SUBARU

QUALITY DRIVEN® SERVICE

CERTIFIED SUBARU TECHNICIAN

Technicians Reference Booklet

Electrical Systems Operation & Diagnosis

Module 602

AUTOMOTIVE Youth Educational Systems

September 2006

MSA5P0135C

Technical Training

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Table of Contents

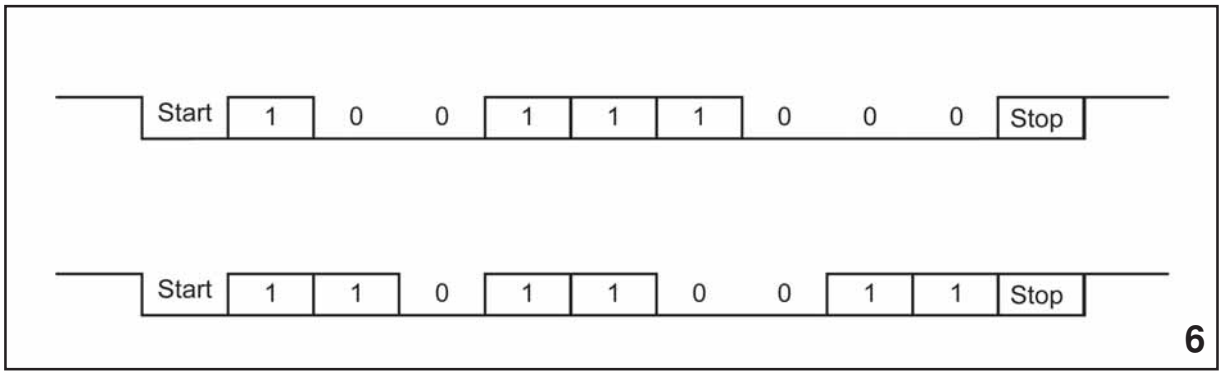
Introduction

This module will provide information and hands on experience that will provide you with an understanding of Subaru Electrical System Operation and Diagnosis.

Class room and lab participation is encouraged so that you may gain the experience needed to repair Subaru Electrical systems on your first attempt correctly and in a timely manner.

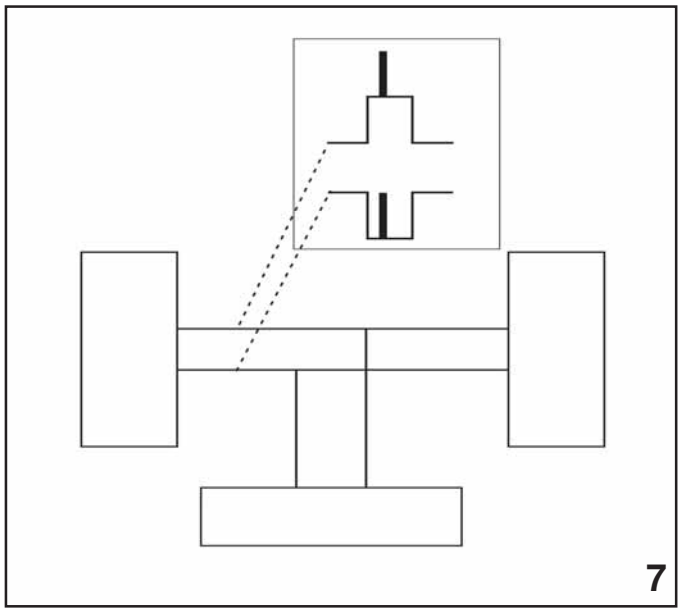
2005 Electrical System

LAN/CAN systems first appeared on the 2005 Legacy vehicles, followed by the 2006 Subaru B9 Tribeca and 2006 Forester. The LAN (Local Area Network), a system where multiple computers are linked together with a single pair of twisted wires, improves equipment operation and functions while reducing the weight of the vehicle by eliminating a considerable amount of wiring harnesses.



Sample Signals (Artwork)

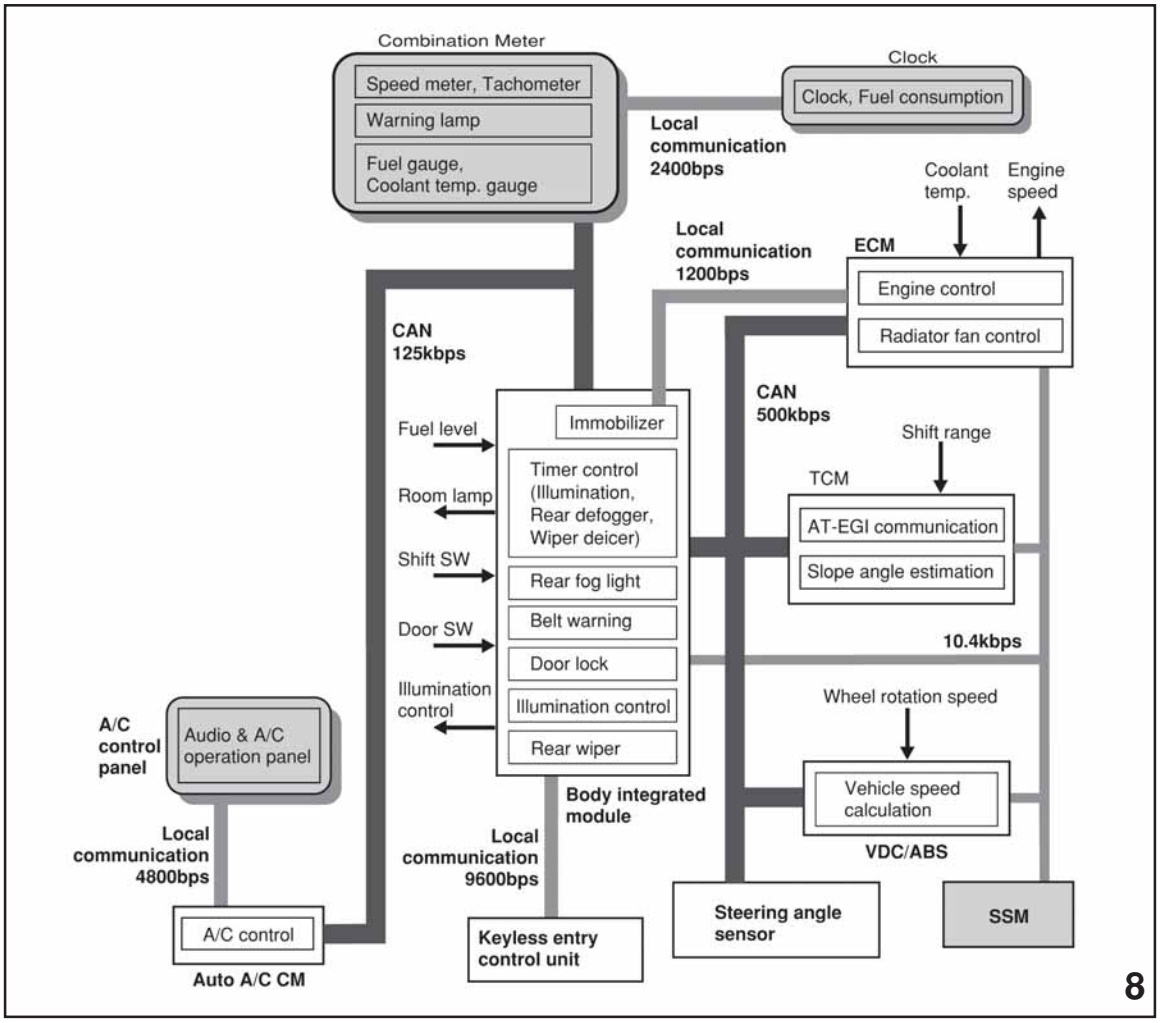
The LAN operates using Controller Area Network (CAN) communications protocol. CAN communications are frames of vehicle data that deliver and share all vehicle information among the computers of the LAN. The frames of data are composed of binary code or 0s and 1s that are coded and decoded by the LAN.



Noise (Artwork)

A Controller Area Network (CAN) signal is composed of two separate pulses. One pulse is low voltage changing to high voltage and one pulse is high voltage changing to low voltage. Each pulse has its own wire. The two pulses are sent simultaneously from one control unit to all the other control units on the Local Area Network (LAN). A control unit receiving the two pulses compares the potential difference between them.

A wire crossing over the twisted wire may induce interference through the magnetic field surrounding the wire. This magnetic field will place noise or an unwanted voltage signal into the CAN signal. The polarity of the unwanted signal will usually be constant. Superimposed over the CAN signal, the noise will cancel itself out as the control units only view the potential difference between the two wires. The more twists per meter a wire has the more it reduces noise.



LAN (Artwork)

CAN communications are designed to operate at different speed levels dependant on the operating speeds of the components on different parts of the LAN. The power train side of the LAN operates at 500 Kbps (500,000 bites per second). The body side of the LAN operates at a slower rate of 125 Kps (125,000 bites per second). The individual sides of the LAN are referred to as bus. Any references to the high speed bus are referencing to the power train side of the LAN and the low speed bus is referring to the body side of the LAN. Communications between the high speed and low speed bus sides of the LAN are not possible unless the data to be shared is adjusted to the same rate of speed. This adjusting process is referred to as passing through the gateway. The gateway function is accomplished by the Body Integrated Unit (BIU). Additional functions of the BIU control and monitor body related electrical circuits such as the rear defogger and door switches.

Components of the high speed bus include the Engine ECM, Transmission Control Module, ABS/VDC ECM and the Steering Angle Sensor (Vehicles with VDC).

Components of the low speed bus include the Combination Meter and A/C Control Unit (Auto A/C).

The twisted wire connecting all components of the CAN to the BIU must maintain its twisted shape to help with keeping out electrical interference. Repairs to the wire are allowed but the length of the twisted wire cannot differ more than 3.94 inches (8cm).

CAN Joint Connector

There are several CAN joint connectors used on both bus lines to connect all the components. Use care when working on and around these connectors so that damage to them is avoided.

Special Features of CAN

All control modules can receive messages (engine speed, vehicle speed and other data) from the CAN bus at the same time.

Multi-Master

When the bus is idle (when no control modules send messages to the bus), any control module can send messages to the bus.

System Flexibility

As the control modules connected the bus do not have unique addresses, there is no need to change the control module software or hardware or application when other control modules are added to the bus.

Message Priority

The identification added to a message defines the priority of the sent data. For this reason, when several control modules have transmitted messages at the same time, the control module with the highest priority continues to send, while the control modules with a lower priority stop sending. The modules with the lower priority message switch to receive mode. This prevents message collision.

Data Frame Construction

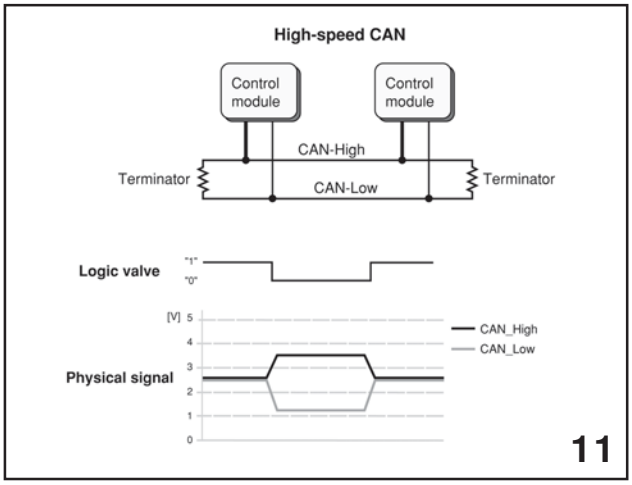
A data frame of communication is composed of several elements that ensure the information is sent and received properly.

1. Start of frame- Signals the start of a message
2. Arbitration field- Contains the identification that determines the priority of the message.
3. Data Field- Contains the actual data such as engine speed and engine temperature.
4. CRC- Contains a check signal for data transmission errors.
5. ACK field- A signal from the receiving computers to the sending computer that the data was correctly received.
6. EOF- End of frame, the message is at the end.

Signal Construction

When reviewing the service manual you will find references to High Speed CAN and Low Speed CAN. Each of these has a CAN-High wire and a CAN-Low wire. The differences in operating speed have already been discussed and now the construction of the two circuits needs to be understood before fully understanding operational differences.

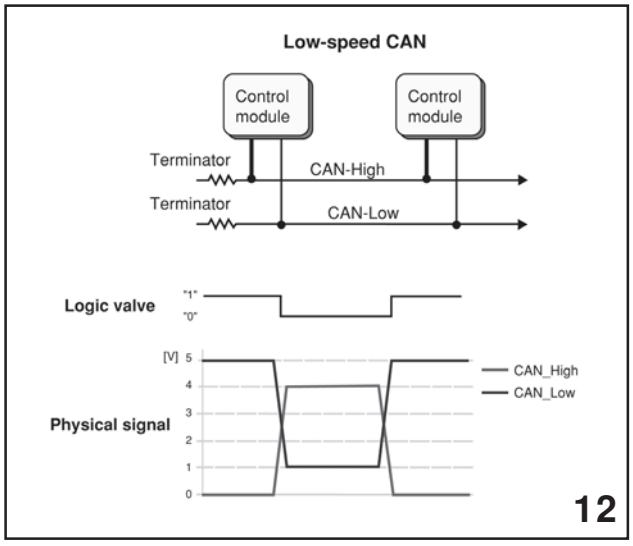
Logic Value of High Speed CAN



High Speed CAN (Artwork)

When the logic value of the High Speed CAN is 1 there is no potential difference between the voltage levels of CAN High and CAN Low. The level of both signals is 2.5 volts. When the logic value changes to a 0 the voltage level of both signals move away from each other. CAN High will be 3.5 volts and CAN Low will be 1.2 volts. This operation helps to ensure that there is no electrical interference and the signals received by the various components of the LAN are receiving genuine signals. The terminators of this circuit are wired in series so a fault with either of the twisted pair wires will stop communications of the components of the High Speed CAN.

Logic Value of the Low Speed CAN



Low Speed CAN (Artwork)

When the logic value of the Low Speed CAN is 1 the voltage of the CAN High signal is 0 volts and the value of the CAN Low signal is 5 volts. As the logic changes to 0 the CAN High voltage will change to 4 volts and the CAN Low signal will change to 1 volt. This operation combined with the slower speed of the Low Speed CAN and parallel installation of the terminators allows the components wired on this circuit to continue sending and receiving signals.

Monitoring of Trouble in the System

The control modules in the LAN system monitor the communication data between them. When a control module detects an error in the data it immediately transmits an error flag to notify the error to all the other modules of the LAN. This prevents reception of messages with an error by the other modules. When the trouble is detected in the system, the Body Integrated Unit transmits trouble information to the Combination Meter and displays it on the Trip Meter.

Er IU

The Combination Meter will display the LAN system codes any time the ignition is on and in case of multiple codes the display is determined by priority listed below:

- High Speed CAN
- Low Speed CAN
- Body Integrated Unit
- ECM
- TCM
- VDC/ABS
- Vehicle Speed

CAN Trouble Codes

Er-- High speed and low speed CAN communication error at the same time

Er HC High speed CAN communication error

Er LC Low speed CAN communication error

Er IU No data or irregular data received from the Body Integrated unit

Er EG Engine Control Module or CAN communication error

Er TC Transmission Control Module or CAN communication error

Er Ab ABS/VDC Control Module or CAN communication error

Er SP Irregular vehicle speed signal (ABS/VDC Diagnostic Code Information)

CAN data vehicle speed – Pulse input vehicle speed >=15 km/h

Er SS Irregular vehicle speed signal (Wheel Speed Signal error)

Pulse input vehicle speed –CAN data vehicle speed >=15 km/h

Er Pd Power Window Control Module or CAN communication error

The Combination Meter can also be used to display Diagnostic Trouble codes of the ECM, TCM and ABS/VDC system.

The display function of the DTC's is activated by turning on the ignition and while the Combination Meter needles are sweeping, push the Trip Meter control stalk one time.

2005MY **THE D CHECK CONNECTORS OF THE COMBINATION METER MUST BE CONNECTED.**

2006MY **THE D CHECK CONNECTOR OF THE COMBINATION METER HAVE BEEN ELIMINATED.**

The DTC display is designed to communicate in four ways.

- Receiving DTC, The P (EGI and TCM) or C (ABS/VDC) flashes while the codes are being received from each control module.
- There is no code. The P or C illuminates steady with a — following the letter
- The P or C illuminated with the numerical code following (codes are displayed in the order in which they were stored)
- CAN communication error, A — will be displayed indicating it is impossible to communicate with the LAN

Signal Chart

The following chart can be used to determine where a signal is transmitted from and where it is received. Many signals are routed through the BIU which performs the gateway function, allowing components to communicate with each other when they operate at different speeds.

T = Transmit

R = Receive

G = Gateway

Signal	ECM	TCM	VDC ABS	SAS	BIU	Com. Meter	AC
Steering Angle Sensor			R	T			
Current engine torque	T	R	R				
Accelerator pedal open angle	T	R	R				
Engine Speed	T	R	R		R		
Torque down prohibit	T	R					
Idle Switch	T	R					
Power Steering Switch	T	R					
VDC torque down prohibit	T		R				
AC compressor output	T	R					
Cruise control setting VSP	T				G	R	
Cruise Control main switch	T	R	R				
Throttle position switch	T	R					
Torque control signal	R	T					
Idle up request	R	T					
Gear Position	R	T			GR	R	
Lock up information	R	T					
AT turbine speed	R	T					
Road surface gradient est.	R	T			G	R	
ATF Temperature	R	T			G	R	
Sport lamp output		T			G	R	
AWD lamp output		T			G	R	

Signal	ECM	TCM	VDC ABS	SAS	BIU	Com. Meter	AC
ECO lamp output*		T			G	R	
Sports shift buzzer output		T			G	R	
Shift range information	R	T			G	R	
AT trouble info 1,2	R	T			G	R	
Requested torque value	R		T				
Yaw Rate		R	T				
Brake pressure		R	T				
Lateral acceleration		R	T				
Longitudinal acceleration			T		G	R	
VDC warning lamp			T		G	R	
ABS warning lamp			T		G	R	
EBD warning lamp			T		G	R	
VDC off			T		G	R	
ABS operation	R	R	T		R		
TCS operation	R	R	T		G	R	
VDC operation			T		G	R	
VDC/ABS sensor failure	R	R	T		R		
Vehicle speed	R	R	T		GR	R	R
ABS/VDC judgment flag	R	R	T		R		
Latest DTCs (VDC/ABS)			T		G	R	
Brake lamp switch	R	R			T		
Sport Shift mode switch		R			T		
Sport Shift, shift up		R			T		
Sports shift, shift down	R			T			
ECO mode switch*	R	R			T		
BIU failure info	R	R			T	R	
Air conditioner failure	R				G	R	T
Ambient temperature	R	R			T	R	R
Headlight on		R				T	
Rear defogger on	R				R		T
Wiper operation	R				T		
Rear defogger on	R				T		R
Small light switch	R				G	T	
Blower fan switch signal	R				G		T
Blower fan switch AC co	R				G		T
Fuel level sensor resistance	R				T	R	
18 inch tire info. (Gateway	R				G	T	
Fuel consumption amount	T				G	R	
Engine coolant temp	T	R			G	R	R
Number of cylinders	T		R				
Displacement	T		R				

Signal	ECM	TCM	VDC ABS	SAS	BIU	Com. Meter	AC
AT/MT judgment flag	T				R		
Camshaft type	T		R				
Super charger	T		R				
Radiator Fan information	T				R		
Rear fog lamp output*					T	R	
Illumination control info					T	R	R
Room lamp (Off delay time)							
Answer back buzzer output							
Door lock output							
Bright request signal					T	R	
Door open/close driver's					T	R	
Door open/close other than driver					T	R	

*** Not applicable to North American Models**

Combination Meter

The Combination Meter receives CAN and Analog data. The CAN data is received from the LAN while the Analog data is received directly from individual control modules or switches.

CAN data	Analog data
Fuel gauge	Speedometer
Coolant temperature gauge	Tachometer
Door open warning light	Brake fluid level warning light
Front fog light indicator light	Parking brake warning light
AWD warning light (Tire air pressure)	ABS warning light
VDC warning light/VDC off indicator	SRS airbag warning light
ATF temperature warning light	Oil pressure warning light
Sport shift indicator (AT model)	Charge warning light
Sport mode indicator (AT model)	Check engine light
AT select level lever position	Security/immobilizer indicator light
VDC operation light	Head light beam indicator
Cruise control main switch indicator	Lighting switch indicator
Cruise set indicator	Turn signal indicator
Low fuel waning light	Seat belt warning light
Rear fog light indicator*	
VSP/ Speedometer	

*** Not applicable to North American Models**

The vehicle speed signal provided as the input to the Combination Meter has CAN data and pulses (analog data). Normally the pulse data input is used for the driving of the speedometer. The CAN data is used as a backup when there is a problem with the analog data.

Select Monitor

The Select Monitor will display analog and CAN data while viewing the Integ. Unit mode.

Analog data	CAN data
BATT Voltage (Control)	Key lock warning SW
BATT Voltage (Back up)	Stop Light Switch
IG power supply voltage	Front Fog lamp switch
ACC Voltage	Rear Fog lamp switch*
Illumination VR voltage	Lighting SW
Illumi. Output d-ratio	Door key lock SW
Ambient temp sensor V	Door unlock SW
Ambient temperature	Passenger door SW
Fuel level voltage	Rear right door SW
Fuel level resistance	Rear left door SW
Key lock solenoid V	Rear gate SW
Number of regist.	Manual lock SW
Front wheel speed	Manual unlock SW
VDC/ABS latest f-code	Hood lock SW
Blower fan steps	Bright SW
Fuel level resistance 2	Tiptronic mode SW
Fuel consumption	TIP UP SW
Coolant Temp.	TIP DOWN SW
Vehicle lateral G	PSW
Sport shift stages	Rear Wiper SW
Shift position	Rear Wiper INT SW
Off Delay time	Rear Washer SW
Auto lock time*	Wiper deicer SW

*** Not applicable to North American Models**

CAN data	CAN data
Rear Defogger SW	Driver seat SW
Passenger seatbelt SW	Front wiper input
Registration SW	Identification SW
Rear defogger output	Lock actuator LOCK output
All seat UNLOCK output	Driver seat UNLOCK output
Rear gate/trunk unlock output	Double lock output
Rear wiper output	Shift lock solenoid
Key locking output	Wiper deicer SW input
Starter cutting output	Hazard output
Keyless buzzer output	Horn output
Siren output*	Driver belt warning light
Passenger belt warning light	Illumination lamp o/p
Room lamp output	Key illumination lamp o/p
Rear fog lamp output*	Rear fog lamp monitor*
Immobilizer lamp output	Keyless operation 1
Keyless operation 2	CC main lamp
CC set lamp	Sport lamp
Sport blink	ATF temperature lamp
ATF blink	Tire diameter abnormal 1
Tire diameter abnormal 2	SPORT SHIFT up
SPORT SHIFT down	Sport shift buzzer 1
Sports shift buzzer 2	ABS/VDC judging
ADA Existence judging	Small lamp SW
Headlamp	Headlight HI
Turn signal LH	Turn signal RH
Rear Defogger SW	Australia judging flag
Tire 18 inch flag	Number of cylinders
Camshaft specification	Turbo
E/G displacement (2.5L)	E/G displacement (3.0L)
AT/MT identification terminal	E/G cooling fan
Heater Cock valve*	Power window up
Power window down	Keyless buzzer
Bright request	P/W ECM Failure*
Keyless Hook SW*	Door lock SW open
Door lock SW close	Door key SW open
Door key SW close	Under hood registration*
Hook registration end*	Unlock request
Center display Failure*	NAVI failure*
IE bus failure	

*** Not applicable to North American Models**

BIU Customizing

The select monitor is also used to change the settings of the following items. This can be used to increase a customer's satisfaction of the vehicle and during vehicle diagnosis.

Settings and Contents

The items that can be set with the Select Monitor and the setup contents are shown in the following table.

No.	Item (SSM display)	Setting	Setting contents	
			After closing doors	After unlocking doors with keyless entry
1	Off delay time	OFF	0 sec.	0 sec.
		Short	3 sec.	10 sec.
		Normal	5 sec.	20 sec.
		Long	8 Sec.	30 sec.
2	Rr defogger op.mode	Normal	Automatically stops 15 minutes after switch has been turned on.	
		Continue	Turns on for 15 minutes and turns off for 2 minutes repeatedly until switch is turned off.	
3	Wiper deicer op. mode	Normal	Automatically stops 15 minutes after switch has been turned on.	
		Continue	Turns on for 15 minutes and turns off for 2 minutes repeatedly until switch is turned off.	
4	Security alarm setup	ON	Set to "ON" to activate alarm	
		OFF		
5	Impact sensor set up	ON	Set to "ON" to activate Impact sensor	
		OFF		
6	Alarm delay setup	ON	Set to "ON" to activate delay	
		OFF		
7	Lockout prevention	ON	Activates lockout prevention.	
		OFF	Stops operation of lockout prevention	
8	Impact sensor	ON	Set to "ON" to activate sensor	
		OFF		
9	Siren setting	ON	For Japanese domestic models only. Set to "OFF" for all other models	
		OFF		
10	Answer-back buzzer setup	ON	Set to "ON" to activate answer back buzzer	
		OFF		
11	Hazard answer-back setup	ON	Activates hazard light during Lock/Unlock operaton using Keyless Entry.	
		OFF	Deactivates hazard light opertation duing Lock/Unlock operation using Keyless Entry.	
12	Ans.-back buzzer	ON	Set to "ON" to activate buzzer	
		OFF		
13	Initial keyless setting	!	!	
		Execution	Returns to initialization of setup contents related to Keyless Entry. (No.2=30 sec. No.11=OFF, No 12=ON, No. 13+ON, No. 14=OFF)	
14	Initial button setting	!	!	
		Execution	Returns to initialization of various setup contents.	
			(No.1=Normal, No. 3=Normal, No 4=Normal, No. 8=ON)	
15	Initial security setting	!	!	
		Execution	Returns to initialization of Security setup contents. (No.5=OFF , No 6=OFF, No. 7=ON, No. 10=OFF)	

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Settings and Contents

The items that can be set with the Select Monitor and the setup contents are shown in the following table.

No.	Item (SSM display)	Setting	Setting contents
16	Passive alarm	Support	For US models only. Set to "No support" for all other models
		No support	Set to "Support" for US models equipped with a passive alarm system.
17	Door opening warning	Support	Turns off the room light, key ring light, and door open warning light if the door is left open for more than 30 minutes, to prevent the battery from becoming depleted. (The door courtesy light is not turned off however.)
		No support	The room light, key ring light, and Door Open warning light stay on continuously.
18	A/C ECM	Support	Set to "Support" for models equipped with A/C.
		No support	Set to "No support" for models not equipped with A/C.
19	Center display failure	Support	If set to "No support" in models equipped with a Center Display, the display may not show information correctly.
		No support	
20	Wiper deicer	Support	If set to "No support" in models equipped with a wiper deicer, the wiper deicer will not operate even if the wiper deicer switch is turned on.
		No support	
21	Factory initial setting	Factory	If set to "Market," all items from No. 18 through 20 will be set to "No support." Once "Factory" has been set, it must be set again. If this item is set to "Factory", key ring light will blink.
		Market	This item must always be set to "Market"

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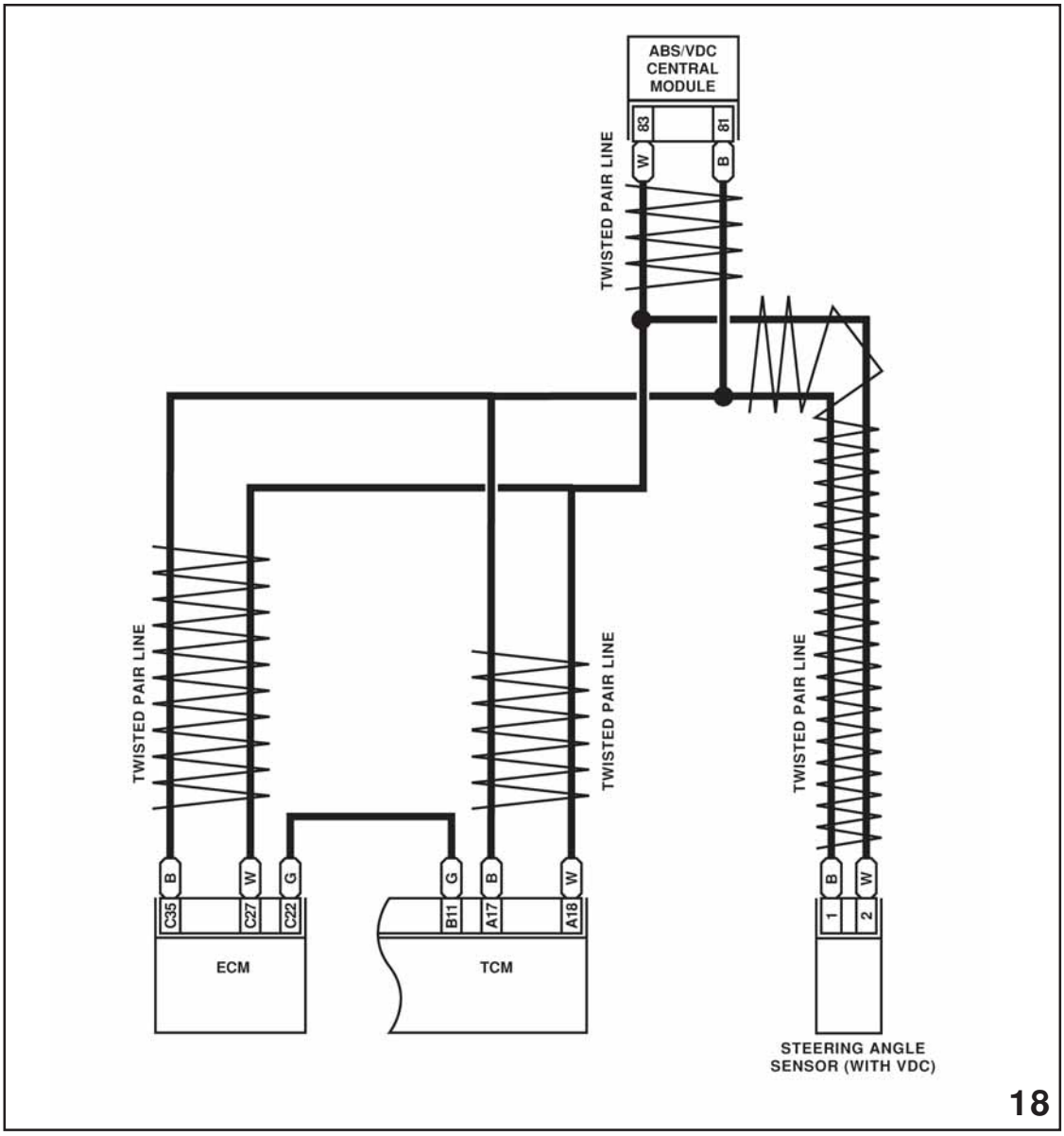
Forester 2006

The CAN communications of the Forester utilizes high speed CAN only. No BIU is used and the signals shared between the individual control modules of CAN are similar to the high speed CAN of the Legacy and Subaru B9 Tribeca.

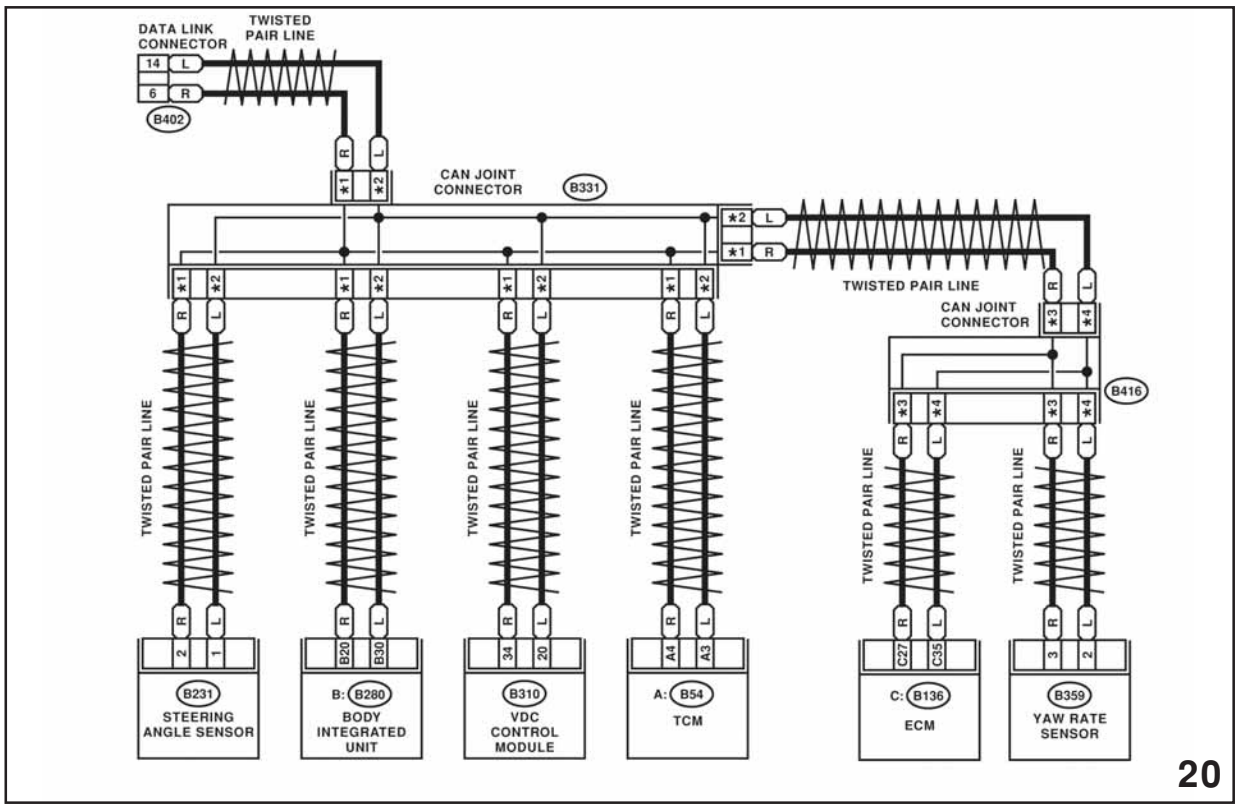
This design does not use CAN joint connectors. Terminators are installed in the ECM and ABS/VDC control module.



2006 Forester ABS/VDC Wiring

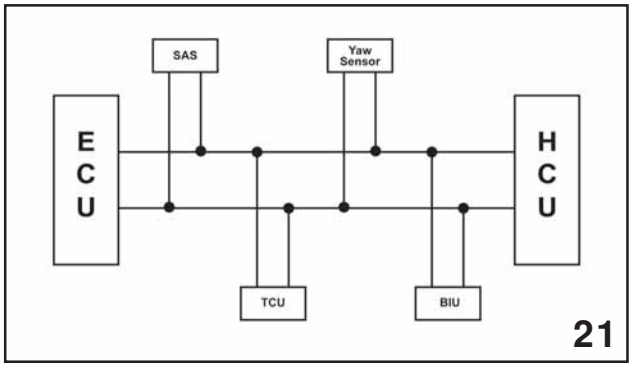
Diagnostics

Diagnostic communications for all systems (2006 and newer except Impreza) have changed to ISO-15765, CAN communications protocol. This enhances communication speed and also allows for increased Select Monitor III usage for diagnostics.



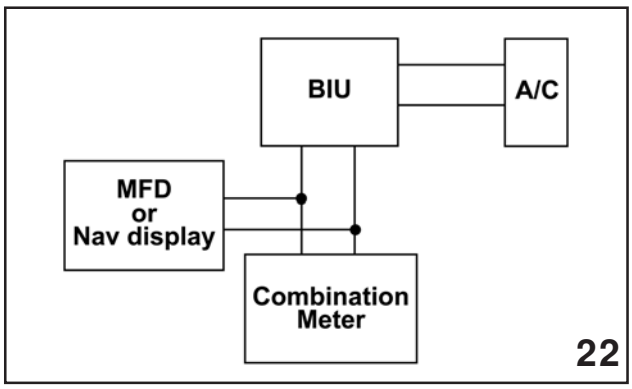
ISO-15765

CAN



High Speed CAN

The Yaw sensor is now part of the high speed CAN.



Low Speed CAN

The MFD or Navigation display are part of the low speed CAN.

Body Integrated Unit (BIU)

Body Integrated Unit (BIU)

The Body Integrated Unit (BIU) for 2006 features have been enhanced as compared to the BIU from the 2005 Legacy. The enhancements include:

- New key-off warning sound
- New seatbelt-off warning sound
- Key interlock disengaging for delivery transport
- Shift button signal input to TCU for N-R lock engaging sound improvement
- Speed-sensitive rear gate latch release (for safety)
- Keyless entry sound changing procedure changed
- Switch control of instrument panel brightness (no SSM customizing)
- Emergency room lamp activating by security alarm (off-default, turned on by SSM customizing)
- Room lamp on/off at ACC key position
- Synchronized on/off of map lamp with room lamp
- Longer off-delay for ignition ring illumination
- (Deleted) synchronized security disarming with driver-side key cylinder
  - Starting the engine will turn off the security system.

Immobilizer

System Construction

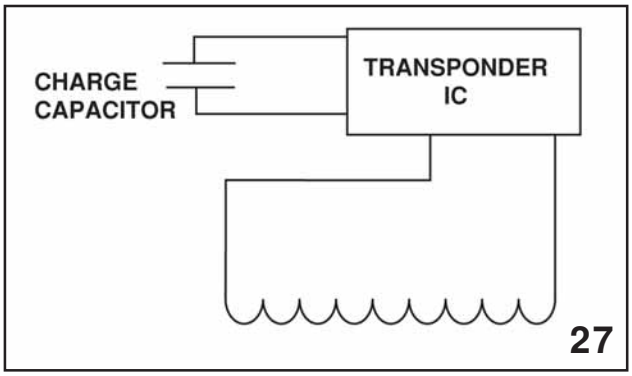
The Subaru Immobilizer is designed to prevent unauthorized people from operating the vehicle. This is accomplished by the use of a coded transponder key that reacts with the Body Integrated Unit (BIU), Engine Control Module (ECM) and the Combination meter.

The Immobilizer almost simultaneously checks the key, BIU, combination meter and Engine Control Module to see if they are all part of a matched set. If any one part does not match, the vehicle becomes inoperable.

The Immobilizer is not a security system. However the vehicle is wired to accept the addition of the components needed to install the security system. Note: The installed items must be programmed into the BIU using the Select Monitor and cartridge 24082AA260 or the Select Monitor III.

Key

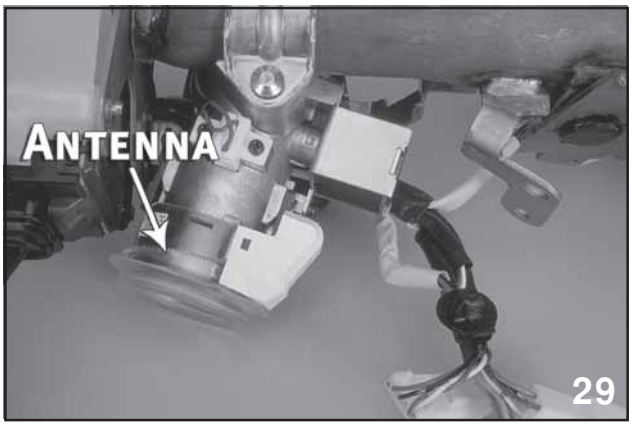
The key contains the transponder which consists of an antenna, capacitor and integrated circuit.



Transponder (Artwork)

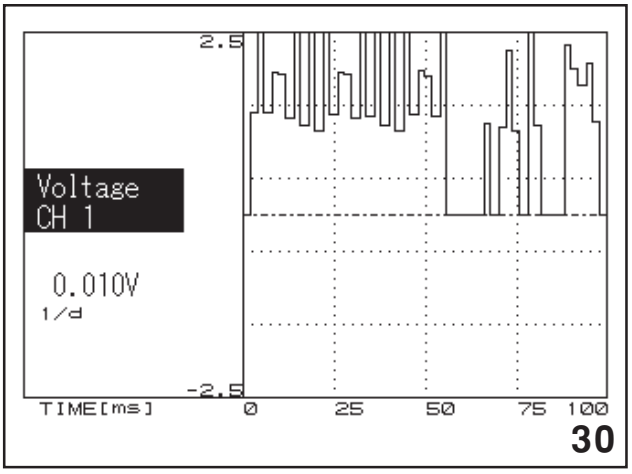
Ignition switch

When the key is placed into the ignition a signal from the key warning switch activates the BIU to send a high frequency electric wave to the antenna coil surrounding the ignition switch.



Antenna

The electric wave, absorbed by the antenna in the transponder, charges the capacitor in the transponder. An encrypted code is sent at the end of the charging wave. The transponder decrypts the code and sends an encrypted code back to the antenna coil, which travels back to the BIU.



Signal sent and received at antenna coil

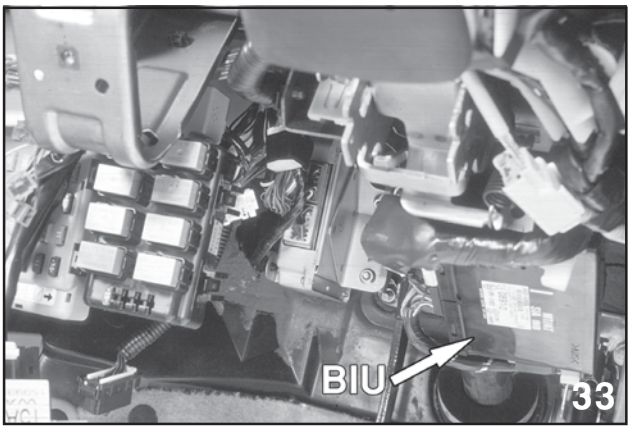
The BIU compares the code sent by the transponder with the code programmed into the BIU and sends an encrypted code to the combination meter.

Combination Meter

The combination meter decrypts the code and sends a response back to the BIU.

The result of this signal determines if the engine is allowed to continue operating if it has been started.

ECM

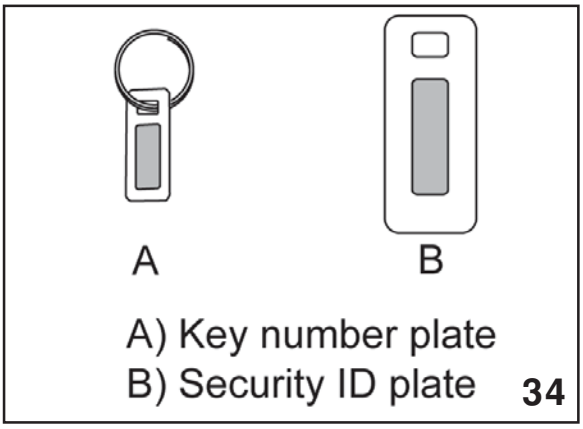


BIU

The result sent from the combination meter is stored in the BIU until the Engine control module has requested a decision to allow the engine to operate or to turn off the injectors and shut the engine off.

Key

The vehicle is shipped with two keys. Both keys contain a transponder that is registered to the vehicle. One key is the master key and the other key is the valet key. The only functional difference is that the valet key will not open the trunk lock. Also shipped with the vehicle, on the key ring, are two metal tags.



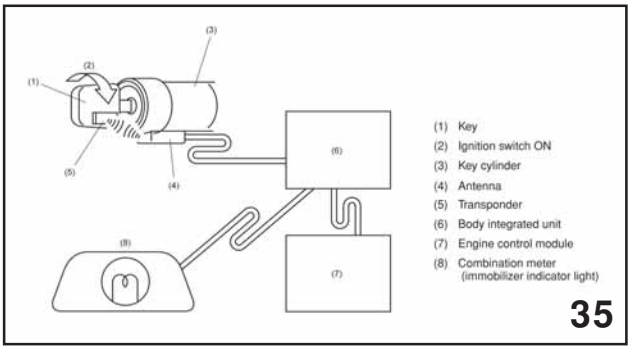
Key Tags

The smaller tag is the mechanical key code. This is what the customer would use to have another key cut for the vehicle. The larger tag is the security code for the Immobilizer. This number must be available to the Technician when the vehicle Immobilizer system and its components are being serviced.

A key can only be registered to one vehicle. A vehicle may have up to four keys registered to it. The registration process, once started, clears the BIU of all keys. This means that when one key is registered, they all must be registered. The registration process is accomplished using the Select monitor and cartridge number 24082AA290 or the Select Monitor III.

BIU

Replacing the BIU requires that all the keys be replaced. The new keys must be registered to the vehicle and the new BIU.



BIU (Artwork)

NOTE: THE INSTALLATION OF A NEW BIU REQUIRES THAT ALL KEYLESS TRANSMITTERS BE REPROGRAMMED TO THE VEHICLE. THE BIU CUSTOMIZING FEATURES MUST BE SET AT THIS TIME. IF POSSIBLE RECORD THE CURRENT SETTINGS OF THE BIU BEFORE REPLACEMENT. IF THE CURRENT SETTINGS CANNOT BE OBTAINED ASK THE CUSTOMER TO PROVIDE YOU WITH THEIR SELECTIONS.

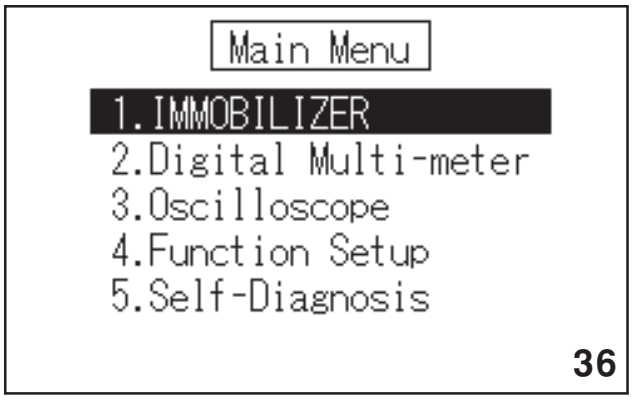
NOTE: THE BIU ON ALL VEHICLES MUST BE SET TO "MARKET MODE".

Combination Meter or Engine Control Module

Replacement of the combination meter or Engine Control Module* requires that the new part be registered to the vehicle after installation. Also all the keys previously registered to the vehicle must be present. Failure to register the current keys during the registration process will result in the absent keys not being able to start the engine.

- While diagnostic items are being checked, do not operate radios, portable telephones, etc. which emit electromagnetic waves near or inside the vehicle.
- When turning the ignition switch to ON or OFF while diagnostic items are being checked, do not allow keys with different ID codes close to the ignition switch. If the ignition key is in a key holder, remove it from the holder before carrying out diagnosis.
- When repeatedly turning the ignition switch to ON or OFF while diagnostic items are being checked, it should be switched in cycles of “ON” for at least 5 seconds and “OFF” for at least 8 seconds.
- If the engine fails to start with a registered ignition key, detach the ignition key from ignition switch and wait for approx. 1 second until immobilizer indicator light begins to flash. And then start the engine again.
- Before checking the diagnostic items, obtain all keys for the vehicle to be checked possessed by owner.

Registration Process



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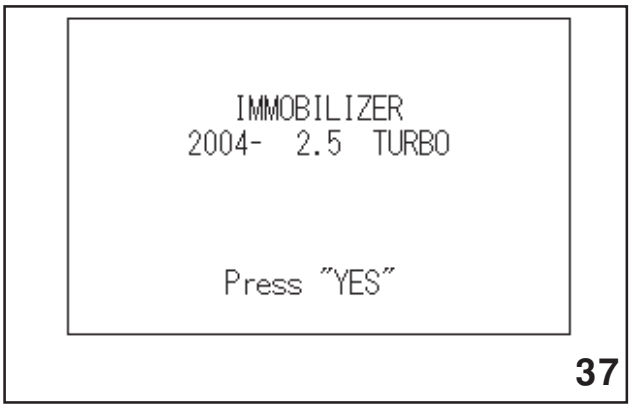
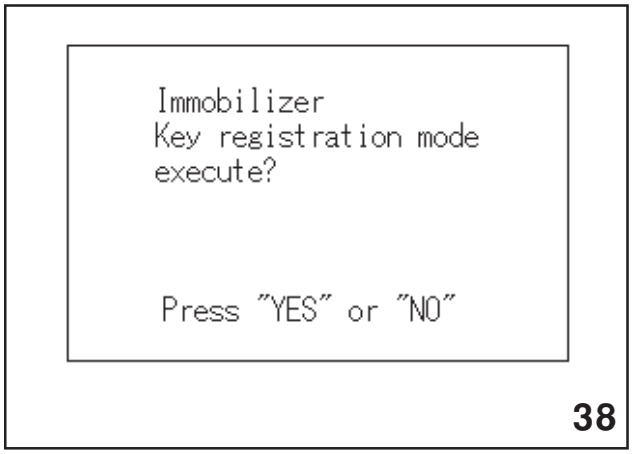
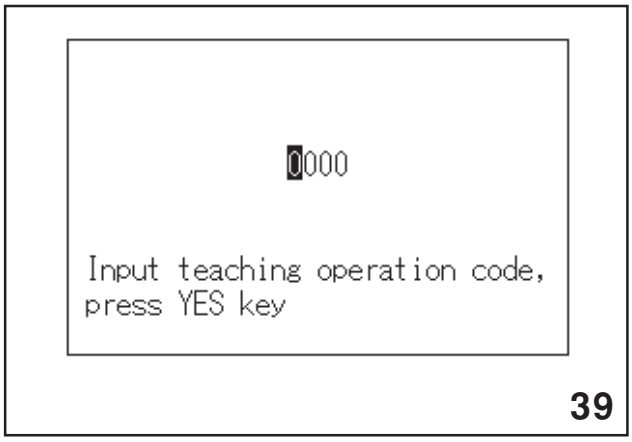


37

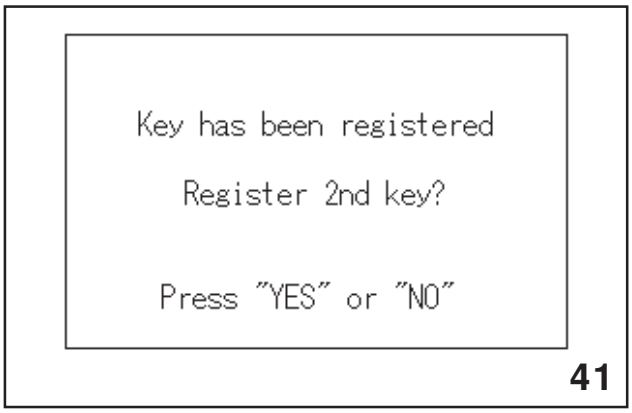


38



This number will be given to the technician by the instructor

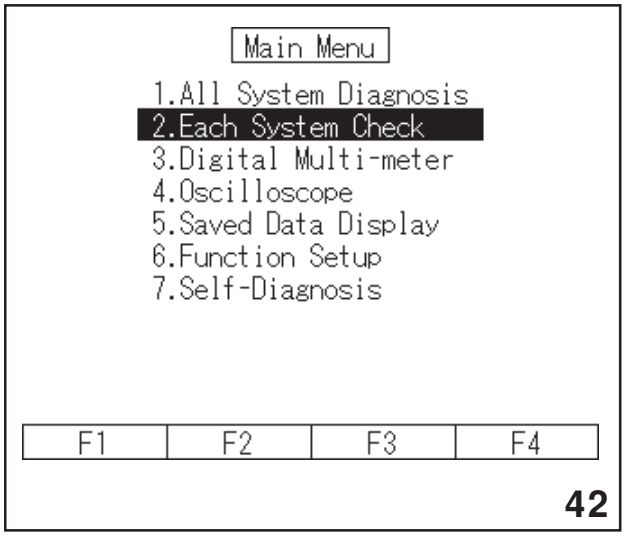
This is the number on the larger key tag

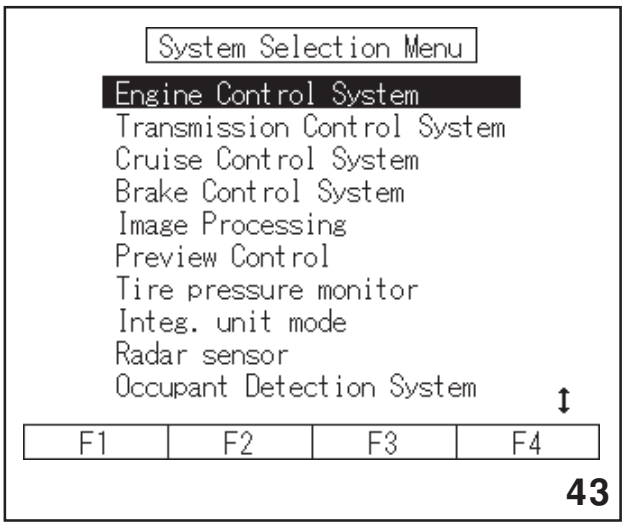


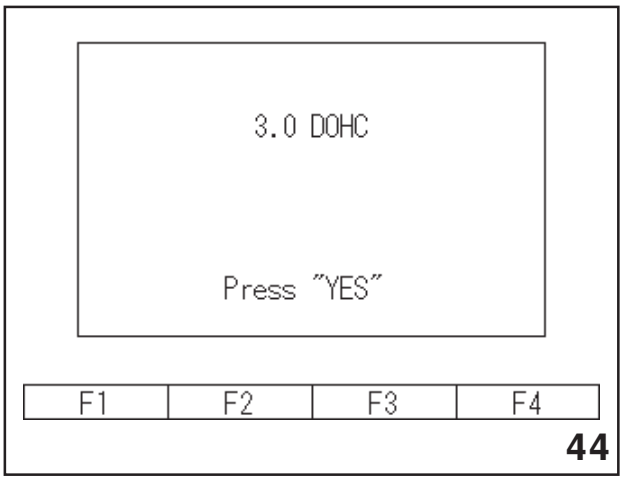
Press "YES" to register another key
Press "NO" to complete the registration process.

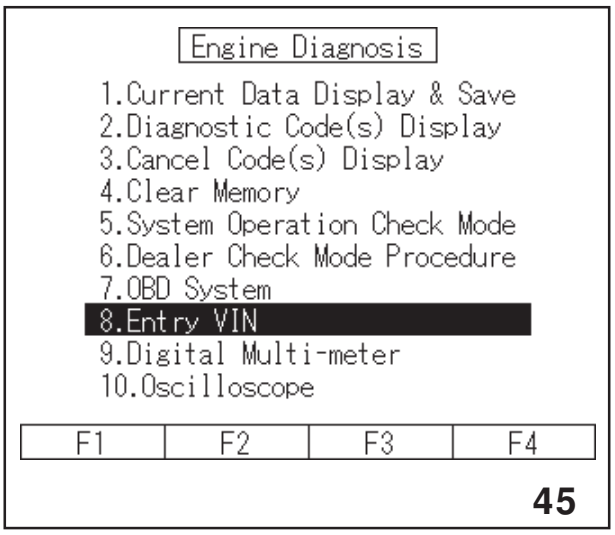
ECM Replacement

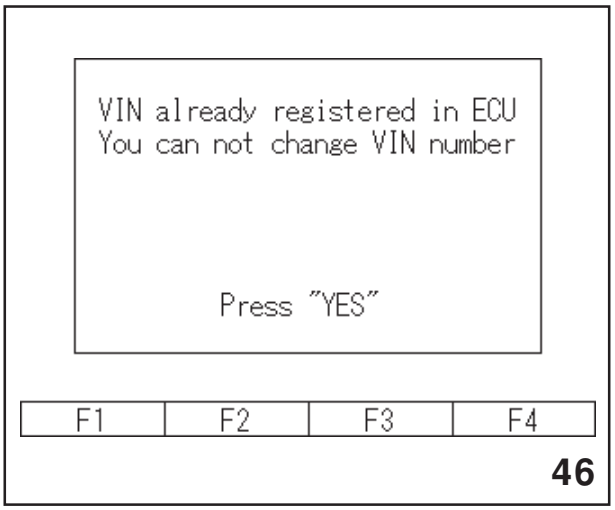
Replacement of the ECM requires that the new ECM be registered to the vehicle by the vehicle identification number (VIN). Use Subaru New Select Monitor (NSM) and diagnostic cartridge 24082AA260 to register the ECM and then re-initialize the ECM to the Immobilizer with the cartridge 24082AA290 or the Select Monitor III.





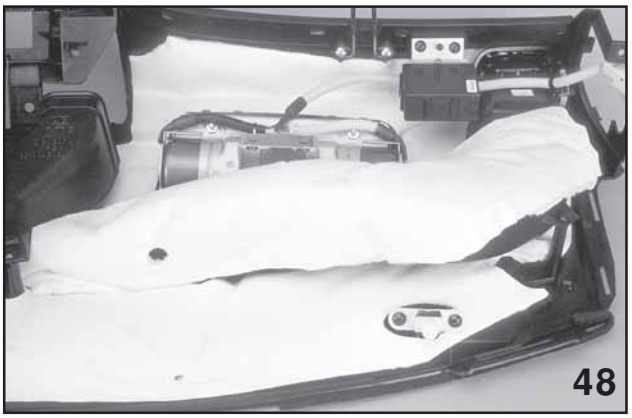




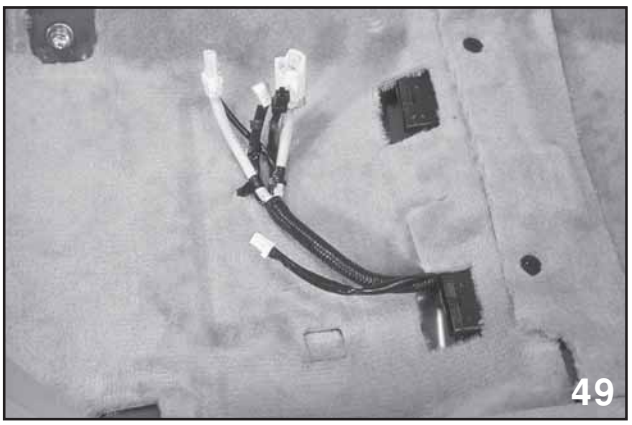


Follow the directions on the NSM to register the ECM. An ECM can only be registered once. Confirm the VIN before entering the number.

Keyless Entry System (2005 and Newer)



Keyless Control Unit



Under Passenger Seat

The Legacy is equipped with keyless entry. The keyless control unit is mounted behind the glove box to dash assembly. Keyless transmitters must be programmed to the vehicle using either the select monitor or manually using the driver door lock and unlock button.

Function of Keyless Entry System

Keyless Transmitter

Function	Function method	Action on a vehicle	Answer back
Locking the doors	Press the Lock button once.	All doors lock.	The hazard flasher blinks once and the buzzer sounds once (if all the doors were closed when the Lock button was pressed).
			The hazard flasher blinks 5 times and the buzzer sounds 5 times (if any of the doors were open when the Lock button was pressed).
Unlocking the doors	The first time: Press the Unlock button once.	Only the driver's door unlocks. (*1)	The hazard flasher blinks twice and the buzzer sounds twice.
	The second time: Press the Unlock button once within 5 seconds after the first time.	All doors unlock.	
Unlocking the trunk lid	Press and hold the Trunk lid/Rear gate button for at least 2 seconds.	Only the trunk lid unlocks.	The hazard flasher blinks twice and the buzzer sounds twice.
Unlocking the rear and gate	Press the Trunk lid/Rear gate button once.	Only the rear gate unlocks.	The hazard flasher blinks twice the buzzer sounds twice.
Panic alarm	Press the Panic button once.	The horn sounds and the hazard flasher blinks continuously.	
Stopping the panic alarm	Press any button once.	The horn stops sounding and the flasher stops blinking.	
Buzzer ON/OFF switch	(1) Press the Unlock button once.	The buzzer setting switches from ON to OFF.	The hazard flasher blinks twice and the buzzer sounds twice.
	(2) Simultaneously press and hold both the Lock and Unlock buttons for at least 2 seconds.	The buzzer setting switches from OFF to ON.	The hazard flasher blinks once and the buzzer sounds once.
Vehicle finder function	Press the Lock button 3 times in succession within 5 seconds.	The horn sounds once and the hazard flasher blinks 3 times.	
Confirming that doors are closed	(1) Press the Lock button once when a door is open. (2) Close all the doors.	All doors lock.	The hazard flasher blinks once

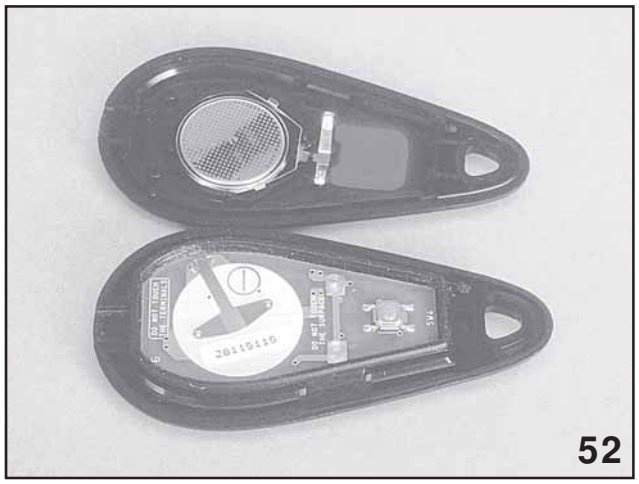
***1:** If any of the doors are open when you press the Unlock button (even for the first time), all the doors will unlock.

How To Register the Transmitter

Using the Subaru Select Monitor

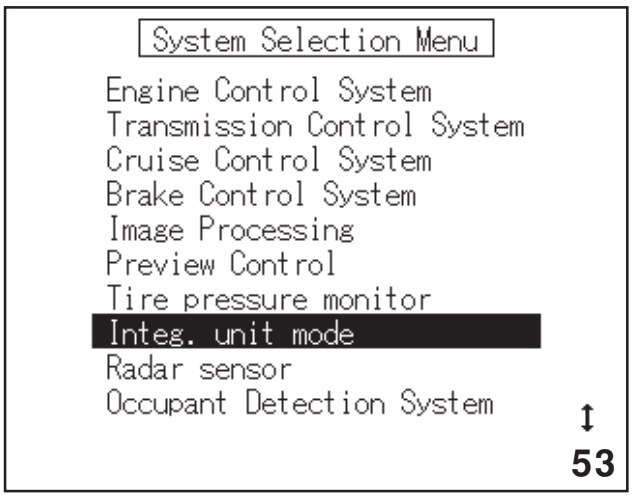
1) Make a note of the ID number. A label showing the ID number is affixed either to the bag containing the transmitter or the circuit board inside the transmitter.

Bag (ID number)

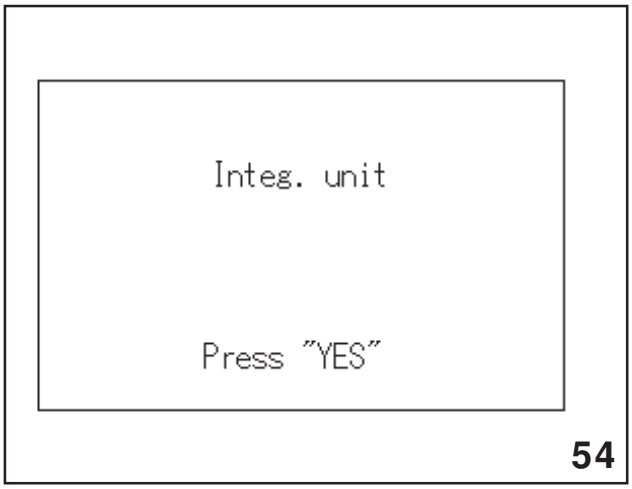


Open transmitter

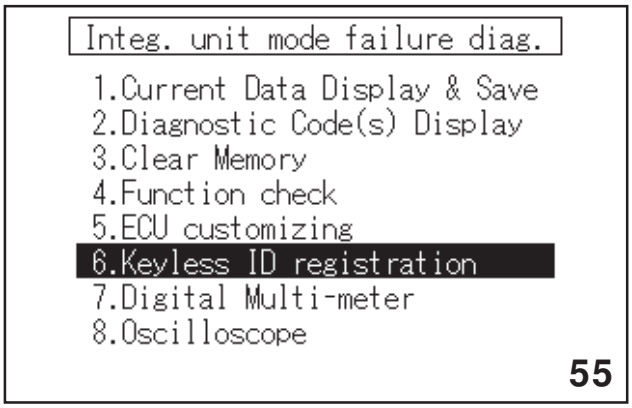
2) Connect the Subaru Select Monitor (SSM) to the vehicle.
3) Turn the ignition switch to the ON position.
4) Operating the SSM as described below.



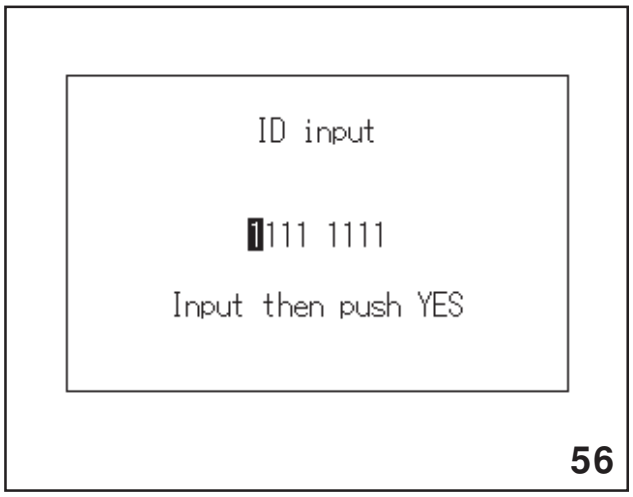
System Selection Menu



Integ. Unit

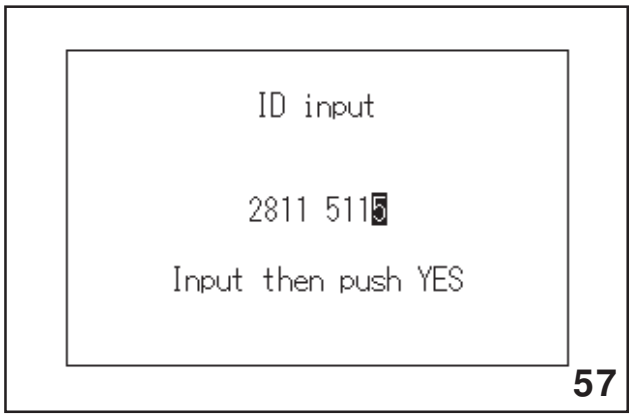


Integ. Unit Mode Failure diagram

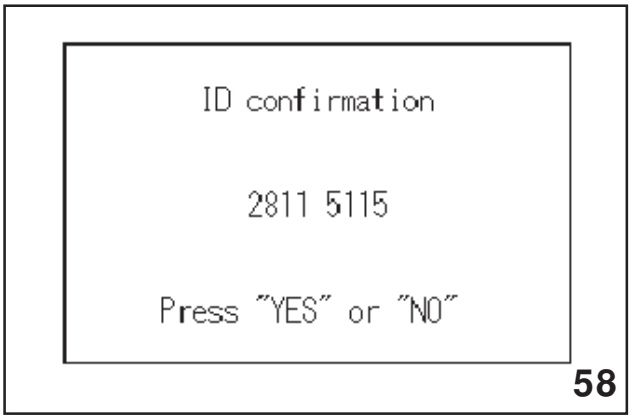


ID Input

Use the [△] key or the [▽] key on the SSM to change the number, and then use the [◁] key or the [▷] key to move to the next digit.

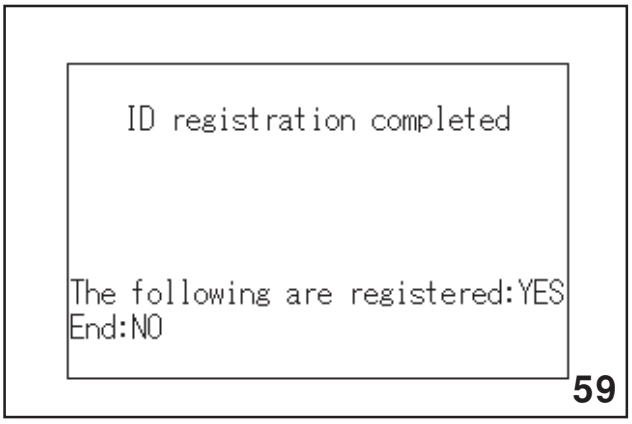


ID Input



ID Confirmation

6) Confirm the displayed number with the number recorded in step 1.

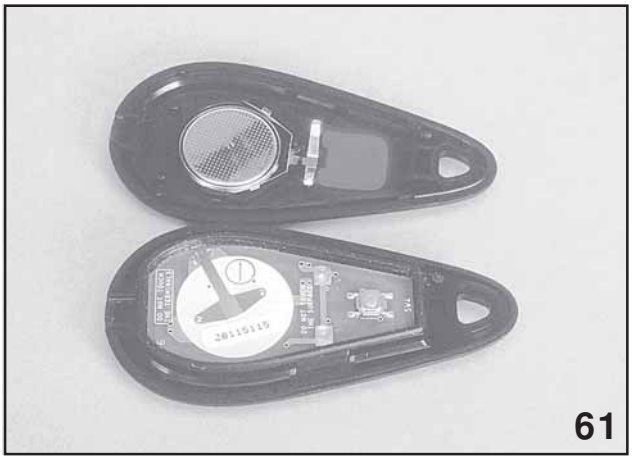


ID Registration Completed

7) Press "yes" to enter another transmitter code. Press "no" to end the procedure. A maximum of four transmitters can be registered to a single vehicle.

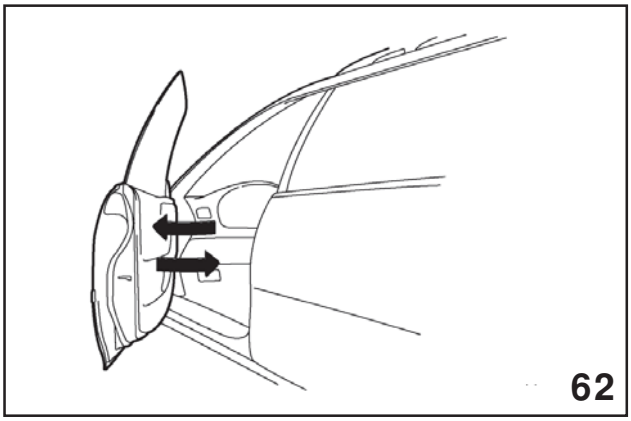
Not Using the Subaru Select Monitor

Bag



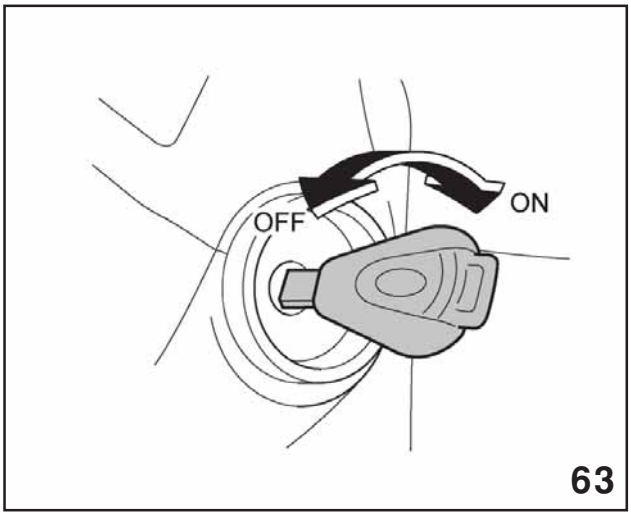
Transmitter

1) Make a note of the ID number. A label showing the ID number is affixed either to the bag containing the transmitter or the circuit board inside the transmitter.
2) Firmly close the doors and the rear gate or trunk lid.



Door

3) Open the driver's door, sit on the driver's seat, and close the door.
4) Perform the following steps within 45 seconds.
   (1) Open and close the driver's door once.



Key in the Ignition

   (2) Insert the key into the ignition switch, then turn it from the "OFF" position to the "ON" position 10 times within 15 seconds.

NOTE: WHEN YOU COMPLETE STEP (2), AN ELECTRONIC TONE AND A BUZZER WILL SOUND AND THE INTERIOR LAMP WILL FLASH.

IF YOU DO NOT PERFORM STEPS (1) AND (2) WITHIN 45 SECONDS, AN ERROR WILL OCCUR. NEITHER AN ELECTRONIC TONE NOR THE BUZZER WILL SOUND, AND THE INTERIOR LAMP WILL NOT FLASH. IN THIS EVENT, PERFORM THE WHOLE PROCEDURE AGAIN BEGINNING WITH PART 2).

5) Open and close the door once within 15 seconds of the end of operation of the electronic tone, buzzer, and interior lamp.

NOTE: WHEN PART 5) OF THE PROCEDURE IS COMPLETED, AN ELECTRONIC TONE WILL SOUND FOR 30 SECONDS.

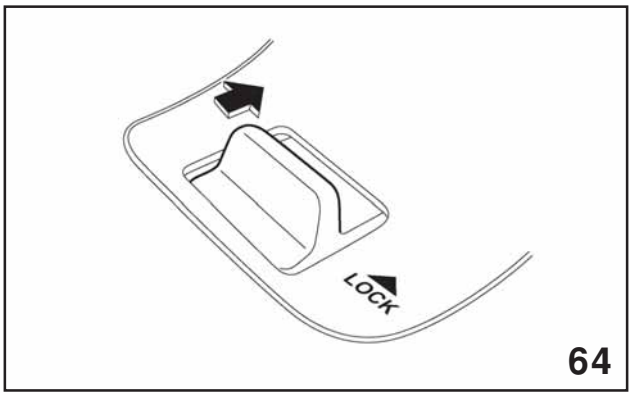
IF YOU DO NOT PERFORM THE OPERATIONS IN PART 5) WITHIN 15 SECONDS, AN ERROR WILL OCCUR AND THE ELECTRONIC TONE WILL NOT SOUND. IN THIS EVENT, PERFORM THE REGISTRATION STEPS AGAIN BEGINNING WITH PART 4) OF THE PROCEDURE.

6) Before the electronic tone stops sounding, press the power door lock knob to the "LOCK" side the same number of times as the leftmost digit of the transmitter code. For example, press the lock knob eight times if the leftmost digit of the code is 8.

NOTE: THE ELECTRONIC TONE WILL STOP SOUNDING WHEN YOU FINISH ENTERING THE NUMBER.

IF YOU DO NOT START ENTERING THE NUMBER USING THE LOCK KNOB BEFORE THE ELECTRONIC TONE STOPS SOUNDING, AN ERROR WILL OCCUR. IN THIS EVENT, PERFORM THE REGISTRATION STEPS AGAIN BEGINNING WITH PART 4) OF THE PROCEDURE.

IF THE INTERVAL BETWEEN ONE PUSH OF THE KNOB AND THE NEXT EXCEEDS FIVE SECONDS, AN ERROR WILL OCCUR. IN THIS EVENT, PERFORM THE PROCEDURE AGAIN BEGINNING WITH PART 5). IF AN ERROR OCCURS SIX TIMES, PERFORM THE PROCEDURE AGAIN STARTING WITH STEP 4).

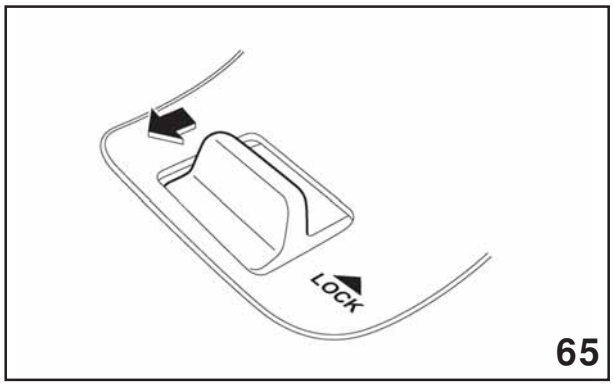


Door Locked

7) When you have finished entering the number, pull the lock knob to the "UNLOCK" side within five seconds.

NOTE: AN ELECTRONIC TONE WILL SOUND.

IF YOU PULL THE LOCK KNOB TO THE "UNLOCK" SIDE WHEN MORE THAN FIVE SECONDS HAVE PASSED, AN ERROR WILL OCCUR. IN THIS EVENT, PERFORM THE PROCEDURE AGAIN BEGINNING WITH PART 5). IF AN ERROR OCCURS SIX TIMES, PERFORM THE PROCEDURE AGAIN STARTING WITH STEP 4).



Door Unlocked

8) Perform parts 6) and 7) of the procedure for each of the remaining digits of the transmitter code beginning with the second digit (counting from the left) and finishing with the eighth digit.

NOTE: WHEN YOU FINISH ENTERING THE EIGHTH DIGIT, AN ELECTRONIC TONE WILL SOUND FOR 30 SECONDS.

IF THE INTERVAL BETWEEN ONE PUSH OF THE KNOB AND THE NEXT EXCEEDS FIVE SECONDS, AN ERROR WILL OCCUR.

IN THIS EVENT, PERFORM THE PROCEDURE AGAIN BEGINNING WITH PART 5). IF AN ERROR OCCURS SIX TIMES, PERFORM THE PROCEDURE AGAIN STARTING WITH STEP 4).

9) Before the electronic tone stops sounding, use the power door lock knob to again enter the transmitter code beginning with the leftmost digit.

NOTE: IF YOU DO NOT START ENTERING THE NUMBER USING THE LOCK KNOB BEFORE THE ELECTRONIC TONE STOPS SOUNDING, AN ERROR WILL OCCUR. IN THIS EVENT, PERFORM THE PROCEDURE AGAIN BEGINNING WITH PART 4).

10) When you have finished entering the code a second time, an electronic tone will sound for one second to indicate completion of registration provided the code entered the second time is identical to the code entered the first time.

NOTE: IF THE CODE ENTERED THE SECOND TIME IS NOT IDENTICAL TO THE CODE ENTERED THE FIRST TIME, AN ERROR WILL OCCUR. IN THIS EVENT, PERFORM THE PROCEDURE AGAIN BEGINNING WITH PART 6). IF AN ERROR OCCURS FIVE TIMES, PERFORM THE PROCEDURE AGAIN STARTING WITH STEP 4).

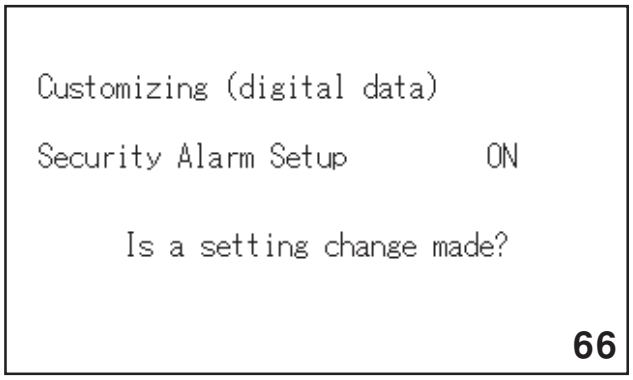
11) If you wish to program another transmitter code into the system (up to four transmitter codes can be programmed into the system), perform the procedure beginning with part 3). When you have finished programming all of the necessary transmitter codes into the system, remove the key from the ignition switch.

12) Test every registered transmitter to confirm correct operation.

Security System

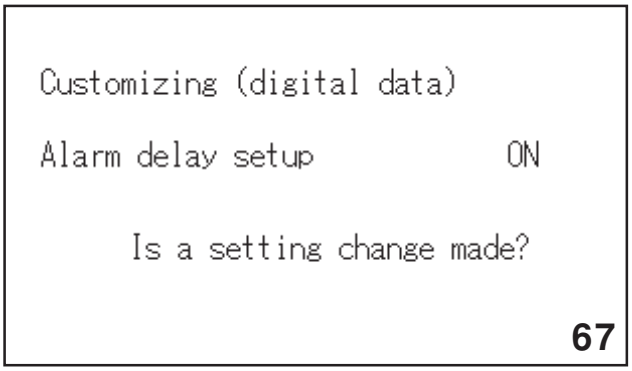
The security system for the 2005 Legacy vehicles is controlled by the BIU. The security system and its chosen operating characteristics must be set and adjusted with the select monitor and cartridge number 24082AA260.

The following select monitor displays briefly introduce the items to be set and adjusted.



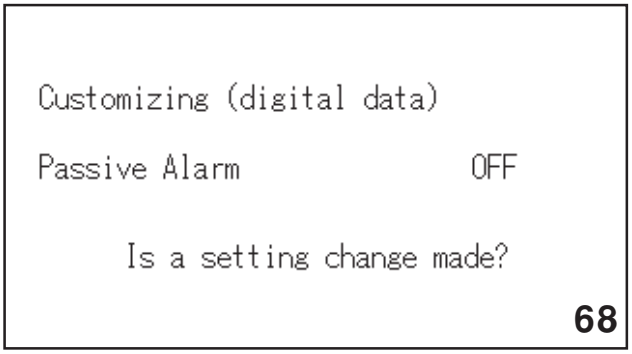
Security System

Active mode-The Alarm System is activated by the keyless entry transmitter. The Alarm system can be adjusted to arm immediately or enter a 30 second delay. This is accomplished using the “Alarm delay Setup”. During the 30 second delay the security light will flash at 5 Hz and change to a 1 Hz flash when the system is armed.



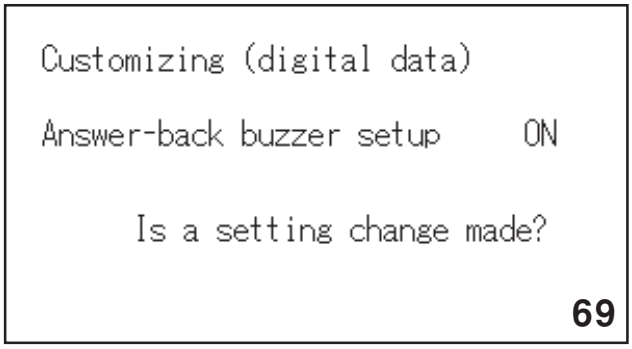
Active Mode

Passive mode-The Alarm system is activated by exiting the vehicle. The Alarm system will arm 60 seconds after all doors are closed. This time cannot be adjusted.

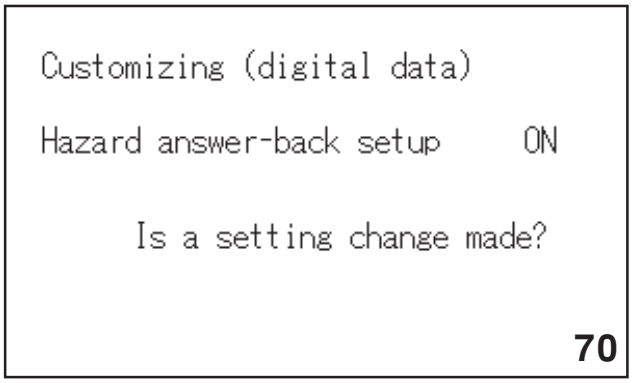


Passive Mode

The answer back buzzer and the hazard light answer back can be programmed to respond or not to respond to the arming or disarming of the Alarm system.



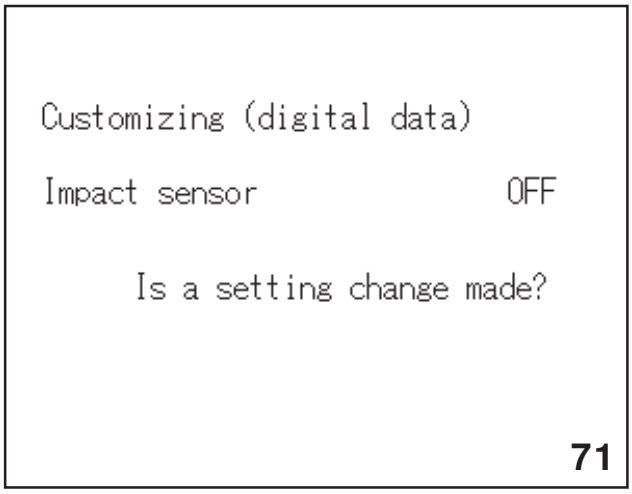
Answer-Back Buzzer Setup



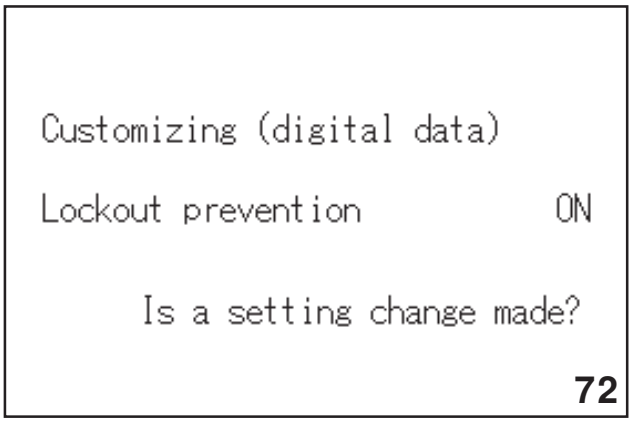
Hazard Answer-Back Setup

The impact sensor must be turned on and the sensitivity adjusted. Sensitivity is adjustable on a scale of 1 to 10 with 5 being the setting from the factory.

The smaller number is, the more sensitive the sensor becomes.



Impact Sensor



Lockout Prevention

Lock out prevention is also adjustable. This prevents the vehicle from being locked while the keys are in the ignition.

This functions when using the lock button to lock the vehicle only.

Remote Engine Start System (RES)

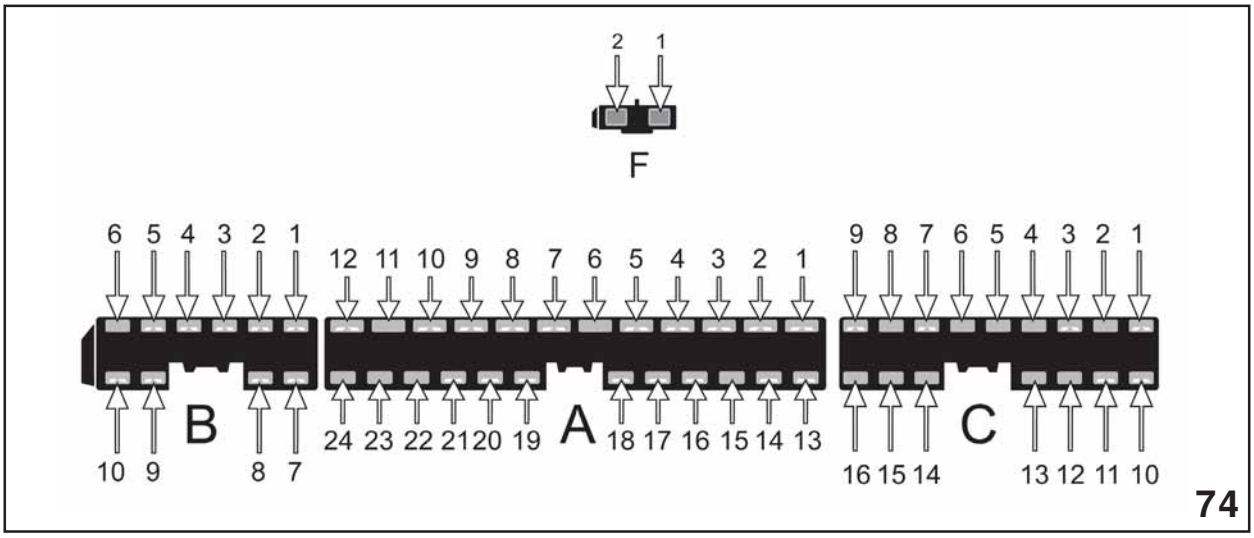
All 2007 Subaru B9 Tribeca and Legacy models are pre-wired for a new Remote Starter accessory - available for port or dealer installation. This accessory includes an additional wireless key fob that can start/stop the engine. This allows the driver to pre-warm or cool the interior prior to entering the vehicle. The climate controls must be set to the on position before exiting the vehicle.

The Remote Engine Start system (RES) operates by commanding currently installed vehicle components with signals from the RES control module.
The RES is designed to operate the engine for **15 minutes**, after an RES start. Unless the engine speed drops below 500 R.PM. or increases to over 3000 R.P.M.

NOTE: (RES WILL NOT START THE VEHICLE IF THE BATTERY VOLTAGE IS BELOW NORMAL).

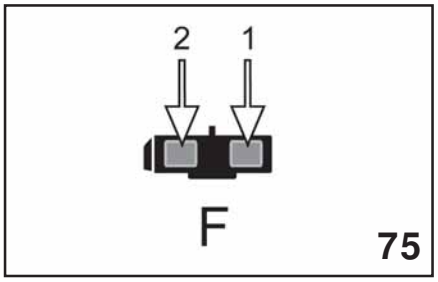
Pressing on the brake pedal will deactivate the RES and the engine will return to off.

The next five pages describes the four connectors connected to the RES control unit. Wire color, description and value for each terminal is also described.



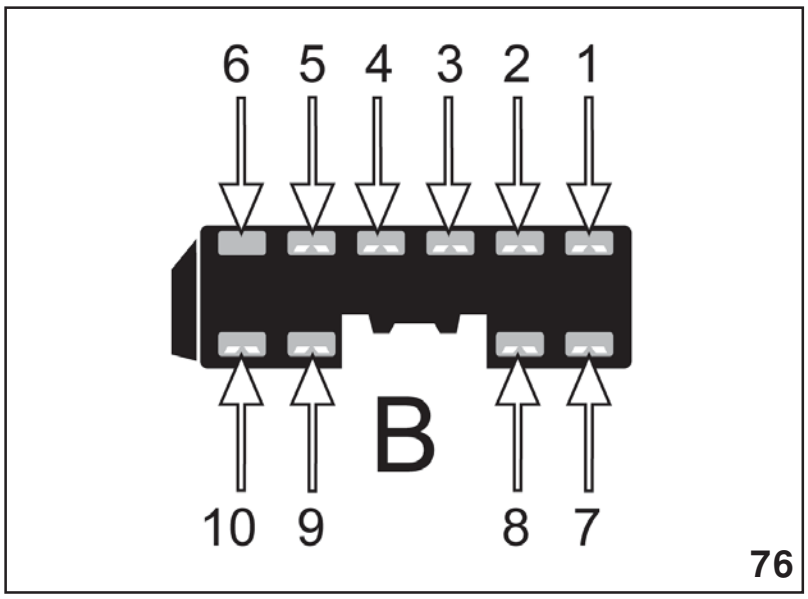
RES Connectors

NOTE: THIS SYSTEM CAN NOT BE INSTALLED ON 2006 MODEL YEAR VEHICLES.



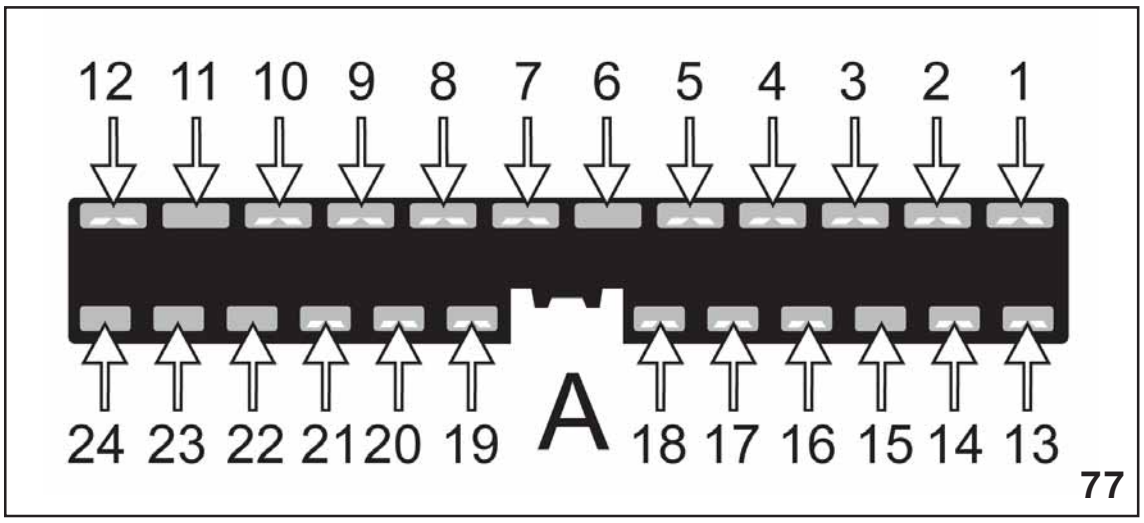
F Connector

	Wire Color	Description	Value For Each Terminal
1.	Shielded	Antenna on Windshield	
2.	Insulated	Antenna on Windshield	



B Connector

Wire Color	Description	Value For Each Terminal
1. White	Battery	Continuous Battery Voltage
2. White	Battery	Continuous Battery Voltage
3. Blue	Ignition 2	Battery voltage during RES operation Battery voltage during normal operation
4. Yellow	Acc 1	Battery voltage during RES operation Battery voltage during normal operation
5. Yellow	Acc 2	Battery voltage during RES operation Battery voltage during normal operation
6. Blank		
7. Brown	Brake Switch Input	0 voltage brake off
		Battery voltage brake on
8. Black/White Tracer	Key Sensor Input	Battery voltage key in for less than 10 seconds during RES start
9. Violet	Tachometer Circuit	Square wave pattern average 2.3 volts (5 volts)
10. Pink	Encryption output Immobilizer interface	Square wave pattern less than 5 seconds, prior to starter engagement

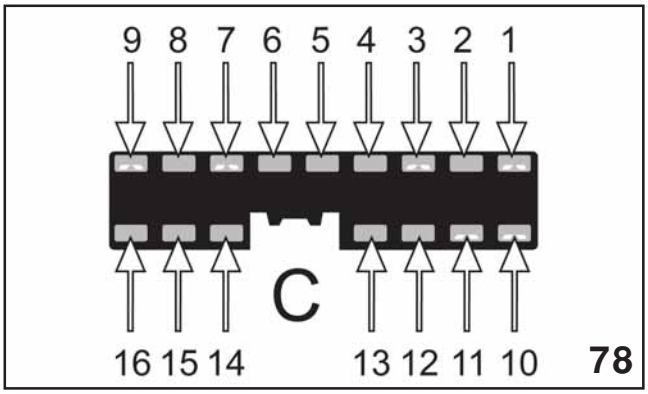


A Connector

Wire Color	Description	Value For Each Terminal
1. Violet	Parking Lights	RES on. Battery voltage
2. White	Starter Motor-Normal	Battery voltage while turning key to start position.
3. Black/White	Key Sensor Output	Battery voltage for less than 10 second during RES cranking cycle. Battery voltage when key in ignition.
4. White	Battery	Continuous battery voltage
5. Black	Ground	Continuous ground
6. Blank		
7. Dark Green	Ignition 1	Battery voltage during and after RES start. Battery voltage during normal operation.
8. Black/White Tracer	Crank Output-RES	Battery voltage during RES start. Battery voltage during normal start.
9. Light Green	Driver Unlock Input	Battery voltage during pressing of the unlock door switch.
10. Blue	Door Ajar Input	9.4 volts door closed 0.62 volts door open
11. Blank		
12. Brown/Black	Unlock Switch Input	Battery voltage. 0 volts while pushing unlock switch.
13. Brown	Power Window Relay Interrupt	Ground for window lockout.
14. White/black Tracer	Starter Motor	Battery voltage during RES start. Battery voltage during normal start
15. Blank		

Continued on next page

16.	Orange	Security Recovery	Battery voltage. 10Hz square wave to ground for less than 10 second when security system activated during RES operation.
17.	Dark Brown	Program Button	Ground
18.	Dark Brown	Program Button	Battery voltage. When pushing program button value goes to ground.
19.	Gray	Hood Switch	Hood closed battery voltage. Hood open 0 volts
20.	White	Battery	Battery voltage.
21.	Red/White Tracer	Horn Output Horn Relay	Battery voltage. 0 volts when horn sounds



C Connector

Wire Color	Description	Value For Each Terminal
1. Red/Black Tracer	Starter Motor	Battery voltage normal start only
2. Blank		
3. Red/Black Tracer	Starter Motor	Battery voltage normal start only
4. Blank		
5. Blank		
6. Blank		
7. White/Black Tracer	Rear Gate Motor Lock (Trunk Motor Lock)	Battery voltage during opening of Rear gate (trunk lock)
8. Blank		
9. Brown/Red	Battery voltage from Power Windows relay coils	Normal operation 0 volts RES operation battery voltage.
10. Brown/Yellow Tracer	Lock output	Battery voltage. Momentarily drops to 0 during locking of the doors for RES
11. Black/Brown	Immobilizer Interface	Greater than 11 volts, dropping .75 volts during RES start. After RES start greater than 9. Normal operation greater than 12.
12. Blank		
13. Blank		
14. Blank		
15. Blank		
16. Blank		

This system has been designed to work with the Immobilizer system by registering the RES software card and immobilizer interface as one ignition key. These two parts must be replaced if the BIU is replaced, along with the ignition keys currently programmed to the immobilizer system.

A service mode is available that will deactivate the RES.

Tachometer Idle Speed Programming

NOTE: IF YOU DID NOT PROGRAM THE VEHICLE'S TACH IDLE SPEED AS INSTRUCTED IN THE INSTALLATION INSTRUCTIONS THE VEHICLE WILL NOT ATTEMPT TO START INSTEAD YOU WILL GET THREE ADDITIONAL BEEPS FROM THE HORN.

THE RES SYSTEM MUST LEARN A VALID IDLE SPEED PRIOR TO ATTEMPTING TO PROGRAM THE IMMOBILIZER INTERFACE.

1. Open driver's door (leave open throughout programming operation).
2. Turn the ignition key to the ON or RUN position.
3. Press and hold the momentary programming button for approximately 10 seconds until the vehicle's horn honks (3) times.

Momentary Programming Button

4. Release the momentary programming button.
5. Press and release the momentary programming button. The vehicle's horn will honk (4) times.
6. Press and release the vehicle's brake pedal (1) time. The horn will honk (1) time to indicate that the system has entered tachometer idle speed programming mode.
7. Start the vehicle with the ignition key. The RES system will begin honking the vehicle's horn 1 time every 3 seconds to indicate a valid tach signal.
8. When the engine has settled to a normal idle speed (normally 750-1000 RPM), press and release the brake pedal (1) time. The horn will honk (2) times to indicate the system has exited tach idle speed programming.

NOTE: BE SURE THAT THE VEHICLE HAS MAINTAINED 750-1000 RPM IDLE SPEED PRIOR TO EXITING TACHOMETER IDLE SPEED PROGRAMMING.

Immobilizer Interface Programing

NOTE: THE IMMOBILIZER INTERFACE WILL BE PROGRAMMED TO THE VEHICLE AS AN IGNITION KEY. THIS WILL TAKE UP ONE OF THE 4 SLOTS AVAILABLE IN THE BIU. THREE ADDITIONAL KEYS MAY BE PROGRAMED TO THE VEHICLE.

NOTE: ONLY ONE KEY FOB IS REGISTERED DURING THIS STEP BUT BOTH KEY FOBS WILL OPERATE THE RES.

Starting your Vehicle

The remote control start function activates by pressing the START (key icon) button twice within 3 seconds on your remote control transmitter. The system will check certain **preconditions before starting, and if all safety parameters are correct, the engine will start within 5 seconds. If the vehicle's starter cranks but does not start or starts and stalls, the remote engine start system will power off then attempt to start the vehicle an additional four times. If the remote start system shuts down 2 seconds after starting the vehicle, the vehicle has a battery problem.

WARNING: AVOID DANGER OF CARBON MONOXIDE, NEVER REMOTE START A VEHICLE IN A CLOSED SPACE SUCH AS A CLOSED GARAGE.

Turning Your Vehicle Off

Press and hold the START (key icon) button again to turn the vehicle off. If the vehicle is left running the remote start system will allow the vehicle to run for a total of **15 minutes** and then automatically turn off.

Entering the Vehicle While it is Running via Remote Start

1. Unlock the vehicle doors using the factory keyless remote. If the vehicle's doors are unlocked manually using the key, the vehicle's security system will trigger and the remote start system will turn off. Inserting the ignition key into the ignition cylinder and turning it to the ON or Run position will disarm the security system.
2. Enter the vehicle. Do not press the brake pedal.
3. Insert the key into the ignition and turn to the ON position. If the ignition key is accidently turned to the start position, the system's "starter anti-grind" feature will prevent the starter from re-cranking.
4. Press brake pedal. The RES disengages, the vehicle's power window features are re-enabled and the vehicle will operate normally.

To engage the service mode, turn the ignition key to the ON or Run position, depress and hold the brake pedal then, press and release the START (key icon) button on the remote control transmitter three (3) times. The system will pause for one second and then flash the parking lights three (3) times indicating the system is in service mode. When attempting to activate the remote start system while in service mode, the parking lights will flash three (3) times and will not start.

To disengage the service mode, turn the ignition key to the On or RUN position, depress and hold the brake pedal, then press and release the START (key icon) button on the remote control transmitter three (3) times. The system will pause for one second and flash the parking lights one (1) time indicating that the system has exited service mode.

** *Key in ignition or hood open, inspection mode connector connected*

IMPORTANT NOTE: WHEN TAKING YOUR VEHICLE IN FOR SERVICE, IT IS RECOMMENDED THAT YOU INFORM THE SERVICE PERSONNEL THAT YOUR VEHICLE IS EQUIPPED WITH A REMOTE START SYSTEM.

Remote (RES) Transmitter Programming Mode

1. Open the driver's door (the driver's door must remain opened throughout the entire process).

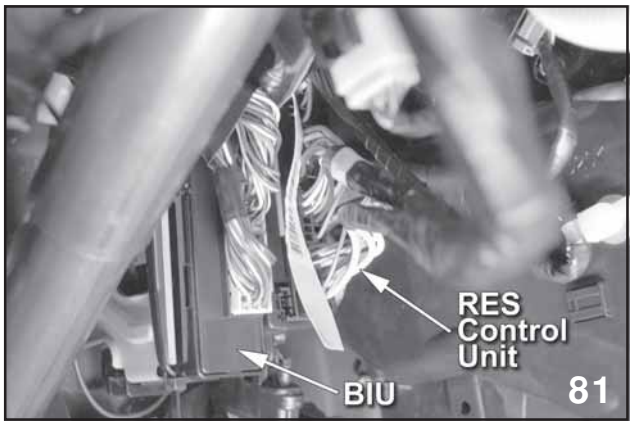
Remote Transmitter

2. Insert the ignition key into the vehicle's ignition cylinder and turn to the ON or Run position.
3. Locate the small black programming button behind the fuse box cover on the left side of the driver's side lower dashboard. (Refer to page 39 for picture)
4. Press and hold the black programming button for 10-15 seconds. The horn will honk and the parking lights will flash three times to indicate that the system has entered transmitter programming mode.
5. Press and release the START (key icon) button on each transmitter. The horn will honk and the parking lights will flash one time to indicate a successful transmitter learn each time the START (key icon) button is pressed.
6. To exit transmitter programming mode, turn the ignition key to the OFF position, remove the ignition key from the ignition cylinder and test operation of the remote transmitter(s).

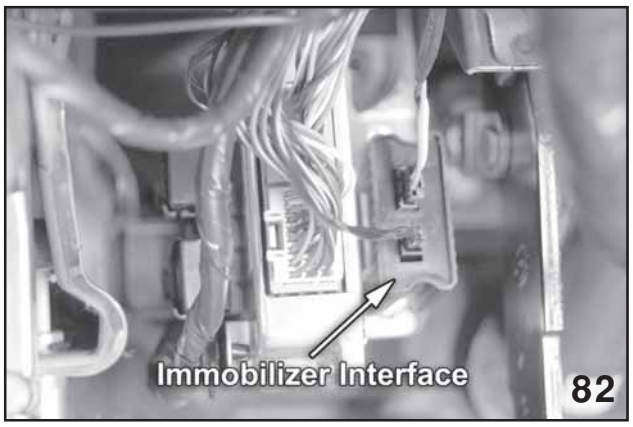
Enabling / Disabling Confirmation Horn Honks

1. Follow steps 1-4 in "Remote transmitter Programming Mode" above.
2. Pressing the vehicle's brake pedal will enable the confirmation horn honk feature. The vehicle's horn will honk 1 time to indicate that confirmation horn honks have been disabled and honk 2 times to indicate that confirmation horn honks have been enabled.
3. To exit programming mode, turn the ignition key to the OFF position, remove the ignition key from the ignition cylinder and test operation of the remote transmitter(s).

CHECK STIS FOR THE MOST UP TO DATE INFORMATION IN THE OWNER'S MANUAL ON THE REMOTE ENGINE START SYSTEM.



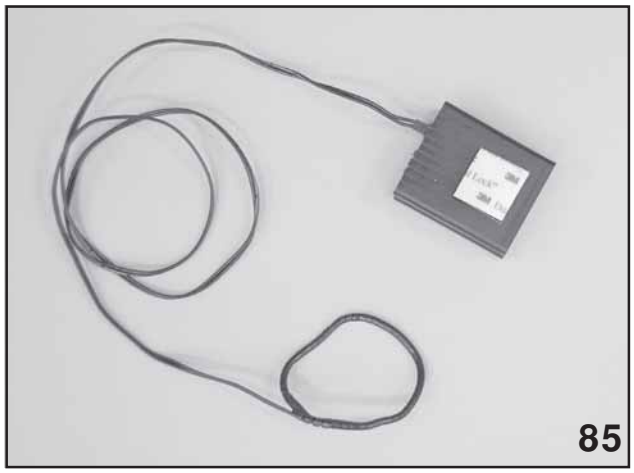
BIU & Res Control Unit Location



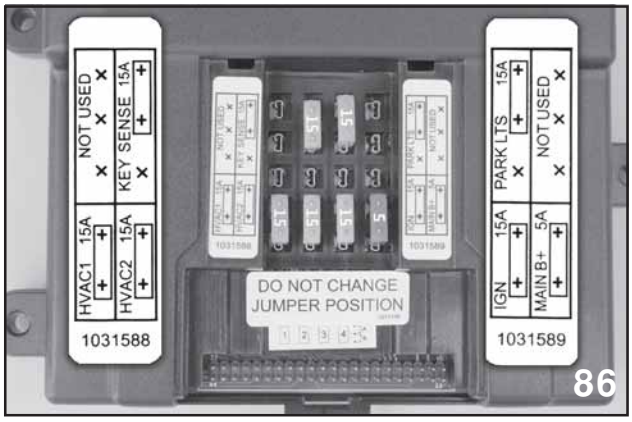
Immobilizer Interface Location

Software Card & RES Control Unit

RES Software Card



Immobilizer Interface



Inside RES control unit, under software card

NOTE: IF THE BIU IS REPLACED ALL KEYS, SOFTWARE CARD AND IMMOBILIZER BOX OF THE RES MUST BE REPLACED.

IMMOBILIZER INTERFACE PROGRAMMING

NOTE: The immobilizer interface will be programmed to the vehicle as an ignition key

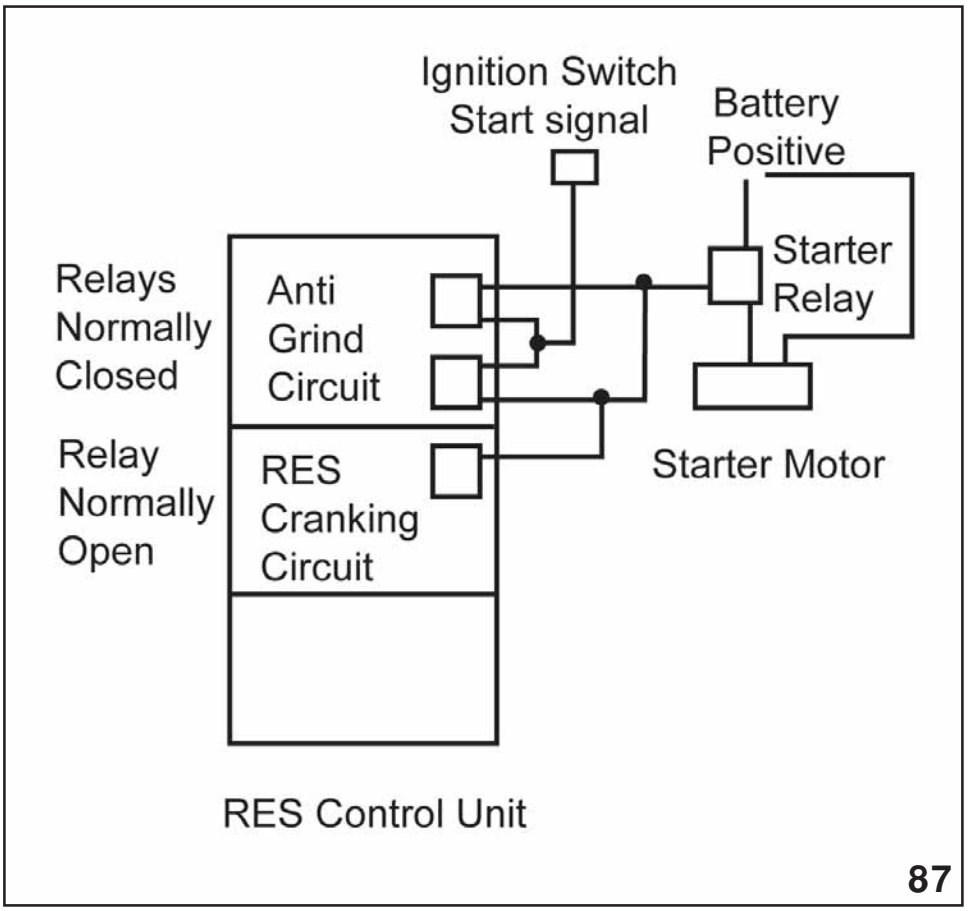
1. Plug the "Subaru Diagnostic Interface" (SDI) cable into the vehicle's diagnostic plug.
2. Turn one of the ignition keys to the RUN position.
3. Press the SDI Menu and C buttons until the SDI enters into "Stand Alone Mode".
4. Using the arrows on the SDI, select Subaru Vehicle and press enter.
5. On the SDI screen select "IMM Regist" using the arrows and then press enter.
6. The screen will display "Execute Key Reg?", press enter.
7. The SDI screen will prompt for the 4-digit teaching operation code (this is a number specific to the B9 Tribeca). Using the arrows, enter the teaching operation code and press enter.
8. The SDI screen will prompt for the 5-digit security ID (this number is vehicle specific and is located on the large metal tag attached to the vehicle's keys). Using the arrows, enter the vehicle specific security ID and press enter.
9. The SDI screen will display "Registering Key". After registration is complete, the SDI screen will display "Program 2nd Key", press enter.
10. The SDI screen will display "Key Change", turn the ignition OFF and turn the ignition ON using the 2nd key.
11. The SDI screen will display "Register Key?", press enter.
12. The SDI screen will display "Registering Key". After registration is complete, the SDI screen will display "Program 3rd Key", press enter.
13. The SDI screen will display "Key Change", turn the ignition OFF and turn the ignition ON using the 3rd key.
14. The SDI screen will display "Register Key?", press enter.
15. The SDI screen will display "Registering Key". After registration is complete, the SDI screen will display "Program 4th Key", press enter.
16. The SDI screen will display "Key Change", turn the ignition OFF and remove the 3rd key.
17. Press and release the remote start system programming button one time to access "Immobilizer Interface Registration Mode".
18. Activate the remote start system by pressing the transmitter START (key icon) button (2) times.
19. The ignition will power and the SDI will display "Register Key?", press enter.
20. The SDI screen will display "Registering Key". After complete, the SDI screen will display "Ending Key Reg", press the vehicle's brake pedal (1) time to exit "Immobilizer Interface Registration Mode" and turn the vehicle's ignition off.

NOTE: The above steps assume that all (3) vehicle ignition keys are available at time of installation. If any keys are not present during programming, they will not operate the vehicle after these steps are completed.

The RES (Remote Engine Start) controls and provides the following features.

- Starter motor operation
- Anti grind
- Power supply to the Acc circuit
- Power supply to IGN 1 and IGN 2 circuit
- Horn output
- Door locking
- Power window lock out
- Power supply for security system

These controls and features are only available during RES Operation.



RES Schematic during Operation

Anti-Grind

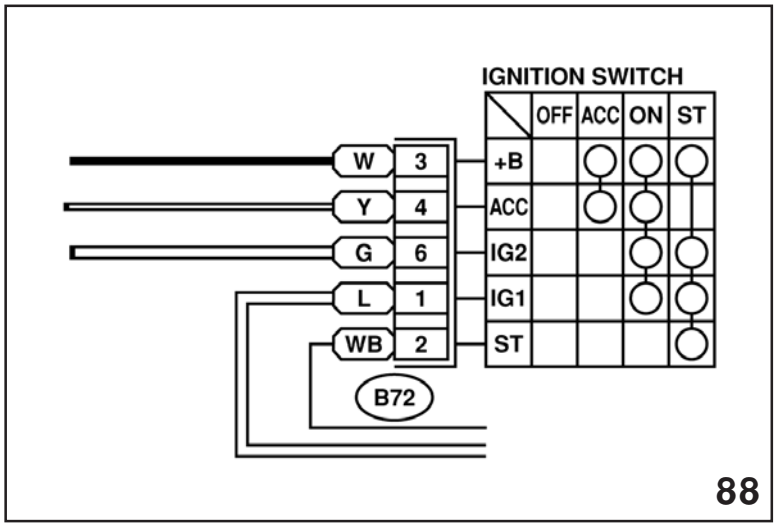
Two relays are used to provide redundancy.

Even when the engine is started with the ignition key, the power from the ignition switch is routed through the RES control unit. During RES operation these normally closed relays are opened and any power from the ignition switch (start signal) is prevented from going to the starter solenoid.

Starter Motor Operation

The RES cranking relay delivers power to the starter solenoid during RES operation.

The relay is deactivated when the engine speed signal from the ECM exceeds cranking speed.



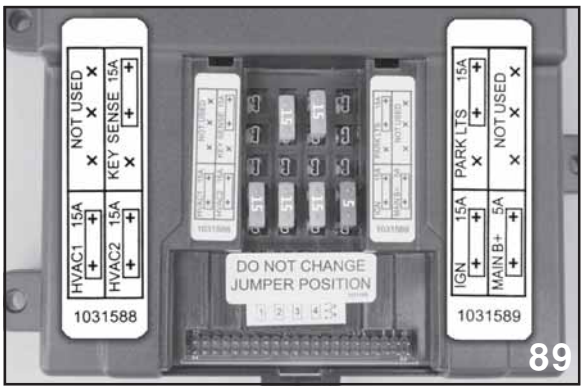
RES Ignition Switch

Accessory Power Supply

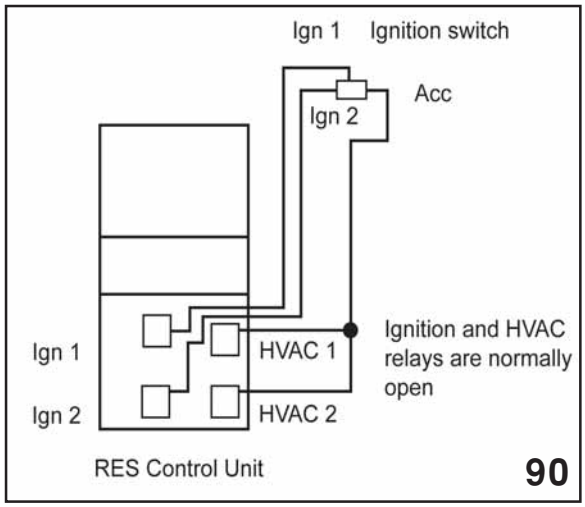
Two relays are used to deliver the amperage that may be required.

The accessory circuit power supply can be traced on STIS (Service Manual)

Currently the fuse labeling in the RES control unit marked HVAC 1 and HVAC 2 protect the RES accessory power supply circuits and Relays. Future production of RES control units will have these fuses labeled ACC 1 and ACC 2.



Inside Res Control Unit



RES Wiring

Additional RES information

NOTE: THE GROUND FOR THE POWER WINDOW RELAY IS PART OF THE RES CIRCUIT. (IF THE RES CONTROL UNIT IS REMOVED FROM THE VEHICLE, THE POWER WINDOWS WILL NOT OPERATE.)

RES Summary of events

- Installation-**(Close hood and open windows)**
- Idle speed learning
- Program Key fobs to RES
- Program all keys and key fob to Immobilizer.
  (Do not forget to push the programming button during key fob Immobilizer registration.)

RES Diagnostics

Prior to beginning the troubleshooting procedure below, verify the following:

1. The vehicle's battery is fully charged.
2. All remote engine start harness connections are secure.
3. Please have a copy of the remote engine start installation and owner's instructions for reference.

	Symptom	Check	Yes	No
1	Vehicle's horn honks an additional two times after remote start confirmation	A) Verify that the vehicle's hood is closed. B) Verify that the vehicle's brake pedal is not depressed. C) Verify that the ignition key was not left in the ignition cylinder. D) Verify that the remote start system is not in "Service Mode"	End	A) Replace the hood safety switch and hood safety switch jumper harness. B) Verify operation of the vehicle's brake pedal switch and replace if necessary. C) Take the system out of "Service Mode". Refer to Owner's Manual. D) Replace the remote start control module
2	Vehicle's horn honks an additional four times after remote start confirmation.	A) Follow the installation instructions for tach idle speed programming. B) Verify that the remote start harness 24-way connector is securely connected to the vehicle's pre-fit 24-way connector.	End	Replace the remote start control module.
3	The vehicle starts then stalls when the remote start system is activated and the dashboard security light remains on solid.	Verify that the immobilizer interface module is installed as per the installation instructions and programmed	End	Replace the remote start immobilizer interface module and software card.
4	The vehicle starts when the remote start system is activated but the air conditioning/heater does not turn on.	A) Verify that the vehicle's air conditioning/heater controls are pre-set prior to activating the remote start system.B) Verify that the remote start harness 6-way ignition switch connectors are properly seated.C) Verify that the remote start module 15AMP HVAC1 and HVAC2 fuses are not blown	End	A) Replace the 15AMP HVAC1 and HVAC2 fuses as necessary and test operation. Replace the remote start control module.
5	The remote engine start system does not turn on the vehicle's ignition after receiving remote start confirmation.	B) Verify that the remote start harness 6-way ignition switch connectors are properly seated. C) Verify that the remote start module 15AMP IGN fuse is not blown	End	Replace the 15AMP IGN fuse as necessary and test operation. Refer to Figure A.B) Replace the remote start control module.
6	The vehicle's ignition turns on when the remote engine start system is activated but does not crank the starter.	Verify that the remote start harness 6-way ignition switch connectors are properly seated	End	End. Replace the remote start control module.
7	The vehicle's power windows operate while the vehicle is operating by the remote engine start system.	Verify that the remote engine start 2-way connector is properly connected to the vehicle's pre-fit 2-way connector.	End	End. Replace the remote start control module.

Subaru Remote Engine Start Troubleshooting Guide

	Symptom	Check	Yes	No
8	The vehicle's perimeter security system triggers when the door is opened while running by the remote engine start system.	A) Was the driver's door unlocked using the remote keyless entry transmitter? The perimeter security system will not disarm when the doors are unlocked using the ignition key. B) Verify that the remote engine start harness 24-way connector is properly connected to the vehicle's 24-way pre-fit connector.	End	Replace the remote start control module.
9	The perimeter security feature does not arm when the vehicle is operating by remote engine start.	A) Verify that all vehicle doors are hatch/trunk are closed.B) Verify that the remote engine start harness 24-way connector is properly connected to the vehicle's 24-way pre-fit connector.	End	Replace the remote start control module.
10	The remote engine starter transmitter range is poor. (Normal operating range should be 500'-800' depending on vehicle angle and RF interference)	A) Test and replace batteries as necessary in the remote transmitters. B) Verify that the remote engine start antenna is properly mounted and plugged into the remote start control module.	End	A) Replace the remote start transmitters. B) Replace the remote start antenna
11	The vehicle's parking lights do not flash when the remote engine start transmitter button is pressed and do not turn on when the vehicle is operating by remote engine start.	A) Verify that the vehicle's parking lights turn on using the vehicle parking light switch.B) Verify that the vehicles parking light fuse is not blown and replace as necessary.C) Verify that the remote engine start system's 15AMP parking light fuse is not blown and replace as necessary (refer to Figure A). D) Verify that the remote start harness 24-way connector is properly connected to the vehicle's 24-way pre-fit connector.	End	Replace the remote start control module.
12	The vehicle's horn emits 1 long honk when the remote start system is activated.	Verify that the remote engine start system's 15AMP key sense fuse is not blown and replace as necessary	End	Verify operation of the vehicle's key-in warning switch and replace as necessary.
13	The remote start system shuts down 2 seconds after starting the vehicle.	Check vehicle's battery for a low voltage condition and replace as necessary.	End	

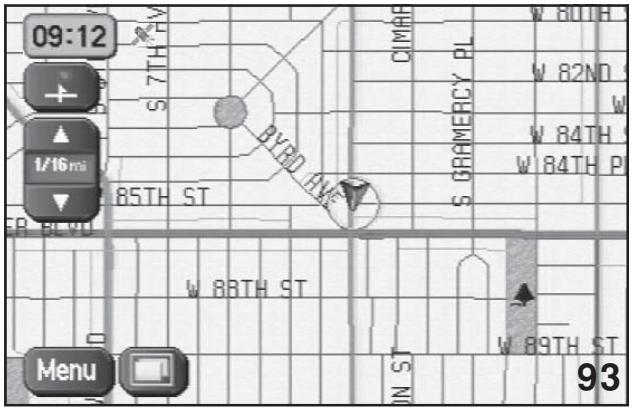
Subaru Remote Engine Start Troubleshooting Guide

OPERATIONAL CONDITIONS

	Symptom	Check	Yes	No
14	The vehicle's power windows do not operate while the vehicle is operating by the remote engine start system.	The remote engine start system is equipped with a power window disable feature during remote start operation.	End	
15	The remote start system is activated while any door is open and then all doors are closed, the doors remain unlocked. If you open any unlocked door the security system triggers and the remote start shuts down.	This is a normal function. If a door is left open during remote start activation, the automatic lock feature is disabled for that cycle to prevent accidentally locking the ignition keys in the vehicle. While the vehicle is running by RES, once all doors are closed, the door security protection arms. If a door is opened at anytime, the security system will trigger and the RES system will shut down.	End	
16	The remote start system is activated while any door is open, the customer enters the vehicle and closes all doors (the door security protection arms and the vehicle's doors remain unlocked). The ignition key is turned to the ON or RUN position. Any door is opened causing the horn to honk one time and the vehicle will stay running	This is a normal function. When the ignition key is turned to the ON or RUN position the RES system is still in operation until the brake pedal is pressed, the transmitter button is held for 2 seconds or the door security protection is triggered. Because the RES system is still operating, opening any door will trigger the door security protection causing the horn to honk one time and the RES system will disengage and the ignition key will take over operation of the vehicle. Approximately 1 second after the RES system disengages, the system will recognize that the ignition key is in the ON or RUN position allowing the door security protection system to disarm	End	
17	If the RKE fob unlock button is pressed within 5 seconds of shutting down the remote start system, the doors will unlock but the door security protection will trigger when any door is opened.	This is a normal function. When the remote start system shuts down by any means (15 minute run time expires, transmitter shutdown, hood opened, engine over-rev or stall) the vehicle's security module will initiate a security monitor and re-arm process that will prevent security system disarm for approximately 5 seconds	End	

Subaru B9 Tribeca and Legacy

(Navigation System)



Map screen

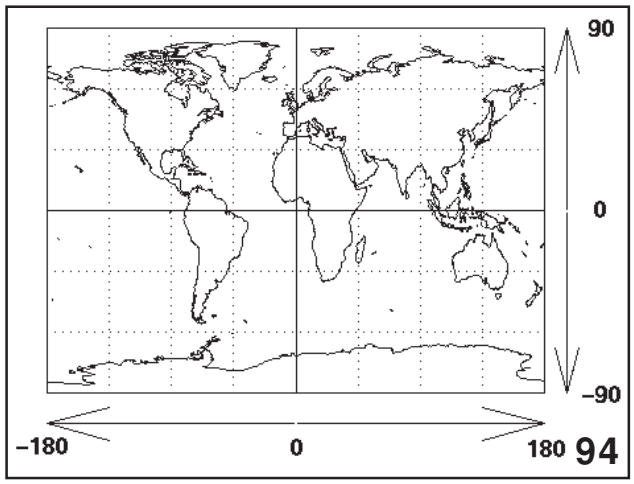
The Subaru Navigation System has been designed as an integral part of the vehicle from the beginning of vehicle design. This has provided a means of enhancing two way communications between the vehicle operator or navigator and onboard vehicle systems.

Onboard vehicle systems and features include:

- Navigation
- Rear seat entertainment
- Fuel consumption and economy
- Maintenance reminders
- Calculator
- Customization of Navigation display during Navigational and Non Navigational displays
- Calendar
- Customization of the security and keyless entry system
- Customization of adjustable passenger compartment audible and visual features.

Supplemental Navigation Information

LATITUDE AND LONGITUDE



World Map

Latitude is measured from the equator, with positive values going north and negative values going south. Longitude is measured from the Prime Meridian (which is the longitude that runs through Greenwich, England), with positive values going east and negative values going west. So, for example, 65 degrees west longitude, 45 degrees north latitude is -65 degrees longitude, +45 degrees

GMT

The **Greenwich Meridian** (Prime Meridian or Longitude Zero degrees) marks the starting point of every time zone in the World. GMT is Greenwich Mean (or Meridian) Time is the mean (average) time that the earth takes to rotate from noon-to-noon.

Greenwich, England has been the home of Greenwich Mean Time (GMT) since 1884. GMT is sometimes called **Greenwich Meridian Time** because it is measured from the Greenwich Meridian Line at the Royal Observatory in Greenwich.

GPS History

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day. There are no subscription fees or setup charges to use GPS.

GPS Operation

GPS satellites circle the earth twice a day in a very precise orbit and transmit signal information to Earth. GPS receivers take this information and use triangulation to calculate the user's exact location. The GPS receiver compares the time a signal was transmitted by a satellite with the time it was received. The time difference tells the GPS receiver how far away the satellite is. Computed with distance measurements from at least three more satellites, the receiver can determine the user's position and display it on an electronic map.

Once the user's position has been determined, the GPS unit can calculate other information, such as speed, bearing, track, trip distance and distance to destination.

Here are some other interesting facts about the GPS satellites (also called NAVSTAR, the official U.S. Department of Defense name for GPS):

- The first GPS satellite was launched in 1978.
- A full constellation of 24 satellites was achieved in 1994.
- Each satellite is built to last about 10 years. Replacements are constantly being built and launched into orbit.
- A GPS satellite weighs approximately 2,000 pounds and is about 17 feet across with the solar panels extended.
- Transmitter power is only 50 watts or less.

GPS Signal Construction

The signals travel by line of sight, meaning they will pass through clouds, glass and plastic but will not go through most solid objects such as buildings and mountains.

A GPS signal contains three different bits of information — a Pseudorandom code, Ephemeris data and Almanac data. The Pseudorandom code is simply an I.D. code that identifies which satellite is transmitting information.

Ephemeris data, which is constantly transmitted by each satellite, contains important information about the status of the satellite (healthy or unhealthy), current date and time. This part of the signal is essential for determining a position.

The Almanac data tells the GPS receiver where each GPS satellite should be at any time throughout the day. Each satellite transmits Almanac data showing the orbital information for that satellite and for every other satellite in the system.

Navigation Components

Components of the Navigation include, Navigation Computer, Navigation Display, GPS antennae, remote buttons and DVD Rom.

Under Driver Seat

The Navigation Computer is located under the driver seat and is protected by metal guards and a door that protects the front.

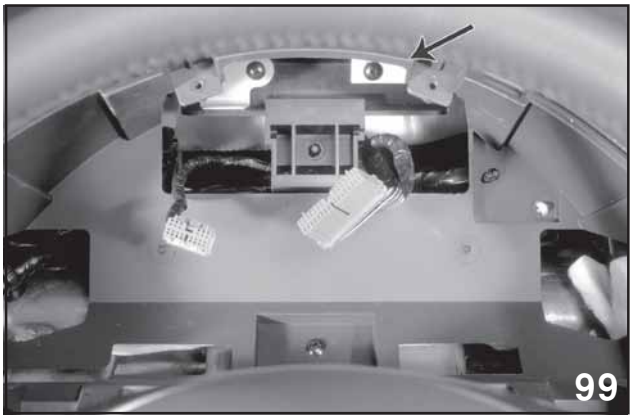
Door Closed

Door Opened

The door must be opened to access the drive for the DVD Rom and reset button. (Do not install or remove a DVD Rom while the vehicle is motion)

Navigation Display

The Navigation display is a Liquid Crystal Diode type display that provides touch screen control and communicates Navigation and vehicle information to the driver and front seat passenger.



Antennae Location

Antennae Circled

The GPS antennae is located behind the combination and provides satellite signal inputs to the Navigation Computer.

Remote Buttons

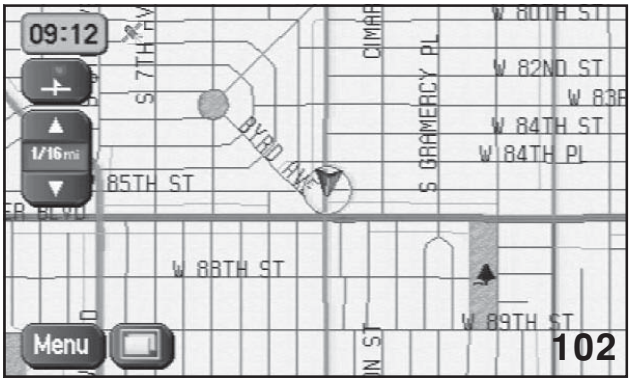
The remote buttons are located on the dash above the radio controls and are used to control many of the Navigation and on board features.

The Subaru Navigation system operates from software contained in either of two DVD Roms. The two DVD Roms are described as East or West, containing navigation software for either the east or west sections of the United States and Canada.

Navigation Operation

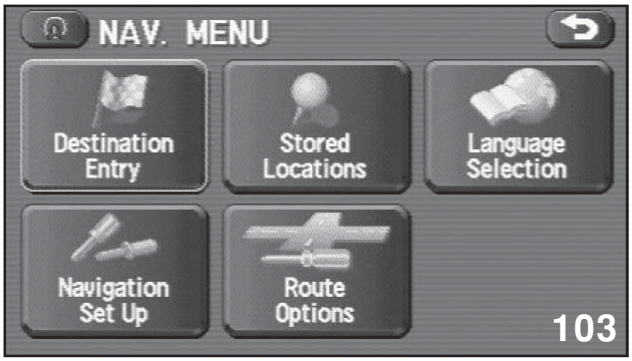
Map screen

Pressing the map button will display the map screen.



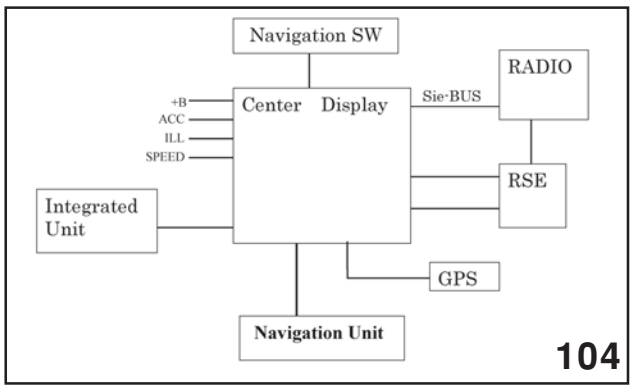
Map Screen

Pressing the menu button on either the Navigation Display or the remote button will display:



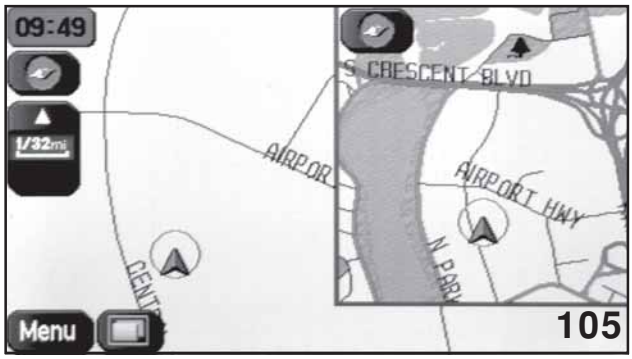
Navigation Menu

- Destination entry
- Navigation set up
- Stored Locations
- Route options
- Language set up



Schematic

Dual map mode



Dual Map

Main Map

Pressing the dual map mode button displays a smaller map in the right hand corner of the navigation display. Each map can be adjusted without affecting the other. Touching the Navigation Screen allows adjustment of the map touched. POI and memory points can only be selected on the main map.

Zoom

Allows adjustment of the range on the display from 128 to 1\32 of a mile.

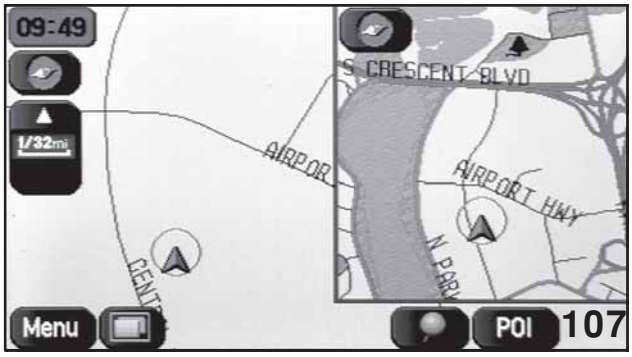
Compass

Allows the control of setting the map or the vehicle icon to north orientation.

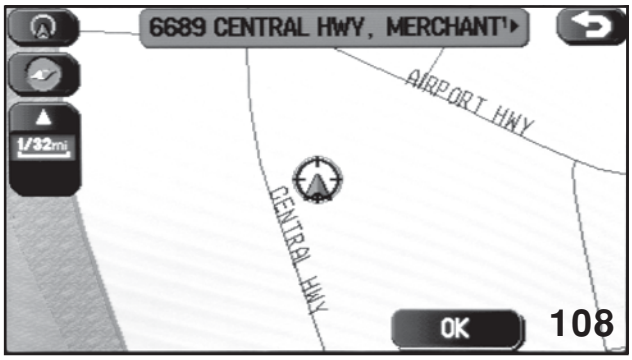
Clock

Indicates the current time. 12 hour and 24 hour time display is available. The clock setting is first set by the GPS signal to GMT. Adjustments for +1 or -1 must be made to correct to local time.

Touching the screen in a place other than where an icon is displayed will activate the memory point icon and the POI icon.



POI



Press Ok

Touching the memory point icon will display the current address and OK. Press OK to save the current vehicle position as a memory point. Pressing map or return will not save the current position as a memory point.

Touching quick POI displays 6 categories of POI. They can be turned on or off by touching the icon. The display will return to the map screen after the selection.

At the map screen touch the POI desired until the POI icon is flashing. Select info for the phone number and address or press the route calculation button for the navigation system to calculate a route to the POI location. POI points will not be displayed on the map screen if the zoom is set to higher than ½ mile. If the next button is illuminated while viewing a flashing POI icon, another POI is in the same location. Pressing next will display the icon for that POI.

Destination Entry 1

Destination Entry 2

Destination entry is composed of two screens. Each available selection provides a different way of selecting destinations.

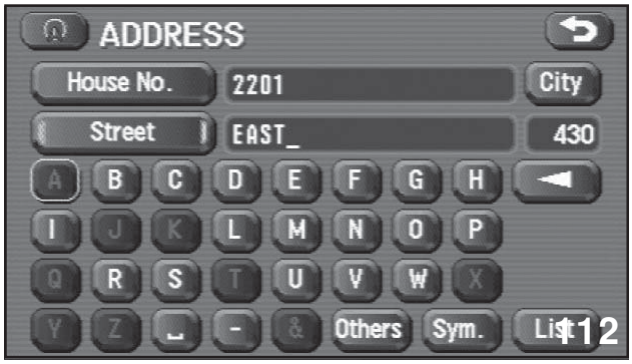
North American Map

The first and most important decision to make is, in what search area is the destination located. Search areas US1, US2, US3, US4, US5, US6, US7 and Canada are located on the West DVD Rom. The East DVD Rom contains the search areas for US6, US7, US8, US9, US10 and Canada. 056

Select the search area and return to the Destination Entry screen. Select one of the 10 options to enter a destination.

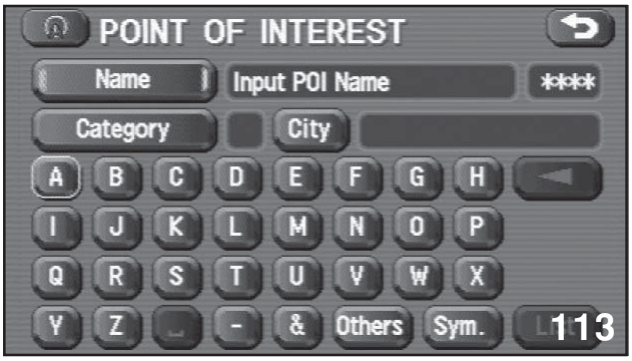
Address-Enter the house or building number and the street name by following the directions on the screen (some letters will be grayed out as the street name is typed,. This indicates that the grayed out letters do not match the letters already inputted) . The number in the box to the right of the street name will indicate how many names are matching the letters inputted into the street name field. When the number of street names is low enough, press the box and a list of streets will be displayed. Press on the name of the street desired. If the same street is found in multiple cities in the search area, the screen will change to the city screen and a decision of a city will need to be made. After the city selection, the Map screen will appear with the route to the destination outlined in green.

Follow the instructions on the screen to begin navigation.



Address Screen

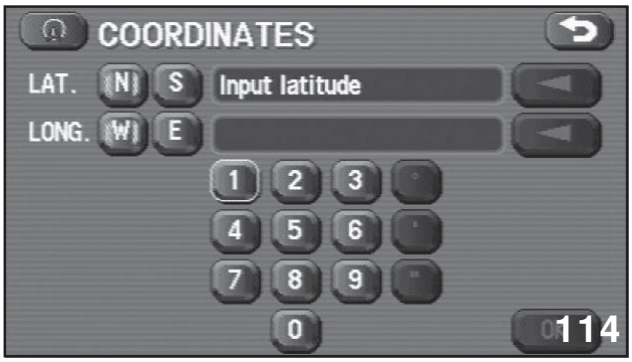
Point of interest-Type in the name of the destination desired, restaurant, shop, etc..The category of the business or location can be changed on this screen also.



POI Screen

A list of matches will be displayed by name or distance.

- Select from map-Touching the screen and pressing the calculate button will establish a route.
- Emergency-Allows selection of Police and Medical locations.
- Memory point-Provides guidance to locations previously marked on the map during a prior trip.
- Previous destination-Allows selection of destination that was chosen on a prior trip.
- Intersection-Provides guidance to the intersection as entered by street names.
- Freeway Ent/Exit-Provides guidance by name of the street and name of the exit.
- Phone number-Locates an address based on the phone number.



Coordinates Screen

- Coordinates- Provides guidance to a location based on the latitude and longitude.

Coordinates

Latitude and longitude are displayed in degrees, minutes and seconds.

Example XX° XX' XX"

Some hand held aftermarket GPS and navigation systems display in degrees, minutes and thousands of a minute.

Example XX° XX'.XXX

Converting GPS coordinates of this type for use in the Subaru navigation system is accomplished by performing the following:

1. Round the thousands digit .XXX to the closets hundredths of a minute.

   Example .478 change to .48

2. Multiply the rounded number by .6

   .48
   x .6

   .288

3. Now move the decimal over two places

   Example: .288 28.8

   The new number is 28.8

4. Round the number to the right of the decimal point up (.5 or over) or down (.4 or lower).

5. The number is 29, representing 29 seconds of a minute.

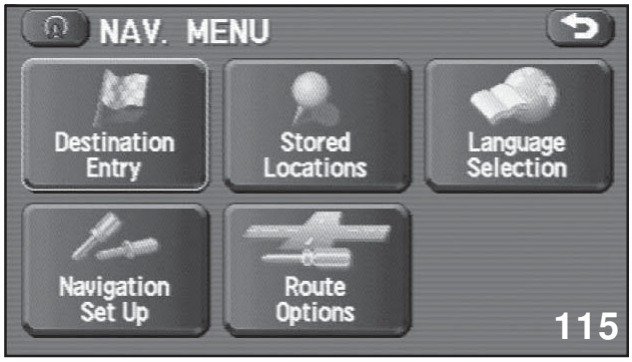
XX° XX'.XX

60 seconds = 1 minute so the highest number in this field will be 59.

XX° XX'.XXX

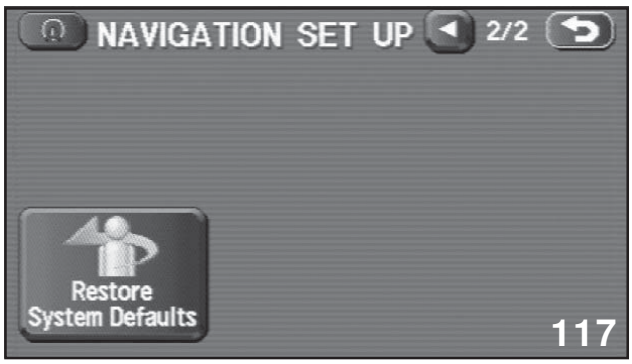
1000 thousandths = 1 minute, so the highest number in this field will be .999.

Navigation Set Up



Navigation Menu

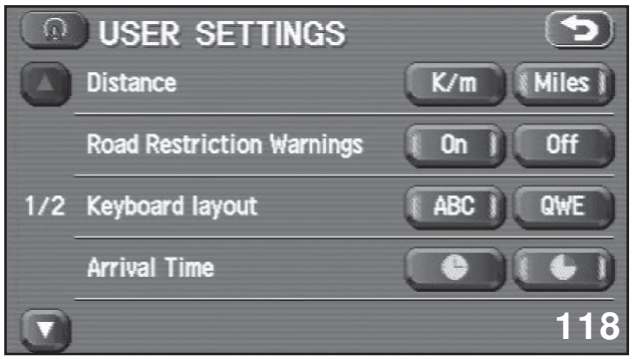
Navigation Set Up 1/2



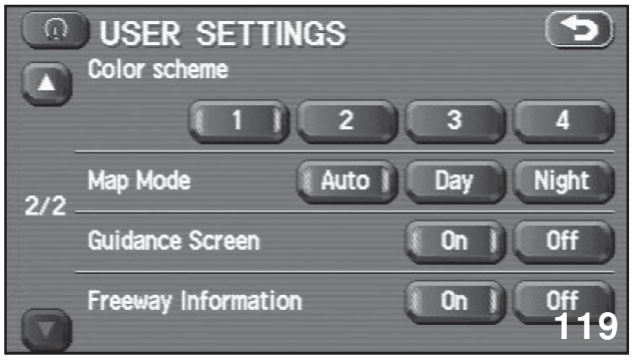
Navigation Set Up 2/2

- User Settings
- Navigation Information
- Quick POI selection
- Calibration
- Volume
- Set clock
- Restore system defaults

User settings



User Settings 1



User Settings 2

Allow the selection of k/m or miles.

Allows the selection of Road Restriction Warnings

Allows the selection of ABC or QWE type keyboard

Allows the selection of time to reach or time expired while traveling on a calculated route.

Allows the selection of color schemes for the Navigation Display.

Allows the selection of the Navigation Display illumination. Auto will change the illumination to a dark background when the headlights are on unless the manual illumination control is set to full bright. Head lights off will result in a light colored back ground. Selecting Day or Night will result in the background illumination staying in either a dark color or light color.

Brightness and contrast settings are different from the back ground color settings. Brightness and contrast settings can be adjusted while observing any screen by pressing the for right remote button. The display can be completely turned off in this mode if desired. The display can be turned back on by pressing any of the remote buttons.

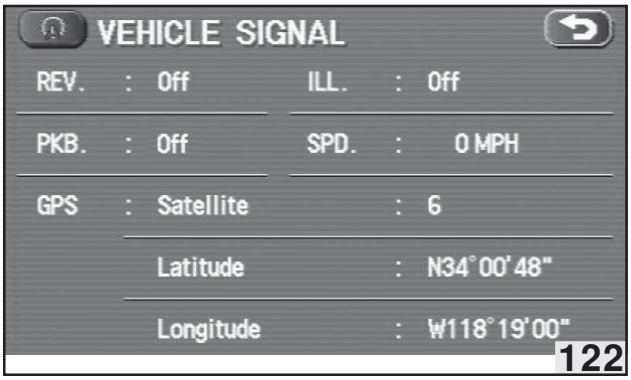
Allows the selection of Guidance screen allowed or not allowed. When not allowed only the dual map screen becomes available, prevent the next turn, next exit etc.… from being displayed.

Allows the selection of Freeway information to be displayed if available.

Navigation Information

Navigation Set Up 1

Navigation Information

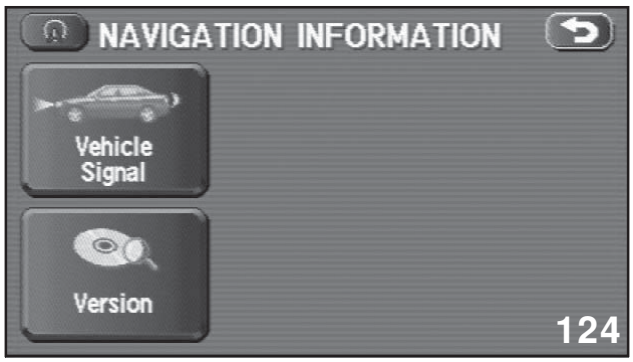


Vehicle Signal Screen

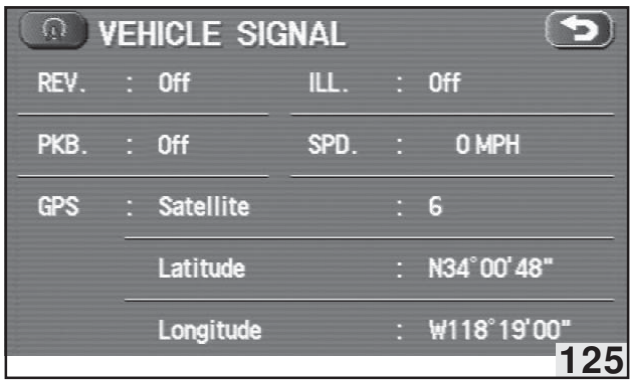
- Vehicle signal
- Indicates if the vehicle is in reverse.
- Indicates if the head lights are on.
- Displays current vehicle speed.
- Indicates if the parking brake is set. (Not applicable to 06 model year)
- Displays the number of GPS satellite signals being received. A minimum of three satellite signals are required for navigation. The navigation system can function for a time without satellite signals, basing vehicle position from last known position and information received from a gyroscope and vehicle speed sensor input.
- Displays the current longitude
- Displays the current latitude
- Longitude and Latitude updating can take as long as 2/10s of mile dependant on the vehicles travel across the latitude and longitude lines.

Navigation Information

Navigation Set Up 1/2



Navigation Information



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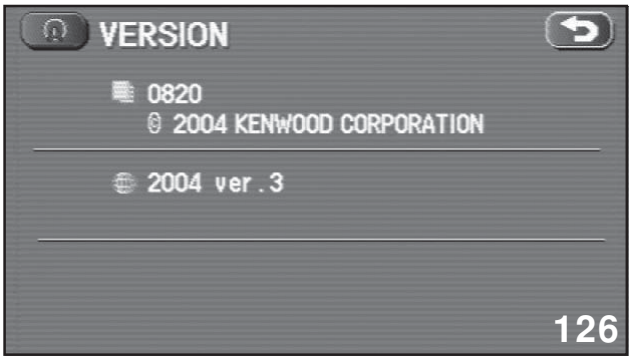
Version



Version

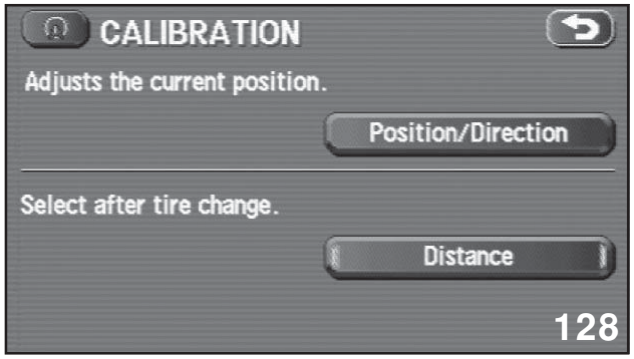
- Displays the version number of the software contained on the DVD Rom in the Navigation Computer.

Quick POI selection

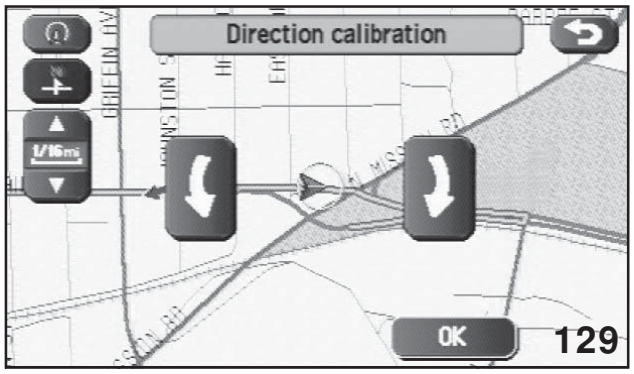
Quick POI

Allows selected POI icons to be displayed or turned off on the map screen.

Calibration



Calibration Screen



Calibration Adjustment

Adjusts the current position by using the map screen as a representation of latitude and longitude. The vehicles forward facing direction can also be adjusted. The address data stored in the DVD Rom cannot be adjusted.

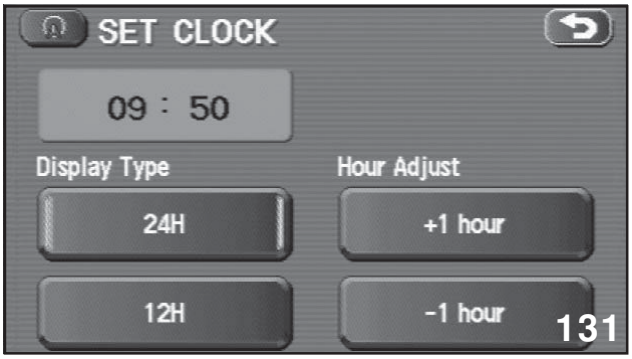
Select after new tires have been installed. Driving the vehicle in normal operation will recalculate the rolling circumference of the new tires. About 6 miles of vehicle travel are required for this calculation. The procedure will self cancel after the new calculation is complete. Normal Navigation system operation can be utilized while this function is occurring.

Volume

Volume Adjustment

Allows the volume of voice guidance to adjusted or turned off. Voice guidance takes control of the front speakers and is not dependant on the radio operation.

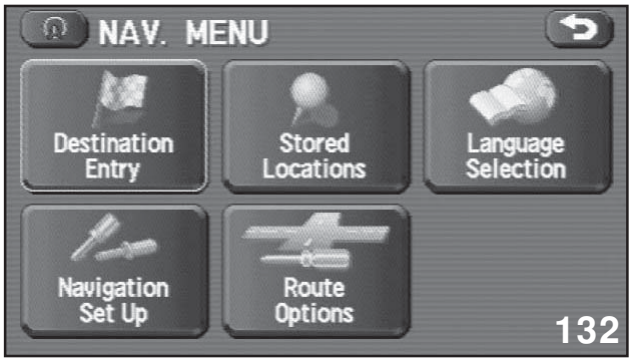
Set clock



Set Clock Screen

24 hour and 12 hour time display is available. Time adjustment is achieved by adjusting the GPS time signal by adding or subtracting 1 hour increments.

Stored Locations



Navigation Menu

Stored Locations

Provides a library of saved locations as memory points ,home, areas to avoid, previous destinations, Waypoints and preset destinations. These locations can be used to calculate routes and waypoints.

Route Options

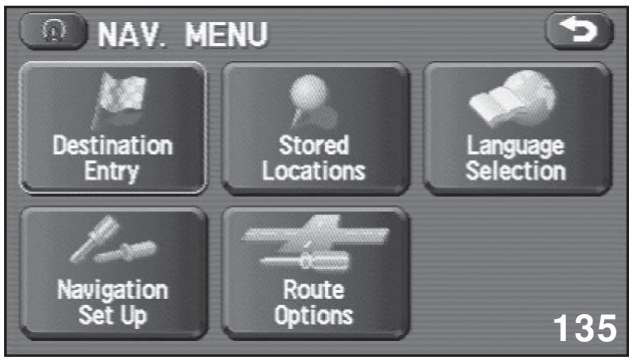
Route Options

Search condition becomes active only after a route has been calculated . The destination is displayed with three options on the routes to the destination (when multiple routes are available). Quick, alternate and shortest , press one of the options and calculate. The map screen will be displayed with the route chosen.

Destination and Waypoint

Allows listing and editing of destinations and waypoints.

Destinations are desired locations at the end of a journey. Waypoints are created by the planning of a route or adding the waypoint in after the journey has begun.

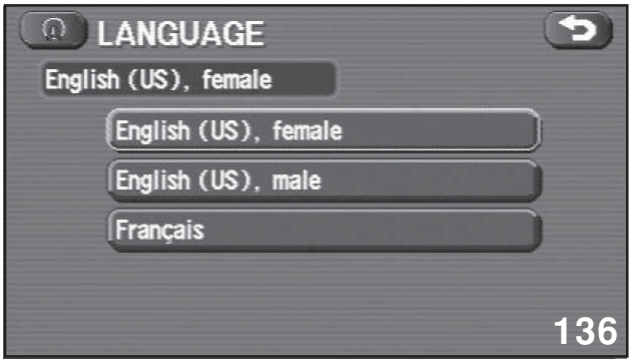


Navigation Menu

Calculate and cancel guidance.

Navigation can be recalculated and canceled by pressing the route options button.

Language selection



Language Screen

Allows the guidance voice to be selected.

Selections include English US female, English US male and French.

Rear Entertainment System

Headliner Interior

The monitor and player are mounted in the roof to offer visibility to all 2nd and 3rd seat passengers.

DVD Player

The rear seat entertainment system consists of the 9 inch QVGA (Quarter Video Graphics Array) monitor and DVD player, external inputs, remote control and head phones.

The Quarter Video Graphics Array (QVGA) provides a display screen with 320 x 240 resolution (240 x 320 in portrait mode). The QVGA term has been established because the display provides 25% of original VGA displays.

Navigation Display

The driver and front seat passenger can view the rear entertainment system through the Navigation Display provided the vehicle is not in motion and the parking brake is set. (Ignition on-Parking brake set-Rear seat entertainment-auxiliary button pushed-Audio button pushed)

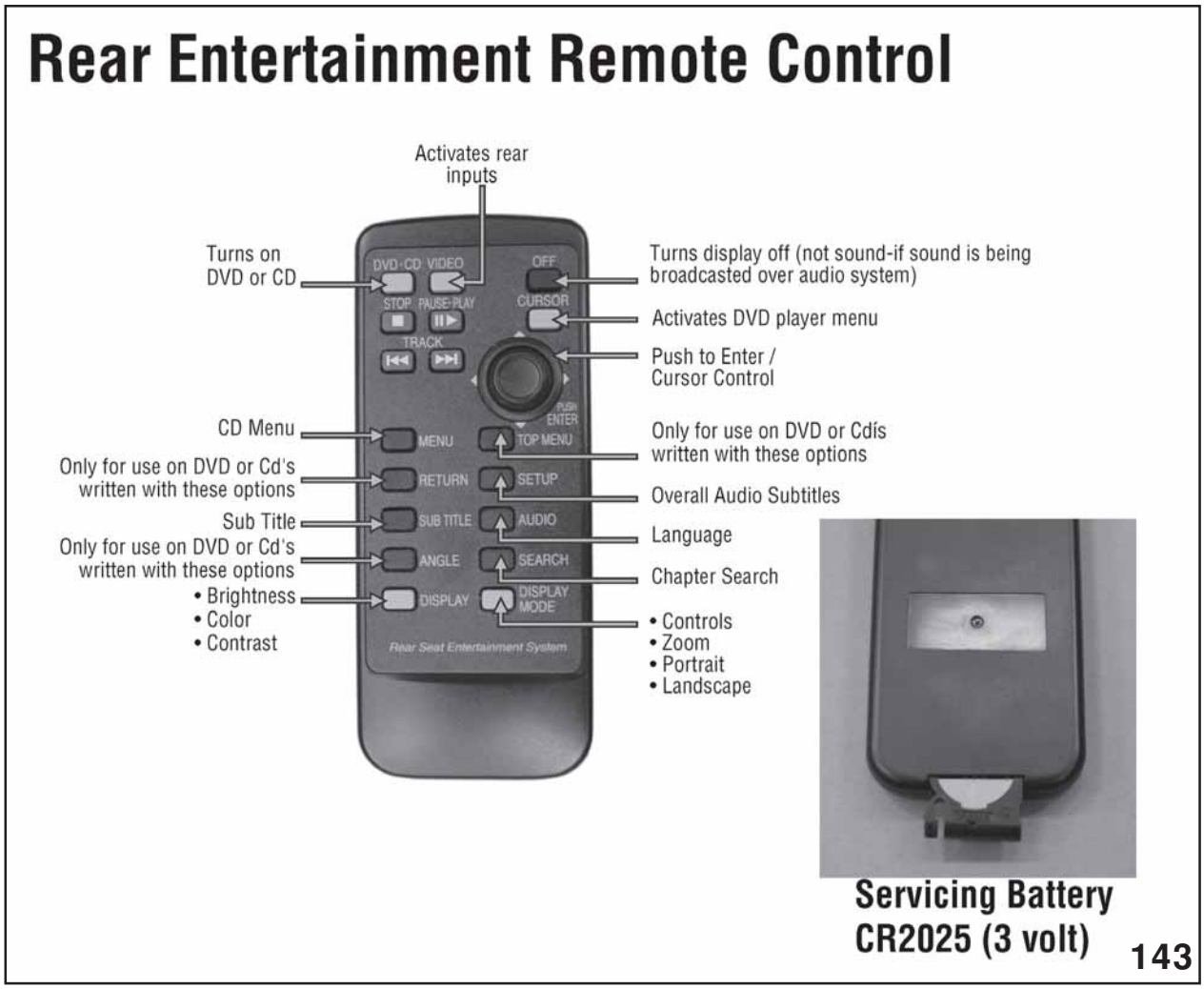
Remote Buttons

Any time the display is changed for viewing vehicle information or navigational display viewing, the audio button will require pushing to return to viewing of the rear entertainment system.

Control for the rear entertainment system is provided only through the use of the remote control. The remote control is powered by one 3 volt CR2025 battery. Headphones can be used when the driver has turned off the Rear seat entertainment-auxiliary input into the radio or desires to listen to the radio.

Infrared

Sound from the rear entertainment system is projected to the rear of the vehicle through an infrared LED assemble (The headphones must be in the line of sight of the monitor and player assembly)



Remote Control

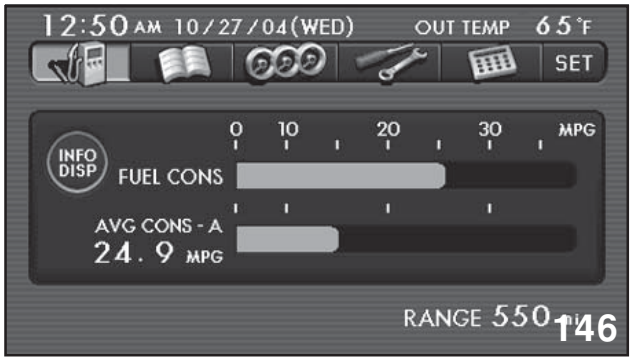
Vehicle Information

If the ignition is turned off while the rear entertainment system is being used for DVD viewing, the DVD will restart at the stopping point once the ignition is turned back on, however, the remote control must be used to activate the monitor by pressing the DVD button. If the sound was being broadcast over the vehicles sound system, the DVD will self start with the monitor off. If the audio was only available through the head phones then the remote must be used to start the DVD (Pressing the DVD button on the remote).

Pressing the info button will display last viewed of four possible information and customizing sources.

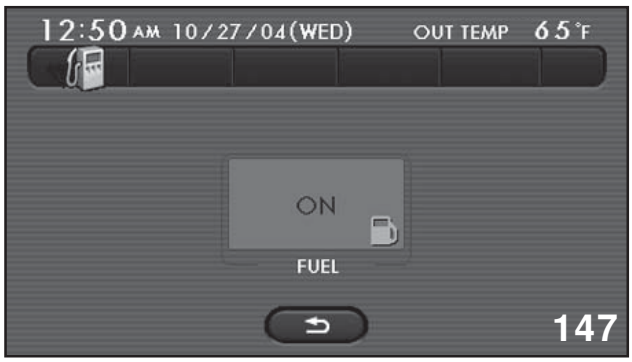
Remote Buttons

- Fuel economy
- Travel log
- Virtual Gauges
- Calculator
- SET



Fuel Screen

Fuel economy is displayed to indicate current fuel consumption and the average fuel consumption at the same time. The average fuel consumption is calculated on the mileage for trip meters A or B. Pressing the Trip Meter stalk will change the display for the average fuel consumption for the two Trip Meters.



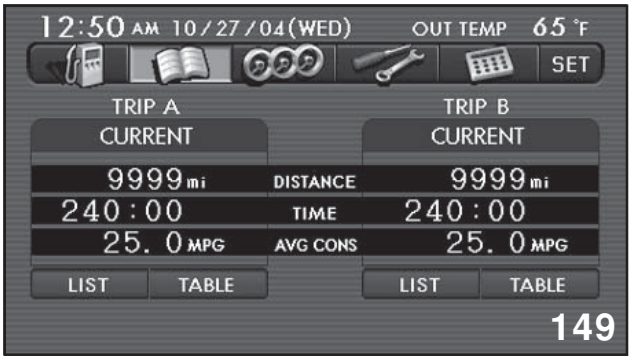
Fuel Warning

Pressing the INFO DISPLAY button to the left of the current fuel consumption indicator will allow the low fuel warning light to be turned on or off.

Low Fuel Light ON

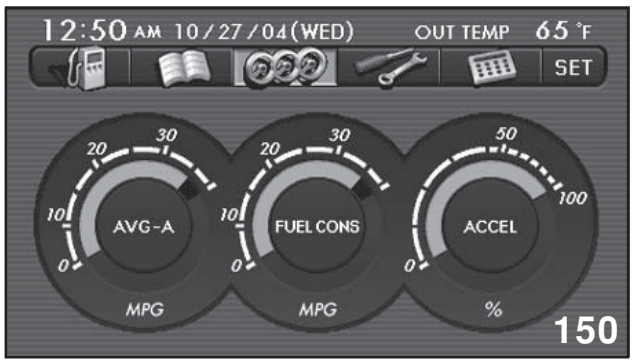
When the fuel level reaches the specified level the low fuel warning will be displayed over the Navigation Display and when ever the vehicle is started with the specified fuel level. Pressing the map button will turn off the warning display until the vehicle is restarted.

The low fuel warning light on the combination meter is not related to this function. The low fuel light is controlled by the fuel temperature sensor on the fuel pump and will remain illuminated until the vehicle is refilled with fuel.



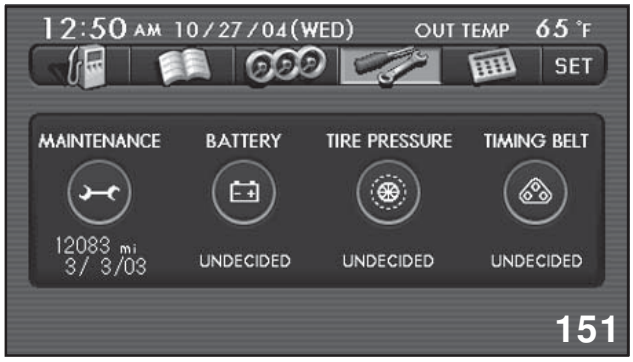
Travel Log

The travel log displays distance, time traveled and average fuel consumption. Additional details are available by pressing the LIST or TABLE buttons at the bottom of the display.



Virtual gauges

The virtual gauges indicate average fuel consumption for A or B Trip Meter, current fuel consumption and degree of acceleration.



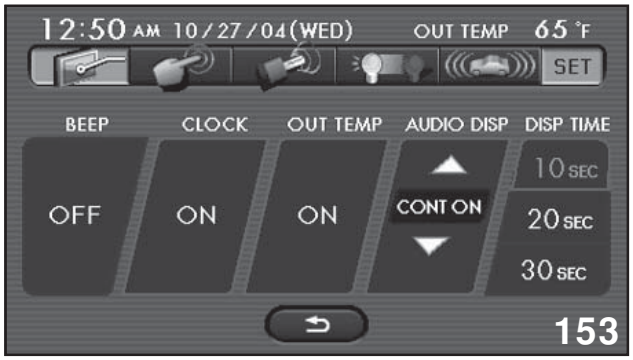
Maintenance Reminders

The maintenance reminders allows dates or mileage to be set as a visual reminder to schedule the vehicle in to the dealer. Items available include: Maintenance, Battery, Tire Pressure and Timing Belt.

Calculator

A calculator is available by pressing the calculator icon.

SET allows many features to be adjusted.



SET

Mail box-Allows the Beep of the Navigation System, the clock and outside temperature to be set to display or remain hidden.

The Audio Display time can adjusted. Press the up or down arrow to change the time that the radio display remains on the Navigation Display when a change to radio settings is made. The time can also be adjusted by pressing one of the available settings to the right. The time can be adjusted from 5 to 30 seconds or continuously on or off.

Touch Panel Adjustment

Pressing the finger icon will activate the Touch panel adjustment of the Navigation Display. This will calibrate the finger pressure required as well as the placement position.

Lock Signal

Pressing the Key icon will allow adjustment of the keyless entry response from the vehicle. The lights and beep can be turned on or off.

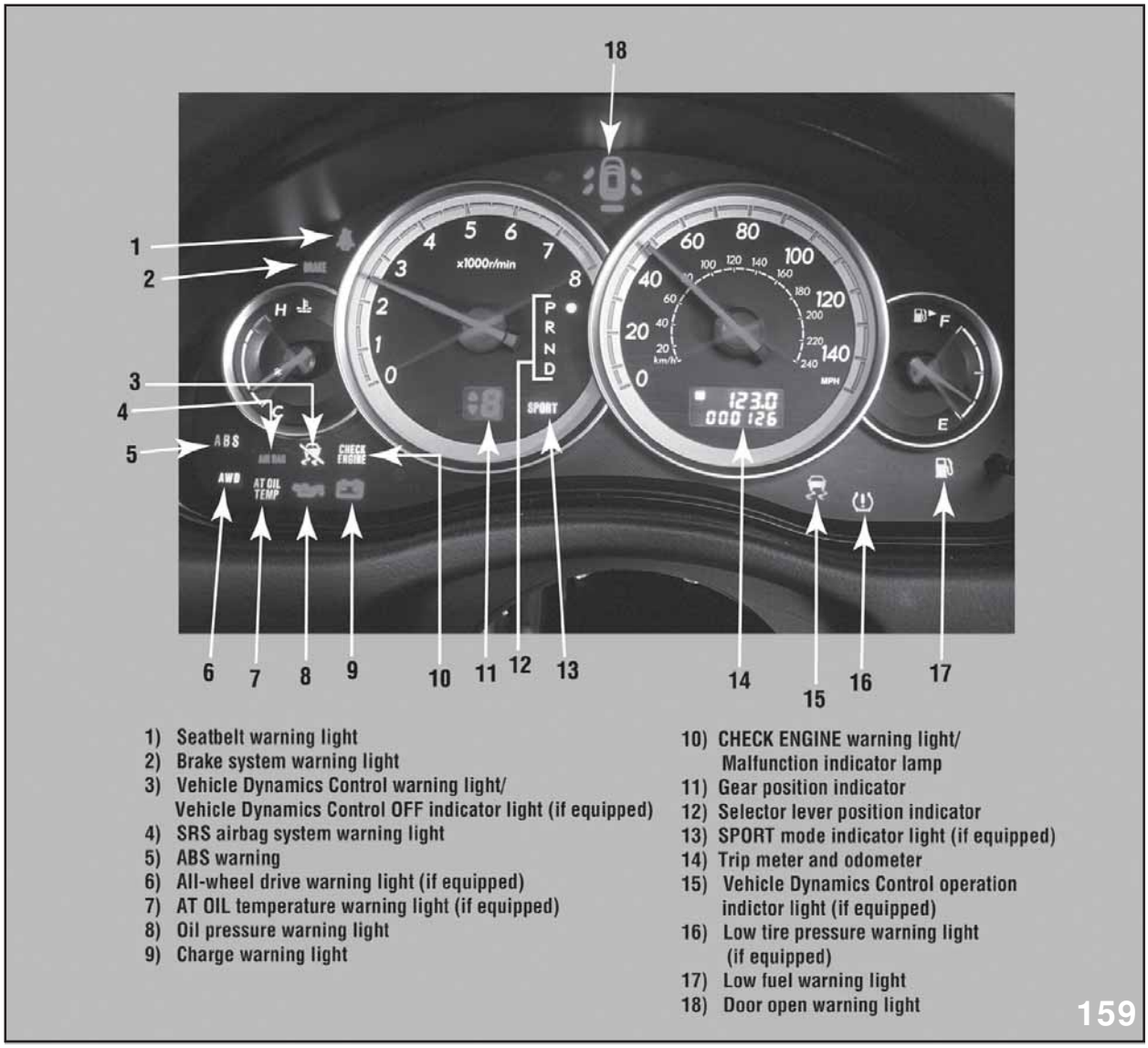
Key Alert

Pressing the light bulb icon will allow key in the ignition alert to be turned on or off (Forced lockout on or off). The room lamp, defogger and Deicer on times can also be adjusted. (Defogger and Deicer times are set for continuously on or 15 minutes from exiting the vehicle.)

Alarm

Pressing the vehicle icon will allow the security system to be turned on or off (allowing for proper operation). The set delay can also adjusted (0 to 30 seconds).

Combination Meter



Combination Meter

Turning the ignition key to the run position starts the light check cycle and activates the sweep of all gauge needles. Pushing the Trip Meter stalk with the ignition off will illuminate the Trip Meter display and activate the fuel gauge to show the actual fuel level.

S-ON

The Combination Meter can be adjusted to delete the sweep function of the gauges and the sequential illumination. Turn the ignition key to the accessory position . Push the Trip Meter stalk 2 times from the “B” Trip Meter or 3 pushes of the Trip Meter stalk from the “A” Trip Meter. When the “S-On” appears in the Trip Meter display push and hold the Trip Meter stalk for 2 seconds until the “S-Off” is displayed.

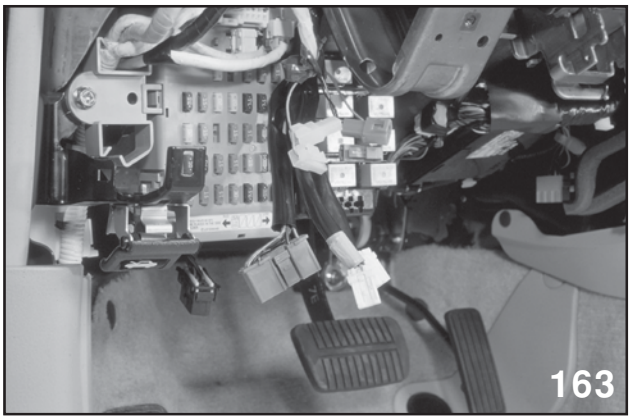
S-Off

This feature can be used to turn the gauge sweep off of all Legacy models. The GT models can be adjusted to turn the gradual illumination off. Push the Trip Meter stalk again while the status of the gauge sweep is being displayed and the display will change to “I-on”.

Push and hold the Trip Meter stalk for 2 seconds until the display changes to “I-off”. Follow the same procedure to turn the gauge sweep and sequential illumination back on. In each case the current status will be displayed. To change it push and hold the Trip Meter stalk for at least 2 seconds. Pushing less than 2 seconds will advance the display to the next item.

D Check Connector Side View

The Combination Meter can be forced into a D check procedure. A set of one pole white connectors (2005MY only) are located on the left side of the dash, near and above the hood release handle.



D Check Connector Side View

Plug the two white pole connectors together and turn the ignition to the run position.

Gauge Sweep

While the gauges are sweeping, push the Trip Meter stalk 2 times. The D check will now begin. All lights, gauges, beeps and displays will turn on and off. This will allow for a visual and audible check of all Combination Meter devices.

After the initial sweep the combination meter can be controlled to advance in the D check , one step at a time.

Push the trip meter stalk at the end of the initial sweep. This will allow only certain items to be checked.

Continue pressing the stalk as each item is checked, until all items have been inspected.

Manual Advance

Pushing Trip Meter Stalk 1 time will activate the Trip Meter to display trouble codes. Push the Trip Meter Stalk to advance the code display. The codes will be displayed in the following order on the list below.

ECM ⟶ TCM ⟶ ABS/VDC

This must be done when the Combination Meter is not performing a D check.

2006 Subaru B9 Tribeca Combination Meter

Dash

The Sweep and sequential illumination of the Combination Meter can be turned on and off.

- Ignition key to accessory
- Press the Trip Meter stalk 3 times (or until the “S” appears in the Trip Meter display).
- Press and hold the Trip Meter for more than 2 seconds to change the “I” or “S” setting.

  “S-On” indicates the sweep function is on. “S-off” indicates the sweep function is off.

  “I-on” indicates the sequential illumination is on. “I-off” indicates the sequential illumination is off.

The Combination Meter D check procedure is accomplished by performing the following steps: **(begin the first push of the Trip Meter stalk before the sweep function ends)**

- Ignition off
- Ignition on, small light (parking lights from the head light switch) on.
- Push Trip Meter 3 times
- Small light off
- Push Trip Meter 3 times
- Small light on
- Push Trip Meter 3 times

DTCs can be viewed on the Trip Meter by following the steps above but push the Trip Meter 4 times in each step instead of 3 times.

Toggle through the DTCs by pressing the Trip Meter stalk. The first set of codes will be for the engine, followed by the transmission DTCs. The ABS codes C- - - will be viewed on the Trip Meter display, however, the new ABS/ HCU does not communicate DTCs to the Combination Meter.

Combination meter D check

Procedure of change over to DIAG mode.

NOTE: THE NUMBER OF THE TIME PUSHING THE K-NOB IS DIFFERENT BETWEEN THE "DTC READING MODE" AND THE "SELF DIAGNOSIS MODE OF COMBINATION METER"

1) Within 3 second after the IG switch turned on, turn the illumination switch on, then perform the following steps 2)- 4) with in the followed 10 seconds.
2) Push the "trip nob" 3 times while ilumi SW ON.
3) Turn the ilumi SW off, then push the trip nob 4 times. (3 times for self diag mode)
4) Turn the ilumi SW ON again, push the trip nob 4 times. (3 times for self diag mode)

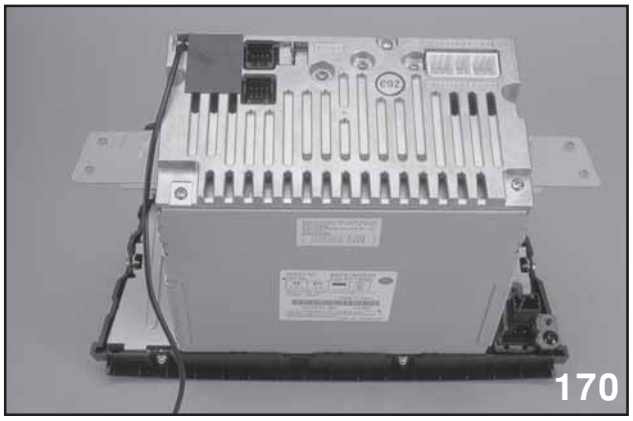
   now, the mode was changed to DTC reading mode or Self diagnosis mode of combination meter.

NOTE: THE WHITE DIAGNOSTIC CONNECTOR AT THE FUSE-BOX UNDER THE INSTRUMENTAL PANNEL IS ELIMINATED.

Audio System

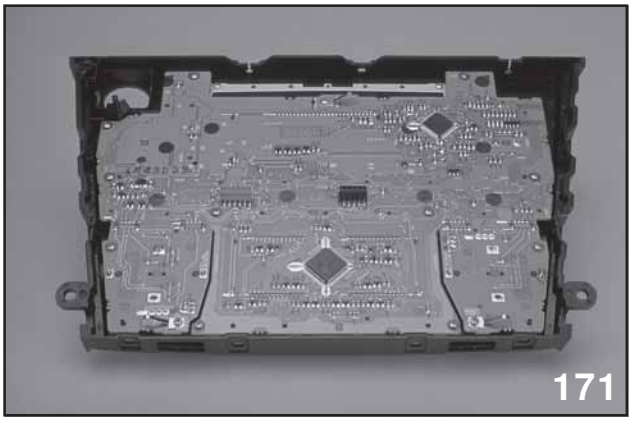
Beauty Shot

The 2005 Legacy and newer models are available with one of 3 types of audio packages. The owners manual provides detailed operating instructions for each type. The 3 types of audio packages are identified as type A, B or C. Each progressive letter providing a higher level of capabilities.



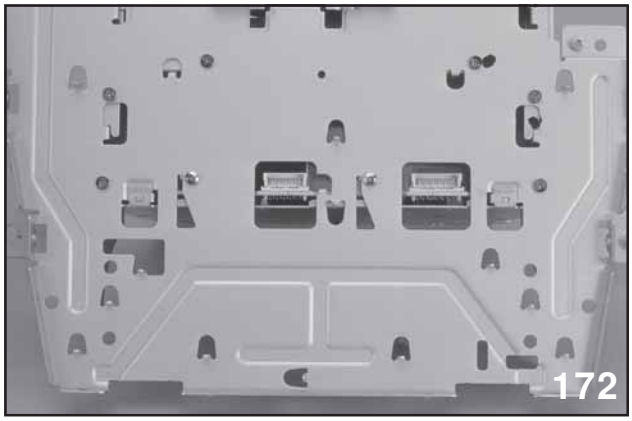
Rear View of Radio

All 3 types are controlled through the Audio/ HVAC control panel.



Rear View of Control Panel

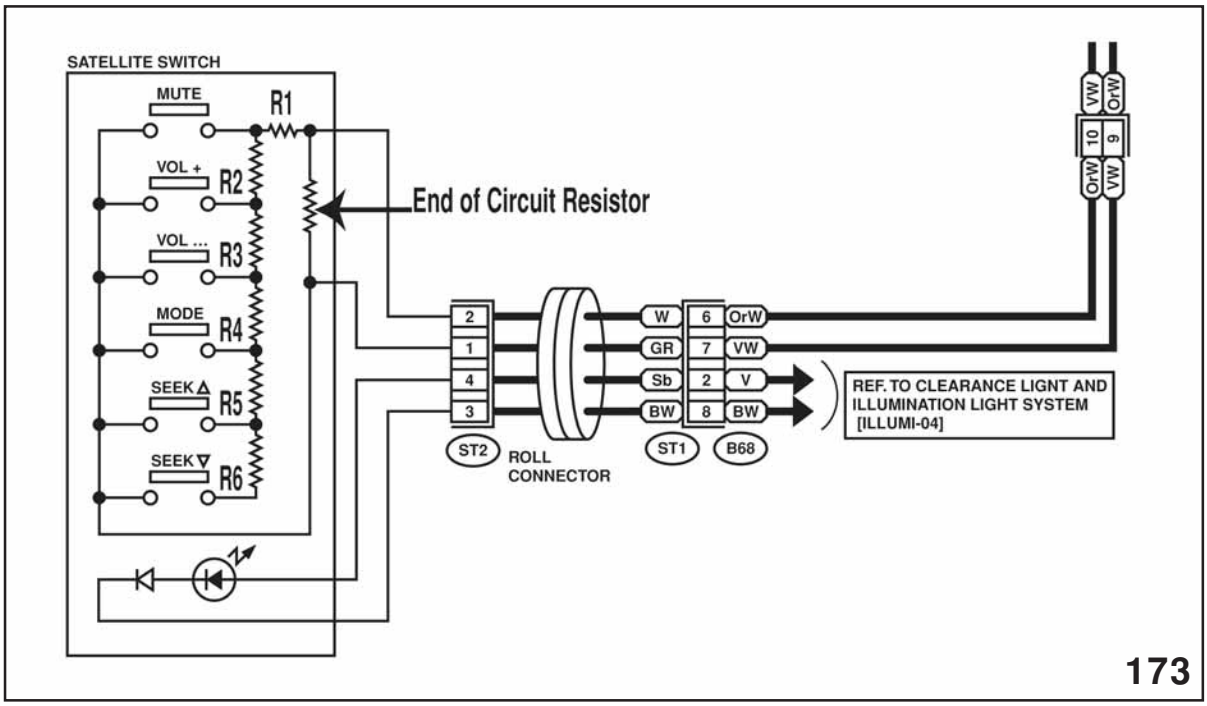
This panel carries the desired input signals from the driver to the audio unit.



Front View of Radio control Panel

The panel also carries the HVAC signals (Automatic A/C models) from the control panel, through the radio and out to the HVAC actuators. (Manual HVAC uses a cable for temperature control.)

B9 Tribeca Audio Wiring



Audio Wiring

Control	Total Circuit Resistance
Mute	22.3 Ω
Volume -	88.5 Ω
Volume+	192.2 Ω
Mode	335.5 Ω
Seek △	602 Ω
Seek ▽	1.142K Ω
End of Circuit Resistance	4.68K Ω

The satellite audio controls located on the steering wheel pad function by varying the resistance between the 2 wires that lead from the radio chassis to the satellite audio control assemble.

The "end of circuit resistor" will send a high resistance value (aprx. 4.6 k ohms) to the radio when no switches are closed maintaining the last set radio condition. Operating any of the switches creates a parallel circuit, effecting the total circuit resistance.

The different resistance values operated the radio and only one control signal can be sent to the radio at a time.

For example:

R4 = 360Ω End of circuit resistance=4680Ω

$$RT = \frac{R1 \times R2}{R1 + R2}$$

$$RT = \frac{4680 \times 360}{4680 + 360}$$

$$RT = \frac{1684800}{5040}$$

RT= 334.29

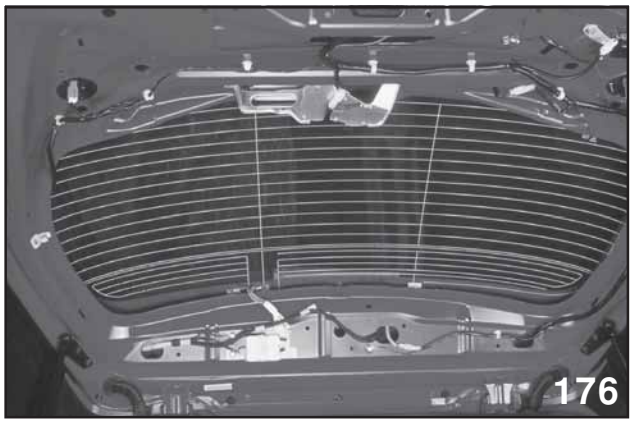
Left Remote Control

Type C audio packages are equipped with remote controls located on the steering wheel. The control on the left side provides mode changes. The modes will change from FM (one band of FM only) to AM and then to CD.

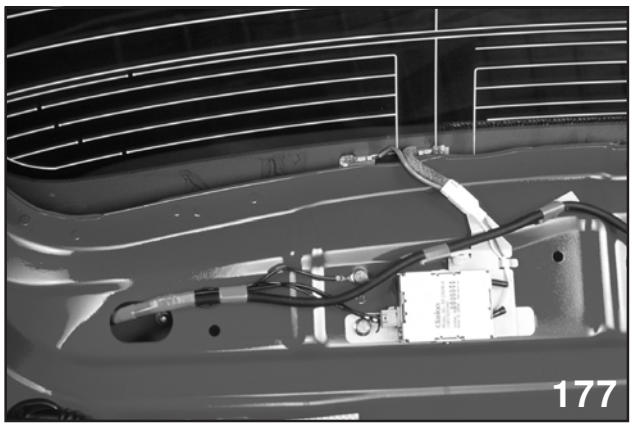
The up and down arrows allow for changes in stations and CD tracks. The remote controls will not provide scan functions. The mode switch will turn on the audio system to last function it was performing before it was turned off.

Right Remote Control

The remote control on the right side provides volume up, down and mute.

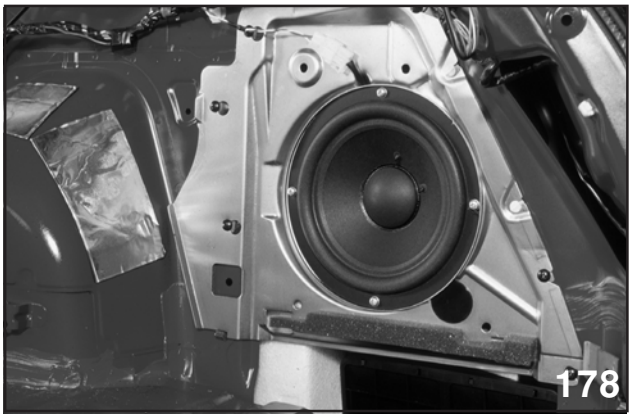


Rear Window



Amplifier

The antenna is located on the rear gate glass with the amplifier located under the gate trim.



Woofer

The C audio package also is equipped with a woofer speaker in the rear of the vehicle.

Trip Computer

Ambient Temperature

The Trip Computer performs 5 functions. The functions are changed by pressing the “display” button. The “bright” illumination control button when pushed brightens all Combination Meter displays including the displays of the Trip Computer, radio and HVAC. The radio/HVAC control panel and other illuminated controls will continue to be controlled by the main illumination control. The displays affected by the “bright” button will remain isolated from the main illumination control until the “bright” button is pushed again.

- Ambient temperature is displayed in Fahrenheit for American models.
- Ambient temperature is displayed in Celsius for Canadian models.

Current MPG

The current “MPG” indicates the miles per gallon currently being achieved by the present driving condition. The vehicle must be moving before the display will activate.

AVG MPG

The “AVG MPG” indicates the average miles per gallon determined by the fuel being injected and distance traveled in miles from the last time the respective Trip Meter was reset. The vehicle must travel at least one mile before a reading can displayed.

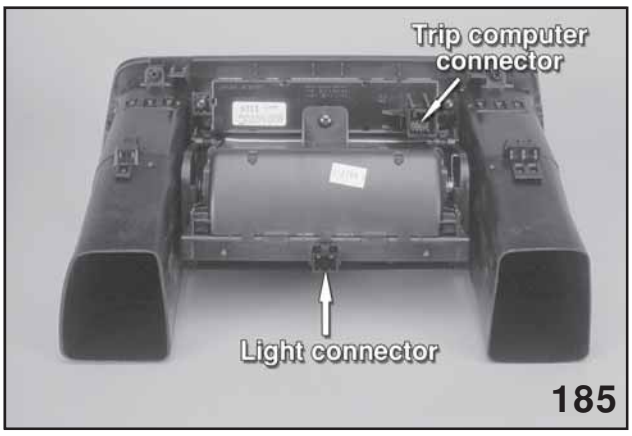
Pushing the Trip Meter stalk on the Combination Meter changes the display form "A" to "B".

Miles to Refuel

Miles to refuel indicates the estimated mileage that can be traveled on the remaining fuel. The illumination ring around the fuel gauge (GT models) will flash 4 times when the low fuel light is illuminated. The Trip Computer of all models will flash 1 time when the low fuel light is illuminated.

E/T

E/T is the estimated time that the vehicle has been operating since the last time the engine was started.



Back view of Trip computer

The Trip Computer is connected to the vehicle with a single 10 pin connector. Before Trip Computer removal an additional connector for the storage compartment light must also be disconnected.

Trip Meter-2007 Legacy

Trip Meter

NOTE: TRIP METER FUNCTIONS ARE NOW DISPLAYED ON THE ODOMETER AND CONTROLLED BY PRESSING THE TRIP METER STALK.

THE CLOCK ON THE TRIP METER IS SET TO 24 HOUR TIME AND CANNOT BE CHANGED.

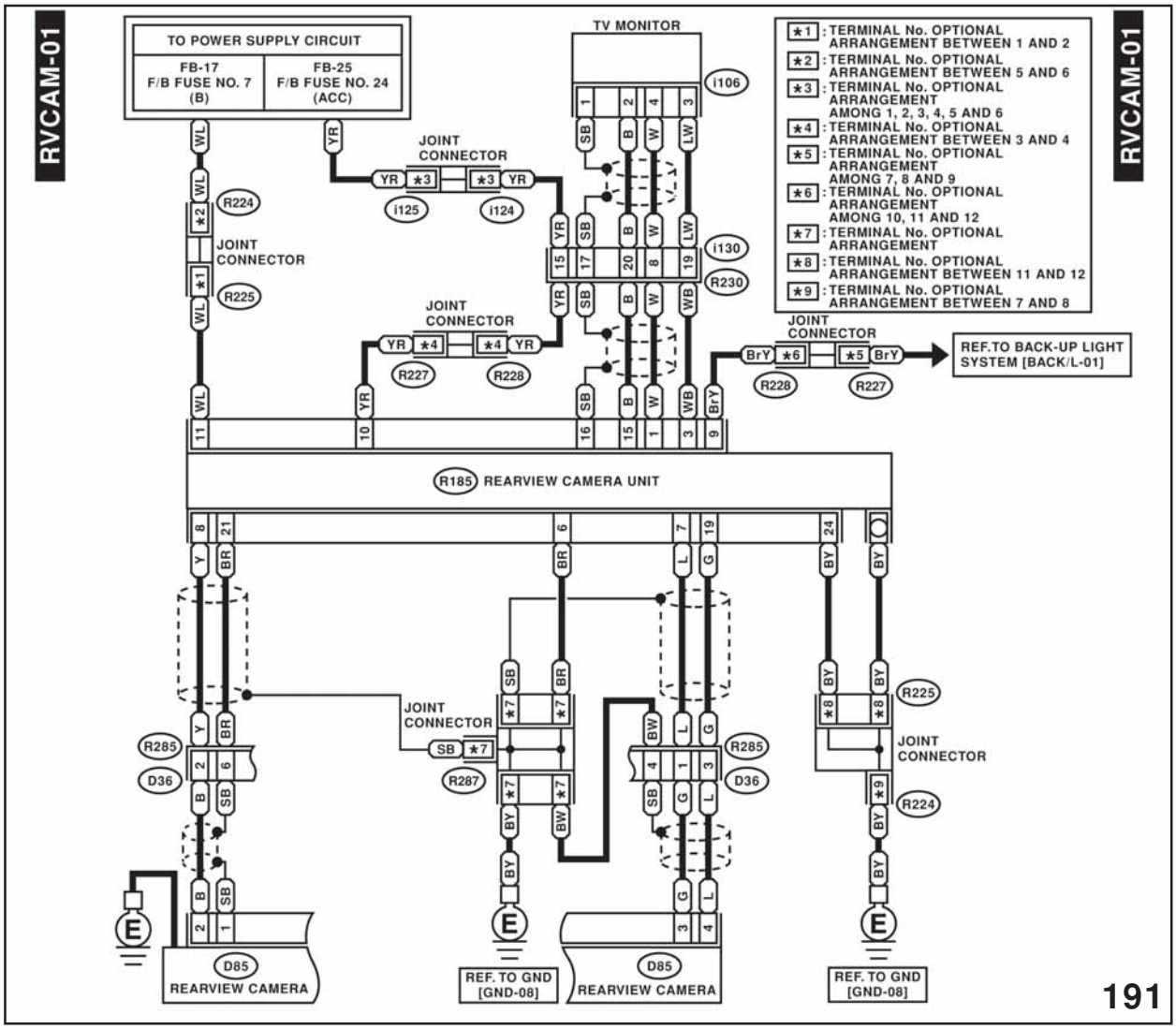
Rear Vision Camera

Rear Vision Camera on Back Gate

Rear View Image on LCD Screen

A rear vision camera is now standard on all 2007 navigation-equipped models. The system displays an image of behind the vehicle with reference lines to aid in backing up/parking. The image is shown on the high-resolution LCD screen only when the transmission is in reverse. This system will turn the LCD screen on when going into reverse even if the LCD screen has been turned off. This system is factory installed.

NOTES:

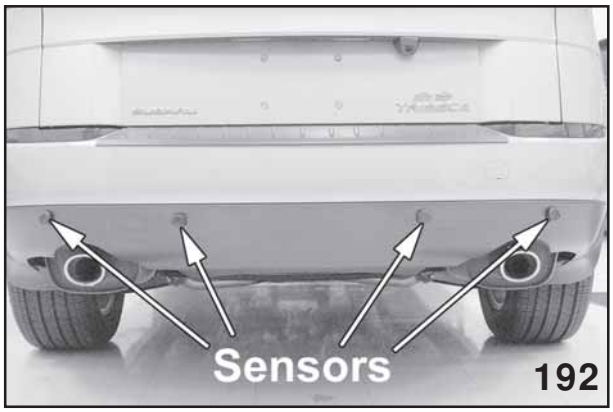


Rear View Camera Electrical Schematic

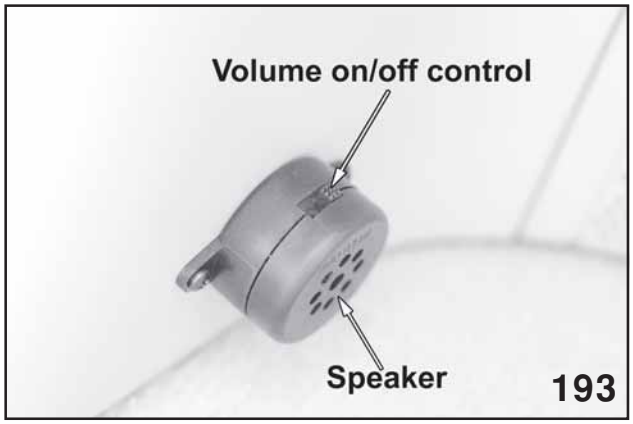
Back-up Sensor System

This Back-Up Sensor System is strictly a driver assistance device, and should not be relied upon as a substitute for safe driving practices. When driving in reverse always follow recommended safe driving guidelines from your state or local Department of Motor Vehicles regarding the engagement of reverse gear. To help prevent accidents, always use caution when driving in reverse by visually checking to ensure that your path is clear. When applicable, that may include conducting a visual check before you enter your vehicle. While driving in reverse, keep speeds under 5 MPH.

NOTE: THIS SYSTEM CAN BE INSTALLED ON 2006 MODEL YEAR VEHICLES.



Location of Sensors



(Speaker located on right rear trim panel)

Understanding Your Back-Up Sensor System's Audible Warning Zones

The Back-Up Sensor System emits and receives ultrasonic signals that are projected from the sensors mounted in the vehicle's rear bumper. As the signals reflect off of objects in the detection field, an audible warning tone will be heard inside the vehicle.

This warning tone alerts the driver to obstacles in the vehicle's path.
When the gearshift is put into reverse, the system will make one short 'beep' to verify system functionality. This alert serves multiple purposes:

1) Notification that the system is active and is scanning for objects in the detection field.
2) As a reminder that the vehicle is in reverse gear.
3) As an indication that the Back-Up Sensor System has performed a self-check.

NOTE: IF ADDITIONAL "QUICK BEEPS" ARE HEARD THE BACK-UP SENSOR SYSTEM MAY REQUIRE DIAGNOSIS. IF WARNING TONES CONTINUE AFTER REVERSE IS INITIALLY SELECTED, CHECK FOR OBSTACLES BEHIND THE VEHICLE.

The Back-Up Sensor System reverse scanning system will detect objects in three distinct "Zones", which correspond to the vehicle's distance from an object. When reversing towards an object, the Back-Up Sensor System audible alerts are as follows:

"Zone 1" - At a distance of approximately 48 to 72 inches the Back-Up Sensor System will begin to beep slowly indicating an obstacle is in the vehicle's path.

"Zone 2" - At a distance of approximately 24 to 48 inches, the Back-Up Sensor System will beep three times per second, indicating that an obstacle is in the vehicle's path.

"Zone 3" – If an object is within 24 inches of the vehicle's bumper a continuous warning tone will be heard.

NOTE: ALWAYS USE EXTREME CAUTION IN "ZONE 2" AND ALWAYS STOP WHEN A SOLID WARNING TONE INDICATING "ZONE 3" IS HEARD. IF A MOVING OBJECT ENTERS "ZONE 3", THE SYSTEM IS DESIGNED TO "LOCK" ONTO IT, MAKING THE "ZONE 3" TONE CONSTANT, UNTIL THE OBJECT MOVES TO A SAFE DISTANCE FROM "ZONE 3", (I.E., THE OBJECT MOVES 2 FEET OUTSIDE OF THE "ZONE 3" DETECTION AREA).

SITUATIONS WHERE OBSTACLES MAY NOT BE DETECTED OR WHICH MAY PROVIDE MOMENTARY DETECTION SIGNALS

The Back-Up Sensor System utilizes ultrasonic technology to locate objects in the vehicle's path when driving in reverse. Under some circumstances, however, an object may not be detected, so always exercise extreme caution when driving in reverse. Look behind the vehicle and maintain speeds of less than 5 MPH. Inclement weather may reduce performance or cause intermittent detection of rain or snow. "

"The back up sensors must be kept clean for optimum performance. Dirt, snow or ice accumulations may cause reduced performance."

A small object, under your bumper or too close to the vehicle may not be detected due to the angle of the sensor's signal.

When driving in reverse down a steep slope or driveway, gravel and/or the road surface may cause momentary detection signals due to the sensor's following the sloping angle of the vehicle.

In general, reversing at an angle towards a partial wall or other large flat surface may refract ultrasonic signals, causing the object not to be detected. Driving in reverse on loose gravel, rough surfaces and potholes may produce intermittent detection due to signal bouncing off of refractive surfaces behind the vehicle. Entering or exiting a garage may result in a brief detection signal as the vehicle passes through the doorway.

If driving in reverse towards a 90-degree angle, such as a corner of a wall or pillar, sensor detection pattern will refract until the vehicle is close enough to receive a signal back from corners. In such situations the vehicle could be very close to an object before it is detected.

Adjusting the Back-Up Sensor System Speaker

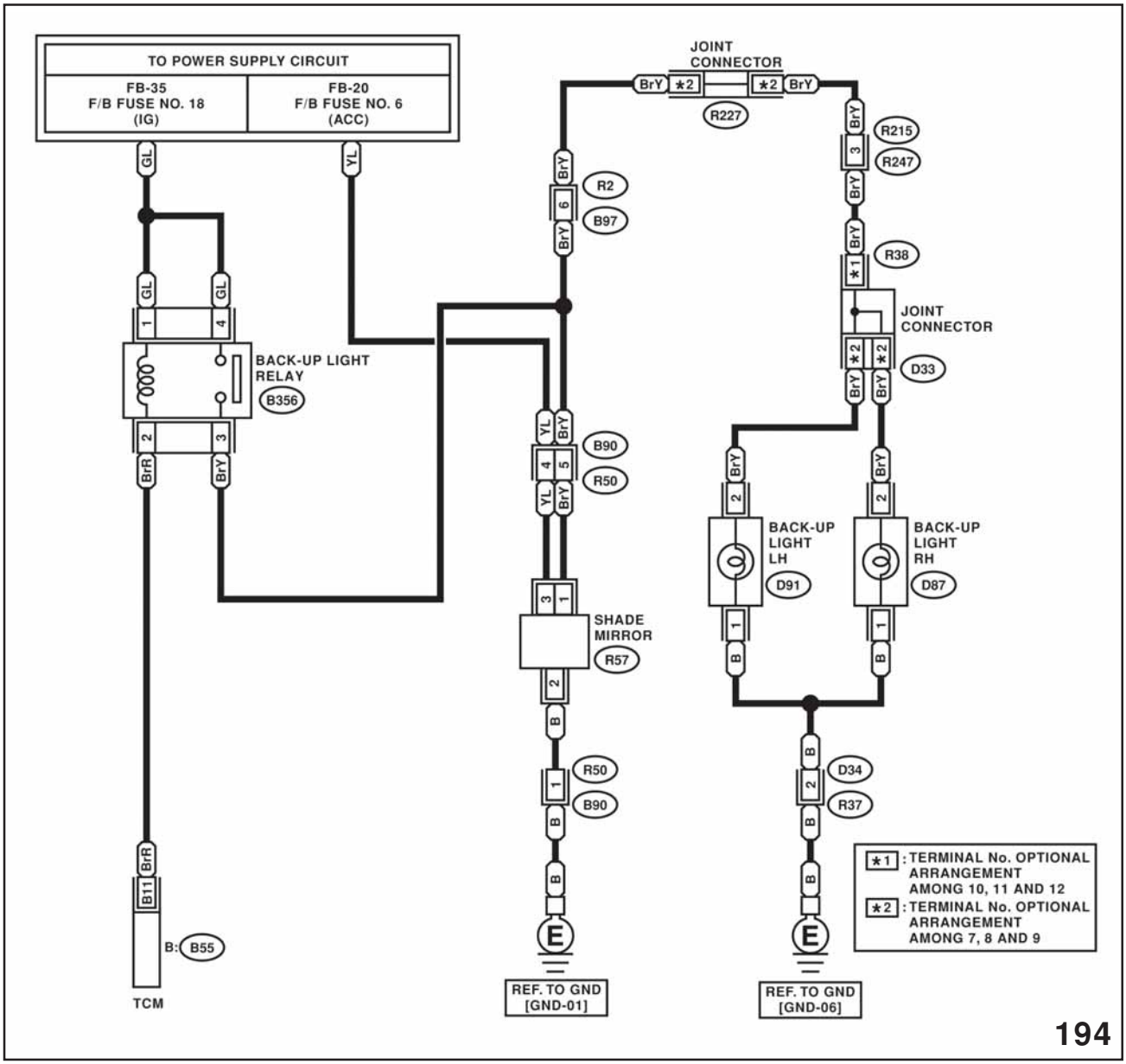
The Back-Up Sensor System comes equipped with an adjustable warning indication speaker located in the rear passenger side of the vehicle.

The speaker has three controllable audio settings:

1) HI Volume setting: For individuals desiring a loud warning tone.
2) LOW Volume Setting: For individuals desiring a soft warning tone.
3) OFF: The speaker should be turned off when the vehicle is towing with a trailer hitch, a ball mount is installed, or when a hitch-mounted Bike Carrier is used. In all other instances, the speaker should remain on.

Adjusting the volume setting is easy. A fingertip slide switch is accessible and used to select the desired setting.

This system is port or dealer installed. Power for the back up sensor system is supplied by the power for the reverse light circuit.



Back up Sensor Wiring Schematic

Back Up Sensor Diagnostics

Test the Back-Up Sensor System

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

Back-up Sensor System (Diagnostics)

Section 0 - System Function Check:

NOTE: In order to perform the system function check, the vehicle shall be parked in a level open area with no objects behind the vehicle for a minimum of ten feet. The parking brake must be applied and the trailer hitch ball mount must be removed.

	Step	Check	Yes	No
1	Active the vehicle parking brake. Turn the key to the run position. Do not start the vehicle. Step on the brake and shift the vehicle into reverse.	Did the system give a single beep?	Proceed to Step 2.	Proceed to Step 6.
2	Stand in front of the outermost sensor on the driver's side.	Does the system emit a constant tone	Proceed to Step 3.	Proceed to Step 6.
3	Stand in front of the driver's side center sensor.	Does the system emit a constant tone.	Proceed to Step 4.	Proceed to Step 6.
4	Stand in front of the passenger's side outermost sensor.	Does the system emit a constant tone?	Proceed to Step 5.	Proceed to Step 6.
5	Stand in front of the passenger's side center sensor.	Does the system emit a constant tone?	System Works. End Diagnostic Check	Proceed to Step 6.
6	Activate the vehicle parking brake. Turn the key to the run position. Do not start the vehicle. Step on the brake and shift the vehicle into reverse.	Does the system emit a multiple beeps?	Proceed to Section 3 (Multiple Beeps).	Proceed to Step 7.
7	Activate the vehicle parking brake. Turn the key to the run position. Do not start the vehicle. Step on the brake and shift the vehicle into reverse.	Does the system emit multiple beeps?	Proceed to Section 2 (Multiple Beeps).	Proceed to Step 6.
8	Active the vehicle parking brake. Turn the key to the run position. Do not start the vehicle. Step on the brake and shift the vehicle into reverse	Is the system silent?	Proceed to Section 1 (No Sound).	Return to Step 1.

NOTE: THE NEXT 8 PAGES DESCRIBE THE DIAGNOSTICS OF THE BACK UP SENSOR SYSTEM. THIS INFORMATION IS NOT INCLUDED IN THE SERVICE MANUAL.

Test the Back-Up Sensor System

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

Back-up Sensor System (Diagnostics)

Section 1 - No sound when system is turned ON.

NOTE: In order to perform the system function check, the vehicle shall be parked in a level open area with no objects behind the vehicle for a minimum of ten feet. The parking brake must be applied and the trailer hitch ball mount must be removed.

	Step	Check	Yes	No
1	Verify that the speaker switch is either in the "HI" or "LO" position.	determine if the speaker switch is either in the "HI" or "LO" position.	Proceed to Step 3.	Move the speaker switch from the "OFF position to either in the "HI" or "LO" position. Proceed to Step 2.
2	Turn the key to the run position. Press the vehicle parking brake and shift the vehicle into reverse gear. If the vehicle is already in reverse gear, shift the vehicle into park then to reverse.	Does the system emit a single beep?	continue System Function Check. (Section 0)	Proceed to Step 3.
3	Check that the 2-pin speaker connector is plugged into the 2-pin connector on the main power harness/ harness?	Is the 2-pin connector plugged into the 2-pin connector on the main	Proceed to Step 5.	Plug the 2-pin speaker connector into the 2-pin connector on the main power harness. Proceed to Step 4.
4	Turn the key to the run position. Press the vehicle parking brake and shift the vehicle into reverse gear. If the vehicle is already in reverse gear, shift the vehicle into park then to reverse.	Does the system emit a single beep?	Continue System Function Check. (Section 0)	Proceed to Step 5.
5	Disconnect the 2-pin speaker connector. apply 12 VDC to Pin 1 (green) terminal and Ground to Pin 2 (blue)	Did speaker emit a Constant tone?	Proceed to Step 7.	Replace a Speaker. Proceed to Step 6.
6	Turn the key to the run position. Press the vehicle parking brake and shift the vehicle into reverse gear. If the vehicle is already in reverse gear, shift the vehicle into park then to reverse.	Does the system emit a single beep?	Continue System. Function Check. (Section 0)	Proceed to Step 7.
7	Verify that the 4-pin connector on the main power harness is plugged into the 4-pin connector on the control module at "PWBZ".	Is the 4-pin connector on the main power harness plugged into the 4-pin connector on the control module at "PWBZ"?	Proceed to Step 9.	Plug the 4-pin connector on the main power harness into the 4-pin connector on the control module marked "PWBZ". Proceed to Step 8.
8	Turn the key to the Run position. Press the vehicle parking brake and shift the vehicle into reverse gear. If the vehicle is already in reverse gear, shift the vehicle into park then to reverse.	Does the system emit a single beep?	Continue system Function Check. (Section 0)	Proceed to Step 9
9	Verify that the 2 Amp fuse is not opened on the main power harness.	Is the 2 Amp good?	Proceed to Step 11.	Replace the 2 Amp fuse on the main power harness. Proceed to Step 10.
10	Turn the key to the run position. Press the vehicle parking brake and shift the vehicle into reverse gear. If the vehicle is already in to reverse.	Does the system emit a single beep?	Continue System Function Check. (Section 0)	Proceed to Step 11.

Test the Back-Up Sensor System

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

Back-up Sensor System (Diagnostics)

Section 1 - No sound when system is turned ON. (countinued)

NOTE: In order to perform the system function check, the vehicle shall be parked in a level open area with no objects behind the vehicle for a minimum of ten feet. The parking brake must be applied and the trailer hitch ball mount must be removed.

	Step	Check	Yes	No
11	Remove the 4-pin connectior on the control module and measure the input voltage between Pins 3 and 4 of the main connector. Was the input voltage +10 VDC or greater?	Is the voltage measured across pins 3 & 4 + 10 VDC or greater?	Proceed to Step 13	Check the Posi-Tap ® Connection. Proceed to Step 12.
12	Turn the key to the run position. Press the vehicle parking brake and shift the vehicle into reverse gear. If the vehicle is already in reverse gear, shift the vehicle into park then to reverse.	Does the sytstem emit a single beep?	Continue system Function check. (Section 0)	Proceed to Step 13.
13	Disconnect the 2-pin speaker connector. Place an object in fron of the sensors Measure the voltage between Pin 1 (green) and Pin 2 (blue).	Was the measured voltage + 10VDC or greater?	Replace Main Power Harness. Proceed to Step 14.	Replace a Control Module. Proceed to Step 14.
14	Turn the key to the run position. Press the vehicle parking brake and shift the vehicle into reverse gear. If the vehicle is already in reverse gear, shift the vehicle into park then to reverse.	Does the system emit a single beep?	Continue System Function Check. (Section 0)	

Test the Back-Up Sensor System

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

Back-up Sensor System (Diagnostics)

Section 2 - The system emits multiple beeps when shifted into reverse.

NOTE: In order to perform the system function check, the vehicle shall be parked in a level open area with no objects behind the vehicle for a minimum of ten feet. The parking brake must be applied and the trailer hitch ball mount must be removed.

	Step	Check	Yes	No
1	Active the vehicle parking brake. Turn the key to the run position. Do not start the engine. Step on the brake and shift the vehicle into reverse.	Did the system give a single beep?	Continue system Function Check. (Section 0)	Proceed to Step 2.
2	Activate the vehicle parking brake. Turn the key to the run position. Do not start the engine. Step on the brake and shift the vehicle into reverse.	Does the system emit multiple beeps?	The number of beeps relates to the number of problem sensors. Proceed to Step 3.	Proceed to Section 1 (No sound when system is turned on).
3	Verify that all sensors are connected into the correct connectors on the Control Module.	Check that all sensors are properly connected to the Control Module.	Proceed to Step 4.	Connect sensor(s) into the correct connector(s) on the Control Module. Proceed to Step 1.
4	Determine the number of problem sensors.	When activated does the system emit multiple beeps?	The number of beeps indicates the number of problem sensors. If the system emits 2 beeps, proceed to Step 5. If the system emits 3 beeps, proceed to Step 10. If the system emits 4 beeps, proceed to Step 12. If the system emits 5 beeps, proceed to Step 16.	Continue System Function Check. (Section 0)
5	The system emits two beeps when activated. determine the sensor that is not communicating properly with the control module.	Stand behind the vehicle and place an object behind each sensor. The malfunctioning sensor will not emit an audible tone.	If the L sensor is the suspect sensor, proceed to Step 6. If the CL sensor is the suspect sensor, proceed to step 7. If the CR sensor is the suspect sensor, proceed to Step 8. If the R sensor is the suspect sensor, Proceed to step 9.	The system emits a solid tone after an object is placed in front of each sensor. The system is functioning properly, continue system function check. (Section 0)

Test the Back-Up Sensor System

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

Back-up Sensor System (Diagnostics)

Section 2 - The system emits multiple beeps when shifted into reverse. (continued)

NOTE: In order to perform the system function check, the vehicle shall be parked in a level open area with no objects behind the vehicle for a minimum of ten feet. The parking brake must be applied and the trailer hitch ball mount must be removed.

	Step	Check	Yes	No
6	Sensor L is the suspect sensor. Unplug Sensors L & R from the control module. Plug the sensor marked L into the control module connector marked R. Plug the sensor marked R into the control module connector marked L.	Recycle power to the system. Stand behind the vehicle and place an object behind sensor L and then behind sensor R. Does the system emit an audible tone when an object is placed behind the sensor in position R and does not emit an audible tone when an object is placed behind the sensor in position L?	Sensor L has malfunctioned. Return Sensor R to its correct position on the control module. Replace Sensor L with a new sensor. Proceed to step 1 to retest the system with the new sensor installed.	The control module has malfunctioned.. Replace the control module. Proceed to step 1 retest the system with the new control module installed.
7	Sensor CL is the suspect sensor. Unplug Sensors CL & CR from the control module. Plug the sensor marked CL into the control module connector marked CR. Plug the sensor marked CR into the control module connector marked CL.	Recycle power to the system. Stand behind the vehicle and place an object behind sensor CL and then behind sensor CR. Does the system emit an audible tone when an object is placed behind the sensor in position CR and does not emit an audible tone when an object is placed behind the sensor in position CL?	Sensor CL has malfunctioned. Return Sensor CR to its correct position on the control module. Replace Sensor CL with a new sensor. Proceed to step 1 to restart the system with the new sensor installed.	The control module has malfunctioned. Replace the control module. Proceed to step 1 to retest the system with the new control module installed.
8	Sensor CR is the suspect sensor. Unplug Sensors CR & CL from the control module. Plug the sensor marked CR into the control module connector marked CL. Plug the sensor marked CL into the control module connector marked CR.	Recycle power to the system. Stand behind the vehicle and place an object behind sensor CR and then behind sensor CL. Does the system emit an audible tone when an object is placed behind the sensor in position CL and does not emit an audible one when an object is placed behind the sensor in position CR?	Sensor CR has malfunctioned. Return Sensor CL to its correct position on the control module. Replace Sensor CR with a new sensor. Proceed to step 1 to retest the system with the new sensor installed.	The control module has malfunctioned. Replace the control module. Proceed to step 1 to retest the system with the new control module installed.

Test the Back-Up Sensor System

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

Back-up Sensor System (Diagnostics)

Section 2 - The system emits multiple beeps when shifted into reverse. (continued)

NOTE: In order to perform the system function check, the vehicle shall be parked in a level open area with no objects behind the vehicle for a minimum of ten feet. The parking brake must be applied and the trailer hitch ball mount must be removed.

	Step	Check	Yes	No
9	Sensor R is the suspect sensor. Unplug Sensors R & L from the control module. Plug the sensor marked R into the control module connector marked L. Plug the sensor marked L into the control module connector marked R.	Recycle power to the system. Stand behind the vehicle and place an object behind sensor R and then behind sensor L. Does the system emit an audible tone when an object is placed behind the sensor in position L and does not emit an audible tone when an object is placed behind the sensor in position R?	Sensor R has malfunctioned. Return Sensor L to its correct position on the control module. Replace Sensor R with a new sensor. Proceed to step 1 to retest the system with the new sensor installed	The control module has malfunctioned. Replace the control module. Proceed to step 1 retest the system with the new control module installed.
10	The system emits three beeps when activated. The three beeps indicate that two sensors may not be working properly. Determine the sensors that are not communicating properly with the control module.	Stand behind each sensor. The malfunctioning sensors will not emit an audible tone.	Two sensors were found not emitting an audible tone when an object was placed in front of them. Proceed to step 11.	The system emits a solid tone after an object is placed in front of each sensor. The system is functioning properly, continue system function check. (Section 0)
11	Unplug one of the non-working sensors from the control module. Unplug one of the working sensors from the control module. Connect the first sensor into the second disconnected sensor connector. Connect the second sensor into the first disconnected sensor connector.	Recycle power to the system. Stand behind the swapped sensors. Does the system emit an audible tone when an object is placed behind the sensor in position 1 and does not emit an audible tone when an object is placed behind the sensor in position 2?	Sensor 1 has malfunctioned. Return Sensor 2 to its correct position on the control module. Replace Sensor 1 with a new sensor. Proceed to step 1 to retest the system with the new sensor installed.	The control module has malfunctioned. Replace the control module. Proceed to step 1 to retest the system with the new control module installed.
12	The system emits four beeps when activated. The four beeps indicate that three sensors may not be working properly. Determine the sensors that are not communicating properly with the control module.	Stand behind sensor. The malfunctioning sensors will not emit an audible tone.	Three sensors were found not emitting an audible tone when an object was placed in front of them The one sensor that emitted an audible tone shall be referred to as Sensor 1. Proceed to Step 13.	The system emits a solid tone after an object is placed in front of each sensor. The system is functioning properly, continue system function check. (Section 0)

Test the Back-Up Sensor System

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

Back-up Sensor System (Diagnostics)

Section 2 - The system emits multiple beeps when shifted into reverse. (continued)

NOTE: In order to perform the system function check, the vehicle shall be parked in a level open area with no objects behind the vehicle for a minimum of ten feet. The parking brake must be applied and the trailer hitch ball mount must be removed.

	Step	Check	Yes	No
13	Disconnect all sensor connectors from the control module. Plug Sensor 1 into the first non-working connector on the control module.	Recycle power to the system. Stand behind the vehicle and place an object in front of Sensor 1. Does the system emit an audible tone when an object is placed in front to Sensor 1?	The Sensor has malfunctioned. Reconnect Sensor 1 to its proper location and replace the malfunctioning sensor with a new one. Proceed to step 14.	The control module has malfunctioned. Replace the control module. Proceed to step 1 retest the system with the new control module installed.
14	Plug Sensor 1 into the second non-working connector on the control module.	Recycle power to the system. Stand behind the vehicle and place an object in front of Sensor 1. Does the system emit an audible tone when an object is placed in front of Sensor 1?	The sensor has malfunctioned. Reconnect sensor 1 to its roper location and replace the malfunctioning sensor with a new one. Proceed to step 15.	The control module has malfunctioned. Replace the control module. Proceed to step 1 to retest the system with the new control module installed.
15	Plug Sensor 1 into the third non-working connector on the control module.	Recycle power to the system. Stand behind the vehicle and place an object in front of Sensor 1. Does the system emit an audible tone when an object is placed in front of Sensor 1?	The sensor has malfunctioned. reconnect sensor 1 to its proper location and replace the malfunctioning sensor with a new one. Proceed to step 1.	The control module has malfunctioned. Replace the control module. Proceed to step 1 to retest the system with the new control module installed.
16	When activated, the system emits 5 beeps. The five beeps indicate that there are problems with all four sensors of the system.	The control module may be the cause of the system malfunction. Replace the control module and connect all sensors to the correct connectors. Power up the system and verify that the system no longer emits 5 beeps.	The system no longer emits 5 beeps, indicating that the control module malfunctioned. Proceed to step 1.	The system still emits 5 beeps after the control module was replaced and all sensors were connected. All of the sensors are malfunctioning. Replace all sensors and proceed to step 1.

Test the Back-Up Sensor System

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

Back-up Sensor System (Diagnostics)

Section 3 - The system emits constant tone

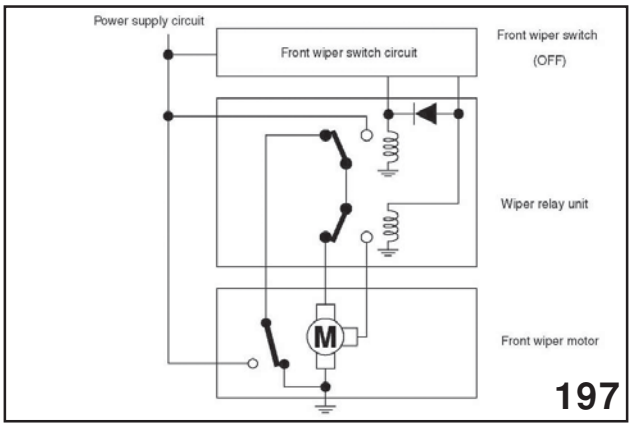
NOTE: In order to perform the system function check, the vehicle shall be parked in a level open area with no objects behind the vehicle for a minimum of ten feet. The parking brake must be applied and the trailer hitch ball mount must be removed.

	Step	Check	Yes	No
1	Activate the vehicle parking brake. Turn the key to the run position. Do not start the engine. Step on the brake and shift the vehicle into reverse.	Does the system emit a constant tone?	Proceed to Step 2. Check. (Section 0)	Continue System Function
2	Verify that there are no objects on the ground behind the vehicle.	Are there objects on the ground behind the vehicle?	Remove objects. Proceed to Step 1.	Proceed to Step 3.
3	Check if the vehicle has a trailer hitch.	Does the vehicle have a trailer hitch with anything installed (i.e. bike rack trailer adapter, ball mount etc.)	The trailer hitch attachment is causing the system to emit a constant tone. The user should turn the speaker off in this condition or remove the attachment.	The vehicle does not have a trailer hitch or an attachments. Replace the control module. proceed to Step 1.

NOTE: On vehicles equipped with a trailer hitch, the ball mount assembly should be stowed in the vehicle when unused.

Windshield Wiper Relay

Front windshield

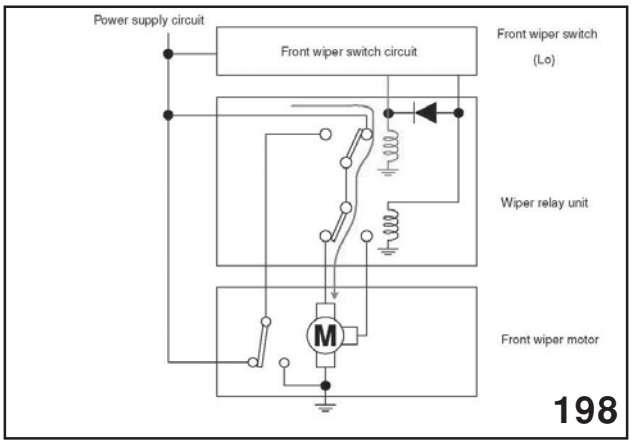


Front Windshield Relay

A front windshield wiper relay has been added to accept large electrical current from higher drive torque of wiper motor (current fed directly to wiper switch until '05 Legacy)

The relay is built with 2 contact points and 2 relay coils for high/low speed wiper operation.

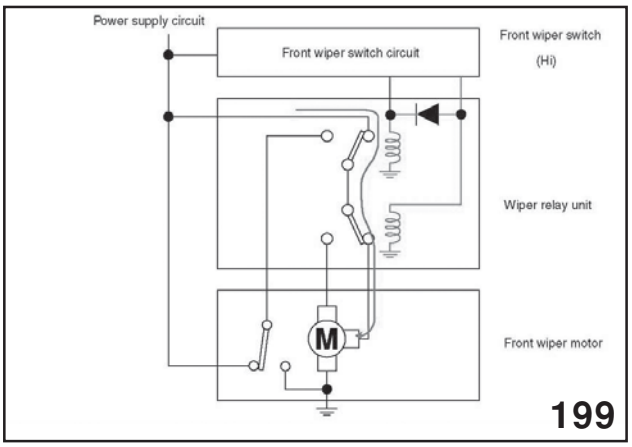
Low speed operation:



Low Speed Operation

- Current is fed to one of relay coils from wiper switch, closing contact point to allow drive current to go through low speed terminal of wiper motor. Wiper operates in low speed mode.

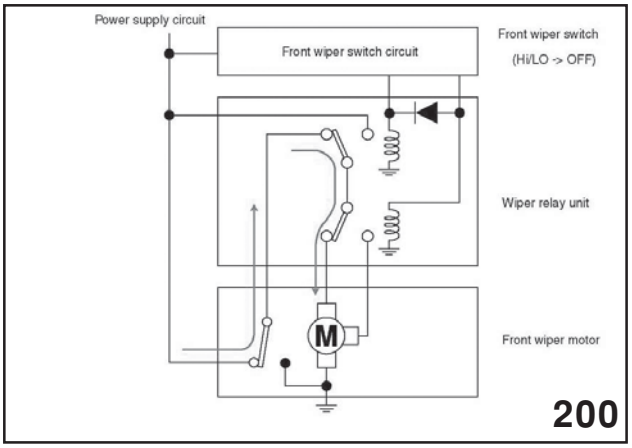
High-speed operation:



High Speed Operation

- Current is fed to both relay coils from wiper switch, closing second contact point to switch circuit to high speed terminal of wiper motor. The wiper operates in high-speed mode.

Switch off action:



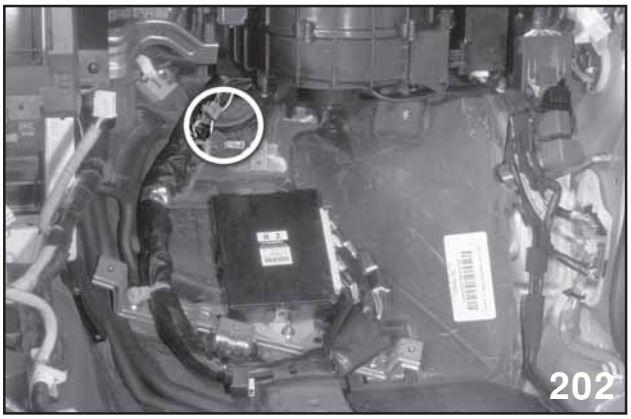
Switch Off Operation

- Wiper switch shuts off current to both relay coils, switching both contact points off/low side. Until wiper returns to correct stowed position, auto stop switch in wiper motor temporarily feeds current to wiper motor.

Enhancement for vehicle delivery

Fuse Box

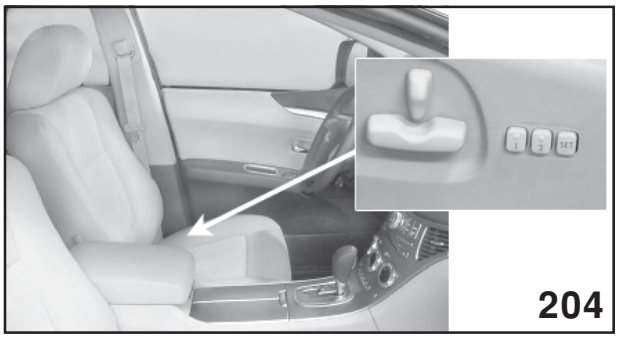
An enhancement for vehicle delivery is the function of the ignition key lock solenoid deactivation circuit.



ECM

With the inspection mode connectors connected and the back up power supply fuse out (PDI fuse), the key lock solenoid will stay off. This will allow the ignition to be off and the key removed from the vehicle during transportation when the transmission is in neutral.

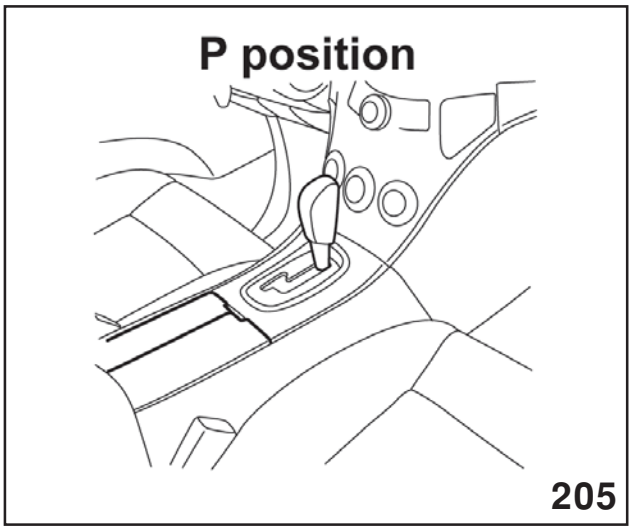
2007 and Newer Power Seat Memory Calibration Procedure



Power Seat Buttons

CALIBRATION PROCEDURE

If the seat is removed or replace with a new one, Memory Power Seat System will need to be recalibrated.

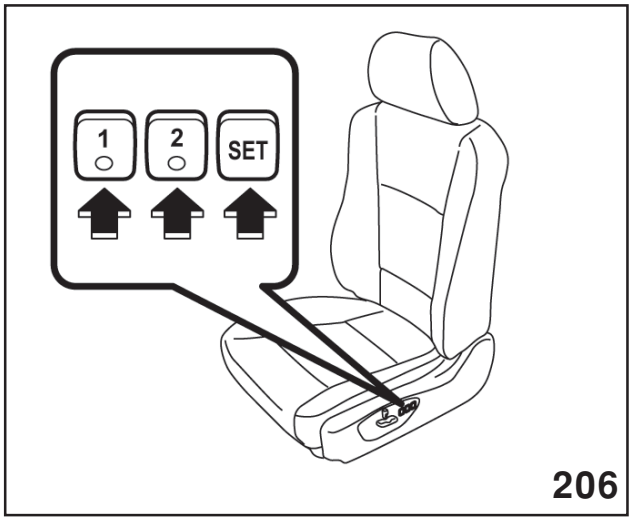


P Position

1. With the transmission selector lever in the “P” position.
2. Press and hold the SEATBACK switch to the upright MOST position until the beep sounds once.
3. Press and hold the SLIDE switch to rear MOST position until the beep sounds once.

4. Press and hold the TILT switch to lower MOST position until the beep sounds once.
5. Press and hold the LIFTER switch to lower MOST position until the beep sounds once.
6. When you release the LIFTER switch, the beep sounds three times (OK signal).

Driver's Seat Memory Function



Location of Buttons

Two seat positions can be registered. Register the seat position with button “1” or “2” and retrieve the seat position by pressing either button.

The following seat positions can be registered:

Forward/backward position of the seat

Angle of seatback

Angle of seat cushion

Height of seat

Registration of seat position:

1. With the transmission selector lever in the “P” position, adjust the seat position.
2. While pressing the “SET” button, press the desired button “1” or “2”.
3. The chime sounds once, and the seat position is registered.

Never retrieve the seat position while driving to avoid the possibility of loss of vehicle control and or personal injury.

Perform the seat position retrieval before driving. Be sure to confirm that the selector lever position is in the “P” position. Do not drive until the retrieval of the seat position is complete.

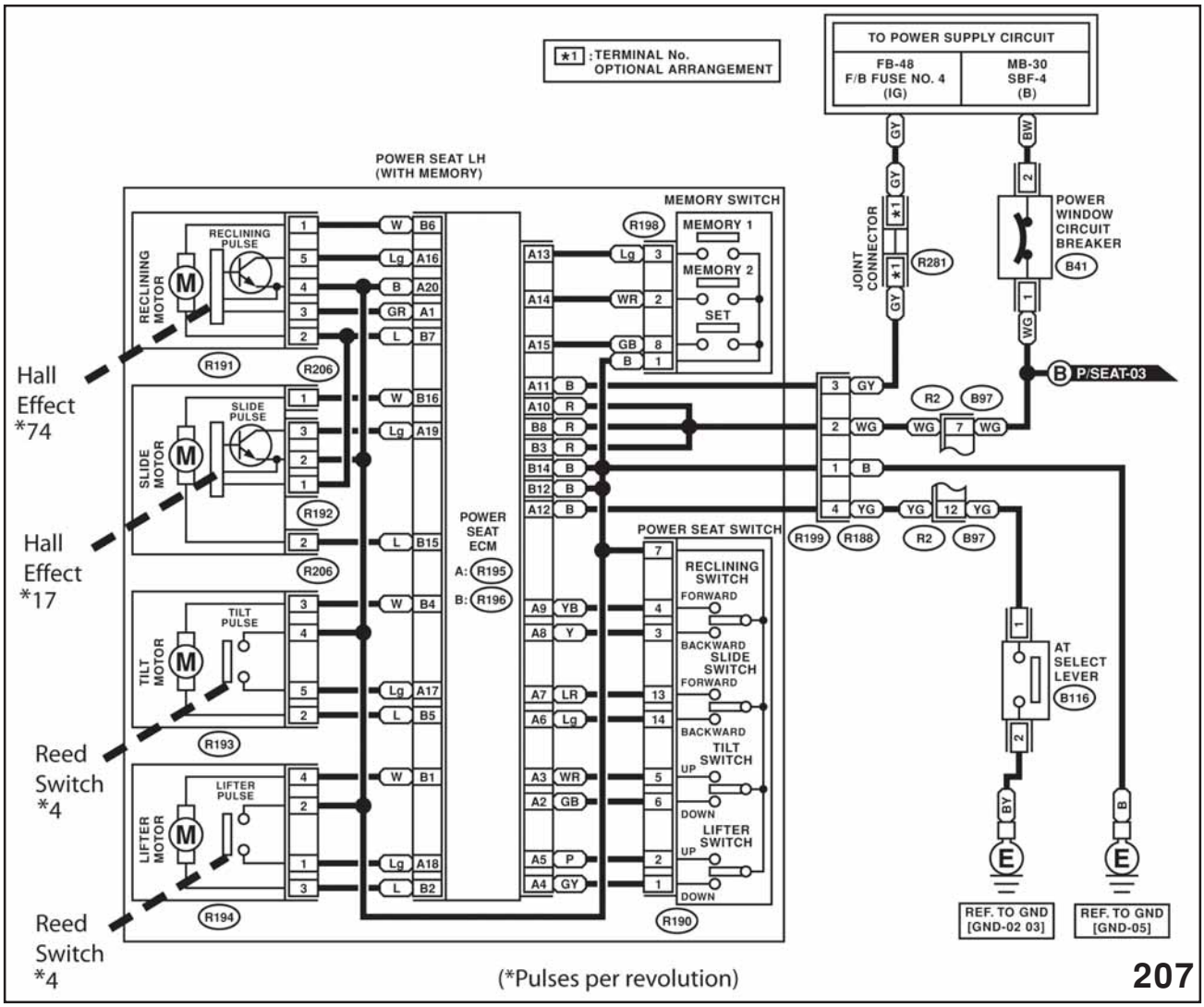
When retrieving a registered seat position, make sure the hands, feet and possessions of rear seat passengers are clear of the seat adjusting mechanism.

When any trouble or a malfunction occurs during the retrieval of the seat position, stop the retrieval of the seat position using any of the control switches for manual adjustment, seat memory set button, seat memory registered button 1 or 2.

1. With the transmission selector lever in the “P” position, press the desired button “1” or “2”.
2. The chime sounds once and the seat moves to the registered position.
3. When the seat moves to the registered position, the chime sounds twice.

NOTE: IF A NEW POSITION IS REGISTERED FOR THE SAME BUTTON, THE PREVIOUS SEAT POSITION IS DELETED.

EVEN IF THE BATTERY IS DISCONNECTED, THE REGISTERED SEAT POSITION IS NOT DELETED.



Wiring Schematic

The reclining and slide motors are equipped with hall effect sensors and the tilt and lifter motors are equipped with reed switches.

These sensors count the magnetic pulses created during operation and determine seat position during setting of the memory or when returning to a previous memorized position.

2003 Legacy OnStar

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

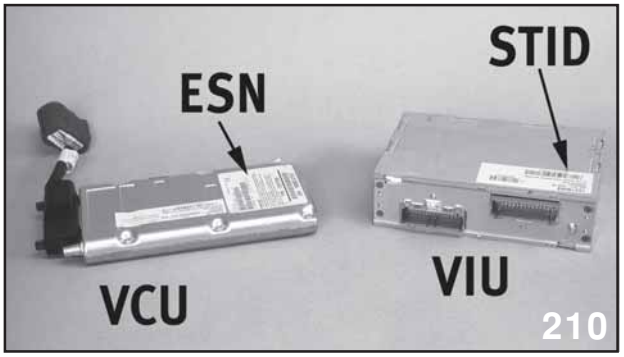
Radio

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



VCU / VIU

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

Three Button Control Module

Microphone

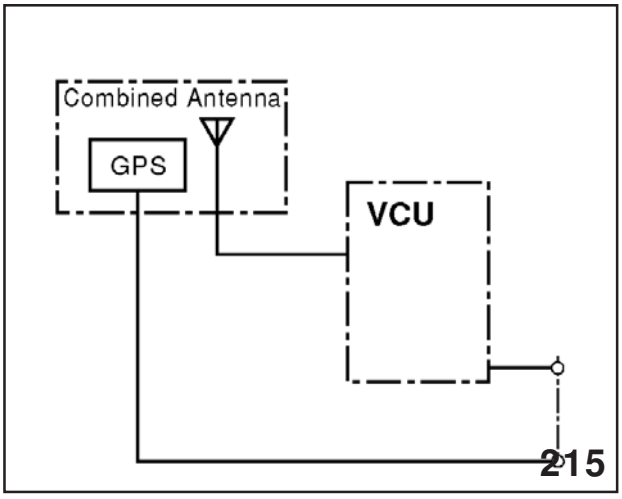
Antenna

Cellular antenna and Global Positioning System (GPS) antenna.

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.

Three Button

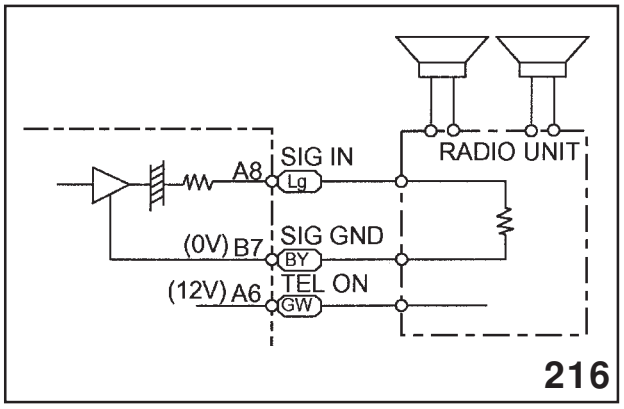
The 3 Button Module provides the input from the driver to make a cellular call, receive a cellular call, and end a cellular call. The 3 Button Module is also equipped with a 2 color led that indicates trouble with the OnStar system. Red illumination indicates a present problem while green illumination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



VCU (Artwork)

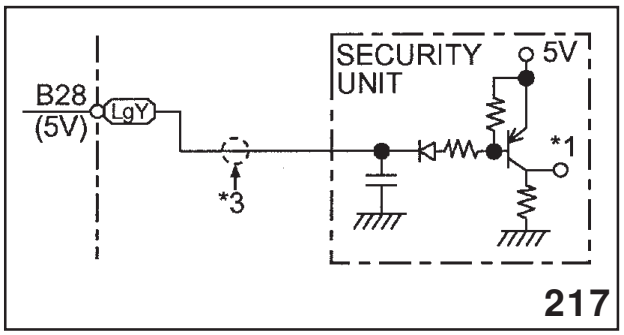
The VCU is the cell phone unit of the vehicle. It is connected to the combined cellular / GPS antenna and the VIU.

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



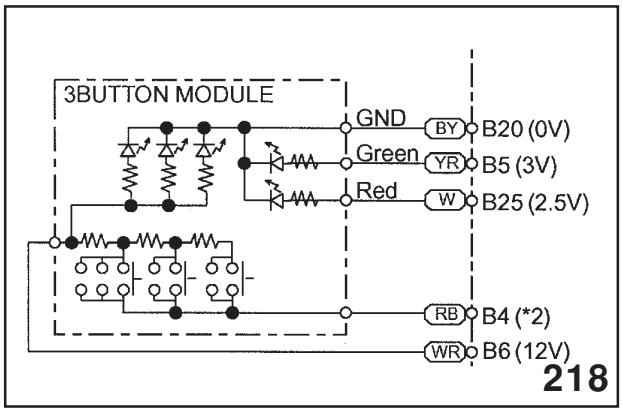
Radio (Artwork)

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.



Security (Artwork)

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

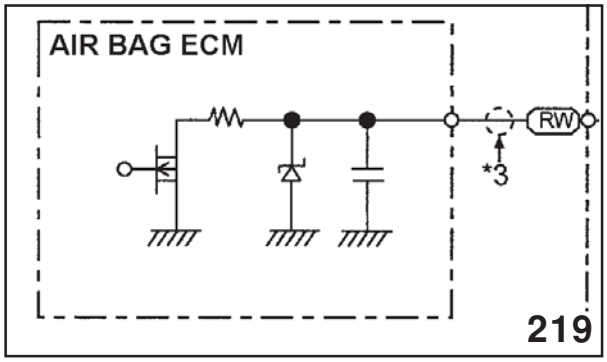


Three Button (Artwork)

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.

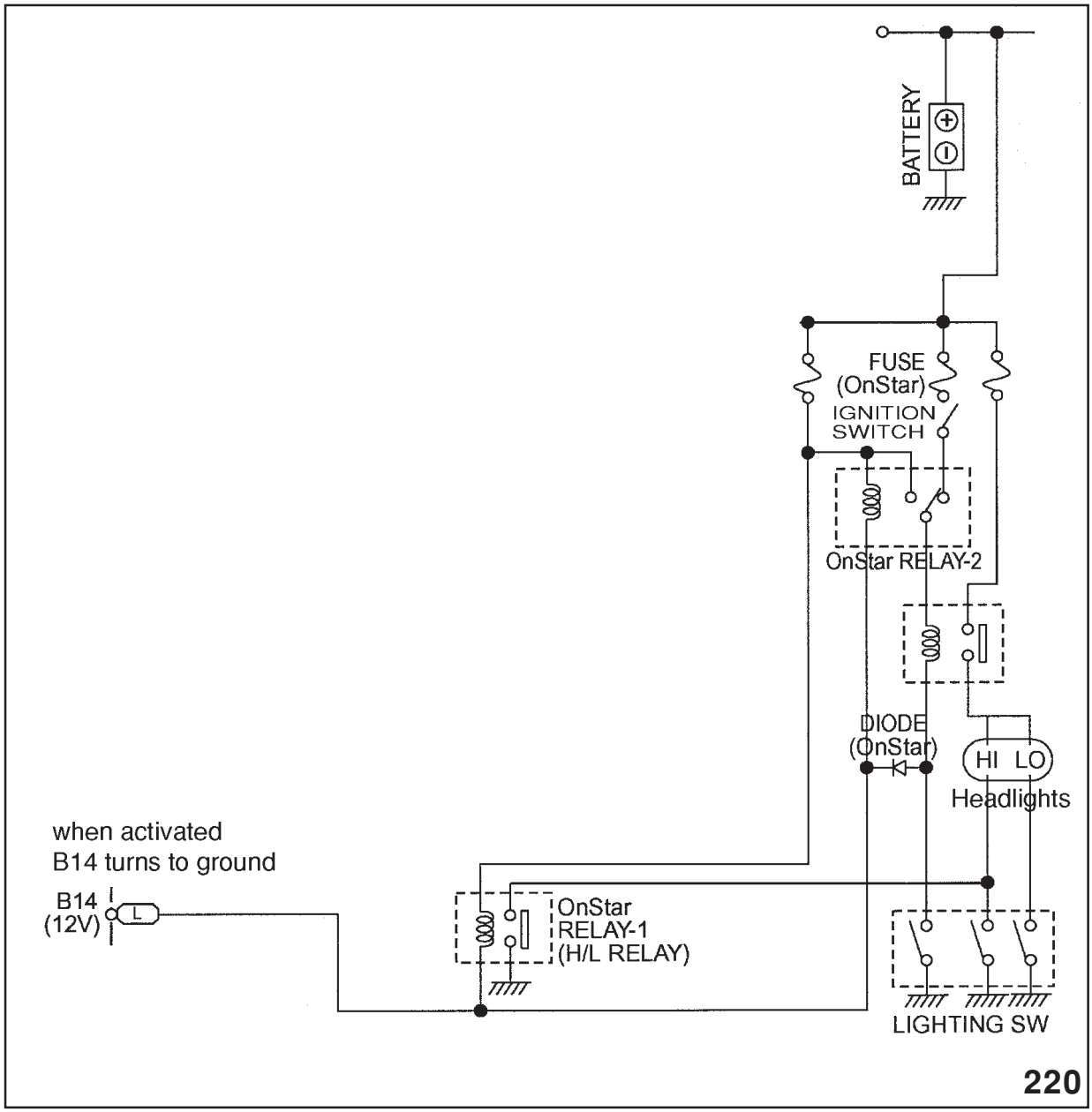
Each button of the 3 Button Module, when pushed, supplies a different resistance value to the wire supplying the input to the VIU. The VIU will perform the commands that match that resistance value. Two wires and a ground control the red/green led. The green illumination control uses 3 volts and the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



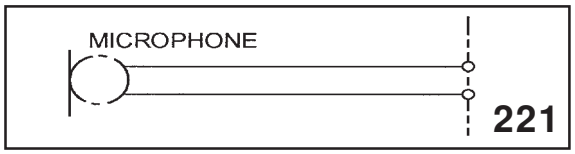
SRS (Artwork)

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.



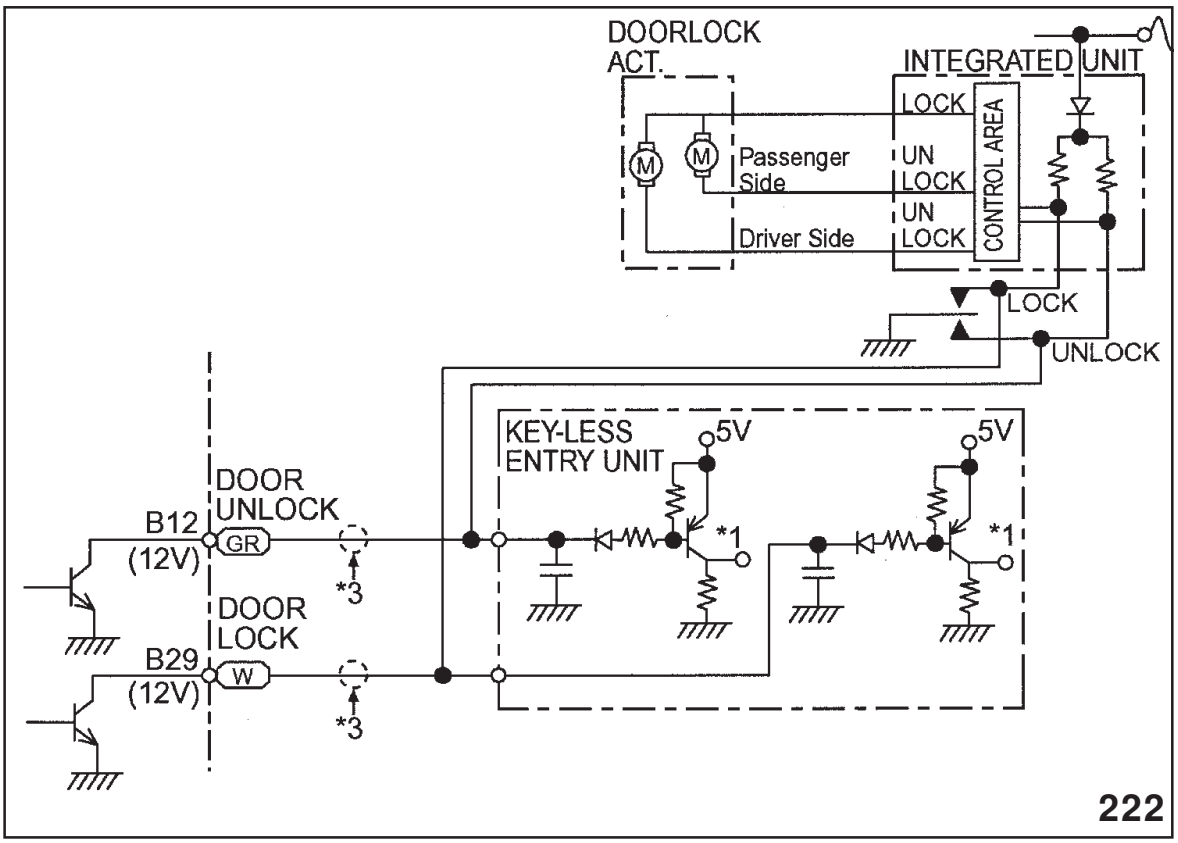
Headlight (Artwork)

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



Microphone (Artwork)

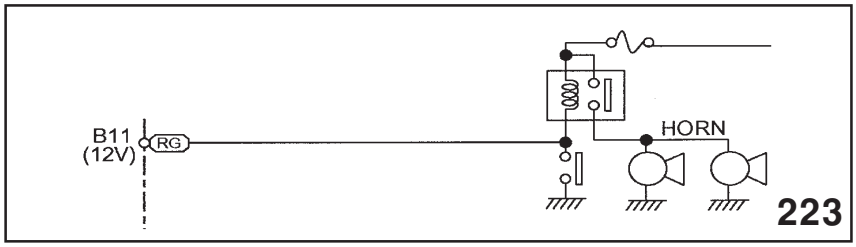
The microphone provides voice input to the VIU. This is used to communicate to the onboard OnStar system and to provide voice input during phone calls.



Keyless (Artwork)

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.



Horn (Artwork)

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.

Three Button Module

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 (**Only flashes green**)
4	GPS and Mircroprocessor communication fault
5	Button assembly malfunction

Exceptions

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

The EEPROM check-sum 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 by 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 Removal

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 upwards pressure to the corner of the shifter trim plate.

Shifter Trim

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

Coin Tray

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.

Ash Tray Bracket

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

HVAC Trim

Apply gentle upwards 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.

Electrical Connectors

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

Removing Trim Screw

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

Driver Side

Remove the two screws located under the OnStar buttons.

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

Passenger Side

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.

Aspirator Tube Location

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.

Radio Removal

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.

Three Button Module

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.

Slide Sequence

Slide No.	Description	Page No.
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2	Created By	
3	Teaching Aids	
4	Introduction	8
5	Title Slide (2005 Electrical System)	8
6	Sample Signals (Artwork)	8
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Slide Sequence

Slide Sequence

Slide Sequence

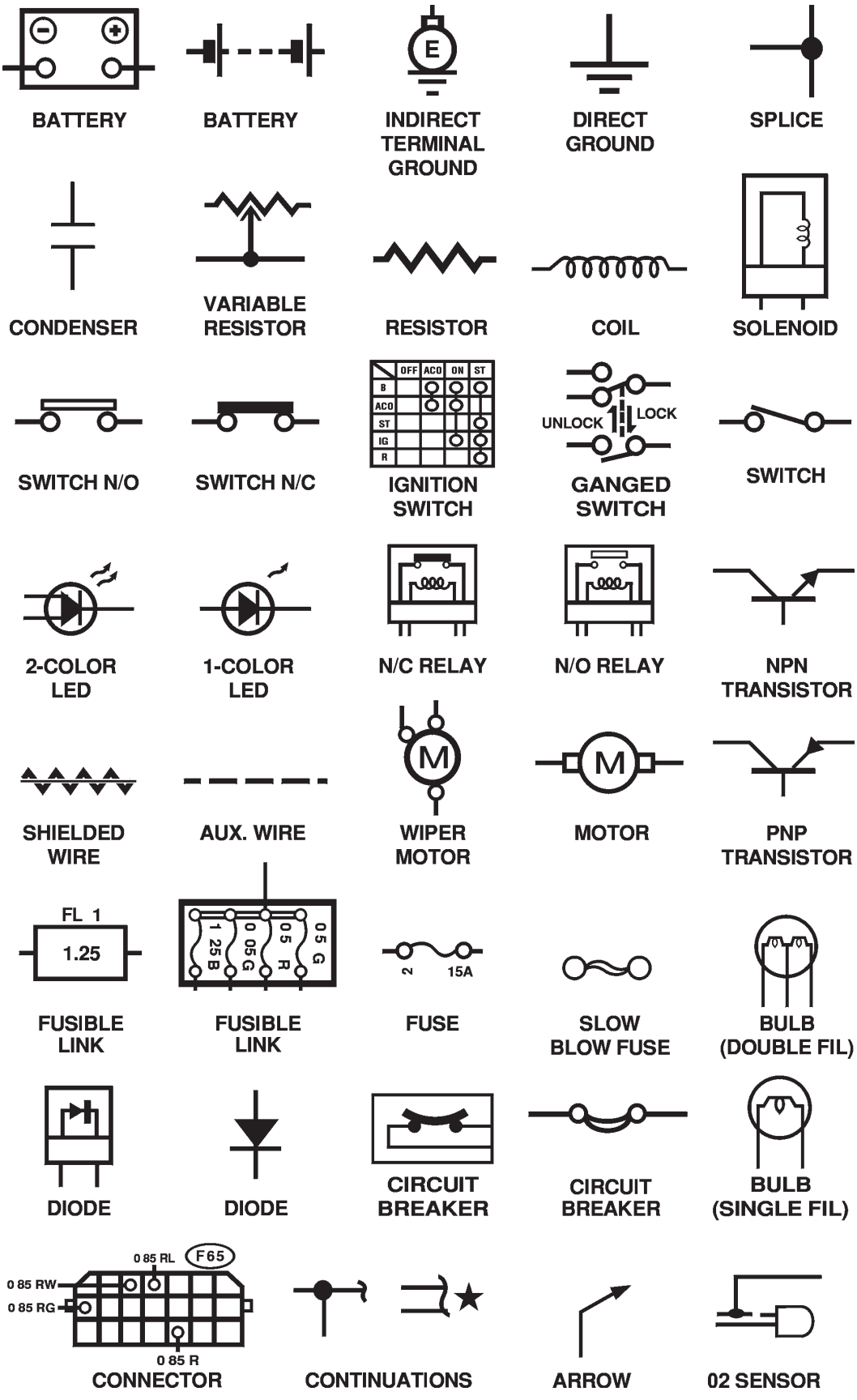
Slide Sequence

Service Bulletins

No.	Date	Title
07-50-93R	12/02/94	Repair of rear window defogger metal tab Repair of rear window defogger grids
07-54-05	11/21/05	Front fog light lens & Reflector
07-56-05	08/01/06	Fog light lens and Body
07-57-06	08/24/06	Seat Heater anchor point modification
07-58-06	08/25/06	Change in Horn(s)

Tech TIPS

Date Subject


BATTERY
BATTERY
E
INDIRECT TERMINAL GROUND
DIRECT GROUND
SPLICE
CONDENSER
VARIABLE RESISTOR
RESISTOR
COIL
SOLENOID
SWITCH N/O
SWITCH N/C
OFF ACO ON ST
B
ACO
ST
IG
R
IGNITION SWITCH
UNLOCK
LOCK
GANGED SWITCH
SWITCH
2-COLOR LED
1-COLOR LED
N/C RELAY
N/O RELAY
NPN TRANSISTOR
SHIELDED WIRE
AUX. WIRE
M
WIPER MOTOR
M
MOTOR
PNP TRANSISTOR
FL 1
1.25
FUSIBLE LINK
1 25 B
0 05 G
0 5 R
0 5 G
FUSIBLE LINK
2
15A
FUSE
SLOW BLOW FUSE
BULB (DOUBLE FIL)
DIODE
DIODE
CIRCUIT BREAKER
CIRCUIT BREAKER
BULB (SINGLE FIL)
0 85 RL
F65
0 85 RW
0 85 RG
0 85 R
CONNECTOR
CONTINUATIONS
ARROW
02 SENSOR


CERTIFIED
SUBARU
TECHNICIAN


AUTOMOTIVE
Youth
Educational
Systems
YES
PROUD PARTNER