Chapter 12
Body electrical system

Contents

Degrees of difficulty

Easy, suitable for novice with little experience 

Fairly easy, suitable for beginner with some experience 

Fairly difficult, suitable for competent DIY mechanic 

Difficult, suitable for experienced DIY mechanic 

Very difficult, suitable for expert DIY or professional 

1 General information

The electrical system is a 12-volt, negative earth type. Power for the lights and all electrical accessories is supplied by a lead/acid-type battery which is charged by the alternator.

This Chapter covers repair and service procedures for the various electrical components not associated with the engine. Information on the battery, alternator, distributor and starter motor will be found in Chapter 5.

It should be noted that when portions of the electrical system are serviced, the cable should be disconnected from the negative battery terminal to prevent electrical shorts and/or fires.

2 Electrical fault finding - general information

A typical electrical circuit consists of an electrical component, any switches, relays, motors, fuses, fusible links, in-line fuses or circuit breakers related to that component and the wiring and electrical connectors that link the component to both the battery and the chassis. To help you pinpoint an electrical circuit problem, wiring diagrams are included at the end of this Chapter.

Before tackling any troublesome electrical circuit, first study the appropriate wiring diagrams to get a complete understanding of what makes up that individual circuit. Trouble spots, for instance, can often be narrowed down by noting if other components related to the circuit are operating properly. If several components or circuits fail at one time, chances are the problem is in a fuse or earth connection, because several circuits are often routed through the same fuse and earth connections.

Electrical problems usually stem from simple causes, such as loose or corroded connections, a blown fuse, a melted fusible link or a bad relay. Visually inspect the condition of all fuses, wires and connections in a problem circuit before diagnosing it.

If testing instruments are going to be utilised, use the diagrams to plan ahead of time where you will make the necessary connections in order to accurately pinpoint the trouble spot.

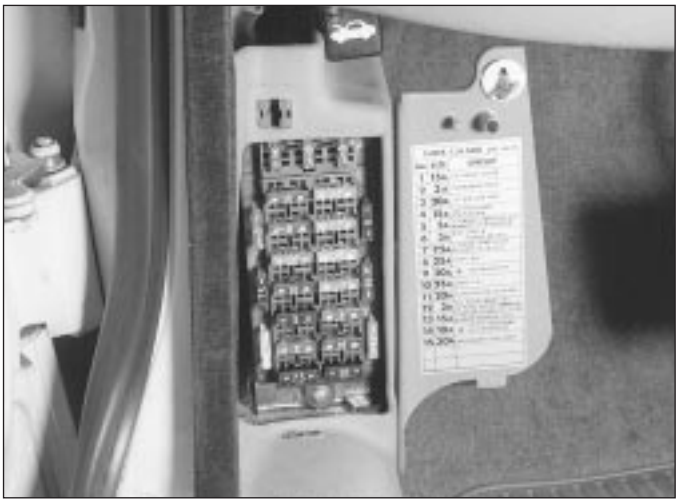
The basic tools needed for electrical fault finding include a circuit tester or voltmeter (a 12-volt bulb with a set of test leads can also be used), a continuity tester, which includes a bulb, battery and set of test leads, and a jumper wire, preferably with a circuit breaker incorporated, which can be used to bypass electrical components. Before attempting to locate a problem with test instruments, use the wiring diagram(s) to decide where to make the connections.

Voltage checks

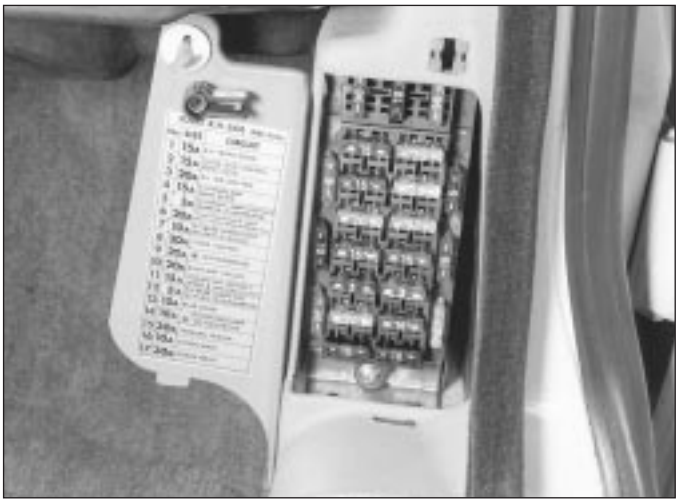
Voltage checks should be performed if a circuit is not functioning properly. Connect one lead of a circuit tester to either the negative battery terminal or a known good earth. Connect the other lead to a electrical connector in the circuit being tested, preferably nearest to the battery or fuse. If the bulb of the tester lights, voltage is present, which means that the part of the circuit between the electrical connector and the battery is problem free. Continue checking the rest of the circuit in the same fashion. When you reach a point at which no voltage is present, the problem lies between that point and the last test point with voltage. Most of the time the problem can be traced to a loose connection. **Note:** *Keep in mind that some circuits receive voltage only when the ignition key is in the Accessory or Run position.*

Finding a short

One method of finding shorts in a circuit is to remove the fuse and connect a test light or voltmeter in its place. There should be no voltage present in the circuit. Move the wiring harness from side to side while watching the test light. If the bulb goes on, there is a short



3.1a The left side fusebox is located in the passenger's side kick panel, behind the fuse panel cover



3.1b The right side fusebox is located in the driver's side kick panel, behind the fuse panel cover

to earth somewhere in that area, probably where the insulation has rubbed through. The same test can be performed on each component in the circuit, even a switch.

Earth check

Perform an earth test to check whether a component is properly earthed. Disconnect the battery and connect one lead of a self-powered test light, known as a continuity tester, to a known good earth. Connect the other lead to the wire or earth connection being tested. If the bulb goes on, the earth is good. If the bulb does not go on, the earth is not good.

Continuity check

A continuity check is done to determine if there are any breaks in a circuit - if it is passing electricity properly. With the circuit off (no power in the circuit), a self-powered continuity tester can be used to check the circuit. Connect the test leads to both ends of the circuit (or to the "power" end and a good earth), and if the test light comes on the circuit is passing current properly. If the light doesn't come on, there is a break somewhere in the circuit. The same procedure can be used to test a switch, by connecting the continuity tester to the power in and power out sides of the switch. With the switch turned On, the test light should come on.

Finding an open circuit

When diagnosing for possible open circuits, it is often difficult to locate them by sight because oxidation or terminal misalignment are hidden by the electrical connectors. Merely wiggling an electrical connector on a sensor or in the wiring harness may correct the open circuit condition. Remember this when an open circuit is indicated when diagnosing a circuit. Intermittent problems may also be caused by oxidised or loose connections.

Electrical fault finding is simple if you keep in mind that all electrical circuits are basically electricity running from the battery, through the wires, switches, relays, fuses and fusible links to each electrical component (light bulb, motor, etc.) and to earth, from which it is passed back to the battery. Any electrical problem is an interruption in the flow of electricity to and from the battery.

3 **Fuses** - general information

The electrical circuits of the vehicle are protected by a combination of fuses, circuit breakers and In-line fuses. The fuse blocks are located in the left and right side kick panels and in the centre console glove box **(see illustrations)**.

Each of the fuses is designed to protect a specific circuit, and the various circuits are identified on the fuse panel cover.

Miniaturised fuses are employed in the fuse blocks. These compact fuses, with blade terminal design, allow fingertip removal and renewal. If an electrical component fails, always check the fuse first. The best way to check the fuses is with a test light. Check for power at the exposed terminal tips of each fuse. If power is present on one side of the fuse but not the other, the fuse is blown. A blown fuse can be confirmed by visual inspection **(see illustration)**.

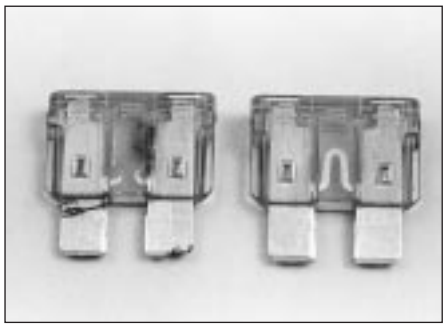
Be sure to renew blown fuses with the correct type. Fuses of different ratings are physically interchangeable, but only fuses of the proper rating should be used. Replacing a fuse with one of a higher or lower value than specified is not recommended. Each electrical circuit needs a specific amount of protection. The amperage value of each fuse is moulded into the fuse body.

If the renewal fuse immediately fails, don't renew it again until the cause of the problem is isolated and corrected. In most cases, this will be a short circuit in the wiring caused by a broken or deteriorated wire.

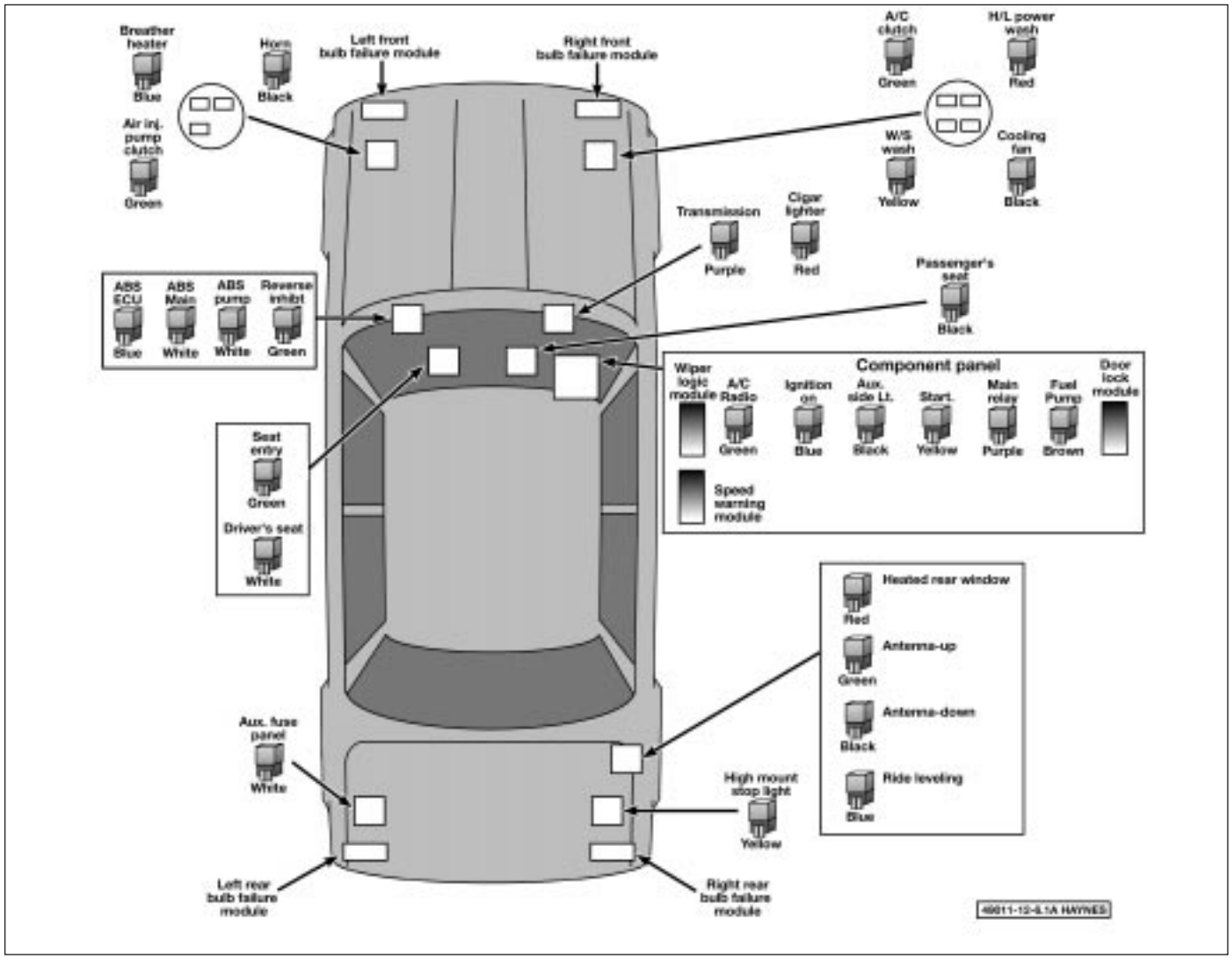
4 **In-line fuses** - general information

Some circuits are protected by in-line fuses. In-line fuses are used in such circuits as the windscreen wiper system, headlight

3.1c A third fusebox is located in the centre console glove box



3.3 When a fuse blows, the metal element between the terminals melts - the fuse on the left is blown, the one on the right is ok



1988 to 1989 relay location details

wash system, radio memory and the ABS main feed and pump circuits.

In-line fuses are located through out the vehicle depending on the year, make and model. Consult the wiring diagrams at the end of this Chapter for further information.

In-line fuses also have a blade terminal design, which allow fingertip removal and renewal. If an electrical component fails, always check the fuse first. A blown fuse is easily identified through the clear plastic body. Inspect the element for evidence of damage **(see illustration 3.3)**.

Be sure to renew blown fuses with the correct type. Fuses are usually colour-coded to indicate their rating. Fuses of different ratings are physically interchangeable, but only fuses of the proper rating should be used. Replacing a fuse with one of a different value than specified is not recommended. Each electrical circuit needs a specific amount of protection. The amperage value of each fuse is moulded into the fuse body.

If the renewal fuse immediately fails, don't renew it again until the cause of the problem is isolated and corrected. Don't substitute anything else for the fuse. In most cases, this will be a short circuit in the wiring caused by a broken or deteriorated wire.

5 Circuit breakers - general information

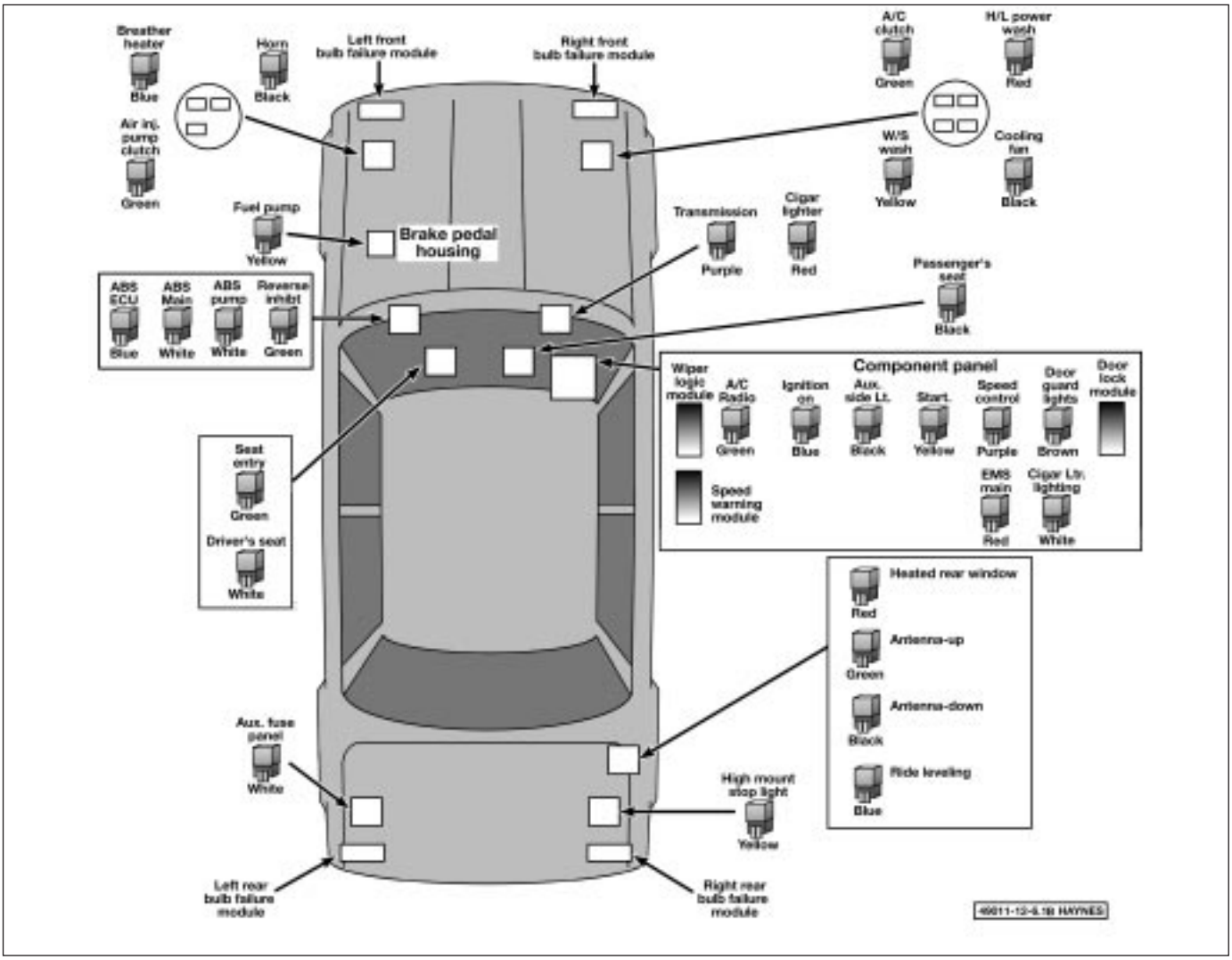
Circuit breakers generally protect components such as electric windows, central locking and headlights. On some models the circuit breaker resets itself automatically, so an electrical overload in the circuit will cause it to fail momentarily, then come back on. If the circuit doesn't come back on, check it immediately. Once the condition is corrected, the circuit breaker will resume its normal function. Some circuit breakers have a button on top and must be reset manually.

To test a circuit breaker, use an ohmmeter to check continuity between the terminals. A reading of zero to 1.0 ohms indicates a good circuit breaker. An open circuit reading on the meter indicates a bad circuit breaker.

6 Relays - general information and testing

General information

Several electrical accessories in the vehicle, such as the fuel injection system, electric windows, central locking, etc, use relays to transmit the electrical signal to the component. Relays use a low-current circuit (the control circuit) to open and close a high-current circuit (the power circuit). If the relay is defective, that component will not operate properly. The relays are mounted throughout the vehicle **(see illustrations)**. If a faulty relay is suspected, it



1990 to 1992 relay location details

can be removed and tested using the procedure below or by a dealer service department or a repair workshop. Defective relays must be replaced as a unit.

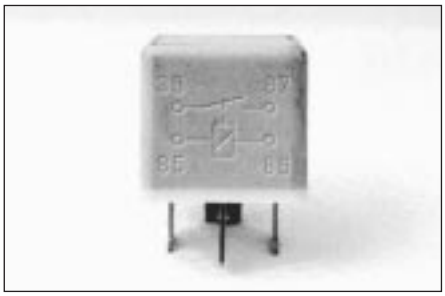
Testing

1 It's best to refer to the wiring diagram for the circuit to determine the proper connections for the relay you're testing. However, if you're not able to determine the correct connection from the wiring diagrams, you may be able to determine the test connections from the information that follows.

2 On most relays, two of the terminals are the relay's control circuit (they connect to the relay coil which, when energised, closes the large contacts to complete the circuit). The other terminals are the power circuit (they are connected together within the relay when the control-circuit coil is energised).

3 Relays are sometimes marked as an aid to help you determine which terminals are the control circuit and which are the power circuit **(see illustration)**. As a general rule, the two thicker wires connected to the relay are the power circuit; the thinner wires are the control circuit.

4 Remove the relay from the vehicle and check for continuity between the relay power circuit terminals. There should be no continuity.



6.3 Most relays are marked on the outside to easily identify the control circuit and power circuits

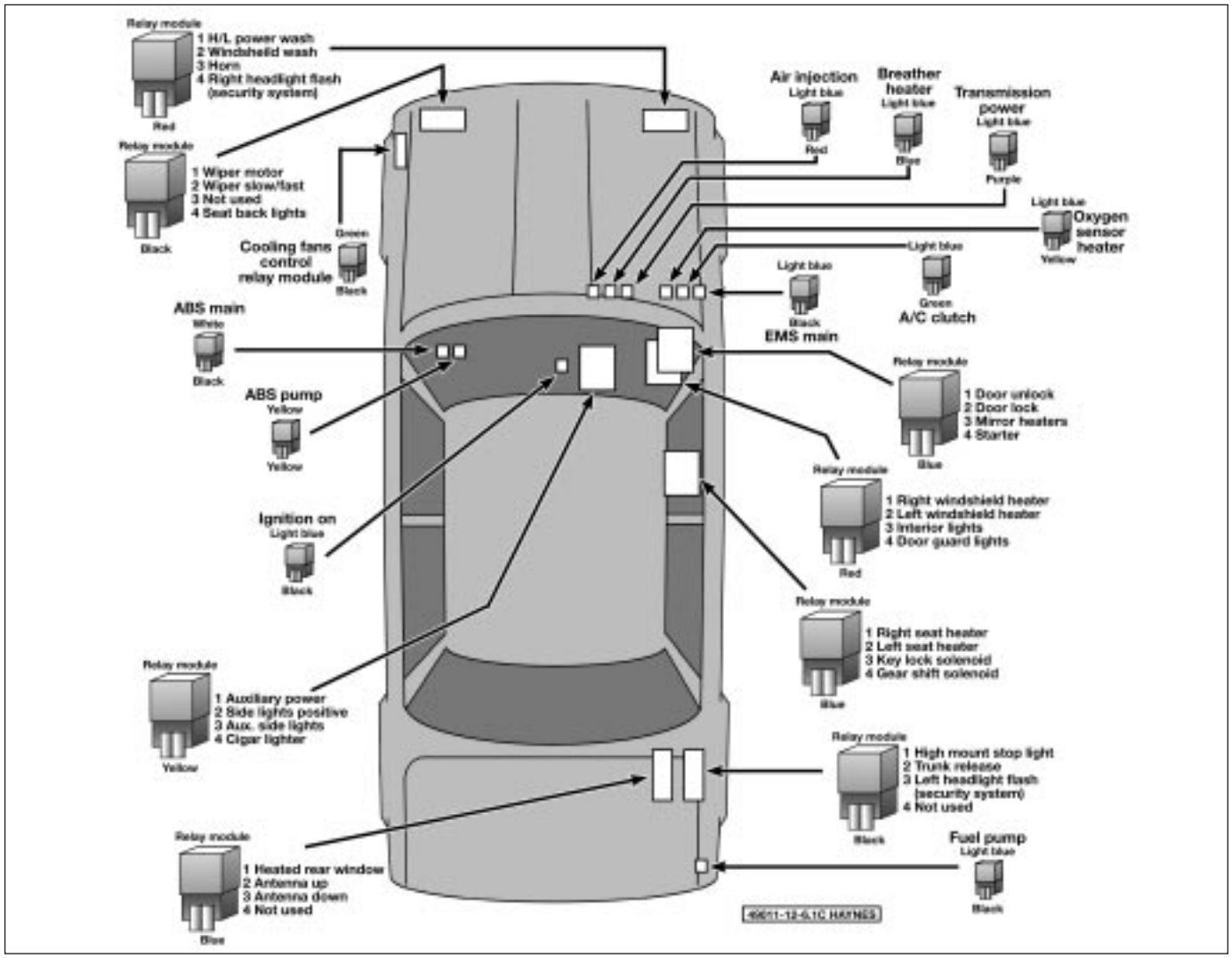
5 Connect a fused jumper wire between one of the two control circuit terminals and the positive battery terminal. Connect another jumper wire between the other control circuit terminal and earth. When the connections are made, the relay should click. On some relays, polarity may be critical, so, if the relay doesn't click, try swapping the jumper wires on the control circuit terminals.

6 With the jumper wires connected, check for continuity between the power circuit terminals. Now, there should be continuity.

8 If the relay fails any of the above tests, renew it.

7 Direction indicator/hazard flasher - general information

Warning: Later model vehicles are equipped with airbags. To prevent accidental deployment



1993 to 1994 relay location details

of the airbag, which could cause personal injury or damage to the airbag system, DO NOT work in the vicinity of the steering column or instrument panel. The manufacturer recommends that, on airbag equipped models, the following procedure be performed at a dealer service department or other properly equipped repair facility because of the special tools and techniques required to disable the airbag system.

The direction indicator and hazard flasher systems are governed by the central processing unit. The central processing unit requires special testers and diagnostic procedures which are beyond the scope of this manual.

If the direction indicator/hazard flasher system fails and the indicator bulbs are in working condition take the vehicle to a dealer service department or an automotive electrical specialist for further diagnosis and repair.

8 Steering column switches - removal and refitting

Warning: Later models are equipped with airbags. To prevent accidental deployment of the airbag, which could cause personal injury or damage to the airbag system, DO NOT work in the vicinity of the steering column or instrument panel. The manufacturer recommends that, on airbag equipped models, the following procedure be performed at a dealer service department or other properly equipped repair facility because of the special tools and techniques required to disable the airbag system.

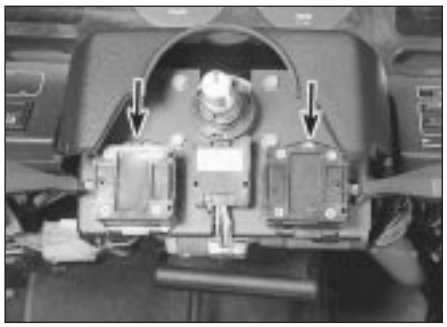
Caution: If the stereo in your vehicle is equipped with an anti-theft system, make sure you have the correct activation code before disconnecting the battery.

1 Disconnect the negative battery cable.

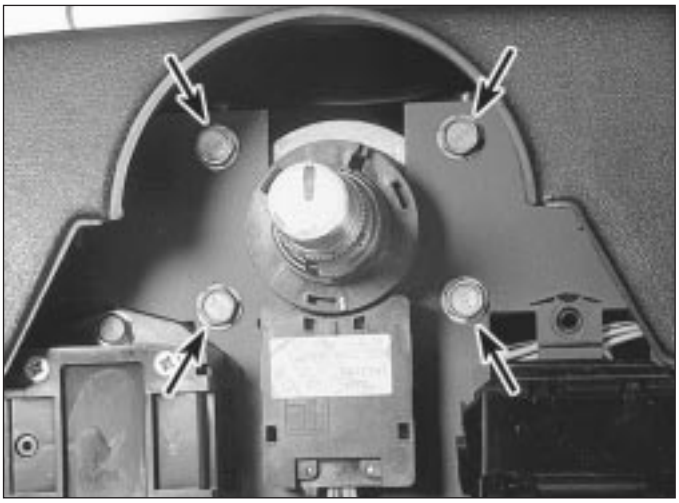
2 Remove the steering wheel (Chapter 10).

3 Remove the lower steering column cover (see Chapter 11).

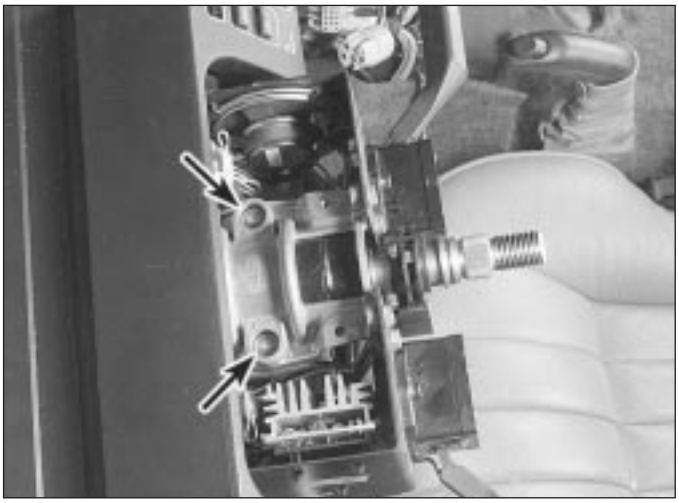
4 Remove the switch retaining screw(s) **(see illustration)**.



8.4 Remove the switch retaining screws, disconnect the electrical connectors and pull the switches outward (arrowed)



9.4 Remove the switch mounting plate screws (arrowed). Lower the mounting plate and switch assembly to access the ignition switch/key lock cylinder



9.5 To remove the ignition switch/lock cylinder assembly, drill out the centre of the two retaining bolts (arrowed) and remove them with a screw extractor

5 Disconnect the electrical connectors from underneath the steering column and remove the switch or switches from the vehicle.
6 Refitting is the reverse of removal.

9 Ignition switch and key lock cylinder - removal and refitting

Warning: Later models are equipped with airbags. To prevent accidental deployment of the airbag, which could cause personal injury or damage to the airbag system, DO NOT work in the vicinity of the steering column or instrument panel. The manufacturer recommends that, on airbag equipped models, the following procedure be performed at a dealer service department or other properly equipped repair facility because of the special tools and techniques required to disable the airbag system.
Caution: If the stereo in your vehicle is equipped with an anti-theft system, make sure you have the correct activation code before disconnecting the battery.

1 Disconnect the negative battery cable.
2 Remove the steering wheel (Chapter 10).
3 Remove the steering column trim covers (see Chapter 11).
4 Remove the steering column switch mounting plate screws **(see illustration)**.
5 Remove the shear-head bolts retaining the ignition switch/lock cylinder assembly and separate the bracket halves from the steering column. This can be accomplished by drilling out the centre of the screws and using a screw extractor to remove them **(see illustration)**.
6 Place the new switch assembly in position, refit the new shear-head bolts and tighten them until the heads snap off.
7 The remainder of the refitting is the reverse of removal.

10 Instrument panel switches - removal and refitting

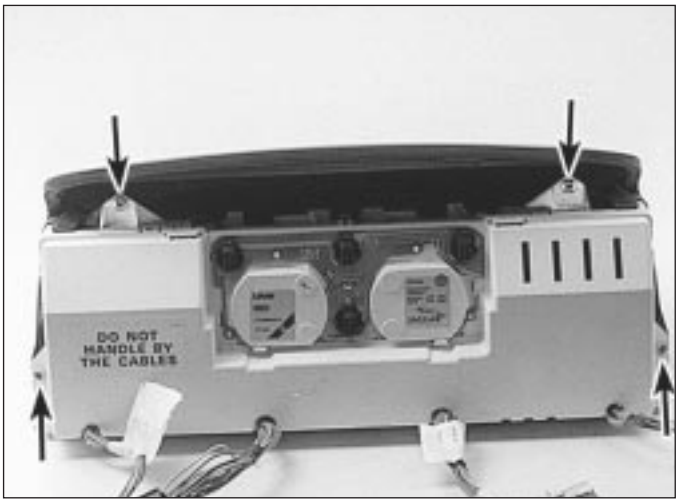
Warning: Later models are equipped with airbags. To prevent accidental deployment of the airbag, which could cause personal injury or damage to the airbag system, DO NOT work in the vicinity of the steering column or instrument panel. The manufacturer recommends that, on airbag equipped models, the following procedure be performed at a dealer service department or other properly equipped repair facility because of the special tools and techniques required to disable the airbag system.
Caution: If the stereo in your vehicle is equipped with an anti-theft system, make sure you have the correct activation code before disconnecting the battery.

1 Remove the lower trim cover(s) **(see illustration)**.
2 To remove the vehicle condition monitor (VCM) switch assembly, simply depress the switch retaining clip and lower the switch assembly from the instrument panel **(see illustration)**.
3 To remove the headlight switch assembly, detach the switch knob and remove the hex nut securing the switch to the instrument panel **(see illustration)**. Depress the retaining clip securing the switch, disconnect the electrical connectors and remove the switch assembly from the instrument panel.
4 Refitting is the reverse of removal.

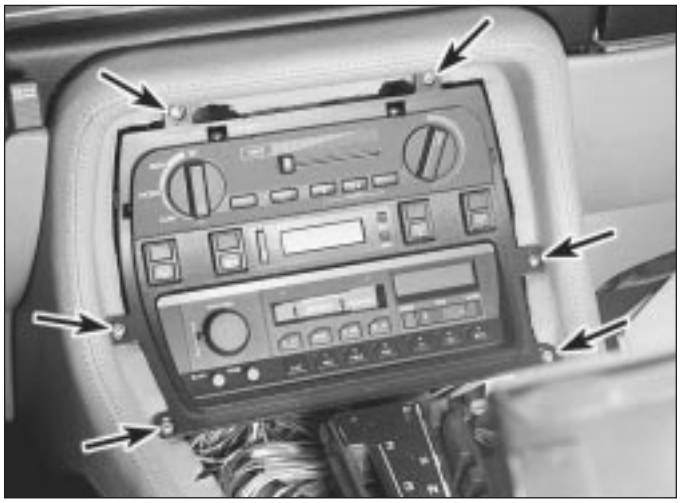
10.1 Remove the lower trim cover(s) from the instrument panel switch assembly

10.2 Depress the clip on the front, lower the switch assembly from the instrument panel and unplug the connectors

10.3 Detach the headlight switch knob, then remove the hex nut securing the switch to the instrument panel (arrowed)



12.3 Remove the instrument cluster retaining screws (arrowed) then separate the instrument cluster from the cluster housing



13.3 Remove the retaining screws (arrowed) and pull the radio/control panel out enough to unplug the connectors

11 Fuel, oil and temperature gauges - check

Warning: Later models are equipped with airbags. To prevent accidental deployment of the airbag, which could cause personal injury or damage to the airbag system, DO NOT work in the vicinity of the steering column or instrument panel. The manufacturer recommends that, on airbag equipped models, the following procedure be performed at a dealer service department or other properly equipped repair facility because of the special tools and techniques required to disable the airbag system.

1 All tests below require the ignition switch to be turned to ON position when testing.

2 Check the fuse if the gauge pointer does not move from the empty, low or cold positions. If the fuse is OK, locate the particular sender unit for the circuit you're working on (see Chapter 4 for fuel sender unit location, Chapter 2 for oil sender unit location, or Chapter 3 for temperature sender unit location). Connect the sender unit connector to earth If the pointer goes to the full, high or hot position renew the sender unit. If the pointer stays in same position use a jumper wire to earth the terminal on the back of the gauge. If the pointer moves with the back of the gauge earthed the problem lies in the wire between the gauge and the sender unit. If the pointer does not moves with the back of the gauge earthed check for voltage at the other terminal of the gauge. If voltage is present renew the gauge.

12 Instrument cluster - removal and refitting

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Caution: If the stereo in your vehicle is equipped with an anti-theft system, make sure you have the correct activation code before disconnecting the battery.

1 Disconnect the negative battery cable.

2 Remove the instrument cluster housing (see Chapter 11).

3 Remove the instrument cluster mounting screws **(see illustration)**. Separate the instrument cluster from the cluster housing.

4 Refitting is the reverse of removal.

13 Radio and speakers - removal and refitting

Warning: Later models are equipped with airbags. To prevent accidental deployment of the airbag, which could cause personal injury or damage to the airbag system, DO NOT work in the vicinity of the steering column or instrument panel. The manufacturer recommends that, on airbag equipped models, the following procedure be performed at a dealer service department or other properly equipped repair facility because of the special tools and techniques required to disable the airbag system.

Caution: If the stereo in your vehicle is equipped with an anti-theft system, make sure you have the correct activation code before disconnecting the battery.

1 Disconnect the negative battery cable.

Radio

2 Remove the radio trim bezel (Chapter 11).

3 Remove the retaining screws **(see illustration)**, pull the radio/control panel outward to access the backside and disconnect the electrical connectors and aerial lead. Detach the retaining clips and separate the radio from the control panel.

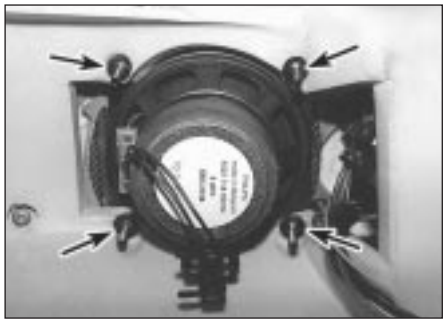
4 Refitting is the reverse of removal.

Speakers

5 Remove the door trim panel (Chapter 11).

6 Remove the nuts from the speaker mounting studs **(see illustration)**. Disconnect the electrical connector and remove the speaker from the vehicle.

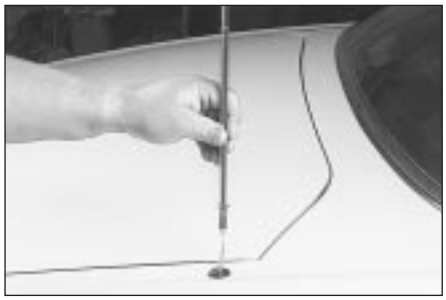
7 Refitting is the reverse of removal.



13.6 Remove the nuts from the retaining studs (arrowed) to remove the speaker

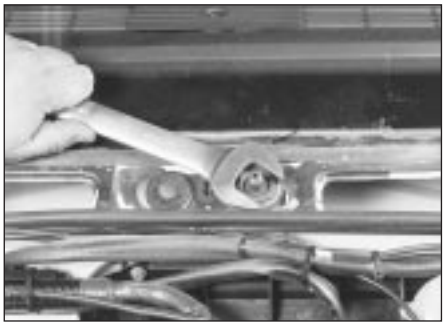
14.1 The aerial mast retaining nut can be removed with an open end spanner

14.3 Remove the retaining bolts (arrowed), pull the aerial assembly out and unplug the electrical connectors and aerial lead

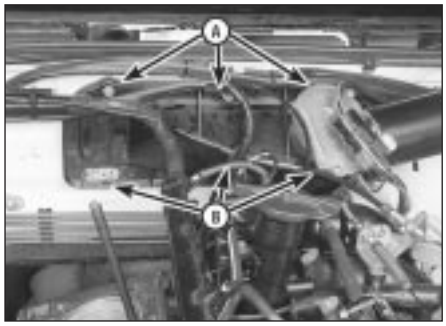


14.6 With the ignition key and the radio in the ON position, guide the aerial mast out of the motor assembly - note the direction of the "teeth" on the aerial cable

15.1 Lift up the wiper arm nut cover, remove the nut and pull the wiper arm straight off the shaft



15.3 Use a spanner or socket to remove the drive spindle retaining nut



15.4 Remove the bolts (A) along the top edge of the housing and detach the clips (B) along the bottom edge

14 Electric aerial - removal and refitting

Aerial motor assembly

1 Remove the aerial mast retaining nut **(see illustration)**.
2 Working in the boot, pry out the plastic clips securing the driver's side boot finishing panels to allow access to the aerial motor assembly.
3 Detach the motor assembly retaining bolts **(see illustration)**. Disconnect the electrical connector and earth strap then remove the aerial motor assembly from the vehicle.
4 Refitting is the reverse of removal.

Aerial mast

5 Remove the aerial mast retaining nut **(see illustration 14.1)**.
6 With an assistant controlling the ignition switch, turn the ignition key and the radio to the ON position. Guide the aerial mast out of the body as the cable unwinds from the motor assembly **(see illustration)**. Note the direction the "teeth" on the aerial cable are facing for refitting purposes.
7 To refit the aerial mast, insert the aerial cable into the motor assembly with the cable teeth facing the direction as noted above. Have your assistant turn the ignition key and the radio to the ON position. Guide the cable and aerial mast through the opening as the cable winds back into the motor assembly.
8 Refit the aerial mast retaining nut.

15 Windscreen wiper motor - removal and refitting

1 Pull the wiper arm nut cover back to access the wiper arm nuts. Remove the nuts and pull the wiper arm straight off the shaft **(see illustration)**.
2 Remove the screws and detach the cowl cover (see Chapter 11).
3 Remove the drive spindle nut **(see illustration)**.
4 Remove the retaining bolts located along the top edge of the wiper motor housing and detach three retaining clips along the bottom edge of the wiper motor housing **(see illustration)**.
5 Disconnect the electrical connector and remove the motor assembly from the vehicle.
6 Refitting is the reverse of removal.

16 Heated rear window - check and repair

1 The heated rear window consists of a number of horizontal elements baked onto the glass surface.
2 Small breaks in the element can be repaired without removing the rear window.

Check

3 Turn the ignition switch and heated rear window switches to the ON position.
4 When measuring voltage during the next two tests, wrap a piece of aluminium foil around the tip of the voltmeter negative probe and press the foil against the heating element with your finger **(see illustration)**. Place the voltmeter positive lead against the heated window positive terminal.
5 Check the voltage at the centre of each heating element **(see illustration)**.

16.4 When measuring the voltage at the heated rear window grid, wrap a piece of aluminium foil around the negative probe of the voltmeter and press the foil against the element with your finger

16.5 To determine if a heating element has broken, check the voltage at the centre of each element. If the voltage is 6-volts, the element is unbroken; if the voltage is 12-volts, the element is broken between the centre and the positive end. If there is no voltage, the element is broken between the centre and earth

16.7 To find the break, place the voltmeter positive lead against the heated window positive terminal, place the voltmeter negative lead with the foil strip against the heating element at the positive terminal end and slide it toward the negative terminal end - the point at which the voltmeter reading changes abruptly is the point at which the element is broken

6 If the voltage is 6 volts, the element is okay (there is no break). If the voltage is 12 volts, the element is broken between the centre of the element and the positive end. If the voltage is 0 volts the element is broken between the centre of the element and earth.
7 To find the break, place the voltmeter positive lead against the defogger positive terminal. Place the voltmeter negative lead with the foil strip against the heating element at the positive terminal end and slide it toward the negative terminal end. The point at which the voltmeter deflects from zero to several volts is the point at which the heating element is broken **(see illustration)**.

Repair

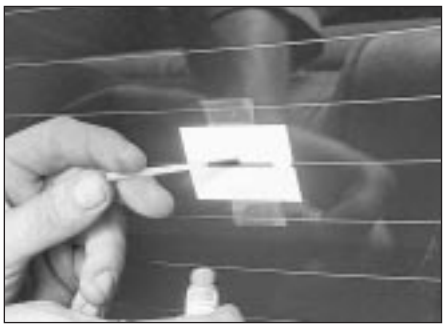
8 Repair the break in the element using a repair kit specifically recommended for this purpose.
9 Prior to repairing a break, turn off the system and allow it to cool off for a few minutes.
10 Lightly buff the element area with fine steel wool, then clean it thoroughly with rubbing alcohol.
11 Use masking tape to mask off the area being repaired.
12 Thoroughly mix the epoxy, following the instructions provided with the repair kit.
13 Apply the epoxy material to the slit in the masking tape, overlapping the undamaged area about 3/4-inch on either end **(see illustration)**.
14 Allow the repair to cure for 24 hours before removing the tape and using the system.

17 Headlights - renewal

Warning: Later models are equipped with halogen gas-filled headlight bulbs which are under pressure and may shatter if the surface is damaged or the bulb is dropped. Wear eye protection and handle the bulbs carefully, grasping only the base whenever possible. Do not touch the surface of the bulb with your fingers because the oil from your skin could cause it to overheat and fail prematurely. If you do touch the bulb surface, clean it with rubbing alcohol.

Sealed beam units

1 Remove the radiator grille (see Chapter 11).
2 Detach the headlight bezel trim cover **(see illustration)**.
3 Remove the headlight bezel **(see illustrations)**.
4 Remove the screws which secure the retaining ring and withdraw the ring. Support the light as this is done **(see illustration)**.

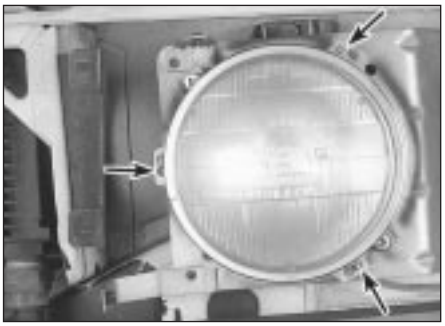


16.13 Apply masking tape to the inside of the window at the damaged area, then brush on the special conductive coating

17.2 Remove the screws (arrowed) and detach the headlight bezel trim cover

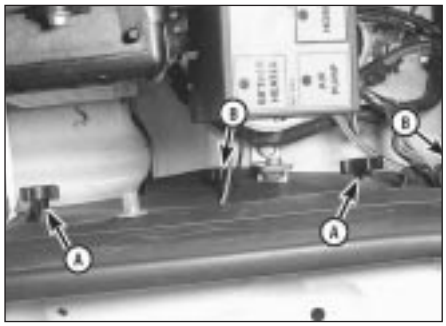
17.3a Remove the two retaining screws at the top and the one in the grille opening (arrowed)

17.3b The retaining screw at the outside lower corner can be accessed from under the bumper



17.4 Loosen the retaining ring screws (arrowed) a few turns - rotate the retaining ring anti-clockwise to remove it

17.9 Disconnect the electrical connector and rotate the bulb assembly 1/4-turn anti-clockwise



18.2 The headlight horizontal adjustment knob (A) is located at the top of the headlight and the vertical adjustment knob (B) is below the headlight

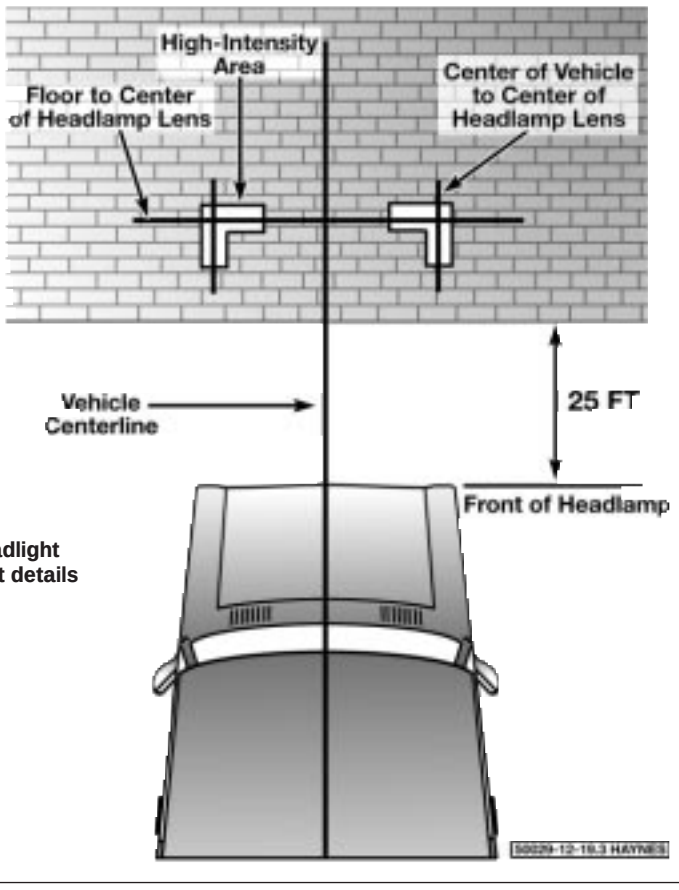
5 Pull the headlight out slightly and disconnect the electrical connector from the rear of the light, then remove the light from the vehicle.
6 To refit, position the new unit close enough to connect the electrical connector. Make sure that the numbers moulded into the lens are at the top.
7 Refit and tighten the retaining ring. Test the headlight operation.
8 The remainder of the refitting is the reverse of removal.

Halogen gas-filled bulbs

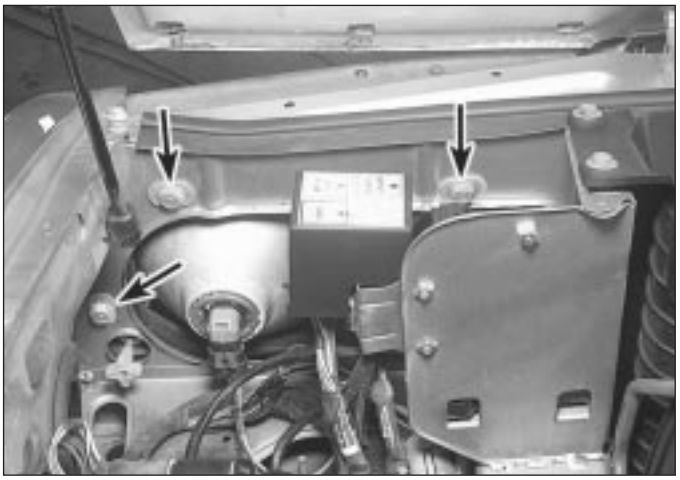
9 Disconnect the electrical connector from the bulb assembly. Rotate the headlight bulb connector 1/4-turn anti-clockwise (viewed from the rear) **(see illustration)**.
10 Withdraw the bulb assembly from the headlight housing.
11 Without touching the glass with your bare fingers (see the **Warning** at the start of the Section), insert the new bulb assembly into the headlight housing and rotate the bulb socket 1/4-turn clockwise to refit it.
12 Plug in the electrical connector and test headlight operation.

18 Headlights - adjustment

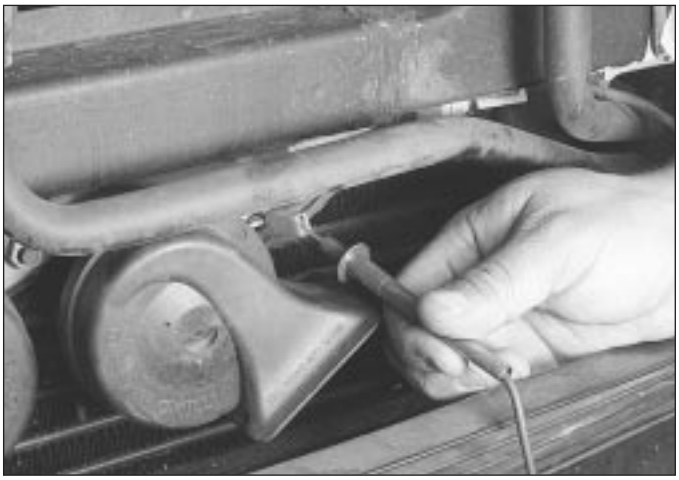
Note: *The following procedure is intended for emergency use only, and we strongly recommend that the headlight aim is only checked using optical beam-setting equipment. It is important that the headlights are aimed correctly. If adjusted incorrectly they could blind the driver of an oncoming vehicle and cause a serious accident or seriously reduce your ability to see the road. The headlights should be checked for proper aim every 12 months and any time a new headlight is installed or front end body work is performed.*
1 Adjustment should be made with the vehicle sitting level, the petrol tank half-full and no unusually heavy load in the vehicle.
2 Early models with sealed beam headlights have four adjusting knobs protruding through the backside of the radiator support. The vertical (up and down) adjustment knobs are located above the headlight and the horizontal (left to right) adjusting knobs are located below the headlight **(see illustration)**.
3 On later models with halogen bulbs, adjustments are made in the same manner as described in the previous step, except there are only two adjusting knobs which tilt the headlight housing to the desired angle.
4 If the headlight housing has been replaced or the vehicle has suffered front-end damage, refer to following procedure.
5 This method requires a blank wall, masking tape and a level floor.
6 Position masking tape vertically on the wall in reference to the vehicle centreline and the centrelines of both headlights **(see illustration)**.
7 Position a horizontal tape line in reference to the centreline of all the headlights. **Note:** *It may be easier to position the tape on the wall with the vehicle parked only a few inches away.*



18.6 Headlight adjustment details



19.2 Remove the headlight housing retaining nuts (arrowed) from the backside of the radiator support



20.3 Check for power at the horn terminal with the horn button depressed

8 Adjustment should be made with the vehicle parked 25 feet from the wall, sitting level, the petrol tank half-full and no unusually heavy load in the vehicle.

9 Starting with the low beam adjustment, position the high intensity zone so it is two inches below the horizontal line and two inches to the right of the headlight vertical line. Adjustments are made by turning the knobs located behind the headlight housings **(see illustration 18.2)**.

10 With the high beams on, the high intensity zone should be vertically centred with the exact centre just below the horizontal line. **Note:** *It may not be possible to position the headlight aim exactly for both high and low beams. If a compromise must be made, keep in mind that the low beams are the most used and have the greatest effect on safety.*

11 Have the headlights adjusted by a dealer service department or service station at the earliest opportunity.

19 Headlight housing (1992 to 1994 models) - removal and refitting

Warning: These vehicles are equipped with halogen gas-filled headlight bulbs which are under pressure and may shatter if the surface is damaged or the bulb is dropped. Wear eye protection and handle the bulbs carefully, grasping only the base whenever possible. Do not touch the surface of the bulb with your fingers because the oil from your skin could cause it to overheat and fail prematurely. If you do touch the bulb surface, clean it with rubbing alcohol.

1 Remove the headlight bulb (Section 17).

2 Remove the retaining nuts, detach the housing and withdraw it from the vehicle **(see illustration)**.

3 Refitting is the reverse of removal.

20 Horn - check and renewal

Check

Note: *Check the fuses before beginning electrical diagnosis.*

1 Disconnect the electrical connector from the horn.

2 To test the horn, connect battery voltage to the two terminals with a pair of jumper wires. If the horn doesn't sound, renew it.

3 If the horn does sound, check for voltage at the terminal when the horn button is depressed **(see illustration)**. If there's voltage at the terminal, check for a bad earth at the horn.

4 If there's no voltage at the horn, check the relay (see Section 6). Note that most horn relays are either the four-terminal or externally earthed three-terminal type.

5 If the relay is OK, check for voltage to the relay power and control circuits. If either of the circuits are not receiving voltage, inspect the wiring between the relay and the fuse panel.

6 If both relay circuits are receiving voltage, depress the horn button and check the circuit from the relay to the horn button for continuity to earth. If there's no continuity, check the circuit for an open. If the circuit is good, renew the horn button.

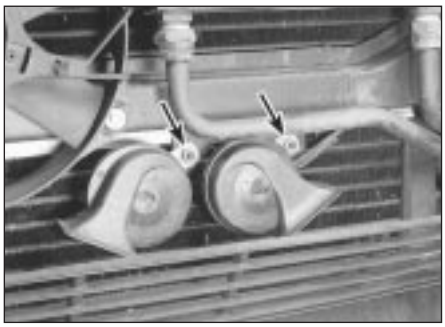
7 If there's continuity to earth through the horn button, check for an open or short in the circuit from the relay to the horn.

Renewal

8 Remove the radiator grille inserts (see Chapter 11).

9 Disconnect the electrical connector and remove the retaining nuts securing the horn brackets **(see illustration)**.

10 Refitting is the reverse of removal.



20.9 Disconnect the electrical connector, remove the retaining nuts (arrowed) - then detach the horn(s)

21 Bulb renewal

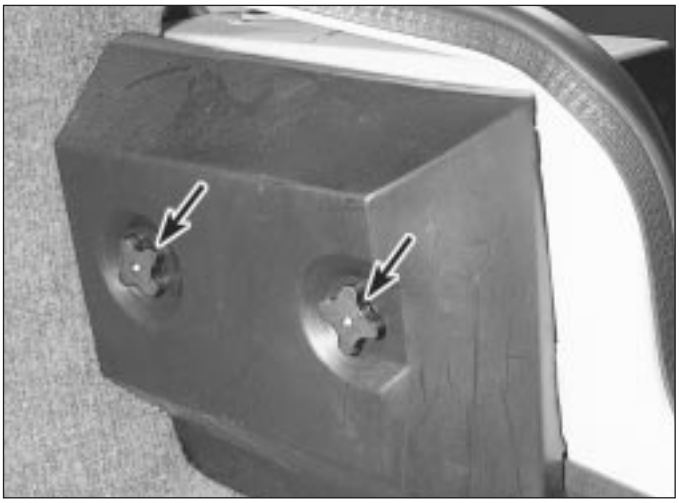
Front direction indicator/rear parking and side marker lights

1 Remove the lens retaining screws and the lens **(see illustration)**.

2 Push inward and rotate the bulb anti-clockwise to remove it from the holder.

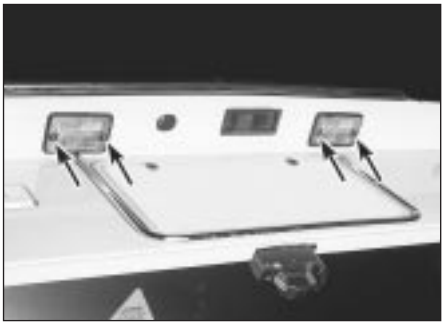
3 Renew the bulb, refit the lamp lens and test the bulb operation.

21.1 The front direction indicator/rear parking and side marker light bulbs are accessible after removing the lens screws



21.4 The Rear direction indicator, brake, tail and reversing light bulbs are accessible from the boot compartment after removing the plastic knobs (arrowed) securing the bulb housing covers

21.5 Remove the bulb cluster from the tail light housing - The bulb is removed by pushing in and turning the bulb anti-clockwise



21.6 Detach the lens retaining screws (arrowed) and the lens to access the number plate light bulbs

21.9 The interior light bulbs can be accessed after lowering the overhead console

21.10 To remove an instrument cluster bulb, depress the bulbholder and rotate it anti-clockwise

Rear direction indicator, brake, tail and reversing lights

4 Open the boot and remove the plastic knobs securing the tail light housing trim cover **(see illustration)**.

5 Remove two more plastic knobs and detach the tail light bulb cluster from the rear tail light housing. The defective bulb can then be pulled out of the socket and replaced **(see illustration)**.

Number plate light

6 Remove the lens retaining screws **(see illustration)**.

7 Detach the lens and renew the defective bulb.

High-mounted brake light

8 The brake light cover is retained by screws. Remove the cover and renew the bulb.

Interior lights

9 Remove the overhead console (Chapter 11). Detach the bulb from the retaining clips and renew the bulb **(see illustration)**.

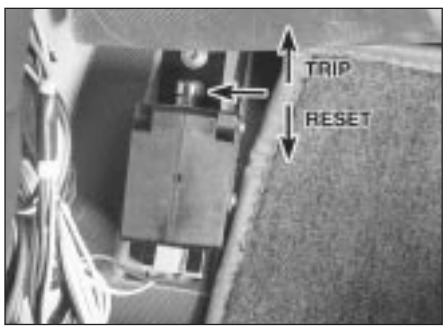
Instrument cluster illumination

10 To gain access to the instrument cluster illumination lights, the instrument cluster housing will have to be removed (Chapter 11). The bulbs can then be removed and replaced from the rear of the cluster **(see illustration)**.

22 Inertia switch - description and check

1 The inertia switch is a safety mechanism which governs various electrical circuits such as the central locking, electric window and ignition circuits. In the event of a crash, the inertia switch will automatically unlock the doors, shut off power to all ignition circuits, and lock the boot lid and the fuel filler cap.

2 To test the inertia switch, turn the ignition key to the ON position, then lock the driver and passenger side doors and unlock the boot lid. Then simply pull upward on the trip/reset button located on top of the inertia switch. All ignition circuits should shut off, the doors should unlock and the boot lid should lock. To reset the inertia switch, simply push downward on the trip/reset button **(see illustration)**.



22.2 The inertia switch is located behind the passengers side kick panel - pull upward on the button to trip the switch - push downward on the button to reset the switch

23 Cruise control system - description and check

1 The cruise control system maintains vehicle speed with an independently operated vacuum motor located on the passenger's side inner wing in the engine compartment. When the cruise control switch is turned on, a vacuum actuator (connected the throttle linkage) is activated by vacuum from the vacuum motor. The system consists of the vacuum motor, vacuum actuator, brake switch, control switches, a relay and associated vacuum hoses. Some features of the system require special testers and diagnostic procedures which are beyond the scope of this manual. Listed below are some general procedures that may be used to locate common problems.
2 Locate and check the fuse (see Section 3).
3 Have an assistant operate the brake lights while you check their operation (voltage from the brake light switch deactivates the cruise control).
4 If the brake lights don't come on or don't shut off, correct the problem and re-test the cruise control.
5 Visually inspect the vacuum hose connected to the vacuum motor and vacuum actuator. Check the freeplay between the vacuum actuator stop and the throttle link slot **(see illustration)**.
6 Test drive the vehicle to determine if the cruise control is now working. If it isn't, take it to a dealer service department or an automotive electrical specialist for further diagnosis and repair.

24 Electric window system - description and check

1 The electric window system operates electric motors, mounted in the doors, which lower and raise the windows. The system consists of the control switches, relays, the motors, regulators, glass mechanisms and associated wiring.
2 The electric windows can be lowered and raised from the master control switch by the driver or by remote switches located at the individual windows. Each window has a separate motor which is reversible. The position of the control switch determines the polarity and therefore the direction of operation.
3 The circuit is protected by a fuse. Each motor is also equipped with an internal circuit breaker, this prevents one stuck window from disabling the whole system.
4 The electric window system will only operate when the ignition switch is ON. In addition, many models have a window lockout switch at the master control switch which, when activated, disables the switches at the rear windows and, sometimes, the switch at the passenger's window also. Always check these items before diagnosing a window problem.
5 These procedures are general in nature, so if you can't find the problem using them, take the vehicle to a dealer service department or other properly equipped repair facility.
6 If the electric windows won't operate, always check the fuse first.
7 If only the rear windows are inoperative, or if the windows only operate from the master control switch, check the rear window lockout switch for continuity in the unlocked position. Renew it if it doesn't have continuity.
8 Check the wiring between the switches and fuse panel for continuity. Repair the wiring, if necessary.
9 If only one window is inoperative from the master control switch, try the other control switch at the window. **Note:** *This doesn't apply to the driver's door window.*
10 If the same window works from one switch, but not the other, check the switch for continuity.
11 If the switch tests OK, check for a short or open in the circuit between the affected switch and the window motor.
12 If one window is inoperative from both switches, remove the trim panel from the affected door and check for voltage at the switch and at the motor while the switch is operated **(see illustration)**.
13 If voltage is reaching the motor, disconnect the glass from the regulator (see Chapter 11). Move the window up and down by hand while checking for binding and damage. Also check for binding and damage to the regulator. If the regulator is not damaged and the window moves up and down smoothly, renew the motor. If there's binding or damage, lubricate, repair or renew parts, as necessary.
14 If voltage isn't reaching the motor, check the wiring in the circuit for continuity between the switches and motors. You'll need to consult the wiring diagram for the vehicle. If the circuit is equipped with a relay, check that the relay is earthed properly and receiving voltage.
15 Test the windows after you are done to confirm proper repairs.

25 Central locking system - description and check

The central locking system operates the door lock actuators mounted in each door. The system consists of the switches, relays,

23.5 Check the cruise control throttle linkage for binding

24.12 If no voltage is present at the motor with the switch depressed, check for voltage at the switch

actuators, a control unit and associated wiring. Diagnosis can usually be limited to simple checks of the wiring connections and actuators for minor faults which can be easily repaired. Since this system uses an electronic control unit, in-depth diagnosis should be left to a dealership service department.

Central locking systems are operated by bi-directional solenoids located in the doors. The lock switches have two operating positions; Lock and Unlock. When activated, the switch sends a signal to the door lock control unit to lock or unlock the doors. Depending on which way the switch is activated, the control unit reverses polarity to the solenoids, allowing the two sides of the circuit to be used alternately as the feed (positive) and earth side.

Some vehicles may have an anti-theft system incorporated into the locks. If you are unable to locate the trouble using the following general paragraphs, consult a dealer service department or other properly equipped repair facility.

1 Always check the circuit protection first. Some vehicles use a combination of circuit breakers and fuses.

2 Operate the door lock switches in both directions (Lock and Unlock) with the engine off. Listen for the click of the solenoids operating.

3 Test the switches for continuity. Renew the switch if there's not continuity in both switch positions.

4 Check the wiring between the switches, control unit and solenoids for continuity. Repair the wiring if there's no continuity.

5 Check for a bad earth at the switches or the control unit.

6 If all but one lock solenoid operates, remove the trim panel from the affected door (see Chapter 11) and check for voltage at the solenoid while the lock switch is operated **(see illustration)**. One of the wires should have voltage in the Lock position; the other should have voltage in the Unlock position.

7 If the inoperative solenoid is receiving voltage, renew the solenoid.

8 If the inoperative solenoid isn't receiving voltage, check for an open or short in the wire between the lock solenoid and the control unit. **Note:** *It's common for wires to break in the portion of the harness between the body and door (opening and closing the door fatigues and eventually breaks the wires).*

25.6 Check for voltage at the lock solenoid while the lock switch is operated

26 Electric mirrors - description and check

1 Most electric mirrors use two motors to move the glass; one for up and down adjustments and one for left-right adjustments.

2 The control switch has a selector portion which sends voltage to the left or right side mirror. With the ignition ON but the engine OFF, roll down the windows and operate the mirror control switch through all functions (left-right and up-down) for both the left and right side mirrors.

3 Listen carefully for the sound of the electric motors running in the mirrors.

4 If the motors can be heard but the mirror glass doesn't move, there's probably a problem with the drive mechanism inside the mirror. Remove and dismantle the mirror to locate the problem.

5 If the mirrors don't operate and no sound comes from the mirrors, check the fuse (see Chapter 1).

6 If the fuse is OK, remove the mirror control switch from its mounting without disconnecting the wires attached to it. Turn the ignition ON and check for voltage at the switch. There should be voltage at one terminal. If there's no voltage at the switch, check for an open or short in the circuit between the fuse panel and the switch.

7 If there's voltage at the switch, disconnect it. Check the switch for continuity in all its operating positions. If the switch does not have continuity, renew it.

8 Re-connect the switch. Locate the wire going from the switch to earth. Leaving the switch connected, connect a jumper wire between this wire and earth. If the mirror works normally with this wire in place, repair the faulty earth connection.

9 If the mirror still doesn't work, remove the mirror and check the wires at the mirror for voltage. Check with ignition ON and the mirror selector switch on the appropriate side. Operate the mirror switch in all its positions. There should be voltage at one of the switch-to-mirror wires in each switch position (except the neutral "off" position).

10 If there's not voltage in each switch position, check the circuit between the mirror and control switch for opens and shorts.

11 If there's voltage, remove the mirror and test it off the vehicle with jumper wires. Renew the mirror if it fails this test.

27 Electric sunroof - description and check

1 The electric sunroof is powered by a single motor in the roof behind the overhead console. The power circuit is protected by a fuse.

2 The control switches (tilt and slide) send an earth signal to the sunroof motor when the switches are pressed. Power is supplied to the motor from the relay. With the ignition ON but the engine OFF, operate the sunroof control switch through the tilt and slide functions.

3 Listen carefully for the sound of the sunroof motor running in the roof.

4 If the motors can be heard but the sunroof glass doesn't move, there's probably a problem with the drive mechanism or drive cables.

5 If the sunroof does not operate and no sound comes from the motor, check the fuse (see Chapter 1).

6 If the fuse is OK, remove the control switches (see Chapter 11). Disconnect the wires attached to it. Turn the ignition ON and check for voltage at the switch. If there's no voltage at the switch, check for power and earth at the motor. If power and earth exist at the motor and there's still no voltage at the switch renew the motor. If there's no voltage at the motor, check the relay or an open or short in the wiring between the relay and the motor.

7 If there's voltage at the switch, disconnect it. Check the switch for continuity in all its operating positions. If the switch does not have continuity, renew it.

8 If the switch has continuity re-connect the switch. Locate the wire going from the switch to earth. Leaving the switch connected, connect a jumper wire between this wire and earth. If the motor works normally with this wire in place, repair the faulty earth connection.

9 The sunroof can be closed manually by inserting the T-handle spanner which is located inside the overhead console. Insert the spanner into the motor drive shaft and rotate the shaft clockwise **(see illustration)**.

28 Airbag system - general information

Warning: Failure to follow these precautions could result in accidental deployment of the airbag and personal injury.

27.9 To close the sunroof manually, insert the T-handle spanner in the motor shaft and rotate it clockwise

Later models are equipped with a Supplemental Restraint System (SRS), more commonly known as an airbag. This system is designed to protect the driver, and on 1994 models, the passenger from serious injury in the event of a head-on or frontal collision. It consists of an airbag module in the centre of the steering wheel and a passenger airbag module on the right side of the dash above the glove box on 1994 models.

The airbag modules contain an inflater and a sensor assembly which activates from impact energy that is transmitted through the body and steering column upon impact or collision.

DO NOT try to dismantle or remove any component in the vicinity of the steering column or instrument panel on models equipped with air bags. Serious personal injury or damage may result. The manufacturer recommends that, on airbag equipped models, service which requires removal of any component in the vicinity of the instrument panel or steering column should be left to a dealer service department or other properly equipped repair facility because of the special tools and techniques required to disable the air bag system.

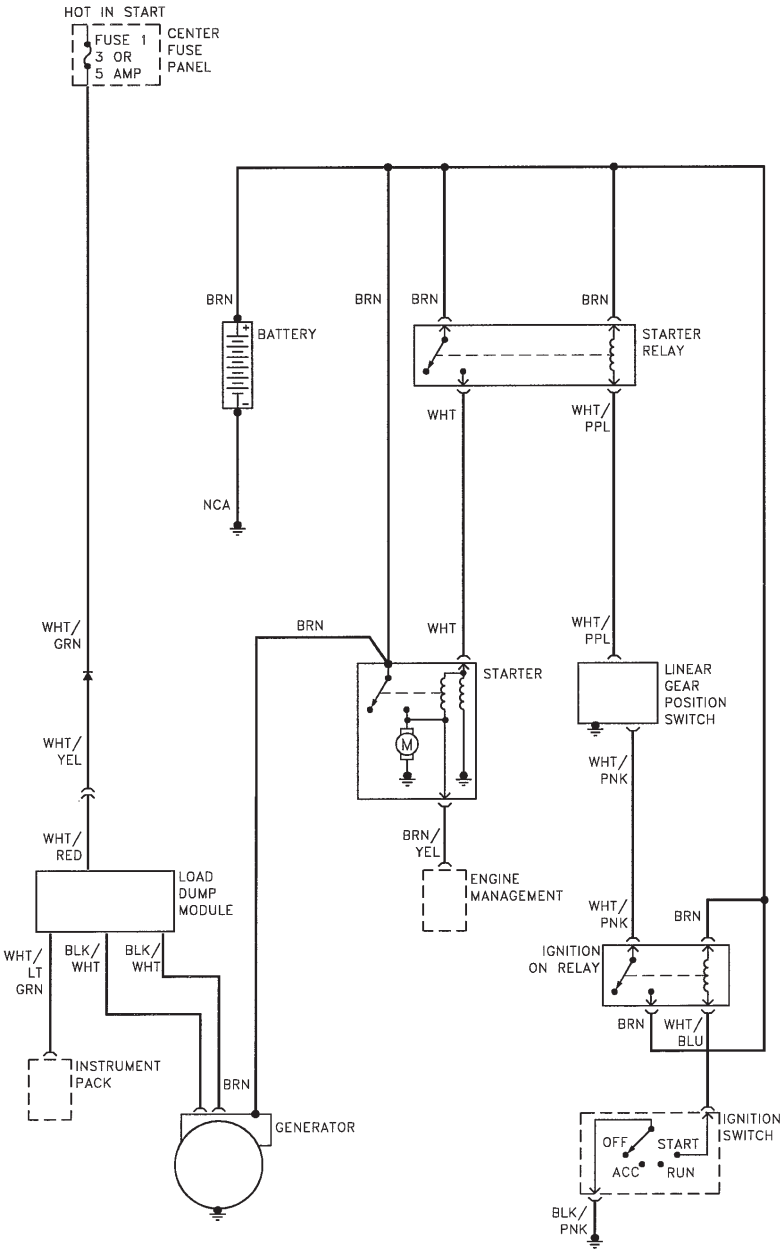
29 Wiring diagrams - general information

Since it isn't possible to include a complete wiring diagram for every year covered by this manual, the following diagrams are those that are typical and most commonly needed.

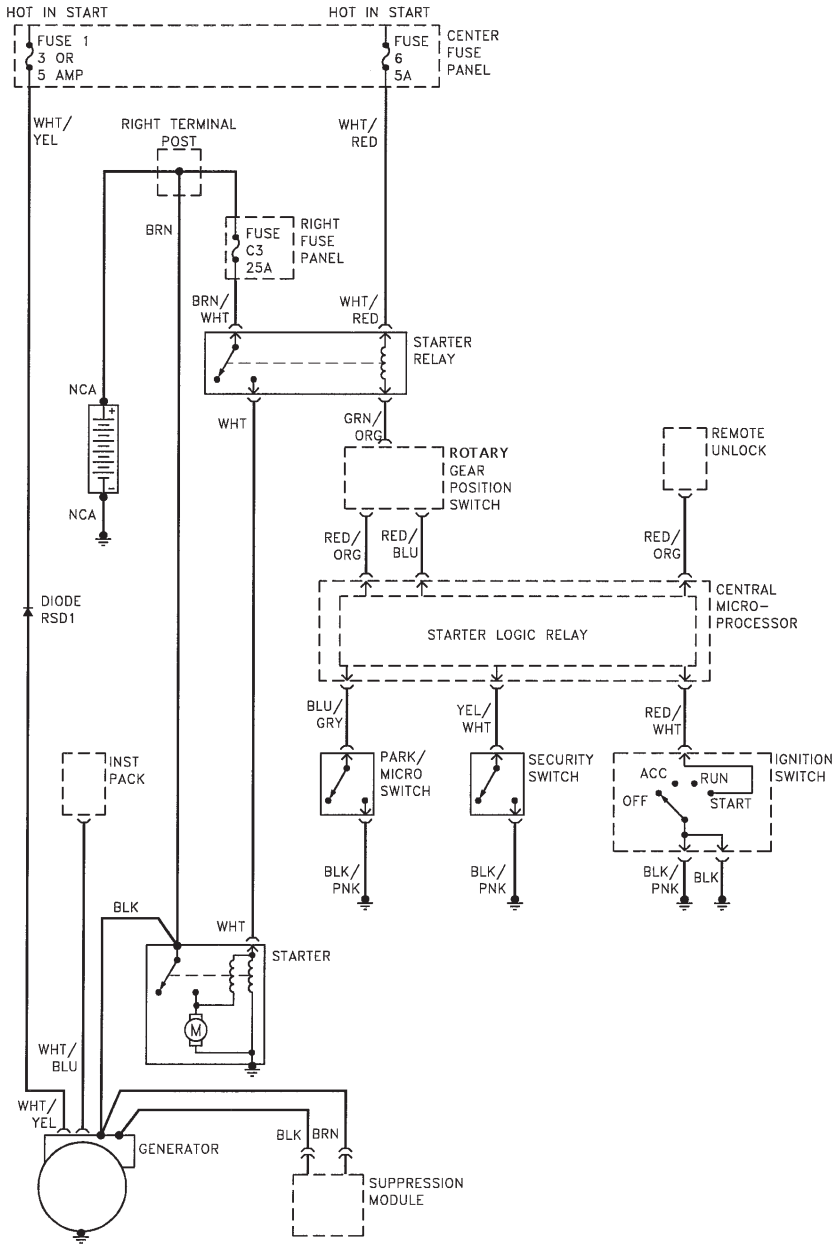
Prior to diagnosing any circuits, check the fuse and circuit breakers (if equipped) to make sure they are in good condition. Make sure the battery is properly charged and has clean, tight cable connections (see Chapter 1).

When checking the wiring system, make sure that all electrical connectors are clean, with no broken or loose pins. When unplugging an electrical connector, do not pull on the wires, only on the connector housings themselves.

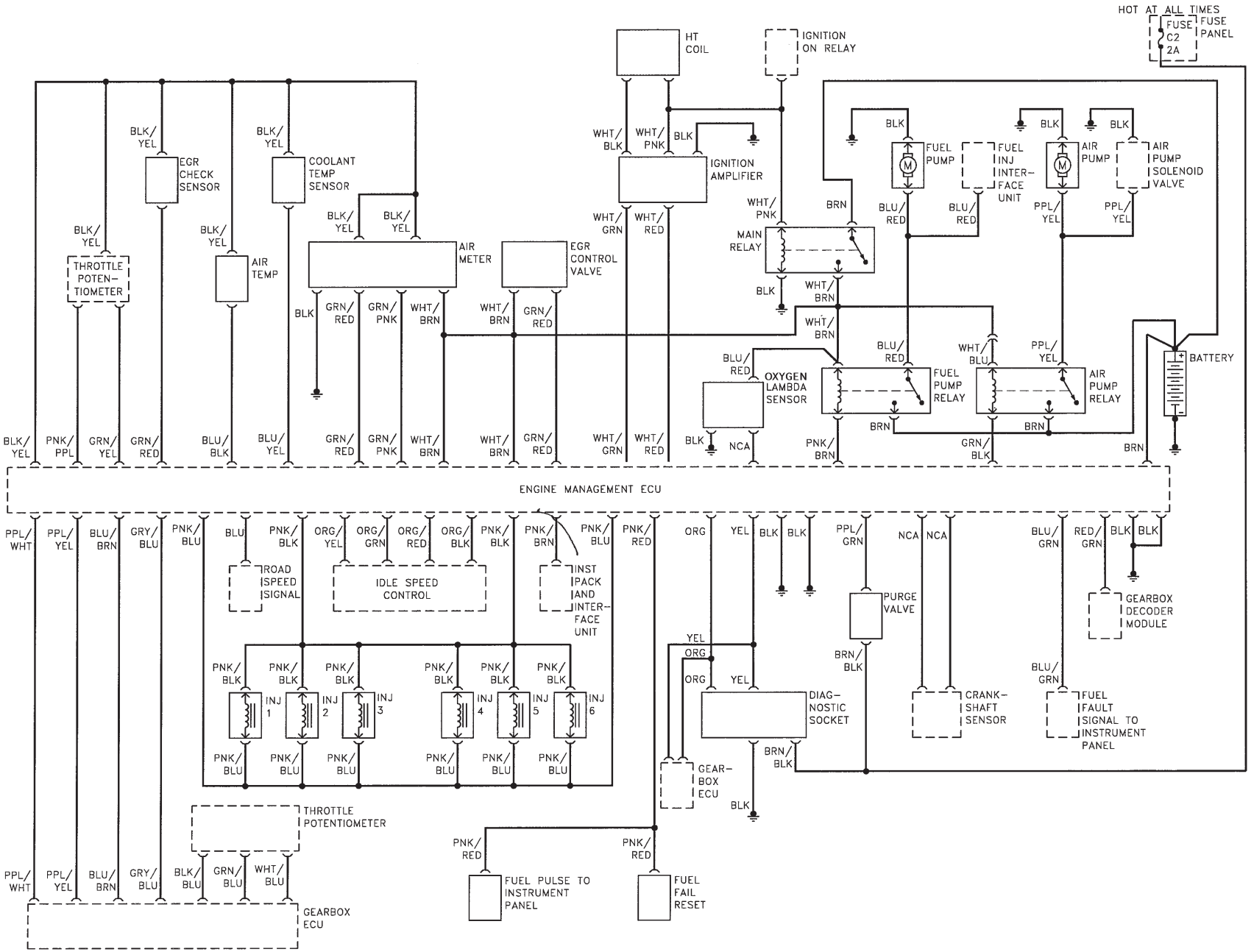
Wiring diagrams commence overleaf



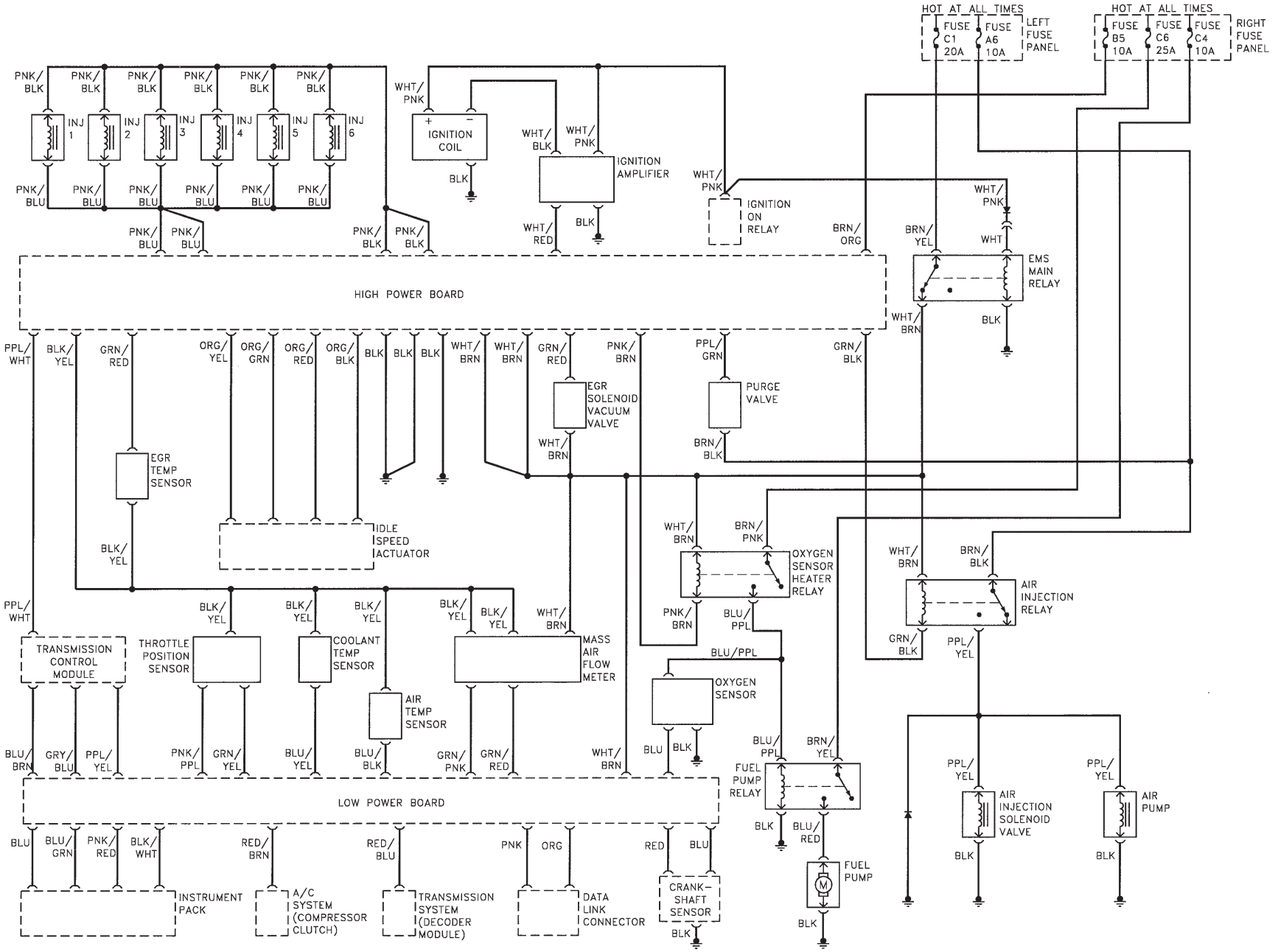
Typical 1988 to 1992 starting and charging system



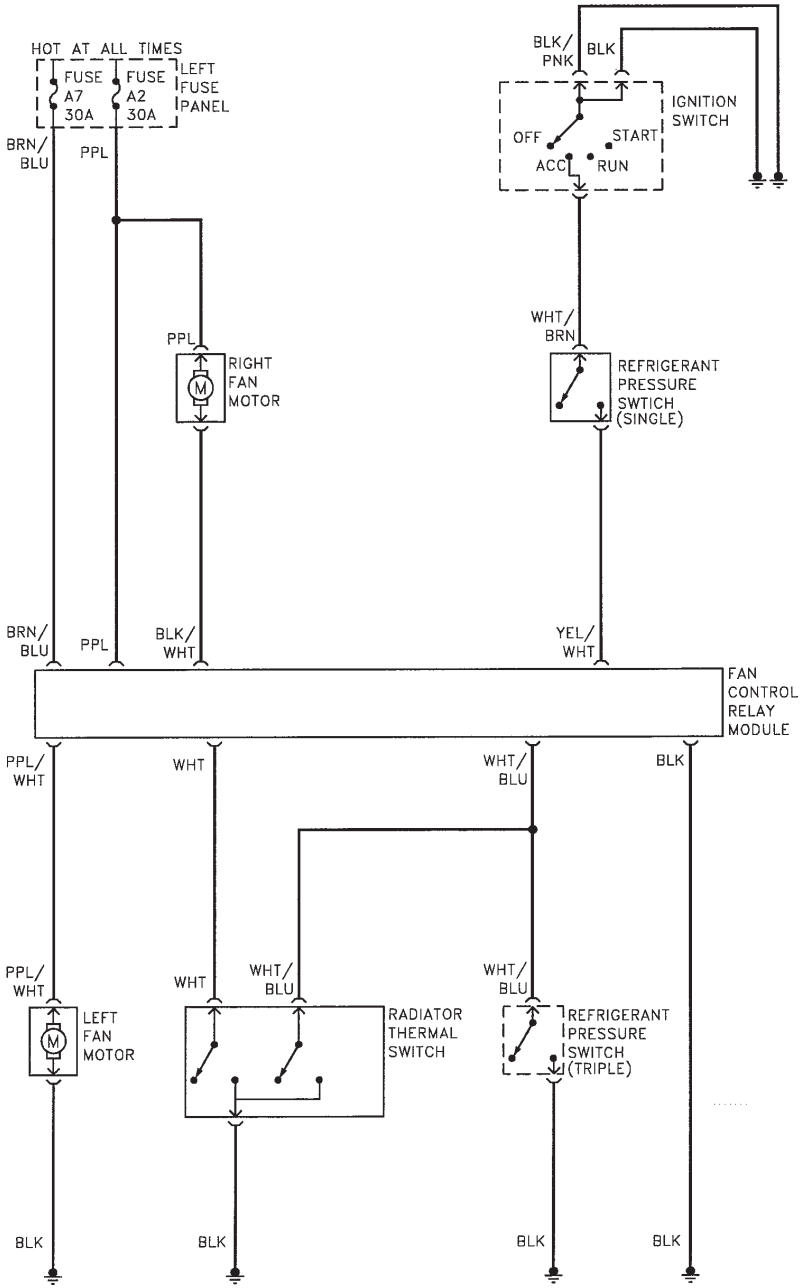
Typical 1993 and 1994 starting and charging system



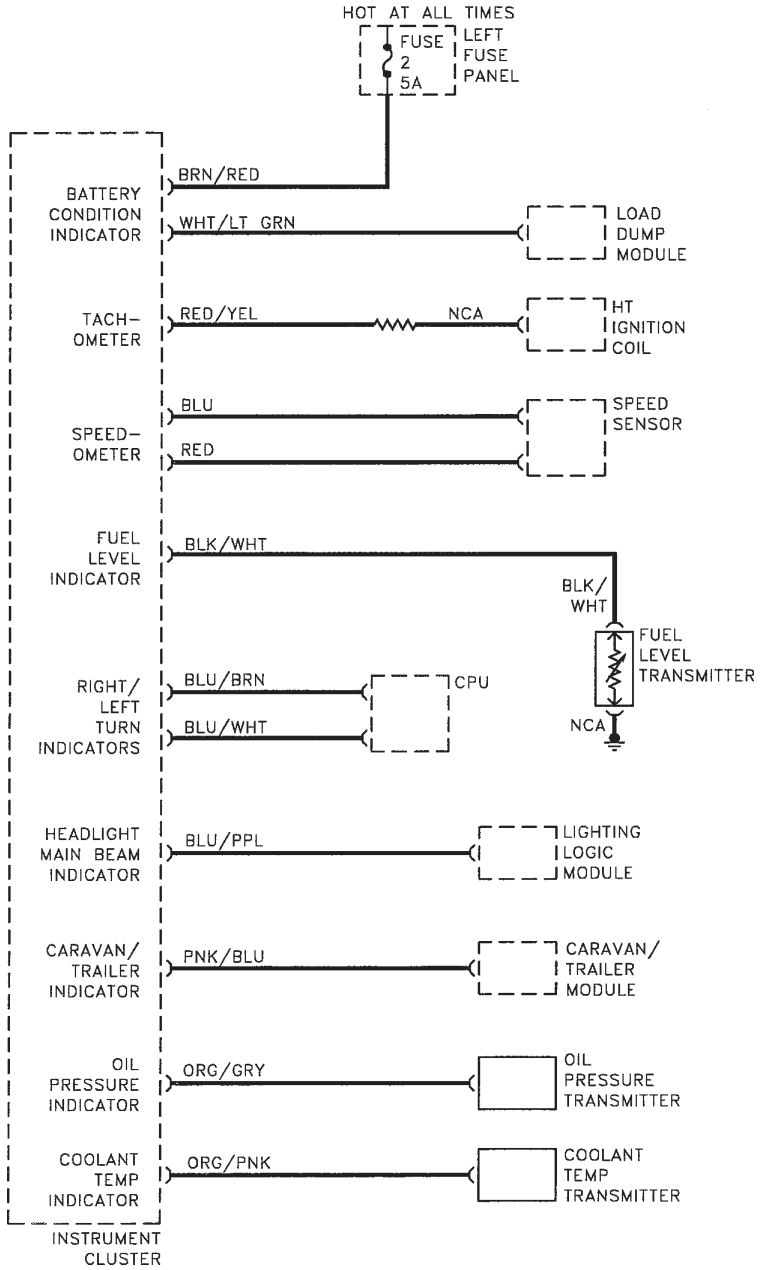
Typical 1988 to 1992 engine management system



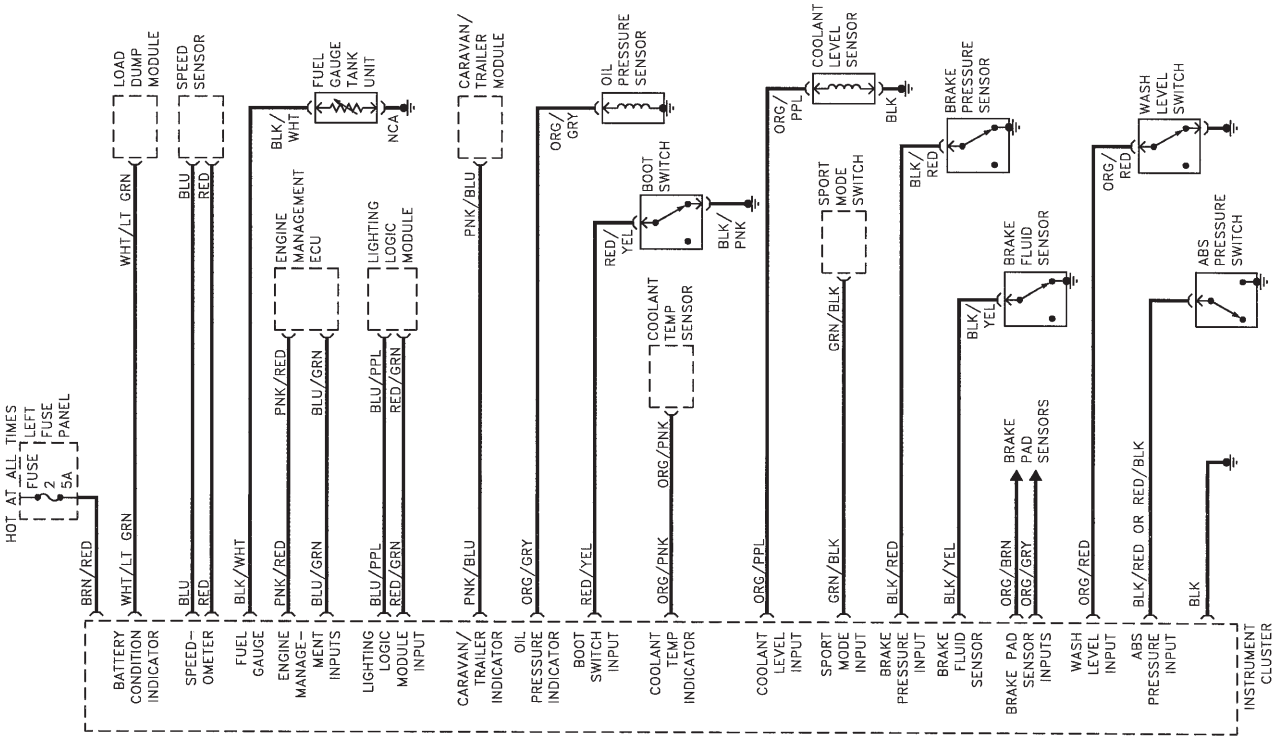
Typical 1993 and 1994 engine management system



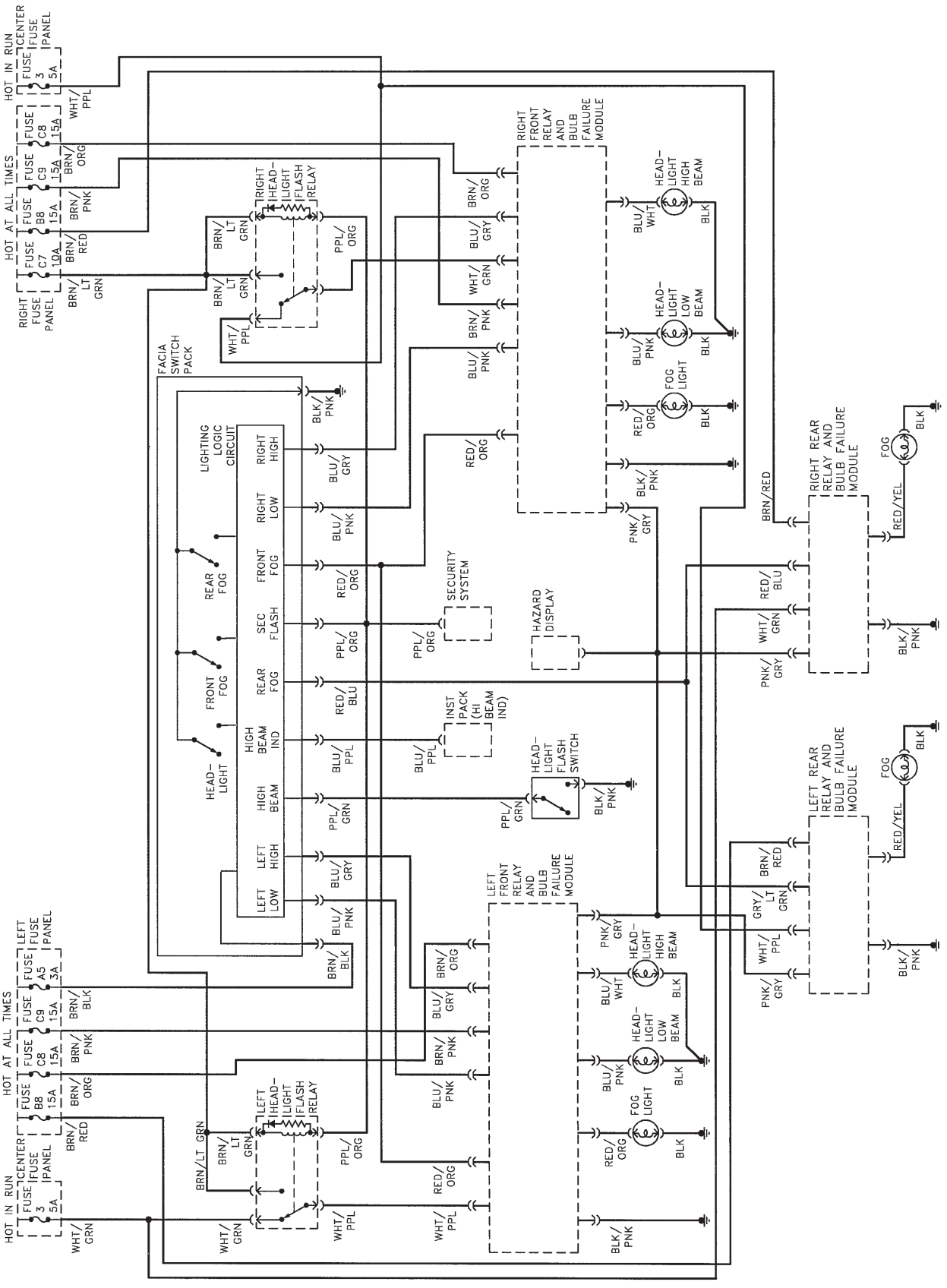
Typical engine cooling fan system



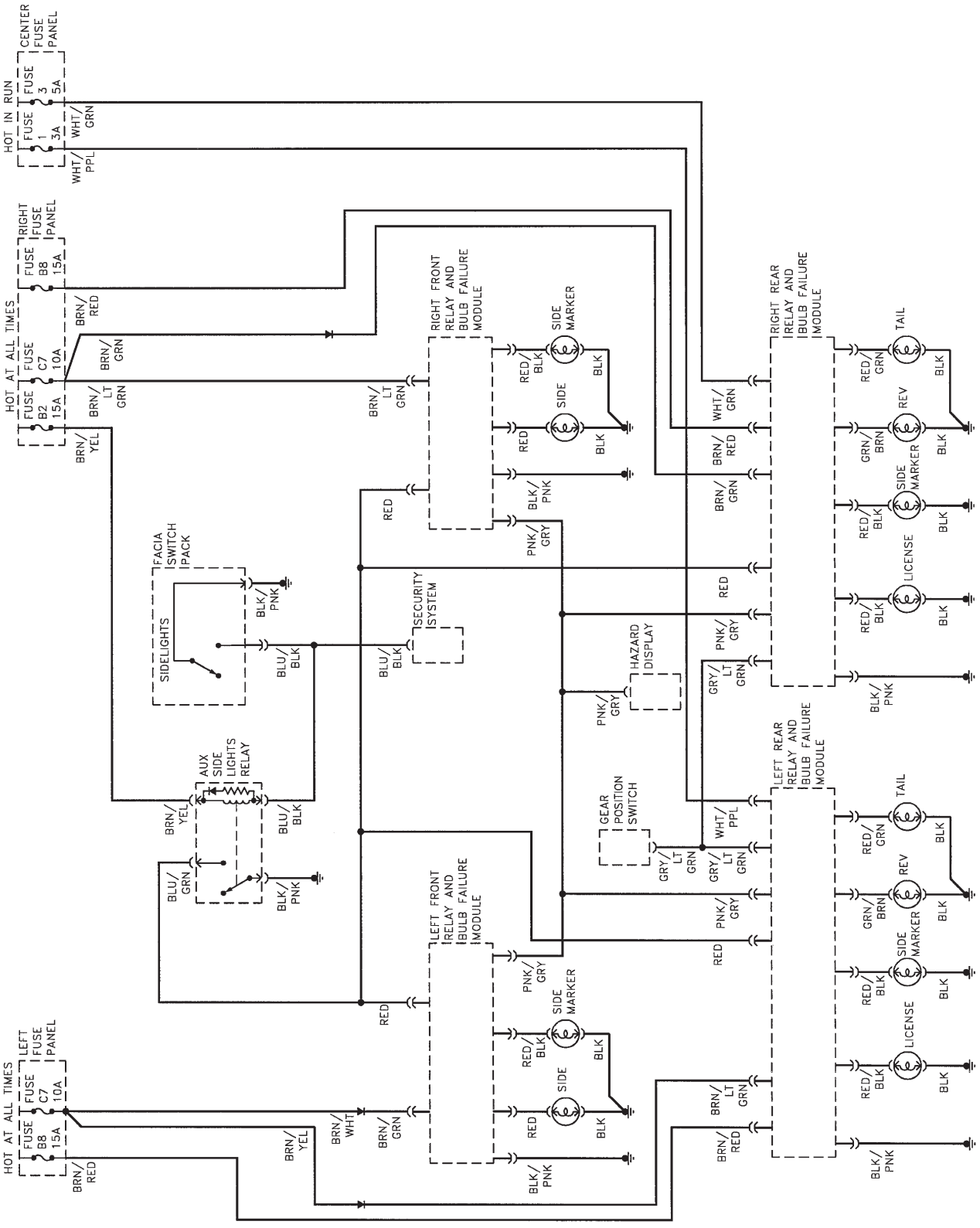
Typical 1988 instrument warning light system



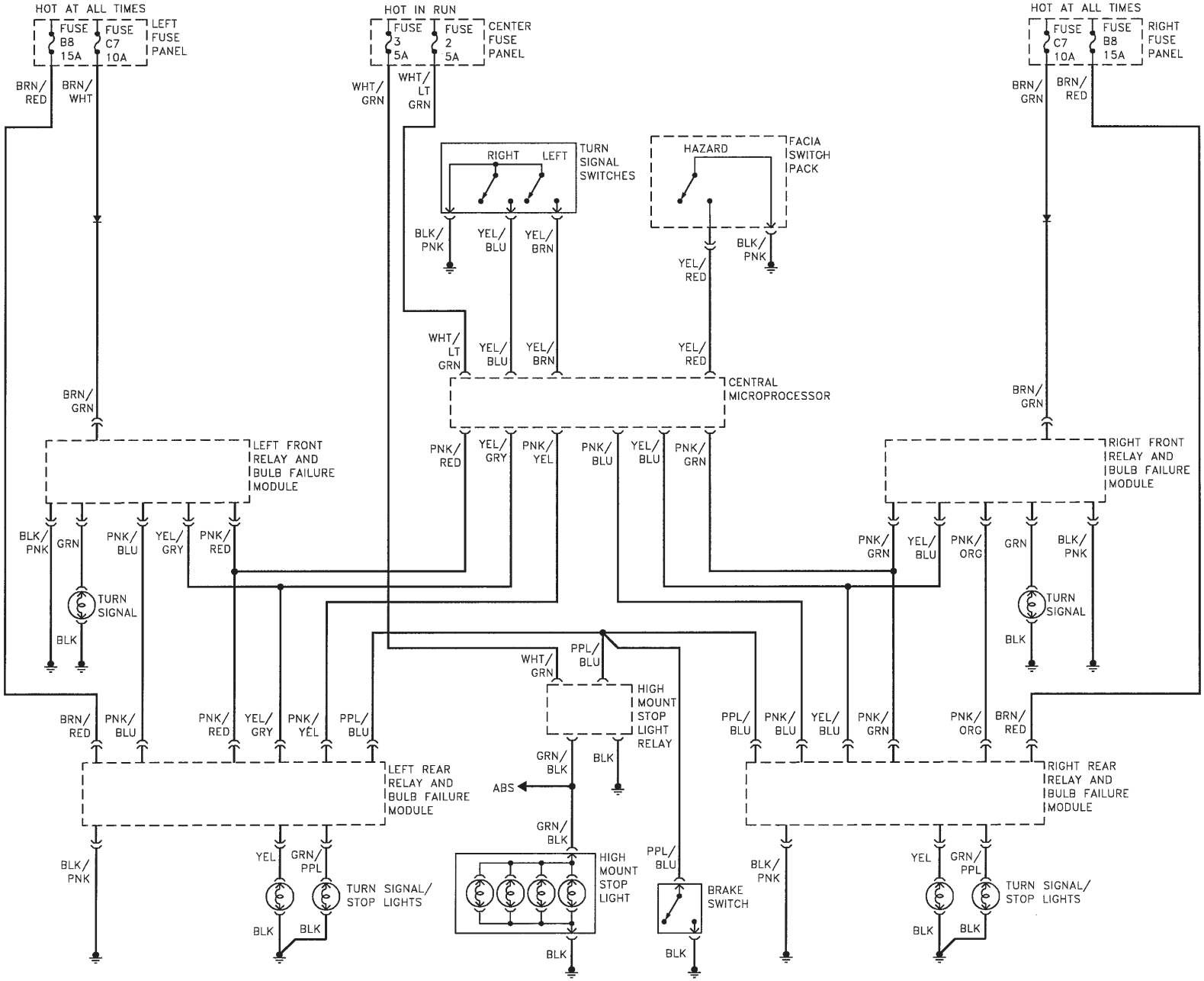
Typical 1989 to 1994 instrument warning light system



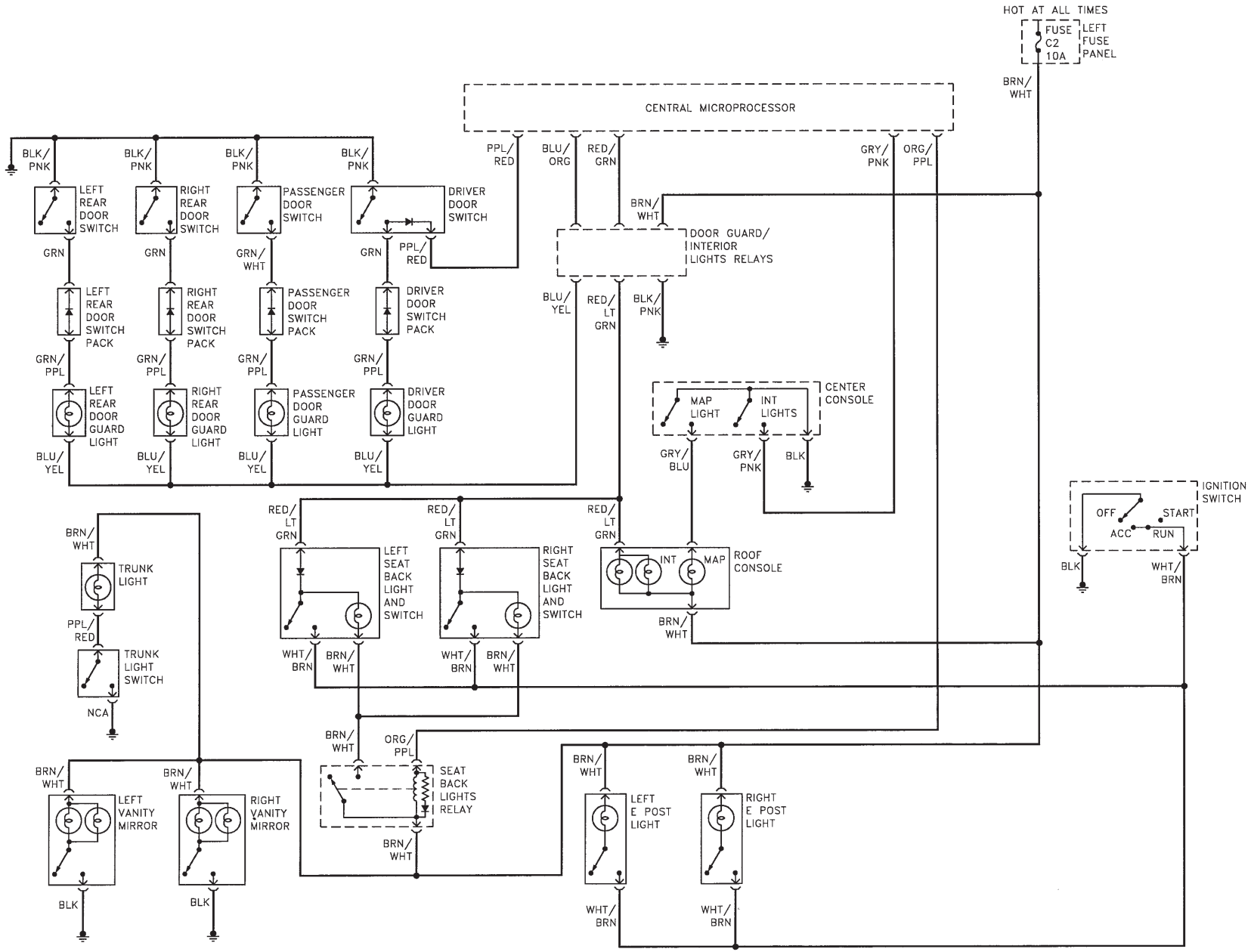
Typical headlight system



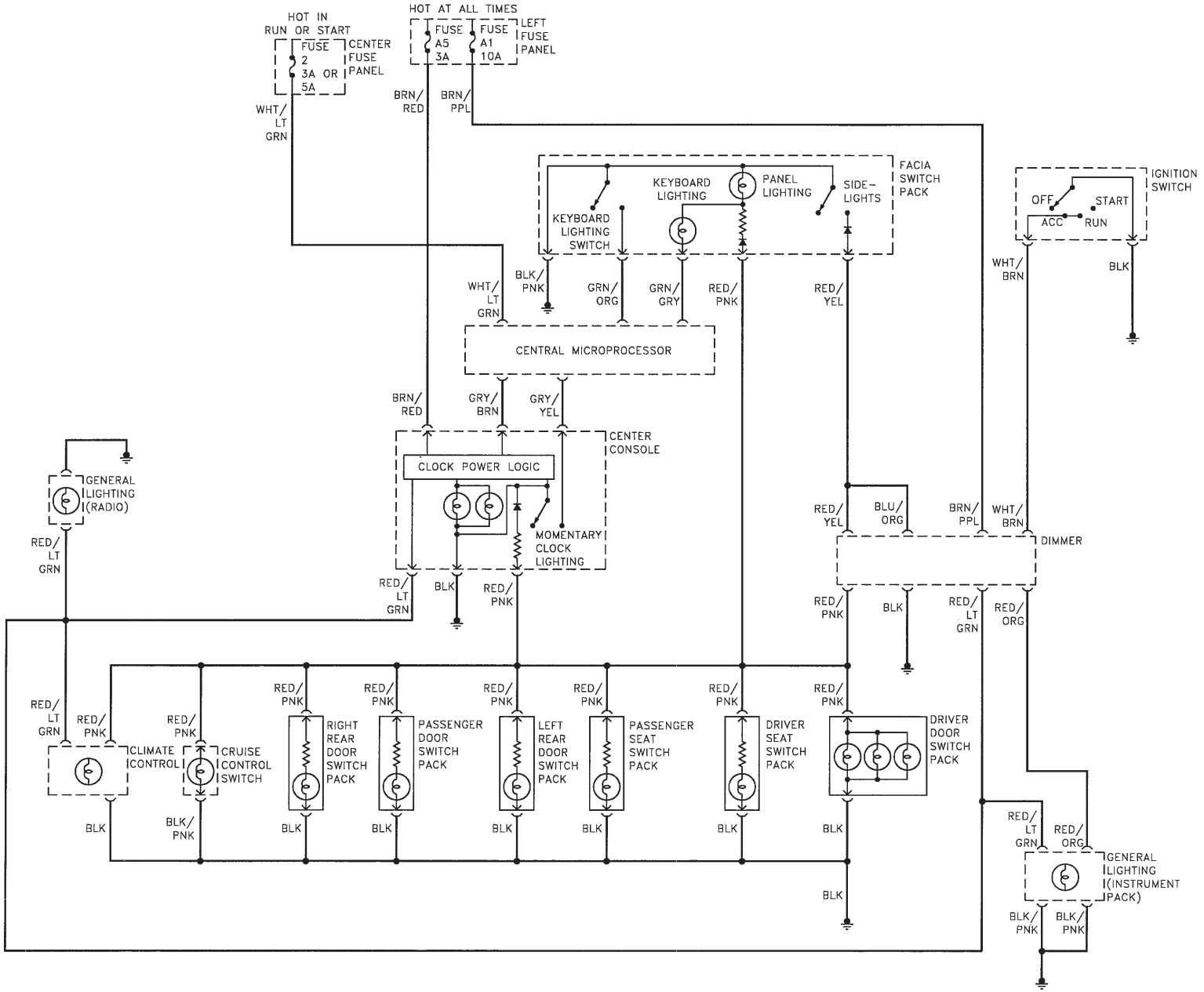
Typical side marker and tail light system



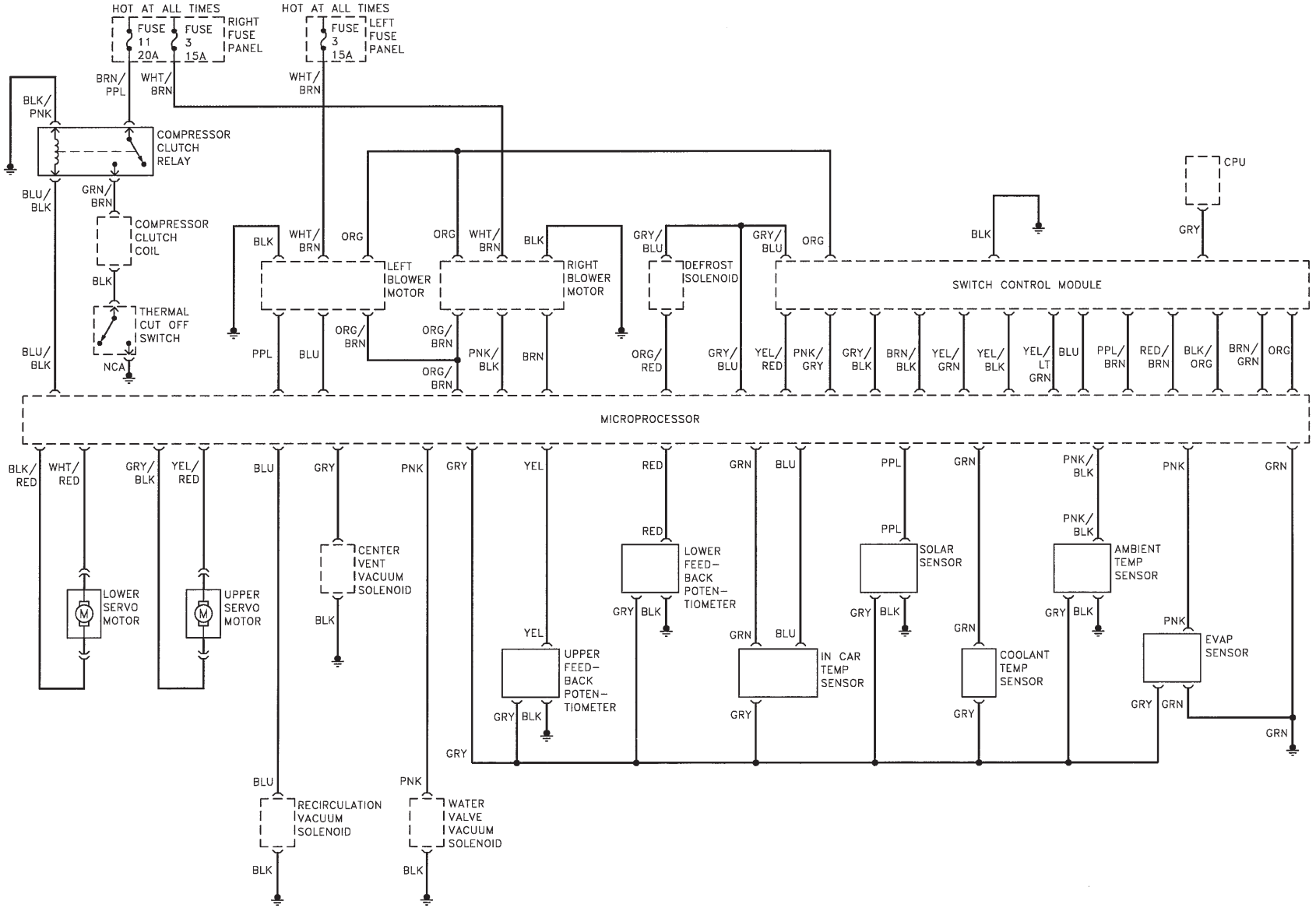
Typical hazard/turn signal and stop light system



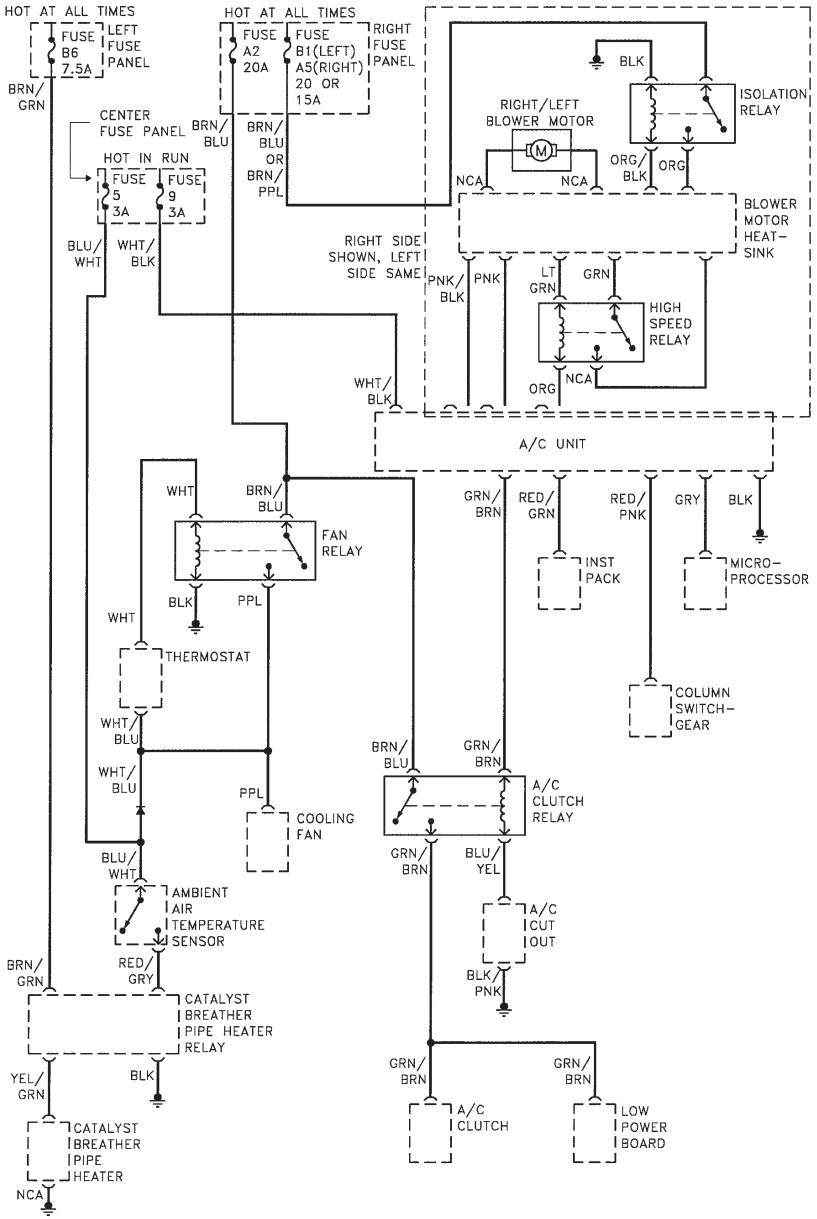
Typical interior lighting system



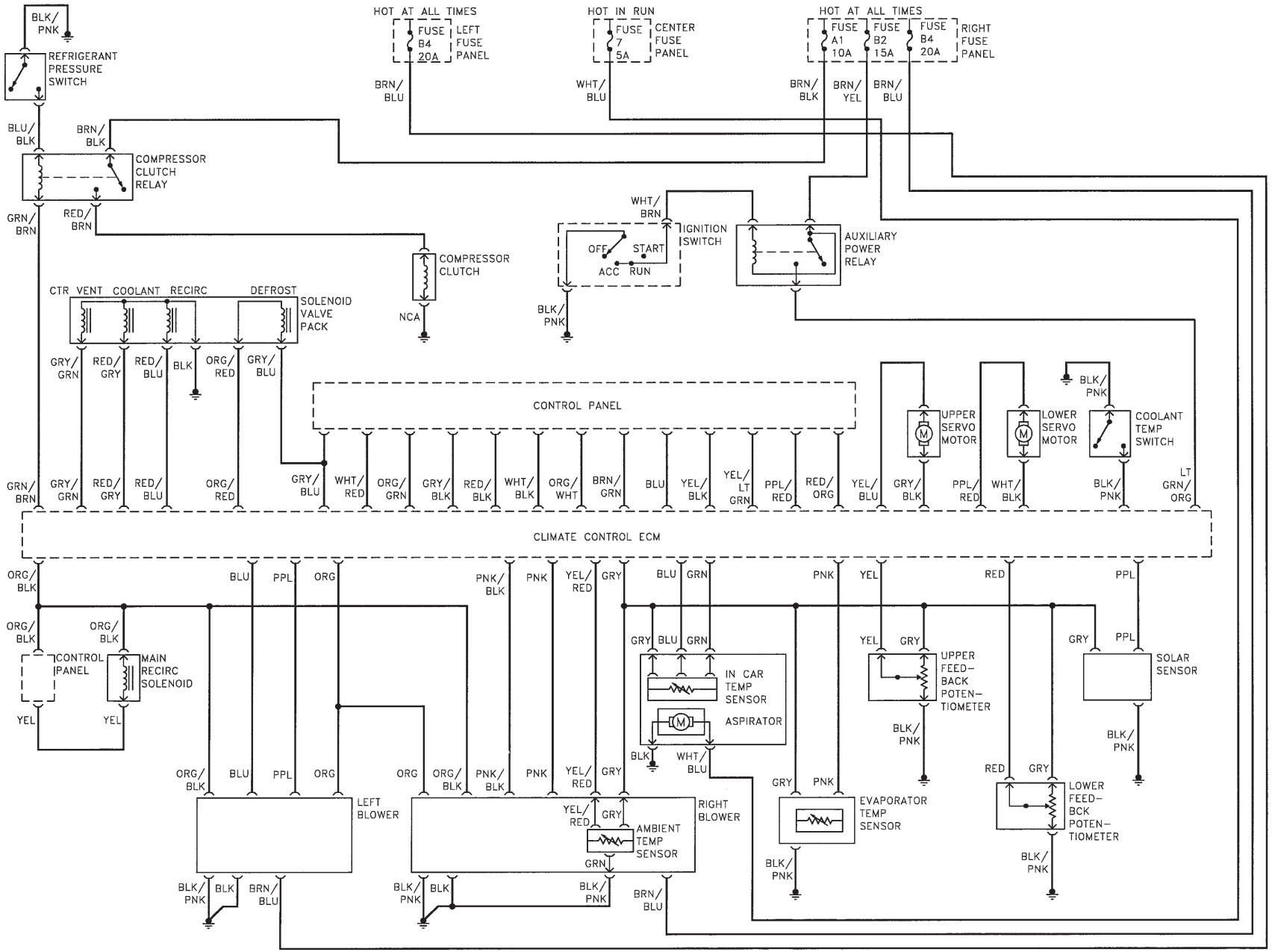
Typical instrument cluster lighting system



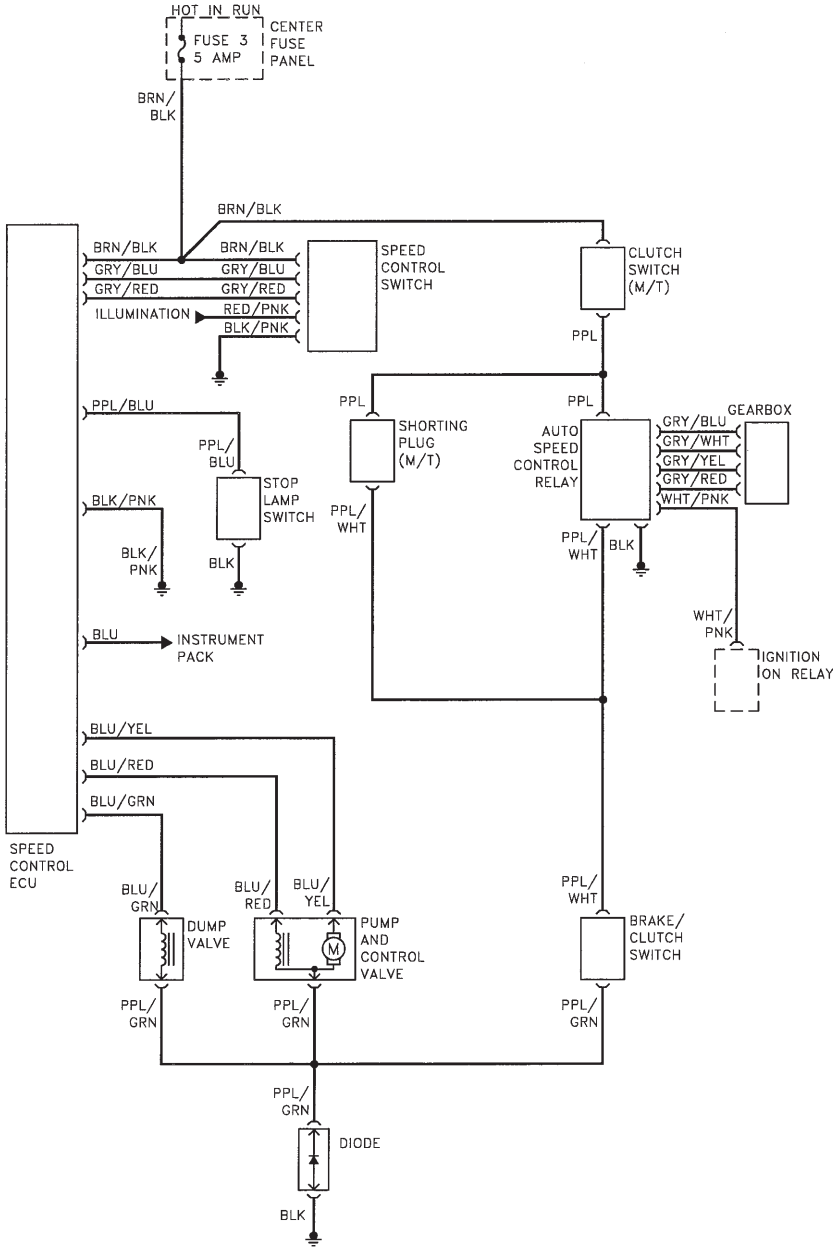
Typical 1988 heater and air conditioning system



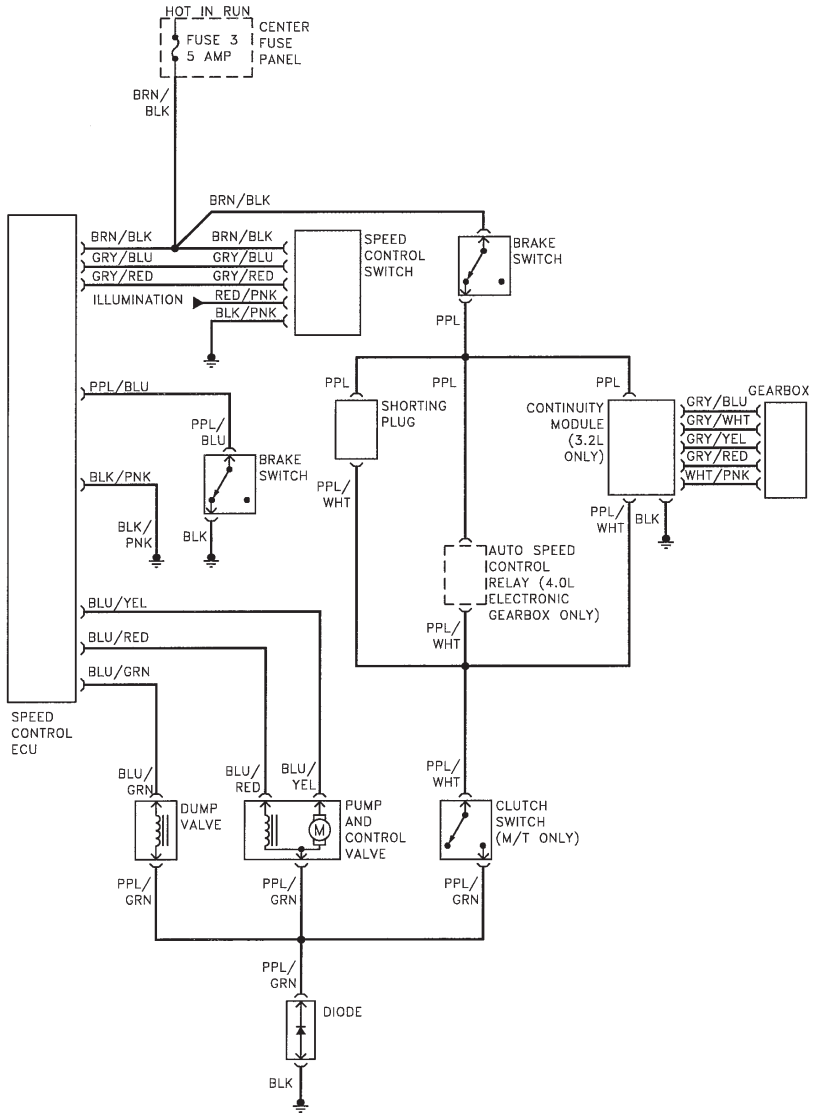
Typical 1989 to 1992 heater and air conditioning system



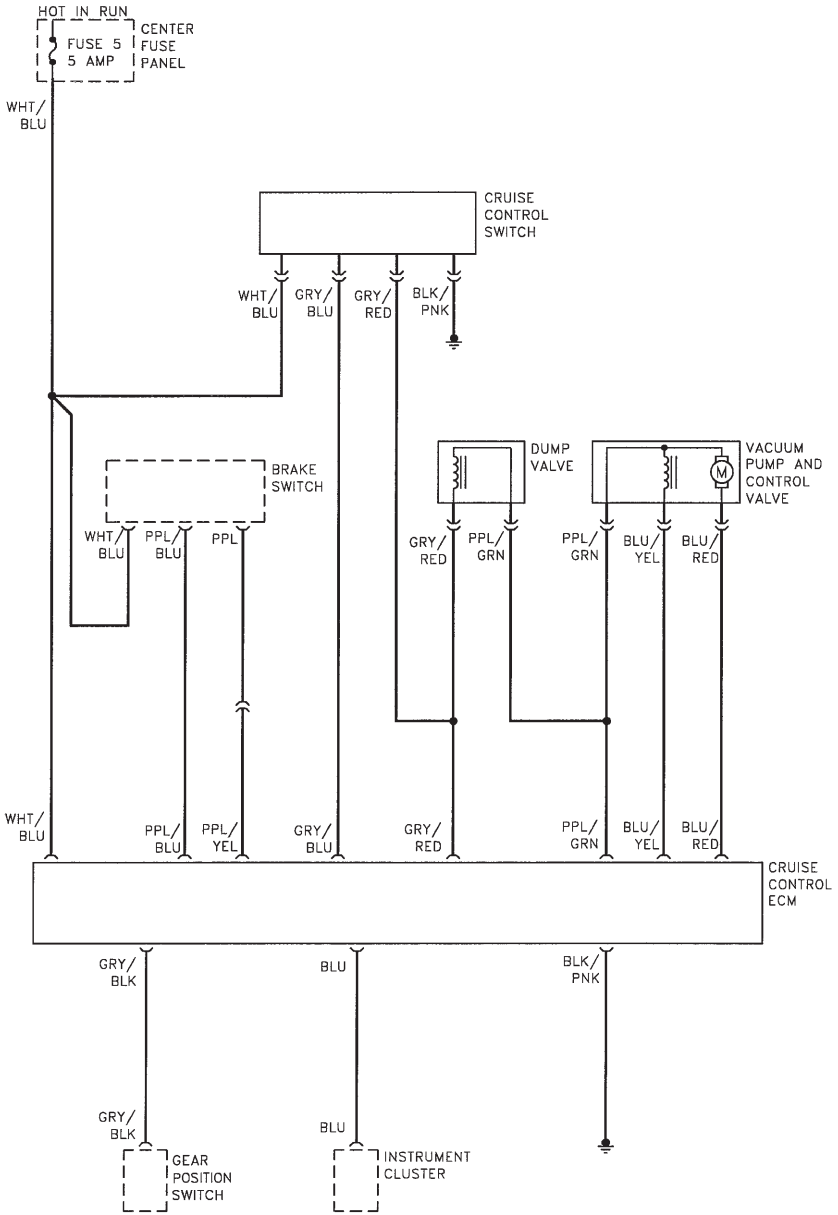
Typical 1993 and 1994 heater and air conditioning system



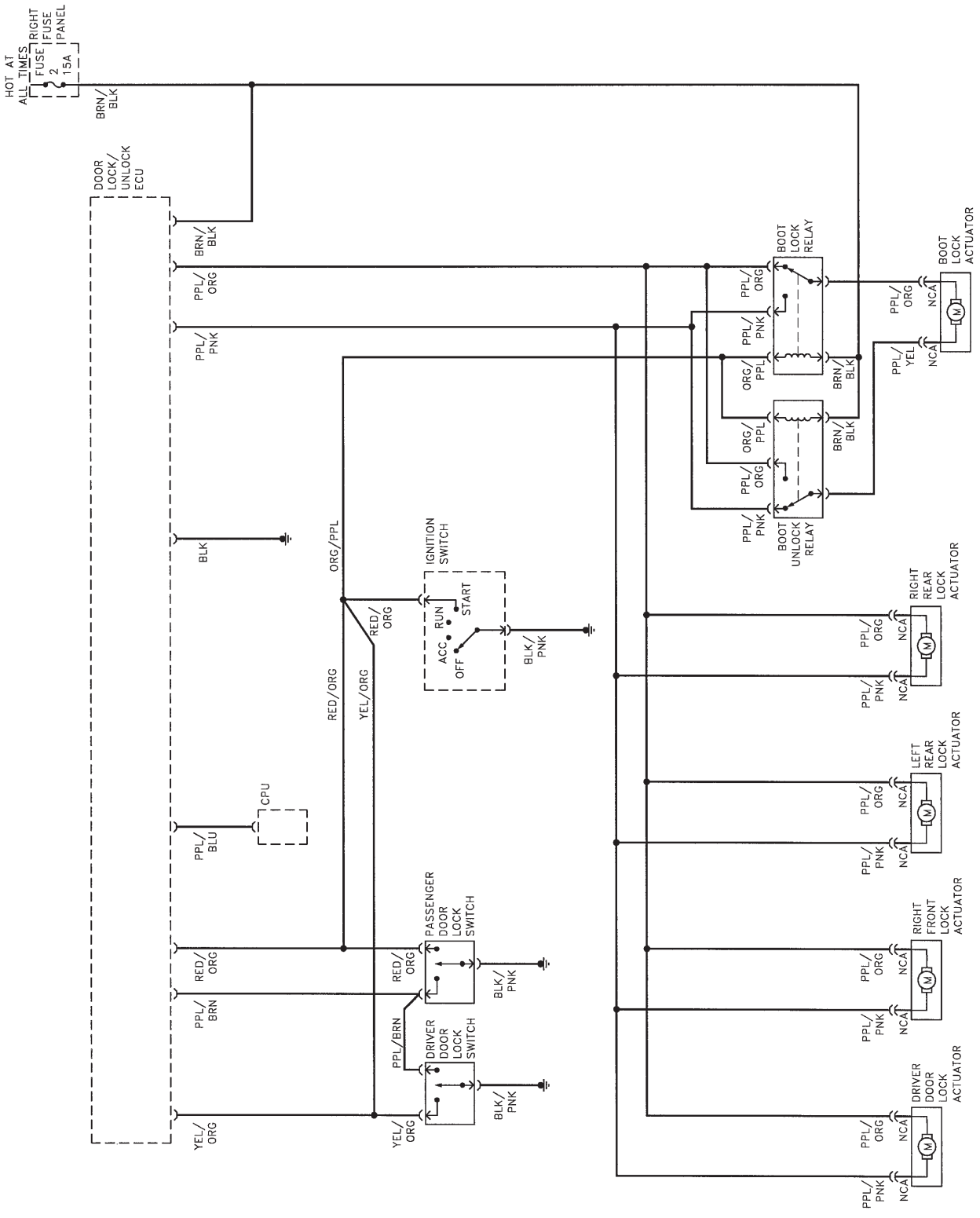
Typical 1988 to 1990 cruise control system



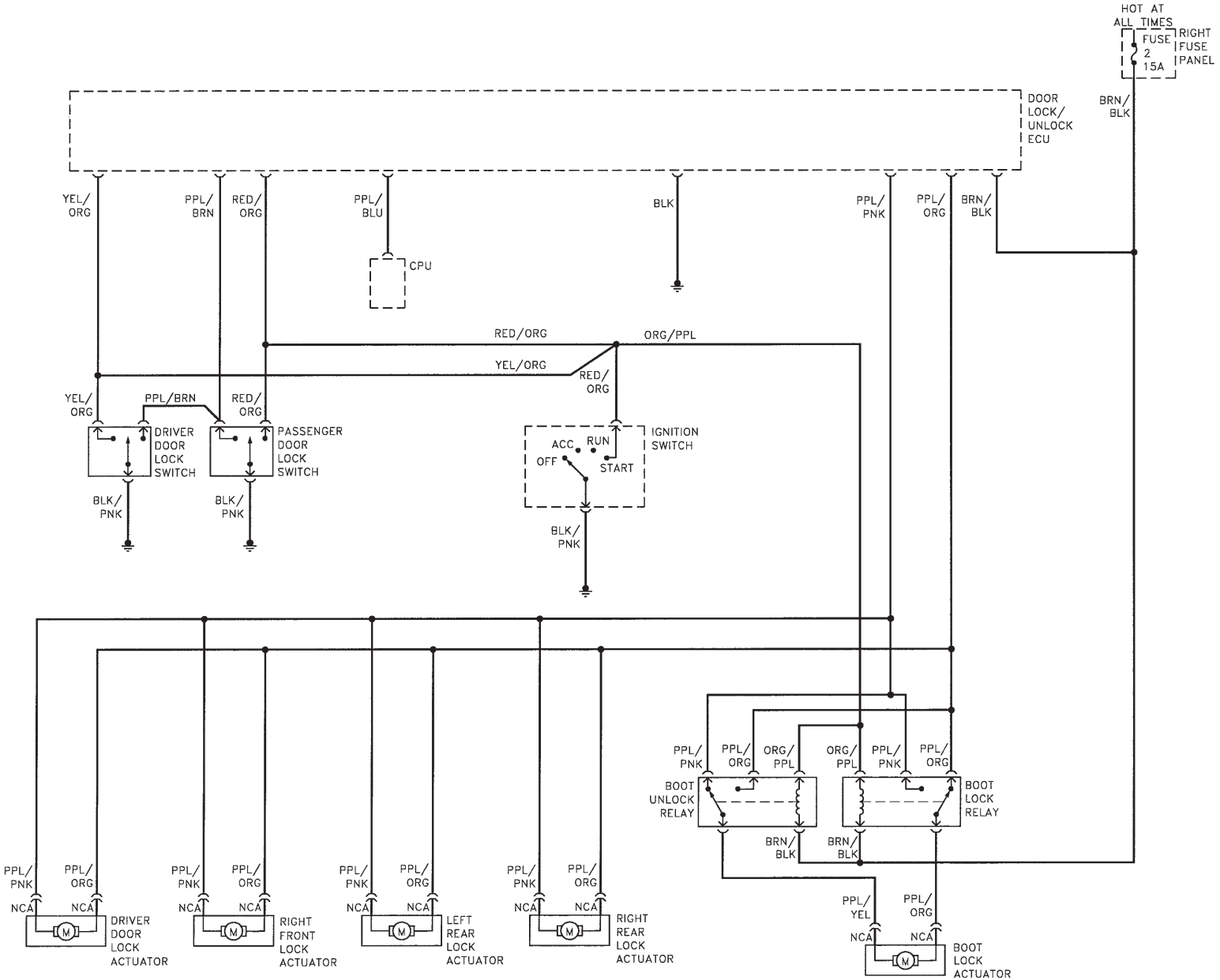
Typical 1991 and 1992 cruise control system



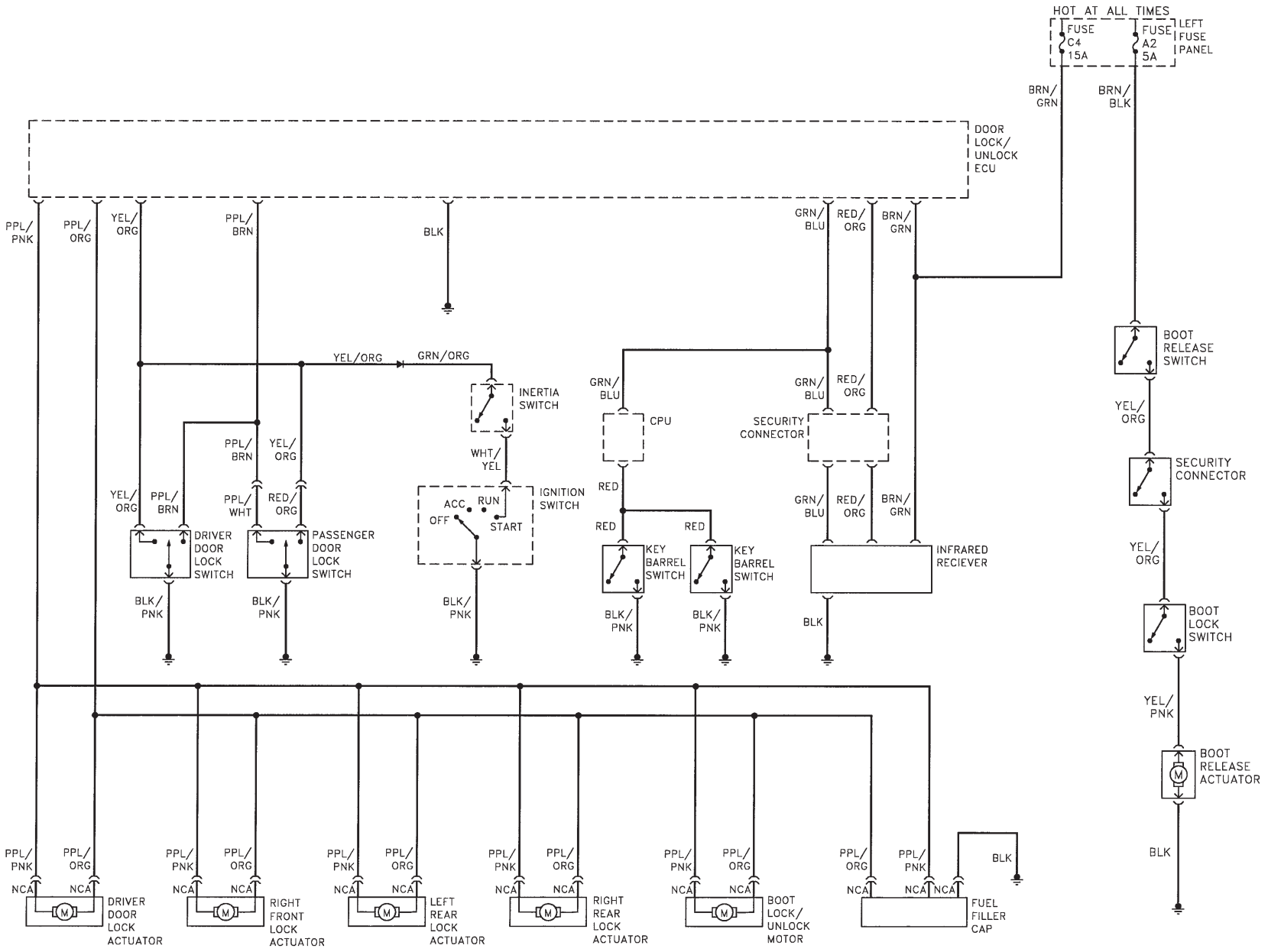
Typical 1993 and 1994 cruise control system



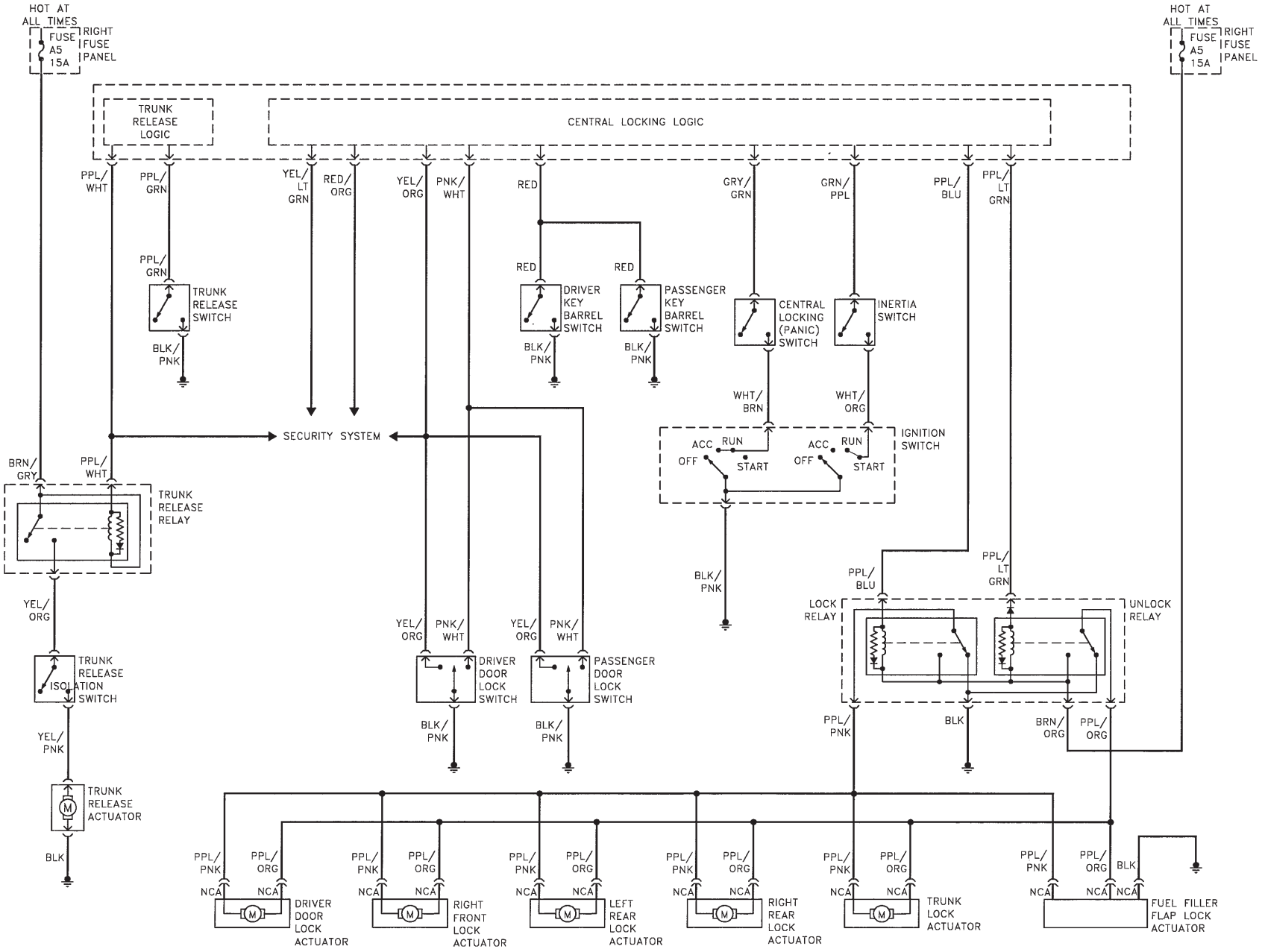
Typical 1988 central locking system



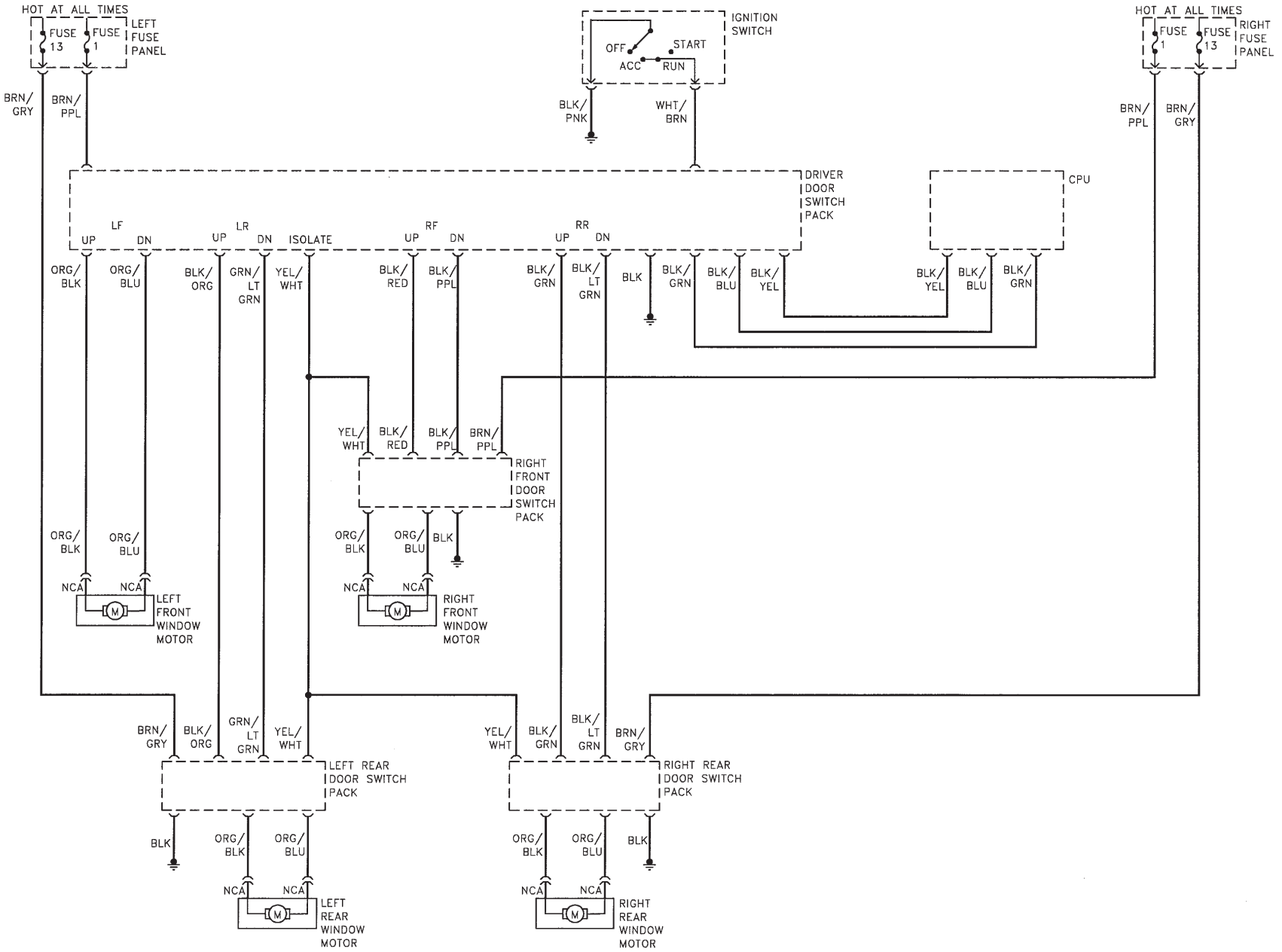
Typical 1989 and 1990 central locking system



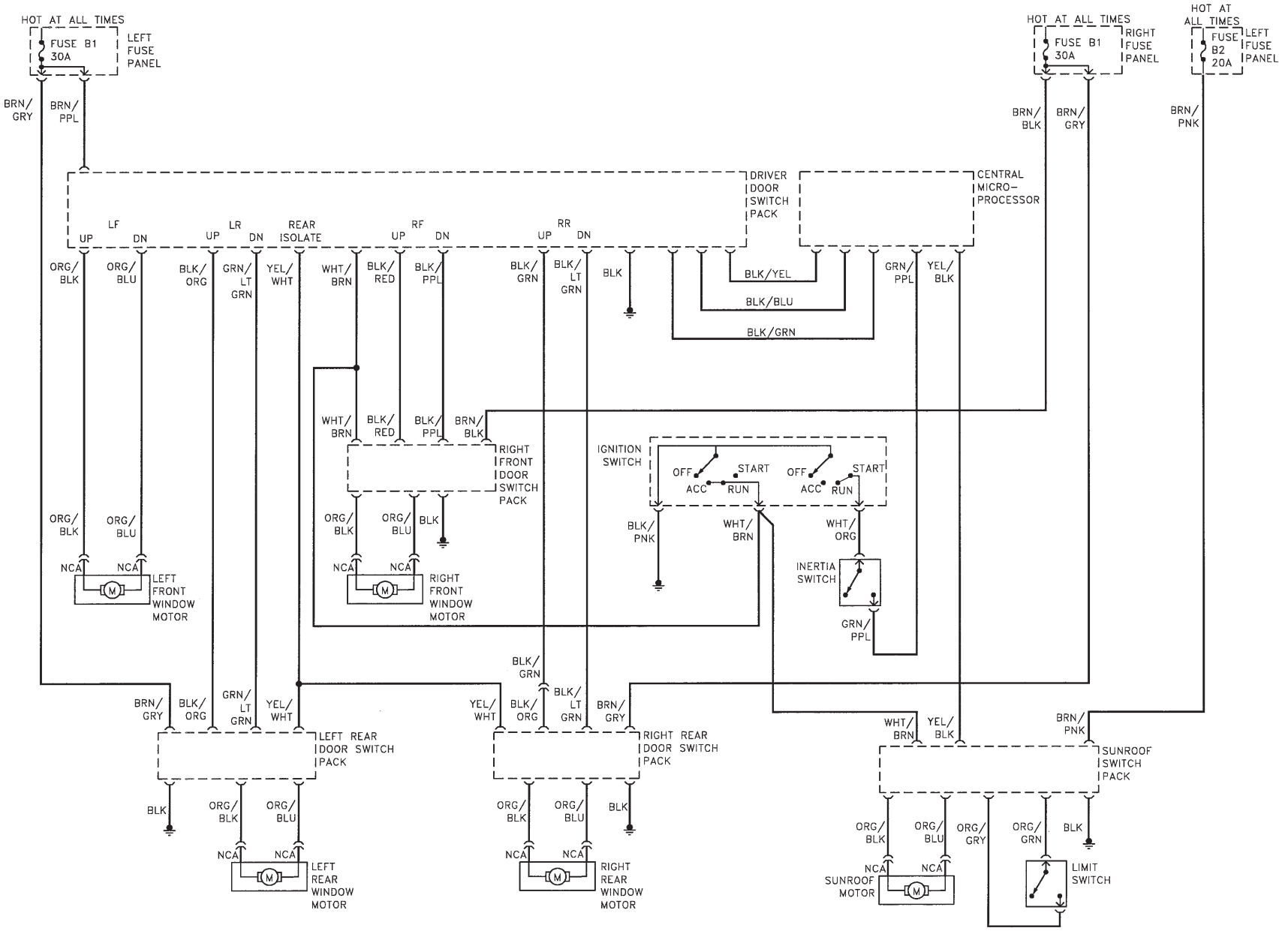
Typical 1991 and 1992 central locking system



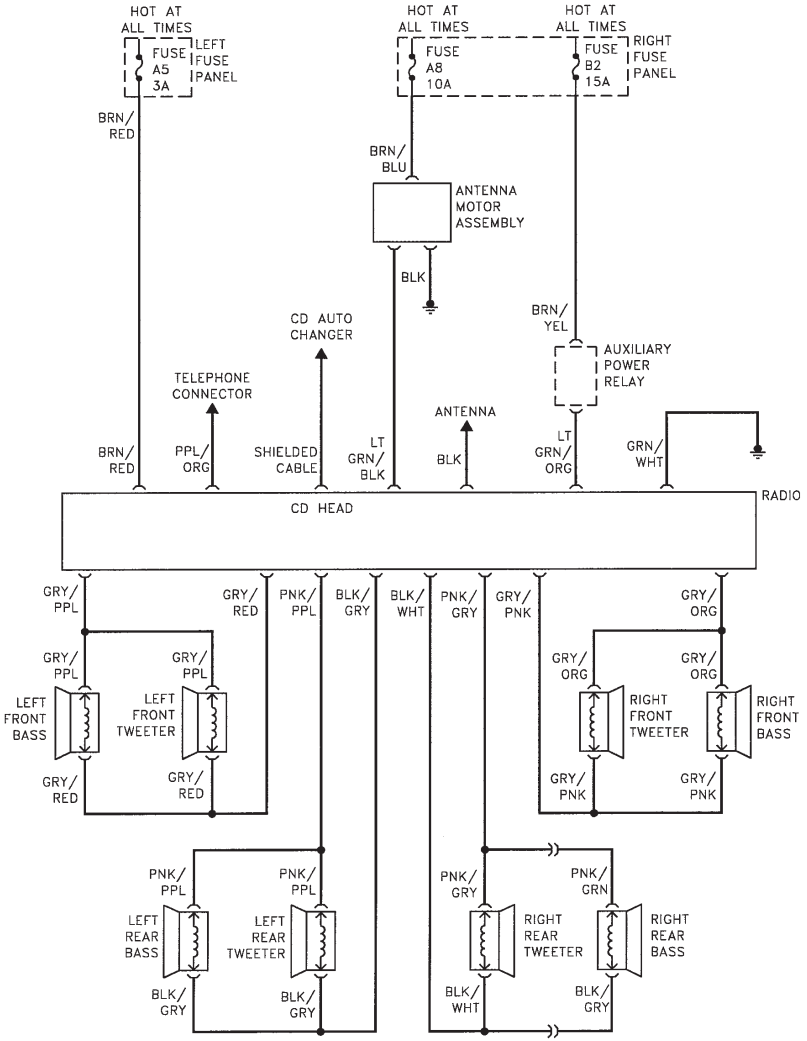
Typical 1993 and 1994 central locking system



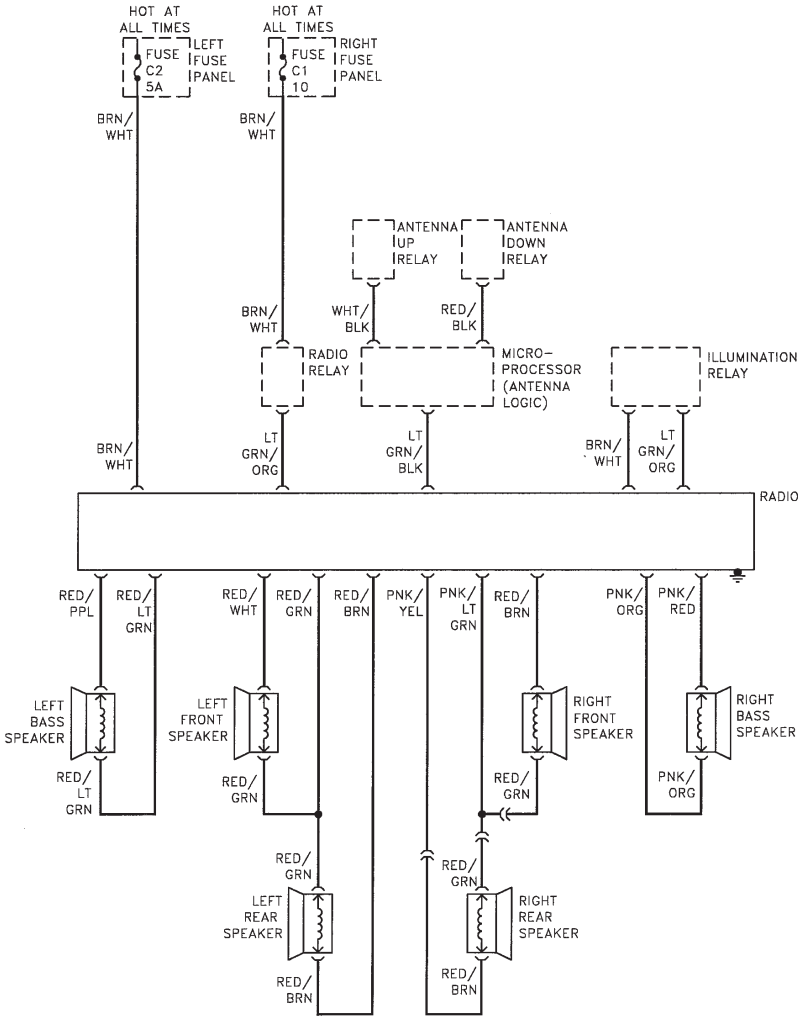
Typical 1988 to 1992 electric windows



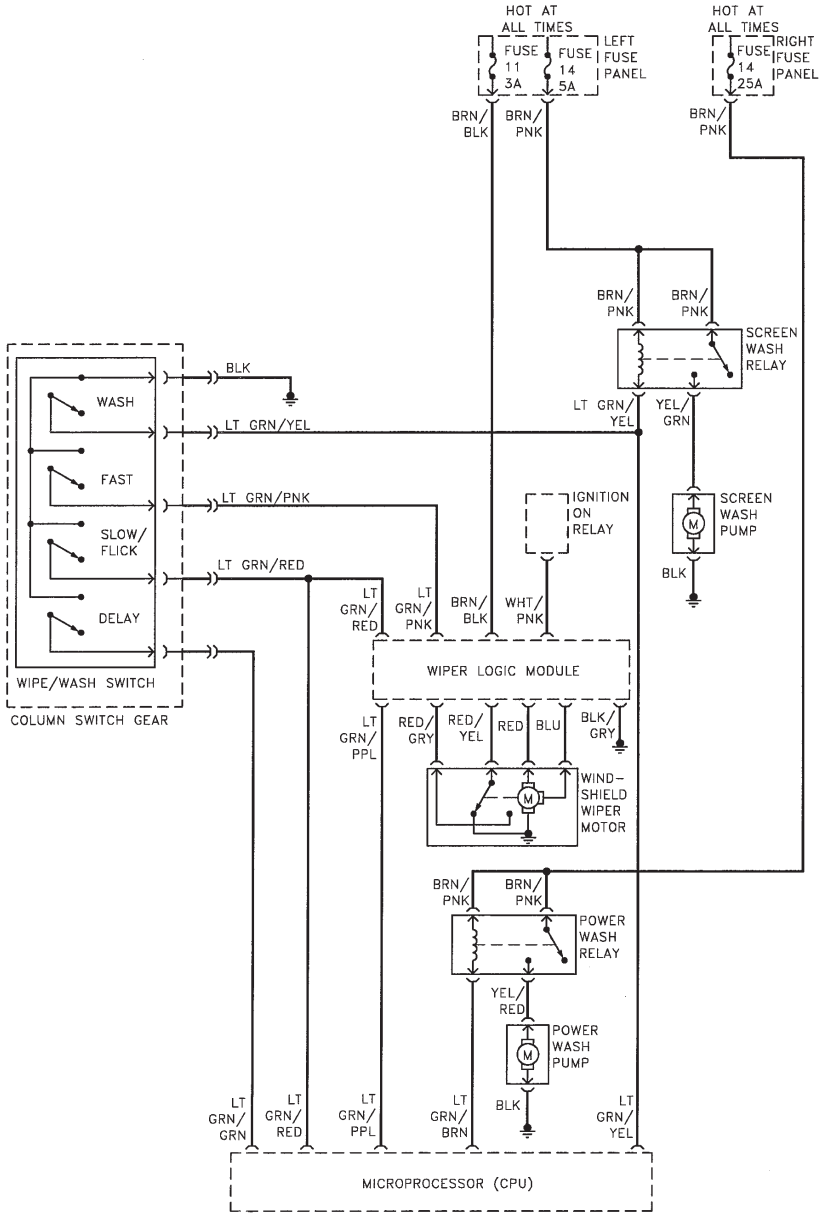
Typical 1993 and 1994 electric windows



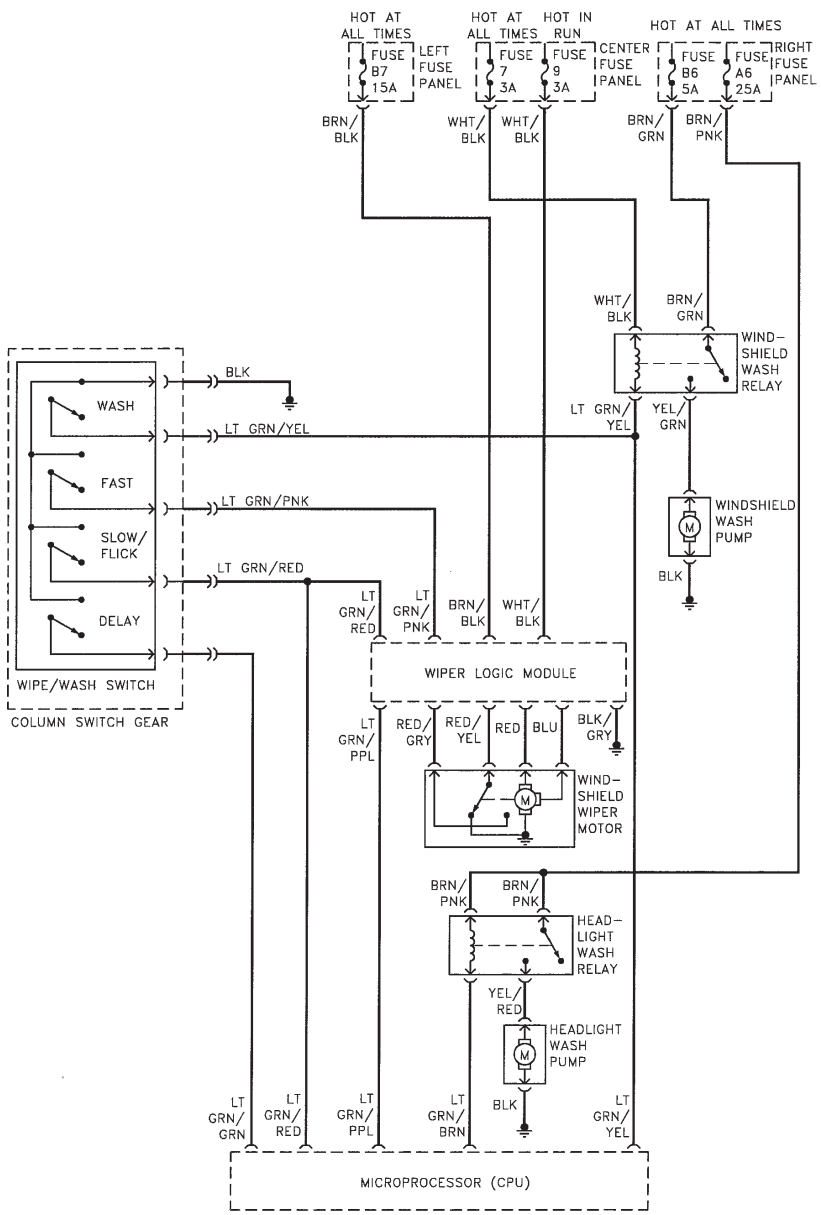
Typical 1993 and 1994 audio system



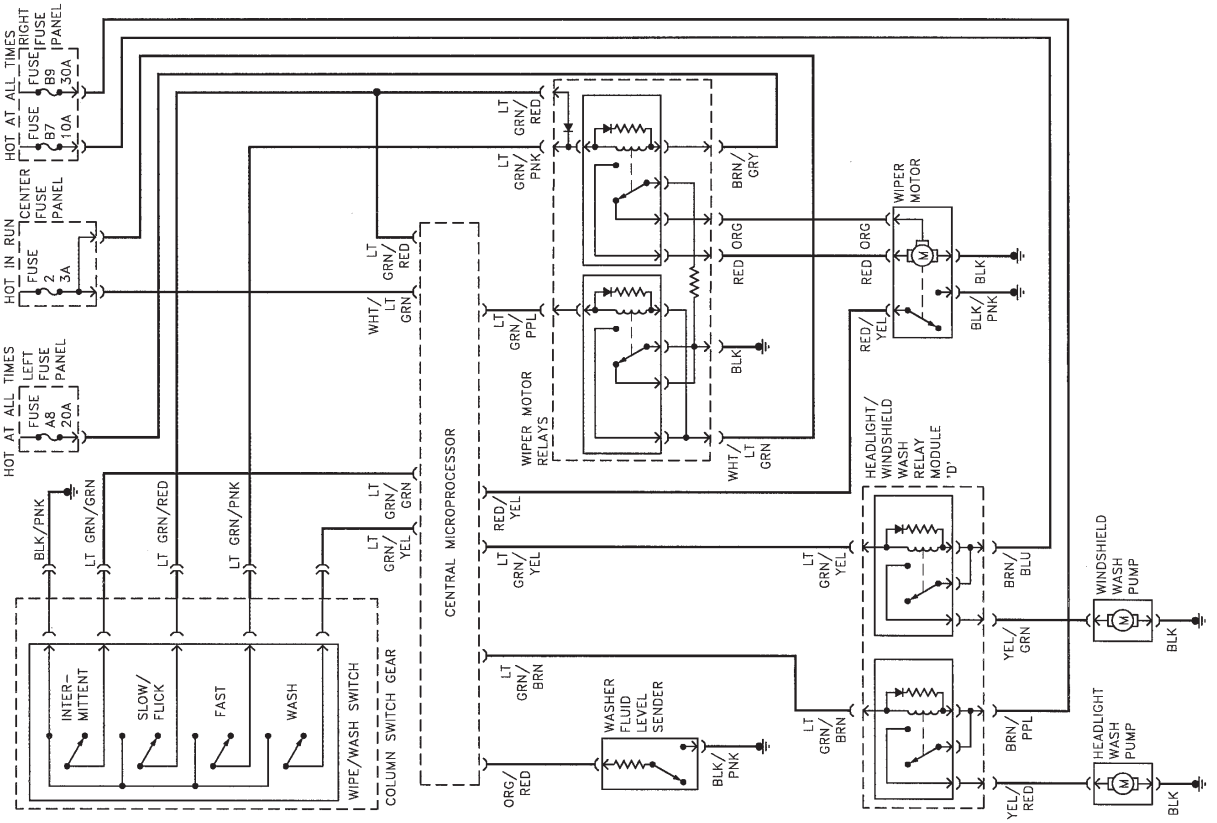
Typical 1988 to 1992 audio system



Typical 1988 to 1990 windscreen washer and wiper system



Typical 1991 and 1992 windscreen washer and wiper system



Typical 1993 and 1994 windscreen washer and wiper system