

SECTION 8B

LIGHTING SYSTEMS

CAUTION: Before removing or installing any electrical unit, or when a tool or equipment could easily come in contact with exposed electrical terminals, make sure the ignition switch and headlamp switch are in the OFF position. In cases where the circuit would still be "live" or "hot at all times," disconnect the negative battery cable. This is to help prevent personal injury and/or damage to the vehicle or components.

NOTICE: When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread locking compound will be called out. The correct torque value must be used when installing fasteners that require it. If the above conditions are not followed, parts or system damage could result.

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GENERAL DESCRIPTION

LIGHTING SYSTEMS

When diagnosing a system, keep in mind that a problem in one circuit may show up in other circuits because of a common junction. Also, several lighting circuits may have a common switch and fuse.

To become familiar with wiring systems, refer to the electrical diagnosis section of NATP-9442. The diagrams will be helpful in tracing circuits and diagnosing lighting system problems.

Periodically verify that all wiring connections are clean and tight, that lighting units are tightly mounted to provide a good ground, and that headlamps are proper-

ly adjusted. High resistance from loose or corroded connections may cause a discharged battery, difficult starting, dim lamps, and possible damage to the generator and its regulator.

Wires and/or harnesses must be replaced if insulation is burned, cracked, or deteriorated. When it is necessary to splice a wire or repair one that is broken, use rosin flux solder to bond the splice and cover all splices and bare wires with splicing tape. By referring to applicable wiring diagrams in the electrical diagnosis section of NATP-9442, circuits may be tested for continuity and shorts with a voltmeter or an circuit powered test lamp.

DESCRIPTION OF EXTERIOR FRONT LIGHTING

FOG LAMP SYSTEM

Fog lamps are optional. The fog lamp circuit is controlled by a switch located on the instrument panel to the right of the steering column and a relay (figures 1, 2, 3, and 6). The ORN/BLK wire at the relay is hot at all times. When the fog lamp switch is turned on, the coil in the fog lamp relay is energized and the relay switch closes, completing the circuit to the fog lamps. An indi-

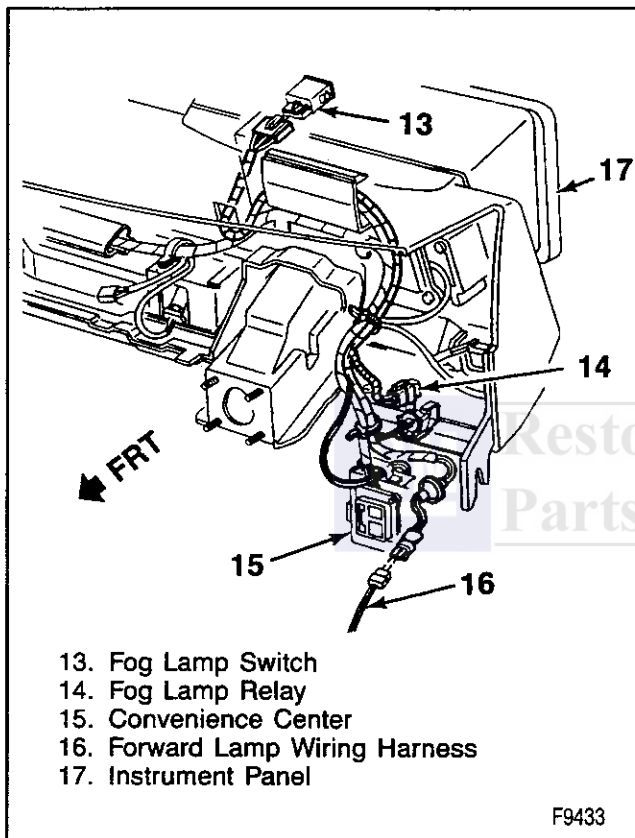


Figure 1—Fog Lamp Wiring

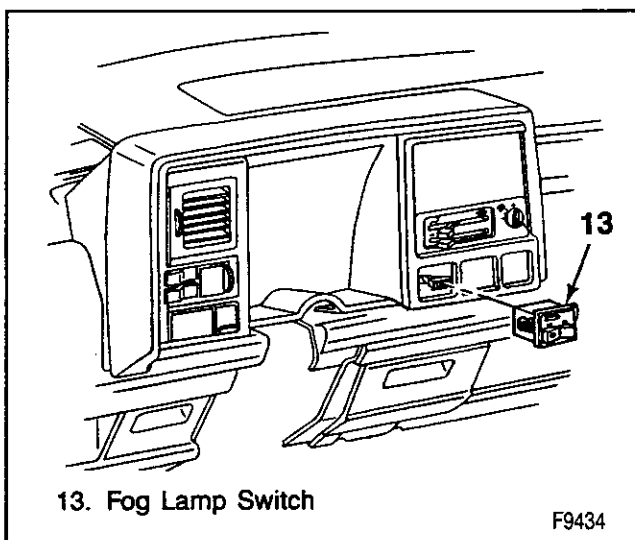


Figure 2—Fog Lamp Switch

cator lamp in the fog lamp switch turns on when the fog lamps are on.

The parking lights or the low beam headlamps must be on before the fog lamps can be turned on.

If the headlamp dimmer switch is turned to the high beams, voltage is applied to the fog lamp switch through the LT GRN wire. The ON/OFF logic in the fog lamp switch will open the coil circuit, shutting off power to the lamps.

The fog lamp circuit and switch are protected by the 30-amp ACC/CB circuit breaker and 5-amp PANEL LPS fuse.

HEADLAMP SYSTEM

The headlamps are controlled by the headlamp switch located on the left side of the instrument panel. The switch has an internal self-resetting circuit breaker that opens when the headlamp circuit draws too much current. When the circuit breaker cools, it closes again.

If the ignition is off and the headlamps are on, a warning tone will sound as a reminder to turn the lamps off. Refer to the electrical diagnosis section of NATP-9442 for diagnosis of the reminder system.

Sealed beam halogen headlamps are standard equipment. Rectangular composite headlamps with halogen bulbs are optional.

The headlamp harness routes from the fuse block to the lamp switches, then to the left side of the engine compartment and across the lower radiator support (figures 4 and 5).

The headlamp high and low beams are controlled by the dimmer switch located on the steering column. Refer to SECTION 3F1 or 3F2 for service information on the dimmer switch.

HEADLAMPS WITH DAYTIME RUNNING LIGHTS (CANADA ONLY)

Canadian vehicles are equipped with daytime running lights (DRL). This system is designed to turn on the high beam headlamps at reduced brightness any time the ignition switch is in the RUN position and the parking brake is released. If the headlamp switch is turned on, the DRL system is disconnected by the DRL module, and the headlamps operate normally.

When the daytime running lamps are on, an indicator lamp will turn on in the instrument cluster for 2 reasons: as an indicator that DRL is operating, and as a reminder to turn on the headlamps after dusk.

Voltage is applied at all times to the DRL relay through the DRL fuse and ORN wire (figures 6 and 7). When the ignition switch is in the RUN position, voltage is applied through the GAGES fuse and the PNK/BLK wire. When the coil is energized, the switch in the relay closes, and current flows through the DK BLU/WHT wire to the high beam of the left headlamp, through the LT GRN wire to the high beam of the right headlamp and ground. This puts the high beam lamps in series.

The DRL module controls the relay to prevent the daytime running lamps from turning on when the parking brake is applied, when the engine is being cranked,

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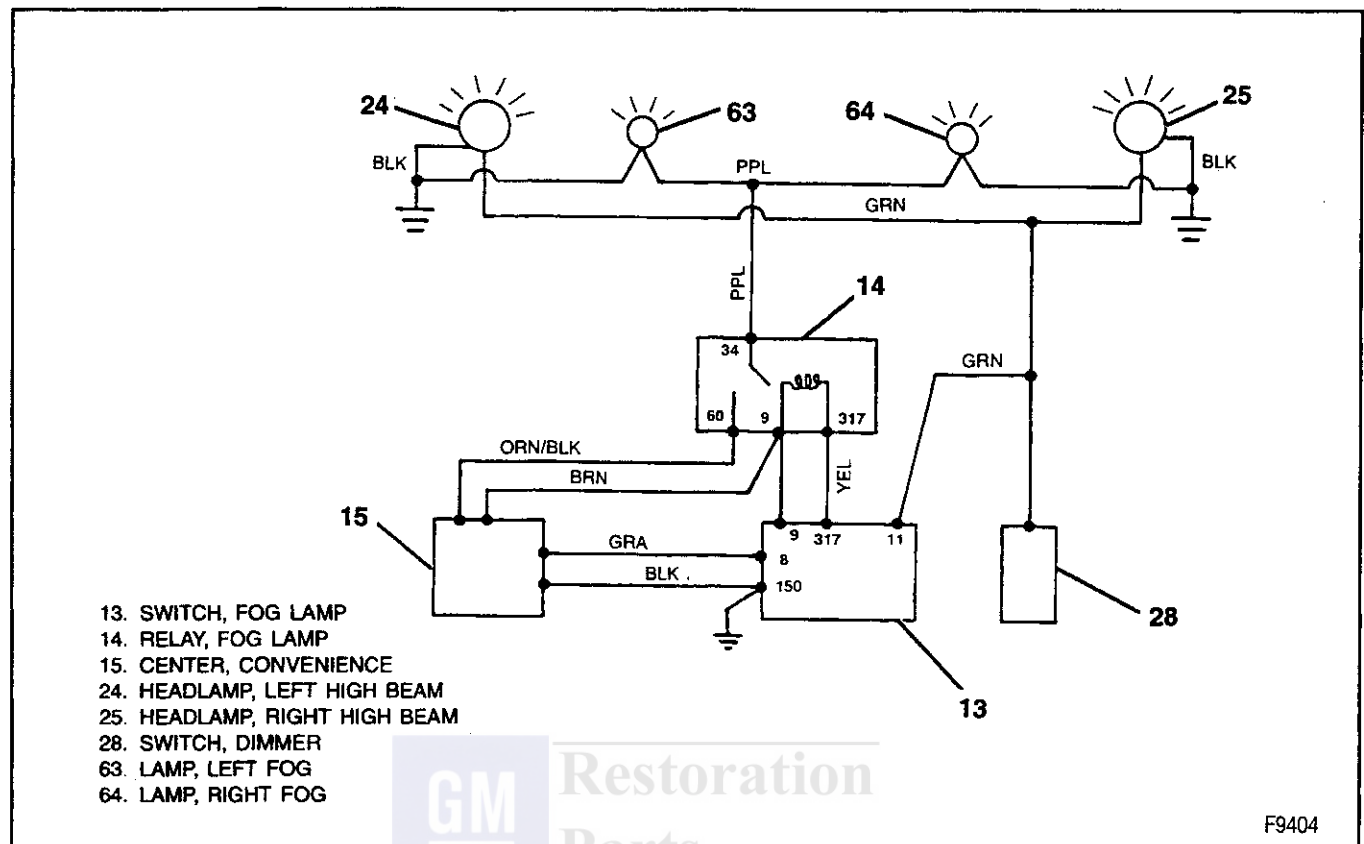


Figure 3—Fog Lamp Circuit—

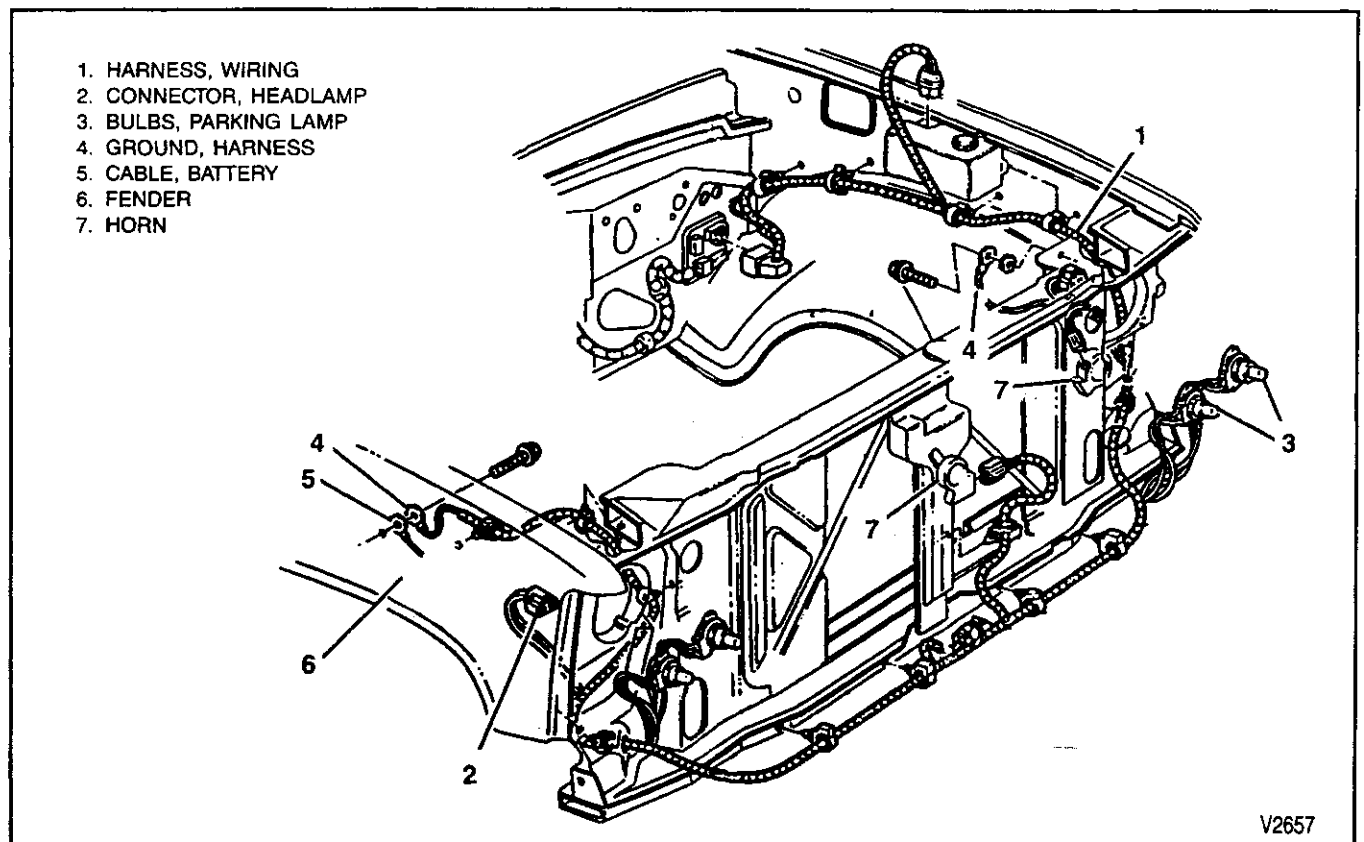


Figure 4—Forward Lamp Harness (Sealed Beam Headlamps)

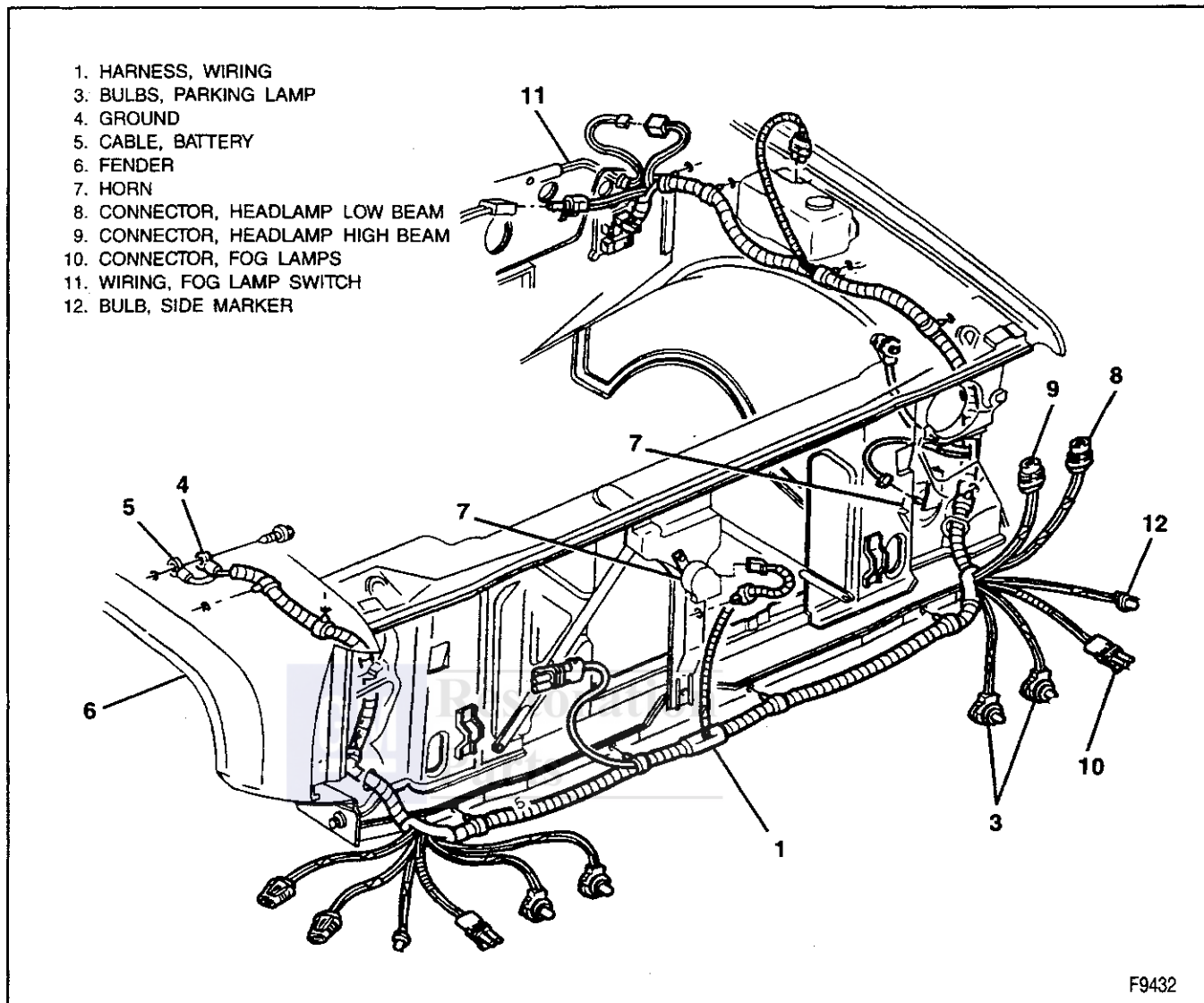


Figure 5—Forward Lamp Harness (Composite Headlamps and Fog Lamps)

or when the headlamp switch is turned on. It does this by controlling the ground side of the relay coil (LT GRN/BLK wire) and the ground side of the relay switch (BLK wire). Voltage is applied to the DRL module when the ignition switch is in RUN through the BRN wire from the A/C HTR fuse (suburban/utility) or the PNK/BLK wire (pickups and cab/chassis). The module grounds the relay through the LT GRN/BLK wire, and the DRL indicator lamp in the instrument cluster turns on.

If the parking brake is applied, the DRL module senses this through the TAN/WHT wire. If the engine is cranked, voltage will not be applied through the BRN wire. In either instance, the DRL module will not switch the LT GRN/BLK wire from the relay to ground, so the relay will not energize.

The DRL module is also part of the headlamp circuit. The headlamp wiring and dimmer switch wiring connect to the module through the YEL wire and the LT GRN wire. When the headlamp switch is turned on, the module senses battery voltage at the YEL wire and will not connect the LT GRN relay wire to ground. With the

relay de-energized, the headlamps operate normally. However, ground for the left headlamp is provided through the DK BLU/WHT wire, the normally closed contacts of the DRL relay, and the BLK wire.

The DRL module is located behind the left side of the instrument panel and is taped to the instrument panel wiring harness.

TURN SIGNAL RELAYS (SNOW PLOW APPLICATION)

Two relays mount to the radiator support when the vehicle is equipped with the snow plow option (figure 8). The circuit starts at the battery junction block. Voltage is supplied at all times to the switch in each relay. When the turn signal lever is turned to the left or right, the coil in the left or right relay energizes, and the switch closes, providing voltage to the snow plow turn signal. The coil in the left relay grounds at the sheet metal above the left headlamp. The coil in the right relay grounds at the right fender near the battery.

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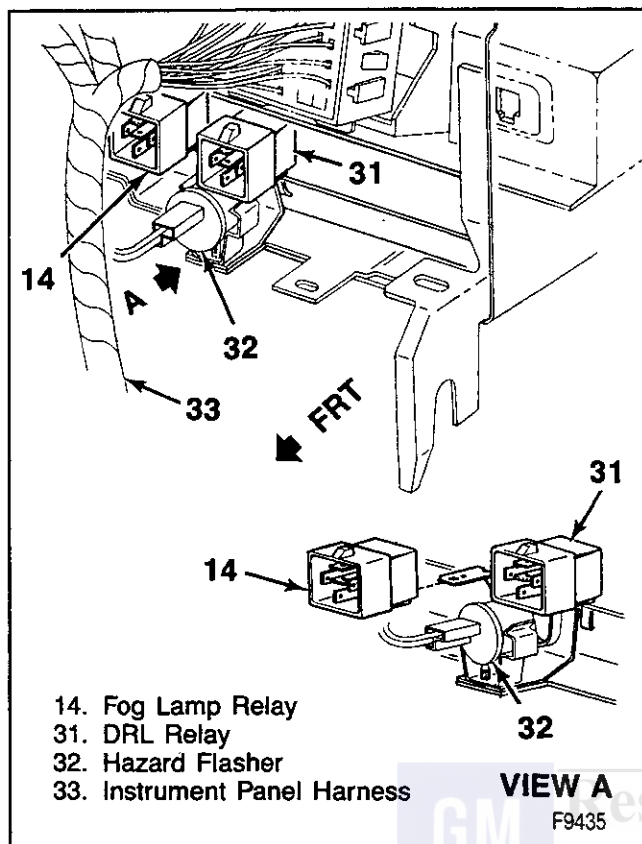


Figure 6—DRL Relay and Fog Lamp Relay

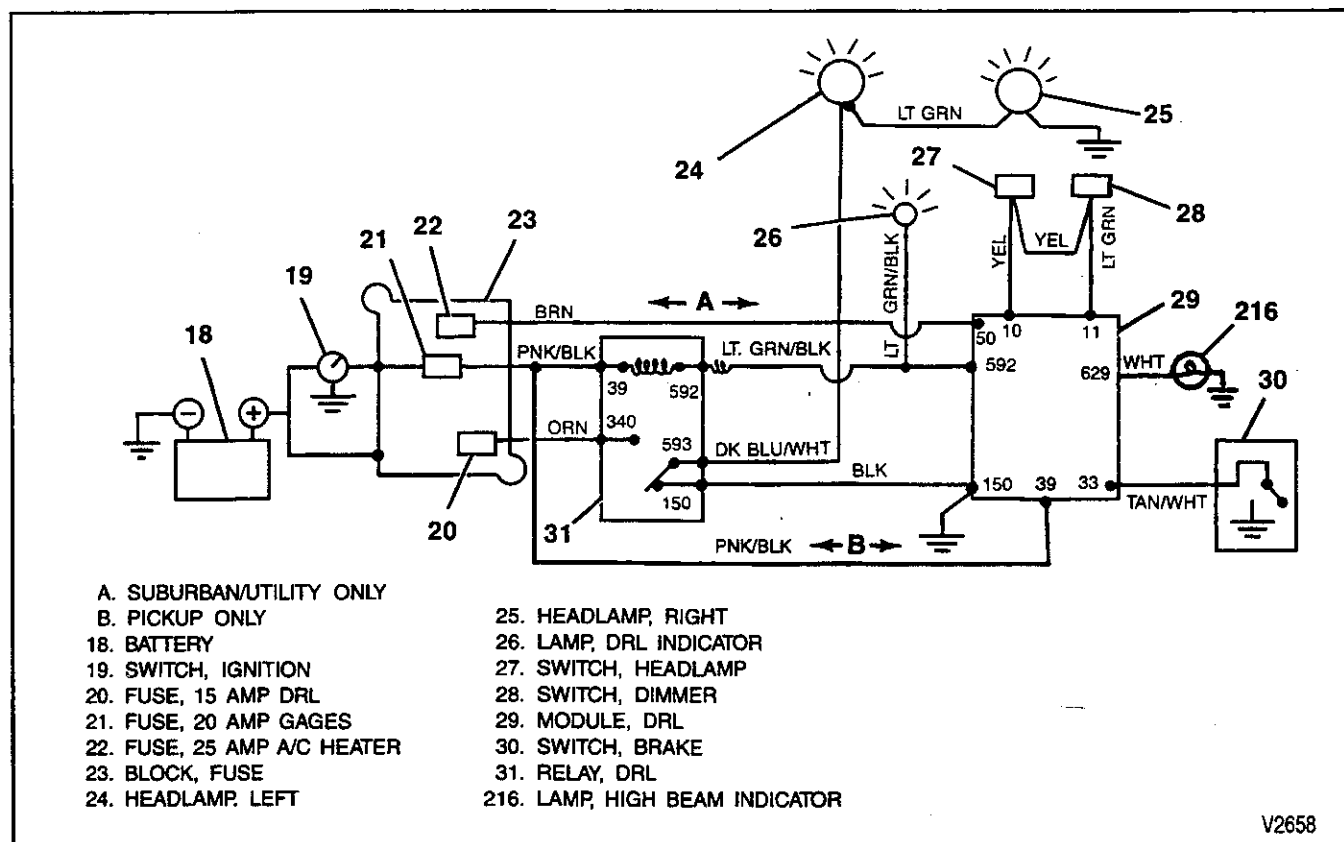


Figure 7—DRL Schematic

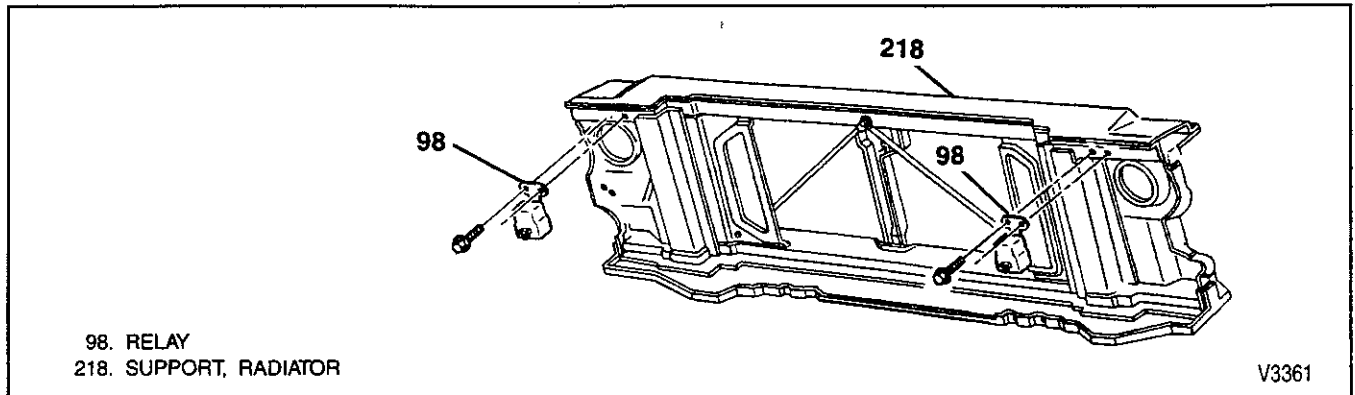


Figure 8—Snow Plow Relays

DESCRIPTION OF EXTERIOR REAR LIGHTING

BACKUP LAMP SYSTEM

The backup lamp system consists of the backup switch and the backup lamp circuit. The circuit is protected by the 15-amp TURN/BU fuse. The backup switch is located on the steering column for automatic transmissions (figure 9) and on the left side of the transmission for manual transmissions.

The backup lamps are turned on when the transmission is shifted into reverse. The backup lamps are located in the rear lamp assemblies. Refer to SECTION 7B for service information on the transmission-mounted switch (manual transmission only). Refer to SECTION 3F for service information on the steering column-mounted switch (automatic transmission only).

HAZARD FLASHER SYSTEM

The hazard flasher system consists of a hazard switch that is mounted on the lower right side of the steering column, and a hazard flasher unit mounted below the instrument panel (figures 6 and 10). The circuit is protected by the 15-amp STOP/HAZ fuse in the fuse block. Refer to SECTION 3F1 or 3F2 for service information on the hazard switch.

LICENSE LAMP CIRCUIT

The license lamp circuit branches from the rear lamp harness at the rear corner of the vehicle. The license lamp turns on when the park lamp switch or headlamp switch is turned on.

MARKER, PARK, AND TAILLAMP SYSTEM

The marker lamp system consists of marker lamps that are located at each corner of the vehicle. The marker lamps have wrap-around lenses, that enable the lamps to function as parking lamps in front and taillamps in the rear.

The marker lamps are turned on when the parking lamp switch or the headlamp switch is turned on. The front harness of this system routes along the left side of the engine compartment and along the bottom of the radiator support. The rear harness is routed from the bulkhead connector in the engine compartment to the

frame then along the left frame rail to the rear panel. The rear lamp harness connects inside the back of the frame rail.

ROOF MARKER LAMPS

The roof marker lamp harness starts at the convenience center, is taped to the back of the cowl, then runs up the side of the door pillar and through two holes in the door pillar and the roof frame to the roof marker lamps. The harness is covered by the roof garnish molding and the roof trim panel. The circuit is protected by the 20-amp PARK LP fuse.

STOPLAMP SYSTEM

The stoplamp system consists of a non-adjustable stop switch connected to the rear taillamps circuit. Pickup and cab/chassis models have a combination cargo/stoplamp mounted on the rear of the cab. Suburban and utility models have an LED stoplamp screwed to the roof, above the rear doors. The LED stoplamp is not serviceable and must be replaced if diagnosis leads to a faulty lamp assembly. Refer to the electrical diagnosis section of NATP-9442 for stoplamp diagnosis.

The circuit is protected by the 15-amp STOP fuse. The stop switch is located at the upper end of the brake pedal lever (figure 11). Refer to SECTION 5 for service information on the stop switch.

TURN SIGNAL SYSTEM

The turn signal system consists of the turn signal switch, the flasher unit, the turn lamps located at each corner of the vehicle, and indicator lamps in the instrument cluster. When the turn signal switch is positioned for left or right turn, the left or right turn lamps connect to the flasher unit. Current flows through the flasher unit, to the lamps, and ground. The flasher unit turns on and off, causing the lamps to flash.

The turn signal switch mounts on the steering column, a flasher unit mounts under the instrument panel in the upper left corner of the convenience center, and a harness connects the front turn lamps and rear taillamps (figure 10). The circuit is protected by the 15-amp TURN/BU fuse in the fuse block. Refer to SECTION 3F1 or 3F2 for service information on the turn signal switch.

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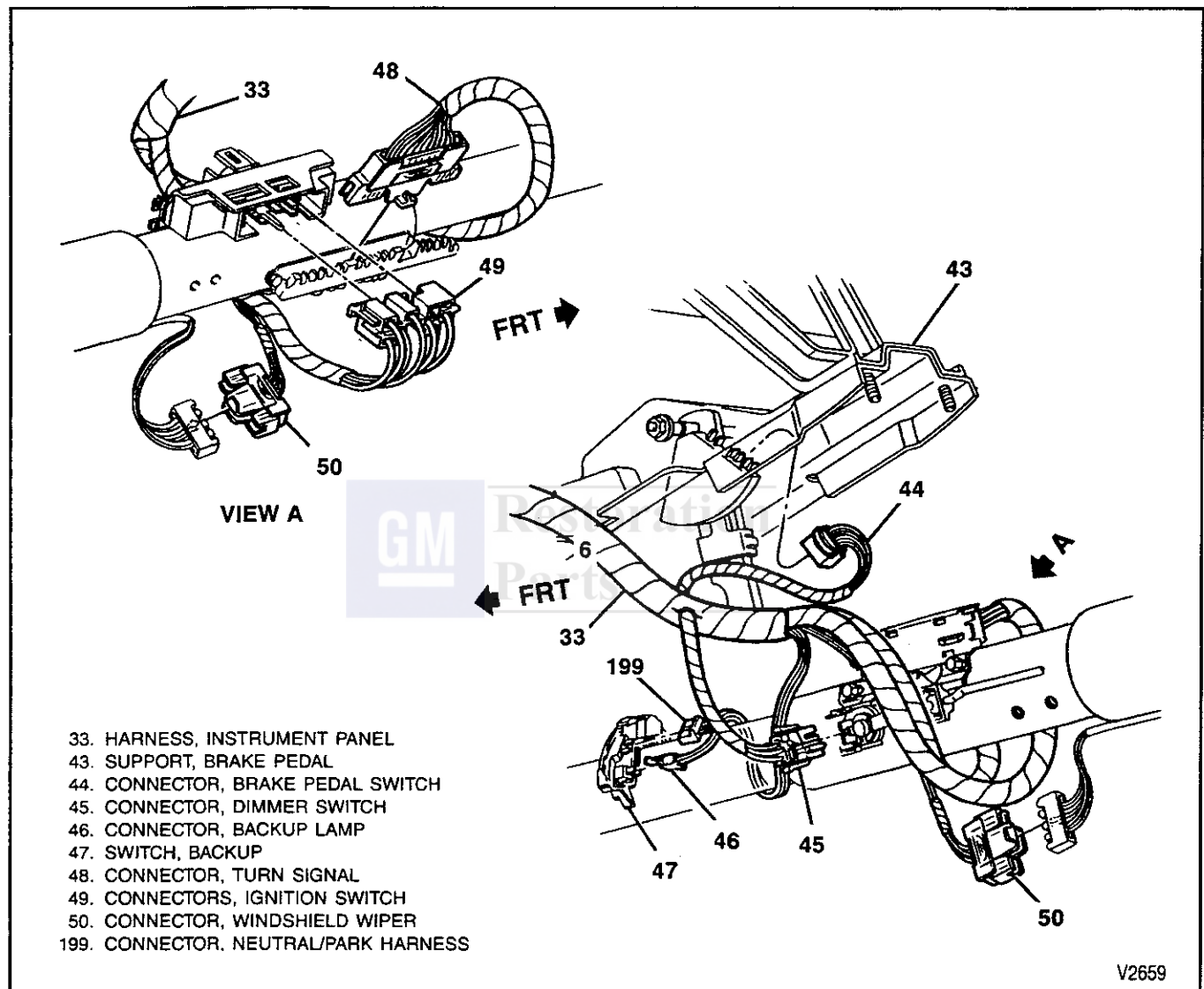


Figure 9—Steering Column Connectors

UNDERHOOD LAMPS

The underhood reel lamp harness runs from the junction block on the engine side of the cowl to the reel lamp along the right side inner fender. The underhood stationary lamp is located on the hood, and supplied from the junction block. Both lamps have an in-line 5-amp fuse and are grounded to a relay bracket at the junction block.

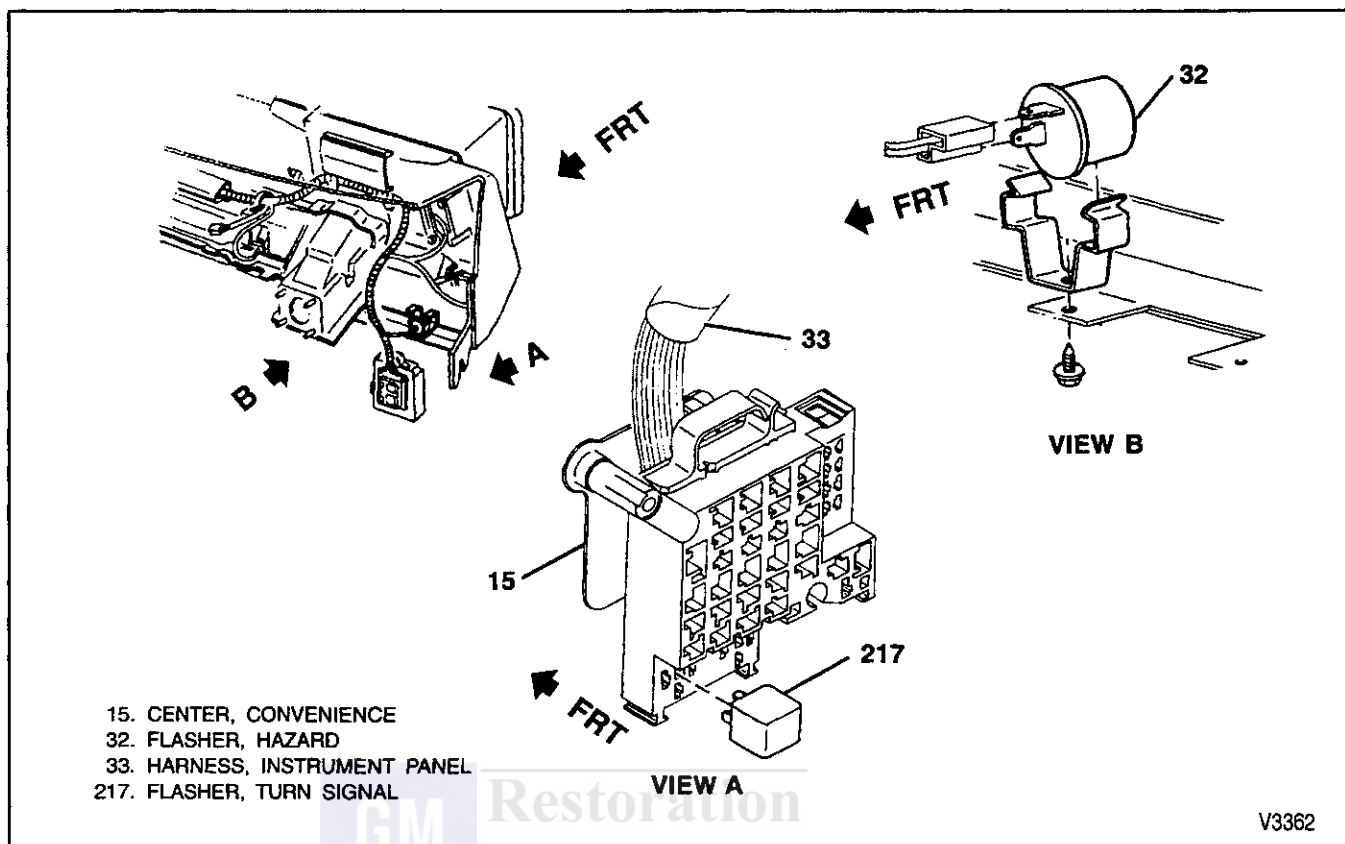


Figure 10—Hazard and Turn Signal Flashers

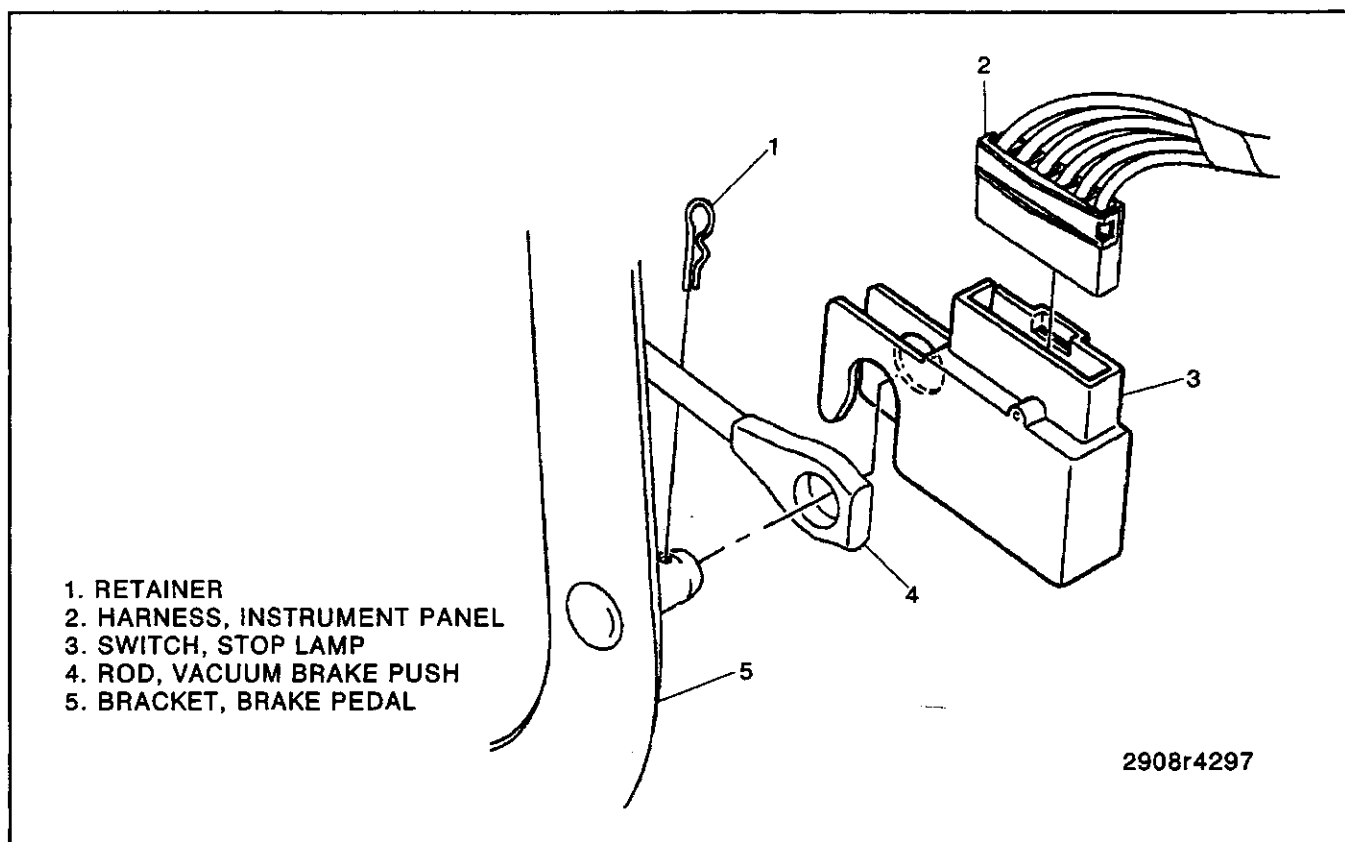


Figure 11—Stop Switch

DESCRIPTION OF INTERIOR LIGHTING

CARGO LAMP SYSTEM

Pickup and cab/chassis models have a combination cargo/stoplamp.

The cargo lamp front harness starts at the convenience center and routes to the cargo lamp switch on the left side of the instrument panel (figure 12). The rear harness is wired from the convenience center through the body wiring conduit inside the left door opening, then behind the body side trim panel, and up

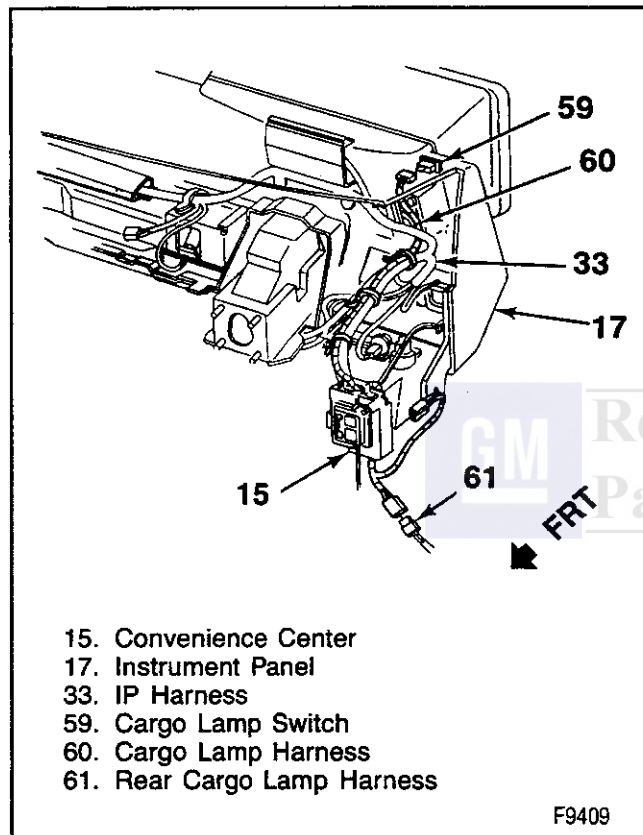


Figure 12—Cargo Lamp Switch Wiring

and across the roof above the roof inner panel (figure 13). The circuit is protected by the 20-amp CTSY fuse and grounds to the data link connector bracket behind the left side of the instrument panel.

DOME LAMP SYSTEM

The dome lamp is controlled by the door jamb switches and the instrument panel dimmer switch. The dome lamp and courtesy lamps under the instrument panel will turn on whenever a door is opened or the dimmer switch is turned past the detent all the way to the right.

The dome lamp harness starts at the convenience center and routes along the left kick panel to the floor, along the floor through the body wiring conduit, up the left side of the cab behind the body molding, and along the roof behind the roof inner trim panel (figures 14, 15, and 16). The harness is protected by the 20-amp CTSY fuse and is grounds to the data link connector bracket under the left side of the instrument panel.

An optional dome lamp override switch can be turned off to prevent the dome and courtesy lamps from turning on when a door jamb switch closes (door opens).

INSTRUMENT PANEL LAMP SYSTEM

The wiring harness for the instrument panel lamps starts at the convenience center and routes from left to right through the conduit behind the instrument panel (figure 17). The harness grounds to the data link connector bracket behind the left side of the instrument panel. The instrument panel compartment lamp and courtesy lamps are protected by the 20-amp CTSY fuse. The ashtray lamp and cigarette lighter lamps are protected by the 20-amp PARK LP fuse. The lamps for the instrument cluster, radio, and switches are protected by the 5-amp PNL LP fuse.

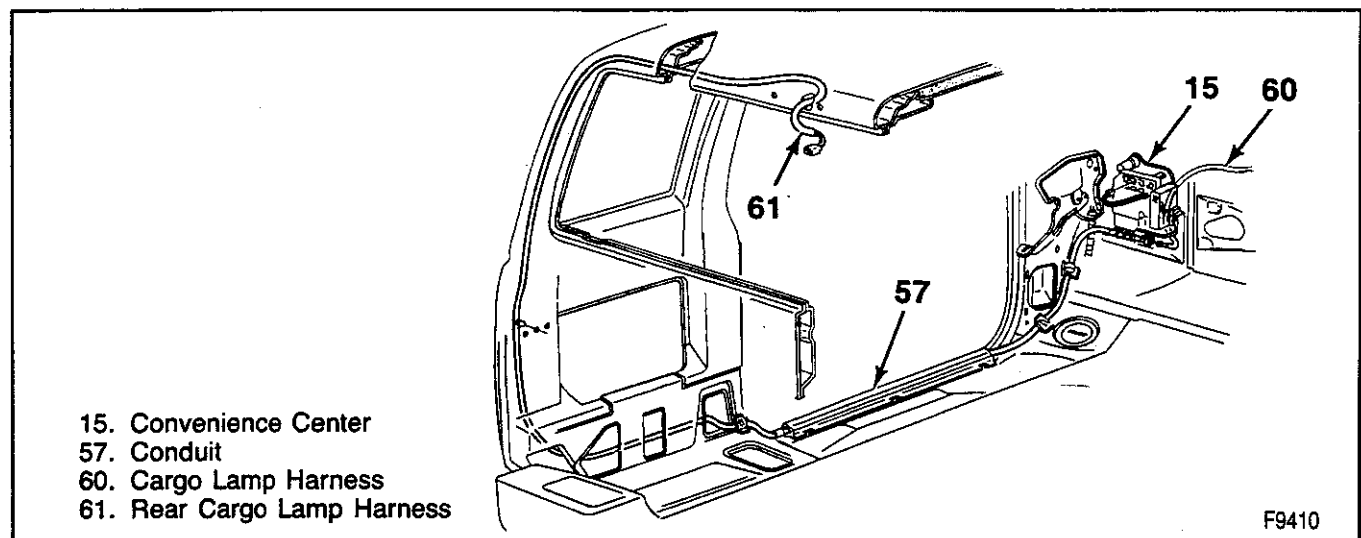


Figure 13—Rear Cargo Lamp Wiring

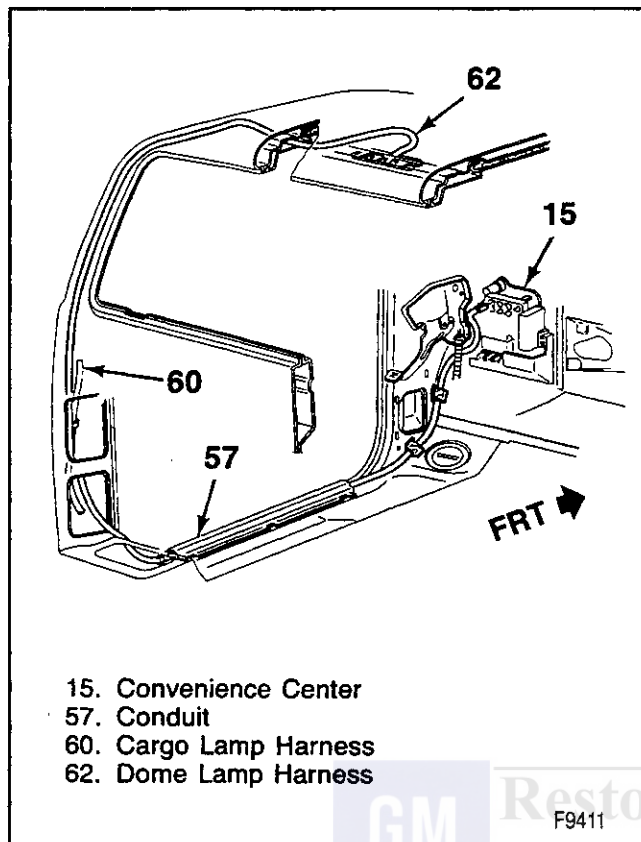


Figure 14—Dome Lamp Harness

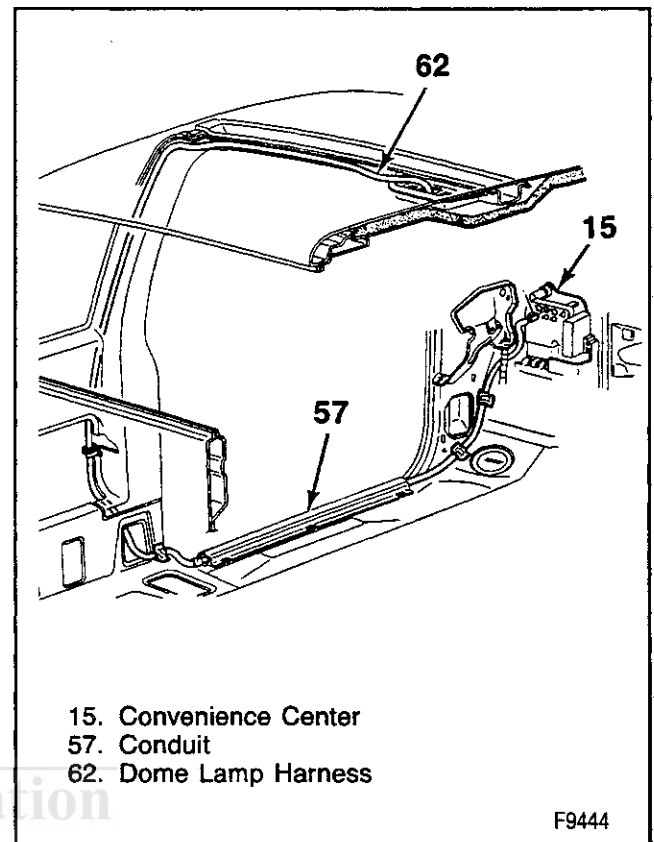


Figure 15—Dome Lamp Harness (Extended Cab)

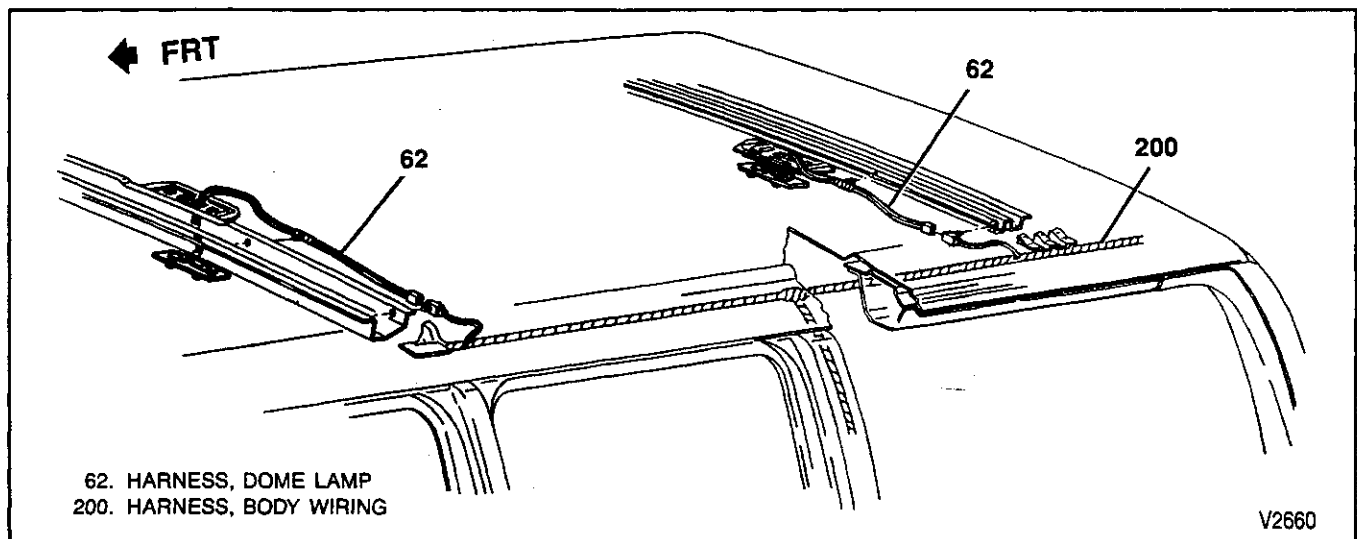


Figure 16—Dome Lamp Harness Extension (Utility Vehicle and Suburban)

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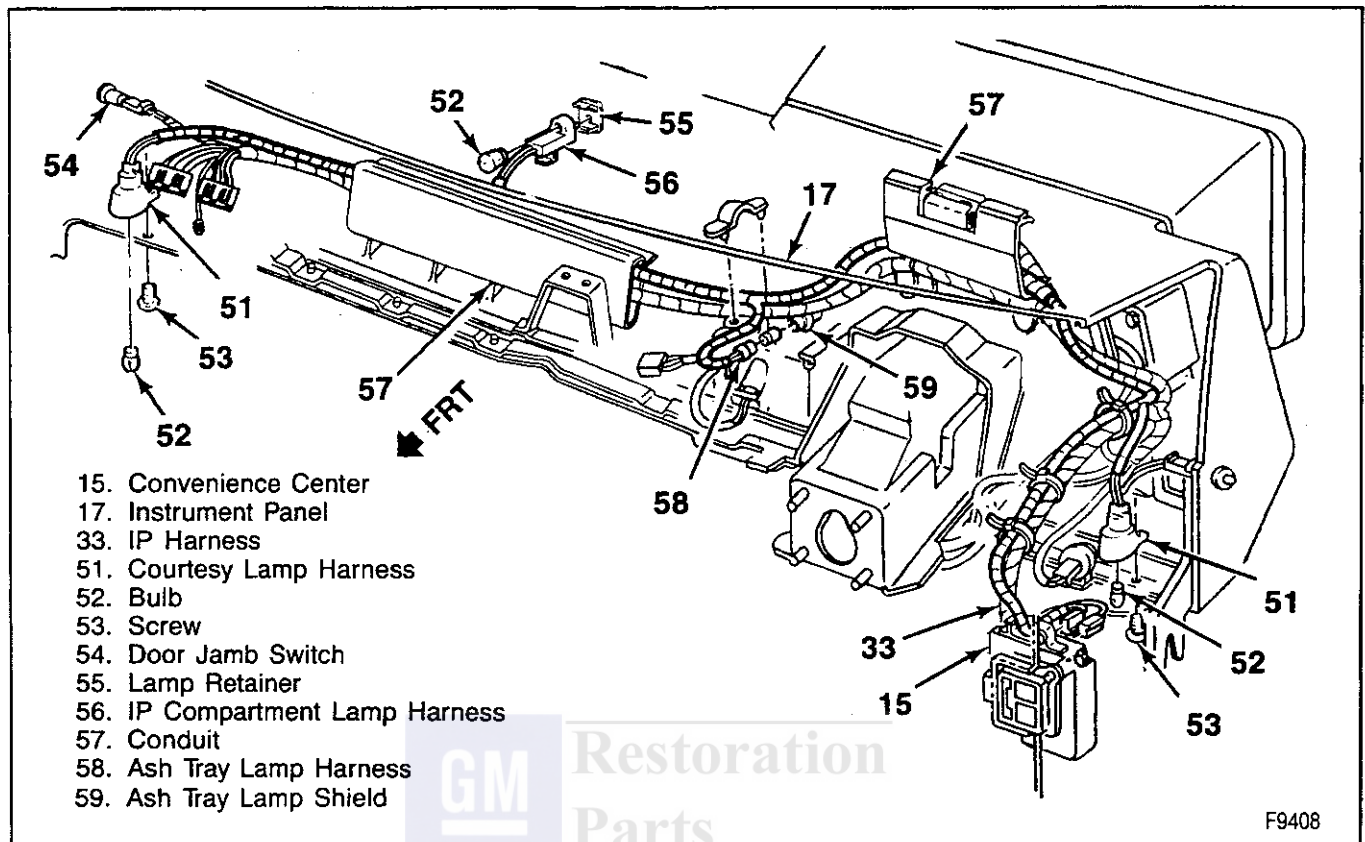


Figure 17—Instrument Panel Lamps

DIAGNOSIS OF LIGHTING SYSTEMS

For complete circuit views, including splices and connectors, refer to the electrical diagrams section of NATP-9442.

DIAGNOSIS OF THE BACKUP LAMPS

BACKUP LAMPS DO NOT OPERATE

TEST	RESULT	ACTION
1. Place the transmission in reverse. Connect a test lamp from the light green wire to the black wire at each backup lamp connector.	Test lamp lights.	Replace the bulb.
	Test lamp does not light.	Locate and repair the open in the black wire from the backup lamp connector to ground.
2. Connect a test lamp from the dark blue wire at the backup lamp switch connector at the transmission (manual) or on the steering column (auto).	Test lamp lights.	Go to step 3.
	Test lamp does not light.	Check the condition of the TURN-B/U fuse. If the fuse is good, locate and repair the open in the dark blue wire from the backup lamp switch to the fuse block.
3. Connect the test lamp from the light green wire at the backup lamp switch connector to ground.	Test lamp lights.	Go to step 4.
	Test lamp does not light.	Adjust the backup lamp switch. If the switch will not adjust properly, replace it.

DIAGNOSIS OF THE BACKUP LAMPS

4. Connect the test lamp from the light green wire at the connector at the bulkhead in the engine compartment to ground.	Test lamp lights.	Go to step 5.
	Test lamp does not light.	Locate and repair the open in the light green wire between the back-up lamp switch connector and the connector at the crossmember.
5. Connect the test lamp from the light green wire at the connector at the left rear crossmember to ground.	Test lamp lights.	Locate and repair the open in the light green wire between the connector and the splice at the left rear lamp harness.
	Test lamp does not light.	Locate and repair the open in the light green wire between the connector at the bulkhead and the connector at the left rear crossmember.

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DIAGNOSIS OF THE FOG LAMPS

FOG LAMPS DO NOT OPERATE

TEST	RESULT	ACTION
1. Place the fog lamp switch ON and the headlamp switch OFF. Connect a test lamp from the purple wire at the fog lamp relay connector to ground.	Test lamp lights.	Locate and repair the open in the purple wire from the fog lamp relay to the fog lamps.
	Test lamp does not light.	Go to step 2.
2. Connect the test lamp from the orange/black wire at the fog lamp relay connector to ground.	Test lamp lights.	Go to step 4.
	Test lamp does not light.	Go to step 3.
3. Connect the test lamp from the orange/black wire at the convenience center to ground.	Test lamp lights.	Locate and repair the open in the orange/black wire from the fog lamp relay connector to the convenience center.
	Test lamp does not light.	Check the condition of the PWR ACC circuit breaker. If circuit breaker is good, locate and repair the open in the orange/black wire between the convenience center and fuse block.
4. Connect the test lamp from the brown wire at the fog lamp relay connector to ground.	Test lamp lights.	Go to step 7.
	Test lamp does not light.	Go to step 5.
5. Connect the test lamp from the brown wire at the convenience center to ground.	Test lamp lights.	Locate and repair the open in the brown wire between the convenience center and the fog lamp relay connector.
	Test lamp does not light.	Go to step 6.
6. Place the headlamp switch in PARK. Observe the taillamps.	Taillamps are on.	Locate and repair the open in the brown wire between the convenience center and the splice under the left side of the instrument panel.
	Taillamps are off.	Locate and repair the open in the brown wire between the headlamp switch connector and the splice.
7. Connect a test lamp from the yellow wire at the fog lamp relay connector to ground.	Test lamp lights.	Replace the fog lamp relay.
	Test lamp does not light.	Go to step 8.

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DIAGNOSIS OF THE FOG LAMPS

8. Connect the test lamp from the yellow wire at the fog lamp switch to ground.	Test lamp lights.	Locate and repair the open in the yellow wire between the fog lamp switch and fog lamp relay connector.
	Test lamp does not light.	Go to step 9.
9. Connect the test lamp from the black wire at the fog lamp switch connector to ground.	Test lamp lights.	Replace the fog lamp switch.
	Test lamp does not light.	Go to step 10.
10. Connect the test lamp from the black wire at the convenience center to ground.	Test lamp lights.	Locate and repair the open in the black wire between the convenience center and the fog lamp switch connector.
	Test lamp does not light.	Go to step 11.
11. Turn on the radio.	Radio operates.	Locate and repair the open in the black wire between the convenience center the the splice under the left side of the instrument panel.
	Radio does not operate.	Locate and repair the open in the black wire between the splice and ground at the data link connector.

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DIAGNOSIS OF THE FRONT PARK AND SIDE MARKER LAMPS

FRONT PARK AND SIDE MARKER LAMPS DO NOT OPERATE

TEST	RESULT	ACTION
1. Place the headlamp switch in the PARK position. Connect a test lamp from the orange wire at the headlamp switch to ground.	Test lamp lights.	Go to step 3.
	Test lamp does not light.	Go to step 2.
2. Push the horn button.	Horn sounds.	Locate and repair the open in the orange wire between the headlamp switch and the splice under the left side of the instrument panel.
	Horn does not sound.	Check the condition of the PARK LP fuse. If the fuse is good, locate and repair the open in the orange wire from the fuse block to the splice.
3. Connect the test lamp from the brown wire at the headlamp switch to ground.	Test lamp lights.	Go to step 4.
	Test lamp does not light.	Replace the headlamp switch.
4. Connect the test lamp from the brown wire at the cowl in the engine compartment to ground.	Test lamp lights.	Locate and repair the open in the brown wire between the splice and the connector near the left headlamp.
	Test lamp does not light.	Locate and repair the open in the brown wire from the connector at the cowl and the headlamp switch.

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DIAGNOSIS OF THE HAZARD SYSTEM

HAZARD LAMPS DO NOT OPERATE

TEST	RESULT	ACTION
1. Check the condition of the STOP-HZ fuse.	Fuse is not blown.	Go to step 2.
	Fuse is blown.	Locate and repair the source of the overload. Then, replace the fuse.
2. Place the ignition switch in RUN and position the turn signal lamps as if making a turn.	Turn signal lights operate.	Go to step 3.
	Turn signal lights do not operate.	Replace the turn signal switch.
3. Turn off the turn signal lamps and put the hazard warning lamps on. Connect a test lamp from the brown wire at the turn signal switch connector to ground.	Test lamp flashes.	Replace the turn signal switch.
	Test lamp does not flash.	Go to step 4.
4. Connect the test lamp from the brown wire at the hazard flasher connector to ground.	Test lamp flashes.	Locate and repair the open in the brown wire between the hazard flasher connector and the turn signal switch connector.
	Test lamp does not flash.	Go to step 5.
5. Connect the test lamp from the orange wire at the hazard flasher connector to ground.	Test lamp lights.	Replace the hazard flasher.
	Test lamp does not light.	Locate and repair the open in the orange wire between the hazard flasher connector and the fuse block.

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DIAGNOSIS OF THE HEADLAMPS WITHOUT DAYTIME RUNNING LIGHTS

HEADLAMPS DO NOT OPERATE—BOTH SIDES

TEST	RESULT	ACTION
1. Connect a test lamp from the red wire at the headlamp switch connector to ground.	Test lamp lights.	Go to Step 3.
	Test lamp does not light.	Go to Step 2.
2. Connect the test lamp from the red wire connector at the cowl to ground.	Test lamp lights.	Locate and repair the open in the red wire from the headlamp switch to the connector at the cowl.
	Test lamp does not light.	Locate and repair the open in the red wire or fusible link between the connector and the battery junction block.
3. With the headlamp switch on and the dimmer switch on high beam, connect a test lamp from the yellow wire connector at the headlamp switch to ground.	Test lamp lights.	Go to Step 4.
	Test lamp does not light.	Replace the headlamp switch.
4. Connect the test lamp from the yellow wire connector at the dimmer switch to ground.	Test lamp lights.	Replace the headlamp dimmer switch.
	Test lamp does not light.	Repair the open in the yellow wire from the headlamp dimmer switch to the headlamp switch.

8B-16 LIGHTING SYSTEMS

DIAGNOSIS OF THE HEADLAMPS WITHOUT DAYTIME RUNNING LIGHTS

LOW BEAM LAMP(S) DO NOT OPERATE

TEST	RESULT	ACTION
1. Turn the headlamp switch on and the headlamp dimmer switch to the low beam position. Connect a test lamp from the tan wire at the inoperative lamp(s) to ground.	Test lamp does not light.	Go to Step 3.
	Test lamp lights.	Go to Step 2.
2. Connect the test lamp from the tan wire to the black wire(s) at the headlamp connectors (right dual beam lamp or right high beam lamp) or from the tan wire connector to ground (left dual beam lamp or left high beam lamp).	Test lamp does not light.	Locate and repair the open in the black wire(s) from the headlamp connector(s) to the ground terminal(s).
	Test lamp lights.	Replace the headlamp(s).
3. Connect the test lamp from the tan wire at the dimmer switch connector to ground.	Test lamp does not light.	Replace the headlamp dimmer switch.
	Test lamp lights.	Locate and repair the open in the tan wire from the headlamp dimmer switch to the headlamp.

HIGH BEAM LAMP(S) DO NOT OPERATE

TEST	RESULT	ACTION
1. Turn the headlamp switch on and the headlamp dimmer switch to the high beam position. Connect a test lamp from the light green wire at the inoperative lamp(s) to ground.	Test lamp lights.	Go to Step 2.
	Test lamp does not light.	Go to Step 3.
2. Connect the test lamp from the light green wire to the black wire(s) at the headlamp connectors.	Test lamp lights.	Replace the headlamp(s).
	Test lamp does not light.	Locate and repair the open in the black wire(s) at the headlamp connector(s) to the ground connection(s).
3. Connect a test lamp from the light green wire at the headlamp dimmer switch connector to ground.	Test lamp lights.	Locate and repair the open in the light green wire from the headlamp connector(s) to the headlamp dimmer switch connector.
	Test lamp does not light.	Replace the headlamp dimmer switch.

DIAGNOSIS OF THE HEADLAMPS WITH DAYTIME RUNNING LIGHTS

PRELIMINARY CHECKS

Turn the ignition switch to RUN and release the parking brake. Check the condition of the DRL and GAGES fuses. If either is blown, locate and repair the source of the overload. Then replace the fuse.

The DRL system operates by disconnecting one of the headlamp system grounds, turning a parallel circuit into a series circuit. If the DRL do not come on when they should, turn on the high beam headlamps. If one of them is burned out, the DRL system will not operate.

(On a vehicle with dual headlamps, each headlamp contains a high beam and low beam filament. The DRL module applies voltage to both, although the low beam filament will light only dimly. The DRL module only monitors the high beam circuit for an open, so if a low beam filament burns out, creating an open, the daytime running lights will continue to operate).

The daytime running lights may not come on unless battery voltage is close to 12 volts. If the battery voltage is about 9 volts, the vehicle may start, but the DRL may not turn on. With the engine running, apply the parking brake and then release it, or turn on the headlamp switch and then turn it off. If this causes the DRL to turn on, check the battery voltage. Refer to SECTION 6D1.

For other checks, consult the following diagnostic charts.

DAYTIME RUNNING LAMPS DO NOT OPERATE

TEST	RESULT	ACTION
1. Connect a test lamp from the orange wire at the DRL relay connector to ground.	Test lamp lights.	Go to Step 2.
	Test lamp does not light.	Locate and repair the open in the orange wire between the relay connector and the fuse block.
2. Connect the test lamp from the pink/black wire at the relay connector to ground.	Test lamp lights.	Go to Step 4.
	Test lamp does not light.	Go to Step 3.
3. Place the parking brake on. Observe the brake indicator lamp on the instrument cluster.	Test lamp lights.	Locate and repair the open in the pink/black wire between the relay connector and the splice under the left side of the instrument panel.
	Test lamp does not light.	Locate and replace the open in the pink/black wire between the splice and the fuse block.
4. Connect a test lamp from the light green/black wire at the DRL relay connector to ground.	Test lamp lights.	Go to step 5.
	Test lamp does not light.	Go to step 6.
5. Connect the test lamp from the dark blue/white wire at the relay connector to ground.	Test lamp lights.	System operating normally.
	Test lamp does not light.	Replace the DRL relay.
6. Connect a test lamp from the light green/black wire at the DRL module to ground.	Test lamp lights.	Locate and repair the open in the light green/black wire between the module and the relay.
	Test lamp does not light.	Go to step 7.
7. Connect the test lamp from the pink/black wire (pickup) or brown wire (suburban/utility) at the module to ground.	Test lamp lights.	Go to step 8.
	Test lamp does not light.	Locate and repair the open in the pink/black wire between the module to the splice under the left side of the instrument panel (pickup) or the brown wire between the module and the fuse block (suburban/utility).
8. Connect the test lamp from the black wire at the module to ground.	Test lamp lights.	Go to step 10.
	Test lamp does not light.	Go to step 9.
9. Turn on the radio.	Radio operates.	Locate and repair the open in the black wire from the module to the splice under the left side of the instrument panel.
	Radio does not operate.	Locate and repair the open in the black wire between the splice and ground at the data link connector.

DIAGNOSIS OF THE HEADLAMPS WITH DAYTIME RUNNING LIGHTS

10. Connect the test lamp from the tan/white wire at the DRL module to ground.	Test lamp lights.	Locate and repair the short to ground in the tan/white wire between the module and the parking brake switch connector. If no short is found replace the parking brake switch.
	Test lamp does not light.	Replace the DRL module.

T2889

LOW BEAM LAMP(S) DO NOT OPERATE

TEST	RESULT	ACTION
1. Place the headlamp switch in the ON position and the headlamp dimmer switch in the low beam position. Connect a test lamp from the tan wire at the inoperative lamp(s) to ground.	Test lamp lights.	Go to step 2.
	Test lamp does not light.	Go to step 6.
2. Connect the test lamp from the tan wire to the black wire at the right headlamp connector or to the dark blue/white wire at the left headlamp connector.	Test lamp lights.	Replace the headlamp(s).
	Test lamp does not light.	Locate and repair the open in the black wire from the right headlamp connector to ground. Go to step 3 for the left headlamp.
3. Connect a test lamp from the dark blue/white wire at the DRL relay connector to ground.	Test lamp lights.	Locate and repair the open in the dark blue/white wire between the relay connector C291 and the headlamp connector.
	Test lamp does not light.	Go to step 4.
4. Connect the test lamp from the black wire at the relay connector to ground.	Test lamp lights.	Replace the DRL relay.
	Test lamp does not light.	Go to step 5.
5. Turn on the radio.	Radio operates.	Locate and repair the open in the black wire between the relay connector and the splice under the left side of the instrument panel.
	Radio does not operate.	Locate and repair the open in the black wire between the splice and ground at the data link connector.
6. Connect the test lamp from the tan wire at the headlamp dimmer switch to ground.	Test lamp lights.	Locate and repair the open in the tan wire from the headlamp dimmer switch connector to the headlamp connector(s).
	Test lamp does not light.	Replace the headlamp dimmer switch.

HIGH BEAM LAMP(S) DO NOT OPERATE

TEST	RESULT	ACTION
1. Place the headlamp switch in the ON position and the headlamp dimmer switch in the high beam position. Connect a test lamp from the light green wire at the inoperative lamp(s) to ground.	Test lamp lights.	Go to step 2.
	Test lamp does not light.	Go to step 6.
2. Connect the test lamp from the light green wire to the black wire at the right headlamp connector or to the dark blue/white wire at the left headlamp connector.	Test lamp lights.	Replace the headlamp(s).
	Test lamp does not light.	Locate and repair the open in the black wire from the right headlamp connector to ground. Go to step 3 for the left headlamp.

3. Connect a test lamp from the dark blue/white wire at the DRL relay connector to ground.	Test lamp lights.	Locate and repair the open in the dark blue/white wire between the relay connector and the left headlamp connector.
	Test lamp does not light.	Go to step 4.
4. Connect the test lamp from the black wire at the relay connector to ground.	Test lamp lights.	Replace the DRL relay.
	Test lamp does not light.	Go to step 5.
5. Turn on the radio.	Radio operates.	Locate and repair the open in the black wire between the relay connector and the splice under the left side of the instrument panel.
	Radio does not operate.	Locate and repair the open in the black wire between the splice and ground at the data link connector.
6. Connect the test lamp from the light green wire at the headlamp dimmer switch connector to ground.	Test lamp lights.	Locate and repair the open in the light green wire from the headlamp dimmer switch connector to the headlamp connector(s).
	Test lamp does not light.	Replace the headlamp dimmer switch.

T2890

DAYTIME RUNNING LIGHTS STAY ON

TEST	RESULT	ACTION
Remove the DRL circuit board from the module case. Place the ignition switch in RUN and the headlamp switch ON. Connect a voltmeter to the yellow wire at the module case to ground.	Battery voltage.	Replace the DRL module circuit board.
	No voltage.	Locate and repair the open in the yellow wire from the DRL module to the headlamp switch.

T2354

DIAGNOSIS OF THE REAR EXTERIOR LAMPS

PRELIMINARY CHECKS:

1. Rear lamp systems (taillamps, clearance lamps, endgate lamps, and license plate lamps) all receive voltage from the same brown wire circuit and share the same ground terminal located at the left rear side member or at the left side of the platform hitch. If only one system is not working, locate and repair the open in the wiring and/or bulbs that pertain to that system.
2. If none of the rear lamp systems work, check the PARK LP fuse.

STOPLAMPS DO NOT OPERATE

TEST	RESULT	ACTION
1. Connect a test lamp from the orange wire at the stoplamp switch to ground.	Test lamp lights.	Go to step 3.
	Test lamp does not light.	Check the condition of the STOP-HAZ fuse. If the fuse is OK, go to step 2.
2. Turn on the hazard flashers.	Hazard flashers operate.	Locate and repair the open in the orange wire between the splice and the stoplamp switch.
	Hazard flashers do not operate.	Locate and repair the open in the orange wire between the fuse block and the splice.
3. Connect the test lamp from the white wire at the stoplamp switch connector to ground. Depress the brake pedal.	Test lamp lights.	Go to step 4.
	Test lamp does not light.	Replace the stoplamp switch.

DIAGNOSIS OF THE REAR EXTERIOR LAMPS

4. Connect the test lamp from the white wire at the turn signal switch connector to ground. Depress the brake pedal.	Test lamp lights.	Go to step 5.
	Test lamp does not light.	Locate and repair the open in the white wire between the stoplamp switch connector and turn signal switch connector.
5. Connect the test lamp from the yellow or dark green wire at the turn signal switch connector to ground. Depress the brake pedal.	Test lamp lights.	Verify the condition of the bulkhead connector and the rear lamp connector at the left rear crossmember.
	Test lamp does not light.	Replace the turn signal switch.

STOPLAMPS DO NOT OPERATE ON ONE SIDE

TEST	RESULT	ACTION
1. Connect a test lamp from the yellow or dark green wire at the affected stoplamp connector to ground. Depress the brake pedal.	Test lamp lights.	Go to step 4.
	Test lamp does not light.	Go to step 2.
2. Connect the test lamp from the yellow or dark green wire (depending on the side with the failure) at the connector at the left rear crossmember to ground. Depress the brake pedal.	Test lamp lights.	Locate and repair the open in the yellow or dark green wire between the connector and the affected stoplamp.
	Test lamp does not light.	Go to step 3.
3. Connect the test lamp from the yellow or dark green wire (depending on the side with the failure) at the connector at the bulkhead to ground. Depress the brake pedal.	Test lamp lights.	Locate and repair the open in the yellow or dark green wire between the connector and the connector at the left rear crossmember.
	Test lamp does not light.	Locate and repair the open in the yellow or dark green wire between the connector at the bulkhead and the turn signal switch connector. If no open is found, replace the turn signal switch.
4. Connect a test lamp from the black wire at the affected stoplamp to ground.	Test lamp lights.	Replace the stoplamp.
	Test lamp does not light.	Locate and repair the open in the black wire between the stoplamp and ground.

REAR LAMP SYSTEMS DO NOT OPERATE

TEST	RESULT	ACTION
1. Place the headlamp switch in PARK. Observe the front park and marker lamps.	Front park and marker lamps operate.	Go to step 3.
	Front park and marker lamps to not operate.	Check the condition of the PARK LP fuse. If the fuse is OK, go to step 2.
2. Push the horn button.	Horn sounds.	Locate and repair the open in the orange wire between the splice under the left side of the instrument panel and the headlamp switch connector. If no open is found, replace the headlamp switch.
	Horn does not sound.	Locate and repair the open in the orange wire between the fuse block and the splice.
3. Connect the test lamp from the brown wire at the left tail, stop, turn and backup lamp connector to ground.	Test lamp lights.	Locate and repair the open in the black wire between the splice at the left rear crossmember and ground. Check the condition of the ground.
	Test lamp does not light.	Go to step 4.

DIAGNOSIS OF THE REAR EXTERIOR LAMPS

4. Connect the test lamp from the brown wire at the connector and the left rear crossmember to ground.	Test lamp lights.	Locate and repair the open in the brown wire between the connector and the splice under the left side of the instrument panel.
	Test lamp does not light.	Go to step 5.
5. Connect the test lamp from the brown wire at the bulkhead connector to ground.	Test lamp lights.	Locate and repair the open in the brown wire between the bulkhead connector and the connector at the left rear crossmember.
	Test lamp does not light.	Locate and repair the open in the brown wire between the splice under the left side of the I/P and the bulkhead connector.

T2896

DIAGNOSIS OF THE ROOF MARKER LAMPS

The splices referred to in this chart are located in the wiring harness above the bulkhead connector under the left side of the instrument panel.

ROOF MARKER LAMPS DO NOT OPERATE

TEST	RESULT	ACTION
1. Turn the parking lamps on. Connect a test lamp from the orange wire at the headlamp switch to ground.	Test lamp lights.	Go to step 3.
	Test lamp does not light.	Go to step 2.
2. Push the horn button.	Horn sounds.	Locate and repair the open in the orange wire between the headlamp switch and the splice.
	Horn does not sound.	Check the condition of the PARK LP fuse. If the fuse is good, locate and repair the open in the orange wire from the fuse block to the splice.
3. Connect the test lamp from the brown wire at the headlamp switch to ground.	Test lamp lights.	Go to step 4.
	Test lamp does not light.	Replace the headlamp switch.
4. Connect the test lamp at the white wire at the convenience center to ground.	Test lamp lights.	Go to step 6.
	Test lamp does not light.	Go to step 5.
5. Check the condition of the parking lamps.	Parking lamps operate.	Locate and repair the open in the brown wire between the splice and convenience center.
	Parking lamps do not operate.	Locate and repair the open in the brown wire from the splice to the headlamp switch.
6. Connect a test lamp from the black wire at the convenience center to ground.	Test lamp lights.	Locate and repair the open in the white wire or the black wire in the roof marker lamps harness.
	Test lamp does not light.	Go to step 7.
7. Turn on the radio.	Radio operates.	Locate and repair the open in the black wire between the convenience center and splice.
	Radio does not operate.	Locate and repair the open in the black wire between the splice and ground.

T2895

8B-22 LIGHTING SYSTEMS

DIAGNOSIS OF THE TURN SIGNAL SYSTEM

If the turn signals do not work, turn on the hazard system. If all the lamps operate, check the TURN/BU fuse and replace it if necessary. If the turn signals still don't work, but the hazard system does, replace the turn signal flasher unit.

TURN SIGNALS DO NOT OPERATE ON ONE SIDE (FRONT)

TEST	RESULT	ACTION
1. Turn the hazard flasher ON. Observe the lamps on the side of the turn signals that do not work.	Lamps flash.	Check for improper bulb. Replace if necessary.
	Lamps do not come on.	Go to step 2.
2. Turn the hazard flasher OFF. Turn the ignition switch to RUN and the turn signals to the side that does not work. Connect the test lamp from the light blue wire (left) or dark blue wire (right) at the turn signal switch connector to ground.	Test lamp lights.	Go to step 3.
	Test lamp does not light.	Replace the turn signal switch.
3. Connect the test lamp from the light blue wire (left) or dark blue wire (right) at the park lamp connector to ground.	Test lamp lights.	Go to step 4.
	Test lamp does not light.	Locate and repair the open in either the light blue or dark blue wires.
4. Connect the test lamp from the light blue or dark blue wire to the black wire at the park lamp connector.	Test lamp lights.	Check the condition of the bulb sockets.
	Test lamp does not light.	Locate and repair the open in the black wire.

TURN SIGNALS DO NOT OPERATE ON ONE SIDE (REAR)

TEST	RESULT	ACTION
1. Turn the hazard flasher ON. Observe the lamps on the side of the turn signals that do not work.	Lamps flash.	Check for improper bulb. Replace if necessary.
	Lamps do not come on.	Go to step 2.
2. Turn the hazard flasher OFF. Turn the ignition switch to RUN and the turn signal to the side that does not work. Connect the test lamp from the yellow wire (left) or dark green wire (right) at the turn signal switch connector to ground.	Test lamp lights.	Go to step 3.
	Test lamp does not light.	Replace the turn signal switch.
3. Connect the test lamp from the yellow wire (left) or dark green wire (right) at the taillamp connector to ground.	Test lamp lights.	Go to step 4.
	Test lamp does not light.	Locate and repair the open in either the yellow or dark green wires.
4. Connect the test lamp from the black wire at the taillamp connector.	Test lamp lights.	Check condition of the bulb sockets.
	Test lamp does not light.	Locate and repair the open in the black wire.

T2683

ON-VEHICLE SERVICE OF EXTERIOR LIGHTING

CARGO/STOPLAMP REPLACEMENT

PICKUP AND CAB/CHASSIS MODELS



Remove or Disconnect (Figure 18)

• Make sure the headlamp-switch is off.

1. Lens screws and lens.
2. Bulb.
3. Lamp assembly screws.
4. Lamp assembly from the roof.
5. Wiring harness from the lamp assembly.
6. Gasket from the roof.

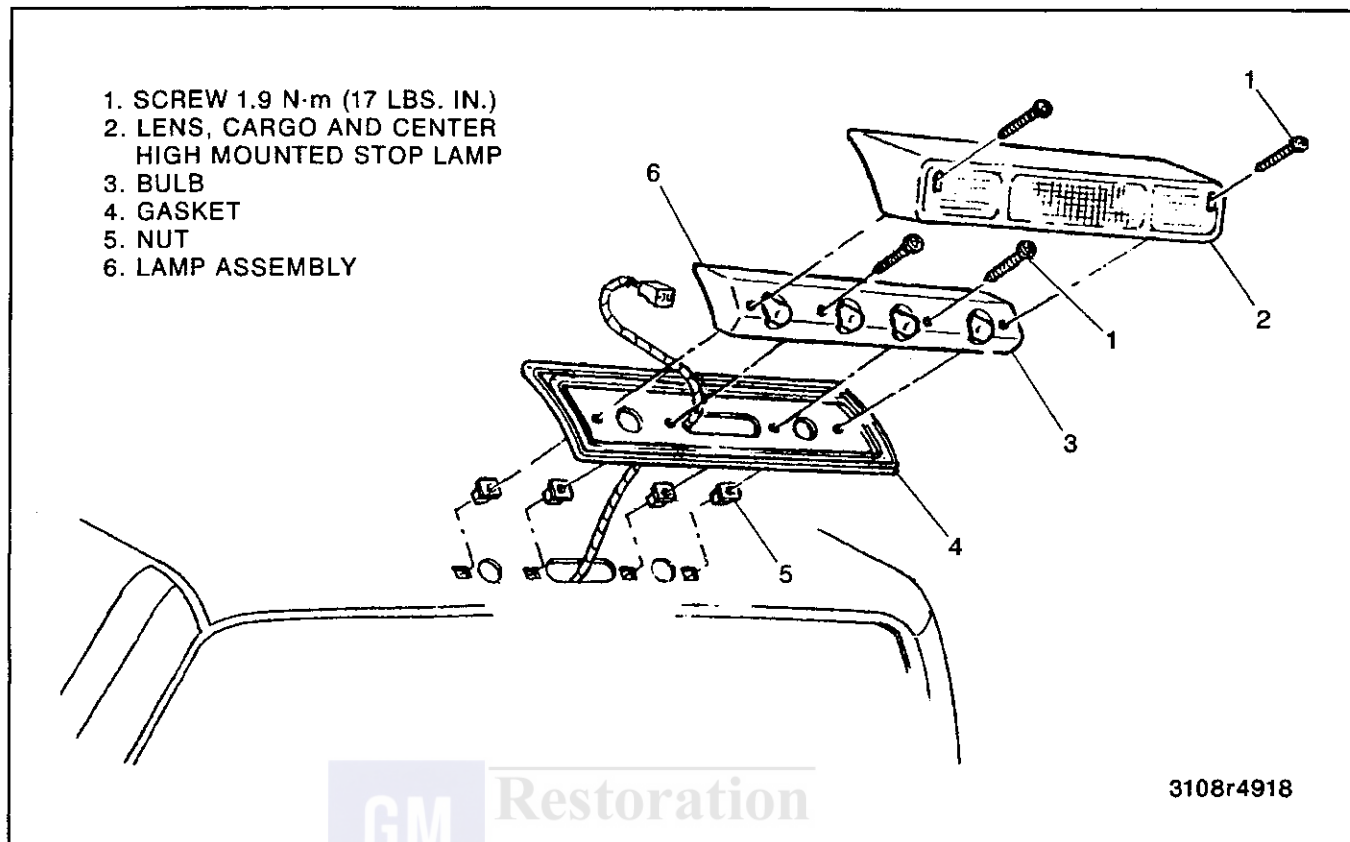


Figure 18—Cargo/Stoplamp Components (Pickup and Cab/Chassis Models)

Install or Connect (Figure 18)

1. Gasket to the roof.
2. Wiring harness to the lamp assembly.
3. Lamp assembly to the roof.
4. Lamp assembly screws.
5. Bulb.
6. Lens screws and lens.

**CENTER HIGH-MOUNTED
STOPLAMP REPLACEMENT**

SUBURBAN AND UTILITY MODELS

Remove or Disconnect (Figure 19)

- Make sure the headlamp switch is OFF.
1. Rear dome lamp. Refer to "Dome Lamp Replacement."
 2. Electrical connector from the dome lamp harness.
 3. CHMSL retaining screws.
 4. CHMSL from the vehicle.

Install or Connect (Figure 19)

1. CHMSL lamp wire through hole in the roof panel and connect it to the dome lamp harness.

2. CHMSL to the vehicle with screws.

Tighten

- CHMSL retaining screws to 1.9 N-m (17 lbs. in.).
3. Rear dome lamp. Refer to "Dome Lamp Replacement."

**COMPOSITE HEADLAMP
BULB REPLACEMENT**

Remove or Disconnect (Figures 20 and 21)

- Make sure the headlamp switch is off.
1. Grille. Refer to SECTION 2B.
 2. Bulbs from the headlamp capsules by reaching in from the engine compartment and twisting to the left.

NOTICE: Refer to "Notice" on page 8B-1.

8B-24 LIGHTING SYSTEMS

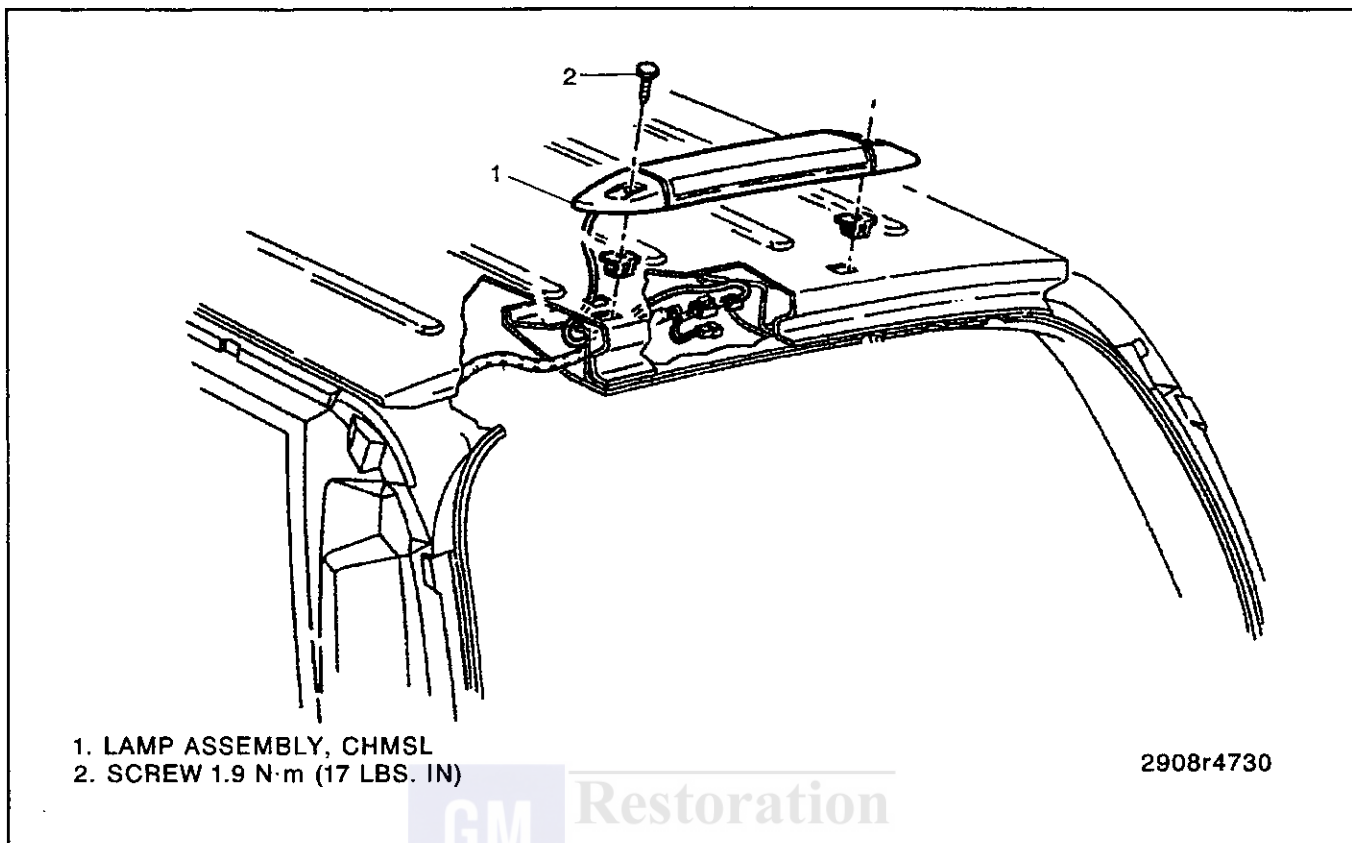


Figure 19—CHMSL Replacement (Utility)

CAUTION: Halogen bulbs contain a gas under pressure. Handling a bulb improperly could cause it to shatter into flying glass fragments. To help avoid personal injury:

- Turn off the lamp switch and allow the bulb to cool before changing it. Leave the switch off until change is complete.
 - Always wear eye protection when changing a halogen bulb.
 - Handle the bulb only by its base. Avoid touching the glass.
 - Do not drop or scratch the bulb. Keep moisture away.
 - Place the used bulb in the new bulb's carton and dispose of it properly.
3. Two long screws from the top of the radiator support (figure 20).
 - Pull the headlamp assembly forward.
 4. Electrical connector from the burned out bulb assembly.



Install or Connect (Figures 20 and 21)

NOTICE: Avoid touching the bulb or letting it come in contact with anything damp. Oil from your skin or moisture on the bulb can cause the bulb to explode when it is turned on. If either comes in contact with the bulb, clean it with alcohol or a suitable degreaser and wipe the bulb dry.

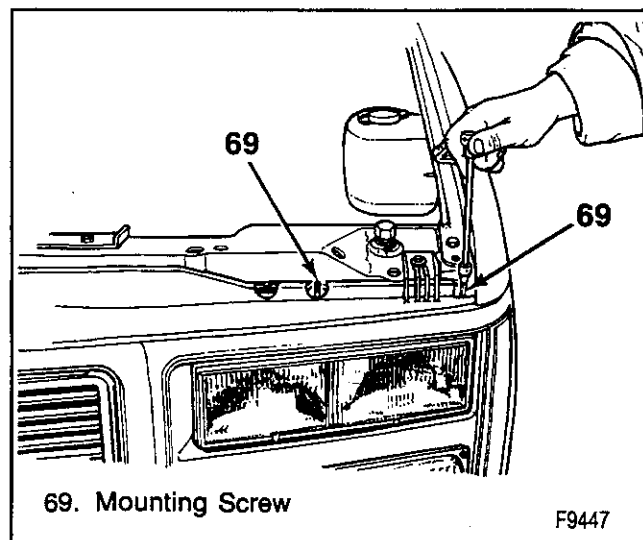


Figure 20—Composite Headlamp Removal

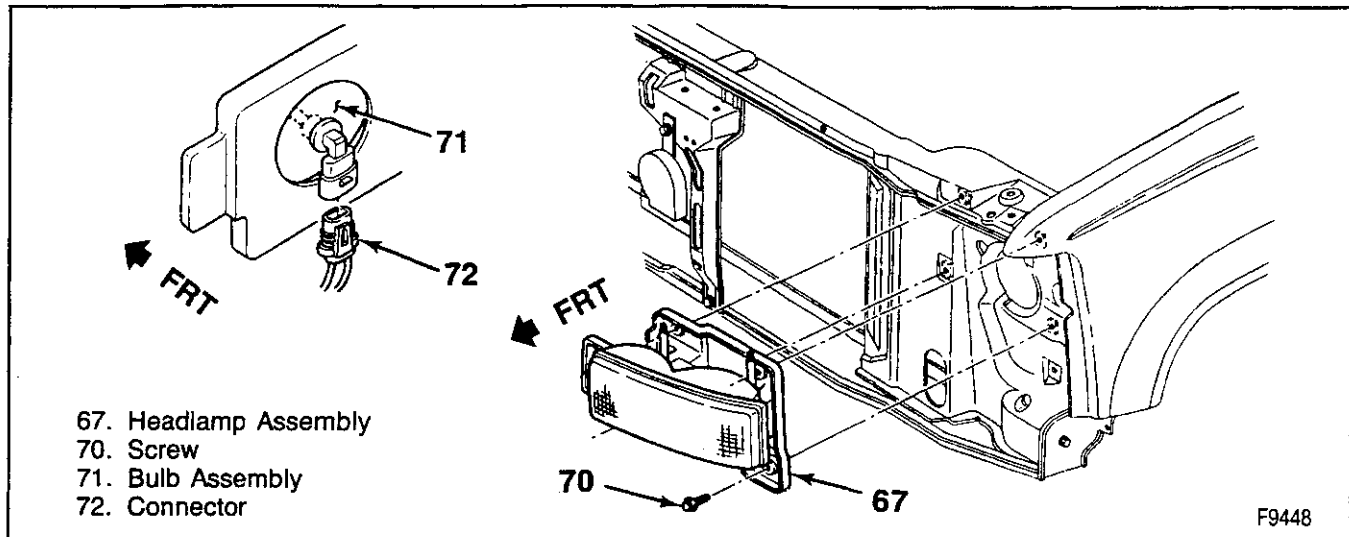


Figure 21—Composite Headlamp Assembly

2. Electrical connector to the bulb assembly.
3. Headlamp assembly.
4. Two long screws through the top of the radiator support and tighten.
5. Grille. Refer to SECTION 2B.

COMPOSITE HEADLAMP ADJUSTMENT

Horizontal and vertical aiming of each headlamp assembly is done by two adjusting screws. The screws are located within the radiator support, and are not easily seen. Two holes in the radiator support for each headlamp assembly provide access to the recessed brass adjusting screws (figures 22 and 23). The screws can be turned using a T15 torx head bit.

Adjust the headlamps to the specifications required by state and/or local authorities.

There are three methods for aiming the headlamps.

VISUAL HEADLAMP AIMING PROCEDURE (PREFERRED)

All equipment for testing headlamps must comply with the SAE Recommended Practice for Headlamp Inspection Equipment.

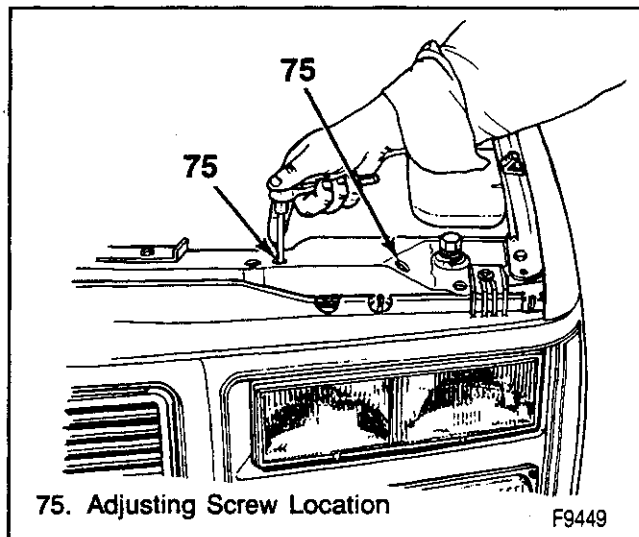
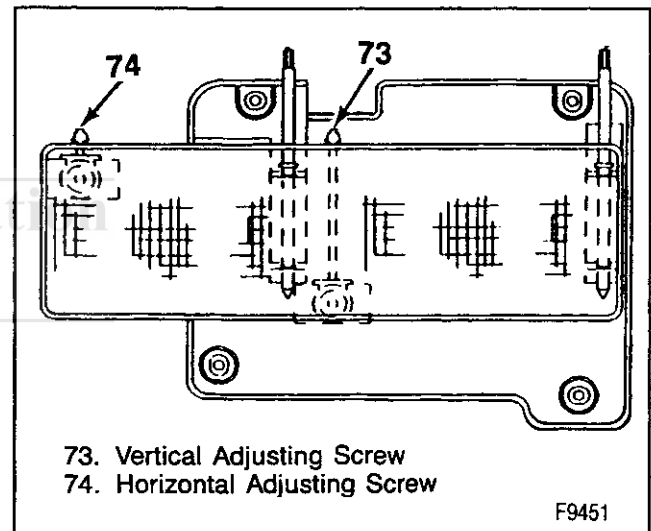


Figure 22—Adjusting the Headlamps



**Figure 23—Composite Headlamps Adjusting
Screws**

If a headlamp testing machine is used, it should give results equivalent to those obtained using the screen procedure as shown in figure 24. It should be in good repair and properly adjusted, and should be used in accordance with the manufacturer's instructions. The machine using a photoelectric cell or cells to determine aim should also include a visual screen upon which the beam pattern can be projected proportional to its appearance and aim on a screen at 7.62 m (25 ft). The screen should be plainly visible to the technician who is adjusting the headlamps, and should have horizontal and vertical reference lines to permit visual appraisal of the headlamp beam.

HEADLAMP AIMING BY THE SCREEN METHOD

Location

The area should be darkened and large enough to allow for the vehicle and an additional 7.62 m (25 ft.) measured from the face of the headlamps to the front of the screen. The floor on which the vehicle rests must be flat with the bottom of the screen. If the floor is not level, compensate.

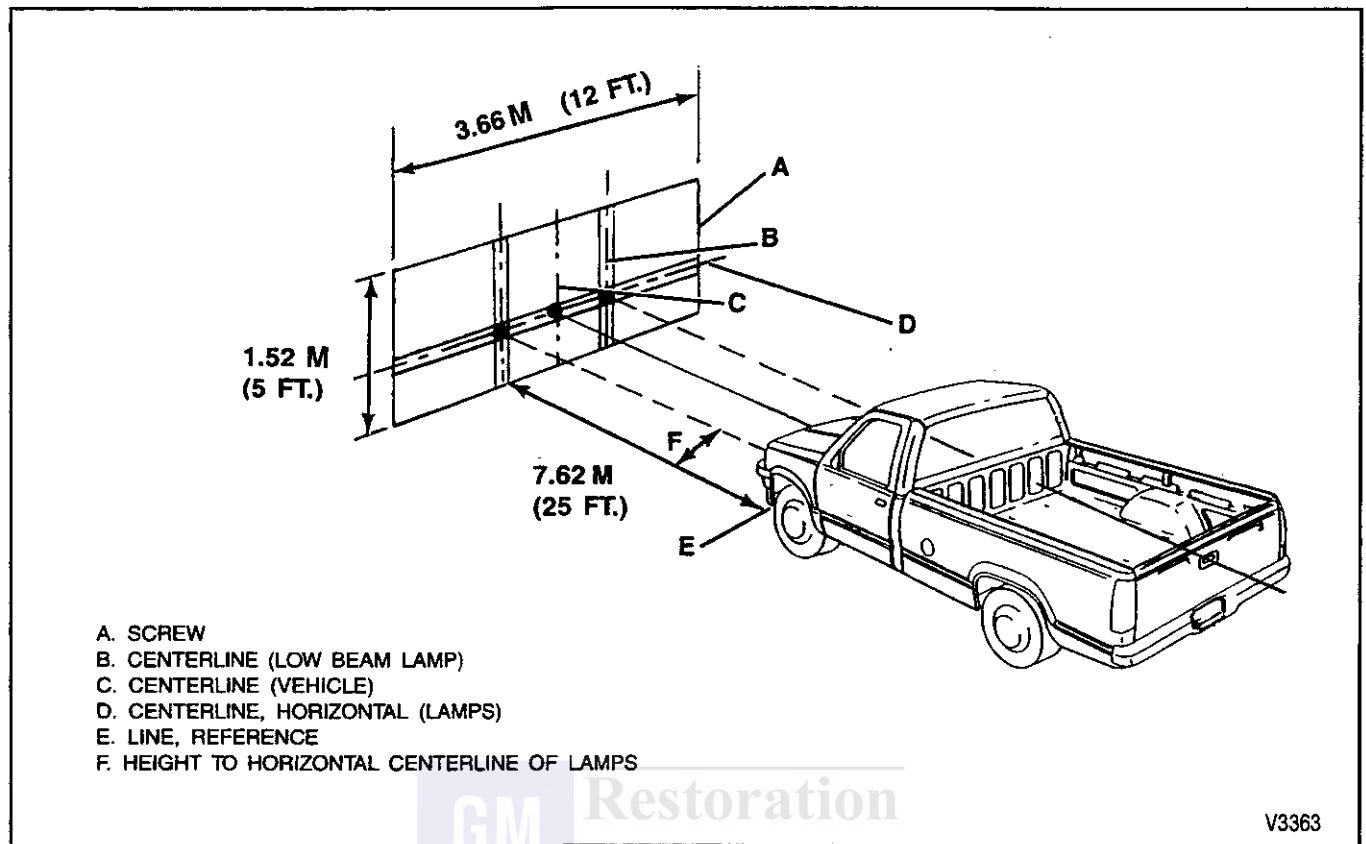


Figure 24—Visual Headlamp Inspection and Adjustment

Aiming Screen

If a screen is used, it should be at least 1.52 m (5 ft.) high by 3.66 m (12 ft.) wide with a matte white surface well shaded from extraneous light, and properly adjusted to the floor on which the vehicle stands. The screen should be moveable so that it can be aligned parallel with the rear axle of the vehicle. It should be positioned so that a horizontal line drawn perpendicular to the centerline of the screen will pass an equal distance midway between the two headlamps (figure 24).

The screen should be provided with a vertical centerline, two laterally adjustable vertical tapes, and one vertically adjustable horizontal tape.

If a regular commercial aiming screen is not available, the screen may consist of a wall having a clear uninterrupted area at least 1.83 m (6 ft.) high by 3.66 m (12 ft.) wide. The surface should be finished with a washable no-gloss white paint.

After the aiming screen has been set up and located, paint or tape a reference line on the floor 7.62 m (25 ft.) from the screen. The vehicle should be parked with the front of the headlamps directly over this reference line.

Headlamp Aiming Procedure

1. Park the vehicle square with the screen and with the headlamps directly over the reference line.
2. Make sure all components are in place, if other work has been done on the vehicle.
3. Make sure the vehicle is on a level surface.
4. Stop all other work on the vehicle.
5. Make sure the vehicle has one-half tank of fuel or less.
6. Close the vehicle's doors.

7. Rock the vehicle sideways.
8. Line up the centerline of the vehicle with the centerline of the aiming screen. This can be done by marking the vertical center of the rear and front windows with tape. Use these lines as "sights" to line up the centerline of the vehicle and screen.
9. Adjust the vertical tapes on the screen to match the vertical centerline of each low beam lamp. (Measure the distance from the centerline of the vehicle to the centerline of a low beam lamp).
10. Adjust the horizontal tapes on the screen to match the horizontal centerline of each low beam headlamp. (Measure the height from floor to the center of a low beam).
11. Turn on the low beam lamps. Observe the left and top edges of the high intensity zone on the screen. Adjust the headlamps so that:
 - A. The top edge of the center of intensity on the screen for the low beam is less than 101.6 mm (4 in.) above or below the cross section of the headlamp centerlines.
 - B. The left edge of the center of intensity on the screen for the low beam is less than 101.6 mm (4 in.) to the left or right of the cross section of the headlamp centerlines.

HEADLAMP AIMING ALTERNATIVE PROCEDURE

Tool Required:

J 25300-B Headlamp Aimer

Prepare the vehicle.

1. Make sure all components are in place, if other work has been done on the vehicle.
2. Make sure the vehicle is on a level surface.

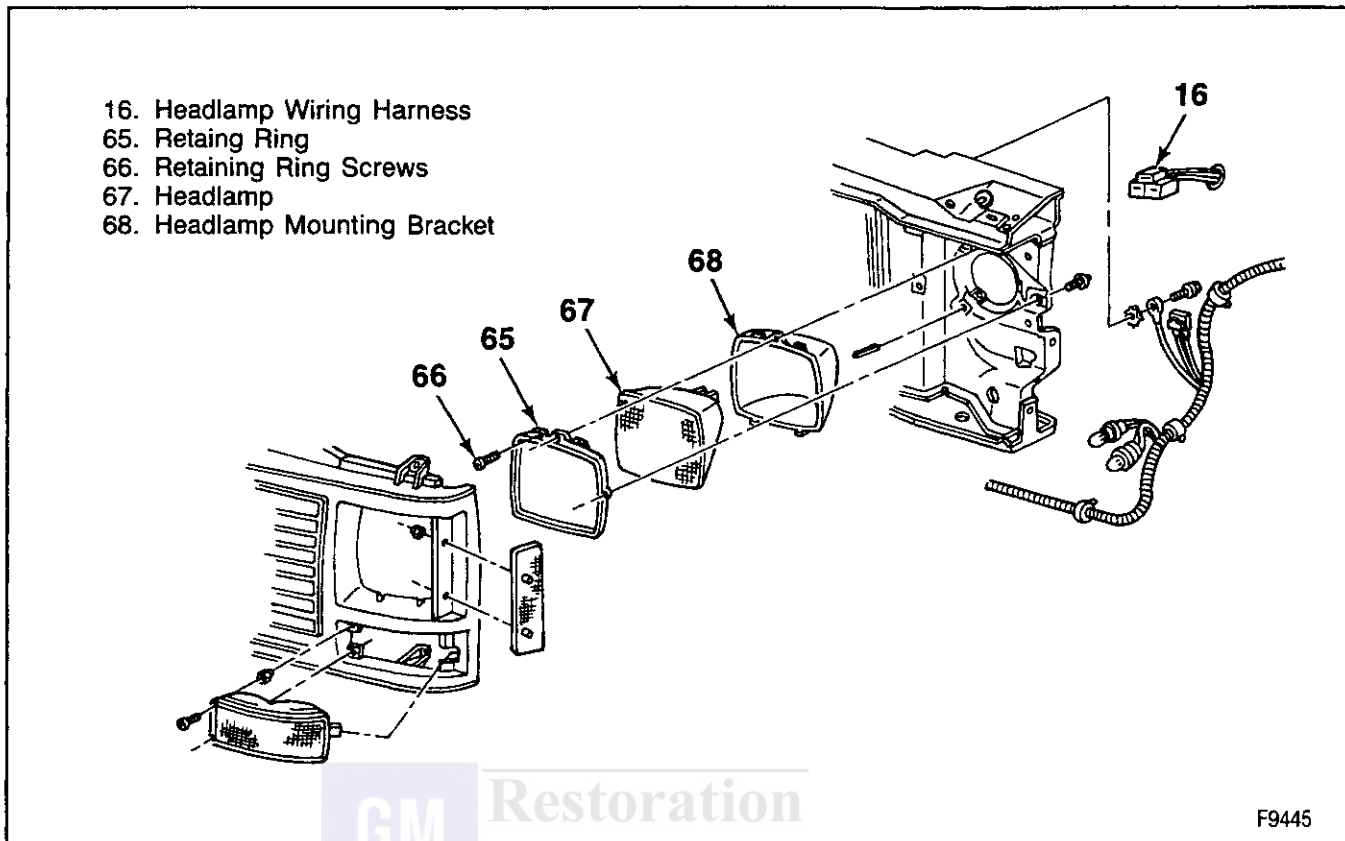


Figure 25—Dual Headlamp Components

3. Stop all other work on the vehicle.
4. Make sure the vehicle has one-half tank of fuel or less.
5. Close the doors.
6. Rock the vehicle sideways.

Using Headlamp Aimer J 25300-B, adjust the headlamps to the specifications required by state and/or local authorities. Instructions for tool use accompany the tool. This kit contains special adapters for use with composite lenses.

If an older kit without the special adapters is already on hand, the adapters can be purchased separately. Use J 25300-203, Composite Headlight Aimer Adapter (Small Pad Pattern). The adapter set contains a set of blue square adapters, vacuum cup extenders, and complete instructions.

2. Headlamp to the headlamp mounting bracket.
3. Retaining ring to the headlamp.
4. Retaining ring screws to the retaining ring.

SEALED BEAM HEADLAMP ADJUSTMENT

Tool Required:

J 25300-B Headlamp Aimer

Horizontal and vertical aiming of each headlamp is done by two adjusting screws which move the mounting bracket against the tension of the coil spring (figure 26). These screws are located in the headlamp bezel area on sealed beam headlamp models (one above and one to the side of the headlamp).

SEALED BEAM HEADLAMP REPLACEMENT

Remove or Disconnect (Figure 25)

- Make sure the headlamp switch is off.
1. Retaining ring screws from the retaining ring.
 2. Retaining ring from the headlamp.
 3. Headlamp from the headlamp mounting bracket.
 4. Electrical connector from the headlamp.

Install or Connect (Figure 25)

1. Electrical connector to the headlamp.

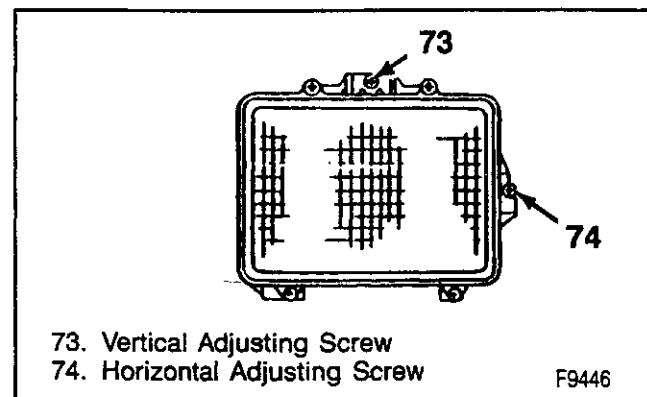


Figure 26—Headlight Aiming Screws (Dual Headlamps)

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The adjusting screw directly above the headlamp is used to adjust the horizontal position while the screw to the side is used to adjust the vertical position of the headlamp.

Using Headlamp Aimer J 25300-B, adjust the headlamps to the specifications required by state and/or local authorities. Instructions for tool use accompany the tool.

The headlamps can also be adjusted using the screen method described earlier for composite headlamps. Follow the same directions and observe the same tolerances for the aim of the beam.

ENDGATE LAMP REPLACEMENT

Remove or Disconnect (Figure 27)

The lens, lamp, and base must be replaced as one assembly.

- Make sure the headlamp switch is off.

1. Lens.
2. Two screws.

3. Lamp assembly.

Install or Connect (Figure 27)

1. Lamp assembly to the endgate.
2. Two screws.
3. Lens.

FOG LAMP ADJUSTMENT

The fog lamps are bracket mounted to the air dam and bumper (figure 28).

Before checking the aim of the fog lamps, prepare the vehicle.

1. Make sure all components are in place, if other work has been done on the vehicle.
2. Make sure the vehicle is on a level surface.
3. Stop all other work on the vehicle.
4. Make sure the vehicle has one-half tank of fuel or less.
5. Close the doors.
6. Rock the vehicle sideways.
7. Make sure the vehicle has no load other than the driver.

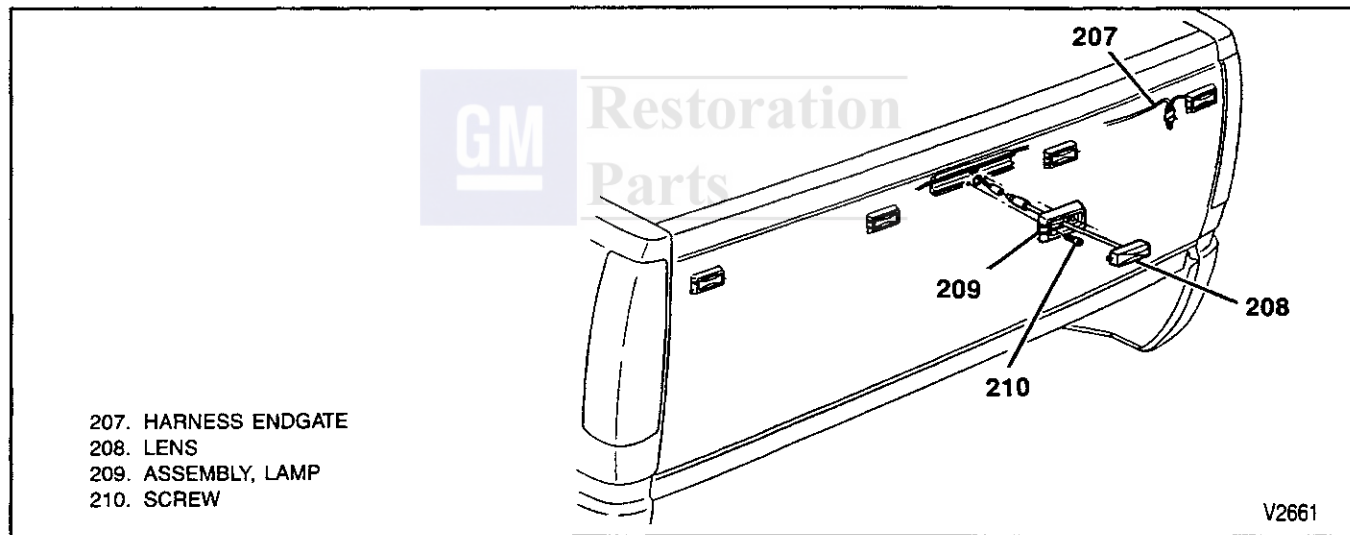


Figure 27—Endgate Identification Lamps

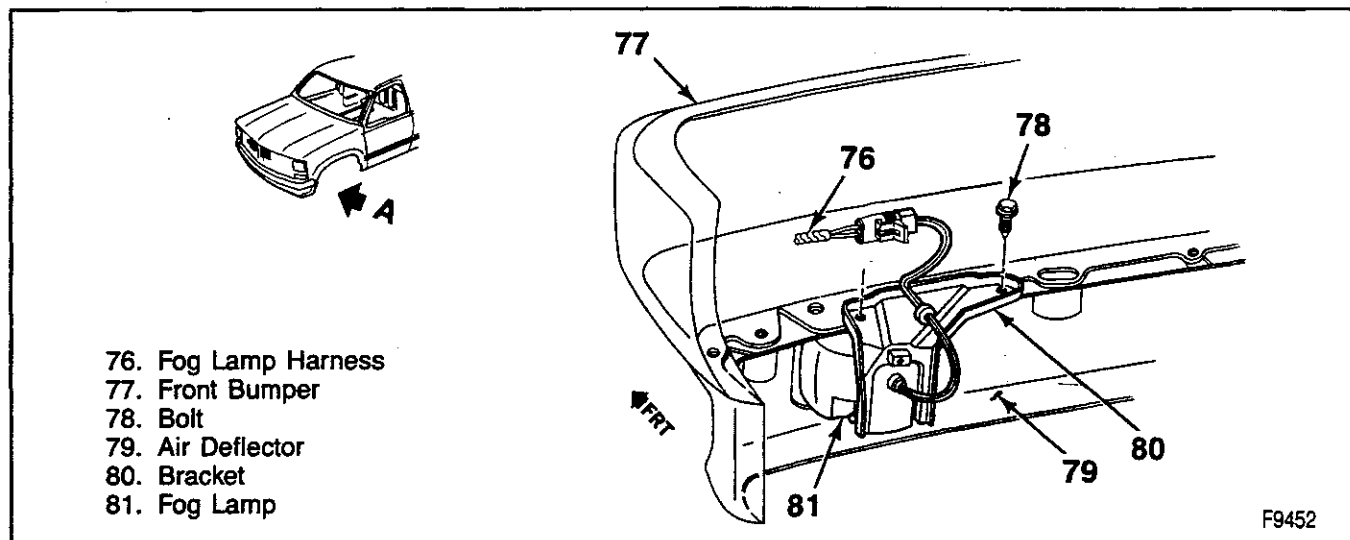


Figure 28—Fog Lamps

Place a screen 760 mm (2.5 ft.) in front of the vehicle. Draw a horizontal line at the same height as the centerline of the lamps (figure 29). Turn on the fog lamps. The top edge of the high intensity zone should be 5 to 20 mm (0.2 to 0.8 inches) below the centerline of the lamps.

The fog lamps can be adjusted up and down by turning the adjusting screw above the lens on the lamp assembly. The lamps cannot be adjusted horizontally.

The fog lamps can also be adjusted using the screen method described in "Composite Headlamp Adjustment" earlier in this section. The vehicle should be parked 7.62 m (25 ft.) in front of the screen. Using tape, make a horizontal line on the screen at the same height as the centerline of the lamps. Then turn on the fog lamps. The top edge of the high intensity zone should be 101.6 mm (4 inches) below the horizontal centerline of the fog lamps.

FOG LAMP BULB REPLACEMENT



Remove or Disconnect

- Make sure the headlamp switch and fog lamp switch are off.

1. Two screws and the lens from the front of the lamp assembly.

CAUTION: Halogen bulbs contain a gas under pressure. Handling a bulb improperly could cause it to shatter into flying glass fragments. To help avoid personal injury:

- Turn off the lamp switch and allow the bulb to cool before changing it. Leave the switch off until change is complete.
- Always wear eye protection when changing a halogen bulb.
- Handle the bulb only by its base. Avoid touching the glass.
- Do not drop or scratch the bulb. Keep moisture away.
- Place the used bulb in the new bulb's carton and dispose of it properly.

2. Bulb by twisting it to the left.



Install or Connect

NOTICE: Avoid touching the bulb or letting it come in contact with anything damp. Oil from your skin or moisture on the bulb can cause the bulb to explode when it is turned on. If either comes in contact with the bulb, clean it with alcohol or a suitable degreaser and wipe the bulb dry.

1. Bulb into the lamp assembly and twist it to the right.
2. Lens and two screws.

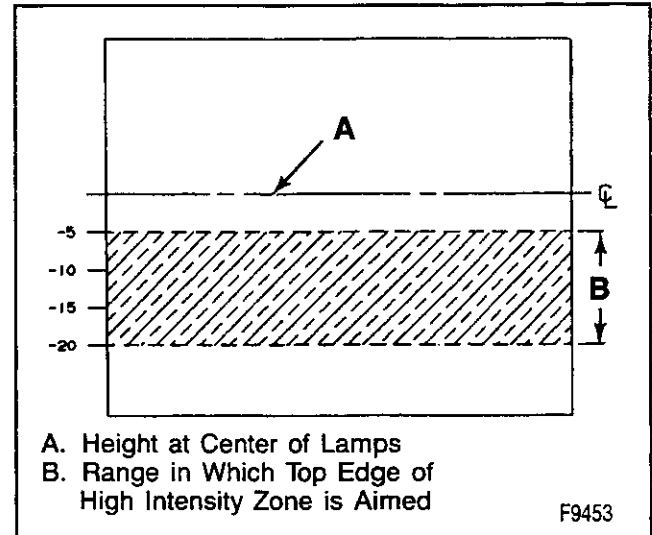


Figure 29—Fog Lamp Aiming Zone

FRONT PARKING LAMP REPLACEMENT

There are two bulbs in the parking lamp assembly and one bulb in the front side marker. All three turn on together as turn signals and parking lights.



Remove or Disconnect (Figure 30)

- Make sure the headlamp switch is off.

1. Screws.
2. Parking lamp assembly.
3. Electrical connector.
4. Bulbs from the assembly.



Install or Connect (Figure 30)

1. Bulbs to the parking lamp assembly.
2. Lamp assembly.
3. Parking lamp electrical connector.
4. Screws.

FRONT SIDE MARKER AND REFLECTOR REPLACEMENT



Remove or Disconnect (Figure 30)

- Make sure the headlamp switch is off.

1. Grille. Refer to "Grille Replacement" in SECTION 2B.
2. Nuts.
3. Side marker and/or reflector lens.
4. Bulb from the electrical connector.



Install or Connect (Figure 30)

1. Bulb to the electrical connector.
2. Side marker and/or reflector lens.
3. Nuts to the side marker.
4. Grille.

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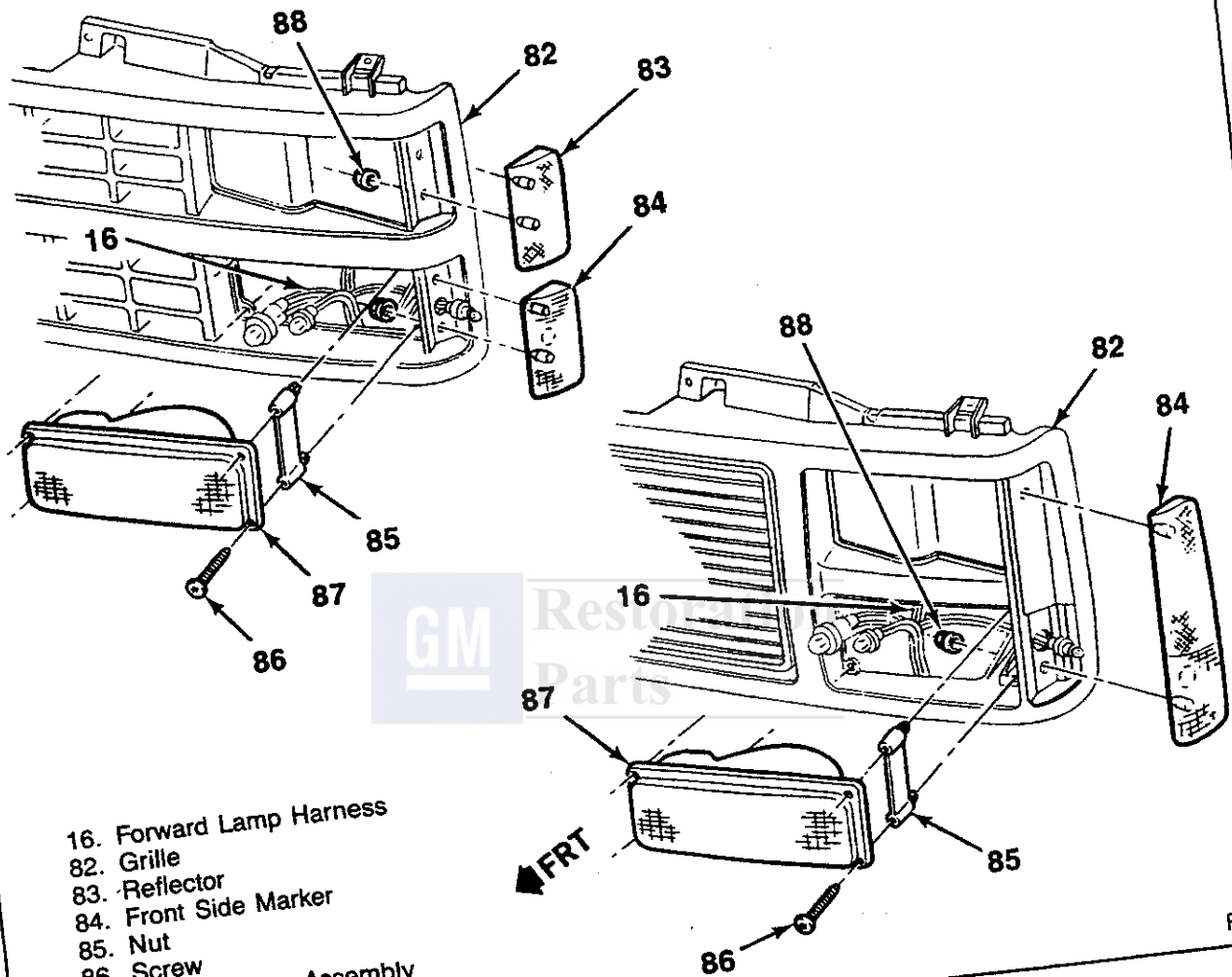


Figure 30—Parking Lamp and Reflector Components

LICENSE LAMP REPLACEMENT

↔ Remove or Disconnect (Figures 31 through 35)

- Make sure the headlamp switch is off.
- 1. Lens from the lamp assembly or lamp from the back of the lens assembly.
- 2. Bulb.

↔ Install or Connect (Figures 31 through 35)

1. Bulb.
2. Lens to the lamp assembly or bulb and wiring to the back of the lens assembly.

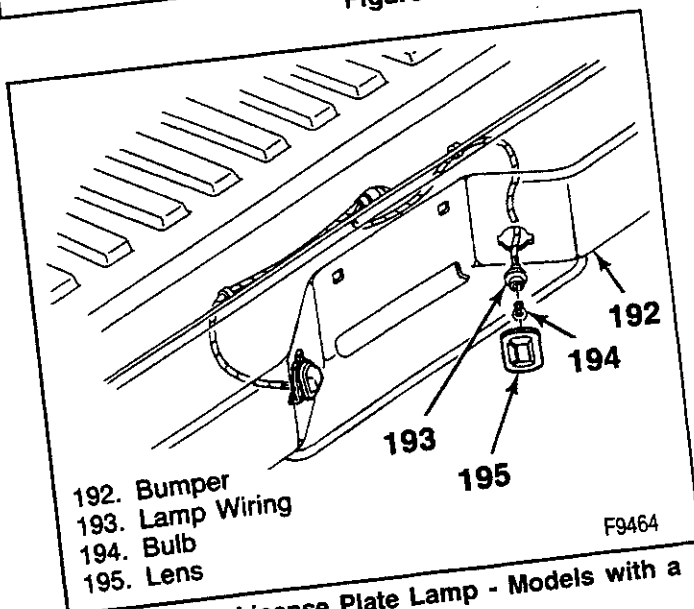


Figure 31—License Plate Lamp - Models with a Bumper

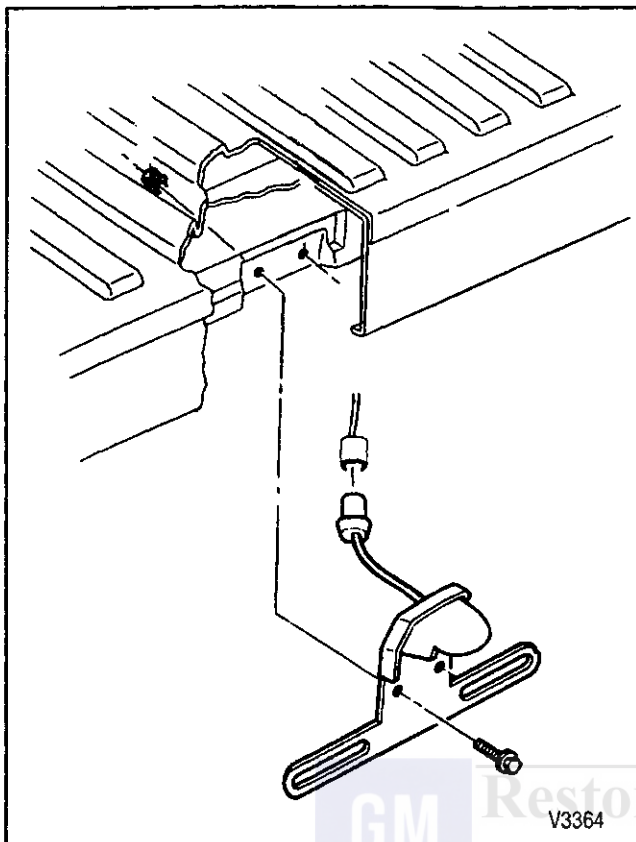


Figure 32—License Plate Lamp - Fleetside Pickup without a Step Bumper

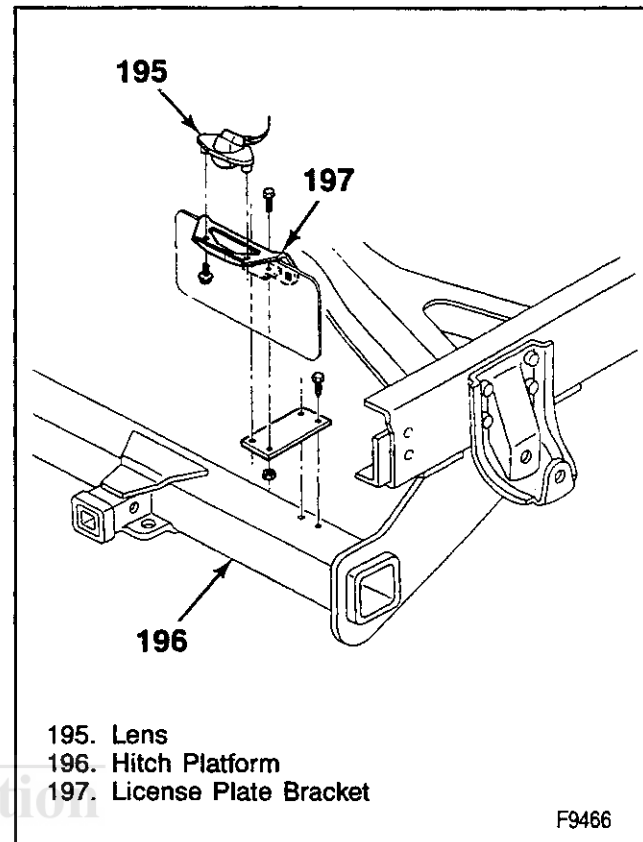


Figure 34—License Plate Lamp - Cab/Chassis with Hitch Platform

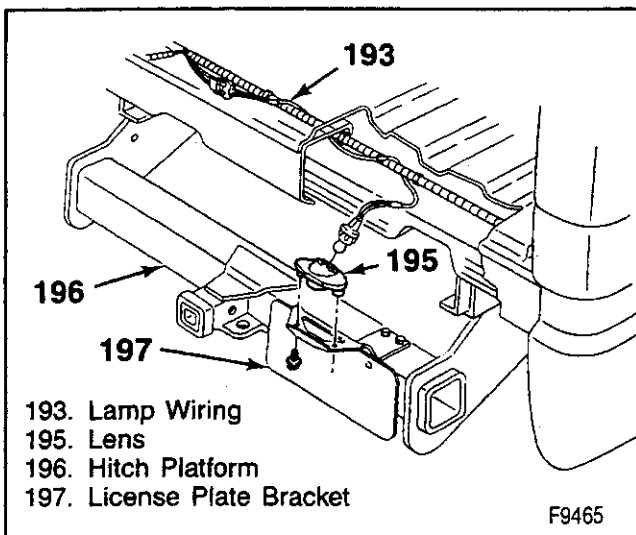


Figure 33—License Plate Lamp - Pickup with Hitch Platform

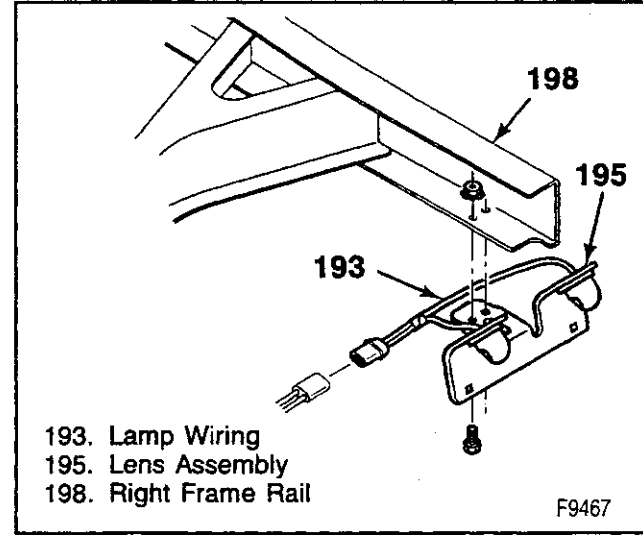


Figure 35—License Plate Lamp - Pickup without a Bumper

REAR FENDER MARKER LAMP REPLACEMENT

↔ Remove or Disconnect (Figure 36)

- Make sure the headlamp switch is off.
- 1. Lamp assembly screws.
- 2. Lamp assembly from the fender.

↔ Install or Connect (Figure 36)

1. Bulb to the socket.
2. Electrical connector and bulb to the lamp.
3. Lamp assembly to the fender.
4. Lamp assembly screws.

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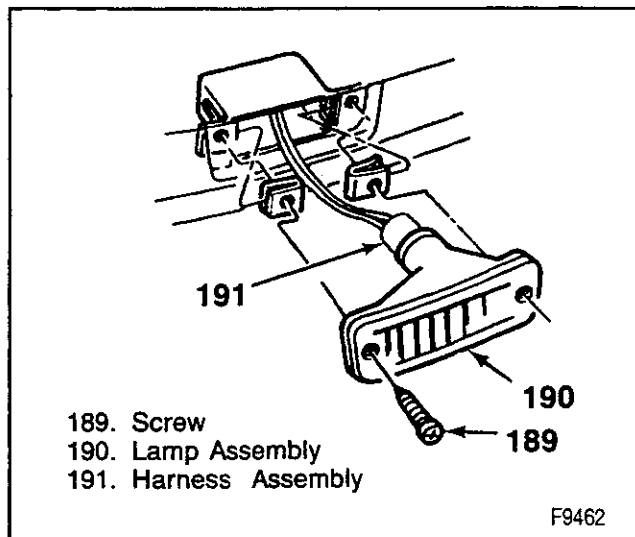


Figure 36—Rear Fender Marker Lamps

ROOF MARKER LAMP HARNESS REPLACEMENT

↔ Remove or Disconnect (Figure 37)

- Make sure the headlamp switch is off.
- 1. Roof garnish molding. Refer to SECTION 10A4.
- 2. Roof trim panel. Refer to SECTION 10A4.
- 3. Electrical connector from the convenience center.
- 4. Roof marker lamps. Refer to "Roof Marker Lamp Replacement."
- 5. Electrical connector from the lamps.
- 6. Harness from the vehicle.

↔ Install or Connect (Figure 37)

1. Harness to the vehicle.
2. Electrical connector to the lamps.
3. Roof marker lamps. Refer to "Roof Marker Lamp Replacement."
4. Electrical connector to the convenience center.
5. Roof trim panel and garnish molding. Refer to SECTION 10A4.

ROOF MARKER LAMP REPLACEMENT

↔ Remove or Disconnect (Figure 37)

1. Lens screws.
2. Lens.
3. Insulator.
4. Bulb.

↔ Install or Connect (Figure 37)

1. Bulb.
2. Insulator.
3. Lens.
4. Lens screws.

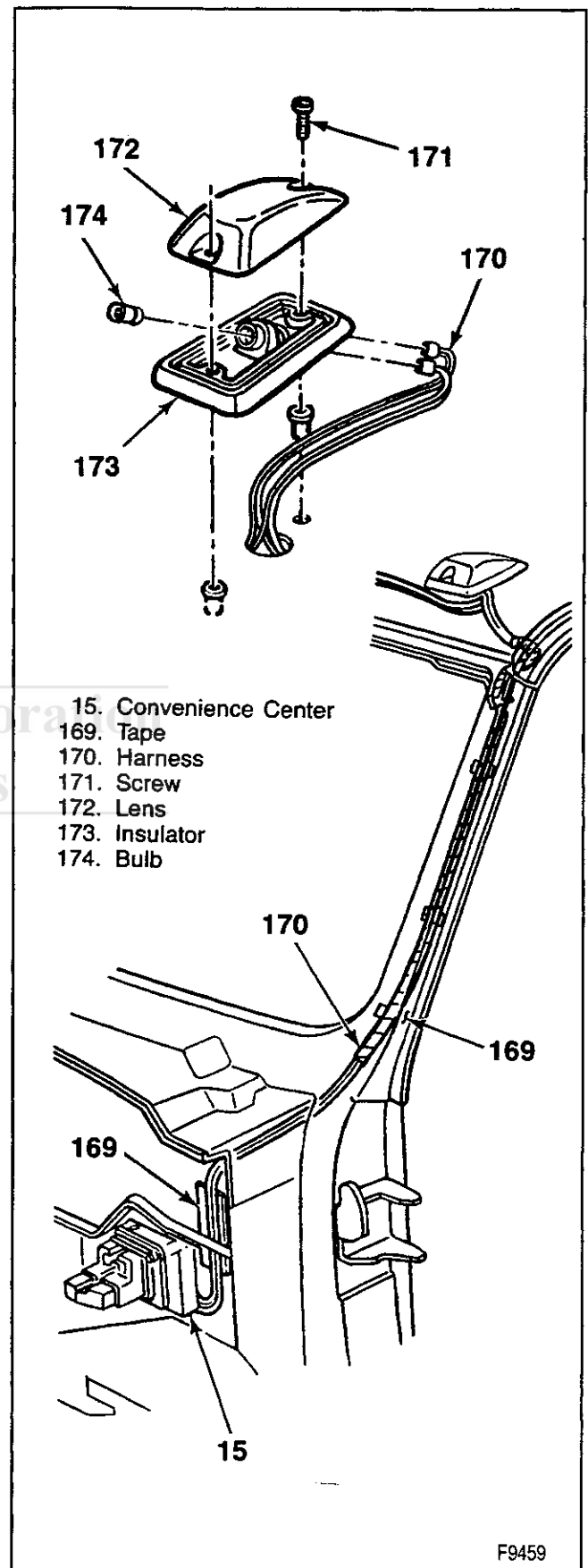


Figure 37—Roof Marker Lamp and Harness

TAILLAMP REPLACEMENT

CAB/CHASSIS

Bulb Replacement

Remove or Disconnect (Figure 38)

- Make sure the headlamp switch is off.
- 1. Four lens screws, lens, and gasket.
- 2. Bulbs.
 - Push the bulb in and turn it 1/4 turn to the left to remove it.
 - The top bulb is the backup light. The lower bulb is the stop, turn, and parking light.

Install or Connect (Figure 38)

1. Bulbs to the lamp assembly.
 - Push the bulb in and turn it 1/4 turn to the right.
2. Gasket and lens to the lamp assembly with four screws.

Lamp Assembly Replacement

Remove or Disconnect (Figure 38)

1. Lamp electrical connector from lamp assembly.
2. Nuts from the back of the bracket.
3. Lamp assembly from the bracket.

Install or Connect (Figure 38)

1. Lamp assembly to the bracket.
2. Nuts.
3. Electrical connector to the lamp assembly.

PICKUP, SUBURBAN, AND UTILITY MODELS

Remove or Disconnect (Figure 39)

- Make sure the headlamp switch is off.
- Lower the endgate.
- 1. Two screws retaining the taillamp assembly to the body.
- 2. Taillamp assembly from the vehicle.
- 3. Electrical connector from the assembly.
- 4. Bulbs from the lamp base.
 - The top bulb is a parking light.
 - The center bulb is a parking, brake, and turn indicator light.
 - The lower bulb is a backup light.
- Remove a bulb by pulling it straight out by the tabs on the base of the bulb.

Install or Connect (Figure 39)

1. Bulbs to the lamp assembly.
 - Push each bulb straight in.
2. Lamp base to the lens assembly with two screws.
3. Electrical connector.
4. Taillamp assembly to the vehicle with two screws.

UNDERHOOD REEL LAMP HARNESS REPLACEMENT

Remove or Disconnect (Figures 40 and 41)

1. Negative battery cable. Refer to SECTION 0A.
2. Junction block cover.
3. Reel lamp connector from the junction block and relay.
4. Reel lamp harness from the reel lamp.
5. Harness clips from the inner wheel well.
6. Harness from the vehicle.

Install or Connect (Figures 40 and 41)

1. Harness to the vehicle.
2. Harness clips to the inner wheel well.
3. Reel lamp harness to the reel lamp.
4. Reel lamp harness to the junction block and relay.
 - Connect the harness with the relay inboard mounting screw.
5. Junction block cover.
6. Negative battery cable.

UNDERHOOD REEL LAMP REPLACEMENT

Remove or Disconnect (Figure 40)

1. Negative battery cable. Refer to SECTION 0A.
2. Electrical connector from the lamp assembly.
3. Lamp screws.
4. Lamp assembly from the bracket.
5. Lens from the base of the assembly by pressing down on the lens and turning it until the tab on the lens clears the slot on the base. Then lift off the lens.
6. Bulb from the base.

Install or Connect (Figure 40)

1. Bulb into the base assembly.
2. Lens onto the base.
 - Slide the tab on the lens into the slot on the base.
1. Lamp to the vehicle.
2. Lamp screws.
3. Electrical connector to the lamp assembly.
4. Negative battery cable.

UNDERHOOD STATIONARY LAMP REPLACEMENT

Remove or Disconnect (Figure 41)

1. Negative battery cable. Refer to SECTION 0A.
2. Junction block cover.
3. Wiring harness from the junction block and relay.
4. Bolts.
5. Underhood stationary lamp from the hood.

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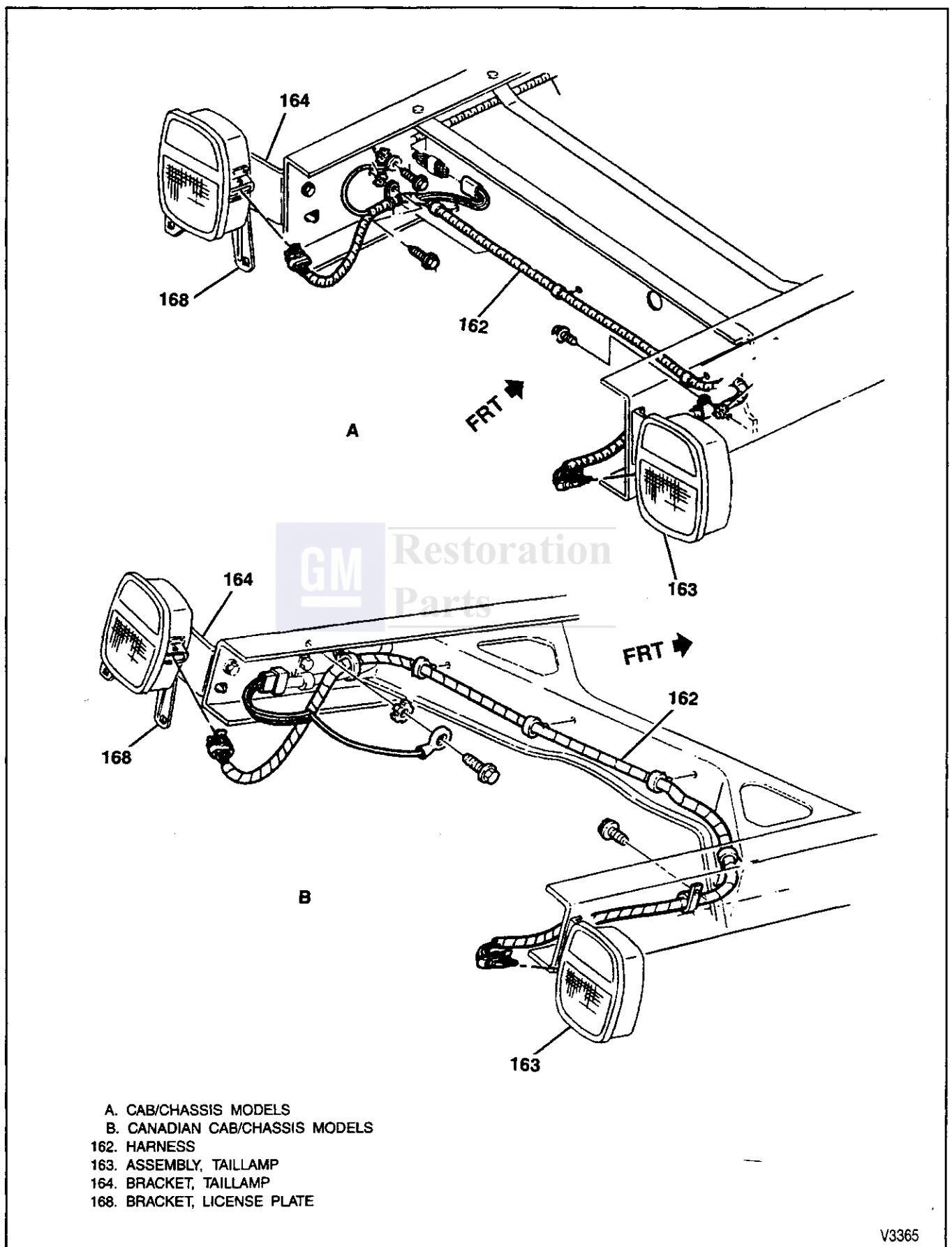


Figure 38—Cab/Chassis Taillamps

Install or Connect (Figure 41)

1. Underhood stationary lamp to the hood.
2. Bolts.
3. Wiring harness to the junction block and relay.
 - Connect the harness with the relay inboard mounting screw.
4. Junction block cover.
5. Negative battery cable.

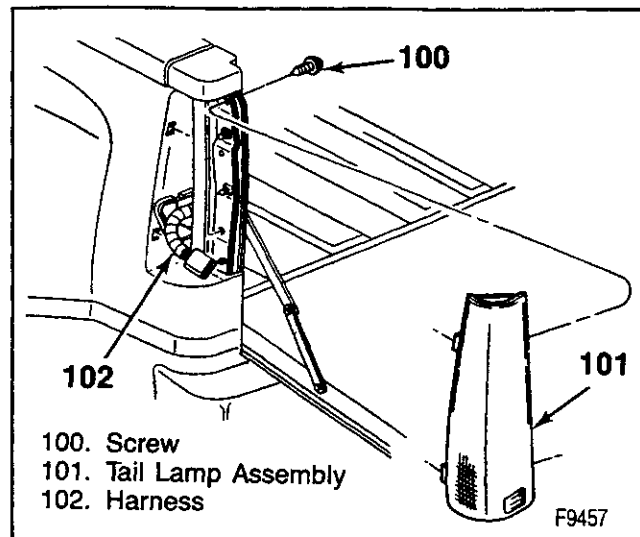


Figure 39—Taillamp Assembly

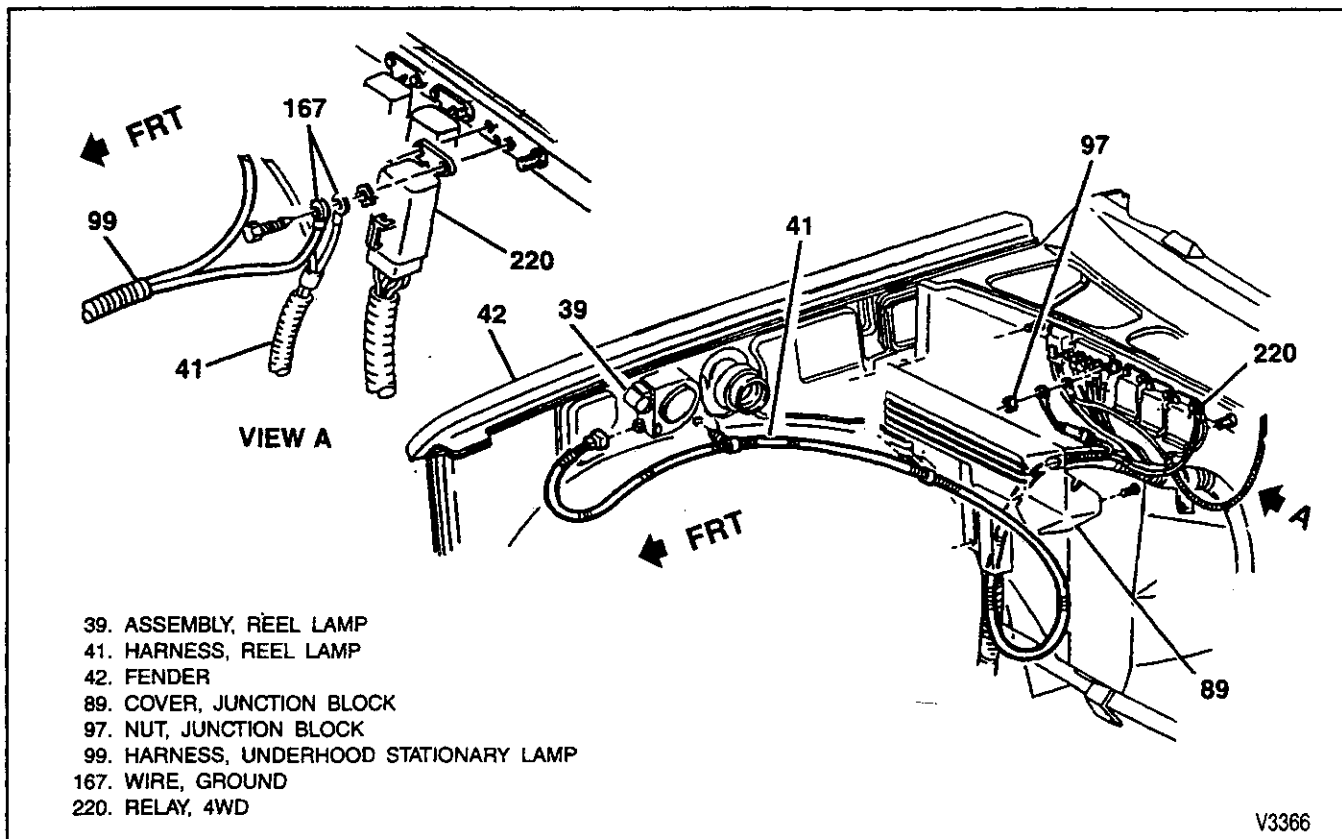


Figure 40—Underhood Reel Lamp

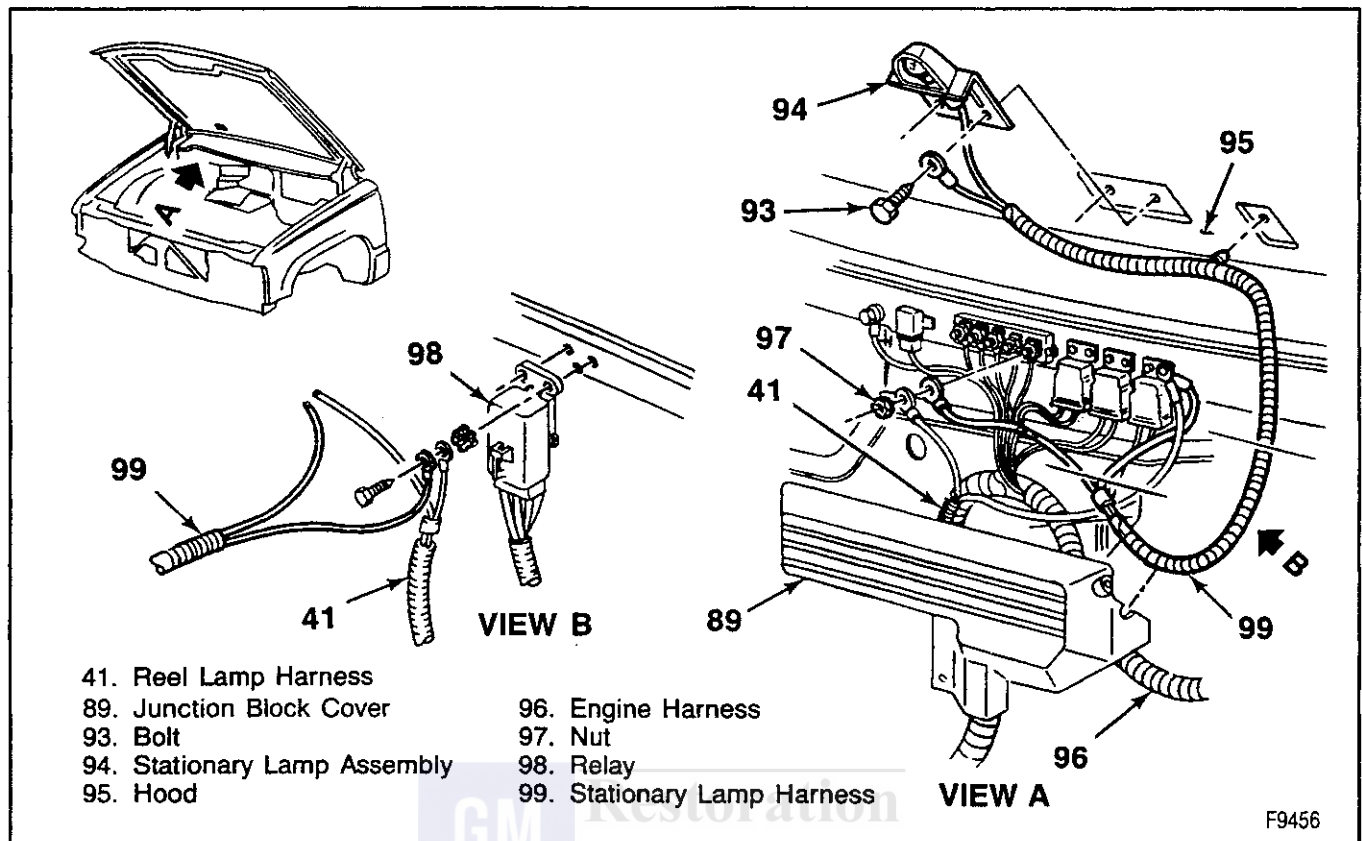


Figure 41—Underhood Stationary Lamp and Reel Lamp Harness

ON-VEHICLE SERVICE OF INTERIOR LIGHTING AND SWITCHES

ASHTRAY LAMP REPLACEMENT

Remove or Disconnect (Figure 17)

- Make sure the headlamp switch is off.
- 1. Four ashtray screws.
- 2. Ashtray assembly.
- 3. Lamp assembly and shield from the top of the ashtray bracket.
- 4. Shield from the lamp assembly.
- 5. Bulb from the base by pulling it straight out.

Install or Connect (Figure 17)

- 1. Bulb into the base by pushing it straight in.
- 2. Shield to the lamp assembly.
- 3. Lamp assembly and shield to the top of the ashtray bracket.
- 4. Ashtray assembly to the instrument panel with four screws.

BACKUP LAMP SWITCH REPLACEMENT

Remove or Disconnect (Figure 42)

- 1. Negative battery cable. Refer to SECTION 0A.

- 2. Lower insulator panel.
- 3. Electrical connector from the switch terminals.
- 4. Switch from the steering column jacket by pulling the switch outward.

Install or Connect (Figure 42)

- A. Align the actuator on the switch with the holes in the shift tube.
- B. Set the parking brake. Place the gear selector in neutral.
- C. Press down on the front of the switch until the tangs snap into the rectangular holes in the steering column jacket.
- 1. Electrical connector.
 - Adjust the switch by moving the gear selector to park. The main housing and the housing back should ratchet, providing the proper switch adjustment.
- 2. Lower insulator panel.
- 3. Negative battery cable. Check for proper switch operation.
- If necessary, readjust the switch by moving the housing all the way toward the low gear position. Then repeat the adjustment procedure under step 1.

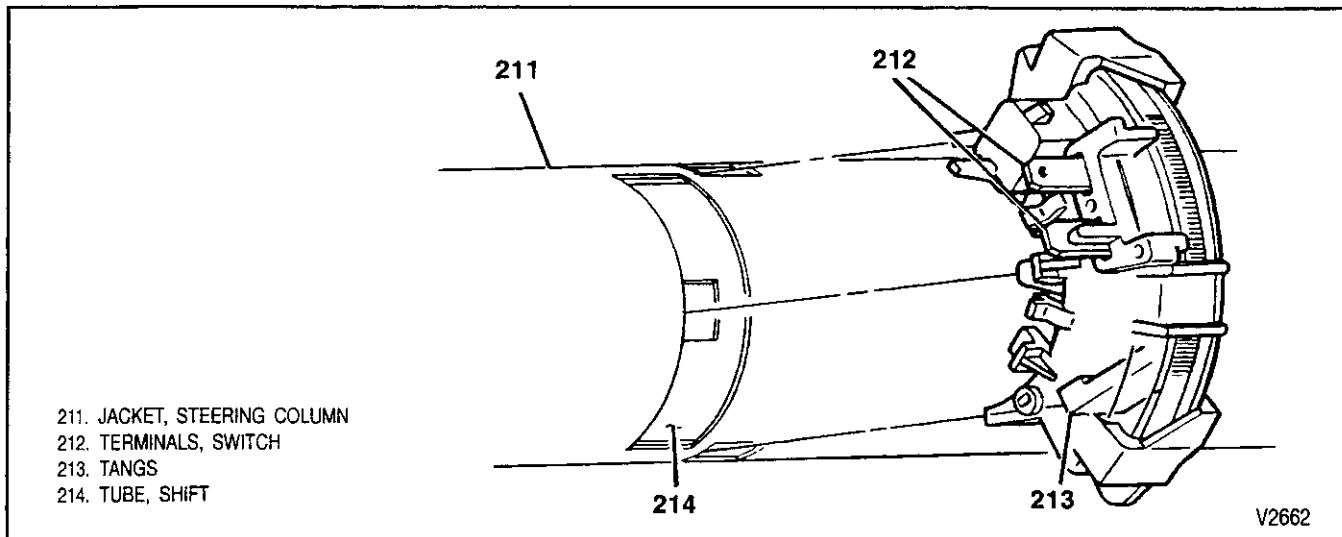


Figure 42—Backup Lamp Switch (Automatic Transmission)

CARGO/DOME LAMP AND HATCH RELEASE SWITCH REPLACEMENT

Both switches are located beneath the headlamp switch. There may be a hatch release switch on the left (for suburban or utility models) and/or an optional dome/override switch or cargo lamp switch on the right side.

Remove or Disconnect (Figure 43)

1. Negative battery cable. Refer to SECTION 0A.
2. Four instrument panel bezel screws.
3. Bezel by pulling it forward slightly.
4. Wiring connectors to the headlamp, panel dimmer, cargo/dome, and rear window release switches.
5. Cargo/dome or rear window release switch from the back of the bezel.

- Squeeze the tangs together at the sides of the switch to remove it.

Install or Connect (Figure 43)

1. Switch into the bezel by squeezing the tangs at the side of the switch and pressing it in to the front of the bezel.
2. Electrical connectors to the back of the switches.
3. Bezel to the instrument panel with four screws.
4. Negative battery cable.

DRL MODULE AND RELAY REPLACEMENT

DRL MODULE

The DRL module consists of a circuit board in a black case. The case acts as a connector. The module breaks out of the instrument panel harness behind the left side of the instrument panel. The case is taped to the harness.

Remove or Disconnect

- Make sure the ignition switch and headlamp switch are off.
- Roll back the instrument panel. Refer to "Instrument Panel Replacement" in SECTION 10A4.

1. Tape from around the case and wiring harness.
 - Open the case.
2. Board from the case.

Install or Connect

1. New board to the case.
2. Tape to the module and wiring harness.
3. Instrument panel.

DRL RELAY

Remove or Disconnect (Figure 6)

1. Negative battery cable. Refer to SECTION 0A.
2. Electrical connector.
3. Relay from the clip behind the left side of the instrument panel.

Remove or Disconnect (Figure 6)

1. Relay to the clip.
2. Electrical connector.
3. Negative battery cable.

DOMELAMP REPLACEMENT

Remove or Disconnect (Figure 44)

1. Negative battery cable. Refer to SECTION 0A.
2. Lens.
3. Bulb.
4. Housing screws.
5. Housing assembly or lamp assembly.
6. Electrical connector.

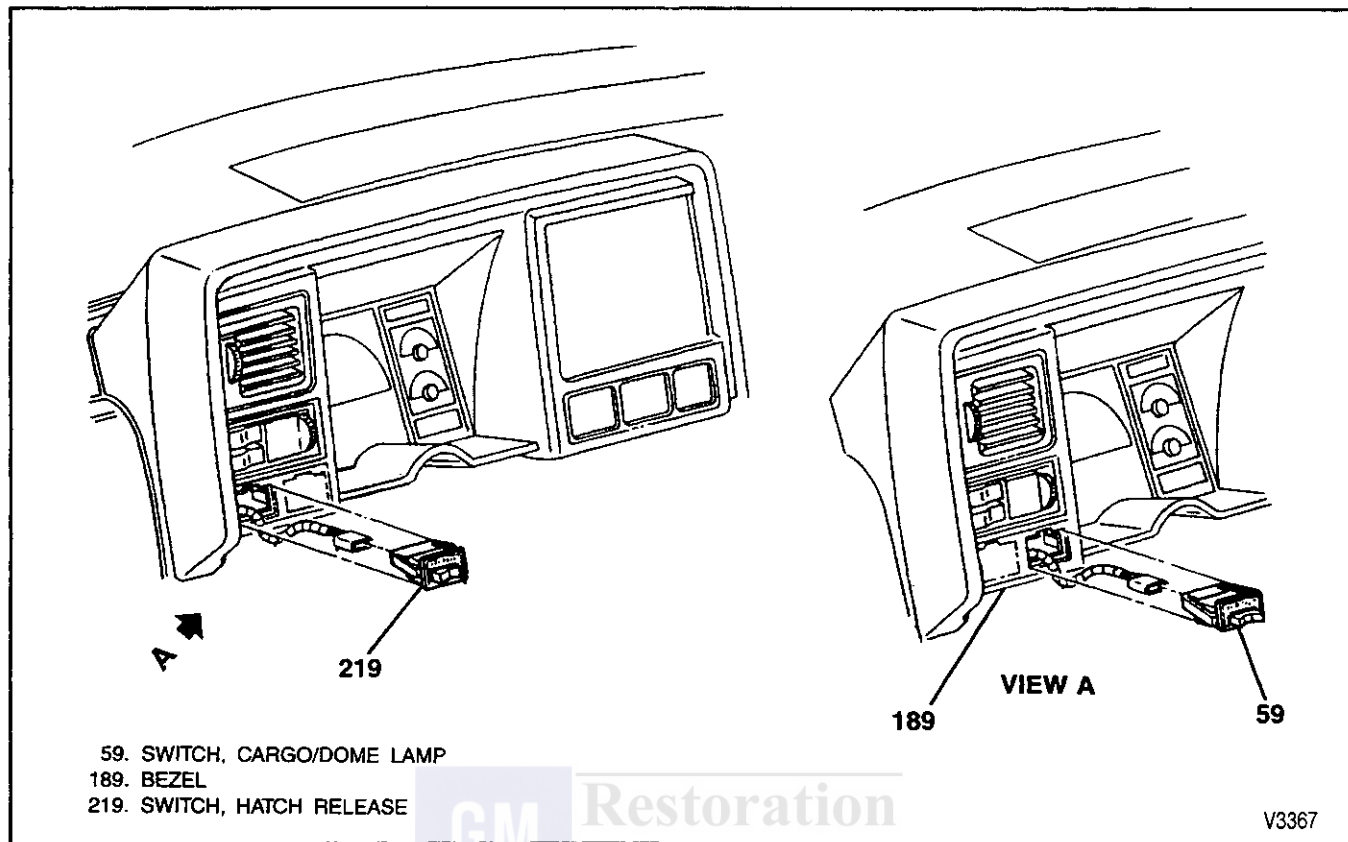


Figure 43—Cargo/Dome Lamp Switch

7. Bezel.

Install or Connect (Figure 44)

1. Bezel.
2. Electrical connector.
3. Housing assembly or lamp assembly.
4. Housing screws.
5. Bulb.
6. Lens.
7. Negative battery cable.

DOOR JAMB SWITCH REPLACEMENT

Remove or Disconnect (Figure 17)

1. Negative battery cable. Refer to SECTION 0A.
 - Reach up under the instrument panel, squeeze the switch tangs together, and push the switch through the side of the instrument panel.
2. Door jamb switch electrical connector.
3. Door jamb switch.

Install or Connect (Figure 17)

1. Door jamb switch to the electrical connector.
 - Squeeze the switch tangs together, and push the switch into the side of the instrument panel.
2. Negative battery cable.

FOG LAMP SWITCH REPLACEMENT

Remove or Disconnect (Figure 2)

1. Negative battery cable. Refer to SECTION 0A.
2. Bezel from the instrument panel.
3. Fog lamp switch electrical connector at the back of the bezel.
4. Fog lamp switch from the front of the bezel.

- Squeeze the tangs together at the sides of the switch and push the switch forward.

Install or Connect (Figure 2)

1. Fog lamp switch to the bezel.
2. Electrical connector to the switch.
3. Bezel to the instrument panel.
4. Negative battery cable.

FOUR-WHEEL DRIVE INDICATOR LAMP REPLACEMENT

Remove or Disconnect (Figure 45)

- Make sure the headlamp switch is off.
1. Shift lever knob by unscrewing it.
 2. Four bezel screws.
 3. Transfer case bezel.

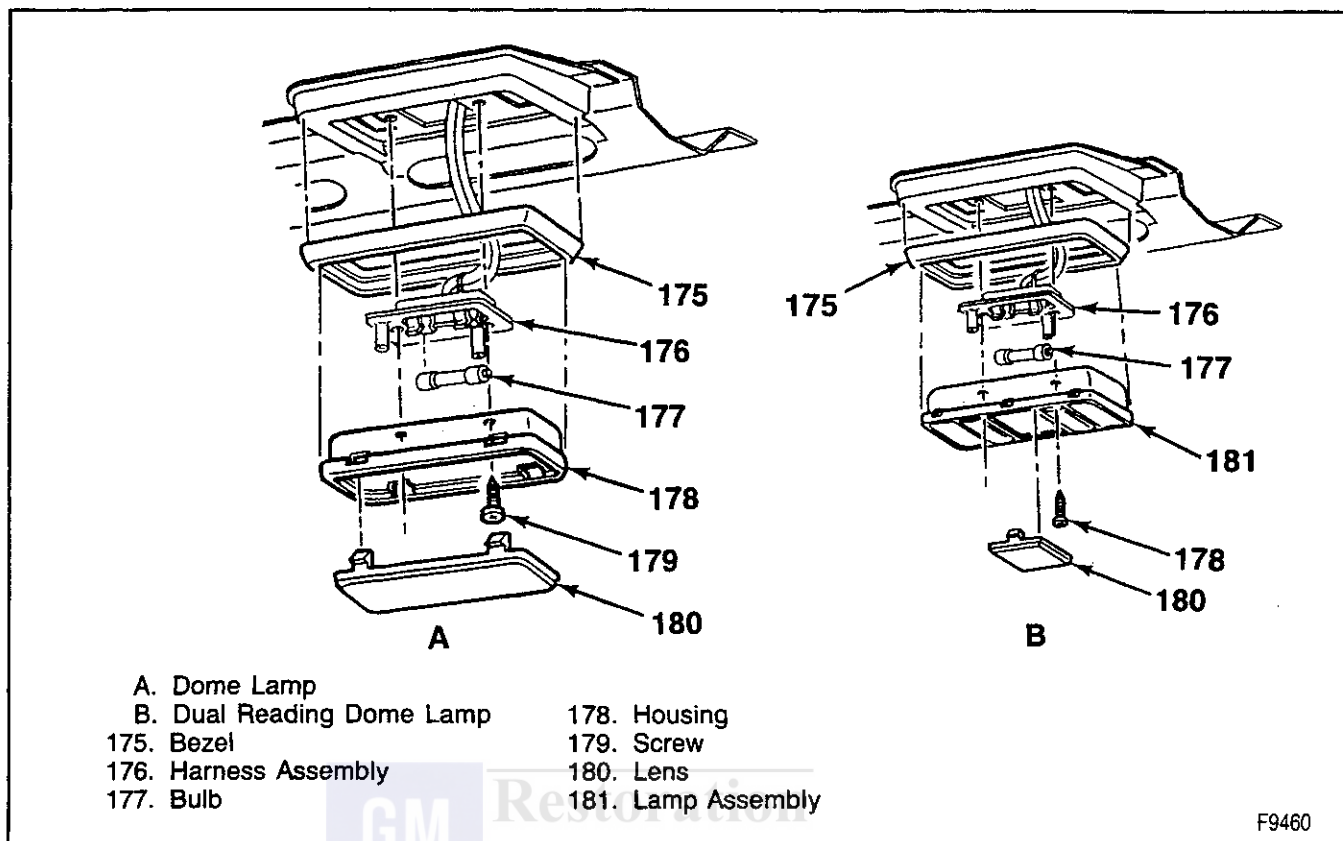


Figure 44—Dome Lamp Replacement

4. Bulbs from the sockets by pulling them straight out.

Install or Connect (Figure 45)

1. Bulbs into the sockets by pushing them straight in.
2. Bulbs and sockets into the back of the bezel.
3. Bezel to the floor with four screws.
4. Shift lever knob.

HEADLAMP SWITCH REPLACEMENT

Remove or Disconnect (Figure 46)

1. Negative battery cable. Refer to SECTION 0A.
2. Bezel.
3. Headlamp switch, cargo lamp switch, fog lamp switch, and defogger switch electrical connectors.
4. Four switch to bezel screws.
5. Headlamp switch assembly from the back of the bezel.
6. Headlamp switch and/or panel dimmer switch from the mounting switch mounting plate.

Install or Connect (Figure 46)

1. Headlamp switch and/or panel dimmer switch to the mounting plate.
2. Switch assembly to the back of the bezel with four screws.

3. Electrical connectors to the back of the switches in the bezel.

4. Bezel to the instrument panel.
5. Negative battery cable.

INSTRUMENT PANEL COMPARTMENT LAMP AND SWITCH REPLACEMENT

LAMP

Remove or Disconnect (Figure 17)

- Make sure the headlamp switch is off.

1. Instrument panel compartment screws.
2. Instrument panel compartment.
3. Bulb from behind the instrument panel by pulling it straight out.

Install or Connect (Figure 17)

1. Bulb into the socket by pushing it straight in.
2. Instrument panel compartment with screws.

SWITCH

Remove or Disconnect

1. Negative battery cable. Refer to SECTION 0A.
2. Instrument panel compartment.
3. Switch cover from the front of the instrument panel.

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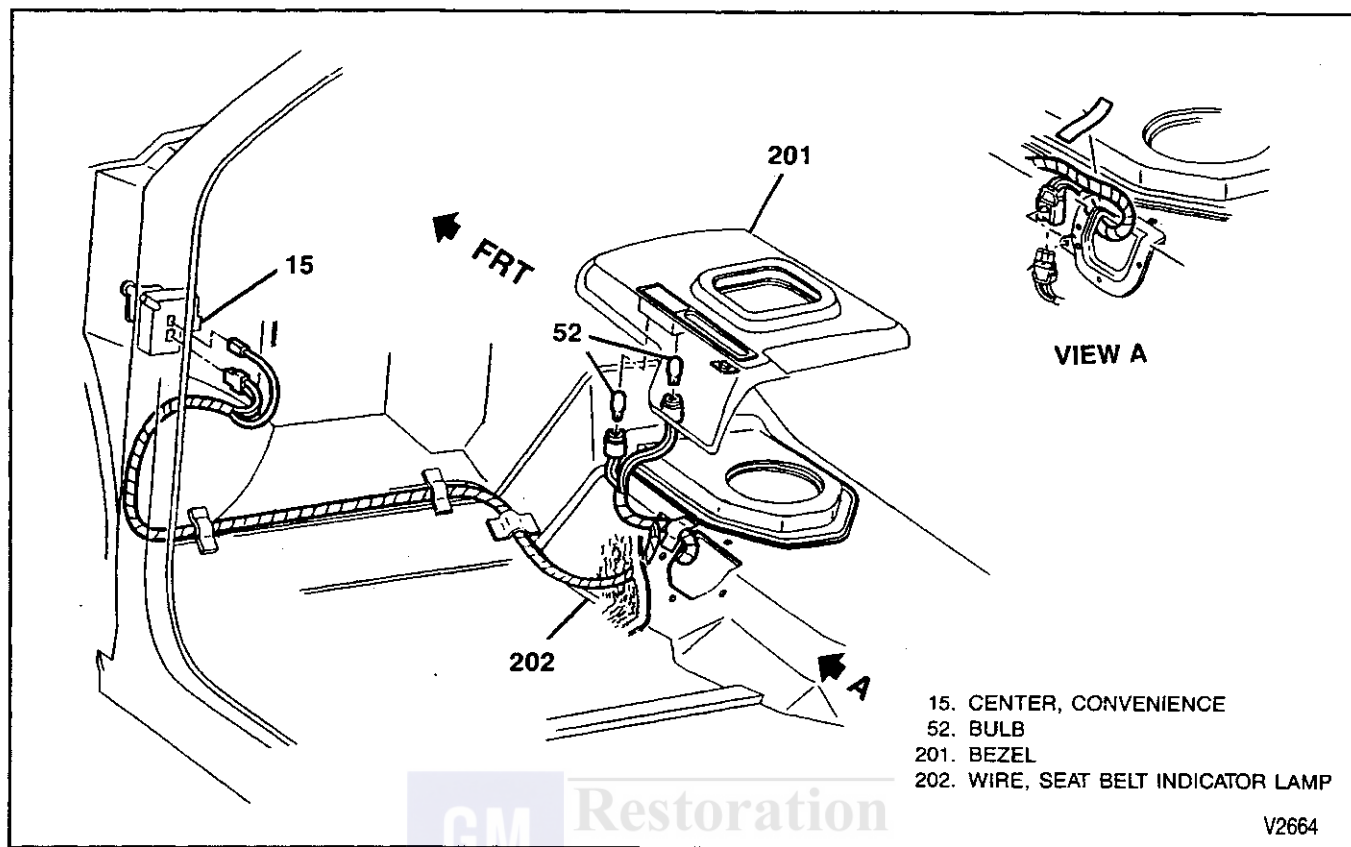


Figure 45—Four-Wheel Drive Indicator Lamps

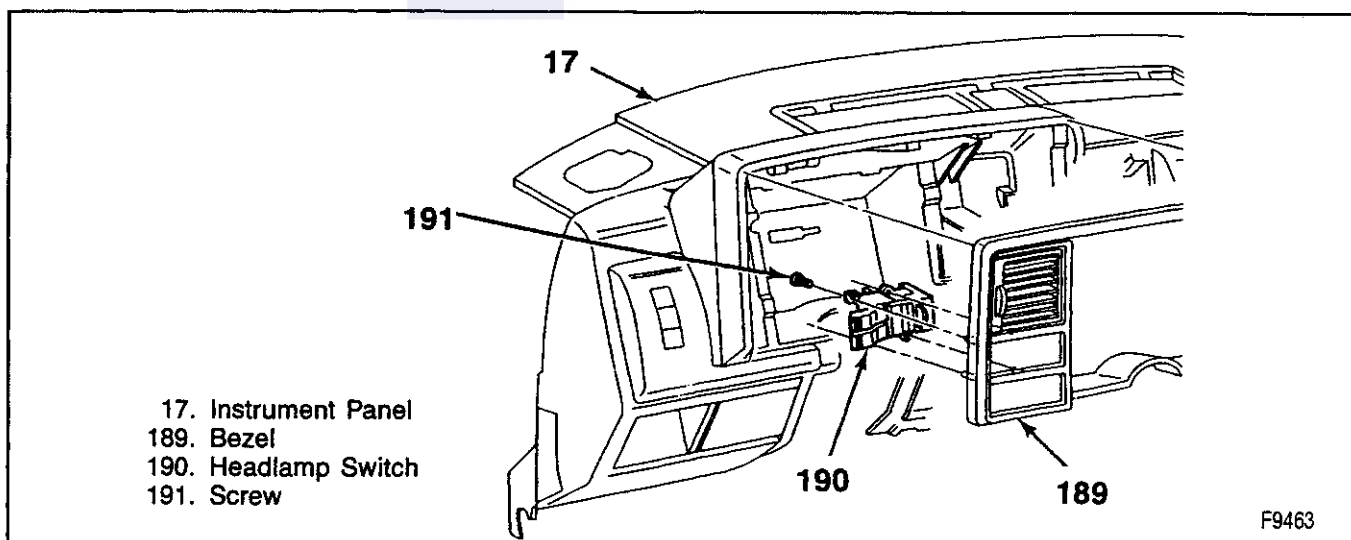


Figure 46—Headlamp Switch

4. Switch from behind the instrument panel.
 - Lift up the tab on the switch to remove the two wire connectors.



Install or Connect

1. Wire connectors to the switch.
 - Push down the tab on the switch to hold the wire connectors.
2. Switch to the back of the instrument panel.
3. Switch plate to the front of the instrument panel.
4. Instrument panel compartment with screws.
5. Negative battery cable.

OVERHEAD CONSOLE AND LAMP REPLACEMENT

LAMP REPLACEMENT



Remove or Disconnect (Figure 47)

1. Negative battery cable. Refer to SECTION 0A.
2. Lamp assembly.
 - A. Push upward against the reading lamp assembly and turn it to the left.
 - B. Lower the assembly from the console.

3. Bulb and base from the back of the assembly.
4. Bulb from the base by pulling it straight out.

Install or Connect (Figure 47)

1. Bulb into the base by pushing it straight in.
2. Bulb and base into the lens and socket assembly.
3. Lamp assembly into the console by pushing it in and turning it to the right.
4. Negative battery cable.

CONSOLE REPLACEMENT

Remove or Disconnect (Figure 47)

1. Negative battery cable. Refer to SECTION 0A.
2. Console screw from the front of the console.
 - Lift the console from the slots in the headliner, slide it forward, and lower it.
3. Wiring connector at the back of the console.

Remove or Disconnect (Figure 47)

1. Electrical connectors to the back of the console.
2. Tabs on the end of the console into the slots in the headliner.
3. Screw through the front of the console.
4. Negative battery cable.

SUNSHADE VANITY MIRROR LAMP REPLACEMENT

The vanity mirror assembly is an integral part of the sunshade. If it is damaged, the sunshade assembly must be replaced. Only the lamps can be replaced separately.

Remove or Disconnect (Figure 48)

- Lift the cover on the vanity mirror.
1. Lamp lens by prying it out.
 2. Lamp bulb by gently prying it out.

Install or Connect (Figure 48)

1. New lamp bulb by pressing it in.
2. Lamp lens.

TRANSMISSION INDICATOR (PRNDL) LAMP REPLACEMENT

On vehicles with automatic transmissions, the transmission indicator and lamp are part of the instrument cluster. The bulb and base are one assembly. For replacement instructions, refer to SECTION 8C.

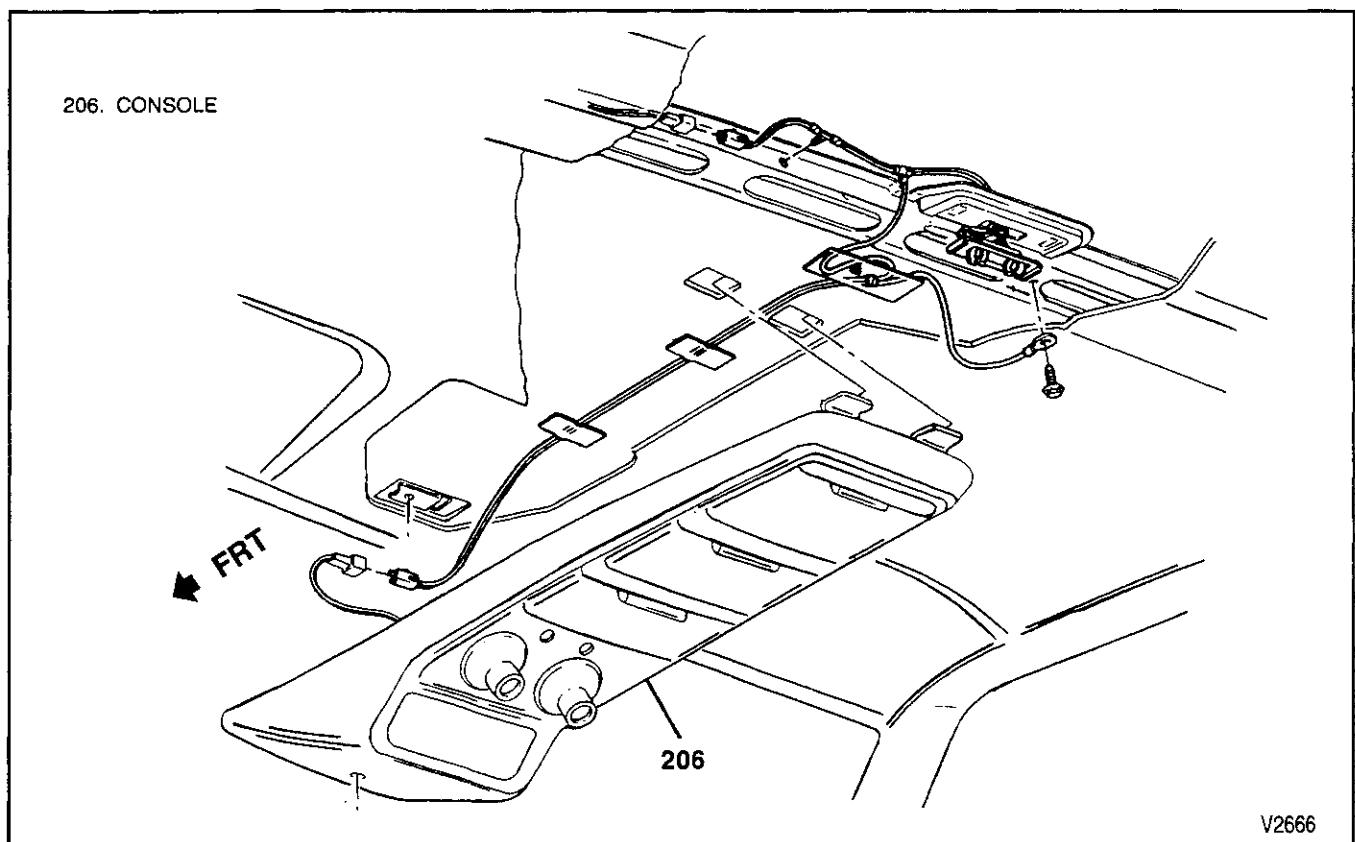


Figure 47—Overhead Console

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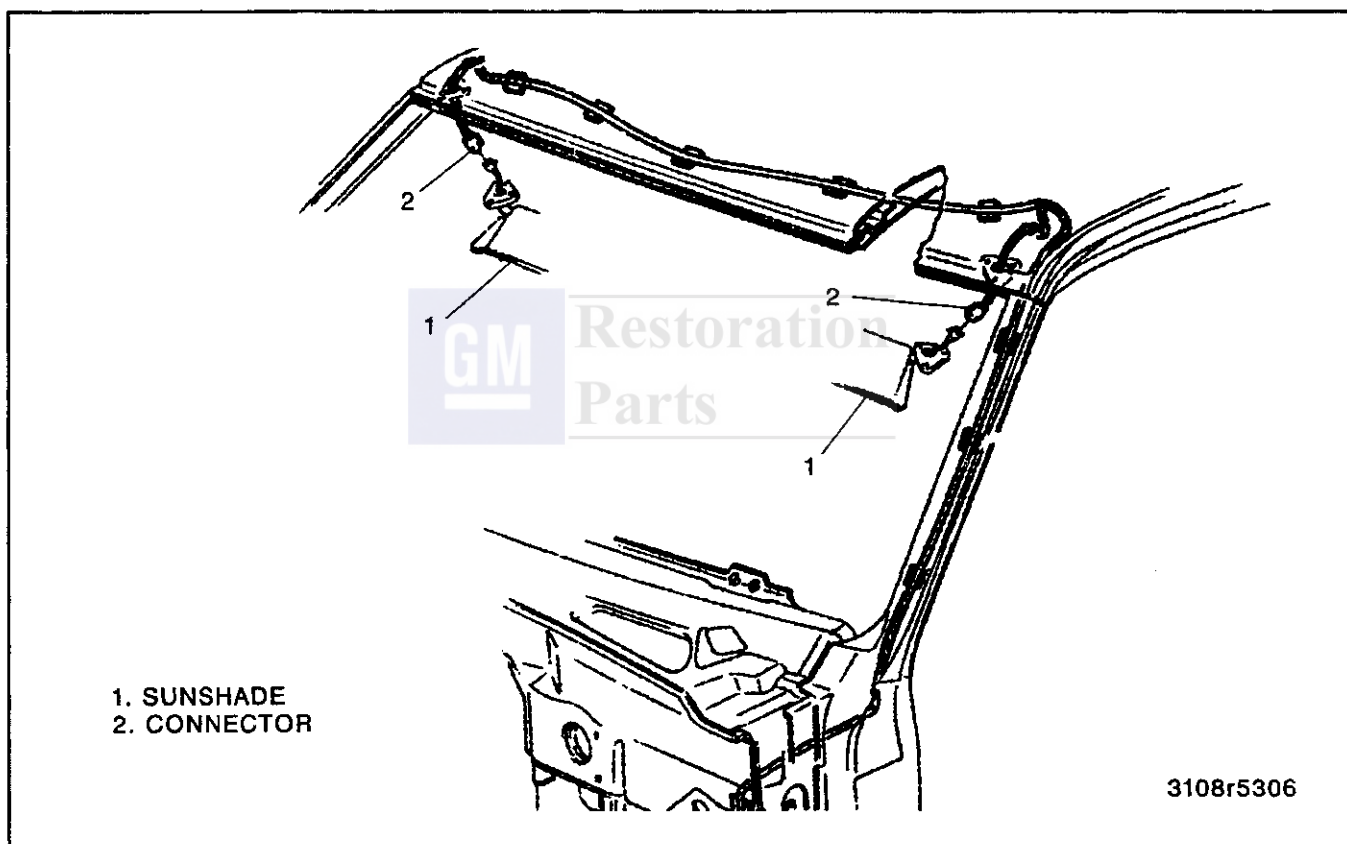


Figure 48—Sunshade with Lighted Vanity Mirror

SPECIFICATIONS

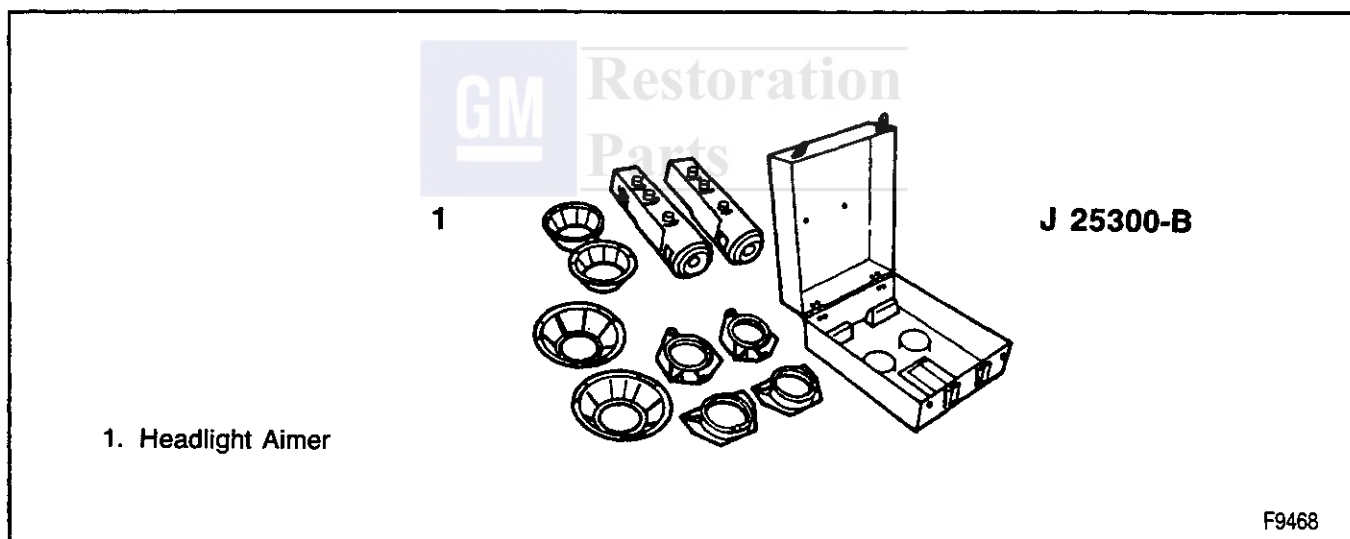
Lamp or Bulb	Trade No.	Power Rating at 12.8V, Watts	Quantity			
			Pickup	Crew Cab	Utility	Suburban
Exterior Lights:						
Headlamps: 2 Headlamp System Halogen (Opt.)	6052	55/65	2	2	2	2
	H6054	35/65	2	2	2	2
Headlamps: 4 Headlamp System (Composite)	9005	65	2	2	2	2
	9006	55	2	2	2	2
		Candle Power				
Fog Lamp	H3	115	2	—	—	—
Front Marker Lamp	194	2	2	2	2	2
Front Park and Turn Lamp	2357NA	30/2	4	4	4	4
Rear Parking Lamp	3057	32-2	2	2	2	2
Rear Stop and Turn Lamp	3057	32-2	2	2	2	2
Backup Lamp	3156	32	2	2	2	2
Backup Lamp (Cab/Chassis Only)	1156	32	2	2	—	—
Rear Park, Stop, and Turn Lamp (Cab/Chassis Only)	1157	32-3	2	2	—	—
Fender Clearance Lamp	194	2	4	4	—	—
Roof Marker Lamp	194	2	5	5	—	5
CHMSL Bulb	921	32	1	1	—	—
License Plate Lamp	194	2	2	2	2	2
Underhood Lamp	93	15	1	1	1	1
Reel Lamp	232	10	1	1	1	1
Interior Lights:						
Dome Lamps	211-2	12	1	2	2	2
Reading Lamps	211-2	12	2	4	4	4
Roof Console Lamps	168	3	—	2	2	2
Courtesy Lamp	1003	15	2	2	2	2
Heater or A/C Control Lamp	194	2	1	1	1	1
Four Wheel Drive Indicator	161	1	1	1	1	1
Four Wheel Drive Shift Lever	194	1	1	1	1	1
Instrument Panel Compartment Lamp	194	2	1	1	1	1
Ashtray Lamp	194	2	1	1	1	1
Sunshade Vanity Mirror	74	0.7	—	4	4	4
Instrument Panel Lights						
Transmission Indicator (PRNDL)	161	1	1	1	1	1
Daytime Running Lights Indicator†	74	.7	1	1	1	1
Charging System Indicator Lamp	74	.7	1	1	1	1
Instrument Cluster	Gage 194	.2	4	4	4	4
Illuminating Lamps	W. Tach 194	.2	6	6	6	6
Headlamp Beam Indicator	74	.7	1	1	1	1
Directional Signal Indicator	74	.7	2	2	2	2
Brake Warning Indicator	74	.7	1	1	1	1
Safety Belt Warning	74	.7	1	1	1	1
Check Gages Indicator	74	.7	1	1	1	1
Malfunction Indicator ("Service Engine Soon")	74	.7	1	1	1	1
Malfunction Indicator ("Service Throttle Soon")	74	.7	1	1	1	1
Upshift Indicator	74	.7	1	1	1	—
ABS Warning Indicator	74	.7	—	—	1	1
Wait Lamp*	74	.7	1	1	—	—
Low Coolant Lamp*	74	.7	1	1	—	—
Service Fuel Filter Lamp*	74	.7	1	1	—	—

*Diesel only †Canadian Vehicles only

T2857

8B-44 LIGHTING SYSTEMS

SPECIAL TOOLS



SECTION 8C**INSTRUMENT PANEL AND GAGES**

NOTICE: When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread locking compound will be called out. The correct torque value must be used when installing fasteners that require it. If the above conditions are not followed, parts or system damage could result.

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GENERAL DESCRIPTION

INSTRUMENT PANEL AND GAGES

The instrument panel is designed to allow the removal of all control switches from the driver's side (figure 1). The standard instrument cluster is equipped with mechanical gages that show engine oil pressure, coolant temperature, and charging system voltage (figures 2 and 4). An optional cluster includes an analog tachometer (figures 3 and 4).

NOTICE: When replacing a speedometer or odometer assembly, federal law requires that the odometer reading of the replacement unit be set to register the same mileage as the prior odometer. If the same mileage cannot be set, the law requires that the replacement odometer be set at zero and a label be installed on the driver's door frame to show the previous odometer reading and the date of replacement.

ELECTRIC SPEEDOMETER

The instrument cluster contains a high-torque type electric speedometer. The electro-mechanical gages are individually plugged into socket-type metal connectors in the cluster case. Integrated circuits control the air core speedometer and stepper motor odometer. Lighting is provided by removable bulb and socket assemblies that insert into the back of the instrument cluster.

The speedometer system consists of the instrument cluster, vehicle speed sensor (VSS) calibrator, vehicle speed sensor (VSS), and related wiring.

The one-piece instrument cluster mounts in front of the driver in the instrument panel and is not serviceable. If diagnosis leads to a malfunctioning instrument cluster, it must be replaced. Repairs to the instrument cluster can only be performed by an authorized instrument cluster service center.

The vehicle speed sensor calibrator (VSS calibrator) is a solid-state device that changes the analog output from the vehicle speed sensor (VSS) to a digital signal

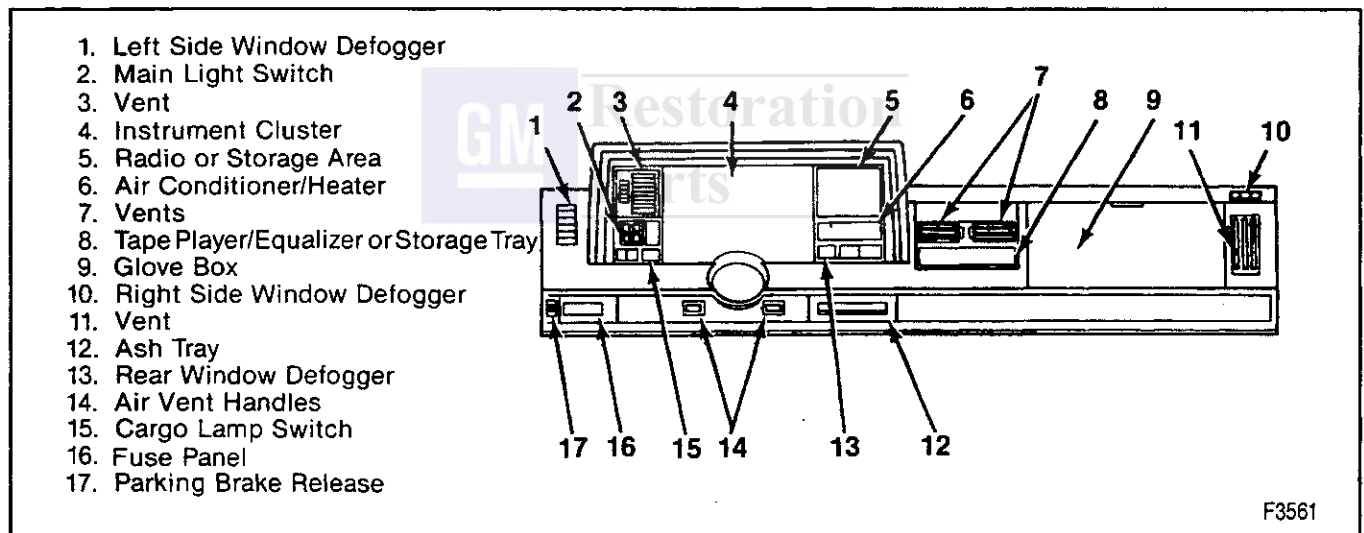


Figure 1—Instrument Panel and Controls

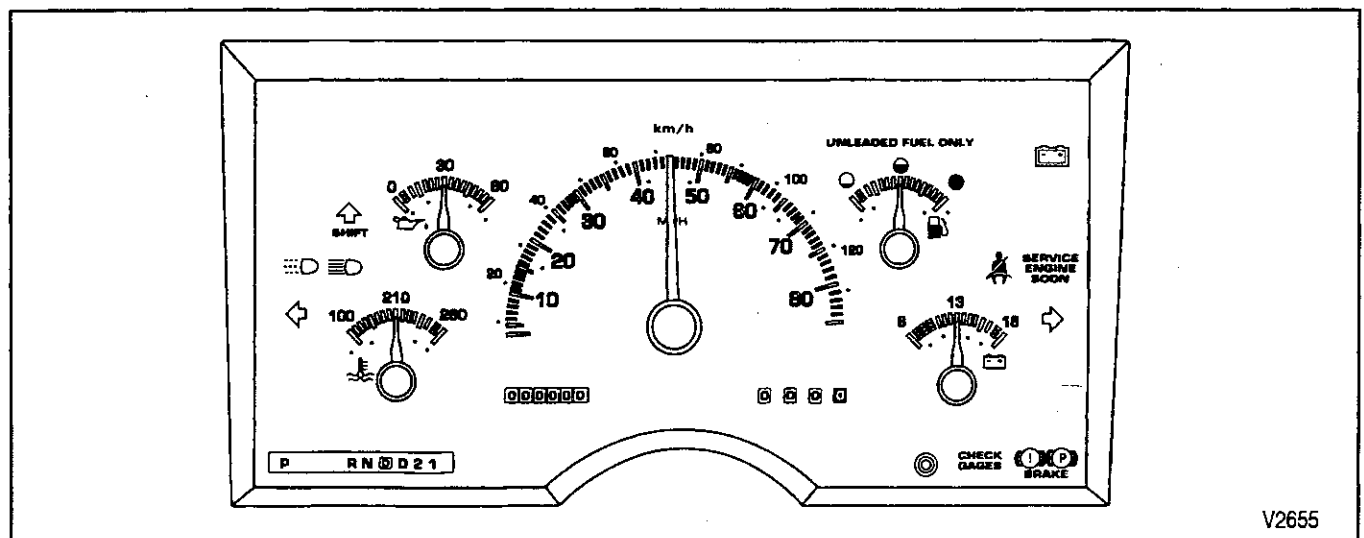


Figure 2—Gage Cluster—Gasoline Models

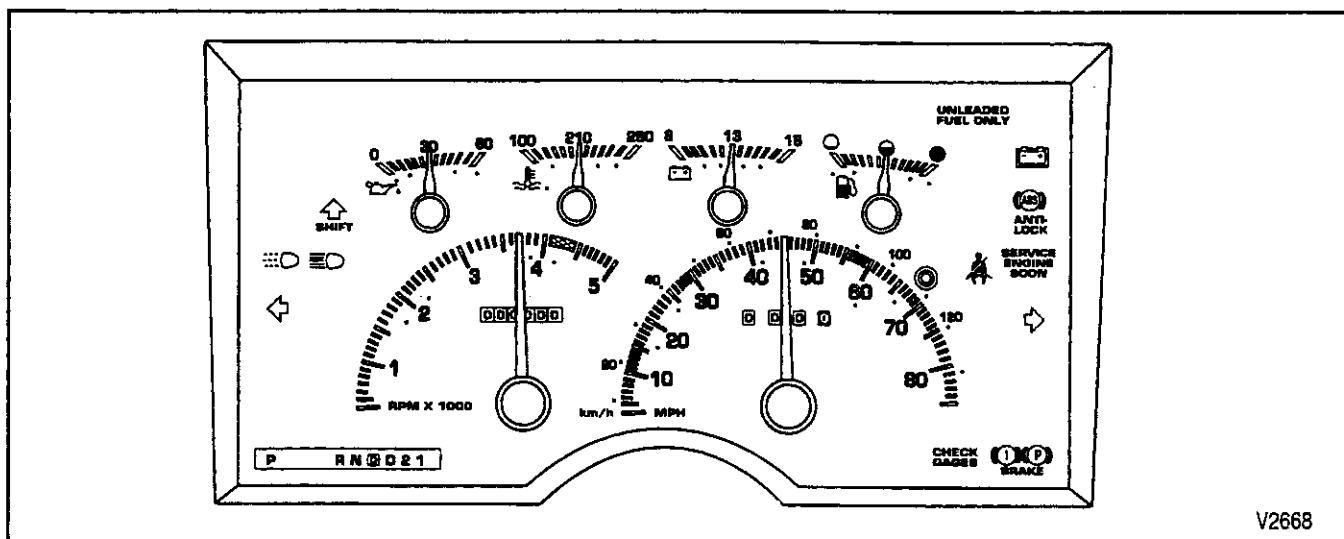


Figure 3—Tachometer Cluster—Gasoline Models

containing 4000 pulses per mile (PPM) for the instrument cluster. The VSS calibrator is matched to the final drive and tire size of each vehicle. It must be replaced with the proper VSS calibrator part number to match that vehicle. If the final drive or tire size is changed for any reason, replace the VSS calibrator to match the new final drive or tire size. If not, the signal will not be accurate for proper speedometer/odometer operation. An incorrect VSS calibrator can also affect antilock brakes, vehicle control module (VCM), and cruise control systems.

The VSS calibrator attaches to the passenger side of the instrument panel near the instrument panel storage compartment with hook and loop type fastener. All powertrain combinations use a separate VSS calibrator.

The vehicle speed sensor (VSS) is a permanent magnet signal generator that sends an analog signal proportional to the propeller shaft speed to the VSS calibrator. The VSS mounts to the transmission tailshaft extension housing on two-wheel drive models and the transfer case output shaft housing on four-wheel drive models. Refer to SECTION 7A and 7B for VSS replacement procedures.

TACHOMETER

An optional tachometer indicates engine speed in revolutions per minute (RPM) with the ignition switch in the "RUN" position. A wire to the "TACH" connector on the ignition control module (gasoline engines) or this "I" terminal on the generator (diesel engines) measures the ignition pulses of the module. An electronic circuit on the tachometer converts these pulses to an analog display.

FUEL GAGE

The fuel gage indicates the quantity of fuel in the tank when the ignition switch is in the "RUN" position. When the ignition switch is turned to the "OFF," "LOCK," "START," or "ACC" position, the pointer may come to rest at any position.

The fuel gage measures current from a variable resistor inside the fuel tank that is controlled by a float. When the fuel tank is full and the ignition switch is in the "RUN" position, resistance is high and the fuel gage

indicator moves to the maximum position, or FULL on the gage face. When the fuel tank is empty, resistance is low and the fuel gage indicator moves to the minimum position, or EMPTY on the gage face. Corroded connections or severed ground paths generally cause the indicator to register past FULL on the gage face. Short circuits to ground generally result in the indicator resting below EMPTY.

The fuel gage sender assembly mounts to the top of the fuel tank and is retained by a cam-type locking ring. A seal is used between the fuel tank and the sender. The fuel gage sender assembly consists of float attached to a variable resistance sender, a woven plastic filter on the fuel pickup tube, and a vane-type electric fuel pump. For fuel gage sender replacement procedures, refer to the Driveability, Emissions, and Electrical Diagnosis Manual.

The fuel gage sender will have two or three hose connections. One is used for the fuel feed hose, the second connects to the vapor canister, and the third is used for the fuel return line to the fuel tank. On some fuel tank senders, a short connector lead is used while others have the connector attach directly to the sender.

COOLANT TEMPERATURE GAGE

The coolant temperature gage measures current from a variable resistance sensor in the engine coolant jacket with the ignition switch in the "RUN" position. The sensor changes resistance with coolant temperature. As coolant temperature increases, the resistance of the sensor decreases.

The coolant temperature sensor (CTS) is located in the middle of the cylinder head on the driver's side of the vehicle for the 4.3L, 5.0L, 5.7L, and 7.4L engines. The 6.5L diesel engine has a coolant temperature sender at the front of the cylinder head.

OIL PRESSURE GAGE

The oil pressure gage indicates engine oil pressure with the ignition switch in the "RUN" position. An oil pressure sender in the engine block changes resistance with oil pressure.

8C-4 INSTRUMENT PANEL AND GAGES

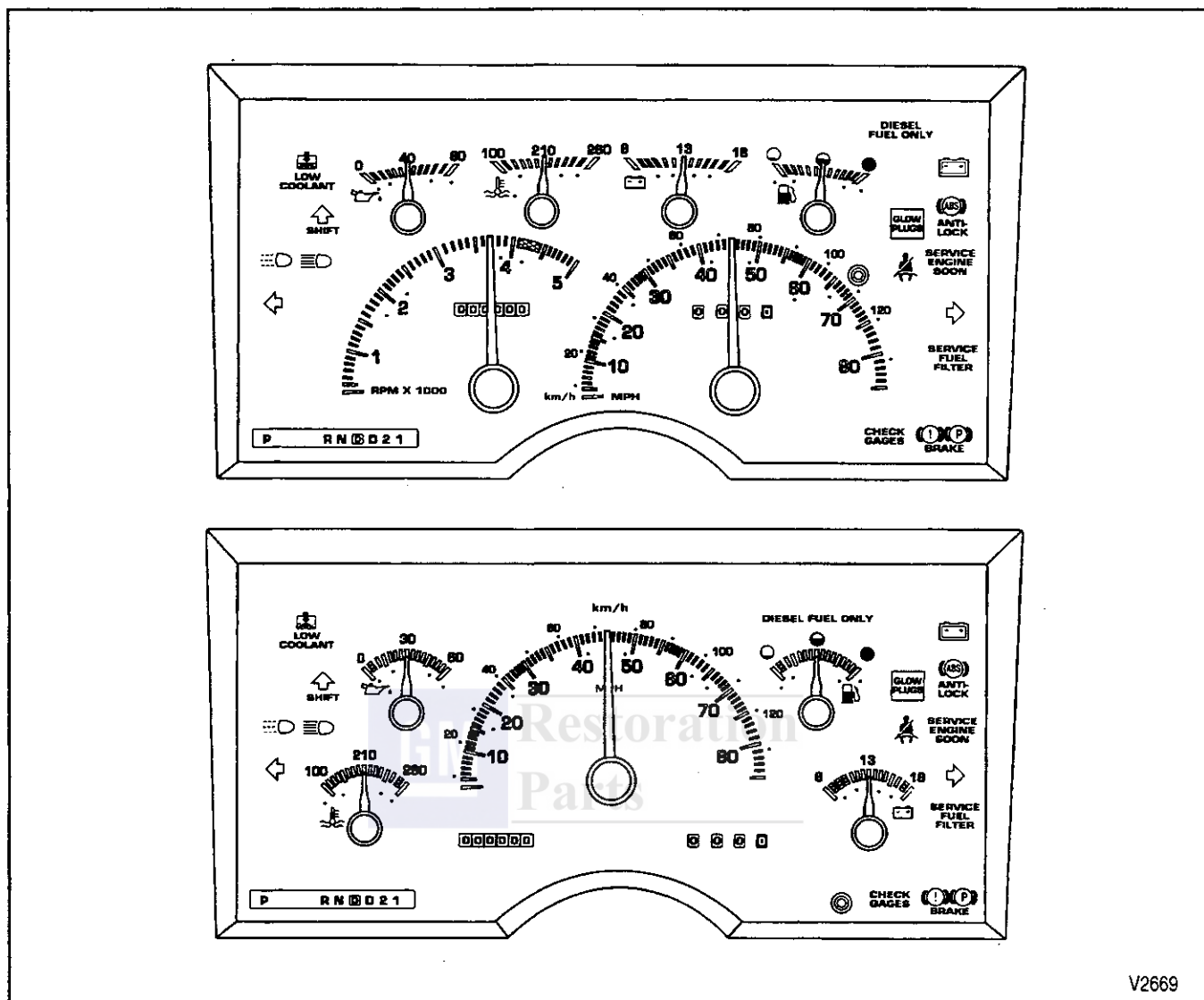


Figure 4—Gage and Tachometer Cluster—Diesel Models

The oil pressure gage sender is located at the front of the engine block on the 7.4L engine. On all other engines, including diesels, the oil pressure sender is located at the rear of the engine block.

VOLTMETER

The voltmeter indicates nominal electrical system voltage. When the engine is running, the indicator should be between 10 and 16 volts. If the indicator is not within these limits with the engine running, refer to SECTION 6D3.

The voltmeter has a red band at each extreme end of its range. It is normal operation for the indicator to rest just outside of either band. If the indicator rests inside either band, a charging system problem is indicated.

CHARGING SYSTEM WARNING LAMP

The charging system warning lamp appears on the instrument cluster as a battery symbol. It turns on when the ignition switch is in the "RUN" position and the

engine is not running. It turns off when the engine is running, if the charging system functions properly. A charging system malfunction is indicated when the charging system warning lamp is on with the engine running. This warning lamp will glow at full brilliance, not half lit, when a charging system malfunction occurs or system voltage is too high or too low.

MALFUNCTION INDICATOR LAMP (MIL)

The malfunction indicator lamp (commonly known as MIL or "Service Engine Soon") should turn on with the ignition switch in the "RUN" position and the engine off. The lamp should turn off one to five seconds after the engine starts. If the lamp stays on or turns on while driving, service to the emission control system may be required. Refer to the Driveability, Emissions, and Electrical Diagnosis Manual.

"SERVICE THROTTLE SOON" INDICATOR LAMP

All vehicles equipped with diesel engines have an electronic throttle control. Throttle cables are no longer used on diesel engines. An electronic throttle pedal assembly sends signals to the powertrain control module (PCM). The PCM collects this throttle position signal, compares it with information such as road speed, and transmission range, and signals a solenoid on the injector pump assembly. In this manner, precise control is kept over the entire diesel throttle system.

The "Service Throttle Soon" lamp will appear in the instrument cluster on vehicle's with diesel engines. It will turn on when the ignition switch is in "RUN" and the engine is off. The lamp should turn off one to five seconds after the engine starts. If the lamp stays on or turns on while driving, service to the electronic throttle system may be required. Refer to the Driveability, Emissions, and Electrical Diagnosis Manual.

BRAKE WARNING SYSTEM

The brake warning system consists of two lamps in the instrument cluster; the brake warning lamp and the antilock indicator lamp.

The brake warning lamp indicates that a low fluid pressure condition exists in the brake system when it finds ground through the pressure differential switch in the combination valve. It also indicates the parking brake is applied when it finds ground through the parking brake switch. For additional information on the brake warning lamp operation, refer to SECTION 5.

The "ANTILOCK" lamp serves as an indication of four wheel antilock system operation and malfunctions. A bulb check is done each time the ignition switch is turned to the "RUN" position. The lamp should turn on and remain on for about two seconds. To determine the specific cause of a system malfunction, refer to SECTION 5E1.

"CHECK GAGES" LAMP

The "CHECK GAGES" lamp turns on when engine coolant temperature is too high and/or engine oil pressure is too low. Signals from the engine coolant temperature sensor and engine oil pressure sender are monitored by the check gages lamp driver. The check gages lamp driver is part of the temperature gage circuit board inside the instrument cluster and controls current to the "CHECK GAGES" lamp.

UP-SHIFT INDICATOR LAMP (MANUAL TRANSMISSION ONLY)

The up-shift indicator in the instrument cluster turns on to indicate optimum shift points for maximum fuel economy. When this lamp turns on, shift the transmission to the next higher gear range, if conditions permit.

Control of the up-shift indicator is a function of the powertrain control module (PCM). Several conditions are monitored, such as engine speed, load, and throttle position to turn on the lamp. If the lamp is erratic or inoperative, verify the integrity of the circuit, then replace the PCM if no resolution is found.

INSTRUMENT PANEL HARNESS

This harness is located along the upper back edge of the instrument panel. It starts from the convenience center, which is located at the left side of the instrument panel, and goes up the left side of the instrument panel, then across to the right side of the cab (figure 5).

As the harness routes across the instrument panel, various circuits branch off to the switches, indicators, and instrument cluster. The harness is held in place with bendable clips.

Other harnesses are carried along the same supports. These harnesses consist of wiring for the power door locks, power windows, radio, heater, and air conditioning.

HEATER AND AIR CONDITIONING HARNESS

The harness begins at the convenience center and branches up to the heater and air conditioning control unit (figure 5). It then branches to the blower motor and relays. Refer to SECTION 1A and SECTION 1B for further information.

FUSE BLOCK AND CONVENIENCE CENTER

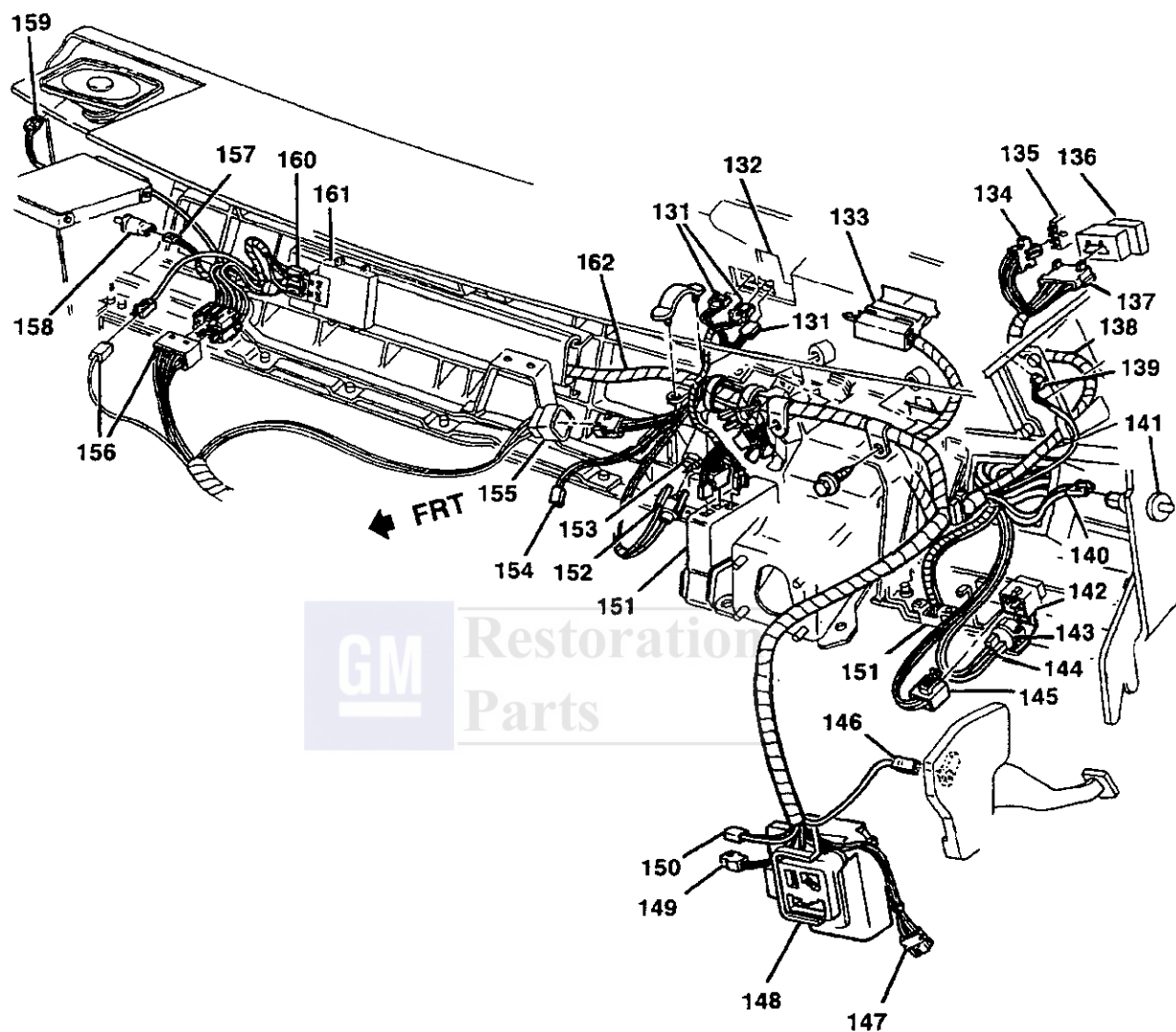
The fuse block is located behind a pull cover in the instrument panel to the left of the steering column.

The fuse block contains fuses and circuit breakers for several individual circuits within the vehicle.

The convenience center is located just below the instrument panel on the driver's side. It contains individual relays such as: the seat belt and ignition key alarm, horn relay, and flasher.

For further information about the fuse block or convenience center, refer to the Driveability, Emissions, and Electrical Diagnosis Manual.

8C-6 INSTRUMENT PANEL AND GAGES



- 131. CONNECTORS, RADIO
- 132. RADIO
- 133. CONNECTOR, INSTRUMENT CLUSTER
- 134. CONNECTOR, DIMMER SWITCH
- 135. SWITCH, DIMMER
- 136. SWITCH, HEADLAMP
- 137. CONNECTOR, HEADLAMP SWITCH
- 138. HARNESS, HEADLAMP
- 139. CONNECTOR, SPEAKER
- 140. CONNECTOR, DOOR JAMB SWITCH
- 141. SWITCH, DOOR JAMB
- 142. RELAY, DAYTIME RUNNING LAMP
- 143. FLASHER, HAZARD
- 144. CONNECTOR, HAZARD FLASHER
- 145. CONNECTOR, DAYTIME RUNNING LAMP RELAY
- 146. CONNECTOR, PARK BRAKE SWITCH

- 147. CONNECTOR, REAR SPEAKER HARNESS
- 148. CONVENIENCE CENTER
- 149. CONNECTOR, SEAT BELT
- 150. CONNECTOR, MANUAL TRANSMISSION
- 151. ASSEMBLY, AMPLIFIER
- 152. CONNECTOR, CIGAR LIGHTER
- 153. LIGHTER, CIGAR
- 154. CONNECTOR, LOW COOLANT INDICATOR
- 155. CONNECTOR, A/C, HEATER
- 156. CONNECTORS, ENGINE HARNESS
- 157. CONNECTOR, DOOR JAMB SWITCH
- 158. SWITCH, DOOR JAMB
- 159. CONNECTOR, SPEAKER
- 160. CONNECTOR, VEHICLE SPEED CALIBRATOR MODULE
- 161. VEHICLE SPEED CALIBRATOR MODULE

3108r5362

Figure 5—Instrument Panel Harness

DIAGNOSIS OF THE SPEEDOMETER AND VEHICLE SPEED SENSOR CALIBRATOR

PROBLEM	POSSIBLE CAUSE	CORRECTION
Speedometer and Odometer are Inaccurate	Incorrect vehicle speed sensor calibrator.	Install correct vehicle speed sensor calibrator.
Speedometer And Odometer Do Not Operate Properly	<ol style="list-style-type: none"> 1. Inoperative vehicle speed sensor calibrator. 2. Poor ground path from the vehicle speed sensor calibrator. 3. No signal from the vehicle speed sensor. 4. Inoperative vehicle speed sensor calibrator (speedometer output). 5. Inoperative vehicle speed sensor calibrator (cruise output). 6. Inoperative instrument cluster. 	<ol style="list-style-type: none"> 1. Disconnect the vehicle speed sensor calibrator, and place the ignition in "RUN". Check for voltage between the PNK/BLK wire in the harness and a good chassis ground. If the voltage is less than the battery voltage, check for an open or short in the PNK/BLK wire. 2. Check for voltage between the PNK/BLK wire in the harness and the BLK/WHT wire. If the voltage is less than battery voltage, check for an open or short in the BLK/WHT wire. 3. Raise and support the vehicle, start the engine, and place the transmission in drive. Check for AC voltage that varies with engine rpm between the PPL/WHT wire, and the LT GRN/BLK wire at the vehicle speed sensor calibrator. If there is not AC voltage at these wires, check for opens in the PPL/WHT wire and the LT GRN wire. If there are not shorts or opens, replace the vehicle speed sensor. 4. Raise and support the vehicle, start the engine, and place the transmission in drive. Check for AC voltage that varies with engine RPM, between the BLU/BLK and BLK/WHT wires at the vehicle speed sensor connector (connector attached to calibrator). If AC voltage varies with RPM, replace the vehicle speed sensor calibrator. 5. Raise and support the vehicle, start the engine, and place the transmission in drive. Check for AC voltage that varies with engine rpm between the RED/WHT and the BLK/WHT wires at the vehicle speed sensor calibrator connector (connector attached). If AC voltage varies with rpm, replace the vehicle speed sensor calibrator. 6. Replace Cluster.

8C-8 INSTRUMENT PANEL AND GAGES

DIAGNOSIS OF THE FUEL GAGE

PROBLEM	POSSIBLE CAUSE	CORRECTION
Gage Stays at Empty	<ol style="list-style-type: none">1. No fuel.2. Circuit is grounded.	<ol style="list-style-type: none">1. Fill the fuel tank.2. Disconnect the lead at the fuel tank. Place the ignition in "RUN". The gage should read past the full mark. If the gage reads past the full mark, replace the fuel tank sender. If the gage stays at the empty mark, find the ground in the circuit between the gage and the fuel tank.
Gage Stays at Full or Beyond	Open circuit between the gage and the sender.	Disconnect the sender lead at the fuel tank. Ground the lead. Place the ignition in "RUN". The fuel gage should read at the empty mark. If the gage reads at the empty mark, replace the sender. If the gage still reads at full or beyond, find the open between the gage and the fuel tank.
Gage Reads Wrong	<ol style="list-style-type: none">1. Corrosion or a loose connection.2. Sender.3. Gage.	<ol style="list-style-type: none">1. Clean and tighten the terminals.2. Remove the sender. Test the sender with an ohmmeter. The empty position should read between 0 and 3 ohms. The one-half full position should read 44 ohms. The full position should read between 88 and 92 ohms.3. Disconnect the front body connector. Connect J 33431-A tester to the lead that goes to the gage. Turn the engine control switch "ON". If the gage responds accurately, check the wiring between the rear compartment and the front body connector. If the gage reads between one fourth and one half with the J 33431-A set at 90 ohms, replace the cluster.

D0152

DIAGNOSIS OF THE COOLANT TEMPERATURE GAGE

PROBLEM	POSSIBLE CAUSE	CORRECTION
Gage Does Not Move from "Cold" when the Engine is "Hot"	<ol style="list-style-type: none"> 1. Blown fuse. 2. Sensor. 3. Open circuit. 	<ol style="list-style-type: none"> 1. Check fuse and replace if blown. If the gage does not work, turn ignition switch "OFF." Check for continuity between the sensor wire at the gage to ground, and between the ignition terminal and ground. If all checks "OK," replace the cluster. 2. Turn ignition switch "ON." Do not start engine. Remove the lead at the sensor. Connect the test lamp from the sensor lead to ground. If the lamp glows, then short the sensor lead to ground. Gage should indicate "HOT." If the gage indicates "HOT," check the sensor lead connector on the sensor. If OK, replace the sensor. If the gage indicates "COLD" check the cluster connector. If OK, remove the cluster for repair. 3. If the test lamp does not glow, turn ignition switch "OFF." Check for continuity between the sensor wire at the gage and ground, and between the ignition terminal and ground. If all checks "OK," replace the cluster.
Gage Indicates "Hot" with Cold Engine	Shorted or grounded circuit.	Turn ignition switch "ON." Remove the lead at the sensor. The gage should swing to "COLD." If not, check the harness for shorts or grounds. If the harness is not grounded and the needle still indicates "HOT," disconnect the cluster from the harness connector. If the needle indicates "COLD," repair the grounded harness. If the needle indicates "HOT," repair the instrument cluster.
Gage Reads Low	<ol style="list-style-type: none"> 1. Determine if problem is engine or gage related. 2. Resistance in the circuit due to corrosion or a loose connection. 3. Sensor. 	<ol style="list-style-type: none"> 1. Connect a scan tool and read engine coolant temperature. Do the scan tool and temperature gage agree? If so, correct the engine problem. If not, proceed to step 2. 2. Clean and tighten the terminals and connections in the circuit. Check for resistance in the ground path of the sensor. 3. Remove the lead at the sensor. Measure the resistance with an ohmmeter. At 40°C (104°F) the resistance is about 1300 ohms. At 95°C (203°F) resistance is about 220 ohms, plus/minus 20. If the sensor does not have approximately these values, replace the sensor.
Gage Reads High	<ol style="list-style-type: none"> 1. Sensor. 2. Circuit has a high resistance ground. 	<ol style="list-style-type: none"> 1. Measure the sensor's resistance as described in the previous step. 2. Disconnect the sensor lead at the gage and sensor. Check for a high resistance ground with an ohmmeter. Repair the circuit as necessary.

8C-10 INSTRUMENT PANEL AND GAGES

DIAGNOSIS OF THE OIL PRESSURE GAGE

PROBLEM	POSSIBLE CAUSE	CORRECTION
Gage Reads at 0	<ol style="list-style-type: none">1. Low oil level.2. The circuit is grounded between the gage and the sensor.3. Sensor.	<ol style="list-style-type: none">1. Check oil level. Add oil if necessary. Refer to Section 6.2. Remove the sensor lead at the sensor. The gage should read "80." If the gage stays at "0", remove the sensor lead at the gage. The gage should read "80." If the gage reads "80", find the ground in the circuit between the gage and the sensor. If the gage reads "0", replace the cluster.3. Remove the sensor lead at the sensor. Connect an ohmmeter to the sensor. With the engine stopped, the resistance should be one ohm. With the engine running, the resistance should be about 44 ohms at 40 psi (275 kPa). If the sensor reads one ohm with the engine running, replace the sensor.
Gage Reads 80 or Above	The sensor circuit has an open.	Disconnect the sensor lead from the sensor. Ground the sensor lead. The gage should read "0" psi. If the gage reads "0" psi, replace the sensor. If the gage stays at "80" psi, find the open in the circuit between the gage and the sensor.
Gage Readings are in Error	Gage.	Remove the sensor lead from the sensor. Connect the J 33431-A Tester to the sensor lead and ground. If the gage responds accurately to the tester, replace the sensor. If the gage does not respond accurately to the tester, replace the cluster.
Gage Readings are Delayed on Cold Start	Normal condition on 4 wheel drive diesel vehicles.	Following a diesel engine start on 4 wheel drive models that have not run for 2 hours or more, a few seconds (5-10) may elapse before the oil pressure gage indicates oil pressure. This is a normal condition.
D0154		

DIAGNOSIS OF THE VOLTMETER

PROBLEM	POSSIBLE CAUSE	CORRECTION
Voltmeter Reads at Bottom of the Red Band	<ol style="list-style-type: none">1. Discharged battery.2. High resistance in the voltmeter connections.3. Voltmeter.	<ol style="list-style-type: none">1. Measure the voltage across the battery. Recharge the battery. Read the instrument cluster voltmeter with the charger working. The voltage should come up to at least above the top of the lower red band. Find and correct the cause of the battery discharging.2. Clean and tighten the connections.3. Apply 12 volts across the ignition and ground leads. If the voltmeter doesn't read above the lower red band, replace the cluster.
D0155		

DIAGNOSIS OF THE BRAKE WARNING SYSTEM

PROBLEM	POSSIBLE CAUSE	CORRECTION
Warning Lamp Won't Light During Bulb Check	1. Lamp bulb is burned out. 2. Open in the circuit.	1. Replace the bulb. 2. Remove the switch lead at the switch. Refer to Section 5. Ground the switch lead with a jumper. Turn ignition switch "ON." If the lamp comes on, test the switch. Refer to Section 5. If the switch is bad, replace it. Refer to Section 5.
D0158		

DIAGNOSIS OF THE "CHECK GAGES" LAMP

PROBLEM	POSSIBLE CAUSE	CORRECTION
"Check Gages" Tell-tale Lamp Does Not Light With High Temperature	1. Burned out bulb. 2. Inoperative check gages circuit.	1. Replace "Check Gages" telltale bulb. 2. Replace cluster.
"Check Gages" Tell-tale Lamp Does Not Light With Low Oil Pressure	1. Burned out bulb. 2. Inoperative check gages circuit.	1. Replace "Check Gages" telltale bulb. 2. Replace cluster.
Check Gages Telltale Lights at All Times	1. Verify temperature gage circuit works correctly. 2. Verify oil pressure gage circuit works correctly.	1. Replace cluster. 2. Replace cluster.
D0269		

ON-VEHICLE SERVICE

ELECTROSTATIC DISCHARGE (ESD) NOTICE

Many solid state electrical components can be damaged by electrostatic discharge (ESD). Some will display a label but many will not (figure 6).

NOTICE: In order to avoid possibly damaging any components, observe the following:



Figure 6—Electrostatic Discharge Label

1. Body movement produces an electrostatic charge. To discharge personal static electricity, touch a ground point (metal) on the vehicle. This should be done any time you:
 - Slide across the vehicles seat.
 - Sit down or get up.
 - Do any walking.
2. Do not touch exposed terminals on components with your finger or any tools. Remember, the connector that you are checking might be tied into a circuit that could be damaged by Electrostatic Discharge.
3. When using a screwdriver or similar tool to disconnect a connector, never let the tool come in contact with or come between the exposed terminals.
4. Never jump, ground, or use test equipment probes on any components or connectors unless specified in diagnosis. When using test equipment, always connect the ground lead first.
5. Do not remove the solid state component from its protective packaging until you are ready to install the part.

8C-12 INSTRUMENT PANEL AND GAGES

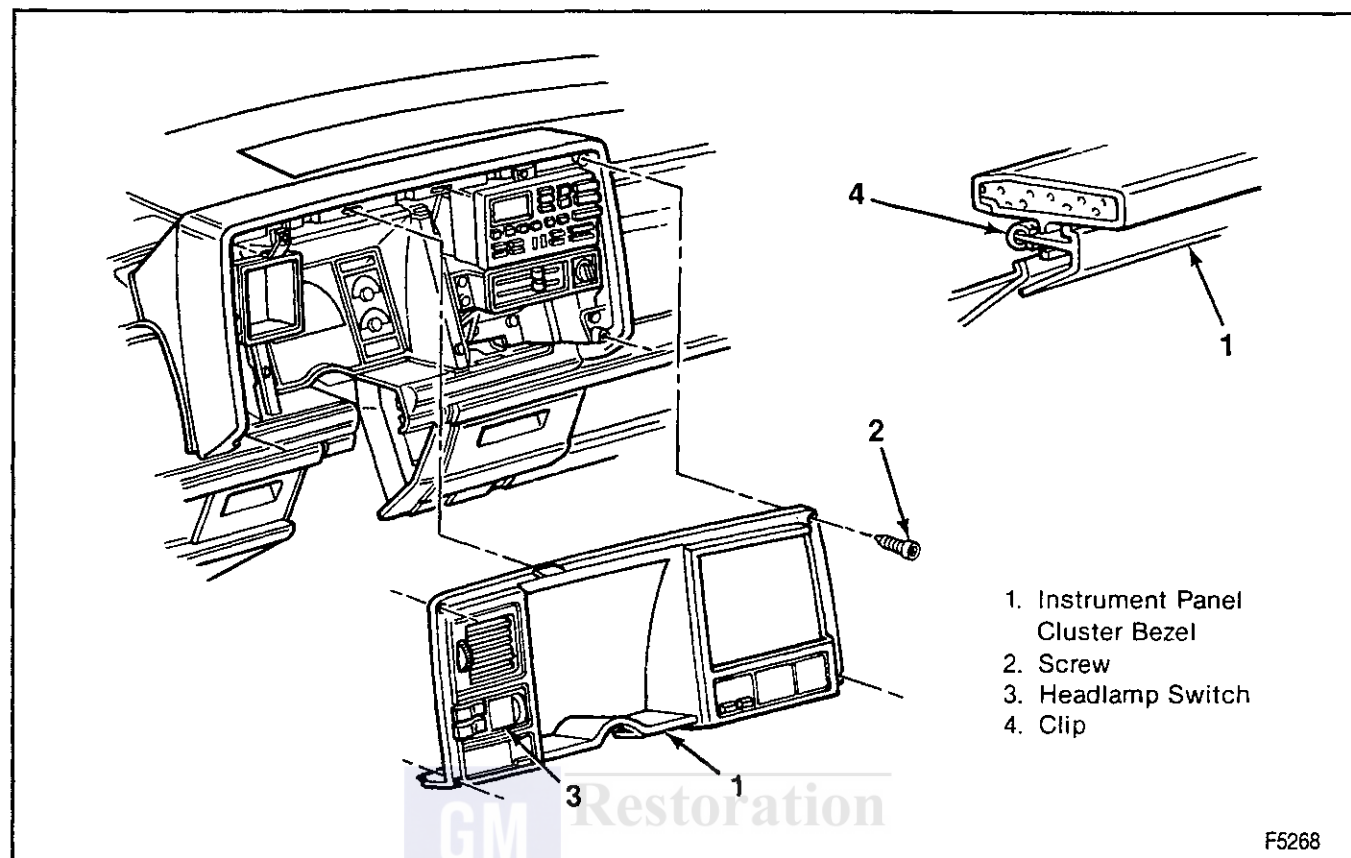


Figure 7—Instrument Cluster Bezel

6. Always touch the solid state components package to a ground before opening. Solid state components can also be damaged if:

- They are bumped or dropped.
- They are laid on any metal work benches or components that operate electrically, such as a TV, radio, or oscilloscope.

INSTRUMENT CLUSTER AND INDICATOR LAMP REPLACEMENT

! Important

- If the instrument cluster is to be sent out for repair, exchange, or is being replaced, note the number and type of bulb and socket assemblies before proceeding. Due to the variety of optional equipment available, replacement clusters do not always have the correct number or type of indicator lamps. Comparing bulb locations beforehand will ensure that all indicator lamps remain functional.

↔ Remove or Disconnect (Figures 7, 8, and 9)

1. Negative battery cable. Refer to SECTION 0A.
2. Instrument panel cluster bezel.
 - Electrical connections for headlamp switch, dimmer control, and any accessory switches.
3. Six screws holding the radio control head.
 - Disconnect the harness and antenna connectors and set the control head aside.

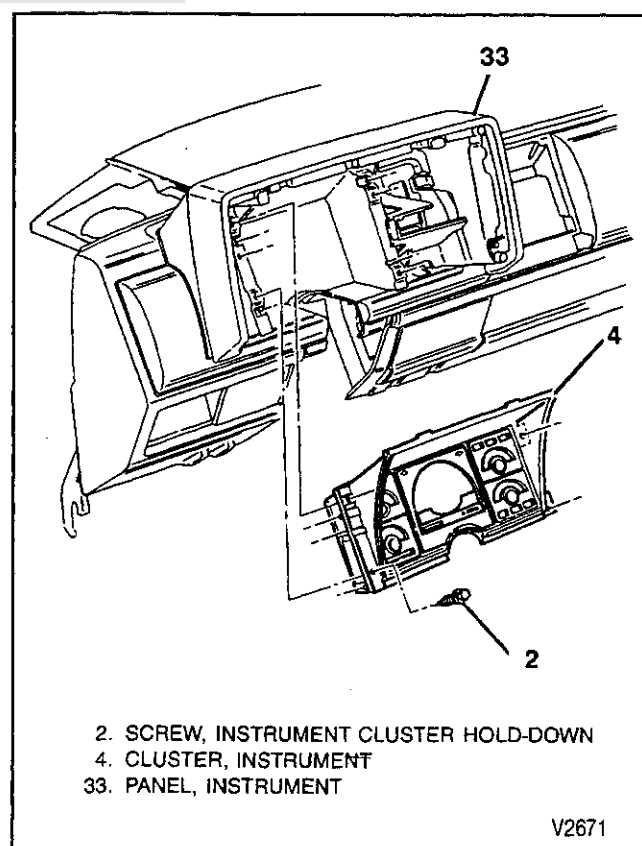
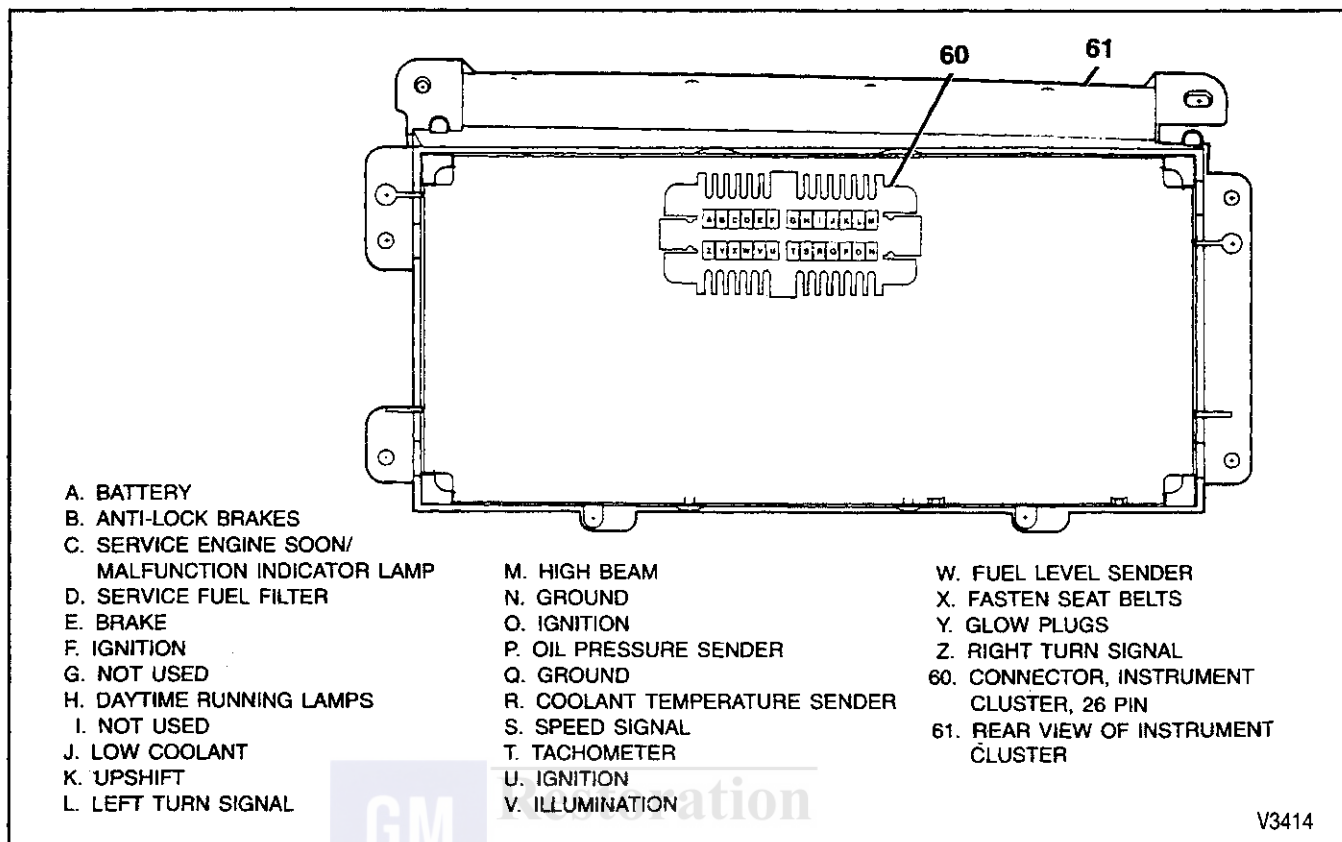


Figure 8—Instrument Cluster Replacement


Figure 9—Instrument Cluster 26 PIN Connector

4. Four screws holding the heater control unit and set aside.
 - For air conditioned vehicles, disconnect the A/C harness.
5. Instrument cluster hold-down screws.
6. Gear shift indicator cable from the steering column lower shift bowl.

NOTICE: Refer to ESD "Notice."

7. Instrument cluster.
 - Keep fingers and other foreign objects away from the flexible circuit connections.
8. Bulb and base assembly by turning 1/2 turn to the left. Refer to SECTION 8B for bulb identification.

↔ **Install or Connect (Figures 7, 8, and 9)**

NOTICE: Refer to ESD "Notice."

1. Bulbs to the cluster by inserting the socket and bulb assembly into the cluster and twisting to the right.
2. Instrument cluster.

NOTICE: Refer to "Notice" on page 8C-1.

3. Instrument cluster hold-down screws.
4. Gear shift indicator cable to the lower shift bowl of the steering column (if equipped). Refer to "Transmission Indicator (PRNDL) Replacement" for adjustment sequence.

5. Radio and heater control units.
 - Electrical connections as required.
6. Instrument cluster bezel.
 - Reconnect headlamp switch and dimmer controls.
7. Negative battery cable.

TRANSMISSION INDICATOR (PRNDL) REPLACEMENT

↔ **Remove or Disconnect**

NOTICE: Refer to ESD "Notice."

1. Instrument cluster. Refer to "Instrument Cluster Replacement."
2. Cluster lens.
3. Transmission indicator assembly.

↔ **Install or Connect**

1. Indicator assembly to instrument cluster.
2. Instrument cluster lens.
3. Instrument cluster to the vehicle.

🔑 **Adjust Shift Indicator**

4. Indicator cable to the lower shift bowl.
 - A. Set the parking brake.
 - B. Place the transmission in neutral.

8C-14 INSTRUMENT PANEL AND GAGES

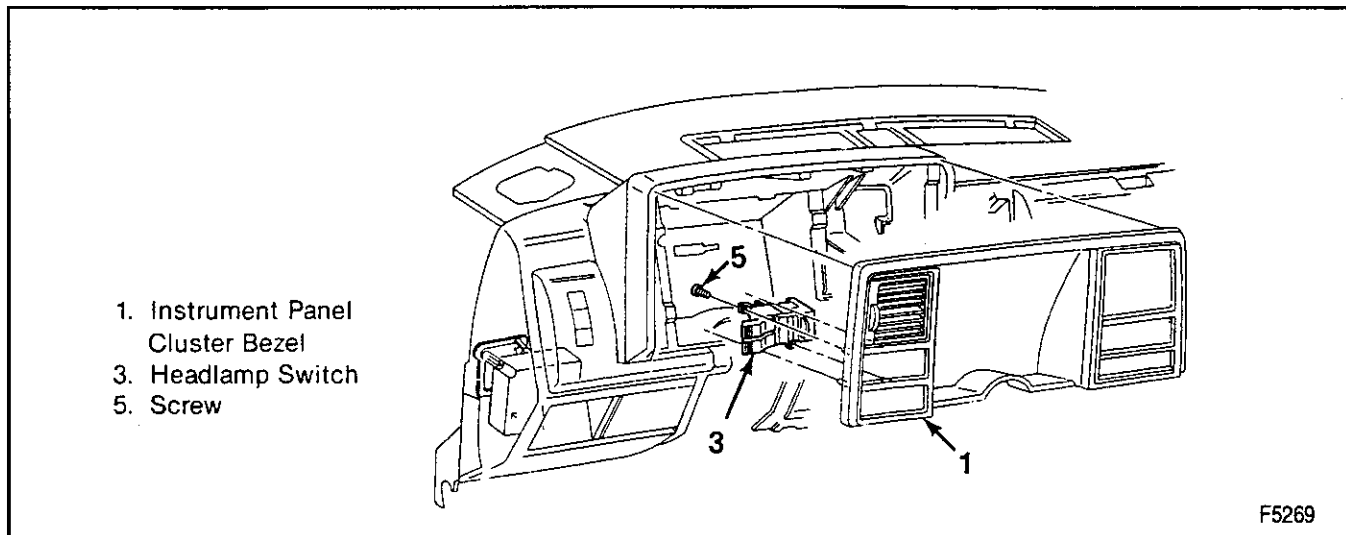


Figure 10—Headlamp Switch

- C. Pull the cable until the needle is aligned with neutral on the indicator.
D. Attach the cable clip to the lower shift bowl in this position.
5. Instrument cluster to the vehicle. Refer to "Instrument Cluster Replacement."
2. Headlamp switch screws.
3. Instrument cluster bezel clips to the bezel.
4. Instrument cluster bezel to the instrument panel.
5. Instrument cluster bezel screws.

INSTRUMENT CLUSTER BEZEL AND HEADLAMP SWITCH REPLACEMENT

VEHICLE SPEED SENSOR CALIBRATOR REPLACEMENT

Remove or Disconnect (Figures 7 and 10)

1. Screws.
2. Instrument cluster bezel.
 - Pull the bezel away from the instrument panel clips.
3. Headlamp switch screws.
4. Headlamp switch from the bezel.

Install or Connect (Figures 7 and 10)

1. Headlamp switch to the bezel.

Remove or Disconnect (Figure 11)

1. Negative battery cable. Refer to SECTION 0A.
2. Instrument panel storage compartment inner panel.
3. Vehicle speed sensor calibrator from the fastener pad.
4. Electrical connectors from the vehicle speed sensor calibrator.

Install or Connect (Figure 11)

1. Electrical connectors to the vehicle speed sensor calibrator.

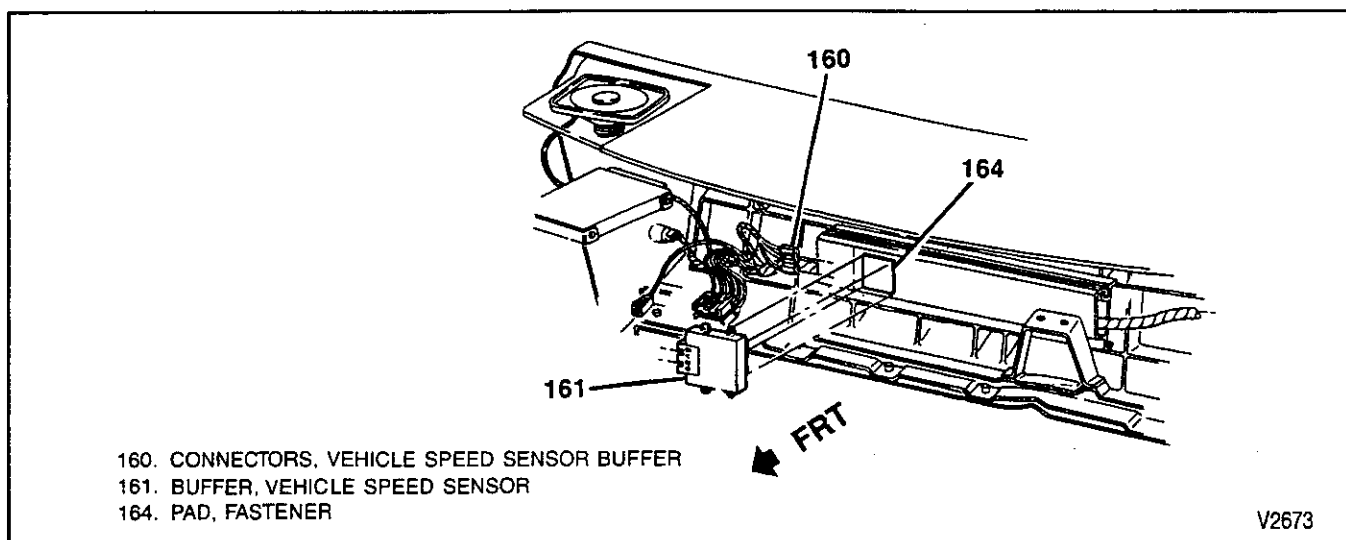


Figure 11—Vehicle Speed Sensor Calibrator (Buffer) Replacement

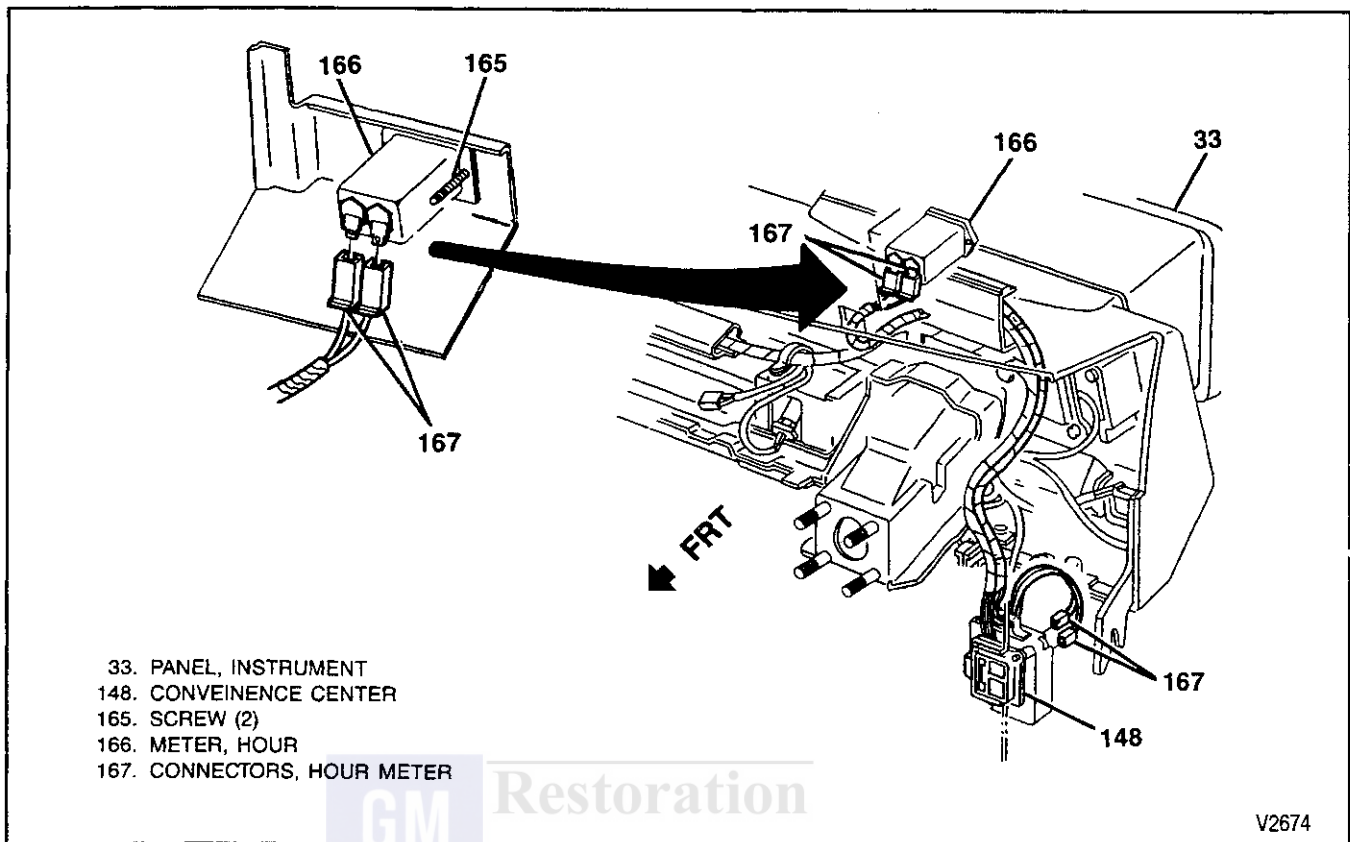


Figure 12—Hour Meter Replacement and Wiring Harness

2. Vehicle speed sensor calibrator to the fastener pad.
3. Instrument panel storage compartment inner panel.
4. Negative battery cable.

HOURLY METER REPLACEMENT

Remove or Disconnect (Figure 12)

1. Negative battery cable. Refer to SECTION 0A.
2. Screws.
3. Hour meter from the instrument panel.
4. Electrical connections from the hour meter.

Install or Connect (Figure 12)

1. Electrical connections to the hour meter.
2. Hour meter to the instrument panel.
3. Screws.
4. Negative battery cable.

COOLANT TEMPERATURE SENSOR REPLACEMENT

Remove or Disconnect (Figures 13 through 16)

1. Negative battery cable. Refer to SECTION 0A.
2. Coolant. Refer to SECTION 6B1.
3. Electrical connector.
4. Sensor.

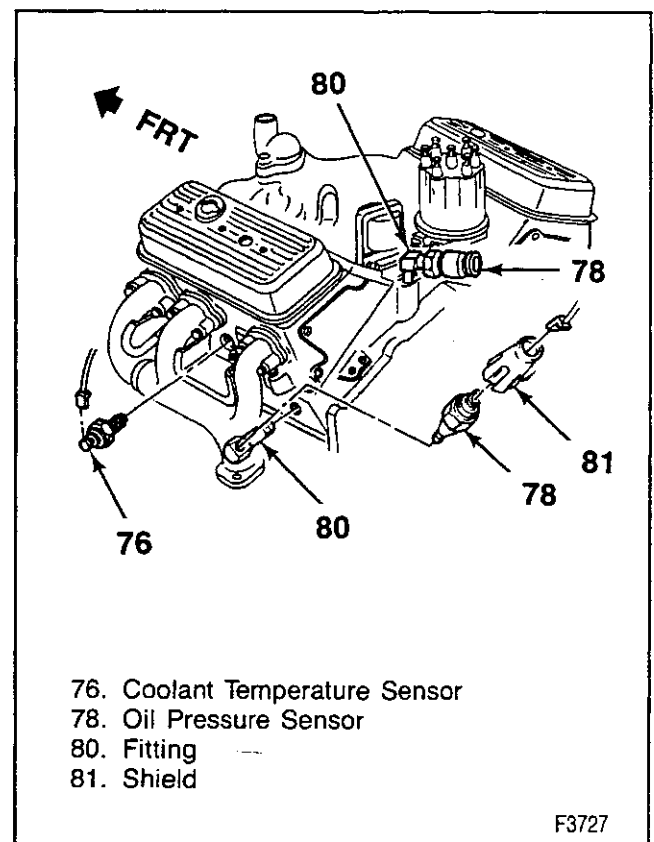


Figure 13—Coolant Temperature and Oil Pressure Sensors (4.3L VIN Z)

8C-16 INSTRUMENT PANEL AND GAGES

Install or Connect (Figures 13 through 16)

1. Sensor.
2. Electrical connector.
3. Coolant. Refer to SECTION 6B1.
4. Negative battery cable.

OIL PRESSURE SENSOR REPLACEMENT

Remove or Disconnect (Figures 13 through 16)

Tool Required:
J 35749 Socket

1. Negative battery cable. Refer to SECTION 0A.
2. Electrical connector.
3. Sensor using J 35749.

Install or Connect (Figures 13 through 16)

Tool Required:
J 35749 Socket

1. Sensor using J 35749.
2. Electrical connector.
3. Negative battery cable.

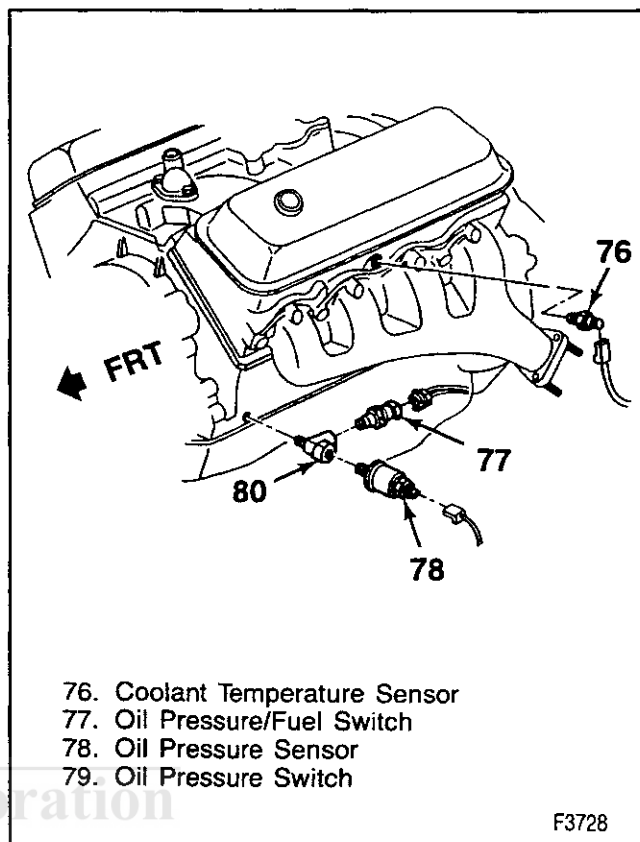


Figure 15—Coolant Temperature and Oil Pressure Sensors (7.4L VIN N)

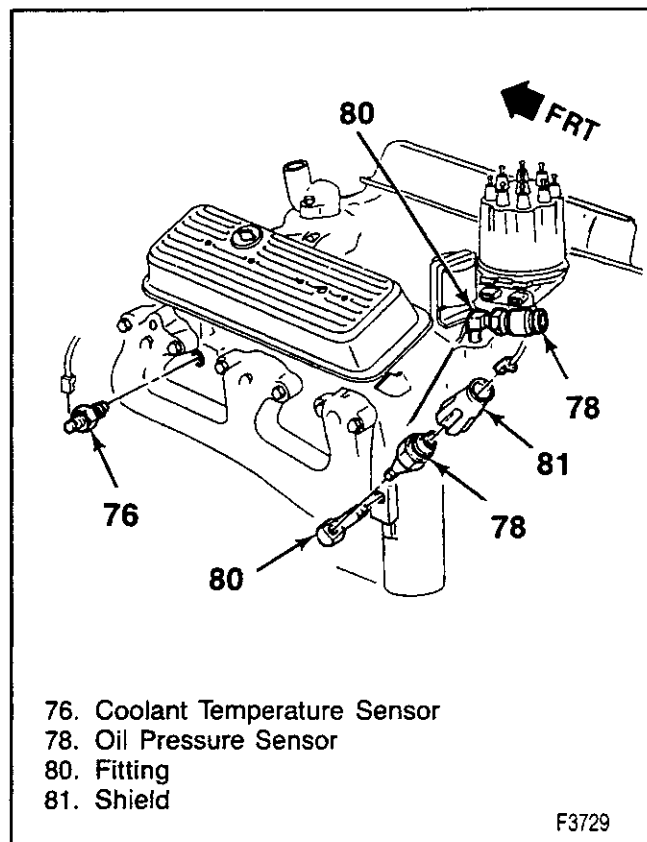


Figure 14—Coolant Temperature and Oil Pressure Sensors (5.0L VIN H and 5.7L VIN K)

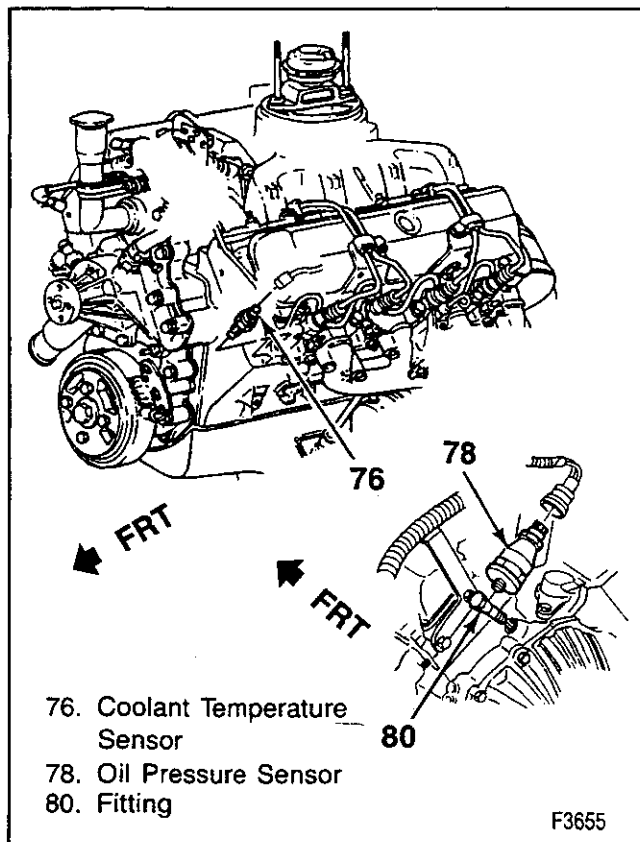


Figure 16—Coolant Temperature and Oil Pressure Sensors (6.5L VIN P, S, and F)

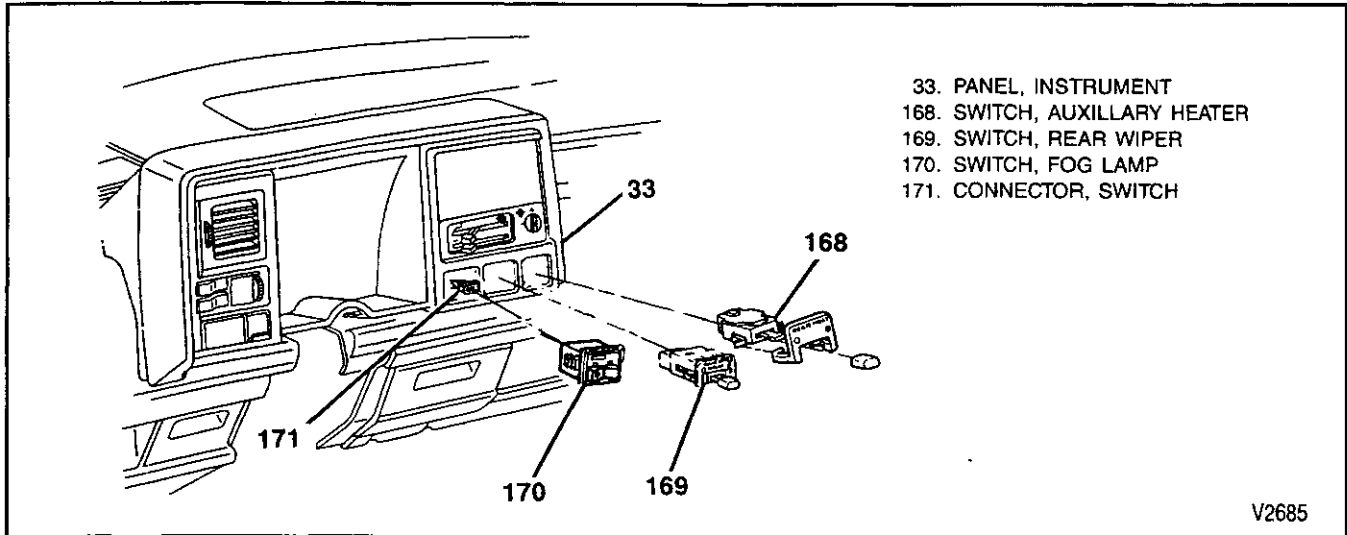


Figure 17—Accessory Switch Replacement

ACCESSORY SWITCH REPLACEMENT

←← Remove or Disconnect (Figures 7 and 17)

1. Negative battery cable. Refer to SECTION 0A.
2. Instrument panel cluster bezel. Refer to figure 7.
3. Electrical connector.
4. Switch (168, 169, or 170) from the bezel.

→→ Install or Connect (Figures 7 and 17)

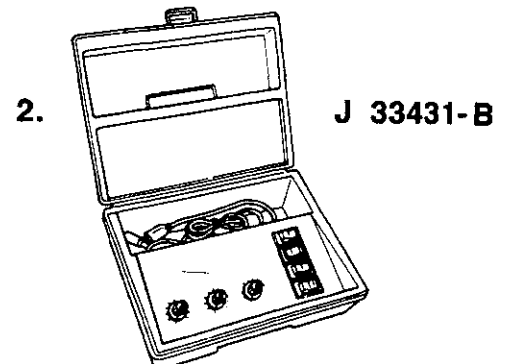
1. Switch (168, 169, or 170) to the bezel.
2. Electrical connector.
3. Instrument panel cluster bezel. Refer to figure 7.
4. Negative battery cable.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

ITEM	N·m	In. Lbs.
Vehicle Speed Sensor Bolt.....	11	97
		T2846

SPECIAL TOOLS



1. Oil Pressure Sending Unit Socket
2. Signal Generator and Instrument Panel Tester

8C-18 INSTRUMENT PANEL AND GAGES

NOTES



SECTION 8D

CHASSIS ELECTRICAL

NOTICE: When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread locking compound will be called out. The correct torque value must be used when installing fasteners that require it. If the above conditions are not followed, parts or system damage could result.

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Camper and Trailer Wiring	8D-1
Snow Plow Relay Location	8D-2
Diagnosis of the Horn System	8D-3
On-Vehicle Service	8D-4
Horn Replacement	8D-4
Snow Plow Relay Replacement	8D-4
Specifications	8D-6
Fastener Tightening Specifications	8D-6

GENERAL DESCRIPTION

HORN SYSTEM

The horn system starts at the fuse block with the horn/dome fuse. The circuit goes from the fuse block to the horn relay. At the horn relay, the circuit splits; one branch goes through the relay coil to the horn switch in the steering column, and the other goes through the relay contacts to the horn.

When the horn switch is closed, it provides a ground path for the horn relay coil. Current flows into the relay coil, closing the contacts, then to the horn, creating an appropriate sound.

The horn relay is located in the convenience center located under the instrument panel on the left side of the steering column (figure 1).

CAMPER AND TRAILER WIRING

Two trailer harnesses are available: heavy-duty trailer towing (UY7) and camper (UY1).

Option UY7 trailer harness is for heavy-duty towing applications. A 30-amp fused battery feed wire and auxiliary circuit routes from the cowl-mounted junction block, along the body side rail, to the rear bumper crossmember. The harness for the brake/parking lamps is spliced from the rear lamp harness. The harness is located at the rear bumper crossmember and is bound with a plastic strap. The wiring harness is wrapped with tape to prevent short circuits.

The function of the seven wires are:

1. Red—30-amp fused battery feed.
2. Dark Blue—An auxiliary circuit.
3. Brown—Tail and license lamps.
4. Light Green—Backup lamps.
5. Dark Green—Right turn signal and stoplamp.
6. Yellow—Left turn signal and stoplamp.
7. White—Ground.

This option does not include a connector at the end of the harness and must be wired after production by a qualified service person.

Attach the trailer harness wiring to the trailer and then strap it to the vehicle frame rail in such a way that enough slack is left in the harness to prevent bending, binding, or breakage of the wiring. Do not allow the harness to drag on the ground. Tape or strap the trailer portion of the harness (if used) to the tongue of the trailer. This will prevent the harness from dragging on the ground.

When the wiring is not being used, wrap the harness together and bind it with a tie strap to keep it from being damaged. Store the harness behind the rear bumper on the fuel tank strap with a band or tie strap.

The second wiring harness option is the UY1 camper wiring harness, and is also spliced from the rear lamp harness.

This harness is for the brake/parking lamps and an auxiliary power feed. The harness is located in the front stake pocket during production and is wrapped and

8D-2 CHASSIS ELECTRICAL

bound with a plastic strap. This option uses a single harness and a connector using five wires (figures 2 and 3).

The function of the wires are:

1. Dark Blue—A 30-amp fused auxiliary power circuit. The other end of this wire is taped to the wiring near the junction block on the cowl.
2. Dark Green—Right turn signal and stoplamp.
3. Yellow—Left turn signal and stoplamp.
4. Brown—Tail lamps.
5. White—Ground.

Route the trailer harness wiring between the frame and bumper, or camper and body, in such a way that enough slack is left in the harness to prevent bending, binding, or breakage of the wiring. Do not allow the harness to drag. Tape or strap the trailer portion of the harness (if used) to the vehicle. This will prevent the harness from dragging.

When the wiring is not being used, wrap the harness together and bind it with a tie strap to keep it from being damaged.

SNOW PLOW RELAY LOCATION

Some vehicles are equipped with option VYU. This means the vehicle has been prepared for an optional snow plow. A vehicle with this option has two relays mounted on the radiator support. These relays are for optional equipment that may be installed when using a snow plow.

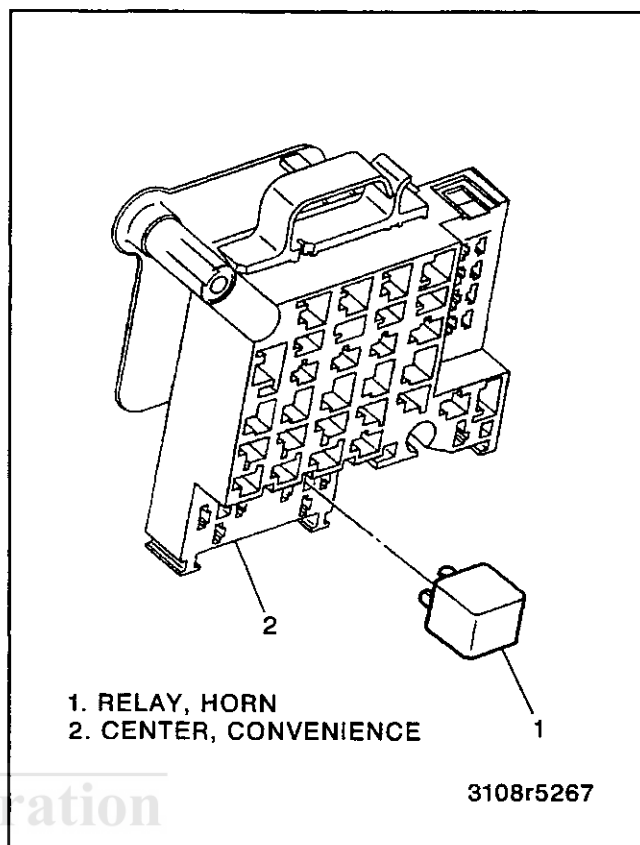


Figure 1—Horn Relay

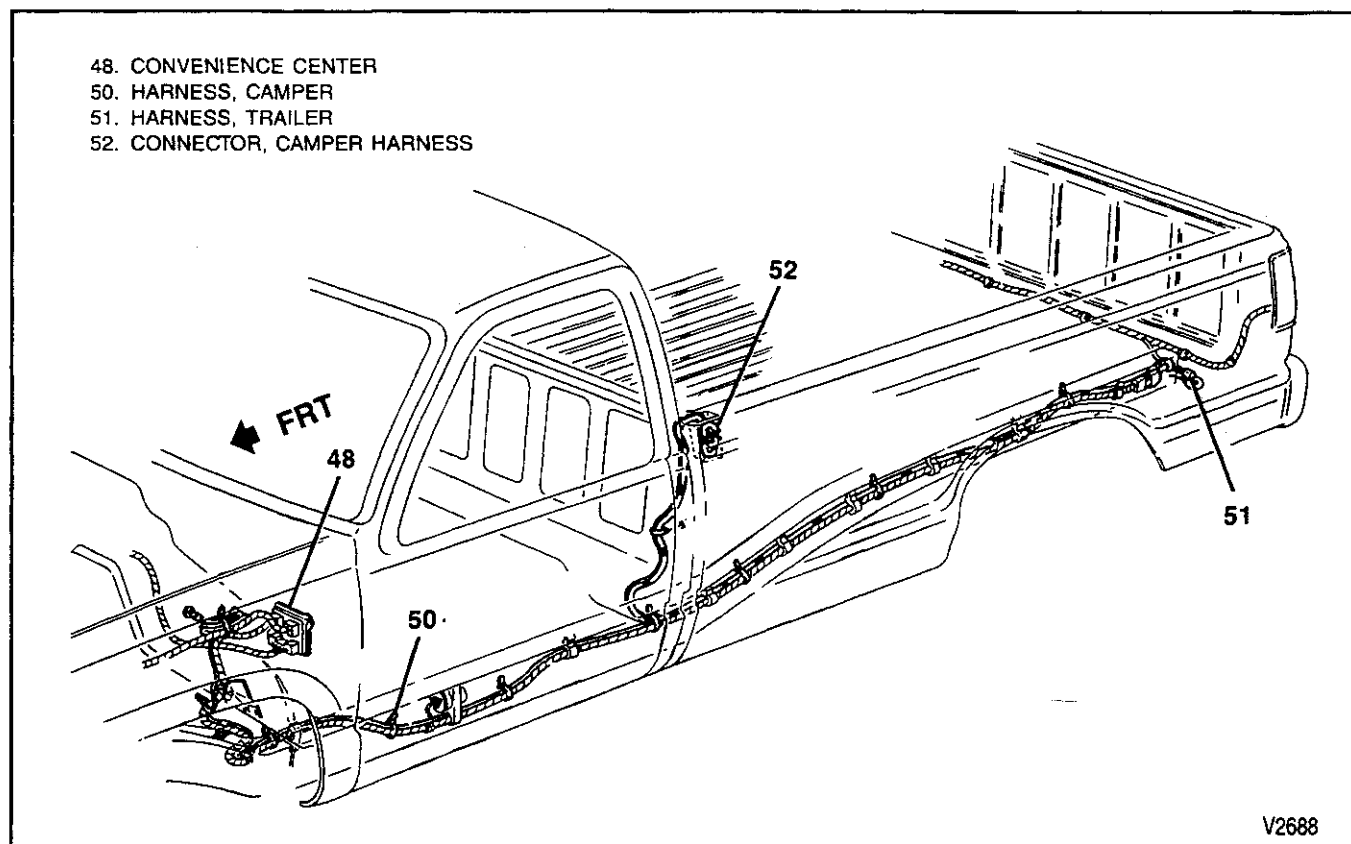


Figure 2—Camper Harness Routing

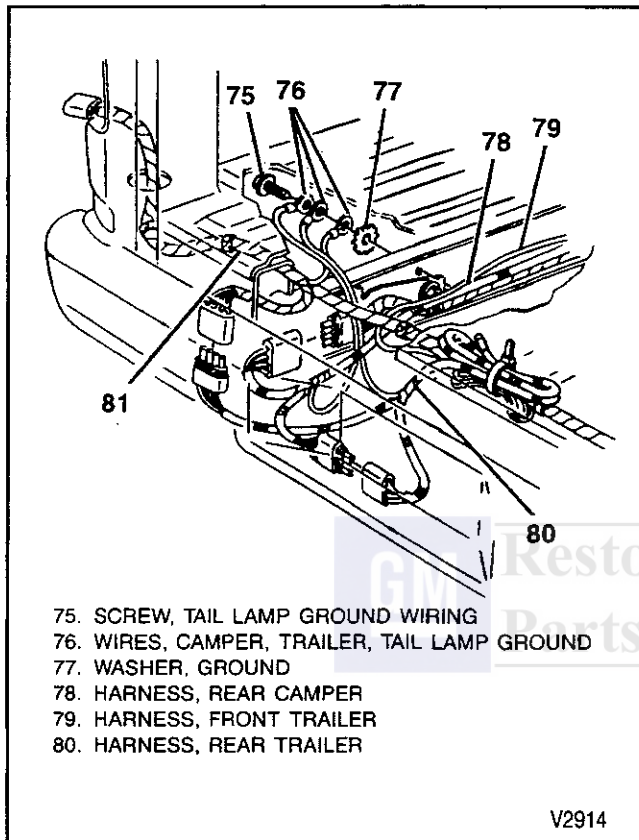


Figure 3—Trailer Harness Routing

DIAGNOSIS OF THE HORN SYSTEM

PROBLEM	POSSIBLE CAUSE	CORRECTION
Horn Won't Blow, Interior Lights Inop- erative	1. HORN/DOME lamp fuse blown.	1. Check HORN/DOME lamp fuse. Replace as necessary. If the new fuse blows, repair short to ground in the ORN/BLK wire from the fuse to the horn relay. If fuse blows when horn switch is depressed, repair short to ground in the GRN wire from the horn relay to the horn. If fuse continues to blow, check other circuits on HORN/DOME lamp fuse circuit for short to ground.

8D-4 CHASSIS ELECTRICAL

DIAGNOSIS OF THE HORN SYSTEM (cont'd)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Horn Inoperative	1. Horn relay inoperative. 2. Open circuit.	1. Check for battery voltage at terminal #29 of the convenience center, relay installed, while depressing the horn switch. If battery voltage is present, then the relay is OK. If less than battery voltage and all other circuits are known to be good, replace the relay. 2. Check the ORN/BLK wire for an open circuit between the fuse block and the horn. Repair as necessary. Check DK GRN wire for an open circuit between the horn relay and the horn. Repair as necessary. Check the BLK wire and horn switch for an open circuit. Repair as necessary.
Horn Sounds Continuously	1. Horn switch contacts stuck in closed position. 2. Horn relay stuck in closed position. 3. Short to ground in DK GRN wire before the relay.	1. Replace horn switch. 2. Replace horn relay. 3. Find and repair short in DK GRN wire.

D0112

ON-VEHICLE SERVICE

HORN REPLACEMENT



Remove or Disconnect (Figure 4)

1. Negative battery cable. Refer to SECTION 0A.
2. Grille to radiator support filler panel for access (left horn only).
3. Connector.
4. Horn attaching bolt.
5. Horn from the vehicle.



Install or Connect (Figure 4)

1. Horn to the vehicle.

NOTICE: Refer to "Notice" on page 8D-1.

2. Bolt.



Tighten

- Horn bolt to 25 N.m (18 lbs. ft.).

3. Connector.
4. Grille to radiator support filler panel (if removed).
5. Negative battery cable.

SNOW PLOW RELAY REPLACEMENT



Remove or Disconnect (Figure 5)

1. Negative battery cable. Refer to SECTION 0A.
2. Electrical connection from the relay.
3. Bolt.
4. Relay.



Install or Connect (Figure 5)

1. Relay.

NOTICE: Refer to "Notice" on page 8D-1.

2. Bolt.



Tighten

- Snow plow relay bolt to 6 N.m (53 lbs. in.).

3. Electrical connection to the relay.
4. Negative battery cable.

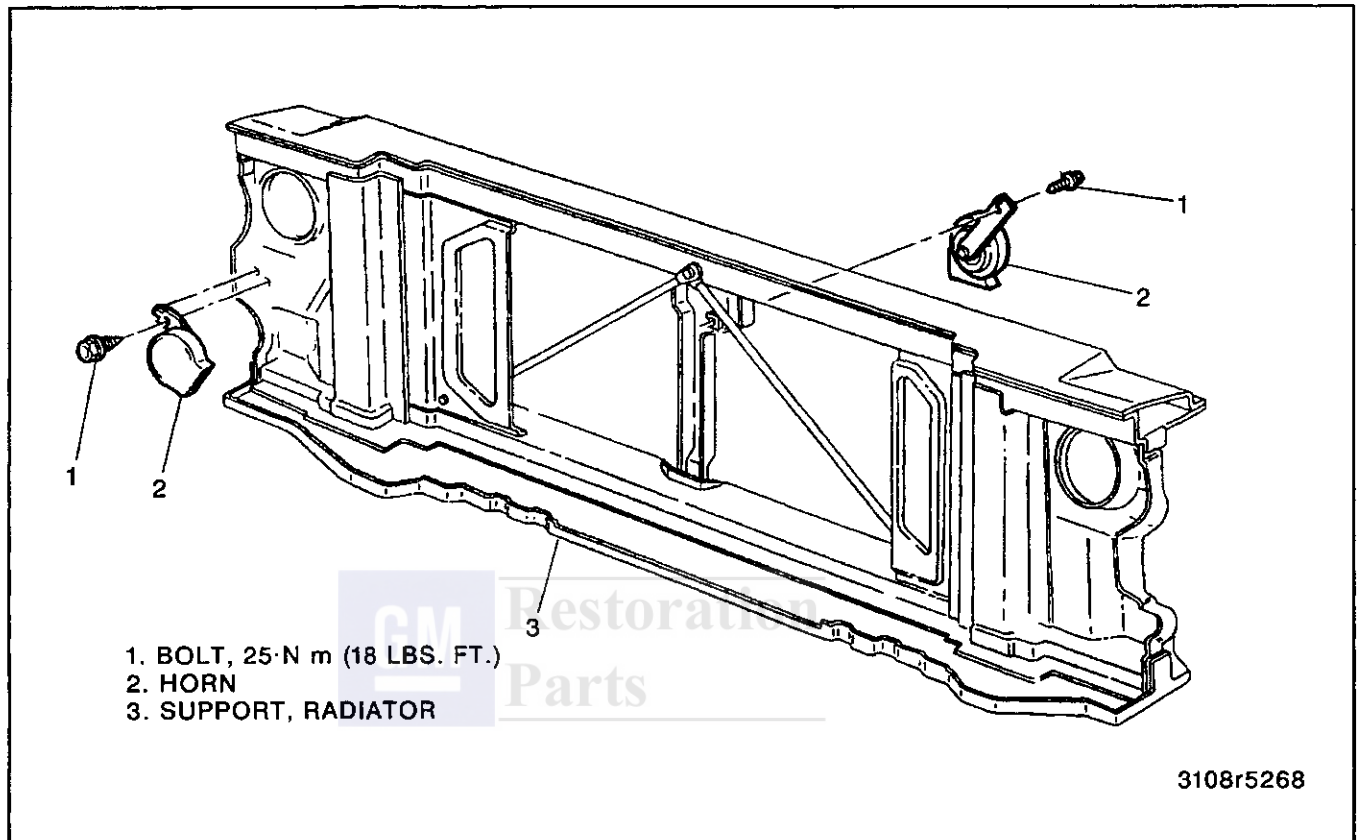


Figure 4—Horn Replacement

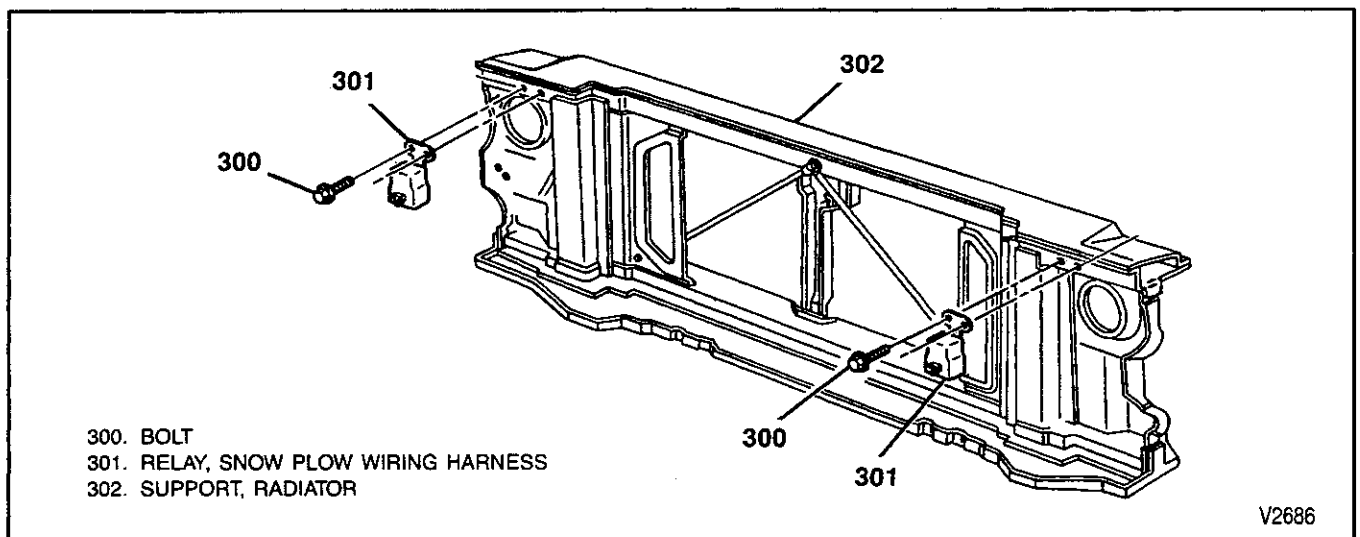


Figure 5—Snow Plow Relay Replacement

8D-6 CHASSIS ELECTRICAL

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

ITEM	N-m	In. Lbs.
Horn Attaching Bolt	25	18*
Snow Plow Relay Mounting Bolt	6	53
*Foot Pounds		
		T2859

SECTION 8E1**WINDSHIELD
WIPER/WASHER SYSTEM
(PULSE)**

NOTICE: When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread locking compound will be called out. The correct torque value must be used when installing fasteners that require it. If the above conditions are not followed, parts or system damage could result.

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Wiper Arm Assembly Replacement	8E1-16
Wiper Blade Assembly and Element Replacement	8E1-16
Circuit Board and Terminal Assembly Replacement	8E1-17
Wiper Transmission Assembly Replacement	8E1-17
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GENERAL DESCRIPTION

WIPER/WASHER SYSTEM

The windshield wiper/washer system consists of a permanent magnet, positive-park wiper motor assembly (figure 1), a transmission assembly, wiper arm and blade assemblies, a washer pump mounted on the side of a washer solvent container, and a turn signal-type wiper/washer switch assembly with detents. The die-cast aluminum housing of the wiper motor provides

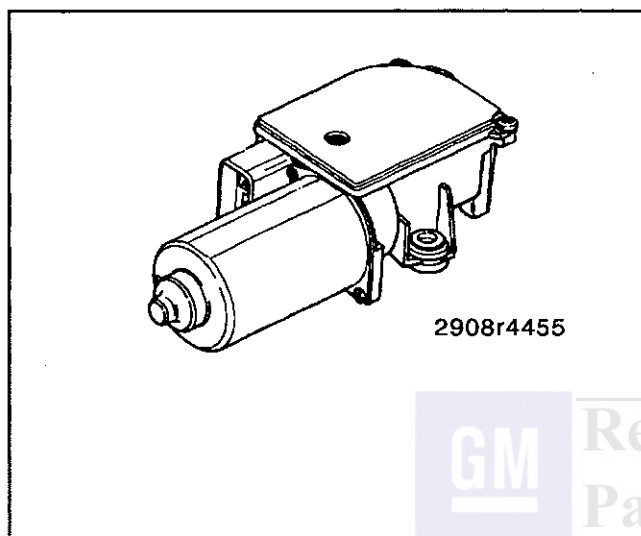


Figure 1—Wiper Motor Assembly

cooling for interior parts. The wiper motor is equipped with RFI (radio frequency interference) suppression.

The wiper motor drives a crank arm that attaches to individual transmission links for both the right and left sides. The transmission links are mounted in front of the windshield inside the fresh air plenum. The transmission transfers rotary motion from the wiper motor into reciprocating motion at the transmission drive shafts.

The wiper motor is sealed, and no service parts are available. The motor must be replaced and not repaired if service is required.

The delay module is also sealed and attached directly to the wiper motor. It is replaced as a unit during service.

WIPER/WASHER OPERATION

The electronic circuit board controls all the timing and washer commands (figure 2). When a wash button is pushed for more than 1 second, washer solvent is sprayed on the windshield as long as the button is held. This is accompanied by wiper activity that continues for about 6 seconds after the button is released.

Rotating the wiper switch to the "LO" or "HI" speed position closes the respective brush circuit and the wiper motor runs at that speed.

Rotating the wiper switch to the "DELAY" mode operates the wiper motor intermittently and the delay can be varied by rotating the switch back and forth.

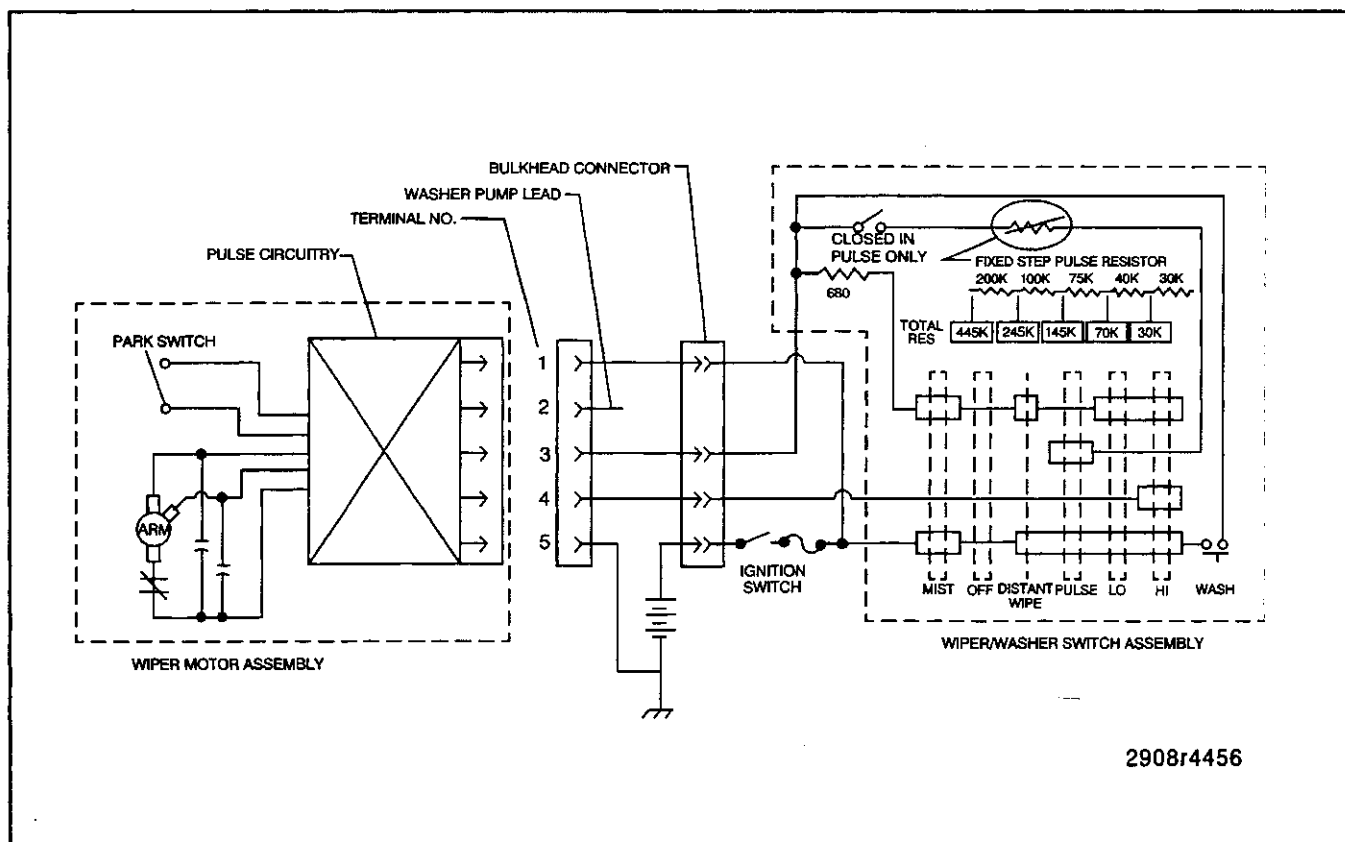


Figure 2—Wiper/Washer Motor Circuit Diagrams

WINDSHIELD WIPER/WASHER SYSTEM 8E1-3

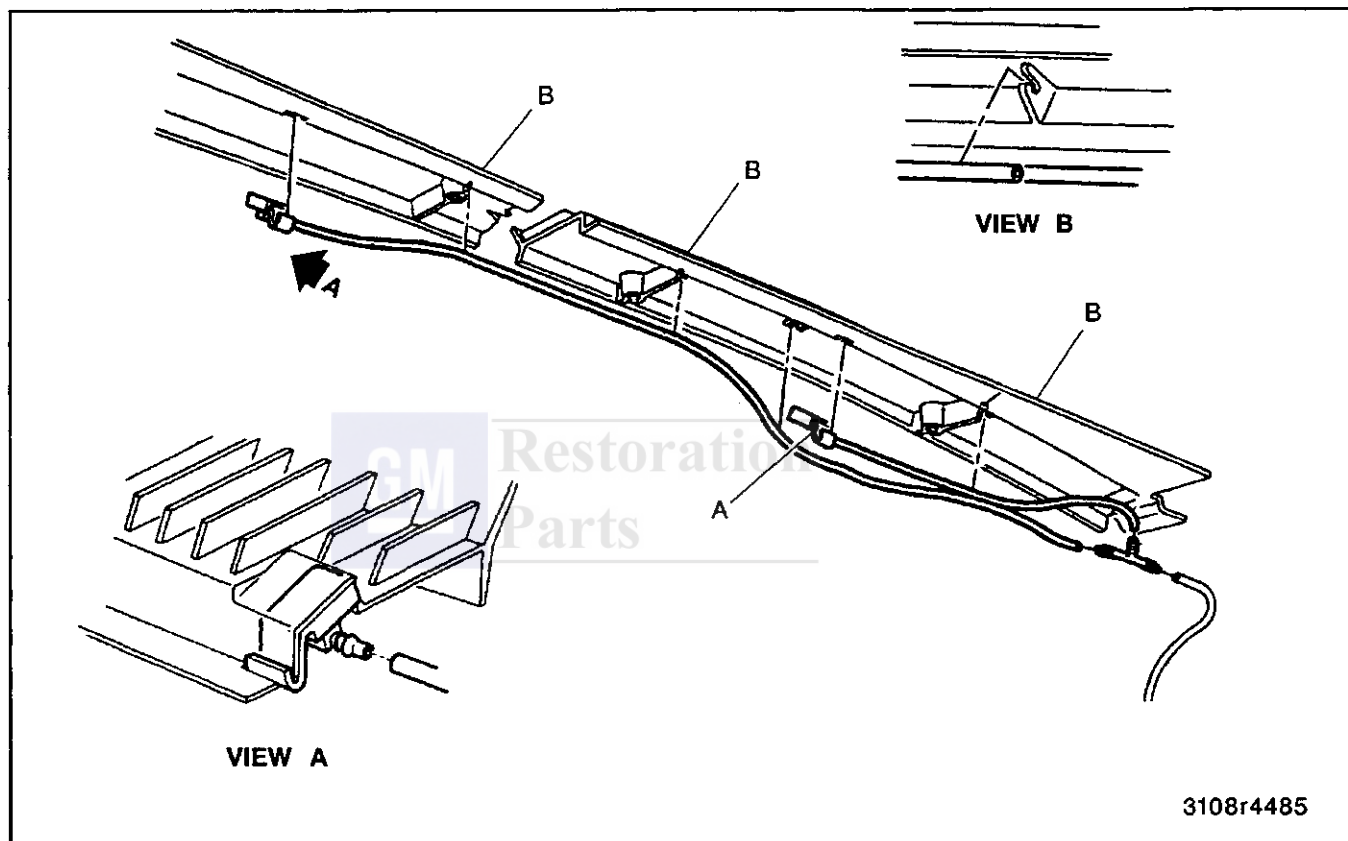


Figure 3—Washer Hose Routing (Cowl)

For an immediate wiping activity, rotate the wiper switch to the "MIST" position. The wiping activity will continue as long as the switch is held.

WASHER HOSE ROUTING

Washer hose routing begins at two nozzles mounted to the cowl vent grille (figure 3). The hose is clipped in various places to the cowl vent grille, then exits the

cowl area through a grommet on the engine side of the cowl (figure 4). The hose is strapped to the forward lamp harness and runs a parallel path along the left inner fender to the washer solvent container and finally, to the washer pump motor. A one-way check valve between the hose and pump motor assembly allows fluid flow in one direction only.

8E1-4 WINDSHIELD WIPER/WASHER SYSTEM

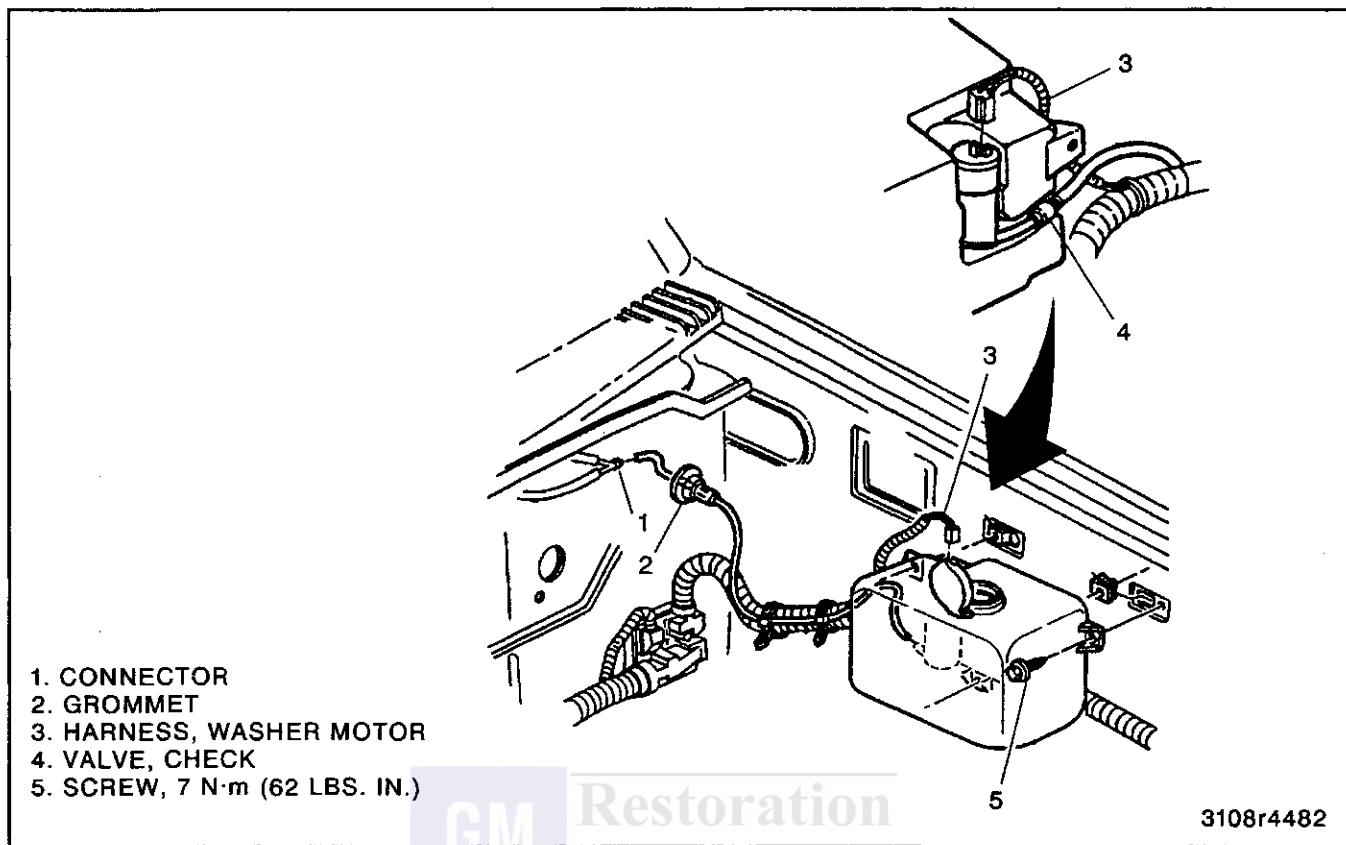


Figure 4—Washer Hose Routing (Container)

DIAGNOSIS OF THE WIPER/WASHER SYSTEM

WIPER ARM CHATTER

If the wipers chatter or shudder when wiping the windshield, the windshield and/or blades may need cleaning. Use a non-abrasive cleaner such as Bon Ami® to clean the windshield. Continue cleaning until water sheets off the windshield. Use undiluted windshield wiper/washer solvent and a clean, lint-free cloth to clean wiper elements.

CAUTION: Avoid prolonged skin contact with washer solvent to avoid damage to your skin. Overexposure may cause central nervous system effects.

When marking the windshield for inside rearview mirror replacement or any other purpose, use only a water-soluble marker to make marks on the windshield. Other types of markers may damage the wiper blades. The chemicals that are used to remove other types of markers may damage the paint, glass, blades, or leave a residue on the glass which could lead to blade chatter.

Wiper arms must not be subjected to temperatures above 70°C (160°F). Remove wiper arms before any painting operations that include the use of an oven to cure the paint.

CHECKING WIPER ARM PRESSURE

If the wipers miss or shudder when wiping the windshield, and the windshield and wiper blades have been cleaned, the wiper arm pressure should be checked. Refer to figure 5. If the wiper arms are not within the specifications given in figure 5, they should be replaced. Refer to "Wiper Arm Assembly Replacement."

BLADE ELEMENT SET CHECK

Remove the wiper blade assemblies from the wiper arms. Look down the length of the blade element (figure 6). The rubber element that contacts the glass must be on the centerline of the blade assembly ± 15 degrees. Replace the element if necessary.

WIPER MOTOR ASSEMBLY DIAGNOSIS

Always perform the system check first as a guide to normal operation. Then refer to figures 7 through 16 for wiper motor assembly diagnosis. The electrical diagrams and diagnosis section of NATP-9442 contains diagnostic procedures for vehicle wiring.

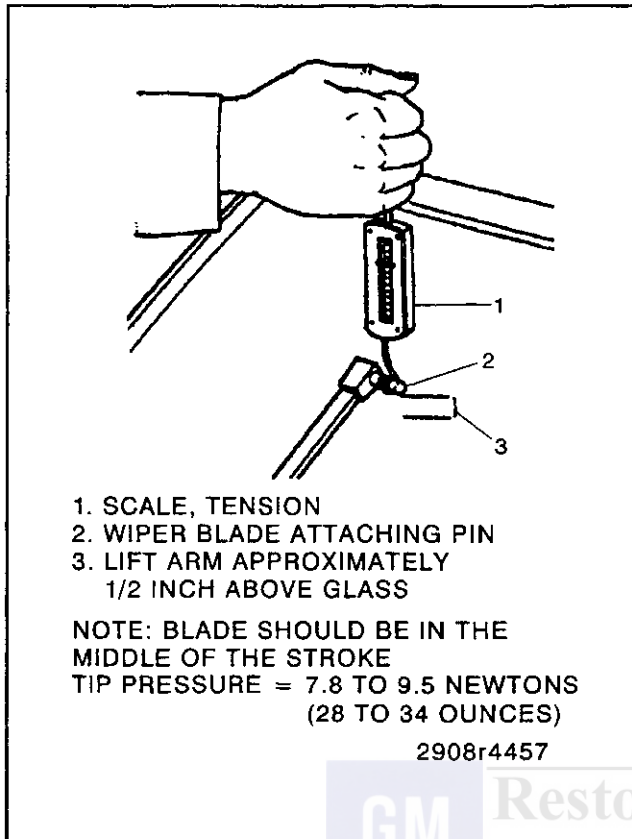


Figure 5—Checking Wiper Arm Pressure

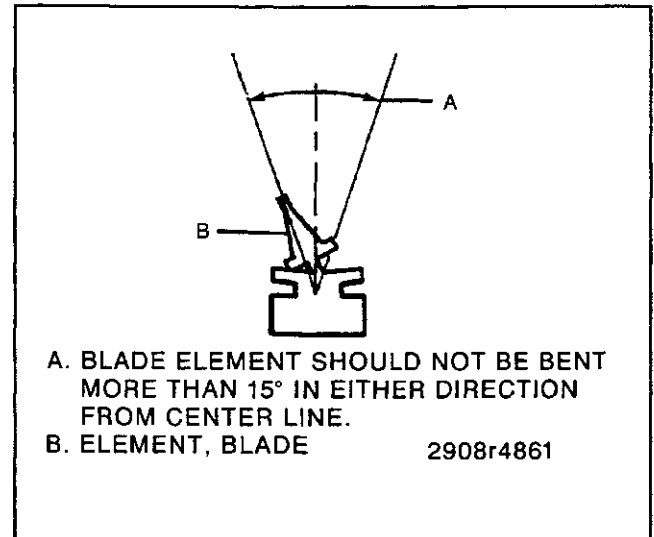


Figure 6—Blade Element Set Check

PULSE WIPER SYSTEM CHECK

ACTION	NORMAL OPERATION
1. Ignition switch in ACCY or RUN. • Hold washer switch ON for 1 to 2 seconds.	1. Washer sprays windshield until switch is released. Wipers run at low speed and continue to run for approximately 6 seconds after washer cycle is complete, then return to park position.
2. Turn wiper switch to DELAY (pulse mode). • Activate delay time by turning wiper switch through delay range.	2. Wipers make one complete sweep, then pause for 0 to 25 seconds before making next sweep.
3. Wiper switch in DELAY. • Push washer switch ON for 1 to 2 seconds.	3. Washers sprays as long as washer switch is held ON. Wipers run at low speed during spray period and continue for approximately 6 seconds after spray cycle. Wipers return to pulse mode.
4. Turn wiper switch to LO.	4. Wipers run continuously at low speed.
5. Turn wiper switch to HI.	5. Wipers run at faster speed.
6. Turn wiper switch to OFF.	6. Wipers return to park position at low speed.
7. Turn wiper switch to MIST, then release.	7. Wipers make one complete sweep at low speed and park. If switch is held in MIST, wipers run continuously at low speed until switch is released.

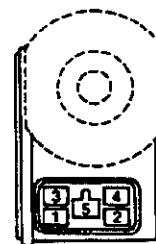
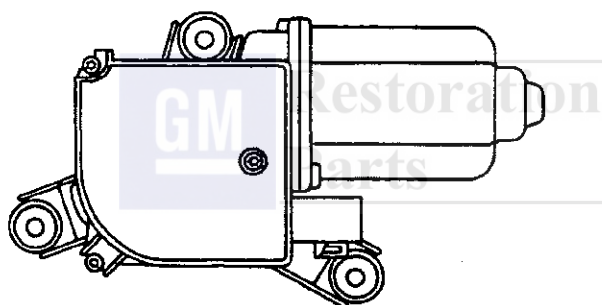
DIAGNOSTIC PROCEDURES

NOTE: The following procedures assume that the technician has checked the following:

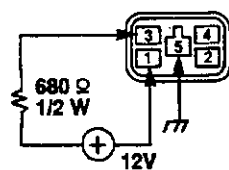
1. Continuity of all harness wires
2. Wiper motor-to-cowl mounting screws tight
3. Fuses
4. Washer hoses clear

WIPER MOTOR

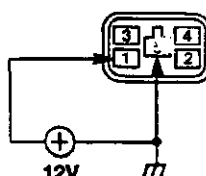
CHECK FOR MOTOR OPERATION BEFORE REMOVING FROM VEHICLE. DISCONNECT ALL WIRING FROM WIPER AND PERFORM THE FOLLOWING CHECKS IN THIS ORDER:



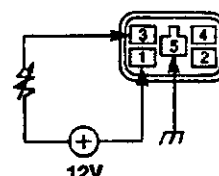
① MIST



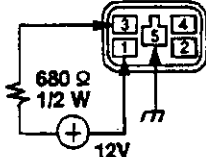
② OFF/PARK



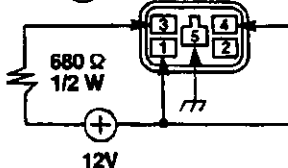
③ PULSE



④ LO

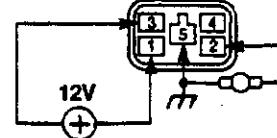


⑤ HI



NOTE: Connect terminal #3 before connecting terminal #4. Otherwise damage to P.C. board may occur.

⑥ WASH



Connect a test pump (bottom-bottle-mount type) of proven quality. Do not use pump off vehicle. Test washer pump should pulse 9 to 11 times in 15 seconds. Do not hold WASH button longer than this without a 2 minute pause.

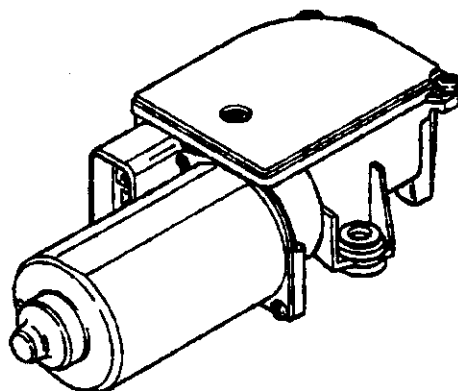
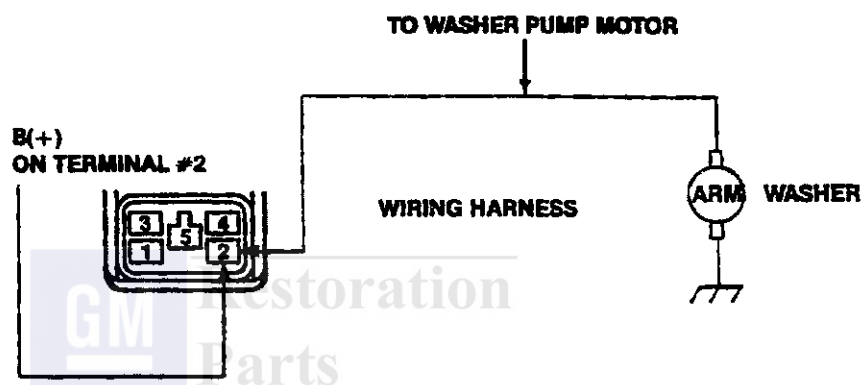
1. If wiper motor functions in all above modes, go to Wiper-Washer Switch Tests.
2. If the motor does not function in any of the above checks, see Diagnosis Chart.

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Figure 7—Wiper Motor On-Vehicle Check

DIAGNOSTIC PROCEDURES (CONT'D)**WASHER PUMP**

CHECK FOR WASHER PUMP OPERATION BEFORE REMOVING FROM VEHICLE. REMOVE CONNECTOR AND APPLY B(+) TO #2 WIRING HARNESS TERMINAL AS SHOWN.



1. If motor does not run or pump solvent, replace washer pump.
2. If motor runs and pumps solvent, problem is in circuit board, motor park switch or wiper switch. Refer to Wiper-Washer Switch Tests.

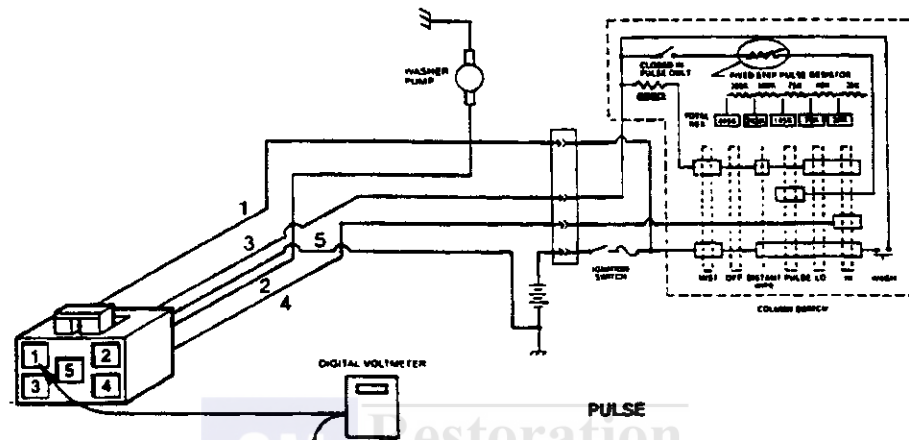
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Figure 8—Washer Pump On-Vehicle Check

8E1-8 WINDSHIELD WIPER/WASHER SYSTEM

WIPER-WASHER SWITCH TESTS

Disconnect wiring harnesses from wiper motor and perform the following switch tests using a digital voltmeter and ignition switch on:



PULSE	SWITCH MODE						
	1	2	3	4	5	6	7
1	B+	B+	B+	B+	B+	B+	B+
2	—	—	—	—	—	—	C
3	B+	—	B+	B+	C	C	—
4	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—

NOTE: All voltage readings taken with respect to vehicle ground.

C = Continuity between terminals

To use Wiper-Washer Switch Check chart, probe terminals 1 thru 5 with digital voltmeter and wiper switch in various positions.

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Figure 9—Wiper/Washer Switch Tests

WINDSHIELD WIPER/WASHER SYSTEM 8E1-9

SYMPTOM	PROCEDURE NO.
1. Pump inoperative—wiper motor operates	1
2. Washer pumps continuously	2
3. Wiper motor inoperative (all modes)	3
4. "Lo" speed only—inoperative in "Hi"	4
5. "Hi" speed only—inoperative in "Lo"	5
6. One speed only—runs the same in both speeds	6
7. Wiper shuts off but blades don't park	7
8. Wiper will not shut off	8
9. Intermittent inoperative	9
10. Wiper motor runs but blades don't move	10
11. Wiper parks above park position	11

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Figure 10-Symptom Diagnosis Chart

8E1-10 WINDSHIELD WIPER/WASHER SYSTEM

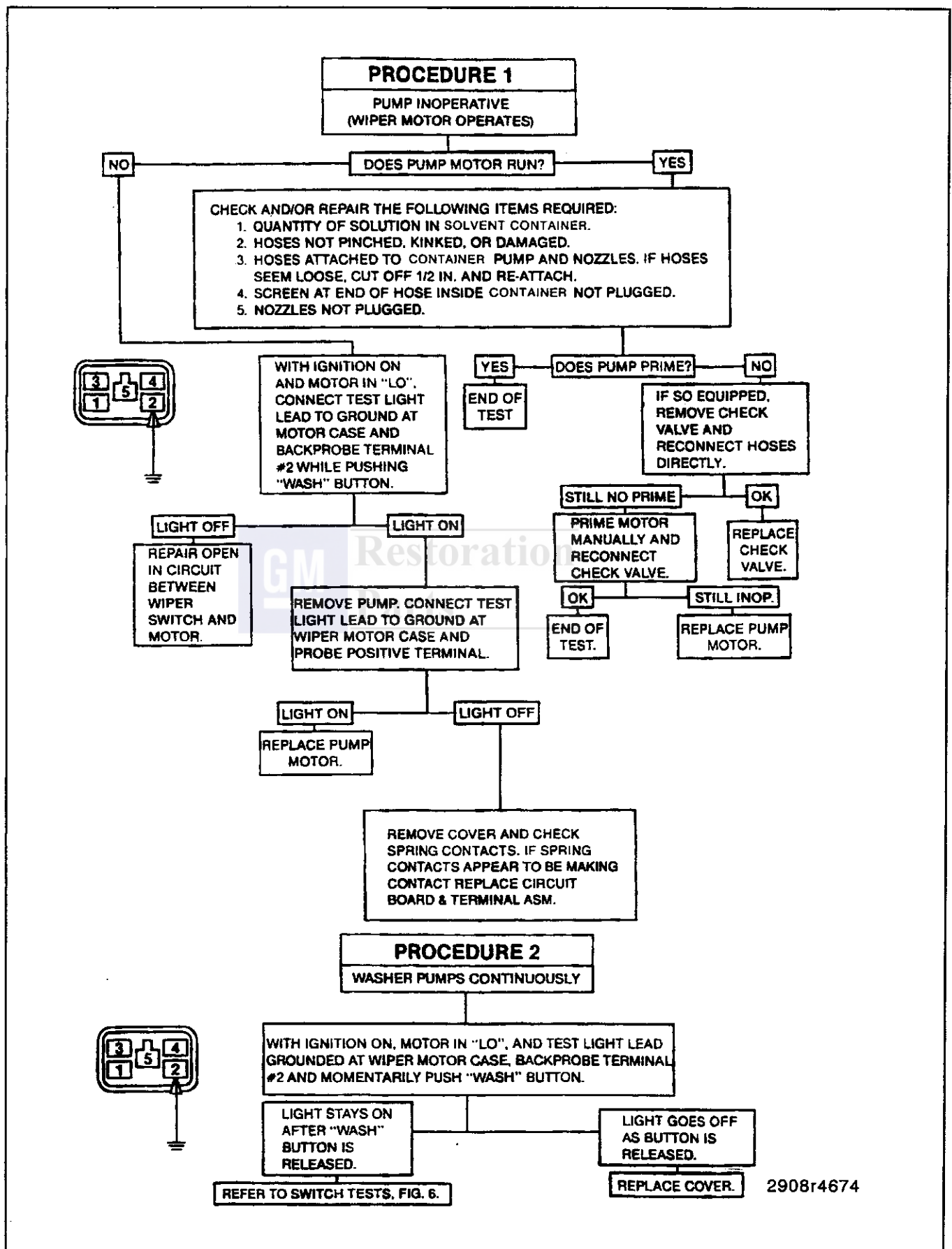


Figure 11—Wiper/Washer Diagnosis (1 of 6)

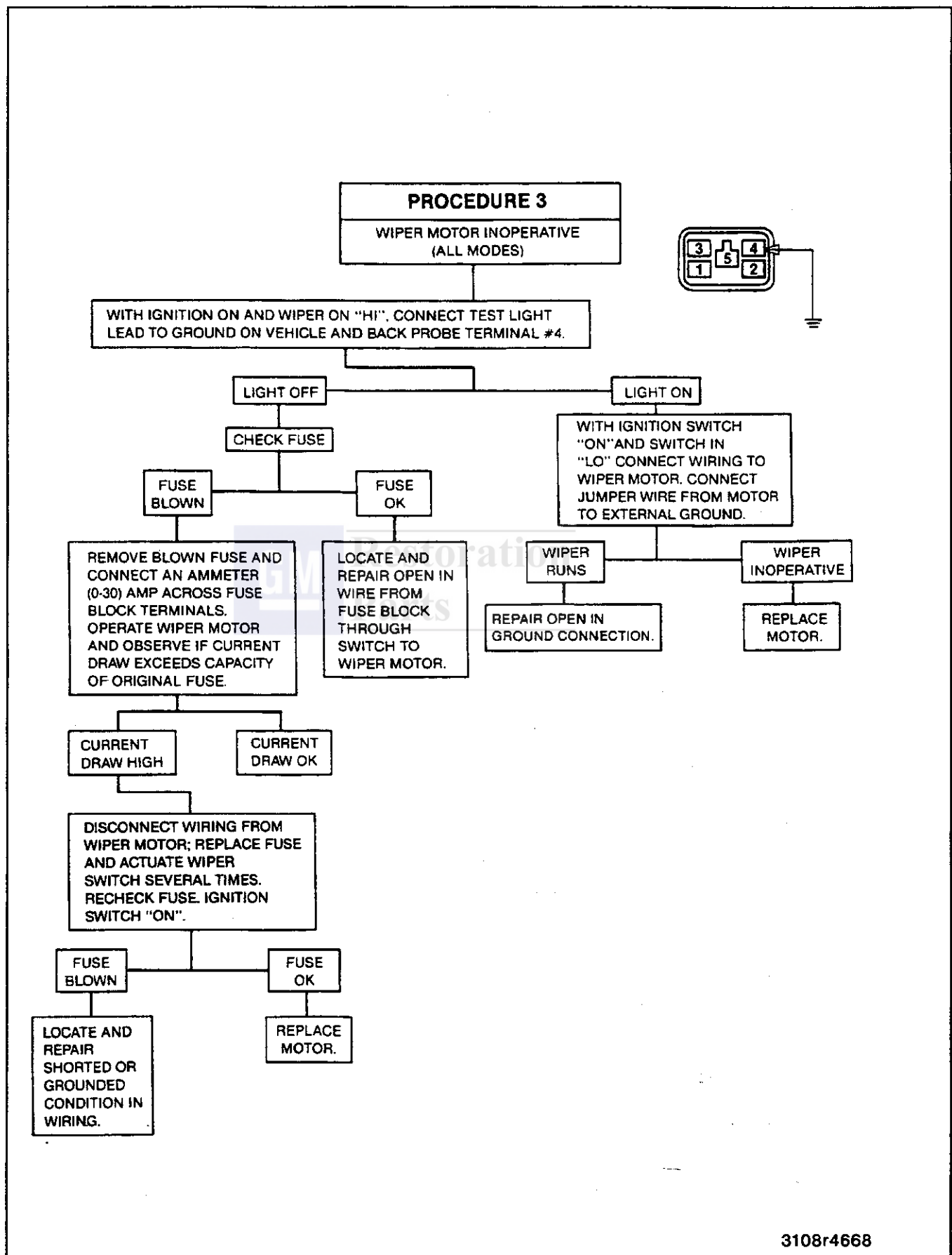


Figure 12—Wiper/Washer Diagnosis (2 of 6)

8E1-12 WINDSHIELD WIPER/WASHER SYSTEM

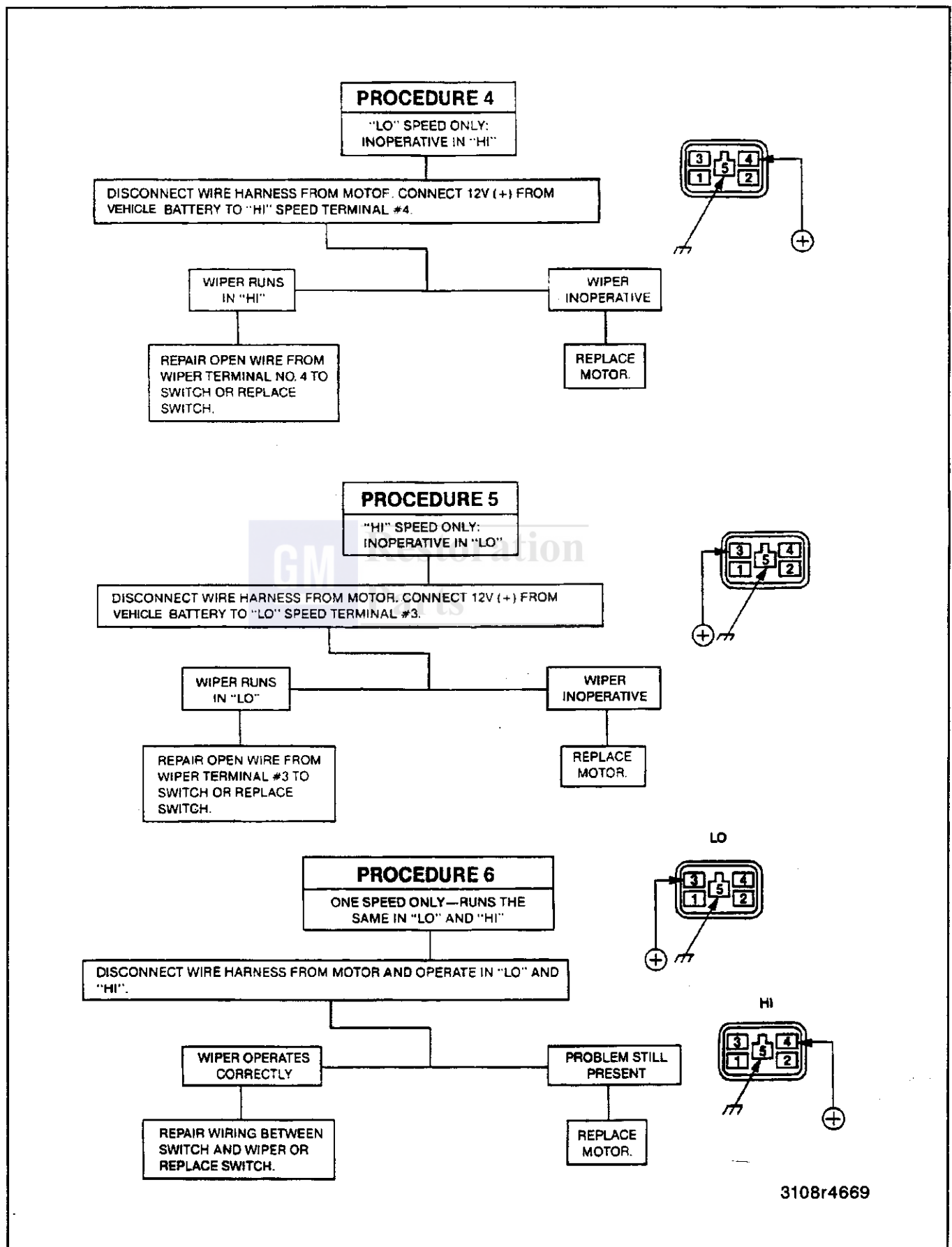


Figure 13—Wiper/Washer Diagnosis (3 of 6)

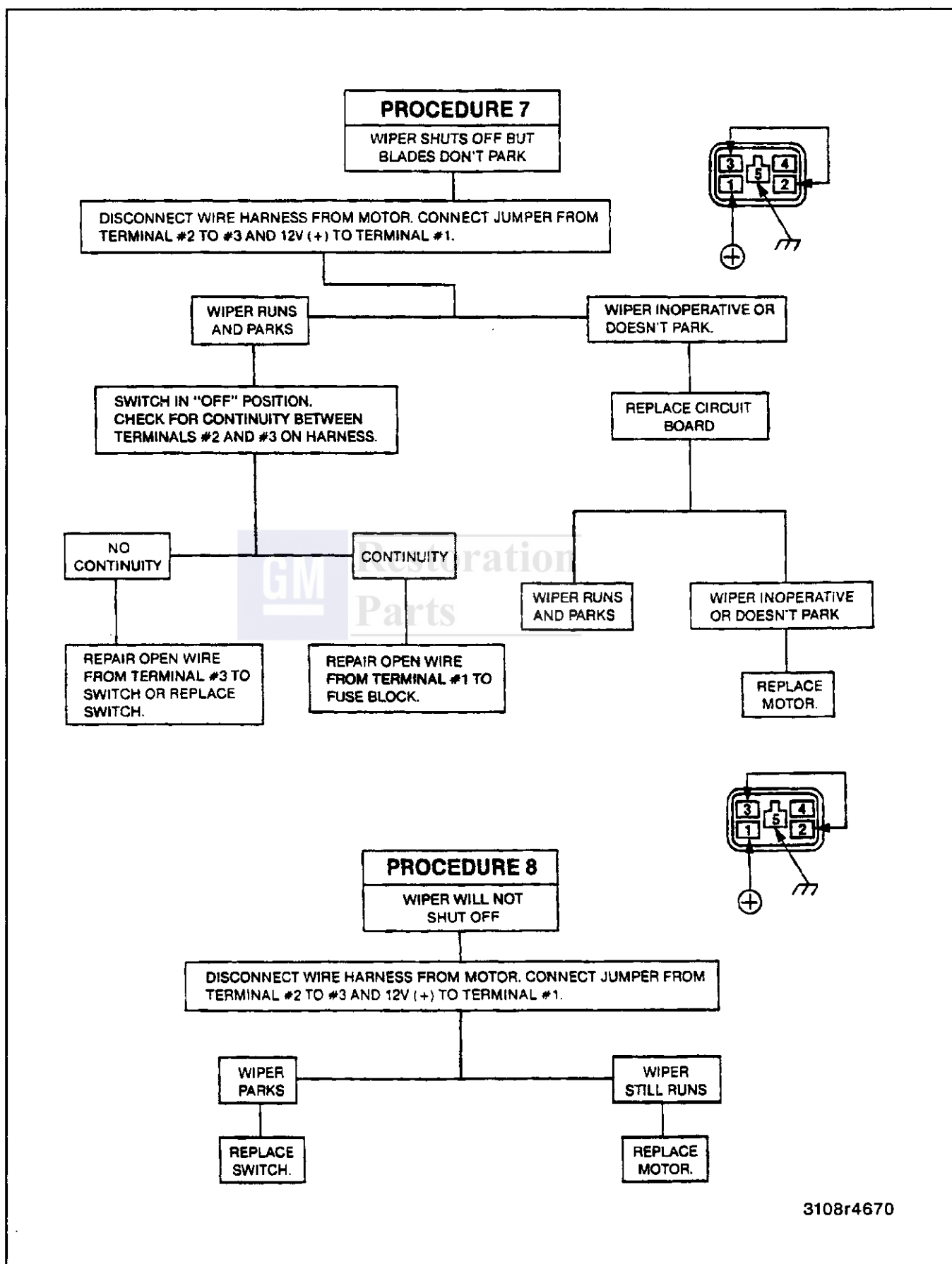


Figure 14—Wiper/Washer Diagnosis (4 of 6)

8E1-14 WINDSHIELD WIPER/WASHER SYSTEM

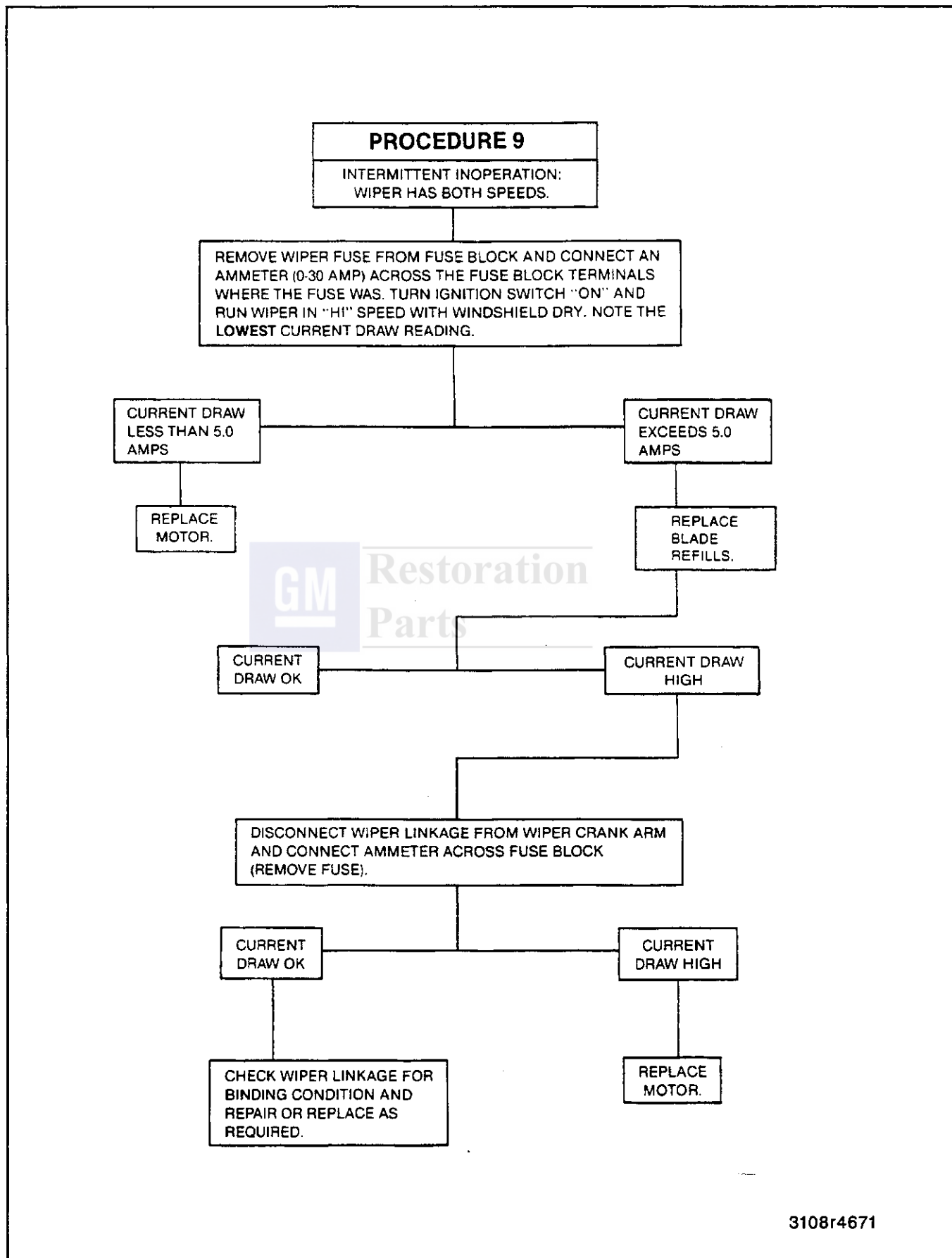
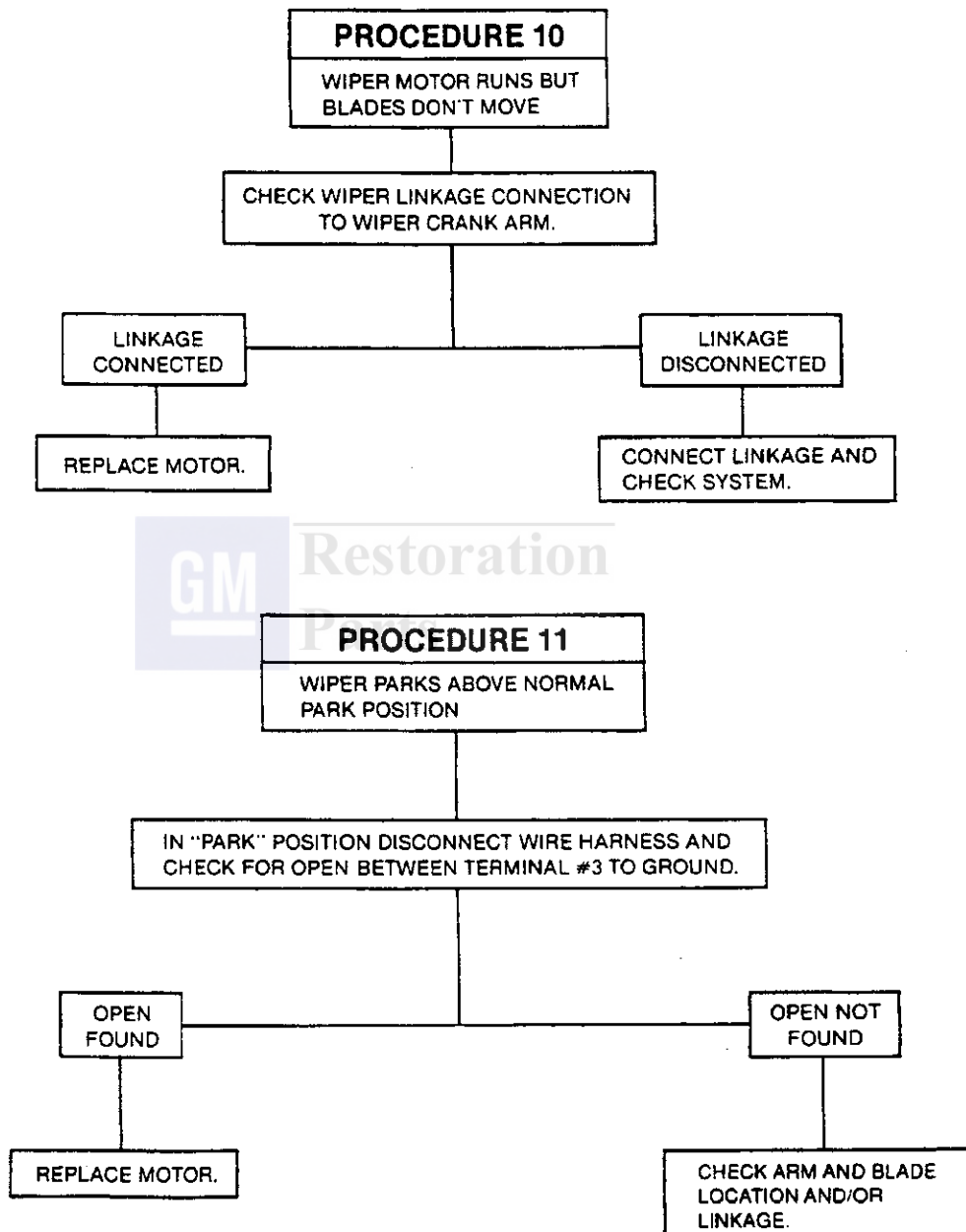


Figure 15—Wiper/Washer Diagnosis (5 of 6)



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Figure 16—Wiper/Washer Diagnosis (6 of 6)

ON-VEHICLE SERVICE**WIPER ARM ASSEMBLY REPLACEMENT****Important**

- Before removing one or both arm and blade assemblies, use a suitable marker on the windshield to indicate proper park position to aid in reinstallation.

**Remove or Disconnect (Figure 17)**

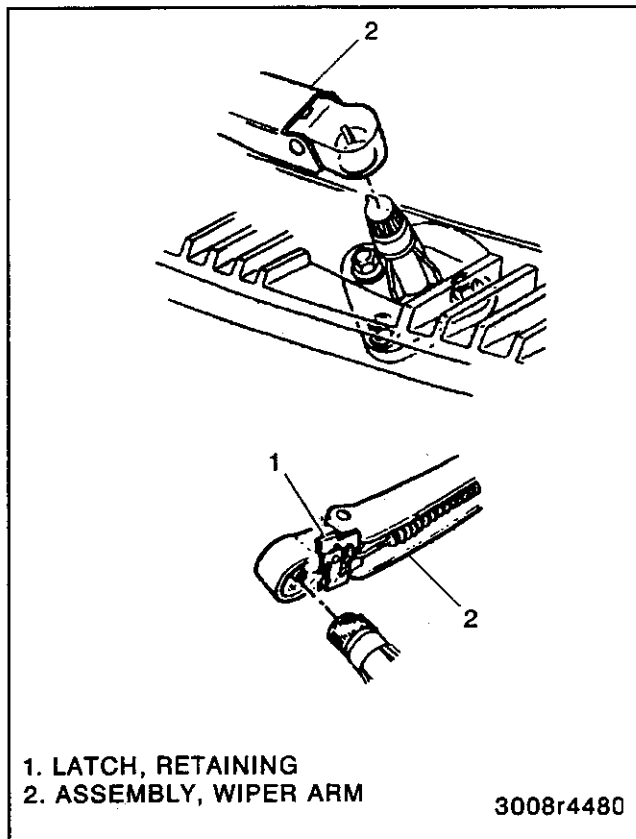
1. Washer hose.
2. Lift the wiper arm assembly from windshield, then pull retaining latch.
3. Arm assembly from transmission drive shaft.

**Install or Connect (Figure 17)**

1. Position wiper arm assembly on the drive shaft so that the wiper blade aligns with the mark made before removal.
 - Seat the arm assembly on the drive shaft, then press in retaining latch.
2. Washer hose.

**Inspect Wiper Operation**

- Run wipers and check wipe pattern and blade tip park position.

**Figure 17—Wiper Arm Attachment****WIPER BLADE ASSEMBLY AND ELEMENT REPLACEMENT****Remove or Disconnect (Figure 18)**

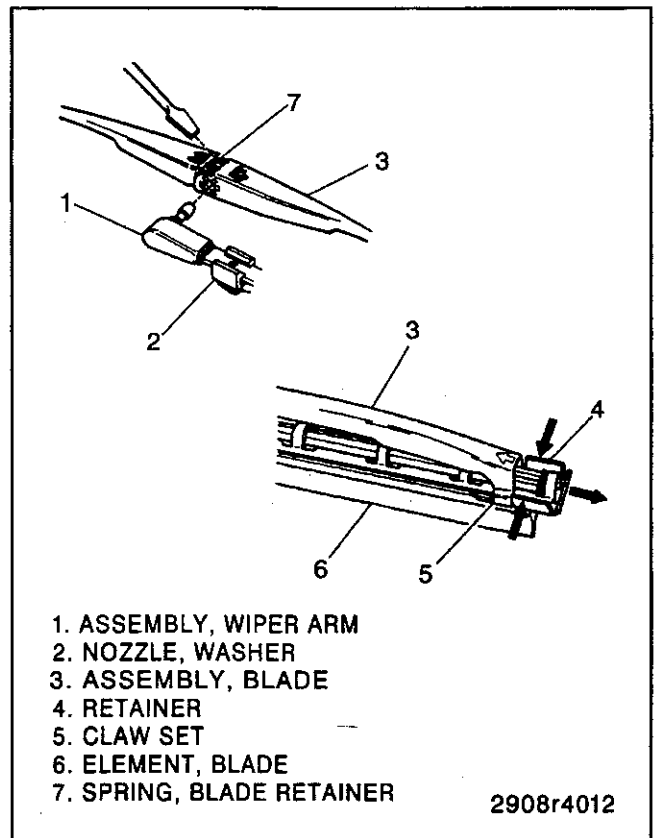
1. Wiper blade assembly from the arm assembly.
 - Insert a narrow-bladed screwdriver into the slot over the retainer spring. Pivot the screwdriver so that the blade tip presses downward on the retainer spring and release the blade from the pin of the wiper arm assembly.
2. Element from blade assembly.
 - Squeeze locking tabs together and pull the element from the blade assembly.

**Important**

- Element must be replaced if removed.

**Install or Connect (Figure 18)**

1. Element to the blade assembly.
 - A. Position retainer at bottom end of blade assembly.
 - B. Guide element through blade assembly, being sure to engage the claw sets along the entire length of the blade.

**Figure 18—Wiper Blade Assembly and Element Replacement**

- C. Element is fully seated when both locking tabs engage the claw set.
2. Blade assembly to the wiper arm assembly by snapping it into place.

CIRCUIT BOARD AND TERMINAL ASSEMBLY REPLACEMENT

Remove or Disconnect (Figure 19)

1. Negative battery cable. Refer to SECTION 0A.
2. Wiper motor electrical connector.
3. Cover screws.
4. Cover.
5. Circuit board and terminal assembly by lifting up on terminal.

Install or Connect (Figure 19)

1. Circuit board and terminal assembly.

NOTICE: Refer to "Notice" on page 8E1-1.

2. Cover and three screws.

Tighten

- Screws to 2.6 N·m (23 lbs. in.).
3. Wiper motor electrical connector.
 4. Negative battery cable.

WIPER TRANSMISSION ASSEMBLY REPLACEMENT

Remove or Disconnect (Figure 20)

1. Wiper arm assemblies. Refer to "Wiper Arm Assembly Replacement."
2. Cowl vent grille. Refer to SECTION 2B.
3. Loosen bracket to crank arm nuts.
4. Transmission brackets from the wiper motor crank arm.
5. Transmission to cowl bolts.
 - Note the position of the right and left transmission links for reassembly.
6. Transmission assembly from the vehicle.

Install or Connect (Figure 20)

NOTICE: For steps 2, and 4, refer to "Notice" on page 8E1-1.

1. Wiper transmission assembly to the vehicle.
2. Transmission to cowl bolts.

Tighten

- Bolts to 7 N·m (62 lbs. in.).
3. Transmission brackets to the wiper motor crank arm.

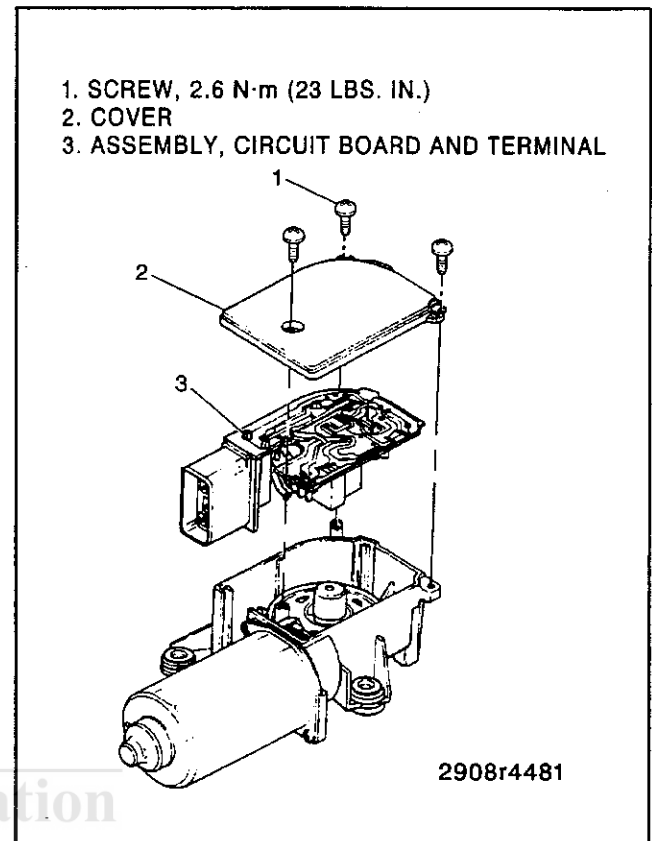


Figure 19—Circuit Board and Terminal Assembly Replacement

Tighten

- Drive link nuts to 5 N·m (44 lbs. in.).
4. Cowl vent grille. Refer to SECTION 2B.
 5. Wiper arm assemblies. Refer to "Wiper Arm Assembly Replacement."

WIPER MOTOR ASSEMBLY REPLACEMENT

Remove or Disconnect (Figures 17 and 20)

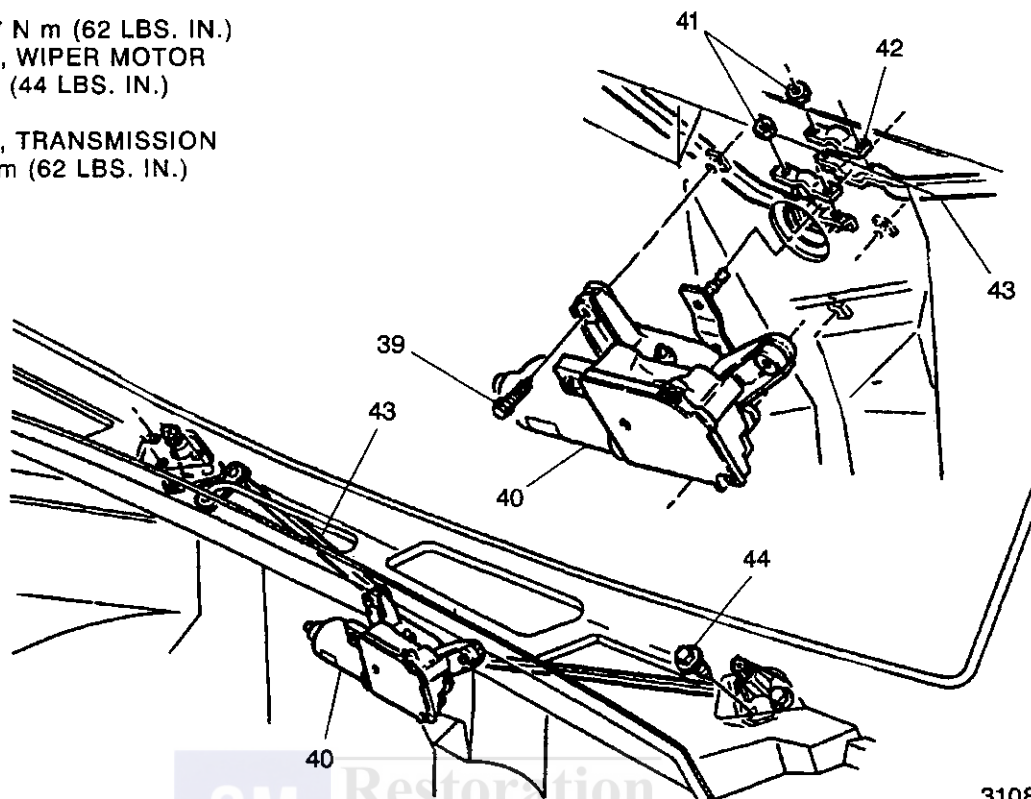
1. Negative battery cable. Refer to SECTION 0A.
2. Wiper arm assemblies.
 - Lift the wiper arm into the servicing position, and move the latch into the open position before removing the wiper arm (figure 17).
3. Cowl vent grille. Refer to SECTION 2B.
4. Wiring connector from the motor assembly.
5. Drive link brackets from the wiper motor crank arm. **DO NOT REMOVE THE CRANK ARM.**
 - Loosen the nuts and slide the brackets off the crank arm.
6. Wiper motor screws and wiper motor assembly from the vehicle.

Install or Connect (Figures 17 and 20)

NOTICE: For steps 2 and 3, refer to "Notice" on page 8E1-1.

8E1-18 WINDSHIELD WIPER/WASHER SYSTEM

- 39. SCREWS, 7 N·m (62 LBS. IN.)
- 40. ASSEMBLY, WIPER MOTOR
- 41. NUT, 5 N·m (44 LBS. IN.)
- 42. BRACKET
- 43. ASSEMBLY, TRANSMISSION
- 44. BOLT, 7 N·m (62 LBS. IN.)



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Figure 20—Wiper Transmission and Motor Assembly Replacement

1. Wiper motor assembly to the vehicle.
2. Wiper motor screws.



Tighten

- Screws to 7 N·m (62 lbs. in.).
3. Drive link brackets to the wiper motor crank arm.
 - Assemble the brackets in the order shown in figure 20. (Right side linkage closest to the wiper motor).



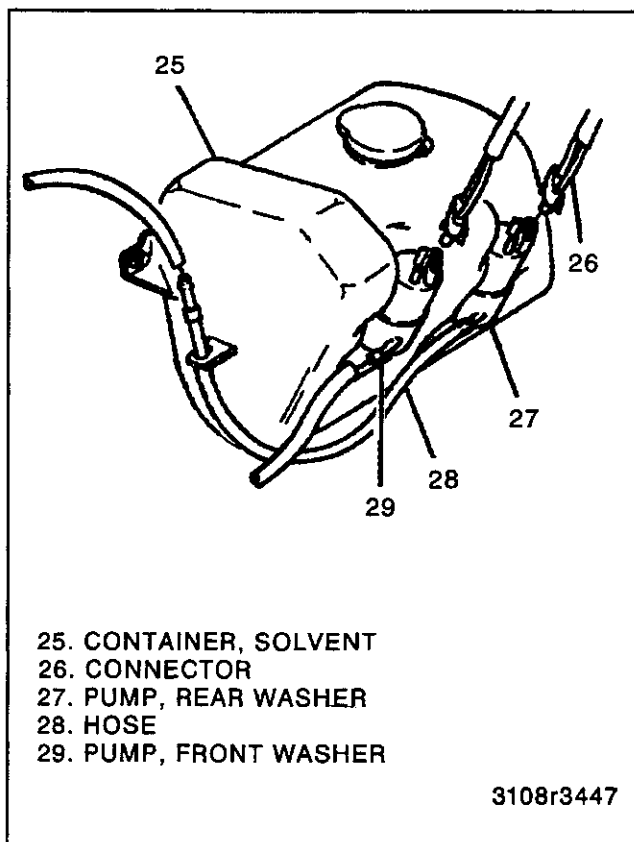
Tighten

- Drive link nuts to 5 N·m (44 lbs. in.).
4. Wiring connector to the wiper motor.
 5. Cowl vent grille. Refer to SECTION 2B.
 6. Wiper arm assemblies.
 - Place the wiper arms on the transmission drive shafts and lock them into place with the latch (figure 17).
7. Negative battery cable.

WIPER/WASHER SWITCH ASSEMBLY REPLACEMENT

The wiper/washer switch assembly is part of the steering column assembly. For replacement procedures without optional cruise control, refer to SECTION 3F.

The multifunction lever is part of the optional cruise control. For replacement procedures, refer to SECTION 9B.



- 25. CONTAINER, SOLVENT
- 26. CONNECTOR
- 27. PUMP, REAR WASHER
- 28. HOSE
- 29. PUMP, FRONT WASHER

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Figure 21—Washer System Components

WINDSHIELD WIPER/WASHER SYSTEM 8E1-19

WASHER SOLVENT CONTAINER AND PUMP REPLACEMENT



Remove or Disconnect (Figure 21)

1. Negative battery cable. Refer to SECTION 0A.
2. Wiring connectors from both washer pumps (if equipped).
3. Hose(s) from washer pump connectors.
4. Solvent container bolts.
5. Container from the vehicle.
6. Washer pump(s) from the container.



Install or Connect (Figure 21)

1. Washer pump(s) to the solvent container.
 - Make sure washer pump(s) are pushed all the way into the container seals.

2. Solvent container to the vehicle.

NOTICE: Refer to "Notice" on page 8E1-1.

3. Container bolts.



Tighten

- Container bolts to 12 N·m (106 lbs. in.).
4. Washer hose(s) to pump connectors.
 5. Wiring connectors to both washer pumps (if equipped).
 6. Negative battery cable.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

ITEM	N·m	Lbs. In.
Container Bolts	12	106
Circuit Board and Terminal Assembly Cover Screws.....	2.6	23
Transmission Assembly Drive Link Nuts.....	5	44
Transmission to Cowl Bolts	7	62
Wiper Motor to Cowl Screws.....	7	62

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8E1-20 WINDSHIELD WIPER/WASHER SYSTEM

NOTES



SECTION 8E2

REAR WINDOW WIPER/WASHER SYSTEM

NOTICE: When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread locking compound will be called out. The correct torque value must be used when installing fasteners that require it. If the above conditions are not followed, parts or system damage could result.

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Diagnosis of the Rear Window Wiper/Washer System.....	8E2-5
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Wiper/Washer Switch Assembly Replacement.....	8E2-7
Washer Pump Replacement	8E2-7
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GENERAL DESCRIPTION

REAR WINDOW WIPER/WASHER SYSTEM

The rear window wiper/washer system has a one-speed, permanent magnet, depressed park wiper motor assembly with a pulse (delay) mode (figure 1). The wiper motor assembly drives a gear box, that in turn drives a wiper pivot that provides an oscillating output to the arm and blade.

A controller assembly is retained by the wiper motor bracket and is the only replaceable wiper motor component. The controller's printed circuit board controls all wiper motor functions as determined by the position of the wiper/washer switch (figure 2).

SYSTEM OPERATION

The system operates only with the ignition switch is in the "RUN" or "ACC" position. There are four electrical terminals on the controller assembly of the wiper motor assembly (figures 3 and 4).

When the wiper switch is turned "ON," battery voltage is applied to terminal B of the controller. The motor and controller are grounded at terminal A. If the delay button is pressed, battery voltage is applied to terminals B and

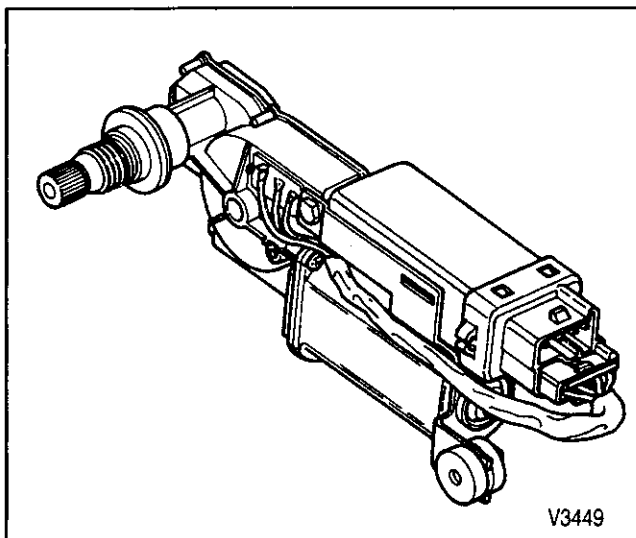


Figure 1—Wiper Motor Assembly

8E2-2 REAR WINDOW WIPER/WASHER SYSTEM

D at the controller. The operation of the wiper motor will be pulsed, with about 9 seconds between each wiper sweep.

When the wiper switch is turned "OFF," only terminals A and D are used. D remains battery positive and the circuit is completed through terminal A and the closed park switch terminals. A cam on the wiper motor gear then opens at the park position and the wiper motor turns off.

CONTAINER-MOUNTED WASHER SYSTEM

The rear washer pump and solvent container mounts to the left fender, inside the engine compartment. The rear window wiper/washer will always run out of solvent before the windshield wiper/washer does. If the rear washer fails to operate, try washing the windshield. If you are able to wash the windshield and not the rear window, try filling the solvent container.

The washer hose routes from the solvent container, along the inside of the left frame rail to the rear of the vehicle (figure 5). A one-way check valve between the

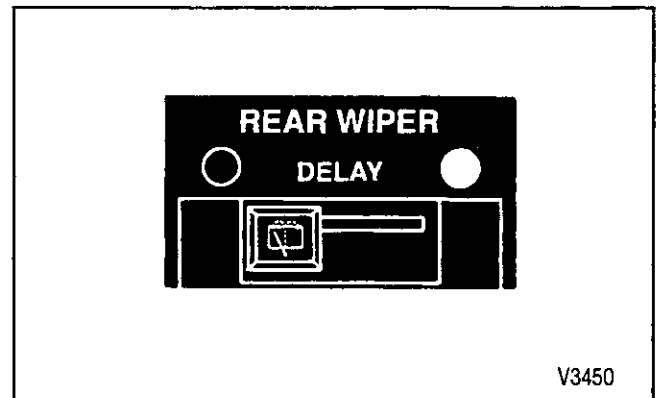


Figure 2—Wiper/Washer Switch Assembly

washer pump motor assembly and the washer hose harness allows fluid flow toward the washer nozzle only. A second check valve is behind the rear bumper, where the hose continues up the right side of the door opening frame, across the vehicle to the rear window wiper motor assembly (figure 6).

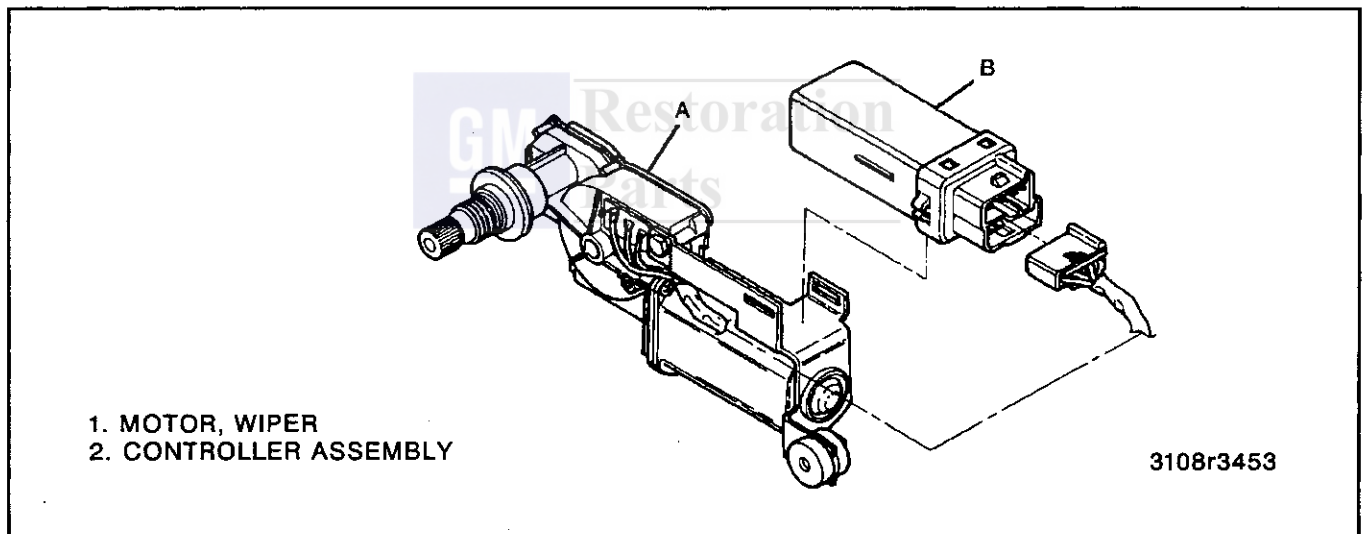


Figure 3—Wiper Motor Assembly Components

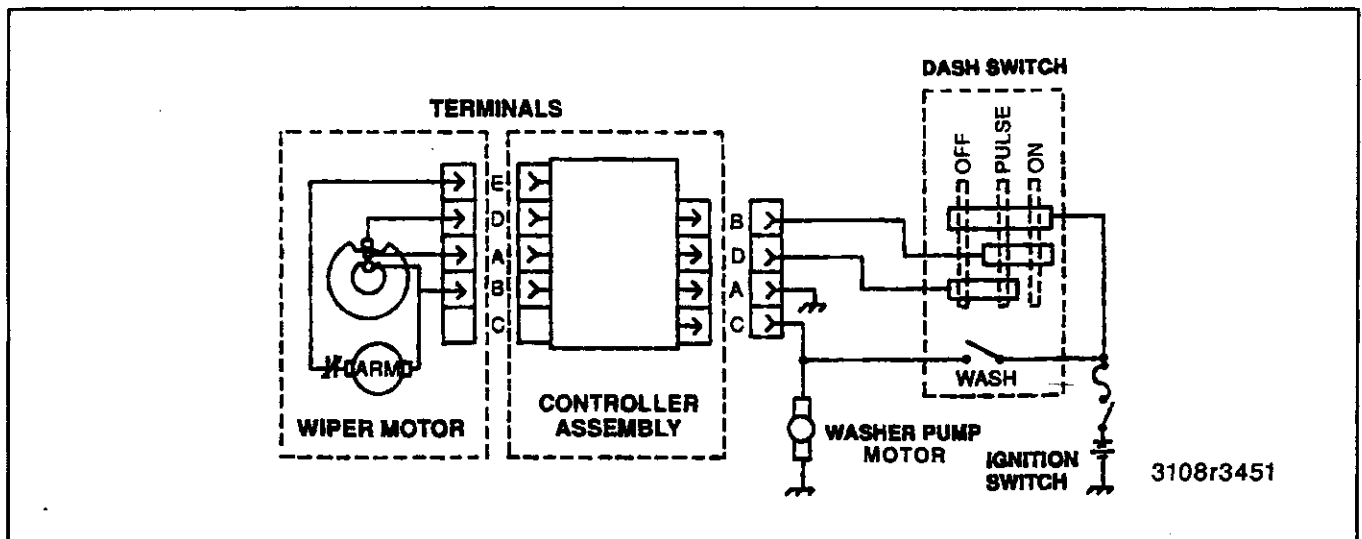


Figure 4—Wiper/Washer Motor Circuit Diagram

REAR WINDOW WIPER/WASHER SYSTEM 8E2-3

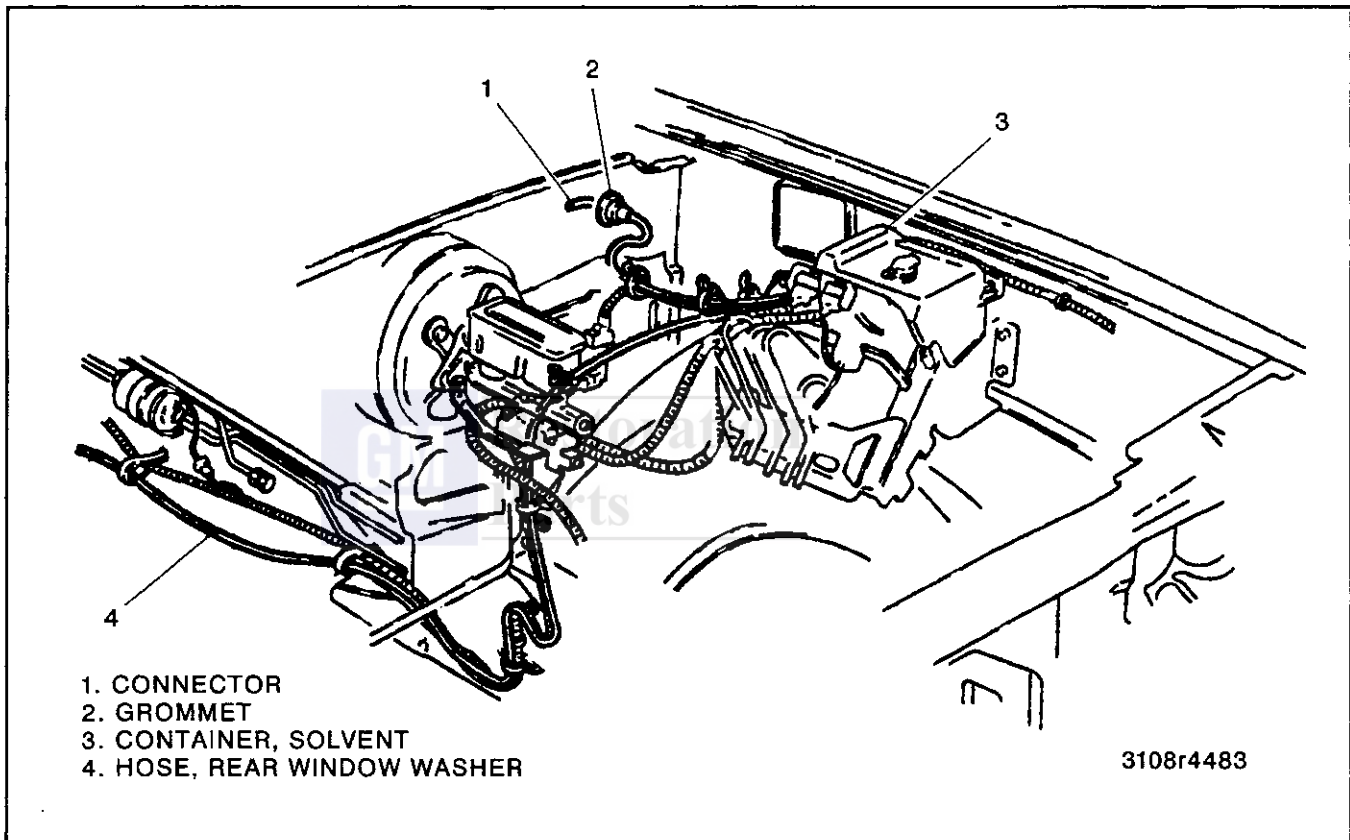


Figure 5—Washer Hose Routing (Front)

Depressing the wash button while the wiper motor operates in either "DELAY" or "ON" completes the washer motor's circuit to ground, energizing the motor and operating the washer pump. The pump operates only while the wash button is held. When the button is released, approximately 3 wipes are made without washing activity before the wiper motor turns off.

A "demand" wash will be performed if the wash button is pressed with the wiper/washer switch in the "OFF" position. The wash action will last until the wash button is released, followed by approximately 3 wipes without washing activity before the wiper motor turns off.

8E2-4 REAR WINDOW WIPER/WASHER SYSTEM

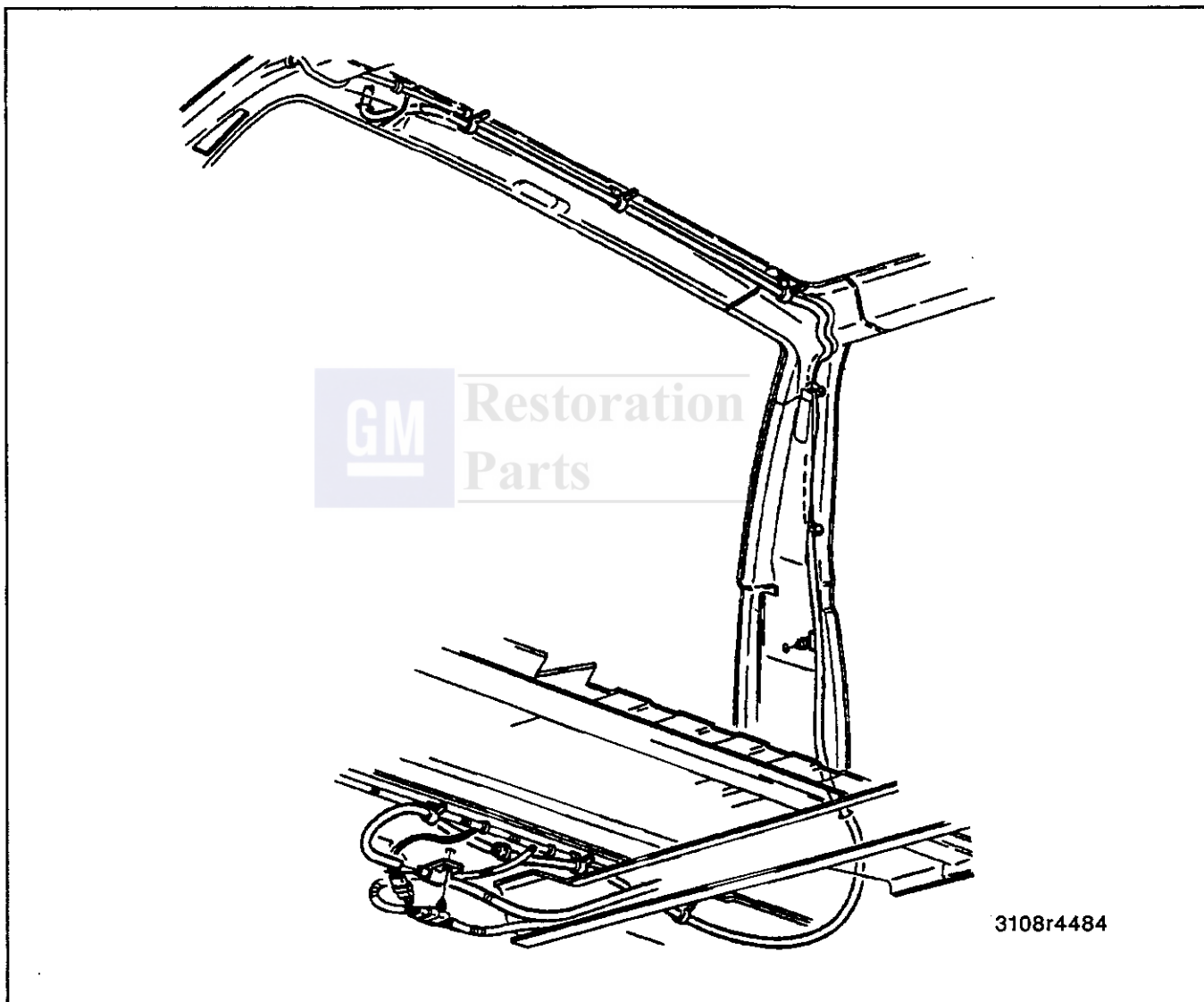


Figure 6—Washer Hose Routing (Rear)

DIAGNOSIS OF THE REAR WINDOW WIPER/WASHER SYSTEM

Always perform the System Check first as a guide to normal operation, then verify that power and ground are at the correct wiper motor terminals using "Controller Terminals Used in RUN." The wiper motor and controller assemblies cannot be repaired. If diagnosis leads to a faulty motor or controller, replace them. The electrical diagrams section of NATP-9442 provides circuit diagrams and harness diagnosis.

CONTROLLER TERMINALS USED IN "RUN"

"RUN" OR "ON" MODE TERMINALS	BATTERY VOLTAGE AT TERMINALS	GROUND TERMINAL
A, B, & C	A & C	B

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SYSTEM CHECK

ACTION	NORMAL OPERATION
1. Slide the rear window wiper switch to the middle position.	1. Wiper operates in delay mode. A wipe is performed approximately every 9 seconds.
1. Slide the rear window wiper switch all the way to the right.	1. Wiper operates at a constant speed.
1. With wiper running, push wiper switch in.	1. Washer fluid sprays back window until switch is released. Wiper continues to operate.
1. Slide the rear window wiper switch all the way to the left.	1. Wiper returns to park position.

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ON-VEHICLE SERVICE

WIPER ARM ASSEMBLY REPLACEMENT

Remove or Disconnect (Figure 7)

1. Washer hose.
2. Lift the wiper arm assembly from the glass and pull the retaining latch.
3. Wiper arm assembly from the wiper motor driveshaft.

Install or Connect (Figure 7)

1. Wiper arm assembly with the wiper motor in the park position.
 - A. Install the head of the wiper arm assembly onto the serrated wiper motor driveshaft in a position where the blade will rest in a proper parked position (blade parallel to the edge of the glass).
 - B. Lift the wiper arm extension and push in the retaining latch when the head is fully seated onto the driveshaft.
2. Washer hose, engaging the hose grommet in the lift glass hole.

WIPER BLADE ASSEMBLY REPLACEMENT

Remove or Disconnect (Figure 7)

1. Wiper blade assembly.

- A. Insert a screwdriver into the blade retainer slot over the spring.
- B. Pivot the screwdriver so the blade tip presses downward on the retainer spring, releasing the pin of the wiper arm.

Important

- Protect the glass when removing the wiper blade assembly.

Install or Connect (Figure 7)

1. Wiper blade assembly by pressing the pin of the wiper arm assembly into the blade retainer until the pin is engaged.

WIPER BLADE ELEMENT REPLACEMENT

Remove or Disconnect (Figure 7)

1. Wiper blade element by squeezing the element retainer tabs together, then pull the blade element out.

Install or Connect (Figure 7)

1. Insert the blade element until its retainer is engaged by the outer claw set.

8E2-6 REAR WINDOW WIPER/WASHER SYSTEM

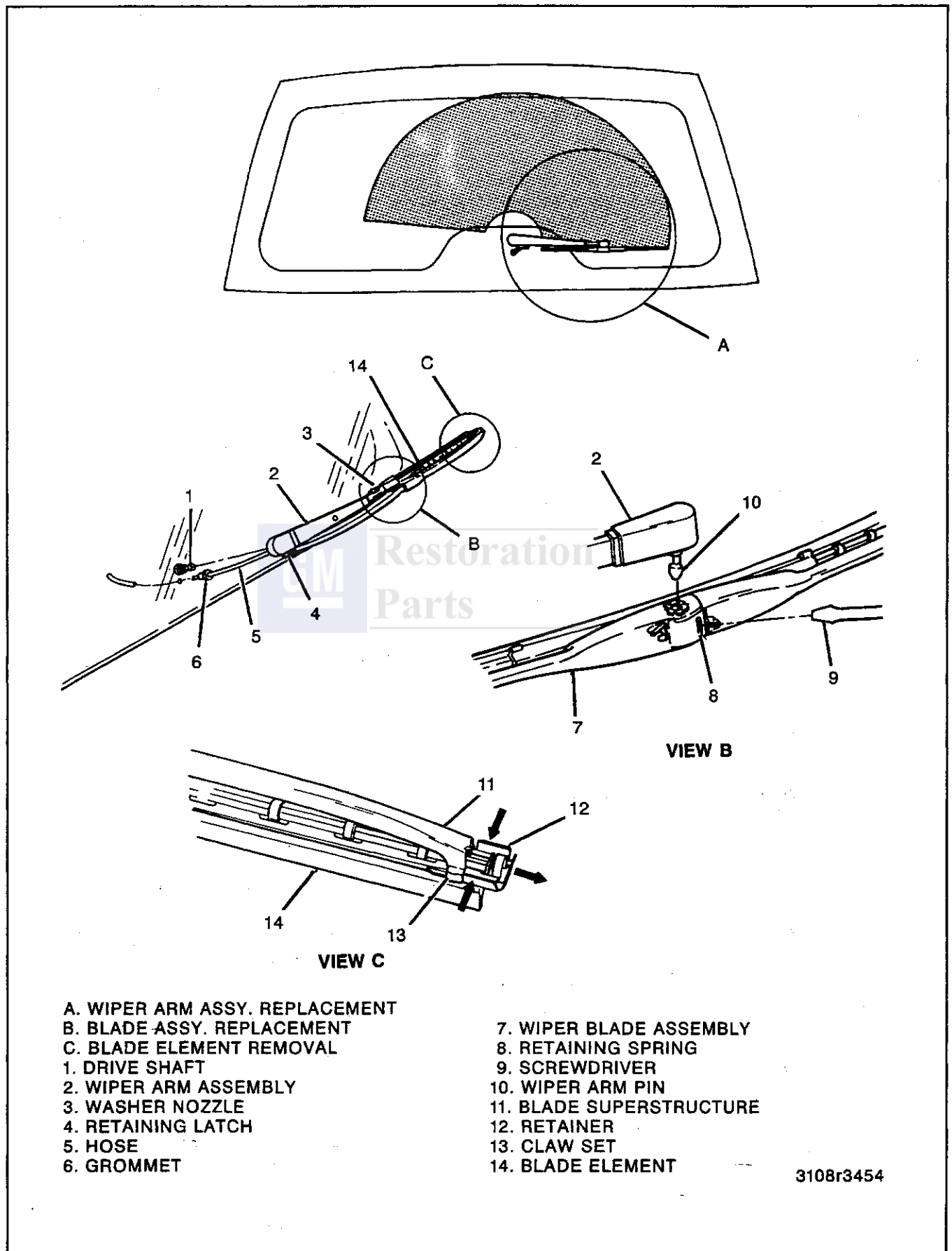


Figure 7—Wiper Arm Assembly, Blade, and Element Replacement

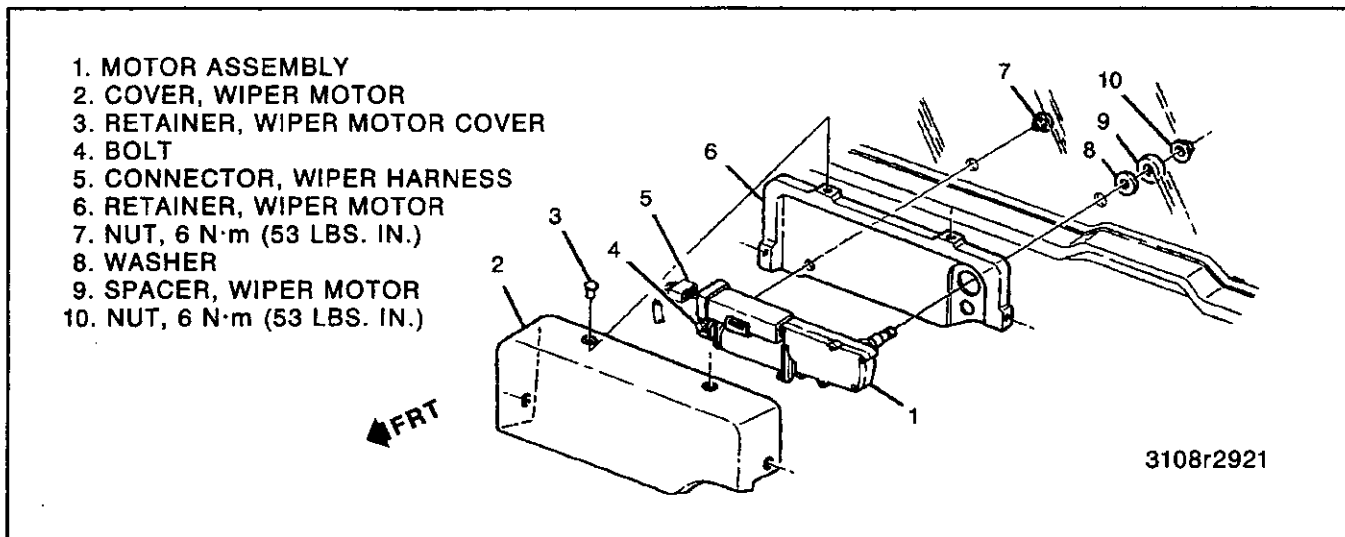


Figure 8—Wiper Motor Assembly Replacement



Important

- Be the sure blade element is secure in all claw sets.
- 2. Check the wipe pattern and compare it to figure 7.

CONTROLLER ASSEMBLY REPLACEMENT



Remove or Disconnect (Figures 3 and 8)

1. Wiper motor assembly. Refer to "Wiper Motor Assembly Replacement."
2. Four retainers and the cover.
3. Wiring harness and wiper motor electrical connectors.
4. Use a screwdriver to pry the locking tabs of the controller assembly free from the slots in the wiper motor bracket.



Install or Connect (Figures 3 and 8)

1. Press the controller assembly into the wiper motor bracket so the locking tabs engage both bracket slots.
2. Wiper motor assembly to the vehicle. Refer to "Wiper Motor Assembly Replacement."

WIPER MOTOR ASSEMBLY REPLACEMENT



Remove or Disconnect (Figure 8)

1. Negative battery cable. Refer to SECTION 0A.
2. Wiper arm assembly. Refer to "Wiper Arm Assembly Replacement."
3. Cover from the wiper motor.
4. Electrical connector.
5. Bolt from the wiper motor.
6. Nut, spacer, and washer.
7. Nut.
8. Wiper motor assembly from the vehicle.



Install or Connect (Figure 8)

NOTICE: For steps 2, 3, and 4, refer to "Notice" on page 8E2-1.

1. Wiper motor assembly to the vehicle.
2. Washer, spacer, and nut to the right side of the motor assembly.
3. Nut to the left side of the motor assembly.
4. Bolt to the wiper motor.



Tighten

- Nut to 6 N·m (53 lbs. in.).

5. Electrical connector.
6. Cover to the wiper motor.
7. Wiper arm assembly. Refer to "Wiper Arm Assembly Replacement."
8. Negative battery cable.

WIPER/WASHER SWITCH ASSEMBLY REPLACEMENT

Refer to SECTION 8C for Rear Wiper/Washer (Accessory) Switch Replacement.

WASHER PUMP REPLACEMENT



Remove or Disconnect (Figure 9)

1. Negative battery cable. Refer to SECTION 0A.
2. Electrical connector and washer hose.
3. Washer pump from the solvent container.



Install or Connect (Figure 9)

1. Washer pump into the solvent container.

8E2-8 REAR WINDOW WIPER/WASHER SYSTEM



Important

- Make sure the new washer pump is pushed all the way into the container seal.
2. Electrical connector and washer hose.
 3. Negative battery cable.

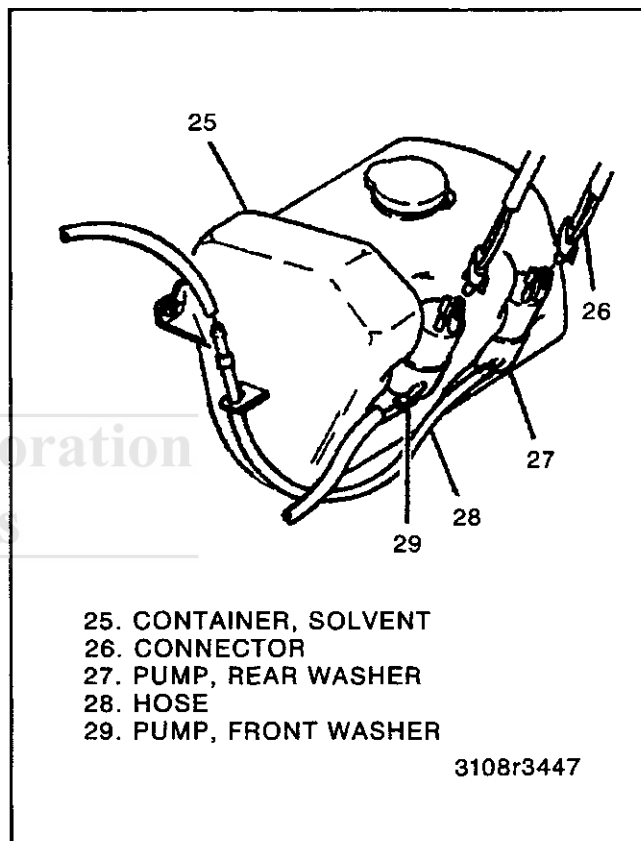


Figure 9—Washer System Components

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

ITEM	N·m	Lbs. Ft.	Lbs. In.
Wiper Motor Mounting Bolt.....	6	—	53
Wiper Motor Mounting Nut.....	6	—	53

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