

# ACS 553 - ACS 553-P - ACS 563 - ACS 563-P



**BOSCH**

**en** Repair instruction  
**A/C Service Unit**

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## Safety Warnings

### Explanation of Safety Signal Words Used in this Manual

Safety signal words designate the degree, or level, of hazard seriousness.

 **DANGER:** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



 **WARNING:** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

 **CAUTION:** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

**CAUTION:** Used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

These safety messages cover situations Bosch is aware of. Bosch cannot know, evaluate, or advise you as to all possible hazards. You must verify that conditions and procedures do not jeopardize your personal safety.

### Explanation of Safety Decals Used on the Machine

	Carefully read all instructions.
	Do not use in open air in case of rain or high humidity.
	Wear gloves.
	Wear protection goggles.
	Alternating voltage.
	Grounding protection.
	Electrical shock hazard.

**WARNING: To prevent personal injury,**

**ALLOW ONLY QUALIFIED PERSONNEL TO OPERATE THE MACHINE.** Before operating the machine, read and follow all instructions and warnings in this manual. The operator must be familiar with air conditioning and refrigeration systems, refrigerants, and the dangers of pressurized components. If the operator cannot read this manual, all operating instructions and safety precautions must be read and discussed in the operator's native language.



**USE THE MACHINE AS OUTLINED IN THIS MANUAL.** Using the machine in a manner for which it was not designed will compromise the machine and nullify the protections provided.



**PRESSURIZED TANK CONTAINS LIQUID REFRIGERANT.** Do not overfill the internal storage vessel (ISV), because overfilling may cause explosion resulting in personal injury or death. Do not recover refrigerants into a nonrefillable container; use only type-approved refillable containers that have a pressure relief valve.



**HOSES MAY CONTAIN LIQUID REFRIGERANT UNDER PRESSURE.** Contact with refrigerant may cause personal injury, including blindness and frozen skin. Wear protective equipment, including goggles and gloves. Disconnect hoses using extreme caution.



Ensure the phase has been completed before disconnecting the machine to prevent the release of refrigeration to the atmosphere.



**DO NOT BREATHE REFRIGERANT AND LUBRICANT VAPOR OR MIST.** Refrigerant reduces the oxygen available for breathing, resulting in drowsiness and dizziness. Exposure to high concentrations of refrigerant causes asphyxiation, injury to the eyes, nose, throat, and lungs, and can affect the central nervous system. Use the machine in locations with mechanical ventilation that provides at least one air change per hour. If accidental system discharge occurs, ventilate the work area before resuming service.

**DO NOT DISPERSE THE REFRIGERANT INTO THE ENVIRONMENT.** Such a precaution is necessary to prevent the possible presence of refrigerant in the working environment. The refrigerant R1234yf (for ACS 563 only) is heavier than air and tends to concentrate in the pits of the workshop.



**TO REDUCE THE RISK OF FIRE,** do not use the machine in the vicinity of spilled or open containers of gasoline or other flammable substances.

**TO REDUCE THE RISK OF FIRE,** do not use an extension cord. An extension cord may overheat and cause fire. If you must use an extension cord, use the shortest possible cord with a minimum size of 14 AWG.

**TO REDUCE THE RISK OF FIRE,** do not use the machine in the vicinity of flames and hot surfaces. Refrigerant decomposes at high temperatures, freeing toxic substances to the environment which are noxious to the user.

**TO REDUCE THE RISK OF FIRE,** do not use the machine in environments containing explosive gases or vapors.

**TO REDUCE THE RISK OF FIRE,** Do not use this machine in ATEX classified zones or areas. Protect the machine from conditions that may cause electrical failure or other hazards relating to ambient interaction.



**DONOT USE COMPRESSED AIR TO PRESSURE TEST OR LEAK TEST THE MACHINE OR VEHICLE AIR CONDITIONING SYSTEM.** Mixtures of air and refrigerant can be combustible at elevated pressures. These mixtures are potentially dangerous and may result in fire or explosion causing personal injury and/or property damage.



**HIGH VOLTAGE ELECTRICITY INSIDE THE MACHINE HAS A RISK OF ELECTRICAL SHOCK.** Exposure may cause personal injury. Disconnect the power before servicing the machine.

**NEVER LEAVE THE MACHINE LIVE IF AN IMMEDIATE USE IS NOT SCHEDULED.** Disconnect the electrical supply before a long period of inactivity or before internal maintenance is performed.

**NOTE (for R1234yf only):** To minimize the risk of ignition, the unit software guided leak check is periodically performed otherwise the unit will lock. For same purpose, also hardware features such as ventilation fan monitoring system, suitably located vents on cart bottom (R1234yf is heavier than air) and sealed power switching circuits are present.



**CAUTION: The machine is not intended to operate with oils classified as flammable or hazardous according to EN 1272/2008 (CLP).**

**CAUTION : To prevent equipment damage,**



**TO PREVENT CROSS-CONTAMINATION, USE THIS MACHINE WITH R1234yf (ACS 563) OR R134a (ACS 553) REFRIGERANT ONLY.** The machine is equipped with special connectors to recover, recycle, and recharge only R1234yf ( ACS 563) or R134a (ACS 553) refrigerant. Do not attempt to adapt the machine for another refrigerant. Do not mix refrigerant types through a system or in the same container; mixing of refrigerants will cause severe damage to the machine and the vehicle air conditioning system. Do not use refrigerants other than those indicated on the technical data plate. It is also recommended to buy it from specialized companies that guarantee its good quality.



**DO NOT USE THIS MACHINE OUTDOORS DURING RAIN OR HIGH HUMIDITY.** Protect the machine from conditions that may cause electrical failure or other hazards relating to ambient interaction.

**DO NOT USE THIS MACHINE IN DIRECT SUNLIGHT.** Position the machine far from heat sources, such as direct sunlight which can cause excessive temperatures. The use of this machine under normal environmental conditions (10°C to 50°C) keeps pressures under reasonable limits. Make sure the machine does not exceed the operating temperature indicated on the technical data plate.

**DO NOT USE THIS MACHINE IN AREAS WHERE THERE IS A RISK OF EXPLOSION.**

Place the station on a flat surface and in sufficient lighting conditions; lock the front wheels and do not subject them to vibration.

Further information regarding health and safety may be obtained from the refrigerant manufacturer.



**WARNING: Warranty is not valid in all cases of improper use of the machine and if the machine is not submitted to periodic ordinary and extraordinary maintenance (according to PED directive 2014/68/EU) provided in this original instructions. The manufacturer therefore declines all responsibilities for any damage resulting from not observing all the instructions and warnings provided to the user regarding installation, use and maintenance.**

## Protective devices

The machine is equipped with the following protective devices:

- Over pressure valves.
- A maximum pressure switch stops the compressor when excessive pressure is sensed.



**WARNING: Tampering with these protective devices could result in serious injury.**



**WARNING: Do not modify the pressure relief valve or change the control system settings. Using the machine in a manner for which it was not designed will compromise the machine and nullify the protections provided.**



**CAUTION: Check always the pressure gauges values to ensure that pressures are maintained within the limits specified in the “Unit specifications” section.**

## PED directive 2014/68/EU

The machine includes parts subject to PED EU directive 2014/68/EU, Pressure Equipment Directive. PED directive regulates all the pressurized part defining for them categories based on volume-pressure ratio and based on fluid refrigerant type. Those parts then have not to be anyhow modified nor removed. Under the responsibility of the owner, the machine and parts falling in the scope of PED shall be checked either during commissioning and periodically fulfilling local country regulations and norms. Parts in the scope of PED are:

- Tank.
- Pressure relieve valve.
- High pressure switch.
- Recovery group.
- Piping.

Call Bosch service center to get technical specifications for each part listed.

## Machine handling

The unit should normally be moved on flat surfaces with a maximum slope of 15 ° and on the four wheels, avoiding excessive shaking. When stopped then the brake on the front wheels must be inserted. On slightly irregular surfaces, the unit can be moved by keeping it slightly inclined and grounded on the two rear wheels by making sure to have a firm grip on the rear handle.



**CAUTION: Although heavier components of the unit are installed on the bottom of the unit in order to lower as much as possible the center of gravity, it's however not completely removed the risk of overturning.**

## Target group

Repair of the ACS 553, ACS 563 may only be performed by service technicians, trained in handling of refrigerants, personal protective equipment, refrigerant leakage prevention, handling of charging, leak detection and proper disposal.

Service technicians must be trained and certified by Robert Bosch GmbH or its regional representatives / subsidiaries.

If a service technician is already certified, he may train other employees in the organization authorized by Robert Bosch GmbH in servicing the ACS 553, ACS 563.

For specific work, the service technician needs the following additional qualifications (country-specific):

- Electrotechnical knowledge for working on electrotechnical systems and equipment as per EN 50110-1 and EN 50110-2 (see accident prevention regulation for electrical systems and equipment, e. g. DGUV V3 in Germany) and qualified in ESD protection measures.
- Knowledge of handling refrigerants according to F-Gas Regulation (EU) No 517/2014 and safety of refrigerating systems according to EN 378. Refer to your local regulations.

All warranty claims (personal injury, faulty equipment) are rendered null and void if the ACS 553, ACS 563 is opened or modified by unauthorized individuals.

# INTRODUCTION

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## Introduction

These units are designed to be compatible with existing service equipment and standard service procedures. These machines utilize a single-pass system that meets specifications for recycled refrigerant. Follow recommended service procedures for the containment of refrigerant.

Each unit includes a high-vacuum pump for fast, thorough evacuation. The compressor first pulls the A/C system to -0.4 bar.

**NOTE:** Refrigerant systems require special oils. Refer to the A/C system manufacturer's service manual for oil specifications.

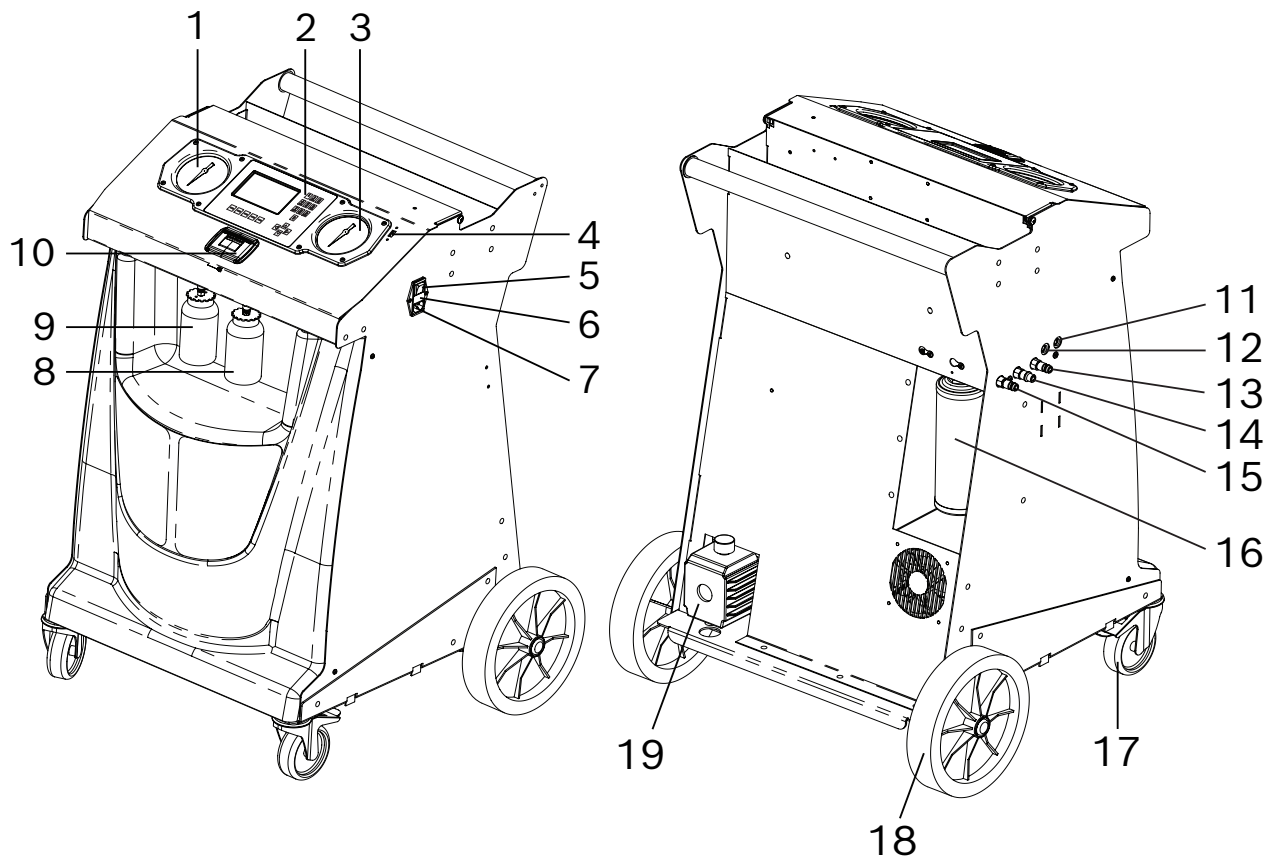







Figure 1-1. Description of machine



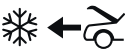
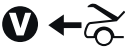
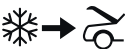


- |  |  |
|--|--|
| 1. Gauge low pressure (LP)                     | 11. Service hose port (high pressure*)                     |
| 2. Display and control panel                   | 12. Service hose port (low pressure*)                      |
| 3. Gauge high pressure (HP)                    | 13. Contaminant recovery outlet port<br>(for R1234yf only) |
| 4. 1 x USB 2.0 slot                            | 14. Flush port (high pressure*)                            |
| 5. Main power supply switch                    | 15. Flush port (low pressure*)                             |
| 6. Fuse holder                                 | 16. Dryer filter   |
| 7. Power supply socket                         | 17. Front wheels with locking brake                        |
| 8. Fresh oil bottle (PAG or POE)               | 18. Rear wheels  |
| 9. Oil drain bottle                            | 19. Vacuum pump  |
| 10. Printer (optional, standard on P variants) |  |

(\*) max 25 bar (2.5 MPa)

## Control Panel Functions

-  **ARROW UP** moves selection of a menu item to the previous item.
-  **ARROW DOWN** moves selection of a menu item to the following item.
-  **ARROW RIGHT** scrolls to next screen.
-  **ARROW LEFT** scrolls to previous screen.
-  **SELECTION KEYS** (function keys) to select the functions shown on display (bottom icons).
- 0...9  
A...Z     The **input keys** can be used to enter letters, numbers and special characters in the input boxes.

## Icon Legend

-  **DATABASE** supplies information regarding charge capacity by vehicle model.
-  **AUTOMATIC** activates a menu that helps the user set up an automatic recover / vacuum / leak test / charge sequence.
-  **RECOVER** activates the sequence to recover refrigerant from the vehicle A/C system.
-  **VACUUM** activates the sequence that pulls a deep vacuum on the vehicle A/C system to remove air and moisture.
-  **CHARGE** activates the sequence that charges the vehicle A/C system with a programmed amount of refrigerant.
-  **HELP** displays information related to the current display.
-  **MENU** accesses additional functions and parameters.

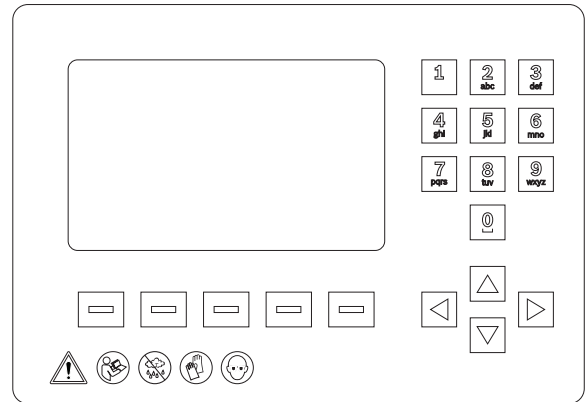
















Figure 1-2. Control Panel Keyboard

-  **NEXT** to move to the next screen or step.
-  **BACK** to return to the previous screen or step.
-  **ON/OFF** to enable or disable the selected function.
-  **OK** to confirm, proceed or save settings.
-  **ESC** to cancel the operation and return to the previous function or the Main menu.
-  **UP** to move menu selection upward.
-  **DOWN** to move menu selection downward.
-  **PRINT** to perform a print (only for variants with printer).
-  **BACKSPACE** to erase the character to the left of the cursor.
-  **PAUSE** to pause a process.
-  **PLAY** to resume a paused process.
-  **RETRY** to repeat the last step.
-  **DELETE** to delete a selected entry from the memory of the machine.
-  **WIFI** indicates that the WiFi connection is enabled.



**BLUETOOTH** indicates that the Bluetooth connection is enabled.



**HS LS** to set which side to charge thru (high pressure, low pressure or both sides).



**ml oz** to set the unit of measurement (ml or oz).



**kg oz lb** to set the unit of measurement (kg, oz or lb).



**USB** to export data onto a USB key.

## Glossary

**A/C System:** The vehicle air conditioning system being serviced.

**Evacuation:** Moisture and other incondensables are removed from an A/C system by using a vacuum pump.

**Internal Storage Vessel (ISV):** The tank designed specifically for this machine has refrigerant disposable capacity of 7.8 kg, except the ACS 553 has a disposable capacity of 8.8 kg.

**Machine:** Model No. ACS 553 or ACS 563.

**PAG/POE:** Different oil types in the vehicle air-conditioning system depending on the vehicle manufacturer.

**Recovery/Recycling:** Refrigerant is recovered from an A/C system, filtered, and stored in the ISV.

**Refrigerant:** R134a (ACS 553) or R1234yf (ACS 563).

**Source (or External Tank):** A disposable tank of new refrigerant used to refill the ISV; not included.

## Setup Menu

The machine launches into the initial Setup mode (the first time the machine is powered up).

**NOTE:** It is needed to complete all the setup procedure sequence before to use the A/C unit.

Carry out the following setup:

1. Language selection.
2. License agreement review.
3. Units (Metric/Imperial) selection.
4. Date and Time adjustment.
5. Edit Print Header.
6. Service Vacuum.
7. Oil inject viscosity selection.
8. Internal Tank Fill.

At the end of the initial setup procedure it is suggested to:

- Perform air flow calibration (for R1234yf only).

## Functions Menu

1. Call up the Main Menu.
2. Select **NEXT** icon.
3. Select **MENU** icon.
  - Select **Functions** to access the following functions.

## A/C Performance Test

Performs a pressure test on an A/C system of a vehicle with a refrigerant already present.

## Flush Hoses

Flushes residual oil from the machine to prepare for the service of next vehicle.

## System Flush

Provides a method of removing oil and impurity by forcing liquid refrigerant through an A/C system or components of an A/C system. After flushing, the refrigerant is recovered by the machine and filtered by the recycling circuit.

## Tank Fill

Use this function to transfer refrigerant from a source tank to the ISV. The tank fill value may be adjusted up or down to suit the user's needs. Refer to "Tank Fill" in the Maintenance section.

### Refrigerant Tracking

Function to memorize the refrigerant amount recovered and charged for every vehicle. The display shows five selection options:

- √ **Display:** to show data of recovered and charged refrigerant.
- √ **Export to USB:** to extract the report with recovered and charged refrigerant amount in the vehicle. Data extraction via USB stick, recommended size 2 GB and FAT format (support is not part of scope delivery). Data are transferred as **.csv** file.
- √ **Erase all records:** to erase all data stored on the machine.
- √ **Print all records:** to print all data stored on the machine.
- √ **Disable Tracking:** to disable the Refrigerant tracking function.

### Change Oil Type

To flush the oil injection port in case of oil change. Plug the bottle to be used (PAG or POE) into the oil injection port, before starting the function.

- Select **BACK** icon to return to the Setup Menu.

### Settings Menu

- Select **Settings** to access the following functions.

### Select Language

Select a language for screen prompts. English is the default language.

### Select Units

Program the machine to display metric or imperial values. The default display is in a metric system.

### Date and Time

Program the machine for current date and time.

### Edit Print Header

Programs information that will appear on the printout each time a print function is used.

### Unit Activation

Failure to register and activate the machine within 30 days of initial startup will cause the machine to lock out and not function. Select this Settings Menu item and follow the prompts before the trial period expires.

### Refrigerant Identifier (only if enabled)

To enable or disable the purity test of the external refrigerant identifier connected to the USB port of the machine. The display shows three selection options:

- √ **Always display identifier prompts:** Displays the steps required to perform the purity test.
- √ **Skip display identifier prompts:** Does not display the steps required to perform the purity test.
- √ **Ask user to connect identifier:** Ask a user, with a special message, to confirm whether or not to perform the purity test.

### Default Vacuum Leak Test Time

Program the machine to change duration of the vacuum leak test time.

### Set Buzzer

Program the machine to turn the buzzer on or off.

### Firmware Update

To upgrade the firmware through a USB stick or via WiFi (with Bosch WiFi dongle - optional -). The display shows five selection options:

- √ **Check for Update:** To check if new firmware updates are available.
- √ **USB Update:** To upgrade the firmware through a USB stick.
- √ **Wi-Fi Update:** To upgrade the firmware through a WiFi network. If the unit is connected to WiFi network and the WiFi network is connected to Internet, it will automatically start searching for new updates.
- √ **RI Firmware Update:** to check or install the firmware update of the Refrigerant Identifier, if available.
- √ **WiFi-BT Firmware Update:** to check or install the firmware update of the WiFi dongle, if available.

## WiFi Configuration

To configure the WiFi connection to the machine. The display shows five selection options:

- ✓ **Search WiFi Networks:** To search for available WiFi networks.
- ✓ **WiFi status:** To display some WiFi connection data used.
- ✓ **Test WiFi connection:** to perform a WiFi network connection test used by the machine.
- ✓ **Disconnect current network:** To disable the WiFi network connection stored on the machine.
- ✓ **Manual connect:** to perform manual scan and selection of WiFi network.

## Asanetwork

To enable or disable the asanetwork function. For further information contact Customer Service.

## Connected Repair [CoRe]

To enable or disable the CoRe function. For more information see Connected Repair [CoRe] chapter on the user manual.

- Select **BACK** icon to return to the Setup Menu.

## Maintenance Menu

- Select **Maintenance** to access the following functions.

## Filter Maintenance

The filter removes acid, particulates, and moisture from the refrigerant. To meet requirements, it is mandatory to replace the filter after (SEE TABLE) of refrigerant has been filtered.

Model R134a	Replacement filter at: 68 kg (alert 56 kg)
Model R1234yf	Replacement filter at: 150 kg (alert 138 kg)

This menu item displays the filter capacity remaining until the machine locks down and no longer functions. Refer to “Filter Maintenance” in the Maintenance section.

## Pump Maintenance

Displays the amount of time remaining until the next vacuum pump oil change is needed. For maximum vacuum pump performance, change vacuum pump oil every time the filter is replaced. Refer to the “Vacuum Pump Maintenance” in the Maintenance section.

## ISV Purge Condition

Displays internal storage vessel (ISV) pressure and temperature. It is used to eliminate incondensables gas and helps to limit the pressure in the ISV.

## Calibration Check

Use to verify internal scale calibration. Refer to “Calibration Check” in the Maintenance section of this manual.

## Display Title Info

To activate or deactivate the pressure values display of the machine.

## System Information

Displays the revision level of the software in the unit.

## Periodic Leak Test (for R1234yf only)

Performs double test (in vacuum and pressure) to detect any leakage on the machine.

## Service Menu

For service center use only.

## Production Menu

For production use only.

## Calibrate Air Flow (for R1234yf only)

To perform the air flow calibration. Refer to “Calibrate Air Flow” in the Diagnostics and Testing section.

- Select **BACK** icon to return to the Setup Menu.

## General Maintenance

Do not use abrasive cleaning agents, solvents (petrol, diesel, etc.) and coarse workshop cloths to clean the machine. Clean only using a soft cloth and neutral cleaning agents.

**NOTE:** In cases of refrigerant leaks, such as during installation, maintenance or repair of machine, or even during normal use after machine rest, there will be no refund by the manufacturer.



**CAUTION: Disconnect the power supply before any maintenance.**

## Electrical Protection

ACS 553 - ACS 563 is equipped with 2 protection fuses. If the protection fuses are blown, the power supply of ACS 553 - ACS 563 is cut off.

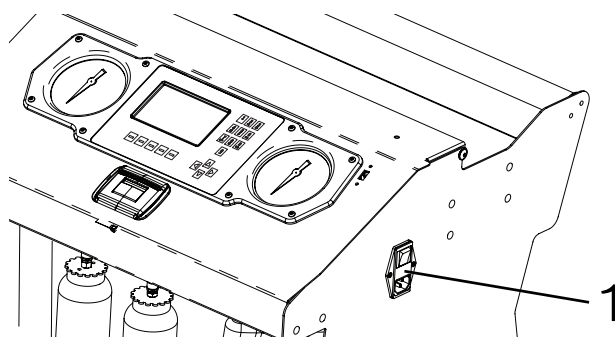


Figure 1-3. Fuses Location

- Replace the fuses (1) (6.3A F) if blown to restore the power supply of ACS 553 - ACS 563.

## Tank Fill

This menu (available on Function menu) is used to transfer refrigerant from a source tank to the ISV.

1. Call up the Main Menu.
2. Select **NEXT** icon.
3. Select **MENU** icon.
4. Select **TANK FILL** from the Functions Menu. The machine displays:

FILL AMOUNT: xx.xxyy  
RECOVER CAPACITY: xx.xxyy  
CHARGE CAPACITY: xx.xxyy

5. Enter the fill amount (at least 4 kg) to ensure enough liquid refrigerant is available for charging and select **OK** icon. Unit is set with 1.0 kg dead space (first 1.0 kg are not shown on display anymore). If the source tank is empty, or has insufficient refrigerant for transfer, tank fill will stop.
6. Connect the low pressure service hose (blue) to the liquid connector on a full source tank.
7. Position the source tank in such a way that liquid refrigerant is supplied to the connection. Open the source tank valve.
8. Select **OK** icon to start the tank fill process.
9. The machine (if the external refrigerant identifier is enabled) checks the refrigerant in the source tank to verify it is R1234yf and not contaminated. The machine displays the following screens:

INITIALIZING REFRIGERANT IDENTIFIER  
ANALYZING REFRIGERANT SAMPLE  
REFRIGERANT PURITY PASSED

10. The machine begins filling the internal storage vessel (ISV) and automatically stops when the preset tank fill level is reached. To stop the tank fill before the preset level is reached, select **PAUSE** icon.
11. Close the liquid valve and remove the hose from the source tank.
12. Select **OK** icon to return to the Function Menu.

## Filter Maintenance

The filter is designed to trap acid and particulates, and to remove water from refrigerant. To meet this mandate, the filter must be replaced after (SEE TABLE) of refrigerant has been filtered.

The unit gives a warning when (SEE TABLE) of the filter capacity has been used; the unit locks down when the (SEE TABLE) filter capacity has been reached and will no longer function.

### Check Remaining Filter Capacity

1. Call up the Main Menu.
2. Select **NEXT** icon.
3. Select **MENU** icon.
4. Select **Filter Maintenance** from the Maintenance Menu or when the machine prompts. The machine displays:

REMAINING FILTER CAPACITY: XXX.XYY  
REPLACE FILTER NOW?

- The machine displays amount of filter capacity remaining until the machine locks down. This message may occur at anytime during the course of an A/C system maintenance action.
5. Select **OK** icon to change the filter; Select **ESC** icon to resume using the machine.

### Replace the Filter

1. If **OK** icon was selected to change the filter, the unit will clear the filter, then prompts for the new filter code to be entered:

ENTER NEW FILTER SERIAL NUMBER

**NOTE:** If SERIAL NUMBER WRONG is displayed, the serial number has been incorrectly entered or the filter has already been used in this machine.

2. Use the keypad to enter the serial number that appears on the new filter and select **OK** icon to continue.
  - The machine clears the existing filter and displays:

TURN POWER OFF  
AND REPLACE FILTER

3. Switch off the machine.
4. Remove the old filter (1) by turning it counterclockwise. Refer to Figure 1-4.

5. Look at the new filter. Verify both O-rings are lubricated and correctly located in the grooves as shown in Figure 1-5.
6. Install the new filter by threading it clockwise into place. Verify the filter is positioned correctly. Tighten the filter to 20 Nm  $\pm$  1.
7. Switch on the machine.
8. Machine starts with vacuum pump oil change (Refer to the "Vacuum Pump Maintenance" in this section).
9. Recycle the filter that was removed from the machine according to the laws in your jurisdiction.

**CAUTION: Use only authentic Bosch filters in this machine. All performance tests and claims are based on using this specific filter.**

Model R134a	Replacement filter at: 68 kg (alert 56 kg)
Model R1234yf	Replacement filter at: 150 kg (alert 138 kg)

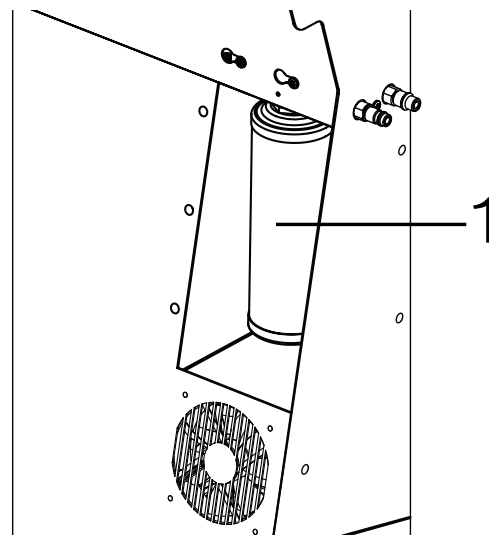


Figure 1-4. Filter Location

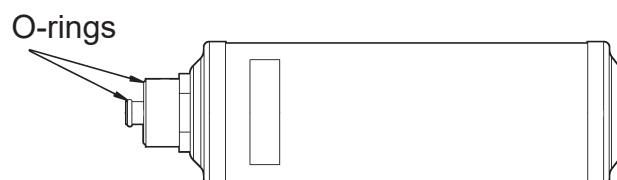


Figure 1-5. O-ring Location

## Vacuum Pump Maintenance

**NOTE:** Vacuum pump oil must be changed with every filter change, every 100 hours pump runs or more often as necessary.

1. Call up the Main Menu.
2. Select **NEXT** icon.
3. Select **MENU** icon.
4. Select **Pump Maintenance** from the Maintenance Menu or when prompted. The display shows how long the vacuum pump has operated since the last oil change.

REMAINING OIL LIFE XXX:XX (hhh:mm)  
CHANGE OIL NOW?

5. Select **OK** icon to change vacuum pump oil.
6. If the the machine displays:

WARMING OIL FOR DRAIN

- allow the vacuum pump to run for two minutes to warm up the oil.

7. If the oil is already warm, the display shows:  
DRAIN USED OIL FROM PUMP AND REPLACE WITH 250 ML OF NEW OIL REMOVE CAP TO SPEED DRAINING OF OIL

8. Slowly open the oil fill port cover (2) to verify there is no pressure in the machine. Then carefully remove the cover. See Figure 1-6.
9. Remove the oil drain fitting cap (3) and drain the oil into a suitable container for disposal. Reinstall the oil drain cap (3) and close tightly.
10. Slowly add vacuum pump oil to the pump through the oil fill port until the oil reaches the center of the sight glass (1).
11. Reinstall the oil fill port cover (2) and close tightly.
12. Select **OK** icon to continue.
13. The display show a message that indicate to the user to check that the oil level is at the center of the sight glass pump.

**NOTE:** In case it is necessary to add more oil, repeat steps 8, 10 and 11 for add oil.

14. Select **ESC** icon to return to the Maintenance Menu.

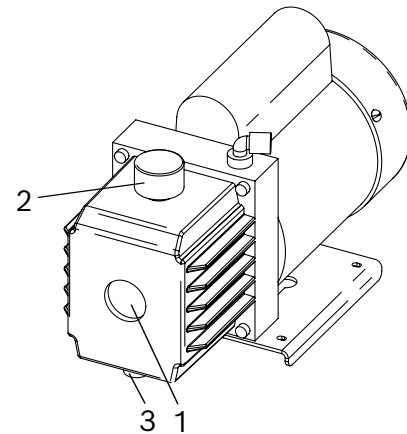


Figure 1-6. Oil Ports



**CAUTION:** To prevent personal injury, do NOT operate the machine at any other time without the oil fill port cap installed, because the vacuum pump is pressurized during normal operation.

**NOTE:** Review the laws and regulations in your jurisdiction to determine correct disposal procedures for pump oil. It is the responsibility of the user to determine if a material is a hazardous waste at the time of disposal. The user must ensure compliance with all applicable laws and regulations.

## Edit Print Header

To make changes to the printer text (available in Setting menu) appearing in the header on each printout:

1. Call up the Main Menu.
2. Select **NEXT** icon.
3. Select **MENU** icon.
4. Select **Edit Print Header** in the Settings Menu. The cursor is in the first field.
5. Update the text by using the arrows and the multi-tap interface on the numeric keypad:
  - **BACKSPACE** icon acts as a backspace key.
  - **Right** or **left** arrow moves the cursor to the right or to the left.
  - **Zero (0)** key also acts as a spacebar.
  - **Up** and **Down** arrows navigate between the rows.
6. Select **OK** icon to save the changes and return to the Settings Menu.
7. Select **ESC** icon to exit and return to the Settings Menu.

## Replace Printer Paper (only for variants with printer)

To install a new paper roll in the printer:

1. Remove the cover on the printer by pulling out on the tab (2) as shown in Figure 1-7.
2. Remove the paper core.
3. Install the new roll of paper with the end of the paper at the top of the roll.
4. Assemble the cover onto the printer with the leading edge of the paper over the roller (1).

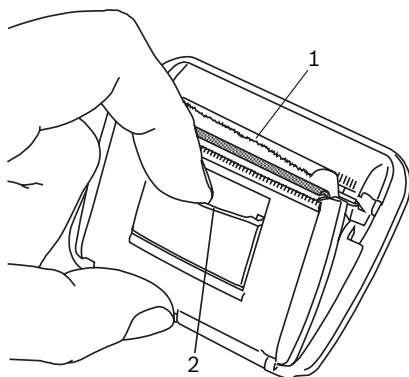


Figure 1-7. Replace Print Paper

## Calibration Check

This function is used to ensure the machine's internal scale is always calibrated. To perform this check make use of Bosch calibration kit (optional) including sample weight and magnet. First time magnet must be installed.

1. Verify the magnet on the bottom of the machine is clean. Refer to Figure 1-8.
2. Call up the Main Menu.
3. Select **NEXT** icon.
4. Select **MENU** icon.
5. Select **Calibration Check** from the Maintenance Menu. The machine displays:

PLACE CALIBRATION WEIGHT ON MAGNET LOCATED ON THE BOTTOM OF MACHINE

6. Attach the calibration weight to the magnet (1) on the bottom of the machine.
7. Select **OK** icon to continue.



**ALERT: Unit shown "Reading, do not disturb".**

The machine displays:

REMOVE CALIBRATION WEIGHT FROM MAGNET LOCATED ON THE BOTTOM OF MACHINE

8. Remove calibration weight from magnet located on the bottom of machine.
9. Select **OK** icon to continue.



**ALERT: Do not touch the unit in this phase!**

- If the display shows **Calibration passed** the scale is calibration. Select **OK** icon to return to the Maintenance Menu.
- If the display shows **Calibration failed** the scale is out of calibration. Select **RETRY** icon to retry. If calibration continues to fail, contact an authorized service center for assistance.

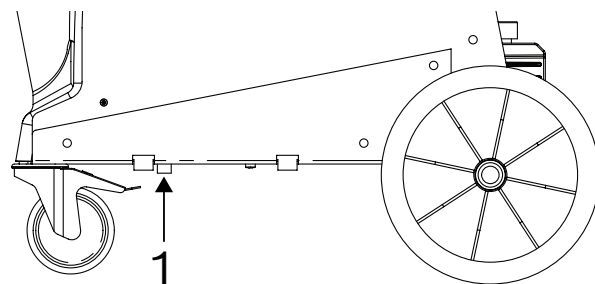


Figure 1-8. Magnet Location

## Pressure Decay Leak Test (for R1234yf only)

This function is available on Maintenance menu. To ensure a safe, environmentally friendly, and economic operation, the unit performs a software-controlled self-test in regular intervals every 10 days (for R1234yf only).

1. Follow the on-screen prompts to connect the hose service couplers to the storage connectors on the side of the machine. Open the hose couplers by turning the collars clockwise.
2. Select **OK** icon to start the test.
3. The machine performs a self-recovery and displays:

RECOVER IN PROGRESS

4. The machine performs a 30-second vacuum test and displays:

VACUUM CHECK IN PROGRESS

- If the vacuum test fails, the machine will prompt to check for leaks.
5. Once the machine passes the vacuum test, a controlled pressure is applied to its internal components. The machine displays:

PRESSURE CHECK IN PROGRESS

6. Pressure is held for five minutes and monitored for decay. There is not a default pressure value. The machine monitors the pressure reached during the pressurization. Minutes and seconds count down on the display.
  - If an acceptable pressure decay is detected, the machine recovers refrigerant until -0,44 bar and returns to the Maintenance Menu, ready for normal operation.
  - If an unacceptable pressure decay is detected, the machine will prompt to check for leaks. Take the machine to an authorized service center for repair.

**NOTE:** Leak Check may also be selected at any time from the Maintenance Menu. If you decline to run the Leak Check when prompted, the machine will continue to prompt for the test at each power-up until the test is completed (for R1234yf only).

## Printer kit installation



**WARNING:** Disconnect the unit from the power source before beginning service work. Incorrect use or connections can cause electrical shock.

For the printer installation follow instructions hereby:

1. Switch off the machine.
2. Remove the printer protective cover.

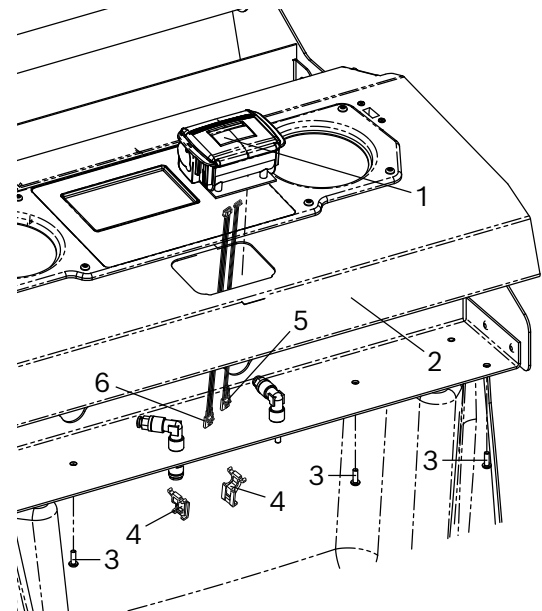


Figure 1-9. Print installation

3. Remove the four screws (3) from the control panel (2).
4. Tilt the control panel (2) upwards the front of the unit.
5. Connect the RS232 cable (5) and the power supply cable (6) to the suitable connectors on the printer (1).
6. Fit the printer (1) and fix it by means of the proper fixing tabs (4).
7. Connect the RS232 cable (5) to the **P18** connector of the control board.
8. Connect the power supply cable (6) to the **P15** connector of the control board.
9. Tilt the control panel (2) down and secure with four screws (3).
10. Connect again the machine to the power supply system and switch it on.
11. The printer is ready to be used.

## Calibration check kit installation (optional)

For the magnet installation, refer to Figure 1-10.

1. Plug the magnet (1) within the housing underneath the machine base.

For fix the calibration weight, refer to “Calibration check” in this section.

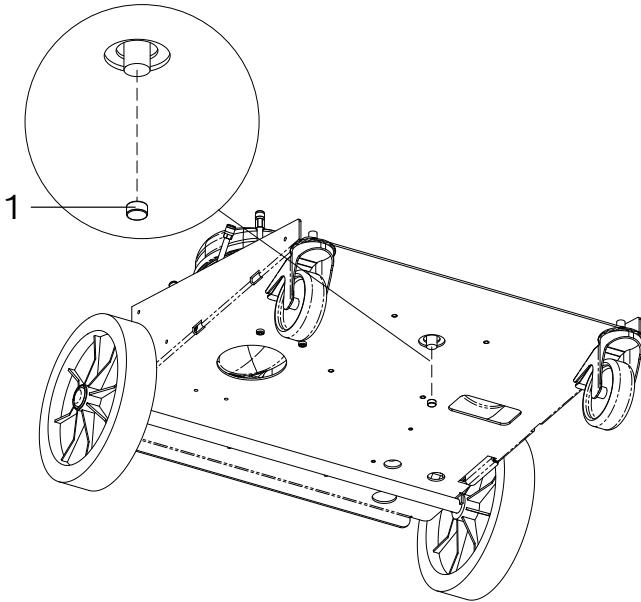


Figure 1-10. Calibration check kit installation

## Refrigerant conversion kit

**WARNING:** Disconnect the unit from the power source before beginning service work. Incorrect use or connections can cause electrical shock.

**WARNING:** Wear safety goggles when working with refrigerants. Refrigerants can cause eye injury.

**WARNING:** Use extreme caution when disconnecting hoses. Pressurized refrigerant may be present in hoses. Point hoses away from you and anyone nearby.

For the conversion kit installation follow instructions hereby:

1. Call up the Main Menu.
2. Select **NEXT** icon.
3. Select **MENU** icon.
4. Select **Maintenance** → **Service** menu and enter password then select **OK** icon.
5. Select **AC unit emptying** and select **OK** icon to start the function.

**NOTE:** To empty the A/C unit make use of a second recovery machine with same refrigerant and suitable free capacity.

6. Connect the two A/C units as indicated on display. Turn on the recovery unit and select **OK** icon.
7. Start the recovery function from the recovery unit.

**NOTE:** In case of recovery machine without deep-recovery capabilities, perform vacuum for definitive emptying.

8. Disconnect the recovery machine and connect hoses as indicated at display.
9. Select **OK** icon to start the vacuum function.

**NOTE:** The A/C unit can move to the second step “Convert unit refrigerant” only if previous “AC unit emptying” has been completed successfully.

10. The vacuum function is finished when the display shows:

SERVICE VACUUM COMPLETE

11. Select **OK** icon to continue.
12. Select **Convert unit refrigerant** and select **OK** icon to start the function.
13. Select **OK** icon to continue with the conversion procedure.
14. The display prompts to replace all the components.
15. Switch off the machine.
16. Remove the service hoses with quick couplers.

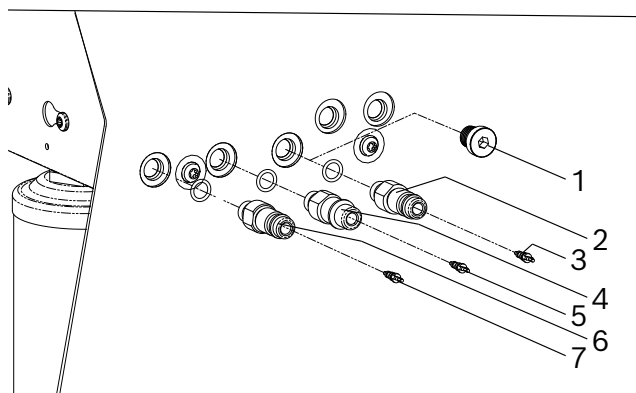


Figure 1-11. Ports assembly

17. Remove the HP (red) and LP (blue) flush ports.
18. Remove the cap (1).
19. Place the contamination port (2) with its o'ring and tighten at 15 Nm torque.
20. Place the Schrader valve in it (3) and tighten at  $0.3 \text{ Nm} \pm 0.1$  torque.
21. Place the LP (blue) flush port (6) with its o'ring and tighten at 15 Nm torque.
22. Place the Schrader valve in it (7) and tighten at  $0.3 \text{ Nm} \pm 0.1$  torque.
23. Place the HP (red) flush port (4) with its o'ring and tighten at 15 Nm torque.
24. Place the Schrader valve in it (5) and tighten at  $0.3 \text{ Nm} \pm 0.1$  torque.
25. Attach new high- (red) and low-side (blue) service hoses with quick couplers. Tighten at 7.9 Nm torque.
26. Connect the unit to a power source and place the power switch on.

27. Follow the instructions on display to replace filter (refer to "Filter Maintenance" in the Maintenance section) and vacuum pump oil (refer to the "Vacuum Pump Maintenance" in the Maintenance section).

**NOTE:** If the A/C unit never recovered refrigerant then it won't be asked to replace the filter nor replenish the pump oil.

28. The conversion procedure is finished when the display shows:

THIS AC UNIT IS NOW CONVERTED  
TO R-XXXX (refrigerant)

29. Select **OK** icon to complete the process.
30. Remove the refrigerant identification decal from the right side of the enclosure replacing it with the new one.
31. Perform air flow calibration. Refer to "Air Flow Calibration" in the Diagnostics and Testing section.
32. Perform 3 kg tank refill and then a "Periodic Leak Test" to verify system tightness (refer to the "Pressure Decay Leak Test" in the Maintenance section).

## UNIT SPECIFICATIONS

	ACS 563	ACS 553
<b>Refrigerant</b>	R1234yf	R134a
<b>ISV total capacity (water capacity)</b>	10 l	10 l
<b>Internal Vessel Maximum Storage Capacity (kg of refrigerant)</b>	8.934 kg of R1234yf (7.8 kg manageable by operator)	9.827 kg of R134a (8.8 kg manageable by operator)
<b>Fluid Maximum Working Pressure (PS)</b>	25 bar (2.5 Mpa)	25 bar (2.5 Mpa)
<b>Fluid Operating Temperature Range (TS)</b>	-10 °C ÷ +120 °C	-10 °C ÷ +120 °C
<b>Maximum Recovery Speed (liquid phase)</b>	-	-
<b>Overall Leak Rate</b>	<80g/year	<80g/year
<b>Power Supply</b>	230 Vac/1 50/60 Hz	230 Vac/1 50/60 Hz
<b>Overvoltage category</b>	II	II
<b>Power Consumption</b>	805 W	805 W
<b>Unit Storage Temperature Range</b>	-20 °C ÷ +60 °C	-20 °C ÷ +60 °C
<b>Unit Operating Temperature Range</b>	+10 °C ÷ +50 °C	+10 °C ÷ +50 °C
<b>Humidity (non-condensing)</b>	32.2°C (90°F), 86% RH	32.2°C (90°F), 86% RH
<b>Maximum Altitude</b>	2000 m (6561.66 ft)	2000 m (6561.66 ft)
<b>IP Protection Rating</b>	IP20	IP20
<b>Pollution dregree</b>	2	2
<b>Noise</b>	<70 dB(A)	<70 dB(A)
<b>Dimensions</b>	99 x 69 x 67 cm	99 x 69 x 67 cm
<b>Weight (empty tank + accessories)</b>	74 kg	74 kg
<b>Display</b>	4.3in. 262K RGB (480 x 272) color LCD with LED backlight	4.3in. 262K RGB (480 x 272) color LCD with LED backlight
<b>Filter</b>	700 cc dessicant	700 cc dessicant
<b>Manometer</b>	Ø 100 mm EN 837-1 Class 1	Ø 100 mm EN 837-1 Class 1
<b>Bottles (Oils and Dye)</b>	3 x 250 ml	3 x 250 ml
<b>Service hoses</b>	250 cm / R1234yf	250 cm / R134a
<b>Quick Couplers</b>	For R1234yf	For R134a
<b>Flush Port</b>	Yes	Yes
<b>Refrigerant Identifier</b>	Optional as external device	-
<b>Flush Kit</b>	Optional for R1234yf	Optional for R134a
<b>Wireless</b>	Optional with Wifi/BT usb dongle	Optional with Wifi/BT usb dongle

	ACS 563	ACS 553
<b>Compressor</b>		
<b>Power</b>	1/4 HP	1/4 HP
<b>Displacement</b>	8.85 cm <sup>3</sup>	8.85 cm <sup>3</sup>
<b>Recovery performance (maximum, liquid phase)</b>	-	-
<b>Power Supply</b>	230 Vac/1 50/60 Hz	230 Vac/1 50/60 Hz
<b>Vacuum Pump</b>		
<b>Free Air Displacement</b>	70 l/min (2.5 CFM)	70 l/min (2.5 CFM)
<b>Ultimate Vacuum (min)</b>	375 microns	375 microns
<b>Oil Capacity</b>	310 ml	310 ml
<b>Type</b>	1 stage oil bath	1 stage oil bath
<b>Power Supply</b>	230 Vac/1 50/60 Hz	230 Vac/1 50/60 Hz
<b>Scales</b>		
<b>ISV scale accuracy</b>	±15 g	±15 g

## MAINTENANCE SCHEDULE

MAINTENANCE TASK	RECOMMENDED INTERVAL			
<b>Change filter</b>	After (SEE TABLE) of refrigerant has been filtered. Refer to “Filter Change” in the Maintenance section of this manual.			
	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Model R134a</td> <td>Replacement filter at: 68 kg (alert 56 kg)</td> </tr> <tr> <td>Model R1234yf</td> <td>Replacement filter at: 150 kg (alert 138 kg)</td> </tr> </table>	Model R134a	Replacement filter at: 68 kg (alert 56 kg)	Model R1234yf
Model R134a	Replacement filter at: 68 kg (alert 56 kg)			
Model R1234yf	Replacement filter at: 150 kg (alert 138 kg)			
<b>Change vacuum pump oil</b>	When the filter is replaced or every 100 hours. Refer to “Vacuum Pump Maintenance” in the Maintenance section of this manual.			
<b>Check casters and wheels for ease of operation</b>	Monthly.			
<b>Check internal scale calibration</b>	Monthly. Refer to “Calibration Check” in the Maintenance section of this manual. Every year all scales must be calibrated by an authorized service center.			
<b>Check machine for leaks</b>	Automatic every 10 days. Refer to “Pressure Decay Leak Test” in the Maintenance section of this manual (for R1234yf only). Every yearly — performed by an authorized service center (for R134a only).			
<b>Air flow calibration (for R1234yf only)</b>	Monthly.			
<b>Clean air intake panels</b>	Monthly. Use a clean cloth.			
<b>Clean cabinet and control panel</b>	Monthly. Use a clean cloth.			
<b>Inspect power cord and hoses for cuts and abrasions</b>	Daily.			
<b>Lubricate wheel bearings and brake components</b>	Monthly.			
<b>Solenoid valves inspection</b>	Every yearly — performed by an authorized service center.			

Due to normal wear and tear, these units require regular maintenance to ensure safe operation and optimum performance. The above chart provides a schedule of the minimum recommended maintenance tasks.

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## FUNCTIONAL CHECK

Prior to performing a functional or diagnostic check, make sure the software version is current. This is especially true if the control and/or power boards have been replaced. If the software version is not current, corrupt, or unknown, follow the procedure in *Updating System Software Instruction*.

### Updating System Software Instruction

To upgrade the firmware through a USB stick or via WiFi (see Firmware update in the Setup Menu function section).

#### Download and install current Software with USB stick

##### Equipment Requirements:

(1) USB stick

This item may be purchased from most retail office supply/electronics stores or from any online retailer that carries computer accessories. In case of Firmware update with USB stick follow the instruction:

1. Insert the USB stick to your computer.
2. Format as FAT32.
3. Download the current software from: \EDIS\software\systemsw\acs6xx\_7xx\.
4. Put the zip package as is into the root folder of the USB stick.
5. Insert the USB stick into the USB port on the unit.
6. Turn ON the unit.
7. Call up the Main Menu.
8. Select **NEXT** icon.
9. Select **MENU** icon.
10. Select **Settings → Firmware update and USB Update**.
11. Allow the unit to install the software completely and then remove the USB stick, this operation may requires several minutes.
12. Reboot the unit when prompted.
13. When the unit reboot confirm the installation procedure by press **<Yes>** button when the bootloader black and white screen is shown.

14. The unit will go through a file updating period (it can take several minutes) to finalize the entire update procedure, then will display the Main Menu.

#### Install Current Software with WiFi

Once WiFi connection has been established select Wi-Fi Update (Call up the Main Menu and select **Next → Menu → Settings → Firmware update → Wi-Fi Update**).

##### 1. Manual path:

Select Wi-Fi Update and check the new software availability then select **HELP** icon to look into release note or **OK** icon to start the update procedure that is composed by the following steps:

- Downloading compressed software package.
- Decrypt the software package and validate it to be sure that is a not corrupted.
- Decompress the content.
- Install all new files.
- Request user to reboot unit and complete the install procedure.
- When the unit reboot confirm the installation procedure by press **<Yes>** button when the bootloader black and white screen is shown.
- The unit will go through a file updating period (it can take several minutes) to finalize the entire update procedure, then will display the Main Menu.

##### 2. Automatic path:

After an internet connection is established, the machine will automatically connect to that network when the unit is powered on, and immediately (before showing the Main Menu) search for available software updates. If updates are available, it will show an alert message and progress through the process as mentioned above (point 1).

**NOTE:** Refer to Scale Calibration at Replacement Scale Assembly in the Electrical section, if necessary.

The Recover and Charge function tests must be performed sequentially, in the order presented here.

## Recover Function

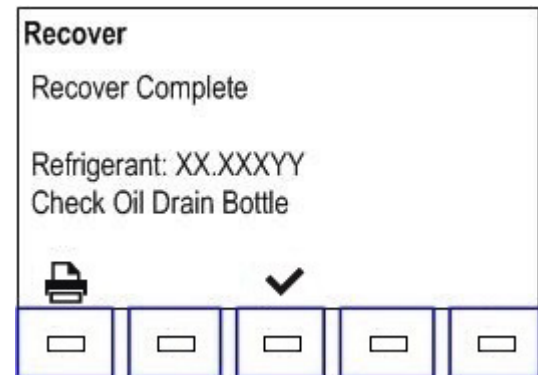
During the Recover process, the system will initiate a filter check, service data entry, and inlet pressure check.

1. Empty the oil drain bottle before starting a recovery.
2. Connect the high-side (red) and/or low-side (blue) hoses to the test tank.
3. Open the coupler valves on the hoses by turning the collars clockwise.
4. Select the **RECOVER** icon from the main menu.
5. The screen will message display: "Connect both service hoses to AC system being serviced and open both coupler valves".
6. Select **OK** icon and unit perform:
  - Inlet pressure check.
  - A/C unit internal clearing process.
  - Recovery stage.
7. Select **OK** icon to continue or **ESC** icon to cancel.
8. The machine (if the external refrigerant identifier is enabled) checks the refrigerant in the source tank to verify it is R1234yf and not contaminated. The machine displays the following screens:

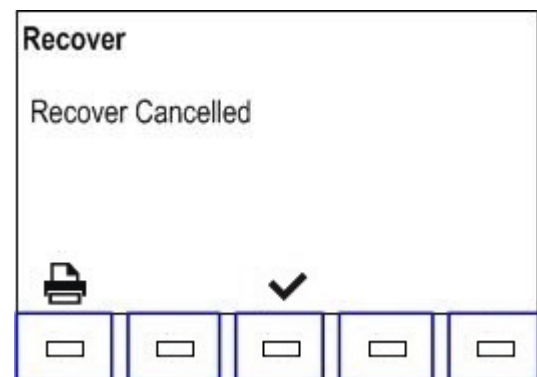
INITIALIZING REFRIGERANT IDENTIFIER  
ANALYZING REFRIGERANT SAMPLE  
REFRIGERANT PURITY PASSED

9. The unit performs a self-cleaning cycle to clean the internal hoses from refrigerant traces, if any.
10. The function stops when the refrigerant is fully recovered.

11. After the recovery, the machine performs an oil drain procedure, which may take up to 90 seconds to be completed.
12. After the oil drain is complete, a summary of the amount of refrigerant recovered and oil drained is displayed. The unit displays:



Or:

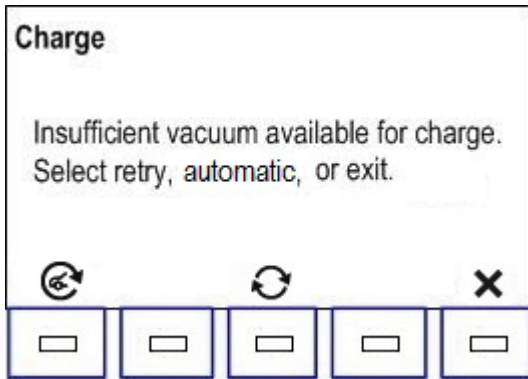


13. Select **Print** icon to print out recovery information and pre-recover diagnostics or select **OK** icon to return the main menu. The displayed recovered weight can vary depending on ambient conditions and should not be used as an indicator of scale accuracy. The amount of oil that was removed from the A/C system is the amount of new oil that can be charged into the A/C system after evacuation is complete.
  - Use only **new** oil to replace the oil removed during the recycling process.
  - Dispose of used oil according to government laws and regulations.

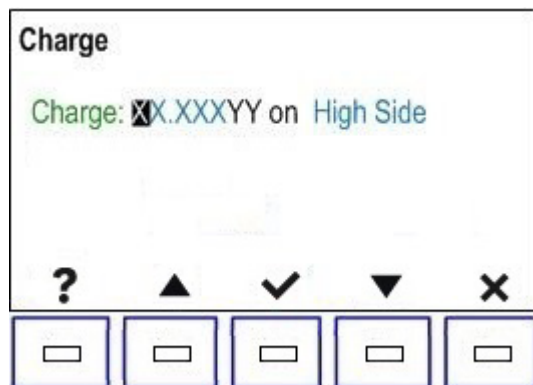
Recovery is complete.

**Charge Function**   

1. Connect (or verify) **both** service hoses to the test tank and turn the quick couplers clockwise.
2. Select the **CHARGE** icon from the main menu. Unit shows the ENTER VEHICLE DATA input page, confirm with **OK** icon. The following display may show:

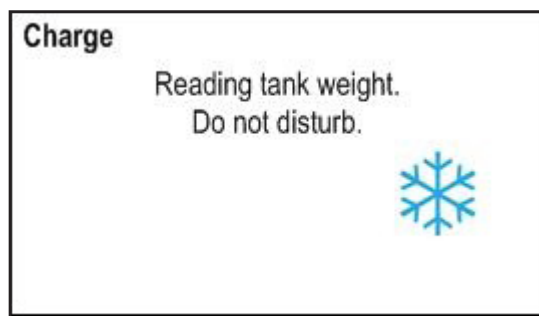


If there is sufficient vacuum available, this displays:

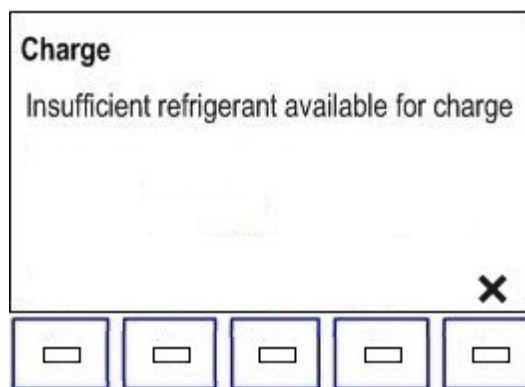


- Machine is asking to input:
- Charge amount (min is 10 g).
  - Select charge hoses (3 option: High, Low and Both side).
3. Select **OK** icon to continue.

- Machine is asking to input:
- Oil inject (Yes or No). If select No unit don't inject any oil.
  - Oil amount: xxx ml (is possible set as ml, oz or lb).
  - Oil type: 2 option (PAG or POE).
  - Type the measured ambient temperature and set the viscosity of oil being used.
4. Confirm with **OK** icon and begin the charge process. Moving or bumping the unit at this point may result in an inaccurate charge. *Charging please wait* displays:

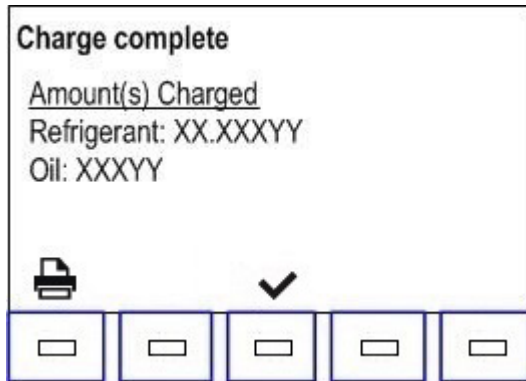


5. When the charge cycle gets close to the desired weight value, the machine slows down. It will charge, settle, charge again, settle, etc.
6. If there is not sufficient refrigerant in the tank to charge the system, the display shows:



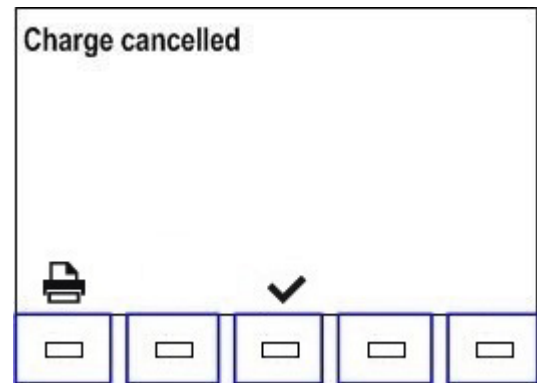
7. Select **ESC** icon to exit. May require tank fill.

8. If the amount of refrigerant is sufficient to charge the system to completion, the display will show hoses compensation a few seconds and then close coupler valves and disconnect service hoses from vehicle. The charge is complete:



9. Select **OK** icon then the unit will begin a hose clearing process to remove refrigerant from the hoses, followed by a short recovery.  
 10. At the end unit shows the charged data and print out option.

11. If the charge was cancelled, *Charge complete* will change to *Charge cancelled* and the values on the display will disappear:



12. Select **OK** icon to exit.  
 13. The unit will begin a hose clearing process to remove refrigerant from the hoses, followed by a short recovery.  
 Charge is complete.

## DIAGNOSTICS AND TESTING

**NOTE:** These are the Service Options at the time of printing this service manual. Some options may be added or deleted in future circuit board and software updates and revisions.



**WARNING:** Never change the default settings unless directed by the factory. Otherwise the unit may fail to operate properly.



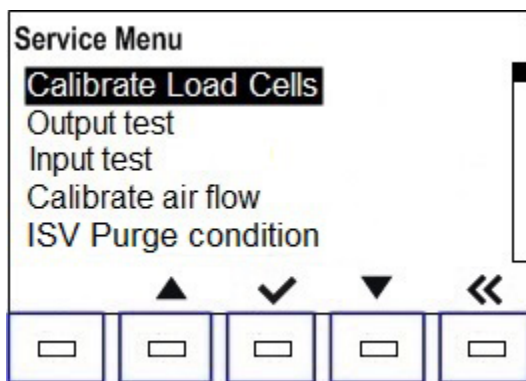
**WARNING:** Never give the programming or service codes to customers.

### Service Center Menu

**NOTE:** Consult the Technical Service Bulletins for the latest software version as applicable. To navigate through the Service Menu, use the keypad and arrow keys.

### Diagnostics and Troubleshooting

1. Turn unit on and allow it to run through the boot sequence.
2. Select **NEXT** icon.
3. Select **MENU** icon.
4. Select **MAINTENANCE**.
5. From the maintenance menu, scroll up and find **SERVICE MENU**.
6. Enter password then select **OK** icon. The following displays:



- To perform any of the checks in the Service Menu, use the up and down arrows to scroll to the desired test listed and select **OK** icon.
- To exit the Service Menu, select **BACK** icon.

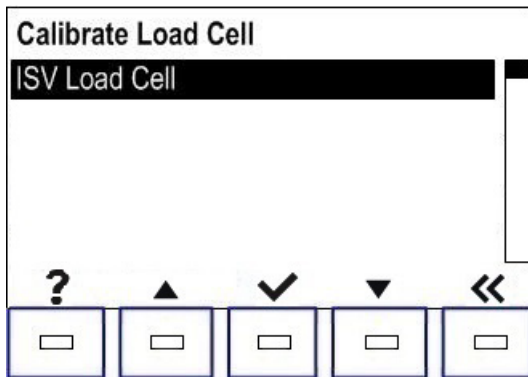
Service Menu
• Calibrate Load cell
• Output test
• Input Test
• Calibrate air flow
• ISV Purge condition
• A/C unit internal clearing
• Service vacuum
• End user install
• Maintenance counters
• Keypad test
• Set boot mode
• Reset Board
• Refrigerant identifier
• Charge leak test
• 10 days leak test
• Default vacuum time
• Default vacuum leak test time
• Default precharge leak test time
• Service hose length
• Enter plate only
• Refrigerant tracking password
• Customer configuration
• Database configuration
• Tank check valve test
• AC unit emptying
• Convert unit refrigerant

**Calibrate load cell**

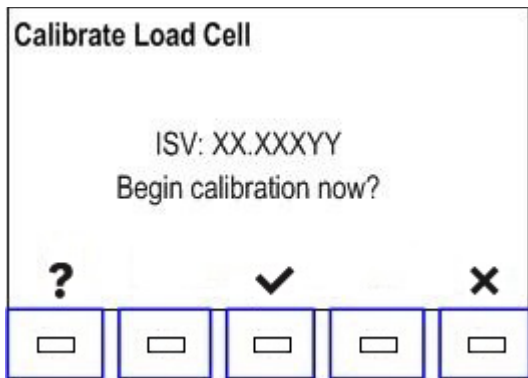
All units include load cell scale: ISV Load Cell.

**ISV Load Cell Calibration**

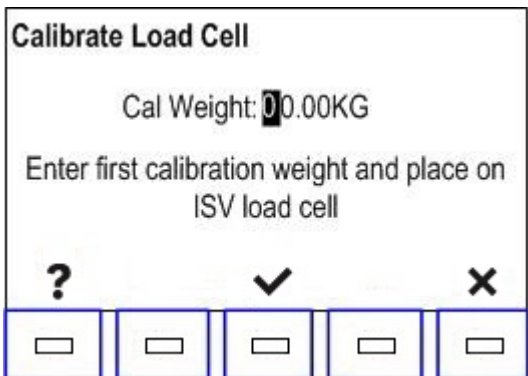
1. Remove the internal storage vessel (ISV) from the scale.
2. After selecting Calibrate Load Cell from the Service Menu by pressing **OK** icon, the following displays:



3. Select **OK** icon to enter the ISV load cell calibration.



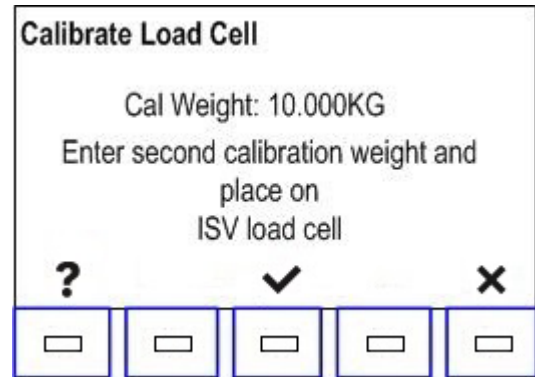
4. Select **OK** icon to begin the calibration.



5. Use the calibration weight as displayed for this step. (The first weight should be 0 as displayed on the screen.) Select **OK** icon to save the displayed weight value.

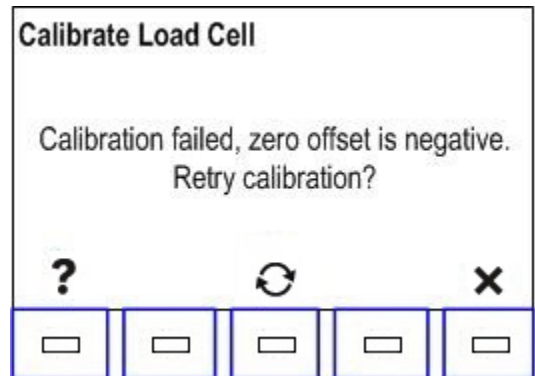
**NOTE:** DO NOT DISTURB unit during weight calibration.

After 5 seconds:

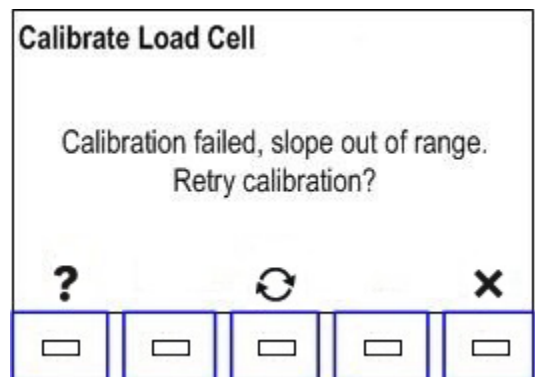


6. Place a 10 kg (editable) weight on the scale and enter the weight using the keypad. When finished, select **OK** icon to save the entered weight value.
7. If the calibration is accepted, the offset and slope will be calculated. If either calculation fails, a fail screen for the offset or slope will be displayed.

Offset Failure:

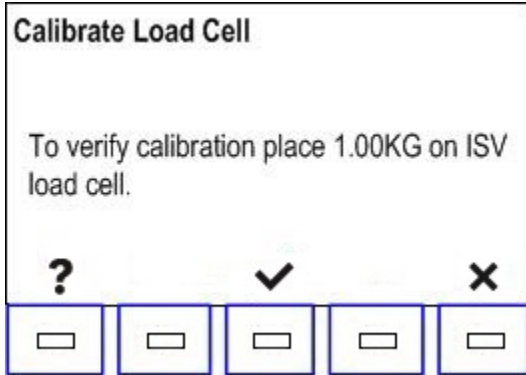


Slope Failure:

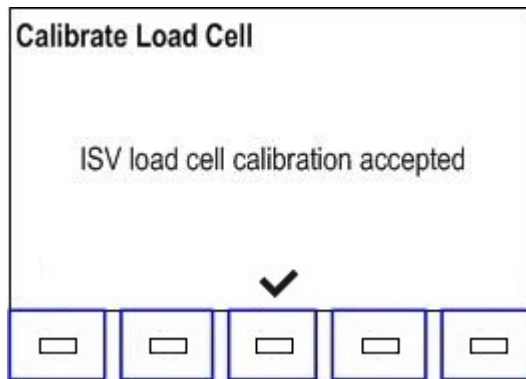


The operator is given the opportunity to retry the calculation or to exit the calibration function.

- If the calculation is accepted, the following is displayed:



- Typically adding 1.00 kg (2 lb) is sufficient to perform this test.
- If **OK** icon is selected and the calibration is accepted, the following displays:

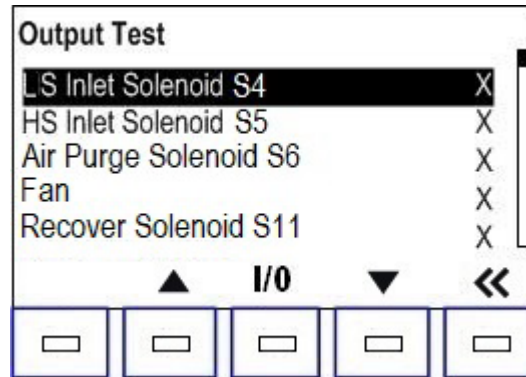


- Select **OK** icon to terminate.
- If the calibration is not accepted, a Calibration Failed screen is displayed as shown in Step 7.
- Selecting **ESC** icon returns to Calibrate Load Cell in the service menu.

### Output Test

The Output Test checks the electrical outputs from the power board and wiring harnesses to the various solenoids, fan, vacuum pump, and compressor. This test is useful as a troubleshooting method to determine if a device is operating properly or not.

- From the Service Menu, scroll to **Output Test**.
- Select **OK** icon. The following displays:



Placeholder X indicates the state of the output device. A 1 or 0 indicates whether the device is ON or OFF. A list of the tests is provided in the table below:

OUTPUT TEST	
Low-Side Inlet Solenoid S4	X
High-Side Inlet Solenoid S5	X
Air Purge Solenoid S6	X
Fan	X
Recover Solenoid S11	X
Oil Return Solenoid S13	
Oil Inject Solenoid S14	
Vacuum Pump	
Compressor	
Alert Beeper	
Tank liquid solenoid S7	
Oil Drain Solenoid S8	
Vacuum Solenoid S9	

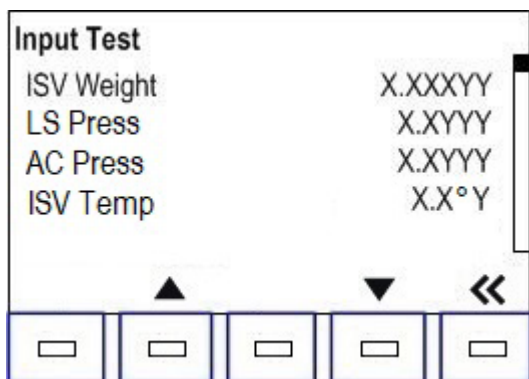
- As the tests are highlighted, select **ON/OFF** icon. The state will change from 0 to 1. There should be a click heard as the solenoids are energized, the motors of the fan, vacuum pump, and compressor should start, the beacon, if installed will flash once, and the beeper will sound.

- When the test is complete, select **BACK** icon to return to the Service Menu.

### Input Test

The input test displays the current state of the measurable parts of the unit such as the amount of refrigerant, temperatures, and the various pressures present within the unit. The values shown are absolute and indicate what is happening within the unit at any given moment during operation. The values are observable only and cannot be changed or deleted. They can indicate whether a sensor or device is operating within the required limits for proper unit operation.

- From the Service Menu, scroll to **Input Test**.
- Select **OK** icon. The following displays:



Placeholders X and Y represent numbers displayed during this test. A list of the sensors and devices and what the values represent follows:

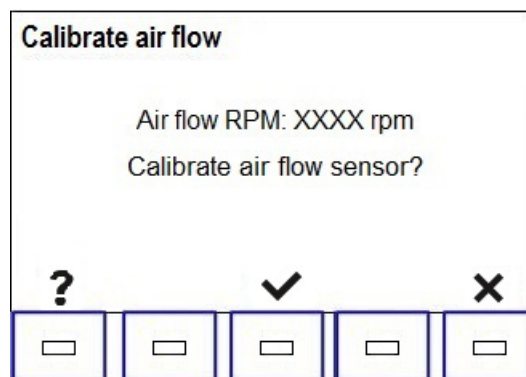
INPUT TEST		
Sensor or Device	Value Format	Property
ISV Weight	X.XXXYY	ISV Weight
LS Press	X.XYYY	Low-Side Pressure
AC Press	X.XYYY	Accumulator Pressure
ISV Temp	X.X°Y	ISV Temperature
HP Sw	X	High-Pressure Switch
Air Flow	XXXXrpm	Fan Air Flow (for R1234yf only)

- Scroll through the sensors or devices to observe their values. When finished, select **BACK** icon to return to the Service Menu.

### Calibrate air flow (for R1234yf only)

The air flow inside the unit must be present at the correct volume to make sure enough air is present to prevent the buildup of refrigerant and to keep the compressor temperature below its upper limit.

- From the Service Menu, scroll to **Calibrate air flow**.
- Select **OK** icon. The following displays:

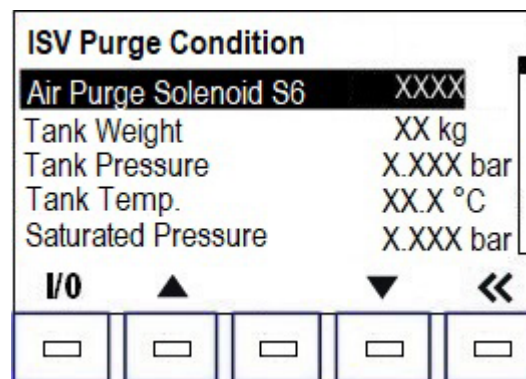


- Check :
  - All body panels are installed.
  - Fan is clean and running.
- Select **OK** icon, and wait unit is performing calibration automatically.
- If calibration succeeds, unit will return to service menu.
- If calibration fails, unit will prompt user to retry.

### ISV Purge Condition

Displays internal storage vessel (ISV) pressure and temperature.

- From the Service Menu, scroll to **ISV Purge Condition**.
- Select **OK** icon. The following displays:



- Scroll to the **Air purge Solenoid S6** and keep **ON/OFF (I/O)** pressed to purge incondensable gas from tank.

### A/C unit internal clearing

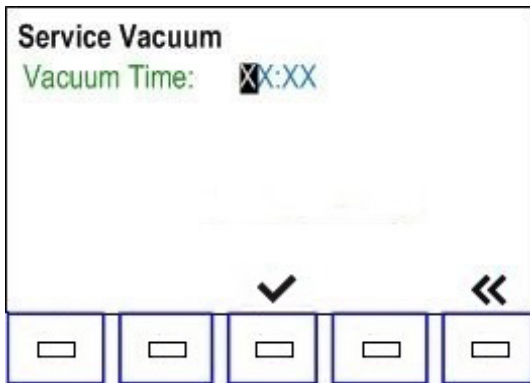
The A/C unit internal clearing is used to evacuate service hoses, oil separator and dryer filter (compressor discharge not cleared). Components ON:

1. LS inlet Solenoid S4.
2. HS Inlet Solenoid S5.
3. Recover Solenoid S11.
4. Compressor.

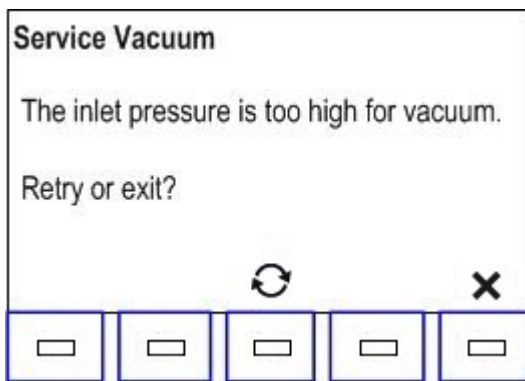
### Service Vacuum

Service vacuum is a manually operated test used to pull a vacuum on the machine to remove air from the manifold and ISV prior to refilling the ISV after service.

1. From the Service Menu, scroll to **Service Vacuum**.
2. Select **OK** icon. The following displays:

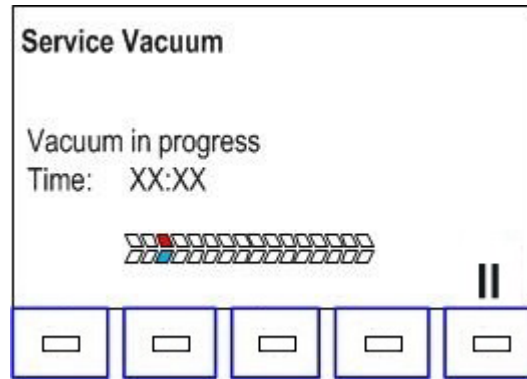


3. Enter a new time using the keypad and select **OK** icon to begin the vacuum. If the pressure is greater than 0.35 bar, this screen displays:



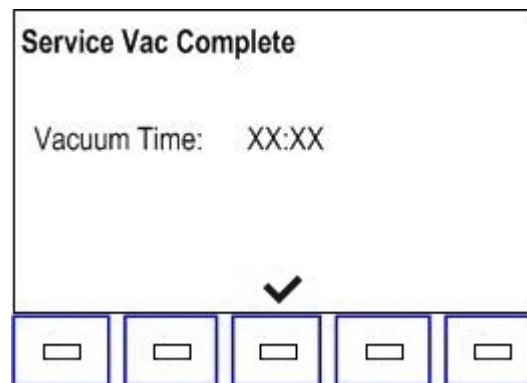
4. Select **RETRY** icon to repeat, or **ESC** icon to return to the Service Menu.

5. The vacuum pump should turn on and the time begins to count down. Process will stop early if sufficient vacuum level is achieved. To pause at any point during the process select **PAUSE** icon. At the Pause function, the Service Vacuum can either be resumed or cancelled.



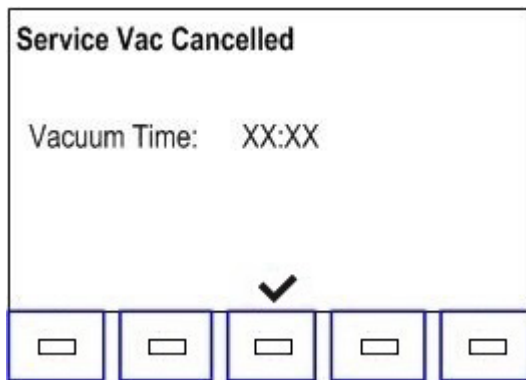
The inlet pressure should stay below 0.35 bar throughout the Service Vacuum. The Vacuum Pump, Vacuum Solenoid, Oil Return Solenoid, LS Inlet Solenoid, Tank Liquid Solenoid and Recover Solenoid will turn ON during this test.

6. When the vacuum Time Remaining falls to 00.00, the outputs will turn OFF and the following displays:



7. Select **OK** icon to return to the Service Menu.

- If the Inlet pressure rises above 0.35 bar during the Service Vacuum, any outputs that are ON will turn OFF and the vacuum time will stop counting down. The following displays:



- Selecting **OK** icon may restart the vacuum process if the Inlet pressure has dropped below 0.35 bar. If restart is achieved, the vacuum pump will restart and the outputs (see Step 5) will turn ON again completing the Service Vacuum.
- Select **OK** icon to return to the Service Menu.

### End User Install

The End User Install allows the service technician to access, review and/or change the parameters set during the initial setup of the machine. The functions include:

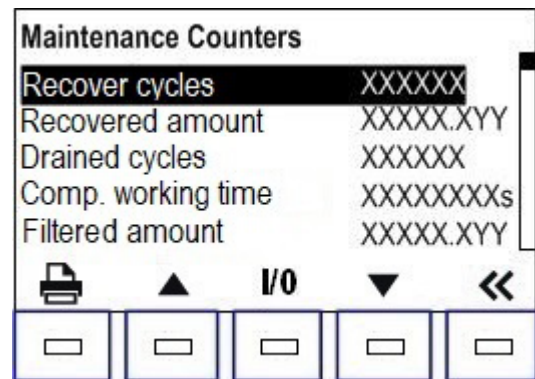
- Language selection.
- License agreement review.
- Units (Metric/Imperial) selection.
- Date and Time adjustment.
- Edit Print Header.
- Service Vacuum.
- Oil inject viscosity selection.
- Internal tank fill.

These functions can be accessed to customize the unit for the end user, or to check the customization when the unit is activated for the first time after shipment. The End User Install would not normally be needed.

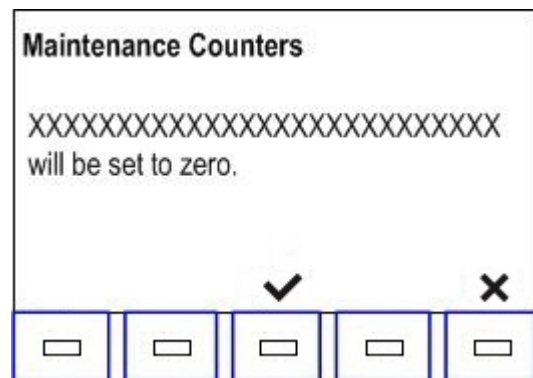
### Maintenance Counters

Maintenance Counters record the number of times a maintenance function has been performed. The counters also record the amount of refrigerant recovered, refrigerant filtered, refrigerant charged, refrigerant replenished, and how many times the compressor and vacuum pump have run. These counters run in the background.

- From the Service Menu, scroll to **Maintenance Counters** and select **OK** icon. The following displays:



- Scroll through the list and select the counter to be viewed.
- Select **PRINT** icon to print the entire list of Maintenance Counter items and associated values. Select **BACK** icon to return to the Service Menu.
- To reset an amount, select **ON/OFF** icon then enter 28712347 in the space provided. Select **OK** icon.
- If the password is valid, the following displays:



The second line of the display, above, represents the item to be reset.

- Select **OK** icon to reset the amount. Select **ESC** icon to leave the amount current and return to the Service Menu.

7. Scroll to the next desired Maintenance Counter. If none is desired, select **BACK** icon to return to the Service Menu.

The list of available items follows in the table:

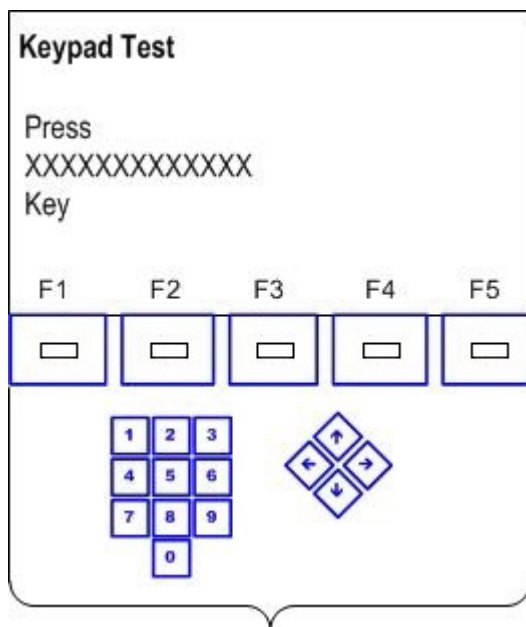
<b>Display</b>	<b>Description</b>
Recover cycles	displays the number of recovery cycles performed from the station
Recovered amount	displays the total quantity of refrigerant recovered from the station
Drained cycles	displays the total quantity of used oil drained from the station
Comp. working time	displays the total operating hours of the compressor
Filtered amount	displays the total quantity of refrigerant filtered by the station
Filtered cycles	displays the number of times the dryer filter has been changed
Vacuum cycles	displays the number of vacuum cycles performed from the station
Vacuum working time	displays the total operating hours of the vacuum pump
Vac. pump oil change	displays the number of times the vacuum pump oil has been changed
Vac. pump oil time	displays the vacuum pump operating hours since the last oil change
Charge cycles	displays the number of charge cycles performed from the station
Charged amount	displays the total quantity of refrigerant charged in kg/lb
Flush hoses cycles	displays the number of hose flush cycles performed from the station
Replenished amount	displays the total quantity of replenished refrigerant in kg/lb with the "Tank filling" function

### Keypad Test

The Keypad Test is used to determine if the keys on the control panel are functioning when pressed. The keys affected by this test are listed in the table below:

• F1	• 1	• 6	• Up Arrow
• F2	• 2	• 7	• Down Arrow
• F3	• 3	• 8	• Left Arrow
• F4	• 4	• 9	• Right Arrow
• F5	• 5	• 0	-----

1. From the Service Menu, scroll to **Keypad Test** and select **OK** icon. The following displays:



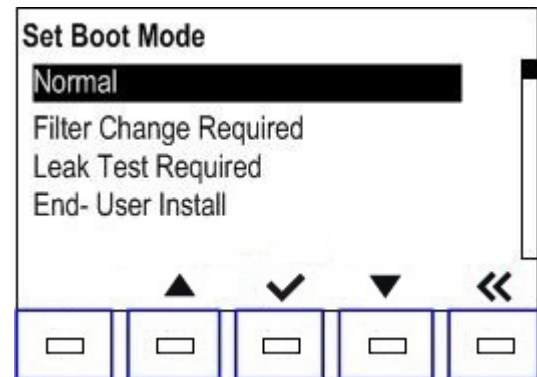
The X displayed represents the key to be tested. The first key is F1, followed by F2 and so on. After each key is tested, the next key will scroll up automatically.

This test cannot be aborted. Once complete, the display will automatically return to the service menu.

### Set Boot Mode

Setting the Boot Mode makes it possible to boot into a mode other than Normal (default). The choices to boot are Normal, Filter Change Required, Leak Test Required, and End-User Install.

1. From the Service Menu, scroll to **Set Boot Mode** and select **OK** icon.
2. Enter password 28768347 then select **OK** icon. If the password is valid, the following displays:

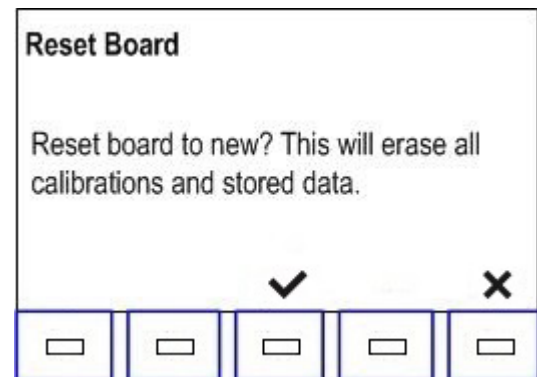


3. Scroll to the boot mode desired and select **OK** icon. The unit will boot to the selected mode at the next power up cycle.
4. To leave set boot mode without change, select **BACK** icon to return to the Service Menu.

### Reset Board

Unless absolutely necessary, resetting the board is not recommended. *Resetting the board will erase any calibration/customization and restore the factory defaults.*

1. From the Service Menu, scroll to **Reset Board** and select **OK** icon. The following displays:



2. To reset the board to the default values, select **OK** icon.
3. To leave the board configuration as is, select **ESC** icon to return to the Service Menu.

## Refrigerant Identifier

The Refrigerant Identifier is used to enable/disable the external refrigerant identifier.

## Charge Leak Test

The Charge Leak Test is used to enable/disable the pre-charge leak test.

## 10 Days Leak Test (for R1234yf only)

The 10 Days Leak Test is used to enable/disable the periodical leak test.

## Default Vacuum Time

The Default Vacuum Time is editable. Default 5 min.



**CAUTION:** this time is editable to make easier diagnostic and repair, change the timing as default could reduce the unit performance.

## Default Vacuum Leak Test Time

The Default Vacuum Leak Test Time is editable. Default 5 min.



**CAUTION:** this time is editable to make easier diagnostic and repair, change the timing as default could reduce the unit performance.

## Default Precharge Leak Test Time

The Default Precharge Leak Test Time is editable. Default 5 min.



**CAUTION:** this time is editable to make easier diagnostic and repair, change the timing as default could reduce the unit performance.

## Service hose length

It is used to set the service hose length (2.5 m or 5 m).

## Enter plate only

The Enter plate only is used to enable / disable the vehicle data input page where only license plate is present as mandatory field.

## Refrigerant tracking password

The Refrigerant tracking password is used to enable/disable the access with password for the refrigerant tracking menu.

## Customer configuration

To set some special features requested by a specific customer or dealer.

## Database configuration

To enable or disable the usage of a specific refrigerant database.

## Tank check valve test

To test the tank check valve.

## AC unit emptying

Function that manages the refrigerant emptying process by usage of an external recovery machine before actual refrigerant conversion.

## Convert unit refrigerant

It starts the actual refrigerant conversion.

## TROUBLESHOOTING

### Grounding, Noise, and Power Issues

To provide proper protection and maximize system reliability, it is important to consider grounding, shielding, and AC and DC power supply issues.

#### Grounding Issues

Grounding must be looked at first, for without a low-impedance ground; all noise protection measures built into the electronic components and assemblies are rendered useless.

Grounding equipment is done for two reasons. The first and most important is safety. To meet safety requirements, any exposed conductive surface of the equipment must be within the safe touch-voltage range of under 30 Volts **RMS**. Any voltage greater may result in a life threatening electrical shock, under the right conditions.

The second reason is the process by which the case and any extensions of the case are connected to earth ground. If the ground is open or has a high resistance, electrical noise will not be shorted to ground and can radiate into the unit.

#### Noise (Shielding) Issues

Proper shielding prevents noise from entering the unit. Two types of noise can affect the operation of a unit; noise coming in on the AC line and external noise (such as ignition noise) radiated directly into the unit.

**AC Noise** - any signal on the power line other than the advertised voltage and frequency; this includes spikes, surges, and sags.

**External Noise** - (such as ignition noise) is generally radiated into the unit. Other types of radiated noise sources are light ballasts, transmitting towers, power lines, etc. External noise can cause the unit to lock-up, reset, or behave erratically. The effect varies with the type and intensity of the noise.

### Power Issues

The power applied to the unit must be from a stable, low-impedance source. Long-term stability must be within  $\pm 10\%$  of the nominal voltage. For a nominal 230 V line, the limits are 207 V to 253 V. The unit will operate above and below the voltage limits. However, problems in operation may appear if the voltage drops (sags) below or rises above (surges) these limits. The life expectancy of the components in the unit may be shortened significantly.

The impedance controls the ability of the line to supply a constant voltage with a changing load. Noting the line voltage with the unit off, then noting the voltage with the unit on, a technician can determine the impedance of the line from the unit to the power transformer. If there is a greater than 10% change, the line has too much resistance or the load is too great. The solution is a dedicated line.

The line cord must be wired correctly. When replacing the line cord, make sure the terminals at the plug have the high, neutral, and ground connections in their proper location. A ground circuit tester can be used to test wiring.

#### Verify the Power Outlet

1. Ensure the outlet is in good working order.
2. With no load on the circuit, use a ground circuit tester to verify proper polarity and presence of earth ground.
3. Using a digital volt meter, with no load on the circuit, verify there is less than 0.3 V from neutral to ground and the voltage is stable. Be suspicious of a 0 V reading. This may indicate a short between neutral and ground.
4. With no load on the circuit, verify the output voltage is nominally 230 V and stable.
5. With the unit connected to the circuit (loaded) verify the voltage varies less than 4 VAC measured from neutral to ground.
6. Using an oscilloscope, monitor the waveform output from the outlet for any distortion. The signal should be a sine wave.

## Will Not Power Up, No Display

1. Verify the unit is connected to a known good power source with a good ground and not through an extension cord.
2. Verify the power cable is wired correctly and the connector has not been damaged. Replace or repair as required.
3. Turn on the main power switch.
4. If the display does not activate, verify line voltage is present at the input and output terminals of the switch.
  - If line voltage is *not* present at power switch input, check connections between the power switch and AC connector.
  - If line voltage is present at power switch input, but not at output with switch turned on, check the fuses (not blown).
  - If line voltage is present at both input and output of switch, check the power supply.

## Will Not Fill Tank

**NOTE:** The compressor should be running during this test. If it does not run, refer to compressor troubleshooting in the Compressor section of this manual.

1. Verify the low-side service hose is properly connected and threaded completely onto the source tank fitting. Check quick-seal on low-side service hose and make sure virgin tank valve is open.
2. Is there a message on the display stating the source tank is empty? If so, verify the source tank has liquid refrigerant and the source tank valve is open.
3. Verify the source tank and the tank is positioned to supply liquid refrigerant to the low-side service hose. Disposable tanks should be inverted. Attach the low-side service hose to the liquid port on a refillable tank.

**NOTE:** The recover solenoid (S11) is controlled to maintain a maximum of 2.5 bar (35 psi) in the accumulator.

4. Monitor accumulator pressure. If reading is low, check for restriction upstream of the accumulator. If pressure is normal, check compressor oil return solenoid (S13).
5. Check the recover (S11), compressor oil return (S13) and oil drain (S8) solenoids for bleed-through. Repair as needed.
6. Check the compressor for suction and discharge performance. Refer to the *Compressor Testing* procedure in this section.
7. Remove the filter and inspect all fittings and gaskets to verify that no obstructions exist. Replace/repair gaskets as needed and reinstall filter.
8. Verify the scale is calibrated and free to move.

## Stuck In Clearing

**NOTE:** The recover process begins with low-side clearing. Low-side clearing activates the compressor only and runs until the accumulator transducer reads -0.45 bar (13 in HG) plus 15 seconds. The unit will then go into the first stage of recovery. There is no high-side clearing in these units. If a unit gets stuck in the clearing process, use the following procedure to troubleshoot this condition.

1. Attach a calibrated gauge to the accumulator test port on the side of the manifold.
2. Disconnect the fan by unplugging it at the power board. Do this with the machine disconnected from its power source.
3. Turn on the display pressures feature ("display title info" available in maintenance menu) so the transducer readings are displayed on the screen while operating the machine.
4. Verify the problem by attempting to recover the hoses or a test tank.

**NOTE:** There must be pressure in the unit to verify stuck in clearing.

5. Verify the transducers are the correct pressure rating and wired correctly.
6. Verify all lines going to and from the compressor are tight and leak free. Retest if any loose/leaking lines are found.
7. Close the valve on the source tank if attached and valve is open, and retest. If the unit completes clearing, replace the recover solenoid and retest.
8. Verify the accumulator test gauge and transducer readings match. If the test gauge shows the vacuum level in the accumulator is below the minimum level and the transducer reading doesn't match (the accumulator transducer reading and the calibrated test gauge reading should match), replace the accumulator transducer and retest.
9. Check Tank Liquid solenoid (S7) for debris.
10. Verify the oil drain solenoid isn't leaking the vacuum. Place a finger over the end of the oil drain tube and check for suction. If a suction is detected, replace the oil drain solenoid. Retest.

11. Disconnect the manifold end of the compressor oil return line and check for pressure coming from the manifold (with compressor running). If pressure is detected at the compressor oil return line connection on the manifold, replace the compressor oil return solenoid. Retest.
12. Verify the accumulator/oil separator bowl is tight. Tighten and retest if loose.
13. Verify the compressor oil separator bowl is tight and the O-ring is installed.
  - If the compressor oil separator bowl is loose, retighten and retest.
  - If the O-ring is missing, install a new O-ring, reassemble, and retest.
14. Reinstall the compressor oil separator bowl; do not reinstall the system oil separator bowl.
15. Access the service menu and select the Output Test option.
16. Scroll to the *Compressor* and turn it on. Once the compressor is running check the compressor oil separator thread for leakage with a soapy water solution or other leak detection fluid. Remove the leaking component and verify the O-rings are in place and not cut or damaged. The O-rings and mating parts should be lubricated prior to assembly. Repair any leaks found and retest.

**NOTE:** Limit the amount of time the compressor is running, as it will be pulling in air and adding it to the ISV. Be sure to purge the air from the ISV once the machine is repaired.

17. If the unit doesn't complete clearing, test the compressor as recommended procedure. Refer to *Compressor Troubleshooting* in the Compressor section of this manual.

## Will Not Recover

**NOTE:** The compressor should be running during this test. If it does not run, refer to *Compressor troubleshooting* in the Compressor section of this manual.

1. Verify there is pressure reading on the gauges.
  - If pressure is present, the service hoses are connected correctly.
  - If pressure is absent, the service hoses are connected improperly or there is a restriction. Clear and reconnect service hoses.
2. Display the accumulator pressure (enable “display title info” in maintenance menu).
  - If there is no pressure, inspect inlet valves, recover solenoid, and check valves.
  - If pressure seems normal at the accumulator, inspect oil return solenoid (S13), and compressor.

**NOTE:** The recover solenoid (S11) is controlled to maintain a maximum of 2.5 bar (35 psi) in the accumulator.

3. Verify operation of the recover check valve. Replace as needed.
4. Check the compressor for suction and discharge performance.
5. Remove the filter and inspect all fittings and gaskets to verify that no obstructions exist. Replace/repair gaskets as needed and reinstall filter.
6. Verify the accumulator transducer is functioning properly by attaching a calibrated gauge to the service port and compare readings to those on the manual gauge. The readings should be within the specifications on the transducer ID plate.
7. Check the oil return (S13) solenoid for bleed-through and proper operation. Repair as needed.
8. Check Tank Liquid solenoid (S7) for debris.
9. If problem still exists, check the vacuum (S9) solenoid, as applicable.

**NOTE:** If the compressor fails to operate, refer to *Compressor Troubleshooting*.

## Will Not Drain Oil

1. Verify the accumulator transducer is functioning properly.
2. Is an Oil Drain Error Message displayed?
  - *Oil drain halted. Pressure error. Retry or exit?*
    - a. Verify operation of the compressor oil return solenoid (S13) (check the power board and control board).
    - b. Check there is enough pressure in the Tank.
    - c. Verify the oil drain solenoid (S8) is receiving power and opening properly.
    - d. If not receiving power, check the continuity of the wiring between solenoid and power board. Repair as needed.
    - e. If the oil drain solenoid is receiving power and is opening, verify the oil drain line isn't plugged.
    - f. If the wiring is correct and no power is being applied to the solenoid, replace the power board.
    - g. If the unit continues to drain oil for few minutes, Oil Drain Error will display. The accumulator may be filled with oil that must be drained manually.
    - h. Check the hose between oil drain solenoid (S8) and oil drain bottle is free.

**NOTE:** Determine the reason the oil separator isn't draining properly. Improper draining could be caused by a faulty component or improper operation by the user. Access the maintenance counters in the service menu. Comparing the recover cycles to the oil drain cycles may indicate user operational errors.

## Will Not Air Purge

1. Verify the air purge solenoid (S6) is receiving power and opening properly.
  - If not receiving power, check the continuity of the wiring between solenoid and power board. Repair as needed.
  - If the wiring is correct and no power is being applied to the solenoid, replace the power board.

**NOTE:** Verify the tank temperature sensor and tank pressure are functioning properly.

2. Verify temperature sensor is reading correctly.
  - The air purge function will time out after four minutes if the ISV pressure doesn't reach the calculated pressure within that time. This may indicate excessive air in the ISV that must be purged.
3. If the air doesn't purge, check the 0.028-in. orifice between the ISV and air purge solenoid (S6) for debris.
  - If the orifice is contaminated or defective, repair or replace as needed.
  - If the orifice is operating properly, proceed to the next step.
4. To test the temperature sensor, determine the ISV temperature and compare it to the temp probe reading in the air purge info screen.
5. To verify Tank pressure, perform the following:
  - Open service menu and go into **Output test** to enable the tank liquid solenoid (S7) and LS inlet solenoid (S4).
  - Compare the low-side transducer reading shown in the tool bar (enable "display title info" in maintenance menu) with the reading on the low-side panel gauge. The readings should match, assuming the low-side panel gauge is accurate.

## Will Not Evacuate (Vacuum)

**NOTE:** The vacuum pump should be running during this test. If the pump does not run, refer to *Vacuum Pump Troubleshooting* in the Vacuum Pump section of this manual.

1. Verify the service hoses are properly attached to the unit (valves open) without any restrictions.
2. Make sure the one plastic vacuum line is snug at both ends and not obstructed. Check the pneumatic fittings for leaks.
3. Check for proper vacuum oil level in the vacuum pump sight glass (oil level should be in the center of the sight glass while the pump is running). Replace vacuum pump oil if necessary.
4. Check for suction at the intake of the pump. If there is none, replace the pump.
5. Verify the vacuum solenoid (S9) is receiving power and that the low-side (S4) and high-side (S5) inlet solenoids are open.
  - If not receiving power, check continuity of the wiring between the solenoids and power board. Repair as needed.
  - If the wiring is correct and no power is being applied to the solenoid, replace the power board.
6. Check the Oil inject solenoid (S14) for bleed-through and proper operation. This can be done by checking for suction at the oil inject tube in the oil inject bottle. Remove the oil inject bottle during the vacuum process and check for suction at oil inject tube or watch for oil movement in the tube towards the manifold. Repair as needed.
7. Verify the low-side pressure transducer is functioning properly.

## Vacuum Pump Not Running

1. Check gauges for vacuum.
2. If pressure is over 690 mBar (10 psi), clear hoses. If unit won't maintain vacuum, check the following for leakage:
  - Tank Liquid solenoid (S7).
  - Hose couplers.
  - Hoses.
  - Gauge tubing.
  - Suction side vacuum hoses and connections.
3. If there is no pressure on gauges and display says Pressure Exists, enter the service menu and verify low-side inlet transducer reading. If it is reading pressure where none exists, replace transducer. If replacing the transducer doesn't correct the reading, replace the power board.
4. Refer to *Vacuum Pump Does Not Run* in electrical troubleshooting.

## Fails Leak Test

**NOTE:** To ensure an accurate leak test, it is imperative that a thorough recovery and evacuation of the system be performed. During the recovery process, cold spots can develop in an automotive system. Pockets of refrigerant in desiccant and in system oil will continue to vaporize as the A/C system temperature equalizes toward ambient. As this occurs, A/C system pressure will increase, which may be interpreted by the unit as a leak. This will vary somewhat with ambient temperature conditions.

1. Verify the service hoses are properly attached to the unit (valves open) without any restrictions.
2. If vacuum can not be maintained, using Service Leak Check in the service menu, pressurize the unit and use a leak detector to check all hoses, fittings, and components for leaks. Repair as needed.
3. Check the oil inject (S14), tank Liquid (S7) and vacuum (S9) solenoids for bleed-through. Repair as needed.

**NOTE:** A leaking tank liquid solenoid (S7) may be identified by an internal pressure rise above zero. A leaking vacuum (S9) or oil inject (S14) solenoid would not normally rise above zero.

4. Verify the low-side pressure transducer is functioning properly. Enter service menu and verify low-side inlet transducer reading.
  - Compare the low-side transducer reading shown in the service menu with the reading on the low-side panel gauge. The readings should match, assuming the low-side panel gauge is accurate.
  - If the low-side inlet transducer is reading pressure while the system is in a vacuum, replace the transducer. Verify the replacement transducer reads zero at atmosphere by plugging it into the wiring harness prior to installation.
  - If replacing the transducer doesn't correct the reading, replace control board.

## Will Not Inject Oil

1. Verify the oil injection bottle is securely attached and contains an appropriate amount of oil.
2. Verify a vacuum has been pulled on the system.
3. Verify the high-side service hose is properly attached to the unit without any restrictions and coupler valve is open.
4. Open service menu and go into **Output test** to activate the oil inject solenoid (S14) and HS inlet solenoid (S5).
5. Verify power to the oil inject solenoid (S14) and HS inlet solenoid (S5).
6. Verify the solenoid coil is opening the solenoid properly.
  - With the system pulled into a vacuum, remove the oil bottle, place a finger over the end of the oil inject tube and activate the oil inject solenoid. Suction should be felt at the oil inject tube.
  - If no suction is felt, the oil inject solenoid may not be receiving power. Check the continuity of the wiring between solenoid and power board. Repair as needed.
  - If the wiring is correct and no power is being applied to the solenoid, replace the power board.
7. Verify operation of the oil inject check valve. Replace as needed.

## Will Not Charge

**NOTE:** There is no component that pumps refrigerant into a system during the charge process. The refrigerant flows due to a pressure differential. If the system is not in a vacuum, unit will not charge.

1. Verify the service hoses are properly attached to the unit without any restrictions and coupler valves are open.
2. Verify a deep vacuum has been pulled on the system being charged.
3. Check that all ISV hoses are properly installed and check Tank Liquid solenoid (S7) for debris.
4. Verify the scale has been calibrated.
5. INSUFFICIENT REFRIG AVAILABLE will be displayed if the weight entered leaves less than 1.0 kg of refrigerant in the internal tank after charge. If there is enough refrigerant in the tank, check scale calibration and recalibrate if necessary.
6. Verify the low-side inlet (S4), high-side inlet (S5) and tank liquid (S7) solenoids are receiving power and opening properly.
  - If not receiving power, check the continuity of the wiring between solenoid and power board. Repair as needed.
  - If the wiring is correct and no power is being applied to the solenoid, replace the power board.

**NOTE:** If the unit does not complete a full charge, the compressor is switched on and off to build tank pressure.

## Slow Charge

When the charge has slowed, the unit will enter the power charge process to build tank pressure and temperature. It will attempt to power charge three times before displaying:

Charge Stalled.

**Retry, ESC**, or select **Charge** icon to use vehicle A/C system to complete charge.

1. Check and ensure there is a good vacuum in the vehicle being tested.
2. Verify sufficient pressure in the ISV to transfer refrigerant.

**NOTE:** During the charge process, there must be a transfer of at least 23 g (0.05 lb) of refrigerant within 30 seconds. If not, the compressor is switched on and off to build tank pressure. This process may be repeated twice.

3. Ensure chargeable weight is greater than desired charge.
4. Verify the charge couplers are completely open and the vehicle ports are actuated.
5. Check for debris in any of the charging circuit solenoids. Clean or replace if necessary.
6. If slow charge persists, there may be a pin hole leak in the ISV dip tube. Substitute a known good ISV tank.

## Will Not Hose Flush

Flushing the hoses is required if the next vehicle to be serviced contains a different type of A/C system oil than the previous vehicle serviced.

1. Verify the service hoses are properly attached to the unit storage ports without any restrictions and coupler valves are open.
2. Check Tank Liquid solenoid (S7) for debris and tank hoses are properly connected to the ISV.
3. If there is no pressure on the gauges, refer to the *Will Not Charge* troubleshooting procedures earlier in this section.
4. If the pressure does not clear on the gauges, refer to the *Will Not Recover* troubleshooting procedures earlier in this section.

## Will Not Print (only for variants with printer)

1. Does the printer have power?
2. Does the printer have paper? Verify the paper is installed correctly in the printer. The paper should be rolling off the back of the roll.
3. If the machine is operating in direct sunlight, move it or cover the face of the printer and try again.

### Printer Has Power

If the printer has power, check the continuity of the printer harness between the printer and the control board (P15).

- If harness tests good, replace the printer assembly and retest. If the harness test fails, replace printer harness.
- Check the output of the power supply at PSJ2. If there is 12 VDC at PSJ2, check the power input to the control board at CBP19.
- If printer still does not print, replace the control board.

### Printer Does Not Have Power

Verify the printer is receiving power at harness connector. Test for +5 VDC across the RED (pin 1) or YELLOW (pin 2), and BLACK (pins 3 & 4) wires.

- If voltage is present, replace the printer assembly and retest. If not, check for printer power at CBP15.
- The control board receives power from the power board PBP2, through connector P19. If the control board is not receiving power, the printer will not function.
- If printer power is present at CBP15, check for continuity of the printer harness. Repair or replace if necessary. If printer power is not present at CBP15, replace the control board.

### Replace the Printer Paper

1. Pull the cover open by inserting a finger into the pocket in the cover and pull.
2. Remove the paper core.
3. Install the new roll of paper with the end of the paper at the top of the roll, unrolling from the back.
4. Feed the paper out the top of the opening, and close cover.

## Power Board Troubleshooting

1. Possible reasons to replace the power board:
  - No power to any components.
  - A solenoid won't open.
  - Compressor and fan won't start.
  - Vacuum pump won't start.
  - A function does not start or finish a process.
2. Do not replace the power board for these issues:
  - Display has lines, missing characters, etc.
  - Repeated read errors.
  - Repeated communication errors.
  - Display is blank at power up, contrast can't be adjusted, and power has been verified.

The best way to troubleshoot is to go into the diagnostic menu:

- If you are able to switch a solenoid or relay on and off, the output portion of the board is likely okay.
- If the fan, compressor, or vacuum pump is selected it should receive power.

Pressures can be verified with a gauge at the accumulator port, low-side hose, and by accessing the tank. The tank pressure transducer can be checked by charging a hose and comparing to the low-side transducer or the gauges. They should be reasonably close initially, but the gauge or low-side reading should drop quickly if the tank is warm.

## Control Board Troubleshooting

1. Possible reasons to replace control board:
  - Repeated read errors.
  - Repeated Communication errors.
  - Keys don't read (after verifying keypad).

**NOTE:** Before reflashing, make sure the unit has the latest software version installed. If the software version is current. Do not reflash controller if updating the software solves the problems, unless a TSB indicates reflashing is needed (refer to "Replacement Control Board" in the Electrical section).

2. Do not replace the control board for these issues:
  - A solenoid will not open.
  - A motor won't start.
  - Scale is out of calibration, (overcharge/ undercharge etc).
  - The display is dim or dark (unless it can not be adjusted).
  - A pressure reading is wrong.
  - High pressure, air purge time out, etc.
  - A function doesn't start or complete (Recovery, Charge Tank Fill etc).

## Compressor Troubleshooting

1. Check for proper power source and electrical connectors for damage or corrosion.
2. Clear service hoses and remove them.
3. Disconnect unit from the power source.
4. Remove the front plastic cover.
5. Connect the unit directly to a known good power source. Do not use an extension cord.
6. Check for 230 VAC to the compressor.
  - If there is no voltage to the compressor's start components, proceed to the next step.
  - If voltage is present at the compressor, replace the compressor thermal protector and start relay assembly. If compressor runs, verify the compressor amp draw is within specs. If the compressor doesn't run and/or is drawing locked rotor amps, replace the compressor.

**CAUTION: If using the output step test to run compressor, the oil return solenoid must be open before the compressor is started.**

7. Check for 230 VAC from the power board on connector P6, pins 1 and 2.
  - When checking voltage to the compressor, it is normal to read a low voltage at the connector when it's disconnected and the power to the compressor is off.
  - If voltage is present, check wiring between the power board and the compressor start components. Repair as needed.
  - If voltage is not present, replace the power board.
8. Perform functional check.

### Compressor Testing Procedure

1. Disconnect unit from the power source.
2. Remove all three lines attached to the compressor.
3. Unscrew the screws and remove the compressor.
4. Cap off the compressor oil return port.
5. Connect a manifold set to the compressor, high side to the compressor discharge and the low side to the suction port. Remove hose from center port of manifold.
6. Close both valves on the manifold.
7. Connect the unit to the power source.

8. Enter the service menu, scroll to the Output test and select the Compressor test.

ss00649

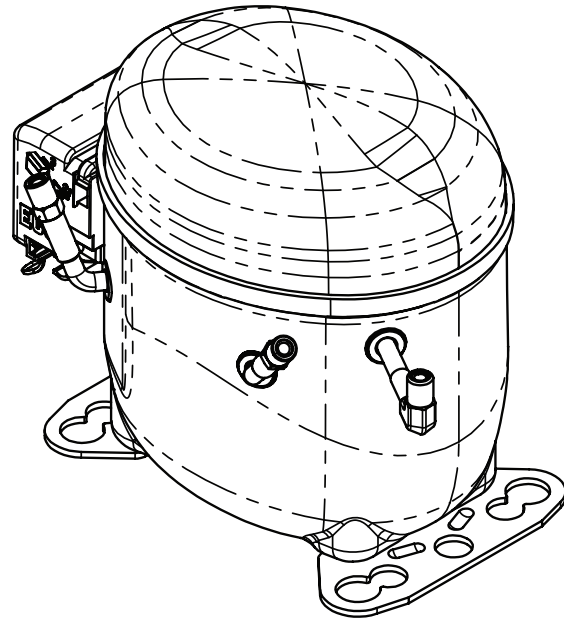


Figure 2-1. Compressor Assembly

9. Start the compressor.
10. The first time the compressor is tested, the gauges may read approximately 7 bar (100 psi) and 540 mBar (16 in-Hg).
11. Turn off the compressor and release pressure from manifold.

### Testing the Compressor a Second Time

**NOTE:** Studies have shown the first test may give false compressor values due to embedded refrigerant in the oil.

1. Close the valves on the manifold and start the compressor.
2. A good compressor will produce 25 bar (363 psi).
3. Release all pressure and vacuum from the manifold set, close both valves and repeat the test a third time to verify readings.
4. If the suction or discharge of the compressor is under specifications, replace the compressor.
5. Restore all the components as original.
6. Reinstall the front plastic cover.

## Vacuum Pump Troubleshooting

1. Check gauges for vacuum.
2. If pressure is over 0.7 bar (10 psi), recover hoses.
3. If unit won't maintain vacuum, check tank liquid solenoid (S7), hoses, couplers, gauges, and other related components, for leakage.
4. If there is no pressure on the gauges and the display says Pressure Exists, enter the Service Menu and verify low-side inlet transducer reading. If it is reading pressure where none exists, replace transducer. If replacing the transducer doesn't correct the reading, replace the control board.
5. If the Vacuum Pump is not running or appears to be running poorly, refer to Vacuum Pump Does Not Run.

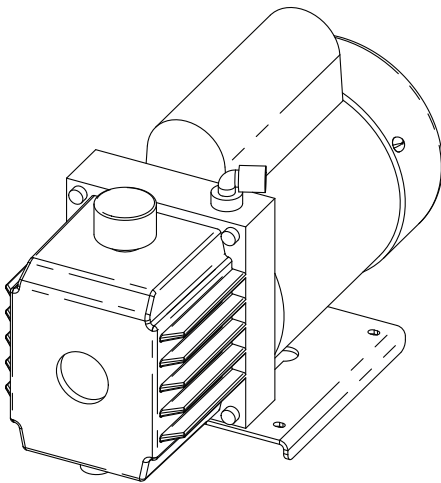


Figure 2-2. Vacuum Pump Assembly

## Vacuum Pump Does Not Run

1. Check for proper power source and electrical connectors for damage or corrosion. Replace or repair as required.
  2. Clear service hoses.
  3. Disconnect unit from the power source.
  4. Remove the front plastic cover.
  5. Connect the unit power cable directly to the power source. Do not use an extension cord.
  6. Check for 230 V at the vacuum pump connector, pins 2 and 3.
    - If voltage is present, replace vacuum pump assembly.
    - If voltage is not present, continue to next step.
- NOTE:** When checking voltage to the vacuum pump it is normal to read low voltage at the connector when it's disconnected and the power to the vacuum pump is off.
7. Check for 230 V from the power board on connector P6 pins 3 and 4.
    - If voltage is present, check wiring between the power board and the vacuum pump. Repair as needed.
  8. Perform functional check.
  9. Reinstall the front plastic cover.

## ERROR MESSAGES

PROCEDURE	ERROR/WARNING	DESCRIPTION OF ERROR/WARNING
Calibrate Load Cells	Calibration failed! Slope is out of range.	Difference between upper and lower limits is too great. Select <b>RETRY</b> or <b>ESC</b> icon
Calibrate Load Cells	Calibration failed! Verification weight X. XXXYY.	Weight too high or low. Select <b>RETRY</b> or <b>ESC</b> icon.
Calibration Check	Calibration failed.	Select <b>RETRY</b> icon to return to the beginning of the calibration check, or <b>ESC</b> icon to return to the service menu.
Charge	Insufficient vacuum for charge.	System vacuum too low to draw in enough refrigerant. Select <b>AUTOMATIC</b> , <b>RETRY</b> or <b>ESC</b> icon.
Charge	Insufficient refrigerant available for charge.	Refrigerant in ISV too low. Select <b>ESC</b> icon. May require tank fill.
Charge Leak Test	Leak test failed!	Check for leaks and retest. Select <b>ESC</b> icon.
Drain Oil	Oil drain halted. Pressure error.	Pressure insufficient to push oil out of separator. Select <b>RETRY</b> or <b>ESC</b> icon.
Drain Oil	Oil drain halted. Flow error.	Oil drain timed out. Select <b>RETRY</b> or <b>ESC</b> icon.
Enter Password	Invalid password!	Password entered is incorrect. Verify function password is correct. Select <b>RETRY</b> or <b>ESC</b> icon.
Fast Charge	Charge stalled! Check connections and valves. XX.XXXYY of XX.XXXYY charged.	Check panel valve position and couplers. Select <b>RETRY</b> or <b>ESC</b> icon.
Filter Change	Invalid serial number!	Filter serial number must be different from any other filter serial number previously installed. Select <b>RETRY</b> or <b>ESC</b> icon.
Filter Change	Serial number has already been used.	Filter serial number must be different from any other filter serial number previously installed. Select <b>RETRY</b> or <b>ESC</b> icon.
Helium Leak Test	Transducer error.	For production only. Exit test.
Leak Check	Pressure test failed. Check for leaks.	Locate and repair any leaks. Select <b>RETRY</b> or <b>ESC</b> icon.
Leak Check	Vacuum test failed. Check for leaks.	Locate and repair any leaks. Select <b>RETRY</b> or <b>ESC</b> icon.

PROCEDURE	ERROR/WARNING	DESCRIPTION OF ERROR/WARNING
Oil Inject	Oil inject error. Inject: XXXYY	<ol style="list-style-type: none"> <li>1. Check if enough oil is present in oil bottle.</li> <li>2. Check for oil inject tube kinks or cuts.</li> <li>3. Check for oil inject solenoid failure.</li> <li>4. Check for Oil inject stuck check valve.</li> </ol>
Recover	No pressure on inlets. Recover Anyway?	Select <b>OK</b> (Yes) or <b>ESC</b> icon (No).
Service Vacuum	Vacuum halted! The inlet pressure is too high for vacuum.	Select <b>RETRY</b> or <b>ESC</b> icon.
Set Tank Tare	Invalid entry. Must be between XXYY and XXYY.	Tank tare range is either too low or too high. Select <b>Retry</b> to re-enter tank tare value or <b>ESC</b> icon.
Slow Charge	Charge stalled! Check connections and valves. XX.XXXYY of XX.XXXYY charged.	Check panel valve position and couplers. Select <b>RETRY</b> or <b>ESC</b> icon.
Startup	System Fault. RTC Fault.	System missing date/time information. Select <b>ESC</b> icon to run RTC routine.
System Flush	Insufficient refrigerant. 6.00 kg required for system flush.	Select <b>ESC</b> icon, then perform tank fill.
System Flush	Pressure too high for flush. System must be recovered.	Select <b>ESC</b> icon, then perform recovery.
Tank Fill	Source tank is empty. Filled: XX.XXYY.	Source tank emptied during the tank fill process. Connect new source tank, then select <b>RETRY</b> or <b>ESC</b> icon.
Vacuum	The inlet pressure is too high for vacuum. Recover or Cancel.	Run a recovery by selecting <b>Recover</b> or <b>ESC</b> icon to quit.
Vacuum	Vacuum Halted! The inlet pressure is too high for vacuum.	Select <b>RETRY</b> or <b>ESC</b> icon.
Vacuum Test	Test failed!	Select <b>RETRY</b> or <b>ESC</b> icon.
RPM Calibration	Air Flow Calibration Error (for R1234yf only)	Error that appears when the difference between speed fan on and speed fan off is less than 200 RPM. Select <b>Retry</b> or <b>ESC</b> icon.
All Procedure	High pressure switch activated	The machine is locked because the pressure inside the tank is too high, maybe because of the excessively high temperature of the tank.

**Error messages for refrigerant identifier (if available)**

PROCEDURE	ERROR/WARNING	DESCRIPTION OF ERROR/WARNING
Refrigerant Identification	Identifier Unstable Reading Error 1	Possible reasons: 1. Sampling path problem: <ul style="list-style-type: none"> <li>• Brass filter clogged and/or sample hose clogged.</li> <li>• Sample hose is broken, cracked or punctured.</li> <li>• Sample hose is disconnected.</li> </ul> 2. Identifier internal piping problem: <ul style="list-style-type: none"> <li>• One or more tubes are disconnected.</li> <li>• One or more tubes are broken, cracked or punctured.</li> <li>• One or more tubes are clogged.</li> </ul> 3. Identifier white paper filter defective: <ul style="list-style-type: none"> <li>• White paper filter is broken.</li> <li>• White paper filter is clogged.</li> <li>• White paper filter is disconnected.</li> </ul> 4. Identifier air intake or air exhaust clogged.                     5. Identifier solenoid leaking during calibration.
Refrigerant Identification	Identifier Unstable Reading Error 2	Possible reasons: 1. Sampling path problem: <ul style="list-style-type: none"> <li>• Brass filter clogged and/or sample hose clogged.</li> <li>• Sample hose is broken, cracked or punctured.</li> <li>• Sample hose is disconnected.</li> </ul> 2. Identifier internal piping problem: <ul style="list-style-type: none"> <li>• One or more tubes are disconnected.</li> <li>• One or more tubes are broken, cracked or punctured.</li> <li>• One or more tubes are clogged.</li> </ul> 3. Identifier white paper filter defective: <ul style="list-style-type: none"> <li>• White paper filter is broken.</li> <li>• White paper filter is clogged.</li> <li>• White paper filter is disconnected.</li> </ul> 4. Identifier solenoid issue during analysis: <ul style="list-style-type: none"> <li>• Identifier solenoid is clogged.</li> <li>• Identifier solenoid cable is defective.</li> <li>• Identifier solenoid power board issue.</li> </ul>

PROCEDURE	ERROR/WARNING	DESCRIPTION OF ERROR/WARNING
Refrigerant Identification	Identifier Unstable Reading Error 3	Possible reason: 1. Radio transmitters and arc welders.
Refrigerant Identification	Identifier Air Calibration Error	Possible reasons: 1. Sampling path problem: <ul style="list-style-type: none"> <li>• Brass filter clogged and/or sample hose clogged.</li> <li>• Sample hose is broken, cracked or punctured.</li> <li>• Sample hose is disconnected.</li> </ul> 2. Identifier internal piping problem: <ul style="list-style-type: none"> <li>• One or more tubes are disconnected.</li> <li>• One or more tubes are broken, cracked or punctured.</li> <li>• One or more tubes are clogged.</li> </ul> 3. Identifier white paper filter defective: <ul style="list-style-type: none"> <li>• White paper filter is broken.</li> <li>• White paper filter is clogged.</li> <li>• White paper filter is disconnected.</li> </ul> 4. Identifier air intake or air exhaust clogged.
Refrigerant Identification	Identifier Refrigerant Flow Error	Possible reasons: 1. Sampling path problem: <ul style="list-style-type: none"> <li>• Brass filter clogged and/or sample hose clogged.</li> <li>• Sample hose is broken, cracked or punctured.</li> <li>• Sample hose is disconnected.</li> </ul> 2. Identifier internal piping problem: <ul style="list-style-type: none"> <li>• One or more tubes are disconnected.</li> <li>• One or more tubes are broken, cracked or punctured.</li> <li>• One or more tubes are clogged.</li> </ul> 3. Identifier white paper filter defective: <ul style="list-style-type: none"> <li>• White paper filter is broken.</li> <li>• White paper filter is clogged.</li> <li>• White paper filter is disconnected.</li> </ul> 4. Identifier solenoid issue during analysis: <ul style="list-style-type: none"> <li>• Identifier solenoid is clogged.</li> <li>• Identifier solenoid cable is defective.</li> <li>• Identifier solenoid power board issue.</li> </ul>

PROCEDURE	ERROR/WARNING	DESCRIPTION OF ERROR/WARNING
Refrigerant Identification	Identifier Temperature Out of Range	Possible reasons: 1. Ambient temperature below 10 °C. 2. Ambient temperature above 50 °C.
Refrigerant Identification	Identifier Pressure Out of Range	Possible reason: 1. Identifier air exhaust clogged.
Refrigerant Identification	Identifier Factory Calibration Expired	Possible reason: 1. Refrigerant identifier analysis parameters calibration expired.
Refrigerant Identification	Identifier Communication Error	Possible reasons: 1. Identifier power supply chain issue: <ul style="list-style-type: none"> <li>• Identifier internal power supply issue.</li> <li>• Identifier power supply cable issue.</li> <li>• Power supply output for Identifier issue.</li> </ul> 2. Identifier communication chain issue: <ul style="list-style-type: none"> <li>• Identifier USB cable issue.</li> <li>• Identifier internal USB port issue.</li> <li>• Control board USB port issue.</li> </ul>
Refrigerant Identification	Identifier IR Emitter Error	Possible reason: 1. Identifier internal IR sensor defective.

# ELECTRICAL SYSTEM OPERATION AND REPAIR

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## ELECTRICAL SYSTEM OPERATION

The electrical system provides the various voltage levels required for the machine to operate effectively. The power board, power supply, and control board work together to condition the input voltage by removing voltage spikes and noise, transforming the input voltage to 12 VDC (power supply) for operating relays and voltage regulators (power board), to power the unit cooling fan, engage the compressor and vacuum pump when required. Inputs from the sensors and transducers are processed (control board), to ultimately power the manifold solenoids (power board) for recovering and recharging vehicle A/C systems.

### Power Board and Power Supply Operation

The Power Board is shown in Figure 3-1. The Power Supply is shown in Figure 3-2. Refer to these figures as needed.

### Power Board Connector Assignments

See Figure 3-1, Power Board for connector locations:

J1: Control Board J1

P1: Power Supply J2

P2: Control Board P19

P3: AC Input

P4: Power Supply J1

P6: Vacuum Pump, Compressor

P7: High-Pressure Switch

P8: Solenoids S4-1, S4-2, S5-1, S5-2, S6, S7, S8, S9, S11, S13, S14 and Fan.

The Power Board (PB) receives AC voltage at PBP3 from the power switch to PBP3 pins:

- Pin 1 – Unit ground
- Pin 2 – AC low
- Pin 3 – AC high

The input voltage is immediately applied to the Power Supply (PS) through PBP4 and the interconnecting cable to PSJ1. The output of the power supply is 12 V  $\pm$  0.1 VDC. This is the main system control voltage and used throughout the unit for its various functions through PSJ2 to PBP1 and Control Board (CB) receives 12 VDC from power board PBP2 through an interconnecting cable to CBP19 (See Control Board Functions). Relay K3 is used to couple the 12 V output from the power supply to the power board through PBP1.

Input AC voltage within the power board is also routed to relays K3 and K4. Relay functions are:

- K3 – Compressor
- K4 – Vacuum Pump

Power for the vacuum pump, and compressor is routed to those units through PBP5 and PBP6 and wiring harnesses.

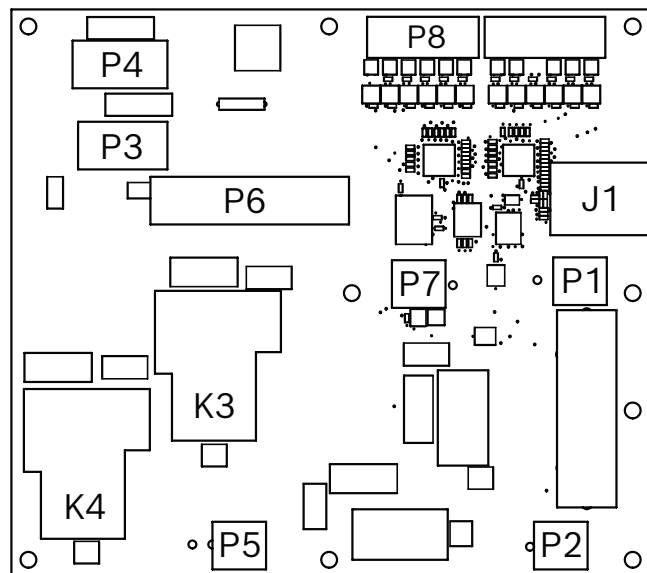


Figure 3-1. Power Board

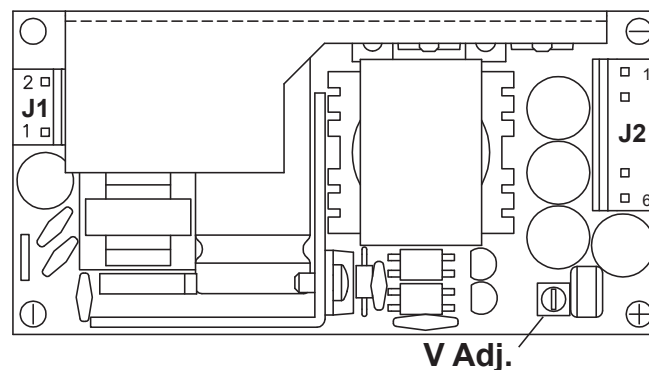


Figure 3-2. 12 VDC Power Supply

## Control Board Operation

The Control Board, Figure 3-3, is mounted in the control panel and provides the control for the entire operation of the unit based upon the signals from sensors, transducers, and manual operator inputs via the keyboard.

## Control Board Connector Assignments

See Figure 3-3 for connector locations.

J1: Power Board J1

P1: Air Flow Sensor (disabled on R134a)

P6: Accumulator Pressure Transducer, Low-Side Pressure Transducer and ISV Tank Temperature Sensor.

P8: Scale Assembly

P13: USB Port

P15: Printer Power (if present)

P17: Keypad

P18: Printer Data (if present)

P19: 12 VDC from Power Board P2

The Control Board (CB) receives power from the Power Board PBP2 to CBP19. This voltage is used to power the sensor circuits, processors, and is provided as an output signal to the Power Board to energize manifold solenoids, and the compressor and vacuum pump relays.

Three regulated power supplies of 8 VDC, 5 VDC, and 3.3 VDC provide the power for the logic and data circuitry. A fourth regulated power source supplies voltage to the optional printer.

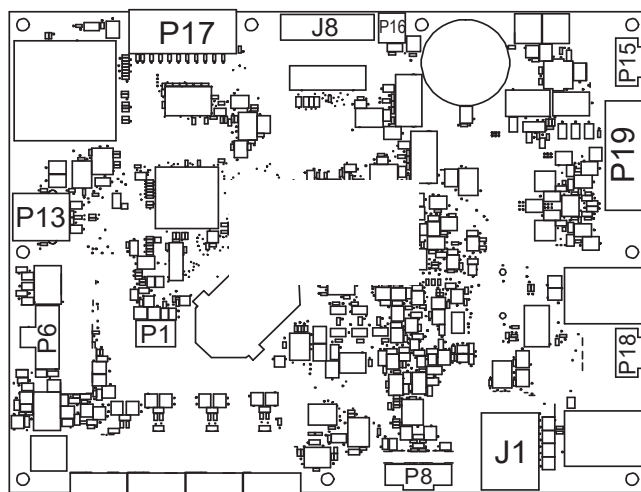


Figure 3-3. Control Board

## Control Board Functions

1. Reads Keypad
  - If a key does not respond, it's most likely that:
    1. it isn't supposed to respond at that time
    2. the keypad is faulty (replace keypad)
3. Operates Display
  - The display contrast changes with temperature and light conditions.
  - Always try to adjust the contrast before replacing the control board (Up/Down Arrows).
  - After adjustment, if there are missing segments, characters, etc., in the lines of the display, replacement is required.
4. Contains Programming
  - Normally, if a unit runs at all, the program and the control board are okay. Reflashing does nothing unless a valid upgrade program is available.
5. Communicates with USB ports.
  - This occurs during software updates.
6. Contains calibration and other stored variables
  - Normally if a variable is corrupt an error will appear.
  - Never replace the control board to try to correct a reading inaccuracy.
  - If the calibration data is repeatedly corrupt and causing calibration errors or won't hold calibration, the board could be suspect.
7. Communicates with the Power Board
  - Never replace the control board to correct an input reading or output failure.
  - If any part of the program works the controller is not the problem (it will not fail to operate any one output or input).

## Sensors and Transducers

The sensors and transducers provide the input and feedback data needed to control the operation of unit.

Sensors include:

1. **Air Flow Sensor (AF):** the sensor is integrated in the fan (disabled on R134a).
2. **Scale Assembly:** weighs the refrigerant in the ISV as a baseline for determining the amount of refrigerant withdrawn from the vehicle A/C system, the amount of refrigerant added to the system, and how much refrigerant is available in the ISV for use.
3. **ISV Tank Temperature (TT):** supplies the temperature of the refrigerant stored in the ISV for adjusting fluid weight based on density.
4. **Refrigerant Identifier (ID):** identifies R1234yf refrigerant and tests refrigerant for purity (external through the USB port).

Transducers include:

1. **Low-side Pressure (LSP):** measures the pressure in the low side of the vehicle A/C system.
2. **Accumulator Pressure (AP):** measures the pressure in the oil separator to ensure proper oil separation from the refrigerant.

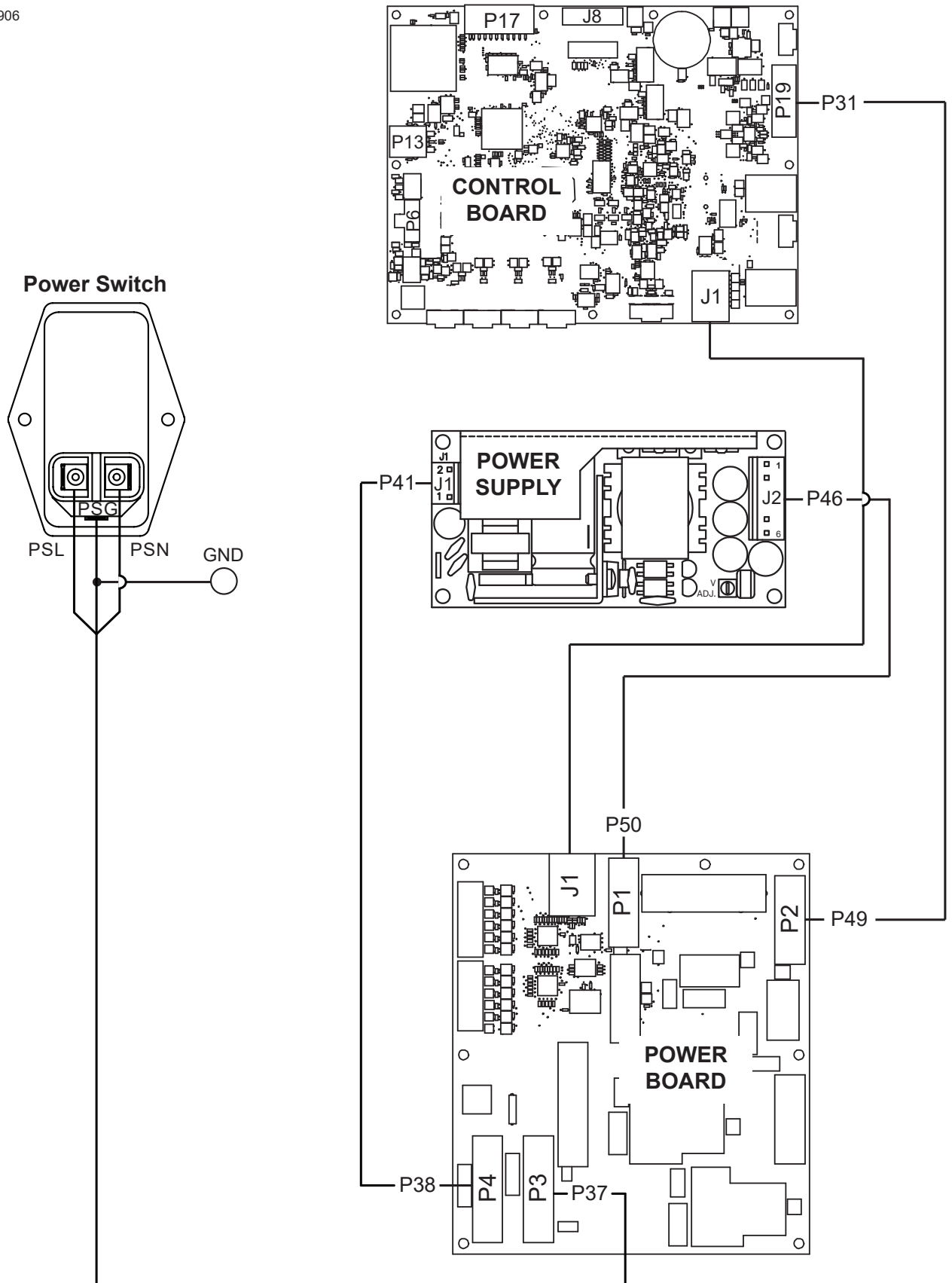
**NOTE:** The tank pressure is read by low-side pressure transducer.

## Control Board Software Updating Methods

To access the operational capability of the unit, or to provide an interface to an external computer (or network), or to update the software as required occasionally to keep the unit current. See "Firmware update" in the Setup Menu section.

Refer to Figure 3-4 (Sheets 1 through 4), for a graphical representation of the interconnection of the electrical components.

ss01906



**Figure 3-4. Electrical Connections (Sheet 1 of 4)**

ss01904

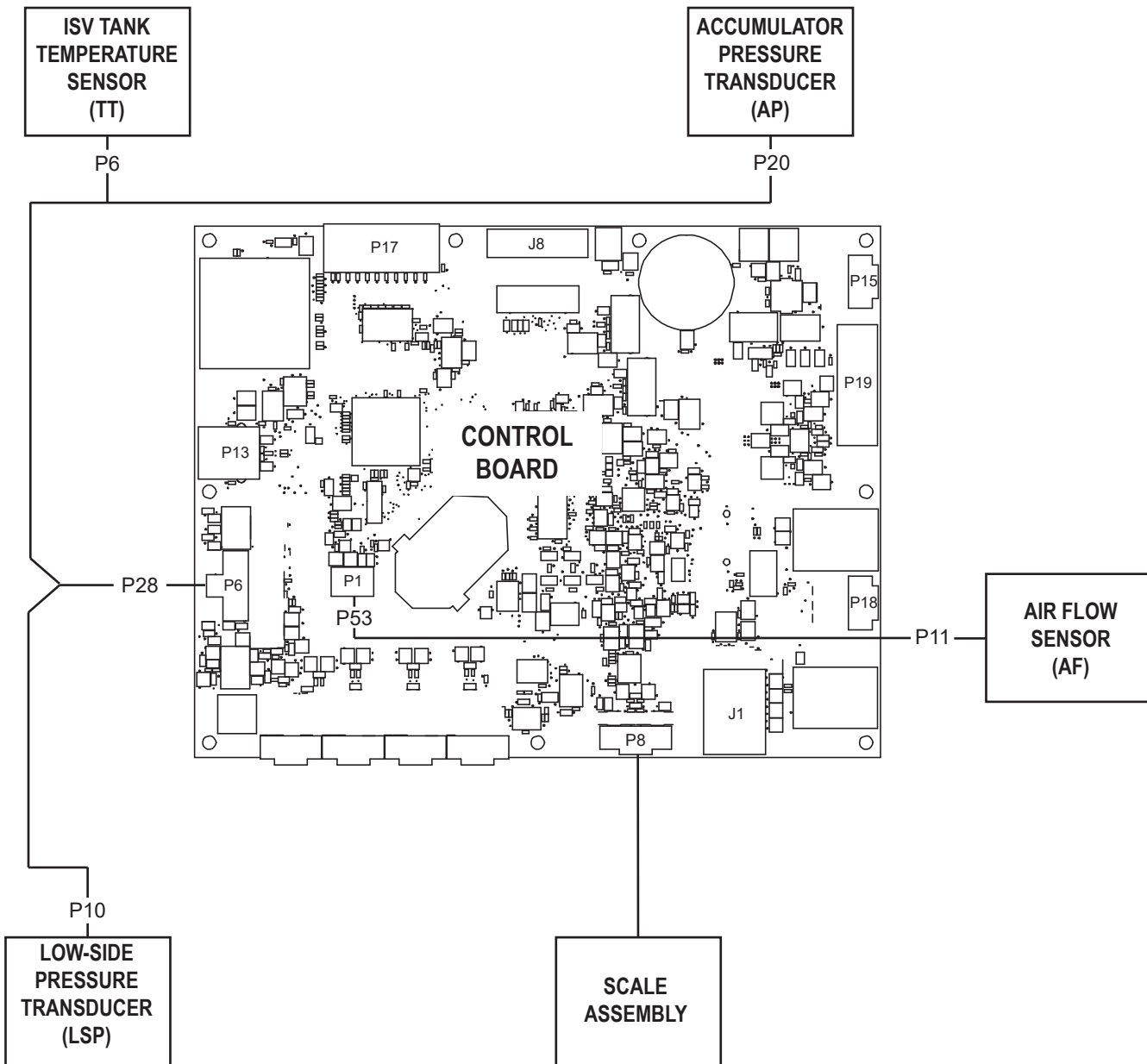
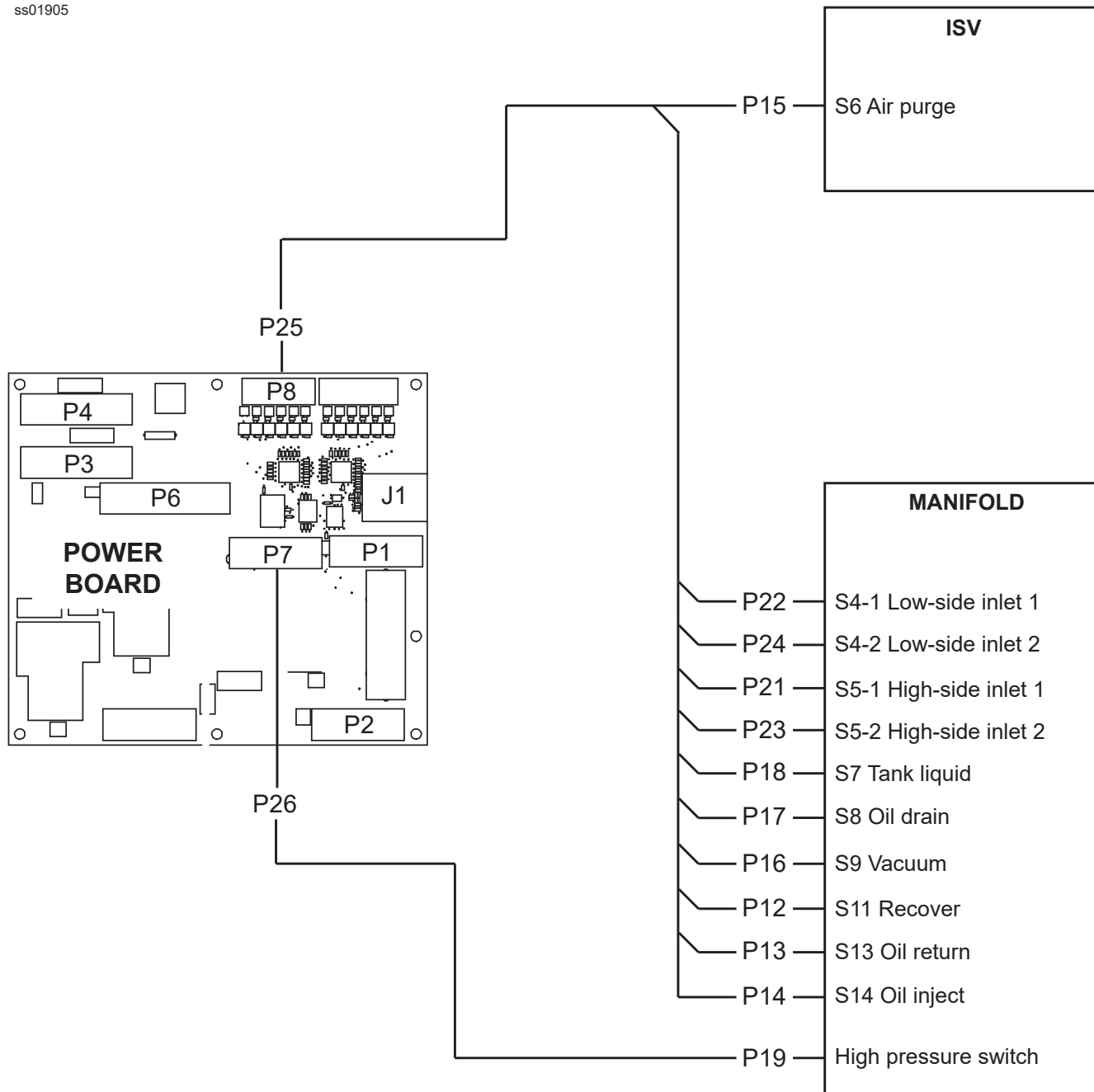


Figure 3-4. Electrical Connections (Sheet 2 of 4)

**NOTE:**

- The Air Flow Sensor (AF) is integrated in the fan.

ss01905



**Figure 3-4. Electrical Connections (Sheet 3 of 4)**

ss01907

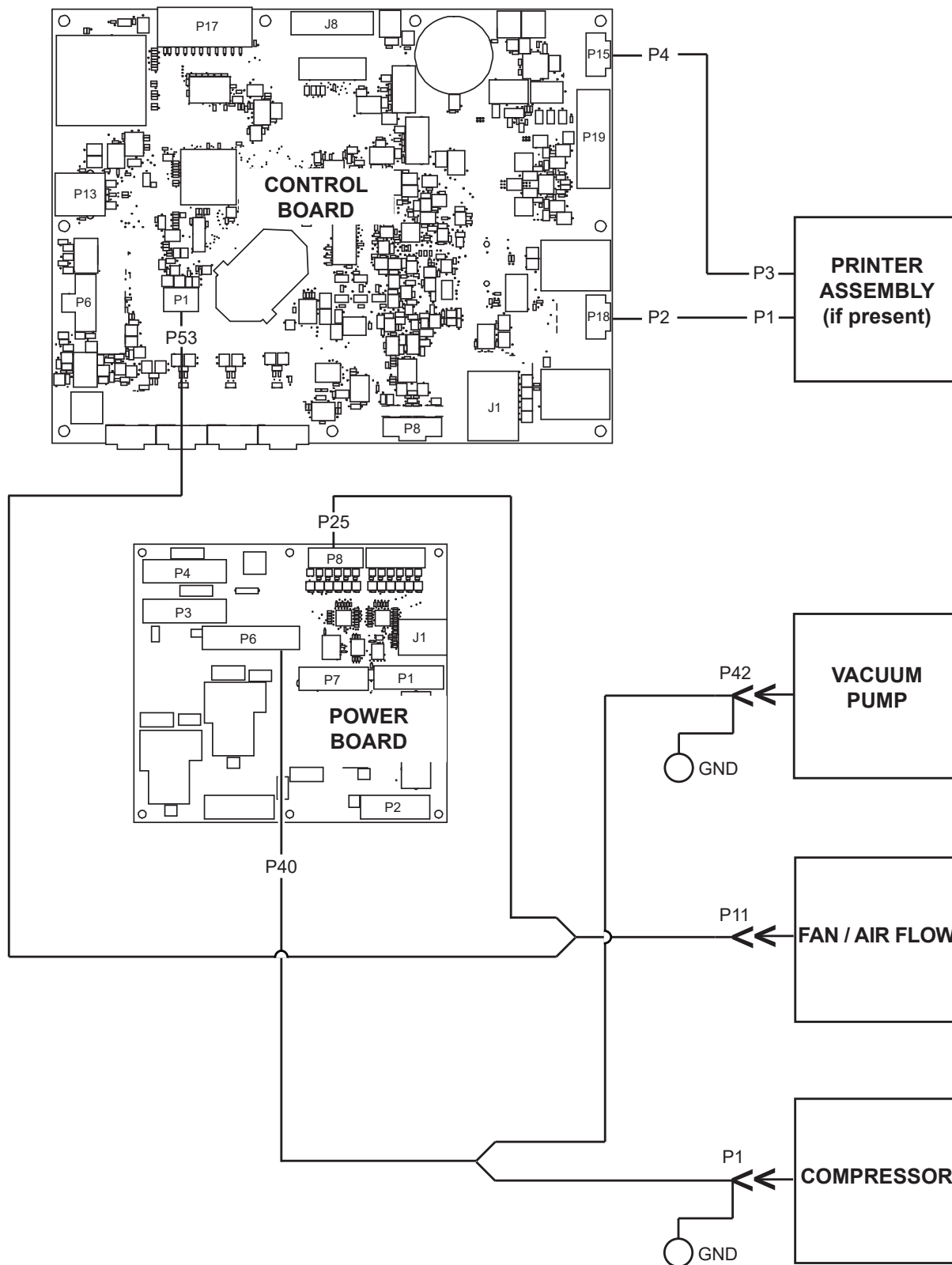


Figure 3-4. Electrical Connections (Sheet 4 of 4)

## ELECTRICAL SYSTEM REPAIR

### Replacement Power Board

**WARNING:** Disconnect the unit from the power source before beginning service work. Incorrect use or connections can cause electrical shock.

**WARNING:** Wear safety goggles when working with refrigerants. Refrigerants can cause eye injury.

**WARNING:** Use extreme caution when disconnecting hoses. Pressurized refrigerant may be present in hoses. Point hoses away from you and anyone nearby.

### Instructions

These instructions outline the basic steps to replace the power board. Refer to Figure 3-5.

### Remove Existing Power Board

1. Disconnect unit from the power source.
2. Remove the four screws under the control panel.
3. Tilt the control panel upwards the front of the unit.
4. Disconnect all wires from power board.
5. Remove screws securing power board in place and remove power board.

### Install Replacement Power Board

1. Install new power board and secure in place with screws.
2. Connect wires as shown in power board wiring diagram. See Figure 3-5.
3. Tilt the control panel down and secure with four screws.
4. Power up the unit and perform a functional test.

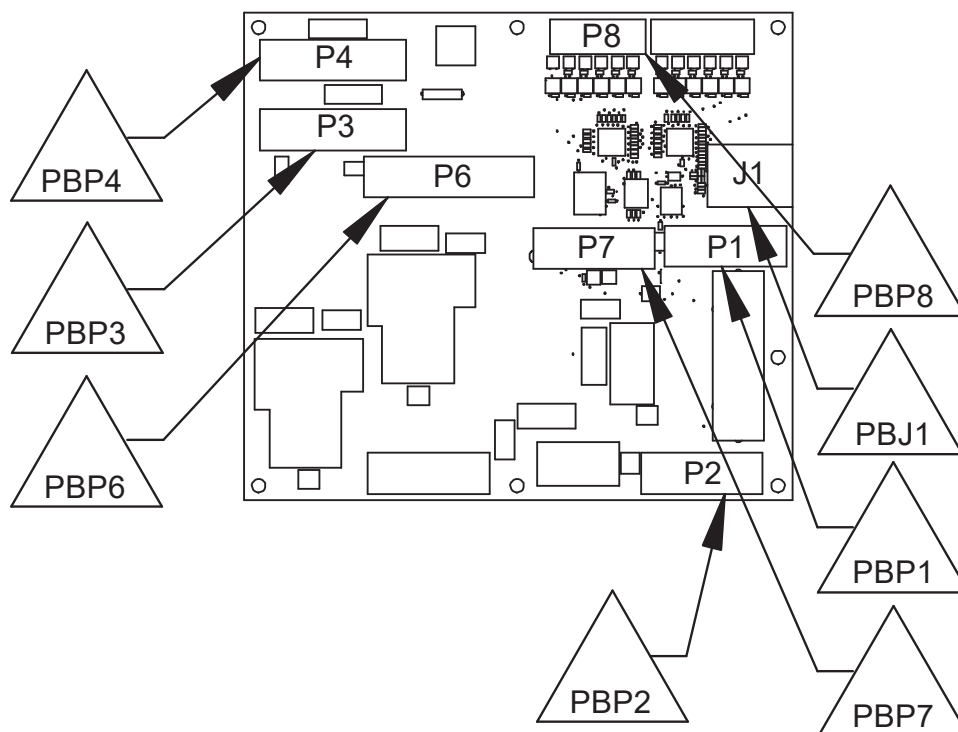


Figure 3-5. Power Board Connector Identification

## Replacement Control Board

**WARNING:** Disconnect the unit from the power source before beginning service work. Incorrect use or connections can cause electrical shock.

**WARNING:** Wear safety goggles when working with refrigerants. Refrigerants can cause eye injury.

**WARNING:** Use extreme caution when disconnecting hoses. Pressurized refrigerant may be present in hoses. Point hoses away from you and anyone nearby.

## Instructions

These instructions outline the basic steps to replace the control board. Refer to Figure 3-6.

### Remove Existing Control Board

1. Disconnect unit from the power source.
2. Remove the four screws under the control panel.
3. Tilt the control panel upwards the front of the unit.
4. Disconnect all wires from control board including keypad and display ribbon cables.
5. Remove screws securing control board in place and remove control board.

## Install Replacement Control Board

**NOTE:** All control boards are shipped from the factory without **any software on board**. Service centers must follow these installation procedures to set the board and get unit ready to use.

1. Attach the display and keypad ribbon cables to the control board.
2. Connect wires as shown in Figure 3-6.
3. Keep the original SD card and format as FAT 32.
4. Download **right service software** and unzip it into AC/ACS unit original SD card.
5. Insert original SD card with service software in new control board.
6. Tilt the control panel down and secure with four screws.
7. Download the last AC/ACS software release (take care about the model) and copy and paste in one USB dongle (previously format as FAT 32).
8. Insert USB dongle in the unit slot (see Figure 1-1 in the Introduction section).
9. Remove the front plastic cover (needed for tank calibration), then plug in power cord and switch ON.
10. Unit ask for firmware update, press **YES**.
11. Unit ask to RESET the board erasing all the data and calibrations stored, press **YES** and please wait. After that service routine starts with required settings.

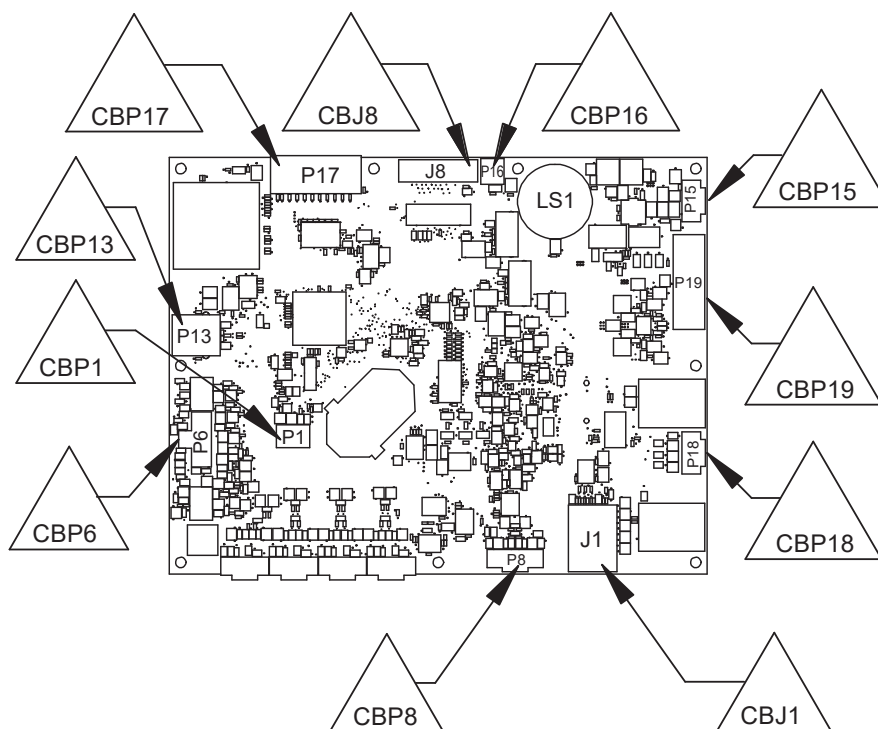


Figure 3-6. Control Board Connector Identification

12. Select **Languages** and confirm.
13. Select **AC/ACS** model (unit require the input 2 times) and confirm.
14. Set **time/date** and confirm.
15. Set **serial number** (unit require the input 2 times). Take the one in the unit data plate and confirm.
16. Perform air flow calibration (refer to Calibrate Air Flow in the Diagnostics and Testing section) and confirm (for R1234yf only).
17. Perform tank calibration (refer to ISV Load Cell Calibration in the Diagnostics and Testing section) and confirm.
18. Select **Imperial/Metric** and confirm.
19. Edit **garage data** and confirm.
20. Now unit is ready to install the last encrypted software present in the USB dongle. If the dongle is not connected/programmed and the unit don't find the software an error message will be shown on display asking to retry.
21. The encryption can take several minutes, the % progress is shown in the display.
22. When unit reboots and displays stand-by page, please switch unit off and reinstall the front plastic cover (take care to secure the tank with screws).
23. Key in the activation code again, using original serial number the activation code is still the same.
24. Now the unit is ready to use.

**NOTE:** All data input not required into procedure above are already available in the dedicated software.

## Replacement High-Pressure Cut-Out Switch



**WARNING:** Disconnect the unit from the power source before beginning service work. Incorrect use or connections can cause electrical shock.



**WARNING:** Wear safety goggles when working with refrigerants. Refrigerants can cause eye injury.



**WARNING:** Use extreme caution when disconnecting hoses. Pressurized refrigerant may be present in hoses. Point hoses away from you and anyone nearby.

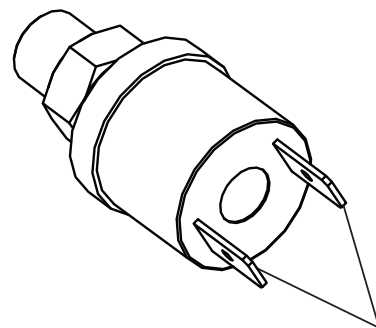
### Replacement Instructions

Follow these steps to replace the high-pressure cut-out switch on the unit. See Figure 3-7.

1. Evacuate the unit with a recovery service unit.
2. Turn off the power switch and disconnect the unit from the power source.
3. Remove the front plastic cover.
4. Remove the four screws under the control panel.
5. Tilt the control panel upwards the front of the unit.
6. Disconnect the wires from the faulty high-pressure cut-out switch.
7. Carefully remove the faulty cut-out switch.
8. Clean the fitting by wiping away dirt, grease, and oil.

**NOTE:** DO NOT apply thread sealant to any internal threads. Apply thread sealant to only the external pipe threads of the fittings.

9. Install the new high-pressure cut-out switch.
10. Connect the wires to the new switch.
11. Tilt the control panel down and secure with four screws.
12. Reinstall the front plastic cover.
13. Connect the unit to the power source.
14. Operate the unit and check for leaks.



Attach control wires to these terminals

**Figure 3-7. High-Pressure Cut-Out Switch**

## Replacement Fan / Air Flow

**WARNING:** Disconnect the unit from the power source before beginning service work. Incorrect use or connections can cause electrical shock.

**WARNING:** Wear safety goggles when working with refrigerants. Refrigerants can cause eye injury.

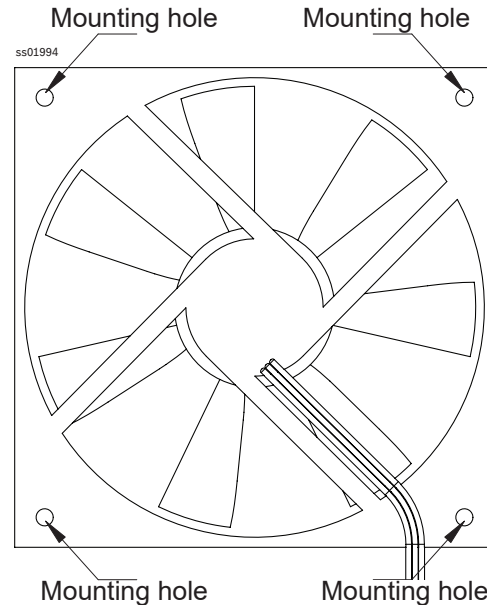
**WARNING:** Use extreme caution when disconnecting hoses. Pressurized refrigerant may be present in hoses. Point hoses away from you and anyone nearby.

### Replacement Instructions

Follow these steps to replace the fan. Refer to Figure 3-8.

1. Disconnect unit from the power source.
2. Remove the front plastic cover.
3. Remove the four screws under the control panel.
4. Tilt the control panel upwards the front of the unit.
5. Remove the compressor (Refer to "Replacement Compressor" in the Plumbing and Mechanical section).
6. Remove 4 nuts inside the frame to free the fan.
7. Note the orientation of the fan blades.
8. Disconnect the FAN connector from the fan.
9. Remove the fan.
10. With the fan blades properly oriented as noted in step 8, install the replacement fan by securing it with 4 nuts.
11. Connect the FAN connector to the fan.
12. Tilt the control panel down and secure with four screws.

13. Connect the unit to a power source and place the power switch on. The fan should run. If the fan does not run, refer to the *Diagnostics and Testing* section.
14. Reinstall the front plastic cover.



**Figure 3-8. Fan**

## Replacement Scale Assembly



**WARNING:** Disconnect the unit from the power source before beginning service work. Incorrect use or connections can cause electrical shock.



**WARNING:** Wear safety goggles when working with refrigerants. Refrigerants can cause eye injury.



**WARNING:** Use extreme caution when disconnecting hoses. Pressurized refrigerant may be present in hoses. Point hoses away from you and anyone nearby.



**WARNING:** If scale assembly circuit are not calibrated, the tank can overflow, causing possible explosion and/or vehicle overcharge.

## Instructions

These instructions outline the steps to replace the scale assembly. See Figure 3-9.

### Removing Scale Assembly

1. Disconnect unit from the power source.
2. Remove the front plastic cover.
3. Remove the four screws under the control panel.
4. Tilt the control panel upwards the front of the unit to access the control board to disconnect the scale cable.
5. Close the red and blue tank valve.
6. Disconnect the liquid hose and vapor hose from the tank.
7. Disconnect the wires from the air purge solenoid and tank temperature sensor.
8. Remove the two bolts securing the tank to the scale.
9. Remove the tank from the scale.
10. Remove the four nuts holding the scale in place.
11. Remove the harness connected to the control board.
12. Remove the scale.

### Installing Replacement Scale Assembly

1. Install the scale into the unit fastening securely with four nuts.
2. Connect the scale assembly wire to the control board.

3. Tilt the control panel down and secure with four screws.
4. Connect the unit to the power source.
5. Perform scale calibration.

### Scale Calibration (Load Cells)

1. Switch the power on. The unit will verify application loaders, files, and sensors during the power up sequence and then will display the amount of refrigerant available in the internal tank.
2. Disconnect the liquid hose and vapor hose from the tank.
3. Disconnect the electrical wires from the air purge solenoid and tank temperature sensor.
4. Remove the bolts securing the tank to the scale assembly.
5. Remove the tank from the scale and verify there is no weight on the scale or anything interfering with the operation of the scale.
6. Access the SERVICE MENU.
7. Enter password.
8. Complete the necessary steps to select CALIBRATE LOAD CELLS.

**NOTE:** Calibration can be performed in Imperial or Metric units. The unit of measure displayed is determined at machine set-up.

9. Perform Calibrate Load Cells procedure in the *Diagnostics and Testing* section.
10. Remove the sample weights and place the tank on the scale.
11. Reconnect tank temperature sensor and air purge solenoid wires.
12. Reconnect liquid and vapor hoses to tank and open the tank valves.
13. Secure the tank to the scale with two bolts.
14. Reinstall the front plastic cover.

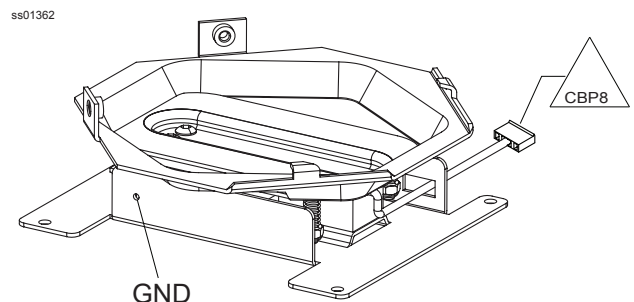


Figure 3-9. Scale Assembly

# PLUMBING AND MECHANICAL SYSTEM OPERATION AND REPAIR

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## PLUMBING AND MECHANICAL SYSTEM OPERATION

The plumbing and mechanical system is controlled by electrical impulses from the electrical system. There are four main components to the plumbing system:

- Compressor
- Vacuum Pump
- Internal Storage Vessel (ISV)
- Manifold Assembly

Along with these components are several ancillary components:

- Fan / Air flow
- Oil Drain Bottle
- High- and Low-Side Gauges
- High- (red) and Low-Side (blue) Service Hoses

All components are interconnected with various lengths and diameters of flexible tubing or copper tubing. The copper tubing connects the compressor discharge port to the manifold assembly. All lines connected to the compressor are high-pressure lines.

**NOTE:** Every time the circuit under pressure is opens or one component (hoses, compressor, gauges) is replaced, perform a pressure leak test with external leak detector.

### Compressor

When replacing the compressor, heed all warnings, cautions, and any other related safety information. For compressor specifications, see Unit Specifications chapter of this manual.

### Vacuum Pump

The vacuum pump is used in this unit for the recovery and vacuum processes. For vacuum pump specifications, see Unit Specifications chapter of this manual.

### Internal Storage Vessel (ISV)

The ISV stores the refrigerant from the vehicle A/C system and from the external refrigerant source tank. Sensor and solenoid on the ISV include:

- Air Purge (S6)
- ISV Temperature (TT) sensor
- Vapor and liquid valves

### Manifold

The manifold assembly consists of solenoids:

- Low-Side Inlet 1 (S4-1)
- Low-Side Inlet 2 (S4-2)
- High-Side Inlet 1 (S5-1)
- High-Side Inlet 2 (S5-2)
- Tank liquid (S7)
- Oil Drain (S8)
- Vacuum (S9)
- Recover (S11)
- Oil Return (S13)
- Oil inject (S14).

Also included are transducers:

- Low Side Pressure (LSP) transducer
- Accumulator Pressure (AP) transducer

The manifold assembly permits efficient, reliable operation of the unit. The oil separator is a single unit. That and the filter/dryer are attached below the manifold. This manifold assembly is not interchangeable with any other manifold assembly.

Repair or replacement of the manifold should be performed under clean conditions so particulates do not enter the assembly from any open ports. Particulates can clog the small chambers and cause solenoid and check valve malfunctions, as well as contaminate a vehicle air conditioning system.

Ancillary components and assemblies included are:

**Fan / Air flow:** The fan is necessary to keep the compressor below its maximum ambient operation temperature of 50°C (122°F) or less.

**Oil Drain Bottle:** This bottle provides a reservoir for used oil and must be drained when the user is instructed to do so by the control panel. Operators should drain this bottle prior to each use of the unit to make sure unit operation is not interrupted.

**High- and Low-Side Gauges:** These gauges monitor the high- and low-side pressures when the unit is operating.

**High- (Red) and Low-Side (Blue) Service Hoses:** These hoses connect the unit to the vehicle A/C system.

## PLUMBING AND MECHANICAL SYSTEM REPAIR

### Replacement Compressor



**WARNING:** Disconnect the unit from the power source before beginning service work. Incorrect use or connections can cause electrical shock.



**WARNING:** Wear safety goggles when working with refrigerants. Refrigerants can cause eye injury.



**WARNING:** Use extreme caution when disconnecting hoses. Pressurized refrigerant may be present in hoses. Point hoses away from you and anyone nearby.

### Instructions

These instructions outline the steps to replace the existing compressor. See Figure 4-1, Plumbing Interconnection Diagram. Refer to this schematic of the unit plumbing and mechanical system when performing all removals and replacements of plumbing or other mechanical parts and assemblies.

### Removing Compressor



**WARNING:** There may be pressure in the hoses.

1. Disconnect the unit from its power source.
2. Remove the front plastic cover.
3. Remove the four screws under the control panel.
4. Tilt the control panel upwards the front of the unit.
5. Disconnect the copper line from the compressor.
6. Disconnect the hoses from the compressor.
7. Remove two compressor mounting bolts and washers and slide the compressor out from the rear retainer.
8. Disconnect the compressor pigtail from the COMP connector on the main harness.
9. Remove the compressor from the unit.

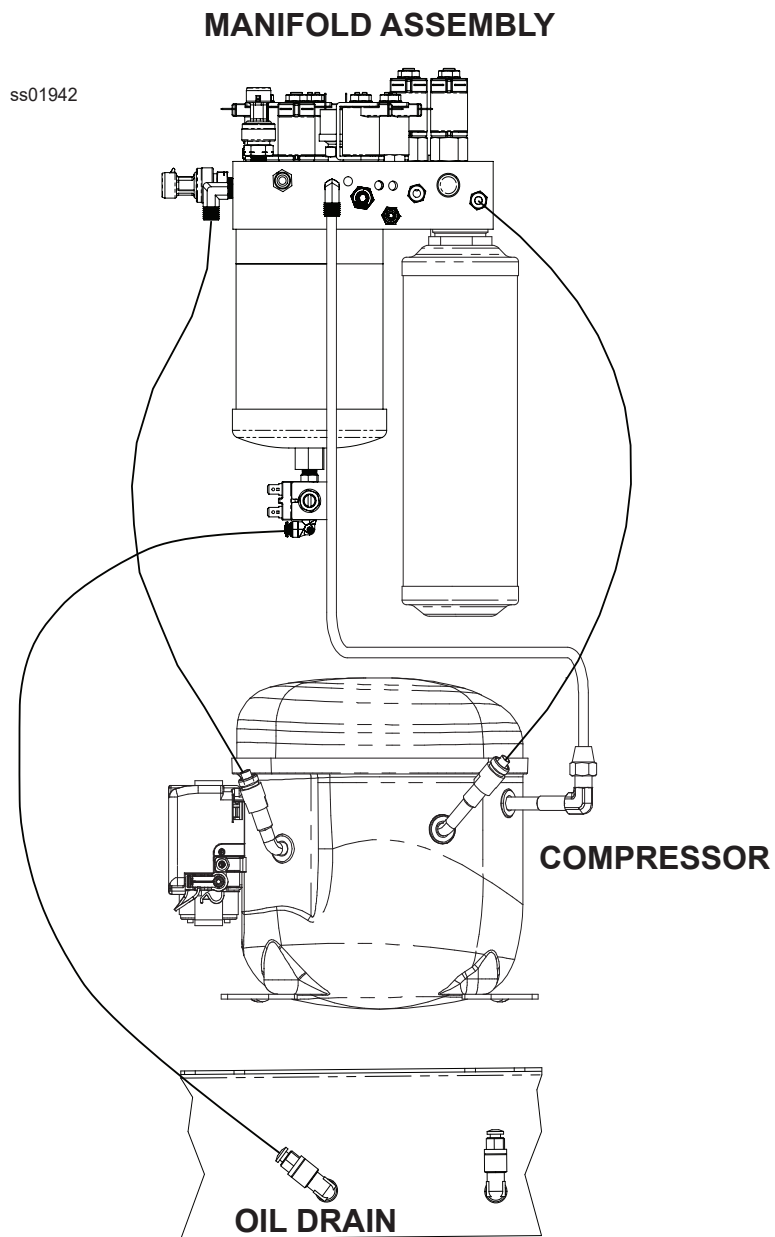


**CAUTION:** To prevent personal injury, use caution when removing the compressor. The capacitor may still be energized.

### Installing Replacement Compressor

Refer to Figure 4-1 during this installation.

1. Install the rubber mounts into the base of the compressor. Place two metal sleeves in the front mounts only (included in kit).
2. Place the compressor into the unit, sliding it towards the rear of the unit until the rear rubber mounts are under the compression bracket and two front bolt holes line up with the holes in the base. If sliding is difficult, multi-purpose grease can be applied to the bottom of the rubber mounts.
3. Connect the compressor pigtail to the COMP connector on the main wire harness.
4. Refer to the illustration and install the hoses connecting the compressor to the manifold. Replace the O-rings where used on the hoses.
5. Secure the compressor in the rear bracket and in the front side with two bolts and washers.
6. With the O-rings in place, connect the copper line to the discharge side of the unit.
7. Tilt the control panel down and secure with four screws.
8. Reinstall the front plastic cover.
9. Connect the unit to the power source, perform a function test, and check for leaks.

**NOTES:**

1. Apply Loctite 222 to equivalent to threads.
2. Torque hose fittings to  $8.5 \pm 0.5$  Nm.

**Figure 4-1. Compressor Interconnection Diagram**

## Replacement Vacuum Pump



**WARNING: Disconnect the unit from the power source before beginning service work. Incorrect use or connections can cause electrical shock.**



**WARNING: Wear safety goggles when working with refrigerants. Refrigerants can cause eye injury.**



**WARNING: Use extreme caution when disconnecting hoses. Pressurized refrigerant may be present in hoses. Point hoses away from you and anyone nearby.**

## Instructions

These instructions outline the steps to replace the existing vacuum pump. See Figures 4-2 and 4-3.

### Removing Vacuum Pump

1. Disconnect unit from the power source.
2. Remove the front plastic cover.
3. Remove the four screws under the control panel.
4. Tilt the control panel upwards the front of the unit.
5. Remove the plastic line from the vacuum pump.

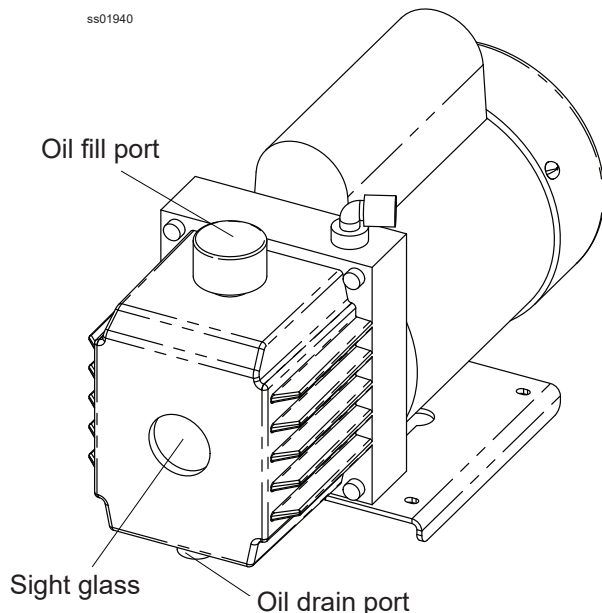


Figure 4-2. Vacuum Pump

6. Remove the two nuts from isolators threaded studs that fastening the vacuum pump to the frame of the unit.
7. Disconnect the vacuum PUMP connector from the main harness.
8. Remove the cap from the vacuum pump oil fill port.
9. Remove the vacuum pump from the unit.

### Installing Replacement Vacuum Pump

1. Remove the cap from the vacuum pump oil fill port.
2. Place the vacuum pump in the unit.
3. Slide the horizontal tab of the pump base through the rectangular hole in the base so the tab is located under the base frame and rubber trim.
4. Cam the vacuum pump base downward, aligning the isolator studs on the base with the holes on the pump base.
5. Secure the vacuum pump to the isolators with two nuts.
6. Connect the electrical connector (PUMP) from the vacuum pump to the main harness.
7. Connect the plastic line.
8. Add 250 ml of oil into the vacuum pump.
9. Place the cap on the fill port.
10. Tilt the control panel down and secure with four screws.
11. Reinstall the front plastic cover.
12. Perform the steps to start the pump.
13. While the vacuum pump is running, check the correct fill level through the sight glass.
14. Perform a function test and check for leaks.

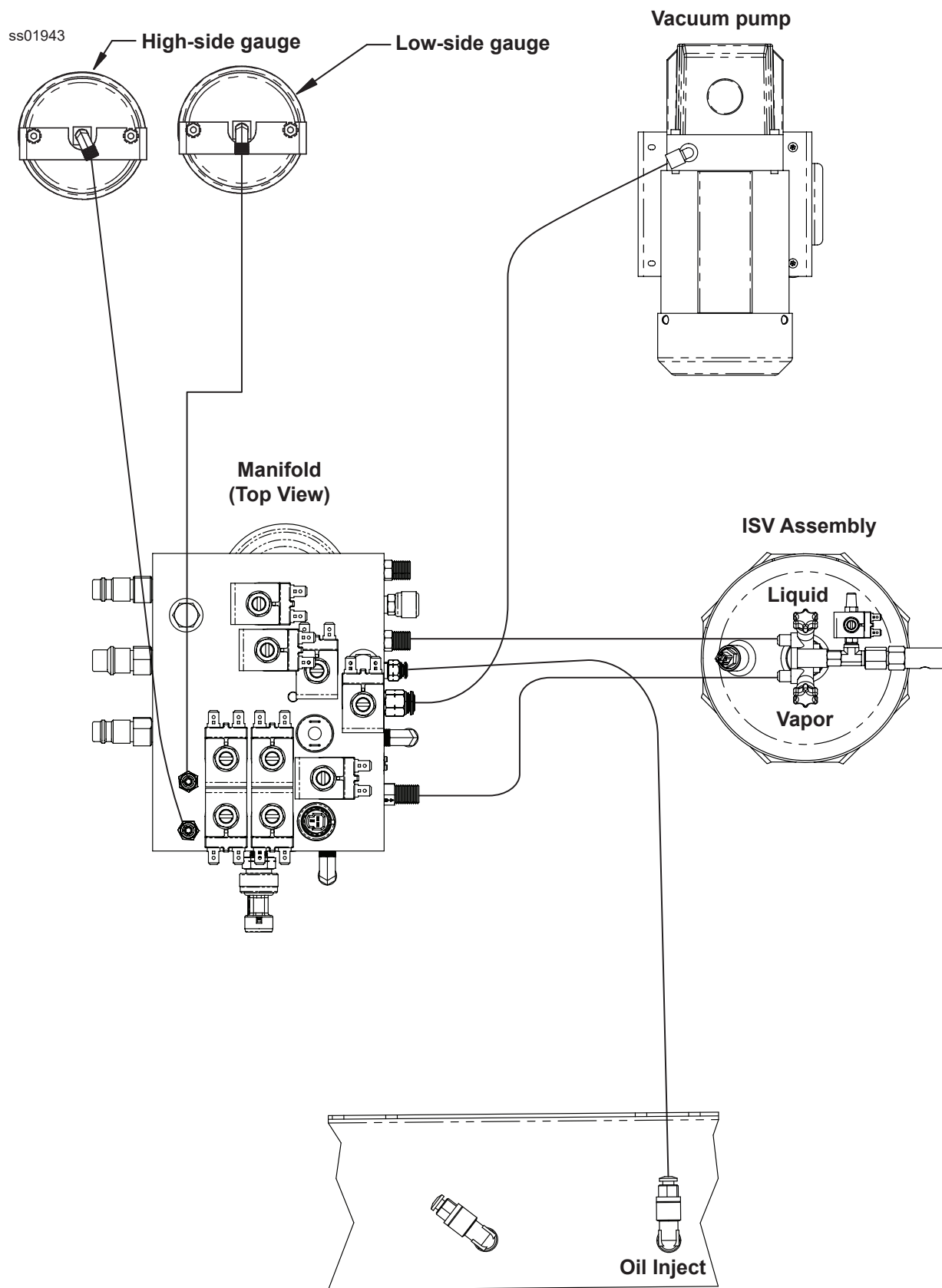


Figure 4-3. Plumbing Interconnection Diagram

## Replacement ISV Assembly



**WARNING:** Disconnect the unit from the power source before beginning service work. Incorrect use or connections can cause electrical shock.



**WARNING:** Wear safety goggles when working with refrigerants. Refrigerants can cause eye injury.



**WARNING:** Use extreme caution when disconnecting hoses. Pressurized refrigerant may be present in hoses. Point hoses away from you and anyone nearby.

## Instructions

These instructions outline the steps to replace the ISV assembly.

### Removing ISV Assembly

1. Remove the front plastic cover.
2. Close red and blue tank valves and depressurize the unit (select “AC unit emptying” function in the service menu).
3. Disconnect unit from the power source.
4. Disconnect the liquid hose and vapor hose from the tank.
5. Disconnect the wires from the air purge solenoid and tank temperature sensor.
6. Remove the two bolts securing the tank to the scale.
7. Remove the tank from the scale.

## Installing Replacement ISV Assembly

1. Place the tank on the scale.
2. Secure the tank to the scale with two bolts.
3. Reconnect liquid and vapor hoses to tank and open the tank valves.
4. Reconnect tank temperature sensor and air purge solenoid wires.
5. Connect the unit to the power source.
6. Perform service vacuum (refer to “Service Vacuum” in the Diagnostics and Testing section).
7. Perform tank fill (refer to “Tank Fill” in the Maintenance section).

**NOTE:** Every time the ISV is replaced, during the tank fill, perform a test with external leak detector.

8. Reinstall the front plastic cover.

## Replacement Manifold



**WARNING: Disconnect the unit from the power source before beginning service work. Incorrect use or connections can cause electrical shock.**



**WARNING: Wear safety goggles when working with refrigerants. Refrigerants can cause eye injury.**



**WARNING: Use extreme caution when disconnecting hoses. Pressurized refrigerant may be present in hoses. Point hoses away from you and anyone nearby.**

### Instructions

These instructions outline the steps to replace the existing manifold. See Figure 4-5.

In most cases, the manifold does not have to be removed from the unit for repair. Most solenoids and check valves can be replaced without complete removal of the block from the unit. When this is possible, remove and replace the faulty component in place, after following steps 1 through 5 in *Removing Manifold*.

The remaining steps (6-11) outline the procedure for removing the entire manifold. See Figure 4-5.

If the manifold is being repaired, refer to the *Repairing or Replacing a Solenoid* or *Replacing Check Valve* as needed. When installing hoses, solenoids, and check valves, replace the O-rings and use thread sealant where necessary.

### Removing Manifold

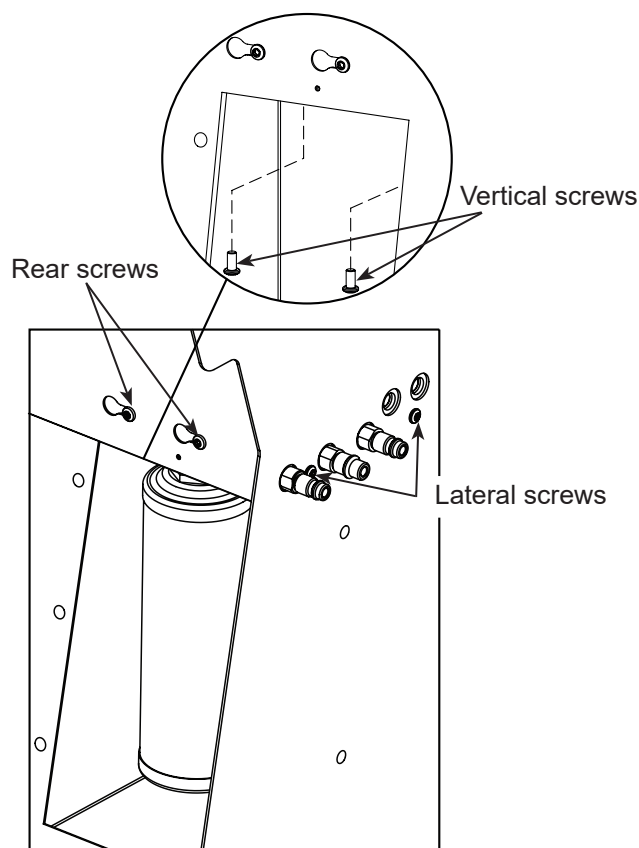
1. Clear service hoses and remove them.
2. Disconnect unit from the power source.
3. Remove the front plastic cover.
4. Remove the four screws under the control panel.
5. Tilt the control panel upwards the front of the unit.
6. Disconnect all hoses from the manifold.
7. Disconnect all wires from the block components.
8. Remove the dryer filter by turning it counterclockwise.

9. Loosen the two rear screws and remove the 2 lateral screws (see Figure 4-4).
10. Remove the 2 vertical screws behind the dryer filter (see Figure 4-4).
11. Remove the manifold by sliding the manifold away from the unit side panel until the rear screws can fit through the two keyholes.

### Installing Replacement Manifold

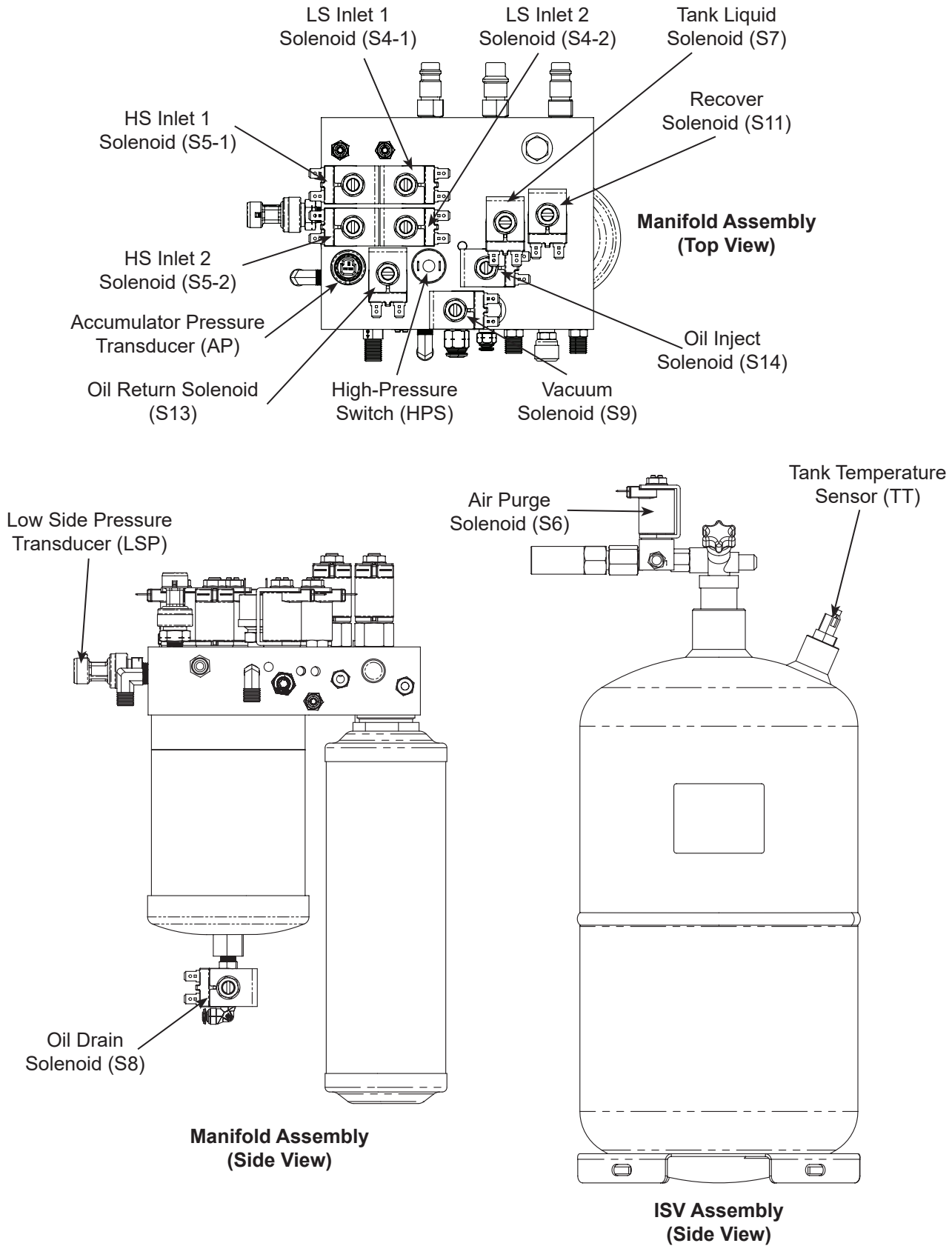
See Figure 4-5 while performing the following procedures.

1. Connect the hoses and lines to the manifold. Refer to Figures 4-1, 4-3, and 4-5 for the proper location of the hoses.
2. Reconnect all wiring as shown in Figure 4-5.
3. Restore the manifold as original.
4. Tilt the control panel down and secure with four screws.
5. Reinstall the front plastic cover.
6. Attach the outside high- (red) and low-side (blue) service hoses. Tighten at 7.9 Nm torque.
7. Connect the unit to the power source, perform a function test, and check for leaks.



**Figure 4-4. Manifold Removal**

*NOTE: All wires must be clear of moving parts, pinch points, and sharp edges.*



**Figure 4-5. Assembly Component Names**

## Repairing or Replacing a Solenoid



**WARNING:** Disconnect the unit from the power source before beginning service work. Incorrect use or connections can cause electrical shock.



**WARNING:** Wear safety goggles when working with refrigerants. Refrigerants can cause eye injury.



**WARNING:** Use extreme caution when disconnecting hoses. Pressurized refrigerant may be present in hoses. Point hoses away from you and anyone nearby.

### Instructions

These instructions outline the steps to repair solenoids found throughout the unit.

### Removing Solenoid

1. Close red and blue tank valves and depressurize the unit (select "AC unit emptying" function in the service menu).
2. Disconnect the unit from the power source.
3. Remove the front plastic cover and service hoses.
4. Remove the four screws under the control panel.
5. Tilt the control panel upwards the front of the unit.
6. Disconnect the two wires connected to the solenoid being repaired or replaced.
7. Remove the fastener holding the coil on the solenoid, and remove the coil.

**NOTE:** Once the nut and coil on top has been removed, a special tool (14 mm stud remover) has to be used to dismount the plunger.

8. Remove the solenoid assembly.
9. Check the manifold block for any debris before installing a repaired or replacement solenoid.

## Installing Solenoid

1. Lubricate the O-rings and threads on the new solenoid assembly.
2. Install the repaired or replacement solenoid assembly and hand tighten.

**NOTE:** Once the nut and coil on top has been removed, a special tool (14 mm stud remover) has to be used to dismount the plunger.

3. Using a torque wrench, torque the solenoid assembly to 8.5 Nm.
4. Install the coil on the solenoid assembly, and secure with the fastener holding the coil in place.
5. Using a torque wrench, torque the coil retaining bolt to  $3.5 \pm 0.5$  Nm.
6. Reconnect the wires that were disconnected earlier when removing the faulty solenoid assembly.
7. Tilt the control panel down and secure with four screws.
8. Reinstall the front plastic cover.
9. Attach the outside high- (red) and low-side (blue) service hoses. Tighten at 7.9 Nm torque.
10. Connect the unit to the power source, perform a function test, and check for any leaks.

**NOTE:** To remove S7, S11 and S14 solenoid valves you must loosen the 2 rear screws and remove the 2 lateral and 2 vertical screws (see Figure 4-4).

## Replacing Check Valve



**WARNING:** Disconnect the unit from the power source before performing service work. Incorrect use or connections can cause electrical shock.



**WARNING:** Wear safety goggles when working with refrigerants. Refrigerants can cause eye injury.



**WARNING:** Use extreme caution when disconnecting hoses. Pressurized refrigerant may be present in hoses. Point hoses away from you and anyone nearby.

## Instructions

These instructions outline the steps to replace manifold check valves.

### Removing Check Valve

1. Close red and blue tank valves and depressurize the unit (select “AC unit emptying” function in the service menu).
2. Disconnect the unit from the power source.
3. Remove the front plastic cover and service hoses (if needed).
4. Remove the four screws under the control panel.
5. Tilt the control panel upwards the front of the unit.
6. Remove the faulty check valve.

### Installing Replacement Check Valve

1. Lubricate the O-rings on the new check valve.
2. Install the new check valve and hand-tighten.
3. Torque the check valve to 8.5 Nm.
4. Tilt the control panel down and secure with four screws.
5. Reinstall the front plastic cover.
6. Connect the unit to the power source, perform a function test, and check for leaks.

### Removing Solenoid Check Valve

1. Close red and blue tank valves and depressurize the unit (select “AC unit emptying” function in the service menu).
2. Disconnect the unit from the power source.
3. Remove the front plastic cover.
4. Remove the four screws under the control panel.
5. Tilt the control panel upwards the front of the unit.
6. Refer to *Removing Solenoid* on the previous page.
7. Remove the check valve from the manifold after removing the solenoid.

### Installing Replacement Solenoid Check Valve

1. Lubricate the O-rings on the new check valve.
2. Install the new check valve and hand-tighten.
3. Torque the check valve to  $17 \pm 1$  Nm.
4. Perform the *Installing Solenoid* procedures on the previous page.

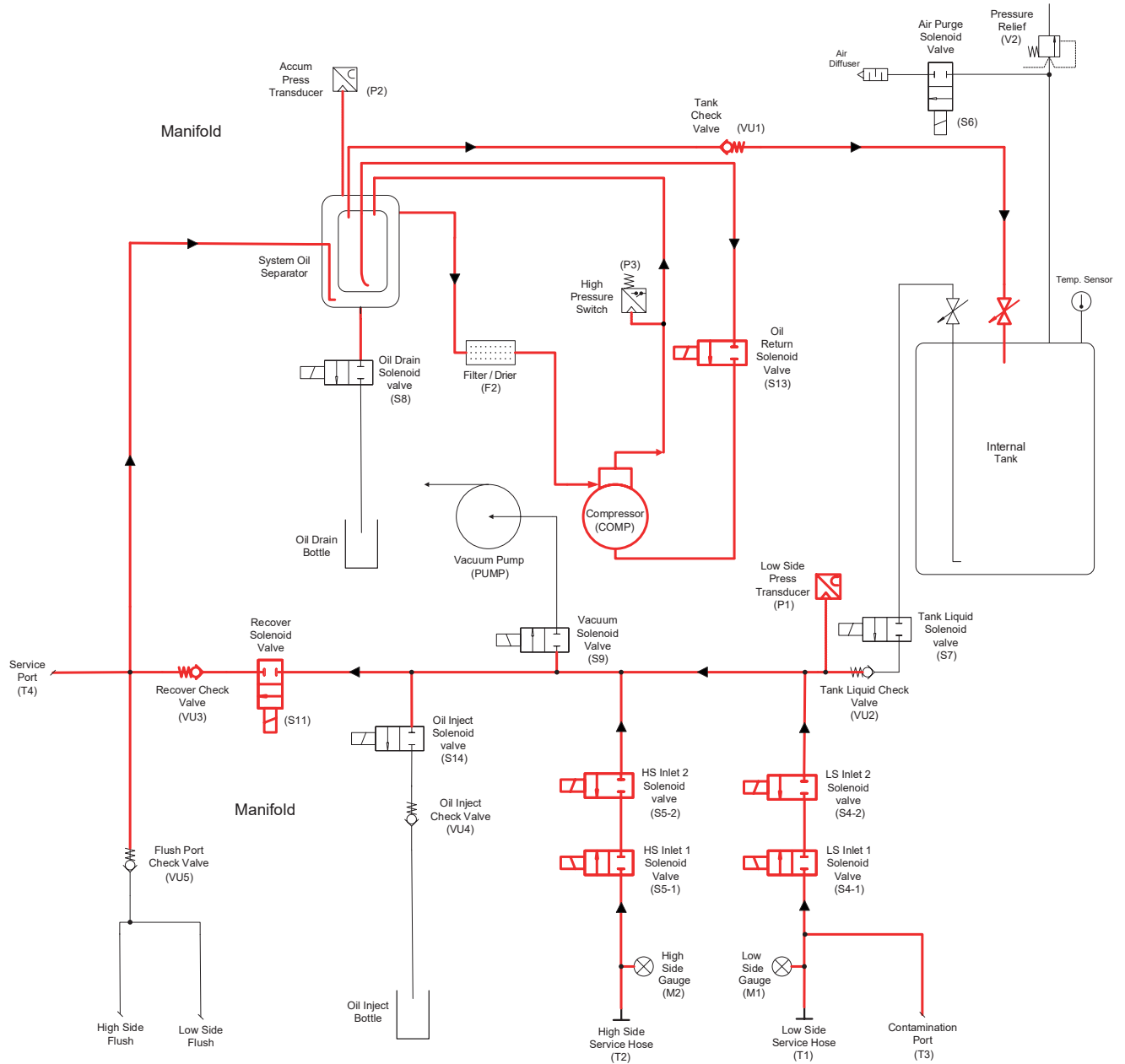
## COMPONENT APPLICATION CHARTS

<b>Manifold Component Application Chart, ACS 553 and ACS 563</b>													
Function Component	Tank Fill	Low Side Clearing	Recover	Oil Drain	Vacuum	Vacuum Leak Test	Air Purge	Oil Inject (PAG/POE)	Pre-Charge	Charge	Tank Conditioning	Hose Flush	Periodic Leak Test
LS Inlet 1 & 2 solenoid (S4)	ON		ON		ON	ON			ON	I		I	I
HS Inlet 1 & 2 solenoid (S5)	ON		ON		ON	ON		ON	ON	I		I	I
Air Purge solenoid (S6)							I						
Tank liquid solenoid (S7)				I			I		ON	ON	ON	ON	I
Oil Drain solenoid (S8)				ON									
Vacuum solenoid (S9)					ON								
Recover solenoid (S11)	I	ON	I	I			I				I	I	ON
Oil Return solenoid (S13)	I	I	I	I					I		I	I	ON
Oil inject solenoid (S14)								ON					
Vacuum Pump					ON								
Compressor	ON	ON	ON						I		ON	ON	ON
Fan	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	
Legend	ON		ON					I		ON Intermittently			

**Fluid Flow Diagram Locations**

<b>Function</b>	<b>Figure No.</b>
Tank Fill	4-6
Low Side Clearing	4-7
Recover	4-8
Oil Drain	4-9
Vacuum	4-10
Vacuum Leak Test	4-11
Air Purge	4-12
Oil Inject (PAG/POE)	4-13
Pre-charge (for R1234yf only if enabled)	4-14
Charge	4-15
Tank Conditioning	4-16
Hose Flush	4-17
Periodic leak test (for R1234yf only)	4-18

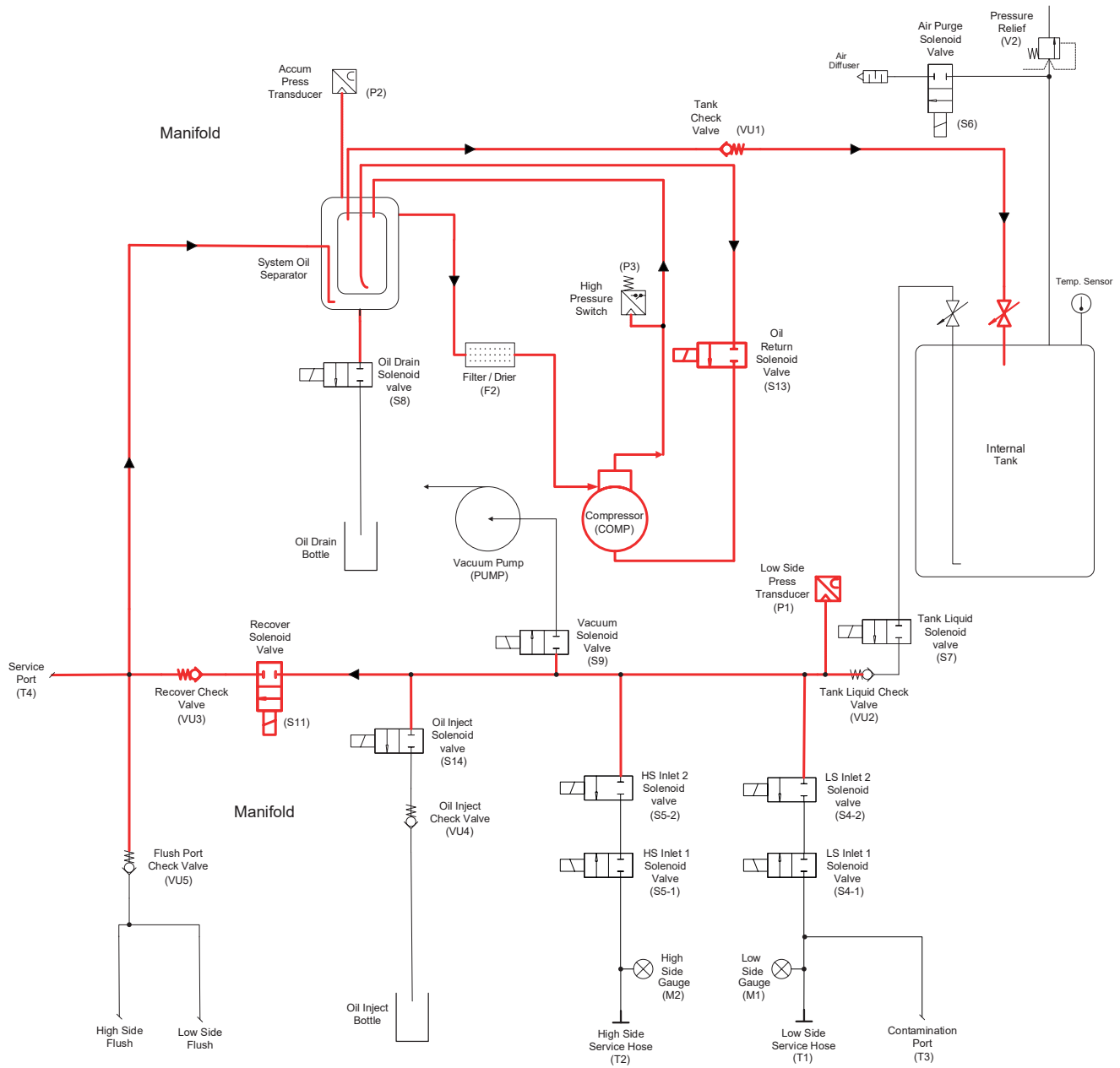
# FLOW DIAGRAMS



## TANK FILL PROCESS

During the Tank Fill process the compressor, fan, HS and LS inlet solenoids, recover solenoid and oil return solenoid are activated (see application chart). The output state of the recovery solenoid is controlled to maintain 2.4 bar (35 psi) in the accumulator. When the ISV reaches the “target” weight, all components are deactivated.

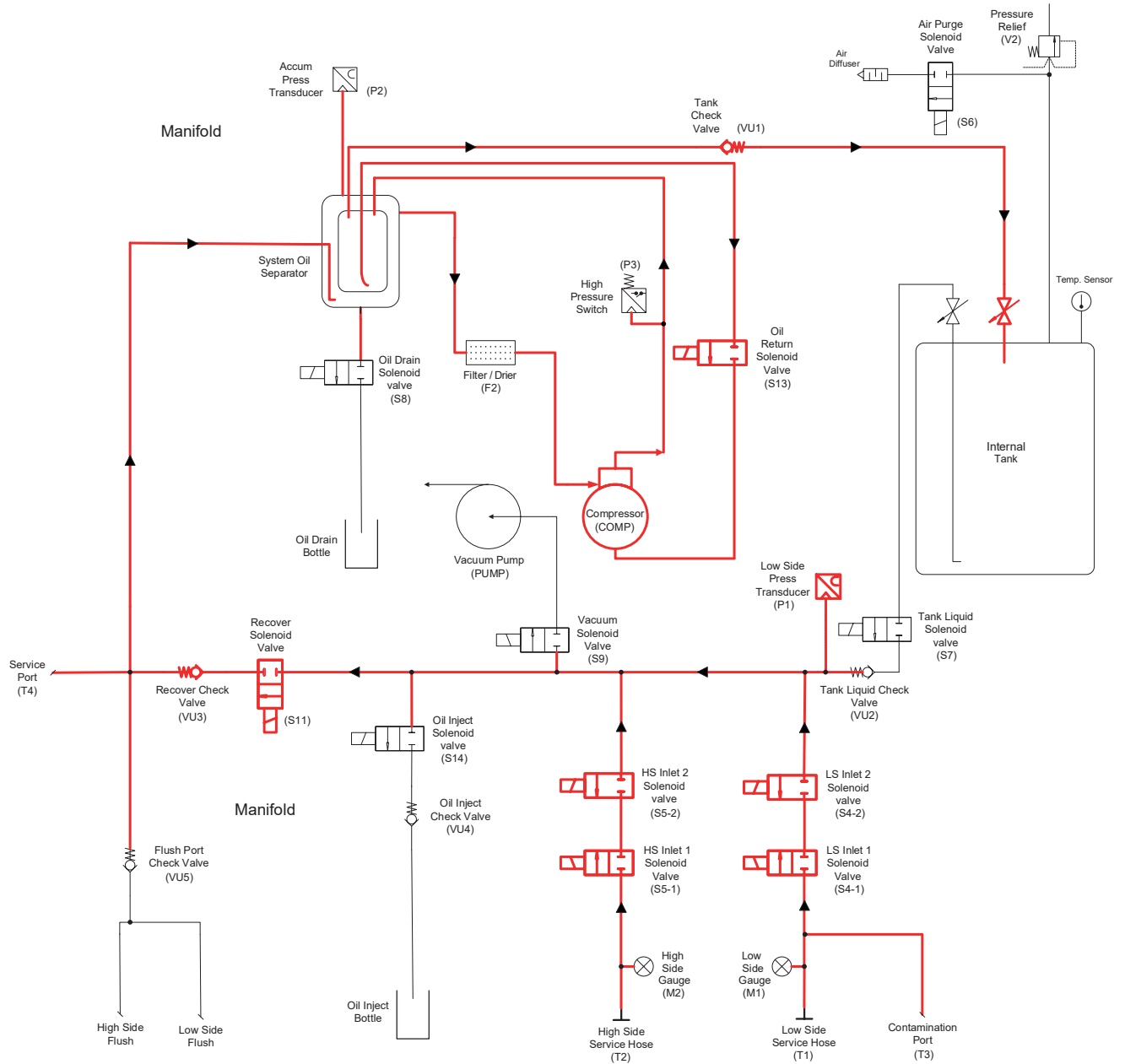
Figure 4-6. Tank Fill



**LOW SIDE CLEARING PROCESS**

During the low side clearing process, the compressor is activated. The process continues until -0.45 bar (13 in Hg) is reached, plus 15 seconds.

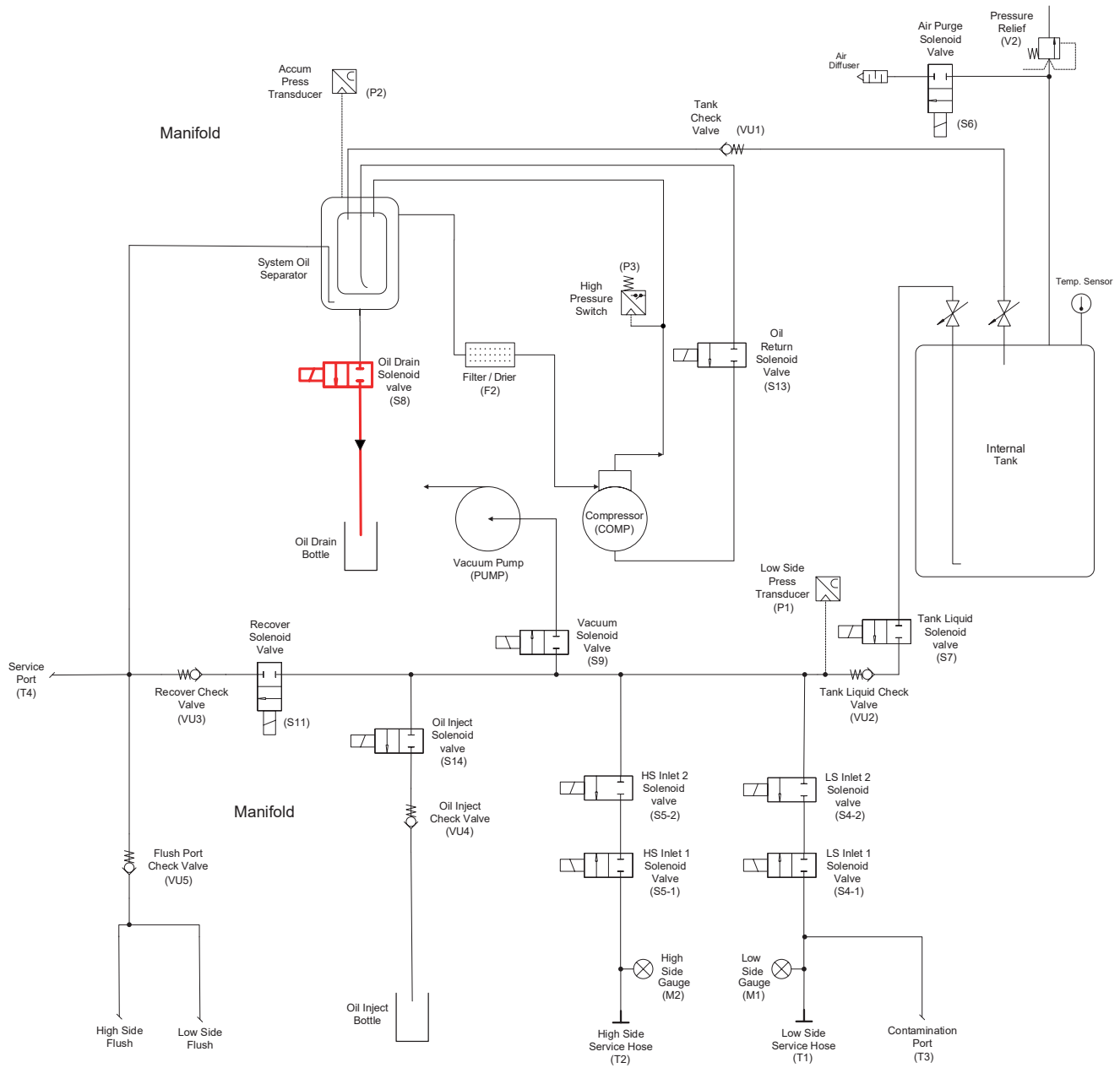
**Figure 4-7. Low Side Clearing**



**RECOVERY PROCESS**

During the first stage of the recovery process, the fan, compressor, HS and LS inlet solenoids, recovery solenoid, oil return solenoid are activated (see application chart). Recover and oil return solenoids are activated intermittently. Recovery stops when -0.45 bar is reached, plus 15 seconds.

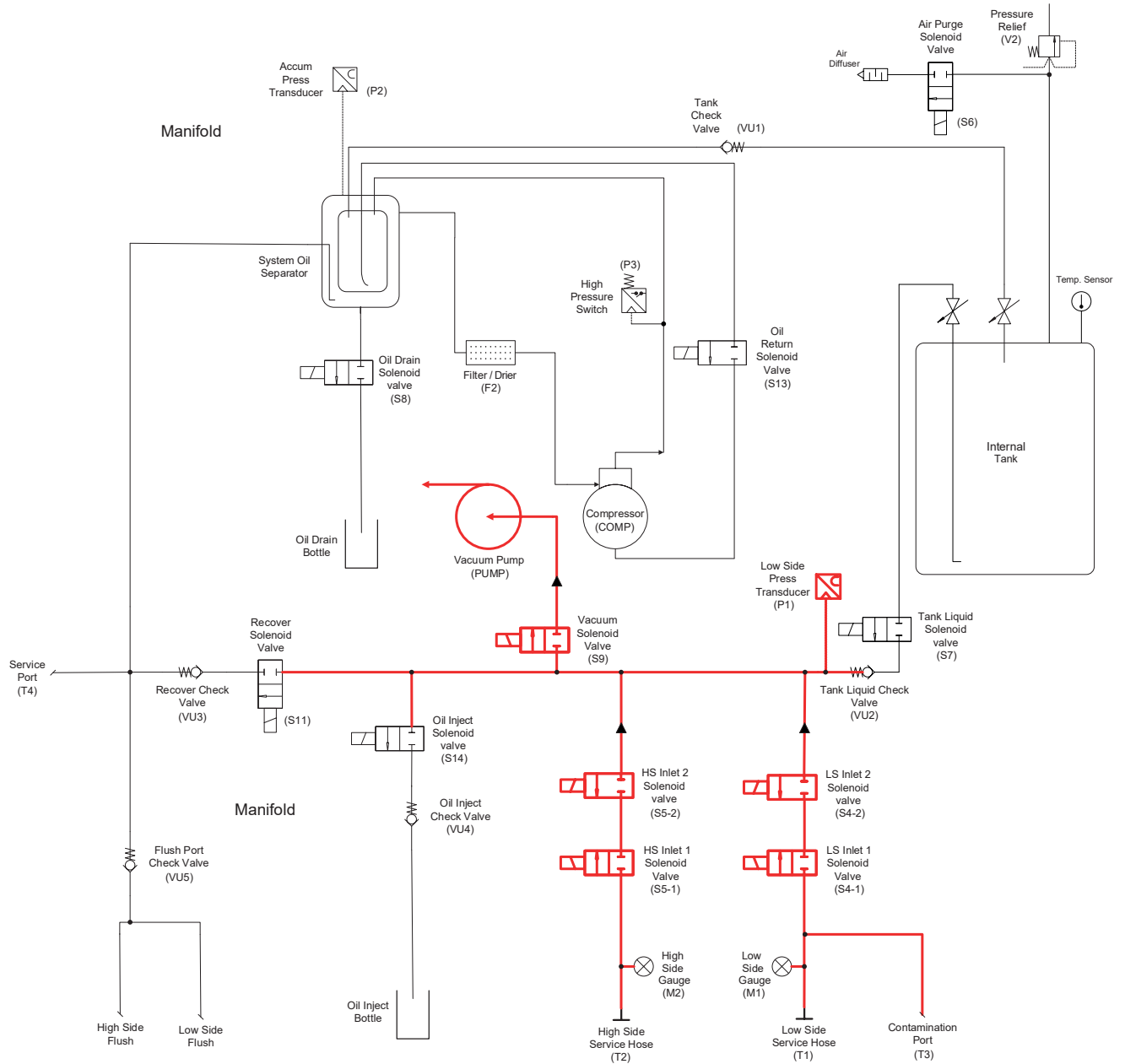
**Figure 4-8. Recover**



**OIL DRAIN PROCESS**

During the Oil Drain process, the unit pressurize the accumulator until 1.1 bar. Then oil drain solenoid opens and release pressure and oil (see application chart). The oil amount discharged is calculated in function of accumulator depressurization time.

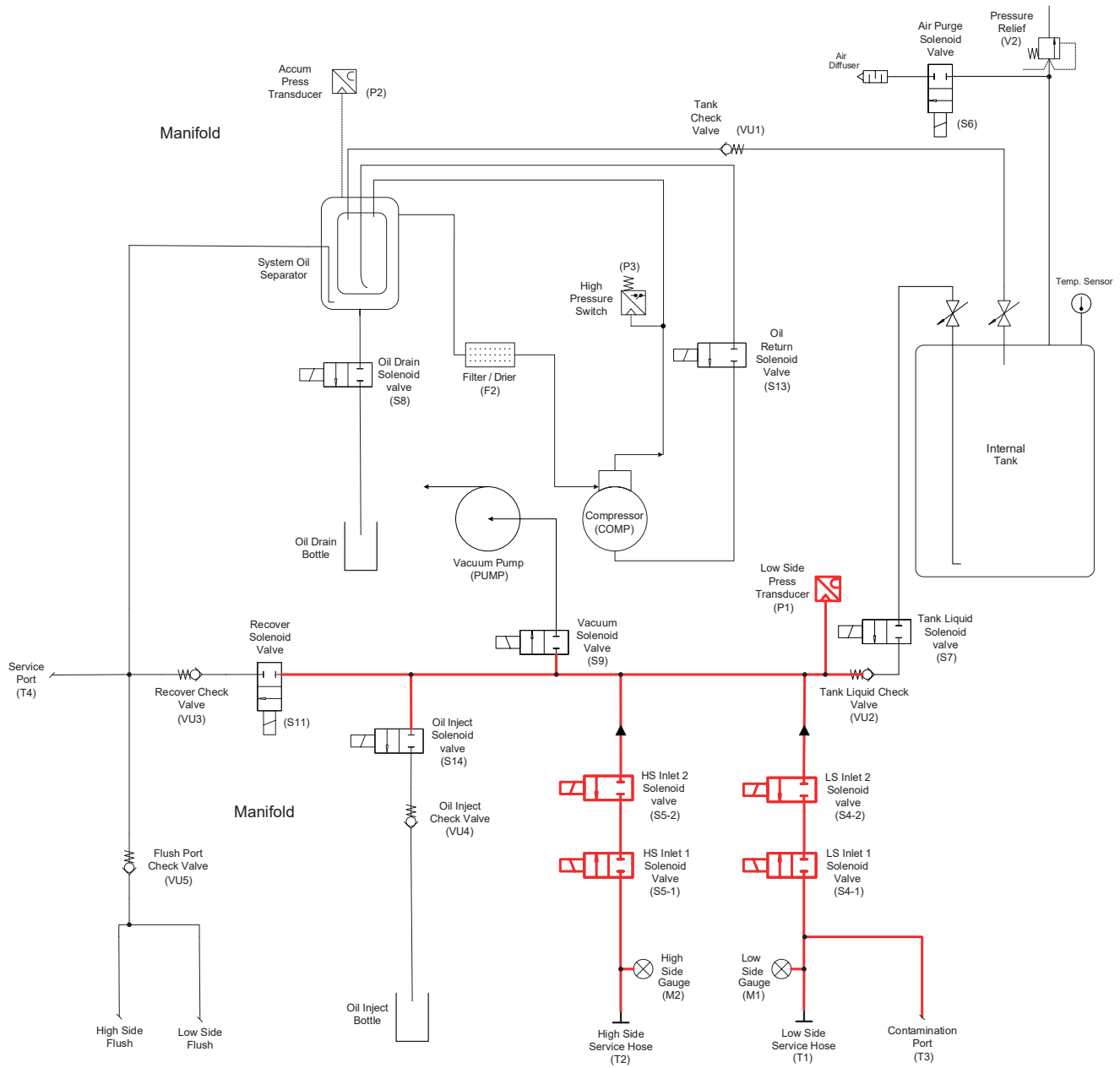
**Figure 4-9. Oil Drain**



**VACUUM PROCESS**

The default vacuum time is 5 minutes. When the vacuum process begins, the vacuum pump is activated. After a 5 second delay, the vacuum, HS and LS inlet solenoids are also activated. When the timer reaches 0 (zero), the vacuum process will stop.

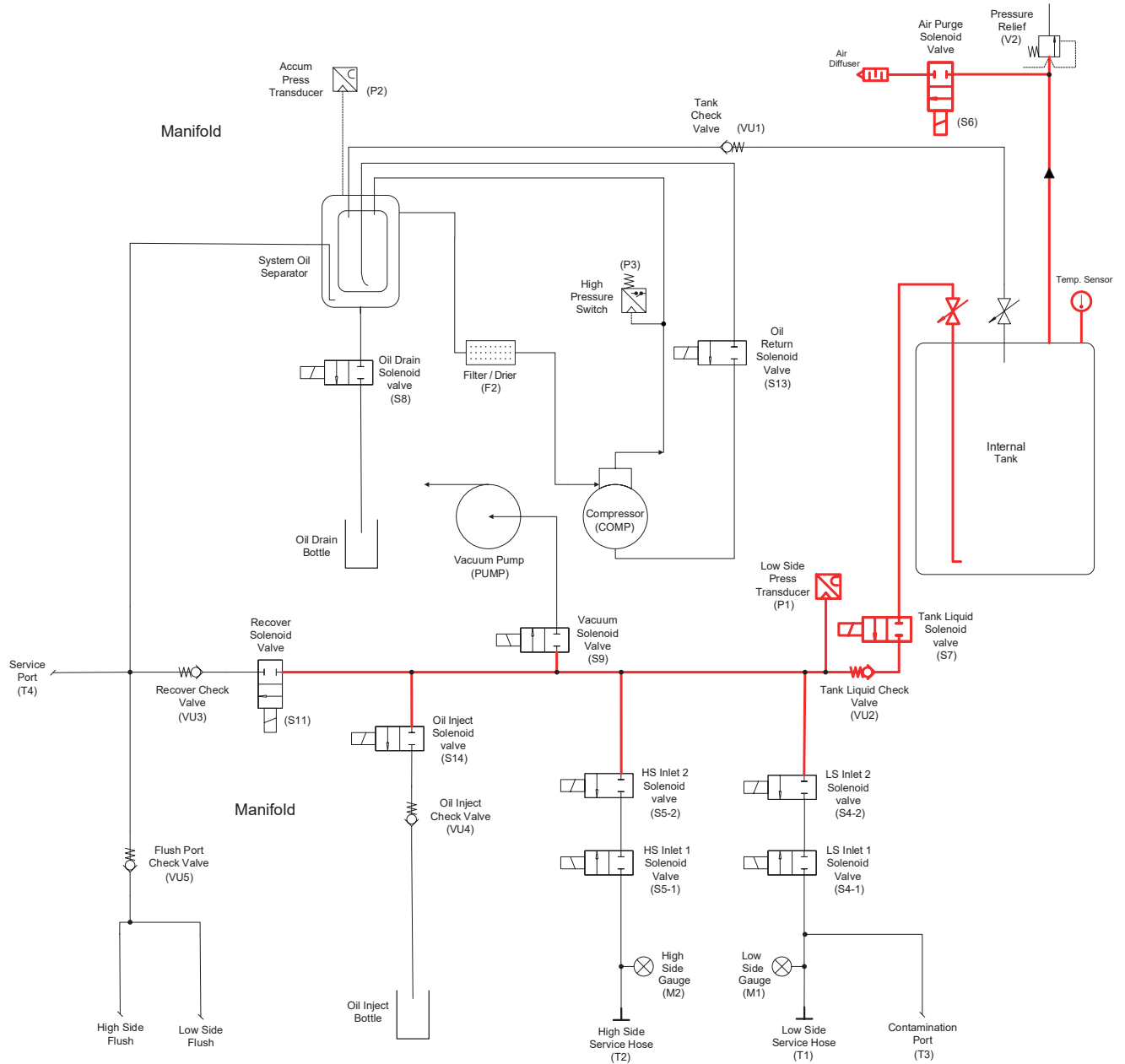
**Figure 4-10. Vacuum**



**VACUUM LEAK TEST PROCESS**

HS and LS inlet solenoids are activated to equalize high and low sides of system being serviced. Unit checks low-side transducer for rise in vacuum. If the unit sees a pressure rise within 5 minutes time, the vacuum leak test will fail.

**Figure 4-11. Vacuum Leak Test**

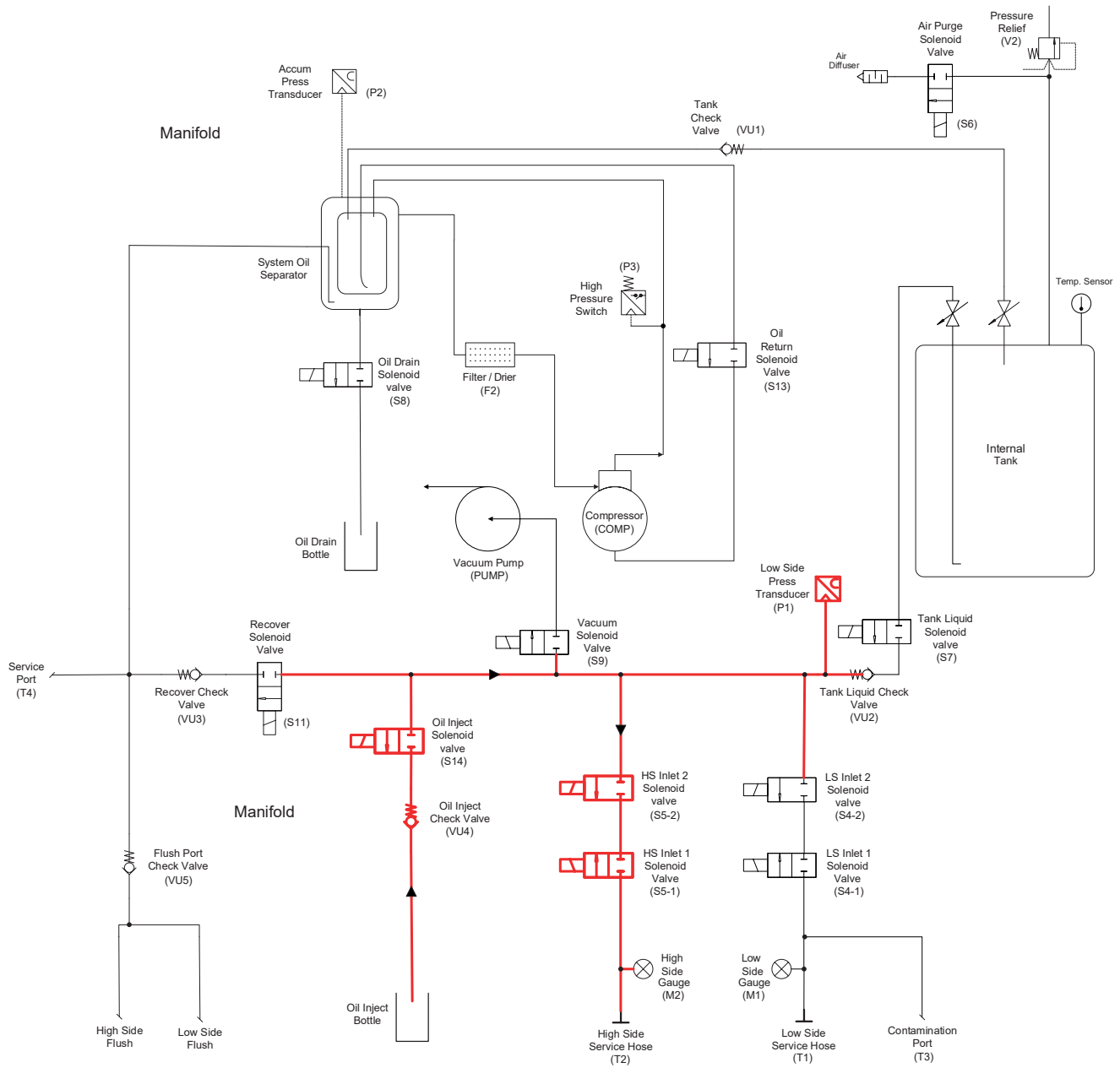


**AIR PURGE PROCESS**

The air purge solenoid is activated to release excess pressure from the internal storage vessel (ISV). The tank liquid solenoid opens to check LS transducer pressure value (see application chart). The air purge will occur when the machine is on and idle for 5 minutes.

**ON/OFF (I/O) button** must be pressed and held to continue purging incondensable gas from tank. The unit will only allow user to purge 45 seconds at a time.

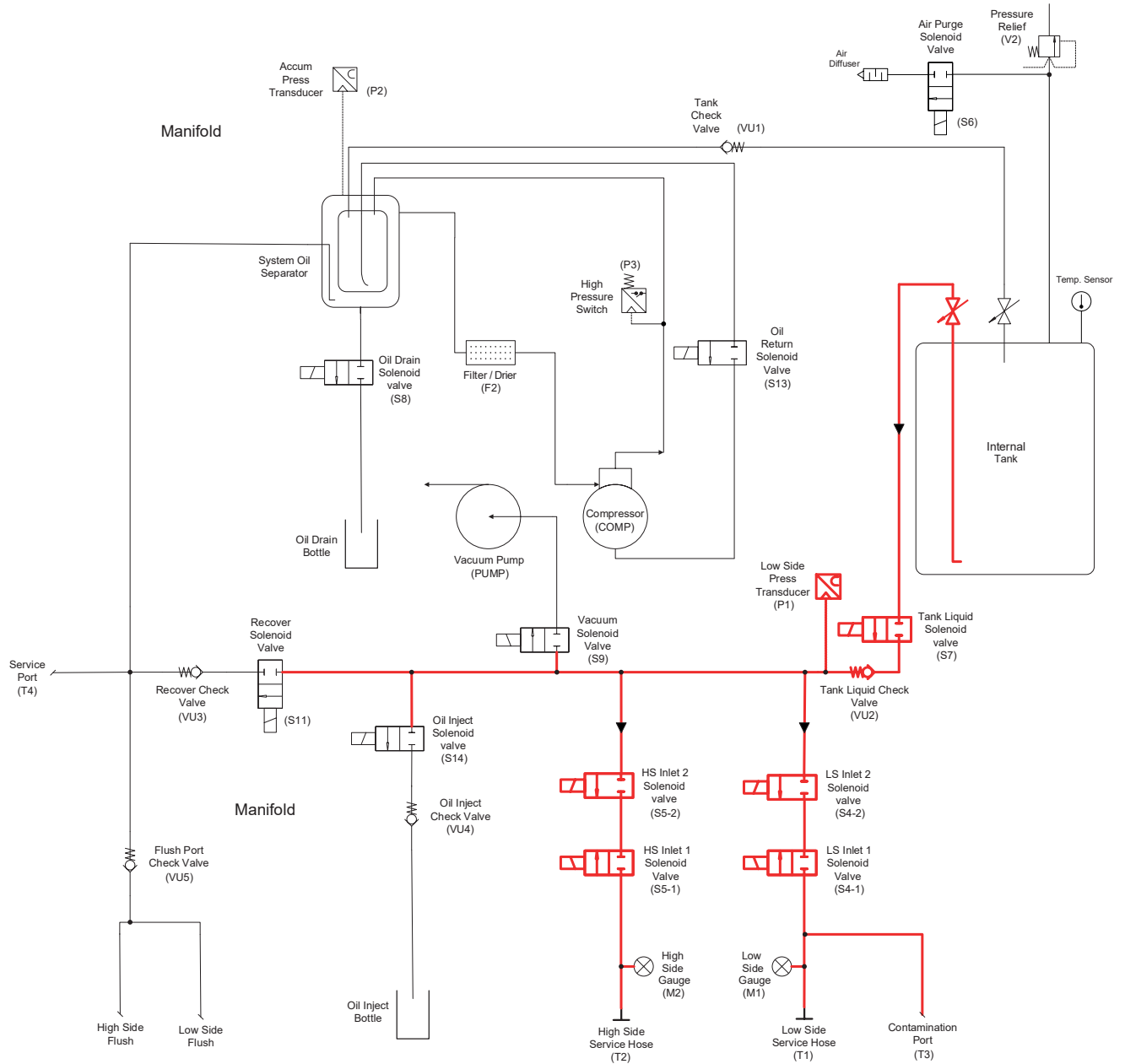
**Figure 4-12. Air Purge**



**OIL INJECT (PAG/POE) PROCESS**

The oil injection is an automatic process. During the charge setup, the operator must enter the amount of oil, viscosity, type of oil wanted and the ambient temperature. The machine injects the oil automatically adding the amount discharged with amount input by user. The system being serviced must have a vacuum to pull oil from the oil PAG/POE inject bottle.

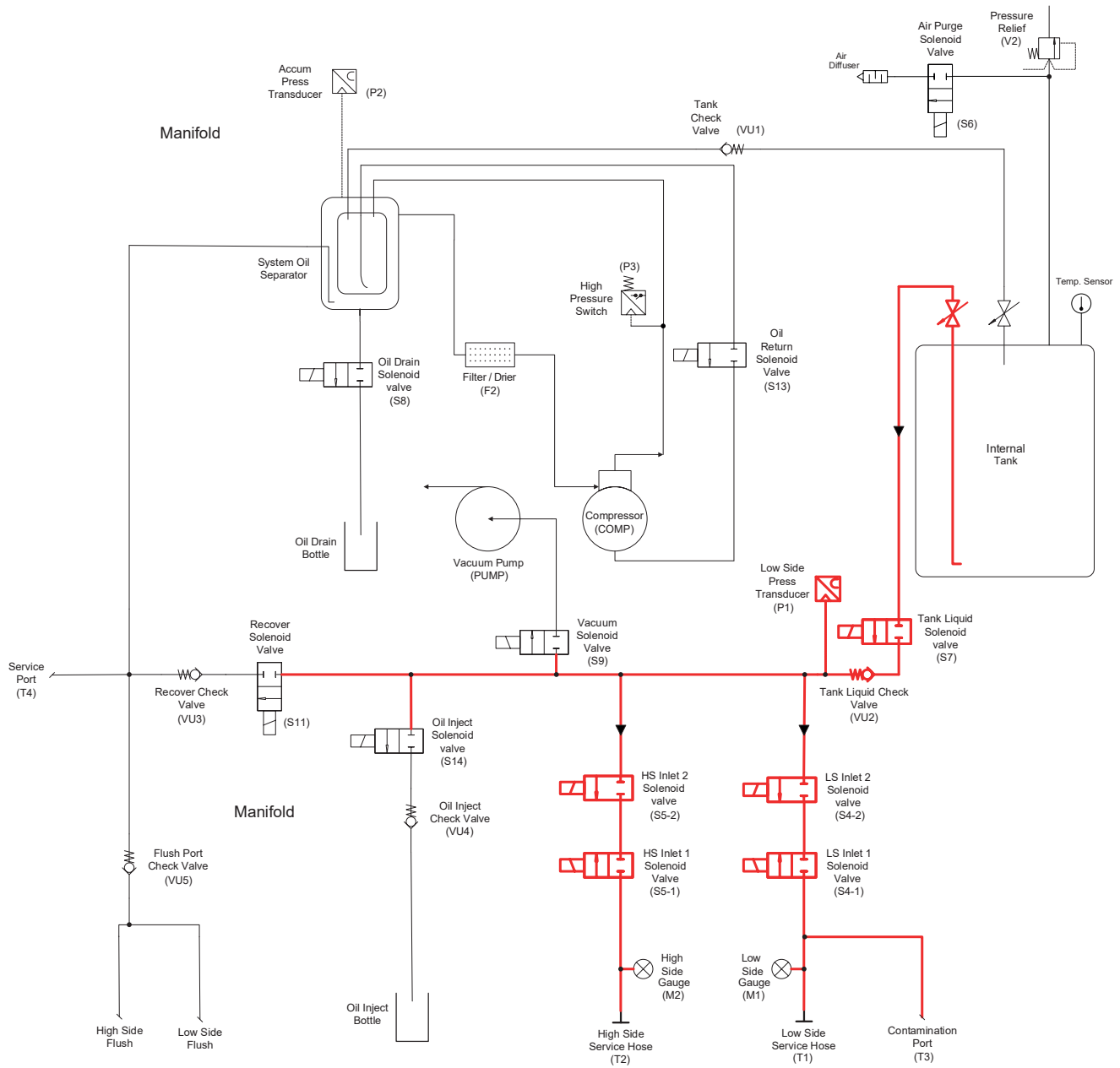
**Figure 4-13. Oil Inject (PAG/POE)**



**PRE-CHARGE PROCESS (for R1234yf only if enabled)**

During the pre-charge process (before to perform the charge), the unit charges a small amount of refrigerant in the A/C system and performs a pressure test to check any leaks.

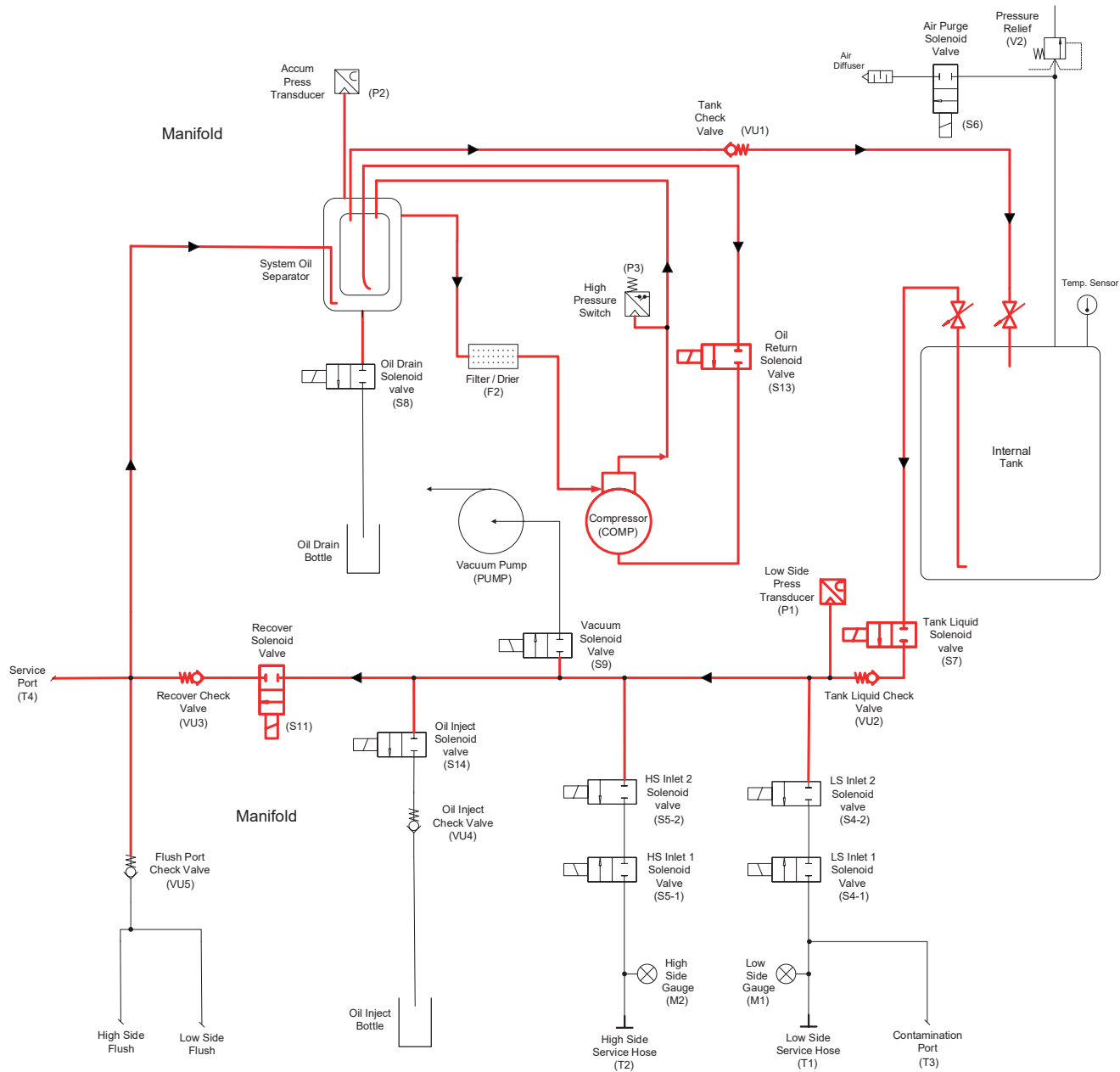
**Figure 4-14. Pre-Charge**



### CHARGE PROCESS

During the Charge process, the end user may select either high-side charge, low-side charge, or both. When the charge process gets close to the programmed weight, the unit slows down. The unit charges by compensation and will prompt the user in completing the charge.

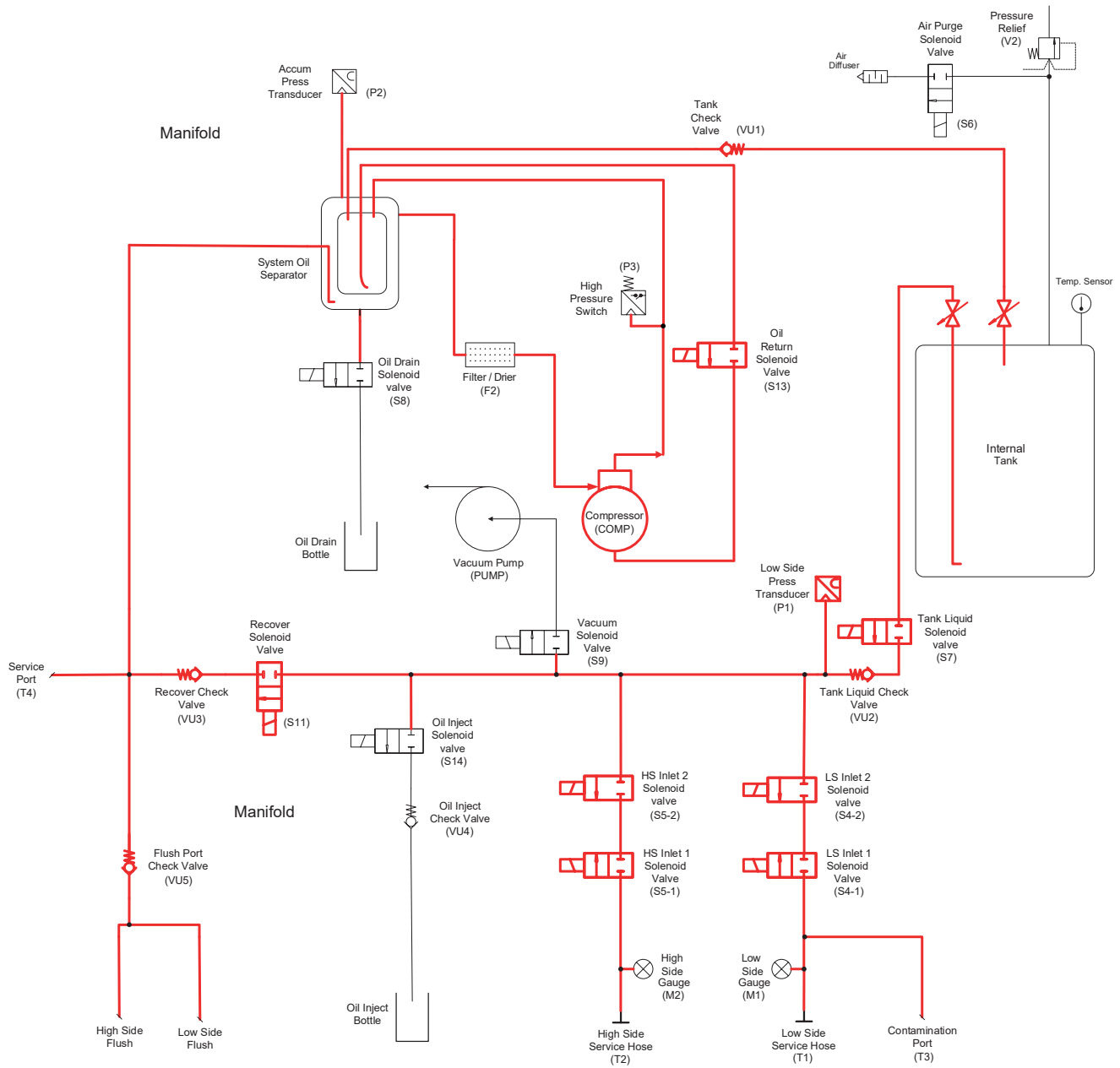
Figure 4-15. Charge



**TANK CONDITIONING PROCESS**

If the unit does not complete a full charge, the compressor and recovery solenoid are activated (see application chart), then stop to build tank pressure.

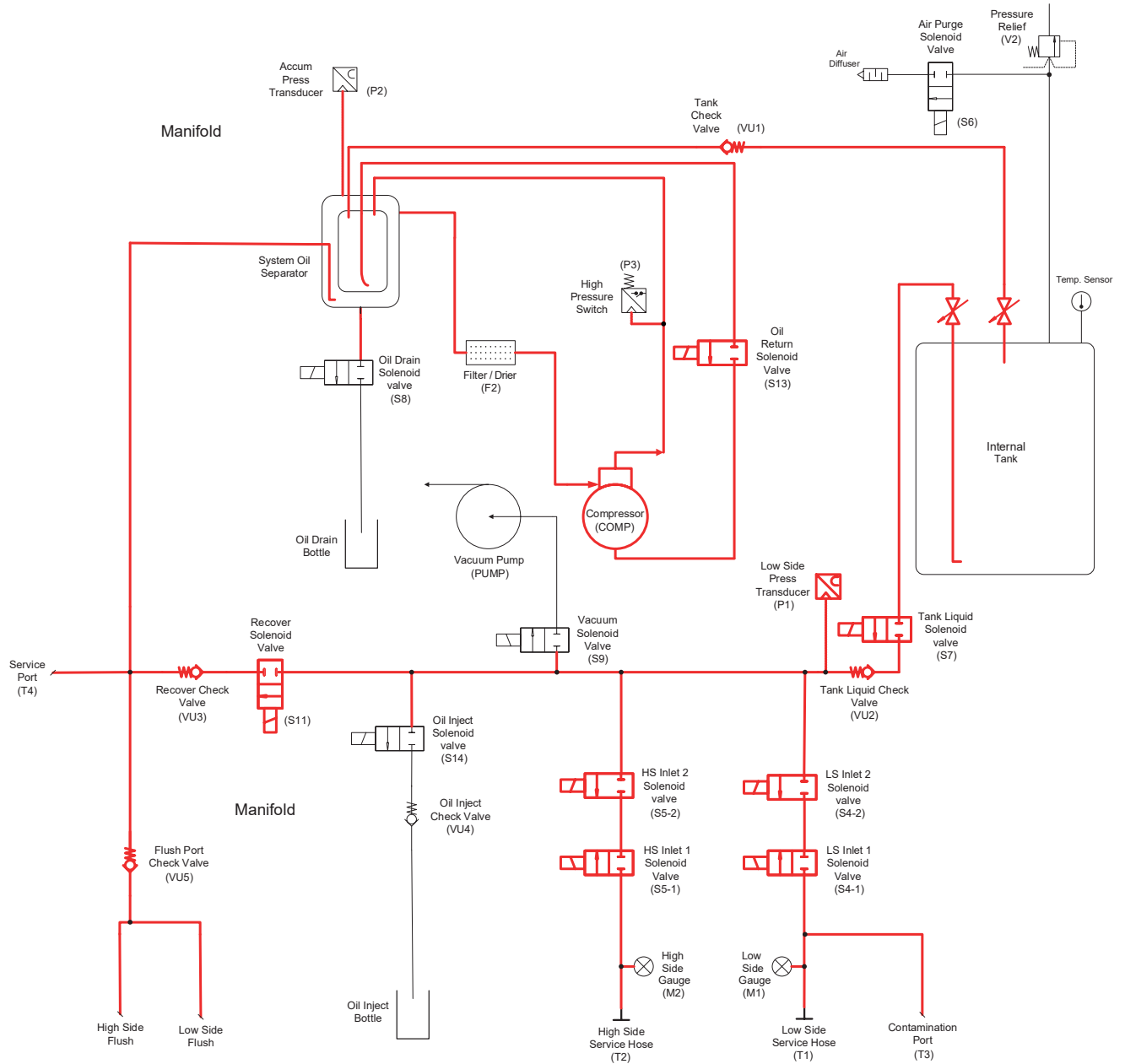
**Figure 4-16. Tank Conditioning**



**HOSE FLUSH PROCESS**

Flushing of the hoses is required if the next vehicle to be serviced contains a different type of A/C system oil than the previous vehicle serviced. During the Hose Flush Process, the compressor and tank liquid solenoid are activated. The HS and LS inlet and recover solenoids are intermittently activated in a charge/recover process to flush hoses or residual oils.

**Figure 4-17. Hose Flush**



**PERIODIC LEAK TEST (for R1234yf only)**

During the periodic leak test process the circuit is pressurized. The unit activates the high side inlet, low side inlet, oil return, recover solenoids to check any pressure decay (see application chart).

**Figure 4-18. Periodic Leak Test**

## MAIN COMPONENT DESCRIPTIONS

**12V POWER SUPPLY**— Provides 12 Volts to power the circuit boards, all solenoids, and sensors requiring 12V power.

**BOTTLE, OIL DRAIN** — Recovers the used oil during the oil drain process.

**BOTTLE, OIL INJECT (PAG/POE)** — Stores PAG/POE oil for injection into the A/C system.

**CALIBRATION WEIGHT (OPTIONAL)**— Calibration standard that attaches to magnet under scale assembly. Used to verify scale calibration.

**CHECK VALVE**— Allows refrigerant, air, or oil flow in one direction only.

**COMPRESSOR**— Moves refrigerant from the A/C system being serviced into the ISV on the unit.

**COMPRESSOR CAPACITOR**— Used for starting the compressor, helping reduce the initial high current demand required by the compressor on start-up.

**COMPRESSOR OIL SEPARATOR**— Removes the compressor oil from the refrigerant leaving the compressor. New oil is returned to the compressor when the oil return solenoid receives power.

**CONTROL PANEL**— User interface panel, display, and keypad for controlling refrigerant recovery, recycling and recharging.

**DISPLAY/CONTROL BOARD**— Front display panel and main control of the unit.

**FAN**— Keeps the compressor from exceeding its normal operating temperature. The fan runs whenever the power switch is turned on.

**FILTER DRYER, SPIN-ON**— Used to remove moisture and particles from refrigerant. Must be changed every time 150 kg (R1234yf) - 68 kg (R134a) of refrigerant is recovered.

**GAUGE, HIGH-SIDE**— Monitor high-side pressure of the vehicle being serviced.

**GAUGE, LOW-SIDE**— Monitors low-side pressure of the vehicle being serviced.

**HIGH-PRESSURE CUTOFF SWITCH**— Switch opens at  $22.5 \pm 0.7$  bar ( $326 \pm 10$  psi) and resets at  $17 \pm 0.7$  bar ( $250 \pm 10$  psi). If pressure in the high side of the system exceeds 22.5 bar (326 psi), the switch opens stopping all functions.

**INTERNAL STORAGE VESSEL (ISV)**— Storage tank where the recovered and recycled refrigerant is stored. Vapor, liquid, and air purge access is on-top of tank.

**KEYPAD**— Touch-pad providing the user interface for controlling, entering date, or navigating through the operation of the unit.

**MANIFOLD ASSEMBLY**— Internal manifold assembly that contains solenoids, check valves and switches. Refrigerant will flow through the manifold assembly for proper distribution.

**MUFFLER, AIR EXHAUST**— Disperses excessive air from the ISV. Provides effective reduction of objectionable air exhaust noise.

**OIL DRAIN ASSEMBLY**— Provides a means for attaching the oil drain bottle to the unit.

**ORIFICE, UNION**— Fitting used to reduce the flow rate.

**POWER CORD**— Supplies main power to the unit.

**PRESSURE RELIEF VALVE** — Spring-loaded safety valve to release pressure from internal storage vessel if pressure exceeds 25 bar (362 psi).

**POWER BOARD**— Controls power to all electrical components.

**SCALE ASSEMBLY**— Measures the amount of refrigerant in the ISV being charged into or recovered from the vehicle A/C system.

**SIGHTGLASS**— Used to view vacuum pump oil level.

**SOLENOID (S4), LOW-SIDE INLET**— Allows an open pathway for refrigerant flow and vacuum between the A/C system low side and the unit.

**SOLENOID (S5), HIGH-SIDE INLET**— Allows an open pathway for refrigerant flow and vacuum between the A/C system high side and the unit.

**SOLENOID (S6), AIR PURGE**— Energized to allow excessive air to escape from the ISV.

**SOLENOID (S7), TANK LIQUID**—When energized, allows refrigerant from ISV to enter of system being serviced.

**SOLENOID (S8), OIL DRAIN**— Energized at the end of the Recover process to drain oil.

**SOLENOID (S9), VACUUM** — When energized, allows a vacuum or deep recovery to be pulled on the A/C system being serviced.

**SOLENOID (S11), RECOVER**— When energized, provides the primary pathway of removing refrigerant from the system being serviced. This solenoid is also powered during the Flush process.

**SOLENOID (S13), OIL RETURN**— When energized, it returns compressor oil from the compressor oil separator to the compressor and equalizes the pressure on the high and low side of the compressor.

**SOLENOID (S14), OIL INJECT (PAG/POE)** — Energized during the PAG/POE Oil Inject process to allow A/C system oil to be replenished.

**SWITCH ON/OFF**—Allows the unit to be turned ON and OFF.

**TANK TEMPERATURE SENSOR**— Monitors the temperature inside the ISV.

**TRANSDUCER, ACCUMULATOR (SYSTEM OIL SEPARATOR)** — Measures the pressure within the system oil separator.

**TRANSDUCER, LOW-SIDE**— Measures the pressure of incoming refrigerant from the A/C system. Pressure readings are then relayed to the control board.

**VACUUM PUMP**— Pump designed to removed moisture and air from an A/C system. Also aids in the recovery process by performing a deep recovery of A/C system.





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