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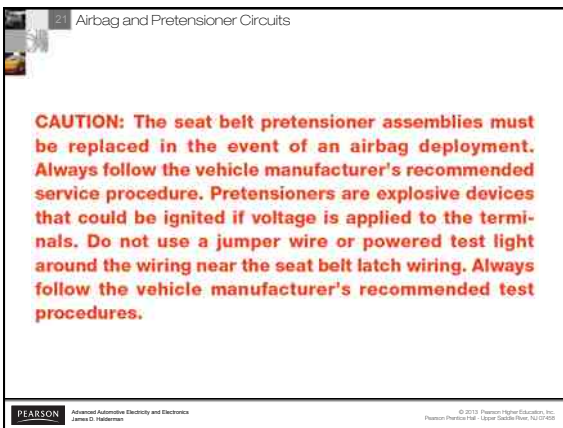
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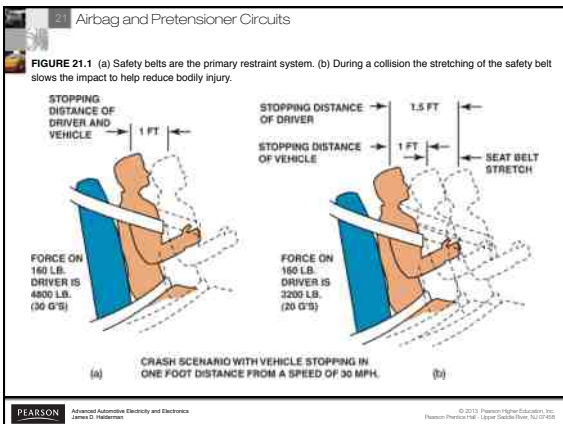
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21 Airbag and Pretensioner Circuits

**FIGURE 21.2** Most safety belts have an inertia-type mechanism that locks the belt in the event of rapid movement.

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**FIGURE 21.3** A typical safety belt warning light.

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21 Airbag and Pretensioner Circuits

**FIGURE 21.4** A small explosive charge in the pretensioner forces the end of the seat belt down the tube, which removes any slack in the seat belt.

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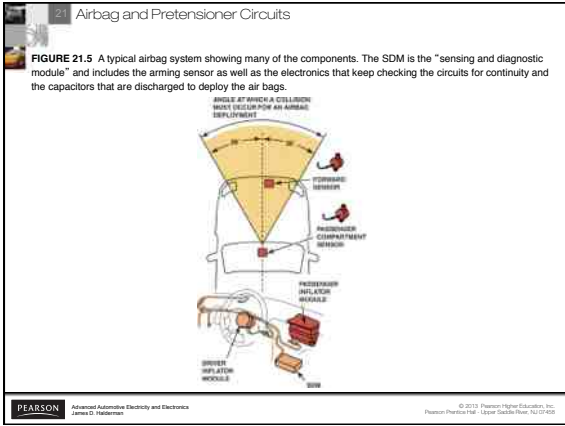
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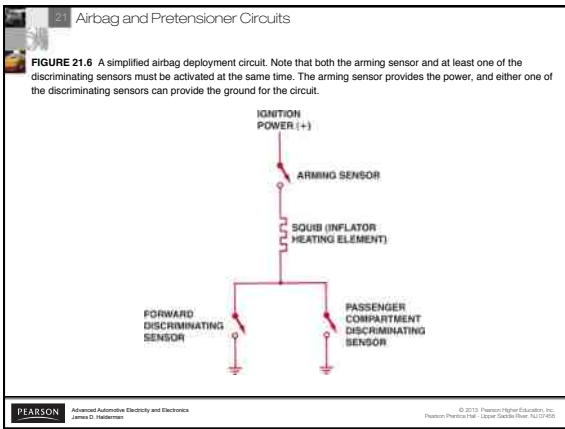
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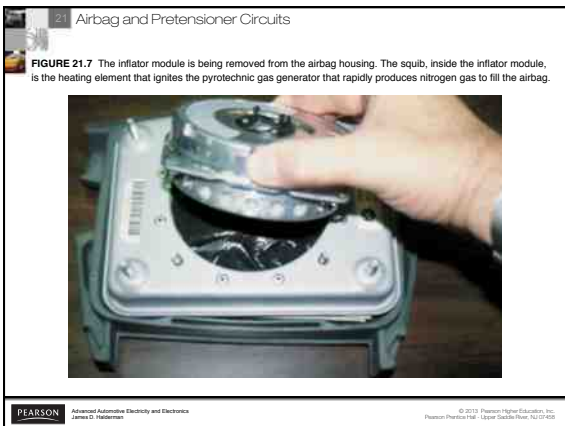
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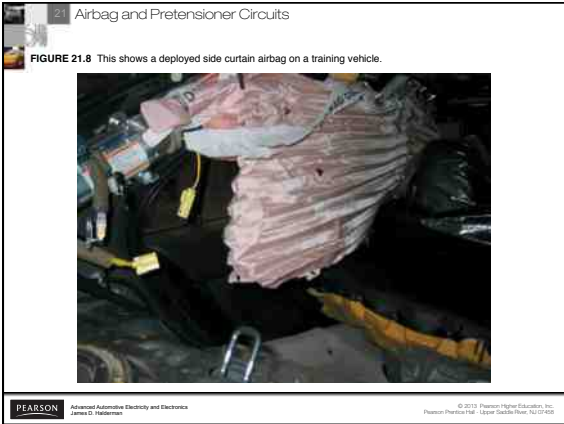
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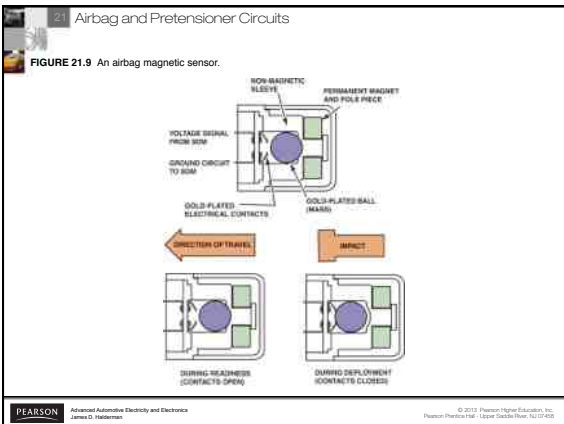
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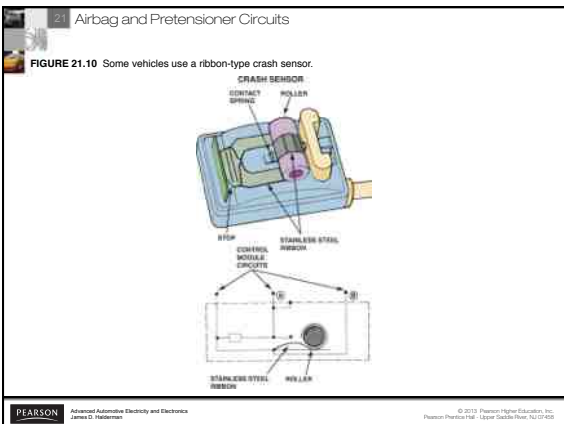
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21 Airbag and Pretensioner Circuits

**FIGURE 21.11** A sensing and diagnostic module that includes an accelerometer.

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21 Airbag and Pretensioner Circuits

**FIGURE 21.12** A driver's side airbag showing two inflator connectors. One is for the lower force inflator and the other is for the higher force inflator. Either can be ignited or both at the same time if the deceleration sensor detects a severe impact.

CONNECTORS TO EACH STAGE INFLATOR MODULE

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21 Airbag and Pretensioner Circuits

**SAFETY TIP**

**Dual-Stage Airbag Caution**

Many vehicles are equipped with **dual-stage airbags** (two-stage airbags) that actually contain two separate inflators, one for less severe crashes and one for higher speed collisions. These systems are sometimes called **smart airbag systems** because the accelerometer-type sensor used can detect how severe the impact is and deploy one or both stages. If one stage is deployed, the other stage is still active and could be accidentally deployed. A service technician cannot tell by looking at the airbag whether both stages have deployed. Always handle a deployed airbag as if it has not been deployed and take all precautions necessary to keep any voltage source from getting close to the inflator module terminals.

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2 | Airbag and Pretensioner Circuits

**TECH TIP**

**Pocket the Ignition Key to Be Safe**

When replacing any steering gear such as a rack-and-pinion steering unit, be sure that no one accidentally turns the steering wheel. If the steering wheel is turned without being connected to the steering gear, the airbag wire coil (clockspring) can become off center. This can cause the wiring to break when the steering wheel is rotated after the steering gear has been replaced. To help prevent this from occurring, simply remove the ignition key from the ignition and keep it in your pocket while servicing the steering gear.

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2 | Airbag and Pretensioner Circuits

**FIGURE 21.13** The airbag control module is linked to the powertrain control module (PCM) and the body control module (BCM) on this Chrysler system. Notice the airbag wire connecting the module to the airbag through the clockspring. Both power, labeled "driver airbag high" and ground, labeled "driver airbag low" are conducted through the clockspring.

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2 | Airbag and Pretensioner Circuits

**CAUTION: Most vehicle manufacturers specify that the negative battery terminal be removed when testing or working around airbags. Be aware that a memory saver device used to keep the computer and radio memory alive can supply enough electrical power to deploy an airbag.**

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21 Airbag and Pretensioner Circuits

**FIGURE 21.14** An airbag diagnostic tester. Included in the plastic box are electrical connectors and a load tool that substitutes for the inflator module during troubleshooting.



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21 Airbag and Pretensioner Circuits

**FREQUENTLY ASKED QUESTION**

**What Are Smart Airbags?**

Smart airbags use the information from sensors to determine the level of deployment. Sensors used include:

- **Vehicle speed (VS) sensors.** This type of sensor has a major effect on the intensity of a collision. The higher the speed is, the greater the amount of impact force.
- **Seat belt fastened switch.** If the seat belt is fastened, as determined by the seat belt buckle switch, the airbag system will deploy accordingly. If the driver or passenger is not wearing a seat belt, the airbag system will deploy with greater force compared to when the seat belt is being worn.
- **Passenger seat sensor.** The sensor in the seat on the passenger's side determines the force of deployment. If there is not a passenger detected, the passenger side airbag will not deploy on the vehicle equipped with a passenger seat sensor system.

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21 Airbag and Pretensioner Circuits

**FREQUENTLY ASKED QUESTION**

**Why Change Knee Bolsters If Switching to Larger Wheels?**

Larger wheels and tires can be installed on vehicles, but the powertrain control module (PCM) needs to be reprogrammed as the speedometer and other systems that are affected by a change in wheel/tire size can work effectively. When 20-in. wheels are installed on General Motors trucks or sport utility vehicles (SUVs), GM specifies that replacement knee bolsters be installed. Knee bolsters are the padded areas located on the lower part of the dash where a driver or passenger's knees would rest in the event of a front collision. The reason for the need to replace the knee bolsters is to maintain the crash testing results. The larger 20-in. wheels would tend to be forced further into the passenger compartment in the event of a front-end collision. Therefore to maintain the frontal crash rating standard, the larger knee bolsters are required.

**WARNING:** Failure to perform the specified changes when changing wheels and tires could result in the vehicle not being able to provide occupant protection as designed by the crash test star rating that the vehicle originally achieved.

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21 Airbag and Pretensioner Circuits

**FIGURE 21.15** After disconnecting the battery and the yellow connector at the base of the steering column, the airbag inflator module can be removed from the steering wheel and the yellow airbag electrical connector at the inflator module disconnected.

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21 Airbag and Pretensioner Circuits

**FIGURE 21.16** Shorting bars are used in most airbag connectors. These spring-loaded clips short across both terminals of an airbag connector when it is disconnected to help prevent accidental deployment of the airbag. If electrical power was applied to the terminals, the shorting bars would simply provide a low-resistance path to the other terminal and not allow current to flow past the connector. The mating part of the connector has a tapered piece that spreads apart the shorting bars when the connector is reconnected.

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21 Airbag and Pretensioner Circuits

**FIGURE 21.17** An airbag clockspring showing the flat conductor wire. It must be properly positioned to ensure proper operation.

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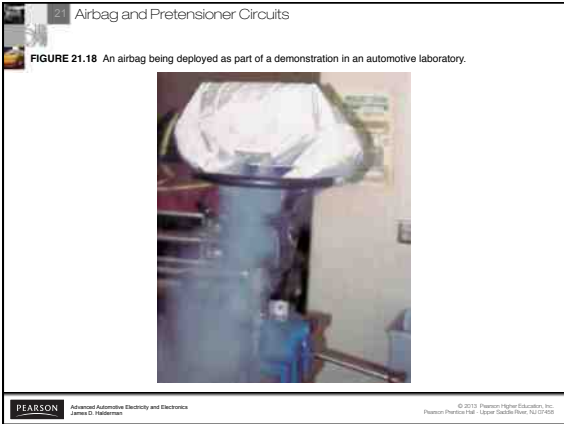
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21 Airbag and Pretensioner Circuits

**FIGURE 21.21** A gel-filled (bladder-type) occupant detection sensor showing the pressure sensor and wiring.



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21 Airbag and Pretensioner Circuits

**FIGURE 21.22** A resistor-type occupant detection sensor. The weight of the passenger strains these resistors, which are attached to the seat, thereby signaling to the module the weight of the occupant.



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21 Airbag and Pretensioner Circuits

**FIGURE 21.23** A test weight is used to calibrate the occupant detection system on a Chrysler vehicle.



**CAUTION:** Because the resistors are part of the seat structure, it is very important that all seat fasteners be torqued to factory specifications to ensure proper operation of the occupant detection system. A seat track position (STP) sensor is used by the airbag controller to determine the position of the seat. If the seat is too close to the airbag, the controller may disable the airbag.

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21 Airbag and Pretensioner Circuits

**FIGURE 21.24** A typical seat (side) airbag that deploys from the side of the seat.



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21 Airbag and Pretensioner Circuits

**TECH TIP**

**Aggressive Driving and OnStar**

If a vehicle equipped with the OnStar system is being driven aggressively and the electronic stability control system has to intercede to keep the vehicle under control, OnStar may call the vehicle to see if there has been an accident. The need for a call from OnStar usually will be determined if the accelerometer registers slightly over 1 g-force, which could be achieved while driving on a race track.

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**CAUTION:** Avoid using a lockout tool (e.g., a "slim jim") in vehicles equipped with side airbags to help prevent damage to the components and wiring in the system.

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