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TRANSPORTATION SCIENCES CENTER
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Division of Calspan SRL Corporation
Buffalo, New York 14225

CALSPAN ON-SITE AIR BAG DEPLOYMENT INVESTIGATION
CALSPAN CASE NO. 95-19
VEHICLE: 1993 SUBARU IMPREZA
LOCATION: PENNSYLVANIA

Contract No. DTNH22-94-D-07058

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
Washington, D.C. 20590

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points are coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

TECHNICAL REPORT STANDARD TITLE PAGE

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15. Supplementary Notes
On-site investigation of an alleged inadvertent deployment of the driver's side air bag in a 1993 Subaru Impreza.

16. Abstract
This on-site investigation was initiated following the driver's complaint of an alleged inadvertent deployment of the supplemental air bag system in her 1993 Subaru Impreza. As she initiated a left turn into a parking lot, the driver stated that the air bag system deployed without impact. Following the inspection of the vehicle and incident site, in combination with a diagnostic test of the vehicle's SRS, it was determined that the system deployed as a result of undercarriage contact with a concrete rain gutter which paralleled the roadway.

17. Key Words On-site investigation Alleged inadvertent deployment Undercarriage contact	*18. Distribution Statement* General Public

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CALSPAN ON-SITE AIR BAG DEPLOYMENT INVESTIGATION
CALSPAN CASE NO. 95-19
VEHICLE: 1993 SUBARU IMPREZA
LOCATION: PENNSYLVANIA

SUMMARY

This on-site investigation focused on an owner's complaint of an inadvertent deployment of the supplemental driver's side air bag in a 1993 Subaru Impreza. The driver/owner stated that she was accelerating from a stopped position and initiated a left turn into a parking lot when the vehicle's air bag deployed without impact. She sustained multiple soft tissue injuries of the face, neck, and chest from her involvement with the deploying air bag. The vehicle was subsequently towed to a local dealership where an undercarriage impact was noted to the right front tie-down bracket. Following a thorough inspection of the vehicle, a diagnostic test of the vehicle's air bag system, and an inspection of the scene of the incident, it was determined that deployment resulted from minor undercarriage contact with a concrete rain gutter which paralleled the edge of the asphalt road surface.

The undercarriage related deployment occurred in [redacted] 1995, during daylight hours, at the junction of a two-lane city street and a wide parking lot for a zoo and animal clinic. The dry asphalt road surface was 15.8 m (52.0') in width inclusive of designated diagonal parking adjacent to the right (south) curbline. The two lane roadway was posted with a 40 km/h (25 mph) speed limit. Traffic flow at the time of the deployment incident was rated as heavy with pedestrian travel crossing the road at the marked crosswalk.

The involved vehicle, a 1993 Subaru Impreza L, was a 4-door hatchback configuration and was equipped with the all-wheel drive option (AWD). The driver stated that her and her husband purchased the vehicle as new and had owned the Subaru for approximately two years. She noted that her husband was the primary driver of the vehicle. In addition to the AWD, the Subaru was equipped with a 4-speed automatic overdrive transmission with a console mounted shifter, power-assisted steering and brakes, power windows, and a tilt mechanism for vertical adjustment of the steering column, as opposed to tilt-wheel. The Subaru was also equipped with a Supplemental Restraint System (SRS) which consisted of a driver's side air bag. The vehicle was manufactured on 3/93 and was identified by vehicle identification number JF1GF2448PH (production number deleted). At the time of vehicle inspection, the Subaru's odometer had a reading of 38,654 km (24,019 miles). It should be noted that the Subaru was not equipped with a cellular phone or any aftermarket electronic equipment (i.e., alarm system, compact disc player, citizens band radio, etc.)

The Subaru was occupied by the 38 year old female driver and three children, seated in the right front and rear outboard seated positions. The driver had a stated height of 151.80 cm (59.75") and an approximate weight of 52 kg (115 lbs.). She was wearing a short sleeve blouse, shorts, and wire framed prescription eyeglasses. The driver stated that she typically drove the vehicle with the seat track adjusted approximately 7-10 cm (3-4") rearward of the full forward position. She reported that all occupants of the vehicle were properly restrained by the manual 3-point lap and shoulder belts that were equipped at all outboard seated positions.

The driver was traveling in an easterly direction on the two-lane road and approached the parking lot to the zoo and animal clinic at a slow rate of speed due to heavy volume of vehicular and pedestrian traffic. She was momentarily stopped in the eastbound travel lane for standing traffic. As she approached the marked pedestrian crosswalk, the driver initiated a left turn across the westbound travel lane into the parking lot. The driver estimated her turning speed at approximately 5-8 km/h (3-5 mph) and noted that the lot was full with parked vehicles. As she entered the parking lot, the driver reported that the supplemental air bag system deployed in the Subaru. The driver stated that she heard a loud sound similar to a gun shot and noted a white powder within the vehicle. She immediately applied the vehicle's brakes and stopped the Subaru Impreza a driver estimated distance of 15 m (50') from the north roadedge. The driver unfastened her manual restraint system and opened the left front door to exit the vehicle. As she exited the Subaru, the vehicle began to roll forward. She reapplied the vehicle's brakes and placed the console mounted transmission selector lever in the park position. The driver assisted the children from the vehicle and ordered them to stand away from the Subaru. A woman standing in the area of the deployment, proceeded to a telephone and called for fire department assistance.

The petite driver was positioned within a close proximity to the steering assembly and air bag module. The deploying air bag contacted the driver's face, anterior neck, chest and left forearm. She was wearing facial makeup and lipstick which transferred onto the face of the deploying air bag. The lipstick transfer began 9.1-15.0 cm (3.6-5.9") right of the air bag's centerline and extended 2.3-4.8 cm (0.9-1.9") below the horizontal centerline (refer to Photograph No. 29). An additional lipstick transfer was noted within the tether reinforcement and was located 2.8-7.4 cm (1.1-2.9") right of center and 2.0-4.4 cm (0.8-1.75") below the center point. This transfer blended into a flesh-tone makeup transfer that was contained within the tether reinforcement circle. This transfer extended 0-5.1 cm (0.0-2.0" left of center and from 0.6 cm (0.25") above the horizontal centerline to 5.1 cm (2.0") below the referenced axis. A second area of makeup transfer was noted 12.7-16.5 cm (5.0-6.5") left of center and 1.0-4.4 cm (0.4-1.75") below the horizontal centerline. This wide-band of makeup resulted from the bag expanding across the driver's face. The driver's prescription eyeglasses remained on her face and were not displaced or damaged from air bag deployment. The right side of the knee bolster was scuffed from an apparent right knee contact by the driver. She did not complain of injury to the lower extremities.

The driver's involvement with the deploying air bag resulted in abrasions (AIS-1) of the right cheek, nose, and right anterior neck. She also sustained contusions (AIS-1) of the upper chest, left anterior forearm, and of the dorsal aspect of the left hand, between the thumb and index finger. The left hand contusion probably resulted from contact with the left A-pillar if the hand was displaced from the steering wheel rim by the expanding air bag. In addition to the soft tissue injuries, the driver complained of pain to the chest area and swelling of the lips. She was transported by private vehicle to a local hospital where she was treated in the emergency room for her injuries. The three children in the vehicle were not injured.

The responding fire department was informed of the air bag deployment. A fireman folded the deployed air bag into the module assembly and taped the cover flaps closed with duct tape. The vehicle was subsequently placed into a parking space within the lot. The driver notified the local dealership of the deployment and was advised that the vehicle would be towed to the facility for repair.

The service manager at the dealership noted a recent contact which abraded the right tie-down bracket that was mounted below the front bumper and forward of the right front axle position at the front corner of the unibody chassis. The Subaru was inspected at the local dealership approximately 2.5 weeks following the deployment event. The vehicle was found locked and reportedly untouched since arriving at the dealership. There was no external damage or contact noted to the body or bumper components of the vehicle. The U-shaped right tie-down bracket was heavily abraded on the lower leading edge (refer to Photograph Nos. 8-12). This bracket was formed from 1.3 cm (0.5") diameter round stock and was attached (probably welded) in a fore and aft configuration to the unibody of the vehicle. Directly above the radiuses, the bracket was 11.4 cm (4.5") in width and narrowed to 11.1 cm (4.375") at its attachment point to the chassis. The tie-down bracket protruded 4.8 cm (1.875") below the unibody and was exposed 4.4 cm (1.75") below the bumper facia and integral air dam and 5.4 cm (2.125") below the lower radiator support panel. The abrasion involved the leading edge of the bracket and extended 3.8-4.8 cm (1.5-1.875") from the mounting point. There was no visual displacement or deformation to the bracket.

The Subaru was subsequently driven into the dealership's service department and elevated on a floor lift for a more thorough undercarriage inspection. The undercarriage of the vehicle was carefully examined and no additional contact evidence or damage was observed. The factory undercoating that was applied to the area directly above the tie-down bracket was cracked in an irregular pattern (refer to Photograph No. 12). The high density polyethylene right inner fender liner was removed to provide visual inspection to the chassis and mounting point of the bracket (refer to Photograph No. 13). There was no visual residual damage to the unibody chassis of the vehicle. This was confirmed by a certified Subaru technician and the service manager.

The dealership had on-staff a Subaru technician who received the factory training relating to diagnostic and repair of the SRS. This investigator discussed the diagnostic test procedure with a Subaru District Technical Manager prior to initiating the diagnostic test of the SRS. The diagnostic test of the SRS was performed in an attempt to identify stored faults in the system. The instrument panel mounted air bag indicator lamp was initially tested to check for its post-deployment condition. With the ignition switch turned to the on-position, the air bag indicator lamp illuminated and remained on. This procedure was repeated and yielded the same results. The driver stated that prior to the deployment, the air bag indicator lamp was off. A normal operative system requires the lamp to glow for approximately 8 seconds as the ignition switch is turned to the on-position, then go off for the remainder of the ignition cycle.

Following the indicator lamp test which was consistent with a normal air bag deployment, the driver's side air bag module was removed from the steering wheel to access the wiring harness which plugs into the inflator assembly. This procedure required the removal of four *TORX* head bolts which attached the module assembly to the steering wheel. The yellow three wire male/female connector was disconnected. The Subaru *Test Harness C* was plugged into the female connector and the green switch incorporated into the harness was depressed. The harness contains a resistor which offers the same resistance as the air bag module. Following this procedure, the ignition was turned to the on-position and the indicator lamp illuminated for approximately 8 seconds and went off and remained off, indicating that there were no malfunctions in the SRS system. A system malfunction would result in the light remaining on or off continuously (refer to Page 3 of Attachment B, Supplemental Restraint System Manual).

The service technician located the six prong test plug from under the instrument panel, right of the steering column. Two grounding wires were attached to the vehicle harness adjacent to the six prong plug. The technician connected a ground wire into terminal No. 1 (refer to Page 3 of Attachment B) which induced a fault into the system. The air bag indicator light glowed for two seconds, went off, then flashed a sequence of a light for two seconds followed by two short flashes which indicated a No. 12 trouble code. The No. 12 trouble code indicates the following:

- Air bag main harness circuit is open
- Air bag module harness circuit is open
- Roll connector circuit is shorted
- Air bag control module is faulty.

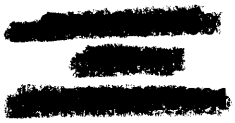
The technician connected the second ground wire to terminal No. 2 to clear the memory. With the ignition switch on, the flashing mode of the air bag indicator light resumed. The ignition was turned to the off-position then turned back to the on-position. Following this procedure, the indicator light illuminated for 8 seconds, then went off and remained off, indicating a normal operative system. The SRS manual notes that if a problem with the system exists, the memory cannot be cleared, therefore based on this diagnostic test procedure, there were no problems with the Subaru's SRS.

Based on the above procedure and the inspection of the vehicle and site of the deployment, the deployment of the driver's side air bag system resulted from undercarriage contact with the tie-down bracket. As the driver was initiating her left turn into the parking lot, the vehicle overrode the concrete rain gutter which paralleled the north (left) roadedge. The rain gutter was previously paved over with an asphalt, however, large amounts of the asphalt had eroded away from vehicle traffic and probable snow plowing. As a result, the gutter was irregular in depth, which varied from 6.4-10.2 cm (2.5-4.0"). During the turning maneuver, the left front tire initially entered the gutter which would have resulted in compression of the vehicle's left front suspension. As the Subaru continued forward, the suspension rebounded as the right front tire overrode the rain gutter. This resulted in a significant compression of the right front suspension which allowed the protruding right tie-down bracket to contact the concrete and/or asphalt surface. Although unconfirmed by driver statements, a possible braking input by the driver as the vehicle overrode the rain gutter could have resulted in additional compression of the front suspension. The tie-down bracket contact with the pavement resulted in a longitudinal pulse to the vehicle which triggered deployment of the supplemental driver's side air bag.

The driver stated that she noted a change in the vehicle's ride as it entered the parking lot, however, she did not specifically detect a deceleration induced by the tie-down bracket contact. The deceleration, however, displaced the driver forward with respect to the decelerating vehicle. This was evidenced by the right knee scuff to the right lower corner of the knee bolster.

The driver's side air bag deployed from the steering wheel mounted module assembly. The module cover flaps opened at the designated tear points in an H-configuration. The upper flap was embossed with *SUBARU SRS AIRBAG* directly above the horizontal tear seam. This flap was 16.5 cm (6.5") in width at the seam and widened to 17.1 cm (6.75") at the upper hinge point. The vertical height of the upper flap was 8.6 cm (3.375"). The lower module cover flap was 16.5 cm (6.5") in width with a vertical height of 5.7 cm (2.25"). The air bag was constructed of a pink colored nylon-type fabric with a coated inner surface. The inner surface of the bag was not lined with a typical neoprene-

type liner, however, it was coated with a sealer-like material to prevent gas leakage through the fabric. The bag was approximately 71.1 cm (28.0") in diameter and was vented with two 3.2 cm (1.25") diameter vent ports at the 10:30 and 1:30 o'clock positions. The center of the ports were located 19.7 cm (7.75") from the internally sewn peripheral seam and 7.6 cm (3.0") above the gas generator. The bag was tethered by four internal tethers that measured 6.7 cm (2.625") in width which extended from a 16.5 cm (6.5") diameter reinforcement sewn to the face of the bag with two rows of green stitching (refer to Photograph No. 29). Identifications numbers stamped on the back side of the bag at the 12 o'clock position were as follows (refer to Photograph No. 36):

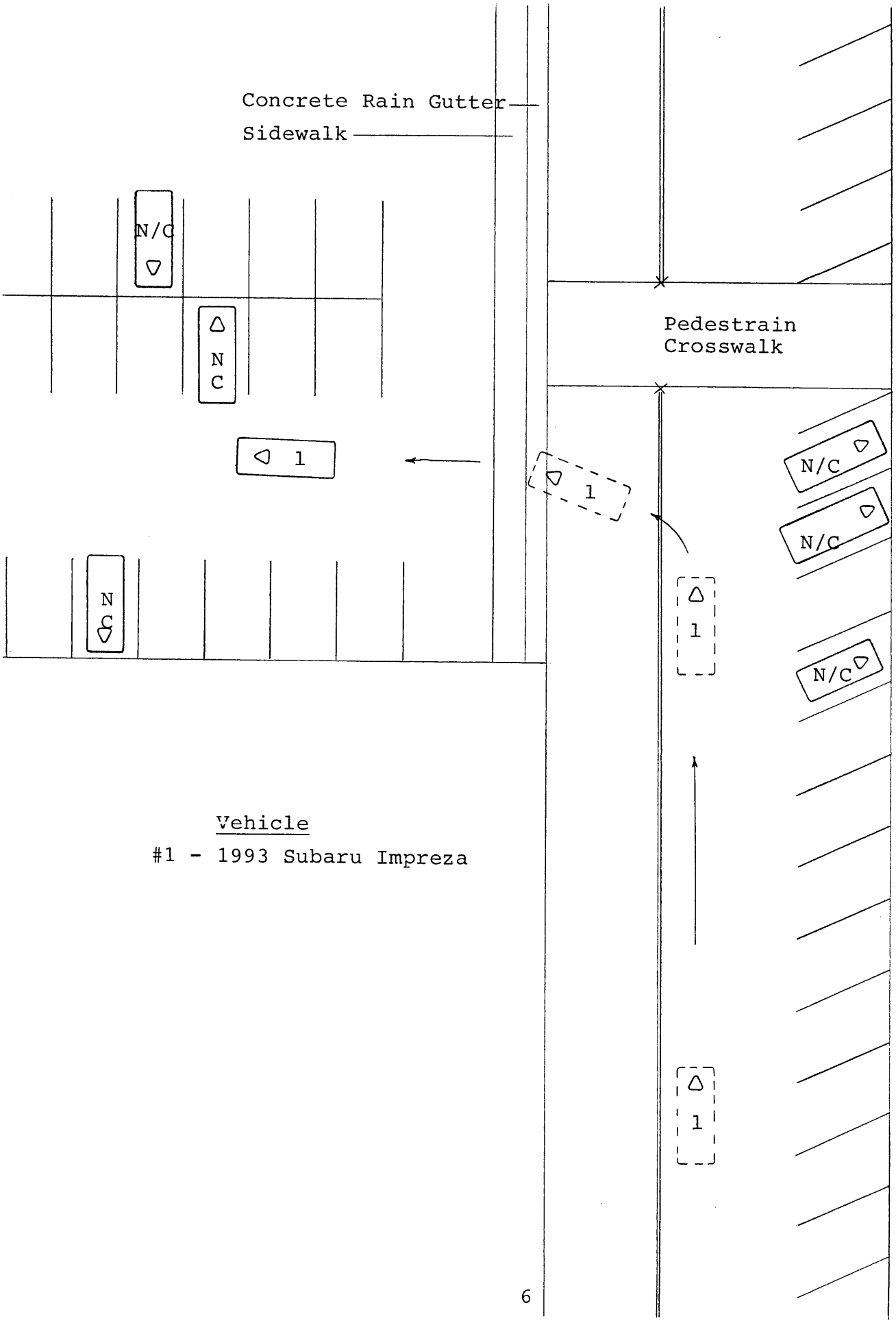


The gas generator was constructed of an alloy material and was identified by the follows bar coded labels (refer to Photograph No. 35):

There was no damage to the SRS or indication of loose electrical connectors and/or wires.

CRASH SCHEMATIC

CALSPAN CASE NO. 95-19



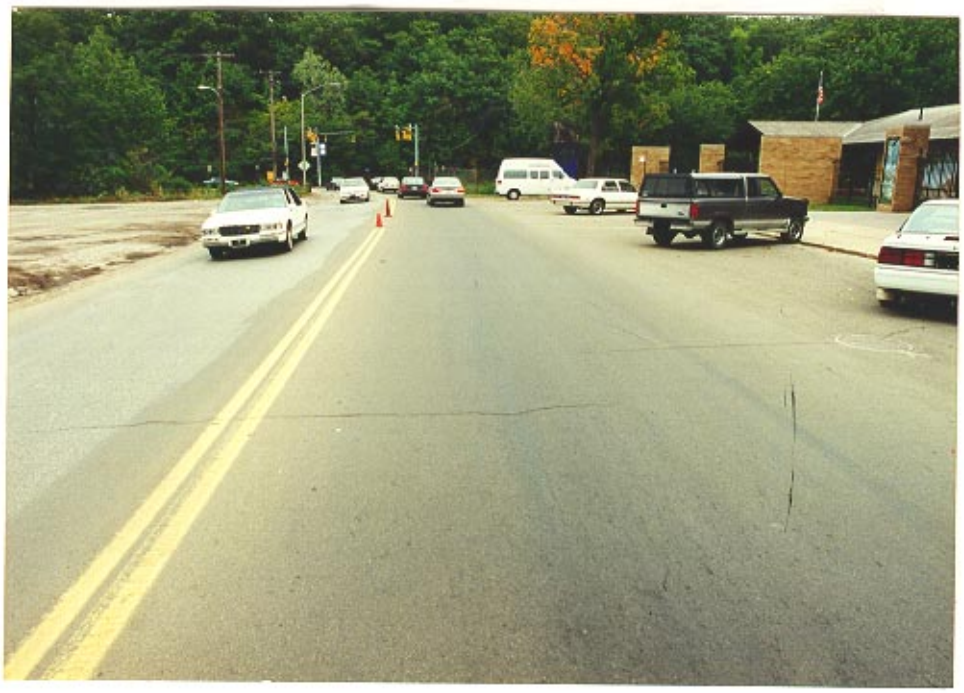
Vehicle

#1 - 1993 Subaru Impreza

ATTACHMENT A:

Color Prints

1. Approach of the 1993 Subaru Impreza to the undercarriage impact site.



2. Approximate stopped position of the Subaru prior to initiating the left turn.

3. Left turn maneuver into the parking lot.

4. Longitudinal view of the concrete rain gutter in the area of the left turn maneuver.

5. Vehicle's entry into the parking lot following undercarriage contact and deployment.

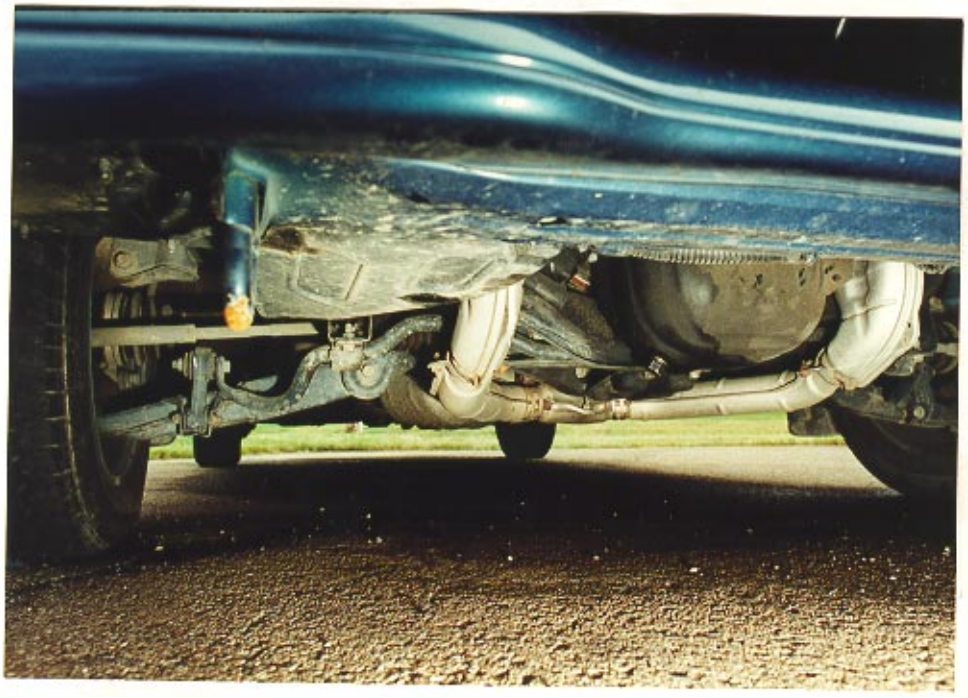
6. Look back view of the vehicle's trajectory.

7. Overall frontal view of the Subaru Impreza.

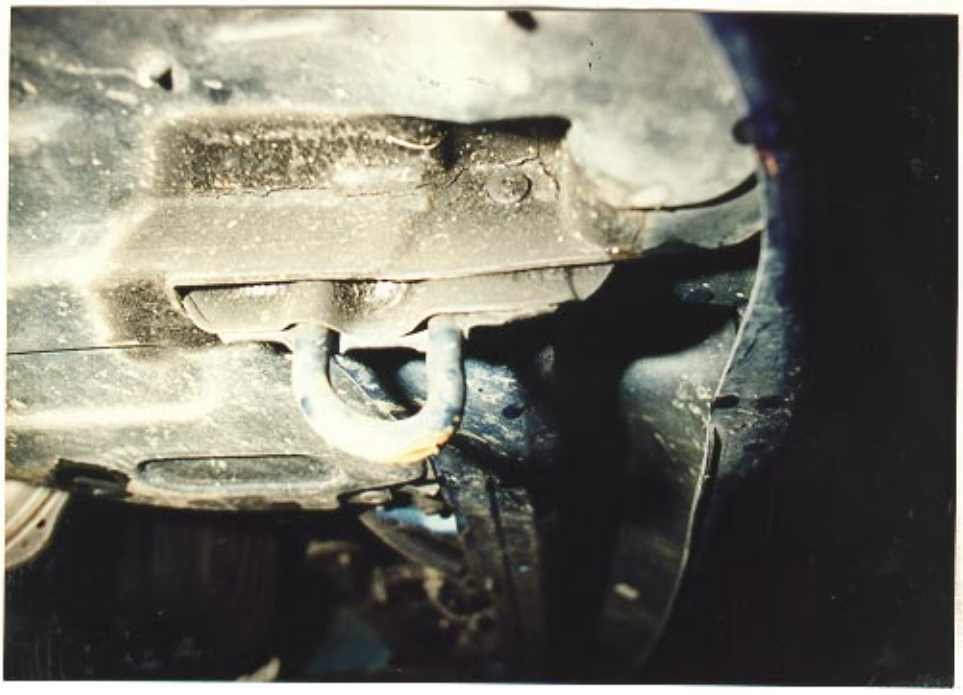
8. Location and exposure of the right tie-down bracket.

9. Contact damage to the right tie-down bracket.

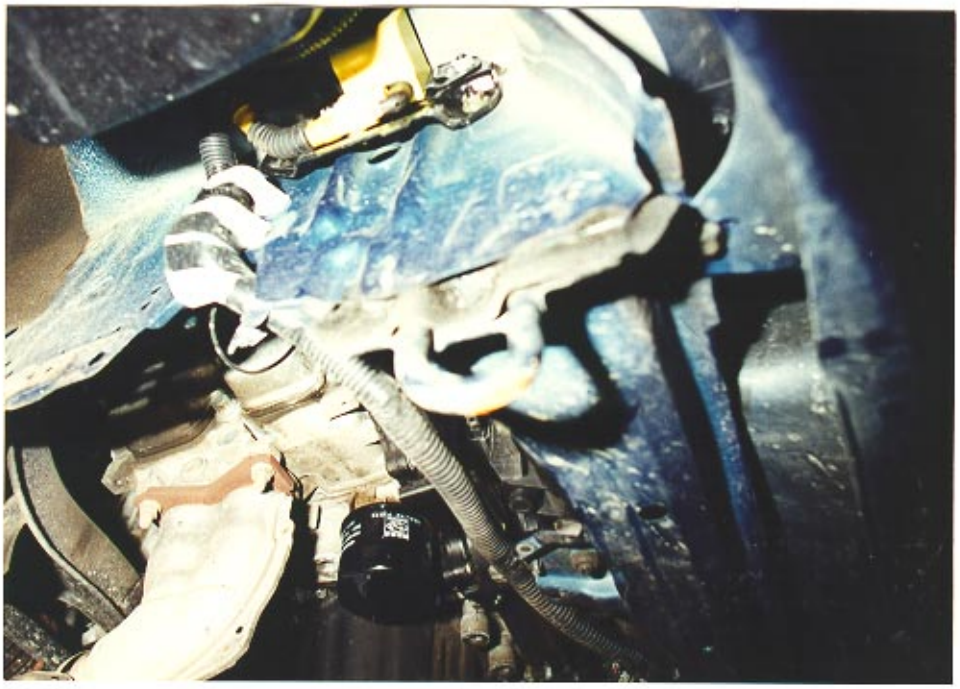
10. Close-up view of the contact damage.



11. Undercarriage view of the vehicle showing lack of additional contact damage.



12. Cracking to undercarriage undercoat sealer directly above the right tie-down bracket.



13. Vehicle structure above the tie-down; no residual deformation.

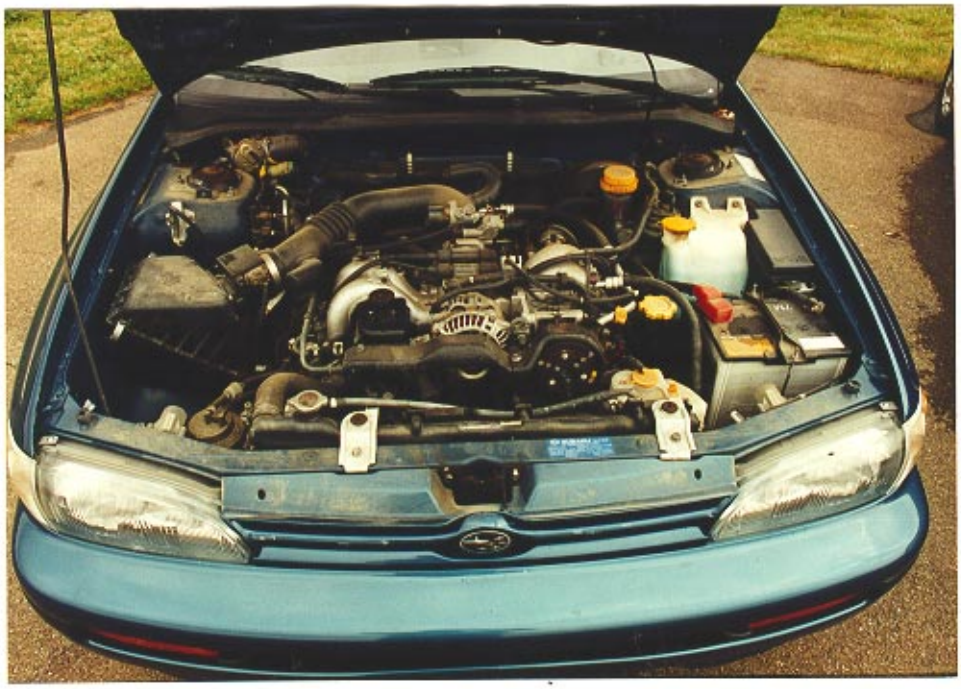
14. Left front three-quarter view of the Subaru Impreza.

15. Left rear three-quarter view of the vehicle.

16. Right rear three-quarter view of the Impreza.

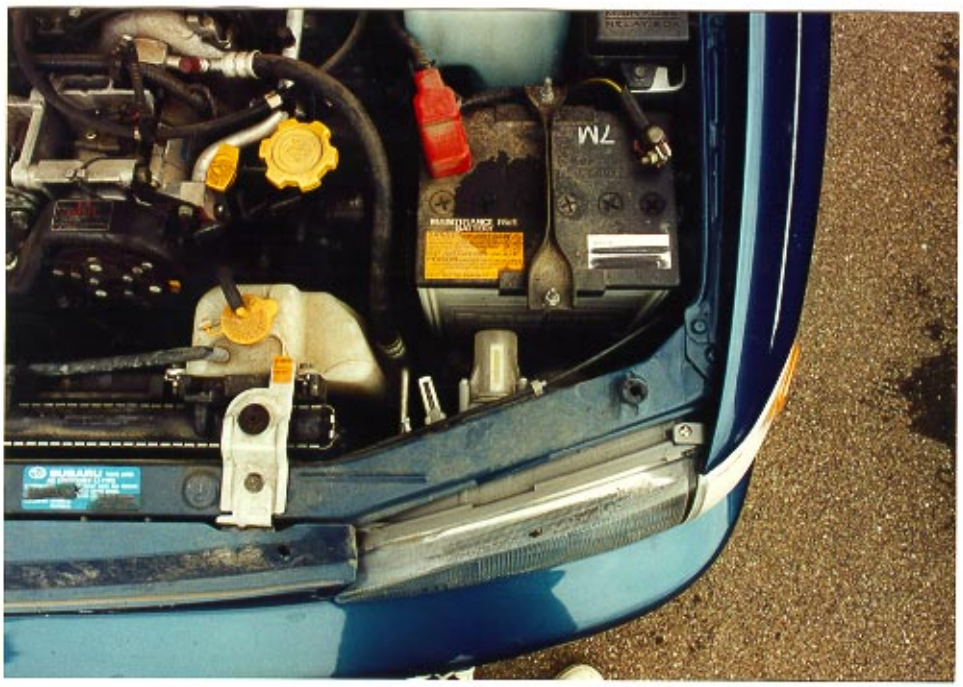
17. Right side view of the vehicle.

18. Right front three-quarter view of the vehicle.



19. Engine compartment of the Subaru.

20. Perpendicular view of the upper radiator support panel.



21. & 22. Undeformed areas of the front mounted crash sensors.

23. Exemplar vehicle in dealership's lot.

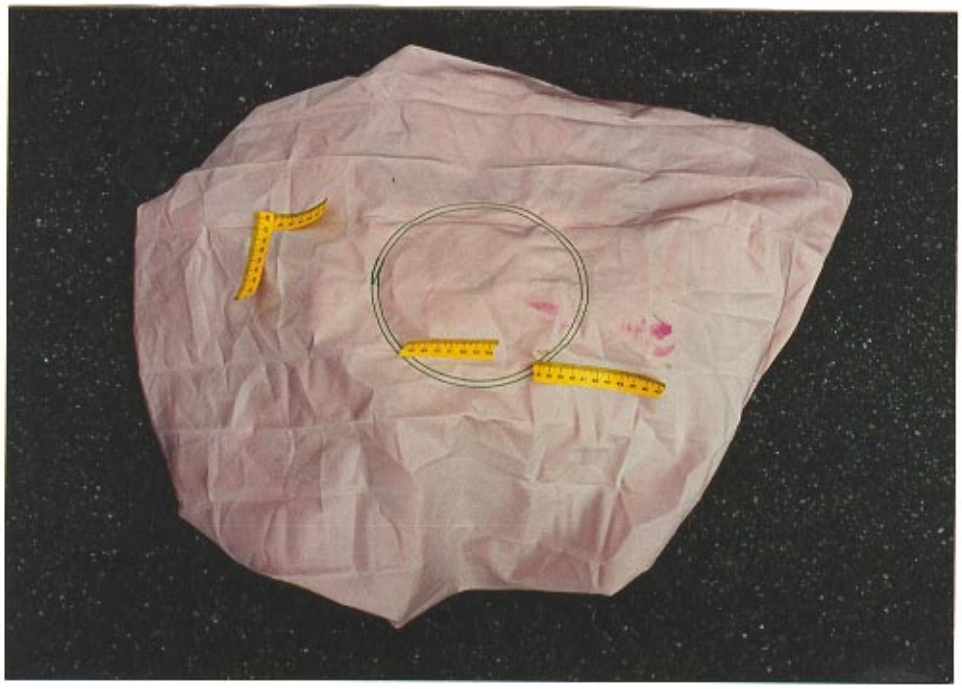
24. Similar contact to the left tie-down bracket of the exemplar vehicle. This contact did not result in air bag deployment.

25. Overall view of the deployed driver's side air bag.

26. Upper air bag module cover flap.

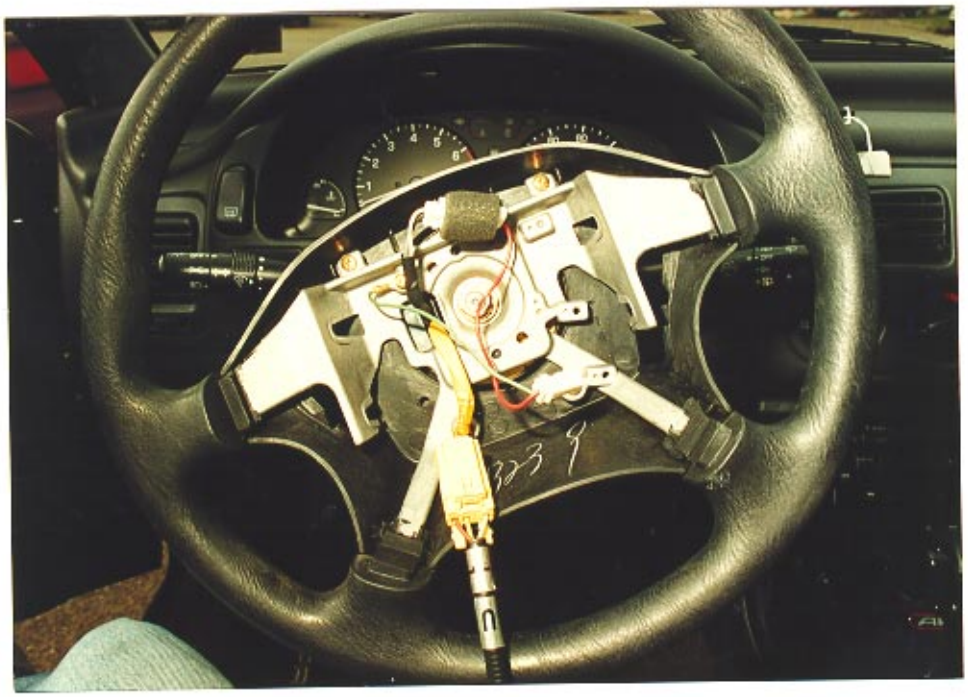
27. Possible driver's right knee scuff to the knee bolster.

28. Driver's seat and manual belt system.



29. Driver's lipstick and makeup transfer on air bag.

30. Overall view of the steering assembly with the air bag module removed.



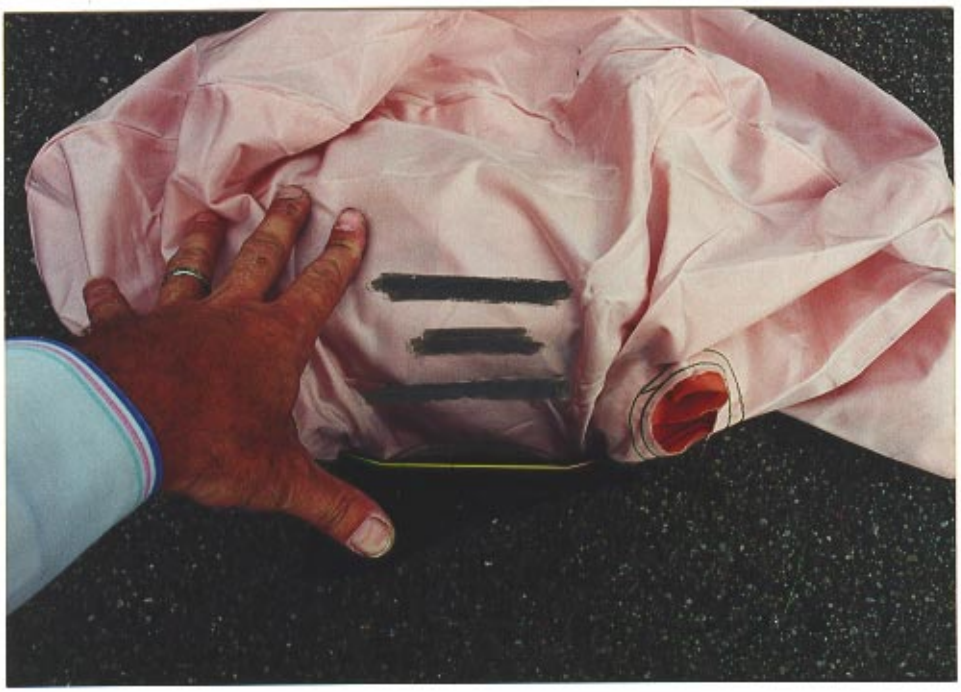
31. Close-up view of Test Harness C plugged into air bag wiring harness.

32. Test Harness C used for testing of on board diagnostics of air bag system.

33. Driver's side air bag module cover flaps.

34. Profile view of the symmetrical module cover flaps.

35. Air bag identification numbers stamped onto bag between vent ports.



36. Air bag vent ports.

37. Identification labels affixed to the backside of the gas generator.

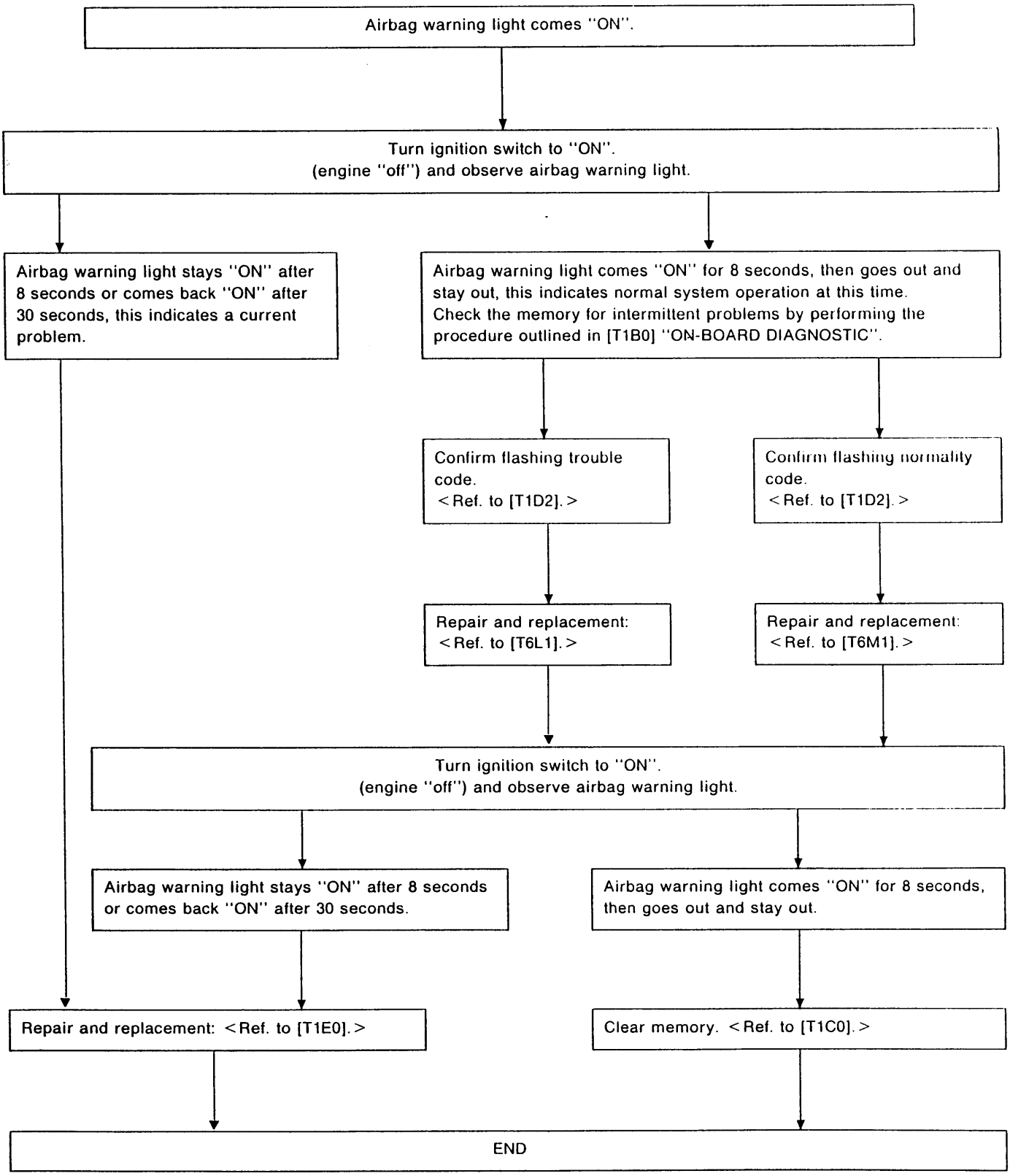
ATTACHMENT B:

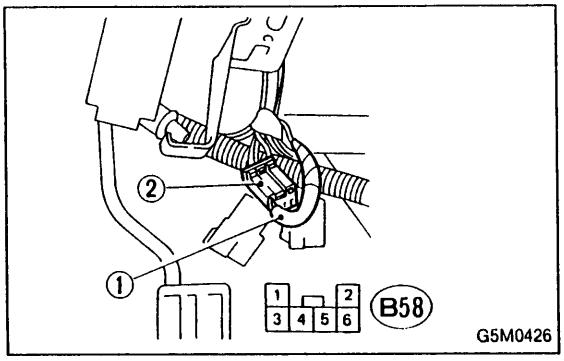
Subaru Supplemental Restraint System Manual

SUPPLEMENTAL RESTRAINT SYSTEM 5-5

1. Diagnostics Chart for On-board Diagnostic System

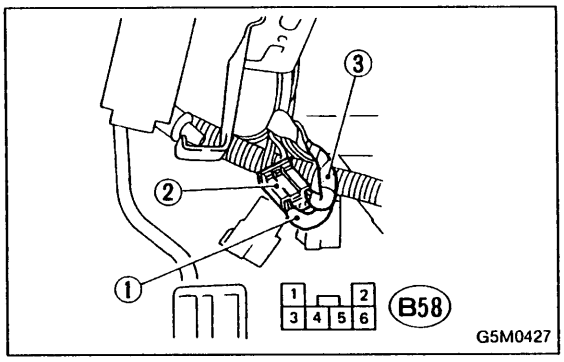
A: BASIC DIAGNOSTICS PROCEDURE





B: ON-BOARD DIAGNOSTIC

When the airbag system is in functioning condition, the airbag warning light will remain on for 8 seconds and go out when the ignition switch is set to ON.
If there is any malfunction, the airbag warning light will either stay on or off continuously. In such cases, perform on-board diagnostic in accordance with the specified procedure to determine trouble codes.
1) Turn ignition switch ON (with engine OFF)
2) Connect DIAG. terminal ① to No. 1 terminal of diagnosis connector ② located below lower cover.
3) Check in accordance with the trouble code indicated by the AIRBAG warning light, and record the trouble codes.
4) Turn the ignition switch "OFF" and remove the DIAG. terminal from No.1 terminal of diagnosis connector.



C: CLEAR MEMORY

After eliminating problem as per trouble code, clear memory as follows:
Make sure ignition switch is ON (and engine off). Connect one DIAG. terminal ① on diagnosis connector ② terminal No. 1.
While warning light is flashing, contact the other DIAG. terminal ③ on terminal No. 2 for at least three seconds. After memory is cleared, normal warning light flashing rate resumes. (Warning light flashes every 0.6 seconds ON-OFF operation). Memory cannot be cleared if any problem exists.

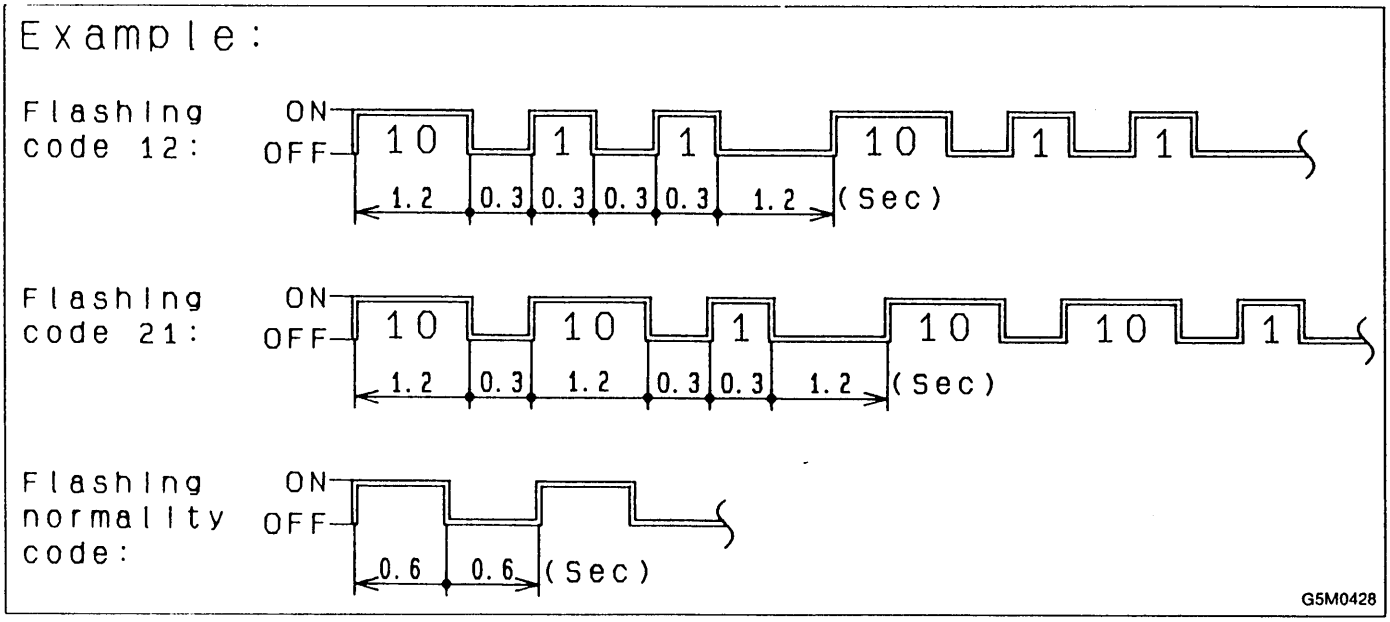
D: LIST OF TROUBLE CODES

1. TROUBLE CODES

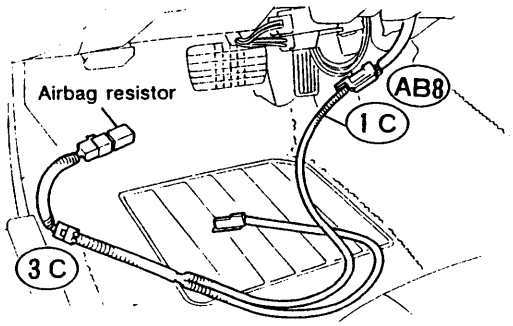
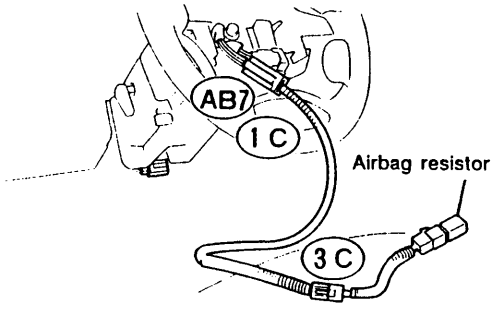
Trouble code/Contents of troubles		Memory function	Contents of diagnosis
02		Provided.	1) Front sensor harness is shorted. 2) Airbag main harness is shorted. 3) Airbag module harness is shorted. 4) Roll connector is shorted. 5) Airbag control module is faulty.
03		Provided.	1) Front sensor harness circuit is open. 2) Front sensor unit circuit is open.
11		Provided.	1) Airbag control module is faulty. 2) Airbag main harness circuit is open. 3) Fuse No. 8 is blown. 4) Body harness circuit is open.
12		Provided.	1) Airbag main harness circuit is open. 2) Airbag module harness circuit is open. 3) Roll connector circuit is open. 4) Airbag control module is faulty.
13		Provided.	1) Airbag main harness circuit is shorted. 2) Airbag module harness is shorted. 3) Roll connector circuit is shorted. 4) Airbag control module is faulty.
14		Not provided.	1) (AB2) and (AB7) are not connected properly 2) (AB3) and (AB8) are not connected properly 3) (AB4), (AB5) and (AB6) are not connected properly to airbag control module.
21		Provided.	Airbag control module is faulty.
23		Provided.	1) Airbag main harness is shorted to power supply. 2) Front sensor harness is shorted to power supply. 3) Airbag module harness is damaged. 4) Roll connector is shorted to power supply. 5) Airbag control module is faulty.
31		Not provided.	1) Airbag control module is faulty. 2) Airbag main harness circuit is open. 3) Fuse No. 16 is blown. 4) Body harness circuit is open.
Airbag warning light remains on.		Not provided.	1) Airbag warning light is faulty. 2) Airbag control module-to airbag warning light harness circuit is shorted or open. 3) Grounding circuit is faulty. 4) Airbag control module is faulty. 5) (AB1) and (B39) are not connected properly.
Airbag warning light remains off.		Not provided.	1) Fuse No. 15 is blown. 2) Body harness circuit is open. 3) Airbag warning light is faulty. 4) Airbag main harness is faulty. 5) Airbag control module is faulty.
Warning light indicates trouble code, then normal code.	Flashing trouble code.	Provided.	Airbag system component parts are faulty.
	Flashing normality code.	Not provided.	1) Airbag connector is faulty. 2) Fuse No. 16 is blown. 3) Airbag main harness is faulty. 4) Airbag control module is faulty. 5) Body harness is faulty.

2. HOW TO READ TROUBLE CODES

The AIRBAG warning light flashes a code corresponding to the faulty parts.
The long segment (1.2 sec on) indicates a "ten", and the short segment (0.3 sec on) indicates a "one".

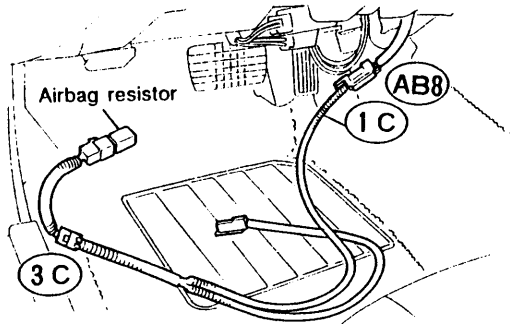


E: DIAGNOSTICS PROCEDURE

Airbag warning light stays on after 8 seconds.
1) Perform on-board diagnostic. <Ref. to 5-5 [T1B0].>
2) Are trouble codes 2, 12, 13, or 23 indicated? <Ref. to 5-5 [T1D1].> Trouble code is written down.
3) If "NO", proceed with diagnostics and repair according to trouble code indicated then perform step 20.
4) If "YES", proceed by turning ignition switch "OFF", disconnecting the battery, and waiting 20 seconds. If codes 12 or 13 are indicated proceed to step 6. If codes 12 or 13 are not indicated proceed to step 5.
5) Remove lower cover panel and connect test harness C connector (1C) to (AB8) <Ref. to 5-4 [W1A0].> with airbag resistor attached to test harness C connector (3C). Turn ignition switch "ON". Does airbag warning light go "OFF" after 8 seconds and remain off for more than 30 seconds? See notes 1) and 2) If "YES" proceed to step 6. If "NO" proceed to step 3.    G5M0429
6) Remove airbag module and connect test harness C connector (1C) to (AB7). <Ref. to 5-5 [W1B1].> Connect airbag resistor to test harness C connector (3C).    G5M0430
7) Reconnect battery cable.
8) Turn ignition switch "ON", does airbag warning light go out after 8 seconds and remain "OFF" for more than 30 seconds? See notes 1) and 2).
9) If "YES", disconnect battery, turn ignition switch "OFF", and wait 20 seconds. Install a new airbag module <Ref. to 5-5 [W1B1].> then proceed to step 20.

Test harness C-PN98299PA020
Airbag resistor-PN98299PA040

10) If "NO", connect test harness C connector (1C) to (AB8) <Ref. to 5-4 [W1A0].> with airbag resistor attached to test harness C connector (3C).



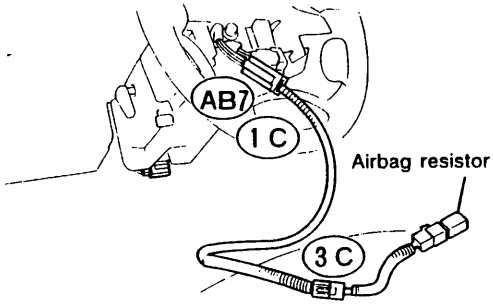
G5M0429

11) Turn ignition switch "ON". Does airbag warning light go "OFF" after 8 seconds and remain off for more than 30 seconds? See notes 1) and 2).

12) If "YES", replace combination switch, <Ref. to 5-5 [W1F1].> and proceed to step 16.

13) If "NO", proceed with diagnostics according to trouble code indicated during on-board diagnostic.

14) After repair, reconnect test harness C connector (1C) to (AB7) <Ref. to 5-5 [W1B1].> with airbag resistor attached to (3C).



G5M0430

15) Turn ignition switch "ON". Does airbag warning light go "OFF" after 8 seconds and remain off for more than 30 seconds? See notes 1) and 2).

16) If "YES", disconnect battery. Turn ignition switch "OFF", and wait 20 seconds. Install airbag module <Ref. to 5-5 [W1B1].> and proceed to step 18.

17) If "NO", replace combination switch, <Ref. to 5-5 [W1F1].> and proceed to step 16.

18) Reconnect battery and turn ignition switch "ON". Does airbag warning light go off after 8 seconds and remain off for more than 30 seconds? See notes 1) and 2).

19) If "NO", disconnect battery, turn ignition switch "OFF", replace a new airbag module <Ref. to 5-5 [W1B1].> and repeat step 18.

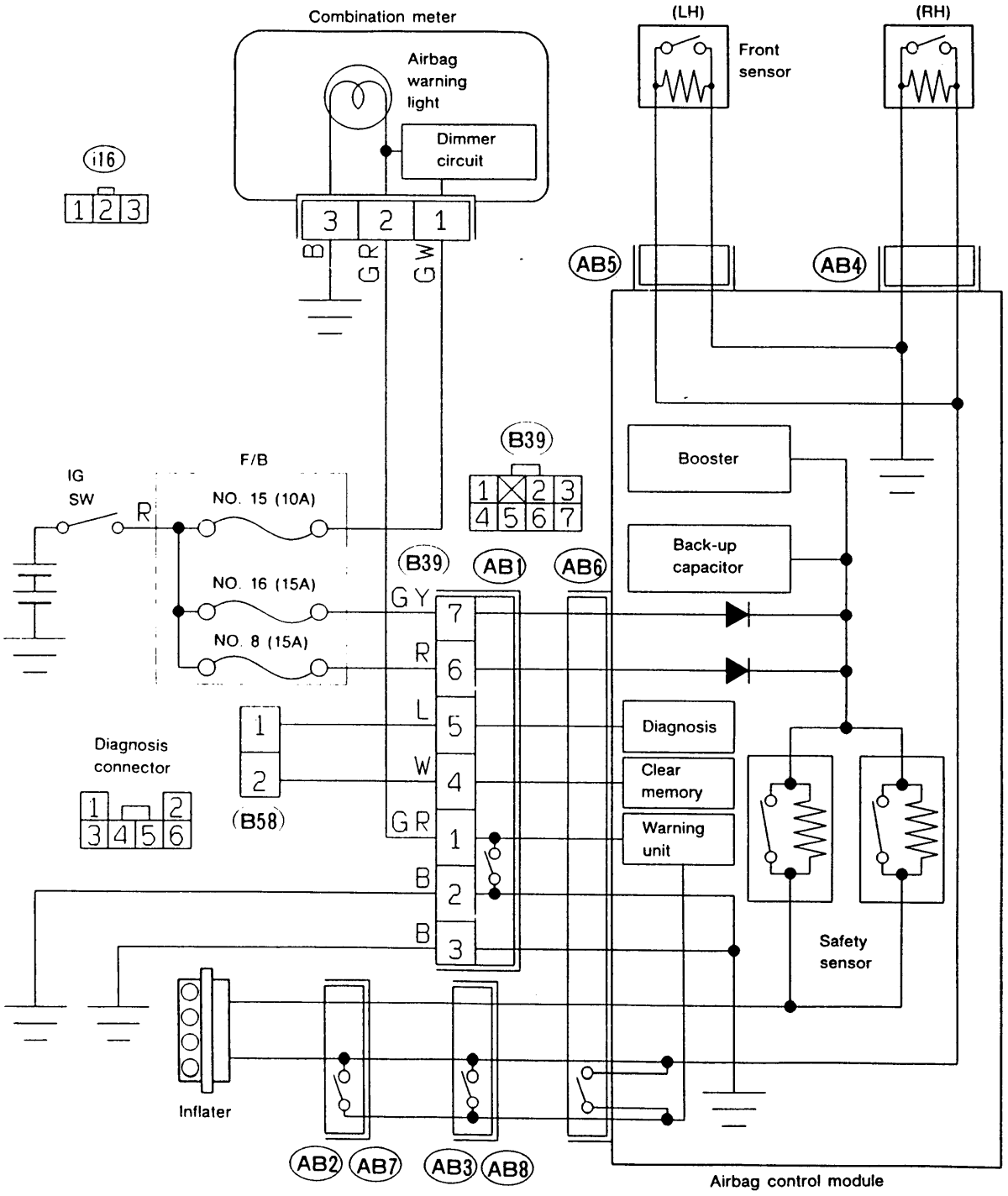
20) If "YES", perform clear memory procedure. <Ref. to 5-5 [T1C0].>

21) If memory cannot be cleared, another trouble code exists. Proceed to returning to step 1.

NOTES:
1) Always remember to secure the green double locks before turning the ignition switch "ON".
2) In some cases the airbag warning light will go "OFF" after 8 seconds but will turn "ON" again within 30 seconds. In this case continue diagnostics with the basic diagnostics procedures or trouble code procedures.

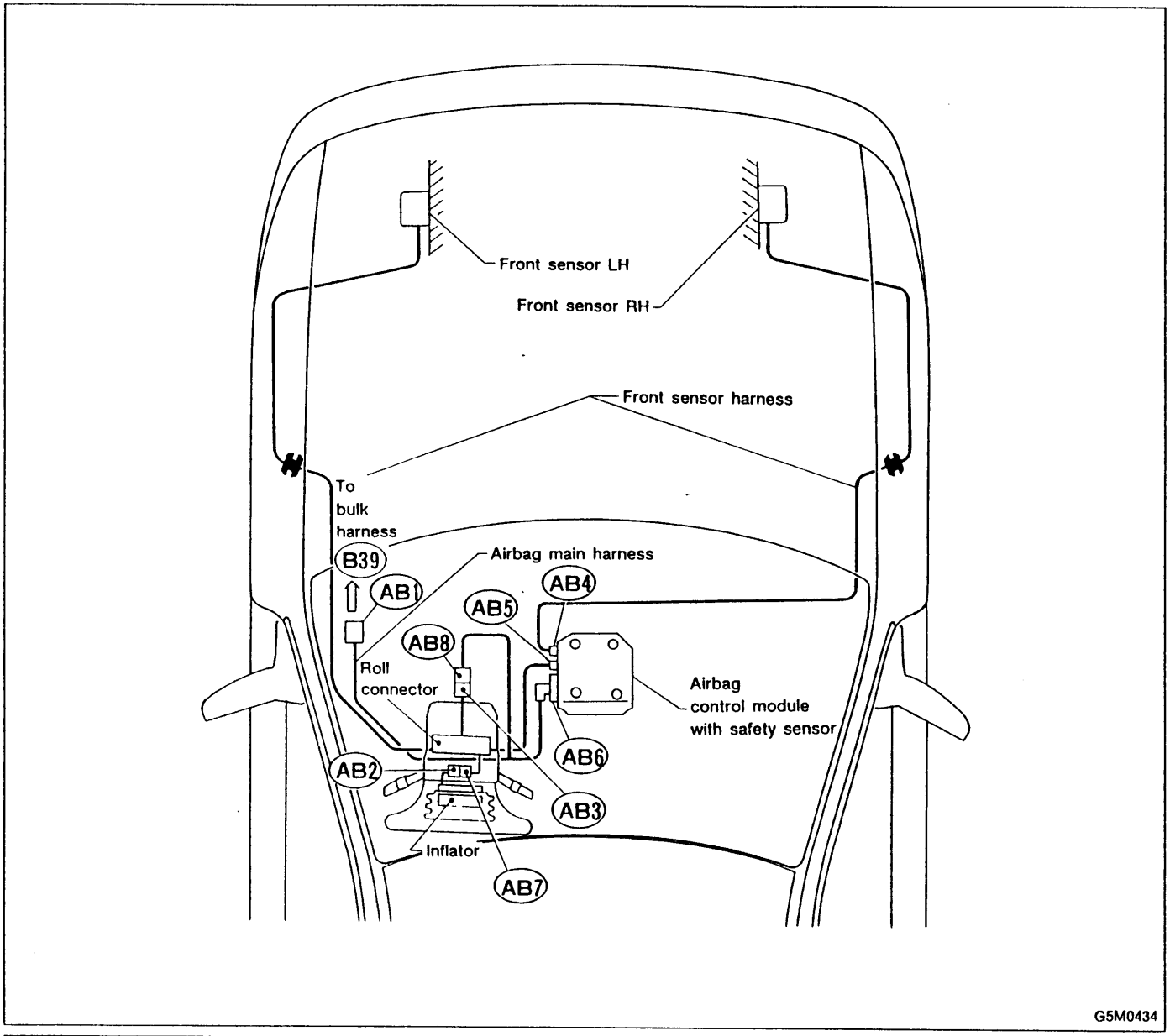
Test harness C-PN98299PA020
Airbag resistor-PN98299PA040

2. Diagram of SRS Airbag



G5M0433

3. Wiring Location

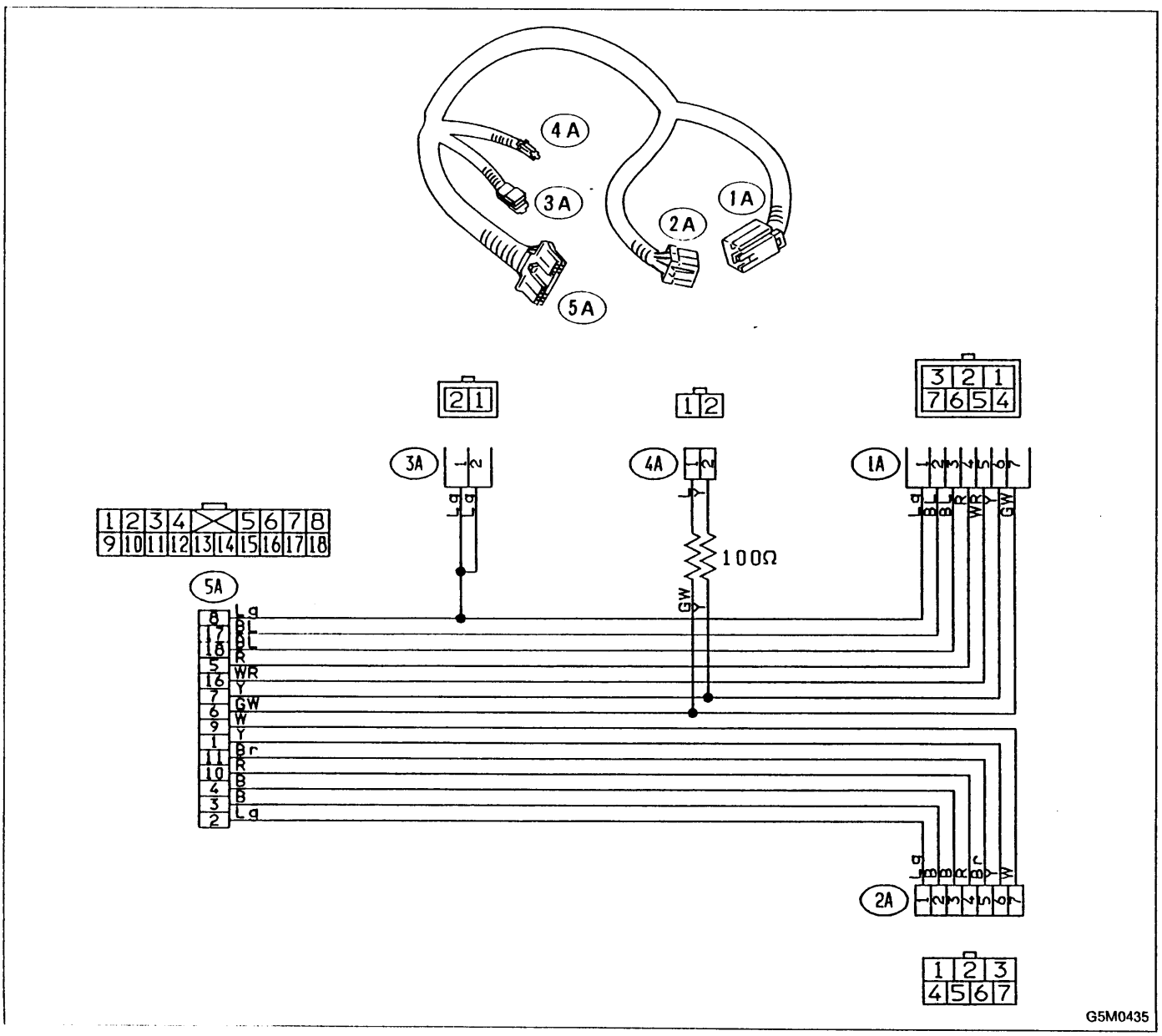


Connector No.	(AB1)	(AB2)	(AB3)	(AB4)	(AB5)	(AB6)	(AB7)	(AB8)
Pole	7	3	3	2	2	12	3	3
Color	Yellow	Yellow	Yellow	Blue	Orange	Yellow	Yellow	Yellow
Male/Female	Male	Female	Female	Female	Female	Female	Male	Male

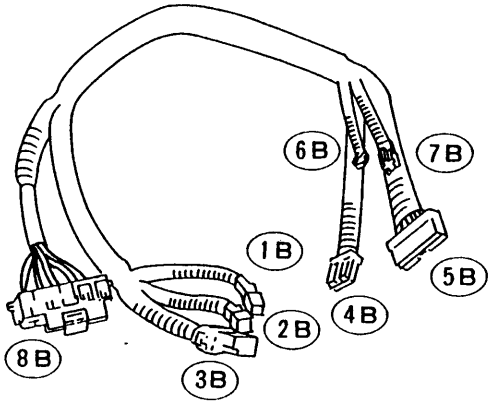
4. Test Harnesses and Airbag Resistor

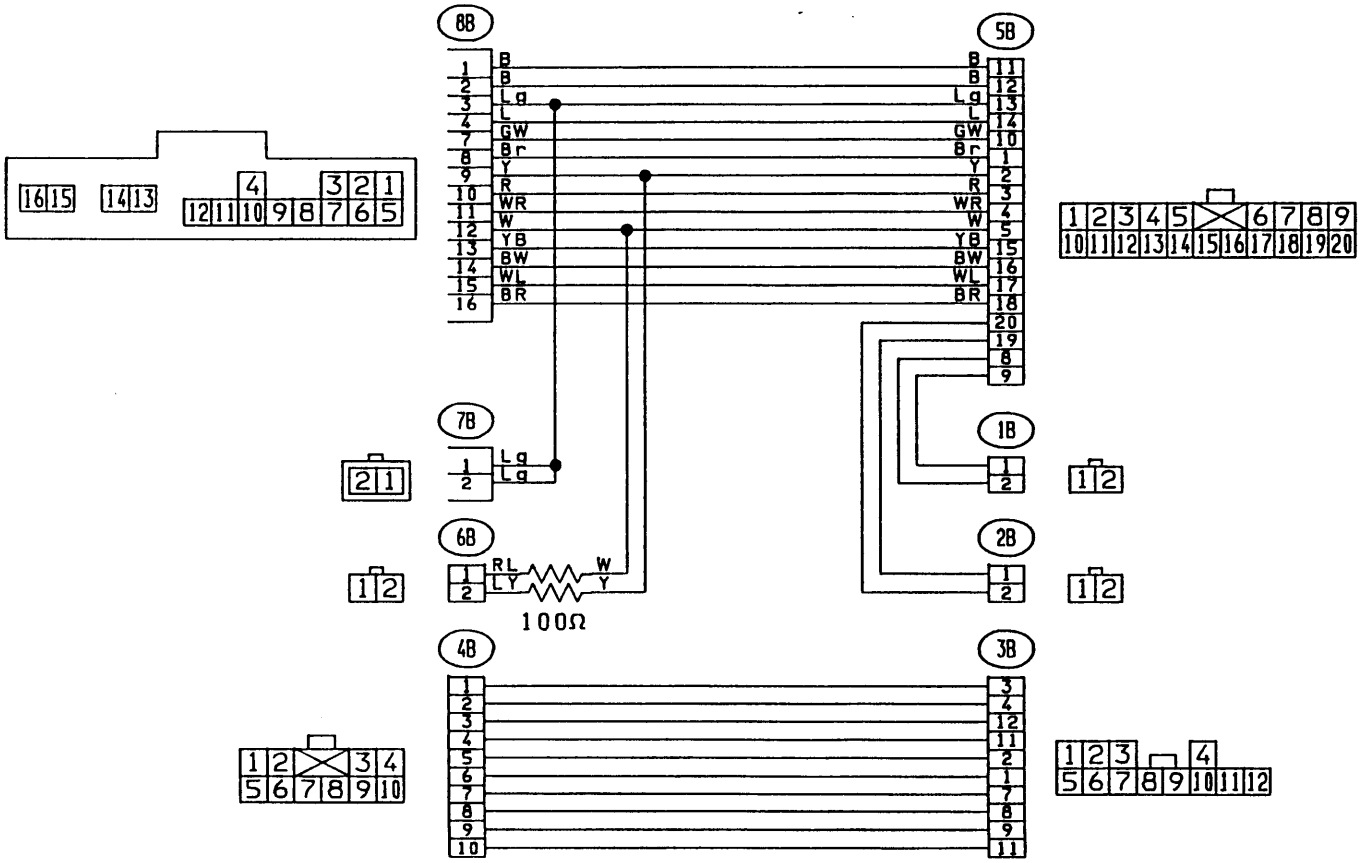
CAUTION:
Be sure to use specified test harness A, B or C when measuring voltage, resistance, etc. of AIRBAG system component parts.

A: TEST HARNESS A (PN98299PA000)



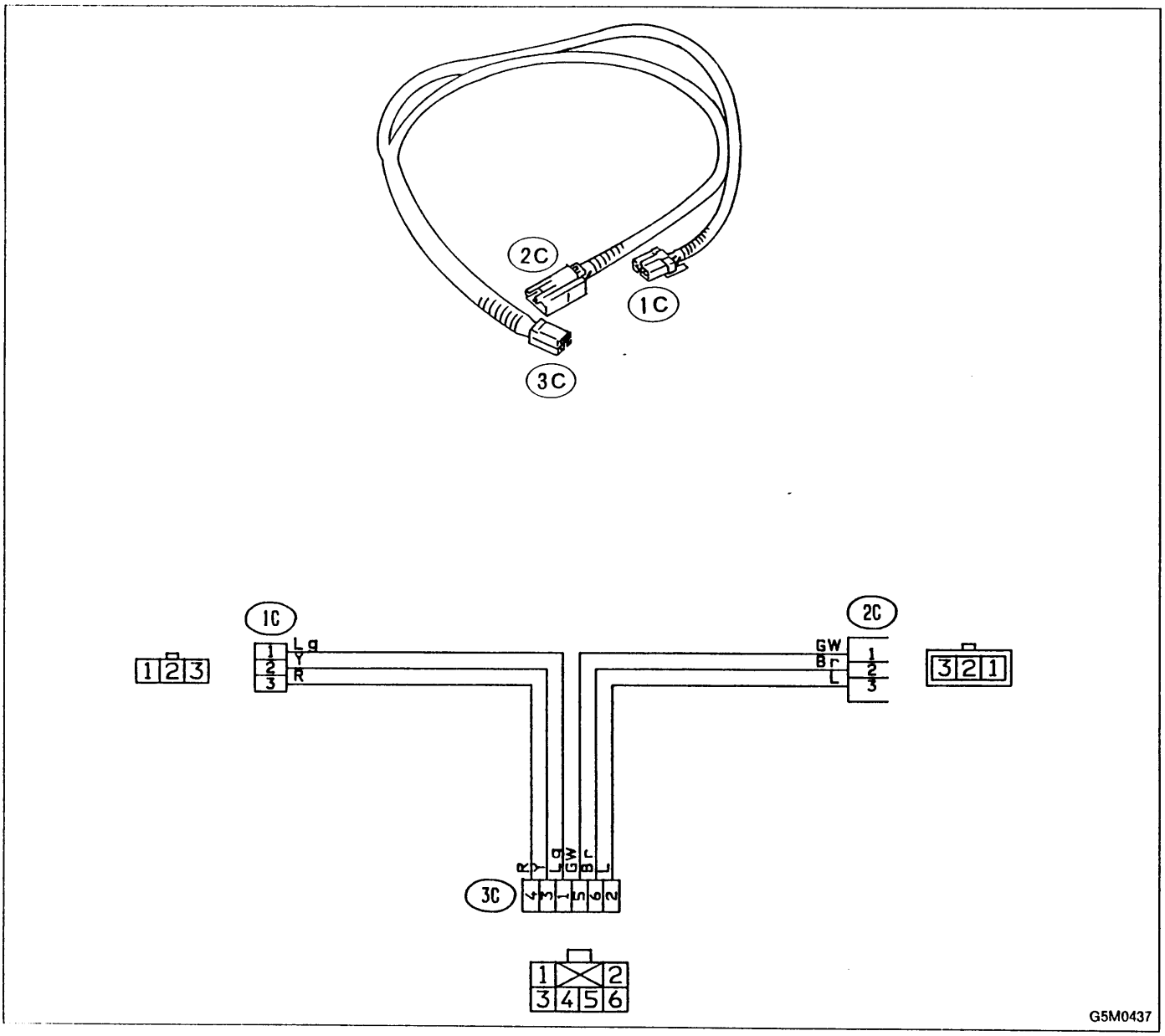
B: TEST HARNESS B (PN98299PA010)





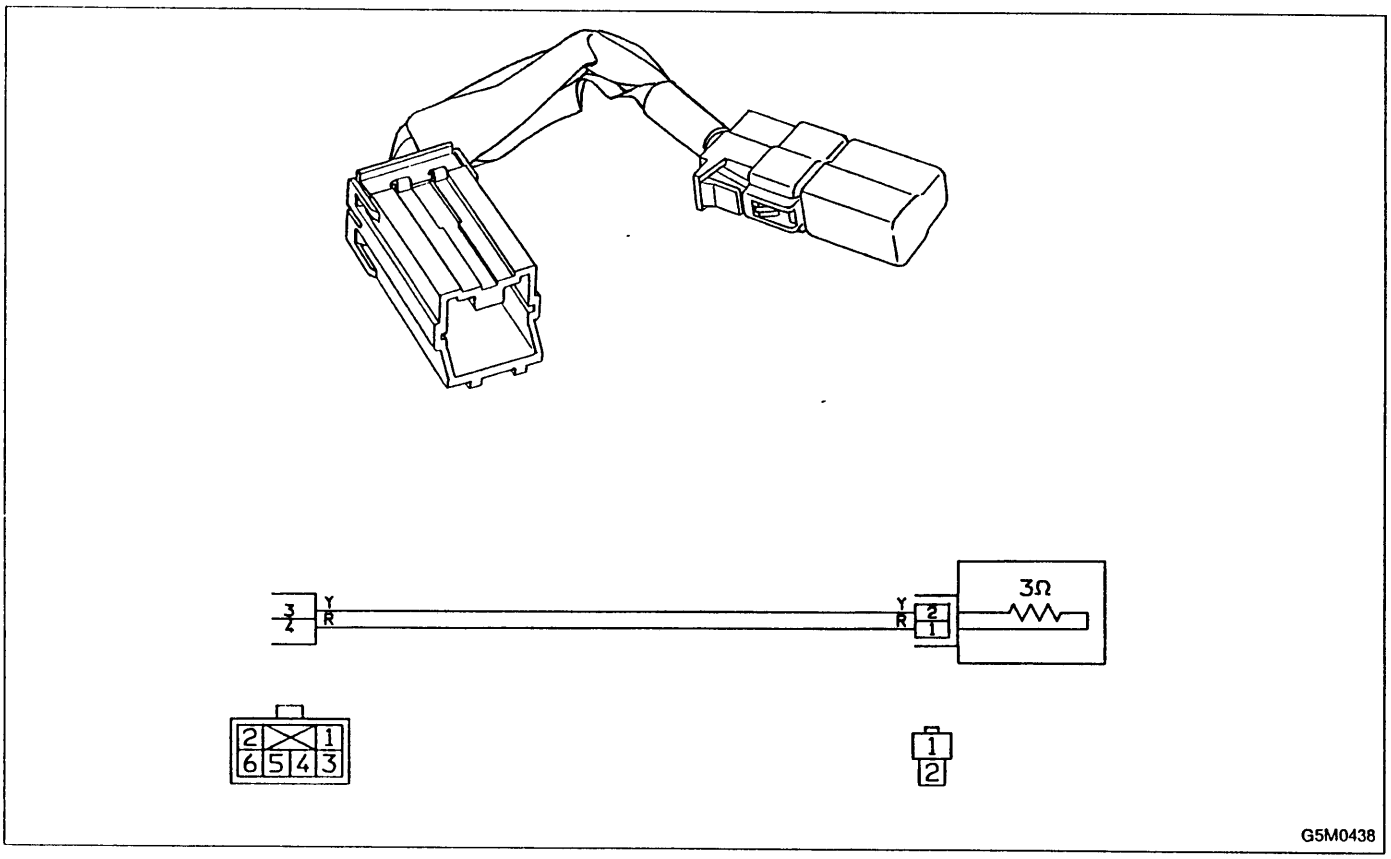
G5M0436

C: TEST HARNESS C (PN98299PA020)



D. AIRBAG RESISTOR (PN98299PA040)

The airbag resistor is used during diagnostics. The airbag resistor has the same resistance as the airbag module and thus provides safety when used instead of the airbag module. It also makes it possible to finish, diagnostics in less time.



MEMO:

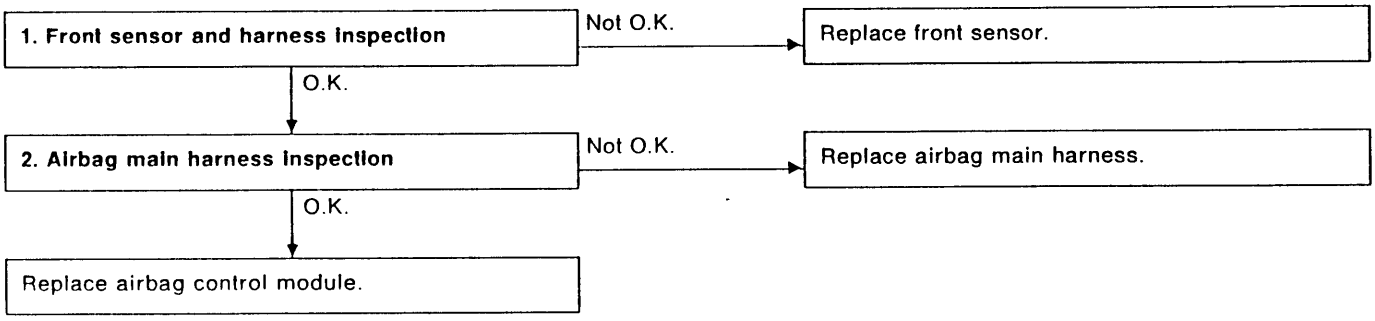
5. Diagnostics Chart with Trouble Code

Trouble code/Contents of troubles		Memory function	Contents of diagnosis	Page
02		Provided.	1) Front sensor harness is shorted. 2) Airbag main harness is shorted. 3) Airbag module harness is shorted. 4) Roll connector is shorted. 5) Airbag control module is faulty.	16
03		Provided.	1) Front sensor harness circuit is open. 2) Front sensor unit circuit is open.	18
11		Provided.	1) Airbag control module is faulty. 2) Airbag main harness circuit is open. 3) Fuse No. 8 is blown. 4) Body harness circuit is open.	20
12		Provided.	1) Airbag main harness circuit is open. 2) Airbag module harness circuit is open. 3) Roll connector circuit is open. 4) Airbag control module is faulty.	22
13		Provided.	1) Airbag main harness circuit is shorted. 2) Airbag module harness is shorted. 3) Roll connector circuit is shorted. 4) Airbag control module is faulty.	23
14		Not provided.	1) (AB2) and (AB7) are not connected properly. 2) (AB3) and (AB8) are not connected properly. 3) (AB4), (AB5) and (AB6) are not connected properly to airbag control module.	24
21		Provided.	Airbag control module is faulty.	26
23		Provided.	1) Airbag main harness is shorted to power supply. 2) Front sensor harness is shorted to power supply. 3) Airbag module harness is damaged. 4) Roll connector is shorted to power supply. 5) Airbag control module is faulty.	26
31		Not provided.	1) Airbag control module is faulty. 2) Airbag main harness circuit is open. 3) Fuse No. 16 is blown. 4) Body harness circuit is open.	28
Airbag warning light remains on.		Not provided.	1) Airbag warning light is faulty. 2) Airbag control module-to airbag warning light harness circuit is shorted or open. 3) Grounding circuit is faulty. 4) Airbag control module is faulty. 5) (AB1) and (B39) are not connected properly.	30
Airbag warning light remains off.		Not provided.	1) Fuse No. 15 is blown. 2) Body harness circuit is open. 3) Airbag warning light is faulty. 4) Airbag main harness is faulty. 5) Airbag control module is faulty.	34
Warning light indicates trouble code, then normal code.	Flashing trouble code.	Provided.	Airbag system component parts are faulty.	36
	Flashing normality code.	Not provided.	1) Airbag connector is faulty. 2) Fuse No. 16 is blown. 3) Airbag main harness is faulty. 4) Airbag control module is faulty. 5) Body harness is faulty.	39

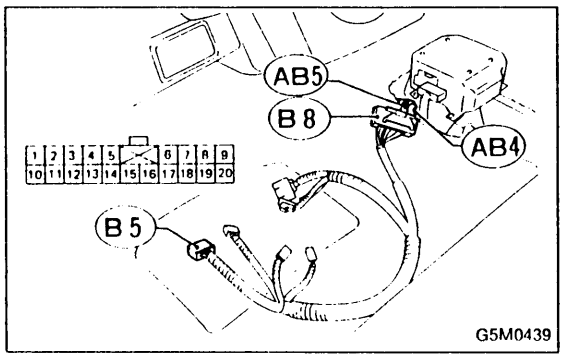
A: TROUBLE CODE 02

DIAGNOSIS:

- Front sensor harness is shorted.
- Airbag main harness is shorted.
- Airbag module harness is shorted.
- Roll connector is shorted.
- Airbag control module is faulty.



CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground terminal and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8).



Test harness B-PN98299PA010

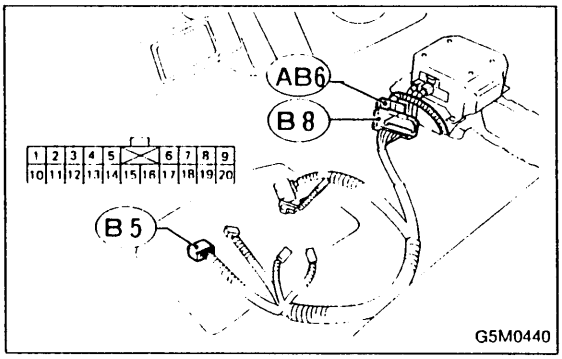
1. FRONT SENSOR AND HARNESS INSPECTION

1) Disconnect connectors (AB4) and (AB5) from airbag control module. <Ref. to 5-5 [W1E1].>
2) Connect connectors (AB4) and (AB5) to connector (8B) of test harness B.
3) Measure resistance between connector (5B) terminals indicated below.

(5B) Terminals / Specified resistance:
(RH: AB4): No. 17 — No. 18 / 1.4 — 1.6 kΩ
(LH: AB5): No. 15 — No. 16 / 1.4 — 1.6 kΩ

4) Measure resistance between each connector (5B) terminal and body.

(5B) Terminals / Specified resistance:
(RH: AB4): No. 17 — Body / 200 Ω, or more
No. 18 — Body / 200 Ω, or more
(LH: AB5): No. 15 — Body / 200 Ω, or more
No. 16 — Body / 200 Ω, or more



2. AIRBAG MAIN HARNESS INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W1E1].>, and connect (AB6) to test harness-B connector (8B).
2) Measure resistance between each (5B) terminal and body.

(5B) Terminals / Specified resistance:
No. 1 — Body / 200 Ω, or more
No. 14 — Body / 200 Ω, or more

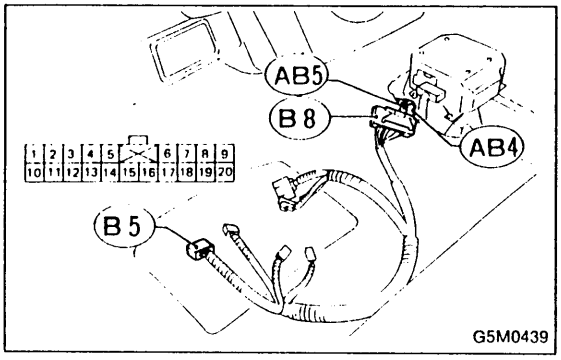
B: TROUBLE CODE 03

DIAGNOSIS:

- Front sensor harness circuit is open.
- Front sensor unit circuit is open.

1. Front sensor (LH and RH) inspection	→ Identify faulty sensor and replace front sensor.

CAUTION:
Before performing the diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground terminal and then wait at least 20 seconds.



Test harness B-PN98299PA010

1. FRONT SENSOR (LH AND RH) INSPECTION

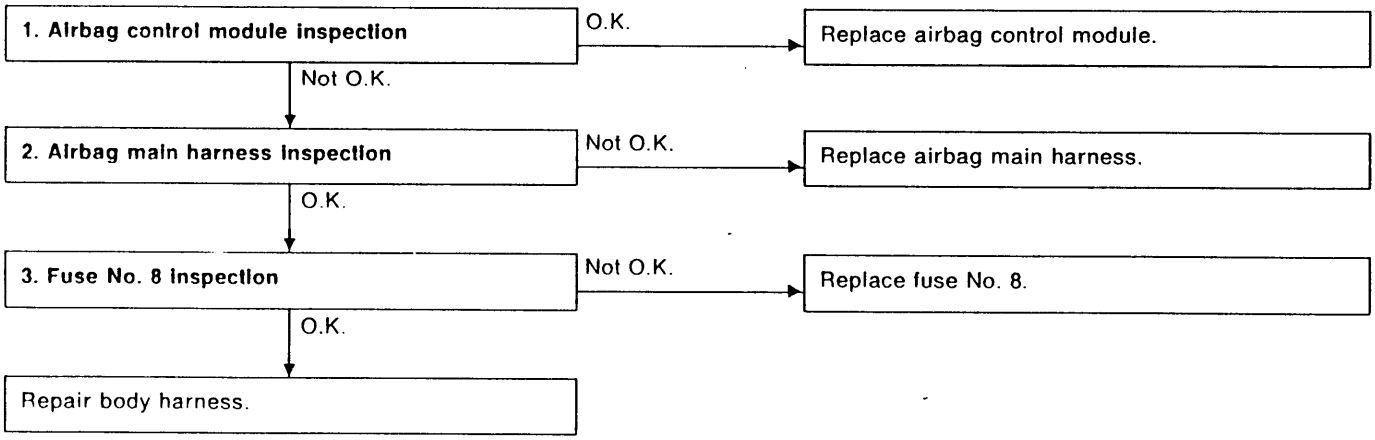
1) Disconnect connectors (AB4) and (AB5) from airbag control module. <Ref. to 5-5 [W1E1].>
2) Connect connectors (AB4) and (AB5) to test harness-B connector (8B).
3) Measure resistance between connector (5B) terminals.

(5B) Terminals / Specified resistance:
(RH: AB4): No. 17 — No. 18 / 1.4 — 1.6 kΩ
(LH: AB5): No. 15 — No. 16 / 1.4 — 1.6 kΩ

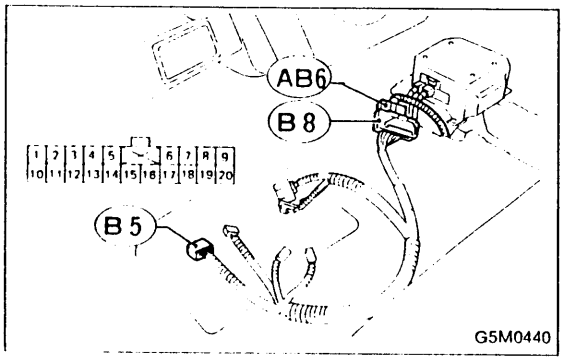
C: TROUBLE CODE 11

DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No. 8 is blown.
- Body harness circuit is open.



CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.
After 20 seconds elapse, remove instrument panel lower cover, and disconnect (AB3) and (AB8).



Test harness B-PN98299PA010

1. AIRBAG CONTROL MODULE INSPECTION

1) Disconnect connector (AB6) from airbag control module <Ref. to 5-5 [W1E1].> and connect it to test harness-B connector (8B).

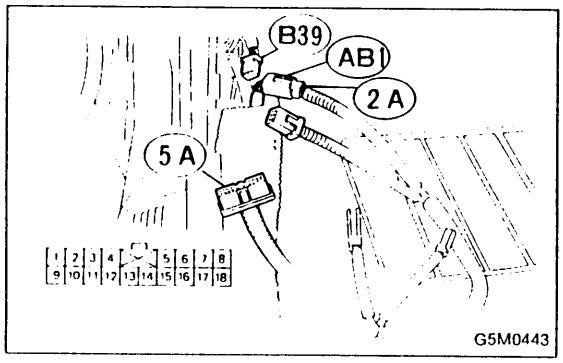
2) Connect battery ground cable and turn ignition switch "ON". (engine off)

3) Measure voltage across connector (5B) terminal and body.

(5B) Terminal / Specified voltage:
No. 2 — Body / 10 V, or more

2. AIRBAG MAIN HARNESS INSPECTION

1) Go to step 2) below after performing diagnostics on airbag system as per flowchart under "1. Air Bag Control Module Inspection" previously outlined.
2) Turn ignition switch "OFF", disconnect battery ground terminal and then wait at least 20 seconds.



Test harness A-PN98299PA000

3) Disconnect bulk harness connector (B39) from connector (AB1) at front lower pillar, and connect connector (AB1) to test harness-A connector (2A).

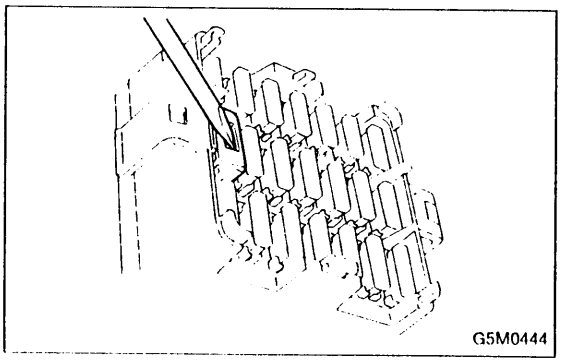
4) Measure resistance between test harness-A connector (5A) terminal and test harness-B connector (5B) terminal.

Connector & terminal / Specified resistance:
(5A) No. 1 — (5B) No. 2 / 10 Ω, or less

5) Measure resistance between terminals of connectors (5A) and (5B).

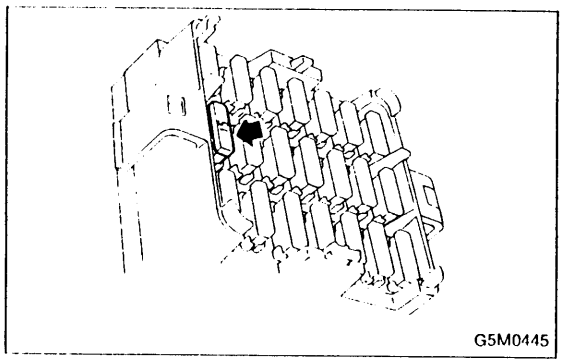
(5A) Terminal / Specified resistance:
No. 1 — Body / 10 kΩ, or more

(5B) Terminal / Specified resistance:
No. 2 — Body / 10 kΩ, or more



3. FUSE NO. 8 INSPECTION

1) Turn ignition switch "OFF", and remove airbag fuse protector.

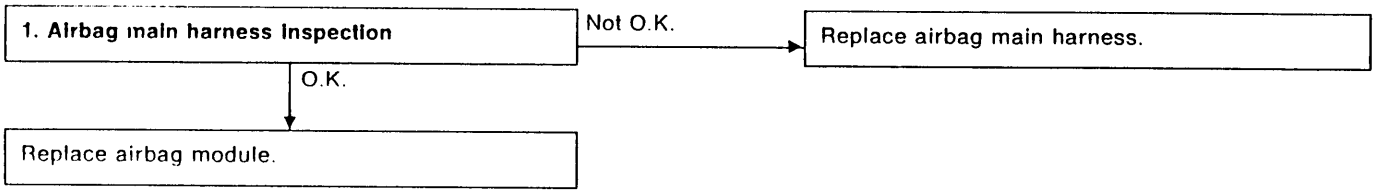


2) Remove and visually check fuse No. 8.

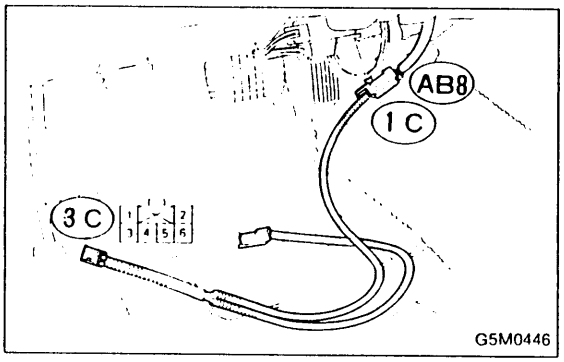
D: TROUBLE CODE 12

DIAGNOSIS:

- Airbag main harness circuit is open.
- Airbag module harness circuit is open.
- Roll connector circuit is open.
- Airbag control module is faulty.

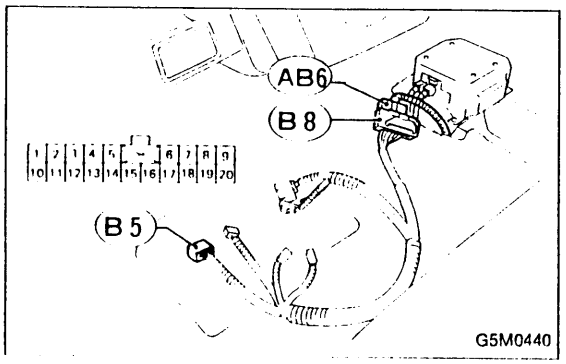


CAUTION:
Before performing diagnostics on airbag system, turn ignition switch "OFF", disconnect battery ground cable and then wait at least 20 seconds.



1. AIRBAG MAIN HARNESS INSPECTION

1) Remove lower cover panel <Ref. to 5-5 [W1A0].>, and connect connector (AB8) below steering column to test harness-C connector (1C).



2) Disconnect connector (AB6) <Ref. to 5-5 [W1E1].> from airbag control module, and connect it to test harness-B connector (8B) terminal.

3) Measure resistance between test harness-B connector (5B) and test harness-C connector (3C) terminals.

Connector & terminal / Specified resistance:
(5B) No. 14 — (3C) No. 2 / 10 Ω, or less
(5B) No. 1 — (3C) No. 3 / 10 Ω, or less

Test harness B-PN98299PA010
Test harness C-PN98299PA020