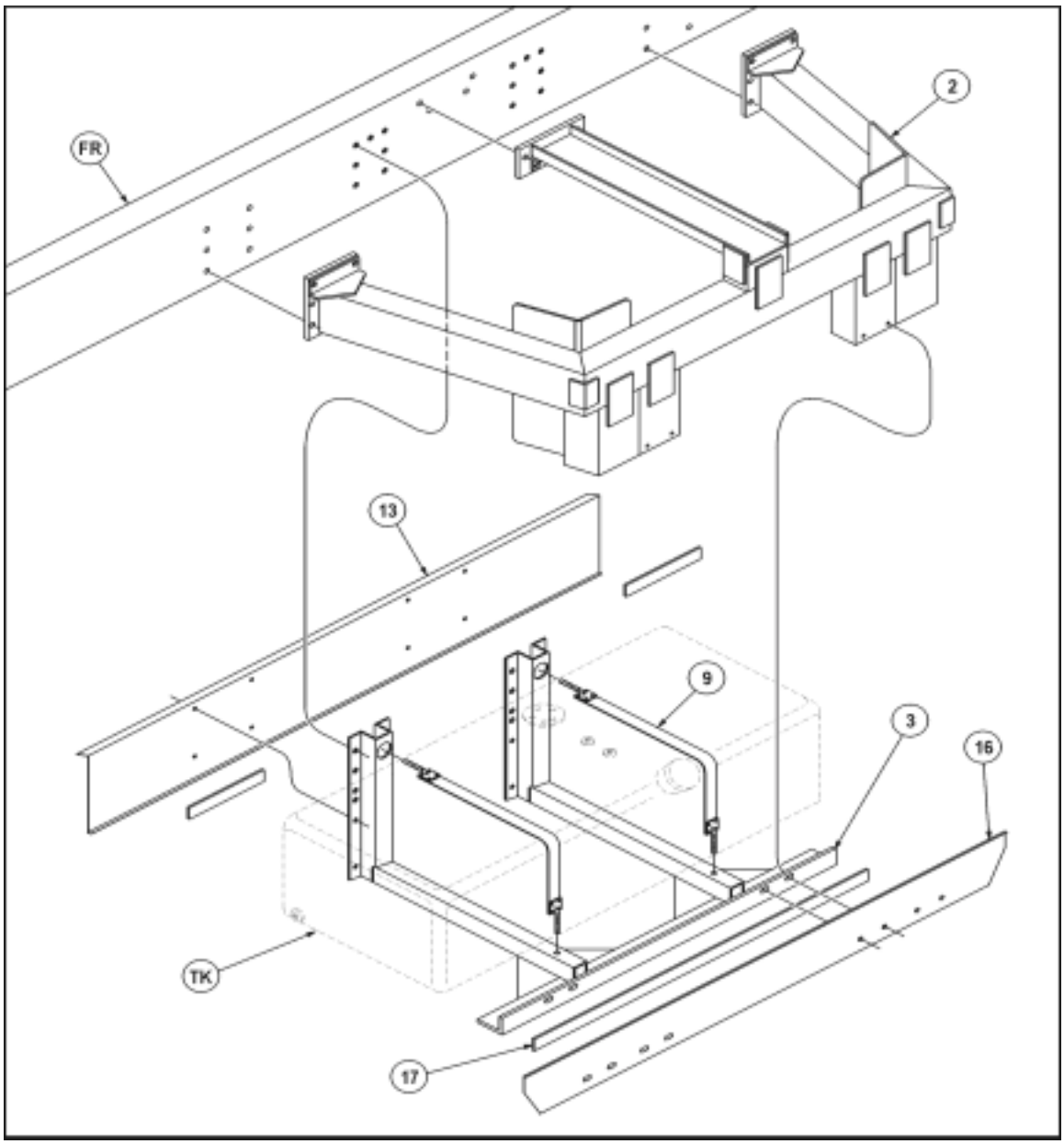

Figure 2—Side-Mount Fuel Tank

Warning

Diesel fuel is toxic, flammable and an irritant to skin, eyes and lungs. Always use appropriate protective gear, including eye protection and gloves, when working with this material. Work only in well ventilated areas, away from sparks, heat and open flames. Disconnect the negative (-) battery cable.

1. Drain the fuel tank (using the drain provided in the bottom) into an

appropriate container for storage. Observe all local, state and federal laws concerning the handling and storage of diesel fuel.

2. Disconnect the fuel level sender through the inspection hole inside the coach.
3. With adequate support in place, remove the hardware from supporting frame members. **Figure 3**.
4. Remove jam nuts and nuts (10), and flat washers (12). These components are on the inside of the frame rail. **Figure 3**.
5. Loosen nut (6) and lock washer (5) on capscrew (8) in four places. Do not remove the capscrews until the fuel tank is supported. **Figure 3**.

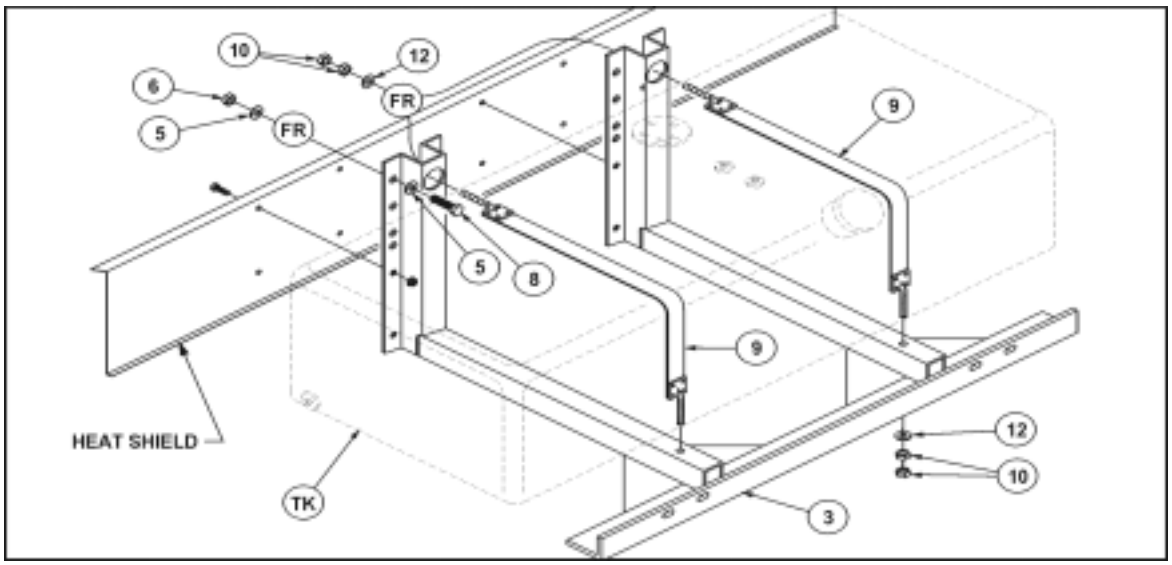

Figure 3—Side Mount Straps and Bracket

Warning

Be sure support of the fuel tank assembly is adequate before continuing.

6. Remove nuts (6) and lock washers (5) from capscrews (7) in four places. **Figure 4**. Remove capscrews (7) from four places.

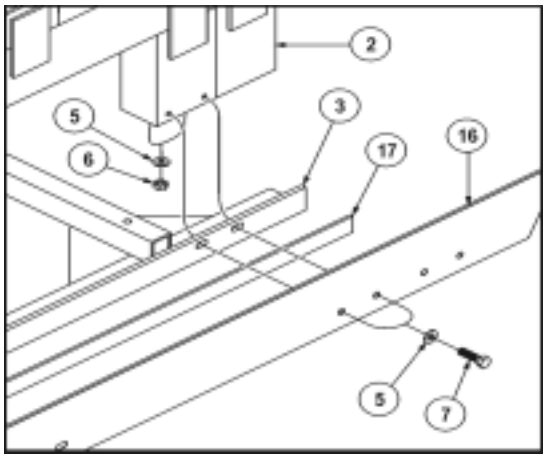

Figure 4—Side Mount Tank Assembly

7. Carefully lower the fuel tank assembly, watching for stress on the fuel supply and return lines. When it is possible, disconnect the fuel supply and return lines at the swivel connectors ((1) and (2)). **Figure 6**.

Caution
Be careful not to cut any lines at the through holes in the frame.

Installation of Side Mount Fuel Tank
Installation is accomplished by reversing the removal process above.

Warning
Particular attention should be paid to place the hoses and wiring in the correct positions. All heat shields must be returned to the proper place to protect the fuel system from the heat of the exhaust system. ***Figure 3.***

The new fuel tank should be assembled with the proper fittings and vent hoses, etc., using the general instructions outlined below in "Assemble a New Tank". Always refer to **Figure 6** for the proper orientation and placement of component parts.

1. With the fuel tank resting on a lifting device fitted with a suitable cradle, lift the tank and carriage assembly (3) high enough to make the hose and wiring connections. **Figure 3**. Install flare connectors to supply and return lines finger tight, then tighten 1½ flats to seal the connections.

Note
It is best to lay the tank hold down straps (9) in place at this time. Install the washers (12) and nuts (10) loosely. If you are installing a new fuel tank, see ***Figure 6*** *for components placement, and "Assemble a New Tank" below for assembly instructions.*

2. Continue to lift the tank and carriage assembly into place, carefully observing the hoses and wiring.

Warning
Installation of these components requires strict adherence to the torque requirements, as listed in the torque tables of the Introduction section of this manual. Install all fasteners with the threaded end away from the tank and components.

3. Install capscrews (8) and washers (5) through the frame rail at the top of the carriage members. **Figure 3**.
4. Install capscrews (7) into the supporting frame. **Figure 2** and **Figure 4**.
5. Install washer (12) and jam nut (10) assembly at four places on the ends of hold down straps (9) to secure the tank.
6. Connect the fuel level sender through the inspection hole inside the coach.
7. Being careful to properly route them through the frame rails, install all fuel lines in a manner to avoid chafing. See **Figure 6** for detailed routing.
8. Route overflow tube into support member as shown in **Figure 5**.

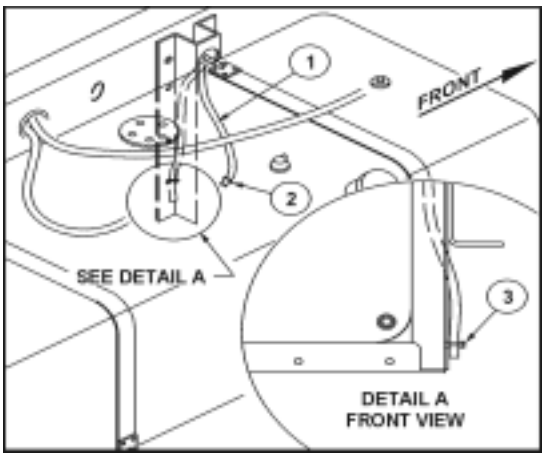

Figure 5—Side Mount Tank Hose Assemblies

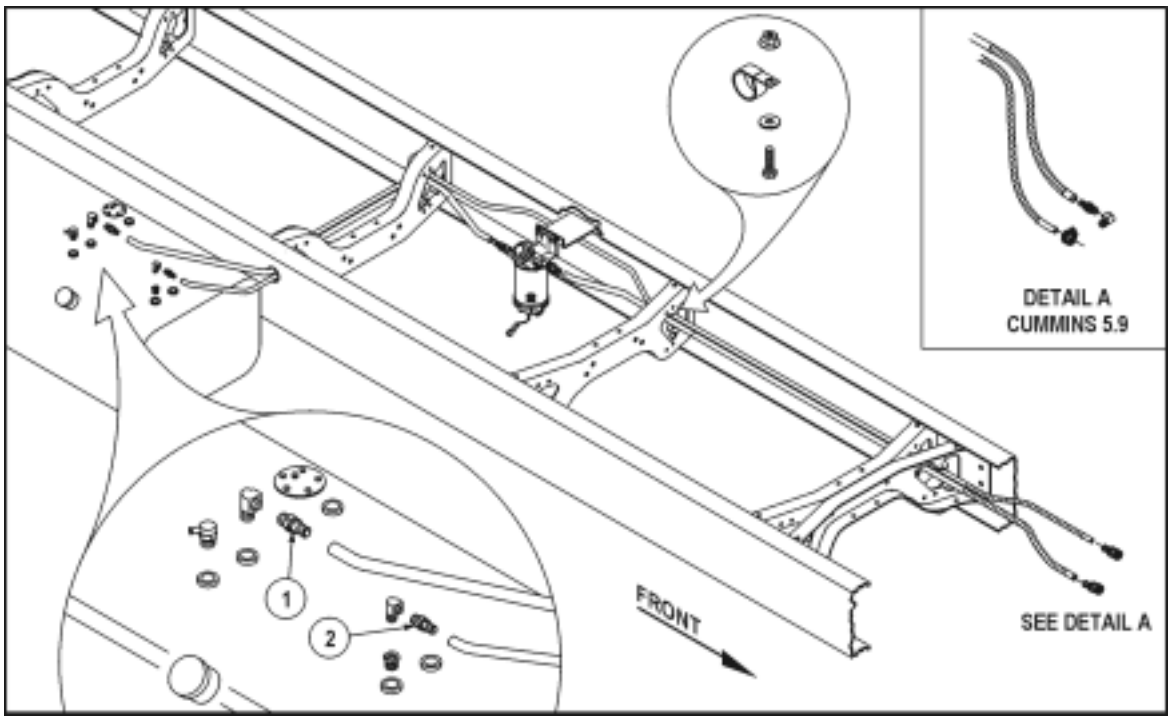

Figure 6—Tank Connections and Hose Routing

Mid-Mount Tanks

Removal of Filler Tube

Warning

The filler tube cannot be repaired; it must be replaced if it is damaged.

To remove the filler tube/vent tube assembly for replacement, or to facilitate the removal of the fuel tank:

1. Remove screws (36) and washers (39) from the underbody, filler neck cover. **Figure 12**.
2. The filler tube and vent hose will now lift up and out of the positioning slot in the body (49).

Removal of Mid-Mount Tank

Warning

Diesel fuel is toxic, flammable and an irritant to skin, eyes and lungs. Always use appropriate protective gear, including eye protection and gloves, when working with this material. Work only in well ventilated areas, away from sparks, heat and open flames.

Drain the fuel tank of all fuel, using the drain plug fitted in the bottom of the tank. Remove the filler tube and vent assembly as outlined in the steps provided in "Removal of Filler Tube".

Warning

Capture, store and dispose of diesel fuel in accordance with all applicable local, state and federal laws.

1. Remove the wiring from the fuel level sender through the inspection plate hole located inside the coach.

Warning

The fuel tank assembly must be supported with a suitable cradle before continuing.

2. Support the fuel tank on a wheeled jack, fitted with a suitable cradle made for this purpose.
3. Remove nuts (25), washers (24) and capscrews (23) from four places at each end of the fuel tank support assembly. **Figure 7** and **Figure 8**.
4. Remove nuts (22), washers (21) and capscrews (20) from two places at each end of support brackets (7). **Figure 7** and **Figure 9**.
5. Carefully lower the fuel tank, just enough to be able to remove the hose clamps. See Steps 6 and 7 below.

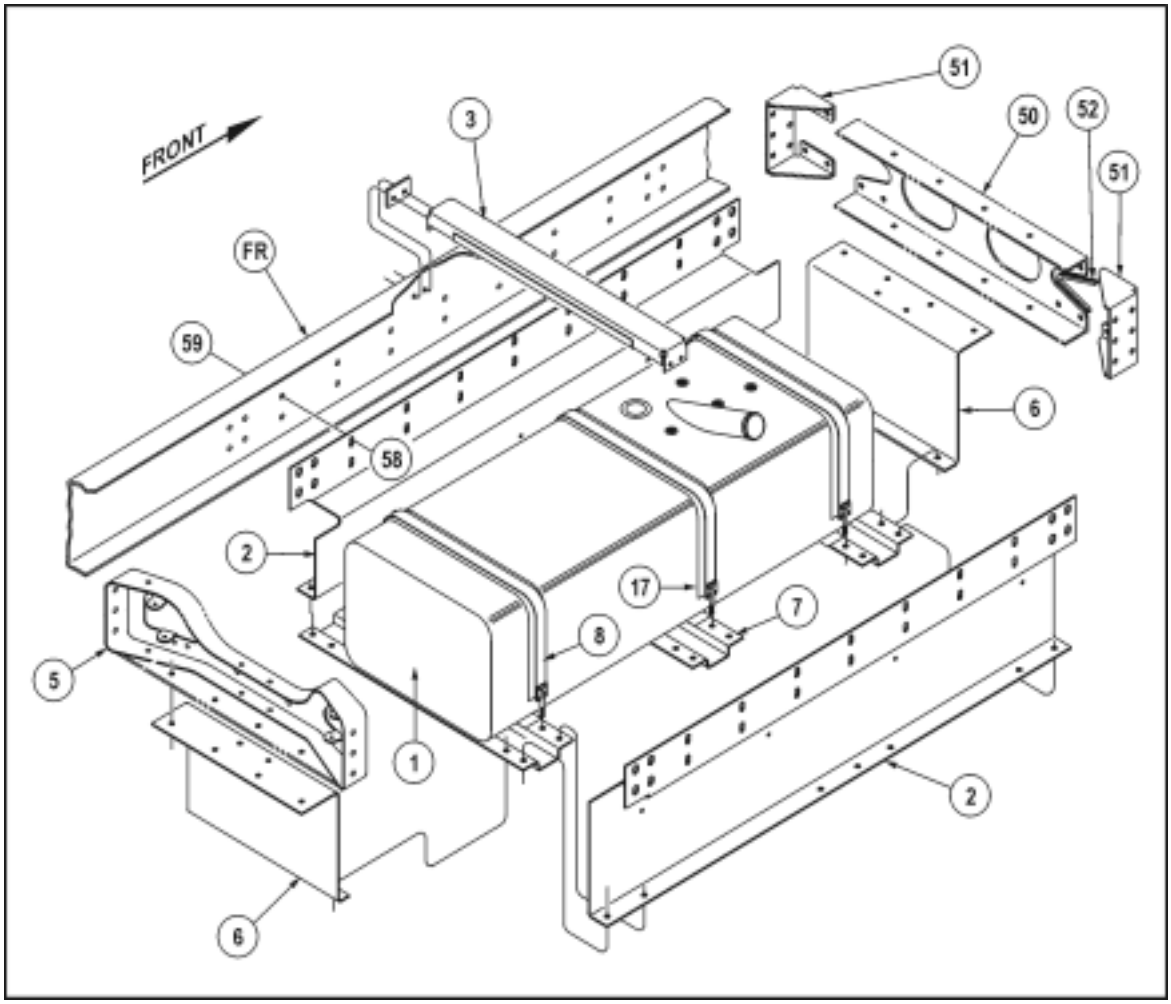

Figure 7—Mid-Mount Tank Brackets

Note

There is a loop of approximately 18 inches (45.72 cm) in the fuel supply hoses on top of the tank to allow for removal. The filler tube and vent hose will slip over the frame rail as needed.

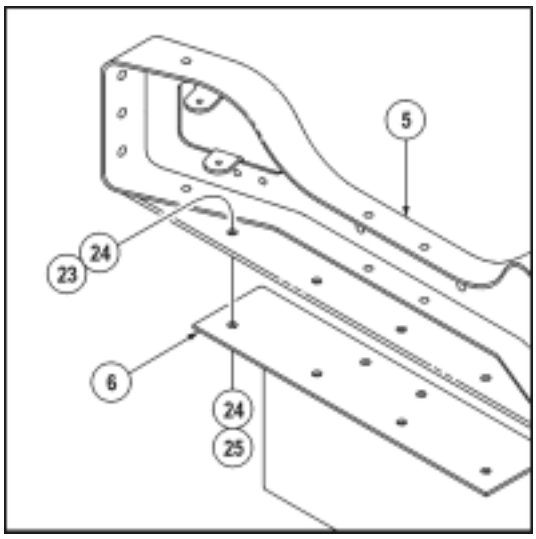

Figure 8—Mid-Mount Bracket

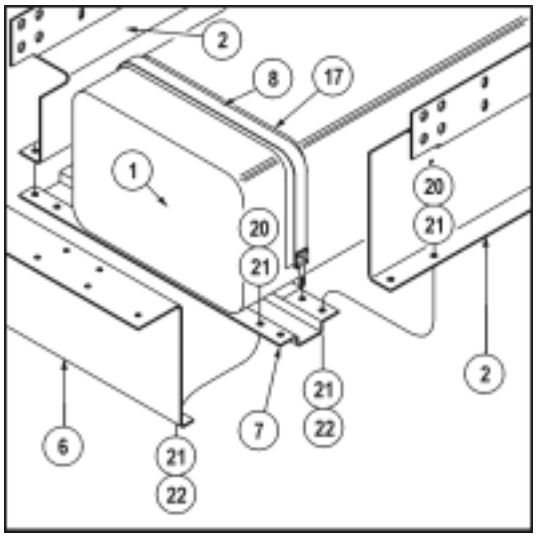

Figure 9—Mid-Mount Strap Assemblies

6. Remove hose clamp (64) from the fuel tank end of vent hose (63). **Figure 12.**
7. Remove the constant tension hose clamp (27) from the fuel tank end of the filler hose (29). **Figure 12**.
8. Remove the filler tube/vent hose assembly over the frame rail.
9. Cap the filler spout on the fuel tank to prevent contamination.

Note

It is now possible to lower the fuel tank assembly a little more to facilitate the removal of the supply line fittings.

Fuel Supply and Return Line Removal

The small lines that supply fuel to the engine and return excess fuel are mounted on swivel-type, flared fittings to allow for disassembly and installation.

1. Using an open end or tubing wrench, loosen and remove the return line fitting (3) from the 90° fitting (4) on the fuel tank. **Figure 13**. Do not remove the hose from the swivel connector unless the hose must be replaced.
2. Using an open end or tubing wrench, remove the supply line swivel fitting (8) from the 90° fitting (7) on the fuel tank. Do not remove the supply hose from the swivel fitting unless the hose is to be replaced.
3. Carefully lower the fuel tank assembly and remove from the chassis. The vent tubes on 90° fittings (6) can remain in place. However, if they are damaged, they must be replaced prior to reinstalling the fuel tank.

Installation of Filler Tube

Filler tube installation is accomplished in the reverse order of the removal instructions above.

1. Install the filler tube/vent tube assembly into the holding slot behind the fuel cap/filler tube door.

Note

Install filler tube at the fuel tank with a minimum of 1½ inches (3.81 cm) overlap.

Install hose clamps with the worm gear to the front and the nut/slot vertically upward.

2. Install the filler tube (29) on the fuel tank and tighten the constant tension hose clamp (27) to 45 in-lbs. (5.08 Nm). **Figure 12**.
3. Install the vent hose (63) on the 90° fitting (6). **Figure 12**. Tighten hose clamp (64) to 45 in-lbs. (5.08 Nm).
4. Install washer (39) and screws (36) to install the underbody filler neck cover. Torque to proper values as listed in the required torque tables in Section 005—Introduction of this manual.
5. Complete installation of the fuel tank. See instructions below under "Installation of Mid-Mount Tank".

Assemble a New Tank

The fuel tank must be supported by a jack of sufficient strength, fitted with an appropriate cradle made for this purpose.

1. Place the new tank on the support rails (7). **Figure 7**.
2. Install hold down straps (8). Leave them loose enough to reposition during installation.

Warning

Protective webbing must be installed under the hold down straps and under the new fuel tank. There should be no metal-to-metal contact.

3. Install overflow fitting (6) in two places. **Figure 13**. Tighten the fittings finger tight, apply Perma-Lok™ LH-150 (or equivalent) thread sealant around the thread, and then tighten two turns with an appropriate wrench. Be sure to orient the barb toward the nearest edge of the fuel tank, in the direction the filler tube runs.
4. Install 18-20 inch rubber tubing to direct fuel overflow past the frame rail.
5. Install return line 90° fitting (4) finger tight into the fuel tank at the appropriate opening. **Figure 13**. Apply a bead of Perma Lok™ LH-150 (or equivalent) thread sealant, and then tighten two turns with an appropriate wrench. Be sure to orient the flange thread toward the outboard side of the tank, in the direction the filler tube runs.
6. Install the supply line 90° fitting (7) finger tight into the fuel tank at the appropriate opening. **Figure 13**. Apply a bead of Perma Lok™ LH-150 (or equivalent) thread sealant, and then tighten two turns with an appropriate wrench. Be sure to orient the flange thread in the outboard position, as with the return line fitting.
7. Install the 45° elbow vent fitting (2) finger tight into the proper opening. **Figure 13**. Apply a bead of Perma Lok™ LH-150 (or equivalent) thread sealant, and then tighten two turns with an appropriate wrench. Be sure to orient the flange fitting in the same direction as the filler tube.
8. Install tubing adapter (1) into 45° vent hose fitting, finger tight. Apply a bead of Perma-Lok™ LH 150 thread sealant, and then tighten 1½ flats.

Installation of Mid-Mount Fuel Tank

Caution

Install all fasteners, with threaded end away from the fuel tank and components.

1. Install hold down straps (8), leaving the center member loose enough to adjust its position during installation into the frame rails. **Figure 9** and **Figure 10**.
2. Install tank support bracket (6) at each end of the fuel tank. **Figure 7**, **Figure 8** and **Figure 9**. Torque all fasteners to the value specified in the torque requirements table located in Section 005—Introduction of this manual. (Do

not torque the mounting straps on the center cross member at this time.)

3. Raise the fuel tank assembly enough to connect the supply and return hoses.
4. Using an open end or tubing wrench, install the supply line swivel connector (8) to 90° fitting (7). **Figure 13**. Tighten the swivel fittings finger tight, and then tighten 1½ flats.

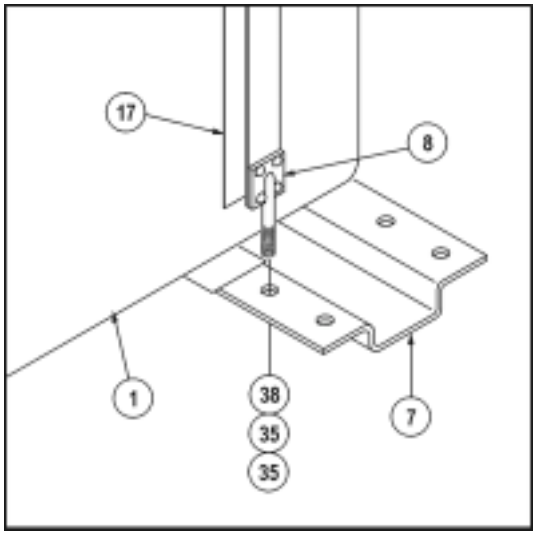

Figure 10—Mid-Mount Tank and Strap Assemblies

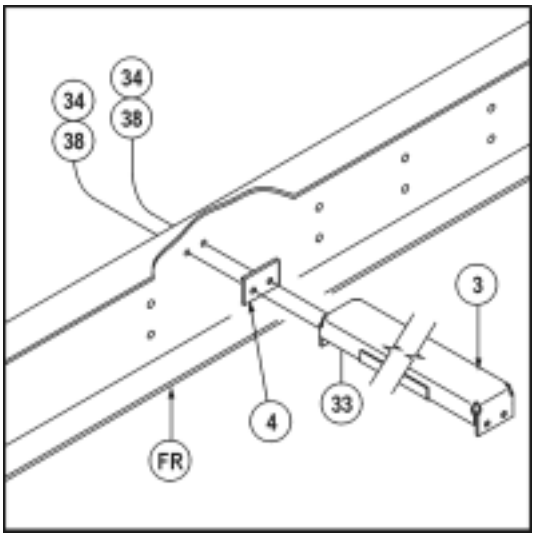

Figure 11—Mid-Mount Tank and Bracket Assemblies

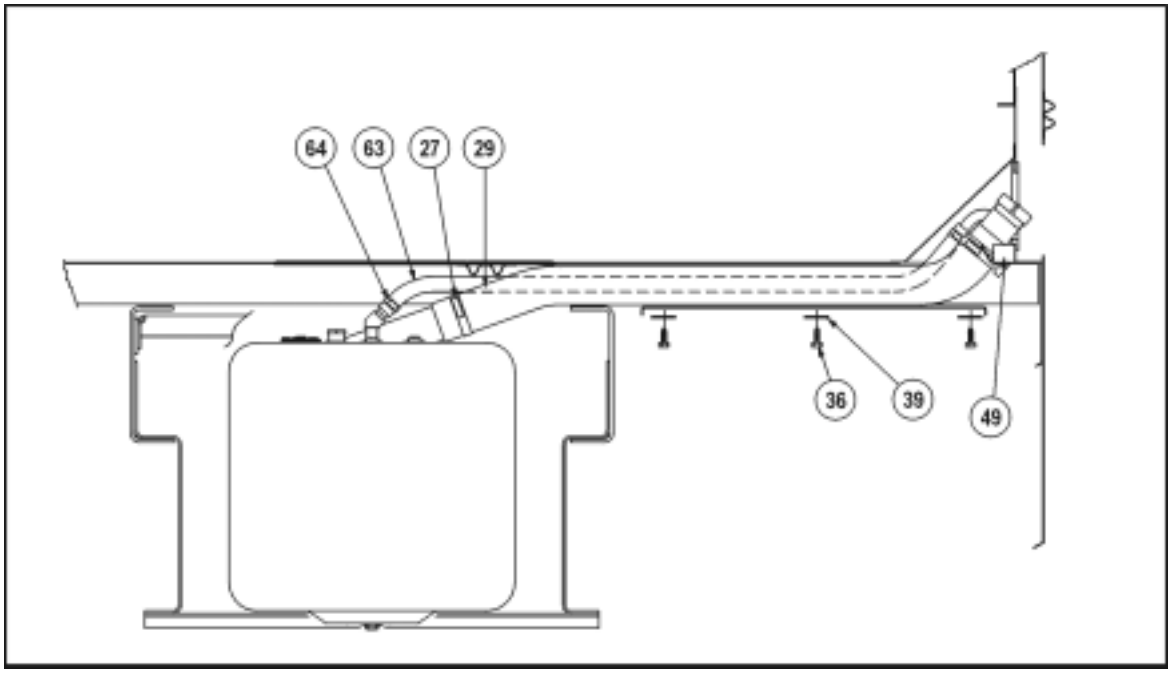

Figure 12—Mid-Mount Position of Fuel Fill Line and Tank

5. Using an open end or tubing wrench, install the return line swivel connector (3) to the 90° fitting (4). **Figure 13**. Tighten the swivel connector finger tight, and then tighten 1½ flats.
6. Continue to raise the fuel tank assembly to the point where you can install the filler tube (29) and vent hose (63), using the constant tension clamp (27) and the hose clamp (64). **Figure 12**.
7. Observe that the overflow tubes connected to fittings (6) are draped over the near side of the fuel tank (away from the exhaust system) and that they extend below the tank.
8. Lift the fuel tank assembly fully into place.
9. Install capscrew (23), washers (24) and nut (25) in four places at each holding bracket, at the ends of the fuel tank. **Figure 8**. Torque to specifications found in the Section 005—Introduction of this manual.
10. Install bolt (22), washers (21) and nut (22) in two places at each end of each cross member. **Figure 9**. There are a total of 12 places. Torque to specifications indicated in the Introduction section of this manual.
11. Torque the center hold-down strap to specifications and apply the jam nut.

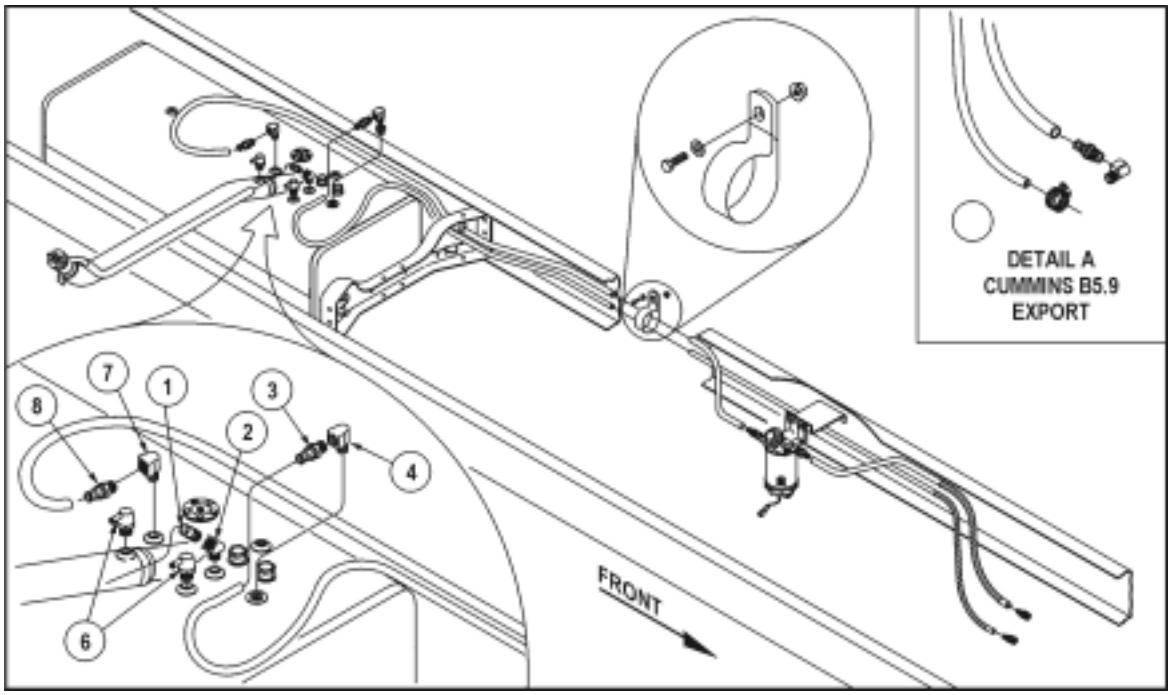

Figure 13—Tank Fittings and Hoses

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