

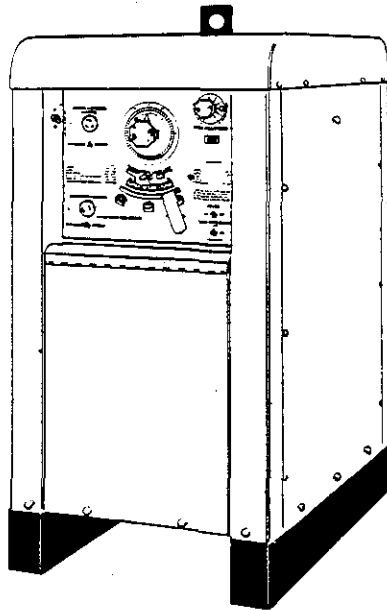
July 1988

FORM: OM-340P

Effective With Serial No. JJ396523



MODEL
330P
330A/BP



OWNER'S MANUAL

IMPORTANT: Read and understand the entire contents of both this manual and the power source manual used with this unit, with special emphasis on the safety material throughout both manuals, before installing, operating, or maintaining this equipment. This unit and these instructions are for use only by persons trained and experienced in the safe operation of welding equipment. Do not allow untrained persons to install, operate, or maintain this unit. Contact your distributor if you do not fully understand these instructions.

Miller Electric Mfg. Co.

A Miller Group Ltd. Company

P.O. Box 1079
Appleton, WI 54912 USA
Tel. 414-734-9821

LIMITED WARRANTY

EFFECTIVE: FEBRUARY 16, 1988

This warranty supersedes all previous MILLER warranties and is exclusive with no other guarantees or warranties expressed or implied.

LIMITED WARRANTY - Subject to the terms and conditions hereof, Miller Electric Mfg. Co., Appleton, Wisconsin warrants to its Distributor/Dealer that all new and unused Equipment furnished by Miller is free from defect in workmanship and material as of the time and place of delivery by Miller. No warranty is made by Miller with respect to engines, trade accessories or other items manufactured by others. Such engines, trade accessories and other items are sold subject to the warranties of their respective manufacturers, if any. All engines are warranted by their manufacturer for one year from date of original purchase, except Tecumseh engines which have a two year warranty.

Except as specified below, Miller's warranty does not apply to components having normal useful life of less than one (1) year, such as spot welder tips, relay and contactor points, MILLERMATIC parts that come in contact with the welding wire including nozzles and nozzle insulators where failure does not result from defect in workmanship or material.

Miller shall be required to honor warranty claims on warranted Equipment in the event of failure resulting from a defect within the following periods from the date of delivery of Equipment to the original user:

1. Arc welders, power sources, robots, and components . . . 1 year
2. Load banks 1 year
3. Original main power rectifiers 3 years
(labor - 1 year only)
4. All welding guns, feeder/guns and torches 90 days
5. All other Millermatic Feeders 1 year
6. Replacement or repair parts, exclusive of labor . . . 60 days
7. Batteries 6 months

provided that Miller is notified in writing within thirty (30) days of the date of such failure.

As a matter of general policy only, Miller may honor claims submitted by the original user within the foregoing periods.

In the case of Miller's breach of warranty or any other duty with respect to the quality of any goods, the exclusive remedies therefore shall be, at Miller's option (1) repair or (2) replacement or, where authorized in writing by Miller in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized Miller service station or (4) payment of or credit for the purchase price (less reasonable depreciation based upon actual use) upon return of the goods at Customer's risk and expense. MILLER's option of repair or replacement will be F.O.B., Factory, at Appleton, Wisconsin, or F.O.B., at a MILLER authorized service facility, therefore, no compensation for transportation costs of any kind will be allowed. Upon receipt of notice of apparent defect or failure, Miller shall instruct the claimant on the warranty claim procedures to be followed.

ANY EXPRESS WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY OR REPRESENTATION AS TO PERFORMANCE, AND ANY REMEDY FOR BREACH OF CONTRACT WHICH, BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION, OPERATION OF LAW, CUSTOM OF TRADE OR COURSE OF DEALING, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR PARTICULAR PURPOSE, WITH RESPECT TO ANY AND ALL EQUIPMENT FURNISHED BY MILLER IS EXCLUDED AND DISCLAIMED BY MILLER.

EXCEPT AS EXPRESSLY PROVIDED BY MILLER IN WRITING, MILLER PRODUCTS ARE INTENDED FOR ULTIMATE PURCHASE BY COMMERCIAL/INDUSTRIAL USERS AND FOR OPERATION BY PERSONS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT AND NOT FOR CONSUMERS OR CONSUMER USE. MILLER'S WARRANTIES DO NOT EXTEND TO, AND NO RESELLER IS AUTHORIZED TO EXTEND MILLER'S WARRANTIES TO, ANY CONSUMER.

ERRATA SHEET

After this manual was printed, refinements in equipment design occurred. This sheet lists exceptions to data appearing later in this manual.

AMENDMENT TO PARTS LIST

Amend Parts List As Follows:

**	Dia. Mkgs.	Part No.	Replaced With	Description	Quantity
2-11	SR3,5	035 914	035 704	RECTIFIER, integ 30A 600V	2
4-7	SR2,4	035 914	035 704	RECTIFIER, integ 30A 600V	2
4-8	C12	046 140	031 670	CAPACITOR, cer disc .05uf 500VDC	1
4-9	C13	046 139	031 630	CAPACITOR, elctlt 22uf 50VDC	1
5-14	R1	080 929	030 603	RESISTOR, WW fxd 10W 10K ohm	1
10-1		047 497	123 154	LABEL, warning general precautionary	1
14-2		016 258	124 275	CHAMBER, plenum 14in (Effective with JK674521)	1

**First digit represents page no - digits following dash represent item no.

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

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 POWER SOURCE

SECTION 1 - RÈGLES DE SÉCURITÉ POUR LE FONCTIONNEMENT DU POSTE DE SOUDAGE À L'ARC

1-1. INTRODUCTION - We learn by experience. Learning safety through personal experience, like a child touching a hot stove is harmful, wasteful, and unwise. Let the experience of others teach you.

Safe practices developed from experience in the use of welding and cutting are described in this manual. Research, development, and field experience have evolved reliable equipment and safe installation, operation, and servicing practices. Accidents occur when equipment is improperly used or maintained. The reason for the safe practices may not always be given. Some are based on common sense, others may require technical volumes to explain. It is wiser to follow the rules.

Read and understand these safe practices before attempting to install, operate, or service the equipment. Comply with these procedures as applicable to the particular equipment used and their instruction manuals, for personal safety and for the safety of others.

Failure to observe these safe practices may cause serious injury or death. When safety becomes a habit, the equipment can be used with confidence.

These safe practices are divided into two Sections: 1 - General Precautions, common to arc welding and cutting; and 2 - Arc Welding (and Cutting) (only).

Reference standards: Published Standards on safety are also available for additional and more complete procedures than those given in this manual. They are listed in the Standards Index in this manual. ANSI Z49.1 is the most complete.

The National Electrical Code, Occupational Safety and Health Administration, local industrial codes, and local inspection requirements also provide a basis for equipment installation, use, and service.

1-2. GENERAL PRECAUTIONS

Different arc welding processes, electrode alloys, and fluxes can produce different fumes, gases, and radiation levels. In addition to the information in this manual, be sure to consult flux and electrode manufacturers for specific technical data and precautionary measures concerning their material.

A. Burn Prevention

Wear protective clothing - gauntlet gloves designed for use in welding, hat, and high safety-toe shoes. Button shirt collar and pocket flaps, and wear cuffless trousers to avoid entry of sparks and slag.

Wear helmet with safety goggles or glasses with side shields underneath, appropriate filter lenses or plates (protected by clear cover glass). This is a **MUST** for welding or cutting, (and chipping) to protect the eyes

1-1. INTRODUCTION - Contrairement à l'apprentissage de la vie, l'apprentissage de la sécurité par expérience personnelle, comme l'enfant qui touche un poêle chaud, est dangereux, imprudent et inutile. Instruisez-vous donc de l'expérience d'autrui.

Des méthodes de sécurité issues de l'expérience du soudage et du coupage sont décrites dans le manuel. La recherche, le progrès et l'expérience dans ce domaine ont développé un matériel fiable et des méthodes de sécurité pour l'installation, le fonctionnement et l'entretien. Des accidents se produisent lorsque le matériel est inadéquatement utilisé ou entretenu. La raison de ces méthodes de sécurité peut ne pas être toujours donnée. Certaines sont fondées sur le sens commun, d'autres demanderont à être expliquées par des livres techniques. Il est plus sage de suivre les règles.

Lisez et comprenez ces méthodes de sécurité avant d'essayer d'installer, de faire fonctionner ou de réparer l'appareil. Pour votre sécurité personnelle et celle d'autrui, conformez-vous à ces règles et aux manuels d'instructions.

Manquer d'observer ces méthodes de sécurité pourrait entraîner des blessures graves ou même la mort. Quand la sécurité devient une habitude, le matériel peut alors être utilisé en toute confiance.

Ces méthodes de sécurité sont divisées en deux sections: 1 - Précautions générales, communes au soudage et au coupage à l'arc, et 2 - Soudage à l'arc (et coupage) (uniquement).

Normes de référence: Des publications des normes américaines de sécurité sont aussi à votre disposition pour d'autres modes opératoires plus complets que ceux du présent manuel. Elles sont données dans l'Index des Normes de ces règles de sécurité. ANSI Z49-1 est la plus complète.

Les codes de l'ACNOR, les codes provinciaux et municipaux donnent aussi les exigences pour une installation, une utilisation et un entretien sûrs.

1-2. PRÉCAUTIONS GÉNÉRALES

Plusieurs procédés du soudage à l'arc, des électrodes alliés, et les flux peuvent produire des vapeurs, gaz, et niveaux de rayonnement différents. Pour tout renseignement supplémentaire à ce manuel, consultez aussi les fabricants des électrodes et des flux afin d'obtenir les renseignements techniques spécifiques et les mesures de précaution concernant leurs matériaux.

A. Prévention des brûlures

Portez des vêtements de protection - des gants à crispin spécialement désignés pour le soudage, un casque et des chaussures de sécurité. Boutonnez le col de votre chemise et les pattes de vos poches, et portez des pantalons sans revers pour éviter que des étincelles et du laitier ne s'y introduisent.

Portez un masque avec lunettes de sécurité ou avec écrans latéraux de protection, des lunettes filtrantes ou des couvre-lentilles (protégés par un verre clair). Pour le soudage ou le coupage (et le burinage), il est

from radiant energy and flying metal. Replace cover glass when broken, pitted, or spattered. See 1-3A.2.

Avoid oily or greasy clothing. A spark may ignite them.

Hot metal such as electrode stubs and workpieces should never be handled without gloves.

Medical first aid and eye treatment. First aid facilities and a qualified first aid person should be available for each shift unless medical facilities are close by for immediate treatment of flash burns of the eyes and skin burns.

Ear plugs should be worn when working on overhead or in a confined space. A hard hat should be worn when others work overhead.

Flammable hair preparations should not be used by persons intending to weld or cut.

B. Toxic Fume Prevention

Severe discomfort, illness or death can result from fumes, vapors, heat, or oxygen enrichment or depletion that welding (or cutting) may produce. Prevent them with adequate ventilation as described in ANSI Standard Z49.1 listed 1 in Standards index. NEVER ventilate with oxygen.

Lead -, cadmium -, zinc -, mercury -, and beryllium - bearing and similar materials, when welded (or cut) may produce harmful concentrations of toxic fumes. Adequate local exhaust ventilation must be used, or each person in the area as well as the operator must wear an air-supplied respirator. For beryllium, both must be used.

Metals coated with or containing materials that emit toxic fumes should not be heated unless coating is removed from the work surface, the area is well ventilated, or the operator wears an air-supplied respirator.

Work in a confined space only while it is being ventilated and, if necessary, while wearing an air-supplied respirator.

Gas leaks in a confined space should be avoided. Leaked gas in large quantities can change oxygen concentration dangerously. Do not bring gas cylinders into a confined space.

Leaving confined space, shut OFF gas supply at source to prevent possible accumulation of gases in the space if downstream valves have been accidentally opened or left open. Check to be sure that the space is safe before re-entering it.

Vapors from chlorinated solvents can be decomposed by the heat of the arc (or flame) to form PHOSGENE, a highly toxic gas, and other lung and eye irritating products. The ultraviolet (radiant) energy of the arc can also decompose trichloroethylene and perchloroethylene vapors to form phosgene. DO NOT WELD or cut where solvent vapors can be drawn into the welding or cutting atmosphere or where the radiant

OBLIGATOIRE de protéger ses yeux contre l'énergie de rayonnement et les éclats de métal. Remplacez le verre protecteur lorsqu'il est brisé, piqué ou qu'il a reçu des projections. Voir 1.3A.2.

Évitez de porter des habits imprégnés d'huile ou de graisse. Une étincelle pourrait les enflammer.

Ne manipulez jamais sans gants un métal chaud tel que des chutes d'électrode et des pièces à souder.

Premiers soins et traitement des yeux: Tout atelier devrait avoir à sa disposition un poste de premiers soins ainsi qu'une personne compétente, à moins qu'un service médical ne soit à proximité pour soigner immédiatement les brûlures des yeux et de la peau.

Portez des bouche-oreilles lorsque vous travaillez au plafond ou dans un espace restreint. Portez un casque lorsque d'autres personnes travaillent au plafond.

Les personnes devant souder ou couper ne doivent pas employer des préparations inflammables pour leurs cheveux.

B. Prévention des gaz toxiques

Les gaz, les vapeurs, la chaleur, un enrichissement ou un manque d'oxygène peuvent entraîner un malaise, une maladie ou même la mort. Remédiez-y par la ventilation décrite dans la Norme ANSI Z49.1 paragraphe 1 de l'Index des Normes. NE ventilez JAMAIS à l'oxygène.

En soudant ou en coupant, les plomb, cadmium, zinc, mercure et béryllium ou autres matériaux semblables peuvent créer des concentrations nocives de gaz toxiques. On doit avoir recours à une ventilation aspirante adéquate du local, ou alors toute personne sur les lieux, de même que le soudeur, doit porter un masque à adduction d'air. On doit employer les deux pour le béryllium.

Les métaux enrobés ou composés de matériaux émettant des gaz toxiques ne doivent pas être chauffés à moins que l'enrobage ne soit ôté de la surface à travailler, que le local ne soit bien ventilé, ou que le soudeur ne porte un masque à adduction d'air.

Ne travaillez dans un espace restreint que s'il est bien ventilé et, si nécessaire, portez un masque à adduction d'air.

On doit éviter les fuites de gaz dans un espace restreint. Les fuites de gaz en grande quantité peuvent transformer dangereusement la concentration d'oxygène. N'amenez pas de bouteilles de gaz dans un espace restreint.

En quittant un espace restreint, FERMEZ le robinet d'alimentation de gaz de la bouteille. Ainsi on pourra rentrer en toute sécurité dans la pièce, même si les robinets "aval" ont été ouverts par accident, ou si on les a laissés ouverts.

Les vapeurs de dissolvants chlorés peuvent être décomposées par la chaleur de l'arc (ou de la flamme) et former du PHOSGÈNE, gaz très toxique, et d'autres produits irritant les poumons et les yeux. L'énergie ultra-violette de l'arc peut aussi décomposer les vapeurs de trichloroéthylène et de perchloroéthylène pour former du phosgène. NE SOUDEZ PAS ou ne coupez pas dans des endroits où les vapeurs de dissolvants peuvent être attirées dans l'atmosphère de soudage ou de

energy can penetrate to atmospheres containing even minute amounts of trichloroethylene or perchloroethylene.

C. Fire and Explosion Prevention

Causes of fire and explosion are: combustibles reached by the arc, flame, flying sparks, hot slag or heated material; misuse of compressed gases and cylinders; and short circuits.

BE AWARE THAT flying sparks or falling slag can pass through cracks, along pipes, through windows or doors, and through wall or floor openings, out of sight of the goggled operator. Sparks and slag can fly 35 feet.

To prevent fires and explosion:

Keep equipment clean and operable, free of oil, grease, and (in electrical parts) of metallic particles that can cause short circuits.

If combustibles are in area, do NOT weld or cut. Move the work if practicable, to an area free of combustibles. Avoid paint spray rooms, dip tanks, storage areas, ventilators. If the work cannot be moved, move combustibles at least 35 feet away out of reach of sparks and heat; or protect against ignition with suitable and snug-fitting, fire-resistant covers or shields.

Walls touching combustibles on opposite sides should not be welded on (or cut). Walls, ceilings, and floor near work should be protected by heat-resistant covers or shields.

Fire watcher must be standing by with suitable fire extinguishing equipment during and for some time after welding or cutting if:

- a. appreciable combustibles (including building construction) are within 35 feet
- b. appreciable combustibles are further than 35 feet but can be ignited by sparks
- c. openings (concealed or visible) in floors or walls within 35 feet may expose combustibles to sparks
- d. combustibles adjacent to walls, ceilings, roofs, or metal partitions can be ignited by radiant or conducted heat.

Hot work permit should be obtained before operation to ensure supervisor's approval that adequate precautions have been taken.

After work is done, check that area is free of sparks, glowing embers, and flames.

An empty container that held combustibles, or that can produce flammable or toxic vapors when heated, must never be welded on or cut, unless container has first been cleaned as described in AWS Standard A6.0, listed 3 in Standards index.

This includes: a thorough steam or caustic cleaning (or a solvent or water washing, depending on the com-

coupage et où l'énergie de rayonnement peut pénétrer dans des atmosphères contenant des quantités même minuscules de trichloroéthylène ou de perchloroéthylène.

C. Prévention des incendies et des explosions

Les causes d'incendie et d'explosion sont les combustibles atteints par l'arc, la flamme, les étincelles, le laitier chaud ou les matériaux chauffés, le mauvais emploi des gaz comprimés et des bouteilles ainsi que les courts-circuits.

Sachez que les éclats d'étincelles ou la chute du laitier peuvent s'infiltrer dans les fissures, le long des tuyauteries, par les fenêtres et les portes et par les couvertures des murs ou du sol, sans que le soudeur portant des lunettes ne les voie. Les étincelles et les scories peuvent voler jusqu'à 35 pieds.

Pour prévenir les incendies et les explosions: Veillez à ce que votre appareil soit propre et en état de marche, dénué d'huile et de graisse, et de particules de métal sur les pièces électriques qui pourraient entraîner des courts-circuits.

Si des combustibles se trouvent à proximité, ne soudez pas, ne coupez pas. Si possible, déplacez votre travail loin des combustibles. Évitez les ateliers de peinture au pistolet, les cuves d'immersion, les entrepôts, les ventilateurs. Si cela n'est pas possible, placez les combustibles à au moins 35 pieds des étincelles et de la chaleur et protégez-les des étincelles avec des couvertures ou des écrans protecteurs adéquats, bien ajustés et ignifugés.

On ne doit pas souder (ou couper) le côté opposé des murs touchant les combustibles. Les murs, plafonds et planchers proches du travail doivent être protégés par des couvertures ou écrans protecteurs ignifugés.

Un surveillant doit se tenir à proximité avec un matériel de lutte contre l'incendie adéquat, pendant et quelque temps après le soudage ou le coupage si:

- a. Des quantités appréciables de combustibles (y compris une construction en chantier) se trouvent à moins de 35 pieds.
- b. Des quantités appréciables de combustibles sont à plus de 35 pieds mais peuvent être enflammées par des étincelles.
- c. Des ouvertures (cachées ou visibles) sur les planchers ou les murs à moins de 35 pieds peuvent exposer des combustibles aux étincelles.
- d. Les combustibles adjacents aux murs, plafonds, toits ou cloisons métalliques peuvent être enflammés par une chaleur rayonnante ou transmise.

Avant de commencer, avisez le contremaître pour qu'il s'assure que les précautions adéquates soient prises.

Une fois le travail terminé, vérifiez qu'il n'y ait pas d'étincelles, de cendres ardentes ou de flammes dans le local.

On ne doit jamais souder ni couper sur un récipient ayant contenu des combustibles, ou pouvant produire des vapeurs inflammables ou toxiques à la chauffe, à moins que le récipient n'ait été lavé au préalable, comme décrit dans la Norme AWS A6.0, figurant au paragraphe 3 de l'Index des Normes.

Cela comprend: un nettoyage à fond à la vapeur ou au caustique (ou un lavage avec dissolvant ou eau selon la solubilité du combustible) suivi d'une purge et d'une in-

bustible's solubility) followed by purging and inerting with nitrogen or carbon dioxide, and using protective equipment as recommended in A6.0. Waterfilling just below working level may substitute for inerting.

A container with unknown contents should be cleaned (see paragraph above). Do NOT depend on sense of smell or sight to determine if it is safe to weld or cut.

Hollow castings or containers must be vented before welding or cutting. They can explode.

Explosive atmospheres. Never weld or cut where the air may contain flammable dust, gas, or liquid vapors (such as gasoline).

D. Compressed Gas Equipment

Standard precautions. Comply with precautions in this manual, and those detailed in CGA Standard P-1, PRECAUTIONS FOR SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, listed 6 in Standards index.

1. Pressure Regulators

Regulator relief valve is designed to protect only the regulator from overpressure; it is not intended to protect any downstream equipment. Provide such protection with one or more relief devices.

Never connect a regulator to a cylinder containing gas other than that for which the regulator was designed.

Remove faulty regulator from service immediately for repair (first close cylinder valve). The following symptoms indicate a faulty regulator:

Leaks - if gas leaks externally.

Excessive Creep - if delivery pressure continues to rise with downstream valve closed.

Faulty Gauge - if gauge pointer does not move off stop pin when pressurized, nor returns to stop pin after pressure release.

Repair. Do NOT attempt repair. Send faulty regulators for repair to manufacturer's designated repair center, where special techniques and tools are used by trained personnel.

2. Cylinders

Cylinders must be handled carefully to prevent leaks and damage to their walls, valves, or safety devices:

Avoid electrical circuit contact with cylinders including third rails, electrical wires, or welding circuits. They can produce short circuit arcs that may lead to a serious accident. (See 1-3C.)

ICC or DOT marking must be on each cylinder. It is an assurance of safety when the cylinder is properly handled.

jection d'azote ou de gaz carbonique, en utilisant un équipement de protection comme recommandé dans l'A6-0. L'atmosphère inerte peut être remplacée par un niveau d'eau arrivant au-dessous du travail à effectuer.

Vous devez laver un récipient dont la nature de contenu est inconnue (voir paragraphe ci-dessus). NE vous fiez PAS à l'odorat ou à la vue pour dire si l'on peut le souder ou le couper en toute sécurité.

Vous devez pratiquer un évent sur les pièces ou récipients creux avant de les souder ou couper: ils peuvent exploser.

Atmosphères explosives: Ne soudez ni ne coupez jamais dans des lieux où l'air peut contenir des poussières, gaz ou vapeurs liquides inflammables (tels que l'essence).

D. Gaz comprimé

Précautions générales: Suivez les précautions de ce manuel, et celles décrites à la Norme CGA P-1 (Précautions de sécurité pour la manipulation de gaz comprimés en bouteilles), paragraphe 6 de l'Index des Normes.

1. Détendeurs de pression

La soupape de sûreté d'un détendeur est destinée à protéger seulement le détendeur de la surpression. Elle n'a pas pour but de protéger les boyaux et le chalumeau: on protège ceux-ci par des soupapes de retenue conçues spécialement pour cette fonction.

Ne montez jamais un détendeur sur une bouteille contenant un gaz différent de celui pour lequel le détendeur a été conçu.

Enlevez immédiatement un détendeur défectueux pour le faire réparer (d'abord, fermez le robinet de la bouteille). Les symptômes suivants dénotent la défectuosité du détendeur:

Fuites - si le gaz fuit extérieurement.

Ascension excessive - si la pression de débit continue à monter, le robinet du chalumeau étant fermé.

Manomètre défectueux - si l'aiguille du manomètre ne s'écarte pas de la goupille de butée lors de la mise en pression, ou ne revient pas sur la goupille après l'échappement de la pression.

Réparation. N'ESSAYEZ PAS de réparer vous-mêmes. Envoyez les détendeurs défectueux à réparer aux ateliers de réparation agréés du fabricant, où des techniques et des outils spéciaux sont utilisés par un personnel formé.

2. Bouteilles

Les bouteilles doivent être manipulées avec soin pour prévenir les fuites ou dégâts à leurs parois, robinets ou systèmes de sûreté. Évitez qu'un circuit électrique soit en contact avec les bouteilles, y compris les rails de contact, les fils électriques ou les circuits de soudage. Cela pourrait créer des arcs courts-circuits pouvant entraîner des accidents graves (Voir 1.3C.).

Chaque bouteille doit porter les inscriptions ICC ou DOT. C'est un gage de sécurité pourvu que la bouteille soit bien manipulée.

Identifying gas content. Use only cylinders with name of gas marked on them; do not rely on color to identify gas content. Notify supplier if unmarked. NEVER DEFACE or alter name, number, or other markings on a cylinder. It is illegal and hazardous.

Empties: Keep valves closed, replace caps securely; mark MT; keep them separate from FULLS and return promptly.

Prohibited use. Never use a cylinder or its contents for other than its intended use, NEVER as a support or roller.

Locate or secure cylinders so they cannot be knocked over.

Passageways and work areas. Keep cylinders clear of areas where they may be struck.

Transporting cylinders. With a crane, use a secure support such as a platform or cradle. Do NOT lift cylinders off the ground by their valves or caps, or by chains, slings, or magnets.

Do NOT expose cylinders to excessive heat, sparks, slag, and flame, etc. that may cause rupture. Do not allow contents to exceed 130°F. Cool with water spray where such exposure exists.

Protect cylinders particularly valves from bumps, falls, falling objects, and weather. Replace caps securely when moving cylinders.

Stuck valve. Do NOT use a hammer or wrench to open a cylinder valve that can not be opened by hand. Notify your supplier.

Mixing gases. Never try to mix any gases in a cylinder.

Never refill any cylinder.

Cylinder fittings should never be modified or exchanged.

3. Hose

Prohibited use. Never use hose other than that designed for the specified gas. A general hose identification rule is: red for fuel gas, green for oxygen, and black for inert gases.

Use ferrules or clamps designed for the hose (not ordinary wire or other substitute) as a binding to connect hoses to fittings.

No copper tubing splices. Use only standard brass fittings to splice hose.

Avoid long runs to prevent kinks and abuse. Suspend hose off ground to keep it from being run over, stepped on, or otherwise damaged.

Coil excess hose to prevent kinks and tangles.

Protect hose from damage by sharp edges, and by sparks, slag, and open flame.

Examine hose regularly for leaks, wear, and loose connections. Immerse pressured hose in water; bubbles indicate leaks.

Identification du gaz: N'utilisez que les bouteilles indiquant la nature du gaz; ne vous fiez pas à la couleur pour reconnaître la nature du gaz. Adressez-vous à votre fournisseur si cela n'est pas indiqué.

N'EFFACEZ ou ne modifiez JAMAIS les noms, numéros ou autres indications sur une bouteille. Cela est illégal et dangereux.

Vides: Maintenez les robinets fermés, remplacez bien les chapeaux; inscrivez "Vides"; séparez-les des "Pleines" et retournez-les rapidement.

Emploi interdit: N'utilisez une bouteille ou son contenu que pour ce à quoi elle est destinée, mais JAMAIS comme support ou rouleau.

Placez les bouteilles pour qu'elles ne tombent pas. Lorsqu'un détendeur (et un boyau) est monté sur elles, placez les ou attachez-les debout.

Passages et lieux de travail. Enlevez les bouteilles d'un endroit où l'on pourrait les frapper.

Transport des bouteilles. Avec une grue, utilisez un support fiable tel qu'une plate-forme ou un cadre. NE SOULEVEZ PAS des bouteilles du sol par leur robinet ou chapeau, ou avec des chaînes, élingues ou aimants.

N'EXPOSEZ PAS les bouteilles à une chaleur excessive, aux étincelles, au laitier et aux flammes, etc., pouvant causer leur rupture. Le contenant ne doit jamais dépasser 55°C. Refroidissez en pulvérisant de l'eau si nécessaire.

Protégez les bouteilles et particulièrement les soupapes contre les chocs, les chutes, les chutes d'objets et la température. Remettez bien les chapeaux lorsque vous déplacez les bouteilles.

Robinet coincé. N'UTILISEZ PAS un marteau ou une clé métallique pour ouvrir un robinet de bouteille que l'on ne peut pas ouvrir à la main. Avisez votre fournisseur.

Mélange de gaz. N'essayez jamais de mélanger des gaz dans une bouteille.

Ne rechargez jamais une bouteille. Les éléments de la bouteille ne doivent jamais être modifiés ou remplacés.

3. Boyau

Utilisation interdite. N'utilisez jamais un boyau autre que celui approprié au gaz indiqué. La règle générale d'identification est: rouge pour les gaz combustibles, vert pour l'oxygène, et noir pour les gaz inertes.

Utilisez des bagues ou colliers appropriés au boyau (et non du fil ordinaire ou autre substitution) pour brancher les boyaux à l'appareillage.

N'utilisez pas des raccords en cuivre. N'utilisez que des accessoires standard en laiton pour raccorder un boyau.

Utilisez une petite longueur de boyau. Cela évitera les noeuds et l'usure prématurée. Suspendez le boyau au-dessus du sol pour éviter qu'il ne soit écrasé, piétiné ou endommagé.

Enroulez le surplus de boyau pour éviter les noeuds et emmêlements. Évitez que le boyau ne soit endommagé par des tranchants, étincelles, laitier et flamme nue.

Repair leaky or worn hose by cutting area out and splicing (1-2D3). Do NOT use tape.

4. Proper Connections

Clean cylinder valve outlet of impurities that may clog orifices and damage seats before connecting regulator. Except for hydrogen, crack valve momentarily, pointing outlet away from people and sources of ignition. Wipe with a clean lintless cloth.

Match regulator to cylinder. Before connecting, check that the regulator label and cylinder marking agree, and that the regulator inlet and cylinder outlet match. NEVER CONNECT a regulator designed for a particular gas or gases to a cylinder containing any other gas.

Tighten connections. When assembling threaded connections, clean and smooth seats where necessary. Tighten. If connection leaks, disassemble, clean, and retighten using properly fitting wrench.

Adapters. Use a CGA adapter (available from your supplier) between cylinder and regulator, if one is required. Use two wrenches to tighten adapter marked RIGHT and LEFT HAND threads.

Regulator outlet (or hose) connections may be identified by right hand threads for oxygen and left hand threads (with grooved hex on nut or shank) for fuel gas.

5. Pressurizing Steps:

Drain regulator of residual gas through suitable vent before opening cylinder (or manifold valve) by turning adjusting screw in (clockwise). Draining prevents excessive compression heat at high pressure seat by allowing seat to open on pressurization. Leave adjusting screw engaged slightly on single-stage regulators.

Stand to side of regulator while opening cylinder valve.

Open cylinder valve slowly so that regulator pressure increases slowly. When gauge is pressurized (gauge reaches regulator maximum) leave cylinder valve in following position: For oxygen, and inert gases, open fully to seal stem against possible leak. For fuel gas, open to less than one turn to permit quick emergency shutoff.

Use pressure charts (available from your supplier) for safe and efficient, recommended pressure settings on regulators.

Check for leaks on first pressurization and regularly there-after. Brush with soap solution (capful of Ivory Liquid* or equivalent per gallon of water). Bubbles indicate leak. Clean off soapy water after test; dried soap is combustible.

E. User Responsibilities

Remove leaky or defective equipment from service immediately for repair. See User Responsibility statement in equipment manual.

*Trademark of Proctor & Gamble

Vérifiez régulièrement les fuites, l'usure et les raccordements lâches. Plongez le boyau sous pression dans de l'eau; les bulles indiqueront les fuites.

Réparation. Coupez la partie percée ou usée, et raccordez (1-2D3). N'UTILISEZ JAMAIS de ruban adhésif.

4. Branchements corrects

Avant de brancher le détendeur, nettoyez la sortie du robinet de la bouteille des impuretés qui peuvent obstruer les orifices et endommager les sièges. Sauf pour l'hydrogène, ouvrez momentanément le robinet, en éloignant la sortie des personnes et des sources inflammables. Essuyez avec un tissu propre et non gras.

Appareillez le détendeur à la bouteille. Avant de brancher, vérifiez que la marque du détendeur et la description de la bouteille concordent, et que l'orifice d'entrée du détendeur et l'orifice de sortie de la bouteille aillent ensemble. NE BRANCHEZ JAMAIS un détendeur conçu pour un gaz spécial (ou des gaz spéciaux) à une bouteille contenant d'autres gaz.

Serrez les branchements. Lorsque vous assemblez des branchements filetés, nettoyez et polissez les sièges où c'est nécessaire. Serrez. Si les branchements perdent, démontez-les, nettoyez et resserez avec une clef adéquate.

Adaptateurs. Placez, si besoin est, un adaptateur CGA (en vente chez votre fournisseur) entre la bouteille et le détendeur. Avec deux clefs, serrez l'adaptateur fileté À DROITE et À GAUCHE.

On peut reconnaître les branchements de sortie du détendeur (ou boyau) à l'aide du filetage à droite pour l'oxygène et à gauche (identifié par un écrou cannelé) pour les gaz combustibles.

5. Démarches de mise en pression

Purgez le détendeur de résidu de gaz avant d'ouvrir la bouteille (ou le robinet de canalisation) en serrant la vis de réglage (dans le sens des aiguilles d'une montre). Cette opération permet au siège de haute pression de s'ouvrir à la mise en pression, supprimant ainsi toute surchauffe de compression. Maintenez la vis de réglage des détendeurs à simple détente légèrement engagée. Avant d'ouvrir le robinet de la bouteille, assurez-vous que les boyaux sont branchés et que les soupapes aval sont fermées.

Tenez-vous latéralement au détendeur en ouvrant le robinet de la bouteille. Ouvrez-le lentement pour que la pression du détendeur monte progressivement. Lorsque le manomètre est mis sous pression (indique le maximum) le robinet de la bouteille de gaz inerte ou d'oxygène devra être ouvert à fond pour assurer l'étanchéité et celui de la bouteille de gaz combustible ouvert de moins d'un tour pour pouvoir le refermer rapidement en cas d'urgence.

Référez-vous aux tableaux de pression (distribués par votre fournisseur) pour un réglage recommandé de pression sûr et efficace sur les détendeurs. Vérifiez les fuites à la première mise en pression puis régulièrement, brossez avec une solution savonneuse (un bouchon d'Ivory Liquid* ou semblable par gallon d'eau). Les bulles indiquent une fuite. Enlevez l'eau savonneuse après examen; le savon sec est inflammable.

*Marque de Commerce de Proctor & Gamble

F. Leaving Equipment Unattended

Close gas supply at source and drain gas.

G. Rope Staging-Support

Rope staging-support should not be used for welding or cutting operation; rope may burn.

1-3. ARC WELDING - Comply with precautions in 1-1, 1-2, and this section. Arc Welding, properly done, is a safe process, but a careless operator invites trouble. The equipment carries high currents at significant voltages. The arc is very bright and hot. Sparks fly, fumes rise, ultraviolet and infrared energy radiates, weldments are hot, and compressed gases may be used. The wise operator avoids unnecessary risks and protects himself and others from accidents. Precautions are described here and in standards referenced in index.

A. Burn Protection

Comply with precautions in 1-2.

The welding arc is intense and visibly bright. Its radiation can damage eyes, penetrate lightweight clothing, reflect from light-colored surfaces, and burn the skin and eyes. Skin burns resemble acute sunburn, those from gas-shielded arcs are more severe and painful. **DON'T GET BURNED; COMPLY WITH PRECAUTIONS.**

1. Protective Clothing

Wear long-sleeve clothing (particularly for gas-shielded arc) in addition to gloves, hat, and shoes (1-2A). As necessary, use additional protective clothing such as leather jacket or sleeves, flame-proof apron, and fire-resistant leggings. Avoid outer garments of untreated cotton.

Bare skin protection. Wear dark, substantial clothing. Button collar to protect chest and neck and button pockets to prevent entry of sparks.

2. Eye and Head Protection

Protect eyes from exposure to arc. **NEVER** look at an electric arc without protection.

Welding helmet or shield containing a filter plate shade no. 12 or denser must be used when welding. Place over face before striking arc.

Protect filter plate with a clear cover plate.

Cracked or broken helmet or shield should **NOT** be worn; radiation can pass through to cause burns.

Cracked, broken, or loose filter plates must be replaced **IMMEDIATELY**. Replace clear cover plate when broken, pitted, or spattered.

E. Responsabilités de l'utilisateur

Ôtez immédiatement les parties percées ou défectueuses. Voir les Responsabilités de l'Usager du manuel de l'appareil.

F. Appareil laissé sans surveillance

Fermez l'alimentation de gaz à la source et purgez.

G. Liens et supports temporaires

Pour vos travaux de soudage ou de coupage, n'utilisez pas de la corde comme soutien, elle est inflammable.

1-3. SOUDAGE À L'ARC - Conformez-vous aux précautions des paragraphes 1.1 et 1.2 de cette section. Le soudage à l'arc bien exécuté est sûr, mais un soudeur négligent est un danger. Le poste de soudage transporte des courants élevés sous de fortes tensions. L'arc est très vif et chaud. Les étincelles volent, les vapeurs montent, l'énergie ultra-violette et infrarouge rayonnent, les soudures sont chaudes, et des gaz comprimés peuvent être utilisés. Le soudeur prudent évite les risques inutiles, se protège et protège autrui contre les accidents. Les précautions sont décrites ici et dans les normes données dans l'Index.

A. Protection contre les brûlures

Conformez-vous aux précautions du paragraphe 1.2. L'arc de soudage est intense et visiblement vif. Son rayonnement peut blesser les yeux, traverser les habits légers, se réfléchir sur les surfaces claires, et brûler la peau et les yeux. Les brûlures de la peau ressemblent à un gros coup de soleil. Celles d'arcs sous gaz protecteur sont plus graves et plus douloureuses. **NE VOUS BRÛLEZ PAS - SUIVEZ LES PRÉCAUTIONS.**

1. Vêtements de protection

Portez des vêtements à manches longues (surtout pour l'arc en atmosphère inerte) avec gants, masque et chaussures (1.2A.).

Si nécessaire portez en plus une veste ou des manches en cuir, un tablier et des guêtres ignifugés. De préférence ne portez pas de vêtements en coton non traité.

Protection de la peau. Portez des vêtements épais foncés. Boutonnez le col pour protéger la poitrine et le cou, et boutonnez les poches pour prévenir l'infiltration d'étincelles.

2. Protection des yeux et de la tête

Évitez que vos yeux soient exposés à l'arc. **NE** regardez **JAMAIS** un arc électrique sans protection.

Lorsque vous soudez, portez un écran ou masque avec verre filtrant teinté N° 12 ou plus foncé. Mettez-le sur le visage avant d'amorcer l'arc.

Protégez le verre filtrant d'un couvre-verre clair. **NE PORTEZ PAS** un masque fendu ou brisé; le rayonnement peut s'infiltrer et causer des brûlures.

Les verres filtrants fendus, brisés ou lâches doivent être remplacés **IMMÉDIATEMENT**. Remplacez un couvre-verre brisé, piqué ou taché par des projections.

Flash goggles with side shields **MUST** be worn under the helmet to give some protection to the eyes should the helmet not be lowered over the face before an arc is struck. Looking at an arc momentarily with unprotected eyes (particularly a high intensity gas-shielded arc) can cause a retinal burn that may leave a permanent dark area in the field of vision.

3. Protection of Nearby Personnel

Enclosed welding area. For production welding, a separate room or enclosed bay is best. In open areas, surround the operation with low-reflective, non-combustible screens or panels. Allow for free air circulation, particularly at floor level.

Viewing the weld. Provide face shields for all persons who will be looking directly at the weld.

Others working in area. See that all persons are wearing flash goggles.

Before starting to weld, make sure that screen flaps or bay doors are closed.

B. Toxic Fume Prevention

Comply with precautions in 1-2B.

Generator engine exhaust must be vented to the outside air. Carbon monoxide can kill.

C. Fire and Explosion Prevention

Comply with precautions in 1-2C.

Equipment's rated capacity. Do not overload arc welding equipment. It may overheat cables and cause a fire.

Loose cable connections may overheat or flash and cause a fire.

Never strike an arc on a cylinder or other pressure vessel. It creates a brittle area that can cause a violent rupture or lead to such a rupture later under rough handling.

D. Compressed Gas Equipment

Comply with precautions in 1-2D.

E. Shock Prevention

Exposed hot conductors or other bare metal in the welding circuit, or in ungrounded, electrically-HOT equipment can fatally shock a person whose body becomes a conductor. **DO NOT STAND, SIT, LIE, LEAN ON, OR TOUCH** a wet surface when welding, without suitable protection.

Vous devez porter des lunettes à écrans latéraux sous le masque pour protéger les yeux dans le cas où le masque ne serait pas abaissé sur le visage avant l'amorçage de l'arc. Regarder momentanément un arc sans protection (principalement un arc en atmosphère inerte à haute intensité) peut brûler la rétine et laisser un point sombre permanent dans le champ de vision.

3. Protection du personnel à proximité

Local de soudage fermé. Pour le soudage de production, il vaut mieux utiliser une salle séparée ou une baie fermée. Dans les locaux ouverts, entourez les travaux d'écrans ou panneaux peu réfléchissants et ininflammables. Laissez l'air circuler librement, particulièrement au niveau du sol.

Donnez des masques aux personnes qui regarderont directement la soudure.

Autres personnes travaillant sur les lieux. Veillez à ce que toutes les personnes portent les lunettes de protection.

Avant d'attaquer la soudure, assurez-vous que les rebords d'écran ou les portes soient fermés.

B. Prévention des gaz toxiques

Suivez les précautions du paragraphe 1.2B. L'échappement du moteur de la génératrice doit être ventilé à l'air extérieur. L'oxyde de carbone peut tuer.

C. Prévention des incendies et des explosions

Suivez les précautions 1.2C. Puissance nominale de l'appareil. Ne surchargez pas le poste de soudage à l'arc. Cela peut surchauffer les câbles et causer un incendie.

Les branchements lâches de câble peuvent surchauffer ou faire des étincelles et causer un incendie.

N'amorcez jamais un arc sur une bouteille ou autre récipient sous pression. Cela créerait un point de rupture entraînant à plus ou moins longue échéance l'explosion du réservoir.

D. Gaz comprimé

Suivez les précautions 1.2D.

E. Prévention des décharges électriques

Des conducteurs chargés ou métal nu incorporés au circuit de soudage ou à un appareil chargé sans mise à la terre peuvent donner une décharge fatale à la personne dont le corps devient conducteur. **NE SOUDEZ PAS DEBOUT, ASSIS, COUCHÉ, PENCHÉ** sur une surface humide ni en contact avec une telle surface sans protection appropriée.

To protect against shock:

Keep body and clothing dry. Never work in damp area without adequate insulation against electrical shock. Stay on a dry duckboard, or rubber mat when dampness or sweat can not be avoided. Sweat, sea water, or moisture between body and an electrically HOT part - or grounded metal - reduces the body surface electrical resistance, enabling dangerous and possibly lethal currents to flow through the body.

1. Grounding the Equipment

When arc welding equipment is grounded according to the National Electrical Code, and the work is grounded according to ANSI Z49.1 "Safety in Welding And Cutting," a voltage may exist between the electrode and any conducting object. Examples of conducting objects include, but are not limited to, buildings, electrical tools, work benches, welding power source cases, workpieces, etc. **Never touch the electrode and any metal object unless the welding power source is off.**

When installing, connect the frames of each unit such as welding power source, control, work table, and water circulator to the building ground. Conductors must be adequate to carry ground currents safely. Equipment made electrically HOT by stray current may shock, possibly fatally. Do NOT GROUND to electrical conduit, or to a pipe carrying ANY gas or a flammable liquid such as oil or fuel.

Three-phase connection. Check phase requirements of equipment before installing. If only 3-phase power is available, connect single-phase equipment to only two wires of the 3-phase line. Do NOT connect the equipment ground lead to the third (live) wire, or the equipment will become electrically HOT - a dangerous condition that can shock, possibly fatally.

Before welding, check ground for continuity. Be sure conductors are touching bare metal of equipment frames at connections.

If a line cord with a ground lead is provided with the equipment for connection to a switchbox, connect the ground lead to the grounded switchbox. If a three-prong plug is added for connection to a grounded mating receptacle, the ground lead must be connected to the ground prong only. If the line cord comes with a three-prong plug, connect to a grounded mating receptacle. Never remove the ground prong from a plug, or use a plug with a broken off ground prong.

2. Electrode Holders

Fully insulated electrode holders should be used. Do NOT use holders with protruding screws.

3. Connectors

Fully insulated lock-type connectors should be used to join welding cable lengths.

Pour vous protéger contre les décharges électriques, maintenez votre corps et vêtements secs. Ne travaillez jamais dans un endroit humide sans isolation adéquate contre les décharges électriques. Lorsque vous ne pouvez éviter l'humidité ou la sueur, placez-vous sur un caillbotis sec ou un tapis en caoutchouc. La sueur, l'eau de mer, ou l'humidité entre le corps et une pièce CHARGÉE, ou une pièce de métal à la masse, réduisent la résistance électrique de la surface du corps, permettant l'entrée de courants dangereux, voire mortels.

1. Mise à la terre de l'appareil

Lorsque l'appareil de soudage à l'arc est mise à la terre suivant la norme National Electrical Code, et la masse est mise à la terre suivant la norme ANSI Z49.1 "Safety in Welding and Cutting," une tension peut exister entre l'électrode et un objet conducteur. Certaines de ces objets sont par exemple (mais pas seulement), des bâtiments, des outils électriques, des établis, des châssis de postes de soudure, des pièces d'ouvrage, etc. **Ne jamais touchez l'électrode ou des objets en métal avant d'avoir mis le poste de soudure à l'arrêt.**

À l'installation, branchez les châssis de chaque élément (source de courant, commande, établi et circuit d'eau) à la terre. Les conducteurs doivent pouvoir conduire les courants telluriques en toute sécurité. L'appareil chargé par les courants vagabonds peut donner une décharge risquant d'être mortelle. **NE BRANCHEZ PAS VOTRE PRISE DE TERRE** à une conduite électrique, ou à un tuyau de gaz ou de liquide inflammable tel que l'huile ou un combustible.

Connexion triphasée. Avant l'installation vérifiez la phase nécessaire à l'appareil. Si seul le triphasé est disponible, ne branchez l'appareil monophasé qu'à deux des fils de la ligne triphasée. **NE BRANCHEZ PAS** le conducteur de terre de l'appareil au troisième fil (sous tension), autrement l'appareil serait chargé: condition dangereuse pouvant donner une décharge fatale.

Avant le soudage, vérifiez si la prise de terre est uniforme. En branchant, assurez-vous que les conducteurs touchent le métal nu du châssis de l'appareil.

Lorsqu'un appareil doit être alimenté à partir d'un coffret d'alimentation, le conducteur de terre doit être relié à celui-ci.

Si vous avez en plus une fiche à trois broches pour la terre, ne branchez le conducteur de terre qu'à la broche de terre. Si le cordon d'alimentation a une fiche à trois broches, reliez-le à une prise femelle tripolaire reliée à la terre. **N'enlevez jamais la broche de terre d'une fiche ou n'utilisez jamais une fiche dont la broche de terre serait brisée.**

2. Pince-électrodes

Utilisez des pince-électrodes bien isolées. **N'UTILISEZ PAS** des pince-électrodes avec vis saillantes.

3. Connecteurs

Utilisez des connecteurs à verrouillage bien isolés pour assembler de longs câbles.

4. Cables

Frequently inspect cables for wear, cracks and damage. IMMEDIATELY REPLACE those with excessively worn or damaged insulation to avoid possibly - lethal shock from bared cable. Cables with damaged areas may be taped to give resistance equivalent to original cable.

Keep cable dry, free of oil and grease, and protected from hot metal and sparks.

5. Terminals And Other Exposed Parts.

Terminals and other exposed parts of electrical units should have insulating covers secured before operation.

6. Electrode

- a. Equipment with output on/off control (contactor)

Welding power sources for use with the gas metal arc welding (GMAW), gas tungsten arc welding (GTAW) and similar processes normally are equipped with devices that permit on-off control of the welding power output. When so equipped the electrode wire becomes electrically HOT when the power source switch is ON and the welding gun switch is closed. Never touch the electrode wire or any conducting object in contact with the electrode circuit unless the welding power source is off.

- b. Equipment without output on/off control (no contactor)

Welding power sources used with shielded metal arc welding (SMAW) and similar processes may not be equipped with welding power output on-off control devices. With such equipment the electrode is electrically HOT when the power switch is turned ON. Never touch the electrode unless the welding power source is off.

7. Safety Devices

Safety devices such as interlocks and circuit breakers should not be disconnected or shunted out.

Before installation, inspection, or service, of equipment, shut OFF all power and remove line fuses (or lock or red-tag switches) to prevent accidental turning ON of power. Disconnect all cables from welding power source, and pull all 115 volts line-cord plugs.

Do not open power circuit or change polarity while welding. If, in an emergency, it must be disconnected, guard against shock burns, or flash from switch arcing.

Leaving equipment unattended. Always shut OFF and disconnect all power to equipment.

Power disconnect switch must be available near the welding power source.

4. Câbles

Vérifiez fréquemment l'usure, les fissures et l'altération des câbles. REMPLACEZ IMMÉDIATEMENT ceux dont l'isolation serait trop usée ou altérée pour prévenir les décharges mortelles provoquées par un câble dénudé. Vous pouvez enrouler les parties endommagées de ruban adhésif en épaisseur suffisante pour donner une résistance de câble neuf. Maintenez les câbles secs, dépourvus d'huile et de graisse et mettez-les à l'abri du métal chaud et des étincelles.

5. Têtes de câbles et autres parties dénudées

Avant la mise en marche, les têtes de câbles et autres parties dénudées d'un appareil électrique doivent être munies de leurs couvre-fils isolants.

6. Électrode

- a. Appareil équipé d'une commande marche/arrêt (contacteur)

En général, les postes de soudure utilisés pour le soudage à l'arc sous protection gazeuse avec électrode fusible (GMAW), ou avec électrode tungstène (GTAW) et des procès semblables sont équipés d'une commande marche/arrêt de la puissance de sortie. Lorsque l'interrupteur est en position "MARCHE" et l'interrupteur du pistolet est fermé, le fil d'électrode devient chargé. Ne touchez jamais le fil électrode ou tout autre objet conducteur faisant contact avec le circuit d'électrode sans couper le courant au poste de soudure.

- b. Appareil non-équipé d'une commande marche/arrêt (sans contacteur)

Les postes de soudure utilisés pour le soudage à l'arc avec électrode enrobée (SMAW) et des procès semblables peuvent être non-équipés d'une commande marche/arrêt de la puissance de sortie. Lorsque l'interrupteur est en position "MARCHE" l'électrode devient chargé. Ne touchez jamais l'électrode sans couper le courant au poste de soudure.

7. Dispositif de sécurité

Le dispositif de sécurité-verrouillage et coupe-circuit ne doit pas être débranché ou déshunté.

Avant l'installation, l'inspection ou la réparation de l'appareil, mettez l'alimentation sur ARRÊT et enlevez les fusibles généraux (ou verrouillez les interrupteurs) pour éviter une remise en MARCHE accidentelle. Débranchez tous les câbles de la source de courant ainsi que les prises des cordons d'alimentation en 115 volts.

Lors du soudage, n'ouvrez pas le circuit d'alimentation et ne changez pas la polarité. S'il est débranché au cours d'une urgence, faites attention aux brûlures de décharge ou aux jaillissements d'étincelles.

Appareil laissé sans surveillance. Mettez toujours sur ARRÊT et débranchez l'appareil.

F. Protection For Wearers Of Electronic Life Support Devices (Pacemakers)

Magnetic fields from high currents can affect pacemaker operation. Persons wearing electronic life support equipment (pacemaker) should consult with their doctor before going near arc welding, gouging, or spot welding operations.

1-4. STANDARDS BOOKLET INDEX - For more information, refer to the following standards or their latest revisions and comply as applicable:

1. ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING obtainable from the American Welding Society, 550 Le Jeune Rd, P.O. Box 351040, Miami, FL 33135.
2. NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
3. OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, obtainable from the U.S. Government Printing Office, Washington, D.C. 20402.
4. ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
5. ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY -TOE FOOTWEAR obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018
6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES obtainable from the American Welding Society, 550 Le Jeune Rd., P.O. Box 351040, FL 33135.
8. NFPA Standard 51, OXYGEN - FUEL GAS SYSTEMS FOR WELDING AND CUTTING obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
9. NFPA Standard 70-1978, NATIONAL ELECTRICAL CODE obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

L'interrupteur d'arrêt doit toujours se trouver à proximité de la source de courant.

F. Protection pour toute personne portant des appareils électroniques de sauvetage (appareil pour le règlement de battement de coeur)

Inducteurs de courant élevé peuvent nuire le fonctionnement d'un appareil pour le "règlement de battement de coeur." Toute personne portant un appareil électronique de sauvetage (appareil pour le règlement de battement de coeur), devrait consulter un docteur avant d'approcher toute opération de soudage à l'arc, à la gouge ou à point.

1-4. INDEX DES NORMES - Pour plus de renseignements, référez-vous aux normes de l'ACNOR ou aux normes américaines suivantes:

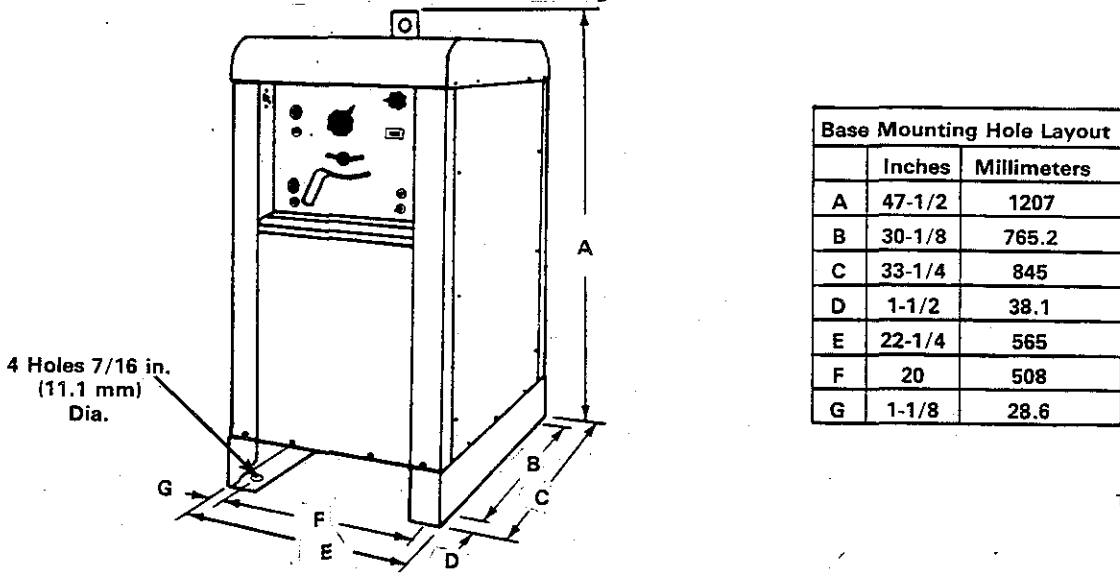
1. ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING distribué par l'American Welding Society, 550 Le Jeune Rd., P.O. Box 351040 Miami, FL 33135
2. NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING distribué par le Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402
3. OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, distribué par U.S. Department of Labor, Washington D.C. 20210
4. ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION distribué par l'American National Standards Institute, 1430 Broadway, New York, NY 10018
5. ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY - TOE FOOTWEAR distribué par l'adresse donnée en 4.
6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES distribué par l'adresse donnée en 4.
7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE COMBUSTIBLES distribué par l'adresse donnée en 1.
8. NFPA Standard 51, OXYGEN - FUEL GAS SYSTEMS FOR WELDING AND CUTTING distribué par la National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210
9. NFPA Standard 70-1978, NATIONAL ELECTRICAL CODE distribué par l'adresse donnée en 8
10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES distribué par l'adresse donnée en 8

11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS obtainable from the Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.
 12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.
 13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103.
 14. American Welding Society Standard AWSF4.1 "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", obtainable from the American Welding Society, 550 Le Jeune Rd., P.O. Box 351040, Miami, FL 33135.
 15. ANSI Standard Z88.2 "Practice for Respiratory Protection" obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS distribué par la Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.
 12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING distribué par la Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.
 13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY distribué par la National Welding Supply Association, 1900 Arch Street Philadelphia, PA 19103.
 14. American Welding Societe Standard AWSF4.1 "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", distribué par l'American Welding Societe, 550 Le Jeune Rd., P.O. Box 351040, Miami, FL 33135.
 15. ANSI Standard Z88.2 "Practice For Respiratory Protection" distribué par l'American National Standards Institute, 1430 Broadway, New York, NY 10018.

SECTION 2 - INTRODUCTION

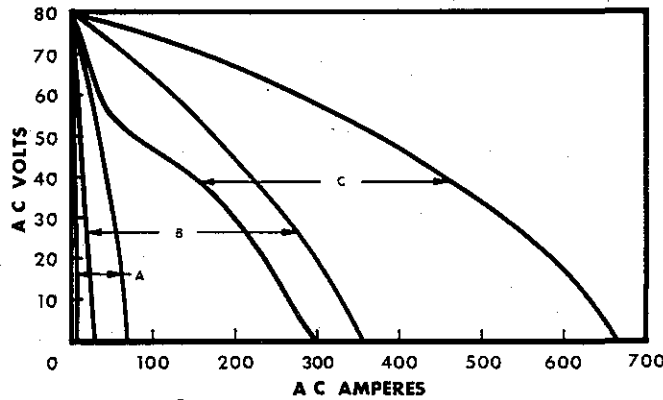
Rated Welding Amperes At 60% Duty Cycle	Welding Ranges In Amperes				Max. Open-Circuit Voltage	Input At Rated Load Output 60 Hz Single-Phase					Overall Cabinet Size	Weight		
	AC Gas Tungsten Arc	AC Shielded Metal Arc	DC Gas Tungsten Arc	DC Shielded Metal Arc		Amperes At				kva		kw	Net	Ship
						200V	230V	460V	575V					
300 @ 32 Volts	5-45 20-215 135-435	5-55 20-260 200-460	5-50 15-260 180-460	5-40 12-165 80-315	80 AC 72 DC	110	96	48	38.4	22	18	Height - 47-1/2 in. (1207 mm) Width - 22-1/4 in. (565 mm) Depth - 33-1/4 in. (845 mm)	830 lbs. (376 kg)	850 lbs. (383 kg)

Figure 2-1. Specifications



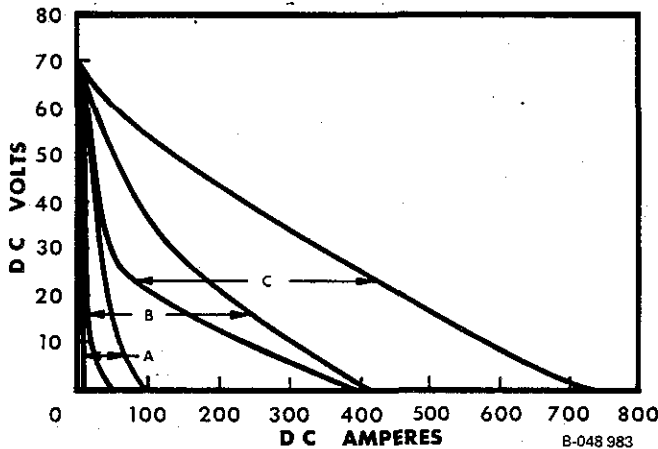
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Figure 2 - 2. Overall Dimensions And Base Mounting Hole Layout



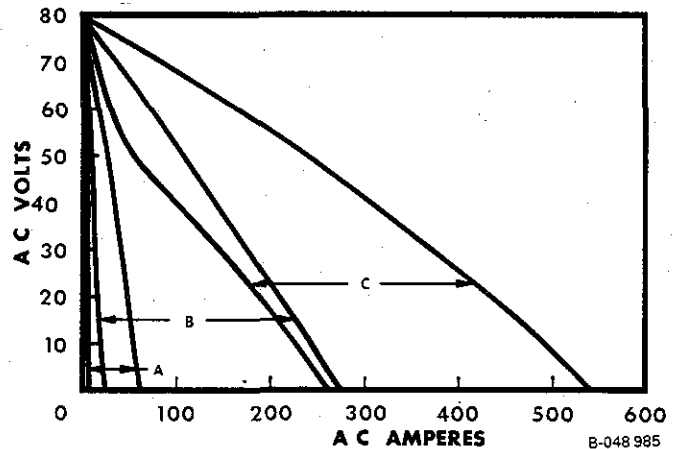
B-048 987

AC Shielded Metal Arc Volt-Ampere Curve



B-048 983

DC Shielded Metal Arc & Gas Tungsten Arc Volt-Ampere Curve



B-048 985

AC Gas Tungsten Arc Volt-Ampere Curve

Figure 2 - 3. Volt-Ampere Curves

2 - 1. VOLT-AMPERE CURVES (Figure 2-3)



The volt-ampere curves show the voltage and amperage output capabilities of the welding power source at the minimum and maximum values of the WELD AMPERAGE ADJUSTMENT control setting. Curves of other settings will fall between the curves shown. With the use of the volt-ampere curves, it is possible to determine the weld amperage at any particular load voltage.

2 - 2. DUTY CYCLE (Figure 2-4) - The duty cycle of a welding power source is the percentage of a ten minute period that a welding power source can be operated at a given output without causing overheating and damage to the unit. This welding power source is rated at 60 percent duty cycle. This means that the welding power source can be operated at rated load for six minutes out of every ten. During the remaining four minutes, the unit should idle to permit proper cooling. If the welding amperes are decreased, the duty cycle will increase. Figure 2-4 enables the operator to determine the output of the welding power source at various duty cycles.

CAUTION: EXCEEDING DUTY CYCLE RATINGS will damage the welding power source.

- Do not exceed indicated duty cycles.

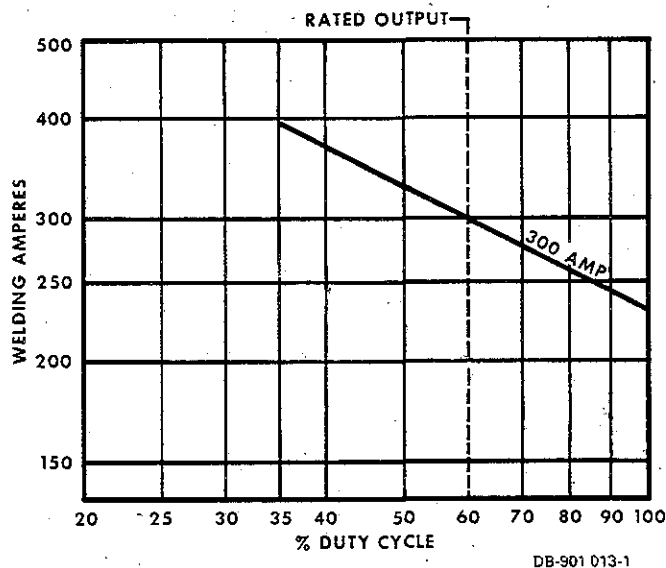


Figure 2 - 4. Duty Cycle Chart

2 - 3. GENERAL INFORMATION AND SAFETY

A. General

Information presented in this manual and on various labels, tags, and plates on the unit pertains to equipment design, installation, operation, maintenance, and troubleshooting which should be read, understood, and followed for the safe and effective use of this equipment.

The nameplate of this unit uses international symbols for labeling the front panel controls. The symbols also appear at the appropriate section in the text.

B. Safety

The installation, operation, maintenance, and troubleshooting of arc welding equipment requires practices and procedures which ensure personal safety and the safety of others. Therefore, this equipment is to be installed, operated, and maintained only by qualified persons in accordance with this manual and all applicable codes such as, but not limited to, those listed at the end of Section 1 - Safety Rules For Operation Of Arc Welding Power Source.

Safety instructions specifically pertaining to this unit appear throughout this manual highlighted by the signal words **WARNING** and **CAUTION** which identify different levels of hazard.

WARNING statements include installation, operation, and maintenance procedures or practices which if not carefully followed could result in serious personal injury or loss of life.

CAUTION statements include installation, operation, and maintenance procedures or practices which if not carefully followed could result in minor personal injury or damage to this equipment.

A third signal word, **IMPORTANT**, highlights instructions which need special emphasis to obtain the most efficient operation of this equipment.

2 - 4. RECEIVING-HANDLING - Before installing this equipment, clean all packing material from around the unit and carefully inspect for any damage that may have occurred during shipment. Any claims for loss or damage that may have occurred in transit must be filed **by the purchaser with the carrier**. A copy of the bill of lading will be furnished by the manufacturer on request if occasion to file claim arises.

When requesting information concerning this equipment, it is essential that Model Description and Serial Number of the equipment be supplied.

2 - 5. DESCRIPTION - This unit is a constant current ac/dc arc welding power source with single-phase electrical input. It is designed for Gas Tungsten Arc Welding (GTAW) and Shielded Metal Arc Welding (SMAW).

SECTION 3 - INSTALLATION

3 - 1. LOCATION (Figure 2-2)

IMPORTANT: Read entire Section 7 regarding high-frequency equipment location and installation requirements.

WARNING: FALLING EQUIPMENT can cause serious personal injury and equipment damage.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, trailer, or any other heavy accessories.
- Use equipment of adequate capacity to lift the unit.
- If using lift forks to handle this unit, be sure the lift forks are long enough to extend out of the opposite side of the base.

Using lift forks too short will expose internal components to damage should the tips of the lift forks penetrate the bottom of the unit.

RESTRICTED AIR FLOW causes overheating and possible damage to internal parts.

- Maintain at least 18 inches (457 mm) of unrestricted space on all sides of unit and keep underside free of obstructions.
- Do not place any filtering device over the intake air passages of this welding power source.

Warranty is void if any type of filtering device is used.

This welding power source has a lifting device for moving the unit and holes in the base for mounting purposes. Figure 2-2 gives overall dimensions and base mounting hole layout.

The location should allow room to remove the top cover and side panels for installation, maintenance, and repair procedures.

The service life and efficiency of this unit are reduced when the unit is subjected to high levels of dust, dirt, moisture, corrosive vapors, and extreme heat.

3 - 2. WELD OUTPUT CONNECTIONS (Figure 3-1)



To obtain the full rated output from this unit, it is necessary to select, install, and maintain proper welding cables. Failure to comply in any of these areas may result in less than satisfactory welding performance.

A. Welding Cables

If welding cables were not ordered with this unit, the steps listed should be followed to ensure the best welding performance:

1. Keep cables as short as possible and place cables close together. Excessive cable length adds resistance which may reduce output or cause overloading of the unit. Excessive cable length also increases high-frequency radiation (see Section 7).

2. Select adequate size welding cable for the anticipated maximum weld current. Use total length of welding cable in the circuit to determine cable size. For example: If the torch or electrode holder cable is 25 feet (8 m) long and the work cable is 25 feet (8 m) long, select the size cable recommended in Table 3-1 for 50 ft (15 m). The maximum recommended cable length when using high frequency is 50 feet (15 m).

Table 3 - 1. Welding Cable Size

WELDING AMPERES	*TOTAL LENGTH OF CABLE (COPPER) IN WELD CIRCUIT							
	*50	100	150	200	250	300	350	400
100	4	4	4	3	2	1	1/0	1/0
150	3	3	2	1	1/0	2/0	3/0	3/0
200	2	2	1	1/0	2/0	3/0	4/0	4/0
250	1	1	1/0	2/0	3/0	4/0	4/0	2-2/0
300	1/0	1/0	2/0	3/0	4/0	4/0	2-2/0	2-3/0
350	1/0	1/0	3/0	4/0	4/0	2-2/0	2-3/0	2-3/0
400	2/0	2/0	3/0	4/0	2-2/0	2-3/0	3-2/0	2-4/0
500	3/0	3/0	4/0	2-2/0	2-3/0	2-3/0	2-4/0	3-3/0

A-002 624

- NOTE:
- *A. 50 FEET OR LESS.
 - *B. CABLE SIZE IS BASED ON DIRECT CURRENT (DC), 60% DUTY CYCLE AND EITHER A 4 VOLTS OR LESS DROP OR A CURRENT DENSITY OF NOT OVER 300 CIRCULAR MILS PER AMP.
 - *C. WELD CABLE INSULATION WITH A VOLTAGE RATING TO WITHSTAND THE OPEN-CIRCUIT VOLTAGE (OCV) OF THE WELDING POWER SOURCE MUST BE USED. WHILE MOST WELDING POWER SOURCES HAVE AN OPEN-CIRCUIT VOLTAGE OF LESS THAN 100 VOLTS, SOME WELDING POWER SOURCES OF SPECIAL DESIGN MAY HAVE HIGHER OPEN-CIRCUIT VOLTAGE.

3. Do not use damaged or frayed cables.
 4. Install correct size lugs of adequate amperage capacity onto ends of both cables for connecting to work clamp, torch or electrode holder if applicable, and weld output terminals.
 5. If applicable install electrode holder onto cable following manufacturer's instructions. An insulated electrode holder must be used to ensure operator safety.
 6. Install work clamp onto cable.
- B. Installation (Figure 3-1)**



WORK



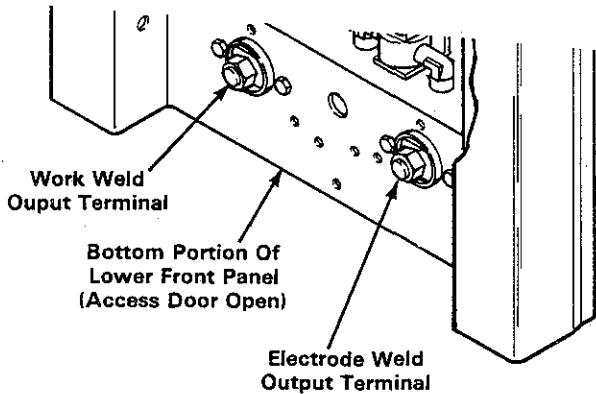
ELECTRODE

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down unit and disconnect input power employing "lockout/tagging procedures" before making weld output connections.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

1. Open lower front access door.



Ref. TB-901 013-6B

Figure 3 - 1. Lower Front Panel View Of Weld Output Terminals

2. Locate weld output terminals on the lower front panel.
3. For Gas Tungsten Arc Welding (GTAW)
 - a. Connect torch cable or connector to ELECTRODE weld output terminal.
 - b. Connect one end of work cable to WORK weld output terminal and remaining end to workpiece.
4. For Shielded Metal Arc Welding (SMAW)
 - a. Connect end of electrode holder cable to ELECTRODE weld output terminal.
 - b. Connect one end of work cable to WORK weld output terminal and remaining end to workpiece.

3 - 3. REMOTE AMPERAGE CONTROL CONNECTION (Figure 4-1)



The REMOTE AMPERAGE control receptacle provides a connection point between an optional remote control and the welding power source amperage control circuitry.

To connect the remote control, insert remote control plug into the three-pole, twistlock receptacle, and rotate clockwise.

3 - 4. REMOTE CONTACTOR CONTROL CONNECTION (Figure 4-1)



The REMOTE CONTACTOR control receptacle provides a connection point between an optional remote control and the welding power source contactor control circuitry.

To connect the remote control, insert remote control plug into the two-pole, twistlock receptacle, and rotate clockwise.

3 - 5. JUMPER LINK CONNECTIONS FOR MODELS WITH OPTIONAL SHIELDING GAS VALVE, WATER VALVE, OR SPOT WELD TIMER (Figure 3-2)

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down unit and disconnect input power employing "lockout/tagging procedures" before reconnecting jumper links.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

A. Maintained Contact Switch Operation

This unit is shipped from the factory with jumper links across terminals A and B on terminal strip 1T for operation with a maintained contact Remote Contactor switch. Closing the Remote Contactor switch provides open-circuit voltage, high frequency, shielding gas, and water as applicable. The remote contactor switch must be maintained closed for the duration of the weld. Opening the Remote Contactor switch shuts off weld output and continuous high frequency and starts the postflow of shielding gas and water if applicable.

B. Momentary Contact Switch Operation

If remote contactor control using a momentary contact switch is desired, remove the right side panel, and reposition the jumper links across terminals A, B, and C on terminal strip 1T as shown in Figure 3-2. Open-circuit voltage, high frequency, shielding gas, and water as applicable are available with a momentary closure of the Remote Contactor switch. After arc initiation, the Remote Contactor switch can be released. Pulling the torch or electrode holder away from the workpiece breaks the arc and shuts off weld output and continuous high frequency and starts the postflow of shielding gas and water if applicable.

C. Optional Spot Weld Operation

IMPORTANT: If this unit is ordered with an optional spot weld timer, the unit is shipped with terminal strip 1T connected for spot weld operation.

All terminals are open on terminal strip 1T for spot weld operation allowing the use of either a maintained or momentary contact Remote Contactor Switch for remote contactor control. Open-circuit voltage, high frequency, shielding gas, and water as applicable are available when the Remote Contactor switch is closed.

After the arc is started, the Remote Contactor switch can be released. When the spot timer times out, weld output and continuous high frequency are shut off and postflow of shielding gas and coolant begins if applicable.

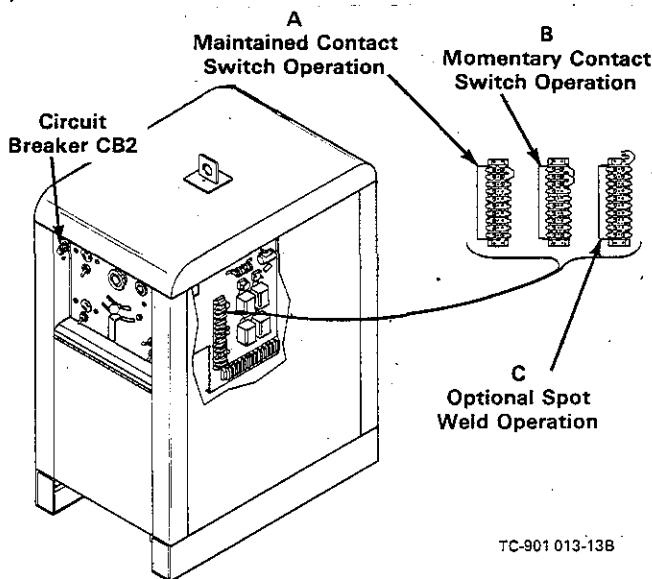


Figure 3 - 2. Terminal Strip 1T Location And Jumper Link Arrangements

3 - 6. OPTIONAL WATER VALVE CONNECTIONS ON MODELS ALSO EQUIPPED WITH OPTIONAL SHIELDING GAS VALVE (Figure 4-2)

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down unit and disconnect input power employing "lockout/tagging procedures" before making water valve connections.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

OVERHEATING Gas Tungsten Arc Welding torch can damage torch.

- If using a water-cooled torch and recirculating coolant system, make connections directly from the coolant system to the torch hoses. Do not use water connections on the welding power source.

A valve is provided to control on and off flow of coolant to the torch. The COOLANT IN and COOLANT OUT fittings both have 5/8-18 left-hand threads. Route and connect a hose from the coolant source to the COOLANT IN fitting. Route and connect the torch Coolant In hose to the COOLANT OUT fitting. Route and connect a hose from the torch Coolant Out fitting to a proper drain.

3 - 7. OPTIONAL SHIELDING GAS VALVE CONNECTIONS (Figure 4-2)

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down unit and disconnect input power employing "lockout/tagging procedures" before making shielding gas connections.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red tagging circuit breaker or other disconnecting device.

The shielding gas valve is located on the lower front panel. The GAS IN and GAS OUT fittings both have 5/8-18 right-hand threads. To make gas connections, proceed as follows:

1. Open lower front panel access door.
2. Route and connect a hose from the shielding gas supply regulator/flowmeter to the GAS IN fitting.
3. Route and connect a shielding gas hose from the torch to the GAS OUT fitting.
4. Close and secure lower front panel access door.

The gas flow must be accurately controlled with a regulator and flowmeter. Recommendations for rate of gas flow should be obtained from the torch manufacturer.

3 - 8. FULL WAVE/HALF-WAVE BALANCE CONNECTIONS (Figure 3-3) - Gas Tungsten Arc Welding

(GTAW) of magnesium and aluminum is commonly done with ac weld output. In theory, half of the total number of electrons in the ac weld output would flow from the tungsten to the work and the other half would flow from the work back into the tungsten.

In practice, however, this condition does not occur when Gas Tungsten Arc Welding (GTAW) is done on oxide-forming materials such as aluminum or magnesium. The oxides on the surface of the metal make it easier for the ac weld output to pass from tungsten to workpiece than in the opposite direction.

This unbalancing of the ac weld output can cause problems in some cases. Some of the results which may be encountered are:

1. Poor cleaning action.
2. Porosity.
3. Fluctuation in the arc.
4. Uneven weld penetration.

It is important to remember that different alloys of aluminum or magnesium may react differently and that variations of temperature or technique play an important part. Generally speaking, problems caused by rectification may be corrected with this welding power source by changing over to the half-wave circuit.

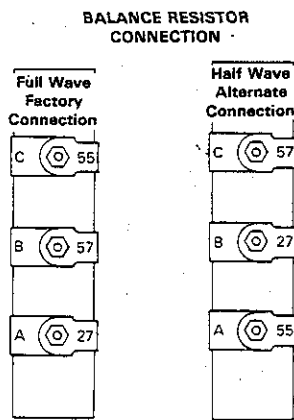
The unit is shipped connected to the full-wave circuit. To change to the half-wave circuit, proceed as follows:

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down unit and disconnect input power employing "lockout/tagging procedures" before inspecting or changing connections.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

1. Remove left side panel and locate the appropriate wiring harness leads (see Figure 3-3).
2. Remove ties and slide sleeving away to expose connections.
3. Disconnect lead 27 from lead A, 57 from lead B, and 55 from lead C (see Figure 3-3).
4. Reconnect lead 55 to lead A.
5. Reconnect lead 27 to lead B.
6. Reconnect lead 57 to lead C.
7. Check all connections and be sure they are correct and secure.
8. Slide sleeving over connections and secure to leads.
9. Reinstall left side panel.



IMPORTANT: These are wiring harness lead connections.

TA-023 983

Figure 3 - 3. Full-Wave/Half-Wave Connections

3 - 9. ELECTRICAL INPUT CONNECTIONS (Figure 3-4)



IMPORTANT: Read and comply with entire Section 7 regarding high-frequency equipment location and installation requirements before making electrical input connections.

A. Electrical Input Requirements

This welding power source is designed to be operated from single-phase, 60 Hertz, ac power supply which has

a line voltage rating that matches one of the electrical input voltages shown on the nameplate or input voltage label. Consult the local electric utility if there is any question about the type of electrical system available at the installation site or how proper connections to the welding power source are to be made.

B. Matching The Welding Power Source To The Available Input Voltage

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down unit and disconnect input power employing "lockout/tagging procedures" before inspecting or installing.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

CAUTION: INCORRECT INPUT VOLTAGE JUMPER LINK PLACEMENT can damage unit.

- Position jumper links as shown on the input voltage label located on inside of rear access door.
- Store unused jumper links across linked terminals.

This unit is equipped with input voltage jumper links either installed or in a bag on the input terminal board to allow operation from different line voltages. If installed, the jumper links are positioned for the highest voltage stated on the nameplate or input voltage label. If in a bag, proper installation is necessary before operation.

Open the rear panel access door. Reposition or install, if applicable, the jumper links onto the input terminal board to match the available line voltage positions shown on the input voltage label (see Figure 3-4).

C. Input Conductor Connections

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Install a fusible line disconnect switch in the input circuit to the welding power source.

The input circuit switch provides a safe and convenient means to completely remove all electrical power from the welding power source whenever it is necessary to inspect or service the unit.

- Employ "lockout/tagging procedures" on input line before making input connections to the welding power source.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

- Connect input conductors to the welding power source before connecting to single-phase input power.

Table 3-2 provides guidelines for selecting the proper size input conductors and line fuses. The input conductors should be covered with an insulating material that complies with national, state, and local electrical codes. Install terminal lugs of adequate amperage capacity and correct stud size onto the input and ground conductors.

Table 3 - 2. Input Conductor And Fuse Size

Input Wire Size - AWG*				Fuse Size In Amperes			
200V	230V	460V	575V	200V	230V	460V	575V
2 (6)	2 (6)	6 (8)	8 (8)	200	175	90	70

*Input conductor sizes are based on allowable ampacities of insulated copper conductors, having a temperature rating of 75° C, with not more than three conductors in a raceway or cable. Numbers in () are equipment ground conductor sizes.

WARNING: ELECTRIC SHOCK can kill.

- Do not connect an input conductor to the ground terminal in the unit.
- Do not connect the ground conductor to an input line terminal.

Incorrect input connections can result in an electrically energized welding power source chassis. The ground terminal is connected to the welding power source chassis and is for grounding purposes only.

Install and connect input and ground conductors as follows:

1. Obtain and install a proper strain relief connector into rear panel access hole (hole accepts standard conduit fittings).
2. Insert conductors through strain relief installed in Step 1 and route conductors to input terminal board (see Figure 3-4).
3. Connect input conductors to line terminals on input terminal board (see Figure 3-4).

4. Connect ground conductor to ground terminal on input terminal board (see Figure 3-4).
5. Connect remaining end of ground conductor to a proper ground. Use a grounding method that is acceptable to the local electrical inspection authority.
6. Secure input cable in strain relief connector.
7. Close and secure rear panel access door.

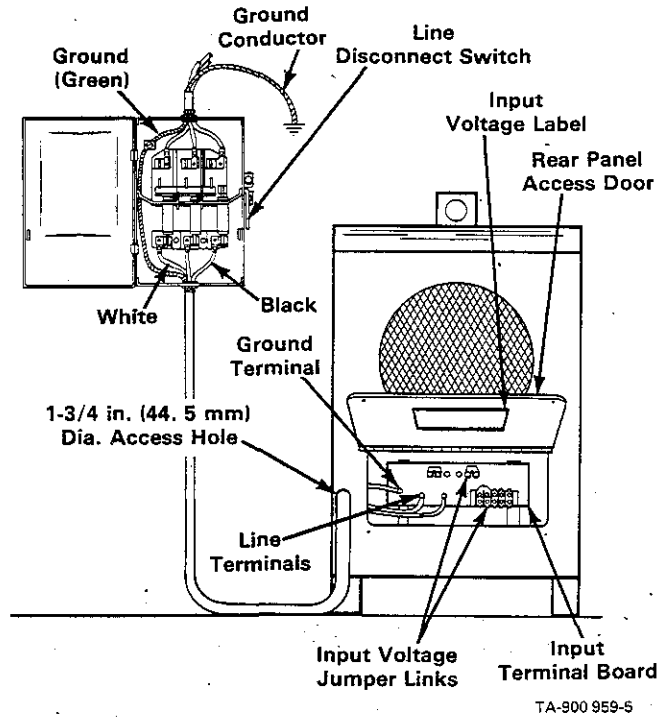


Figure 3 - 4. Input Conductor Connections

SECTION 4 - OPERATOR CONTROLS

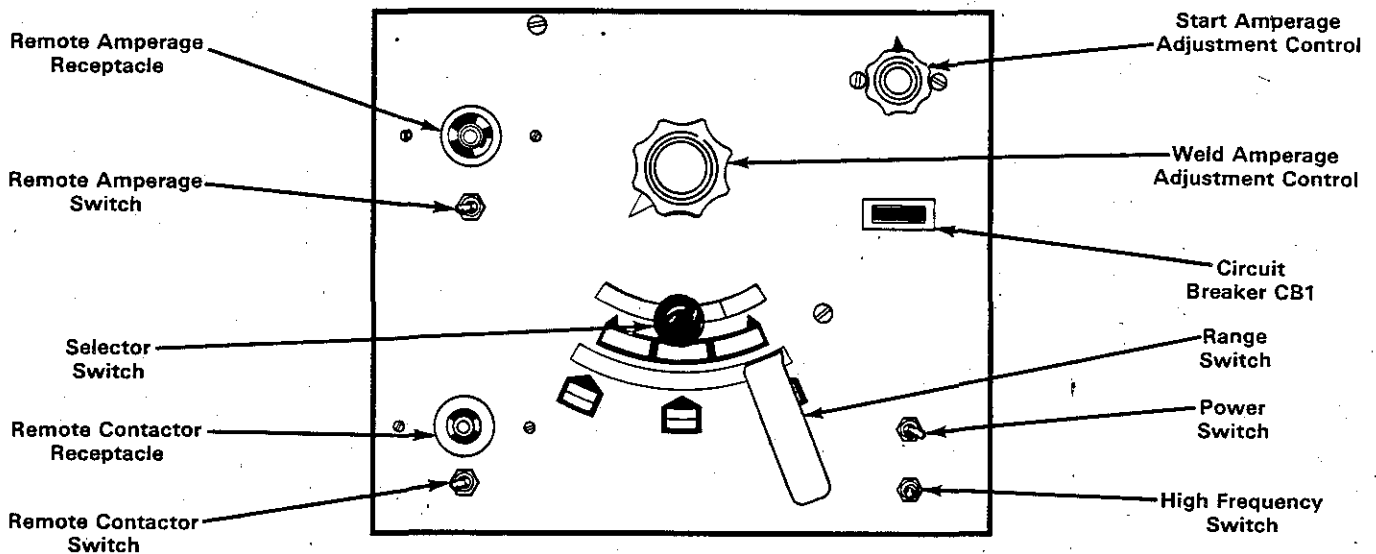
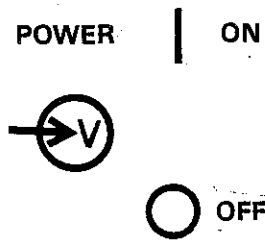


Figure 4 - 1. Upper Control Panel

TA-901 013-4B

4 - 1. POWER SWITCH (Figure 4-1)



Placing the POWER switch in the ON position energizes the welding power source and places the unit in a ready-to-weld status. Placing the POWER switch in the OFF position shuts down the welding power source.

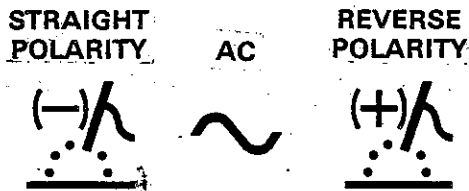
4 - 2. RANGE SWITCH (Figure 4-1)

CAUTION: ARCING can damage switch contacts.

- Do not change switch position while welding or under load.

The Range switch provides a means of selecting one of three coarse amperage ranges. If the desired amperage is in the overlapping area of two ranges, use the lower range for better fine amperage control.

4 - 3. SELECTOR SWITCH (Figure 4-1)



CAUTION: ARCING can damage switch contacts.

- Do not change switch position while welding or under load.

The Selector switch allows the operator to select dc straight polarity/electrode negative, ac, or dc reverse polarity/electrode positive weld output without changing weld output connections.

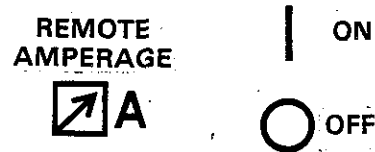
4 - 4. WELD AMPERAGE ADJUSTMENT CONTROL (Figure 4-1)



The WELD AMPERAGE ADJUSTMENT control provides fine amperage adjustment within the range selected on the RANGE switch. Rotating the control clockwise increases amperage output. The scale surrounding the control is calibrated in percent and should not be read as an amperage value.

IMPORTANT: The WELD AMPERAGE ADJUSTMENT control may be adjusted while welding.

4 - 5. REMOTE AMPERAGE SWITCH (Figure 4-1)



If remote amperage control is desired, make connections to the REMOTE AMPERAGE receptacle as instructed in Section 3-3. Place the REMOTE AMPERAGE switch in the ON position.

When a Remote Amperage Control is used, the remote amperage control functions as a fine amperage adjustment for the WELD AMPERAGE ADJUSTMENT control setting on the welding power source. For example: If the WELD AMPERAGE ADJUSTMENT control on the welding power source is set at mid-range, the Remote Amperage Control will provide (from its minimum to maximum adjustment) fine amperage adjustment of one half of the welding power source output for the amperage range selected on the Range switch. If the WELD AMPERAGE ADJUSTMENT control on the welding power source is set at the maximum position, the Remote Amperage Control will provide (from its minimum to maximum adjustment) maximum output for the amperage range selected on the Range switch.

If remote amperage control is not desired, place the REMOTE AMPERAGE switch in the OFF position.

4 - 6. REMOTE CONTACTOR SWITCH (Figure 4-1)



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Do not touch the weld output terminals when the contactor is energized.
- Do not touch torch or electrode holder and work clamp at the same time.

When the REMOTE CONTACTOR switch is in the OFF position, open-circuit voltage is present at weld output terminals for as long as the welding power source is energized.

If remote contactor control is desired, make connections to the REMOTE CONTACTOR receptacle as instructed in Section 3-4. Place the REMOTE CONTACTOR switch in the ON position. Open-circuit voltage is present at the weld output terminals when the remote contactor switch is closed.

If remote contactor control is not desired, place the REMOTE CONTACTOR switch in the OFF position. Open-circuit voltage will be available at the weld output terminals whenever the POWER switch is in the ON position.

4 - 7. START AMPERAGE ADJUSTMENT CONTROL AND SWITCH (Figures 4-1 And 4-2)



The START AMPERAGE ADJUSTMENT control provides a means of selecting an amperage for arc initiation which is either below or above the setting of the WELD AMPERAGE ADJUSTMENT control. The selected start amperage is always within the minimum to maximum range selected on the Range switch.

If a different amperage is desired for arc initiation, place the START CIRCUIT switch in the IN position and the START AMPERAGE ADJUSTMENT control in the desired position. After arc initiation, the weld amperage slopes up or down to the setting of the WELD AMPERAGE ADJUSTMENT control or Remote Amperage Control if used.

If a different amperage is not desired for arc initiation, place the START CIRCUIT switch in the OUT position.

4 - 8. POST FLOW TIME CONTROL (Figure 4-2)

A Post Flow time control, located on the center portion of the lower front panel, provides an adjustable 0.5 to 60 second time selection. This timer controls the length of time that the shielding gas valve and optional water valve allow shielding gas and coolant flow after the arc is extinguished.

To make a time selection, rotate the knob on the timer to the desired setting.

Once the timer has timed out, the shielding gas valve and water valve, if applicable, close thereby shutting off shielding gas and coolant flow to the torch. The timer automatically resets itself making it ready for another weld sequence.

4 - 9. HIGH FREQUENCY SWITCH (Figure 4-1)



WARNING: USING HIGH FREQUENCY WITH THE SHIELDED METAL ARC WELDING (SMAW) PROCESS can result in serious personal injury.

- Place the HIGH FREQUENCY switch in the OFF position before using Shielded Metal Arc Welding (SMAW).

The attempted use of high frequency to establish an arc with a stick electrode could cause an arc to form between the electrode holder and operator.

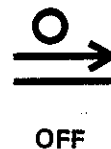
The HIGH FREQUENCY switch allows the operator to choose whether high frequency will be used or not and for how long.

A. START



High frequency is present from the time the contactor is closed until an arc is established. Once an arc is established, high frequency is no longer present. High frequency is present any time the arc is broken to aid in restarting the arc as long as the contactor is energized.

B. OFF



High frequency is not present. The HIGH FREQUENCY switch should be in the OFF position when high frequency is not desired.

C. CONTINUOUS



High frequency is present from the time the contactor is closed throughout the welding operation until the contactor opens. When the contactor opens, high frequency is not present until the contactor closes again.

4-10. HIGH FREQUENCY INTENSITY CONTROL ADJUSTMENT (Figure 4-2)

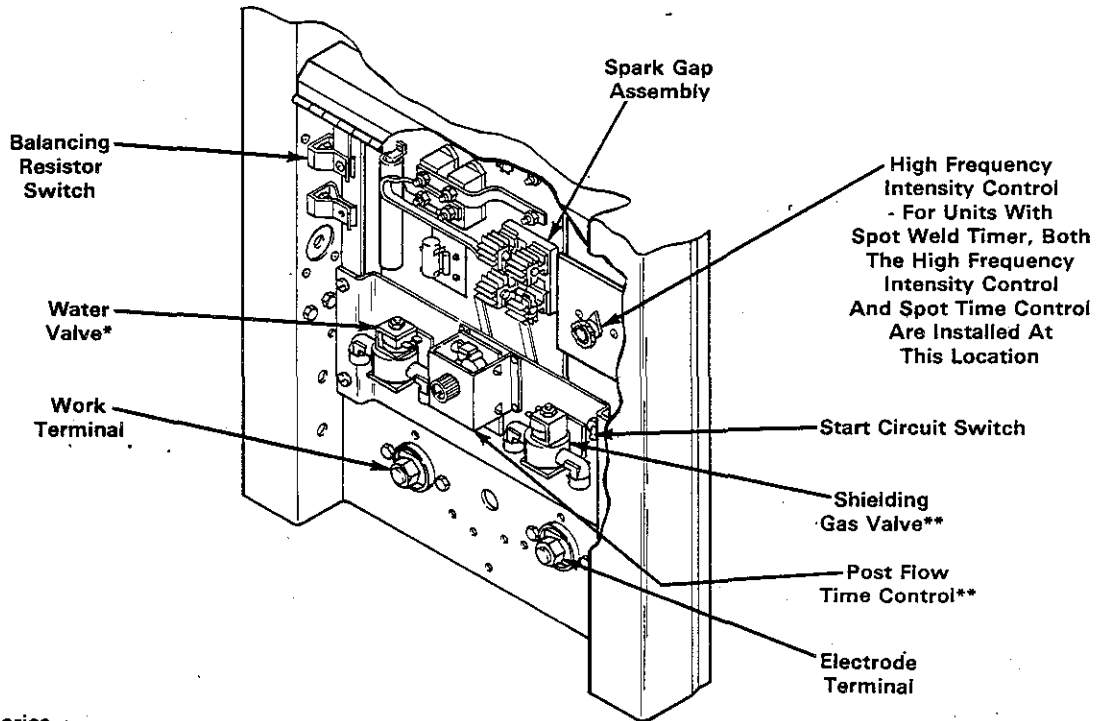
The High Frequency Intensity control provides a means of adjusting the intensity of high frequency energy available to initiate or maintain an arc. Normally this control needs to be adjusted only initially. To adjust the HIGH FREQUENCY Intensity control, proceed as follows:

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source before adjusting HIGH FREQUENCY Intensity control.

1. Open lower front panel access door.
2. Rotate the control clockwise to increase or counterclockwise to decrease the high frequency intensity.
3. Close and secure lower front power access door.

IMPORTANT: As the high-frequency intensity is increased, the possibility of causing interference with communication equipment as well as local radio and television receivers also increases. Set the HIGH FREQUENCY Intensity control to as low a position as practical while still maintaining a satisfactory welding operation to avoid such interference.



*Optional Accessories
 **330A/BP Models Only

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Figure 4 - 2. Lower Front Panel View With Access Door Open

4-11. BALANCING RESISTOR SWITCH (Figure 4-2)

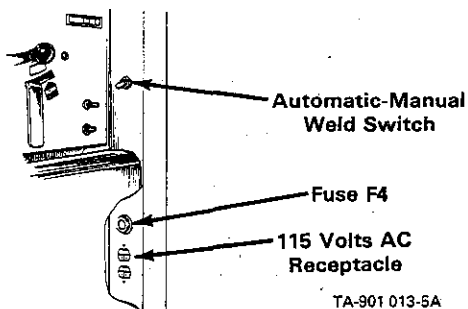
WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source before changing Balance Resistor switch position.

The Balancing Resistor switch places the proper resistance in the welding power source necessary to provide proper welding characteristics for either Shielded Metal Arc Welding (SMAW) or Gas Tungsten Arc Welding (GTAW).

When Shielded Metal Arc Welding (SMAW) is performed, the arm of the Balancing Resistor switch must be in the METALLIC (up) position. When performing Gas Tungsten Arc Welding (GTAW), the arm of the switch must be in the TIG (down) position.

4-12. AUTOMATIC-MANUAL WELD SWITCH (Figure 4-3) (Models With Optional Spot Weld Timer Only)



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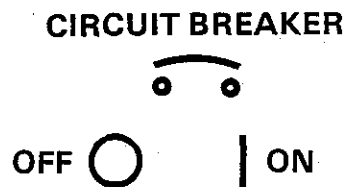
Figure 4 - 3. Automatic-Manual Weld Switch

The AUTOMATIC-MANUAL WELD switch determines whether the Spot Weld Timer or the Remote Contactor Control governs the period of time during which weld output is available when terminal strip 1T is connected for spot panel operation (see Section 3-5C).

When in the AUTOMATIC position, the time of the weld is determined by the Spot Weld Timer.

When in the MANUAL position, the weld time is governed by the Remote Contactor Control. Place the switch in the proper position to suit the application.

4-13. CIRCUIT BREAKER FOR CONTROL CIRCUITRY (Figure 4-1)



CIRCUIT BREAKER CB1 protects the welding power source from overload. Should an overload occur, CB1 would open causing the contactor W coil to open thereby stopping all weld output from the welding power source.

4-14. 115 VOLTS AC DUPLEX RECEPTACLE (Figure 4-3)

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source before making connections to the 115 volts ac duplex receptacle.

The duplex receptacle provides up to 10 amperes of 115 volts ac 60 Hertz, for operating cord-connected accessory equipment.

4-15. SPOT WELD TIMER (Optional) (Figure 4-2)

IMPORTANT: For the Spot Weld Timer to be functional, the WELD switch must be in the AUTOMATIC position and terminal strip 1T must be connected for spot weld operation (see Sections 3-5 and 4-12).

An adjustable 0 to 5 second SPOT TIME control provides a means of selecting the period of time that weld

output is available when spot welding. Rotating the control in a clockwise direction increases the spot time. The scale surrounding the SPOT TIME control is calibrated in percent and should not be read as seconds.

After an arc is initiated, the spot weld timer begins to time out the selected period of time set on the spot time control. When the time has elapsed or the arc is extinguished, the Post Flow timer circuitry begins to time out and the spot weld timer automatically resets itself making it ready for another spot weld sequence.

4-16. METERS (Optional) - The meters are provided to monitor the welding operation and serve as an indication of the welding process. They are not intended for exact amperage or voltage measurements. The voltmeter(s) is internally connected to the welding power source output terminals. The voltmeter(s) will indicate the voltage at the weld output terminals, but will not necessarily indicate the actual voltage at the welding arc (due to cable resistance, poor connections, etc.). The ammeter(s) indicates output amperage of the unit.

SECTION 5 - SEQUENCE OF OPERATION

WARNING: ELECTRIC SHOCK can kill; MOVING PARTS can cause serious injury; IMPROPER AIR FLOW AND EXPOSURE TO ENVIRONMENT can damage internal parts.

- Keep all covers and panels in place while operating.

Warranty is void if the welding power source is operated with any portion of the outer enclosure removed.

ARC RAYS, SPARKS, AND HOT SURFACES can burn eyes and skin; NOISE can damage hearing.

- Wear correct eye, ear, and body protection.

FUMES AND GASES can seriously harm your health.

- Ventilate to keep from breathing fumes and gases.
- If ventilation is inadequate, use approved breathing apparatus.

HOT METAL, SPATTER, AND SLAG can cause fire and burns.

- Watch for fire.
- Have a fire extinguisher nearby, and know how to use it.
- Allow work and equipment to cool before handling.

MAGNETIC FIELDS FROM HIGH CURRENTS can affect pacemaker operation.

- Wearers should consult with their doctor before going near arc welding, gouging, or spot welding operations.

See Section 1 - Safety Rules For Operation Of Arc Welding Power Source for basic welding safety information.

5 - 1. GAS TUNGSTEN ARC WELDING (GTAW)

WARNING: Read and follow safety information at beginning of entire Section 5 before proceeding.

1. Install and connect unit according to Section 3.

2. Make shielding gas connections as instructed in Section 3-7.
3. Make water valve connections if applicable as instructed in Section 3-6.
4. Connect a Remote Contactor Control to the REMOTE CONTACTOR control receptacle, and place the REMOTE CONTACTOR switch in the ON position (see Section 4-6).
5. If remote amperage control is not used, place the REMOTE AMPERAGE switch in the OFF position. If remote amperage control is to be used, place the REMOTE AMPERAGE switch in the ON position (see Section 4-5).
6. Place Range switch in desired position (see Section 4-2).
7. Place the Selector switch in the desired position (see Section 4-3).
8. Rotate the WELD AMPERAGE ADJUSTMENT control to desired position (see Section 4-4).
9. Place the START CIRCUIT switch in the desired position. If this switch is placed in the IN position, rotate the START AMPERAGE ADJUSTMENT control to the desired position (see Section 4-7).
10. Place the HIGH FREQUENCY switch in the desired position. If this switch is placed in the START or CONTINUOUS position, rotate the HIGH FREQUENCY Intensity control to the desired position (see Sections 4-9 and 4-10).
11. Place the Balancing Resistor switch in the TIG position (see Section 4-11).

12. Place the WELD switch if applicable in the MANUAL position (see Section 4-12).
13. Set the Post Flow time control for the desired time (see Section 4-8).
14. Turn on shielding gas supply and coolant supply if applicable at the source.
15. Place the POWER switch in the ON position (see Section 4-1).
16. Begin welding.

5 - 2. GAS TUNGSTEN ARC (GTAW) SPOT WELDING

WARNING: Read and follow safety information at beginning of entire Section 5 before proceeding.

1. Install and connect unit according to Section 3.
2. Make shielding gas connections as instructed in Section 3-7.
3. Make water valve connections if applicable as instructed in Section 3-6.
4. Connect a Remote Contactor Control to the REMOTE CONTACTOR control receptacle, and place the REMOTE CONTACTOR switch in the ON position (see Section 4-6).
5. If remote amperage control is not used, place the REMOTE AMPERAGE switch in the OFF position. If remote amperage control is to be used, place the REMOTE AMPERAGE switch in the ON position (see Section 4-5).
6. Place the Range switch in the desired position (see Section 4-2).
7. Place the Selector switch in the desired position (see Section 4-3).
8. Rotate the WELD AMPERAGE ADJUSTMENT control to the desired position (see Section 4-4).
9. Place the START CIRCUIT switch in the desired position. If this switch is placed in the IN position, rotate the START AMPERAGE ADJUSTMENT control to the desired position (see Section 4-7).
10. Place the HIGH FREQUENCY switch in the desired position. If this switch is placed in the START or CONTINUOUS position, rotate the HIGH FREQUENCY intensity control to the desired position (see Sections 4-9 and 4-10).
11. Place the Balancing Resistor switch in the TIG position (see Section 4-11).

12. Place the WELD switch in the AUTOMATIC position (see Section 4-12).
13. Set the Spot Weld Timer for the desired time (see Section 4-15).
14. Set the Post Flow time control for the desired time (see Section 4-8).
15. Turn on shielding gas supply and coolant supply if applicable at the source.
16. Place the POWER switch in the ON position (see Section 4-1).
17. Begin welding.

5 - 3. SHIELDED METAL ARC WELDING (SMAW)

WARNING: Read and follow safety information at beginning of entire Section 5 before proceeding.

1. Install and connect unit according to Section 3.
2. Place the Range switch in the desired position (see Section 4-2).
3. Place the Selector switch in the desired position (see Section 4-3).
4. Place the REMOTE CONTACTOR switch in the OFF position (see Section 4-6).
5. Place the HIGH FREQUENCY switch in the OFF Position (see Section 4-9).

WARNING: USING HIGH FREQUENCY WITH THE SHIELDED METAL ARC WELDING (SMAW) PROCESS can result in serious personal injury.

- Place the HIGH FREQUENCY switch in the OFF Position before doing Shielded Metal Arc Welding (SMAW).

The attempted use of high frequency to establish an arc with a stick electrode could cause an arc to form between the electrode holder and operator.

6. If remote amperage control is not used, place the REMOTE AMPERAGE switch in the OFF position. If remote amperage control is to be used, place the REMOTE AMPERAGE switch in the ON position (see Section 4-5).
7. Rotate the WELD AMPERAGE ADJUSTMENT control to the desired position (see Section 4-4).
8. Place the START CIRCUIT switch in the desired position. If this switch is placed in the IN position, rotate the START AMPERAGE ADJUSTMENT control to the desired position (see Section 4-7).
9. Place the Balancing Resistor switch in the METALLIC position (see Section 4-11).

10. Place POWER switch in the ON position (see Section 4-1).

11. Begin welding.

5 - 4. SHUTTING DOWN

1. Stop welding.
2. Allow unit to idle for three minutes with no load applied.

3. Place POWER switch in OFF position.

4. Turn off the shielding gas supply and coolant supply if applicable.

WARNING: HIGH CONCENTRATION OF SHIELDING GAS can harm health or kill.

- Shut off gas supply when not in use.

SECTION 6 - MAINTENANCE & TROUBLESHOOTING

IMPORTANT: Every six months inspect the labels on this unit for legibility. All precautionary labels must be maintained in a clearly readable state and replaced when necessary. See Parts List for part number of precautionary labels.

6 - 1. FAN MOTOR - This unit is equipped with an exhaust fan and relies on forced draft for adequate cooling. The fan motor is manufactured with lifetime sealed bearings and requires no maintenance.

6 - 2. INTERNAL CLEANING

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down unit and disconnect input power employing "lockout/tagging procedures" before inspecting, maintaining, or servicing.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

Blow out or vacuum the dust and dirt from around the internal components. Do this annually depending on the location of the unit and the amount of dust and dirt in the atmosphere. If dirty or dusty conditions are present, clean unit monthly. The welding power source outer enclosure should be removed and a clean, dry, airstream or vacuum suction should be used for this cleaning operation.

6 - 3. WELD CABLES

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down unit and disconnect input power employing "lockout/tagging procedures" before inspecting, maintaining, or servicing.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

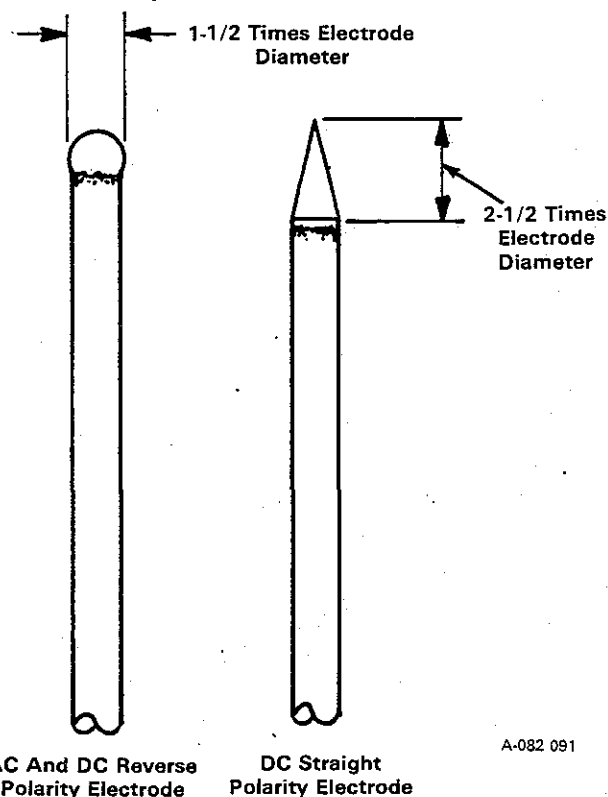
Inspect cables for breaks in insulation, and be sure that all connections are clean and tight. Repair or replace cables if insulation breaks are present. Clean and tighten connections at each inspection.

6 - 4. PREPARING TUNGSTEN ELECTRODES (Figure 6-1)

CAUTION: HOT FLYING METAL PARTICLES can injure personnel, start fires, and damage equipment.

- Shape tungsten electrode only with properly guarded grinder in a safe location wearing proper face, hand, and body protection.

Tungsten electrode shaping should be done on a fine grit, hard abrasive wheel. Since tungsten is harder than most grinding wheels, causing the tungsten to be chipped away rather than cut away, the grinding marks should run lengthwise with the electrode.



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Figure 6 - 1. Properly Prepared Tungsten Electrodes

On electrodes that are used on ac or dc Reverse Polarity and which form a hemisphere or balled end, the sharp edge of the electrode should be ground to a slight taper. Weld current will cause the electrode to form the balled end. The diameter of the end should not exceed the diameter of the electrode by more than 1-1/2 times. For example: A 1/8 in. (3.2 mm) diameter electrode should only form a 3/16 in. (4.8 mm) diameter end (see Figure 6-1).

In pointing an electrode, the end should be ground to a taper for a distance of 2 to 2-1/2 electrode diameters in length. For example: The ground surface for a 1/8 in. (3.2 mm) electrode would be 1/4 in. (6.4 mm) to 5/16 in. (8.0 mm) long (see Figure 6-1).

6 - 5. SPARK GAPS (Figures 4-2 And 6-2) - It is necessary to readjust the spark gaps every three to four months or when intermittent operation occurs. Normal spark gap setting is 0.010 in. (0.254 mm).

High-frequency output varies with the spark gap setting. When a great amount of high frequency is necessary, the spark gaps can be adjusted to 0.010 in. to 0.013 in. (0.254 to 0.330 mm). This, however, increases high-frequency radiation which increases interference with communications equipment. It is suggested that a minimum spark gap setting of 0.004 to 0.010 in. (0.102 to 0.254 mm) be used.

IMPORTANT: Spark gaps widen with normal operation. At regular inspections, check and maintain the 0.010 inch (0.254 mm) spark air gap to ensure consistent welding, results and compliance with FCC radiation regulations.

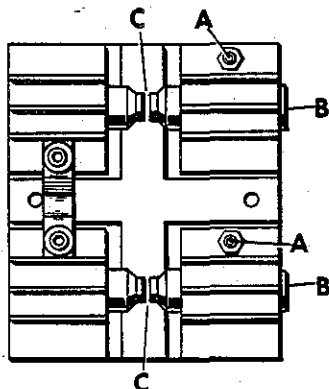


Figure 6 - 2. Spark Gap Adjustment

IMPORTANT: Do not clean or dress points since the material at the tips is tungsten and impossible to file. The entire point should be replaced when the tungsten section has completely disappeared.

This unit is provided with a spark gap assembly located behind the lower front panel access door (see Figure 4-2). To adjust spark gaps, proceed as follows:

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down unit and disconnect input power employing "lockout/tagging procedures" before inspecting, maintaining, or servicing.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

1. Open lower front panel access door.
2. Loosen screws A on both sides.
3. Place feeler gauge of proper thickness between points C.
4. Apply slight pressure against points B so feeler gauge is held firmly in gap.
5. Tighten screws A.
6. Close and secure lower front panel access door.

6 - 6. OVERLOAD PROTECTION

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down unit and disconnect input power employing "lockout/tagging procedures" before inspecting, maintaining, or servicing.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

Maintenance to be performed only by qualified persons.

CAUTION: IMPROPER FUSES can damage unit.

- Be sure replacement fuses are same size, type, and rating (see Parts List).

A. Transformer Protection

The main transformer T2 is protected from overload by fuse F2 located next to the input terminal board (see Figure 6-3). Should F2 open, the unit would be completely inoperative.

To replace fuse F2, proceed as follows:

1. Open the rear panel access door.
2. Check F2, and replace if necessary.
3. Close and secure rear panel access door.

B. 115 Volts AC Circuit Protection

The 115 volts ac control winding of main transformer T2 is protected from overload by fuse F4 located above the duplex receptacle (see Figure 4-3). Should F4 open, contactor W would drop out (deenergize) stopping all output.

To replace fuse F4, proceed as follows:

1. Open lower front panel access door.
2. Check F4, and replace if necessary.
3. Close and secure lower front panel access door.

C. 24 Volts AC Circuit Protection

The 24 volts ac control winding of main transformer T2 is protected from overload by circuit breaker CB2 located next to the upper front control panel (see Figure 3-2). Should an overload occur, CB2 would open causing weld output to drop to near minimum for the range selected. If CB2 opens, correct the problem and manually reset CB2.

D. 15 Volts AC Bias Circuit Protection

The 15 volts ac bias winding of main transformer T2 is protected from overload by fuse F3 located on the center air baffle near rectifier SR5 inside the unit. Should F3 open, operation of the WELD AMPERAGE ADJUSTMENT control for the low and medium range selections is not functional.

To replace fuse F3, proceed as follows:

1. Remove left side panel.
2. Check F3, and replace if necessary.
3. Reinstall left side panel.

6 - 7. THERMAL PROTECTION - This unit is protected by thermostat TP1. Should TP1 open, thermal shutdown would occur and the unit would be completely inoperative with no output. The fan motor FM would continue to run. A cooling period of approximately fifteen minutes would be required if thermal shutdown occurs.

6 - 8. RESETTING CIRCUIT BREAKER CB1 (Figure 4-1)

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*

If CB1 trips, weld output stops but electrical power is still present inside the unit on the control circuits until the unit is shut down.

Circuit breaker CB1 is an automatic-trip type breaker. When the circuit breaker switch is in the ON position, the circuit breaker is functional. When the switch is in the OFF position, the breaker is open and not functional. If the breaker trips, an overload condition is probably present. Should the breaker trip, manually reset it by placing the switch in the ON position. Reduce the weld load and stay within the recommended unit duty cycle (see Section 2-2).

6 - 9. TROUBLESHOOTING CHART

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down unit and disconnect input power employing "lockout/tagging procedures" before inspecting or servicing.*

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

MOVING PARTS can cause serious injury.

- *Keep clear of moving parts.*

HOT SURFACES can cause severe burns.

- *Allow cooling period before servicing.*

Troubleshooting to be performed only by qualified persons.

It is assumed that the unit was properly installed according to Section 3 of this manual, the operator is familiar with the function of controls, the welding power source was working properly, and that the trouble is not related to the welding process. The following chart is designed to diagnose and provide remedies for some of the troubles that may develop in this welding power source.

Use this chart in conjunction with the circuit diagram while performing troubleshooting procedures. If the trouble is not remedied after performing these procedures, the nearest Factory Authorized Service Station should be contacted. In all cases of equipment malfunction, the manufacturer's recommendations should be strictly followed.

TROUBLE	PROBABLE CAUSE	REMEDY
No weld output; unit completely inoperative; fan motor FM does not run.	Line disconnect switch in the OFF position.	Place line disconnect switch in the ON position.
	Line fuse(s) open.	Check and replace line fuse(s).
	Improper electrical input connections.	See Section 3-9 for proper input connections.
	Input voltage jumper links not in proper position.	See Section 3-9B for proper jumper link position.
	Fuse F2 open.	Check and replace F2 (see Section 6-6).
	Contactors W.	Check W points for wear, and replace points if necessary.
	POWER switch S1.	Replace S1.
No weld output; fan motor FM running.	Circuit breaker CB1 open.	Reset CB1 (see Section 6-8).
	Fuse F4 open.	Check and replace F4 (see Section 6-6).
	Thermostat TP1 open (thermal shutdown).	Allow a cooling period of approximately fifteen minutes (see Section 6-7).
Low output with no control.	REMOTE AMPERAGE switch S2 in ON position with no Remote Amperage Control connected to REMOTE CONTROL receptacle RC1.	Place S2 in OFF position or connect Remote Amperage Control to RC1 (see Sections 3-3 and 4-5).
	Circuit breaker CB2 open.	Reset CB2 (see Section 6-6).
Erratic weld output.	Poor and/or improper input and/or output connections.	Refer to Sections 3-2 and 3-9 for proper input and output connections.
	Electrode.	Replace electrode.
Fan does not run.	Fan motor FM.	Replace FM.
Tungsten electrode oxidizing and not remaining bright after conclusion of weld.	Loose gas fittings on regulator or gas line. This will siphon oxygen into the weld zone.	Check and tighten all gas fittings.
	Insufficient gas flow.	Increase 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.
	Insufficient high frequency.	Increase setting of R5 (see Section 4-10).
No weld output control with the WELD AMPERAGE ADJUSTMENT control in low or medium range selection.	Fuse F3 open.	Check and replace F3 (see Section 6-6).

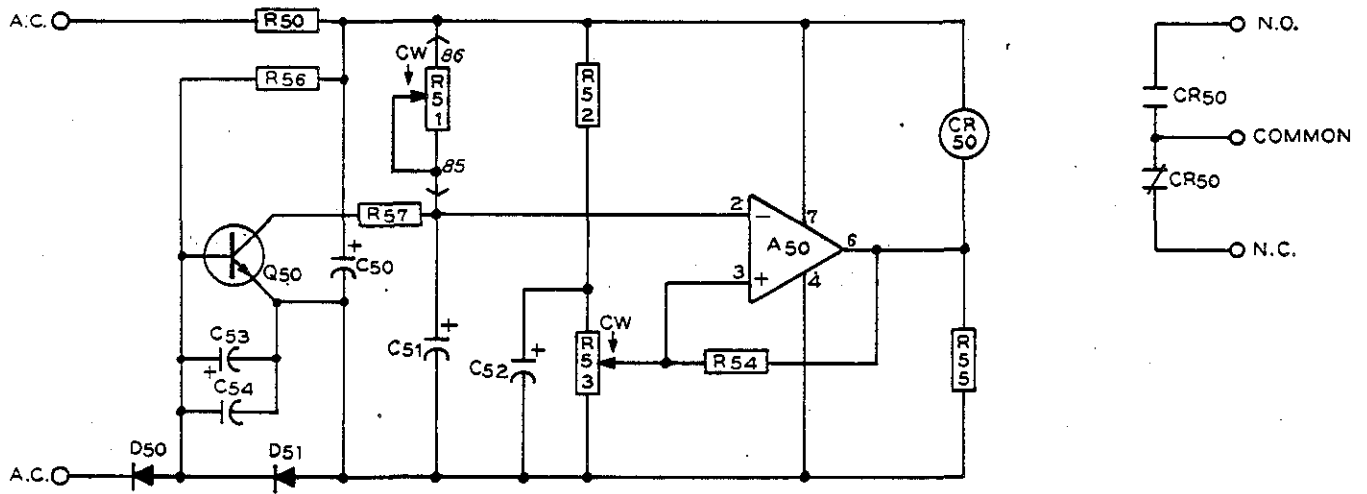
TROUBLE	PROBABLE CAUSE	REMEDY
Lack of high frequency; difficulty in establishing an arc.	HIGH FREQUENCY switch S3 in OFF position.	Place S3 in the desired position (see Section 4-9).
	Use of tungsten larger than recommended for welding amperage.	Use proper size tungsten for welding amperage (see Table 6-1).
	Dissipation of high frequency from electrode holder lead.	Be sure that electrode holder cable is not near any grounded metal.
	Weld cable leakage.	Check cables and torch for cracked or worn insulation or bad connections. Repair or replace necessary parts.
	Improper spark gap.	Check spark gaps G and adjust if necessary (see Section 6-5).
	HIGH FREQUENCY Intensity control R5 setting too low.	Increase setting of R5 (see Section 4-10).
Wandering arc; poor control of direction of arc.	Use of tungsten considerably larger than recommended.	Use proper size tungsten (see Table 6-1).
	Improperly prepared tungsten.	Prepare tungsten as instructed in Section 6-4.

Table 6-1. Tungsten Size Chart

Pure Tungsten Diameter	Current Range - Amperes			
	DCSP-Argon	DCRP-Argon	ACHF-Argon	AC Balanced Wave-Argon
.010"	Up to 15	*	Up to 15	Up to 10
.020"	5-20	*	5-20	10-20
.040"	15-80	*	10-60	20-30
1/16"	70-150	10-20	50-100	30-80
3/32"	125-225	15-30	100-160	60-130
1/8"	225-360	25-40	150-210	100-180
5/32"	360-450	40-55	200-275	160-240
3/16"	450-720	55-80	250-350	190-300
1/4"	720-950	80-125	325-450	250-400
2% Thorium Alloyed Tungsten Diameter				
.010"	Up to 25	*	Up to 20	Up to 15
.020"	15-40	*	15-35	5-20
.040"	25-85	*	20-80	20-60
1/16"	50-160	10-20	50-150	60-120
3/32"	135-235	15-30	130-250	100-180
1/8"	250-400	25-40	225-360	160-250
5/32"	400-500	40-55	300-450	200-320
3/16"	500-750	55-80	400-500	290-390
1/4"	750-1000	80-125	600-800	340-525
Zirconium Alloyed Tungsten Diameter				
.010"	*	*	Up to 20	Up to 15
.020"	*	*	15-35	5-20
.040"	*	*	20-80	20-60
1/16"	*	*	50-150	60-120
3/32"	*	*	130-250	100-180
1/8"	*	*	225-360	160-250
5/32"	*	*	300-450	200-320
3/16"	*	*	400-550	290-390
1/4"	*	*	600-800	340-525

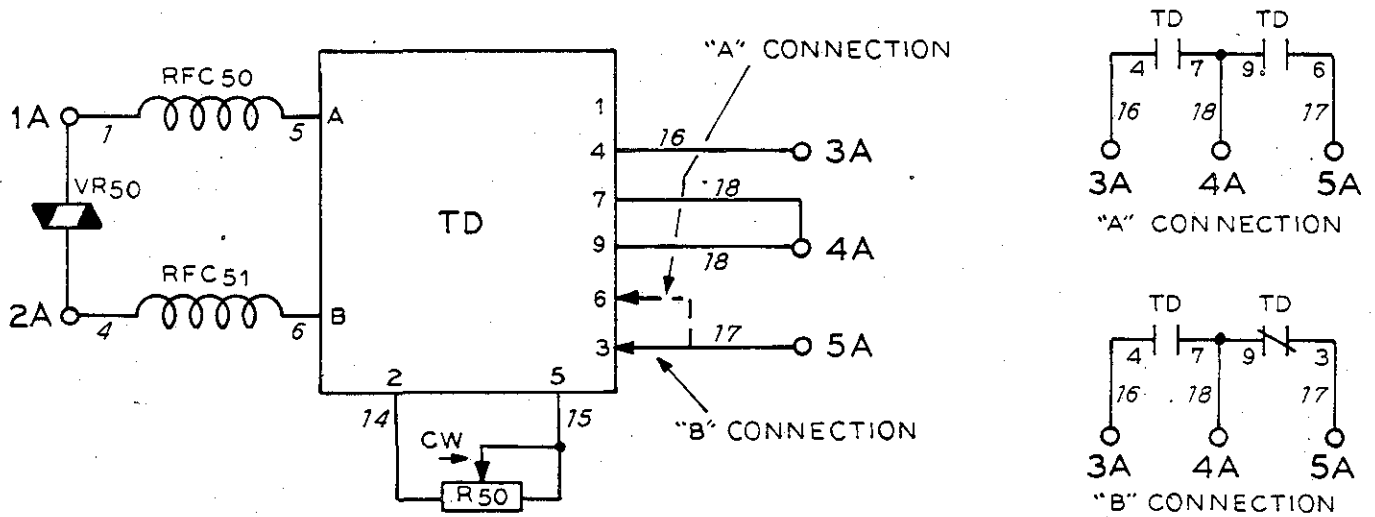
***NOT RECOMMENDED**

The figures listed are intended as a guide and are a composite of recommendations from American Welding Society and electrode manufacturers.



Circuit Diagram No. A-045 288-B

Figure 6-4. Circuit Diagram For Post Flow Timer TD1 (A/BP Models Only)



Circuit Diagram No. A-092 208

Figure 6-5. Circuit Diagram For Optional Spot Weld Timer TD2

SECTION 7 - CERTIFICATION FOR HIGH FREQUENCY ARC WELDING EQUIPMENT

7 - 1. GENERAL - This following information is necessary to make a proper installation of the high frequency arc welding equipment described in this instruction manual. In order to comply with Part 18 of the Rules and Regulations of the Federal Communications Commission, the certificate in front of this manual must be filled in completely and signed. The certificate must be kept **WITH THE EQUIPMENT AT ALL TIMES** to comply with the regulation.

The manufacturer of the equipment covered herein has conducted approved field tests and certifies that the radiation can reasonably be expected to be within the legal limits if the correct installation procedures, as outlined, are followed.

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 that invariably an inadequate installation was at fault.

The user of the equipment must complete the certification by stating that he has installed the equipment and is using it, according to the manufacturer's instructions. The user must sign the certification notice appearing in front of this instruction booklet indicating that he has complied with the requirements.

In the event that interference with authorized services occurs, in spite of the fact that the radiation from the welding equipment is within the specified limits, the user is required to take suitable steps to clear the situation. The factory personnel will assist the user by supplying technical information to clear the situation.

In lieu of complying with the installation requirements and the certification of each individual installation, the user may elect to certify his entire plant by having a reputable engineering firm make a plant radiation survey. In such cases, the installation instructions incorporated in this instruction booklet could very well serve as a guide in minimizing interference that might be contributed by the high frequency arc welding equipment.

7.- 2. GENERAL INFORMATION - In a high frequency stabilized arc Welding Machine installation, interfering radiation can escape in four distinct ways as outlined below:

1. Direct radiation from the welding machine. This is radiation that escapes directly from the Welding Machine case. This is very pronounced if access doors are left open and unfastened and if the Welding Machine case is not properly grounded. Any opening in the metal Welding Machine case will allow some radiation to escape. The high frequency unit of this certified equipment is adequately shielded to prevent direct radiation of any consequences if proper grounding is carried out.
2. Direct feedback to the power line. High frequency energy may get on the power line by

direct coupling inside the equipment or the high frequency unit, the power line then serving as a radiating antenna.

By proper shielding and filtering, direct coupling is prevented in this certified equipment.

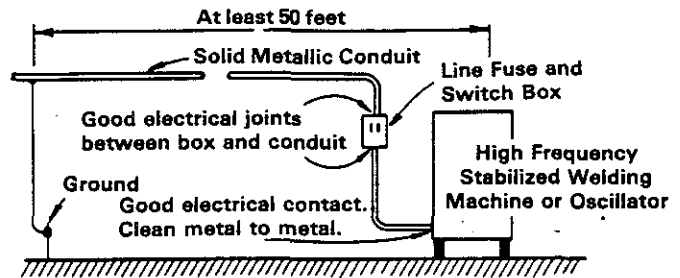


Figure 7-1. Power Service Installation H.F. Stabilized Arc Welding Machine

3. Direct radiation from welding leads. Direct radiation from the welding leads, although very pronounced, decreases rapidly with distance from the welding leads. By keeping the welding leads as short as possible, the operator can do a great deal to minimize interference from the source.

The intensity and frequency of the radiation can be altered over wide limits by changing the location and relative position of the welding leads and work. If possible, loops and suspended sections should be avoided.

4. Pick-up and reradiation from power lines. Even though welding lead radiation falls off rapidly with distance, the field strength in the immediate vicinity of the welding area may be extremely high. Unshielded wiring and ungrounded metallic objects in this strong field may pick up the direct radiation, conduct the energy for some distance, and produce a strong interference field in another area.

This is usually the most troublesome source of interference, but careful adherence to proper installation procedure as outlined in this booklet will minimize this type of interference.

7 - 3. POWER SOURCE - The specific installation instructions for making the proper primary connections to the equipment as outlined in the instruction booklet furnished with the equipment, should be followed carefully with one exception as noted in the following paragraph.

Frequently installation instructions specify that the primary power service shall be run in solid or flexible metallic conduit. Ordinary helically wrapped conduit is designed for mechanical protection and is not suitable for electrical shielding. Only solid metallic conduit or conduit of "equivalent electrical shielding ability" should be used to enclose the primary power service leads.

Solid metallic shielding shall enclose the primary power service to the equipment from a point 50 feet from the equipment in an unbroken run.

This shielding shall be grounded at the farthest point from the equipment and should make good electrical contact with the casing of the equipment. The ground should be in accordance with the specifications outlined in the section entitled "GROUNDS" and as shown in Figure 7-1. Care should be taken that paint or corrosion at the junction of conduit and case, does not interfere with good electrical contact.

There shall be no gap in this shielding run. This simply means that within 50 feet of the equipment, no portion of the power wires serving the equipment shall be unshielded. If there is any question about the electrical efficiency of the joints between individual conduit sections, outlet boxes and the equipment case, bonding should be carried out by soldering a copper strap or wire across the joint as shown in Figure 7-2.

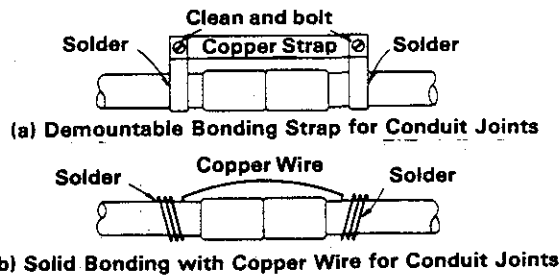


Figure 7-2. Two Recommended Methods For Electrical Bonding Across Poor-Conductivity Conduit Joints

7 - 4. WELDING MACHINE - The location of the equipment should be chosen with respect to nearness to a suitable ground connection. The equipment case, firmly bonded to the power conduit, should be grounded to the work terminal of the equipment with a copper cable or braid with rated current carrying capacity equal to or greater than that of the power service wires.

This "work" output terminal of the equipment should then be grounded to a "good electrical ground" (as defined in section entitled "GROUNDS") with a short length of welding cable of the same capacity as the "work lead". (see Figure 7-3).

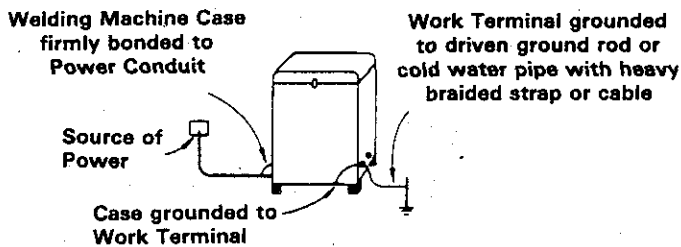


Figure 7-3. Ground Connections At Welding Machine

No change in the wiring or the location of parts inside the equipment, other than power service tap changes or other adjustments specifically covered shall be made. The equipment shall not be modified in any way since

changes in the equipment can affect the radiation characteristics and may not be in accordance with the test data upon which the manufacturer bases his certification.

While the equipment is in operation, all access and service doors shall be closed and properly fastened.

Spark gap settings shall be maintained at the minimum separation consistent with satisfactory welding results.

7 - 5. WELDING LEADS - In order to minimize direct weld lead radiation, the welding leads (electrode lead and work lead) must be kept as short as possible. Certification tests on this machine have been made with leads 25 feet long. Considerable improvement in radiation minimization can be had by shortening the leads as much as possible.

Keeping the electrode lead and ground or work lead as close as possible and on the floor serves to reduce the radiation. (See Figure 7-4).

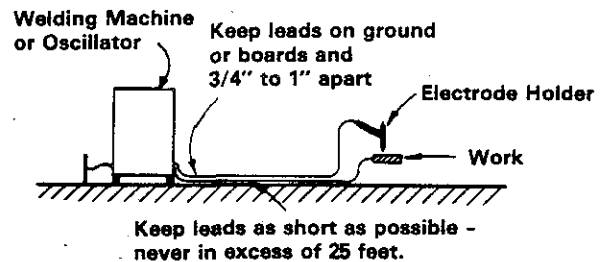


Figure 7-4. General Rules For Welding Leads

7 - 6. WIRING IN THE VICINITY OF THE WELDING AREA - As discussed in the general information section, the most serious source of interference is reradiation from wires that are located near the welding area.

Any ungrounded electrical conductor in the strong "directly radiated" field, produced by the welding leads, serves as a pick-up device and may conduct the interference for some distance and reradiate strongly at another location.

For purpose of simplification and standardization, the space all around the weld zone at a distance of 50 feet in all directions is referred to as the High Field Intensity (H.F.I.) zone. (See Figure 7-5).

To minimize radiation of this type all wiring in the H.F.I. zone shall be in rigid metallic conduit, lead covered cable, copper braid or material of equivalent shielding efficiency. Ordinary flexible helically wrapped metallic conduit, commonly referred to as "B.X." is not satisfactory for shielding, and should not be used. The shield on all wiring should be grounded at intervals of 50 feet and good electrical bonding between sections shall be maintained.

This shielding requirement applies to all wiring, including telephone, inter-communication, signal and control and incidental service.

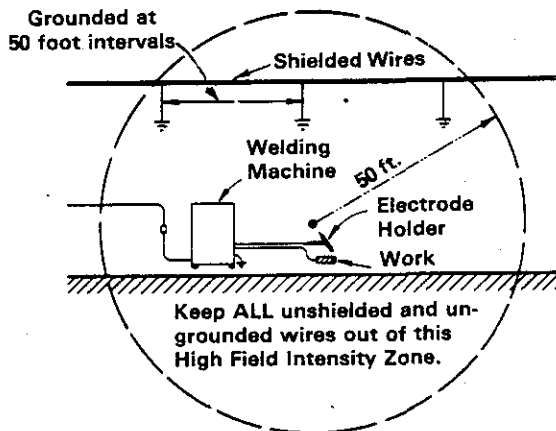


Figure 7-5. General Requirements to Minimize Reradiation Pick-up In The Vicinity of the Weld Zone

Extreme precaution should be taken to make sure that the location of the zone is chosen so that none of the conditions are voided by unshielded wires off the premises but still within the radial dimensions of the H.F.I. zone.

This 50 foot H.F.I. zone is a minimum that is imposed on the installation. Certification tests by the manufacturer are based on this limit.

Keeping unshielded wires farther than 50 feet from the weld zone will materially aid in minimizing interference.

If it is impossible to relocate unshielded wires, that section within the H.F.I. zone, should be placed in conduit and each end of the conduit section grounded.

NOTE: *It must be emphasized that all changes in power and lighting wiring should be made by a qualified electrician and comply with the National Electrical Code requirements. Any shielding or relocation of telephone or signal wires must be done either by the service company concerned or with the specific permission of said company.*

7 - 7. GROUNDS - Frequent reference is made to a "good ground" in previous sections. Although there is considerable leeway in the interpretation of this term, for the purpose covered in this booklet the following specifications apply:

A "ground" connection should be made to a driven rod at least 8 feet long and driven into moist soil.

A cold water pipe can be used in place of the ground rod provided it enters the ground within 10 feet of the equipment to be grounded.

All leads connecting the point to be grounded to the ground rod or pipe should be as short as possible since the ground lead itself can become an effective radiating antenna.

The effectiveness of a ground in reducing interference depends upon the ground conductivity. In certain locations it may become necessary to improve the ground conductivity by treating soil around the ground rod with a salt solution.

7 - 8. METAL BUILDING - It is frequently thought that operating of high frequency stabilized arc welding equipment in metallic buildings will completely eliminate troublesome radiation. This, however, is a false assumption.

A metallic building structure, if properly grounded, may serve to reduce direct radiation from the weld zone but will have no effect on conducted interference and reradiation. As a result, all installation requirements necessary for certification must be complied with.

If the metallic building is not properly grounded, bonding to several good electrical grounds placed around the periphery of the building will give reasonable assurance that the building itself is not contributing to the radiation.

7 - 9. INDIVIDUAL INSTALLATION CERTIFICATION - Any or all of the above installation requirements may be waived by the user if he desires to exercise the option of making an individual field survey of the particular unit installation (or the complete installation if more than one unit is involved), and certifying on that basis.

This survey shall be made by a competent engineer in accordance with the test procedure requirements as set forth in Part 18 of the Rules and Regulations of the Federal Communications Commission.

Surveys of this nature can cover a single unit or multiple units or may include the complete plant structure.

7-10. CHECK LIST - The following questions may be used by the installer as a check to see if all installation requirements have been met:

1. Has the equipment been located so that ground leads can be kept short?
2. Are the power leads, serving the unit, in conduit?
3. Is there good electrical contact between power conduit and case?
4. Do the conduit couplings make good electrical contact? (If in doubt, use bonding).
5. Is there good electrical contact between conduit and switch on service boxes?
6. If rigid metallic conduit is not used, is the shielding used of equivalent shielding efficiency? (Copper sleeving, lead covered cable, etc., is satisfactory. Spirally wound flexible metallic conduit is not suitable).
7. Is the conduit system grounded at a point at least 50 feet from the equipment?
8. Is the conduit run complete (without any gap) in the H.F.I. zone?
9. Is the equipment case connected to the work terminal of the secondary?

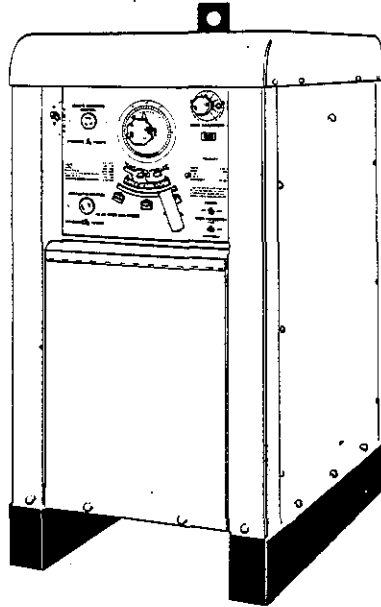
10. Is the wire used for this connection of sufficient size?
11. Is the work terminal connected to a good electrical ground?
12. Is the cable or copperbraid used for this connection equal to or greater in current carrying capacity than the welding lead?
13. Is this cable as short as possible?
14. Are the spark-gaps set at .008" or less?
15. Are all service and access doors closed and bolted?
16. Are the welding leads less than 25 feet long?
17. Are they as short as possible?
18. Are the welding leads on the floor or placed on a suitable board?
19. Are the welding leads approximately 3/4" to 1" apart?
20. Have you visualized the H.F.I. zone, a sphere with a 50 foot radius centered on the weld zone?
21. Have the unshielded power and light wires originally in this H.F.I. zone been placed in grounded shields or been relocated outside the zone?
22. Have all large metallic objects and any long guy or supporting wires in the H.F.I. zone been grounded?
23. Have you checked so that no external power or telephone lines off the premises are within the zone?
24. Are the grounds driven ground rods?
25. Is a cold water pipe used as ground?
26. If so, does it enter the ground 10 feet or less from the connection?
27. Are the connections to the ground clean and tight?
28. If operated within a metal building, is the building properly grounded?

If your answer is "yes" to the above questions, you can certify the installation by signing the certificate.

July 1988

FORM: OM-340P

Effective With Serial No. JJ396523



PARTS LIST

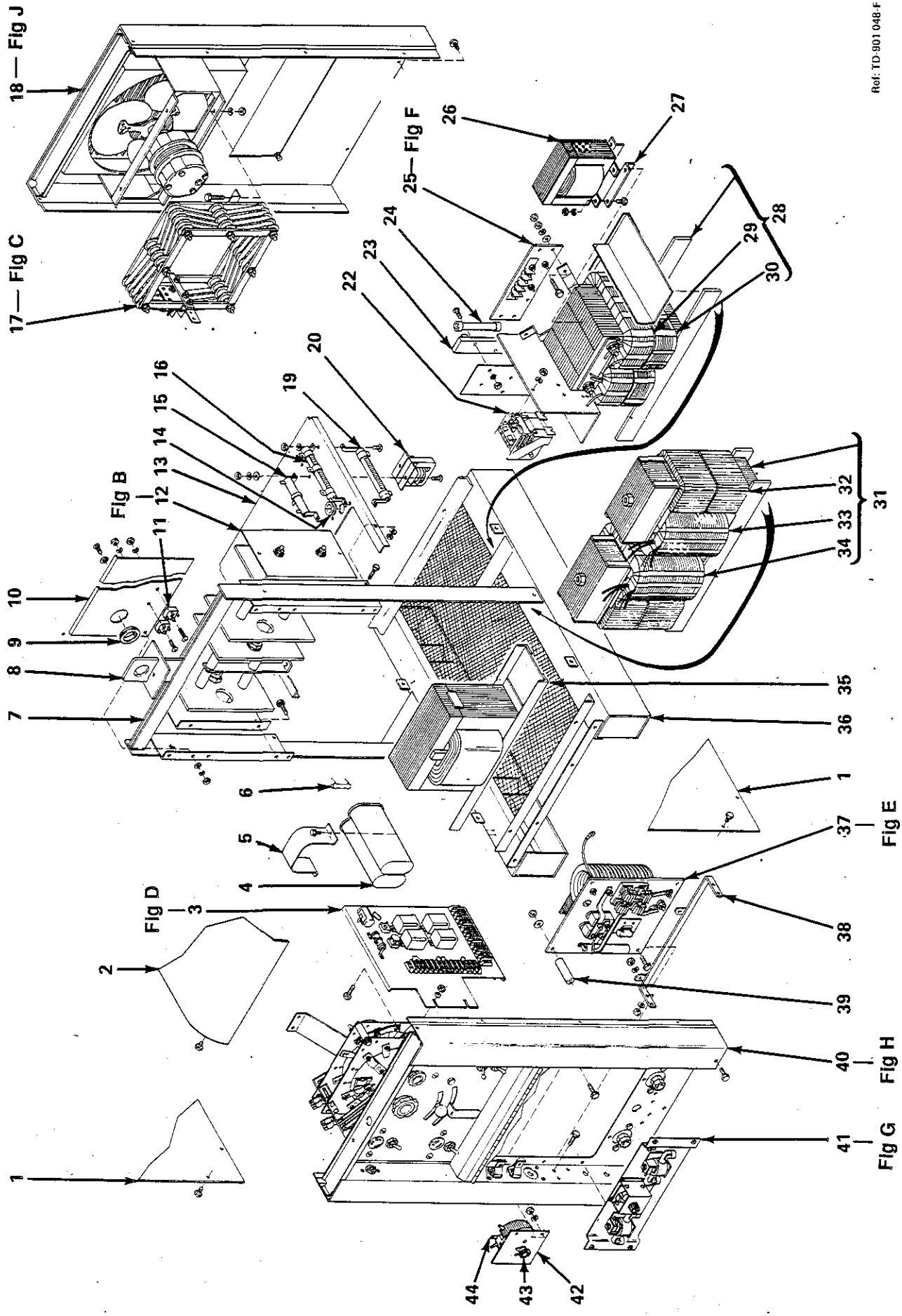


Figure A - Main Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure A Main Assembly				
1		014 607	PANEL, side	2
2		014 604	COVER, top	1
3		048 102	CONTROL PANEL, master (Fig D Pg 4)	1
		+025 141	BRACKET, mtg-capacitor	1
4	C1	+114 610	CAPACITOR, paper-oil 39 uf 480 volts	2
5		+025 141	BRACKET, mounting-capacitor	1
6	R4	030 603	RESISTOR, WW fixed 10 watt 10K ohm	1
7		095 577	FRAME, upright-base	1
8		026 627	GASKET, lifting eye	1
9		010 494	BUSHING, snap-in 1-3/8 ID x 1-3/4 dia hole	1
10		014 630	BAFFLE, air-vertical	1
11	SR3,5	035 914	RECTIFIER, integrated 30 amp 400 volts	2
	VR1,2	082 722	VARIATOR, 0.6 watt 175 volts dc	2
	F3	*012 655	FUSE, miniature-glass 10 amp 250 volts	1
		012 571	HOLDER, fuse	1
12	SR1	080 782	RECTIFIER, silicon diode (Fig B Pg 3)	1
13		015 548	BAFFLE, air - horizontal	1
14		010 493	BUSHING, snap-in 5/8 ID x 7/8 mtg hole	1
15	R10	030 636	RESISTOR, WW adj 50 watt 4 ohm	1
16	R11	030 640	RESISTOR, WW adj 100 watt 5 ohm	1
		605 741	CLIP, mtg-resistor 5/16 ID	2
		605 742	CLIP, mtg-resistor 1/2 ID	4
17	R6	030 609	RESISTOR, balance (Fig C Pg 3)	1
18		Figure J	PANEL, rear-w/components (Pg 14)	1
19	R12	030 965	RESISTOR, WW fixed 100 watt 100 ohm	1
20	CT1	036 208	TRANSFORMER, current 200/5	1
22	W	114 779	CONTACTOR, 60 amp 2 pole 115 volts (consisting of)	1
		114 787	· COIL	1
23		070 404	HOLDER, fuse	1
24	F2	*012 639	FUSE, cartridge 6 amp 600 volts	1
25	TE1,2	038 442	TERMINAL ASSEMBLY, primary (Fig F Pg 6)	1
26	T2	095 173	TRANSFORMER, kva 1 115	1
27		100 917	BRACKET, mounting - transformer kva	2
28	T1	095 172	TRANSFORMER (200/230/460) (consisting of)	1
28	T1	095 174	TRANSFORMER (230/460/575) (consisting of)	1
29		048 438	· COIL, sec RH	1
		048 439	· COIL, sec LH	1
30		095 081	· COIL, pri RH (200/230/460)	1
30		095 083	· COIL, pri RH (230/460/575)	1
		095 082	· COIL, pri LH (200/230/460)	1
		095 084	· COIL, pri LH (230/460/575)	1
31		044 371	AMPLIFIER, magnetic (consisting of)	1
32	CWD	033 640	· COIL, control dc	4
33	CWA	048 440	· COIL, control ac RH	1
34	CWA	048 441	· COIL, control ac LH	1
35	Z	023 061	STABILIZER	1
36		095 689	BASE	1
37		112 361	HF PANEL (Fig E Pg 5)	1
38		020 665	BRACKET, mounting - HF Panel	1
39		010 957	TUBING, 1/2 OD x 17 ga wall x 1-3/4	2
40		Figure H	PANEL, front w/components (Pg 10)	1
41		020 100	CONTROL PANEL, start (Fig G Pg 8)	1
41		107 366	CONTROL PANEL, gas & water (Fig G Pg 8)	1
42		042 211	BRACKET, mounting - rheostat	1
43		097 922	KNOB	1
44	R5	603 942	RHEOSTAT, WW 150 watt 5 ohm	1

*Recommended Spare Parts.

+Location of these items are changed to the right rear of the base.

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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Figure B 080 782 Rectifier, Silicon Diode (Fig A Pg 2 Item 12)

1	R14, VR4	044 482	SUPPRESSOR	1
2	D1-4	037 956	DIODE, 275 amp 250 volts SP	4
3	C5-8	031 689	CAPACITOR, ceramic 0.01 uf w/3/16 & 1/4 terminals	4

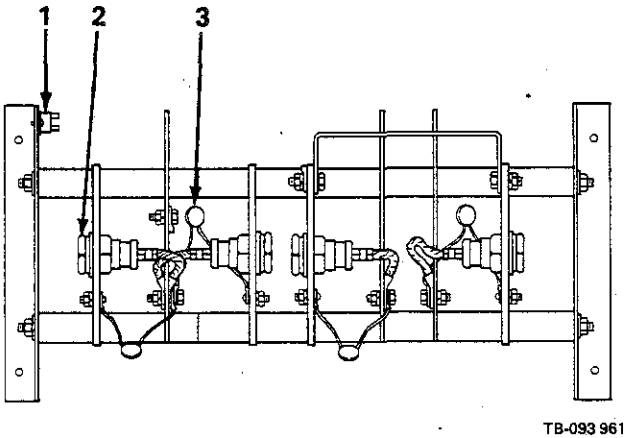


Figure B – Rectifier, Silicon Diode

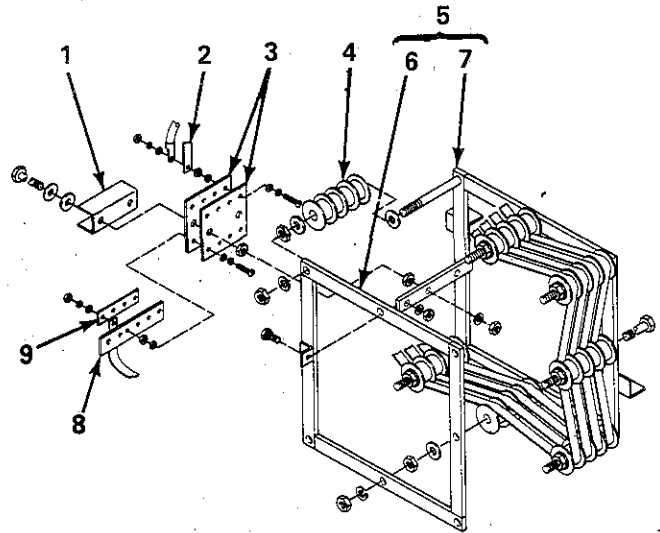


Figure C – Resistor, Balance

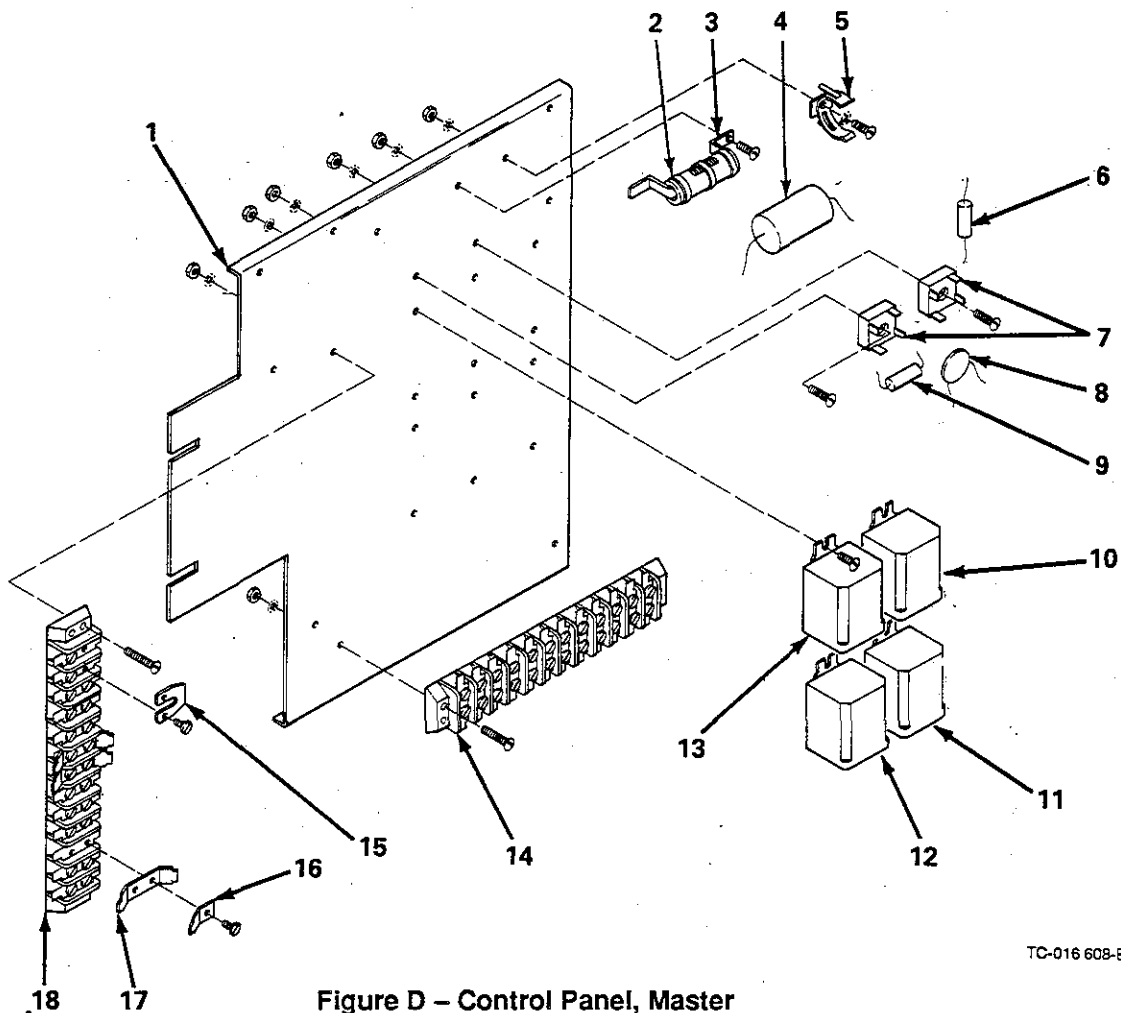
Item No.	Part No.	Description	Quantity
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Figure C 030 609 Resistor, Balance (Fig A Pg 2 Item 17)

1	026 932	INSULATION	1
2	**030 612	BAND, ribbon indicator	4
3	038 671	TERMINAL BOARD	2
4	026 616	SPOOL, insulating - band	7
5	014 629	BRACKET, mounting (consisting of)	1
6	018 744	. BRACKET, mounting - frame section	1
7	018 764	. FRAME	1
8	102 552	BUS BAR	1
9	102 551	BUS BAR	1

****Replace At Factory Or Factory Authorized Service Station.
BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.**

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure D 048 102 Control Panel, Master (Fig A Pg 2 Item 3)				
1		081 260	PANEL, mounting	1
2	R2	*030 601	RESISTOR, WW adj 25 watt 1000 ohm	1
3		605 741	CLIP, mtg 5/16 ID	2
4	C4	031 610	CAPACITOR, electrolytic 40 uf 250 volts dc	1
5		022 301	CLAMP, capacitor 3/4 inch	1
6	R9	*604 178	RESISTOR, carbon 2 watt 100 ohm	1
7	SR2,4	*035 914	RECTIFIER, integrated 30 amp 400 volts	2
	VR3	082 722	VARISTOR, 0.6 watt 175 volts dc	1
8	C12	046 140	CAPACITOR, ceramic 0.05 uf 200 volts dc	1
9	C13	046 139	CAPACITOR, electrolytic 22 uf 50 volts dc	1
10	CR2	052 603	RELAY, enclosed 110 volts dc DPDT 10 amp	1
11	CR4	059 268	RELAY, enclosed 120 volts ac DPDT 20 amp	1
12	CR3	000 174	RELAY, enclosed 24 volts ac 3PDT 10 amp	1
13	CR1	059 267	RELAY, enclosed 12 volts dc DPDT	1
14	2T	038 429	BLOCK, terminal 30 amp 12 pole	1
15		038 620	LINK, jumper - terminal block 30 amp	2
16		601 218	CONNECTOR, block 30 amp	2
17		035 131	CONNECTOR, block 30 amp	3
18	1T	081 111	BLOCK, terminal 30 amp 13 pole	1



TC-016 608-E

Figure D - Control Panel, Master

*Recommended Spare Parts.

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
----------	------------	----------	-------------	----------

Figure E 112 361 HF Panel (Fig A Pg 2 Item 37)

1	R3	083 784	RESISTOR, WW fixed 100 watt 10 ohm	1
2		010 884	STRIP, conductor	1
3	C2	096 761	CAPACITOR, mica 0.002 uf 10000 volts	2
4		016 601	MOUNTING BOARD, component	1
5	T4	074 398	TRANSFORMER, HV 115 volts	1
6	T3	033 373	COIL, coupling	1
7		601 838	NUT, brass-hex jam 3/8-16	5
8		601 835	NUT, brass-hex 10-32	6
9		038 887	STUD, brass 10-32 x 1-3/8 w/hex collar	2
10		603 737	SCREW, brass-round hd 3/8-16 x 1-3/4	2
11	G	020 623	SPARK GAP (Fig E1 Pg 6)	1
12		010 885	STRIP, conductor	1
13		010 883	STRIP, conductor	1
14	R1	080 929	RESISTOR, WW fixed 10 watt 10K ohm	1
15		081 291	CAPACITOR, HF (consisting of)	1
16		081 282	STRIP, mounting - capacitor	1
17		007 532	CLAMP, capacitor 1 inch dia	2
18	C3	059 887	CAPACITOR, metal film 10 uf 220 volts	1

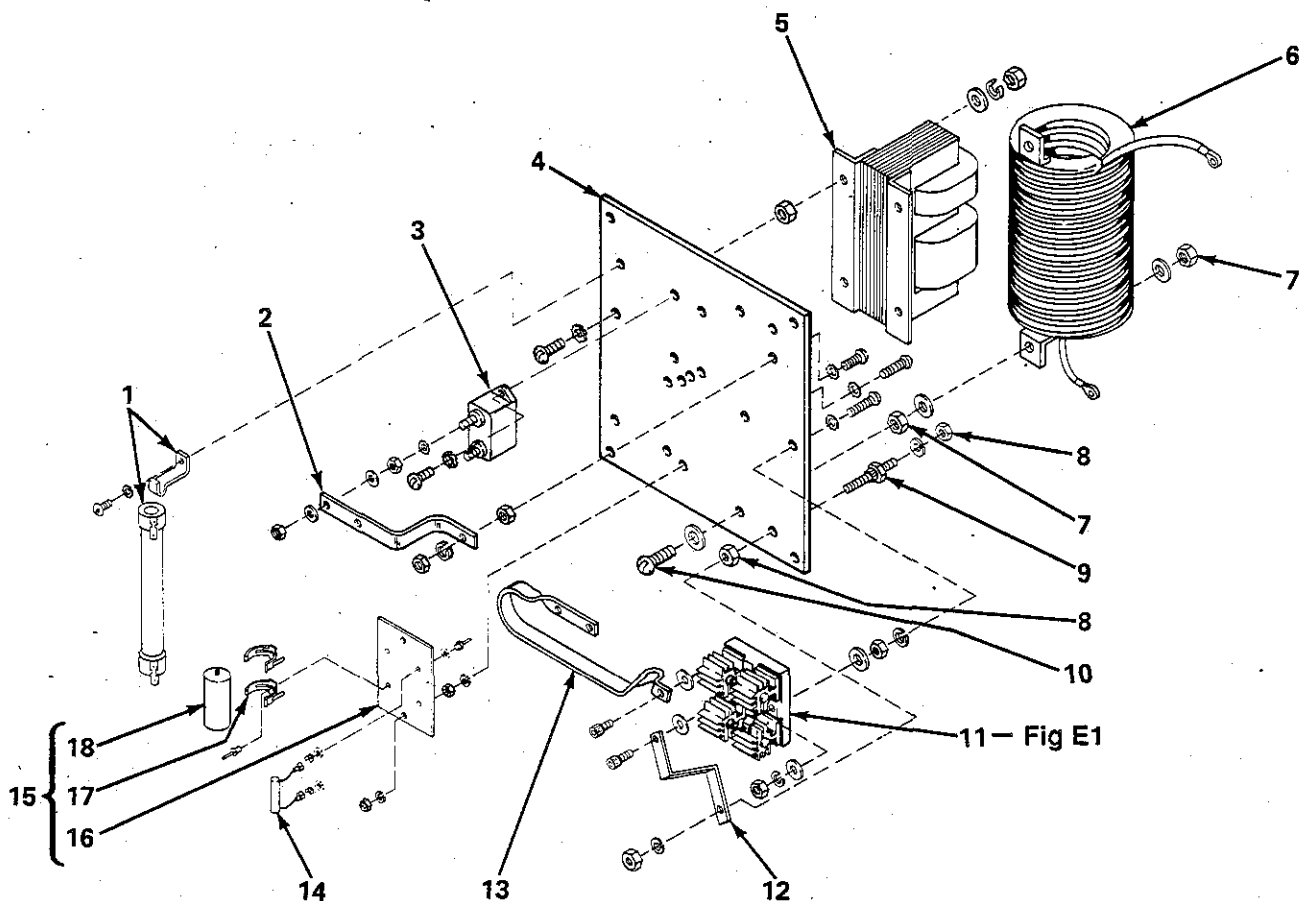


Figure E – HF Panel

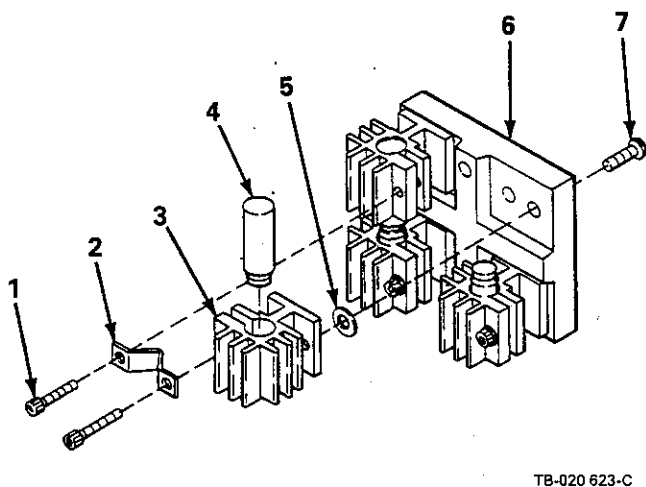
TC-020 612-B

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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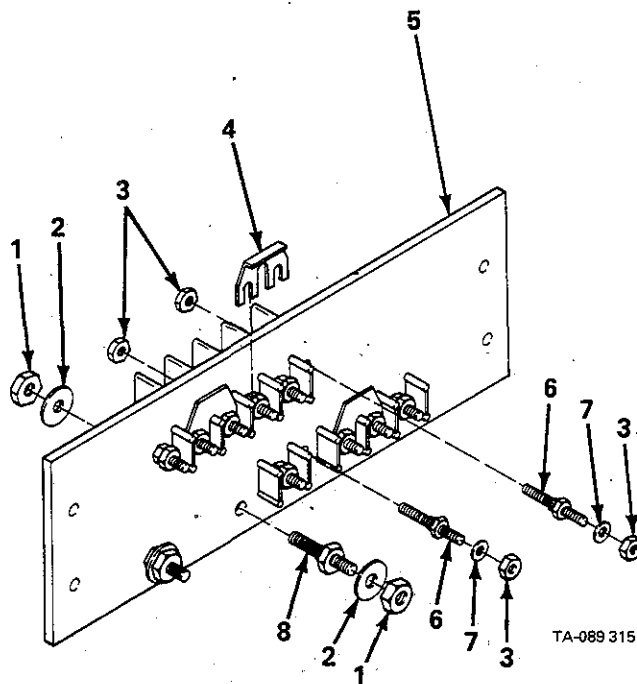
Figure E1 020 623 Spark Gap (Fig E Pg 5 Item 11)

1		602 023	SCREW, cap - socket hd 10-24 x 3/4	4
2		010 888	CONNECTOR, holder	1
3		020 622	HOLDER, points	4
4	G	*020 603	POINT, spark gap	4
5		010 913	WASHER, flat - brass 3/16 ID x 1/2 OD	8
6		095 621	BASE	1
7		047 909	SCREW, round-hd 10-24 x 5/8	8



TB-020 623-C

Figure E1 - Spark Gap



TA-089 315

Figure F - Terminal Assembly, Primary

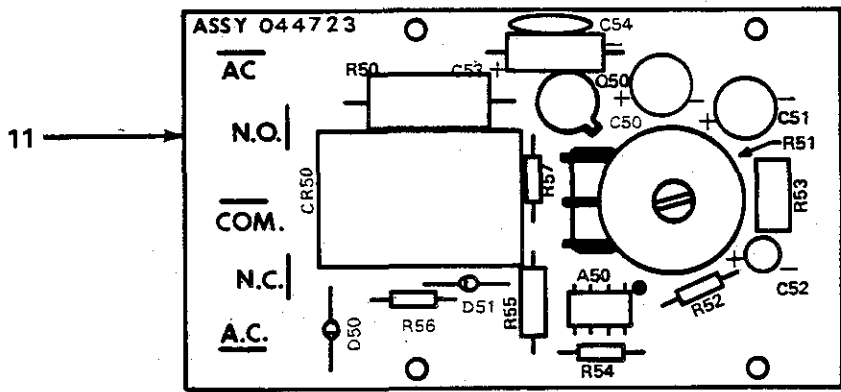
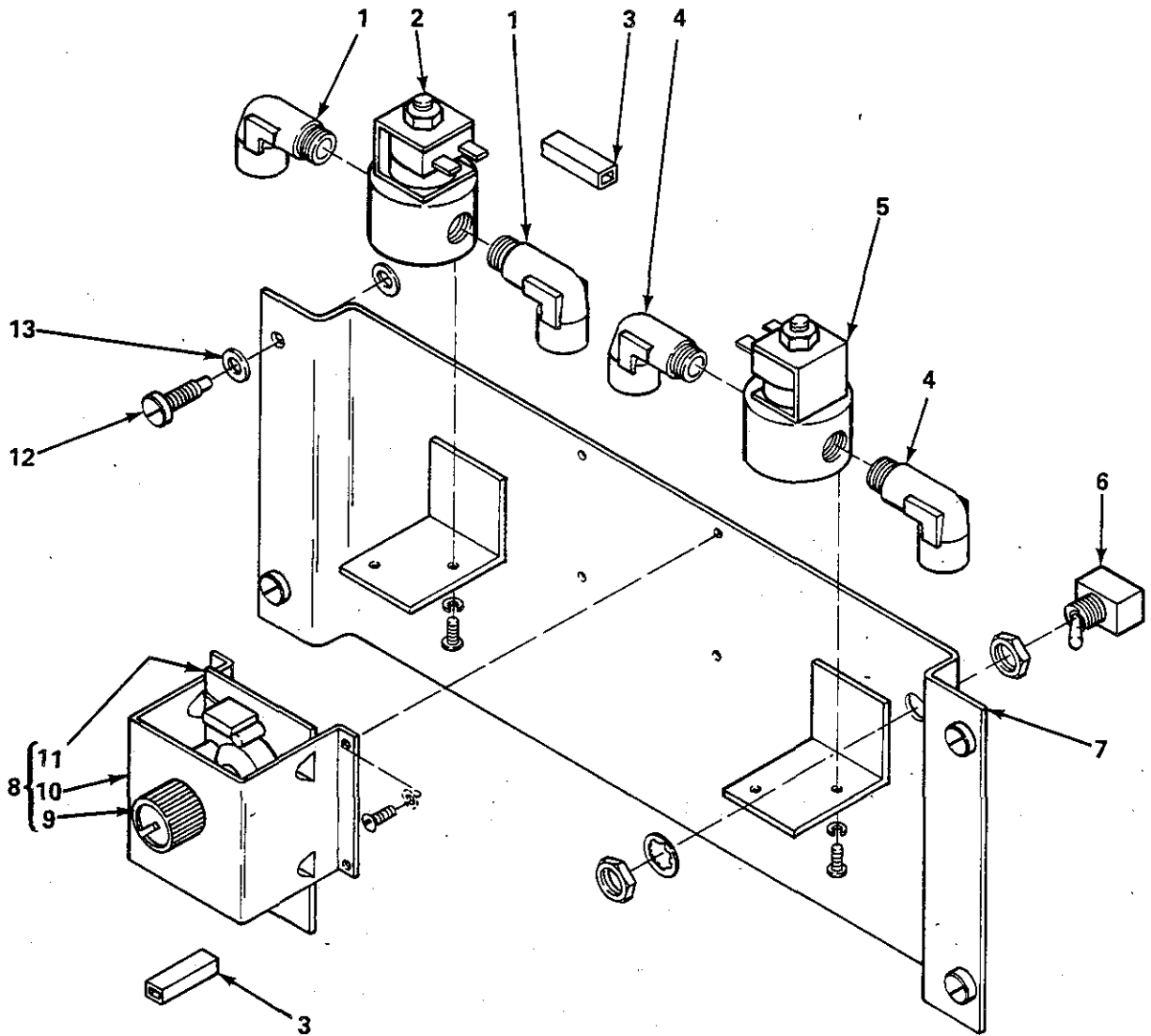
Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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Figure F 038 442 Terminal Assembly, Primary (Fig A Pg 2 Item 25)

1		601 836	NUT, hex-brass 1/4-20	4
2		010 915	WASHER, flat-brass 1/4 ID x 5/8 OD	4
3		601 835	NUT, hex-brass 10-32	22
4		038 618	LINK, jumper-terminal	3
5		083 433	TERMINAL BOARD	1
6		038 887	STUD, brass 10-32 x 1-3/8 w/hex collar	11
7		010 913	WASHER, flat-brass 3/16 ID x 1/2 OD	11
8		038 888	STUD, brass 1/4-20 x 1-1/2 w/hex collar	2

*Recommended Spare Parts.

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.



TB-018 563-D

Figure G – Control Panel, Gas & Water

Item No.	Dia. Mkgs.	Part No.	Description	Quantity	
				W/O Gas & Water	W/Gas & Water
Figure G Control Panel, Gas & Water (Fig A Pg 2 Item 41)				020 100	107 366
1		†010 295	FITTING, hose-brass elbow M 1/4 NPT x 5/8-18 LH		2
2	WS1	†003 538	VALVE, 115 volts ac 2 way 1/4 IPS port 1/8 orifice		1
3		026 837	INSULATOR, terminal-nylon		4
4		010 296	FITTING, hose-brass elbow M 1/4 NPT x 5/8-18 RH		2
5	GS1	003 538	VALVE, 115 volts ac 2 way 1/4 IPS port 1/8 orifice		1
6	S7	089 085	SWITCH, toggle SPDT 20 amp 125 volts ac	1	1
7		014 627	PANEL, mounting	1	1
8	TD1	*052 192	TIMER, 0-60 sec (consisting of)		1
9		052 370	. KNOB		1
10		039 449	. BRACKET, mtg-circuit card		1
11		044 723	. CIRCUIT CARD, post flow (consisting of)		1
	A50	008 971	. IC, linear 741		1
	C50,51	039 482	. CAPACITOR, electrolytic 100 uf 35 volts dc		2
	C52	039 481	. CAPACITOR, electrolytic 3.3 uf 50 volts dc		1
	C53	031 677	. CAPACITOR, tantalum 5.6 uf 35 volts dc		1
	C54	031 670	. CAPACITOR, ceramic 0.05 uf 500 volts dc		1
	CR50	039 486	. RELAY, enclosed 24 volts dc SPDT 2.5 amp		1
	D50,51	026 202	. DIODE, 1 amp 400 volts SP		2
	Q50	000 088	. TRANSISTOR, 800 MA 400 volts NPN		1
	R50	074 121	. RESISTOR, carbon 2 watt 3300 ohm		1
	R51	059 954	. POTENTIOMETER, carbon 1 turn 0.5 watt 600K ohm ...		1
	R52	035 888	. RESISTOR, carbon film 0.25 watt 2200 ohm		1
	R53	000 342	. POTENTIOMETER, cermet 1 turn 0.5 watt 5K ohm		1
	R54	039 332	. RESISTOR, carbon film 0.25 watt 15K ohm		1
	R55	030 997	. RESISTOR, carbon 0.5 watt 2700 ohm		1
	R56	039 335	. RESISTOR, carbon film 0.25 watt 47K ohm		1
	R57	605 919	. RESISTOR, carbon film 0.25 watt 47 ohm		1
12		010 853	FASTENER, screw-slotted hd No. 2	4	4
13		010 855	RETAINER, screw No. 2	4	4

*Recommended Spare Parts.

†Optional Equipment.

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

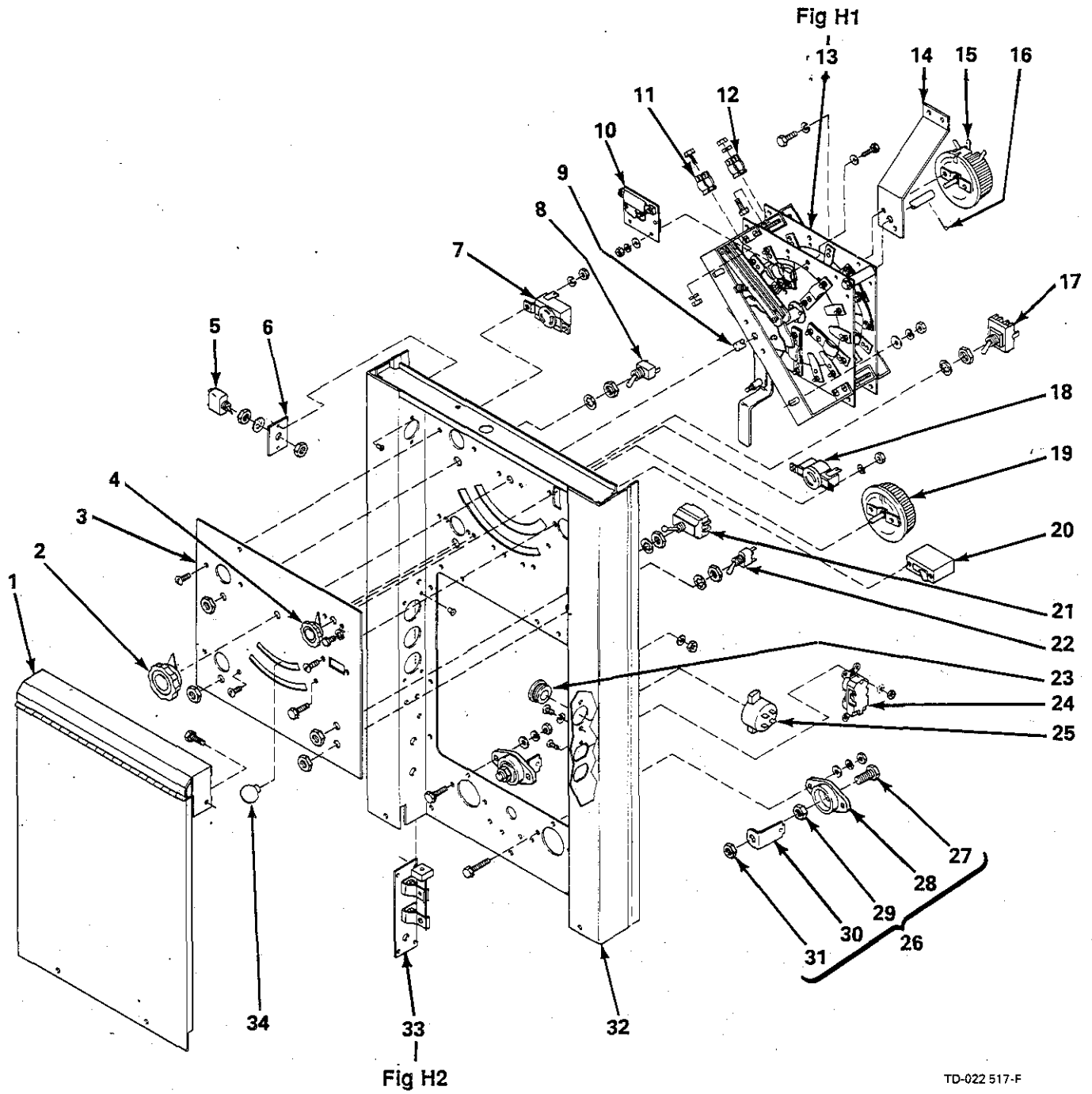


Figure H – Panel, Front - W/Components

TD-022 517-F

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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Figure H Panel, Front – W/Components (Fig A Pg 2 Item 40)

		047 497	LABEL, general precautionary	1
1		+015 110	DOOR, access-front	1
2		019 602	KNOB, pointer	1
3			NAMEPLATE (order by model and serial number)	1
4		097 924	KNOB	1
5	CB2	079 530	CIRCUIT BREAKER, magnetic SPST 10 amp 125 volts ac	1
6		080 463	PLATE, switch	1
7	RC1	039 607	RECEPTACLE, twistlock 3P3W 20 amp 250 volts	1
		605 797	CAP, (RC1) Arrow Hart No. 6312	1
8	S2	011 609	SWITCH, toggle SPDT 10 amp 125 volts	1
9		030 655	SHAFT, rheostat	1
10		031 897	CONTROL CORE RESET (consisting of)	1
	D5	605 938	. DIODE, 12 amp 400 volts SP	1
	R13	030 947	. RESISTOR, WW fixed 40 watt 5 ohm	1
		031 889	. PANEL, mtg-components	1
		031 890	. HEAT SINK	1
11		010 917	HANGER, minerallic No. 0	1
12		010 926	HANGER, minerallic No. 2	2
13	S9,10	011 726	SWITCH, range & selector (Fig H1 Pg 11)	1
		011 965	LINK, connecting-switch selector	1
14		011 660	BRACKET, support-switch	1
15	R7	030 041	RHEOSTAT, WW 150 watt 15 ohm	1
16		602 355	PIN, cotter 3/32 x 1/2	1
17	S4	011 611	SWITCH, toggle DPDT 15 amp 125 volts	1
18	RC2	039 602	RECEPTACLE, twistlock 2P2W 20 amp 250 volts	1
		039 618	CAP, (RC2) Arrow Hart No. 9102N	1
19	R8	030 653	RHEOSTAT, WW 150 watt 15 ohm	1
20	CB1	034 944	CIRCUIT BREAKER, manual reset 5 amp 240 volts ac	1
21	S1	*011 813	SWITCH, toggle 3PST 20 amp 250 volts	1
22	S3	088 409	SWITCH, toggle 2PDT w/center off 15 amp 125 volts	1
23	F4	*012 601	FUSE, plug 10 amp 125 volts	1
24	RC3	604 176	RECEPTACLE, duplex-grounded straight 2P3W 15 amp 277 volts	1
		073 690	CAP, P & S 5266DF	1
25		117 252	HOLDER, fuse	1
26		039 047	TERMINAL, power output (consisting of)	2
27		601 976	. SCREW, cap-hex hd 1/2-13 x 1-1/2	1
28		039 049	. TERMINAL BOARD, red	1
29		601 880	. NUT, hex-jam 1/2-13	1
30		039 044	. BUS BAR	1
31		601 879	. NUT, hex-full 1/2-13	1
32		020 299	PANEL, front or	
32		†031 305	PANEL, front (spot timer model only)	
33	S6	079 934	SWITCH, changeover (Fig H2 Pg 14)	1
34		019 603	KNOB, ball	1
		010 854	NUT, speed No. 2 clip on	4

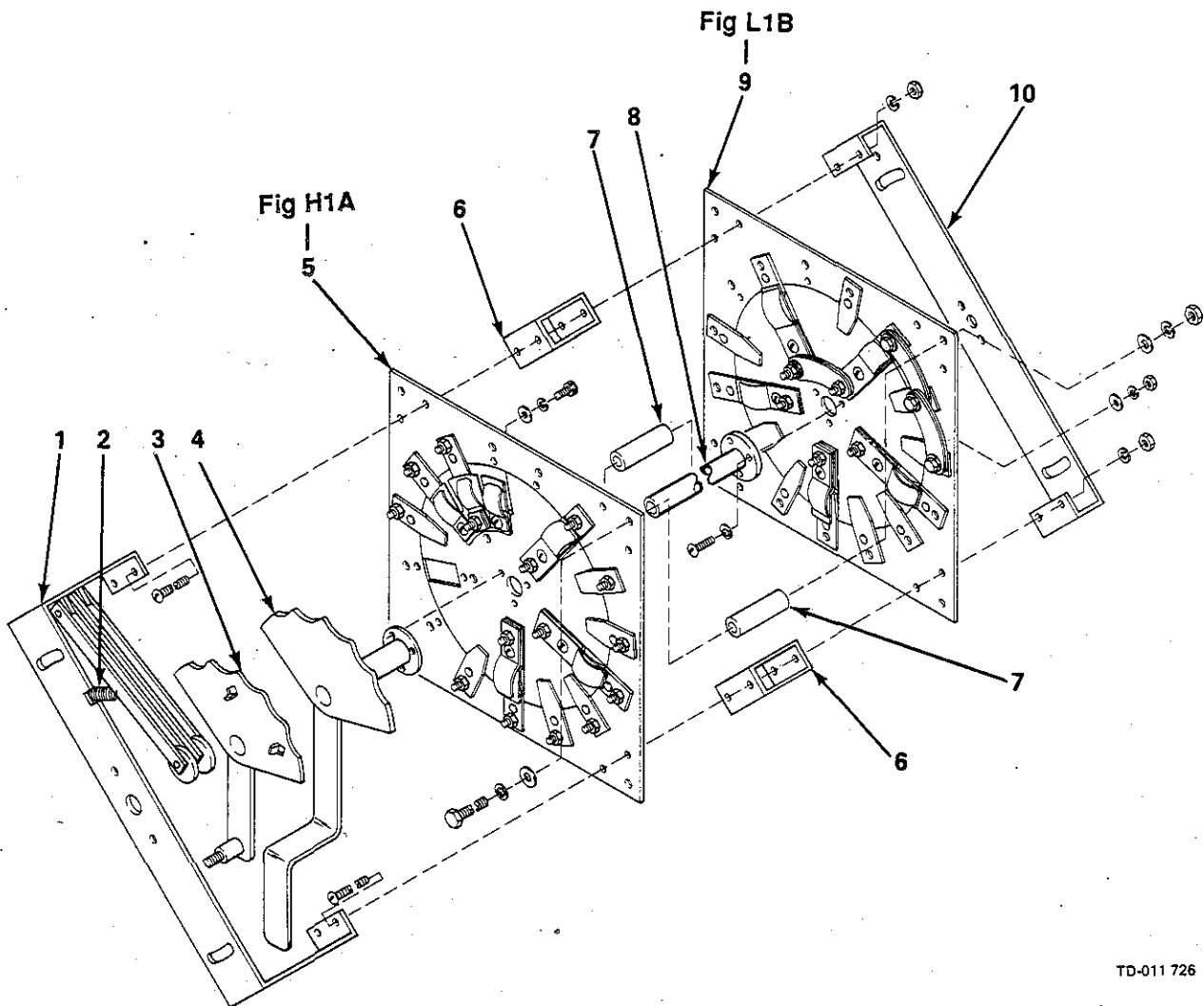
*Recommended Spare Parts.

+ When ordering a component originally displaying a precautionary label, the label should also be ordered.

†Optional Equipment.

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure H1 011 726 Switch, Range & Selector (Fig H Pg 10 Item 13)				
1		011 654	BRACKET, mounting - switch (consisting of)	1
2		010 671	. SPRING	2
3		019 605	HANDLE-HUB, switch selector	1
4		019 604	HANDLE-HUB, range switch	1
5	S9	011 635	CONTACT BOARD, range switch (Fig H1B Pg 12)	2
6		011 657	SPACER, mounting - switch	2
7		011 826	TUBING, 5/8 OD x 12 ga wall x 2	1
8		003 627	SHAFT, control - switch	1
9	S10	011 604	CONTACT BOARD, polarity switch (Fig H1B Pg 13)	1
10		011 643	BRACKET, mounting - switch	1



TD-011 726

Figure H1 – Switch, Range & Selector

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Part No.	Description	Quantity
Figure H1A 011 635 Contact Board, Range Switch (Fig H1 Pg 11 Item 5)			
1	011 080	SPACER, copper	2
2	011 079	SPRING, pressure - center front	1
3	011 371	CONTACT, segment	2
4	011 968	CONTACT BOARD, movable switch	1
5	011 012	SHIM, guide - contact	3
6	100 623	GUIDE, contact board	3
7	011 078	SPRING, pressure - center rear	1
8	011 049	SPRING, pressure - rear	2
9	100 747	CONTACT BOARD, movable switch	1
10	011 644	CONTACT, copper - stationary	11
11	011 645	CONTACT, copper - movable (consisting of)	3
12	011 075	SPRING, pressure - rear	1
13	011 074	SPRING, pressure - front	1
14	011 953	CONTACT, copper - movable	2
15	011 048	SPRING, pressure - front	2

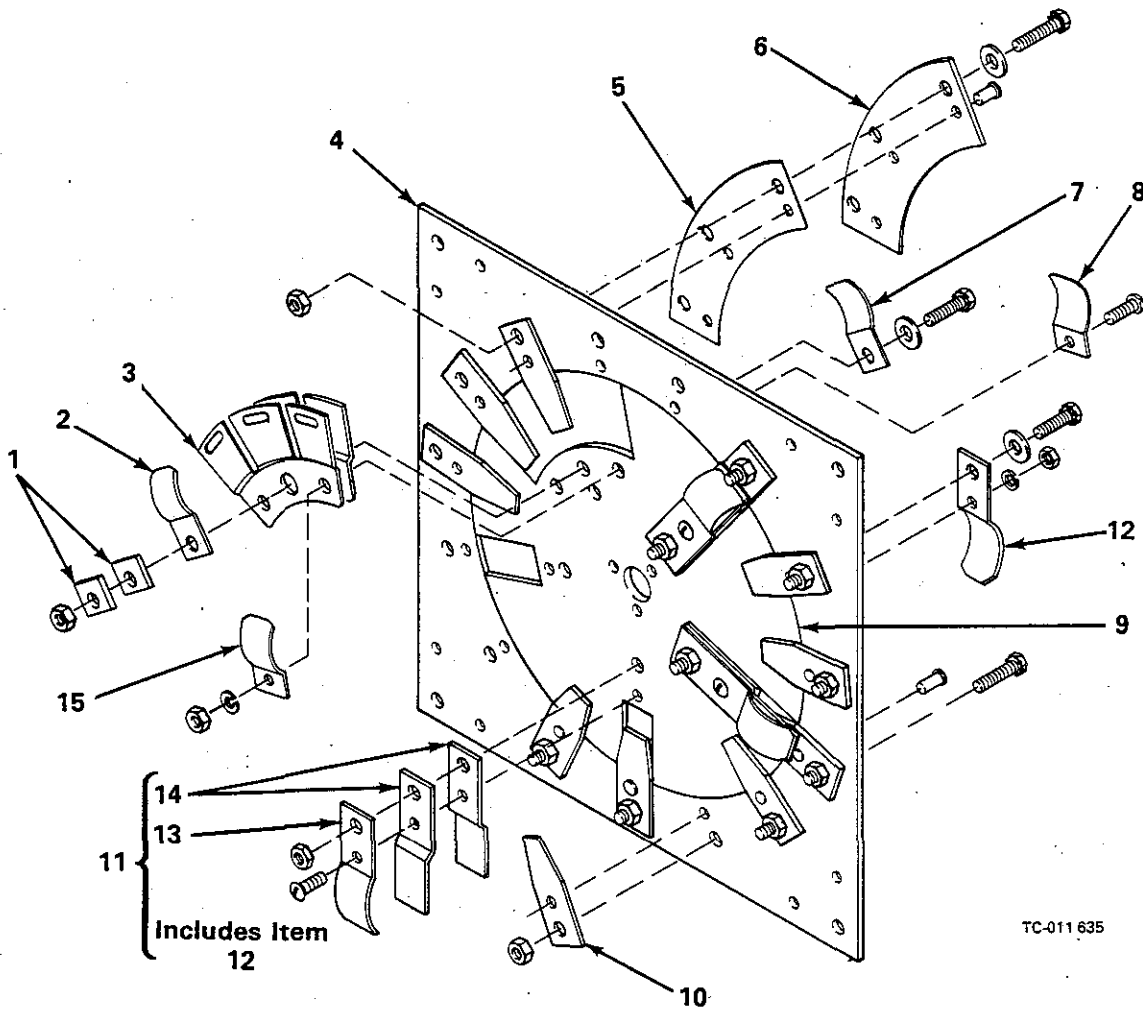


Figure H1A – Contact Board, Range Switch

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Part No.	Description	Quantity
Figure H1B 011 604 Contact Board, Polarity Switch (Fig H1 Pg 11 Item 9)			
1	100 621	LINK, connecting switch	6
2	011 968	CONTACT BOARD, stationary	1
3	011 969	CONTACT BOARD, movable	1
4	100 623	GUIDE, contact board, movable	3
5	100 622	SHIM, guide (as req'd)	1
6	011 644	CONTACT, copper - stationary	13
7	011 645	CONTACT, copper - movable (consisting of)	5
8	011 075	SPRING, pressure - rear	1
9	011 953	CONTACT, copper	2
10	011 074	SPRING, pressure - front	1

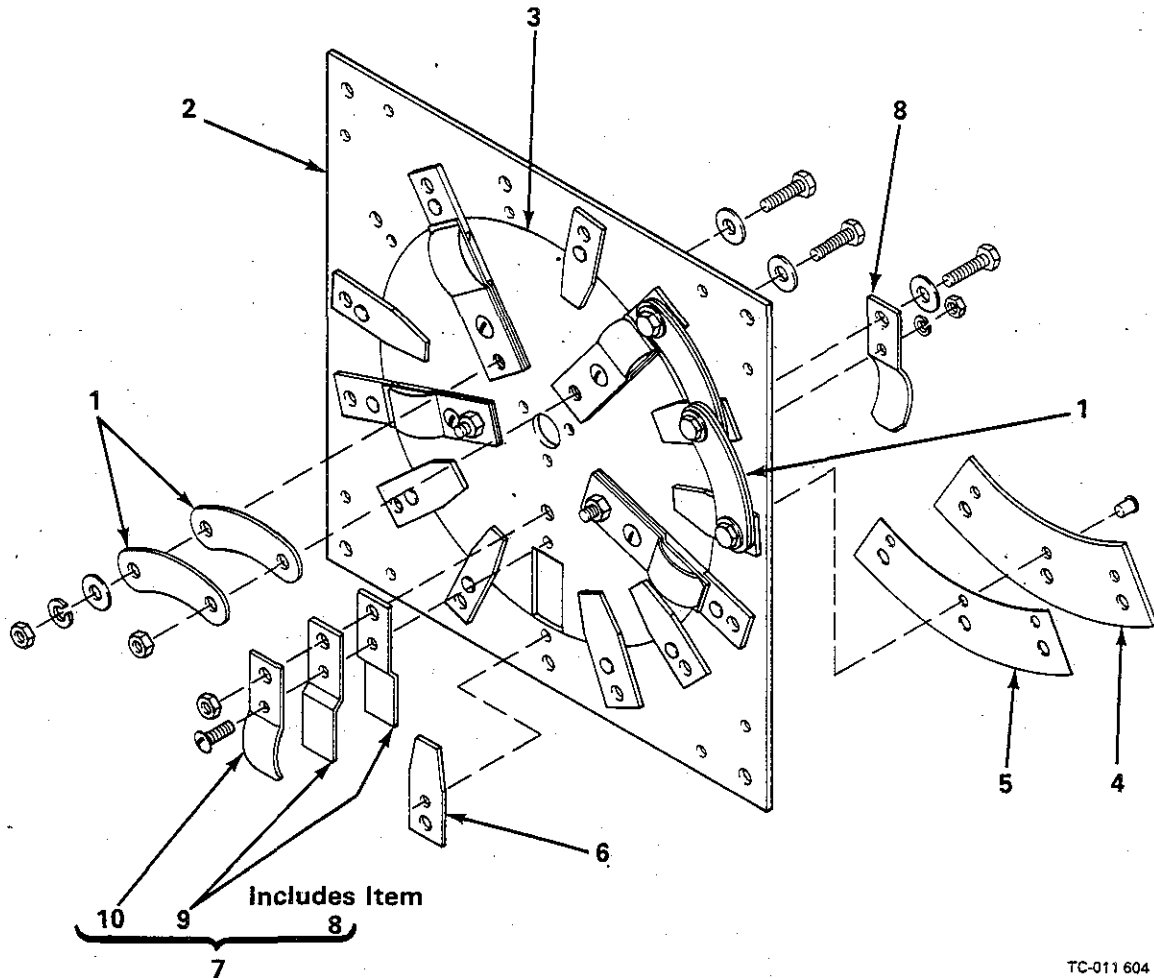
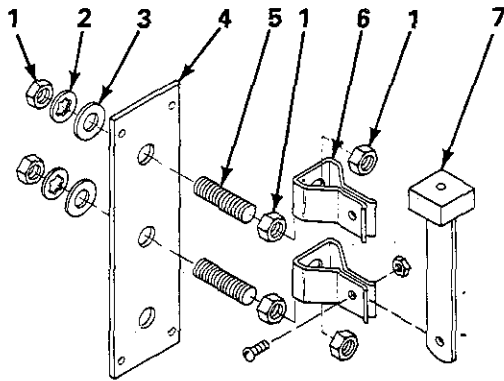


Figure H1B – Contact Board, Polarity Switch

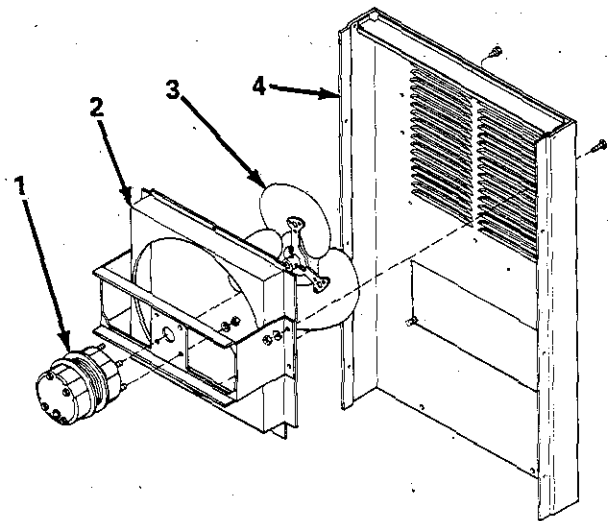
BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Part No.	Description	Quantity
Figure H2 079 934 Switch, Changeover (Fig H Pg 10 Item 33)			
1	601 838	NUT, hex jam - brass 3/8-16	6
2	602 221	WASHER, lock - internal tooth 3/8	2
3	010 910	WASHER, flat - 3/8 SAE	2
4	038 606	TERMINAL BOARD, power output	1
5	038 306	STUD, brass 3/8-16 x 1-1/2	2
6	012 647	CLIP, fuse 100 amp	2
7	011 173	BLADE, switch knife	1



TB-011 787-C

Figure H2 - Switch, Changeover



TC-022 518

Figure J - Panel, Rear - W/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure J Panel, Rear-W/Components (Fig A Pg 2 Item 18)				
1	FM	116 190	MOTOR, 1/12 hp 230 volts 1550 rpm	1
2		016 258	CHAMBER, plenum	1
3		032 604	BLADE, fan 60 Hz 14 inch 3 wing	1
3		†032 611	BLADE, fan 50 Hz 14 inch 3 wing	1
4		022 025	PANEL, rear	1

†Optional Equipment
 BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Dia. Mkgs.	Part No.	Description	Quantity
Optional Equipment			
	040 962	METER KIT, A & V ac (consisting of)	1
CT2	036 611	TRANSFORMER, current 500/5	1
A2	025 617	METER, amp ac 0-500	1
V2	025 602	METER, volt ac 0-100	1
P1	025 701	FILTER, HF dc volt & amp meter	1
P2	025 700	FILTER, HF ac amp meter	1
	103 966	PANEL, front-meter box	1
	103 967	PANEL, rear-meter box	1
	103 962	WRAPPER, meter box	1
	010 493	BUSHING, snap 5/8 ID x 7/8	1
	014 604	COVER, top	1
	040 978	METER KIT, A & V dc (consisting of)	1
	094 885	CABLE, shunt 29-1/2 long	1
V2	025 604	METER, volt dc 0-100	1
A2	025 608	METER, amp dc 50 MV 0-500	1
P1	025 701	FILTER, HF dc volt & amp meter	2
	103 966	PANEL, front-meter box	1
	103 967	PANEL, rear-meter box	1
	103 965	WRAPPER, meter box	1
	010 493	BUSHING, snap 5/8 ID x 7/8	1
	010 858	CLAMP, hose 1/2 x 29/32 dia	1
	027 661	COVER, top	1
	040 992	METER KIT, A & V ac/dc (consisting of)	1
CT2	036 611	TRANSFORMER, current 500/5	1
	094 885	CABLE, shunt 29-1/2 long	1
V	025 602	METER, volt ac 0-100	1
V	025 604	METER, volt dc 0-100	1
A	025 617	METER, amp ac 0-500	1
A	025 608	METER, amp dc 50 MV 0-500	1
P1	025 701	FILTER, HF dc volt & amp meter	3
P2	025 700	FILTER, HF ac amp meter	1
	103 969	PANEL, front-meter box	1
	103 970	PANEL, rear-meter box	1
	103 968	WRAPPER, meter box	1
	010 493	BUSHING, snap 5/8 ID x 7/8	1
	010 858	CLAMP, hose 1/2 x 29/32 dia	1
	003 635	COVER, top	1
	041 392	SPOT WELD TIMER (consisting of)	1
	046 557	CONTROL, panel (consisting of)	1
C4	031 610	CAPACITOR, electrolyte 40 uf 250 volts dc	1
C12	046 140	CAPACITOR, ceramic 0.05 uf 500 volts dc	1
C13	046 139	CAPACITOR, electrolyte 22 uf 50 volts dc	1
CR1	059 267	RELAY, enclosed 12 volts dc DPDT	1
CR2	052 603	RELAY, enclosed 110 volts dc DPDT	1
CR3	000 174	RELAY, enclosed 24 volts ac 3PDT	1
CR4	059 268	RELAY, enclosed 120 volts ac DPDT	1
CR5	006 393	RELAY, enclosed 24 volts ac DPDT	1
R2	030 601	RESISTOR, WW adj 25 watt 1K ohm	1
R9	604 178	RESISTOR, carbon 2 watt 100 ohm	1
SR2,4	035 914	RECTIFIER, integrated 30 amp 400 volts	2
VR3	082 722	VARISTOR, 0.6 watt 175 volts dc	1
1T	081 111	BLOCK, terminal 30 amp 13 pole	1
2T	038 429	BLOCK, terminal 30 amp 12 pole	1
	038 620	LINK, jumper-terminal block 30 amp	2
	035 131	CONNECTOR, block 30 amp 45 deg	3
	601 218	CONNECTOR, block 30 amp flat	1

Dia. Mkgs.	Part No.	Description	Quantity
Optional Equipment (Cont'd.)			
	605 741	.. CLIP, mtg-resistor 5/6 ID	2
	081 260	.. PANEL, mtg-components	1
	007 532	.. CLAMP, capacitor 1 inch dia	1
S5	011 611	.. SWITCH, toggle DPDT 15 amp 125 volts	1
TD2	071 735	.. TIMER, 5 sec solid state (consisting of)	1
	047 281	.. TIMER, delay 5 sec (consisting of)	1
TD	047 133	... RELAY, enclosed 120 volts ac DPDT	1
RFC50,51	052 978	... CHOKE, 5600 UH 45 ohm	2
R50	030 108	... POTENTIOMETER, carbon 1 turn 2 watt 100K ohm	1
VR50	091 963	... VARISTOR, 0.6W 175 volts dc	1
	038 839	... BLOCK, terminal 20 amp 5 pole	1
	047 124	... CHASSIS, timer	1
	097 922	... KNOB, pointer	1
	047 233	.. NAMEPLATE, interval timer	1
	072 581	.. PANEL, mtg-timer	1
	031 305	.. PANEL, front	1
	042 211	.. BRACKET, mtg	1

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

ACCESSORIES

ELECTROSLOPE® 3

Stock No. **040 258** (Factory) Stock No. **041 558** (Field)

The Electroslope 3 provides adjustment of the starting amperage, up-slope rate, downslope rate and final amperage for gas tungsten-arc (TIG) welding. A switch is included which has a center off and momentary up/down position.

SPOOLMATIC® 2 FEEDER/GUN

Stock No. **000 256**

Includes proper contact tubes, guide tube liners and drive rolls for use with .030", .035", .045", 3/64" and 1/16" wire. Requires optional WC-2 or optional 24A gun control.

Note: Provides spray transfer welding.

MILLERMATIC™

WC-2 Weld Control

Stock No. **003 356**

The flexibility of the Gold Star 330 power source can be extended with the addition of an optional WC-2 control to accommodate a Spoolmatic 2 Feeder/Gun for gas metal-arc (spray transfer) welding. This control contains 24 volt circuitry with a terminal strip for easy attachment of the gun leads.

Note: The Gold Star 330 is a constant current type welding power source and provides spray type of metal transfer only.

MILLERMATIC™ WC-2/S

Stock No. **003 357**

Same features as WC-2 control except includes spot timer for MIG spot welding. Requires optional spot nozzles.

	Stock No.
Flat Spot Nozzle	000 442
90° Angle Spot Nozzle	000 443
Outside Corner Spot Nozzle	009 925

LOW AMPERAGE RANGE: 1.5 to 9 amperes for the 330 models is available. This additional range is included on the front panel and must be factory installed.

Stock No. **041 391** — CY 50 model **041 394**

Spot/Weld Timer

Stock No. **041 392** (Factory)

Stock No. **041 530** (Field)

To add TIG spot capabilities to all models. (0 to 3 seconds)

METERS

Voltmeter and ammeters are available in either ac or dc or a combination of both ac and dc. Meters are RF protected and mount in metal case on top of welding machine.

METERS	330-A/BP	
	Factory	Field Kit
AC Volt & Ammeter	040 962	040 961
DC Volt & Ammeter	040 978	041 843
AC & DC Volt & Ammeter	040 992	040 991
Factory calibration of meters. (two standard meters)		
Stock No. 041 770		