SHOP TIPS

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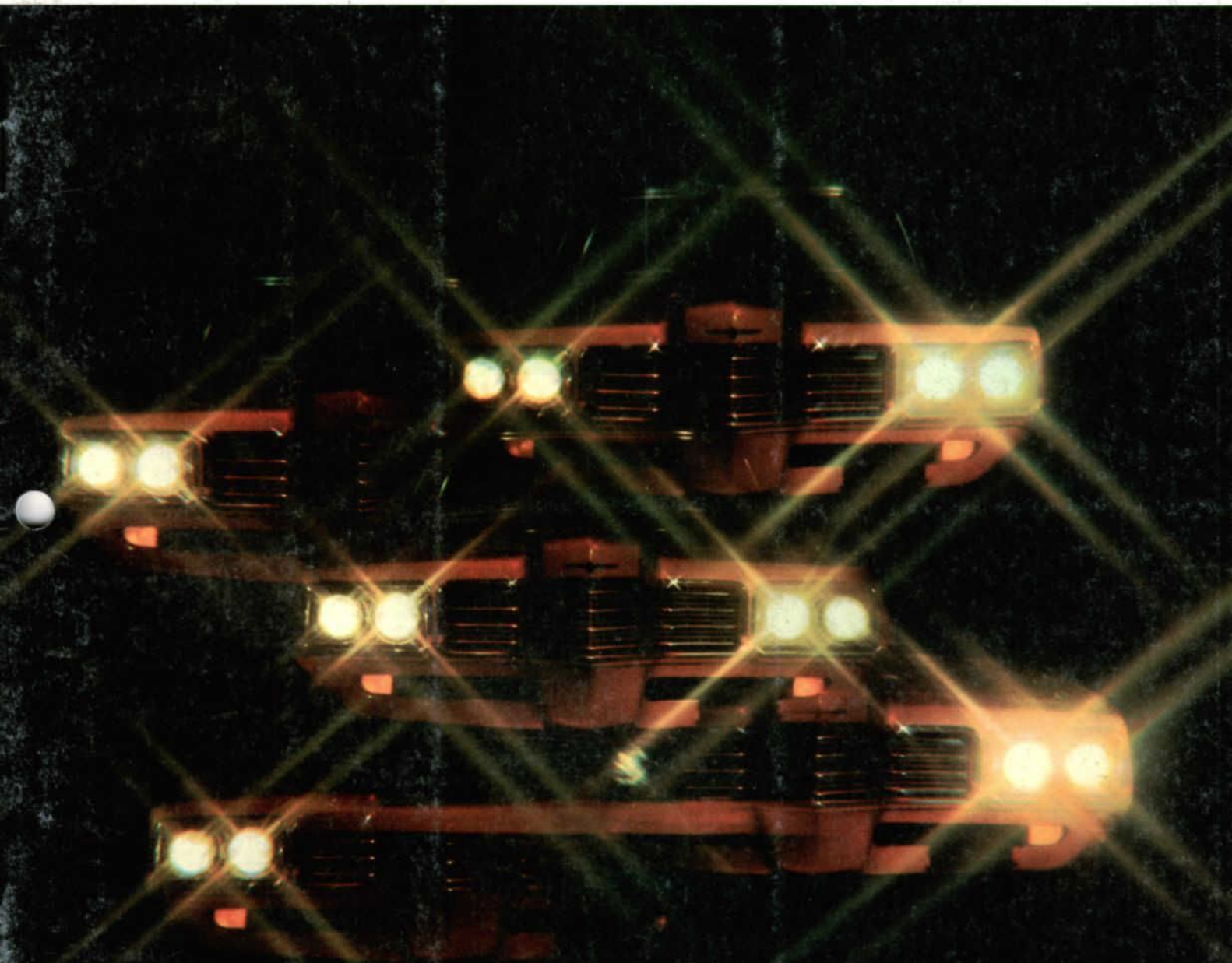

LIGHTING SYSTEMS... Tips on Servicing

THE LIGHTING

Technical parts and service information published by the Autolite-Ford Parts Division and distributed by Ford and Lincoln-Mercury Dealers to assist servicemen in Service Stations, Independent Garages and Fleets.

IN THIS ISSUE

Be sure to file this and future issues for ready reference. If you have any suggestions for articles that you would like to see included in this publication, please write to: Autolite-Ford Parts Division, Merchandising Services Dept., P.O. Box 3000, Livonia, Michigan 48151.

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Motorcraft

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VOL. 72 MSD 6 LITHO IN U.S.A.

FACTS AND FIGURES

Many of 1969 to 1972 Ford-built passenger cars have more than 50 lamp bulbs and hundreds of feet of wiring in their lighting systems. And coupled with all this are protective devices such as fuses and circuit breakers.

These "sentries" of the electrical system are inserted in the wiring system to protect electric motors, switches, relays and of course the actual wiring, from overloads, short circuits and burn-out.

Some of the larger passenger cars such as the Mark IV and the full-size Ford and Mercury have as many as 10 circuit breakers ranging from a small 1-ampere rating up to a larger 35-ampere rating.

Circuits with 10 fuses are not uncommon. And, interesting enough, each of these fuses protects more than one circuit. For example, the 1972 Mercury uses a 4-ampere fuse to protect all of the instrument cluster lights, the clock light, the steering column light for the PRND21 shift quadrant, the radio light, the heater A/C control lights, and the ashtray light. Quite a job for such a small fuse and yet it is a vital part needed to guard bulbs and their wiring circuits.

As you know, fuses are available in a wide range of standard sizes and amperage rating which have been set by the Society of Fuse Engineers (SFE).

When it comes to light bulbs, unlike many other parts and units of a car or truck, the light bulb's "life" (its service life) is measured in hours of actual usage. Rough usage, severe driving conditions and excessive line voltage shortens the number of service hours that the bulb functions.

Servicing car and truck lighting systems and bulb replacement is generally a fairly easy job. Too, it is not a difficult service to sell to the motoring public. More importantly, having all lights working properly is vital to highway safety.

Often the motorist is not aware that a bulb has burned out. If you spot the burn-out, the average driver is usually agreeable to having the bulb replaced with a new one, or the wiring repaired, the terminals cleaned, or the fuse replaced.

During a recent year, 83,000,000 sealed beam lamps were manufactured along with 617,000,000 other bulbs for stop lights, panel lights and parking lights for example.

WHAT A MARKET!

To get your share of this tremendous market potential, make it a habit to check *all* lights on every car that comes in for one kind of service or another. You will also be doing your full share in making highway driving safer for everyone.

Remember this—lamp design today is greatly improved over design of only a few years ago. These improvements can be sold to owners of older cars who will then benefit from the improved headlights and other smaller bulbs available.

LIGHTING CIRCUIT

All Ford-built passenger cars (with a 12-volt battery) use a negative ground system. This means that the negative terminal of the battery is grounded as shown in Figure 1.

By "ground" we mean that the metal parts of the car are used to complete the electrical circuits rather than many return wires running back to the source of power which is the battery.

This "common ground" method is used in all automotive electrical systems so that only a single wire is needed to conduct electrical power to the load . . . which can be a motor . . . a bulb . . . a relay and so forth.

The electrical circuit, as shown, will operate the load since the battery and the load are both grounded to the chassis of the car. Thus, the chassis is used to complete the circuit.

The ground wire does not have to be insulated because the common ground is not insulated. And, the load itself may be self-grounded. Many light bulbs are grounded by the contact of their sockets with the car.

Open circuits can be caused by poor ground connections. These "open circuits" can also result from breaks or other open conditions in the wire conductors.

All feed or "hot" wires must be insulated. If the insulation breaks or chafes through and the hot wire touches a metal part of the car, this condition causes a "short circuit." The end result is a blown fuse or a circuit breaker that starts its "make and break" action.

Electricity flows whenever the circuit or flow path is closed . . . that is, whenever the circuit is complete. An open point in the circuit (may be a switch in the OFF position) stops the flow and the load (bulb for example) does not operate. This is an "open circuit."

A "short circuit" is a path for electricity that wasn't designed into the system. It is a condition that happens accidentally. A short occurs when a "hot" conductor contacts another conductor or is grounded because of faulty insulation or insulation that gets chafed or cut so that bare wires contact metal surfaces.

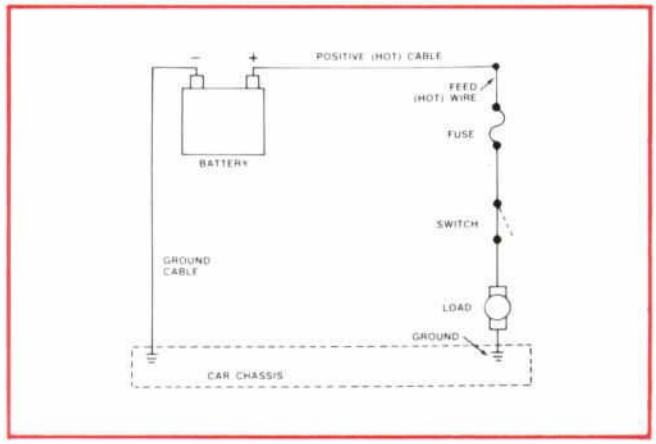


Figure 1—Here is a simple electrical circuit that is the basis for more complicated circuits found in modern passenger cars. However, most circuits today are the parallel type so that multiple loads can operate from the same power source. Parallel electrical systems operate independently from each other as long as the main feed is intact from the power source to the common electrical supply point.

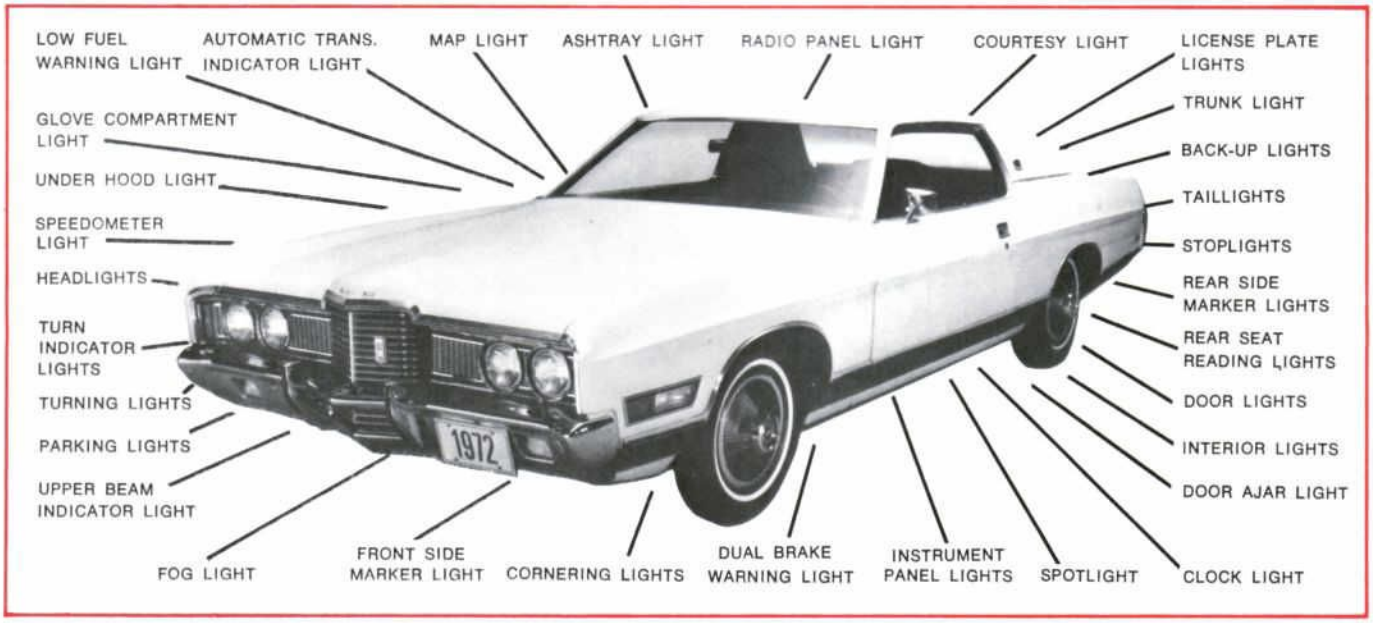


Figure 2—Here is a 1972 Ford showing that modern American produced passenger cars use a multitude of light bulbs to illuminate everything from the roadway to the ashtray and almost everything in between. Statistics have shown that nearly 80 percent of all older model cars safety checked have some kind of lighting defect or problem. Almost 50 percent of all lighting defects consist of burned out or mis-aimed headlights. Others include burned out small bulbs . . . damaged or broken lenses, corroded, rusted or damaged connectors or housings, and burned out fuses and turn signal flashers.

THE LIGHTING

UNDERSTANDING THE LIGHTING SYSTEM

HEADLIGHTS

The Maverick, Comet and Mustang use TWO No. 2 sealed-beam headlights. Each of these lights has a low-beam and a high-beam filament. On all other Ford-built car lines, FOUR sealed-beam headlights are used. See Figure 3.

The two *outboard* lights have TWO filaments each . . . one for the low beam and one for the high beam. The number "2" is molded into the glass lens. Locating tabs molded into the glass allow the mounting of the No. 2 headlights in the *outboard* support frames only. The low beams are used for city driving and when meeting oncoming traffic on the highway.

The *inboard* headlights with a number "1" molded into the glass lens have only one filament. They are used for highway driving together with the high beam filaments of the No. 2 headlights. Locating tabs molded into the glass allow the mounting of the No. 1 headlights in the *inboard* headlight support frames only.

HEADLIGHT SWITCH

A combination switch, having three positions, is mounted at the lower left of the instrument panel. This headlight switch controls the electrical circuits to the headlights, parking lights, marker lights, courtesy lights, taillights, license plate light and instrument panel lights. An 18-ampere circuit breaker in the switch protects the headlight circuit while a 15-ampere circuit breaker in the switch protects circuits for the taillights, the license plate light, the parking lights and the marker lights.

SMALL BULBS

Miniature bulbs are used for the majority of lights (other than headlights . . . fog lights . . . road lights). These smaller type bulbs are available in the following base designs: Single contact bayonet base . . . double contact bayonet base . . . double contact bayonet base with staggered indexing lugs and in some installations, such as dome lights . . . the cartridge type is used. See Figure 4.

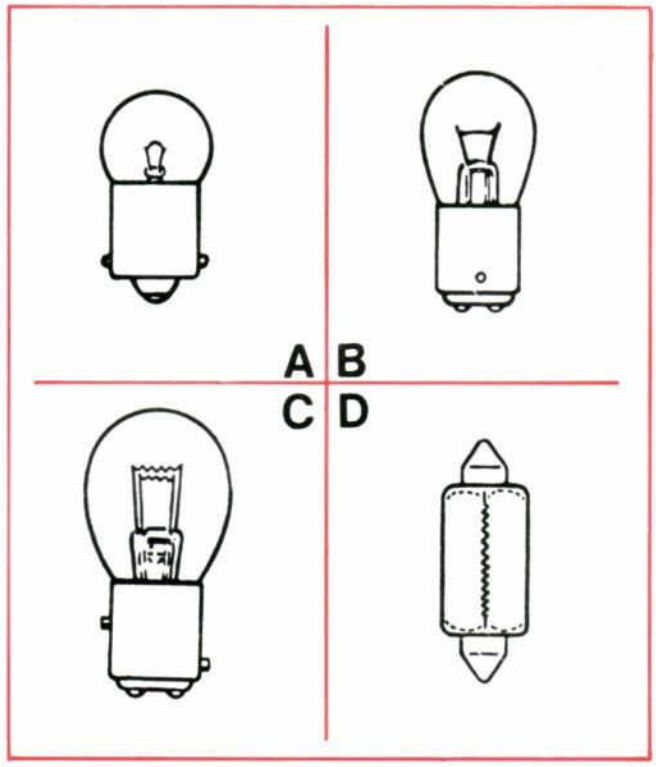


Figure 4—Here are the four most popular types of small bulbs used in American produced passenger cars. "A" is a single contact bayonet base type. This bulb is used most often for instrument panel lights and back-up lights as just two examples. "B" is the double contact bayonet base type. This bulb is most often used for the brake and taillights, turn signals and parking lights. "C" is the double contact bayonet base type with staggered indexing lugs. This lug arrangement permits installation in one position only so that the filament connection is correct. Also used for stop lights, parking lights, etc. "D" is the cartridge type of small bulb which is often used in dome lights and other areas that require a shallow socket because of limited bulb space.

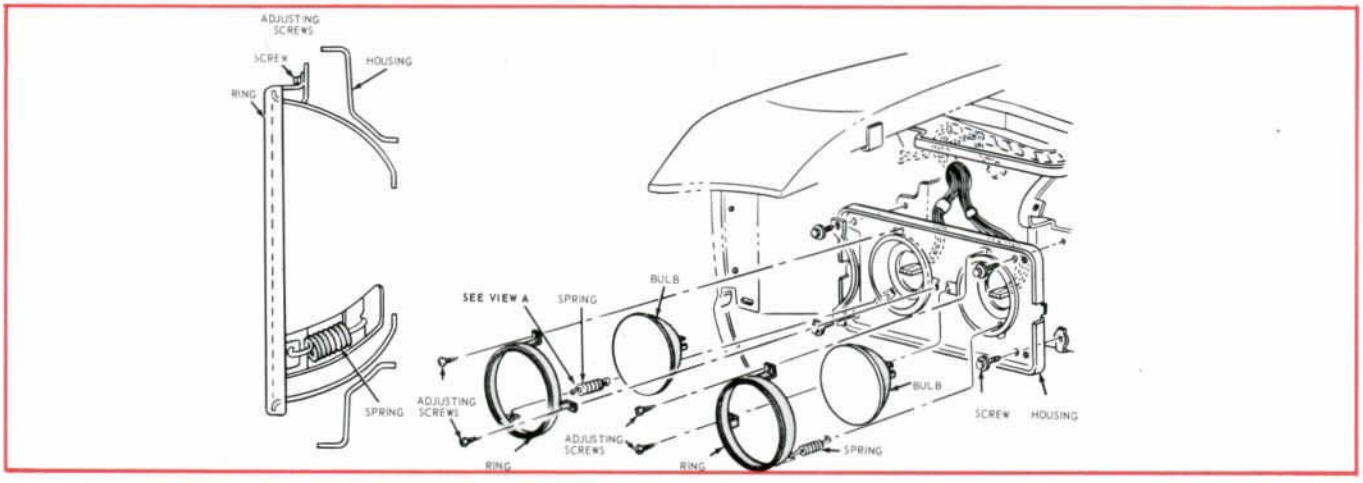


Figure 3—The Dual Headlight Arrangement on Ford-Built passenger cars. All except Mustang, Maverick and Comet models.

REMOVING/INSTALLING HEADLIGHTS

All Cars Except Mustang, Maverick and Comet

1. If the vehicle is equipped with headlight covers, close the bypass valve to raise the covers for access to the headlight bulbs. On models so equipped, remove the headlight door retaining screws and remove the headlight door.

   On Mercury low series and Meteor, the radiator outer grille must be removed first.
2. Unhook the spring from the tab on the bulb retainer ring while holding a hand over the headlight assembly to steady it. See Figure 3. Remove the two retainer ring screws and remove the retainer ring from the headlight bulb.
3. Pull the headlight bulb forward and disconnect the wiring assembly plug.
4. Connect the wiring assembly plug to the new headlight bulb and place the bulb in position, locating the bulb glass tabs in the positioning slots.
5. Attach the bulb retainer ring to the assembly with the two retainer ring screws. Hook the spring to the tab of the retainer ring.
6. On models so equipped, place the headlight door in position and install the retaining screws. If equipped with headlight covers, open the bypass valve to lower the covers.
7. Check the headlight bulb aim and adjust as necessary.

Mustang, Maverick and Comet

1. Remove the headlight door retaining screws and remove the headlight door.
2. Loosen, but do not remove, the three screws that hold the bulb retainer to the adjusting ring. Rotate the retainer ring so as to disengage the ring from the screws.
3. Pull the headlight bulb forward and disconnect the wiring assembly plug.
4. Connect the headlight bulb wiring assembly plug to the new headlight bulb and place the bulb in position, locating the bulb glass tabs in the positioning slots.
5. Position the retainer ring over the bulb and rotate the ring so that the slots engage the screws. Tighten the screws.
6. Place the headlight door in position and install the three retaining screws.
7. Check the headlight bulb aim and adjust as necessary.

■

ELECTRICAL SYMBOLS

Whenever it becomes necessary to troubleshoot any part of the lighting system, you will find it extremely helpful to "read" the electrical wiring system chart for the particular car.

Tracing the source of power and reading the symbols used to designate certain units in the car's electrical wiring can make the job of correcting the difficulty easier and quicker.

Shown in the chart, Figure 5, are a number of the most commonly found symbols used in our vehicles' wiring diagrams. Familiarize yourself with these, especially the ones that are new to you.

Note the switch assembly and the motor assembly in the chart. The boxes drawn around these assemblies are called enclosures. An enclosure is used whenever two or more components are built into an assembly. The relay and flasher symbols are drawn in enclosures; since each assembly contains a coil and a set of points.

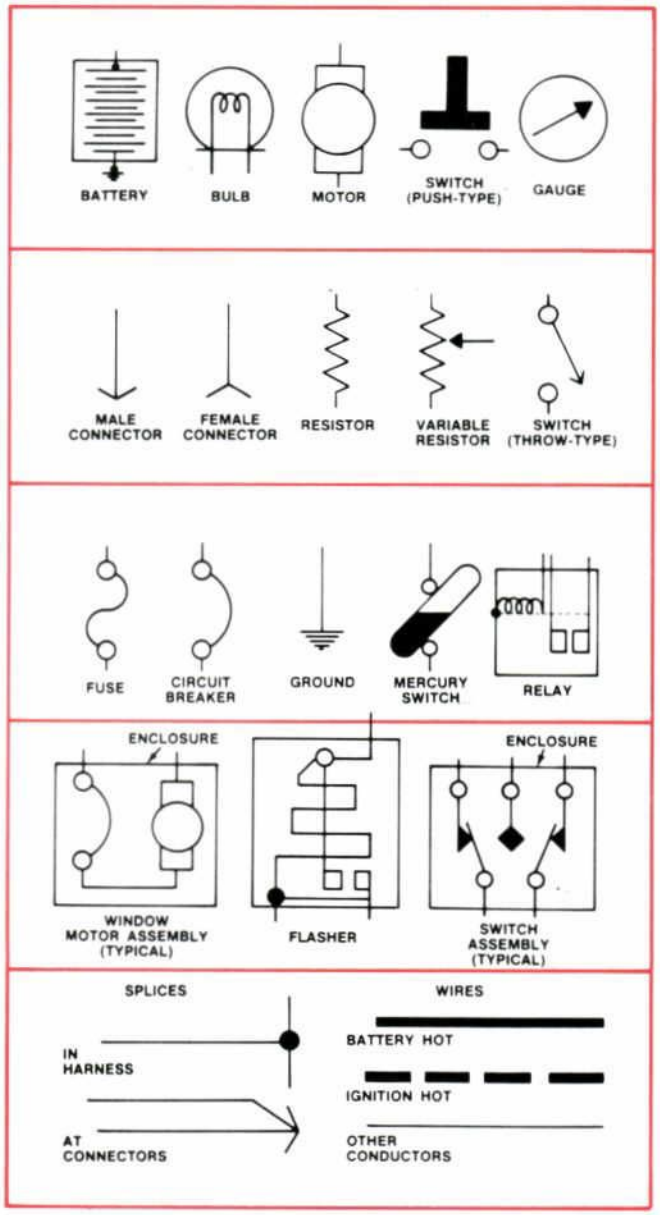


Figure 5—Common symbols used in Full-System Electrical Schematics.

THE LIGHTING

FUSES

Fuses never burn out or "blow" because of high voltages. Voltage has nothing to do with a fuse failure. High amperage in the circuit, greater than the capacity of the fuse, causes the fuse "strip" to heat up and open the circuit.

For example, a specific rated fuse is quite capable of protecting a circuit carrying 200 volts or as little as 12 volts. And when it comes to the amperage (current) rating of a fuse, the fuse makers build in about a 10 percent overload factor so that minor surges, often called "wild current," will not cause early fuse failure.

In modern cars, it is almost rare to experience an "open" fuse. Ford's improved wiring harnesses, chafe-resistant harness covering material, better routing of the chassis wiring, and rubber grommets and plastic straps to eliminate rub-through to the bare wires all contribute to a reduction in fuse failure. And this is all accomplished with added hundreds of feet of wiring and a greater number of electrical accessories than ever before.

FUSE CONSTRUCTION

Auto fuses are known as the "cartridge" type. See Figure 6. That is, they have a very pure zinc "strip" attached to two metal end caps, and this strip is surrounded by a glass tube. They are not vacuum-sealed as all light bulbs are.

The notch in the zinc strip is the "weak" link, and it is this section of the fuse that opens whenever a short circuit condition exists. The wider section at both ends of the notched section is made with a larger width to give a better temperature-carrying ability. In a temporary current overload condition, the "heat" is transferred to the fuse clips and in effect slows down a fuse burn-out.

However, in a heavy "short," the zinc fuse material goes from a solid to a vapor in micro-seconds. This is desirable and the prime idea for having fuses since they are the least expensive part of an electrical circuit.

STOPLIGHT SWITCH

The mechanical stoplight switch assembly is installed on the pin of the brake pedal arm so that it straddles the master cylinder push rod. See Figure 7.

The switch assembly is a slip fit on the pedal arm pin and thus the switch assembly moves with the pedal arm whenever the brake pedal is depressed.

The brake pedal arm pin has a designed-in clearance with the eye of the master cylinder push rod. See Figures 8 and 9. Because of this clearance, whenever the brake pedal is pushed forward the stoplight switch contacts, moving with the pedal arm, are actually pushed against the end of the master cylinder push rod, through the switch actuating pin. It is this movement of the switch with respect to the actuating pin and master cylinder push rod that closes the switch contacts completing the circuit to the stoplights.

When the brake pedal is released, the spring in the stoplight switch returns the actuating pin to its normal position and the circuit to the stoplights opens

REMOVING AND INSTALLING FORD'S STOPLIGHT SWITCH

1. Disconnect the wires at the connector.
2. Remove the hairpin retainer, slide the stoplight switch, the push rod and the nylon washers and bushing away from the pedal, and remove the switch. See Figure 7.
3. Position the switch, push rod, and bushing and washers on the brake pedal pin as shown and install the hairpin retainer.
4. Connect the wires at the connector, and install the wires in the retaining clip.

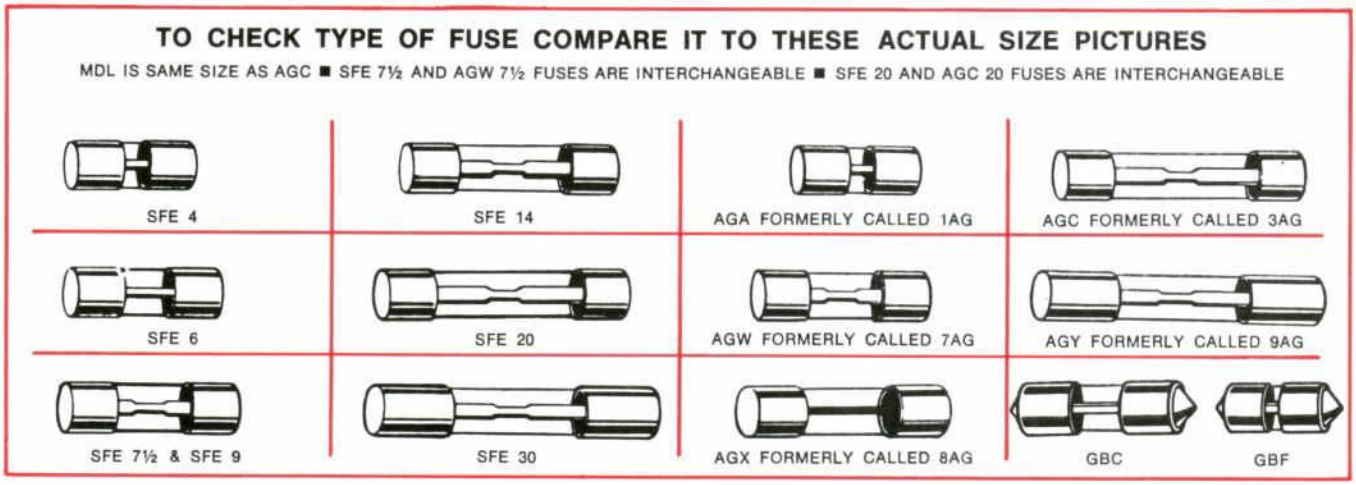


Figure 6—Commonly found fuses that are shown in their actual size. These are the "sentries" of the electrical system along with circuit breakers.

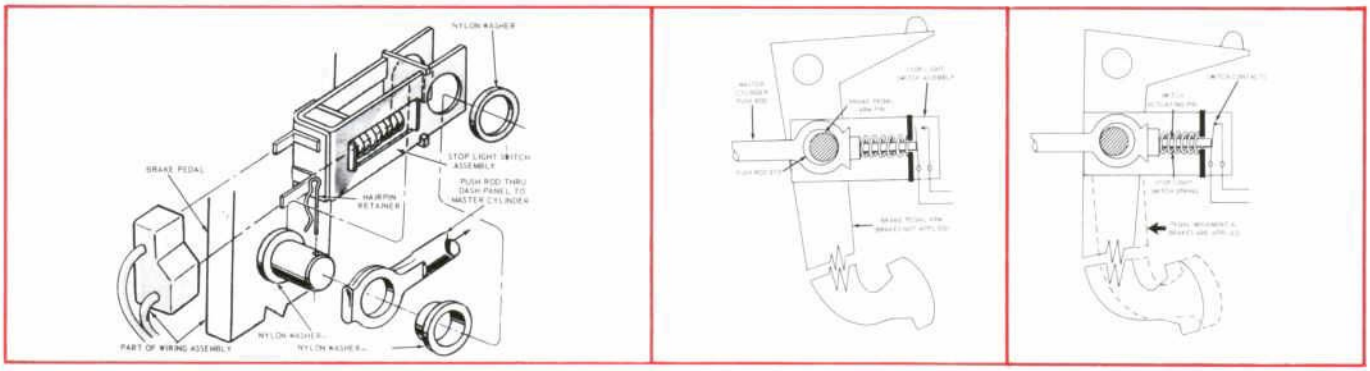


Figure 7—Note the simplified assembly and design of the Stoplight Switch used on Ford and Lincoln-Mercury Division passenger cars. ■ *Figure 8—Note that when the brakes are not applied, the contacts in the stoplight switch are open and the brake pedal arm pin is back against the push rod eye.* ■ *Figure 9—Note that when the brakes are applied in stopping the car, the switch actuating pin moves rearward and forces the contacts together to complete the stoplight electrical circuit.*

TROUBLESHOOTING WIRING

TESTING FOR SHORT CIRCUIT

A short circuit is an electrical "path" that wasn't designed into the electrical system. It can be tested and isolated with a self-powered test lamp.

Figure 10 (top view) shows an electrical circuit with a short to ground between the switch and the bulb. Every time the switch is closed, the fuse blows.

The test for a short is illustrated in the bottom view.

The following procedure will isolate a short circuit:

1. Remove power and ground from the circuit.
2. Connect one end of the self-powered test lamp to the circuit and the other to ground. If the light glows, the circuit is grounded.
3. Unplug the connector farthest from the light and observe if the test lamp still glows. If the light goes out, the short is beyond that connector.
4. Continue opening connectors or switches working toward the test lamp. When the light goes out, the short is beyond that disconnect and before the next disconnect.

OPEN CIRCUIT TESTING WITH A JUMPER

A jumper wire can be used as a temporary substitute for electrical components such as switches, fuses, breakers, relays, wires or other low-resistance components suspected of being open. Here is how to make such a test:

1. Connect the jumper wire to bypass the component or conductor suspected of being open. Figure 11.
2. If the circuit is operative, the removed component is open; if not, the defect is somewhere else.

CAUTION: The jumper should never be used to bypass a resistance component, such as a motor. It would then produce a short to ground and could cause an electric shock or fire.

It's a common practice to "jump" directly from the battery or the starter relay terminal to the hot connection of a load component to see if the component is functional. If the load functions, then the open point in the circuit can be found by leaving one terminal of the jumper in place and moving the other to succeeding check points closer to the first.

In Figure 11, one end of the jumper is stationary at point A. If the motor runs with other end at E, it indicates that it is functional and there is continuity from E to ground. The test lead then is moved successively back toward the power source to find the open condition.

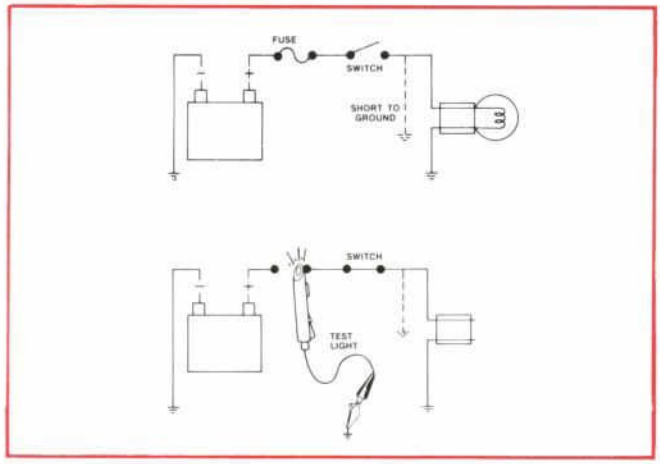


Figure 10—Short circuit testing using a self-powered test lamp.

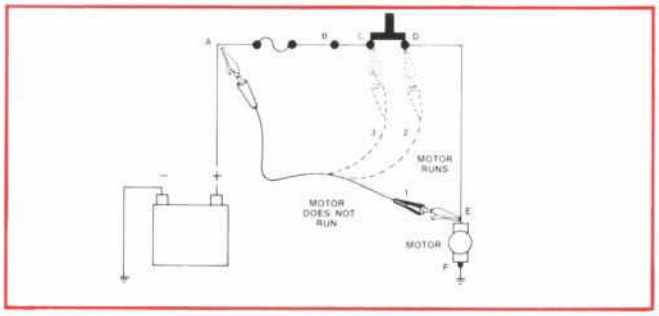


Figure 11—How to isolate an open point in the electrical system of an automobile using a jumper wire as the testing device.

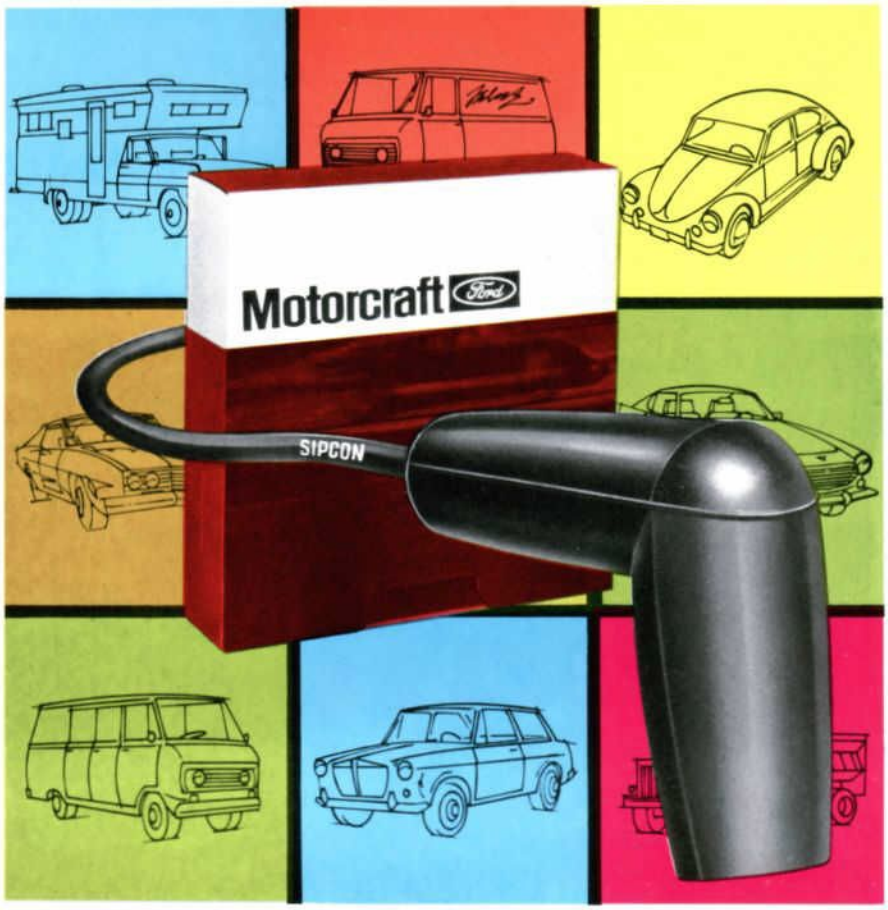
LIGHTING PROBLEMS/TROUBLESHOOTING CHART

Problem	Cause	What to do
Lights burn out quickly	High voltage	Test and adjust voltage setting of voltage regulator or if excessive, or voltage varies, replace unit. Follow manufacturer's recommended procedure.
Lights dim	Battery low or discharged	Test, recharge or install a new battery as necessary.
	Alternator not charging	Test, repair or replace. Test complete charging circuit.
	Voltage low	Test and adjust voltage setting of regulator or replace as necessary.
	Lighting circuit resistance high	Check contacts in light sockets; clean, tighten connections. Replace defective wiring or install a new light relay.
Lights flicker	Loose connection	Clean, tighten connections. Clean socket and/or terminal contacts. Check for rusted condition and looseness of fender lights.
	Circuit breaker operating	Shorted condition in lighting circuit. Check connections and wire insulation for bare wires.
Lights flare	High voltage setting	Some flare normal on acceleration. If excessive, check as for "Lamps burn out quickly."
Lights glare and approaching motorists "flashing" to signal condition	Lights adjusted too high	Align with headlight tester.
	Rear springs sag	Check for collapsed or weak springs.
	Rear tires soft	Inflate to correct pressure.

BULB CHART

BULB TRADE NUMBER	CANDLE POWER	CURRENT @ RATED VOLTAGE
53X	1	.12 Amps
67AF	4	.59 Amps
90	6	.58 Amps
93	15	1.04 Amps
97	4	.69 Amps
158	2	.24 Amps
161	1	.19 Amps
211	12	1.02 Amps
212	6	.74 Amps
256	1.6	.27 Amps
257	1.6	.27 Amps
631	6	.63 Amps
1003	15	.94 Amps
1004	15	.94 Amps
1034	32-4	1.80- .51 Amps
1073	32	1.80 Amps
1076	32	1.80 Amps
1095	4	.51 Amps
1141	21	1.44 Amps
1142	21	1.34 Amps
1155	4	.59 Amps
1156	32	2.10 Amps
1157	32-4	2.10- .59 Amps

BULB TRADE NUMBER	CANDLE POWER	CURRENT @ RATED VOLTAGE
1178	4	.69 Amps
1195	50	3.00 Amps
1196	50	3.00 Amps
1232	4	.59 Amps
1445	1.5	.15 Amps
1815	1.4	.20 Amps
1816	3	.33 Amps
1891	2	.24 Amps
1892	1.3	.12 Amps
1893	2	.33 Amps
1895	2	.27 Amps
4001	26,000	2.93 Amps
4002	21,000 Low 14,000 Hi	3.91, 2.93 Amps
4405	50,000	2.34 Amps
4412	35 Watts	2.74 Amps
4414	18 Watts	1.41 Amps
4415	35 Watts	2.73 Amps
4416	30 Watts	2.34 Amps
4435	75,000	2.34 Amps
4475	30 Watts	2.34 Amps
6012	21,000 Low 32,000 Hi	3.12, 3.91 Amps
6013	21,000 Low 32,000 Hi	3.12, 3.91 Amps
6112	21,000 Low 14,000 Hi	3.91, 2.93 Amps



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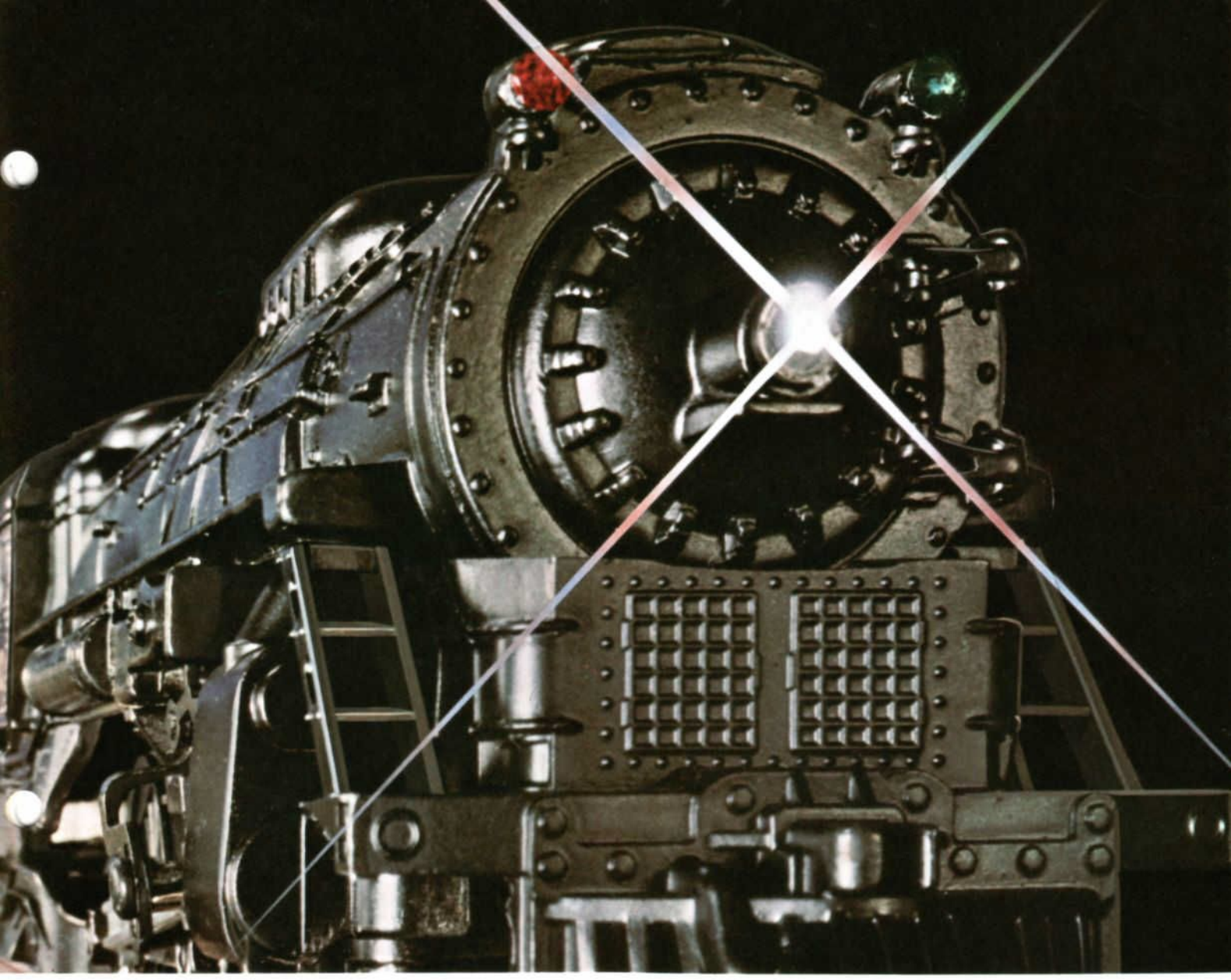

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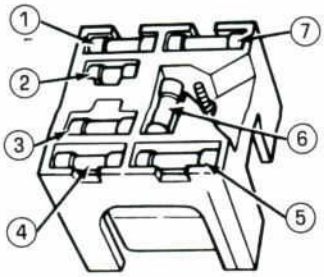
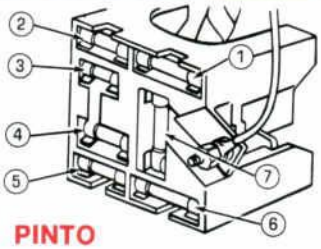
Engines · Parts

FUSES AND CIRCUIT BREAKERS . . . Locations and Ratings on All 1972 Ford-Built Cars



FORD

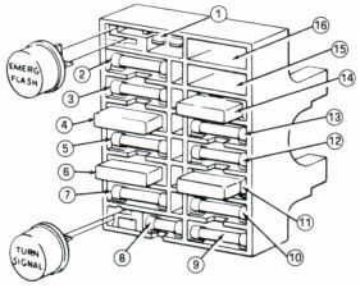
(1) (3) (4) —14-amp fuse
(5) (6) (7) —20-amp fuse
(2) — 4-amp fuse



PINTO

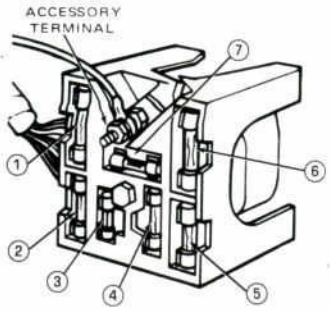
(1) —20-amp fuse
(6) —15-amp fuse
(2) (5)* —14-amp fuse
(4) — 4-amp fuse
(3) (7) —spare

*NOTE: (5) Requires 30-amp. fuse for A/C.



LINCOLN CONTINENTAL

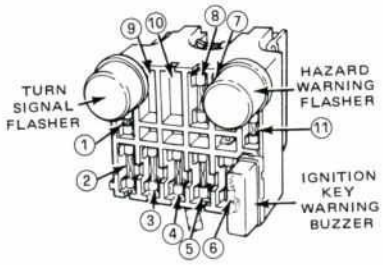
(1) — 3-amp fuse (or spare)
(3) (5) —25-amp fuse
(6) —30-amp CB
(8) — 6-amp fuse
(2) (9) (12) — 7.5-amp fuse
(4) (14) —20-amp CB
(7) (10) (13) —15-amp fuse
(11) —35-amp CB
(15) (16) —(spares)



MAVERICK, MUSTANG, COMET (Note exceptions)

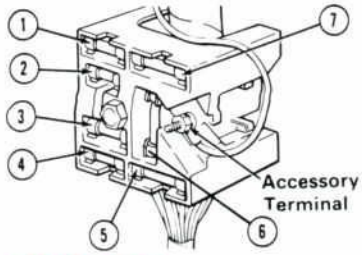
(1) (7) —20-amp fuse
(3) (4) —Maverick 4-amp fuse
(3) —Mustang, Comet 4-amp fuse
(2) (4) (5)* —14-amp fuse
(6) —15-amp fuse

*NOTE: (5) Requires 30-amp. fuse for A/C.



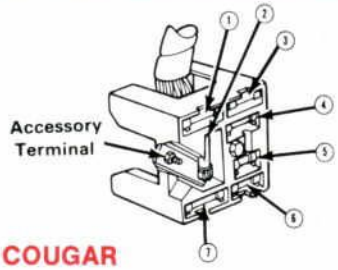
MONTEGO, TORINO (Note exceptions)

(1) —4-amp fuse
(2) —Montego 35-amp CB with A/C 25 amp fuse with heater
(2) —Torino: 7.5-amp fuse
(3) —Montego: 14-amp fuse
(5) (9) —Montego: 7.5-amp fuse
(4) (6) (7) (8) —Montego: 15-amp fuse
(8) —Torino 35-amp CB with A/C 25-amp fuse with heater
(3) (4) (5) (6) —Torino: 15-amp fuse
(10) —Montego: 15-amp CB
(9) (10) —Torino: Blanks
(11) —Torino: 4-amp fuse



MERCURY

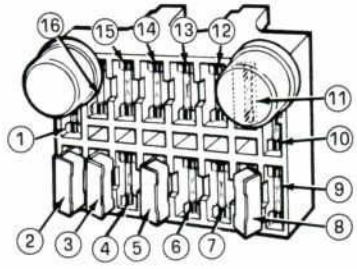
(1) (3) (4) —14-amp fuse
(5) (6) (7) —20-amp fuse
(2) — 4-amp fuse



COUGAR

(1) —15-amp fuse
(3)* (4) (6) —14-amp fuse
(2) (7) —20-amp fuse
(5) — 4-amp fuse

*NOTE: (3) Requires 30-amp. fuse for A/C.



THUNDERBIRD AND MARK IV

(1) — 6-amp fuse
(2) —35-amp CB
(3) (8) —20-amp CB
(4) (7) (9) —20-amp fuse
(5) —30-amp CB
(6) —30-amp fuse
(10) — 3-amp fuse
(11) (12) (15) (16) —7.5-amp fuse
(13) (14) —15-amp fuse

SERVICE TIPS for removing and installing

HINTS FOR REMOVAL

The C-4 automatic transmission can be removed and installed with very little effort and relatively few problems by following the service steps contained in this article.

You will note that we have simplified the procedures and numbered them in a specific sequence.

As with any service job, there are certain tools needed to reach and loosen or tighten bolts, nuts, screws and mechanical connections.

In Figure 1, you will note that only a few hand tools are required and none are classified as specialized. Most professional service technicians have them in their tool boxes. If you are called upon to remove and replace an automatic transmission in the Pinto, be sure you have all the tools shown. If not, contact one of your local tool supply men to round out your set. You'll save time, effort and your knuckles when you have the complete set.

NOTE: When you remove the driveshaft assembly, make sure you protect the finished surface and splines of the slip yoke against damage. Wrap this end of the driveshaft in a large shop cloth.

Figure 1

1. **Manual Linkage** ■ Removal of this linkage should be done at the shift tower lever and linkage rod connection. Pry the shift tower lever off of the bushing on the rod. Do not loosen the nut on the linkage rod. See Figure 2.
2. **Converter Dust Cover** ■ Use a ⅜" ratchet drive and ¼" socket to remove the converter dust cover.
3. **Converter Drive Stud Nuts** ■ To remove the converter-to-flexplate nuts, use a ⅜" ratchet and 9/16" socket. Rotate the nuts into position with a remote control starter switch. A small mirror will help to locate the position of the converter nuts to gain accessibility. See Figure 3.
4. **Converter Drain Plug** ■ Whether you decide to drain the converter or let it remain full, the drain plug must be positioned at 6:00 o'clock, (bottom of the bell housing). This will insure easy alignment when it comes time to install the transmission.
5. **Starter Removal** ■ Remove the two bottom bolts first. Remove the top bolt last. A ⅜" drive ratchet, 20" extension and ½" universal socket will make this a simple job. See Figure 4.

Figure 2

6. **Converter Housing Bolts** ■ To gain accessibility to the bolts, use a long extension to reach them from behind the crossmember. *CAUTION: Be careful not to damage the water temperature sending switch.* See Figure 5 for location.
7. **Crossmember Removal** ■ To obtain more working clearance, remove the crossmember and rear mount in one piece.
   - Remove the two saddle bolts at the rear engine mount to extension housing.
   - Position jack under transmission and raise slightly.
   - Remove crossmember and rear mount assembly.
8. **Top Converter Housing Nuts** ■ Lower jack so that transmission will tilt down far enough to expose top stud nuts. Remove the two top converter housing nuts using a ⅜" ratchet drive, 9/16" deep socket and pieces of long extension approximately 36" long.

   NOTE: It is not required that the muffler inlet pipe be disconnected from the exhaust manifold in all cases. If difficulty is experienced in removing the transmission, the pipe may be disconnected from the manifold.
9. **Cooler Line Removal** ■ There are two suggested methods to remove the cooler lines.

Removal when transmission is partially lowered.

- Remove the cooler lines from the engine clip.
- Carefully lower the transmission and cooler lines so that the fittings will be accessible just below the muffler inlet pipe (if pipe was not disconnected) as shown in Figure 6.
- Disconnect cooler lines with ½" tube nut wrench.
- Position the lines out of the way.

Removal when transmission is in line with engine.

- Use a ½" crow-foot tube nut wrench, 20" extension and ⅜" ratchet to remove the lines.
- Remove the lines from the clip on the engine.
- Position the lines out of the way.

Figure 3

HINTS FOR INSTALLATION

1. **BE SURE CONVERTER IS FULLY ENGAGED IN PUMP (CONVERTER CRANKSHAFT PILOT SHOULD BE APPROXIMATELY 5/8" INSIDE THE FRONT FACE OF THE CONVERTER HOUSING).**
2. Position and secure the starter motor **away from the engine backing plate** in order to maintain alignment of the backing plate with the engine dowel pins and two (2) top studs.
3. Position converter drain plug on bottom of bell housing for easy alignment to flex plate.
4. Cooler line installation methods.

Transmission partially in position behind engine.

- Raise transmission into position so that the cooler fittings are just below the exhaust pipe as shown in Figure 6.
- Connect cooler lines and tighten with a ½" tube nut wrench, using care not to bend lines.

Figure 4

Transmission in line with engine.

- Use a ½" crow-foot tube wrench, 20" extension and 3/8" ratchet drive and fasten cooler lines in the same manner as followed when disconnecting them.

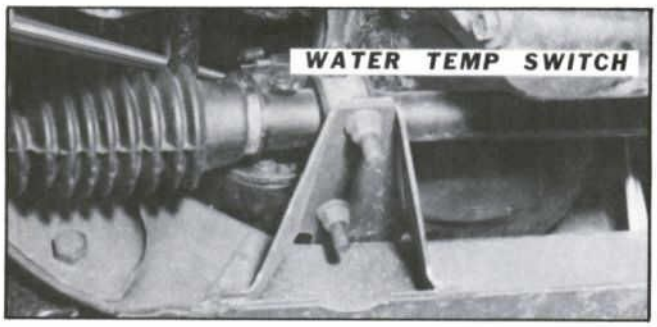


Figure 5

5. **Mounting Transmission to Engine** ■ Pull down on the exhaust pipe and insert a pry bar between the floor pan and exhaust pipe as shown in Figure 7. Or, jack up the front of the engine. This will ease the alignment of transmission to engine and help to position the transmission on the two top studs.
6. **Converter-Flywheel Alignment** ■ A small screwdriver inserted through the access hole in the backing plate and hole in the flywheel will aid in lining up the drain plug and converter drive studs.
7. After the transmission is attached to the engine, the pry bar or jack from the front of the engine may be removed.

Figure 6

8. **Top Converter Housing Stud Nuts** ■ When installing the two top converter housing stud nuts, install the vacuum line retaining clip and hand start the nut on the left or linkage side. Install the other top nut and tighten both to specification.

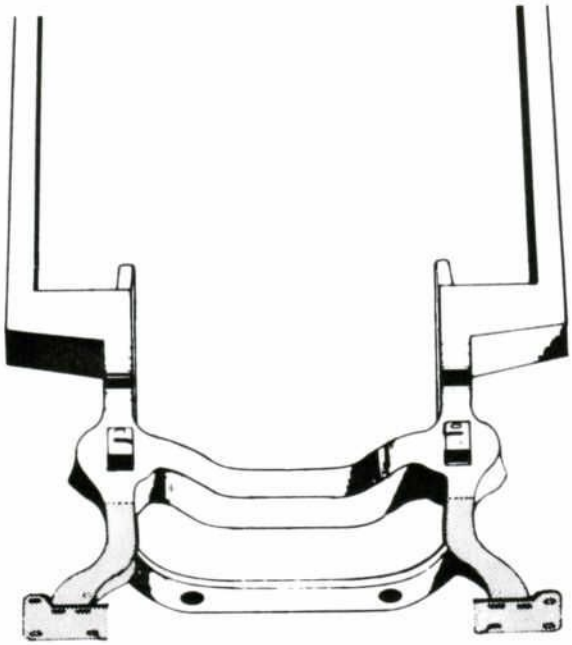
CAUTION: Do not use the converter to flywheel nuts which appear to be the same as the converter housing to engine retaining nuts. The converter to flywheel nuts have a finer thread.

9. When installing the converter housing bolt that attaches the filler tube and exhaust bracket, it may be necessary on some vehicles to also attach the battery ground strap at this time.
10. Snap linkage rod to shift tower lever with pliers as shown in Figure 2.
11. Install crossmember loosely and install both saddle bolts. Now tighten crossmember bolts and remove jack.
12. If the transmission was reassembled dry, install 5 quarts of automatic transmission fluid (meeting Ford specification, M2C33-F) before starting the engine. Start engine and continue to fill to proper level at normal operating temperature. Adjust the manual and kickdown linkage as required.

Figure 7

Frame horns simplify and speed

. . . collision shops can now provide



This illustration spotlights the "S" shaped frame horn section of a typical Ford-built, perimeter type, rugged frame. In the event of a major crash, these frame horns generally absorb the tremendous impact forces and help to prevent misalignment or distortion from traveling into the main frame sections.

Restoring the front frame sections to their proper alignment after a major collision is often one of the biggest headaches in a modern body shop.

For one thing, expensive and cumbersome push-pull hydraulic equipment is needed to force the bent sections into their normal alignment with other areas of the frame. Also, considerable skill and time is usually required. And, at times, large amounts of heat are needed in crushed or severely damaged metal areas during the push-pull procedure to restore the sections to their correct structural dimensions to a specified datum plane.

This alignment of the front frame sections is critical in the rebuild process since the fenders, hood, grille and all other body components are directly dependent upon a proper foundation to insure acceptable sheet metal alignment when the job is buttoned up and ready for the customer.

A solution to the time-consuming problem of heating, straightening and patching these front frame sections is the availability of *new* frame horns.

When frame horns have been badly damaged and restoration is impractical or you do not have the major hydraulic equipment needed to do the straightening job, they can be replaced by simply cutting off the severely damaged frame horns and welding new ones into the frame stub.

The only equipment required for this job is a welding torch (an arc welder is also handy for this operation), an air chisel, and the commonly used equipment found in most collision shops.

Average installation time, after the bolted on parts have been removed (chassis sheet metal, bumper, radiator, etc.), is about three hours or less.

This represents a savings in time and when the new frame horns are welded in place and in proper alignment, the job of reinstalling the front chassis sheet metal is made easier since bolt holes and attachments line up properly. You also have the added assurance that all parts and units will fit properly. Such factors as the correct gap between hood-to-cowl, hood-to-fenders as well as grille-to-body, is assured. Thus makeshift changes are eliminated during the buildup, and you'll turn out a professional body shop repair.

FRAME HORN CHART

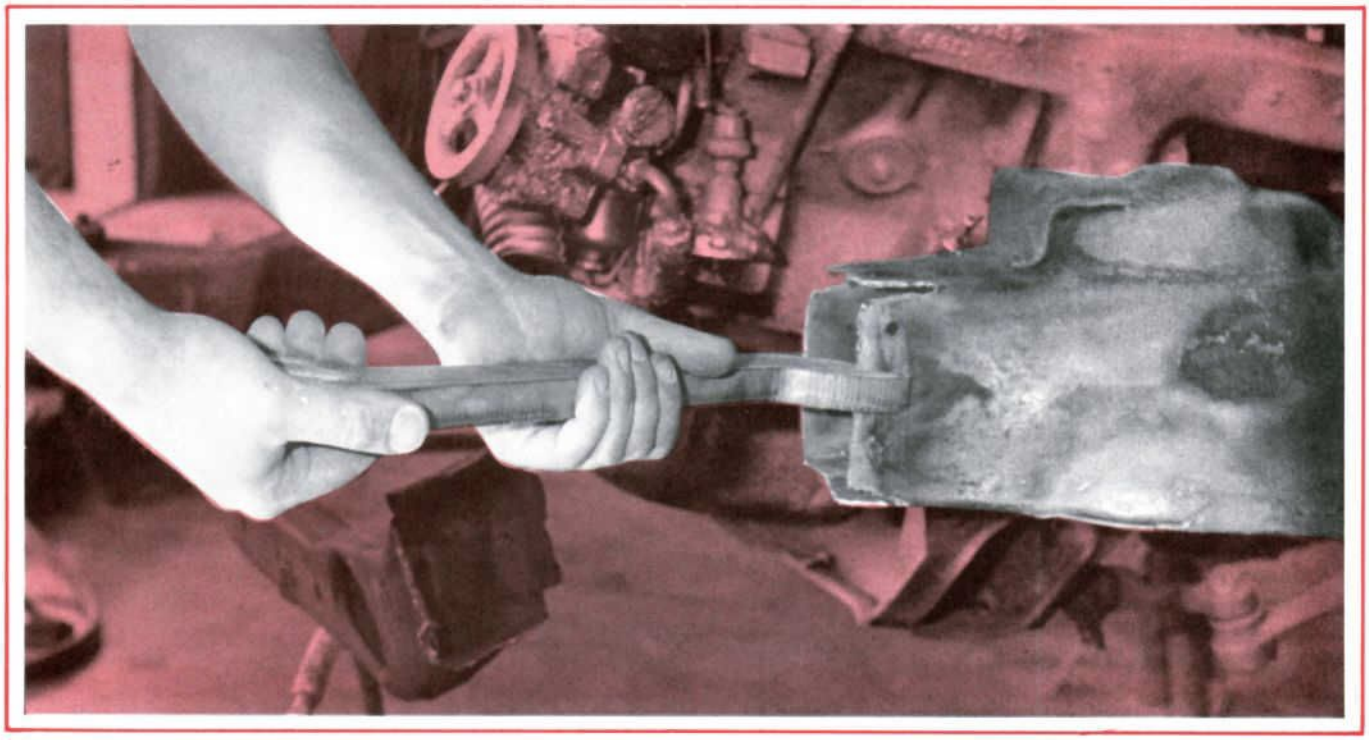
1965-68 Fords and Mercurys
&
1967-69 Thunderbirds
Part Number C5AZ-5B117-A (R.H.),
C5AZ-5B117-B (L.H.)

1969-72 Fords and Mercurys
&
1970-72 Lincolns
Part Number C9AZ-5B117-A (R.H.),
C9AZ-5B117-B (L.H.)

Contact our Parts Department for more details!

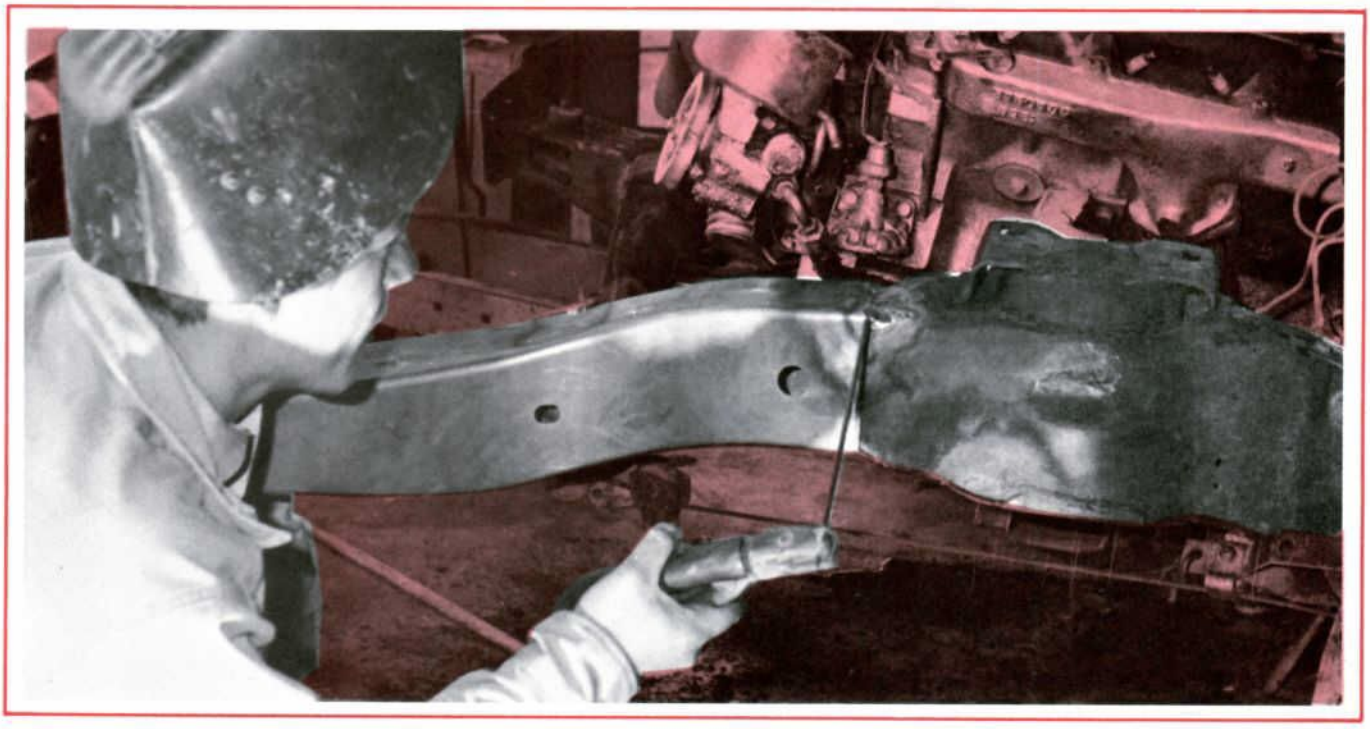
front end crash repairs . . .

complete crash work repairs



Here is a view of the main structural section of the frame after the crushed and badly damaged frame horn has been removed by cutting off with a torch. As you will note, the stub section remaining has been slotted so that the "ears" can be bent inwards. This step is necessary so that the new frame horn will have a strong lap-type joint when it is welded into proper alignment to the main frame structure.

Here we see the new frame horn being tack welded into proper position at the prepared stub end of the main frame. The position of the frame horn must be maintained and must be in correct alignment according to the datum plane and dimensional specifications set forth by service engineering standards. These specifications are found in the 1969-71 Car Shop Manual, Volume Four, Body; and in the specific Car Shop Manual for the model years 1965 to 1968.



TECHNICAL SERVICE BRIEFS

SPECIAL POINT GAP ADJUSTING SLEEVE

Motorcraft Tune-Up Kits for the 1600 cc and 2000 cc Pinto engines (TKF-18 and TKF-24 respectively) contain a *new point gap adjusting sleeve*. This sleeve is designed to reduce the time needed to install the distributor point set and increase accuracy when the point gap is adjusted.

Instructions in the use of this gauge are included with each of the two kits.

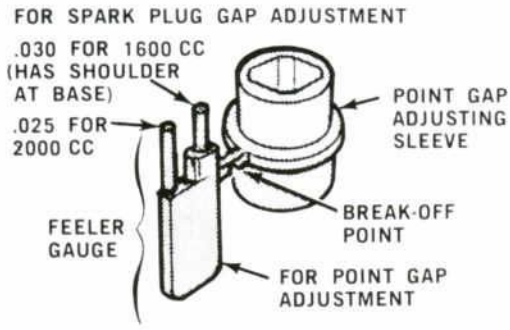
As shown in the illustration, the special sleeve is made of a plastic material and has a flat feeler gauge for checking the distributor points and a round gauge for setting the correct spark plug gap on both Pinto engines. This special gauge is simple to use.

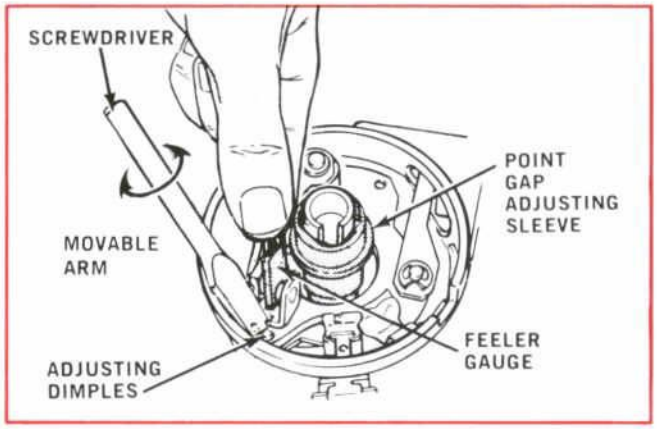
After the new distributor points have been installed, position the point set so that the rubbing block clears the distributor cam surfaces. Tighten attachment screws slightly. Then place the point gap adjusting sleeve down over the distributor cam (with the small diameter facing down).

You probably will have to push the rubbing block away from the cam to allow the adjusting sleeve to be fully seated over the cam as shown in the illustration. Next the distributor points must be adjusted so that the contact point gap is .052" using the plastic feeler gauge.

NOTE: This will give the correct point gap of .025" when the point gap adjusting sleeve is removed.

Adjustment is correct when the gauge will pass between the contact points with just a slight feel of touching between the points and the gauge. Tighten attaching screws securely and remove plastic sleeve.



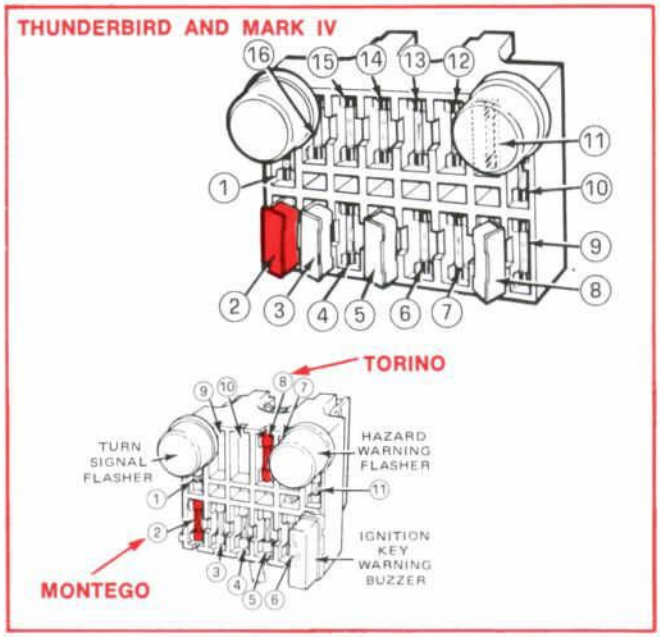


NEW CIRCUIT BREAKER . . . 1972 MODELS

Increased electrical circuit protection is needed in the 1972 Thunderbird and Mark IV passenger cars and the intermediate size 1972 Torino and Montego models because of a new high performance air conditioning blower motor.

This new 35-ampere circuit breaker replaces the 30-ampere circuit breaker in all 1972 Thunderbirds and Mark IV models (AC equipped), and this same 35-ampere circuit breaker replaces the 30-ampere fuse formerly used in AC equipped Torino and Montego car lines.

Insert this information in an appropriate place such as the September issue of *Shop Tips* and/or the applicable 1972 Car Shop Manual or Owner's Manual.



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If you spot an error or there is some misunderstanding in these publications, please let us know about it. You will be helping us as well as a great many others in the automotive service and parts business.

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Just jot your question down and drop the card in the mail. You will receive a direct reply from us as soon as possible and where appropriate, questions and the related replies will also appear "In The Mailbag" of our monthly magazine in future issues.

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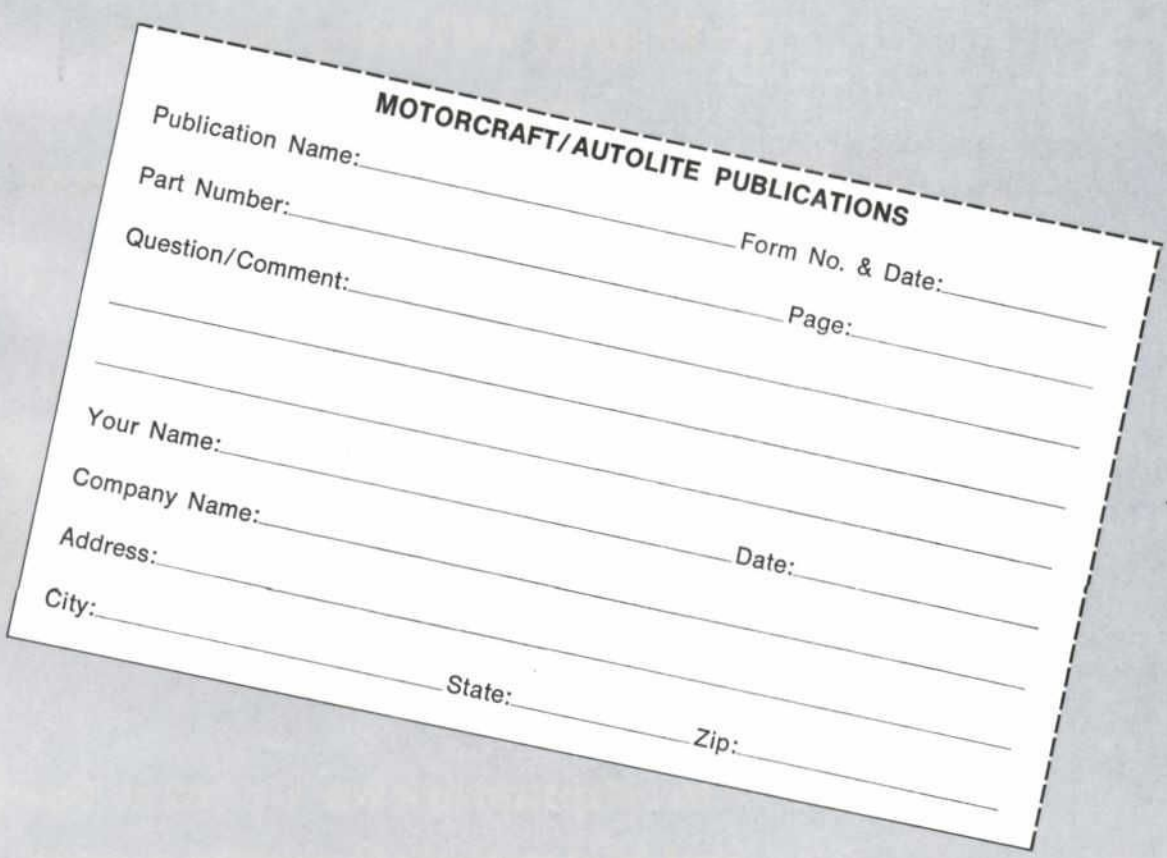
P.S. Typing or printing your questions and inquiries legibly will aid us considerably. Be sure to include the name, form number and date of the catalog or price list as well as the part number and page involved.



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