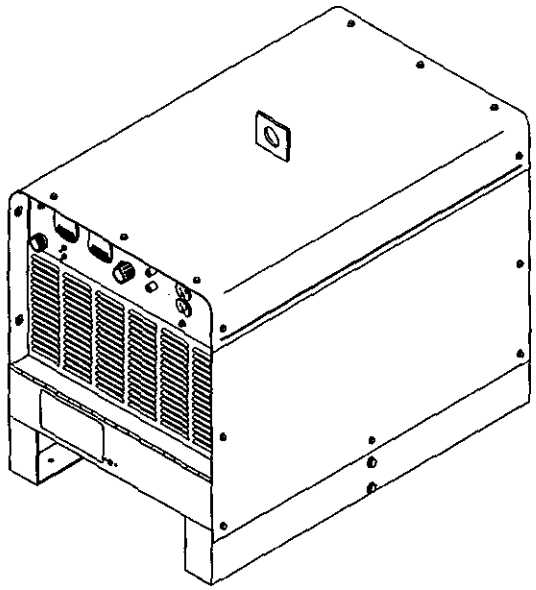
Miller®

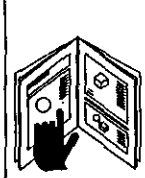
December 1994 Form: OM-232S
Effective With Serial No. KD529373

OWNER'S MANUAL



Deltaweld® 451 And 651

- CV/DC Welding Power Source
- For GMAW, FCAW, SAW Welding, And CAC-A Cutting And Gouging
- 450 Amperes, 38 Volts DC At 100% Duty Cycle
  650 Amperes, 44 Volts DC At 100% Duty Cycle
- Uses Three-Phase Input Power
- Overheating, Short Circuit, And Receptacle Overload Protection
- 14-Pin Remote Control Receptacle



- Read and follow these instructions and all safety blocks carefully.
- Have only trained and qualified persons install, operate, or service this unit.
- Call your distributor if you do not understand the directions.

- Give this manual to the operator.

- For help, call your distributor
- or: MILLER Electric Mfg. Co., P.O. Box 1079, Appleton, WI 54912 414-734-9821

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PRINTED IN USA

MILLER'S TRUE BLUE™ LIMITED WARRANTY

Effective January 1, 1995
(Equipment with a serial number preface of "KC" or newer)

This limited 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 below, MILLER Electric Mfg. Co., Appleton, Wisconsin, warrants to its original retail purchaser that new MILLER equipment sold after the effective date of this limited warranty is free of defects in material and workmanship at the time it is shipped by MILLER. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR *IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.*

Within the warranty periods listed below, MILLER will repair or replace any warranted parts or components that fail due to such defects in material or workmanship. *MILLER must be notified in writing within thirty (30) days of such defect or failure, at* which time MILLER will provide instructions on the warranty claim procedures to be followed.

MILLER shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the date that the equipment was delivered to the original retail purchaser, or *one year after the equipment is sent to a North American distributor or eighteen* months after the equipment is sent to an International distributor.

1. 5 Years Parts – 3 Years Labor
   - Original main power rectifiers
2. 3 Years — Parts and Labor
   - Transformer/Rectifier Power Sources
   - Plasma Arc Cutting Power Sources
   - Semi-Automatic and Automatic Wire Feeders
   - Robots
3. 2 Years — Parts and Labor
   - Engine Driven Welding Generators (NOTE: Engines are warranted separately by the engine manufacturer for a period of two years.)
   - Air Compressors
4. 1 Year — Parts and Labor
   - Motor Driven Guns
   - Process Controllers
   - Water Coolant Systems
   - HF Units
   - Grids
   - Spot Welders
   - Load Banks
   - SDX Transformers
   - *Running Gear/Trailers*
   - Plasma Cutting Torches (except APT, ZIPCUT & PLAZCUT Models)
   - Field Options

     (NOTE: Field options are covered under True Blue™ for the remaining *warranty period of the product they are installed in, or for a minimum of* one year — whichever is greater.)
5. 6 Months — Batteries
6. 90 Days — Parts and Labor
   - MIG Guns/TIG Torches
   - APT, ZIPCUT & PLAZCUT Model Plasma Cutting Torches
   - Remote Controls
   - Accessory Kits
   - Replacement Parts

MILLER'S True Blue™ Limited Warranty shall not apply to:

1. Items furnished by MILLER, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer's warranty, if any.
2. Consumable components; such as contact tips, cutting nozzles, contactors and relays or parts that fail due to normal wear.
3. Equipment that has been modified by any party other than MILLER, or equipment that has been improperly installed, improperly operated or misused *based upon industry standards, or equipment which has not had reasonable* and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

MILLER PRODUCTS ARE INTENDED FOR PURCHASE AND USE BY COMMERCIAL/INDUSTRIAL USERS AND PERSONS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT.

In the event of a warranty claim covered by this warranty, the exclusive remedies 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 as determined by MILLER. Therefore no compensation or reimbursement for transportation costs of any kind will be allowed.

TO THE EXTENT PERMITTED BY LAW, THE REMEDIES PROVIDED HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL MILLER BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT), WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY.

ANY EXPRESS WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY OR REPRESENTATION AS TO PERFORMANCE, AND ANY REMEDY FOR BREACH OF CONTRACT TORT OR ANY OTHER LEGAL THEORY 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 FITNESS *FOR PARTICULAR PURPOSE, WITH RESPECT TO ANY AND ALL EQUIPMENT* FURNISHED BY MILLER IS EXCLUDED AND DISCLAIMED BY MILLER.

Some states in the U.S.A. do not allow limitations of how long an implied warranty lasts, or the exclusion of incidental, indirect, special or consequential damages, so the above limitation or exclusion may not apply to you. This warranty provides specific legal rights, and other rights may be available, but may vary from state to state.

In Canada, legislation in some provinces provides for certain additional warranties or remedies other than as stated herein, and to the extent that they may not be waived, the limitations and exclusions set out above may not apply. This Limited Warranty provides specific legal rights, and other rights may be available, but may vary from province to province.

RECEIVING-HANDLING

Before unpacking equipment, check carton for any damage that may have occurred during shipment. File any claims for loss or damage **with the delivering carrier.** Assistance for filing or settling claims may be obtained from distributor and/or equipment manufacturer's Transportation Department.

When requesting information about this equipment, always provide Model Designation and Serial or Style Number.

Use the following spaces to record Model Designation and Serial or Style Number of your unit. The information is located on the rating label or nameplate.

Model _____

Serial or Style No. _____

Date of Purchase _____

ARC WELDING SAFETY PRECAUTIONS

⚠ WARNING

ARC WELDING can be hazardous.

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS KEEP AWAY UNTIL CONSULTING YOUR DOCTOR.

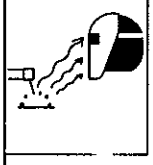
In welding, as in most jobs, exposure to certain hazards occurs. Welding is safe when precautions are taken. The safety information given below is only a summary of the more complete safety information that will be found in the Safety Standards listed on the next page. Read and follow all Safety Standards.

HAVE ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR WORK PERFORMED ONLY BY QUALIFIED PEOPLE.

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

1. Do not touch live electrical parts.
2. Wear dry, hole-free insulating gloves and body protection.
3. Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
4. Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
5. Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
6. Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
7. When making input connections, attach proper grounding conductor first – double-check connections.
8. Frequently inspect input power cord for damage or bare wiring – replace cord immediately if damaged – bare wiring can kill.
9. Turn off all equipment when not in use.
10. Do not use worn, damaged, undersized, or poorly spliced cables.
11. Do not drape cables over your body.
12. If earth grounding of the workpiece is required, ground it directly with a separate cable – do not use work clamp or work cable.
13. Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
14. Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
15. Wear a safety harness if working above floor level.
16. Keep all panels and covers securely in place.
17. Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.



ARC RAYS can burn eyes and skin; NOISE can damage hearing; FLYING SLAG OR SPARKS can injure eyes.

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Noise from some processes can damage hearing. Chipping, grinding, and welds cooling throw off pieces of metal or slag.

NOISE

1. Use approved ear plugs or ear muffs if noise level is high.

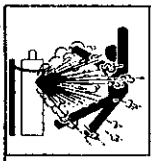
ARC RAYS

2. Wear a welding helmet fitted with a proper shade of filter to protect your face and eyes when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
3. Wear approved safety glasses with side shields.
4. Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
5. Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection.

FUMES AND GASES can be hazardous to your health.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

1. Keep your head out of the fumes. Do not breathe the fumes.
2. If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
3. If ventilation is poor, use an approved air-supplied respirator.
4. Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instruction for metals, consumables, coatings, cleaners, and degreasers.
5. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watchperson nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
6. Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
7. Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.



CYLINDERS can explode if damaged.

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

1. Protect compressed gas cylinders from excessive heat, mechanical shocks, slag, open flames, sparks, and arcs.
2. Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
3. Keep cylinders away from any welding or other electrical circuits.
4. Never drape a welding torch over a gas cylinder.
5. Never allow a welding electrode to touch any cylinder.
6. Never weld on a pressurized cylinder – explosion will result.
7. Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
8. Turn face away from valve outlet when opening cylinder valve.
9. Keep protective cap in place over valve except when cylinder is in use or connected for use.
10. Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.

WELDING can cause fire or explosion.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

1. Protect yourself and others from flying sparks and hot metal.
2. Do not weld where flying sparks can strike flammable material.
3. Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
4. Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
5. Watch for fire, and keep a fire extinguisher nearby.
6. Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
7. Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared according to AWS F4.1 (see Safety Standards).
8. Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
9. Do not use welder to thaw frozen pipes.
10. Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
11. Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
12. Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.

⚠ WARNING

ENGINES can be hazardous.

ENGINE EXHAUST GASES can kill.

Engines produce harmful exhaust gases.

1. Use equipment outside in open, well-ventilated areas.
2. If used in a closed area, vent engine exhaust outside and away from any building air intakes.

ENGINE FUEL can cause fire or explosion.

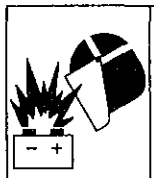
Engine fuel is highly flammable.

1. Stop engine and let it cool off before checking or adding fuel.
2. Do not add fuel while smoking or if unit is near any sparks or open flames.
3. Do not overfill tank – allow room for fuel to expand.
4. Do not spill fuel. If fuel is spilled, clean up before starting engine.

MOVING PARTS can cause injury.

Moving parts, such as fans, rotors, and belts can cut fingers and hands and catch loose clothing.

1. Keep all doors, panels, covers, and guards closed and securely in place.
2. Stop engine before installing or connecting unit.
3. Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
4. To prevent accidental starting during servicing, disconnect negative (–) battery cable from battery.
5. Keep hands, hair, loose clothing, and tools away from moving parts.
6. Reinstall panels or guards and close doors when servicing is finished and before starting engine.



SPARKS can cause BATTERY GASES TO EXPLODE; BATTERY ACID can burn eyes and skin.

Batteries contain acid and generate explosive gases.

1. Always wear a face shield when working on a battery.
2. Stop engine before disconnecting or connecting battery cables.
3. Do not allow tools to cause sparks when working on a battery.
4. Do not use welder to charge batteries or jump start vehicles.
5. Observe correct polarity (+ and –) on batteries.

STEAM AND PRESSURIZED HOT COOLANT can burn face, eyes, and skin.

It is best to check coolant level when engine is cold to avoid scalding.

1. If the engine is warm and checking is needed, follow steps 2 and 3.
2. Wear safety glasses and gloves and put a rag over cap.
3. Turn cap slightly and let pressure escape slowly before completely removing cap.

PRINCIPAL SAFETY STANDARDS

Safety in Welding and Cutting, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami FL 33126

Safety and Health Standards, OSHA 29 CFR 1910, from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

Safe Practices For Occupation And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting And Welding Processes, NFPA Standard 51B, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

CONSIGNES DE SÉCURITÉ POUR LE SOUDAGE À L'ARC

⚠ MISE EN GARDE

LE SOUDAGE À L'ARC peut être dangereux.

SE PROTÉGER ET PROTÉGER LES AUTRES CONTRE LES BLESSURES GRAVES VOIRE MORTELLES. TENIR LES ENFANTS À L'ÉCART. LES PERSONNES QUI PORTENT UN STIMULATEUR CARDIAQUE NE DOIVENT PAS NON PLUS S'APPROCHER DU POSTE DE SOUDAGE, À MOINS D'AVOIR CONSULTÉ UN MÉDECIN.

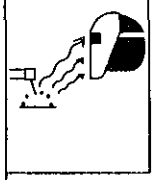
Le soudage, comme la plupart des travaux, présente certains dangers. Par contre, le soudage peut être effectué en toute sécurité quand on prend les mesures qui s'imposent. Les consignes de sécurité données ci-après ne font que résumer l'information contenue dans les normes de sécurité énumérées à la page suivante. Lire et respecter toutes ces normes de sécurité.

L'INSTALLATION, L'UTILISATION, L'ENTRETIEN ET LES RÉPARATIONS NE DOIVENT ÊTRE CONFIÉS QU'À DES PERSONNES QUALIFIÉES.

UN CHOC ÉLECTRIQUE peut tuer.

Un simple contact avec des pièces électriques peut provoquer une électrocution ou des blessures graves. L'électrode et le circuit de soudage sont sous tension dès que l'appareil est sur ON. Le circuit d'entrée et les circuits internes de l'appareil sont également sous tension à ce moment-là. En soudage semi-automatique ou automatique, le fil, le dévidoir, le logement des galets d'entraînement et les pièces métalliques en contact avec le fil de soudage sont sous tension. Des matériels mal installés ou mal mis à la terre présentent un danger.

1. Ne jamais toucher les pièces électriques sous tension.
2. Porter des gants et des vêtements de protection secs ne comportant pas de trous.
3. S'isoler de la pièce et de la terre au moyen de tapis ou d'autres moyens isolants suffisamment grands pour empêcher le contact physique éventuel avec la pièce ou la terre.
4. Couper l'alimentation ou arrêter le moteur avant de procéder à l'installation, à la réparation ou à l'entretien de l'appareil. Déverrouiller l'alimentation selon la norme OSHA 29 CFR 1910.147 (voir normes de sécurité).
5. Installer et mettre à la terre correctement cet appareil conformément à son manuel d'utilisation et au codes nationaux, provinciaux et municipaux.
6. Toujours vérifier la terre du cordon d'alimentation – Vérifier et s'assurer que le fil de terre du cordon d'alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
7. En effectuant les raccordements d'entrée fixer d'abord le conducteur de mise à la terre approprié et contre-vérifier les connexions.
8. Vérifier fréquemment le cordon d'alimentation pour voir s'il n'est pas endommagé ou dénudé – remplacer le cordon immédiatement s'il est endommagé – un câble dénudé peut provoquer une électrocution.
9. Mettre l'appareil hors tension quand on ne l'utilise pas.
10. Ne pas utiliser des câbles usés, endommagés, de grosseur insuffisante ou mal épissés.
11. Ne pas enrouler les câbles autour du corps.
12. Si la pièce soudée doit être mise à la terre, le faire directement avec un câble distinct – ne pas utiliser le connecteur de pièce ou le câble de retour.
13. Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d'une autre machine.
14. N'utiliser qu'un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretenir l'appareil conformément à ce manuel.
15. Porter un harnais de sécurité quand on travaille en hauteur.
16. Maintenir solidement en place tous les panneaux et capots.
17. Fixer le câble de retour de façon à obtenir un bon contact métal-métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.



LE RAYONNEMENT DE L'ARC peut brûler les yeux et la peau. Le BRUIT peut endommager l'ouïe; les PROJECTIONS DE LAITIER OU LES ÉTINCELLES peuvent blesser les yeux.

L'arc de soudage produit des rayons visibles et invisibles intenses (ultraviolets et infrarouges) qui peuvent brûler les yeux et la peau. Le bruit produit par certains procédés peut endommager l'ouïe. Des projections de métal ou de laitier sont produites par le piquage, le meulage ou le refroidissement des soudures.

BRUIT

1. Utiliser des bouche-oreilles ou des serre-tête antibruit approuvés si le niveau de bruit est élevé.

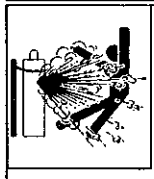
RAYONNEMENT DE L'ARC

2. Porter un masque à serre-tête muni d'un verre filtrant de nuance appropriée pour protéger le visage et les yeux quand on soude ou observe la travail de soudage (voir les normes ANSI Z49.1 et Z87.1 données sous la rubrique Principales normes de sécurité).
3. Porter des lunettes de sécurité approuvées avec écrans latéraux.
4. Utiliser des paravents ou des barrières de protection pour protéger les personnes à proximité contre les coups d'arc et l'éblouissement; avertir les autres personnes de ne pas regarder l'arc.
5. Porter des vêtements de protection en tissu ignifuge durable (laine et cuir) et des chaussures de sécurité.

LES VAPEURS ET LES FUMÉES peuvent être dangereuses pour la santé.

Le soudage produit des vapeurs et des fumées qu'il est dangereux de respirer.

1. Garder la tête à l'extérieur des vapeurs et des fumées et ne pas les respirer.
2. À l'intérieur, ventiler le poste de travail ou utiliser un dispositif placé au niveau de l'arc pour évacuer les vapeurs et fumées de soudage.
3. Si la ventilation est mauvaise, utiliser un appareil respiratoire à adduction d'air pur approuvé.
4. Consulter les fiches signalétiques et les consignes du fabricant relatives au métaux, produits d'apport, revêtements, nettoyants et dégraissants.
5. Ne travailler dans un espace confiné que s'il est bien ventilé, ou en portant un appareil respiratoire à adduction d'air pur. Demander à un observateur ayant reçu la bonne formation de toujours se tenir à proximité. Les vapeurs et fumées de soudage peuvent déplacer l'air et abaisser le niveau d'oxygène et causer des blessures graves voire mortelles. S'assurer que l'air est propre à la respiration.
6. Ne pas souder à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et les rayons de l'arc peuvent réagir avec les vapeurs pour former des gaz hautement toxiques et irritants.
7. Ne pas souder sur des métaux revêtus comme l'acier galvanisé, au plomb ou cadmié à moins que la pièce n'ait été entièrement décapée, que le poste de travail soit bien ventilé. S'il y a lieu, porter un appareil respiratoire à adduction d'air pur. Les revêtements et les métaux qui contiennent de tels éléments peuvent dégager des vapeurs toxiques lors du soudage.



LES BOUTEILLES peuvent exploser si elles sont endommagées.

Les bouteilles contenant des gaz de protection sont à haute pression. Une bouteille endommagée peut exploser. Étant donné que les bouteilles de gaz font normalement partie du matériel de soudage, les traiter avec le plus grand soin.

1. Protéger les bouteilles de gaz comprimé contre la chaleur intense, les chocs, le laitier, les flammes nues, les étincelles et l'arc.
2. Placer les bouteilles à la verticale en les fixant à un support fixe ou à un chariot pour éviter qu'elles ne tombent ou ne basculent.
3. Tenir les bouteilles à l'écart du poste de soudage ou d'autres circuits électriques.
4. Ne jamais poser un chalumeau soudeur sur une bouteille de gaz.
5. Ne jamais laisser une électrode de soudage toucher une bouteille.
6. Ne jamais souder sur une bouteille sous pression : elle exploserait.
7. N'utiliser que des bouteilles de gaz de protection, des détendeurs, des tuyaux souples et des raccords appropriés conçus pour l'application particulière; conserver ces matériels et leurs pièces en bon état.
8. Éloigner le visage de la sortie du robinet de la bouteille quand on l'ouvre.
9. Replacer le chapeau sur la bouteille après utilisation.
10. Lire et suivre les consignes relatives aux bouteilles de gaz comprimé, au matériel connexe ainsi que la publication P-1 de la CGA donnée sous la rubrique Principales normes de sécurité.

LE SOUDAGE peut causer un incendie ou une explosion.

Ne pas souder sur des récipients fermés comme des réservoirs, des fûts ou des tuyaux : ils peuvent exploser. L'arc de soudage peut produire des étincelles. Des étincelles, une pièce chaude et un matériel chaud peuvent provoquer des incendies et des blessures. Le contact accidentel de l'électrode sur des objets métalliques peut produire des étincelles, l'explosion, la surchauffe ou un incendie. S'assurer que le lieu ne présente pas de danger avant d'effectuer le soudage.

1. Se protéger et protéger les personnes à proximité des étincelles et du métal chaud.
2. Ne pas souder dans un endroit où les étincelles peuvent atteindre *des matériaux inflammables.*
3. Enlever toutes les matières inflammables dans un rayon de moins de 10 m de l'arc. Si cela n'est pas possible, bien les recouvrir en utilisant des bâches approuvées.
4. Prendre garde que les étincelles et les projections ne pénétrent dans des zones adjacentes en s'infiltrant dans des petites fissures et ouvertures.
5. Prendre garde aux incendies et toujours avoir un extincteur à proximité.
6. Se rappeler que si l'on soude sur un plafond, un plancher, une cloison ou autre, le feu peut prendre de l'autre côté.
7. Ne pas souder sur des récipients fermés comme des réservoirs, des fûts ou des tuyaux à moins qu'ils ne soient préparés de façon appropriée conformément à la norme F4.1 de l'AWS (voir la rubrique Principales normes de sécurité).
8. Raccorder le câble de retour à la pièce, le plus près possible de la zone de soudage, pour empêcher que le courant de soudage ne suive une trajectoire longue et éventuellement inconnue et qu'il ne provoque des risques d'électrocution et d'incendie.
9. Ne pas utiliser le chalumeau soudeur pour dégeler des tuyaux.
10. Enlever l'électrode enrobée du porte-électrode ou couper le fil de soudage au ras du bec contact quand on ne l'utilise pas.
11. Porter des vêtements de protection non huileux comme des gants en cuir, une chemise épaisse, des pantalons sans revers, des chaussures montantes et un casque.
12. Ne pas porter des matières combustibles sur soi comme un briquet à gaz ou des allumettes quand on soude.

⚠ MISE EN GARDE

LES MOTEURS peuvent présenter un danger.

LES GAZ D'ÉCHAPPEMENT DES MOTEURS peuvent être mortels.

Les moteurs produisent des gaz d'échappement nocifs.

1. Utiliser le matériel à l'extérieur, dans des lieux ouverts et bien ventilés.
2. Si on utilise un moteur dans un local fermé, évacuer les gaz d'échappement à l'extérieur et loin des prises d'air du bâtiment.

LE CARBURANT peut provoquer un incendie ou une explosion.

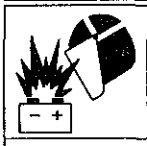
Le carburant est hautement inflammable.

1. Arrêter le moteur et le laisser refroidir avant de vérifier le niveau de carburant ou de refaire le plein.
2. Ne pas fumer en faisant le plein ou si l'appareil se trouve à proximité d'étincelles ou de flammes nues.
3. Ne pas remplir le réservoir à ras bord : prévoir de l'espace pour la dilatation du combustible.
4. Ne pas renverser du carburant. Si on renverse du carburant, nettoyer les lieux avant de faire démarrer le moteur.

LES PIÈCES EN MOUVEMENT peuvent causer des blessures.

Les pièces en mouvement comme les ventilateurs, les rotors et les courroies peuvent couper les doigts et les mains et happer les vêtements amples.

1. S'assurer que les portes, les panneaux, les capots et les protecteurs sont bien fermés et bien à leur place.
2. Arrêter le moteur avant de mettre en place ou de raccorder un dispositif.
3. Seules des personnes qualifiées doivent démonter les protecteurs ou les capots pour faire l'entretien ou les réparations nécessaires.
4. Pour empêcher un démarrage accidentel d'un système pendant l'entretien ou les réparations, débrancher le câble négatif (–) de la batterie.
5. Éloigner les mains, les cheveux, les vêtements amples et les outils des pièces en mouvement.
6. Replacer les capots ou les protecteurs et refermer les portes une fois l'entretien et les réparations terminés et avant de faire démarrer le moteur.



LES ÉTINCELLES peuvent faire EXPLOSER LE GAZ DES BATTERIES; L'ÉLECTROLYTE peut brûler la peau et les yeux.

Les batteries contiennent un produit acide et dégagent des vapeurs explosives.

1. Toujours porter un écran facial quand on travaille sur une batterie.
2. Arrêter le moteur avant de brancher ou de débrancher les câbles de la batterie.
3. Ne pas faire des étincelles avec les outils quand on travaille sur une batterie.
4. Ne pas utiliser la source de courant de soudage pour charger les batteries ou pour faire démarrer un véhicule.
5. Ne pas intervertir la polarité des batteries.

LA VAPEUR ET LE LIQUIDE DE REFROIDISSEMENT BRÛLANT SOUS PRESSION peuvent brûler la peau et les yeux.

Il vaut mieux vérifier le niveau du liquide de refroidissement quand le moteur est froid afin d'éviter les brûlures.

1. Si l'on doit vérifier le niveau quand le moteur est chaud, suivre les étapes 2 et 3.
2. Porter des lunettes de sécurité et des gants et placer un chiffon sur le bouchon.
3. Tourner lentement le bouchon et laisser la pression s'échapper lentement avant d'enlever complètement le bouchon.

PRINCIPALES NORMES DE SÉCURITÉ

Safety in Welding and Cutting, norme ANSI Z49.1, de l'American Welding Society, 550 N.W. Lejeune Rd, Miami FL 33126

Safety and Health Sandards, OSHA 29 CFR 1910, du Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practice for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, norme AWS F4.1, de l'American Welding Society, 550 N.W. Lejeune Rd, Miami FL 33126

National Electrical Code, NFPA Standard 70, de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, de la Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Règles de sécurité en soudage, coupage et procédés connexes, norme CSA W117.2, de l'Association canadienne de normalisation, vente de normes, 178 Rexdale Boulevard, Rexdale (Ontario) Canada M9W 1R3.

Safe Practices For Occupation And Educational Eye And Face Protection, norme ANSI Z87.1, de l'American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting and Welding Processes, norme NFPA 51B, de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

EMF INFORMATION

NOTE ☞ *Considerations About Welding And The Effects Of Low Frequency Electric And Magnetic Fields*

The following is a quotation from the General Conclusions Section of the U.S. Congress, Office of Technology Assessment, *Biological Effects of Power Frequency Electric & Magnetic Fields – Background Paper*, OTA-BP-E-53 (Washington, DC: U.S. Government Printing Office, May 1989): ". . . there is now a very large volume of scientific findings based on experiments at the cellular level and from studies with animals and people which clearly establish that low frequency magnetic fields can interact with, and produce changes in, biological systems. While most of this work is of very high quality, the results are complex. Current scientific understanding does not yet allow us to interpret the evidence in a single coherent framework. Even more frustrating, it does not yet allow us to draw definite conclusions about questions of possible risk or to offer clear science-based advice on strategies to minimize or avoid potential risks."

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around the body.
4. Keep welding power source and cables as far away as practical.
5. Connect work clamp to workpiece as close to the weld as possible.

About Pacemakers:

The above procedures are among those also normally recommended for pacemaker wearers. Consult your doctor for complete information.

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SECTION 1 – SAFETY INFORMATION

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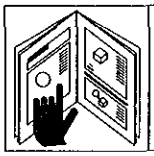
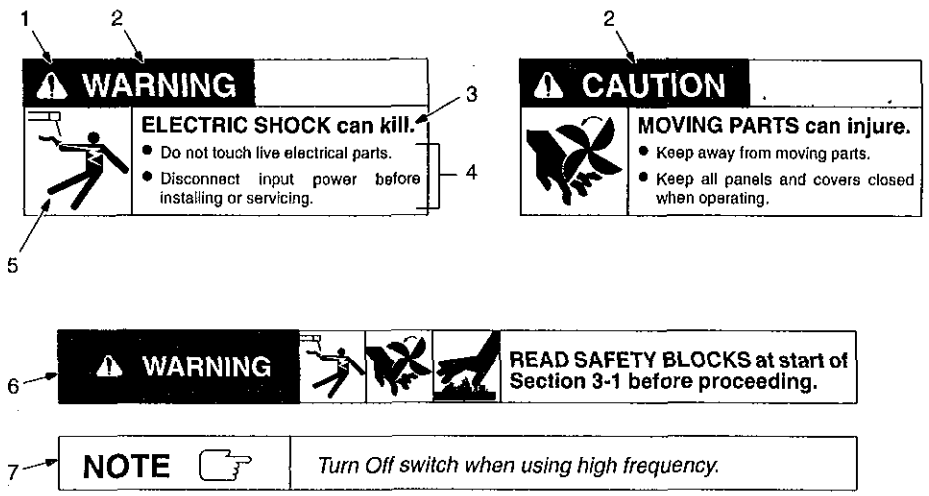


- Read all safety messages throughout this manual.
- Obey all safety messages to avoid injury.
- Learn the meaning of WARNING and CAUTION.



1 Safety Alert Symbol

2 Signal Word

WARNING means possible death or serious injury can happen.

CAUTION means possible minor injury or equipment damage can happen.

3 Statement Of Hazard And Result

4 Safety Instructions To Avoid Hazard

5 Hazard Symbol (If Available)

6 Safety Banner

Read safety blocks for each symbol shown.

7 NOTE

Special instructions for best operation – not related to safety.

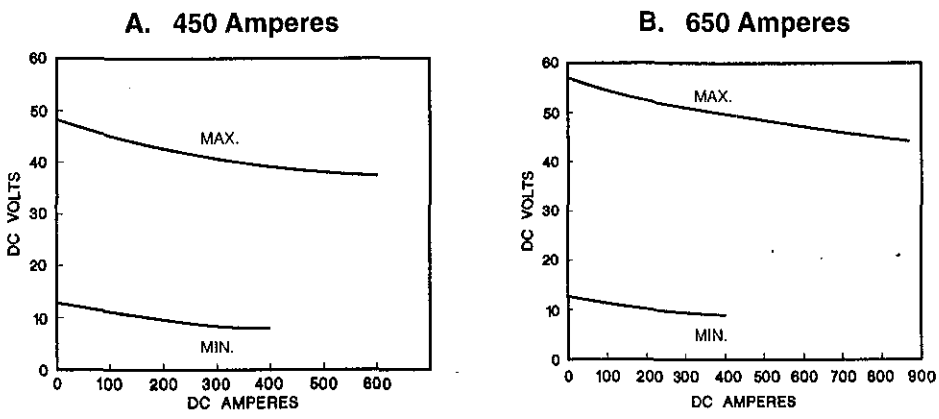
Figure 1-1. Safety Information

SECTION 2 – SPECIFICATIONS

Table 2-1. Welding Power Source

Specifications	Description	
Type Of Output	Constant Voltage/Direct Current (CV/DC)	
Welding Processes	Gas Metal Arc (GMAW), Flux Cored Arc (FCAW), Submerged Arc Welding (SAW); Air Carbon Arc Cutting And Gouging (CAC-A)	
Type Of Input Power	Three-Phase; 200, 230, 460, 575 Volts AC; 60 Hz	
Options	See Rear Cover	
	450 Ampere	**650 Ampere**
Rated Weld Output	450 Amperes, 38 Volts DC At 100% Duty Cycle (See Section 2-2)	650 Amperes, 44 Volts DC At 100% Duty Cycle (See Section 2-2)
Input Amperes At Rated Output	81 A At 200 V, 70 A At 230 V, 35 A At 460 V 28 A At 575 V	118 A At 230 V, 59 A At 460 V, 47 A At 575 V
KVA/KW Used At Rated Output	28 kVA/23 kW	46.6 kVA/37 kW
Voltage Range	14 – 38 Volts DC	14 – 46 Volts DC
Maximum Open-Circuit Voltage	48 Volts DC	60 Volts DC
Weight	Net: 434 lb (197 kg); Ship: 447 lb (203 kg)	Net: 558 lb (253 kg); Ship: 574 lb (260 kg)
Overall Dimensions	See Figure 3-3	See Figure 3-3

2-1. Volt-Ampere Curves



The volt-ampere curves show the minimum and maximum voltage and amperage output capabilities of the welding power source. Curves of other settings fall between the curves shown.

ssb1.1 10/91 – Ref. SB-093 401-A / SB-045 804-C

Figure 2-1. Volt-Ampere Curves

2-2. Duty Cycle

⚠ CAUTION

WELDING LONGER THAN RATED DUTY CYCLE can damage unit and void warranty.

- Do not weld at rated load longer than shown below.

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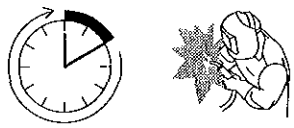
Minutes

Definition

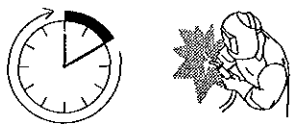
Duty Cycle is percentage of 10 minutes that unit can weld at rated load without overheating.

100% Duty Cycle At 450 Amperes For 450 Ampere Models



Continuous Welding

100% Duty Cycle At 650 Amperes For 650 Ampere Models



Continuous Welding

Chart

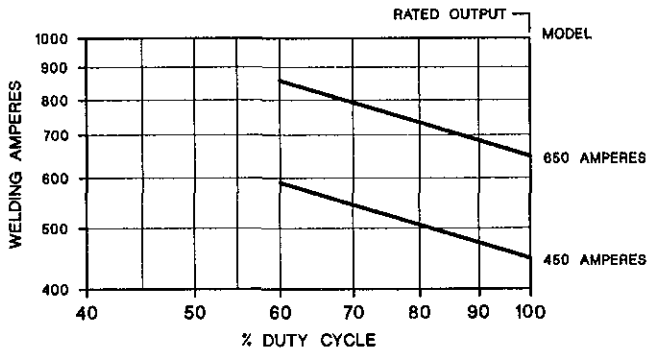


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Figure 2-2. Duty Cycle

SECTION 3 – INSTALLATION

3-1. Typical Process Connections

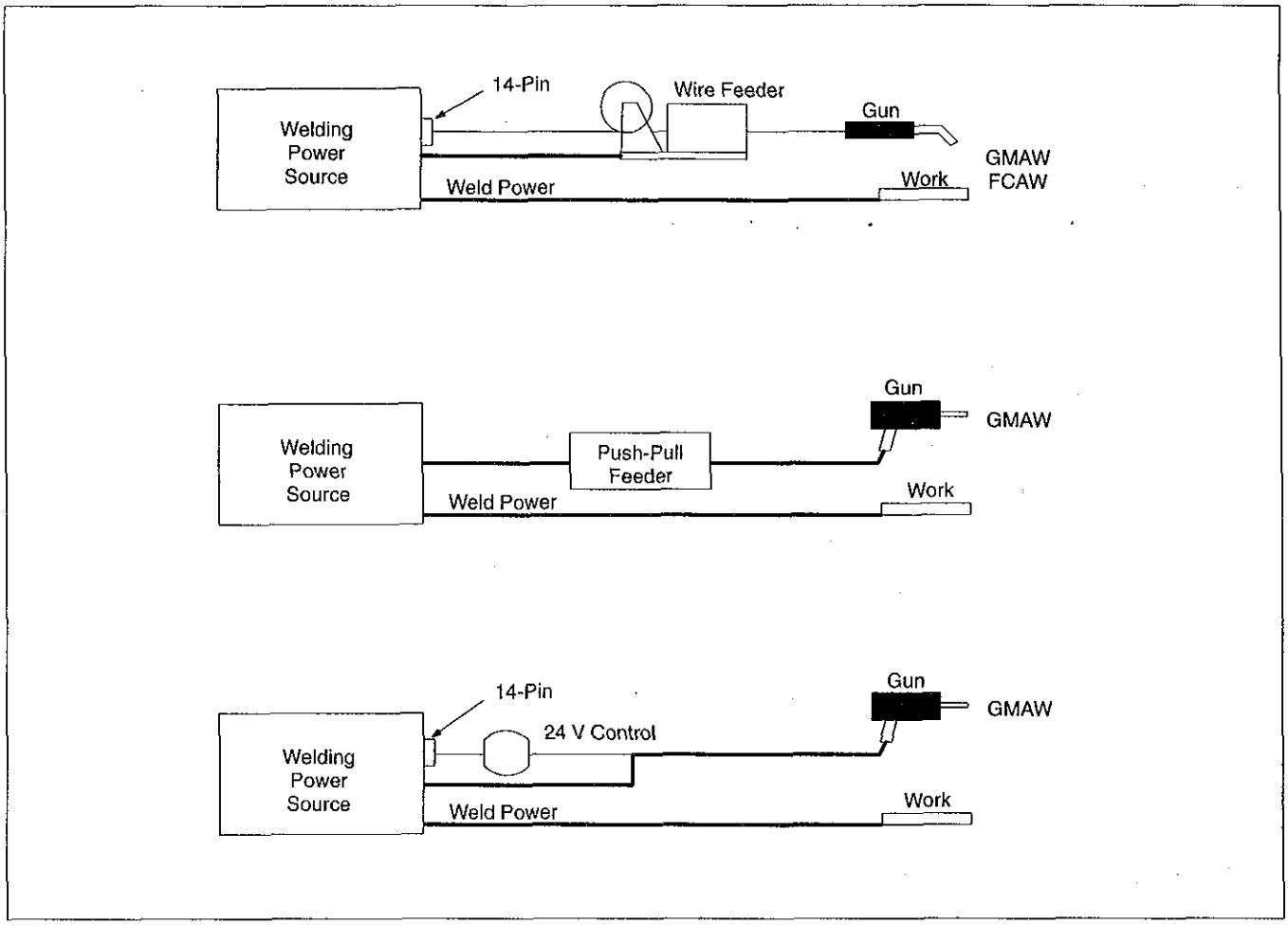

Figure 3-1. Typical Process Connections

3-2. Selecting A Location And Moving Welding Power Source

⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Disconnect input power conductors from de-energized supply line BEFORE moving welding power source.

FIRE OR EXPLOSION can result from placing unit on, over, or near combustible surfaces.

- Do not locate unit on, over, or near combustible surfaces.
- Do not install unit near flammables.

BLOCKED AIRFLOW causes overheating and possible damage to unit.

- Do not block or filter airflow.

Warranty is void if any type of filter is used.

FUMES can be hazardous; LACK OF FRESH AIR AND PROPER VENTILATION can be harmful.

- Do not breathe welding fumes.
- Place unit only where there is a good fresh air supply and proper ventilation.

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift the unit.

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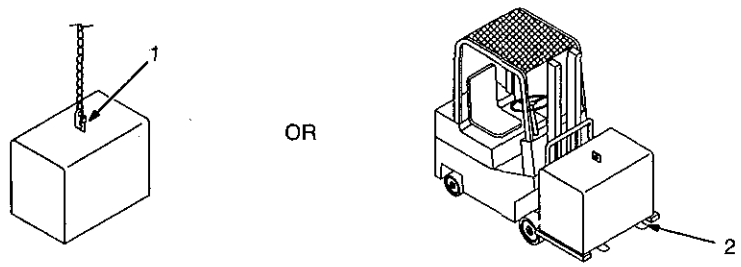
Movement



1 Lifting Eye

2 Lifting Forks

Use lifting eye or lifting forks to move unit.

If using lifting forks, extend forks beyond opposite side of unit.

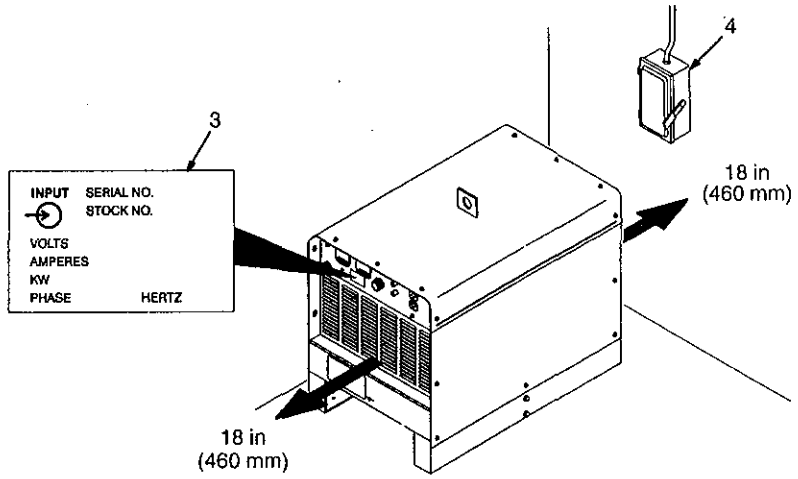
3 Rating Label

Use rating label to determine input power needs.

4 Line Disconnect Device

Locate unit near correct input power supply.

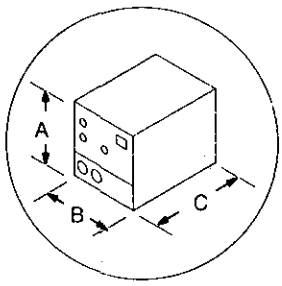
Location And Airflow

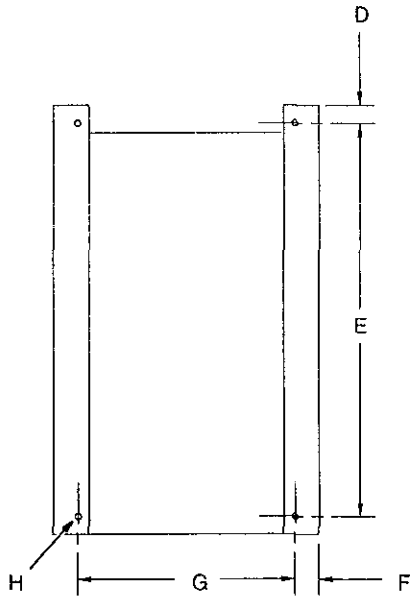


ssb9.1 12/93 – ST-800 402 / ST-049 953-E

Figure 3-2. Movement And Location Of Welding Power Source

NOTE ☞ *Overall dimensions (A, B, and C) include lifting eye, handles, hardware, etc.*





	Inches	Millimeters
A	30-1/4	769
B	22-1/4	565
C*	35-3/4	908
D	1-1/2	38
E+	32-3/4	832
F	1-1/8	29
G	20	508
H	7/16 Dia. 4 Holes	11 Dia. 4 Holes

*40 in (1016 mm) On 650 Ampere Models
+37 in (940 mm) On 650 Ampere Models

ST-153 600

Figure 3-3. Overall Dimensions And Base Mounting Hole Layout

3-3. Selecting And Preparing Weld Output Cables

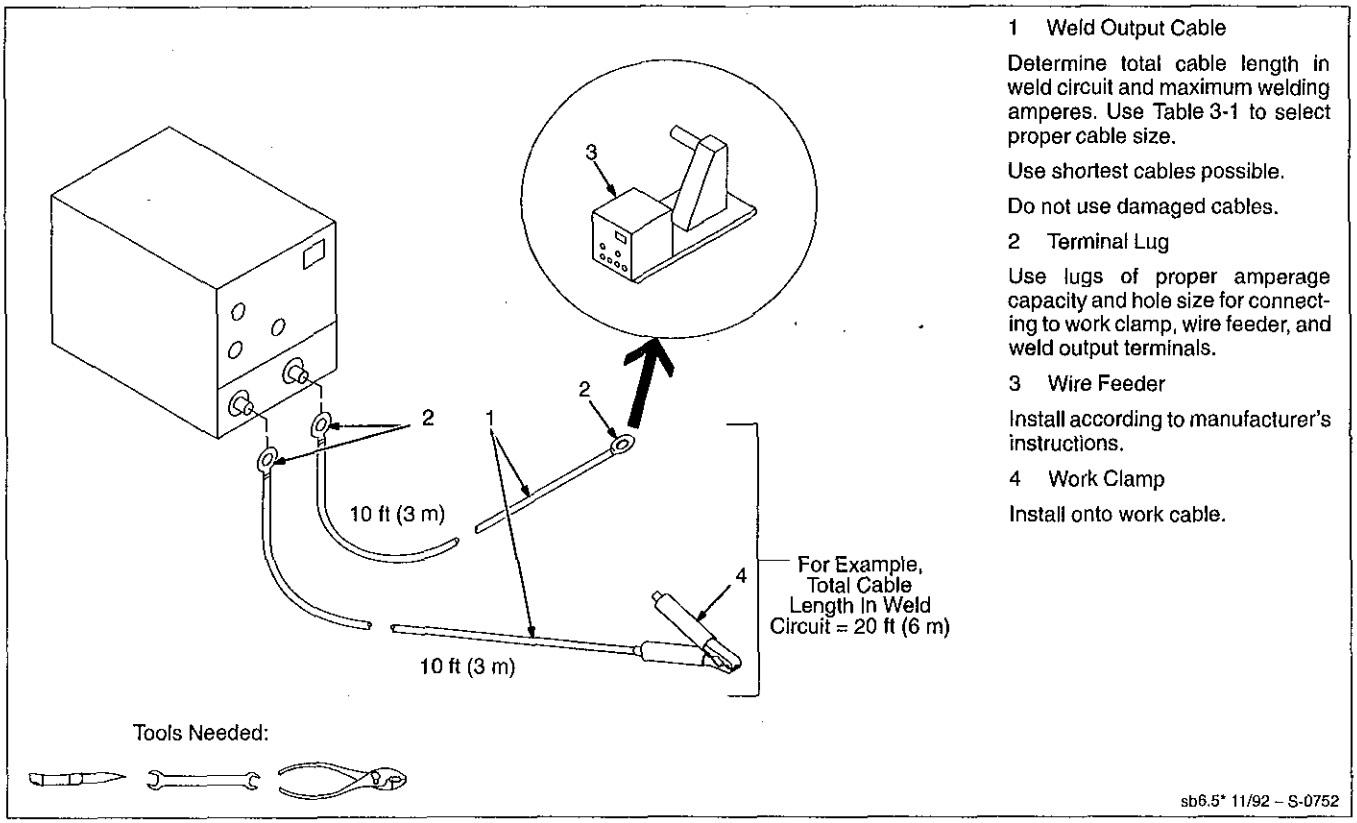


Figure 3-4. Selecting And Preparing Weld Output Cables

Table 3-1. Weld Cable Size*

Welding Amperes	Total Cable (Copper) Length In Weld Circuit Not Exceeding							
	100 ft (30 m) Or Less		150 ft (45 m)	200 ft (60 m)	250 ft (70 m)	300 ft (90 m)	350 ft (105 m)	400 ft (120 m)
	10 To 60% Duty Cycle	60 Thru 100% Duty Cycle	10 Thru 100% Duty Cycle					
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	3	2	1	1/0	2/0	3/0	4/0	4/0
250	2	1	1/0	2/0	3/0	4/0	2-2/0	2-2/0
300	1	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0
350	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0	2-4/0
400	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	2-4/0
500	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	3-3/0	3-3/0
600	3/0	4/0	2-2/0	2-3/0	2-4/0	3-3/0	3-4/0	3-4/0
700	4/0	2-2/0	2-3/0	2-4/0	3-3/0	3-4/0	3-4/0	4-4/0
800	4/0	2-2/0	2-3/0	2-4/0	3-4/0	3-4/0	4-4/0	4-4/0

*Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of at least 300 circular mils per ampere. S-0007-D

3-4. Connecting To Weld Output Terminals

⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Turn Off welding power source, and disconnect input power before making any weld output connections.

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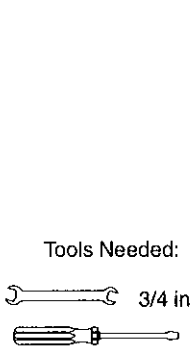
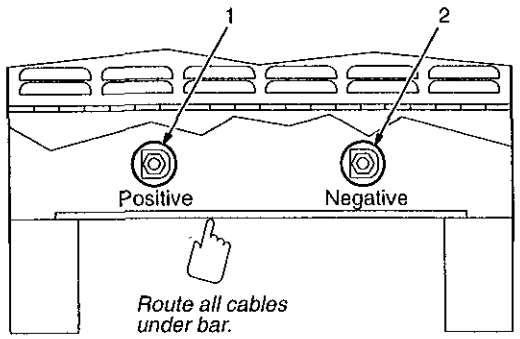




Turn screw and open lower access door.

1 Positive Weld Output Terminal

2 Negative Weld Output Terminal

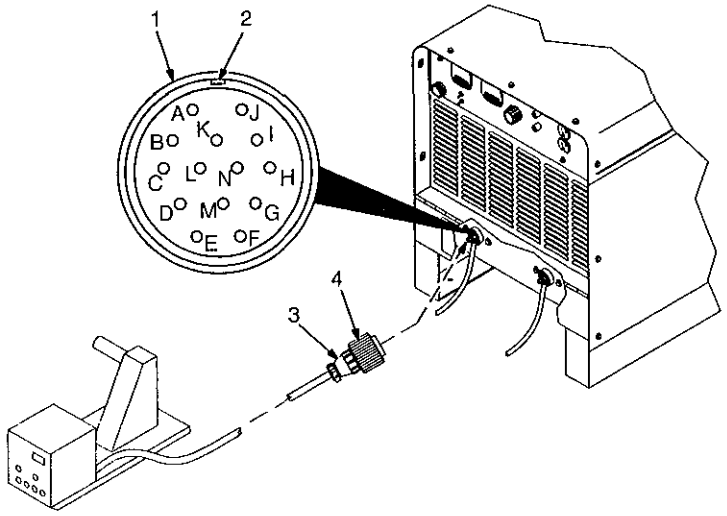
For Electrode Positive (DCEP), connect work cable to negative (–) terminal and wire feeder cable to positive (+) terminal.

For Electrode Negative (DCEN), reverse cable connections.

Close door. Ref. SB-048 934-E

Figure 3-5. Weld Output Connections

3-5. Remote 14 Receptacle Information And Connections



1 Remote 14 Receptacle RC3 (See Table 3-2)

2 Keyway

3 Plug

4 Threaded Collar

To connect to receptacle, align keyway, insert plug, and tighten threaded collar.

sb7.1* 12/93 – Ref. ST-800 634 / Ref. S-0004-A / S-0750

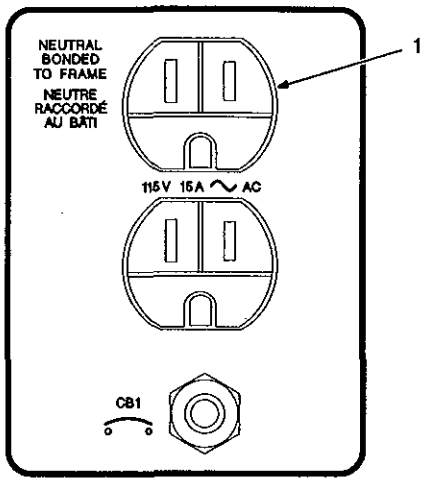
Figure 3-6. Remote 14 Connections

Table 3-2. Remote 14 Socket Information

REMOTE 14	Socket*	Socket Information
OUTPUT (CONTACTOR)	A	24 volts ac. Protected by circuit breaker CB2.
	B	Contact closure to A completes 24 volts ac contactor control circuit.
	I	115 volts ac. Protected by circuit breaker CB1.
FEEDER	J	Contact closure to I completes 115 volts ac contactor control circuit.
	G	Circuit common for 24 and 115 volts ac circuits.
	C	+10 volts dc output to remote control.
	D	Remote control circuit common.
V VOLTAGE	E	0 to +10 volts dc input command signal from remote control.
	K	Chassis common.

*The remaining sockets are not used.

3-6. 115 Volts AC Duplex Receptacle



1 115 Volts AC Duplex Receptacle

This welding power source supplies up to 15 amperes of 115 volts ac power.

Power output is shared between this receptacle and the Remote 14 receptacle (see Section 3-5).

Ref. SC-129 776

Figure 3-7. Connecting To 115 Volts AC Duplex Receptacle

3-7. Connecting Input Power

⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Turn Off welding power source, and disconnect input power before inspecting or installing.
- Have only qualified persons install unit.
- Installation must meet National Electrical Code and all other codes.

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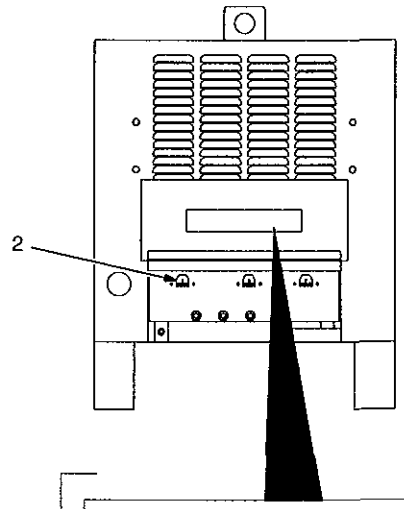
A. Positioning Jumper Links



Jumper links allow operation on different input voltages and are factory set for the highest input voltage.

Check input voltage available at site.

Open rear panel access door to check jumper links.

1 Input Voltage Label – Only One Is On Unit

Look at jumper links and compare link position with applicable label.

2 Input Voltage Jumper Links

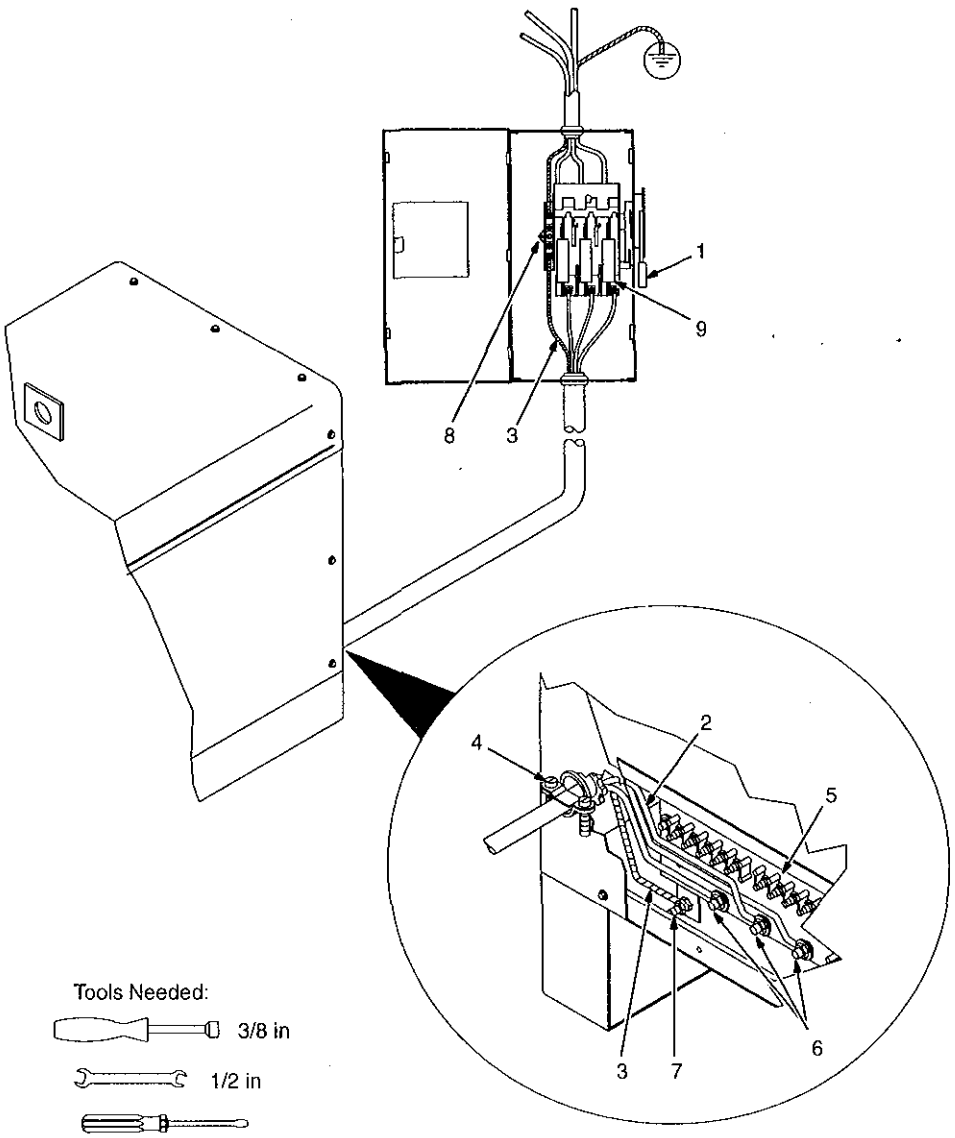
Move links to match input voltage. For example, use 230 volts position when 230 volts input power is available.

Close and secure rear panel access door or go on to Figure 3-9.

ssb5.1* 2/92 – Ref. ST-048 933-E

Figure 3-8. Input Voltage Jumper Links Location

B. Connecting Input Power



Tools Needed:

3/8 in

1/2 in

Have only qualified persons make this installation.

Open rear panel access door.

1 Line Disconnect Device Of Proper Rating

2 Input Conductors

3 Grounding Conductor

Select size and length using Table 3-3. Conductor rating must comply with national, state, and local electrical codes. Use lugs of proper amperage capacity and correct hole size.

4 Strain Relief Connector

Insert conductors through strain relief.

5 Input Terminal Board

6 Line Terminals

7 Welding Power Source Ground Terminal

Connect grounding conductor to ground terminal first. Then connect input conductors to line terminals.

8 Disconnect Device Ground Terminal

Install and connect grounding conductor and input conductors in conduit or equivalent to deenergized line disconnect device.

Connect grounding conductor first, then line input conductors.

Be sure grounding conductor goes to an earth ground.

Close access door.

9 Overcurrent Protection

Select type and size using Table 3-3. Install into deenergized line disconnect device (fused disconnect switch shown).

ssb2.4* 1/94 – Ref. ST-153 855-A

Figure 3-9. Input Power Connections

Table 3-3. Electrical Service Requirements

	450 Ampere Model				650 Ampere Model		
Input Voltage	200	230	460	575	230	460	575
Input Amperes At Rated Output	81	70	35	28	118	59	47
Recommended Standard Fuse Or Circuit Breaker Rating In Amperes[1]	125	110	50	40	175	90	70
Input Conductor Size In AWG/Kcmil[2]	4	4	8	10	1	6	8
Maximum Input Conductor Length In Feet (Meters)[3]	128 (39)	170 (52)	290 (88)	300 (92)	182 (56)	276 (84)	280 (85)
Grounding Conductor Size In AWG/Kcmil[4]	6	6	10	10	6	8	8

* These values are calculated from the 1993 edition of the National Electrical Code (NEC).

1 Recommended fuse or circuit breaker size is that closest to 150% of rated input amperage of the welding power source. Article 630-12(a) of NEC allows fuse or circuit breaker sizing up to 200% of rated input amperage.

2 Input conductor size is for insulated copper wire with 75°C rating with not more than three single current-carrying conductors in a cable or raceway (Table 310-16 of NEC).

3 Maximum length is to prevent more than a 3% voltage drop between service entrance and input terminals of the welding power source (Articles 210-19(a) and 215-2(b) of NEC).

4 The grounding conductor shall be colored or identified as specified in the NEC. Grounding conductor size for copper wire is not required to be larger than input conductor (Article 250-95 of NEC).

S-0092-G

SECTION 4 – OPERATION

⚠ WARNING

ELECTRIC SHOCK can kill.

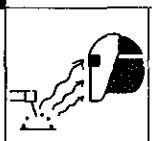
- Always wear dry insulating gloves.
- Insulate yourself from work and ground.
- Do not touch live electrical parts.
- Keep all panels and covers securely in place.

FUMES AND GASES can be hazardous to your health.

- Keep your head out of the fumes.
- Ventilate area, or use breathing device.
- Read Material Safety Data Sheets (MSDSs) and manufacturer's instructions for material used.

WELDING can cause fire or explosion.

- Do not weld near flammable material.
- Watch for fire; keep extinguisher nearby.
- Do not locate unit over combustible surfaces.
- Do not weld on closed containers.
- Allow work and equipment to cool before handling.



ARC RAYS can burn eyes and skin; NOISE can damage hearing.

- Wear welding helmet with correct shade of filter.
- Wear correct eye, ear, and body protection.

MOVING PARTS can cause injury.

- Keep away from moving parts.
- Keep all doors, panels, covers, and guards closed and securely in place.

MAGNETIC FIELDS FROM HIGH CURRENTS can affect pacemaker operation.

- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.

See Safety Precautions at beginning of manual for basic welding safety information.

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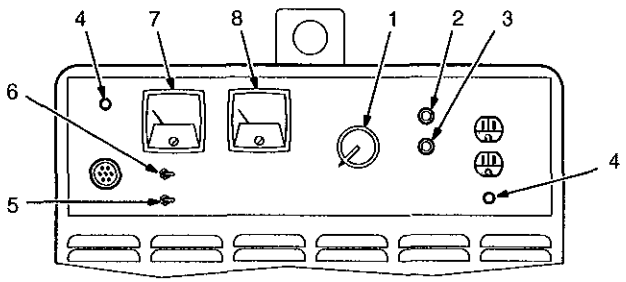
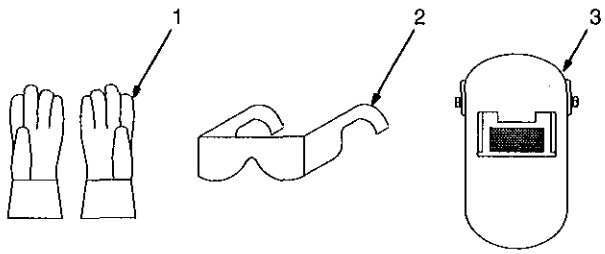


1 Voltage Adjustment Control
2 Power On Push Button
3 Power Off Push Button
4 Circuit Breakers CB1 And CB2 (See Section 5-2)
5 Output (Contactor) Switch
6 Voltage Control Switch
7 Voltmeter
8 Ammeter

Ref. ST-048 934-E

Figure 4-1. Controls

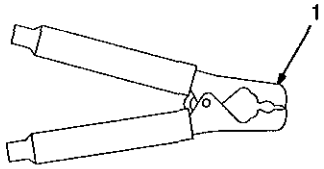


Wear the following while welding:

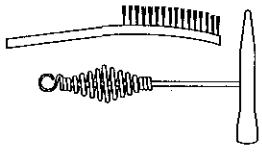
1 Dry, Insulating Gloves
2 Safety Glasses With Side Shields
3 Welding Helmet With Correct Shade Of Filter (See ANSI Z49.1)

sb3.1 1/94

Figure 4-2. Safety Equipment



Tools Needed:



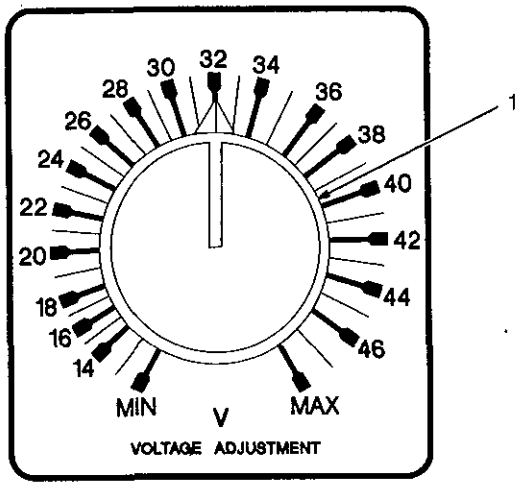
1 Work Clamp

Connect work clamp to a clean, paint-free location on workpiece, as close to weld area as possible.

Use wire brush or sandpaper to clean metal at weld joint area. Use chipping hammer to remove slag after welding.

sb4.1 2/93

Figure 4-3. Work Clamp



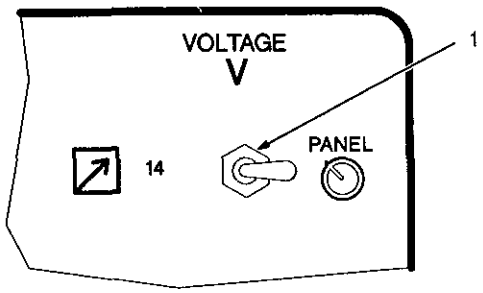
1 Voltage Adjustment Control

Use control to select desired voltage within the range of the welding power source. Scale surrounding control is calibrated in dc volts.

Control may be adjusted while welding.

Ref. SC-129 776

Figure 4-4. Voltage Adjustment Control (650 Ampere Model Shown)



1 Voltage Control Switch

Use switch to select way of adjusting voltage.

For front panel control, place switch in Panel position.

For remote voltage control, make connections to Remote 14 receptacle (see Section 3-5), and place switch in Remote 14 position.

Figure 4-5. Voltage Control Switch

⚠ WARNING

ELECTRIC SHOCK can kill.

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

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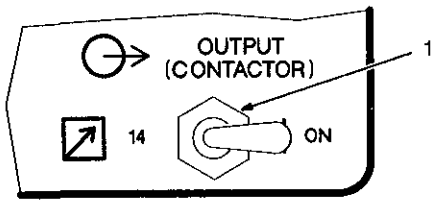
⚠ **Weld output terminals are energized when switch is On and Power is On.**



1 Output (Contactor) Switch

Use switch to select way of controlling unit output.

For weld output, place switch in On position.

For remote output control, make connection to Remote 14 receptacle (see Section 3-5), and place switch in Remote 14 position.

Ref. ST-129 776

Figure 4-6. Output (Contactor) Control Switch

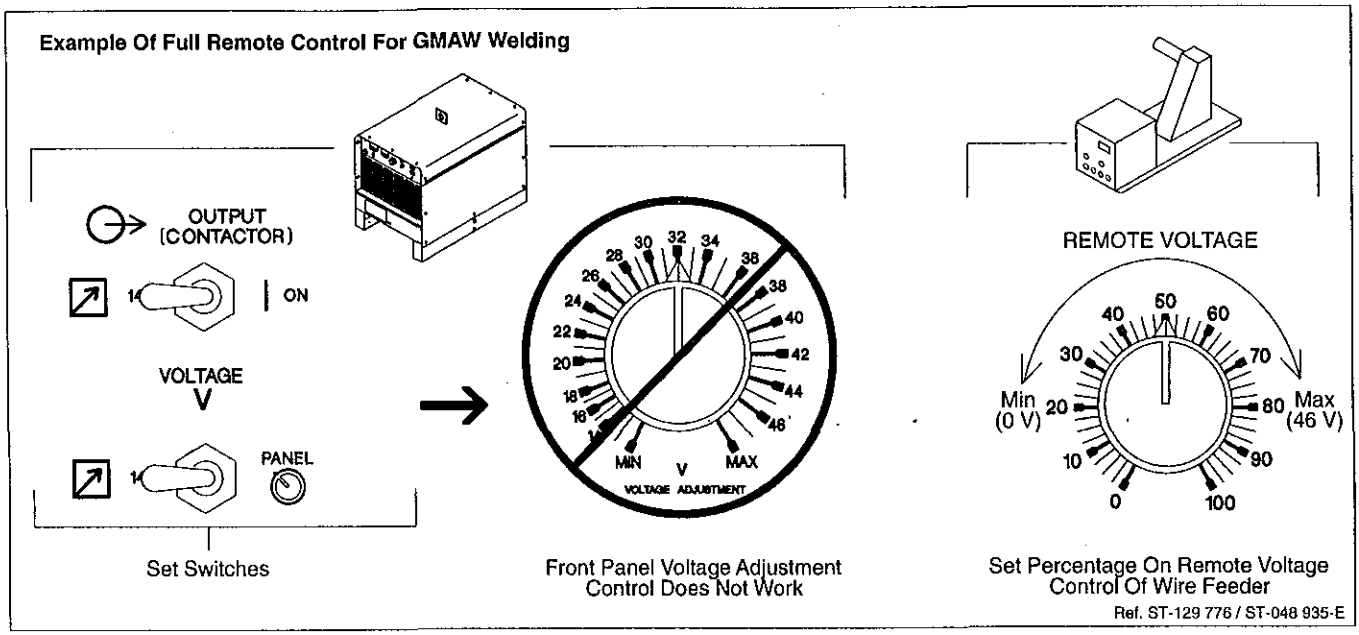


Figure 4-7. Remote Control Example (650 Ampere Model Shown)

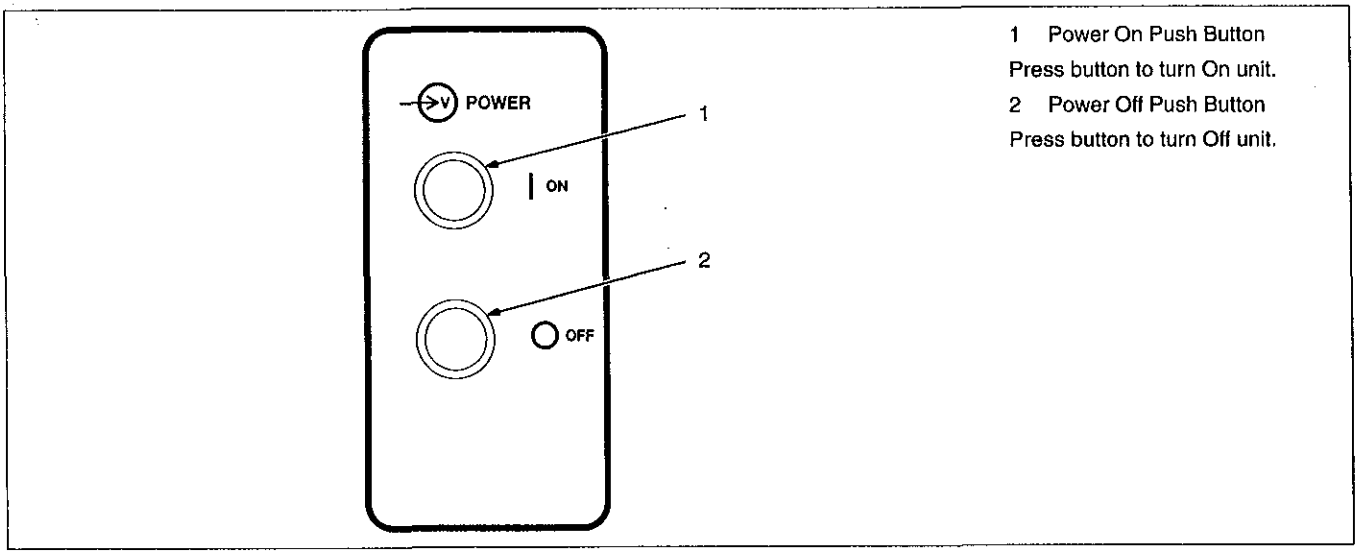


Figure 4-8. Power Switch

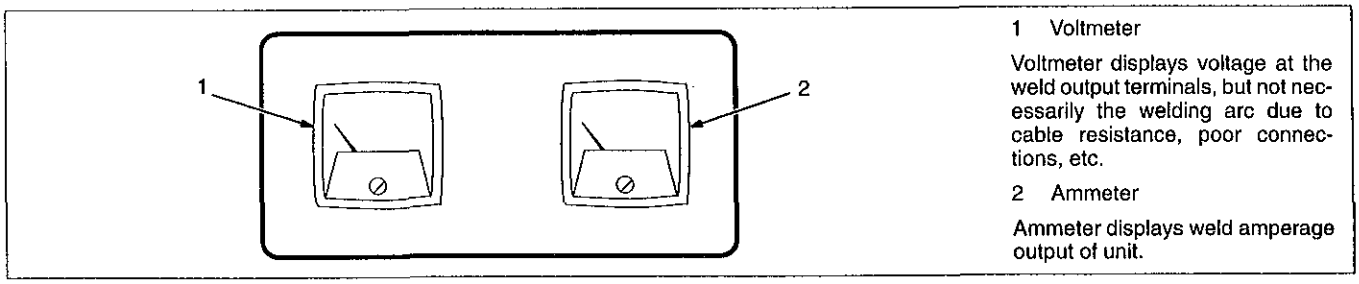


Figure 4-9. Ammeter And Voltmeter

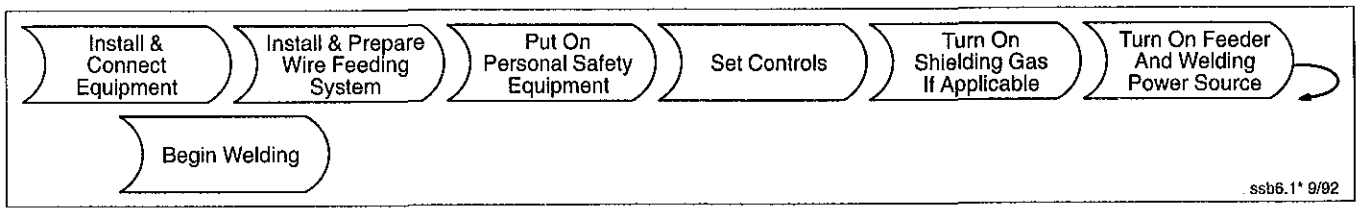


Figure 4-10. Sequence Of Gas Metal Arc (GMAW) And Flux Cored Arc Welding (FCAW)

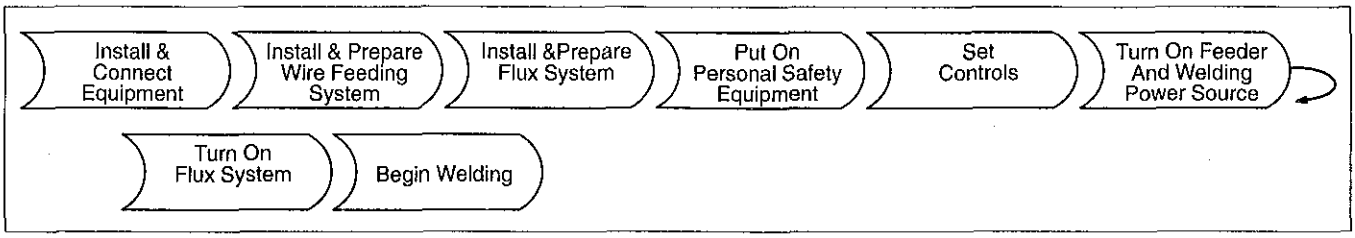


Figure 4-11. Sequence Of Submerged Arc Welding (SAW)

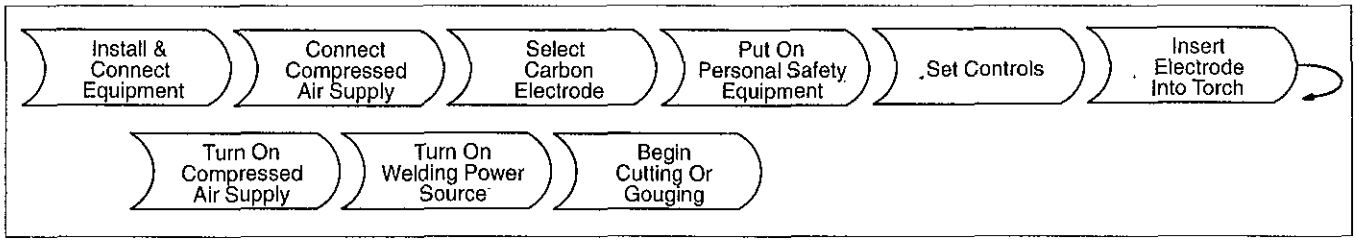


Figure 4-12. Sequence Of Air Carbon Arc Cutting And Gouging (CAC-A)

SECTION 5 – MAINTENANCE & TROUBLESHOOTING

⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Turn Off welding power source, and disconnect input power before inspecting, maintaining, or servicing.

HOT PARTS can cause severe burns.

- Allow cooling period before maintaining or servicing.

MOVING PARTS can cause injury.

- Keep away from moving parts.

Maintenance to be performed only by qualified persons.

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5-1. Routine Maintenance

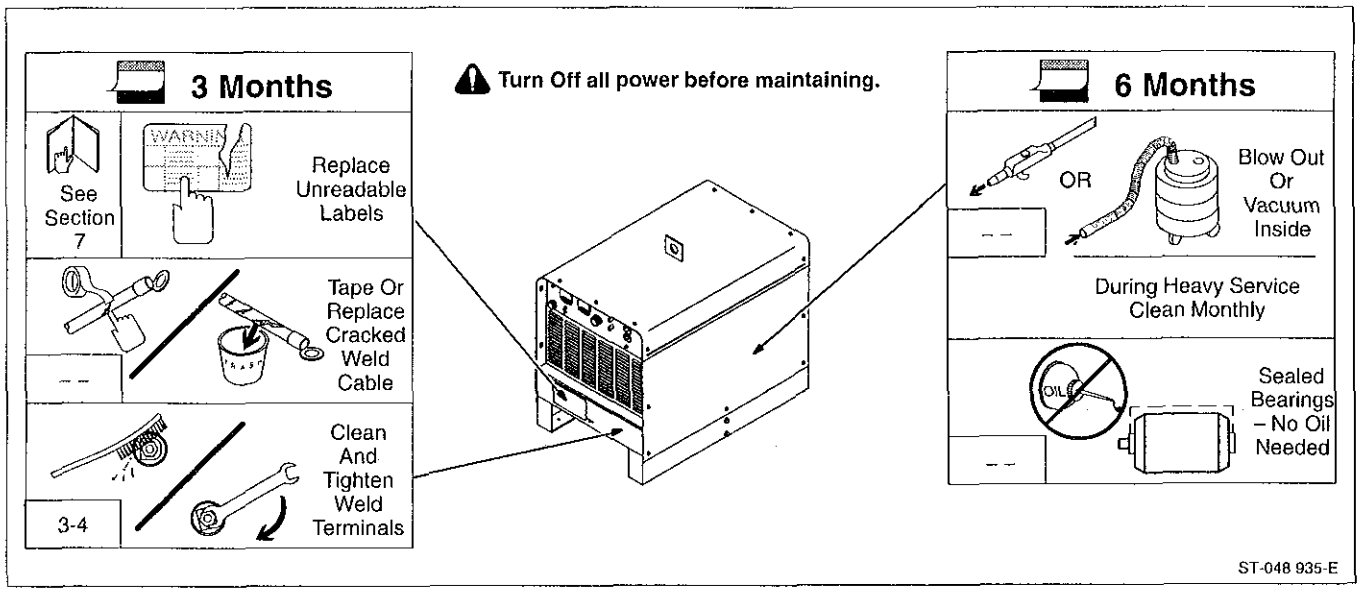


Figure 5-1. Maintenance Schedule

5-2. Overload Protection

⚠ WARNING	READ SAFETY BLOCKS at start of Section 5 before proceeding.

A. Foldback Circuit Operation

The foldback circuit is designed to prevent SCR failure caused by sustained short-circuit conditions (such as contact tip shorting to work). This circuitry automatically reduces the output until the short-circuit condition is removed, then normal operation automatically resumes.

B. Single-Phase Detection Circuit Operation

The single-phase detection circuit is designed to prevent SCR failure caused by loss of primary-phase (single-phasing). This circuitry automatically reduces the output until the the single-phasing condition is removed. Turn off unit, and correct single-phasing condition. Turn unit on, and normal operation automatically resumes.

C. Overheating

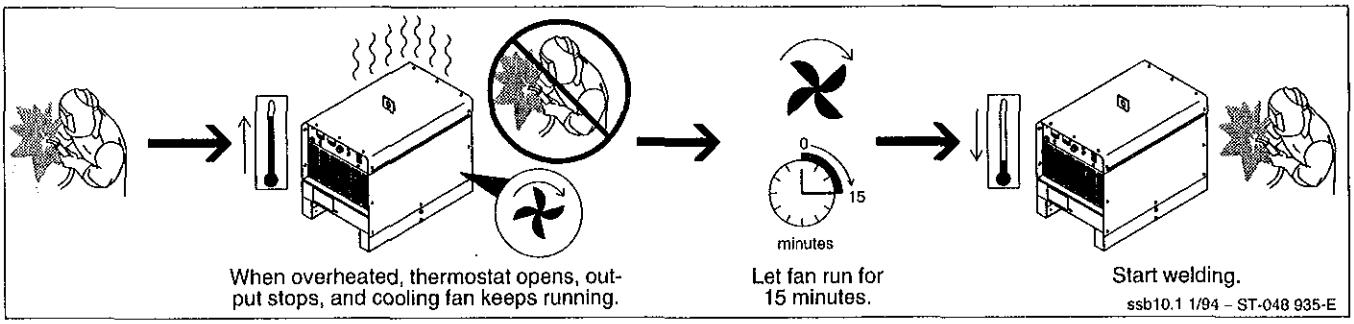
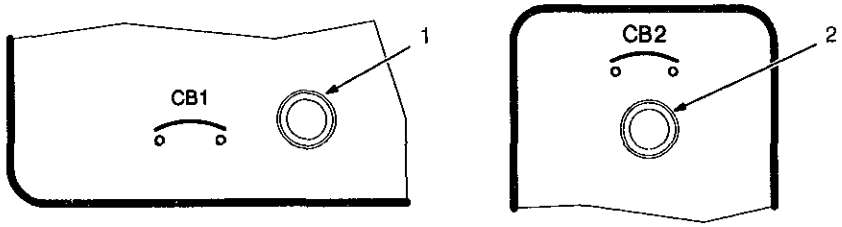


Figure 5-2. Overheating

D. Circuit Breakers CB1 And CB2



1 Circuit Breaker CB1

CB1 protects the 115 volts portion of Remote 14 receptacle and the 115 volts ac duplex receptacle from overload.

2 Circuit Breaker CB2

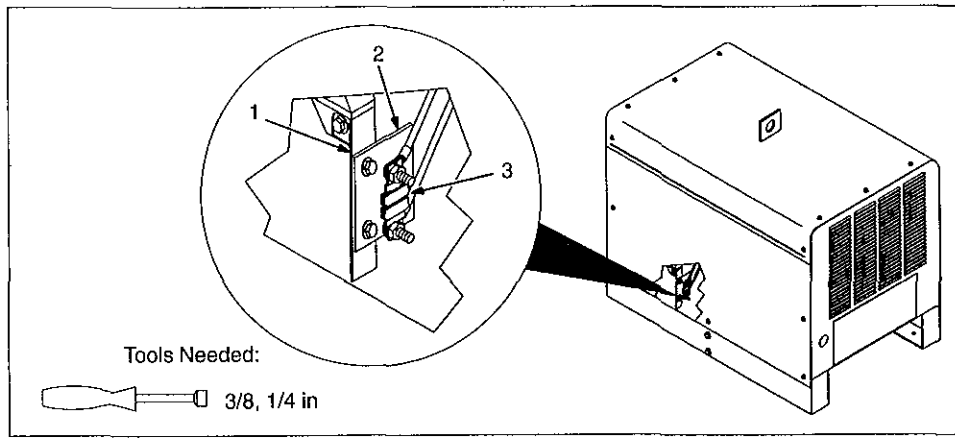
CB2 protects the 24 volts ac portion of Remote 14 receptacle from overload.

If an overload occurs, the appropriate circuit breaker opens and stops output to the receptacle.

Reset breaker. Ref. ST-129 776-B

Figure 5-3. Circuit Breakers CB1 And CB2

E. Fuse Link F1



Turn Off welding power source.

Remove right side panel.

1 Rectifier Mounting Bracket

2 Fuse Link Mounting Strip

3 Fuse Link F1 (See Parts List For Rating)

Check F1, and replace if necessary.

F1 protects the output filter capacitor bank from overload. F1 opens under unbalanced or single-phase input conditions. If F1 opens, short circuit transfer welding is erratic.

Reinstall side panel. ST-153 856-A

Figure 5-4. Fuse Link F1 Location

5-3. Troubleshooting

⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Turn Off welding power source, and disconnect input power before inspecting, maintaining, or servicing.

HOT PARTS can cause severe burns.

- Allow cooling period before servicing.

MOVING PARTS can cause injury.

- Keep away from moving parts.

Troubleshooting to be performed only by qualified persons.

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Table 5-1. Welding Trouble

Trouble	Remedy	Section
No weld output; unit completely inoperative.	Place line disconnect switch in the On position.	3-7B
	Check and replace open line fuse(s), if necessary. Reset circuit breakers.	3-7B
	Check for proper input connections.	3-7B
	Check for proper jumper link positions.	3-7A
	Thermostat(s) TP1, and/or TP2 open. Allow a cooling period of approximately fifteen minutes.	5-2C
No weld output; fan motor FM running.	Place Output (Contactor) switch in On position or connect Remote Contactor Control to receptacle.	3-5, Figure 4-6
Limited output and low open-circuit voltage.	Check and replace open line fuse, if necessary. Reset circuit breaker.	3-7B
	Check for proper input connections.	3-7B
	Check for proper jumper link positions.	3-7A
	Have Factory Authorized Service Station/Service Distributor check control board.	– –
Erratic or improper weld output.	Use proper size and type of cables.	Table 3-1
	Clean and tighten all welding connections.	3-4
	Check wire feeder installation.	– –
	Check and replace fuse F1, if necessary.	5-2E
	Have Factory Authorized Service Station/Service Distributor check SCR in main rectifier.	– –
	Have Factory Authorized Service Station/Service Distributor check Control Board.	– –
High weld output; voltage control does not vary output.	Have Factory Authorized Service Station/Service Distributor check Control Board.	– –
No 115 volts ac output at 115 volts ac duplex receptacle RC4 or 115 volts ac portion of Remote 14 receptacle.	Reset circuit breaker CB1, if necessary.	5-2D
No 24 volts ac output at Remote 14 receptacle.	Reset circuit breaker CB2, if necessary.	5-2D
Fan not operating.	Check and clear blocked fan blade.	– –
	Check fan motor FM, and replace if necessary.	– –

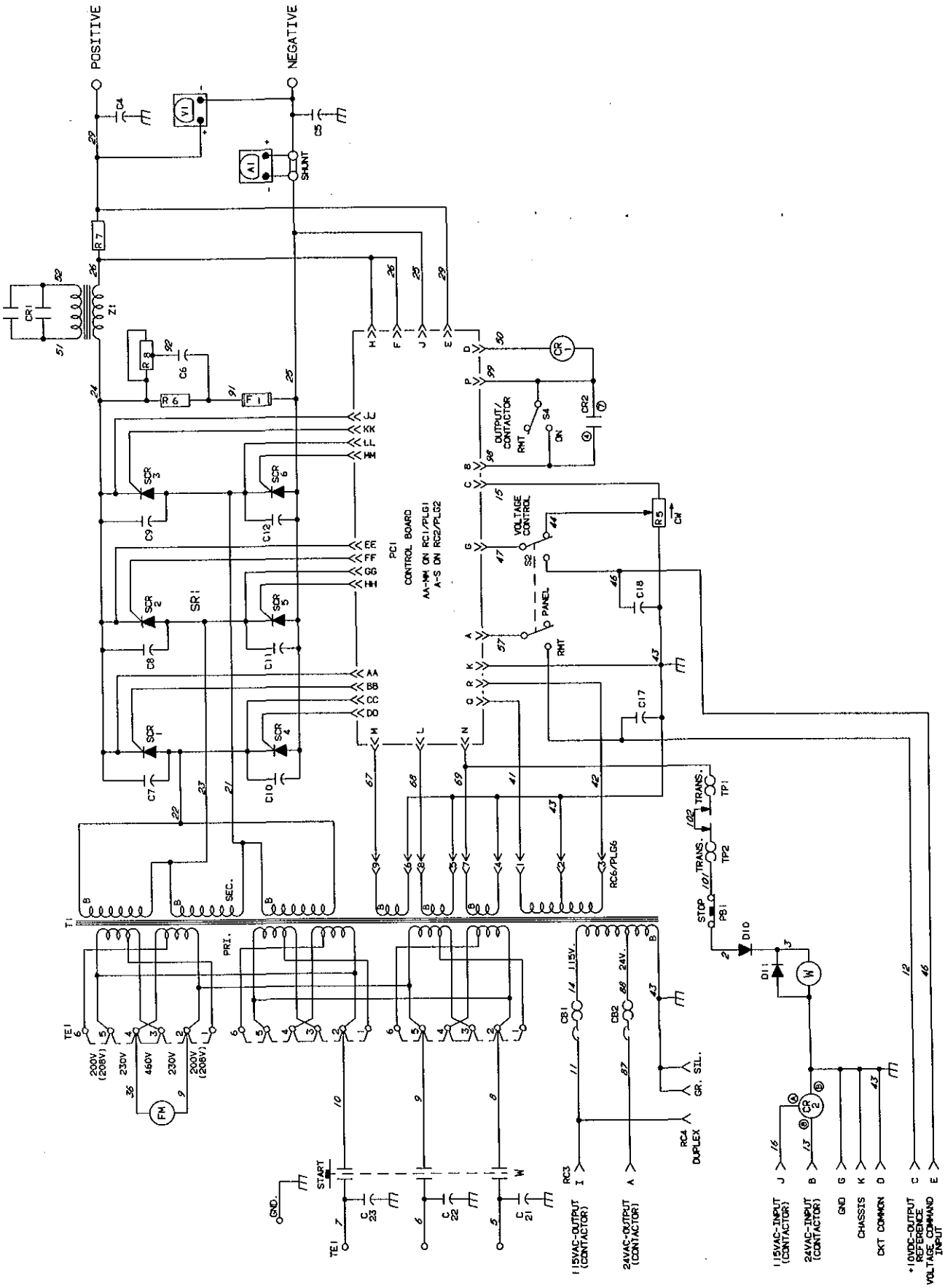


Figure 6-1. Circuit Diagram For Welding Power Source

SC-160 968

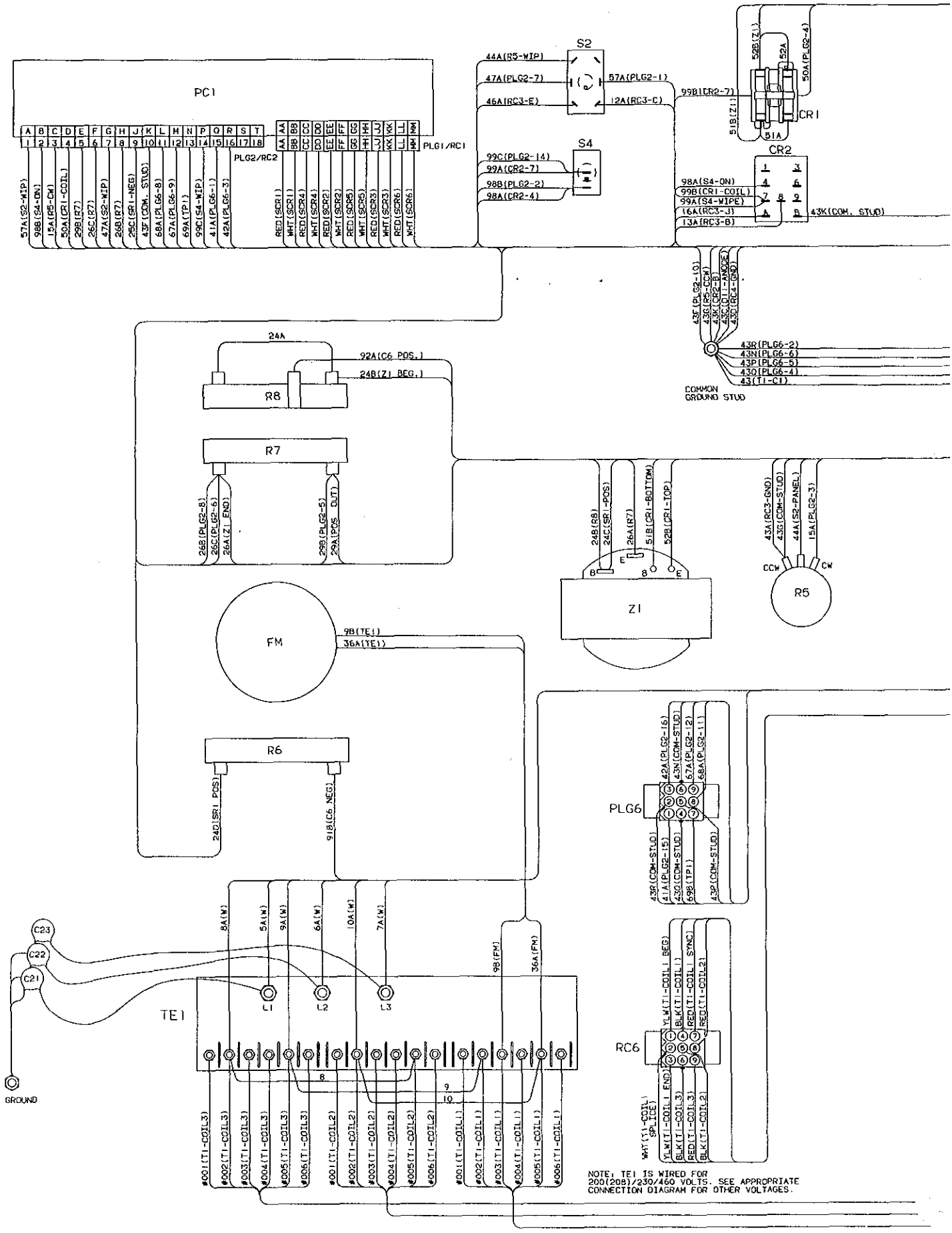
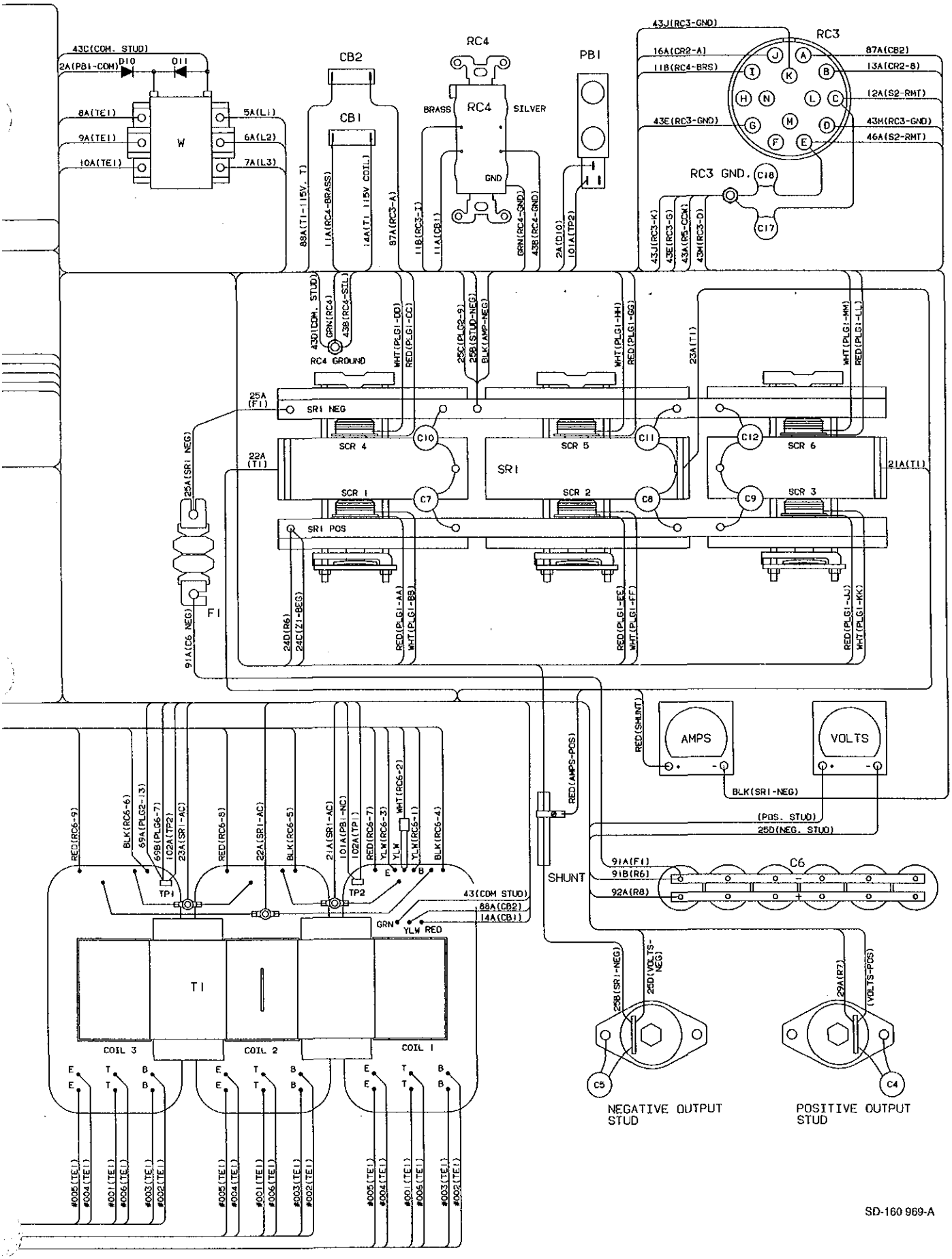


Figure 6-2. Wiring Diagram For Welding Power Source


43C(COM. STUD)
2A(PB1-COM)
D10
D11
W
8A(TE1)
9A(TE1)
10A(TE1)
5A(L1)
6A(L2)
7A(L3)
CB2
CB1
RC4
BRASS
SILVER
GND
PB1
RC3
43J(RC3-GND)
16A(CR2-A)
11B(RC4-BRS)
43E(RC3-GND)
87A(CB2)
13A(CR2-B)
12A(S2-RMT)
43H(RC3-GND)
46A(S2-RMT)
RC3 GND.
C18
C17
89A(T1-115V. T)
11A(RC4-BRASS)
14A(T1 115V COIL)
87A(RC3-A)
11B(RC3-I)
11A(CB1)
GRN(RC4-GND)
43B(RC4-GND)
2A(D10)
101A(TP2)
43J(RC3-K)
43E(RC3-G)
43A(C5-CCW)
43M(RC3-D)
43D(COM. STUD)
GRN(RC4)
43B(RC4-SIL)
RC4 GROUND
WHT(PLG1-DD)
RED(PLG1-CC)
25C(PLG2-9)
25B(STUD-NEG)
BLK(AMP-NEG)
WHT(PLG1-HH)
RED(PLG1-GG)
23A(T1)
WHT(PLG1-MM)
RED(PLG1-LL)
25A (F1)
SR1 NEG
SCR 4
SCR 5
SCR 6
C10
C11
C12
22A (T1)
SR1
21A(T1)
SCR 1
SCR 2
SCR 3
C7
C8
C9
SR1 POS
25A(SR1 NEG)
F1
91A(C6 NEG)
24D(R6)
24C(Z1-BEG)
RED(PLG1-AA)
WHT(PLG1-BB)
RED(PLG1-EE)
WHT(PLG1-FF)
RED(PLG1-JJ)
WHT(PLG1-KK)
RED(SHUNT)
AMPS
VOLTS
BLK(SR1-NEG)
(POS. STUD)
25D(NEG. STUD)
RED(AMPS-POS)
SHUNT
91A(F1)
91B(R6)
92A(R8)
C6
RED(RC6-9)
BLK(RC6-6)
69A(PL02-13)
69B(PL06-7)
102A(TP2)
23A(SR1-AC)
RED(RC6-8)
22A(SR1-AC)
BLK(RC6-5)
21A(SR1-AC)
101A(PB1-NC)
102A(TP1)
RED(RC6-7)
YLW(RC6-3)
YLW
WHT(RC6-2)
YLW(RC6-1)
BLK(RC6-4)
TP1
TP2
E
B
43(COM STUD)
68A(CB2)
14A(CB1)
GRN
YLW
RED
T1
COIL 3
COIL 2
COIL 1
E
T
B
#005(TE1)
#004(TE1)
#001(TE1)
#006(TE1)
#003(TE1)
#002(TE1)
25B(SR1-NEG)
25D(VOLTS-NEG)
29A(R7)
(VOLTS-POS)
C5
C4
NEGATIVE OUTPUT STUD
POSITIVE OUTPUT STUD
SD-160 969-A

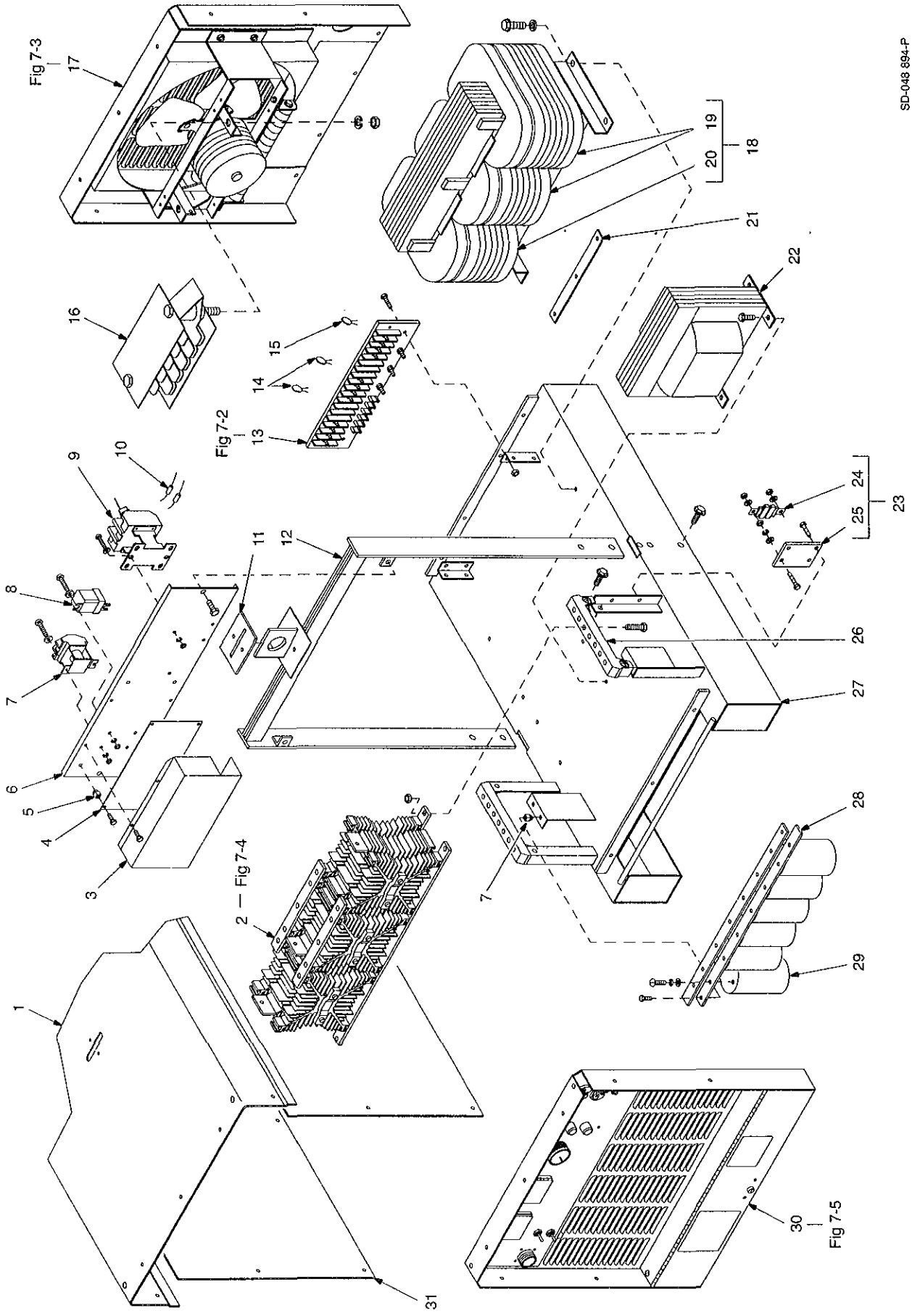


Figure 7-1. Main Assembly

Replace All Coils At Factory Authorized Service Station

Item No.	Dia. Mkgs.	Part No.	Description	Quantity 450 Amp	Quantity 650 Amp
			Figure 7-1. Main Assembly		
1		006 017	COVER, top	1	
1		005 194	COVER, top		1
2	SR1	092 709	RECTIFIER, SCR main (Fig 7-4)	1	
2	SR1	092 617	RECTIFIER, SCR main (Fig 7-4)		1
3		128 063	COVER, circuit card	1	1
4	PC1	166 720	CIRCUIT CARD, control	1	
4	PC1	166 721	CIRCUIT CARD, control		1
	PLG1		CONNECTOR & SOCKETS, (See Fig 7-4)	1	1
	PLG2	165 572	CONNECTOR & SOCKETS, (consisting of)	1	1
		081 378	CONNECTOR, rect skt 22-18ga Amp 102100-2	18	18
5		080 509	GROMMET, scr 8/10	9	9
6		049 227	PANEL, mtg components	1	1
7	CR1	160 966	CONTACTOR, def prp 30A 2P 24VAC	1	1
8	CR2	134 163	RELAY, encl 24/120VAC DPDT	1	1
9	W	137 900	KIT, contactor	1	
9	W	137 901	KIT, contactor		1
		023 562	CLAMP, hose .312-.875clp dia	1	1
10	D10,11	082 456	DIODE	1	1
11		026 627	GASKET, lifting eye	1	1
12		091 055	FRAME, upright base	1	1
13	TE1	038 138	TERMINAL ASSEMBLY, pri (Fig 7-2)	1	1
14	C21,22	137 674	CAPACITOR	2	2
15	C23	137 771	CAPACITOR	1	1
16	R7,8	086 661	RESISTOR, grid	1	1
17		Fig 7-3	PANEL, rear w/components	1	1
	TP1	163 266	THERMOSTAT	1	1
	TP2	026 181	THERMOSTAT, NC	1	1
18	T1	149 347	TRANSFORMER, 200/230/460 (consisting of)	1	
19		150 605	COIL, pri/sec RH & center	2	
20		150 605	COIL, pri/sec LH	1	
18	T1	149 346	TRANSFORMER, 230/460/575 (consisting of)	1	
19		150 665	COIL, pri/sec RH & center	2	
20		150 665	COIL, pri/sec LH	1	
18	T1	150 879	TRANSFORMER, 230/460/575 (consisting of)		1
19		092 506	COIL, pri/sec RH & center		2
20		121 359	COIL, pri/sec LH		1
21		048 930	BUS BAR, connecting transformer		1
22	Z1	169 289	STABILIZER	1	
22	Z1	121 098	STABILIZER		1
23		131 374	PANEL, fuse (consisting of)	1	
23		092 740	PANEL, fuse (consisting of)		1
24	F1	*027 267	FUSE, link 300A 250V	1	
24	F1	*059 943	FUSE, link 350A 250V		1
25		092 724	STRIP, mtg fuse	1	1
26		138 378	BRACKET, mtg rectifier	2	2
27		139 787	BASE	1	
27		139 788	BASE		1
28		085 527	BUS BAR, connecting capacitors	2	2
29	C6	085 273	CAPACITOR, elctlt 16000uf 60VDC	6	
29	C6	110 080	CAPACITOR, elctlt 16000uf 70VDC		6
30		Fig 7-5	PANEL, front w/components	1	1
31		006 016	PANEL, side	2	
31		005 195	PANEL, side		2

*Recommended Spare Parts.

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

Item No.	Part No.	Description	Quantity

Figure 7-2. Terminal Assembly, Pri (Fig 7-1 Item 13) 038 138

1	601 835	NUT, brs hex 10-32reg	36
2	038 058	TERMINAL BOARD	1
3	038 887	STUD, pri bd brs 10-32 x 1.375	18
4	010 913	WASHER, flat brs .218 ID x .460 OD x .031thk	18
5	038 618	LINK, jumper	6
6	601 836	NUT, brs hex .250-20	6
7	010 915	WASHER, flat brs .250 ID x .625 OD x .031thk	6
8	038 888	STUD, pri bd brs .250-20 x 1.500	3

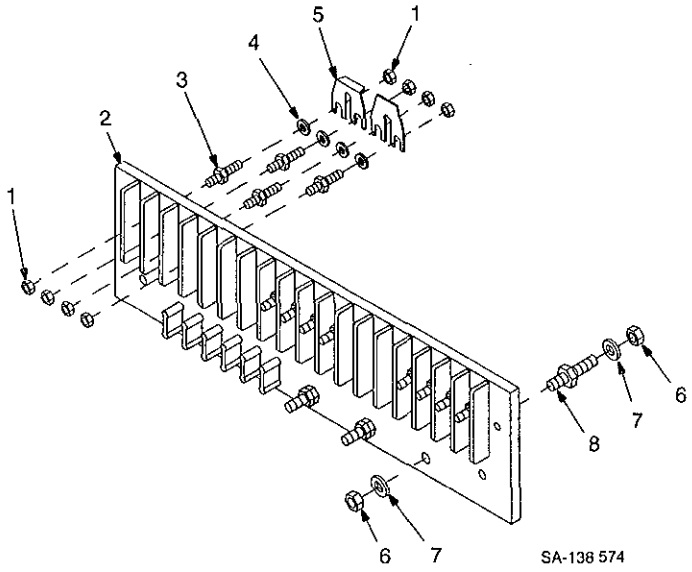


Figure 7-2. Terminal Assembly, Pri

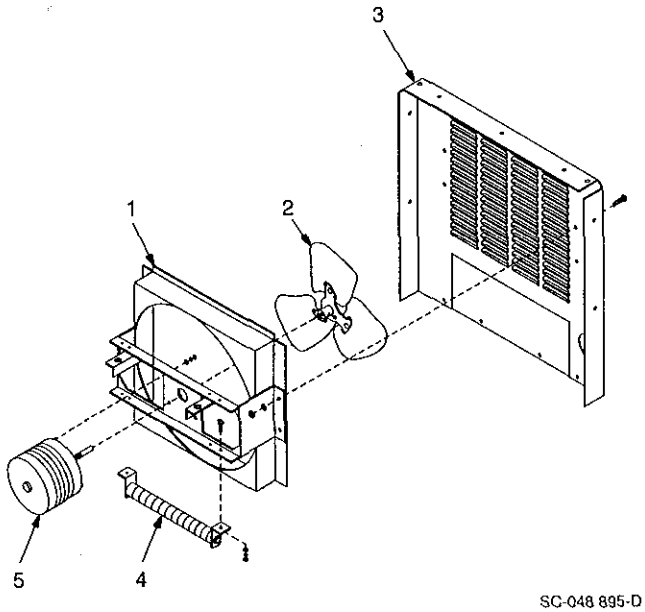


Figure 7-3. Panel, Rear w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity Model 450 Amp	Quantity Model 650 Amp

Figure 7-3. Panel, Rear w/Components (Fig 7-1 Item 17)

1		131 362	CHAMBER, plenum	1	
1		132 259	CHAMBER, plenum		1
2		032 611	BLADE, fan 14 in 3wg 23deg	1	
2		605 799	BLADE, fan 14 in 5wg 30deg		1
3		018 144	PANEL, rear	1	1
4	R6	119 998	RESISTOR, WW fxd 300W 5 ohm	1	1
5	FM	116 190	MOTOR, 1/12hp 230V 1550RPM	1	
5	FM	032 605	MOTOR, cap SP 1/4hp 230VAC		1

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

Item No.	Dia. Mkgs.	Part No.	Description	Quantity Model 450 Amp	Quantity Model 650 Amp
			Figure 7-4. Rectifier, SCR Main (Fig 7-1 Item 2)	092 709	092 617
1	C7-12	048 420	CAPACITOR, rectifier	6	6
2		114 530	BAR, mtg rectifier	2	2
3	SCR1-6	109 270	THYRISTOR, SCR 300A 300V	6	
3	SCR1-6	112 940	THYRISTOR, SCR 600A 200V		6
4		048 779	HEAT SINK	6	
4		048 373	HEAT SINK		6
5		082 694	CLAMP, thyristor	3	
5		082 693	CLAMP, thyristor		3
6		048 777	HEAT SINK	3	
6		048 375	HEAT SINK		3
		010 381	CONNECTOR, rectifier	1	1
	PLG1	165 573	CONNECTOR & SOCKETS, (consisting of)	1	1
		081 378	CONNECTOR, rect skt 22-18ga Amp 102100-2	12	12
7		091 582	BAR, mtg rect	2	2

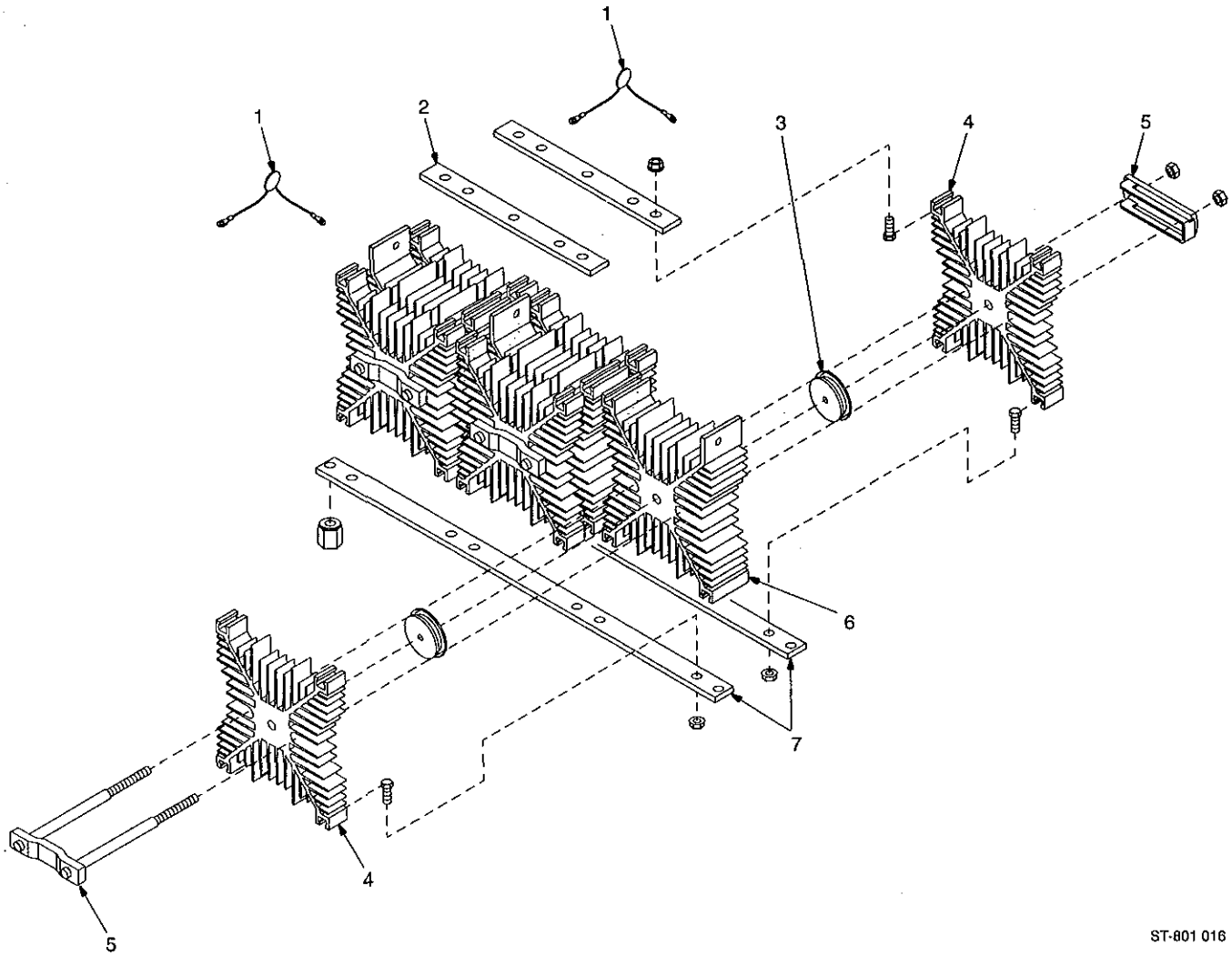
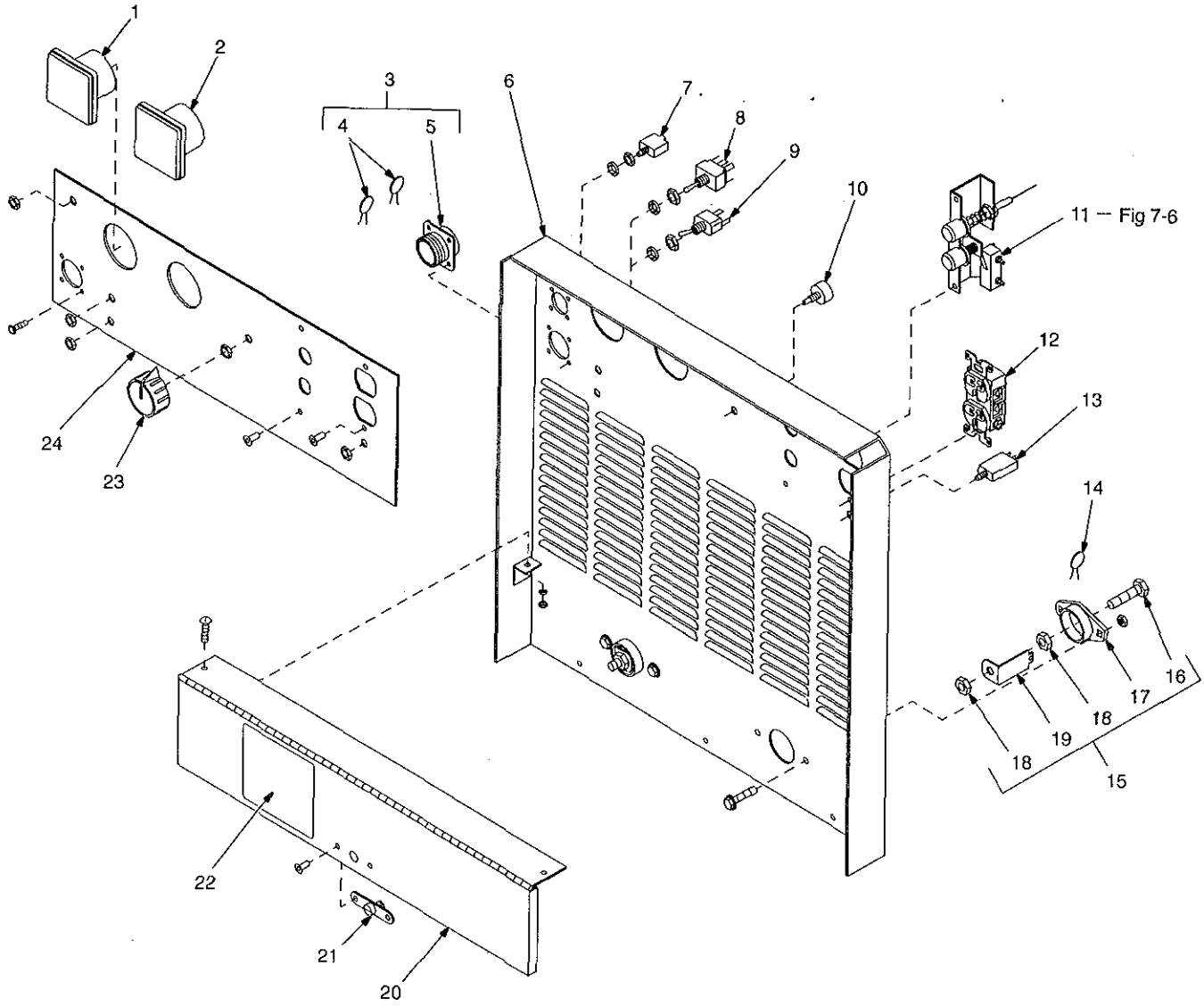


Figure 7-4. Rectifier, SCR Main

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



SC-048 897-N

Figure 7-5. Panel, Front w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity Model 450 Amp	Quantity Model 650 Amp
			Figure 7-5. Panel, Front w/Components (Fig 7-1 Item 30)		
1	V	118 902	METER, volt dc 0-50 scale	1	
1	V	119 006	METER, volt dc 0-100 scale		1
2	A	118 900	METER, amp dc 50MV 0-600 scale	1	
2	A	118 899	METER, amp dc 50MV 0-800 scale		1
3		142 027	CONNECTOR, w/leads (consisting of)	1	1
4	C17	142 028	LEAD ASSEMBLY, elect	1	1
4	C18	142 026	LEAD ASSEMBLY, elect	1	1
5	RC3	143 976	CONNECTOR w/SOCKETS, (consisting of)	1	1
		079 534	CONNECTOR, circ skt push-in 14-18ga	14	14
		134 734	CONNECTOR, circ 14 pin plug Amp 213571-2		
		134 731	CONNECTOR, circ pin push-in 14-18ga Amp 213603-1		
		079 739	CONNECTOR, circ clamp str rlf sz 17-20 Amp 206322-2 (or)		
		143 922	CONNECTOR, circ clamp str rlf sz 17-20 Amp 206070-3		
6		158 286	PANEL, front	1	1
7	CB2	083 432	CIRCUIT BREAKER, man reset 1P 10A 250V	1	1
8	S2	011 611	SWITCH, tgl DPDT 15A 125V	1	1
9	S4	011 609	SWITCH, tgl SPDT 15A 125VAC	1	1
10	R5	035 897	POTENTIOMETER, CP std slot 1/T 2W 1K linear	1	1
11	PB1	046 746	SWITCH, PB (Fig 7-6)	1	
11	PB1	046 745	SWITCH, PB (Fig 7-6)		1
12	RC4	604 176	RECEPTACLE, str dx grd 2P3W 15A 125V	1	1
		073 690	PLUG, str grd armd 2P3W 15A 125V P&S 5266DF		
13	CB1	053 283	CIRCUIT BREAKER, man reset 1P 15A 250V	1	1
14	C4,5	087 337	CAPACITOR,	2	2
15	NEG	039 046	TERMINAL, pwr output black (consisting of)	1	1
15	POS	039 047	TERMINAL, pwr output red (consisting of)	1	1
16		601 976	SCREW, cap stl hexhd .500-13 x 1.500	1	1
17		039 045	TERMINAL BOARD, black	1	1
17		039 049	TERMINAL BOARD, red	1	1
18		601 880	NUT, stl hex jam .500-13	2	2
19		039 044	BUS BAR	1	1
20		+109 449	DOOR, access front	1	1
21		605 583	CATCH, spring loaded door	1	1
22		134 327	LABEL, warning general precautionary	1	1
23		097 926	KNOB, pointer (R5)	1	1
24			NAMEPLATE, (order by model and serial number)	1	1

+When ordering a component originally displaying a precautionary label, the label should also be ordered.
BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Part No.	Description	Quantity Model 450 Amp	Quantity Model 650 Amp
		Figure 7-6. Switch, PB (Fig 7-5 Item 11)	046 746	046 745
1	059 885	BUTTON, push reset red	1	1
2	018 606	SPRING, cprsn .430 OD x .040 wire x 1.500	1	1
3	045 546	PUSH BUTTON SET, w/cable & housing	1	
3	044 713	PUSH BUTTON SET, w/cable & housing		1
4	081 008	BRACKET, mtg	1	1
5	027 878	SWITCH, lim leaf actg SPDT	1	1

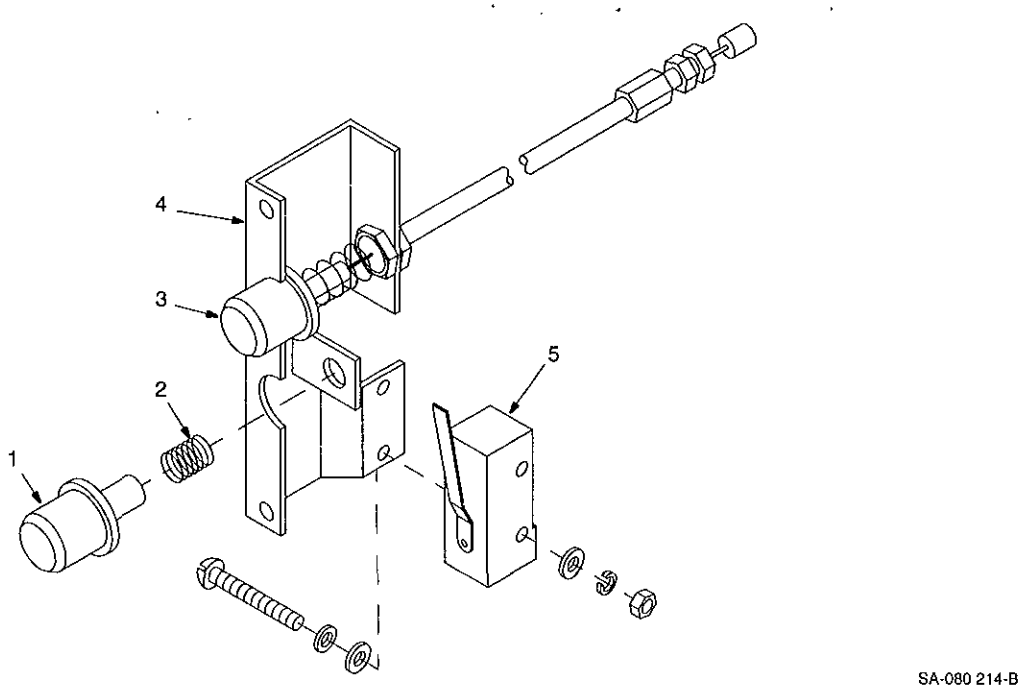


Figure 7-6. Switch, PB

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

OPTIONS AND ACCESSORIES

POLARITY REVERSING/ ISOLATION CONTROL (#041 894)
A dual function control designed for use with dual wire feeders or any application where electrical isolation and/or polarity reversing is required. Both functions can be performed at the same time.

NO. 20 RUNNING GEAR (#041 581)
Four 8 in. (203 mm) poly/rubber blend wheels and 30 in. (762 mm) towing handle. (Shipped unassembled.)

NO. 5CR CYLINDER RACK (#041 584)
Used with No. 20 running gear.