

AC/DC CONVERTER 200 AMP/500 WATT/115V



FOR STOCK NUMBERS

14414-010

THROUGH

14414-012

AM1440-1

NOVEMBER 1968



INSTALLATION

OPERATION

MAINTENANCE

WARRANTY

This equipment is sold by Air Research Company, Inc. and the following warranties are made in the following paragraphs. Such warranty is extended only to the purchaser of the equipment.

This equipment is warranted by AIRCO from the time of purchase for a period of 12 months or 1000 hours, whichever comes first. AIRCO will repair or replace, at its option, any part of the equipment which is defective in material or workmanship under normal use and service. This warranty does not cover the generator and accessories furnished by the individual manufacturer. The cost of replacement or repair of any defective part of the equipment shall be borne by the purchaser during the warranty period as its responsibility. The purchaser shall be responsible for transportation charges prepaid and which are necessary to bring the equipment to the factory for repair or replacement. The purchaser shall be responsible for any damage to the equipment or parts which are caused by the purchaser or his employees, or by fire, theft, or accident. The purchaser shall be responsible for any damage to the equipment or parts which are caused by the purchaser or his employees, or by fire, theft, or accident. The purchaser shall be responsible for any damage to the equipment or parts which are caused by the purchaser or his employees, or by fire, theft, or accident. The purchaser shall be responsible for any damage to the equipment or parts which are caused by the purchaser or his employees, or by fire, theft, or accident.

The foregoing warranty shall not apply if the equipment has been altered or repaired by anyone other than an authorized AIRCO representative or if the equipment has been subjected to abuse, misuse, negligence, or accident. There are no warranties which extend beyond the description of the equipment contained in this manual, other than the foregoing warranty. AIRCO makes no warranty of merchantability in respect to this equipment.

USER RESPONSIBILITIES

This equipment will perform safely and reliably only when installed, operated, maintained, and repaired in accordance with the instructions in this manual and/or engine driven generators, the instructions in the engine manual. Equipment must be checked periodically and repaired or replaced as necessary to insure continued safe and reliable performance. Parts which are broken, worn, or which plainly work disassembled should be replaced immediately with parts which are furnished or sold by AIRCO. The equipment or any of its parts should not be modified without the prior written approval of AIRCO Equipment Engineering and Development Department. The user of this equipment shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, or repair by anyone other than an authorized AIRCO representative or from parts which have been damaged or modified by anyone other than an authorized AIRCO representative.

WARRANTY REPLACEMENT PROCEDURE

All parts which, whether to replace parts which failed within the warranty period or not, will be replaced full factory price. The order for such parts must be accompanied by a Return Goods Ticket (requested). Upon receipt of the new part and Return Goods Ticket, the part which was returned to the factory transporter should be returned to the factory for examination. Credit will be given if factory inspection indicates failure was due to defect of material or workmanship, and if failure occurred during the warranty period.

No warranty consideration will be given on parts showing evidence of tampering or disassembly.

RENEWAL PARTS

In order that shipment of correct replacement parts for the particular equipment involved can be made, it is absolutely necessary that the following information be supplied with every order:

1. Full description of equipment.
2. Stock number, serial number, and model number of equipment.
3. On engine driven generators, serial number, model number, and manufacturer of engine.

MINIMUM BILLING

The factory maintains a minimum billing of \$10.00 on all parts orders.

CERTIFICATE

NAME OF EQUIPMENT: _____ MODEL NO. _____

SERIAL NO. _____ DATE _____

This equipment has been type-tested under standardized field test conditions as recommended by the Joint Industry Committee on High Frequency Stabilized Arc Welding Machines found to radiate less than 10 microvolts per meter at a distance of one mile, the maximum allowable limit established by the Federal Communications Commission for equipment of this type.

Installations using this equipment on the basis of these tests, may reasonably be expected to meet the radiation limitations established by the Federal Communications Commission, only when installed, operated and maintained as specified in the instruction book provided.

USER'S CERTIFICATION

The welding equipment identified above has been installed in accordance with the specific instructions applicable to this model as outlined in the instruction book furnished. It is being used only for the purpose for which it was intended and is being maintained and operated in accordance with the manufacturer's instructions.

Date Installed _____ Signed _____

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SECTION 1- SAFETY RULES FOR OPERATION OF ARC WELDING MACHINE

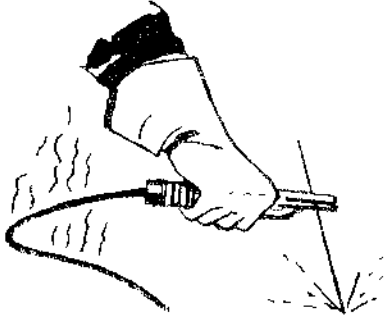
1.1. GENERAL

- (A). These rules apply to ac and dc welding generators, ac transformer and ac/dc welding machines, and dc transformer rectifier welding machines.
- (B). In arc-welding operations, where electrically energized parts are exposed, observe the following safety rules to insure maximum personal safety and protect nearby persons.
- (C). Failure to observe these safety precautions may expose not only you, but fellow workers as well, to serious injuries. Once these rules are learned and kept in mind, proceed with maximum assurance.

WELDING MACHINE

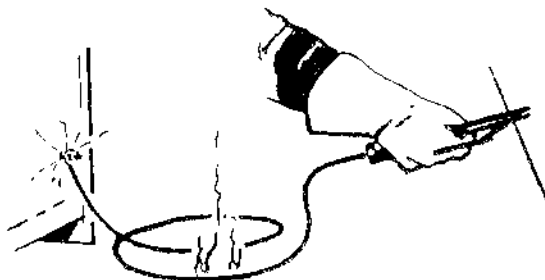
1.2. WELDING CABLES

DON'T overload cables.



- (A). Never use welding cables at currents in excess of their rated capacity. It will cause overheating and rapid deterioration of the insulation. It is also uneconomical.

DON'T use worn or poorly connected cables.

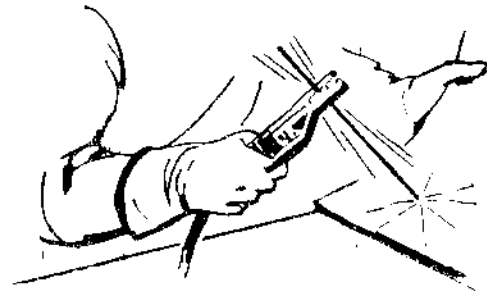


- (B). Inspect the cables frequently. Immediately repair all breaks in the insulation with rubber and friction tapes. Tighten all cable connections and adequately insulate any joints where a connector may have an exposed conductive part. In addition to the potential hazard to life, a hazard occurs when exposed sections of cable come in contact with grounded metallic objects, causing an arc. Unprotected eyes may be injured and fire may result if combustible materials such as oil or grease are in the vicinity. The efficiency and quality of welding will be improved by elimination of these dangerous grounds, and by keeping connections tight.

1.3. ELECTRODE HOLDER

DON'T use electrode holders with defective jaws.

- (A). Keep the jaws of the electrode holder tight and the gripping surfaces in good condition to provide close contact with the electrodes. Defective jaws will permit the electrode to wobble, making control of the welding operations difficult.



DON'T use electrode holder with loose electrode connections.

- (B). Keep the connections of the electrode lead to the holder tight at all times.
- (C). Use only fully insulated electrode holders (and without protruding screwheads.)
- (D). Never touch two electrode holders from two separate welding machines at the same time.

1.4. CODE CONFORMANCE

- (A). The machine and its equipment must be installed and maintained in accordance with the National Electrical Code and local requirements.

1.5. PARALLEL CONNECTIONS

- (A). See diagrams in the instruction manual applying to the welding machine used.

1.6. POWER DISCONNECT SWITCH

- (A). If the welding machine does not include a power disconnect switch, install one at or near the machine.

1.7. POLARITY SWITCH

DON'T operate the polarity switch under load.

- (A). The polarity switch (when supplied) is provided for changing the electrode lead from positive (reverse polarity) to negative (straight polarity). Never move it while under the load of a welding current. Operate this switch only while the machine is idling and the welding circuit is open. The potential dangers of opening the circuit while carrying high current are:
 - (1) An arc will form between the contact surfaces of the switch and severely burn them.
 - (2) The person throwing the switch may receive a severe burn from this arcing.

1.8. RANGE SWITCH

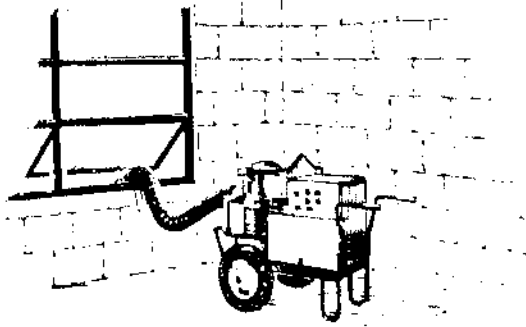
DON'T operate the range switch under load.

- (A). The range switch (when supplied) is provided for obtaining required current settings. It must never be operated while the machine is under the load of welding current. Operate the range switch only while the machine is idling and the welding circuit is open. The potential danger of switching the circuit while carrying high current is the formation of an arc between the contact surfaces which will severely burn them. Reported occurrences of this arcing will eventually prevent operation of the contacts.

1.9. EXHAUST GASES

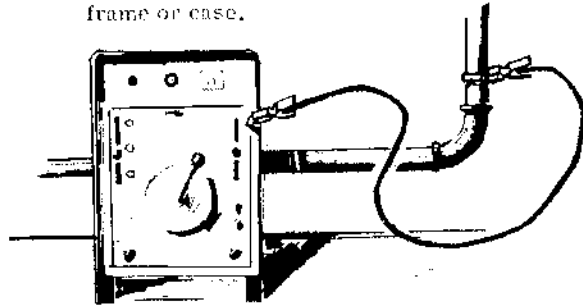
DON'T use gas engine units in confined spaces without venting the exhaust gases.

- (A). If gasoline or other fuel driven welding machines are operated indoors, provide means to pipe the exhaust gases to the outside air to avoid carbon monoxide poisoning.



1.10. POWER CIRCUIT GROUND

DON'T use welding machine without grounding frame or case.



- A. Ground the ground cable of every power circuit to prevent accidental shock by stray current. The potential danger is that development of a stray current may give a fatal shock should a person, for example, place one hand on the welding machine and the other on the switch box, or other grounded equipment. Do not ground to pipelines carrying gases or flammable liquids and conduits carrying electrical conductors. Be sure conductors can safely carry the ground current. When connecting the welding machine, properly ground the machine frame or case.

WELDING OPERATIONS

1.11. CONTAINERS WHICH HELD COMBUSTIBLES

DON'T weld on containers which have held combustible or flammable materials or materials which, when heated, give off flammable or toxic vapors without proper cleaning, purging, or inerting.

- A. Welding on containers which have held flammable or combustible materials may be extremely dangerous. To prevent a fire or explosion of the container, follow the recommendations of the American Welding Society Pamphlet A6.0 "Welding or Cutting Containers Which Have Held Combustibles".

DON'T depend on your eyes or nose to decide if it is safe to weld on a closed container.

- B. Find out what was in the container or use an explosimeter. A very small amount of residual flammable gas or liquid can cause a serious explosion.

NEVER use oxygen to ventilate a container.

- C. When you know the container held a gas or liquid which will readily dissolve in water:
 - (1) Flush out with water several times and then fill with water as far as work permits, positioning container to permit introduction of as much water as possible.

- (2) Before welding be sure there is a vent or opening to provide for release of air pressure.
- D. When you know the container held a gas or liquid which will not readily dissolve in water.
 - (1) Clean out thoroughly with steam or a cleansing agent and purge all air or inert with a gas such as carbon dioxide or nitrogen before repairing. Carbon dioxide is heavier than air and will tend to remain in the container if the opening is at the top.
 - (2) Use steam to clean out light material.
 - (3) Use a strong caustic soda solution to clean out heavy oils or grease.
 - (4) Be sure to purge all air or inert with a gas, such as nitrogen or carbon dioxide, no matter how well you have cleaned. There may still be traces of oil, grease, or other readily oxidizable material under the seams.
- E. Be careful when cleaning with steam or caustic soda wear goggles and gloves.

DON'T clean where there is poor ventilation.

- F. Ventilation is necessary to carry away harmful or explosive vapors.

DON'T clean where there are open flames.

- G. When scraping or hammering to remove heavy sludge or scale, use a spark resistive tool and keep it wet to avoid sparks.
- H. Keep your head and arms as far away from your work as possible.

1.12. HOLLOW CASTINGS

DON'T weld on hollow (cored) castings that have not been properly vented. The casting may explode.



1.13. EXPLOSION HAZARDS

NEVER weld in or near explosive atmospheres. Such atmospheres can be created by flammable gas leaks or by vapors from flammable liquids (gasoline, alcohol, etc.) or by combustible dusts.

1.14. VENTILATION

DON'T weld in confined spaces without adequate ventilation.

- A. When welding in confined spaces, provide ventilation in accordance with United States of America Standard Z49.1, 1967. Always provide adequate ventilation by blowers, air lines, or other acceptable means. Never use compressed oxygen. The depletion of the oxygen supply, the heat of welding, and the fumes given off may cause severe discomfort or a serious illness.
- B. When toxic fumes from lead or cadmium bearing materials or any other substances are present in harmful concentrations, always use an air supplied respirator.

1.15. SOLVENTS

- A. Do not weld where chlorinated hydrocarbon vapors from degreasing, cleaning, or spraying may reach or be drawn into air surrounding the welding operation. The heat of the arc can decompose solvent vapors to form phosgene, a highly toxic gas and other irritating decomposition products.
- B. Do not weld where ultraviolet light from the electric arc can penetrate air containing even minute amounts of vapors from solvents such as trichloroethylene or perchloroethylene. Ultraviolet light can decompose the vapors to form phosgene, a highly toxic gas, and other irritating products.

1.16. FIRE HAZARDS

DON'T weld near flammable or combustible materials.

- A. Fires can be caused by the arc, by contact with the heated metal, by slag, or sparks. Keep combustibles at least 35 feet from the arc or suitably protected. If welding must be done in a particular area, move the combustibles away. If they cannot be moved, cover them completely with fire resistive screens. Cover cracks or openings in floors or walls; sweep floor free of combustibles and wet down, if wood, being sure welder wears insulation shoe coverings. Avoid welding on partition walls in contact with combustibles. Heated metal on the other side of partition wall being welded upon can ignite combustibles in contact with the partition. Where other than a minor fire might develop, have a fire watcher stand by with suitable fire extinguishing equipment for at least one-half hour after the welding is completed.

1.17. ELECTRICAL SHOCK VOLTAGE

OPEN power circuits before checking machines.

- A. Before working on the wiring, switches, controls, etc., open the power line disconnect switch. In most welding shops the power supply used for arc welding machines is 230 or 460 volts. Open circuit voltages are usually less than 100 volts and welding or arc voltage drops are still lower. However, all of these voltages are capable of developing a harmful or fatal current to the body.

DON'T touch electrically "hot" parts.

- B. Never touch any exposed or non-insulated part of the cables, cable connectors, clamps, electrode holders, electrodes, or the power supply equipment to prevent harmful or fatal electric shock or burns.

1.18. ELECTRICAL SHOCK-DAMPNESS

NEVER work in a damp area without suitable insulation against shock. Keep hands, feet, and clothing dry at all times.

- A. To prevent harmful body shocks, keep hands, feet and clothing dry. Never stand or lie in puddles of water, damp ground, or against grounded metal when welding without suitable insulation against shock. Always find a dry board or rubber mat to stand on when water, moisture, or perspiration cannot be avoided. Dampness between the body and an energized or grounded metallic part lowers the resistance to the passage of current to the body which may produce a harmful or fatal shock. Salt in perspiration or sea water dangerously lowers contact resistances.

1.19. STARTING UNDER LOAD

DON'T leave an uninsulated electrode holder, or a

"live" electrode on the table top or in contact with a grounded metallic surface.



When it is not in use, never place an electrode holder in contact with the table top or other metallic surface in contact with welding ground. Provide an insulated hook or holder for the electrode holder. A potential danger is that a holder in contact with the ground circuit provides a dead short circuit on the welding machine. If the machine should be started up, this short circuit would cause an excessive load on the machine and may damage the insulation.

1.20. FACE PROTECTION

DON'T use cracked or defective helmets or shields.

Keep the helmet, hand shields, or face shield in good condition. If cracks occur in the fibre material, replace the shield, since the leakage of arc rays may cause serious burns.

1.21. EYE PROTECTION

NEVER under any circumstances, look at an electric arc without eye protection.



CAUTION

Make sure that flash goggles are used under the welding helmet at all times, particularly while gas shielded-arc welding.

- A. In some type of arc welding, such as gas shielded-arc welding, ultra-violet and infrared radiation from the arc is particularly intense and requires constant attention to avoid arc flashes to the welder when striking an arc and to avoid exposure to other welders.

NEVER strike an arc without ascertaining that nearby persons either have the necessary protective equipment or are looking in the opposite direction.

- B. For welding operations in open areas, provide portable, non-reflecting screens to shield persons nearby from the rays of the arc. Eye burns from the arc, though not generally permanent injuries, are exceedingly painful. Such burns frequently referred to as "flashes", feel like hot sand in the eye. For eye burns consult your first aid station or doctor.

NEVER use cracked, ill-fitting, or defective plates.

- C. The filter glass plate provided in the helmets and shields must be of reputable manufacture conforming to the latest USA Standard Z2.1. Replace cracked or ill-fitting filter plates promptly.

NEVER use filter plates without a protecting cover glass.

- D. Keep a clean cover glass in front of the filter plate for the protection thereof. Frequent renewal of these cover glasses is necessary, since they become covered with spatter, reducing vision.

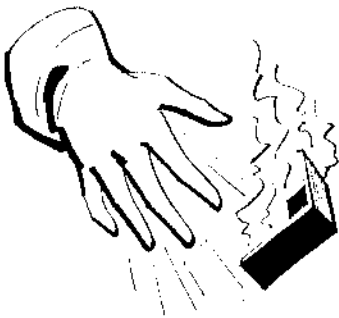
1.22. CLOTHING

NEVER use poor, inadequate, or worn-out clothing. Wear heavy shoes, tightly laced. Keep clothing dry.

- A. Proper and dry, oil-free clothing is essential for the welder's protection. Clothing must not only keep off the spatter and molten particles, but must also abstract the rays of the arc and, when necessary, insulate the body from harmful electrical currents.
- B. Wear leather or asbestos gloves at all times to protect the hands and wrists. Dark colored shirts are preferred to light ones because light ones reflect arc rays to exposed parts of the body. In the case of gas shielded-arc welding, light colors are more reflective and may cause eye burns due to the intense ultra-violet rays given off by the process. Avoid cotton fabrics when gas shielded-arc welding.
- C. An arc burn on the skin resembles a sunburn, except that it is usually more severe. Clothing can be made flame resistant by treatment with a solution of 3/4 pound of sodium stannate in 1 gallon of water, then wrung out and dipped in a solution of 1/4 pound ammonium sulphate per gallon of water. Don't wash clothing so prepared in water, but dry clean.
- D. When welding operations are to be performed in vertical and overhead positions, leather sleevelets, aprons, and in some cases leggings and ear plugs should be used to prevent severe burns from spatter and molten metal.

1.23. HOT METAL BURNS

NEVER pick up hot objects.



- A. Never pick up pieces of metal which have just been welded or heated, or the stub ends of electrodes which have been discarded.

1.24. GRINDING AND CHIPPING

- A. Whenever it is necessary to grind or chip metal, wear protective goggles specifically designed for this purpose. Serious eye injuries may result from failure to wear protective goggles.

NEVER do any chipping or grinding without protective goggles.



1.25. COMPRESSED GAS CYLINDERS

NEVER strike an arc on compressed gas cylinders.

- A. Avoid accidental contact of the electrodes, electrode holder, or other electrically energized parts with a compressed gas cylinder or any other pressure vessel. Serious accidents or fires may result.
- B. Use I.C.C. cylinders. They are manufactured and maintained in accordance with I.C.C. requirements and are safe so long as they are properly handled. Don't drop cylinders.
- C. Identify gas content by the name marked on the cylinder. If the cylinder is unmarked, do not use it. Return it to the supplier. Do not rely on color code.
- D. Never use a cylinder or its contents for other than intended purposes.
- E. Keep oil and grease away from oxygen cylinders and cylinder valves.
- F. Keep cylinders away from exposure to sparks, hot slag, open flame and all possible sources of ignition or excessive heat.
- G. Be careful that cylinders are not placed so as to become a part of an electrical circuit. Avoid third rails, wires and electric welding circuits.
- H. When transporting cylinders by crane, use cradle, platform or other suitable support.
- I. Never lift the cylinders by slings, by the caps or by electric magnets.
- J. Never use cylinders as supports or rollers.
- K. Never try to mix any gases in a cylinder.
- L. Never try to refill a cylinder.
- M. Mark empty cylinders "Empty" or "M.T".
- N. Send "Emptys" back to the supplier promptly.
- O. Keep "Emptys" and "Fulls" separate.
- P. Never tamper with or alter cylinder numbers or other markings. This is not only foolish but may be illegal.
- Q. Do not tamper with or change fittings on cylinders.
- R. If valves cannot be opened by hand, do not use hammer or wrench. Notify supplier.
- S. Protect cylinder valves from bumps, falls, falling objects, and from weather. Keep them covered with cylinder caps when moving cylinders.
- T. Keep valves closed on empty cylinders.
- U. See that your cylinders are clear of passageways and active work areas and that they are secured against falling.
- V. If adapter is required between cylinder and regulator, always use a standard adapter. These may be obtained from your supplier. Where right and left hand threads are used on adapter, use two wrenches to insure leak proof connections.
- W. Do not store cylinders in unventilated areas.

INTRODUCTION

GENERAL

This manual has been prepared especially for use in familiarizing personnel with the design, installation, operation and maintenance of the welding machine. In some cases, the contents of this publication are generalized. All information presented herein should be given careful consideration to assure optimum performance and service of the equipment.

Process information is available from your nearest representative.

RECEIVING-HANDLING

To prepare the welding machine for installation, several items should be checked. Clean all packing material from around the unit and carefully inspect for damage that may have been caused by shipping. Any claims for loss or damage that may have occurred in transit must be filed by the buyer with the carrier. Copy of bill of lading and freight bill will be furnished on request if occasion to file claim arises.

Be sure to **READ ALL THE INSTRUCTIONS** before attempting to operate the welding machine.

When requesting information concerning the welding machine, **BE SURE**, to furnish **SERIAL AND MODEL NUMBERS**.

DESCRIPTION

These ac/dc model welding machines are designed for use in Gas Tungsten-Arc (TIG) Welding or manual Shielded Metal-Arc (Stick Electrode) Welding. The design incorporates provisions to permit remote control of crater elimination and amperage control.

These welding machines consist of a power transformer, dc and ac control coils, rectifier stacks, built-in high frequency oscillator, amperage, gas and water control circuits. Closing the line power switch supplies proper operating voltage to the fan motor and to the control circuits. When the contactor is closed, power is applied to the power transformer and the ac control coils. The dc control coil controls the current supplied to the secondary output terminals, through the main rectifiers. High frequency current is coupled to the electrode output through an air coupling transformer.

All models are power factor corrected and are built in two sizes, rated at 200 and 300 amperes respectively at 60 percent duty cycle. Each size unit is available in one of three models designed as P, A/B or A/B/S. "P" Models: This is the basic unit with built-in high

frequency, primary contactor, control transformer and starting current control if desired. Terminals are also provided for crater elimination. For Gas Tungsten-Arc Welding, external control of gas and water are necessary because no gas or water valves are furnished with this model.

"A/B" Control Panel: Conversion of "A" to "B" control or "B" to "A" control is readily made by removing the cover from the welding machine and changing the links on the terminal strip on the control panel. (Factory connected "A" unless otherwise specified.)

With "A" control the welding machine is equipped with a control system consisting of gas and water valves and an adjustable postflow time delay relay - all mounted inside the welding machine. Control of the welding machine and gas and water valves is by a maintained contact remote switch. When connected for "A" control the welding machine is available for either manual or automatic Gas Tungsten-Arc Welding applications as well as Shielded Metal-Arc (Stick Electrode) Welding.

When connected for "B" control, all the functions of the "A" control are performed except that when the arc is broken, the contactor opens immediately and gas and water valves close after an adjusted time delay - all automatically. "B" control is for manual welding only.

"A/B/S" Control Panel: Operation of the "A/B/S" Panel is the same as for "A" and "B" Panel operation with the exception that the "S" Panel can also be used for inert gas spot welding. "S" Panel control incorporates an adjustable pneumatic timer which automatically controls the weld time for inert gas spot welding and similar processes.

SAFETY

Refer to and read the "Safety Rules for Operation of Arc Welding Machines" at the end of this manual before making any primary or secondary connections and operating the machine.

Compliance should be made with the requirements for arc welding established by industrial agreement and contained in the latest edition of American Standard "Safety in Electric and Gas Welding and Cutting Operations," Z49.1, and in "Recommended Safe Practices for Inert Gas, Metal-Arc Welding," American Welding Society Pamphlet A6.1-58T.

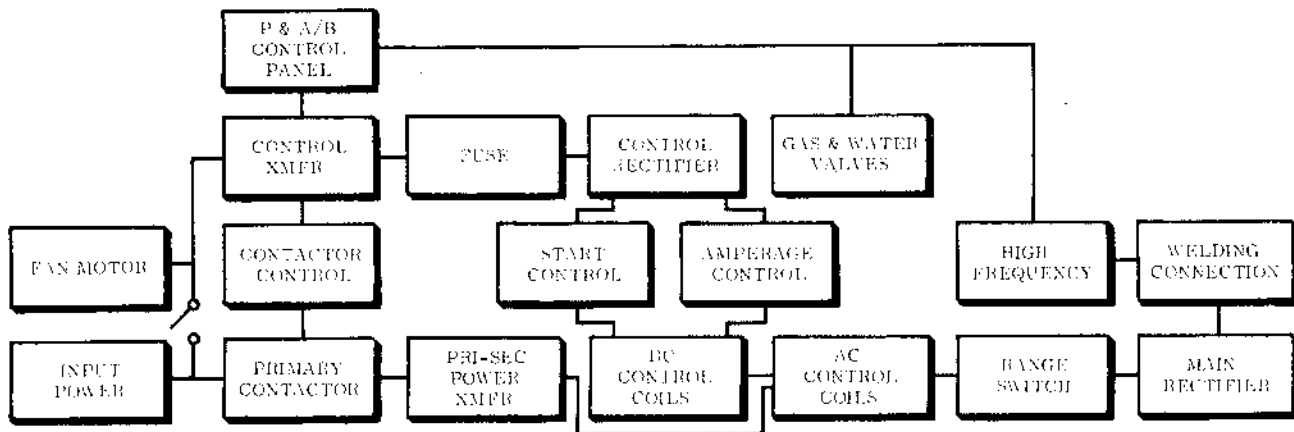


FIGURE 1 - BLOCK DIAGRAM

The use of flash goggles (medium shade), in addition to a welding helmet, is recommended both for the operator and for personnel in the vicinity of the welding area.

Do not weld in the presence of even a minute quantity of chlorinated solvents (such as carbon tetrachloride). Ultraviolet light from the electric arc will break down these vapors to form phosgene, a poisonous gas.

Never make primary or secondary connections, change parts or make repairs without first turning off the line disconnect switch.

Caution should be exercised in taking voltage measurements when trouble shooting the unit. Always avoid contact between any part of the human body and any current carrying part of the welding machine.

Be sure when installing the welding machine that a

ground cable is connected from the stud labeled Grid on the primary connection board, to a suitable ground.

The following definitions apply to Cautions, Important and Notes found throughout this manual.

CAUTION

Installation, operating and maintenance procedures, practices, etc., which will result in personnel injury or loss of life if not carefully followed.

IMPORTANT

Installation, operating and maintenance procedures, practices, etc., which will result in damage to equipment.

NOTE

Installation, operating and maintenance procedures, practices, etc., which it is essential to emphasize.

SPECIFICATIONS

MODEL	WELDING CURRENT RANGE AMPERES				RATED WELDING CURRENT @ 40 VOLTS 60% DUTY CYCLE	OPEN CIRCUIT VOLTAGE A-C & D-C	POWER INPUT AT RATED LOAD				
	A-C TUNGSTEN ARC	A-C METALLIC ARC	D-C TUNGSTEN ARC	D-C METALLIC ARC			AMPERES			KW	KVA
							208 V.	230 V.	460 V.		
200 AMP A-C/D-C	5-45 12-125 85-300	6-45 10-155 90-330	5-30 10-160 120-300	5-40 10-130 70-260	200 Amperes	80	80	72	36	14	16.5
300 AMP A-C/D-C	5-48 80-230 190-435	5-48 90-245 300-470	5-60 90-250 230-460	5-45 16-200 150-350	300 Amperes	80	115	104	52	21.8	23.9

WEIGHTS AND OUTSIDE DIMENSIONS

MODEL		200 AMP A-C/D-C	300 AMP A-C/D-C
APPROXIMATE WEIGHT (Lbs.)	NET	760	845
	SHIPPING	810	895
	HEIGHT	47 $\frac{3}{8}$ "	47 $\frac{3}{8}$ "
DIMENSIONS OF CABINET	WIDTH	22 $\frac{1}{4}$ "	22 $\frac{1}{4}$ "
	DEPTH	33 $\frac{1}{8}$ "	33 $\frac{1}{8}$ "

INSTALLATION

1. LINE DISCONNECT SWITCH

CAUTION

A precautionary measure should be taken to provide maximum protection against electrical shock. When electrical connections are made from the welding machine to the main line disconnect switch, BE SURE the line disconnect switch is open or the line fuses are removed until the installation has been completed.

1a. Proper installation can contribute materially to the satisfactory and trouble-free operation of the welding machine. It is suggested that each step in this section be studied carefully and followed in detail.

2. LOCATION

2a. A good installation is essential if the welding machine is to provide satisfactory and dependable service. Proper component operating temperatures are maintained by the air stream produced by the welding machine fan unit. Therefore, the welding machine should be located so that the air passage into the front and bottom of the welding machine is not restricted. The back of the welding machine should be away from the wall (18 inches minimum distance) so that the air passage from the fan will not be blocked. The location should be such that a minimum amount

of dirt or dust will be drawn into the air stream. Preventive maintenance will consist of removing the cover and blowing out the dust accumulation inside the welding machine. For this reason it is desirable to locate the unit so that the cover can be removed without much restriction.

2b. Mounting holes are provided in the welding machine base for machines that require mounting. Figure 2 gives overall dimensions and the base mounting hole layout for console installation or other installations that may require this information.

3. HIGH FREQUENCY RADIATION

IMPORTANT

High frequency has certain undesirable characteristics which should be eliminated or at least minimized. Any electrical equipment utilizing high frequency energy in any way is capable of radiating interference if not properly installed. Since the high frequency unit is a basic type of radio transmitter, it may cause interference with reception of nearby radio units. It is recommended, therefore, that a maximum of protection be provided to arrest, as much as possible, leakage of radiation.

3a. The Federal Communications Commission has established certain radiation limits that must be maintained

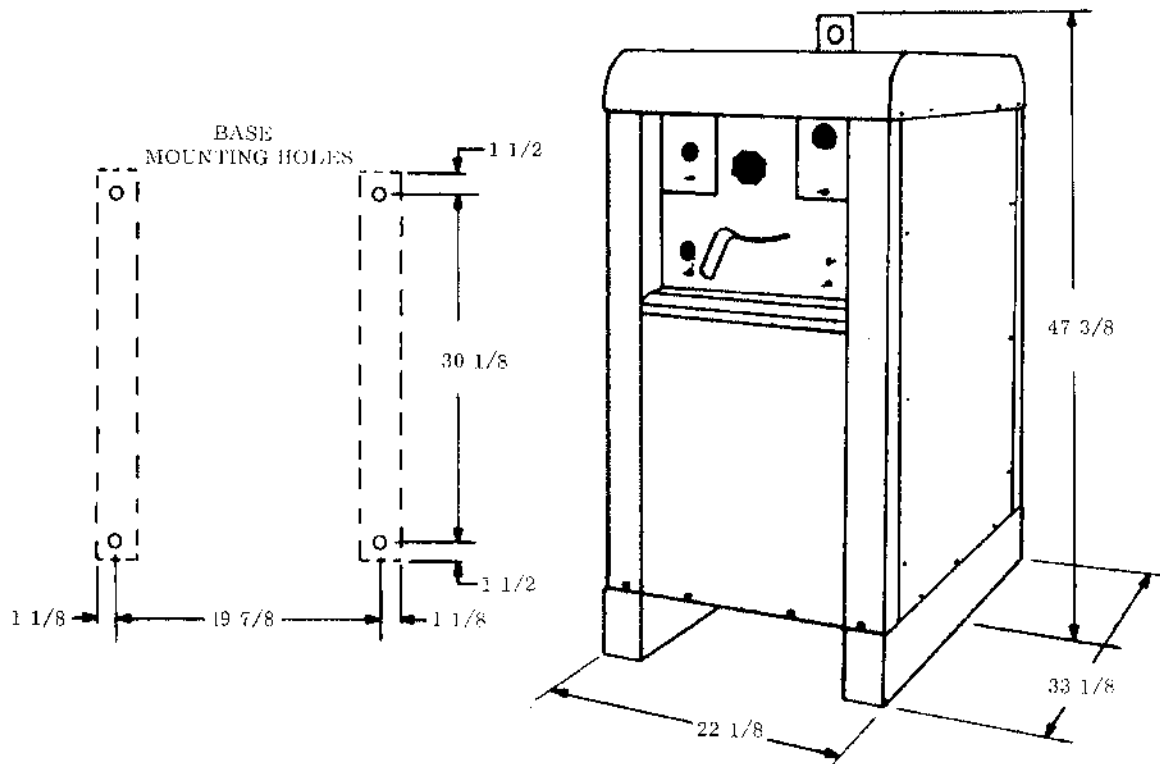


FIGURE 2 - DIMENSIONAL DRAWING & BASE MOUNTING HOLE LAYOUT

in order to comply with legal operating requirements. The manufacturer of the equipment covered in this manual has conducted approved field tests on the type and model and certified on page 1 of this manual, that the radiation can reasonably be expected to be within the legal limits, IF THE CORRECT INSTALLATION PROCEDURES ARE FOLLOWED AS OUTLINED IN THE HIGH FREQUENCY CERTIFICATION SECTION IN THE REAR OF THIS MANUAL. The importance of a correct installation cannot be over-emphasized since case histories of interference due to high frequency stabilized arc welding machines have shown invariably an inadequate installation was at fault.

4. PRIMARY CONNECTIONS

(a) These ac/dc model arc welding machines are SINGLE phase units and must be connected to a SINGLE phase power line or any one phase of a two or three phase system of the proper voltage. Usually a two phase system consists of four wires and one phase of this type system consists of one outside wire and the wire next to it. A three phase system ordinarily consists of three wires and any two of the three wires constitute one phase.

If there is any question about the type of the system used locally, or the proper connections to obtain single phase power service to the welding machine, consult the local power and light company.

Locate and open the access door below the fan on the rear panel of the welding machine. The primary input voltage connection terminal board is behind this access door.

(b) The welding machine should be operated from a separately fused or circuit breaker protected circuit. The maximum capacity of the welding machine is affected by the line voltage and if the circuit is overloaded, the performance of the welding machine will be impaired.

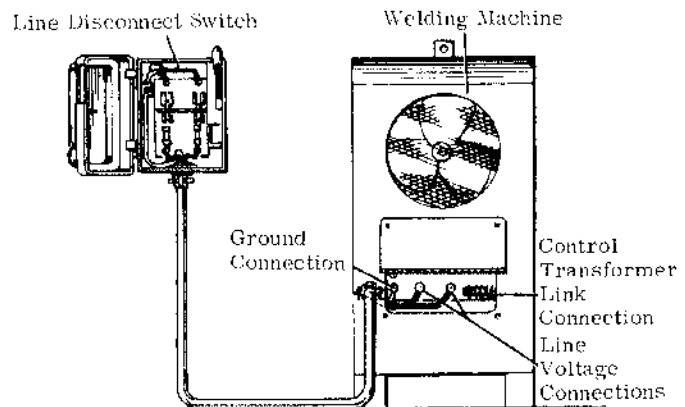


FIGURE 3 - PRIMARY LINE VOLTAGE CONNECTIONS

Install separate leads (See Figure 3) or a cable consisting of two primary leads plus one ground wire (See Table I for proper wire and fuse size) into the rear of the welding machine near the bottom through the inlet hole provided for this purpose. This opening will take standard conduit fittings and the service wires from the line disconnect switch to the welding machine should be run in solid or flexible conduit. If flexible conduit is used, "Breeze" type conduit is recommended because of its better radio frequency shielding characteristics.

The primary cables connect to terminals labeled "L" or "LINE". A third lead, ground connection should be fastened to the terminal labeled "GRD". The other end of the ground lead or cable should be attached to a suitable ground such as a water pipe, ground rod, etc. USE A GROUNDING MEANS THAT IS ACCEPTABLE TO THE LOCAL ELECTRICAL INSPECTION AUTHORITIES.

TABLE I

RECOMMENDED LINE VOLTAGE WIRE AND FUSE SIZES

MODEL	LINE VOLTAGE WIRE SIZE - AWG				LINE VOLTAGE FUSE SIZE IN AMPERES			
	208 V	230 V	460 V	575 V	208 V	230 V	460 V	575 V
200 AMP	No. 4 (No. 8)	No. 4 (No. 8)	No. 8 (No. 8)	No. 10 (No. 8)	150	125	70	50
300 AMP	No. 2 (No. 6)	No. 2 (No. 6)	No. 6 (No. 8)	No. 8 (No. 8)	200	175	90	70

Numbers in () are ground wire sizes.

CAUTION

Be sure that when installing the welding machine that a ground lead is connected from the stud labeled "GRD", on the primary connection board, to a suitable ground. This is absolutely necessary as any development of stray currents may give severe shock should anyone touch the welding machine and at the same time touch any grounded object. The stud labeled "GRD" is connected to the welding machine chassis and is for grounding purposes only. If the welding machine is to be connected to one phase of a three phase line, DO NOT connect the third wire from a three phase line to the stud labeled "GRD" as this may result in a hot welding machine chassis.

10c. These welding machines are designed to operate on standard voltage of either 208 volts, 230 volts or 460 volts SINGLE PHASE, 50/60 cycle ac power line. Facilities for operation on other line voltages, if ordered, are incorporated at the factory. To connect the welding machine properly for the voltage available, position the copper links, located immediately above the primary input studs labeled "L" or "LINE" as illustrated in Figure 4 and the PRIMARY VOLTAGE CONNECTIONS AND LINK ARRANGEMENT, Figure 5. Welding machines are always shipped with the connections in the highest line voltage position for which the particular machine was built unless otherwise ordered.

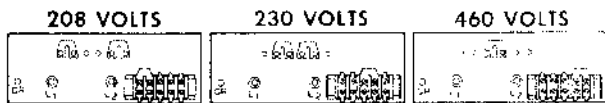


FIGURE 4 - PRIMARY VOLTAGE JUMPER LINKS

5. SECONDARY (WELDING) CONNECTIONS (See Figure 13)

10a. Remove the screws from the bottom of the front access door. Open the door and locate the two secondary terminals labeled "Work" and "Electrode". It is recommended that the welding leads be kept as short as possible to prevent high frequency dissipation and erratic operation. On automatic welding operations where jigs and an electrode holder carriage may be used, it is important that all metallic parts in contact with the work be firmly grounded.

Table II shows the welding cable sizes recommended for various TOTAL welding cable lengths and currents. These figures are based on direct current and a 4 volt drop. Use next larger size for ac welding.

10b. Bring the welding cables up from the bottom through the access opening and connect the cable from the material to be welded to the "Work" terminal. Con-

nect the electrode holder welding cable to the "Electrode" terminal. An adapter may be necessary for some welding processes.

NOTE

DO NOT attempt to carry "work" current through any bearings in welding fixtures. Insulate bearings and by-pass them through adequate high pressure brush contacts.

TABLE II

Recommended Cable Size for Welding Cable Length

GAS TUNGSTEN-ARC (TIG) WELDING						
AMPERES	MAX. CABLE LENGTH			CABLE SIZE		
200	15 Feet			#1		
300	15 Feet			#2/0		
400	15 Feet			#3/0		
SHIELDED METAL-ARC (STICK ELECTRODE) WELDING						
WELDING AMPERES	DISTANCE IN FEET FROM WELDING MACHINE					
	50	75	100	125	150	175 200
100	2	2	2	2	1	1/0 1/0
150	2	2	1	1/0	2/0	3/0 3/0
200	2	1	1/0	2/0	3/0	4/0 4/0
250	2	1/0	2/0	3/0	4/0	4/0 2-2/0
300	1	2/0	3/0	4/0	4/0	2-2/0 2-3/0
350	1/0	2/0	4/0	4/0	2-2/0	2-3/0 2-3/0
400	1/0	3/0	4/0	2-2/0	2-3/0	3-2/0 2-4/0
500	2/0	3/0	2-2/0	2-3/0	2-3/0	2-4/0 3-3/0
600	3/0	2-2/0	2-3/0	3-2/0	2-4/0	3-3/0 3-4/0
700	4/0	2-3/0	2-4/0	3-4/0	3-4/0	4-4/0 4-4/0

If longer cables are required for Gas Tungsten-Arc (TIG) double the amount of cables shown.

It is important, especially where high frequency is used, that the lugs or frayed portions of the welding cable do not touch or come too close to the case of the welding machine. In certain instances, where electrode holder adapters are used it may be necessary to insulate or block away from the case.

REMEMBER when welding with ac or dc, if the welding cables are coiled up they will generate a magnetic field that will seriously affect the operation of the welding machine. Always lay the welding cables out. Also, the welding cables should not be taped together, when using high frequency, but placed about 3/4 inch to 1 inch apart on a suitable board such as a 2 x 4, 1 x 4 or 1 x 6 and fastened with plastic clamps or clips. DO NOT use metal clamps as they will tend to serve as an antenna and radiate high frequency. If available, the use of vinyl covered cables is recommended as this material has better high frequency shielding characteristics than rubber covered cable.

6. GAS AND WATER CONNECTIONS (For Gas Tungsten-Arc Welding) (See Figure 13) (P Panel only models are equipped with gas and water valves)

10a. The gas valve is located on the right side behind the front access door. Bring the gas hose up through the access opening at the bottom of the machine and connect to the gas valve connection labeled "IN".

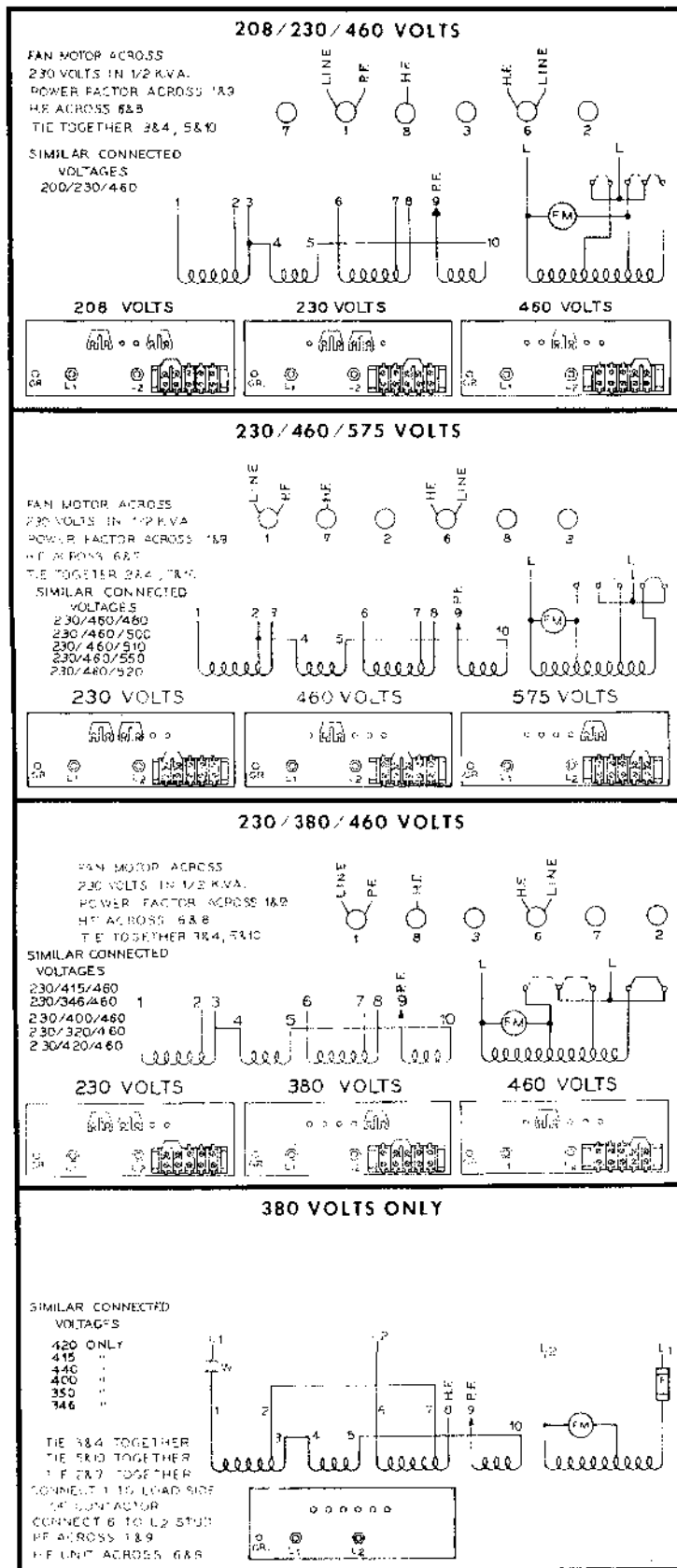


FIGURE 5 - PRIMARY LINE VOLTAGE CONNECTIONS AND LINK ARRANGEMENTS.

The gas connections have a right hand, 5/8-18 female thread. Make sure the direction of gas flow through the valve will be as indicated on the panel.

- b. Bring the electrode holder gas hose up through the front access opening and connect to the gas valve connection labeled "OUT".
- c. The water valve is located on the left side, behind the front access door. The water valve adapter connections have a left hand 5/8-18 female thread. Do not make connections to the water valve as a portable water coolant system is used, connections should be made directly to the electrode holder water connections, by-passing the welding machine's water valve.
- d. Connect the hose from the electrode holder labeled "WATER IN" to the water valve connections labeled "OUT".
- e. The gas flow must be controlled accurately with the aid of a regulator and a flowmeter. No specific recommendations for rates of flow can be given as this depends entirely on the specific welding conditions. Correct argon flow is usually between 8 and 35 cubic feet of gas per hour. The helium flow is between 18 and 35 cubic feet per hour. When designing, fixturing, and setting up welding procedures, remember the specific gravity of argon is heavier than air, 1.38 and helium is lighter than air, .138, air being 1. More specific information concerning the process to satisfy the welding needs can be obtained from the manufacturer of the electrode holder equipment.

7. REMOTE AMPERAGE CONTROL CONNECTIONS (See Figure 11)

- a. A receptacle (Labeled Remote Amperage Control) is provided on the control panel for connecting a remote amperage control. A Model RHC-3 (Remote Hand Control), RFC-3A or RFC-23A (Remote Foot Control) can be plugged into this receptacle to provide remote amperage control. RFC-23A (Remote Foot Control) provides both remote contactor control and amperage control.
- b. Place the "Remote Standard" Switch, located immediately below the Remote Amperage Control Receptacle, in the Remote position when a remote control is used.

8. CRATER ELIMINATION CORRECTIONS

- a. The crater at the end of the weld deposit does not present a good appearance and may affect the strength of the joint. Reducing the amperage at the end of the weld, helps to minimize crater formation by gradually decreasing the size of the molten pool. Crater elimination can be accomplished by connecting a Remote Foot Control, RFC-3A or RFC-23A to the Remote Amperage Control Receptacle. Backing off slightly on the Remote Control's foot pedal at the end of the weld, will decrease the current low enough to minimize crater formation. Manual crater elimination can also be accomplished by the use of a RHS-11 Remote Hand Switch (Optional Equipment) taped to the electrode holder handle. Crater elimination is accomplished by opening the dc control circuit at the end of the weld. To install, remove the cover from the welding machine and remove the jumper link from the two

post terminal strip located on top of the front panel. See Figure 6. Bring the two conductor cord through the rubber grommet and connect to the terminals in place of the link. Replace the cover.

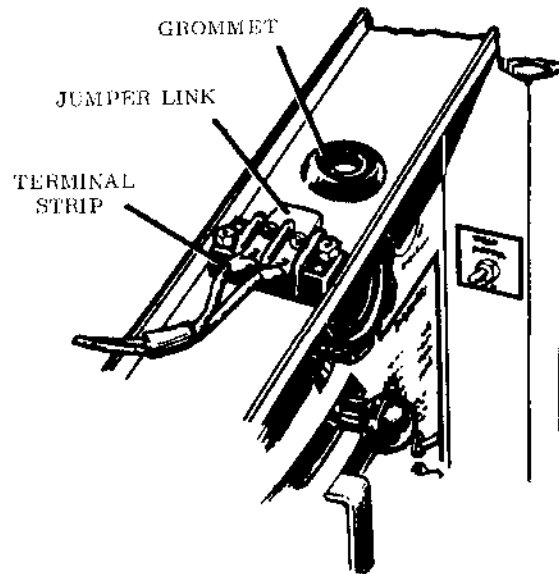


FIGURE 6 - SWITCH CONNECTION

In automatic welding set ups, a normally closed limit switch may be used in this low voltage control circuit. Amperage will drop to the minimum of the current range in use with this arrangement.

9. REMOTE CONTACTOR CONTROL CONNECTIONS (See Figure 11)

- a. A receptacle (Labeled CONTACTOR CONTROL) is provided on the control panel for connecting a maintained contact switch (RHS-21, RFS-2 or RFC-23A) for "A" panel operation. A momentary contact normally open switch (RHS-2) is connected to this receptacle for "B" panel operation.
- b. When a remote switch is used for contactor control, place the "STANDARD REMOTE" Switch, directly below the CONTACTOR CONTROL Receptacle, in the "REMOTE" position. With the CONTACTOR CONTROL Switch in the "Remote" position, both the contactor and gas and water controls are operated with the proper remote control switch plugged into the CONTACTOR CONTROL Receptacle.

Changing position of links on terminal strip, located behind the right hand side panel, (Figure 14) gives choice of control on A/B and A/B/S models. "A" type control operates with maintained contact switch such as RHS-21, RFS-2 or RFC-23A which controls the closing and opening the contactor and the gas and water valves. The gas and water valves close after an adjustable time delay. This connection is for either manual or automatic welding. "B" type control operates with momentary contact normally open switch. Breaking the arc automatically shuts off power, gas and water. This is for manual welding only.

OPERATION

CAUTION

NEVER, under any circumstances, operate the welding machine with the cover or sides removed. In addition to the safety hazard, improper cooling may result in damage to the power transformer and welding machine components. **WARRANTY IS VOID IF THE MACHINE IS OPERATED WITH THE COVER OR SIDES REMOVED.**

10. DUTY CYCLE

a. Welding machines are rated on a percent duty cycle based on 10 minute intervals. For example: A 60 percent duty cycle simply means that the welding current is on for 6 minutes off 4 minutes, on again for 6 minutes and so on. As the output is either increased or decreased, the duty cycle will increase or decrease.

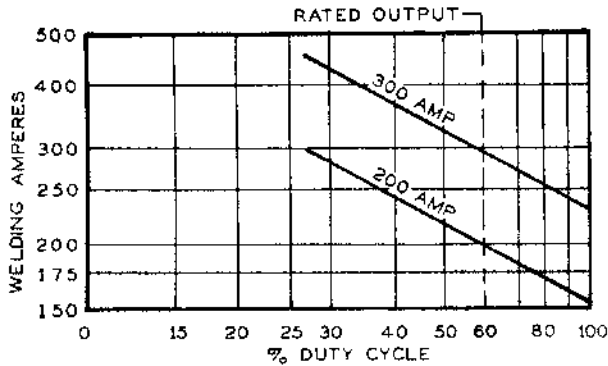


FIGURE 7 - DUTY CYCLE CHART

See Figure 7. It must be kept in mind that time intervals other than 10 minutes will yield different test rating results.

11. VOLT-AMPERE CURVES (Figure 8, 9, and 10)

- a. The volt-ampere curves show the output voltage available at any given output current within the limit of the minimum and maximum current range of the welding machine. With the use of the volt-ampere curves, it is possible to determine the amperage available for a particular load voltage. In Shielded Metal-Arc (Stick Electrode) welding, it is impossible for the operator to hold an arc length that does not vary. This varying arc length causes arc voltage to vary which in turn produces corresponding changes in welding current. The steeper the slope of the volt-ampere curve, the lower the current change for a given voltage change.
- b. At open circuit voltage the current flow in the welding circuit is zero. When a welding arc is initiated, open circuit voltage changes to arc voltage and will vary with the arc length. Decreasing the length of the arc, will increase the current and decrease arc voltage.

12. WELDING AMPERAGE CONTROL

a. **WELDING CURRENT RANGES:** Select the welding current range desired, by adjusting the Current Range Switch (Figure 11) to one of the three current positions. Current ranges shown on the nameplate are Gas Tungsten-Arc ratings. Amperage output will be somewhat higher for ac and somewhat lower for dc Shielded Metal-Arc (Stick Electrode) Welding than that shown on the nameplate below the Range

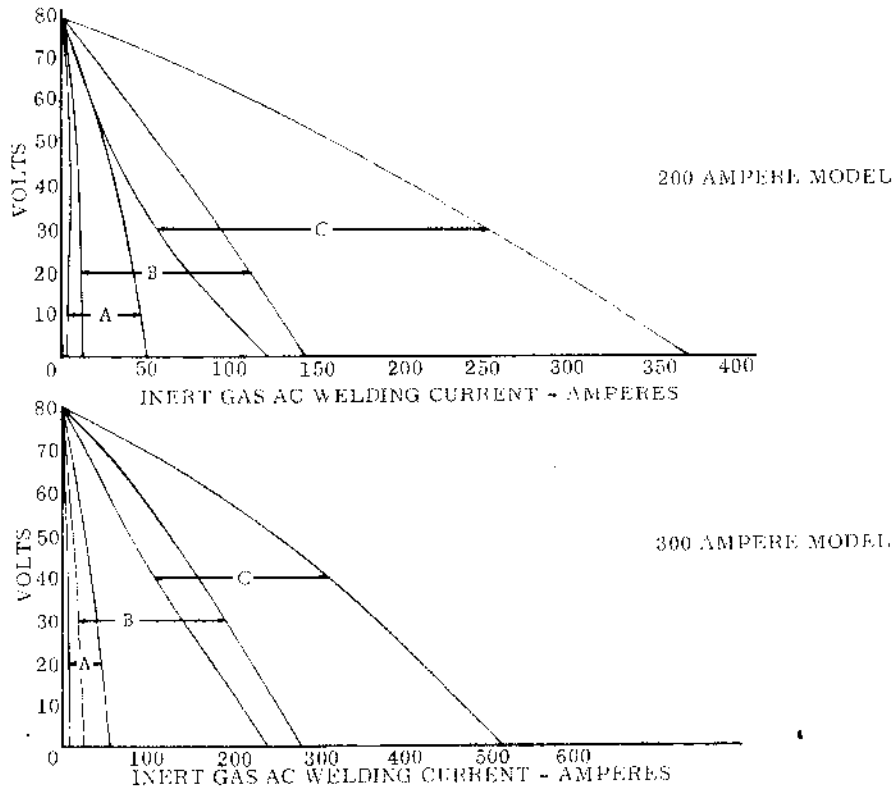


FIGURE 8 - a-c INERT GAS VOLT AMPERE CURVES

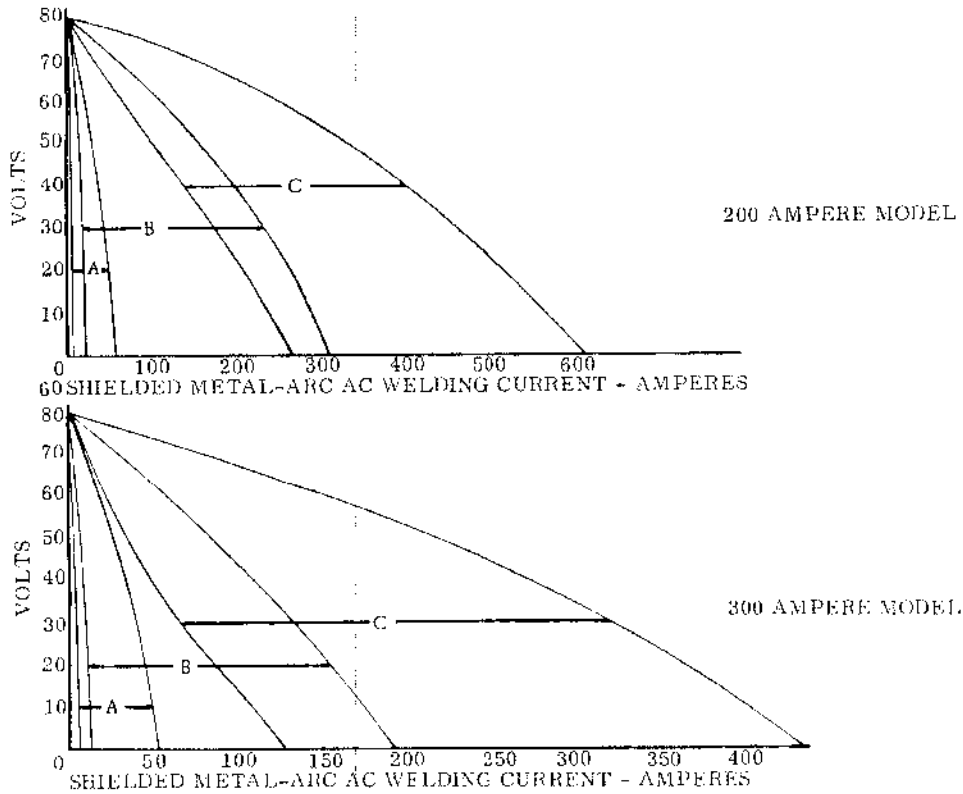


FIGURE 9 - a-c SHIELDED METAL-ARC (STICK ELECTRODE) VOLT AMPERE - CURVES

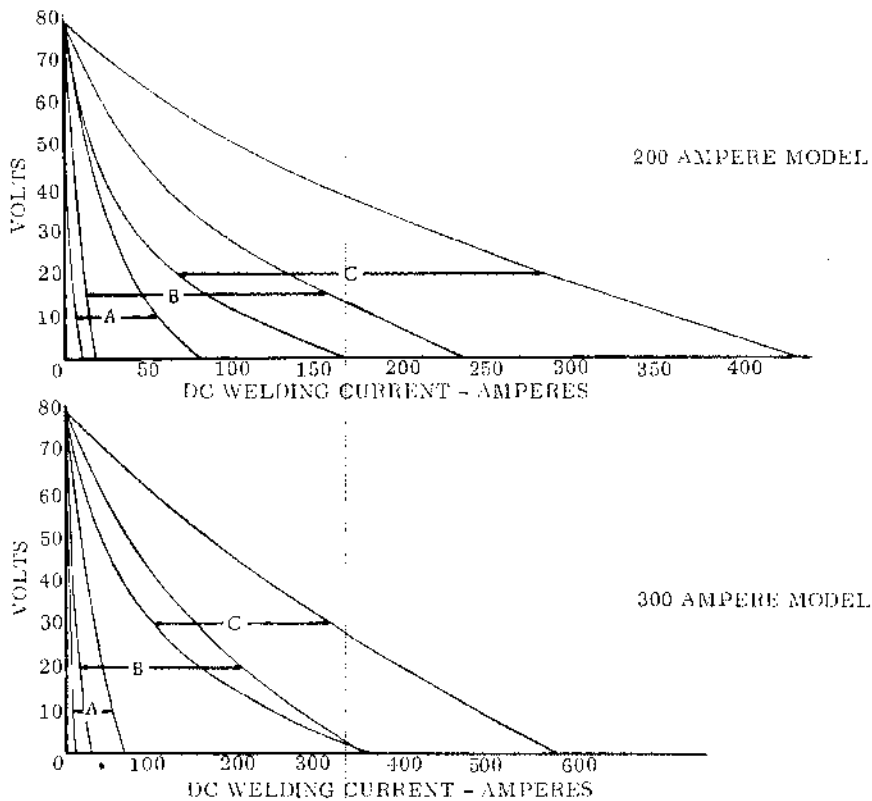


FIGURE 10 - d-c SHIELDED METAL ARC AND INERT GAS AMPERE - CURVES

Switch. See Shielded Metal-Arc (Stick Electrode) current ranges listed under SPECIFICATIONS.

IMPORTANT

DO NOT operate the Current Range Switch or the ac/dc Selector and Polarity Switch under load. Arcing caused by opening the switch carrying high current will severely burn the contact surfaces of the switch. This burning of the contact surfaces will decrease the maximum current carrying capacity of the switch and possibly cause the switch to become inoperative.

- b. AC/dc SELECTOR AND POLARITY SWITCH: A three position Selector and Polarity Switch (Figure 11) permits the welding machine operator to select "ac", "dc STRAIGHT" or "dc REVERSE" Polarity. Place the switch in the proper position required for the welding application.
- c. WELD CURRENT CONTROL: Weld current adjustment can be accomplished by turning the Weld Current Control in either the clockwise or counter-clockwise direction. The Weld Current Control Dial is calibrated in percent, so the setting of the control will determine the percentage of current between minimum and maximum of the current range in use.
- d. REMOTE AMPERAGE CONTROL (Optional Equipment) A Remote "Amperage Control Receptacle" is provided for connecting a (RHC-3) Remote Hand Control or a (RFC-3A) Remote Foot Control or any other suitable remote controls. (See Optional Equipment). The Remote Amperage Control Receptacle is located on the upper left side of the control panel. A switch labeled "STANDARD-REMOTE" is located immediately below the receptacle and must be placed in the "REMOTE" position when a remote amperage control is used.

IMPORTANT

DO NOT operate the welding machine with the "STANDARD-REMOTE" Switch in the "REMOTE" position unless a Remote Control is plugged into the receptacle. Failure to do this could damage the switch and the dc control coil.

Operating the welding machine with the "STANDARD-REMOTE" Switch in the "REMOTE" position without a Remote Control plugged into the receptacle, causes an inductive kick to be developed in the dc control coil. Removing the Remote Control plug from the Remote Amperage Control Receptacle, with the welding machine in operation, and with the switch in the "REMOTE" position will have the same effect.

The control circuit is designed so that the Weld Current Control on the welding machine will indicate only the maximum welding output of each current range, when the remote control unit is used. Control from maximum to minimum is accomplished with the remote control unit. If full range control is required, set the control knob pointer on the welding machine to maximum (100) position.

For an example, if the pointer on the Weld Current Control is set at one half (50) of the scale, the remote control will provide current control from minimum of the range being used to a maximum of one half of that range. This feature is very valuable for two reasons: First, it enables the welding machine operator to regulate the current at a remote position away from the welding machine. Secondly, the Remote Current Control provides very fine current adjustment by setting the Weld Current Control on the welding machine as low as possible on the current range being used.

- e. START ADJUSTMENT CURRENT CONTROL
 - (1) A two position switch is provided for starting

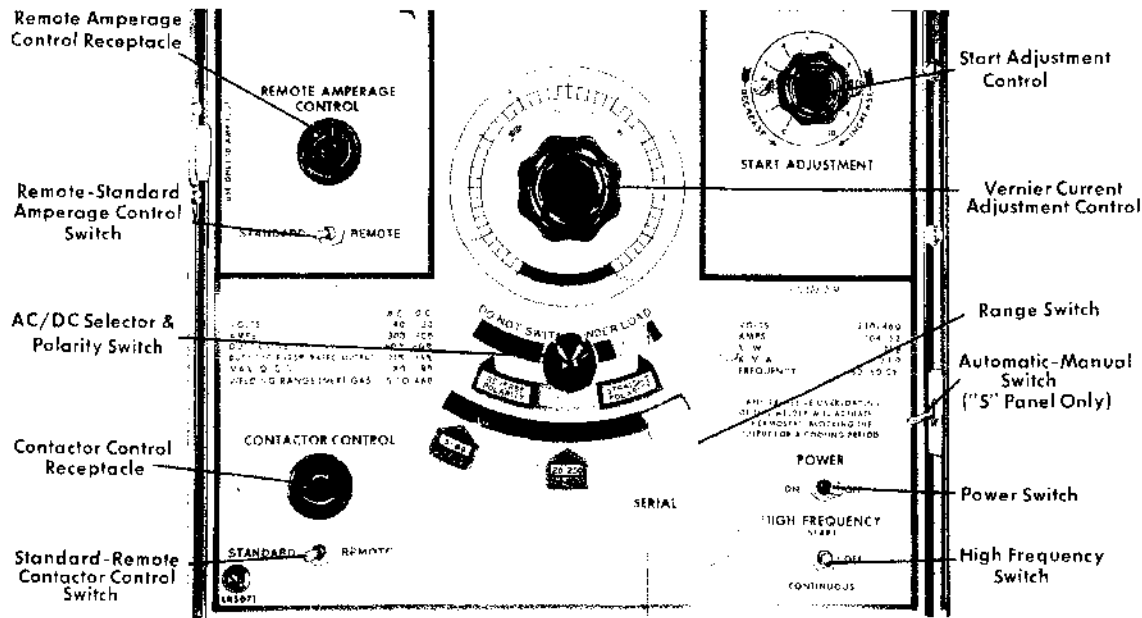


FIGURE 11 - CONTROL PANEL VIEW OF WELDING MACHINE

current control and is located behind the lower front access door. The switch is labeled Start Control In-Out and provides the operator with a selection of connecting the starting current control circuit either in or out of the welding circuit. Placing the switch in the "IN" position connects the starting current control in the welding circuit. Placing the switch to the "OUT" position removes the starting current control from the welding control circuit.

- (2) The Start Adjustment Control is labeled "Increase-Decrease" and is used to control the welding arc when starting to weld. The start circuit consists of time delay components which allows pre-set starting current to flow for approximately 35 to 40 cycles (2/3 of a second). After the time delay, current will automatically change to the current setting of the Weld Current Adjustment Control.

To avoid burn-through on light gauge metals, the Start Adjustment Control should be set in the counterclockwise direction at a lower setting than the Weld Current Control. If the Weld Current Control is near the zero setting of its range, it may be well to change the Range Switch to the next lowest range setting, if a lower range is available. For heavy gauge metals a full clockwise setting or higher than the Weld Current Control setting is recommended as a higher starting current is required to preheat the metal at the beginning of the weld.

13 CONTACTOR CONTROL RECEPTACLE AND SWITCH (Figure 11)

- Ea. With the CONTACTOR CONTROL Switch in the "STANDARD" position, the contactor is opened and closed by operating the "ON-OFF" POWER Switch.

With the CONTACTOR CONTROL Switch in the "REMOTE" position, both contactor and gas and

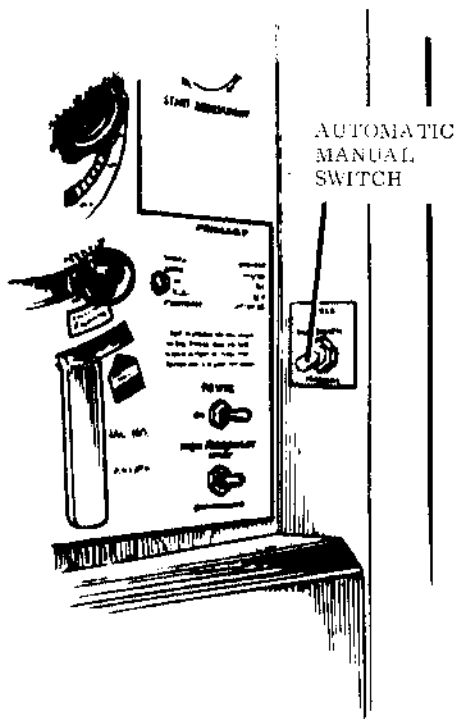


FIGURE 12 - AUTOMATIC-MANUAL SWITCH

water controls are operated with a proper remote control switch connected to the CONTACTOR CONTROL Receptacle as explained in Step No. 9.

14. AUTOMATIC - MANUAL SWITCH AND WELD TIMER (Models Equipped With S Panel Only) (Figure 12)

- Ea. When this switch is set to "AUTOMATIC" position, the welding machine may be used for Gas Tungsten-Arc Spot Welding. The Weld Timer located immediately below the High Frequency Intensity Control, behind the lower front access door, is used to control the spot weld time interval required. This timer is adjusted by turning the indicator to the desired welding time interval of zero to three (3) seconds.

15. HIGH FREQUENCY CONTROL AND SWITCH (Figures 11 and 13)

- Ea. The high frequency assembly has a dual function; to enable starting the arc (in Gas Tungsten-Arc Welding) without touching the electrode to the work and to stabilize the arc during the welding operation. The HIGH FREQUENCY INTENSITY Control allows the operator to choose the proper intensity for the high frequency output. Adjust the control located behind the lower front access door, for the required high frequency intensity to start the welding arc.
- Eb. The HIGH FREQUENCY Switch has three positions; "START, CONTINUOUS, and OFF". Position the switch in accordance with the requirements for the particular welding job. In the "START" position, high frequency will be introduced into the welding circuit only, when starting to weld. This position is usually used for dc Gas Tungsten-Arc welding. In the "CONTINUOUS" position, usually used for ac Gas Tungsten-Arc welding, high frequency will be introduced into the welding circuit during the ENTIRE welding operation.
- Ec. The HIGH FREQUENCY Switch on the upper control panel, should be placed in the "OFF" position when the welding machine is used for shielded metal-arc (stick electrode) welding.

IMPORTANT

Remember that since the High Frequency Oscillator is a basic type of radio transmitter, the higher the setting of the High Frequency Intensity Control, the greater the amount of radiation. It is recommended therefore that the control be kept at the minimum setting that will provide satisfactory weld starting and operation.

16. BALANCING RESISTOR CONTROL SWITCH (Figure 13)

- Ea. The knife switch is located behind the front access door that covers the lower half of the control panel. The switch is located on the left recessed column. The switch has two positions: the lower position labeled Shielded Metal-Arc is for shielded metal-arc (stick electrode) welding and the upper position labeled Gas Tungsten-Arc is for gas tungsten-arc (TIG) welding. When the switch is in the lower position, it shunts out the balancing resistor providing normal shielded metal-arc welding characteristics. When the switch is in the upper position the balancing resistor is in the circuit providing the characteristics for Gas Tungsten-Arc welding. The welding machine is shipped with the switch in the upper position.

17. POST FLOW GAS AND WATER VALVE TIMER (Figure 13)

17a. The post flow gas and water valve timer is located between the gas and water valves behind the lower front access door. The post flow gas and water valve timer controls the length of time the gas and water will continue to flow after the arc has been broken. This timer should be set so that the gas flow continues for a sufficient length of time to allow the tungsten to cool to a point where it will no longer be contaminated when exposed to the air. This time setting is usually 10 seconds for each 100 amperes of welding current being used. THE TUNGSTEN MUST COOL BRIGHT AND SHINY, ANY BLUEING OR BLACKENING OF THE TUNGSTEN INDICATES A LACK OF GAS COVERAGE AND WILL INTRODUCE TUNGSTEN CONTAMINATION INTO THE WELD. This lack of gas coverage may be caused by a short cooling time, wrong gas cup, loose connection, drafty conditions, etc.

18. ON-OFF POWER SWITCH (Figure 11)

18a. The POWER Switch controls the primary line power to the control transformer. When the switch is placed in the "ON" position, the exhaust fan will operate and voltage is applied to the control circuits.

19. P, A, B AND S PANEL CONNECTIONS

19a. "P" PANEL: For "P" operation, the welding machine can be used as a standard machine or it can be remotely controlled by connecting a normally open maintained contact switch to the CONTACTOR CONTROL Receptacle and placing the "STANDARD-REMOTE" Switch in the "REMOTE" position. NOTE: The models designed for "P" Panel operation only do not have gas and water valves. When Gas Tungsten-Arc Welding is to be done, gas and water will have to be controlled from an external source.

19b. "A" PANEL: (This type of operation is used for automatic welding) For "A" operation of A/B Panel (See Figure 14) the CONTACTOR CONTROL Switch must be in the "REMOTE" position. A normally open maintained contact switch, must be connected to the CONTACTOR CONTROL Receptacle. With this switch engaged, the contactor in the welding machine is energized, starting gas and water flow, full open circuit voltage (when no arc is established), high frequency is present (with the switch in either "Start" or "Continuous" position) and the Start Adjustment Control circuit is energized.

When welding is begun, the high frequency will shut off (with the switch in the "START" position only), and the START ADJUSTMENT Control will change to the main welding control. Welding can continue as long as the remote control switch is maintained in the closed position.

To stop welding, the control switch must be opened; this drops out the contactor and breaks the arc. The post flow gas timer will start to time out.

NOTE: If the arc is broken manually, gas and water will continue to flow, full open circuit voltage is present, high frequency is present (if switch is in "Continuous" position) and the START ADJUSTMENT Control circuit is energized. The maintained contact switch must be opened to de-energize the welding circuit.

19c. "B" PANEL: This type of operation is used for manual welding. For "B" operation of A/B Panel (See Figure 14 for link position) the contactor control switch must be in the remote position. A momentary contact switch must be connected to the CONTACTOR CONTROL Receptacle. With this switch engaged the contactor in the welding machine is energized, starting gas and water flow, full open circuit voltage (when no arc is established), high frequency is present (with the switch in either "Start or Continuous" position) and the start adjustment circuit is energized.

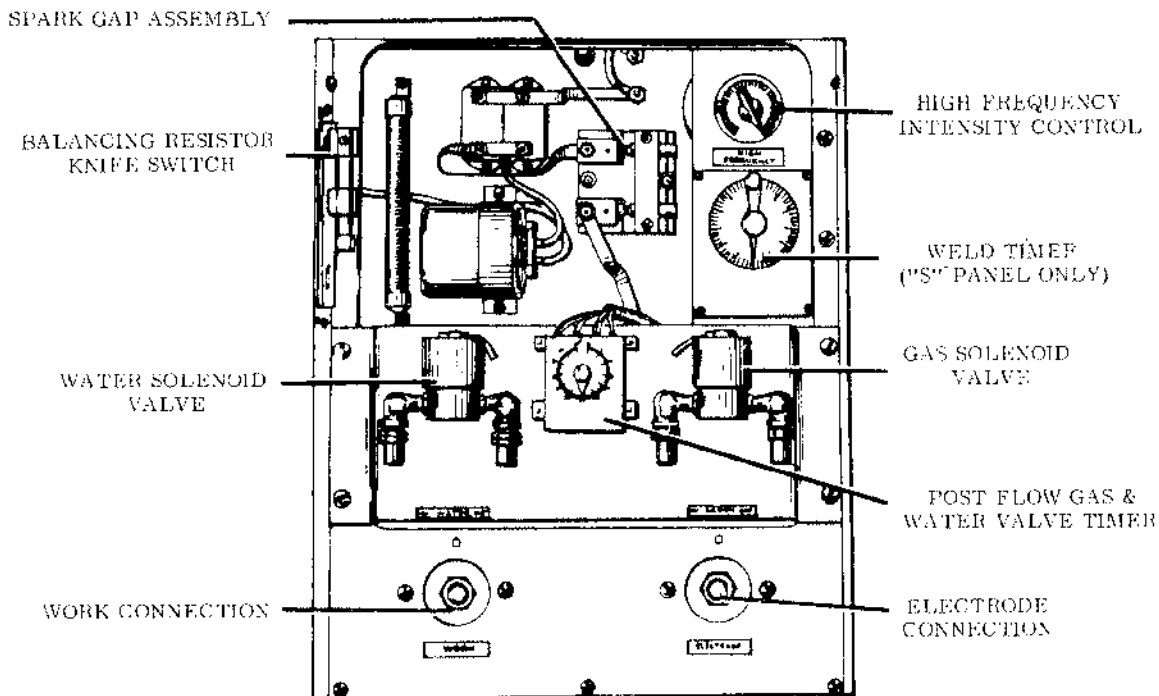


FIGURE 13 - LOWER CONTROL PANEL VIEW

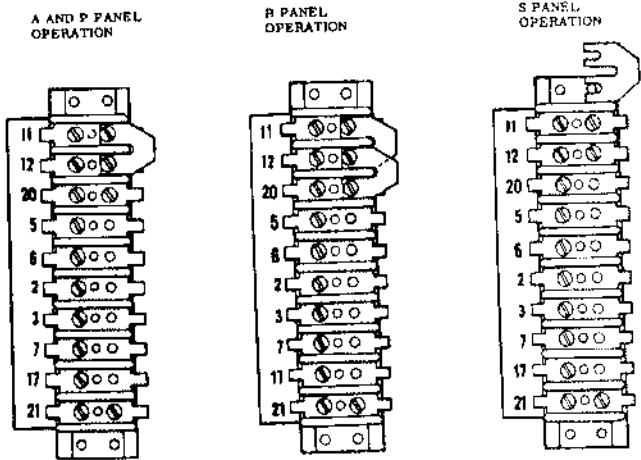


FIGURE 14 - A/B/S PANEL CONNECTIONS

When welding is begun, momentary switch can be released, the high frequency will shut off (with the

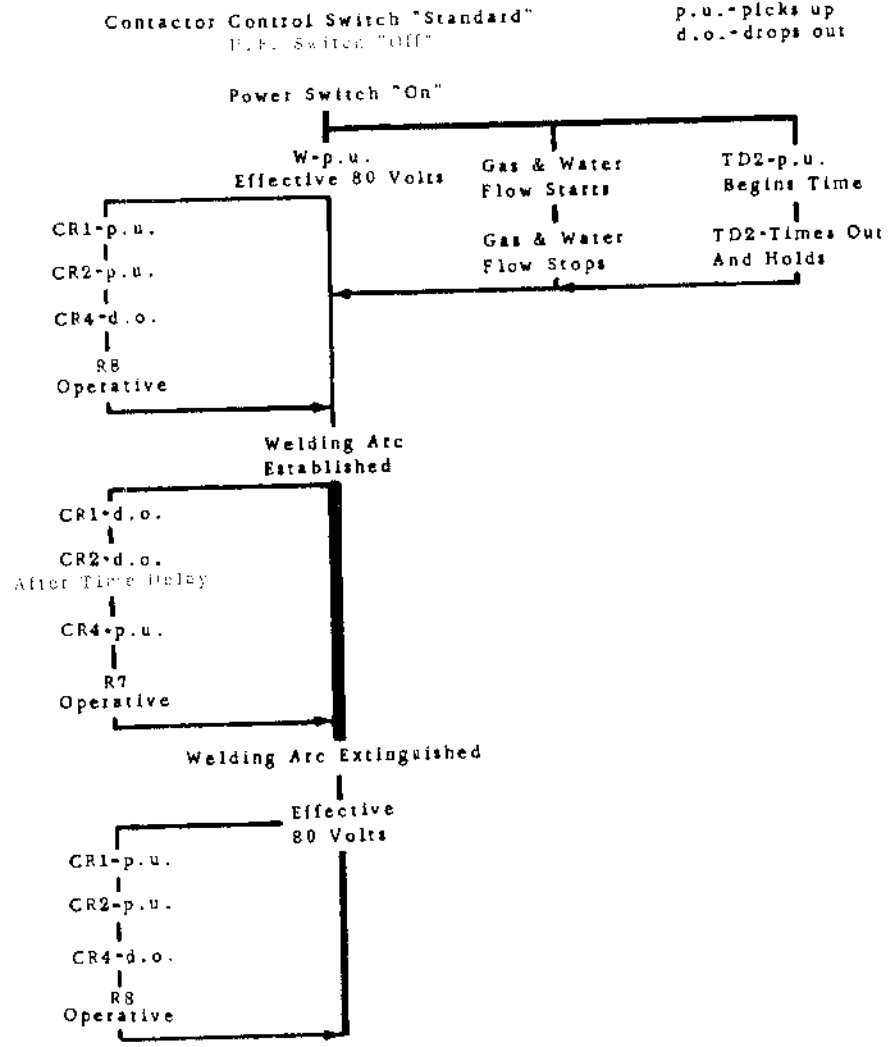
switch in the "Start" position only) and the START ADJUSTMENT Control will change to the main welding control.

To stop welding, break the arc by withdrawing the electrode holder from the work. The contactor will open and gas and water will start to time out automatically.

□d. "S" PANEL: (A/B/SP Model Only) This type of operation is used for spot welding. When using the "S" Panel control (See Figure 14 for link position) it will be necessary to position the "Automatic-Manual" Switch as required. See Figure 12. With the "Automatic-Manual" switch in the "Manual" position, "A" control operation is possible. With the switch in the "Automatic" position, "S" control operation is possible. When using the "S" control for Gas Tungsten-Arc Spot Welding, it will be necessary to place the CONTACTOR CONTROL Switch in the "REMOTE" position. The weld timer, located behind front access door, is provided for automatic control of weld current time.

SEQUENCE OF OPERATION

SHIELDED METAL-ARC (STICK ELECTRODE) WELDING



20. SHIELDED METAL-ARC (STICK ELECTRODE) WELDING

- a. Remove any CONTACTOR CONTROL Switch from the CONTACTOR CONTROL Receptacle.
- b. Place the CONTACTOR CONTROL Switch in the "STANDARD" position. After power is applied, the gas valve will go through one cycle and shut off.
- c. Place the HIGH FREQUENCY Switch in the "OFF" position.
- d. If start current control is desired, place the START CONTROL Switch to the IN position.
- e. Turn the START ADJUSTMENT Control if used to maximum position except for light gauge metal.
- f. Adjust the RANGE Switch to the approximate desired current range.
- g. Place the ac/dc SELECTOR and POLARITY Switch in the position to suit the welding application, electrode, etc.
- h. Place the REMOTE AMPERAGE CONTROL Switch in the "STANDARD" position. If a remote amperage control is used, connect the remote amperage control to the Remote Amperage Control Receptacle and place the switch in the "REMOTE" position.
- i. Adjust the WELD CURRENT Control for the approximate percentage of current within the range of the Range Switch setting.
- j. Connect a welding cable of ample size to the "Work" terminal on the welding machine and the other end to the work. See Table II.
- k. Connect the electrode holder cable to the "ELECTRODE" terminal on the welding machine. Determine the proper electrode for the welding application and insert it into the electrode holder.
- l. Place the "ON-OFF" Power Switch in the "ON" position.
- m. Commence welding and if a remote amperage control is used, adjust the control for the proper operation of the electrode. Adjust the RANGE Switch and WELD CURRENT Control if necessary.

21. GAS TUNGSTEN-ARC (TIG) WELDING

- a. Remove the right hand side case panel from the welding machine.

- b. For automatic controlled welding, connect the jumper links for "A" Panel operation as shown in Figure 14. Connect jumper links for "B" panel operation if manual control is desired. See Figure 14.
- c. After panel connections have been made, replace the side panel on the welding machine.
- d. Make gas and water connections as described in step number 6.
- e. Connect a 10 foot length of 2/0 welding cable to the "WORK" terminal on the welding machine and the other end to the workpiece. Connect the electrode holder cable to the "ELECTRODE" terminal on the welding machine. See Table III for the tungsten size.
- f. Place the CONTACTOR CONTROL Switch in the "REMOTE" position.
- g. Connect a contactor control switch to the CONTACTOR CONTROL Receptacle and attach the switch to the electrode holder handle if manual control is desired. See step number 9 for instructions on selecting the proper remote control switch.
- h. Place the REMOTE AMPERAGE CONTROL Switch in the "STANDARD" position. If a remote amperage control is used, connect the remote amperage control to the REMOTE AMPERAGE CONTROL Receptacle and place the switch in the "REMOTE" position.
- i. Adjust the RANGE Switch to the approximate desired current range. See step number 12.
- j. Place the ac/dc SELECTOR and POLARITY Switch in one of the three positions to correspond with particular welding application. Metal to be welded is usually the determining factor in selecting the proper current.
- k. Adjust the WELD CURRENT Control for the approximate current within the current range of the RANGE Switch setting.
- l. If starting current is desired, place the START CONTROL Switch in the "IN" position.
- m. Set the START ADJUSTMENT Control, if used, at approximately the same setting as what the WELD CURRENT Control has been set at. See step number 12e.
- n. Place the HIGH FREQUENCY Switch in the "START"

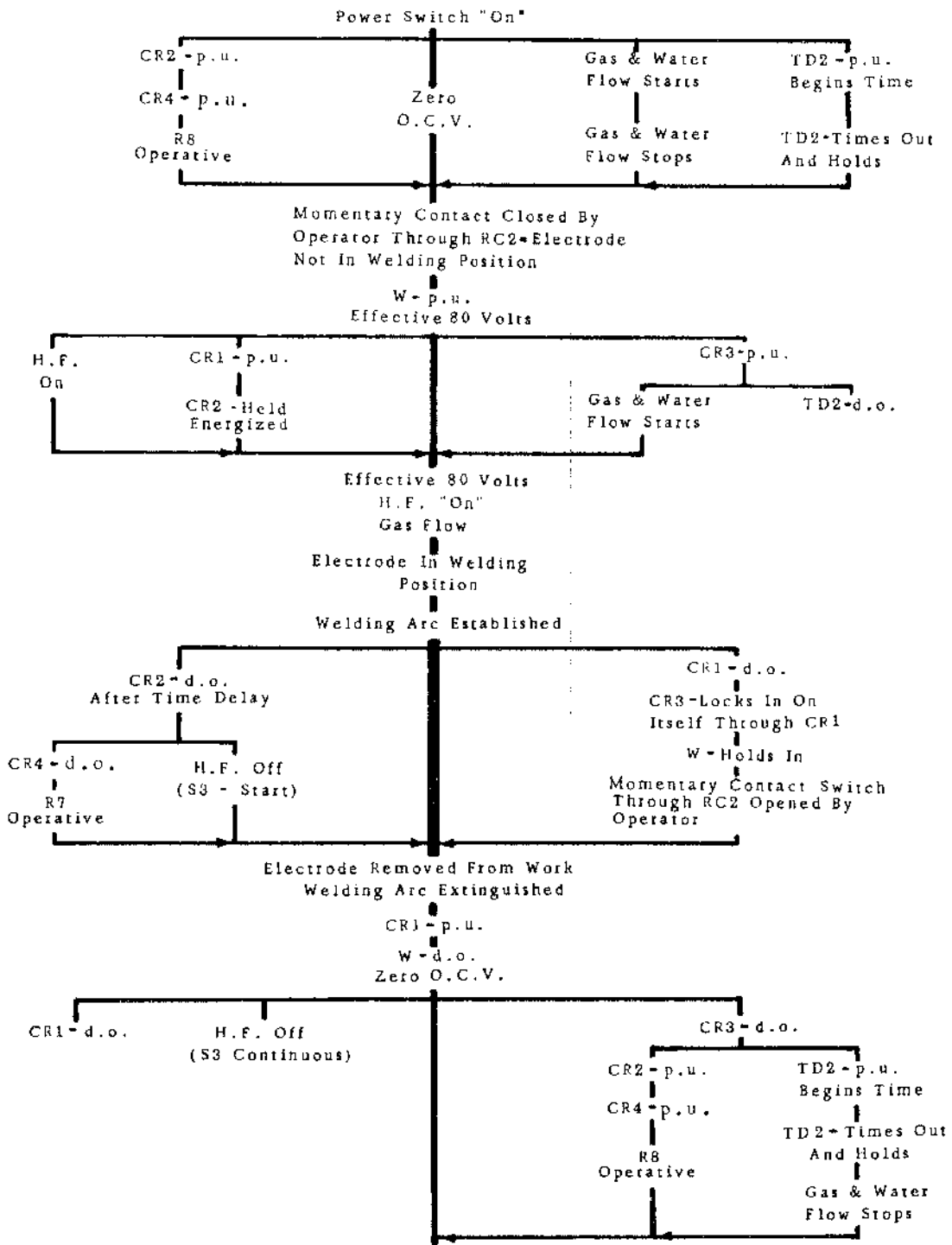
TABLE III

Guide for Selecting Electrode for Gas Tungsten Arc Welding			
PURE TUNGSTEN Electrode Dia. (in.)	CURRENT RANGE		
	ACHF - Argon	DCSP - Argon	DCSP - Helium
.010	Up to 15	Up to 15	Up to 20
.020	10 to 30	15 to 50	20 to 60
.040	20 to 70	25 to 70	30 to 90
1/16	50 to 125	50 to 135	60 to 150
3/32	100 to 160	125 to 225	140 to 250
1/8		215 to 360	240 to 400
1% AND 2% THORIATED TUNGSTEN			
.010	Up to 25	Up to 25	Up to 30
.020	15 to 35	15 to 40	20 to 50
.040	20 to 80	25 to 80	30 to 100
1/16	50 to 140	50 to 145	60 to 160
3/32	130 to 250	135 to 235	150 to 260
1/8		225 to 360	250 to 400

AC AND DC GAS TUNGSTEN ARC WELDING

Contactor Control Switch "Remote"
 High Frequency Switch "AC-Continuous - DC-Start"
 Panel Selection "B"

p.u. = picks up
 d.o. = drops out



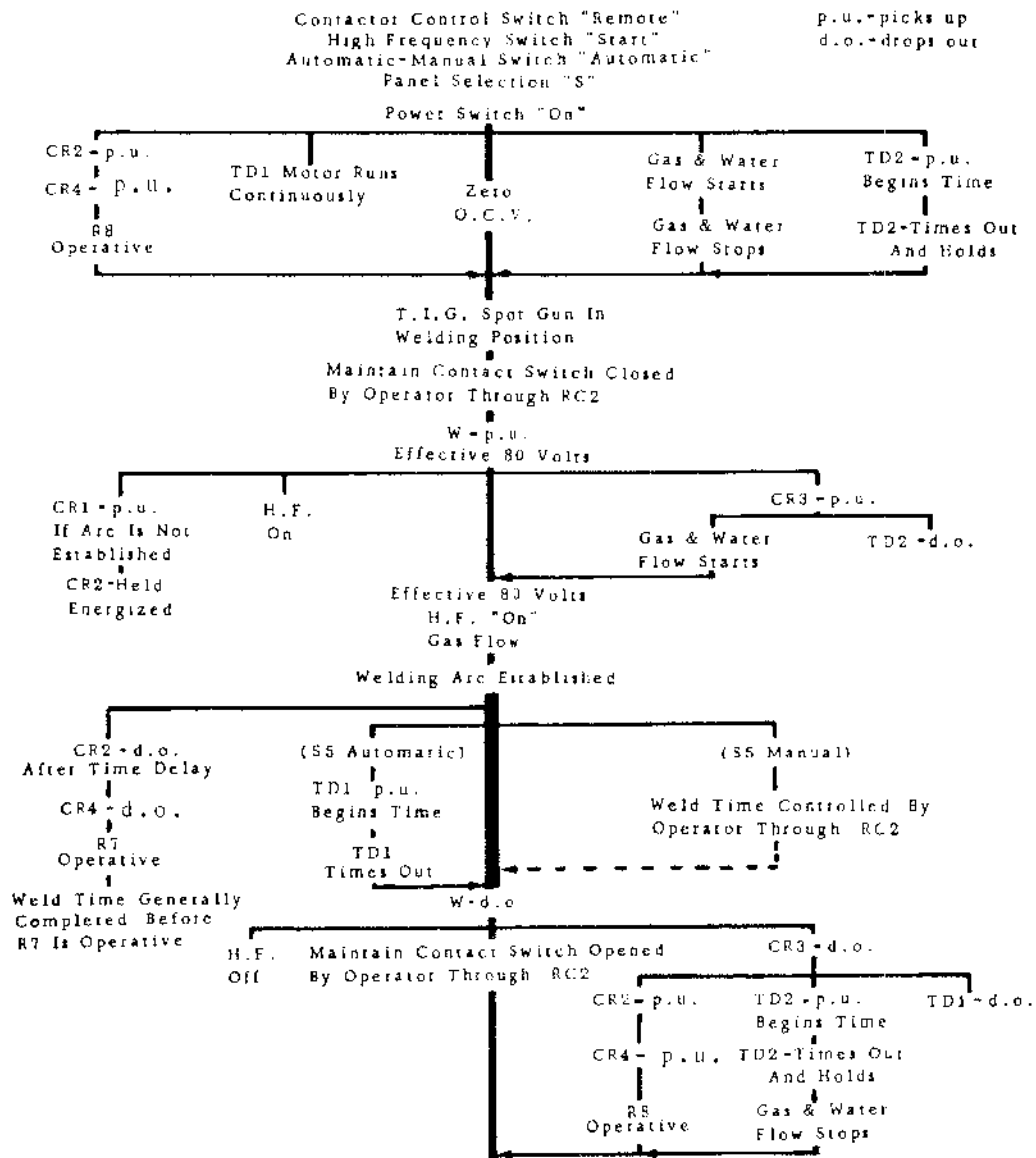
- position for dc welding or in the "CONTINUOUS" position for ac welding.
- Lo. Check the position of the BALANCING RESISTOR CONTROL Switch. Place in the TUNGSTEN INERT GAS (Upper) position. See step number 16.
 - Lp. Adjust the POST FLOW GAS AND WATER VALVE Timer for approximately 10 seconds for each 100 amperes of welding current. See step number 17.
 - Lq. Set the HIGH FREQUENCY INTENSITY Control to 60. The setting may have to be higher for proper starting when the tungsten in the electrode holder is cold. Re-adjust accordingly. Remember, the lower the control setting, the lower the intensity of high frequency radiation.
 - Lr. Place the "ON-OFF" POWER Switch in the "ON" position.
 - Ls. Energize the REMOTE CONTACTOR CONTROL Switch. Shielding gas will begin to flow, high frequency and full open circuit voltage will be impressed across

- the electrode and the work.
- Lt. Adjust the regulator on the gas supply according to gas manufacturer recommendations.
- Lu. Bring the electrode close to the work. High frequency current will jump the air gap and establish a welding arc.
- Lv. Re-adjust any of the controls, if necessary, until proper welding operation is obtained.
- Lw. After the welding job is completed, open the CONTACTOR CONTROL Switch if connections are made for "A" Panel control or break the welding arc if connected for "B" Panel control and the contactor will drop out. Shielding gas and water will continue to flow for the pre-set time on the POST FLOW GAS AND WATER Timer.

22. GAS TUNGSTEN-ARC SPOT WELDING ("S" Panel ac/dc Model Only)

- La. Remove the right hand side case panel from the

DC GAS TUNGSTEN ARC SPOT WELDING



- welding machine and connect the jumper links for "S" panel control as shown in Figure 14.
- b. After panel connections have been made, replace the side panel on the welding machine.
 - c. Use the adapter furnished by the spot gun manufacturer and connect the spot gun and water drain hose to the electrode terminal on the welding machine.
 - d. Connect gas and water supplies as described in step number 6.
 - e. Connect a 10 foot length of 2/0 welding cable from the "WORK" terminal on the welding machine to the workpiece.
 - f. Remove the plug from the spot gun contactor control lead. Then connect the two prong twistlock contactor control plug, furnished with "S" Panel models, to the spot gun contactor control lead.
 - g. Connect the two prong contactor control twistlock plug to the CONTACTOR CONTROL Receptacle.
 - h. Place the CONTACTOR CONTROL Switch in the "REMOTE" position.
 - i. Place the REMOTE AMPERAGE CONTROL Switch in the "STANDARD" position. If a remote amperage control is used, connect the remote amperage control to the REMOTE AMPERAGE CONTROL Receptacle and place the switch in the "REMOTE" position.
 - j. Adjust the RANGE Switch to the approximate desired current range. See step number 12.
 - k. Place the ac/dc SELECTOR and POLARITY Switch in the "STRAIGHT POLARITY" position. Straight polarity is recommended for spot gun operation.
 - l. Adjust the WELD CURRENT Control for the approximate current within the current range of the Range Switch setting.
 - m. If starting current control is desired, place the START CONTROL Switch to the "IN" position.
 - n. Set the START ADJUSTMENT Control, if used, at the upper half of its range. Re-adjust later if necessary.
 - o. Place the HIGH FREQUENCY Switch in either the "CONTINUOUS" or "START" position. This will depend on the application.
 - p. Place the AUTOMATIC-MANUAL Switch in the "AUTOMATIC" position. Weld time interval of zero to 3 seconds will be controlled by the Weld Timer, Figure 13. If it is desired to control the weld time manually, place the switch in the "MANUAL" position and the gun switch will control the weld timer.
 - q. Adjust the WELD TIME Timer for the spot weld interval. Re-adjust, if necessary, after first trial spot weld.
 - r. Check the position of the BALANCING RESISTOR CONTROL Switch. Place in the TUNGSTEN INERT GAS (Upper) position. See step number 16.
 - s. Set the HIGH FREQUENCY INTENSITY Control to 60. The setting may have to be higher for proper starting when the tungsten in the electrode holder is cold. Re-adjust accordingly. Remember: the lower the control setting, the lower the intensity of high frequency radiation.
 - t. Place the "ON-OFF" POWER Switch in the "ON" position.
 - u. Energize the switch for the spot gun or machine electrode holder. Shielding gas will begin to flow high frequency and full open circuit voltage will be impressed across the electrode and the work.
 - v. Adjust the regulator on the gas supply according to gas manufacturer recommendations.
 - w. Follow the spot gun or machine electrode holder manufacturers instructions for spot weld operation.
 - x. Re-adjust the above mentioned controls, if necessary, until proper spot welding operation is obtained.

- y. After the weld timer times out, the contactor opens and gas and water will continue to flow for the duration of the setting of the Post Flow Gas and Water Timer.

23. COMPONENT FUNCTIONS

a. Capacitors

C1 - Power Factor Correction

- (1) Compensates for lagging phase shift or primary line current caused by inductive reactance of main power transformer of welding machine. (Has no effect on welding other than to raise output due to higher line voltage.)

C2 - High Voltage Capacitors

- (1) Part of high frequency oscillator circuit. Charge from T2 and discharge through ("G") spark gaps causes high frequency oscillations to be coupled to the electrode lead through T3.

C3 - Blocking Capacitor

- (1) Purpose of C3 together with R1 and R3 is to reduce the high frequency feedback into the transformer of the welding machine. Protects welding machine from high RF voltages and aids arc starting.

C4 - Time Delay Capacitor

- (1) Charge on C4 keeps CR2 energized for approximately 40 cycles after an arc is established to provide starting current and high frequency control.

b. Resistors

R1 & R3 - By-Pass Resistors

- (1) Purpose of by-pass panel consisting of R1, R3 and C3 is to reduce the high frequency feedback into the transformer of the welding machine.

R2 - Voltage Divider Resistor

- (1) Adjustable for proper ac or dc voltage to allow CR1 to p.u. at open circuit voltage and d.o. at arc voltage or below.
- (2) This resistor supplies correct voltage so that the coil of CR1 relay will p.u. on open circuit voltage and d.o. when an arc is established. To adjust R2 turn H.F. switch off, connect dc voltmeter across coil of CR1 (leads 35 & 37). Energize the welding machine by putting the remote contactor control switch S4 in "standard" position. Without an arc being established, adjust slider of R2 to supply 16 V. dc to CR1 coil.

R4 - Discharge Resistor

- (1) Provides discharge of MA1 to prevent damage to CR4 relay contacts.

R5 - High Frequency Intensity Rheostat

- (1) Is connected in series with high frequency oscillator circuit to control the amplitude of high frequency current. Does not vary frequency.

R6 - Ribbon Resistor

- (1) R6 is connected in series with the "Work" when doing Gas Tungsten-Arc (TIG) welding to compensate for the unbalance of the dc component.

R7 - Weld Current Control Rheostat

- (1) Operative at welding voltage.

R8 - Start Adjustment Current Control Rheostat

- (1) Operative at zero and open circuit voltage and for approximately 40 cycles after an arc is established.

R9 - Time Delay Resistor

- (1) Increases discharge time of C4 to keep CR2 energized for approximately 40 cycles.

R10 - Control Circuit Resistor

- (1) Current limiting resistor adjustable for proper dc control current.

R11 - Bias Resistor

- (1) Current limiting resistor adjustable for proper

dc bias current.

c. Relays

CR1 - Voltage Sensing Relay

- (1) D.o. at welding voltage and zero open circuit voltage.
- (2) P.u. at open circuit voltage.
- (3) P.u. CR2 when the contactor control switch is in "Standard" position. Initiates weld start and high frequency start control.
- (4) Holds in W in "B" panel selection and d.o. W at completion of weld. Permits momentary W control through RC2 (Contactor Control Switch in "Remote" position.)
- (5) Initiates weld time delay in "S" panel selection. Contactor Control Switch in "Remote" position.

CR2 - Time Delay Relay

- (1) D.o. at welding voltage after time delay.
- (2) P.u. at open circuit voltage.
- (3) P.u. through CR3 when the Contactor Control Switch is in the "Remote" position.
- (4) Stays closed for approximately 40 cycles by the discharge of C4 after de-energization either by CR1 or CR3, and provides weld starting current control and high frequency start control.

CR3 - Control Relay

- (1) Controlled by operator through RC2.
- (2) Initiates gas and water post flow timer.
- (3) Holds gas and water solenoids energized while welding. (Contactor Control Switch in the "Remote" position.)
- (4) Provides an interlock on itself in "B" panel selection and permits a momentary contactor control through RC2.
- (5) Initiates time delay of CR2 when the Contactor Control Switch is in the "Remote" position. CR1 will initiate the time delay of CR2 if a welding arc is not established immediately.

CR4 - Start Control Relay

- (1) P.u. at welding voltage.
- (2) D.o. at open circuit voltage if switch across RC2 has been opened.
- (3) D.o. at zero open circuit voltage when the Contactor Control Switch No. S4 is in the "Remote" position.
- (4) Transfers current control from the Start Control Rheostat R8 to the Main Rheostat R7.

d. Timers

TD1 - Weld Timer ("S" Panel Models Only)

- (1) Provides weld time set by operator when Automatic-Manual Switch No. S5 is in the "Automatic" position and with panel selection links TE3 in "S" position.
- (2) D.o. primary contactor and CR3 after time delay.
- (3) Timer motor runs continuously. Timer clutch solenoid provides mechanical linkage. Clutch operated by CR1 when CR1 drops out due to arc initiation, i.e. arc voltage.

TD2 - Gas And Water Control Timer

- (1) Provides post flow time of gas and water. Time is set by operator.
- (2) Timer will run through one timing cycle when the main Power Switch "S1" is put in the "ON" position. The gas and water solenoids will be energized for the duration of the one cycle and then d.o.

e. Contactors

W - Primary Contactor

- (1) With switch connected to RC2 remote control of power to main welding transformer is provided.

f. Receptacles

RC1 - Remote Current Control

- (1) Outlet to connect a remote current control rheostat for remote amplitude control of welding current.

RC2 - Remote Contactor Control Switch

- (1) Outlet to connect a momentary or maintained contact switch (see paragraph 9, page 13) for remote on-off control of primary contactor.

RC3 - 115 Volt ac Receptacle (Optional)

- (1) Outlet to connect remote equipment requiring 115 volt ac power. (Important - Do not exceed 5 amperes.)

g. Terminal Strips

TE1 - Primary Line Voltage Connection Terminal Strip

- (1) Is provided with jumper links for matching the main power transformer with the primary line voltage.

TE2 - Control Transformer Terminal Strip

- (1) Is provided with a jumper link to properly connect the primary winding of the transformer to correspond with the primary line voltage.

TE3 - Panel Selection Terminal Strip

- (1) Provides selection of "A", "B", or "S" panel operation. (See paragraph 19, page 21.)

TE5 - Crater Elimination Connection Terminal Strip

- (1) Manual crater elimination is accomplished by removing jumper link and connecting a RHIS-11 Remote Hand Switch.

h. Switches

S1 - On-Off Power Switch

- (1) Provides on-off operation of the welding machine.

S2 - Remote Current Control Switch

- (1) Provides selection of remote or standard control of welding current.
- (2) Remote position - Welding current within each range is controlled by a remote current control connected to RC1. The remote current control will control the current between minimum and the maximum setting of R7.
- (3) Standard position - Welding current within each range is controlled by rheostat R7.

S3 - High Frequency Switch

- (1) Provides start, continuous, or off control of the high frequency oscillator.
- (2) Continuous Position - The high frequency is "ON" any time the primary contactor is energized. Recommended for ac welding.
- (3) Start Position - The high frequency is "ON" when the primary contactor is energized and shuts off automatically after 40 cycles time delay via CR1-CR2 after the welding arc is established. Recommended for dc welding.
- (4) Off Position - The high frequency is "OFF" under all conditions.

S4 - Remote-Standard Contactor Control Switch

- (1) Provides selection of Standard or Remote contactor control.
- (2) Standard Position - W - p.u. any time power is applied to the welding machine and S1 is in the "ON" position.
- (3) Remote Position - W remotely controlled by switch connected to RC2.

S5 - Automatic-Manual Switch ("S" panel models only)

- (1) Provides selection of automatic or manual control of W when "S" panel selection is used.
- (2) Automatic Position - W or weld time is controlled with the weld timer.
- (3) Manual Position - W or weld time is controlled by the operator via switch at RC2.

- S6 - Balancing Resistor Control Switch
- (1) Metallic Position - Shunt out balancing resistor R6 for normal Shielded Metal-Arc (Stick Electrode) Welding characteristics.
 - (2) TIG Position - Places balancing resistor R6 in series with welding circuit. Compensates for dc component present in Gas Tungsten-Arc welding.
- S9 - ac/dc Selector & Polarity Switch
- (1) Provides selection of "ac", "dc Straight" or "dc Reverse" welding current.
- S10 - Range Switch
- (1) Provides selection of welding current range.

i. Rectifiers

- SR1 - Main Rectifiers

- (1) Rectifies the ac welding current to dc welding current.
- SR2 - Control Voltage Rectifier
- (1) Rectifies ac welding or open circuit voltage to operate CR1.
- SR3 - Current Control Rectifier
- (1) Rectifies control circuit voltage necessary to control welding current output.
- SR4 - Time Delay Rectifier
- (1) Rectifies 115 volt ac for operation of Time Delay Relay CR2.
- SR5 - Bias Circuit Rectifier
- (1) Rectifies bias circuit voltage necessary to control welding current output.

MAINTENANCE

CAUTION

BE SURE the branch circuit, main disconnect switch or circuit fuses are removed before attempting any inspection or work on the inside of the welding machine. Placing the "ON-OFF" POWER SWITCH on the welding machine in the "OFF" position, does not remove voltage from the power terminals inside of the machine. BE SAFE AND BE ALIVE, OPEN THE BRANCH CIRCUIT.

INPUT POWER AND WELDING CABLES

These cables should be inspected periodically. Fraying and broken wires may occur at the ELECTRODE HOLDER and WORK CLAMP. The insulation should be checked for cracks and bare spots.

RECTIFIER

It is recommended that the rectifier be cleaned occasionally by blowing out with compressed air so that maximum cooling will be accomplished by the air stream. This should be done periodically, depending upon the location of the unit and the amount of dust and dirt in the atmosphere.

A clean dry air stream should be used for cleaning the rectifier and should be directed across the entire length of the air opening in front of the welding machine and between each louver. The welding machine should be in operation so that the exhaust fan will draw the dirt out the rear of the welding machine. The welding machine case cover should NOT be removed for this cleaning operation.

When used in a dusty, oily atmosphere, heavy accumulation of foreign material will collect on rectifier plates used on rectifier type welding machines. Removal of an oily substance from the rectifier plates, using an air stream only, is difficult and next to impossible.

A solvent which will loosen dirt accumulations without damage to the rectifier stack is available from the factory. This solvent comes in one gallon containers and when ordering refer to part number 037 730, rectifier cleaning solvent.

Spraying generous quantities of this solvent onto the rectifier stack will loosen and remove the dirt accumulation from the rectifier plates. Directing an air stream between the rectifier plates will then readily dry them.

FAN MOTOR

All models are equipped with an exhaust fan and rely on forced draft for adequate cooling for high duty cycles and overloads. The fan motor is manufactured with life

time lubricated sealed ball bearing and no attention is required.

TRANSFORMER

Occasional blowing out the dust and dirt from around the transformer is recommended. This should be done periodically depending upon the location of the unit and the amount of dust and dirt in the atmosphere. The welding machine case cover and sides should be removed and a clean dry air stream should be used for this cleaning operation.

CONTROL CIRCUIT FUSING

The control circuit fuse is of 10 ampere plug type size and is mounted in the case at the upper left hand side of the front panel. DO NOT USE ANYTHING OTHER THAN A 10 AMPERE SIZE. The purpose of this fuse is to provide protection to the control rectifier and the circuit components.

The symptom of a blown fuse is complete loss of control of the welding current but minimum output of each range is available. Before replacing the fuse, examine leads for short circuit or other signs of trouble, especially at the point where the leads enter the remote control case. Examine the Amperage Adjustment Control Rheostat in the welding machine, and, if a remote amperage control is used, also examine the rheostat in the remote control.

THERMAL PROTECTION

This welding machine is protected with two (2) normally closed overload thermostats located in the Main Rectifier (TP2) and in the Right Secondary Coil of the Main Weld transformer (TP1). Any excessive overload of either one of these components will cause the Main Contactor to open, stopping the welding machine's output. If this occurs, stop welding and allow the welding machine about three (3) minutes cooling off time. Normal operation can then be resumed.

POWER FACTOR CORRECTION CAPACITORS

Power factor correction capacitors are built into the welding machine as standard equipment. These capacitors require no maintenance or attention and should possess very long or unlimited life, unless power line is subjected to extremely high surges. If any capacitor should fail, the defect can be readily recognized by the bulged case, and oil spillage and can be easily replaced. They are fastened with a bracket and are held in position with clamping bolts.

HIGH VOLTAGE CAPACITORS

These parts require no attention and are rarely a source

of trouble. A defective capacitor, however, is evident usually by the appearance of melted sealing material at the bottom of the housing or evidence of oil leakage in certain cases. Any local radio repair shop can readily determine the condition of the capacitors. (If one of the high voltage capacitors should fail, operation may be continued with one capacitor until a new one can be secured.) In order to prevent excessive overload on the remaining single capacitor, the spark gap point setting should be reduced to about .004".

SPARK GAPS

The spark gaps can be readily inspected by raising the access door of the welding machine case.

The spark gaps are normally set at .008" apart at the factory. It will be necessary to periodically re-adjust these after extended operation. Usually inspection and adjustment every three or four months will suffice. Re-adjustment is also indicated when intermittent operation of the gaps is noted. Usually this occurs when the setting has increased to .013" or greater.

SPARK GAP ADJUSTMENT

Generally speaking, the high frequency output varies directly (up to a certain point) with the spark gap spacing. In extreme cases where the greatest amount of high frequency is needed it may be necessary to adjust the spark gap setting to .010" or even .012". This naturally also increases the high frequency radiation and it is suggested that the minimum gap setting (.004" to .008") consistent with good welding operation be used.

NOTE: Widening the spark gaps through normal operation may, if not corrected, increase the loading of the high voltage capacitors discussed in a previous section, and thus contribute to their pre-mature failure. Cleaning or dressing of the points of the spark gaps is not recommended as the material at the points is tungsten and it is impossible to file. The entire point should be replaced when the tungsten section has completely disappeared.

TO ADJUST SPARK GAPS

- 1. Loosen screws A on both sides.
- 2. Place feeler gauge of proper thickness between gaps C.
- 3. Apply slight pressure against spark gap holder B so feeler gauge is held firmly in gap.
- 4. Tighten screws A.

BY-PASS PANEL

The purpose of the by-pass panel is to reduce the high

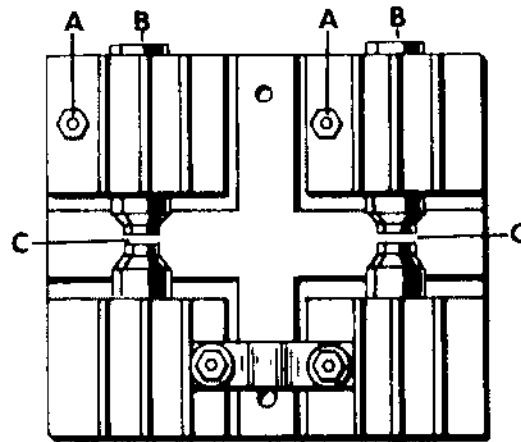


FIGURE 15 - SPARK GAP ADJUSTMENT

frequency feedback into the transformer of the welding machine.

A defective capacitor in this circuit would reduce the high frequency output and might be evident by loss of oil from the metal case. If in doubt as to condition of the capacitors, have them checked at a radio repair shop. The resistors would show evidence of being cracked if they are defective. Failure in this circuit is rare and would be suspected only as a last resort.

FAILURE OF HIGH FREQUENCY

Check the following when no high frequency is apparent on the welding leads:

- 1. Be sure the switch labeled "high frequency" is in the "ON" position, (either start or continuous).
- 2. Be sure the spark gaps are set between the allowable limits, .003 to .010 inches.
- 3. Check for broken leads to the high voltage transformer.
- 4. Check for voltage across terminals to which primary of the high voltage transformer is connected. Voltage at this point and not at transformer terminals would indicate a defective High Frequency Switch.
- 5. Check capacitors for failure. (Have them tested at a local radio repair shop.)
- 6. Check by-pass circuit for defective capacitor or resistor.

TROUBLE SHOOTING		
TROUBLE	POSSIBLE CAUSE	REMEDY
Control of welding current with Start Adjustment Control only. High Frequency remains on when H.F. Switch is in "START" position.	CR1 relay remains energized after arc begins.	Examine CR1 relay. May be necessary to adjust R2 resistor. See paragraph 23.c Page 21.
Changing position of Start Adjustment Control does not affect starting current. High frequency does not turn on when switch is in "START" position.	CR1 relay does not p.u. when welding machine is turned on and no arc is established.	May be necessary to adjust R2 resistor to increase voltage applied to CR1. See paragraph 23.c Page 21.
	Start Control Switch in OUT position.	Place Start Control Switch in IN position if starting current is desired.

TROUBLE SHOOTING - Continued

TROUBLE	POSSIBLE CAUSE	REMEDY
Welding current very low - increasing Weld Current Control setting does not increase welding current.	Blown 10 ampere control circuit fuse - upper left hand side of welding machine control panel.	Replace if defective.
	Amperage Control Switch in the Remote position with no remote amperage control connected to receptacle.	Either place Amperage Control Switch in the Standard position or connect a remote amperage control to the Remote Amperage Control Receptacle.
	Using remote amperage control with Weld Current Control on machine turned to minimum.	Increase the setting of the Weld Current Control on the machine.
Welding current low - Weld Current Control does not control current.	Low line voltage.	Check line voltage - if low, Check with Power Company to determine cause.
	Use of welding cable which is too long or too small for the welding current employed.	See Table II for cable size requirement for current used.
	Loose connection to workpiece or in welding cable connection.	Check all secondary welding connections.
Machine delivering welding amperage more or less than marked on nameplate.	Operating welding machine on incorrect line voltage.	Check jumper links on primary line voltage connections, See Figure 5.
Lack of high frequency, difficulty in establishing arc.	Spacing of spark gaps has increased.	Set spark gap points .008" to .010".
	Use of tungsten larger than recommended for welding amperage involved.	See Table III for proper size tungsten.
	Dissipation of high frequency from electrode holder lead.	Make certain electrode holder cable is not in close proximity to any grounded metal.
	High Frequency Intensity Control setting too low.	Increase setting of High Frequency Intensity Control.
Wandering arc - poor control of direction of arc.	Use of tungsten considerably larger than recommended.	Refer to tungsten size in Table III.
Tungsten electrode oxidizing and not remaining bright after conclusion of weld.	Water lead in electrode holder.	Refer to torch parts list for parts or parts requiring replacement.
	Loose gas fittings on regulator or gas line. This will siphon oxygen into the weld zone.	Check all gas fittings and tighten.
	Insufficient gas flow.	Include gas flow setting.
	Drafts blowing gas shield away from tungsten.	Shield weld zone from drafts.
	Dirty filler rod or material.	Use clean filler rod or material.
	Gas shutting off too quickly after end of weld.	Increase time delay setting of Post Flow Gas and Water Valve Timer.
	Insufficient high frequency.	Increase setting of High Frequency Intensity Control.
Power switch on and you have no weld current and fan motor is not running.	F2 fuse blown.	Replace if defective.
High frequency unit has no power.	F3 fuse blown.	Replace if defective.

OPTIONAL EQUIPMENT

REMOTE CONTROLS

- RFS-2 - For Contactor Control - Remote maintained contact foot switch with two prong twistlock plug and cable.
- RHS-2 - For Contactor Control - Remote momentary contact hand switch which can be clamped to the electrode holder with two prong twistlock plug and cable.
- RHS-21 - For Contactor Control - Remote maintained contact hand switch for "A" panel operation.
- RFC-3 - For Weld-Current Control - Remote foot control for welding current only. With three prong twistlock plug, all with cable.
- RFC-3A - For Weld Current Control - Remote foot control for welding current only. With three prong twistlock plug and cable.
- RFC-23A - For Contactor and Weld Current Control - Remote foot control for welding current and contactor

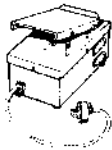
- control complete with both a two and a three prong twistlock plug and with cable.
- RMC-23 - For Contactor and Weld Current Control - Remote motor control for welding current, contactor and current slope control. Complete with both a two and a three prong twistlock plug, a two prong straight

RUNNING GEAR

- No. 1 Running Gear - with four 8" steel wheels and towing handle. Carries welding machine only.
- No. 2 Running Gear - same as No. 1 except 8" rubber tired wheels in place of steel.
- No. 3 Running Gear - has 3 pneumatic rubber tired wheels 16 inches in diameter. Will carry welding machine, gas cylinder and water coolant system.

WATER COOLANT SYSTEMS

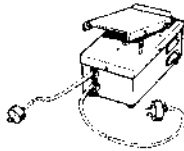
- 115/230 volt 60 cycle ac, 10 gallon capacity.
- 115/230 volt 60 cycle ac, 40 gallon capacity.



RFC-3A REMOTE FOOT AMPERAGE CONTROL



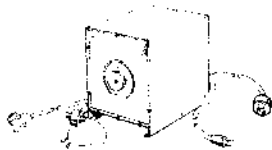
RFC-3 REMOTE HAND AMPERAGE CONTROL



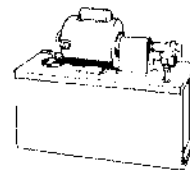
RFC-23A REMOTE FOOT AMPERAGE AND CONTACTOR CONTROL



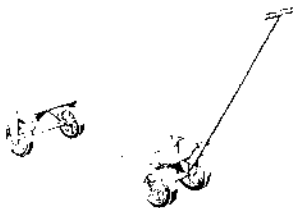
RFS-2 REMOTE FOOT SWITCH



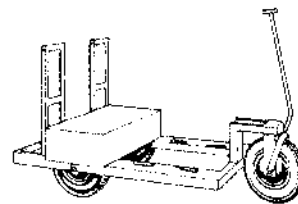
RMC-23 REMOTE MOTOR OPERATED AMPERAGE AND CONTACTOR CONTROL



WATER COOLANT SYSTEM



NO. 2 RUNNING GEAR



NO. 3 RUNNING GEAR

FIGURE 16 - OPTIONAL EQUIPMENT

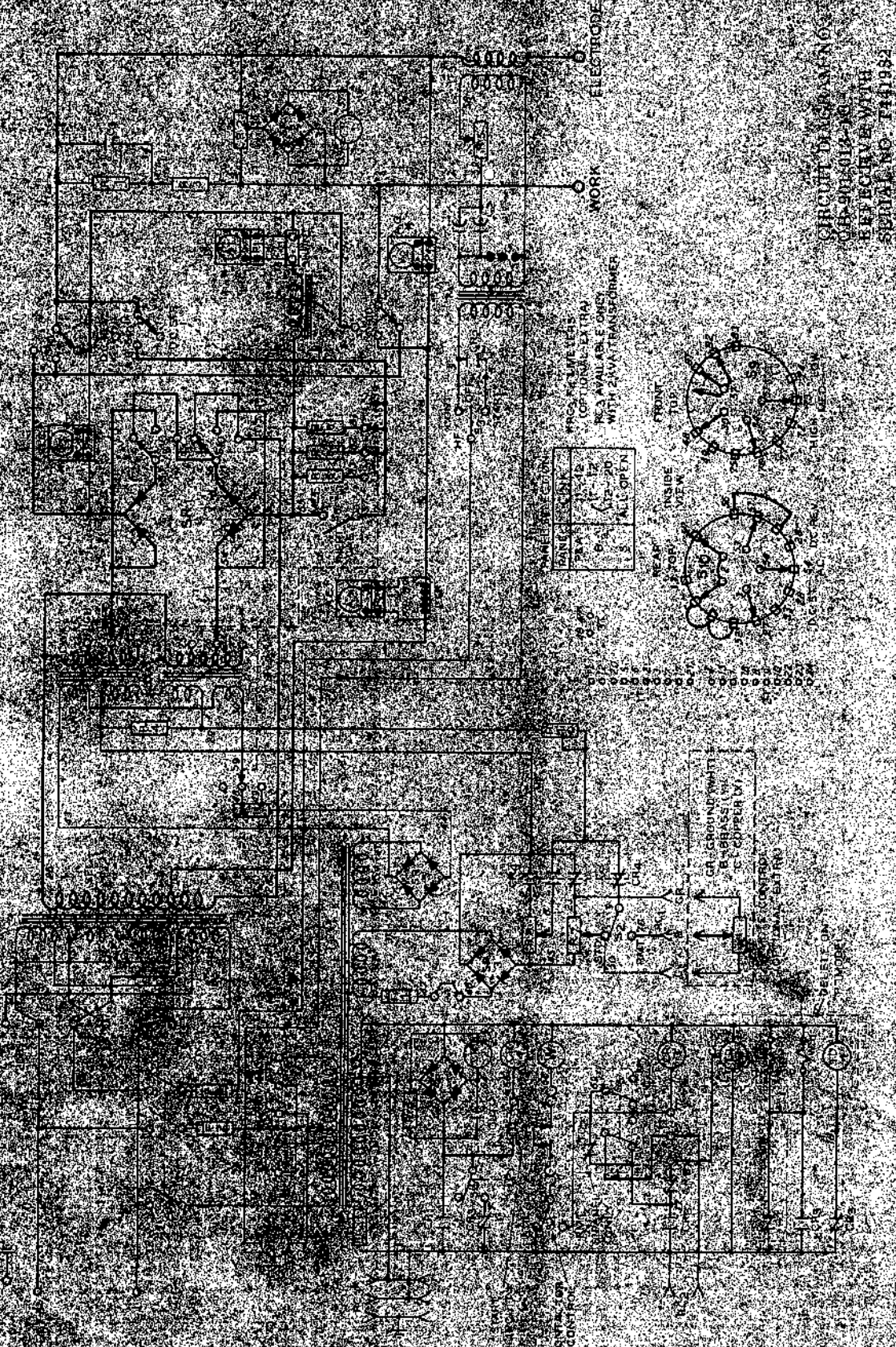
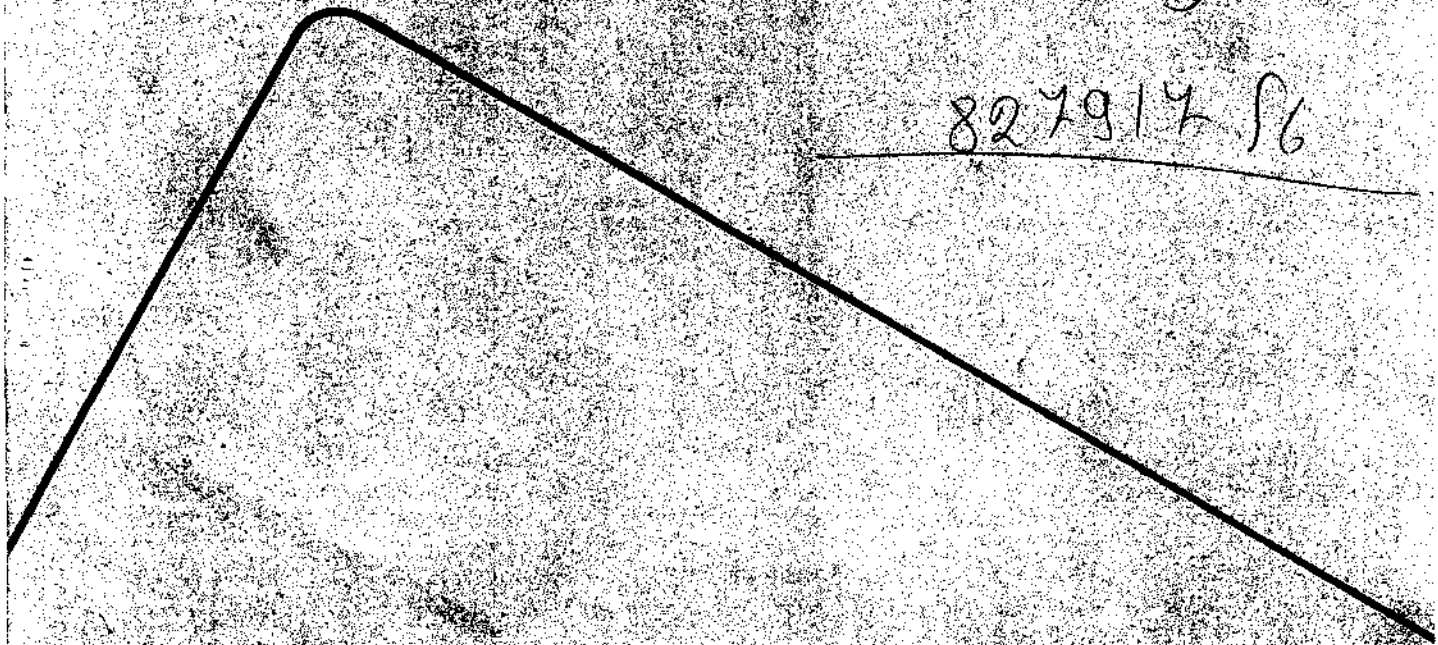


FIGURE 17 - CIRCUIT DIAGRAM

0.00 1.32

827917 S6



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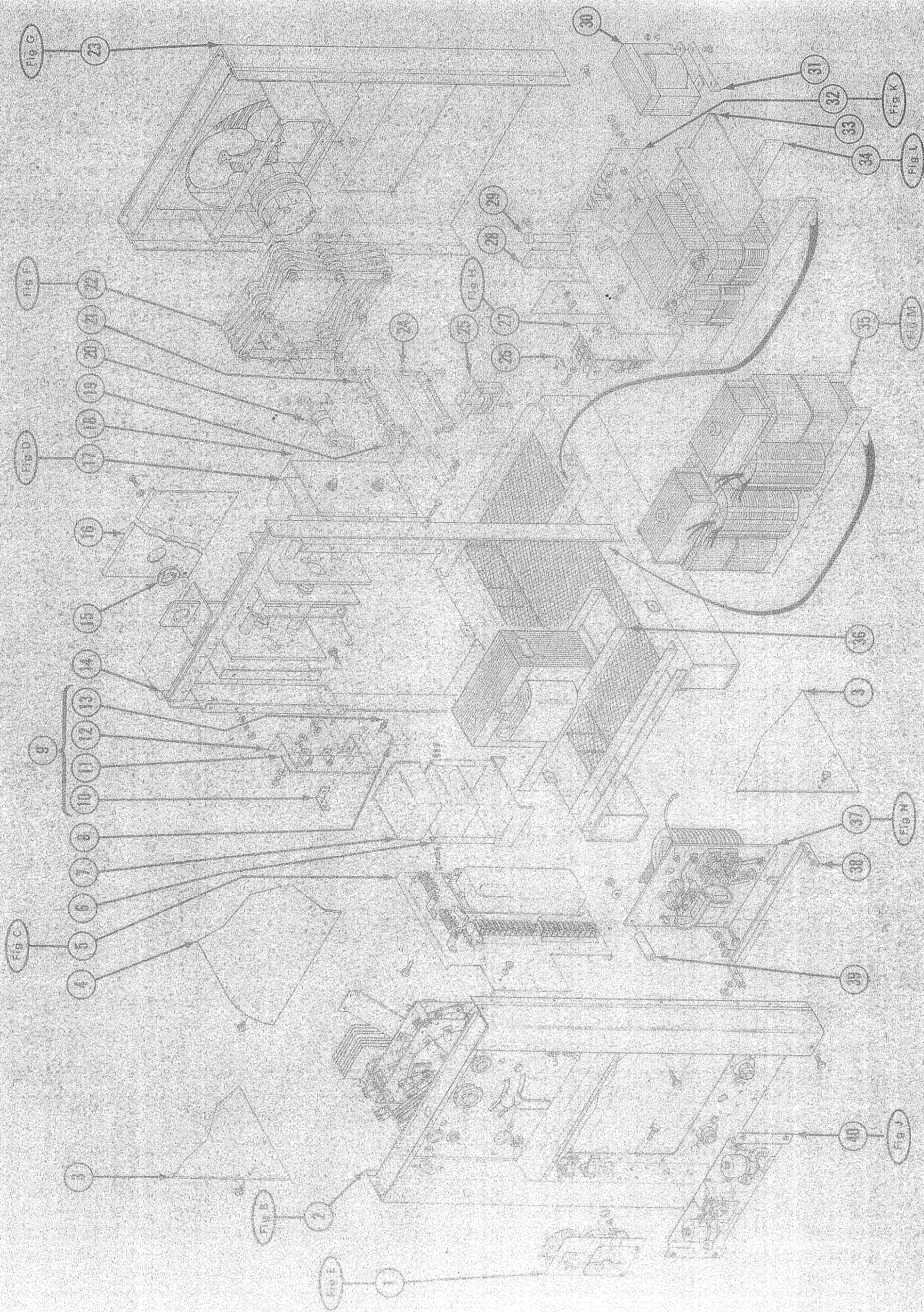


Figure A - Main Assembly

200 Ampere Model Effective with serial No. 71-562075
 300 Ampere Model Effective with serial No. 71-560696

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity					
				200 Ampere Models			300 Ampere Models		
				Power Factor Only	A/B Panel	Spot Timer	Power Factor Only	A/B Panel	Spot Timer
Figure A				Main Assembly					
	1		SPOT TIMER & RHEOSTAT ASS'Y (See Page 10)		1	1		1	1
	2		PANEL ASS'Y, front (See Page 4)	1	1	1	1	1	1
	1377-3066	3	PANEL, side	2	2	2	2	2	2
	1377-3062	4	COVER	1	1	1	1	1	1
	1377-2375	5	PANEL ASSEMBLY, control (See Fig. C Page 9)	1	1	1	1	1	1
	1377-8175	6	BRACKET, mtg - capacitor	1	1	1	1	1	1
	††1377-8399	6	BASE, mtg - capacitor	1	1	1	1	1	1
	††1377-8403		BRACKET, mtg - capacitor	1	1	1			
	††1377-8402		BRACKET, mtg - capacitor				1	1	1
	1377-3617	7	C1 CAPACITOR, 30 mfd 440 volt	1	1	1	2	2	2
	††1377-8404	7	C1 CAPACITOR, 30 mfd 440 volt	1	1	1	2	2	2
	1377-2044	8	R4 RESISTOR, 10K ohm 10 watt	1	1	1	1	1	1
	1377-8174	9	BOARD ASS'Y, resistor (consisting of)	1	1	1	1	1	1
	1377-8154	10	. BUS	3	3	3	3	3	3
	1377-8173	11	. BOARD	1	1	1	1	1	1
	1377-8148	12	. BRACKET, mtg	2	2	2	2	2	2
	1377-4769	13	. SCREW, 1/4-20 x 1-1/2	3	3	3	3	3	3
	1377-6184	14	BASE	1	1	1	1	1	1
	1377-7645	15	BUSHING, snap 1-3/4" hole	1	1	1	1	1	1
	1377-5976	16	BAFFLE, air - vertical	1	1	1	1	1	1
	1377-8077	17	SR1 RECTIFIER ASS'Y (See Fig. D Page 10)	1	1	1			
	1377-8076	17	SR1 RECTIFIER ASS'Y (See Fig. D Page 10)				1	1	1
	1377-5977	18	BAFFLE, air - horizontal	1	1	1			
	1377-6577	18	BAFFLE, air - horizontal				1	1	1
	1377-7350	19	BUSHING, snap 7/8" hole	1	1	1	1	1	1
	1377-3251	20	R10 RESISTOR, 4 ohm 50 watt adj	1	1	1	1	1	1
	1377-3252	21	R11 RESISTOR, 5 ohm 100 watt adj	1	1	1	1	1	1
	1377-2525	22	R6 RESISTOR ASS'Y, balancing (See Fig. F Page 11)	1	1	1			
	1377-2526	22	R6 RESISTOR ASS'Y, balancing (See Fig. F Page 11)				1	1	1
		23	PANEL ASS'Y, rear (See Page 11)	1	1	1	1	1	1
	1377-8066	24	R12 RESISTOR, 100 ohm 100 watt	1	1	1	1	1	1
	1377-6667	25	CT1 TRANSFORMER, current 200/5	1	1	1	1	1	1
	1377-8059	26	LINK, jumper (Allen Bradley contactor) or						
	1377-8078	26	LINK, jumper (Furnas contactor)	4	4	4	4	4	4
	1377-3892	27	W CONTACTOR, Allen Bradley or						
	1377-7127	27	W CONTACTOR, Furnas (See Fig. H Page 12)	1	1	1	1	1	1
	1377-3977	28	FUSEHOLDER, cartridge	1	1	1	1	1	1
	*1377-3978	29	F2 FUSE, cartridge 6 ampere	1	1	1	1	1	1
	1377-3247	30	T2 TRANSFORMER, control 1/2 kva	1	1	1	1	1	1
	†1377-4341	30	T2 TRANSFORMER, control 2 kva	1	1	1	1	1	1
	1377-8176	31	BRACKET, mtg - control xfmr	2	2	2	2	2	2
	1377-8407	32	TE1 TERMINAL BOARD ASS'Y, pri (See Fig. K Page 13)	1	1	1	1	1	1
	1377-8143	33	BAFFLE, mtg - contactor	1	1	1	1	1	1
	**1377-8060	34	T1 TRANSFORMER ASS'Y, main (See Fig. L Page 14)	1	1	1			
	**1377-8061	34	T1 TRANSFORMER ASS'Y, main (See Fig. L Page 14)				1	1	1
	**1377-8062	35	MA1 AMPLIFIER ASS'Y, magnetic (See Fig. M Page 15)	1	1	1			
	**1377-8063	35	MA1 AMPLIFIER ASS'Y, magnetic (See Fig. M Page 15)				1	1	1
	1377-8155	36	Z STABILIZER	1	1	1	1	1	1
	1377-8156	36	Z STABILIZER				1	1	1
	1377-8058	37	BOARD ASS'Y, high frequency (See Fig. N Page 16)	1	1	1	1	1	1
	1377-5947	38	BRACKET, mtg - high frequency	1	1	1	1	1	1
	1377-5622	39	SPACER, mtg - high frequency	2	2	2	2	2	2

						Quantity			
						200 Ampere Models		300 Ampere Models	
Airco Stock No.	Item No.	Dia. Mkgs.	Description	Power Factor Only	A/B Panel	Spot Timer	Power Factor Only	A/B Panel	Spot Timer

Figure A			Main Assembly (Continued)						
1377-7644	40		PANEL ASS'Y, start control (See Fig. J Page 13)	1			1		
1377-7077	40		PANEL ASS'Y, gas & water (See Fig. J Page 13)		1	1		1	1
1377-7341			SWITCH ASSEMBLY, N. O.	1	1	1	1	1	1
1377-5805			SWITCH ASSEMBLY, maintained	1	1	1	1	1	1
1377-6673			CAP, twistlock - 2 wire	1	1	1	1	1	1
†1377-6101		RC3	RECEPTACLE, duplex 115 volt	1	1	1	1	1	1
★†1377-3694		F4	FUSE, plug type 15 ampere	1	1	1	1	1	1

*Recommended Spare Parts **Replace at Factory or authorized service station.
†Optional Equipment
††These items are effective with serial No. 71-598508
★When welding machine is ordered with a 2 KVA control transformer, this fuse replaces F4 fuse.
BE SURE TO PROVIDE STOCK, MODEL, AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.

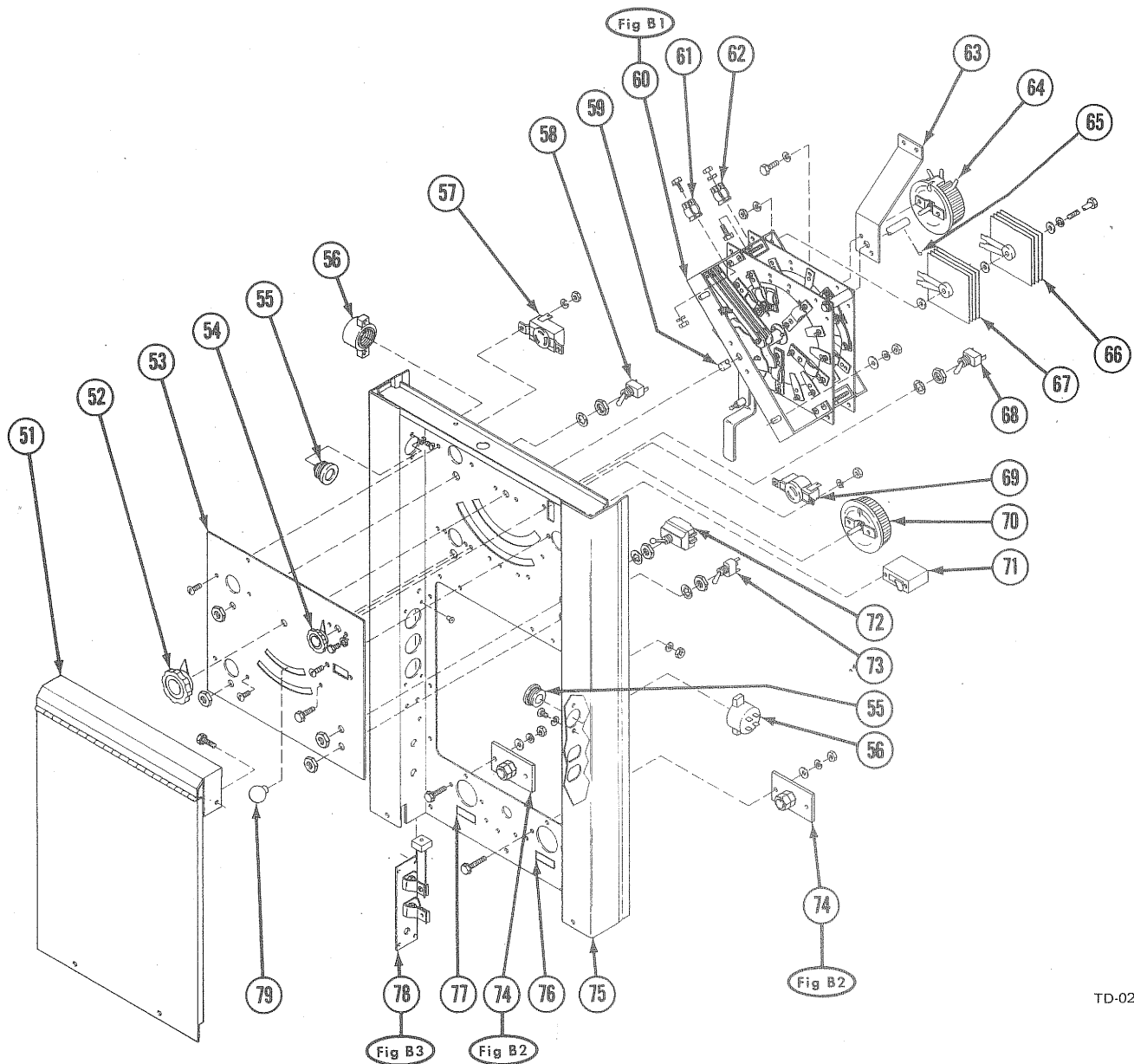


Figure B - Panel Assembly, Front

TD-022 517

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity Models	
				200 Amp	300 Amp
	Figure B		Panel Assembly, Front (See Fig. A Page 2 Item 2)		
1377-5955	51		DOOR, access	1	1
1377-2497	52		KNOB, pointer - large	1	1
	53		NAMEPLATE (order by stock, model and serial No.) . . .	1	1
1377-4442	54		KNOB, pointer - small	1	1
*1377-3287	55	F1,4	FUSE, plug type 10 ampere	2	2
1377-5555			LABEL, fuse 10 ampere	2	2
1377-3308	56		FUSEHOLDER, plug type	2	2
1377-3993	57	RC1	RECEPTACLE, twistlock 3 wire	1	1
1377-2436	58	S2	SWITCH, toggle SPDT	1	1
1377-3866	59		SHAFT, rheostat	1	1
1377-3248	60		SWITCH ASS'Y, range & selector (See Fig. B1 Page 5) . .	1	1
1377-4595	61		HANGER, minerallic No. 1	1	
1377-5964	61		HANGER, minerallic No. 2		1
1377-5964	62		HANGER, minerallic No. 2	1	1
1377-3874	63		BRACKET, support - switch	1	1
1377-7074	64	R7	RHEOSTAT, 15 ohm 150 watt	1	1
1377-8181	65		PIN, cotter 3/32 x 1/2"	1	1
1377-3250	66	SR5	RECTIFIER, control	1	1
*1377-2748	67	SR3	RECTIFIER, control	1	1
1377-3231	68	S4	SWITCH, toggle DPDT	1	1
1377-2145	69	RC2	RECEPTACLE, twistlock 2 wire	1	1
1377-3844	70	R8	RHEOSTAT, 15 ohm 150 watt	1	1
1377-8057	71	CB	BREAKER, circuit 5 ampere 250 volt	1	1
*1377-4263	72	S1	SWITCH, toggle 3PST	1	1
1377-2359	73	S3	SWITCH, toggle - center off SPDT	1	1
1377-3845	74		TERMINAL BOARD ASS'Y, sec (See Fig. B2 Page 8)	2	2
1377-8182	75		PANEL, front	1	1
1377-5654	76		LABEL, "Electrode"	1	1
1377-5953	77		LABEL, "Work"	1	1
1377-4275	78	S6	SWITCH ASS'Y, tig - metallic (See Fig. B3 Page 8)	1	1
1377-3237	79		KNOB, round	1	1
1377-8397			NUT, speed	4	4

*Recommended Spare Parts

BE SURE TO PROVIDE STOCK, MODEL, AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity
1377-3248	Figure B1		Switch Assembly, Range & Selector (See Fig. B Page 4 Item 60)	
1377-2837	91		BRACKET, mtg - switch (consisting of)	1
1377-3414	92		. SPRING	2
1377-3875	93		HANDLE, switch - selector	1
1377-3048	94		HANDLE, switch - range	1
1377-3249	95	S9	PLATE ASSEMBLY, range (See Fig. B1A Page 6)	1
1377-3871	96		SPACER, 1 x 2 x 2" w/extra 17/64" hole	1
1377-4422	97		SPACER, round - plate	2
1377-3873	98		SHAFT, switch control	1
1377-3042	99	S10	PLATE ASSEMBLY, selector (See Fig. B1B Page 7)	1
1377-3872	100		BRACKET, support - rear	1
1377-3581	101		SPACER, 1 x 2 x 2"	1

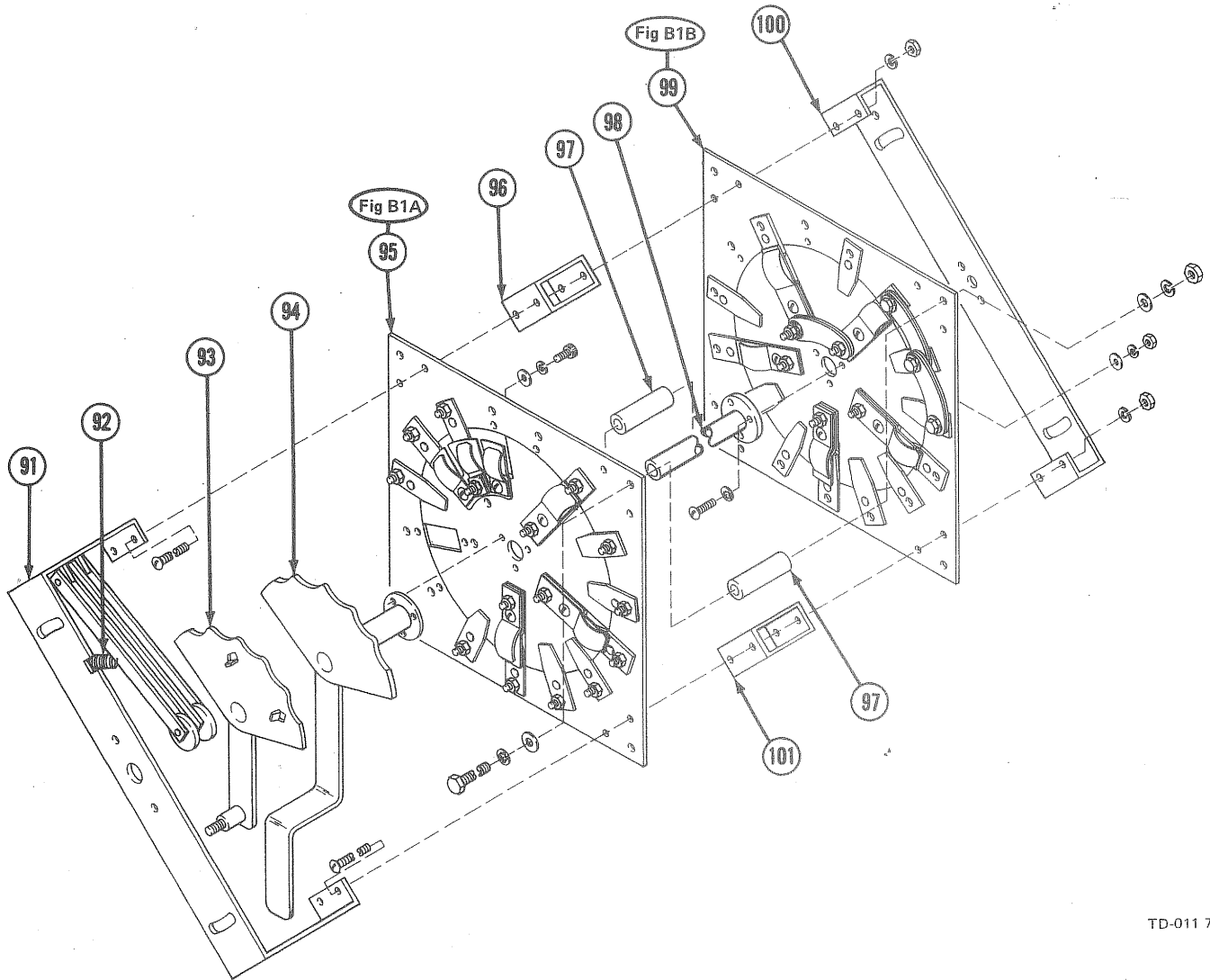
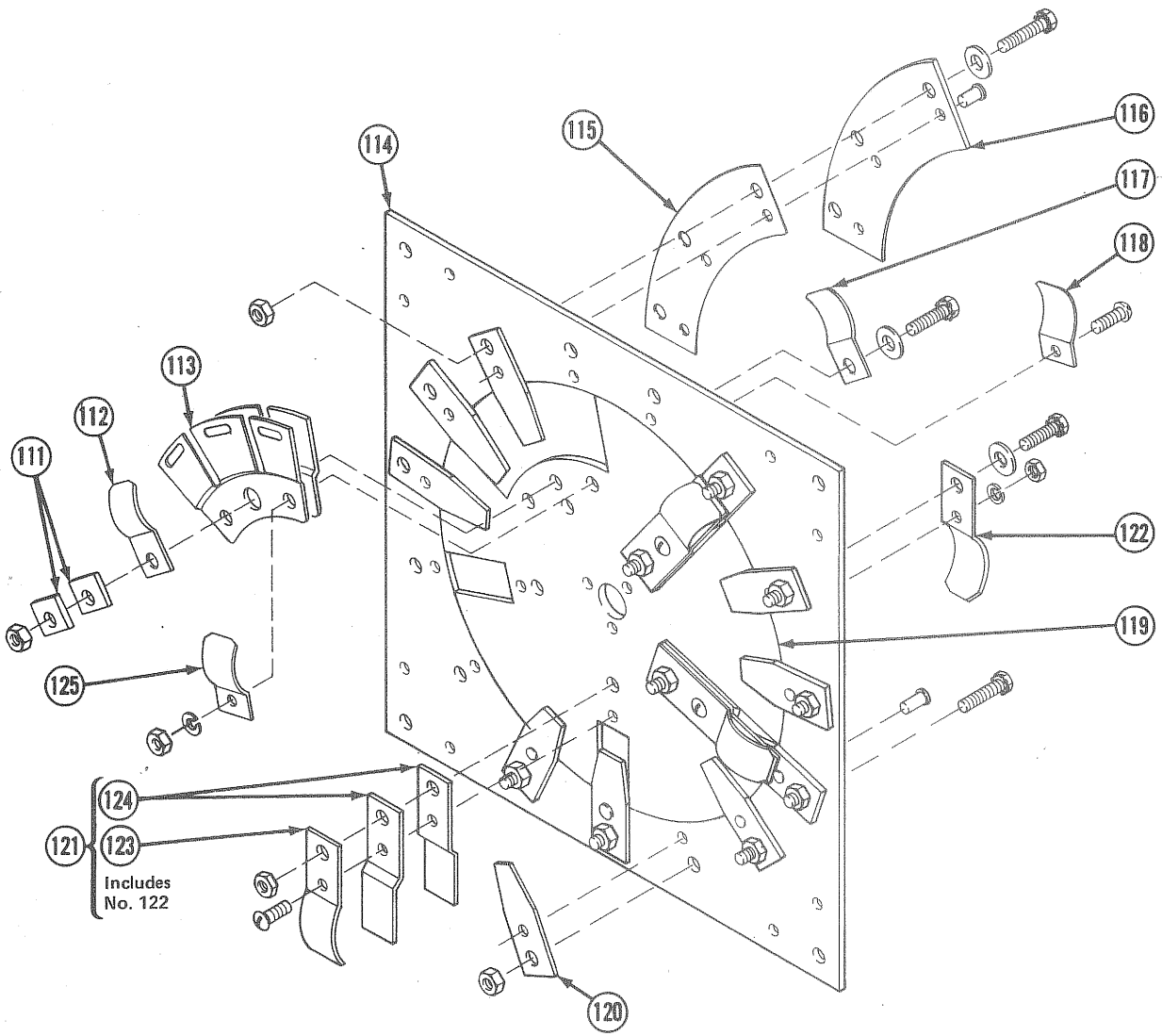


Figure B1 - Switch Assembly, Range & Selector

TD-011 726

BE SURE TO PROVIDE STOCK, MODEL, AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity
1377-3249	Figure B1A		Plate Assembly, Range (See Fig. B1 Page 5 Item 95)	
1377-7485	111		SPACER, copper	2
1377-7674	112		SPRING, pressure - center front	1
1377-7675	113		CONTACT, 3 segment	2
1377-6739	114		BOARD, mtg - components	1
1377-6738	115		SHIM, guide - rotor	As Req'd
1377-6737	116		GUIDE, rotor	3
1377-7673	117		SPRING, pressure - center rear	1
1377-7438	118		SPRING, pressure -rear	2
1377-7676	119		ROTOR, mtg - components	1
1377-3729	120		CONTACT, copper - stationary	11
1377-3730	121		CONTACT ASSEMBLY, movable (consisting of)	3
1377-6746	122		. SPRING, pressure - rear	1
1377-6748	123		. SPRING, pressure - front	1
1377-6747	124		. CONTACT, copper - movable	2
1377-7672	125		SPRING, pressure - front	2

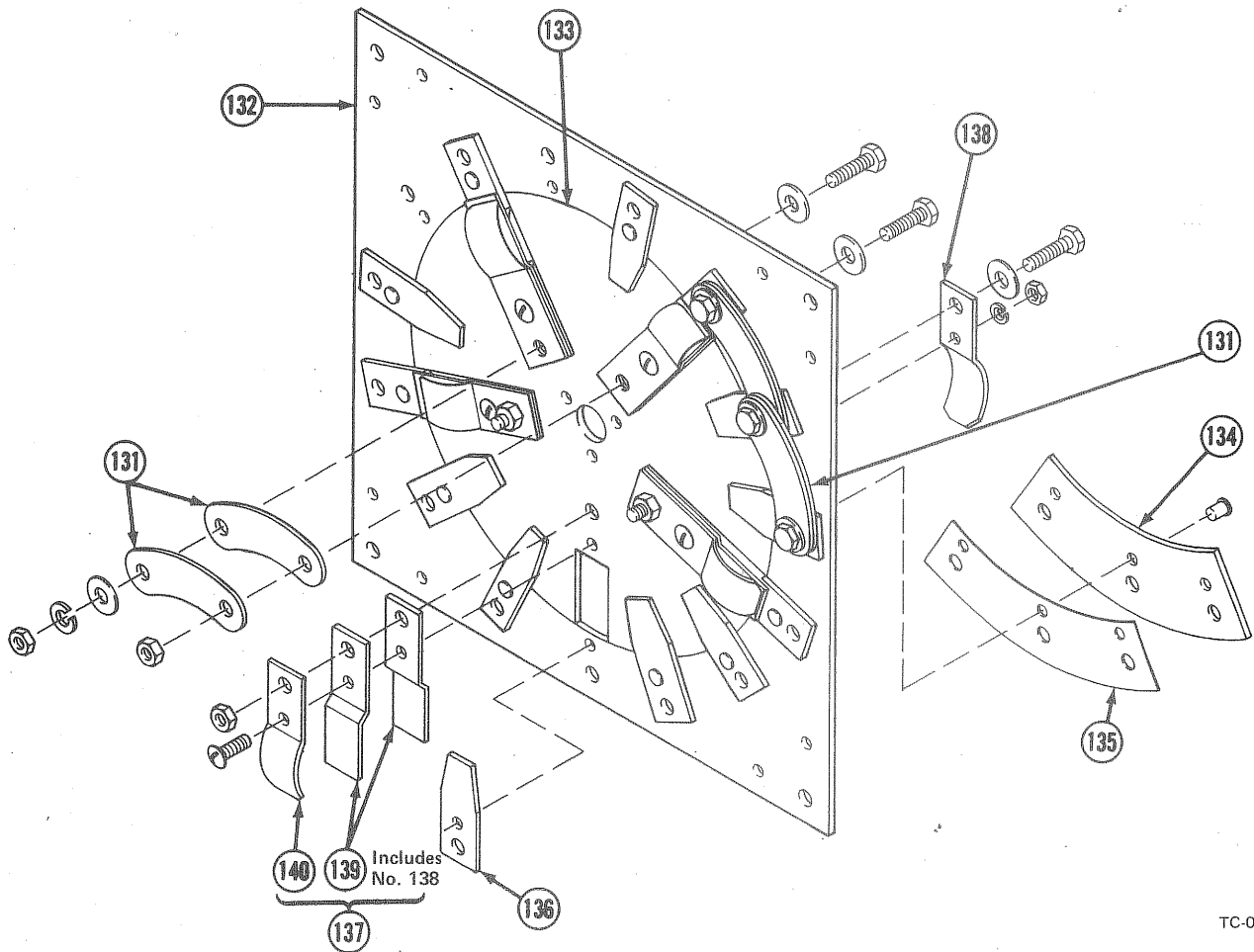


TC-011 635

Figure B1A - Plate Assembly, Range

BE SURE TO PROVIDE STOCK, MODEL, AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity
1377-3042	Figure B1B		Plate Assembly, Selector (See Fig. B1 Page 5 Item 99)	
1377-7360	131		BAR, shorting	6
1377-6739	132		BOARD, mtg - components	1
1377-6759	133		ROTOR, mtg - components	1
1377-6737	134		GUIDE, rotor	3
1377-6738	135		SHIM, guide - rotor	As Req'd
1377-3729	136		CONTACT, copper - stationary	13
1377-3730	137		CONTACT ASSEMBLY, movable (consisting of)	5
1377-6746	138		. SPRING, pressure - rear	1
1377-6747	139		. CONTACT, copper - movable	2
1377-6748	140		. SPRING, pressure - front	1

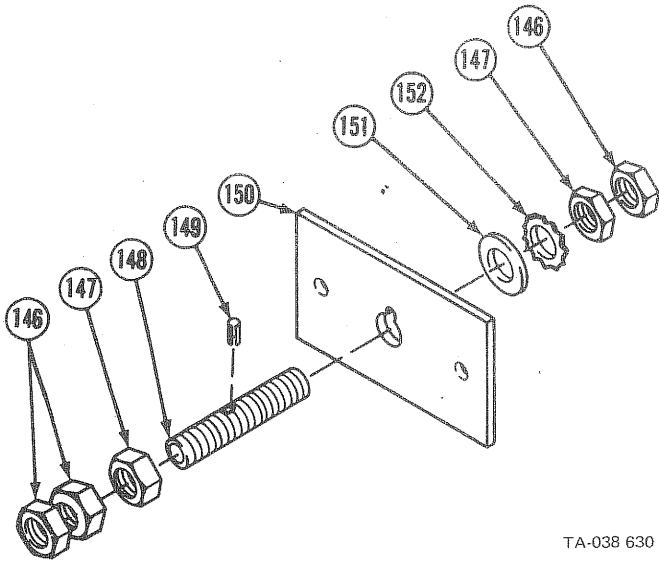


TC-011 604

Figure B1B - Plate Assembly, Selector

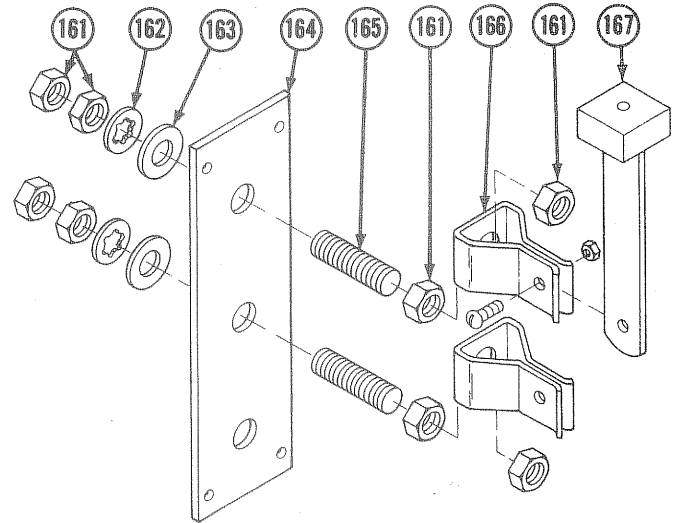
BE SURE TO PROVIDE STOCK, MODEL, AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity
1377-3845	Figure B2		Terminal Board Ass'y, Secondary (See Fig. B Page 4 Item 74)	
1377-5703	146		NUT, hex - brass 1/2-13 full	3
1377-5706	147		NUT, hex - brass 1/2-13 jam	2
1377-5458	148		STUD, brass 1/2-13 x 2-5/8"	1
1377-5228	149		PIN, roll 1/8 x 3/8"	1
1377-2678	150		BOARD, glastic	1
1377-5704	151		WASHER, flat 1/2" S.A.E.	1
1377-5705	152		WASHER, lock - external tooth 1/2"	1



TA-038 630

Figure B2 - Terminal Board Assembly, Secondary



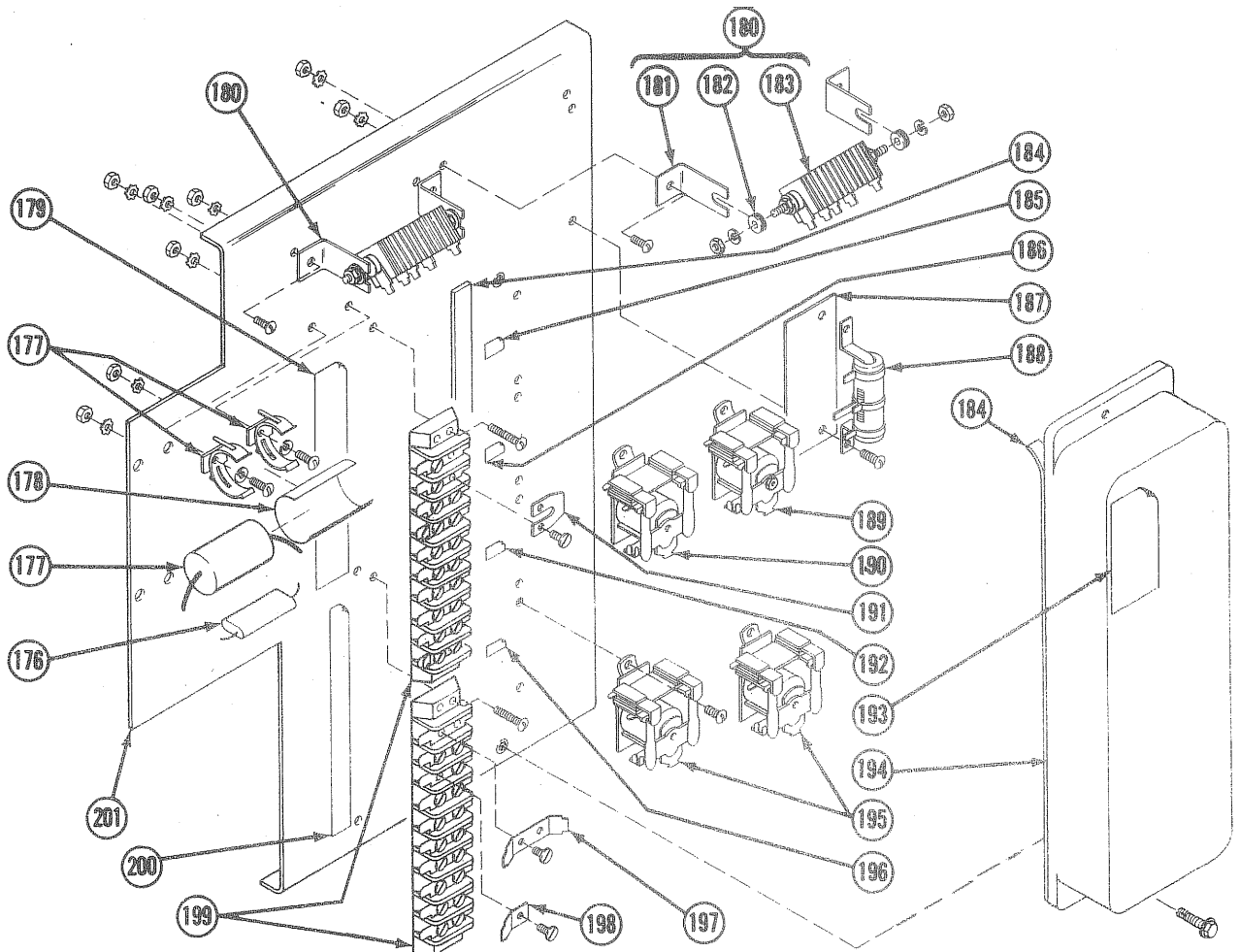
TB-011 787

Figure B3 - Switch Assembly, Tig-Metallic

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity
1377-4275	Figure B3		Switch Assembly, Tig-Metallic (See Fig. B Page 4 Item 78)	
1377-5961	161		NUT, hex - brass 3/8-16 jam	8
1377-5963	162		WASHER, lock - internal tooth 3/8"	2
1377-5764	163		WASHER, flat 3/8" S.A.E.	2
1377-2901	164		BOARD, mtg - components	1
1377-5962	165		STUD, brass 3/8-16 x 1-1/4"	2
1377-4279	166		CLIP, contact blade	2
1377-7173	167		HANDLE	1

BE SURE TO PROVIDE STOCK, MODEL, AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity
1377-2375	Figure C		Panel Assembly, Control (See Fig. A Page 2 Item 5)	
1377-2864	176	R9	RESISTOR, 100 ohm 2 watt	1
1377-3349	177	C4	CAPACITOR, 40 mfd 250 volt	1
1377-8164	178		STRIP, insulating - capacitor	1
1377-5971	179		LABEL	1
*1377-8172	180	SR2,4	RECTIFIER ASSEMBLY (consisting of)	2
1377-6281	181		. BRACKET, mtg	2
1377-5486	182		. WASHER, insulating	2
1377-7568	183		. RECTIFIER	1
1377-5968	184		STRIPPING, weather (order by foot)	4 ft.
1377-4778	185		LABEL, CR1	1
1377-4779	186		LABEL, CR2	1
1377-8163	187		STRIP, insulating - resistor	1
*1377-3000	188	R2	RESISTOR, 1K ohm 25 watt adj.	1
1377-3005	189	CR1	RELAY, 24 volt dc	1
1377-3362	190	CR2	RELAY, 2PDT 110 volt dc	1
1377-2869	191		LINK, jumper - brass	2
1377-5966	192		LABEL, CR3	1
1377-5969	193		LABEL	1
1377-4478	194		COVER, dust	1
1377-2139	195	CR3,4	RELAY, 2PDT 115 volt ac	2
1377-5967	196		LABEL, CR4	1
1377-4586	197		CONNECTOR, 45 degree 2 sides	2
1377-8179	198		CONNECTOR, 1 side	2
1377-3880	199	1,2T	BLOCK, terminal 10 pole	2
1377-5970	200		LABEL	1
1377-7329	201		PANEL, mtg - components	1



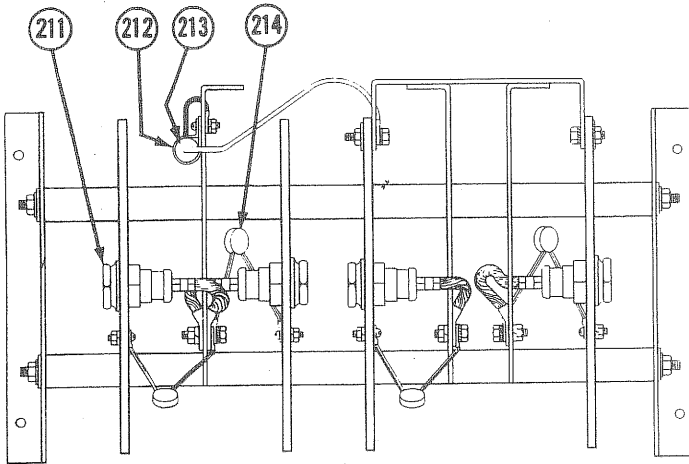
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Figure C - Panel Assembly, Control

*Recommended Spare Parts

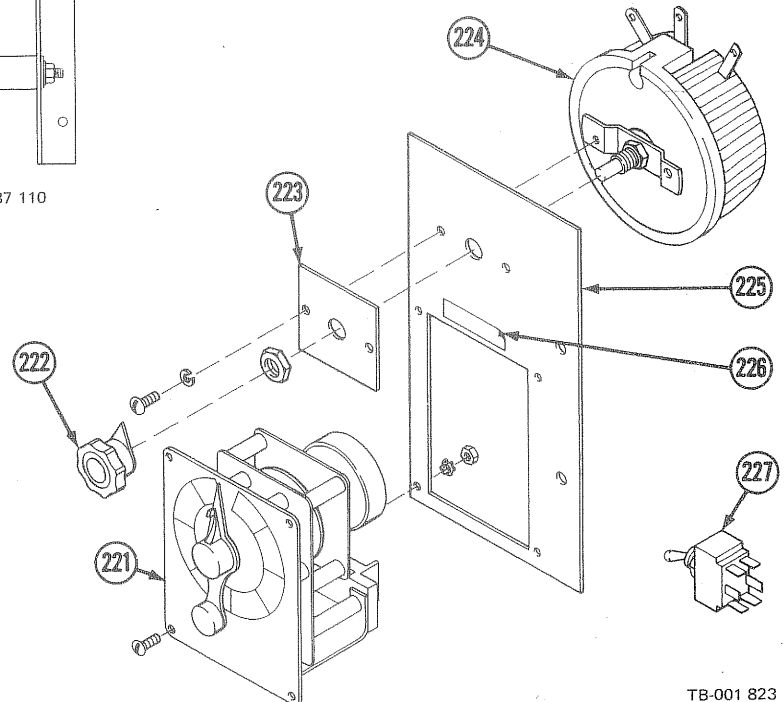
BE SURE TO PROVIDE STOCK, MODEL, AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity Models	
				200 Amp	300 Amp
Figure D			Rectifier Assembly (See Fig. A Page 2 Item 17)	1377- 8076	1377- 8077
1377-5718	211	D1-4	DIODE, 70U30A	4	
1377-6668	211	D1-4	DIODE, IR 66-9390		4
1377-5784	212		CLAMP, mtg - capacitor	1	1
1377-5902	213	C9	CAPACITOR, 0.5 mfd 200 volt dc	1	1
1377-6449	214	C5-8	CAPACITOR ASSEMBLY	4	4



TB-037 110

Figure D - Rectifier Assembly



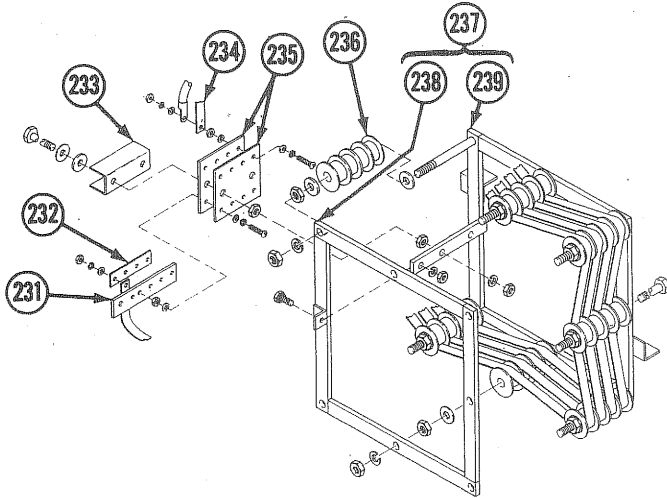
TB-001 823

Figure E - Spot Timer & Rheostat Assembly

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity Models	
				A/B Panel	Spot Panel
Figure E			Spot Timer & Rheostat Assembly (See Fig. A Page 2 Item 1)		
1377-2871	221	TD2	RELAY, time delay 3 second 115 volt		1
1377-8268	222		KNOB, rheostat	1	1
1377-5956	223		PLATE, indicator	1	1
1377-6155	224	R5	RHEOSTAT, 5 ohm 150 watt	1	1
1377-5959	225		STRIP, mtg - components	1	
1377-5958	225		STRIP, mtg - rheostat		1
1377-5957	226		LABEL, "High Frequency"	1	1
1377-3231	227	S5	SWITCH, toggle DPDT		1

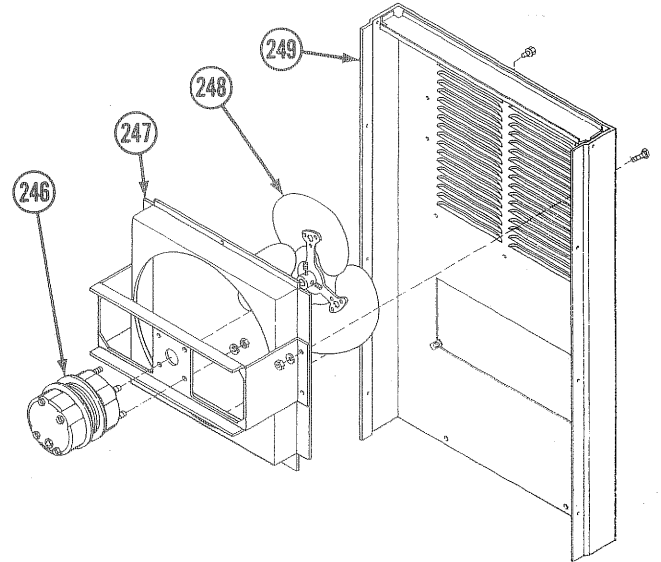
BE SURE TO PROVIDE STOCK, MODEL AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity Models	
				200 Amp	300 Amp
	Figure F		Resistor Assembly, Balancing (See Fig. A Page 2 Item 22)	1377- 2525	1377- 2526
1377-8178	231		BUS, copper 4-3/16" lg.	1	1
1377-8177	232		BUS, copper 2-3/4" lg.	1	1
1377-8183	233		INSULATOR, paper	1	1
*1377-2760	234		BAND, nichrome	3	4
1377-3910	235		BOARD, terminal	2	2
1377-2527	236		INSULATOR, spool	7	7
1377-3911	237		BRACKET ASSEMBLY (consisting of)	1	1
1377-8146	238		. BRACKET, mtg	1	1
1377-8147	239		. FRAME	1	1



TC-030 609

Figure F - Resistor Assembly, Balancing



TC-022 518

Figure G - Panel Assembly, Rear

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity
	Figure G		Panel Assembly, Rear (See Fig. A Page 2 Item 23)	
1377-2076	246	FM	MOTOR, fan (consisting of)	1
*1377-3078			. BEARING	2
1377-7037	247		WINDTUNNEL	1
1377-2075	248		BLADE, fan 60 Hz	1
★1377-3441	248		BLADE, fan 50 Hz	1
1377-8184	249		PANEL, rear	1

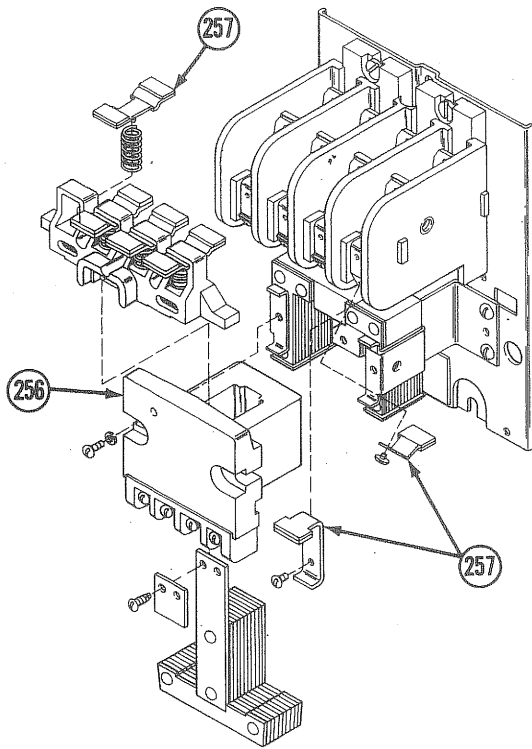
*Recommended Spare Parts

**Replace at Factory or Authorized Service Station

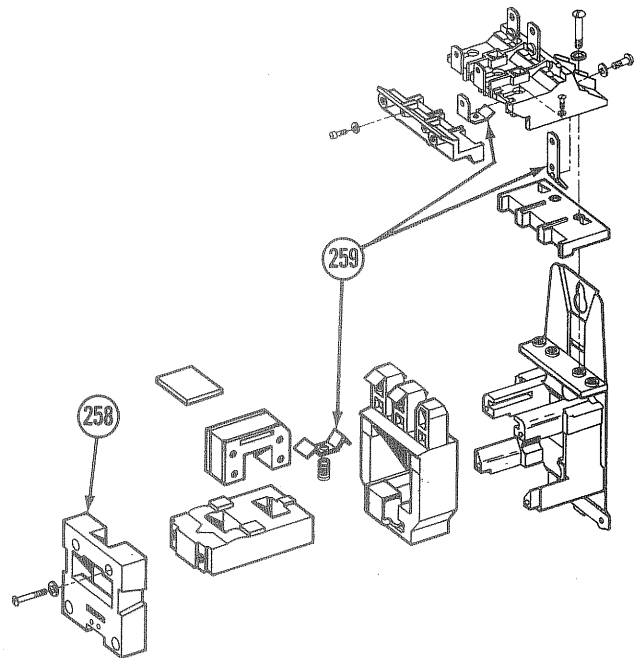
★For 50 Hz models only

BE SURE TO PROVIDE STOCK, MODEL, AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity
	Figure H		Contactor Assembly (See Fig. A Page 2 Item 27)	1377-3892 1377-7127
1377-7126	256		COIL (Furnas)	1
*1377-7128	257		KIT, contact points (Furnas)	4
1377-3901	258		COIL (Allen Bradley)	1
*1377-3748	259		KIT, contact points (Allen Bradley)	1



TB-034 820



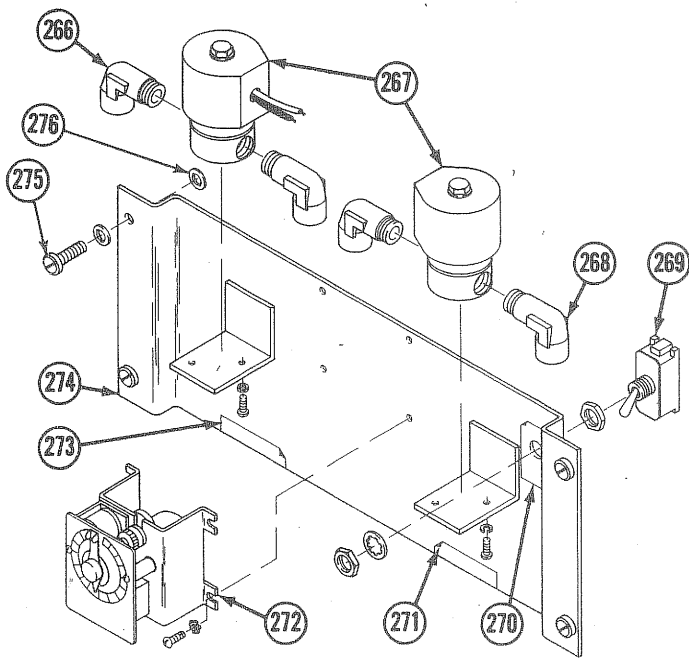
TC-034 653

Figure H - Contactor Assembly

*Recommended Spare Parts

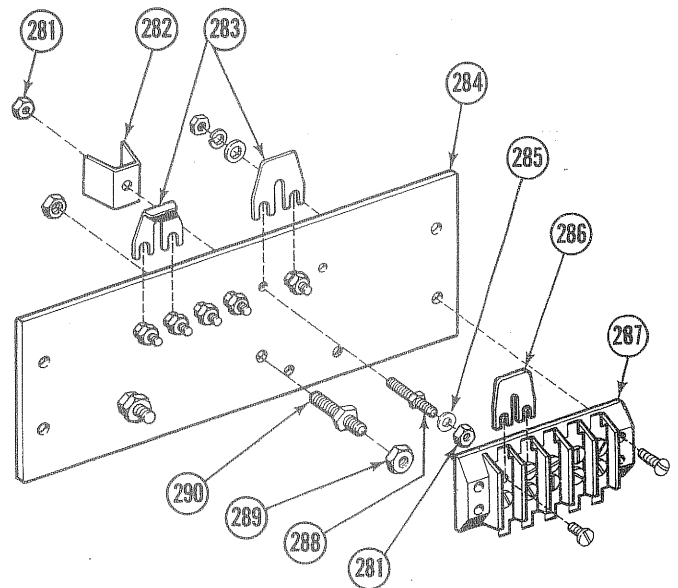
BE SURE TO PROVIDE STOCK, MODEL, AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity Models	
				Power Factor	A/B Panel Spot Timer
	Figure J		Panel Assembly, Gas & Water (See Fig. A Page 2 Item 40)	1377- 7644	1377- 7077
1377-6939	266		ELBOW, street L. H. thread - water		2
1377-2143	267	GS1, WS1	SOLENOID, valve (consisting of)		2
*1377-4760			. COIL		1
1377-6940	268		ELBOW, street R. H. thread - gas		2
1377-2055	269	S7	SWITCH, toggle SPSP	1	
1377-5972	270		LABEL, "start circuit in-out"	1	
1377-5974	271		LABEL, "in-gas-out"		1
*1377-3004	272	TD1	TIMER, 60 second 115 volt or		1
	272	TD1	TIMER, 60 second 115 volt		1
1377-5975	273		LABEL, "in-water-out"		1
1377-3885	274		PANEL, mtg - components	1	1
1377-8396	275		SCREW, No. 2	4	4
1377-8398	276		WASHER, retainer	4	4



TB-018 563

Figure J - Panel Assembly, Gas & Water



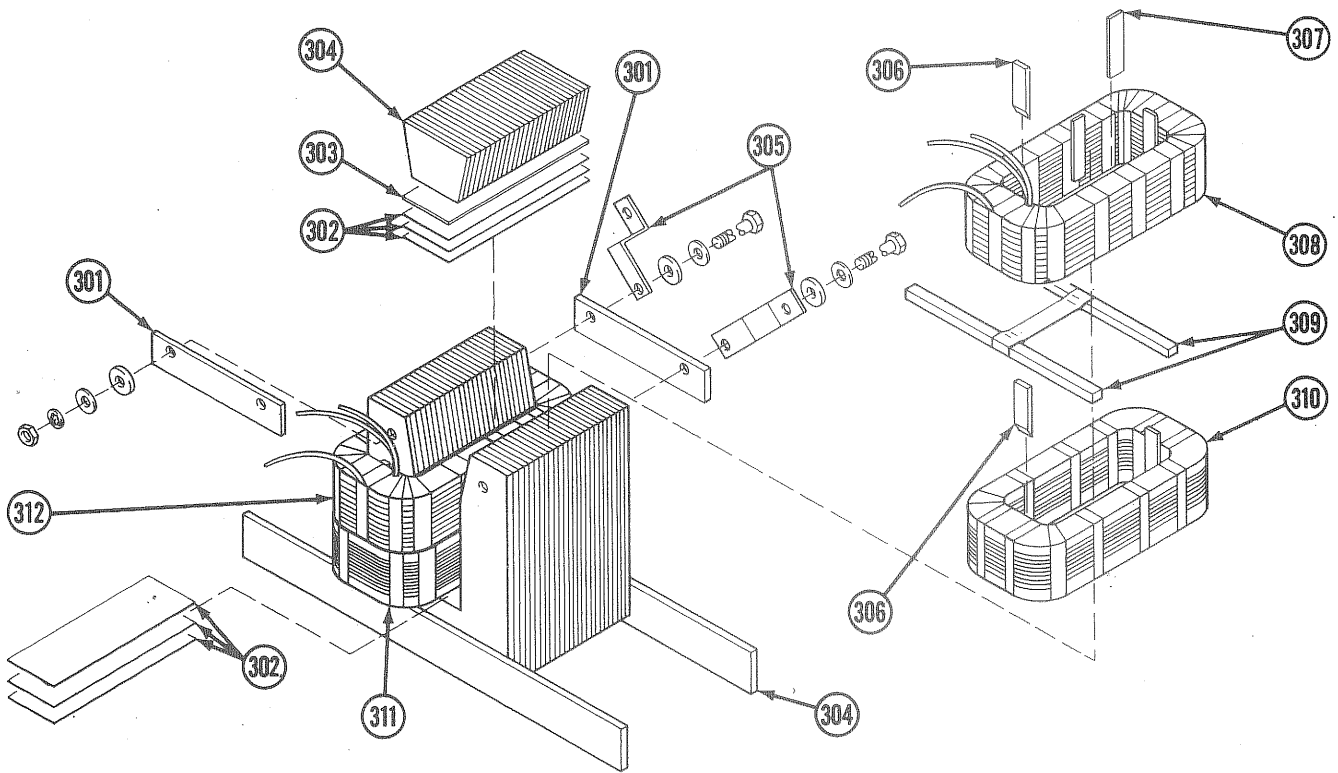
TB-038 442

Figure K - Terminal Board Assembly, Primary

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity
1377-8407	Figure K		Terminal Board Ass'y, primary (See Fig. A Page 2 Item 32)	
1377-5707	281		NUT, hex - brass 10-32	12
1377-4983	282		INSULATION, paper	6
1377-3235	283		LINK, jumper	2
1377-3905	284		BOARD, mtg - components	1
1377-4954	285		WASHER, flat - brass 3/16"	6
1377-2869	286		LINK, jumper - terminal block	1
1377-3382	287	TE2	TERMINAL BLOCK, 5 pole	1
1377-3968	288		STUD, hex collar 10-32 x 1-3/8"	6
1377-5710	289		NUT, hex - brass 1/4-20	4
1377-4985	290		STUD, hex collar 1/4-20 x 1-1/2"	2

BE SURE TO PROVIDE STOCK, MODEL AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.

Airco Stock No.	Item No.	Dia., Mkgs.	Description	Quantity Models	
				200 Amp	300 Amp
	Figure L		Transformer Assembly, Main (See Fig. A Page 2 Item 34)	1377- 8060	1377- 8061
1377-8144	301		BAR, anchor - transformer	2	2
1377-8166	302		INSULATION, 2-1/2 x 8"	7	6
1377-8167	303		INSULATION, fiber 1/16 x 2-1/2 x 7-1/2"		1
**1377-5987	304		CORE	1	
**1377-5988	304		CORE		1
1377-8148	305		BRACKET, mtg - primary board	2	2
★1377-8157	306		WEDGE, wood 3/16 x 1 x 2" or	8	8
★1377-8141	306		WEDGE, wood 1/4 x 1 x 2" or	8	8
★1377-8152	306		WEDGE, wood 5/16 x 1 x 2" or	8	8
★1377-8151	306		WEDGE, wood 3/8 x 1 x 2" or	8	8
★1377-8159	306		WEDGE, wood 7/16 x 1 x 2" or	8	8
★1377-8161	306		WEDGE, wood 1/2 x 1 x 2" or	8	8
1377-8150	307		WEDGE, glastic 1/8 x 5/8 x 2"	2	2
***1377-3211	308		COIL, primary - right hand	1	
***1377-8068	308		COIL, secondary - right hand		1
***1377-8180	309		STRIP, phenolic 1/4 x 3/8 x 10-1/2"	2	2
***1377-8071	310		COIL, secondary	1	
***1377-3213	310		COIL, primary - right hand		1
***1377-8071	311		COIL, secondary	1	
***1377-3214	311		COIL, primary - left hand		1
***1377-3212	312		COIL, primary - left hand	1	
***1377-8067	312		COIL, secondary - left hand		1
1377-8591	TP1		THERMOSTAT ASSEMBLY	1	1



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Figure L - Transformer Assembly, Main

**Replace At Factory Or Authorized Service Station

★Size of the wedge varies with thickness of coils. The 200 Ampere models have the primary coils on top and secondary coils on the bottom the 300 ampere has the secondary coils on top and primary coils on the bottom.

BE SURE TO PROVIDE STOCK, MODEL, AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity Models	
				200 Amp	300 Amp
Figure M			Amplifier Assembly, Magnetic (See Fig. A Page 2 Item 35)	1377- 8062	1377- 8063
★1377-8158	316		WEDGE, wood 3/16 x 1 x 6" or	4	4
★1377-8170	316		WEDGE, wood 1/4 x 1 x 6" or	4	4
★1377-8171	316		WEDGE, wood 5/16 x 1 x 6" or	4	4
★1377-8153	316		WEDGE, wood 3/8 x 1 x 6" or	4	4
★1377-8160	316		WEDGE, wood 7/16 x 1 x 6" or	4	4
★1377-8149	316		WEDGE, wood 1/2 x 1 x 6"	4	4
1377-8168	317		STRIP, fiber .020 x 4-1/2 x 7-1/2"	2	
1377-8169	317		STRIP, fiber .025 x 4-1/2 x 7-1/2"		2
**1377-8075	318		CORE	1	
**1377-5991	318		CORE		1
1377-8165	319		INSULATION, 2-1/2 x 4-7/8"	12	12
★1377-8157	320		WEDGE, wood 3/16 x 1 x 2" or	8	8
★1377-8141	320		WEDGE, wood 1/4 x 1 x 2" or	8	8
★1377-8152	320		WEDGE, wood 5/16 x 1 x 2" or	8	8
★1377-8151	320		WEDGE, wood 3/8 x 1 x 2" or	8	8
★1377-8159	320		WEDGE, wood 7/16 x 1 x 2" or	8	8
★1377-8161	320		WEDGE, wood 1/2 x 1 x 2"	8	8
1377-8162	321		STRIP, glastic 1/8 x 5/8 x 4-1/2"	2	2
**1377-3894	322		COIL, control dc	4	
**1377-3246	322		COIL, control dc		4
**1377-8142	323		STRIP, glastic 1/8 x 1 x 6"	4	4
**1377-8072	324		COIL, control ac right hand	1	
**1377-8069	324		COIL, control ac right hand		1
**1377-8073	325		COIL, control ac left hand	1	
**1377-8070	325		COIL, control ac left hand		1

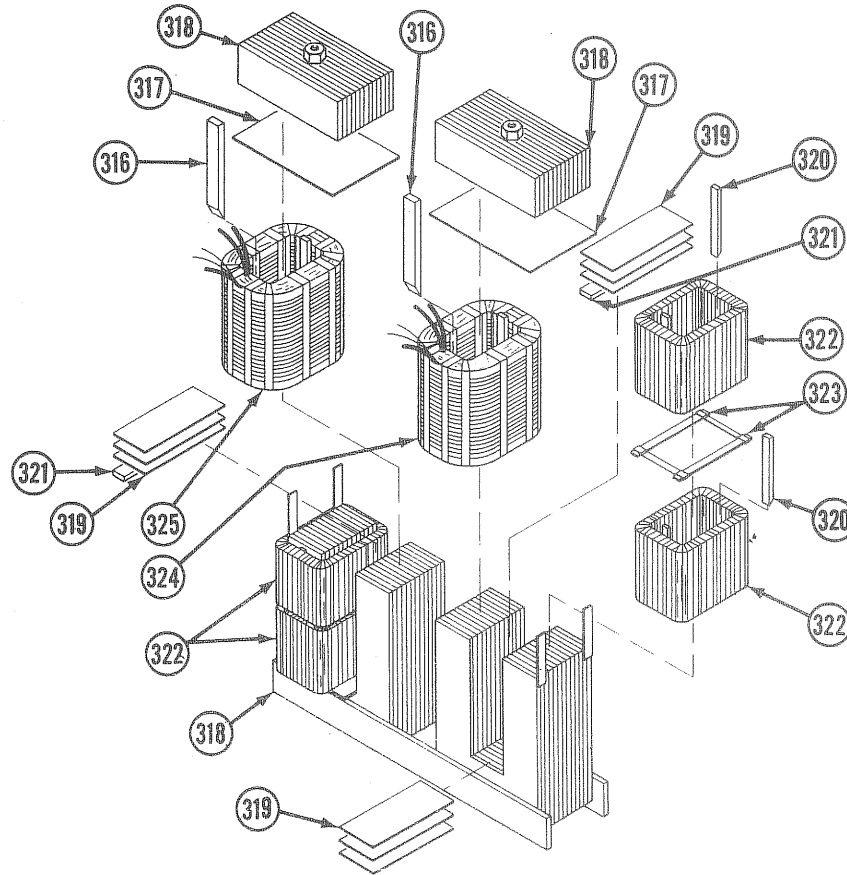


Figure M - Amplifier Assembly, Magnetic

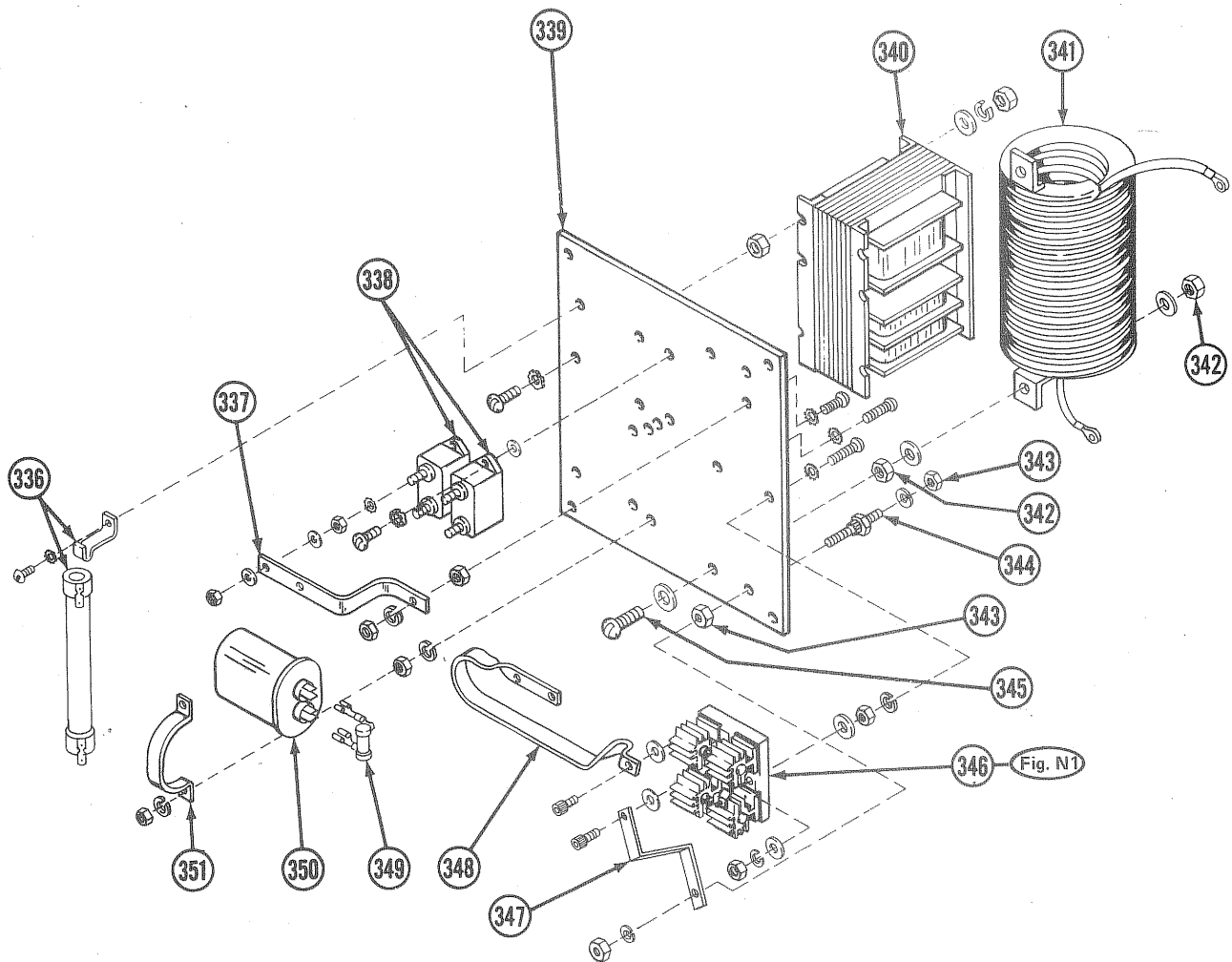
**Replace At Factory Or Authorized Service Station
 ★Size of the wedge varies with the thickness of the coils.

BE SURE TO PROVIDE STOCK, MODEL, AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity
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1377-8058 Figure N Board Assembly, High Frequency (See Fig. A Page 2 Item 37)

1377-2043	336	R3	RESISTOR, 10 ohm 100 watt	1
1377-4772	337		STRAP, bus - copper 6-3/4" lg.	1
*1377-2024	338	C2	CAPACITOR, .002 mfd 6000 volt	2
1377-3133	339		BOARD, mtg - components	1
1377-2039	340	T4	TRANSFORMER, 115 volt	1
1377-4479	341	T3	COIL, coupling - air	1
1377-5763	342		NUT, hex - brass 3/8-16 jam	4
1377-5707	343		NUT, hex - brass 10-32	7
1377-4768	344		SCREW, w/hex collar 10-32 x 1-3/8"	2
1377-6965	345		SCREW, brass - rnd hd 3/8-16 x 1-3/4"	2
1377-4265	346		SPARK GAP ASSEMBLY (See Fig. N1 Page 17)	1
1377-4773	347		STRAP, bus - copper 5-3/8" lg.	1
1377-4771	348		STRAP, bus - copper 8" lg.	1
1377-2044	349	R1	RESISTOR, 10K ohm 10 watt	1
*1377-2025	350	C3	CAPACITOR, 10 mfd 600 volt	1
1377-4598	351		BRACKET, mtg - capacitor	1



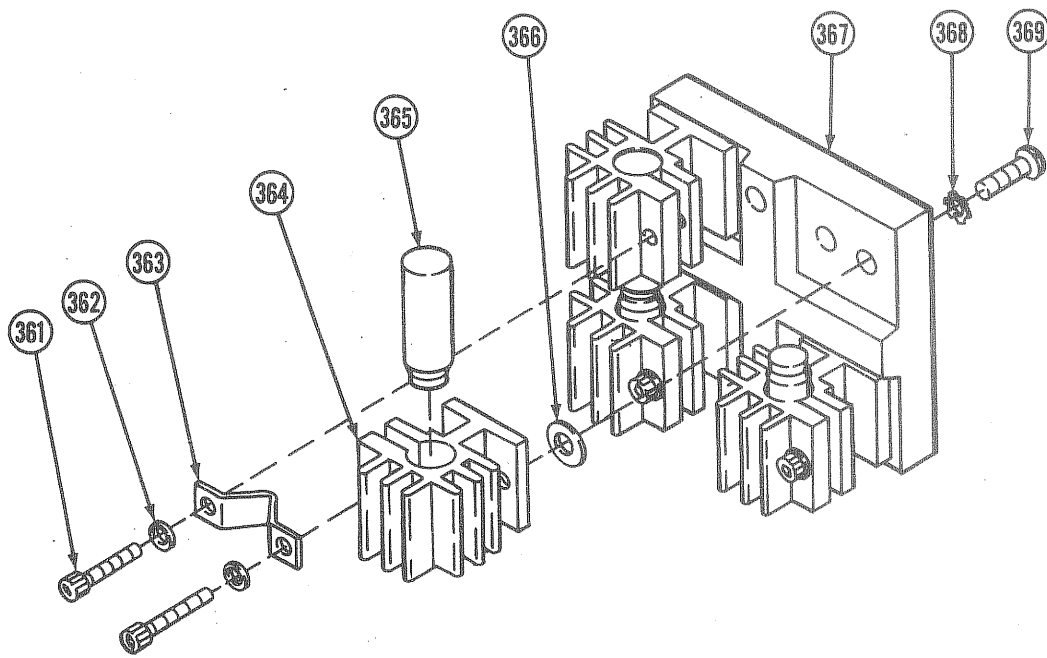
TC-020 612

Figure N - Board Assembly, High Frequency

*Recommended Spare Parts

BE SURE TO PROVIDE STOCK, MODEL, AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.

Airco Stock No.	Item No.	Dia. Mkgs.	Description	Quantity
1377-4265	Figure N1		Spark Gap Assembly (See Fig. N Page 16 Item 346)	
1377-6977	361		SCREW, cap - socket hd 10-24 x 3/4"	4
1377-6976	362		WASHER, flat No. 8 SAE	4
1377-4774	363		CONNECTOR, holder	1
1377-4267	364		HOLDER, point	4
*1377-2056	365	G	POINT, set of four	1 set
1377-4954	366		WASHER, flat - brass 3/16"	8
1377-4266	367		BASE	1
1377-6978	368		WASHER, lock - external tooth No. 10	8
1377-6979	369		SCREW, rnd hd 10-24 x 5/8"	8

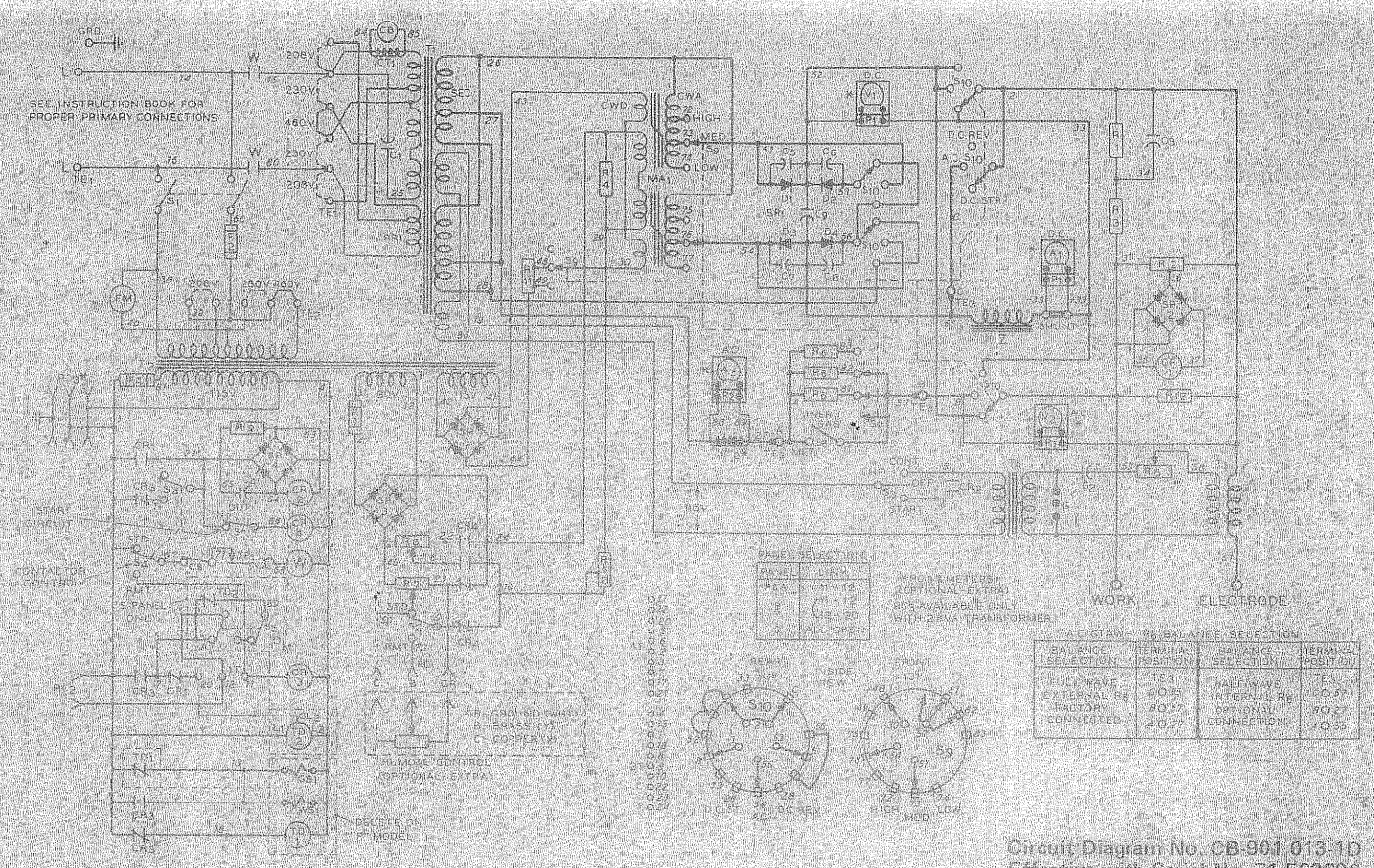


TA-020 623

Figure N1 - Spark Gap Assembly

*Recommended Spare Parts

BE SURE TO PROVIDE STOCK, MODEL, AND SERIAL NUMBERS WHEN ORDERING REPLACEMENT PARTS.



SET INSTRUCTION BOOK FOR PROPER PRIMARY CONNECTIONS

START SUPPLY

CONTROL FOR CONTROL

115V

GROUND WIRE
A BRASS
B BRASS
C COPPER

REMOVE CONTROL
OPTIONAL EXTRA

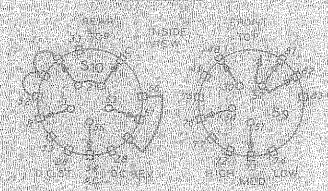
DELETE ON
MODEL

PANEL SELECTION

PANEL	URNS
A	11-12
B	13-20
C	ALL OFF

NO. 1 METERS
OPTIONAL EXTRA
NOT AVAILABLE ONLY
WITH DVA TRANSFORMER

- D1 0.05
- D2 0.05
- D3 0.05
- D4 0.05
- D5 0.05
- D6 0.05
- D7 0.05
- D8 0.05
- D9 0.05
- D10 0.05
- D11 0.05
- D12 0.05
- D13 0.05
- D14 0.05
- D15 0.05
- D16 0.05
- D17 0.05
- D18 0.05
- D19 0.05
- D20 0.05



BALANCE SELECTION	BALANCE SELECTION	
	INTERNAL POSITION	EXTERNAL POSITION
FACTORY	70.52	70.52
OPTIONAL	70.52	70.52
CONVERTED	70.52	70.52

Circuit Diagram No. CB-901-013-1D
Effective with Serial No. 71-560896

Circuit Diagram