SUBARU

*Confidence in Motion*

# Technician Reference Booklet

## Automatic Climate Control Systems

MSA5P2606C

AUTOMOTIVE Youth Educational Systems PROUD PARTNER

WE SUPPORT PROFESSIONAL CERTIFICATION THROUGH THE National Institute for AUTOMOTIVE SERVICE EXCELLENCE

April 2015

***This Technical Reference Booklet (TRB) is designed to be used in a classroom environment or as a guide for self study.***
***The TRB is not intended to be used as a supplement or substitute for the Subaru Service Manual. Always consult the appropriate Service Manual when performing any diagnostics, maintenance or repair to any Subaru vehicle.***



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NOTES

# Introduction


*2015 Impreza*


*2015 Legacy*

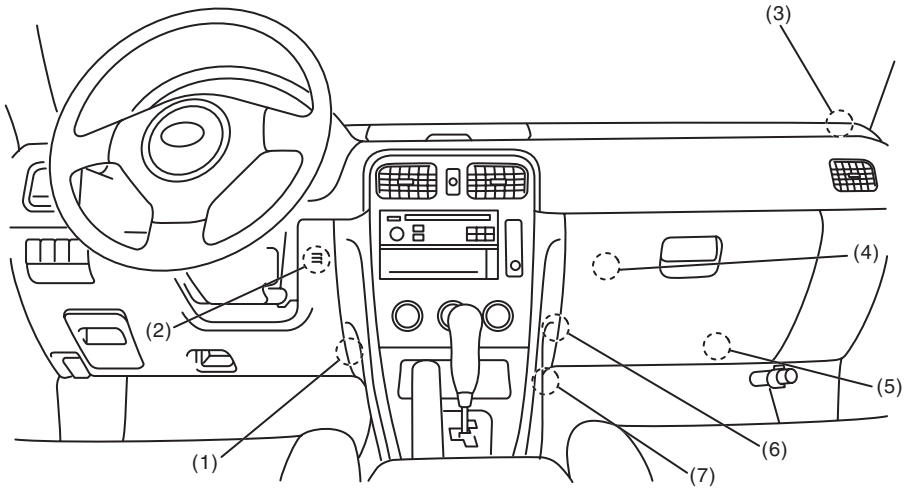
Automatic climate control has been designed to provide maximum comfort for vehicle occupants and to decrease fuel consumption.


*HVAC control panel*

Optimum control of air temperature, flow, and direction is accomplished with logic programmed into the Automatic Air Conditioning Control Unit, and requires minimum input from the vehicle driver. Lower refrigerant pressures result from precise control of the A/C system which results in lower loads placed against the engine, contributing to more efficient fuel consumption.

Subaru Automatic Climate Control systems are designed to work with fixed and variable displacement compressors. Currently, the only models to be equipped with a variable displacement compressor are the Legacy and Outback models (2010 model year to present).

This system provides additional control and requires more input data to function efficiently and is therefore more difficult to diagnose.




(1) Mode door actuator
(2) In-vehicle sensor
(3) Sunload sensor
(4) Intake door actuator
(5) Blower motor
(6) Evaporator sensor
(7) Air mix door actuator

**1-5**

*Sensor / actuator location*

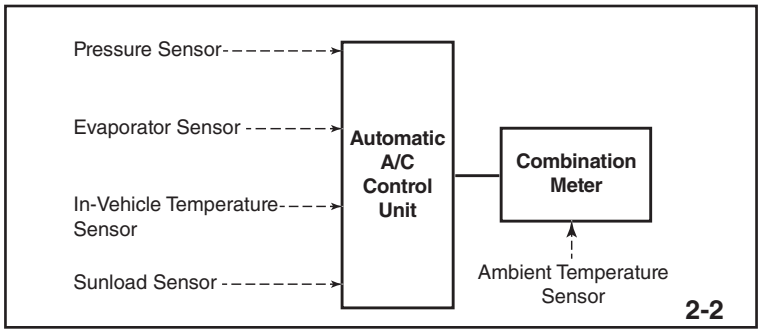
Sensors provide input to the Automatic Climate Control Module. The Control Module processes the signals and then sends output signals to the Actuators, Blower Motor, and Engine Control Module (ECM). The Climate Control's Self-Diagnostic Mode will check the Sensor Circuits for an "Open" or "Shorted" condition. The self-diagnostic function will not check for an incorrect sensor signal. If the Sensor is sending an incorrect signal to the Control Module, system performance problems could develop and diagnostics by phenomenon should be performed.

**Example: If the Cabin Sensor sends a signal that the Control Module interprets as 68 degrees, but the actual cabin temperature is 98 degrees, a poor performance complaint might be reported. Since the sensor input signal to the Control Module directly affects the Control Module output signal. Please consult the appropriate service manual for diagnosing a sensor whose signal is suspect.**

# Sensors

Both types of Automatic Climate Control systems, fixed and variable displacement, are equipped with 5 common input sensors.

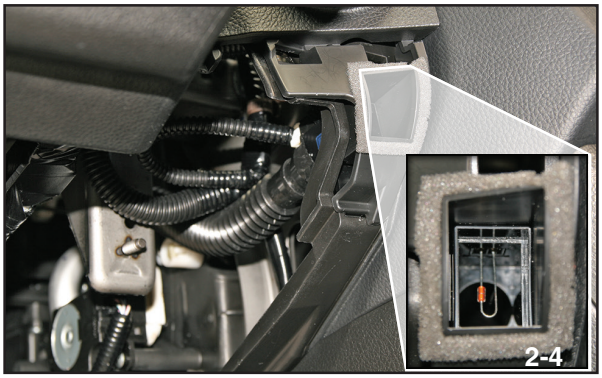
**Note: Variable displacement systems require additional input data and will be discussed later in this lesson.**




*Common sensors*

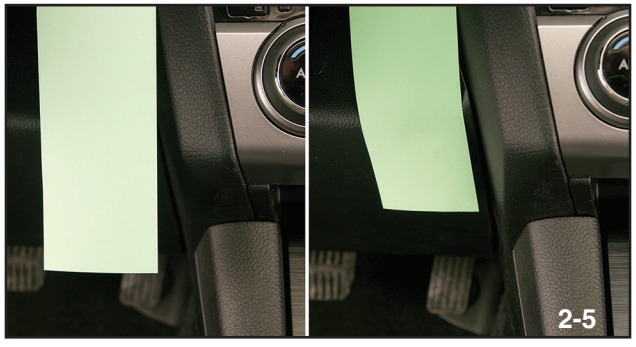
The In-vehicle Temperature Sensor measures the temperature of the air in the passenger compartment and inputs the value to the A/C control unit (A/C panel).


*In-vehicle temperature sensor*



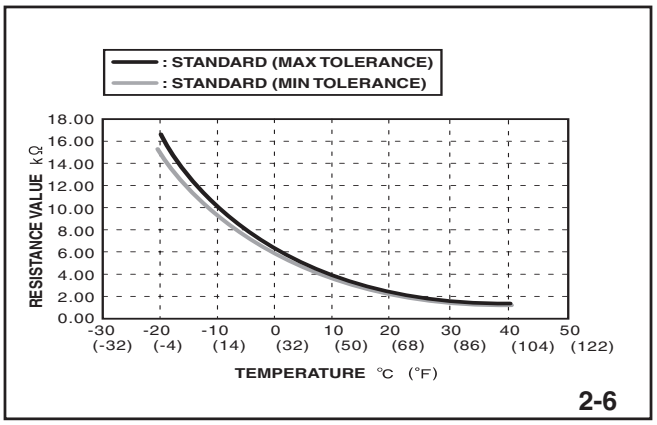

*Aspirator tube and In-vehicle temperature sensor*

An aspirator tube connected to the In-vehicle Temperature Sensor creates a negative pressure area at the vent of the In-vehicle Temperature Sensor. The negative pressure area allows air to flow across the negative temperature coefficient (NTC) sensor.




*Negative pressure*

NTC sensor resistance decreases with increased temperature and resistance increases when temperature decreases.




*Intake air temperature sensor resistance chart*


*Sunload sensor in car*

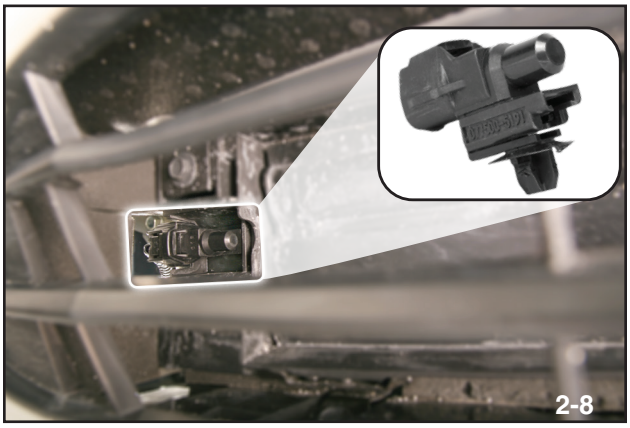
## Sunload Sensor

A photosensitive diode is used in the construction of the Sunload Sensor. The sensor detects changes in the sun's intensity and converts it into a small current, which is then input to the Control Module. This sensor will affect the target location of the air blend actuator and blower speed.

**Note: A high intensity light source must be used when testing the Sunload Sensor or an "open" Circuit could exist while checking the system in the Self-diagnostic Mode.**

## Ambient Temperature Sensor

The Ambient Temperature Sensor measures the temperature of the ambient or outside air, which is an input to the Control Module. Due to its construction, the ambient sensor can only measure an average outside temperature and does not respond to sharp temperature changes quickly.



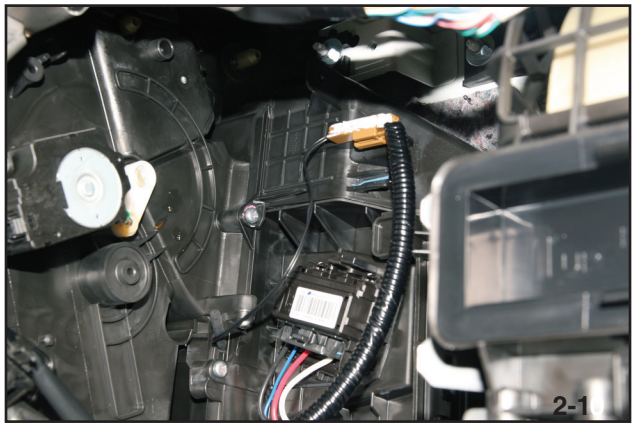

*Ambient temperature sensor*


*Ambient temperature display MFD*

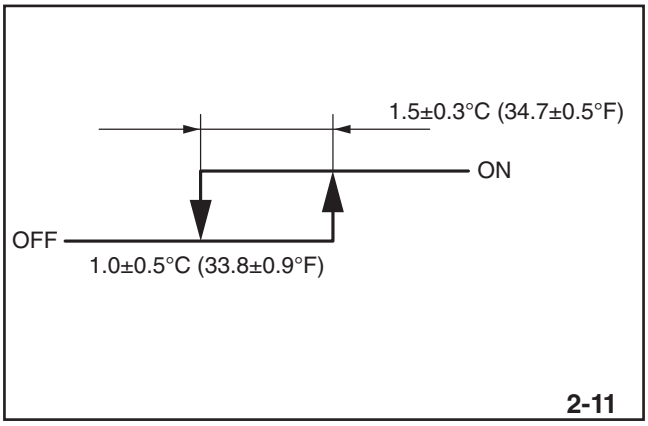
The ambient temperature value can be adjusted on certain models, (+ or – 3 degrees), using the Select Monitor work support for the combination meter or by using vehicle controls as directed in the service manual in the IDI (INSTRUMENTATION/DRIVER INFO (DIAGNOSTICS) section.

## Evaporator Sensor

This sensor is located at the air outlet side of the evaporator core. It is positioned on the evaporator core at a location that develops the coldest air flow from the evaporator. This sensor inputs a value to the ECM, which changes with temperature. If the temperature approaches the freezing level, the ECM will cut the output signal to the Compressor Clutch Circuit.




*Evaporator sensor in place*



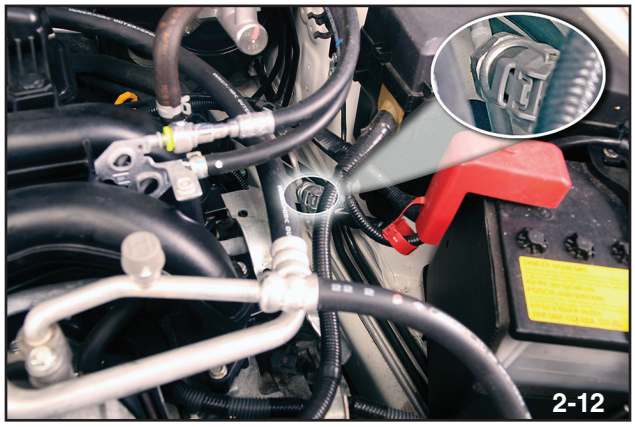

*Evaporator sensor ECM operating logic*

The evaporator sensor of the climate control system is a 2 wire sensor that changes resistance (NTC) with changes in temperature. Colder temperatures create higher resistance values that equate to higher voltage readings as the positive wire of the sensor is measured.

## Pressure Switch (Except Legacy and Outback)

The Pressure Switch is located on the high pressure line and is threaded onto a fitting made onto the line. **Never remove the Pressure Switch while refrigerant is in the A/C system.**

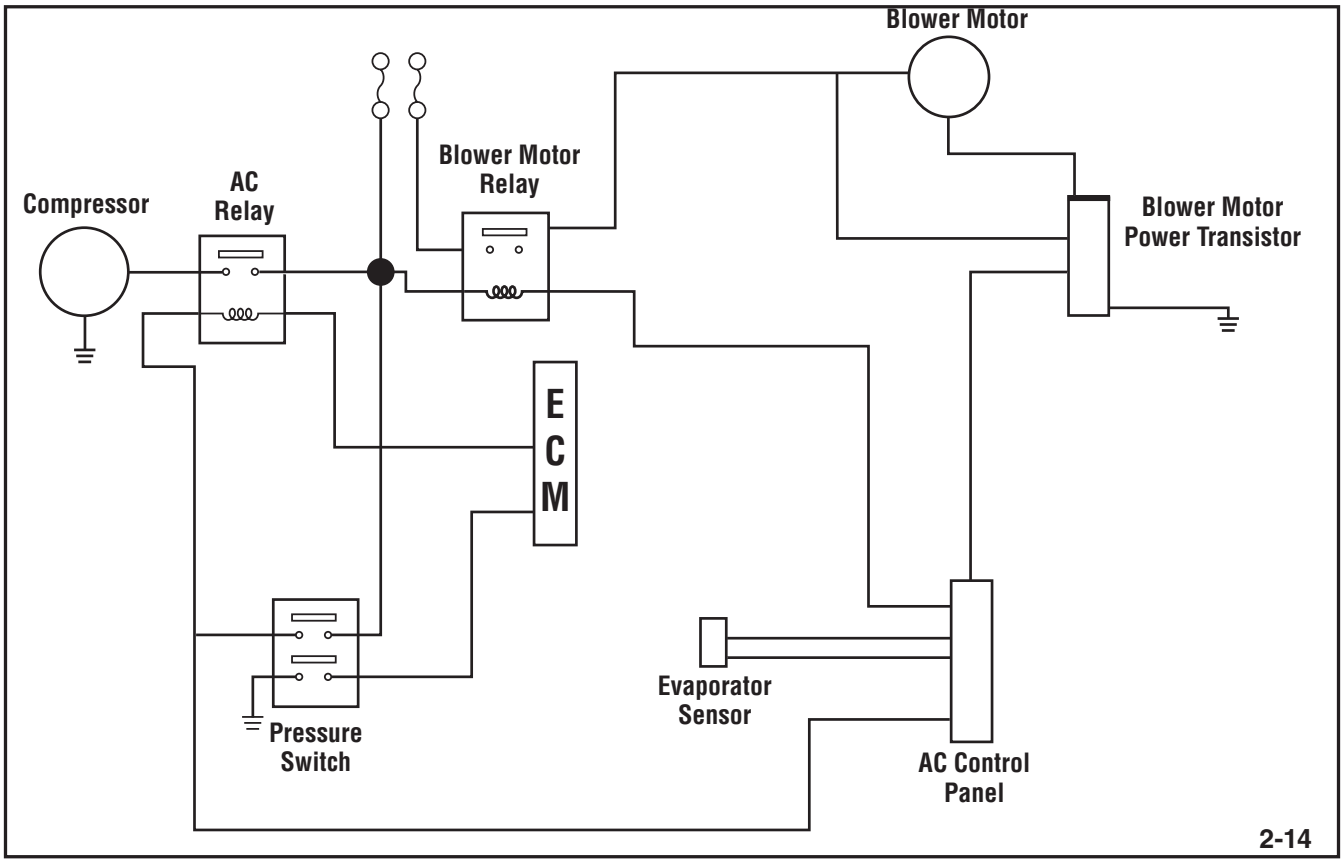
The pressure sensor of Automatic climate control vehicles, except Legacy and Outback, is a dual diaphragm, 2 switch device, which provides 2 types of control and 1 signal input to the engine computer.




*Pressure sensor location*


*Pressure sensor*

The first control is electrical power supply to the A/C relay and the A/C control panel.




*Air conditioning wiring (execpt Legacy and Outback)*

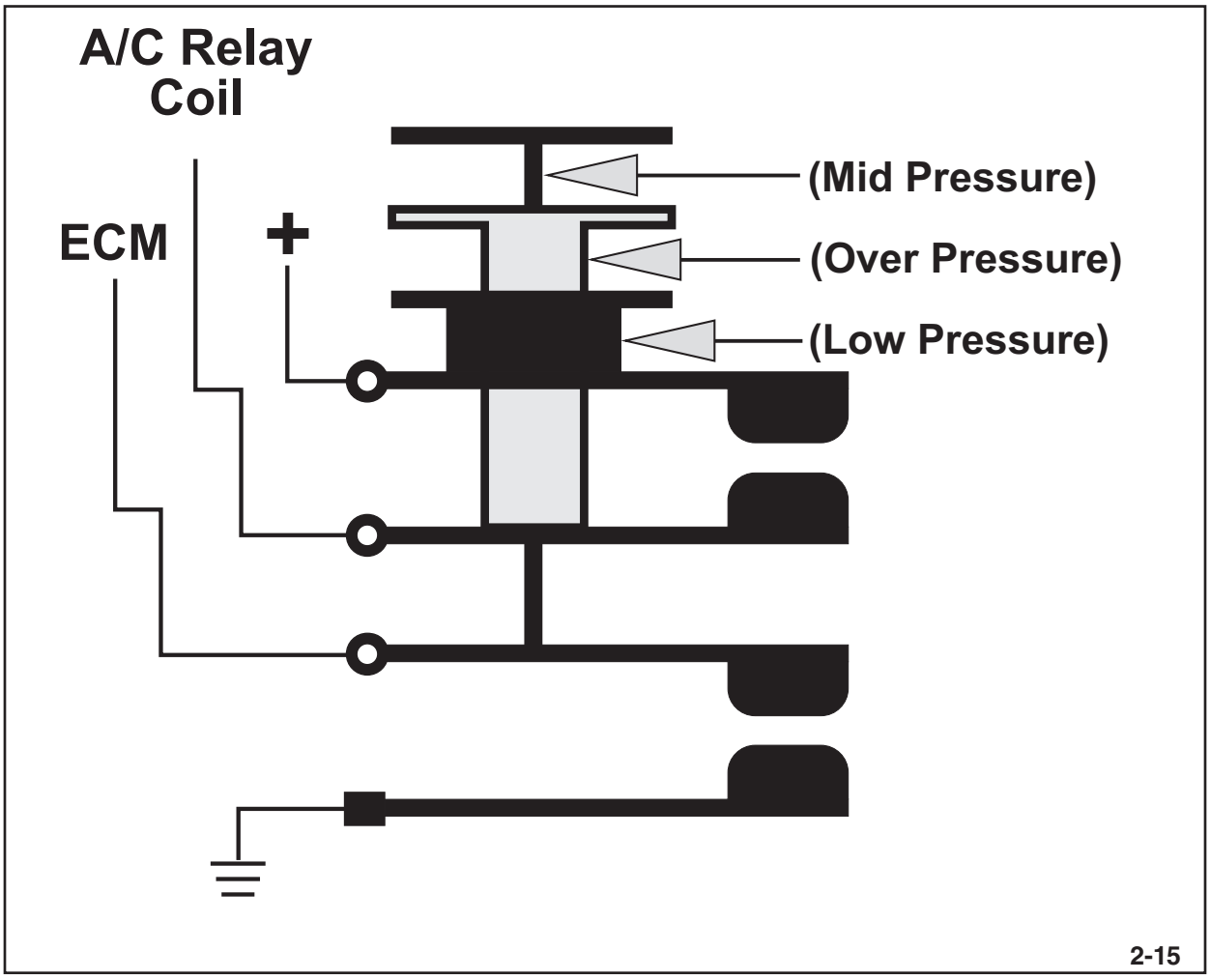
A minimum of 32 P.S.I. is required to close the low pressure switch. Below 32 P.S.I., the low pressure switch will be open and no voltage will exist at the A/C relay and the A/C control panel. This protects the A/C system by preventing the compressor from operating when oil cannot be circulated through the system.

The second control is over pressure protection. If the high side pressure exceeds 340 P.S.I. the pressure switch will open and electrical power to the A/C relay and the A/C control panel will be removed. Operating pressures above 340 P.S.I. will reduce cooling performance and possibly damage mechanical parts.

The pressure switch also creates an input signal to the ECM. The second switch in the pressure sensor is named the mid-pressure switch.

When the high side pressure reached approximately 256 P.S.I. the mid-pressure switch will close and a ground signal will be supplied to the ECM.

The ECM will activate the radiator fans as a result of the signal and the radiator fans will continue to operate until the high side pressure has been reduced to approximately 210 P.S.I..

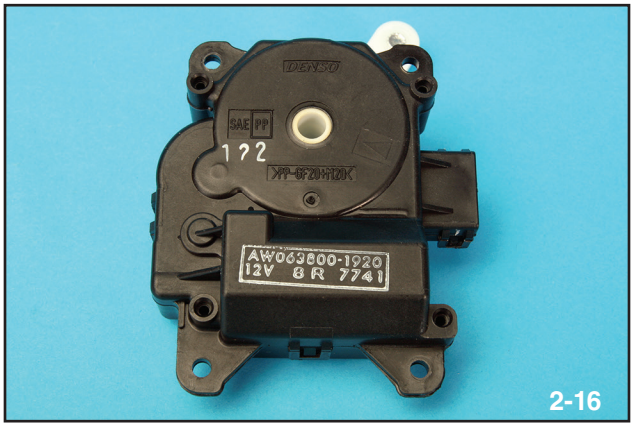



*Pressure switch mechanical operation*

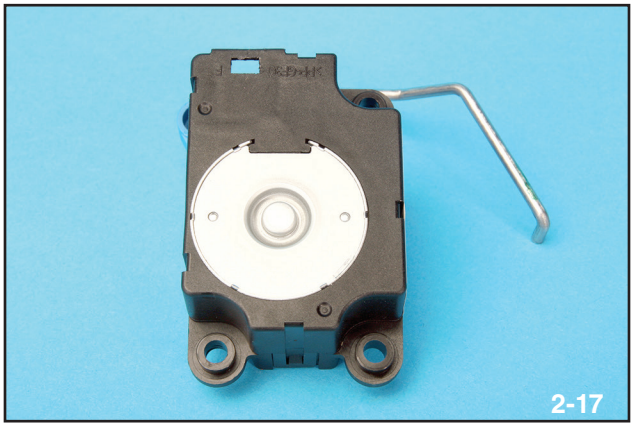
The switches are controlled by refrigerant pressure acting on the pressure discs of the Pressure Switch. Each disc pushes on a post that moves the contact points of the 2 switches. The center post closes the mid-pressure switch, controlling the signal for the radiator fans. The center post moves the lower contact away from the upper contact of the pressure switch, providing for over pressure control. The outer most post moves the upper contact into the lower contact of the pressure switch, providing minimum pressure control.

## Actuators

Subaru automatic climate control systems are equipped with electronic actuators that operate the mode and air blend doors of the heating and cooling unit as well as the fresh and recirculation door assembly.



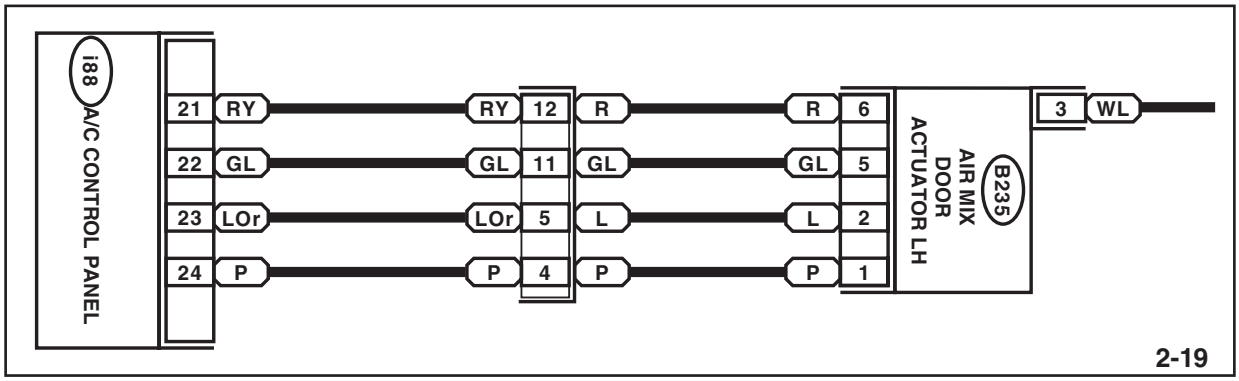

*Actuator Legacy external*




*Actuator Impreza external*

All models, except Legacy and Outback, are equipped with stepper motor actuators with no feedback sensors for the mode and air blend door operation. The fresh and recirculation actuator is equipped with a potentiometer that signals door position to the A/C control Unit (control panel). (Legacy and Outback actuators will be covered later in this TRB).


*Schematic actuator Legacy*

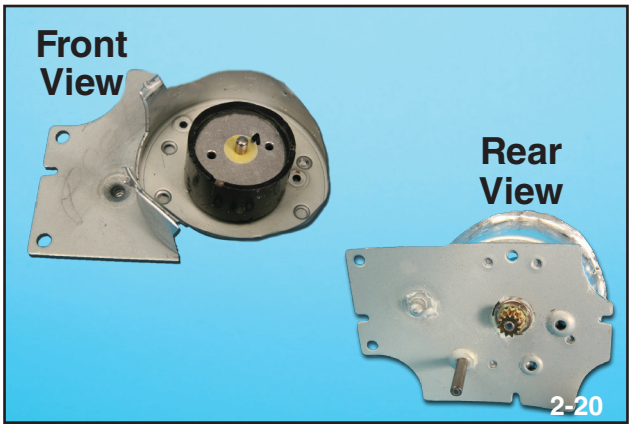



*Schematic actuator Impreza*

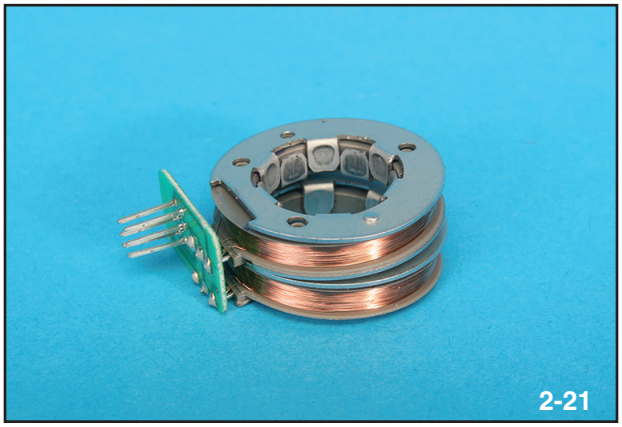
**Forester, Impreza, and WRX STI**

The A/C control unit (control panel), counts the number of step operations of the actuator motor to determine actuator position. The In-vehicle Temperature Sensor provides data to assist with positioning the air blend doors for temperature control but there is no sensor to assist with mode door positioning.

The air mix and mode door actuators of this system are constructed with a rotor equipped with 6 permanent magnetic poles.

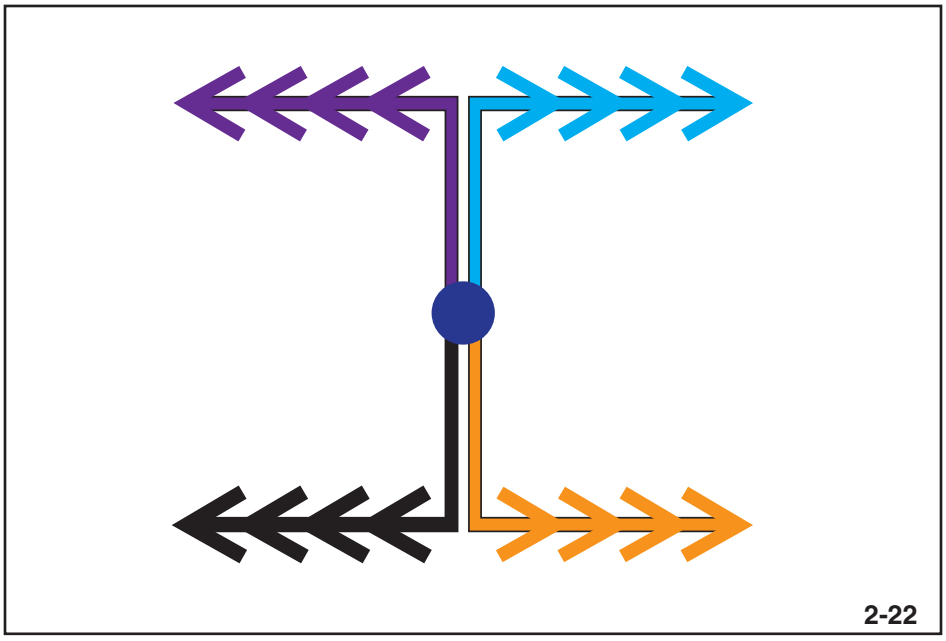



*Rotor*



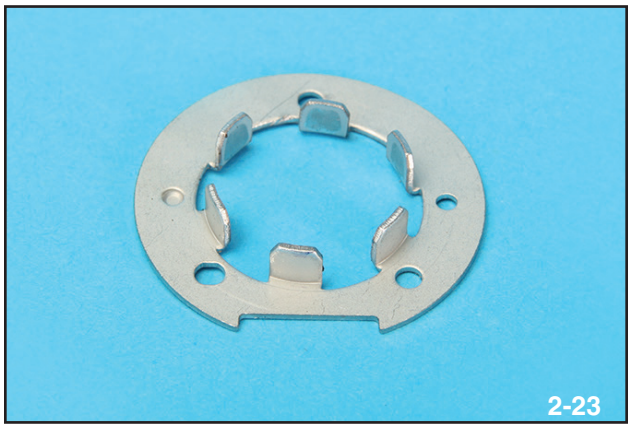

*Stator winding spools*

The rotor interfaces with 4 stator windings which are wound around an upper and lower spool. Each spool has two sets of stator windings that are wound in opposite directions to create oppositioning magnetic poles.



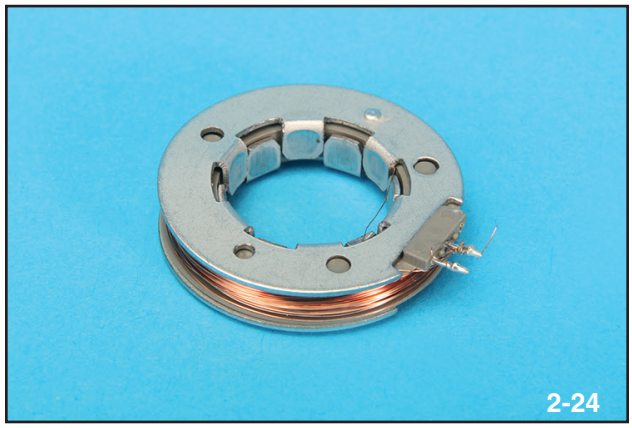

*Stator winding configuration*

Each spool is also equipped with an upper and lower set of claw poles.

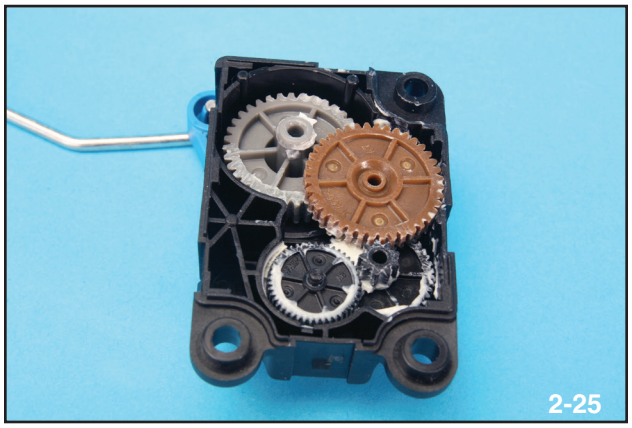



*Claw pole*

The claw poles extend the reach of the magnetic field created by the stator windings.




*Claw poles and spools*

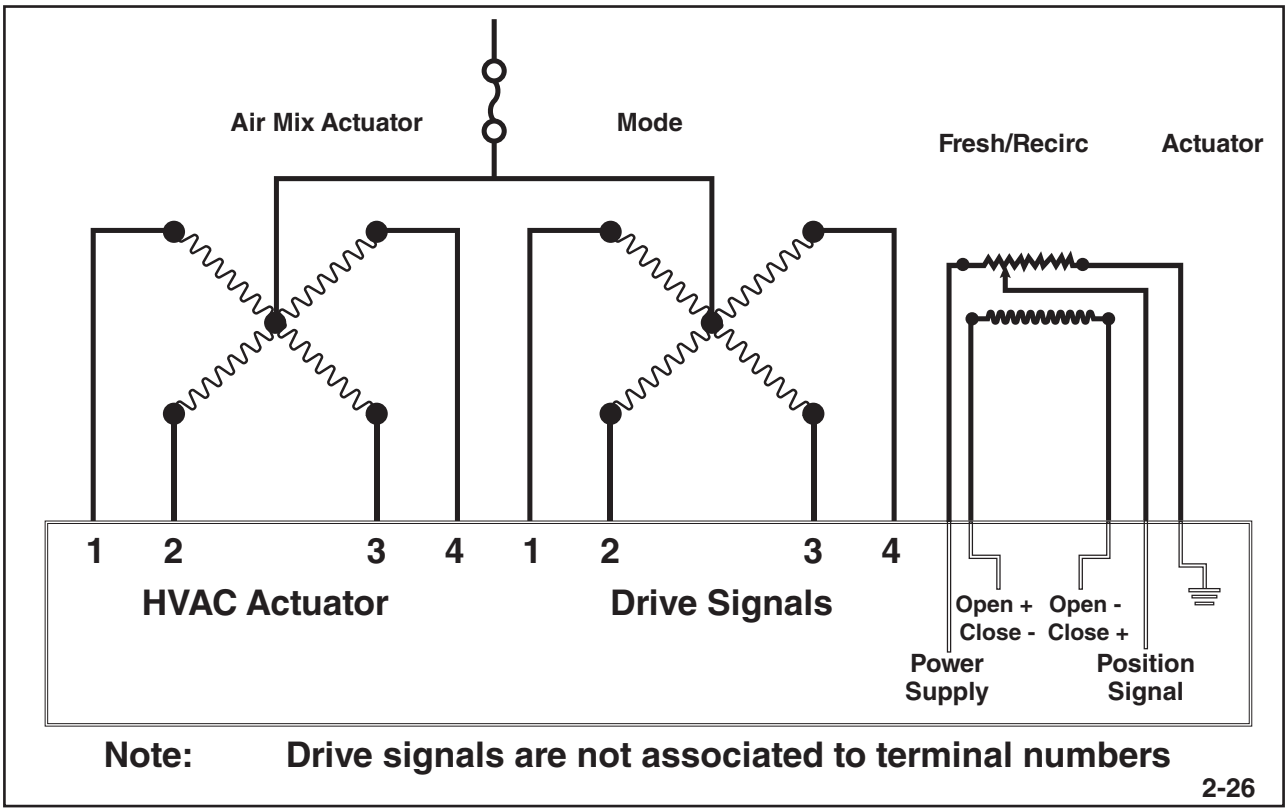



*Acuator gear set*

The HVAC control unit grounds each set of stator windings independently to control the magnetic fields necessary to move the rotor clockwise or counterclockwise.

The HVAC control unit counts the number of times each stator winding is grounded to determine the number of revolutions of the rotor. (The position of air mix and mode doors is determined by the direction and number of revolutions of the rotor).

The actuator motor meshes with the gear set to drive the linkage that operates the mode or air mix doors.




*Stator drive signals*

Since the rotor is not equipped with a sensor to determine its exact location, the HVAC control unit calibrates or zeroes the rotor position by creating a balanced magnetic field which forces the rotor to a fixed position. This is performed by the HVAC control unit each time the ignition is turn off or when the air conditioning system is turned off. The rotor is controlled to move the number of revolutions stored in the HVAC logic that estimates the exact location and is then finely positioned using the calibration or zeroing control.

Mode door actuator calibration or zeroing

- Ignition off forces the actuator to move to the end of mechanical movement of the mode door linkage.
- Air conditioning off forces the actuator to approximately the middle range of movement of the mode door linkage.

Air mix door actuator calibration or zeroing

- Air conditioning off forces the actuator to approximately the middle range of movement of the air mix door linkage.
- The in-vehicle air temperature sensor assists with the correct setting of the air mix door actuator.

NOTES

# Diagnostics

There are three types of diagnostics available for Automatic Climate Control systems:

Basic Diagnostics - Troubleshooting of refrigerant pressures and electrical circuits required to operate the normal refrigerant cycle and the control and operation of air flow. Safety equipment, A/C gauges, and a multi-meter are required to perform basic diagnostics.

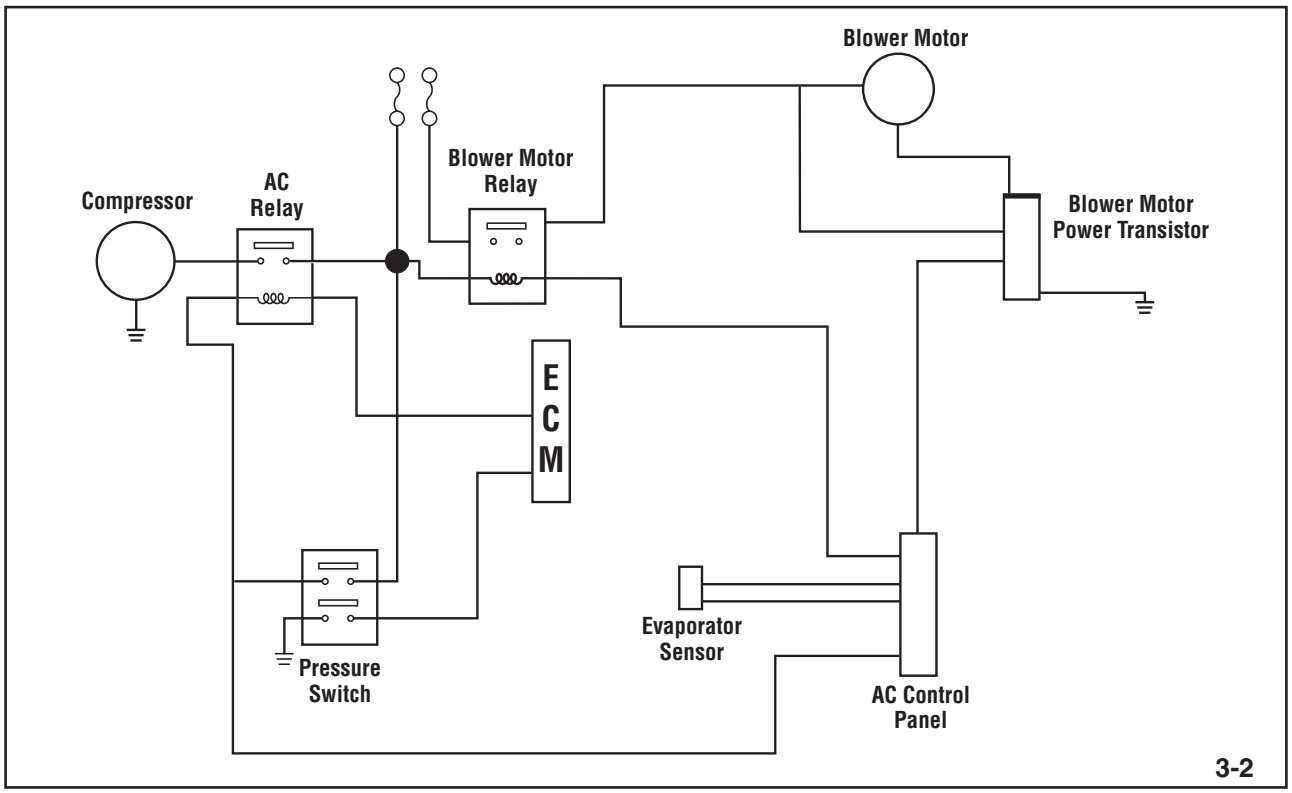
Self Diagnostics -Troubleshooting using the built in diagnostics of the air conditioning control unit is performed. Sensor circuits, actuator movement, and airflow direction and velocity can be checked. Trouble codes or fault conditions can be read from the LED status of switches. No other tools are required to perform the self diagnostic check.

**Note: Additional tools will be required to confirm an identified fault.**

Diagnostics with the Select Monitor – The Select Monitor can display the data stream from the air conditioning control unit, display trouble codes, and activate forced drive or active tests. Additional tools will be required to confirm an identified fault.

## Basic Diagnostics

### Power Transistor and Blower Motor Control



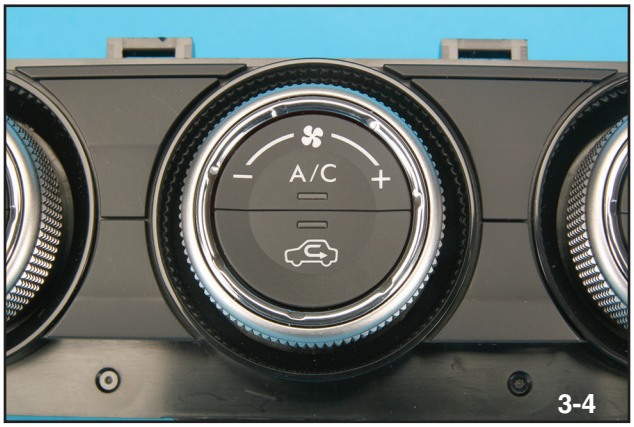

*A/C system wiring*

# Automatic Climate Control Systems

The automatic climate control system fan speed switch is an integral part of the A/C control panel and cannot be serviced separately from the control panel. The fan has no off or "0" speed selection, which is found on a manual A/C system. When the A/C climate control system is turned to Auto or if a manual mode is selected, the blower motor relay will be grounded and the blower motor will operate at least to the minimum speed.

**Note: The blower motor speed for automatic mode, when set to temperatures higher than coolant temperature, will not increase to higher speeds until the A/C system has determined that the coolant temperature is high enough to meet the set temperature.**

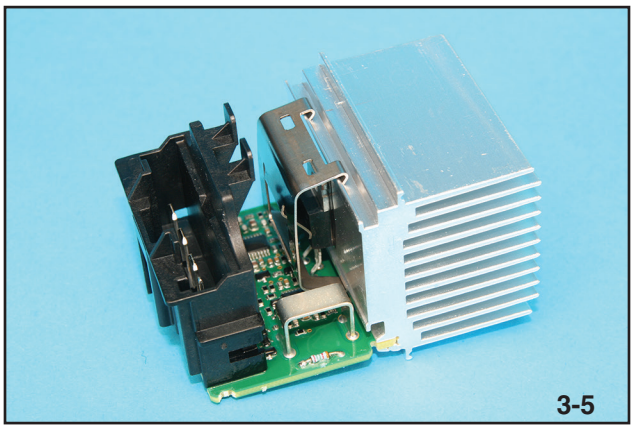

*Control panel*



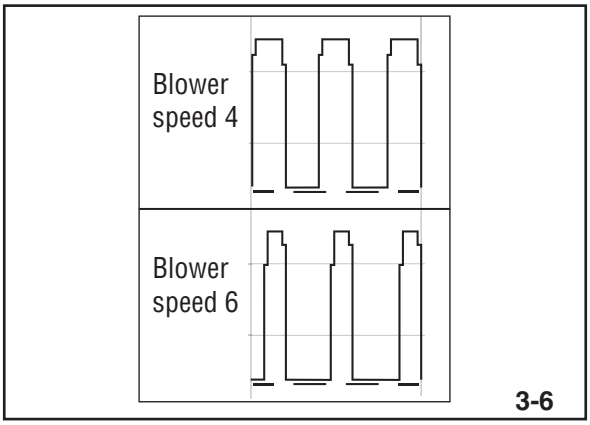

*Blower motor switch*

The power transistor of the automatic climate control system controls the ground circuit of the blower motor. A duty control signal from the air conditioning control unit, at a frequency of 500Hz with a changing duty ratio, controls the amount of ground potential available to the blower motor. The off duty ratio of the signal increases as the blower fan speed is increased.

**Note: Maximum blower motor speed is a complete ground signal to the power transistor.**




*Power transistor*




*Oscilloscope image of duty signal*

A multi-meter can be used to check the duty control wire from the air conditioning control unit. The voltage reading will average to the following:

1st fan speed 9 volts

2nd fan speed 8 volts

3rd fan speed 7 volts

4th fan speed 6 volts

5th fan speed 5 volts

6th fan speed 3.5 volts

7th fan speed 0.5 volts

**Note: See I/O chart of the A/C control unit for more details.**

## Refrigerant

The information for performing a basic check for refrigerant condition that allows for the normal operation of the A/C system can be found in the explanation of the pressure switch operation.

1. A minimum of 32 P.S.I. is required to close the low pressure switch.
2. Below 32 P.S.I., the low pressure switch will be open and no voltage will exist at the A/C relay and the A/C control panel.
3. If the high side pressure exceeds 340 P.S.I. the pressure switch will open and electrical power to the A/C relay and the A/C control panel will be removed.
4. When the high side pressure reaches approximately 256 P.S.I. the mid-pressure switch will close and a ground signal will be supplied to the ECM to operate the radiator fans.
5. When the high side pressure reaches approximately 210 P.S.I. the mid pressure switch will open and the ground signal to the ECM will be removed and the radiator fans will turn off.

**Note: Always check the compressor drive belt for proper tension.**

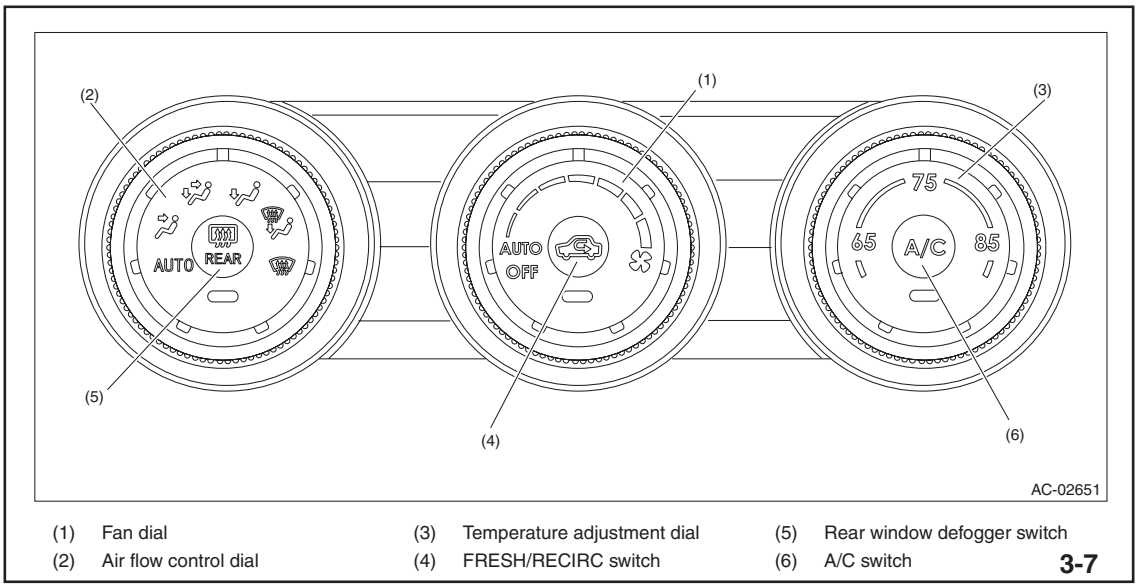
## Self Diagnostics

Automatic climate control systems have built in self diagnostic functions that allow tests for L.E.D.s, switches, air flow, air temperature, sensors, compressor command function, and A/C control unit to be performed.

Activation of the self diagnostic tests varies from year to year and model to model, however, the test is similar to the following;

1. Identify the air conditioning system.

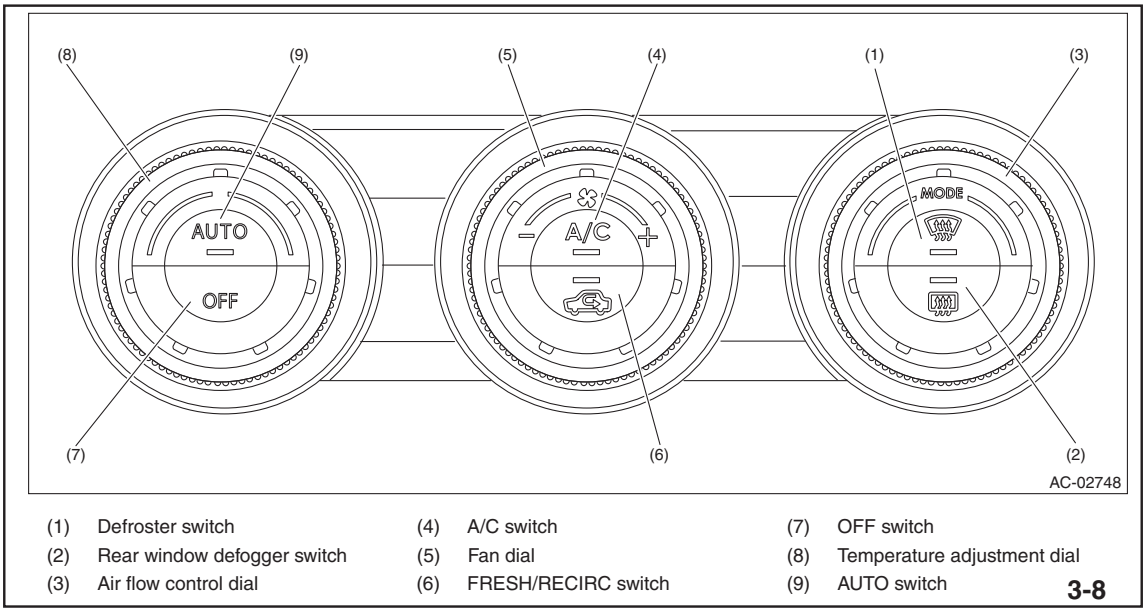
   Single zone, dual zone, and models with High Grade Multi-function Display A/C control panels differ. The service manual outlines a separate method of activation and interpretation of results for each system.




| | | | | | |
|---|---|---|---|---|---|
| (1) | Fan dial | (3) | Temperature adjustment dial | (5) | Rear window defogger switch |
| (2) | Air flow control dial | (4) | FRESH/RECIRC switch | (6) | A/C switch |

**3-7**

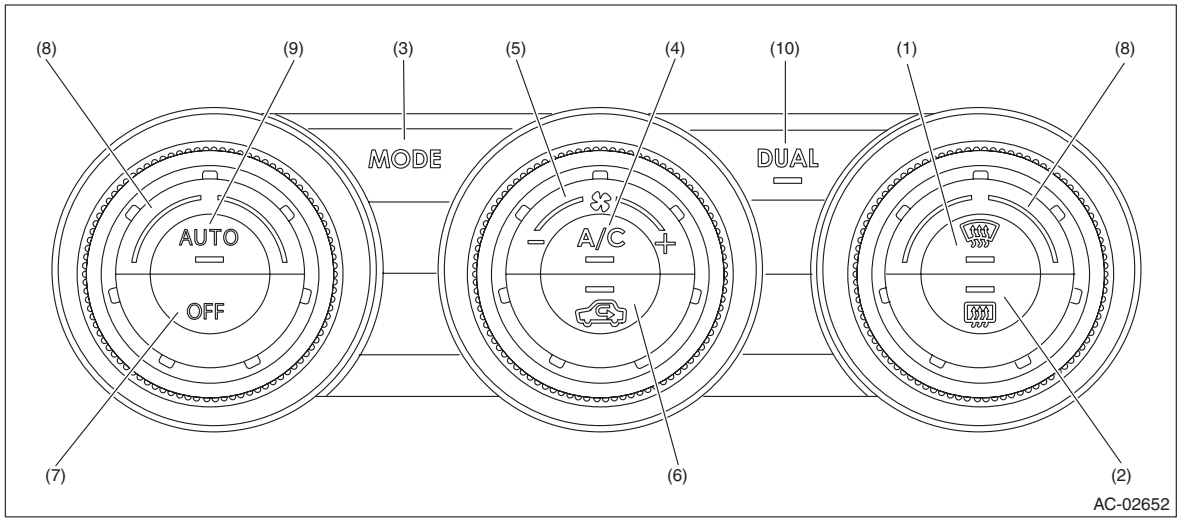
*Without left / right independent air conditioning function (without high grade MFD)*




| | | | | | |
|---|---|---|---|---|---|
| (1) | Defroster switch | (4) | A/C switch | (7) | OFF switch |
| (2) | Rear window defogger switch | (5) | Fan dial | (8) | Temperature adjustment dial |
| (3) | Air flow control dial | (6) | FRESH/RECIRC switch | (9) | AUTO switch |

**3-8**

*Without left / right independent air conditioning function (with high grade MFD)*




(1) Defroster switch
(2) Rear window defogger switch
(3) Air flow control switch
(4) A/C switch
(5) Fan dial
(6) FRESH/RECIRC switch
(7) OFF switch
(8) Temperature adjustment dial
(9) AUTO switch
(10) Dual switch

**3-9**

*With left / right independent air conditioning function*

2. Read the entire section of the Subaru Service Manual that describes the activation process and “Check Tables”.
3. Follow the steps provided and refer to the “Check Tables” for results.

For this example, without left/right independent air conditioning function (with high grade MFD) , has been selected.

| | Step | Check | Yes | No |
|---|---|---|---|---|
| 1 | **SELECT SELF-DIAGNOSIS MODE IN THE CONTROL MODULE.**<br>Start the engine with the A/C switch and the FRESH/RECIRC switch pressed. | Does the self-diagnosis mode operate? | Go to step **2**. | <Ref. to AC(diag)-19, NOTHING IS DISPLAYED ON THE SCREEN. NO ILLUMINATION APPEARS ON THE INDICATOR, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |

3-10

*Step 1*

**Note: Do not release the A/C switch and Fresh / Recirc switch until the LEDs of all switches begin to flash.**


*Pushing A/C and Fresh / Recirc switch*

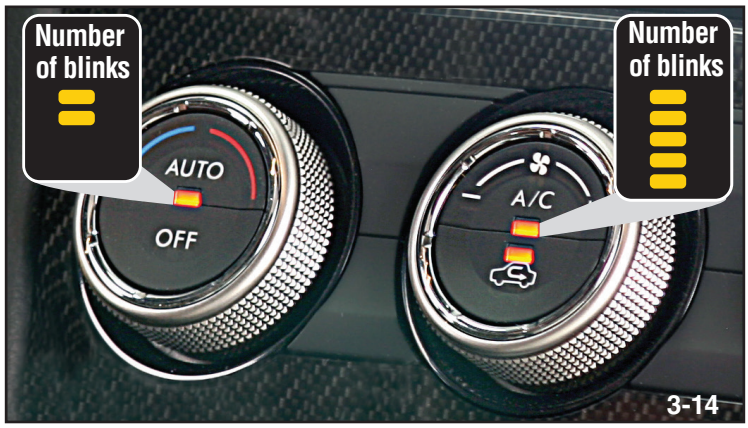
| | Step | Check | Yes | No |
|---|---|---|---|---|
| 2 | **CHECK INDICATOR BLINKS.**<br>Make sure that all switch indicators on the control panel blink. | Do all indicators blink eight times?<br><br>** 7 or 8 blinks are acceptable.* | Go to step **3**. | Replace the A/C control panel. <Ref. to AC-50, REMOVAL, Control Panel.> |

3-12

*Step 2*


*Control panel LEDs*

The next step is the sensor malfunction check. Observe the number of blinks of the Auto switch. Two blinks indicate the sensor check is in progress. Count the flashes of the A/C switch and reference the **"Sensor Check Table"** to confirm malfunctioning sensors.




*Fan dial and auto switch LED*

| Step | | Check | Yes | No |
|---|---|---|---|---|
| 3 | **CHECK SENSOR MALFUNCTION.**<br>1) The inspection mode for sensor is initiated by turning the fan dial one click to the right. (The auto switch indicator blinks two times.)<br>2) If all sensors have no malfunctions, the A/C switch indicator illuminates. If any sensor has a malfunction, the A/C switch indicator blinks.<br>3) Identify defective sensors according to the sensor check table. <Ref. to AC(diag)-13, SENSOR CHECK TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.> | Does the A/C switch indicator illuminate? | Go to step **4**. | Repair the defective sensor. |

**3-15**

*Step 3*

## Sensor Check Table

| Sensor | A/C switch indicator | FRESH/RECIRC switch indicator | | | | Rear defroster switch indicator *2 | |
|---|---|---|---|---|---|---|---|
| | | Open | Sequence of priority | Short | Sequence of priority | Current malfunction | Past malfunction |
| In-vehicle sensor | Once | Light OFF | 1 | Light ON | 2 | Light OFF | Light ON |
| Ambient sensor | Twice | Light OFF | 3 | Light ON | 4 | Light OFF | Light ON |
| Evaporator sensor | 3 times | Light OFF | 5 | Light ON | 6 | Light OFF | Light ON |
| Engine coolant temperature sensor | 4 times | Light OFF | | | 7 | Light OFF | Light ON |
| Sunload sensor | 5 times | Light OFF*1 | 8 | Light ON | 9 | Light OFF | Light ON |
| CAN communication | 6 times | Light OFF | 10 | — | | Light OFF | Light ON |
| FRESH/RECIRC potentiometer | 7 times | Light OFF | 11 | Light ON | 12 | Light OFF | Light ON |

**3-16**

*Without left/right independent air conditioning function (with high grade MFD), with left/right independent air conditioning function*

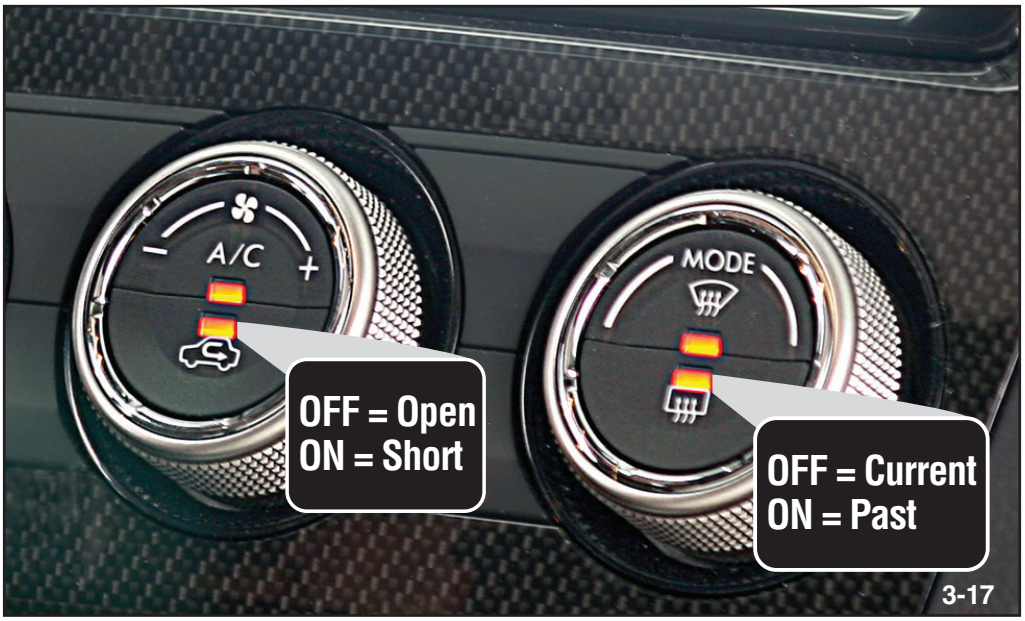
The example vehicle provided should indicate a failed Sunload sensor (unless a strong artificial light source has been provided). Pressing the A/C switch will toggle to the next failed sensor (if multiple failures exist).

Status of a failed sensor (open or shorted) can be judged to have happened in the past or has currently failed.

The Fresh / Recirc switch indicator “OFF” indicates open and “ON” indicates short.

Observe the Rear Defroster indicator, off is a current failure, on is a past failure.

Previous failures can be cleared by holding the Fresh / Recirc switch in the on position for more than 5 seconds.




*Fresh / recirc and rear defrost LEDS*

**NOTE:**

- When the Sunload sensor check is performed indoors or in the shade, it could be diagnosed as having an open circuit. Always check the Sunload sensor at a location exposed to direct sunlight.
- If there are multiple defective sensors, a malfunction is displayed in the sequence of priority (1, 2, 3, etc.). The display changes in the sequence of priority (1, 2, 3, etc.) each time the A/C switch is pressed.
- Past malfunction will illuminate if four malfunctions or more were detected previously.
- To cancel the past malfunction, perform either of the following procedure: Disconnect the negative battery terminal or press and hold the FRESH/RECIRC switch for 5 seconds or more while performing self diagnosis step 3 — 4.

*1: Displays current malfunction only

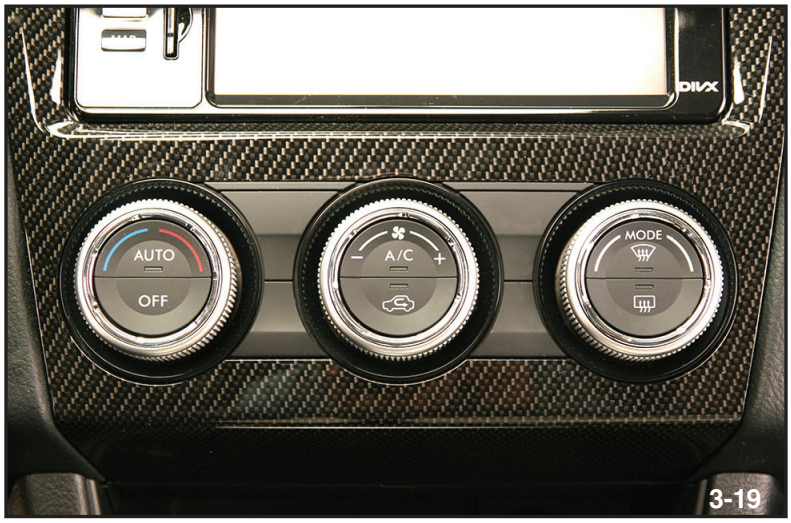
*2: If the same diagnostic object contains a current malfunction and a past malfunction, the current malfunctions is displayed.

The Actuator Drive signal check is activated by turning the fan dial one click clockwise. Turning one click counter clockwise returns to the sensor check.

| Step | | Check | Yes | No |
|---|---|---|---|---|
| 4 | **CHECK ACTUATOR DRIVE SIGNAL.**<br>1) The inspection mode for actuator is initiated by turning the fan dial one click to the right. (The AUTO switch indicator blinks three times.)<br>2) If all actuators have no malfunctions, the defroster indicator illuminates. If any actuator has a malfunction, the defroster indicator blinks.<br>3) Identify defective actuator circuit according to the drive signal check table. <Ref. to AC(diag)-16, DRIVE SIGNAL CHECK TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.> | Does the defroster switch indicator illuminate? | Go to step **5**. | Repair the defective actuator circuit. |

**3-18**

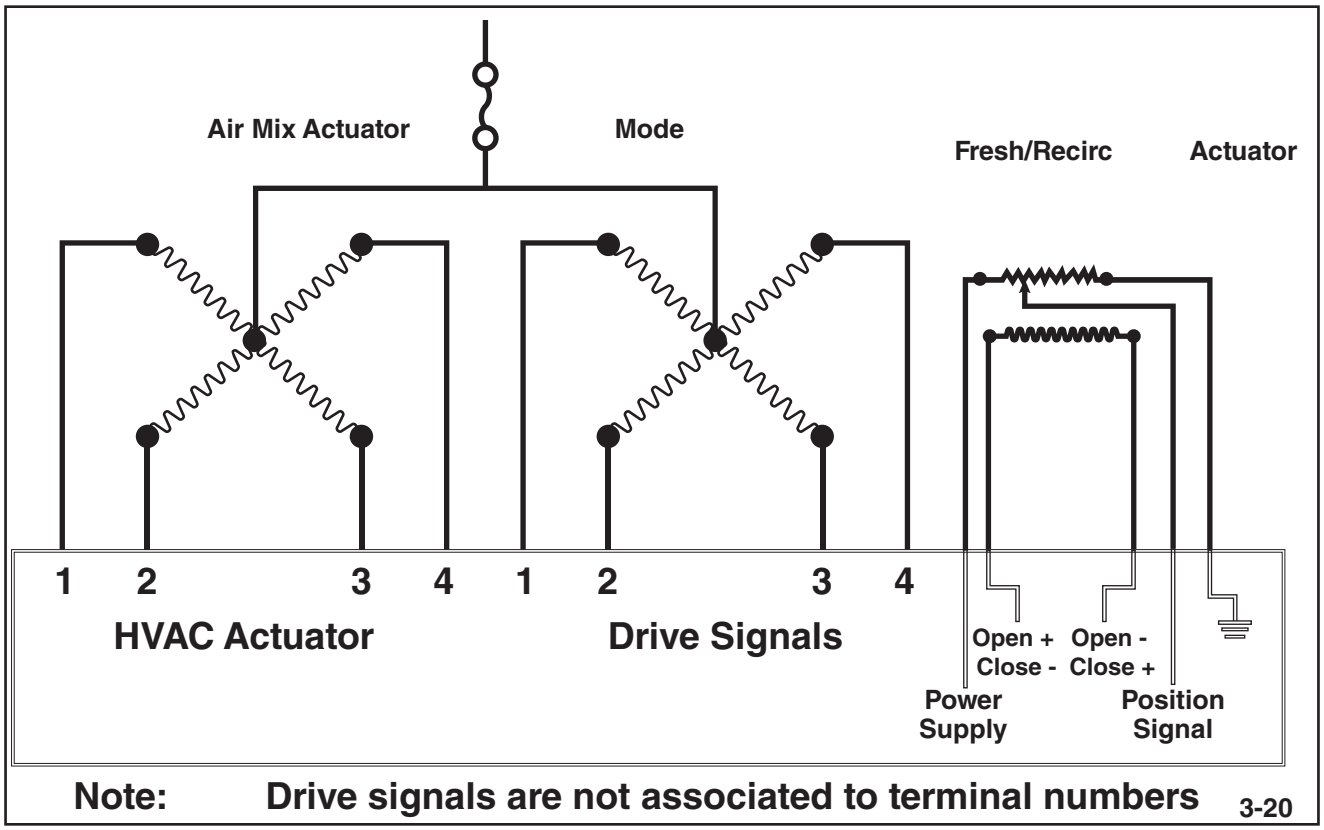
*Step 4*




*Fan dial and auto switch LED and defroster switch*

**Drive signal Check Table**

The Drive Signal Check Table in the service manual for the model selected describes how the HVAC control unit checks the signals that drive the air mix door actuator, mode door actuator, and the Fresh / Recirc door actuator. The air mix door actuator and the mode door actuator are stepper motors that are controlled using 4 grounding circuits in the HVAC control unit. The Fresh / Recirc actuator is a conventional motor that is controlled by reversing the polarity of the open and close terminals at the HVAC control unit.




*Actuator drive signals*

**Note: The Mode door and Air Mix door actuators can continue to function with a missing drive signal. The operation will be slow and the actuator will buzz or vibrate slightly.**

The drive signal check table in the Subaru Service Manual should be used as follows:

A. Count the flashes of the A/C switch LED.
This identifies which drive signal is being tested.

B. Count the flashes of the Defrost (front) switch LED.
This identifies which actuator is being tested.

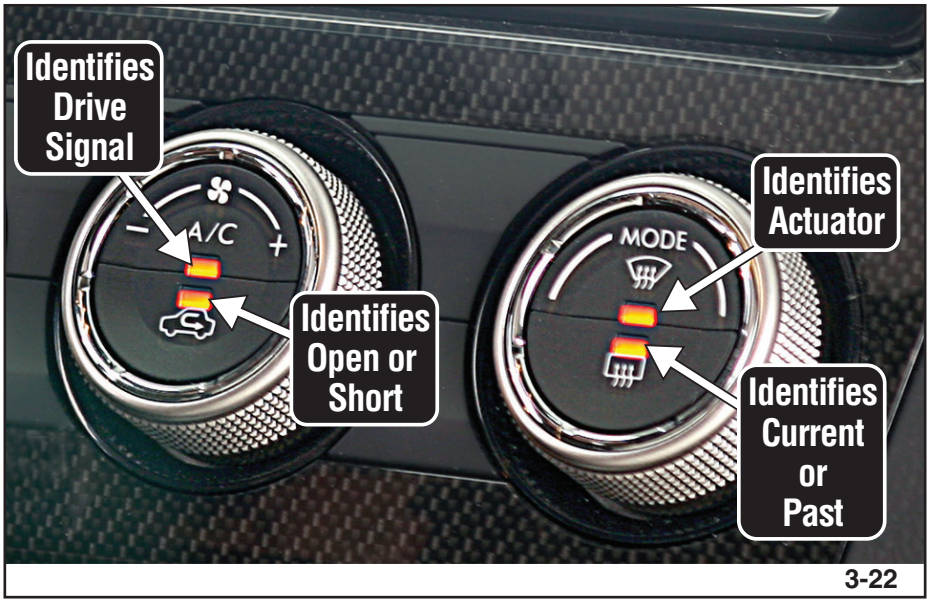
C. Observe the illumination status of the Fresh / Recirc LED.
Off, indicates an open circuit. On, indicates a short circuit.

D. Observe the status of the Rear Defogger LED.
Off, indicates a current malfunction. On, indicates the malfunction occurred in the past.

| Drive signal | | Defroster indicator | A/C switch indicator | FRESH/RECIRC switch indicator | | | | Rear defogger switch indicator *3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Open | Sequence of priority | Short | Sequence of priority | Current malfunction | Past malfunction |
| Air mix door actuator *1 or air mix door actuator RH *2 | #1 | Once | Once | Light OFF | 1 | Light ON | 2 | Light OFF | Light ON |
| | #2 | | Twice | Light OFF | 3 | Light ON | 4 | Light OFF | Light ON |
| | #3 | | 3 times | Light OFF | 5 | Light ON | 6 | Light OFF | Light ON |
| | #4 | | 4 times | Light OFF | 7 | Light ON | 8 | Light OFF | Light ON |
| Air mix door actuator LH *2 | #1 | Twice | Once | Light OFF | 9 | Light ON | 10 | Light OFF | Light ON |
| | #2 | | Twice | Light OFF | 11 | Light ON | 12 | Light OFF | Light ON |
| | #3 | | 3 times | Light OFF | 13 | Light ON | 14 | Light OFF | Light ON |
| | #4 | | 4 times | Light OFF | 15 | Light ON | 16 | Light OFF | Light ON |
| Air flow control door actuator | #1 | 3 times | Once | Light OFF | 17 | Light ON | 18 | Light OFF | Light ON |
| | #2 | | Twice | Light OFF | 19 | Light ON | 20 | Light OFF | Light ON |
| | #3 | | 3 times | Light OFF | 21 | Light ON | 22 | Light OFF | Light ON |
| | #4 | | 4 times | Light OFF | 23 | Light ON | 24 | Light OFF | Light ON |
| Intake door actuator | | 4 times | Light ON | Light ON | | | | — | Light ON |

3-21

*Drive signal check table*




3-22

*Drive signal check*

Operation of the Actuators, blower motor, compressor, and operating logic can be checked. Advance the fan dial switch one click clockwise and refer to the **"Operating Mode Table"**.

| | Step | Check | Yes | No |
|---|---|---|---|---|
| 5 | **CHECK OPERATION OF EACH ACTUATOR, BLOWER FAN AND COMPRESSOR CLUTCH.**<br>1) The inspection mode for blower fan, actuator and compressor is initiated by turning the fan dial one click to the right. (The AUTO switch indicator blinks four times.)<br>2) The number of blinking of A/C switch indicator changes and the operation mode changes each time the A/C switch is pressed.<br>3) Check each operation according to the operating mode table. <Ref. to AC(diag)-15, OPERATING MODE TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.> | Does each operation match to operating mode table? | System is normal. Press the OFF switch or turn the ignition switch to OFF in order to complete self-diagnosis. | Repair the defective part in accordance with each diagnostic chart. |

**3-23**

*Step 5*

The A/C switch LED will indicate the vertical row to read. This information advises actuator position, fan speed, air mix, and compressor status that should be occurring.

**Note: Operate the vehicle for a few minutes to bring the coolant temperature to near operating range.**

## OPERATING MODE TABLE

| Operation | Number of blinking of A/C switch indicator | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Once | Twice | 3 times | 4 times | 5 times | 6 times | 7 times | 8 times |
| Blower fan | 4 V | 4 V | 4.9 V | 5.9 V | 7.0 V | 8.3 V | 9.8 V | 14 V |
| FRESH/RECIRC door | RECIRC | RECIRC | MIX | FRESH | FRESH | FRESH | FRESH | FRESH |
| Air flow control door | FACE | FACE | FACE | B/L | HEAT | HEAT | D/H | DEF |
| Air mix door *1 or air mix door RH *2 | 0% | 0% | 0% | 50% | 50% | 100% | 100% | 100% |
| Air mix door LH *2 | 0% | 0% | 0% | 50% | 50% | 100% | 100% | 100% |
| A/C compressor | OFF | ON | ON | ON | ON | ON | ON | ON |

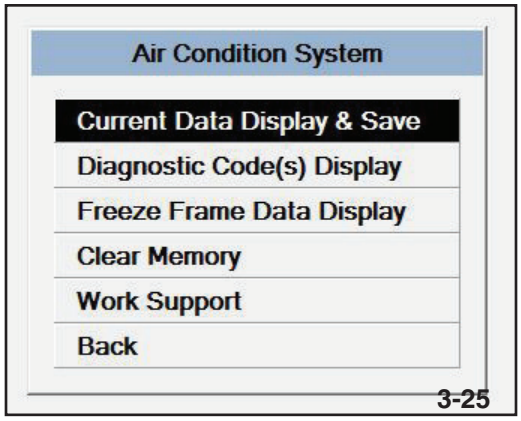
*1: Without left/right independent air conditioning function
*2: With left/right independent air conditioning function

**3-24**

*Operating mode table*

### Diagnostics with the Select Monitor

The Select monitor can be used to view current data, diagnostic codes and freeze frame data. Clear memory and work support are also provided.




*SMIII air conditioning system menu*

Current data includes all inputs and outputs that monitor and control the Air conditioning system.

**Note: Due to the world wide use of the Select Monitor, P.I.D.s from other markets may be listed but will not have any values displayed.**

| Item | Value | Unit | Maximum | Minimum | Average |
|---|---|---|---|---|---|
| In-vehicle Sensor Temperature | 62.42 | °F | 62.42 | 62.42 | 62.42 |
| Quantity of Sunload | 0 | W/m^2 | 0 | 0 | 0 |
| A/C Pressure Switch | No Trouble | | - | - | - |
| Heater Water Temperature | 134.60 | °F | 134.60 | 129.20 | 131.97 |
| Heater Control Panel Setting Value (Driver's) | 75.00 | | 75.00 | 75.00 | 75.00 |
| Air mix door actuator position (driver's side) | 100.00 | % | 100.00 | 100.00 | 100.00 |
| Mode Door Actuator Position | 55.60 | % | 55.60 | 55.60 | 55.60 |
| Fresh/Recircle Air Door Actuator Position | 90.22 | % | 90.32 | 90.02 | 90.16 |
| Target air mix door actuator position (driver's side) | 100.00 | % | 100.00 | 100.00 | 100.00 |
| Mode Door Actuator Position Target | 55.60 | % | 55.60 | 55.60 | 55.60 |
| Fresh/Recircle Air Door Actuator Position Target | Ambient Tempe... | | - | - | - |
| Blower Fan Level | 0 | | 0 | 0 | 0 |
| Ambient Air Temperature | 30.20 | °F | 30.20 | 30.20 | 30.20 |
| Compressor operation status | OFF | | - | - | - |
| Blower Fan Operating Condition | AUTO | | - | - | - |
| A/C Operating Condition | AUTO | | - | - | - |
| Fresh/Recircle Air Operating Condition | AUTO | | - | - | - |
| Mode Operating Condition | AUTO | | - | - | - |
| Rear Defogger | OFF | | - | - | - |
| Engine Speed | 726 | rpm | 769 | 704 | 743 |
| Vehicle Speed | 0.00 | MPH | 0.00 | 0.00 | 0.00 |
| Evaporator Temperature | 60.26 | °F | 60.26 | 59.72 | 59.95 |
| Evaporator Temperature Target | 60.26 | °F | 60.26 | 59.72 | 59.95 |
| Blower outlet Door Request Temperature | 146.52 | °F | 146.52 | 146.52 | 146.52 |
| PTC permitted number | 0 | | 0 | 0 | 0 |
| PTC operation steps | 0 | | 0 | 0 | 0 |
| PTC Heater 1 | Inoperative | | - | - | - |
| PTC Heater 2 | Inoperative | | - | - | - |
| PTC Heater 3 | Inoperative | | - | - | - |
| Request engine speed | Without Request | | - | - | - |

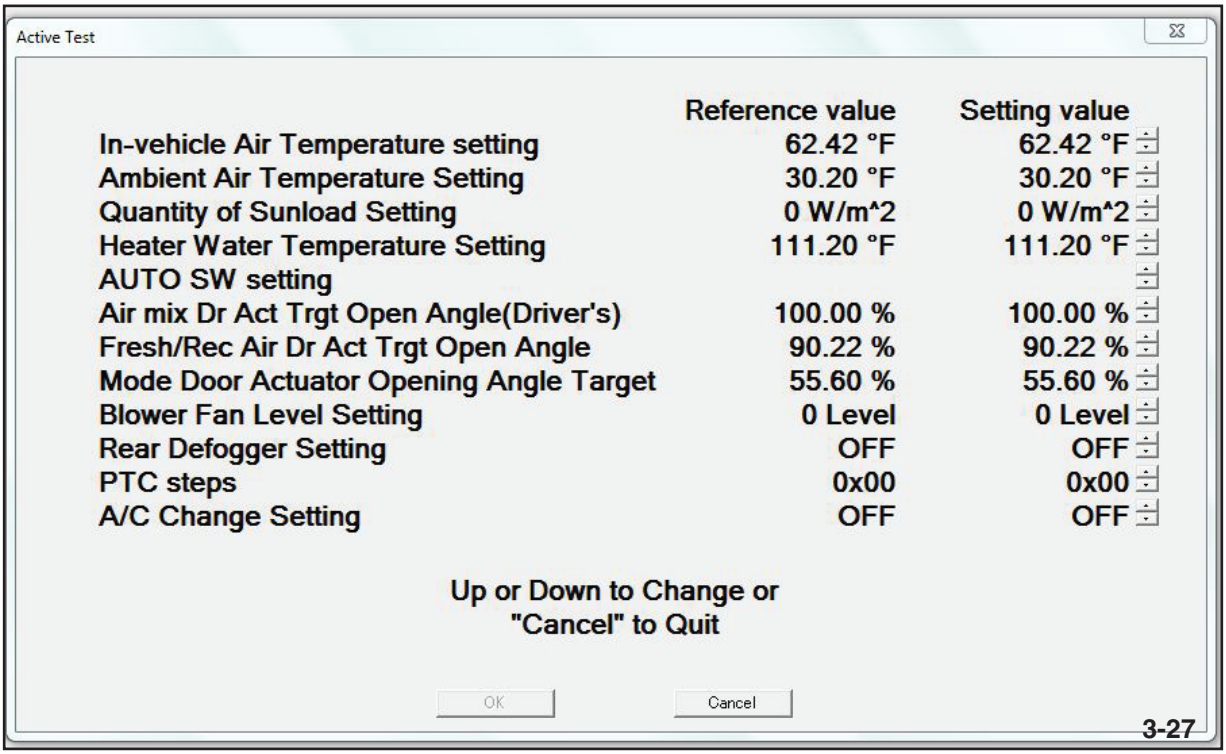
3-26

*SSMIII image*

Work support allows for the manual setting of values. These values can then be read as a reference value as interpreted by the HVAC control unit. Output of work is affected by the manual settings and allows for the checking of air temperature, direction and velocity.

**Note: The operating range for actuators is 0 to 100%. Manual selection of a value higher than 100% will not command the actuator to go beyond 100%.**

**Note: The A/C control displays, on some models, will be affected by work support. Do not attempt to diagnose these displays using Air conditioning work support.**




*Impreza work support*

# Legacy and Outback


*2015 Legacy*

The air conditioning system of the Legacy and Outback is equipped with a clutch-less air conditioning compressor which is equipped on manual and automatic climate control systems.


*Compressor*


*Legacy control panel*

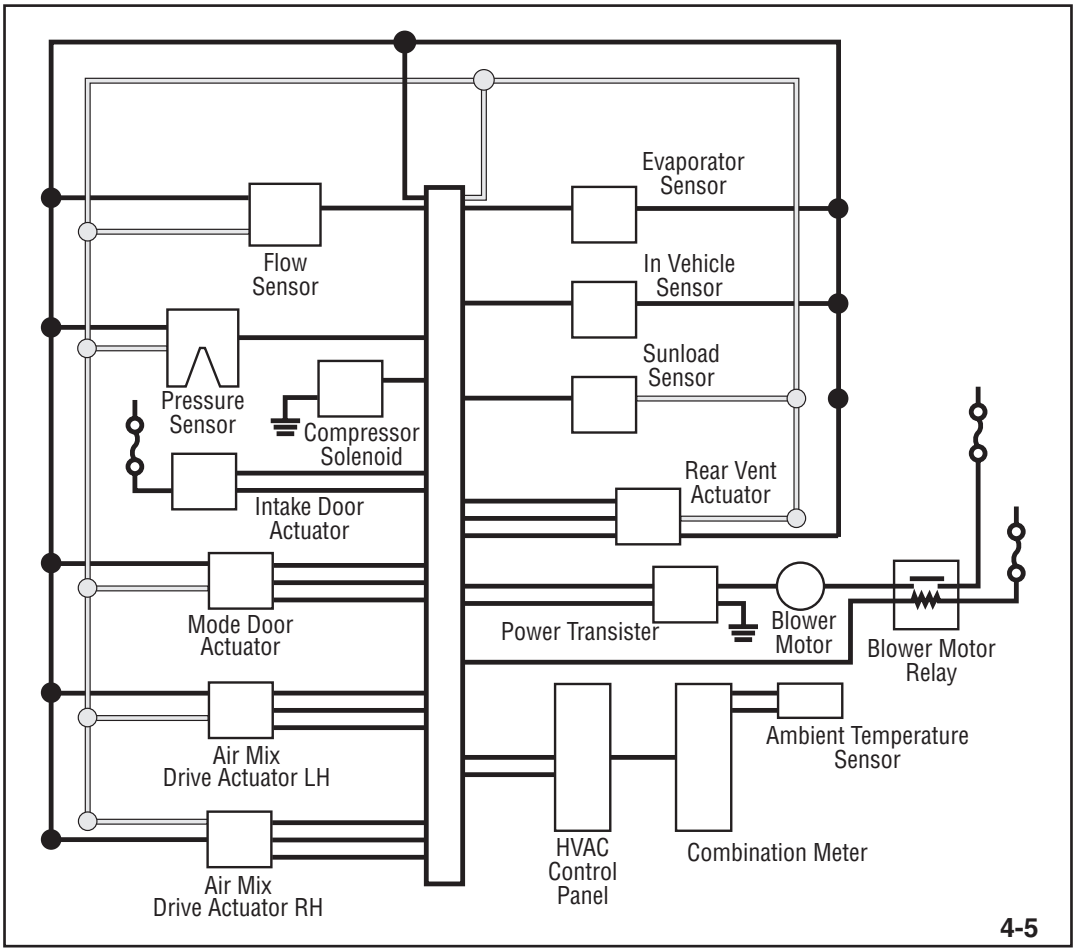
The difference between the two systems is the manual adjustment of mode and temperature on the manual air conditioning system. All inputs and outputs are identical (except in-vehicle temperature sensor).

The Legacy and Outback automatic climate control system logic functions similar to other Subaru models. The vehicle operator and or passenger adjusts the passenger compartment temperature and the HVAC control unit determines the air direction and velocity.

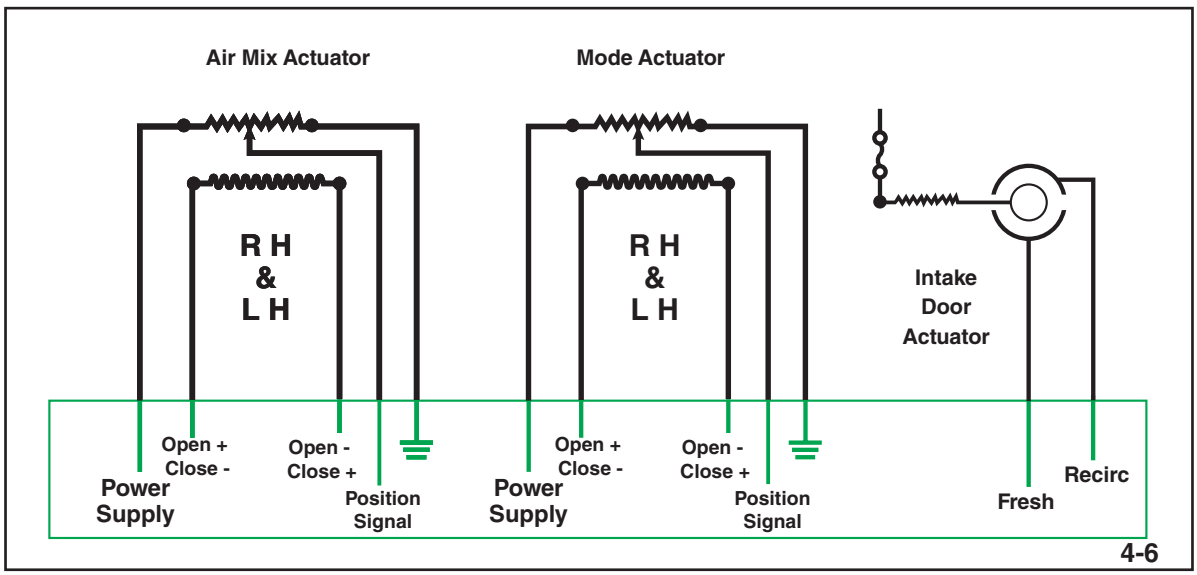
**Note: Only temperature can be adjusted by the passenger on dual zone systems. Any adjustment to air speed or mode results in the system switching over to manual mode.**

# Automatic Climate Control Systems

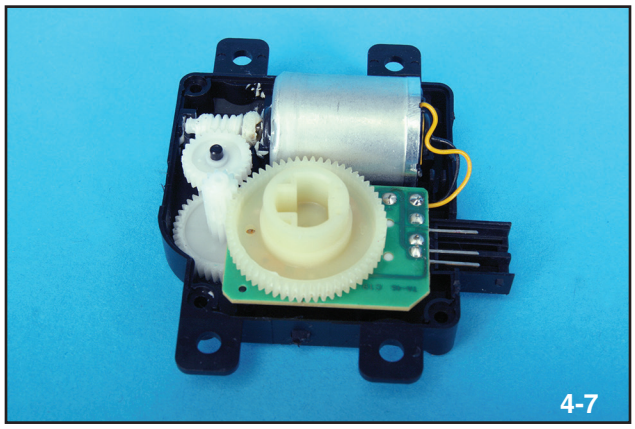
The Legacy and Outback climate control systems utilize actuators that are constructed with motors and potentiometers that return a feedback or position signal to the HVAC control unit. The control unit is programmed with the resistance values for each mode and base temperature control logic.



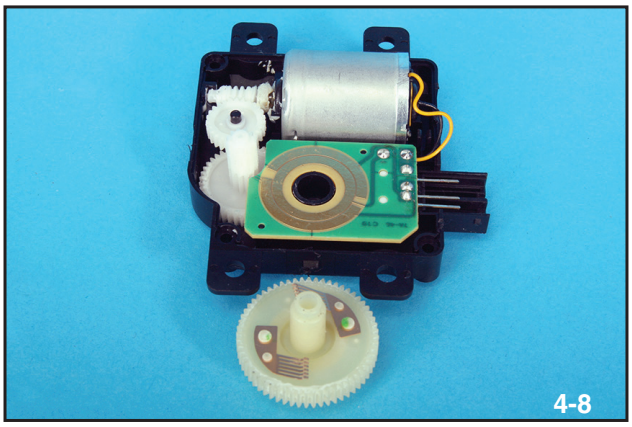

*Legacy and Outback A/C sensors and actuators*




*Air mix and mode door wiring*



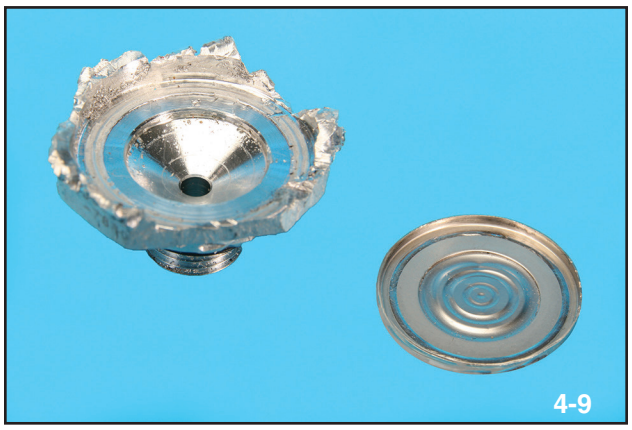

*Legacy Fresh / Recirc or Intake door actuator*



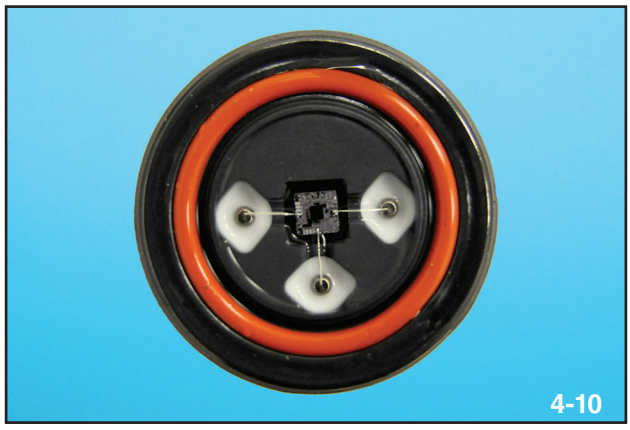

*Rotary contact switch*

The intake door actuator is not equipped with a potentiometer. Instead, a rotary switch provides control that turns off the motor in the actuator once it has reached the correct door position. The control unit turns on and off the circuits that interact with the rotary switch to rotate the intake door mechanism to the fresh or re-circulated air position.

The pressure switch design and operation differs from that of other Subaru climate control systems. The A/C pressure switch is built into the high pressure line leading from the compressor to the expansion valve, and is not available as a separate replacement part.




*Legacy and Outback pressure sensor cutaway*




*Legacy and Outback pressure sensor*

The pressure sensor is filled with Fluorine base oil that applies pressure against a quartz crystal that changes shape and resistance as pressure is applied and released. This creates a voltage signal that controls the A/C functions that rely on pressure data. These include minimum pressure, compressor displacement, and radiator fan operation. The pressure sensor is wired directly to the HVAC control unit.

**Note: Refrigerant enters the pressure sensor and applies pressure against the circular diaphragm. The diaphragm deflection places pressure against the Fluorine oil.**

## Clutch-less Compressor System Construction

The new clutch-less Air Conditioning compressor is utilized on both the manual and auto air conditioning systems. Both systems use a control unit to maintain proper compressor operation.


*Accessory drive belt and compressor*


*HVAC control unit*

The compressor is a variable displacement type using an adjustable swash plate and 6 cylinders.

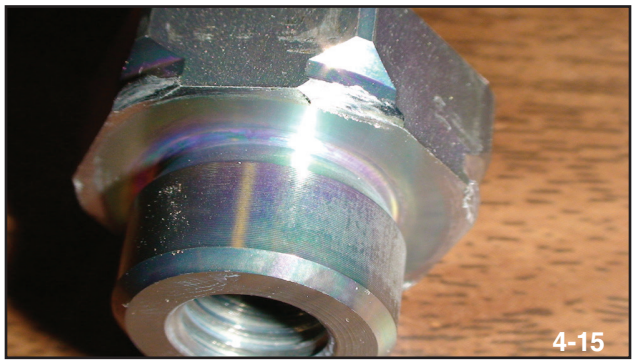

*Compressor front view*


*Idler pulley and drive plate*

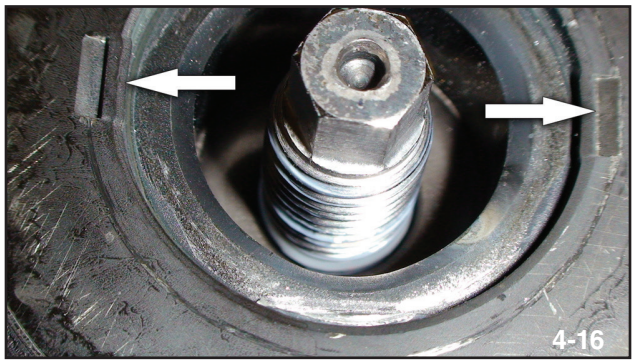
The clutch-less compressor drive is a torque limiting device that can break away from the drive shaft of the compressor if the compressor itself begins to lock up or requires too much engine power to operate. This ensures that the accessory drive belt continues to power the alternator and power steering pump.

The top of the idler pulley is built with notches that engage with the bottom of the drive plate.

The Drive Plate delivers power to the crankshaft nut.




*Crankshaft nut*

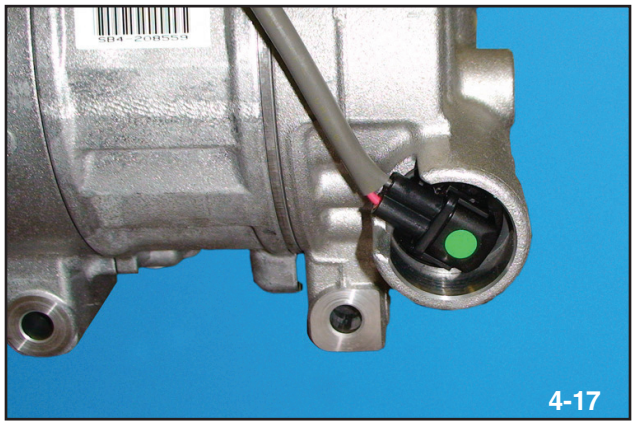



*Drive plate flats*

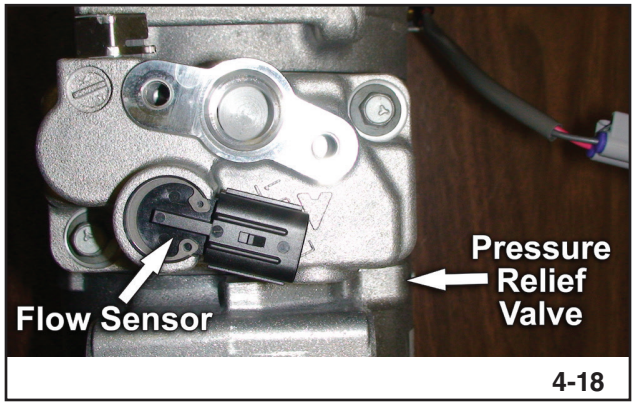
The two flat edges of the drive plate engage with the flats on the crankshaft nut.

The crankshaft nut delivers power to the crankshaft, driving the compressor.

If the flats between the crankshaft nut and the flats of the drive plate round out or strip, the compressor is no longer driven. The Idler Pulley then rotates freely around the compressor for accessory belt operation.



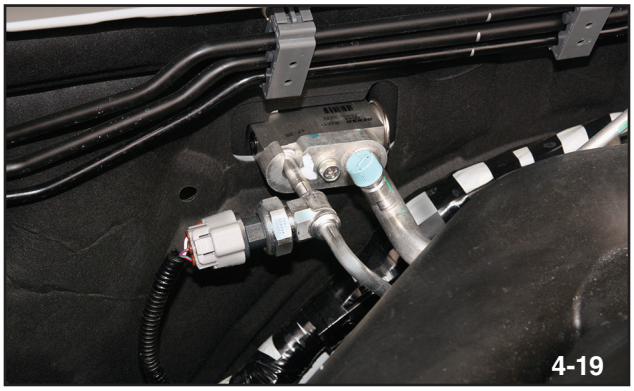

*Displacement solenoid*



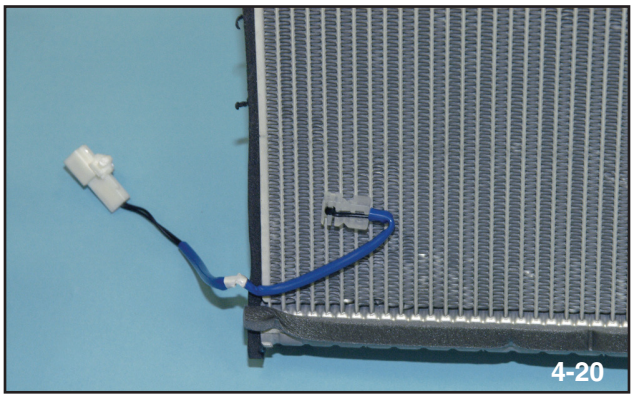

*Flow sensor*

The compressor is equipped with a Displacement Solenoid and a Flow Sensor.

The pressure relief valve will open at 3.4 MPa.

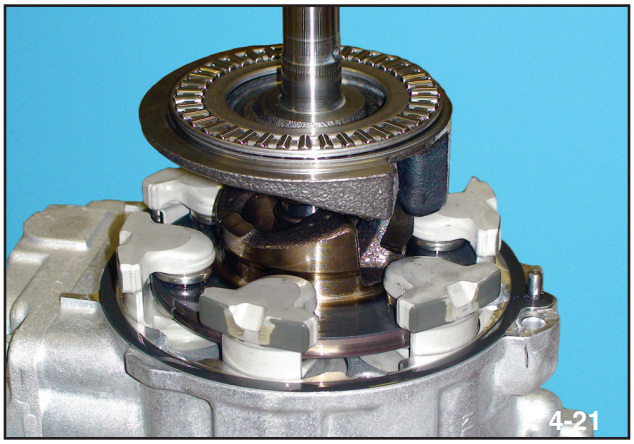



*Pressure switch*




*Evaporator temperature sensor*

A temperature sensor is installed into the evaporator.

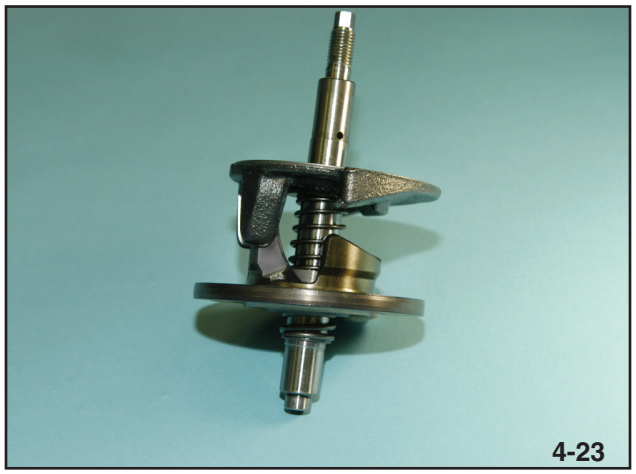



*Swash plate and pistons*


*Piston*

The swash plate is hinged to the crank shaft of the compressor. The pistons of the compressor are lifted (intake stroke) and pushed (discharge stroke) by the swash plate. During low duty ratio operation the pressure from the Displacement Solenoid pushes the swash plate against its hinge and moves to an almost flat configuration. This configuration will remain as long as the pressure from the Displacement Solenoid is high.

During high duty ratio operation the pressure on the swash plate from the Displacement Solenoid is low. The pressure on the swash plate will be almost equal to the low side pressure that is on intake stroke.




*Crankshaft and swash plate*

Since the swash plate is hinged and the pressures are equal, the pistons on intake stroke pull against the rotating swash plate. This results in an increased swash plate operating angle. Higher displacement is the result.

**Additional information**

- The temperature sensor in the evaporator inputs to the HVAC control unit and is used to lower displacement to prevent freeze over at low temperature. It also serves as an input for displacement quantity calculations.
- The expansion valve performs the same as it has for previous models.
- The HVAC control unit at engine start up sends a very low duty ratio signal to the Displacement Solenoid. This results in low displacement and minimum load placed on the engine.
- The Auto and Manual systems differ in the following :
  - No in vehicle temperature sensor for the Manual system
  - No digital display of the set temperature for the Manual system
  - No automatic air mix door changing for the Manual system
- Both systems use only electronic actuators to move mode doors, air mix doors and circ/refresh doors.
- The Dual Zone system has one additional switch compared to previous models and that is the Single/Dual zone control. Selecting Single zone allows both sides of the vehicle to be controlled at the same time while dual zone allows for independent control.
- Displacement logic for fixed conditions

| Condition | Duty ratio |
|---|---|
| Key on engine off | 0 % |
| Engine Start | 0% |
| Idle A/C on | Varies with temperature |
| Idle A/C off | 0% |
| Stall Speed | 0% |
| Full Throttle | 0% |

4-24

*Fail-safe*

- Faulty circuit conditions with the Evaporator temperature sensor, Pressure Sensor or Flow Sensor results in 0% displacement.
- Overheating engine conditions result in 0 % displacement.
- An electrical condition of an air mix door will prevent control of the conditioned air temperature on one side only of a dual zone system or both sides of a manual system.
- An In Vehicle temperature sensor electrical problem fail safes to 77° F.

## Compressor Duty Ratio Control

There are 3 levels of compressor duty ratio control.

Normal

Partial Reduction

Full Reduction

**Normal** compressor control varies the duty ratio to the compressor according to the inputs to the HVAC control unit except for engine accelerator opening angle and vehicle speed. This control is for normal engine loads while cruising or idling.

**Partial Reduction** occurs when the engine load exceeds an established value below an established vehicle speed. For example: 35 degrees of accelerator pedal angle at 16 MPH will result in a duty ratio of 30%. 58 degrees of accelerator opening angle at 31 MPH will result in a duty ratio of 29%. The amount of compressor duty ratio reduction will be about 40%. This reduction in engine load ensures smooth vehicle acceleration while still providing conditioned air to the vehicle occupants

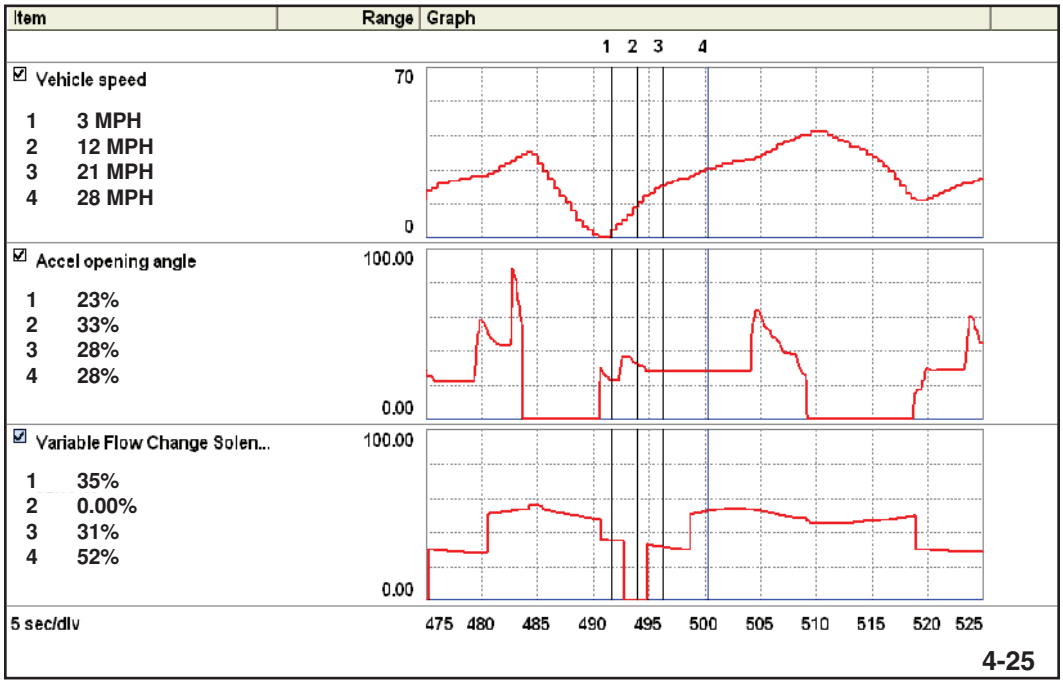
**Note: The percentage of compressor duty ratio reduction will remain constant however the duty ratio values will change based on vehicle heat load and humidity.**

**Full Reduction** occurs when the engine load exceeds the conditions established for Partial Reduction. For example: 45 degrees of accelerator pedal opening at 13 MPH will result in a duty ratio of 0%. This reduction commands the compressor to go to minimum displacement, removing all load to the engine created by the A/C compressor. This is similar to the compressor cut function of previous models.

The HVAC control unit decides to go to partial or full reduction based on accelerator pedal angle compared to vehicle speed. The slower the vehicle speed, the lower the accelerator pedal angle will be to command a full reduction. Higher vehicle speeds require higher accelerator pedal angles to command full reduction. By having two levels of reduction, comfort to the vehicle occupants can be maintained while providing reduced engine loads.

Duty ratio is returned from a full reduction in a stepped method. This reduces engine surge and ensures smooth vehicle operation.

Full throttle acceleration at any speed results in full reduction of duty ratio.

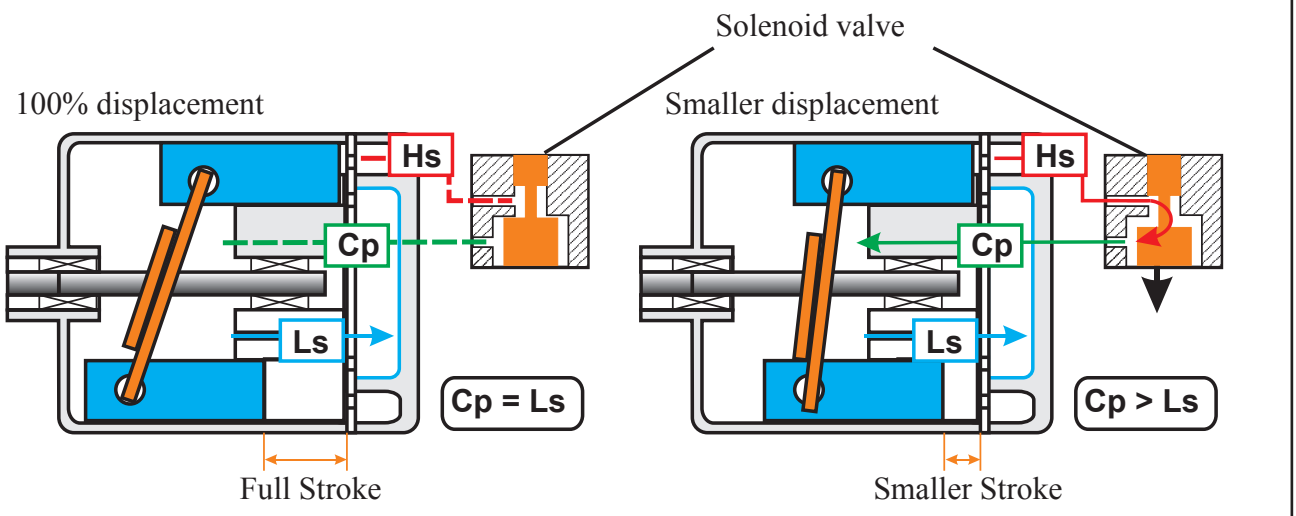



*Duty ratio control*

The Displacement Solenoid meters high side pressure to the swash plate. A low duty ratio creates a small displacement by creating a larger passage for high side pressure to push on the swash plate.

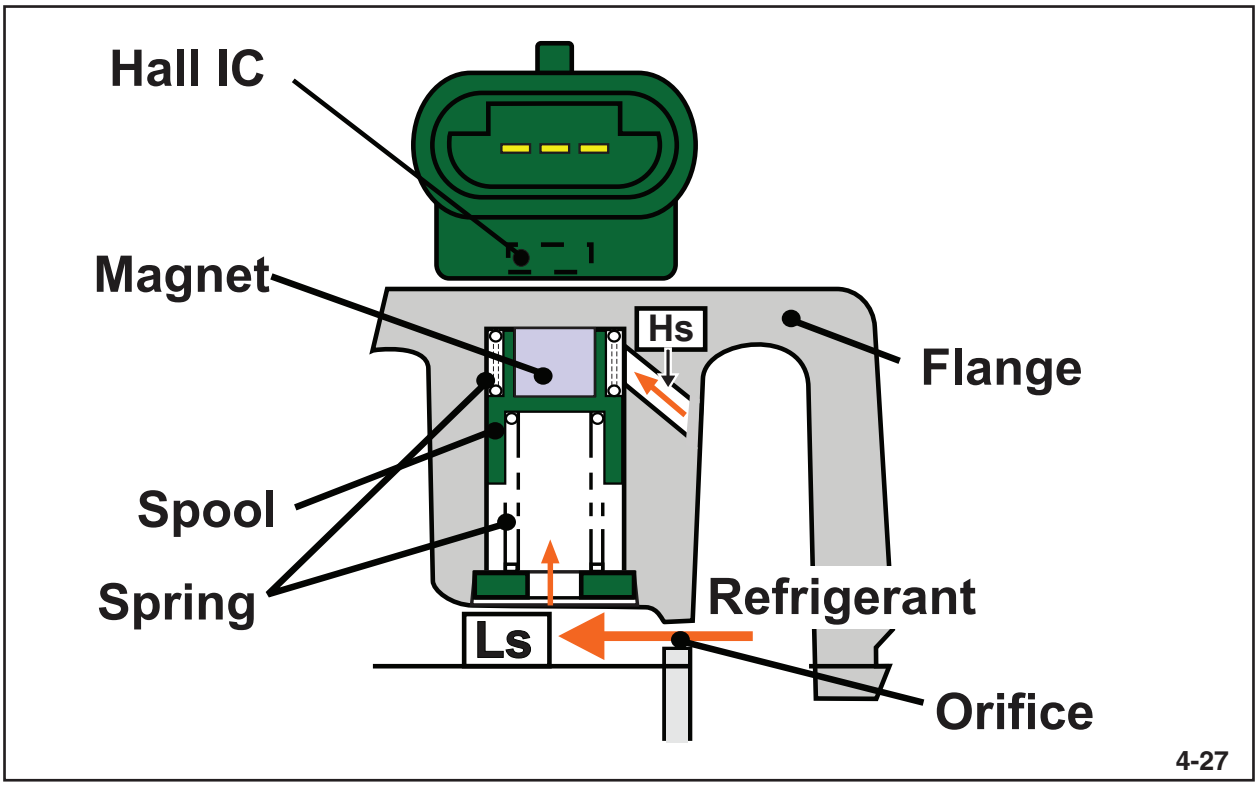
A high duty ratio creates a smaller passage in the Displacement Solenoid and the swash plate will be moved to full displacement.

| Duty | Valve opening | CP | Slant angle | Piston stroke | Displacement |
|---|---|---|---|---|---|
| 0% | BIG | HIGH | SMALL | SHORT | 0% |
| 100% | Small | Low | Big | Long | 100% |




*Displacement logic*

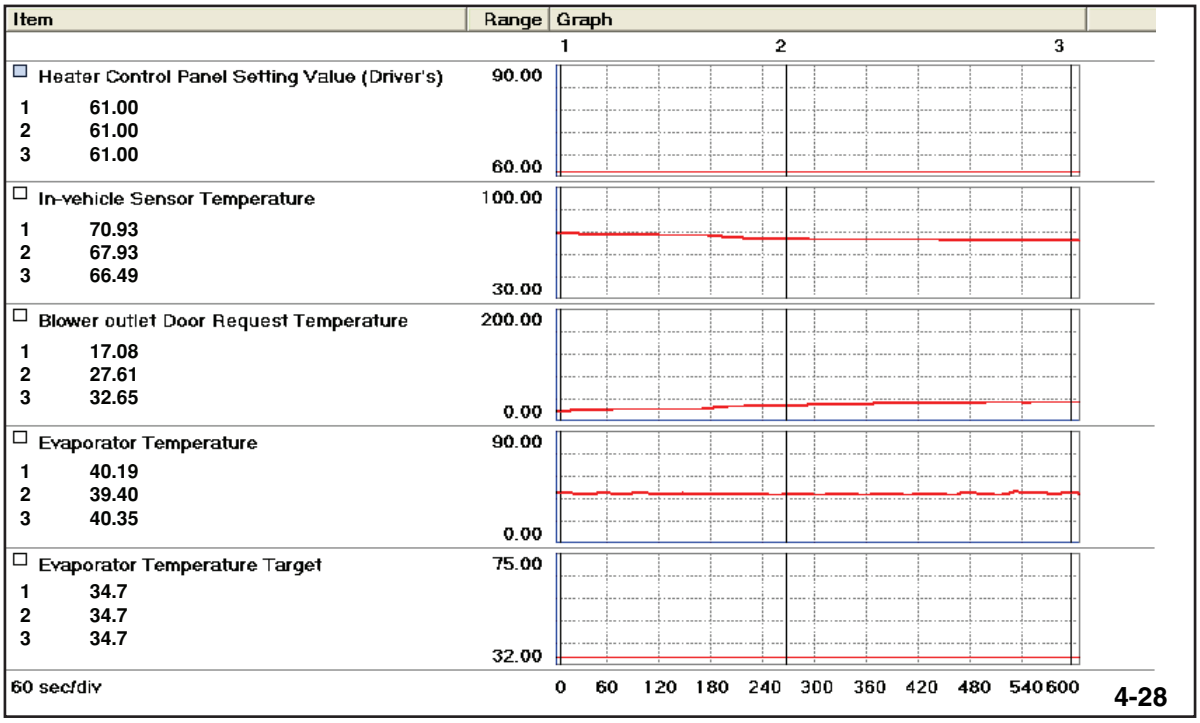
The Flow Sensor is comprised of a magnet fixed to an aluminum spool valve inside the compressor (senses high side pressure) and a hall effect sensor mounted to the outside of the compressor. Increased pressure creates increased flow of the refrigerant and pushes the spool valve up towards the hall effect sensor. The changing magnet position changes the value on the Flow Sensor and the value is sent to the HVAC control unit. This information monitors changes in displacement and assists the HVAC control unit with determining if it is operating correctly.


Hall IC
Magnet
Hs
Flange
Spool
Spring
Refrigerant
Ls
Orifice
4-27

*Flow sensor*

## Heater Control Panel

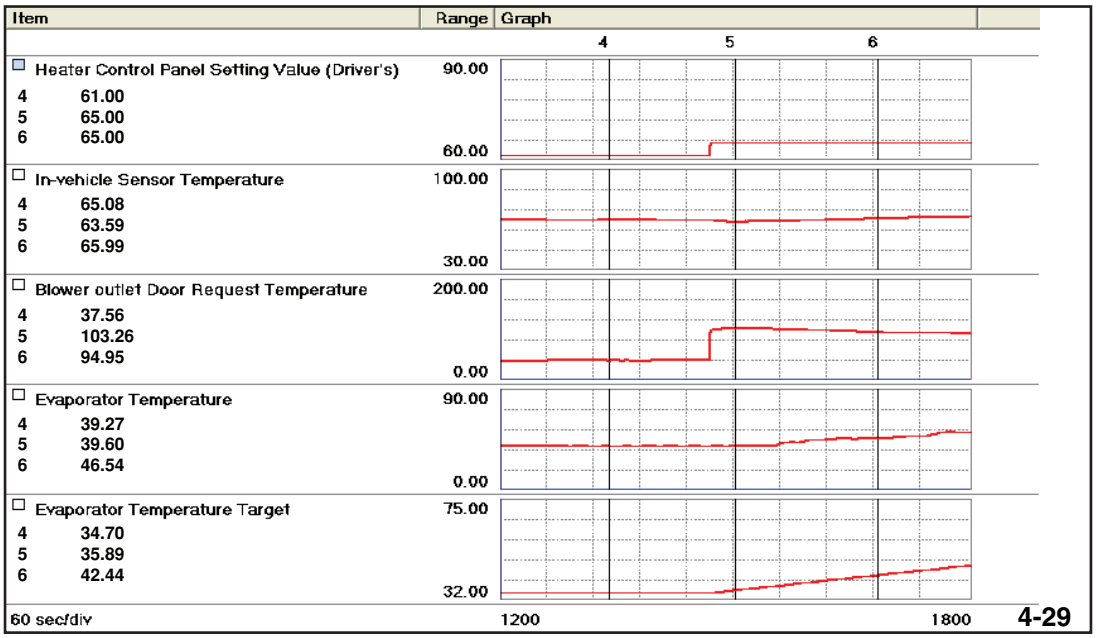
**Note: graphs 1 2 3, 4 5 6 and 7 were taken from a vehicle idling in a shop with an ambient temperature of approx. 70° F. These values are for explanation of the new A/C operation and should not be used for a base model during diagnosis.**




*Graph 1 2 3*

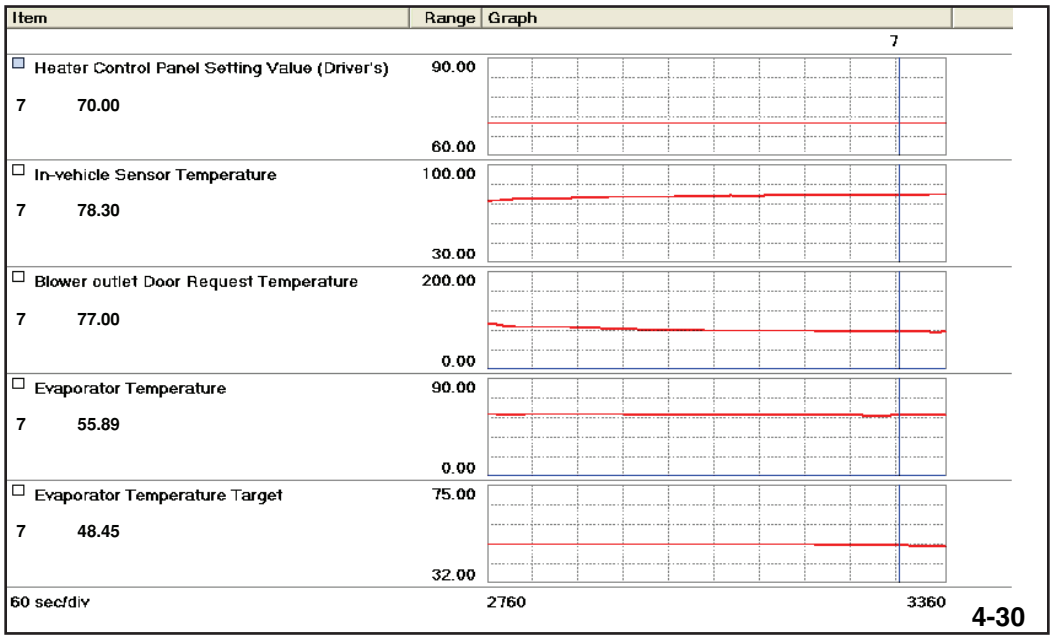
Graph 1 2 3 has the Heater Control Panel Setting at 61°(degrees) The In Vehicle Temperature Sensor shows 70.93° degrees so the HVAC control unit will set a very low target temperature and very low Blower Outlet Door Request. This will command the system to bring the In Vehicle Temperature to the driver's demand as fast as possible. In this case 17° degrees is selected for the Blower Outlet Door Request. This will prevent any warm air from mixing with the air blown from the evaporator to the vents.

As the passenger compartment or In Vehicle air temperature drops the Blower Outlet Request Temperature will increase.




*Graph 4 5 6*

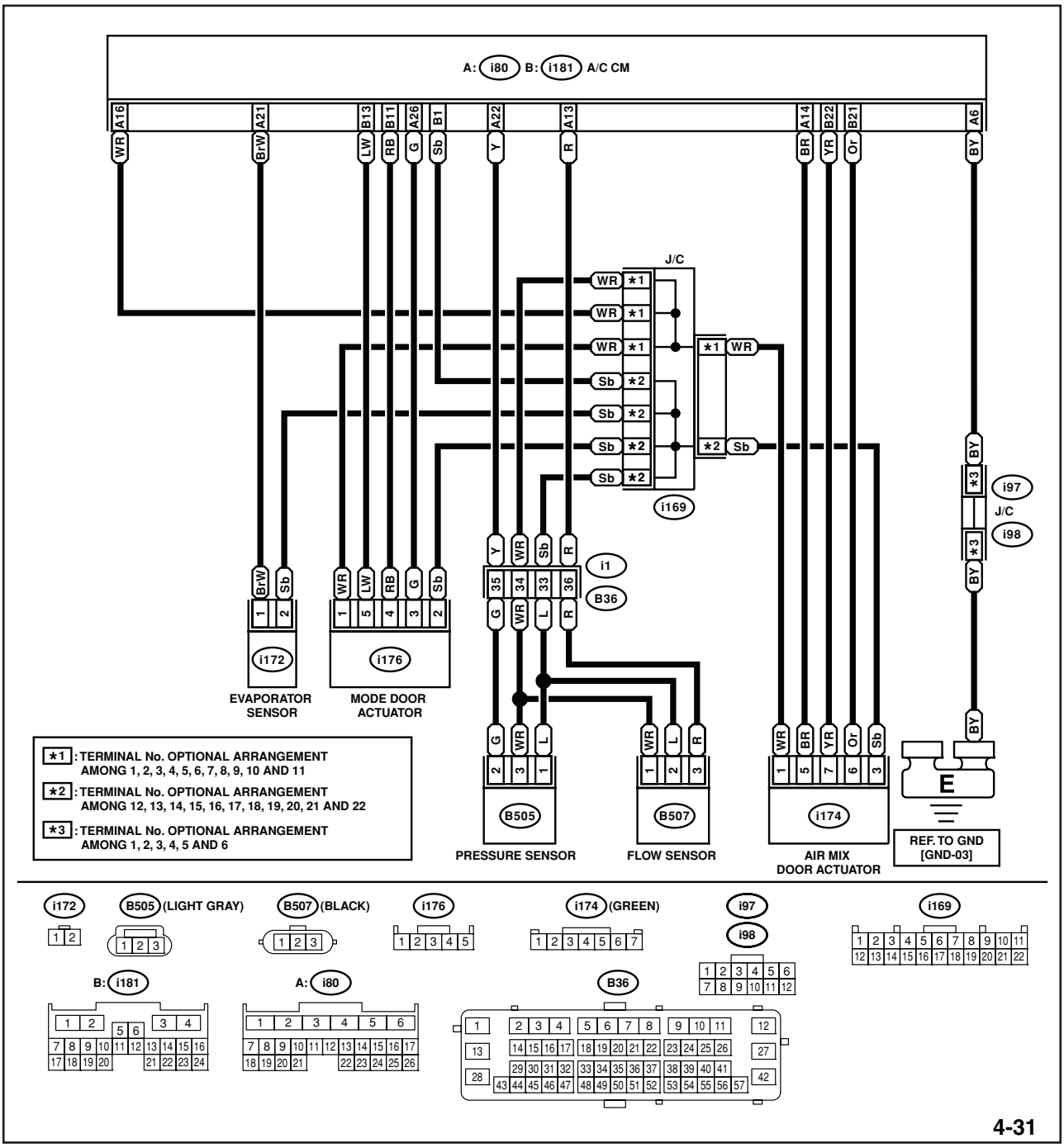
Graph 4 5 6 shows the results of the driver changing the Heater Control Panel setting to a temperature higher than the In Vehicle Temperature. The result to the Blower Outlet Request Temperature is very high. This mixes a high amount of warm air with the air blown from the evaporator to the vents. As the passenger compartment or In Vehicle Temperature warms the Blower Outlet Request Temperature drops.




*Graph 7*

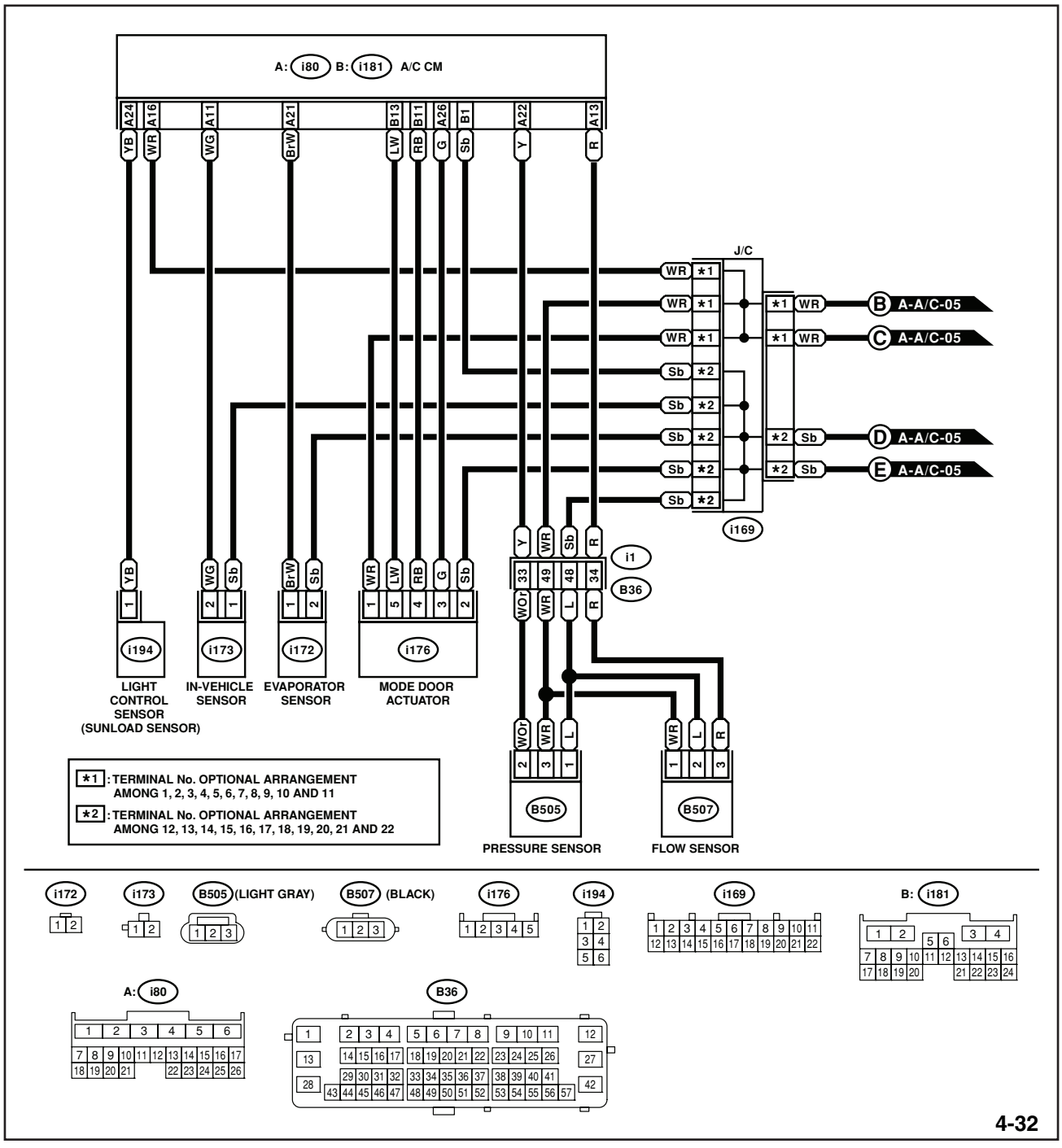
During normal operation when the heat load and humidity on the vehicle is stable and the vehicle operating conditions are stable, the values on graph 7 will be typical. It is normal for the In Vehicle Temperature to be approx. 8 to 10° degrees different than the Heater Control Panel Setting.

## Manual System




*Wiring for manual system*

## Automatic System




*Wiring for automatic climate control system*

NOTES

# Diagnostics

When performing diagnostics on the Legacy and Outback climate control systems, do not forget to consider the variable displacement compressor. The results of the basic of all checks for A/C systems, pressure testing, can easily be incorrectly interpreted if the compressor is not at full displacement. Always adjust the climate control system to the coldest setting to force the compressor to full displacement before evaluating refrigerant pressures.

The complexity of the climate control system makes it necessary to follow the steps provided in the service manual for diagnostics.

1. Basic diagnostic procedure – Provides direction of diagnostics
2. Diagnosis with the Select Monitor – Allows current data to be observed, viewing of DTCs, and provides work support for force driving components.
3. Self Diagnostics – Provides on board diagnostics to be activated by pressing control buttons of the A/C control panel which activates a display of the DTCs. Components can be forced driven to allow manual checking of the air flow direction, temperature and velocity.
4. Diagnostics by phenomenon – Provides guidance for diagnostics by vehicle condition.

### 1. Basic diagnostic procedure

**Note: When the sunload sensor check is performed indoors or in the shade, it could be diagnosed as sensor having an open circuit. Always perform the inspection in direct sunlight.**

| | Step | Check | Yes | No |
|---|---|---|---|---|
| 1 | **START INSPECTIONS.**<br>1) Prepare the tools. <Ref. to AC-18, PREPARATION TOOL, General Description.><br>2) Perform the pre-inspection. <Ref. to AC(diag)-3, INSPECTION, General Description.> | Is any malfunction found in pre-inspection? | Fix the malfunction found in pre-inspection, and go to the next inspection step. Go to step **2**. | Go to step **2**. |
| 2 | **PREPARE SUBARU SELECT MONITOR.**<br>Prepare the Subaru Select Monitor. | Is the Subaru Select Monitor ready? | Go to step **3**. | Go to step **4**. |
| 3 | **CHECK DTC.**<br>1) Under the failure condition, leave the vehicle for one minute or more.<br>2) Read the DTC using Subaru Select Monitor.<br>NOTE:<br>• If the communication function of the Subaru Select Monitor cannot be executed properly, check the communication circuit. <Ref. to AC(diag)-54, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostic Procedure for Subaru Select Monitor Communication.><br>• Record the freeze frame data recorded together with the DTC. | Is DTC displayed? | Perform diagnosis according to the DTC. <Ref. to AC(diag)-56, LIST, List of Diagnostic Trouble Code (DTC).> After diagnosis, Go to step **5**. | Refer to Diagnostics with Phenomenon. <Ref. to AC(diag)-14, INSPECTION, Diagnostics with Phenomenon.> |
| 4 | **A/C CONTROL PANEL SELF-DIAGNOSIS.**<br>1) Under the failure condition, leave the vehicle for one minute or more.<br>2) Perform the self-diagnosis of A/C control panel. <Ref. to AC(diag)-9, OPERATION, Diagnostic Chart for Self-Diagnosis.> | Are other codes except “20” displayed? | <Ref. to AC(diag)-11, SENSOR CHECK TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.> | Refer to Diagnostics with Phenomenon. <Ref. to AC(diag)-14, INSPECTION, Diagnostics with Phenomenon.> |
| 5 | **PERFORM DIAGNOSIS.**<br>1) Perform the Clear Memory Mode.<br>2) Perform the Inspection Mode. <Ref. to AC(diag)-49, Inspection Mode.> | Is DTC displayed on Subaru Select Monitor? | Perform diagnosis according to the DTC. | Finish the diagnosis. |

**5-2**

*Basic diagnostic procedure*

## 2. Diagnosis with the Select Monitor

SUBARU Select Monitor III - USB - Air Conditioner

File View Tool Help

F2 Hold

Number of samples 6574 3278.78 s from sampling start

| Item | Value | Unit | Maximum | Minimum |
|---|---|---|---|---|
| Engine Speed | 709 | rpm | 763 | 641 |
| Heater Control Panel Setting Value (Driver's) | 70.00 | | 70.00 | 61.00 |
| Heater Control Panel Setting Value (Passenger's) | 70.00 | | 70.00 | 61.00 |
| Blower outlet Door Request Temperature | 76.87 | °F | 103.33 | 16.90 |
| Blower outlet request temperature (Driver's) | 76.87 | °F | 103.33 | 16.90 |
| Blower outlet request temperature (Passenger's) | 76.87 | °F | 103.33 | 16.90 |
| Blower Fan Operating Condition | MANU | | - | - |
| A/C Operating Condition | AUTO | | - | - |
| Fresh/Recircle Air Operating Condition | AUTO | | - | - |
| Mode Operating Condition | AUTO | | - | - |
| Rear Defogger | OFF | | - | - |
| In-vehicle Sensor Temperature | 78.33 | °F | 78.33 | 63.57 |
| Evaporator Temperature | 55.65 | °F | 58.59 | 38.80 |
| Quantity of Sunload | 0 | W/m^2 | 0 | 0 |
| Refrigerant Pressure | 0.94 | MPa | 1.14 | 0.74 |
| Refrigerant Flow | 64.53 | [kg/h] | 65.50 | 0.00 |
| Airmix Door Actuator Position (Driver's) | 36.01 | % | 51.95 | 0.52 |
| Airmix Door Actuator Position (Passenger's) | 36.66 | % | 51.80 | 0.37 |
| Fresh/Recircle Air Door Actuator Position | 100.00 | % | 100.00 | 0.00 |
| Mode Door Actuator Position | 29.02 | % | 54.89 | 1.02 |
| Heater Water Temperature | 203.00 | °F | 204.80 | 174.20 |
| Ambient Air Temperature | 68.90 | °F | 68.90 | 68.90 |
| Vehicle speed | 0 | MPH | 0 | 0 |
| Accel opening angle | 0.00 | % | 0.00 | 0.00 |
| Airmix Actuator Position Target (Driver's) | 34.04 | % | 54.53 | 0.00 |
| Airmix Actuator Position Target (Passenger's) | 34.04 | % | 54.53 | 0.00 |
| Fresh/Recircle Air Door Actuator Position Target | 100.00 | % | 100.00 | 0.00 |
| Mode Door Actuator Position Target | 28.00 | % | 56.00 | 0.00 |
| Blower Fan Level | 23 | Level | 23 | 1 |
| Variable Flow Change Solenoid Duty | 39.67 | % | 56.60 | 30.29 |
| Evaporator Temperature Target | 48.33 | °F | 49.10 | 34.70 |
| Variable Load Compressor Torque Value | 8.50 | Nm | 8.56 | 0.00 |
| Request idle engine speed | 800 | rpm | 800 | 800 |
| Request engine speed | Without Request | | - | - |
| Discharge pressure | 0.983 | Mpa_G | 1.155 | 0.740 |
| Intake pressure | 0.277 | Mpa_G | 0.356 | 0.135 |
| Cooler request distinction | Without Request | | - | - |
| Heater request dinstinction | Without Request | | - | - |
| Break-in variable compressor drive, finish status | incomplete | | - | - |

5-3

*Legacy and Outback HVAC SMIII P.I.D.s*

## Service Manual PID Description

| Display item | Unit of measure | Description |
|---|---|---|
| Diagnostic code | — | DTC recorded in A/C CM |
| Engine speed | rpm | Data value received via CAN |
| Heater control panel setting (driver's side) | LO: 18°C (64°F)<br>HI: 32°C (90°F) | Value displayed on control panel |
| Heater control panel setting (passenger's side) | LO: 18°C (64°F)<br>HI: 32°C (90°F) | Value displayed on control panel |
| Required outlet temperature | °C ( °F) | Value set in A/C CM |
| Required outlet temperature (driver's side) | °C ( °F) | Value set in A/C CM |
| Required outlet temperature (passenger's side) | °C ( °F) | Value set in A/C CM |
| Blower fan operating status | MANU/AUTO | Value input in A/C CM |
| A/C operating status | MANU/AUTO | Value input in A/C CM |
| Intake door actuator operating status | MANU/AUTO | Value input in A/C CM |
| Mode operating status | MANU/AUTO | Value input in A/C CM |
| Rear defogger | ON/OFF | Value input in A/C CM |
| In-vehicle sensor temperature | °C ( °F) | Value input in A/C CM |
| Evaporator temperature | °C ( °F) | Value input in A/C CM |
| Quantity of sunload | W/m2 | Value input in A/C CM |
| Refrigerant pressure | MPa | Value input in A/C CM |
| Refrigerant flow | kg/h | Value input in A/C CM |
| Air mix actuator position (driver's side) | % | Value input in A/C CM |
| Air mix actuator position (passenger's side) | % | Value input in A/C CM |
| Intake door actuator position | % | Value input in A/C CM |
| Mode door actuator position | % | Value input in A/C CM |
| Heater water temperature | °C ( °F) | Data value received via CAN |
| Ambient sensor temperature | °C ( °F) | Data value received via CAN |
| Vehicle speed | km/h | Data value received via CAN |
| Acceleration opening angle | % | Data value received via CAN |
| Air mix door actuator position target (driver's side) | % | Value input in A/C CM |
| Air mix door actuator position target (passenger's side) | % | Value input in A/C CM |

**Chart continued on next page**

| Display item | Unit of measure | Description |
|---|---|---|
| Intake door actuator position target | % | Value input in A/C CM |
| Mode door actuator position target | % | Value input in A/C CM |
| Blower fan level | Level | Value output from A/C CM |
| Duty of variable flow change solenoid | % | Value output from A/C CM |
| Evaporator temperature target | °C ( °F) | Value input in A/C CM |
| Variable compressor load torque value | Nm | Value input in A/C CM |
| Required idle speed | rpm | Value output from A/C CM |

Request Engine Speed, Cooler Request Distinction and Heater Request Distinction apply only to vehicles with CVT Lineartronic transmission.

Note: Do not confuse Request Engine Speed with Request Idle Engine Speed. Request Idle Speed is controlled by the Variable Load Compressor Torque Value (Calculated from Pressure Sensor and Flow Sensor data).

The HVAC control unit will send a signal to the TCM to alter gear ratio if the current engine speed is not providing enough power to provide the cooling or heating of the vehicle. During this situation the HVAC system cannot meet the driver's demand without a higher compressor speed or higher coolant temperature.

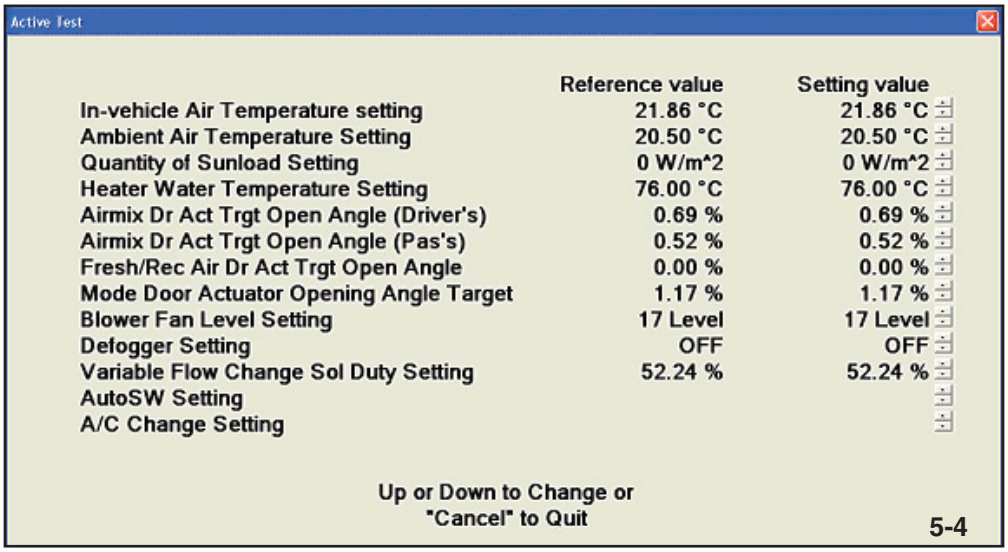
When the Request Engine Speed value appears it will be accompanied by either the Cooler or Heater request. This identifies why the additional engine speed was requested.

There are 4 levels of request. Cool Low, Cool High, Heat Low and Heat High. The increase in engine speed will be based on those values.

**NOTE: Intake pressure is a calculated value using the Flow Sensor and Evaporator Temperature Sensor.**

The Discharge Pressure and Refrigerant Pressure are values determined by the Pressure Sensor (Near the expansion value).

## Work Support or Active Test




*Work support or active test*

The active test is provided on the SMIII. This allows for force driving of all components listed. Click on the ⇳ next to an item and adjust as necessary. (The actual values chart indicates door % and air flow direction or temperature).

| Mode Door | |
|---|---|
| Mode | Percent % |
| ↓ | 54-56 |
| ↕ | 70-71 |
| → | 0-1 |
| ↓ → | 26-28 |
| ↑ | 98-100 |

| Air Mix | |
|---|---|
| Display Setting F | Percent % |
| 90 | 100 |
| 85 | 74 |
| 80 | 58 |
| 75 | 45 |
| 70 | 20 |
| 65 | 1.67 |
| 60 | 0 |

| Fresh/Recirc | |
|---|---|
| Mode | Percent % |
| Closed | 0 |
| Open | 100 |

5-5

*Control table*

Target Values of Mode Door % or temperatures below 0 or above 100, if displayed, are not normal (For these 3 doors and display settings).

Values below 0 or above 100 are the result of a faulty electrical circuit or mechanical condition and the HVAC Control unit response in attempting to gain control.

## Compressor Break In

Variable Compressor Break In operation complete status indicates if the compressor has completed the following break in procedure.

1. Replace compressor
2. Fill refrigerant
3. Reset A/C control module by disconnecting the connector.
4. Insert a fuse in the “Delivery mode” fuse holder.
5. Connect SSMIII
6. Manual air conditioner: Set blower fan control to maximum.
   Automatic air conditioner: No special operation is required.
7. Engine start
8. Confirm if SSMIII indication of “Compressor’s brake in operation ”changes from “not finished” to “finished”
9. Stop engine.
10. Take out the fuse from “delivery mode” fuse holder.
11. Disconnect SSMIII

DTCs when using the Subaru Select Monitor

**Note: DTCs in self diagnostic check are 2 digit codes.**

| DTC | Item | Note |
|---|---|---|
| B1430 | In-Vehicle Sensor Open | <Ref. to AC(diag)-58, DTC B1430 ROOM TEMPERATURE SENSOR CIRCUIT WIRE BREAK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1431 | Room Temperature Sensor Circuit Short-Circuit | <Ref. to AC(diag)-60, DTC B1431 ROOM TEMPERATURE SENSOR CIRCUIT SHORT-CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1432 | Outside Air Sensor Circuit Wire Break (Air-Conditioning) | <Ref. to AC(diag)-62, DTC B1432 OUTSIDE AIR SENSOR CIRCUIT WIRE BREAK (AIR-CONDITIONING), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1433 | Outside Air Sensor Circuit Short-Circuit (Air-Conditioning) | <Ref. to AC(diag)-64, DTC B1433 OUTSIDE AIR SENSOR CIRCUIT SHORT-CIRCUIT (AIR-CONDITIONING), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1434 | Ambient Temperature Sensor Circuit Wire Break | <Ref. to AC(diag)-66, DTC B1434 AMBIENT TEMPERATURE SENSOR CIRCUIT WIRE BREAK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1435 | Evaporator Sensor Circuit Short-Circuit | <Ref. to AC(diag)-68, DTC B1435 EVAPORATOR SENSOR CIRCUIT SHORT-CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1436 | Air Mix Door Actuator Potentiometer Circuit Wire Break (Passenger's Seat) | <Ref. to AC(diag)-70, DTC B1436 AIR MIX DOOR ACTUATOR POTENTIOMETER CIRCUIT WIRE BREAK (PASSENGER'S SEAT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1437 | Air Mix Door Actuator Potentiometer Circuit Short-Circuit (Passenger's Seat) | <Ref. to AC(diag)-72, DTC B1437 AIR MIX DOOR ACTUATOR POTENTIOMETER CIRCUIT SHORT-CIRCUIT (PASSENGER'S SEAT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1438 | Mode Door Actuator Potentiometer Circuit Open | <Ref. to AC(diag)-74, DTC B1438 MODE DOOR ACTUATOR POTENTIOMETER CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1439 | Mode Door Actuator Potentiometer Circuit Short | <Ref. to AC(diag)-76, DTC B1439 MODE DOOR ACTUATOR POTENTIOMETER CIRCUIT SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1440 | Air Mix Door Actuator Potentiometer Circuit Wire Break (Driver's Seat) | <Ref. to AC(diag)-77, DTC B1440 AIR MIX DOOR ACTUATOR POTENTIOMETER CIRCUIT WIRE BREAK (DRIVER'S SEAT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1441 | Air Mix Damper Control Servomotor Circuit (Passenger Side) | <Ref. to AC(diag)-79, DTC B1441 AIR MIX DAMPER CONTROL SERVOMOTOR CIRCUIT (PASSENGER SIDE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1442 | Air Inlet Damper Control Servomotor | <Ref. to AC(diag)-81, DTC B1442 AIR INLET DAMPER CONTROL SERVOMOTOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1443 | Air Outlet Damper Control Servomotor Circuit | <Ref. to AC(diag)-83, DTC B1443 AIR OUTLET DAMPER CONTROL SERVOMOTOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1446 | Air Mix Damper Control Servomotor Circuit (Driver Side) | <Ref. to AC(diag)-85, DTC B1446 AIR MIX DAMPER CONTROL SERVOMOTOR CIRCUIT (DRIVER SIDE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1448 | Rear Vent Door Actuator Potentiometer Circuit Open | <Ref. to AC(diag)-87, DTC B1448 REAR VENT DOOR ACTUATOR POTENTIOMETER CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B1449 | Rear Vent Door Actuator Potentiometer Circuit Short | <Ref. to AC(diag)-89, DTC B1449 REAR VENT DOOR ACTUATOR POTENTIOMETER CIRCUIT SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B144A | Rear Vent Door Actuator Potentiometer Lock | <Ref. to AC(diag)-91, DTC B144A REAR VENT DOOR ACTUATOR POTENTIOMETER LOCK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B14A1 | Sunload Sensor Circuit Open | <Ref. to AC(diag)-93, DTC B14A1 SUNLOAD SENSOR CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).><br>NOTE:<br>When inspection is performed indoors or in the shade, sunload sensor can be diagnosed as wire breaking due to the short amount of light. Inspect the sunload sensor under the direct sunlight. |

**5-6**

*2015 Legacy DTC chart*

| DTC | Item | Note |
|---|---|---|
| B14A2 | Sunload Sensor Circuit Short | <Ref. to AC(diag)-95, DTC B14A2 SUNLOAD SENSOR CIRCUIT SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).><br>NOTE:<br>When inspection is performed indoors or in the shade, sunload sensor can be diagnosed as wire breaking due to the short amount of light. Inspect the sunload sensor under the direct sunlight. |
| B14A3 | Refrigerant Pressure Sensor Circuit Open | <Ref. to AC(diag)-97, DTC B14A3 REFRIGERANT PRESSURE SENSOR CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B14A4 | Refrigerant Pressure Sensor Circuit Short | <Ref. to AC(diag)-99, DTC B14A4 REFRIGERANT PRESSURE SENSOR CIRCUIT SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B14A5 | Refrigerant Flow Sensor Circuit Open | <Ref. to AC(diag)-101, DTC B14A5 REFRIGERANT FLOW SENSOR CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B14A6 | Refrigerant Flow Sensor Circuit Short | <Ref. to AC(diag)-103, DTC B14A6 REFRIGERANT FLOW SENSOR CIRCUIT SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B14A7 | Variable Duty Solenoid Valve Circuit Failure | <Ref. to AC(diag)-105, DTC B14A7 VARIABLE DUTY SOLENOID VALVE CIRCUIT FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B14A8 | Refrigerant Not Sealed Drive Error | <Ref. to AC(diag)-107, DTC B14A8 REFRIGERANT NOT SEALED DRIVE ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B14B1 | Sheet Heater Thermistor Circuit Open (Driver's) | <Ref. to AC(diag)-108, DTC B14B1 SHEET HEATER THERMISTOR CIRCUIT OPEN (DRIVER'S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B14B2 | Sheet Heater Thermistor Circuit Short (Driver's) | <Ref. to AC(diag)-110, DTC B14B2 SHEET HEATER THERMISTOR CIRCUIT SHORT (DRIVER'S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B14B3 | Sheet Heater Thermistor Circuit Open (Passenger's) | <Ref. to AC(diag)-112, DTC B14B3 SHEET HEATER THERMISTOR CIRCUIT OPEN (PASSENGER'S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| B14B4 | Sheet Heater Thermistor Circuit Short (Passenger's) | <Ref. to AC(diag)-114, DTC B14B4 SHEET HEATER THERMISTOR CIRCUIT SHORT (PASSENGER'S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| U0001 | CAN Communication Bus Off | <Ref. to AC(diag)-116, DTC U0001 CAN COMMUNICATION BUS OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| U0002 | CAN Communication Error | <Ref. to AC(diag)-116, DTC U0002 CAN COMMUNICATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| U0028 | Heater Control Panel Communication Error | <Ref. to AC(diag)-117, DTC U0028 HEATER CONTROL PANEL COMMUNICATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| U0073 | Control Module Communication Bus Off | <Ref. to AC(diag)-118, DTC U0073 CONTROL MODULE COMMUNICATION BUS OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |

**5-7**

*2015 Legacy DTC chart*

## 3. Self Diagnostics

| | Step | Check | Yes | No |
|---|---|---|---|---|
| 1 | **SET SELF-DIAGNOSIS MODE BY OPERATING A/C CONTROL PANEL.**<br>1) Turn the ignition switch to OFF.<br>2) Start the engine while holding down the AUTO switch and FRESH/RECIRC switch.<br>NOTE:<br>Self-diagnosis can also be performed with ignition switch ON, but start the engine because observing the compressor operation is difficult.<br>3) All the indicators blink four times. | Does the self-diagnosis function operate and do all the indicators flash four times? | Go to step **2**. | <Ref. to AC(diag)-13, DIAGNOSTIC PROCEDURE WHEN SELF DIAGNOSIS USING A/C CONTROL PANEL DOES NOT OPERATE, OPERATION, Diagnostic Chart for Self-Diagnosis.> |

**5-8**

*Step 1*

| | Step | Check | Yes | No |
|---|---|---|---|---|
| 2 | **CHECK EACH SENSOR AND POTENTIOMETER.**<br>1) After the indicators stop blinking, automatically change to the Inspection Mode of sensor and potentiometer.<br>NOTE:<br>Display items can be changed each time the A/C switch is pressed. (Step Operation)<br>2) Read the code appeared on the display.<br>When no open circuit or short-circuit is found in each sensor and potentiometer, code “20” is displayed on the screen. When open circuit or short-circuit is found in each sensor and potentiometer, codes except “20” are displayed on the screen.<br>NOTE:<br>It takes one minute or more to complete all diagnostic steps after the engine has started. | Are other codes except “20” displayed? | Repair the defective circuit. <Ref. to AC(diag)-11, SENSOR CHECK TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.> | Go to step **3**. |

**5-9**

*Step 2*

| Display screen | Sensor | Trouble contents | Note |
|---|---|---|---|
| 21 | Open circuit in in-vehicle sensor | In-vehicle air temperature sensor circuit is open. | <Ref. to AC(diag)-58, DTC B1430 ROOM TEMPERATURE SENSOR CIRCUIT WIRE BREAK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| –21 | Short-circuit in in-vehicle sensor | In-vehicle air temperature sensor circuit is shorted. | <Ref. to AC(diag)-60, DTC B1431 ROOM TEMPERATURE SENSOR CIRCUIT SHORT-CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 22 | Ambient sensor trouble or communication failure | Sensor trouble or communication failure | <Ref. to AC(diag)-64, DTC B1433 OUTSIDE AIR SENSOR CIRCUIT SHORT-CIRCUIT (AIR-CONDITIONING), Diagnostic Procedure with Diagnostic Trouble Code (DTC).><br><Ref. to AC(diag)-62, DTC B1432 OUTSIDE AIR SENSOR CIRCUIT WIRE BREAK (AIR-CONDITIONING), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 23 | Open circuit in evaporator sensor | Post evaporator sensor circuit is open. | <Ref. to AC(diag)-66, DTC B1434 AMBIENT TEMPERATURE SENSOR CIRCUIT WIRE BREAK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| –23 | Short-circuit in evaporator sensor | Post evaporator sensor circuit is shorted. | <Ref. to AC(diag)-68, DTC B1435 EVAPORATOR SENSOR CIRCUIT SHORT-CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 24 | Engine coolant temperature sensor trouble or communication failure | Sensor trouble or communication failure | — |
| 25 | Open circuit in sunload sensor | Sunload sensor circuit is open. *1 | <Ref. to AC(diag)-93, DTC B14A1 SUNLOAD SENSOR CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| –25 | Short-circuit in sunload sensor | Sunload sensor circuit is shorted. | <Ref. to AC(diag)-95, DTC B14A2 SUNLOAD SENSOR CIRCUIT SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 26 | Open circuit in air mix door actuator — potentiometer (driver's) | Air mix door actuator potentiometer circuit is open. | <Ref. to AC(diag)-77, DTC B1440 AIR MIX DOOR ACTUATOR POTENTIOMETER CIRCUIT WIRE BREAK (DRIVER'S SEAT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| –26 | Open circuit in air mix door actuator — potentiometer (passenger's) | Air mix door actuator potentiometer circuit is open. | <Ref. to AC(diag)-70, DTC B1436 AIR MIX DOOR ACTUATOR POTENTIOMETER CIRCUIT WIRE BREAK (PASSENGER'S SEAT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 27 | Short-circuit in air mix door actuator — potentiometer (driver's) | Air mix door actuator potentiometer circuit is shorted. | <Ref. to AC(diag)-81, DTC B1442 AIR INLET DAMPER CONTROL SERVOMOTOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| –27 | Short-circuit in air mix door actuator — potentiometer (passenger's) | Air mix door actuator potentiometer circuit is shorted. | <Ref. to AC(diag)-72, DTC B1437 AIR MIX DOOR ACTUATOR POTENTIOMETER CIRCUIT SHORT-CIRCUIT (PASSENGER'S SEAT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 28 | Open circuit in mode door actuator — potentiometer | Mode door actuator potentiometer circuit is open. | <Ref. to AC(diag)-74, DTC B1438 MODE DOOR ACTUATOR POTENTIOMETER CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 29 | Short-circuit in mode door actuator — potentiometer | Mode door actuator potentiometer circuit is shorted. | <Ref. to AC(diag)-76, DTC B1439 MODE DOOR ACTUATOR POTENTIOMETER CIRCUIT SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 41 | Open circuit in rear vent door actuator — potentiometer*2 | Rear vent actuator potentiometer circuit is open. | <Ref. to AC(diag)-87, DTC B1448 REAR VENT DOOR ACTUATOR POTENTIOMETER CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| –41 | Short-circuit in rear vent door actuator — potentiometer*2 | Rear vent actuator potentiometer circuit is shorted. | <Ref. to AC(diag)-89, DTC B1449 REAR VENT DOOR ACTUATOR POTENTIOMETER CIRCUIT SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |

**5-10**

*2015 Legacy sensor check table*

| Display screen | Sensor | Trouble contents | Note |
|---|---|---|---|
| 42 | Open circuit in refrigerant pressure sensor | Pressure sensor circuit is open. *1 | <Ref. to AC(diag)-97, DTC B14A3 REFRIGERANT PRESSURE SENSOR CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| –42 | Short-circuit in refrigerant pressure sensor | Pressure sensor circuit is shorted. *1 | <Ref. to AC(diag)-99, DTC B14A4 REFRIGERANT PRESSURE SENSOR CIRCUIT SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 43 | Open circuit in refrigerant flow sensor | Refrigerant flow circuit is open. *1 | <Ref. to AC(diag)-101, DTC B14A5 REFRIGERANT FLOW SENSOR CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| –43 | Short-circuit in refrigerant flow sensor | Refrigerant flow sensor circuit is shorted. *1 | <Ref. to AC(diag)-103, DTC B14A6 REFRIGERANT FLOW SENSOR CIRCUIT SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 44 | Refrigerant flow sensor circuit failure | Refrigerant flow sensor is faulty. | — |
| 46 | Variable flow change solenoid duty circuit failure | Variable flow change solenoid duty circuit is open or shorted. *1 | <Ref. to AC(diag)-105, DTC B14A7 VARIABLE DUTY SOLENOID VALVE CIRCUIT FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 47 | Air mix door actuator — lock (driver's) | Air mix door actuator does not operate due to being stuck or other reasons. | <Ref. to AC(diag)-85, DTC B1446 AIR MIX DAMPER CONTROL SERVOMOTOR CIRCUIT (DRIVER SIDE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 48 | Air mix door actuator — lock (passenger's) | Air mix door actuator does not operate due to being stuck or other reasons. | <Ref. to AC(diag)-79, DTC B1441 AIR MIX DAMPER CONTROL SERVOMOTOR CIRCUIT (PASSENGER SIDE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 49 | Mode door actuator — lock | Mode door actuator does not operate due to being stuck or other reasons. | <Ref. to AC(diag)-83, DTC B1443 AIR OUTLET DAMPER CONTROL SERVOMOTOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 52 | Rear vent door actuator — lock | Rear vent actuator does not operate due to being stuck or other reasons. | <Ref. to AC(diag)-91, DTC B144A REAR VENT DOOR ACTUATOR POTENTIOMETER LOCK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 53 | Heater control panel communication error | Communication with heater control panel is impossible. *1 | <Ref. to AC(diag)-117, DTC U0028 HEATER CONTROL PANEL COMMUNICATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 54 | CAN communication bus off | Bus off*1 | <Ref. to AC(diag)-116, DTC U0001 CAN COMMUNICATION BUS OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 55 | CAN communication error | Communication error*1 | <Ref. to AC(diag)-116, DTC U0002 CAN COMMUNICATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 57 | Open circuit in seat heater (driver's side) | Seat heater circuit is open. | <Ref. to AC(diag)-108, DTC B14B1 SHEET HEATER THERMISTOR CIRCUIT OPEN (DRIVER'S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| -57 | Short-circuit in seat heater (driver's side) | Seat heater circuit is shorted. | <Ref. to AC(diag)-110, DTC B14B2 SHEET HEATER THERMISTOR CIRCUIT SHORT (DRIVER'S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 58 | Open circuit in seat heater (passenger's side) | Seat heater circuit is open. | <Ref. to AC(diag)-112, DTC B14B3 SHEET HEATER THERMISTOR CIRCUIT OPEN (PASSENGER'S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| -58 | Short-circuit in seat heater (passenger's side) | Seat heater circuit is shorted. | <Ref. to AC(diag)-114, DTC B14B4 SHEET HEATER THERMISTOR CIRCUIT SHORT (PASSENGER'S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> |
| 20 blinking | When all conditions are normal | | — |

*1: Displays current malfunction only.
*2: Displays for vehicles with rear seat air conditioning only.

**5-11**

*2015 Legacy sensor check table*

| | Step | Check | Yes | No |
|---|---|---|---|---|
| 3 | **CHECK EACH ACTUATOR, BLOWER FAN AND COMPRESSOR.**<br>1) After completing each sensor and potentiometer inspection, change to the Inspection Mode of actuator, blower fan and compressor by pressing the defroster switch.<br>2) Each mode will change and operate automatically every four seconds.<br>NOTE:<br>Operation mode items can be changed each time the A/C switch is pressed. (Step Operation)<br>3) Check the operation of actuator, blower fan and compressor in each mode according to the operating mode table. <Ref. to AC(diag)-13, OPERATING MODE TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.> | Do the actuator, blower fan and compressor operate as described in the operating mode table? | A/C control system is normal. Press the OFF switch and complete the self-diagnosis function. | Repair each defective part. |

**5-12**

*Step 3*

| Display screen | Blower fan | Mode door | FRESH/ RECIRC door | A/C compressor | Air mix door | Rear vent |
|---|---|---|---|---|---|---|
| 31 | LO | FACE | FRESH | OFF | Maximum cool | 74.5% |
| 32 | LO | FACE | RECIRC | ON | Maximum cool | 74.5% |
| 33 | M1 | FACE | RECIRC | ON | Maximum cool | 74.5% |
| 34 | M1 | B/L | FRESH | ON | 50% | 74.5% |
| 35 | M1 | FOOT | FRESH | ON | 50% | -5.5% |
| 36 | M3 | FOOT | FRESH | ON | Maximum hot | -5.5% |
| 37 | M3 | F/D | FRESH | ON | Maximum hot | -5.5% |
| 38 | HI | DEF | FRESH | ON | Maximum hot | -5.5% |

**5-13**

*Operating mode table*

**4. Diagnostics by phenomenon**

Inspection

1. Perform diagnosis according to the diagnosis procedure for the corresponding symptom listed in the symptom table.
2. If there are multiple symptoms, perform the diagnosis in the order of symptom number (1→2 →... →13).

| Symptoms | | Diagnosis procedure |
|---|---|---|
| 1 | Nothing is displayed on the screen or indicators do not illuminate. | <Ref. to AC(diag)-15, NOTHING IS DISPLAYED ON THE SCREEN OR INDICATORS DO NOT ILLUMINATE, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 2 | Air conditioner does not stop even when the OFF switch is pressed. (vehicles with fully automatic air conditioner) | <Ref. to AC(diag)-17, AIR CONDITIONER DOES NOT STOP EVEN WHEN THE OFF SWITCH IS PRESSED. (VEHICLES WITH FULLY AUTOMATIC AIR CONDITIONER), DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 3 | The windshield glass is not cleared even when the DEF switch is pressed. (vehicles with fully automatic air conditioner) | <Ref. to AC(diag)-18, THE WINDSHIELD GLASS IS NOT CLEARED EVEN WHEN THE DEF SWITCH IS PRESSED. (VEHICLES WITH FULLY AUTOMATIC AIR CONDITIONER), DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 4 | Cold air not emitted. | <Ref. to AC(diag)-20, COLD AIR NOT EMITTED, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 5 | Warm air not emitted. | <Ref. to AC(diag)-22, WARM AIR NOT EMITTED, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 6 | Compartment temperature is excessively lower than setting temperature. | <Ref. to AC(diag)-25, COMPARTMENT TEMPERATURE IS EXCESSIVELY LOWER THAN SETTING TEMPERATURE, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 7 | Compartment temperature is excessively higher than setting temperature. | <Ref. to AC(diag)-27, COMPARTMENT TEMPERATURE IS EXCESSIVELY HIGHER THAN SETTING TEMPERATURE, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 8 | Air does not come out, or airflow capacity is insufficient. (Blower motor does not rotate.) | <Ref. to AC(diag)-30, AIR DOES NOT COME OUT, OR AIRFLOW CAPACITY IS INSUFFICIENT, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 9 | Air goes out of control. (Blower motor rotates at high speed.) | <Ref. to AC(diag)-37, AIR GOES OUT OF CONTROL, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 10 | Cold air does not come out even when the A/C switch is pressed. The glass cannot be defogged. (Compressor does not operate. (variable)) | <Ref. to AC(diag)-40, COLD AIR DOES NOT COME OUT EVEN WHEN THE A/C SWITCH IS PRESSED. THE GLASS CANNOT BE DEFOGGED. (COMPRESSOR DOES NOT OPERATE. (VARIABLE)), DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 11 | Unable to switch suction vents. | <Ref. to AC(diag)-42, UNABLE TO SWITCH SUCTION VENTS, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 12 | Unable to switch blow vents. | <Ref. to AC(diag)-44, UNABLE TO SWITCH VENTS, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |
| 13 | Illumination does not come on, or cannot dim. | <Ref. to AC(diag)-45, ILLUMINATION DOES NOT COME ON OR CANNOT DIM, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.> |

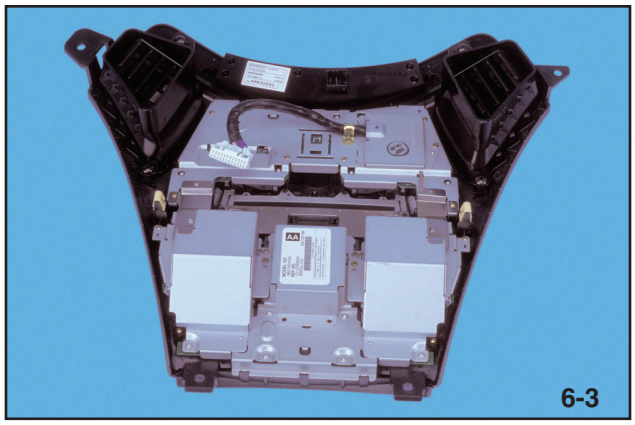
**5-14**

*Symptom table*

NOTES

# Subaru Tribeca (Audio System) Supplemental

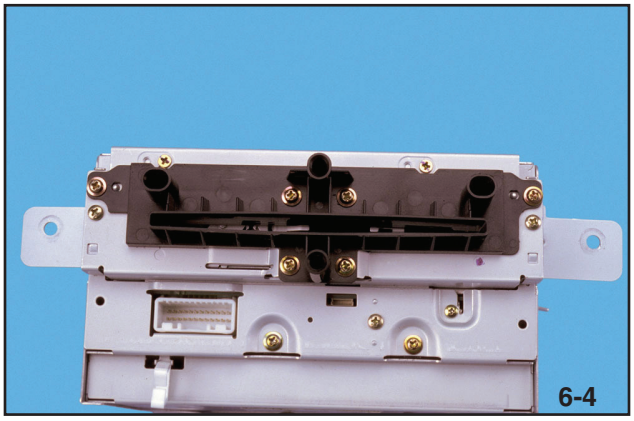

*Face plate front view*



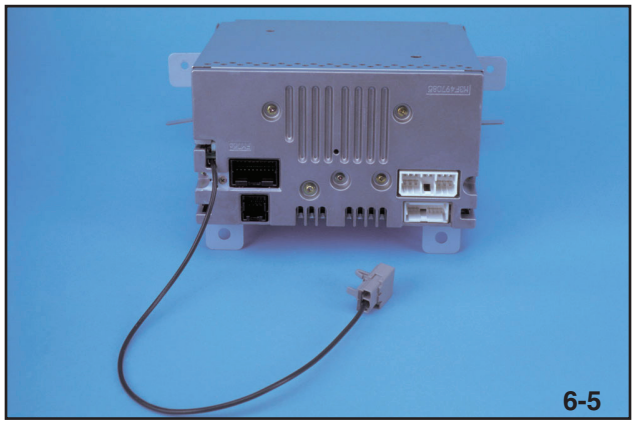

*Face plate back view*

The Audio Unit is controlled by a faceplate which is also used to control the Air Conditioning.

The Audio Unit transfers the control signals from the faceplate through the Audio Unit circuitry to the harness connecting to the radio. This harness then connects to the HVAC wiring and to the HVAC Control Unit.




*Audio unit front view*




*Audio unit rear view*

The faceplate connects to the audio unit with a single connector.

Before diagnostics for the HVAC control system can be performed the faceplate operation must be checked.

**Note: Radio and HVAC must be off**

- Turn the key to accessory on and wait 2 seconds
- Press and hold the Auto and Mode buttons on while the ignition is turned on.
- Check that all segments of the Vacuum Fluorescent Displays (VFD) are illuminating.
- If Seat Heater equipped, those switches can be checked at this time.
- Press all control buttons and observe if a corresponding indicator light is illuminated.

**Audio Control Check**

Multi-Function Display (MFD) or Navigation Display will display mechanical problems and compact disc problems when “MECHA ERROR” or “CHECK DISC” appears on the display.

The audio set can diagnose problems using its face panel buttons so that the face panel and the CD/radio unit can be separated depending on their problems.

By use of this diagnostic function, judgement to one of the following three conditions can be made:

(A) Face Panel failure

(B) CD/radio unit failure

(C) Poor contact between the face panel and CD/radio unit (communication error)

1. To enter the diagnostic mode:

   1) Turn the ignition switch to ACC. (Turn off the audio.)

   2) Press buttons “TUNE D”, “SEEK Ñ” and “RDM” together for at least 2 seconds.

   3) You will hear a beep.

      (If beep does not sound, try again. If you cannot hear the beep, both face panel and CD/radio unit have a possibility of a problem and/or poor contact between the face panel and CD/radio unit should be considered.)

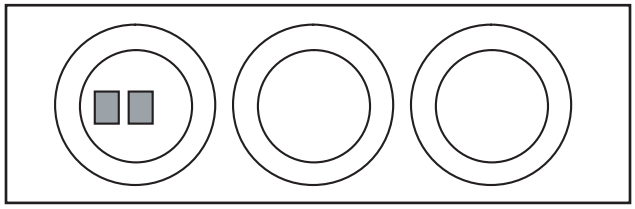
   4) Within 15 seconds after the beep sounds, press the preset button “1” to enter the diagnostic mode.

      In the diagnostic mode, VFD’S (Vacuum Fluorescent Displays) on the climate control dials illuminate.

**Note: The Tribeca has built in self diagnostics, similar to other models with automatic climate control, however the select monitor cannot communicate with HVAC control unit, refer to the appropriate Subaru service manual when performing any A/C diagnostics for detailed procedures.**

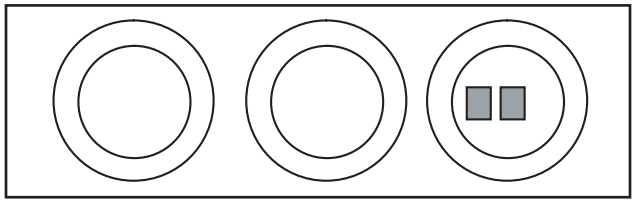
**In Diagnostic Mode**

**If VFD on the Left side dial illuminates**



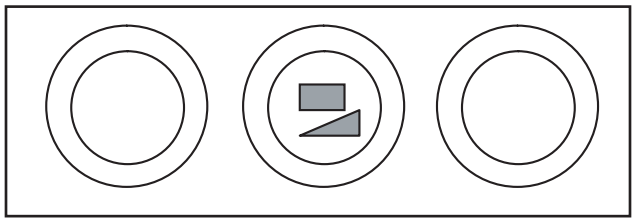
The face panel has NO problem. The CD/radio unit has a possibility of a problem and/or poor contact between the face panel and CD/radio unit is considered.

**If VFD on the Right side dial illuminates**



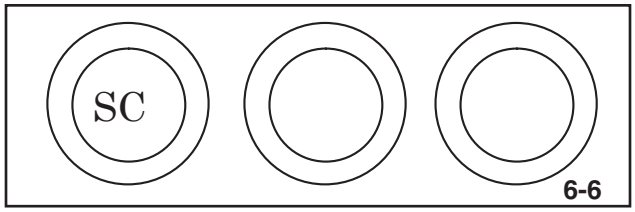
The CD/radio unit has NO problem. The face panel has a possibility of a problem and/or poor contact between the face panel and CD/radio unit should be considered.

**If VFD on the Center dial illuminates**



Confirm each audio control button's function by pressing the button.

VFD'S will show specific letter symbol corresponding to each button's function. For example, when "SCAN" button is pressed, letter symbol "SC" appears on the VFD.




*VFD chart*

(However buttons of "POWER", "FM", "AM", "CD" and "RES/AUX" have no function.)

If each button is confirmed to be functioning
The CD/radio unit has a possibility of problem.
If any of buttons is confirmed to be malfunctioning
The face panel is faulty.

### If VFD'S on the 3 dials do not illuminate

Audio set has not been switched to diagnostic mode. Try procedure 1 again.
If you cannot enter the diagnostic mode, both face panel and CD/radio unit have a possibility of a problem and/or poor contact between the face panel and CD/radio unit should be considered.

## To return from diagnostic mode

Perform any of the following operations.

- Press "POWER" button
- Press "CD", "FM", "AM" or "AUX" button
- Turn ignition switch to OFF

Diagnostic chart

PN: Possibility of NG

Turn the ignition switch to ACC and then turn the key off. Turn off the audio.
Press buttons "TUNE △", "SEEK ▽" and "RDM" together for at least **2 seconds**.

Beep sounds.

Press the preset button "1" **within 15 seconds** after beep sounds.

No illumination

| Radio Unit | Face Panel | Connection |
|---|---|---|
| | PN | PN |

Illumination on

| Radio Unit | Face Panel | Connection |
|---|---|---|
| PN | OK | PN |

Illumination on Center dial's VFD

Press each button to check button

(OK)

| Radio Unit | Face Panel | Connection |
|---|---|---|
| PN | OK | OK |

(NG)

| Radio Unit | Face Panel | Connection |
|---|---|---|
| OK | NG | OK |

PN: Possibility of NG

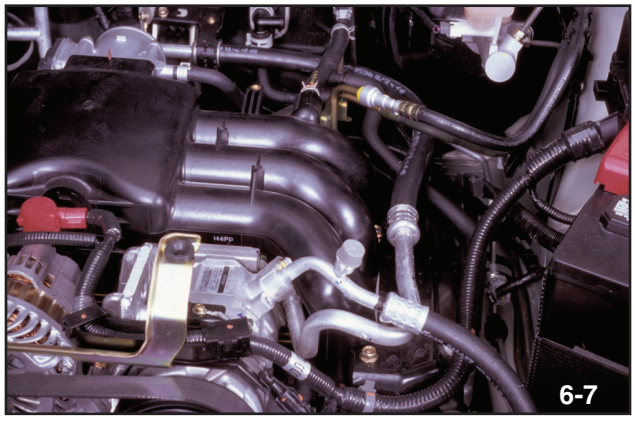
Beep does not sound.

| Radio Unit | Face Panel | Connection |
|---|---|---|
| PN | PN | PN |

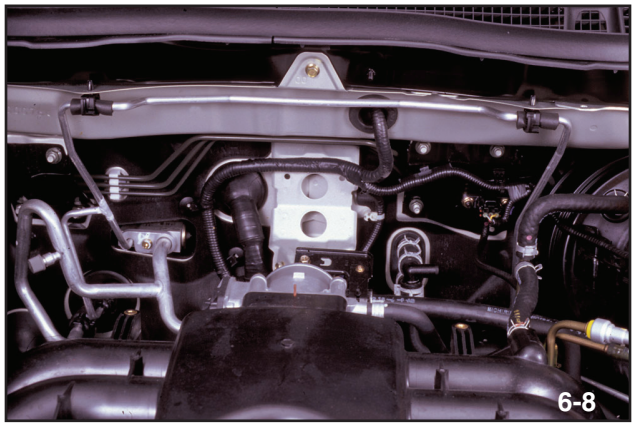
Illumination on

| Radio Unit | Face Panel | Connection |
|---|---|---|
| OK | PN | PN |

## Subaru Tribeca HVAC (Automatic Air)



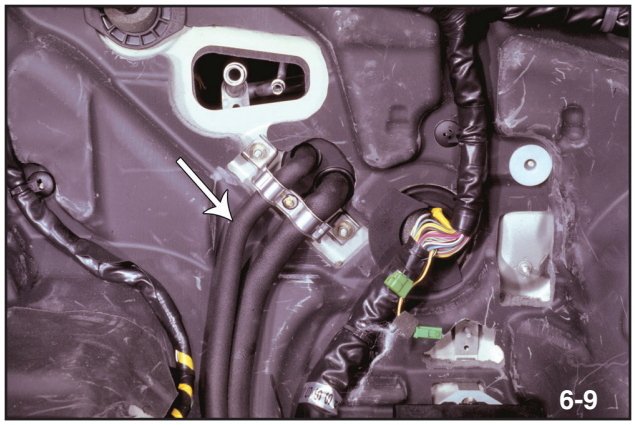

*Compressor*



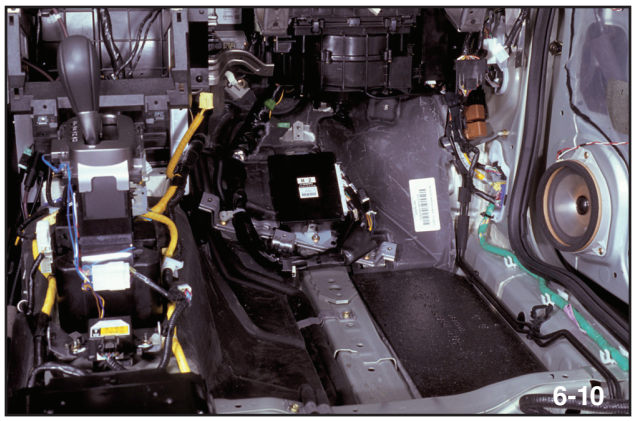

*Above engine compartment*

**Note: Fixed swash plate compressor**

The Subaru Tribeca is equipped with Dual Zone climate control and rear air conditioning (7 passenger models). Diagnostics for climate control is provided using the A/C control unit to communicate trouble codes to the control displays. The control unit is located on the blower housing assembly.
The low pressure refrigerant hose is routed from the compressor to the front expansion valve and Ts to the grommet for the rear evaporator hose. The high pressure refrigerant hose is routed from the compressor to the condenser. Then along the frame rail to the trinary switch and above the engine compartment to the front expansion valve and T's to the grommet for the rear evaporator hose.



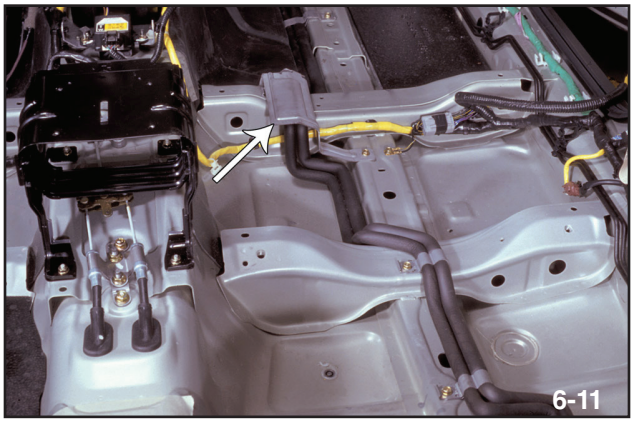

*Entering passenger compartment*



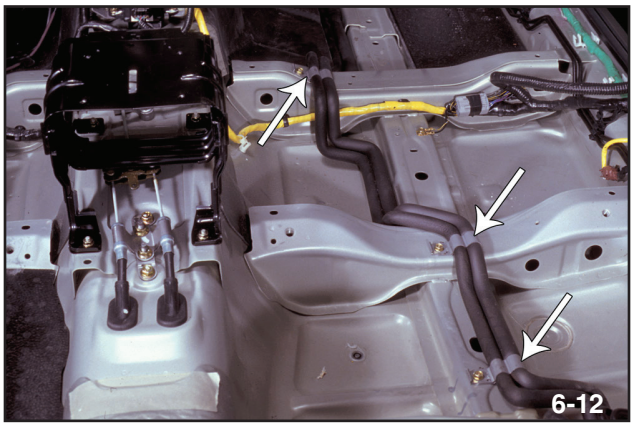

*Under passenger seat*

Both the high and low pressure hoses enter the passenger compartment and are clamped in place to the vehicle body behind the dash and above and to the left of the ECM.

There are three different sections of A/C hoses in the passenger compartment. The front section is routed from the bulkhead to just ahead of the second row seat bottom cushion. The connection between the front section and the rear section of A/C hoses are accessed by removing the lower door jam trim of the right rear passenger side door. Removal of the front section of hoses requires the removal of the dash, steering support beam, blower motor assembly and right front passenger seat.



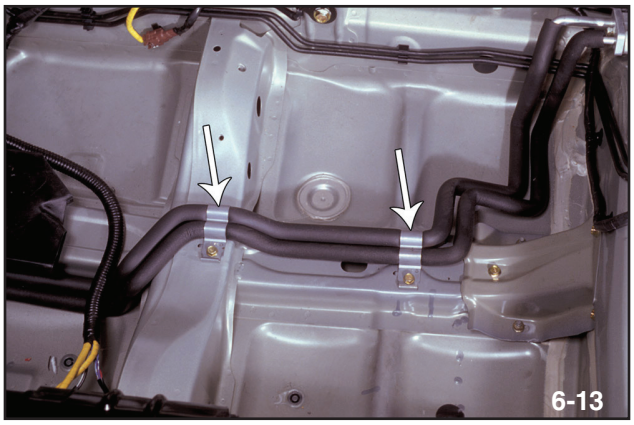

*In front of 2nd row seat*



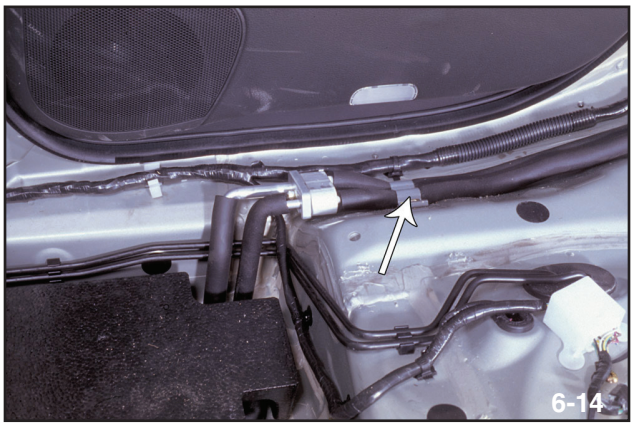

*Clamps*

From the bulk head the hoses are routed to the right side of the center console and cross over the frame channel that serves as a forward mount for the front seat. The hoses are protected by a shield and are clamped to the frame channel.

The hoses are then routed under the right front seat and cross over the frame channel that serves as the rear mount of the front seat. The shape of the channel and the location of the hoses crossing the frame channel, protect the hoses from damage.



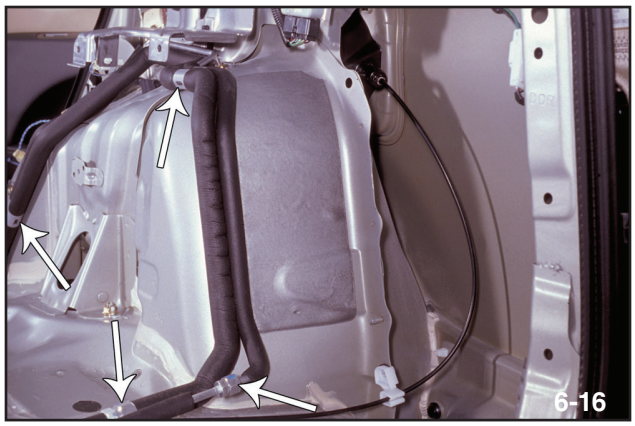

*Hose clamps*




*Connection*

A polystyrene block protects the hoses as they are routed on to the right rear door jam area.

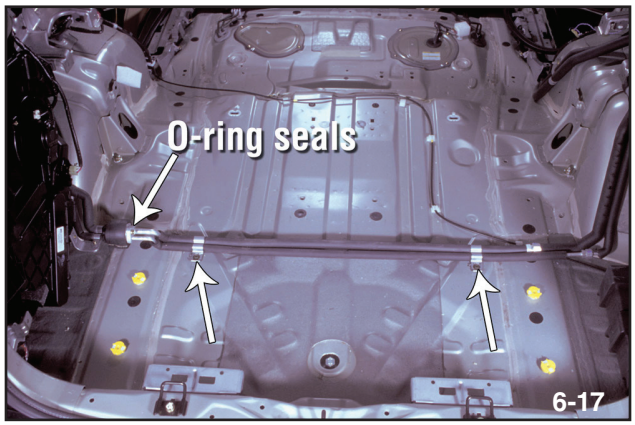

*Wheel well*




*Connection*

A metal cover protects the hoses as the front and middle sections meet (O-ring seals). The metal cover provides protection until the hoses are routed to the wheel well area where the inner trim panels provide protection.

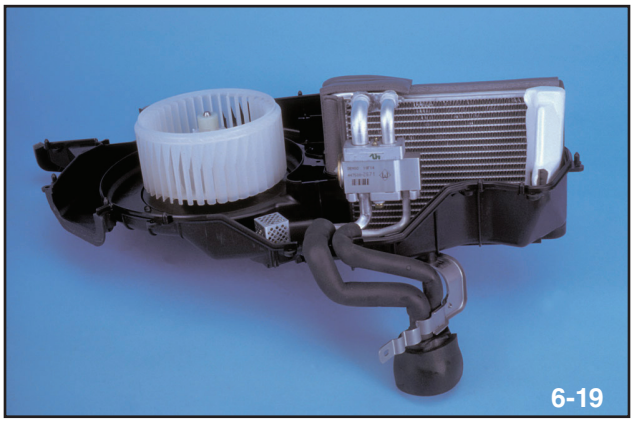
The hoses are routed over the wheel well and make a turn to the driver side of the vehicle. At this point the middle and the rear section of A/C hoses meet (compression sealed).




*Connection at rear evaporator*

The hoses are routed across the back of the vehicle just ahead of the tool storage tray, to the rear evaporator.


*Air inlet*

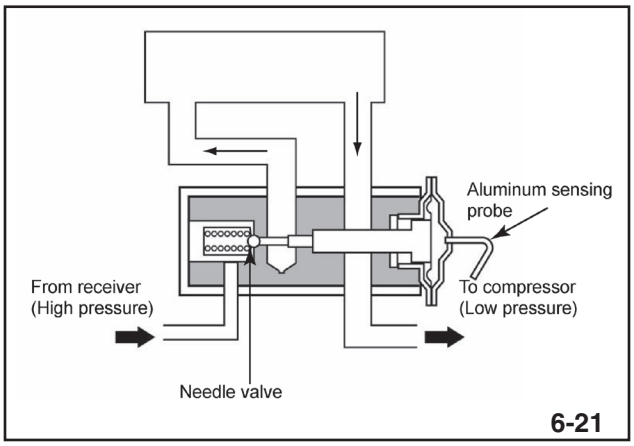



*Rear evaporator split*

Air cooled by the rear evaporator is drawn into rear blower motor through the rear vent in the cargo area.

The rear blower motor is equipped with a resistor style fan speed controller which is controlled by a single blower motor fan speed switch. In operation the refrigerant flowing through the rear evaporator will decrease as the rear expansion valve senses the decreasing evaporator outlet temperature.


*Rear blower switch*




*Rear expansion valve*

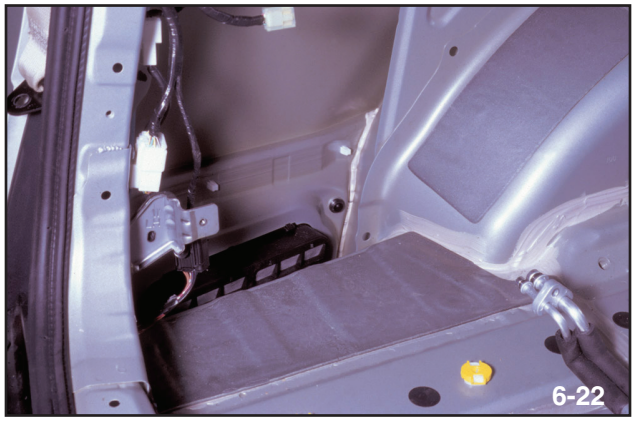
As the amount of refrigerant flowing through rear evaporator decreases the efficiency of the front evaporator increases due to the reduce heat load placed on the low pressure side. Only one thermistor is used on the Subaru B9 Tribeca A/C system and it is located in the front evaporator.

Low temperature at evaporator exit:

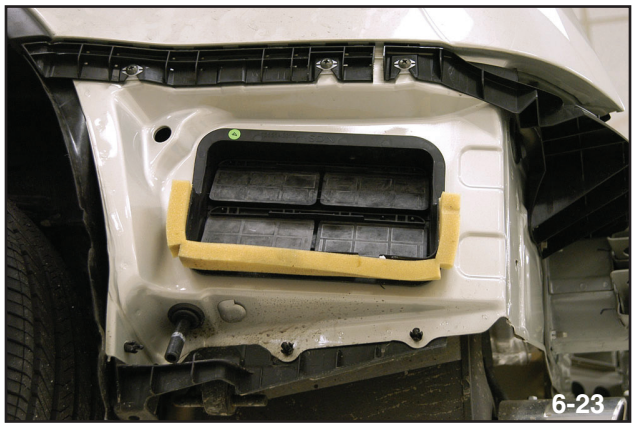
Gas pressure inside diaphragm decreases, reducing volume, pulling aluminum sensing probe right and throttling the needle valve.

High temperature at evaporator exit:

Gas pressure inside diaphragm increases, expanding volume, pushing aluminum sensing probe left, opening the needle valve to increase coolant flow.




*Rear evaporator removed*

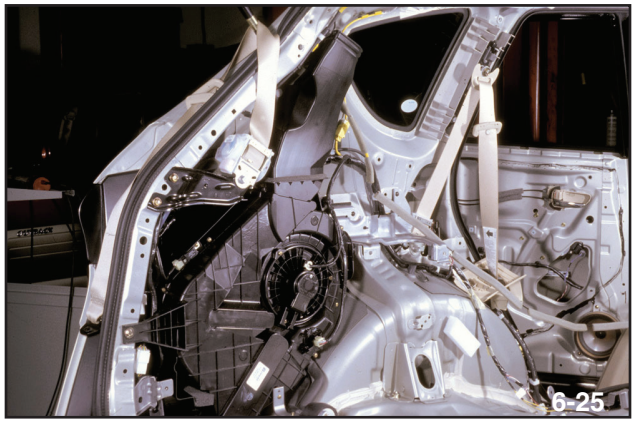



*Rear evaporator drain hose*

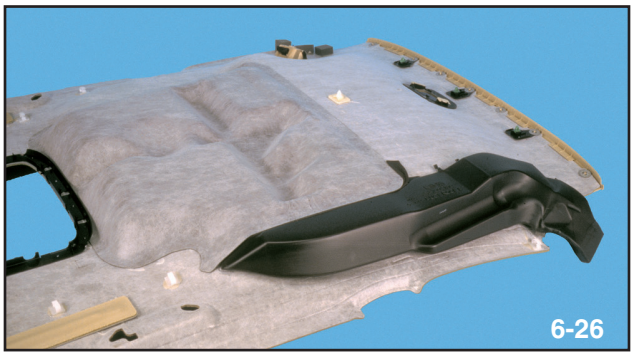
The rear evaporator drain hose is routed from the rear evaporator case to a grommet in the bottom of the left rear cargo area. The drain hose exits the vehicle behind the left rear inner fender and in front of the rear bumper cover. Installation of the hose to the vehicle body is accomplished by depressing the lock tabs of the forced ventilation assemble and pushing the forced ventilation assemble outward slightly. Place the hose into the grommet. Pull the forced ventilation assemble back into place, ensuring the lock tabs engage. Position the rear evaporator assemble in the vehicle, leaving enough room to reach behind the evaporator assemble install the drain hose onto the evaporator case.

Verify the drain hose did not move out of the grommet. Secure the evaporator case to the vehicle.


*Headliner*




*Rear blower motor*




*Bottom of headliner*

The blown air from the rear evaporator case is routed up the D pillar post area through the vent tube made onto the head liner. The air distribution vent tubes are an incorporated portion of the headliner and cannot be serviced separately. Air blown into the passenger compartment can be closed off or redirected by operating the vent levers of the individual headliner vents.

NOTES

NOTES

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