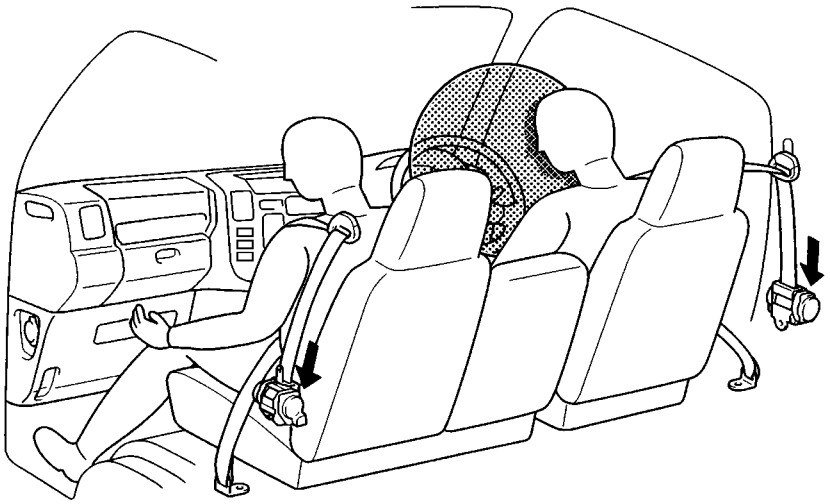
■SRS AIRBAG AND SEAT BELT PRETENSIONER (for Australia as option)

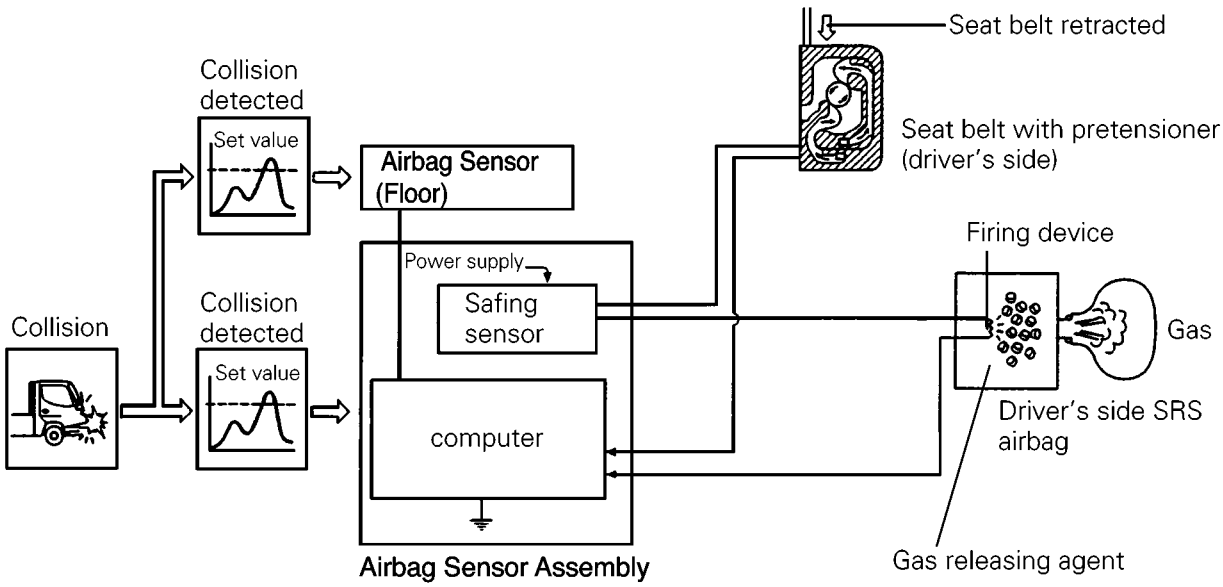
1. General

- A driver's side electrically inflated SRS (Supplemental Restraint System) airbag and seat belt with pretensioner were adopted.
- The SRS airbag is designed to supplement the seat belt's restraining effect and restrain the vehicle occupants when the vehicle receives a strong impact from the front. The airbag inflates instantaneously and the impact to the head and chest areas of the occupants.
- The pretensioner equipped on the seat belt retracts the belt instantaneously, assisting the belt's restraining effect, when the vehicle receives a strong impact from the front.



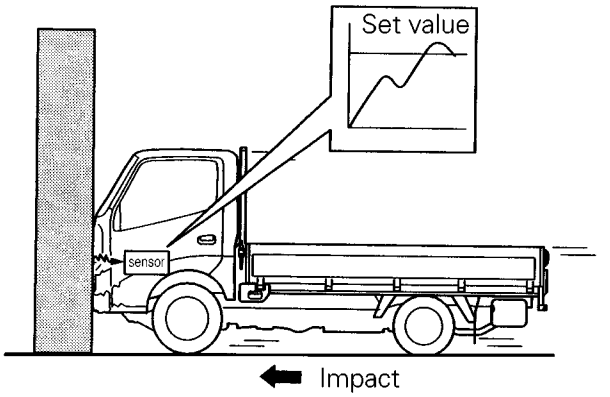
▶ System Diagram ◀

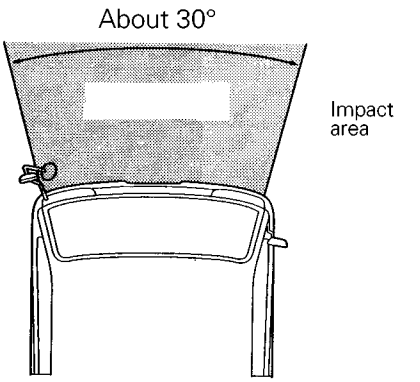
The ECU determines when to activate the SRS airbag and pretensioner, and send signals to fire the inflators, when the floor airbag sensor installed in the cab floor and the safing sensor inside the airbag sensor assembly detect a drop in vehicle speed due to a frontal impact, and output corresponding signals to the ECU.



2. System Operation

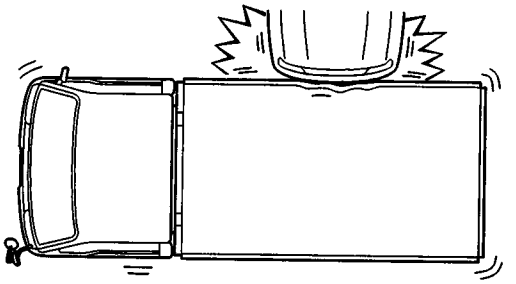
The SRS airbag and seat belt with pretensioner operate only when the system detects a frontal impact larger than a predetermined value. The airbag will deploy if the vehicle collides with a solid, immovable wall at a speed of at least 25 km/h and with an area of impact of about 30°.
If the vehicle receives a strong impact from below, the airbag may deploy because the floor airbag sensor and safing sensor will detect a drop in speed at the time of the impact. (Typical examples include driving over a curb, driving into a deep hole or gutter, bouncing and hitting the road surface, and driving off the road.)



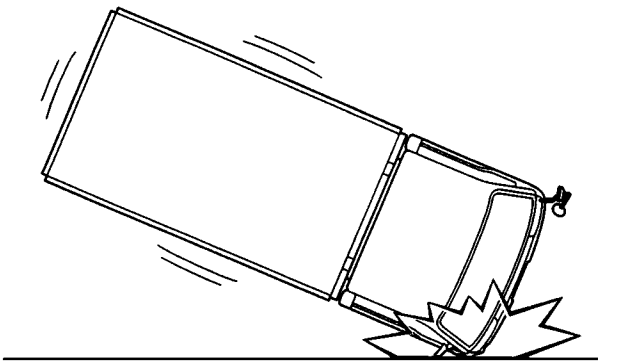


▶ When the SRS airbag will not deploy ◀

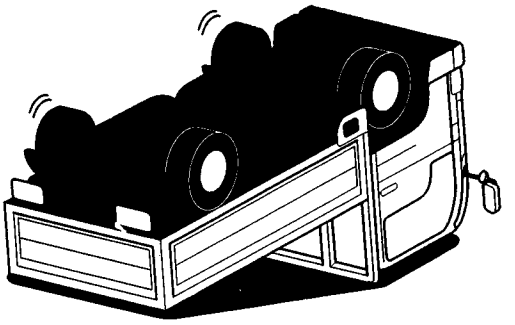
The airbag may not deploy under certain circumstances, because the floor airbag sensor and safing sensor are designed to detect a drop in vehicle speed due to an impact received from the vehicle front. The airbag will not deploy if the drop in speed is less than the sensor set value, even if the vehicle receives a frontal impact.



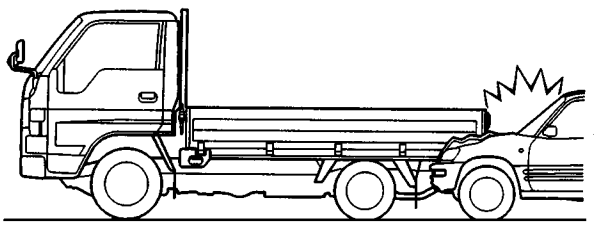
• When the vehicle receives an impact from the side



• When the vehicle receives a frontal impact at an oblique angle



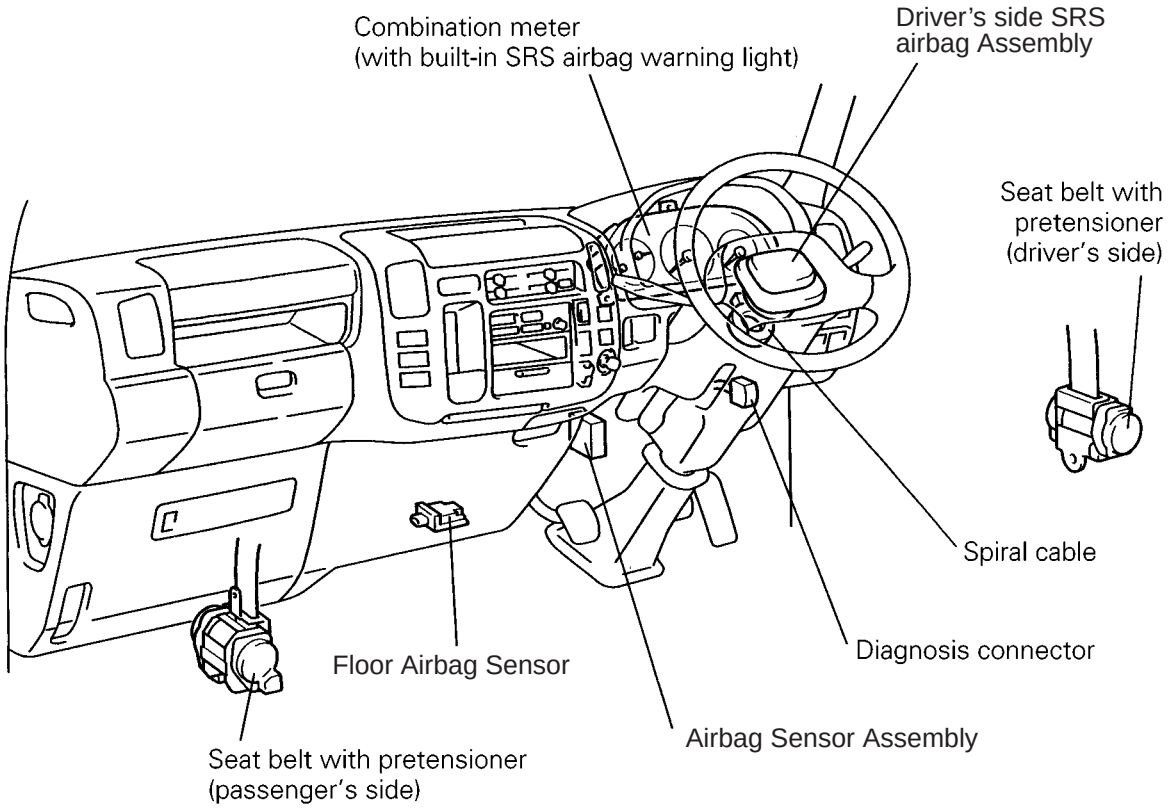
• When the vehicle rolls over on its top



• During a rear-end collision

3. Layout of Components

- The SRS airbag system is comprised of the SRS airbag assembly, airbag sensor assembly, floor airbag sensor, seat belt with pretensioner, and other components.



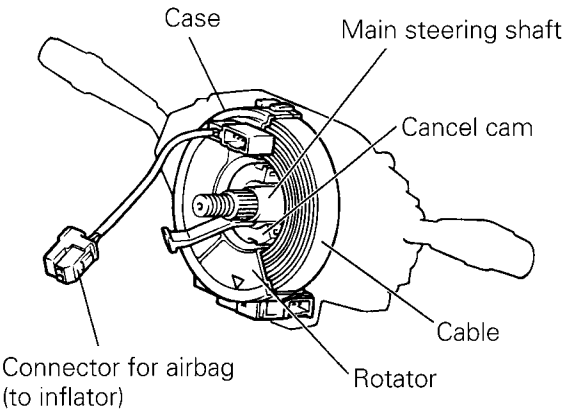
▶ Main Components and Functions ◀

Component	Function
Spiral cable	Transmits inflator firing signal from airbag sensor assembly (computer) to the driver's side airbag inflator.
SRS airbag Assembly	Comprised of inflator and airbag; inflator releases gas that instantaneously inflates the airbag to cushion impact to vehicle occupants.
Pretensioner mechanism	Pretensioner mechanism Instantaneously retracts seat belt, boosting the belt's restraining effect, using gas produced in a chamber by firing of gas generator.
SRS airbag warning light	Lights up or flashes to warn driver of system malfunction.
Floor airbag sensor	Detects drop in vehicle speed due to frontal impact and outputs firing signal to airbag sensor Assembly.
Airbag sensor Assembly	Consists of a safing sensor, firing criteria circuit, and other components; determines firing criteria based on signals from floor airbag sensor and safing sensor when a drop in vehicle speed due to frontal impact is detected; outputs firing signal to SRS airbag Assembly and pretensioner mechanism; and diagnoses system trouble when diagnosis mode is selected.

4. Construction and Operation

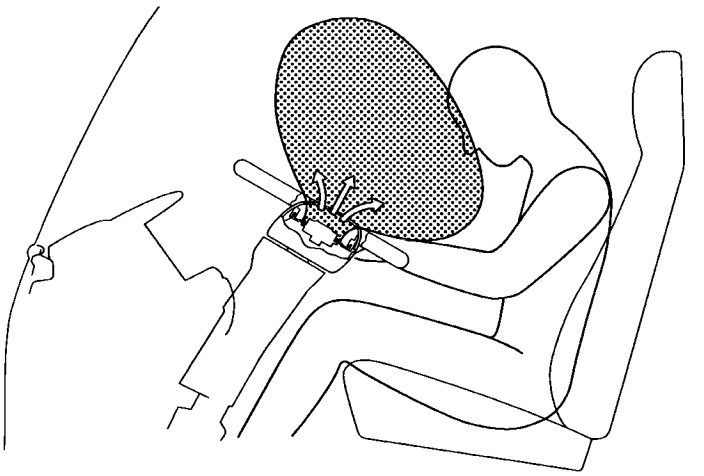
[1] Spiral cable

A spiral cable was installed between the vehicle wire harness and the steering wheel connector. It consists of a rotator, case, cable, cancel cam, and other parts. The cancel cam and rotator form an integral unit that turns together with the steering wheel. The cable is coiled inside the case and the rotator can make 2.5 turns clockwise and counterclockwise from a neutral position.

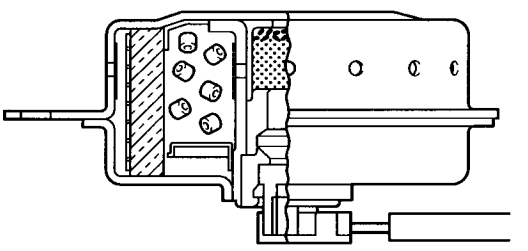


[2] Driver's side SRS airbag Assembly

The driver's side SRS airbag Assembly is housed inside the steering wheel pad. It is a non-removable type and consists of an inflator, airbag, wheel pad, and other parts. The igniter inside the inflator has an electrical firing device, which operates when a firing signal is received from the airbag sensor. The spark is instantly diffused by a flame spreading agent and gas releasing agent, which releases a gas inside the inflator. At the same moment the airbag starts to inflate.



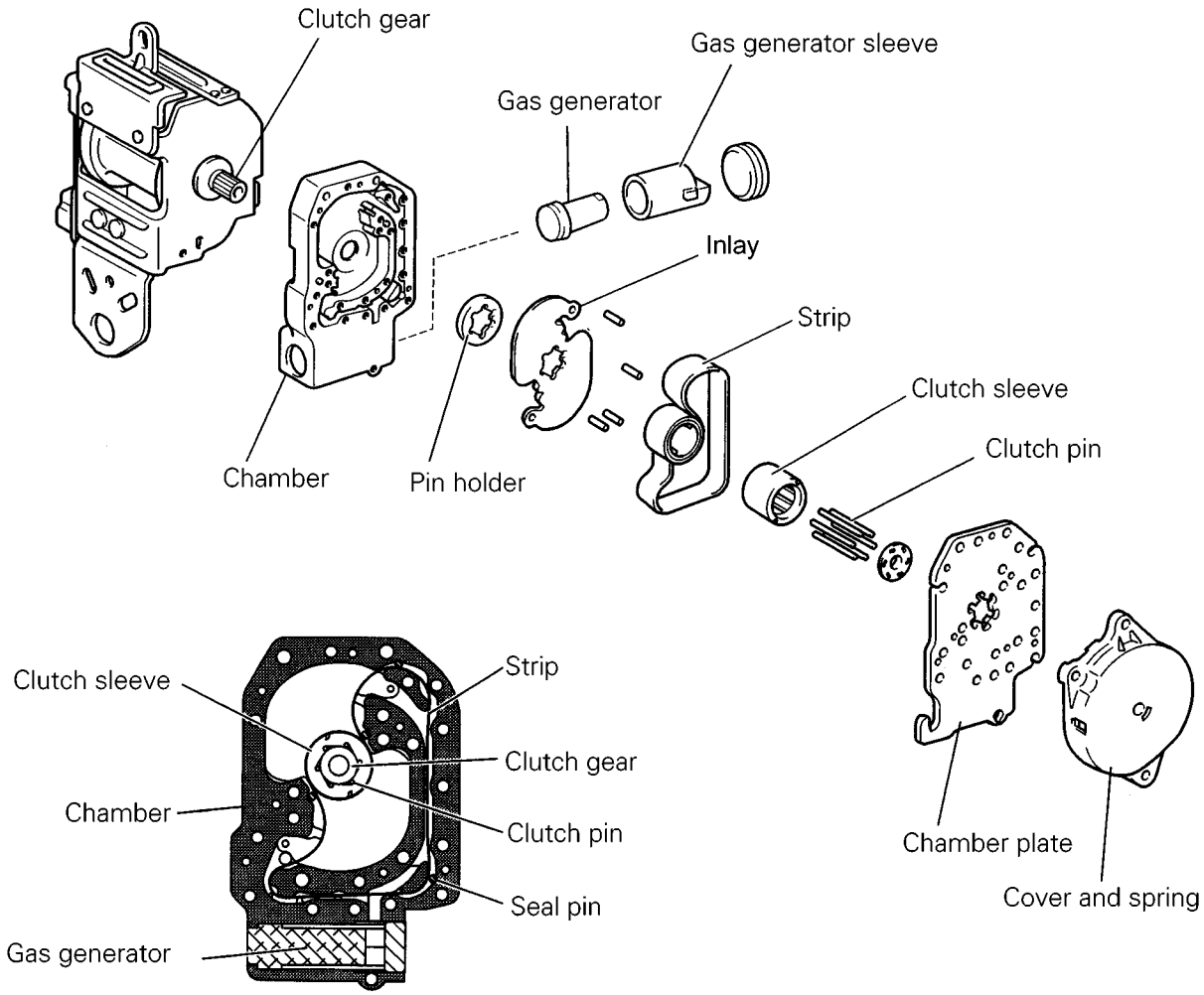
Inflated airbag



Inflator

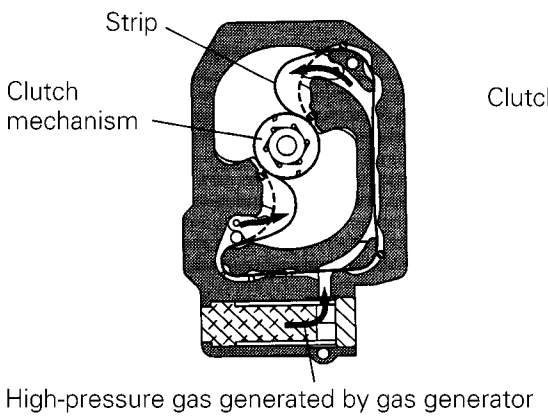
[3] Seat belt with pretensioner

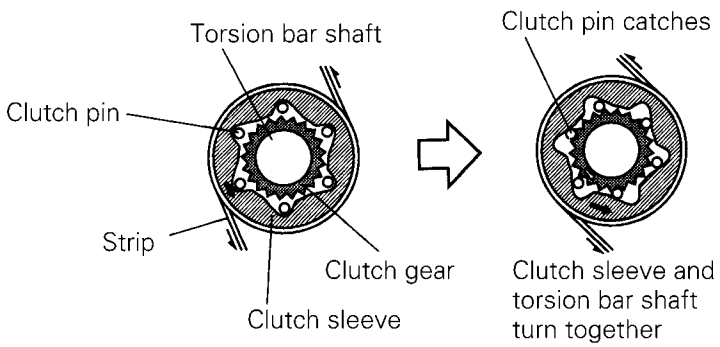
A pretensioner mechanism is installed in the seat belt retractor and it is comprised of a gas generator, chamber, chamber plate and strip, clutch sleeve, clutch gear, and other components.



▶ Pretensioner Mechanism Operation ◀

The gas generator produces a high-pressure gas inside the chamber according to a firing signal from the ECU, and this causes the strip coiled around the clutch sleeve to be pulled out.
The clutch sleeve then rotates until the clutch pin separates from the pin holder and wedges itself between the clutch sleeve and the clutch gear. This causes the spool to rotate via the torsion bar shaft and retract the seat belt.



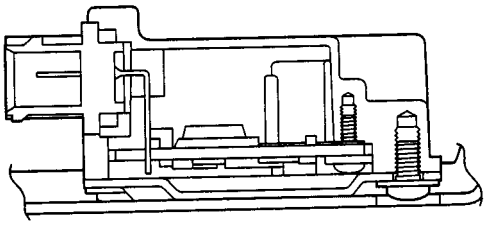


Clutch Mechanism Operation

BE

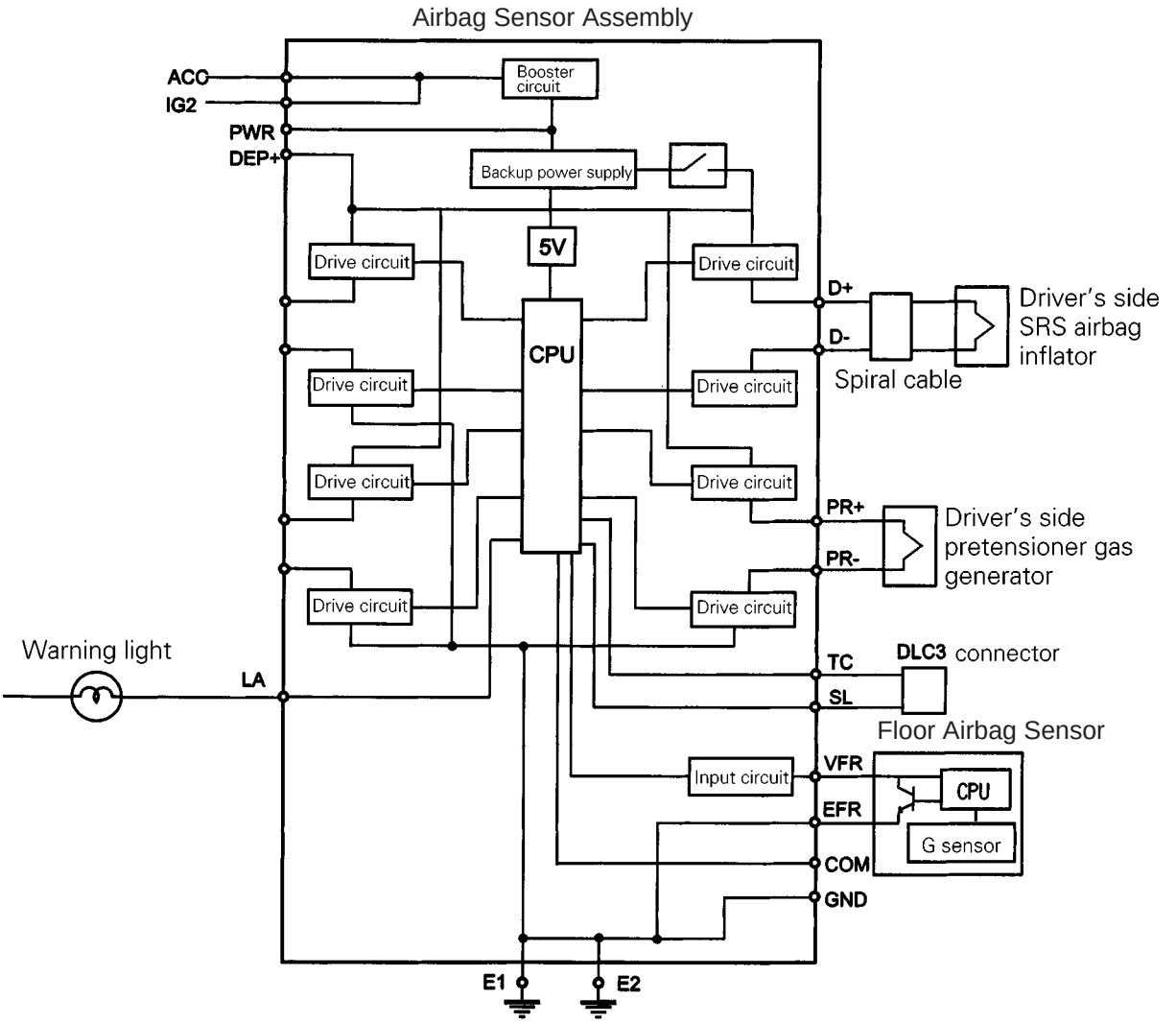
[4] Floor airbag sensor

Installed in the floor below the center of the instrument panel, the floor airbag sensor is a diaphragm-type G sensor that responds to a drop in speed with linear output characteristics, sending a signal to the airbag sensor Assembly when it detects a drop in speed.



[5] Airbag sensor Assembly (computer)

The airbag sensor Assembly is installed on the accelerator pedal bracket. Its structural components include a mechanical safing sensor, firing criteria circuit, drive circuit, and backup power supply. The airbag sensor determines the airbag and pretensioner firing criteria based on signals from the floor airbag sensor, and it is equipped with a self-diagnosis function for diagnosing system trouble when it occurs.

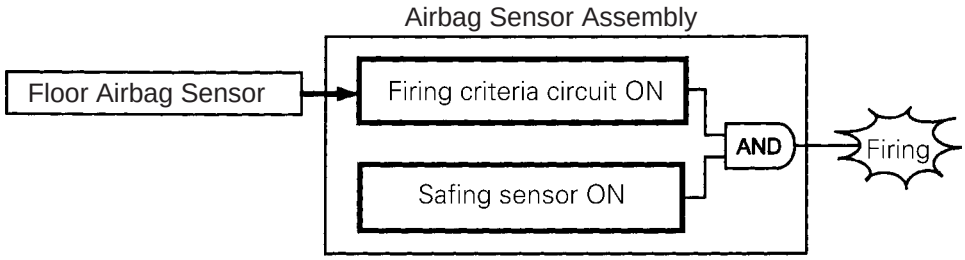


▶ System Components ◀

Component	Function
Safing sensor	Turns on the drive circuit to the inflator when it detects a drop in vehicle speed due to an impact larger than a predetermined value.
Backup power supply	Consists of a backup capacitor that supplies power to the system during a collision or power supply system malfunction, and a booster circuit for boosting the voltage when a voltage drop occurs.
Airbag Sensor Assembly	Carries out prescribed computations according to signals from the floor airbag sensor and outputs a firing signal when the computed value exceeds a predetermined value. Also, determines total system breakdown from trouble diagnosis circuit, warns the driver of the trouble, and diagnoses the trouble location using its self-diagnosis function.

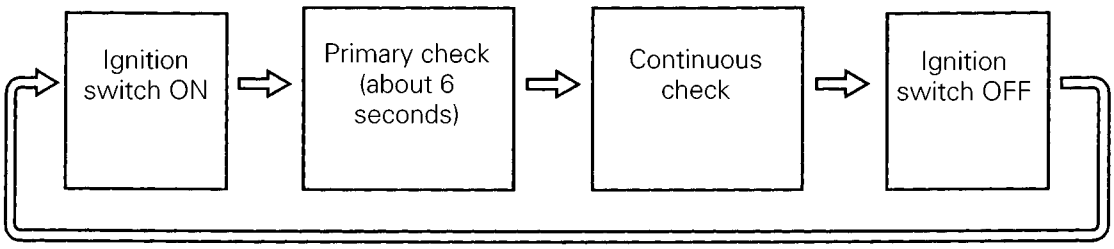
a. Operating criteria

A firing signal is output when both the floor airbag sensor and safing sensor are activated by an impact.



b. Diagnosis circuit operation

Operation of the diagnosis circuit is indicated by the warning light in the combination meter.
The diagnosis circuit operates in two stages a primary check and a continuous check.



1) Primary check

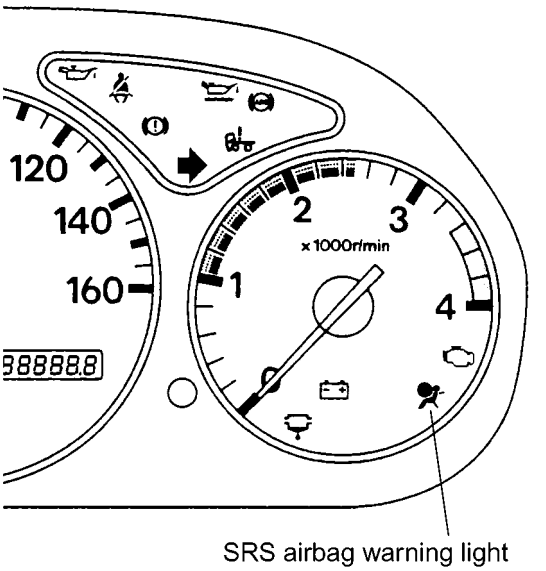
When the ignition switch is turned on, the airbag warning light comes on for about 6 seconds and the primary check is executed. During this time the airbag sensor assembly operation is checked for conditions that would prevent firing. If trouble is detected, the airbag warning light will stay on or start flashing.

2) Continuous check

Once the primary check is completed and the airbag warning light goes out, firing is possible and the diagnosis circuit checks for system trouble continuously. If trouble is detected, the airbag warning light will come on or start flashing. (In the event of a line voltage drop, the warning light will go out if the normal line voltage is restored.)

3) Self-diagnosis function

When diagnosis mode is selected, the trouble location is indicated by the warning light flashing pattern. With the new self-diagnosis function, diagnosis codes that indicate the trouble location can be read by connecting diagnostic tools to the DLC3 connector.



▶ Diagnostic Trouble Code Chart ◀

DTC No.		Detection Item	DTC No.		Detection Item
2-digit	5-digit		2-digit	5-digit	
11	B0102	Short in D squib circuit (to ground)	36	B1148	Short in airbag sensor assy No.2 circuit (to +B)
12	B0103	Short in D squib circuit (to +B)	61	B0132	Short in P/T squib (RH) circuit (to ground)
13	B0100	Short in D squib circuit	62	B0133	Short in P/T squib (RH) circuit (to +B)
14	B0101	Open in D squib circuit	63	B0130	Short in P/T squib (RH) circuit
24	B1135	Half connection in airbag ECU assy connector	64	B0131	Open in P/T (RH) circuit
31	B1100	Seat belt buckle switch (LH) malfunction			

[6] Airbag system designated connectors

All airbag system connectors are yellow, and specially designated connectors and wire harnesses are used. All terminals are plated terminals with superior anticorrosive and conducting properties. Connectors with special locking mechanisms are used for reliable connections. For details, see the 2003 Dyna Repair Manual (Pub. No. RM1008E).