

Forney F.I.G. 753

ARC TRON

AN ACCESSORY DESIGNED FOR AC OR DC (SINGLE POLARITY) WITH ANY 180 TO 300 AMP. FORNEY WELDER AND MOST OTHER MAKES.

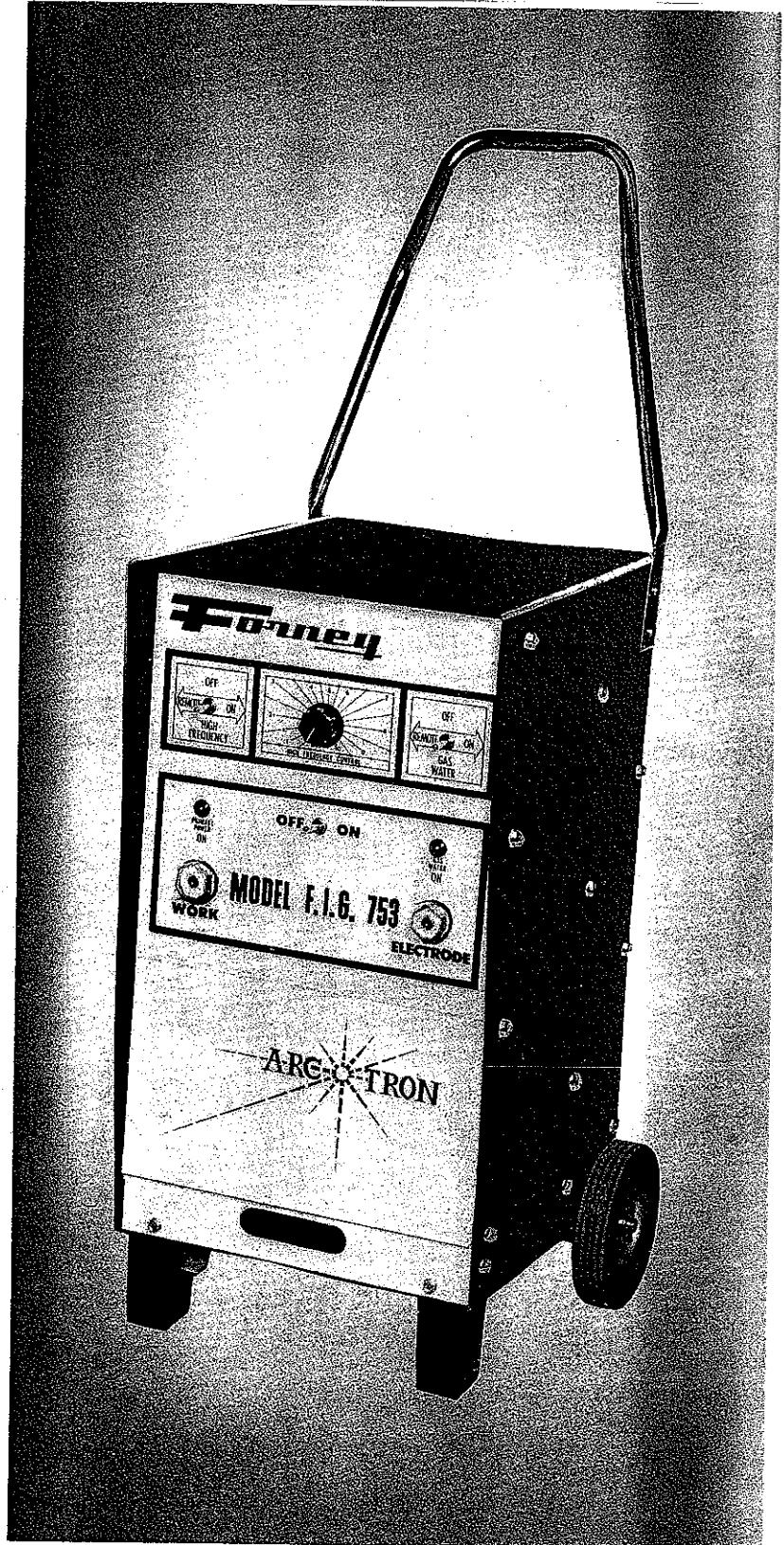
A COMPACT TIG welding attachment which adds: high frequency arc stabilization, water cooled TIG welding torch, and inert gas for arc shielding, to the AC or DC input welding current. All of these components are brought together in this unit to provide the Tungsten Inert Gas needed for jointing: Aluminum, Stainless Steel, Iron Metals, and other Non-Ferrous Metals.

ECONOMY OF OPERATION is outstanding and exceeded only by its excellent performance. Built-in features, such as the remote or manual argon gas flow control, will cut your inert gas wastage to zero. Also the high frequency arc stabilizer can be operated manually or by remote control to provide unlimited applications. Even the cooling water flow is adjustable with a micronic valve to eliminate the need for resetting the cooling water flow each time the unit is turned on.

VERSATILITY of use means added savings in production, maintenance, and repair. When not in use for Tungsten Inert Gas process, the Model FIG 753 Arctron can be used for metallic arc welding plus high frequency arc stabilization for use with many problem electrodes or unusual welding situations.

NOW WELD WITH EASE

ALUMINUM • STAINLESS STEEL • IRON METALS • OTHER NON-FERROUS METALS



MAXIMUM PERFORMANCE is achieved with the reliable operation of the FIG 753 Arctron and the most efficient set of accessories and supplies. Greater production and easier repairs are obtained through use of a torch which can be held in all welding positions and hard-to-get-at places because the torch is small and light weight.

TORCH The most efficient torch for inert gas welding. Pictured here with some of the tungsten electrodes, ceramic nozzles, electrode collets, and asbestos cover which can be purchased separately. The capacity for this heavy duty torch is 300 Amps and is water cooled for high duty cycle production welding. It takes tungsten electrodes of the following sizes: .040", 1/16", 3/32", 1/8" and 5/32". Collets and ceramic nozzles for each of the above five sizes of electrodes match up to give this torch the perfect versatility needed for inert gas welding. All hose connections are leak-proof and streamlined. The water in, gas in, and water out amperage in cable are all plastic of high flexibility. All of the hoses are enclosed in an additional plastic sleeving to prevent snarling and soiling. All necessary fittings are provided for fast hookup of the torch to the Model FIG 753. Also available in a collet cap to accommodate the longer 7" tungsten electrodes.

FLOWMETER This sturdy flowmeter is designed for use with argon shielding gas. The preset output gas pressure of 25 psi is controlled by the regulator which is a part of the flowmeter. The flowmeter is calibrated from zero to 80 cubic feet per hour (cfh) and is designed for instantaneous indication of the exact gas flow.

REMOTE CONTROLS A wide range of remote controls are available for remote control of the inert gas solenoid, the high frequency relay, or both. These remote controls are equipped with 15 or 25 foot cables to provide great flexibility to the operating unit.

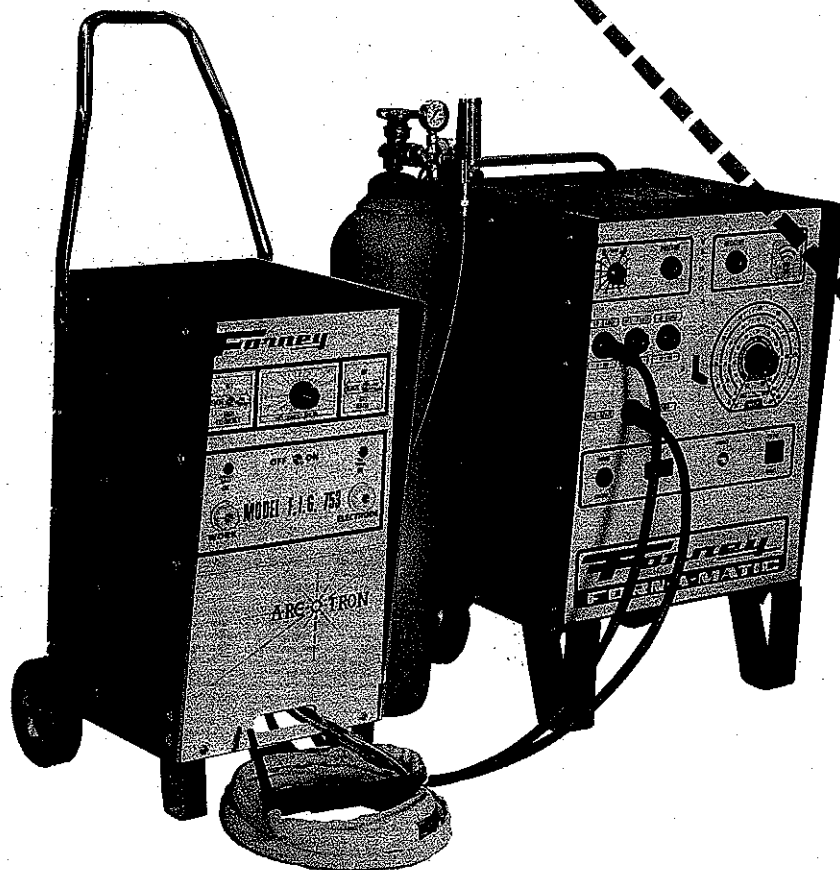
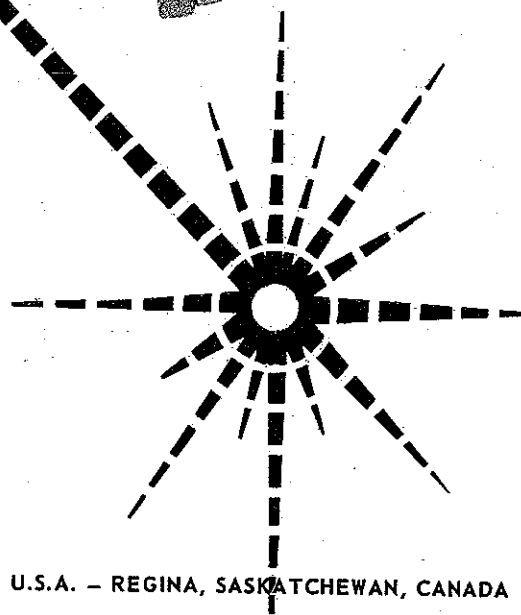
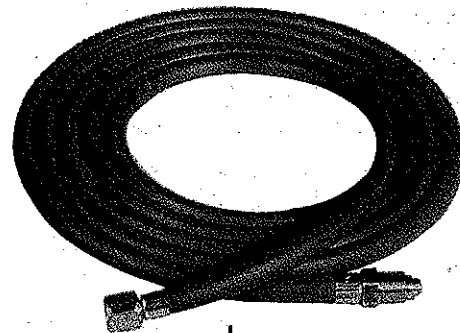
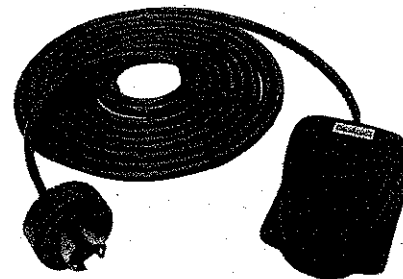
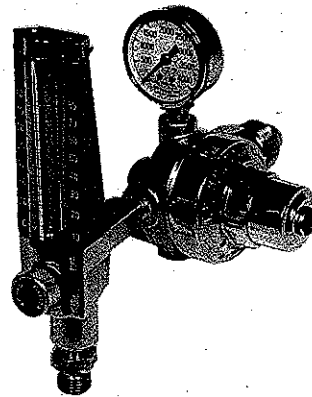
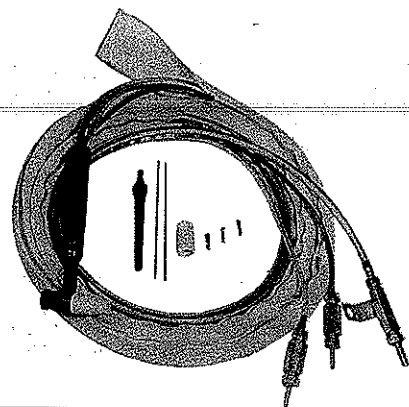
ASBESTOS CABLE COVER Designed especially to protect the plastic hoses of the torch from hot metal sparks and burn through. Easily installed or removed by a full length zipper. The long cover is designed to protect the cable and hoses just below the torch head. Prevents chafing and abrasion of hoses and cables in the welding area.

COLLETS Quick change collets for each of the five tungsten electrode sizes are available. The collets are quickly changed by simply removing the collet cap and allowing the collet to fall out so that the next size may be inserted.

NOZZLES Made of high temperature ceramic to withstand 2200° F. High temperature resistance, yet quick heat dissipation are obtained from these ceramic nozzles which easily screw onto the torch head. The nozzles are high impact resistant to reduce breakage from damage or heat shock.

ELECTRODES Pure or thoriated tungsten electrodes in 7" lengths are available in the following sizes: .040", 1/16", 3/32", 1/8" and 5/32". The electrodes can be used in their full length by using the long collet cap. For shorter lengths the electrodes may be easily snapped in a vise or cut in two with a grinder.

GAS HOSE 1/4" rubber hose, pressure conditioned, red in color and available in custom lengths. Normally supplied in 10 ft. lengths with the proper fittings to connect to the flowmeter and to the Forney FIG 753 Arctron.





FORNEY
F.I.G. 753
ARC TRON

**INSTALLATION
MAINTENANCE
and OPERATING
INSTRUCTIONS**

FORNEY

Industries, Inc. U.S.A.

Box 563 Fort Collins, Colo. 80521 U.S.A. • Box 1040, Regina, Sask. Canada • 45 Shirley Ave., Kitchner, Ontario Canada

Arc Welders Ltd. CANADA



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INSTRUCTIONS FOR THE INSTALLATION AND MAINTENANCE OF THE FORNEY INERT GAS ATTACHMENT -
MODEL FIG-753 (ARCTRON).

The Forney Model FIG-753 Arctron is a completely engineered attachment to your present AC or DC Arc Welder. The scope of your welding operation can now include (TIG) High Frequency Inert Gas Welding. The FIG-753 Arctron features controlled high frequency current, inert gas, and water for torch cooling.

The Model FIG-753 Arctron can be quickly attached to any Forney Welder. A change of the attachment cable plugs may be required for some models. We recommend the combination of the FIG-753 Arctron with a Model VS-300 AC/DC, VS-300, CB, or CBBT Forney Welder.

The FIG-753 Arctron attachment is equipped with a 115 volt supply cable (3 prong grounded type). Plug into suitable 115 volt 60 cycle AC source. (Note: DO NOT connect to the 115 volt convenience outlet on the welder.) The attachment cables coming out of the lower front of the FIG-753 Arctron (Photo #1) are to be connected to the welding amperage jacks on the welder. Your selection of welding heats is determined by the connection of these cables to the welder. (Note: Polarity of these cables must be observed only when a DC Welder is used. To reverse polarity, reverse the attachment cables at the welder output.)

A water solenoid switch is provided inside the door in the lower section of the FIG-753 Arctron. One end of the water supply hose is attached to the "IN" side of the water solenoid switch. Connect the other end of this incoming water supply hose to a water hose or water faucet.

A gas solenoid switch is also provided inside the door in the lower section of the FIG-753 Arctron. One end of the flexible gas hose is to be connected securely to the "IN" side of this solenoid. Connect the other end of the gas hose into the bottom fitting of the gas flow meter which has been connected to an argon or helium tank.

The small flexible rubber hose (without connections) is the water exhaust hose. Slip one end of this hose onto the brass connection on the end of the Tungsten Inert Gas (TIG) welding torch cable. Place other end of water exhaust hose at drain or in container.

Attach the lug on the heavy brass connection at the end of the (TIG) welding torch cable to the upper left stud inside the FIG-753 unit and tighten wing nut securely. (Photo #3) The water exhaust hose that has been slipped on the end of this torch cable will loop back down and extend out beneath the unit to the drain.

The TIG welding torch assembly also has a small red hose and a small clear hose. Connect the small red hose to the "OUT" side of the gas solenoid in the lower section of the FIG-753 arctron unit. (Photo #3) Connect the small clear hose to the "OUT" side of the water solenoid also in the lower section of the FIG-753 arctron unit. (Photo #3) Be sure all connections are tightened securely.

The remote foot control switch wire is extended beneath the FIG-753 unit and plugged into the receptacle as shown in the center of Photo #3. The ground cable from the welder is plugged into the plug marked "WORK" on the face of the FIG-753 arctron and connected to the parts to be welded. (Photo #4)

When all accessories for the TIG welding have been attached, turn the gas and water switch on the face of the FIG-753 to the "ON" position. (Photo #5) Turn the main Off-On switch to the "ON" position. Turn the water faucet on very slightly and allow the water to run until it has pushed all of the air out and water is running out the drain hose.

CAUTION: Do not allow full or high water pressure to be applied to the system as damage may result. Additional cooling will not be gained by attempting to force a great volume of water through the torch head. It is recommended that the water supply faucet be adjusted while observing the water flow from the exhaust tube. At the point the flow changes from a fast drip to a steady stream will provide cooling for amperages up to 160 amps. Slightly more water flow should be used for over 160 amps.

Turn the valve on the Inert gas bottle open. Adjust the flow meter to the desired number of cubic feet of gas flow desired. (Refer to chart in this booklet.) When water and gas flow have both been adjusted, turn the gas and water switch from the "on" position to the "remote" position. Press the remote foot switch and release to see that it is operating properly. There will be a few seconds delay in the gas and water solenoids closing after releasing the foot switch.

Your FIG-753 arcron unit is also equipped with a high frequency switch and a high frequency control. The switch is off in the center position. It has a remote position and is operated by the remote foot switch when on this setting. It also has an on position that can be used when the operator is in a situation where he cannot use the remote foot switch easily. The high frequency control adjustment is marked from zero to ten. An increase in the number will increase the intensity of the spark.

A normal spark distance, between the tungsten tip and the ground clamp, with the gas supply ON and the welder OFF is between 1/8" to 3/16" with the high frequency knob (Photo #5) set at maximum (#10 on the scale). If the high frequency spark becomes weak, the spark gap electrodes may need cleaning or adjustment. In most instances only cleaning is necessary - usually a piece of ordinary paper can be inserted between the electrodes. The abrasiveness of the paper will provide the only cleaning necessary. If the electrodes become heavily pitted, cleaning can be accomplished with a very light emery cloth inserted between the electrodes. With the electrodes slightly tightened, draw the emery paper through them. The spark gap is set at the factory at .006. Additional opening will increase the high frequency spark distance at the torch. (An excessively wide gap will not improve the characteristics of the welding arc and may lead to radio and TV interference.) **CAUTION:** Be sure the FIG-753 unit is unplugged when adjusting the spark gap. The spark gap assembly is located just above the gas and water solenoids inside the lower section of the arcron. (Photo #3) A standard allen wrench can be used to loosen or tighten the set screw to set the spark electrodes.

Your FIG-753 can also be used for standard electrode welding, utilizing the high frequency feature of the FIG-753 arcron. (Photo #2) This allows electrodes that are difficult to run on AC welders to be run easily. (The Inert gas is not used when welding with a standard electrode on high frequency.) Striking an arc and welding on low amperages with a regular welding rod is also much more easily accomplished by using high frequency.

Forney

FIG 753

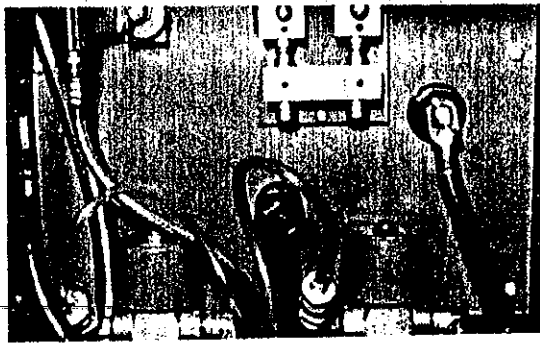


PHOTO 1

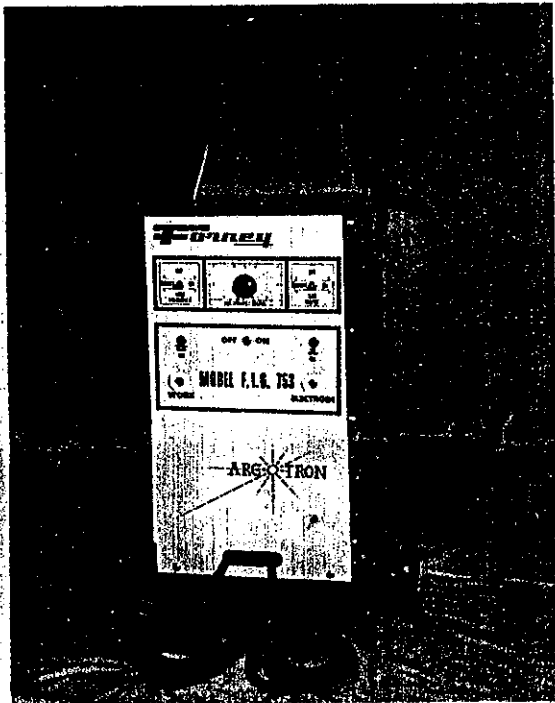
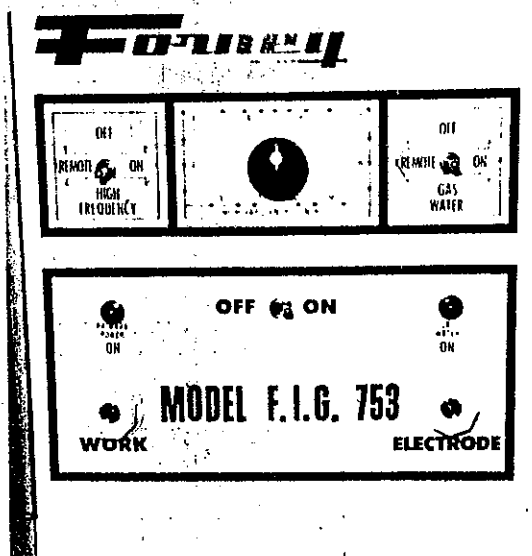
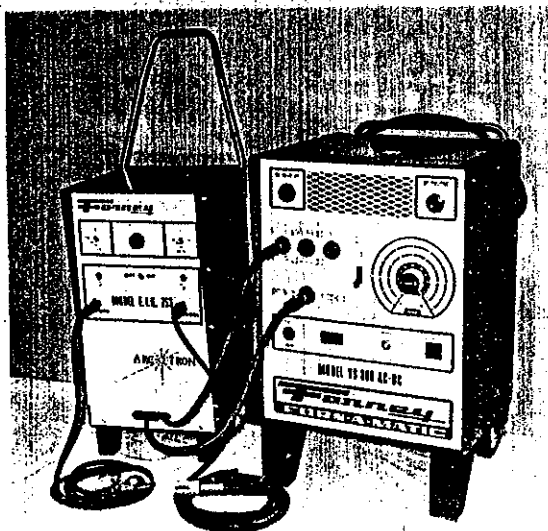


PHOTO 4



PHOTO 2

PHOTO 5



TUNGSTEN-INERT GAS WELDING
AND
OPERATING INSTRUCTIONS FOR THE FORNEY
MODEL FIG-753 ARCTRON

GENERAL

Tungsten-inert gas welding, commonly referred to as the TIG process is ideal for welding aluminum, especially thin sheet and plate, and some other non-ferrous metals.

The process makes use of a non-consumable tungsten electrode which is used to produce the arc and to heat the base metal. In most cases the welding is done with a filler rod which is inserted in the molten pool created by the arc. Inert gas is used in the welding to shield the molten metal from oxidation. Usually this gas is argon, or helium or a mixture of both. Argon is generally preferred. It eliminates the need for welding flux, and because it is transparent, the operator can see the bead and fusion zone at all times and thus produce a neater, sounder weld.

Because the TIG process is so highly popular for welding aluminum, there are some considerations about the metal that should be covered here.

Weldable commercial aluminum alloys start to melt at 1050 F. Pure aluminum melts at 1220 F. Steel melts at about 2800 F. Copper melts at about 1980 F. In all these metals except aluminum it is possible to detect the melting point by appearances. Not so with aluminum, except with the TIG process. While using TIG, aluminum will develop a glossy, liquid pool or spot under the arc when it is approaching the melting point or has reached the temperature for welding.

There are two types of aluminum alloys:

1. The work hardenable alloys such as EC (Electrical Conductor grade), 1100, 3003, 5052, 5083, and 5086.
2. The heat treatable alloys such as 6061, 6062, and 6063.

The 2000 and the 7000 series are also heat-treatable aluminum alloys but they are not normally recommended for arc welding.

Aluminum alloys will lose individual characteristics of strength and hardness when reheated to high temperatures. Above 900 F the aluminum will revert to the annealed state. Most welding is done above 1050 F so it is easy to see the change that will take place under these conditions.

These considerations are not intended to discourage the repair of aluminum but to provide basic information for those in the business of fabricating new articles of aluminum. Additional information on welding aluminum will be furnished manufacturers on receipt of inquiries addressed to: Educational Research Division, Forney Arc Welders, Box 563, Fort Collins, Colorado.

For those engaged in repairing aluminum articles most of the above technical data can be ignored because the measures taken to repair the part will change appearance, shape or function to some degree anyway.

Oxides quickly form on aluminum. They melt at considerably higher temperatures than do the alloys or pure aluminum. A skin of aluminum oxide gives the appearance that the base metal is under the welding temperature while actually such is not the case. When trying to weld through these oxides without first removing them, a collapse of the base metal usually occurs.

~~Aluminum oxides should be removed before the welding begins. This can be done by using a clean stainless steel wire brush. Cleaning with alcohol or acetone is highly recommended. Any oil or dirt on the base metal near the fusion zone will cause unsound welds (porosity caused by gas, dross inclusions, skips, etc.). Cleanliness in joint preparation and welding procedures is important.~~

Moisture on the tungsten electrode, in the gas line, or along the edges of the base metal can release hydrogen that could be trapped in the weld causing porosity which in turn could impair its strength and ductility. An inspection of base metal parts and welding equipment before the welding starts can prevent this.

The thermal expansion of aluminum is about twice that of steel, so speed of welding is important in controlling the possible distortion. Root openings on butt joints can be closed quite quickly by too much heat and/or too slow a welding process.

Large pieces or shapes of aluminum to be welded should be well tacked and the tack welds should be close together. Mechanical clamps or devices should not be used to hold the base metal parts too securely as the contraction forces could crack the weld.

Sometimes preheating is advisable, especially if the base parts are of such mass or size as to conduct the heat away too fast from the fusion zone. It also helps in preventing distortion and speeds up the welding time.

Joint design is quite simple. On base parts 1/16" to 3/16" thick, a square butt joint is satisfactory. For thicker metals, a single or double vee joint is preferred. Root openings are determined by the thickness of the base metal. Allowances for expansion of base metal in the joint should be made to prevent distortion, and to provide for complete penetration.

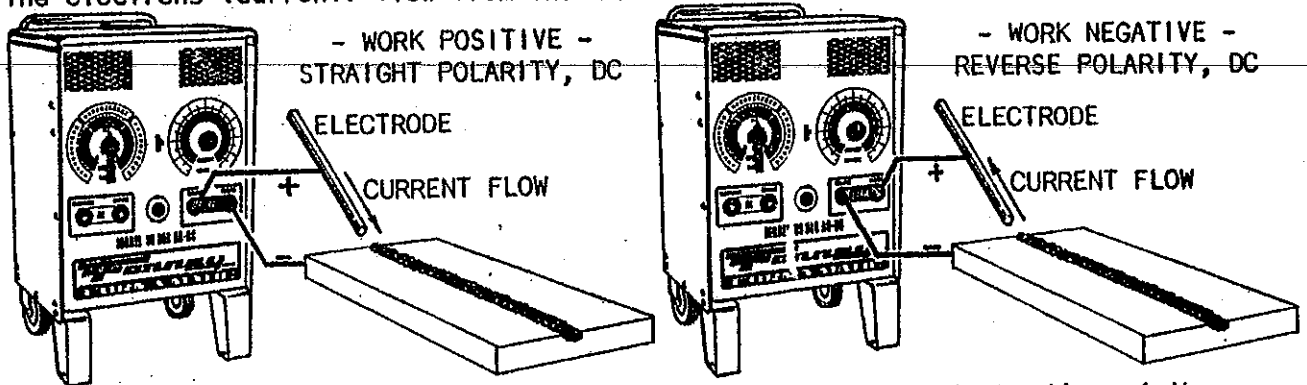
TIG WELDING WITH THE FORNEY FIG-753 ARCTRON AND FORNEY WELDER

FUNDAMENTALS

Alternating (AC) current is recommended for TIG welding of aluminum. This kind of current is produced by your Forney Welder and transmitted through the FIG-753 Arctron.

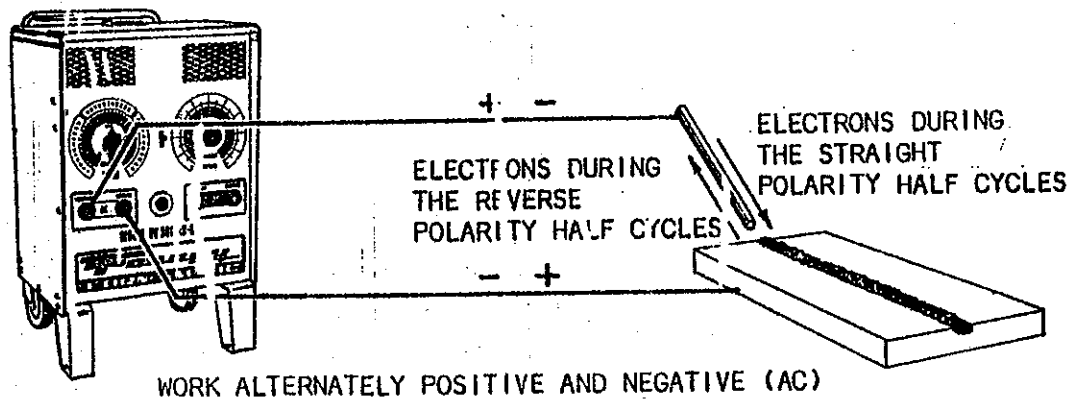
To get a better understanding of the advantages of alternating current in this case it is well to consider the effects of direct current using straight and reverse polarity.

In the drawing below, the flow of current is shown. In direct current straight polarity the electrode is negative and the work is positive so that the electrons (current) flow from the electrode to the work. In direct current reverse polarity the electrons (current) flow from the work to the electrode.



The use of direct current straight polarity causes considerable heating of the work, while the electrode stays relatively cool. Direct current reverse polarity is just the opposite in which the electrode receives the heat from the electron transfer, and is frequently overheated at low current settings. Reverse polarity thus causes tungsten burn-off and contamination of the weld.

Alternating current has the decided advantage because theoretically it is a combination of the two types of polarity in direct current. This can be seen in the drawing below.



The term "alternating" describes the changing of direction of the flow of current. For one half the time (cycles) the current is straight polarity, and for the other half it is reverse polarity.

EQUIPMENT AND SUPPLIES

In addition to your Forney Welder which supplies the power for your Forney FIG-753 Arctron a water supply with regular garden hose with sufficient length to reach the welding area will be necessary. A drain for the water outlet will be necessary. In field work, where water must be conserved, a tank with pump can be used to recirculate the water. Its capacity should be great enough to allow for cooling of the water used and, of course, this would be in proportion to the amount of welding done at any one time.

The Forney FIG-753 Arctron comes completely equipped to do the average TIG welding job. Larger or smaller electrodes, nozzles and other supplies can be purchased from Forney for special work.

A supply of the proper filler rod should be on hand.

A supply of Inert gas with regulator-flowmeter, hose and fittings should be obtained and on hand.

Vise grip welding clamps, vise grip "C" clamps, back-up material, cleaning brushes, should also be available to the operator before the welding is started.

OPERATION OF EQUIPMENT

The Forney FIG-753 Arctron should be located near the operator in the welding area, and as close to the Forney Welder as required. DO NOT PLACE THE ARCTRON ON TOP OF THE WELDER. Whenever possible, 230 volt current (to power the welder) should be convenient to the welding area. (See special grounding recommendations by the Joint Industry Committee of High Frequency Stabilized Arc Welders.)

The Forney FIG-753 is provided with a 115 volt power cord, which activates the high frequency unit. This power cord is to be plugged into a regular 115 wall outlet (Caution - DO NOT PLUG THE FIG-753 INTO THE 115 VOLT OUTLET ON THE FRONT OF YOUR WELDER).

The selection of amperage and thus the hook-up to the FIG-753 Arctron is dependent on the metal thickness and electrode diameter. In the chart below are recommended amperage settings, nozzle sizes and gas flow rates, etc., for various metal thicknesses.

Metal Thickness	Electrode Dia.	Nozzle Sizes Orifice Diameter	Amp. Settings	Argon Gas Flow	Filler Rod Diam.	No. Passes
Less than 1/16	0.04	1/4 inch	10-60	5CFH	3/32	1
1/16	1/16	1/4 inch	40-120	7CFH	3/32	1
1/8	3/32	5/16 inch	100-160	10CFH	1/8	1
1/4	1/8	3/8 inch	150-210	15CFH	3/16	2
5/16 up	5/32	1/2 inch	200-300	up to 20CFH	1/4	3

After determining the amperage you desire to use, take the cable from the front of the FIG-753 with the colored molding, and plug into the appropriate ground, and take the other cable, with the black molding, and plug it into the amperage you desire to use. To change amperage with the Model FIG-753, merely adjust it on the face of the welder with the use of the cables from the arctron the same as you would if you were using the welding cables. (When using the FIG-753 Inert Gas process, be sure to plug a regular ground cable into the plug marked work on the arctron and thereby ground the work you'll be working on.

The maximum gas pressure on this hose and torch is 25 pounds. (Regulators supplied by Forney are preset for this pressure.) See instructions on operation of regulator

The clear hose (the one without the cable inside) is to be used for the water inlet. It is easily connected to the connection marked out on the water solenoid switch in the FIG-753 Arctron. The nut should be tightened with a wrench but only enough to make a leakproof connection.

The water, circulating through the torch head, keeps the torch from overheating. It is therefore important to keep the small openings in the torch head from becoming plugged by small particles of dirt brought in by the water supply. A screen is placed in the water line. It should be inspected and cleaned frequently. If the water hose is ever disconnected the opening should be kept clean and free of dirt.

The recommended water pressure on this hose and torch is 18 pounds. If the water pressure is not known, the water tap can be turned on easily until water is exhausted through the drain hose in a fast drip or small stream.

An electrode of the proper diameter (as selected from Chart) with the proper size chuck can be inserted in torch head. The length of the electrode protruding beyond the end of the nozzle should be approximately 1/8".

The FIG-753 can be supplied with either hand or foot operated switches for remote control of gas and/or high frequency.

The gas flowmeter is one of the finest quality and should be attached to the tank by means of the standard fitting which is wrench tightened. Be sure the knurled knob on the side of the flowmeter is off before turning the tank valve on full open. (Do not use wrench. If valve cannot be opened by hand return tank to supplier.)

Because this regulator is preset to deliver the gas from the flowmeter at no more than 25 pounds there is no pressure valve handle on the regulator itself.

Attach the red gas hose to the fitting at the bottom of the flowmeter and to the FIG-753 Arctron. Wrench tighten. By slowly turning the knurled knob on the flowmeter adjust the rate of flow to that found on Chart for the welding job at hand. The Arctron must be on to make this adjustment.

When the welding is to be stopped for any length of time, close gas tank valve.

When everything has been connected and all fittings tested and found leakproof, the hoses and cable can be brought through the grommeted opening at the front of the Arctron and the lid closed. Be sure hoses have no kinks. This specially made zippered asbestos cover is to protect the assembly from burns brought about by falling hot metal, abrasion, and excessive wear. It is highly recommended, that this be on the cable at all times.

TO USE UNIT WITHOUT INERT GAS TORCH

When straight arc welding with high frequency current is desired, and the inert gas process is not needed the Arctron can be quickly converted. It is not necessary to disconnect the hoses. Shut "Gas Control" toggle switches off. Plug regular electrode holder cable into the "Electrode" tap on face of the Arctron.

For either use (with or without inert gas process) the Arctron has a rheostat on the face of the unit to increase or decrease the intensity of the spark. The control knob turns from "Lo" to "Hi" to increase the length and intensity of the spark.

TO ADJUST SPARK GAP

Periodic adjustment to reset gap length is easily done. Spark gap setting of .006 inch is the best gap for most welding (metallic arc or inert gas). The maximum gap is .010 inch though .006 inch is preferred and recommended.

* * * * *

Operation Check List

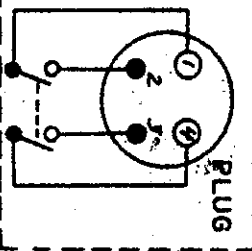
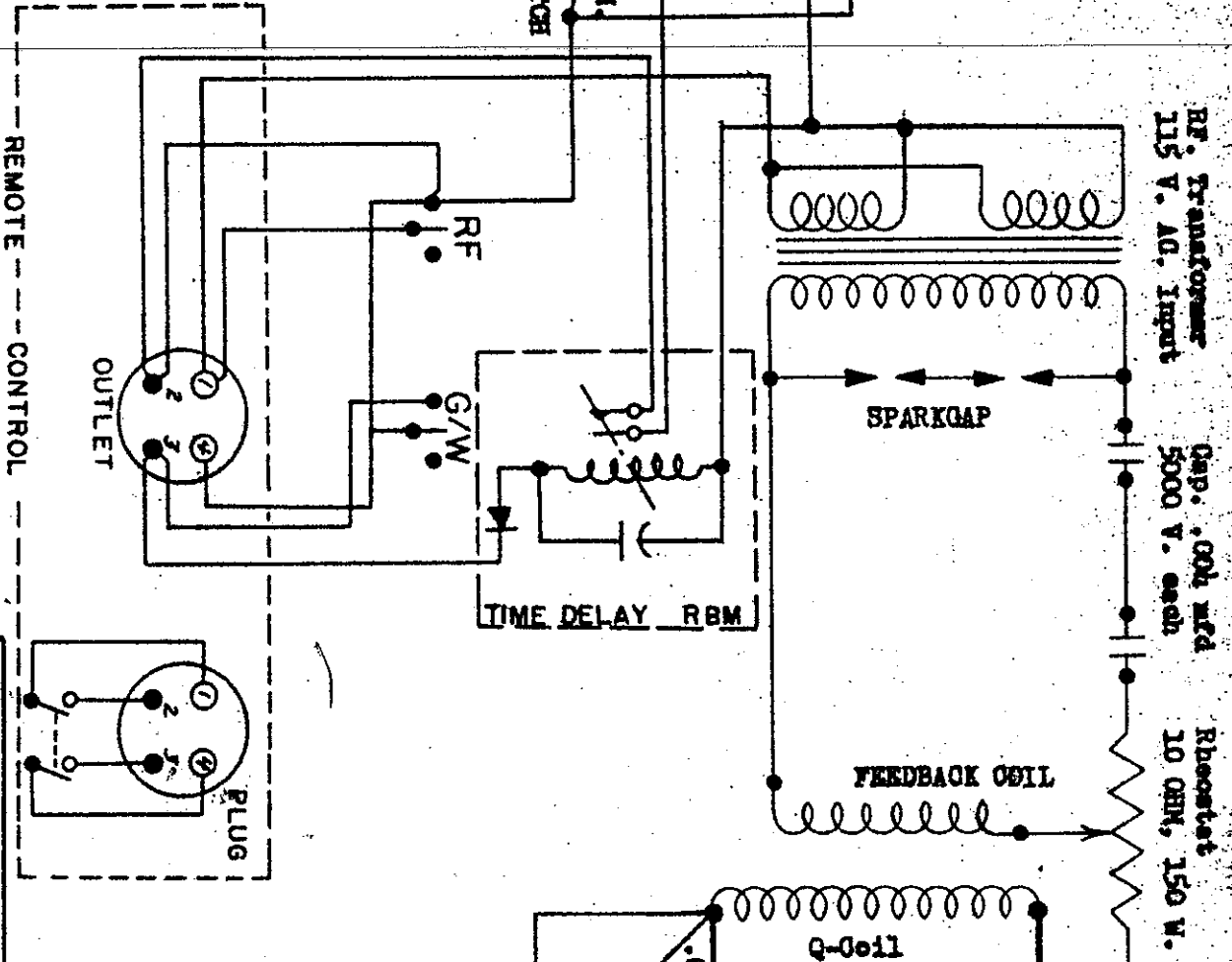
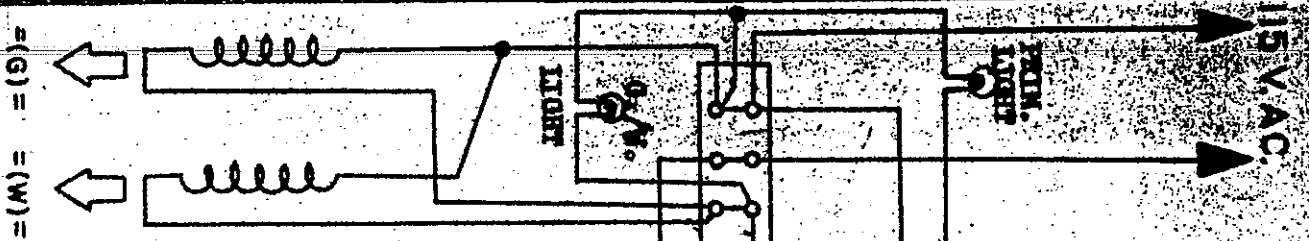
1. Connect Arctron to Welder for power as well as amperage setting.
2. Connect torch cable and switch wires.
3. Connect and check Water-In supply.
Recommend 18 psi water flow.
4. Connect Inert Gas Line
 - A. Check for gas leak by blocking end of torch and reading gas flowmeter gauge. Leak is apparent if gauge registers any gas flow.
 - B. Check gas line for condensation. Blow line out thoroughly. Moisture in gas line causes black pitted welds and porosity. Torch reaction is a violent sputtering.
5. Material to be welded must be clean, especially free from oil.
6. Select proper tungsten electrode and nozzle size for type of work being welded. (See Chart)
7. Use either pure or thoriated tungsten electrodes on your Model FIG-753.
 - A. Tungsten that is too small for the amount of amperage will disintegrate.
 - B. Tungsten that is too large for the amount of amperage will cause a wavering arc.
 - C. Tungsten off center will cause a wavering arc. Check for bent tungsten electrode.
 - D. Touching tungsten electrode with filler rod will contaminate the electrode and cause oxidation and black welds.
 - E. Tungsten protruding too far beyond the tip of nozzle will cause discoloration and porosity of weld.
 - F. Tungsten not protruding far enough beyond tip of nozzle will result in short nozzle life, due to the reflected heat or touching the weld puddle.
 - G. Recommend tungsten electrode on AC welding protrude approximately 1/8" beyond nozzle end.

8. Inert gas shield.

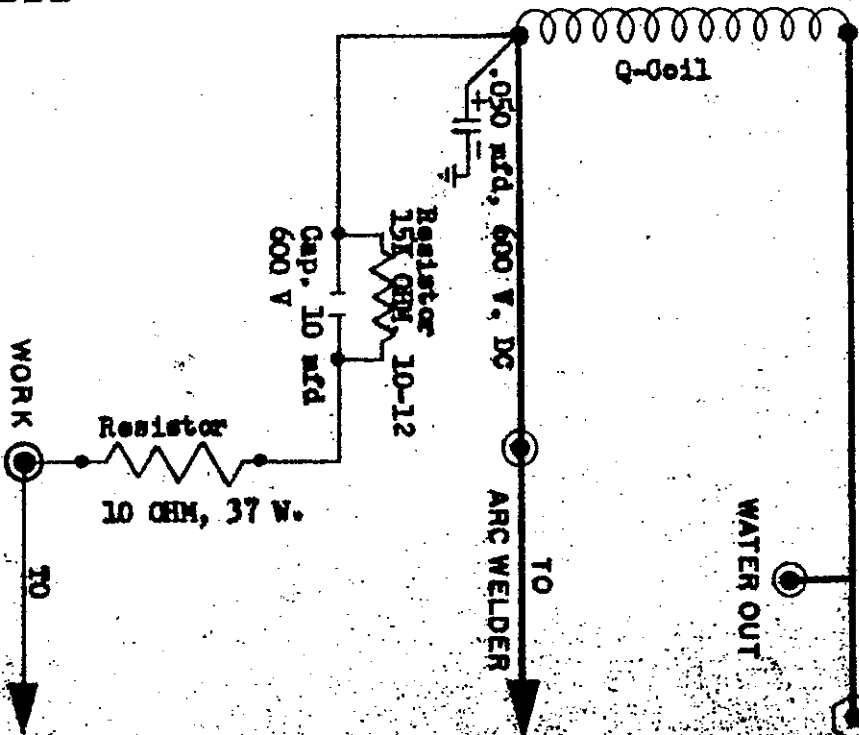
- A. Improper nozzle size will give poor shielding and result in black welds.
- B. Wind drafts cause a break in the gas shield and result in oxidation, i.e. black welds.
- C. Magnetic attraction will also cause a wavering arc.

9. Secure gas tank.

- A. Chain it to post if possible, so it will not fall.
- B. Never force connections which do not fit.
- C. Do not drop or abuse cylinder.
- D. Protect hose from oil and grease. Prevent kinking. Do not leave in way of someone to trip over.
- E. Never strike an arc on cylinder.
- F. If regulator connection suspected of leaking, test only with soapy water.
- G. Do not force tank valve with wrench. Hand tighten or loosen only.



SERIAL NUMBER:



SCHMATIC, ELECTRICAL

FORNEY INERT GAS, MODEL "759", SPEC. # 119A U-1

DRAWN	GRP	8-4-66
DATE		
SCALE		

FORNEY MANUFACTURING CO
DIV. OF FORNEY INDUSTRIES, INC.
FORT COLLINS, COLORADO

DWG. NO. 3402
W.T.D.