

1988-2003 AIR BAG
Diagnostic Trouble Codes

IDENTIFICATION

For air bag system identification, see [AIR BAG SYSTEM APPLICATION](#) table.

NOTE: Diagnostic information is not available. To perform diagnosis, BMW MoDIC (hand-held scan tester) or BMW Service Tester (Sun 2013 Engine Analyzer) is necessary.

AIR BAG SYSTEM APPLICATION

Application	(1) SRS System	Number Of Air Bags
All Models		
1988-91	SRS 1	1
1991-93	SRS 2	1-2
3-Series		
1993-95	5WK4 060	1
1993-00	BAE	1-2
1993-00	ZAE	1-2
1995-00	ZAE2	4-6
1995-01	MRS	4-6
1995-02	MRS2	4-6
1997-00	MRS3	4-6
2001-02	MRS4	4-6
5-Series		
1993-95	5WK4 060	1
1993-01	BAE	1-2
1993-01	ZAE	1-2
1993-01	ZAE2	4-6
1995-01	MRS	4-6
1995-01	MRS2	4-6
1997-02	MRS3	4-6
2001-02	MRS4	4-6
7-Series		
1993-95	5WK4 060	1
1993-01	BAE	1-2
1993-01	ZAE	1-2
1993-01	ZAE2	4-6
1993-01	MRS	4-6
1993-01	MRS2	4-6
1996-01	MRS3	4-6
2001	MRS4	4-6
8-Series		
1993-95	5WK4 060	1
1993-98	BAE	1-2
1993-98	ZAE	1-2
1993-98	ZAE2	4-6
1993-98	MRS	4-6

1993-98	MRS2	4-6
X5		
1999-02	MRS3	4-6
2001-02	MRS4	4-6
Z3		
1995-01	BAE	1-2
1995-01	MRS	4-6
1995-01	MRS2	4-6
1995-02	MRS3	4-6
1995-01	ZAE2	4-6
2001-02	MRS4	4-6
Z8		
2000-02	MRS3	4-6
2001-02	MRS4	4-6
Mini		
2001-02	MRS4	4-6
(1) Diagnostic information is not available. To perform diagnosis, BMW MoDIC (hand-held scan tester) or BMW Service Tester (Sun 2013 Engine Analyzer) is necessary.		

SRS DIAGNOSTIC TROUBLE CODE TABLES

SRS 1

DIAGNOSTIC TROUBLE CODES (SRS 1)

DTC	Definition	Procedure
1	Air Bag Ignition Capacitor Defect	Replace Ignition Capacitor, Air Bag System Will Not Function If This Is Not Corrected
2	Diagnostic Unit Malfunction	Examine All Faults & Delete Them From Fault Memory, If Fault Recurs, You Must Replace SRS Control Unit
3	Air Bag Supply Wire, Drivers Side	Resistance Too High, Check Wire Resistance, If Necessary Replace Cable Set
4	Air Bag Supply Wire, Driver Side, Power Supply Defect	Check Wire Resistance, If Necessary Replace Cable Set
5	Seat Belt Tensioner Supply Wire Resistance Too High	Check Wire Resistance, If Necessary Replace Cable Set
6	Seat Belt Tensioner Supply Wire, Power Supply Defect	Check Sensor Wire For Breaks Or Shorts, Check Connectors For Corrosion & Breakage
7	Crash Sensor Triggered, Front Left	Check Sensor, Wires & Connections For Breaks, Shorts Or Defects, Delete Faults In Memory, Drive Vehicle Over 15 MPH, Then Rerun Diagnosis
8	Crash Sensor Fault, Front Left	Check Sensor, Wires & Connections For Breaks, Shorts Or Defects, Delete Faults In Memory, Drive Vehicle Over 15 MPH, Then Rerun Diagnosis Replace Crash Sensor If Fault Recurs
9	Crash Sensor Ground Contact Fault, Front Left	Check Sensor Ground Contact, Check Battery Ground Contacts, Delete Faults In Memory, Drive Vehicle Over 15 MPH, Then Rerun Diagnosis, Replace Crash Sensor If Fault Recurs
10	Crash Sensor Triggered, Front Right	Check Sensor, Wires & Connections For Breaks, Shorts Or Defects, Delete Faults In Memory, Drive Vehicle Over 15 MPH, Then Rerun Diagnosis

11	Crash Sensor Fault, Front Right	Check Sensor, Wires & Connections For Breaks, Shorts Or Defects, Delete Faults In Memory, Drive Vehicle Over 15 MPH, Then Rerun Diagnosis, Replace Crash Sensor If Fault Recurs
12	Crash Sensor Ground Contact Fault, Front Right	Check Sensor Ground Contact, Check Battery Ground Contacts, Delete Faults In Memory, Drive Vehicle Over 15 MPH, Then Rerun Diagnosis, Replace Crash Sensor If Fault Recurs
13	Crash Sensor Supply Resistance Too High, Front Left	Check Sensor, Wires & Connections For Breaks, Shorts Or Defects, Delete Faults In Memory, Drive Vehicle Over 15 MPH, Then Rerun Diagnosis
14	Crash Sensor Supply Wire Fault, Front Left	Check Sensor, Wires & Connections For Breaks, Shorts Or Defects, Delete Faults In Memory, Drive Vehicle Over 15 MPH, Then Rerun Diagnosis
15	Crash Sensor Supply Resistance Too High, Front Right	Check Sensor, Wires & Connections For Breaks, Shorts Or Defects, Delete Faults In Memory, Drive Vehicle Over 15 MPH, Then Rerun Diagnosis
16	Crash Sensor Supply Wire Fault, Front Left	Check Sensor, Wires & Connections For Breaks, Shorts Or Defects, Delete Faults In Memory, Drive Vehicle Over 15 MPH, Then Rerun Diagnosis
17	Warning Lamp Short Circuit	Short Circuit Exists In Instrument Panel Or In Supply Wire From Control Unit To Instrument Panel, Check Whether SRS Warning Light Lights Up Permanently Or Not At All
18	Warning Lamp Defect	Check Air Bag Signal Bulb In Instrument Panel & Replace If Necessary
19	(1) Crash Detection Accumulator Activated	Detection Accumulator Is Activated By Operation Of SRS System
20	SRS Control Unit Defect, Dealer Replacement Only	Delete Fault Stored In Memory, Operate Vehicle For 5 Minutes, If Fault Re-Occurs, SRS Control Unit Will Need Replacement
21	Air Bag Supply Wire Resistance Too High, Passenger Side	Check Wire Resistance, If Necessary Replace Cable Set
22	Air Bag Supply Wire, Driver Side Wire Defect	Check Wire Resistance, If Necessary Replace Cable Set
(1) This accumulator can only be diagnosed and reset by a BMW dealer.		

SRS 2

DIAGNOSTIC TROUBLE CODES (SRS 2)

DTC	Definition	Procedure
1	Front Sensor Trigger, One Time
2	Front Sensor Trigger, Multiple Times
5	Front Sensor Trigger, Permanent
13	Two Firing Circuits Are Shorted
19	Front Sensor Supply Voltage, Left Fault
20	Front Sensor Supply Voltage, Right Fault
27	Primary Air Bag Firing Circuit Is Shorted To Battery Positive	Check Wiring For Short
33	Primary Air Bag Firing Circuit Is Shorted To Ground	Check Wiring For Shorts Or Breaks
42	Air Bag Ignition Circuit, Drivers Side	Resistance To Low

43	Seat belt Pretension System, Passenger Air Bag	Resistance In Circuit II Is Too Low
44	Passenger Air Bag	Resistance In Circuit III (Or Spare Resistor) Is To Low
45	Air Bag Ignition Circuit, Drivers Side	Resistance In Supply Wire Is Too High
46	Seat belt Pretension System, Passenger Air Bag	Resistance In Circuit II Is Too High
47	Passenger Air Bag	Resistance In Circuit III (For Spare Resistance) Is Too High
49	SRS Warning Lamp faulty
50	(1) SRS Control Unit Defect	Delete Fault Stored In Memory, Operate Vehicle For 5 Minutes, If Fault Re-Occurs SRS Control Unit Will Need Replacement
52	(1) Crash Accumulator Triggered
(1) Dealer replacement only.		

MRS

DIAGNOSTIC TROUBLE CODES (MRS)

DTC	Probable Fault
1	ECU Internal Fault
2	Warning Lamp Faulty
3	ECU Power Supply
4	Firing Circuit Driver Air Bag
5	Firing Circuit DP
6	Firing Circuit PP
7	Firing Circuit Passenger Air Bag
8	Firing Circuit Left Side Air Bag
9	Firing Circuit Right Side Air Bag
16	Driver Seat Belt Switch
17	Passenger Seat Belt Switch
18	Left Satellite Sensor (Side Bag)
19	Left Satellite Sensor (Side Bag)
20	Left Satellite Sensor (Side Bag)
21	Right Satellite Sensor (Side Bag)
22	Right Satellite Sensor (Side Bag)
23	Right Satellite Sensor (Side Bag)
24	Passenger Seat, Occupancy Sensor
25	Passenger Seat, Occupancy Sensor
26	Passenger Seat, Occupancy Sensor
27	Seat Occupancy Recognition
29	Seat Occupancy Recognition
31	Seat Occupancy Recognition
32	Left Satellite Sensor (Side Bag)
33	Right Satellite Sensor (Side Bag)

MRS2

DIAGNOSTIC TROUBLE CODES (MRS2)

DTC	Probable Cause
1	ECU Internal Fault

2	Warning Lamp Faulty
3	ECU Power Supply
4	Driver Air Bag
5	Driver Pretensioner
6	Passenger Pretensioner
7	Passenger Air Bag
8	Side Air Bag Front Left
9	Side Air Bag Front Right
10	Side Air Bag Rear Left
11	Side Air Bag Rear Right
12	Head Air Bag Left
13	Head Air Bag Right
14	Battery Disconnection
15	Passenger Air Bag Stage
16	Driver Seat Belt Lock
17	Passenger Seat Belt Lock
18	Sensor Left Side Air Bag
19	Sensor Left Side Air Bag
21	Sensor Right Side Air Bag
22	Sensor Right Side Air Bag
23	Sensor Right Side Air Bag
24	Passenger Seat Occupancy Recognition
26	Passenger Seat Occupancy Recognition
27	Seat Occupancy Recognition
28	Seat Occupancy Recognition
29	Seat Occupancy Recognition
31	Seat Occupancy Recognition
32	Sensor Left Side Air Bag
33	Sensor Right Side Air Bag
53	Sensor Left Side Air Bag
54	Sensor Right Side Air Bag

MRS3

DIAGNOSTIC TROUBLE CODES (MRS3)

DTC	Probable Cause
1	Driver Air Bag
2	Driver Pretensioner
3	Passenger Pretensioner
4	Passenger Air Bag
5	Side Air Bag Front Left
6	Side Air Bag Front Right
7	Side Air Bag Rear Left
8	Side Air Bag Rear Right
9	Head Air Bag Front Left
10	Head Air Bag Front Right
11	Battery Disconnection
12	Passenger Air Bag Stage
13	Driver Air Bag Stage
14	Head Air Bag Rear Left

15	Head Air Bag Rear Right
16	Battery Disconnection
17	ECU Power Supply
18	Air Bag Warning Light
19	Attention Warning Light (HWL)
20	Driver Seat Belt Lock
21	Passenger Seat Belt Lock
22	Side Air Bag Sensor Left
23	Side Air Bag Sensor Right
24	External Roll Sensor
25	Seat Occupied Recognition 2 (SBE 2)
26	Seat Occupied Recognition 1 (SBE 1)
27	Crash Message Memory
28	Connector Ignition Circuit Driver Air Bag
29	Connector Ignition Circuit Driver Pre Tensioner
30	Connector Ignition Circuit Passenger Pre-Tensioner
31	Connector Ignition Circuit Passenger Air Bag
32	Connector Ignition Circuit Side Air Bag FL
33	Connector Ignition Circuit Side Air Bag FR
34	Connector Ignition Circuit Side Air Bag RL
35	Connector Ignition Circuit Side Air Bag RR
36	Connector Ignition Circuit Head Air Bag FL
37	Connector Ignition Circuit Head Air Bag FR
38	Connector Ignition Circuit Battery Disconnect 1
39	Connector Ignition Circuit PA Stage 2
40	Connector Ignition Circuit DA Stage 2
41	Connector Ignition Circuit Head Air Bag RL
42	Connector Ignition Circuit Head Air Bag RR
43	Connector Ignition Circuit Battery Disconnect 2
44	Checksum Coding Data
45	Side Air Bag Sensor Front
240	ECU Internal Fault

BAE & ZAE

DIAGNOSTIC TROUBLE CODES (BAE & ZAE)

DTC	Probable Cause
1	ECU Internal Fault
2	Firing Circuit Driver Air Bag
3	Firing Circuit DP
4	Firing Circuit PP
5	Firing Circuit Passenger Air Bag
17	ECU Power Supply
19	Warning Lamp Faulty
20	Passenger Seat, Occupancy Sensor
21	Driver Pressure Sensor
22	Passenger Pressure Sensor
24	Driver Seat Belt Lock
25	Passenger Seat Belt Lock
73	Short Between Firing Circuits

ZAE2

DIAGNOSTIC TROUBLE CODES (ZAE2)

DTC	Probable Cause
1	ECU Internal Fault
2	Warning Lamp Faulty
3	ECU Power Supply
4	Firing Circuit Driver Air Bag
5	Firing Circuit DP
6	Firing Circuit PP
7	Firing Circuit Passenger Air Bag
16	Driver Seat Belt Switch
17	Passenger Seat Belt Switch
24	Passenger Seat, Occupancy Sensor
25	Passenger Seat, Occupancy Sensor
26	Passenger Seat, Occupancy Sensor
27	Seat Occupancy Recognition
29	Seat Occupancy Recognition
31	Seat Occupancy Recognition

5WK4 060

DIAGNOSTIC TROUBLE CODES (5WK4 060)

DTC	Probable Cause
1	Crash Sensor Closed Once
2	Crash Sensor Closed Several Times
5	Crash Sensor Permanently Closed
13	Two Firing Circuits Shorted
19	Crash Sensor Left Supply, Open Circuit
20	Crash Sensor Right Supply, Open Circuit
27	One Firing Circuit Short To Voltage
33	One Firing Circuit Short To Ground
42	Driver Air Bag Resistance Too Low
43	Resistance Too Low Firing Circuit II
44	Resistance Too Low Firing Circuit III
45	Driver Air Bag Resist, Too High
46	Resistance Too High Firing Circuit II
47	Resistance Too High Firing Circuit III
49	Warning Lamp Faulty
50	ECU Internal Fault
52	Crash Evidence Set
102	Ignore This Error

MRS4

DIAGNOSTIC TROUBLE CODES (MR54)

DTC	Probable Cause
1	Driver Air Bag Stage
2	Driver Pretensioner
3	Passenger Pretensioner
4	Passenger Air Bag Stage 1

5	Side Air Bag Front Left
6	Side Air Bag Front Right
7	Side Air Bag Rear Left
8	Side Air Bag Rear Right
9	Head Air Bag Front Left
10	Head Air Bag Front Right
11	Battery Disconnection 1
12	Passenger Air Bag Stage 2
13	Driver Air Bag Stage 2
14	Head Air Bag Rear Left
15	Head Air Bag Rear Right
16	Battery Disconnection 2
17	Pretensioner Rear Left
18	Pretensioner Rear Right
19	Pretensioner Rear Middle
20	Ignition Circuit ZK19
21	Driver Air Bag Stage 2
22	Ignition Circuit ZK7
48	Connector Ignition Circuit DA Stage 1
49	Connector Ignition Circuit D Pretensioner
50	Connector Ignition Circuit P Pretensioner
51	Connector Ignition Circuit PA Stage 2
52	Connector Ignition Circuit Side Air Bag FL
53	Connector Ignition Circuit Side Air Bag FR
54	Connector Ignition Circuit Side Air Bag RL
55	Connector Ignition Circuit Side Air Bag RR
56	Connector Ignition Circuit Head Air Bag FL
57	Connector Ignition Circuit Head Air Bag FR
58	Connector Ignition Circuit Battery Disconnect 1
59	Connector Ignition Circuit PA Stage 2
60	Connector Ignition Circuit DA Stage 2
61	Connector Ignition Circuit Head Air Bag RL
62	Connector Ignition Circuit Head Air Bag RR
63	Connector Ignition Circuit Battery Disconnect On
64	Connector Ignition Circuit Pretensioner RL
65	Connector Ignition Circuit Pretensioner RR
66	Connector Ignition Circuit Pretensioner RM
67	Connector Ignition Circuit ZK19
68	Connector Ignition Circuit DA Stage 2
69	Connector Ignition Circuit ZK7
80	Supply Voltage (B+)
81	Fault Indicator Light
82	Attention Warning Light (HWL)
96	Driver Seat Belt Lock
98	Seat Belt Lock Rear Left
99	Seat Belt Lock Rear Right
100	Seat Belt Lock Rear Middle
112	Seat Occupancy Recognition
113	Seat Occupied Recognition 2 (SBE 2)

117	External Roll Sensor
128	Sensor Front Side Air Bags
129	Sensor Left Side Air Bag
130	Sensor Left Side Air Bag
131	Sensor Left Side Air Bag
132	Sensor Right Side Air Bag
133	Sensor Right Side Air Bag
134	Sensor Right Side Air Bag
144	Coding Error
145	Crash Message Memory
240	Internal ECU Fault

Article GUID: A00151063

2002 ACCESSORIES/SAFETY EQUIPMENT

BMW - Air Bag Restraint Systems

DESCRIPTION & OPERATION

WARNING: Accidental air bag deployment is possible. Personal injury may result. Read and follow all WARNINGS and [AIR BAG SAFETY PRECAUTIONS](#) before working on air bag system or related components.

The Supplemental Restraint System (SRS), also known as air bag system, is designed to provide increased accident protection for driver and passengers by deploying front air bags and seat belt pretensioners in a front-end collision and side air bags and side impact head protection system when side impact is detected.

Main components of the air bag system include air bag control module, driver-side air bag module, passenger-side air bag module, side air bag modules, side impact head protection modules, side air bag crash sensors, seat belt pretensioners, AIR BAG warning light and contact ring (clockspring).

COMPONENT LOCATIONS

RESTRAINT SYSTEM COMPONENT LOCATIONS

Component	Location
Air bag control unit	
3 series	Under middle of rear seat
Z3 & M coupe & roadster	Under center console
Contact ring	On top of steering column, below steering wheel
Data link connector	Under left side of instrument panel
Driver-side air bag module	Front face of steering wheel
Passenger-side air bag module	Right side of instrument panel, above glove box
Side air bag module	Behind door trim panels
Side impact head protection	Under headliner, over front doors

SERVICING

Check AIR BAG warning light operation and diagnostic system for trouble codes at regular service intervals.

SYSTEM OPERATION CHECK

Turn ignition switch to ON position. AIR BAG warning light should illuminate for 6-10 seconds then turn off. If AIR BAG warning light illuminates for 6-10 seconds and turns off, then illuminated again or remains illuminated, a fault in air bag system has been detected. If AIR BAG warning light illuminates while operating the vehicle, fault in air bag system has been detected. If AIR BAG warning light fails to illuminate, this indicates bulb or wiring is faulty.

AIR BAG SAFETY PRECAUTIONS

Observe these precautions when working on air bag system:

- When working on air bag system or components, disable air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) . Wait at least 5 seconds before servicing vehicle.
- Always ensure radio is off before disconnecting battery. This will prevent damage to radio microprocessor.

- Before straightening damaged metal or arc-welding, disable air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#).
- Always wear safety glasses, gloves and long-sleeve shirt when handling deployed air bag modules. Air bag module may contain sodium hydroxide deposits, which could irritate skin.
- Handle sensors carefully. Never strike or jar sensors. All sensors and mounting bracket screws must be tightened to specification to ensure proper sensor operation.
- Never use any air bag system component that has been dropped from 2 feet (0.6 m) or higher.
- DO NOT use self-powered electrical test equipment, such as battery- powered or AC-powered voltmeter, ohmmeter, test light etc.
- Always handle air bag module with trim cover facing away from your body. Always place air bag module on work bench with trim cover facing up.
- Never expose air bag system components to temperatures greater than 167Â°F (75Â°C).
- Never expose any air bag system components to cleaning agents such as solvents, gasoline, lye etc.

ADJUSTMENTS

CONTACT RING

Ensure front wheels are in straight-ahead position. Press down spring clip lock in steering wheel hub center and hold clip lock down. See [Fig. 1](#). On bottom side of steering wheel, turn contact ring all the way either clockwise or counterclockwise until it stops. Turn contact ring back about 3 turns until arrows align. Release spring clip lock. Contact ring is now in center position.

DISABLING & ACTIVATING AIR BAG SYSTEM

WARNING: Accidental air bag deployment is possible. Personal injury may result. Avoid using memory savers when working on air bag system.

DISABLING SYSTEM

Before proceeding, see [AIR BAG SAFETY PRECAUTIONS](#). If equipped with MK3 navigation system, turn ignition off and wait one minute for system to complete power-down procedure. On all models, retrieve and record any fault codes. Obtain radio anti-theft code. Record programmed radio stations. Ensure ignition is off. Disconnect and shield the negative battery cable. Wait at least 5 seconds before servicing vehicle.

ACTIVATING SYSTEM

Ensure ignition is off. Connect negative battery cable. Perform system operation check. See [SYSTEM OPERATION CHECK](#). Reprogram radio and set clock. On some vehicles, infrared locking system keys must be recoded, power windows and slide/tilt sunroof must be reinitialized.

DISPOSAL PROCEDURES

WARNING: Air bag module and seat belt pretensioners must be deployed before disposal. Disposing of undeployed components may violate federal, state and/or local laws. This also applies to vehicles that are to be scrapped.

DEPLOYED AIR BAG MODULES & SEAT BELT PRETENSIONERS

Deployed air bag modules and seat belt pretensioners are not classified as hazardous material; dispose of them like any other part.

ON-VEHICLE DEPLOYMENT (SCRAPPED VEHICLES ONLY)

WARNING: If components will not deploy using the following procedures, contact vehicle

manufacturer for disposal instructions.

All AIR Bags & Seat Belt Pretensioners

1. Before proceeding, see [AIR BAG SAFETY PRECAUTIONS](#) . Move vehicle outdoors to a remote area, away from workshop and people. Disconnect and shield negative battery cable. Close doors and open windows, sunroof and trunk. Ensure all air bag modules are securely installed. Remove loose objects from around air bag modules.
2. Disconnect air bag control unit harness connector. Air bag control unit is located underneath center console between front seats. Attach Firing Device (62 1 270) and Cable (62 1 210) to 30-pin connector or Cable (62 1 310) to 50-pin connector. Connect firing device to 12-volt battery placed 33 feet (10 m) to rear of vehicle.
3. Press firing device switch to deploy air bags and pretensioners. If Cable (62 1 310, 50-pin connector) is used, only air bags and pretensioner on one side of vehicle will deploy. To deploy remaining air bags and pretensioner, connect cable to free connector and repeat this step.

UNDEPLOYED AIR BAG-FAULTY UNIT

If diagnostic testing and deploying procedures indicate air bag module and/or seat belt pretensioner is faulty, DO NOT dispose of in usual manner. Contact vehicle manufacturer for proper disposal instructions.

OFF-VEHICLE DEPLOYMENT

Contact manufacturer for specific instructions.

POST-COLLISION INSPECTION

When a vehicle has been involved in a collision, certain components of the passive restraint system must be inspected or replaced. See [AIR BAG/SRS COMPONENT INSPECTION & REPLACEMENT TABLES](#) article in the GENERAL INFORMATION section.

REMOVAL & INSTALLATION

WARNING: Accidental air bag deployment is possible. Personal injury may result. Read and follow all WARNINGS and [AIR BAG SAFETY PRECAUTIONS](#) before working on air bag system or related components.

AIR BAG CONTROL UNIT

Removal & Installation

1. Before proceeding, see [AIR BAG SAFETY PRECAUTIONS](#) . Disable air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) .
2. On all models except Z3 and M coupe and roadster, remove rear seat. Remove air bag control unit mounting screws. Disconnect electrical connectors and remove control unit from vehicle. On Z3 and M coupes and roadsters, remove center console, disconnect electrical connectors, remove air bag control unit screws and remove control unit.
3. To install, reverse removal procedure. Ensure arrow on top of air bag control unit points toward front of vehicle. Tighten air bag control unit mounting screws to specification. See [TORQUE SPECIFICATIONS](#) . NEW air bag control units must be re-encoded using proprietary BMW DIS/MoDiC tester. Activate air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) .

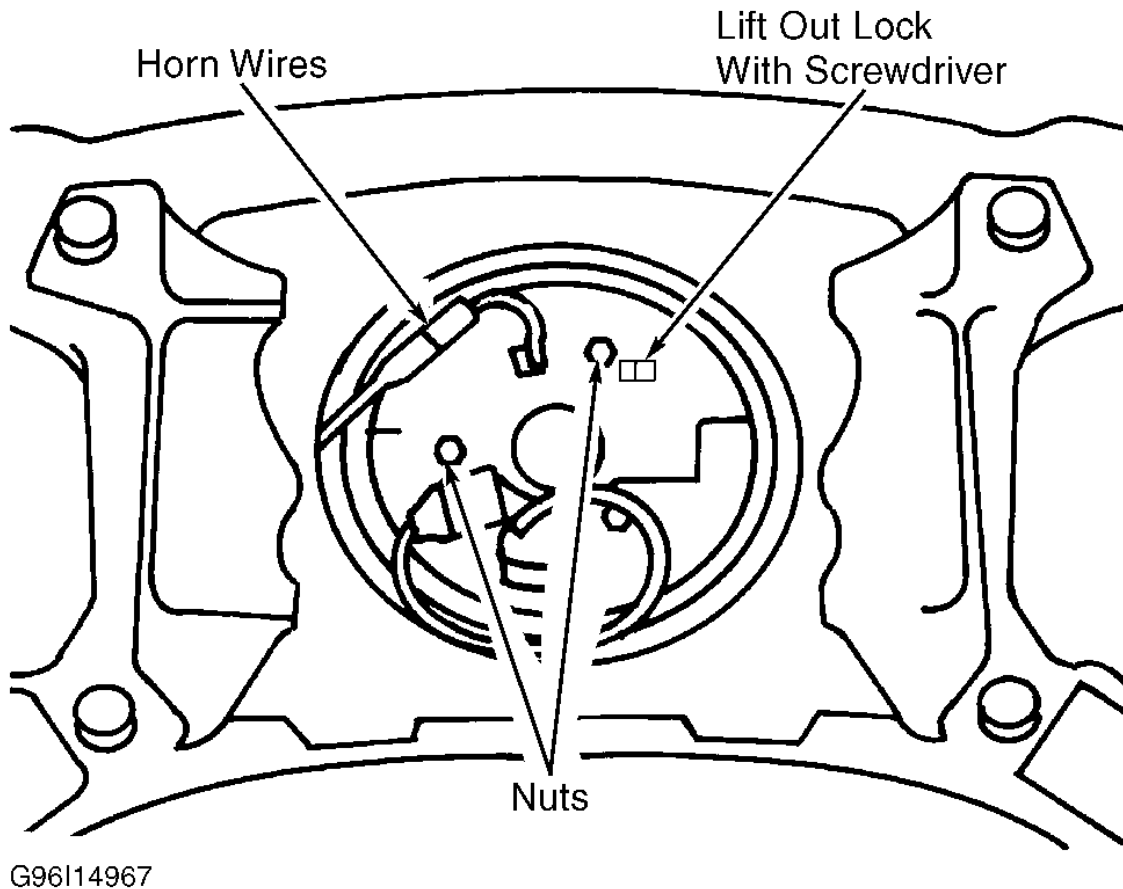
CONTACT RING

Removal

1. Before proceeding, see [AIR BAG SAFETY PRECAUTIONS](#) . Disable air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) . Remove steering wheel. See [STEERING](#)

WHEEL .

2. With steering wheel removed, remove locking clip with a small screwdriver. See [Fig. 1](#) . Disconnect electrical plug, and remove nuts/screws holding contact ring to steering wheel.



[Fig. 1: Removing Contact Ring From Steering Wheel](#)

Courtesy of BMW OF NORTH AMERICA, INC.

Installation

1. To install, reverse removal procedure. If installing original contact ring, center contact ring before installation. See [CONTACT RING](#) under ADJUSTMENTS. If installing NEW contact ring, NEW contact ring is held in center position with shipping lock pin. DO NOT remove lock pin until contact ring is attached to steering wheel.
2. Install contact ring and reinstall screws holding ring to wheel hub. Pinch ends of locking pin with a pliers and remove. Activate air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) .

DRIVER-SIDE AIR BAG MODULE

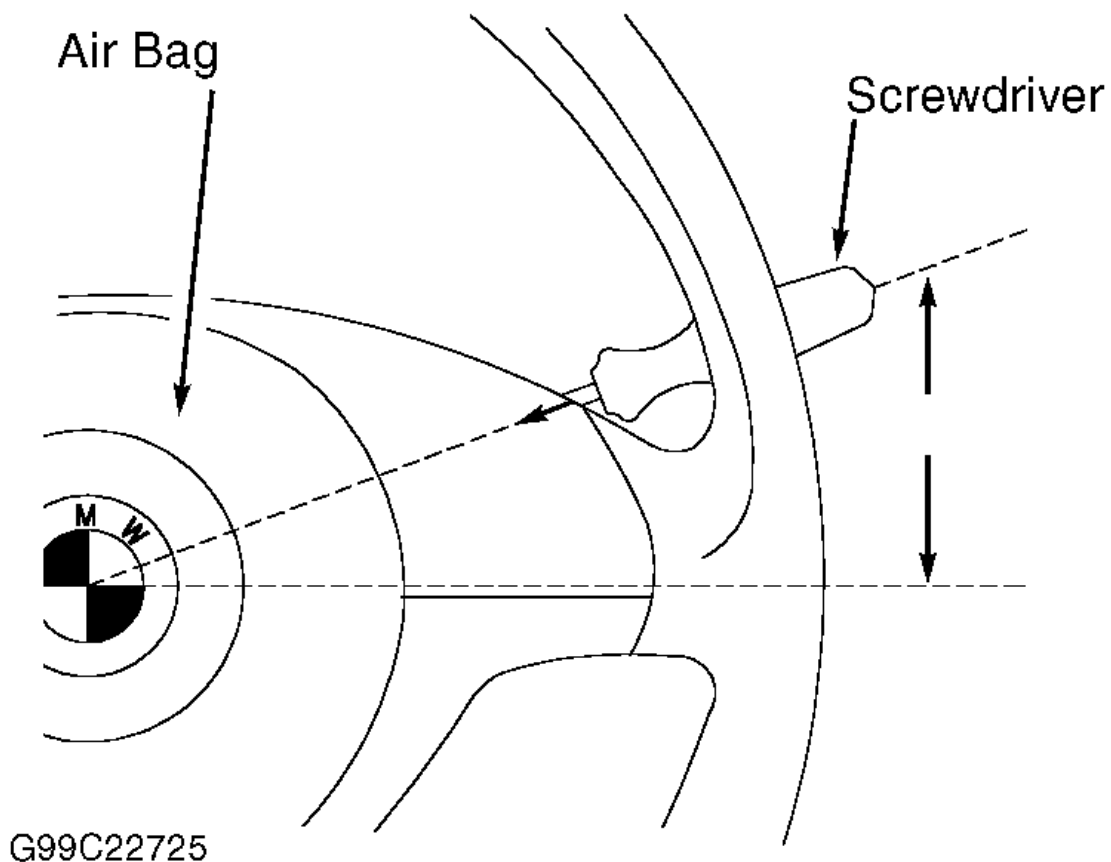
Removal & Installation (4-Spoke Steering Wheel)

1. Before proceeding, see [AIR BAG SAFETY PRECAUTIONS](#) . Disable air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) .
2. Remove screw from lower steering column trim and remove trim. Pull Orange electrical connector off steering column and disconnect. Using Torx T30 bit with long shank, remove air bag module Torx screws from rear of steering wheel. Lift up air bag module to disconnect wiring connector from rear of module. Put air bag module in a secure area with trim pad (air bag) facing upward.
3. To install, reverse removal procedure. Tighten air bag module Torx screws to specification. See

TORQUE SPECIFICATIONS . Activate air bag system. See DISABLING & ACTIVATING AIR BAG SYSTEM .

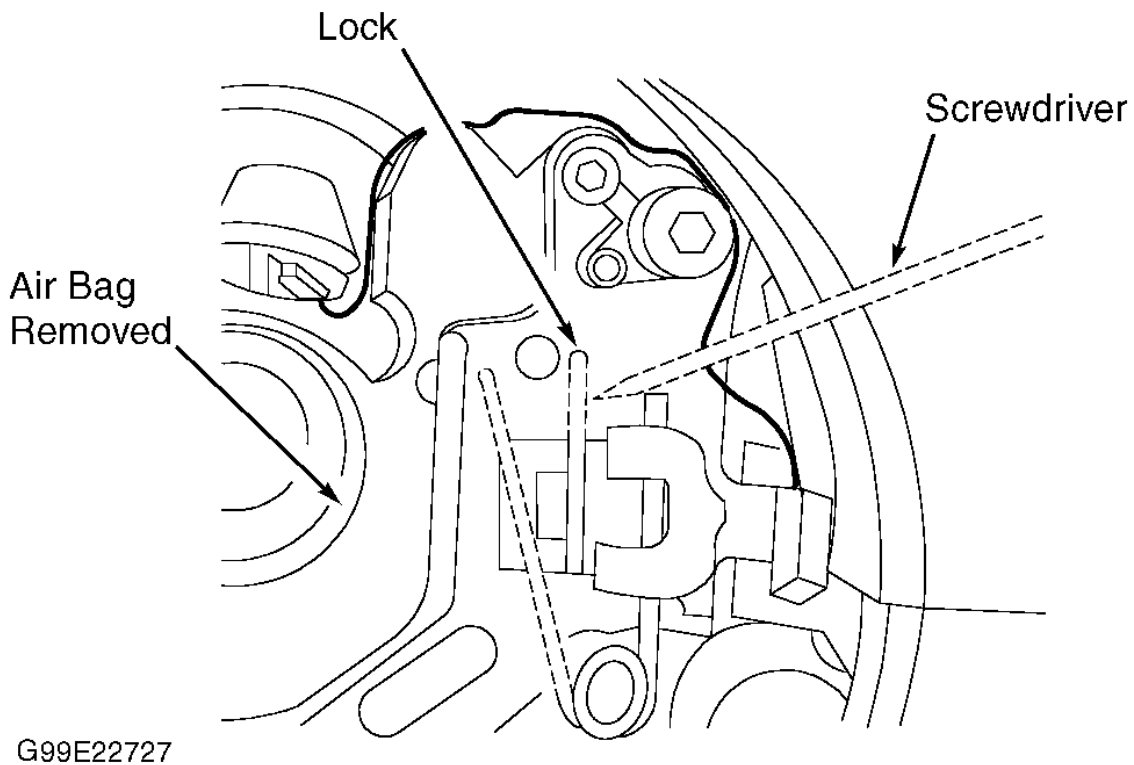
Removal & Installation (3-Spoke Steering Wheel)

1. Before proceeding, see AIR BAG SAFETY PRECAUTIONS . Disable air bag system. See DISABLING & ACTIVATING AIR BAG SYSTEM .
2. Insert screwdriver through opening on rear side of steering wheel. See [Fig. 2](#) . Press down on spring loaded clip and pull out air bag. See [Fig. 3](#) . Repeat process on opposite side. Pull out air bag and disconnect electrical connectors. Open locks on plugs and disconnect plug connections. Remove air bag. Put air bag module in a secure area with trim pad (air bag) facing upward.
3. To install, insert air bag hooks into locks and press into steering wheel. Activate air bag system. See DISABLING & ACTIVATING AIR BAG SYSTEM .



[Fig. 2: Inserting Screwdriver Behind Steering Wheel](#)

Courtesy of BMW OF NORTH AMERICA, INC.



[Fig. 3: Releasing Smart Air Bag Retaining Clips](#)
 Courtesy of BMW OF NORTH AMERICA, INC.

PASSENGER-SIDE AIR BAG MODULE

Removal & Installation

1. Before proceeding, see [AIR BAG SAFETY PRECAUTIONS](#) . Disable air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) .
2. Remove passenger-side instrument panel air vent. Insert Plastic Wedge (00 9 323) on both sides of passenger-side air bag cover and release catches. Remove screw and lift off air bag cover. DO NOT allow tension to occur on air bag cover strap(s) when removing passenger-side air bag or cover. Remove retaining nuts and lift passenger-side air bag module from instrument panel and disconnect electrical connector. Remove air bag module from vehicle.
3. To install, reverse removal procedure. Tighten air bag module retaining nuts to specification. See [TORQUE SPECIFICATIONS](#) . Activate air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) .

SIDE AIR BAG MODULE

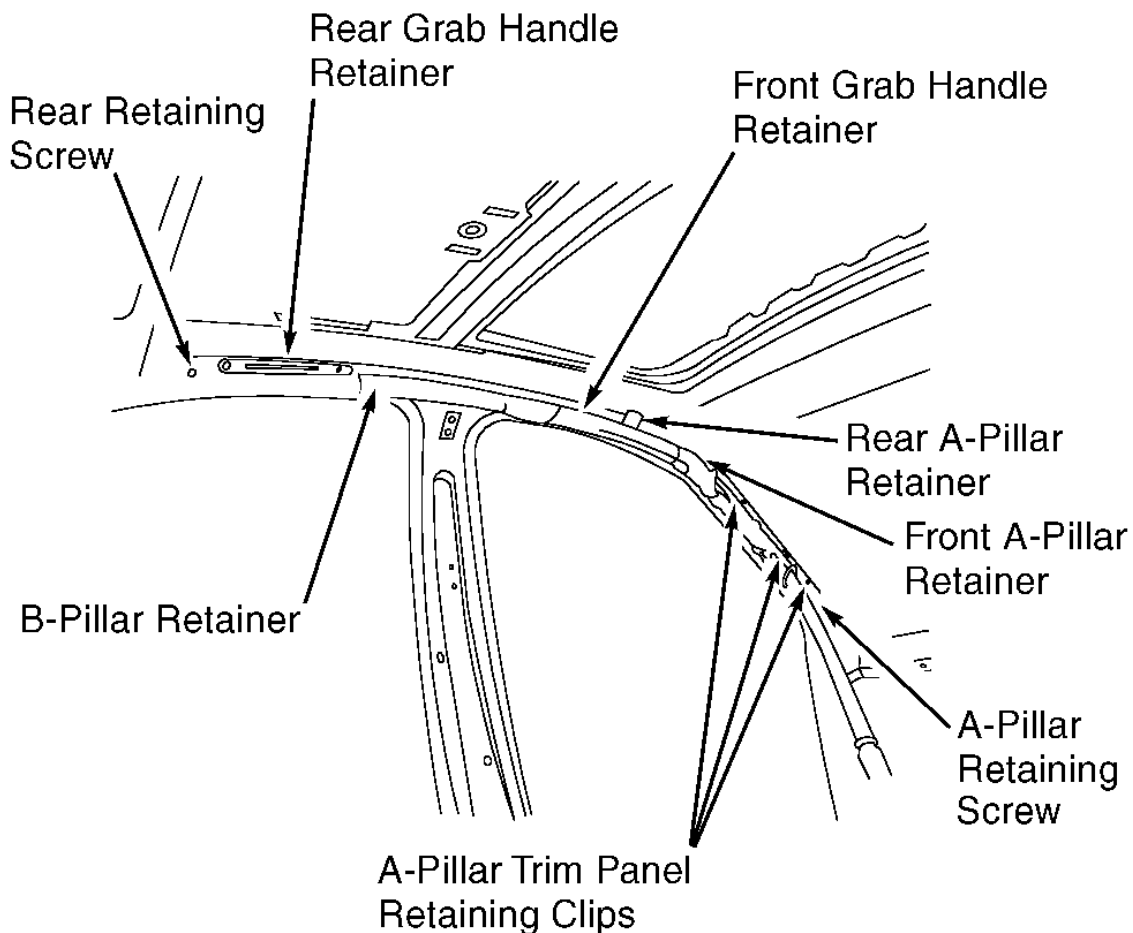
Removal & Installation

1. Before proceeding, see [AIR BAG SAFETY PRECAUTIONS](#) . Disable air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) .
2. Remove appropriate front or rear door, or rear seat side trim panel. Disconnect side air bag module electrical connector. Remove and discard side air bag mounting screws. Remove side air bag module from vehicle.
3. To install, reverse removal procedure. Use NEW micro-encapsulated side air bag module mounting screws and tighten to specification. See [TORQUE SPECIFICATIONS](#) . Activate air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) .

SIDE IMPACT HEAD PROTECTION SYSTEM (HPS)

Removal & Installation (Except 3 Series Coupe)

1. Before proceeding, see [AIR BAG SAFETY PRECAUTIONS](#) . Disable air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) . Lower windows. Remove edge guards from all door openings. Remove front and rear grab handles. Remove A-pillar trim on both sides. Remove B-pillar trim on both sides and suspend on shoulder belt. Remove C-pillar trim on both sides.
2. Remove sun visors and interior lights. Close sun roof. Press in on sun roof trim retainers and remove trim, if equipped with sunroof. Lower front of headliner, push back and disconnect on metal fold. Remove headliner from side of vehicle.
3. Remove steering wheel. See [STEERING WHEEL](#) . Remove steering column switch. Remove instrument cluster retaining screws and remove instrument cluster. Remove center console. Remove glove box. Remove passenger-side air bag module. See [PASSENGER-SIDE AIR BAG MODULE](#) . Remove instrument panel trim and screws underneath. Remove radio. Remove A/C-heater control unit. Remove hood release lever. Remove left and right kick panels.
4. Remove left and right instrument panel under covers. Remove screws on front left and right sides of instrument panel. Remove bolts on bottom left and right of instrument panel (in footwell area). Lift out right and left instrument panel end covers. Lift instrument panel rearward and disconnect electrical connectors. Remove instrument panel.
5. Disconnect HPS gas generator electrical connector. Remove nut securing gas generator to instrument support tube and remove gas generator. Remove front A-pillar retaining screw securing HPS tether to A-pillar. See [Fig. 4](#) . Remove rear mounting bolt. Remove head air bag from rear grab handle bracket. Remove B-pillar retaining screw and bracket.
6. Remove head air bag from front grab handle bracket. Remove rear A-pillar retaining screw and bracket. Remove front A-pillar retaining screw and bracket. Remove expansion rivet. Unclip A-pillar wiring harness from retainers.
7. To install, reverse removal procedure. Ensure air bag does not contact any sharp edges either on body or on clips. Tighten air bag bolts and retainer screws to specification. See [TORQUE SPECIFICATIONS](#) . Activate air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) .



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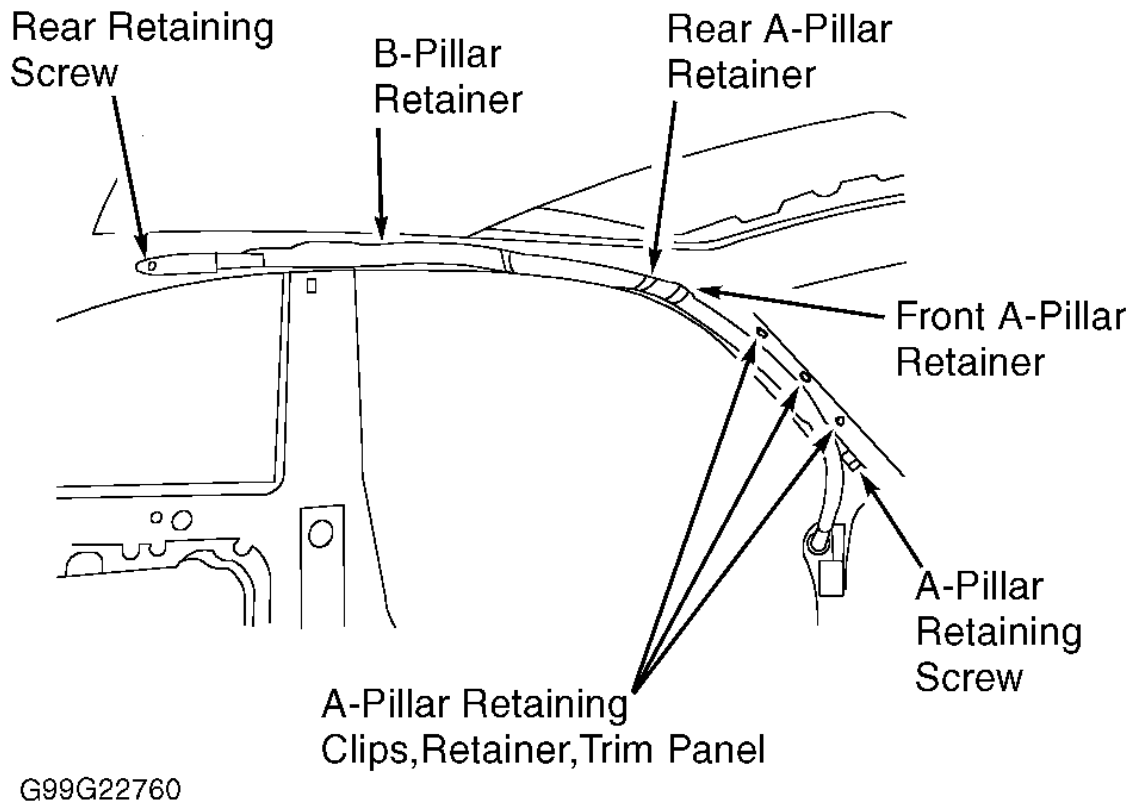
[Fig. 4: Side Impact Head Protection System Retaining Elements \(Except 3 Series Coupe\)](#)

Courtesy of BMW OF NORTH AMERICA, INC.

Removal & Installation (3 Series Coupe)

1. Before proceeding, see [AIR BAG SAFETY PRECAUTIONS](#) . Disable air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) . Lower windows. Remove edge guards from all door openings. Remove front and rear grab handles. Remove A-pillar trim on both sides. Remove B-pillar trim on both sides and suspend on shoulder belt. Remove C-pillar trim on both sides
2. Remove sun visors and interior lights. Close sun roof. Press in on sun roof trim retainers and remove trim, if equipped with sunroof. Lower front of headliner, push back and disconnect on metal fold. Remove headliner from side of vehicle.
3. Remove steering wheel. See [STEERING WHEEL](#) . Remove steering column switch. Remove instrument cluster retaining screws and remove instrument cluster. Remove center console. Remove glove box. Remove passenger-side air bag module. See [PASSENGER-SIDE AIR BAG MODULE](#) . Remove instrument panel trim and screws underneath. Remove radio. Remove heater/AC control unit. Remove hood release lever. Remove left and right kick panels.
4. Remove left and right instrument panel under covers. Remove screws on front left and right sides of instrument panel. Remove bolts on bottom left and right of instrument panel (in footwell area). Lift out right and left instrument panel end covers. Lift instrument panel rearward and disconnect electrical connectors. Remove instrument panel.
5. Disconnect HPS gas generator electrical connector. Remove nut securing gas generator to instrument support tube and remove gas generator. Remove A-pillar mounting bolt securing HPS tether to A-pillar. See [Fig. 5](#) . Remove rear mounting bolt securing HPS tether to roof. Remove B-pillar retaining screw and bracket.

6. Remove rear A-pillar retaining screw and bracket. Remove front A-pillar retaining screw and bracket. Unclip A-pillar wiring harness from retainers. Remove rear A-pillar retaining screw and bracket. Remove front A-pillar retaining screw and bracket. Unclip A-pillar wiring harness from retainers.
7. To install, reverse removal procedure. Ensure air bag does not contact any sharp edges either on body or on clips. Tighten air bag bolts and retainer screws to specification. See [TORQUE SPECIFICATIONS](#) . Activate air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) .



[Fig. 5: Side Impact Head Protection System Retaining Elements \(3 Series Coupe\)](#)

Courtesy of BMW OF NORTH AMERICA, INC.

SEAT BELT PRETENSIONERS

Removal & Installation

1. Before proceeding, see [AIR BAG SAFETY PRECAUTIONS](#) . Disable air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) .
2. Remove front seat and B-pillar trim. Open cable strap for plug on seat belt pretensioner. Disconnect electrical connector from seat belt pretensioner. Remove seat belt pretensioner mounting bolt. Note position of seat belt pretensioner on seat. Remove seat belt pretensioners.
3. To install, reverse removal procedure. Replace micro encapsulated seat belt pretensioner mounting bolt and cable strap. Tighten seat belt pretensioners mounting bolt to specification. See [TORQUE SPECIFICATIONS](#) . Activate air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) .

STEERING WHEEL

Removal (4-Spoke Steering Wheel With AIR Bag)

1. Before proceeding, see [AIR BAG SAFETY PRECAUTIONS](#) . Disable air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) . Remove driver-side air bag module. See

DRIVER-SIDE AIR BAG MODULE .

2. Ensure front wheels are in straight-ahead position. Remove steering wheel bolt. Mark steering wheel hub in relation to steering shaft for installation reference. Loosening steering wheel bolt activates spring clip lock holding contact ring in center position. See [Fig. 1](#) . Remove steering wheel.

Installation

1. Adjust contact ring before completing steering wheel installation. See [CONTACT RING](#) under ADJUSTMENTS.
2. Position steering wheel onto shaft splines using reference mark for realignment positioning. At same time, accurately align column locking pins into opening in contact ring on bottom of steering wheel.
3. Install and tighten steering wheel bolt to specification. See [TORQUE SPECIFICATIONS](#) . Connect horn wiring. Install air bag module. Activate air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) .

Removal & Installation (3-Spoke Steering Wheel)

1. Before proceeding, see [AIR BAG SAFETY PRECAUTIONS](#) . Disable air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) . Remove driver-side air bag module. See [DRIVER-SIDE AIR BAG MODULE](#) .
2. Ensure front wheels are in straight-ahead position. Remove steering wheel bolt. Mark steering wheel hub in relation to steering shaft for installation reference. Remove steering wheel.
3. To install, reverse removal procedure and coat slip ring with grease. Tighten steering wheel bolt to specification. See [TORQUE SPECIFICATIONS](#) . Activate air bag system. See [DISABLING & ACTIVATING AIR BAG SYSTEM](#) .

DIAGNOSTICS

For diagnostic trouble code information, see [1988-2002 AIR BAG TROUBLE CODES](#) article. All air bag system diagnosis must be carried out using proprietary BMW DIS/MoDiC tester.

WIRE REPAIR

Individual pairs of firing circuit wires may be repaired using BMW air bag cable kits. Only one crimping connector can be installed into a single wire. Wires cannot be lengthened as a result of the repair. Damaged wire or connectors in door wiring harness must be repaired by replacing the entire door wiring harness.

TORQUE SPECIFICATIONS

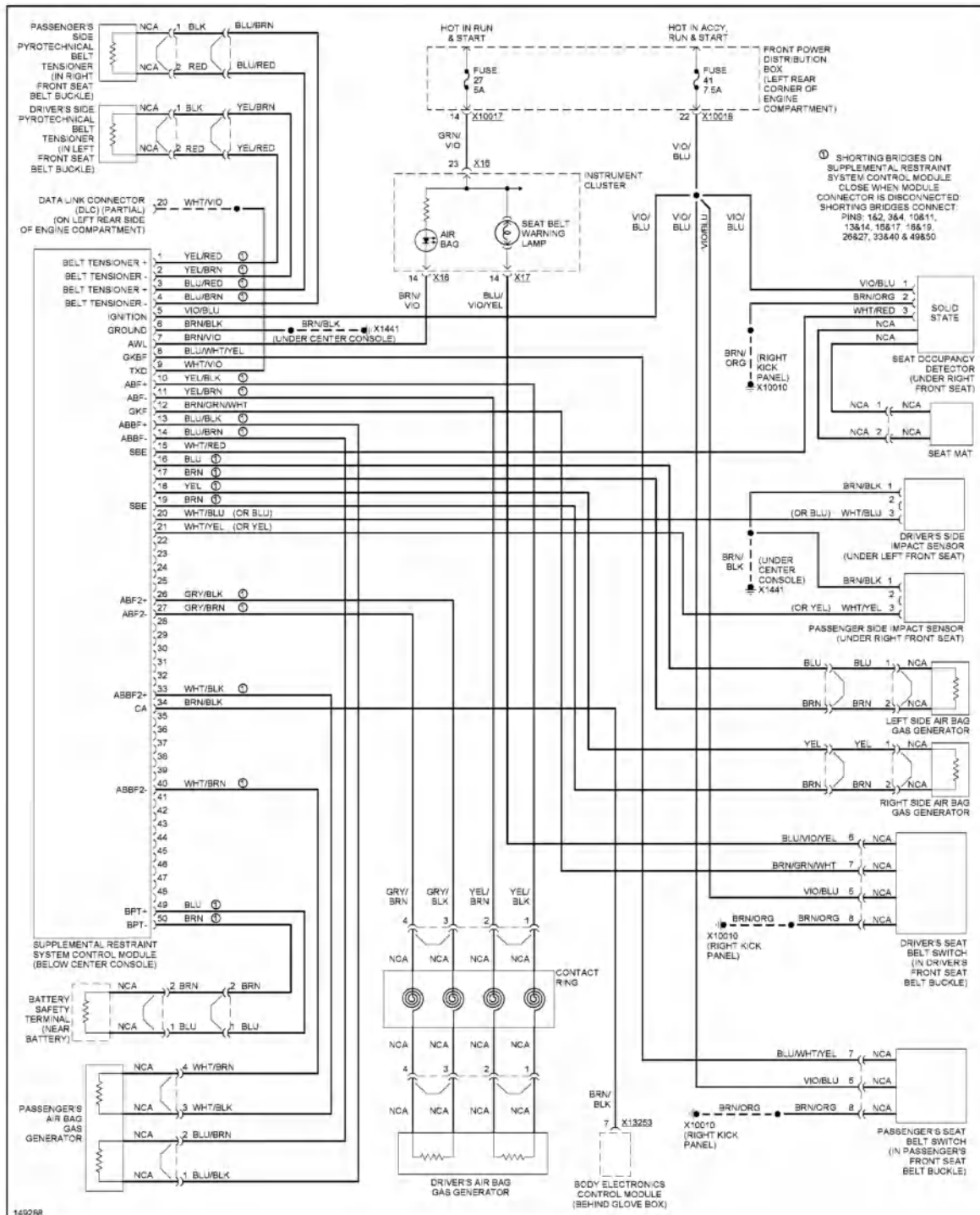
TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Seat belt pretensioner mounting bolt	35 (48)
Steering wheel	
Nut	59 (80)
Bolt	46 (63)
Passenger-side air bag retaining bolts or nuts	
3 Series, M coupe & roadster, M3	16 (22)
Z3	18 (24)
INCH Lbs. (N.m)	
Driver-side air bag module Torx screw	
Air Bag II	18 (2.0)
All Others	70 (8.0)
Head impact air bag	
A-pillar mounting bolt	97 (11.0)

Rear mounting bolt	97 (11.0)
Retainer screws	
Except 3 Series coupe	22 (2.5)
3 Series coupe	35 (4.0)
Head impact gas generator mounting nut	35 (4.0)
Air bag control unit mounting screws	78 (8.8)
Passenger-side air bag cover retaining strap screws	80 (9.0)
Side air bag module mounting screws	75 (8.5)

WIRING DIAGRAMS

NOTE: Wiring diagrams for all models except Z3 coupe and roadster are not available. See [Fig. 6](#).



2005 GENERAL INFORMATION

Passive Safety Systems - Overview - E36, E38, E39, E46, E52, E53

PASSIVE SAFETY SYSTEMS

INTRODUCTION

PASSIVE SAFETY is a multifaceted concept that deals with the protection of the driver and passengers of the vehicle and minimizing the damage to the vehicle once it is involved in a collision.

The foundation for the passive safety of the vehicle is the passenger cell which retains a stable shape when the vehicle is involved in an accident. This, coupled with the door anchoring system and crumple zones, serves to provide the best protection possible for the vehicle's occupants.

The use of the passenger restraint (three point seat belts) systems and airbags further enhance this safety cage concept providing the driver and passengers with additional protection during impacts or collisions.

BMW introduced the driver's side air bag in 1985 on the E23 7-Series. The E24 received the driver's side airbag in 1986. The Driver's airbag continued with the introduction of the E32 7-Series introduced in Model Year 1988.

The Driver's side airbag was made standard equipment on all models starting with the 1990 model year. The passenger's front airbag was added to the 7 and 8 Series vehicles beginning with model year 1993.

The Central "Airbag" system ZAE was introduced in model year 1994 on the 3, 5 and 8 Series vehicles. This system carried over to the E38 7 series with its introduction

The "Multiple Restraint System" MRS was introduced on the 1997 model year E39 and E38s as of 3/96 production. The MRS II followed beginning with 5/97 production E38s

Safety precautions when working with airbag circuits

- Work on the components of the airbag system must always be carried out with the battery disconnected. Disconnect and cover the negative terminal of the battery. Before disconnecting any airbag it is essential to wait the recommended time:
- 30 minutes for vehicles up to 9/93.
- 10 seconds for vehicles from 9/93.
- Components of the airbag system should only be checked when properly mounted and only using the measurement system of the DIS/MoDiC or a high quality, low impedance multi-meter.
- Always disconnect the negative terminal of the battery when performing any welding or body work on the vehicle.
- When removing airbags temporarily they should be stored in the trunk, face-up, with the trunk lid closed.
- Components of the airbag system that have been dropped from more than 18 inches should not be installed in the vehicle.
- Never treat airbag components or connectors with cleaning agents or conductive grease.
- Airbags must not be thrown into the trash, but must be properly disposed of according to local regulations for hazardous materials. Airbags returned to BMW must be shipped back in the original packaging of the replacement part.
- Always dis-arm mechanical seat belt tensioners before working on a seat or removing/installing the tensioners. Do not forget to re-arm when finished.
- Always follow safety precautions in the TIS repair article instructions.

MULTIPLE RESTRAINT SYSTEM III (MRS III)

Model: E36/7, E38, E39, E46, E52, E53

Production Date: E36/7: from 4/99

E38/E39: from 3/99 E46 sedan: from 9/99

All others from start of production.

Purpose of the System:

The MRS III is a passive safety system that is designed to provide the maximum amount of driver and occupant protection in the event that the vehicle is involved in a collision. The system is designed to activate only the necessary components for protection based on:

- The severity of the impact.
- The number and positioning of the passengers.
- The direction from which the impact occurs.

The protection is provided by inflated air bags and tubes as well as seat belt tensioning devices.

The Multiple Restraint System (MRS III) employs the use of "SMART" technology. Smart technology refers to the control module's programming which allows for the deployment of the airbags, in stages depending on the severity of the impact. Two stage airbags are used for both the driver and front passenger which allows for a softer cushioning effect when the bags are triggered at lighter impacts.

In addition to the front air bags, the MRS III incorporates the following restraint/safety devices:

- Front door side impact (thorax) air bags.
- Head protection air bags (ITS).
- Rear door side impact (thorax) air bags - optional.
- Front pyrotechnic seat belt tensioners.
- Battery safety terminal (BST).
- Fuel pump cut off message.

MRS III control modules are manufactured by either Bosch or Temic. While the functional operation of both modules are the same. The control modules are not interchangeable from a replacement standpoint.

MRS III I.P.O.

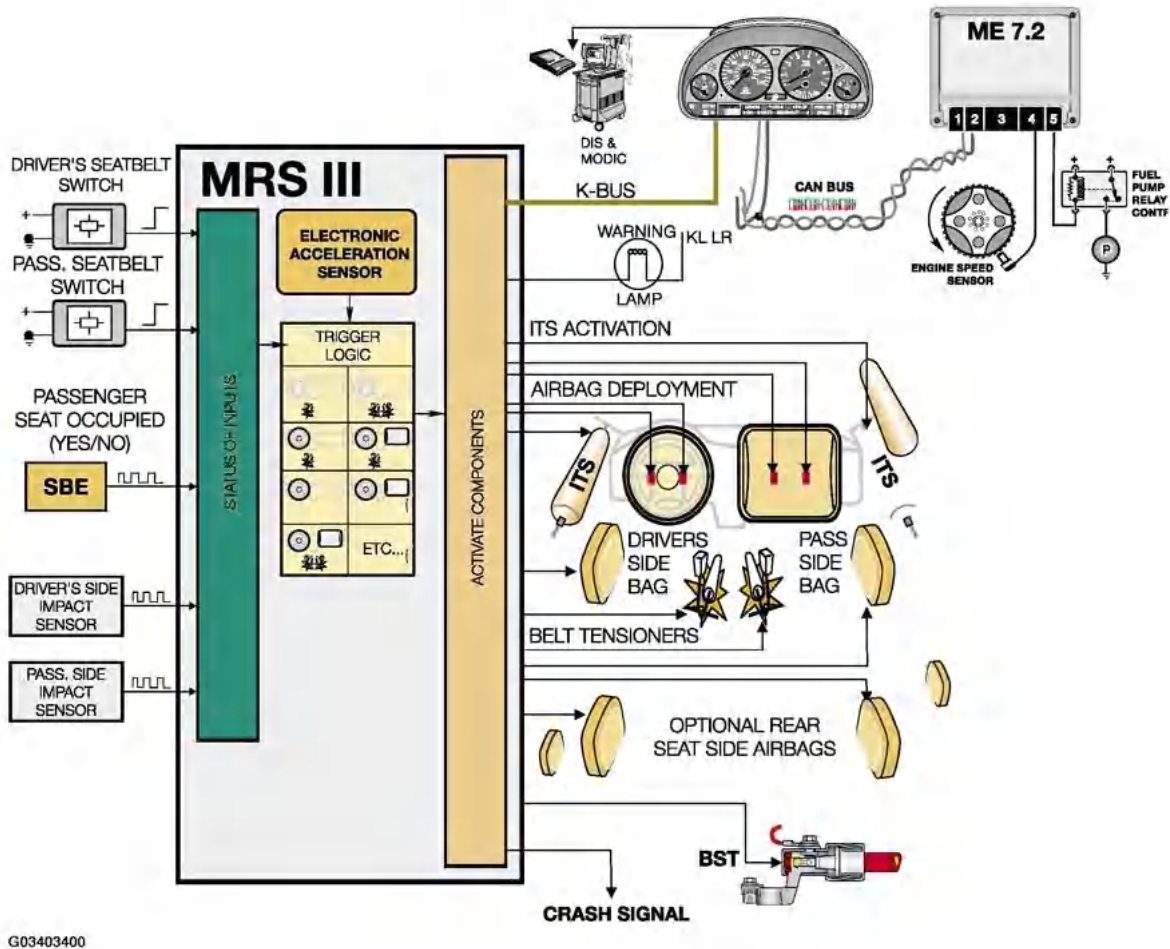


Fig. 1: Identifying MRS III I.P.O.

Courtesy of BMW OF NORTH AMERICA, INC.

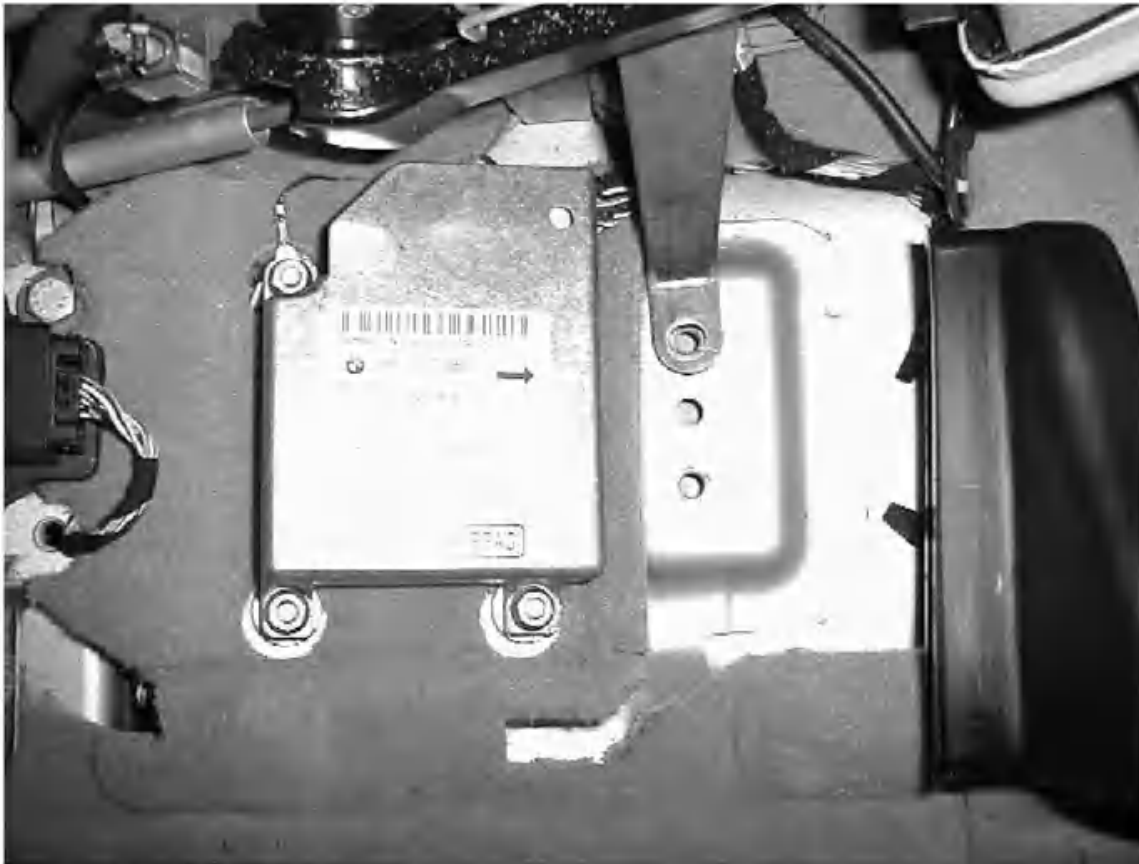
Components

MRS III Control module

The control module is mounted in the center of the vehicle on the driveshaft tunnel below the center console. The control module contains the processing electronics (Smart Technology) for triggering of all air bags and pyrotechnic devices installed in the vehicle. Two electronic deceleration sensors are installed in the module for crash or impact detection.

The system is recognized by the 50 pin connector on the control module. There are two manufacturers of MRS III systems: Bosch and Temic. Definitive verification of the installed system is carried out through the identification pages of the diagnostic testers.

The MRS III is connected to the K-bus (except Z3).



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[Fig. 2: Identifying MRS III Control Module](#)

Courtesy of BMW OF NORTH AMERICA, INC.

[Satellite Sensors](#)

The satellite sensors are mounted below the driver's and passenger's front seats on the vehicle floor pan. The function of the sensors is to detect the severity of side impacts and signal the MRS III control module, through a pulse modulated signal, in the event of a crash. The control module uses this input signal along with its internal impact sensor signal to determine the deployment of the side/head airbags.

The satellite sensors of the MRS III use only two wires over the previous three wire sensors of the MRS II. The signal is received by the MRS III control unit over the reference voltage supply wire.

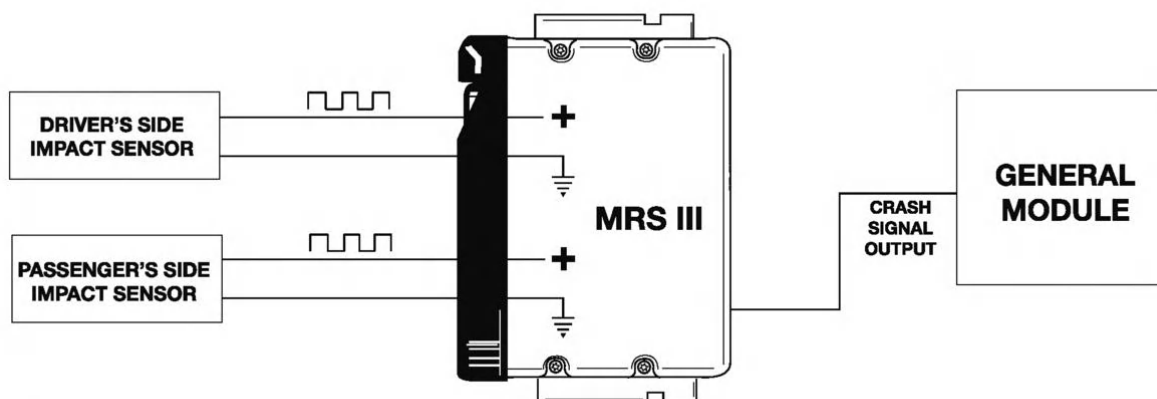
As with the control modules, the satellite sensors are manufacturer specific. The Temic sensors will not interchange with the Bosch sensors.



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[Fig. 3: Identifying Satellite Sensors](#)

Courtesy of BMW OF NORTH AMERICA, INC.



[Fig. 4: View Of MRS III Circuit Diagram](#)

Courtesy of BMW OF NORTH AMERICA, INC.

Driver's Front Air Bag

The driver's front airbag is a two stage bag similar to the passenger's front side bag, introduced on the 1999 model E38/E39s. The complete assembly is mounted beneath the cover in the center of the steering wheel as with previous airbags. The assembly contains the inert gas generator chamber and two ignition stages (ignitors).

The airbag consists of:

- Accumulator/gas generator.
- Two ignition capsules.
- Propellant gas - 13.5% Hydrogen/86.5% Oxygen.



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[Fig. 5: Identifying Driver'S Front Air Bag](#)

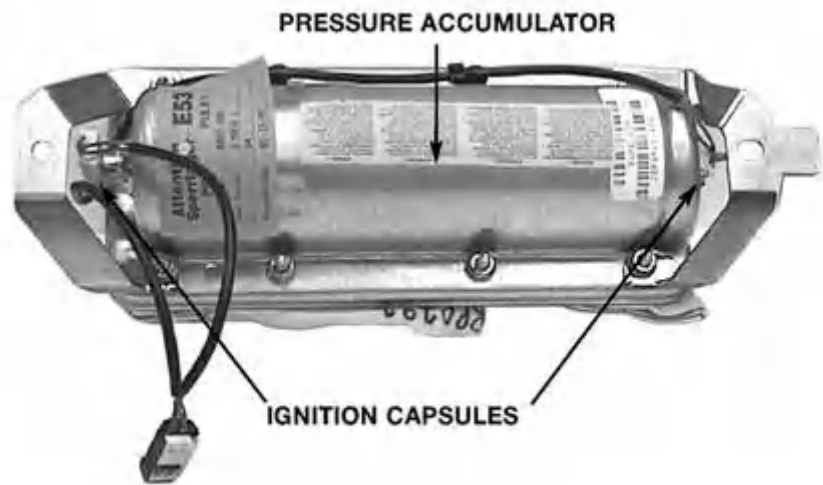
Courtesy of BMW OF NORTH AMERICA, INC.

Passenger's Front Air Bag

The passenger's front airbag is mounted in the dashboard above the glove box.

The airbag consists of:

- Pressure accumulator/gas generator.
- Two ignition capsules - for two stage activation.
- Propellant gas of - 13.5% hydrogen/86.5% oxygen.



G03403405

[Fig. 6: Identifying Passenger Front Air Bag](#)

Courtesy of BMW OF NORTH AMERICA, INC.

Side Air Bags Front And Rear (Thorax)

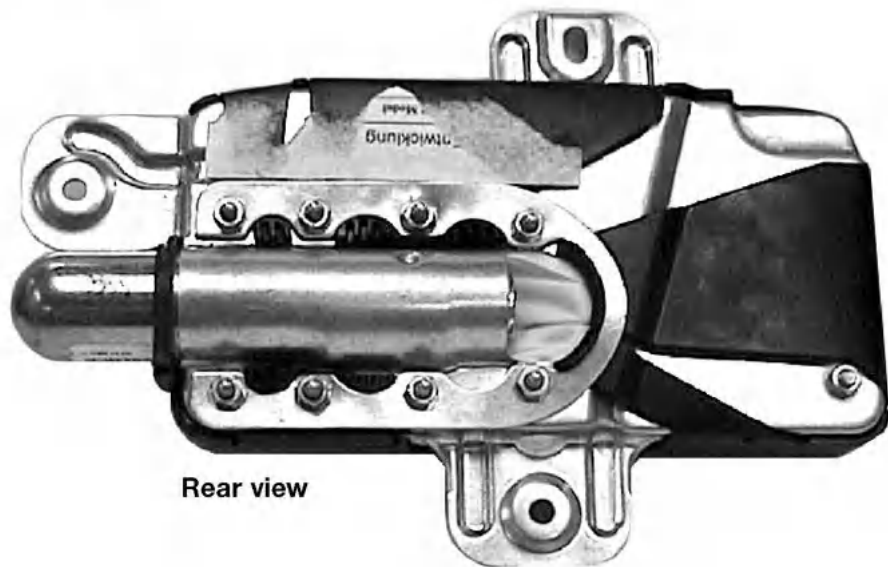
The side airbags are mounted on the inner door frame of the front and rear doors. Deployment of the side airbags is dependent on the triggering thresholds programmed in the MRS III control module and based on the inputs from the satellite sensors and internal crash sensors.

The side airbags use the same cold gas inflation method as the driver's and passenger's front bags.

Rear side airbags arrive de-activated from the factory and can only be enabled upon written customer request. This is designed to prevent a risk of injury to small children who may be sitting out of position and too close to an airbag in the back seat.



Front view



Rear view

G03403406

[Fig. 7: Identifying Side Air Bags \(Thorax\)](#)

Courtesy of BMW OF NORTH AMERICA, INC.

Front Head protection air bags (Inflatable Tubular Structure. ITS)

The head airbags are similar to the ITS bags used on the MRS II system. They are mounted from the "A" pillar up along the headliner and are anchored behind the "B" pillar. The ITS bags of the MRS III system are the cold gas inflation type. The head protection airbags are always triggered along with the front side (thorax) bags.



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[Fig. 8: Identifying Front Head Protection Air Bags \(1 Of 2\)](#)
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 9: Identifying Front Head Protection Air Bags (2 Of 2)

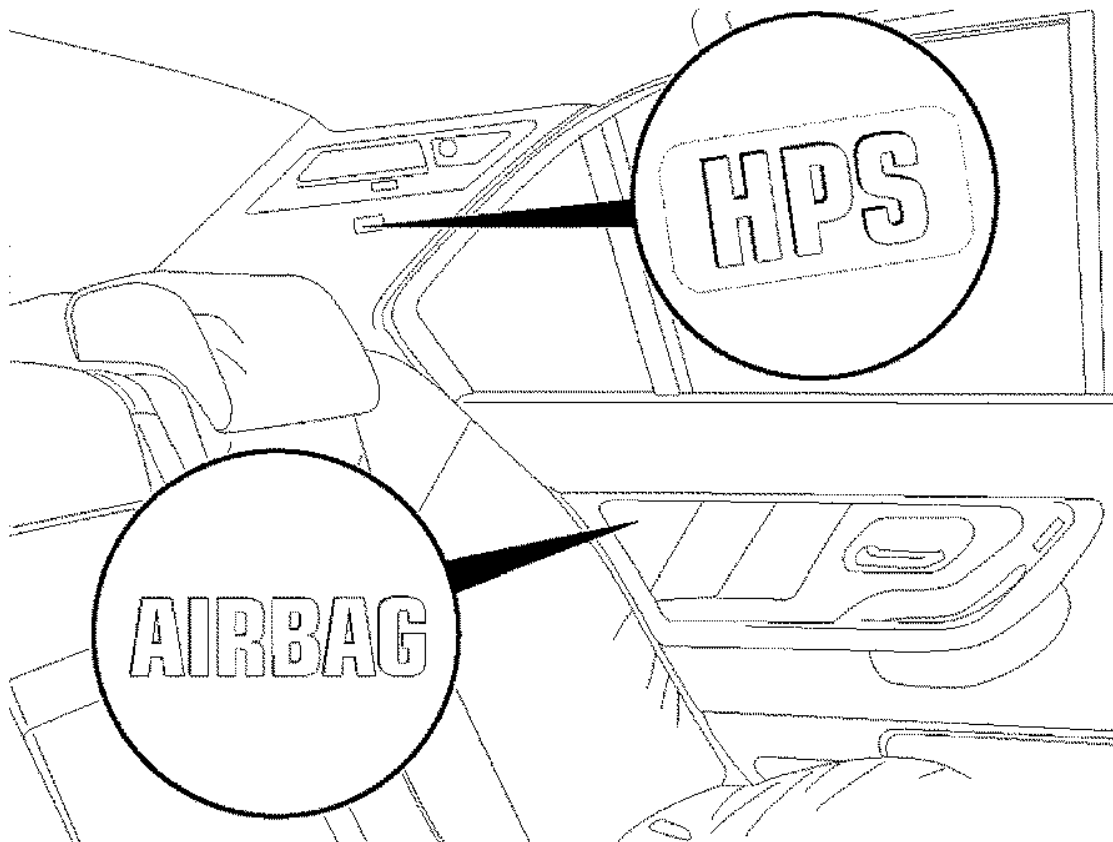
Courtesy of BMW OF NORTH AMERICA, INC.

E38 and E39 Rear Head Protection System

Rear Head protection is available on E38 and E39 sedans ordered with optional rear side airbags.

The airbags are a cushion (not an ITS) that is deployed from behind the C-pillar trim. The HPS will not be deactivated along with the side airbags from the factory since there is no danger to small children sitting out of position.

A vehicle with rear HPS can be identified by observing "HPS" embossed in the C-pillar cover.



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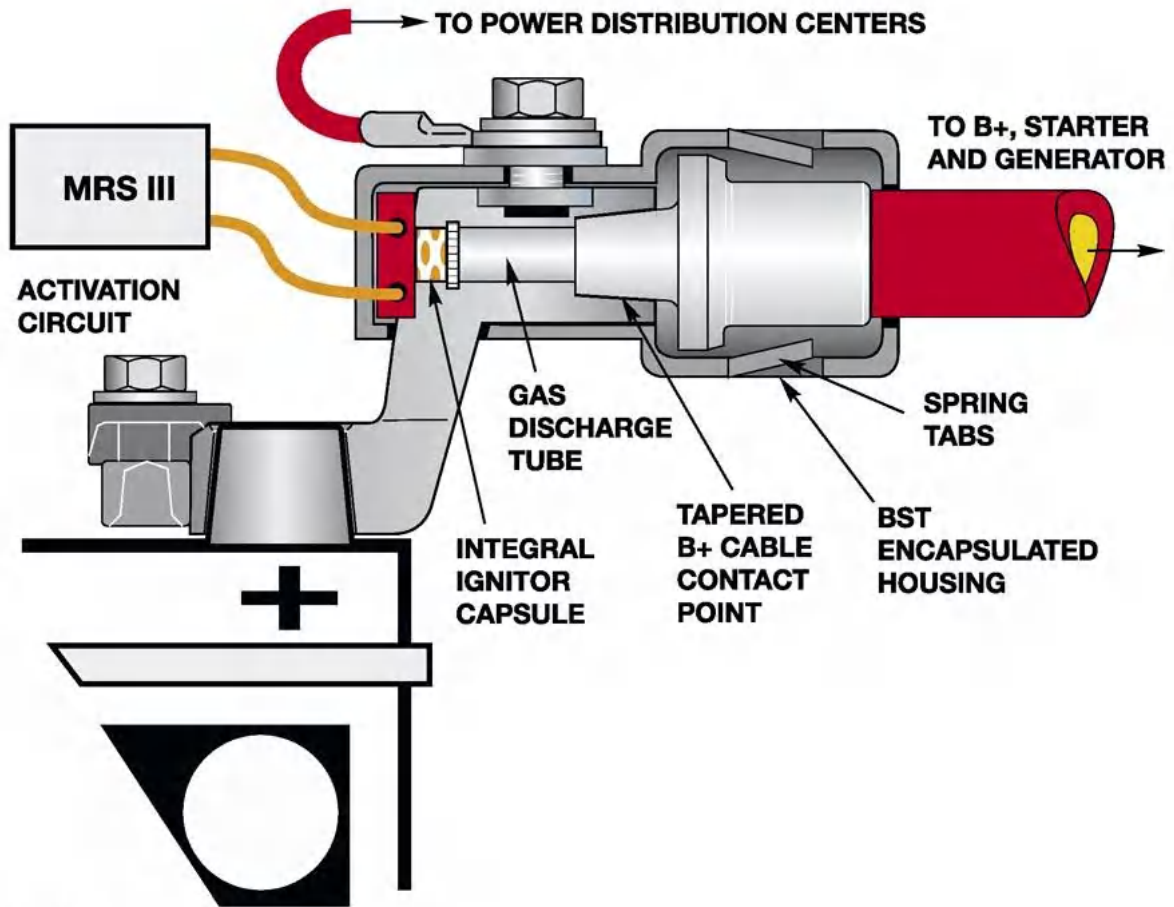
Fig. 10: Identifying E38 And E39 Rear Head Protection System

Courtesy of BMW OF NORTH AMERICA, INC.

Battery Safety Terminal (BST)

The BST is used to disconnect the battery connection to the starter, alternator and charging post in the event of a collision. This safety measure helps prevents the possibility of a short circuit in the engine compartment causing a fire.

The battery connection to the power distribution box and body electronics is un-affected.



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[Fig. 11: Identifying Battery Safety Terminal \(BST\)](#)
 Courtesy of BMW OF NORTH AMERICA, INC.

Seat Belt Tensioners

The seat belt tensioners also make use of the inert gas for triggering. The MRS III control module will deploy the seat belt tensioners based on the programmed parameters during a collision.



G03403411

[Fig. 12: Identifying Seat Belt Tensioners](#)

Courtesy of BMW OF NORTH AMERICA, INC.

[Seat Occupancy Sensor \(SBE\)](#)

The SBE is used as an input to the MRS III control module for detection of a passenger in the right front seat. The MRS III uses the input to determine seat belt tensioner and/or front airbag deployment thresholds.

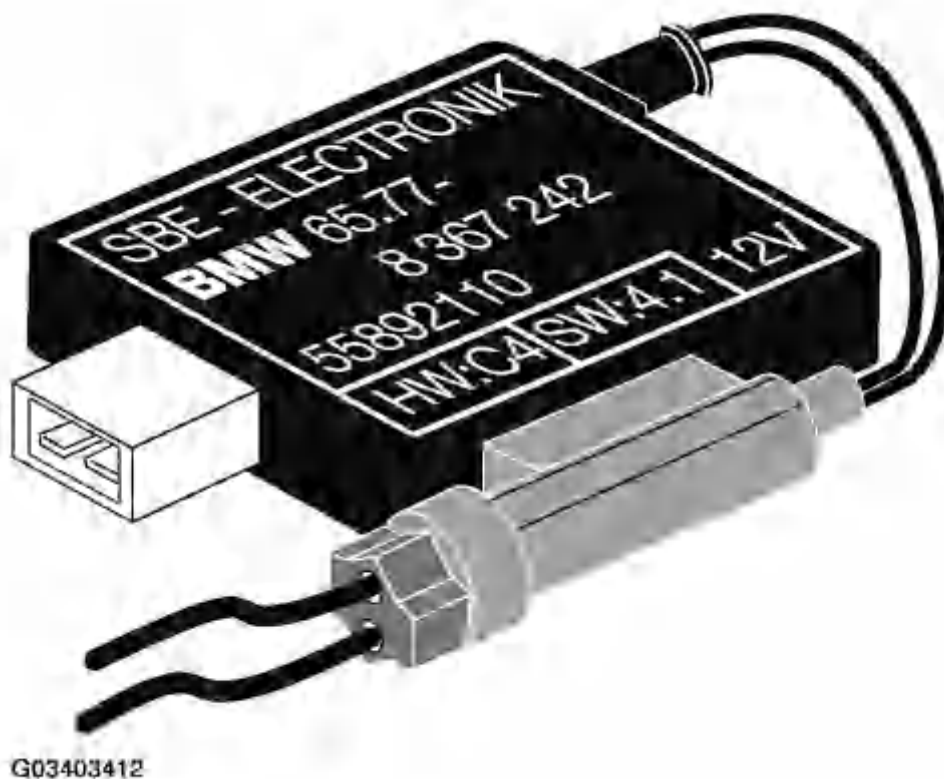


Fig. 13: Identifying Seat Occupancy Sensor (SBE)
 Courtesy of BMW OF NORTH AMERICA, INC.

MRS III Principle of Operation

As with previous MRS systems, the triggering thresholds are programmed in the MRS III control module. These thresholds are determined by BMW through crash and vehicle testing during the design and development of the vehicle. These thresholds will vary depending on the vehicle type.

There are several different thresholds for airbag and safety restraint deployment:

- Belt pre-tensioner threshold for activation of the seat belt tensioners.
- Airbag threshold #1 - the first level of activation for the two stage front airbags, always deployed first when the front triggering threshold is reached.
- Airbag threshold #2 - the second level of the two stage front airbags, can be deployed simultaneously or after a time delay, depending on the severity of the impact.
- Rear crash threshold - for activation of the seatbelt tensioners with a rear impact.
- Battery safety terminal threshold - for activation of the BST with airbag deployment.
- Side airbag/ITS threshold - for deployment of the side and thorax airbags.

Triggering Thresholds For The Two-Stage Front Air Bags

The programming of the MRS III includes four triggering thresholds for the two-stage front airbags. The triggering of the front airbags is also dependent on whether the seat belts are used and if the front passenger seat is detected as occupied. The triggering thresholds for the two stage airbags are as follows:

TRIGGERING THRESHHOLDS FOR 2 STAGE FRONT AIR BAGS

THRESHOLD	NO-SEATBELT	BELTED
1	Ignition Stage 1	No Activation
2	Ignition Stage 1 & 2 with Time	Ignition Stage 1

	Delay	
3	Ignition Stage 1 & 2 with Time Delay	Ignition Stage 1 & 2 with Time Delay
4	Ignition Stage 1 & 2 Simultaneously	Ignition Stage 1 & 2 Simultaneously

If the SBE is faulted when a triggering occurs, the MRS III will react as if the seat is occupied.

If the signal from the seat belt contacts are defective, the MRS III will deploy as if the belts were not buckled.

Triggering Thresholds For The Remaining Safety Devices

Side Airbags and Head Protection

The triggering thresholds for the side and head protection airbags is dependent on the signals from the satellite sensors and the crash sensors in the MRS III control module. The triggering thresholds are independent of the thresholds for the belt tensioners.

Seat Belt Tensioners

The triggering of the seat belt tensioners is dependent on the signal from the seat belt contact and the severity of the impact as detected by the control module.

Battery Safety Terminal

The BST will deploy in a frontal impact at threshold 2 or greater. The threshold for BST activation with a side impact is programmed separately in the side deployment criteria. The BST will also be deployed if a rear impact threshold is exceeded.

Fuel Pump Shut-Off Request

The MRS III system is linked via the K-Bus/CAN Bus to the DME for deactivation of the fuel pump. The MRS III will signal the DME via the K-Bus through the instrument cluster and CAN Bus to shut off the fuel pump in the event that any crash threshold is exceeded.

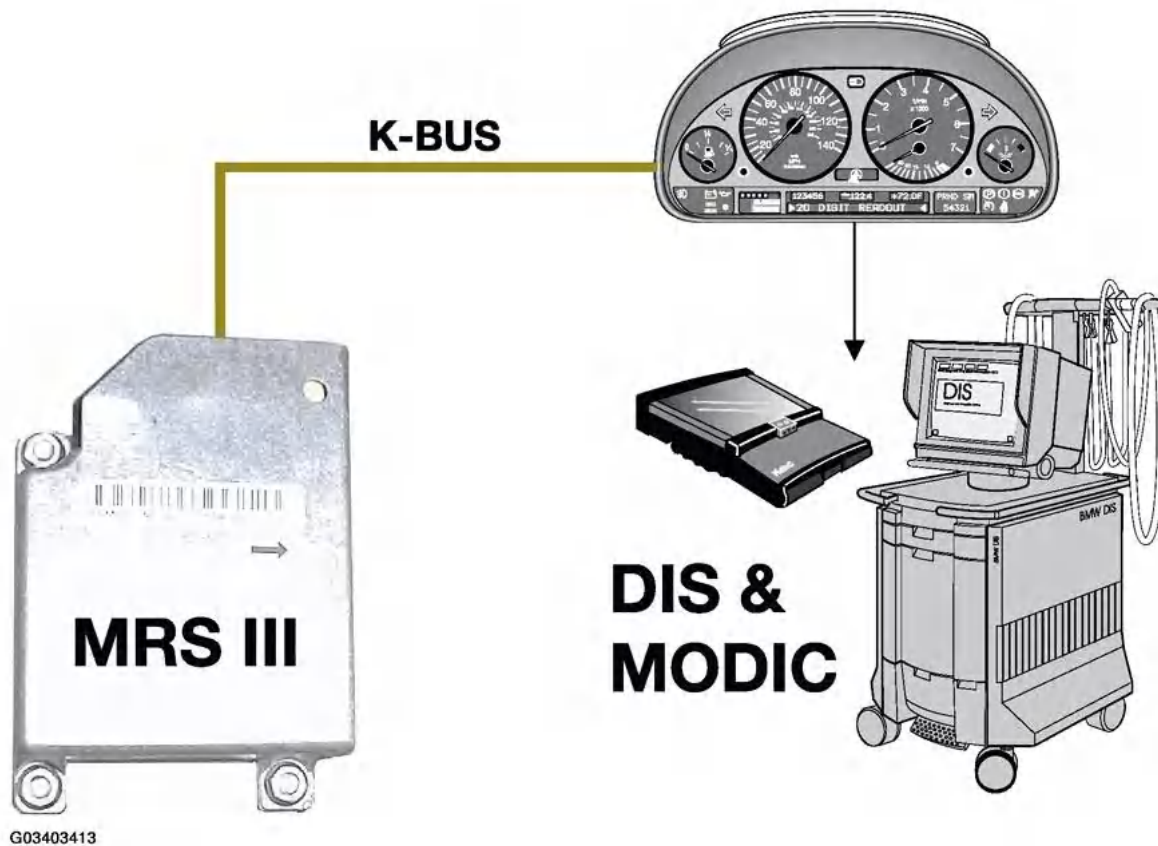
Diagnosis

Diagnosis and troubleshooting of the MRS III system is fault driven and can be accessed using the DIS Tester or MoDiC. The control module performs a self test of the system every time the ignition is switched on (this includes the satellite sensors and seat occupancy sensor). Any faults with the system will cause the warning lamp in the instrument cluster to remain illuminated after the engine is started.

Installation of a new or replacement control module requires ZCS coding also using the DIS or MoDiC.

When servicing or replacing any MRS III components, always follow precautionary measures outlined in the appropriate repair articles. this includes disconnecting the battery prior to any repair or maintenance work being performed.

All airbag components are part number specific by model and require verification in the EPC to ensure the correct component is being installed.



[Fig. 14: Identifying Airbag Components And DIS Tester](#)
 Courtesy of BMW OF NORTH AMERICA, INC.

MULTIPLE RESTRAINT SYSTEM (MRS & MRS II)

Model: E36, E36/7, E38, E39, E46

Production Date: MRS:

E36: from 1/97 to production end

E36/7: from 9/97 to 8/98

E38: from 9/96 to 4/97

E39: from 9/96 to 8/97

MRS II:

E36/7: from 9/98 to 3/99,

E38: from 5/97 to 2/99,

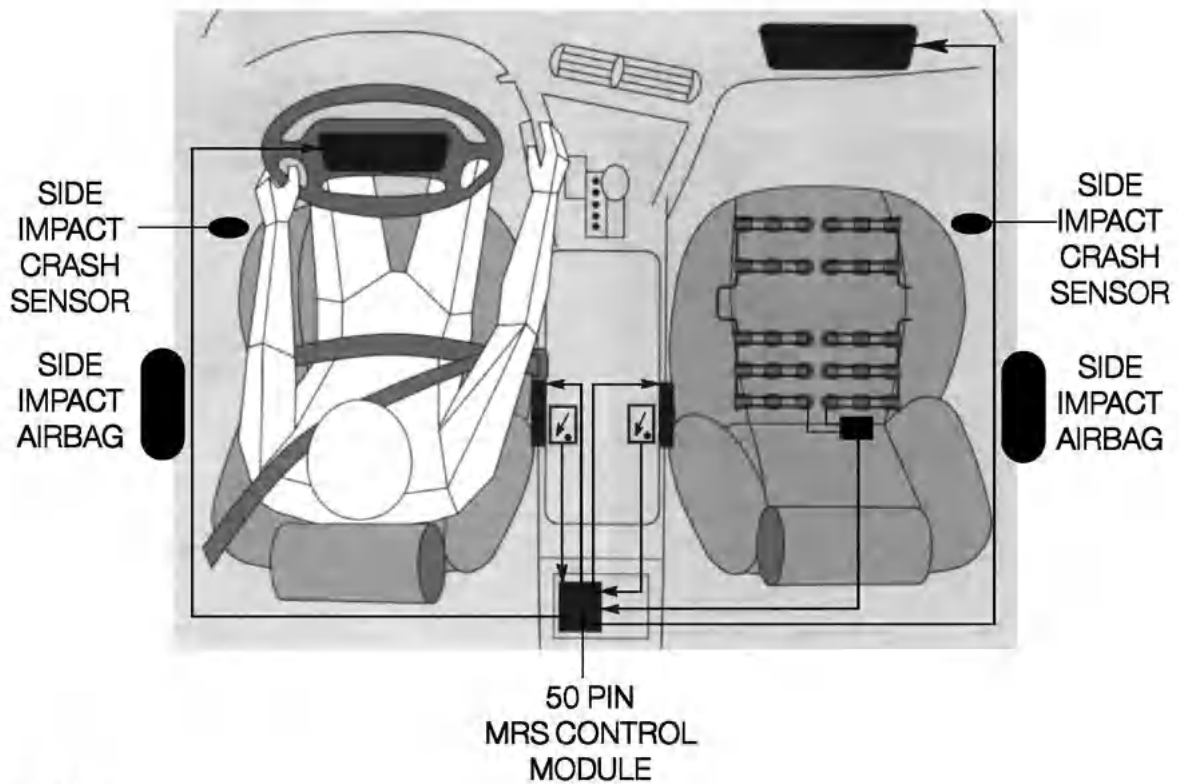
E39: from 9/97 to 3/99,

E46 sedan: from start of production to 8/99.

Overview

The MRS was introduced for the 1996 - E38 and 1997 model year E39. The MRS II was introduced on E38s (5/97 production) and the E39 from start of production (9/97). The MRS and MRS II include the following restraint/safety components:

- Driver and passenger front airbags (MRS/MRS II).
- Side impact (Thorax) airbags for the driver and front passenger (MRS/MRS II).
- Side impact crash sensors left/right (MRS/MRS II).
- Side impact (Thorax) airbags for the rear passengers (MRS II).
- Head Protection System (HPS) for the driver and front passenger (MRS II).
- Battery Safety Terminal - BST (MRS II).
- Hall Sensor seat belt switches (MRS II).



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[Fig. 15: Identifying Driver And Passenger Front Airbags \(MRS/MRS II\)](#)

Courtesy of BMW OF NORTH AMERICA, INC.

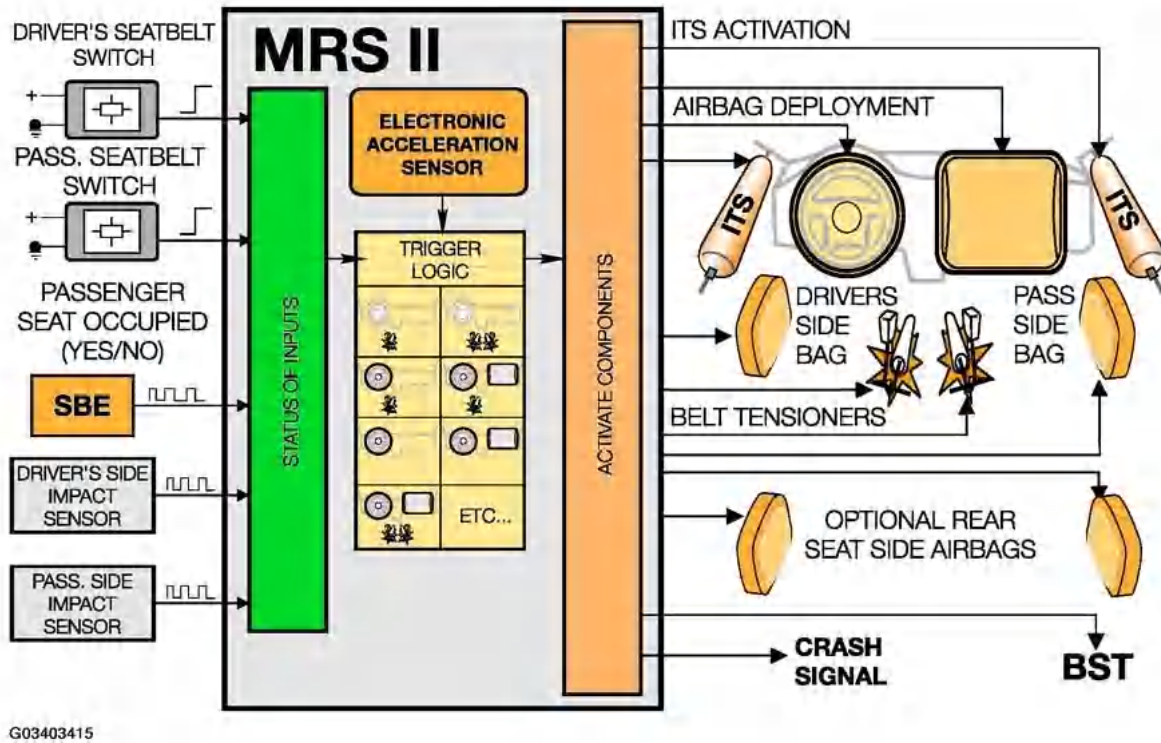
Components

CONTROL MODULE

The control module is located along the center line of the vehicle, generally in the area of the center console depending on model and year. It contains the following circuitry:

- Electronic acceleration sensor for crash detection.
- Processing electronics/final stages for airbag activation.
- Self diagnostics for self test and system monitoring.
- Internal mechanical safety switch - must close in conjunction with acceleration sensor before airbag activation.

Replacement control modules must be coded when installed in the vehicle using the DIS tester or MoDiC.



[Fig. 16: View Of MRS II Control Module](#)
 Courtesy of BMW OF NORTH AMERICA, INC.

FRONT PASSENGER AIR BAG ASSEMBLY

The front airbag is designed to protect the head and upper part of the body in the event of a frontal impact. The assemblies consist of a gas generator, ignition pill and the folded airbag.

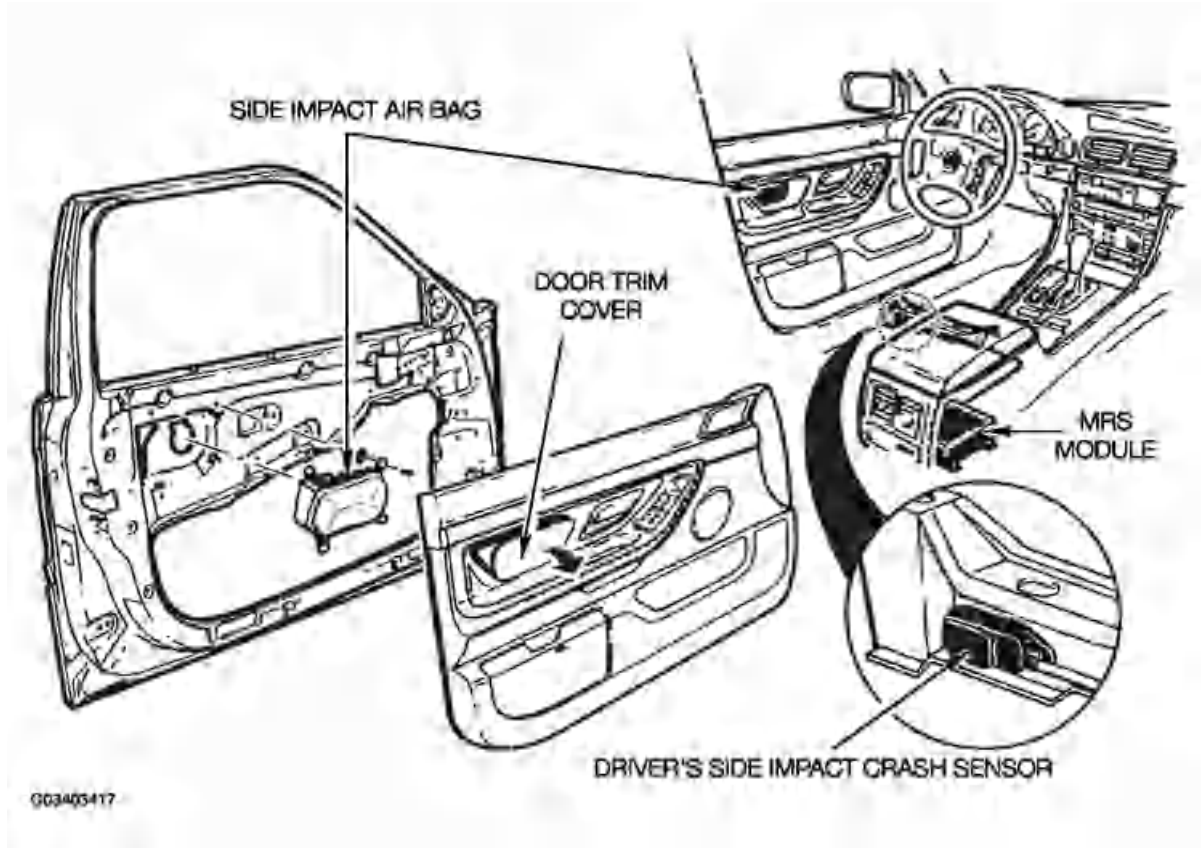


[Fig. 17: Identifying Front Passenger Air Bag Assembly](#)
 Courtesy of BMW OF NORTH AMERICA, INC.

SIDE AIR BAG ASSEMBLY (FRONT/REAR)

The side airbag is designed to protect the upper part of the body (chest/thorax) in the event of a side impact.

The assembly consists of a gas generator, ignition pill and folded airbag. The assembly is bolted to the inner door panel and the trim cover incorporates a break away airbag cover.



[Fig. 18: Locating Side Air Bag Assembly \(Front/Rear\)](#)

Courtesy of BMW OF NORTH AMERICA, INC.

2-STAGE PASSENGER AIRBAG

The E38 and E39 received the 2-stage airbag system as of 9/98 production..

The passenger's airbag is the only modification to the system. The remainder of the MRS II systems are carried over from the 1998 models. The system was modified as follows:

- New pressure accumulator generator.
- New airbag - volume of 105 liters.
- Two ignition capsules - for two stage activation.
- Propellant gas made from 13.5% hydrogen and 86.5% oxygen.
- Deployed units can be disposed of as scrap metal.

The use of two ignition stages, coupled with the lower volume and new propellant, optimizes the deployment of the airbag and makes it less aggressive when the airbag inflates.



[Fig. 19: Identifying 2-Stage Passenger Airbag](#)

Courtesy of BMW OF NORTH AMERICA, INC.

The main component is the gas generator which mounts below the airbag on the passenger's side of the dashboard. The gas generator consists of a pressure chamber with an ignition set at each end. A hose connects the airbag with the pressure chamber.

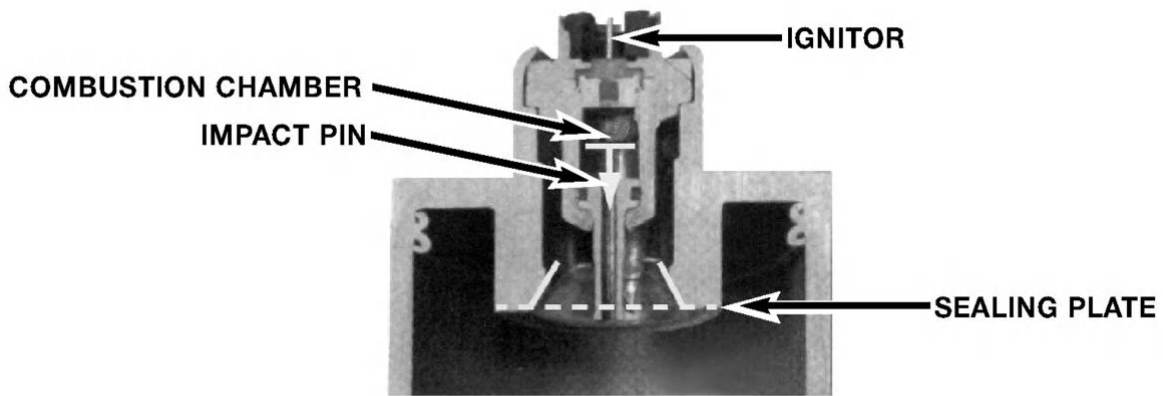
PRESSURE CHAMBER

The propellant charge in the chamber is a mixture of approximately 13.5% Hydrogen and 86.5% Oxygen under pressure.

IGNITION STAGE ONE

The main ignition capsule consists of the ignitor, combustion chamber, the impact pin and the sealing plate.

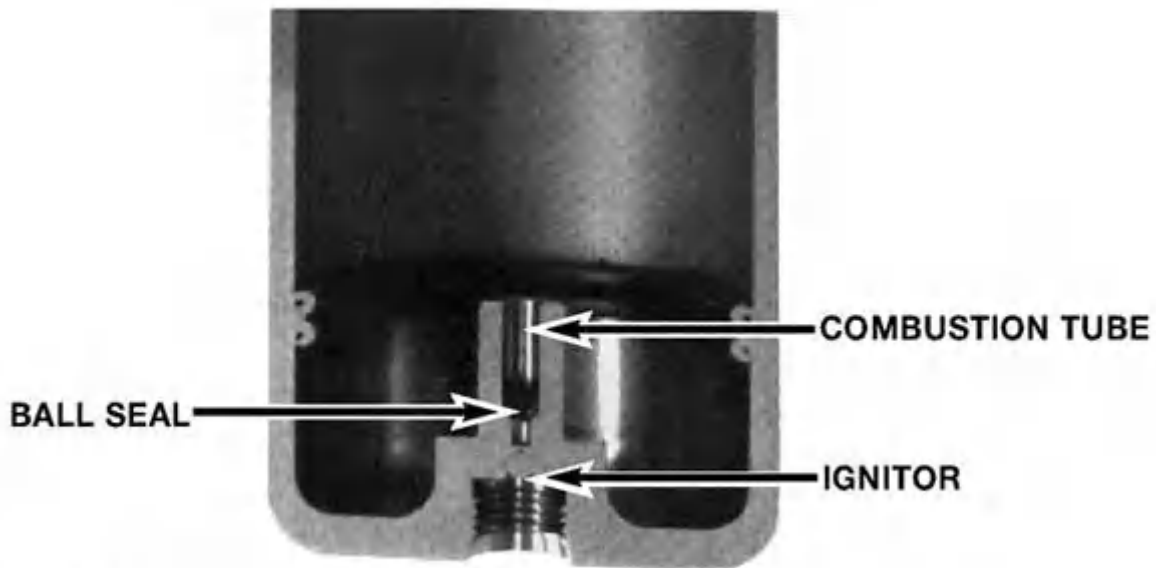
IGNITION STAGE TWO



G03403419

[Fig. 20: Identifying Pressure Chamber](#)
 Courtesy of BMW OF NORTH AMERICA, INC.

The second ignition capsule consists of an ignitor, ball seal and combustion tube.



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[Fig. 21: Identifying Second Ignition Capsule Consists](#)
 Courtesy of BMW OF NORTH AMERICA, INC.

AIRBAG ACTIVATION

Ignition stage one is always the first to be ignited during an impact. Ignition stage two is ignited after a time threshold that is programmed in the MRS II control module. The two stage activation is optimized by the airbag's inflation curve for each model.

When the ignition capsule is ignited, the impact pin is pushed against the sealing plate and the passageway for inflating the airbag is opened. The flame from the ignition capsule ignites the propellant gas and the expanding gas is forced through the tube into the airbag.

After the timed threshold, the second stage is ignited and the ball seal is forced off of its seat. The flame from the second stage ignites the propellant on the opposite side of the pressure chamber and causes further expansion of the gasses. This ensures that the required volume of gas is produced by the pressure chamber to

fully inflate the airbag.

After inflation, the gasses (steam) are allowed to escape from the airbag as with previous generations. The escaping gasses are not harmful to the passengers of the vehicle.



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[Fig. 22: Identifying Airbag Ignition Capsule](#)

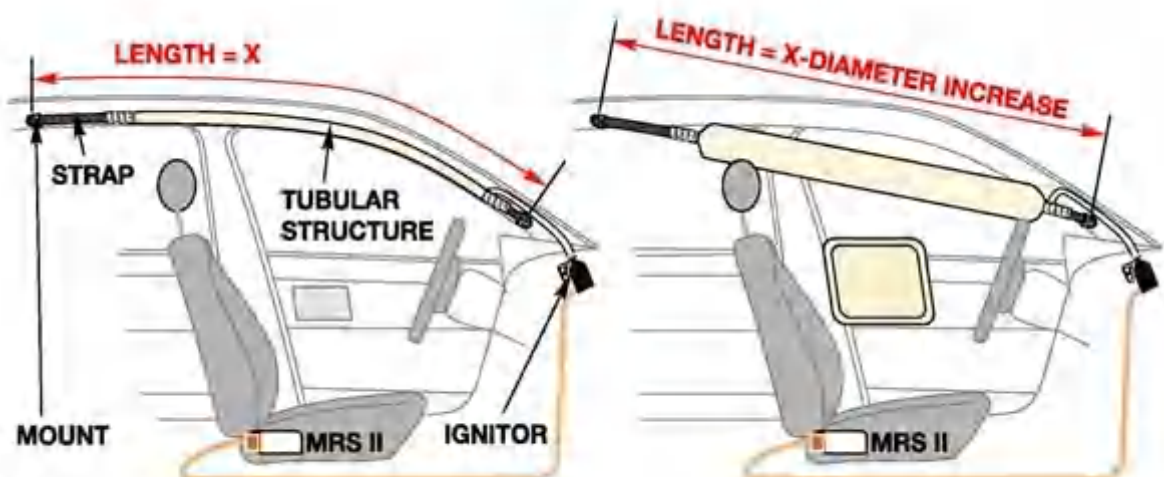
Courtesy of BMW OF NORTH AMERICA, INC.

HEAD AIRBAG ASSEMBLY (ITS)

The ITS is designed to protect the head in the event of a side impact. The assembly consists of a hermetically sealed rubber tube that is encased by a cross woven tubular nylon material, a gas generator and ignition pill.

The ITS is mounted from the "A" pillar, at the front, to the roof panel slightly behind the "B" pillar. The ignitor is mounted to the "A" pillar and is connected to the ITS through a reinforced sealed tube. The ITS is stored behind the roof panel trim over the front doors.

When triggered, the inflation charge causes the diameter of the tube to expand and its length to shorten. As the tube expands, it is forced out of the stored position and it drops over the side door glass to protect the occupants head against impact. The ITS remains fully inflated for several seconds after it is triggered due to the sealed expansion tube. This allows the ITS to continue to provide protection in the event of a secondary impact. The tube will deflate after the gas cools.



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[Fig. 23: Identifying Head Airbag Assembly \(ITS\)](#)

Courtesy of BMW OF NORTH AMERICA, INC.

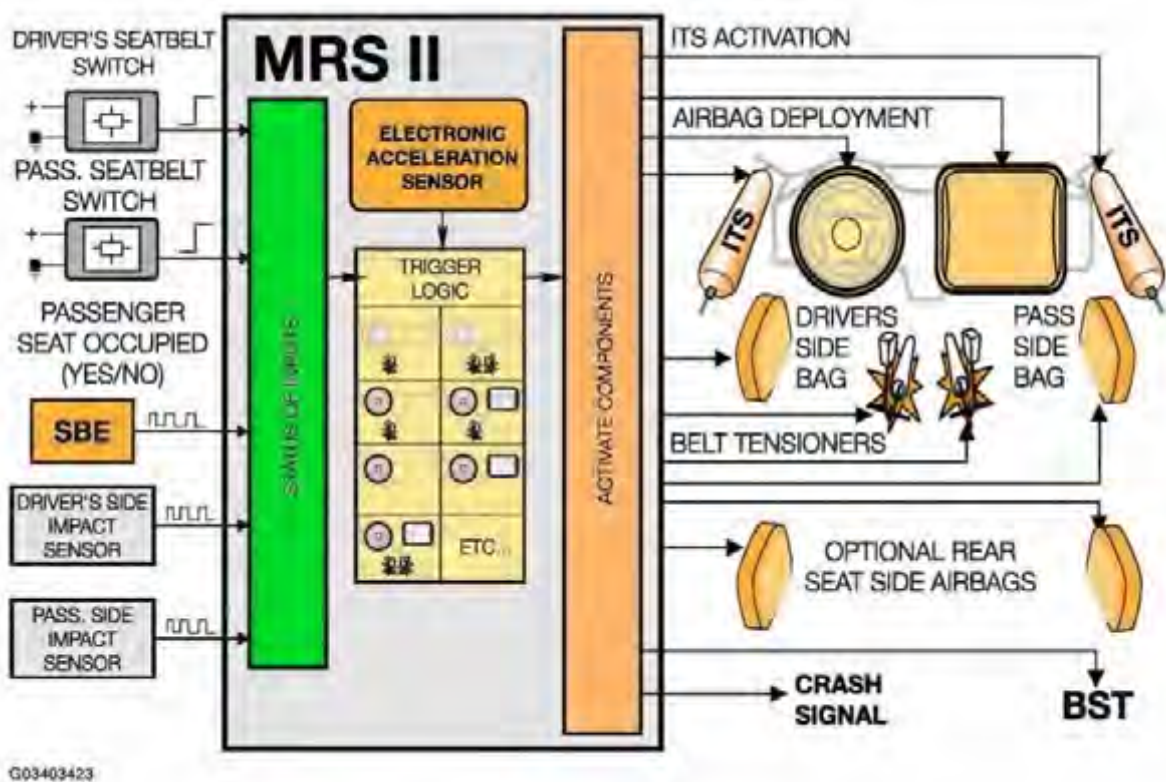
The expandable tube of the ITS is the same for all models. However the securing strap at the "B" pillar end is a different length for the different models. For this reason, the ITS is part number specific for each model and cannot be interchanged.

BATTERY SAFETY TERMINAL (BST)

The BST is designed to disconnect the battery from the starter, generator and B+ terminal in the engine compartment during collisions. This passive safety component is designed to reduce the possibility of short circuits to ground occurring from these high amperage circuits.

However, other systems that require power to function during and after a crash continue to receive power from the positive battery post. These circuits include:

- ABS - provides continued operation if the vehicle is still in motion.
- MRS II - remains operational for crash protection.
- General Module - for unlocking the vehicle and interior light activation.
- Lamp/Check module - for hazard warning light activation.
- Telephone - provides communication after the crash.
- Board Monitor - with navigation system for communication with Cross Country Group for assistance.



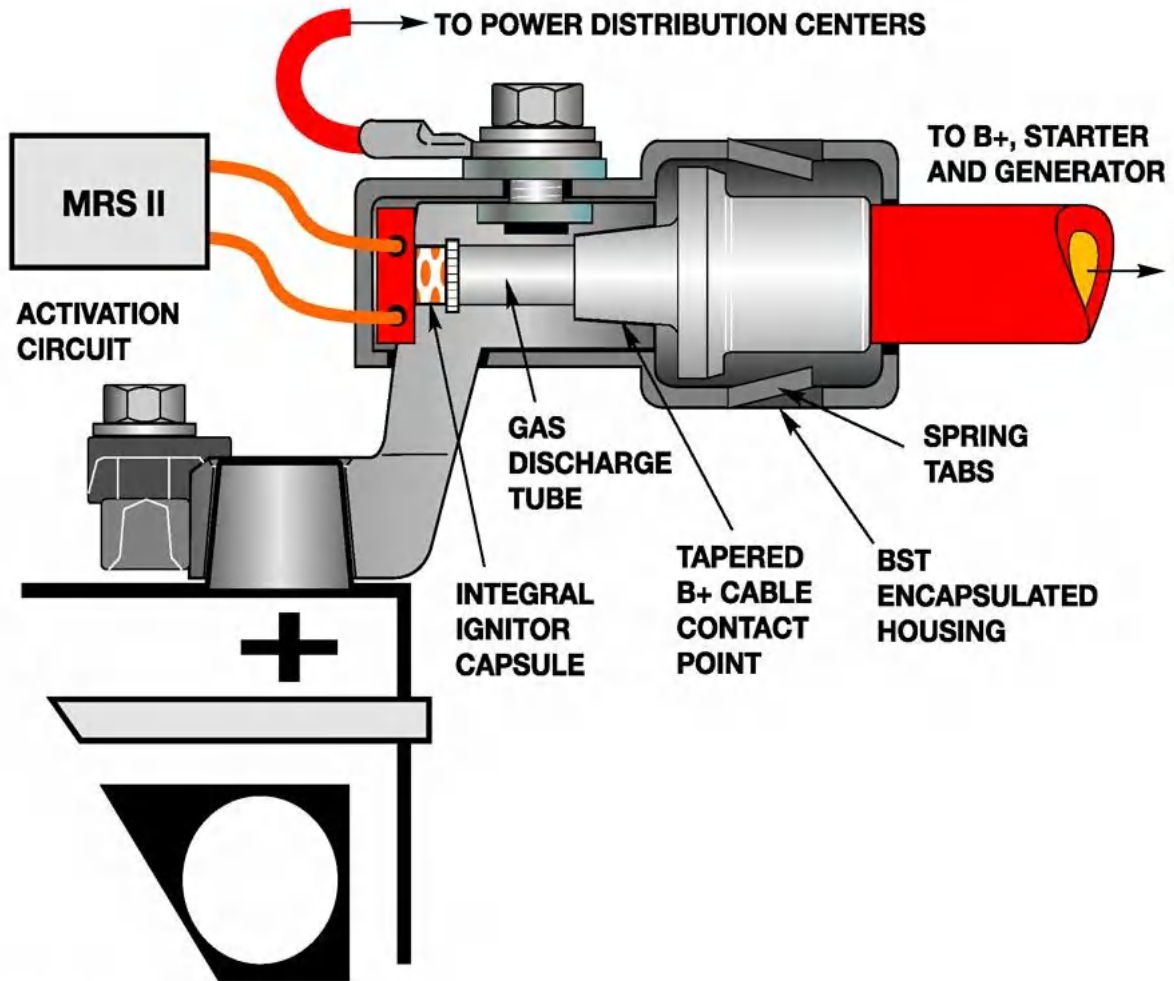
[Fig. 24: Identifying Battery Safety Terminal \(BST\)](#)

Courtesy of BMW OF NORTH AMERICA, INC.

BST CONSTRUCTION

The BST is an encapsulated pyrotechnic device that is similar to an airbag in operation. The BST contains an ignitor capsule and discharge tube that is mounted in front of the high amperage B+ cable. The B+ cable contains a tapered press fit contact that mounts behind the gas discharge tube.

During activation, the tapered B+ cable contact is forced away from the battery post and held away by spring tabs within the capsule.

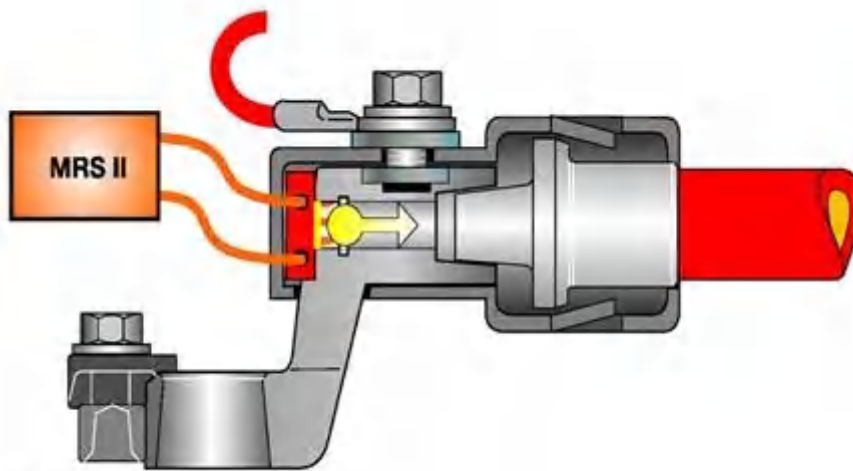


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[Fig. 25: Identifying BST Construction](#)
 Courtesy of BMW OF NORTH AMERICA, INC.

BST ACTIVATION

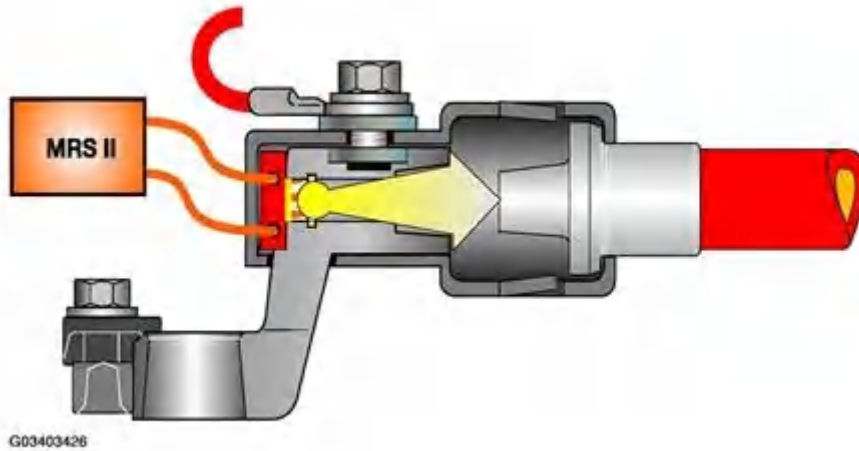
Once activated, the ignitor generates a gas charge which is directed down the internal discharge tube



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[Fig. 26: Identifying BST Activation \(1 Of 3\)](#)
 Courtesy of BMW OF NORTH AMERICA, INC.

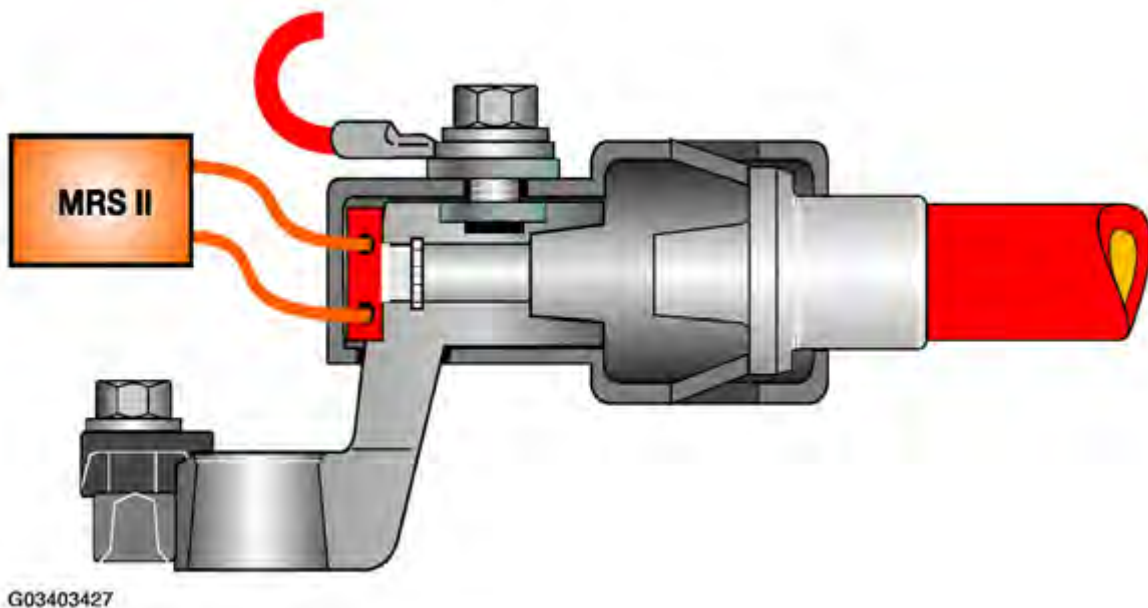
This causes the tapered end of the B+ cable contact to dislodge from its seated position and immediately open the circuit.



[Fig. 27: Identifying BST Activation \(2 Of 3\)](#)

Courtesy of BMW OF NORTH AMERICA, INC.

The force of the charge continues to push the cable contact away from its seated contact. The spring tabs of the housing are compressed as the contact pushes to the end of its travel.



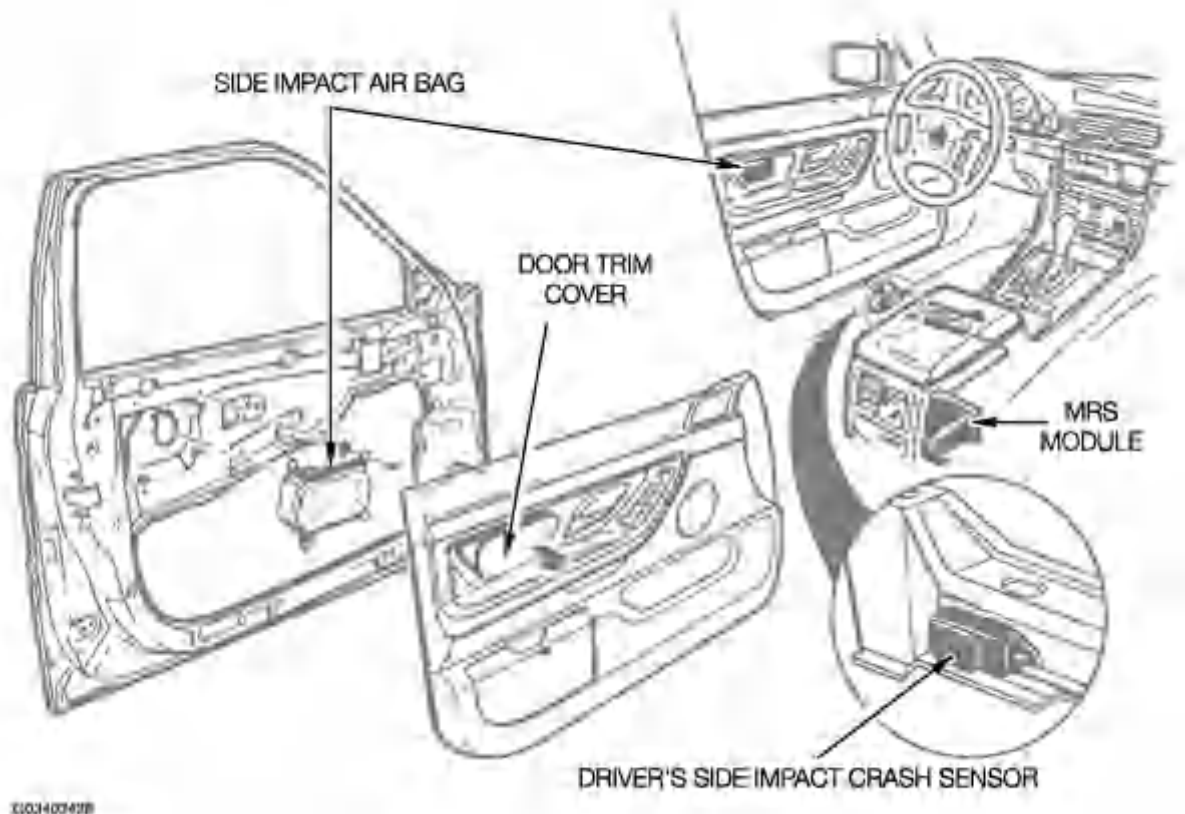
[Fig. 28: Identifying BST Activation \(3 Of 3\)](#)

Courtesy of BMW OF NORTH AMERICA, INC.

When the contact hits the end stop of the housing, it bounces back against the return spring which prevent it from closing the contact with the battery.

SIDE IMPACT SENSORS

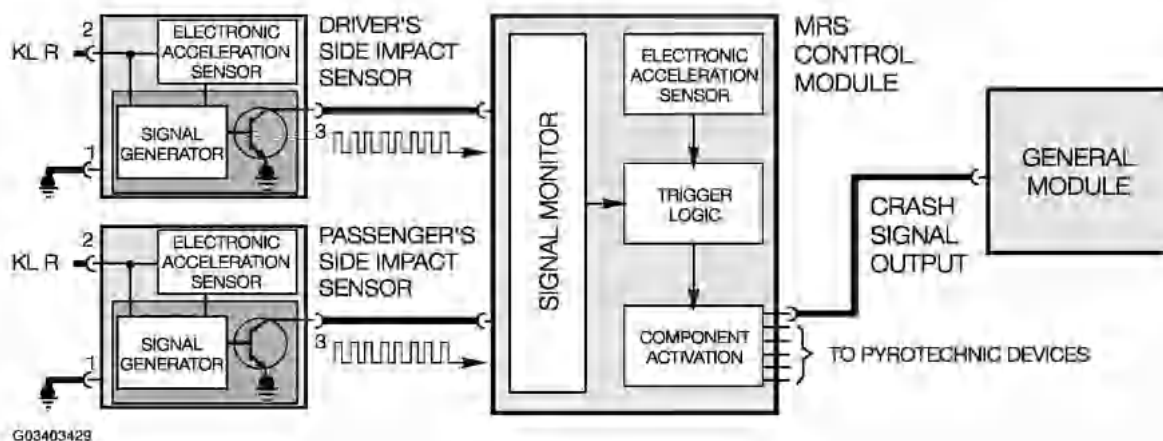
Electronic (piezoelectric) sensors are used for side impact detection. They are mounted at the left and right footwell cross members in front of the driver's and passenger's front seats. The sensors produce a pulse width modulated input signal to the MRS control module for side impact detection. The pulse width of the signal decreases in proportion to the severity of the impact.



[Fig. 29: Identifying Side Impact Sensors](#)

Courtesy of BMW OF NORTH AMERICA, INC.

The control module uses the internal crash sensor as a plausibility check for deployment of the side impact and ITS airbags. Both sensors must detect that the trigger threshold has been exceeded before the bags will deploy.



[Fig. 30: Identifying Internal Crash Sensor Circuit Diagram](#)

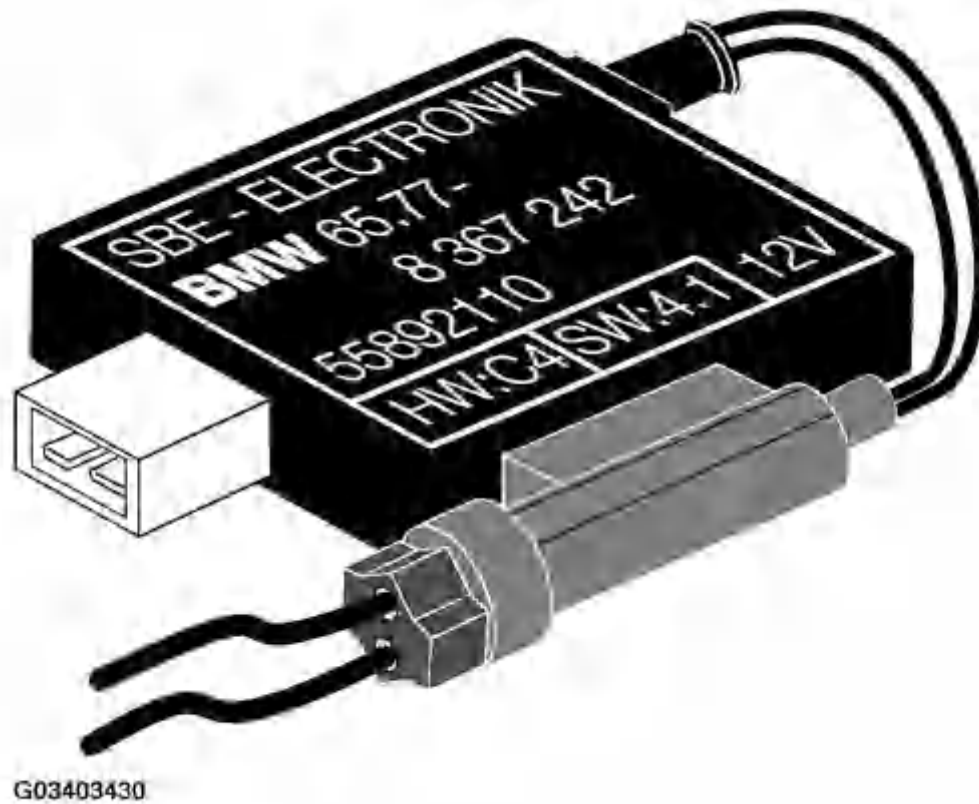
Courtesy of BMW OF NORTH AMERICA, INC.

SEAT OCCUPANCY SENSOR (SBE)

An occupancy sensor pad is incorporated into the front passenger's seat cushion. The pad is a foil contact sensor that is open when the seat is not occupied. When the seat cushion is pressed by the weight of a passenger, the sensor circuit produces a resistance that varies with the weight and/or movement.

This variable resistance signal is input to the Seat Occupancy Module (SBE). The SBE is a small signal converter module, mounted under the passenger's seat. It converts the analog signal, from the seat pad into a square wave modulated output signal that is sent to the MRS control module. The MRS control module uses

this signal for air bag triggering in the event of a collision.



[Fig. 31: View Of Seat Occupancy Sensor \(SBE\)](#)

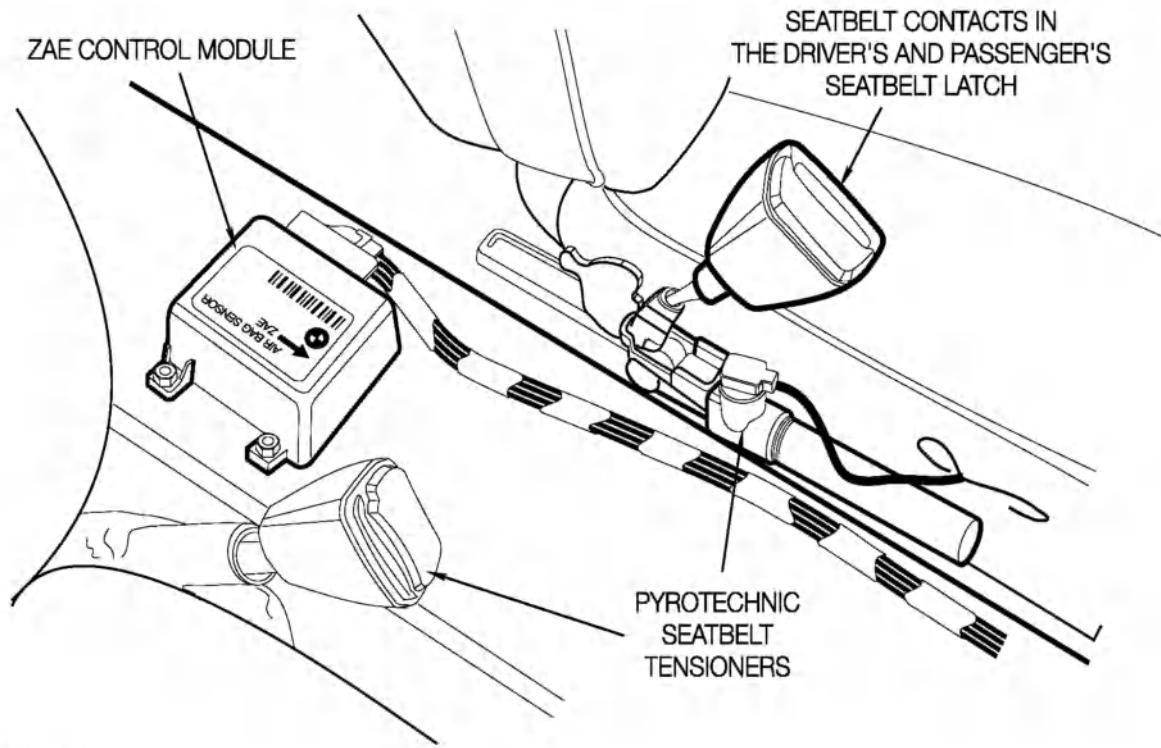
Courtesy of BMW OF NORTH AMERICA, INC.

SEAT BELT TENSIONERS

Pyrotechnic seat belt tensioners are used as a method of reducing the spooling effect of the seat belts during a collision.

The seat belt latch is connected to the pyrotechnic device through a cable. The control module is responsible for triggering the belt tensioner based on its programmed parameters.

The pyrotechnic device is similar to an airbag assembly in that when the control module triggers the belt tensioner, a small gas charge is ignited in the tensioner assembly and the pressure forces the cable to pull the latch tight.



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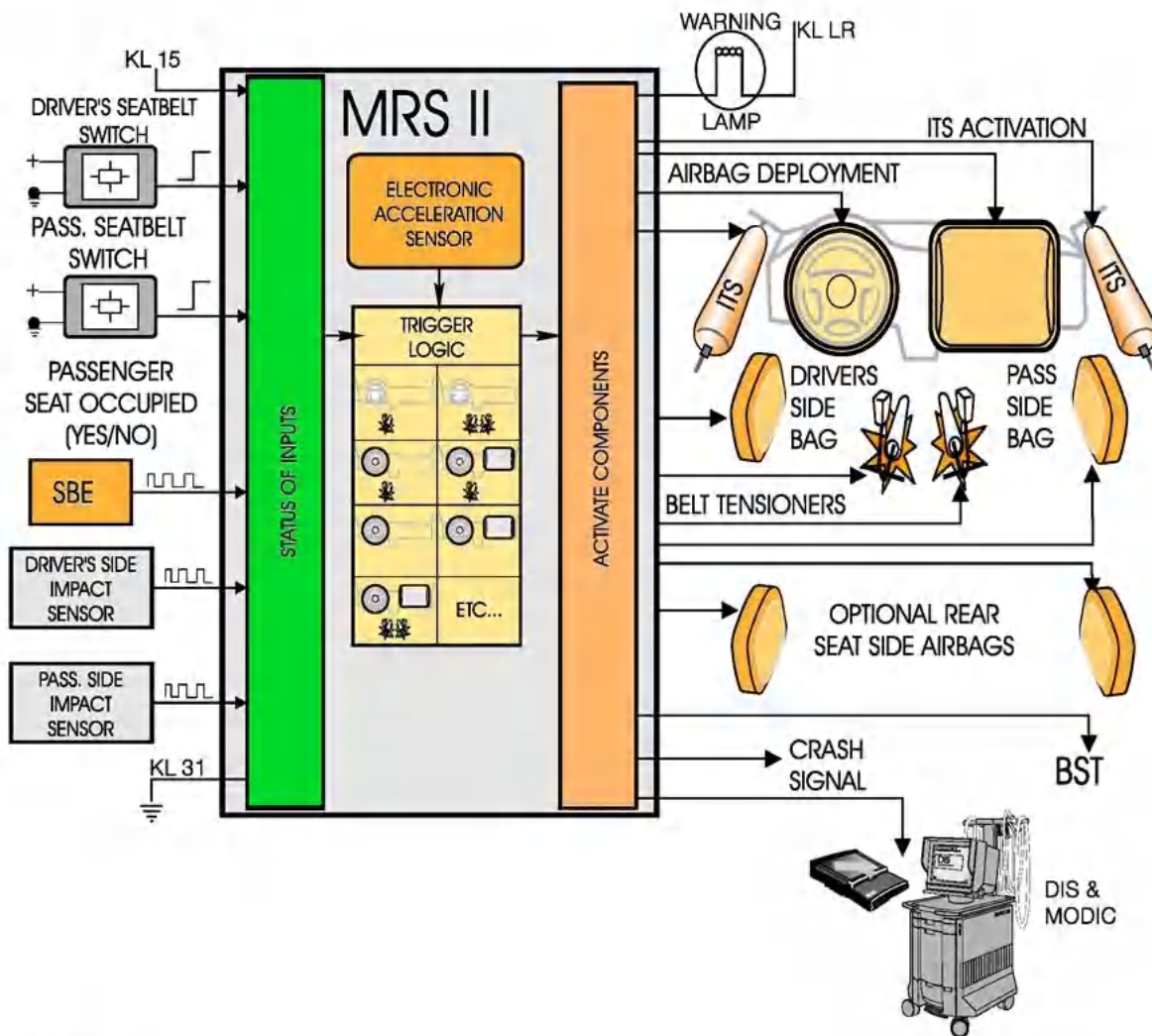
[Fig. 32: Identifying Seat Belt Tensioners](#)

Courtesy of BMW OF NORTH AMERICA, INC.

SEAT BELT SWITCHES

The seat belt switch signals are input signals used by the control module for its deployment logic. Either switch contacts or hall sensors are used for this input, depending on the model year.

MRS/MRS II I.P.O



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[Fig. 33: Identifying MRS/MRS II I.P.O](#)

Courtesy of BMW OF NORTH AMERICA, INC.

MRS/MRS II DEPLOYMENT LOGIC

The design of the MRS/MRS II allows the control module to trigger deployment of the airbags/ seat belt tensioners individually as needed. The logic is based on:

- The severity of the impact.
- The direction of the impact (front/side/rear).
- The status of the front passenger's seat.
- The status of the seatbelt contacts for the driver and passengers.

DRIVER'S FRONT AIRBAG

The deployment threshold for the driver's front airbag is designed so that minor impact forces, will not trigger the airbag, where the seat belt is sufficient to protect the driver. If the seat belt is not connected, the driver's front airbag will deploy to provide the driver with protection.

PASSENGER'S FRONT AIRBAG

The passenger's front airbag is dependent on the seat belt contact and the signal from the SBE for its deployment. If the passenger's seat is unoccupied, the airbag will not deploy unless a severe collision occurs.

SIDE AIR BAGS/ITS

The triggering of the side air bags/ITS depends on the degree of lateral acceleration as detected by the side impact sensors. An acceleration sensor in the control module acts as a plausibility check for side airbag/ITS deployment. Both sensors must detect that the trigger threshold has been exceeded before the airbags/ITS will deploy. The control module also looks at the signal from the SBE for deployment of the passenger's side airbag/ITS.

PYROTECHNIC SEATBELT TENSIONERS

The triggering of the seatbelt tensioners is dependent on the seatbelt contacts. The tensioners will not deploy if the seatbelts are not connected.

The safety logic of the MRS/MRS II will deploy the airbags in an accident if faults are detected with the SBE or seatbelt contact inputs.

BST TRIGGER LOGIC

Triggering of the BST requires no additional sensors. The MRS II control module will trigger the BST as follows:

FRONTAL COLLISION: During a frontal collision that involves deployment of any front air bag, the BST will also be triggered

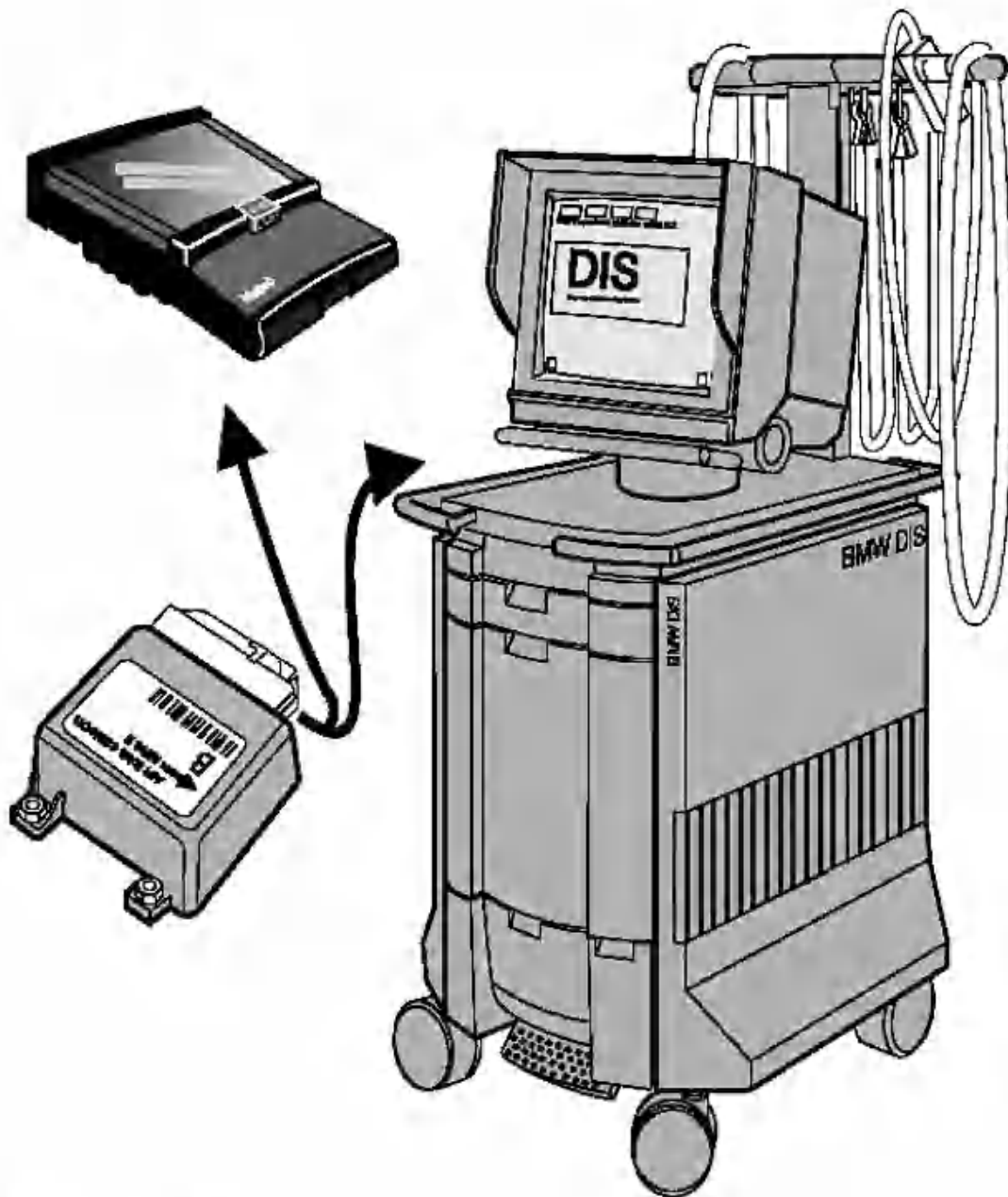
SIDE IMPACT: Depending on the severity of the side impact, the BST may also be activated.

REAR IMPACT: Detection of severe rear impact will cause the MRS II to activate the seat belt tensioners and simultaneously activate the BST.

DIAGNOSIS AND SERVICE PROCEDURES

The control module performs a self test of the restraint system every time the ignition is switched on. Any faults with the system's inputs/outputs or processing capabilities will cause the fault lamp in the cluster to illuminate. The troubleshooting of the MRS system is fault driven and can be accessed using the DIS tester or MoDiC.

Installation of a replacement control module requires ZCS coding also using the MoDiC or DIS.

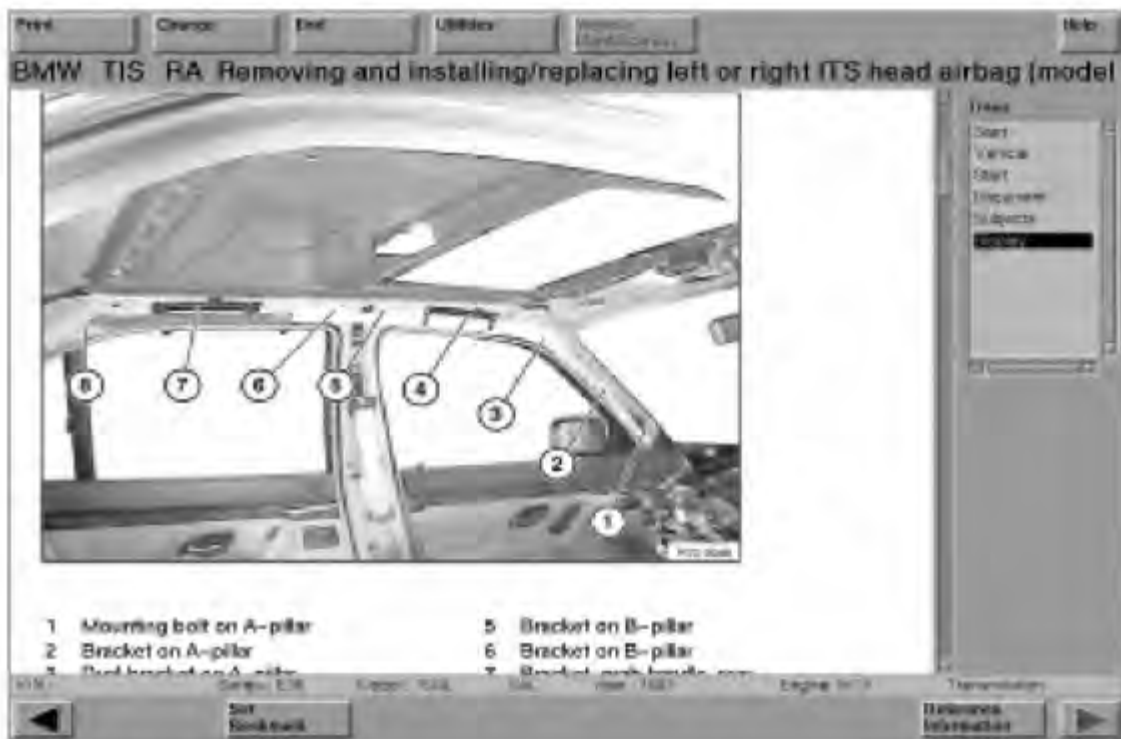


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[Fig. 34: View Of DIS Tester](#)

Courtesy of BMW OF NORTH AMERICA, INC.

When servicing or replacing any MRS components, always follow the precautionary measures outlined in the appropriate repair articles. This includes disconnecting the battery prior to any repair of maintenance work being performed.

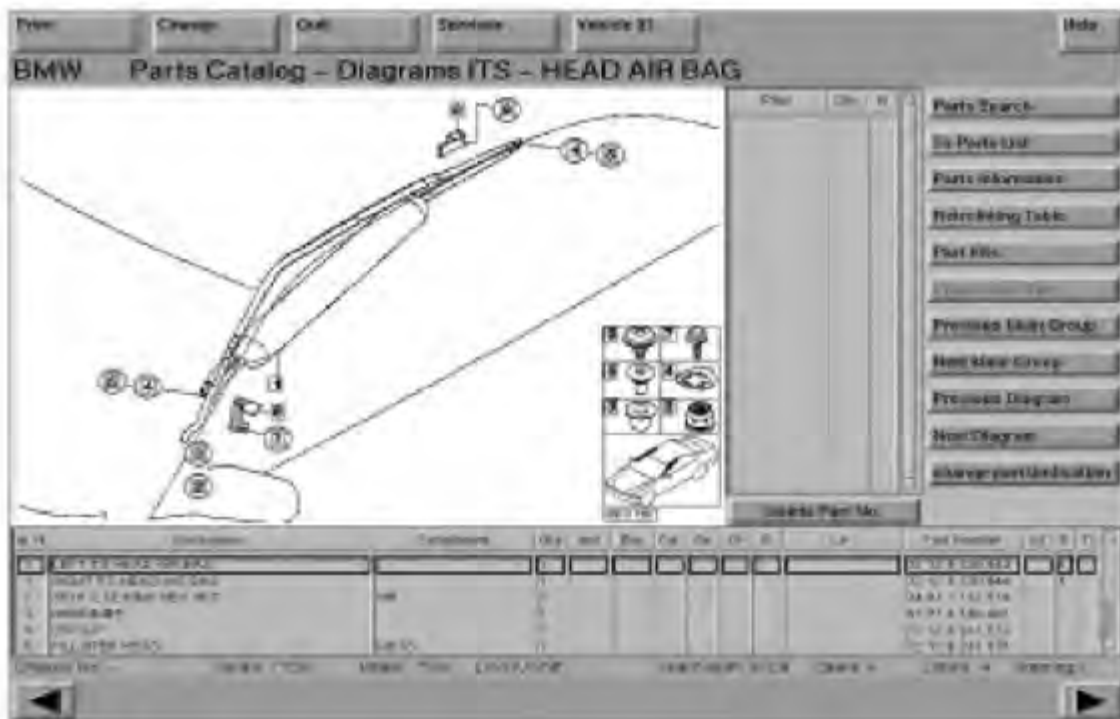


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[Fig. 35: Identifying MRS Removal Procedure](#)

Courtesy of BMW OF NORTH AMERICA, INC.

All airbag units, including the ITS assemblies are part number specific by model. Always use the EPC to verify the correct part number for any component being replaced.



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[Fig. 36: Using EPC To Verify Correct Part Number](#)

Courtesy of BMW OF NORTH AMERICA, INC.

A replacement splice kit is available for the BST following an impact that causes BST activation. The splice kit comes complete with instructions for cutting and stripping the B+ cable for replacement. Follow the instruction completely to prevent future voltage drop problems in the B+ cable circuit.



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[Fig. 37: Identifying Replacement Splice Kit](#)

Courtesy of BMW OF NORTH AMERICA, INC.

CENTRAL AIRBAG TRIGGER MODULE (ZAE & ZAE II)

Model: E31, E34, E36, E36/7, E38

Production Date: E31: from 9/93 to production end

E34: from 9/93 to production end

E36/7: from start of production to 8/97

E36: from 9/93 to 12/96

E38: from start of production to 8/96

E39: from start of production to 8/96

Central " Airbag" Trigger Module (ZAE)

The ZAE passive safety system preceded the MRS systems. It was introduced for the 1994 Model Year vehicles including:

- E31 - all models.
- E34 - all models.
- E36 - all models.

The ZAE was enhanced with added features for the E38 in model year 1995.

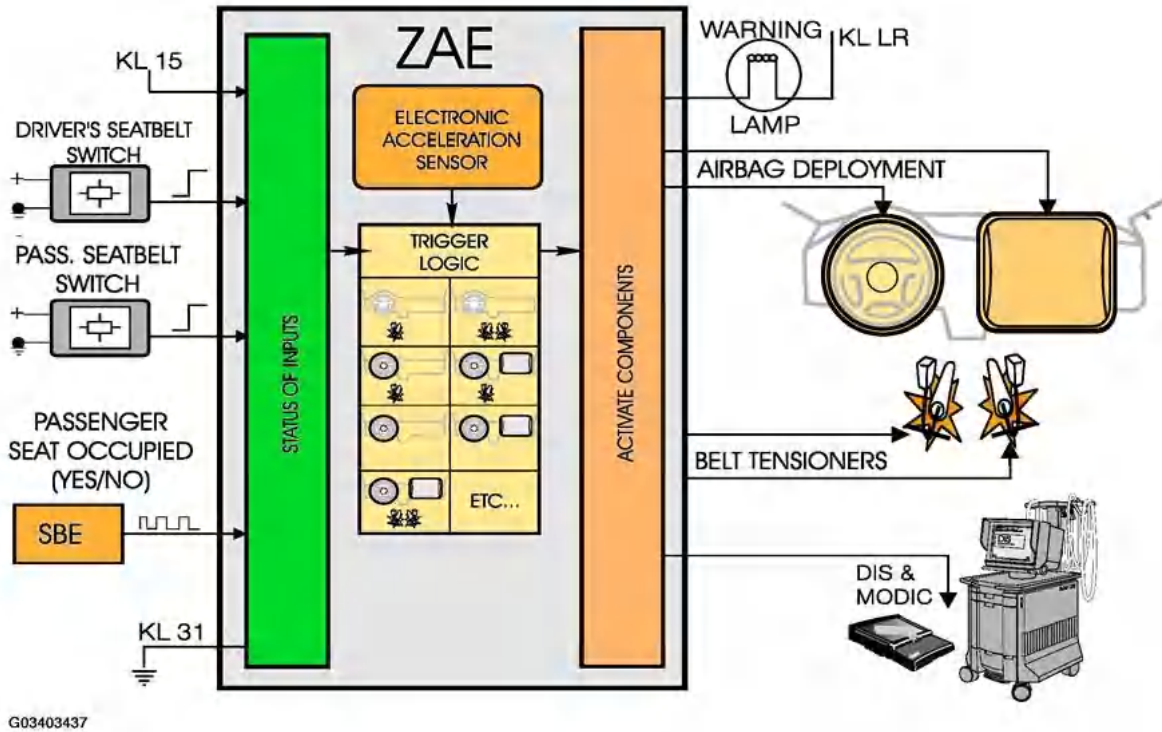
The ZAE system consists of the following components:

- ZAE control module.
- Driver's airbag.
- Passenger's front airbag.
- SRS warning lamp.
- Pyrotechnic seat belt tensioners (with E38).
- Seat belt switch contacts (with E38).
- Passenger's seat occupancy sensor (with E38).

SYSTEM OVERVIEW

The ZAE control system is similar to the MRS system in that impact detection and airbag triggering are combined functions integrated into the ZAE control module.

ZAE -I.P.O.



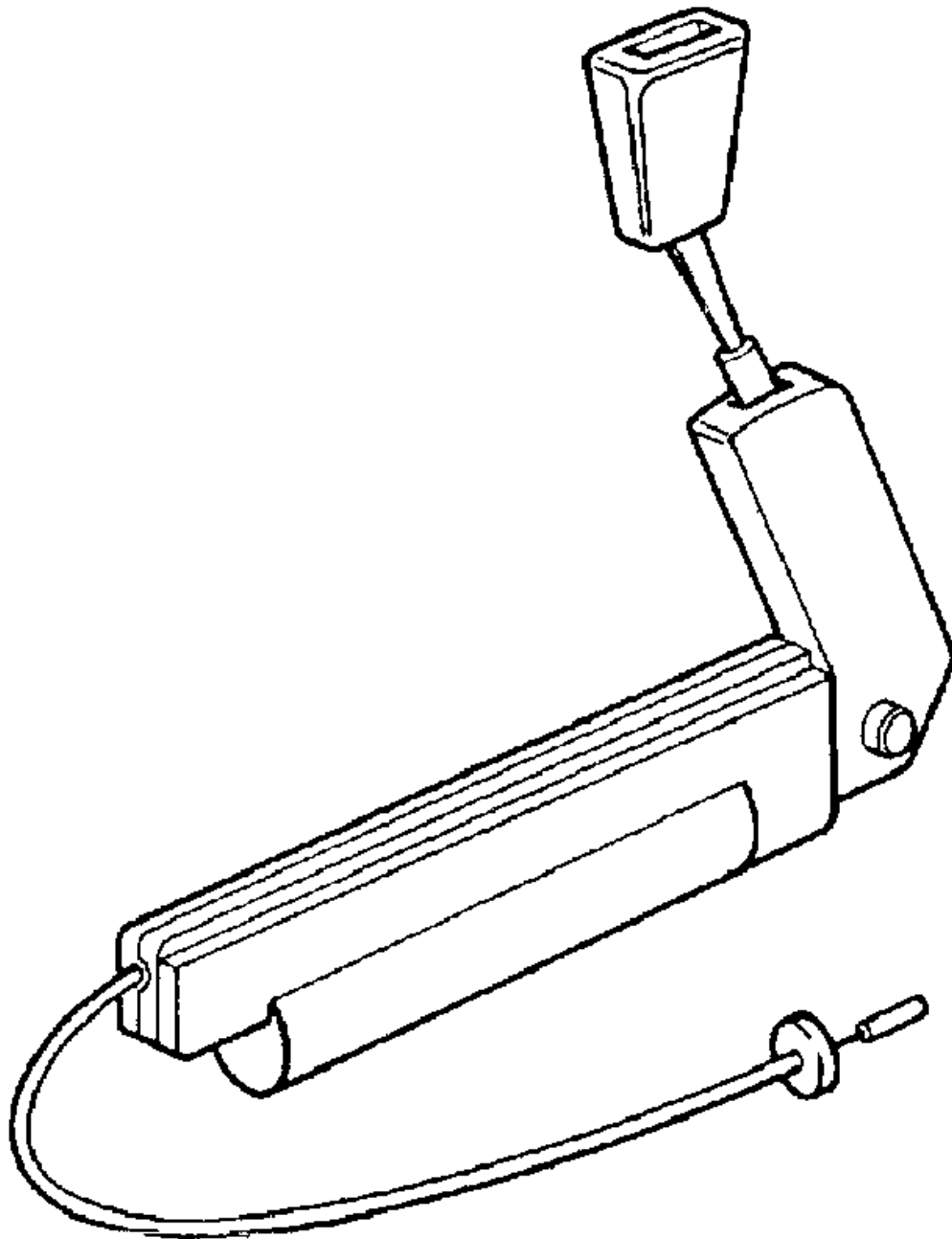
[Fig. 38: Identifying ZAE - I.P.O.](#)

Courtesy of BMW OF NORTH AMERICA, INC.

SEAT BELT TENSIONERS

MECHANICAL SEAT BELT TENSIONERS

The mechanical seat belt tensioner is a simple method of countering the effects of the occupant moving forward (seat belt stretch) during the sharp deceleration of a collision.



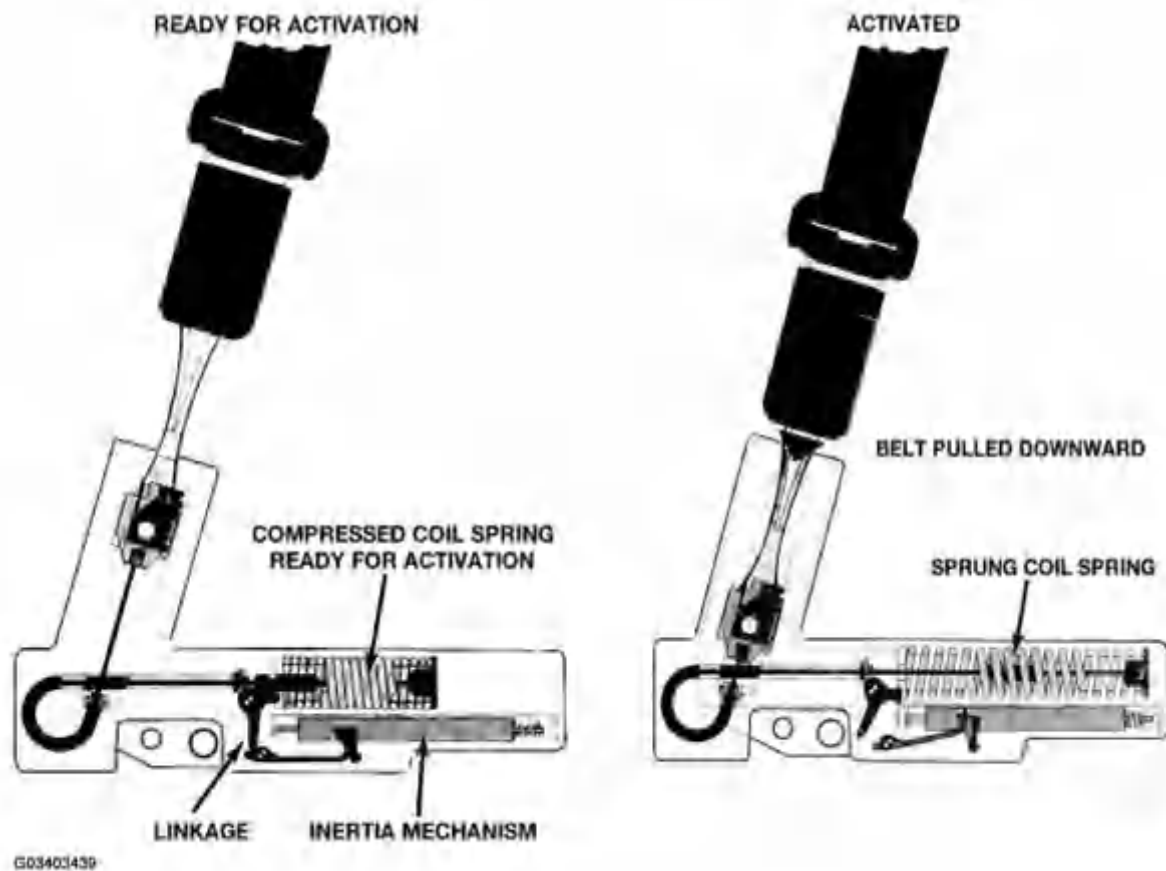
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[Fig. 39: Identifying Mechanical Seat Belt Tensioners](#)

Courtesy of BMW OF NORTH AMERICA, INC.

The seat belt tensioner consists of a cable operated seat belt latch, a tension spring and an inertia mechanism.

When the inertia mechanism is triggered during a collision, The linkage releases the tension spring and the seat belt latch is pulled downward to tighten the belt across the occupant's body. This action counters the effects of inertia and the "spooling" of the seat belt itself.



[Fig. 40: Identifying Inertia Mechanism](#)

Courtesy of BMW OF NORTH AMERICA, INC.

CIPRO/SIEMENS AIRBAG SYSTEM

Model: E23 (L7), E24, E30, E31, E32, E34, E36,

Production Date: E23: 9/95 to production end

E24: 9/96 to production end

E30: 9/89 to production end

E31: production start M.Y. 91 to 9/93

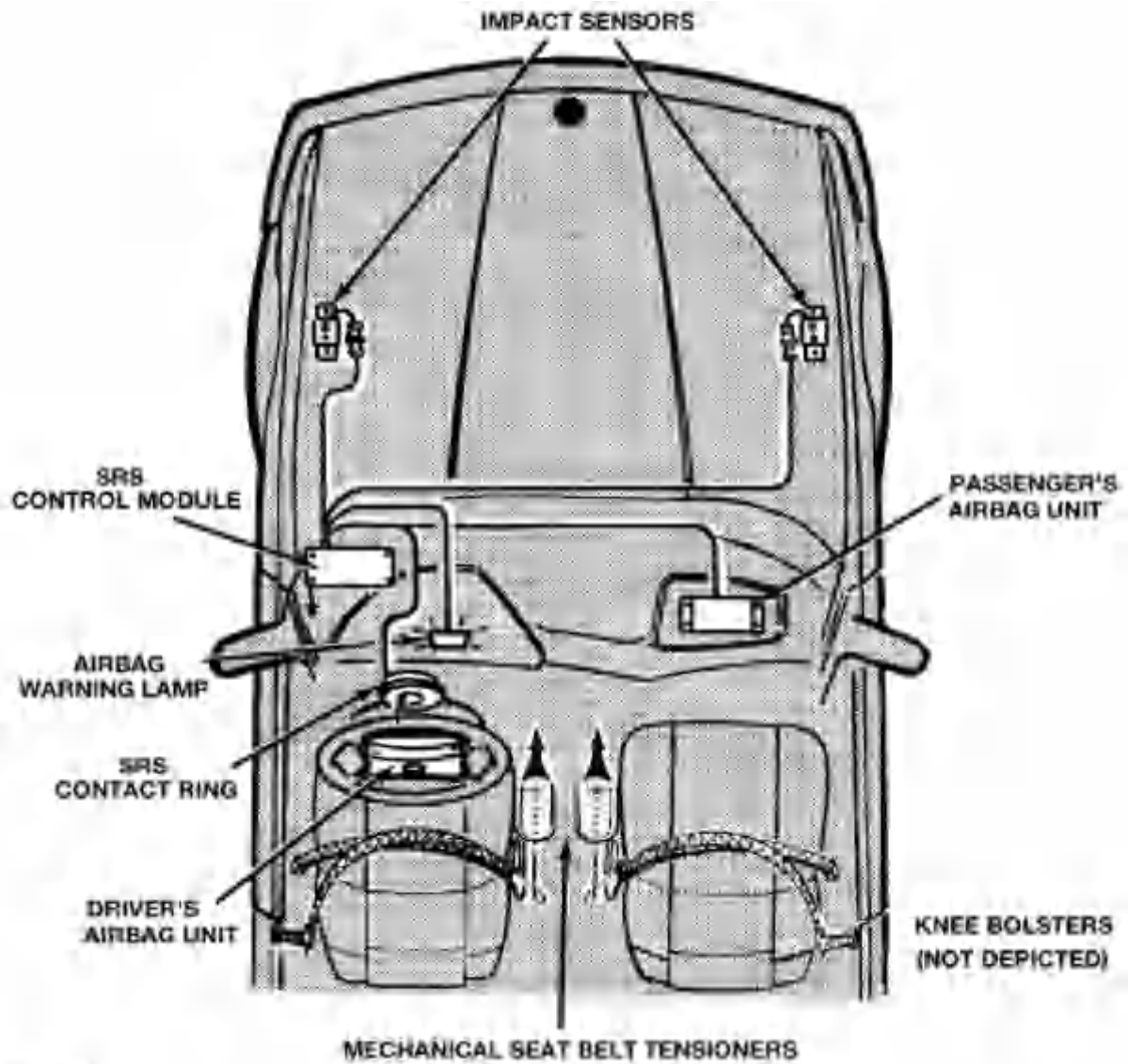
E32: all models E34: from 9/88 to 8/93

E36: from production start M.Y. 92 to 8/93

System Overview

The early SRS consists of the following components:

- Driver's air bag unit with gas generator - mounted in the center of the steering wheel.
- Passenger's front air bag was added beginning with 1993 model year E32/E31.
- Contact ring - under the steering wheel
- Front Impact Sensors - mounted on the left and right wheel housings.
- Control module.
- SRS warning lamp.



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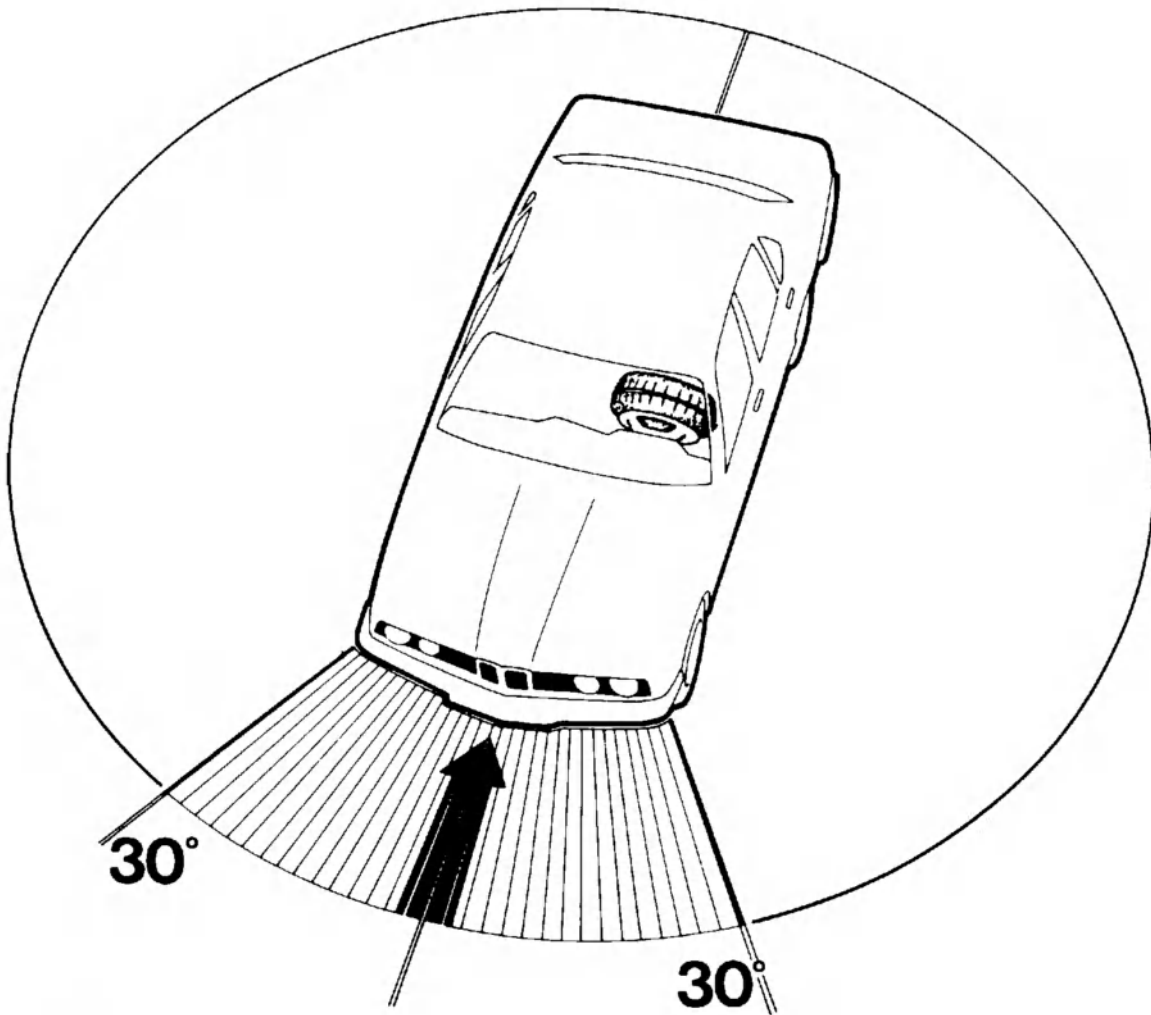
[Fig. 41: Identifying Driver Air Bag Components](#)

Courtesy of BMW OF NORTH AMERICA, INC.

AREA OF IMPACT

The airbag(s) will only activate during a frontal impact and then only when the collision is within a 60° arc, equidistant to the vehicle center line.

The front airbag sensors are spring loaded inertia type switches. The weighted roller will move forward, in the event of a frontal impact, closing the contacts of the sensor.



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[Fig. 42: Identifying Area Of Impact For Activation](#)

Courtesy of BMW OF NORTH AMERICA, INC.

IMPACT SENSOR SIGNALS

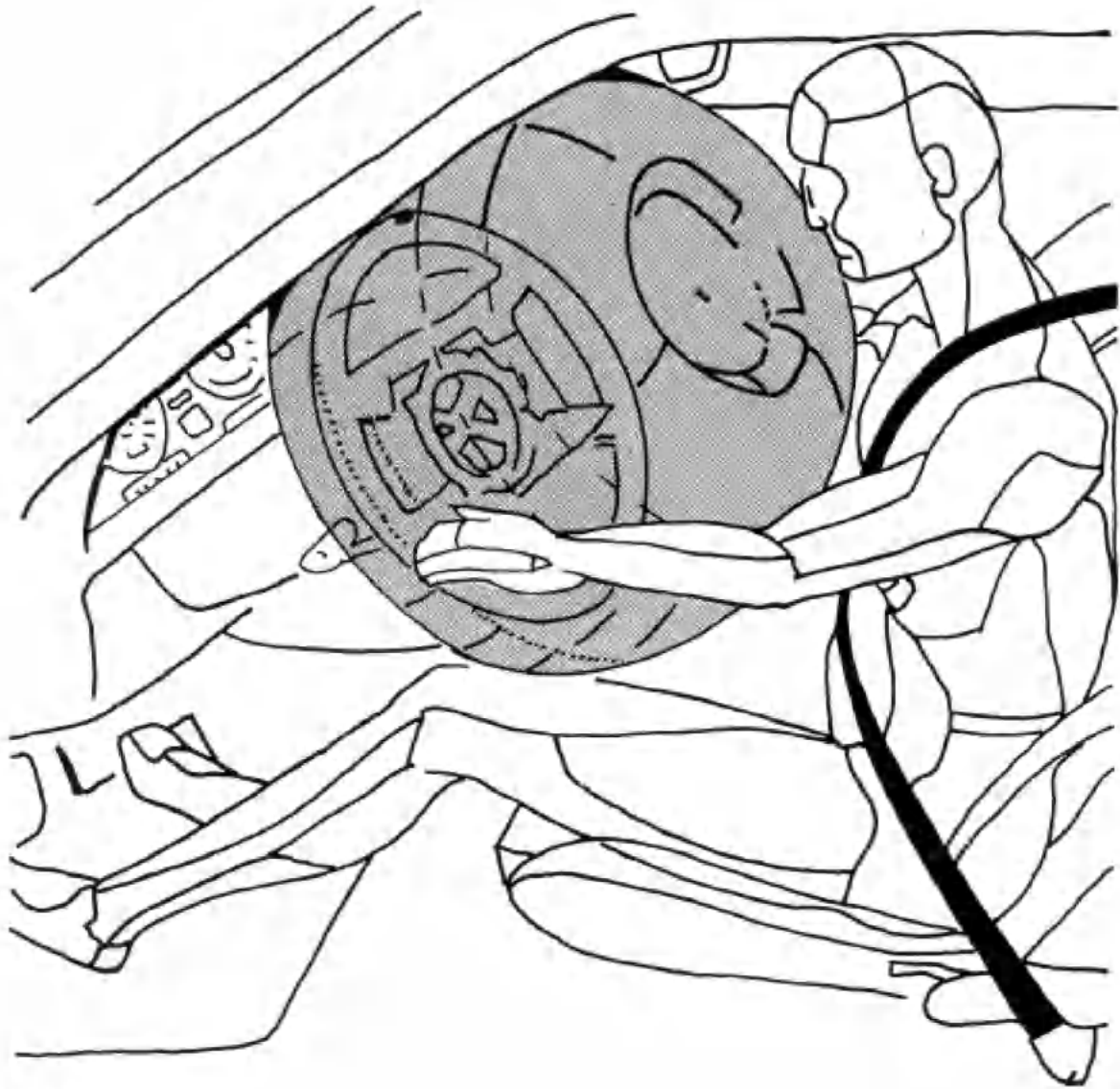
During a frontal collision of sufficient impact at least one impact sensor and the safety sensor in the SRS module will close signalling airbag activation.

Sufficient impact generally results from a collision with a solid, non-moving object at a speed greater than 12 MPH.

SIEMENS OPERATION

The SRS control module and SRS warning lamp receive power when the ignition is switched on (KL R). The control module performs a self check and charges the internal capacitor to approximately 35 volts. The capacitor ensures that enough power will be available for airbag activation. If the self check is "OK", the warning lamp goes out and the system is ready for activation should the need arise.

During the instant of activation the capacitor voltage is used to energize the ignition pill of each airbag gas generator. The airbag fills rapidly with a nitrogen gas (N₂) supplying the needed margin of safety.



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[Fig. 43: View Of Siemens Operation](#)
Courtesy of BMW OF NORTH AMERICA, INC.

CIPRO/SIEMENS 2B-2C I.P.O.

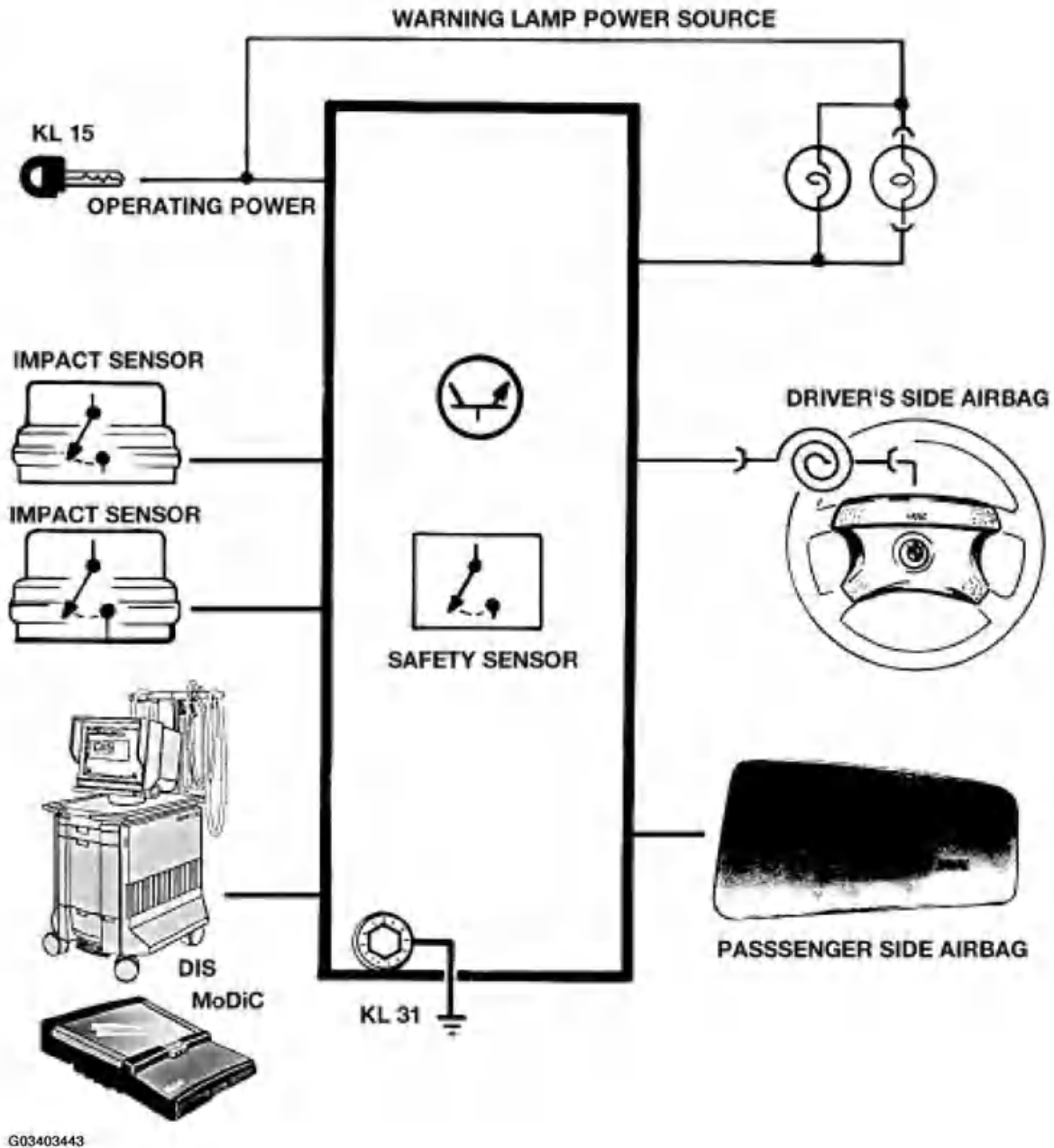


Fig. 44: Identifying Cipro/Siemens 2B-2C I.P.O.
 Courtesy of BMW OF NORTH AMERICA, INC.

ROLLOVER PROTECTION SYSTEM (RPS)

Model: E36

Production Date: All E36 convertibles equipped with RPS.

The RPS is a passive safety system which, like the SRS, will not deploy until needed. When the vehicle is in danger of rolling over, a rollover sensor mounted in the vehicle detects the amount of tilt and in a time span of approximately .3 seconds triggers the system to raise and lock the roll bars into position.

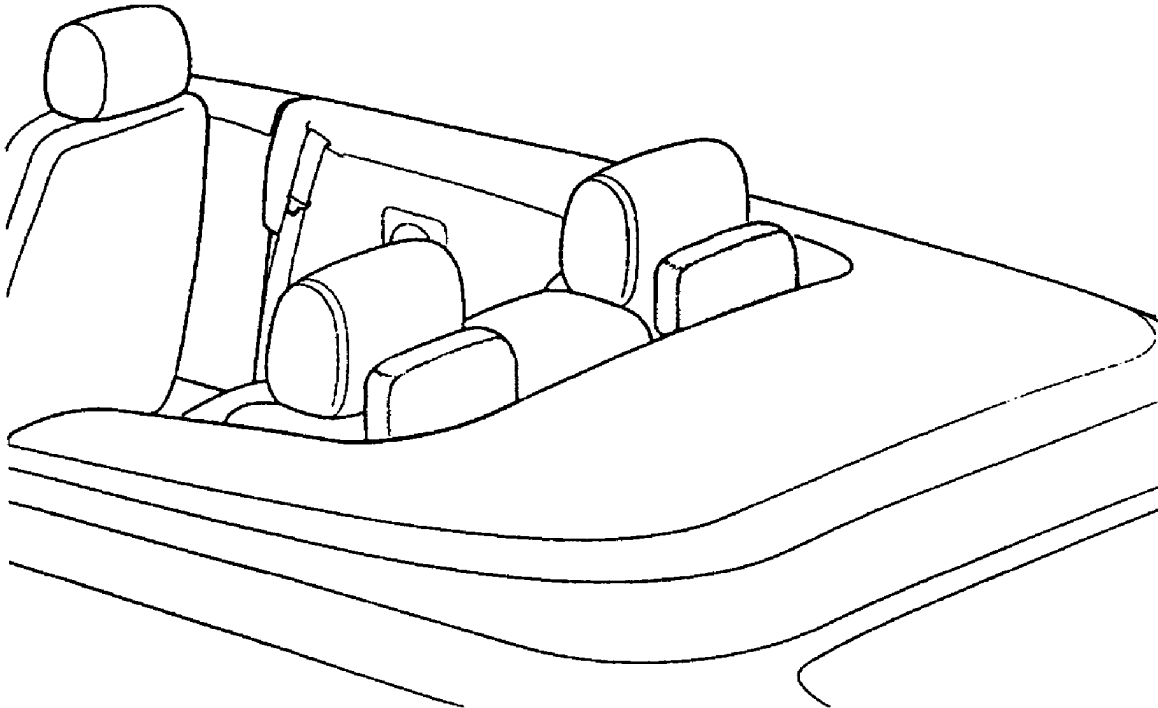
The U S market uses the acronym RPS for the roll over protection system while the German acronym is URSS. This stands for the German words "Uber Roll Schutz System", which may appear in various publications or on the diagnostic test equipment.

The RPS can be reset, in the service shop, in the event of an accident, or inadvertent triggering of the system.

The RPS supplements the integral reinforcement bar that is located in the front windshield frame/ "A" pillar

area. It provides additional protection for passengers of the vehicle, especially those riding in the rear seats.

Deployment of the roll bars with the soft top raised, of the hard top installed will not cause any damage to the rear window. The plastic covers on the bars is designed to protect the window if inadvertent deployment occurs.



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[Fig. 45: Identifying Rollover Protection System \(RPS\)](#)

Courtesy of BMW OF NORTH AMERICA, INC.

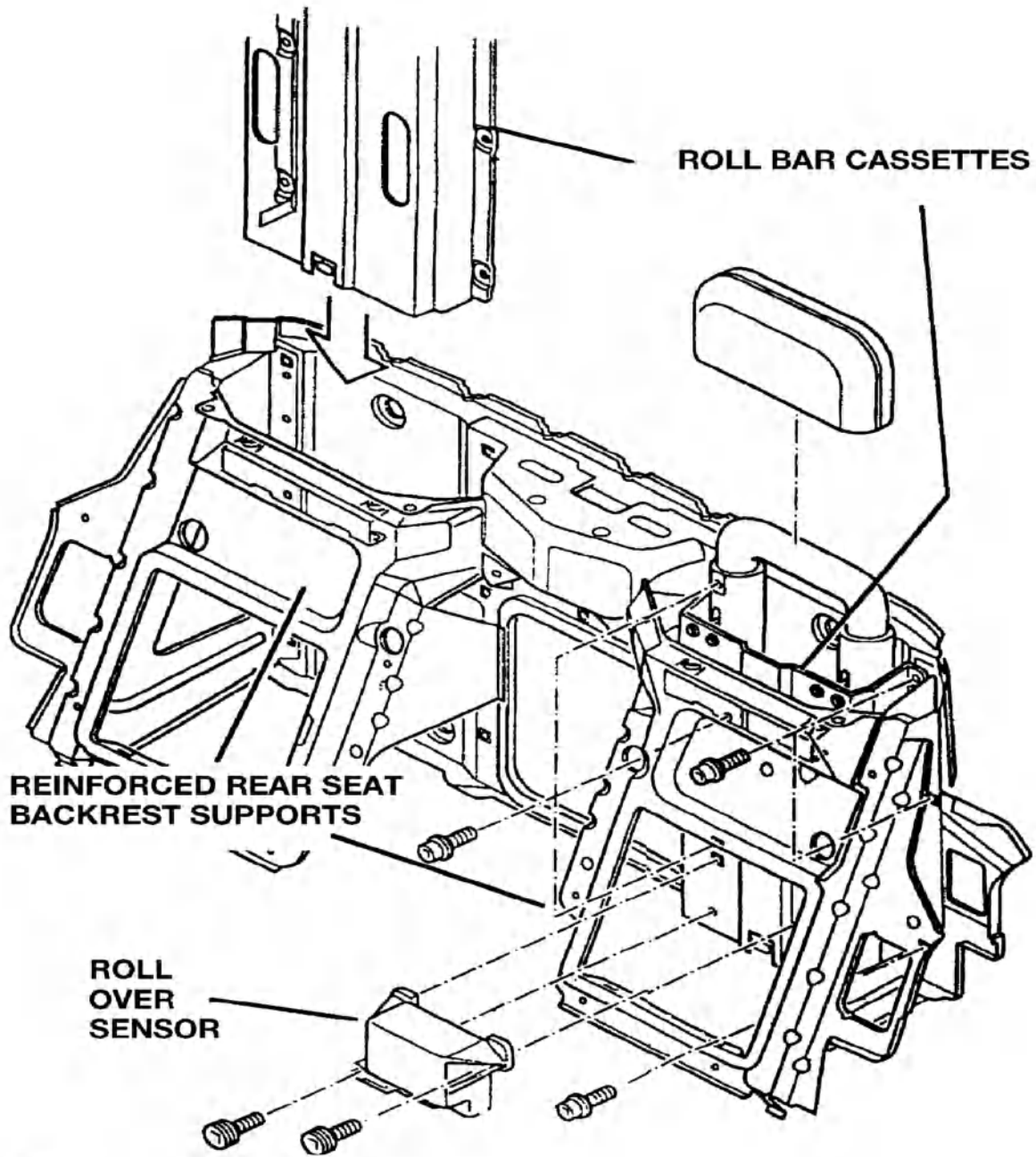
RPS COMPONENTS - OPERATION

The main components of the RPS includes the following:

TWO ROLL BAR CASSETTES

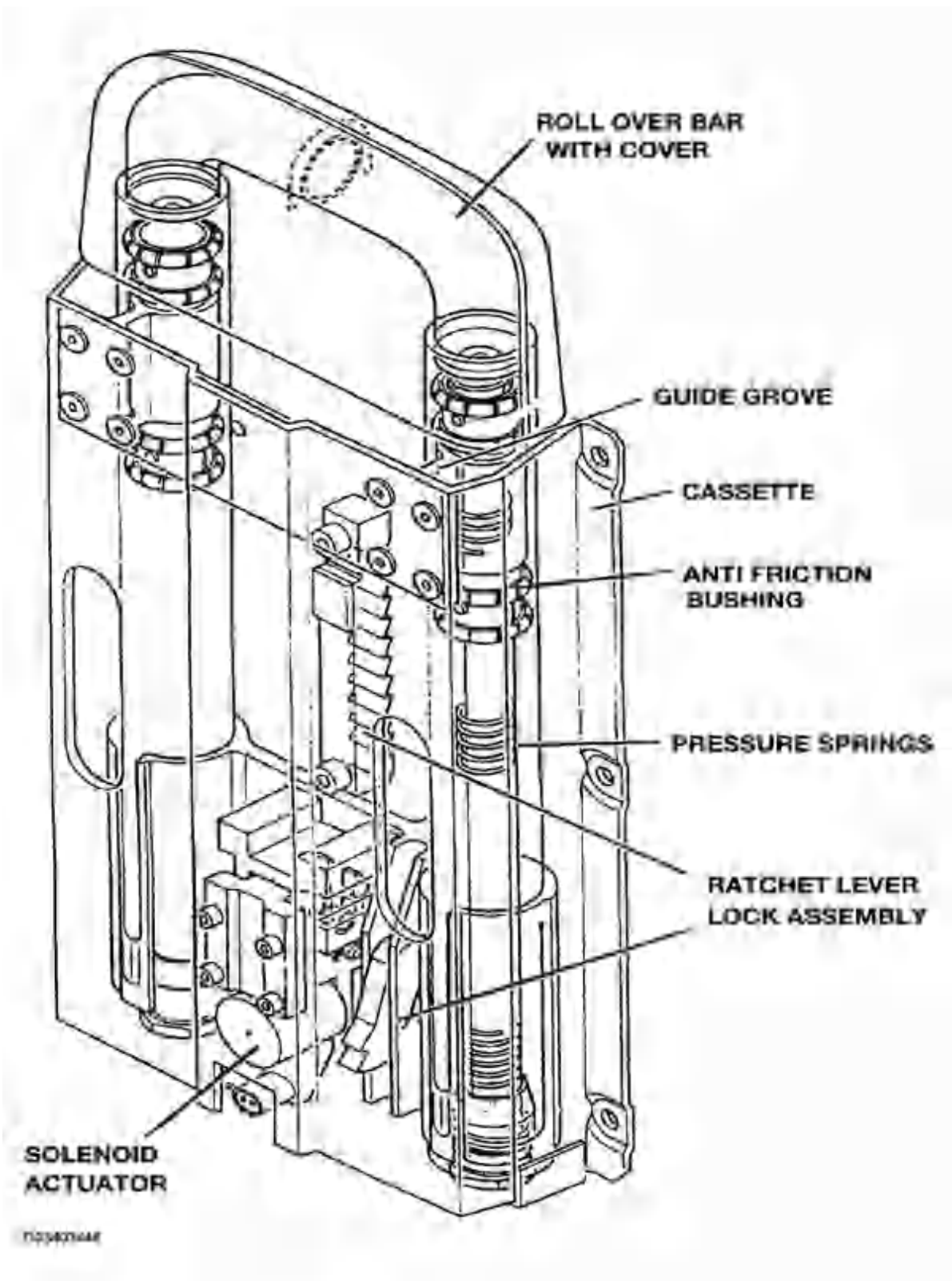
The cassettes are positioned in a reinforced body structure, behind the rear seat backrests. Each cassette assembly consists of a "U" shaped bar that is guided by low friction plastic bushings. The bar is held in the retracted position against spring pressure by a lever. The lever is solenoid controlled to unlock the bar for deployment. The two springs ensure that the bar will deploy quickly to provide adequate protection.

When deployed, the bar is held in place by a ratchet and lever assembly that locks the bar in the raised position.



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[Fig. 46: Identifying RPS Components - Operation \(1 Of 2\)](#)
Courtesy of BMW OF NORTH AMERICA, INC.



[Fig. 47: Identifying RPS Components - Operation \(2 Of 2\)](#)
 Courtesy of BMW OF NORTH AMERICA, INC.

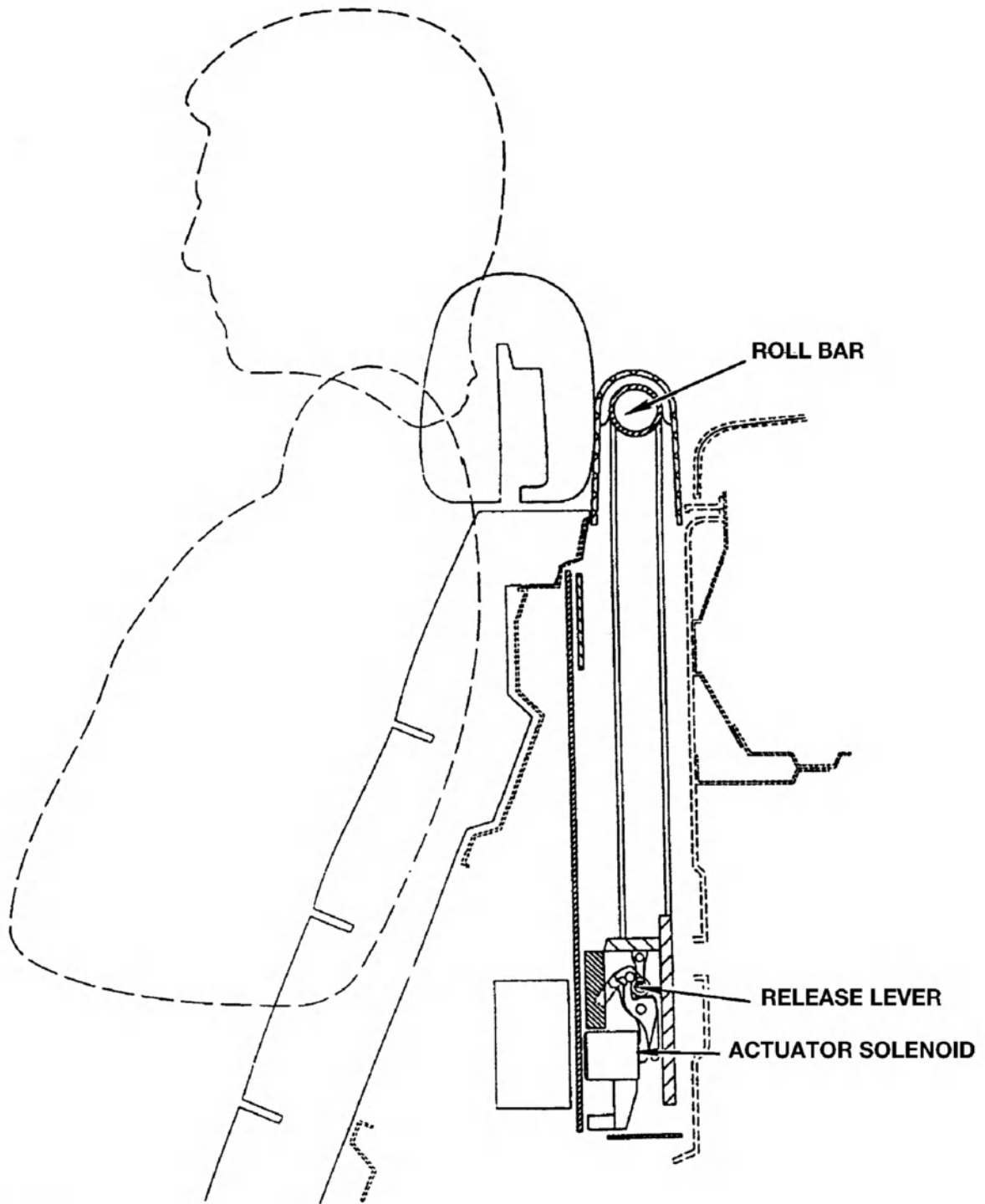
Technical Data

TECHNICAL DATA

Cassette dimensions	249x507x75mm (retracted)
Maximum bar travel	270 mm
Construction	Light alloy steel
Cassette weight	5 kgs (11 lbs)
Absorption force	35 KN

RPS COMPONENTS / OPERATION

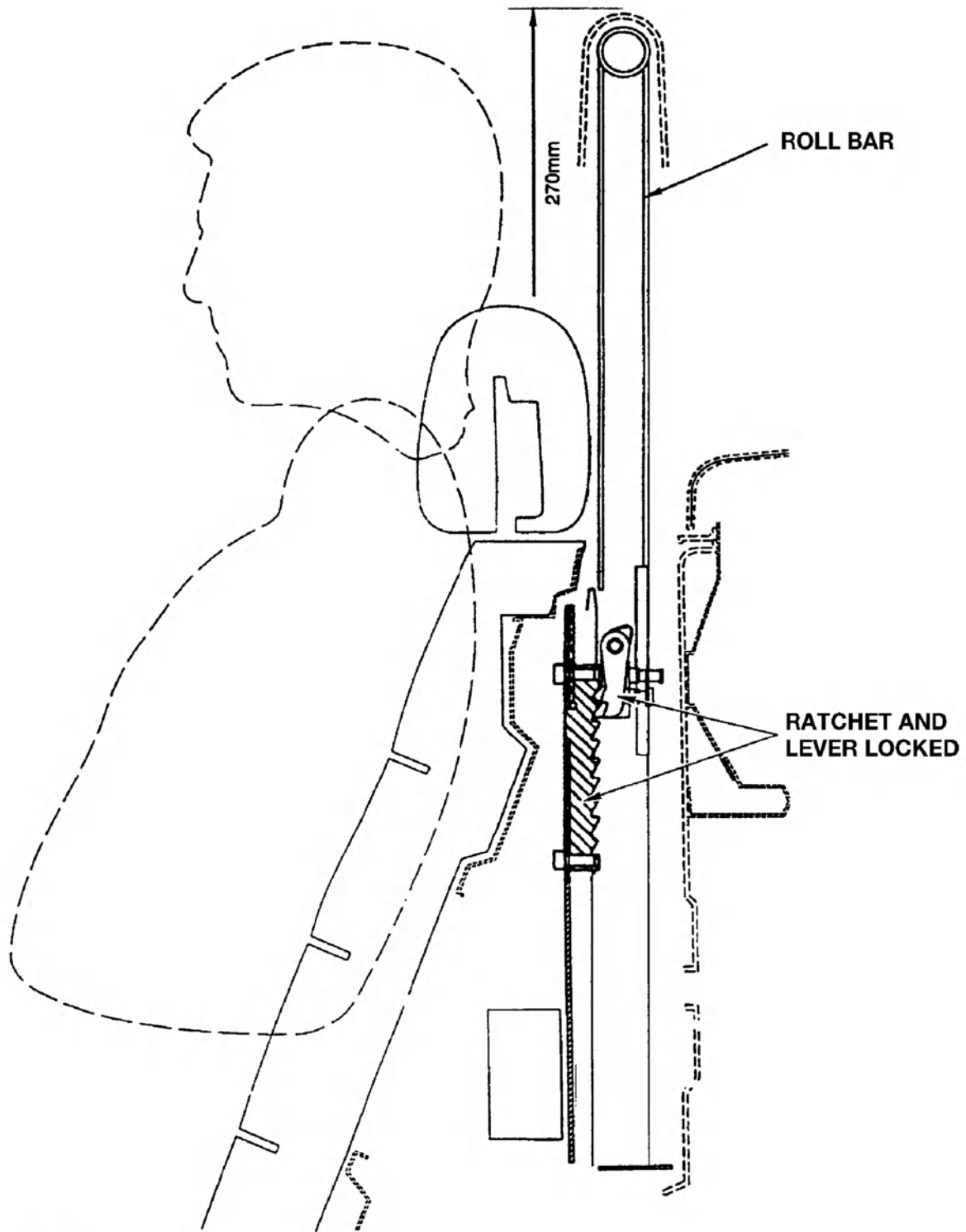
Roll Bar Retracted



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Fig. 48: Identifying RPS Components / Operation
Courtesy of BMW OF NORTH AMERICA, INC.

Roll Bar Deployed

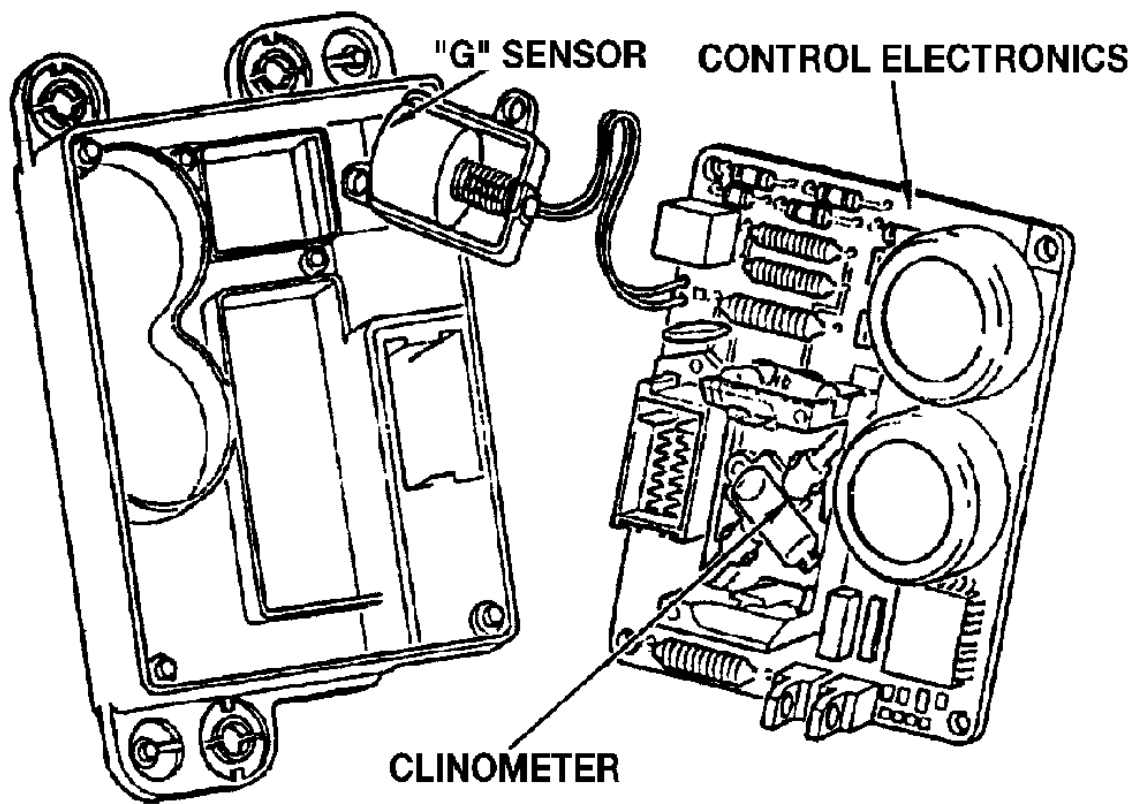


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[Fig. 49: Identifying Roll Bar Deployed](#)
Courtesy of BMW OF NORTH AMERICA, INC.

ROLLOVER SENSOR

The rollover sensor is mounted on the longitudinal axis of the vehicle, behind the left backrest. It contains the sensors and control electronics for roll bar deployment.



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[Fig. 50: Identifying Rollover Sensor](#)

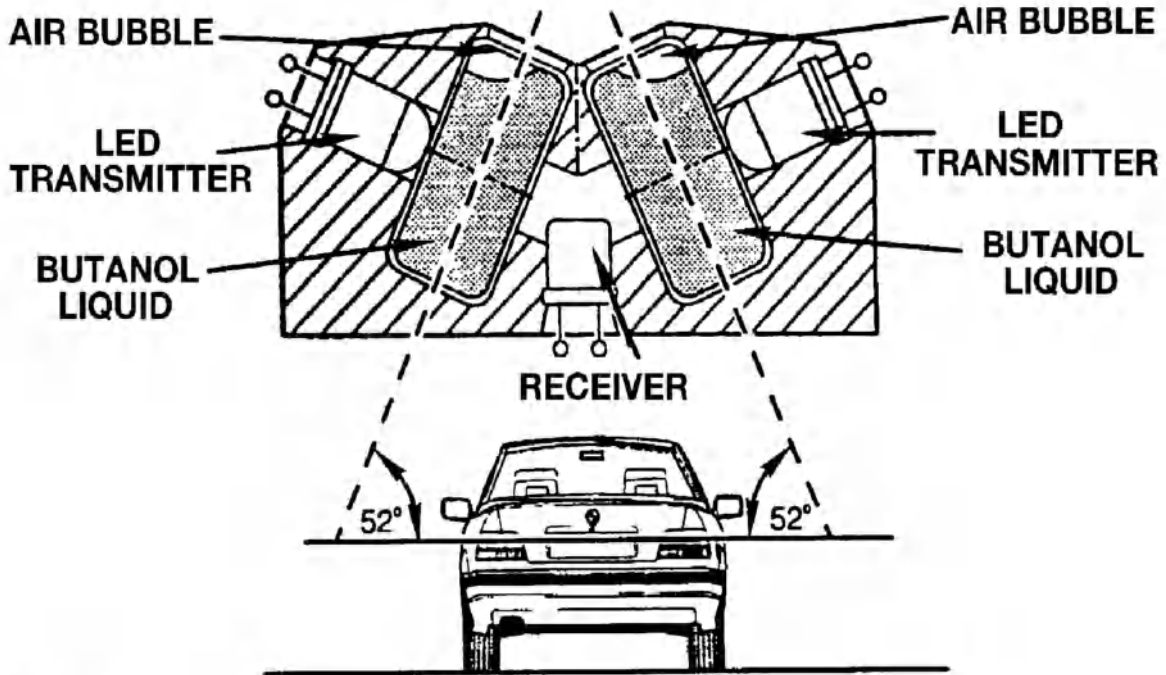
Courtesy of BMW OF NORTH AMERICA, INC.

CONTROL ELECTRONICS

The control electronics include the monitoring circuits for roll bar operation and two capacitors for triggering the roll bars in the event of an electrical failure.

CLINOMETER - (TILT DETECTION)

The clinometer identifies the vehicle's inclination and determines transverse and longitudinal acceleration.



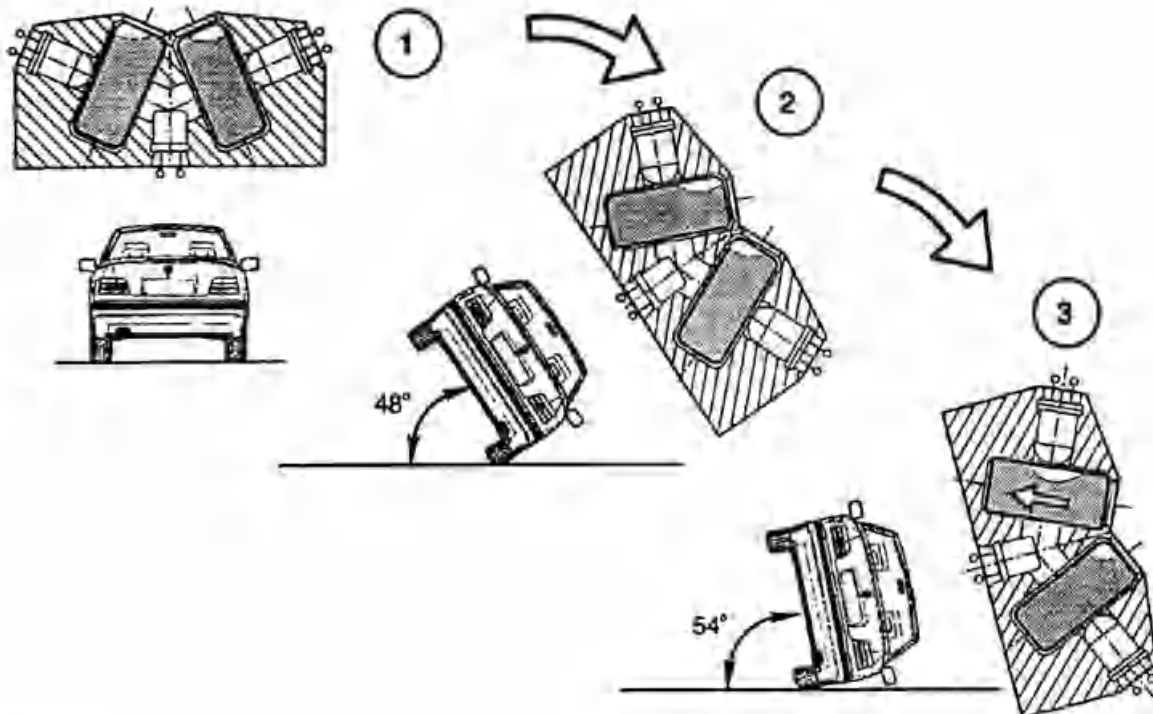
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[Fig. 51: Identifying Clinometer - \(Tilt Detection\)](#)

Courtesy of BMW OF NORTH AMERICA, INC.

The clinometer consists of three air bubble floats with LED transmitters and photo transistor/ receivers. Two of the floats are positioned on opposing angles of 52° to the horizontal axis of the vehicle.

As the vehicle starts to rollover sideways the air bubble will move across the transmitter/ receiver circuit when the angle passes 52° . This will signal the electronics to deploy the roll bars. The critical angle for rollover on the E36 convertible is 62° .



G03403451

Fig. 52: Identifying Critical Angle For Rollover On Convertible

Courtesy of BMW OF NORTH AMERICA, INC.

The third air bubble float is positioned at an angle of 72° to the longitudinal axis of the vehicle. If the vehicle starts to rollover end to end, the sensor will cause deployment of the rollover bars.

If the vehicle slips sideways into an obstacle (i.e.: the curb) the transverse acceleration is retarded rapidly.

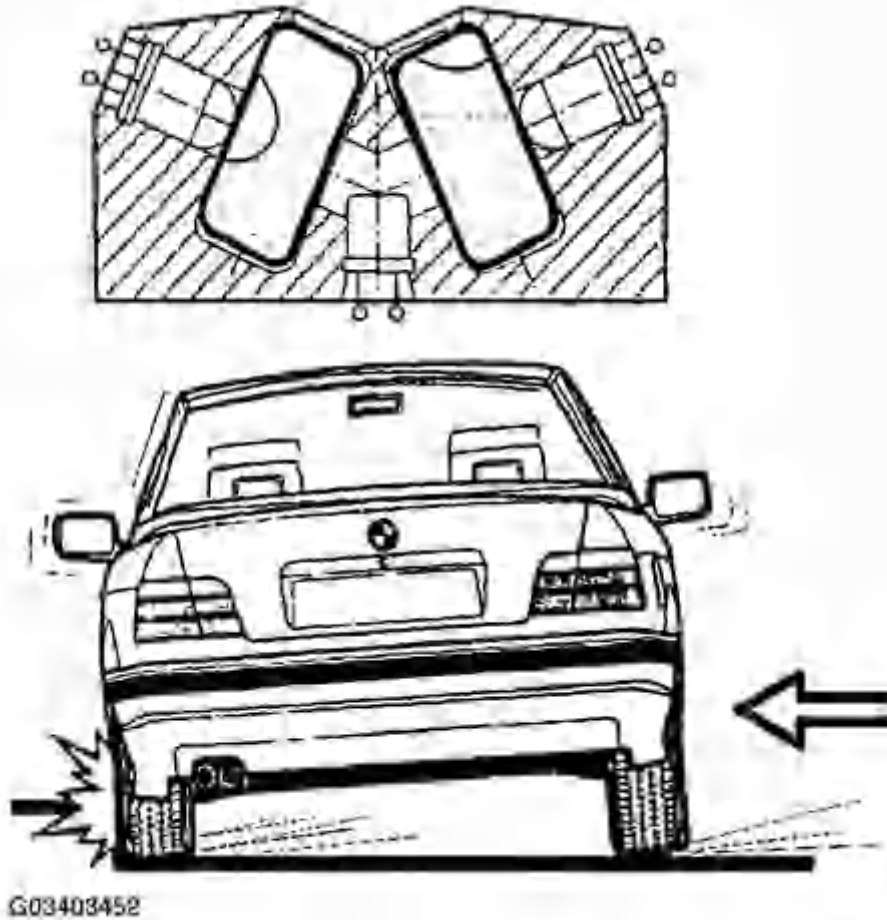


Fig. 53: Identifying Third Air Bubble Float

Courtesy of BMW OF NORTH AMERICA, INC.

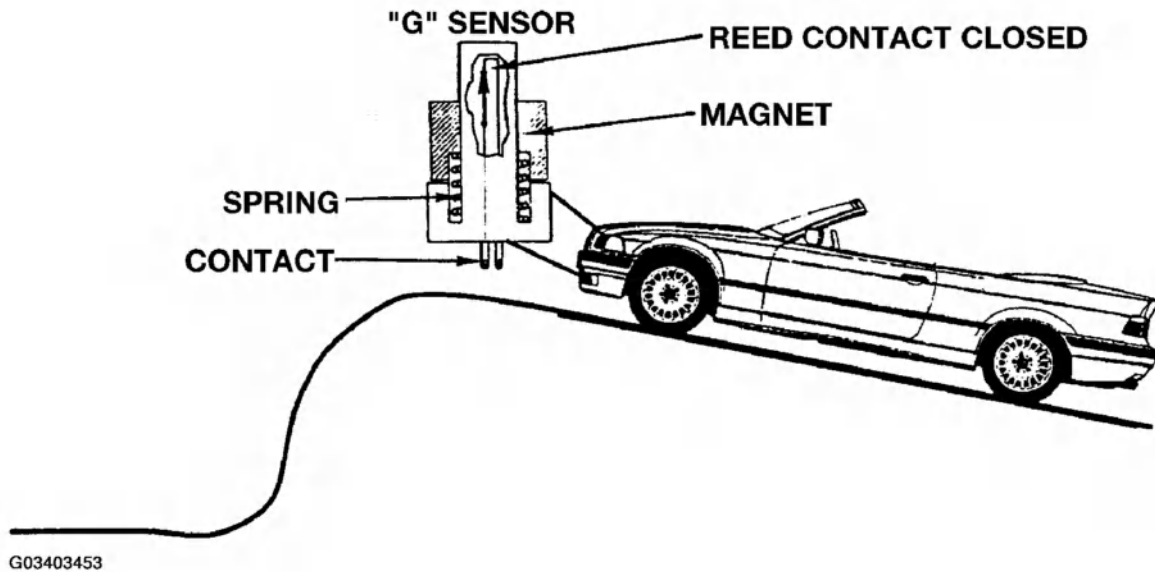
The effect of the vehicle hitting the curb will force the air bubble in the float downwards, before the vehicle starts to rollover. In doing so the air bubble can pass the transmitter/ receiver circuit and trigger the deployment of the bars.

This requires an acceleration force of at least 1.28 "G" lasting for approximately 80ms.

"G" SENSOR - detects vehicle's loss of contact with the road surface

If the vehicle becomes airborne, and the rate of acceleration is 1 "G" or more, the effective weight of the vehicle is zero. At this point, the clinometers can no longer detect transverse acceleration with respect to the gravitational pull. In this situation, the "G" sensor will act as the triggering device for the roll bars.

The "G" sensor consists of a reed contact, magnet and spring assembly. As long as the vehicle is in contact with the road surface, the spring does not have enough tension to overcome the weight of the magnet and gravity.

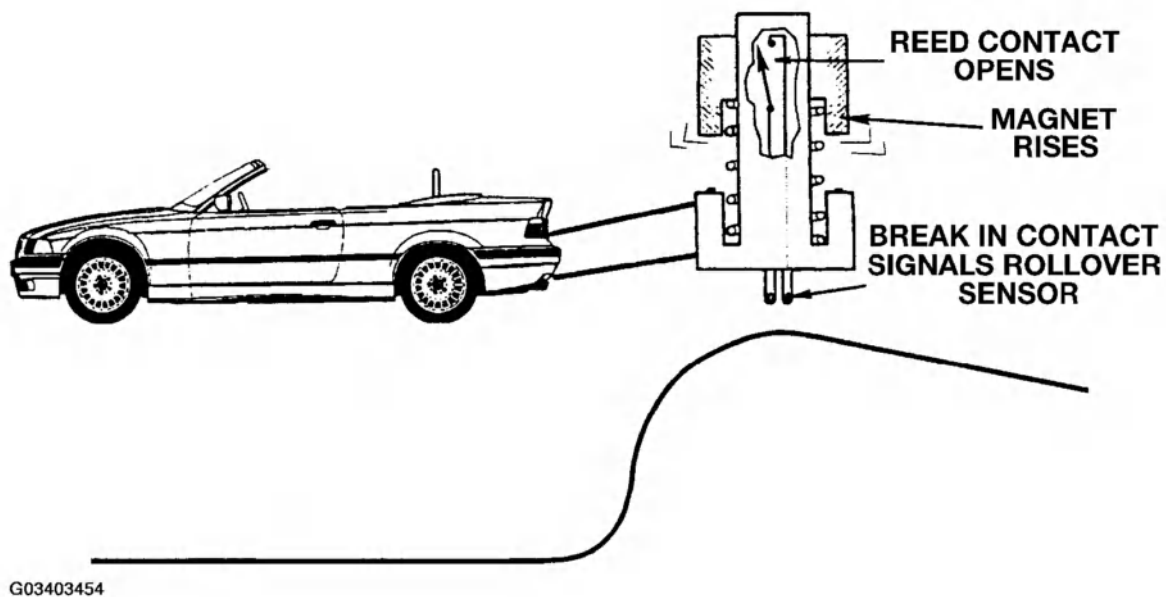


[Fig. 54: Locating "G" Sensor](#)

Courtesy of BMW OF NORTH AMERICA, INC.

However, if the vehicle becomes airborne, and weightlessness occurs, the spring will force the magnet up which opens the reed contact and triggers the deployment of the roll bars.

A time period of approximately .3 seconds with a "G" force of approximately 0.9 or less is required before the roll bars will deploy.



[Fig. 55: Identifying "G" Sensor Opening](#)

Courtesy of BMW OF NORTH AMERICA, INC.

RPS DIAGNOSIS AND TESTING

The roll over sensor performs a self check every time the ignition key is switched on. All components of the sensor are checked including the output stages for the roll over bar solenoids. If a fault is detected, the warning lamp in the cluster is illuminated and the fault is logged in the memory of the convertible top control module.

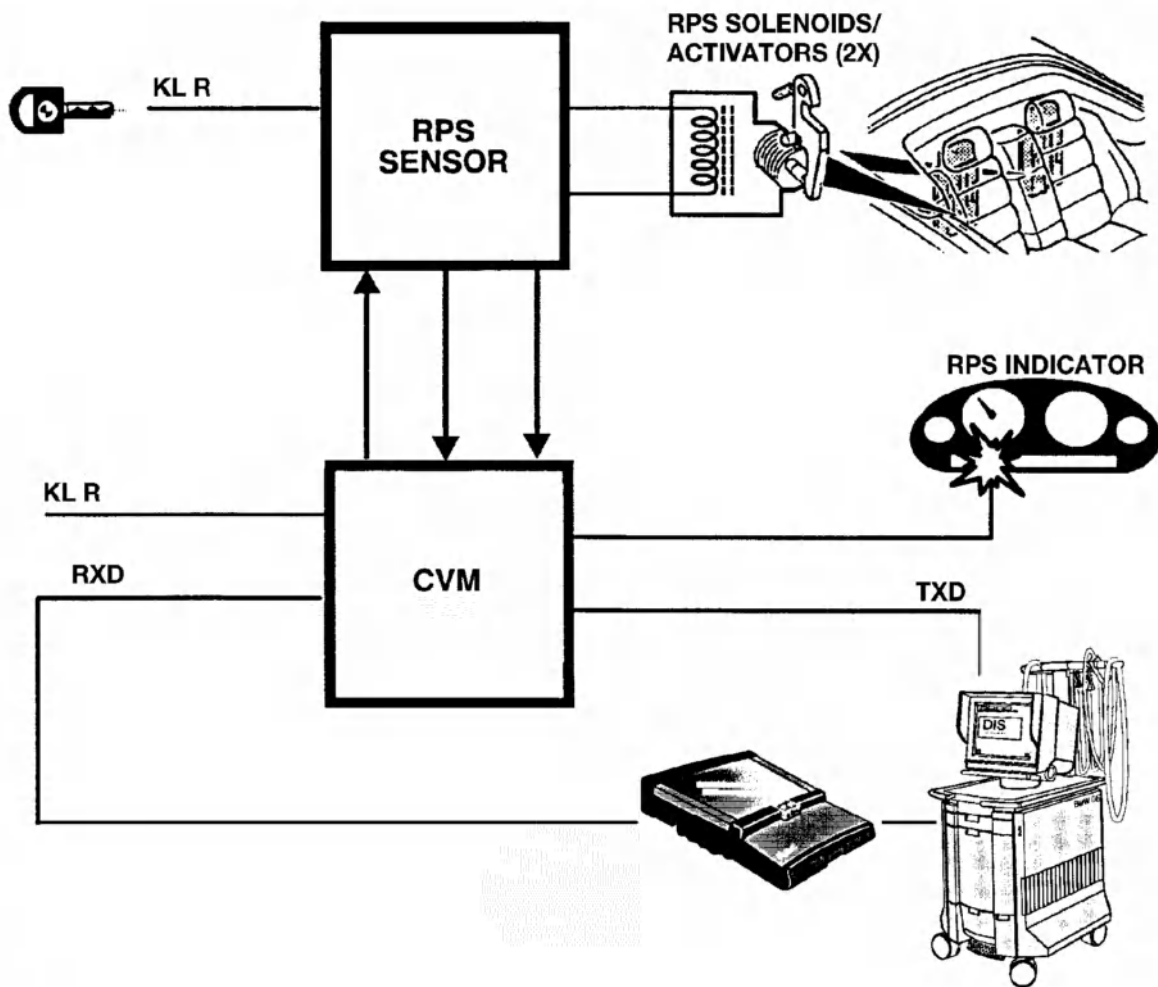
In the event of a power failure, the capacitors in the sensor can still trigger the solenoids for approximately 5

seconds.

The operation of the roll over protection system must be checked as every inspection I & II. The operation of the system is checked using the DIS tester or MoDiC to trigger the deployment of the roll bars. A signal is sent from the Convertible top module to the roll over sensor to activate the system.

The total number of times the system is activated is stored in the memory of the top module. It can be read out through the tester display.

After fifty activations of the system, it must be inspected for wear. Refer to the appropriate article for the proper checking procedures.



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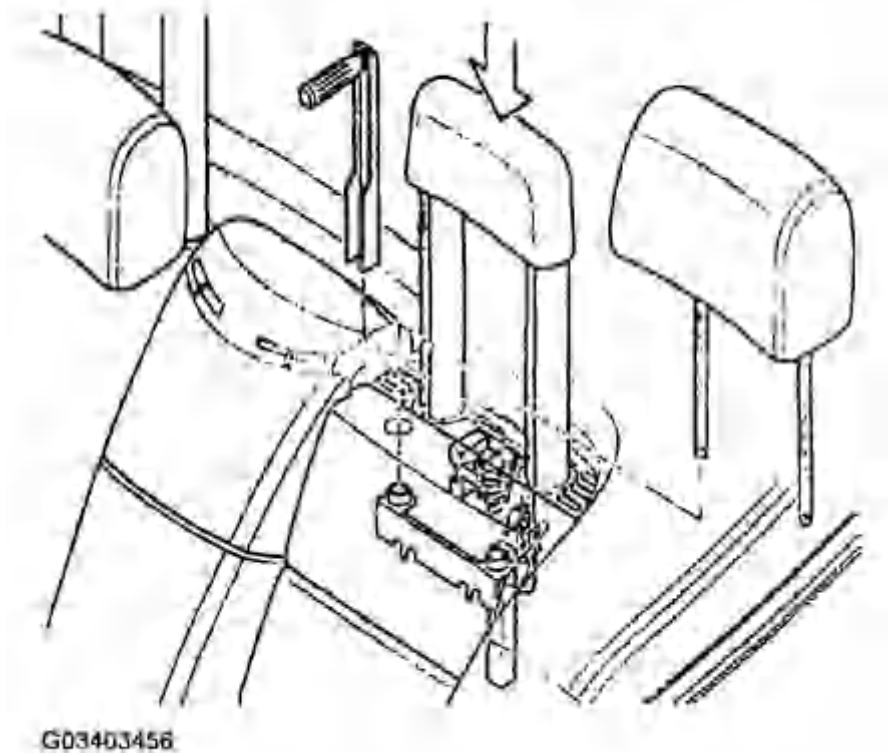
[Fig. 56: Identifying RPS Diagnosis And Testing Circuit Diagram](#)

Courtesy of BMW OF NORTH AMERICA, INC.

RETRACTING OF THE ROLL BARS

The system can be reset (retracted) using the reset tool in the vehicle tool kit. The procedure is as follows:

- Remove the rear head rest.
- Insert the tool in the slot in front of the roll bar.
- Press the tool down to release the ratchet lock of the locking lever.
- Push the roll bar down far enough to clear the ratchet.
- Remove the toll and press the roll bar down until it locks into the actuator.

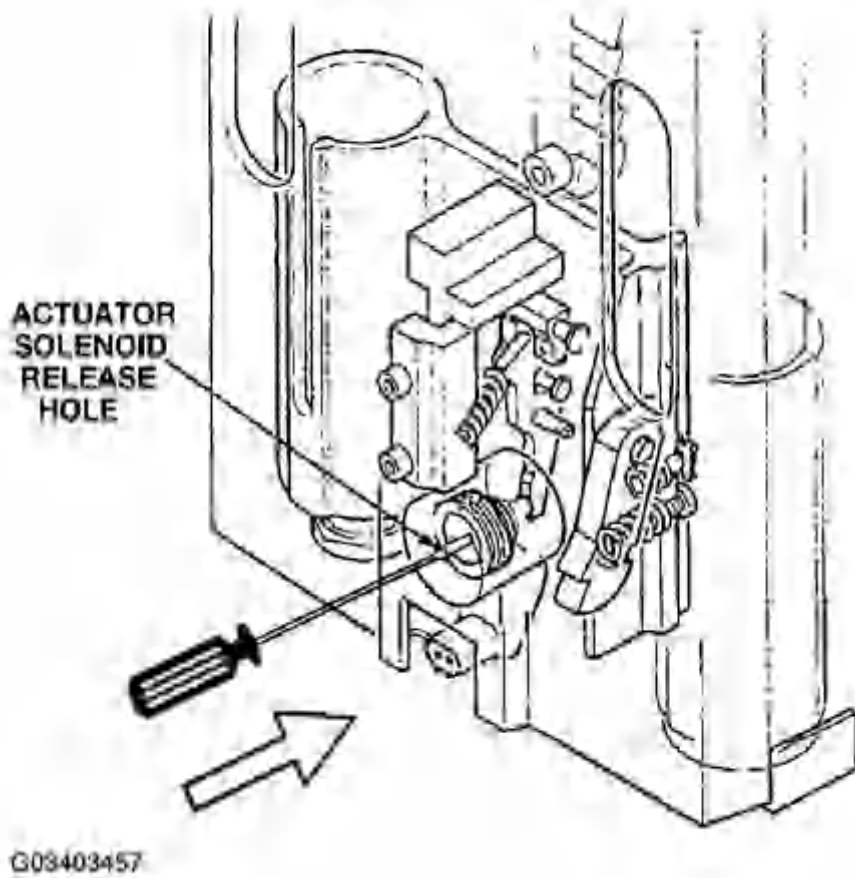


[Fig. 57: Identifying Retracting Of Roll Bars](#)

Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION:

- Adjustments or repairs to the roll bar cassette and actuators are not permitted.
- Each actuator lever has an overlap 1.2mm. This is a critical dimension: > 1.2mm = no release.
< 1.2mm = inadvertent release.
- The cassette can only be removed in a released state. An emergency release is provided on the actuator. A screwdriver can be inserted into the small hole in the actuator to release the roll bar.
- Serious injuries could result from deployment of the roll bars while removing the cassette in an armed state.



[Fig. 58: View Of Actuator Solenoid Release Hole](#)
Courtesy of BMW OF NORTH AMERICA, INC.

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