**NOTE:** *Engine repair information is not contained within this Service Manual. For engine repair, refer to appropriate engine service manual as follows:*

*84202702 - For 6-Cylinder 6.7L NEF Engine*

# BOOK 1 - 84258779

# Section 1000

## STANDARD TORQUE

September, 2009

# PRECAUTIONARY STATEMENTS

## PERSONAL SAFETY

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

Throughout this manual and on machine decals, you will find signal words **DANGER**, **WARNING**, and **CAUTION** followed by specific instructions. These precautions are intended for the personal safety of you and those working with you. Please take the time to read them.

**⚠ DANGER ⚠**

**DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury. The color associated with Danger is RED.**

M1169A

**⚠ WARNING ⚠**

**WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. The color associated with Warning is ORANGE.**

M1170A

**⚠ CAUTION ⚠**

**CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. The color associated with Caution is YELLOW.**

M1171A

**FAILURE TO FOLLOW DANGER, WARNING, AND CAUTION INSTRUCTIONS COULD RESULT IN DEATH OR SERIOUS INJURY.**

## MACHINE SAFETY AND INFORMATION

**NOTICE** is used to address practices not related to personal injury.

***NOTICE:*** *The signal word* ***NOTICE*** *is used throughout this manual followed by specific instructions. These messages are intended for machine safety, or to identify and present supplementary information.*

ANSI 2535.6-2006
ASAE S441.3 FEB04
ISO 11684: 1995

VERSION - MAY 2009

# MAINTENANCE SCHEDULE

***NOTICE:*** *For torque specifications not listed, see Section 1000 Standard Torque.*

## Recommended Break-In Maintenance

Following the recommended break-in maintenance schedule for a new machine and whenever the component is changed or overhauled. Regularly scheduled maintenance is still required in addition to the break-in maintenance.

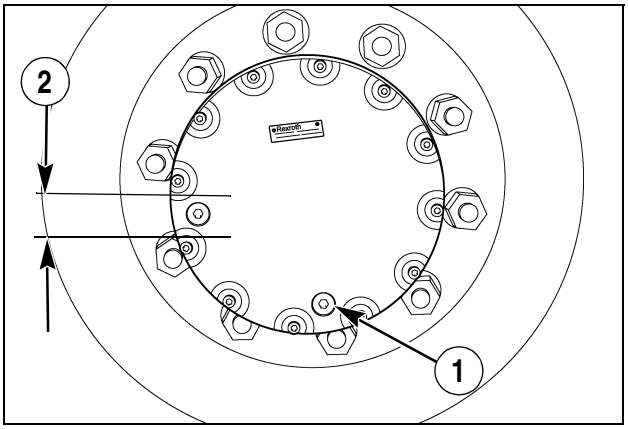
| HOURS | SERVICE POINTS | SERVICE REQUIRED | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | GREASE | DRAIN | CHECK | CLEAN | CHANGE | FILL | TORQUE |
| 8 | Wheel Nuts | | | | | | | x |
| 50 | Hub Lubricant | | | | | x | x | |
| 50 | A/C Compressor Belt | | | x | | | | |
| 50 | Hydraulic Return Filter | | | | | x | | |
| 50 | Charge Pump Filters | | | | | x | | |
| 50 | Battery Cables And Terminals | | | x | | | | |
| 100 | Gear Increaser Lubricant | | | | | x | x | |
| 100 | Engine Oil | | | | | x | x | |
| 100 | Engine Oil Filter | | | | | x | | |
| 100 | Fuel Filter | | | | | x | | |
| 100 | Engine Air Filter | | | x | | x | | |

# Hub Lubricant Level Check

***NOTICE:*** *See capacities in the beginning of this section for hub lubricant type and capacity.*

## STEP 1

Rotate the wheel so the bottom of the check/fill plug (1) is 25 mm (1 in) (2) below the horizontal centerline of the hub. Remove the check/fill plug.




RH09C102

## STEP 2

If the gear lube is at or within 13 mm (0.5 in) of the bottom of the hole, the fluid level is in the correct operating range.

## STEP 3

If the fluid level is more than 13 mm (0.5 in) below the bottom of the hole, add gear lube to bring the level within the operating range.

***NOTICE:*** *Do not overfill the planetary hubs. Overfilling will cause the planetaries to operate at elevated temperatures. Elevated temperatures can cause breakdown of the gear lube resulting in premature wear or failure of the hub.*

## STEP 4

Install the check/fill plug.

# SPECIFICATIONS

## Diesel Engine

| | |
|---|---|
| Model | 3230: Case IH* NEF 667TA/EBY Tier III 164 kW HPCR<br>3330: Case IH* NEF 667TA/EB1 Tier III 186 kW HPCR<br>*Manufactured by Fiat Power Train (FTP) |
| Type | Six Cylinder, Four-Stroke Cycle, Turbocharged, Air-to-Air Aftercooled |
| Firing Order | 1-5-3-6-2-4 |
| Bore | 104 mm (4.0 in) |
| Stroke | 132 mm (5.19 in) |
| Displacement | 6.7 L (409 cu-in) |
| Compression Ratio | 17.1:1 |
| Cylinder Sleeves | Replaceable Wet Type |
| High Engine Idle (without load) | 2266 RPM |
| Rated Engine Speed | 2200 RPM |
| Engine Idle Speed | 900 RPM |

## Engine Lubrication System

| | |
|---|---|
| Oil Type | Case No. 1 |
| Oil Capacity - Without Filter Change | 15 L (16 qt) |
| Oil Capacity - With Filter Change | 16 L (17 qt) |
| Oil Pressure at Idle Speed (Minimum) | 69 kPa (10 PSI) |
| Oil Pressure at High Idle | 276 to 344 kPa (40 to 50 PSI) |
| Type of System | Pressure and Spray |

## Cooling System

| | |
|---|---|
| Coolant Type | Case XHD ASTM D 4546 and ASTM D 5345 |
| Coolant Mix with deionized water | 50-50 |
| System Coolant Capacity | 51 L (13.5 Gal) |

## Fuel System

| | |
|---|---|
| Fuel Injection Pump | BOSCH |
| Fuel Injectors | BOSCH |

## Fuel Tank

| | |
|---|---|
| Fuel Type | ASTM D 975 Grade 2 Diesel Fuel |
| Fuel Tank Capacity | 454 L (120 Gal) |

## Air Intake System

| | |
|---|---|
| Type | Dry Type, Two-Stage Aspirator System with Service Indicator in Instrument Cluster |

## Battery

| | |
|---|---|
| Battery Type: | 12 Volt, Low Maintenance Type Group Size 31 |
| Rating: | 950 CCA at -17°C (0°F) |
| Reserve Capacity: | 170 Minutes |
| Polarity: | Negative Ground |
| Battery quantity | Two |

## Brakes

| | |
|---|---|
| Service Brake | Hydraulic Dry Disc Service Brake on Front Wheels |
| Park Brake | Electronically Controlled, Spring Applied and Pressure Released |

# SPECIAL TORQUE

| | Metric Value | U.S. Value |
|---|---|---|
| Bypass Actuator | 41 Nm | (30 lb ft) |

# SPECIAL TORQUES

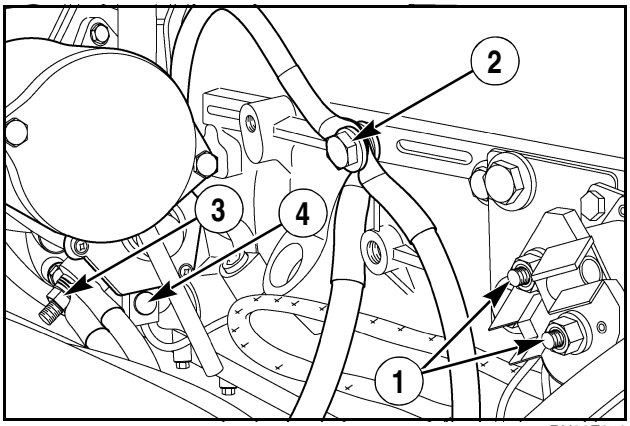
| | Metric Value | U.S. Value |
|---|---|---|
| Motor Mount Bolts | 310 to 380 Nm | (230 to 280 lb ft) |
| Engine Air Tube Clamps | 16 to 18 Nm | (12 to 14 lb ft) |
| Fan Bolts | 9 to 11 Nm | (77 to 93 lb in) |

## STEP 28

Label, then remove wires (1) from starter relay.

Remove bolt to remove ground cables (2) from engine block.

Remove the battery and alternator cables (3) and starter switch power supply wire (4) from the starter solenoid.

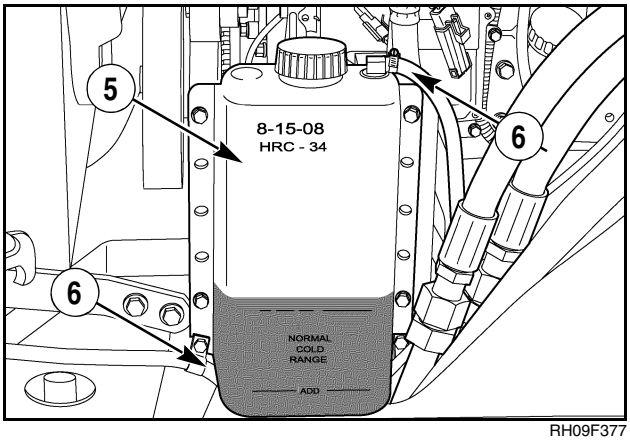


RH09F376

## STEP 29

Remove coolant recovery bottle (5).

Disconnect and plug hoses (6).



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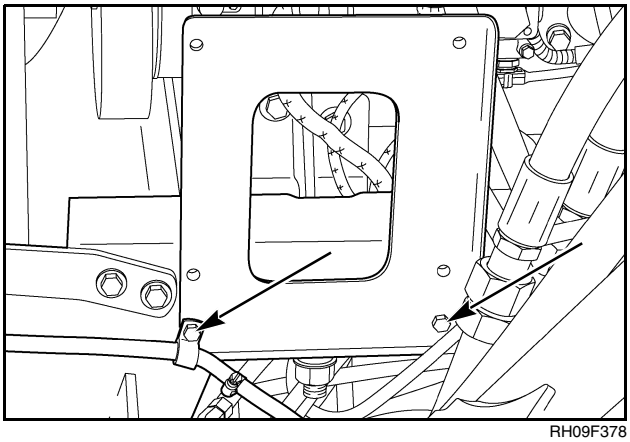
## STEP 30

Remove bolts then remove bracket.

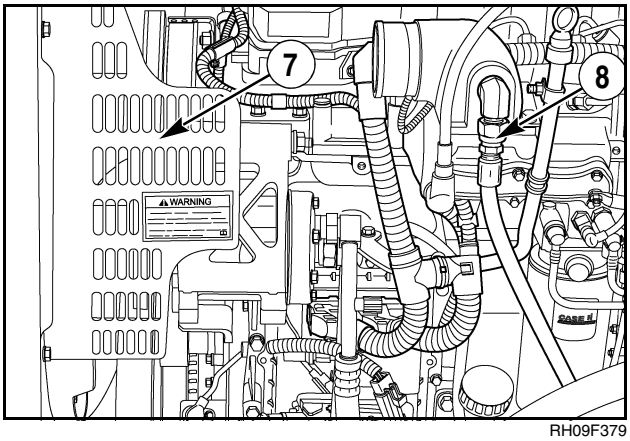

RH09F378

## STEP 31

Remove fan guard (7).

Disconnect hose to air tank from air inlet (8).

***NOTICE:*** *Cap and plug disconnected hose and fitting.*



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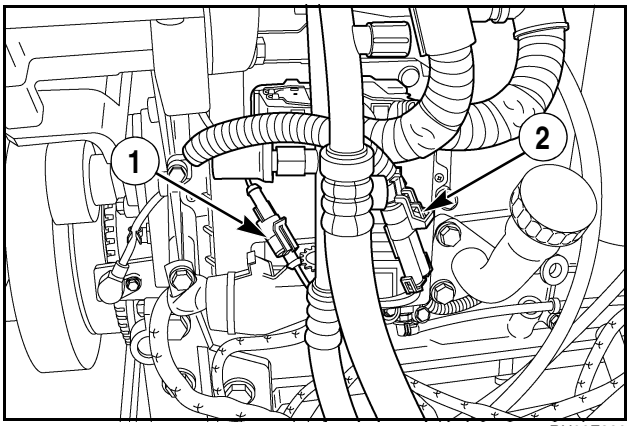
## STEP 14

Plug in A/C compressor clutch (1) connector an A/C high pressure switch (2) to harness.

.

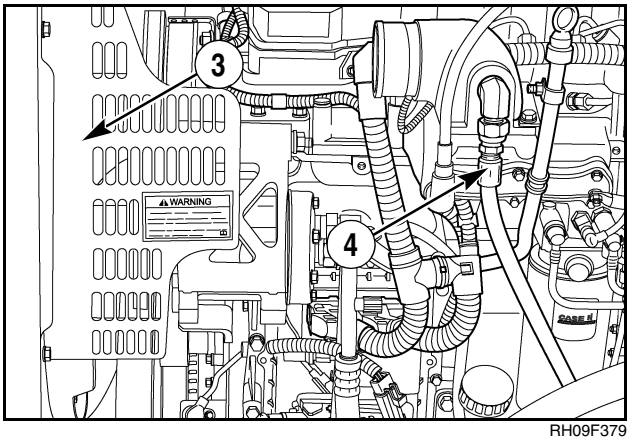


RH09F399

## STEP 15

Install fan guard (3).

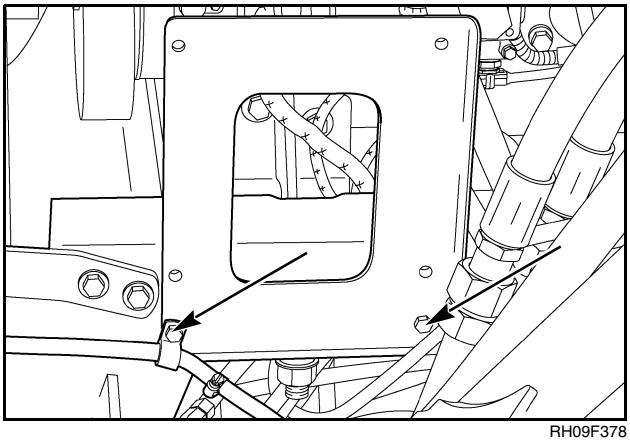
Connect hose to air inlet from air tank (4).



RH09F379

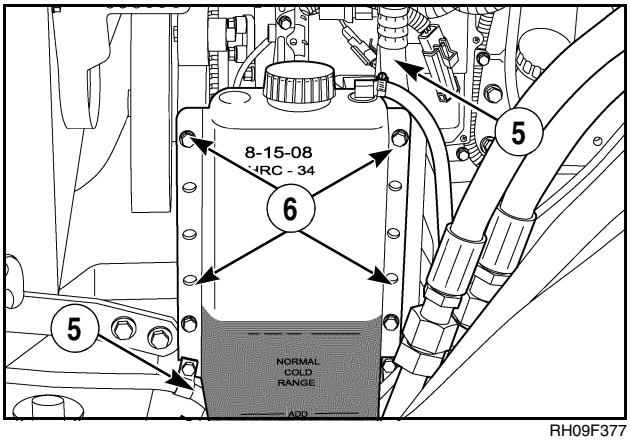
## STEP 16

Install bracket with two bolts. Secure hose and P clamp with front bolt.


RH09F378

## STEP 17

Connect hoses (5) to recovery bottle then secure bottle to bracket with four bolts (6) and nuts.



RH09F377

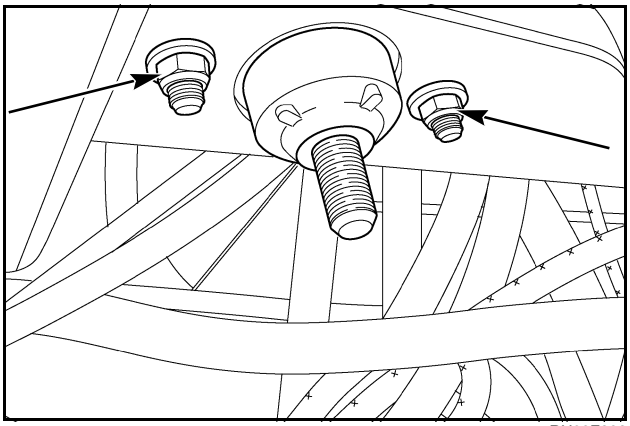
**STEP 3**

**⚠ WARNING ⚠**

Handle all parts carefully. Do not put your hands or fingers between parts. Always wear suitable safety items such as fitted clothing, safety goggles, gloves, shoes, etc. Failure to comply could result in death or serious injury.

M954A

Remove isolator mounting hardware and isolator bolt. Then remove the isolator.



RH09F398

## Engine Isolator Mount Installation

**STEP 1**

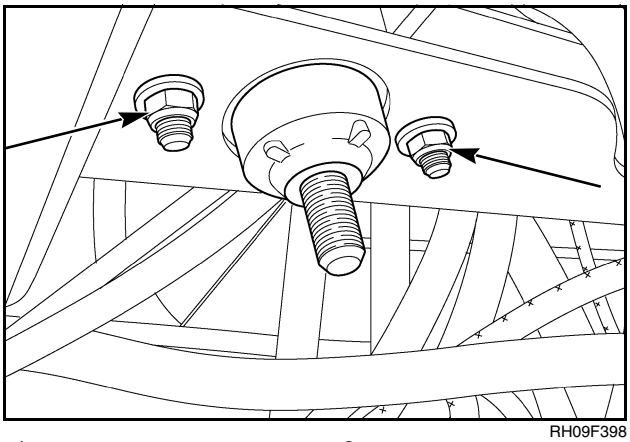
**⚠ WARNING ⚠**

Handle all parts carefully. Do not put your hands or fingers between parts. Always wear suitable safety items such as fitted clothing, safety goggles, gloves, shoes, etc. Failure to comply could result in death or serious injury.

M954A

Install the isolator. Install and tighten isolator mounting hardware. Put isolator bolt in place.

***NOTICE:*** *Do not install isolator nut at this time.*



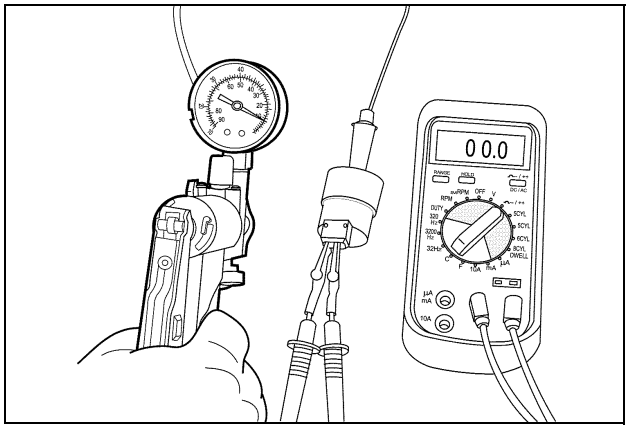
RH09F398

1 2

### STEP 2

Connect the switch to a vacuum hand pump as shown. Use the hand pump to slowly and carefully apply vacuum to the switch. The multimeter should show a closed circuit at approximately 67.2 mbar (1.98 in Hg) of vacuum.

If the switch does not close at 67.2 mbar (2 in Hg) of vacuum or closes before 60.8 mbar (1.8 in Hg of vacuum replace the switch and go to the Installation.

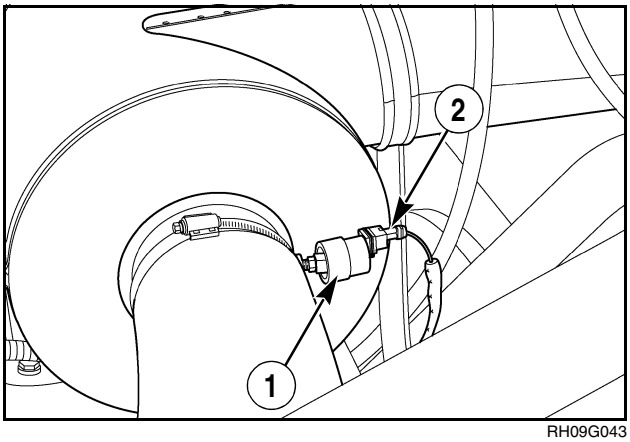



mk00d304

## Restriction Indicator Switch Installation

### STEP 1

Install switch (1) connect wire harness (2).

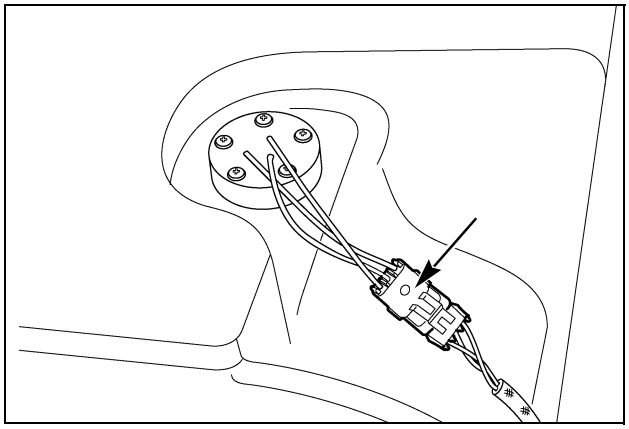



RH09G043

***NOTICE:*** *Hand tighten only. Maximum torque is 3.4 Nm (30 lb in).*

### STEP 5

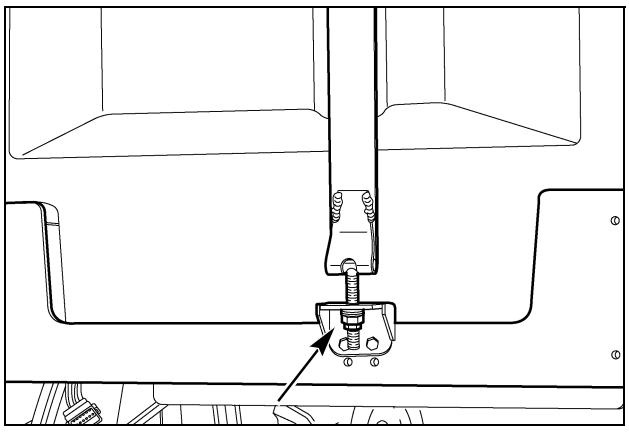
Disconnect the fuel level sensor located at the top rear of the fuel tank.



RH09D020

### STEP 6

Remove the nut and washer from the front and rear of the tank retaining strap Remove the strap from the tank. With an assistant, lift the tank out of the support frame.

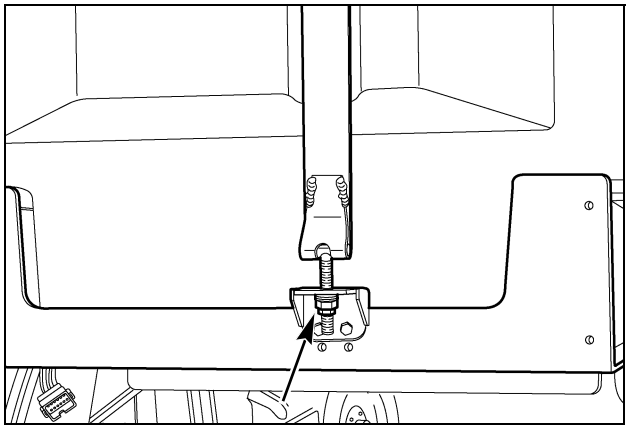


RH09D018

## Fuel Tank Installation

### STEP 1

With the help of an assistant, install the fuel tank into the frame. Position the tank retaining strap over the tank. Install the ends of the strap into the front and rear brackets. Install and tighten the washers and retaining nuts until the retaining strap is snug. Do not overtighten.



RH09D018

# DIAGNOSTICS

## Power Distribution System Circuit Operation

Power distribution consists of the following:

- Unswitched battery power. Unswitched power is available at all times. The battery positive terminal is connected to the unswitched power bus from which all unswitched power circuits are energized.

***NOTICE:*** *Power is available to some fuses regardless of the ignition switch position.*

- Switched battery power. This power is supplied to the system when the ignition system is ON. This switching is controlled by a relay.

When the ignition is switched ON, the cab power relay is energized, supplying battery power to the switched power bus which in turn supplies power to other fuses that are not powered from the unswitched power source.

Accessory relays supply power to supply the headlights and fuses supply work lights, marker lights and dipping relay.

## Power Distribution Circuit Troubleshooting

Before troubleshooting the power distribution system make sure the following operating conditions are met:

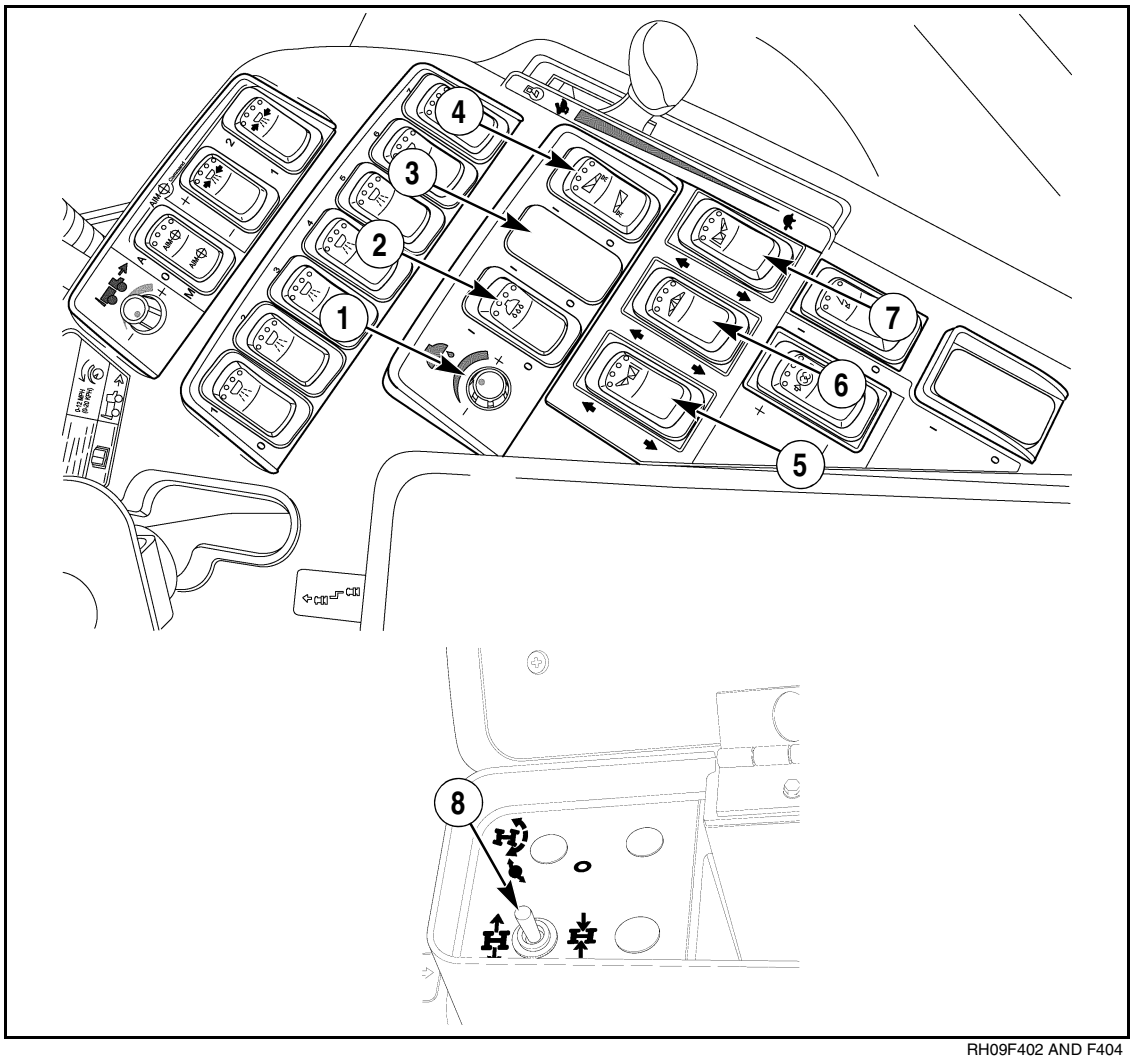
- The batteries are fully charged and all connections are clean and tight.
- Hydrostatic lever in neutral.
- Park brake on.
- Check all connectors for full installation, loose, corroded or pushed out terminals.
- Determine if the power source being investigated is switched or unswitched.
- If the power source problem is a switched power source, the relay controlling the circuit needs to be determined and tested.
- Check the fuse for the circuit.

***NOTICE:*** *Circuit I.D. numbers are primary identification. Colors are helpful, but can change without notice due to manufacturing shortages.*

# Relay Identification

| Relay# | Component Description |
|---|---|
| PR1 | Key PWR |
| PR2 | ACC2 PWR Relay |
| PR3 | ACC1 PWR Relay |
| PR4 | ACC3 PWR Relay |
| PR5 | Worklights |
| | |
| RP1A | Worklight/Interlock |
| RP1B | Marker Lights |
| RP1C | Front Roof Worklights |
| RP1D | Rear Roof Worklights |
| RP1E | |
| RP1F | Neutral Safety |
| RP2A | |
| RP2B | Reverse |
| RP2C | PB Brake |
| RP2D | PB ON |
| RP2E | Rear Worklights |
| RP2F | Headlights |
| RP3A | Cab Pressurization |
| RP3B | Reverse Enable |
| RP3C | Brake Lights |
| RP3D | PB Control |
| RP3E | Back Lights |
| RP3F | Tail Lights |

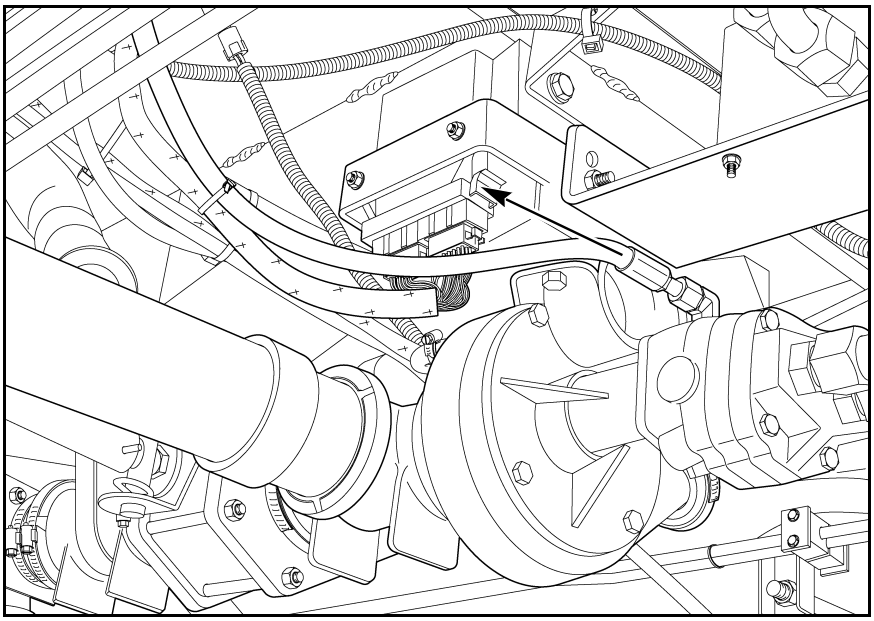
| Relay# | Component Description |
|---|---|
| RP4A | Hi/Lo Beam |
| RP4B | Horn |
| RP4C | |
| RP4D | |
| RP4E | |
| RP4F | |
| RP5A | Spread/Hold |
| RP5B | LH Level Up |
| RP5C | LH Level Down |
| RP5D | LH Fold Out |
| RP5E | LH Fold In |
| RP5F | Foam Marker |
| RP6A | RH Level Down |
| RP6B | RH Level Up |
| RP6C | RH Fold In |
| RP6D | RH Fold Out |
| RP6E | Neutral |
| RP6F | Control Power |
| | **External Relays** |
| J507 | Boom Power Relay |
| J805 | Intermediate Starter Relay |
| GH1 | Grid Heater Relay |




RH09F402 AND F404

**ARM REST CONTROL CONSOLE**

1. FOAM CONTROL
2. FOAM MARKER SWITCH
3. AUTOFOLD (120 ft. booms only)
4. FENCE ROW NOZZLE CONTROL
5. LEFT OUTER BOOM TIP FOLD
6. BOOM HEIGHT
7. RIGHT OUTER BOOM TIP FOLD
8. AXLE ADJUST SWITCH



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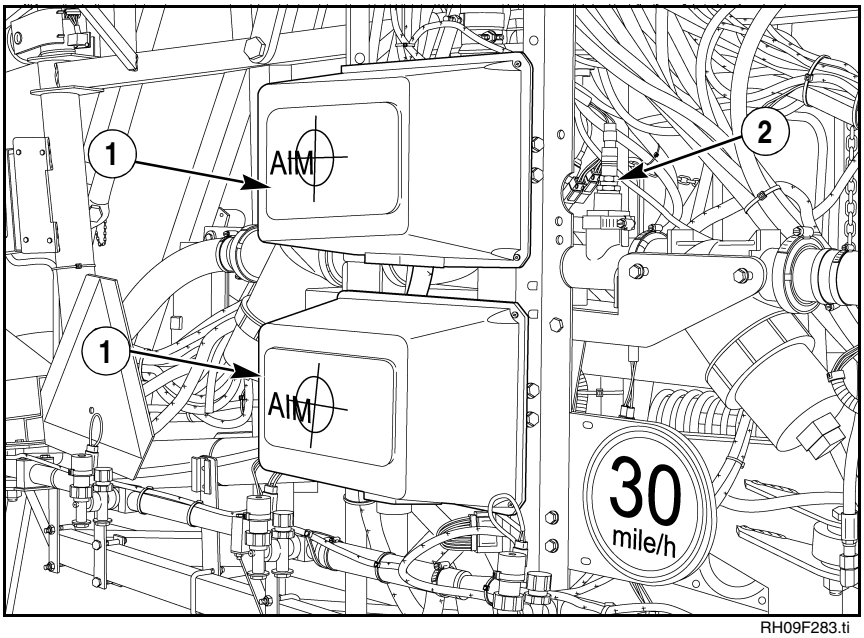
**PRODUCT INPUT CONTROL NODE (NEXT TO PRODUCT PUMP)**

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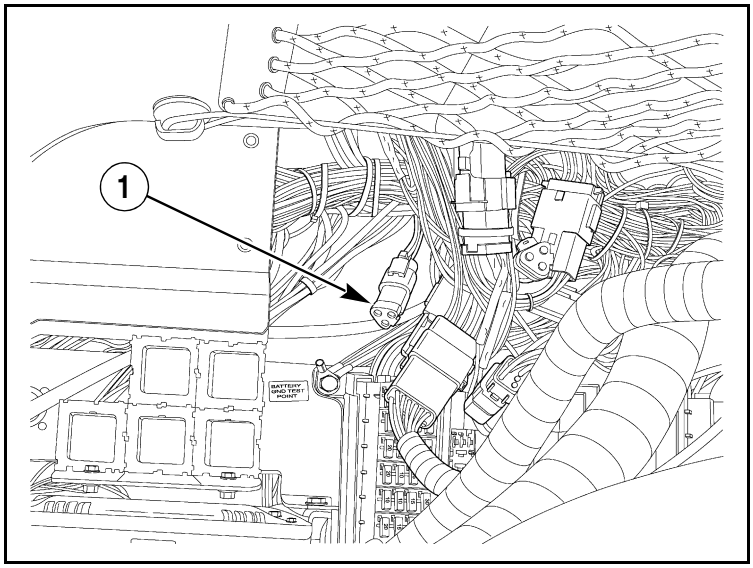
**AIM COMMAND CONTROLLERS (CENTER REAR 120 FOOT BOOM)**

1. AIM COMMAND CONTROLLERS
2. BOOM CIRCUIT PRESSURE SENSOR

# APPLICATION CAN BUS

There are two application can bus terminators. One is located in the electrical bay located behind operator seat. The second terminator is located up on top of the center boom section.

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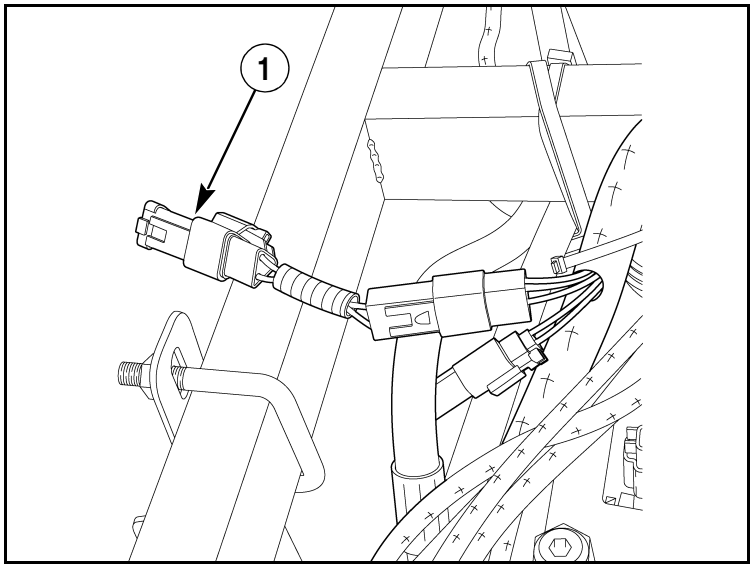
**ELECTRICAL BAY**

1. APPLICATION TERMINATOR CONNECTOR P055




RH09F287

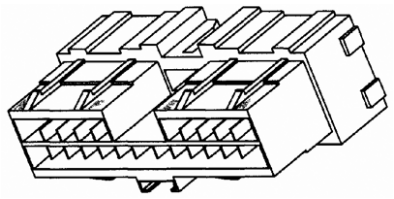
**TOP OF CENTER BOOM**

1. APPLICATION TERMINATOR CONNECTOR P210

To check the application can bus terminators it is easier to make checks at terminator in electrical bay. Disconnect the terminator at connector P055. Use a multimeter to check the resistance directly at terminator. The resistance should read 120 ohms. If the resistance is not approximately 120 ohms replace terminator.

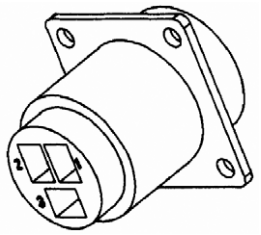
Next, Use the multimeter to check the resistance between the 2 pins on harness end connector P055. The resistance should read approximately 120 ohms. If the reading is not as expected check the center boom section terminator and inspect harness for damage.

**CONNECTOR 179483A1**



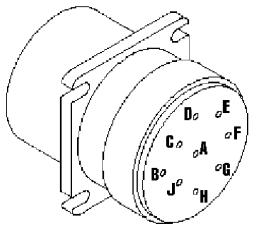
| CONNECTOR J022 | | |
|---|---|---|
| HVAC | | |
| **CAV** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| **A** | 354 | Blower Power |
| **B** | 420 | A/C High Press In |
| **C** | 403 | A/C Comp Clutch |
| **D** | 355 | CCM Blower Low |
| **E** | 357 | CCM Blower Med |
| **F** | 022 | Gnd (HVAC Control) |
| **G** | 356 | CCM Blower High |
| **H** | 361 | Blower SP Select |
| **J** | 023 | Gnd (HVAC ATC) |
| **K** | 317c | B+ Motor PWM CCM |
| **L** | 316b | A/C Switch Cutout |
| **M** | 315b | Indicator Lamp |
| **N** | 336b | Clean Gnd |
| **P** | 336c | Clean Gnd |
| **R** | 323 | Module CPU IGN B+ |
| **S** | 335a | HVAC Gnd |
| **T** | 325 | Temp Pot Control |
| **U** | --- | Open |
| **V** | --- | Open |
| **W** | --- | Open |
| **X** | 343 | F/C HVAC Conversion |
| **Y** | --- | Open |
| **Z** | 334a | A/C Safety Sw Gnd |

**CONNECTOR 225164C1**

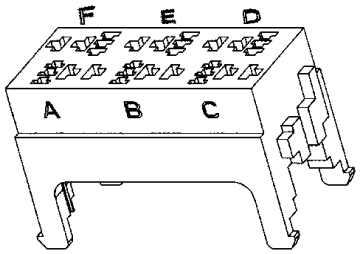



| CONNECTOR J025 | | |
|---|---|---|
| Power Port | | |
| **CAV** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| **A** | 113 | B+ Sw Fender-Port |
| **B** | 118 | B+ Unsw Fender-Port |
| **C** | --- | Open |

**CONNECTOR 310057A1**




| CONNECTOR P026 | | |
|---|---|---|
| Can Bus Diagnostic Port | | |
| **CAV** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| **A** | 034b | Gnd Service Tool |
| **B** | 121b | B+ Unsw, Service Tool |
| **C** | C15Y | Veh Can High |
| **D** | C15G | Veh Can Low |
| **E** | 900 | K-Line (EDC7) |
| **F** | --- | Open |
| **G** | --- | Open |
| **H** | C03Y | App Can High |
| **J** | C03G | App Can Low |
| **Near** | C23B | App Can Ground |
| **Near** | C23R | App Can Power |

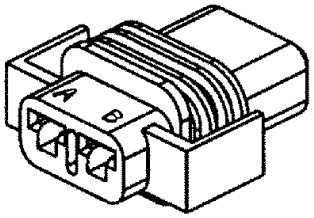



**RELAY MODULE**
**144417A1**

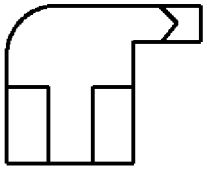
| RP2 | | |
|---|---|---|
| **Relay D** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| D1 | 556b<br>556c | PB Power |
| D2 | 002c<br>002d | Gnd (Relay Panel 2) |
| D3 | 002d<br>002e | Gnd (Relay Panel 2) |
| D4 | --- | Open |
| D5 | 037a | Park Brake Verify |
| **RP2** | | |
| **Relay E** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| E1 | 266c | Worklight_W |
| E2 | 002e<br>002f | Gnd (Relay Panel 2) |
| E3 | 112 | Boom Lights |
| E4 | --- | Open |
| E5 | 169 | Boom Lights |
| **RP2** | | |
| **Relay F** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| F1 | 212a<br>212b | Headlights/Haz Sw |
| F2 | 002f | Gnd (Relay Panel 2) |
| F3 | 124A | Acc Power B+ |
| F4 | --- | Open |
| F5 | 261 | B+ Headlights |
| **RP3** | | |
| **Relay A** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| A1 | 310 | Cab Press Control |
| A2 | 003a<br>003b | Gnd (Relay Panel 3) |
| A3 | 003b<br>003c | Gnd (Relay Panel 3) |
| A4 | --- | Open |
| A5 | 311 | Blower Cab Press |

| RP3 | | |
|---|---|---|
| **Relay B** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| B1 | 518 | Reverse Enable |
| B2 | 003c<br>003d | Gnd (Relay Panel 3) |
| B3 | 499 | Pump Control |
| B4 | 501 | Motor Control |
| B5 | 502 | Reverse |
| **RP3** | | |
| **Relay C** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| C1 | 232a<br>232b | Brake On<br>Brake On (Controller) |
| C2 | 003d<br>003e | Gnd (Relay Panel 3) |
| C3 | 149 | Brake Light |
| C4 | --- | Open |
| C5 | 263 | Brake Light |
| **RP3** | | |
| **Relay D** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| D1 | 556c | PB Power |
| D2 | 003e<br>003f | Gnd (Relay Panel 3) |
| D3 | 177 | Controller Power |
| D4 | 188a | Controller Power |
| D5 | 557 | PB Power |
| **RP3** | | |
| **Relay E** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| E1 | 265 | Headlights/Haz (BLTS) |
| E2 | 003f<br>003g | Gnd (Relay Panel 3) |
| E3 | 184 | Back Lights |
| E4 | --- | Open |
| E5 | 219a | Tail Lights |
| **RP3** | | |
| **Relay F** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| F1 | 262c | Headlights/Haz (TLTS) |
| F2 | 003g | Gnd (Relay Panel3) |
| F3 | 222 | Tail Lights |
| F4 | --- | Open |
| F5 | 225 | Tail Lights |

CONNECTOR
237661A1

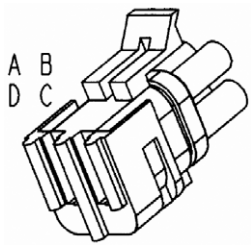


CONNECTOR



| CONNECTOR 18M | | |
|---|---|---|
| RH Front Roof Worklight | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| A | 784C | Worklight B+ |
| B | 178AH | Worklight Ground |
| CONNECTOR 195M | | |
| LH Front Roof Worklight | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| A | 784E | Worklight B+ |
| B | 178AF | Worklight Ground |

CONNECTOR
245715C1

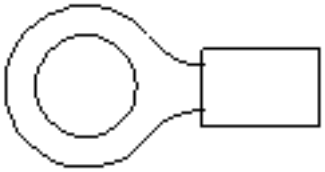



| CONNECTOR 115M | | |
|---|---|---|
| Front Wiper | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| A | 832B | High |
| B | 833B | Low |
| C | 831B | Park |
| D | 834B | Brake |
| CONNECTOR 98M | | |
| Rear Wiper | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| A | --- | Open |
| B | 843B | Low |
| C | 841B | Park |
| D | 844B | Brake |

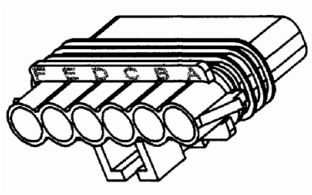
| CONNECTOR 104F | | |
|---|---|---|
| RH Rear Turn signal | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| | 752E | B+ |
| CONNECTOR 105F | | |
| RH Rear Turn signal | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| | 178X | Ground |
| CONNECTOR106F | | |
| LH Rear Turn Signal | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| | 751E | B+ |
| CONNECTOR 107F | | |
| LH Rear Turn Signal | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| | 178W | Ground |
| CONNECTOR 118F | | |
| LH Front Turn Signal | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| | 751D | B+ |
| CONNECTOR 120F | | |
| LH Front Turn Signal | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| | 178U | Ground |
| CONNECTOR 224F | | |
| RH Front Turn Signal | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| | 752D | B+ |
| CONNECTOR 225F | | |
| RH Front Turn Signal | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| | 178V | Ground |

| | | |
|---|---|---|
| **84** | --- | Open |
| **85** | --- | Open |
| **86** | --- | Open |
| **87** | --- | Open |
| **88** | --- | Open |
| **89** | 900 | K-Line (EDC7) |

**CONNECTOR**
**Ring Terminal**



**CONNECTOR**
**182083A1**

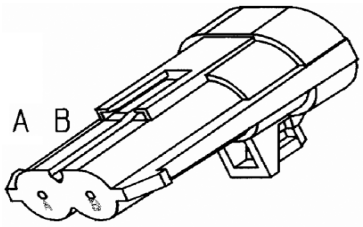



| CONNECTORP 817 | | |
|---|---|---|
| | | |
| **CAV** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| **A** | 800b | Battery Power |
| **B** | 804 | Battery Power |
| **C** | 800C | Battery Power |
| **D** | --- | Open |
| **E** | --- | Open |
| **F** | --- | Open |

| CONNECTORP 818 | | |
|---|---|---|
| | | |
| **CAV** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| **A** | 800D | Battery Power |
| **B** | 801 | Battery Power |
| **C** | 800f | Battery Power |
| **D** | 802 | Battery Power |
| **E** | 800e | Battery Power |
| **F** | 803 | Battery Power |

| CONNECTOR J823 | | |
|---|---|---|
| **RING TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| M12.7 | 800A | Battery Power |
| **CONNECTOR J824** | | |
| **RING TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| M12.7 | 806a | Gnd (Battery) |
| **CONNECTOR J803** | | |
| **RING TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| M8 | 806g | V6 Gnd (INT. St Relay) |
| **CONNECTOR J804** | | |
| **RING TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| M8 | 800g | Battery Power (INT. ST Relay) |
| **CONNECTOR J805** | | |
| **RING TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| M8 | 813 | Starter Sol |
| **CONNECTOR J802** | | |
| **RING TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| M6 | 402 | Starter Relay Coil |
| **CONNECTOR J835** | | |
| **RING TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| M5 | 409 | Alt Excite |

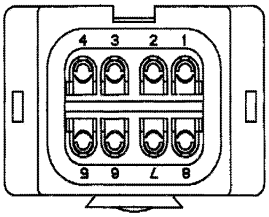
**CONNECTOR**
**292549A1**




| CONNECTOR J813 | | |
|---|---|---|
| **A/C Safety Switch** | | |
| **CAV** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| **A** | 420 | A/C High Press In |
| **B** | 334 | A/C Safety Sw Gnd |

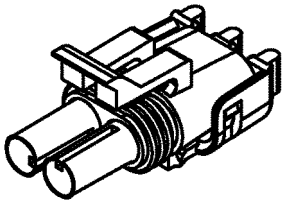
# Harness Extension, 120 Foot, Rear Lights

CONNECTOR
87700321



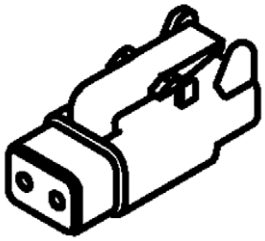

| CONNECTOR J606 | | |
|---|---|---|
| Rear Light Interface | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| 1 | 054a | Gnd (GS) |
| 2 | 227a | Right Turn |
| 3 | 226a | Left Turn |
| 4 | 263a | Brake Light |
| 5 | 225a | Tail Lights |
| 6 | --- | Open |
| 7 | --- | Open |
| 8 | --- | Open |

CONNECTOR
87692855



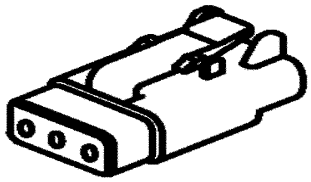
| CONNECTOR P650 | | |
|---|---|---|
| LH Turn | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| A | 226c | Left Turn |
| B | 054f | Gnd (Left Turn) |
| CONNECTOR P651 | | |
| RH Turn | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| A | 227c | Right Turn |
| B | 054g | Gnd (Right Turn) |

CONNECTOR
87696093



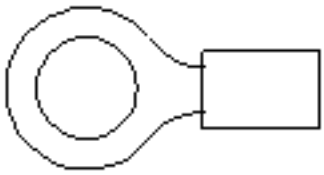
| CONNECTOR P652 | | |
|---|---|---|
| LH Turn/Flash | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| 1 | 054b | Gnd (Left Turn) |
| 2 | 226b | Left Turn |
| CONNECTOR P653 | | |
| RH Turn/Flash | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| 1 | 054d | Gnd (RH Turn) |
| 2 | 227b | Right Turn |

CONNECTOR
87696551



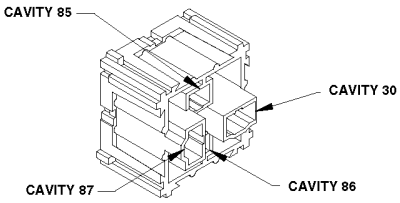
| CONNECTOR P654 | | |
|---|---|---|
| LH Stop/Tail | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| 1 | 054c | Gnd (LH Stop) |
| 2 | 263b | Brake Light |
| 3 | 225b | Tail Lights |

| CONNECTOR P655 | | |
|---|---|---|
| RH Stop/Tail | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| 1 | 054e | Gnd (RH Stop) |
| 2 | 263c | Brake Light |
| 3 | 225c | Tail Lights |



**CONNECTOR**
**Ring Terminal**

| CONNECTOR BH2 | | |
|---|---|---|
| **RING TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| M10 | 44 | Cruise Gnd |
| **CONNECTOR G1** | | |
| **RING TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| M10 | 005A | Gnd (RP5) |
| M10 | 006A | Gnd (RP6) |
| M10 | 038A | Gnd (Sparge) |
| M10 | 41 | Gnd (Foam) |

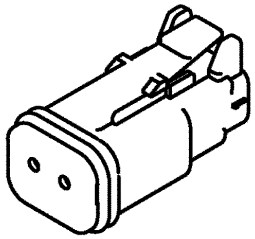



**RELAY Block**
**367145A1**

| RP5 | | |
|---|---|---|
| **Relay A** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| A1 | 506D | Spread/Hold |
| A2 | 005A<br>005B | Gnd (RP5) |
| A3 | 155B | Sw Fuse F42 |
| A4 | --- | Open |
| A5 | 157A | Boom Section Power |
| **RP5** | | |
| **Relay B** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| B1 | 508 | LH Level Up |
| B2 | 005B<br>005C | Gnd (RP5) |
| B3 | 152C | Fuse F20 |
| B4 | --- | Open |
| B5 | 715 | LH Level Up |

| RP5 | | |
|---|---|---|
| **Relay C** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| C1 | 509 | LH Level Down |
| C2 | 005C<br>005D | Gnd (RP5) |
| C3 | 152B<br>152C | Fuse 20 |
| C4 | --- | Open |
| C5 | 714 | LH Level Down |
| **RP5** | | |
| **RelayD** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| D1 | 510B | LH Inner Out |
| D2 | 005D<br>005E | Gnd (RP5) |
| D3 | 151D<br>151E | Neutral |
| D4 | --- | Open |
| D5 | 721 | LH Inner Out |
| **RP5** | | |
| **Relay E** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| E1 | 511B | LH Inner In |
| E2 | 005E<br>005F | Gnd (RP5) |
| E3 | 151C<br>151D | Neutral |
| E4 | --- | Open |
| E5 | 720 | LH Inner In |
| **RP5** | | |
| **Relay F** | | |
| **TERMINAL** | **WIRE NUMBER** | **CIRCUIT REFERENCE** |
| F1 | 539 | Foam Logic Out |
| F2 | 005F | Gnd (RP5) |
| F3 | 517B | Foam Marker Power |
| F4 | 521A | LH Foam |
| F5 | 522A | RH Foam |

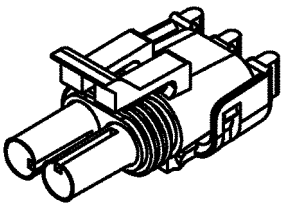
CONNECTOR
87695582



| CONNECTOR P412 | | |
|---|---|---|
| Boom Up | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| 1 | 712A | Boom Up |
| 2 | 094N | Gnd |

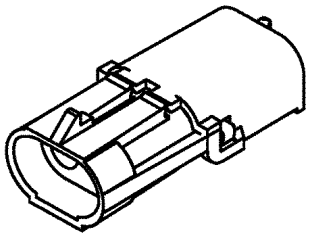
| CONNECTOR P415 | | |
|---|---|---|
| Boom Down | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| 1 | 713A | Boom Down |
| 2 | 094O | Gnd |

CONNECTOR
87692855



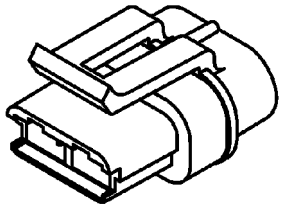
| CONNECTOR P417 | | |
|---|---|---|
| Foam Motor | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| A | 519 | Foam Motor Control |
| B | 094B | Gnd |

CONNECTOR
87692877



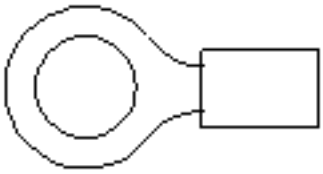
| CONNECTOR J413 | | |
|---|---|---|
| Accessory Power | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| A | 156 | Acc Power F43 |
| B | 094C | Gnd |

CONNECTOR
87688712



| CONNECTOR F400 | | |
|---|---|---|
| Battery Power | | |
| CAV | WIRE NUMBER | CIRCUIT REFERENCE |
| A | 101 | Battery Power |
| B | 100A | Battery Power |

CONNECTOR
RIng TermInal



| CONNECTOR BH1 | | |
|---|---|---|
| Battery Power | | |
| RING TERMINAL | WIRE NUMBER | CIRCUIT REFERENCE |
| M12 | 101 | Bat+ |
| CONNECTOR J420 | | |
| Ground | | |
| RING TERMINAL | WIRE NUMBER | CIRCUIT REFERENCE |
| M10 | 094A | Gnd |

## Excitation Circuit (D+) Test

| Test Point | Good Reading | Possible Cause of Bad Reading |
|---|---|---|
| **1** Ignition in OFF position. Disconnect wiring from alternator connection J835 (D+) and instrument cluster connector CN2/P009. Measure resistance between alternator connection J835 (D+) and connector CN2/P009 terminal 1. | Less than 1 ohm<br><br>If good reading, excitation circuit wiring is okay. | Open circuit between alternator and instrument cluster.<br><br>Check resistance back through circuit from J835 at alternator, through connectors BHE terminal K,connector BH7 terminal 7 and CN1/P009 terminal 1. |

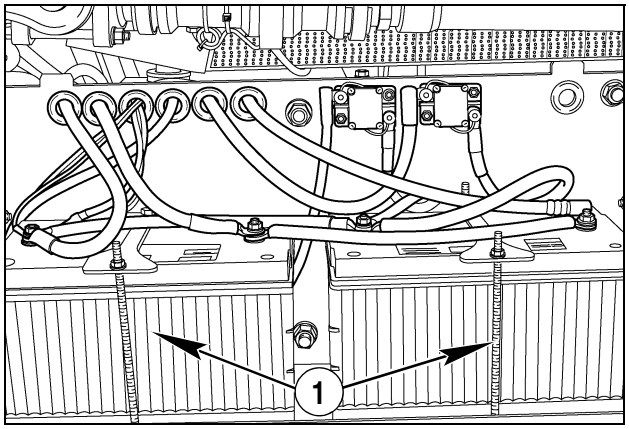
| Fault Code | Amber Warning | Red Stop | Code Meaning |
|---|---|---|---|
| 3128 | X | X - If Also Foot | Hand Throttle - Channel Difference Error |
| 3129 | X | X - If Also Foot | Hand Throttle - Idle Switch Closed Circuit |
| 3130 | X | X - If Also Foot | Hand Throttle - Idle Switch Open Circuit |
| 3131 | X | | Grid Heater Always Switched On |
| 3132 | | | General Error |
| 3133 | | | Cold Start Lamp - No Load |
| 3134 | | | Cold Start Lamp - Short Circuit to Battery |
| 3135 | | | Cold Start Lamp - Short Circuit to Ground |
| 3136 | | | Cold Start Lamp - Excessive Temperature |
| 3137 | X | | Metering Unit - Open Load |
| 3138 | X | | Metering Unit - Signal Not Plausible |
| 3139 | | | Metering Unit ADC - Signal Above Range Max. |
| 3140 | | | Metering Unit ADC - Signal Below Range Min. |
| 3141 | X | | Set Point of Fuel Volume Flow Through Metering Unit is Lower than Calculated Limit |
| 3142 | | | High Pressure Test (deactivates rail press. monitoring) |
| 3143 | | | Air Heater Test Switch On (Voltage Exceeds Higher Threshold) |
| 3144 | | | Air Heater Test Switch On (Voltage Exceeds Higher Threshold) |
| 3145 | | | ECM Terminal 15 Evaluation Circuit Defective |
| 3146 | | X | Water Detected In Fuel |
| 3147 | X | | Oil Temperature Sensor - Signal Above Normal Range |
| 3148 | | | Coolant Temperature Sensor Dynamic Test - Failure |
| 3149 | X | | Coolant Temperature Sensor Absolute Test - Failure |
| 3150 | | | System Lamp - Short Circuit to Battery |
| 3151 | | | System Lamp - Short Circuit to Ground |
| 3152 | | | System Lamp - No Load |
| 3153 | | | System Lamp - Excessive Temperature |
| 3154 | X | | Grid Heater Relay - Short Circuit to Battery |
| 3155 | X | | Grid Heater Relay - Short Circuit to Ground |
| 3156 | X | | Grid Heater Relay - No Load |
| 3157 | X<br>1-box | X<br>2-box | ECM Not Detected on CAN Bus |
| 3158 | | X<br>2-box | Invalid ECM Checksum |
| 3159 | X<br>2-box | | Invalid Engine Reference Torque |
| 3160 | | | Fan Actuator - Signal High |
| 3161 | | | Fan Actuator - Signal Low |
| 3162 | | | Fan Actuator - No Signal |
| 3163 | | | Fan Actuator - Signal Not Plausible |
| 3164 | | | Fan Speed Sensor - Signal High |
| 3165 | | | Fan Speed Sensor - Signal Low |
| 3166 | | | Fuel Filter Heater Relay - Signal High |
| 3167 | | | Fuel Filter Heater Relay - Signal Low |

# REMOVAL AND INSTALLATION OF BATTERIES

***NOTICE:*** *For torque specifications not listed, see Section 1000 - Standard Torque. If replacing component parts, always use the parts noted in this machine's parts manual.*

## Battery Removal

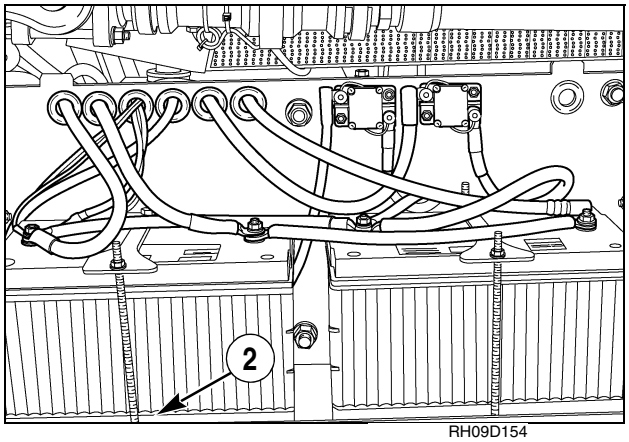
1. Disconnect all ground cables from each battery negative (-) terminal.
2. Disconnect the positive cables from each battery positive (+) terminal.
3. Remove the battery hold down bracket (1) to remove the batteries.



RH09D154

## Battery Installation

1. Be sure the carrier tray (2) is clean and not damaged.
2. Install the battery in the correct position on the carrier. Tighten the hold down bracket (1) securely.
3. Connect the positive cables to each battery positive (+) terminal in the reverse order of removal. Be sure all cable and terminal connections are clean and tight.
4. Connect the ground cables to the negative (-) terminal of each battery in the reverse order of removal. Be sure all cable and terminal connections are clean and tight.



RH09D154

***NOTICE:*** *Apply Case Battery Saver or Urethane Seal Coat to the cable terminals to prevent corrosion. DO NOT use grease.*

## Battery Fast Charging

***NOTICE:*** *Before fast charging a battery, always test the battery. DO NOT fast charge a battery that has not passed the Three Minute Charge Test.*

Find the specific gravity reading of the battery in the Fast Charge Time Table. The time table will give the maximum period of time that the battery can be fast charged. Set the rate of charge on the battery charger so that the voltage is not more than 15.5 volts for a 12 volt battery.

***NOTICE:*** *Always disconnect the battery cables, before fast charging the battery. Fast charging a battery with the cables connected will damage the regulator.*

Always allow fast charging a battery with a period of time of slow charging. Slow charge the battery until the specific gravity reading of the electrolyte indicates the battery is fully charged.

**FAST CHARGE TIME TABLE**

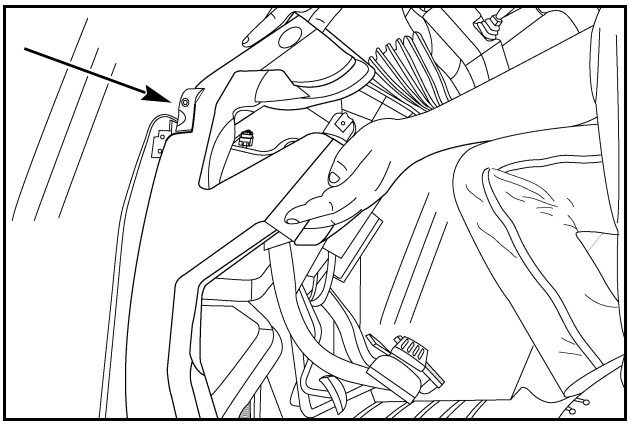
| **SPECIFIC GRAVITY TIME TABLE FOR CLIMATE ZONE** Readings corrected to 27°C (80°F) | | | **CAN BE FAST CHARGED UP TO:** |
|---|---|---|---|
| FRIGID | TEMPERATE | TROPICAL | |
| 1.150 or less | 1.135 or less | 1.110 or less | 1 hour |
| 1.150 - 1.175 | 1.135 - 1.160 | 1.110 - 1.130 | 3/4 hour |
| 1.175 - 1.200 | 1.170 - 1.185 | 1.130 - 1.150 | 1/2 hour |
| 1.200 - 1.225 | 1.185 - 1.210 | 1.150 - 1.170 | 1/4 hour |
| Above 1.225 | Above 1.210 | Above 1.170 | Slow Charge |

# SPECIAL TORQUES

Lock Nut for Steering Column Base ..... 29 to 32 (22 to 24 lb ft)
Nut for Steering Wheel ..... 45 to 54 Nm (33 to 40 lb ft)

## STEP 8

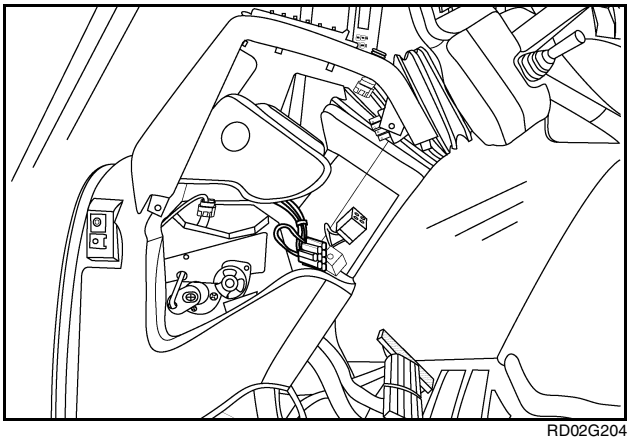
Lift up on the cab floor mat. Position the left console heat duct into the floor duct and install the retaining screw.



RD02G205

## STEP 9

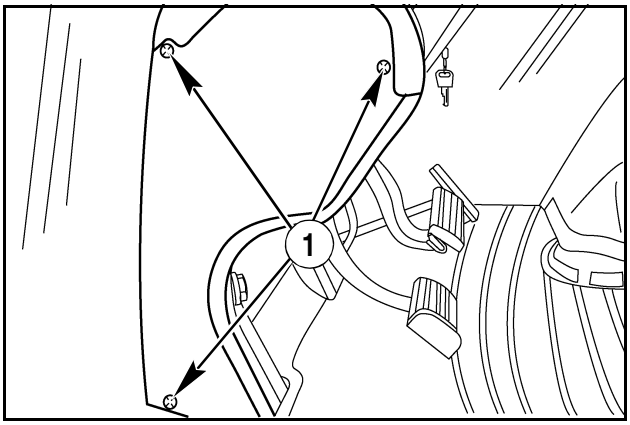
Install the electrical connectors on the switches in the upper console panel and carefully install the panel.



RD02G204

## STEP 10

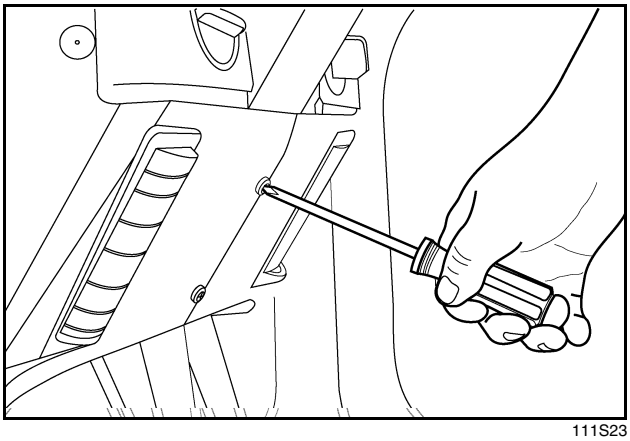
Lift up on the mat and install the left lower console panel. Install the three retaining screws (1). Repeat this procedure for the right lower console panel.




RD02G203

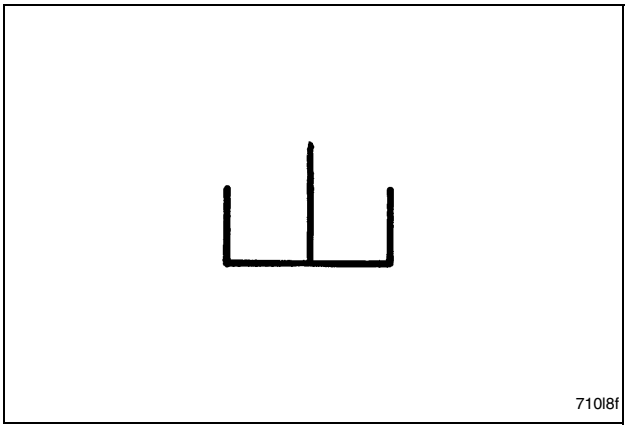
## STEP 11

Install the two retaining screws that attach the left and right lower console panels.

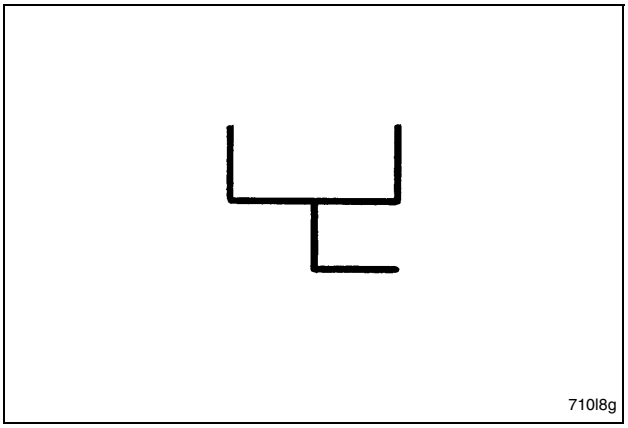


111S23

If the hydraulic line terminates below the fluid level, it is drawn all the way to the bottom of the symbol.

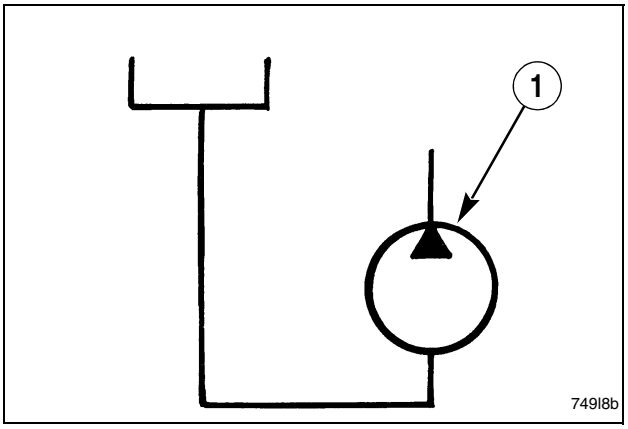



A hydraulic line connected to the bottom of the reservoir may be drawn from the bottom of the symbol if the bottom connection is essential to the systems operation.



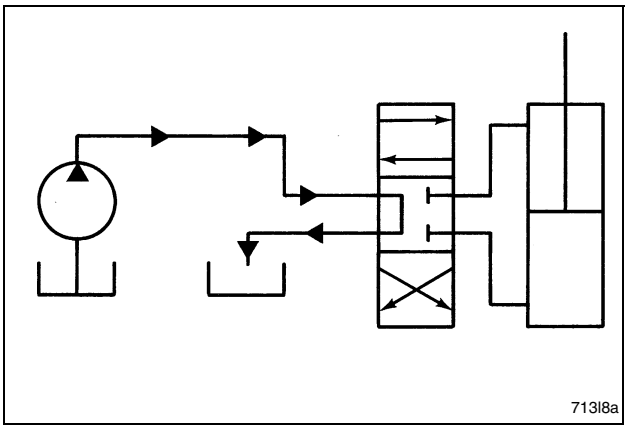

If the pump (1) inlet must be charged or flooded with a positive head of oil above the inlet port, the position of the reservoir symbol above the pump symbol, and draw the suction line out of the bottom of the reservoir symbol.

Every vehicle or system reservoir has at least two hydraulic lines connected to it, and some may have many more. Often the components that are connected to the reservoir are spread all over the schematic. Rather than having a lot of confusing lines all over the schematic, it is customary to draw individual reservoir symbols close to the components. The reservoir is usually the only component symbol pictured more than once.

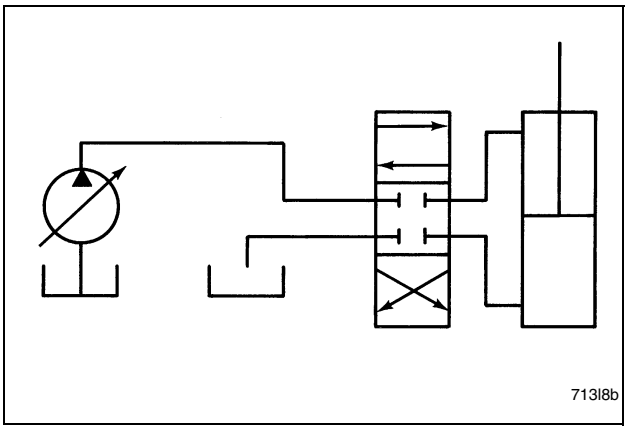


## Three Position Valves

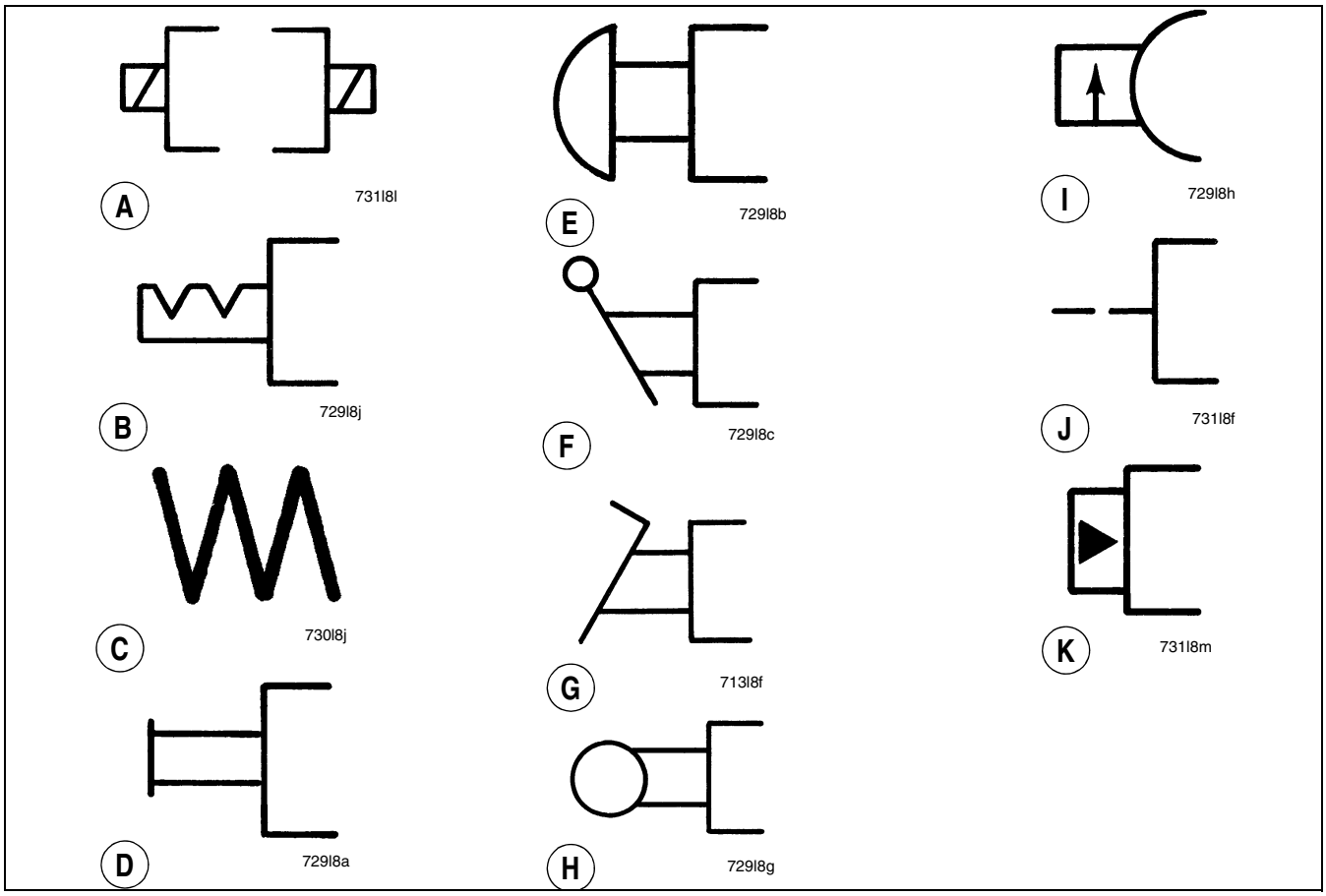
Three position valves will have a centered (neutral) position. The centered position can be either open or closed to flow. The open center is usually used with a fixed displacement pump.




The closed center is usually used with a variable displacement pump.



## Valve Actuators




A. Solenoid
B. Detent
C. Spring
D. Manual
E. Push button
F. Push pull lever
G. Pedal
H. Mechanical
I. Pressure compensated
J. Pilot pressure remote supply
K. Liquid Supply

# Product Pump Circuit Troubleshooting Chart

| Symptom | Possible Cause | Corrective Action |
|---|---|---|
| Controller shows no product pressure at the booms. | Rate controller faulty. | Place rate controller to MAN, if product pressure ok, proceed to the Rate Controller Troubleshooting, in the Rate Controller Manual. |
| | Manual shut-off valves not open. | Open shut-off valves. |
| | Hydraulic oil level low. | Fill hydraulic tank to proper level. See Hydraulic Tank Filling in Section 8020. |
| | Product tank low. | Fill Product Tank. |
| | Product pump control valve faulty. | Test product pump control valve. See Product Pump Control Valve in Section 4000. |
| | Product pump control (Pulse Width Modulated - PWM) valve driver. | Test PWM valve driver. See PWM Valve Driver in Section 4000. |
| | Pump ON sensor faulty. | Test Pump ON sensor. See Pump On Sensor in Section 4000. |
| | Product pump/motor faulty. | Replace product pump. See Product Pump in Section 11020. |
| | Gear pump faulty. | Replace the gear pump. See the Gear Pump in Section 8040. |
| Controller shows product spraying low or erratic output. | Manual shut-off valves not fully open. | Open shut-off valves. |
| | Throttling valve closed (only if using a rate controller). | Open throttling valve. |
| | Hydraulic oil level low. | Fill hydraulic tank to proper level. See Hydraulic Tank Filling in Section 8020. |
| | Product tank level low. | Fill Product Tank. |
| | Product pump control valve faulty. | Test product pump control valve. See Product Pump Control Valve Page 6 in this Section and in Section 4000. |
| | Product pump control (PWM) valve driver faulty. | Test PWM valve driver. See PWM Valve Driver in Section 4000. |
| | Product pump/motor faulty. | Replace Product Pump. See Product Pump in Section 11020. |
| | Gear pump faulty. | Replace the gear pump. See Gear Pump in Section 8040. |
| | Hydraulic suction strainer clogged. | Clean or replace suction strainer. See Hydraulic Tank Strainer Servicing in Section 8020. |

# Hydrostatic Pump Pressure Balance Test

**⚠ WARNING ⚠**

Stay clear! Take necessary safety precautions to clear the area of persons and pets, while performing the procedure. Failure to comply could result in death or serious injury.

M1590

***NOTICE:*** *When testing full system pressure, a second person is required in the cab to apply service brakes and to turn the machine OFF if needed.*

## STEP 1

Pressure balance is when the working pressure of both pumps increase simultaneously and at the same pressure (within 35 bar, 500 PSI). The hydrostatic pump balance or timing is important so each pump or drive system is performing the same amount of work. Pump balance should be verified if drive ability issues occur, or if one or both pumps are replaced.

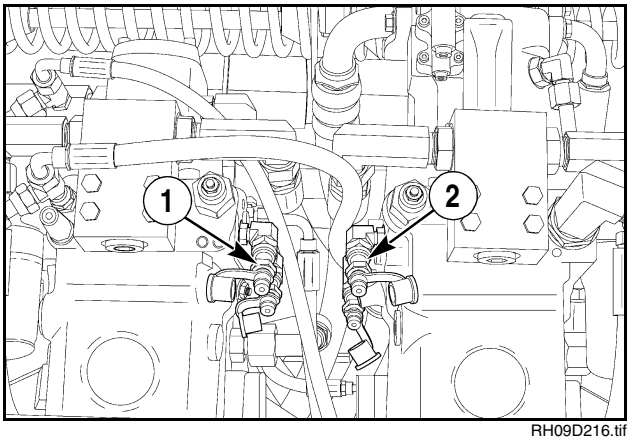
## STEP 2

Install pressure gauges at hydrostatic pumps:

Forward Propel:

- MB-left-hand pump working pressure (1), use 1000 bar (10,000 PSI) gauge.
- MA-right-hand pump working pressure (2), use 1000 bar (10,000 PSI) gauge.

Note which gauge corresponds to the master (left) and the slave (right) hydrostatic pump.

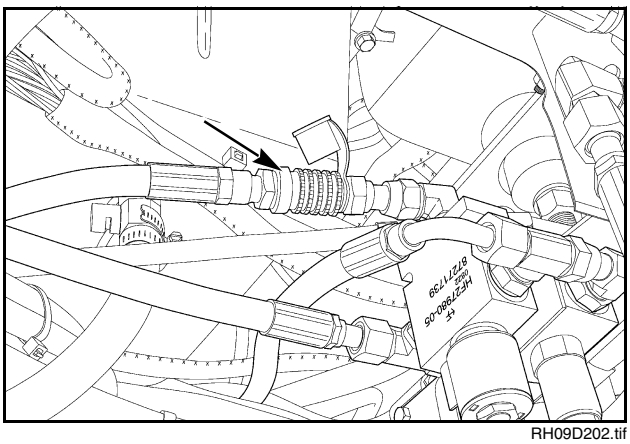



RH09D216.tif

## STEP 3

Disconnect the parking brake quick disconnect and install brake bleed fitting. See PARKING BRAKE SYSTEM in this Section.

***NOTICE:*** *This allows the parking brake switch to be disengaged, which in turn, provides the 12 volt signal to the power train control module. This procedure will allow the machine to think it can propel, or at least attempt to propel, as the parking brakes within the planetaries are still applied.*



RH09D202.tif

# WHEEL MOTOR

## Wheel Motor Case Drain Test

**⚠ WARNING ⚠**

Stay clear! Take necessary safety precautions to clear the area of persons and pets, while performing the procedure. Failure to comply could result in death or serious injury.

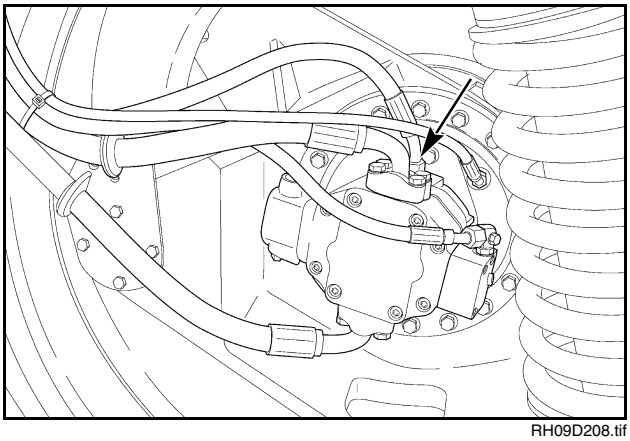
M1590

***NOTICE:*** *When testing full system pressure, a second person is required in the cab to apply service brakes and to turn the machine OFF if needed.*

### STEP 1

Install the flowmeter in the case drain line from the wheel motor to the hydraulic tank.

***NOTICE:*** *Make sure the direction of flow indicated on the meter matches true oil flow out of the motor.*

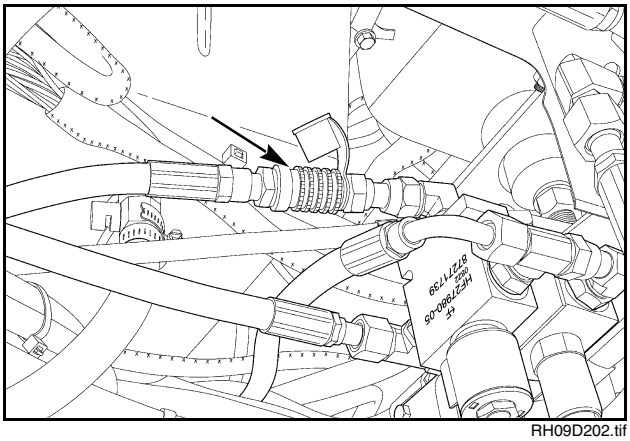


RH09D208.tif

### STEP 2

Disconnect the parking brake quick disconnect and install brake bleed fitting. See PARKING BRAKE SYSTEM in this Section.

***NOTICE:*** *This allows the parking brake switch to be disengaged, which in turn, provides the 12 volt signal to the power train control module. This procedure will allow the machine to think it can propel, or at least attempt to propel, as the parking brakes within the planetaries are still applied.*



RH09D202.tif

### STEP 3

Properly anchor the machine with suitable chain to a immovable object, so it will not move unexpectedly.

## STEP 6

Return engine to low idle. Shutdown engine. Remove flowmeter from circuit and connect supply back to “P” port.

## STEP 7

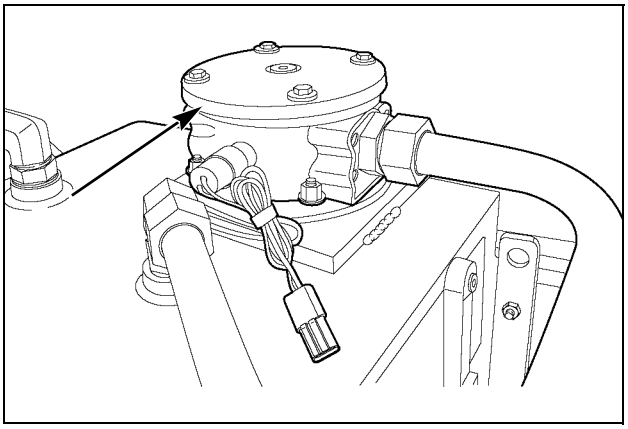
***NOTICE:*** *Anytime the hydraulic system(s) is opened up for repairs, tests and/or anytime fluid is changed or added, it must be assumed that contaminates are being introduced to the system. Cleanliness cannot be overemphasized. Changing the oil filter and oil at the proper intervals is necessary to maintain a reliable hydraulic system*.

***NOTICE:*** *If a system component failed. The hydraulic system* in-tank return filter *must be replaced. See Section 8020 in this manual.*

1. Install a new in-tank return filter on the auxiliary hydraulic circuit.

***NOTICE:*** *Even if the return filter is not being replaced follow the procedure below.*

2. Start the engine and run in neutral at a minimum of 1500 RPM.
3. Allow the engine to run at 1500 RPM with the vehicle in neutral for a minimum of 20 minutes to filter and warm the hydraulic oil prior to any operation.
4. Run the machine for at least one hour under light load to complete the hydraulic oil filtration.
5. Shut down the machine and check for leaks.



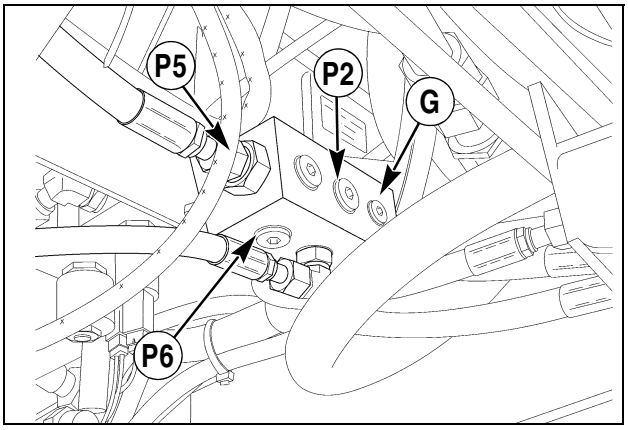
BD0208231

# MANIFOLD

The manifold is beneficial for diagnostic purposes. Several capped ports (G, P2, P5, and P6) are available to install pressure gauges for testing of the pressure compensated pump circuit.

## STEP 1

A 500 bar (5000 PSI) gauge may be installed in any of the (G, P2, P5 and P6) ports.




BD0408112

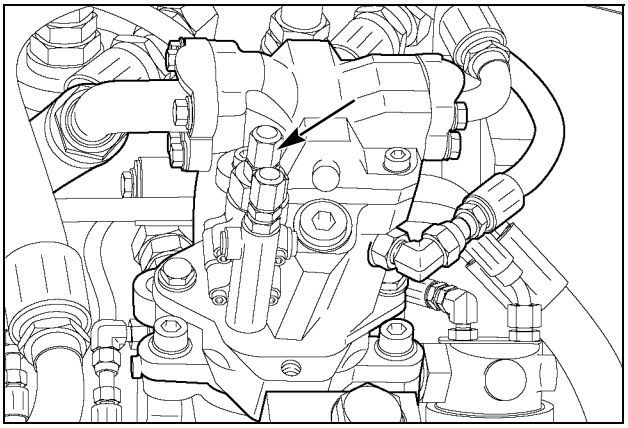
## STEP 2

Start the engine and warm the hydraulic oil to 49°C (120°F).

## STEP 3

As long as no functions are activated, 203 bar (2950 PSI) is the reading on the gauge. If the reading on the gauge is not 203 bar (2950 PSI), the compensator on the PC pump must be adjusted to bring the pressure to the correct setting:

1. Remove the cap over the pressure compensator adjustment screw.
2. Loosen the locknut, turn the adjustment screw in to increase the pressure and out to lower the pressure.
3. Adjust screw and repeat test until the correct pressure is reached.
4. After desired pressure is obtained, hold the adjustment screw stationary, tighten the locknut and install cap.

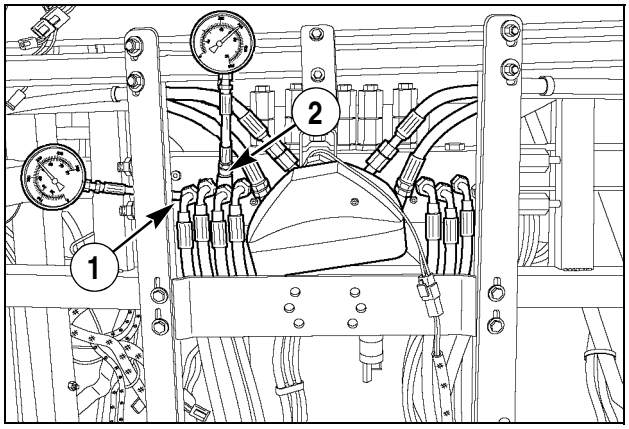


BD0308149

## STEP 1

Install a 300 bar (3000 PSI) gauge in the hydraulic line between the valve body (1) and the blind end side of the inner boom fold cylinder.

Install a 300 bar (3000 PSI) gauge in the hydraulic line between the valve body (2) and the rod end side of the inner boom fold cylinder.




BD0808164

## STEP 2

Activate the function such as to take the boom fold to it's full extent of travel. Record the reading on the corresponding pressure gauge.

***NOTICE:*** *This is for the left-hand inner boom circuit, all other circuits are similar.*

***NOTICE:*** *If the reading does not match the specification on the table in this Section, adjustment is necessary. See Valve Bank Relief Valve Adjustment in this Section.*

## STEP 3

Remove the pressure gauges.

## Boom Cylinder Testing

**⚠ WARNING ⚠**

Pressurized hydraulic fluid can penetrate the skin and cause severe injuries. Tighten all of the connections before starting the engine. If hydraulic fluid has penetrated the skin, seek medical assistance immediately.Failure to comply could result in death or serious injury.

M950A

### STEP 1

Start engine and warm the hydraulic oil to a minimum of 49°C (120°F).

### STEP 2

Fully extend or retract the cylinder in question.

### STEP 3

Disconnect the hydraulic line from the end of the cylinder with the least amount of available volume.

***NOTICE:*** *Disconnect the rod end if the cylinder is fully extended, or disconnect blind end if the cylinder is fully retracted.*

### STEP 4

Place the disconnected hose in a collection container.

### STEP 5

Activate the function so as to attempt to extend a fully extended or retract a fully retracted cylinder.

***NOTICE:*** *If no oil is collected, or only drops per minute, the seal is ok. If leakage is substantial the cylinder will have to be repaired or replaced. See Boom Cylinder Section 8080.*

# Hydraulic Tank Strainer Servicing

**WARNING**

When using solvents, acids or alkaline materials for cleaning, follow the manufacturer's recommendations for use. Wear goggles and protective clothing to reduce the possibility of personal injury. Failure to comply could result in death or serious injury.

M995A

**WARNING**

Always wear appropriate eye and face protection when using compressed air. Flying debris and dirt can cause personal injury. Make sure others are clear of the machine before using the air compressor. Never operate the machine while using the air compressor. Failure to comply could result in death or serious injury.

M994B

## STEP 1

Remove the top rear engine hood and rear engine hood. See Engine Hoods in section 9030.

## STEP 2

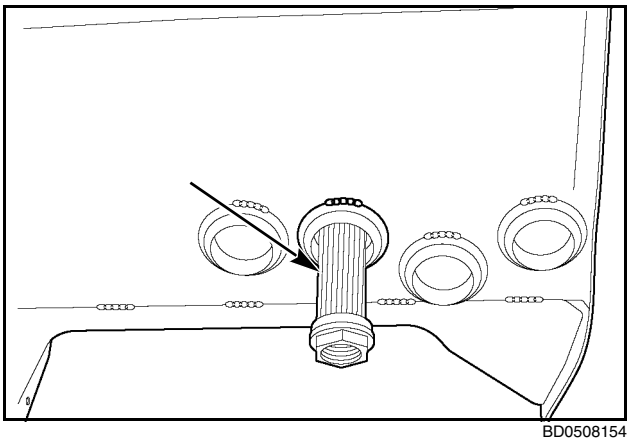
Pressure wash the outside and top of the hydraulic tank. Do this before starting the following procedure.

## STEP 3

Drain the hydraulic tank. See Hydraulic Tank Draining in this section.

## STEP 4

Remove all four hydraulic suction strainers.



BD0508154

# Section

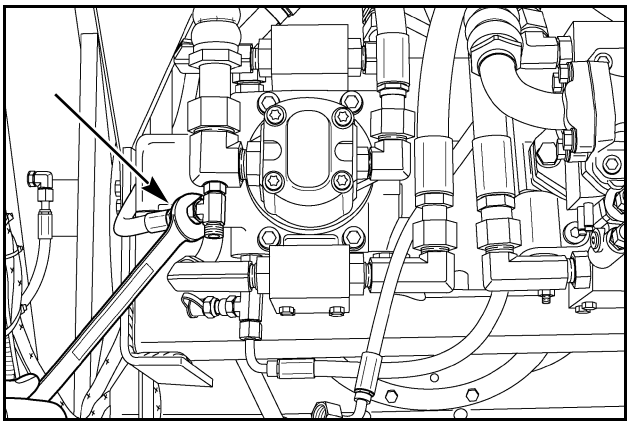
# 8040

## HYDRAULIC PUMPS

Issued September, 2009

## STEP 8

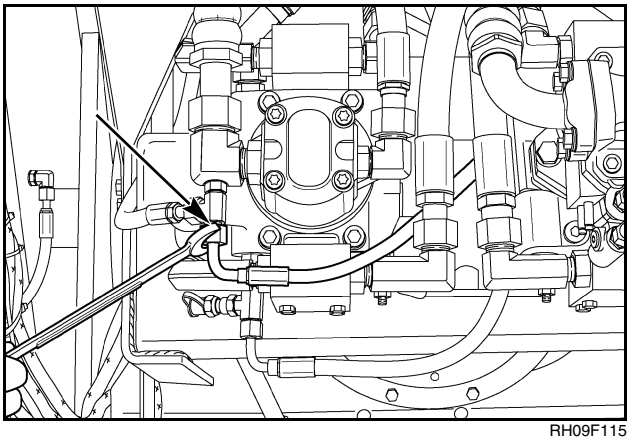
Connect hose to T fitting as shown.



RH09F116

## STEP 9

Connect hose to T fitting as shown.



RH09F115

## STEP 10

Fill hydraulic tank. See Hydraulic Tank Filling in Section 8020.

## STEP 11

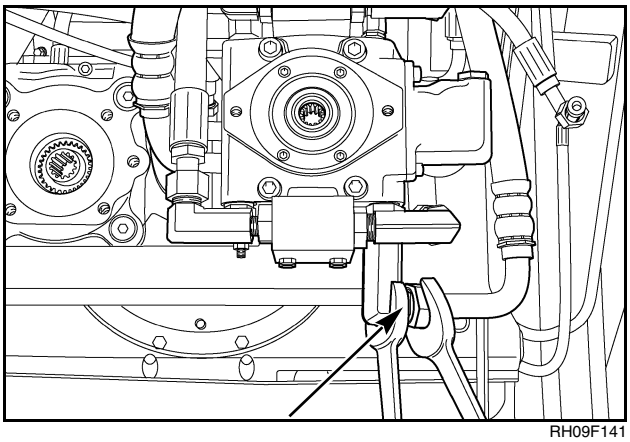
Bleed the air and any impurities from the system by using the following procedure.

1. Install a new in-tank return filter on the auxiliary hydraulic circuit.
2. Start the engine and run at 1500 RPM with the vehicle in neutral for a minimum of 20 minutes to filter and warm the hydraulic oil prior to any operation.
3. Run the machine for at least one hour under light load to complete the hydraulic oil filtration.
4. Shut down the machine and check for leaks.

# Right-Hand Hydrostatic Pump Removal

## STEP 1

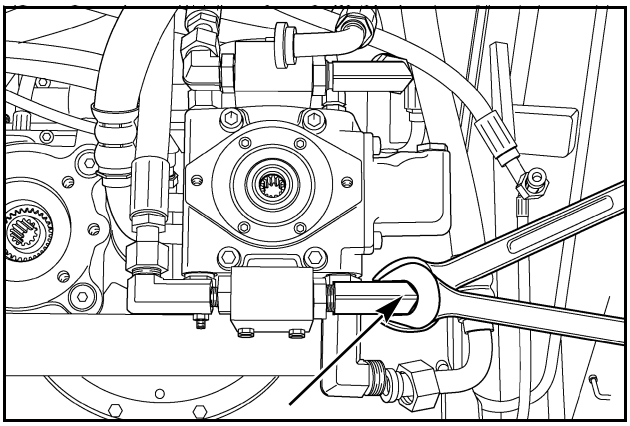
Remove hose from 90-degree fitting. Use second wrench to support fitting.



RH09F141

## STEP 2

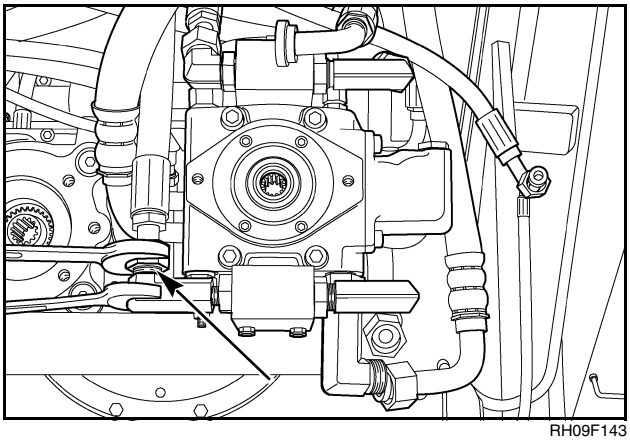
Remove hose from 90-degree fitting. Use second wrench to support fitting.



RH09F142

## STEP 3

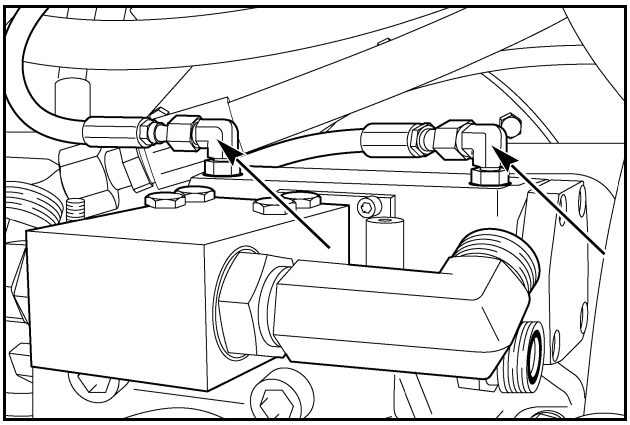
Remove hose from 90-degree fitting. Use second wrench to support fitting.



RH09F143

## STEP 4

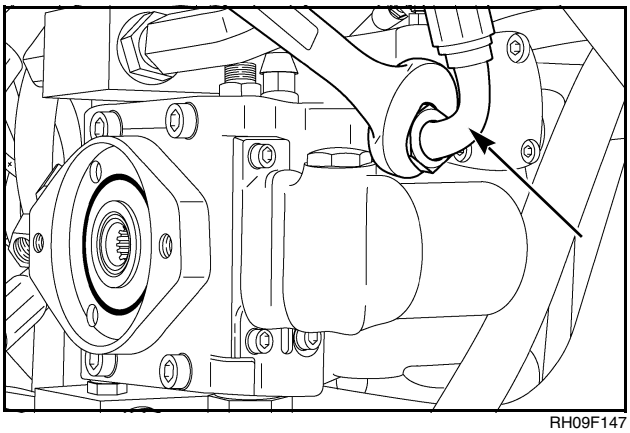
Install the two hoses to the 90-degree fittings as marked during disassembly.



RH09F148

## STEP 5

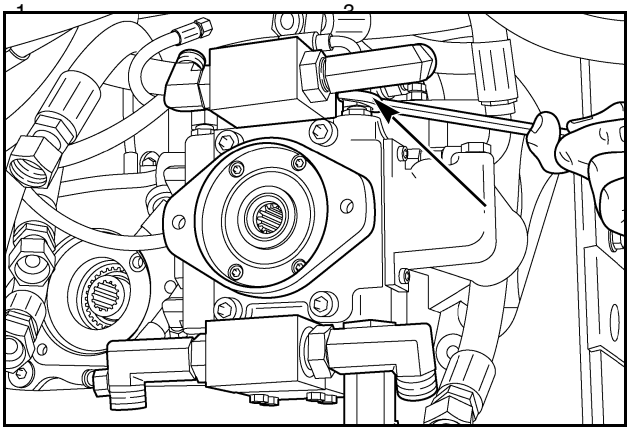
Install hose to fitting.



RH09F147

## STEP 6

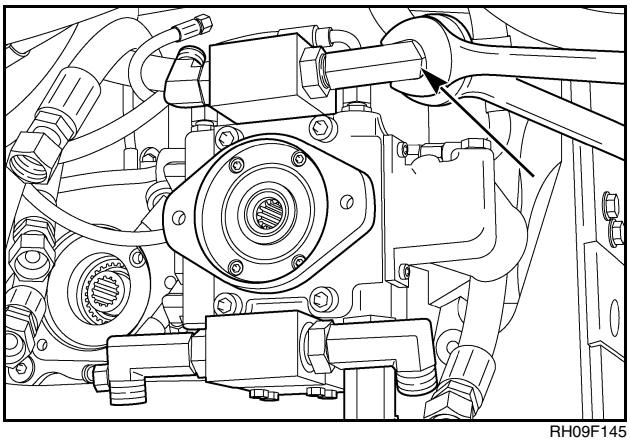
Install hose to fitting.



RH09F146

## STEP 7

Install hose to 90-degree fitting. Use second wrench to support fitting.



RH09F145

### STEP 11

Remove and discard the O-rings and shaft seal.

## Motor Inspection

### STEP 12

Wash all parts in clean solvent. Dry with compressed air.

**⚠ WARNING ⚠**

When using solvents, acids or alkaline materials for cleaning, follow the manufacturer's recommendations for use. Wear goggles and protective clothing to reduce the possibility of personal injury. Failure to comply could result in death or serious injury.

M995A

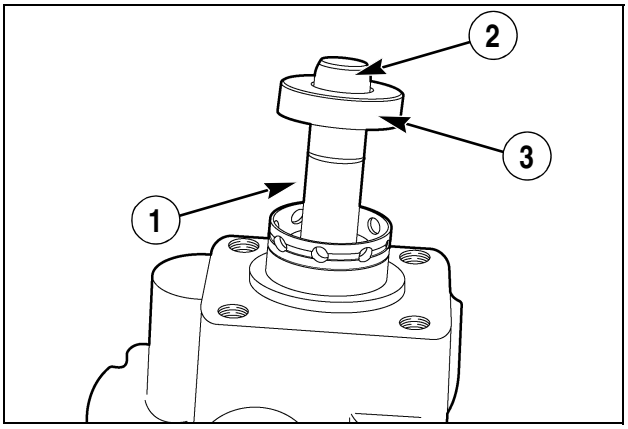
- Inspect the motor end plate, drive plate and gear housing for heavy wear or damage. Check the shaft for wear or grooving in the seal area.
- Check the gears and bearing for heavy wear or damage.
- If any of the above parts have heavy wear or damage, the motor must be replaced.

## Motor Assembly

***NOTICE:*** *Apply clean hydraulic oil to all rotating parts during assembly.*

### STEP 13

Position the drive shaft and bearing assembly (1) in the drive plate. Apply a thin film of clean hydraulic oil onto the seal installation bullet (2). Install the bullet and seal (3) over the shaft tang. Press the seal by hand over the bullet until the seal contacts the drive plate.




RH09E060

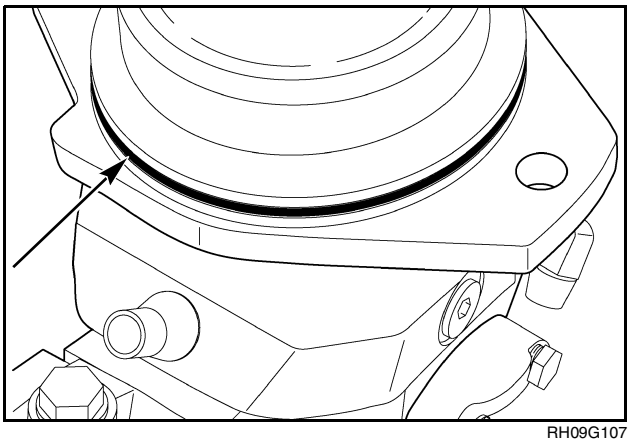
# Wheel Motor Installation

***NOTICE:*** *For torque specifications not listed, see section 1000 Standard Torque. If replacing hardware must use the hardware noted in this machine's parts manual.*

***NOTICE:*** *New O-rings need to be installed on any fittings that are being installed.*

## STEP 1

After cleaning motor, apply petroleum jelly to O-ring and install on to motor.



RH09G107

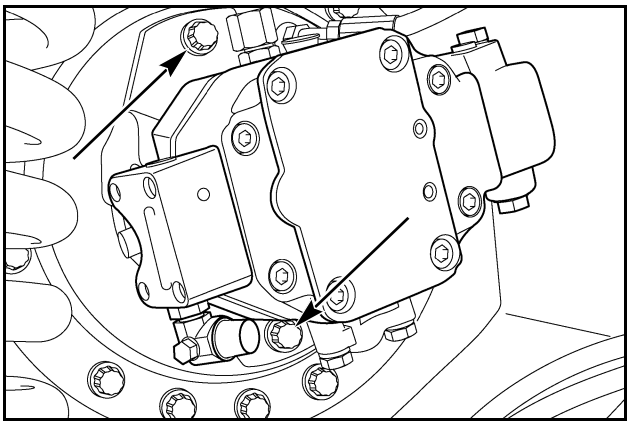
## STEP 2

**⚠ DANGER ⚠**

The equipment you are removing or installing is extremely heavy and mechanical assistance will be required in its removal and installation. Use adequate lifting device to support the weight of the equipment. Failure to comply will result in death or serious injury.

M1166C

Use a proper lifting device to support wheel motor. Install wheel motor and secure with two bolts. Torque bolts to 118 to 132 Nm (87 to 97 lb ft).



RH09G106

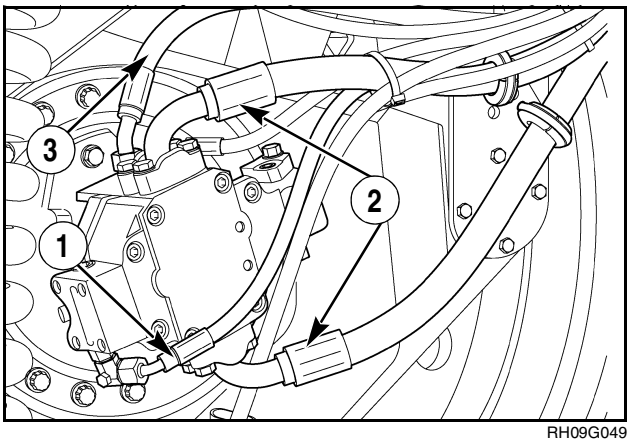
## STEP 3

Remove caps and plugs.

Install hydraulic line (1) onto lower rear side of wheel motor. (Left hand front wheel motor shown).

Install two split flange hoses (2) on top and bottom of wheel motor.

Install hydraulic line (3) onto top of wheel motor. See Standard Torque Section 1000.




RH09G049

# Pump Drive Disassembly

**⚠ DANGER ⚠**

The equipment you are removing or installing is extremely heavy and mechanical assistance will be required in its removal and installation. Use adequate lifting device to support the weight of the equipment. Failure to comply will result in death or serious injury.

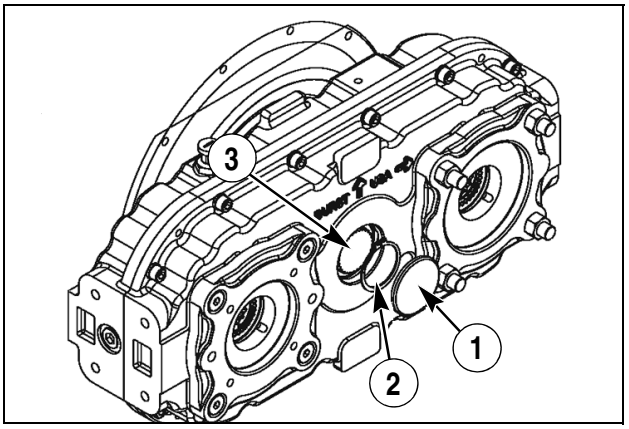
M1166C

## STEP 1

To access the input shaft retaining ring, remove expansion plug (1). Remove retaining ring (2) from input drive shaft (3) and slide shaft out of the engine adapter side.

***NOTICE:*** *The expansion plug must be replaced anytime it is removed.*

***NOTICE:*** *Use a rubber mallet to remove the shaft from the input gear.*

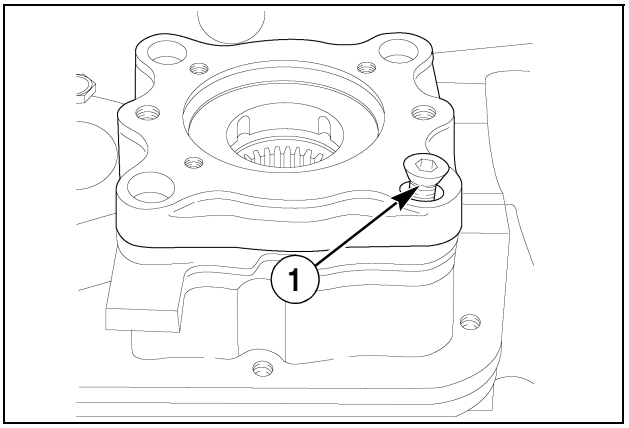



BD0508139

## STEP 2

Remove pump pad mounting bolts (1). Carefully pry pump pads away from housing evenly to avoid damaging the pilot. Remove pump pads from housing.

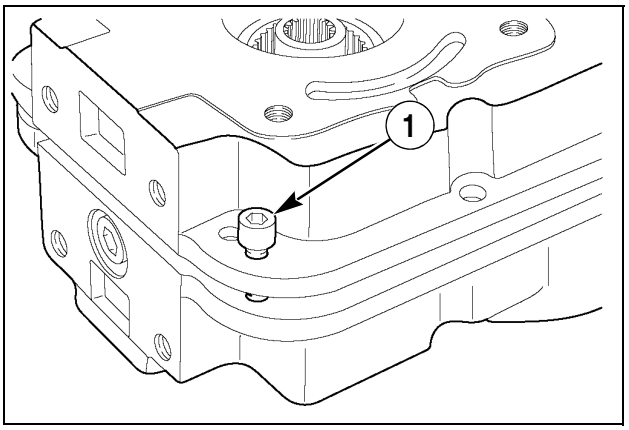
***NOTICE:*** *To avoid oil leaks, all O-rings are to be replaced any time a pump pad is removed.*




BD0708024

## STEP 3

Place pump drive on a flat surface with pump pads facing up. Remove the cap screws. Use cap screws (1) in threaded separating holes to split housing halves. Lightly tap output housing with a rubber mallet to release bearings and gears from bearing bores.




BD0708026

# Section

# 8070

## HYDRAULIC VALVES

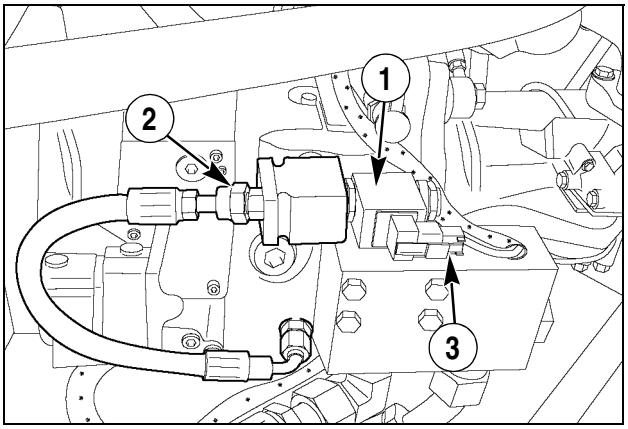
Issued September, 2009

# Neutral Shunt Valve Installation

***NOTICE:*** *If any of the fittings were removed the O-rings must be replaced.*

## STEP 1

Install valve (1). Connect hydraulic line (2) and the wire harness (3).



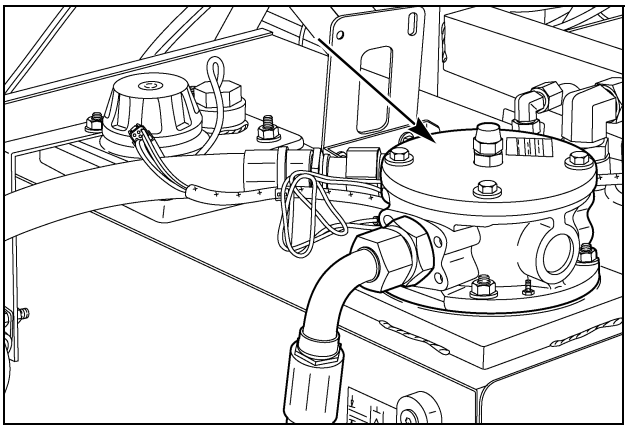

BD0408106

## STEP 2

**⚠ WARNING ⚠**

Air has been introduced into the hydraulic circuit for this valve block. Air in the hydraulic lines can cause the circuit to act abnormally. Components may drop or move unexpectedly. Keep everyone clear of the machine and use caution when testing operation of the circuit after valve block service. Cycle the hydraulic circuit several times to remove air from the system. Failure to comply could result in death or serious injury.

M990A



RH09E154

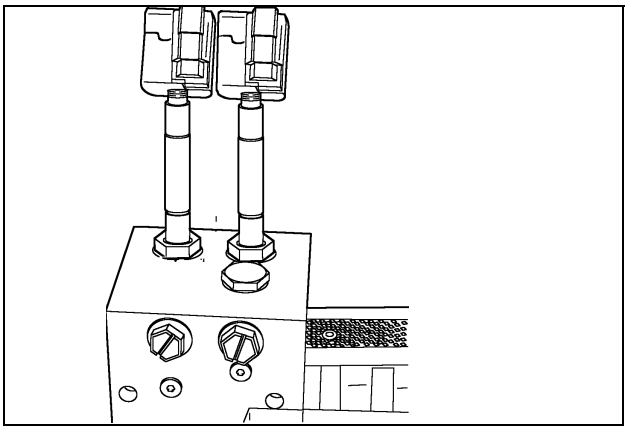
1. Install a new in-tank return filter on the auxiliary hydraulic circuit.
2. Start the engine and allow it to run at 1500 RPM with the vehicle in neutral for a minimum of 20 minutes to filter and warm the hydraulic oil prior to any operation.
3. Run the machine for at least one hour under light load to complete the hydraulic oil filtration.
4. Shut down the machine and check for leaks.

# Two-Section Valve Bank Disassembly

## STEP 1

Remove the two nuts on solenoid valves and the four coils. Check coils for damage or excessive wear. Replace if necessary.

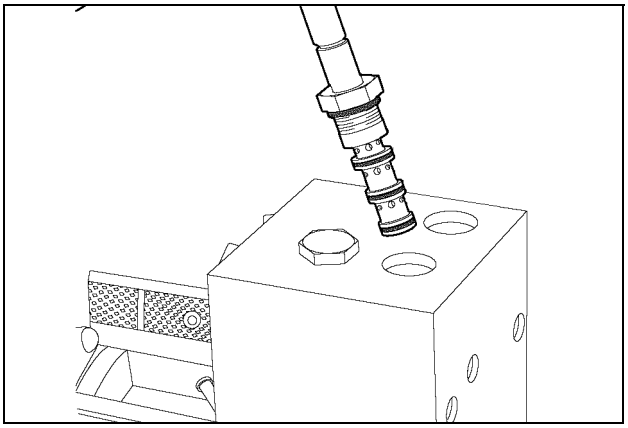
***NOTICE:*** *Note the position of coil electrical connections for proper installation.*



BD0808135

## STEP 2

Remove both solenoid valves. Check valve for damage. Replace if necessary.

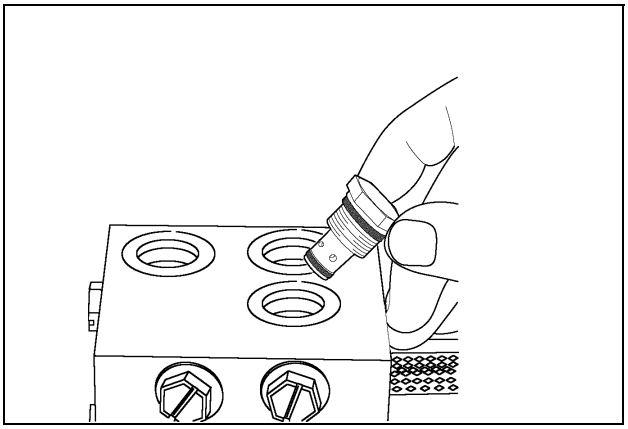


BD0808136

## STEP 3

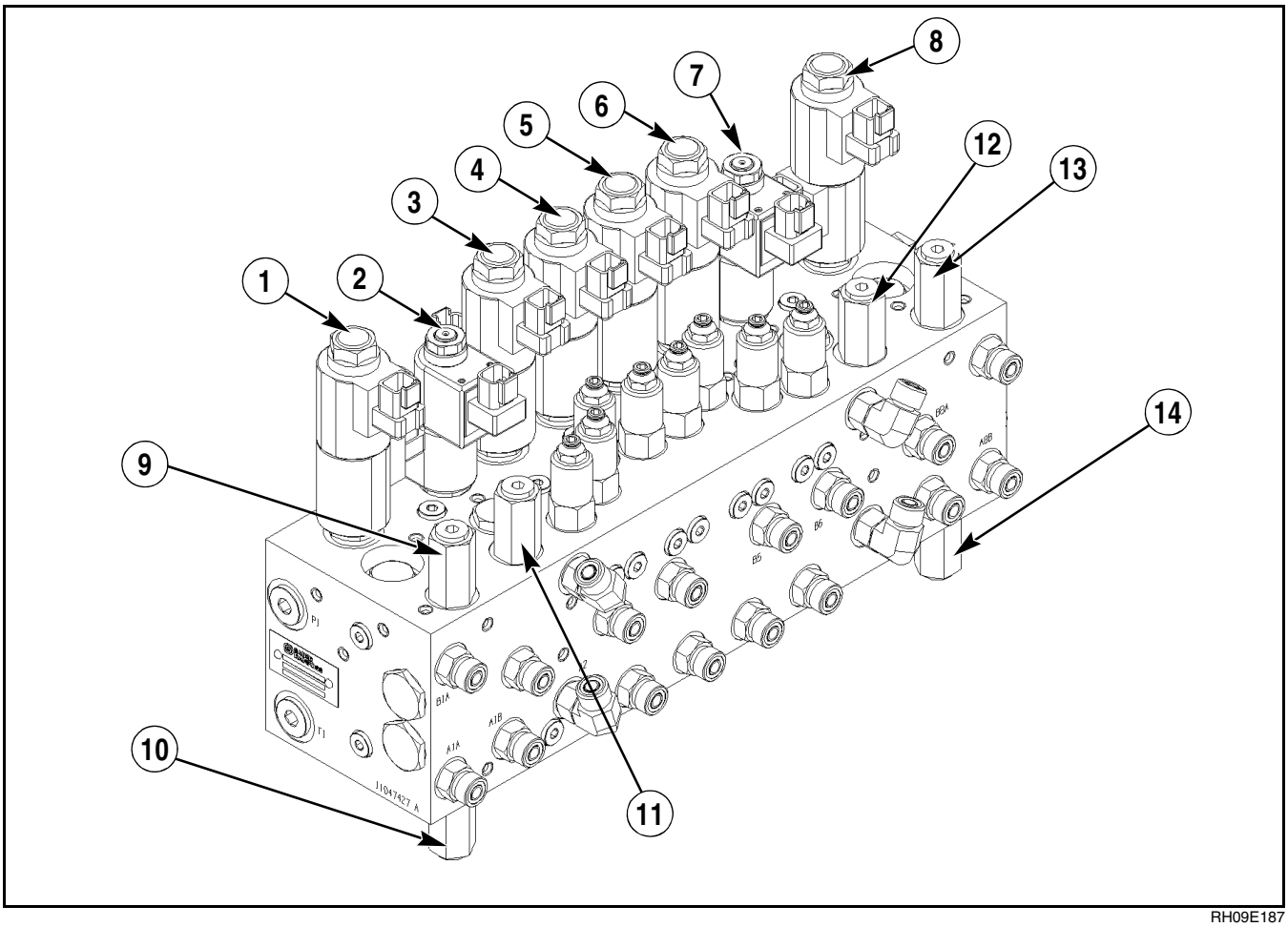
Remove check valve from two-section valve. Check the valve for damage or excessive wear. Replace if necessary.

***NOTICE:*** *There are two check valves in the two section valve assembly. Removal, service, and installation procedures are the same for both.*



BD0808137

## Eight-Function Valve Bank Solenoid Identification




RH09E187

1. LEFT INNER BOOM FOLD
2. LEFT BOOM LEVEL (NON PWM)
3. LEFTMIDDLE BOOM FOLD
4. LEFT OUTER BOOM FOLD
5. RIGHT OUTER BOOM FOLD
6. RIGHT MIDDLE BOOM FOLD
7. RIGHT BOOM LEVEL (NON PWM)
8. RIGHT INNER BOOM FOLD
9. LEFT INNER BOOM FOLD 1500 PSI ROD END RELIEF VALVE
10. LEFT INNER BOOM FOLD 3000 PSI BLIND END RELIEF VALVE
11. LEFT BOOM LEVEL 200 PSI BLIND END RELIEF VALVE
12. RIGHT BOOM LEVEL 200 PSI BLIND END RELIEF VALVE
13. RIGHT INNER BOOM FOLD 1500 PSI ROD END RELIEF VALVE
14. RIGHT INNER BOOM FOLD 3000 PSI BLIND END RELIEF VALVE

***NOTICE:*** *When disassembling components from the valve block, make sure the area is clean of debris and new seals are always utilized.*

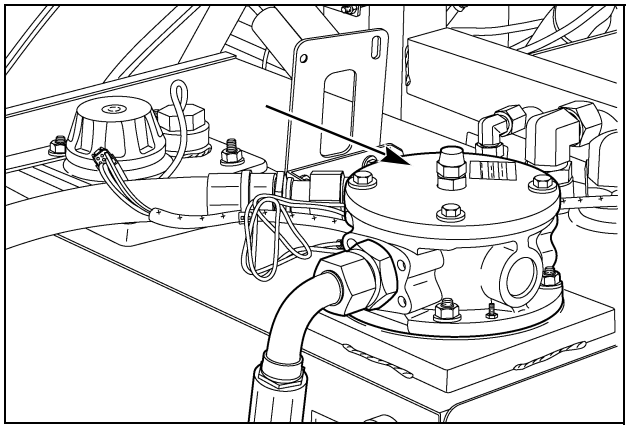
## STEP 3

**⚠ WARNING ⚠**

Air has been introduced into the hydraulic circuit for this valve block. Air in the hydraulic lines can cause the circuit to act abnormally. Components may drop or move unexpectedly. Keep everyone clear of the machine and use caution when testing operation of the circuit after valve block service. Cycle the hydraulic circuit several times to remove air from the system. Failure to comply could result in death or serious injury.

M990A

1. Install a new in-tank return filter on the auxiliary hydraulic circuit.
2. Start the engine and run in neutral at a minimum of 1500 RPM.
3. Allow the engine to run at 1500 RPM with the vehicle in neutral for a minimum of 20 minutes to filter and warm the hydraulic oil prior to any operation.
4. Run the machine for at least one hour under light load to complete the hydraulic oil filtration.
5. Shut down the machine and check for leaks.



RH09E154

# SPECIAL TORQUES

| | Metric Values | U.S. Values |
|---|---|---|
| Mid and outer boom fold cylinder 120 ft mounting nut | 68 Nm | (50 lb ft) |
| Outer boom fold cylinder 120 ft jam nut | 136 Nm | (100 lb ft) |
| Boom height cylinder back pivot pin nut and bolt | 44 to 61 Nm | (33 to 45 lb ft) |
| Steering cylinder mounting bolts and nuts | 393 to 419 Nm | (290 to 310 lb ft) |

***NOTICE:*** *All torque specification above are for the cylinder installation. All torque specifications below are for cylinder overhaul.*

| | | |
|---|---|---|
| Axle adjust cylinder piston locknut | 271.2 to 338.9 Nm | (200 to 250 lb ft) |
| Axle adjust cylinder rod nut | 271.2 to 338.9 Nm | (200 to 250 lb ft) |
| Boom height cylinder accumulator to cylinder | 32.6 to 35.4 Nm | (24 to 26 lb ft) |
| Boom level cylinder rod nut | 454.2 to 508 Nm | (335 to 375 lb ft) |
| Boom level cylinder gland nut | 339 to 406.7 Nm | (250 to 300 lb ft) |
| Inner boom fold cylinder rod nut (except 120 ft boom) | 271.2 to 306 Nm | (200 to 225 lb ft) |
| Inner boom fold cylinder gland nut (except 120 ft boom) | 244.1 to 271.1 Nm | (200 to 250 lb ft) |
| Inner boom fold cylinder rod nut (120 ft boom) | 454.2 to 508 Nm | (335 to 375 lb ft) |
| Inner boom fold cylinder gland nut (120 ft boom) | 339 to 406.7 Nm | (250 to 300 lb ft) |
| Ladder cylinder rod nut | 13.6 to 14.9 Nm | (10 to 11 lb ft) |
| Outer boom fold cylinder rod nut (except 120 ft boom) | 244.1 to 271.1 Nm | (200 to 250 lb ft) |
| Parallel link cylinder rod nut | 244.1 to 271.1 Nm | (200 to 250 lb ft) |
| Parallel link cylinder gland nut | 244.1 to 271.1 Nm | (200 to 250 lb ft) |
| Parallel link cylinder check valve | 40.7 to 47.4 Nm | (30 to 35 lb ft) |
| Steering cylinder rod nut | 271.2 to 305 Nm | (200 to 225 lb ft) |
| Steering cylinder gland nut | 271.2 to 338.9 Nm | (200 to 225 lb ft) |

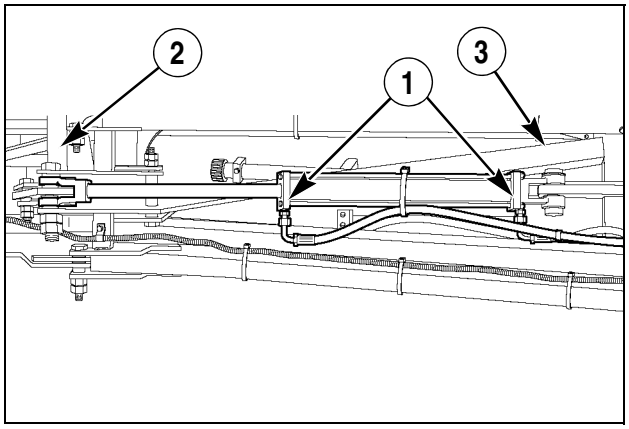
## STEP 4

***NOTICE:*** *Clean all connections to be removed with an aerosol degreaser and brush before loosening. Repeat flush with aerosol degreaser with fitting backed out 2-3 turns.*

***NOTICE:*** *Immediately cap or plug any connection that is opened with clean, threaded caps and plugs.*

Disconnect hydraulic lines (1), remove mounting bolt (2) and pin (3). Remove the cylinder.

***NOTICE:*** *There is no overhaul procedure for these cylinders.*




BD0808150

# LADDER CYLINDER

***NOTICE:*** *For torque specifications not listed, see Section 1000 Standard Torque. If replacing hardware must use the hardware noted in this machine's parts manual.*

***NOTICE:*** *Use Kit #323763 when working on the hydraulic system.*

## Ladder Cylinder Removal

### STEP 1

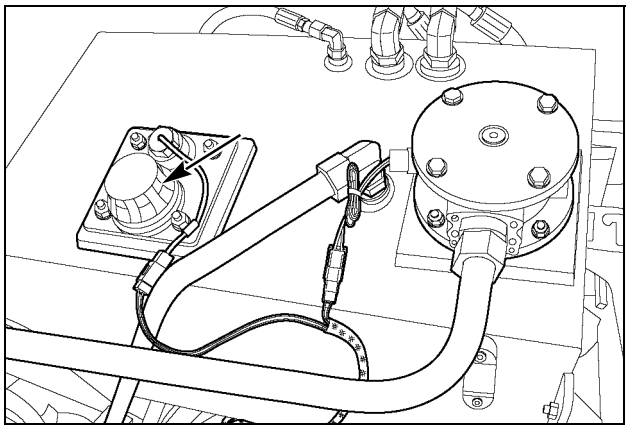
Power wash entire machine, especially around area to be worked on.

### STEP 2

**⚠ WARNING ⚠**

The hydraulic tank is a pressurized system. Vent tank slowly by loosening the breather before performing work on hydraulic filters or the hydraulic system to prevent excess loss of fluid and serious injury. Failure to comply could result in death or serious injury.

M1285A



BD0508115

Remove the pressure from the hydraulic tank by slowly loosening the breather cap until pressure is bled from the hydraulic tank. Tighten breather.

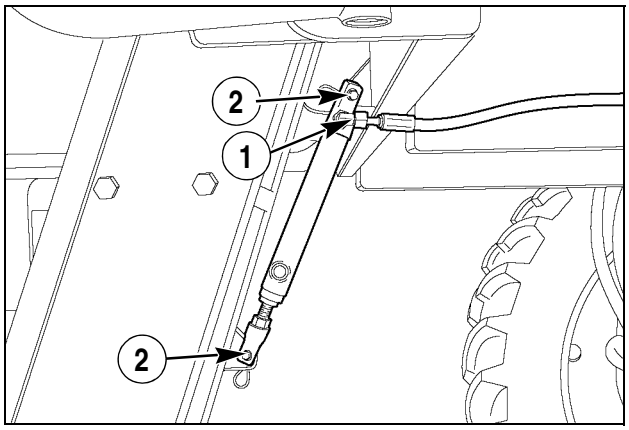
### STEP 3

***NOTICE:*** *Clean all connections to be removed with an aerosol degreaser and brush before loosening. Repeat flush with aerosol degreaser with fitting backed out 2-3 turns.*

***NOTICE:*** *Immediately cap or plug any connection that is opened with clean, threaded caps and plugs.*

Disconnect hydraulic line (1), remove pins (2) and remove cylinder.

***NOTICE:*** *For cylinder overhaul see CYLINDER OVERHAUL on Page 32 in this section.*

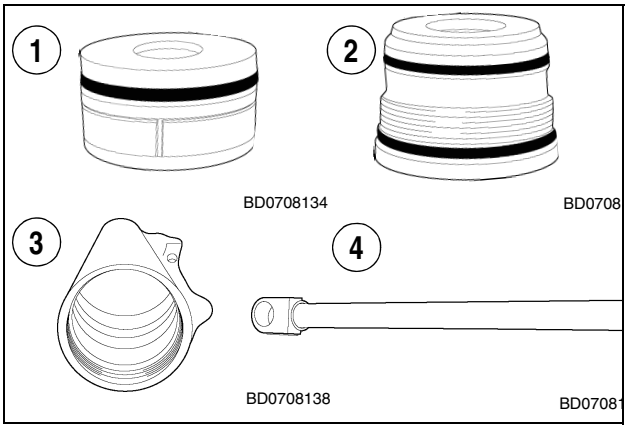



BD0208107

## STEP 4

Inspect piston (1), gland nut (2), cylinder tube (3) and cylinder rod (4) for any damage.

***NOTICE:*** *Pay close attention for any scoring on the polished end of the rod (4) and cylinder tube (3).*



# Section

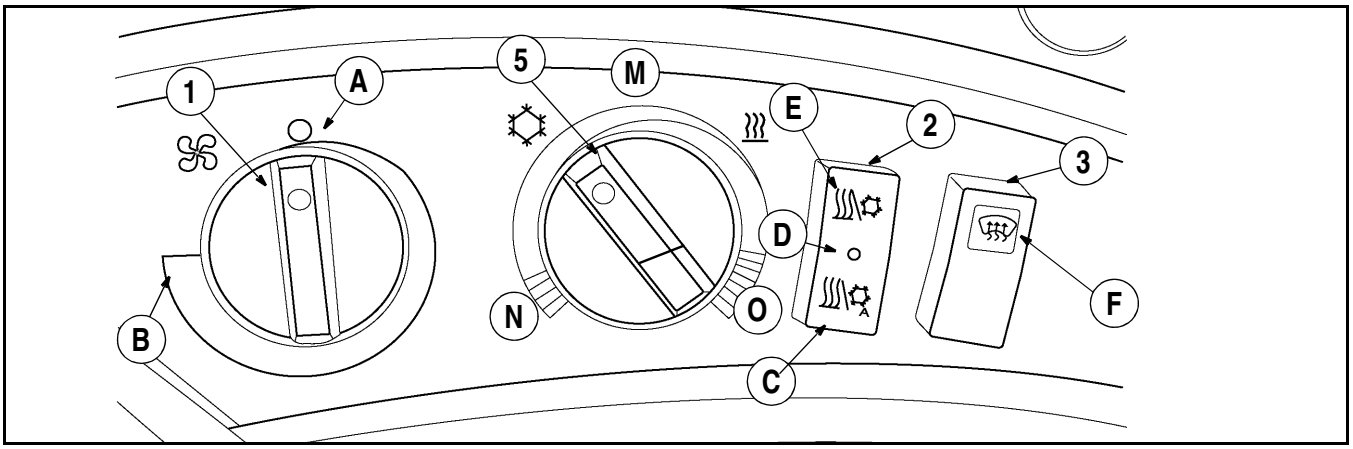
# 9000

## AIR CONDITIONING SYSTEM

## Troubleshooting and Fault Codes



Issued September, 2009




RD05J039

| | | |
|---|---|---|
| **1. Blower Speed Control** | Manual selection of blower speed which overrides controller selection | A. Blower OFF |
| | | B. Maximum Blower Speed |
| **2. ATC Switch** | Selects operational mode | C. Automatic Mode |
| | | D. OFF |
| | | E. Manual Mode |
| **3. Defog/Defrost Switch** | | F. Defog/Defrost Mode |

## ATC Fault Code 125
## High pressure switch (+) shorted to power

**Cause:**

Wire harness/connector failure

***NOTICE:*** *If system is properly charged, then the high pressure switch will be closed and the short could be on either leg of the switch.*

ATC module failure

**Possible failure modes:**

Compressor clutch disabled.

**Solution:**

1. Inspect harness and connectors for possible shorting between high pressure switch wires (both leads) and other wires. If a short exists then replace harness.

2. If no fault found with wire harness, or connectors, then replace ATC module.

## ATC Fault Code 126
## High pressure switch (+) shorted to ground

**Cause:**

Wire harness/connector failure

***NOTICE:*** *If system is properly charged, then the high pressure switch will be closed and the short could be on either leg of the switch.*

ATC module failure

**Possible failure modes:**

Compressor clutch disabled.

**Solution:**

1. Inspect harness and connectors for possible shorting between high pressure switch wires (both leads) and other wires. If a short exists then replace harness.

2. If no fault found with wire harness, or connectors, then replace ATC module.

# ATC Field Reported Symptoms/Causes

| Symptom | Correction/Test Point | |
|---|---|---|
| Hot air discharge out of vents - above 38°C (100°F) - without adjusting the temperature control with cooling request.<br>No fault codes displayed. | 1. Test cab temperature and evaporator temperature sensors and circuits. See **Sensors**.<br>2. Test heater control valve for leakage. See valve “leak through”. | |
| System fails to heat or cool correctly, but otherwise appears to function normally.<br>No fault codes. | 1. Check cab recirculation filter for obstruction.<br>2. Check recirculation filter for cleanness.<br>3. Test cab temperature and evaporator temperature sensors. See **Sensors**. | |
| Blower operates.<br>“AUTO” does not display on Instrument Cluster Display.<br>System does not cool. | Test blower speed potentiometer for short to ground. | |
| In Automatic mode, when switching from maximum cool range to warmer setpoint, if temperature sensed at cab temperature sensor is less than the setpoint selected, controller opens heater valve and warm air blows out the vents. Heat output continues until the cab temperature sensor reaches the setpoint. | System anomaly. | |
| Instrument Cluster Display is blank. | No compressor/heater valve operation. Blower speed at 100% only. | Check Fuse 37<br>Test power and ground to controller. |
| | System cools and heats normally. | Test Instrument Cluster Display. |
| Instrument Cluster displays “88,” and icons and “88” flash on and off. | At startup for less than one minute | Normal. |
| | Continuous with blower cutting in and out | Test power and ground to controller. |
| | Continuous without blower cutting in and out | Test Instrument Cluster display. |
| 16°C (60°F) displays continuously on Instrument Cluster Display. Cannot be changed with temperature control. | Fault Code 121 displays. | Test temperature control potentiometer and circuit for a short. |
| | Fault Code 121 does not display | |

# HEATER CONTROL VALVE

## Operational Check

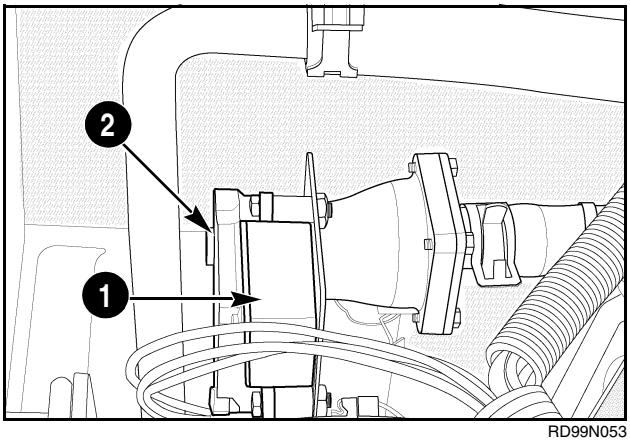
The controller opens or closes the heater control valve based on the operator selected input at the temperature control and the temperature sensed at the cab and evaporator sensors.

The heater control valve can fail mechanically in any position: open, closed or anywhere in the middle.

To confirm proper valve operation, observe the slot on the front of the valve. Rotation of the slot must mirror the movement of the temperature control.

The slot must rotate fully clockwise when the control is turned fully clockwise; the slot must rotate fully counterclockwise when the slot is turned fully counterclockwise.

If the valve does not mirror control movement or does not move, perform the valve motor electrical test.




RD99N053

1. HEATER CONTROL VALVE 2. SLOTTED ACTUATOR

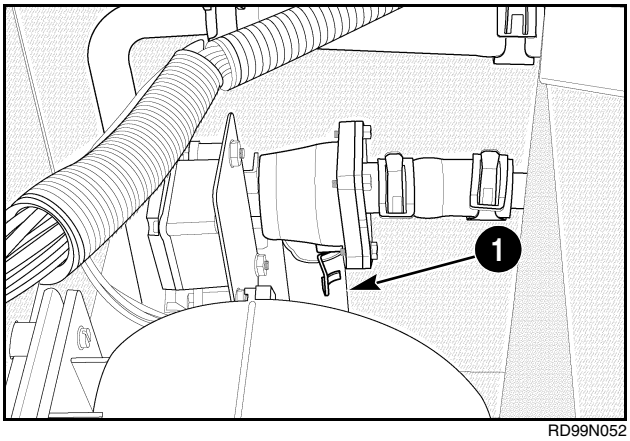
### Valve “Leak Through”

A common problem with the valve is hot coolant flow when cab cooling is desired. This usually occurs by a when a valve does not close completely. To test for leak through from the valve:

1. Operate the A/C system at maximum cooling and blower speed for 15 minutes. See conditions for Performance Testing.

***NOTICE:*** *Do not clamp off the heater supply or return lines at the engine for this test.*

2. Install a stem type thermometer in a mid-cab louver, and record the temperature.
3. Clamp off the coolant supply line before the valve with a vise grip pliers. (The supply line connects at the bottom of the valve.) Wait a few minutes and check the thermometer. If the temperature drops, valve leak through is the problem; replace the valve.




RD99N052

1. HEATER SUPPLY LINES

## Cab Temperature Sensor and Circuit Test

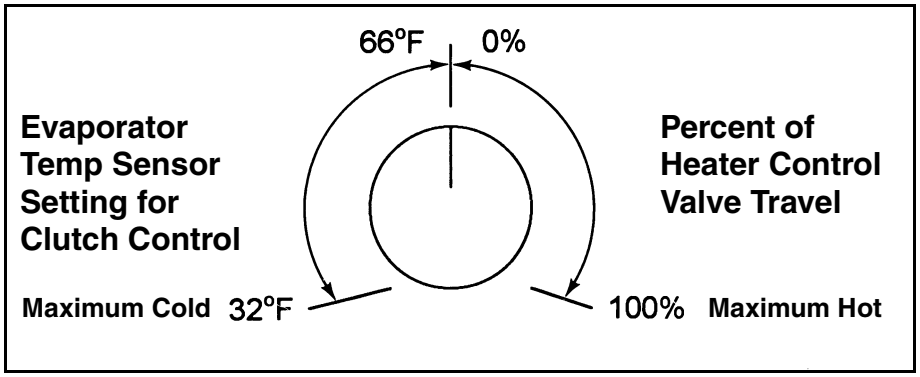
| Steps and Test Point | Corrective Actions |
|---|---|
| 1. Keyswitch OFF. Disconnect the cab temperature sensor from harness. Measure the resistance across the sensor leads. Measure the ambient temperature at the sensor. Compare the readings to the Temperature versus Resistance table on page 53. Is the resistance reading within the minus or plus 2.5% range in the table? | YES - Go to next Step.<br>NO - Replace the sensor. |
| 2. Keyswitch ON and ATC switch to “Auto”. Measure voltage at female connector on sensor. Is voltage present?<br>***NOTICE:*** *Voltage reading will be very low: 0.5V at* 21°C (*70°F); and voltage decreases as temperature increases.* | YES - Go to next Step 4.<br>NO - Go to next Step. |
| 3. Measure voltage at CJ8-21 at the controller. Is voltage present? | YES - Locate and repair open condition between CJ8-21 at the controller and the sensor.<br>NO - Test the controller. See **ATC Controller Test** in this Section. Perform tests 1, 2, and 10. |
| 4. Measure resistance from ring terminal on the sensor to HVAC ground. Less than 1 ohm? | YES - Wrong reading taken. Retest.<br>NO - Locate and repair open condition between sensor and HVAC ground. |

## Standard A/C Operation

The standard A/C controller is an open loop control device. The controller provides electronic thermostat control. The compressor clutch is engaged and disengaged by the standard controller. The clutch is cycled from 0 to 19° C (32 to 66° F) evaporator temperature sensor values proportional to the temperature control potentiometer position from 12 o'clock to full counterclockwise.

The standard controller opens the heater control valve from full closed to full open position proportional to the temperature control potentiometer position from 12 o'clock to full clockwise.

If cab temperature is to be made cooler or warmer or if blower speed is to be increased or decreased, it is the operator who makes the adjustment.




**Standard A/C Temperature Control**

### Smart Pressure Switch Cycling System

The standard A/C system is equipped with pressure switch cycle counters. The compressor is latched OFF after four activations of the low pressure switch within a 60 second interval. The compressor is also latched OFF after two activations of the high pressure switch within a 60 second interval. The 60 second interval starts with the first activation of the switch in both cases.

***NOTICE:*** *Actual interval may be as short as 10 seconds if the open condition is constant.*

The controller flashes the pressure warning lamp (mounted in the A/C On/Off switch) slowly, approximately 7 times in a 10 second period for the low pressure switch, or quickly, approximately 13 times in a 10 second period for the high pressure switch.

The compressor clutch remains latched OFF until the A/C switch or keyswitch is toggled OFF and then ON. However, toggling the switch does not correct the pressure problem, and system service is required.

***NOTICE:*** *Your A/C systems are designed to prevent A/C compressor failure due to low pressure or low refrigerant charge. Operation on days below 4°C (40°F) may actuate the low pressure sensing system and shut down the A/C system. The system is not malfunctioning if this occurs. Toggle the A/C switch OFF and then ON to reset the system.*

# Heater Control Valve

## Operational Check

The controller opens or closes the heater control valve based on the operator selected input at the temperature control and the temperature sensed at the evaporator sensor.

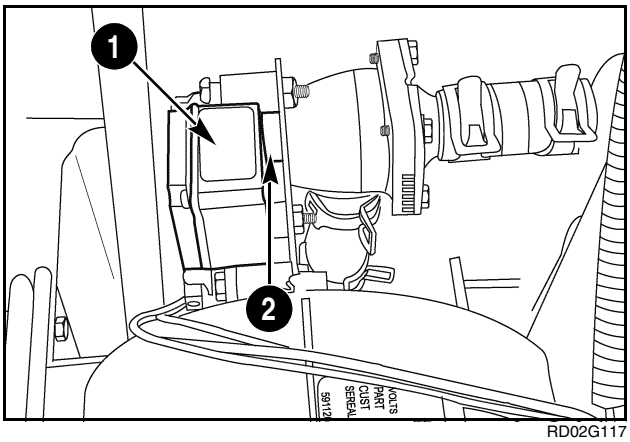
The heater control valve can fail mechanically in any position: open, closed or anywhere in the middle.

To confirm proper valve operation, observe the slot on the front of the valve. Rotation of the slot must mirror the movement of the temperature control.

***NOTICE:*** *Mark the actuator, if required, to better observe rotation.*

The slot must rotate fully clockwise when the control is turned fully clockwise; the slot must rotate fully counterclockwise when the slot is turned fully counterclockwise.

If the valve does not mirror control movement or does not move, perform the valve motor electrical test.



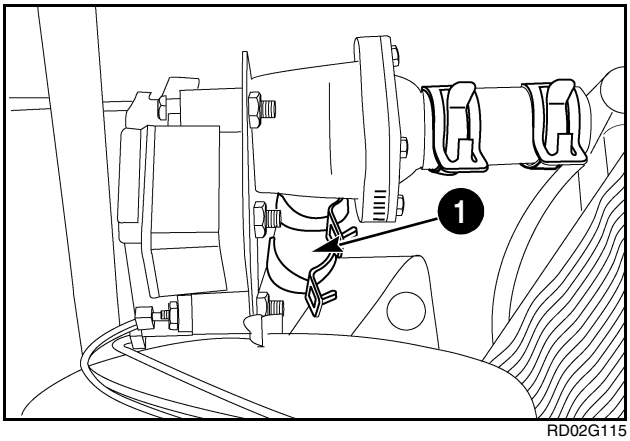

RD02G117

1. HEATER CONTROL VALVE
2. SLOTTED ACTUATOR

### Valve "Leak Through"

A common problem with the valve is hot coolant flow when cab cooling is desired. This usually occurs by a when a valve does not close completely. To test for leak through from the valve:

1. Operate the A/C system at maximum cooling and blower speed for 15 minutes. See conditions for Performance Testing.
2. Install a stem type thermometer in a cab louver, and record the temperature.
3. Clamp off the coolant supply line (1) before the valve with a vise grip pliers. (The supply line connects at the bottom of the valve.) Wait a few minutes and check the thermometer. If the temperature drops, valve leak through is the problem; replace the valve.




RD02G115

***NOTICE:*** *Do not clamp off the heater supply line or close the heater return line valve at the engine for this test.*

## Controller Power Supply and Ground Test

| Steps and Test Point | Corrective Actions |
|---|---|
| 1. Keyswitch ON. Measure the voltage between Pin A at the controller (CCU1) and chassis ground. Is 12V present? | YES - Go to Step 3.<br>NO - Go to next Step. |
| 2. Check Fuse 47 (30 amp). Is 12V present? | YES - Locate and repair open condition between Fuse47 and Pin A at the controller.<br>NO - Locate and repair open condition from Fuse47 to switched B+. Go to next Step. |
| 3. Measure resistance from Pin F at the controller (CCU1) to the HVAC ground stud. Less than 1 ohm? | YES - Test the controller. See **Standard Controller Test** in this Section.<br>NO - Locate and repair open condition from Pin F to HVAC ground. |

## A/C Switch and Circuit Test

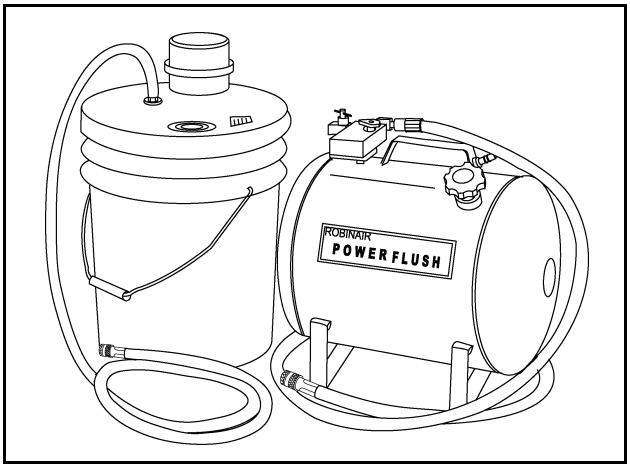
| Steps and Test Point | Corrective Actions |
|---|---|
| 1. Disconnect A/C switch from harness. With switch ON, measure resistance across Pins 5 and 6 on switch. Less than 1 ohm? | YES - Go to next Step.<br>NO - Replace switch. |
| 2. Measure resistance across Pins 9 and 10 at switch. Less than 1 ohm? | YES - Go to next Step.<br>NO - Replace switch. |
| 3. Measure resistance from Pin 5 at the harness connector to chassis ground. Less than 1 ohm? | YES - Go to next Step.<br>NO - Locate and repair open condition between Pin 5 and ground. |
| 4. Keyswitch ON. Is 5V present at Pin 6 at the harness connector? | YES - Go to Step 6.<br>NO - Go to next Step. |
| 5. Is 5V present at Pin E at the controller (CCU1)? | YES - Locate and repair open condition between Pin E at controller and Pin 6 at switch through C139-L and C322-A.<br>NO - Test the controller. See **Standard Controller Test** in this Section. |
| 6. Is 5V present at Pin 10 at the harness connector to the switch? | YES - Go to next Step.<br>NO - Locate and repair open condition in switched B+ to Pin 10 at switch. |
| 7. Reconnect the A/C switch to harness. Disconnect the harness to the low pressure switch. Keyswitch, A/C switch and blower control ON. Temperature control to maximum cool. Is 5V present between Pin C at the controller (CCU2) and chassis ground? | YES - Test the controller. See **Standard Controller Test** in this Section.<br>NO - Locate and repair open condition between Pin C at controller and Pin 9 at the switch through C322-A and C139-M. |

**UV Fluorescent Dye Cleaner - B795016**


RR00F100

**Power Flush Model 17550 BS33801 - A/C Flushing Solution**

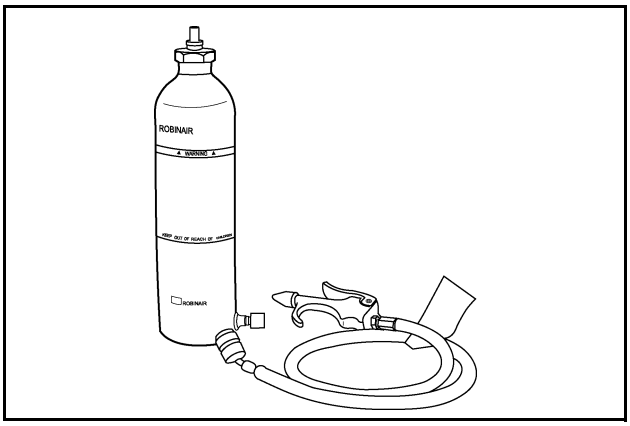
Case of six, one gallon containers




RR00F093

**Flush Gun Kit Model 17585 BS33801 - A/C Flushing Solution**

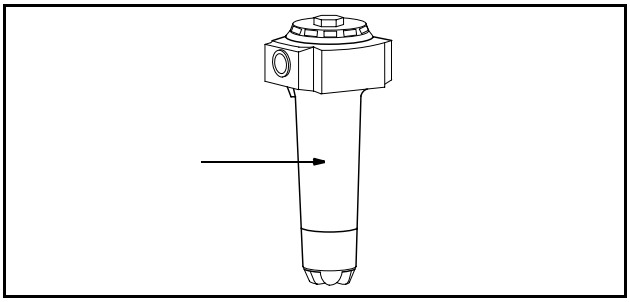
Case of six, one gallon containers




RP00G007

**Coalescing Air Filter/Dryer**

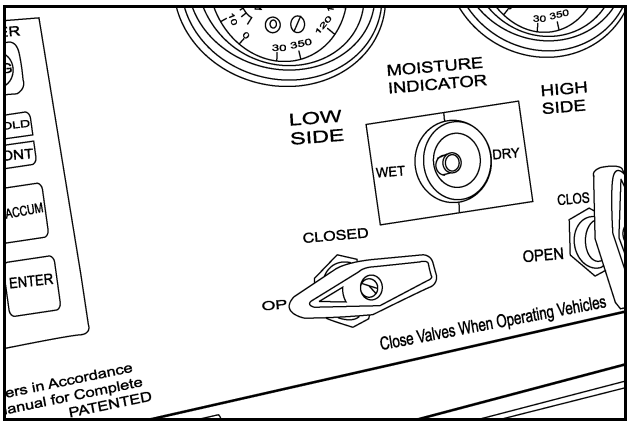
Similar to Ingersoll-Rand Model IR5CHE or Grainger Model 4KR65



RI00F041

## STEP 7

Open the low side manifold on the control panel of OEM1415 or OEM1418.



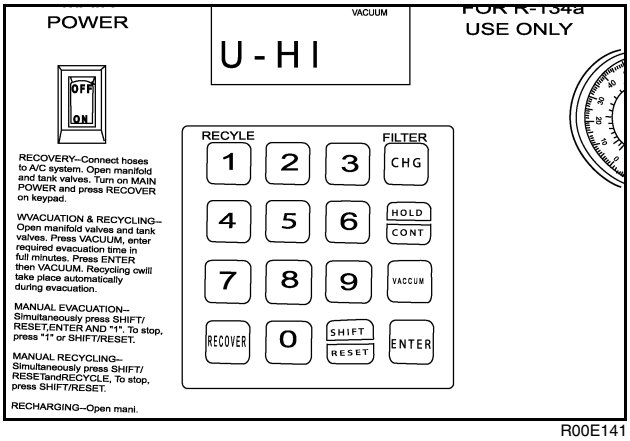

RR00E156

## STEP 8

Press SHIFT/RESET and ENTER at the same time.

Press 1. The vacuum pump starts and runs continuously until any other key is depressed.

Run the vacuum pump for a minimum of 5 minutes. Then press 1 to stop the pump.



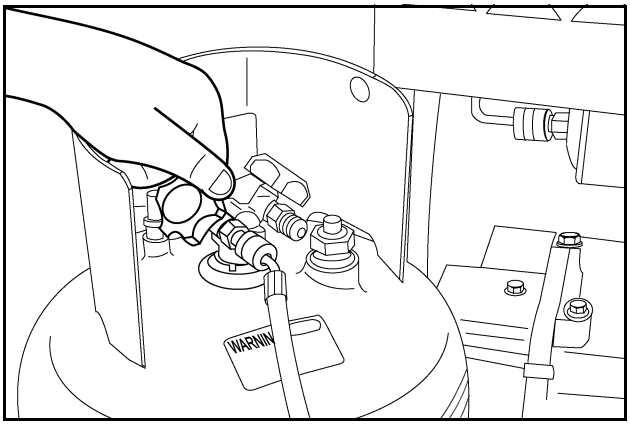

R00E141

## STEP 9

Press SHIFT/RESET again to return to the normal display mode.

Close the valve on the tank.

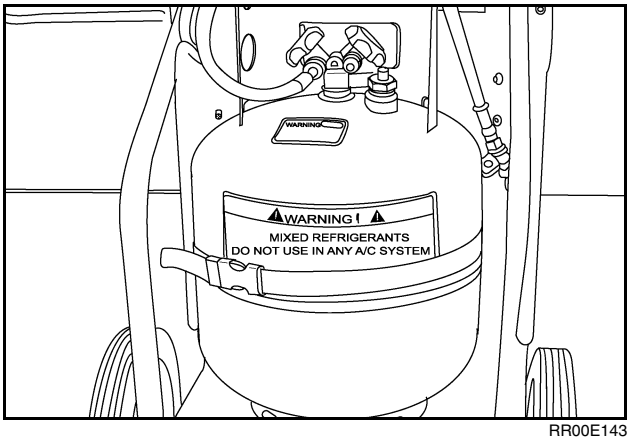
Close the valve on the service coupler by turning it counterclockwise and disconnect the blue hose from the vacuum pump.



RR00E155

## STEP 10

Set the tank on the platform at the rear of the station. Tighten the black strap securely around the tank.

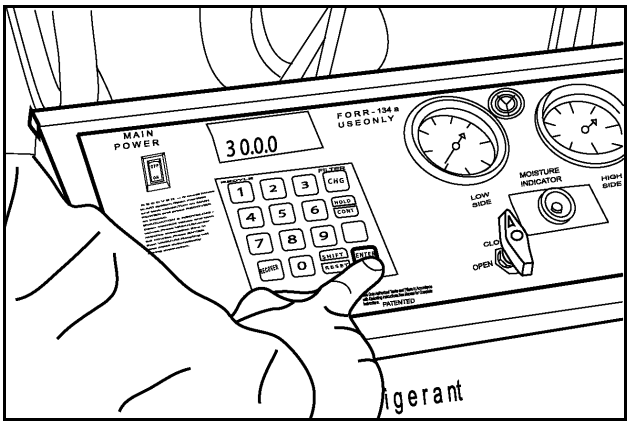



RR00E143

## STEP 8

Program the proper refrigerant amount for your tractor and press the ENTER key:

**All MX/Magnum Tractor Models** .....2.1 kg (4.63 lb) The display will flash once indicating the programmed data has been accepted.

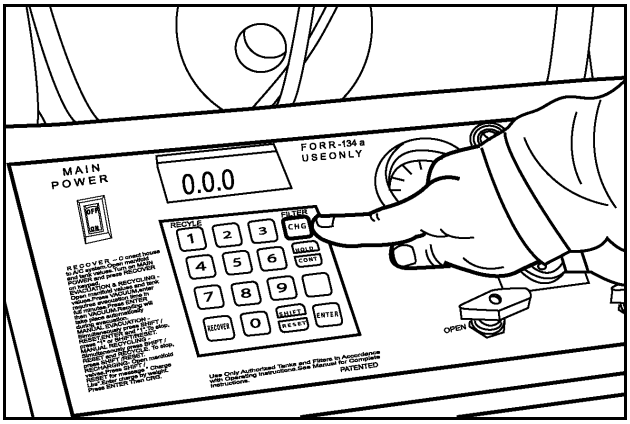



A22113

## STEP 9

Press the CHARGE key to begin refrigerant charging. AUTOMATIC and CHARGE will appear on the display. The display shows the programmed amount and counts down to zero as charging proceeds. When charging is completed, the display shows CPL.

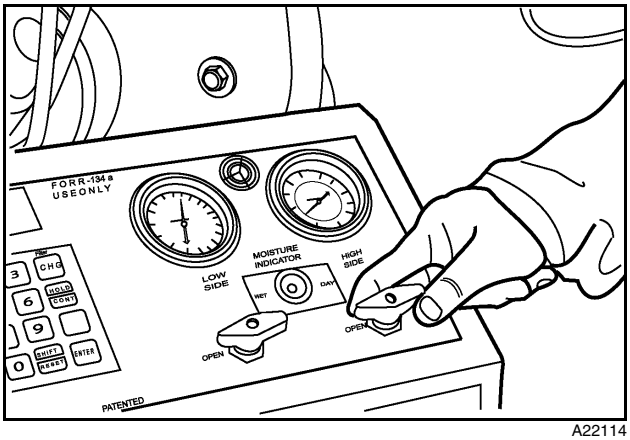
***NOTICE:*** *Check the OEM equipment manual before performing Step 47 to avoid damaging recovery unit. Pressure reading should be obtainable with valves closed. Damage may occur if the tractor is started with the valves accidently open or if either or both valves are opened while the A/C system is operating.*




A22115

## STEP 10

Completely close the high and low pressure manifold valves.




A22114

3. Connect the quick coupler to the low pressure service port under the instructional seat in the cab.

4. To purge air from the hose, slowly unscrew the untapped can a half turn or more. Allow refrigerant from the A/C system to force the air out of the hose, and then retighten the can on the valve.

5. Turn the T-handle clockwise to tap the can.

6. Hold the can upside down to allow the can contents to enter the A/C system. When complete, turn the T-handle counterclockwise to close the valve. Disconnect the tool from the low pressure port.

***NOTICE:*** *You may have to operate the tractor and the A/C system for a few minutes to completely empty the can.*

7. Install the dye identification sticker on a clearly visible area on the compressor body close to the service port. This will alert service personnel in the future to the presence of the dye in the system.

8. Operate the A/C system for about 15 minutes to circulate the dye throughout the system. Turn off the system and use the UV lamp and goggles to locate leaks. The exact location of the leak will be shown by a bright yellow/green glow of the dye.

***NOTICE:*** *The operating time needed for the dye to penetrate a leak and show will depend on the size of the leak. A very small leak could take hours or days of system operation to appear.*

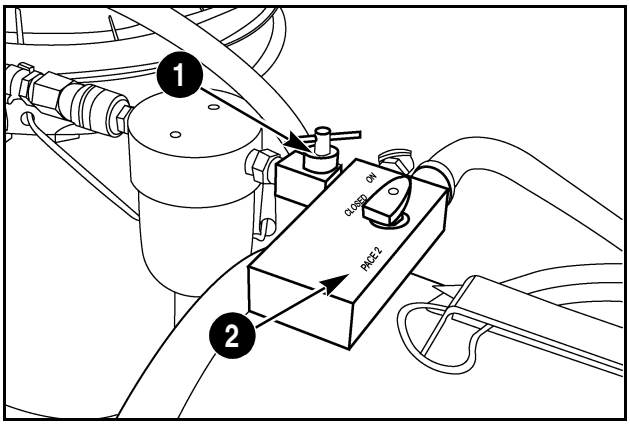
9. After repairing the system, use fluorescent dye cleaner to remove any traces of dye from around the leak location to avoid false diagnosis in the future.

## STEP 9

Open the air valve 1/2 to 3/4 turn.

***NOTICE:*** *Do not exceed this rate of air delivery. This rate delivers one gallon per minute of flush solvent which is ideal for the orifice openings on the components being flushed.*

Turn the flushing valve to the FLUSH position and flush the component for 30 seconds.

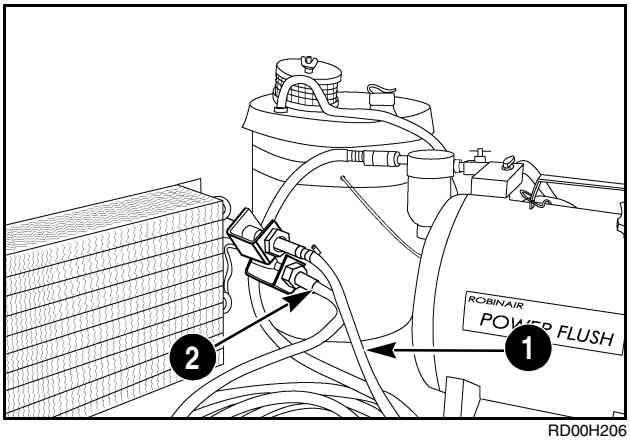



RD00H205

1. AIR VALVE
2. FLUSH VALVE

## STEP 10

Close the flushing and air valves. Reverse hose connections for forward flushing. Open flushing and air valves and repeat flushing until the solvent is clear.



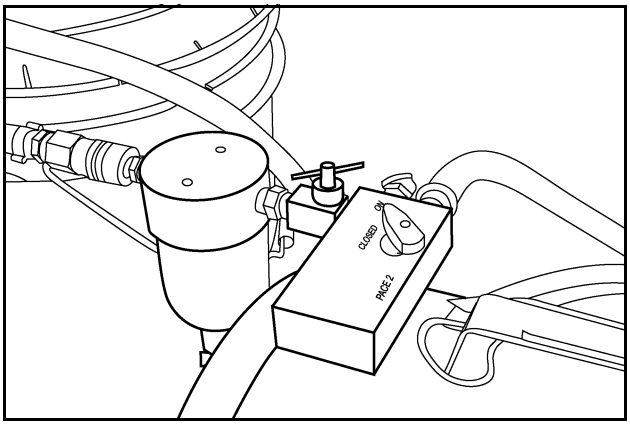

RD00H206

1. FROM THE FLUSH PUMP
2. TO THE RETURN BUCKET

## STEP 11

Turn the flushing valve to the AIR position. Allow air to flow through the component until no noticeable mist is discharged.

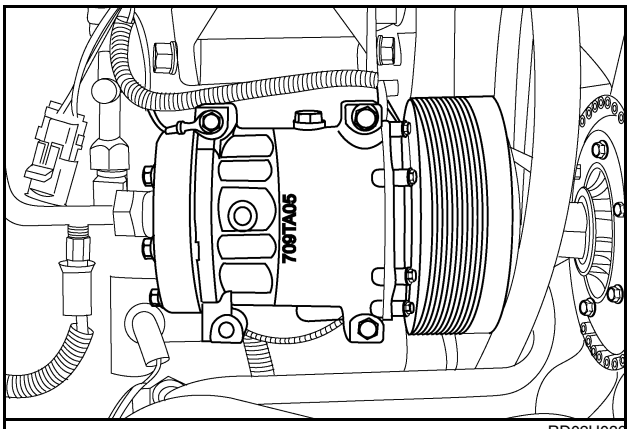
***NOTICE:*** *Air pressure is the only means to remove the flushing solvent from the A/C system, and no solvent must remain in the system when it is evacuated and recharged. Turn the component so gravity can assist in solvent removal.*




RD00H207

## STEP 5

Install a new compressor if required.




RD02H039

## STEP 6

Adjust the level of SP-20 PAG oil in the system. When each component was flushed, some SP-20 PAG oil was removed from the system. Use the following guidelines when adjusting PAG oil:

If the compressor is to be replaced and the entire system was flushed, the new compressor will contain all the SP-20 PAG oil needed and no further adjustment is required.

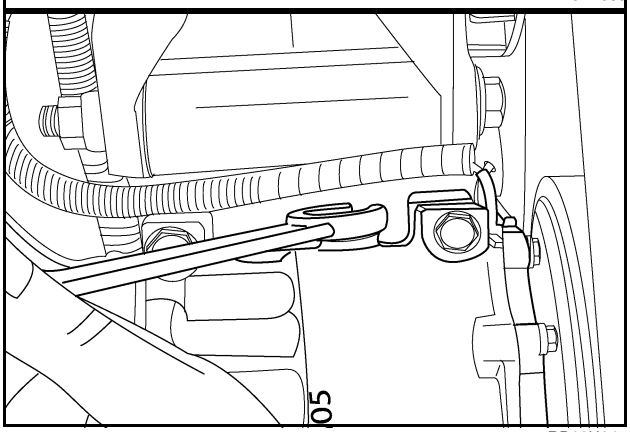
If the compressor is not to be replaced and the entire system was flushed, drain the oil from the compressor to remove any remaining contaminants. Add back to the compressor one container, 250 ml (8.5 oz), of new SP-20 PAG oil. (Some oil, about 35 ml (1.2 oz), will remain in the compressor even after it has been drained.)

If the entire system was not flushed, drain the oil from the compressor to be installed. Add back new SP-20 PAG oil equal to 250 ml (8.5 oz) minus oil amounts still in the components that were not flushed. Use the table below.

***NOTICE:*** *Total system PAG oil should be 285 ml (9.6 oz) and about* 35 ml (1.2 oz) *will remain in a drained compressor.*

| Component Flushed | Amount Of SP-20 PAG Oil To Add |
|---|---|
| Condenser | 50 ml (1.7 oz) |
| Evaporator | 40 ml (1.4 oz) |
| Receiver-Drier | 25 ml (0.85 oz) |
| Each Hose | 10 ml (0.34 oz) |

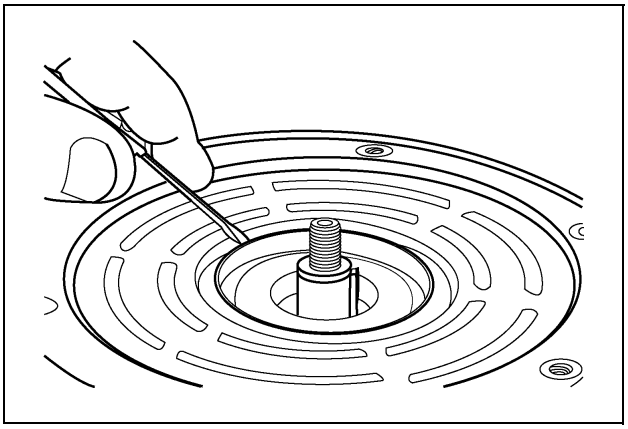
Because the system has been open for a prolonged time, it is very important to draw the system to a deep vacuum to remove all moisture. Evacuate the system for at least 45 minutes to a vacuum of 0.75 mm (29.5 in) of mercury.




RD02H047

## STEP 9

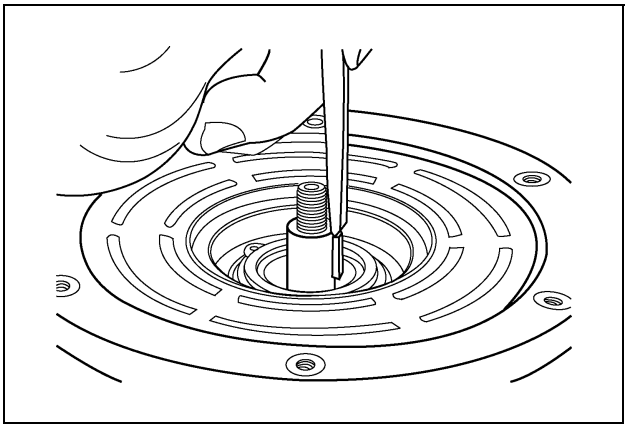
Carefully remove dust cover.



a21257

## STEP 10

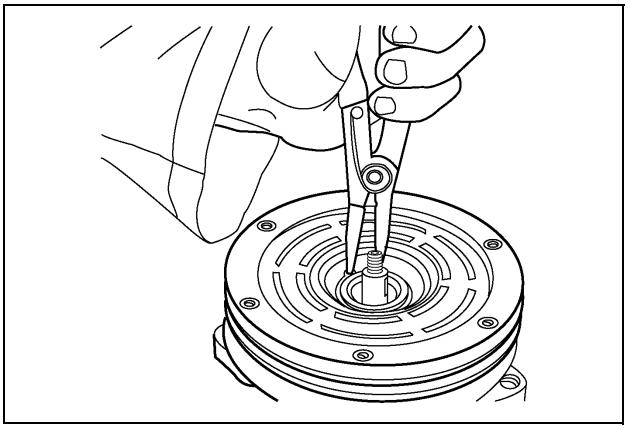
Remove the key from rotor shaft.



a21258

## STEP 11

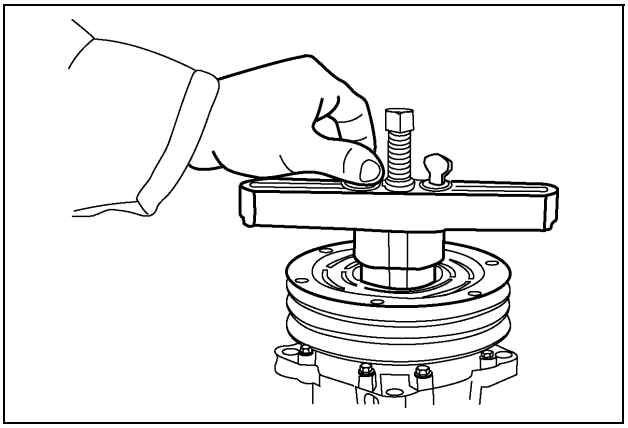
Remove the external snap ring for the bearing and pulley assembly.



a21260

## STEP 12

Install the special puller internal collars into groove on pulley. Install the special tool onto the shaft. Tighten mounting screws finger tight.



a21261

# RECEIVER/DRIER

Replace the receiver-drier if:

- System has been opened before.
- Receiver-drier has been used two or more years.
- Disassembly shows small particles of moisture removing material (gold or brown particles).
- If the system has been open for a long period of time because of a leak (broken hoses, loose connection) that has permitted air and moisture to enter the system.
- If contaminated refrigerant was recovered from the system.

The receiver-drier is normally the last item replaced when servicing the system, just before the system is evacuated. This prevents saturating the drier with moisture.

## Receiver/Drier Removal

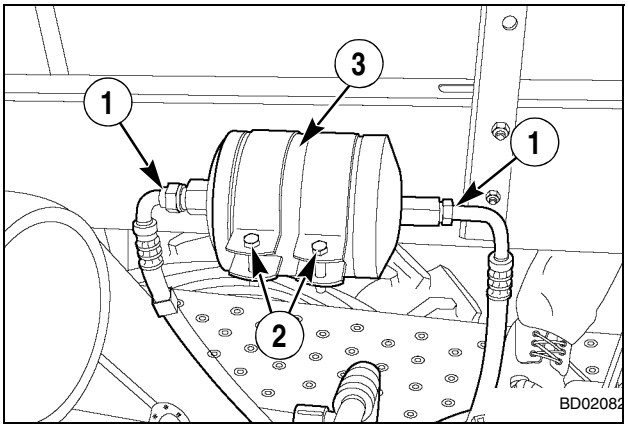
### STEP 1

Recover refrigerant. *See AIR CONDITIONER SYSTEM REFRIGERANT RECOVERY on Page 9 in this section.*

### STEP 2

Disconnect the hoses (1). Remove the bolts (2) and remove the receiver drier (3).

***NOTICE:*** *Cap and plug lines to prevent contamination.*



# EVAPORATOR/HEATER ASSEMBLY

## Evaporator/Heater Assembly Removal

***NOTICE:*** *The thermal expansion valve, heater valve and evaporator/heater assembly are located under the operator seat. See* **ACCESSING THE HVAC BOX***, page 79.*

***NOTICE:*** *Rotate the cab temperature control to the Maximum Heat position before shutting off the tractor for service. This fully opens the heater control valve and allows more coolant to drain from the evaporator/heater assembly.*

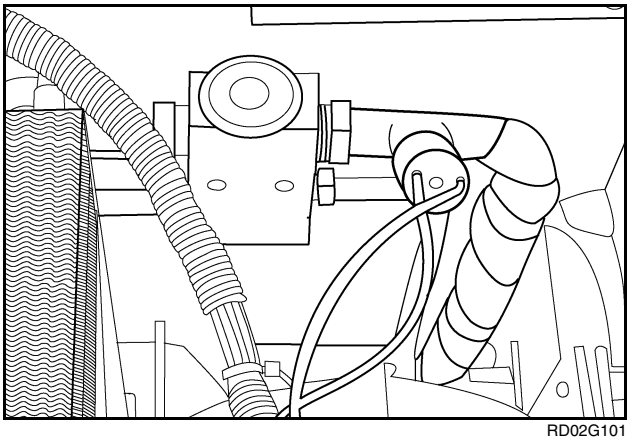
### STEP 1

Use a vise clamp to clamp off the heater supply hose on the right hand side of the engine. Close the valve on the heater return hose at the engine. See component locations in this Section for your engine.

### STEP 2

Remove the thermal insulation tape from the expansion valve and the evaporator lines.

To test the valve see thermal expansion valve testing in this section. Recover the A/C system to remove the evaporator heater core.

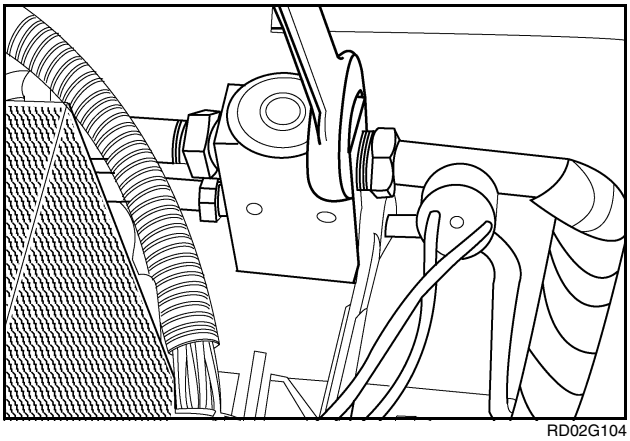


RD02G101

### STEP 3

Using the two hand, two wrench method, disconnect the air conditioning suction and liquid lines at the thermal expansion valve. Remove and discard the O-rings. Cap or plug the lines to prevent dirt and moisture from entering the system.

***NOTICE:*** *Clean packaging tape may be used to seal the expansion valve ports.*



RD02G104

# Standard A/C Controller

The standard A/C controller is located behind the evaporator and is mounted to the rear of the HVAC upper case. With the ignition switch in the OFF position, to replace the standard controller:

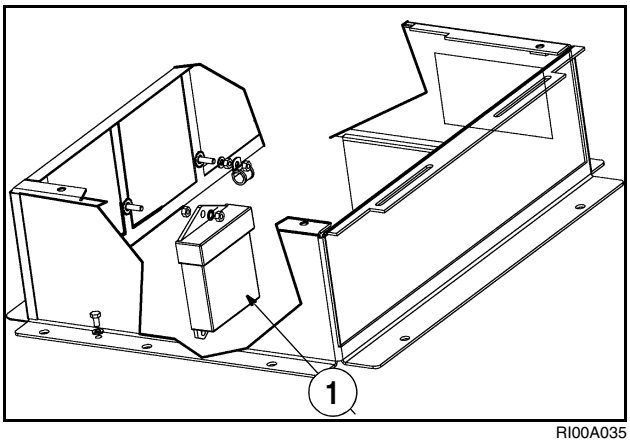
A. See **ACCESSING THE HVAC BOX**, page 79.

B. Disconnect the 6 pin and 5 pin wiring harnesses connected to the standard controller.

***NOTICE:*** *Do not touch exposed pins on the controller to avoid static electricity voltage spikes. Voltage spikes may result in equipment damage.*

C. Remove the single nut securing the controller to the mounting stud and remove the controller.

D. Install a new controller using the existing hardware. Reconnect the harnesses. Reinstall the seat with existing hardware.




RI00A035

# Section

# 9020

## CAB REMOVAL AND INSTALLATION

Issued September, 2009

## STEP 29

**⚠ DANGER ⚠**

The equipment you are removing or installing is extremely heavy and mechanical assistance will be required in its removal and installation. Use adequate lifting device to support the weight of the equipment. Failure to comply will result in death or serious injury.

M1166C

To remove the cab, connect a proper lifting device to the cab lifting bracket. Lift the cab until it is approximately 406 to 508 mm (16 to 20 in) above the machine front frame. While lifting, ensure all cables, hoses and loose items stay free from cab frame. Remove the cab over the front side of the machine frame.

## STEP 30

Place 300 mm (12 in) blocks on the floor under the cab frame.

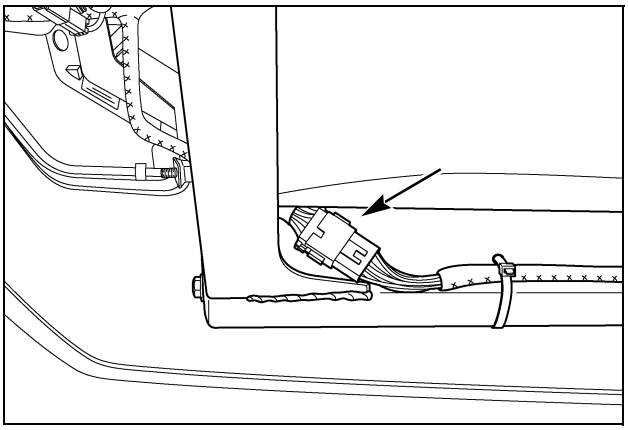
# FRONT HOOD

## Removal

### STEP 1

Disconnect the horn/headlamp connector from the wire harness.

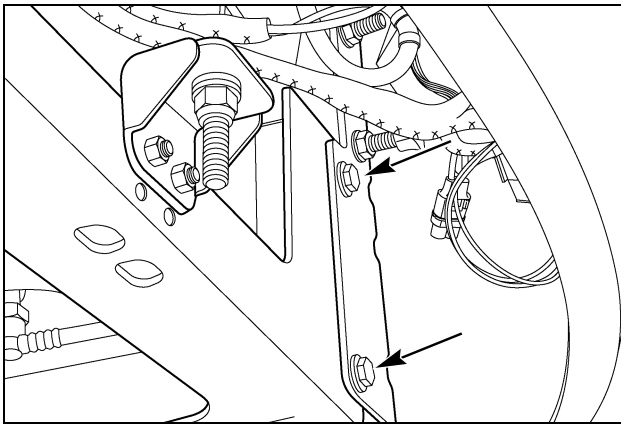
***NOTICE:*** *It may be necessary to loosen the fuel tank front mounting bracket an move the tank slightly to the left to remove the connector from between the frame and tank.*



RH09D024

### STEP 2

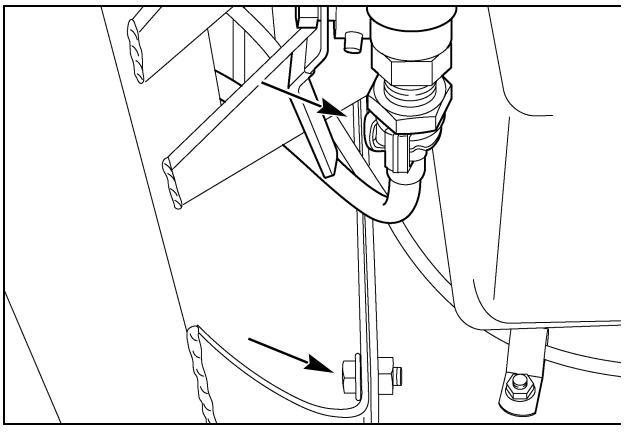
Remove the two bolts, washers and nuts located on the left and right front of the hood (left shown).



RH09D025

### STEP 3

Remove the two bolts, washers and nuts located on the left and right rear of the hood (left shown).



RH09D151

# Section

# 9040

## RADIATOR, COOLERS AND CONDENSER

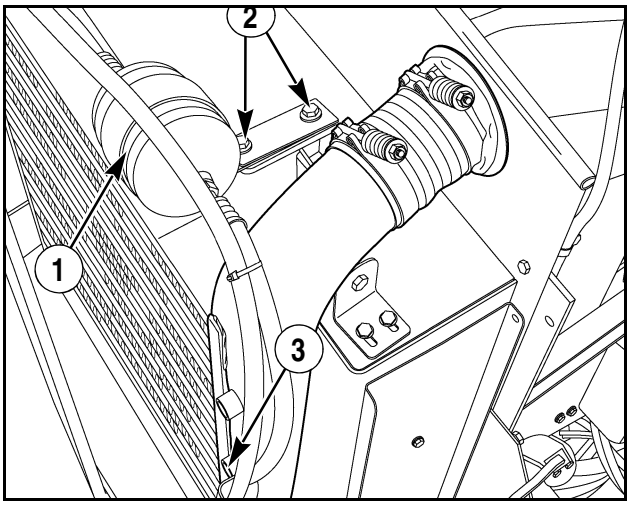
September, 2009

## STEP 7

Move A/C dryer and bracket into position.

Install bolts securing A/C dryer (1) to bracket (2).

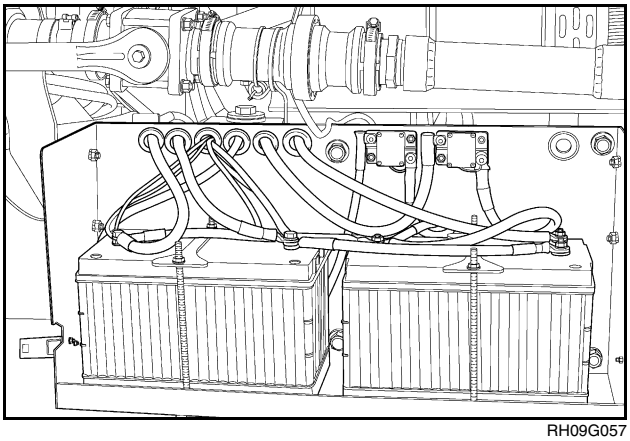
Install bolt securing P-clamp to cooler (3).




RH09G002

## STEP 8

Connect battery cables to negative battery posts.



RH09G057

## STEP 9

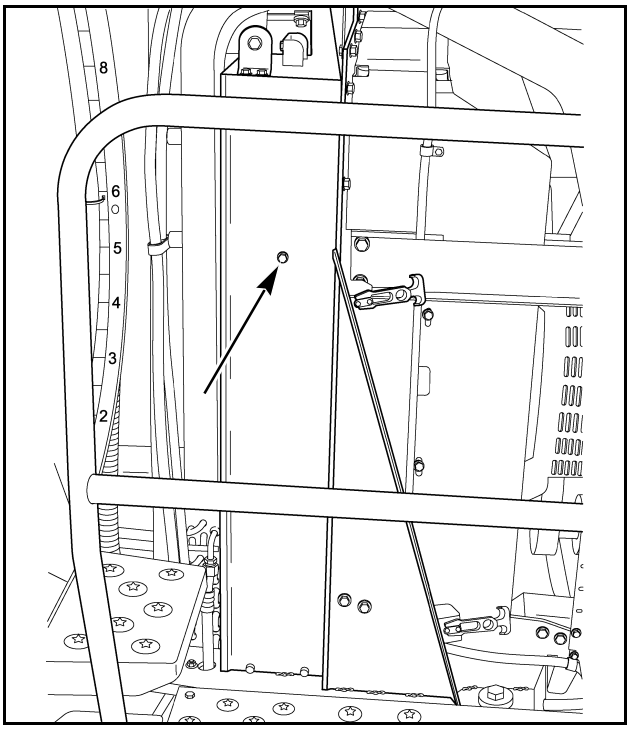
Start engine. Check air tube connections for leaks.

## STEP 10

Install hood. see Engine Hood Installation in Section 9030.

## STEP 4

Remove clean out panels. Left-hand side shown. Remove both sides.



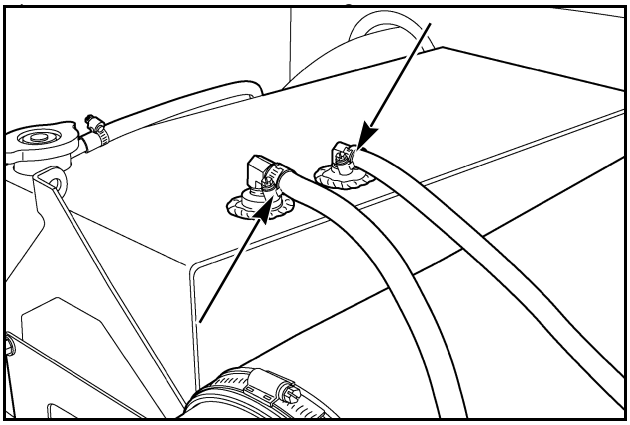
RH09G001

## STEP 5

Power wash the machine around the area to be worked on.

## STEP 6

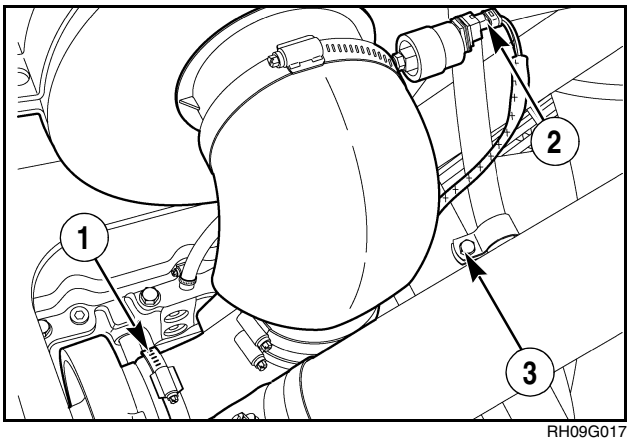
Disconnect two hoses to the deaeration tank.


RH09G016

## STEP 7

Loosen clamp (1) at turbo. Disconnect harness (2) to restricted air flow sending unit.

Remove bolt and nut (3) securing hose and P-clamp to air cleaner bracket.

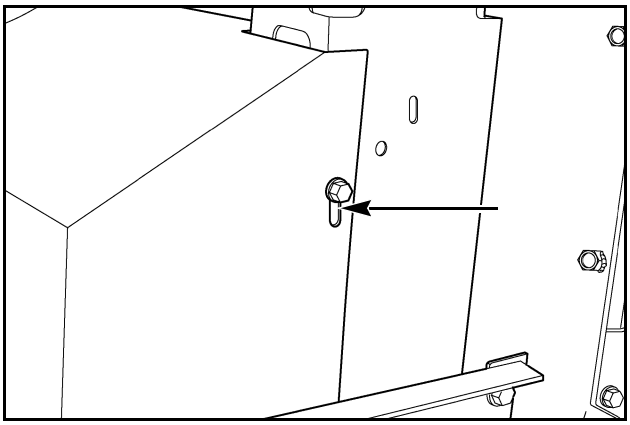


RH09G017

## STEP 10

Align shroud to fan to provide an even gap between fan blades and shroud. (Adjustment slot shown)

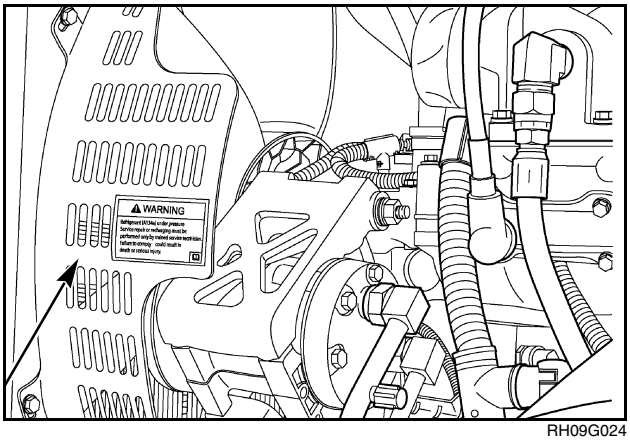
Torque shroud bolts to 27 to 31 Nm (20 to 23 lb ft).



RH09G035

## STEP 11

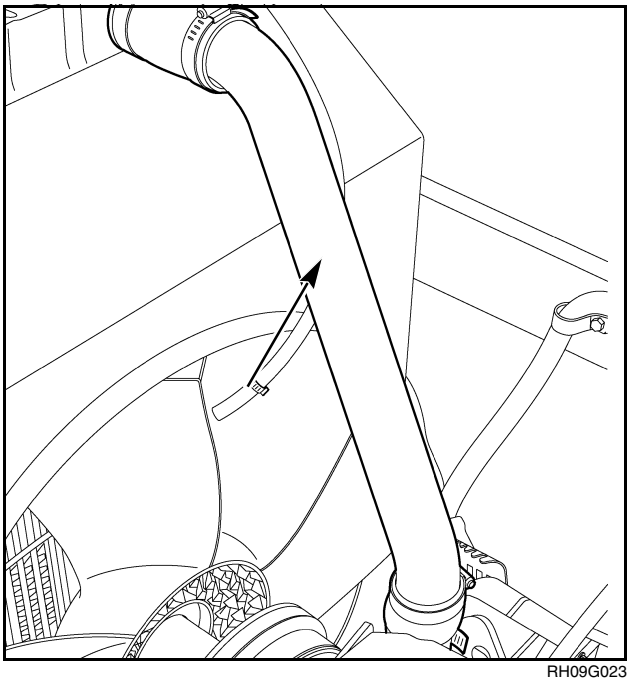
Install safety guard.




RH09G024

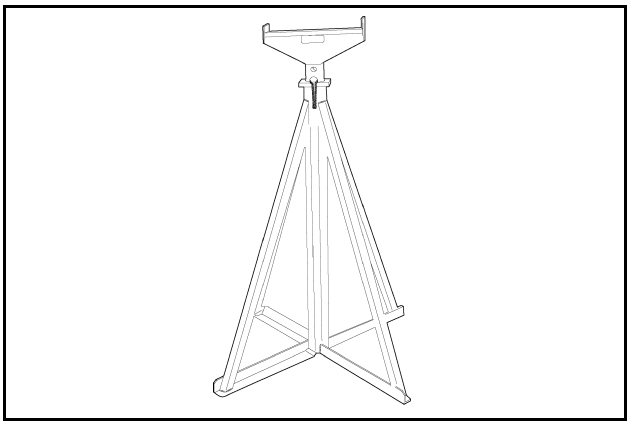
## STEP 12

Install upper radiator tube.



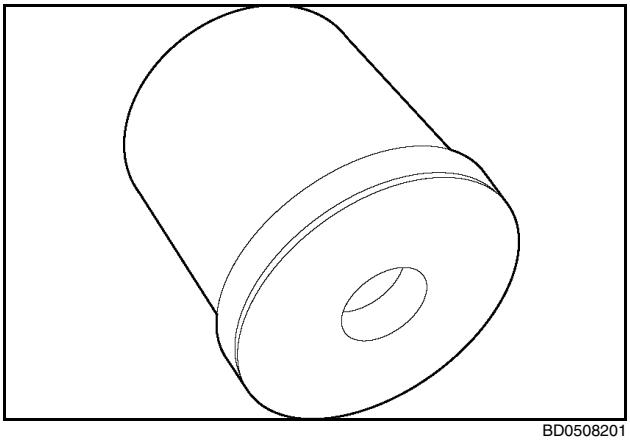
RH09G023

OTC 380002856 15 TON JACKSTAND



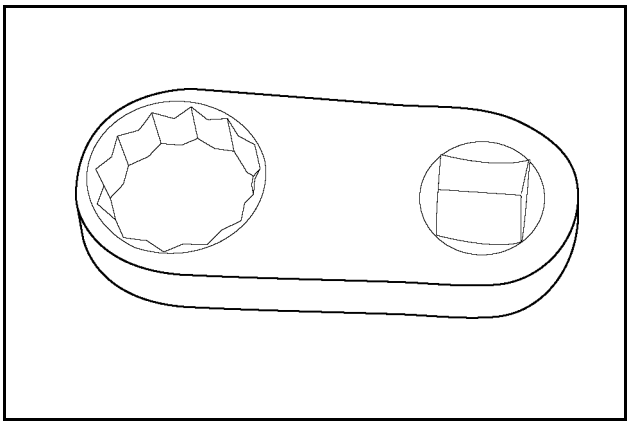
BD0408003

TY1001 SUSPENSION BUSHING INSTALLER



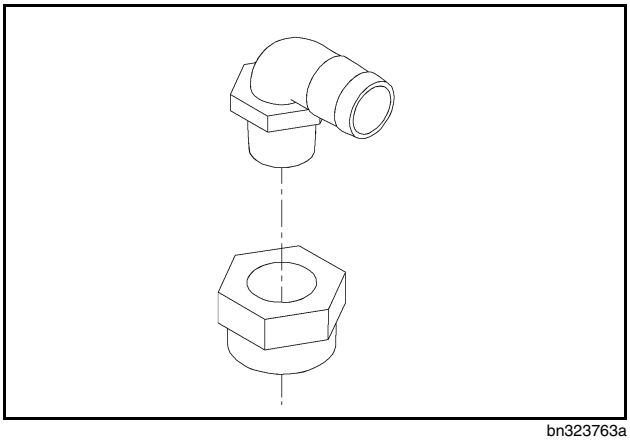
BD0508201

TY1006 SPINDLE WRENCH ADAPTER



BD0508204

BN323763 VACUUM ADAPTER



bn323763a

# Planetary Gear Hub Installation

***NOTICE:*** *The front and back planetary gear hubs are not identical. If replacing the planetary gear hub make sure you have the correct part.*

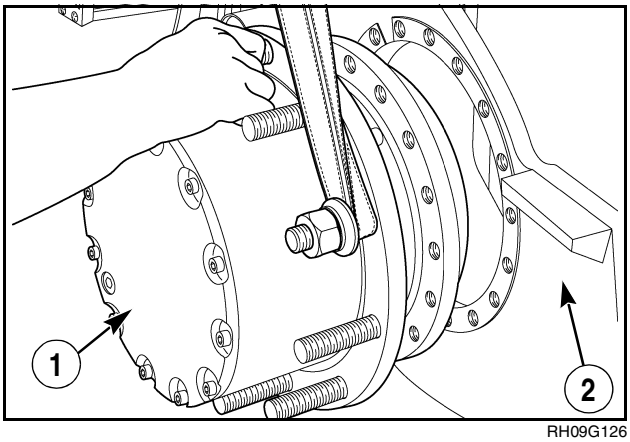
## STEP 1

**⚠ DANGER ⚠**

The equipment you are removing or installing is extremely heavy and mechanical assistance will be required in its removal and installation. Use adequate lifting device to support the weight of the equipment. Failure to comply will result in death or serious injury.

M1166C

Use proper lifting device and install planetary gear hub (1) onto the suspension trailing link (2).

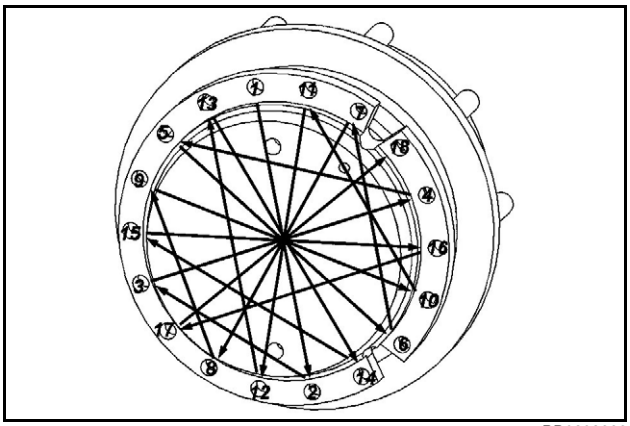


RH09G126

## STEP 2

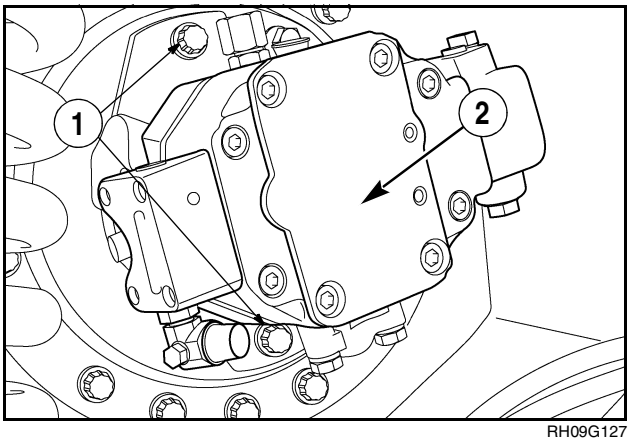
Apply Loctite® Primer #7649 and Loctite® #242 onto the threads of the 18 bolts. Tighten and torque 271.16 Nm (200 lb ft).

***NOTICE:*** *Use illustration for torque sequence.*


BD0308222

## STEP 3

Apply Loctite® Primer #7649 and Loctite® #242 onto the threads of the two wheel motor bolts (1). Install the wheel motor (2) onto the planetary gear hub. Torque the two bolts to 118 to 132 Nm (87 to 97 lb ft).

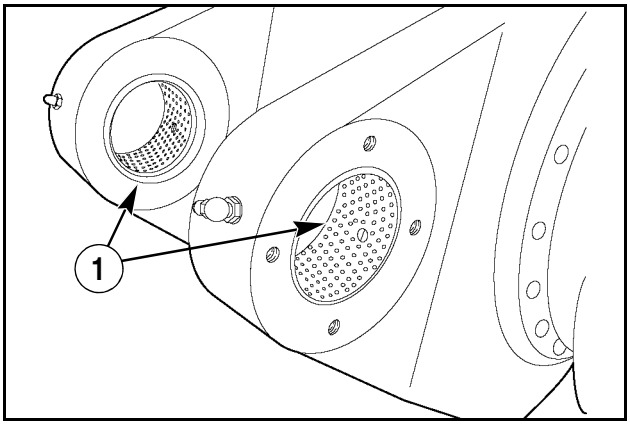


RH09G127

# Trailing Link Disassembly

## STEP 1

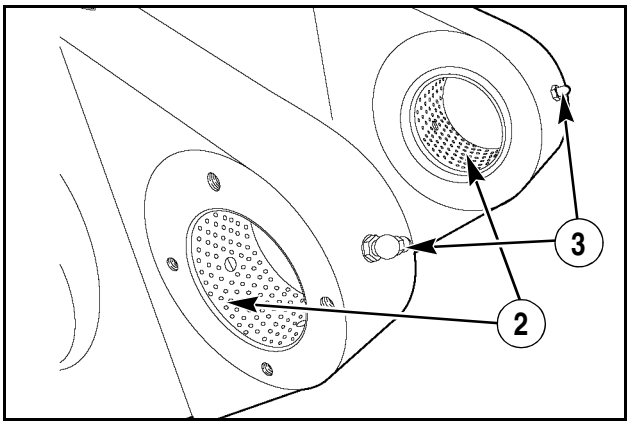
Remove seals (1) from trailing link.




BD0308252

## STEP 2

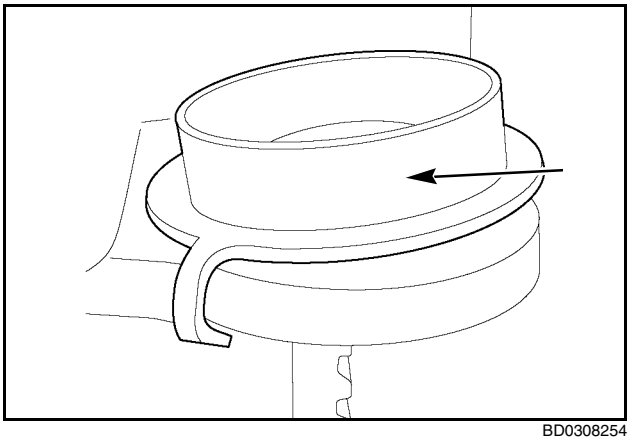
Remove the sleeve bearings (2) and grease zerks (3) from trailing link.




BD0308253

## STEP 3

Bend tabs up and remove spring adapter.

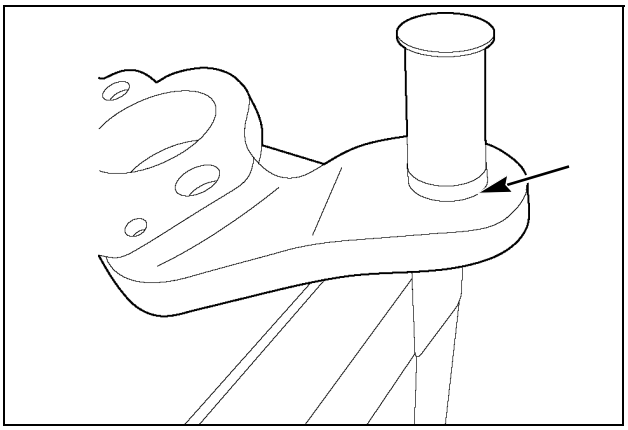


BD0308254

# Steering Arm Assembly

## STEP 1

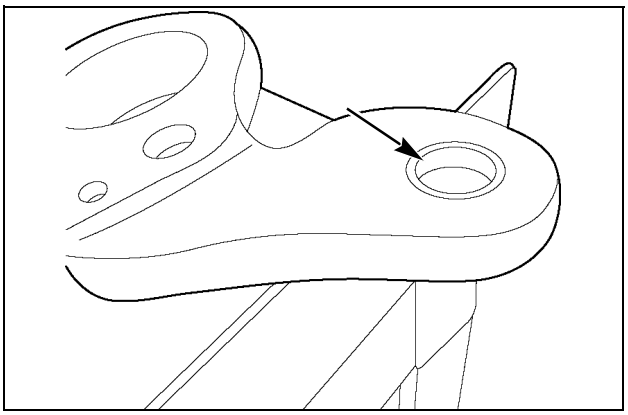
Clean bore in steering arm and outer surface of spherical bearing with solvent. Apply primer to bearing and bore surfaces, allow to dry. Apply Loctite to outer surfaces of spherical bearing and press fit into bores.



BD0308245

## STEP 2

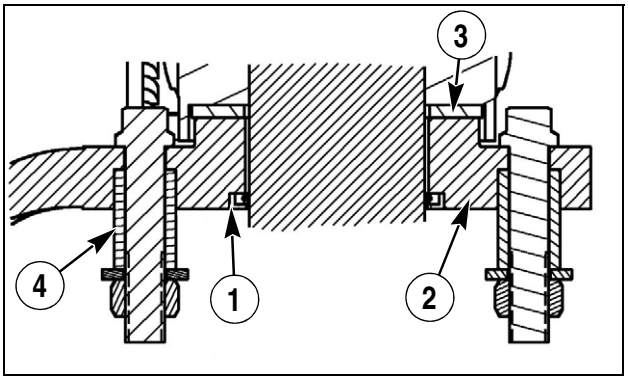
Bearing should be located 2 +/-1.5 mm from either face of steering arm.



BD0308247

## STEP 3

Install seal (1) into steering arm (2) as shown to ensure grease purges up through thrust washer (3). Install bushings (4) into counterbore on steering arm.



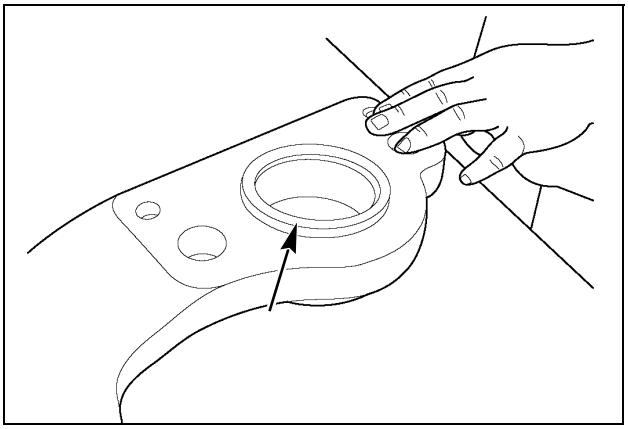

BD0308241

## STEP 4

Install seal with proper size driver until the face seats just below the surface.

## STEP 5

Install Upper Suspension Arm and Wheel. Upper Suspension Arm Installation and Wheel Installation in this section.

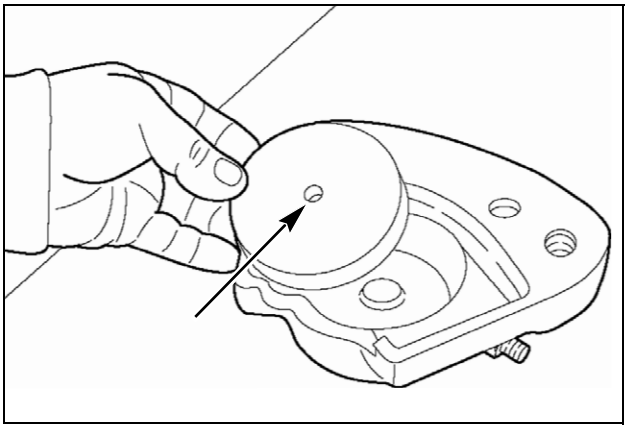


BD0308246

## STEP 4

Remove brake pistons from both housings.

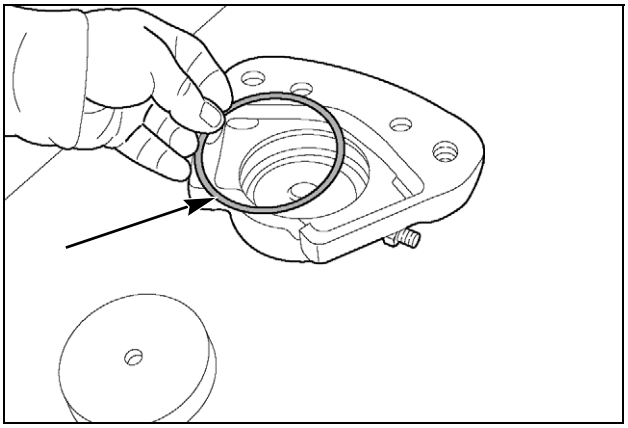
***NOTICE:*** *If brake pistons are stuck, thread a bolt into piston hole and lift out.*



BD0408202

## STEP 5

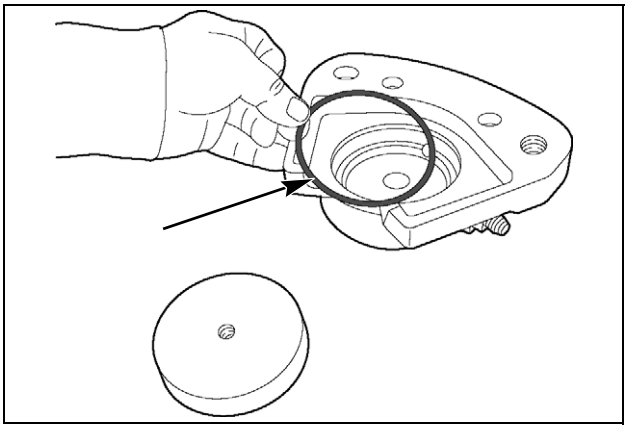
Remove white back-up O-rings.



BD0408204

## STEP 6

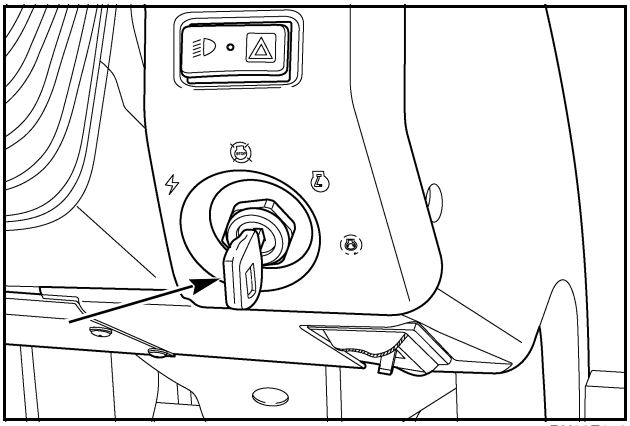
Remove black O-rings.



BD0408201

## STEP 3

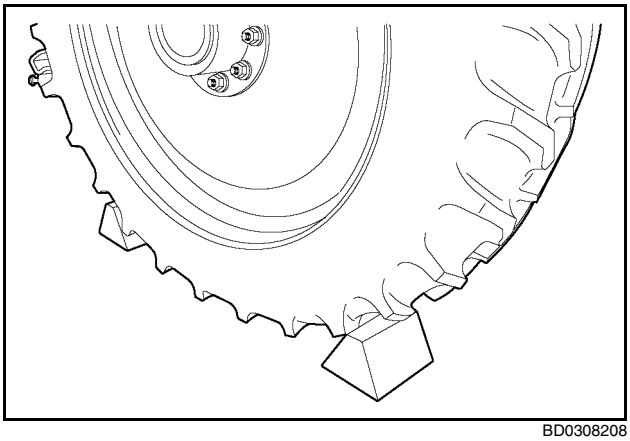
Shut the engine off and remove the key.



RH09F172

## STEP 4

Place wheel chocks in front and rear of tire on opposite axle of tire to be removed.



BD0308208

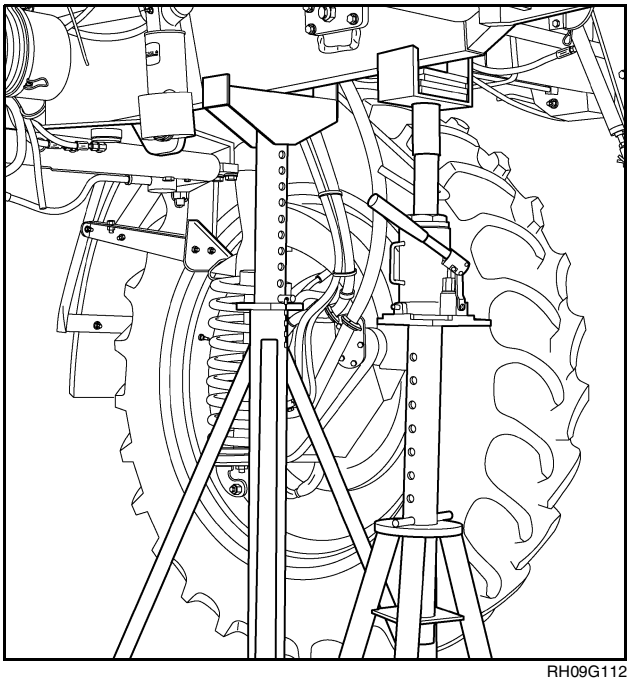
## STEP 5

Use a heavy duty jack to lift the machine.

***NOTICE:*** *Hydraulic jack used for lifting must have a rating of 10 tons or more.*

Support machine using a proper jack stand.

(OTC 380002856 15 TON JACKSTAND shown)



RH09G112

# SPECIAL TORQUES

| | Metric Values | U.S. Values |
|---|---|---|
| Breakaway Tip, Outer, And Inner Boom Extension Hinge Hardware | 57.8 Nm | (50 lb ft) |
| Boom Pivot Pin Bolts | 79 to 107 Nm | (59 to 79 lb ft) |
| Mast Pin Bolts | 45 to 61 Nm | (33 to 45 lb ft) |
| Jam Nuts On Outer And Inner Boom Extension Hardware. | 136 Nm | (100 lb ft) |

# OUTER BOOM 60, 90 AND 100 FT

***NOTICE:*** *For torque specifications not listed, see Section 1000 Standard Torque. If replacing hardware must use the hardware noted in this machine's parts manual.*

## Outer Boom Removal

**⚠ DANGER ⚠**

The equipment you are removing or installing is extremely heavy and mechanical assistance will be required in its removal and installation. Use adequate lifting device to support the weight of the equipment. Failure to comply will result in death or serious injury.

M1166C

**⚠ WARNING ⚠**

Always know the location of all workers in your area. Warn them before you start working on the machine. Always keep all other persons away from your area. Failure to comply could result in death or serious injury.

SB015A

**⚠ DANGER ⚠**

When handling lubricants (oil, grease etc.,) and other chemical products, always follow instructions for their proper use. Use proper containers to collect fluid. Dispose of fluids and filters in a way that will protect the environment and in accordance with the law. DO NOT smoke or use an open flame during the service procedure. Use eye protection. DO NOT run the engine or when the engine or hydraulic oil temperatures exceed 49° C (120° F). Failure to comply will result in a environmental hazard and cause death or serious injury.

M1294

### STEP 1

Remove breakaway tip. See Breakaway Tip Removal on Page 4 in this section.

## STEP 2

Remove the outer boom. For 60, 90 or 100 ft. boom, see Outer Boom Removal on page 13 in this section. For 120 ft. boom see, Outer Boom Removal on page 17 in this section.

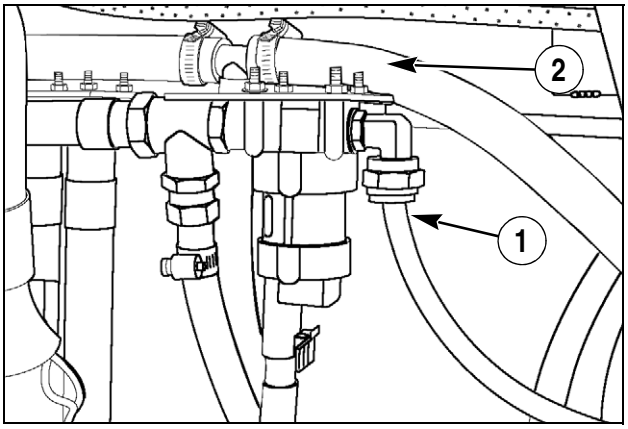
## STEP 3

Properly support boom assembly on the opposite side of the machine being worked on.

## STEP 4

At the center section, remove liquid foamer line (1) from solenoid valve and remove air hose (2) from tee.

***NOTICE:*** *Procedure shown is for removal of right side boom. Left boom removal procedure is similar.*

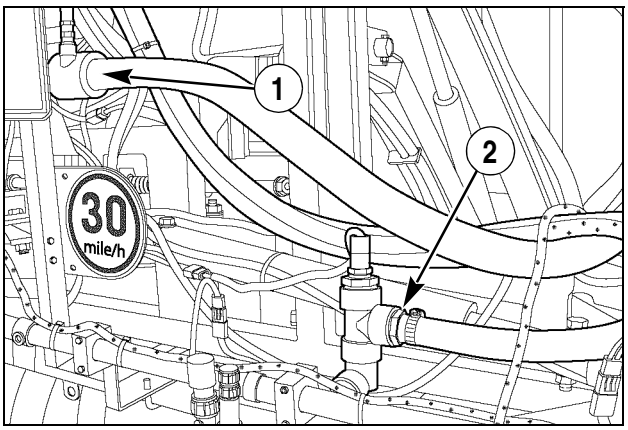



BD0208269

## STEP 5

At the center section, disconnect liquid plumbing hose from valve (1) and disconnect hose from spray bar tee (2).

***NOTICE:*** *Hoses may contain chemical. Drain chemical into a container and dispose of properly.*




BD0208268

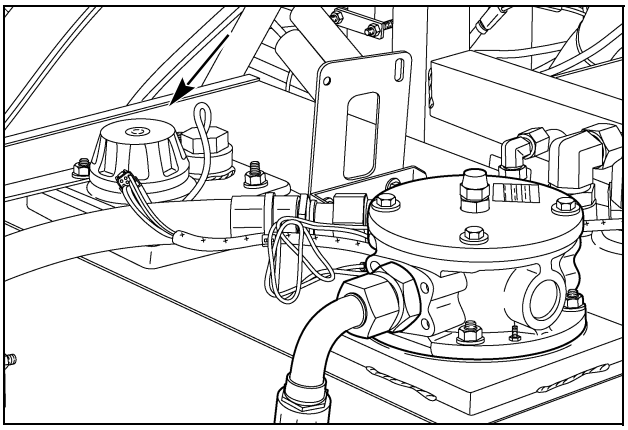
## STEP 6

**⚠ WARNING ⚠**

The hydraulic tank is a pressurized system. Vent tank slowly by loosening the breather before performing work on hydraulic filters or the hydraulic system to prevent excess loss of fluid and serious injury. Failure to comply could result in death or serious injury.

M1285A

Depressurize the hydraulic tank by slowly loosening the breather cap until pressure is bled from the hydraulic tank. Tighten breather.



Rh09E154

# Mid Boom Installation

**WARNING**

Always know the location of all workers in your area. Warn them before you start working on the machine. Always keep all other persons away from your area. Failure to comply could result in death or serious injury.

SB015A

**WARNING**

Always follow the chemical manufacturer's safety instructions before handling components covered with chemicals. Use proper safety equipment (rubber gloves, protective eye wear) and protective clothing when cleaning or working with components covered with chemical. Failure to comply could result in death or serious injury.

M870B

**DANGER**

The equipment you are removing or installing is extremely heavy and mechanical assistance will be required in its removal and installation. Use adequate lifting device to support the weight of the equipment. Failure to comply will result in death or serious injury.

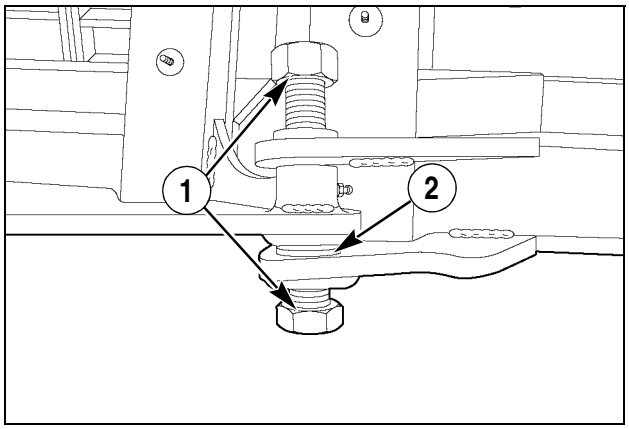
M1166C

## STEP 1

Attach a proper lifting device onto boom extension and lift into place.

## STEP 2

Install nut and bolt (1) and washer (2) into lower hinge.




BD0808117

# CENTER SECTION

***NOTICE:*** *For torque specifications not listed, see Section 1000 Standard Torque. If replacing hardware must use the hardware noted in this machine's parts manual.*

## Center Section Removal

**⚠ DANGER ⚠**

When handling lubricants (oil, grease etc.,) and other chemical products, always follow instructions for their proper use. Use proper containers to collect fluid. Dispose of fluids and filters in a way that will protect the environment and in accordance with the law. DO NOT smoke or use an open flame during the service procedure. Use eye protection. DO NOT run the engine or when the engine or hydraulic oil temperatures exceed 49° C (120° F). Failure to comply will result in a environmental hazard and cause death or serious injury.

M1294

**⚠ WARNING ⚠**

Always know the location of all workers in your area. Warn them before you start working on the machine. Always keep all other persons away from your area. Failure to comply could result in death or serious injury.

SB015A

**⚠ DANGER ⚠**

The equipment you are removing or installing is extremely heavy and mechanical assistance will be required in its removal and installation. Use adequate lifting device to support the weight of the equipment. Failure to comply will result in death or serious injury.

M1166C

### STEP 1

Remove breakaway tips. See Breakaway Tip Removal on Page 4 in this section.

### STEP 2

Remove the outer boom. For 60, 90 or 100 ft. Boom see Outer Boom Removal on page 13 in this section. For 120 ft. boom see Outer Boom Removal on page 17 in this section.

## STEP 3

Remove inner booms. See Inner Boom Removal on Page 22 in this section.

## STEP 4

Remove center section. See Center Section Removal on Page 43 in this section.

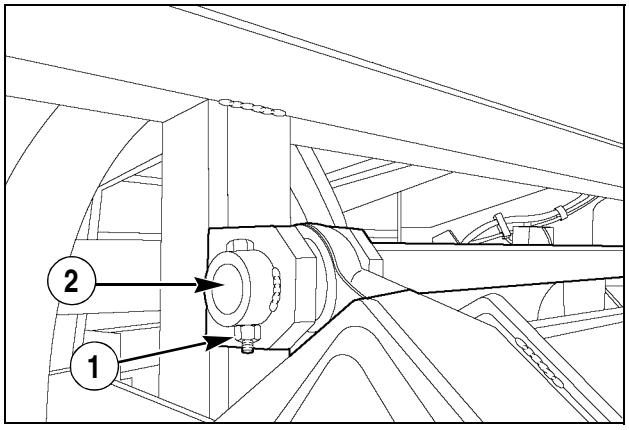
## STEP 5

Attach proper lifting device to support the mast.

## STEP 6

***NOTICE:*** *When removing hardened pins such as a pivot pin, or a hardened shaft, use a soft head (brass or bronze) hammer or use a driver made from brass or bronze and a steel head hammer. Failure to comply may result in damage to the machine.*

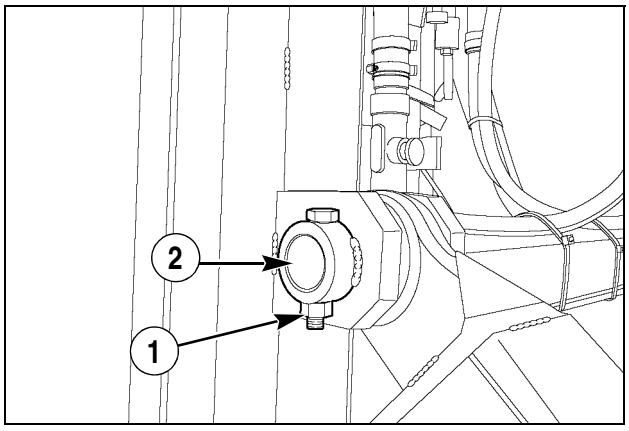
Remove nuts and bolts (1) from upper mast mounts and remove pins (2).




BD0208283

## STEP 7

Remove nuts and bolts (1) from the lower mast mounts and remove pins (2). Remove the mast.

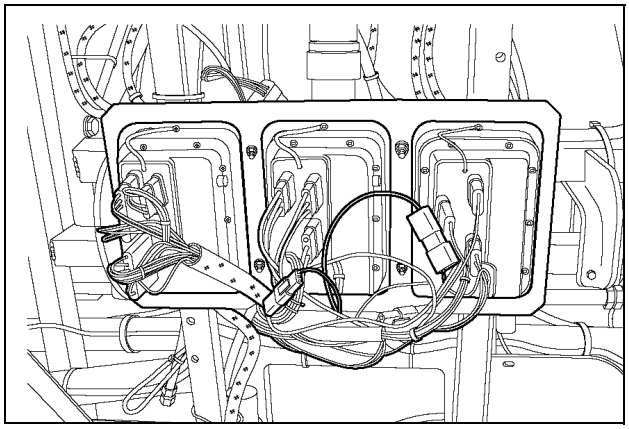



BD0208282

## STEP 7

Disconnect the electrical connections at the center section.

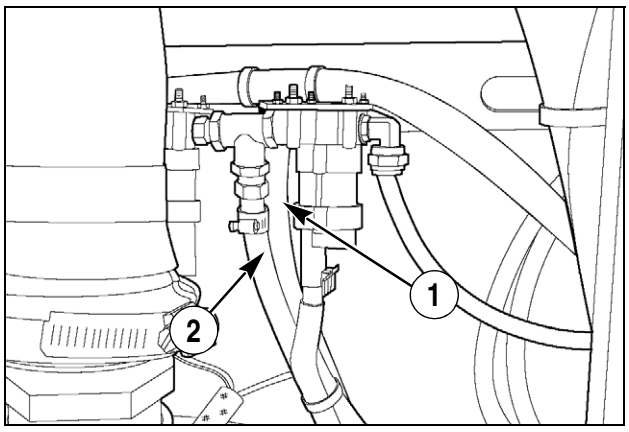
***NOTICE:*** *Mark connectors for proper installation.*



BD0208279

## STEP 8

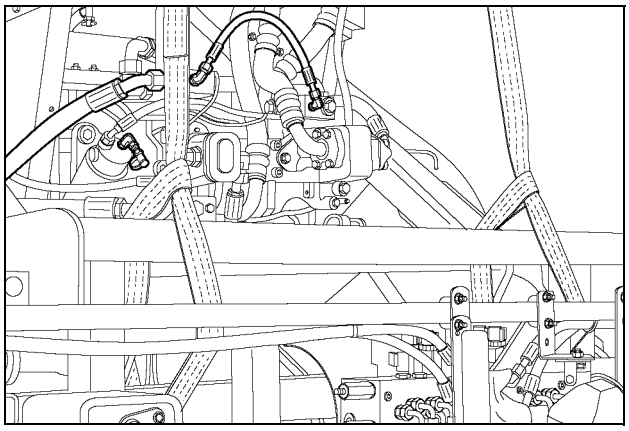
Disconnect air line hose (1) from tee and liquid foamer line (2) from solenoid valve.




BD0208278

## STEP 9

Attach a proper lifting device to support the center section and mast.

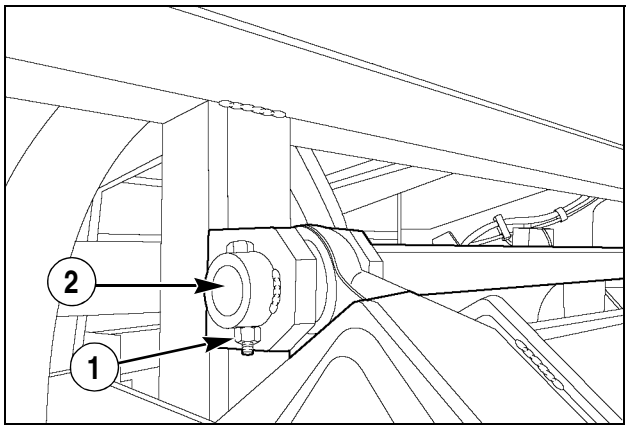


BD0508023

## STEP 10

***NOTICE:*** *When removing hardened pins such as a pivot pin, or a hardened shaft, use a soft head (brass or bronze) hammer or use a driver made from brass or bronze and a steel head hammer. Failure to comply may result in damage to the machine.*

Remove nuts and bolts (1) from upper mast mounts and remove the pivot pins (2).

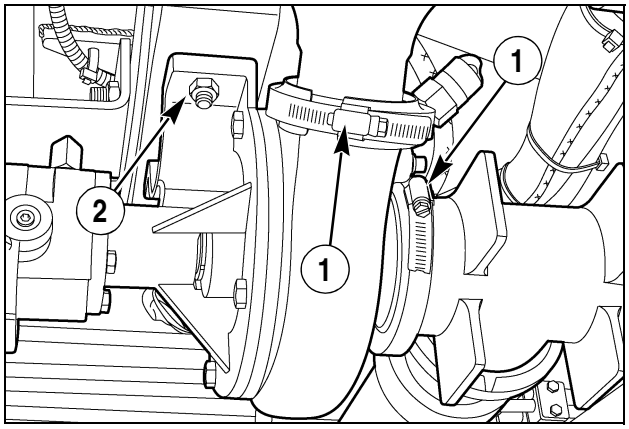



BD0208283

## STEP 6

Loosen the two plumbing clamps (1). Support the product pump/motor assembly and remove the two retaining bolts (2).

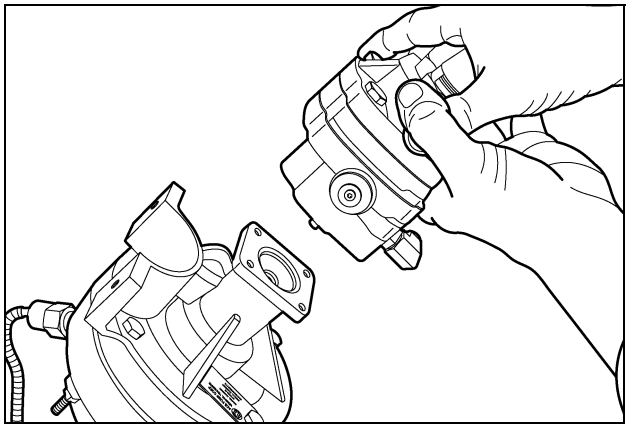
***NOTICE:*** *When the plumbing seals are broken, product remaining in the pump may leak out.*




RH09D014

## STEP 7

Remove the four motor retaining bolts and remove the motor from the product pump.



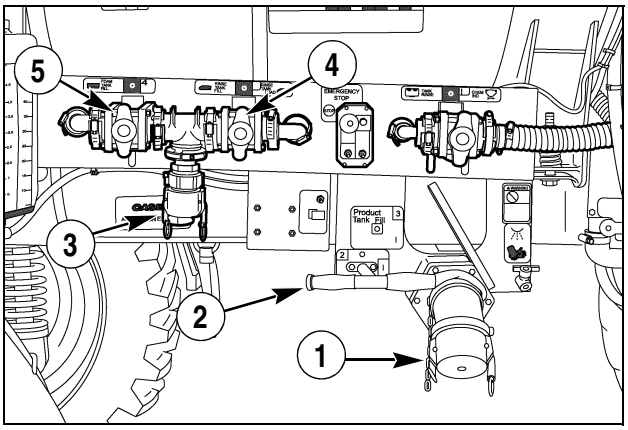
RH09D015

# RELOAD STATION REMOVAL AND INSTALLATION

## Removal

### STEP 1

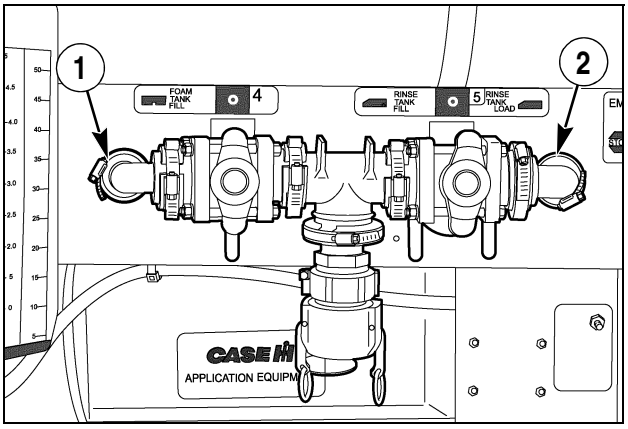
1. Drain product: Remove cap (1) and open handle (2). Drain the tank into a container large enough to hold the product in the tank.
2. Drain rinse tank: Remove cap (3) and turn handle (4) to unload position.
3. Drain foam tank: Remove cap (3) and open foam tank valve (5). Drain the tank into a container large enough to hold the product in the tank.




RH09C106

### STEP 2

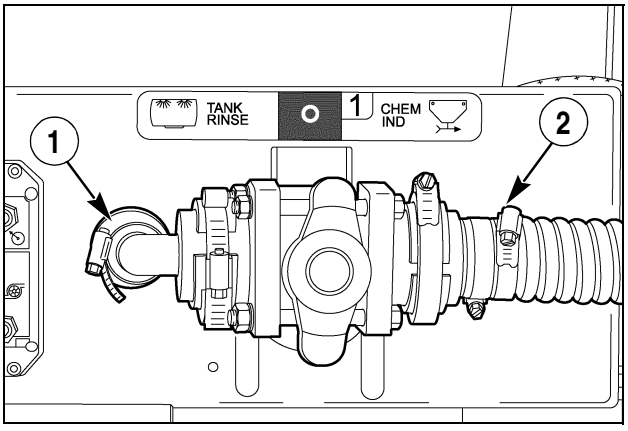
Remove hose clamp and hose for the foam tank (1) and rinse tank (2).




RH09C107

### STEP 3

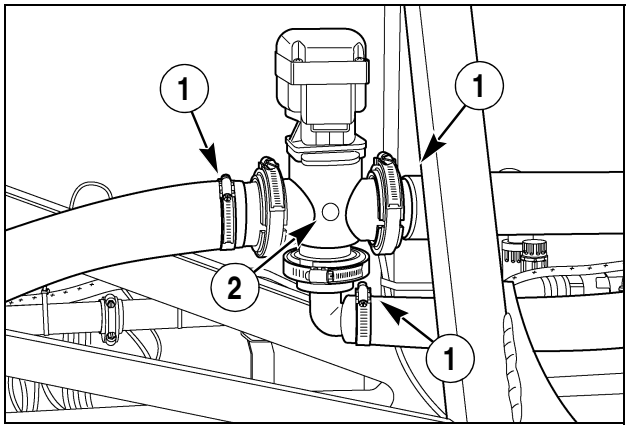
Remove hose clamp and hose for the tank rinse (1) and if equipped, the eductor hopper (2).




RH09C108

### STEP 4

1. Loosen hose clamps (1) on the boom selection valve to be removed.
2. Unplug connector for valve from boom harness.
3. Remove the boom selection valve (2) from the hoses.

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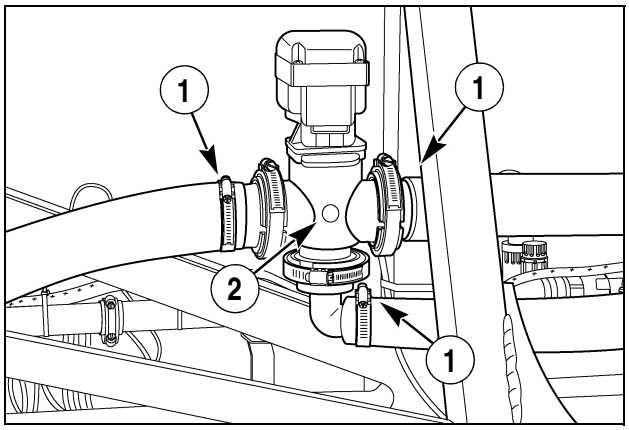
## Boom Selection Shut Off Valve Installation

### STEP 1

1. Install valve assembly (2) on hoses.
2. Tighten hose clamps (1).
3. Plug in connector to boom harness.

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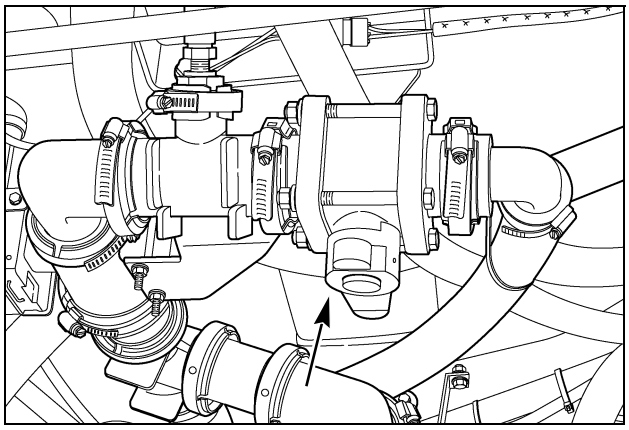
### STEP 2

Open manual sparge valve.



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