Product: MULTI TERRAIN LOADER
Model: 277C MULTI TERRAIN LOADER JWF
Configuration: 277C Multi Terrain Loader JWF00001-UP (MACHINE) POWERED BY 3044C Engine

Systems Operation
3044C Industrial Engine and Engines for Caterpillar Built Machines
Media Number -RENR7578-05 Publication Date -01/07/2007 Date Updated -27/07/2007

i02558839

Air Inlet and Exhaust System

SMCS - 1050

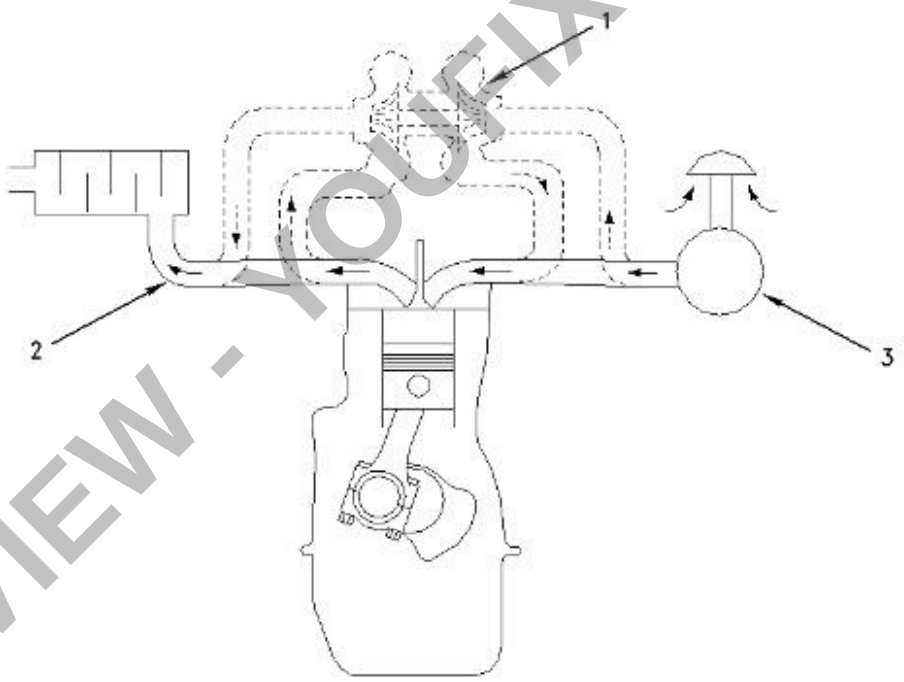


Illustration 1 g00987178

Flow diagram of the air inlet and exhaust system

(1) Turbocharger

(2) Exhaust

(3) Air inlet

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Testing and Adjusting
3044C Industrial Engine and Engines for Caterpillar Built Machines
Media Number -RENR7578-05 Publication Date -01/07/2007 Date Updated -27/07/2007

i01893842

Flywheel - Inspect

SMCS - 1156-040

Inspect the Flywheel

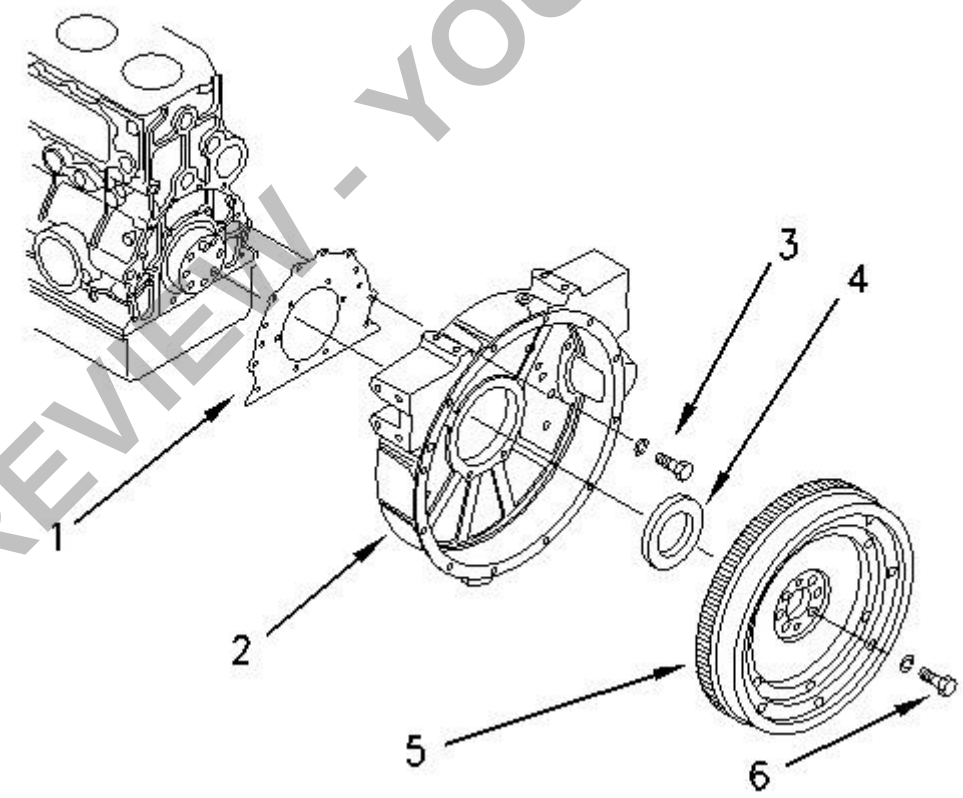


Illustration 1 g00987873

Exploded view of flywheel and flywheel housing

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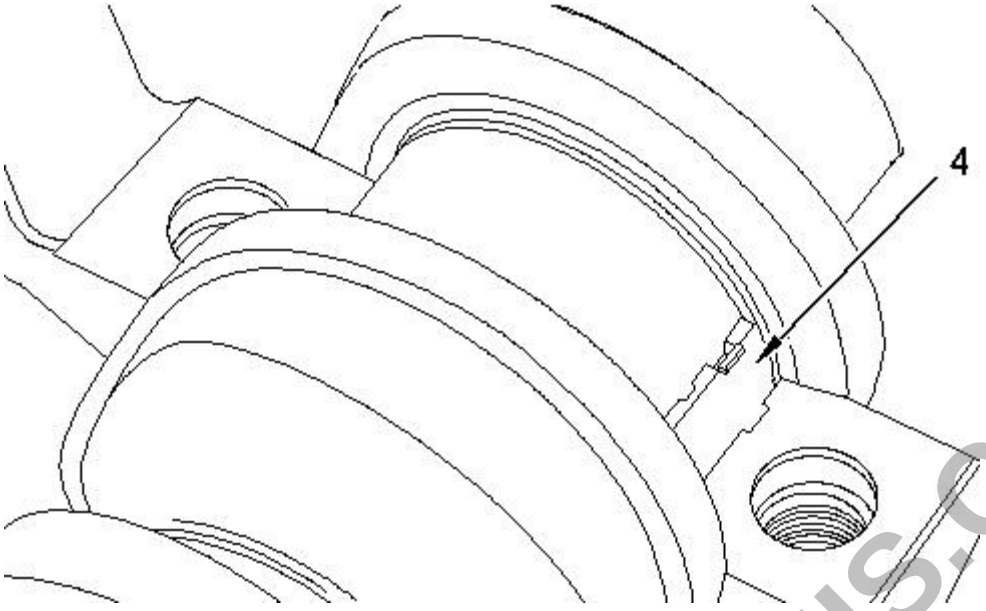


Illustration 1 g00934767

1. Clean upper main bearing (4) and lubricate the bearing surface with clean engine oil.

   Note: Do not put oil on the back sides of the crankshaft main bearings.

   Note: Ensure that the upper halves of the main bearings are installed so that the bearing tabs fit into the notch in the cylinder block.

NOTICE

Only the upper half of the main bearing has lubrication holes. Make sure the upper half of the main bearing is installed correctly in the cylinder block to ensure proper lubrication.

2. Slide upper main bearing (4) into position between the crankshaft journal and the cylinder block.

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Product: MULTI TERRAIN LOADER
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Configuration: 277C Multi Terrain Loader JWF00001-UP (MACHINE) POWERED BY 3044C Engine

Disassembly and Assembly
3044C Industrial Engine and Engines for Caterpillar Built Machines
Media Number -RENR7582-07 Publication Date -01/01/2010 Date Updated -26/02/2010

i01998590

Inlet and Exhaust Valve Guides - Remove and Install

SMCS - 1104-010

Removal Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	4C-6366	Valve Guide Driver	1

Start By:

A. Remove the inlet and exhaust valves. Refer to Disassembly and Assembly, "Inlet and Exhaust Valves - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

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Specifications
3044C Industrial Engine and Engines for Caterpillar Built Machines
Media Number -RENR7577-06 Publication Date -01/07/2007 Date Updated -01/08/2007

i01801979

Connecting Rod

SMCS - 1218

S/N - DWS1-UP

S/N - GCP1-UP

S/N - JAY1-UP

S/N - JWF1-UP

S/N - MAS1-UP

S/N - MJF1-UP

S/N - MST1-UP

S/N - MXF1-UP

S/N - RED1-UP

S/N - TPE1-UP

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Product: MULTI TERRAIN LOADER
Model: 277C MULTI TERRAIN LOADER JWF
Configuration: 277C Multi Terrain Loader JWF00001-UP (MACHINE) POWERED BY 3044C Engine

Systems Operation
3044C Industrial Engine and Engines for Caterpillar Built Machines
Media Number -RENR7578-05 Publication Date -01/07/2007 Date Updated -27/07/2007

i01964002

Cooling System

SMCS - 1350

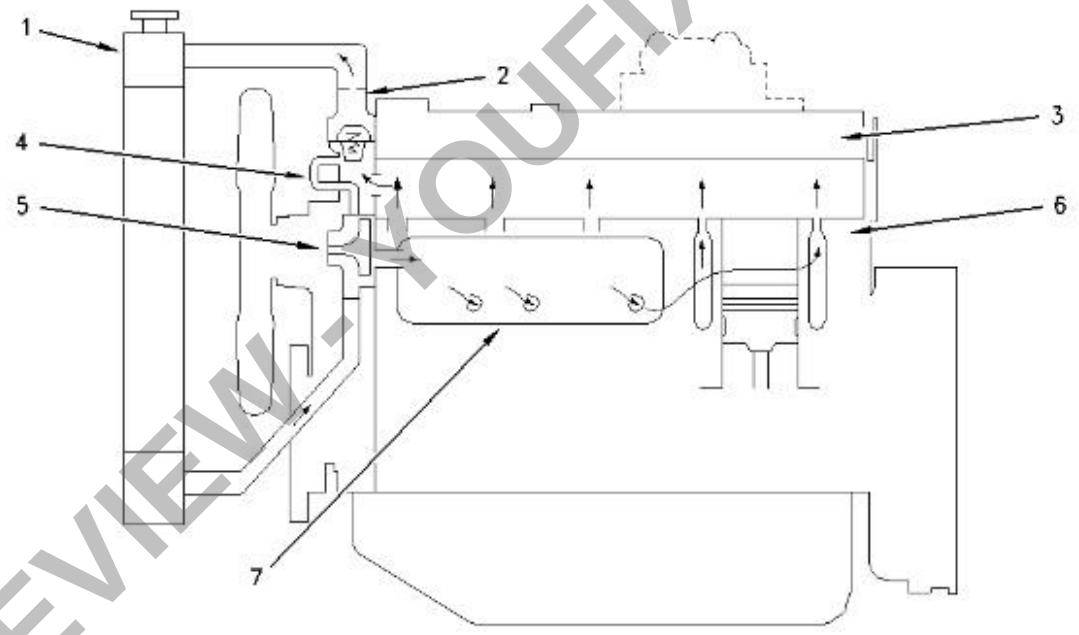


Illustration 1 g00987289

Flow diagram of the cooling system

(1) Radiator

(2) Water temperature regulator housing

(3) Cylinder head

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- Alternator - Test
- Battery - Test
- Electric Starting System - Test
- Glow Plugs - Test

AccuGrade® Grade Control System For Skid-Steer Loader, Multi-Terrain Loader and Compact Track Loader - KENR6250

- Electrical Connector - Inspect
- Wiring Harness (Open Circuit) - Test
- Wiring Harness (Short Circuit) - Test
- Module - Flash Program
- Module - Replace
- Connector Contact Description
- System Schematic

C3.4 Engines for Caterpillar Built Machines - KENR6940

- Alternator - Test
- Battery - Test
- Electric Starting System - Test
- Glow Plugs - Test

Troubleshooting

279C, 279C2, 289C, 289C2 and 299C Compact Track Loaders, 287C, 277C, 277C2, 287C2 and 297C Multi Terrain Loaders and 246C, 256C, 262C, 262C2 and 272C Skid Steer Loaders Machine Electronic Control System - KENR5119

- General Information
- Service Tools
- Connector Locations
- Diagnostic Capabilities
- Symptom Troubleshooting
- Event Code List
- Diagnostic Code List
- Using the Operator Monitor to Determine Diagnostic Codes
- Using Caterpillar Electronic Technician to Determine Diagnostic Codes
- MID 039 - CID 0041 - FMI 03
- MID 039 - CID 0041 - FMI 04
- MID 039 - CID 0070 - FMI 03
- MID 039 - CID 0070 - FMI 04
- MID 039 - CID 0091 - FMI 03
- MID 039 - CID 0091 - FMI 04

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In order to locate machine wiring harness connectors on the machine, the Electrical System Schematic, Parts Manual and Operation and Maintenance Manual for the machine that is being serviced should be used.

The following information is a guide to reading the tables on the back of the Electrical System Schematic.

- The "Component Location" table uses white circles or light gray circles in order to mark the locations in the profile of the machine and in the area views. Alphabetical letters in the "Machine Location" column indicate a general area of the machine. Refer to the corresponding footnote at the end of the table for a description of the location.
- The "Harness Connector Location" table uses white circles or light gray circles in order to mark the locations in the general view and in the area views. Alphabetical letters in the "Machine Location" column indicate a general area of the machine. Refer to the corresponding footnote at the end of the table for a description of the location.

Connector Contact Numbers

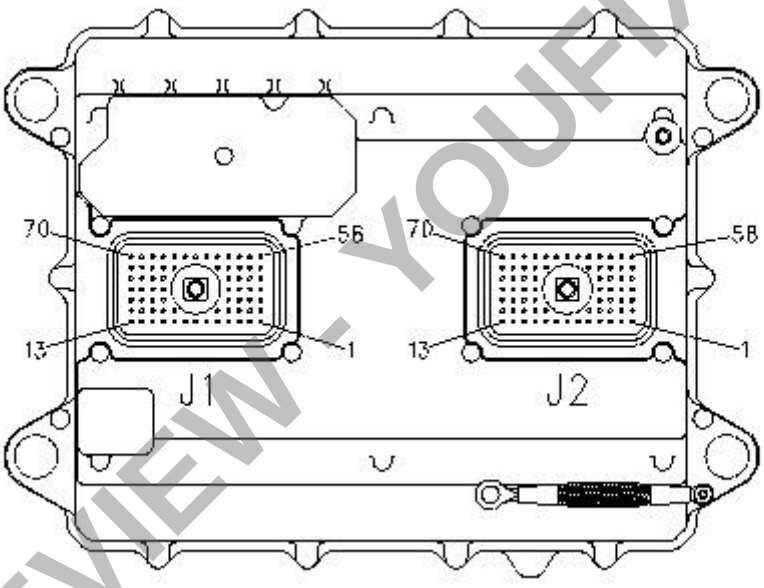


Illustration 2 g00554751

Electronic Control Module (ECM)

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Product: MULTI TERRAIN LOADER
Model: 277C MULTI TERRAIN LOADER JWF
Configuration: 277C Multi Terrain Loader JWF00001-UP (MACHINE) POWERED BY 3044C Engine

Troubleshooting
279C, 279C2, 289C, 289C2 and 299C Compact Track Loaders, 287C, 277C, 277C2, 287C2 and 297C Multi Terrain Loaders and 246C, 256C, 262C, 262C2 and 272C Skid Steer Loaders Machine Electronic Control System
Media Number -KENR5119-05 Publication Date -01/12/2012 Date Updated -12/12/2012

i03560123

MID 039 - CID 1251 - FMI 04

SMCS - 1405-038

Conditions Which Generate This Code:

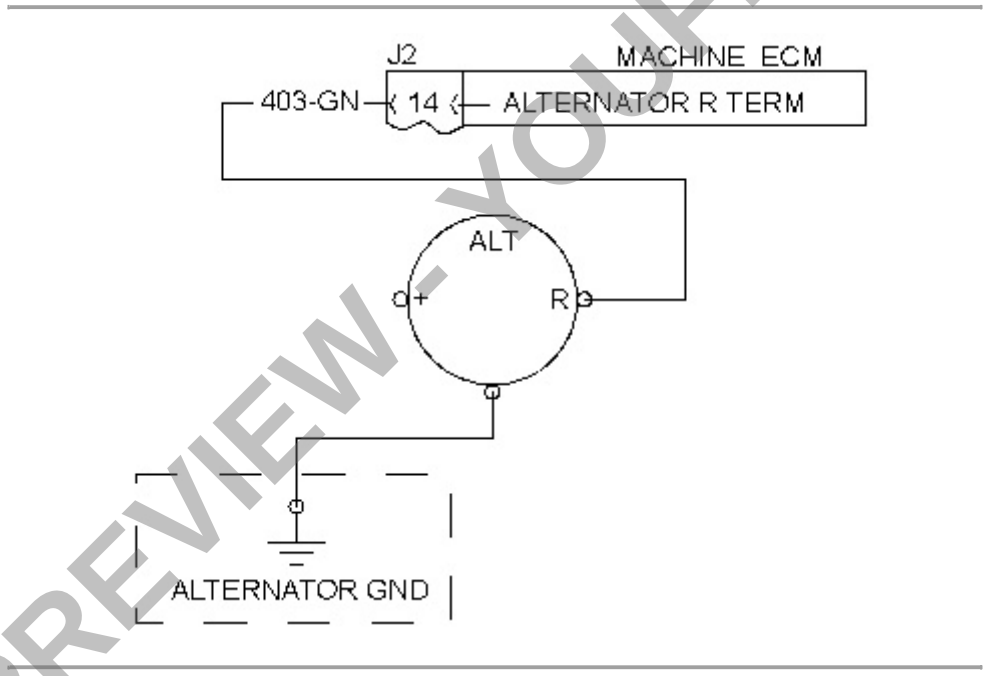


Illustration 1 g01323287

Schematic of the "Alternator R-terminal" circuit

This diagnostic code is recorded when the system voltage is less than 11 DCV and the engine is running.

Test Step 1. CHECK THE "R-TERMINAL" CIRCUIT FOR A SHORT TO GROUND.

A. Turn the key start switch and the disconnect switch to the OFF position.

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- **NOT OK -** The alert indicator remains on the main display module. The machine harness is open or the ECM has failed. Proceed to test step 2.

Test Step 2. CHECK THE VOLTAGE OF THE ECM.

A. Remove the jumper that was used in the previous test step.

B. The signal wire remains disconnected.

C. Measure the pull-up voltage from the signal wire to the ground wire with a digital multimeter.

Expected Result:

The voltage is 8 ± 0.5 volts.

Results:

- **OK -** The voltage is 8 ± 0.5 volts.

  Repair: The voltage is correct. The ECM has failed. It is unlikely that the ECM has failed. Exit this procedure and perform this procedure again. If the problem is not found, replace the ECM. See Troubleshooting, "Electronic Control Module (ECM) - Replace".

  STOP

- **NOT OK -** The voltage is NOT 8 ± 0.5 volts. Proceed to test step 3.

Test Step 3. CHECK THE SIGNAL CIRCUIT OF THE HARNESS.

A. Turn the key start switch to the OFF position.

B. Use the Electrical System Schematic to trace the signal wire from the switch back to the ECM.

C. Determine the signal contact (connector contact) of the machine harness at the ECM.

D. Disconnect the machine harness connectors J1 and J2 from the ECM.

E. At the machine harness connector for the ECM, measure the resistance between the signal contact and contact 2 of the switch.

Expected Result:

The resistance is less than 5 ohms.

Results:

- **OK -** The resistance is less than 5 ohms. The signal circuit of the harness is correct. Proceed to test step 4.

- **NOT OK -** The resistance is greater than 5.0 ohms.

  Repair: The signal circuit of the harness is not correct. Repair the machine harness or replace the machine harness.

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Make sure that the components of the fuel injection nozzle are tightened to the correct torques. Make sure that the gaskets and the insert are positioned correctly. Test the fuel injection nozzle on a nozzle tester in order to measure the pressure setting.

Test the fuel injection nozzle on a nozzle tester.

5. The incorrect fuel injection nozzle is installed.

   Make sure that all fuel injection nozzles have the correct code for the engine.

6. A restriction exists in the high pressure fuel line.

   Inspect all high pressure fuel lines for damage.

7. A seat washer that is not the correct thickness is installed.

   Install the correct thickness of the seat washer.

Troubleshooting Fuel Injection Nozzles on a Nozzle Tester

Note: Be careful when you are handling the fuel injection nozzles in order to prevent damage to the orifices, the threads, and other surfaces. When a fuel injection nozzle is installed, make sure that all surfaces and threads are clean.

Only personnel that have the proper training should disassemble the fuel injection nozzles. Only personnel that have the proper training should perform repairs to the fuel injection nozzles.

Replace the fuel injection nozzle if the fuel injection nozzle cannot be adjusted in order to operate correctly.

Refer to Specifications, "Fuel Injection Nozzles" for additional information.

Back leakage

1. Fuel leaks through the threaded connection of the body and the nozzle nut.

   Make sure that the threads are clean. Tighten the body to the correct torque.

2. Debris or damage exists on the orifices.

   Visually inspect the components of the valve for carbon pitting, for scoring, or for other damage. Clean the surface of the orifices with solvent. Replace the fuel injection nozzles if corrosion exists.

The fuel injection nozzle does not inject fuel in the correct quantity or in the correct pattern.

Probable Cause

1. The setting of the opening pressure is incorrect.

   Test the setting of the opening pressure. Adjust the setting to the correct pressure.

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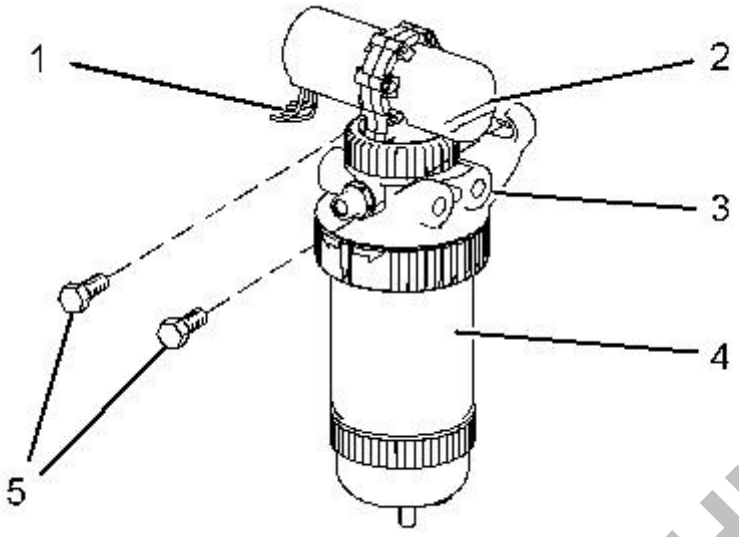


Illustration 1 g01324908

Typical example

3. Drain fuel filter (4). Refer to Operation and Maintenance Manual, "Fuel System Primary Filter/Water Seperator - Drain".
4. Disconnect harness assembly (1) from fuel priming pump (2) .
5. Disconnect the tube assemblies (not shown) from fuel filter base (3) .
6. Remove bolts (5) and remove fuel filter base (3) .

Installation Procedure

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Ensure that the assembly of the fuel priming pump and the fuel filter base is clean and free from damage. If necessary, replace any components that are damaged.

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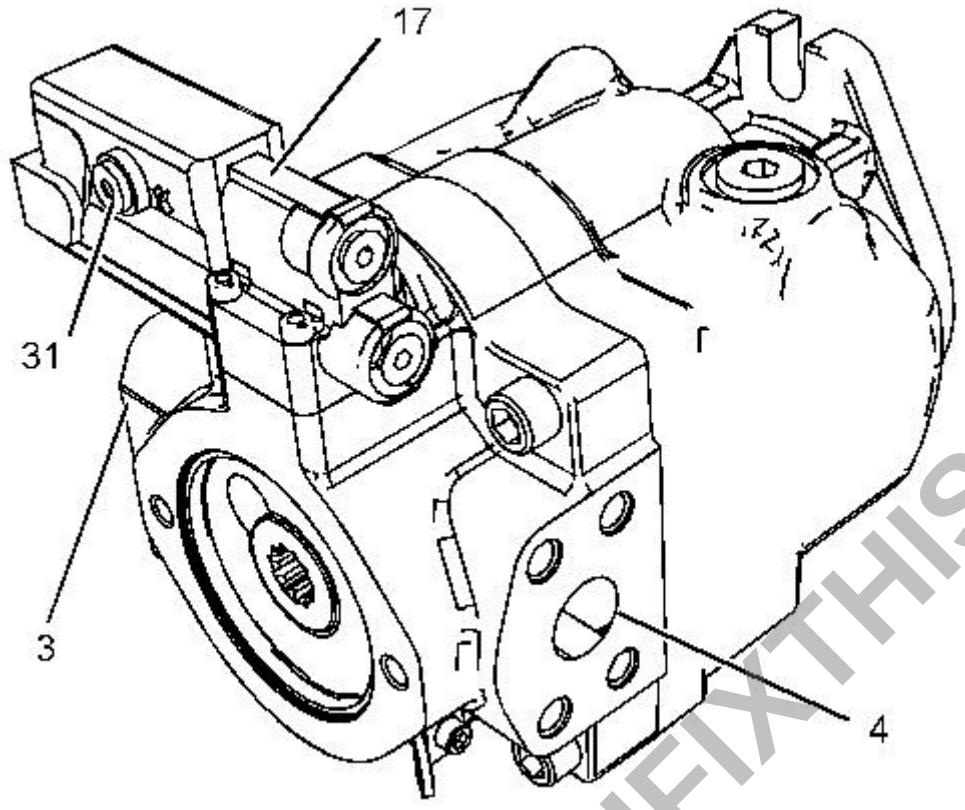


Illustration 3 g01358690

Piston Pump (work tool)

(3) Inlet

(4) Outlet

(17) Pressure and flow

(31) Load sensing port from the work tool control valve

The swashplate angle is controlled by actuator piston (6). Actuator piston (6) is activated by oil pressure from the compensator valve (17).

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12. Unload the pump by adjusting the flow meter valve to the fully open position.

13. Stop the machine. Remove the Multitach Tool Gp (A) and the Portable Hydraulic Tester (B). Reconnect hydraulic lines.

Table 2

System Requirements	
Test	**Specification**
Pump Outlet Pressure	18000 ± 1000 kPa (2610 ± 145 psi)
Engine Speed	2000 ± 10 RPM
Oil Temperature	50° ± 10°C (122° ± 18°F)

Table 3

Charge Pump	
Machine Model	**Minimum Flow**
277C/ 277C2/ 287C/ 287C2/ 297C	36.8 L/min (9.72 US gpm) (Minimum)

ATAAC Pump (If Equipped)

1. Before any tests are performed, prepare the machine. Refer to the machine Testing and Adjusting, "Machine Preparation". Before any tests are performed, visually inspect the complete hydraulic system for oil leaks and damaged parts. Refer to the machine Testing and Adjusting, "Visual Inspection".

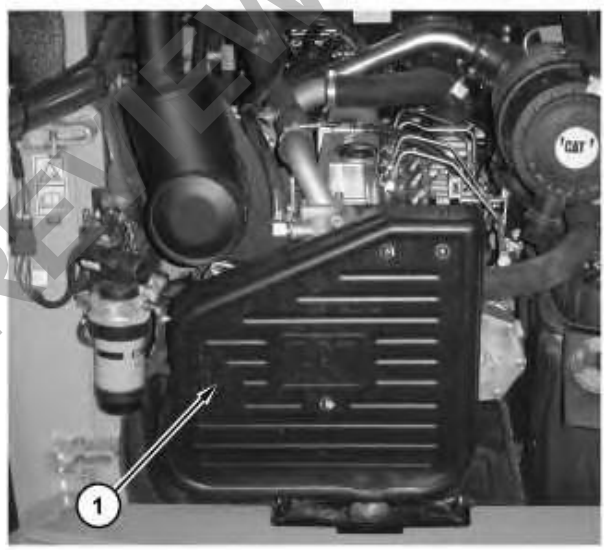


Illustration 4 g01363847

(1) Opening in the engine access cover

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Product: MULTI TERRAIN LOADER
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Troubleshooting
279C, 279C2, 289C, 289C2 and 299C Compact Track Loaders, 287C, 277C, 277C2, 287C2 and 297C Multi Terrain Loaders and 246C, 256C, 262C, 262C2 and 272C Skid Steer Loaders Machine Electronic Control System
Media Number -KENR5119-05 Publication Date -01/12/2012 Date Updated -12/12/2012

i05201232

MID 039 - CID 1076 - FMI 06

SMCS - 1359-038-JV; 5479-038-HFN

Conditions Which Generate This Code:

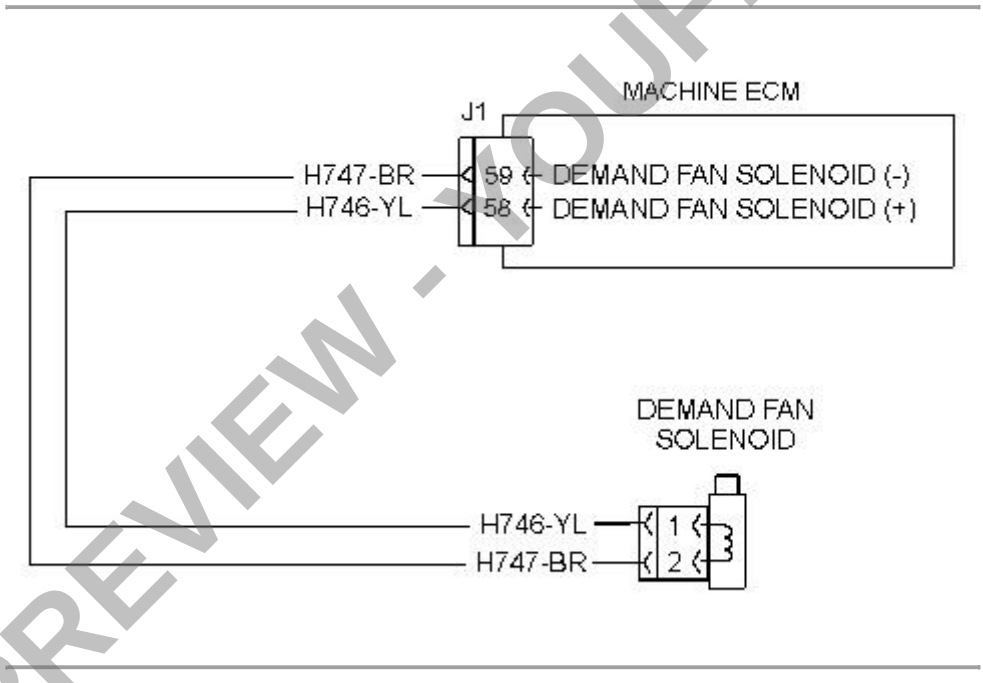


Illustration 1 g02164222

Schematic for the demand fan solenoid

This diagnostic code is associated with the demand fan solenoid. The FMI 06 means that the ECM has detected that the current for the solenoid circuit is above normal.

Conditions that could cause this diagnostic code to be activated are:

- The energize circuit of the solenoid is shorted to a ground source.

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6. Install housing (2) .

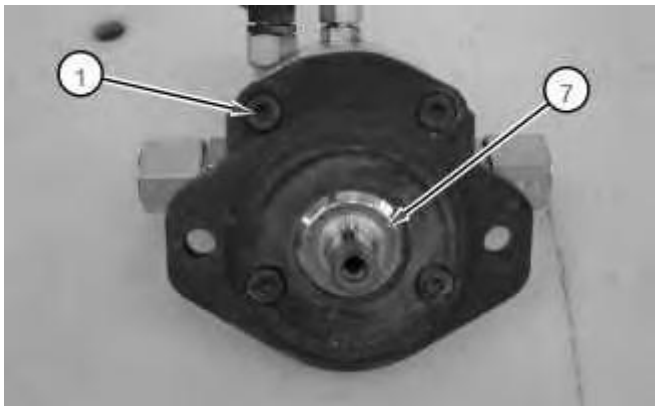


Illustration 5 g01336538

7. Install bolts (1) and seal (7) .

End By: Install the gear motor. Refer to Disassembly and Assembly, "Gear Motor (Fan) - Install".

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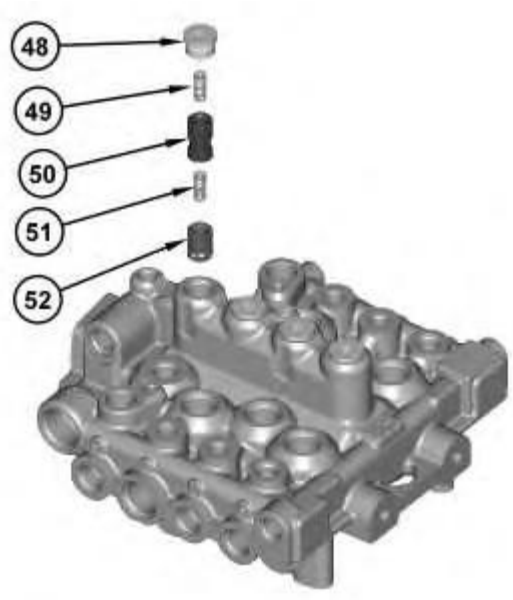


Illustration 1 g01332824

WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

1. Install valve (52), spring (51), valve (50), and spring (49). Install the O-ring seal and plug (48). Repeat for the remaining valve assemblies.

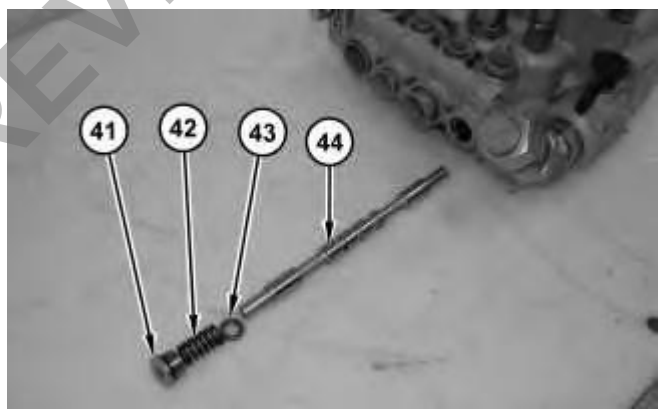


Illustration 2 g01332821

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Disassembly and Assembly
C3.4 Engines for Caterpillar Built Machines
Media Number -KENR6941-04 Publication Date -01/03/2012 Date Updated -01/03/2012

i02638821

Engine Oil Pump - Install

SMCS - 1304-012

Installation Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	9U-7324	Indicator Bracket	1
	7H-1942	Dial Indicator	1
	3S-3268	Indicator Contact Point	1
	7H-1940	Universal Attachment	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

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Personal injury can result from hot coolant. Any contact with hot coolant or with steam can cause severe burns. Allow cooling system components to cool before the cooling system is drained.

If service work is required on an air conditioning system, the refrigerant must be recovered first before components are removed or installed. Use the following procedure:

1. Use the refrigerant identifier. The refrigerant identifier will detect refrigerants that are not R134a. The refrigerant identifier will prevent the refrigerants from contaminating the tools for recovery and the tools for charging. The refrigerant identifier will also detect the percentage of air that may be in the system.

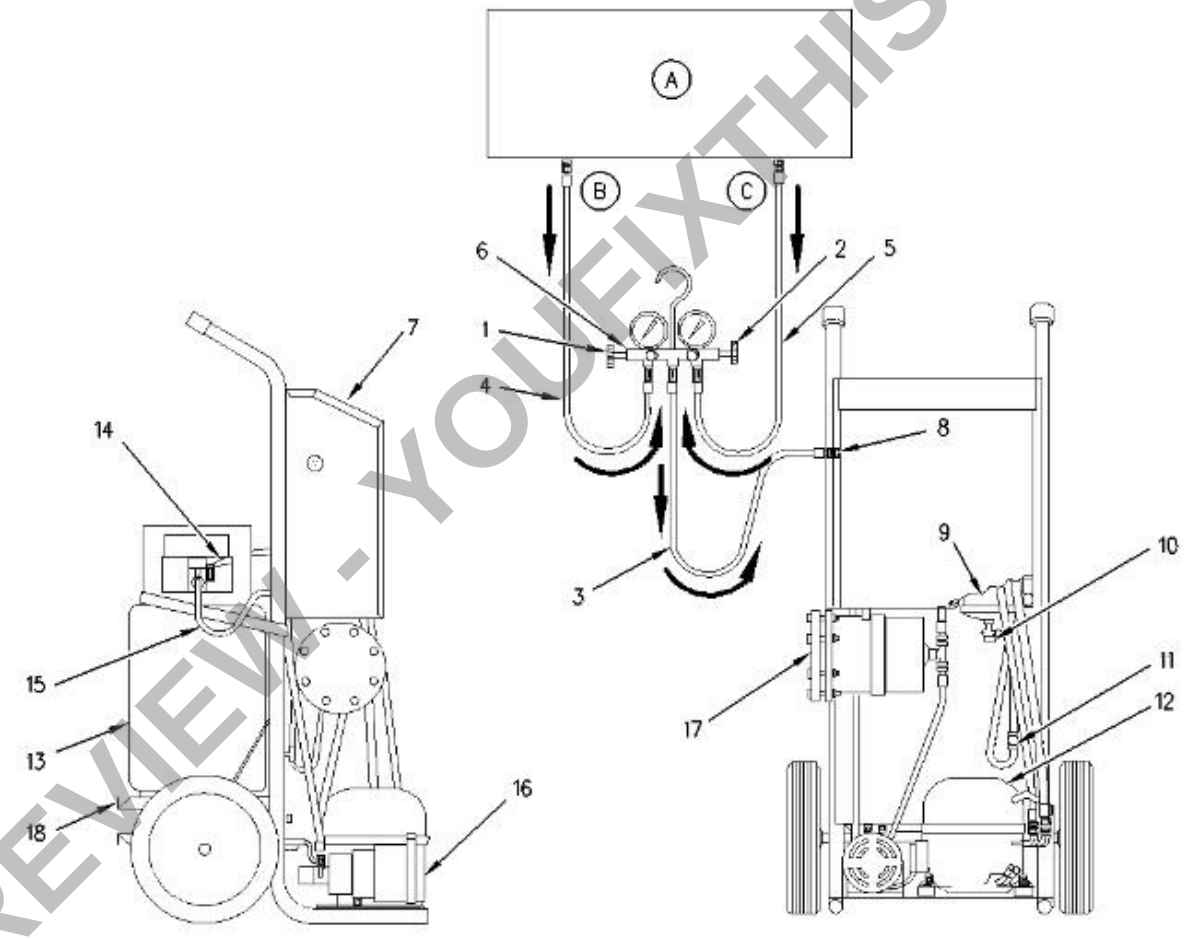


Illustration 1 g00389232

(1) Low pressure valve. (2) High pressure valve. (3) Charging hose. (4) Low pressure hose. (5) High pressure hose. (6) Manifold gauge set. (7) Control panel. (8) Inlet on recovery station. (9) Accumulator/oil separator. (10) Drain valve. (11) Pressure valve on accumulator. (12) Compressor. (13) Refrigerant tank. (14) Hose (liquid). (15) Hose (vapor). (16) Refrigerant pump. (17) Filter dryer. (18) Scale. (A) Refrigerant compressor. (B) Low pressure side (suction). (C) High pressure side (discharge).

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A. Inspect the harness connectors. Clean the harness contacts of the harness connectors and check the wires for damage to the insulation that is caused by excessive heat, corrosion, or chafing.

B. Perform a 45 N (10 lb) pull test on each of the wires that are associated with the sensor circuit.

C. Reconnect all harness connectors. Make sure that the connectors are fully seated. Make sure that the clips for each connector are completely fastened.

D. Turn the key start switch to the ON position.

E. Operate the machine.

F. Determine if the CID 2476 FMI 03 diagnostic code is active.

Expected Result:

The CID 2476 FMI 03 diagnostic code is not active.

Results:

- **OK -** The CID 2476 FMI 03 diagnostic code is not active. The diagnostic code does not exist at this time. The initial diagnostic code was probably caused by a poor connection or a short at one of the connectors that was disconnected and reconnected. Resume normal operation.**STOP**

- **NOT OK -** The CID 2476 FMI 03 diagnostic code is active. The diagnostic code has not been corrected.

  Repair: It is unlikely that the ECM has failed. Exit this procedure and perform this procedure again. Exit this procedure and perform this procedure again. If the cause of the diagnostic code is not found, contact your dealership's Technical Communicator for possible consultation with Caterpillar. This consultation may greatly reduce repair time. If the ECM requires replacement, refer to Testing and Adjusting, "Electronic Control Module (ECM) - Replace"

  STOP

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i03863132

In-Line Refrigerant Dryer - Remove and Install

SMCS - 7322-010-QT

Dryer Installation

WARNING

Personal injury can result from contact with refrigerant.

This system is under pressure at all times, even if the engine is not running. Heat should never be applied to a charged system.

Contact with refrigerant can cause frost bite. Keep face and hands away to help prevent injury.

Protective goggles must always be worn when refrigerant lines are opened, even if the gauges indicate the system is empty of refrigerant.

Always use caution when a fitting is removed. Slowly loosen the fitting. If the system is still under pressure, evacuate the system recovering the refrigerant before removing the fitting.

Personal injury or death can result from inhaling refrigerant through a lit cigarette.

Inhaling air conditioner refrigerant gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting air conditioner refrigerant gas, can cause bodily harm or death.

Do not smoke when servicing air conditioners or wherever refrigerant gas may be present.

Before any checks of the air conditioning and heating system are made, move the machine to a smooth horizontal surface. Lower all implements to the ground. Make sure the transmission is in neutral or park and that

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Illustration 7 g01353756

Travel control lever

(39) Travel control lever

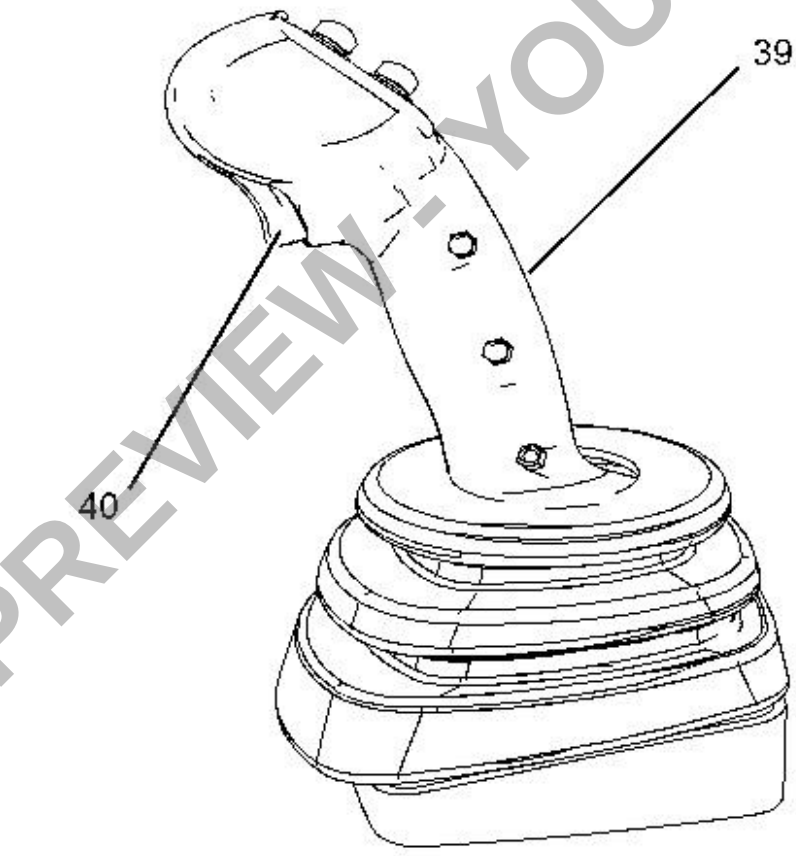


Illustration 8 g01353759

Two speed control switch

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Repair: Repair the harness or replace the harness. Verify that the diagnostic has been cleared. Drive the machine above the speed threshold. Verify that the diagnostic tool has been cleared.

STOP

Test Step 2. CHECK FOR AN OPEN SIGNAL CIRCUIT.

A. Disconnect the negative battery cable and turn the key start switch to the OFFposition.

B. Remove the connector from the speed sensor and place a jumper between pins 3 and 4.

C. Disconnect J1 and J2 connectors from the ECM. Measure the continuity from pin J2-35 wire (834-YL) to pin J2-40 wire (835-GY).

Expected Result:

The resistance between pins 3 and 4 is less than 5Ω.

Results:

- **OK -** The resistance between pins 3 and 4 is less than 5Ω. Proceed to test step 3.
- **NOT OK -** The resistance between pins 3 and 4 is greater than 5Ω. There is an open circuit in one of the signal wires on the machine harness. The open circuit is in wire 834-YL or wire 835-BU.

  Repair: Repair the machine harness or replace the machine harness. Verify that the diagnostic tool has been cleared. Drive the machine above the threshold for the motor speed.

  Proceed to test step3.

Test Step 3. CHECK FOR A SHORT IN THE HARNESS.

A. The machine harness remains disconnected from the sensor.

B. Turn the key start switch to the OFF position.

C. Disconnect the J1 and J2 machine harness connectors from the ECM.

D. At machine harness connector J1 and J2, measure the resistance. Measure the resistance from the contact J2-35 (wire 834-YL) and contact J2-40 (wire 835-BU) of the machine harness to all contacts that are used in the machine harness connectors for the ECM.

Expected Result:

The resistance should be greater than 5000 ohms for each measurement.

Results:

- **OK -** The resistance is greater than 5000 ohms. The machine harness is correct. Proceed to test step 4.
- **NOT OK -** The resistance is NOT correct. There is a short in the machine harness. The short is between wire 835-BU and the circuit with the low resistance measurement or the short is between wire 834-YL and the circuit with the low resistance measurement.

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WARNING

Personal injury can result from hot coolant. Any contact with hot coolant or with steam can cause severe burns. Allow cooling system components to cool before the cooling system is drained.

1. Use the **138-6629** Refrigerant Identifier in order to verify that the refrigerant that is in the air conditioning system is R134a.

2. Connect the manifold gauge set to the service ports near the refrigerant compressor. The service ports for charging are located on the refrigerant lines. Connect the low pressure hose to the service port on the suction side of the compressor. Connect the high pressure hose to the service port on the discharge side of the compressor. Make sure that the valved couplings are turned counterclockwise for installation. Then, turn the valved couplings clockwise in order to open the valves.

3. Turn the pressure valves clockwise and make sure that both pressure valves on the manifold gauge set are closed.

4. Place a clean rag over the charging hose fitting that is loosened at the manifold gauge set. This will prevent the spraying of compressor oil. Open the low pressure valve on the gauge set about 1/2 turn. Keep the valve open for 2 to 3 seconds in order to flush air from the low pressure hose. This will also flush air from the gauge set. Close the low pressure valve on the gauge set. Repeat this process for the high pressure valve. Tighten the charging hose fitting at the manifold gauge set.

Note: Use the refrigerant identifier. The refrigerant identifier will prevent refrigerants that are not R134a from contaminating the recovery and charging tools.

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Illustration 5 g01351524

10. Remove the machine from Tooling (A) .

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