Supplemental Restraint Systems

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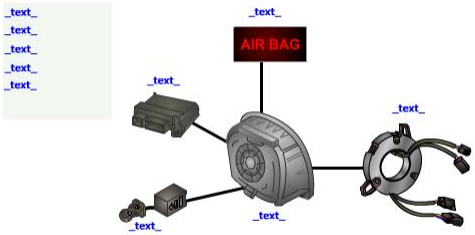
SRS

- Understand SRS operation
- SRS components
- SRS concerns
- Diagnosis of SRS
- System tests
- Interpret tests results

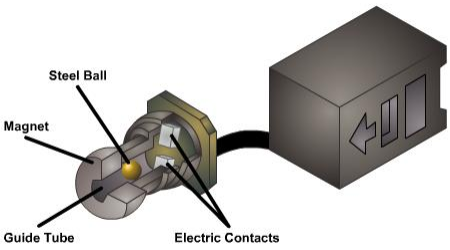
Components

- First generation air bag systems provide collision protection for both front occupants through the deployment of front airbags.
- Frontal deployment occurs at speeds greater than a force of 14mph into rigid barrier.



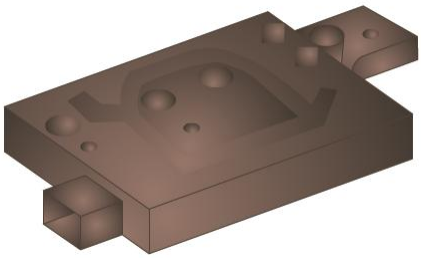
Crash Sensor

- Electromechanical device that reacts l a collision to provide a ground for the airbag deployment system.
- There are up to three sensors located on the front of the vehicle.
  - Safing sensor: low speed low strength magnet may be internal.
  - Impact sensor: higher speed high strength magnet.
- Both sensors must make contact for the air bags to deploy.
- Corner or side impacts do not move the contacts simultaneously.

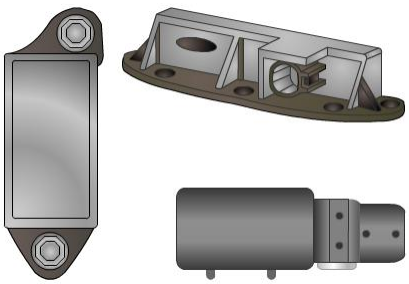


Crash Sensor

- On systems with safing sensors internal to the RCM a crash sensor is utilized.
- The RCM uses this more dynamic sensor input to determine impact severity. One sensor is usually located in the front center of the vehicle.
- Mounting is extremely important with crash sensors and RCMs with internal safing sensors.



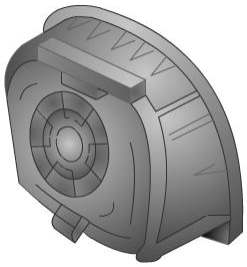
Side Impact Sensors



- Side Crash Satellite Sensors contain an accelerometer, which generates a signal directly proportional to the acceleration/deceleration rate.
- SCS input information is used to determine if a side airbag deployment is needed.
- The system MUST be deactivated before servicing the SCS sensors.

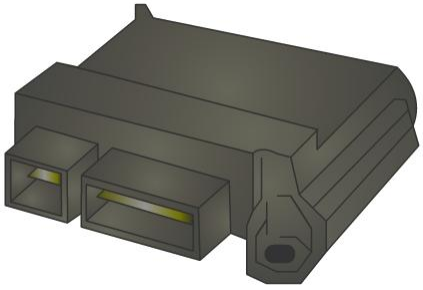
Air Bag Module

- Serviced as a unit.
- Mounted to either the steering wheel or dash panel for front passenger protection.
- Current is sent to the module to perform deployment .
- Dual stage systems are used to allow for protection in lower speed collisions. These systems have two igniters in the module.



RCM

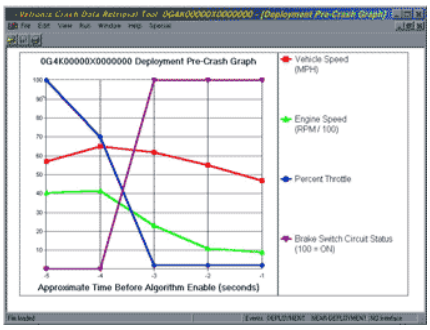
- Monitors inputs for state and faults
- Monitors the air bag Supplemental Restraint System (SRS) for faults
- Determines vehicle's deceleration rate
- Contains an internal safing sensor which is not serviced separately
- Illuminates the air bag indicator if a fault is detected
- Flashes the air bag indicator to indicate the Lamp Fault Code (LFC) detected
- Communicates through the Data Link Connector (DLC) the current or historical Diagnostic Trouble Codes (DTCs)
- Activates a chime if the air bag indicator is not available and another SRS fault exists
- Activates the safety belt pretensioners to remove slack from the safety belt
- Signals the inflators to deploy the air bags in the event of a deployable crash
- Deploys front and side air bags, and seat belt pretensioners

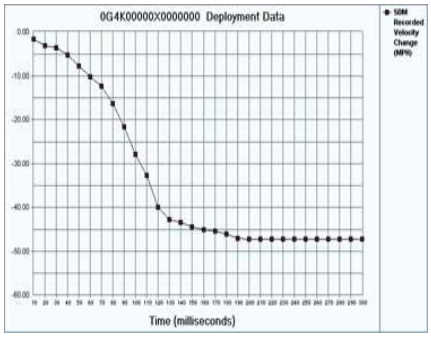


RCM

- Restraint control module
- Monitors the air bag modules for correct resistance.
- Monitors the impact sensors and safing sensor for impact information.
- Includes a thermal fuse that prevents unwanted airbag deployment. In some failure events the module opens the fuse to prevent power from being applied to the airbags.
- Air bag systems diagnostic information can be accessed through the indicator or using an appropriate scan tool.
- RCM and PCM's retain collision data. Since the inception of airbags on GM and Ford vehicles many modules have had the ability to retain collision information. They will record information internal to the module a set time before the collision and after the collision.

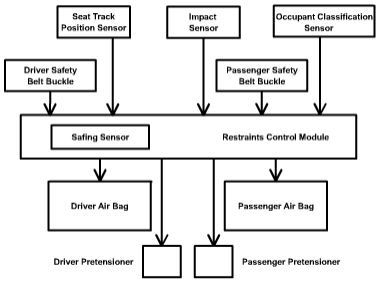
Crash Data Retrieval

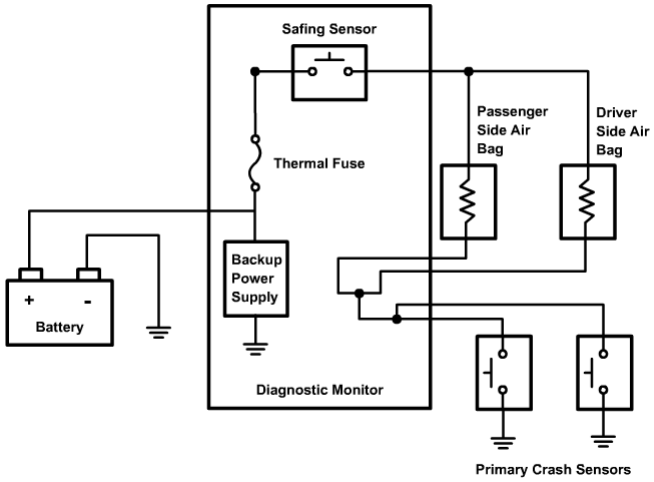




Two stage air bags

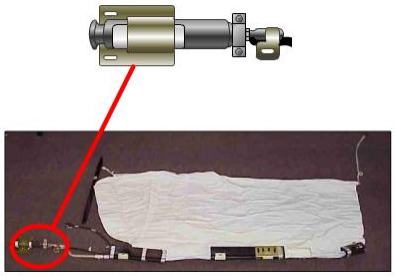
- Dual stage systems are used to allow for protection in lower speed collisions. These systems have two igniters in the module.
- The RCM determines crash severity, seat belt usage, occupant classification, and seat position to determine which stage needs to be deployed.
- If a severe collision is detected then the module deploys both stages within 10-30ms of each other.
- In a single stage event the RCM only deploys one stage. Some modules attempt to deploy the second stage 100ms after the primary event this prevents a non-deployed airbag.
- some airbag modules require the technician to deploy second stage for disposal.



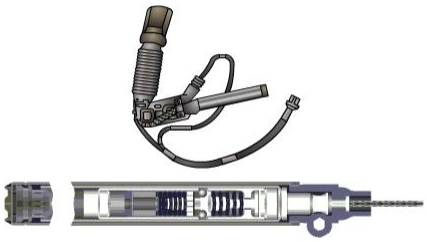


Canopy and Curtain Airbags

- Curtain airbags provide protection in the event of a rollover.
- It is positioned above the window line inside the vehicle.

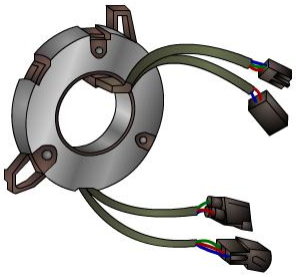


Pretensioners



- Seat belt buckles and retractors are equipped with pretensioning devices that are controlled by the RCM in the event of a collision.
- The device is a pyrotechnic charge that removes slack out of the belt in the event of a collision. During the tensioning the driver is held into the seat and eased into the oncoming airbag.

Clockspring



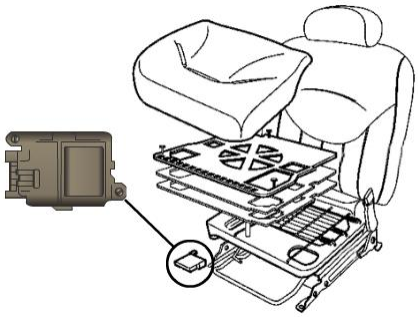
- Replaces the older style sliding contacts.
- The clockspring provides a continuous circuit for the drivers air bag, horn, and steering wheel controls.
- Consists of a ribbon cable, plastic housing, steering wheel and column connectors.
- Serviced

Indicator

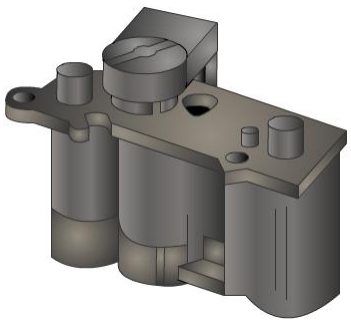
- The seat belt minder light is an important component of the system. Air bags are dangerous when the occupant is not belted.
- The Airbag indicator verifies system operation through a bulb check and can indicate faults.
- Some systems support LFCs

OCS

- Occupant Classification Sensor.
- The sensor is used to determine if the weight of the front passenger exceeds 40lbs.
- The sensor is a silicone filled bladder mounted in the bottom seat cushion, a pressure sensor, and module mounted to the seat frame.
- The OCS system is used by the RCM to determine which stage of air bag to deploy or if to deploy one at all. The
- If the vehicle is equipped with the OCS it will have a white tag with OCS located on the passenger front seat.



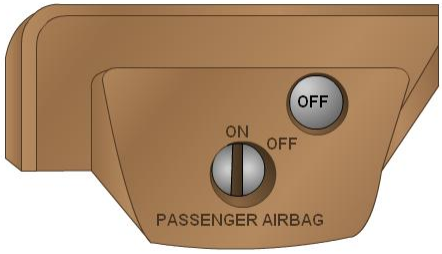
Seat Position Sensor



- The RCM uses the hall effect signal of the SPS to determine the drivers airbag deployment rate.

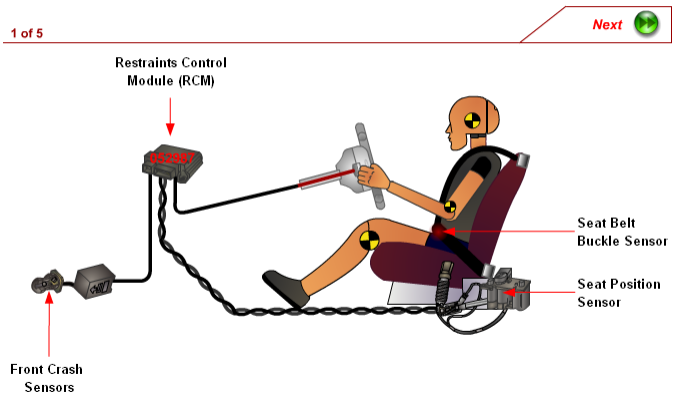
Deactivation Switch

- Before the inception of the Occupant Classification Switch there was an issue with children, pets, and equipment riding in the front seat. The switch allows the driver to deactivate the passenger front switch.
- The switch does not physically interrupt a circuit but is an input the RCM. It is a magnetic reed switch



Operation

The control module looks at several inputs including primary crash sensors, safing sensors, seat position, passenger weight, and belt buckle switches.



Review

- The purpose of the RCM is to _____.
  - Monitor the system for faults
  - Deploy the front and side airbags and seat belt pretensioners
  - Determine the strategy for deployment based on system inputs

Review

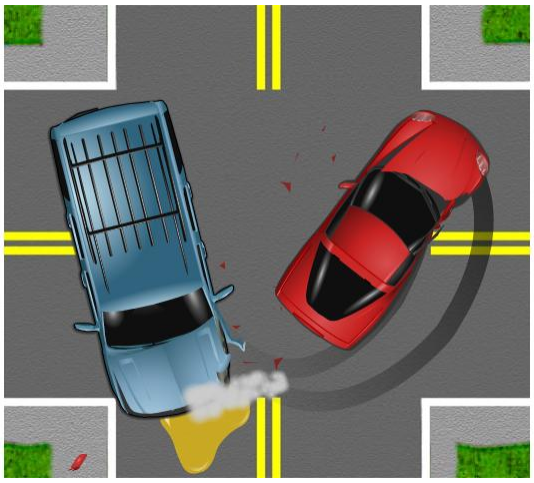
- For the front passenger the dual stage front airbag deployment strategy is based on:
  - Vehicle deceleration rate
  - Seat position and seat belt buckle state
  - Occupant weight

Review

- The safing sensor:
  - Is internal to the control module
  - Ensures that the airbags will not deploy if there is an electrical malfunction
  - Works in conjunction with crash sensors in order for the airbags to deploy.

System Operation Frontal Impact

System Operation Side Impact



System Operation Roll-Over

Symptoms and Malfunctions

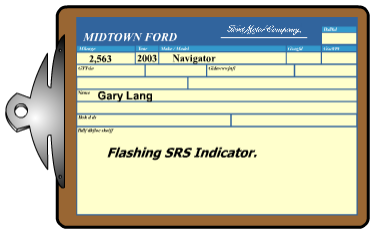
	Symptom	Components
1.	Lamp on or flashing	• Lamp • Control module • Crash sensors • Airbag • Pretensioner • Safety belt switches • Clockspring/sliding contact • Driver seat position switch • Occupant classification sensor • Safing sensor • Back-up power supply • Deactivation switch
2.	Warning tone on	• Control module • Supporting module • Lamp
3.	Safety Belt Minder	• see shop manual

Symptoms and Malfunctions

- A flashing indicator with or without an audible tone indicates a fault and that there are stored fault codes.
- An audible tone only indicates a lamp fault. The RCM instructs the ICM to emit the tone.
- LFCs are flashed five times then the lamp is held steady
- LFC's are two digit codes
- Retrieve DTC's when a fault is present.

Diagnosis
Verify the concern

- Always begin diagnosis by verifying the concern.
- Retrieve OASIS for SSMs, TSBs, and service history.
- Note the system equipment. Does it have Side bolster airbags, pretensioners, curtains, etc…

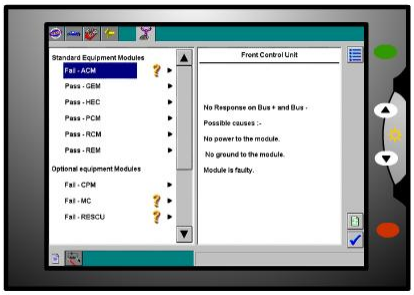


Prechecks

- Perform a good visual inspection, but do not disturb the connectors, harnesses, or module. If there is a component unplugged retrieve codes and start diagnosis.
- Note the LFC,s

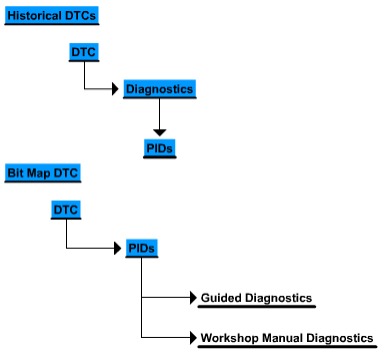
Network Tests

- Either force a network test or review the vehicle log in IDS.
- If the scan tool cannot communicate with optional modules than the vehicle may not be equipped.
- Reasons for failed modules:
  - Module may not be present
  - No power or ground to module
  - Module could be at fault
  - Wiring fault



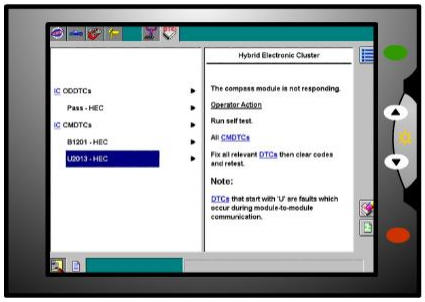
System Test

- Flow chart
- Follow the module DTC's to pinpoint tests
- If there is no communication to the module continue with LFC,s.
- If there are no DTC,s or LFC,s utilize the symptom charts.
- The SRS system is a simple design, but is often misunderstood. Utilize the guided diagnosis provided.

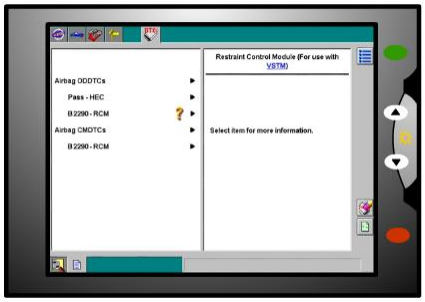


Related Modules

- You may also need to perform some diagnostics on modules related to the SRS system.
- The RCM communicates with the IC for lamp control and tone control .



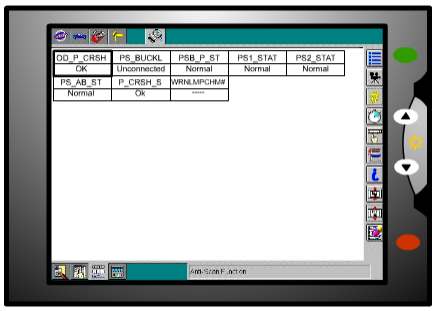
RCM System Tests



- DTC,s have related pinpoint tests.
- If there are no pinpoint test continue to the symptom chart.

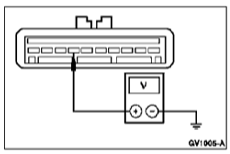
System Tests

- PID data monitor
- Monitor and exercise inputs and outputs to the system. Seat buckles, PADS, lamp, etc… (not air bags)



System Tests

- Pinpoint Tests
- Before you perform the pinpoint test be sure to follow the Deactivation procedure.

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK CIRCUIT 1040 (RD/BK) FOR AN OPEN	
1  Control Module C122	
2 	
3 	3 Measure the voltage between the control module C122 pin 7, circuit 1040 (RD/BK), harness side and ground.
	• **Is the voltage greater than 10 volts?** → **Yes** GO to A2. → **No** REPAIR the circuit. TEST the system for normal operation.

System Depower and Deactivation