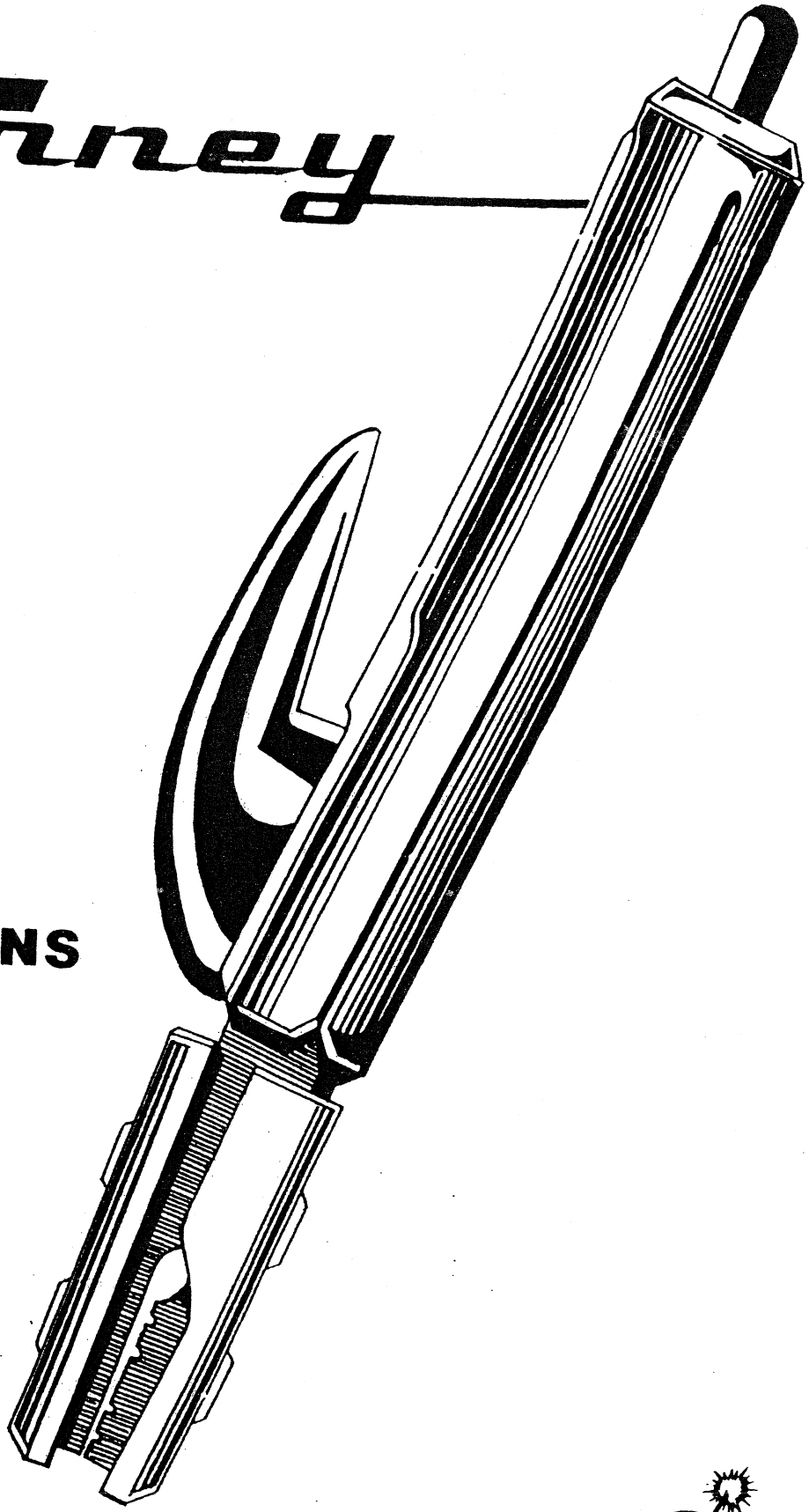
Forney



# OPERATING AND SERVICE INSTRUCTIONS


Forney Industries, Inc. U.S.A.
Box 563, Ft. Collins, CO 80522 U.S.A.

Forney Welding Equip. & Supplies Ltd. CANADA
Regina, Saskatchewan, Canada


O-15294

# FORNEY OPERATING AND SERVICE INSTRUCTIONS

Your Forney Combination Repair Unit is a precision engineered, quality manufactured machine designed for long life and dependable service, It is an easy to use, practical unit for general metal repair–especially designed for filling station and garage work–light manufacturing (heavier models for industrial use) farm repair–body and sheet metal work.

Equipped with the proper accessories, it welds, brazes, solders, hardfaces, heats for bending and forming, thaws frozen water pipes, and charges batteries (if it is a model with built-in charger or has a battery charging accessory).

**MAINTENANCE**-Your Forney Combination Repair Unit does not require any maintenance other than normal care. Keep the case clean and waxed to preserve the original finish. The Electrode Holder, Ground Clamp, and Plugs should be kept clean to give best performance.

**INSTALLATION LOCATION**-The location you pick for your Repair Unit is quite important and certain factors should be considered. Among them are the following:

1. Be sure to remove any and all packaging from bottom side of welding machine.

2. Place your Unit in an area that is free of any volatile liquids, excessive dust, or other easily inflammable items that sparks from welding may ignite.

3. An open area with adequate floor space is important, as many times items to be repaired or remodeled need to be laid out on the floor or on a large bench, for easier operation.

4. Location of your Unit should be free from damp or wet floor or ground, and should be properly wired to eliminate any possibility of shock.

5. If it is intended to work on large equipment such as farm equipment or vehicles that cannot be brought inside the building, it is best to locate your Unit near the door or provide a power receptacle near the door so that it can be used both outside and inside.

6. Your Unit should be located where there is an adequate power supply. If long distances are required, or for larger machines, a #6 wire is recommended to eliminate any excessive voltage drop. If other electrical equipment is to be operated at the same time you are using this unit, increasingly larger wire size will be necessary and can be figured by your electrician.

7. DO NOT connect this Unit to a 3-phase supply or a 3-phase machine. If no 230 volt single phase power is available, the Unit can be used by connecting to only two of the 3-phase connections. However, care must be taken that the third ground safety wire is properly connected to a separate approved ground. (It is recommended that your electrician make this change for you.)

8. LINE HOOK-UP-This forney Unit is built for operation as a 230 volt or 208 volt single phase unit and is wired for 230 volt operation at the Factory. For changeover to 208 volt operation, see special instruction on pages 5 and 6.

**WELDING WITH THE FORNEY COMBINATION REPAIR UNIT** is as easy or easier than with any other Electric Arc Welder. Good strong welds can be easily attained by following these easy procedures:

1. Prepare the joint to be welded by making certain that the metal is clean of all foreign material.

2. Select the correct rod type and size to properly weld the joint. (Chart on Unit supplies this information.)

3. Connect the electrode Holder and Ground Clamp Cables to the proper output jacks, so that the output amperage is matched to the amperage requirements of the rod used.

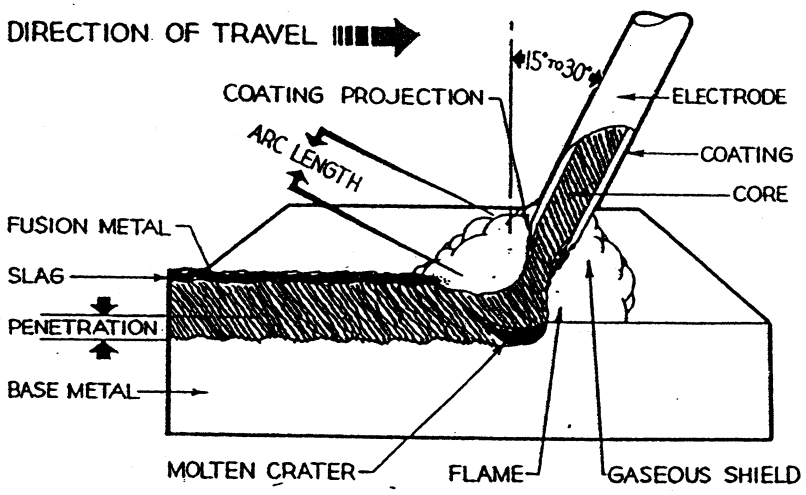
4. Turn the Welder on and proceed to weld, using accepted welding procedures.

## THE FUNDAMENTALS OF ARC WELDING

**FUSION OF METAL:** The metals being welded together are commonly referred to as "base" or "parent" metals, and will be referred to as such here.

Penetration is the term used to describe the depth to which the rod metal mixes and fuses with the parent metal.

See drawing below.




The average welding job requires a medium amount of penetration. Metallic arc welding is a process of uniting metals by melting and fusing them together by heat created from the electric arc. Without penetration there is no fusion. It is necessary that both edges of the joint reach fusing temperature at the same time. The fusing of these metals is produced by creating a gap in the electric circuit. Passage of electric current through this gap is called the electric arc.

The parent metal and the rod metal melt down from the heat of the arc and form the bead.

Welding rods or "electrodes" are made of steel, cast iron, and special alloys required for different welding jobs.

Arc welding is a comparatively simple process. Like any relatively new process, it is often held, by those who are not familiar with it, as being very complicated and requiring considerable study and artistic ability. In reality, the majority of ordinary steel weldings requires only a matter of a few hours practice at the most, if the operator has the normal amounts of mechanical ability and is willing to dismiss from his mind that he is attempting something difficult or impossible.

**PRECAUTIONS REGARDING CLOTHING:** Welding Gloves - it is very desirable to keep a pair of leather or cotton welding gloves in your welding kit. This is advisable not so much for the protection from the Electric Arc, but the danger of accidently picking up a hot piece of iron or touching hot metal that has been welded. Gauntlet-type gloves are preferable.

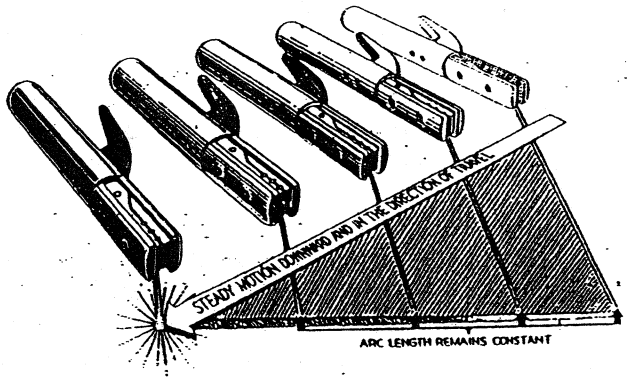
Clothing should cover all parts of the skin to prevent "sunburning." Care should be taken not to wear loose-fitting clothing with big pockets into which hot sparks might fall while welding. Care should be taken to see that sparks do not fall in the cuffs of trousers and shoe tops.

**MISCONCEPTION OF THE ARC:** A few years ago some people thought arc welding was hard on the eyes. Today we are better informed and know that the ultra-violet rays of the arc are the same as found in sunshine, and that these rays will cause sunburn the same as sunlight. If the eyeballs were exposed to direct sunlight or arc light, they would be sunburned and considerable pain would follow, but like any sunburn, the pain in time passes and no permanent damage results. There is no known case in histo in which the eyes have been permanently damaged through exposure to the rays of the arc. However, the eyes must be protected from the arc to eliminate burn, therefore do not look directly at the arc without an approved welding lens. This applies not only to the individual doing the welding, but to others who may be in the work area accessible to the arc.

The eyes should be protected form the arc of the electric Arc Torch, as well as the arc, while welding with an electrode. The approved lens, which comes in your Helmet, is designed to exclude a large portion of these rays. The rays permitted to go through the lens will have a beneficial rather than a detrimental effect. The welding goggles commonly used with oxy-acetylene process, are not adequate and not government approved for arc welding. You should not attempt to use them with an electric welder at any time. If the colored lens ever becomes broken but not smashed, it should be removed and the break covered with a tape which will exclude the rays. Replace as soon as possible.

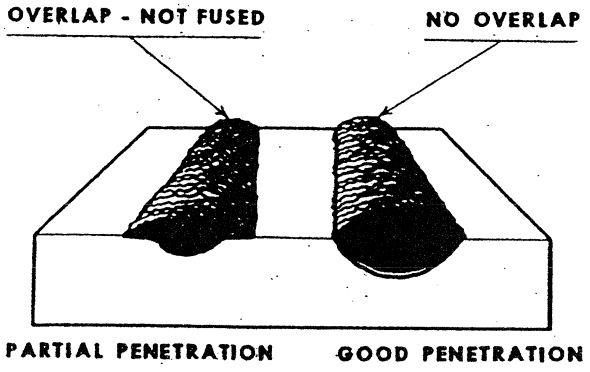
**STRIKING AN ARC AND RUNNING A BEAD:** Striking an arc with an AC Welder is easy. It is simply done by drawing the end of the electrode on the grounded base metal in the manner of striking a match. When the electrode has been drawn an inch or two, the electrode is lifted from the surface about 1/4" and the arc is formed. When the arc is started, the intense heat melts a portion of the base metal almost at once, and the metal from the electrode is fused with this base metal. Tapping or pecking the electrode would tend to freeze it to the base metal.

A right-handed person will usually move the electrode from left to right to form the bead, while the reverse is true for the left-handed operator. The motion of the electrode while welding should be uniform and slow to make a smooth bead. Since the electrode is continually burning off, the hand must be lowered to compensate for shortening of the electrode. (See sketch.)




When the sound of the arc is like that of frying, the arc is of correct length and a good bead is being formed. When, however, an arc "blows", the electrode is too far from the base metal. When the arc is of the correct length, the coating of the electrode forms a slag which affords a protective covering for the bead. If held too long on one place, the covering is not uniform and neither is the bead. A correct bead will be uniform in height, width, and ripple.

**RUNNING CONTINUOUS STRAIGHT BEADS:** An uneven bead usually indicates a shaky hand which may be practically overcome by correct welding position. If you are seated, your elbow can be supported on your knee which will result in a much steadier hand. If you are standing, your elbow may be held tightly against your side, or perhaps, rested on the welding bench or vise. Some find it best to hold the electrode holder with both hands. A weld is successful only if the parent metal and the metal from the welding electrode are thoroughly fused as indicated in the drawing below. About the same amount of welding is used in the right as in the left, but it is apparent that the bead at the left has little value.



The term "Travel Time" is used in welding to refer to the speed with which the electrode is moved in the direction of travel. If travel time is too fast, not enough electrode metal is deposited, and the parent metal hasn't received enough heat to form a good bond. If the travel time is too slow, the bead becomes too large and the parent metal becomes too hot. Correct travel time permits the proper formation of the bead. Arc length should remain the same as the electrode is moved. Remember that as the bead is formed, the motions of the hand are in the direction of travel and downward.

## ACCESSORIES

**FORNEY WELDING MANUAL: OPTIONALLY AVAILABLE** - Over 180 pages of liberally illustrated, understandably written welding fundamentals and short cuts. Includes information on the basics of Arc Welding, Brazing, Soldering, Hard Facing, Rod & Metal identification, and more. Published for use in high schools, colleges, and trade schools. Catalog No. 75200.

**ELECTRODE HOLDER AND CABLE:** The Electrode Holder is a fully insulated heavy-duty holder allowing a full range of welding rod diameters and has four positions to hold welding rod. The cable is extra flexible finestrand welding cable. The plug is machined brass with a molded rubber insulation and grip.

**GROUND CLAMP AND CABLE:** The Ground Cable has a heavy-duty clamp and will grip a wide variety of shapes and sizes to be welded. Cable quality and plug-in the same as Electrode Holder.

**HELMET:** The helmet is molded, rugged fiberglass with semi-flexible headband fully adjustable for comfort fit. Its main features besides the rugged quality is its light weight. Comes complete with Government approved welding arc filter lens and special spatter resistant clear cover lens, allowing much wider visibility. Lens easy to change.

**ELECTRIC ARC TORCH:** A very useful accessory for brazing, heavy soldering, pre-heating, bending, paint and scale removing. Plugs into welding stages and gives up to 9000°F flame. Use the regular amperage plugs and grounds with the torch as you would in welding. The torch is designed to use 3/16", 1/4", 3/8" and 1/2" copper coated carbons. NO LONGER AVAILABLE

The increase in amperage up to a certain point causes the flame to become hotter. The size of the carbon has much to do with this. Listed here are the maximum heats to be used with various sizes of carbons:

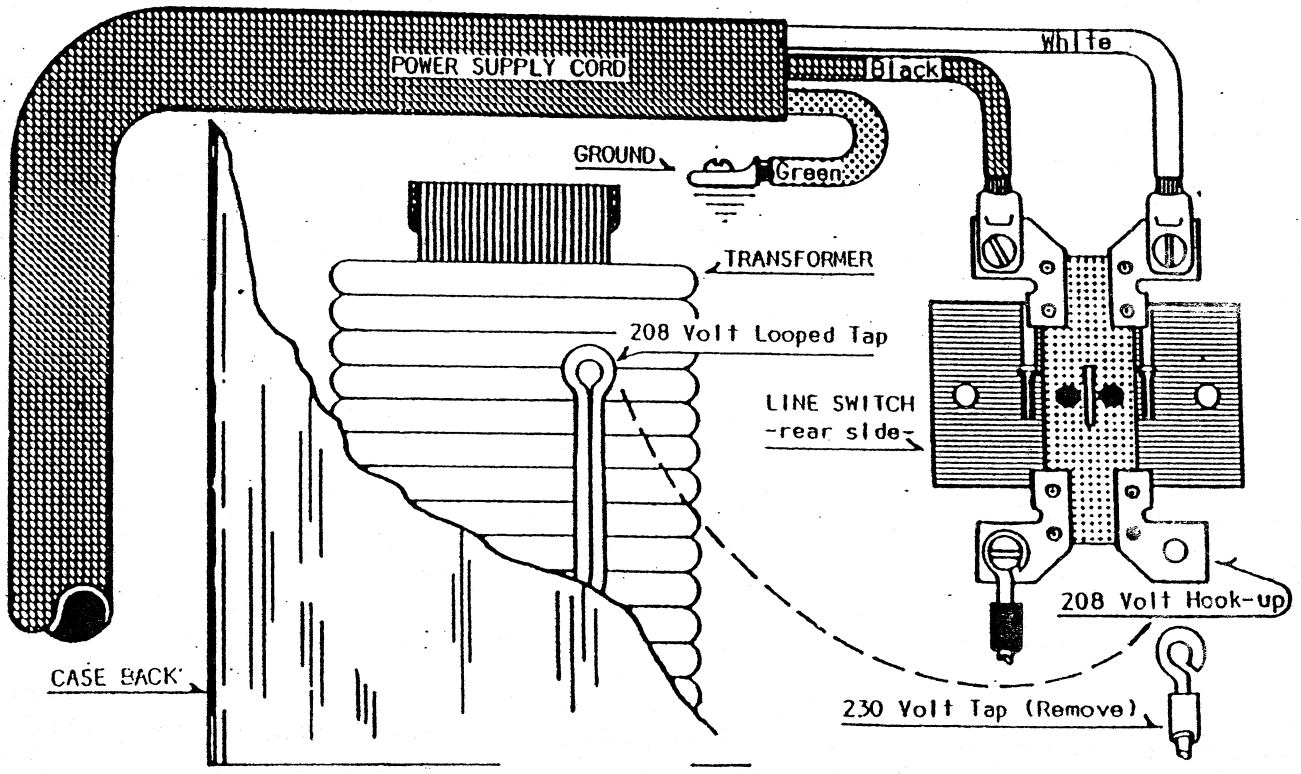
3/16" carbon....not more than 30 amps
1/4" carbon....not more than 50 amps
5/16" carbon....not more than 90 amps
3/8" carbon....not more than 120 amps
1/2" carbon....not more than 140 amps

## INPUT VOLTAGE CHANGEOVER FOR F-225, FT-230, F-240, AND F-275 MODELS

Unless otherwise specified, all units shipped from the factory are wired for 230V operation. However, the input voltage can be changed to 208V operation on standard machine having a 208V primary tap (in form of a loop at the primary leg) for such areas where 208V power supply is available.

The changes to 208V are as follows:

1. Disconnect power cord from electrical supply.
2. Remove top.
3. Disconnect wire on lower left (facing unit) tab of switch.
4. Tape this wire adequate for electrical insulation and position, so it does not touch any wire or components.
5. Locate 208 tap. It is recognized as a double solid wire looped at the end having a vinyl safety sleeve located on side of primary leg. Attach this looped tap to the lower left switch.
6. Check to see that all wires are clear from each other before replacing top panel.



## BATTERY CHARGING

On Cougar Series Welders equipped with the built in BATTERY CHARGER and TRANSISTORIZED ALTERNATOR POLARITY PROTECTOR, you have a "FAIL-SAFE" Battery Charger for slow and fast charging of 6 volt, 8 volt, and 12 volt Batteries. The rugged transformer which is needed for welding operations is many times larger than a transformer that is required for the normal fast charger. Special windings are incorporated in the Welder transformer to provide a powerful, dependable, and long life feature for battery charging.

**OPERATION:** Insert the Charging Cables into the correct "color-coded" output plugs on the Battery Charger section. The Battery Charger section is located at the top of the front panel. The Charging Cables are also color-coded for quick, safe operation. (The Positive plug goes into the RED (+) jack and Negative plug into BLACK (—) jack.) It is recommended to start all charging cycles in the low charge position. Next, connect the clamps of the charging cable to all correct polarity of the battery that is to be charged. (The RED clamp goes to the POSITIVE (+) post. The BLACK clamp goes on the NEGATIVE (—) post.) Be sure to check the electrolyte level before attempting to charge any battery.

The charging procedure can start after the battery has been connected properly (the transistorized alternator polarity protector will not allow the Charger to operate unless both clamps and plugs have been connected correctly.) Before setting the Timer, which turns the charger section "on", turn the welder switch on and then set the Timer to the charge time desired. After charging the battery on a low rate for a few minutes, allowing the battery to warm up, the Timer then can be turned off to allow change to the high rate if desired.

When the Timer has completed the time cycle that you have set, the Timer automatically turns the Battery Charger section "off". It is a good idea when setting the Timer at the start of the charging cycle to remember the approximate time that it has been set to turn "off" so that you can turn the Welder off if it is not to be used further. A "HOLD FEATURE" is also incorporated with the Timer which allows the Timer to act as a switch only. When the dial is in the "HOLD" position it has turned the charger section on without any time cycle. The Timer must be turned manually to the "OFF" position to turn the Battery Section "off". This feature should only be used in a low charge setting where more time will be required to charge a battery than the maximum Timer setting. However, care must be taken so as to not forget to turn the Battery Charger section and Welder "off".

### REMOVING THE BATTERY CHARGER SECTION TO CONVERT TO A NON-BATTERY CHARGER MODEL:

Before attempting to remove the Battery Charger section, disconnect the welder lead-in plug from the wall receptacle. The Battery Charger assembly consists of the Charge Meter, Timer, Output Plugs, and also the internal parts, such as the Rectifier, Alternator Protector components. These are all attached to the upper panel section. To remove this section, first remove the top of the Welder. You will notice three cable leads from the transformer, or the welder jacks, leading to the Battery Charger section.

Disconnect and remove the two red cables from the back of the brass welding jacks. Also, disconnect the lower end of the black cable (which makes the connection between Ammeter and Welding jack) from the welding jack by: (1) unscrew the bolt and remove flex cable; (2) screw the bolt back into the jack so that the solid aluminum wire makes a tight connection. Then by removing the front screws holding the Charger section, the entire Charger section can then be removed. The blank panel purchased from the factory can then be inserted in the place of the Battery Charger section to convert to a NON-BATTERY CHARGER MODEL.

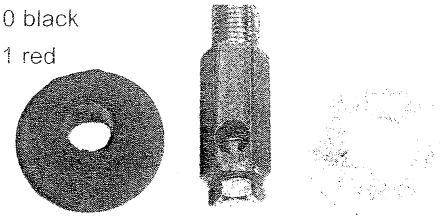
**REMOVING THE BATTERY CHARGER SECTION FOR SERVICE:** If the Battery Charger section is to be removed for service only, and is to be reinstalled, follow same steps as above. The top can then be reinstalled and the Welder used for a short time. It is also recommended that a piece of plastic, wood, or other insulation material be put in this open section so that no one can inadvertently reach inside the Welder.

## FEMALE REPAIR JACKS FOR FORNEY WELDERS

Includes fiber washers & retainer knobs. Fit Models C, CB, FS & F Series Forney Welders (not for Miller or Spitfire Models).

| | |
|---|---|
| **57510•** | **with Black Retainer Knob** |
| **57511•** | **with Red Retainer Knob** |

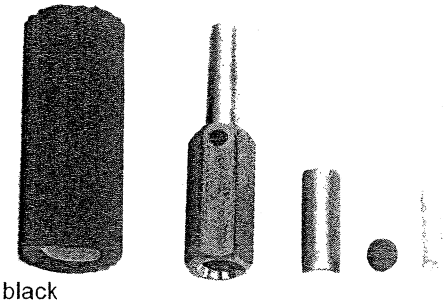
57510 black
57511 red



## MALE SURE-GRIP PLUGS FOR WELDER CABLE ENDS, EXTENSIONS AND BUMPER JUMPER BOOSTER (SEE BELOW)

For assembly or replacement of welding cables #6 to #2. Makes mechanical connection with no soldering. Good for special connecting applications, light to heavy duty. Use on C, CB, FS & F series Forney & Miller welders. Complete with machined solid brass bar stock male plug, insulator sleeve, shim & set screw.

| | |
|---|---|
| **57901•** | **with Black Insulator (Forney style 3/8")** |
| **57902•** | **with Red Insulator (Forney style 3/8")** |
| **57903•** | **with Black Insulator (Miller/Spitfire 5/16")** |
| **57904•** | **with Red Insulator (Miller/Spitfire 5/16")** |



57901 black
57902 red

These are the only parts for the Forney welders that are still available thru Forney Industries. These can be purchased thru a local Forney dealer in your area. They may have to be special ordered from the Forney Warehouse.

Other repair parts such as switch and capacitor are available thru electrical supply stores.

Cable, ground clamp and electrode holders are available thru local Forney dealers. There are no made up assemblies.