SECTION 11-CHASSIS ELECTRICAL

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BATTERY DESCRIPTION

The battery used on vehicles with standard equipment, is 12 volt, 6 cell, 11 plate per cell construction and is rated at 55 ampere-hours (660 watt-hours). On vehicles equipped with air conditioning and/or Quadri-Beam headlamps, a 78 plate battery rated at 70 ampere-hours (840 watt-hours) is used.

The electrical system is NEGATIVE ground. When removing battery from the vehicle, it is important to remove the negative (ground) connection from the battery post first, thus eliminating any possibility of short circuit damage. When installing battery, connect the positive (starter solenoid) cable to positive battery post first.

BATTERY PRINCIPLES OF OPERATION

The battery is constructed in such a manner that each cell contains positive and negative plates alternately placed next to each other. Each positive plate is separated from a negative plate by a non-conducting porous separator which prevents the plates from touching each other. If any of the positive plates should make contact with negative plates within a cell, the cell will short circuit and no longer be useful. All of the positive plates are welded to a post strap, forming a positive group, and all the negative plates are welded to a similar post strap, forming a negative group.

Each positive plate is composed of a lead grid with lead peroxide (lead and oxygen) pasted into the grid openings. The negative plates are composed of a lead grid with spongy lead pasted into the grid openings.

The liquid solution, called electrolyte, is comprised of sulphuric acid and water mixed together to form a sulphuric acid solution.

When the battery is in a fully charged state, the positive plates are composed of lead peroxide and the negative plates are spongy lead.

As the battery is discharged, the sulphate portion of the electrolyte starts to combine chemically with the lead on the positive and negative plates. The oxygen leaves the positive plates and combines with

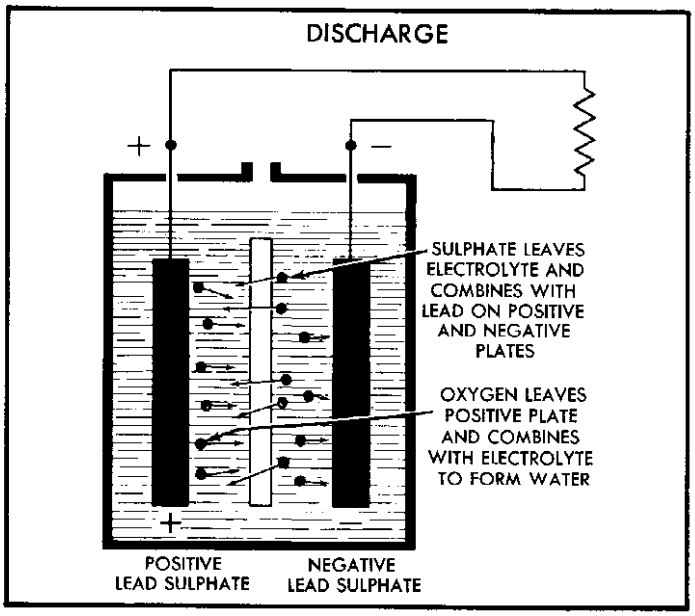

Fig. 11-1—Battery Discharge

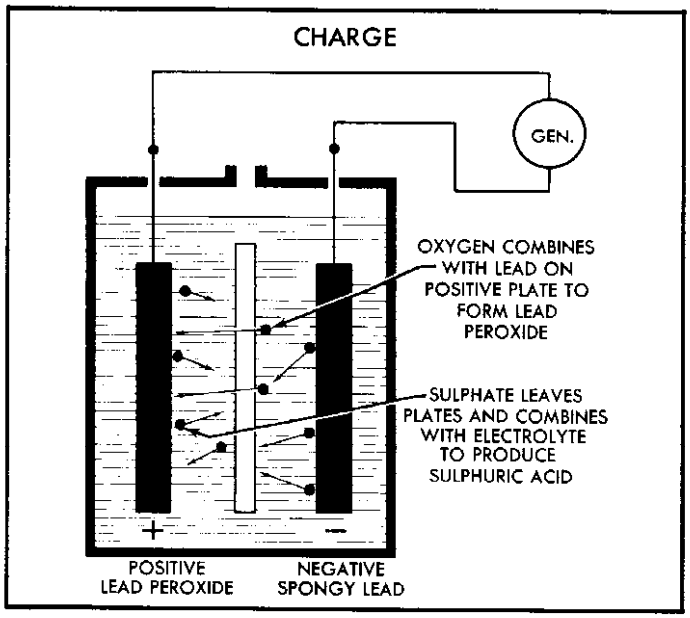

Fig. 11-2—Battery Charge

the electrolyte to form water.

As the battery continues to be discharged, see figure 11-1, the electrolyte reverts mostly to water and the positive and negative plates become lead sulphate.

When the battery is being charged, the lead sulphate is driven off the positive and negative plates back into solution to form sulphuric acid again. The positive plate again becomes lead peroxide by having the oxygen combine with the lead, and the negative plate reverts back to spongy lead. See figure 11-2.

If a battery is allowed to remain in a discharged state (below 1.250) for prolonged periods of time, the sulphate on the plates in the form of lead sulphate will crystallize and harden (sulphation) and the battery may not accept a charge. Before attempting to charge a discharged battery, it should be tested for sulphation. See "Battery Charge Test (3-Minute)". In most cases a sulphated battery can be made serviceable by cycling. To cycle a battery, it must first be completely discharged slowly, then slow charged until specific gravity no longer increases for three successive readings taken at hourly intervals. It may be necessary to cycle badly sulphated batteries more than once.

SPECIFIC GRAVITY OF BATTERY ELECTROLYTE

The specific gravity of battery electrolyte indicates the state of charge of the battery. The electrolyte in a fully charged battery is approximately 1.280 times as heavy as pure water when both liquids are at the same temperature. Therefore, the electrolyte of a fully charged battery would be described as having a specific gravity of 1.280. As previously stated, when the battery discharges, sulphuric acid in the electrolyte combines chemically with the plates, thus lightening the weight of the remaining electrolyte. The battery hydrometer will determine the specific gravity of the electrolyte in a cell. The amount of unused sulphuric acid in the solution is a measure of the degree of charge of a normal cell.

The table below illustrates a typical range of specific gravity for a cell in various stages of charge based on the ability of the battery to "turn over" the engine at 80° F.

SPECIFIC GRAVITY	PER CENT OF CHARGE
1.280	100%
1.250	75%
1.220	50%
1.190	25%
1.160	Limited Useful Capacity
1.130	Discharged

When reading a hydrometer, hold hydrometer vertically and draw just enough acid up into the barrel to raise the float. The float must not touch the sides, nor the top or bottom stoppers of the barrel. Read the hydrometer with the eye on a level with the liquid surface in the barrel. Hydrometer readings will be correct at temperatures from 70° F. to 90° F. and readings need not be corrected.

Readings must be compensated to .004 specific gravity for each 10° F. change in temperature above or below 80° F. For every 10° above 80° add .004 gravity points and for every 10° below 80° subtract .004 gravity points. For example, an uncorrected reading of 1.220 specific gravity with an acid temperature

of 0° F., would indicate a 50% charged battery. However, with a temperature correction of .004 specific gravity for each 10° F. change from the reference temperature of 80° F. or .032 specific gravity (8 x .004 = .032), the corrected hydrometer reading would be 1.188 specific gravity (1.220 — .032 = 1.188) or approximately a 25% charged battery. Most hydrometers have a small thermometer and correction scale built in so that a temperature correction can be readily made.

Gravity readings should not be taken immediately after water has been added to the battery, or immediately after it has been rapidly discharged, such as after prolonged cranking; nor should readings be taken immediately after the battery has been charged at a high rate. If water must be added to obtain a gravity reading, charge the battery after covering the plates to the recommended level. The water and acid will mix rapidly by the resultant gassing. Never transfer electrolyte from one cell to another.

Battery Efficiency at Low Temperatures

The lower the temperatures at which a battery is required to operate, the more necessary it is that the battery be maintained in a fully charged condition. A battery having a low specific gravity of 1.225 at 80° F. will operate the starter at warm temperatures but may fail at extremely low temperatures due to the lower battery efficiency at a low temperature. The following table shows the efficiency of a fully charged battery at various temperatures.

BATTERY EFFICIENCY AT VARIOUS TEMPERATURES

Temperature	Efficiency of a Fully Charged Battery
80° F.	100%
50° F.	82%
30° F.	64%
20° F.	58%
10° F.	50%
0° F.	40%
— 10° F.	33%

BATTERY CARE AND MAINTENANCE

Maximum battery life can be obtained only when proper care and periodic inspection is given the battery. It is also important that output capacity not be exceeded by constant and excessive overloading and that charging requirements be maintained.

Water is one of the essential chemicals of a storage battery and under normal conditions of operation, is the only component of the battery which is lost as a result of charging. It is important that the recommended level of electrolyte be maintained for maximum battery life. The following steps must be observed when servicing a battery:

1. Never allow the electrolyte level to drop below the top of the plates, otherwise the acid will reach a high concentration that will damage the separators and impair the performance of the plates. The plates must be completely covered by the electrolyte to take full part in the battery performance. The level of the electrolyte is correct when the liquid just covers the ring in bottom of filler well.
2. Check the level of the electrolyte, when at or near room temperature.
3. When refilling battery cells, use distilled water or purified tap water. Do not use rain or well water.
4. Always keep battery at least 3/4 charged, otherwise the battery plates will become sulphated and loss of efficiency will result with possible damage from freezing during winter weather.
5. AVOID OVERCHARGING a battery. Excessive charging will create high internal heat, expanding the positive plates and causing them to buckle and warp. Distortion of the battery case and displacement of the sealing compound will also result.
6. Fast charging causes a rapid rise in battery temperature. Do not allow the temperature to exceed 125° F., otherwise the battery may be severely damaged. Safe, fast-charge equipment is available which incorporates a precision thermostat that automatically shuts off the fast charger when the battery temperature reaches 125° F. Thermostatic control assures maximum charge in the shortest

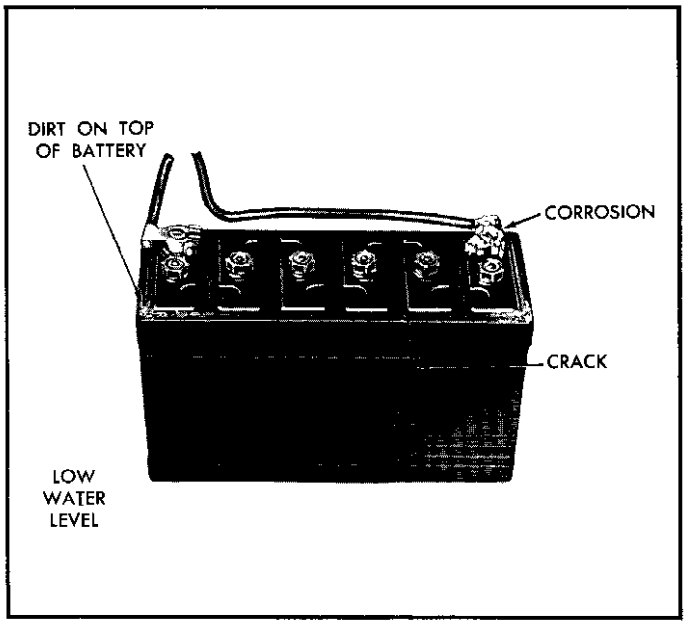

Fig. 11-3—Visual Inspection of Battery

possible time. Maximum fast charge rate for a 12-volt battery should not exceed 30 amperes.

7. Never add sulphuric acid to a cell unless the electrolyte has been lost through spilling. Any electrolyte added must be at the proper specific gravity.

Battery Discharge Time for Electrical Equipment

The following items contribute to battery failure if operated without engine running:

CONDITION	TIME REQUIRED TO DISCHARGE A NEW BATTERY TO 1.200 SP. GR.
Headlamps on	2½ hours
Cigar Lighter on	4 hours
Road Lamps on	6 hours
Door left open	7 hours
Heater on	7 hours
Defroster on	7 hours
Parking Lights on	6 hours
Radio on	8 hours
Ignition Switch on	15 hours
Back-up Lamps on	15 hours
Turn Signals on	16 hours
Deck Lid open	96 hours
Glove Box open	150 hours
Car in new car storage (at 70° F.)	750 hours

These items often appear in combinations. Their effect on the battery then increases. For example: If the door was left open (7 hours) and the radio was turned on (8 hours) their cumulative effect would cause the battery to discharge in 3 hours to 25% capacity.

Visual Inspection of Battery

When making a visual inspection of the battery, it is necessary to inspect for the following conditions:

1. Battery too loose or too tight in the compartment.
2. Corroded cables and connections.
3. Loose connections and worn insulation.
4. Correct electrolyte level.
5. Cracked, swollen or distorted case.
6. Cracked or broken cell covers.
7. Dirt or moisture covered battery. The rate of discharge will be greater than normal if a considerable amount of electrolyte had been spilled over the battery or if the top of the battery is found covered with dirt. It is important that the battery be kept clean at all times. See figure 11-3.

REMOVAL OF BATTERY

To remove battery from compartment, proceed as follows:

1. Remove negative (ground) cable from battery terminal first. Then remove positive cable from battery terminal. If the terminal clamps do not remove easily, use Terminal Clamp Lifter Tool M-276-21. To remove terminal with Tool M-276-21, press upper extension on jaws and drop lifter over terminal clamp as far as possible. Release pressure and turn screw to the right until clamp is lifted or removed.
2. Loosen nuts which secure hold-down clamp. Unhook studs and remove battery hold-down clamp.
3. Lift the battery from the compartment with a carrier strap secured to each terminal post.

INSTALLATION OF BATTERY

Before installing battery, inspect the battery compartment, top clamp and studs for possible damage caused by acid corrosion from the battery. Make sure compartment is free of hardware or objects which would cause damage to the battery case. Corroded parts, cable terminal clamps and battery top may be cleaned with water, to which some household ammonia or sodium bicarbonate (baking soda) has been added. Scrub with a stiff bristle brush. Do not file or scrape the lead coating off the brass terminal clamps. Dry the steel parts and paint with a black acid-proof paint.

Do not paint battery terminals or cable clamps. Examine cables to be sure that insulation is adequate and that the cable clamps and battery terminals are clean. Inspect cables for broken or frayed conductors. Battery terminals and the inside of the cable clamps should be cleaned bright with sandpaper or wire brush. A thin film of mineral grease or vaseline should be applied to the cable clamps and over the bolt studs after connections are made. Clean and tighten ground connection and check starter connections at the starter solenoid for tightness.

1. Attach a carrier strap to each terminal of the battery and place battery in its compartment.
2. Place top clamp over battery edges and install hold-down studs. Tighten nuts securely but not excessively, otherwise the battery case may distort and crack, causing loss of electrolyte from the cells.
3. Spread the cable clamps apart with a wide blade screwdriver sufficiently to allow an easy fit over the battery terminals. Install positive starter solenoid cable to positive terminal of battery first. Connect negative (ground) cable to battery terminal last. Tighten cable clamp bolts securely.

CAUTION: *Correct installation is necessary, otherwise damage to the electrical system will result.*

BATTERY CHARGE TEST (3-MINUTE)

A charged battery can be tested by determining its ability to deliver current.

A discharged battery can be tested by determining its ability to accept a charge.

The following test procedure will determine the condition of a charged or discharged battery, based on the above principle:

1. After making a visual inspection of the battery, make the "Battery Capacity Test" of this section, noting the voltage under a load of 3 times the ampere hour rating.
2. If voltage is 9.25 VOLTS OR MORE, battery has good output capacity and will readily accept a normal charge. If specific gravity reading is 1.250 or more, slow charge battery at a 3 to 4 ampere rate until battery is fully charged. If gravity is below 1.250, test the charging system to determine cause. Slow charge battery at a 3 to 4 ampere rate until battery is fully charged.
3. If voltage is BELOW 9.25 VOLTS, test charge the battery as follows:
   (a) Connect fast charger to battery and charge at a rate of 30 amperes for 3 minutes or maximum rate if 30 amperes cannot be obtained.
   (b) After 3 minutes of fast-charge, with charger still operating on fast-charge, test individual cell voltages of battery. See "Individual Cell Test" of this section. If cell voltages are even, ± .2 volt, test total battery voltage with charger still operating on a fast charge and proceed with steps 4 and 5. If cell voltages are uneven by more than .2 volt, charge battery according to "Charging the Battery" and retest. If cell voltages remain uneven by more than .2 volt, then battery must be replaced.
4. If total charging voltage is UNDER 15.5 VOLTS, test specific gravity. The battery can be fast-charged according to the times listed in the included table, followed with a slow charge for a length of time sufficient to bring the battery to a full state of charge. Be sure that maximum fast-charge rate of 30 amperes is not exceeded. Slow charging should be at a rate of 3 to 4 amperes. Slow-charge until gravity rises to 1.270 and does not increase after three consecutive hourly readings.

SPECIFIC GRAVITY	FAST CHARGE
1.150 or less	*1 hour
1.150 to 1.175	*¾ hour
1.175 to 1.200	*½ hour
1.200 to 1.225	*¼ hour
Above 1.225	Slow charge only

*Follow with slow charge at 3 to 4 amperes.

5. If total charging voltage is OVER 15.5 VOLTS, the battery is unsatisfactory in its present condition and may be sulphated. The battery, in most instances, may be made serviceable by subjecting it to a continued slow charge. Fast charging alone will not bring a battery to a full state of charge. After charging, perform "Battery Capacity Test". If the test voltage checks above 9.25 volts, the battery may be placed back in service. If below 9.25 volts, replace the battery.

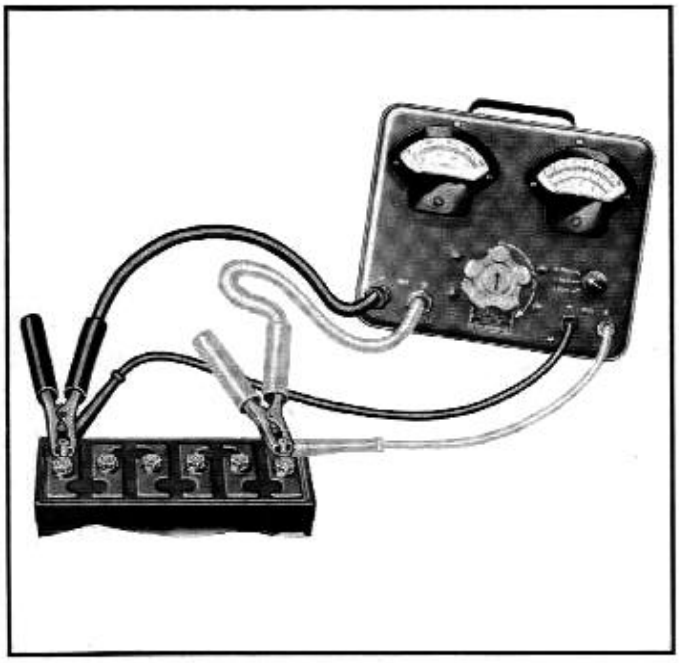

Fig. 11-4—Connections for Battery Capacity Test

BATTERY CAPACITY TEST

The Battery Capacity Test is made to determine

whether the battery has sufficient discharge capacity for the load imposed upon it by ignition, lights, and accessories on the car, while cranking the engine. The voltage reading obtained in this test is used to determine battery condition.

Before testing the battery capacity, be sure that the level of the electrolyte is above the cell plates and the specific gravity of each cell is 1.225 or more.

Test the Battery Capacity as follows: (See figure 11-4.)

1. Turn the control knob on the Battery Starter Tester to OFF position.
2. Turn the voltmeter selector switch to the 16 VOLTS position.
3. Connect the positive test leads to positive battery post and negative test leads to negative battery post.
4. Turn the control knob in a clockwise direction until the ammeter reads the required load. The load is computed as 3 times the ampere hour rating of a battery. Example: a 55 ampere hour battery should be tested at 165 amperes load.
5. With the ammeter reading the required load for 15 SECONDS, note the voltmeter reading (should be 9.25 or more volts). With the reading obtained in this test, perform the "Battery Charge Test" to determine condition of battery.
   CAUTION: *Avoid leaving the high discharge load on the battery for periods longer than 15 seconds.*

INDIVIDUAL CELL TEST

The Individual Cell Test is made to determine condition of the battery (in conjunction with the "Battery Charge Test") by comparing voltage readings taken of the individual cells while the battery is under a load of 3 times the ampere hour rating of the battery. See figure 11-5 for test connections.

1. With the control knob of the Battery Starter Tester in the OFF position, turn the voltmeter selector switch to 4 VOLTS position.
2. Connect the AMP test leads to the battery. Connect positive test lead to positive battery post and negative test lead to negative battery post.
3. Turn the Battery-Starter control in a clockwise direction until the ammeter reads the required load (3 times the ampere hour rating of the battery equals 165 amperes). It is important to maintain an even load on the battery while testing the individual cells.
4. Connect voltmeter test leads to two awls so battery sealing compound can be penetrated on connector straps in taking voltmeter readings. Test each cell in turn and note the individual cell voltages under load. Individual cell voltages should not vary more than .2 volt from each other.
   NOTE: Press sealing compound back into holes caused by awl penetrations.
   CAUTION: *Avoid leaving the high discharge load on the battery for periods longer than 15 seconds.*
5. After completing this test, turn the control knob to OFF position before disconnecting clips.

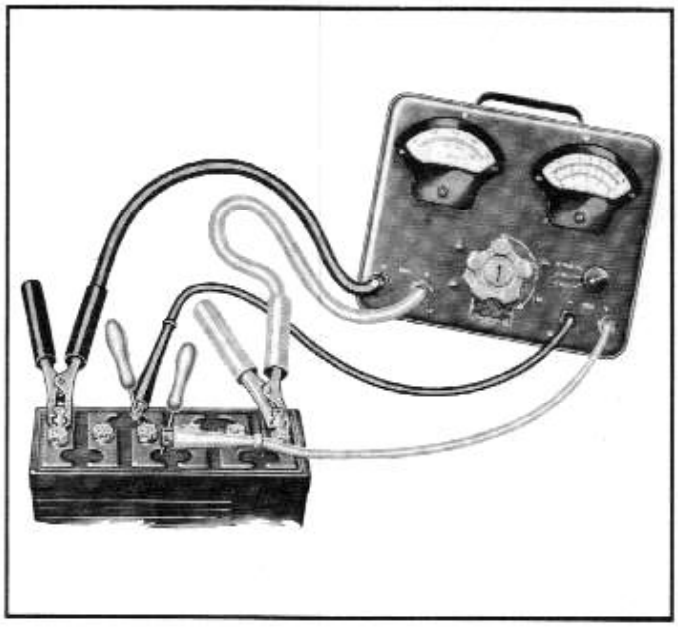

Fig. 11-5—Connections for Individual Cell Test

BATTERY CABLE CONTACT TEST

The Battery Cable Contact Test serves to quickly indicate presence of a poor connection or defective

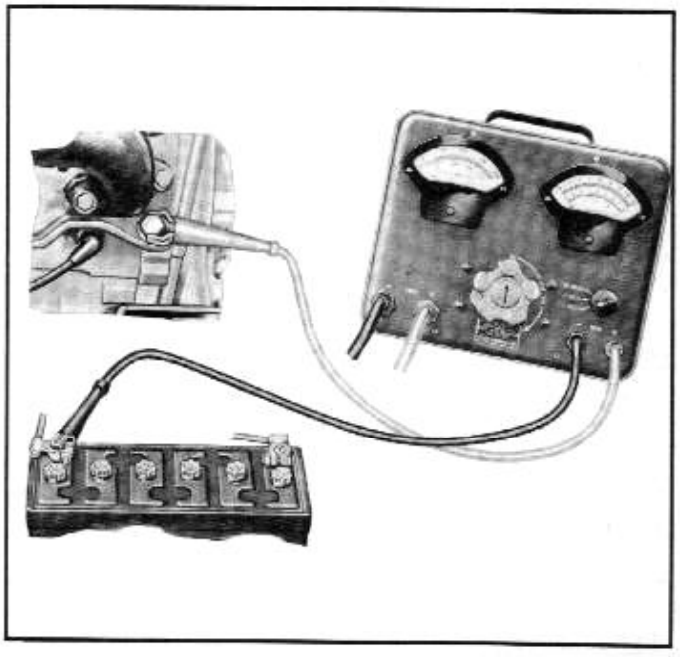

Fig. 11-6—Connections for Battery Cable Contact Test

cable by reading the voltage drop between the battery terminal post and the point of connection on the engine. Make the test as follows: (See figure 11-6.)

1. Turn the voltmeter selector switch of the Battery-Starter Tester to 4 VOLTS position.
2. Connect the voltmeter test leads across the battery ground cable, negative lead to negative battery terminal and positive lead to head bolt on cylinder head. Be sure test leads make good electrical contact.
3. With starting motor engaged, the voltmeter should read .1 volt or less.
4. If the voltmeter reading is greater than .1 volt, clean and tighten connections or replace cable. NOTE: Always test the voltage drop across the battery cable before making test of the starting motor.

Charging the Battery

PREPARE BATTERY FOR CHARGING

Wash all dirt from the battery and clean its terminals before placing it on charge. Do not allow dirt to enter the cells. Bring the liquid level in the cells up to the fill ring. Allow the battery to warm up before adding water as the level will rise as it warms.

SLOW CHARGING

Slow charging is the only method which will *fully* charge a battery. Slow charging should be at a rate of 3 to 4 amperes for a sufficient length of time to fully charge the battery. The battery is fully charged when the cells are all gassing freely and the gravity ceases to rise for three successive readings taken at hourly intervals. Do not stop charging short of the fully charged state, even if it requires charging for 24 hours or more. A battery which is badly sulphated will require more charging time than a normal battery.

HIGH RATE CHARGERS

A high rate charger has the ability to quickly "boost" a battery without removing it from the car. However, a high rate charger may be used, to quickly "boost" a battery or in the process of bench charging a battery. *A high rate charge must always be followed by slow charging* for a length of time necessary to bring the battery to full charge. Follow the instructions provided by the maker of the high rate charger being used, limiting the charge rate to 30 amperes maximum for 12-volt batteries. See the Specific Gravity – Fast Charge time table for recommended maximum fast charge time for batteries in various stages of discharge.

Charging batteries at a high rate causes the temperature of the electrolyte to rise and may cause violent gassing of the electrolyte unless the high rate charge equipment is provided with an automatic time limiting or temperature limiting device to protect the battery electrolyte from exceeding a temperature of 125° F. and gassing excessively.

BATTERY TROUBLE SHOOTING CHART

TROUBLE	CAUSE	REMEDY
(1) Battery uses excessive amount of water.	(a) Voltage limiter setting too high.	(a) Test and adjust generator regulator.
	(b) Cracked case.	(b) Replace battery.
(2) Battery will not remain charged.	(a) Defective generator.	(a) Test and repair generator.
	(b) High resistance in charging circuit.	(b) Test circuit resistance and repair.
	(c) Voltage or current limiter setting too low.	(c) Test and adjust generator regulator.
	(d) Short circuit in vehicle wiring.	(d) Test for shorts and repair.
	(e) Defective battery.	(e) Test and replace battery.
	(f) Excessive idling or low speed driving while operating accessories.	(f) Revise driving habits or charge externally when required.
	(g) Generator regulator cut-out points stick closed.	(g) Adjust or replace generator regulator.
(3) Battery will not accept charge.	(a) Sulphated battery.	(a) Test for sulphation and slow charge battery.
	(b) Open circuit between cells or internal defect or damage.	(b) Replace battery.

DATE CODING AND MANUFACTURER'S CODING OF BATTERIES

The following interpretation of date coding and manufacturer's coding of production and service batteries is provided as an aid to all service personnel. For purpose of cell identification, reference to cell numbers will be made beginning with the positive end cell as number one cell, and running in consecutive order to the negative end cell which is number six cell.

Figure 11-7 illustrates the specified location for the manufacturer's source code symbol and manufacturer's date code numbers. The manufacturer's date, stamped on a lead washer at base of the negative terminal consists of three numbers denoting the year, month and week of manufacture respectively. The manufacturer's date code is as follows:

Year – 0-1-2-3-4-5-6-7-8-9
Month – 1-2-3-4-5-6-7-8-9-10-A-B
Week – 1-2-3-4-5
Example: 7-2-3 = 1957, February, 3rd week.

All batteries shipped for service are stamped with the letter "S" also located on lead washer at base of negative terminal. The following code symbols identify the manufacturer and the manufacturer's plant location.

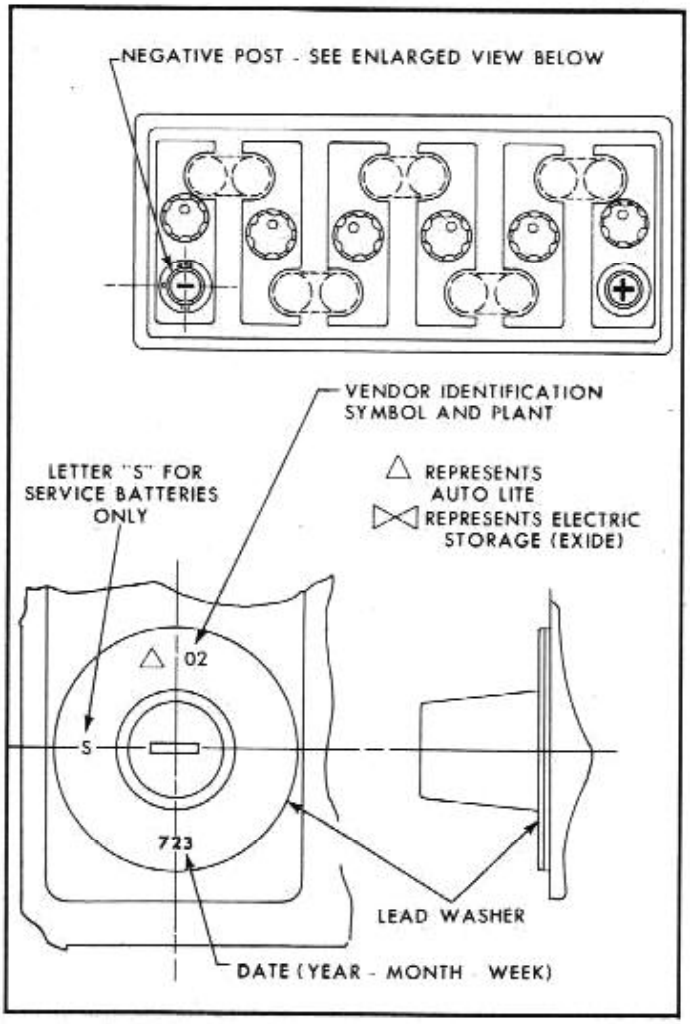

Fig. 11-7—Battery Date Code and Identification

The Electric Storage Battery Company

Exide	*		
Philadelphia	1	Memphis	11
Kansas City	5	Toronto	13
Chicago	9	Fairfield, Conn.	14
Portland	10	Aurora, Ill.	20

Auto-Lite Battery Corporation

Auto-Lite	*		
Niagara Falls	1	Atlanta	6
Oakland, Calif.	3	Owosso	7
Oklahoma City	4	Vincennes	8
Toronto	5	Los Angeles	9

*The appropriate number is stamped beside symbol to indicate the plant.

CONSTANT VOLTAGE GAUGE SYSTEM DESCRIPTION

The electrical system features a constant voltage gauge system through which the input voltage of the fuel and temperature gauge circuits is limited to a constant average voltage rating of five volts. The regulation of fuel and temperature gauge input voltage to a pre-determined constant value provides greater gauge accuracy and stability.

A constant voltage (C.V.) regulator assembly, see figure 11-8, is placed in series between the ignition switch "ACC" terminal and the fuel and temperature

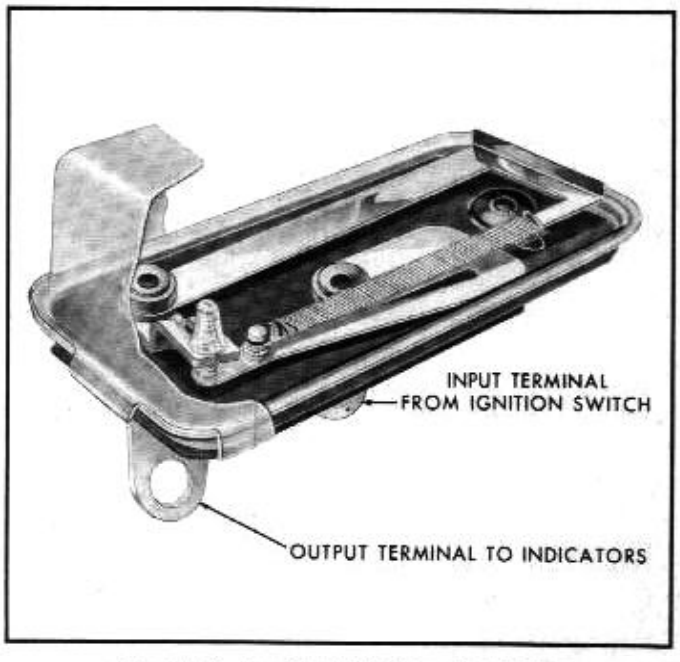

Fig. 11-8—Constant Voltage Regulator

gauge circuits. The temperature compensated C.V. regulator which is located on the rear of the instrument cluster to the right of the windshield wiper switch, consists of a bimetal strip and heater winding acting in conjunction with a pair of contact points. The positive contact is stationary on the regulator base. The negative contact is located on the end of the bimetal strip. As the contacts are closed, the current flow through the bimetal strip causes the bimetal strip winding to become heated to the point of bending the bimetal, thereby opening the contacts. As the contacts are opened, the flow of current is cut off and the bimetal cools to the point of closing the contacts. The cycle of repeated opening and closing of the contacts provides a pulsating voltage at a constant average value of five volts. There are no service adjustments on the C.V. regulator, other than removal and replacement of the regulator assembly. When removing and installing the C.V. regulator, care should be exercised in connecting the ignition switch power feed wire and the indicator gauge wires to their correct terminals. CAUTION: *Avoid even momentary shorting of C.V. regulator. Disconnect negative terminal battery cable from the battery before doing any work around area of C.V. regulator.*

FUEL TANK SENDING UNIT

The fuel level gauge (tank sending unit) consists of a slide rheostat operated by the float in the fuel tank. See figure 11-9. The float is connected to the rheostat through an arm operating a single contact so that when the tank is empty the resistance is at a maximum causing the instrument panel indicator gauge to read zero when the ignition switch is on. As the fuel level is increased toward full, the position of the float reduces the resistance in the tank sending unit, thereby causing an increase in current flow. The increase in current flow causes the heater wire of the bimetal in the instrument panel indicator to further deflect the bimetal, thereby giving indicator readings up to a maximum of full.

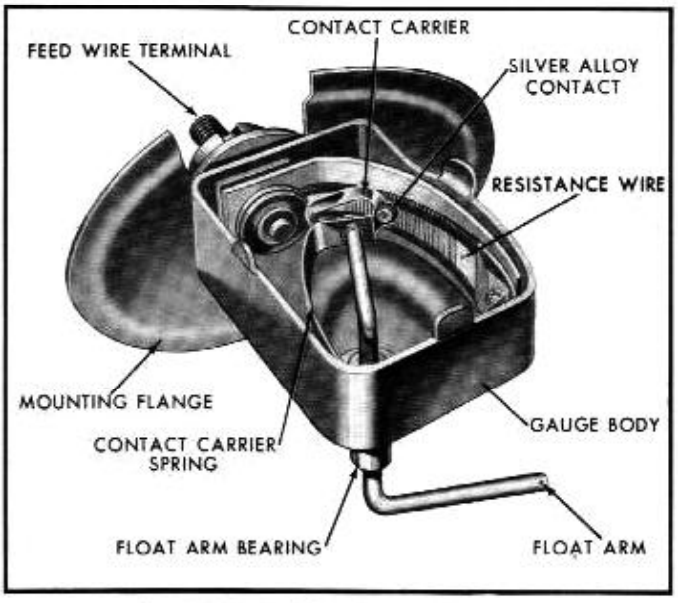

Fig. 11-9—Fuel Tank Sending Unit

TEMPERATURE SENDING UNIT

The engine water temperature indicator bulb (engine sending unit) incorporates a temperature sensing element. See figure 11-10. When surrounded by the cold engine coolant, the bulb provides the highest resistance in the temperature indicator gauge circuit and the resultant low current flow in the circuit causes the indicator on the instrument panel to read the low or cold end of the gauge. As engine coolant temperature increases, the indicator bulb resistance is decreased, and the increased flow in the circuit, through the heater wire in the instrument panel indicator, repeatedly deflects the panel indicator bimetal to register proportionately the temperature of the engine coolant.

REMOVAL OF FUEL INDICATOR GAUGE

1. Disconnect negative (ground) cable of battery to prevent possibility of a short circuit during removal and installation operation.
2. Remove light switch and attached wires as an assembly from instrument panel.
3. Remove two screws securing fuel indicator gauge to instrument panel. Remove gauge and attached wires as an assembly from instrument panel.

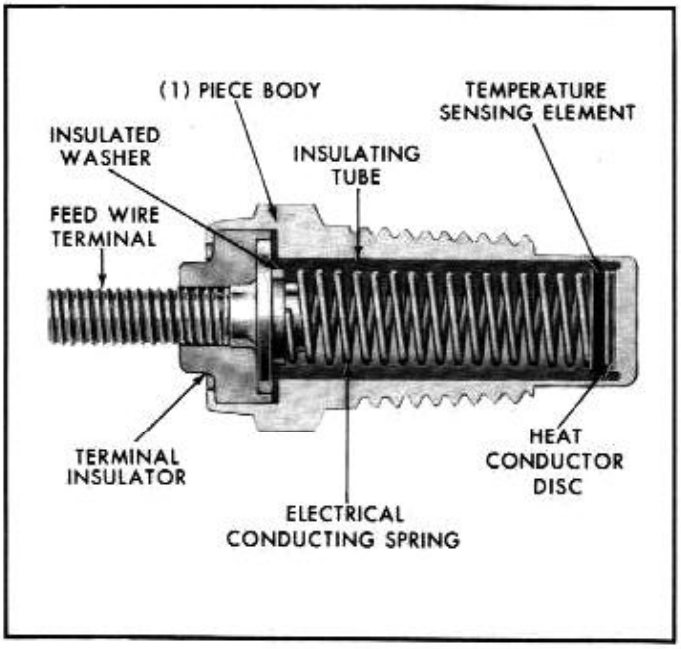

Fig. 11-10—Engine Temperature Sending Unit

NOTE: To remove fuel indicator gauge from Turnpike Cruiser it is necessary to remove speedometer and instrument panel retaining screws. Carefully lift panel out slightly to provide access to indicator gauge.

4. Note position of wire connections, and disconnect wires.

INSTALLATION OF FUEL INDICATOR GAUGE

1. Refer to wiring color code and connect wires to gauge.
2. Install gauge and attached wires in instrument panel and secure with two attaching screws.
3. Install light switch and attached wires in instrument panel.
4. Connect battery negative (ground) cable and check operation of gauge.

REMOVAL OF TEMPERATURE INDICATOR GAUGE

1. Disconnect negative (ground) cable of battery to prevent possibility of a short during removal and installation operation.
2. Remove radio. See "Removal of Radio".
3. Remove left air duct assembly. See "Removal of Air Duct".
4. Remove windshield wiper switch and attached windshield washer vacuum hose as an assembly.
5. Remove two screws securing temperature indicator gauge to instrument panel. Remove gauge and attached wires as an assembly from instrument panel.
6. Note position of wire connections, and disconnect wires.

NOTE: To remove temperature indicator gauge from Turnpike Cruiser, it is necessary to remove speedometer and instrument panel retaining screws. Lift panel out slightly to provide access to indicator gauge.

INSTALLATION OF TEMPERATURE INDICATOR GAUGE

1. Refer to wiring color code and connect wires to gauge.
2. Install gauge and attached wires in instrument panel and secure with two attaching screws.
3. Install windshield wiper switch and attached vacuum line.
4. Install left air duct assembly and connect Bowden wire cable control. Check operation of left air duct valve and Bowden cable control. Adjust cable control at air duct, if necessary, to obtain correct air duct opening.
5. Install radio.

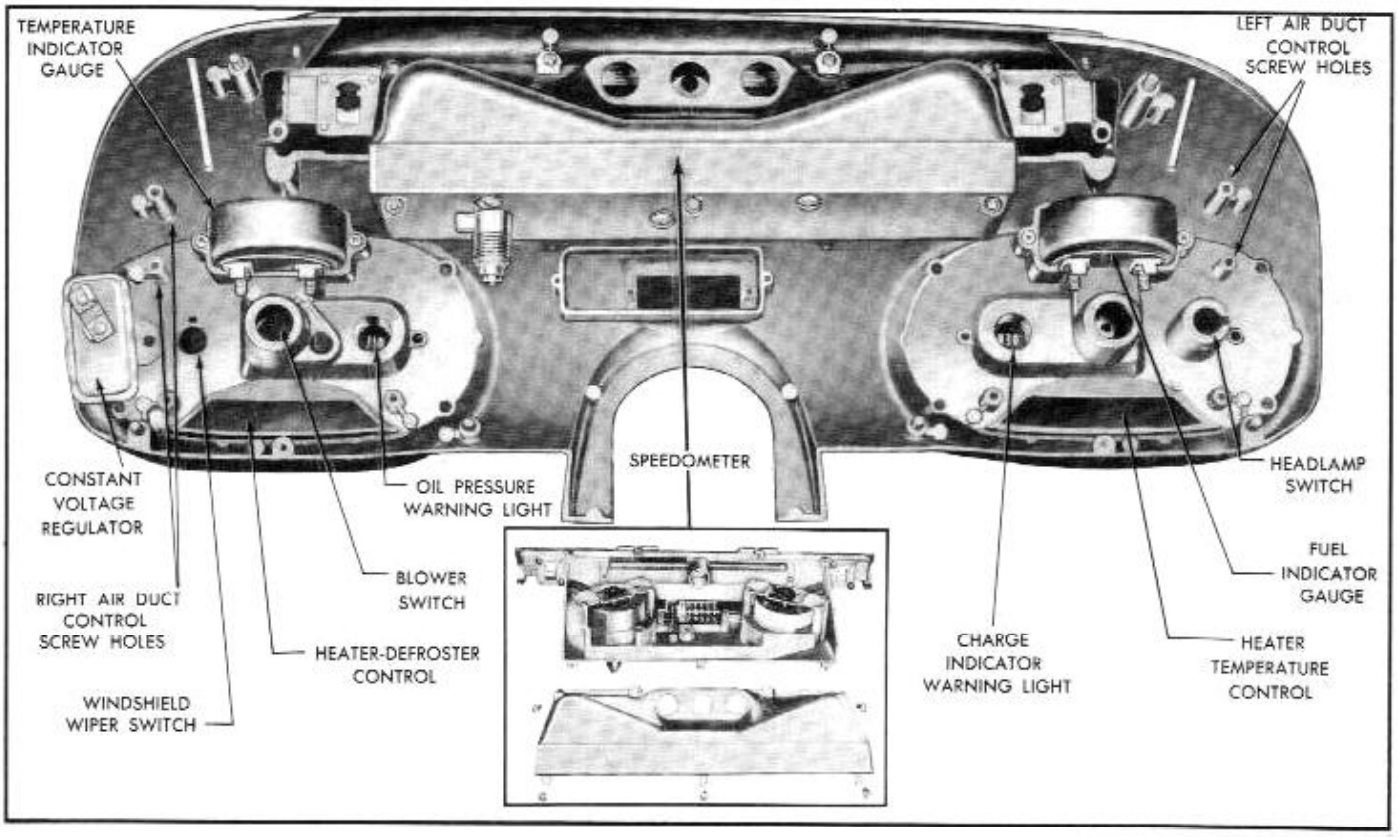

Fig. 11-11—Instrument Cluster—Rear View

6. Connect negative (ground) cable to battery.

REMOVAL AND INSTALLATION OF CONSTANT VOLTAGE REGULATOR

1. Disconnect negative (ground) cable of battery to prevent possibility of a short during removal and installation operation.
2. Remove radio.
3. Remove left air duct assembly.
4. Remove one screw securing constant voltage regulator to instrument panel. The regulator is located directly above the cigar lighter on the right side of the windshield wiper switch. See figure 11-11.
5. Remove regulator and attached wires as an assembly from instrument panel. Note location of wire connections on regulator and disconnect wires.
6. To install regulator, connect wires to regulator and install as an assembly on instrument panel. Observe color coding of wires when attaching.
7. Install left air duct assembly and connect Bowden wire cable control. Check operation of left air duct valve and Bowden cable control. Adjust cable control at air duct, if necessary, to obtain correct air duct opening.
8. Install radio.
9. Connect negative (ground) cable to battery.

CONSTANT VOLTAGE GAUGE SYSTEM — TESTING PROCEDURE

Necessary equipment to adequately test constant voltage gauge system is as follows:

1. Voltmeter equipped with a scale having a maximum deflection of 15 volts or more.
2. A constant voltage fuel gauge sending unit of known accuracy equipped with a short ground lead and clip. Following, is a trouble shooting procedure to assist in locating the cause of various system malfunctions.
   NOTE: An operative constant voltage regulator that is functioning correctly will cause a voltmeter pointer to fluctuate between 0 and approximately 7.0 volts when connected to the output terminal. It will, of course, be impossible to obtain an accurate voltmeter reading. The fluctuating voltage reading indicates, however, that the constant voltage regulator is functioning. The ability to determine if the constant voltage regulator is or is not functioning, is a satisfactory service test.

CONSTANT VOLTAGE SYSTEM TROUBLE SHOOTING CHART

TROUBLE	CAUSE	REMEDY
(1) Temperature and fuel gauges read higher than conditions warrant.	(a) Poor ground at constant voltage regulator.	(a) Clean and tighten regulator ground connection and recheck operation.
(2) Both gauges read maximum after ignition switch is turned to the "IGN" position.	(a) Defective regulator (stuck points or open heater winding).	(a) Check voltage at output terminal of C.V. regulator. A steady 12 volt reading indicates a damaged regulator. (b) Replace constant voltage regulator.
(3) Fuel and temperature gauges remain on "E" and "C" when ignition switch is turned to "IGN" position.	(a) Defective (open) regulator or open circuit on battery side of regulator.	(a) Check voltage at input side of regulator. If reading of approximately 12 volts is obtained, replace regulator. If no voltage, check input circuit for an "open" connection or broken wire.
(4) Temperature indicator functions correctly, but fuel indicator shows higher or lower than actual fuel level.	(a) Defective fuel indicator assembly or tank sender unit.	(a) Disconnect lead wire at sender unit. (b) Connect sender unit lead wire to the fuel sender unit reserved for testing purposes. (c) Connect test sending unit jumper wire to a good ground on vehicle.

CONSTANT VOLTAGE SYSTEM TROUBLE SHOOTING CHART

TROUBLE	CAUSE	REMEDY
		(d) Place float in "empty" position. Turn ignition switch to "IGN" position. Indicator should read "E". Move float to "full" position. Indicator should read "F". (e) If indicator reading is correct, replace tank sending unit. (f) If indicator readings are not correct, replace indicator unit.
(5) Fuel gauge functions correctly but temperature gauge indicates higher or lower than actual engine temperature.	(a) Defective temperature indicator or defective temperature sending unit.	(a) Disconnect lead wire at temperature sending unit. (b) Connect lead wire to fuel tank sending unit reserved for testing purposes. (c) Connect test sending unit jumper wire to good ground on vehicle. (d) Place float in "empty" position. Turn ignition switch to "IGN" position. Temperature indicator should read lowest indication on dial scale. Move float to "full" position. Temperature indicator should read highest (hot) indication on dial scale. (e) If temperature indicator reads correctly, replace temperature sending unit. (f) If temperature indicator does not read correctly replace indicator assembly.
(6) Erratic temperature gauge operation.	(a) Loose connections.	(a) Clean and tighten all connections and re-check gauge system operation.
(7) Erratic fuel gauge operation.	(a) Loose connections or defective fuel tank sending unit.	(a) Check sender unit as outlined (5d). (b) Clean and tighten all connections and re-check operation. Be sure that sending unit is grounded to tank and tank is grounded to the frame.

NOTE: Do not attempt to repair or calibrate any panel indicator or constant voltage regulator in the field. Replacement with a new unit is the only practical means of servicing these units.

REMOVAL OF HEADLAMP SWITCH

1. Disconnect negative (ground) cable of battery to prevent possibility of a short during removal and installation operation.
2. From underneath the instrument panel, depress spring and pin retainer (located on left side of switch) securing switch knob and shaft assembly in light switch. While depressing pin retainer, pull knob and shaft out of switch assembly.
3. Using a wide bladed screwdriver, remove the headlamp switch retainer nut from face of instrument at panel and remove switch assembly.

INSTALLATION OF HEADLAMP SWITCH

1. If installing new switch, refer to wiring color code and transfer wires from old switch to new switch one at a time to ensure correct wiring connections.
2. Position switch assembly and attached wires in instrument panel and secure switch assembly to panel with retainer nut.
3. Tighten retainer nut on face of instrument panel and install knob and shaft assembly.
4. Connect battery negative (ground) cable and test switch for proper operation.

REMOVAL OF IGNITION SWITCH AND/OR IGNITION LOCK

1. Disconnect negative (ground) cable of battery to prevent possibility of a short during removal and installation operation.
2. Remove two screws securing upper lip of left fresh air duct to instrument panel lower flange. Lower air duct upper lip enough to provide accessibility to ignition switch.
3. Grasp rear of ignition switch and push switch toward face of instrument panel. Turn bezel on face of instrument panel and remove bezel. Remove switch and retaining spring from instrument panel.
4. To remove lock cylinder, insert ignition key and turn key. Depress lock cylinder pin and remove cylinder.

INSTALLATION OF IGNITION SWITCH AND/OR LOCK

1. Install lock cylinder in ignition switch. Insert ignition key. Turn key to allow lock cylinder pin to secure cylinder in switch.
   NOTE: If installing new switch assembly, note color coding of wires on old switch and transfer wires between switches one at a time to ensure correct wiring connections.
2. Connect wires to switch terminals.
3. Install switch assembly and retaining spring in instrument panel. Secure to panel with ignition switch bezel.
4. Connect battery negative (ground) cable and test switch for proper operation. Secure upper lip of left fresh air duct to lower flange of instrument panel with two attaching screws.

REMOVAL AND INSTALLATION OF SPEEDOMETER CLUSTER — ALL MODELS EXCEPT TURNPIKE CRUISER

1. Disconnect negative (ground) cable of battery to prevent possibility of short circuit during removal and installation operation.
2. Mask upper surface of instrument panel to prevent damage to instrument panel finish.
3. Remove two cluster retaining screws located at top rear of cluster. See figure 11-12.
4. Remove two speedometer cluster retaining screws located respectively in left and right instrument cluster. See figure 11-13.
5. Carefully lift cluster straight up from instrument panel. Disconnect speedometer cable. Remove three speedometer cluster lamps, and two turn signal indicator lamps from rear of cluster. See figure 11-14.

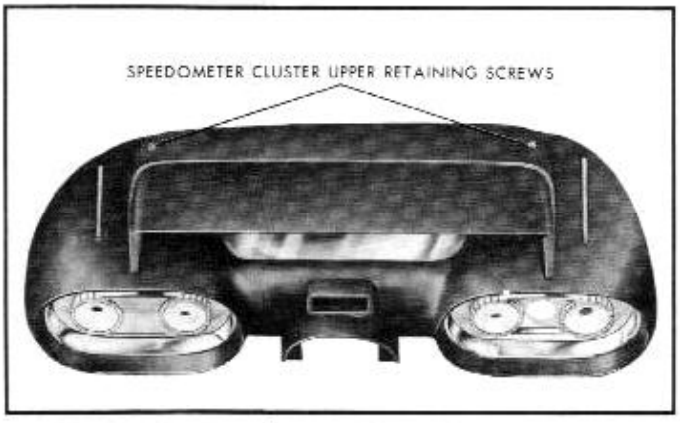

Fig. 11-12—Speedometer Cluster Upper Screws

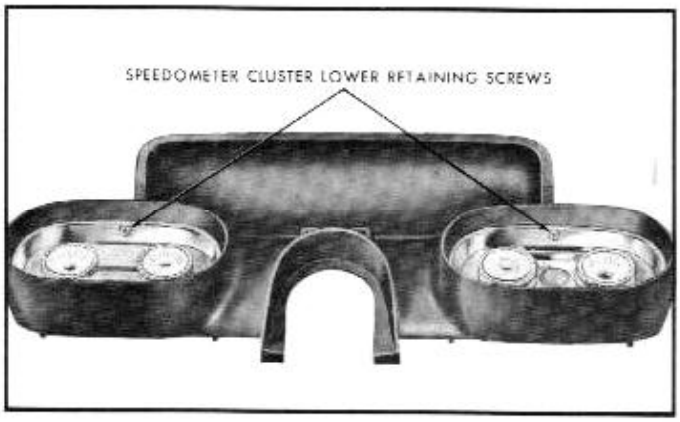

Fig. 11-13—Speedometer Cluster Lower Screws

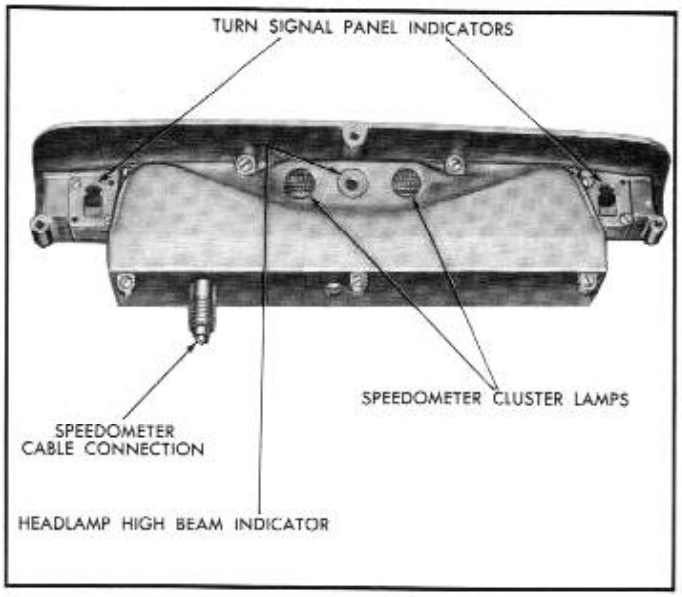

Fig. 11-14—Speedometer Cluster Rear View

6. To install cluster, reverse the above removal procedure.
7. Connect negative (ground) cable to battery.

REMOVAL OF TACHOMETER

1. Disconnect negative (ground) cable from battery.
2. Insert a 1/16" drill, or metal pin of same diameter, through the hole at the bottom of tachometer housing flange and push up on this tool while rotating tachometer assembly counterclockwise to release the three clips attached to tachometer housing from the instrument panel.
   CAUTION: *Do not attempt to remove without releasing spring clips.*
3. With a counterclockwise motion, pull the tachometer assembly from the instrument panel far enough to facilitate removal of dial lamp socket and bulb assembly, and tachometer drive cable from tachometer assembly and remove the dial lamp socket and bulb assembly; remove tachometer drive cable.
4. Remove tachometer.

INSTALLING TACHOMETER

1. Insert dial lamp socket and bulb assembly.
2. Position tachometer so that "R.P.M." designation is at the bottom.
3. Insert tachometer in place on instrument panel.
4. Connect tachometer drive cable.
5. Connect negative (ground) terminal on battery.

REMOVAL OF AVERAGE SPEED COMPUTER AND CLOCK

1. Disconnect negative (ground) terminal from battery.
2. Using a 1/16" drill, or metal pin of same diameter, insert tool through the hole at bottom of computer housing assembly and push up on the tool while rotating the computer assembly counterclockwise to release the three clips holding the computer assembly to the instrument panel housing flange.
   CAUTION: *Do not attempt to remove before first releasing spring clips.*
3. Pull the computer assembly from the instrument panel, with slight counterclockwise motion, far enough to facilitate removal of computer drive cable connector, clock wire and dial lamp socket and bulb assembly.
4. Remove computer and clock assembly.

INSTALLATION OF AVERAGE SPEED COMPUTER CLOCK

1. Replace dial lamp socket and bulb assembly, clock wire, and computer drive cable connector.
2. Position computer assembly so that the clock figure "12" is at top dead center and insert computer in place on the instrument panel.
3. Connect negative (ground) cable on the battery.

REMOVAL OF SPEEDOMETER AND INSTRUMENT CLUSTER — TURNPIKE CRUISER

1. Disconnect negative (ground) cable from battery.
2. Remove the three Phillips head screws located on top rear of speedometer cluster. See figure 11-15.
3. Remove the four Phillips head screws located just above the heater controls. See figure 11-15.
4. Remove the average speed computer and clock assembly.
   NOTE: See "REMOVAL OF AVERAGE SPEED COMPUTER AND CLOCK".
5. Remove the sheet metal screw located at the top and inside the computer and clock instrument panel housing.
6. Remove tachometer assembly.
   NOTE: See "REMOVAL OF TACHOMETER".
7. Remove the sheet metal screw located at the top and inside the tachometer instrument panel housing.
8. Remove right and left turn signal indicator socket and bulb assemblies.
   NOTE: Wire to left turn indicator socket color coded green with white tracer. Wire to right turn indicator socket is color coded white with green tracer.
9. Carefully pull speedometer cluster straight out far enough to enable removal of generator and oil pressure indicator lamp socket and bulb assemblies; remove generator and oil pressure in-

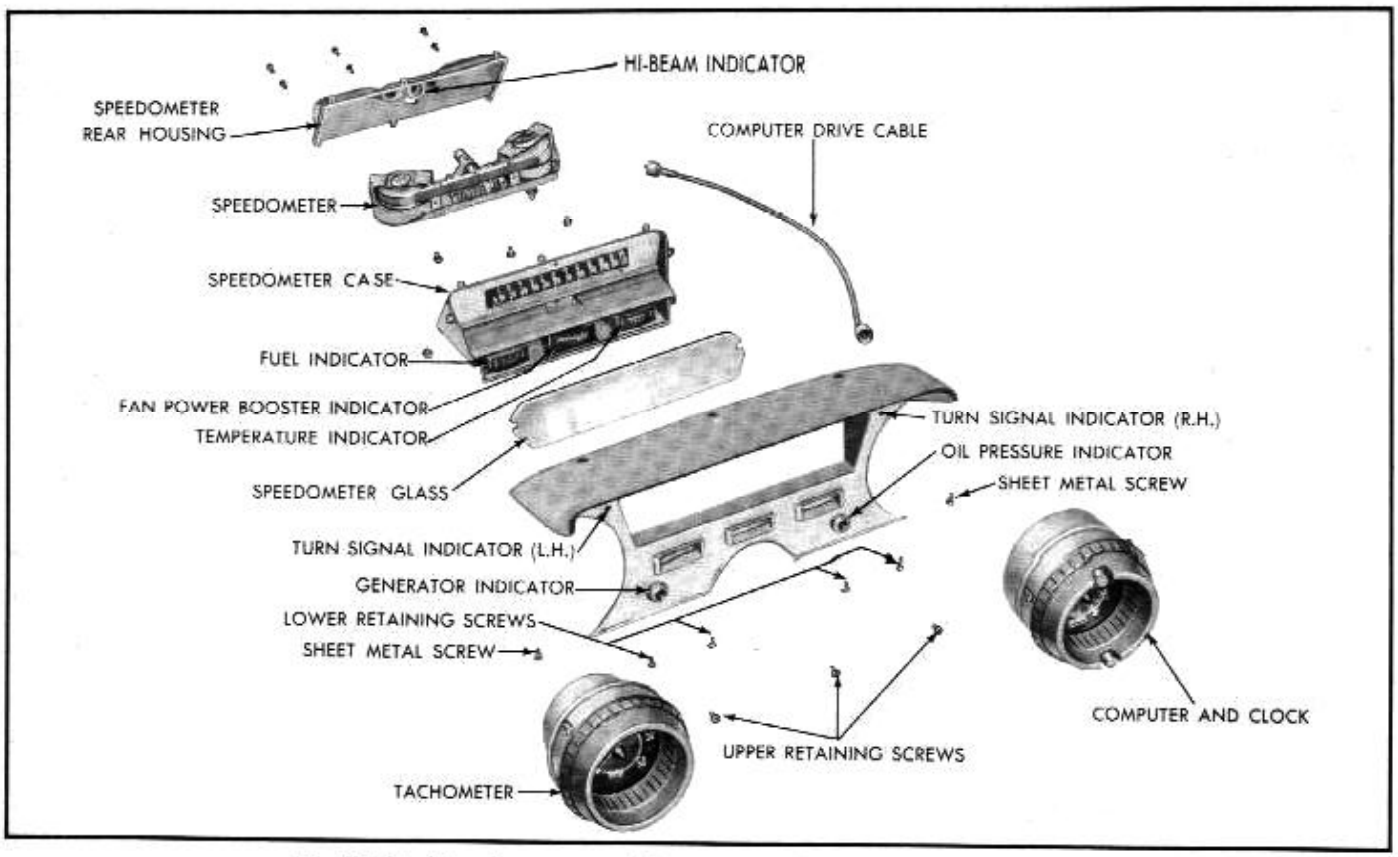

Fig. 11-15—Speedometer and Instrument Cluster—Turnpike Cruiser

dicator socket and bulb assemblies. These sockets have double leads attached.

NOTE: Lay a protective cloth over steering column tube assembly before this operation to prevent scratching the finish.

10. Remove the two instrument cluster lamp socket and bulb assemblies. (Blue-red tracer wires.)
11. Remove the hi-beam indicator socket and bulb assembly. (Green-black tracer wires.)
12. Disconnect the computer drive cable.
13. Disconnect the two wires from temperature indicator gauge.
14. Disconnect the two wires from fuel indicator gauge.
15. Disconnect speedometer drive cable.
16. Remove two instrument (fuel gauge and temperature gauge) socket and bulb assemblies. (Blue-red tracer wires.)
17. Remove speedometer and instrument cluster.

INSTALLATION OF SPEEDOMETER AND INSTRUMENT CLUSTER — TURNPIKE CRUISER

1. Position speedometer and instrument cluster on top of steering post.
2. Connect speedometer drive cable.
3. Connect wires to temperature indicator gauge.

NOTE: Install wire with white connector toward computer assembly.

4. Install hi-beam indicator and speedometer cluster socket and bulb assemblies.
5. Connect wires to fuel indicator gauge.

NOTE: Black wire with green connector toward tachometer.

6. Install the two instrument cluster (temperature indicator and fuel indicator) socket and bulb assemblies.
7. Install oil pressure and generator indicator socket and bulb assemblies.
8. Connect computer drive cable.
9. Position speedometer and instrument cluster in place on instrument panel.
10. Install the two turn signal indicator socket and bulb assemblies.
11. Install the two sheet metal screws.
12. Install the four lower and three upper Phillips head screws securing speedometer and instrument cluster assembly to instrument panel.
13. Install tachometer and computer assemblies.
14. Connect negative (ground) cable on battery.

REMOVAL OF SPEEDOMETER — TURNPIKE CRUISER

1. Remove speedometer and instrument cluster.

NOTE: See "Removal of Speedometer and Instrument Cluster – Turnpike Cruiser".

2. Place speedometer and instrument cluster on bench and remove two nut and exterior star washer assemblies; remove speedometer and instrument cluster from panel.
3. Remove six Phillips head screws securing speedometer cover.
4. Remove three Phillips head screws securing speedometer assembly; remove speedometer assembly.

INSTALLATION OF SPEEDOMETER – TURNPIKE CRUISER

1. Reverse steps 2 through 4 of removal procedure.
2. See "Installation of Speedometer and Instrument Cluster – Turnpike Cruiser", and install on car.

REMOVAL AND INSTALLATION OF OIL PRESSURE INDICATOR LIGHT BULB

1. Disconnect negative (ground) cable of battery to prevent possibility of a short during removal and installation operation.
2. Remove radio.
3. Remove left air duct assembly.
4. Remove bulb socket by pulling socket out from instrument panel. Remove and replace bulb as required.
5. To install socket, place socket in instrument panel opening. If necessary, use a small screwdriver or blunt tool to press socket into its fully seated position in panel.
6. Connect battery negative (ground) cable and check operation of light. Disconnect battery negative (ground) cable.
7. Install left air duct assembly and connect Bowden wire cable control. Check operation of left air duct valve and Bowden cable control. Adjust cable control at air duct if necessary, to obtain correct air duct opening.
8. Install radio.
9. Connect negative (ground) cable to battery.

CHARGE INDICATOR LIGHT OPERATION

A generator charge indicator light is used on all models. This light flashes red if the battery is discharging and the generator is not supplying current. The indicator is connected between the armature terminal of the generator regulator and the coil terminal of the ignition switch. This places the light in parallel with the regulator cut-out contacts. If the ignition switch is on, and the cut-out contacts are open, the charge indicator light will glow red. This indicates that the generator is not connected to the battery.

The circuit for the charge indicator light is from the battery, through the light, and through the generator armature to ground. See wiring diagram figure 10-84. As soon as the generator comes up to speed, the cut-out contacts in the regulator close. When the cut-out contacts are closed, the indicator light goes out indicating that the battery is connected to the generator.

To test the charge indicator light, turn the ignition switch on with the engine stopped. The light should be on. If light is not on, the bulb is either burned out or wiring to the light is defective.

HORN DESCRIPTION (SEA SHELL TYPE)

The horns are dual, electric type, designed to produce two frequencies or tones which, when sounded together, produce a harmonious tone.

PRINCIPLES OF OPERATION

The horn assembly consists of a stud with a flexible diaphragm attached to one end and an armature attached to the other. The armature is held above the core of an electromagnet by the spring tension of the diaphragm. The coil of the magnet is connected across a set of contact points. With the points closed current flows in the coil of the magnet and the armature is pulled downward. A stud, which is forced to move with the armature flexes the diaphragm and also forces the points to separate. This action interrupts the current flow in the electromagnet. The diaphragm then springs back into place again closing the points. This cycle repeats itself so rapidly that the diaphragm vibrates and causes sound.

The major difference between the high pitched horn and the low pitched horn are in the form and thickness of the diaphragm, the weight attached to the diaphragm, the air gap setting between the field and armature, and the length of the air column. The high horn is identified by the raised letters "HI" on the air column and the low horn bears the letters "LO" at the same location.

The horns are located in the space between the radiator and grille, secured with brackets to the fender aprons.

Horn operation is controlled from a ring located at the steering wheel. Pressure at any point on the ring makes a contact between an insulated plate and a snap ring on the steering wheel hub and closes an electrical circuit to the horn relay. Closing of the relay contacts completes a second circuit from the battery to the horns.

REMOVAL OF LEFT OR RIGHT HORN ASSEMBLY

1. Disconnect negative (ground) cable. Leave hood

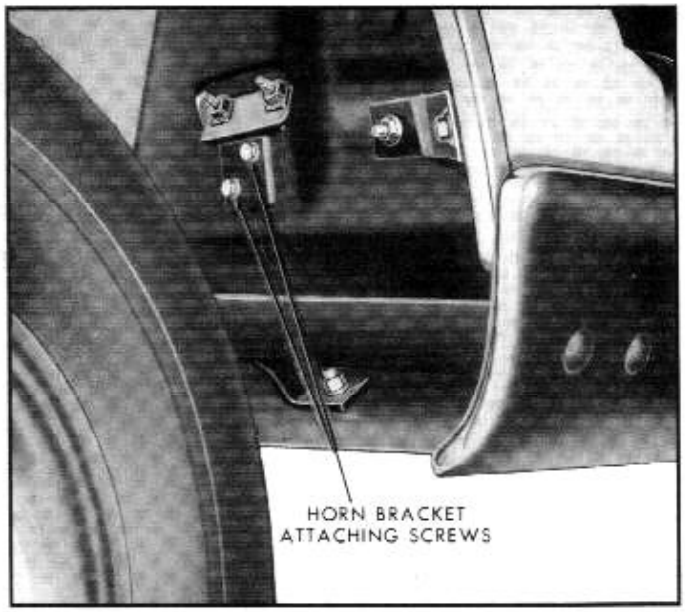

Fig. 11-16—Horn Bracket Attaching Screws

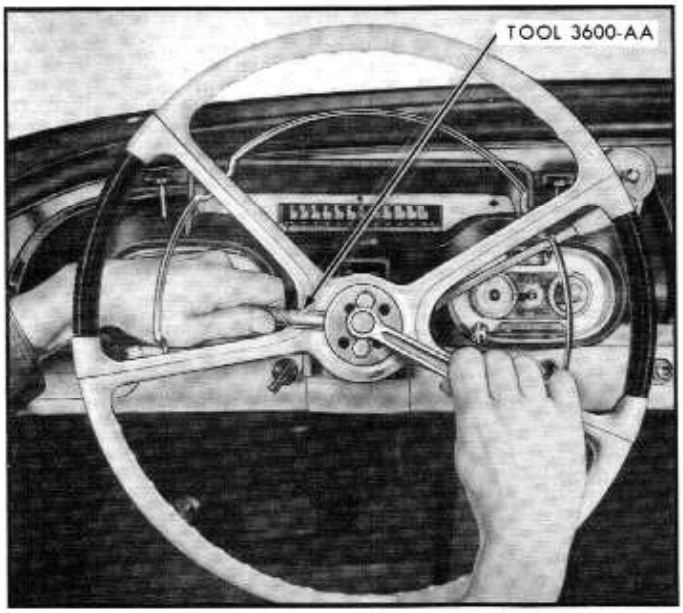

Fig. 11-17—Removing Steering Wheel

in raised position.

NOTE: On cars equipped with air conditioning, it is necessary to lower the front bumper impact bar to remove either horn assembly. Refer to "Removal of Front Bumper Assembly" in the Body Section of this manual.

2. To remove the right horn assembly, remove the two horn bracket attaching screws and washers from inside the right front fender. See figure 11-16. To remove the left horn assembly, remove the two attaching screws and washers from inside the left front fender.
3. With the horn bracket attaching screws and washers removed, reach behind the grille extension and position the horn so that the horn wire connector can be removed. Disconnect horn wire from horn.
4. Carefully move the disconnected horn assembly to a position behind the center grille assembly and directly in front of the center of the radiator. Remove horn by reaching over the fender and lifting the horn up and over the radiator.

INSTALLATION OF LEFT OR RIGHT HORN ASSEMBLY

1. Working over the left or right front fender, place horn in front of the radiator in a position behind the approximate center of the (center) grille assembly.
2. Carefully move the horn assembly from the center rear of the grille to its position behind the left or right grille extension.
3. Connect horn wire to the horn.
4. Position horn so that mounting bracket holes on horn assembly are in alignment with mounting holes in left or right front fender. Start attaching screws and washers from inside front fender.
5. Tighten attaching screws and washers to secure horn assembly.
6. Connect negative (ground) battery cable and test horn and circuit for proper operation.

REMOVAL OF STEERING WHEEL AND HORN BLOWING CONTACT COMPONENTS

1. Disconnect negative (ground) cable from battery.
2. Remove cap and emblem assembly from steering wheel.
3. Remove steering wheel nut and cap and emblem retainer.
4. Install Tool 3600-AA and remove steering wheel. See figure 11-17.

   NOTE: If horn button wire contact support is found defective, remove turn indicator switch plate assembly. Disconnect horn wire at junction block. Attach a 3 or 4 foot length of wire or heavy cord to the end of the wire to enable replacement wire to be pulled through the column. Remove horn button wire contact support from steering column.
5. Remove turn signal indicator cam from steering wheel hub.
6. Remove snap ring.
7. Remove three screws securing contact plate and insulator to spring retainer.
8. All components of the horn blowing assembly are now exposed for inspection and service. See figure 11-18.

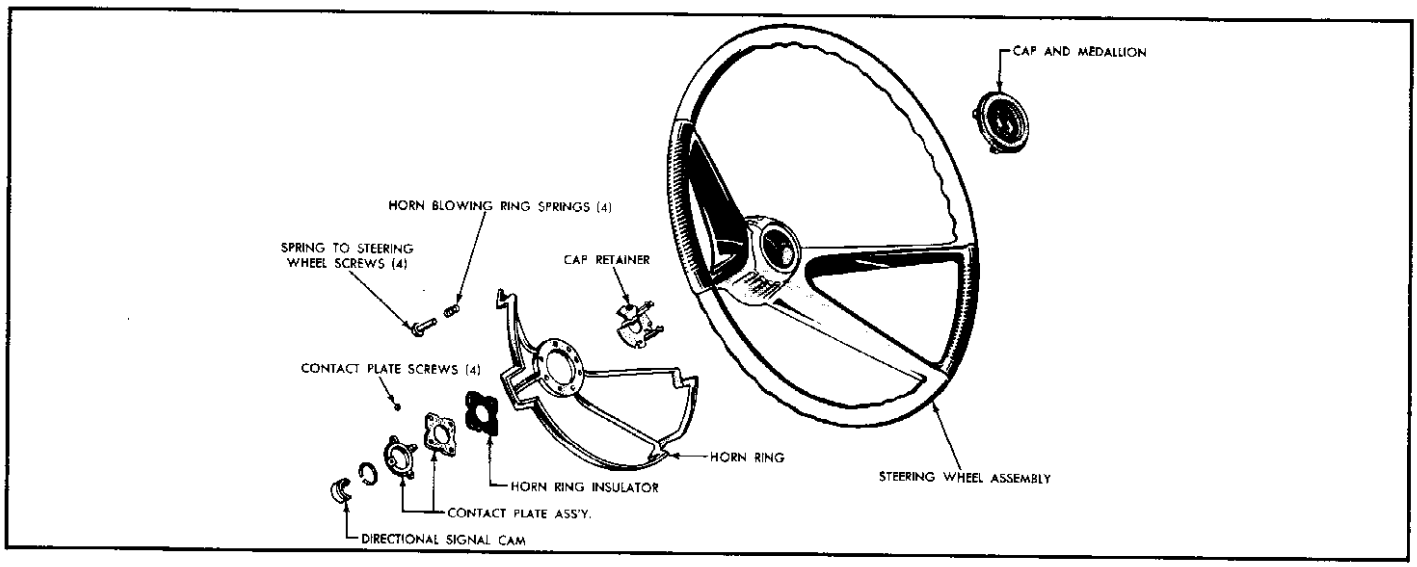

Fig. 11-18—Steering Wheel, Horn Ring and Related Parts

ASSEMBLY OF HORN BLOWING CONTACT COMPONENTS AND INSTALLATION OF STEERING WHEEL

1. Assemble the horn blowing contact components to the steering wheel in the reverse order of removal. See figure 11-18.
   NOTE: Position the turn signal indicator cam on the steering wheel hub so that the opening in the side of the cam will face 180° opposite the turn signal indicator switch assembly when the steering wheel is installed in the straight ahead position.
2. If it was necessary to remove horn button wire contact support, install in the reverse order of removal.
3. Install steering wheel.
4. Connect negative (ground) cable to battery. Check operation of horn blowing assembly.
5. Install cap and emblem retainer. Tab at bottom of retainer must enter pilot hole in steering wheel hub.
6. Install steering wheel nut. Hold cap and emblem retainer centered on wheel hub while tightening nut. Torque wheel nut to 45 lbs. ft.
7. Turn steering wheel to straight ahead position and install cap and emblem assembly with emblem in upright position.

HORN TROUBLE SHOOTING CHART

TROUBLE	CAUSE	REMEDY
(1) One horn fails to operate.	(a) Shorted or open wire from relay to horn.	(a) Replace wire.
	(b) Shorted or open coil in horn.	(b) Replace horn.
	(c) Out of adjustment.	(c) Readjust horn.
(2) Both horns fail to operate.	(a) Loose connection at horn button contact.	(a) Repair connection.
	(b) Open wire from junction block.	(b) Replace wire.
	(c) Open wire from junction block to relay.	(c) Replace wire.
	(d) Inoperative relay.	(d) Replace relay.
	(e) Out of adjustment.	(e) Readjust.
(3) Horns operate continuously or intermittently without pressing the horn ring.	(a) Shorted wire from button contact to junction block.	(a) Replace wire.
	(b) Shorted wire from junction block to relay.	(b) Replace wire.
	(c) Shorted relay.	(c) Replace relay.

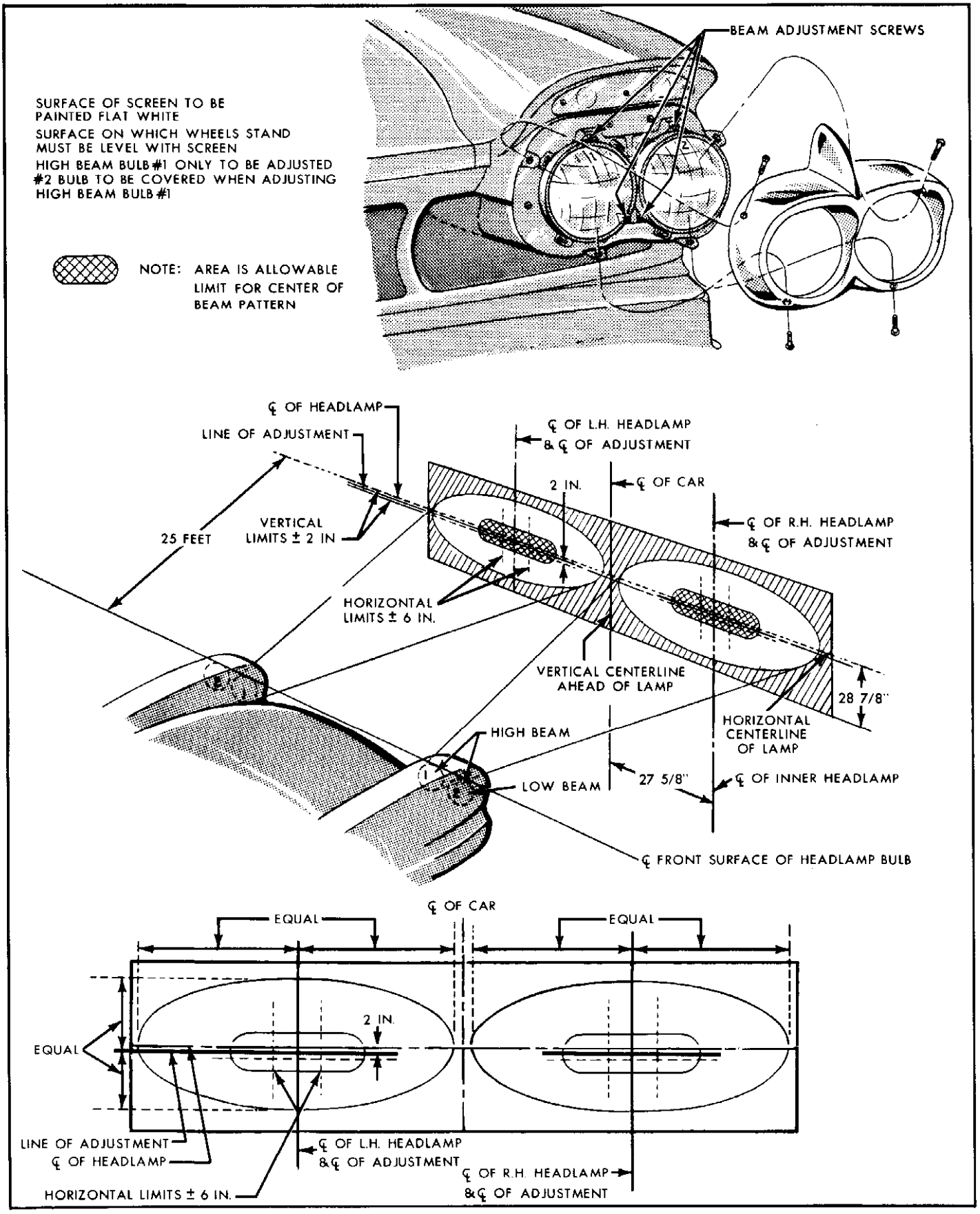

Fig. 11-19—Quadri-Beam Headlamp Adjustment (No. 1 High Beam)

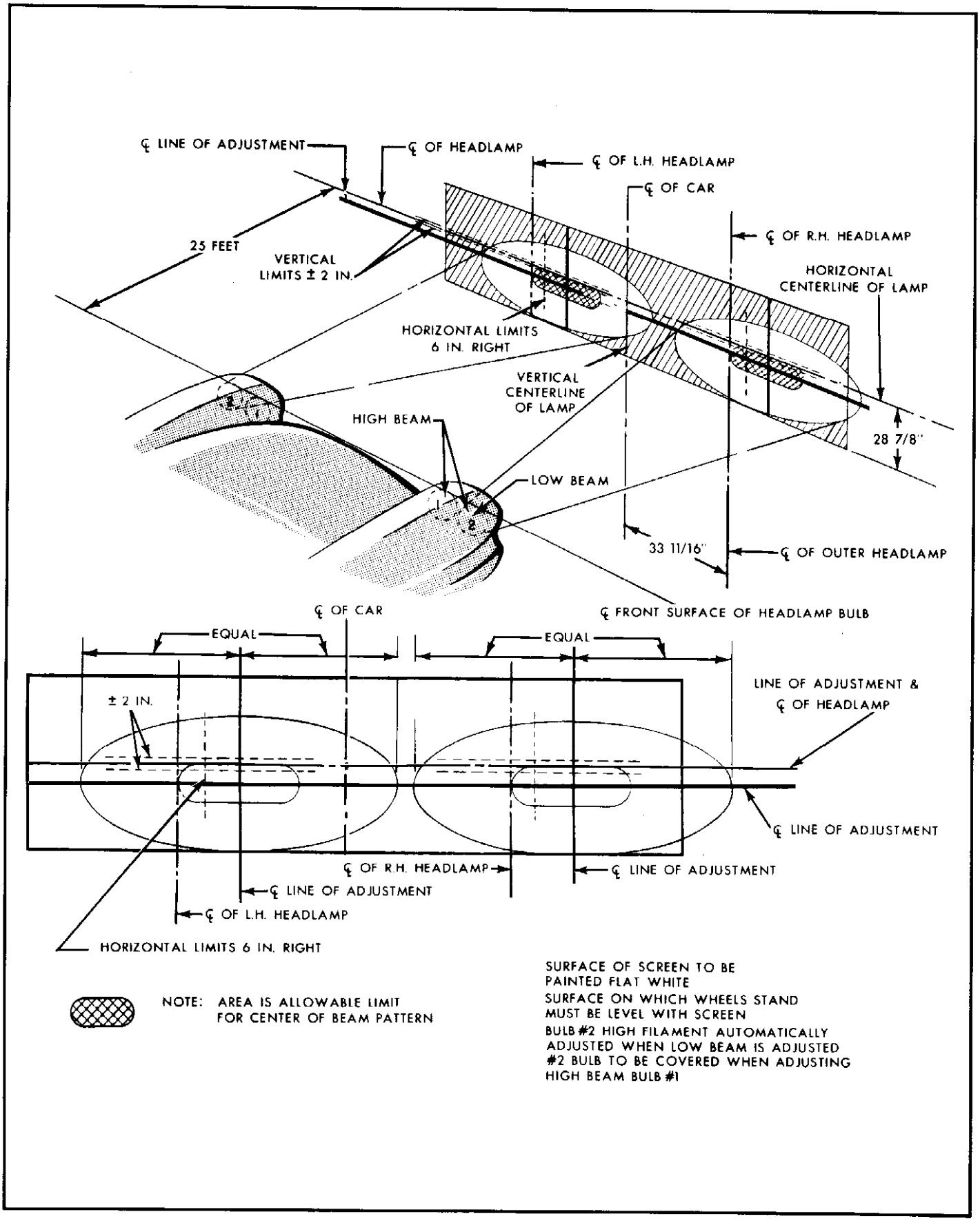

Fig. 11-20—Quadri-Beam Headlamp Adjustment (No. 2 Low Beam)

QUADRI-BEAM HEADLAMPS

Description

Quadri-Beam headlamps used on the Turnpike Cruiser (optional equipment on other models) are plug-in "Sealed-Beam" type lamps. Each assembly consists of a double (50 and 37.5 watt) filament and a single (37.5 watt) filament lamp mounted to an adjustable flange within each fender housing.

The extreme "on" position of the main light switch turns the headlamps on. When the headlamps are turned on, selection of the highway (upper) beam or traffic (lower) beam is made by depressing a foot control switch. When driving conditions warrant the use of the highway (upper) beam, both headlamps in each fender housing will be on. The double filament lamps in the assemblies, located toward the outside of the fenders, function as standard (one headlamp, each fender) headlamps in the event that the traffic (low) beam is desired.

Headlamp Beam Adjustment

Two adjusting screws on each headlamp mounting flange provide means of proper aiming of the light beams. The vertical adjusting screw is at the top of each headlamp. The horizontal adjusting screws are located adjacent to each other within each headlamp flange assembly. See figure 11-19 and figure 11-20.

STANDARD HEADLAMP DESCRIPTION

The headlamps are "Sealed Beam", plug-in type lamps mounted to an adjustable flange within each front fender housing.

The extreme "on" position of the main light switch turns on the headlamps. Selection of the highway (upper) beam or traffic (lower) beam is made by depressing a foot control switch when the headlamps are turned on. Vertical and horizontal headlamp adjustment screws on each assembly permit readjustment of the light beams if necessary.

HEADLAMP ADJUSTMENT

Two adjusting screws on each headlamp provide means for proper aiming of the light beam. The horizontal adjusting screw is located on the right side of the assembly. The vertical adjusting screw is at the top of the headlamp assembly.

Adjustments are as follows:

1. Inflate tires to recommended pressure. Place the car on a level surface 25 feet from the headlamp bulbs to a light-colored vertical screen or wall. Rock car gently to stabilize springs.
2. Draw a horizontal line on the screen two inches below the horizontal centers of the headlamp bulbs. See figure 11-21. For Quadri-Beam headlamp adjustment see figure 11-19 and figure 11-20.
3. Locate and mark center of vehicle on screen.
4. Draw a vertical line on each side of center line on screen at a distance equal to one-half the center-to-center distance between the two headlamp bulbs.
5. Turn on lights. Depress foot control switch for highway (upper) beam.
6. Cover one headlamp and observe where the center of light intensity falls. The area of highest light intensity must center at the intersection of the vertical line and the line drawn two inches below the horizontal center distance of the headlamp bulbs.
7. If high intensity area is not centered at this point, remove headlamp door and turn the vertical or horizontal adjusting screws in a direction to correct the alignment.
8. Adjust opposite headlamp in like manner, covering the headlamp previously adjusted. Install headlamp doors after adjustments have been completed.
9. The traffic (lower) beam needs no adjustment. When the highway (upper) beam is correctly adjusted, the traffic (lower) beam will be correct for standard headlamps.
10. On models equipped with Quadri-Beam headlamps see figure 11-19 and figure 11-20.

REMOVAL AND INSTALLATION OF PARKING LAMP ASSEMBLY

1. Disconnect parking lamp and front turn signal wires at bullet connectors.
2. Loosen sheet metal screw on bottom flange of lamp which secures lamp assembly to radiator grille.
3. Remove lamp assembly by sliding assembly outward and upward from the bottom to disengage upper retaining clip from upper radiator grille moulding. See figure 11-22.
4. To install parking lamp assembly, reverse the above procedure.

REMOVAL AND INSTALLATION OF REAR LAMP ASSEMBLY

1. Remove rear lamp bulb and socket by depressing socket and rotating one-quarter turn.
2. Remove back-up lamp bulb and socket by rotating socket one-quarter turn.
3. Remove five nut assemblies and flat washers securing rear lamp assembly to quarter panel. Remove rear lamp assembly and gasket.

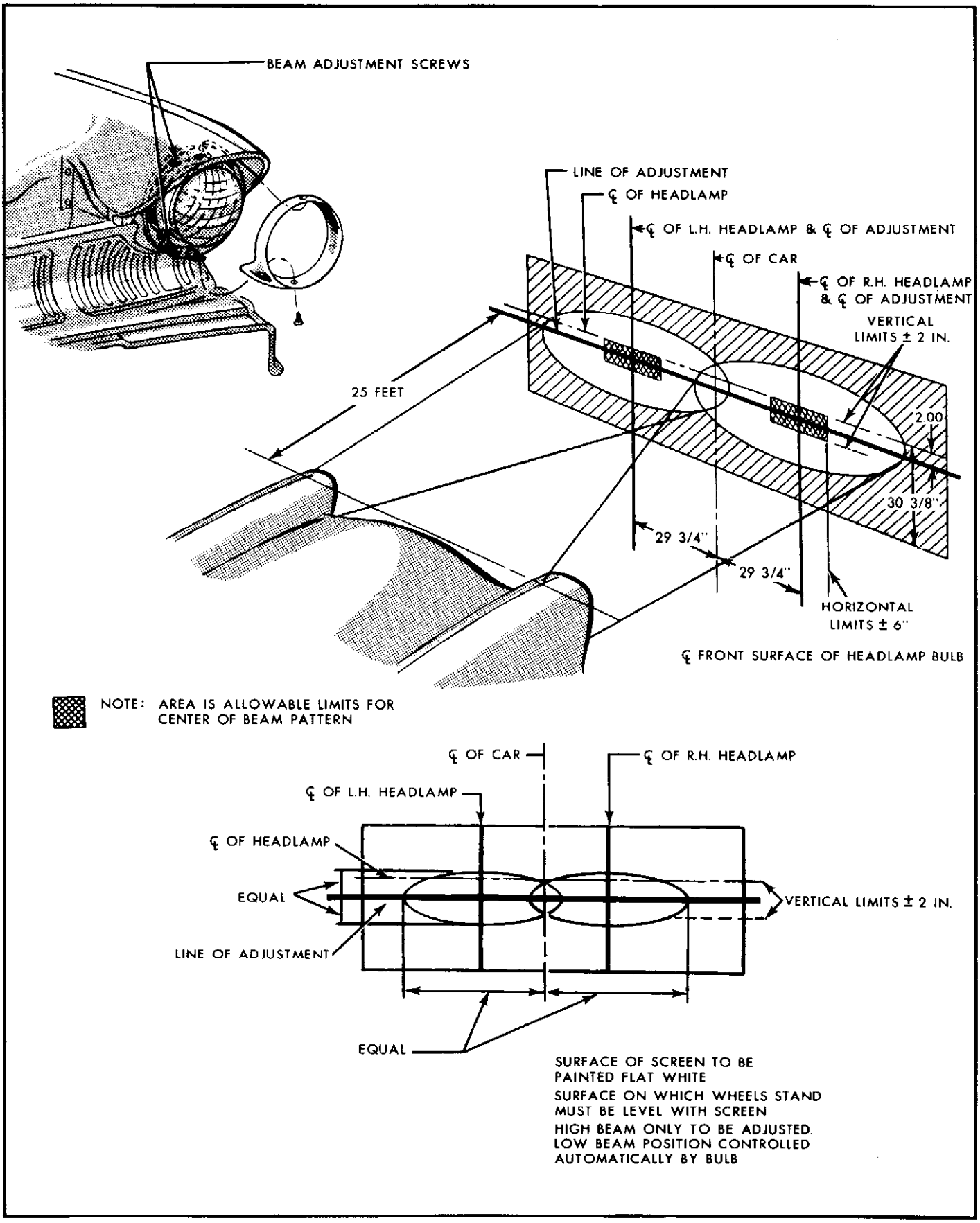

Fig. 11-21—Standard Headlamp Beam Adjustment

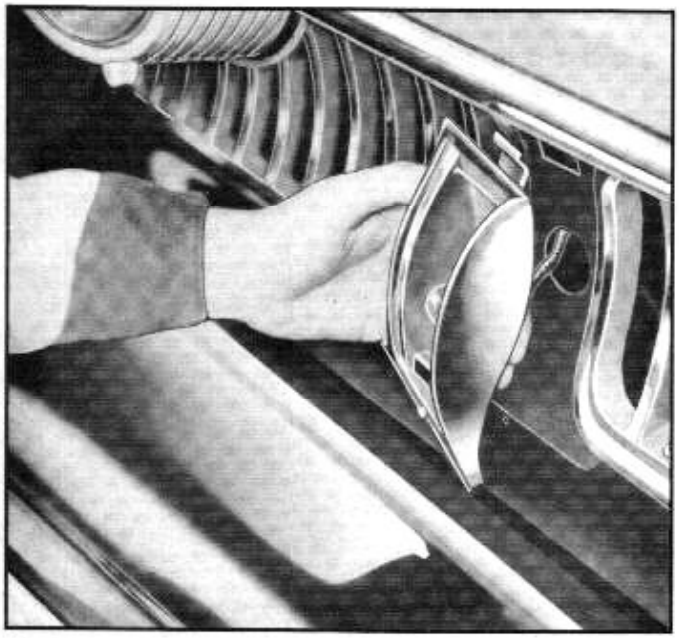

Fig. 11-22—Removing Parking Lamp Assembly

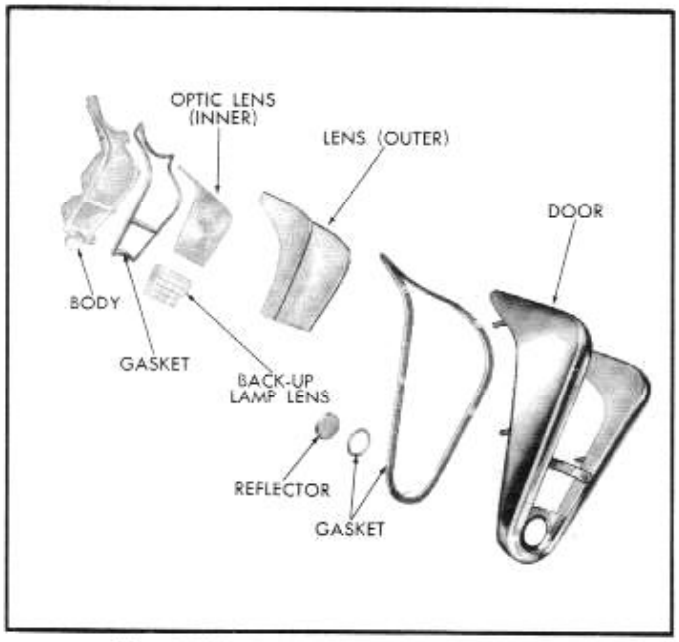

Fig. 11-23—Rear Lamp Disassembled

4. Remove eight screws securing rear lamp assembly to rear lamp door.
5. Remove tail lamp outer lens from rear lamp door. Remove tail lamp lens and back-up lamp lens from rear lamp body. See figure 11-23.
6. To install rear lamp lens and/or rear lamp assembly, reverse the above procedure.

REAR LICENSE PLATE LAMP ASSEMBLY REMOVAL AND INSTALLATION

1. Remove luggage compartment left rear lining board.
2. Disconnect license plate lamp wire at connector plug.
3. Remove socket bulb and assembly if bulb only is to be replaced.
4. If lamp assembly housing is to be removed for replacement, remove the two Phillips head screws located just above license plate bracket; remove lamp assembly.
5. To install, reverse above procedure.

TURN SIGNAL INDICATOR ASSEMBLY

Description

The turn signal indicator is manually operated by moving a lever, located on the steering column, in the same direction that the steering wheel is to be turned (up for a right turn and down for a left turn).

Left or right front and rear signal lights will indicate direction of turn, operating intermittently through the action of a series connected flasher unit when the indicator lever is moved to the up or down position. The flasher unit is located on the fuse panel. Indicating arrows on the instrument panel flash simultaneously with the signal lights to give the operator visual indication of turn signal operation. The turn signal control will turn off automatically when the steering wheel is turned in a direction opposite to that which the indicator lever was set. An SFE 7.5 fuse located in fuse panel on left cowl panel protects the turn signal circuit in the event of electrical overload.

Principles of Operation

Movement of the indicator lever to the up or down position actuates the switch plate assembly. A roller attached to the switch plate assembly falls into a detent at the extremes of lever movement, holding the switch in indicating position. The switch plate assembly is flat, and relies on pressure of a coiled spring attached to the switch lever to hold the roller in a detent. When the indicator lever is set for operation, a pawl attached to the switch plate assembly is moved into position to engage a cam on the steering wheel inner hub. Reversing direction of turn causes the pawl to engage a cam on the steering wheel inner hub and move the switch to the off position. A spring, attached to the switch plate assembly, exerts pressure against the pawl to enable engagement with the cam when turn direction of the steering wheel is reversed.

The switch contacts are positioned to allow the stop light circuit to be opened and the indicator circuit to be switched in. Thus, with the stop lights operating and the indicator lever set for turn indication, one stop light will flash, indicating direction of turn.

One filament of a dual filament bulb in the parking lamp assembly is used to indicate turn direction at

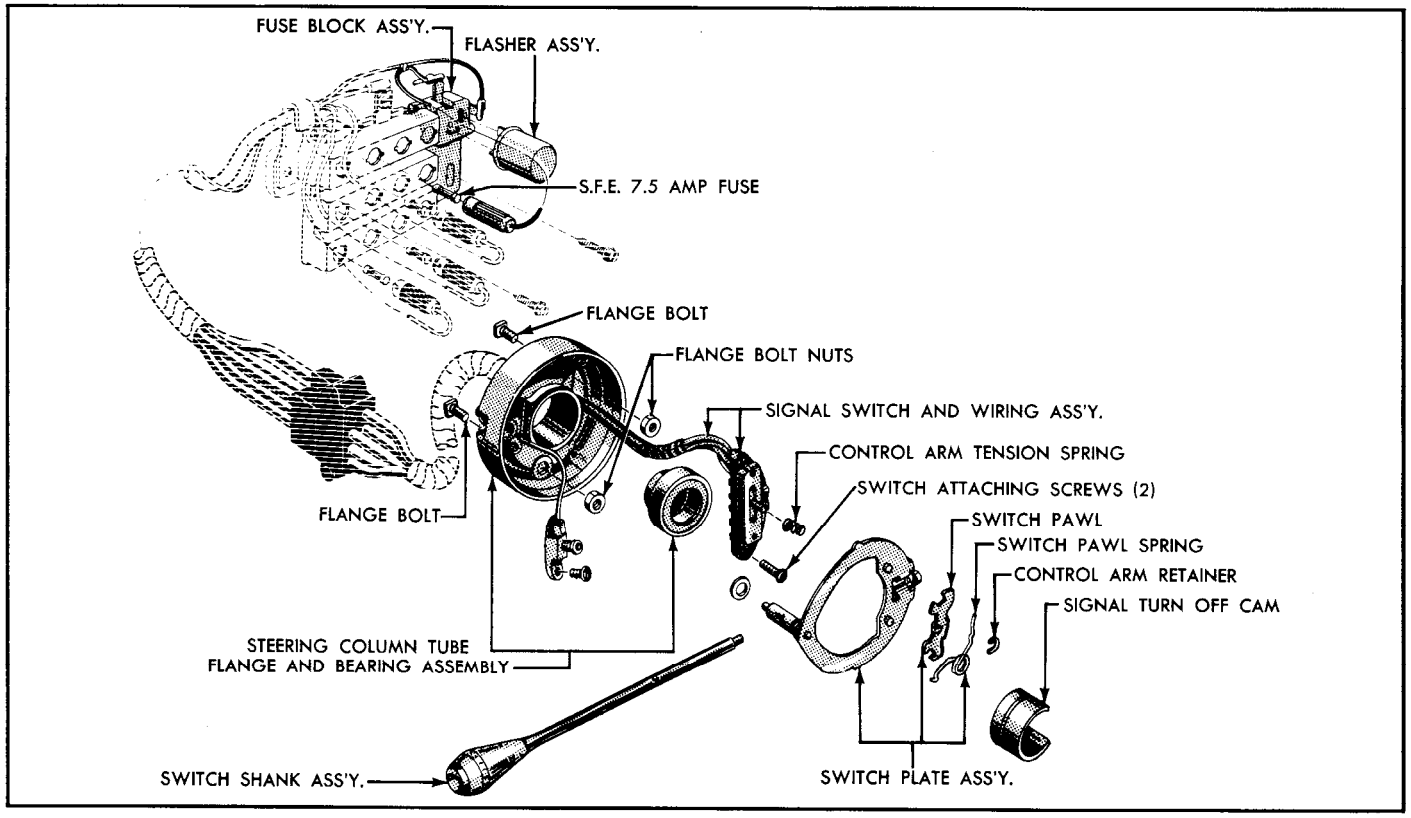

Fig. 11-24—Turn Signals and Related Parts

front of vehicle, flashing simultaneously with the respective left or right rear signal lamp and indicator lamp.

The turn signal circuit is connected through the ignition switch, therefore, it will only operate with the ignition switch turned on for ignition or accessories.

REMOVAL OF TURN SIGNAL INDICATOR CONTROL

For parts identification refer to figure 11-24.

1. Remove cap and emblem assembly from steering wheel.
2. Remove steering wheel nut.
3. Remove steering wheel.
4. Remove coil spring from turn signal indicator switch plate assembly.
5. Remove turn signal indicator lever and lift out switch plate assembly.
6. Disconnect turn signal indicator wires from junction block located near point of entry into steering column. Slide the plastic cover off wires. Attach a 3 or 4 foot length of wire or heavy cord to the end of the six indicator wires to enable replacement wires to be pulled through the column.

   NOTE: The blue horn wire should not be pulled through the column.
7. Remove the two screws securing switch and wiring assembly to the flange.
8. Pull switch and wiring assembly from the steering column far enough to remove the wire or heavy cord attached in step 6.

INSTALLATION OF TURN SIGNAL INDICATOR CONTROL

1. Before installing, inspect parts for excessive wear or defects. Inspect connections at switch. Repair any loose connections.
2. Lubricate hub of switch plate assembly lightly with Lubriplate or equivalent if required.
3. Pull wires through outlet of steering column. Slide plastic cover over all wires entering steering column. Connect wires to junction block. Observe color code of wires, making sure that wires with like color code are connected together.
4. Secure switch to flange with two screws.
5. Install the switch plate assembly with the spring and pawl assembled. Install coil spring on switch plate assembly compress spring and secure with clip.
6. Install indicator lever in position. Check operation of turn signal indicator assembly at this point before completing assembly.
7. Install steering wheel.
8. Install cap and emblem retainer. Tab at bottom

of retainer must enter pilot hole in steering wheel hub.

9. Install steering wheel nut. Hold cap and emblem retainer centered on wheel hub while tightening nut. Torque wheel nut to 45 lbs. ft.
10. Turn steering wheel to straight ahead position and install cap and emblem assembly with emblem in upright position.
11. Check operation of horn and turn signal assemblies.

TURN SIGNAL INDICATOR TROUBLE SHOOTING CHART

TROUBLE	CAUSE	REMEDY
(1) One signal light fails to operate.	(a) Burned out bulb.	(a) Replace bulb.
	(b) Loose connection at junction block.	(b) Repair wire connection at junction block.
	(c) Loose connection at bulb socket.	(c) Tighten or resolder connection.
	(d) Loose connection at switch assembly.	(d) Repair connection.
(2) All signal lamps fail to operate.	(a) Burned out fuse.	(a) Replace fuse. NOTE: Before fuse is replaced, check further for short.
	(b) Faulty switch assembly.	(b) Replace switch
	(c) Faulty flasher unit.	(c) Replace flasher unit.
	(d) Open or shorted wire from flasher unit to switch.	(d) Repair or replace wire.
	(e) Open or shorted wire from ignition switch to fuse.	(e) Repair or replace wire.
(3) Turn signal cancels prematurely.	(a) Cam improperly positioned on hub of wheel.	(a) Reposition cam.
	(b) Coil spring on switch plate assembly loose or defective.	(b) Replace coil spring.

FUSE CHART

See figure 11-25 ("Fuse Location Guide")

COMPONENT	PROTECTION DEVICE	LOCATION
Interior Lamps	SFE 7.5 Amp. Fuse	Fuse panel on left cowl
Turn Signals	SFE 7.5 Amp. Fuse	Fuse panel on left cowl
Heater Blowers	SFE 14.0 Amp. Fuse	Fuse panel on left cowl
Radio	SFE 7.5 Amp. Fuse	Fuse panel on left cowl
Radio Antenna—Electric	SFE 14.0 Amp. Fuse	Fuse panel on left cowl
Spotlight	SFE 7.5 Amp. Fuse	Fuse panel on left cowl
Multi-Luber	SFE 7.5 Amp. Fuse	Fuse panel on left cowl
Clock	1 AG-1 Amp. Fuse	Fuse panel on left cowl
Cigar Lighter	1 Sulphur Disc.	Attached to back of lighter socket
Overdrive	1 AGC 15 Amp. Fuse AGC 15 Amp. Fuse	Fuse panel on left cowl On O.D. Relay bracket in engine compartment
Back-up Lamps	SFE 7.5 Amp. Fuse	Fuse panel on left cowl

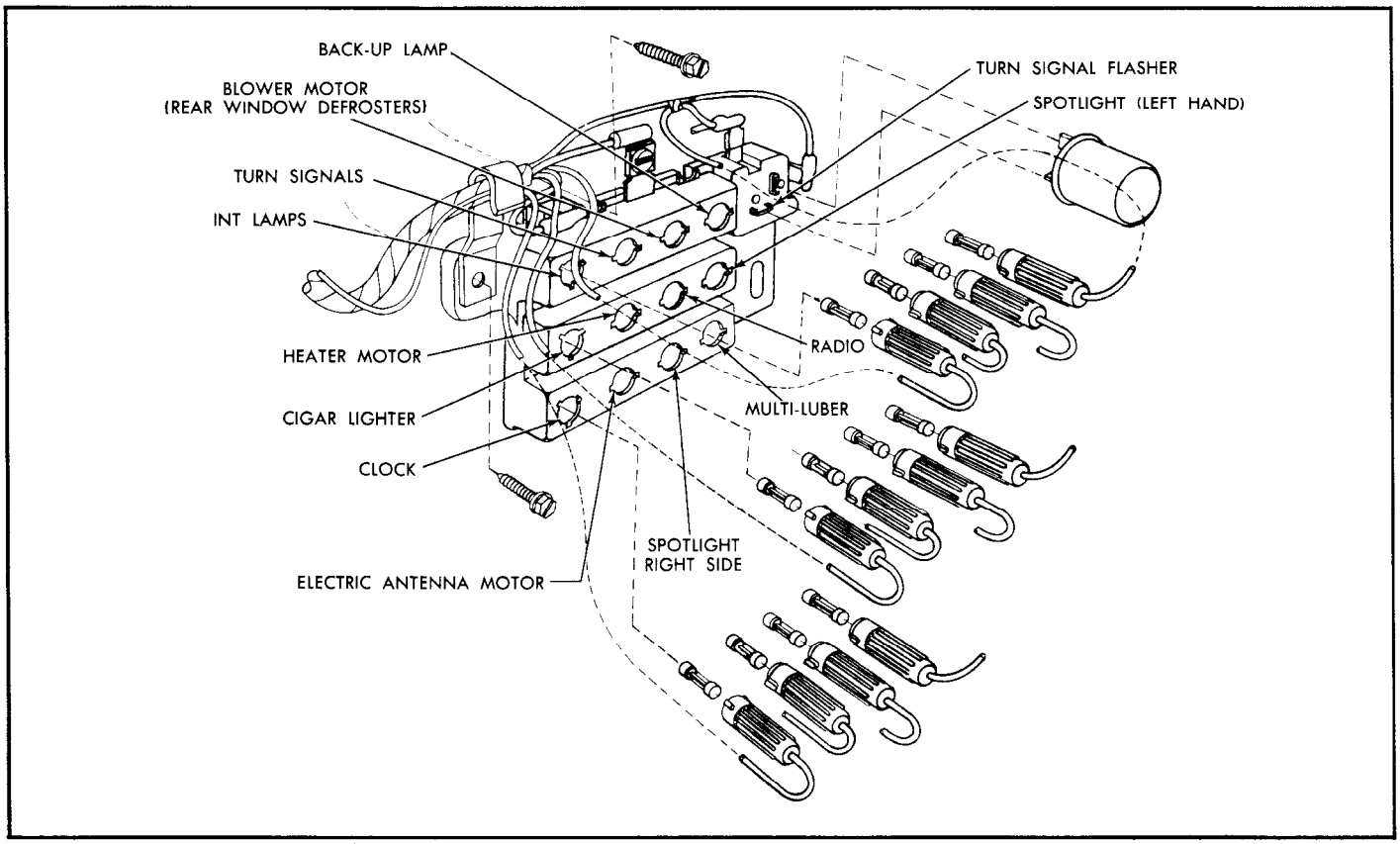

Fig. 11-25—Fuse Location Guide

LAMPS

LAMP DESCRIPTION	NUMBER OF BULBS USED	CANDLE POWER OR WATTAGE	TRADE NUMBER
Standard Headlamps–High/Low Beam	2	50/40 W	5400
Quadri-Beam Headlamps			
High Beam	2	50/37 5W	4002
Low Beam	2	37 5W	4001
Front Turn Signal/Parking	2	32/4 C.P.	1034
Spot Light 4.4″ Diameter	1	30 W	4405
Engine Compartment	1	15 C.P.	93
Rear Turn Signal and Stop/Tail	2	32/4 C.P.	1034
Back-Up Lamps	2	21 C.P.	1141
Luggage Compartment	1	4 C.P.	67
Rear License Plate Lamp	1	4 C.P.	67
Courtesy Lamps			
Arm Rest (Model 76A, B)	2	6 C.P.	89
Instrument Panel (all models)	2	6 C.P.	89
Compass Kit Lamp	1	2 C.P.	57
Dome Lamp–Except Models 65, 75, and 76	1	15 C.P.	1003
Utility Lamp	1	4 C.P.	67
Vanity Mirror Kit Lamp	1	2 C.P.	57
Glove Compartment Lamp	1	2 C.P.	57
Rear Quarter Int. Lamp (Models 65 and 75)	2	6 C.P.	89

Rear Seat Back Moulding (Models 76A, B)	2	15 C.P.	1003
Multi-Luber	1	2 C.P.	57
Instrument Panel			
Indicators and Gauges:			
Fuel Gauge	1	2 C.P.	57
Charge Indicator	1	2 C.P.	57
High Beam	1	1 C.P.	1445
Oil Indicator	1	2 C.P.	57
Speedometer	2	2 C.P.	57
Temperature Gauge	1	2 C.P.	57
Turn Signal	2	1 C.P.	1445
Panel Illumination			
Ash Receptacle	1	1 C.P.	1445
Clock	1	2 C.P.	57
Heater Controls	2	2 C.P.	57
Ignition Key	1	2 C.P.	57
Parking Brake Signal	1	2 C.P.	57
Radio Dial	1	2 C.P.	57
Transmission Keyboard Control	1	2 C.P.	57
Power Booster Fan Indicator	1	1 C.P.	1445

WIRING DIAGRAMS

The wiring diagrams, which follow, are provided as an aid to the mechanic in locating and correcting electrical system failures. Use the circuit symbols as an aid in identification of circuit components. Some of these circuits may appear complicated, but when followed in component order or individually it will be found that a direct comparison can be made between the diagram and the actual parts involved.

Some basic rules to follow when making electrical system repairs are:

1. Disconnect negative (ground) cable from the battery before removal of any electrical component to prevent the possibility of causing a short circuit.
2. In the event of "blown" fuses, the cause should be determined before replacing the fuse. Fuses, and/or circuit breakers, are an integral part of a circuit to prevent damage as a result of short circuits or otherwise overloaded circuits.
3. Any wiring with cracked or worn insulation must be repaired or replaced.
4. Corroded, dirty or loose contact points have a high resistance to the flow of electrical current and, therefore, may be the cause of an overloaded circuit or may be the cause of an open circuit. During diagnosis, inspect all connections for these conditions.
5. Care should be exercised to avoid heavy demands on the battery, especially when the engine is at idle or stopped. See "Battery Discharge Time for Electrical Components".

Battery Discharge Time for Electrical Equipment

The following items contribute to battery failure if operated without engine running:

Condition	Time Required to Discharge a New Battery to 1.200 Sp. Gr.
Headlamps on	2½ hours
Cigar Lighter on	4 hours
Road Lamps on	6 hours
Door left open	7 hours
Heater on	7 hours
Defroster on	7 hours
Parking Lights on	6 hours
Radio on	8 hours
Ignition Switch on	15 hours
Back-up Lamps on	15 hours
Turn Signals on	16 hours
Deck Lid open	96 hours
Glove Box open	150 hours
Car in new car storage (at 70° F.)	750 hours

These items often appear in combinations. Their effect on the battery then increases. For example: If the door was left open (7 hours) and the radio was turned on (8 hours) their cumulative effect would cause the battery to discharge in 3 hours to 25% capacity.

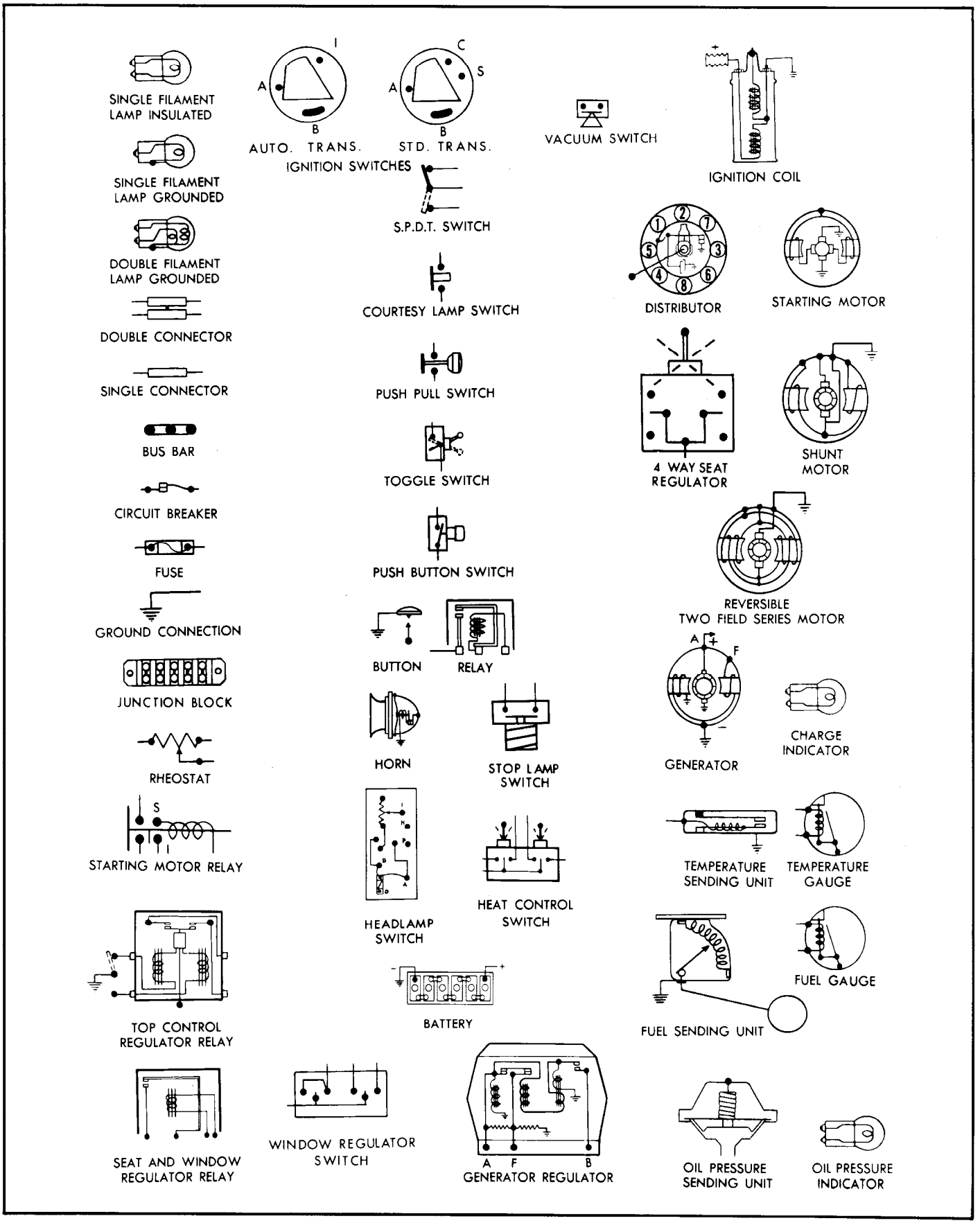

Fig. 11-26—Circuit Symbols

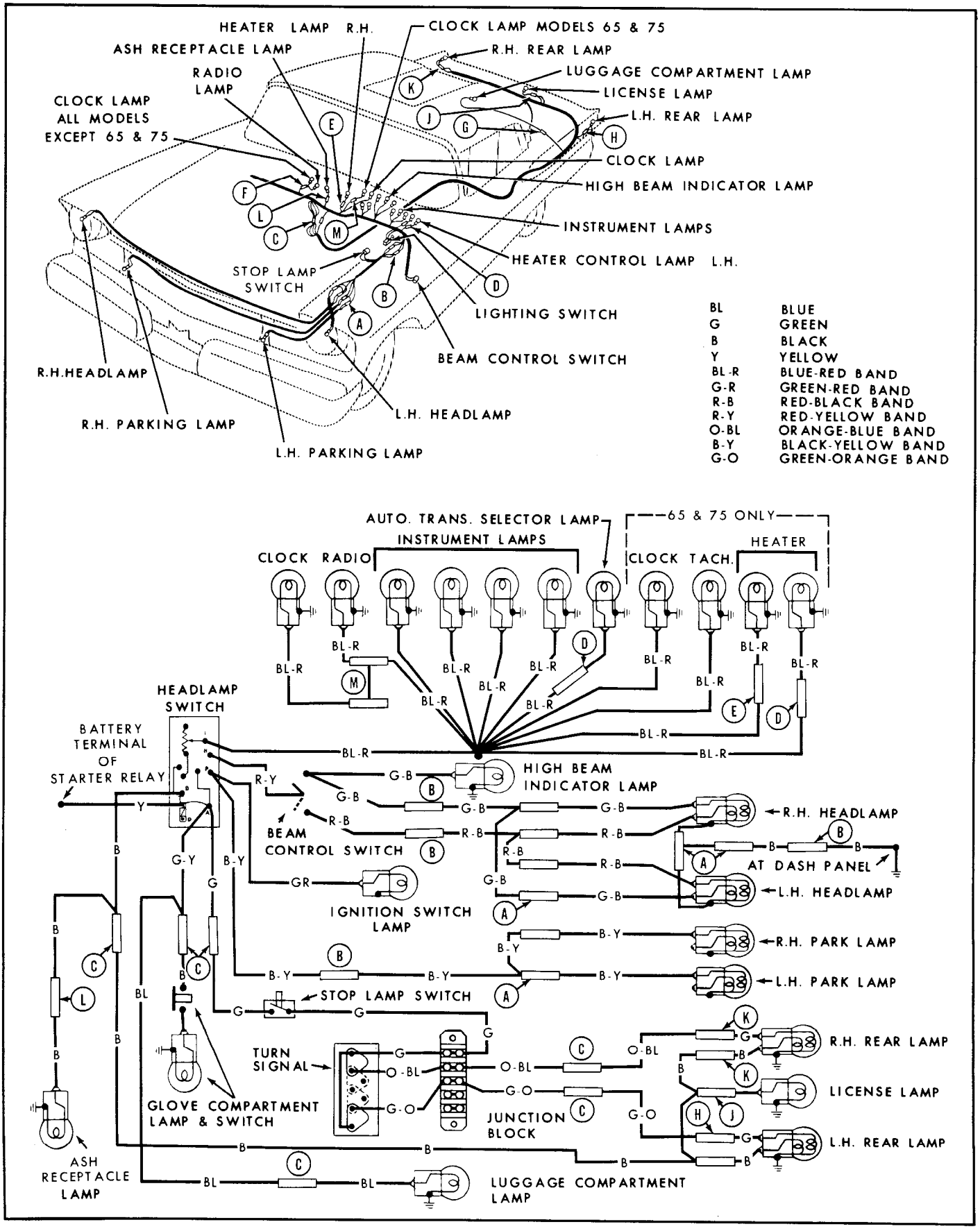

Fig. 11-27—Exterior and Instrument Lamp Circuits

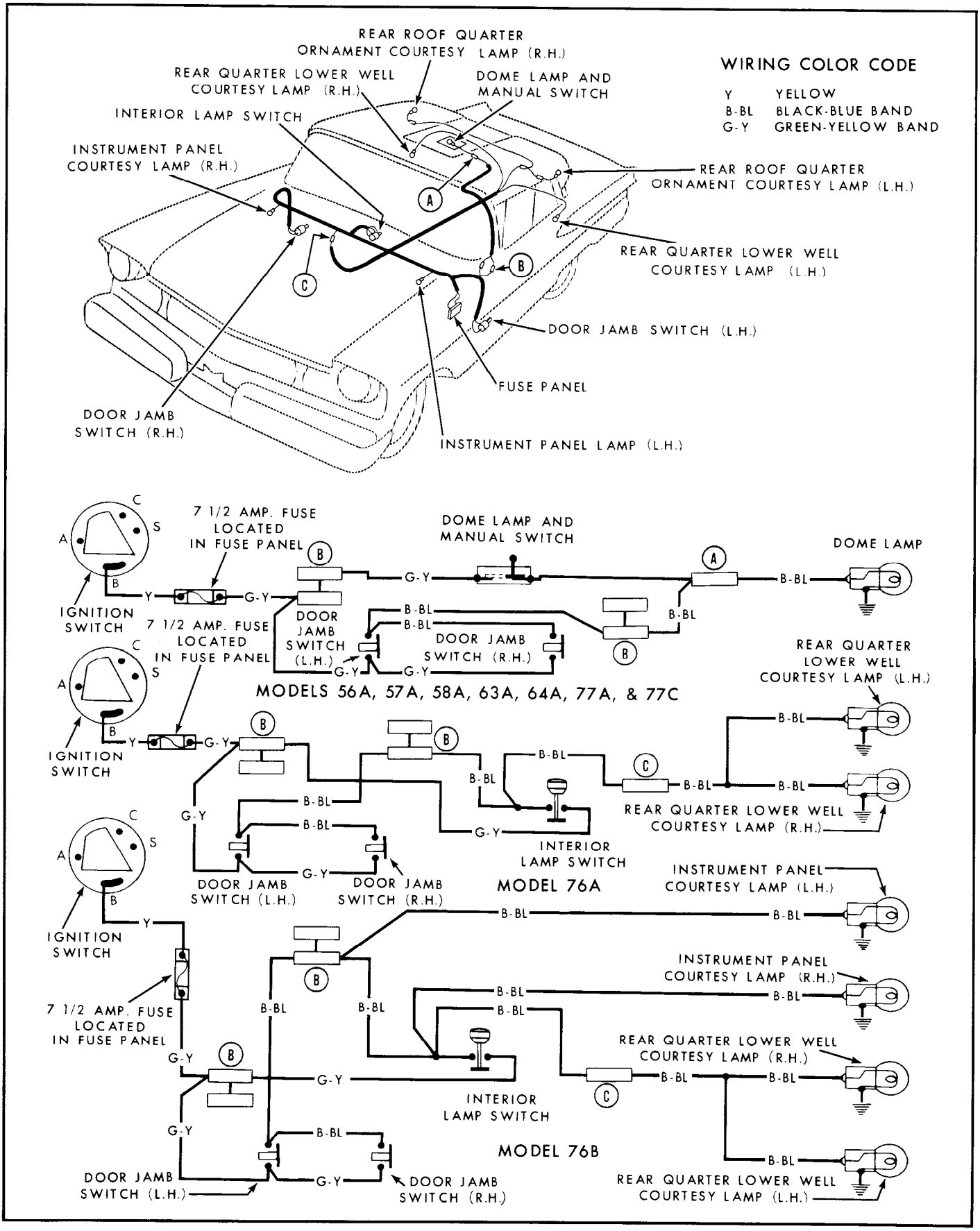

Fig. 11-28—Interior Lamp Circuits—Models as Noted

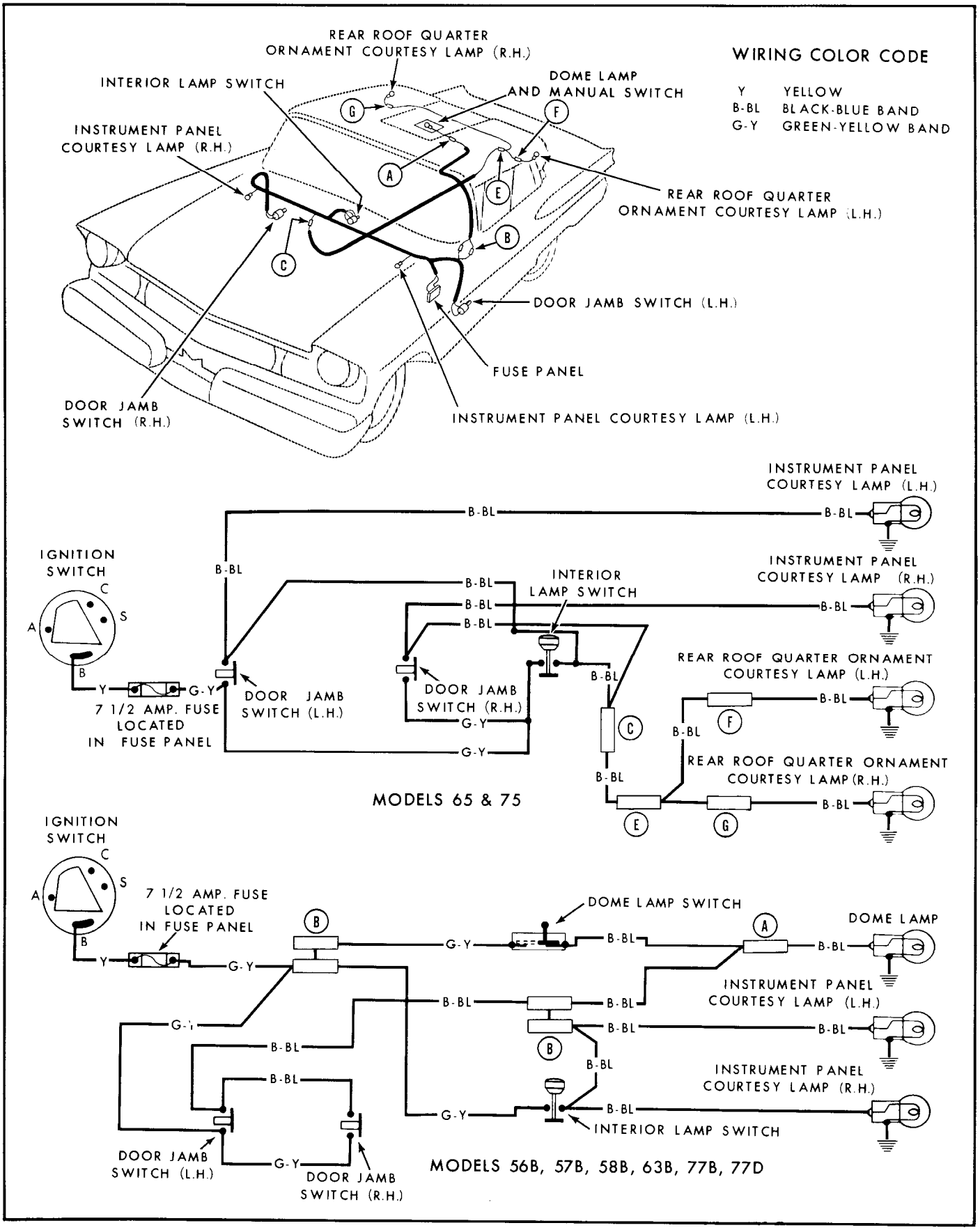

Fig. 11-29—Interior Lamp Circuits—Models as Noted

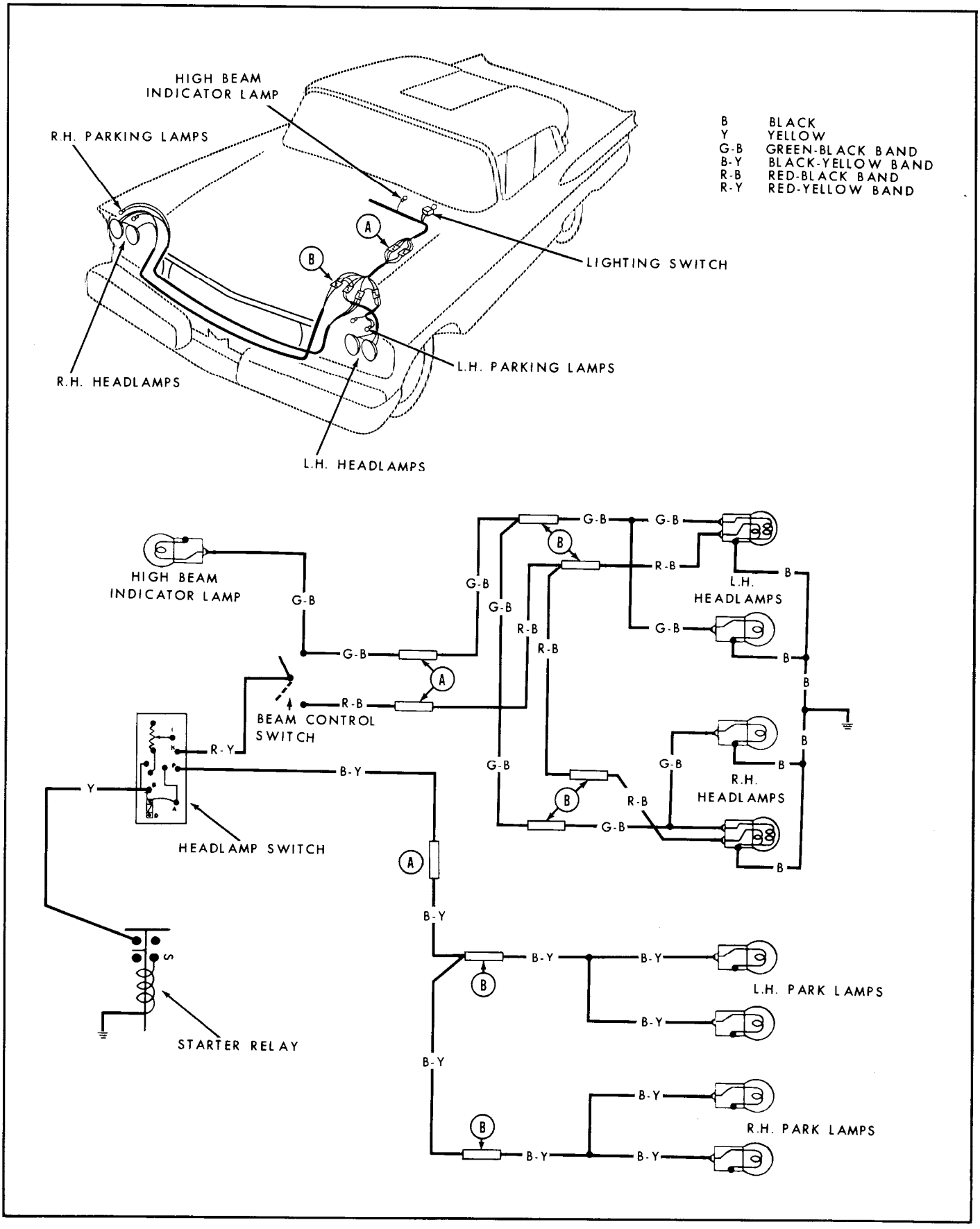

Fig. 11-30—Quadri-Beam Headlamp and Parking Lamp Circuits

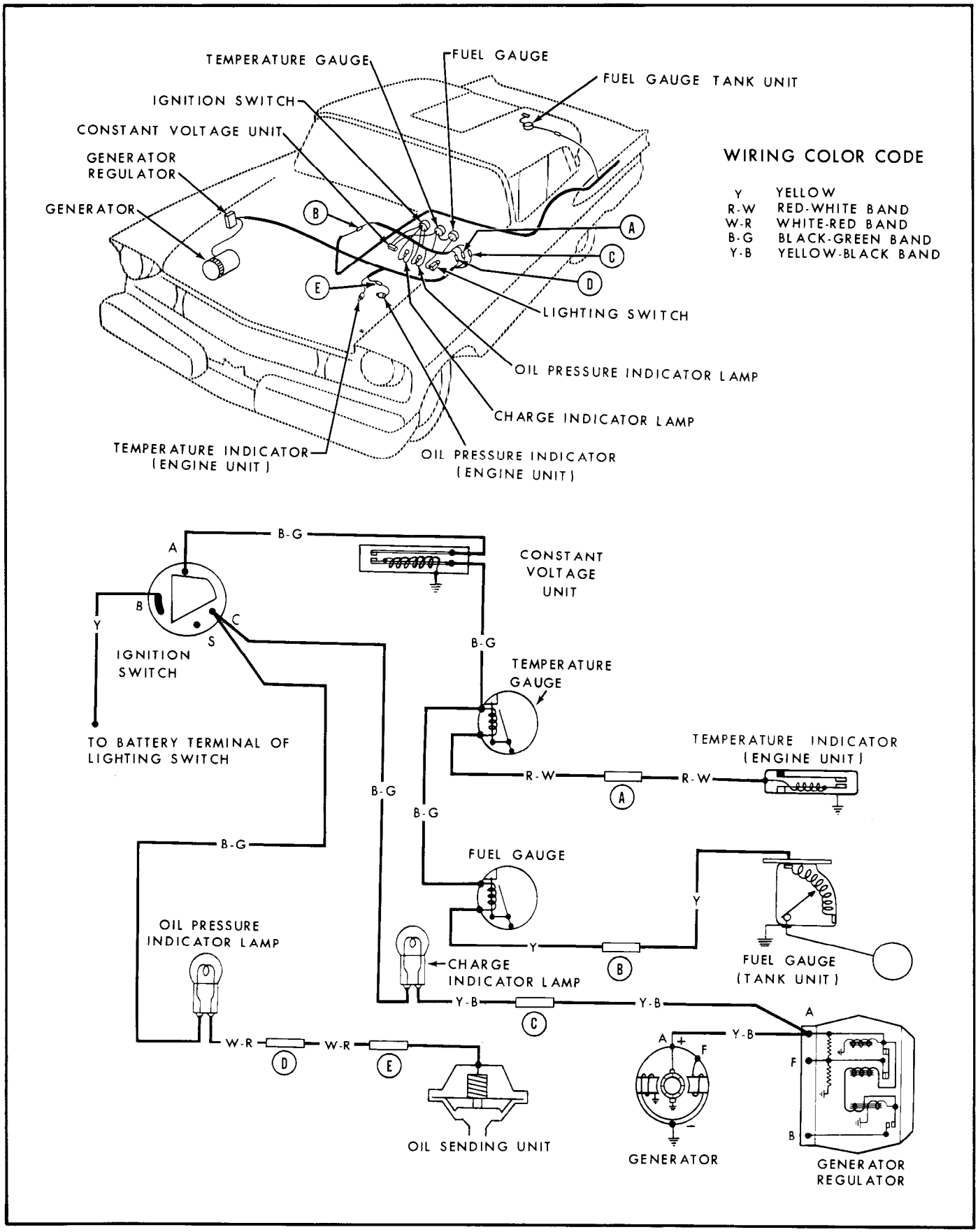

Fig. 11-31—Gauge Circuits

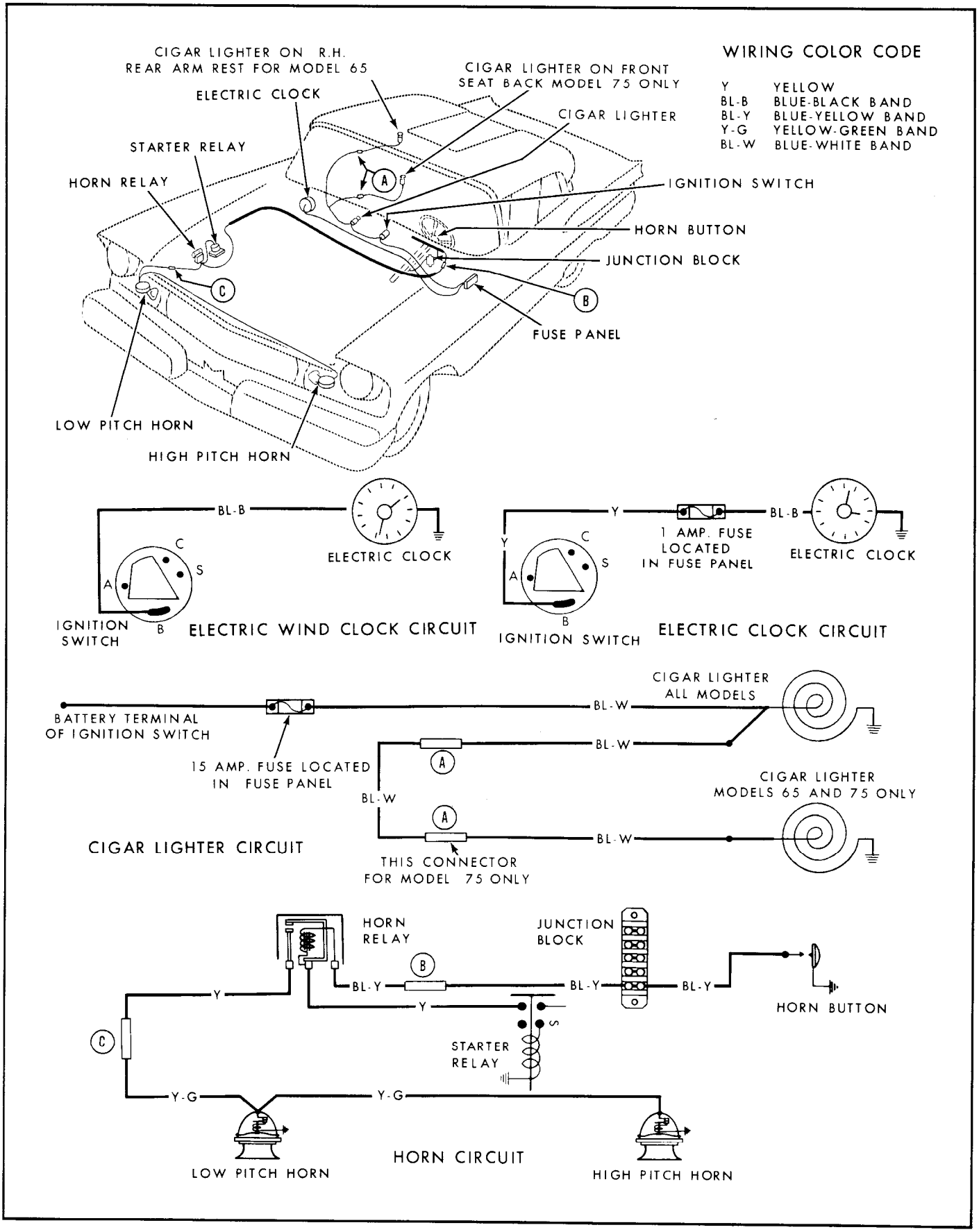

Fig. 11-32—Horn and Clock Circuits

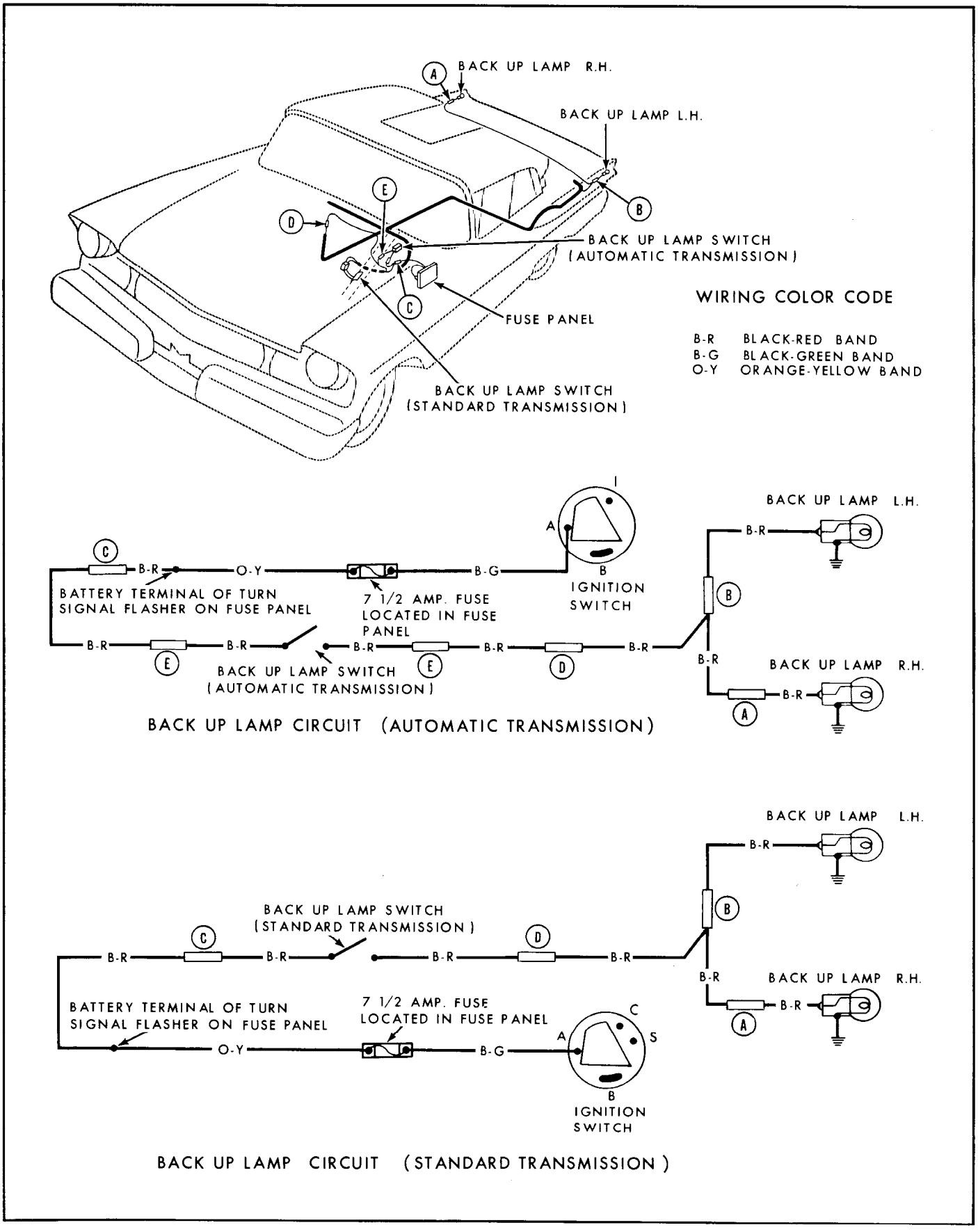

Fig. 11-33—Back-Up Lamp Circuits

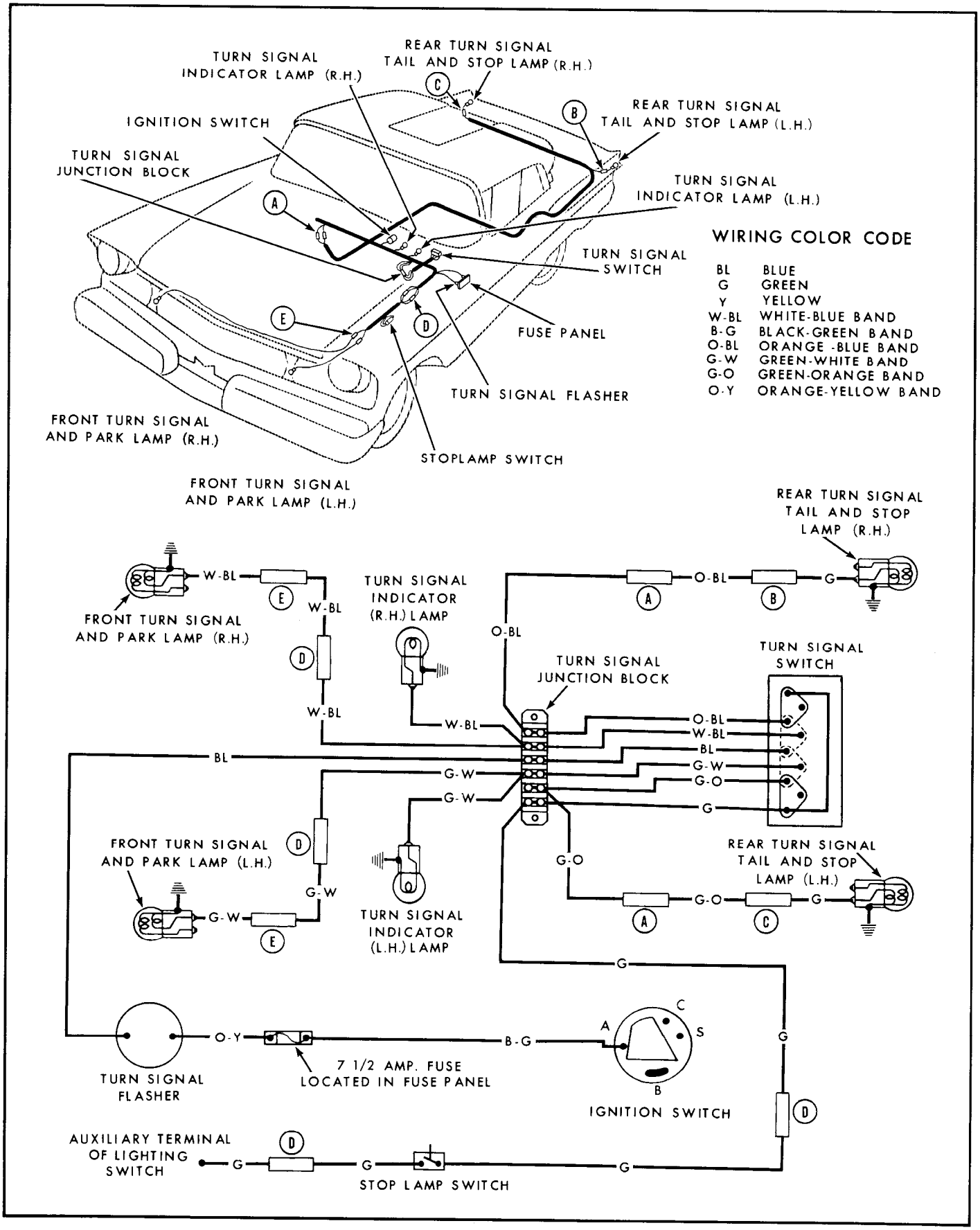

Fig. 11-34—Turn Signal Indicator Circuit

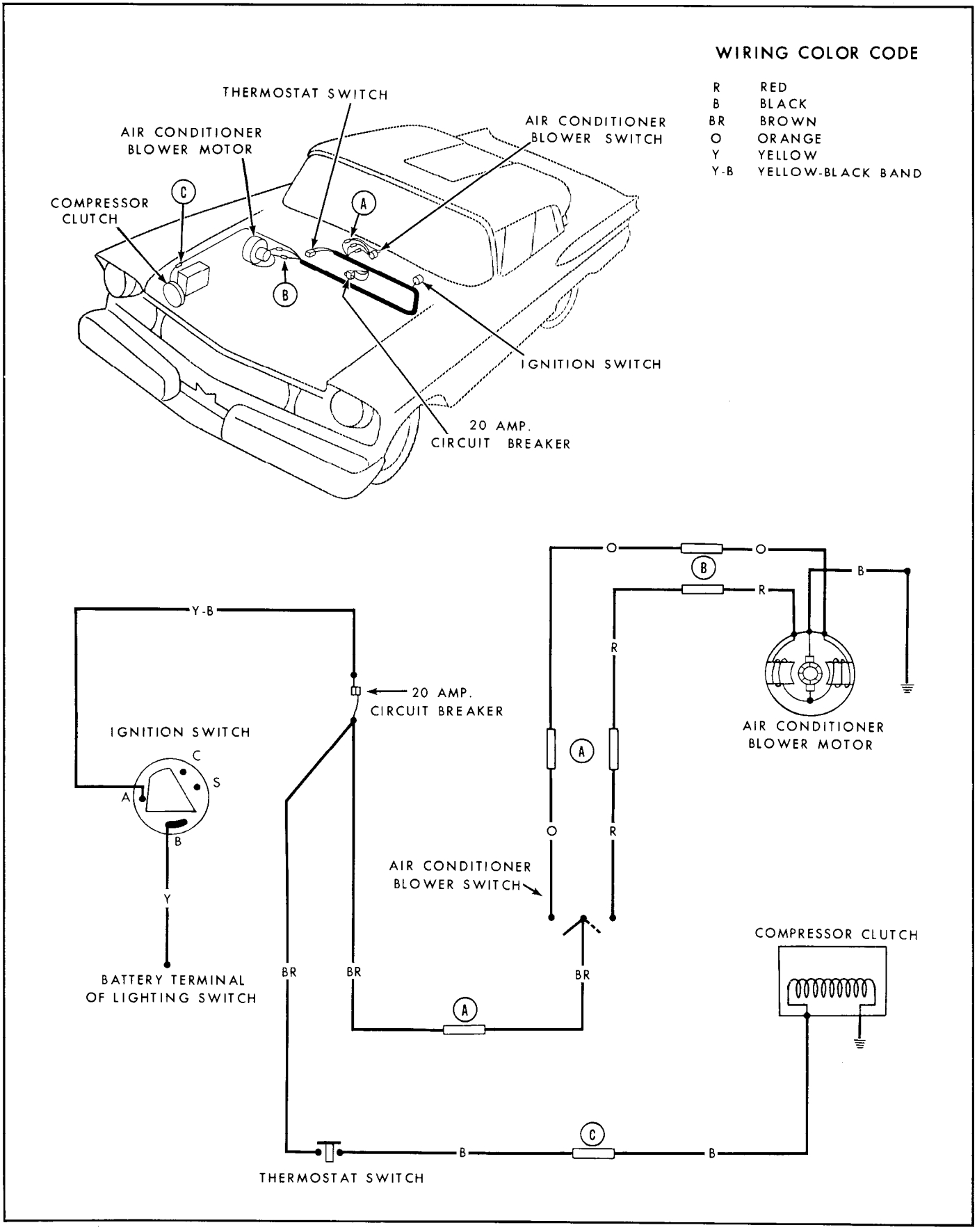

Fig. 11-35—Air Conditioning Blower Circuit