Section 5.0

Introduction to Body Electrical

2002 VUE New Product Participant Guide

Section Structure

Data Link Communications

- Types of Controllers
- Serial Data Communication
- Component Locations
- Serial Data Link Network
- Serial Data Link Network Diagnostics
- Vehicle On-Board System Check

Body Control Module (BCM)

- Control Features of the BCM that are Similar to the L-Series
- BCM Controls
- Control Features of the BCM that are Different from the L-Series
  - Daytime Running Lamps (DRL)
  - Fog lamp Relay Control
  - Brake Transaxle Shift Interlock (BTSI)
  - A/C Compressor Relay
  - A/C Blower After Blow Control
  - Remote Keyless Entry (RKE)

Instrument Panel Cluster, Audio, OnStar® & Restraints

- Instrument Panel Cluster (IPC) Features Similar to the L-Series
- Audio
  - Radio Receivers
  - Speaker Systems
  - Audio Systems
- OnStar®
  - Component Locations
  - OnStar® System
- Restraints
  - Restraint System SIR Components
  - SIR System

Electrical Walk Around

- Location of Control Modules
- SIR Side Air Bag Components
- Location of Grounds

Equipment and Materials

References:
8 VUE Service Manual sets
8 VUE Participant Guides

Classroom Area Equipment:
1 White board and markers
1 Easel pad and markers
1 TV/VCR
1 Overhead projector

Audio/Visual Aids:
1 Overhead slide pack
1 2002 L-Series New Product Video

Student Supplies:
8 Pencils
8 Highlight markers

Vehicle Area Equipment and Supplies:
2 Saturn VUE vehicles
1 DRL resistor pack

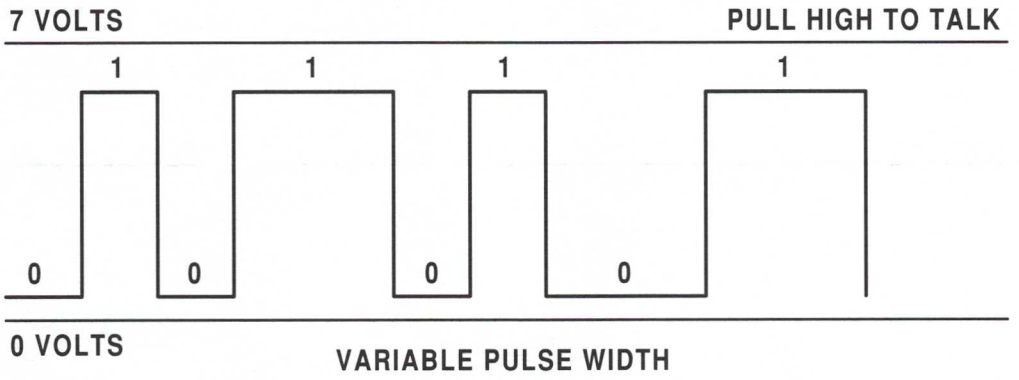
Section 5.1

Data Link Communications

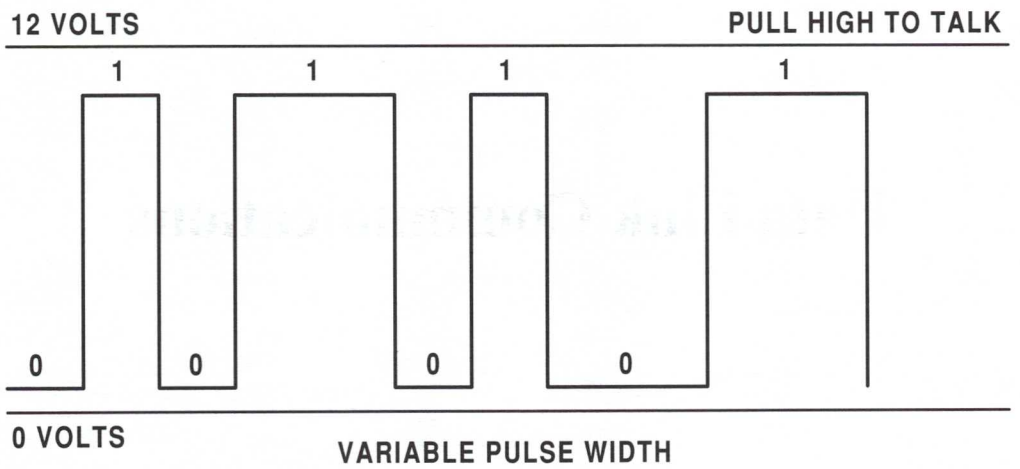
2002 VUE New Product Participant Guide

Serial Data Forms

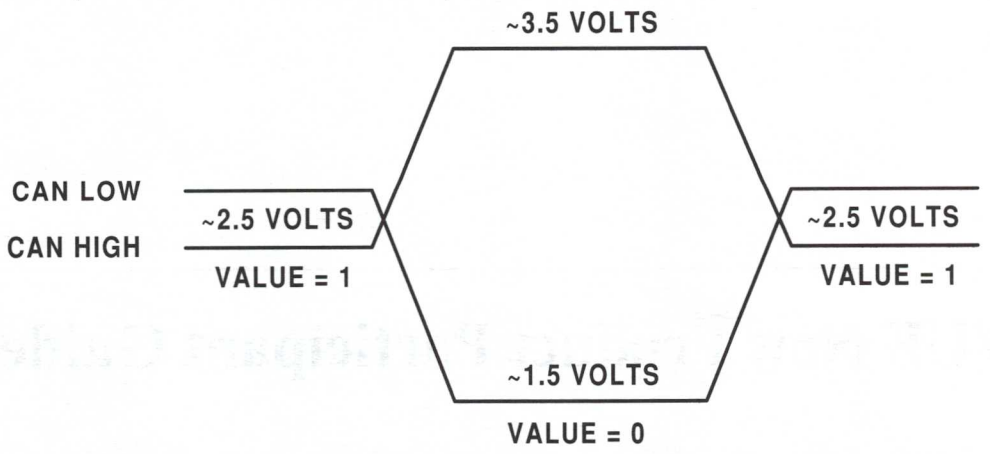
Class II Data Digital Wave Forms



Keyword 2000 Digital Wave Forms



CAN (Controller Area Network) Wave Forms



SERIAL DATA FORMS

Data Link Communications

This section covers:

- Types of Controllers
- Serial Data Communication
- Serial Data Link Network Component Locations
- Serial Data Link Network
- Serial Data Link Network Diagnostics
- Vehicle On-Board System Check

Types of Controllers

The Saturn VUE can incorporate up to eight of the following controllers:

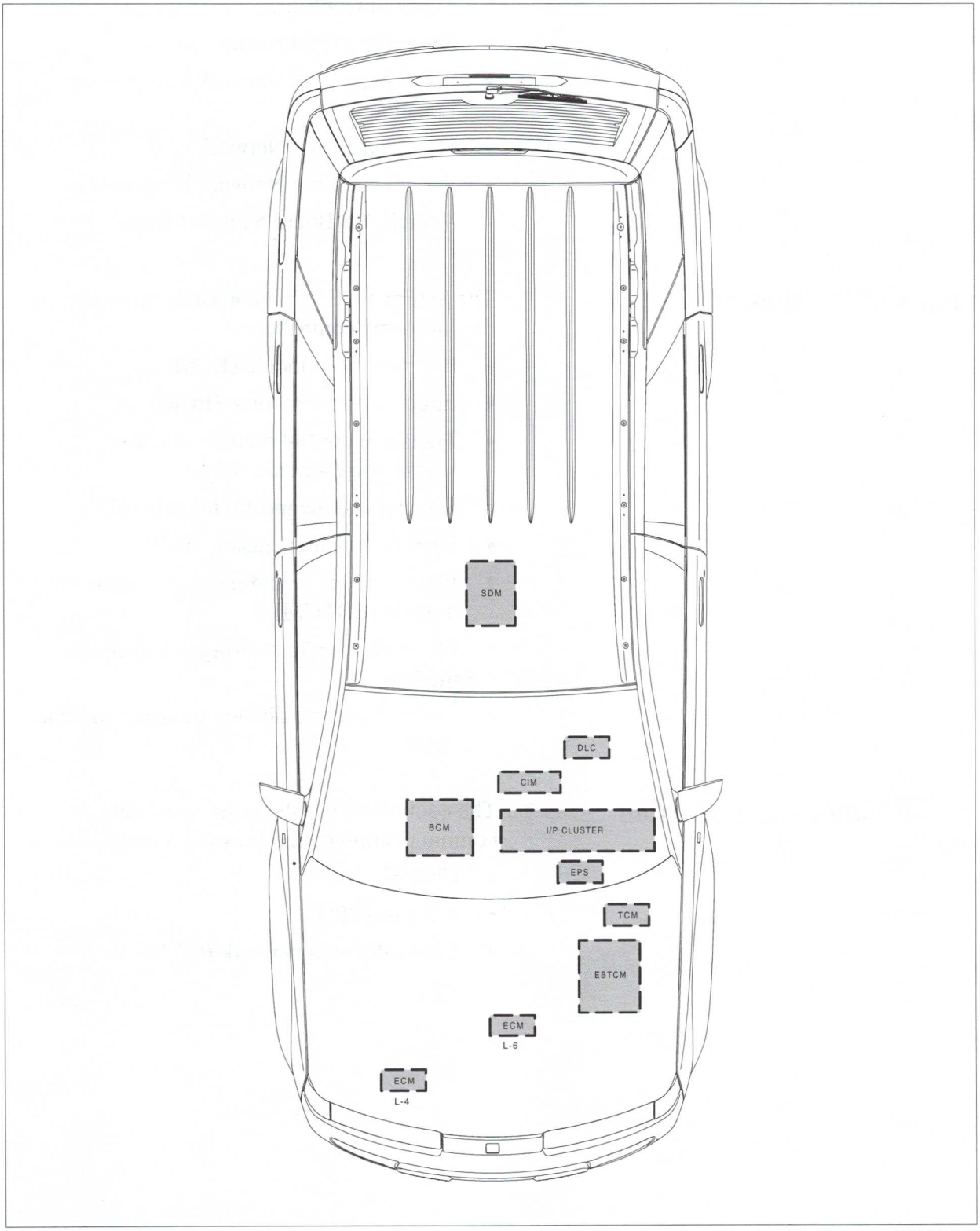
- Body control module (BCM)
- Engine control module (ECM)
- Transaxle control module (TCM) [automatic transaxle only]
- Sensing and diagnostic module (SDM)
- Instrument panel cluster (IPC)
- Electronic brake and traction control module (EBTCM)
- Electronic power steering (EPS) control module
- OnStar® communication interface module (CIM)

Serial Data Communication

The controllers use the same serial data communication methods as the S and L-Series.

- Class II
- Keyword 2000
- Controller area network (CAN)

Serial Data Link Network Component Locations



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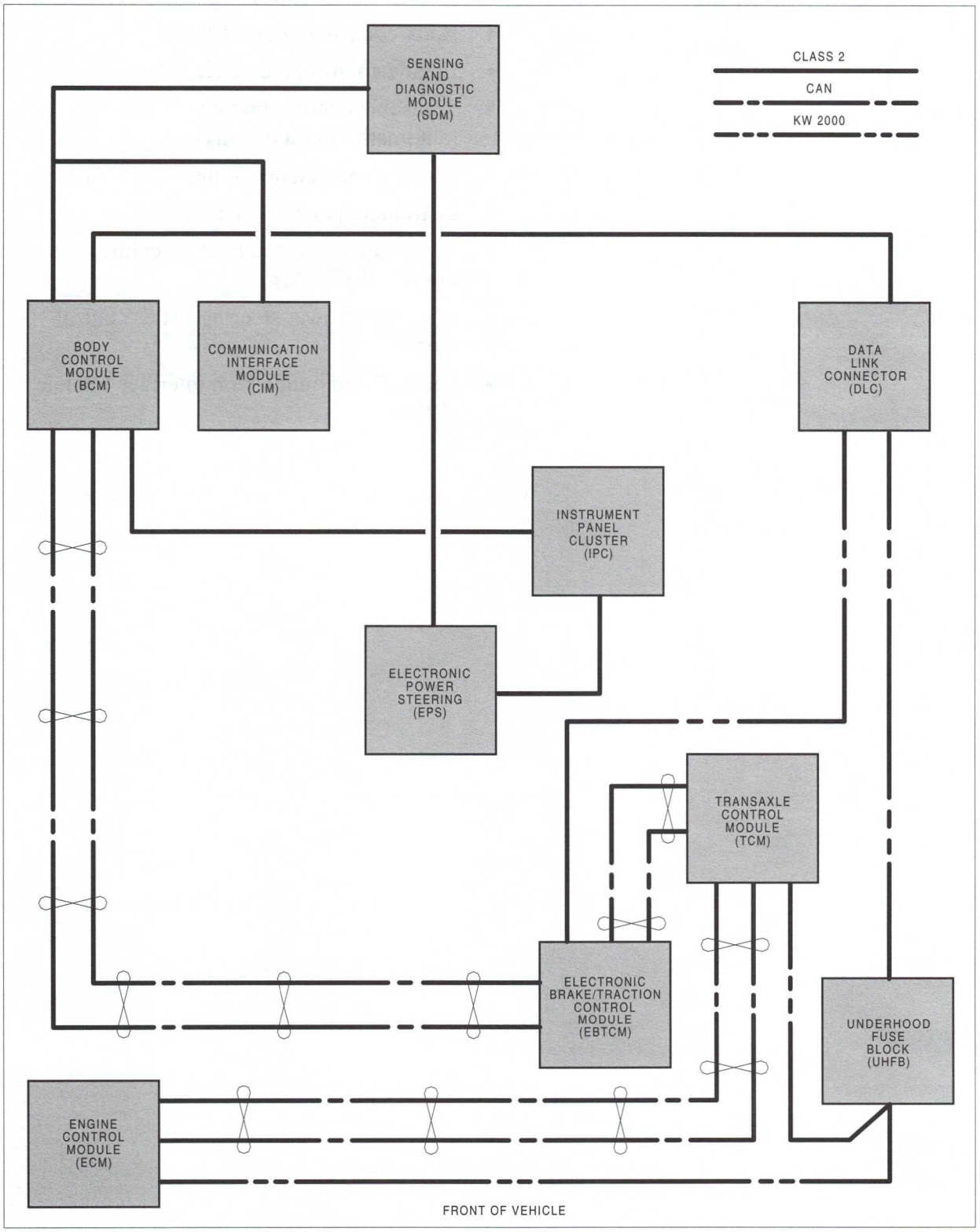
Serial Data Link Networks Component Locations

Refer to the illustration on the opposite page for the location of the following controllers:

- Body control module (BCM)
- Engine control module (ECM)
- Transaxle control module (TCM) [automatic transaxle only]
- Sensing and diagnostic module (SDM)
- Instrument panel cluster (IPC)
- Electronic brake and traction control module (EBTCM)
- Electronic power steering (EPS) control module
- OnStar® communication interface module (CIM)

Serial Data Link Network



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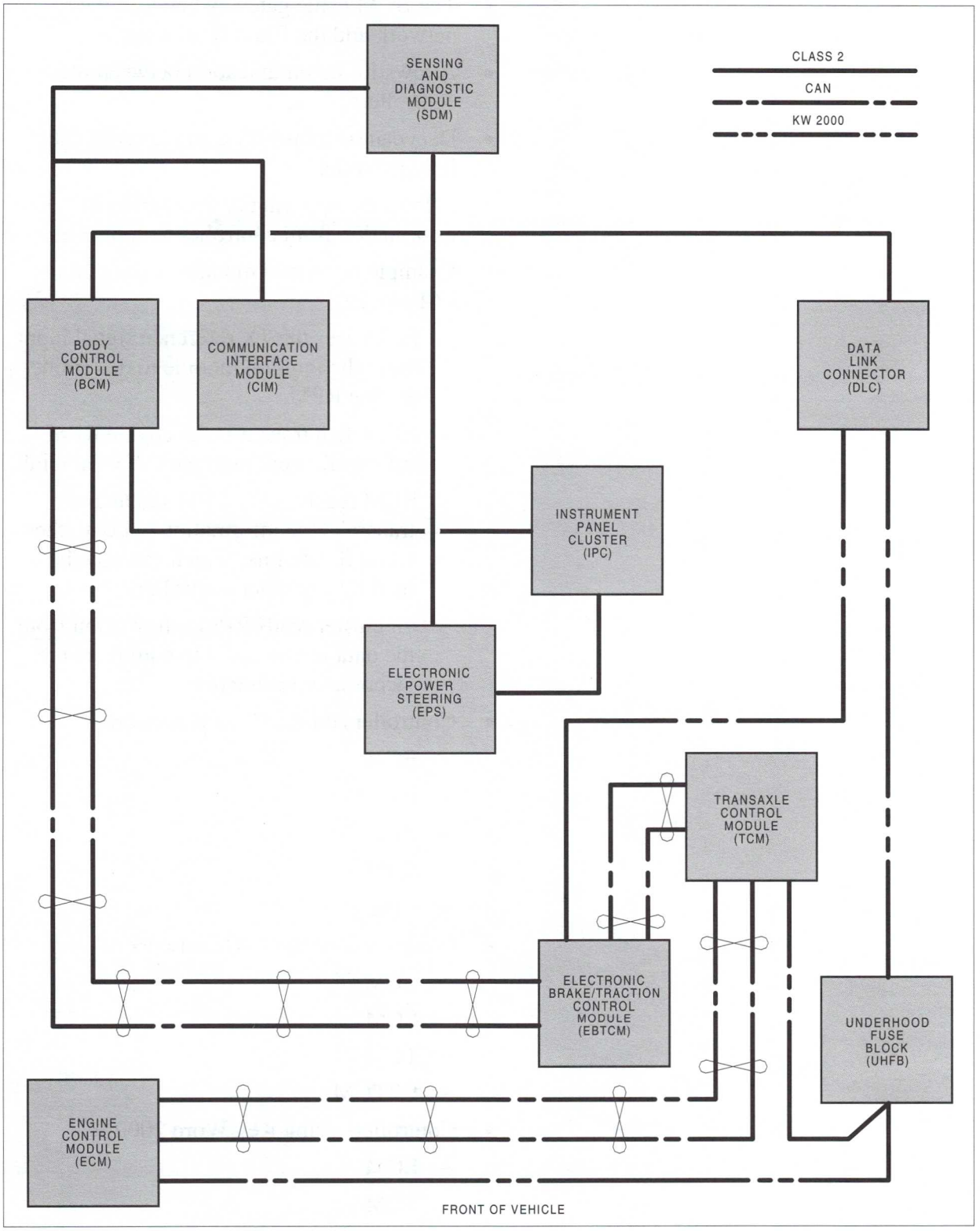
Serial Data Link Network

Features of the serial data link network:

- The BCM is the gateway between the CAN network and the Class II network.
- Allows for communication between the controllers.
- Data can be transmitted on the serial data link networks.
- Allows the opportunity for sharing of information from controller to controller.
- Example of control module sharing on the L61 (4 cyl):
  - ECM uses the 7X reference signal input from the ignition module to determine engine RPM.
  - ECM then transmits the engine RPM information out onto the CAN data link.
  - BCM receives the RPM signal and transmits the information out onto the Class II data link, which can now be read by any other controller.
  - I/P cluster reads RPM information from the data link in order to command the tachometer to function.
- Controllers on the Class II network:
  - BCM
  - IPC
  - EPS
  - SDM
  - CIM
- Controllers on the CAN network
  - BCM
  - ECM
  - TCM
  - EBTCM
- Controllers using Key Word 2000
  - ECM
  - TCM
  - EBTCM

Serial Data Link Network



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Serial Data Link Network Diagnostics

The following is a list of possible serial data link faults.

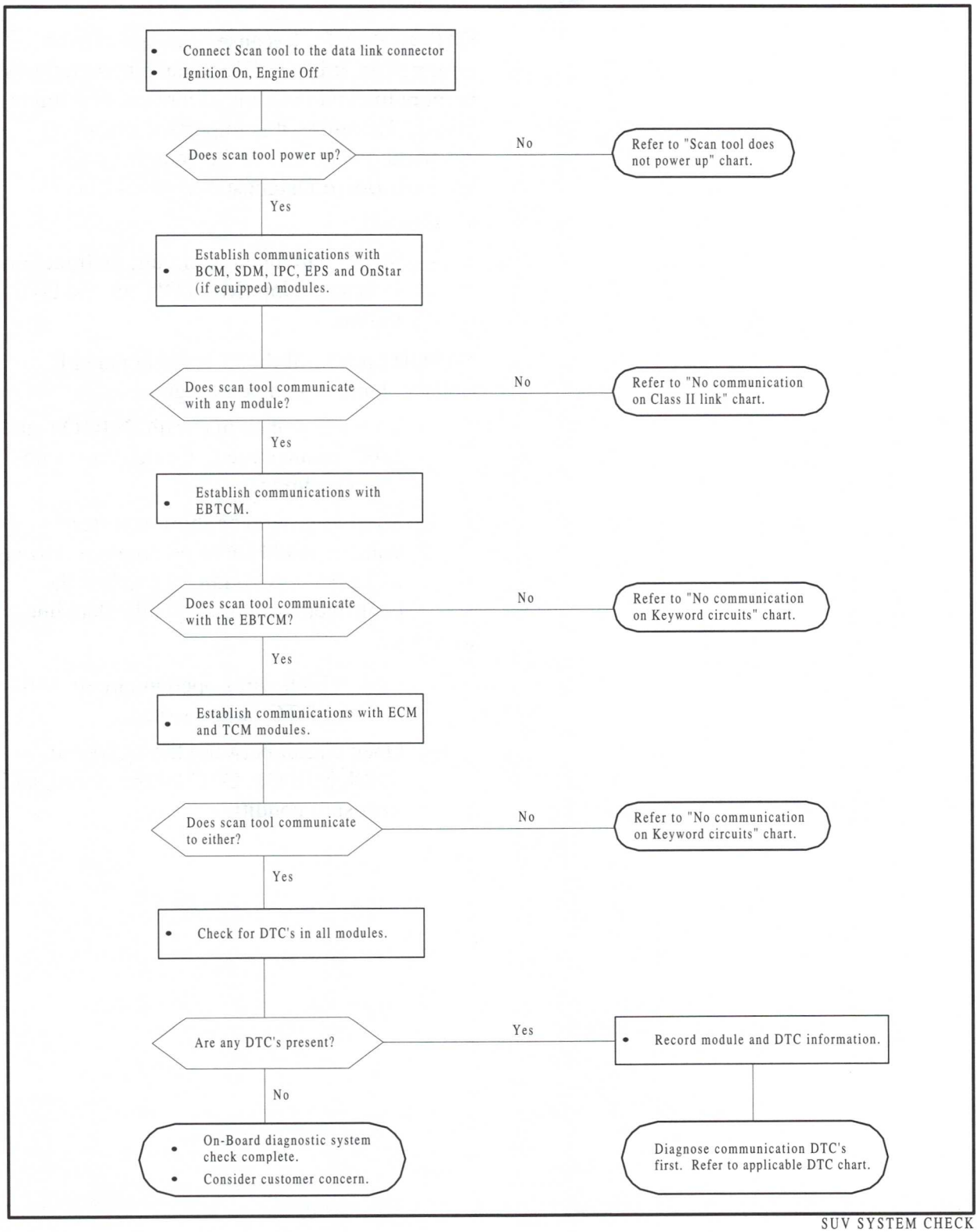
IMPORTANT: Because of the sharing of information, it is possible to have DTC failures in more than one module as a result of a single failure. Therefore, it is important to start all electrical diagnostics at the vehicle system level On-Board Diagnostic Systems Check.

- Class II
  - Single wire open in circuit, malfunction indicator lamp (MIL) Off, and no DTC failure.

IMPORTANT: If the instrument panel is isolated, there would be no lights.

  - Two wires open in circuit, MIL On, and DTC failure stored. Could cause a no-start condition.
  - Short to ground or short to battery voltage would cause no communication and a no-start condition because the controllers cannot toggle the data line.
- CAN
  - One or both wires open in circuit, MIL On, and DTC failure stored.
  - Open circuit between the ECM and BCM, MIL On, DTC failure stored, and a no-start condition.

Vehicle On-Board System Check



SUV SYSTEM CHECK

Vehicle On-Board System Check

The Vehicle On-Board System Check should always be the starting point when diagnosing any powertrain, chassis, or other electrical sub-system due to the following:

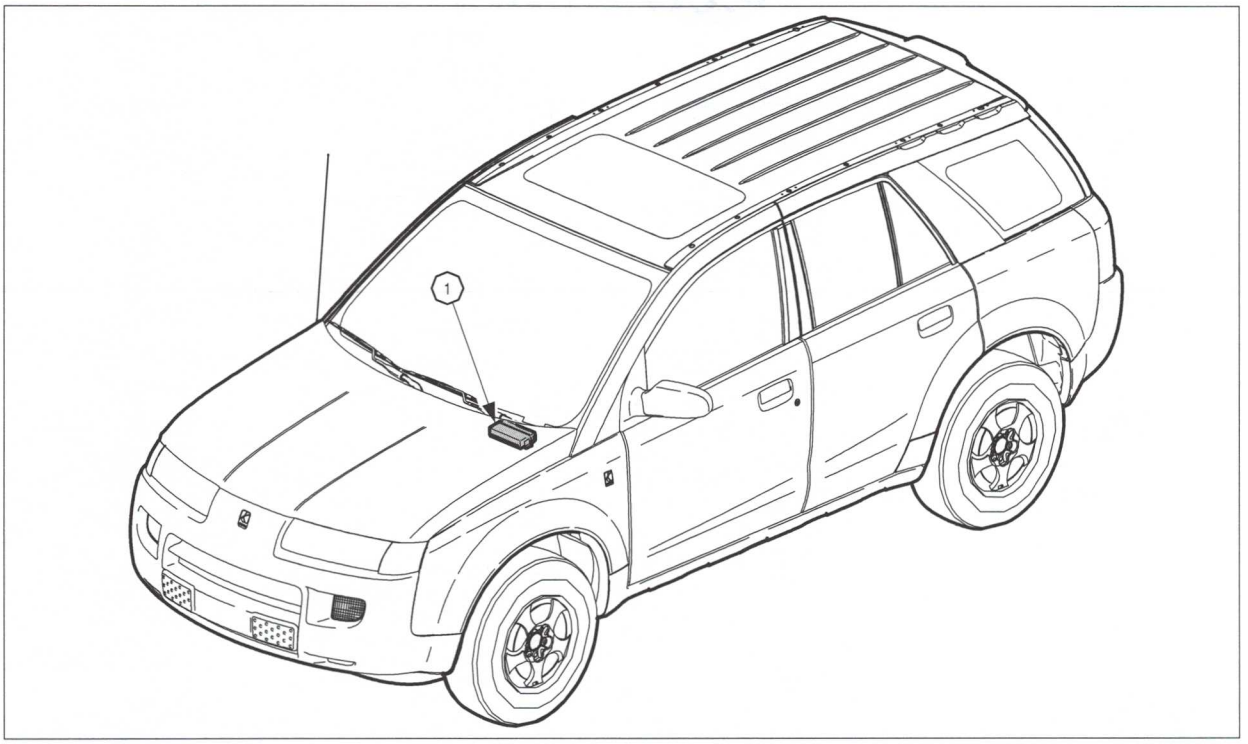
- Amount of systems/sub-systems that are controlled by electronic controllers.
- With the increased functions of these controllers comes more on-board diagnostics, resulting in diagnostic trouble codes (DTCs).
- DTC failures therefore can aid in diagnosing systems/sub-systems.
- Many controllers share the same power or ground circuits as other sub-systems.
- There may be a DTC failure in a controller that appears unrelated to the customer complaint.
- Not all DTCs result in a warning telltale being illuminated.
- Regardless of the complaint or symptom, it is important to establish serial data communications with each controller, read codes from each controller, and record the information gathered.
- Always start with the BCM because:
  - BCM is the closest module to DLC.
  - BCM is the gateway and is capable of detecting when other modules on the Class II link or the CAN link are missing.
  - When the BCM detects a missing controller, a U-type DTC failure will be stored in the BCM.

Section 5.2

Body Control Module

2002 VUE New Product Participant Guide

Body Control Module



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Body Control Module (BCM)

Body Control Module (BCM)

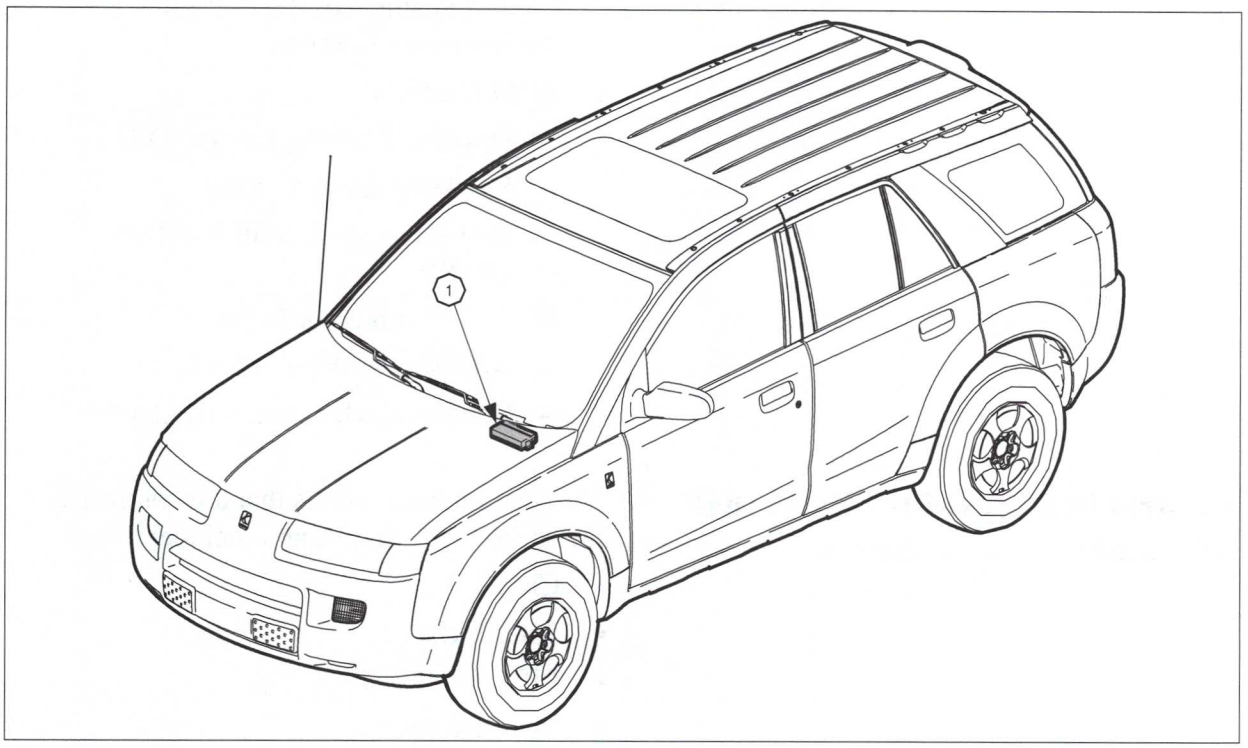
- Control Features of the BCM that are Similar to the L-Series
- BCM Controls
  - Daytime Running Lamps (DRL)
  - Fog lamp Relay Control
  - Brake Transaxle Shift Interlock (BTSI)
  - A/C Compressor Relay
  - A/C Blower After Blow Control
  - Remote Keyless Entry (RKE)

Control Features of the BCM that are similar to the L-Series

This section has features that are controlled similar to the L-Series, and include:

- Chime
- Door locks
- Liftgate release
- Rear defogger
- Interior lighting
- Wiper system
- Passlock system
- Diagnostics
- System performance test

Body Control Module



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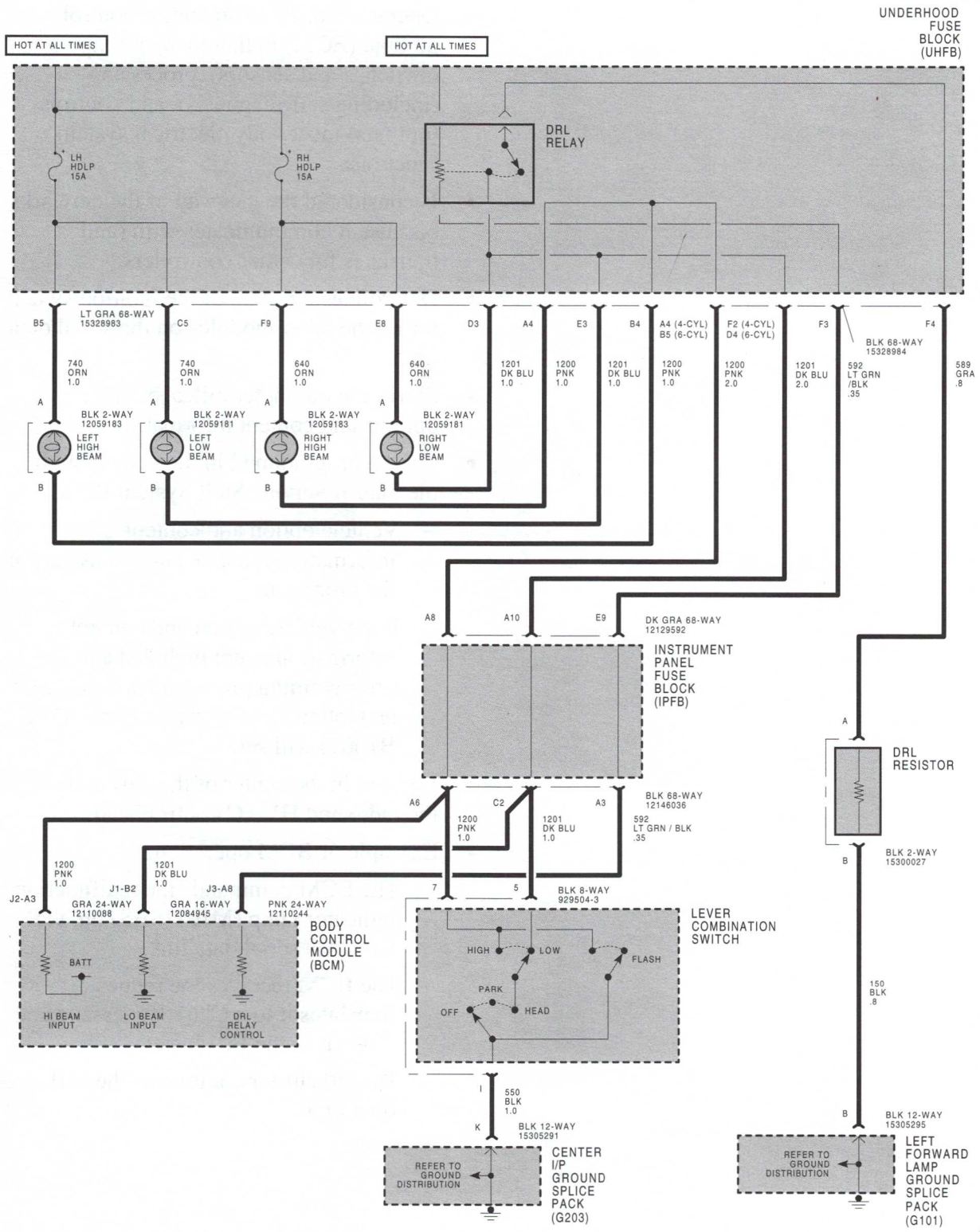
Body Control Module (BCM) Controls

The body electrical system incorporates a body control module (BCM) (1) with the following features:

- Operates similar to an engine control module (ECM) in that there are inputs (switches and sensors), processing (including self-diagnosis), and controls (outputs) most body electrical system functions.
- Is considered the gateway of the networks because it communicates with (and translates for) other controllers.
- Determines the state of the ignition switch for all the other modules on the serial data link.
- Stores the odometer mileage, vehicle options and content information.
- Can be programmed in the vehicle with the Saturn Service Stall System (SSS):
  - Vehicle option and content information must be entered as part of the procedure.
  - If the vehicle option and content information is not included and the programming procedure is completed, an Option Configuration Error (DTC B1001) will set.
- Located in the center of the dash below the radio and HVAC control head.
- Example of BCM operation:
  - The ECM commands the malfunction indicator lamp (MIL) (SES) on, via the CAN serial data link.
  - The BCM receives the request, translates it to a Class II message and sends it to the I/P cluster.
  - The I/P cluster commands the MIL operation.

Daytime Running Lamps (DRL)



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Control Features of the BCM that are Different from the L-Series

Daytime Running Lamps (DRL) Control

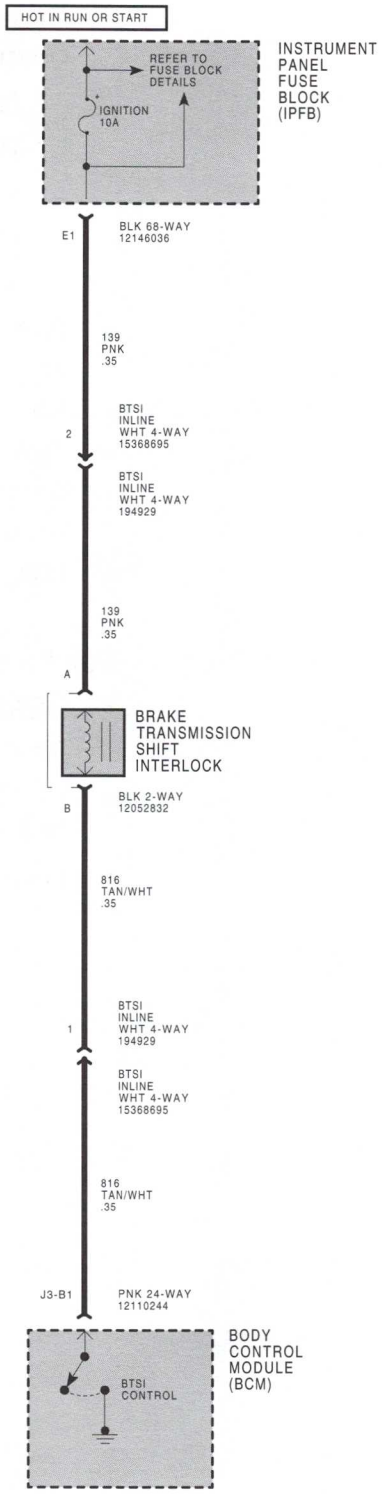
The BCM controls the Daytime Running Lamps as follows:

- Grounds the DRL relay coil under these conditions:
  - Ignition switch is On.
  - Headlamp switch is Off.
  - Vehicle is **not** in Park (automatic transaxle only).
  - The parking brake is released.
- Provides the low beam lamps a path to ground through the DRL relay and DRL resistor located on the left front frame rail.
- Turns the DRL indicator on to notify the driver that daytime running lamps are working.
- DTCs are available for control circuits.

Fog Lamp Relay Control

- BCM monitors the fog lamp switch input for fog lamp request.
- BCM energizes the ground side of the relay coil.
- Fog lamp switch is non-latching.

Brake Transaxle Shift Interlock (BTSI)



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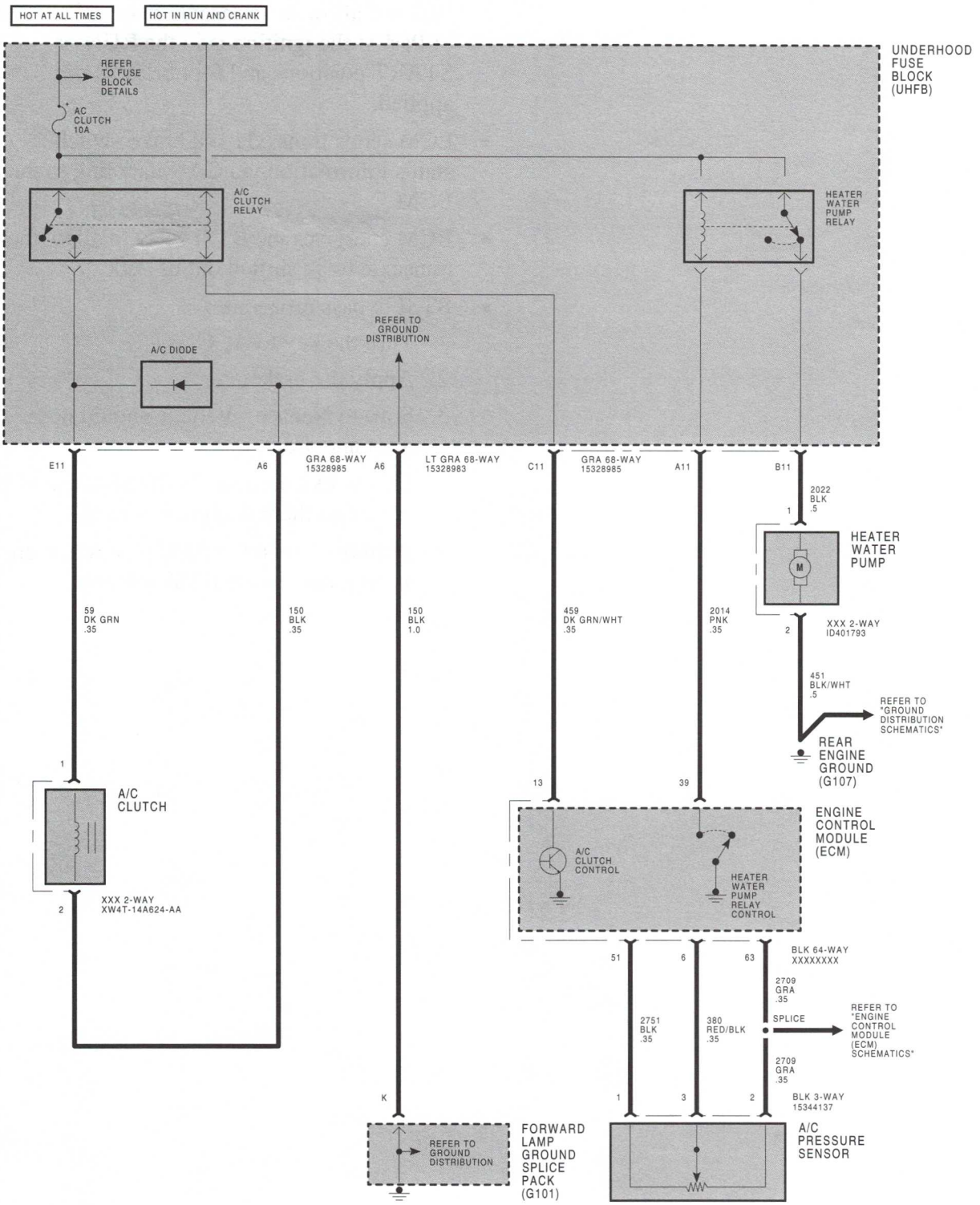
Control Features of the BCM that are Different from the L-Series (Cont'd)

Brake Transaxle Shift Interlock (BTSI)

The BCM controls the Brake Transaxle Shift Interlock (BTSI) as follows:

- Will not allow the transaxle to be shifted out of Park if the ignition is in the RUN or START positions and foot brake is not applied.
- ECM sends transaxle and brake switch status information via CAN data link to the BCM.
- BCM energizes the BTSI relay to allow the transaxle to be shifted out of Park.
- BTSI bypass procedure:
  1. Turn the key to ACC.
  2. Apply the brake.
  3. Shift to Neutral. Vehicle should now start and drive.
  - This works because the BTSI solenoid is off when there is no power to it.
  - With the key in the ACC position, there is no power to the BTSI solenoid.

A/C Compressor Relay Control



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Control Features of the BCM that are Different from the L-Series (Cont'd)

A/C Compressor Relay Control

The BCM controls the A/C relay operation as follows:

- BCM monitors the A/C request input from the controller.
- BCM monitors the evaporator inlet temperature from the thermistor mounted on the side of the thermal expansion valve (TXV).
- BCM sends A/C request status information via CAN data link to the ECM.
- ECM energizes the A/C relay to engage the A/C compressor if pressure transducer inputs are within limits.

A/C Blower After Blow Control

- After blow relay and necessary wiring will be a Retailer Installed Accessory (RIA).
- BCM must be programmed with the Saturn Service Stall System (SSS) to activate the logic.
- BCM can enable the high blower relay to run the blower fan 30–40 minutes after the vehicle has been turned Off, based on the speed the vehicle was driven, air intake temperature and A/C clutch status.
- BCM then determines the run time duration; time will be 30 seconds or 3 minutes, based upon air intake temperature.

RKE Customer Programmable Content Theft Programming

To enter programming mode:

Press PANIC button on transmitter 8-10 times in 5 seconds with ignition On.
Then within 3 seconds select mode by pressing LOCK or UNLOCK button.
Active – Content theft system will only be armed by using the transmitter to lock the doors.
Passive – Content theft system will arm 5 minutes after the ignition is Off, all doors and liftgate are closed. Any door open will reset the 5 minute timer.
Disabled – No content theft system activated.

PRESS TO SELECT MODE	MODE SELECTED	DESCRIPTION	FEEDBACK
Press UNLOCK	Disabled	Content theft system disabled	BCM chime once upon receipt of transmitter feedback
Press LOCK once in 5 seconds	Active	Content theft system active upon RKE LOCK command and ignition Off, all doors and liftgate closed	BCM chime once upon receipt of transmitter feedback
Press LOCK twice in 5 seconds	Passive	System will arm 5 minutes after vehicle secured	BCM chime once upon receipt of transmitter feedback

RKE Scan Tool Only Content Theft Programming

MODE	DESCRIPTION	FEEDBACK	DEFAULT STATE
Pre-Alarm Chirp Horn 10 sec.	Content theft system feedback before full alarm	Chirp horn for 10 seconds	Disabled
Pre-Alarm Chime for 10 sec.	Content theft system feedback before full alarm	BCM chime for 10 seconds	Enabled
Pre-Alarm Silent for 10 sec.	Content theft system feedback before full alarm	Silent	Disabled
Pre-Alarm None	Content theft system feedback before full alarm	No Pre-Alarm	Disabled
CTD FOB only arming	Content theft system status	RKE Arming only	Enabled
CTD FOB and Passive arming	Content theft system status	RKE and Passive Arming	Disabled
CTD Disabled	Content theft system status	Content theft system disabled	Disabled

Control Features of the BCM that are Different from the L-Series (Cont'd)

Remote Keyless Entry (RKE) System

Remote keyless entry (RKE) system operation and features:

- RKE transmitters (fob) send the customer's request to the BCM.
- BCM receives (interprets) the signal from the RKE fob and controls the door locks, horn and interior lighting as requested by the customer.
- BCM controls the following functions based on the fob inputs:
  - Lock and unlock doors
  - Illuminated entry
  - Panic alert
- Fobs must be programmed to the customer specific vehicle using the scan tool.
- BCM can be programmed with up to four fobs.

IMPORTANT: Transmitters do not send the same signal twice. This prevents the signal from being recorded, but it can also allow the transmitter and BCM to become unsynchronized, preventing communication and making synchronization necessary.

- Synchronization can be performed by pressing and holding the Lock and Unlock buttons on the transmitter(s) simultaneously for approximately ten seconds when near the vehicle. Door locks will cycle to confirm synchronization.
- Synchronization can only be performed between a BCM and fob that have previously been programmed together.

Automatic Door Lock and Unlock

- Cannot change the Auto Door Lock feature.
  - Doors lock when the shifter is moved out of park.
- Auto Door unlock can be enabled or disabled.
  - Doors unlock when shifter is put into park.
  - Auto Door unlock is enabled from the factory.

Section 5.3

Instrument Panel Cluster, Audio, OnStar® & Restraints

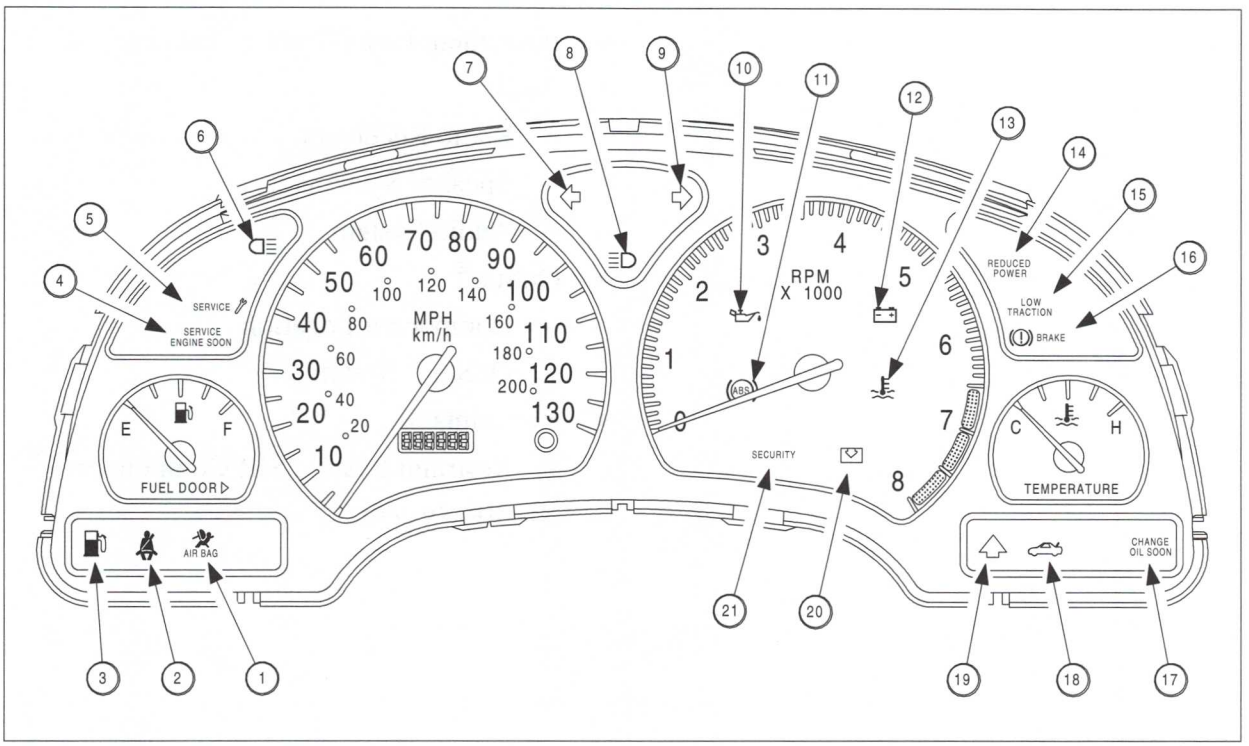
2002 VUE New Product Participant Guide

Section Structure

Instrument Panel Cluster, Audio, OnStar®, Restraints

- Instrument Panel Cluster Features
- Audio
  - Radio Receivers
  - Speaker Systems
  - Audio System
- OnStar®
  - Component Location
  - OnStar® System
- Restraints
  - Restraint System SIR Components
  - SIR System

Instrument Panel Cluster



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		Input to Cluster Direct Wire	Input to Cluster Serial Data
(1)	Air Bag		SDM
(2)	Seat Belt		SDM
(3)	Low Fuel		BCM
(4)	Service Engine Soon		BCM
(5)	Service (Wrench)		BCM
(6)	Daytime Running Lamp (DRL)		BCM
(7)	Left Turn Lamp	X	
(8)	High Beam Lamp		BCM
(9)	Right Turn Lamp	X	
(10)	Oil Pressure		BCM
(11)	ABS		BCM
(12)	Charging System		BCM
(13)	Hot Coolant		BCM
(14)	Reduced Power		BCM
(15)	Low Traction		BCM
(16)	Brake		BCM
(17)	Change Oil Soon		BCM
(18)	Liftgate Ajar		BCM
(19)	Upshift Arrow (Manual Trans Only)		BCM
(20)	Low Coolant		BCM
(21)	Security	X	BCM

Instrument Panel Cluster (IPC) features similar to the L-Series

This section has features that are controlled similar to the L-Series, which include:

- Driver information
- Change oil soon
- Telltales
- Back lighting
- Diagnostic system check

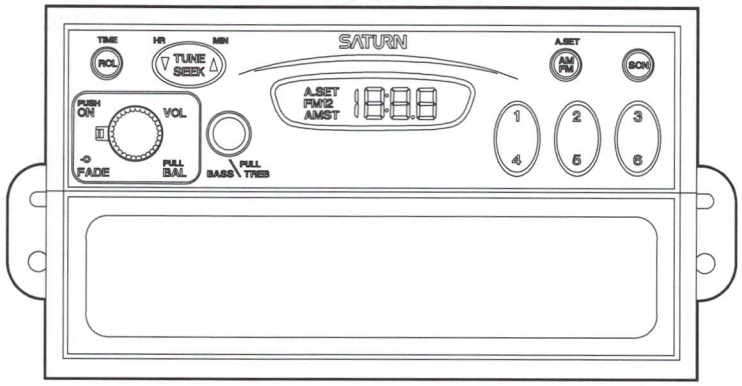
Telltales Not Controlled by the BCM

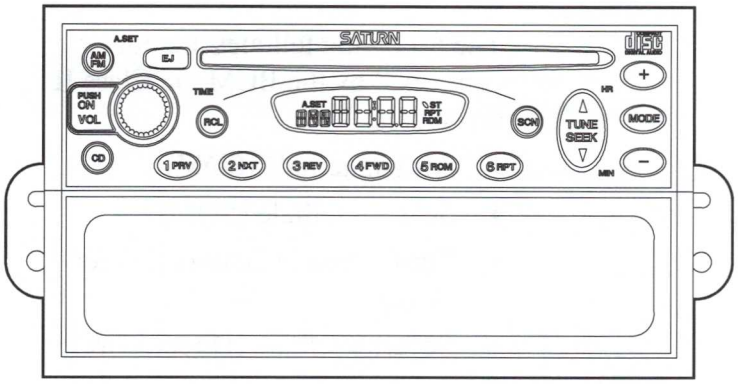
The following telltales are not controlled by the BCM via Class II serial data:

- Air bag telltale (SDM)
- Seatbelt telltale (SDM)
- Turn signal indicators (Direct Wire)
- Security telltale (Direct Wire)

Radio Receivers

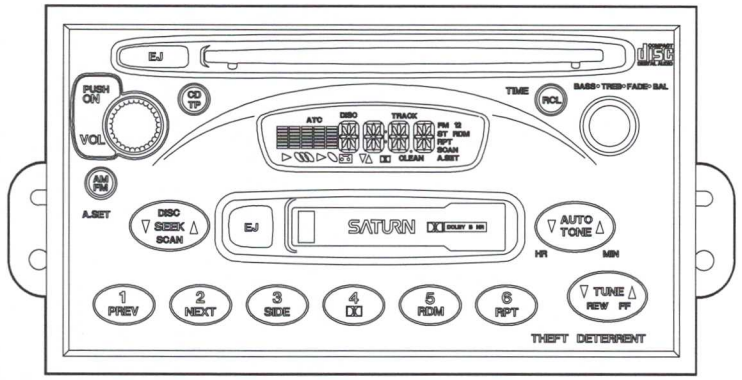
Base Level AM/FM Receiver

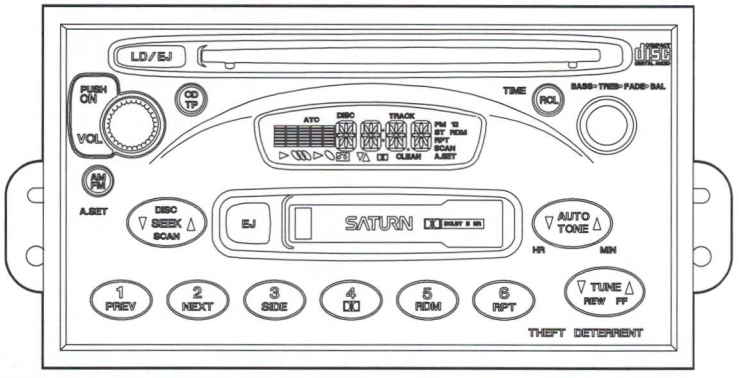




Up-Level AM/FM Receiver CD

Up-Level AM/FM Receiver Cassette/CD





Up-Level AM/FM Receiver Cassette/6 Disc CD

RADIOS

Audio

Radio Receivers

Four different radio receivers are available for the VUE:

- AM/FM
- AM/FM CD
- AM/FM Cassette/CD
- AM/FM Cassette/6 Disc CD

Speaker Systems

Base level audio speaker system is standard with all receivers and includes:

- 25-watt, 6" high-sensitivity speaker (HSS) in each door.

Up-level audio speaker system is available with:

- AM/FM CD receiver
- AM/FM Cassette/CD receiver
- AM/FM Cassette/6 Disc CD receiver

Up-level audio speaker system consists of:

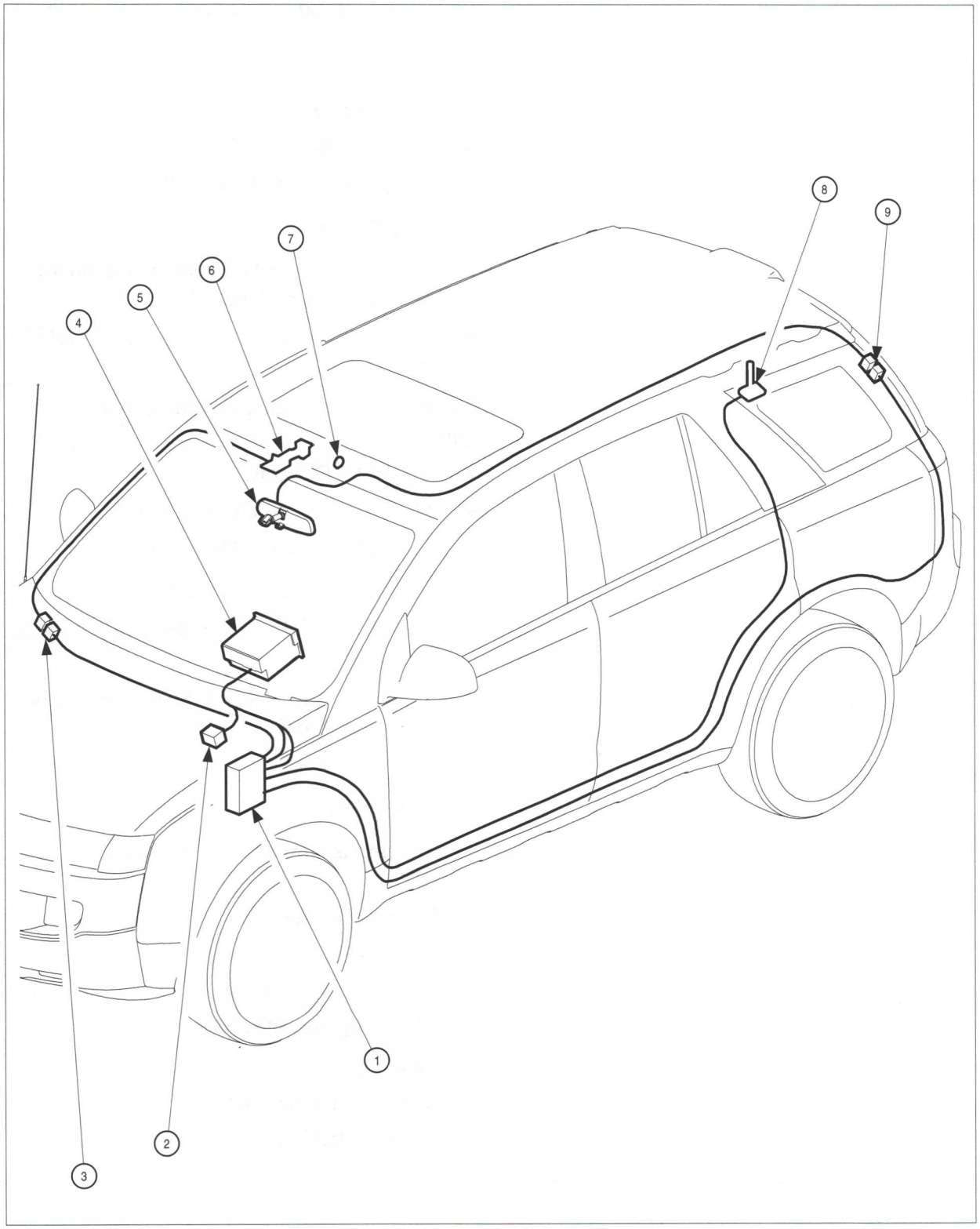
- 25-watt, 6" high-sensitivity speaker (HSS) in each door.
- 15-watt tweeter speaker in each front door mirror patch only.

Audio System

This section is similar to the L-Series, which includes:

- System features
- Diagnostics
- On-board diagnostics
- Diagnostic trouble codes
- Cleaning
- Loading in-dash 6 CD
- Theft Protection

OnStar® Component Locations



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OnStar® Component Locations

The OnStar® system consists of the following components:

(1) OnStar® communication interface module (CIM)

(2) Inline-to-vehicle I/P harness

(3) Global Positioning System (GPS) coax-to-I/P inline

(4) Radio receiver

(5) OnStar® remote control 3-button command assembly (part of inside rear view mirror)

(6) GPS antenna

(7) Hands-free microphone

(8) Cellular antenna

(9) OnStar® body-to-headliner inline connector

OnStar® System

This section is similar to the L-Series, which includes:

- Features
- Operation
- Diagnostic system check

OnStar Call worksheet

Objective: Learn more about the OnStar Service.

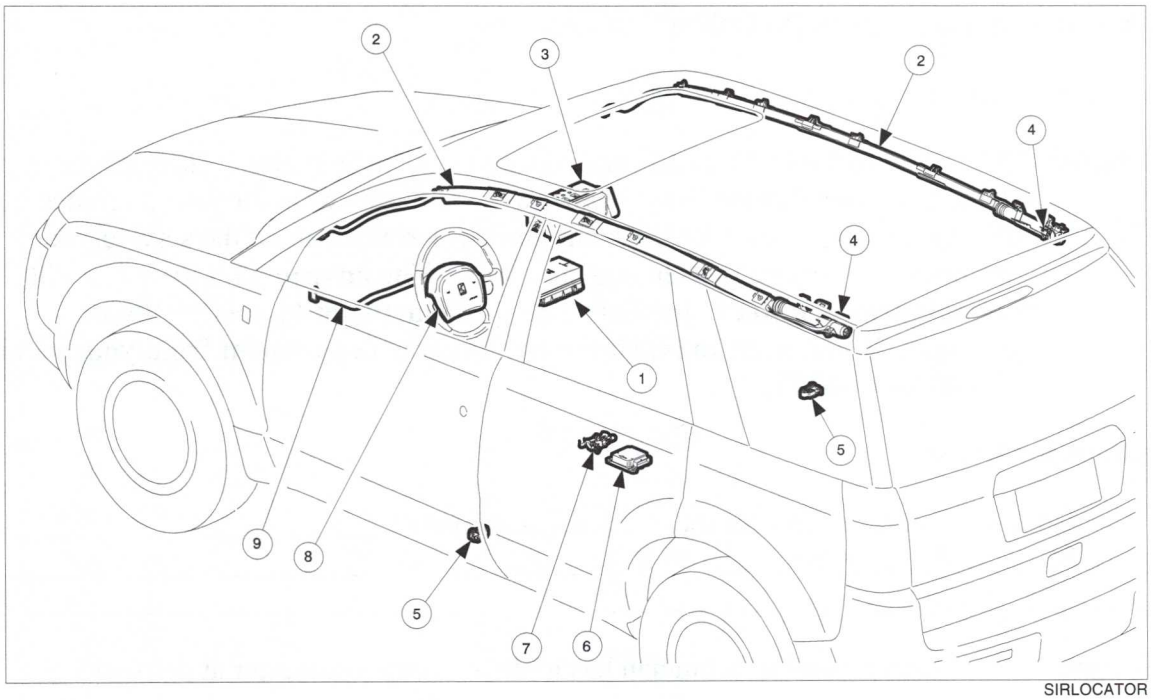
Reference: OnStar advisor.

Directions: Make a call to the OnStar call center using the vehicle in class. Have the instructor ask the questions that are listed below, write in the answers for your reference. After the questions are asked, ask any further questions about the service. The advisor can't answer any technical questions. . **The advisor that answers will probably transfer you to the enrollments department to answer these questions. If you want to reach the enrollments department from your retailer, call 1-888-667-8271.**

Questions for Review

1. What is the activation process for the customer at delivery? Calls in info, 3 min questions
2. Is there anything that a retailer technician has to do to set up a customer at delivery? no if system operation
3. What about demo vehicles, how are they set up for OnStar? dealer calls in info, first year free
4. What are the levels of service a customer can buy? direct/concert, travel leisure, safe & sound 199
5. For Saturn, what are the costs of each service? 1st free
   $3 199 DC 399 a 799
6. If I choose no service, is emergency still available? yes
7. Is the first year free like other GM divisions? yes
8. Do you keep a record of calls made by the customer? yes record

SIR Component Locations



SIRLOCATOR

SIR Component Locations

The VUE SIR system consists of the following components:

(1) I/P fuse block
(2) Curtain inflator modules (left and right)
(3) Passenger inflator module
(4) Disable/enable curtain inflator module connectors (left and right)
(5) Side impact sensors (SIS) (left and right)
(6) Sensing and diagnostic module (SDM)
(7) Connectors-to-curtain inflator wiring harness
(8) Driver inflator module
(9) Roll connector (coil assembly)

SIR System

This section is similar to the L-Series, which includes:

- Features
- Operation
- Service precautions
- Safe handling procedures
- Diagnostic system check

Section 5.4

Electrical Walk Around

2002 VUE New Product Participant Guide

Electrical Walk Around

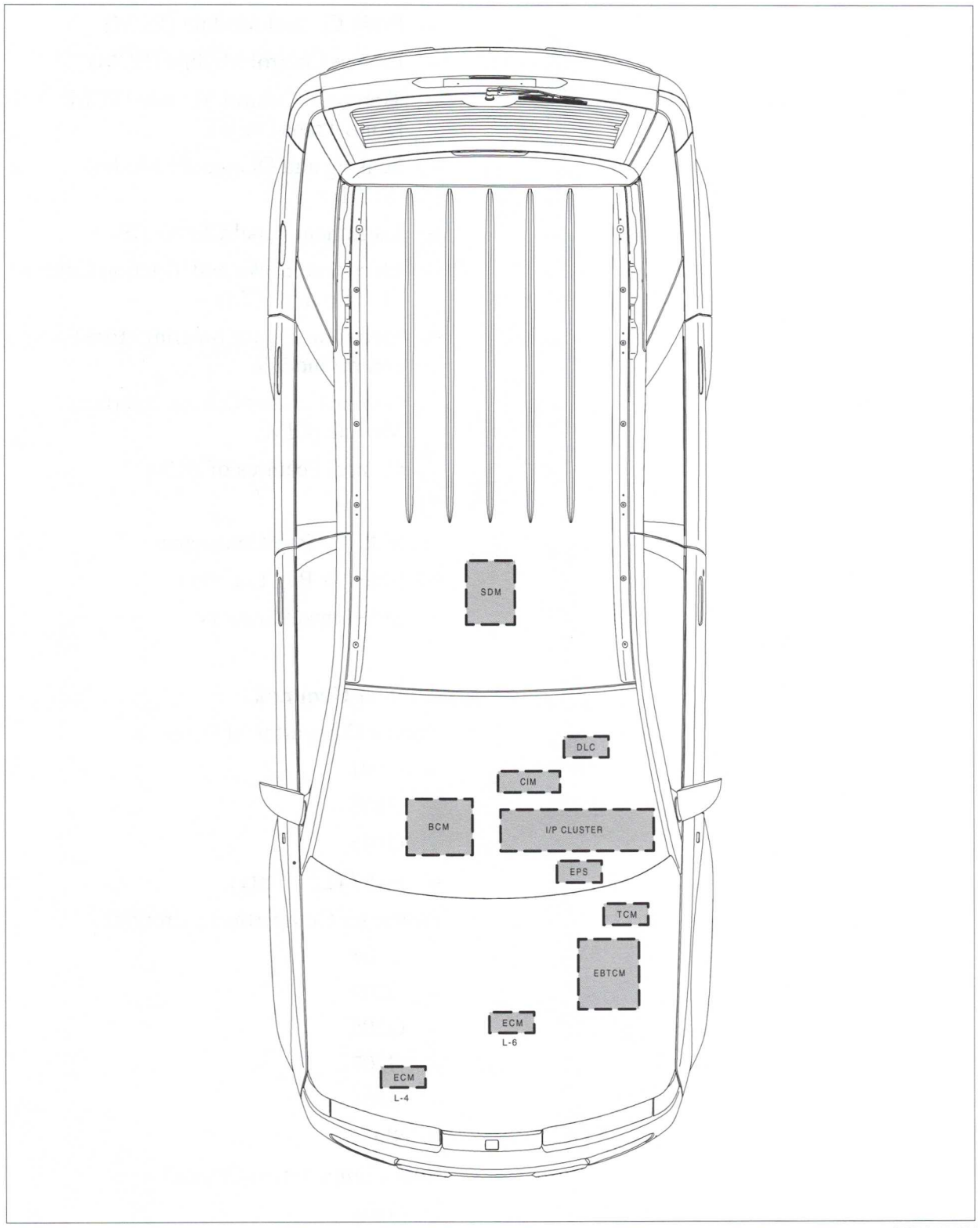
This section covers:

- Location of Control Modules
  - Body Control Module (BCM)
  - Engine Control Module (ECM)
  - Transaxle Control Module (TCM [Auto Trans Only])
  - Sensing and Diagnostic Module (SDM)
  - Instrument Panel Cluster (IPC)
  - Electronic Brake and Traction Control Module (EBTCM)
  - Electronic Power Steering (EPS) control module
  - OnStar Communication Interface Module (CIM)
  - Control Features of BCM
- SIR
  - Side Air Bag Connectors
  - Side Air Bag Location
  - Side Impact Sensors

Location of Grounds

- Engine Compartment Grounds
  - G101
  - G103
  - G105
  - G107 (L81 Only)
- Passenger Compartment Grounds
  - G201
  - G203
  - G205
  - G207
  - G301
  - SDM
- Rear Compartment Grounds
  - G401
  - G403

Controller Locations



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Location of Control Modules

Controllers in different locations

- L81 ECM
  - End of front bank cylinder head

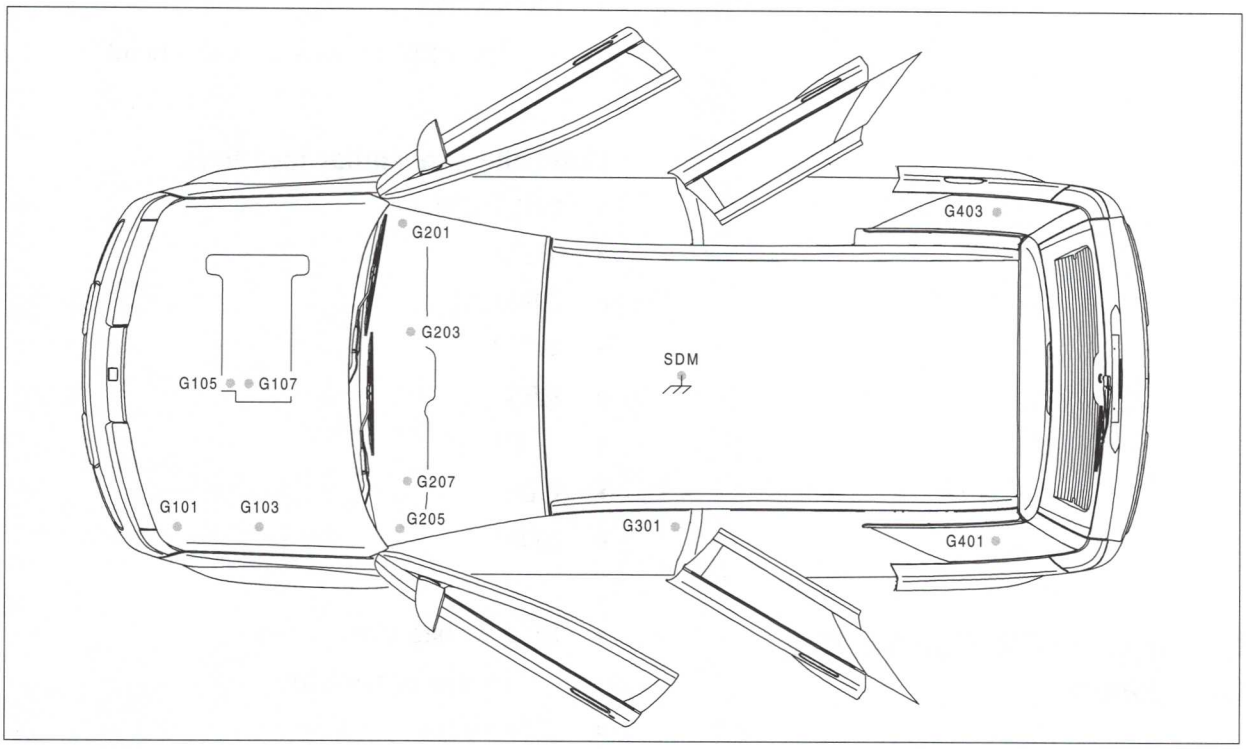
Controllers in similar locations

- L61 ECM
- TCM
- EBTCM
- BCM
- EPS
- IP Cluster
- CIM
- SDM

Location of SIR Side Air Bag Components

- Side air bag Connectors
  - In rear of vehicle
- Side air bag location
  - Side air bags sit in a trough
- Side impact sensors
  - Bottom of pillar

Ground Locations



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Location of Grounds

There is now ground identifiers with the ground names.

Engine Compartment Grounds

- G101-Forward Lamp Ground Splice Pack
- G103-IP/Chassis Ground
- G105-Engine Ground
- G107 (L81 Only)-Engine Ground

Passenger Compartment Grounds

- G201-Right Front Body Ground
- G203-H-Brace Ground
- G205-ABS Ground
- G207-EPS Ground
- G301-Left Body Ground
- SDM

Rear Compartment Grounds

- G401-Left Rear Body Ground
- G403-Right Rear Body Ground