The wiring diagrams in your Service Manual and the actual layout of the wiring on the car don't really have much physical similarity. But, once you know how to read the diagrams, you'll find it much easier to trace the circuits on the car. There's no great secret to tracking down electrical difficulties located in the wiring harnesses. All it really takes is a little understanding and a lot of common sense.

DIAGRAMS GIVE DIRECTIONS

Just reading a wiring diagram won't tell you exactly where any electrical problem is on the car. But, if you know what to look for, the diagram will tell you how to go about tracing out the circuit to pinpoint the difficulty.

DIAGRAMS IN SECTIONS

The Service Manual presents the wiring diagrams in sections. That is, one diagram shows the front-end lighting, another the engine compartment wiring, another covers the instrument panel, a fourth shows the body wiring and, in some cases, there is a separate diagram for the rear lighting. You'll also find diagrams for special equipment, such as consoles, electric window lifts, stereo sound systems and other accessories.

IDENTIFYING COMPONENTS

A wiring diagram is much like everything else we read. That is, you must have some understanding of what you're reading before the diagram will mean anything at all. The wiring diagrams contain some symbols, but most of the components are identified by labels, and they are drawn in roughly the same shape as the actual component. The components will probably not be in the same relative positions in the car as they are in a schematic drawing. But, you'll find that they *are* in the proper circuit location. So, when you're tracing a circuit on the diagram, you can expect to find components, connectors and switches in the correct sequence between battery and ground.

DIAGRAMS ARE CONNECTED

Just as there are connectors in the wiring harnesses, there are also representations of connectors in the wiring diagrams. At some point on each of the diagrams, you'll find a representation of one-half of a connector, with a notation that tells where the other half of the connector is located.

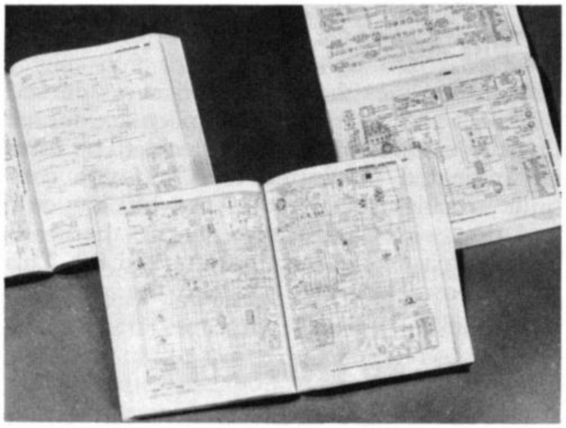

Fig. 1—Wiring diagram in sections

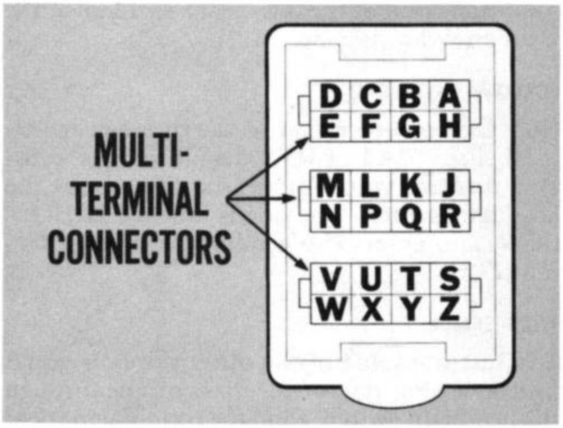

Fig. 2—Diagrams are connected, too

THE DIAGRAM SAYS

Using the diagrams in the 1968 Chrysler-Imperial Service Manual, let's trace a circuit through a typical diagram, to see what we can learn about the circuit. We'll start with the headlights, in the front-end lighting diagram, and trace the circuit all the way back to the source of current and voltage. That way, we'll hit just about all of the components that are included in a wiring diagram.

LAMPS ARE INTERCONNECTED

Starting at the center terminal of the right-hand outboard (low beam) headlamp, note that the wire is labelled L4A-16V*. All of these numbers and letters have specific meanings, which will be discussed later on in the book. Follow this wire on the diagram down to the left outboard headlamp, where it is connected to the center terminal. From the left lamp, you can see that the lead goes to one of the three multi-terminal blocks in the bulkhead disconnect. The wire is now labelled L4-16V*, and enters the disconnect at the terminal marked with an "X".

SWITCH DIAGRAMS

The front-end lighting circuit diagram ends at the bulkhead disconnect. So, turn to the instrument panel wiring diagram to continue tracing the circuit. Pick up the circuit at the bulkhead disconnect in the instrument panel diagram, at the "X" terminal. The wire still carries the L4-16V* designation. Follow the wire to its termination point at the low-beam terminal of the headlamp dimmer switch.

FOLLOW HOT LEAD

Note that one terminal of the dimmer switch is labelled "BATTERY". Don't let this notation mislead you. Follow the line up to the headlight switch. The line is labelled L2B-16-LGN, and enters the headlight switch at terminal "H".

WIRE SPLICE

To illustrate some of the other symbols you'll find on wiring diagrams, let's continue through the headlight switch. Find the terminal marked "B1" and follow the line labelled L1-16BK. This line is one of the power supplies to the switch. It goes directly down to a circle with a number of other lines meeting there. This circle indicates a wire splice, or a junction point. By using splices, we can eliminate the need to run wires directly from the battery to all of the electrical components in the car.

WHEN IS A SPLICE A SPLICE?

All of the lines on these large wiring diagrams cross another line somewhere along the route. This doesn't mean that the wires are connected at these points. The connecting points for two or more wires are indicated only by a circle, a solid black dot, or by the fact that the wires are connected to the same terminal of a switch or other component.

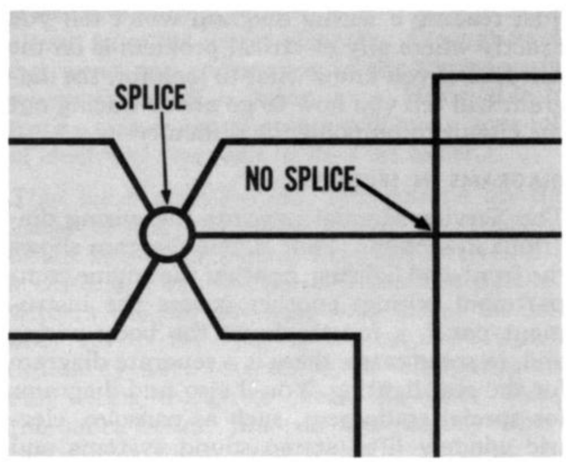

Fig. 3—Splices are marked

THE FUSE BLOCK

One of the lines from the splice is marked Q3-12R, and connects the splice to one of the fuse cavities in the fuse block. (The fuses are indicated by dotted lines.) If you continue tracing through the fuse block, you'll find that wire L8-18P also goes to the headlight switch, to the terminal marked B2. This is the power supply lead for the stoplight and taillight lamps.

NO SECRET CODE

Earlier in the book, we said that the letters and numbers on the wires in the diagrams all have some meaning. These letters and numbers are codes which identify specific circuits or parts of circuits. In the actual wiring harnesses, as you know, you'll find many circuits that use the same colored wires. This is also true on the diagrams, but there are additional codes to separate one circuit from another.

CIRCUIT CODES

The first part of the code designation specifies the individual circuit or portion of circuit you're tracing. Looking at the diagram for front-end lighting, the wire at the bottom of the diagram is labelled L4-16V*. The first part of this code, L4, is actually the part that identifies this part of the headlight circuit.

RELATED CODE

Remember the first wire we looked at in tracing the headlight circuit? It was labelled L4A-16V*. The L4 indicates that this is also a part of the L4 circuit, but the A means that it is a different branch of that circuit. In some of the circuits, such as instrument panel lamps, this additional letter designation will carry on through A, B, C, until all of the lamps have been identified.

SIZE AND COLOR

The last part of the diagram code shows the size of the wire and the color of the insulation. The 16 means that the wire is 16-gauge, and the V means that the insulation is violet color. You'll find a chart in the corner of the diagram to tell you what the different letter designations mean as related to color. You'll also see a notation for a * star, or asterisk. This simpy means that the insulation on that wire has a tracer, or stripe, on the insulation. The tracer might be any color, but it will always contrast with the base color of the insulation.

ABOUT SIZES

Wire sizes are related to the number of drills. That is, as the numbers increase, the diameter of the wire decreases. One thing you should know about cars with a twelve-volt system is that the smallest wire that should be used is 18 gauge. Otherwise, you're going to have resistance that could cause excessive voltage drops, and possible fire hazards.

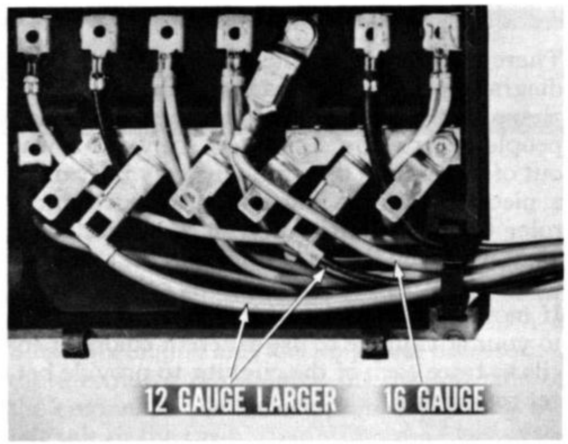

Fig. 4—Wire size numbers

COLORS SOMETIMES CHANGE

You can't always count on a wire being the same color on one end of the circuit as it is on the other end. It might be a case of a wire entering a splice with one color and, because there are other circuits entering the same splice, it comes out of the splice wearing a different color. Or, in some cases, a wire enters a connector with the insulation one color, and the circuit comes out the matching terminal of that connector with another color. In fact, in some instances, a single wire enters one side of a connector and two wires, each a different color come out the other side, at the same terminal. These two points by themselves are enough to emphasize the importance of a wiring diagram.

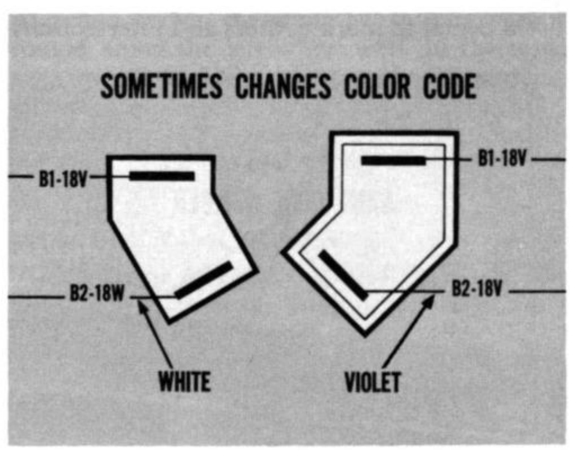

Fig. 5—Color codes change

UNWINDING THE SPAGHETTI

There may be times when, looking at a wiring diagram, you get the idea that it looks like a lot of spaghetti. Well, this has happened to many people before, too. But there's always a way out of a situation like this. One way is by using a piece of thin tracing paper, a pencil and a ruler to trace the circuit you're interested in. That way, you'll have a single circuit to follow, without any confusion from any other circuits. If more than one circuit is involved, it will be to your advantage to use different colored pencils to trace each of the circuits, to provide better separation.

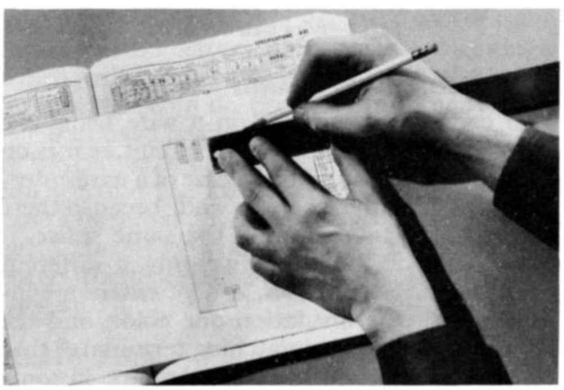

Fig. 6—Make a tracing of circuit

KEEPING STRAIGHT

For the simpler circuits, you'll probably find that following the lines will be easy enough if you just lay a straightedge along the lines and use a pencil to mark corners and intersections.

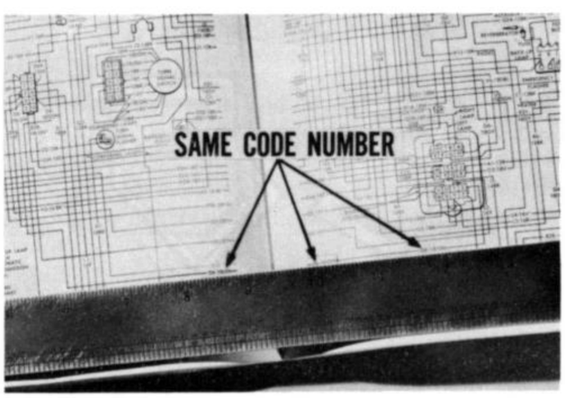

Fig. 7—Use a straightedge

On most of the lines, the identifying codes are near the corners, to make it even less confusing.

SCHEMATIC DRAWINGS

Another type of drawing representation of electrical circuitry is called a schematic. Schematic drawings present the circuitry involved in a single electrical component in the simplest, most easily understood form. All the parts of the component are laid out separately, as nearly as possible in the same general locations as they are found in the component circuit.

A TYPICAL SCHEMATIC

The schematic illustrated here is of the turn-signal system in one of the 1968 Chrysler Corporation cars. You can see that the lights, switch and flasher are found in the same relative positions as they are in the car. Note also that the stoplight circuit, starting at the switch, is included in the drawing. That's because the three systems are very closely related, using some of the same parts, as well as the same circuits.

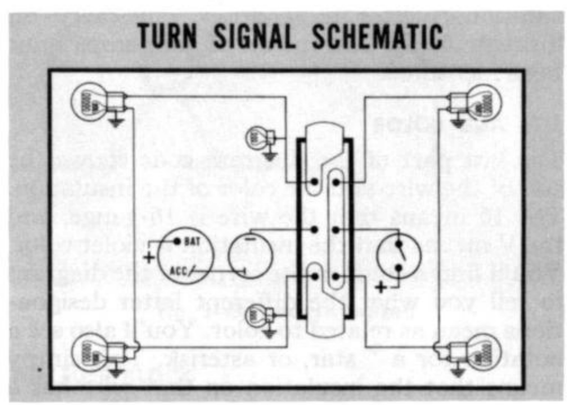

Fig. 8—Typical schematic diagram

FROM MAP TO GUIDE

There is a definite relationship between a wiring diagram and a schematic drawing. Think of it this way: a wiring diagram is a kind of road map that takes you up to the component. The schematic is a street guide that tells you what goes on electrically inside that component system, and where it's happening. Reading the schematic is really no different than reading a wiring diagram, except that it's usually much easier, since there's less chance for confusion.

Once you know how to read a wiring diagram and a schematic drawing, you're just about all set. That is, if you can transfer the information you got from the drawing to the actual wiring on the car. That part becomes easier when you learn where the wiring runs for the circuit.

LAYOUTS ARE GENERALLY SIMILAR

In general, the routing of the harnesses is quite similar for the main circuits, regardless of body style. For example, the harness for the front lighting and horns is routed across the front of the car and along the left front wheel well, back to the bulkhead disconnect. There are, of course, variations, such as additional wiring on the Chrysler 300, to operate the rotating head-lamp doors.

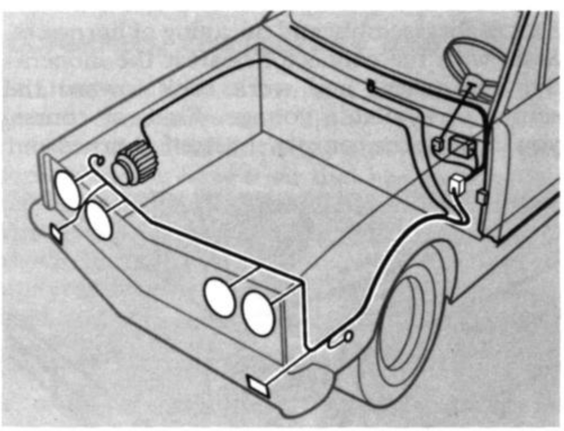

Fig. 9—Front-end lighting harness

ENGINE COMPARTMENT HARNESSES

Nearly all of the alternator harnesses are routed from the disconnect across the bulkhead to the right side of the car. From the right-hand bulkhead they might be clipped to the engine valve rocker covers, or along the right wheel well, up to the alternator. However, in some instances, when the car is equipped with a Slant Six engine and has no power accessories, the alternator is mounted on the left side of the engine, so the harness is routed along the left side of the car.

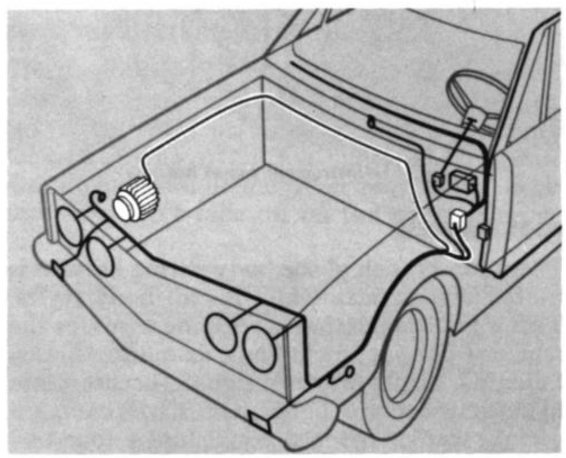

Fig. 10—Alternator harness

As noted above, the front lighting harness is routed along the left wheel well. In the same area, you'll find the harness for the starting circuit, beginning at the positive battery cable, through the relay, where it branches down to the starting motor and to the multi-terminal bulkhead disconnect.

INSTRUMENT PANEL HARNESS

The instrument panel harness begins at the bulkhead disconnect, with a single housing containing the female halves of all three of the engine compartment bulkhead disconnects. From the disconnect, the harness starts out in a large, taped bundle of wires that gradually branch off to tie into the various instrument panel circuits and components. In general, the harness runs from left to right across the panel, with the important exception of the loom that is routed behind the left-hand cowl trim panel. At the end of this loom is a six-terminal connector that plugs into the body wiring harness.

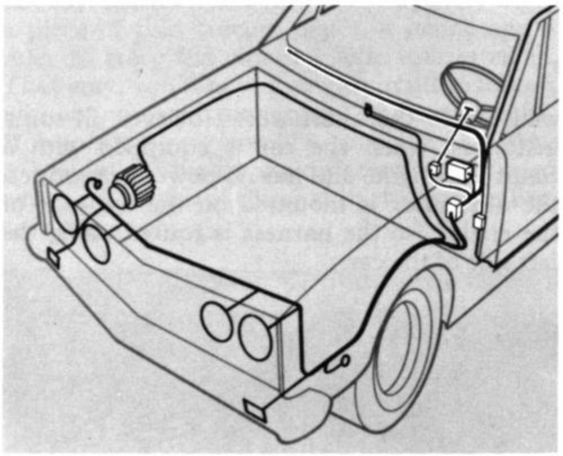

Fig. 11—Instrument panel harness

BODY HARNESS

The main branch of the body wiring harness is routed almost identically for all body styles. This is the branch that carries the wires for the rear-end lighting, including side marker lights, taillights, stoplights, turn signals, license-plate light and backup lights. On some cars, especially earlier models, you'll find a four-terminal connector near the rear of the trunk compartment. This connects to a short harness containing all of the sockets for the rear lights. On later models, the four-terminal connector has been eliminated. Instead, the main harness includes all the sockets for the lights on the left side of the car. A three-terminal connector leads to the harness that includes all of the lights for the right side of the car.

INTERIOR LIGHTS

There are as many routings for the interior lights as there are body styles and lamp locations. For example, the standard dome light is routed from a connector in the left cowl kick panel up through the "A" pillar, along the left roof rail to one of the roof bows and across to the dome light receptacle. On cars with a rear overhead lamp or reading lamps, the wires are routed upward through the left "C" pillar. And, on convertibles, the rear quarter trim panel lights are routed across the floor pan under the rear seat.

CONNECTORS ARE CHECK POINTS

One of the very important details about the routing of the harnesses is the location of the connectors. Many times, when tracking down a short or an open circuit, you can use the connectors as key check points. This can eliminate a lot of disassembly and untaping of harnesses. Start with the connector nearest the inoperative component and work back toward the source of available voltage. First, of course, you'll check the component itself (burned-out

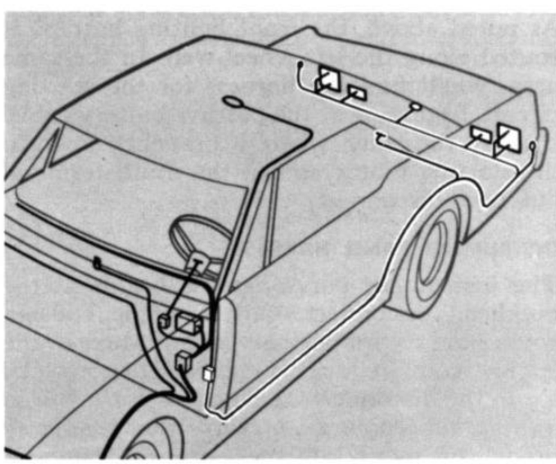

Fig. 12—Body wiring harness

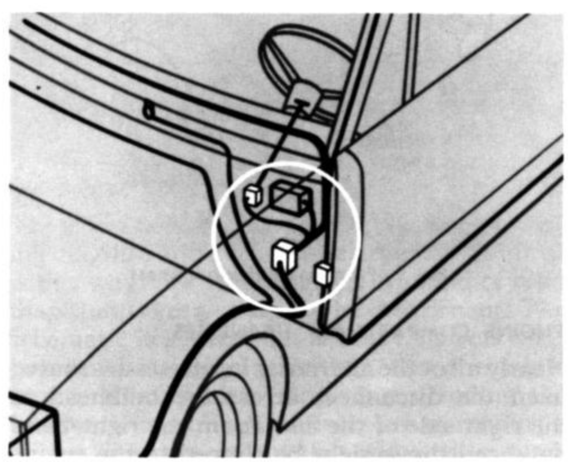

Fig. 13—Connectors are check points

bulb, for instance) and the grounding of the component. You can check the ground by moving the grounding agent or by using a jumper with sharp probes. If the circuit is protected by a fuse, make sure the fuse is not blown. If it's protected by a circuit breaker, the component should operate intermittently, unless the circuit breaker is one of the new remote reset-type breakers. We'll learn about this breaker a little later on in the book.

Fig. 14—Check these first

DIAGRAMS, CONNECTORS AND WIRES

To illustrate how to combine the wiring diagrams, connectors and the actual wiring in tracking down an electrical problem, let's assume that you have a car that has an inoperative left stoplight. Let's also assume that you've already made the preliminary checks discussed above. If those checks show no defects, you're ready to start using diagrams, harness locations and connectors to pinpoint the problem.

START AT THE SOCKET

You can use a continuity light to see if there is voltage available at the socket. Insert the probe into the socket from the rear to contact the rear of the terminal. Be careful not to touch the side of the socket with the probe. Otherwise, you'll cause a direct short and blow the fuse. And, don't forget that the stoplight contact is in the same socket. If there is no voltage available at the stoplight contact, then you're ready to start tracing the circuit forward.

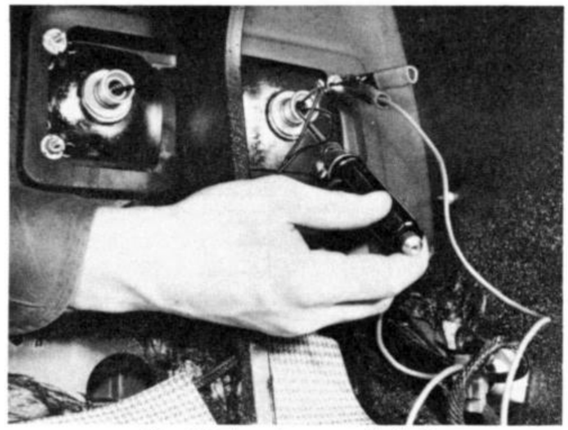

Fig. 15—Is voltage available?

READ THE DIAGRAM FIRST

The diagram in the illustration shows a system with a single stoplight and turn signal on each side of the car. But, the procedure is the same for cars that have multiple lights. The diagram also includes all of the other rear lights, so be sure you don't take off on the wrong circuit.

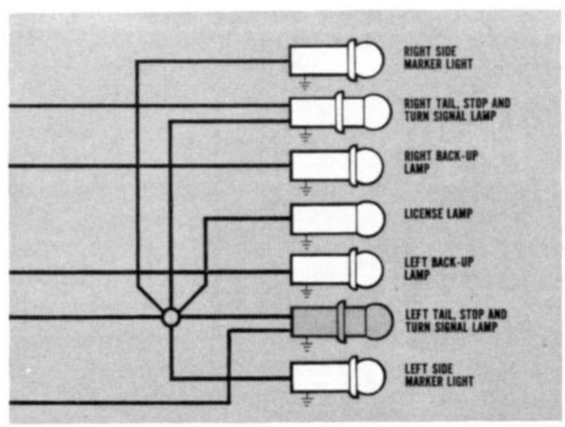

Fig. 16—Typical rear lighting diagram

PASS UP THE SPLICE

The bulb that contains the filaments for the stoplight, turn signal and taillight is labelled on the diagram. As you can see, one of the leads from this bulb goes to a splice. A little bit of observation will show that the license lamp and the side marker lamp are also tied into this splice, so you know that this lead is for the taillamp filament. You want to trace the other lead

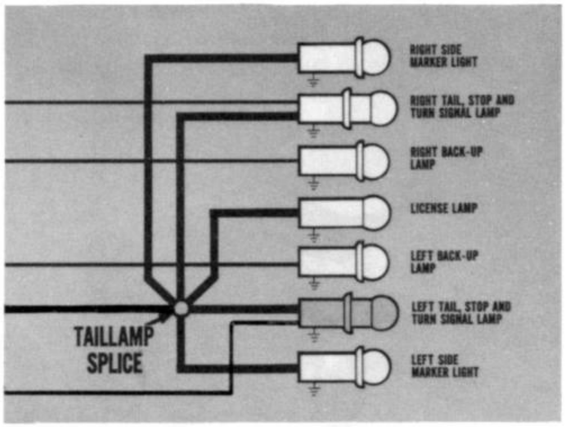

Fig. 17—Not stoplight circuit

from the socket which, as it shows on the diagram, goes directly to a four-terminal connector. As mentioned earlier, this terminal may not be in the car you're working on. If it isn't, then the first connector you'll encounter is inside the left cowl trim panel. But, there's an easier check point that might save you some time and work.

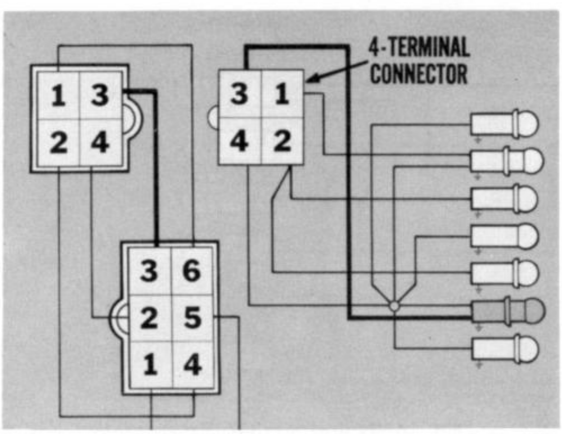

Fig. 18—Body-to-rear lighting connector

CHECK TURN-SIGNAL CONNECTOR

If you turn to the instrument panel wiring diagram, you'll find the other half of the cowl connector in the lower right corner of the page. It's labelled, "To Body Wiring". Find the matching terminal on this connector and trace the circuit to the turn-signal connector, which is much more accessible than the cowl connector. The diagram tells us that the left stop and turn-signal wire is dark green.

TEST FOR VOLTAGE

Insert the continuity light test probe into the turn-switch connector and press the brake pedal. If you don't get a light, then you know that the problem is somewhere between the connector and the fuse block. Test the brake pedal switch to see if it's making contact. If not, there's a chance that a simple adjustment will do the job. If the switch is making contact properly, then you've isolated the problem in the turn-signal switch.

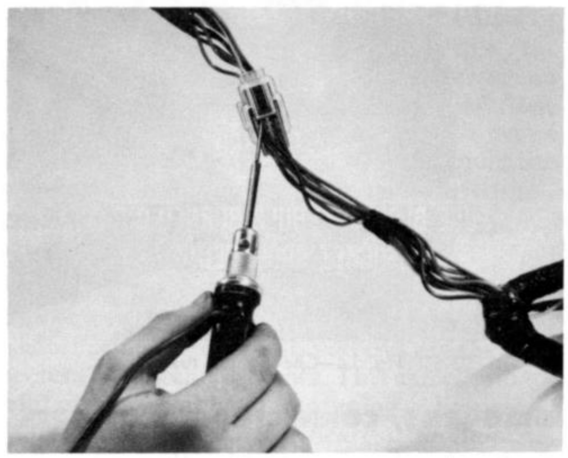

Fig. 19—Turn-signal connector test

COWL CONNECTOR TEST

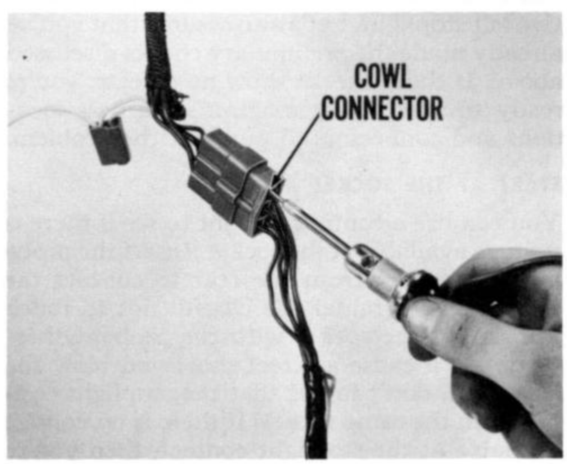

Fig. 20—Check at cowl connector

Let's assume that, when you used your test light at the turn-signal switch connector, the light came on. Then you know that your problem is somewhere between that connector and the rear of the car. Remove the cowl trim panel and use the test light again, at the dark green wire in the six-terminal connector. If there's no juice here, then there's a broken wire between that connector and the turn-signal switch connector. If the light comes on, the broken wire is in the body wiring harness. That means checking the wires that run rearward under the sill scuff plate.

PROBE FOR OPEN

Remove the sill scuff plate and bend back the wiring trough cover to expose the body harness. You'll find that the body wiring harness is encased in a mesh loom, so that you can easily identify wire colors. However, on some earlier model cars, the harness is taped. On these cars, peel back enough tape at the middle of the harness to give access to the wires. Don't forget, the wire we're interested in in this case is colored dark green. So, start at the middle of the harness and push the continuity light probe into the wire far enough to contact the conductor. Have an assistant press the brake pedal.

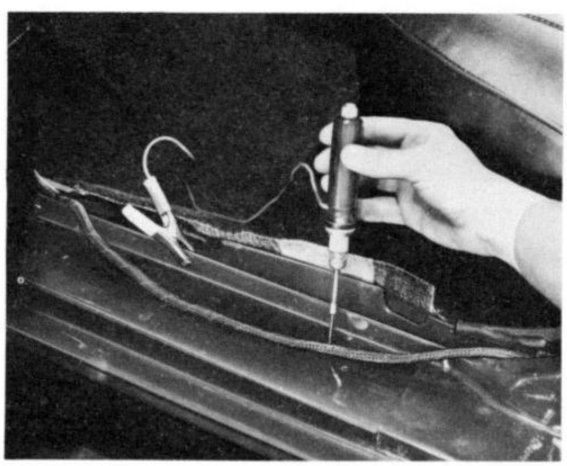

Fig. 21—Check wire for voltage

If the light comes on, then the open, or broken wire, is farther rearward. If you don't get a light, then the open is between that point and the cowl connector. In that case, move about halfway forward and try the probe again. After two or three tries, you should have the open pinned down exactly. Usually, an open circuit of this type can be repaired by splicing the wire and taping the splice for insulation.

TEST LIGHT OR VOLTMETER?

There have been many discussions about the preferred method of determining whether voltage is available in a circuit, when tracing down the cause of some problem. Some Technicians prefer to use a voltmeter, while others prefer the use of a continuity light. Each has its own advantages, and either one is correct. The continuity light is, of course, quicker and, in confined places, it is more convenient to use. On the other hand, the voltmeter will tell you not only whether voltage is available, but how much voltage is available. The only exception to whether you have a preference is when you're working on the charging or starting circuits. On these circuits, you're going to wind up using the voltmeter anyway in the end, so why not start out with the meter?

THE SHORT FINDER

Let's take a case similar to the previous one, where the left turn signal doesn't operate, and neither of the stoplights work. First of all, you know immediately that this almost has to be caused by a blown fuse. By using the wiring diagrams and schematics, as before, you can determine the correct circuit to follow. However, tracing down a short is not quite the same as tracing an open. First of all, if there is a short, then there will not be current flow through the circuit, since the fuse will blow as soon as voltage is applied to the circuit. And, if the fuse were bypassed, it would take only a small amount of time to burn out the complete harness.

SUBSTITUTE FOR FUSE

The short finder tool substitutes a circuit breaker for the fuse. So, the current flow is intermittent, allowing the wires to cool down between surges of current. The circuit breaker is fitted with two leads with alligator clips to make it convenient to hook into the circuit.

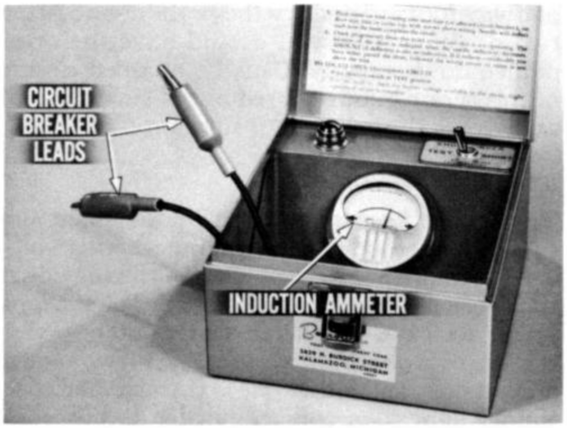

Fig. 22—Short finder tool

INDUCTION IS THE SECRET

Think back to the session on basic electricity, and you'll remember that whenever a direct current is passing through a conductor, it produces a magnetic field around that conductor. If we can determine whether this magnetic field is present, then we'll know whether any current is flowing through the conductor. That's the reason for the meter that is a part of the short finder tool. The meter is a high-sensitivity, induction-type ammeter. Broken down into simple English, that simply means that the meter is designed to measure the strength of a magnetic field and translate that measurement into movement of a needle on a scale. The direction of movement depends on the direction of current flow in relation to the position of the meter.

TRACKING DOWN THE SHORT

To use the short finder in tracking down a short in the stoplight circuit, connect the two circuit breaker leads to the two clips in the fuse block. This will provide the intermittent current flow to the point of the short. Then, without removing the door sill scuff plate, move the short finder meter along the path followed by the body harness. As long as the meter is over a part of the harness where current is flowing, the needle will be deflected slightly to one side. As soon as you pass the point where the short is located, the needle will return to center. When the needle ceases to deflect, back up to the point where it deflects again. This is the exact location of the short circuit.

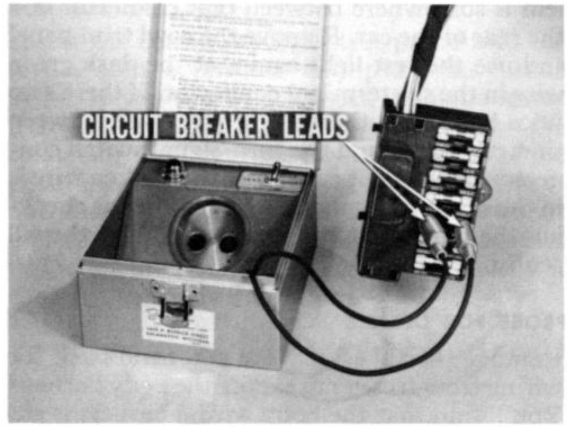

Fig. 23—Connect circuit breaker

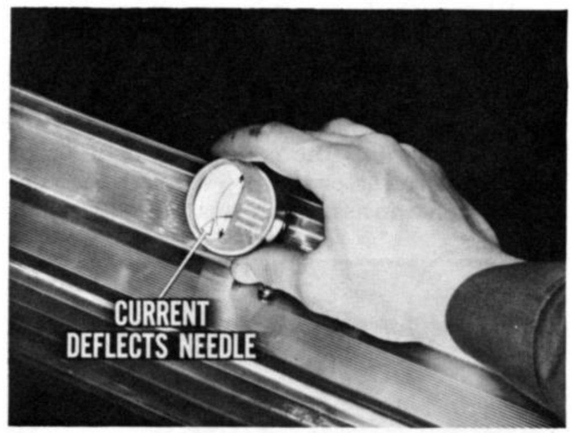

Fig. 24—Follow the harness

NEW CIRCUIT BREAKER

Speaking of circuit breakers, there's a new type breaker currently in use in our cars. It's called a *remote reset* circuit breaker. It differs from the *cycling* type in that it doesn't automatically reset itself.

CYCLING CIRCUIT BREAKER

The cycling circuit breaker consists, basically, of a simple bimetal strip that is in series with the circuit it's protecting. Since it is in series, it carries all of the current that's in that circuit. So, if a short should occur in the circuit it's protecting, the bimetal strip will heat up contact. For this part of the test, you raise engine speed to 2200 rpm, turn off the lights and accessories, and adjust the carbon pile load to reduce output from 15 to 7 amperes.

VOLTAGE RISE IS SLIGHT

After you cycle the regulator, the voltage should be at least 0.2 but not more than 0.7 of a volt higher than in the first test step. Where the voltage does not meet the specs for this test, you'll probably find the regulator air gap, or the point gap incorrect. If the test voltage is okay, the regulator is working properly and the testing job is finished.

VOLTAGE REGULATOR FUSIBLE WIRES

The upper-contact fuse wire in the voltage regulator protects the field circuit against a short to ground in the field wire to the alternator, or in the rotor portion of the circuit.

If there's no output in the first part of the voltage regulator test, the upper contact fuse wire may be burned out. When this fuse wire is open, it cuts out the part of the circuit that supplies high alternator field current to produce full output. However, when the output in the second part of the test is higher than the specs allow, the lower contact fuse wire may be open.