

# INTRODUCTION

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## VEHICLE IDENTIFICATION NUMBER

### DESCRIPTION


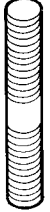


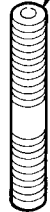

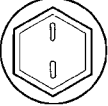
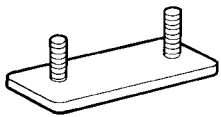


The Vehicle Identification Number (VIN) plate is located on the lower windshield fence next to the left a-pillar. The VIN contains 17 characters that provide data concerning the vehicle. Refer to the VIN DECODING INFORMATION table to determine the identification of a vehicle.

To protect the consumer from theft and possible fraud the manufacturer is required to include a Check Digit at the ninth position of the Vehicle Identification Number. The check digit is used by the manufacturer and government agencies to verify the authenticity of the vehicle and official documentation. The formula to use the check digit is not released to the general public.

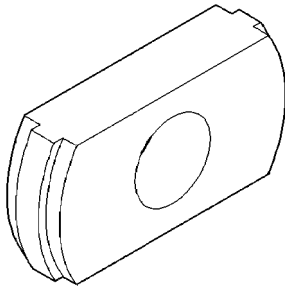
### VIN DECODING INFORMATION

POSITION	INTERPRETATION	CODE = DESCRIPTION
1, 2 & 3	World Manufacturer Code	WDX = Incomplete vehicle / Dodge WD1 = Incomplete vehicle / Dodge WD0 = Truck / Dodge WD2 = Truck / Dodge WD5 = Multi-purpose passenger vehicle / Dodge WD8 = Multi-purpose passenger vehicle / Dodge WDW = Bus / Dodge WDP = Incomplete vehicle / Freightliner WDY = Truck / Freightliner WDR = Multi-purpose passenger vehicle / Freightliner WD3 = Truck / Mercedes-Benz WD4 = Multi-purpose vehicle / Mercedes-Benz WD9 = Incomplete vehicle / Mercedes-Benz
4	Model	B = All 4x2 vehicle types / Canada P = All 4x2 vehicle types / USA X = 4x2 Chassis-cab Y = 4x2 Truck W = 4x2 Multi-purpose passenger vehicle

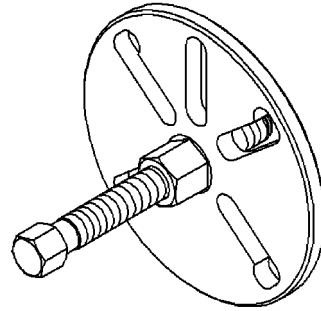
**HOW TO DETERMINE BOLT STRENGTH**

	Mark	Class		Mark	Class
Hexagon head bolt	 Bolt head No. 4 — 5 — 6 — 7 — 8 — 9 — 10 — 11 —	4T 5T 6T 7T 8T 9T 10T 11T	Stud bolt	 No mark	4T
	 No mark	4T			
Hexagon flange bolt w/washer hexagon bolt	 No mark	4T	Welded bolt	 Grooved	6T
Hexagon head bolt	 Two protruding lines	5T			
Hexagon flange bolt w/washer hexagon bolt	 Two protruding lines	6T		4T	
Hexagon head bolt	 Three protruding lines	7T			
Hexagon head bolt	 Four protruding lines	8T			

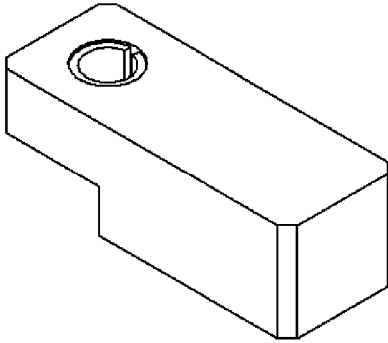
**Fig. 3 FASTENER STRENGTH**



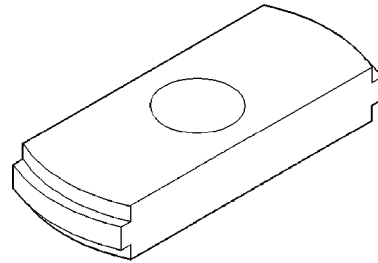
**REMOVER D-103**



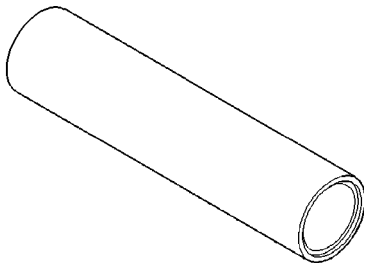
**FLANGE PULLER 8992**



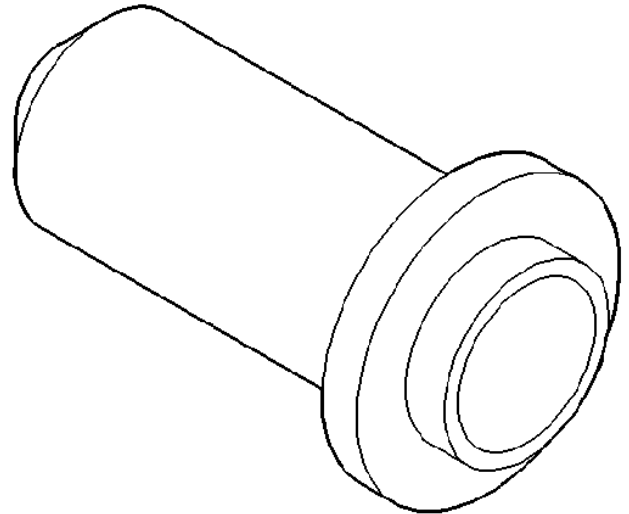
**SCOOTER BLOCK D-115-2A**



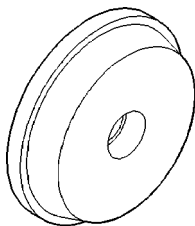
**REMOVER 9084**



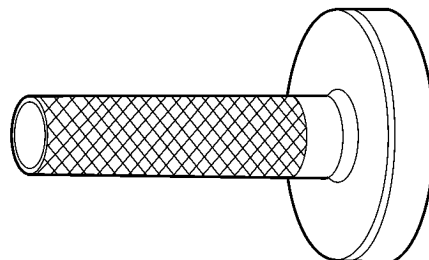
**INSTALLER 6448A**



**INSTALLER 9275**



**INSTALLER 8617**



**INSTALLER 9276**

# ENGINE SYSTEMS

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# BATTERY SYSTEM

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## BATTERY SYSTEM

### DESCRIPTION

A single 12-volt battery is standard factory-installed equipment on this model. Some vehicles are equipped with a second auxiliary battery for running additional electrical equipment. The standard battery is located in the engine compartment, while the auxiliary battery (if equipped) is located under the passengers front seat. The battery system for this vehicle covers the following related components, which are covered in further detail later in this section of the service manual:

- **Battery** - The 12v storage battery(s) provides a reliable means of storing a renewable source of electrical energy within the vehicle.

- **Battery Cables** - The battery cables connect the battery terminal posts to the vehicle electrical system.

- **Battery Holddown** - The battery holddown hardware secures the battery in the battery tray in the engine compartment.

- **Battery Tray** - The battery tray provides a secure mounting location in the vehicle for the battery and an anchor point for the battery holddown hardware.

## REMOVAL

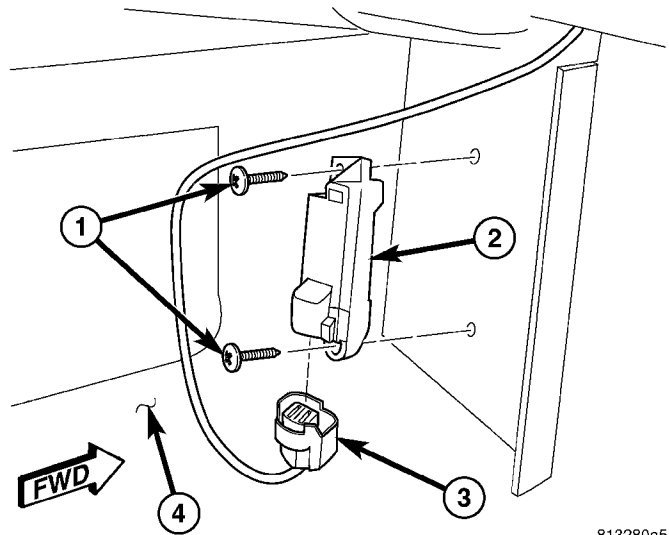
**WARNING:** To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

**WARNING:** To avoid personal injury or death, never strike or drop the side impact sensor, as it can damage the impact sensor or affect its calibration. The side impact sensor enables the system to deploy the side curtain airbags. If an impact sensor is accidentally dropped during service, the sensor must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper supplemental restraint deployment.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) Remove the trim paneling from the interior of the front door step well. (Refer to 23 - BODY/INTERIOR/STEPWELL SCUFF PADS - REMOVAL).

(3) Disconnect the vehicle wire harness connector from the side impact sensor connector receptacle (Fig. 52).



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**Fig. 52 Side Impact Sensor Remove/Install**

- 1 - SCREW (2)
- 2 - IMPACT SENSOR
- 3 - CONNECTOR
- 4 - STEP WELL

(4) Remove the two screws that secure the side impact sensor to the forward vertical surface of the step well.

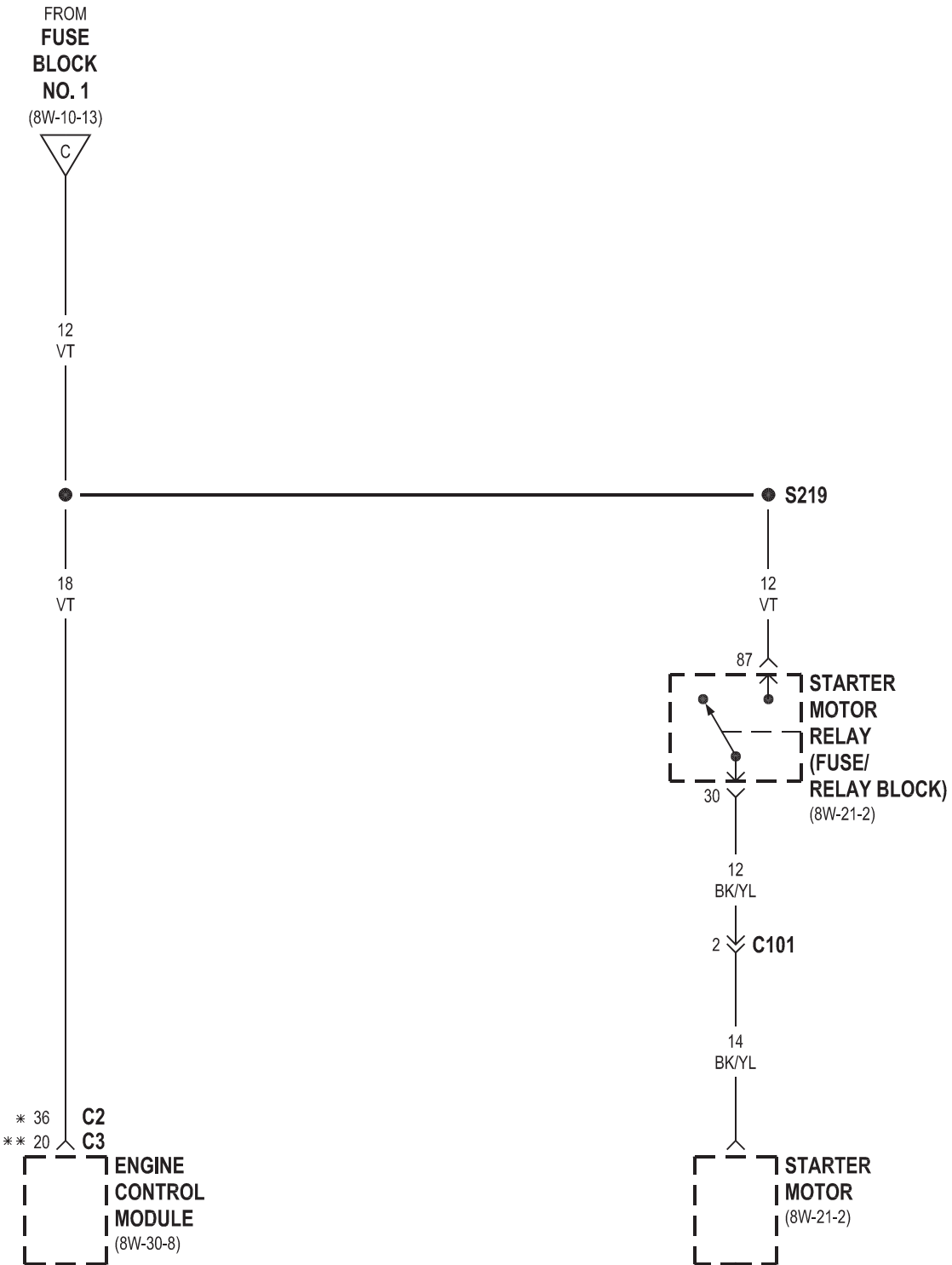
(5) Remove the side impact sensor from the step well.

## INSTALLATION

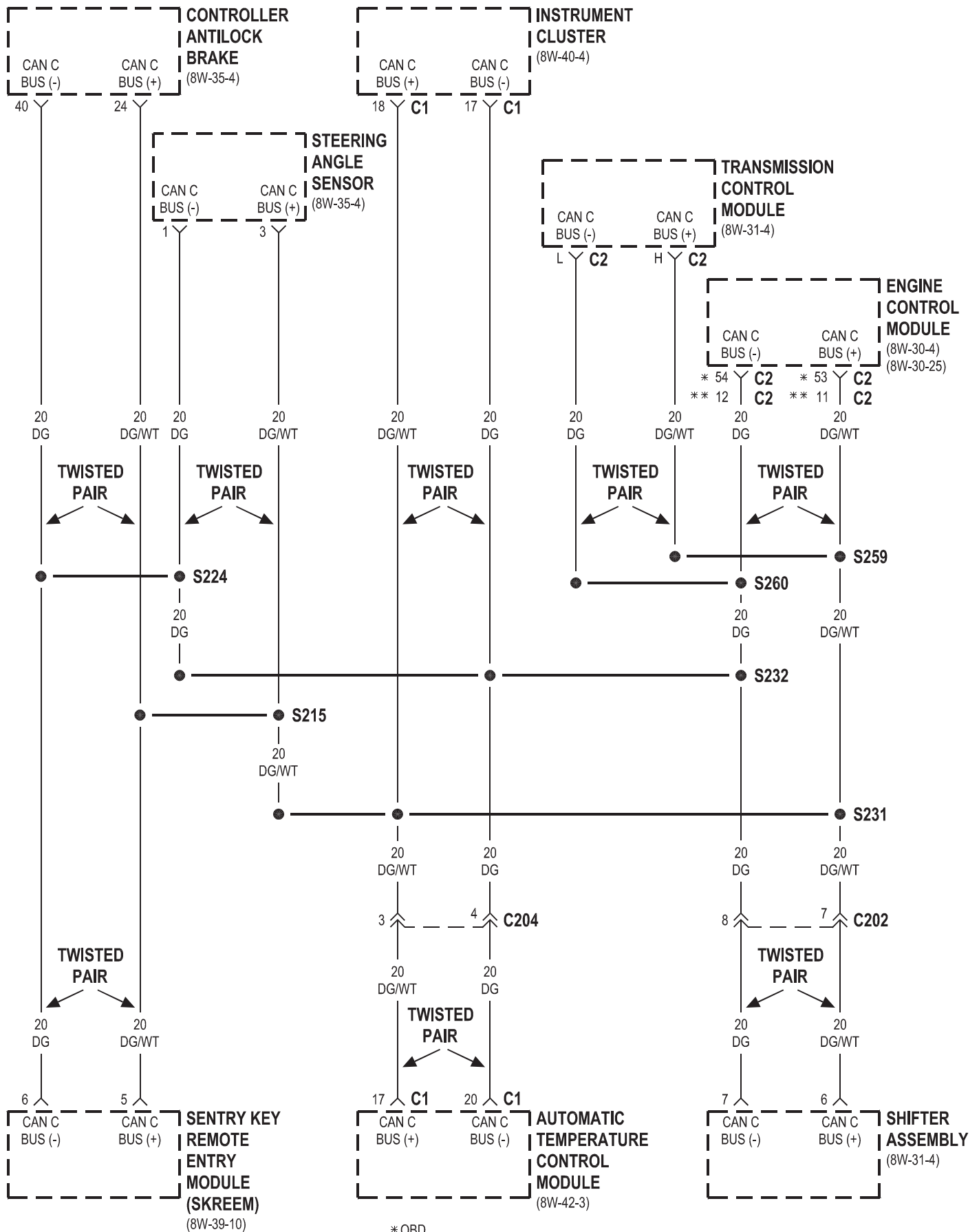
**WARNING:** To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

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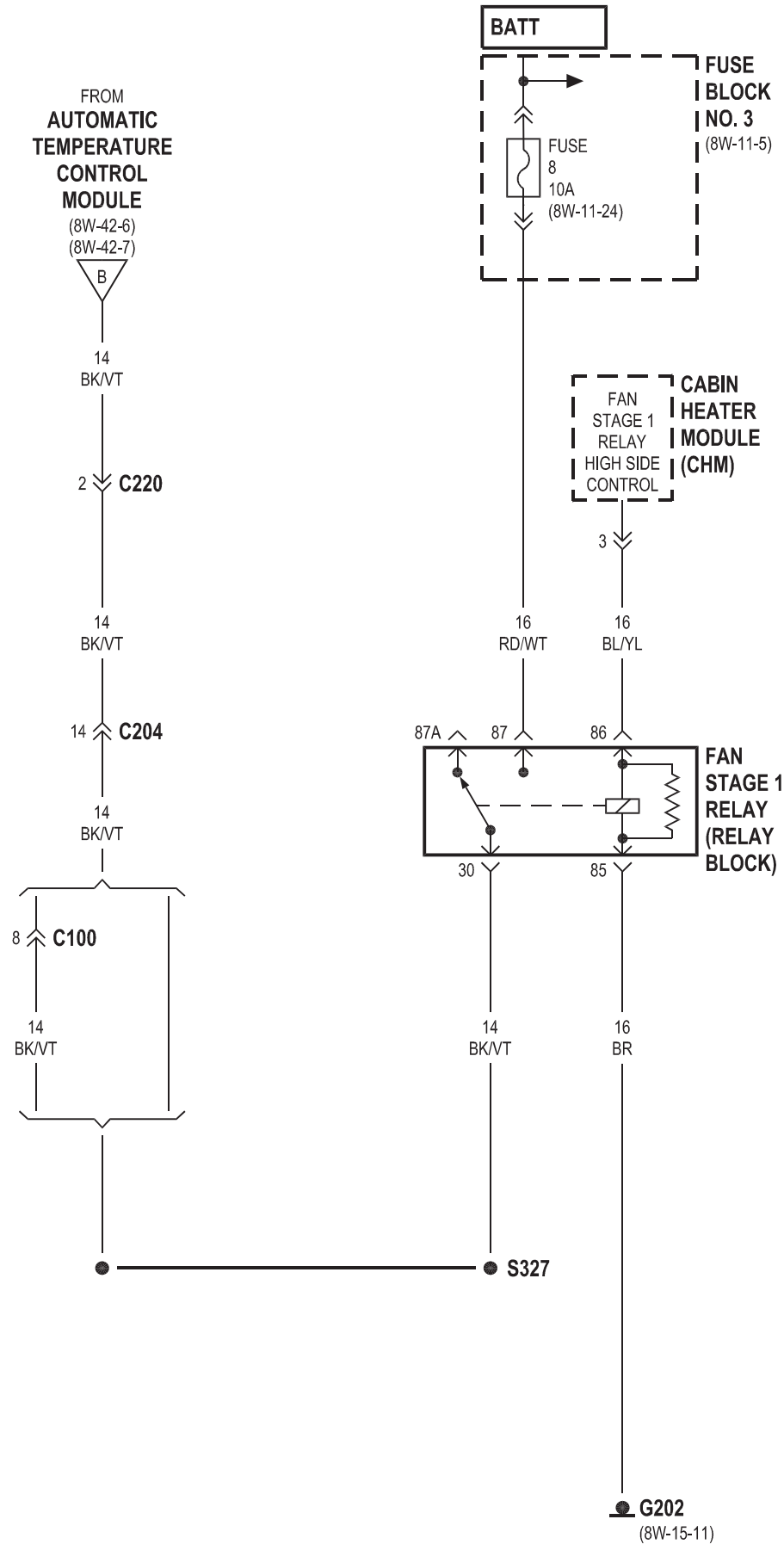
(1) Position the side impact sensor to the forward vertical surface of the step well (Fig. 52). Be certain



\* OBD  
 \*\* EXCEPT OBD



\* OBD  
\*\* EXCEPT OBD

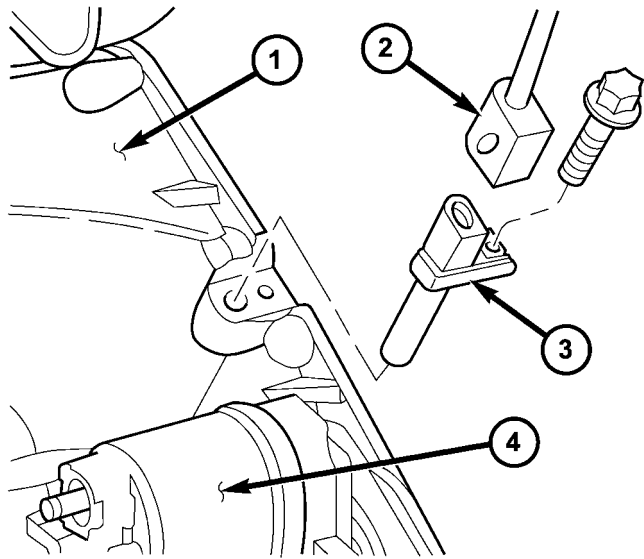




CONNECTOR  
NOT  
AVAILABLE

ENGINE CONTROL MODULE C2 (OBD)

CAV	CIRCUIT	FUNCTION
1	16BK/RD	FUSED ENGINE CONTROL RELAY OUTPUT
2	14BR	GROUND
3	14BK/BL	FUSED ENGINE CONTROL RELAY OUTPUT
4	14BR	GROUND
5	14BK/BL	FUSED ENGINE CONTROL RELAY OUTPUT
6	14BR	GROUND
7	18RD	S/C SWITCH 12 VOLT SUPPLY
8	18BR/WT	HIGH IDLE ON SIGNAL
10	18WT/RD	BOOST PRESSURE SENSOR 5 VOLT SUPPLY
11	18WT/DG	BOOST PRESSURE SENSOR SIGNAL
12	18BR/WT	SENSOR GROUND
13	18GY/DG	ACCEL PEDAL POSITION SENSOR SIGNAL NO. 2
14	18BR/GY	ACCEL PEDAL POSITION SENSOR GROUND NO. 2
17	18BR/DG	KICKDOWN SWITCH SIGNAL
18	20DG/YL	ENGINE RPM
19	18BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
24	18BL/RD	ACCEL PEDAL POSITION SENSOR 5 VOLT SUPPLY
25	18BL/DG	ACCEL PEDAL POSITION SENSOR SIGNAL NO. 1
26	18BR/BL	ACCEL PEDAL POSITION SENSOR GROUND NO. 1
28	18BR/DG	INTAKE AIR TEMPERATURE SENSOR GROUND
31	20BL/YL	K-ECM
32	20DG	ENHANCED ACCIDENT REPORT DRIVER
36	18VT	IGNITION SWITCH OUTPUT (START)
37	18DG	ACCEL/SET SIGNAL
38	18BK	VERIFICATION SIGNAL
42	18DG/WT	INTAKE AIR TEMPERATURE SENSOR SIGNAL
43	18BK/RD	GLOW PLUG MODULE CONTROL
44	18YL/BL	ENGINE CONTROL RELAY CONTROL
50	18YL	DECEL/SET SIGNAL
51	18GY	OFF SIGNAL
52	18BL	RESUME SIGNAL
53	20DG/WT	CAN C BUS (+)
54	20DG	CAN C BUS (-)
55	18BR/RD	FUEL PUMP RELAY CONTROL
58	18VT/DG	STARTER MOTOR RELAY CONTROL



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**Fig. 8 CRANKSHAFT POSITION SENSOR**

- 1 - ENGINE BLOCK
- 2 - WIRING HARNESS CONNECTOR
- 3 - CRANKSHAFT POSITION SENSOR
- 4 - STARTER SOLENOID

(11) Install the torque converter access plate. Refer to (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - INSTALLATION) for correct sequence and torque specification.

(12) Install the transmission cooler lines to transmission. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - INSTALLATION) for correct sequence and torque specification.

(13) Connect the engine valley drain hose to the transmission (Fig. 5).

(14) Install transmission electrical connector and shifter hardware. Refer to (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - INSTALLATION) for correct sequence and torque specification.

(15) Install the steering gear and tighten in two stages. 25 N·m (18.5 lbs. ft.), then 45 N·m (33 lbs. ft.) plus 90°.

(16) Install the starter.

(17) Connect the ground strap (left side).

(18) Align and install the exhaust and bracket (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - INSTALLATION).

(19) Lower the vehicle.

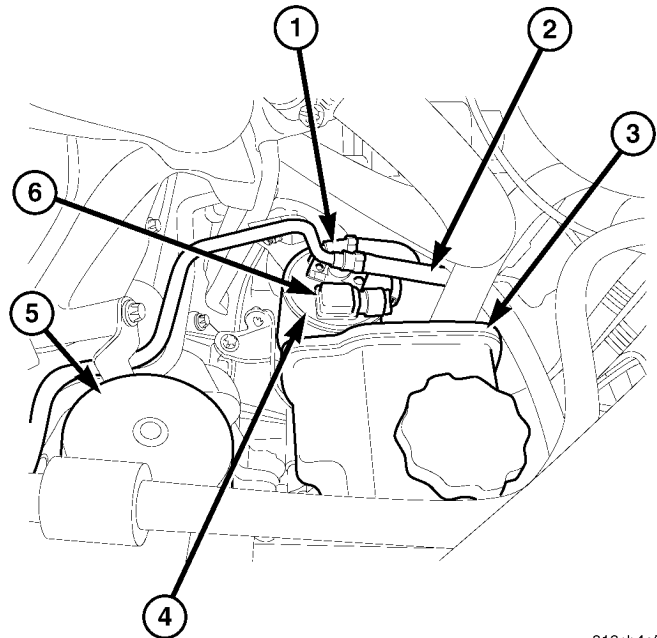
(20) Install the lower heater housing and filter.

(21) Install the air inlet hose, CCV breather and CCV heater at the turbocharger (Fig. 4).

(22) Connect the coolant supply and return hoses.

(23) Connect the brake booster vacuum hose at the vacuum pump.

(24) Connect the fuel lines at the filter assembly (Fig. 9).



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**Fig. 9 FUEL FILTER**

- 1 - FUEL SUPPLY FROM TANK
- 2 - FUEL SUPPLY TO HIGH PRESSURE PUMP
- 3 - POWER STEERING RESERVOIR
- 4 - FUEL FILTER
- 5 - OIL FILTER
- 6 - WATER IN FUEL SENSOR

(25) Connect the power steering hoses.

(26) Install the radiator/charge air cooler and hose(s) assemblies (Refer to 7 - COOLING/ENGINE/RADIATOR - INSTALLATION).

(27) Install A/C condenser and fan assemblies. Connect the fan harness connector.

(28) Connect the refrigerant lines.

(29) Install a air conditioning receiver/drier (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/RECEIVER / DRIER - INSTALLATION).

(30) Connect the upper and lower radiator hoses.

(31) Connect the transmission lines at the radiator.

(32) Install air cleaner housing and connect the air inlet duct and air flow sensor.

(33) Connect the charge air cooler hose at intake manifold. (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

(34) Route the engine wiring harness inside the vehicle and connect.

(35) Install the turbocharger heat shield.

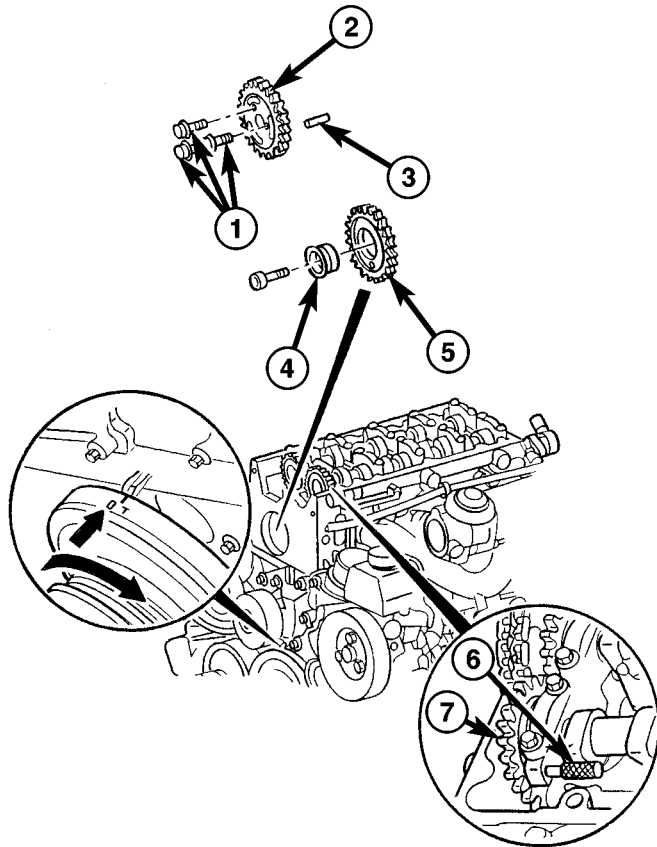
(36) Install the front grille and fascia assembly.

(37) Connect the negative battery cable.

(38) Check and fill engine oil (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - SPECIFICATIONS).

(12) Remove the intake camshaft (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).

(13) Remove intermediate gear and bushing (Fig. 76).



**Fig. 76 HIGH PRESSURE PUMP INTERMEDIATE GEAR**

- 1 - CAMSHAFT SPROCKET BOLTS
- 2 - INTAKE CAMSHAFT
- 3 - DOWEL PIN
- 4 - INTERMEDIATE GEAR BUSHING
- 5 - INTERMEDIATE GEAR
- 6 - CAMSHAFT LOCKING PIN #8929
- 7 - INTAKE CAMSHAFT SPROCKET

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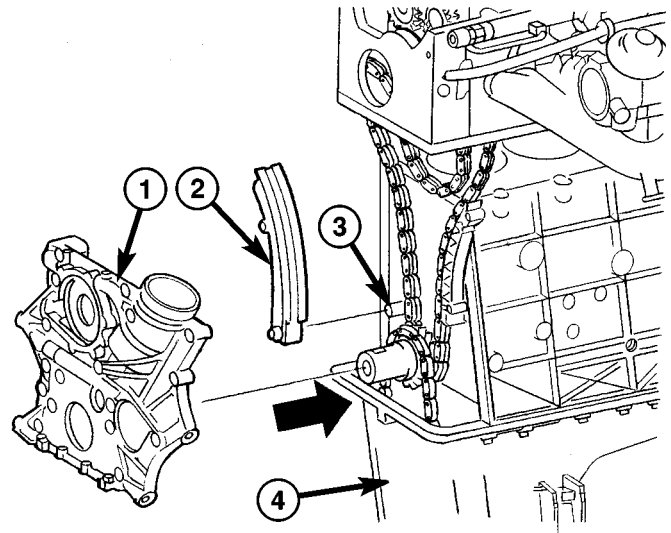
## REMOVAL - TIMING CHAIN TENSIONING RAIL

- (1) Disconnect negative battery cable.
- (2) Remove cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

**NOTE:** Remove timing case cover carefully. Care must be taken not to damage oil pan gasket.

(3) Remove timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

(4) Remove tensioning rail from bearing pin (Fig. 77).



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**Fig. 77 TIMING CHAIN TENSIONING RAIL**

- 1 - TIMING CHAIN COVER
- 2 - TENSIONING RAIL
- 3 - BEARING PIN
- 4 - OIL PAN

## REMOVAL - TIMING CHAIN

(1) Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

**NOTE:** Cover the timing chain area. Care must be taken not to drop any repair debris or pieces into the engine when separating the timing chain links.

(2) Install special tool # 9525 using two of the cylinder head cover bolts (Fig. 78).

# LINKAGE

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## LINKAGE

### DIAGNOSIS AND TESTING - OUTER TIE ROD END

**NOTE: If the outer tie rod end is equipped with a lubrication fitting, grease the joint then road test the vehicle before performing test.**

- (1) Raise the front of the vehicle. Place safety floor stands under both lower control arms as far outboard as possible. Lower the vehicle to allow the stands to support some or all of the vehicle weight.
- (2) Remove the front tires.
- (3) Mount a dial indicator solidly to the vehicle steering knuckle and then zero the dial indicator.

(4) Position indicator plunger on the topside of the outer tie rod end.

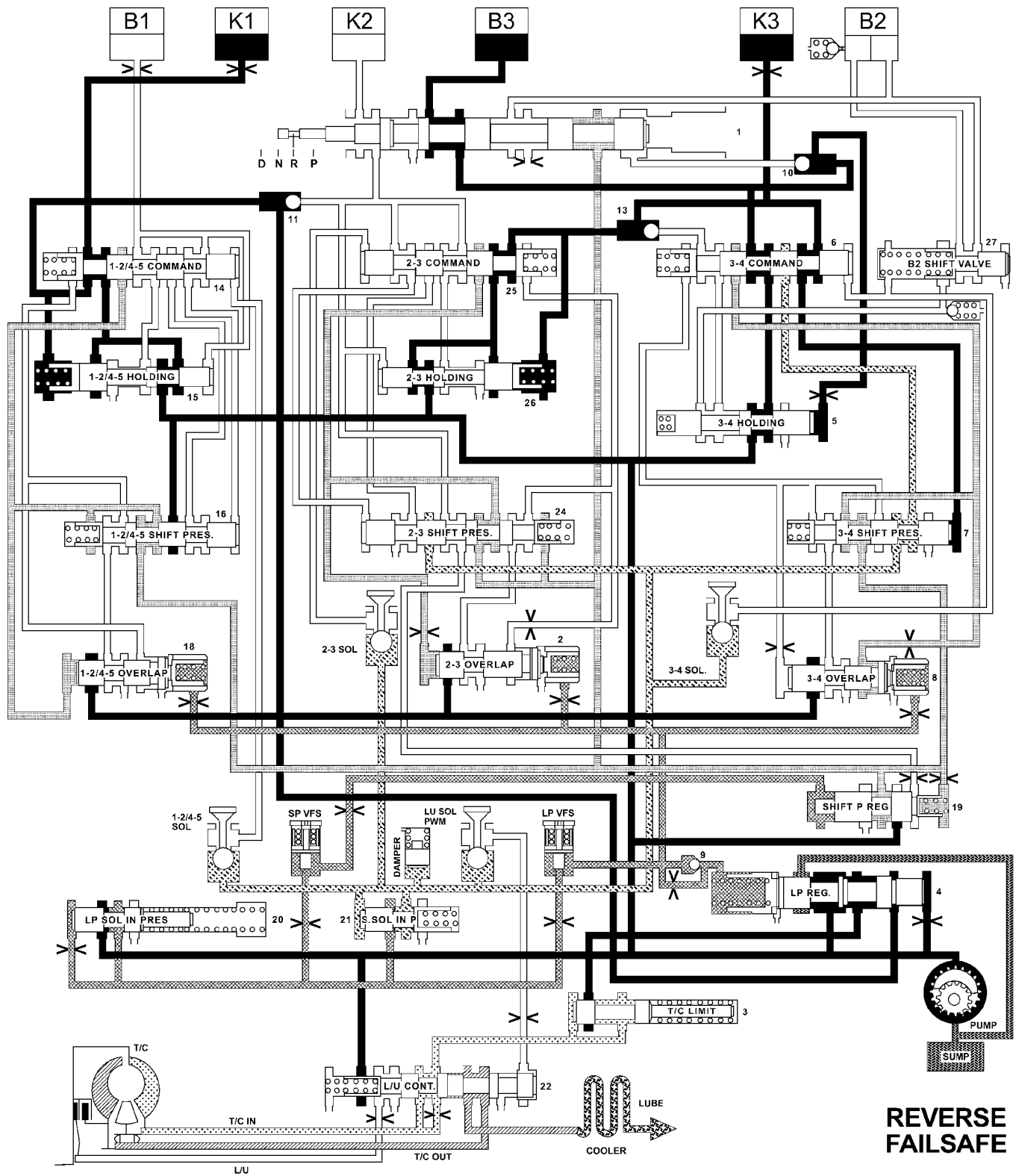
**NOTE: The dial indicator plunger must be perpendicular to the machined surface of the outer tie rod end.**

- (5) Position a pry bar in order to pry downwards on the outer tie rod end.
- (6) If the travel exceeds 0.5 mm (0.020 in.), replace the outer tie rod end (Refer to 19 - STEERING/LINKAGE/TIE ROD END - REMOVAL).
- (7) If the outer tie rod end is within specs reinstall the front tires (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

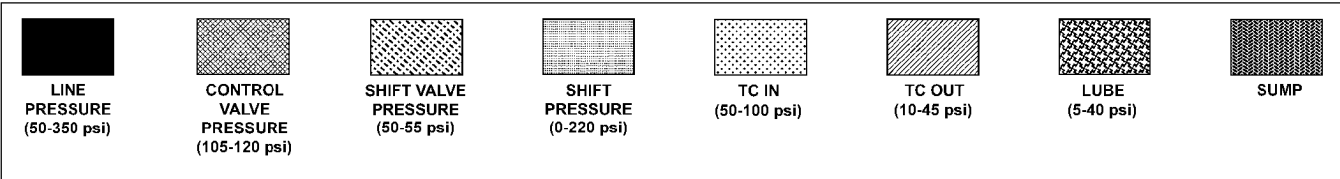
### SPECIFICATIONS - TORQUE CHART

TORQUE SPECIFICATIONS

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Outer Tie Rod End Nut	130	96	—
Outer Tie Rod End Locking Nut	50	37	—
Steering Gear Boot Clamp	7	—	62



**REVERSE FAILSAFE**



**HYDRAULIC FLOW IN REVERSE - FAILSAFE**

Engine starts must not be possible in any other gear position.

(3) With floor shift lever handle push-button not depressed and lever in in:

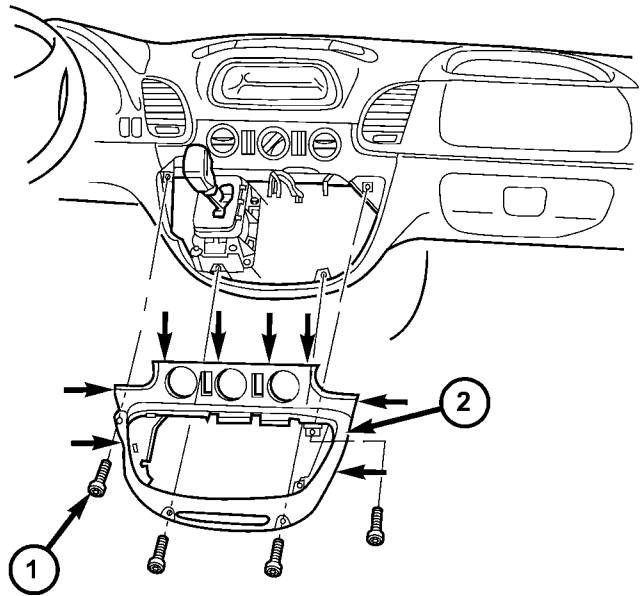
(a) PARK position - Apply forward force on center of handle and remove pressure. Engine starts must be possible.

(b) PARK position - Apply rearward force on center of handle and remove pressure. Engine starts must be possible.

(c) NEUTRAL position - Normal position. Engine starts must be possible.

(d) NEUTRAL position - Engine running and brakes applied, apply forward force on center of shift handle. Transmission shall not be able to shift from NEUTRAL to REVERSE.

**REMOVAL**

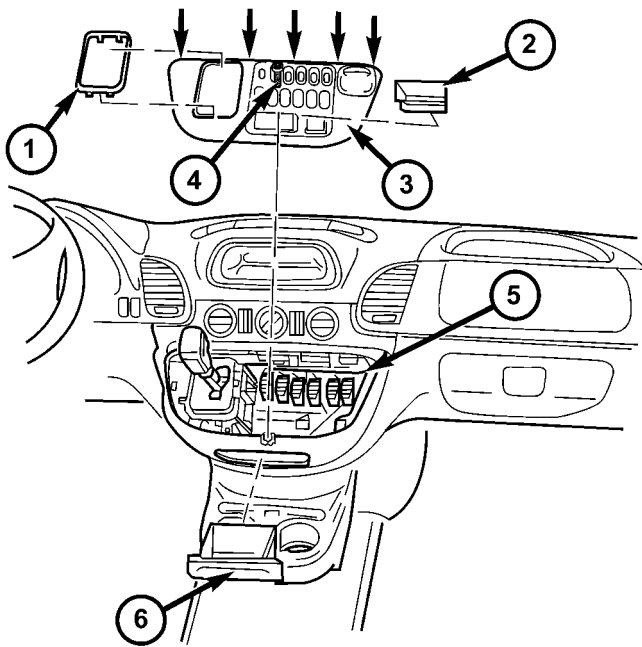


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**Fig. 160 Remove Bottom Section Of Center Instrument Panel**

- 1 - SCREW
- 2 - BOTTOM CENTER PART OF INSTRUMENT PANEL

(3) Remove bottom (2) (Fig. 160) of the center section of instrument panel.

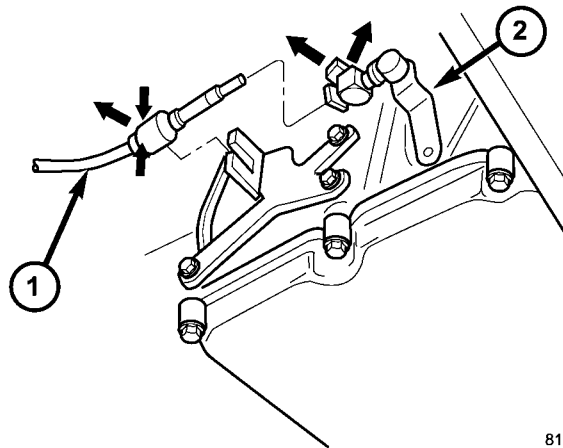


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**Fig. 159 Remove Top Section Of Center Instrument Panel**

- 1 - SHIFT LEVER ASSEMBLY FRAME TRIM
- 2 - STORAGE COMPARTMENT
- 3 - TOP CENTER PART OF INSTRUMENT PANEL
- 4 - SCREW
- 5 - PLUG CONNECTIONS
- 6 - ASHTRAY

(1) Move selector lever to position "D".  
 (2) Remove top (3) (Fig. 159) of the center section of instrument panel.



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**Fig. 161 Remove Shift Cable From Transmission**

- 1 - SHIFT CABLE
- 2 - TRANSMISSION SHIFT LEVER

(4) Pry ball socket of transmission shift cable off ball knob at the shift lever assembly (SLA). Use a suitable slotted screwdriver.

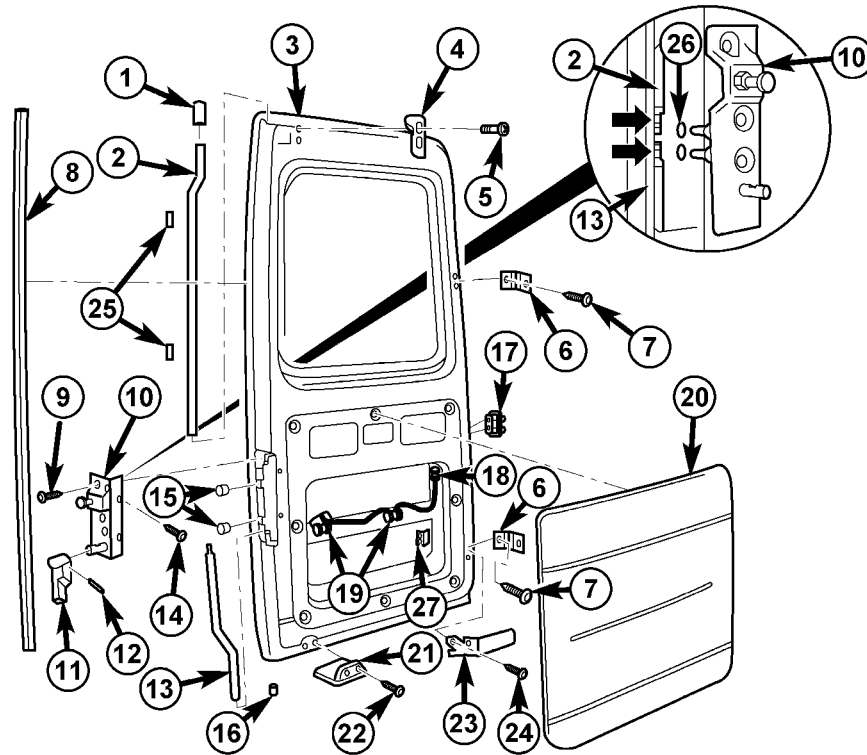
(5) Raise and support vehicle.

(6) Detach shift cable (1) at transmission.

(a) Unlatch ball socket latch (Fig. 161) of cable.

(b) Unclip shift cable retainer from retainer bracket. When pulling out cable, press together hooks of shift cable retainer at the points shown (arrows).

## LEFT DOOR



81125d4a

Fig. 5 LEFT DOOR

- |                          |                             |
|--------------------------|-----------------------------|
| 1 - UPPER LOCK ROD GUIDE | 15 - CLIPS (2)              |
| 2 - UPPER LOCK ROD       | 16 - BOTTOM LOCK ROD GUIDE  |
| 3 - LEFT REAR DOOR       | 17 - SWITCHES               |
| 4 - TOP CLOSING WEDGE    | 18 - ELECTRICAL CONNECTOR   |
| 5 - BOLTS (2)            | 19 - LICENSE PLATE LIGHTING |
| 6 - HINGE                | 20 - TRIM PANEL             |
| 7 - BOLTS (2)            | 21 - BOTTOM CLOSING WEDGE   |
| 8 - REAR DOOR SEAL       | 22 - RIVETS (2)             |
| 9 - SCREWS (2)           | 23 - DOOR CHECK             |
| 10 - LOCK ROD ACTUATOR   | 24 - BOLTS (2)              |
| 11 - LOCK ROD HANDLE     | 25 - FELT STRIP             |
| 12 - ROLL PIN            | 26 - O-RINGS (2)            |
| 13 - BOTTOM LOCK ROD     | 27 - THREADED PLATE         |
| 14 - SCREWS (2)          |                             |

(1) Remove door. (Refer to 23 - BODY/DOORS - REAR/DOOR - REMOVAL)

(2) Remove trim panel (20) (Fig. 5). (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL)

(3) Disconnect electrical connectors and remove license plate lighting (18, 19).

(4) Pull out switch and disconnect electrical connector (17).

(5) Remove and discard roll pin (12) and remove lock rod handle (11).

(6) Remove door check (23). (Refer to 23 - BODY/DOORS - REAR/CHECK - REMOVAL)

(7) Remove door hinge (6). (Refer to 23 - BODY/DOORS - REAR/HINGE - REMOVAL)

(8) Remove closing wedge (4).

(9) Remove rivets (22) and remove bottom closing wedge (21).

(10) Remove rear door seal (8).

(11) Remove the four screws (9, 14) from the lock rod actuator.

(12) Using locking pliers, hold upper lock rod (2) and remove lock rod actuator.

(13) Remove clips (15).

(14) Pull out lock rod guides (1, 16) and remove lock rods (2, 13).