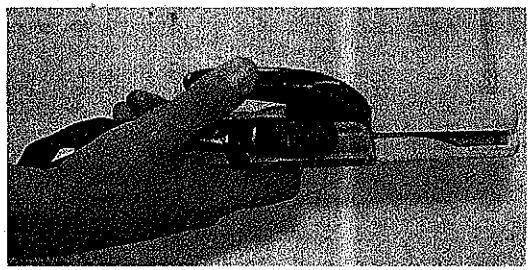


Photo #5

This photo shows recommendations to attach the R1 finger-tip control to a standard electrode holder with tape or a band. The R1 remote control can also be attached to a bench or to the belt of the operator.

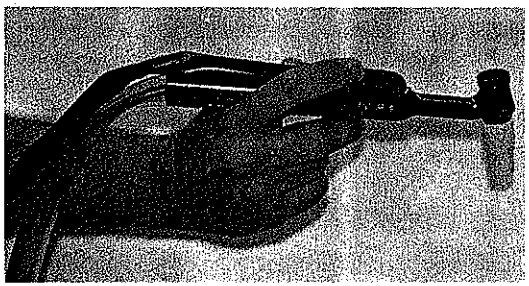


Photo #6

This photo shows the R1 control attached to an inert gas welding torch.

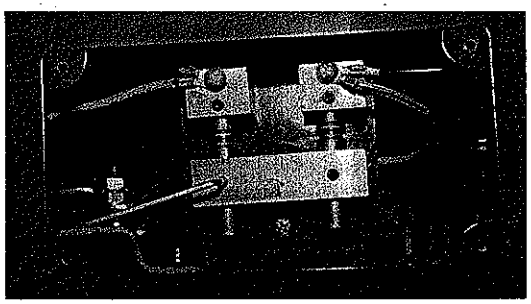


Photo #7

Access to the spark gap control can be made by removing the small door on the rear of the FIG-752 Arctron. A standard Allen wrench can be used to loosen or tighten the set screw to set the spark electrodes (Photo #7).

A normal spark distance with the gas supply **ON** and the welder **OFF** is between 1/8" to 3/16" with the high frequency knob (Photo 8) 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-752 unit is unplugged when adjusting the spark gap

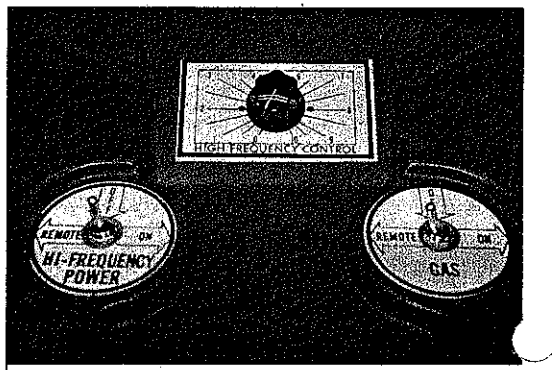


Photo #8

Your FIG-752 Arctron unit provides control for both the high frequency power and the gas with the additional high frequency control adjustment knob. The high frequency control adjustment is marked from zero to ten. An increase in the number will increase the intensity of the spark. The FIG-752 Arctron can be operated without any remote controls by switching either the high frequency or gas switches to the ON position.

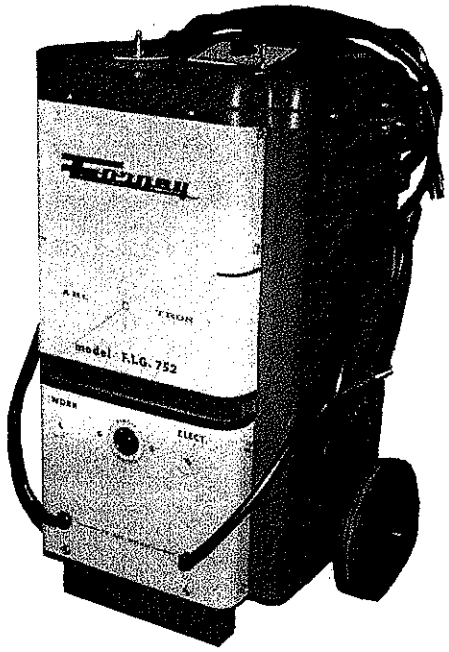
When using remote controls models R1 or R2, the gas switch should be in the "remote" position. The high frequency must be turned on at the unit. When using remote control R2D, switch both the high frequency and gas to the "remote" position.

PRINTED IN U.S.A. O 8 (8/64)

Forney

ARC-TRON FIG-752

INERT GAS ATTACHMENT



Installation and Maintenance Manual

FORNEY INDUSTRIES, INC.
FORT COLLINS, COLO.

12 pages

INSTRUCTIONS FOR THE INSTALLATION AND MAINTENANCE OF THE FORNEY INERT GAS ATTACHMENT — MODEL FIG-752 (Arctron)

The Forney Model FIG-752 Arctron is a completely engineered attachment to your present AC or DC Arc Welder. The scope of your welding operation can now include (TIG) (MIG) High Frequency Inert Gas Welding.

The FIG-752 Arctron features controlled high frequency current, inert gas and water for torch cooling.

The Model FIG-752 Arctron can be quickly attached to any Forney C Series Arc Welders and with a change of the attachment cables can be attached to other models. We recommend the combination of the FIG-752 Arctron with a Model CB or CBBT Welder.

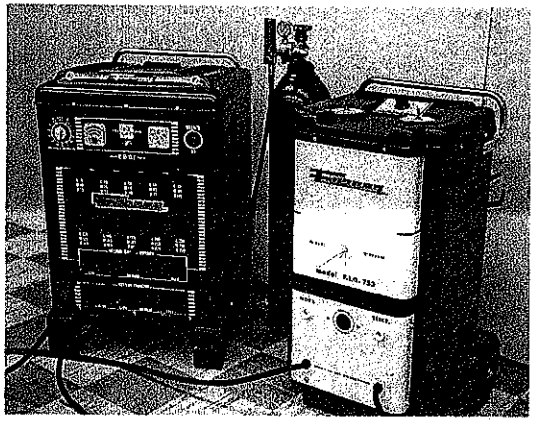


Photo #1

The FIG-752 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 on the lower front of the FIG-752 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 gas outlet is provided at the rear of the FIG-752 Arctron. One end of the flexible gas hose is to be connected securely at this fitting. Connect the other end into the bottom fitting of the gas flow meter which has been connected to an argon/helium tank.

Photo #2

This picture shows the hookup for standard electrode welding utilizing the high frequency feature of the FIG-752 Arctron (the inert gas is not used in this set up.)

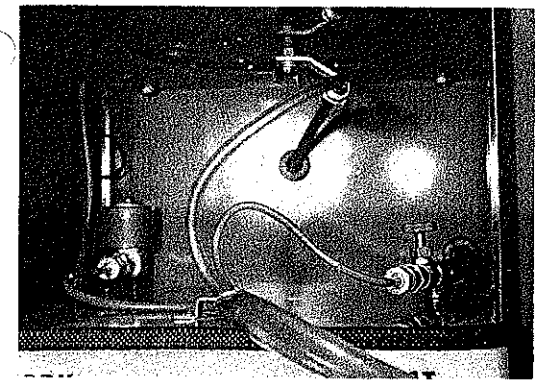


Photo #3

This picture shows the hookup of the inert gas (TIG Welding Torch) to the gas amperage and water connections inside the FIG-752 Arctron. A sketch is also provided on the inside of the door for this purpose. Be sure all connections are secured tightly.

On the rear of the unit you will find the junction for the gas as mentioned under Photo #2. The water cooling hoses are already connected on your FIG-752 Arctron. The large hose is the incoming water supply with the standard garden hose connection. This can be connected to a water hose or water faucet. The small flexible rubber hose is the exhaust hose.

In adjusting the sensitive water flow valve, a proper flow can be determined by observing the water flow from the exhaust tube. At the point the flow changes from drops to a steady stream would provide cooling for amperages up to 160 amps. Slightly more water pressure should be set for over 160 amps.

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 supply water faucet valve be used to turn off the water flow. The sensitive water flow valve will then be set for the next time the unit is to be operated.

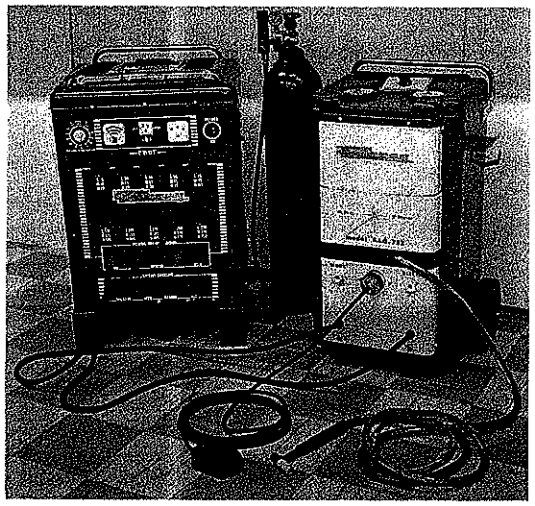


Photo #4

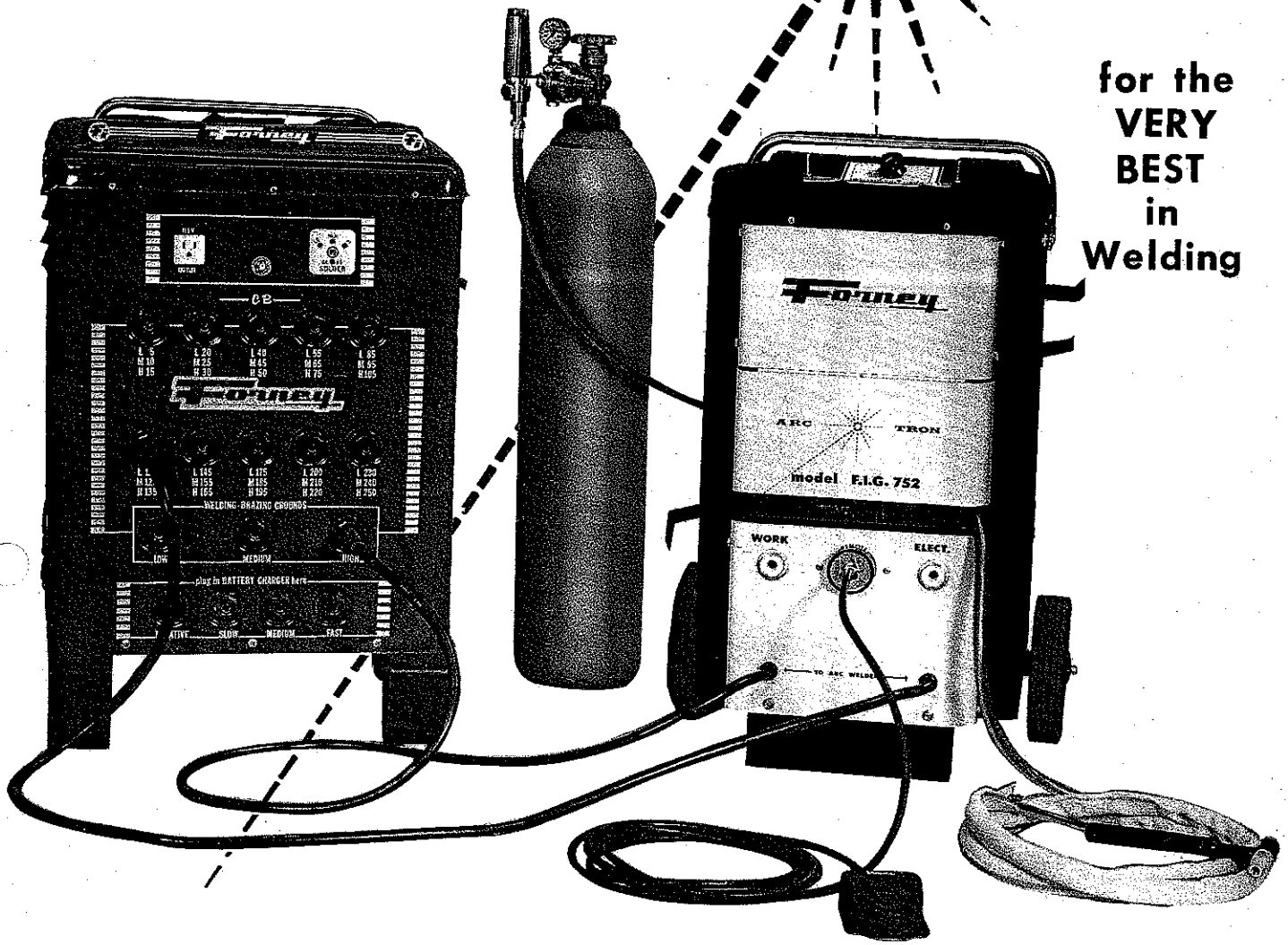
The above shows the proper hookup for the inert gas torch including a R2 or R2D foot control. The R1 remote control can also be utilized as shown in Photos #5 and #6.

Forney

model F.I.G. 752

ARC-TRON

for TUNGSTEN INERT GAS WELDING



for the VERY BEST in Welding

The Model FIG 752 Arctron is 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**
- **OTHER NON-FERROUS METALS**

This all new Tungsten Inert Gas (TIG) unit runs the gamut of heat stages from less than 5 amps to 300 amps. Metals from .002 thickness to heavy cast parts are within its welding range.

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 752 Arctron can be used for metallic arc welding plus high frequency arc stabilization for use with many problem electrodes or unusual welding situations.

DESIGNED FOR AC OR DC (STRAIGHT POLARITY) WITH ANY 180 OR 250 AMP FORNEY WELDER AND MOST OTHER MAKES.

SERVICE BULLETIN

Forney Manufacturing Co.
DIVISION OF FORNEY INDUSTRIES

NO. RDO 126

DATE July 16, 1965

SUBJECT ADJUSTMENT OF SPARK GAP ON FIG-752

The spark gap assembly of this unit, prior to leaving the factory, is properly adjusted at a spacing of approximately .007 inch for a maximum spark length of 5/8 inch with the gas flow properly adjusted and turned on and the intensity control set at maximum.

Recent failures in the FIG-752 Hi-Frequency panel have been determined to be the result of field personnel or customers readjusting the spark gap to a wider setting -- in two specific instances to as much as .020 inch -- with a resultant spark length of one inch or more. The increase in spark length is the direct result of an increase in voltage and if this voltage is increased beyond factory recommended limits, insulation breakdown occurs with failure of the entire unit and possible injury to the operator. Another result is excessive radio and television interference.

WARNING: SPARK GAP SPACING SHOULD NEVER EXCEED .010 INCH. NORMAL SPACING IS .006 to .007 INCH.

Several ideas have been proposed concerning the excessive spark gap settings. Among these were: (1) An increase in spark length so that the operator would not be required to exercise normal care in initiating the arc. (2) High frequency leakage in either the Hi-Frequency panel or torch assembly resulted in a reduced spark at the tungsten and the spark gap was widened to compensate for the leakage. Note: The leakage path must be eliminated rather than opening the spark gap beyond safe limits. (3) The spark gap electrodes have become contaminated and require cleaning or perhaps are not parallel to each other. (Refer to instruction manual.)

If readjustment of the spark gap is absolutely necessary, the following procedure is specified. Failure to follow this procedure can easily cause component or unit failure.

1. Remove spark gap access door.
2. Loosen Allen head set screw holding lower spark contact in position.
3. Insert clean .007 gauge between contact points.
4. Apply slight pressure on lower end of contact with finger tip so that gauge is held snug between points.
5. Tighten set screw.
6. Check Spacing. If spacing is correct, .007 gauge may be inserted or removed with only a slight drag.

TUNGSTEN-INERT GAS WELDING
AND
OPERATING INSTRUCTIONS FOR THE FORNEY
MODEL IG-752 ARC-TRON

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 pure 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 transparrent, 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 metals 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 devises 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.

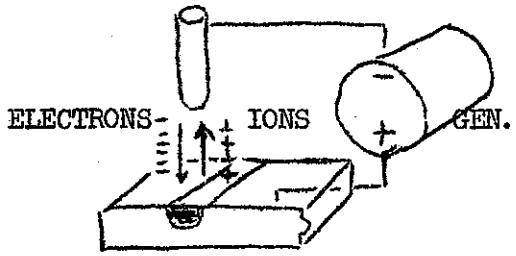
TIG WELDING WITH THE FORNEY IG-752 ARC-TRON AND FORNEY WELDER

FUNDAMENTALS

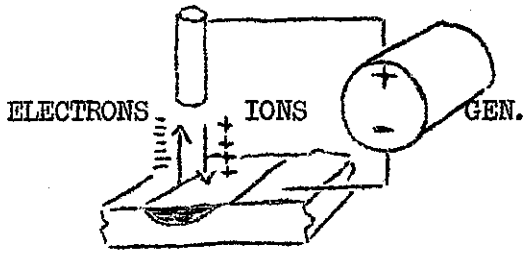
Alternating (AC) current is recommended for TIG welding of aluminum. This kind of current is produced by your Forney Welder and transmitted through the FIG 752 Arc-Tron.

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 as well as the direction of ionization. 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.



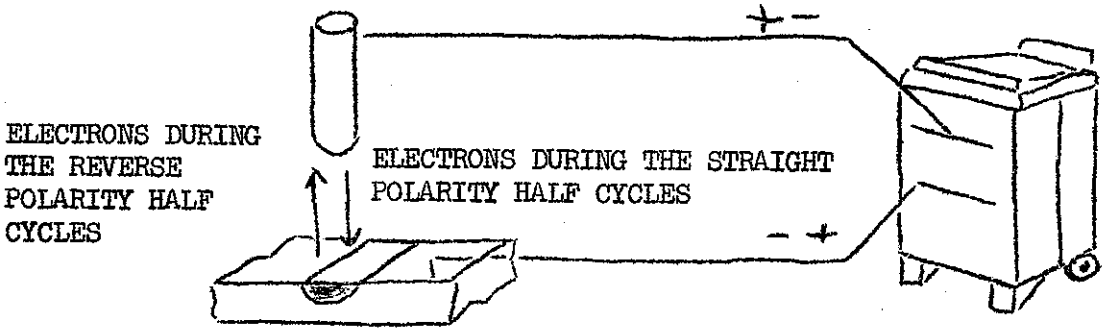
WORK POSITIVE-STRAIGHT POLARITY DC



WORK NEGATIVE REVERSE POLARITY DC

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 could be seen in the drawing below.



WORK (AND OPPOSITELY THE ELECTRODE) ALTERNATELY POSITIVE AND NEGATIVE (AC)

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. AC thus has any of the advantages of DC but none of the disadvantages.

EQUIPMENT AND SUPPLIES

In addition to your Forney Welder which supplies the AC power for your Forney IG-752 Arc-Tron 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 IG-752 Arc-Tron comes completely equipped to do the average TIG welding job. Larger or smaller electrodes, nozzles and other supplies can be purchased from the Company 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 IG-752 Arc-Tron should be located near the operator in the welding area, and as close to the Forney Welder as required. DO NOT PLACE THE ARC-TRON 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 IG-752 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-752 INTO THE 115 VOLT OUTLET ON THE FRONT OF YOUR WELDER)

The selection of amperage and thus the hook-up to the IG-752 Arc-Tron 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 Diameter	Nozzle Sizes			Amperage Settings	Argon Gas Flow	Filler Rod Diam.	Number Passes
		Pyrex	Vycor	Alumina				
Less than 1/16	0.04	#120		.0079	10-60	5CFH	3/32	1
1/16	1/16	#120	#150	.0079	40-120	7CFH	3/32	1
1/8	3/32	#121	#151	.0080	100-160	10CFH	1/8	1
1/4	1/8	#122	#152	.0081	150-210	15CFH	3/16	2
5/16 up	5/32	#123	#153	.0082	200-300	up to 20CFH	1/4	3

After determining the amperage you desire to use, take the cable from the front of the IG-752, with the green 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 IG-752, merely pull out the plugs and insert in amperage heat taps you desire. (When using the IG-752 Inert Gas process, be sure to plug a regular ground cable into the plug marked work, 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 too, is easily connected to the proper connection marked "water" in the IG-752 Arc-Tron. 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.

An electrode of the proper diameter (as selected from Chart No. 1) with the proper size chuck can be inserted in torch head. The chuck can be tightened by two fingers to hold the electrode at a little more than estimated length. The nozzle can then be slipped back on temporarily. The length of the electrode protruding beyond the end of the nozzle should be approximately 1/8". The electrode can be tapped lightly until it is at the right length. The nozzle can then be removed and the chuck tightened with a wrench. When the nozzle is put back on, use two fingers twisting it slightly in one direction to seat it perfectly to the torch head. The rubber covering can then be rolled down over the base of the nozzle. Be sure to use proper size nozzle to Chart No. 1.

The FIG-752 can be supplied with either hand or foot operated switches for remote control of gas and/or high frequency.

The water continues to flow all the time until shut off at the water tap (source).

The gas regulator 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 (toward the operator as he faces the meter) 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 fitting at the back of the IG-752 Arc-Tron. Wrench tighten. By slowly turning the knurled knob on the flowmeter (away from the operator) adjust the rate of flow to that found on Chart No. 1 for the welding job at hand. The Arc-Tron must be on and the torch switch depressed to make this adjustment. Two scales are installed in the flowmeter, so be sure to make the right one for the gas being used.

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 top front of the Arc-Tron 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 ARC TORCH

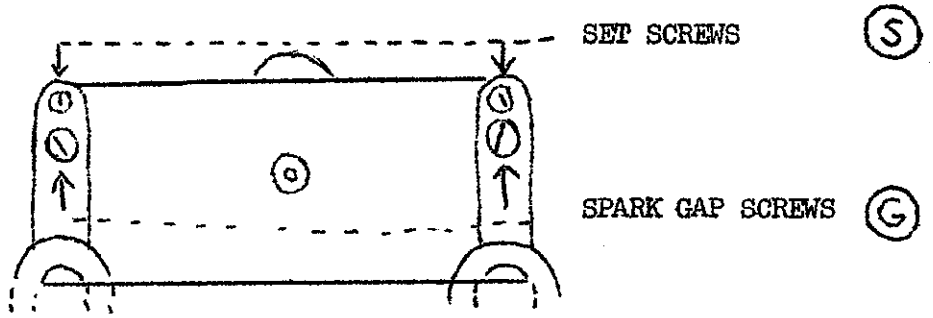
When straight arc welding with high frequency current is desired, and the inert gas process is not needed the Arc-Tron can be quickly converted. Disconnect, the switch control and the torch in the top of the Arc-Tron. That is all. It is not necessary to disconnect the hoses. Shut "Gas Control" toggle switches off. Plug regular electrode holder cable into the "Electrode" tap on face of the Arc-Tron.

For either use (with or without inert gas process) the Arc-Tron 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.

The spark gap assembly is located at the back of your IG-752 Arc-Tron. Remove cover plate to gain access. The following drawing will be helpful in making the adjustment.



Release the tension on the spark gap screws (G) by loosening set screws (S). With feeler gauge, set gap by adjusting the spark gap screws. Lock in position by tightening the set screws (S). Recheck with gauage to make sure gap is properly set when screws are tight, reset properly as necessary.

* * * * * * * * * * * *

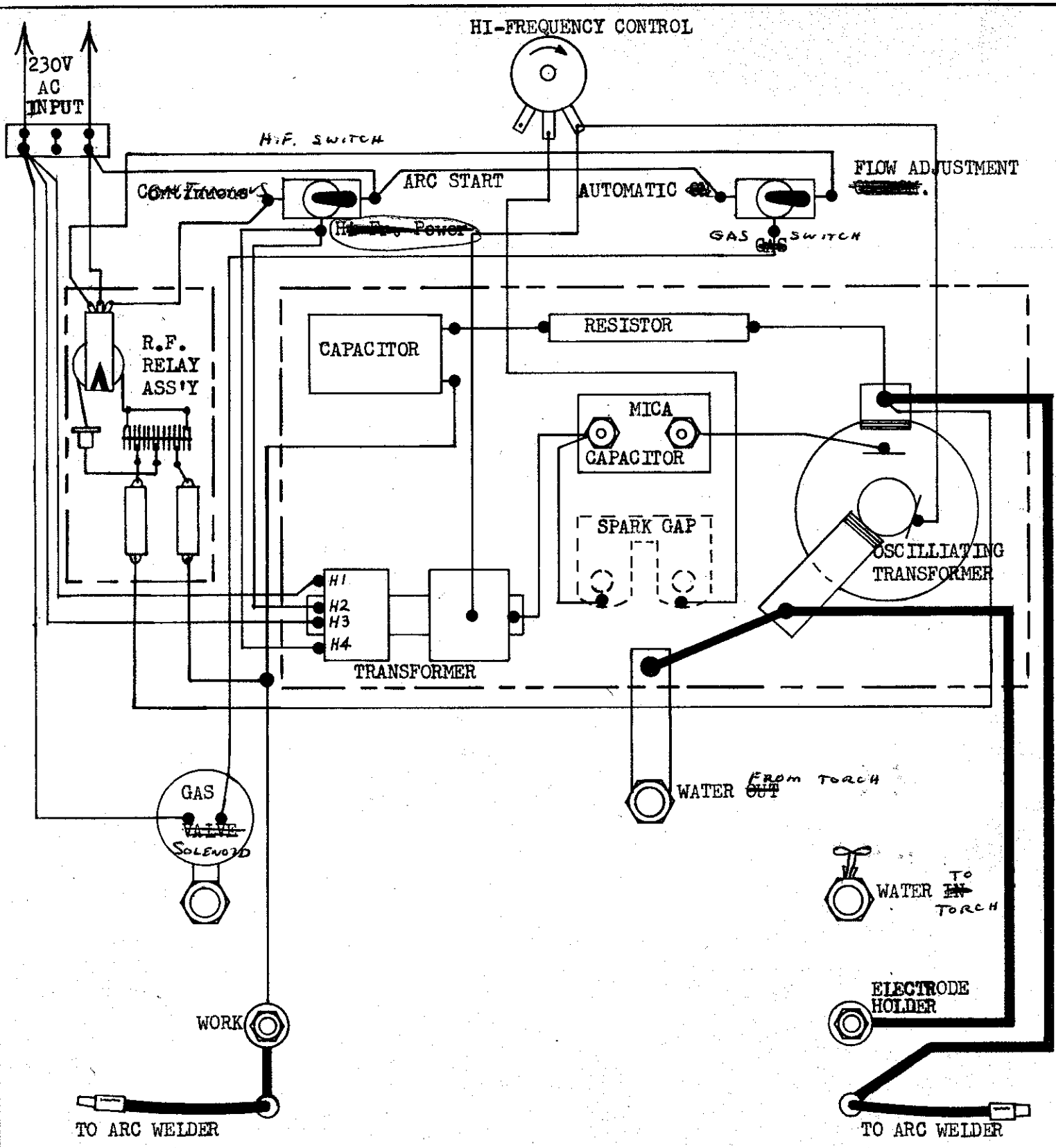
Operation Check List

1. Connect Arc-Tron 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 No. 1).
7. Use either pure or thoriated tungsten electrodes on your Model IG-752.
   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 emough 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 approzimately 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.



SCHEMATIC PICTORIAL		
MODEL FIG 752	SPEC. # 83 U 23	
3300	FORNEY MANUFACTURING CO.	3301
8 — 9 — 63	DIV. OF FORNEY INDUSTRIES, INC.	
E. J. F.	FORT COLLINS, COLORADO	