HOW-TO BOOKLET #3132

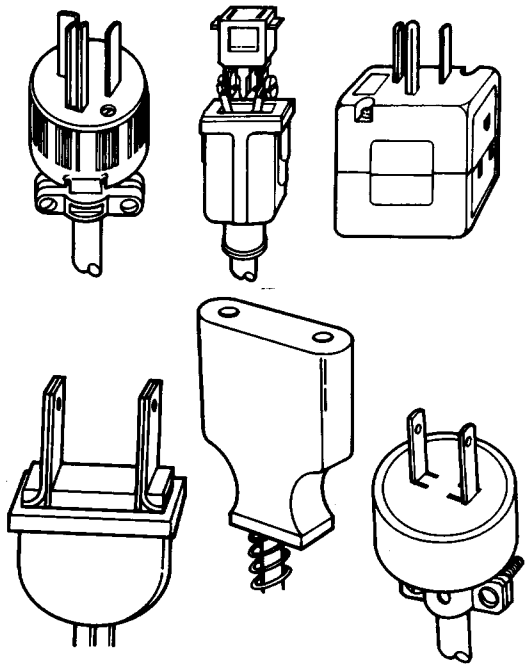
PLUGS, CORDS & SOCKETS

TOOL & MATERIAL CHECKLIST

- ❑ Wire Needed for Project
- ❑ Wire Cutters/Standard Screwdriver
- ❑ Solderless Connectors
- ❑ Wire Strippers
- ❑ Electrician's Tape
- ❑ Knife

Read This Entire How-To Booklet for Specific Tools and Materials Not Noted in the Basics Listed Above.

Fig. 1



Various types of "dead front" plugs

Plugs, cords, and sockets get a lot of heavy use. Most appliances are connected via a plug, a cord, and a length of cable—usually at least 6' long—with a plug on one end and a tap on the other. This is called a cord set. Cord sets are designed to provide a quick, easy disconnect from whatever appliance they are plugged to. Often the plugs and taps are molded with the cord.

A socket, sometimes called a lamp holder, generally contains either a turn key, a push-through, or a pull-chain switching mechanism to control a lamp. Like a plug and cord, the socket can wear out or deteriorate and must be replaced. Fortunately, replacing plugs, cords, and sockets is an easy electrical project to do. Replacement products are readily available and inexpensive.

PLUGS

All newer plugs are "dead front" type and have no exposed wires or screws (**Fig. 1**). However, older styles are often without the dead front feature. That is, many lamps and plug-in electrical devices in use today still have a standard-wired or clamp-type plug, neither of which is recognized by the current National Electrical Code. You may find them for sale, however, in electrical departments.

Replacing a Standard Plug. If you are replacing a plug, make sure that the plug meets code requirements. Do not attempt to repair a broken or damaged plug. A replacement is not costly, and you're assured that the new plug will perform properly.

Many plugs are permanently attached to electrical cords. That is, you can't disassemble the plug to disconnect the cord. In this situation, cut the cord in back of the plug, strip the insulation, and replace the bad plug with a new plug.

Most replacement plugs are wired as shown in **Fig. 2,** whatever cord is used. With a knife, cut the cord in back of the plug you're replacing. Replace the worn or damaged cord.

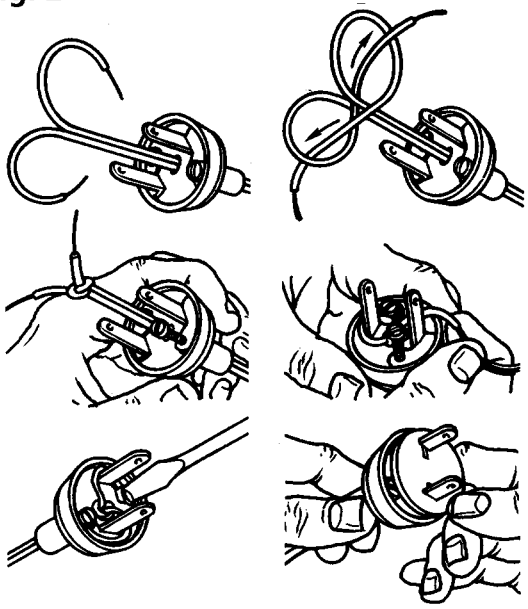
With wire strippers, remove about 3/4" of insulation from the wire ends. Then proceed as follows:

1. Remove the old plug. Thread the cord into the new plug. The cord should fit the plug opening tightly.
2. Tie an Underwriter's knot (**Fig. 2**). Split the cord and/or insulated wires inside the cord so you can tie an Underwriter's knot to prevent the cord from pulling loose from terminal screws.
3. Pull the knot tight. Pull hard on the ends of the wires to tighten the knot. Then pull the cord down into the base of the plug.
4. Wire around the prongs. The cord connections go clockwise around the plug prongs and to the terminal screws in the base.
5. Wire around the terminals. If the cord is stranded, twist it tight and then wrap it around the terminals in the direction the terminal screws turn. Then tighten the terminals.
6. Install the insulator. Install the cardboard insulator over the prongs and push it down flush.

Some of the more common specialty plugs that often need replacement are shown in **Fig. 3.**

Heavy-Duty 125 Volt Plug. These removable twist-lock plugs are used on some appliances. Loosen the cord clamp, unhook the cord and lead the wires around the blades. Hook the black wire to the brass terminal, white wire to the silver terminal, and green wire to the green terminal. Tighten the cord clamp.

Fig. 2



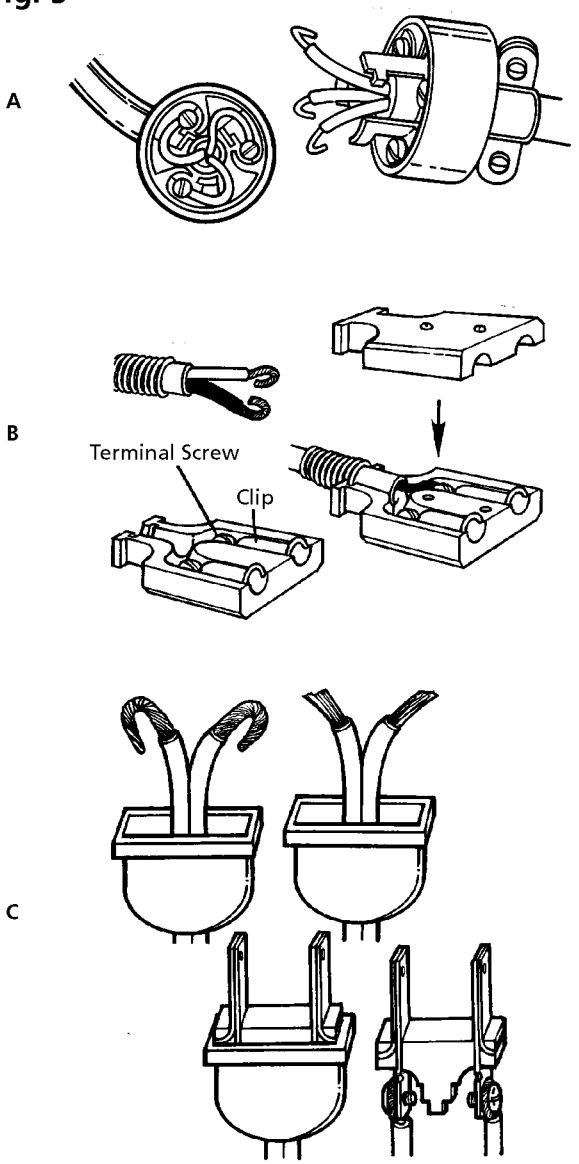
Installing a cord on a standard plug

Flat Appliance Plug. To remove the cord from the terminals, unscrew the clamshell-like cover. Then slip the cord spring onto the new cord and into the groove in the plug base. Then connect the wires to screw terminals. Assemble the plug.

Cord-Wired Plug. Remove the insulator from a flat plug; pull the core out of the housing and remove the wires. Pull the wire through the new plug and separate it. Then fasten wires to the screw terminals on the core. Seat the core in the housing and replace the insulator.

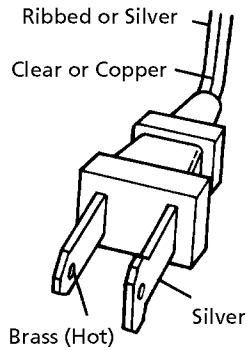
Polarized Plug. If your home is equipped with polarized outlets, replace the lamp cord with a polarized plug and cord set. Buy at least 1' more cord than the total you need. The UL-listed polarized cord should be the same as the cord already in use: No. 18, 16, or whatever gauge 2- or 3- wire cord used.

Fig. 3



Typical specialty plugs: (A) heavy-duty 125 V plug, (B) flat appliance plug, and (C) core-wired plug

Fig. 4



Polarized plug and receptacle

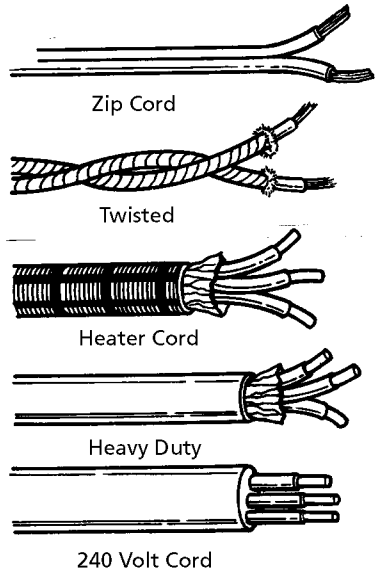
Fig. 4 shows a typical polarized plug. The large prong of the plug goes to the silver wire; the small prong goes to the hot copper wire. The plug and wire are a unit that is designed to enter a receptacle in only one direction. Polarized plugs, in addition to lamps, are particularly important in kitchens, basements, workshops, and garages, and for portable tools, appliances and extension lights/cords.

CORDS

Wiring that is not used for house circuits is called cords. They're either round, jacketed, or flat. They're designed to be flexible. Jacketed cords have stranded copper conductors (two or three); thermoplastic insulation; fillers, usually jute; a separator for the conductors; and a thermoplastic jacket (**Fig. 5**).

Most cords have fine stranded wire conductors, and the insulated wires are colored differently from cable for easy identification. Modern three-wire European cord has two wires colored brown for live and blue for neutral, plus a green/yellow striped wire. Two-wire cord has no ground. The wires are either colored brown and blue, or uncolored. Old three-wire has a red hot wire and a black neutral wire (the same as cable), plus a plain green

Fig. 5



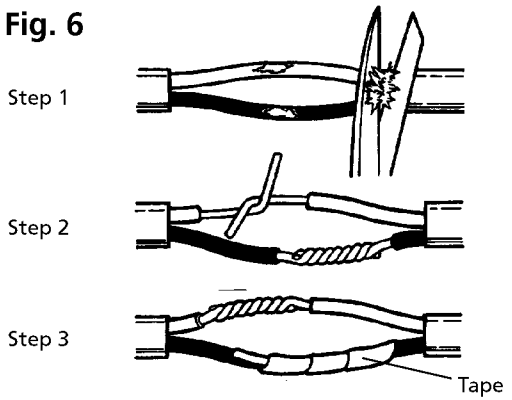
Typical cord types

ground wire. Cord that is old enough to have this coloring should be carefully checked to make sure it has not deteriorated. U.S. cord has colored conductors: black for hot, white for neutral, and green for ground.

Sizes of cords range from No. 18 to No. 10 and even larger. National Electric Code ratings for these cords are: No. 18—7 amps; No. 16—10 amps; No. 14—15 amps; No. 12—20 amps; and No. 10—25 amps.

Many cords are highly specialized. The most familiar of all cords is Underwriters Type SP or SPT. Nicknamed "zip" cord, it's the two-wire material that most small appliances are fitted with. The two halves can be zipped apart when making connections. Most common size is No. 18, but heavier gauges are available. A three-wire version also is made. Type SP has rubber covering. Type SPT has plastic insulation. The data is sometimes on the cord.

Fig. 6



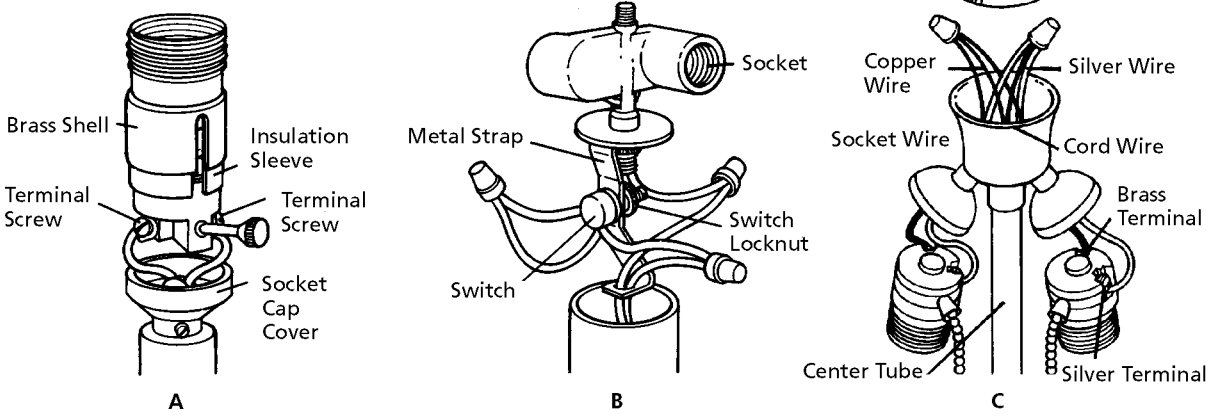
Making a cord wire splice

Another popular cord is Type S, which is round and insulated with rubber. Type ST is the same, but is plastic insulated. Each conductor is insulated too. Types S and ST are for use where the cord will receive abrasion, such as a vacuum cleaner cord. Another type, SJ, has a thinner outer covering than Type S and is generally more useful around the house for washing machines, refrigerators, small motors and the like. The J means junior. Oil-resistant cord of this kind is designated Type SEO for Type S and SJEO for Type SJ. These are made with neoprene covering.

Cord used for appliances that generate heat, such as irons and heaters, is simply called heater cord. Type HPD is the Underwriter's designation. The outside of HPD heater cord is a woven covering of cotton or rayon. Inside, a layer of asbestos wool and neoprene covers each wire. HPN heater cord is a "zip" cord type with neoprene covering.

When replacing an appliance cord, be sure to get the same type of cord that originally came with the appliance. You should stick to the same length, too. This avoids having too much resistance from an overly long appliance cord. Don't overload a cord by using one that's too small for the job. For additional properties - abrasion resistance, oil resis-

Fig. 7



Three types of lamp switches: (A) rotating, (B) push button, and (C) chain

tance, etc. - cords with rubber, neoprene and tougher plastic coverings are available.

Splicing of electrical cords is only a temporary repair. When necessary, it can be done as follows (**Fig. 6**).

1. Cut away the damaged portion of the insulation with a knife or scissors. Cut both wires in half with wire cutters.
2. Remove about 1' of insulation from each wire with a wire stripper. Then twist the ends of both wires together.
3. Wrap each wire with electrical tape. Overlap the tape onto the remainder of the cord.

Extension Cords. Extension cords can be either two- or three-wire types. The two-wire cords should only be used to operate one or two small appliances. Three-wire extension cords are used for electric power tools and outdoor appliances. The third wire is a grounding wire; such a cord should not be plugged into an ungrounded electrical outlet. Use power tools only with a grounded extension cord, unless the tool is double-insulated.

Treat extension cords with care. Don't pull on the plug to disconnect them, and never lay them under the rugs or through doorways. Check extension cords regularly for fraying or damage, and replace a damaged cord at once because it presents a potential fire hazard. Also the extension should be kept as short as possible.

Very long or undersized cords will reduce operating voltage and thus reduce operating efficiency, possibly causing motor damage. Actually, an extension cord should be used only as a last resort. But, when an extension cord must be employed, the wire gauge sizes in the chart are recommended for different lengths.

Cord of any type never should be used as a substitute for permanent wiring. Don't fasten cords to the house in any way, even though staples are often sold for this purpose. Never run cords through doorways, windows, walls, ceilings, floors. Always use cord in continuous lengths from the receptacle to the appliance. Don't ever plug two cords together to make a longer one.

Length	Up to 7amp	7-10amp	10-15amp
To 25'	No. 18	No. 16	No. 14
To 50'	No. 16	No. 14	No. 12
To 100'	No. 14	No. 12	No. 10

SOCKETS

Brass lamp sockets may have rotating, pushbutton, or chain switches (**Fig. 7**). Do not attempt to repair the switch or socket; replace it with a new one. But before doing this, be sure to disconnect the light from the power source before you start working on the socket.

To replace a light socket and switch, proceed as follows:

1. Remove the harp. The lamp shade is attached to the lamp with a frame, called a harp, that fits into a bracket below the socket. Slide up the two finger nuts on the harp as you squeeze the harp.
2. Remove the socket housing. To remove the metal housing from the socket, squeeze in on the sides of the upper sleeve just above the base cap and work it upward, out of the cap. Slip both the brass and cardboard sleeve off to expose the socket and terminal screws.
3. Disconnect the wires. Turn the terminal screws counterclockwise to loosen the wires connected to the screws. At this point, check the cord. If it is damaged, it should be replaced.
4. Wire the new socket. Twist the stranded wire as tightly as you can between your fingers. Then connect the hot copper wire to the brass terminal and the silver wire to the silver terminal. The wires should fit under the terminal screws. If not, disconnect the wires, twist them tight once again, and reconnect them to the terminals.

   Place the cardboard insulation over the socket and install the brass-plated upper section. Tighten the screw holding the cord in the socket, if the socket has one. Replace the harp.