Service Procedures

Air Conditioning (A/C) System Refrigerant Recovery Procedure

Overview

If the Air Conditioning (A/C) system refrigerant is being recovered because a leak is suspected, the leak must be located before refrigerant recovery of the A/C system. See Refrigerant Leak Test (page 3459).

Be aware that this vehicle may have multiple A/C systems. Do not cross-connect the various A/C systems.

WARNING

To prevent personal injury and / or death, always wear approved safe eye protection when performing vehicle diagnostic or service procedures.

WARNING

To prevent personal injury and / or death, or damage to property, always disconnect the ground battery terminal first, then the positive cable. When reconnecting the battery cables, connect the positive cables first, and then reconnect the negative cables. Failure to follow this warning may result in a direct battery short, which is a fire or explosion hazard.

WARNING

To prevent personal injury and / or death, or damage to property, never put any part of your body beneath a raised hood unless the hood is all the way forward in its range of motion and is fully settled in the over center position.

WARNING

To prevent personal injury and / or death, minimize lifting weights over 55 pounds (25 kg). Request assistance or use lifting gear to remove, install, or lift heavy components.

WARNING

To prevent personal injury and / or death, do not let engine fluids stay on your skin. Clean skin and nails using hand cleaner and wash with soap and water. Wash or dispose of clothing and rags contaminated with engine fluids.

Special Tools

Refrigerant Management System with Printer – 37830

Equipment Conditions

1. Vehicle parked on dry, level ground, parking brake set, transmission in Park or Neutral.
2. Key OFF.
3. Wheel chocks installed.

4. Battery disconnected. See Battery Disconnect (page 863).
5. Hood unlatched and opened.
6. Refrigerant management system hoses flushed.
7. Refrigerant Identification Test (page 3457) performed.
8. No occupants in vehicle during maintenance procedures.

Recycling Mode

The locations of A/C system high-pressure and low-pressure service ports vary by vehicle model and year. The high-pressure service port is located on the compressor's high-pressure discharge line between the compressor and the expansion valve. The low-pressure port is located on the compressor suction line, between the expansion valve and the compressor.

Identify discharge, suction A/C service ports, and suction low side by larger diameter hose.

Procedure

Figure 954 Refrigerant Management System Overview

1. Low-pressure refrigerant gauge
2. Tool tray
3. High-pressure refrigerant gauge
4. Main power switch
5. High-pressure refrigerant hose (RED)
6. High-pressure quick disconnect valve (RED)
7. Low-pressure quick disconnect valve (BLUE)
8. START / RESET buttons
9. Oil drain bottle
10. Low-pressure refrigerant hose (BLUE)
11. Oil inject bottle

1. Empty the catch bottle filled with recovered oil located on the recovery station. This allows for accurate measurement of oil recovered during refrigerant recovery procedure.
2. Remove protection caps from both service ports.
3. Verify that all valves are closed on recovery station and hose fittings.
4. Verify that valves at recovery station are set to CLOSED.
5. Verify that valves at quick-disconnect fittings are set fully counterclockwise.

6. Connect recovery station to A/C system as follows:
   a. Connect BLUE hose to low-pressure service port.
   b. Connect RED hose to high-pressure service port.
   c. Open valves, by turning valves clockwise, on quick-disconnect fittings connected to service ports on vehicle.
   d. Set both hand valves on recovery station to RECOVERY or VACUUM.
7. Turn recovery station main power switch ON and press RECOVER. Recovery station will automatically shut off when refrigerant in A/C system has been exhausted to storage tank.
8. Close quick connect valves, and set both valves on recovery station to CLOSED.

NOTE: When recovering refrigerant by use of a recovery station, system oil is separated from refrigerant during recovery cycle.

NOTE: When refrigerant recovery operation is complete, recovery station will drain oil into station's calibrated catch bottle.

NOTE: Amount of oil recovered may be used to determine amount of new oil that must be added back to A/C system. See Air Conditioning (A/C) Compressor Oil Fill Guidelines (Procedure) (page 3477).

9. Remove BLUE and RED hoses from service ports on A/C system.
10. Install protection caps for both service ports on vehicle.

Follow-On Procedure

1. Determine repairs required based on level in recovered oil catch bottle located on recovery station and inspection of integrated receiver dryer plug strainer and desiccant bag.
2. Close and latch hood.
3. Reconnect battery. See Battery Reconnect (page 865).
4. Remove wheel chocks.

Air Conditioning (A/C) System Evacuation Procedure

Overview

After the Air Conditioning (A/C) system has been recovered, evacuate the system to remove all air and moisture before recharging. The A/C system vacuum should measure between 750 and 1,000 microns (0.1 and 0.14 kPa) when complete as measured by electronic vacuum gauge.

WARNING

To prevent personal injury and / or death, always wear approved safe eye protection when performing vehicle diagnostic or service procedures.

WARNING

To prevent personal injury and / or death, or damage to property, always disconnect the ground battery terminal first, then the positive cable. When reconnecting the battery cables, connect the positive cables first, and then reconnect the negative cables. Failure to follow this warning may result in a direct battery short, which is a fire or explosion hazard.

WARNING

To prevent personal injury and / or death, or damage to property, never put any part of your body beneath a raised hood unless the hood is all the way forward in its range of motion and is fully settled in the over center position.

WARNING

To prevent personal injury and / or death, minimize lifting weights over 55 pounds (25 kg). Request assistance or use lifting gear to remove, install, or lift heavy components.

WARNING

To prevent personal injury and / or death, or damage to property, flush, purge or pressure test the system for leaks. Failure to properly flush, purge, or pressure test a system for leaks can result in explosion, fire, or contact with acid-saturated refrigerant or oil mists.

WARNING

To prevent personal injury and / or death, or damage to property, do not remove compressor oil fill plug to check oil level in compressor while Heating Ventilation and Air Conditioning (HVAC) system is charged with refrigerant. The crankcase side of the compressor is under pressure and it will not be possible to check oil levels while the HVAC system is under system pressure.

CAUTION

To prevent damage to property, recover (recycle) A/C system before system is opened for repair.

CAUTION

To prevent damage to property from over filling when adding system refrigerant oil during evacuation or charging procedure, see Oil Fill Guidelines to determine amount of oil to be added. Then, follow all instructions furnished with recovery station, or refrigerant oil injector tool, to add correct amount of new oil to the Heating Ventilation and Air Conditioning (HVAC) system during this procedure.

CAUTION

To prevent damage to property, including the Heating Ventilation and Air Conditioning (HVAC) compressor, due to excessively high head pressure during operation, do not overcharge system with R134a refrigerant. Be sure to check specifications for vehicle being serviced.

CAUTION

To prevent vehicle / property damage, after turning key OFF on a vehicle with Selective Catalyst Reduction (SCR) system, do not disconnect the vehicle batteries for at least 60 seconds. If you can hear a pumping sound from underneath the vehicle, wait for the sound to stop prior to disconnecting the vehicle battery.

Special Tools

Refrigerant Management System with Printer – 37830

Equipment Conditions

1. Vehicle parked on dry, level ground, parking brake set, transmission in Park or Neutral.
2. Key OFF.
3. Wheel chocks installed.
4. Battery disconnected. See Battery Disconnect (page 863).
5. Refrigerant identification performed to prevent tool contamination. See Refrigerant Identification Test (page 3457).
6. Hood unlatched and opened.
7. No occupants in vehicle during maintenance procedures.

Procedure

The high-pressure service port is located on the compressor's high-pressure discharge line between the compressor and its expansion valve. The low-pressure port is located on the compressor suction line, between the expansion valve and the compressor.

Discharge and suction ports are usually marked on the compressor head. If marking is not visible, identify the suction (low-pressure) side by the larger diameter hose connected to compressor.

During the following procedure, do not add oil to the A/C system until the system has been leak tested, and all leaks have been repaired.

1. Determine the amount of NEW refrigerant oil to be added to A/C system. See Air Conditioning (A/C) Compressor Oil Fill Guidelines (Procedure) (page 3477). If adding oil directly to the compressor, add it before starting the evacuation procedure. If oil is added during evacuation or charging procedure, follow instructions furnished with recovery station, or refrigerant oil injector tool, to add oil before charging procedure.

Determine the amount of NEW refrigerant oil to be added to A/C system. See Air Conditioning (A/C) Compressor Oil Fill Guidelines (Procedure) (page 3477). If adding oil directly to the compressor, add it before starting the evacuation procedure. If oil is added during evacuation or charging procedure, follow instructions furnished with recovery station, or refrigerant oil injector tool, to add oil before charging procedure.

Determine the amount of NEW refrigerant oil to be added to A/C system. See Air Conditioning (A/C) Compressor Oil Fill Guidelines (Procedure) (page 3477).

- If adding oil directly to the compressor, add it before starting the evacuation procedure.
- If oil is added during evacuation or charging procedure, follow instructions furnished with recovery station, or refrigerant oil injector tool, to add oil before charging procedure.

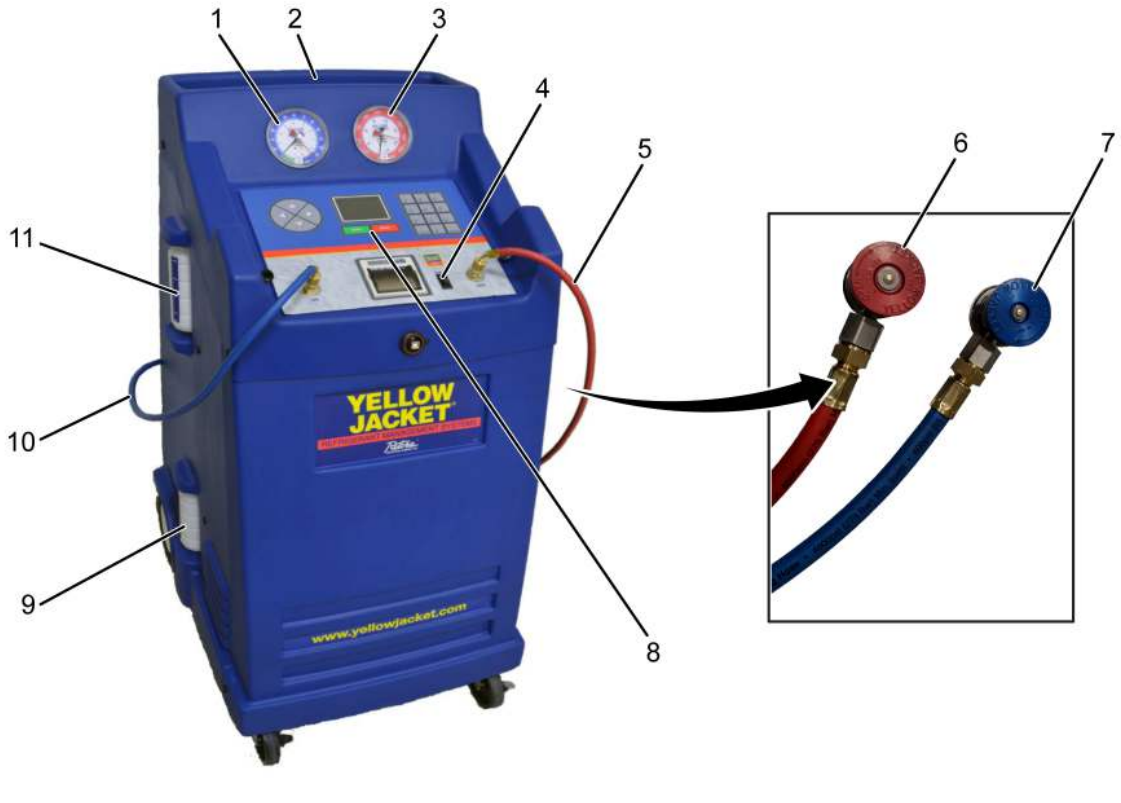

Figure 955 Refrigerant Management System Overview

1. Low-pressure refrigerant gauge
2. Tool tray
3. High-pressure refrigerant gauge
4. Main power switch
5. High-pressure refrigerant hose (red)
6. High-pressure quick disconnect valve (red)
7. Low-pressure quick disconnect valve (blue)
8. START / RESET buttons
9. Oil drain bottle
10. Low-pressure refrigerant hose (blue)
11. Oil inject bottle

2. Verify all valves are closed on both recovery station and hose fittings. Set valves at recovery station to CLOSED. Set valves (knobs) at quick-connect fittings fully counterclockwise.
3. Using valve and T-fittings, connect electronic vacuum gauge to recovery station, at vacuum manifold. Close valve that isolates electronic vacuum gauge from low-pressure line.

CAUTION

4. Connect recovery station to A/C system; follow Steps 5 through 9.
5. Connect BLUE low-pressure hose to low-pressure service port.
6. Connect RED high-pressure hose to high-pressure service port.

7. Open valves on RED and BLUE hoses; turn knobs fully clockwise.
8. Manually set both hand valves on recovery station to RECOVERY or VACUUM; on newer machines, this is an automatic function.
9. Turn on the main power switch and press VACUUM on the recovery station.
10. After the low-pressure gauge on station shows that a vacuum is established in the A/C system, continue to operate the vacuum pump for 10 minutes.
11. After 10 minutes, set both valves on the recovery station to CLOSED and observe the low-side gauge for 1 minute.
    a. If the gauge does not indicate a rise of more than 2inHg, proceed to step 12.
    b. If the gauge indicates a rise greater than 2inHg, repair the system leak. See Refrigerant Leak Test (page 3459).
12. If there are no leaks or all leaks have been repaired, manually set both hand valves on the recovery station to RECOVERY or VACUUM; if using a newer machine, press VACUUM.
13. Open the valve connecting the electronic vacuum gauge to the recovery station low-side line.
14. Continue until the A/C system has pulled a vacuum of 750 to 1,000 microns as measured by the electronic vacuum gauge. Operate the vacuum pump for a minimum of 10 minutes even if vacuum reaches its target value sooner.
15. Close both hand valves on recovery station, if it is not a newer machine that has automatic function, and close valve connecting electronic vacuum gauge to recovery station low-side line.

Follow-On Procedure

1. A/C system is ready to be charged. Remember, if full amount of refrigerant oil has not yet been added to A/C system, it must be added before charging A/C system with refrigerant, as explained in Air Conditioning (A/C) System Charging Procedure (page 3482).
2. Close and latch hood.
3. Reconnect battery. See Battery Reconnect (page 865).
4. Remove wheel chocks.

A/C System Oil Injection Procedure

Overview

Determine the quantity of Air Conditioning (A/C) component oil needed under most common service procedures. The correct volume of refrigerant oil in the A/C system is critical for proper A/C system operation. Insufficient oil will result in component failure. Too much oil decreases cooling efficiency, resulting in poor system cooling performance. When servicing the A/C system, ensure the amount of oil (retained or added) in the repaired system (compressor and components) equals the total captured in the Refrigerant Management System oil drain bottle plus oil for new parts installed.

WARNING

To prevent personal injury and / or death, always wear safe eye protection when performing vehicle maintenance.

WARNING

To prevent personal injury and / or death, or damage to property, park vehicle on hard flat surface, shift transmission to Park or Neutral, turn the engine OFF, set parking brake, and install wheel chocks before performing diagnostic or service procedures.

WARNING

To prevent personal injury and / or death, or damage to property, turn Key OFF and allow system to power off, before performing maintenance on vehicle components.

WARNING

To prevent personal injury and / or death, or damage to property, never put any part of your body beneath a raised hood unless the hood is all the way forward in its range of motion and is fully settled in the over center position.

WARNING

To prevent personal injury and / or death, do not let engine fluids stay on your skin. Clean skin and nails using hand cleaner and wash with soap and water. Wash or dispose of clothing and rags contaminated with engine fluids.

CAUTION

CAUTION UNDER REVIEW

CAUTION

CAUTION UNDER REVIEW

CAUTION

To prevent damage to property, when installing components, use new O-rings and C-plates lubricated with mineral-based oil only.

Special Tools

A/C Oil and Dye Injection Tool – 125401NAV

Oil Capacity by Component
Specifications

TCCI compressor refrigerant oil type	PAG 46
Total system refrigerant oil capacity	10.14 fl oz (300 cc)

Main (Front) A/C System Oil Capacity
Specifications

Evaporator	2 fl oz (60 cc)
Condenser	2 fl oz (60 cc)
Compressor	Equal to amount drained from original compressor
Integrated receiver drier	1 fl oz (30 cc)
Thermal Expansion Valve (TXV)	0 fl oz (0 cc)
Suction line	1 fl oz (30 cc)
Discharge line	1 fl oz (30 cc)
Receiver to expansion valve line	1 fl oz (30 cc)
Pressure switches and sensors	0 fl oz (0 cc)
Minor system leak	1 fl oz (30 cc)
Major system leak	3 fl oz (90 cc)

Sleeper A/C System Oil Capacity
Specifications

Liquid Line to Rear Evaporator and TXV	1 fl oz (30 cc)
Suction Line From Rear Evaporator	3 fl oz (90 cc)
Rear (Auxiliary) Evaporator	2 fl oz (60 cc)
Rear (Auxiliary) TXV	0 fl oz (0 cc)

Equipment Conditions

1. Vehicle parked on dry, level ground, parking brake set, transmission in Park or Neutral.
2. Key OFF.
3. Wheel chocks installed.
4. Hood unlatched and opened.
5. Leak detection performed. See Refrigerant Leak Test (page 3459).
6. A/C system recovered. See Air Conditioning (A/C) System Refrigerant Recovery (page 3468).
7. A/C system repaired.
8. No occupants in vehicle during maintenance procedures.

Procedure

When refrigerant is recovered for purpose of measuring refrigerant charge only, see Oil Separation During Refrigerant Recovery (page 3480).

When a component other than a compressor is replaced, and there is no oil leak, see Component Replacement with No Oil Leak (page 3480).

When there is a refrigerant leak, an unknown amount of oil escapes from the A/C system with refrigerant. When a leak is detected, perform following procedures to re-establish correct A/C system oil level. Contaminated A/C systems must be flushed and purged. See Air Conditioning (A/C) System Flush and Purge (page 3486) procedure; than see Oil Loss Due to Refrigerant Leak (page 3480).

When the compressor is replaced due to internal compressor failure, see Compressor Replacement Due to Internal Compressor Failure (page 3480).

When the compressor is replaced due to clutch failure, see Compressor Replacement Due to Clutch Failure (page 3480).

Oil Separation During Refrigerant Recovery.

1. Add amount of oil removed from A/C system during refrigerant recovery procedure. Total replacement oil quantity equals oil from refrigerant recovery procedure.

Procedure

Component Replacement with No Oil Leak.

1. Total oil replacement is determined by adding amount of oil removed from A/C system during refrigerant recovery procedure, plus amount indicated for replaced component in Oil Capacity table (page 3479).

Procedure

Oil Loss Due to Refrigerant Leak.

For A/C systems that are not contaminated, perform the following:

1. Determine correct quantity of replacement of refrigerant oil. Replacement amount equals oil from refrigerant recovery procedure plus oil indicated in Oil Capacity table (page 3479).
2. Install new integrated receiver dryer. See Integrated Receiver Dryer Installation (page 3566).

Procedure

Compressor Replacement Due to Internal Compressor Failure.

1. Flush and purge A/C system. See Air Conditioning (A/C) System Flush and Purge (page 3486) Procedure.
2. New A/C compressors should have the correct amount of oil 10.14 fl oz (300 cc) for the entire A/C system and can be installed without adding or draining oil.
3. Turn compressor clockwise ten times by hand before installing accessory belt.

Procedure

Compressor Replacement Due to Clutch Failure.

1. Drain oil from old compressor. See Air Conditioning (A/C) Compressor Oil Level Inspection (page 3432).
2. Drain oil from new compressor. See Air Conditioning (A/C) Compressor Oil Level Inspection (page 3432).
3. Using new oil, add amount of oil drained from old compressor plus amount of oil recovered from refrigerant recovery.
4. Install new compressor. See Air Conditioning (A/C) Compressor Installation (page 3503).

Follow-On Procedure

1. Evacuate A/C System. See Air Conditioning (A/C) System Evacuation (page 3472) Procedure.

2. Charge A/C System (Full Charge). See Air Conditioning (A/C) System Charging (page 3482) Procedure.
3. Close and latch hood.
4. Remove wheel chocks.

Air Conditioning (A/C) System Charging Procedure

Overview

The Air Conditioning (A/C) system charge procedure should be performed after the A/C system has been recovered, evacuated, repaired if necessary, and the system has been filled with the required amount of POE oil.

If recycled Air Conditioning (A/C) system refrigerant is to be used, follow instructions supplied with recycling equipment to purge air from refrigerant before charging system.

WARNING

To prevent personal injury and / or death, always wear approved safe eye protection when performing vehicle diagnostic or service procedures.

WARNING

To prevent personal injury and / or death, or damage to property, always disconnect the ground battery terminal first, then the positive cable. When reconnecting the battery cables, connect the positive cables first, and then reconnect the negative cables. Failure to follow this warning may result in a direct battery short, which is a fire or explosion hazard.

WARNING

To prevent personal injury and / or death, or damage to property, never put any part of your body beneath a raised hood unless the hood is all the way forward in its range of motion and is fully settled in the over center position.

WARNING

To prevent personal injury and / or death, minimize lifting weights over 55 pounds (25 kg). Request assistance or use lifting gear to remove, install, or lift heavy components.

WARNING

To prevent personal injury and / or death, or damage to property, flush, purge or pressure test the system for leaks. Failure to properly flush, purge, or pressure test a system for leaks can result in explosion, fire, or contact with acid-saturated refrigerant or oil mists.

WARNING

To prevent personal injury and / or death, or damage to property, do not remove compressor oil fill plug to check oil level in compressor while Heating Ventilation and Air Conditioning (HVAC) system is charged with refrigerant. The crankcase side of the compressor is under pressure and it will not be possible to check oil levels while the HVAC system is under system pressure.

CAUTION

To prevent damage to property, recover (recycle) A/C system before system is opened for repair.

CAUTION

To prevent damage to property from over filling when adding system refrigerant oil during evacuation or charging procedure, see Oil Fill Guidelines to determine amount of oil to be added. Then, follow all instructions furnished with recovery station, or refrigerant oil injector tool, to add correct amount of new oil to the Heating Ventilation and Air Conditioning (HVAC) system during this procedure.

CAUTION

To prevent damage to property, including the Heating Ventilation and Air Conditioning (HVAC) compressor, due to excessively high head pressure during operation, do not overcharge system with R134a refrigerant. Be sure to check specifications for vehicle being serviced.

CAUTION

To prevent vehicle / property damage, after turning key OFF on a vehicle with Selective Catalyst Reduction (SCR) system, do not disconnect the vehicle batteries for at least 60 seconds. If you can hear a pumping sound from underneath the vehicle, wait for the sound to stop prior to disconnecting the vehicle battery.

NOTE: Review and follow general precautions listed on special tool as applicable.

NOTE: Review and follow refrigerant precautions listed on special tool as applicable.

Special Tools

A/C Machine, 34988 or RHS980C-NAV

Refrigerant Charge Quantities

Specifications

Refrigerant Type	R134a
Driver Station – Refrigerant Quantity (Full Charge)	2.0 lbs (32 oz) (0.9 kg)
Front Overhead – Refrigerant Quantity (Full Charge)	3.6 lbs (57.6 oz) (1.6 kg)
Rear Overhead – Refrigerant Quantity (Full Charge)	3.9 lbs (62.4 oz) (1.8 kg)

Equipment Conditions

1. Vehicle parked on dry, level ground, parking brake set, transmission in Park or Neutral.
2. Key OFF.
3. Wheel chocks installed.

4. Battery disconnected. See Battery Disconnect (page 863).
5. Hood unlatched and opened.
6. Charging procedure performed, using new or recycled refrigerant, only after following actions have been completed:
    a. System components repaired or replaced
    b. System flushed or purged (if required). See Air Conditioning (A/C) System Flush and Purge (page 3486).
    c. Refrigerant oil added. See Air Conditioning (A/C) Compressor Oil Fill Guidelines (page 3477).
    d. A/C system completely evacuated. See Air Conditioning (A/C) System Evacuation (page 3472).

Procedure

Figure 956 Refrigerant Management System Overview

1. Low-pressure refrigerant gauge
2. Tool tray
3. High-pressure refrigerant gauge
4. Main power switch
5. High-pressure refrigerant hose (RED)
6. High-pressure quick disconnect valve (RED)
7. Low-pressure quick disconnect valve (BLUE)
8. START / RESET buttons
9. Oil drain bottle
10. Low-pressure refrigerant hose (BLUE)
11. Oil inject bottle

1. A/C servicing system BLUE and RED hoses should still be connected as they were during evacuation procedure. Remove A/C servicing system RED and BLUE hoses.
2. Add oil to return system oil capacity to its correct level. See Air Conditioning (A/C) Compressor Oil Fill Guidelines (page 3477). To add oil during evacuation or charging process, follow instructions furnished with recovery station, or refrigerant oil injector tool.
3. Determine amount of refrigerant needed to charge A/C system. This information can be found in Refrigerant Charge Quantities (page 3483).
4. Following instructions provided with A/C Servicing System, set A/C Servicing System to charge system with specified amount of refrigerant.
5. Connect BLUE low-pressure hose to low-pressure service port.
6. Connect RED high-pressure hose to high-pressure service port.
7. Open valves on RED and BLUE hoses and turn knobs fully clockwise.
8. Press CHARGE to start charge procedure and follow on-screen instructions.
9. Add appropriate amount of refrigerant oil to A/C system. See Air Conditioning (A/C) Compressor Oil Fill Guidelines (page 3477).
10. Before disconnecting A/C Servicing System from A/C system, perform A/C System Operational Checkout Procedure (page 3416).
11. After A/C System Operational Checkout Procedure (page 3416) is complete, follow on-screen instructions to clear hoses; then disconnect BLUE and RED hoses from service ports on vehicle's service port fittings.
12. Install protective caps on both of vehicle service port fittings.

Follow-On Procedure

1. Close and latch hood.
2. Reconnect battery. See Battery Reconnect (page 865).
3. Remove wheel chocks.

Air Conditioning (A/C) System Flush and Purge Procedure

Overview

Start the Air Conditioning (A/C) flush and purge procedure by flushing the front lower A/C system. The front lower A/C system is the basic A/C system. Any other A/C system will follow this basic system. There may be more than one A/C system in the vehicle, and those systems may run close to each other. Care must be taken to ensure various A/C systems do not become cross-connected.

WARNING

To prevent personal injury and / or death, always wear safe eye protection with side shields when performing vehicle maintenance.

WARNING

To prevent personal injury and / or death, or damage to property, park vehicle on hard flat surface, shift transmission to Park or Neutral, turn the engine OFF, set parking brake, and install wheel chocks before performing diagnostic or service procedures.

WARNING

To prevent personal injury and / or death, or damage to property, turn Key OFF and allow system to power off, before performing maintenance on vehicle components.

WARNING

To prevent personal injury and / or death, or damage to property, always disconnect the ground battery terminal first, then the positive cable. When reconnecting the battery cables, connect the positive cables first, and then reconnect the negative cables. Failure to follow this warning may result in a direct battery short, which is a fire or explosion hazard.

WARNING

To prevent personal injury and / or death, or damage to property, never put any part of your body beneath a raised hood unless the hood is all the way forward in its range of motion and is fully settled in the over center position.

WARNING

To prevent personal injury and / or death, minimize lifting weights over 55 pounds (25 kg). Request assistance or use lifting gear to remove, install, or lift heavy components.

WARNING

To prevent personal injury and / or death, do not let engine fluids stay on your skin. Clean skin and nails using hand cleaner and wash with soap and water. Wash or dispose of clothing and rags contaminated with engine fluids.

WARNING

To prevent personal injury and / or death, or damage to property, be sure to properly flush, purge, or pressure test a system for leaks. Failure to do so can result in explosion, fire, or contact with acid-saturated refrigerant or oil mists.

WARNING

To prevent personal injury and / or death, or damage to property, do not remove compressor oil fill plug to check oil level in compressor while HVAC system is charged with refrigerant. Crankcase side of compressor is under pressure.

WARNING

To prevent personal injury and / or death, or damage to property, follow procedural steps in correct order.

WARNING

To prevent personal injury and / or death, or damage to property, do not exceed 100 psi (689 kPa) working pressure when flushing HVAC system components.

WARNING

To prevent personal injury and / or death, or damage to property, do not exceed 200 psi (1,379 kPa) working pressure when purging HVAC system components.

CAUTION

To prevent damage to property, if the HVAC system has had an internal compressor failure, replace the HVAC condenser and flush the HVAC system.

CAUTION

To prevent damage to property, HVAC service should be completed with a service station that meets J2788 standards and has had all current required maintenance procedures completed.

CAUTION

To prevent damage to property, HVAC service in-line filters must be replaced after recovering refrigerant from a system that was determined to have metal contamination. Failure to replace filters will result in premature compressor failure due to metal contaminants re-entering system during refrigerant charging process.

CAUTION

To prevent damage to property, do not flush more than two HVAC assemblies at a time.

CAUTION

To prevent damage to property, recover (recycle) A/C system before system is opened for repair.

CAUTION

CAUTION UNDER REVIEW

CAUTION

CAUTION UNDER REVIEW

CAUTION

To prevent damage to property, never attempt to flush or purge the HVAC compressor, integrated receiver drier, Thermal Expansion Valve (TXV) or the entire Heating Ventilation and Air Conditioning (HVAC) system.

Special Tools

- A/C Flush Equipment – 19-000-01
- A/C Flushing Kit – 19-000-03
- High-volatility Flush Solvent, one gallon for front lower A/C system – Obtain locally
- Plastic plugs – ZTSE43024

Equipment Conditions

1. Vehicle parked on dry, level ground, parking brake set, transmission in Park or Neutral.
2. Key OFF.
3. Wheel chocks installed.
4. Battery disconnected. See Battery Disconnect (page 863).
5. Hood unlatched and opened.
6. Refrigerant identification test performed to prevent tool contamination. See Refrigerant Identification Test (page 3457).
7. HVAC system evacuated. See Air Conditioning (A/C) System Evacuation (Procedure) (page 3472).
8. Integrated receiver driver removed to determine presence of metal contaminants in A/C system. See Integrated Receiver Drier Removal (page 3562). When excessive metal is found in A/C system, flush and purge the system and replace the following components:
    - Integrated receiver drier
    - Compressor

- Condenser
- Front lower TXV and any other system TXV (if equipped)
- A/C sensors and switches
- O-rings, seals, Schrader® valves, and gaskets

9. Flush tank filled.
    - Slowly remove regulator and pulse valve assembly from the top of flush tank, to bleed any pressure remaining in the flush tank.
    - Fill flush tank assembly with high-volatility flush solvent, one gallon for front lower A/C system.
    - Reinstall regulator and pulse valve assembly onto flush tank assembly.
10. Discharge barrel inspected.
    - Inspect discharge barrel for flush solvent left from previous use. Excessive Volatile Organic Compounds (VOCs) could be released into the atmosphere if an excessive amount of solvent is in the discharge barrel.
    - Inspect all filters before every use and replace if needed. Filters may deteriorate over time from usage. Deteriorated filters may result in a high amount of VOCs being released into the atmosphere.
    - Release discharge barrel ring lock and release lever on closing ring.
    - Use BLACK knob on charcoal filter to remove filter pack. Replace filters if necessary.
11. Evaporator lines disconnected and capped using plastic plugs, ZTSE43024.
12. Thermal Expansion Valve (TXV) removed. Leave 1/4 inch extension in the side hole of HVAC housing. See Cab Thermal Expansion Valve (TXV) Removal (page 3528).
13. No occupants in vehicle during maintenance procedures.

Procedure

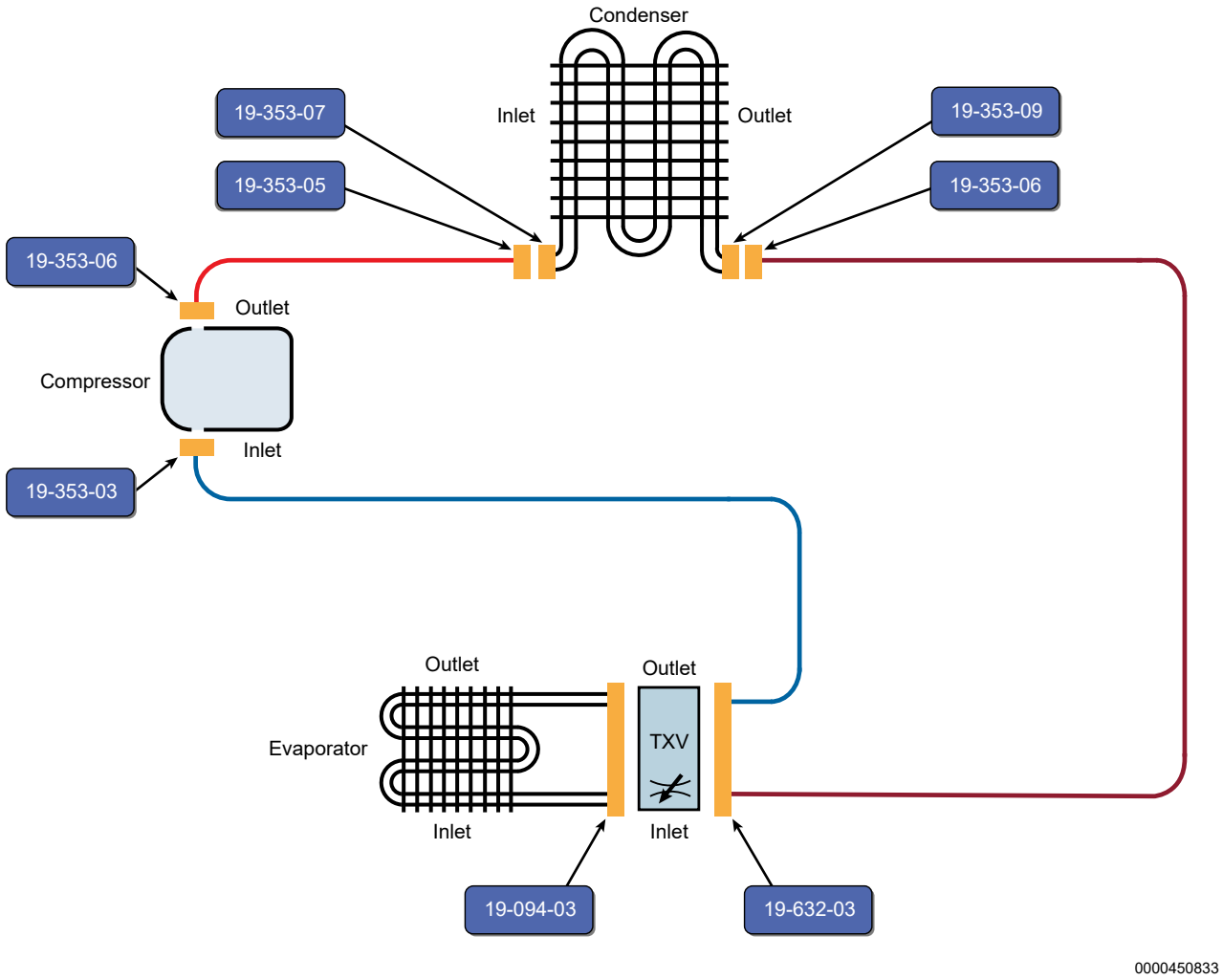

Figure 957 Day Cab Flush and Purge Adapter Locations (Typical)

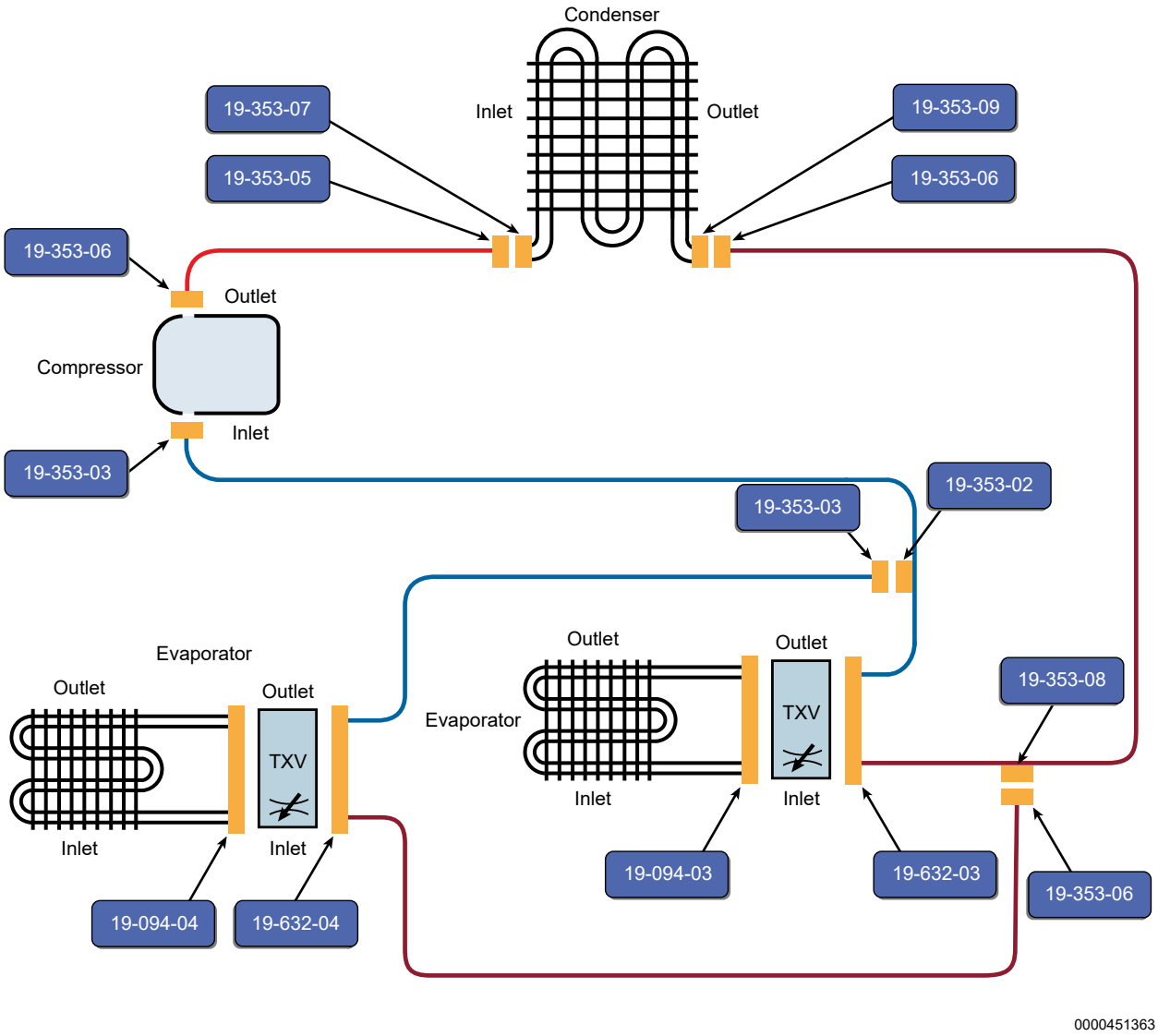

Figure 958 Sleeper Cab Flush and Purge Adapter Locations (Typical)

Evaporator Flush and Purge (Procedure)

1. Inspect flush adapters for damage and replace any deteriorated seals.
2. Attach evaporator adapter tool (front) 19-094-03 to evaporator with old seals.

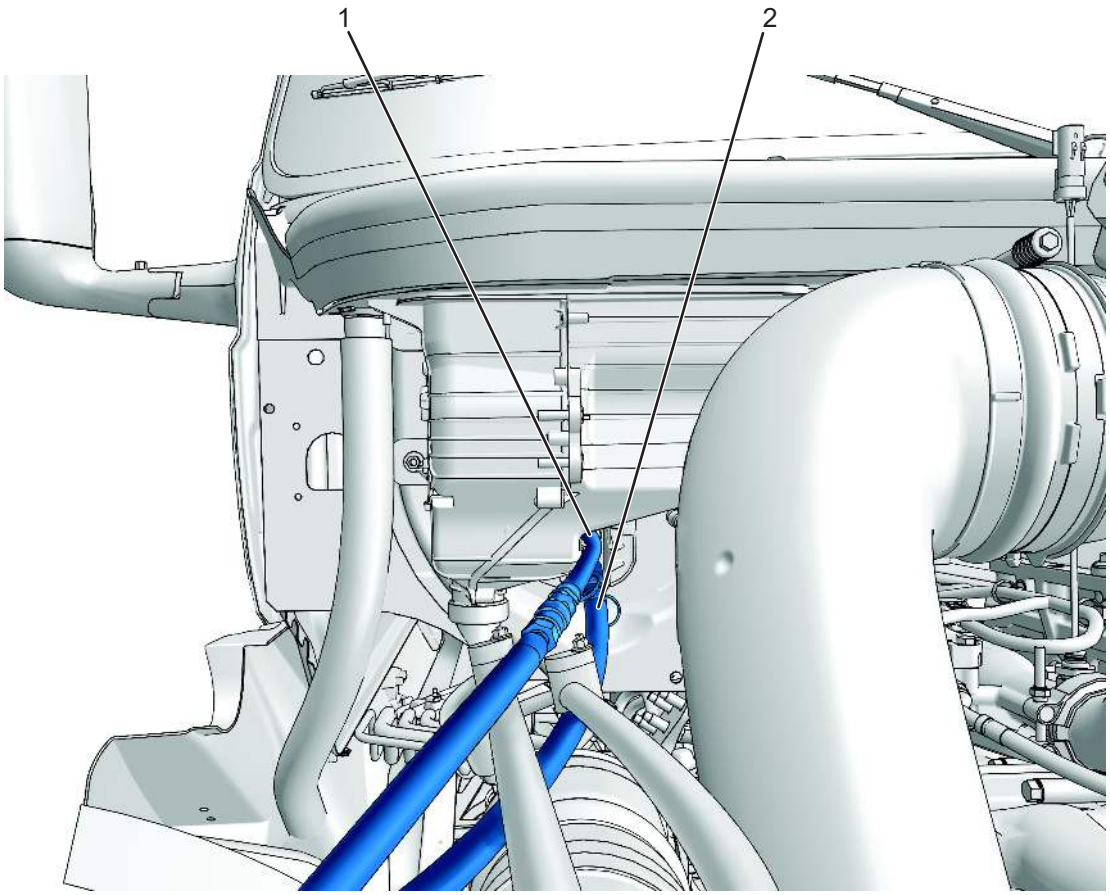

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Figure 959 Evaporator Flush Tool Installed with Flush Hoses (Typical)

1. 19-094-03 inlet
2. 19-094-03 outlet

3. Attach flush gun assembly to 19-094-03 inlet (1).
4. Connect flush gun long hose to pulse valve on the flush tank assembly.
5. Attach discharge hose assembly to 19-094-03 outlet (2).
6. Use sight glass cam-lock coupling, connect discharge hose to discharge barrel.
7. Connect nitrogen regulator hose to nitrogen regulator.
8. Connect nitrogen regulator hose to flush tank assembly.
9. Open nitrogen tank valve fully counterclockwise. Failure to fully open reduces nitrogen volume and pressure during flush and purge procedure.
10. Use regulator knob, adjust outlet pressure to 120 psi (827 kPa), providing 100 psi (689 kPa) working pressure.
11. Squeeze trigger to introduce solvent into component being flushed, then hold trigger for 5 to 10 seconds or until solvent runs clear in discharge sight glass. After appropriate amount of solvent is injected, release trigger.
12. Disconnect flush gun from flush tank and connect flush gun assembly to nitrogen regulator assembly.
13. Squeeze trigger to introduce nitrogen into component being purged. While purging, adjust regulator to 200 psi (1,379 kPa), then down to 100 psi (689 kPa) working pressure. Purge is complete when 100 psi (689 kPa) is reached.

14. After purge is complete, remove flush gun and discharge hoses from adapter. Install plastic plugs on each end of the line or component.

Procedure

Compressor to Condenser Line Procedure

1. Inspect flush adapters for damage and replace any deteriorated seals.
2. Attach 19-353-06 to compressor outlet line.

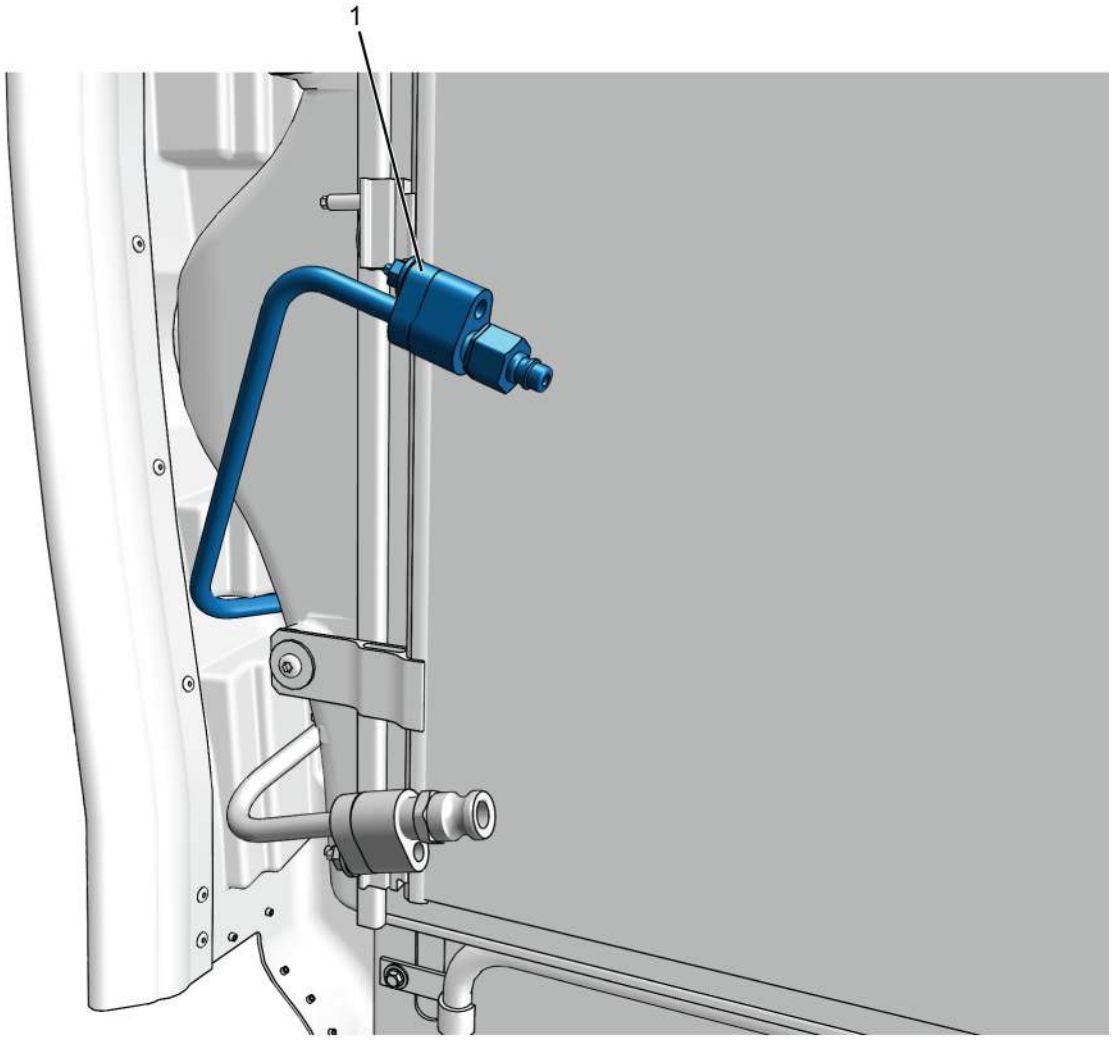

Figure 960 Refrigerant Line Flush Adapters (Typical)

1. Flush adapter, 19-353-05

3. Attach 19-353-05 to line at condenser inlet.
4. Attach flush gun assembly to 19-353-05.
5. Connect flush gun long hose to pulse valve on the flush tank assembly.
6. Attach discharge hose assembly to 19-353-06.
7. Use sight glass cam-lock coupling, connect discharge hose to discharge barrel.

8. Connect nitrogen regulator hose to nitrogen regulator.
9. Connect nitrogen regulator hose to flush tank assembly.
10. Open nitrogen tank valve fully counterclockwise. Failure to fully open reduces nitrogen volume and pressure during flush and purge procedure.
11. Use regulator knob, adjust outlet pressure to 120 psi (827 kPa), providing 100 psi (689 kPa) working pressure.
12. Squeeze trigger to introduce solvent into component being flushed, then hold trigger for 5 to 10 seconds or until solvent runs clear in discharge sight glass. After appropriate amount of solvent is injected, release trigger.
13. Disconnect flush gun from flush tank and connect flush gun assembly to nitrogen regulator assembly.
14. Squeeze trigger to introduce nitrogen into component being purged. While purging, adjust regulator to 200 psi (1,379 kPa), then down to 100 psi (689 kPa) working pressure. Purge is complete when 100 psi (689 kPa) is reached.
15. After purge is complete, remove flush gun and discharge hoses from adapter. Install plastic plugs on each end of the line or component.

Condenser to Evaporator to Compressor (Loop) Procedure

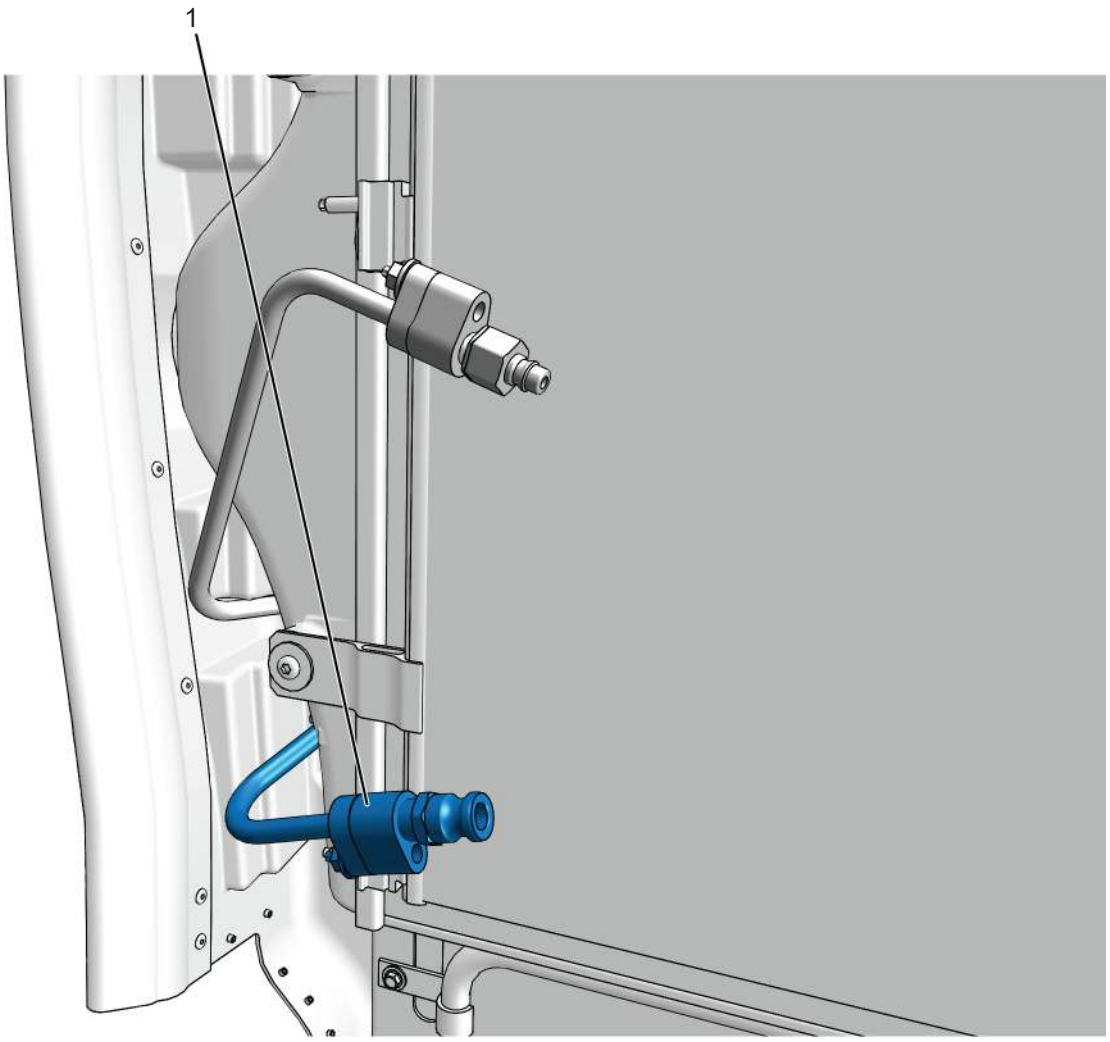

Figure 961 Refrigerant Line Flush Adapters (Typical)

1. Flush adapter, 19-353-06

16. Attach 19-353-06 to line at condenser outlet.
17. Attach 19-632-03 to inlet and outlet lines at evaporator.
18. Attach 19-353-03 to line at compressor inlet.
19. Attach flush gun assembly to 19-353-03.
20. Attach discharge hose assembly to 19-353-06.
21. Open nitrogen tank valve fully counterclockwise. Failure to fully open reduces nitrogen volume and pressure during flush and purge procedure.
22. Use regulator knob, adjust outlet pressure to 120 psi (827 kPa), providing 100 psi (689 kPa) working pressure.
23. Squeeze trigger to introduce solvent into component being flushed, then hold trigger for 5 to 10 seconds or until solvent runs clear in discharge sight glass. After appropriate amount of solvent is injected, release trigger.
24. Disconnect flush gun from flush tank and connect flush gun assembly to nitrogen regulator assembly.

25. Squeeze trigger to introduce nitrogen into component being purged. While purging, adjust regulator to 200 psi (1,379 kPa), then down to 100 psi (689 kPa) working pressure. Purge is complete when 100 psi (689 kPa) is reached.
26. After purge is complete, remove flush gun and discharge hoses from adapter. Install plastic plugs on each end of the line or component.

Procedure

Condenser Flush and Purge Procedure

1. Inspect flush adapters for damage and replace any deteriorated seals.

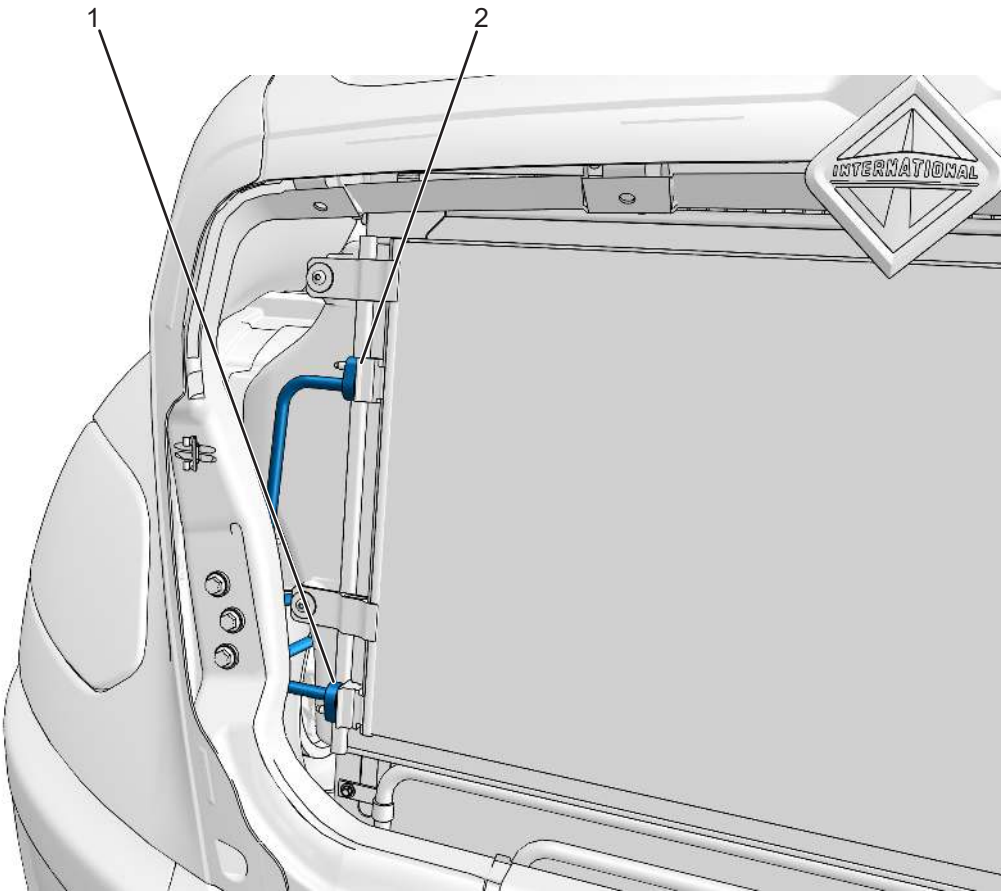

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Figure 962 A/C Condenser (Typical)

1. Condenser outlet
2. Condenser inlet

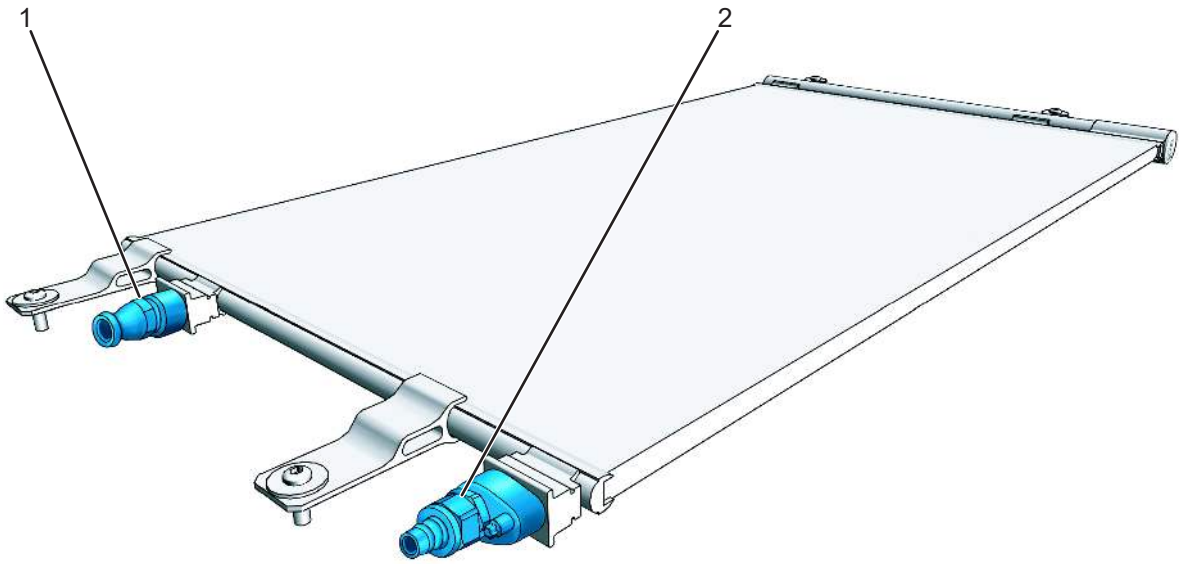

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Figure 963 A/C Condenser Flush Adapters Installed (Shown Off Vehicle for Clarity)

1. Condenser inlet, 19-353-07
2. Condenser outlet, 19-353-09

2. Use a common M8 x 1.25 nut, attach 19-353-07 to A/C condenser inlet (1) with old O-ring.
3. Use a common M8 x 1.25 nut, attach 19-353-09 to A/C condenser outlet (2) with old O-ring.

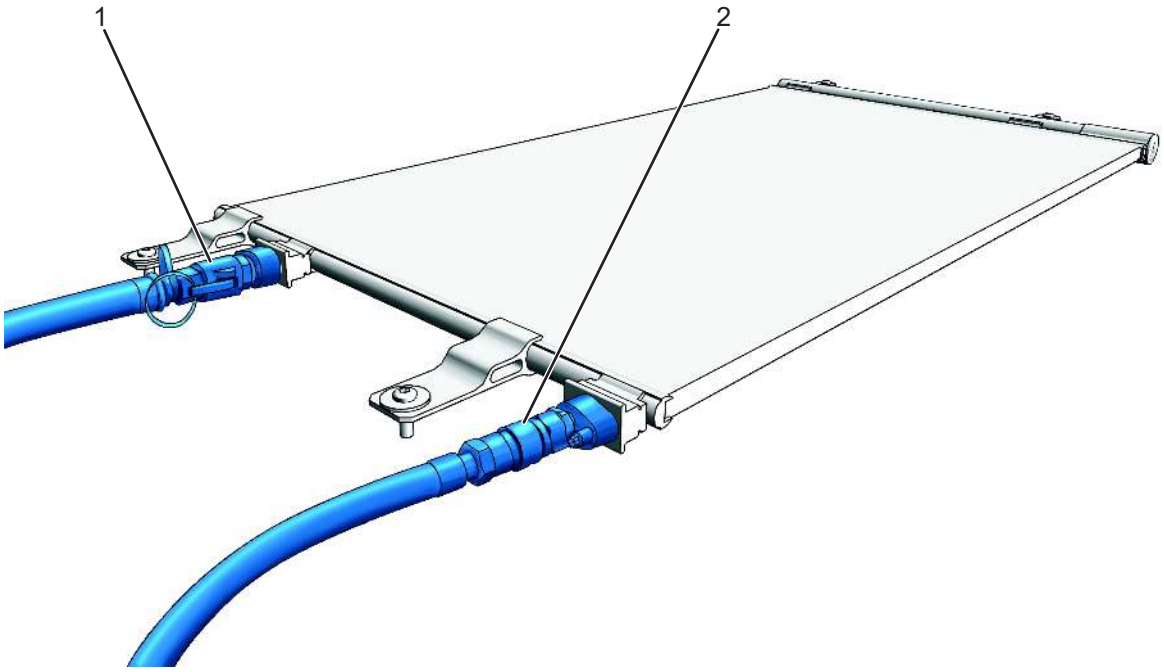

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Figure 964 Condenser Flush Tools Installed (Shown Off Vehicle for Clarity)

1. Discharge hose
2. Flush gun hose

4. Attach purge discharge hose (1) assembly to 19-353-07.
5. Attach flush gun assembly (2) to 19-353-09.
6. Connect flush gun long hose to pulse valve on the flush tank assembly.
7. Use sight glass cam-lock coupling, connect discharge hose to discharge barrel.
8. Connect nitrogen regulator hose to nitrogen regulator.
9. Connect nitrogen regulator hose to flush tank assembly.
10. Open nitrogen tank valve fully counterclockwise. Failure to fully open reduces nitrogen volume and pressure during flush and purge procedure.
11. Use regulator knob, adjust outlet pressure to 120 psi (827 kPa), providing 100 psi (689 kPa) working pressure.
12. Squeeze trigger to introduce solvent into component being flushed, then hold trigger for 5 to 10 seconds or until solvent runs clear in discharge sight glass. After appropriate amount of solvent is injected, release trigger.
13. Disconnect flush gun from flush tank and connect flush gun assembly to nitrogen regulator assembly.
14. Squeeze trigger to introduce nitrogen into component being purged. While purging, adjust regulator to 200 psi (1,379 kPa), then down to 100 psi (689 kPa) working pressure. Purge is complete when 100 psi (689 kPa) is reached.
15. After purge is complete, remove flush gun and discharge hoses from adapter. Install plastic plugs on each end of the line or component.

Follow-On Procedure

For A/C system oil overcharge:

1. Flush and purge condenser. See .

For A/C compressor failure:

1. Remove all A/C flush adapters and plastic cap plugs as components are reinstalled.
2. Replace the following components:
    - Integrated receiver drier
    - Compressor
    - Condenser
    - TXV
    - A/C sensors and switches
    - O-rings, seals, Schrader® valves, and gaskets
3. Reinstall all A/C components
4. Perform refrigerant leak detection test. See Refrigerant Leak Test (page 3459).
5. Evacuate A/C system. See Air Conditioning (A/C) System Evacuation (Procedure) (page 3472).
6. Charge A/C system. See Air Conditioning (A/C) System Charging (Procedure) (page 3482).
7. Close and latch hood.
8. Reconnect battery. See Battery Reconnect (page 865).
9. Remove wheel chocks.