

## SST Fuel Tank Maintenance and Repair

### Introduction:

This document has been made for general information in regards to the maintenance and repair of the New Flyer Stainless steel fuel tank design. It has been modified to suit the WMATA buses that use this design. Always use the New Flyer published service manual section 7: Fuel system in addition to this document.

### WARNING!

**Diesel fuel is flammable. Exercise extreme caution when performing any maintenance or repair work. Always work in a well ventilated area.**

### Removal

Refer to Section 7 of your New Flyer Service Manual for fuel tank removal procedure.

### Disassembly

1. Remove the Level Control Valve, Pressure Relief Valve, and Fuel Sending Unit from the tank. Refer to Section 7 of your New Flyer Service Manual for fuel tank component removal procedures.
2. Remove all fittings, including the fuel tank pickup tube.
3. Remove the fuel tank straps by removing the lock nut from the T-bolts.
4. Remove the three fuel tank straps from the tank.
5. Mark the position of the fuel tank relative to the support structure.

### CAUTION

**The fuel tank weighs approximately 220 lbs. (100 kg). ALWAYS use appropriate lifting equipment or the assistance of additional personnel when lifting or moving the fuel tank.**

6. Use appropriate lifting equipment or the assistance of additional personnel to remove the fuel tank from the support structure.

### Cleaning & Inspection

1. Plug all openings and clean the exterior of the tank by pressure washing to remove any debris, dirt or grime.
2. Remove protective plugs and inspect machined mounting surfaces for evidence of nicks, dents, or scoring.
3. Inspect all threaded holes for damage or corrosion.
4. Inspect pickup tube assembly for kinks, dents, or any other restrictions. Replace pickup tube and fitting as an assembly if damaged.
5. Inspect overall exterior surface of tank for dents, gouges, punctures or other damage. Refer to "Tank Repairs" for corrective action.
6. Inspect welds for cracks at seams. Refer to "Tank Repairs" for corrective action.
7. Inspect exterior surface of tank for missing protective coating, bare metal, or corrosion. Re-protect surfaces as required. Refer to "Tank Repairs" for corrective action.

## SST Fuel Tank Maintenance and Repair

8. Use a bright light and inspect through the openings to assess the condition of the interior of the tank. If sediment is evident or if the tank was removed due to contamination, then the tank will need to be flushed. Refer to "Tank Flushing" in this section for corrective action.
9. Inspect the tank mounting hardware and support structure for damage. Repair or replace components as necessary.
10. Inspect the neoprene liners on the support structure and underside of tank straps. Replace any worn or damaged strips of neoprene. Refer to "Tank Repairs" for replacement procedure.

### Tank Flushing

**CAUTION:**

**Fuel tanks should be sent out to a radiator shop to be properly cleaned by soaking in a hot caustic solution. If this option is not available, then the tank can be washed and flushed using the following procedure.**

1. Clean and flush the fuel tank by pressure washing or steam cleaning. Direct the wand into each compartment at the base of the baffles where most sediment would tend to collect.
2. Invert the position of the tank and repeat the cleaning process to remove any trapped sediment or contaminants.
3. Flush the tank with clear hot water to remove any cleaning detergent residue.
4. Use compressed air to thoroughly dry the interior of the tank. Allow the tank to thoroughly dry before reassembling.

### Weld Repairs

**NOTE:**

*Weld repairs of holes are permissible only if the hole is less than 3/16" diameter. Consult New Flyer Customer Service before attempting any hole repairs of 3/16" diameter or greater.*

**Perform weld repair of small holes as follows:**

1. Clean and flush fuel tank. Refer to "Tank Flushing".
2. Use a wire brush to clean damaged area down to bare metal. Clean surrounding surface to a diameter of approximately six inches.
3. Plug weld the hole using the TIG weld method with 308 stainless filler rod and 100% argon gas. Weld in accordance with GTAW AWS D1.6.
4. Grind the weld flush using 120 grit grinding disc.
5. Reinforce the weld repair site by placing a 14 gauge, 304 stainless steel patch of approximately 0.75 inch diameter over the plug weld site. Weld the patch all around using TIG weld method with 308 stainless filler rod and 100% argon gas. Weld in accordance with GTAW AWS D1.6.
6. Apply Loctite 290 weld sealant to welded area in accordance with manufacturer's instructions.
7. Allow weld repair site to cool to room temperature and then apply PPG Corashield protective coating. Apply Corashield P7972 by brush in accordance with manufacturer's instructions.
8. Allow coating to air dry at room temperature. Do not expose the repaired area to freezing temperatures within 24 hours of application.

## SST Fuel Tank Maintenance and Repair

9. Perform fuel tank leak test before reinstalling the tank in the vehicle. Pressure test the tank as follows:
  - a. Reassemble fuel tank components and fittings. Refer to "Assembly" for procedure.
  - b. Temporarily attach fuel filler hose and fuel filler adapter to tank.
  - c. Perform leak test. Refer to Section 7 of your New Flyer Service Manual for test procedure.

### Perform weld repair of small cracks as follows:

1. Clean and flush fuel tank. Refer to "Tank Flushing".
2. Use a wire brush to clean damaged area down to bare metal.
3. Weld the crack using the TIG weld method with 308 stainless filler rod and 100% argon gas. Weld in accordance with GTAW AWS D1.6.
4. Apply Loctite 290 weld sealant to welded area in accordance with manufacturer's instructions.
5. Allow weld repair site to cool to room temperature and then apply PPG Corashield protective coating. Apply Corashield P7972 by brush in accordance with manufacturer's instructions.
6. Allow coating to air dry at room temperature. Do not expose the repaired area to freezing temperatures within 24 hours of application.
7. Perform fuel tank leak test before reinstalling the tank in the vehicle. Pressure test the tank as follows:
  - a. Reassemble fuel tank components and fittings. Refer to "Assembly" for procedure.
  - b. Temporarily attach fuel filler hose and fuel filler adapter to tank.
  - c. Perform leak test. Refer to Section 7 of your New Flyer Service Manual for test procedure.

### Protective Coating Repairs

1. Use a wire brush to clean the area with missing coating down to bare metal. Feather the surrounding surface to blend with the uncoated area.
2. Apply PPG Corashield P7972 protective coating by brush in accordance with manufacturer's instructions.
3. Allow coating to air dry at room temperature. Do not expose the repaired area to freezing temperature within 24 hours of application.

### Thread Repairs

Threads can be repaired only if damage is confined to the crest of the thread form and less than 10% of the thread engagement area is affected. Use a thread chaser or tap to restore the thread profile.

### Neoprene Liner Replacement

1. Use a sharp scraper to remove the majority of the neoprene material.
2. Use a wire brush to clean the surface down to bare metal.
3. Obtain the proper sized neoprene liner. Refer to your New Flyer Parts Manual for liner requirements.
4. Follow the manufacturer's instructions and apply Sika 4300 adhesive to one side of the neoprene liner.
5. Apply the neoprene liner to the fuel tank, fuel tank tab, or tank strap as required.

## SST Fuel Tank Maintenance and Repair

### Assembly

1. Apply Loctite 567 thread sealant and install all fittings, including the drain plug and fuel pickup tube assembly. Tighten pipe thread fittings finger tight, then two additional turns.

#### CAUTION

**The fuel tank weighs approximately 220 lbs. (100 kg). ALWAYS use appropriate lifting equipment or the assistance of additional personnel when lifting or moving the fuel tank.**

2. Use appropriate lifting equipment or the assistance of additional personnel to place the fuel tank into the support structure.
3. Install the three fuel tank straps and tighten the lock nuts at each tank strap evenly, side to side, so that there is equal thread protruding from each T-bolt.
4. Install the Level Control Valve, Pressure Relief Valve, and Fuel Sending Unit from the tank. Refer to Section 7 of your New Flyer Service Manual for fuel tank component installation procedures.

### Installation

1. Installation is the reverse of removal.
2. Torque fuel tank support to vehicle structure mounting fasteners (3/8" x 12) to 30 to 35 ft-lbs. (41 to 47 Nm).
3. Torque crossover tube hose clamps to 90 to 125 in-lbs. (10 to 14 Nm).
4. Apply Never-Seez and torque fuel fill adapter to 75 to 85 in-lbs. (8 to 10 Nm)

**NEW FLYER**

## Description

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### 2. FUEL SYSTEM

#### 2.1. Description

The fuel system includes the fuel tank, a primary fuel filter, a secondary fuel filter, lift pump, fuel pump, fuel manifold, and fuel lines.

The fuel tank is mounted in the vehicle chassis, forward of the rear wheels. Supply and return fuel lines run between the tank and the engine at the rear of the vehicle. Engine-mounted fuel components include a lift pump, main fuel pump and the injection system. Refer to the OEM Engine Maintenance Manual for further information on the engine fuel system.

#### 2.2. Operation

On engine start-up the lift pump draws fuel from the fuel tank, through a primary fuel filter. The low pressure side of the fuel pump discharges fuel through the fuel manifold, the secondary fuel filter and to the inlet of the high pressure fuel pump. High pressure fuel is delivered through a common fuel rail to the fuel injectors. Surplus fuel returns to the fuel tank through a return line.



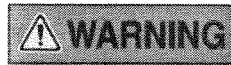
## 2.3. Fuel Tank

### 2.3.1. Description

A single fuel tank is mounted transversely in the vehicle chassis, forward of the rear axle. A fuel filler neck assembly is bolted to the tank and provides mounting locations for the fuel filler adapter, pressure relief valve, and fuel level control valve. Fuel tank fill access is provided through a hinged door on the curbside of the vehicle. Supply and return fuel hoses connect the fuel tank with the engine. The fuel tank is equipped with the following components:

- Pressure Relief Valve
- Fuel Level Control Valve
- Whistle Valve
- Fuel Level Sending Unit

### 2.3.2. Removal



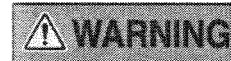
**Diesel fuel is flammable. Keep open flames and sparks away from work area. Work in a well ventilated area. Wear proper eye protection and protective clothing.**

1. Set the Battery Disconnect switch to the OFF position.
2. Remove the fuel filler adapter from the fill tube and remove adapter through the fuel filler access door. Plug the filler tube to prevent debris from entering. See "Fig. 7-1: Fuel Tank Installation" on page 4.
3. Disconnect the pressure relief vent hose and tie it away from the fuel tank.
4. Raise the vehicle. Refer to the General Information Section of this manual for lifting procedures.
5. Remove the drain plug from the bottom of the fuel tank and drain the fuel into a clean container. Temporarily plug the drain port to prevent contamination.

### NOTE:

*The fuel tank capacity is 125 U.S. gal.*

6. Disconnect the fuel supply and return lines from the fuel tank and tie them away from the fuel tank. Plug all fuel lines to prevent contamination.
7. Disconnect the fuel tank ground cable from the vehicle structure.



**Use proper lifting equipment and procedures when removing the fuel tank. The fuel tank weighs approximately 255 lbs and the center support frame weighs approximately 60 lbs.**

8. Position a lift table or similar lifting device beneath the fuel tank center support frame. Arrange wood blocks on the lift so that the weight of the center support frame is taken by the lift.
9. Remove the fasteners holding the center support frame, lower the frame and move away from the vehicle.

### NOTE:

*Record quantity and position of any shims installed between support frame and vehicle structure. Retain shims for reassembly.*

10. Reposition the lift under the fuel tank. Place wooden blocks under the streetside and curbside tank support channels so that the weight of the fuel tank is evenly distributed and taken by the lifting equipment.
11. Check that the fuel tank is properly supported, and then remove the fasteners holding the streetside and curbside supports.
12. Carefully lower the fuel tank and move it to a clean work area.

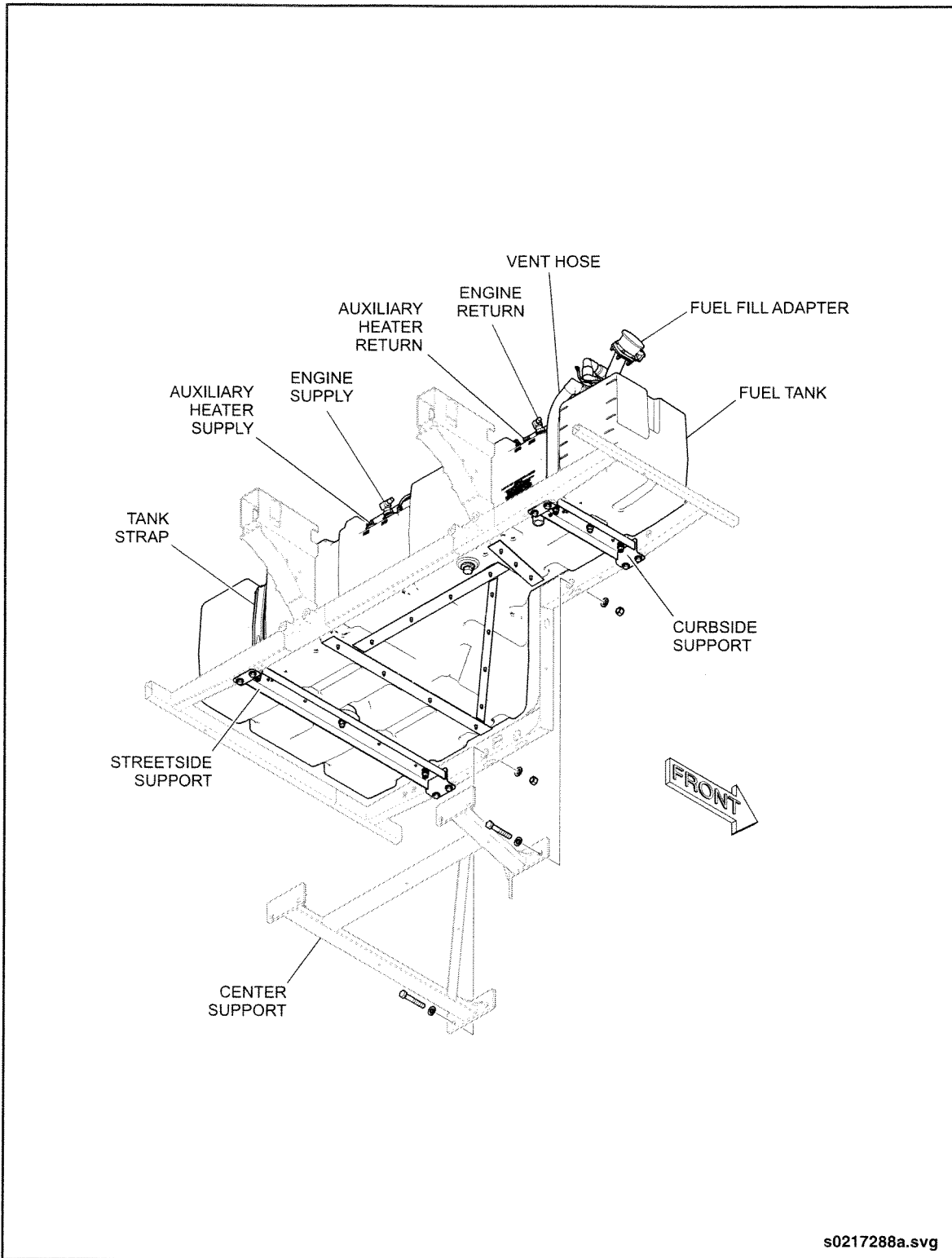


Fig. 7-1: Fuel Tank Installation







## Fuel Tank

### 2.3.4. Cleaning & Inspection

1. Inspect fuel tank for dents, cracks, corrosion, or other damage.
2. Clean all threaded fittings and ports of any thread sealant or thread locking residue.
3. Inspect all fittings and ports for thread damage.
4. Inspect filler neck welded joint at mounting plate for cracks.
5. Inspect all mounting flanges and sealing surfaces for flatness, scoring, corrosion, or other damage.
6. Inspect all neoprene isolator strips located on the side and center support channels and tank straps. Replace damaged or worn neoprene strips using 3M Fastbond 30H adhesive.
7. Inspect interior of tank for rust particles, sludge, water, or microbial growth. Clean and flush tank as required.

### 2.3.5. Assembly

1. Install drain plug using Loctite 567 thread sealant.
2. Install filler neck assembly onto tank with new gasket. Apply Loctite 222 to eight mounting bolts and tighten.
3. Install fuel tank mounted components.

 **NOTE:**

Refer to specific replacement instructions in this section for information on replacing fuel tank mounted components.

 **NOTE:**

Perform a fuel tank pressure test if any components were replaced or repairs

undertaken. Refer to 2.7. "Fuel System Leak Test" on page 14 in this section for test procedure.

4. Position streetside and curbside support channels on underside of fuel tank at locations marked during disassembly. Ensure neoprene isolator strips are in good condition and properly bonded to the support channels.
5. Attach the tank straps to the fuel tank support channels using T-bolt, washer stack, and lock nut. Ensure the washer stack is assembled in the correct pattern. See "Fig. 7-3: Washer Stack Assembly" on page 6.
6. Tighten nuts until the washer stack is fully compressed.

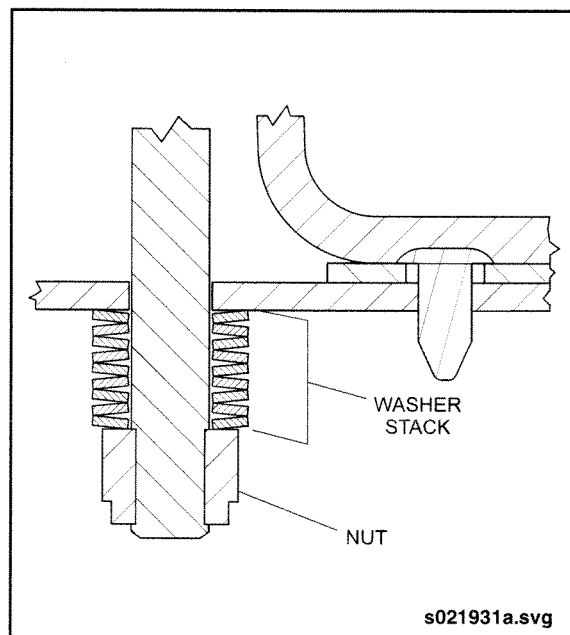


Fig. 7-3: Washer Stack Assembly

**2.3.6. Installation**

1. Raise fuel tank into position, aligning streetside and curbside support channels with threaded mounting holes in vehicle structure.
2. Secure support channels to vehicle structure by applying Loctite 272 thread locker to mounting bolts and installing with washers. Torque bolts 82 to 90 ft-lbs (111 to 122 Nm).
3. Use lifting equipment to raise the center support frame into position. Ensure that the neoprene isolator strips are in good condition and properly bonded to the underside of the support frame.
4. Replace shims, if applicable, in quantity and locations noted during removal. Do not exceed two shims per location.
5. Secure center support frame to vehicle structure using original fasteners. Torque fasteners 155 to 175 ft-lbs. (210 to 237 Nm).
6. Connect fuel supply and return lines to tank.
7. Connect vent hose to pressure relief valve.
8. Connect the fuel tank ground cable to the vehicle structure.
9. Attach pressure-fill adapter to fuel filler pipe using a new gasket. Torque fasteners 75 to 85 in-lbs.
10. Fill the fuel tank.
11. Set the Battery Disconnect switch to the ON position.
12. Purge the fuel system, start the vehicle, and check for leaks.

**2.3.7. Anti-Spill System**

The fuel tank has a Emco anti-spill filler system. The system prevents the fuel from spilling during fuel filling. The Emco system allows for fast pressure filling.

The anti-spill system is mounted on the fuel tank. It consists of a filler neck adapter, level control valve, a whistle valve, and a pressure relief valve.

The fueling nozzle is mechanically locked to the filler neck adapter during fueling, but is easily removed when the tank has been filled to 95% of its maximum capacity.

**NOTE:**

*To engage or disengage the nozzle from the adapter, rotate the nozzle approximately 30° clockwise to engage and counter-clockwise to disengage.*

A whistle valve, attached to the level control valve, emits a whistle sound when the tank is being filled. The whistling sound continues until the level control valve automatically shuts off the whistle valve.

When the fuel level approaches 95% of the tank capacity, the level control valve shuts off the air vent and whistle valve, allowing a slight pressure build-up in the tank. This results in back pressure on the trip mechanism in the nozzle, causing the nozzle to shut off the fuel flow.

**NOTE:**

*The shut-off pressure is approximately 0.7 to 1.1 psi.*

The pressure relief valve functions if the nozzle fails to shut off and fuel continues to fill the tank. When the pressure reaches 3.1 to 3.3 psi in the tank, it causes a spring-loaded poppet in the pressure relief valve to lift off its seat. This allows pressure and fuel to escape via a fuel discharge hose.

Once the flow is shut off, the operator pulls the disconnect handle on the side of the nozzle, thereby activating the pressure relief valve. The pressure relief valve vents the pressure build up in the tank to the atmosphere.

**NOTE:**

*The pressure relief valve activates at 3.1 psi.*

When the venting "hiss" has stopped, the operator keeps the disconnect handle pulled out and rotates the nozzle to disengage it from the adapter.



## Fuel Tank

### 2.3.8. Level Control Valve Replacement

1. Unscrew the whistle valve from the level control valve.
2. Remove screws securing the control valve to the fuel tank. Disconnect the overflow hose and remove from the level control valve. Remove control valve and gasket.
3. Clean mounting surface of the control valve.
4. Position a new gasket and control valve on the fuel tank, install mounting screws to tighten them. Connect overflow hose to control valve.

**NOTE:**

*DO NOT exceed 10 to 15 in-lb. (1.1 to 1.7 Nm) torque when installing gasket mounting screws. DO NOT use power tools to install these screws.*

5. Clean the whistle valve in a suitable solvent. Replace the internal spring in the valve if necessary. Make sure to place the seal, float, and ball in proper positions. See "Fig. 7-4: Level Control Valve" on page 8.
6. Install whistle valve by screwing it into control valve and tightening it securely.

### 2.3.9. Pressure Relief Valve Replacement

1. Disconnect hose and remove from relief valve.
2. Remove screws securing the pressure relief valve to the fuel tank.
3. Remove the relief valve and its gasket from the fuel tank.
4. Clean mounting surface of the relief valve.
5. Position a new gasket and relief valve on the fuel tank, install mounting screws and tighten.

**NOTE:**

*DO NOT exceed 10 to 15 in-lb. (1.1 to 1.7 Nm) torque when installing gasket mounting screws. DO NOT use power tools to install these screws.*

6. Connect hose to relief valve.

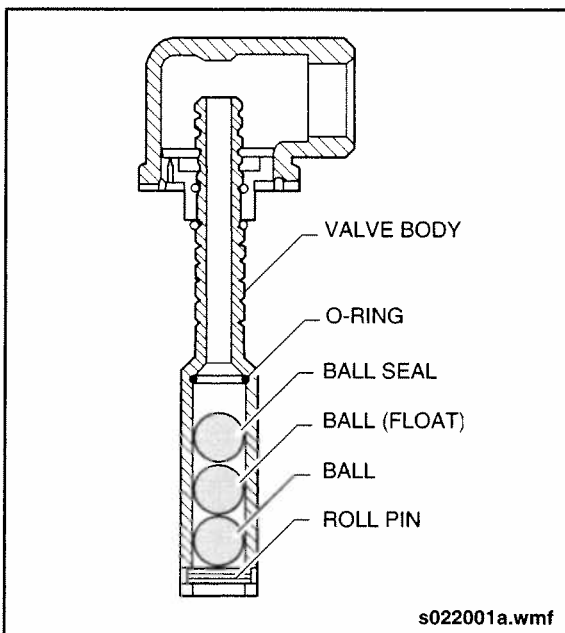


Fig. 7-4: Level Control Valve