



# **Technicians Reference Booklet**

**2003 New Model  
Updates**

**Module 912**

**MSA5P0250C**

**Technical Training**



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# 2003 New Model Update (912)

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## Introduction

This Technicians Reference Booklet introduces the 2003 Forester 2.5X, 2.5XS, Baja and the OnStar system. It covers the component operation, trouble-shooting, diagnosis, and service precautions and procedures. This information is presented with special emphasis on procedures, tools and materials unique to Subaru vehicles. Subaru-specific servicing procedures and precautions are also included in this booklet.

The text and illustrations are derived from and follow the classroom lectures and slide presentations. They are intended to supplement and reinforce classroom instruction and to serve as a home-study reference source.

## 2003 Forester



The New Forester for the 2003 model year is available in three models. The 2.5X, 2.5XS and the 2.5XS Premium Package.

The 2003 Forester is not only the consolidation of recent enhancements and refinements to the Legacy and Impreza in a new more aerodynamic body style. The Forester is also the continuing effort by Subaru to increase safety and drivability by introducing to the new Forester such items as the active head restraint, high pillow side airbags and reduced turning radius.



Weighing in at 3,175 lbs. (Curb 4EAT) the new Forester is equipped with either the 5-speed manual or the 4 speed electronic automatic transmission, coupled with the 165 horsepower 2.5-liter SOHC engine.

## Exterior



The complete taillight assembly is housed on body of the vehicle rather than splitting the light as previous Forester Models.



Servicing of the taillight bulbs is achieved by opening the rear gate and removing two 6 mm bolts and removing the taillight assemble from the body. The bulbs are reached from the backside of the taillight assembly.



An additional line in the rear defogger grid located in the wiper park position provides improved wiper deicing. The rear wiper now parks on the left side of the rear window.



XS models have a larger side view mirror than the X model and are equipped with heated side view mirrors which are activated by the front windshield deicer switch. (15 minute timer)



The side view mirror and the C pillar post trim are metallic colored to improve appearance.



The driver door lock cylinder is the only key position on the exterior of the vehicle. This cylinder will lock and unlock the driver door only. (Keyless entry is standard)



The new (aluminum) hood line is lower on the new Forester. Sliding a thumb across the top of the grill until the release lever is located and slid to the passenger side of the vehicle best activates the secondary release for the hood.



The new headlight assembly can be removed by first removing the grill and the filler panel.



The lower hood line of the vehicle requires the use of a remote located power steering reservoir.



New to the Forester is the use of the module type windshield wiper system. All components are located behind the cowl.



The engine under cover is equipped with an access door to reach the oil filter and the oil drain plug.





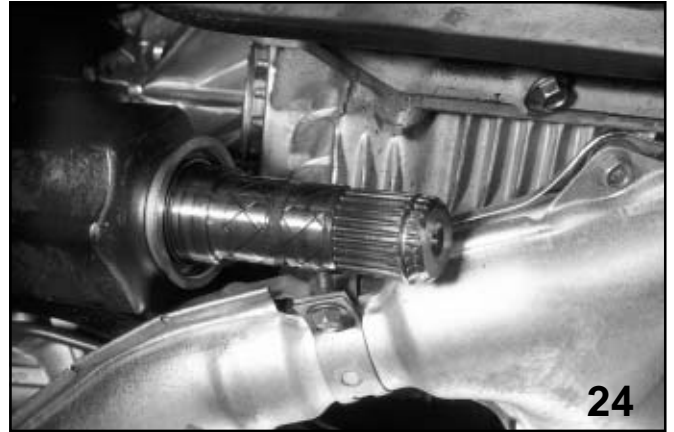
The door is opened by remove the 6 trim plugs and turning the door to the passenger side of the vehicle.



Two visual inspection doors are located near the front of the engine under cover .



Forester is now equipped with same type of subframe introduced with the Impreza WRX.



The stub axles of the front differential have been deleted and replaced with stub axles made onto the end of the drive axle inner joint. The end of the axle has a small circlip that locks the stub axle to the side gear of the differential.



The axle is removed from the differential by using ST28399SA000 and applying pressure between the axle joint and the differential.



The tool is directional. The higher side is placed next to the differential when servicing manual transmission vehicles while the shorter side is placed next to the differential when servicing automatic transmission vehicles.



A new oil seal installer for the differential is available.



An axle oil seal protector is used to prevent damage to the seal when installing the axle.

## Interior



Compartment storage configuration has changed to provide more convenience.



Child seat anchors now have easy open covers to conceal the anchor when not in use.



The moonroof on the 2.5XS and 2.5XS premium package model operates slightly different than previous Subaru moonroofs. When activated to open the moonroof will continue to open with no continued contact with the open button to the  $\frac{3}{4}$  open position.



Pushing the button again and releasing the button will carry the moonroof to the fully open position.



When activated to close the moonroof will continue to close with no continued contact with the close button to the  $\frac{3}{4}$  closed position. Pushing the button again and releasing it will carry the moonroof to the fully closed position.



An increase in the amount of current closing the moonroof will activate an obstruction safety feature that will interrupt the auto close feature and reverse the moonroof to open about 6 inches beyond the obstruction. Removing the obstruction and pushing the close switch again should restore the auto close of the moonroof. If the safety feature continues to operate the auto close feature will turn off. It will only be restored after the safety feature circuit has cooled down. A vehicle speed sensor input is supplied to the moonroof control unit it will increase the sensitivity of the obstruction detection.



New cup holders for the driver and passenger.



Gate type shifter is now equipped on the Forester.



All Forester models are equipped with a front seat ash tray and lighter receptacle. No lighter is delivered with the vehicle. Use only lighter 86719SA000 as other lighters may be too long and make contact with the ashtray door when it is closed, engaging the lighter.



Overhead storage is more convenient by the use of an additional compartment.



The window controls in the front and rear seats are illuminated when ever the ignition is in.



The Subaru logo now appears on the steering wheel.



Combination meter configuration including the gear shift indicator. The fuel gauge also has a low fuel warning light illuminating when the fuel level is 2.4 gallons (9 liters) or less.

Temp and odometer stays illuminated 5 seconds after the key is turned off.



The new clock position makes it necessary to open the center dash storage door to adjust the time.



## Supplemental Restraint System



All Forester models are equipped with front side airbags. The seat covers are tagged as a reminder for technicians.



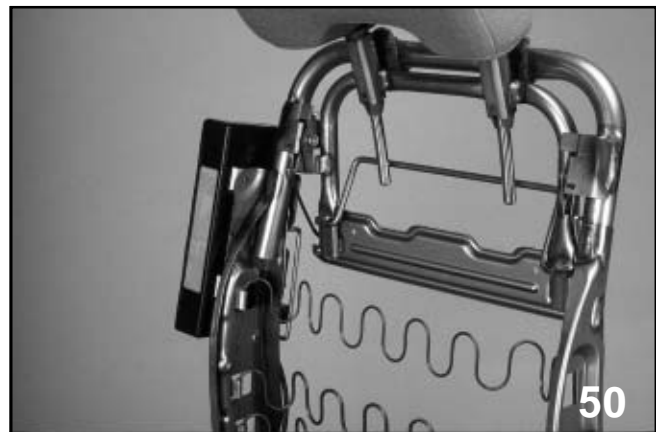
The airbag is attached to the upper seat frame and inflates to form a larger pillow when activated in a side collision.

All Forester front seats are also equipped with active head restraint.

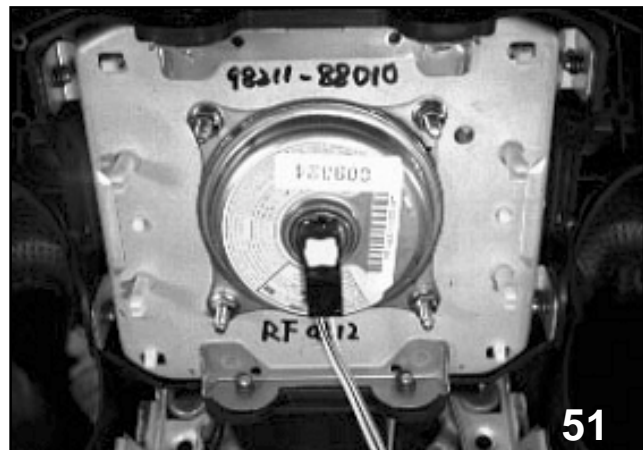
SRS wires routed through the seat are not covered with the yellow plastic cover.



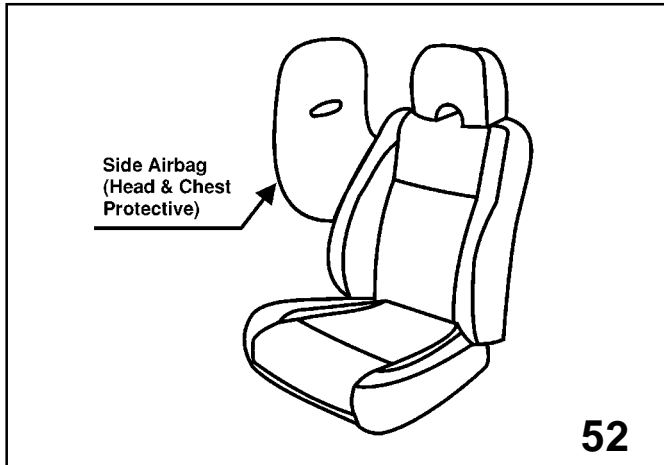
Normal position.



Position during rear impact.



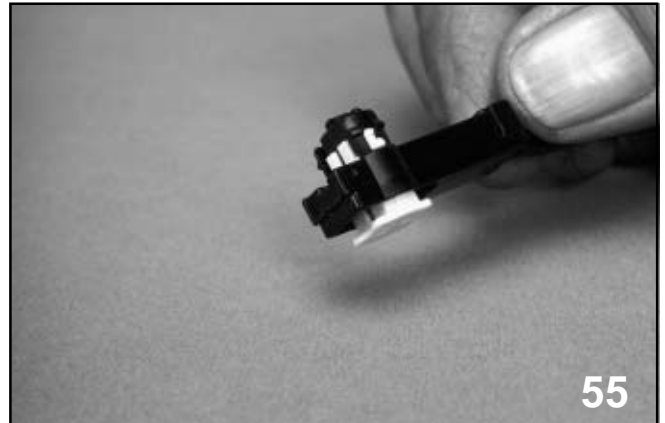
Drivers airbag module.



All 2003 Forester models will be equipped with driver and passenger front SRS Airbags, seat belt pretensioners and driver and passenger side airbags. The side airbags when deployed are larger and provide protection for the chest and head.

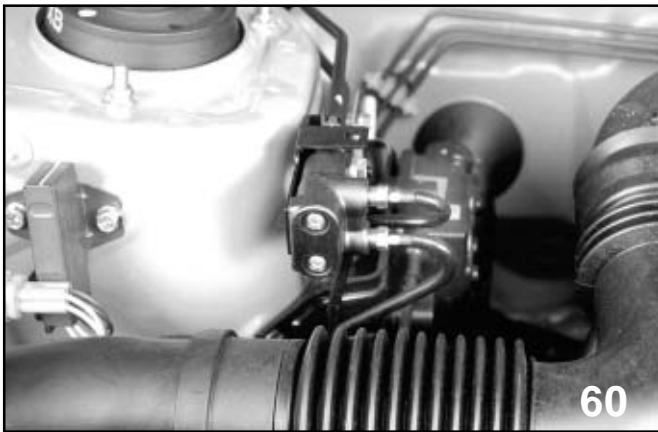


The location of the front Satellite discrimination sensors have been relocated due to the new vehicle design.

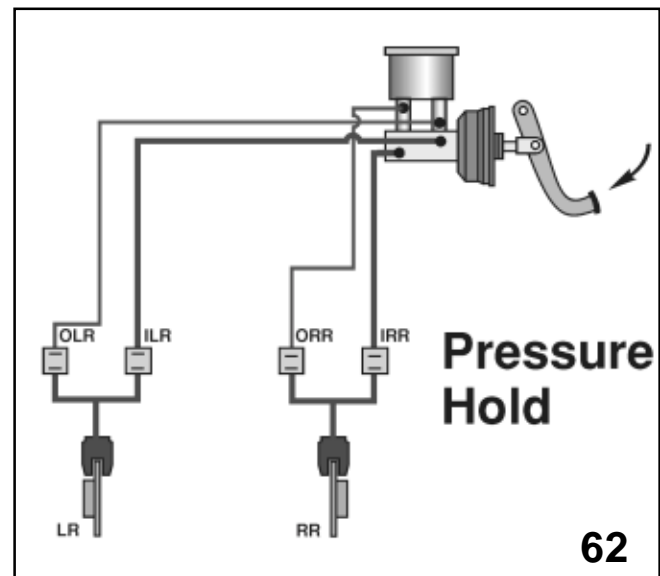
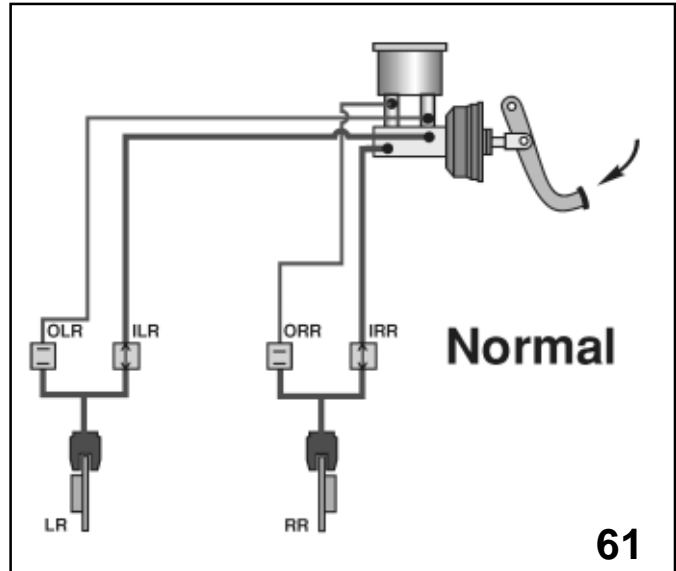


The connector and connector lock on all deployment devices has changed. The new style requires the release of the yellow tab by pulling up on the tab and then separating the connector from the deployment device.

## Brakes

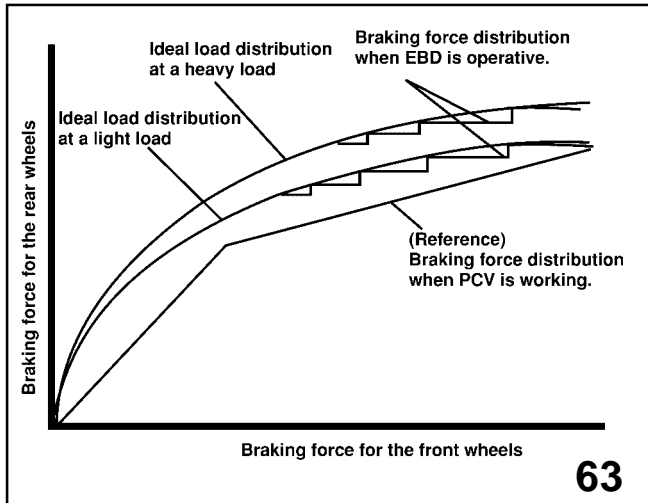


Forester 2.5XS and 2.5XS Premium Package models are equipped with Electronic Brake Distribution (EBD). This new system controls the brake fluid pressure to the rear wheels by taking advantage of existing ABS 5.3I components. This process eliminates the mechanical proportioning valve.



The hydraulic control unit will activate the inlet solenoid valves to achieve pressure hold controlling the pressure to the rear wheels.





The control unit built inside the HCU monitors the wheel speed of the front and rear wheels to decide how much braking force is generated from the rear wheels. The wheel speed difference between the front and rear on a vehicle with a light cargo load generates a higher wheel speed difference and results in lower braking force from the rear wheels. Heavier cargo loads in the rear generate lower speed differences between the front and rear and can receive higher brake fluid pressure.

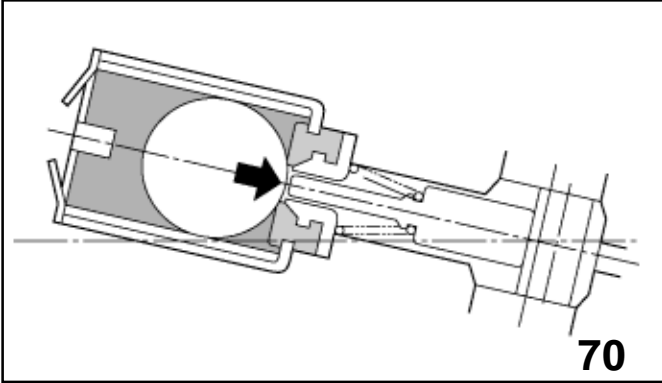
## Hill Holder

The 2003 Forester 5 speed manual transmission model is equipped with a hill holder. The hill holder activates with the clutch and brake pedal pushed when the vehicle is at about a 3 degree incline. Releasing the brake and holding the clutch will trap the brake pressure in the left front and right rear.

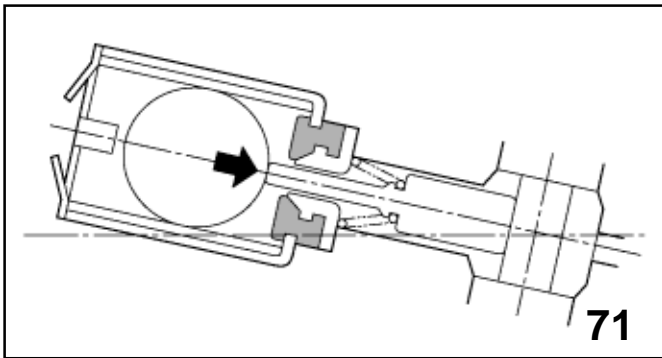


Operation of the pressure control valve (PHV) is accomplished by means of a cable connected to the clutch pedal and routed through the bulk head to the PHV. The end of the cable at the PHV is adjustable.

If the vehicle does not hold on the described incline tighten the adjustment. If the hill holder releases later than the clutch loosen the adjustment. If the hill holder releases too soon tighten the adjustment.



Clutch Pedal in



Clutch Pedal Out

## Automatic Air Conditioning

The Forester 2.5 XS and 2.5 XS premium package models will be equipped with Automatic air conditioning. The 3 control dials of the system communicate their set position to the driver by illuminated LEDs.



### Control Dial 1

Driver sets the desired temperature from 65 to 85 degrees Fahrenheit.

Auto button sets the system to automatic. Air flow direction, temperature and speed will be automatically controlled.

Off button turns the system off.

Holding the off button will change the brightness of the LEDs.

### Control Dial 2

Driver can set the fan to the desired speed

Indicates the fan speed

Indicates the position of the fresh air door

Driver can set the position of the fresh air door

Driver can activate the Air Compressor for manual A/C control

Indicates the operation of the Air Compressor

### Control Dial 3

Indicates the position of the mode door (Air flow direction)

Driver can set the position of the mode door

Driver can activate the front defogger mode

Indicates the operation of the front defogger mode

Driver can activate the rear defogger

Indicates the operation of rear defogger



### Self Diagnostic Procedure

Push and hold the “DEF” and the “A/C” switch while starting the engine.

All of the LEDs will turn on and off in following sequence of 5 steps.

| Step | Fan | Mode     | Def | Rear Def | A/C | Recirc | Auto |
|------|-----|----------|-----|----------|-----|--------|------|
| 1    | 1   | Vent     | On  |          |     |        |      |
| 2    | 2   | Bilevel  |     | On       |     |        |      |
| 3    | 3   | Heat     |     |          | On  |        |      |
| 4    | 4   | Def/Heat |     |          |     | On     |      |
| 5    | 4   | Def/Heat |     |          |     |        | On   |

This process will cycle twice. At the end of the second cycle all LEDs should be off.

**Except the A/C LED.** LEDs remaining on indicate a problem and the condition of that problem.

The chart below describes how to interpret the LED and corresponding problem,

| Step | Sensor                             | LED         |
|------|------------------------------------|-------------|
| 1    | In-vehicle                         | Vent        |
| 2    | Ambient                            | Bi-Level    |
| 3    | Evaporator                         | Heat        |
| 4    | Sun load                           | Def/Heat    |
| 5    | Air mix door PBR                   | Fan Speed 1 |
| 6    | Combination Meter<br>Communication | Fan Speed 2 |

If the “DEF” led is **off** during any of the 6 steps for sensor checks an **open circuit** can be assumed.

If the “DEF” led is **on** during any of the 6 steps for sensor checks a **shorted circuit** can be assumed.

If the **Rear window defogger LED** is **off** during any of the 6 steps for sensor checks the problem is a **current failure**.

If the **Rear window defogger LED** is **on** during any of the 6 steps for sensor checks the problem is a **previous failure**.

# 2003 New Model Update (912) Forester

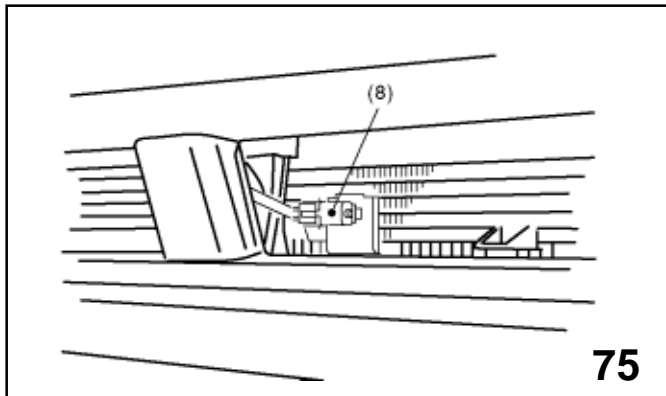
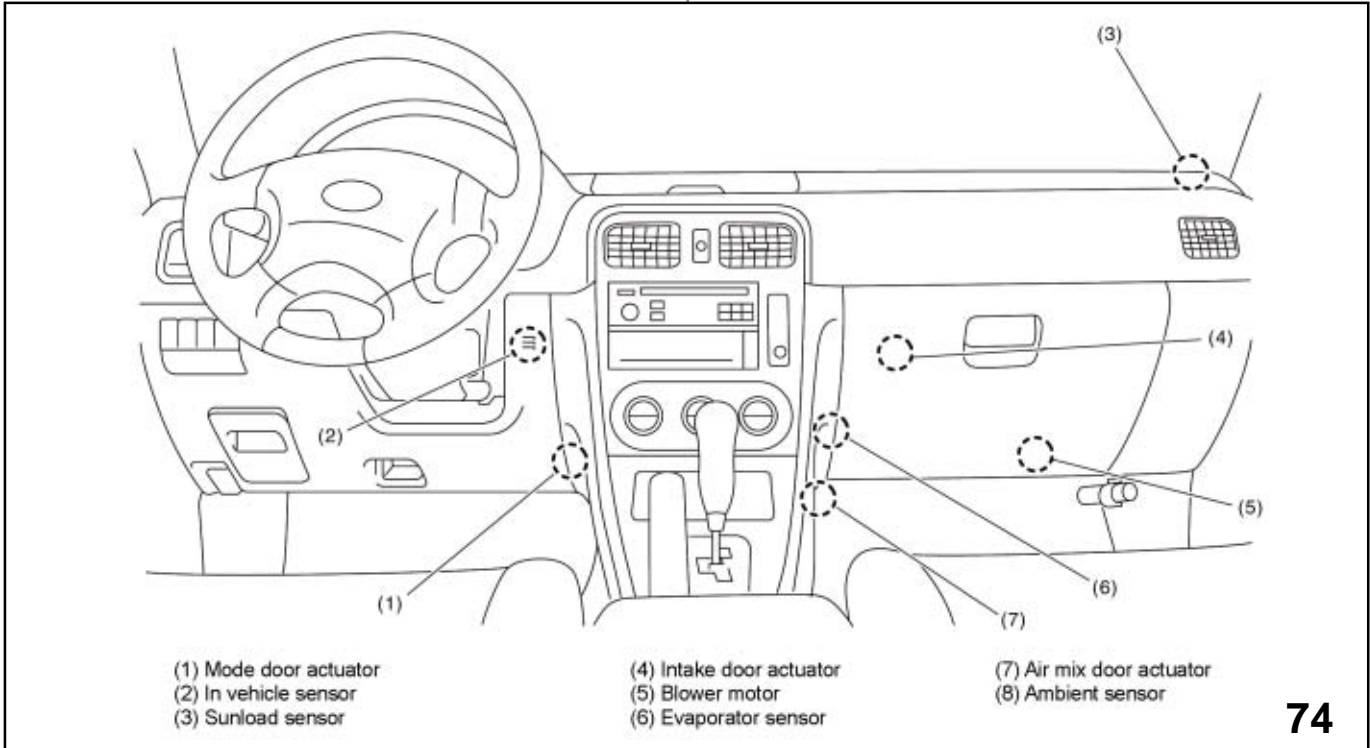
At the end of the sensor check a compulsory check mode can be activated by pushing the “RECIRC” switch. The system will automatically perform the following functions. Check the air flow direction, temperature and speed to determine if any problems are present.

Read the chart from left to right. All of the functions of a step are described on the same line.

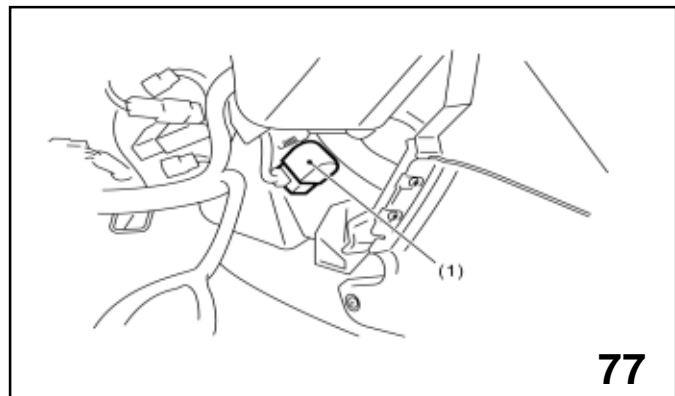
| Step | LED         | Fan Speed | Mode     | Intake Door | Air Mix   | Compressor |
|------|-------------|-----------|----------|-------------|-----------|------------|
| 1    | Vent        | Lo        | Vent     | Fresh       | Full Cool | Off        |
| 2    | Bi/Level    | Lo        | Vent     | Recirc      | Full Cool | On         |
| 3    | Heat        | ML        | Vent     | Recirc      | Full Cool | On         |
| 4    | Def/Heat    | ML        | Bi/Level | Fresh       | 50% Hot   | On         |
| 5    | Fan Speed 1 | ML        | Heat     | Fresh       | 100% Hot  | On         |
| 6    | Fan Speed 2 | MH        | Heat     | Fresh       | 100% Hot  | On         |
| 7    | Fan Speed 3 | MH        | Def/Heat | Fresh       | 100% Hot  | On         |
| 8    | Fan Speed 4 | High      | Def      | Fresh       | 100% Hot  | On         |

Pressing the auto button after entering compulsory check mode will allow the manual advancement through the 8 steps. Press the auto button when advancing to the next step is desired.

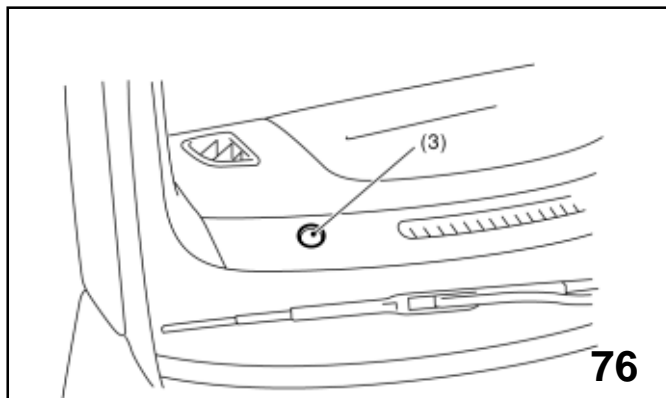
Exiting diagnostic mode is accomplished by cycling the ignition key.



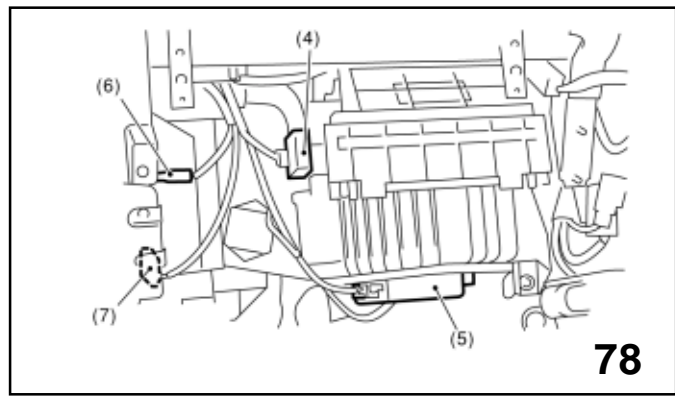
(8) Ambient sensor



(1) Mode Door Actuator



(3) Sunload sensor



(4) Intake door actuator, (5) Blower motor, (6) Evaporator sensor, (7) Air mix door actuator

## Legacy

### OnStar

OnStar, a system that provides communications and other services, will be equipped on all 6-cylinder Legacy vehicles.

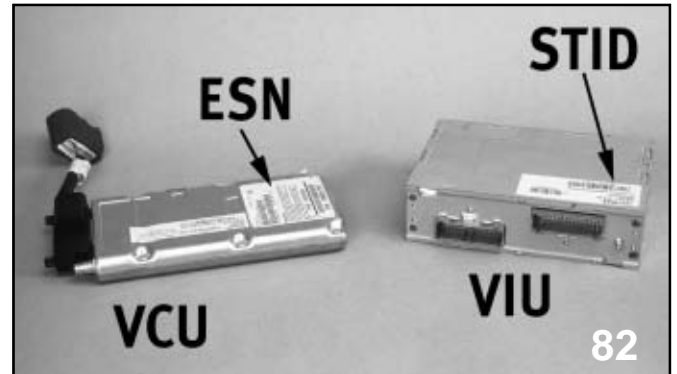


These vehicles will receive a one-year membership to the services provided by OnStar, which begin on the sale date of the vehicle.

The vehicles systems and the OnStar system are networked to provide cellular phone service, automatic emergency cellular phone call to OnStar, concierge service, and vehicle assistance.

The cellular phone strength of the OnStar system is approximately 3 watts compared to the approximately 1 watt of hand held cell phones.

### Components of the OnStar system



Vehicle Cell Unit (VCU), Vehicle Interface Unit (VIU)



3-button control module



Microphone



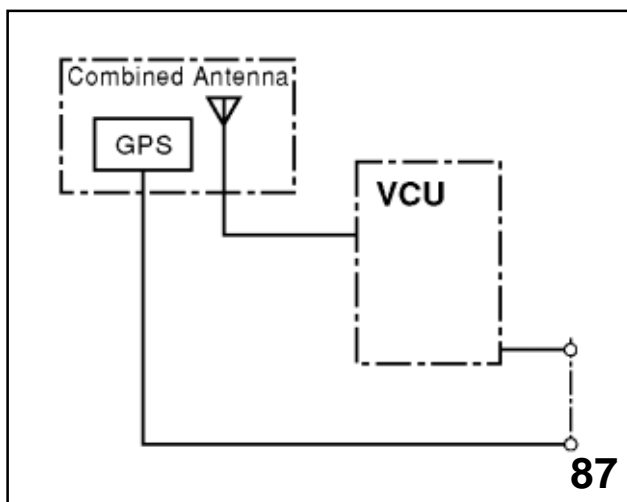
Cellular antenna and Global Positioning System (GPS) antenna.

# 2003 New Model Update (912) Legacy

The VCU and VIU are installed above and below the radio. These parts as well as the remaining OnStar components are installed at SIA. Upon installation the codes for VCU and VIU are recorded and reported to OnStar. This process makes interchanging parts from vehicle to vehicle impossible. Parts replacement of the VCU and or VIU requires a phone call to OnStar to report the new code numbers.

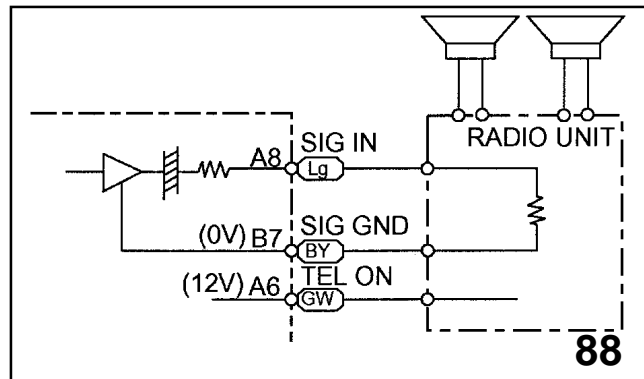


The 3 Button Module provides the input from the driver to make a cellular call, receive a cellular call and end a cellular call. The 3 Button Module is also equipped with a 2 color led that indicates trouble with the OnStar system. Green illumination indicates a present problem while red illumination indicates a past problem during diagnostic mode. During normal operation the green LED indicates no problem and OnStar is ready for operation.

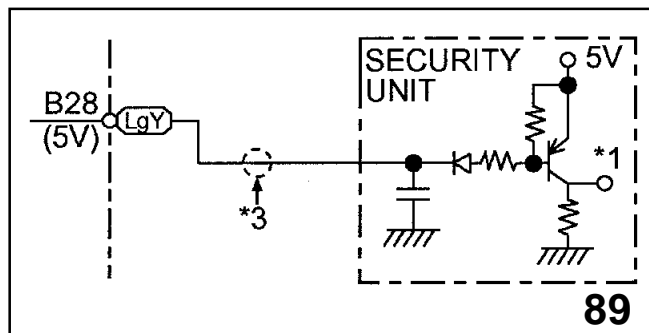


The VCU is the cell phone unit of the vehicle. It is connected to the combined cellular / GPS antenna and the VIU.

The VIU receives input signals and provides output signals to perform cellular phone service and vehicle assistance.

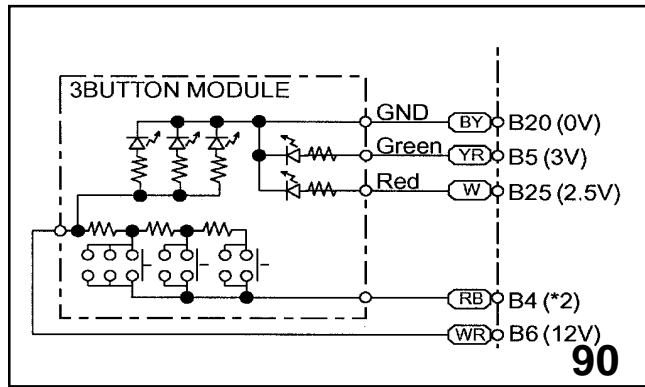


The Radio receives output signals from the VIU. The VIU will turn the Radio on, if it is off, bypass the normal sound system for speaker use and turn the Radio off, if it was off before the output signal from the VIU was generated. Three wires are used to control and communicate with the Radio, two wires for the voice output and one wire for the bypass control.



The Security control module receives 2 input signals from the VIU, arm and disarm. Both signals are sent to the security control module on the same wire. The difference between the two signals is amount of time the wire stays grounded. The arm signal provides 20 milliseconds of ground time while the disarm signal provides 80 milliseconds of ground time.

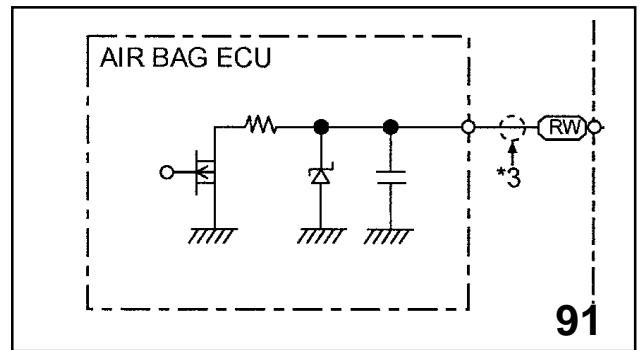




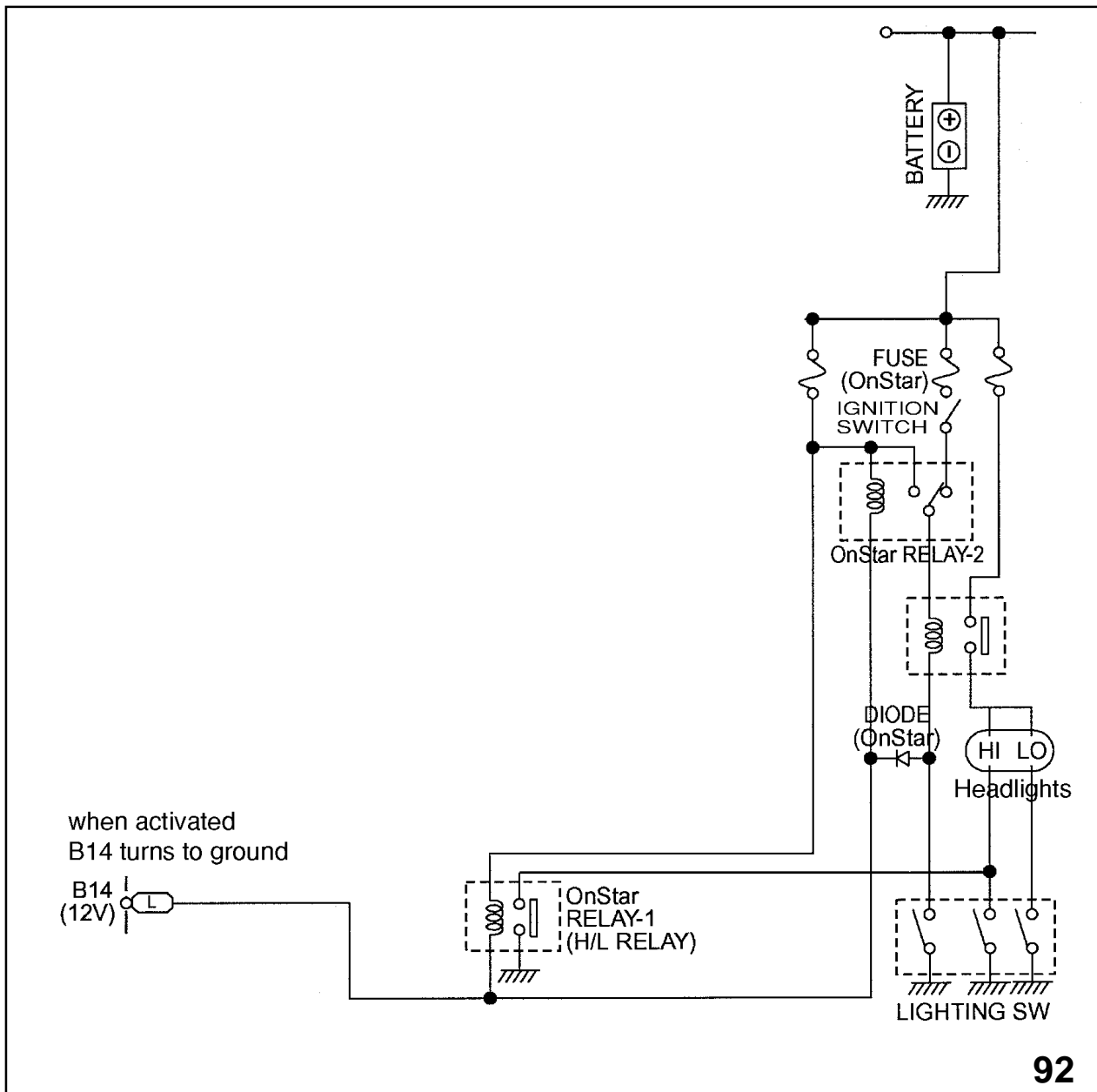
A single wire carries the commands from the 3 buttons to the VIU. The 2 color led is controlled by a different set of wires.

Each button of the 3 Button Module, when pushed, supplies a different resistance value to the wire supplying the input to the VIU. The VIU will perform the commands that match that resistance value. Two wires and a ground control the red/green led. The green illumination control uses 3 volts and the red illumination control uses 2.5 volts.

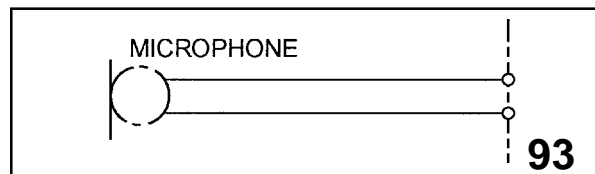
Also contained in the 3 Button Module are the LEDs for each button, which are on when the system is ready to operate.



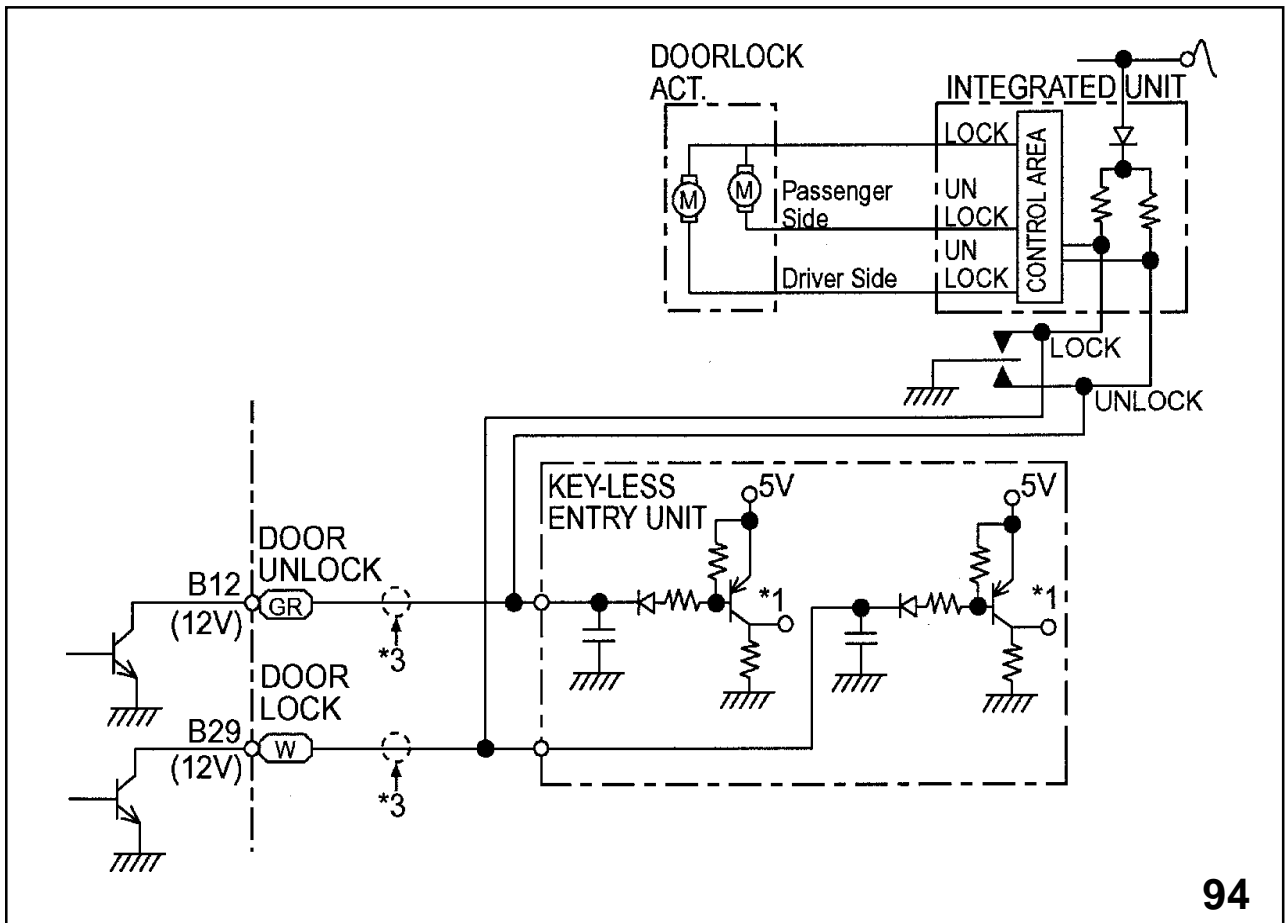
The SRS Air Bag System provides two types of input signals to the VIU, normal and deployed. The normal signal prevents the VIU from illuminating the trouble indicator (2 colored led). The deployed signal will result in the VIU outputting a signal to the VCU. The VCU will then make an emergency cellular phone call to OnStar. OnStar will then call the vehicle. If no response from the vehicle is received emergency vehicles are dispatched to the vehicles location. If the driver pushes the answer button when receiving the cellular phone call from OnStar the driver can decide if emergency vehicles are required. An emergency phone call to OnStar can be made by the driver themselves by pushing the emergency button and request services needed.



The headlight relay receives a signal to ground the coil of the coil of the relay for flashing the headlights. This is done to also assist with locating the vehicle.

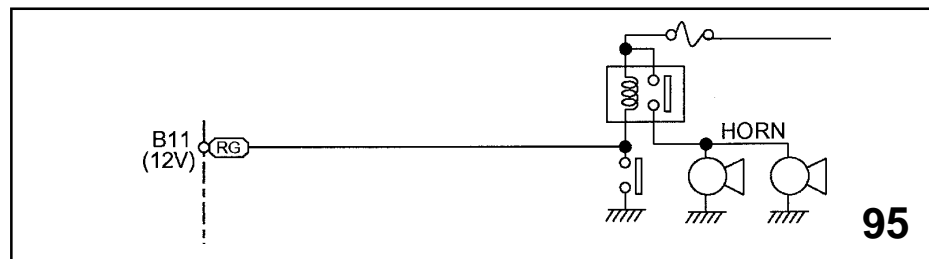


The microphone provides voice input to the VIU. This is used to communicate to the onboard OnStar system and to provide voice input during phone calls.



The Keyless Entry control module receives a Door unlock and Door lock signal from the VIU. Each command uses its own wire. The control of the security system and the keyless entry system are usually commanded together although independent control is possible.

The driver of the vehicle can call OnStar from a separate phone and request that the vehicle be locked, unlocked or security system turned on or off.



The Horn relay receives a signal from the VIU that will supply a ground to the coil of the relay to beep the horn. This is performed if the driver calls OnStar from a separate phone to assist with locating the vehicle.



The OnStar system is equipped with on board diagnosis. The system can perform a DTC check that will evaluate the condition of inputs and outputs as well as perform a compulsory check mode.

Entering the DTC check mode is accomplished using the "Dot" button and the ignition key. Follow the chart below to enter the DTC check mode.

1. Push and hold the "Dot" button
2. With the ignition key off cycle the ignition key to on 4 times within 6 seconds.
3. Release the "Dot" button.

### Results

Normal condition-The green LED will turn off and back on steady.

Red LED will flash to indicate a current problem.

Green LED will flash to indicate a code has occurred in the past but does not currently exist.

| Number of Flashes | DTC   |
|-------------------|---|
| 1                 | GPS signal error                                |
| 2                 | Loss of VCU to VIU communications               |
| 3                 | SRS signal fault<br><b>(Only flashes green)</b> |
| 4                 | GPS and Microprocessor communication fault      |
| 5                 | Button assembly malfunction                     |

### Exceptions

During a GPS and microprocessor communication fault, DTC occurs that disables the button module the VIU will not enter the DTC display mode.

The EEPROM checksum error, DTC shows a transition in the memory but does not mean there is a fault. Therefore no DTCs are displayed.

The SRS signal fault DTC will only show as history in the DTC display mode. (Requires ignition to enable algorithm and the ignition is the only reference for entering the DTC display mode.

The DTC codes will be displayed in two cycles. Current codes are always displayed first, followed the DTCs in memory.

The codes with the least number of flashes are displayed first.

Five codes or less shall be displayed in the same cycle.

The same code shall not be displayed more than once.

### Deleting DTC codes

DTC history status can be cleared at the end of the Display mode by pressing and releasing the OnStar button within 3 seconds at the end of the DTC display mode.

### Output mode

Output mode can be used to enter a compulsory check of the lock, unlock, security system, horn, and light outputs.

The output mode can be entered at the end of the DTC display mode by switching the ignition to off within 3 seconds at the end of the DTC display mode. (LED returning to normal condition).

| Order of occurrence    | Length of signal  |
|------------------------|-------------------|
| 1. Security arm signal | 20 milli seconds  |
| 2. Door lock           | 300 milli seconds |
| 3. Security indicator  | 1.125 seconds     |
| 4. Security disarm     | 80 milli seconds  |
| 5. Door unlock         | 300 milli seconds |
| 6. Horn and lights     | 750 milli seconds |

## VCU / VIU Remove

Set the Parking Brake Turn the ignition switch to the on position.

Place the shifter in the neutral position.

Turn the ignition switch off and disconnect the battery. Apply gentle up pressure to the corner of the shifter trim plate.



Continue applying pressure around the shifter trim plate until it can be removed.



Remove the two screws that secure the coin tray. The forward end of the tray has a point that is set into a notch under the ash tray.



Remove the two screws in the area indicated by the two fingers. A third screw is under the tray near the back.



Apply gentle up pressure to the radio /HVAC bezel. Apply pressure around the bezel until it can be removed.

Pull the bottom of the bezel outward and then slightly down to remove the top of the bezel.



Disconnect the electrical connectors from the back of the radio / HVAC bezel.



Remove the two screws from the Passenger side of the radio.

Complete radio / HVAC removal is then required. Remove the aspirator from the connector above the accelerator pedal.



Remove the indicated screw to allow the dash bezel to move upward when the radio is being removed.



The aspirator tube is routed between this bracket and harness.

Protect the radio and shifter from scratches during removal and installation.

Carefully disconnect all the connectors from the back of the radio.



Remove the two screws located under the OnStar buttons.

Remove the two screws from the driver side of the radio.



Slowly begin to slide the radio outward. This tab will catch on the area below the A/C vent. Push it down slightly to clear.



After reinstalling the OnStar components and the radio, the LED will blink red after connecting the battery and turning on the ignition. This condition will only last a few seconds followed by the LED turning on steady green.

## SPORTSHIFT

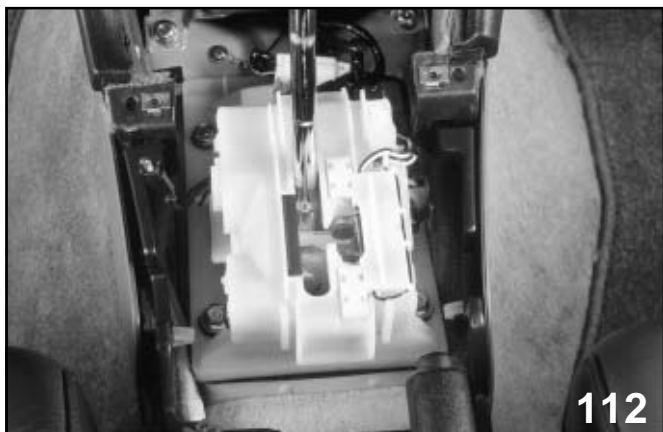


The 2003 Legacy GT model is equipped with VTD and a SPORTSHIFT type gate shifter. This added control feature of the 4EAT allows the driver to operate the changing of the forward gears by using a special SPORTSHIFT gate.

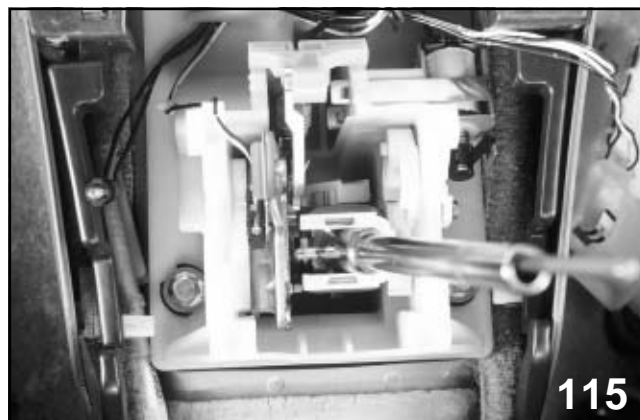


Operation is accomplished by placing the vehicle in "D" range and moving the shift lever to the right. Once in the SPORTSHIFT gate the shifter can be tapped forward for up shifting or tapped backwards for down shifting. Changing of the gears in SPORTSHIFT must be timed with the SPORTSHIFT indicator light on the combination meter. A small box at the top of the shift indicator will communicate the current gear position along with an arrow pointing up, down or both. This tells the driver if the current vehicle operation is good for up shifting to the next gear or down shifting to the previous gear. Normally the shift indicator will illuminate the gear position but while in SPORTSHIFT this feature is turned off. No upshift to 4<sup>th</sup> with cold ATF fluid. (Buzzer will sound)

Automatic up shifting is not performed while in SPORTSHIFT. Engine over rev protection is accomplished with a fuel cut and a full vehicle stop will result in the TCM activating 1<sup>st</sup> gear. At this point the driver will need to advance the forward gears with the shift lever.



The shift lever has a pin that engages with shift cable actuator. During normal shifting the pin moves the actuator back and forth to provide 1<sup>st</sup> through park.



When shifting to SPORTSHIFT the pin is moved away from the shift cable actuator and operates independently in the SPORTSHIFT gate.

TCM control for SPORTSHIFT is accomplished using input signals from the SPORTSHIFT micro switch, up shift micro switch and down shift micro switch.

Output signals are sent to the SPORTSHIFT indicator and sport shift solenoid. The sports shift solenoid is used to turn the low and reverse clutch on and off to provide engine braking should the 1<sup>st</sup> gear be chosen while in SPORTSHIFT.

The transmission trouble code for a failed SPORTSHIFT solenoid is 78. There are no codes for the micro switches.

Spring tension is applied to the shifter lever while in SPORTSHIFT by two spring-loaded pistons that push on the front and backside of the shifter lever.



## Baja



The BAJA is an all-new hybrid vehicle developed and built on the Legacy Outback platform. This vehicle provides pick-up truck versatility and passenger carrying capabilities for four people.



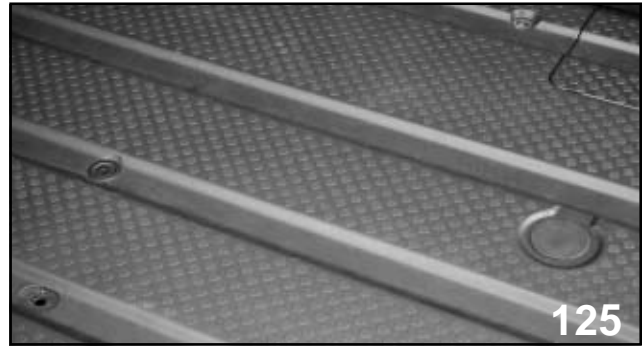
The BAJA is available in a single trim level coming standard with a 2.5-liter engine and a 5 speed all wheel drive transmission.



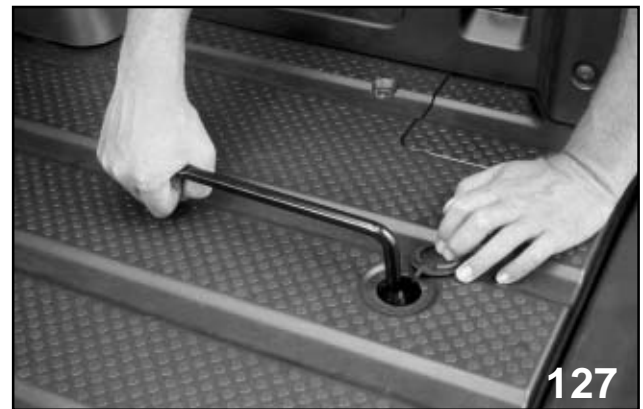
The gas cap is opened from the outside of the vehicle and is not equipped with an interior release.



The front bumper tow hook cover must be removed to access the tow hook.



The rear of the passenger compartment is equipped with a cargo light that will illuminate the cargo area. The light is operated from a switch on the left side of the steering column and is operable with the key on or off.

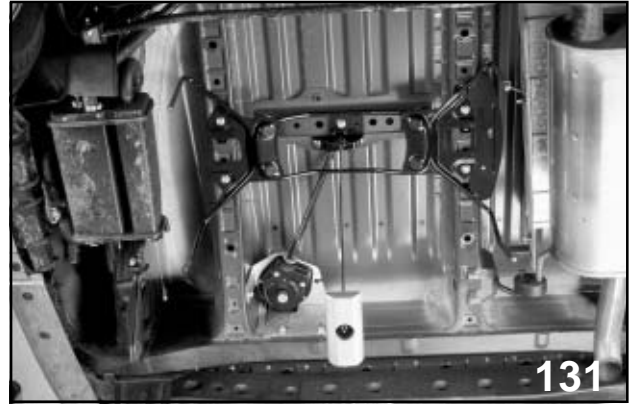


The bed liner is also the access point to lower the temporary spare tire. The full size flat is stored in the cargo area using the full size tire holder and the captured nut in the bed.

The bed liner of the cargo area is equipped with a water drain in each front corner.



The tool used for lowering the spare is located in the tool kit provided with the vehicle. The kit is stored in the passenger compartment behind the rear seat on the driver side.



The mechanism that lowers the spare tire is located under the vehicle and has enough travel to pull the spare tire beyond the rear bumper for removal from the storage cable.



The spare tire is secured to the storage cable by positioning the tire with the valve stem facing up and holding the keeper sideways. Push the keeper through the rim and allow gravity to pull the keeper into place.



To reconfigure the rear seats locate the fabric pull handle under the passenger side of the rear seat and pull upward. Lift the seat 90 degrees and then pull on the upper seat cushion release handle on either the driver or passenger side. Lower the upper cushion until it engages with the provided catches on the lower seat back. The Switchback release handle can be activated to lower the Switchback.



The backside of the upper seat frame is equipped with 2 child seat anchor points.



Any time the Switchback is open the Switchback position indicator light will be illuminated. The light will blink for about 5 seconds after the ignition key has been turned off.



Operation of the vehicle with the tail gate down requires that the license plate be repositioned. Before opening the tailgate push the top of the black release tabs in and swing the license plate holder upward by about 90 degrees. The holder will lock into position.



Removing the plastic cover and metal cover over the tailgate accesses the taillights mounted in the tailgate.





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