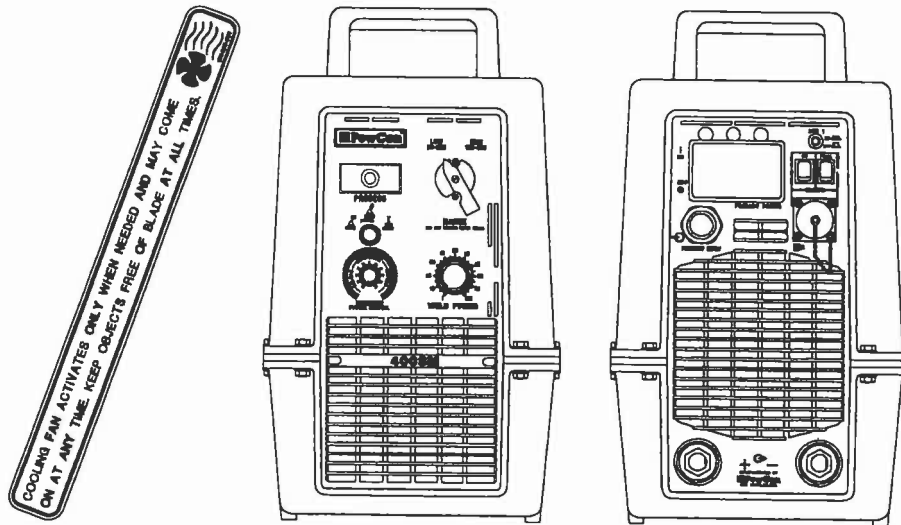




! IMPORTANT !
-FOR YOUR SAFETY-
READ THIS MANUAL BEFORE
INSTALLING OR USING EQUIPMENT

OPERATION MANUAL



400SM

(AMPHENOL REMOTE)

230/460V

Fan On Demand

PowCon Incorporated
8123 Miralani Drive, San Diego, CA 92126
(619) 621-6300 • FAX (619) 621-6301
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THANK YOU!!!

. . . for purchasing **PowCon Incorporated** products. Our commitment to you is to provide an ever expanding family of quality welding and welding/cutting power sources, arc positioning equipment and accessories. Please take a moment to read the following pages as they contain important information regarding proper welding/cutting safety and procedures.

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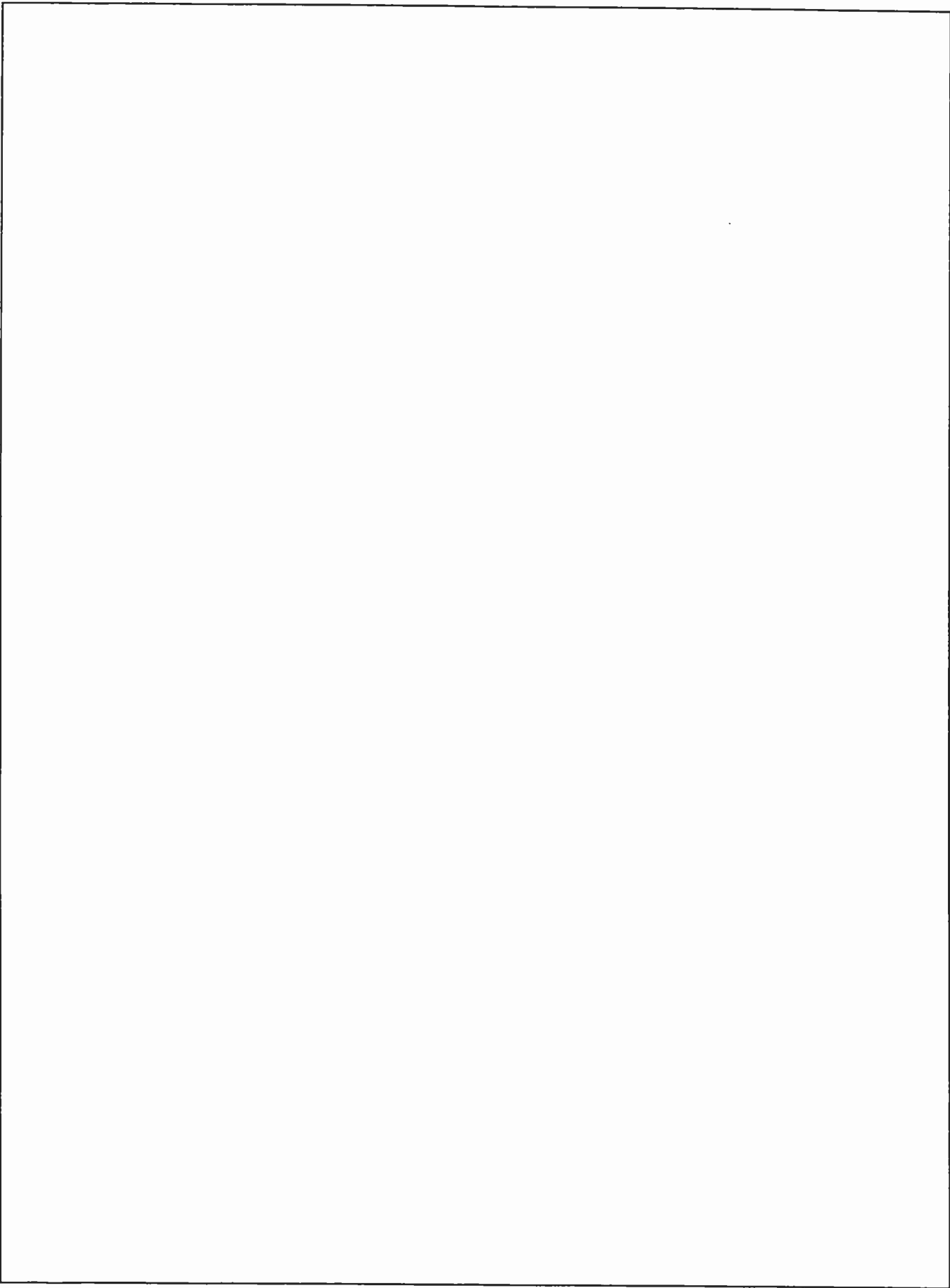
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SAFETY

SAFETY

! IMPORTANT !

THIS MANUAL HAS BEEN DESIGNED FOR EXPERIENCED WELDING AND CUTTING EQUIPMENT OPERATORS AND MUST BE READ COMPLETELY BEFORE USING THIS EQUIPMENT. IF YOU LACK EXPERIENCE OR ARE UNFAMILIAR WITH THE PRACTICES AND SAFE OPERATION OF WELDING AND CUTTING EQUIPMENT, PLEASE CONSULT YOUR FOREMAN. DO NOT ATTEMPT TO INSTALL, OPERATE, OR PERFORM MAINTENANCE ON THIS EQUIPMENT UNLESS YOU ARE QUALIFIED AND HAVE READ AND UNDERSTOOD THIS MANUAL. IF IN DOUBT ABOUT INSTALLING OR OPERATING THIS EQUIPMENT, CONTACT YOUR DISTRIBUTOR OR THE CUSTOMER SERVICE DEPARTMENT OF PowCon.

DEFINITIONS

Throughout this manual, **NOTE**, **CAUTION**, **WARNING** and **DANGER** are inserted to call attention to particular information. The methods used to identify these highlights and the purpose for which each is used, are as follows:

NOTE

Operational, procedural, and background information which aids the operator in the use of the machine, helps the service personnel in the performance of maintenance, and prevents damage to the equipment.

CAUTION

An operational procedure which, if not followed, may cause minor injury to the operator, service personnel and/or bystanders.

WARNING

An operational procedure which, if not followed, may cause severe injury to the operator, service personnel, or others in the operating area.

DANGER



An operational procedure which, if not followed, will cause severe injury or even death to the operator, service personnel or bystanders.

SAFETY INFORMATION

Safety is a combination of good judgement and proper training. Operation and maintenance of any arc welding and cutting equipment involves potential hazards. Individuals who are unfamiliar with cutting and welding equipment, use faulty judgement or lack proper training, may cause injury to themselves and others. Personnel should be alerted to the following potential hazards and the safeguards necessary to avoid possible injury. In addition, before operating this equipment, you should be aware of your employer's safety regulations.

BE SURE TO READ AND FOLLOW ALL AVAILABLE SAFETY REGULATIONS BEFORE USING THIS EQUIPMENT.

ELECTRIC SHOCK



THE VOLTAGES PRESENT IN THE WELDING AND CUTTING ENVIRONMENT CAN CAUSE SEVERE BURNS TO THE BODY OR FATAL SHOCK. THE SEVERITY OF ELECTRICAL SHOCK IS DETERMINED BY THE PATH AND THE AMOUNT OF CURRENT THROUGH THE BODY.

- A) Install and continue to maintain equipment according to USA Standard C1, National Electric Code.
- B) Never allow live metal parts to touch bare skin or any wet clothing. Use only dry gloves.
- C) When welding or cutting in a damp area, or when standing on metal, make sure you are well insulated by wearing dry gloves, rubber soled shoes, and by standing on a dry board or platform.
- D) Do not use worn or damaged welding or torch cables. Do not overload the cables. Use well maintained equipment.
- E) When not welding/cutting, turn equipment **OFF**. Accidental grounding can cause overheating and create a fire hazard. Do not coil or loop the cable around parts of the body.
- F) The ground cable should be connected to the workpiece as close to the work area as possible. Grounds connected to building framework or other locations remote to the work area reduce efficiency and increase the potential hazard of electric shock. Avoid the possibility of the cutting current passing through lifting chains, crane cables or other electrical paths.

SAFETY

- G) Keep everything dry you might touch, including clothing, the work area, welding gun, torch and welding or cutting machines. Fix water leaks immediately. Do not operate equipment standing in water.
- H) Never use a cutting torch or welding gun which is damaged or contains cracks in its housing.
- I) Refer to AWS-Z49.1 for grounding recommendations.

PERSONAL PROTECTION

SKIN AND EYE BURNS RESULTING FROM BODY EXPOSURE TO ELECTRIC-ARC WELDING AND CUTTING RAYS OR HOT METAL CAN BE MORE SEVERE THAN SUNBURN.

A)



Use a proper face shield fitted with the correct filter (#10 or greater) and cover plates to protect your eyes, face, neck and ears from the sparks and rays of the cutting/welding arc when cutting/welding or observing cutting/welding. Warn bystanders not to watch the arc and not to expose themselves to the cutting/welding arc rays or to hot metal.

- B) Wear flameproof gauntlet-type gloves, a heavy long-sleeve shirt, cuffless trousers, high-topped shoes, and a welding helmet or cap (for hair protection) to protect the skin from arc rays and hot sparks or hot metal.
- C) Protect other nearby personnel from arc rays and hot sparks with a suitable non-flammable partition.
- D) Always wear safety glasses or goggles when in a cutting or welding area. Use safety glasses with side shields or goggles when chipping slag or grinding. Chipped slag is hot and may travel a considerable distance. Bystanders should also wear safety glasses or goggles.
- E) Compressed gas cylinders are potentially dangerous, refer to the suppliers for proper handling procedures.
- F) Wear ear plugs or other ear protection devices when operating cutting or welding equipment.

FIRE SAFETY

HOT SLAG OR SPARKS CAN CAUSE A SERIOUS FIRE WHEN IN CONTACT WITH COMBUSTIBLE SOLIDS, LIQUIDS OR GASES.

A)



Move all combustible materials well away from the cutting area or completely cover materials with a non-flammable covering. Combustible materials include but are not limited to wood, clothing, sawdust, gasoline, kerosene, paints, solvents, natural gases, acetylene, propane, and similar articles.

- B) Do not weld, cut or perform other hot work on used barrels, drums, tanks or other containers until they have been completely cleaned. There must be no substances in the container which might produce flammable or toxic vapors.
- C) For fire protection, have suitable extinguishing equipment handy for instant use.

SAFETY

VENTILATION



WELDING AND CUTTING FUMES AND GASES, PARTICULARLY IN CONFINED SPACES, CAN CAUSE DISCOMFORT AND PHYSICAL HARM IF INHALED OVER AN EXTENDED PERIOD OF TIME.

- A) At all times, provide adequate ventilation in the welding and cutting area by either natural or mechanical means. Do not weld or cut on galvanized, zinc, lead, beryllium or cadmium materials unless positive mechanical ventilation is provided to prevent inhaling fumes and gases from these materials.
- B) Do not weld or cut in locations close to chlorinated hydrocarbon vapors coming from degreasing or spraying operations. The heat of arc rays can react with solvent vapors to form phosgene, a highly toxic gas, and other irritant gases.
- C) If you develop momentary eye, nose or throat irritation during welding or cutting, it is an indication that the ventilation is not adequate. Stop work and take the necessary steps to improve ventilation in the welding or cutting area. Do not continue to weld or cut if physical discomfort persists.
- D) Use an air supplied respirator if ventilation is not adequate to remove all fumes and gases.
- E) Beware of gas leaks. Welding or cutting gases containing argon are more dense than air and will replace air when used in confined spaces. Do not locate gas cylinders in confined spaces. When not in use, shut **OFF** the gas supply at its source.
- F) Refer to AWS Standard Z49.1 for specific ventilation recommendations.

SAFETY REFERENCES

The following publications provide additional information on important welding safeguards.

- A) ANSI/ASC Z49.1-1988, American National Standard "Safety in Welding and Cutting".
- B) Bulletin No. F4-1, "Recommended Safe Practices for the Preparation for Welding and Cutting Containers and Piping that have held Hazardous Substances".
- C) OSHA Safety and Health Standards, 29CFR 1910, available from the United States Department of Labor, Washington, DC 20210.
- D) NFPA Standard 51B, "Fire Prevention in Use of Cutting and Welding Processes", available from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 00210.
- E) NEMA Standards Publication/No. EW1-1989, Electric Arc-Welding Apparatus, approved as ANSI C87.1-1989. Available from National Electrical Manufacturers Association, 155 E. 44th Street, New York, NY 10017.

IMPORTANT!

CE MANUEL A ETE CONCU A L'INTENTION D'OPERATEURS AYANT DE L'EXPERIENCE AVEC DES APPAREILS DE SOUDAGE ET DECOUPAGE. IL DOIT ETRE LU INTEGRALEMENT AVANT L'UTILISATION DE CE MATERIEL. SI VOUS MANQUEZ D'EXPERIENCE ET N'ETES PAS FAMILIARISES AVEC LES METHODES ET LE FONCTIONNEMENT SANS RISQUES DE MATERIEL DE SOUDAGE ET DECOUPAGE, VEUILLEZ CONSULTER VOTRE CONTREMAITRE. N'ESSEYER PAS D'INSTALLER, DE FAIRE FONCTIONNER OU D'EFFECTUER L'ENTRETIEN DE CET EQUIPEMENT A MOINS QUE VOUS NE SOYEZ QUALIFIE ET QUE VOUS AYEZ LU ET COMPRIS CE MANUEL. EN CAS DE DOUTE QUANT A L'INSTALLATION ET AU FONCTIONNEMENT DE CET EQUIPEMENT, CONTACTEZ VOTRE DISTRIBUTEUR OU LE DEPARTEMENT SERVICE A LA CLIENTELE DE PowCon.

DEFINITIONS

Des mots tels que **AVIS**, **ATTENTION**, **AVERTISSEMENT** ET **DANGER** figurent tout au long de ce manuel pour attirer votre attention sur des informations particulières. Les méthodes utilisées pour les mettre en évidence et le but poursuivi à cet égard sont les suivants:

AVIS

Information de base concernant le fonctionnement, les procédés qui aident l'opérateur dans l'utilisation de la machine, aide le personnel responsable de la révision à effectuer l'entretien et empêche tout dommage à l'équipement.

ATTENTION

Un procédé de fonctionnement qui, s'il n'est pas suivi, risque de causer une blessure légère à l'opérateur, au personnel d'entretien et/ou à des observateurs.

AVERTISSEMENT

Un procédé de fonctionnement qui, s'il n'est pas suivi, risque de causer une blessure grave à l'opérateur, au personnel d'entretien ou à d'autres personnes à proximité.



DANGER

Un procédé de fonctionnement qui, s'il n'est pas suivi, risque de causer une blessure grave ou même la mort de l'opérateur, du personnel d'entretien ou d'observateurs.

INFORMATIONS SUR LA SECURITE

La sécurité se base à la fois sur un bon jugement et une formation adéquate. Le fonctionnement et l'entretien de tout équipement destiné au soudage à l'arc et au découpage comporte des risques potentiels. Des personnes qui ne sont pas familiarisées avec l'équipement de découpage et de soudage font des appréciations erronées ou manquent d'une formation adéquate et sont susceptibles de se blesser et de blesser les autres. Le personnel devrait être averti des dangers potentiels énumérés ci-après tout en ayant connaissance des mesures de sécurité nécessaires pour éviter toute blessure éventuelle. En outre, avant d'utiliser cet équipement, vous devriez connaître les règles de sécurité de votre employeur.

VEILLES A LIRE ET A SUIVRE TOUTES LES REGLES DE SECURITE A VOTRE DISPOSITION AVANT D'UTILISER CET EQUIPEMENT.

CHOC ELECTRIQUE



DES TENSIONS PRESENTES DANS LA ZONE DU SOUDAGE ET DU DECOUPAGE SONT SUSCEPTIBLES DE CAUSER DES BRULURES GRAVES SUR LE CORPS OU UN CHOC FATAL. LA GRAVITE DU CHOC ELECTRIQUE EST DETERMINEE PAR LE TRAJET ET LA QUANTITE DE COURANT TRAVERSANT LE CORPS.

- A) Installer et poursuivre l'entretien de l'équipement selon "USA Standard C1, National Electric Code." (Norme USA C1).
- B) Eviter tout contact de pièces métalliques sous tension avec la peau nue ou un vêtement mouillé. N'utiliser que des gants secs.
- C) Lorsque vous procédez à une opération de découpage ou de soudage dans une zone humide, veillez à une isolation adéquate en revêtant des gants secs, des chaussures avec semelles en caoutchouc et en vous plaçant sur une planche ou une plate-forme sèche.
- D) N'utilisez pas de câbles de chalumeau usés ou endommagés. Evitez toute surcharge des câbles. N'utilisez que du matériel bien entretenu.
- E) Lorsque vous êtes à l'arrêt, éteindre le courant de votre équipement. Une mise à la terre accidentelle est susceptible de causer une surchauffe et un risque d'incendie. Ne pas enrouler ou torsader le câble autour de parties du corps.

SAFETY

- F) Veillez à ce que le câble de mise à la terre soit relié à l'instrument de travail le plus près possible de la zone de travail. Les terres reliées à la charpente d'un bâtiment ou à tout autre espace éloigné du lieu de travail présentent une efficacité réduite et augmentent le danger d'un choc électrique. Eviter que tout courant de découpage ne passe à travers des chaînes de levage, des câbles de grue ou d'autres trajets de lignes électriques.
- G) Veillez à ce que tout ce que vous touchez soit sec, notamment les vêtements, l'espace de travail, pistolet à souder, chalumeau, machine à découper et à souder. Réparer toute fuite d'eau immédiatement. Ne pas utiliser d'instruments se trouvant dans l'eau.
- H) Ne jamais utiliser un chalumeau à couper endommagé ou dont la structure présente des fissures.
- I) Reportez-vous à la norme AWS-Z49.1 pour ce qui concerne les recommandations de mise à la terre.

PROTECTION DES PERSONNES

DES BRULURES A LA PEAU ET AUX YEUX APRES S'ETRE EXPOSE AUX RAYONS DU SOUDAGE ET DECOUPAGE A L'ARC ELECTRIQUE OU AU METAL CHAUD PEUVENT ETRE PLUS GRAVES QU'UN COUP DE SOLEIL.



- A) Utilisez un écran protecteur pour le visage avec un filtre correct (no. 8 ou plus élevé) ainsi que des plaques pour protéger les yeux, le visage, le cou et les oreilles contre les étincelles et les rayons du découpage à l'arc, soit pendant que vous procédez au découpage soit pendant que vous observez. Avertissez les observateurs de ne pas regarder l'arc et de ne pas s'exposer aux rayons de découpage à l'arc ou à du métal chaud.
- B) Mettez des gants à crêpe ininflammables, une chemise à manches longues épaisse, des pantalons sans revers, des chaussures fermées, et une casquette (pour protéger les cheveux) afin de protéger la peau contre les rayons de l'arc, les étincelles ou le métal chauds.
- C) Protégez d'autres membres du personnel se trouvant à proximité des rayons de l'arc et des étincelles brûlantes au moyen d'une cloison adéquate ininflammable.

- D) Portez toujours des lunettes de sécurité lorsque vous vous trouvez dans une zone de soudage ou découpage. Utilisez des lunettes de sécurité avec écrans latéraux lorsque vous taillez des scories ou lorsque vous broyez. Des scories taillées sont chaudes et risquent de se déplacer sur des distances considérables. Les personnes qui observent doivent également porter des lunettes de sécurité.
- E) Des cylindres de gaz comprimé présentent un danger potentiel. Adressez-vous aux fournisseurs pour les procédures de manutention.
- F) Portez des boules Quiès ou tout autre système de protection pour les oreilles lorsque vous utilisez du matériel de découpage.

PROTECTION ANTI-INCENDIES

DES SCORIES CHAUDES OU DES ETINCELLES PEUVENT CAUSER UN INCENDIE GRAVE AU CONTACT DE SOLIDES, LIQUIDES OU GAZ COMBUSTIBLES.



- A) Eloignez tout matériel combustible à une bonne distance de la zone de découpage, ou bien couvrez complètement ce matériel au moyen d'une couverture ininflammable. Citons parmi les matériaux inflammables: bois, vêtements, sciure de bois, essence, kérosène, peintures, solvants, gaz naturels, acétylène, propane et d'autres articles combustibles similaires.
- B) N'effectuez pas de soudage, ou découpage ou tout autre travail à chaud sur des tonneaux, cylindres, réservoirs ou autres récipients avant qu'ils n'aient été complètement nettoyés et ce, afin d'éliminer toute substance dans le récipient susceptible de produire des vapeurs inflammables ou toxiques.
- C) Comme protection contre l'incendie, ayez un système d'extinction à portée de la main pour utilisation immédiate.

SAFETY

VENTILATION



LES GAZ ET EMANATIONS PROVENANT DE SOUDAGE ET DECOUPAGE, EN PARTICULIER DANS DES ENDROITS FERMES, PEUVENT CAUSER UN MALAISE OU UN DOMMAGE PHYSIQUE S'ILS SONT INHALES PENDANT UNE PERIODE PROLONGEE.

- A) Prévoyez une ventilation adéquate dans la zone de soudage et de découpage au moyen d'une ventilation naturelle ou mécanique. Ne découpez pas des matériaux galvanisés tels que du zinc, plomb, béryllium, ou cadmium à moins qu'une ventilation mécanique positive ne soit en place pour éviter que les émanations et gaz provenant de ces matériaux ne soient inhalés.
- B) Ne procédez pas à du découpage à proximité de vapeurs d'hydrocarbure chloré provenant d'opérations de dégraissage ou de pulvérisation. La chaleur des rayons de l'arc pourrait réagir avec les vapeurs des solvants pour former du phosgène, un gaz très toxique, ainsi que d'autres gaz irritants.
- C) Si vous ressentez une irritation momentanée aux yeux, au nez ou à la gorge, c'est un signe que la ventilation n'est pas adéquate. Arrêtez votre travail et prenez les mesures nécessaires pour améliorer la ventilation dans la zone de découpage. Ne continuez pas le découpage si le malaise persiste.
- D) Utilisez un appareil respiratoire avec approvisionnement en air si la ventilation ne suffit pas à éliminer toutes les émanations et les gaz.
- E) Faites attention aux fuites de gaz. Les gaz de découpage contenant de l'argon sont plus denses que l'air et remplaceront celui-ci dans des espaces fermés. Ne placez pas de cylindres de gaz dans des espaces fermés. FERMEZ le gaz à la source lorsqu'il n'est pas utilisé.
- F) Reportez-vous à la norme AWS Z49.1 en ce qui concerne les recommandations de ventilation.

REFERENCES DE SECURITE

Les publications suivantes fournissent des informations supplémentaires concernant des mesures de sécurité importantes pour le soudage:

- A) ANSI/ASC Z49.1-1988, American National Standard "Safety in welding and cutting" (Norme nationale américaine "Sécurité en matière de soudage et découpage).
- B) Bulletin No. F4-1. "Recommended safe practices for the preparation for Welding and Cutting Containers and Piping that have held Hazardous Substances". (Méthodes pratiques de sécurité recommandées pour la préparation du soudage et découpage de récipients et conduits ayant contenu des substances dangereuses.)
- C) OSHA Safety and Health Standards, 29CFR 1910 à obtenir auprès du "United States Department of Labor", Washington, DC 20210. (Normes de Sécurité et Hygiène OSHA 29CFR 1910).
- D) NFPA Standard 51B "Fire prevention in Use of Cutting and Welding Processes", à obtenir auprès du "National Fire Protection Association", 470 Atlantic Avenue, Boston, MA 00210. (Mesures de prévention d'incendies utilisées dans les procédés de découpage et soudage).
- E) NEMA Standards Publication/No. EW1-1989, Electric Arc Welding Apparatus, approuvé sous la mention ANSI C87.1-1989. A obtenir auprès du "National Electrical Manufacturers Association", 155 E.44th Street, New York, N.Y 10017 (Appareil de soudage à l'arc).

GENERAL INFORMATION

GENERAL INFORMATION

DESCRIPTION OF EQUIPMENT

Traditionally, constant potential (voltage) welding power sources have been used for GMAW and constant current (drooper) welding power sources have been used for SMAW. The unique feature of the constant power converter system used in the **PowCon 400SM** is that both welding processes can be accomplished using one power source. By means of electronic control, the **PowCon 400SM** adjusts the output for a given welding process. The **PowCon 400SM** portable welding power source comes with a 12 foot (3.7M) primary cable.

SPECIFICATIONS

(Subject to change without notice)

PowCon 400SM Welding Power Source:

- Power Input and Output (see Figure 1)
- Open Circuit Voltage - 80V maximum
- Current Range - adjustable from 20 to 400 Amps

- Digital VA meter (OPT)
- 24 VAC transformer for operating wirefeeder 115 VAC is optional.
- Weight - 70 pounds (31.8 Kg)
- Dimensions - Height 17" (43 cm), Width 10" (26 cm), Depth 19" (49 cm)

Accessories:

- Remote GMAW pulser
- Remote, foot-operated and hand-operated contactor and current control
- Remote control cable extension - 25 feet (7.6M) or 50 feet (15.2M) lengths
- Output cable connectors (DINSE or TWECO)

OUTPUT RANGE	DC	20A/20.8V... 400A/36V			
DUTY CYCLE		X	28	60	100 %
RATED OUTPUT @ 3 PHASE PRIMARY INPUT	(U ₁ , 3~) 50/60 HZ	I ₂	400	300	240 A
		U ₂	36	32	29 V
RATED OUTPUT @ 1 PHASE PRIMARY INPUT	(U ₁ , 1~) 50/60 HZ	I ₂	---	200	160 A
		U ₂	---	28	26 V
MAXIMUM CURRENT DRAW AT INDICATED PRIMARY INPUT AND MAXIMUM RATED OUTPUT	U ₁ SUPPLY	I ₁ MAX	/ X		
	230V 3 ~	51	A/	28	%
	460V 3 ~	29	A/	28	%
	230V 1 ~	39	A/	60	%
	415V 3 ~	33	A/	28	%

Figure 1 - Power Input and Output

GENERAL INFORMATION

THEORY OF OPERATION

The **PowCon** Welding Power Sources use the frequency converter principle to produce direct current DC power. In contrast to the conventional transformer rectifier, the frequency converter design offers two main advantages: (1) lower weight and size, and (2) increased electrical efficiency.

For the **PowCon** the input alternating current (AC) primary power is passed through a circuit breaker to a 3-phase full wave bridge rectifier, where the input is transformed to DC power. The DC current output of the rectifier is fed to an inverter of series capacitor switching type. Using SCR's (thyristors), the DC current is switched alternately ON and OFF. The action of charging and discharging the capacitors creates a new alternating current (AC). The frequency of the firing of the SCR's varies from 800 Hz to 5000 Hz, dependent upon the output demand, i.e., the greater the output power required, the higher the frequency. The output power is determined by the weld power dial setting range.

The new alternating current, with its higher frequency provided by the switching devices (SCR's), is fed into the

main transformer. One advantage of higher frequency alternating current is that the size of the transformer can be significantly reduced. The **PowCon** main transformer weighs 12 pounds, versus approximately 200 pounds used in the conventional transformer rectifier. The transformer takes the higher voltage of the switching SCR's and transforms it to the welding voltage range.

The final step in the production of weld current is the AC output of the transformer is rectified by diodes into direct current (DC) for welding. The whole sequence of operations from the primary (AC) input to the weld output (DC), is regulated by the PC board through control logic feedback.

Additionally, input AC power is fed to a transformer that generates auxiliary power. Aux 1 is AC power routed to a remote connector and used for accessories such as Wire Feeders, Remote Arc Starters, Pulsers, etc. Furthermore, the board provides the power to operate the Control and Logic board and provides power to the fan motor. The Fan Motor circulates cooling air inside the power source only on power-up and when welding. The fan ON time directly depends on welding time and settings.

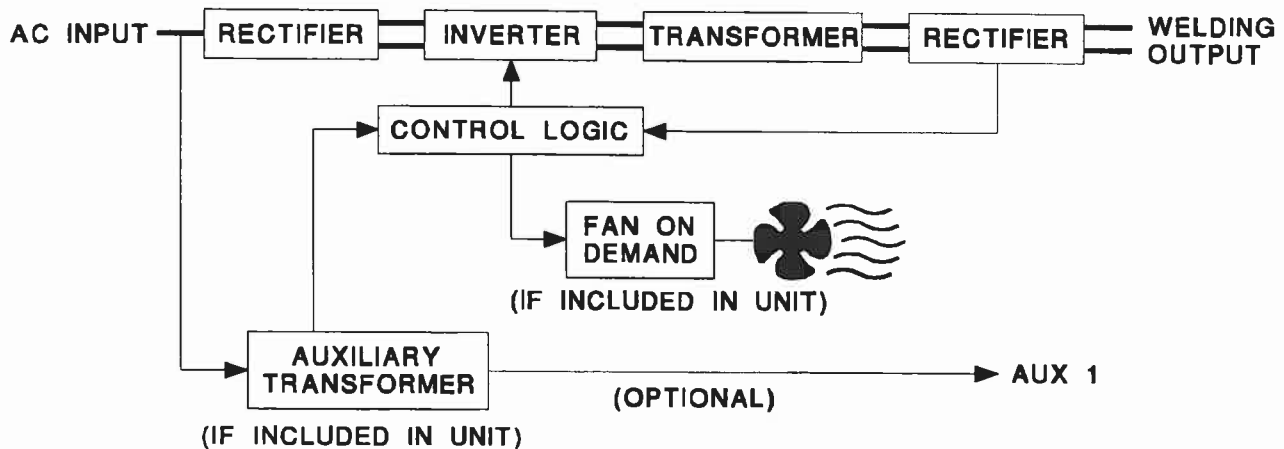


Figure 2-Electronic Block Diagram of Converter Principle

INSTALLATION

INSTALLATION

UNPACKING NEW EQUIPMENT (Receiving and Handling)

Remove the **PowCon** Welding Power Source from its shipping carton and inspect for any possible damage that might have occurred during shipping. Make sure that all items on the packing list are accounted for and identified. One copy of the **PowCon** 400SM Operation Manual is packed with each **PowCon** 400SM unit.

Any claims for loss or damage that may have occurred in transit must be filed by the PURCHASER with the CARRIER. Copies of the bill of lading and freight bill will be furnished by the carrier on request, if the need to file a claim arises. When requesting information concerning this equipment, it is essential that model description, serial number and/or part number of the equipment be supplied.

NOTE

To assure a valid warranty, you must complete and return the warranty card (enclosed with all products) within 10 days of the purchase date.

POWER CONNECTIONS

Only a qualified electrician should perform the installation of the **PowCon** unit to primary power. All installations of this type must conform to the regulations of the National Electrical Code and any other local codes which may be applicable.

The primary cable supplied consists of conductor colors black, red, white, and green. When connecting, always use the proper ampacity primary cord, properly phasing the connection to three phase power with respect to the ground line (green), and providing the proper strain relief between the primary cable and the field connection box or wiring box.

When an attachment plug cap is installed, it must be U.L. Listed, complying with paragraph 9.10 of U.L. 551, Transformer-Type Arc Welding Machines. Make sure that the chosen pin configuration is appropriate for the primary voltage you are using.

The green lead on the primary cable is the ground lead. This must be connected to the indicated terminal on the plug cap. The remaining three phases may be connected in any order to the other terminals on the plug. In the case of a screw connection, care should be taken to ensure that the stranded leads on the primary cable are properly seated before tightening. There should be no loose strands protruding from the sides or back of the terminal after tightening.

After connecting the leads, perform the attachment of the plug casing and the strain relief. The strain relief should grip at least 1/2" of the primary cable's outer jacket. Under no circumstances should the strain relief be connected only to the individual leads of the primary cable. This will result in a shortened cable life and in an unsatisfactory strain relief.

EQUIPMENT INSTALLATION (Input Power Requirements)

The **PowCon** 400SM is manufactured for use on 230 or 460 volt, 50/60 hertz, three phase power and 230 volt, 50/60 hertz, single phase power.

The **PowCon** 400SM comes from the factory wired for 440 to 480 VAC input. To perform a voltage change-over, be sure to review and understand the voltage change-over procedure found on Page 12. Also, understand the purpose and application of the "230" label supplied with the unit.

It's not necessary to check the phasing of the power lines. The **PowCon** 400SM will work properly on any phase sequence.



DANGER

An electrical ground must always be provided to connect to the green wire on the factory installed primary cable.

INSTALLATION

FUSE SIZE

For proper fuse see Table 1.

Table 1 - Recommended Fuse Sizes

Input Voltage	Max* Amperage	Recommended Fuse Capacity
230V, 3 ϕ	51A	60A
460V, 3 ϕ	29A	30A
208V, 230V 1 ϕ	39A	60A

*Effective current or ampacity will be less.

PRIMARY WIRE SIZE

Additional lengths of primary cable are to be considered extension cords to the factory supplied power cord. To maintain the necessary degree of safety, the use of suitably rated U.L. recognized male/female connector plugs are required (see recommended fuse capacity shown in Table 1). Extension primary cord lengths must be of the same grade wire for their entire length, as shown in Table 2.

Table 2 - Recommended Cable Sizes*

Extension Cable Length**	Required Primary Cable Size
250 ft. or less (176M)	10 AWG
250 to 400 feet (122M)	8 AWG
400 to 650 feet (198M)	6 AWG

* Based on National Electrical Code requirements

**The entire extension cable length must be made of the required cable size. For example, a 500 foot extension would be made of 6 AWG cable with appropriate U.L. recognized plugs to connect to the factory provided 12 foot primary



DANGER

Never connect or disconnect the primary unless the unit is turned off at the circuit breaker located on the rear panel. the primary supply line should always be switched off during installation.

A ground must always be provided to connect to the green wire on the factory installed primary.

SINGLE PHASE INSTALLATION

Perform the following steps on the factory equipped primary:

- A) Check if unit is internally wired for required primary voltage (see voltage change-over procedure, Page 12). The current voltage setting is indicated on the data label on the top of the unit.
- B) Connect green wire to ground.
- C) Connect both white and black wires to "HOT" legs.
- D) Electrically isolate red wire.

NOTE

Do not connect the red or green wire to a neutral.

THREE PHASE INSTALLATION

Perform the following steps on the factory equipped primary:

- A) Check if unit is internally wired for required primary voltage (see voltage change-over procedure, Page 12.) The current voltage setting is indicated on the data label on the top of the unit.
- B) Connect green wire to ground.
- C) Connect white, black and red wires to "HOT" legs.

ENGINE DRIVEN GENERATOR USE

Failure to take special precautions with the PowCon Welding Power Sources and engine driven generators will result in damage to the equipment. The following special startup procedure **MUST** be followed to prevent damage to both the unit and the generator.

CAUTION

Never start up the generator with the circuit breaker on the PowCon unit in the up/on position. The PowCon unit may be switched on at the circuit breaker only after the generator is started and running steady (at least ten seconds.)

Perform the following steps on the factory equipped primary:

INSTALLATION

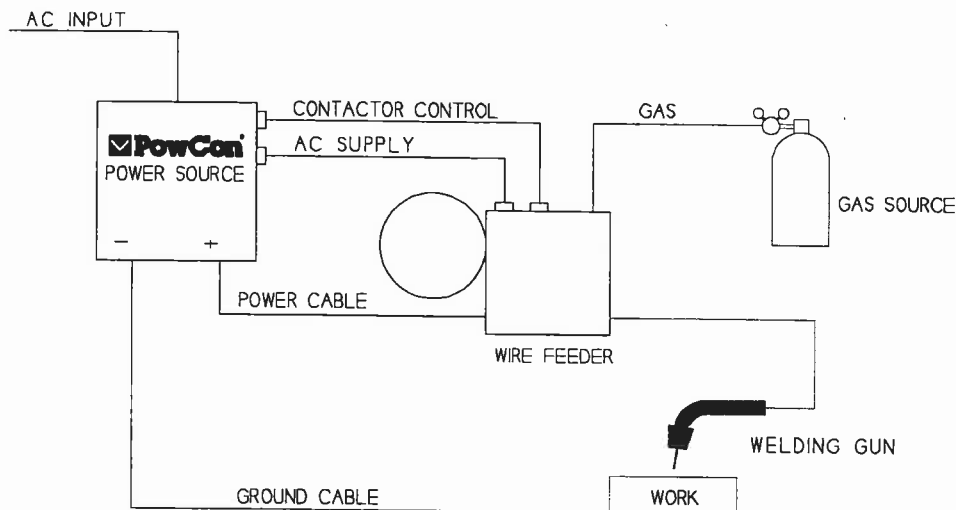


Figure 3 - Typical GMAW Equipment Schematic

- A) Check if unit is internally wired for required primary voltage (see voltage change-over procedure, Page 12.)
- B) Connect green wire to ground.
- C) Connect either single phase or three phase installation as required.

LOCATION OF EQUIPMENT (Service Operating Conditions)

NEMA Standard EW1-2.02 approved as ANSI C87.1-1976 outlines both usual and unusual service conditions for a welding power source. The PowCon 400SM series of welding power sources have been designed and manufactured to meet the usual service conditions as well as conform to the other NEMA standards. If an unusual service condition is required, PowCon should be consulted.

The small size and unique design of the PowCon 400SM series of welding power sources requires the operator be aware of certain safeguards regarding the proper procedure for movement and placement of the unit. Good judgement and compliance with your particular job site safety requirements are essential. The following safeguards are recommended for the movement and placement of the unit.

COOLING

Locate the PowCon Welding Power Source so that air flow into the front and out of the back is not obstructed. Avoid placing the unit where dust or grinding particles will be directed in the unit.

ACCESS

Locate the PowCon Welding Power Source where there is room for the operator to manipulate controls or change

the connections on either the front or back panel. Avoid placing the unit in a hallway or other area where foot traffic might be impeded.

LIFTING

In lifting and carrying the unit, it is recommended that two people be used. The unit is designed to be lifted using a suitably rated and inspected choker (made of rope or nylon) run through both handles. Refer to the applicable OSHA standards or contact PowCon for any questions regarding the lifting of this unit.

SECURITY

Locate the unit where it can be secured to a platform, deck or other structure which is capable of safely supporting the unit and any other potential load.

WARNING

Do not allow the unit to remain operating when lifting or moving it.



DANGER

Do not drag or lift the unit by primary or secondary cable. exercise care in the handling of primary and secondary cable to avoid wearing out or loss of electrical insulation. Do not lift the unit unless all 10 flange screws and nuts holding the top and bottom cases are tight. Any time the PowCon is placed above ground level, the potential hazard of falling exists.

NOTE

On units equipped with "Fan On Demand" the fan will come on at power-up and when welding.

INSTALLATION

OUTPUT CONNECTIONS

WELDING CABLE

Run electrode and ground cables of the appropriate size as shown in Table 3. To avoid excessive heat losses during welding, all output connections, lugs and cables should be secure and well insulated. Failure to use proper cable sizes contributes to lost efficiency of the power source and excessive consumption of electrical power.

The electrode and work leads have to be assembled using customer supplied welding cable and cable connectors. After the cables are assembled, connect the electrode lead to the negative (-) jack and the work lead to the positive (+) jack for straight polarity operation. For reverse polarity operation, the electrode lead is connected to the positive (+) jack and the work lead is connected to the negative (-) jack.

Table 3 - Recommended Copper Welding Cable Sizes*

0' to 150' (45.7M)	150' to 200' (61M)	200' to 250' (76M)
1/0	2/0	3/0

*Based on 60% duty cycle and combined length of electrode and ground cable. Use of aluminum cable requires increase by two AWG sizes over recommended copper cable size. Recommended cable sizes for other duty cycles and output currents can be found in Volume 2, WELDING HANDBOOK, 7th Edition, published by the American Welding Society.

NOTE

Locate the PowCon unit so that the air flow into the front and out of the back of the unit is not obstructed.

REMOTE CURRENT AND CONTACTOR CONTROL CONNECTIONS

Both the remote control devices (hand and foot) come with a 14-pin connector plug which connects to the remote terminal on the rear panel of the PowCon unit. The remote control devices come with a pre-wired plug and 12 1/2 feet (3.8M) of cable.

To connect the remote control device, insert the 14-pin plug from the control cable of the device fully into the receptacle on the rear panel. Ensure that the plug keyways align with the receptacle keys. Rotate the plug threaded collar clockwise as far as possible into the receptacle threaded body to secure the plug in the receptacle.

PROCEDURE FOR INPUT VOLTAGE CHANGE-OVER

There are three (3) voltage change-over locations and all three must be connected for the same primary voltage. The three voltage change-overs are located inside the unit and are as follows:

- 1) Working capacitor board (right front side of unit, see Figure 4.)
- 2) Copper buss bars for main transformer (front of unit, see Figure 4.)
- 3) Copper buss bars for fan motor (left rear side of unit, see Figure 5.)

NOTE

Read entire procedure prior to performance of voltage change-over.

⚠ DANGER

In order to avoid an electrical shock, The unit must be turned off and disconnected from the input circuit prior to performing the voltage change-over procedure.

- A) Remove the top case from the bottom case as follows:
 - 1) Unfasten and remove the 10 bolts and nuts holding the case together.
 - 2) Grab handles firmly and gently lift the top case with a prying movement.
- B) Perform capacitor high voltage bleeding procedure before carrying out voltage changeover.

WARNING

The capacitors in the PowCon welding power source are charged with high voltage. The capacitors will discharge over a long period of time under normal shutdown procedures. However, in order to avoid an electrical shock when the case is removed, the capacitors must be discharged by the use of a bleeder resistor assembly, described on page 13.

- C) Identify the voltage change-over instruction labels for the copper buss bars and working capacitor board located as shown in Figures 4 and 5.

INSTALLATION

LOCATION 1: WORKING CAPACITOR FILTER BOARD CHANGE-OVER

- A) Locate the working capacitor PC board as shown in Figure 4.
- B) Locate the copper buss bars located near the top of this PC board.

NOTE

The copper buss bars when in the vertical position are for 230 vac input, While the horizontal position is for 460 vac input.

- C) Perform the required change-over of the copper buss bars for the input voltage.

NOTE

For 230 VAC input the 3 copper buss bars are used in 3 different locations on the board, While 460 VAC has 2 different locations with one using double copper buss bars.

LOCATION 2: MAIN TRANSFORMER CHANGE-OVER

- A) Locate the instruction label for the copper buss bars shown in Location 2 of Figure 4.
- B) To gain access to the buss bars for the main transformer located near the front panel, perform the following:
 - 1) Unfasten holding screw on knob of range switch.
 - 2) Remove holding screw and range switch knob.
 - 3) Unfasten and remove two retaining screws for the range switch.
 - 4) Remove range switch from front panel assembly and brace out of the access to buss bar.
 - 5) Gently lift front panel assembly out of bottom case taking care not to damage any connections.
 - 6) Prop front panel assembly up and out of the way to gain access to buss bar.
- C) Read the instruction label before performing the required operation on the copper buss bars.

NOTE

Never change the wiring to the terminals connected to the buss bars.

- D) Reconnect range switch to front panel assembly and reinstall front panel assembly.

LOCATION 3: FAN MOTOR CHANGE-OVER

- A) Locate and read the warning label for the copper buss bars shown in Location 3 of Figure 5.
- B) Perform the required operation on the copper buss bars for the proper primary voltage.

NOTE

Never change the wiring to the terminals connected to the buss bars.

- C) Recheck all three input voltage change-over buss bar connections to ensure all three are rated for the same input primary voltage.
- D) Reinstall the top case to the bottom as follows:
 - 1) Check for loose wires and potential pinch points.
 - 2) Replace top case, paying careful attention to front and back panel assemblies fitting into grooves of top case.
 - 3) Make sure both top and bottom cases fit snug with all 10 holes aligned.
 - 4) Insert bolts in 10 holes of case, thread nuts on bolts and tighten firmly.
- E) Check for correct input voltage of primary source and ensure the fuse and plug are UL approved for the rated primary load shown in Table 1.

BLEEDER RESISTOR ASSEMBLY

CONSTRUCTION

This assembly must consist of the following components to be considered acceptable for capacitor bleed-off:

RESISTOR : Minimum requirements - 50 watts, 5 ohm.
CONDUCTOR: #16 AWG 600 VDC insulation rating.
CLIPS: #16 AWG 600 VDC insulation rating.

All connections must be hard wired (soldered). Conductors should be approximately three (3) inches in length.

Entire resistor body and soldered connections to resistor must be encapsulated with 600 VDC rated "heat shrink" insulation.

A discharge resistor assembly is available from PowCon (P/N 250040-001). Contact your local distributor or the factory if you wish to obtain it.

INSTALLATION

USE

Once an acceptable discharge device (as described in the previous section) is available, perform the following:

NOTE

Read entire procedure prior to performing voltage bleeding procedure.



DANGER

Do not attempt to perform this procedure without the power source being turned off and disconnected from the primary input.

- A) Turn range switch to highest range.

CAUTION

Failure to turn range switch to highest range will prevent discharge of all the capacitors.

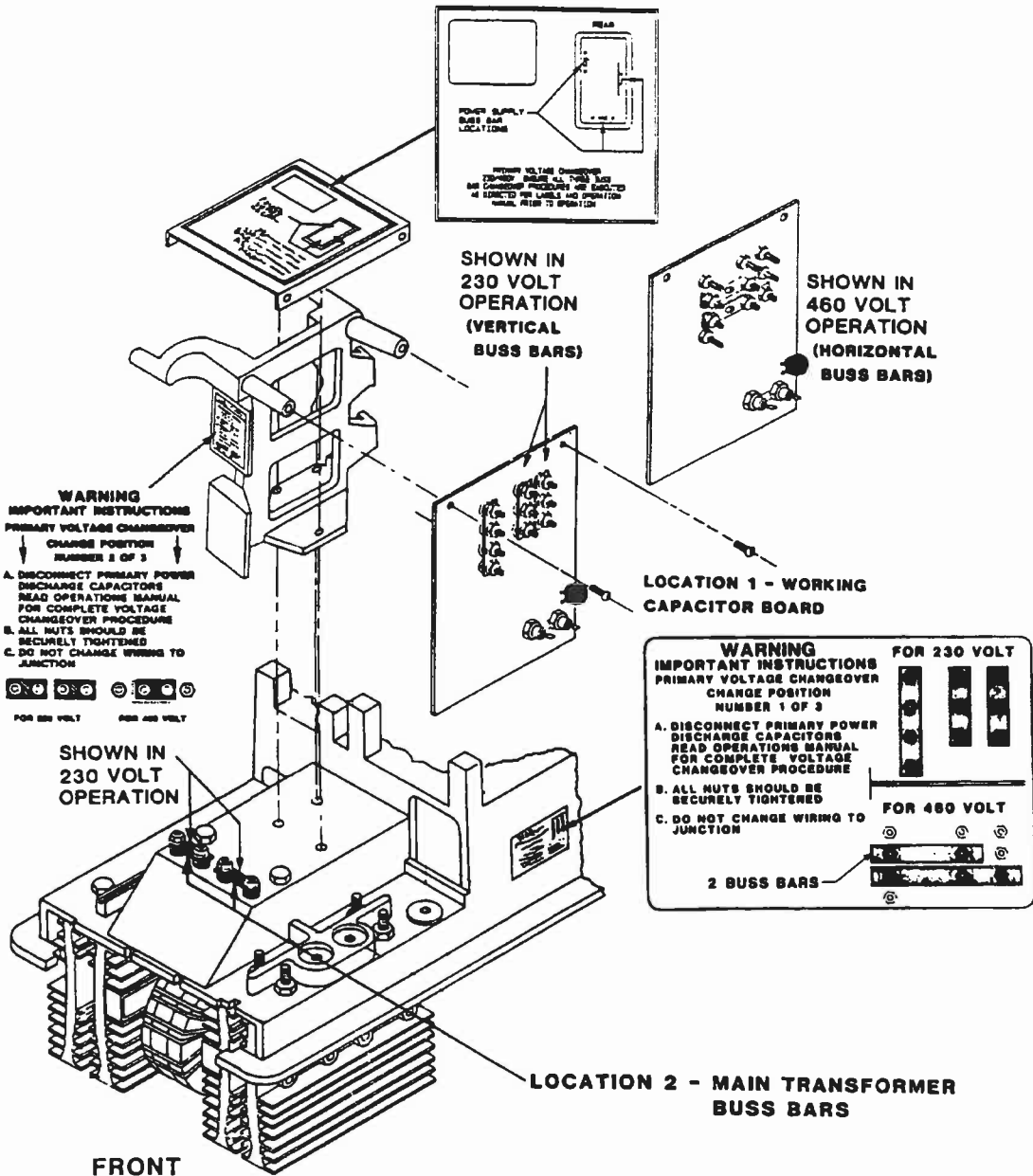


Figure 4 - Location 1 and 2 Voltage Changeover

INSTALLATION

- B) Locate the C.F. assembly inside the unit as shown in Figure 5. The C.F. assembly can be identified by two aluminum heatsinks which contain three diodes each.
- C) Connect one end of the bleeder resistor assembly to one of the heatsinks and attach the other end of the bleeder assembly to the other heatsink. This action will bleed the capacitors.

- D) Leave the bleeder resistor assembly connected for at least 10 seconds.
- E) Remove the bleeder resistor assembly from the unit and continue with the voltage change-over.

WARNING

Do not attempt to discharge this power source by any other means than that described previously.

NOTE

A Spark discharge may be noticed.

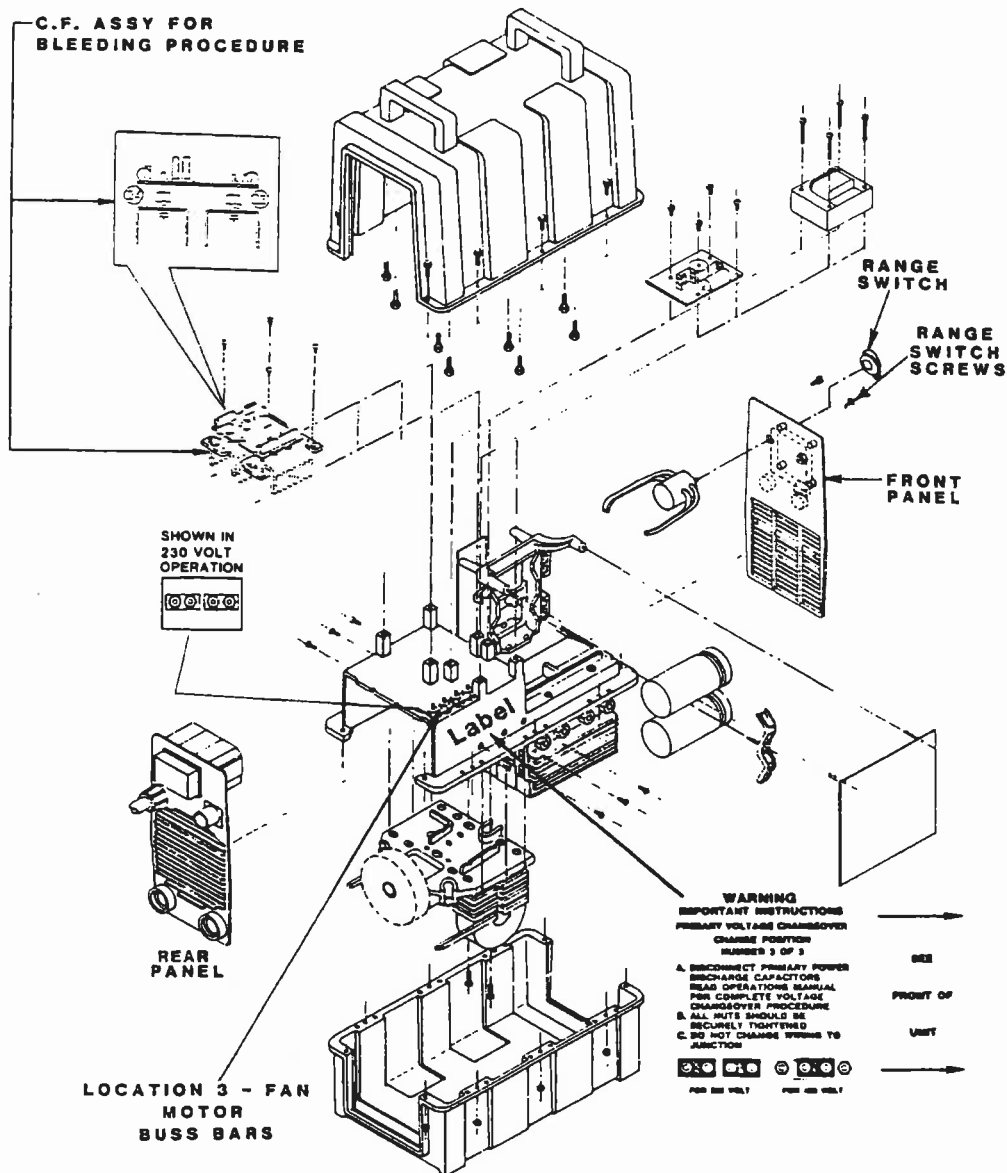


Figure 5 - Location 3, Voltage Changeover

OPERATION

OPERATION

Function Of Operating Controls And Connections

NOTE

On units equipped with "Fan On Demand", the fan motor circulates cooling air inside the power source only on power-up and when welding. The fan ON time directly depends on welding time and settings.

Control Indicator And Functions

1. Power On Indicator

Illuminates when power is applied to unit and when circuit breaker is closed (on).

2. Weld Power Control Dial

Adjusts the output of the unit. It is graduated in 10% increments and adjusts from a minimum in low range of 20 amps @ 20V, to a maximum in the high range of 400 amps @ 36V. The weld power can be adjusted while the unit is under load. See #12, Weld Level Select Switch.

3. Range Switch

Used to select between a high (100-400 amp) range and a low (30-250 amp) range.

CAUTION

Do not switch under load.

4. Process Selection Switch

SMAW - Use for SMAW or GTAW.

GMAW (Short) - Use for GMA short-arc welding.

GMAW (Spray) - Use for either GMA spray transfer or FCAW.

5. Short Arc Puddle Control

This knob controls the puddle characteristics only in the GMAW (short) mode, it controls the Arc Force when in the SMAW mode.

In GMAW, the lower settings of this control are for out of position welding, upper settings are for flat welding.

In SMAW, the lower settings are for minimum arc force, higher settings are for maximum arc force.

NOTE

This control is operative only when the process selection switch is in the GMAW (short) mode. The puddle control can be adjusted while the unit is under load.

6. Circuit Breaker

The circuit breaker acts as a switch to turn the incoming primary power on and off and also protects the semiconductors in the power source in case of fault in the control circuits.

WARNING

In order to avoid an electrical shock, potential fire or equipment malfunction, the circuit breaker must never be forcibly held closed in the ON position.

WARNING

Once the circuit breaker is turned on, DC current is always present at the output of this power source. This means that the electrode is LIVE at all times. Avoid an electric shock.

7. Remote Terminal

Connection for remote contact closure and auxiliary power connection for wirefeeder. Also can be used with remote current control device. See #11, Contactor Control Switch and #12, Weld Level Select Switch.

8. Primary Cable

Unit comes from factory with 12 feet (3.7 meters) of primary lead connected to the circuit breaker through the strain relief.

9. Output Terminals

Quick connect female output receptacle with polarity as marked. User must supply cable and male connect plugs. See INSTALLATION Section for recommended cable size.

10. Aux Power for Wirefeeders (OPT)

A) AUX 1-10A - 24VAC or 5A-115 VAC

11. Contactor Control Switch

WARNING

With the contactor switch in the ON position the welding power source is activated and open circuit voltage is present. Do not touch or short the output welding terminals.

The contactor switch in the ON position will automatically activate the output of the welder.

The contactor switch in the REMOTE position will permit activation of the welder via a remote control device or a wirefeeder contactor switch.

OPERATION

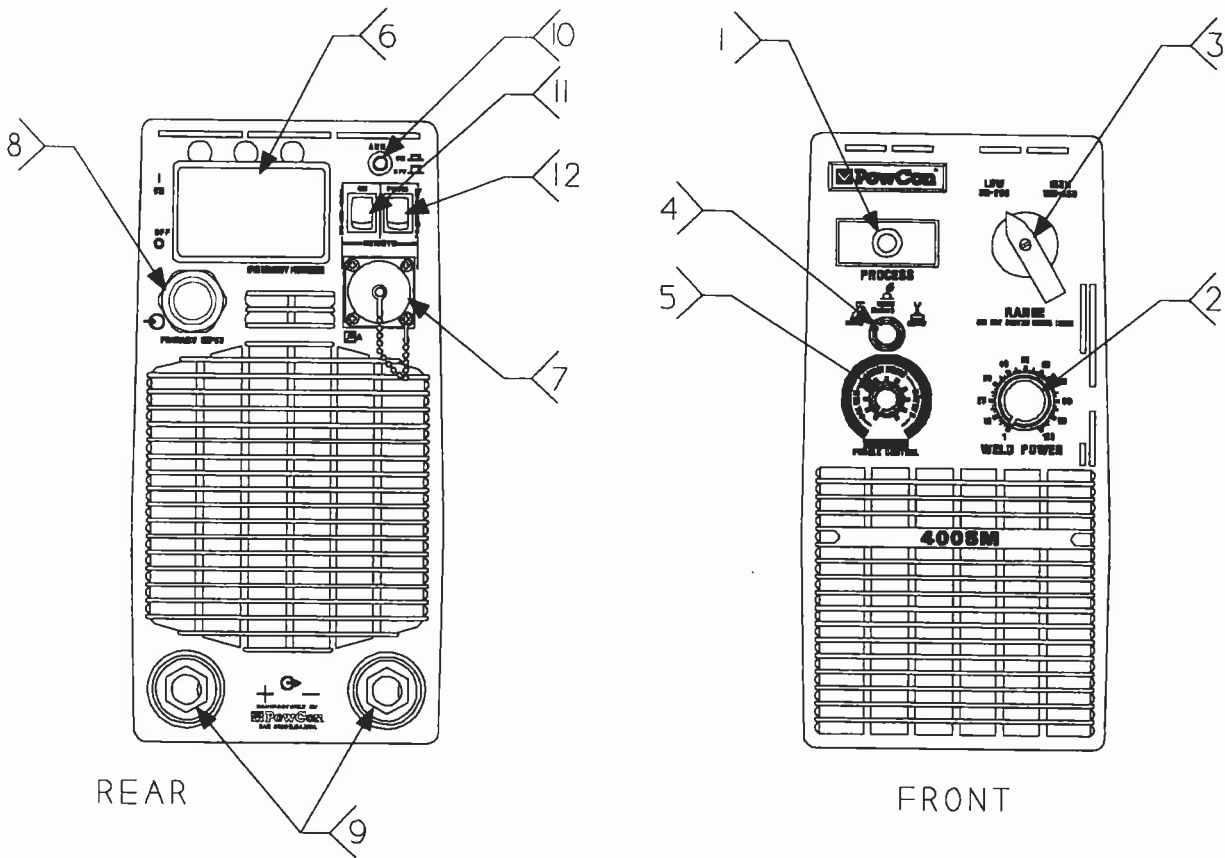


Figure 6 - Front and Rear Panel Controls

12. Weld Level (volts/amps) Select Switch

With the switch in the PANEL position the output volts or amps control is via the front panel potentiometer 2.

With the switch in the REMOTE position the output volts or amps control is relinquished to a remote control device.

SEQUENCE OF OPERATION

GENERAL

The PowCon 400SM may be equipped with a digital/amp meter which indicates the unit's output.

Table 4 - Open Circuit Voltage Range*

Range	Mode		
	SMAW	GMAW/ Spray	GMAW/ Short
R1	73-74	62-63	30-40
R2	74-75	64-65	30-40

*Without remote terminal connection.

The open circuit voltages displayed depend upon both the process mode and the range used. The approximate open circuit voltages displayed under each condition are shown in Table 4.

The open circuit voltage cannot be adjusted to obtain a desired operating point.

Prior to performing any welding, go through the following procedure:

- A) Inspect the unit to make sure it is set up properly according to the equipment installation section.
- B) Select the appropriate weld power range for the application.
- C) Choose the applicable welding process on the process selection switch.
- D) Adjust the Weld Power Control to the desired power level needed for your application.
- E) Lift the handle of the automatic circuit breaker to its "UP" position. At this time the pilot light will come on and the fan will start. A "ticking" sound will be heard (if the machine is not under load). This indicates that the rectifier is coming on about once per second for a very short time to provide the open circuit voltage.

OPERATION

NOTE

In SMAW mode, when either a foot or hand operated remote device is connected to the power source, the "ticking" sound will not occur. The ticking will only occur when the contactor is engaged by the remote device. The indicator lamp and fan, however, will remain on while a remote device is installed.

- F) After welding has been completed, allow the fan in the unit to run for a few minutes to remove the heat from the power source prior to turning the unit off.

WELDING TECHNIQUES

Welding techniques vary as a function of both the individual performing the operation and the code requirements of the applicable welding procedure. Laboratory tests and industrial users have demonstrated the use of the PowCon with a variety of electrode types and diameters.

OPERATING IN THE SMAW MODE

Place the process switch in the SMAW mode. Either Range 1 or 2 can be used dependent upon the desired output. The volt ampere characteristic curves for the

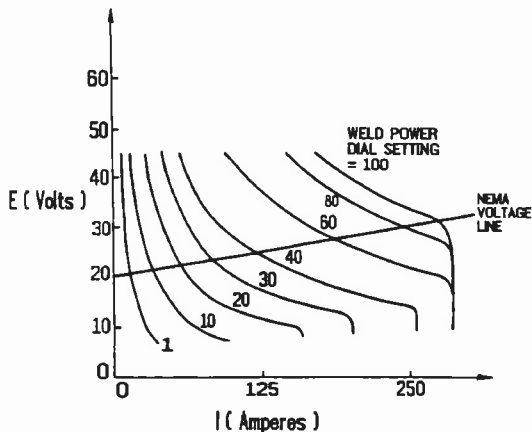


Figure 7 - Volt/Amp Characteristic Curves Range 1, SMAW

Table 5 - Recommended range/power settings for SMAW DCRP*

ELECTRODE DIAMETER	ELECTRODE TYPE	
	E7018	E309-16
3/32"/2.38mm	R1, 35%	R1, 20%
1/8"/3.17mm	R1, 35% R2, 18%	R1, 32% R2, 15%
5/32"/3.96mm	R1, 45% R2, 30%	R1, 40% R2, 20%

*These suggested power and range settings represent the manufacturer's best estimate and are intended as guidelines for the user of the PowCon 400SM.

PowCon SM in the SMAW mode are shown in Figures 7 and 8. Some typical electrodes and recommended machine settings are shown in Table 5.

Set arc force to control the spatter properties for different welding rods used in SMAW (Stick) process. Setting to higher numbers will increase the output current available to clear molten droplets bridging in between the rod and work piece, thus appropriate arc force setting will provide the optimum spatter control at the arc.

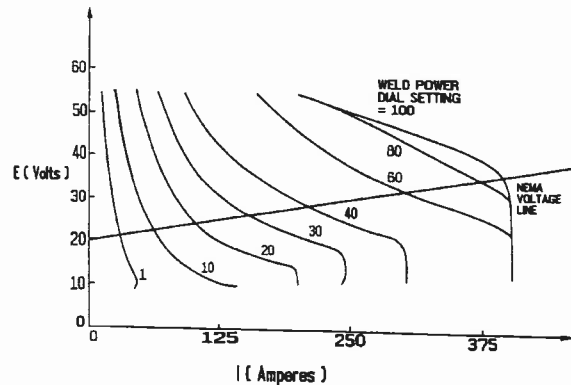


Figure 8 - Volt/Amp Characteristic Curves Range 2, SMAW

OPERATION

OPERATING IN THE SHORT ARC MODE

Short circuiting transfer GMA welding is distinguished from other transfer modes by the use of small diameter wires with relatively low currents. In the Short Circuit mode, the filler metal is transferred to the base material during an instantaneous short circuit between the filler metal wire and the base material.

Introduction

The 400SM achieves the short circuit transfer by precisely controlling the instantaneous power output during alternating arcing and shorting periods.

See Figure 9.

An internal control circuit monitors the output voltage to detect the shorted condition (time 'A' in the figure) and reacts to increase the arc current during the shorted time.

This heats the filler metal in contact with the base material to the melting point; the molten filler flows into the base, the short circuit condition ends (times 'B' and 'C') and a period of arcing begins again (times 'C' and 'D').

During arcing the increase in arc voltage is detected by the internal control which acts to limit the arc current at times 'E' and 'F' until a short circuit is once again detected, beginning another cycle.

The Weld Power Control

The average power supplied to the weld is set with this control while operating GMAW (Short Circuit).

The Puddle Control

Use this adjustment to control the weld puddle characteristics to suit your application; generally speaking, the colder settings are for out of position welds and the hotter settings are for flat welding. The weld puddle control regulates both the rate and the amount of power delivered during each mode of the short circuit transfer. As more puddle control is added, the arc becomes hotter, due to the increase in power delivered during the arcing period. Decreasing the puddle control causes a colder arc by reversing the power delivery schedule outlined above. Another result of changing the puddle control is the weld droplet size increase for hotter settings and decrease for colder settings. The larger the droplet size, the lower the frequency of drops.

Selecting an Operating Point

Obtaining an operating point requires a balanced selection of gas, wire diameter, proper wirefeed speed, and weld power. The weld puddle control should remain at the mid-point during the initial adjustment. Once a suitable combination of weld power and wirefeed speed is obtained, an adjustment to the weld puddle control can be made.

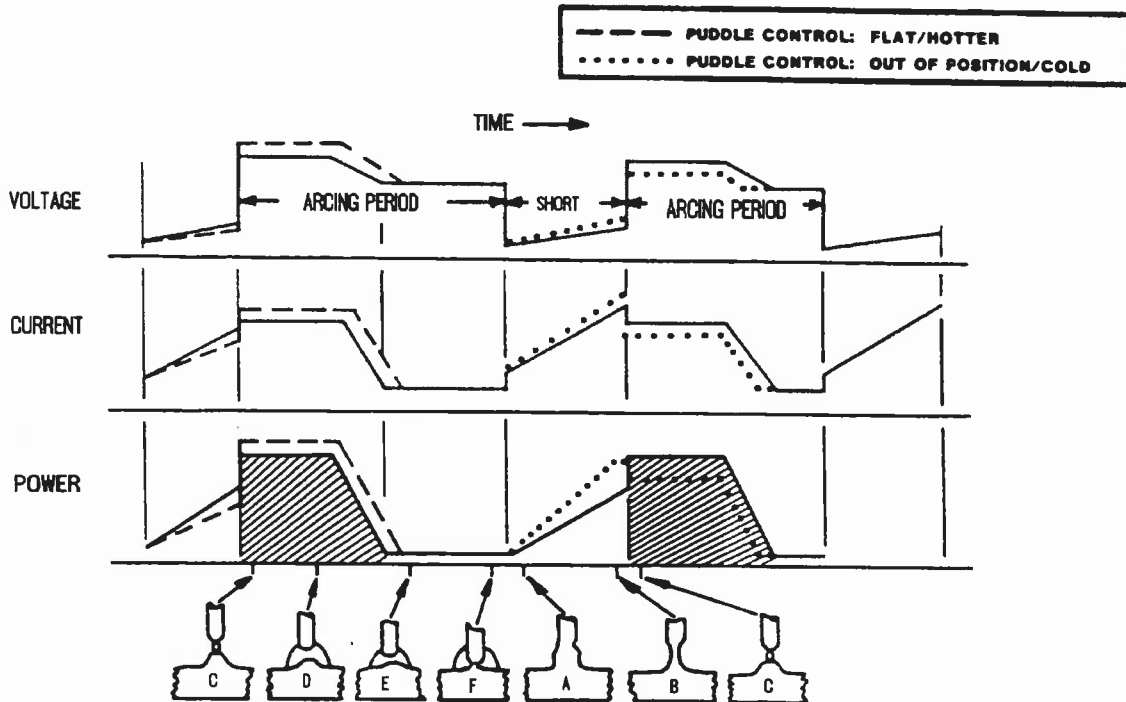


Figure 9-Oscillographs of GMAW Short-Arc Transfer

OPERATION

For some higher current short circuit applications, the process switch can be placed in the GMAW spray position. This switches the power supply out of the low current electronic control mode, and into a dynamic response mode. As a result, at operating points several amps before the spray transition current, excellent crisp short-arcing can be performed on a variety of plate thicknesses and current levels.

NOTE

Failure to allow unit to idle for required period of duty cycle will activate thermal overload protection devices. If these devices are activated, the 400SM will shut down until internal components are sufficiently cooled.

OPERATING IN THE GMAW/SPRAY MODE

The high current densities used for GMAW spray transfer and FCAW usually require use of Range 2. When the unit is switched to regular GMAW spray mode, the puddle control is non-operational and therefore need not be adjusted. General guidelines for the establishing of operating points are shown in Table 6. The volt/ampere characteristic curves for the PowCon in the regulator GMAW spray mode are shown in Figures 10 and 11.

Table 6 - Recommendations for E70S-3 Spray Transfer*

Wire Diameter (Inches)	Range 2 Power Setting	Current A	Wirefeed Speed IPM	Voltage V
.035	50-100	180-290	350-450	25-28
.045	60-100	200-300	250-450	25-28
.062	75-100	280-360	220-290	25-28

* Using 98/2 AR002 shielding gas. The recommended power and range settings represent the manufacturers best estimate and are intended only as guidelines for the PowCon 400SM

DUTY CYCLE

NOTE

On units equipped with "Fan On Demand", the fan motor circulates cooling air inside the power source only on power-up and when welding. The fan ON time directly depends on welding time and settings.

The duty cycle of a welding power source is a measure of the capacity of the unit. The PowCon 400SM has a duty cycle based on a 10 minute time period. The duty cycle is the percent of that time period the unit can produce the specified output.

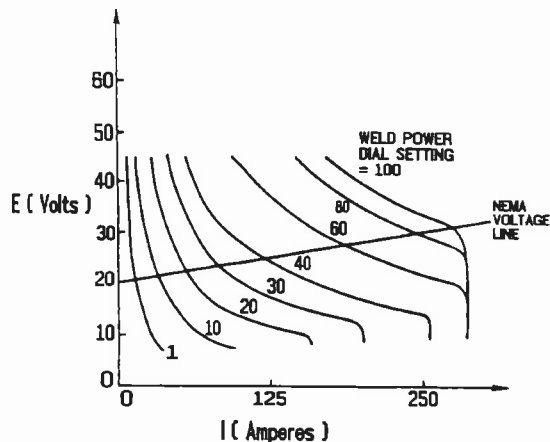


Figure 10 - Volt/Amp Characteristic Curves Range 1, GMAW

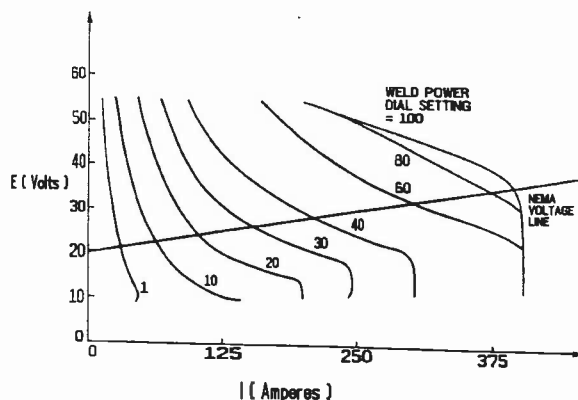


Figure 11 - Volt/Amp Characteristic Curves Range 2, GMAW

The PowCon 400SM can operate for 6 minutes out of a 10 minute period at an output of 300 amperes and 32 volts. To assure the safe operation of the unit the remaining 4 minutes must be spent idling to permit proper cooling. The duty cycle at this output is 60%.

Lowering the output current allows increases in the duty cycle. Thus the 100% duty cycle (weld output continuous) is 240 amperes and 29 volts.

MAINTENANCE

MAINTENANCE

SERVICE

Unauthorized service to this unit by anyone other than a PowCon trained and authorized technician will void the limited warranty.

INTERNAL CLEANING

WARNING

On "Fan On Demand" type units, should the fan not rotate and generate a familiar sound, ensure that the power source is off and disconnected from input power before performing any kind of maintenance.

The use of a PowCon unit in an environment containing airborne dust and dirt requires occasional blowing out or vacuuming of the unit. The frequency of the cleaning operation should be done dependent upon the severity of the environment. Use only clean, dry air or a vacuum suction to clean the unit. Do not open the case; just direct cleaning through the vents while the unit is turned off and disconnected from the primary power source.

EXTERNAL TROUBLESHOOTING

If the PowCon power supply malfunctions, this Troubleshooting Guide will be helpful in locating the problem. This guide covers only malfunctions that can be located and corrected without opening the unit.

- A) Before doing anything else, make sure that the unit is connected to the correct voltage and that all three legs of the three phase power are connected.
- B) Make sure that the unit is properly grounded.

- C) The circuit breaker on the rear panel is intended to trip in the event of a fault or component failure in the unit. It does not trip if the unit overheats; the control circuit automatically turns the output off until it cools down.

If the circuit breaker trips it is probable that a fault has occurred. It may be reset ONCE to see if it was a momentary fault.

NOTE

Repeated resetting of the circuit breaker only increases the chance of causing additional failures to the unit.

- D) With no load connected, turn the unit on and switch between all the output ranges. A "ticking" sound should be heard.

INTERNAL TROUBLESHOOTING

An input voltage change-over is the only internal service that can be performed by other than a PowCon trained and authorized technician. The input voltage change-over procedure is detailed in another section of this manual. No other reason exists for unauthorized personnel opening the case of the unit.



DANGER

Before performing input voltage change-over, an understanding of the procedure on page 12 of this manual is required. The capacitors in this unit can hold a dangerous charge even when the primary power is disconnected. To discharge these capacitors, use the bleeder type resistor assembly procedure outlined on page 13 for input voltage change-over.

Table 7 - General Trouble Shooting

TROUBLE	POSSIBLE CAUSE	REMEDY
Welding current too low for power setting.	Phase missing primary power.	Check primary connections.
Unit shuts down while welding. Fan still rotates and READY light working.	Unit overheated due to: a. Running too high amperage. b. Improper cooling of unit.	Wait 10 minutes. Reduce the welding current and duty cycle. Make sure the air vents are not obstructed.
No wire feed when gun trigger engaged.	Poor contactor connection. Lack of auxiliary power to wirefeeder.	Check remote connections on both PowCon and wirefeeder. Check circuit breaker Aux 1.
No weld current for SMAW.	Remote for wirefeeder still engaged.	Disconnect remote.
Weld control erratic for application.	Wrong mode on process switch. Wrong range. Wrong weld power setting.	Change as required.

PART LIST

PART LIST

Parts List for Figure 12, 230/460V Final Stick/Mig Assembly

Item No.	Qty.	Part Number	Description	Ref. Des.
	SM			
1	1	250018-003	Case Top Kit	
2	1	100006-001	Case, Bottom	
3	1	100199-001	Capacitor Filter PCB	CF
6	1	103533-001T	Control Board	
7	1	100148-002	Assy, Capacitor Bracket w/PTC	RT3
8	2	900000-001	Input Capacitor	
9	4	970025-506	Screw, Thread Forming 10 - 10 X .50	
10	10	970006-614	Screw, Hex Flanged, 1/4 - 20 X 1	
11	4	970002-525	Screw, PanHead, Supadrive	
14	6	970011-506	Screw, FlatHead, Supadrive, Locking, 10 - 32 X .50	
15	10	972001-006	Nut, Flanged Hex, Self Locking	
17	1	103456-001	Aux Transformer 24V - 48 CT	T3
OPT	1	103458-001	Aux Transformer 115V-48 CT	T3
18	1	920000-002	Range Switch SS and SM	S1
21	2	250017-002	Handle Kit	
22	8	970019-606	Screw, Flanged Hex Head 1/4 - 14 X .50	
23	3	912000-001	Diode (Anode to Stud)	CR4 - 6
24	3	912000-002	Diode (Cathode to Stud)	CR1 - 3
25	1	923028-001	Relay 24/120VAC Coil	
26	2	974005-004	Washer, F#8 .304 X .169 X .032 SBZ	
27	2	970025-406	Screw, 8-10 X .50P CRIP SZ	
28	2	100151-001	Buss Bar	

PART LIST

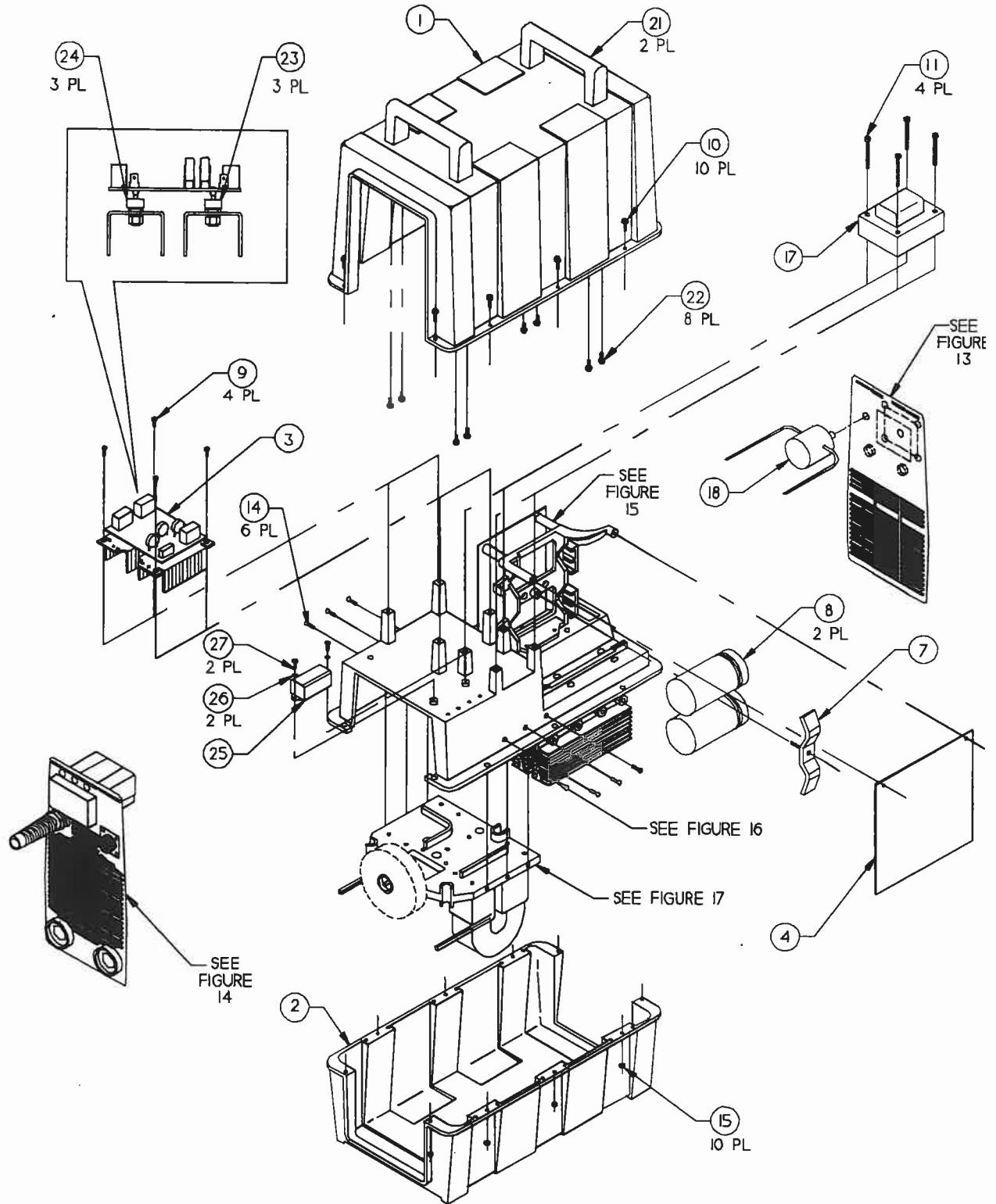


Figure 12, 230/460V Final Stick/Mig Assembly

PART LIST

PART LIST

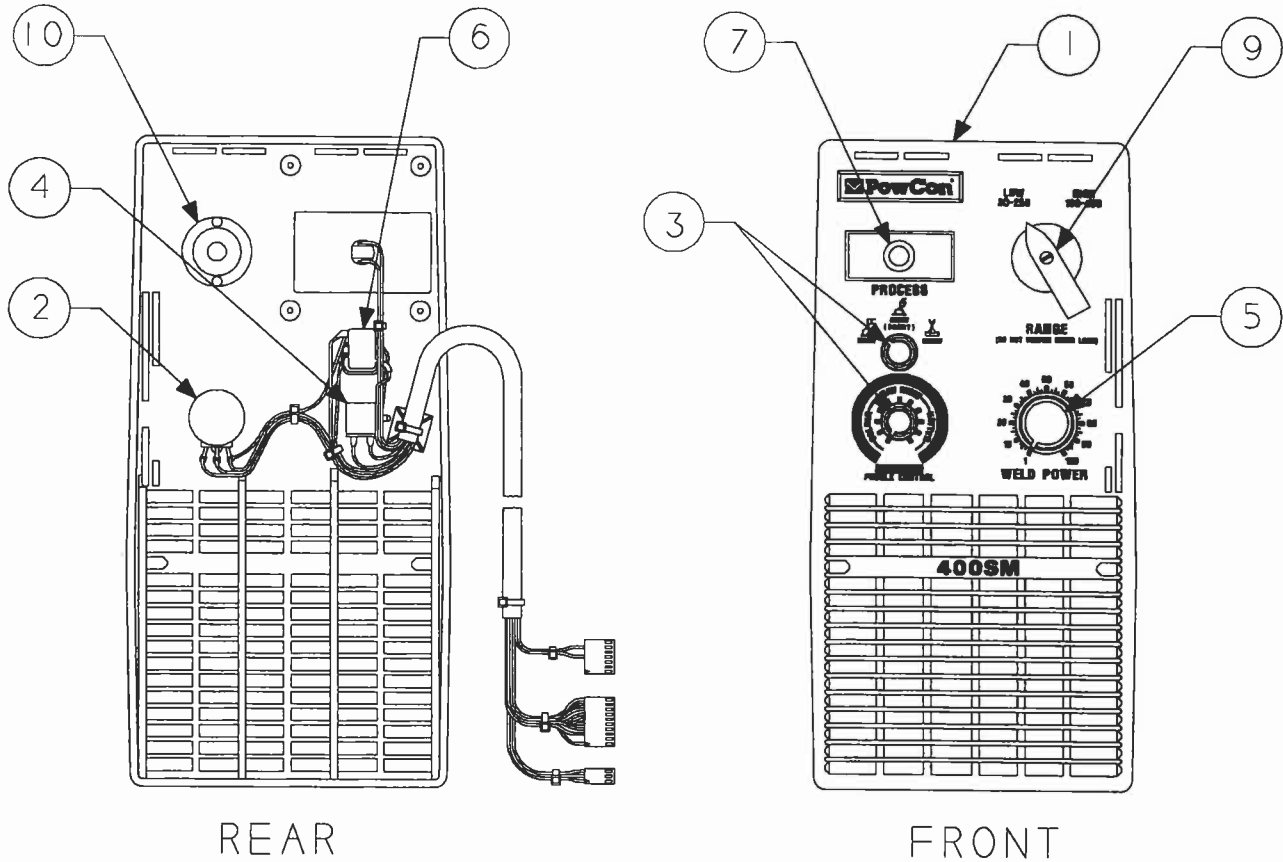


Figure 13, Front Panel Assembly

Item No.	Qty.	Part Number	Description	Ref. Des.
1	1	103513-001	Silkscreened Front Panel	
2	1	903000-002	Potentiometer 5K	R2
3	2	940024-001	Control Knob, Small	
4	1	903010-001	Potentiometer 10K	R1
5	1	940024-101	Control Knob, Large	
6	1	920019-001	Rotary Switch	S2
7	1	941006-001	Yellow Indicator Light (LED)	
Opt	1	600025-001	Meter Lens	
Opt	1	600020-001	Digital V/A Meter 200/300	
Opt	1	600028-001	Digital Meter Insulator	
9	1	920000-100	Knob Range Switch	
10	1	920000-002	Range Switch	

PART LIST

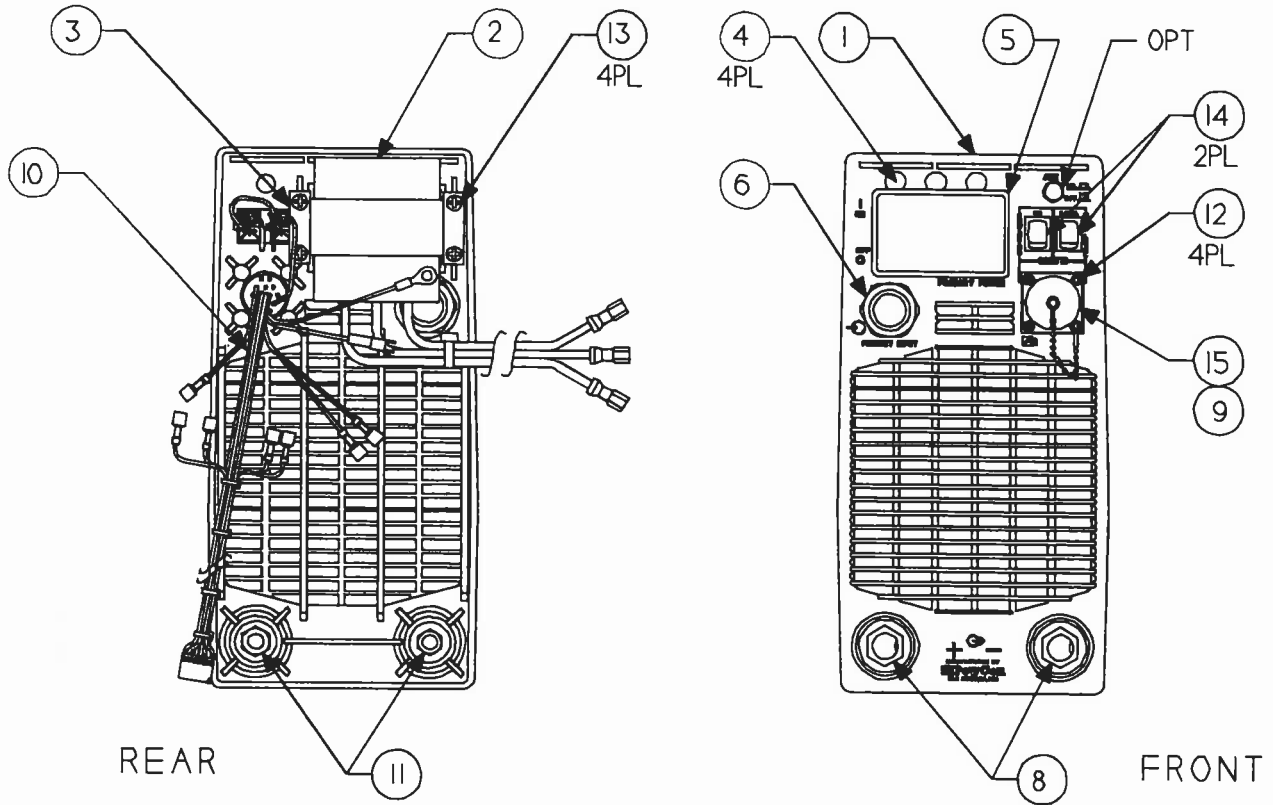


Figure 14, Rear Panel Assembly

Item No.	Qty.	Part Number	Description	Ref. Des.
1	1	100503-001	Rear Panel, Silkscreen 400SS/SM	
2	1	921000-001	Circuit Breaker	CB1
3	1	100030-001	Circuit Breaker Bracket	
4	4	940002-001	Hole Plug Panel	
Opt	1	921013-001	Circuit Breaker - 5 Amp, for 115VAC	Aux 1
Opt	1	921013-002	Circuit Breaker - 10 Amp, for 24VAC	Aux 1
5	1	100005-001	Boot (Moisture Seal)	
6	1	940015-003	Strain Relief with Nut	
8	2	100025-001	Output Jack Tweco	J11, J12
Opt	2	100028-001	Output Jack, Dinse	
9	1	930014-502	Sealing Cap	
10	1	100505-001	Remote Connector Harness	J10
11	1	250002-001	Output Jack Hardware Kit (with Washers and Brass Nuts)	
12	4	970025-304	Screw, Supradrive #6 - 10 x 3/8	
13	4	970025-506	Screw, Supradrive #10 - 10 x 1/2	
14	2	920034-001	Switch, RKR, 4A/250VAC	
15	1	930014-001	Remote Connector	

PART LIST

Parts List for Figure 15, Capacitor Chassis Assembly

Item No.	Qty.	Part Number	Description	Ref. Des.
1	1	100177-002	Capacitor Chassis	
2	1	100220-001	Assembly, PWB Cap Board	C5-8
6	1	250004-001	Assy, Commutating Inductor Kit, rear (includes Items 12 and 34)	L3
7	1	250005-001	Assy, Commutating Inductor Kit, front (includes Items 12 and 34)	L2
8	1	902003-002	Power Resistor	R5
9	1	100128-001	Threaded Rod 10-32 x 5.25"	
10	1	100205-001	Washer, Locating Ryton	
11	1	972001-005	Nut, Flanged Hex, Self Locking 10-32	
12	2	970004-001	Screw, 10-32 x 3.25"	
13	2	970002-506	Screw, Pan Head, Self Locking 10-32 x 1/2"	
14	2	100151-002	Buss Bar Voltage change-over	
15	1	100232-001	Buss Bar - 4 holes	
16	2	100231-001	Buss Bar - 3 holes	
25	1	250003-001	Power Resistor Assembly, Kit (includes items 9, 10 and 11)	
30	1	912002-001	Diode (Anode to Stud)	CR8
31	1	912002-002	Diode (Cathode to Stud)	CR9
32	1	902011-003	Varistor	RV1
33	1	100237-001	Change-over Label	
34	2	974000-005	Washer, Flat #10	
35	8	972001-006	Nut, 1/4-20	
36	3	970030-610	Screw, Panhead Self-locking 12-11 x .75"	

PART LIST

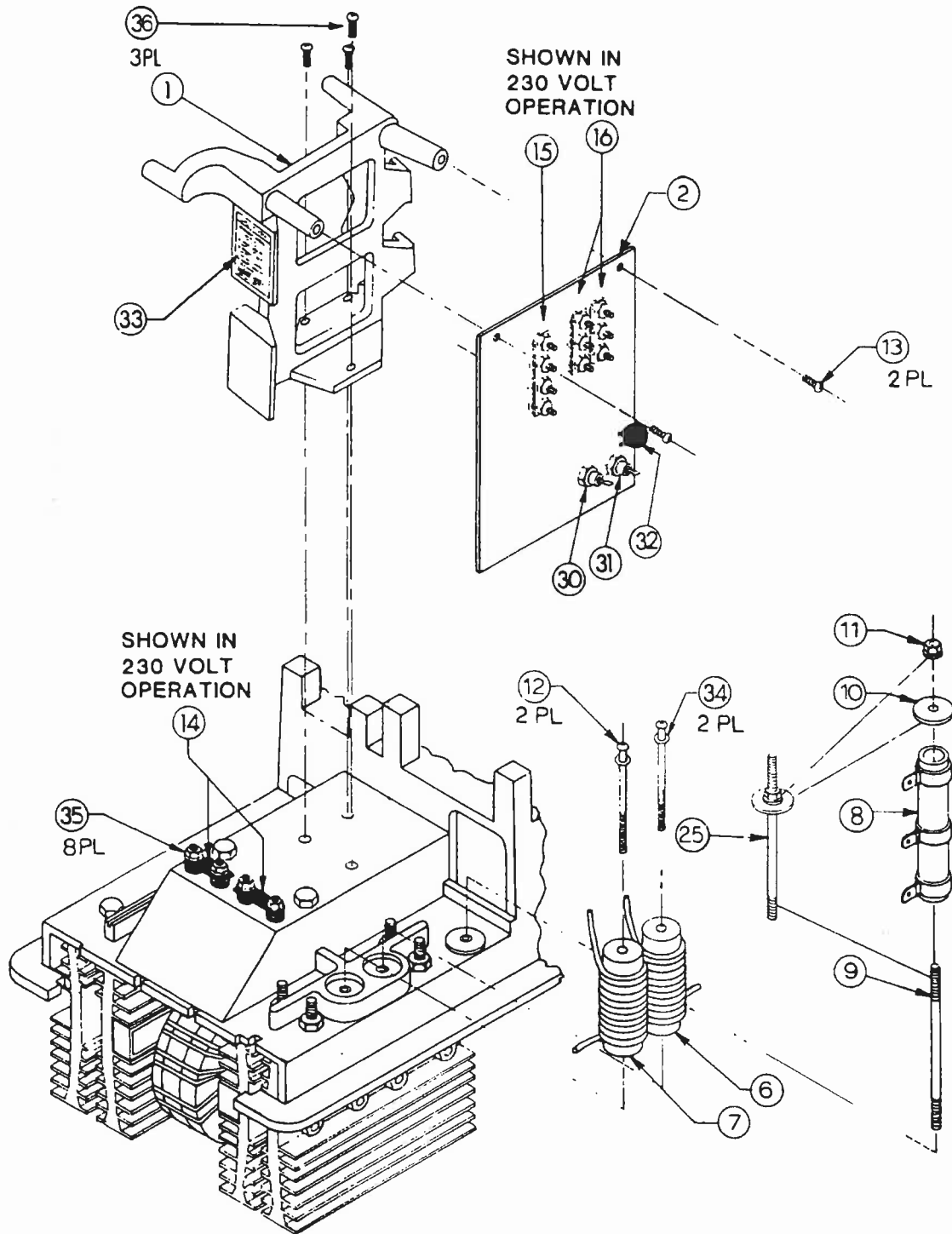


Figure 15 - Capacitor Chassis Assembly

PART LIST

Parts List for Figure 16, Chassis Plate Assembly

Item No.	Qty.	Part Number	Description	Ref. Des.
1	1	100190-003	Chassis Plate	
2	1	100189-001	Assy, Main Transformer	T2, RT1
3	1	100216-001	Assy, SCR Heatsink	Q1-2
4	1	100215-001	Assy, WR Heatsink	CR11-CR12
5	1	100057-001	Assy, Shunt Resistor	SH1
6	2	900001-001	Output Capacitors	C13-14
7	1	100241-001	Assy, PWB Output Board	R9, 10, R6, R7, C11, C12, C15, C16
9	1	105038-002	Clamp Capacitor	
10	1	100183-001	Bracket, X-former Mounting	
11	2	970006-628	Screw, Hex Hd, 1/4-20 X 3.5"	
12	4	100117-001	Screw, Special Shoulder	
13	7	970006-606	Screw, Flanged, Hex Hd 1/4-20 X .50"	
14	1	970002-518	Screw, PNH, Posi-drive 10-32 X 1/50"	
16	4	970025-506	Screw, Thread Forming 10 - 10 X .50	
17	4	972001-005	Flanged Nut, Hex 10-32	

PART LIST

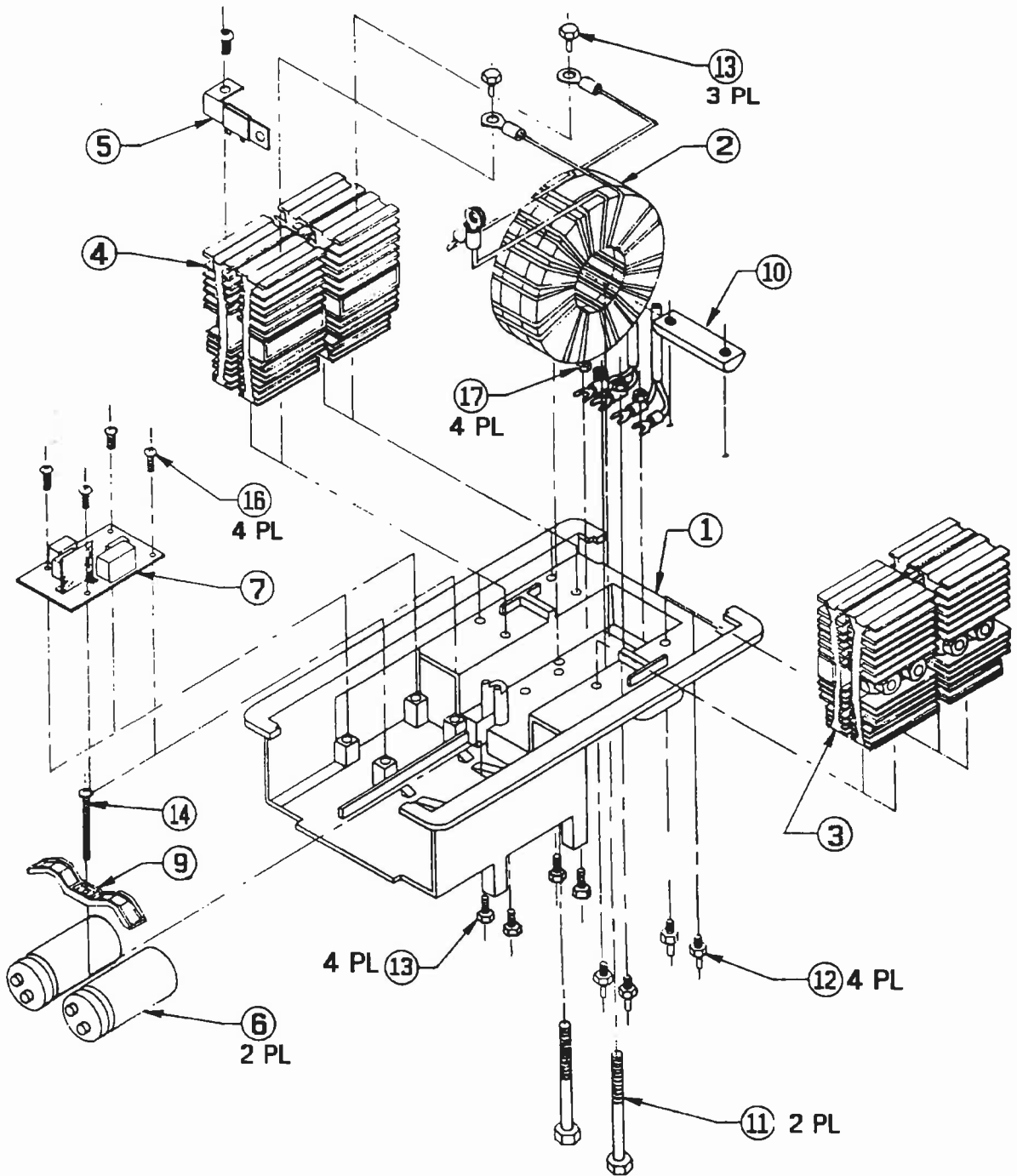


Figure 16 - Chassis Plate Assembly

PART LIST

Parts List for Figure 17, Inductor Plate Assembly

Item No.	Qty.	Part Number	Description	Ref. Des.
1	1	100179-002	Plate Inductor	
2	1	100039-002	Assembly, Inductor - Main	L4, RT2
3	1	103010-002	Assembly, Output Inductor	L5
8	2	902006-001	Resistor, Surge	R 1-2
9	1	103437-002	Fan Motor, Fan On Demand	Fan
11	1	922001-004	Fan Blade 6"	
12	2	100128-001	Threaded Rod 10-32 X 5.25"	
13	2	100205-001	Washer, Locating Ryton	
14	12	970028-506	Screw, Thread Rolling, Hex, 10-32 X 1/2"	
15	4	970001-403	Screw, Panhead, Supadrive, 8-32 X 5/16"	
16	4	972000-004	Nut, Hex 8-32	
18	4	974010-004	Washer, Split Ring, Steel #8	
19	2	972001-005	Nut, Flanged Hex, Self-locking, 10-32	
20	1	250007-001	Surge Resistor Assy Kit (Includes items 12, 13 and 19)	

PART LIST

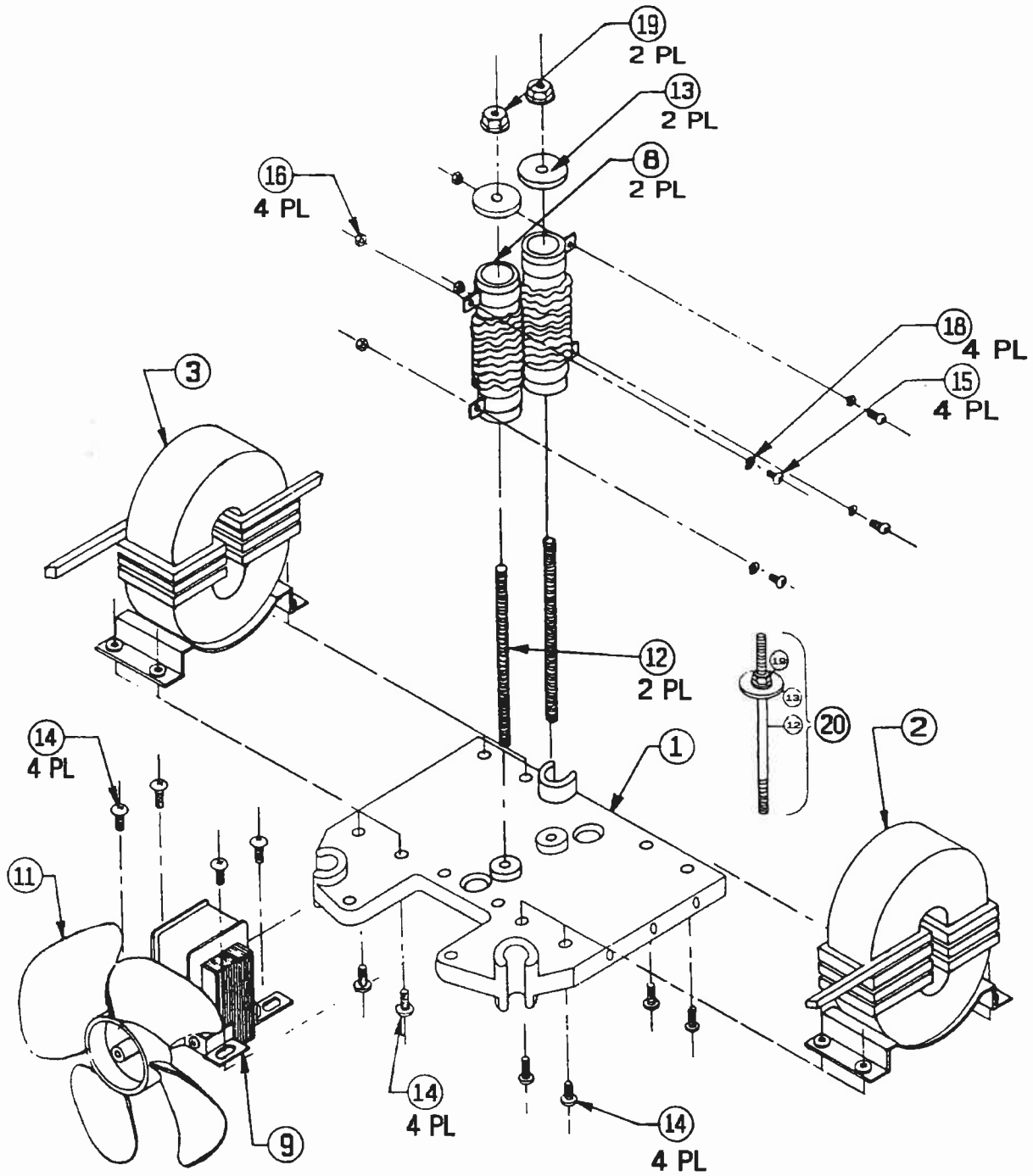
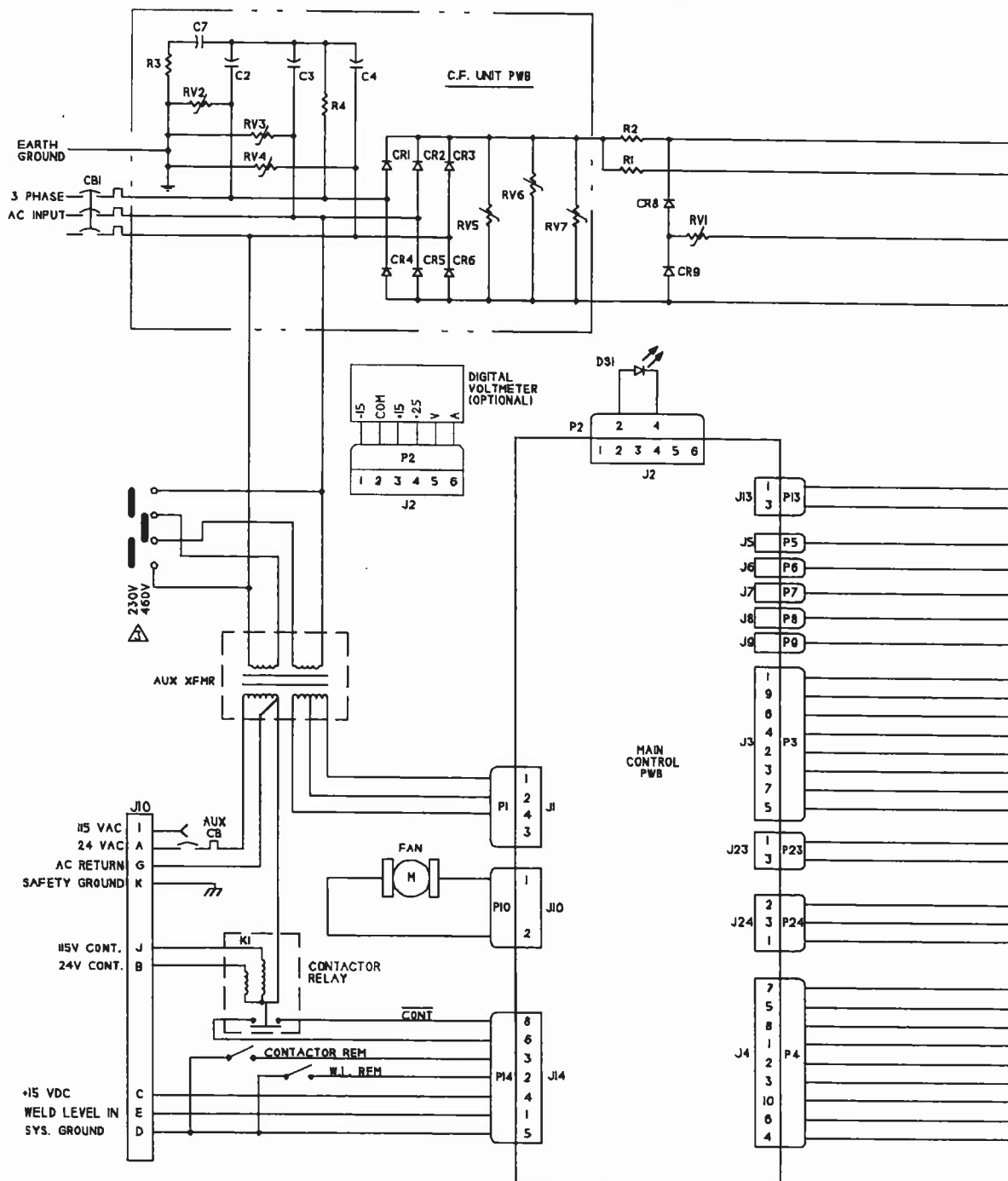


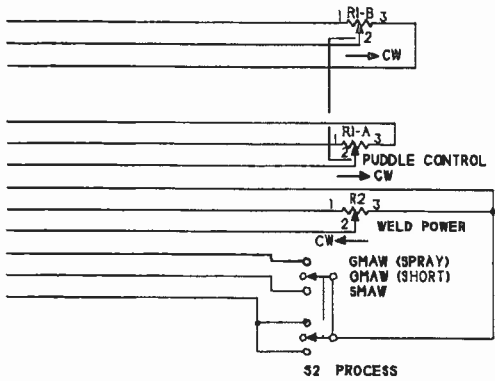
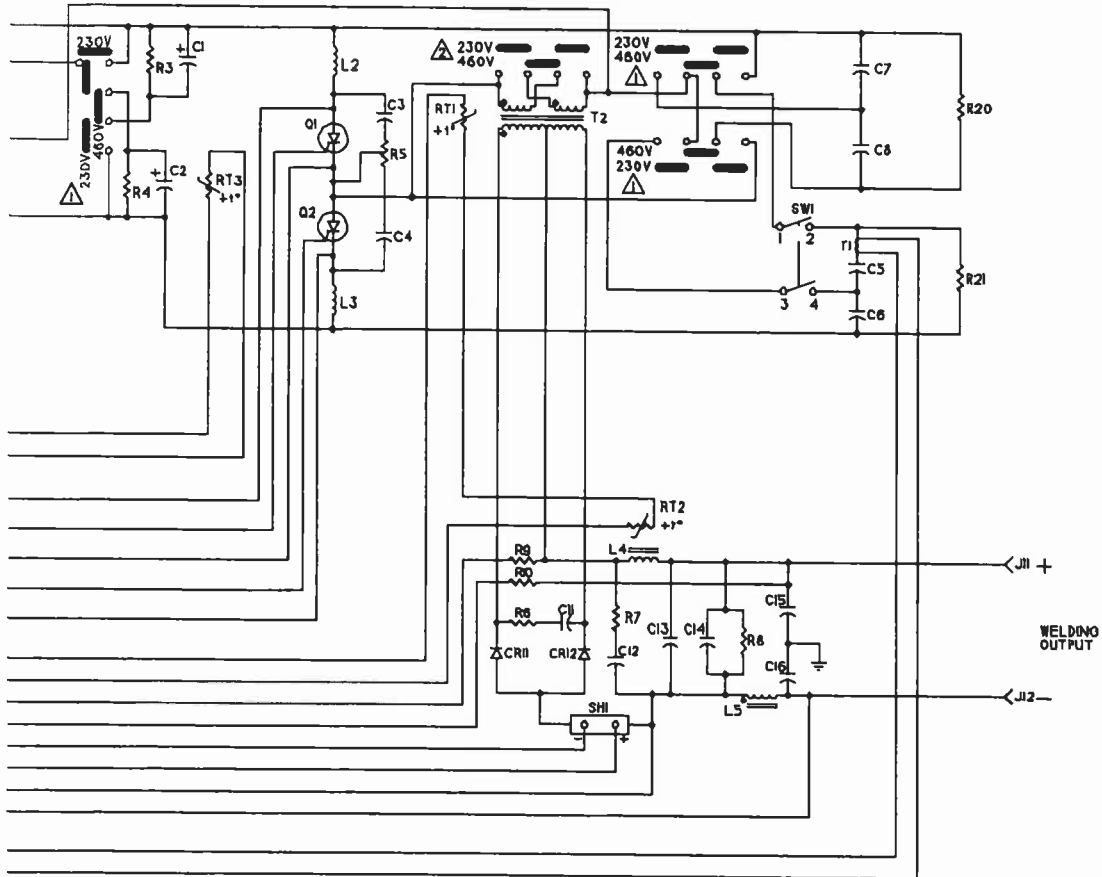
Figure 17 - 230/460 Inductor Plate Assembly

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