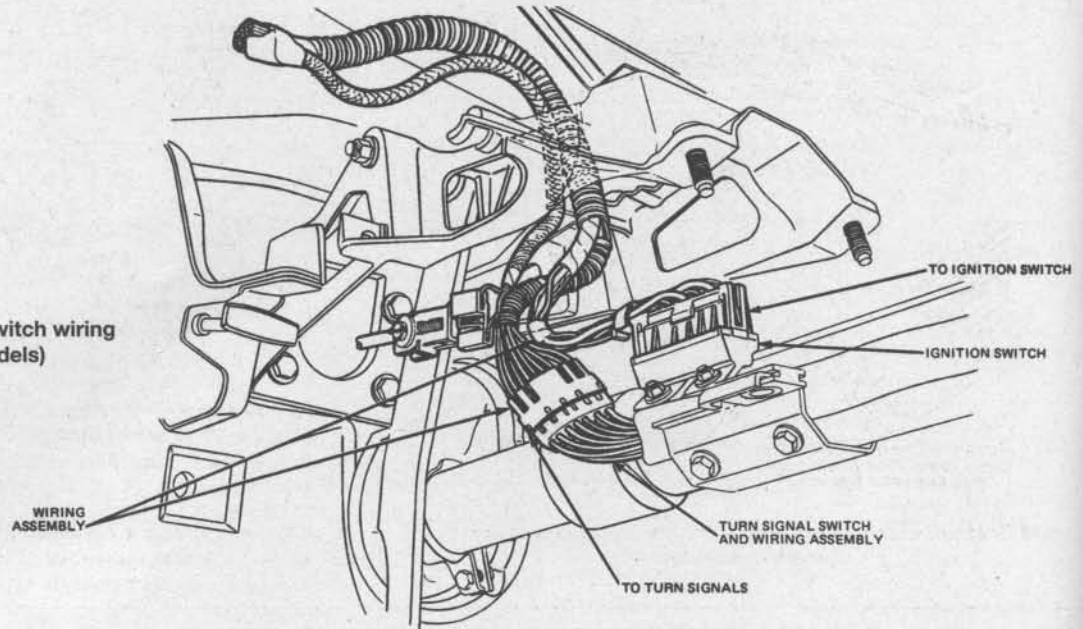


9.1 Typical turn signal switch wiring harness (early models)



the damaged portion, strip about 1/2-inch of insulation from the two wire ends and attach the appropriate replacement fusible link to the stripped wire ends with two proper size butt connectors. Solder the connectors and wires and insulate with tape.

8 To service any fusible link which has an eyelet terminal on one end (like the charging circuit), cut off the open fusible link behind the weld, strip about 1/2-inch of insulation from the cut end and attach the appropriate new eyelet fusible link to the stripped wire with an appropriate size butt connector. Solder the connectors and wires at the point of service and insulate with tape.

- 9 Connect the cable to the negative terminal of the battery.
- 10 Test the system for proper operation.

## 6 Circuit breakers – general information

1 Circuit breakers protect accessories such as power windows, power door locks, the windshield wiper, windshield wiper pump, electronic shift motor (4X4), etc. Circuit breakers are located in the fuse panel. Refer to the fuse panel guide in Section 4 and the fuse panel guide in your owner's manual for the location of the circuit breakers used in your vehicle.

2 Because a circuit breaker resets itself automatically, an electrical overload in a circuit breaker protected system will cause the circuit to fail momentarily, then come back on. If the circuit does not come back on, check it immediately.

- a) Remove the circuit breaker from the fuse panel.
- b) Using an ohmmeter, verify that there is continuity between both terminals of the circuit breaker. If there is no continuity, replace the circuit breaker.
- c) Install the old or new circuit breaker. If it continues to cut out, a short circuit is indicated. Troubleshoot the appropriate circuit (see the wiring diagrams at the back of this book) or have the system checked by a professional mechanic.

## 7 Relays – general information

1 Several electrical components and accessories in the vehicle use relays to transmit the electrical power to the component. If the relay is defective, that component or circuit will not operate. On later models, the relays are located in the power distribution box. Refer to the power distribution box guide in Section 4 or guide in your owner's manual for the exact location and function of the relays used in your vehicle.

2 Testing of relays can be done manually, however, their low costs dictates that replacement is the best option if operation is suspect.

## 8 Turn signal and hazard flasher – check and replacement

- 1 The turn signal flasher unit is located on the front of the fuse panel (refer to Section 4).
- 2 The hazard flasher is located on the rear of the fuse panel behind the turn signal flasher.
- 3 If either of the two flasher functions fail to blink, the problem may be due to a blown fuse, a faulty flasher unit, a broken switch, blown turn indicator bulb(s), or a loose or open connection. If a quick check of the fuse panel indicates that the turn indicator or hazard fuse has blown, check the wiring for a short before installing a new fuse.
- 4 If the fuse is good, locate and remove the suspect flasher unit.
- 5 Check for voltage at the flasher connector socket (red/white wire). Voltage should be indicated. If not, repair the open circuit to the battery.
- 6 Testing of the flasher can be done manually, however, their low cost dictates that replacement is the best option if failure is suspected.
- 7 Install a new flasher unit. If a new flasher fails to correct the problem, there is an open in the circuit between the flasher and the external lights.
- 8 Check and replace all of the turn indicator bulbs as required. If the bulbs are okay, the problem is probably in the turn signal/hazard switch or related wiring.
- 9 Check the turn signal/hazard switch as applicable (refer to Section 9).

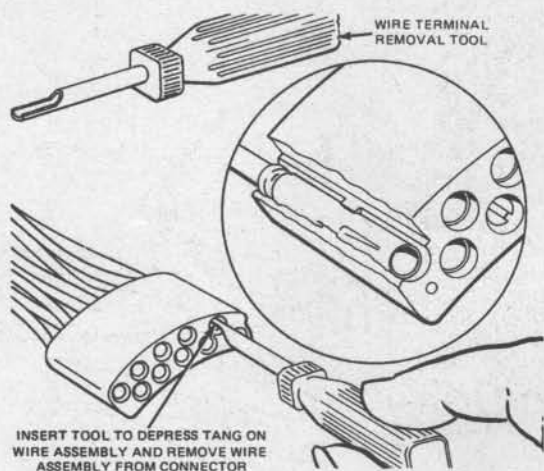
## 9 Steering column switches – check and replacement

Refer to illustrations 9.1, 9.10, 9.16, 9.18a, 9.18b, and 9.19

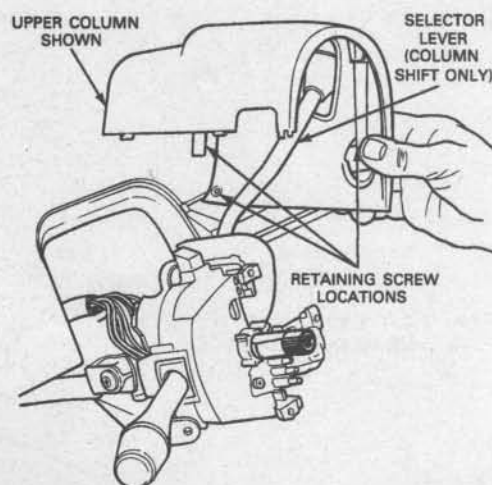
### Turn signal/hazard switch (early models)

#### Check

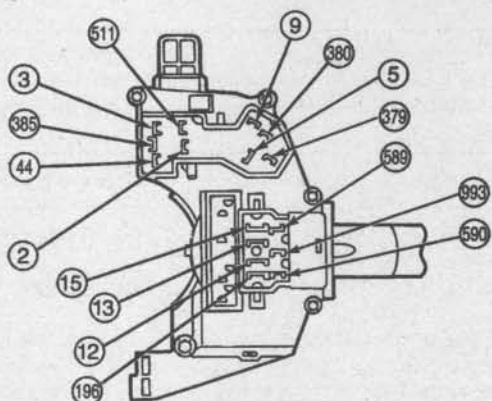
- 1 Locate the turn signal wiring harness connector at the base of the steering column (see illustration).
- 2 Turn the ignition switch to the RUN position (engine not running). Using a 12 volt test light, check for power at the light blue wire (connect the test light to ground and probe the harness connector light blue wire). The light should illuminate.
- 3 Again, using the test light with the ignition on and the turn signal switched to the left or right positions as required, probe the harness



9.10 Method of removing wire terminals from the turn signal switch connector



9.16 To access the multi-function switch connectors and terminals, the upper and lower steering column shrouds must be removed - later models



9.18a Multi-function switch pin and circuit identifiers - later models

Circuit No.	Description
2	Right Front Turn Signal Lamp
3	Left Front Turn Signal Lamp
5	Right Rear Turn Signal Lamp
9	Left Rear Turn Signal Lamp
44	Flasher Feed
44A	Internal Switch Connection
49	Flasher Feed
379	Right Cornering Lamp
380	Left Cornering Lamp
385	Hazard Feed
511	Brake Feed
511A	Internal Switch Connection
IGN	Ignition
BAT	Battery
12	Hi Beam
13	Lo Beam
15	Lighting Switch Feed
196	Flash to Pass Feed
W1(993)	
W2(590)	
W3(589)	

connector to check for power out of the turn signal switch in each of the following wire locations: left front (light green wire with white stripe), left rear (light green wire with orange stripe), right front (white wire with light blue stripe), and right rear (orange wire with light blue stripe).

4 The test light should flash (due to the action of the flasher) at each of the test locations. If not, the problem is in the switch or related wiring.

### Replacement

- 5 Disconnect the negative cable from the battery.
- 6 Remove the steering wheel (refer to Chapter 10). Be sure to heed the airbag warning in the steering wheel removal section.
- 7 Remove the turn signal switch lever from the switch and remove the screws that retain the switch to the steering column.
- 8 Remove the steering column shroud and instrument panel opening cover.
- 9 Disconnect the turn signal switch harness connector at the base of the steering column (see illustration 9.1).
- 10 Using a wire terminal removal tool, remove each individual wire from the turn signal harness connector (see illustration). Record the color code and location of each wire as you remove them, so that they may be re-installed in the correct location.
- 11 Wrap the loose wire ends with tape and tape a pull through wire to the end. Remove the protective wire cover and remove the switch, pulling the wire harness out of the steering column.
- 12 Remove the tape from the defective switch and tape the wires of the new switch to the pull wire. Gently pull the wire harness through the steering column while guiding the switch into position. Remove the pull wire.
- 13 Insert the wire terminals back into their proper location in the connector. If they do not snap securely into position, slightly bend the locking tabs out.
- 14 The remainder of installation is the reverse of removal. Check the operation of all the turn signal and warning flasher functions.

### Multi-function switch (later models)

#### Check

- 15 Disconnect the negative cable from the battery.
- 16 Remove the three screws securing the steering column upper and lower shrouds and remove both shrouds (see illustration).
- 17 Remove the two harness connectors from the rear of the multi-function switch.
- 18 Using switch pin identifier diagram (see illustration), perform circuit continuity checks as shown in the multi-function switch test chart (see illustration).

Circuit	Set-up	Check	Expected value	Action if not expected
Brake lights	Haz OFF, Signal lever in NEUTRAL	511 to 5	Continuity	Replace switch
	Haz OFF, Signal lever in NEUTRAL	511 to 9	Continuity	Replace switch
Turn (left) Lamps - front/rear	Haz OFF, Signal lever in LEFT	511 to 5	Continuity	Replace switch
	Haz OFF, Signal lever in LEFT	44 to 3	Continuity	Replace switch
	Haz OFF, Signal lever in LEFT	44 to 9	Continuity	Replace switch
Turn (left) Lamps - side	Haz OFF, Signal lever in LEFT	15 to 380	Continuity	Replace switch
Turn (right) Lamps - front/rear	Haz OFF, Signal lever in RIGHT	511 to 9	Continuity	Replace switch
	Haz OFF, Signal lever in RIGHT	44 to 2	Continuity	Replace switch
	Haz OFF, Signal lever in RIGHT	44 to 5	Continuity	Replace switch
Turn (right) Lamps - side	Haz OFF, Signal lever in RIGHT	15 to 379	Continuity	Replace switch
Hazard	Haz ON, Signal lever in NEUTRAL	385 to 2	Continuity	Replace switch
	Haz ON, Signal lever in NEUTRAL	385 to 3	Continuity	Replace switch
	Haz ON, Signal lever in NEUTRAL	385 to 5	Continuity	Replace switch
	Haz ON, Signal lever in NEUTRAL	385 to 9	Continuity	Replace switch
High beam	Lever in HIGH	15 to 12	Continuity	Replace switch
Low beam	Lever in LOW	15 to 13	Continuity	Replace switch
Flash-to-pass	Lever in FLASH-TO-PASS	15 to 13	Continuity	Replace switch
	Lever in FLASH-TO-PASS	196 to 12	Continuity	Replace switch
Windshield washer	Washer ON	993 to 590	Continuity	Replace switch
Windshield wiper	Washer OFF, Wiper OFF	589 to 590	Open	Replace switch
	Washer OFF, Wiper OFF	993 to 590	Approx. 103,300 ohms	Replace switch
	Washer OFF, Wiper OFF	993 to 589	Approx. 47,600 ohms	Replace switch
	Wiper LOW, Washer OFF	589 to 590	Open	Replace switch
	Wiper LOW, Washer OFF	993 to 590	Approx. 3,300 ohms	Replace switch
	Wiper LOW, Washer OFF	993 to 589	Approx. 4,100 ohms	Replace switch
	Wiper HIGH, Washer OFF	993 to 590	Approx. 3,300 ohms	Replace switch
	Wiper HIGH, Washer OFF	993 to 589	Continuity	Replace switch

9.18b Multi-function switch continuity chart - use in conjunction with switch and pin identifier diagram to test switch functions

## Replacement

- Remove the screws securing the switch to the steering column casting and remove the switch (see illustration).
- Installation is the reverse of removal.

## 10 Ignition switch and key lock cylinder - check and replacement

Refer to illustrations 10.3, 10.4a, 10.4b, 10.15, 10.23a and 10.23b

### Switch

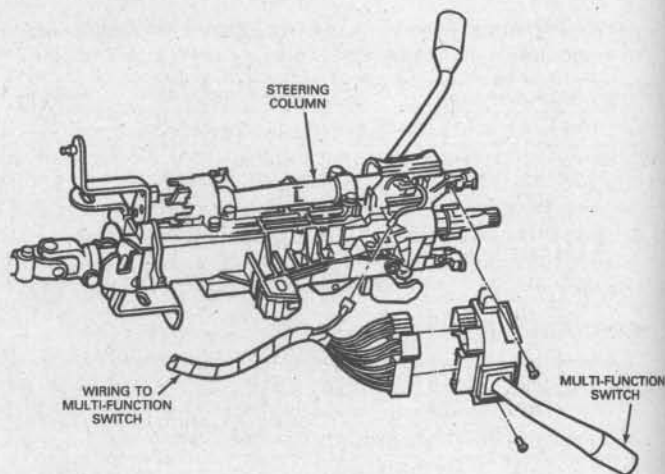
#### Check

- Disconnect the negative cable from the battery.
- Remove the screws securing the steering column shrouds and remove the shrouds.
- Remove the electrical connector from the ignition switch (see illustration).
- Using switch pin identifier and check diagram, perform circuit continuity checks as shown (see illustrations).
- If any checks fail, replace the switch.

#### Replacement

##### Early models

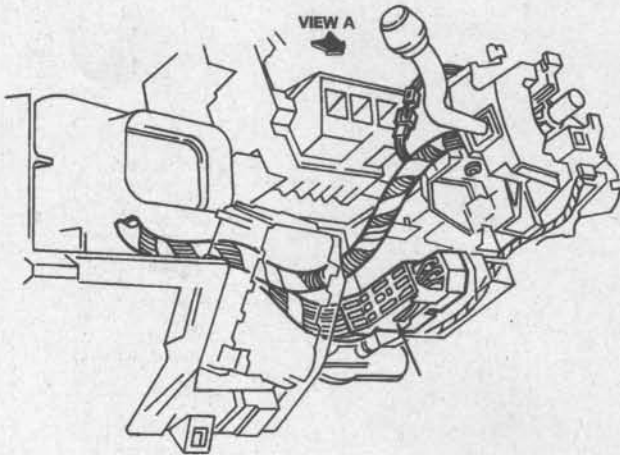
- Remove the bolts securing the steering column support bracket. Lower and support the steering column.
- Remove the nuts securing the ignition switch to the steering column. Lift the switch up, disengage the actuator rod from the switch and remove the switch.
- When installing the ignition switch, both the lock cylinder and the



9.19 If the multi-function switch must be removed, remove the two retaining screws and remove switch from steering column

ignition switch must be in the LOCK position. Place the lock cylinder in LOCK and remove the key. Place the ignition switch in the LOCK position and insert a 5/64-inch drill bit into the locking pin hole on the side of the switch. **Note:** New replacement switches will already be pinned in the LOCK position by a shipping pin.

- Install the switch by first engaging the actuator rod into the switch. Position the switch on the steering column and install the nuts finger tight.

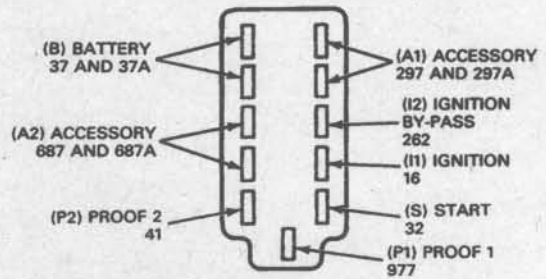


10.3 Location of ignition switch and wiring harness connector (later model shown - for early model, see illustration 9.1)

- 10 Move the switch up and down along the steering column and when you locate the mid-point of rod lash, tighten the retaining nuts.
- 11 After removing the lock pin, the remainder of installation is the reverse of removal. Check the operation of the ignition switch in all the positions.

**Later models**

- 12 Place the ignition key in the RUN position.
- 13 Remove the ignition switch retaining screws (a special TORX type bit will be required).
- 14 Remove the switch from the steering column.
- 15 To install, align the switch pin with the slot in the lock/column assembly (see illustration on following page). **Note:** Both the switch and the ignition key should be in the RUN position, the slot will align with the index mark in the steering column casting when positioned correctly.
- 16 Install and tighten the switch retaining screws.
- 17 The remainder of installation is the reverse of removal.



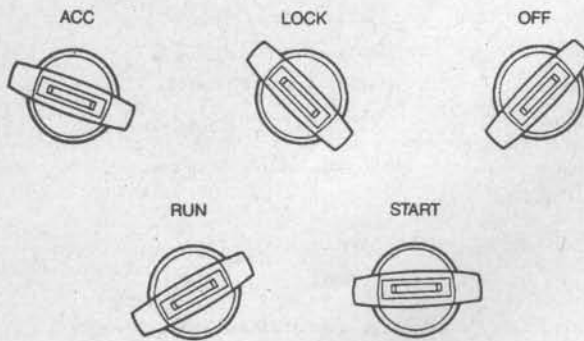
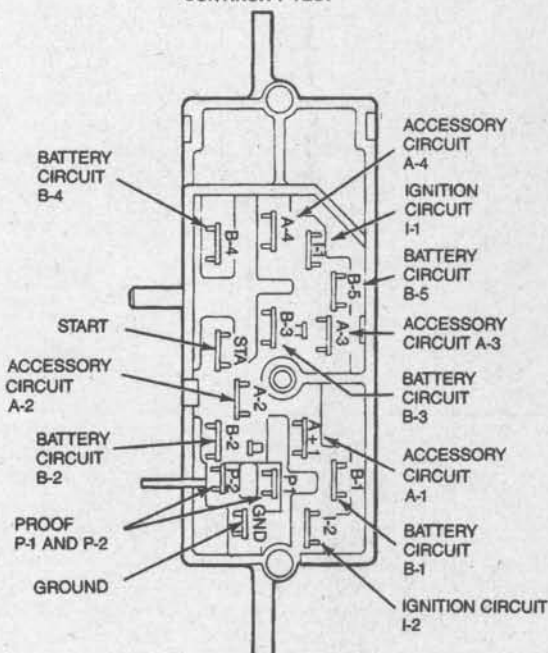
- SWITCH POSITION: CONTINUITY SHOULD EXIST ONLY BETWEEN:
- ACCESSORY 37-37A;297-297A;687-687A
  - LOCK 37-37A;297-297A;687-687A
  - OFF 37-37A;297-297A;687-687A
  - RUN 16-37-37A-297-297A-687-687A
  - START 41-977-GROUND; 37-37A-32-262
- CONTINUITY BETWEEN CIRCUIT 16 AND CIRCUITS 37-37A - 32-262 IN START POSITION IS ALSO PERMISSIBLE.
  - CIRCUIT PAIRS 37 AND 37A, 687 AND 687A, AND 297A ARE CONNECTED TOGETHER INTERNALLY IN THE SWITCH.

10.4a Ignition switch circuit continuity checks (early models) - check each combination of pins in the various key positions as shown

**Key lock cylinder Check**

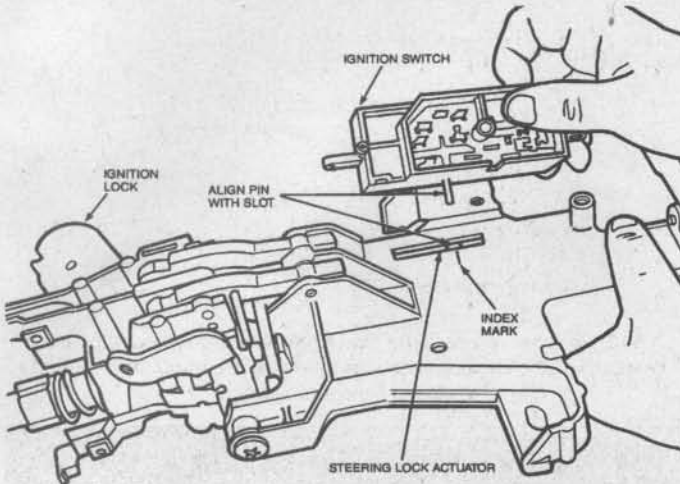
18 Test the steering column ignition system mechanical operation by rotating the key through all switch positions. The movement should feel smooth with no sticking or binding. The ignition switch should return from the Start position to the Run position without assistance (spring return). If sticking or binding is encountered, remove the lock cylinder assembly and check for burrs on the key and for binding of the lock cylinder. If damage is evident, replace the lock cylinder assembly.

**CONTINUITY TEST**



SWITCH POSITION	CONTINUITY SHOULD EXIST ONLY BETWEEN
ACC	A-1 THROUGH B-5
LOCK	NO CONTINUITY
OFF	NO CONTINUITY
RUN	A-1 AND B-1, A-2 AND B-2, A-3 AND B-3, A4 AND B4, I1 AND B5
START	I-1 AND B-5, I-2 AND B-1, STA AND B-4, P-1 AND GRD, P-2 AND GRD.

10.4b Ignition switch circuit continuity checks (later models) - check each combination of pins in the various key positions as shown



10.15 When installing the ignition switch, align the switch pin with the slot in the lock/column assembly as shown - make sure both key and switch are in the RUN position

**Replacement**

**Note:** The following procedure pertains only to functional lock cylinders for which keys are available or for which keys can be made when the lock cylinder number is known. If the ignition lock is inoperative and the lock cylinder cannot be turned due to a lost or broken key and the key number is not known, or the lock cylinder cap is damaged and/or broken to the extent that the lock cylinder cannot be turned, have the lock cylinder assembly replaced by a dealer service department or other repair shop. Replacement will likely involve installation not only of a new lock cylinder but a new lock cylinder housing as well, a procedure that requires disassembly of the steering column.

- 19 Detach the cable from the negative terminal of the battery.
- 20 On early models, remove the steering wheel (refer to Chapter 10).
- 21 On later models, remove the steering column trim shrouds.
- 22 Turn the lock key to the Run position.
- 23 Place a 1/8-inch drill bit in the hole in the casting surrounding the lock cylinder (early models or in the hole in the trim shroud (later models) (see illustrations). Depress the retaining pin while pulling out on the lock cylinder to remove it from the column housing.
- 24 Install the lock cylinder by turning it to the Run position and depressing the retaining pin. Insert the lock cylinder into the lock cylinder housing. Make sure that the cylinder is completely seated and aligned in the interlocking washer before turning the key to the Off position. This will permit the retaining pin to extend into the hole.
- 25 Turn the lock to ensure that the operation is correct in all positions.
- 26 The remainder of installation is the reverse of removal.

**11 Headlight switch – check and replacement**

Refer to illustrations 11.1, 11.4, 11.7 and 11.12

**Check**

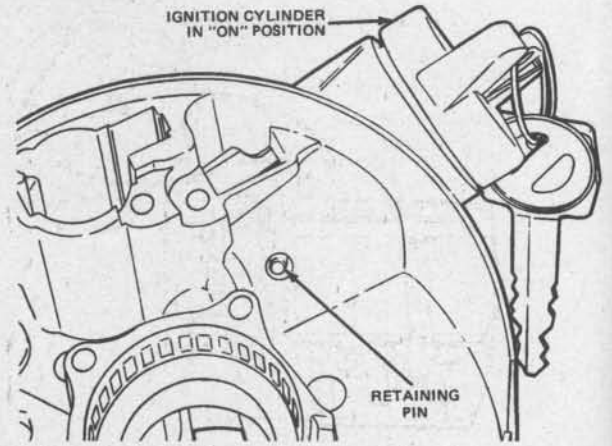
**Note:** A self-powered test light or ohmmeter will be required for the following checks.

- 1 Refer to the accompanying table and perform continuity checks between the indicated terminals (see illustration). Early models may have different terminal locations, but wire color has remained the same.
- 2 If the headlight switch fails any of the above checks, replace it.

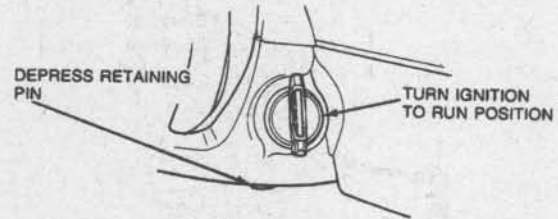
**Replacement**

**Early models**

- 3 Disconnect the cable from the negative battery terminal.
- 4 Remove the knob on the switch by reaching under the dash and pressing the shaft lock tab while pulling the knob and shaft away from the cluster panel (see illustration).

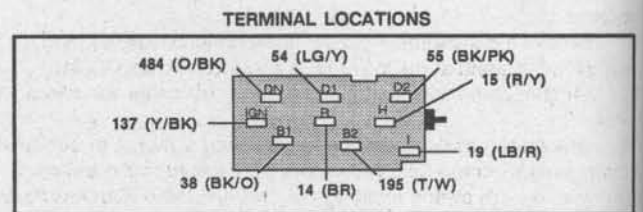


10.23a Location of the lock cylinder retaining pin on an early model non-tilt steering wheel



10.23b Location of the lock cylinder retaining pin hole in the trim shroud on later model steering columns

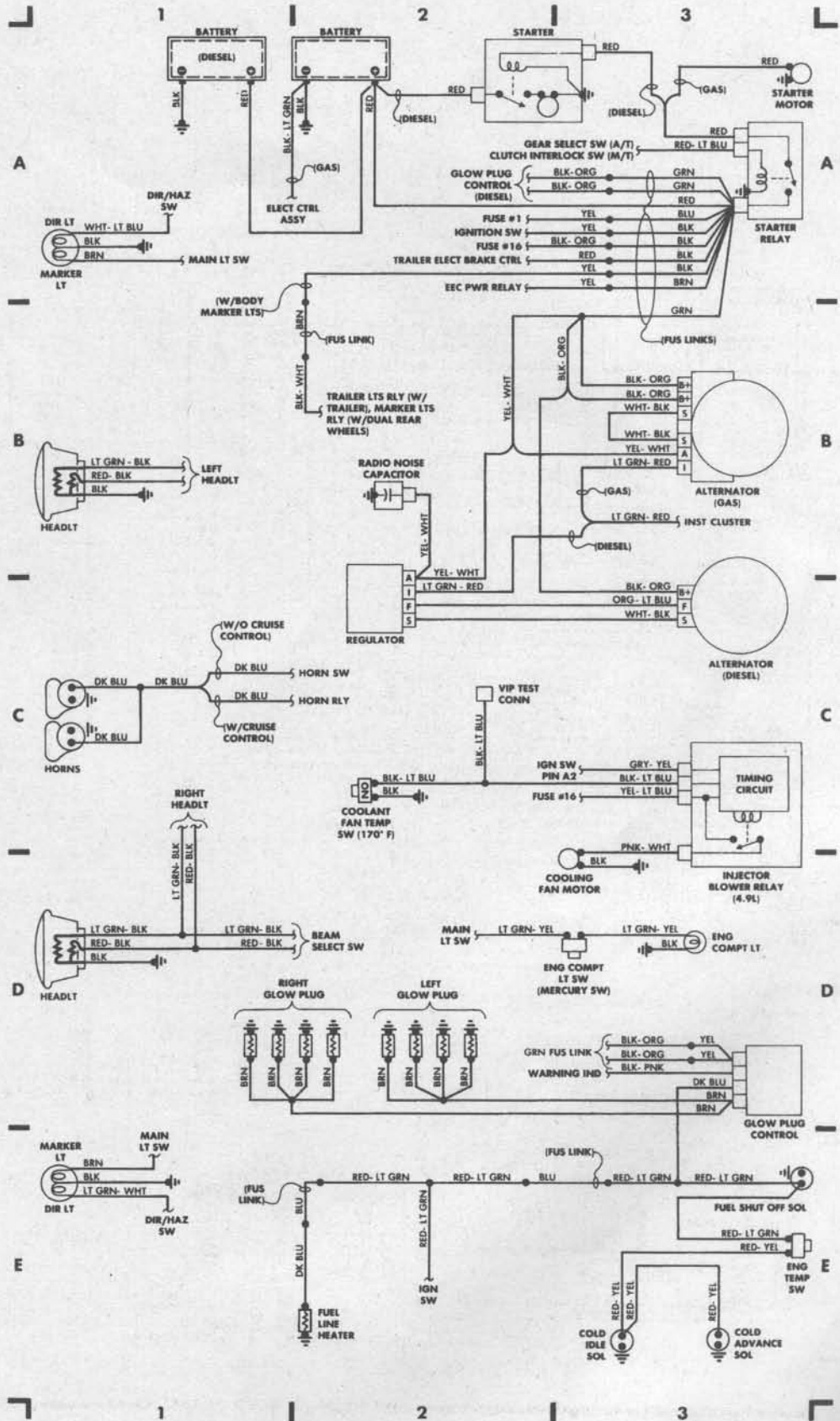
TO TEST	Connect Self-Powered Test Lamp or Ohmmeter to Terminals	Move Switch to These Positions	A Good Switch Will Indicate
Headlamp Circuit	38 BK/O (B1) and 15 R/Y (H)	Off Park Head	Open Circuit Open Circuit Closed Circuit
Park Lamp Circuit	195 T/W (B2) and 14 BR (R)	Off Park Head	Open Circuit Closed Circuit Closed Circuit
Dome Light Circuit	54 LG/Y (D1) and 55 BK/PK (D2)	Thumbwheel rotated full left (in Detent) Thumbwheel rotated fully right (Out of Detent)	Closed Circuit Open Circuit
Panel Light Dimmer Circuit	14 BR (R) and 19 LB/R (I)	Thumbwheel rotated left from full right position	Ohmmeter Will Show Smoothly Increasing Resistance
Ignition On, Lamps Off Circuit	137 Y/BK (IGN) and 484 O/BK (DN)	Off Park Head	Closed Circuit Open Circuit Open Circuit
Cluster Dimmer Circuit	19 LB/R (I) and 484 O/BK (DN)	Off Park Head	Open Circuit Closed Circuit Closed Circuit



11.1 Headlight switch continuity chart

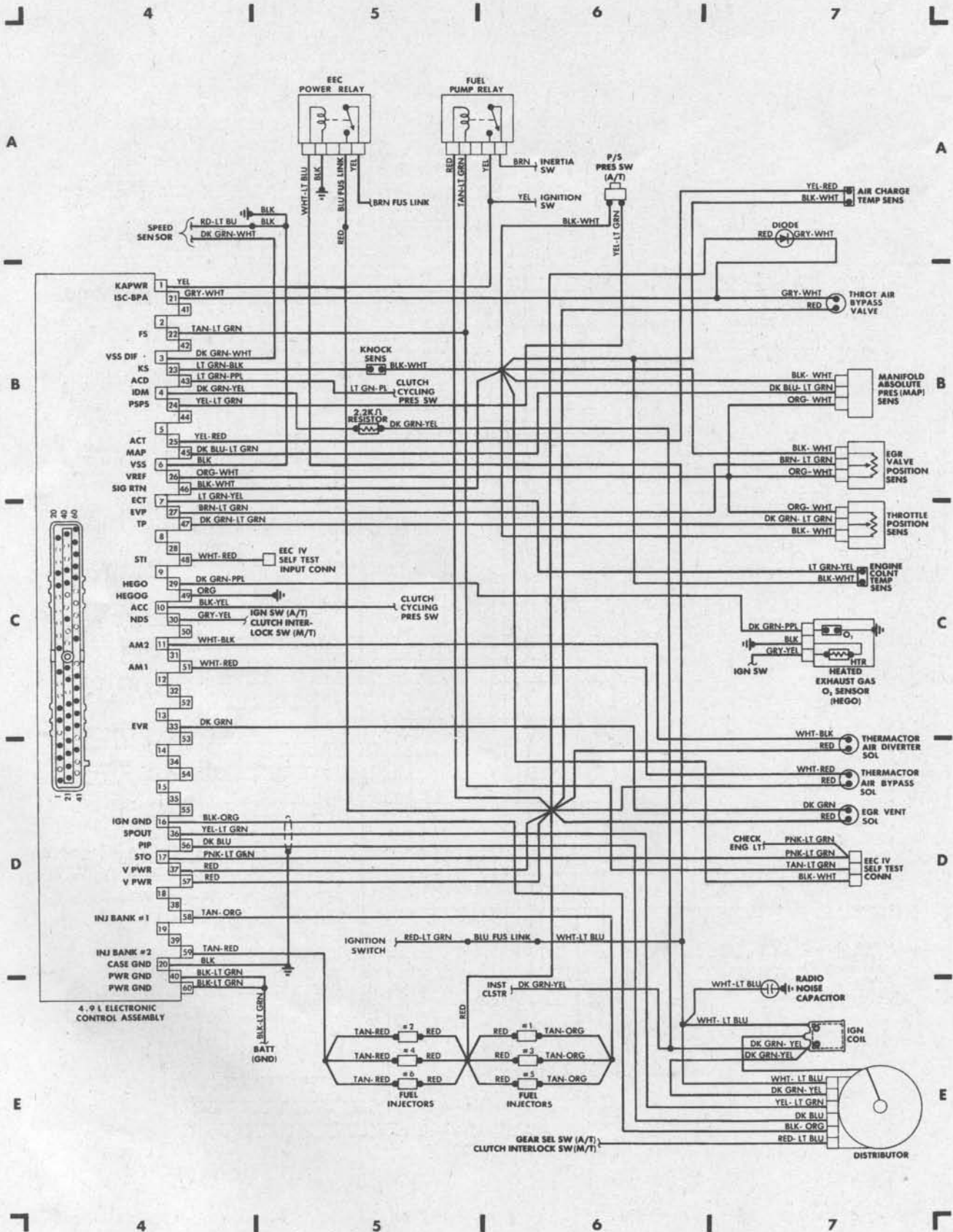
**COMPONENT LOCATOR:**

A/C SYSTEM ..... B-D 18-19  
 ALTERNATOR ..... B 3, C 3  
 ANTI-LOCK BRAKES ..... A-B 16-17  
 BACK-UP LT SWITCH ..... B 12  
 BATTERY ..... A 1, A 2  
 BEAM SELECT SWITCH ..... D 15  
 BLOWER MOTOR ..... B 18, E 18  
 BRAKE WARN SENS ..... B 22  
 CAB MARKER LTS ..... D 14  
 CARGO LIGHT ..... D 24  
 CIGARETTE LIGHTER ..... C 15  
 CLUTCH CYCLING PRES SWITCH ..... C-D 18, C-D 19  
 CLUTCH INTERLOCK SW ..... A 12  
 COLD IDLE & ADVANCE SOLS ..... E 3  
 COOLING FAN MOTOR ..... D 3  
 CRUISE CONTROL ..... C-D 16-17  
 DEFOGGER ..... E 20-21  
 DIR FLASHER ..... C 13  
 DIR/HAZ SWITCH ..... D 20  
 DISTRIBUTOR ..... E 7, E 11  
 DOME LIGHTS ..... C 24, E 25  
 DOME/MAP LIGHTS ..... D 24, E 25  
 DOOR CONTROL SWITCH ..... C-D 24  
 DOOR SWITCHES ..... C 25  
 EEC POWER RELAY ..... A 5, A 9  
 EEC SELF TEST CONN ..... D 7, D 11  
 ELECT CTRL ASSY (4.9L) ..... B-D 4  
 ELECT CTRL ASSY (5.0L, 5.8L & 7.5L) ..... B-D 8  
 ELECT SHIFT CTRL ..... A-B 17-19  
 ENG COMPT LIGHT ..... D 3  
 ENG SPEED SENS (DIESEL) ..... A 21  
 4WD IND SWITCH ..... B 21  
 FUEL INJECTOR ..... E 5-6, E 9-10  
 FUEL LEVEL SENDERS ..... C-E 26  
 FUEL LINE HEATER (DIESEL) ..... E 2  
 FUEL PUMP ..... C 23, C 27  
 FUEL PUMP RELAY ..... A 6, A 10  
 FUEL SHUT-OFF SOL (DIESEL) ..... E 3  
 FUEL WATER SW (DIESEL) ..... E 23  
 FUSE BLOCK ..... B-C 13-14  
 FUS LINKS ..... A-B 2-3  
 GEAR SELECT SW ..... B 12  
 GLOVE BOX LT ..... C 26  
 GLOW PLUG CONTROL ..... D 3  
 HAZ FLASHER ..... C-D 22  
 HEATER ..... E 18-19  
 HEGO SENSOR ..... C 7, C 11  
 HORN RELAY ..... B 15  
 HORN SWITCH ..... C 15  
 IGNITION COIL ..... E 7, E 11  
 IGNITION SWITCH ..... A 12-15  
 ILLUM LIGHTS ..... C-D 12-13  
 INERTIA SWITCH ..... C 23, C 27  
 INFERRED MILEAGE & EXTENDED USEFUL LIFE MOD ..... C 22  
 INJECTOR BLOWER RELAY ..... C 3  
 INST CLUSTER ..... A-C 20  
 INTERIOR LIGHTS ..... C-E 25-26  
 INTERVAL GOVERNOR ..... D 13  
 KEY IN SWITCH ..... D 23  
 LEFT DOOR SWITCH ..... C 25  
 LOW VAC WARN SW ..... B-C 22  
 MAIN LIGHT SWITCH ..... C-D 14-15  
 MARKER LIGHT RELAY ..... B 27  
 P/S PRES SW ..... A 5, A 10  
 POWER DOOR LOCKS ..... C-E 24  
 POWER TAILGATE WDO ..... A-B 25-26  
 POWER WINDOWS ..... A-B 24-25  
 RADIO (PARTIAL) ..... D 23  
 REAR BODY MARKER LIGHTS ..... C 27  
 REAR DEFOGGER ..... E 20-21  
 SEAT BELT SWITCH ..... E 23  
 SPEED SENSOR ..... C 17  
 STARTER ..... A 2, A 3  
 STARTER RELAY ..... A 3  
 STOP LIGHT SWITCH ..... D 21  
 TAILGATE WINDOW SWITCH ..... A 26  
 TRAILER CONN ..... B 27, D 27  
 TRAILER ELECT BRAKE CONTROL ..... A-B 26  
 TRAILER LT RELAY ..... B 27  
 WARNING BUZZER ..... D 23  
 WARNING IND (DIESEL) ..... E 22-23  
 W/SHIELD WIPER & WASHER MOTOR ..... E 16-17  
 W/SHIELD WIPER SWITCH ..... D-E 12, E 13-14



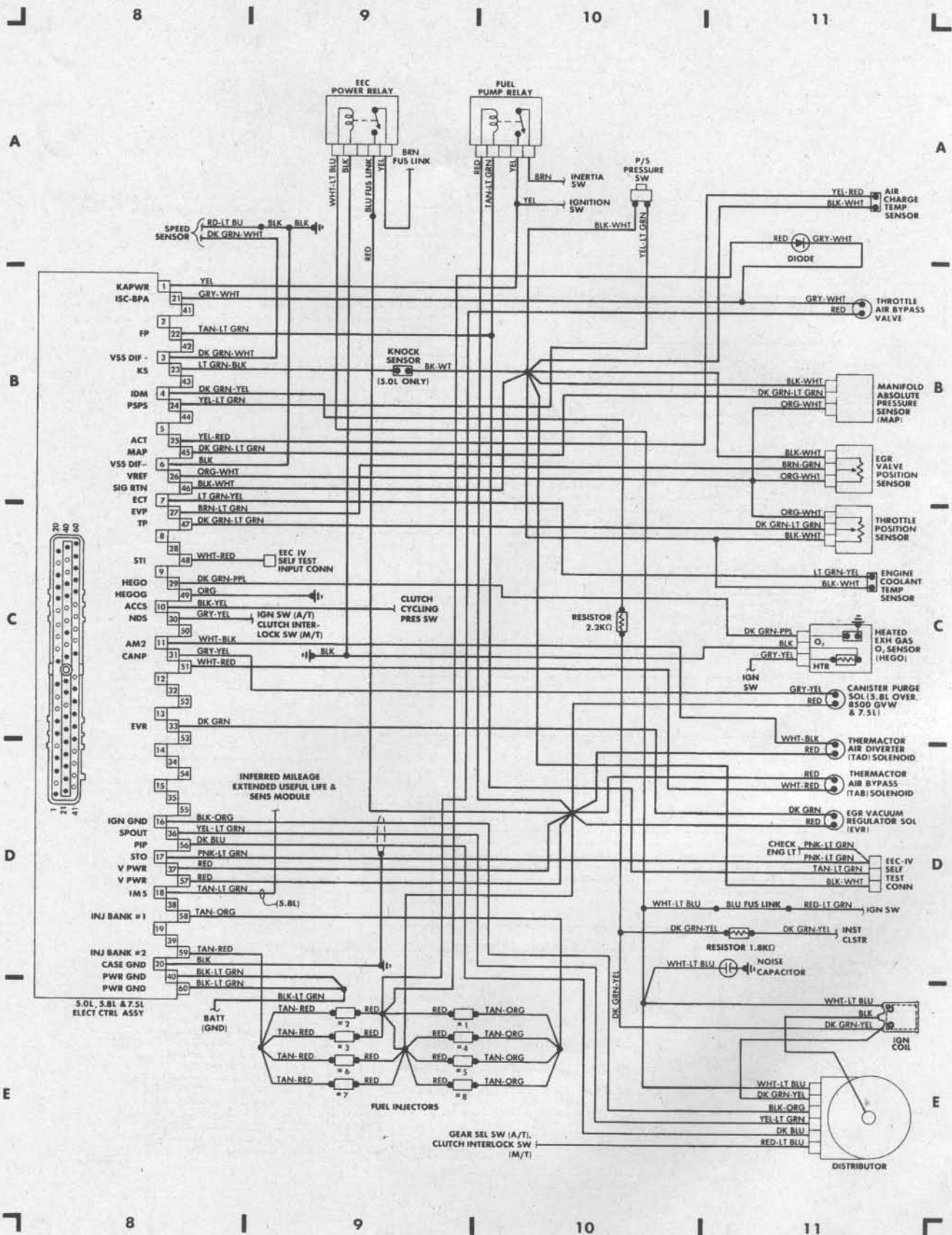
1987 through 1989 F-Series/Bronco wiring diagram (1 of 7)

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1987 through 1989 F-Series/Bronco wiring diagram (2 of 7)

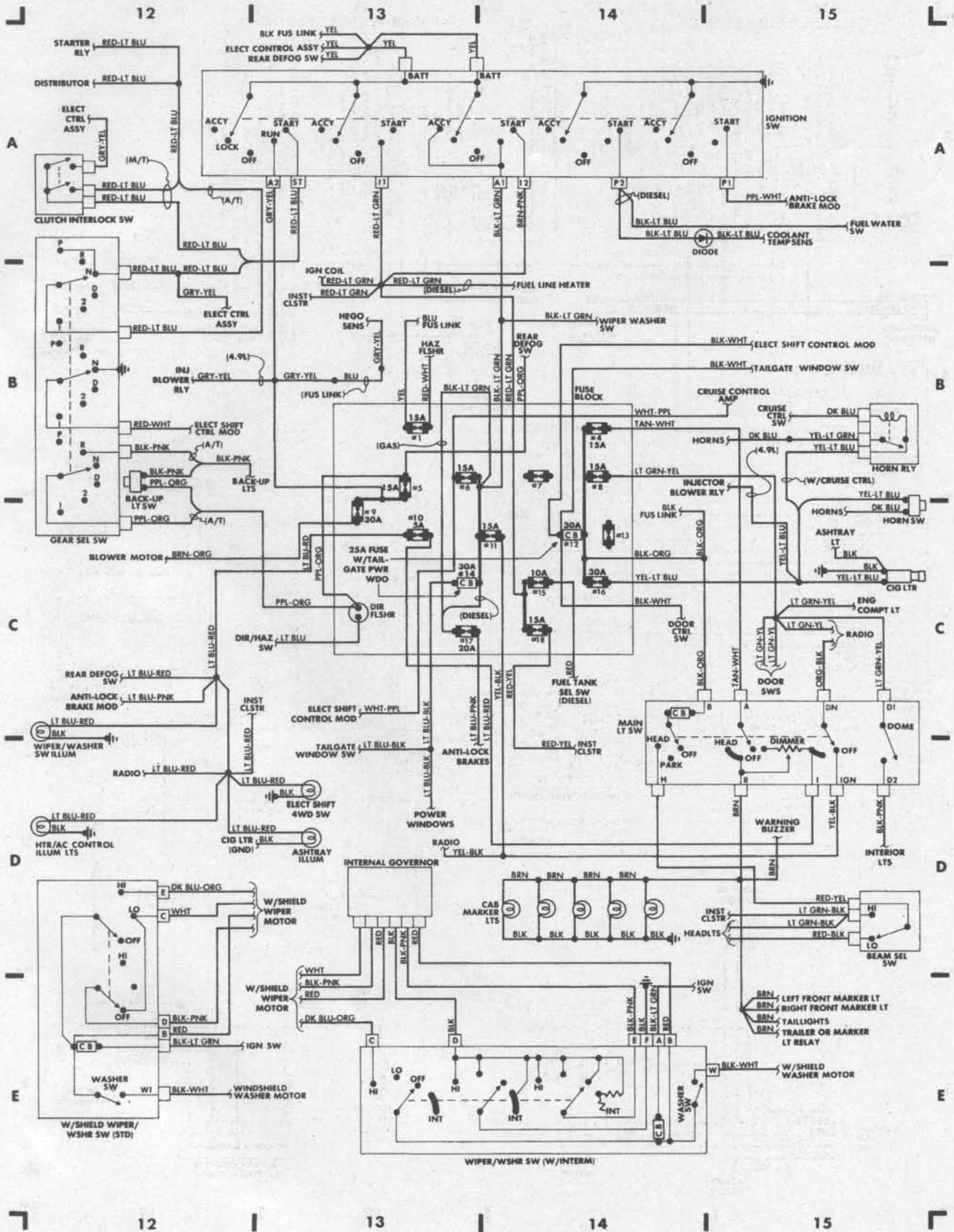
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1987 through 1989 F-Series/Bronco wiring diagram (3 of 7)

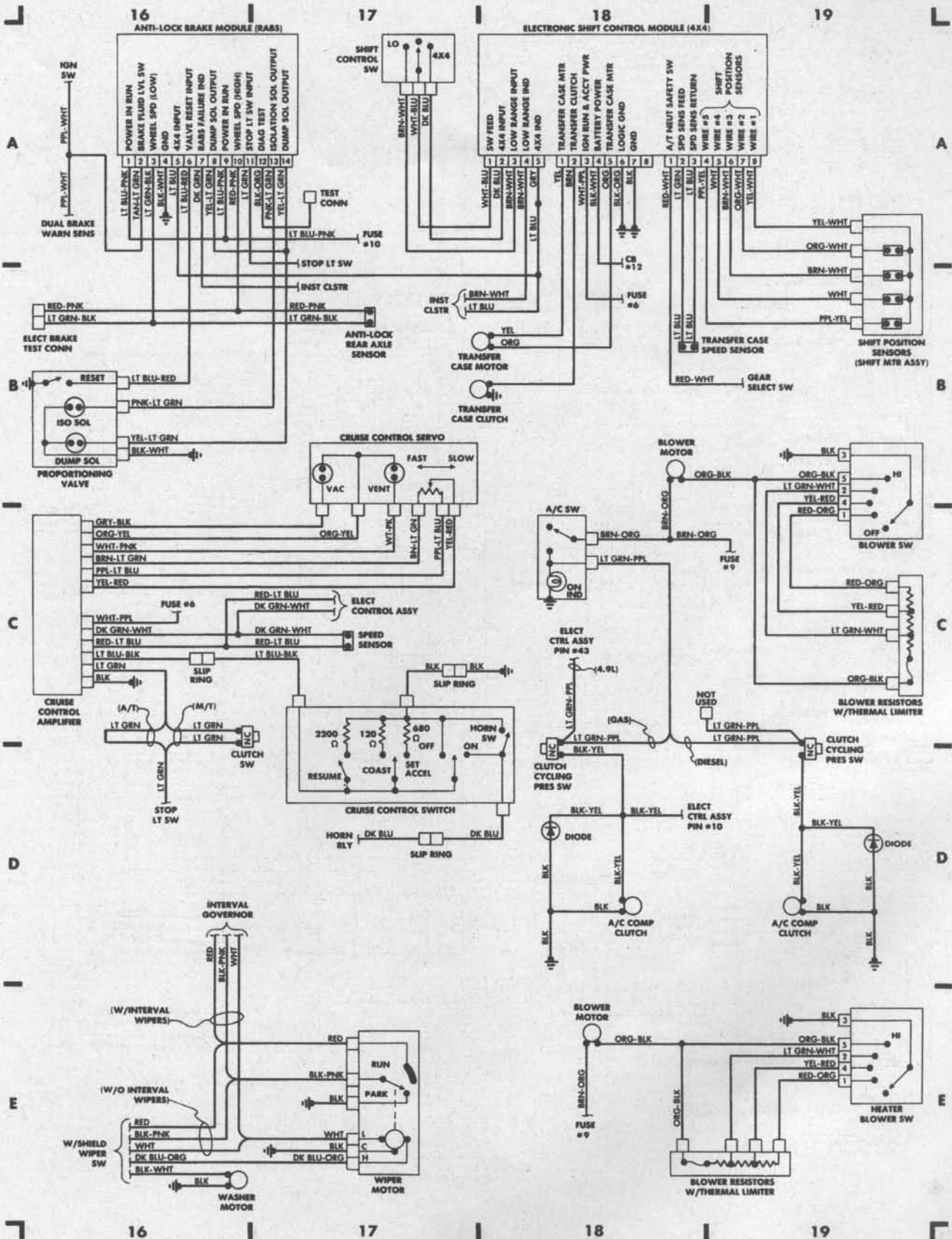
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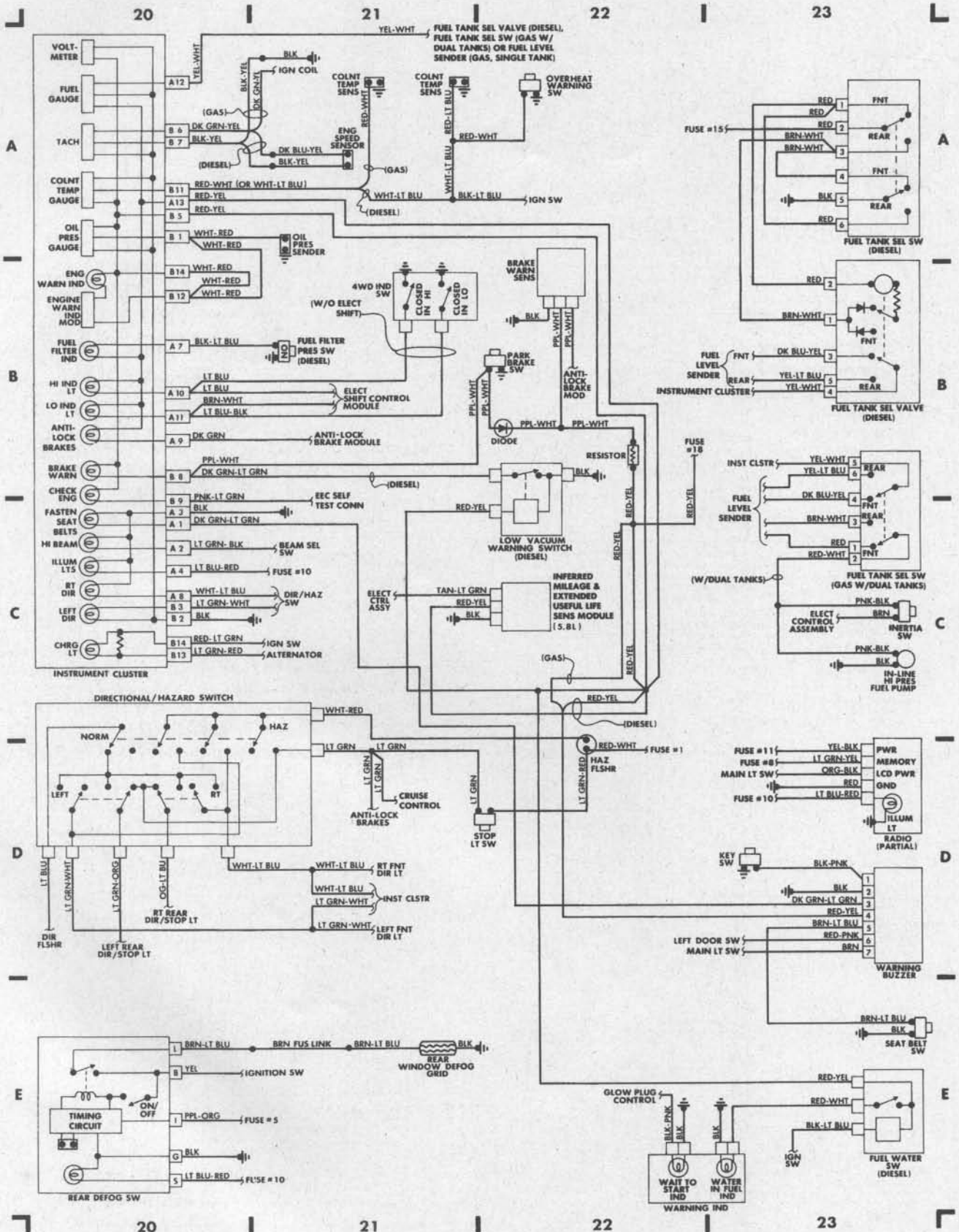
1987 through 1989 F-Series/Bronco wiring diagram (4 of 7)

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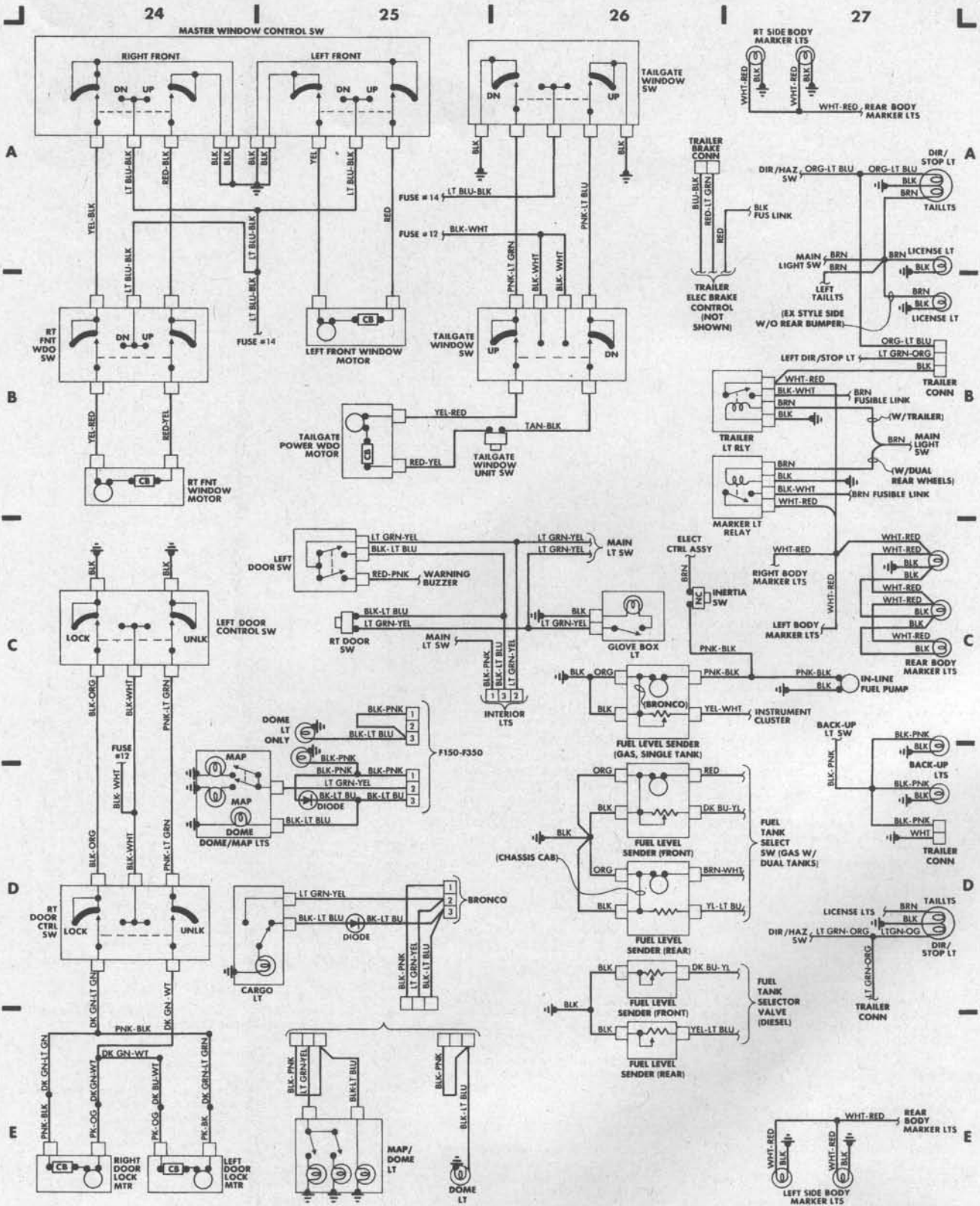
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