



OM-316

087 083L

September 2001

Processes



Stick (SMAW) Welding

Description

AC/DC, 300/200 AC/DC Models:

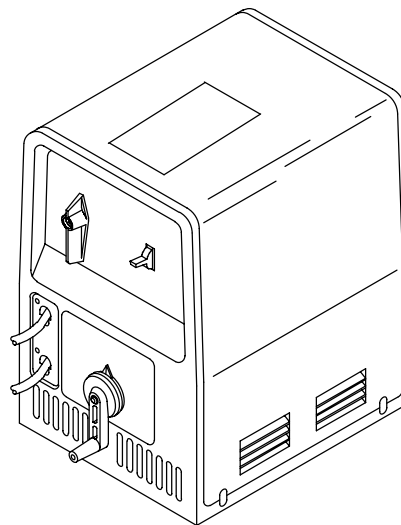


225 And 300 Models:



Arc Welding Power Source

Thunderbolt[®] XL



AC/DC, 300/200 AC/DC, 225, And 300

OWNER'S MANUAL



Visit our website at
www.MillerWelds.com

From Miller to You

Thank you and congratulations on choosing Miller. Now you can get the job done and get it done right. We know you don't have time to do it any other way.

That's why when Niels Miller first started building arc welders in 1929, he made sure his products offered long-lasting value and superior quality. Like you, his customers couldn't afford anything less. Miller products had to be more than the best they could be. They had to be the best you could buy.



Today, the people that build and sell Miller products continue the tradition. They're just as committed to providing equipment and service that meets the high standards of quality and value established in 1929.

This Owner's Manual is designed to help you get the most out of your Miller products. Please take time to read the Safety precautions. They will help you protect yourself against potential hazards on the worksite.



Miller is the first welding equipment manufacturer in the U.S.A. to be registered to the ISO 9001 Quality System Standard.

We've made installation and operation quick and easy. With Miller you can count on years of reliable service with proper maintenance. And if for some reason the unit needs repair, there's a Troubleshooting section that will help you figure out what the problem is. The parts list will then help you to decide which exact part you may need to fix the problem. Warranty and service information for your particular model are also provided.

Miller Electric manufactures a full line of welders and welding related equipment. For information on other quality Miller products, contact your local Miller distributor to receive the latest full line catalog or individual catalog sheets. **To locate your nearest distributor or service agency call 1-800-4-A-Miller, or visit us at www.MillerWelds.com on the web.**



Working as hard as you do – every power source from Miller is backed by the most hassle-free warranty in the business.

Miller offers a Technical Manual which provides more detailed service and parts information for your unit. To obtain a Technical Manual, contact your local distributor. Your distributor can also supply you with Welding Process Manuals such as SMAW, GTAW, GMAW, and GMAW-P.



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WARNING

This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)

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SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

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1-1. Symbol Usage



Means Warning! Watch Out! There are possible hazards with this procedure! The possible hazards are shown in the adjoining symbols.

▲ Marks a special safety message.

☞ Means "Note"; not safety related.



This group of symbols means Warning! Watch Out! possible ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

1-2. Arc Welding Hazards

▲ The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-4. Read and follow all Safety Standards.

▲ Only qualified persons should install, operate, maintain, and repair this unit.

▲ During operation, keep everybody, especially children, away.



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

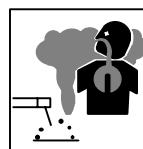
live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- 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).
- Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
- 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.
- When making input connections, attach proper grounding conductor first – double-check connections.
- Frequently inspect input power cord for damage or bare wiring – replace cord immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.
- Do not drape cables over your body.

- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal.

SIGNIFICANT DC VOLTAGE exists after removal of input power on inverters.

- Turn Off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any parts.



FUMES AND GASES can be hazardous.

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

- Keep your head out of the fumes. Do not breathe the fumes.
- If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
- If ventilation is poor, use an approved air-supplied respirator.
- Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instructions for metals, consumables, coatings, cleaners, and degreasers.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watch-person nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- 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.
- 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.



ARC RAYS can burn eyes and skin.

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

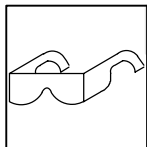
- Wear a welding helmet fitted with a proper shade of filter to protect your face and eyes when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash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



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.

- Protect yourself and others from flying sparks and hot metal.
- Do not weld where flying sparks can strike flammable material.
- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- 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).
- 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.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.



FLYING METAL can injure eyes.

- Welding, chipping, wire brushing, and grinding cause sparks and flying metal. As welds cool, they can throw off slag.
- Wear approved safety glasses with side shields even under your welding helmet.



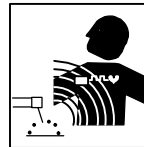
BUILDUP OF GAS can injure or kill.

- Shut off shielding gas supply when not in use.
- Always ventilate confined spaces or use approved air-supplied respirator.



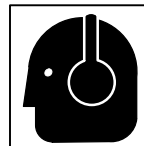
HOT PARTS can cause severe burns.

- Do not touch hot parts bare handed.
- Allow cooling period before working on gun or torch.



MAGNETIC FIELDS can affect pacemakers.

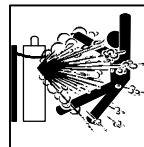
- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.



NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.



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.

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

1-3. Additional Symbols For Installation, Operation, And Maintenance



FIRE OR EXPLOSION hazard.

- Do not install or place unit on, over, or near combustible surfaces.
- Do not install unit near flammables.
- Do not overload building wiring – be sure power supply system is properly sized, rated, and protected to handle this unit.



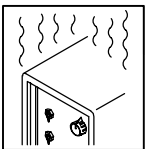
MOVING PARTS can cause injury.

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



FALLING UNIT can cause injury.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.



OVERUSE can cause OVERHEATING

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to weld again.
- Do not block or filter airflow to unit.



STATIC (ESD) can damage PC boards.

- Put on grounded wrist strap BEFORE handling boards or parts.
- Use proper static-proof bags and boxes to store, move, or ship PC boards.



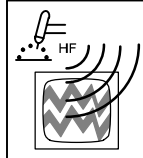
MOVING PARTS can cause injury.

- Keep away from moving parts.
- Keep away from pinch points such as drive rolls.



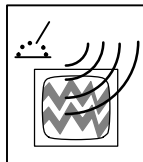
WELDING WIRE can cause injury.

- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.



H.F. RADIATION can cause interference.

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.



ARC WELDING can cause interference.

- Electromagnetic energy can interfere with sensitive electronic equipment such as computers and computer-driven equipment such as robots.
- Be sure all equipment in the welding area is electromagnetically compatible.
- To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor.
- Locate welding operation 100 meters from any sensitive electronic equipment.
- Be sure this welding machine is installed and grounded according to this manual.
- If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

1-4. 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.

1-5. EMF Information

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

Welding current, as it flows through welding cables, will cause electromagnetic fields. There has been and still is some concern about such fields. However, after examining more than 500 studies spanning 17 years of research, a special blue ribbon committee of the National Research Council concluded that: "The body of evidence, in the committee's judgment, has not demonstrated that exposure to power-frequency electric and magnetic fields is a human-health hazard." However, studies are still going forth and evidence continues to be examined. Until the final conclusions of the research are reached, you may wish to minimize your exposure to electromagnetic fields when welding or cutting.

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 your body.
4. Keep welding power source and cables as far away from operator as practical.
5. Connect work clamp to workpiece as close to the weld as possible.

About Pacemakers:

Pacemaker wearers consult your doctor first. If cleared by your doctor, then following the above procedures is recommended.

SECTION 1 – CONSIGNES DE SECURITE – LIRE AVANT UTILISATION

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1-1. Signification des symboles



Signifie Mise en garde ! Soyez vigilant ! Cette procédure présente des risques de danger ! Ceux-ci sont identifiés par des symboles adjacents aux directives.

▲ Identifie un message de sécurité particulier.

Signifie NOTA ; n'est pas relatif à la sécurité.



Ce groupe de symboles signifie Mise en garde ! Soyez vigilant ! Il y a des risques de danger reliés aux CHOCS ÉLECTRIQUES, aux PIÈCES EN MOUVEMENT et aux PIÈCES CHAUDES. Reportez-vous aux symboles et aux directives ci-dessous afin de connaître les mesures à prendre pour éviter tout danger.

1-2. Dangers relatifs au soudage à l'arc

▲ Les symboles présentés ci-après sont utilisés tout au long du présent manuel pour attirer votre attention et identifier les risques de danger. Lorsque vous voyez un symbole, soyez vigilant et suivez les directives mentionnées afin d'éviter tout danger. Les consignes de sécurité présentées ci-après ne font que résumer l'information contenue dans les normes de sécurité énumérées à la section 1-4. Veuillez 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.

▲ Au cours de l'utilisation, tenir toute personne à l'écart et plus particulièrement les enfants.



UN CHOC ÉLECTRIQUE peut tuer.

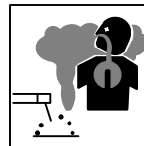
Un simple contact avec des pièces électriques peut provoquer une électrocution ou des blessures graves. L'électrode et le circuit de soudage sont sous tension dès que l'appareil est sur ON. Le circuit d'entrée et les circuits internes de l'appareil sont également sous tension à ce moment-là. En soudage 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.

- Ne jamais toucher les pièces électriques sous tension.
- Porter des gants et des vêtements de protection secs ne comportant pas de trous.
- 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.
- Ne pas se servir de source électrique à courant électrique dans les zones humides, dans les endroits confinés ou là où on risque de tomber.
- Se servir d'une source électrique à courant électrique UNIQUEMENT si le procédé de soudage le demande.
- Si l'utilisation d'une source électrique à courant électrique s'avère nécessaire, se servir de la fonction de télécommande si l'appareil en est équipé.
- 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).
- Installer et mettre à la terre correctement cet appareil conformément à son manuel d'utilisation et aux codes nationaux, provinciaux et municipaux.
- 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.
- En effectuant les raccordements d'entrée fixer d'abord le conducteur de mise à la terre approprié et contre-vérifier les connexions.
- 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.
- Mettre l'appareil hors tension quand on ne l'utilise pas.
- Ne pas utiliser des câbles usés, endommagés, de grosseur insuffisante ou mal épissés.
- Ne pas enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, le faire directement avec un câble distinct.
- Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d'une autre machine.

- N'utiliser qu'un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretien l'appareil conformément à ce manuel.
- Porter un harnais de sécurité quand on travaille en hauteur.
- Maintenir solidement en place tous les panneaux et capots.
- 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.
- Isoler la pince de masse quand pas mis à la pièce pour éviter le contact avec tout objet métallique.

Il y a DU COURANT CONTINU IMPORTANT dans les convertisseurs après la suppression de l'alimentation électrique.

- Arrêter les convertisseurs, débrancher le courant électrique, et décharger les condensateurs d'alimentation selon les instructions indiquées dans la partie entretien avant de toucher les pièces.



LES FUMÉES ET LES GAZ peuvent être dangereux.

Le soudage génère des fumées et des gaz. Leur inhalation peut être dangereuse pour votre santé.

- Eloigner votre tête des fumées. Ne pas respirer les fumées.
- A l'intérieur, ventiler la zone et/ou utiliser un échappement au niveau de l'arc pour l'évacuation des fumées et des gaz de soudage.
- Si la ventilation est insuffisante, utiliser un respirateur à alimentation d'air homologué.
- Lire les spécifications de sécurité des matériaux (MSDSs) et les instructions du fabricant concernant les métaux, les consommables, les revêtements, les nettoyants et les dégraissants.
- Travailler dans un espace fermé seulement s'il est bien ventilé ou en portant un respirateur à alimentation d'air. Demander toujours à un surveillant dûment formé de se tenir à proximité. Des fumées et des gaz de soudage peuvent déplacer l'air et abaisser le niveau d'oxygène provoquant des blessures ou des accidents mortels. S'assurer que l'air de respiration ne présente aucun danger.
- Ne pas souder dans des endroits situés à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et les rayons de l'arc peuvent réagir en présence de vapeurs et former des gaz hautement toxiques et irritants.
- Ne pas souder des métaux munis d'un revêtement, tels que l'acier galvanisé, plaqué en plomb ou au cadmium à moins que le revêtement n'ait été enlevé dans la zone de soudure, que l'endroit soit bien ventilé, et si nécessaire, en portant un respirateur à alimentation d'air. Les revêtements et tous les métaux renfermant ces éléments peuvent dégager des fumées toxiques en cas de soudage.



LES RAYONS DE L'ARC peuvent provoquer des brûlures dans les yeux et sur la peau.

Le rayonnement de l'arc du procédé de soudage génère des rayons visibles et invisibles intenses (ultraviolets et infrarouges) susceptibles de provoquer des brûlures dans les yeux et sur la peau. Des étincelles sont projetées pendant le soudage.

- Porter un casque de soudage muni d'un écran de filtre approprié pour protéger votre visage et vos yeux pendant le soudage ou pour regarder (voir ANSI Z49.1 et Z87.1 énuméré dans les normes de sécurité).
- Porter des protections approuvés pour les oreilles si le niveau sonore est trop élevé.
- Utiliser des écrans ou des barrières pour protéger des tiers de l'éclair et de l'éblouissement; demander aux autres personnes de ne pas regarder l'arc.
- Porter des vêtements de protection constitué dans une matière durable, résistant au feu (cuir ou laine) et une protection des pieds.



LE SOUDAGE peut provoquer un incendie ou une explosion.

Le soudage effectué sur des conteneurs fermés tels que des réservoirs, tambours ou des conduites peut provoquer leur éclatement. Des étincelles peuvent être projetées de l'arc de soudure. La projection d'étincelles, des pièces chaudes et des équipements chauds peut provoquer des incendies et des brûlures. Le contact accidentel de l'électrode avec des objets métalliques peut provoquer des étincelles, une explosion, un surchauffement ou un incendie. Avant de commencer le soudage, vérifier et s'assurer que l'endroit ne présente pas de danger.

- Se protéger et d'autres personnes de la projection d'étincelles et de métal chaud.
- Ne pas souder dans un endroit là où des étincelles peuvent tomber sur des substances inflammables.
- Déplacer toutes les substances inflammables à une distance de 10,7 m de l'arc de soudage. En cas d'impossibilité les recouvrir soigneusement avec des protections homologués.
- Des étincelles et des matériaux chauds du soudage peuvent facilement passer dans d'autres zones en traversant de petites fissures et des ouvertures.
- Surveiller tout déclenchement d'incendie et tenir un extincteur à proximité.
- Le soudage effectué sur un plafond, plancher, paroi ou séparation peut déclencher un incendie de l'autre côté.
- Ne pas effectuer le soudage sur des conteneurs fermés tels que des réservoirs, tambours, ou conduites, à moins qu'ils n'aient été préparés correctement conformément à AWS F4.1 (voir les normes de sécurité).
- Brancher le câble sur la pièce le plus près possible de la zone de soudage pour éviter le transport du courant sur une longue distance par des chemins inconnus éventuels en provoquant des risques d'électrocution et d'incendie.
- Ne pas utiliser le poste de soudage pour dégelier des conduites gelées.
- En cas de non utilisation, enlever la baguette d'électrode du porte-électrode ou couper le fil à la pointe de contact.
- Porter des vêtements de protection dépourvus d'huile tels que des gants en cuir, une chemise en matériau lourd, des pantalons sans revers, des chaussures hautes et un couvre chef.
- Avant de souder, retirer toute substance combustible de vos poches telles qu'un allumeur au butane ou des allumettes.



DES PARTICULES VOLANTES peuvent blesser les yeux.

- Le soudage, l'écaillage, le passage de la pièce à la brosse en fil de fer, et le meulage génèrent des étincelles et des particules métalliques volantes. Pendant la période de refroidissement des soudures, elles risquent de projeter du laitier.
- Porter des lunettes de sécurité avec écrans latéraux ou un écran facial.



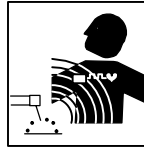
LES ACCUMULATIONS DE GAZ risquent de provoquer des blessures ou même la mort.

- Fermer l'alimentation du gaz protecteur en cas de non utilisation.
- Veiller toujours à bien aérer les espaces confinés ou se servir d'un respirateur d'adduction d'air homologué.



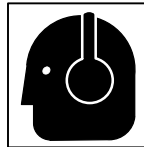
DES PIÈCES CHAUDES peuvent provoquer des brûlures graves.

- Ne pas toucher des parties chaudes à mains nues
- Prévoir une période de refroidissement avant d'utiliser le pistolet ou la torche.



LES CHAMPS MAGNÉTIQUES peuvent affecter les stimulateurs cardiaques.

- Porteurs de stimulateur cardiaque, restez à distance.
- Les porteurs d'un stimulateur cardiaque doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de gougeage ou de soudage par points.



LE BRUIT peut affecter l'ouïe.

Le bruit des processus et des équipements peut affecter l'ouïe.

- Porter des protections approuvés pour les oreilles si le niveau sonore est trop élevé.



Si des BOUTEILLES sont endommagées, elles pourront exploser.

Des bouteilles de gaz protecteur contiennent du gaz sous haute pression. Si une bouteille est endommagée, elle peut exploser. Du fait que les bouteilles de gaz font normalement partie du procédé de soudage, les manipuler avec précaution.

- Protéger les bouteilles de gaz comprimé d'une chaleur excessive, des chocs mécaniques, du laitier, des flammes ouvertes, des étincelles et des arcs.
- Placer les bouteilles debout en les fixant dans un support stationnaire ou dans un porte-bouteilles pour les empêcher de tomber ou de se renverser.
- Tenir les bouteilles éloignées des circuits de soudage ou autres circuits électriques.
- Ne jamais placer une torche de soudage sur une bouteille à gaz.
- Une électrode de soudage ne doit jamais entrer en contact avec une bouteille.
- Ne jamais souder une bouteille pressurisée – risque d'explosion.
- Utiliser seulement des bouteilles de gaz protecteur, régulateurs, tuyaux et raccords convenables pour cette application spécifique; les maintenir ainsi que les éléments associés en bon état.
- Ne pas tenir la tête en face de la sortie en ouvrant la soupape de la bouteille.
- Maintenir le chapeau de protection sur la soupape, sauf en cas d'utilisation ou de branchement de la bouteille.
- Lire et suivre les instructions concernant les bouteilles de gaz comprimé, les équipements associés et les publications P-1 CGA énumérées dans les normes de sécurité.

1-3. Dangers supplémentaires en relation avec l'installation, le fonctionnement et la maintenance



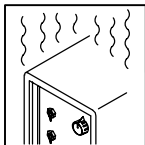
Risque D'INCENDIE OU D'EXPLOSION.

- Ne pas placer l'appareil sur, au-dessus ou à proximité de surfaces inflammables.
- Ne pas installer l'appareil à proximité de produits inflammables
- Ne pas surcharger l'installation électrique – s'assurer que l'alimentation est correctement dimensionnée et protégée avant de mettre l'appareil en service.



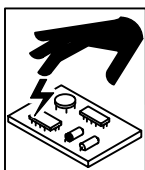
LA CHUTE DE L'APPAREIL peut blesser.

- Utiliser l'anneau de levage uniquement pour soulever l'appareil, NON PAS les chariot, les bouteilles de gaz ou tout autre accessoire.
- Utiliser un engin d'une capacité appropriée pour soulever l'appareil.
- En utilisant des fourches de levage pour déplacer l'unité, s'assurer que les fourches sont suffisamment longues pour dépasser du côté opposé de l'appareil.



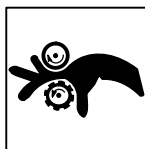
L'EMPLOI EXCESSIF peut SURCHAUFFER L'ÉQUIPEMENT.

- Prévoir une période de refroidissement, respecter le cycle opératoire nominal.
- Réduire le courant ou le cycle opératoire avant de recommencer le soudage.
- Ne pas obstruer les passages d'air du poste.



LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

- Établir la connexion avec la barrette de terre avant de manipuler des cartes ou des pièces.
- Utiliser des pochettes et des boîtes antistatiques pour stocker, déplacer ou expédier des cartes de circuits imprimés.



DES ORGANES MOBILES peuvent provoquer des blessures.

- Ne pas s'approcher des organes mobiles.
- Ne pas s'approcher des points de coincement tels que des rouleaux de commande.



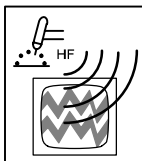
LES FILS DE SOUDAGE peuvent provoquer des blessures.

- Ne pas appuyer sur la gachette avant d'en avoir reçu l'instruction.
- Ne pas diriger le pistolet vers soi, d'autres personnes ou toute pièce mécanique en engageant le fil de soudage.



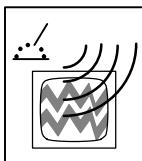
DES ORGANES MOBILES peuvent provoquer des blessures.

- Rester à l'écart des organes mobiles comme le ventilateur.
- Maintenir fermés et fixement en place les portes, panneaux, recouvrements et dispositifs de protection.



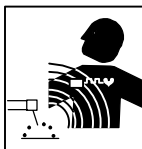
LE RAYONNEMENT HAUTE FRÉQUENCE (H.F.) risque de provoquer des interférences.

- Le rayonnement haute fréquence peut provoquer des interférences avec les équipements de radio-navigation et de communication, les services de sécurité et les ordinateurs.
- Demander seulement à des personnes qualifiées familiarisées avec des équipements électroniques de faire fonctionner l'installation.
- L'utilisateur est tenu de faire corriger rapidement par un électricien qualifié les interférences résultant de l'installation.
- Si le FCC signale des interférences, arrêter immédiatement l'appareil.
- Effectuer régulièrement le contrôle et l'entretien de l'installation.
- Maintenir soigneusement fermés les portes et les panneaux des sources de haute fréquence, maintenir les éclateurs à une distance correcte et utiliser une terre et un blindage pour réduire les interférences éventuelles.



LE SOUDAGE À L'ARC risque de provoquer des interférences.

- L'énergie électromagnétique risque de provoquer des interférences pour l'équipement électronique sensible tel que les ordinateurs et l'équipement commandé par ordinateur tel que les robots.
- Veiller à ce que tout l'équipement de la zone de soudage soit compatible électromagnétiquement.
- Pour réduire la possibilité d'interférence, maintenir les câbles de soudage aussi courts que possible, les grouper, et les poser aussi bas que possible (ex. par terre).
- Veiller à souder à une distance de 100 mètres de tout équipement électronique sensible.
- Veiller à ce que ce poste de soudage soit posé et mis à la terre conformément à ce mode d'emploi.
- En cas d'interférences après avoir pris les mesures précédentes, il incombe à l'utilisateur de prendre des mesures supplémentaires telles que le déplacement du poste, l'utilisation de câbles blindés, l'utilisation de filtres de ligne ou la pose de protecteurs dans la zone de travail.



LES CHAMPS MAGNÉTIQUES peuvent affecter les stimulateurs cardiaques.

- Porteurs de stimulateur cardiaque, restez à distance.
- Les porteurs d'un stimulateur cardiaque doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de gougeage ou de soudage par points.

1-4. 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 Standards, 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.

1-5. Information sur les champs électromagnétiques

Données sur le soudage électrique et sur les effets, pour l'organisme, des champs magnétiques basse fréquence

Le courant de soudage, pendant son passage dans les câbles de soudage, causera des champs électromagnétiques. Il y a eu et il y a encore un certain souci à propos de tels champs. Cependant, après avoir examiné plus de 500 études qui ont été faites pendant une période de recherche de 17 ans, un comité spécial ruban bleu du National Research Council a conclu: "L'accumulation de preuves, suivant le jugement du comité, n'a pas démontré que l'exposition aux champs magnétiques et champs électriques à haute fréquence représente un risque à la santé humaine". Toutefois, des études sont toujours en cours et les preuves continuent à être examinées. En attendant que les conclusions finales de la recherche soient établies, il vous serait souhaitable de réduire votre exposition aux champs électromagnétiques pendant le soudage ou le coupage.

Afin de réduire les champs électromagnétiques dans l'environnement de travail, respecter les consignes suivantes :

- 1 Garder les câbles ensemble en les torsadant ou en les attachant avec du ruban adhésif.
- 2 Mettre tous les câbles du côté opposé de l'opérateur.
- 3 Ne pas courber pas et ne pas entourer pas les câbles autour de votre corps.
- 4 Garder le poste de soudage et les câbles le plus loin possible de vous.
- 5 Relier la pince de masse le plus près possible de la zone de soudure.

Consignes relatives aux stimulateurs cardiaques :

Les personnes qui portent un stimulateur cardiaque doivent avant tout consulter leur docteur. Si vous êtes déclaré apte par votre docteur, il est alors recommandé de respecter les consignes ci-dessus.

SECTION 2 – INSTALLATION

2-1. Specifications

AC/DC Models

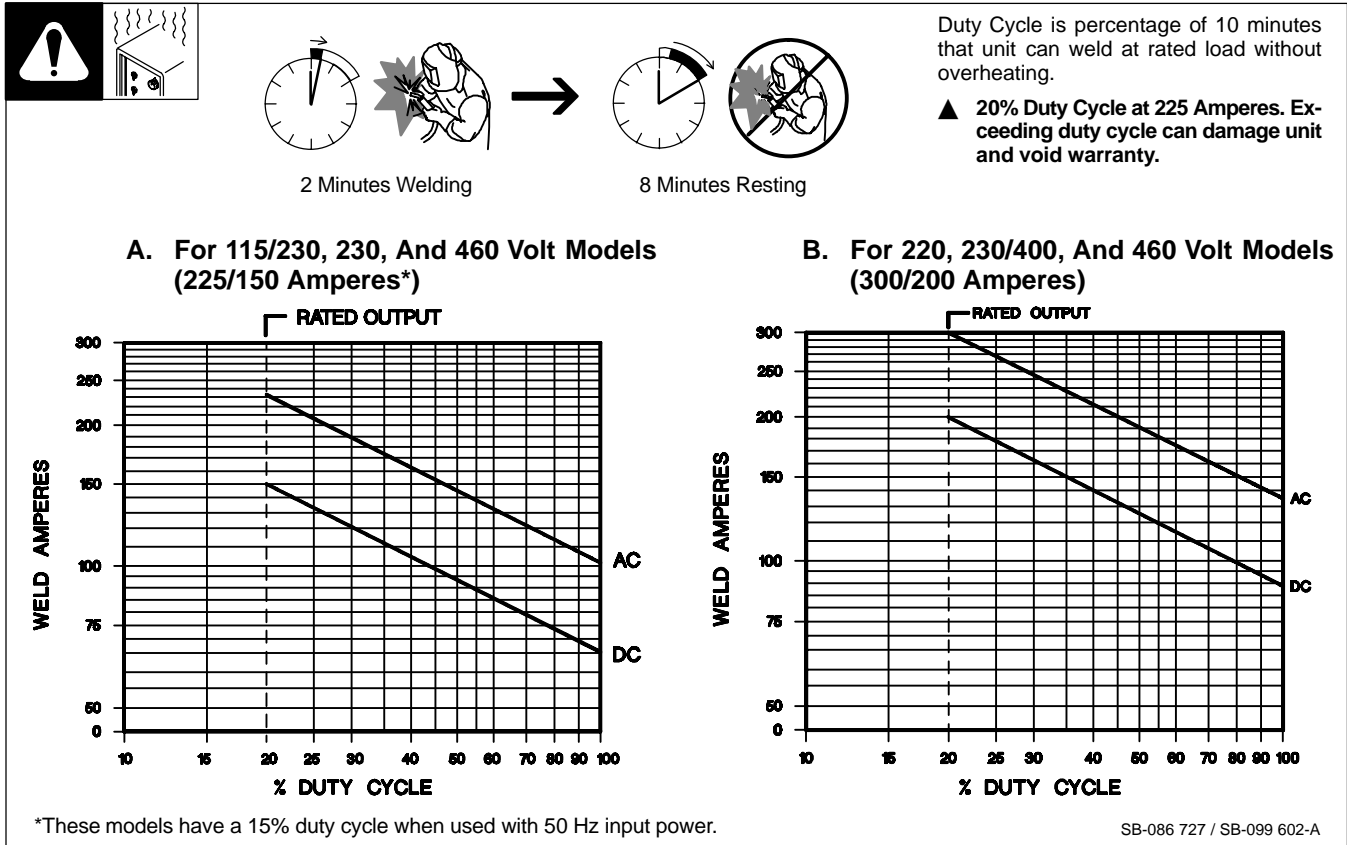
Mode	Rated Welding Output	Amperage Range	Maximum Open-Circuit Voltage	Amperes Input at Rated Load Output 50 Or 60 Hz, Single-Phase					Weight
				115 V	220 V	230 V	400 V	460 V	
AC	225 A @ 25 Volts AC, 20% Duty Cycle @ 60 Hz; 15% Duty Cycle @ 50 Hz	Low: 30 – 150 High: 40 – 235	80 VAC	95 4.6*		47.5 2.3*		23.7 1.2*	104 lb (47 kg)
DC	150 A @ 25 Volts DC, 20% Duty Cycle @ 60 Hz; 15% Duty Cycle @ 50 Hz	30 – 160	80 VDC						
AC	300 A @ 30 Volts AC, 20% Duty Cycle @ 50/60 Hz	Low: 40 – 200 High: 65 – 300	80 VAC	70 5.4*		67 3.6*	39 1.8*	34 1.3*	134 lbs (61 kg)
DC	200 A @ 25 Volts DC, 20% Duty Cycle @ 50/60 Hz	30 – 200	80 VDC						
Overall Dimensions									
Height: 18-3/4 in (476 mm); Width: 12-3/4 in (323 mm); Depth: 17-1/2 in (445 mm)									
*While idling									

AC Models

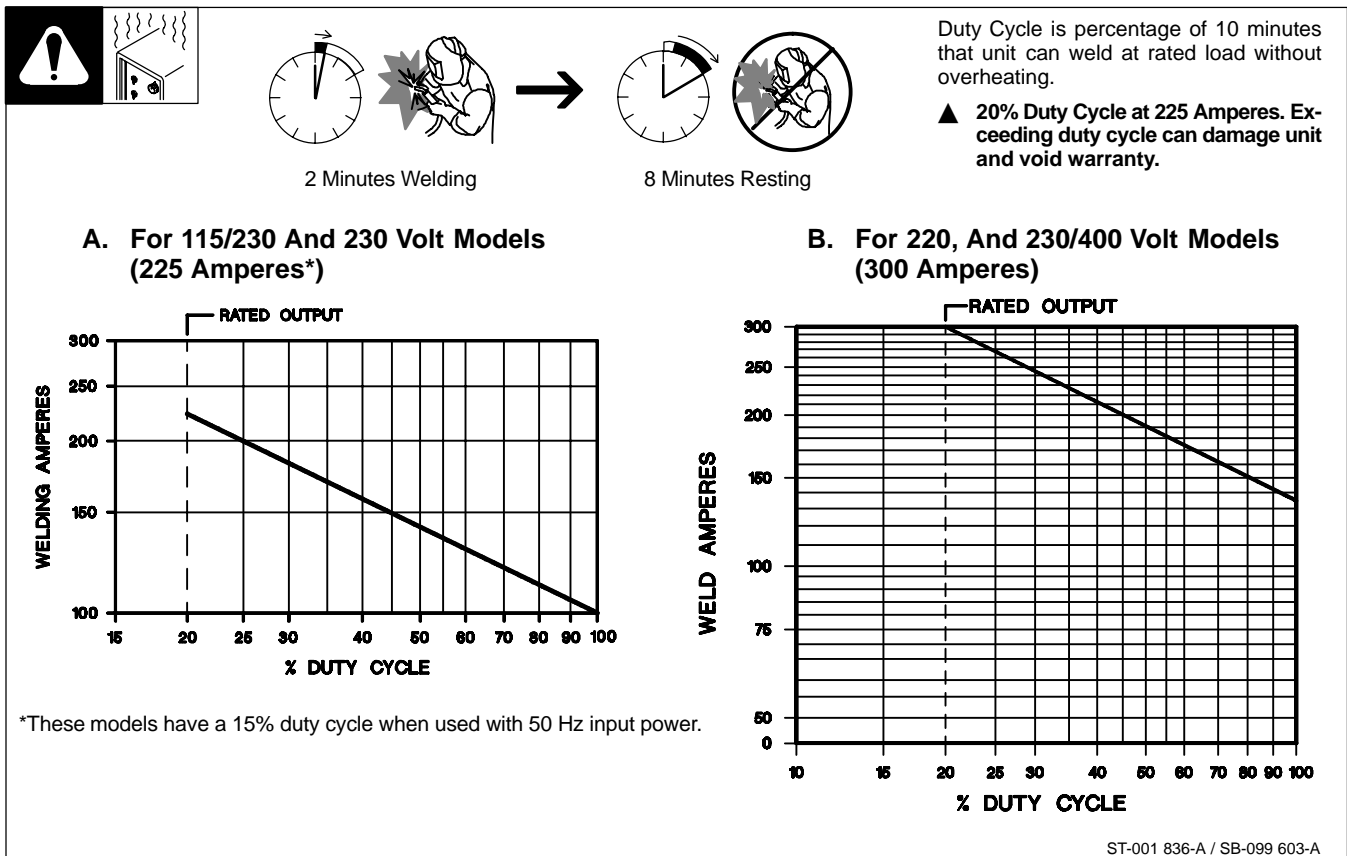
Rated Welding Output	Amperage Range	Max Open-Circuit Voltage	Amperes Input at Rated Load Output 50 Or 60 Hz, Single-Phase				KW	Weight
			115 V	220 V	230 V	400 V		
225 A @ 25 Volts AC, 20% Duty Cycle @ 60 Hz; 15% Duty Cycle @ 50 Hz	Low: 30 – 150A High: 40 – 235A	80 VAC	95 4.6*		47.5 2.3*		7.2 0.22*	85 lb (39 kg)
300 A @ 30 Volts AC, 20% Duty Cycle @ 50/60 Hz	Low: 40 – 200 High: 65 – 300	80 VAC		70 5.4*	67 3.6*	39 1.8*	11.5 0.22*	107 lb (49 kg)
Overall Dimensions								
Height: 18-3/4 in (476 mm); Width: 12-3/4 in (323 mm); Depth: 17-1/2 in (445 mm)								
*While idling								

2-2. Duty Cycle Charts

A. For AC/DC Models



B. For AC Models

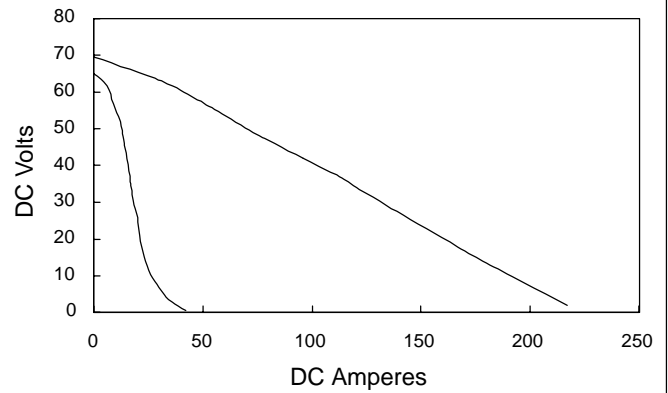
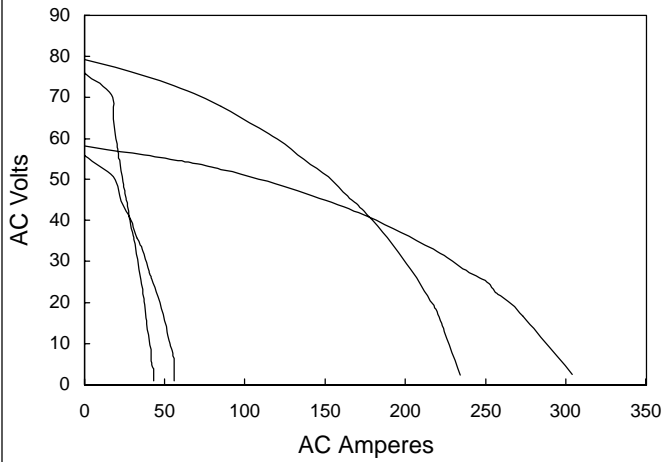


2-3. Volt-Ampere Curves

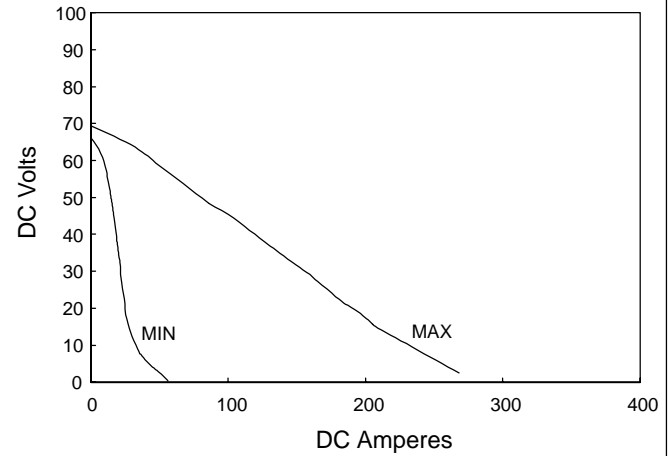
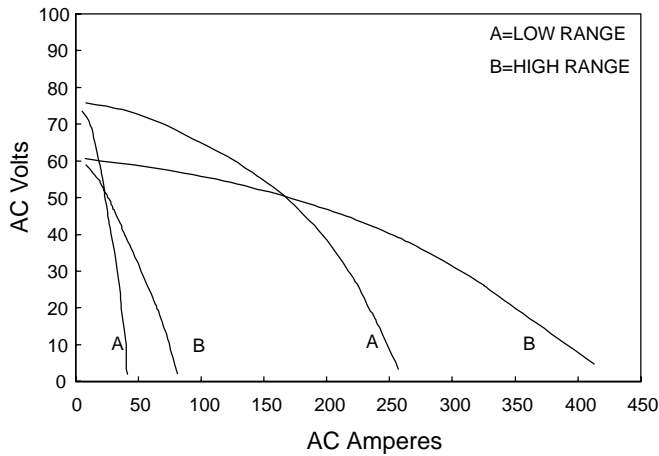
A. For AC/DC Models

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

A. For 115/230, 230 And 460 Volt Models (225/150 Amperes)



B. For 220, 230/400, And 460 Volt Models (300/200 Amperes)

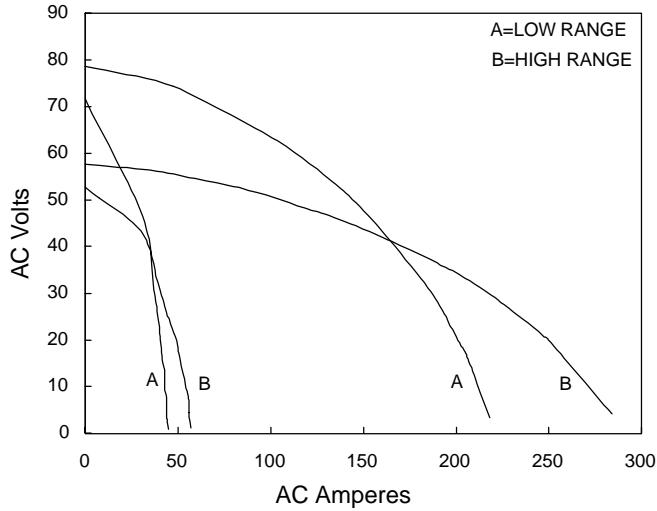


193 509 / 193 510 / 193 511 / 193 512

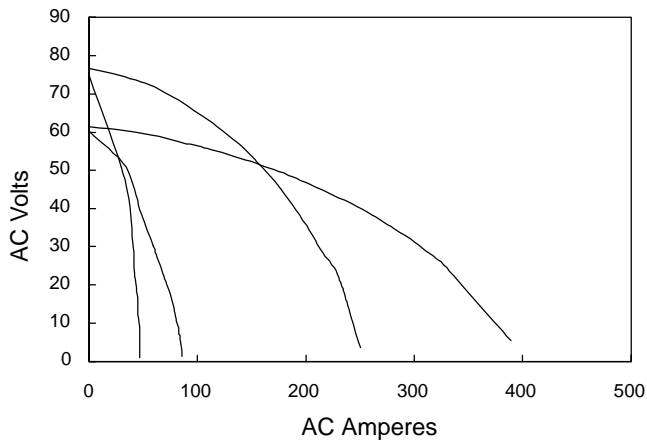
B. For AC Models

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

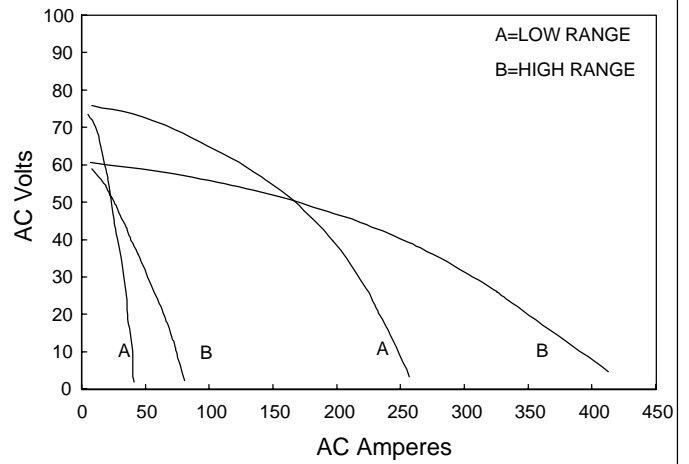
A. For 115/230 And 230 Volt Models (225 Amperes)



B. For 220 Volt Model (300 Amperes)

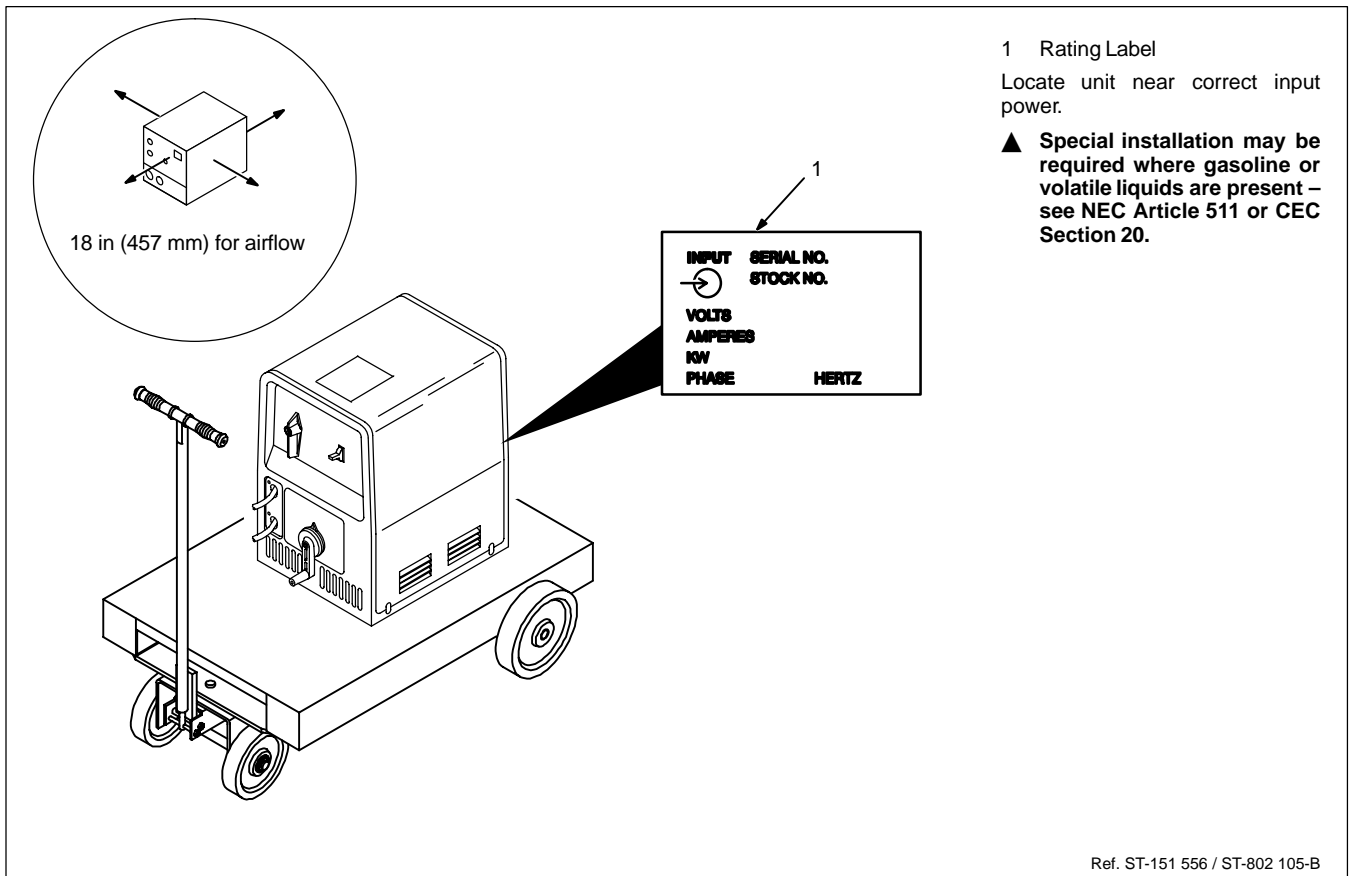


C. For 230/400 Volt Model (300 Amperes)

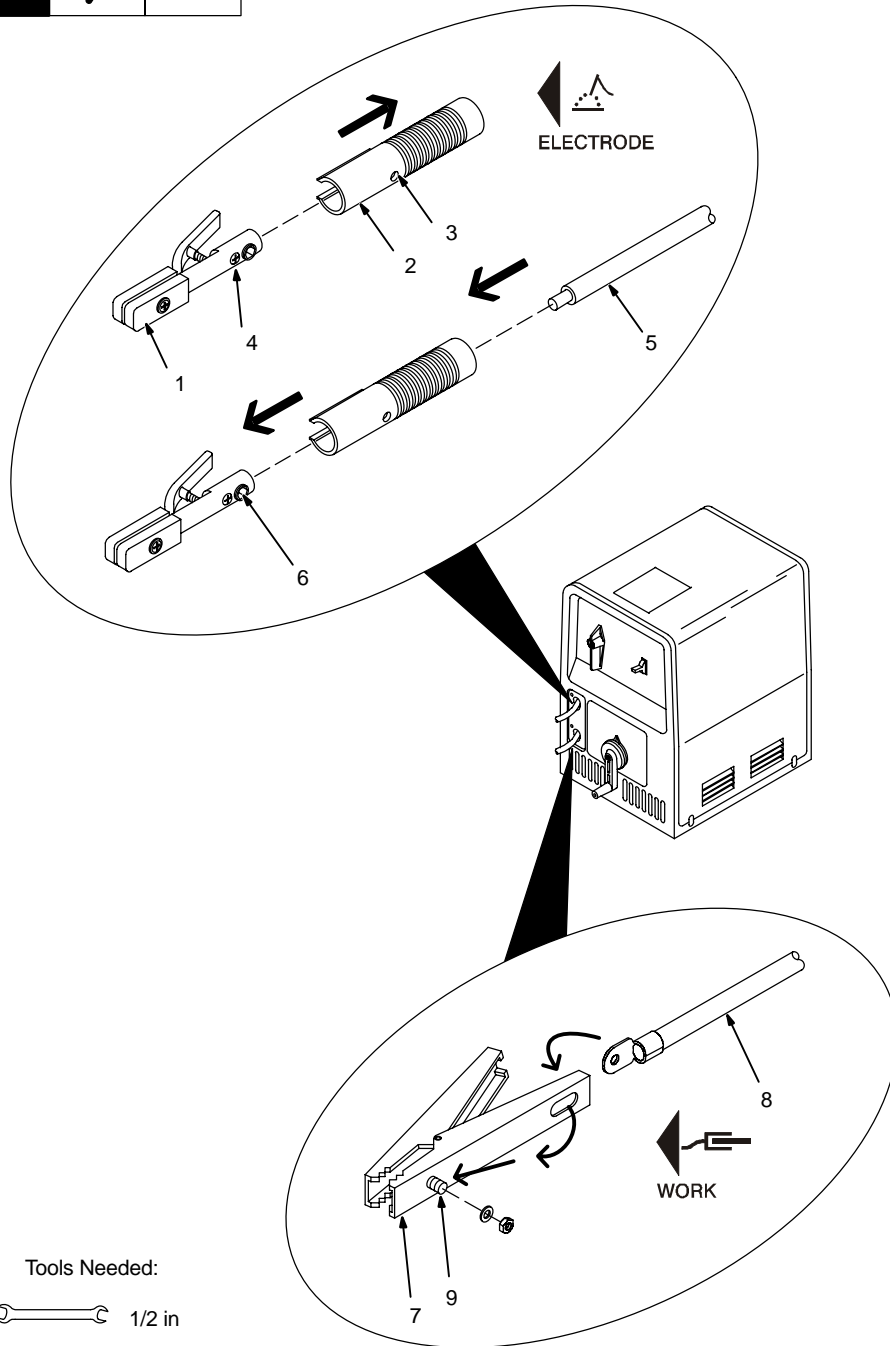


193 508 / 193 513 / 193 511

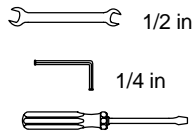
2-4. Selecting A Location



2-5. Installing Electrode Holder And Work Clamp



Tools Needed:



▲ Turn Off unit and disconnect input power before installing electrode holder or work clamp.

Removing Barrel From Electrode Holder

- 1 Electrode Holder
- 2 Barrel
- 3 Access Hole
- 4 Set Screw

Loosen set screw through access hole and slide barrel away from electrode holder.

Installing Electrode Cable and Barrel onto Electrode Holder

- 5 Electrode Cable From Unit (Has Bare Conductors on End)
- 6 Terminal Screw

Back out terminal screw from electrode holder. Insert electrode cable through barrel into end of electrode holder and tighten terminal screw securely.

Move barrel toward electrode holder and tighten set screw to secure barrel in place.

Installing Work Cable onto Work Clamp

- 7 Work Clamp
- 8 Work Cable From Unit (Has Ring Terminal on End)
- 9 Mounting Bolt

Route work cable through work clamp as shown and install onto mounting bolt using supplied hardware.

ST-802 251 / ST802 105-B

2-6. Weld Output Cables

NOTE

For weld output cable replacements or extensions, contact your Factory Authorized Service Agent.

2-7. Electrical Service Guide

Input Voltage	115	220	230	400	460
Input Amperes At Rated Output	95	[70]	47.5 [67]	[39]	23.7 [34]
Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes	150	[110]	70 [100]	[60]	35 [50]
Min Input Conductor Size In AWG/Kcmil	8	[8]	12 [10]	[14]	14 [14]
Max Recommended Input Conductor Length In Feet (Meters)	32 (10)	[75 (23)]	87 (26) [82 (25)]	[101 (31)]	138 (42) [87 (27)]
Min Grounding Conductor Size In AWG/Kcmil	8	[8]	12 [10]	[14]	14 [14]

[] Electrical Service Requirements For 300/200 AC/DC And 300 AC Models

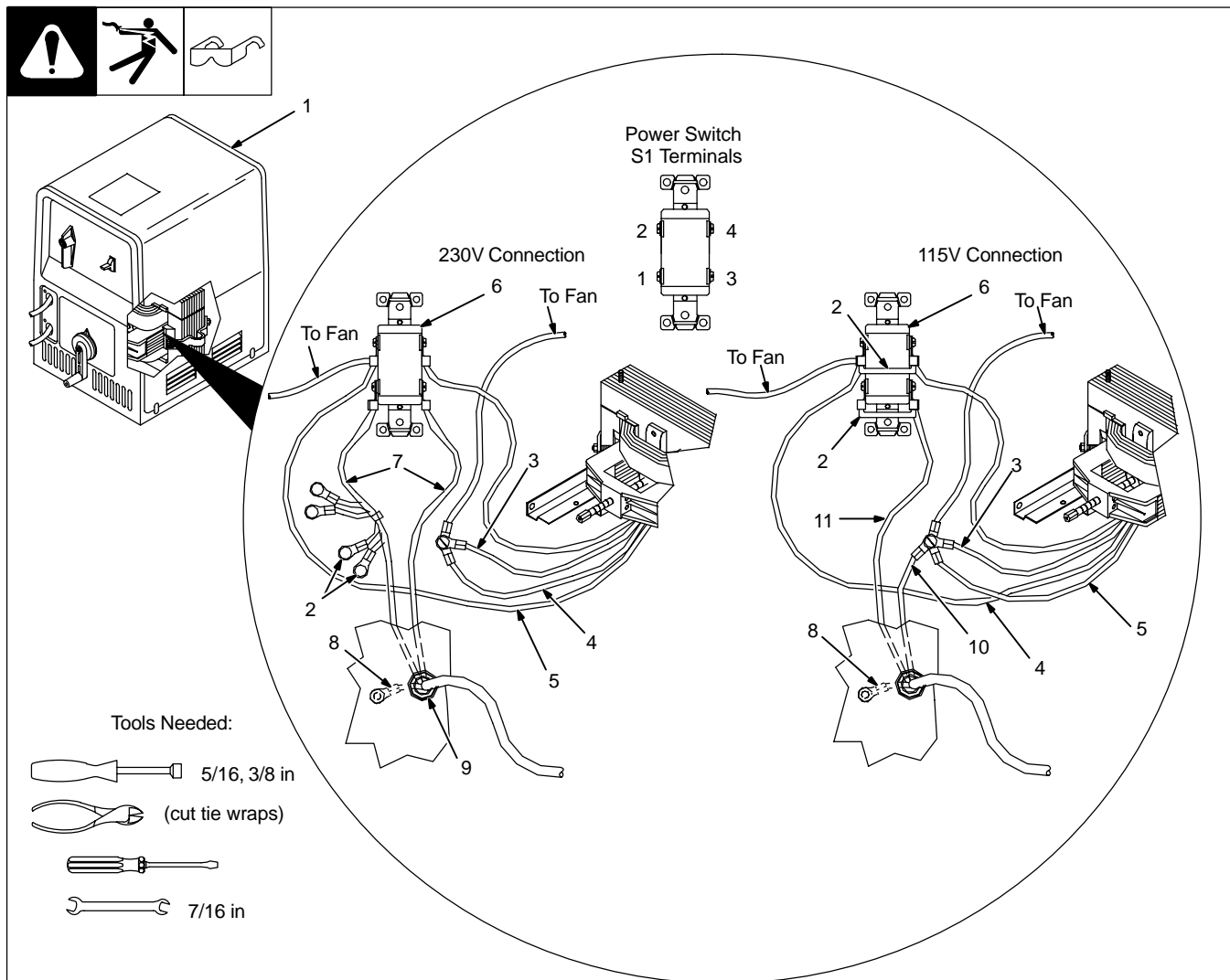
Reference: 1997 National Electrical Code (NEC)

Ref. S-0092-J

2-8. Internal Connections For Operating 115/230 Volts, 225 Amperes AC And AC/DC Models From 115 Volts

NOTE

Follow applicable electrical codes and have a competent electrician make internal connections. Note the input amperes as stated in Section 2-7.



Ref. 802 247-C

▲ Turn Off unit and disconnect input power.

1 Wrapper

Remove wrapper.

2 Jumper Leads

Cut tie wrap securing jumper leads to power cord lead and remove jumper leads.

3 Lead 2

4 Lead 3

Remove insulated sleeving, and disconnect lead 2 from lead 3.

5 Lead 4

6 Power Switch S1 (As Viewed From Rear Of Switch)

Disconnect lead 4 from terminal 2 on S1.

Connect lead 3 and one end of jumper lead to terminal 2.

Connect other end of jumper lead to terminal

4 on S1. Be sure existing connection to that terminal remains.

7 230 V Input Power Cord Black Leads

8 Green Ground Lead (On Rear Panel)


Disconnect input power cord black leads from S1, and disconnect green ground lead from ground terminal on rear panel.

9 Input Power Cord Strain Relief

Loosen strain relief, and remove 230 volt input power cord.

Obtain correct size and length 115 volt input power cord (see Section 2-7). Install correct size ring terminals to cord leads.

Route cord through strain relief, and connect green lead to ground terminal.

 To install large power cords, remove knock-out located on lower rear panel of unit, insert power cord, and install plug into original power cord hole.

▲ Make sure paint has been removed from area where ground terminal is secured on unit.

10 115 V Input Power Cord White Lead

Connect lead 2, lead 4, and white input power cord lead together, and secure with existing hardware. Reinstall insulated sleeving.

11 115 V Input Power Cord Black Lead

Connect black input power cord lead and jumper lead to terminal 3 on S1.

Connect other end of jumper lead to terminal 1 on S1.

Use tie-wraps to secure all leads away from transformer, stabilizer and fan. Be sure leads are clear of movable shunt.

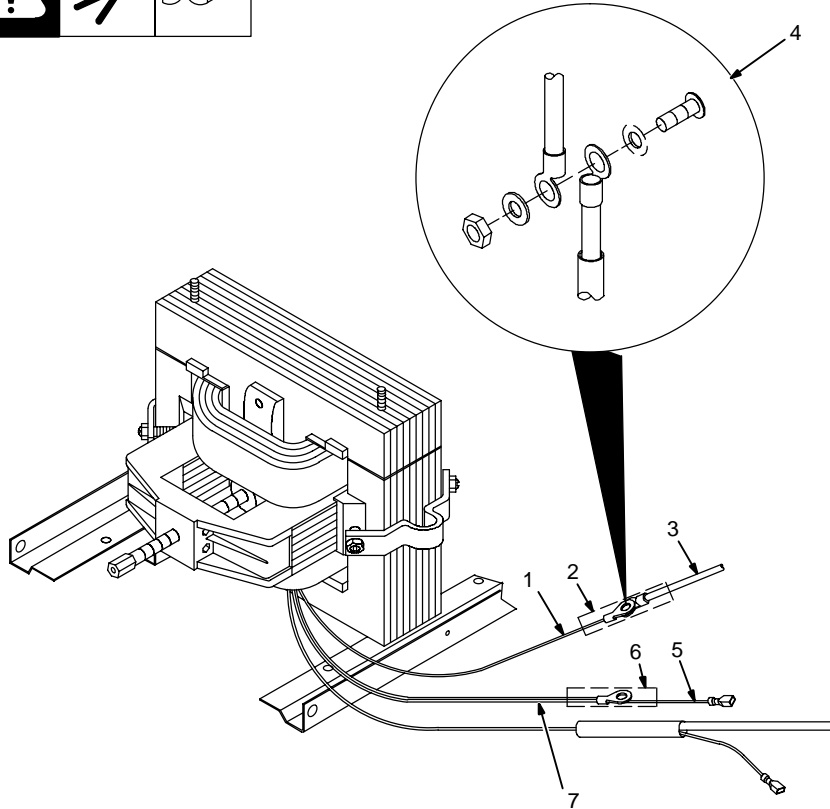
Tighten strain relief, and install wrapper.

Connect input power according to Section 2-10.

2-9. Internal Connections For Operating 230/400 Volts, 300/200 Amperes AC/DC Or 300 Amperes AC Models From 230 Volts

NOTE

Follow applicable electrical codes and have a competent electrician make internal connections. Note the input amperes as stated in Section 2-7.



Connected For 400 Volts

▲ Turn Off unit and disconnect input power.

- 1 Primary Coil Lead 4
- 2 Lead 4 Insulation Sleeving
- 3 Power Switch Lead 4
- 4 Lead Connection Hardware

Slide sleeving down, and disconnect one lead 4 from the other. Remove sleeving.

- 5 Fan Motor (FM) Lead 2
- 6 Lead 2 Insulation Sleeving

Disconnect fan motor lead 2 at fan motor, and remove sleeving.

Take lead 2 sleeving and secure it over the end of primary coil lead 4.

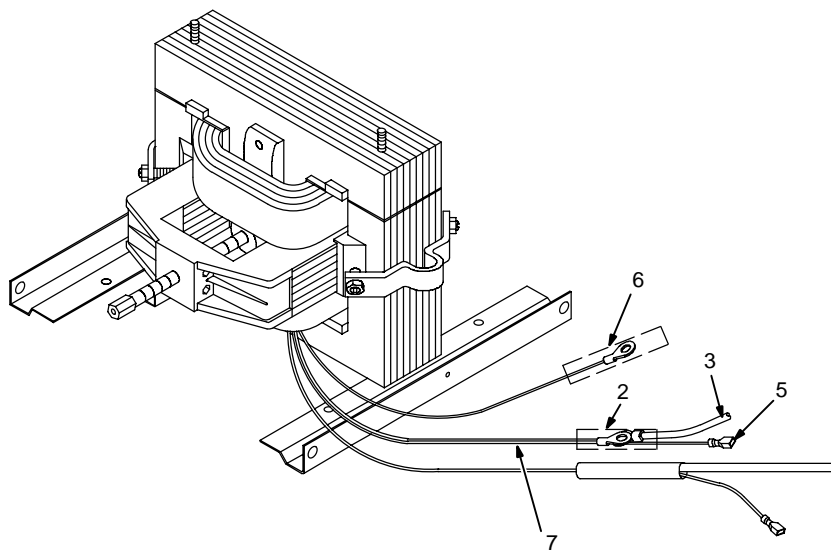
Replace lead 2 sleeving with lead 4 sleeving.

- 7 Primary Coil Lead 2

Slide sleeving out of the way, and connect power switch Lead 4 to primary coil lead 2, and secure with existing hardware. Secure sleeving over connection.

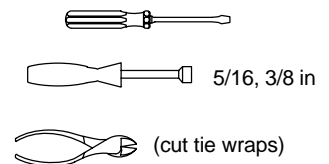
Connect fan motor lead 2 back onto fan motor.

Reinstall wrapper.



Connected For 230 Volts

Tools Needed:



2-10. Connecting Input Power



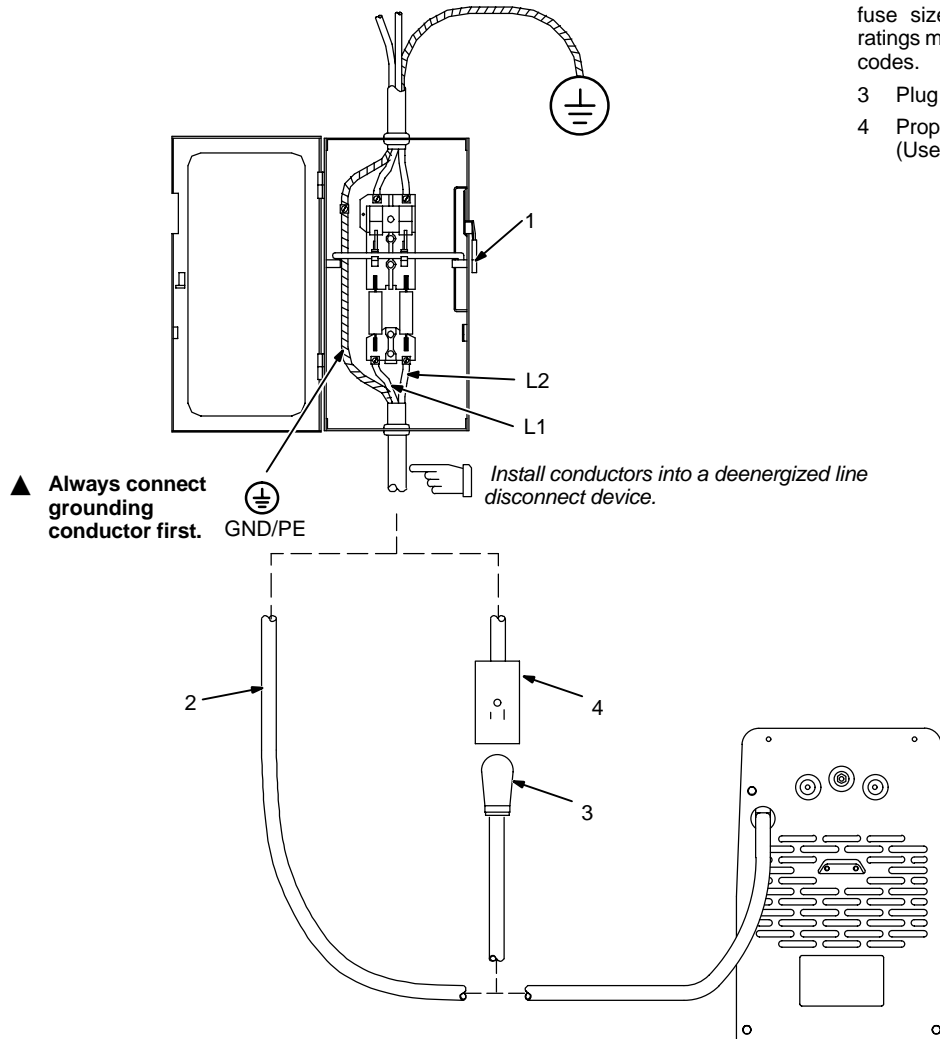
▲ Disconnect and lockout/tag-out input power before connecting input conductors from unit.

▲ Have only qualified persons make this installation. See rating label in Section 2-4, and be sure to supply correct input power.

- 1 Line Disconnect Device
- 2 Input And Grounding Conductors For Models Not Supplied With Plug

See Section 2-7 for conductor and fuse size and ratings. Size and ratings must comply with applicable codes.

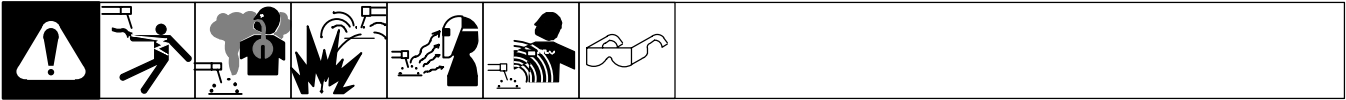
- 3 Plug
- 4 Proper Receptacle (User-Supplied)



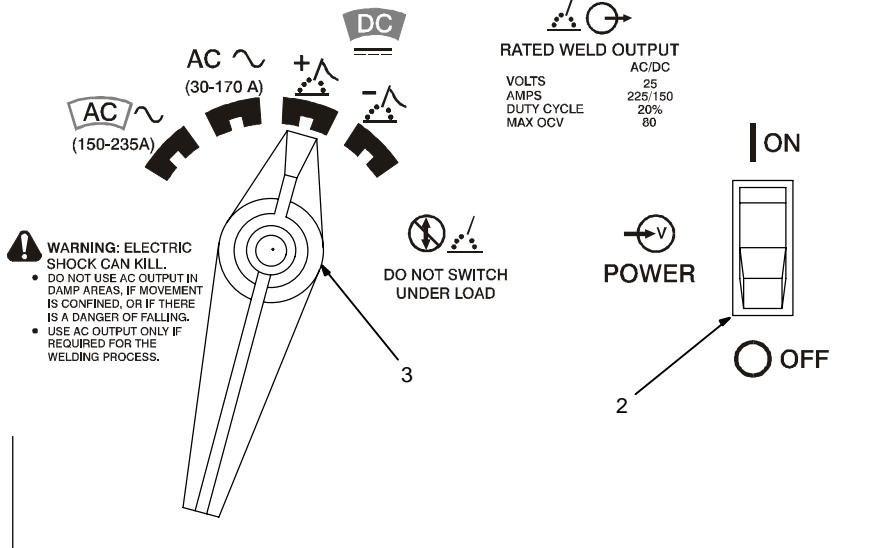
ST-802 246

SECTION 3 – OPERATION

3-1. Controls



A. Controls For AC/DC Models



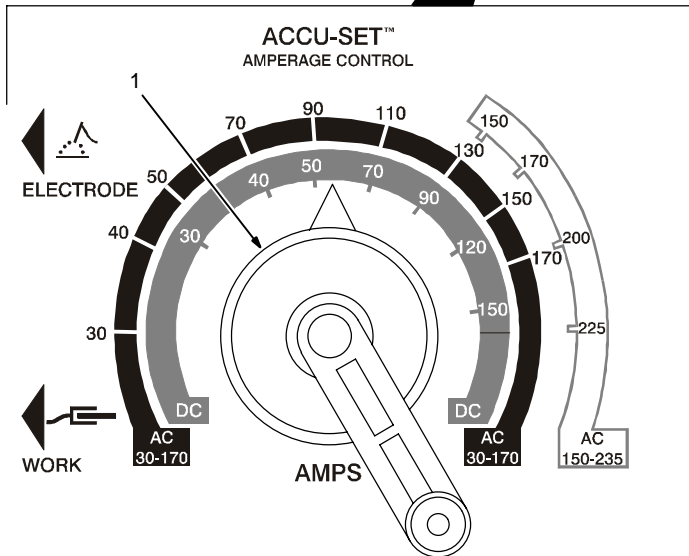
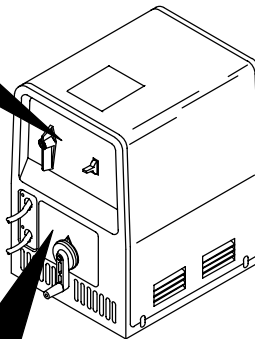
- 1 Amperage Adjustment Control
- 2 Power Switch
- 3 Mode Switch

For DC Weld Output

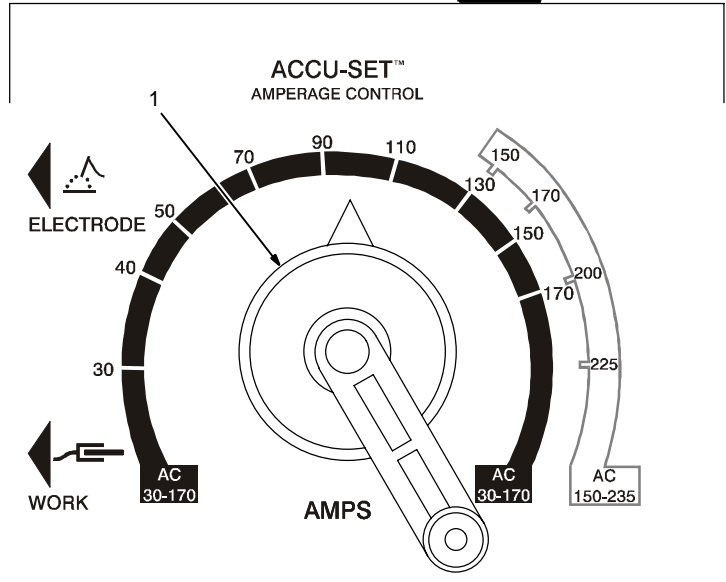
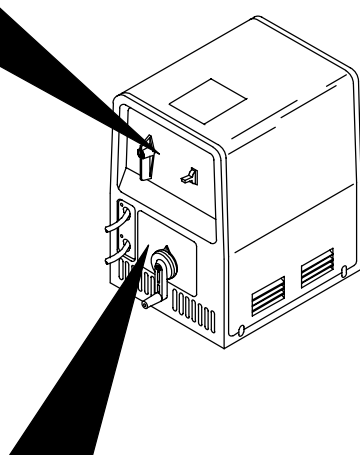
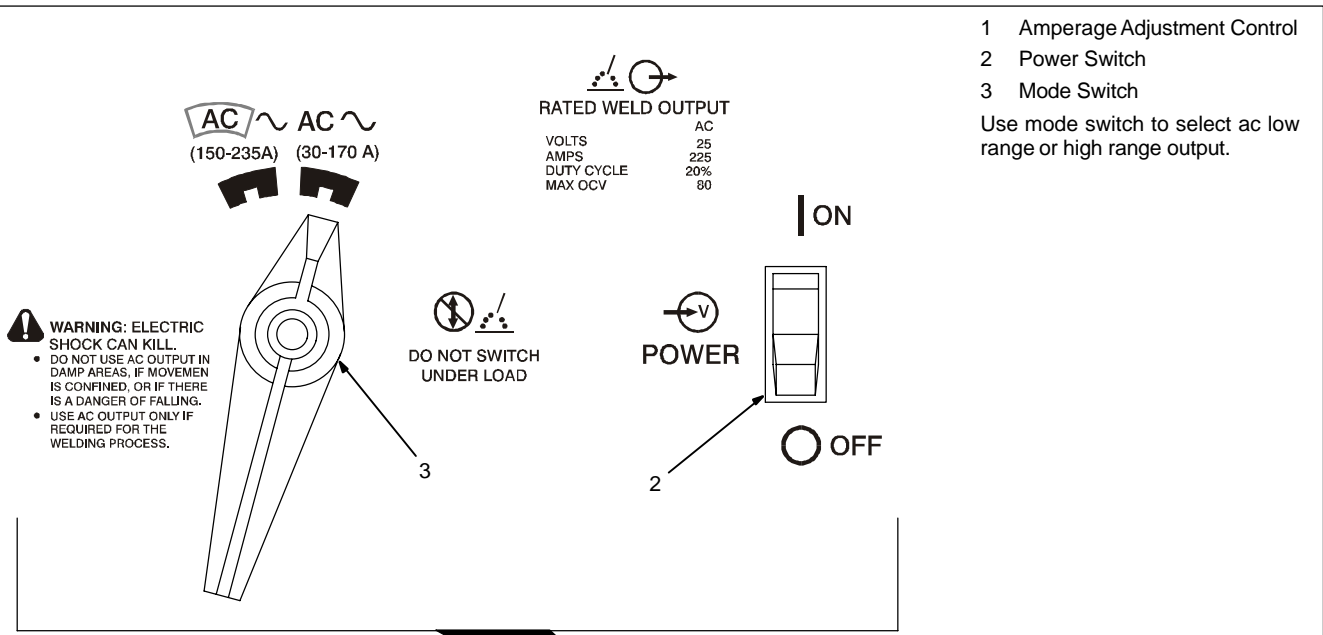
Use mode switch to select polarity of dc output, Electrode Positive/DCEP (+), or Electrode Negative/DCEN (-).

For AC Weld Output

Use mode switch to select ac low range or high range output.

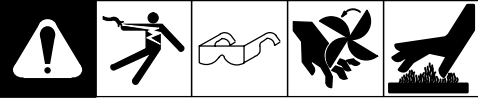



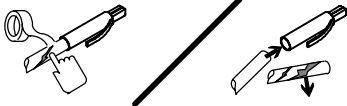


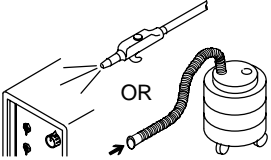
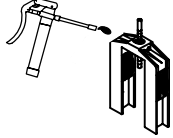


B. Controls For AC Models



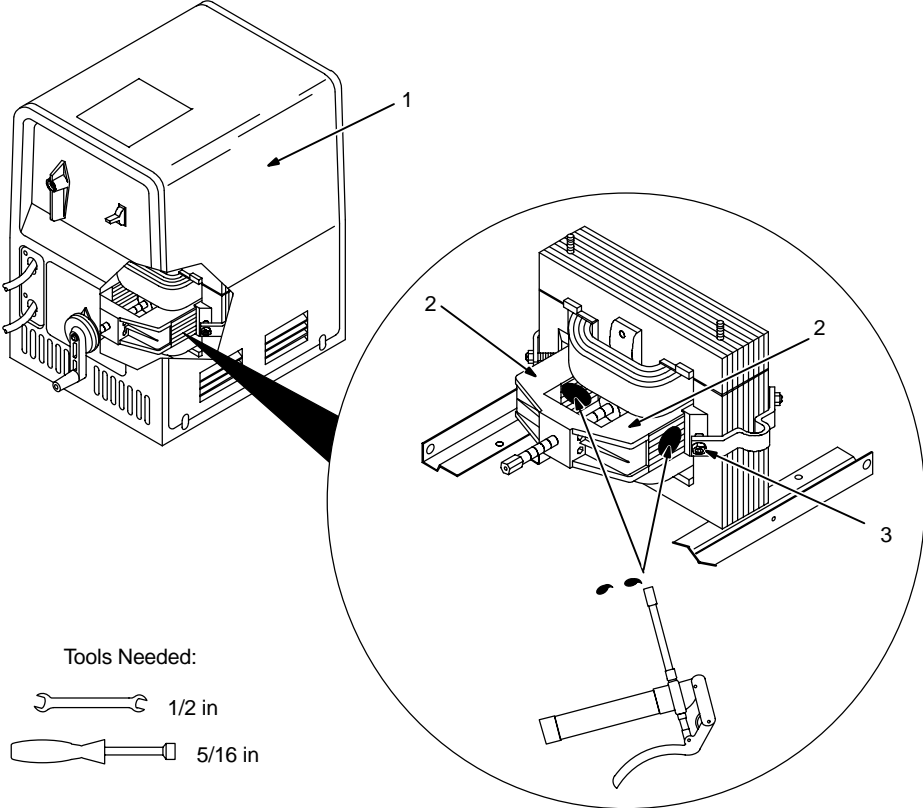
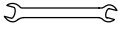
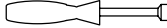


SECTION 4 – MAINTENANCE & TROUBLESHOOTING

4-1. Routine Maintenance

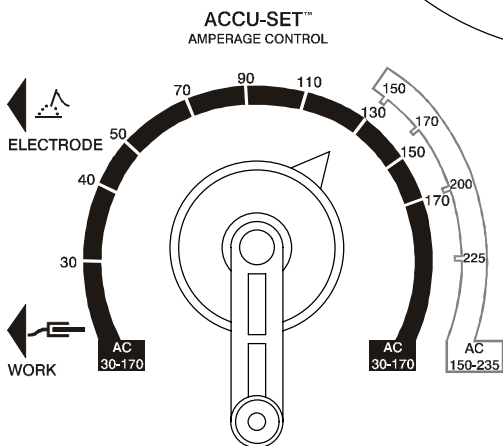
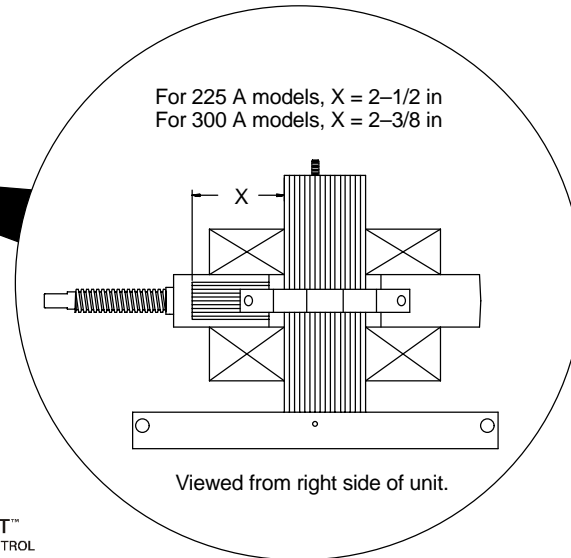
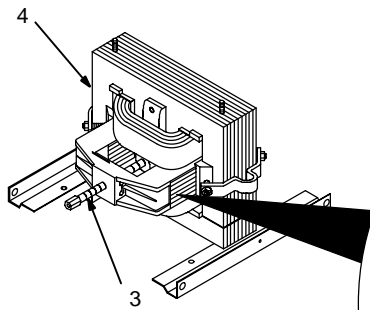
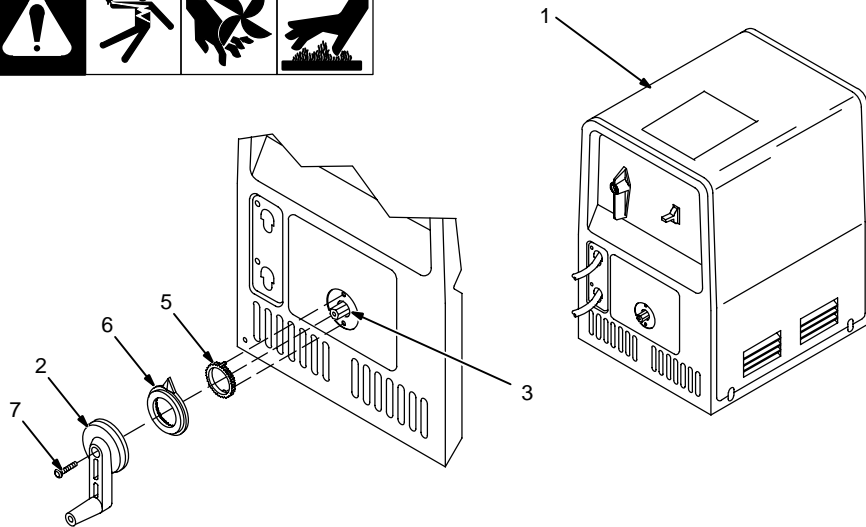
		▲ Disconnect power before maintaining.		
 3 Months				
		Replace Unreadable Labels		Repair Or Replace Cracked Cables
 6 Months		 12 Months		
	OR	Blow Out Or Vacuum Inside, During Heavy Service, Clean Monthly		Lubricate Shunt Block (See Section 4-2)

4-2. Lubricating Shunt Block And Anti-Noise Adjustment

		<p>▲ Turn Off welding power source and disconnect input power.</p> <p>1 Wrapper Remove wrapper.</p> <p>2 Shunt Block</p> <p> Do not grease screw threads on shunt block.</p> <p>Apply light coating of high-temperature grease to shaded areas of both shunt blocks. Turn amperage control handle to spread grease evenly.</p> <p>3 Noise Adjustment Screws</p> <p>If shunt block vibrates and becomes noisy, tighten adjustment screws 1/4 turn. Install wrapper, turn On unit, and check for shunt noise. Repeat procedure until noise stops. Do not overtighten. Call your nearest Factory Authorized Service Agent if noise continues.</p> <p>▲ Install wrapper before turning On power.</p>
		<p>Tools Needed:</p> <p> 1/2 in</p> <p> 5/16 in</p>

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4-3. Reinstalling Amperage Adjustment Indicator



Proper alignment of pointer and crank handle.

▲ Turn Off welding power source and disconnect input power.

- 1 Wrapper
- Remove wrapper from unit.
- 2 Crank Handle
- 3 Shunt Shaft
- 4 Transformer And Shunt (Located Inside Unit)

Insert crank handle onto shunt shaft protruding through front panel and turn crank handle to adjust shunt to the proper value of "X", depending on model (see detail of transformer and shunt).

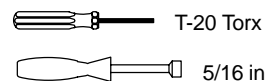
Remove crank handle.

- 5 Pinion Gear
- Install pinion gear onto front panel making sure anti-rotation pins are in holes on front panel.
- 6 Pointer Gear
- Install pointer gear overtop of pinion gear and rotate so pointer is indicating 130 Amps on ac Low Range scale (see example).

Install crank handle overtop the stator/pinion gear assembly with the handle straight down. It may be necessary to turn the handle slightly so vertical alignment is possible.

- 7 Securing Screw
- Install securing screw through handle, into threaded hole in shunt shaft. Tighten securely.
- Reinstall wrapper.

Tools Needed:



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4-4. Troubleshooting

Trouble		Remedy		
No weld output; fan does not run.		Be sure line disconnect switch is in On position (see Section 2-10).		
		Check and replace line fuses if open. Reset breakers if necessary (see Section 2-10).		
Fan does not run; weld output okay.		Be sure nothing is blocking movement of fan. If fan does not run freely, replace fan motor.		
Erratic weld current.		Clean and tighten all weld cable connections.		
Erratic arc with excessive spatter.		Use dry, properly stored electrodes.		
		Shorten arc length.		
		Reduce amperage setting (see Section 3-1).		
Electrode freezing to work.		Increase amperage setting (see Section 3-1).		
		Increase arc length.		
		Use dry, properly stored electrodes.		
Noise and vibration from shunt block.		Lubricate shunt block and/or tighten adjustment screws (see Section 4-2).		

SECTION 5 – ELECTRICAL DIAGRAMS

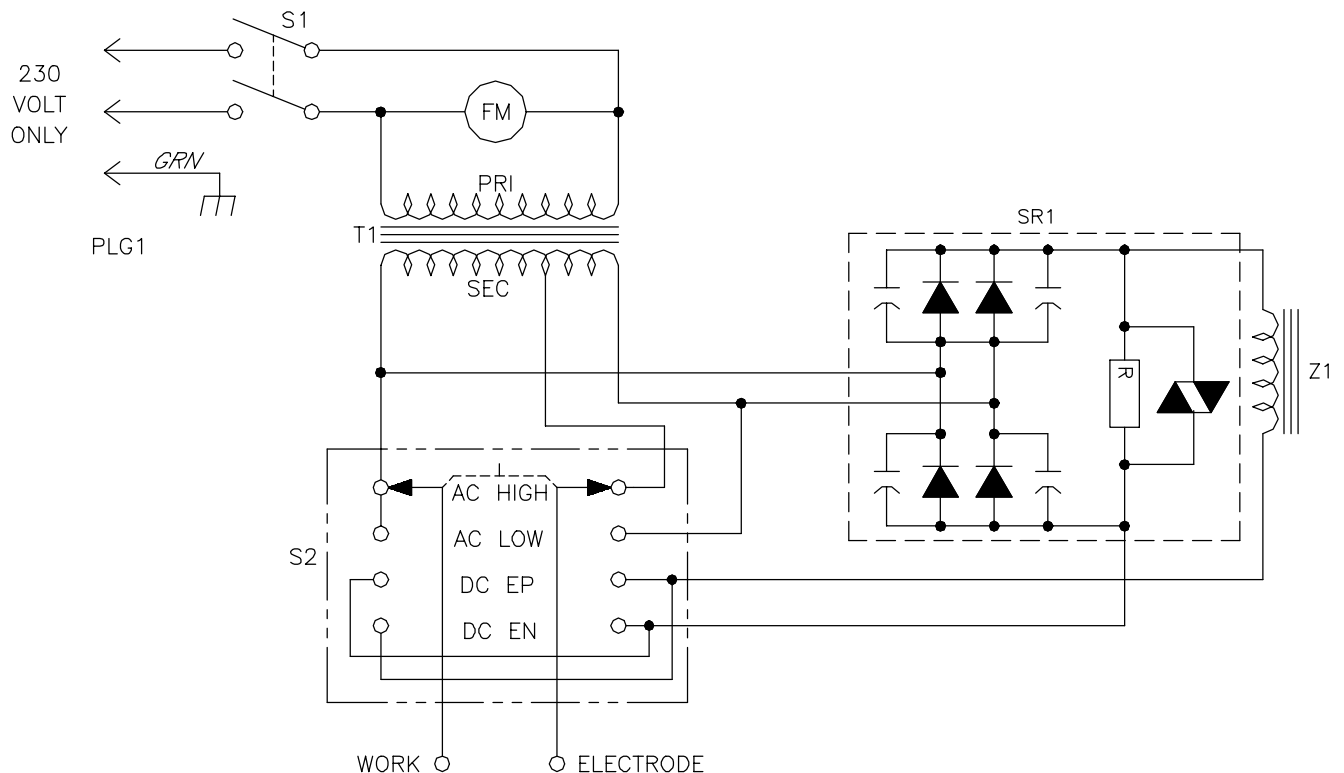
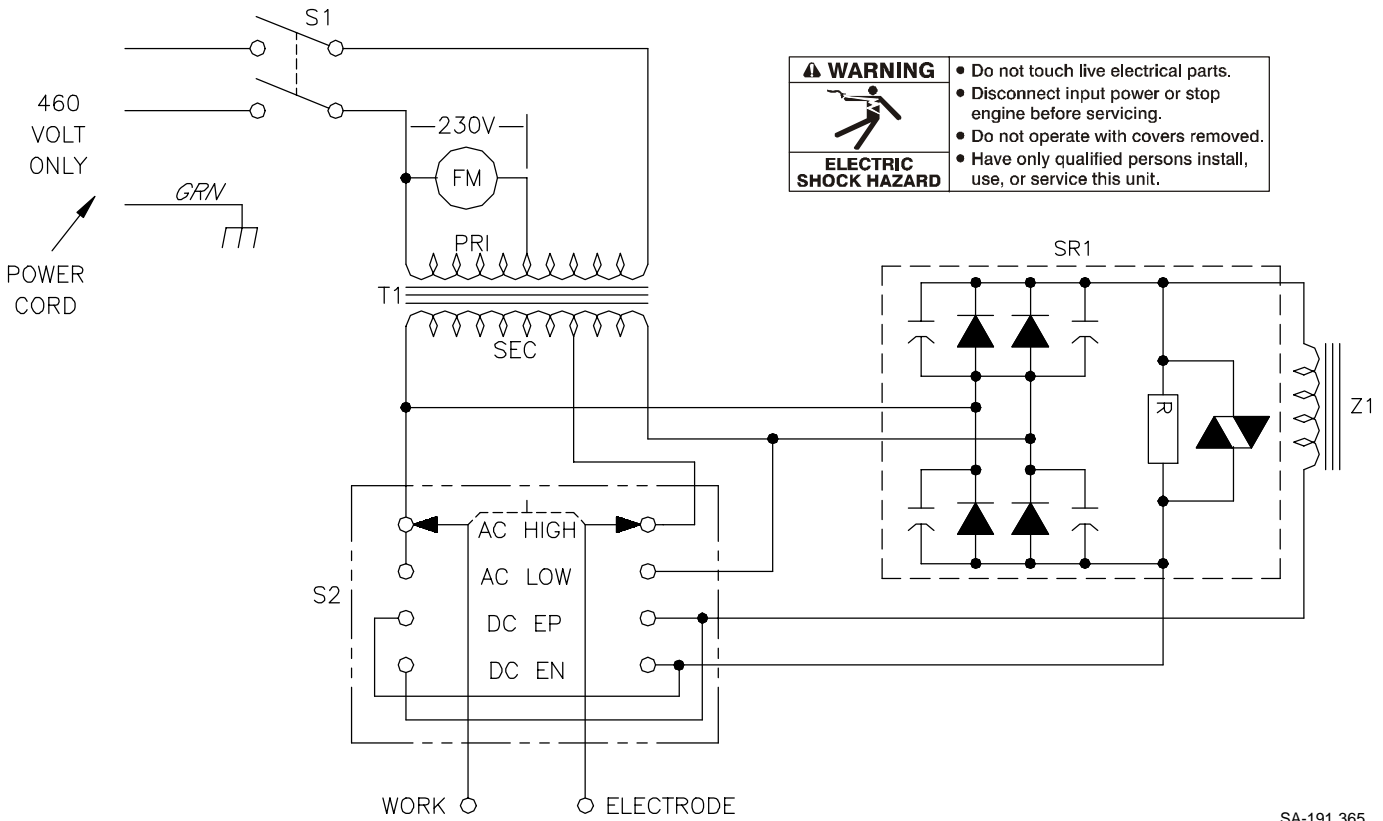
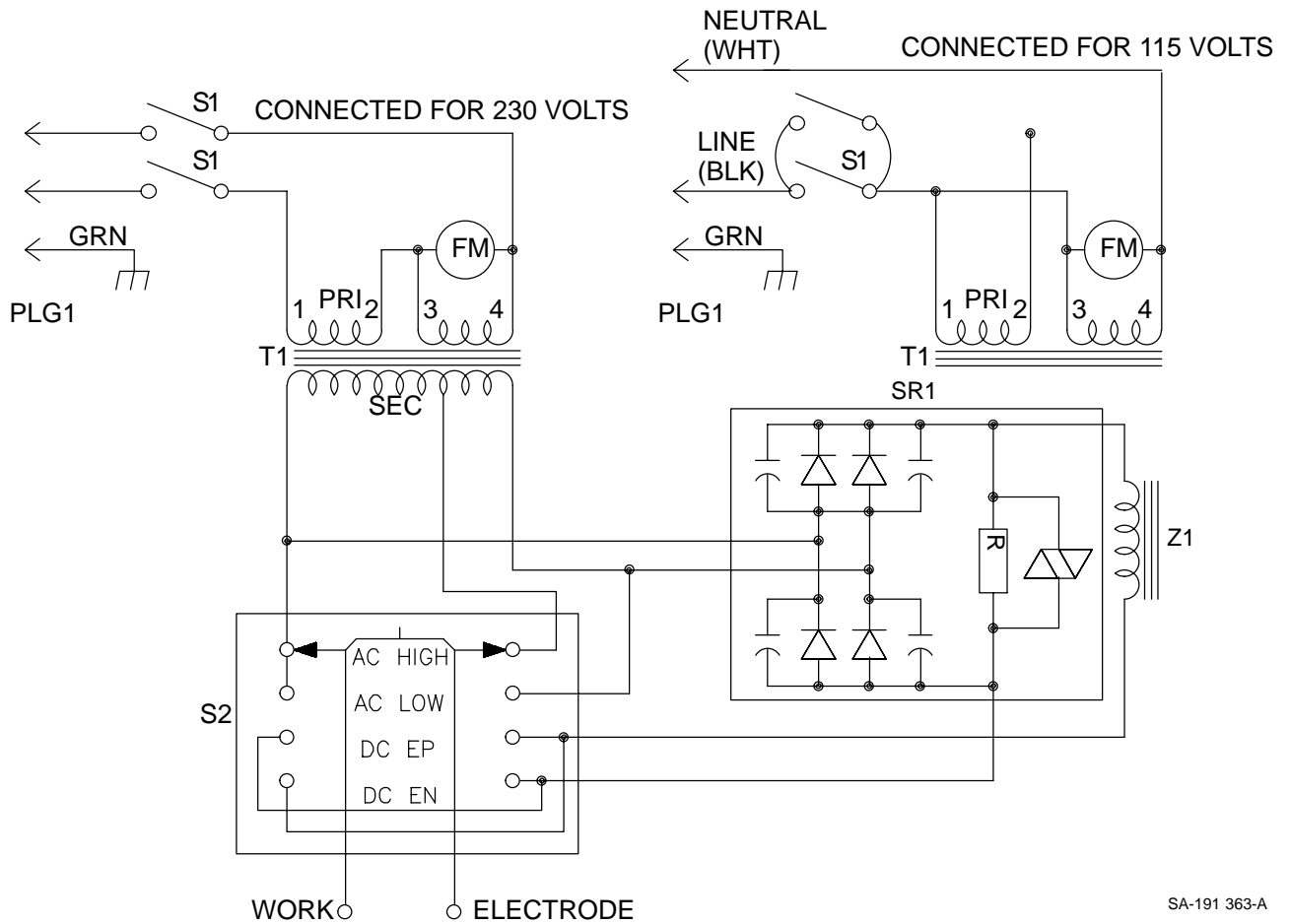


Figure 5-1. Circuit Diagram For AC/DC (230 Volts) Models



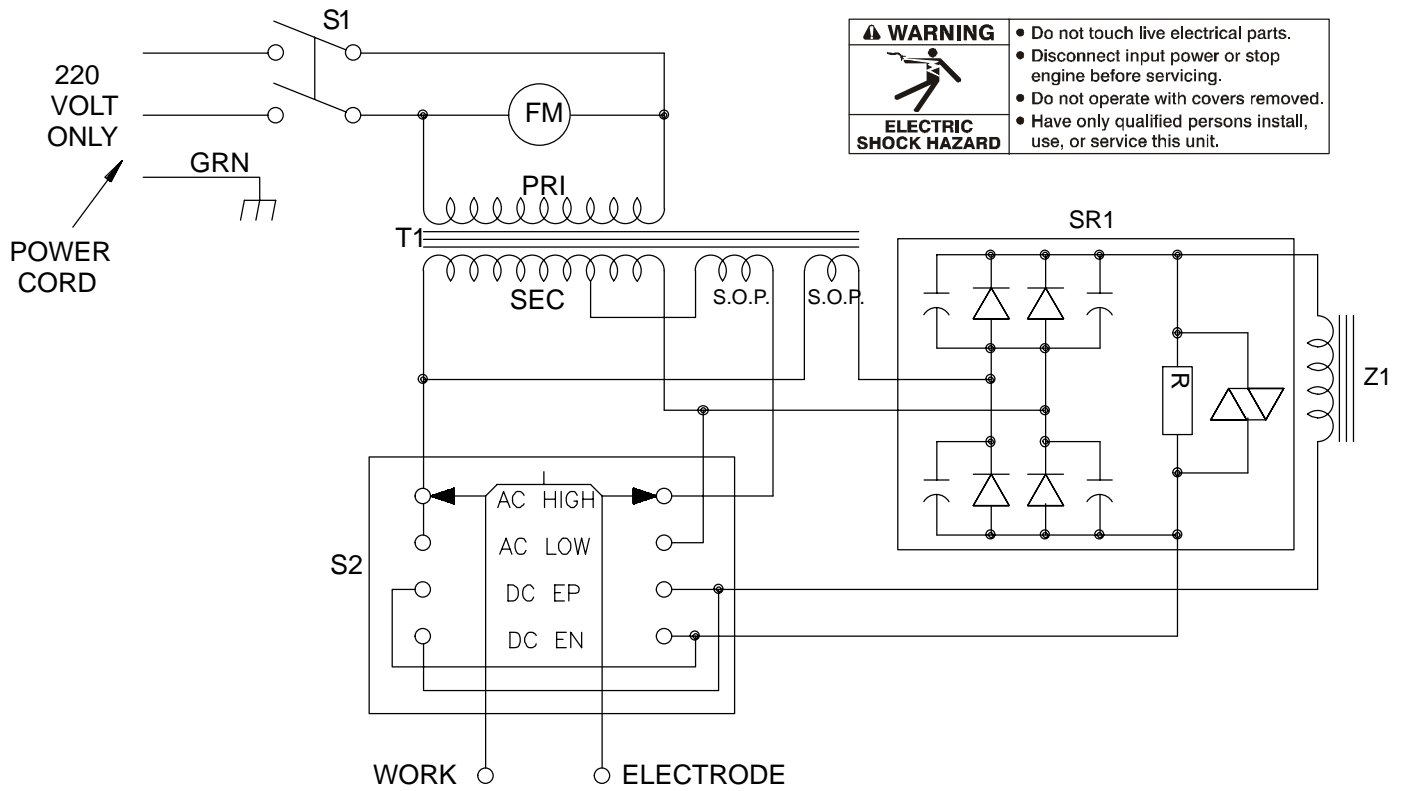
SA-191 365

Figure 5-2. Circuit Diagram For AC/DC (460 Volts) Models



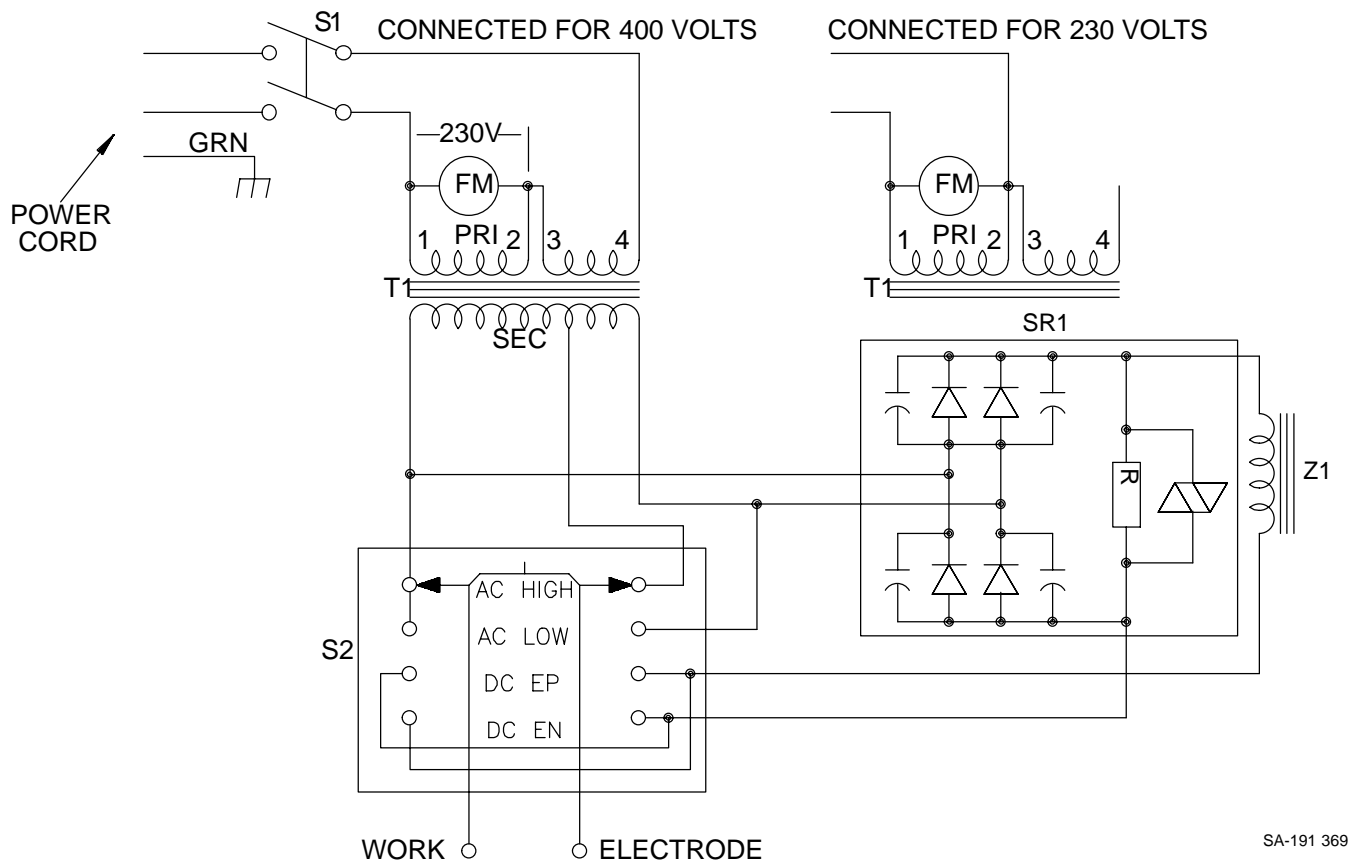
SA-191 363-A

Figure 5-3. Circuit Diagram For AC/DC (115/230 Volts) Models



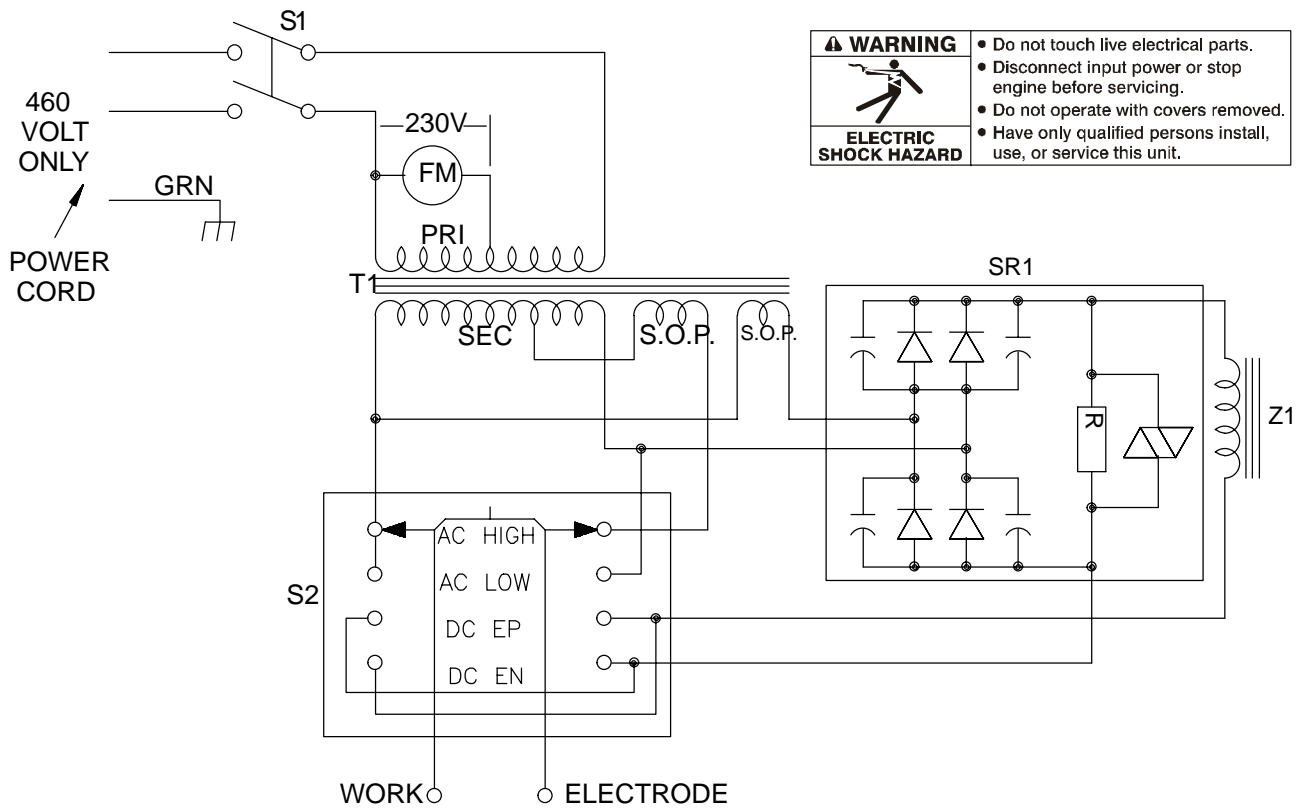
SA-191 368

Figure 5-4. Circuit Diagram For 300/200 AC/DC (220 Volts) Models



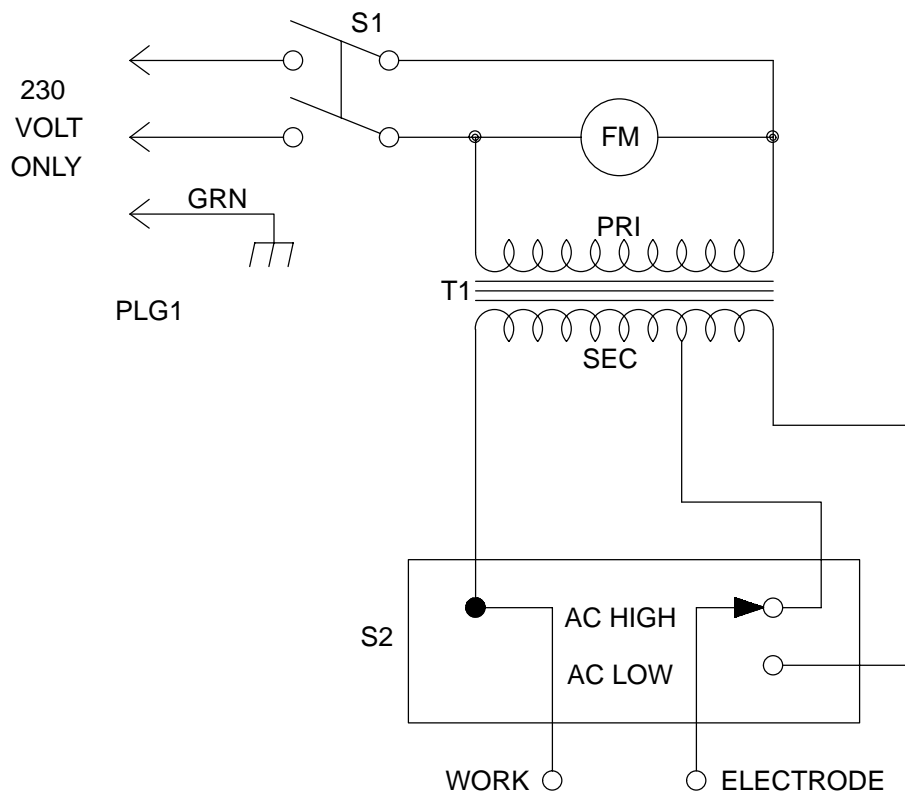
SA-191 369

Figure 5-5. Circuit Diagram For 300/200 AC/DC (230/400 Volts) Models



SA-191 370

Figure 5-6. Circuit Diagram For 300/200 AC/DC (460 Volts) Model



SA-191 362

Figure 5-7. Circuit Diagram For 225 (230 Volts) Models

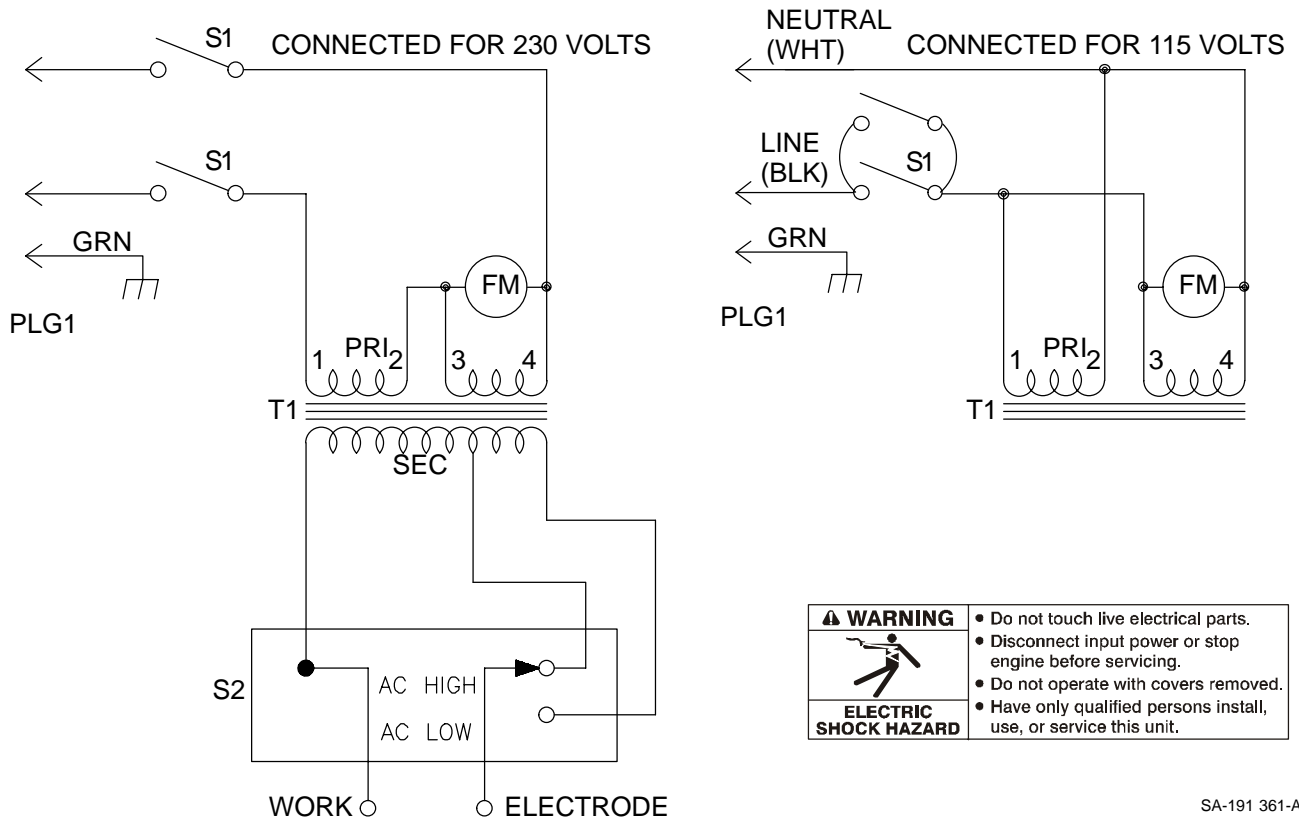


Figure 5-8. Circuit Diagram For 225 (115/230 Volts) Models

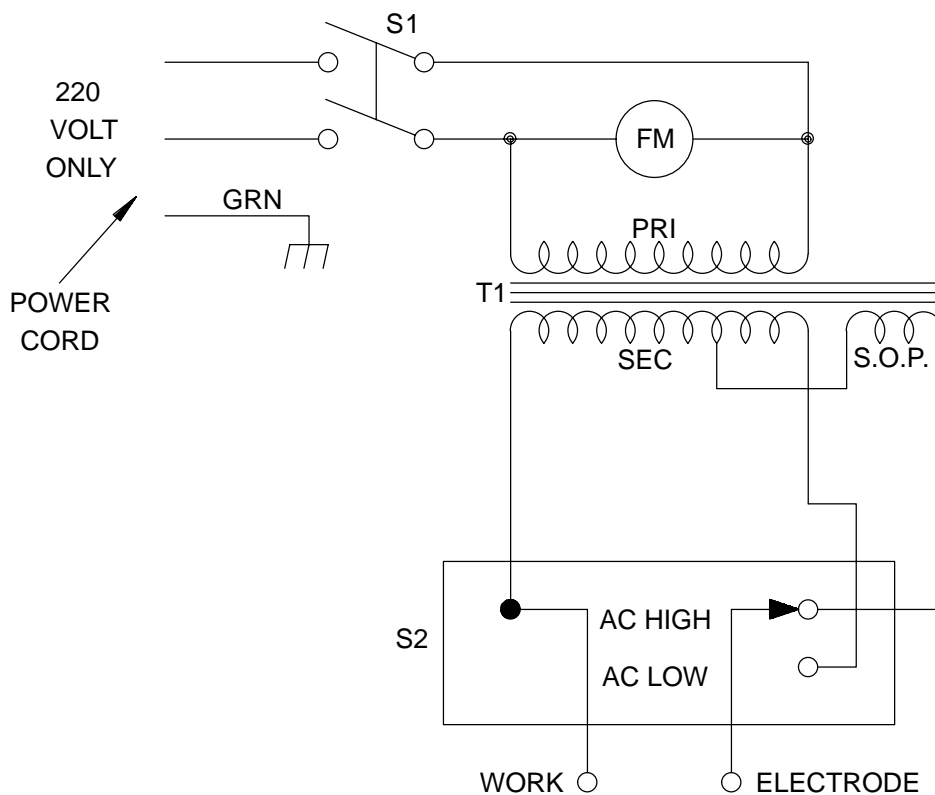
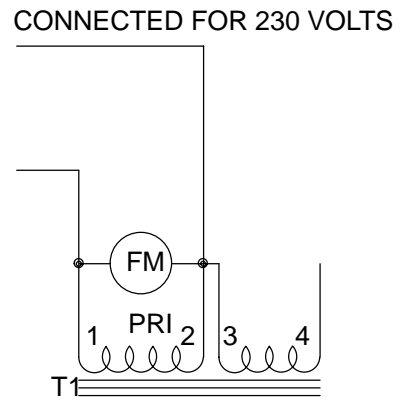
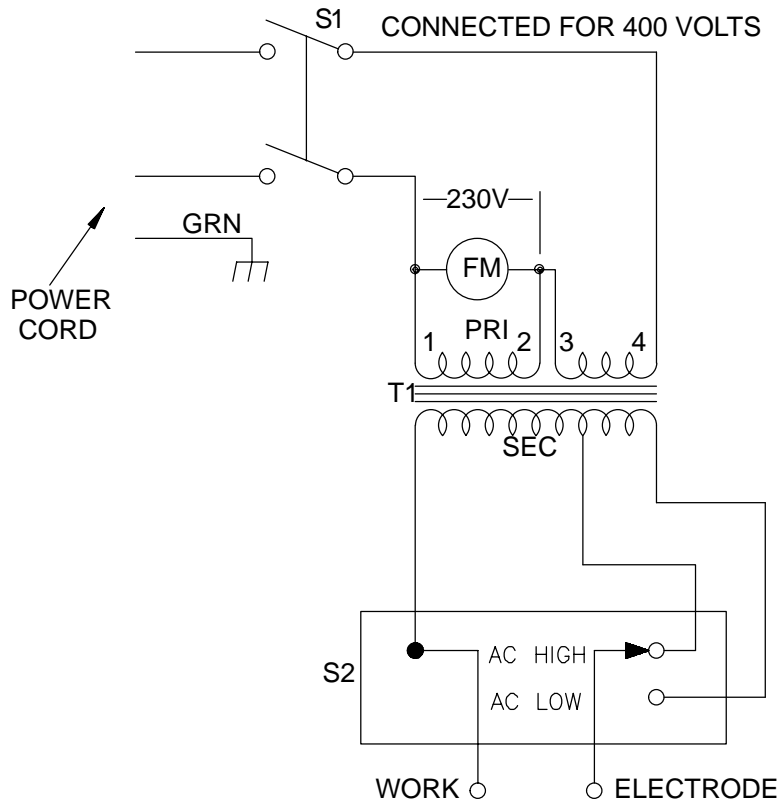



Figure 5-9. Circuit Diagram For 300 (220 Volts) Models



	WARNING	<ul style="list-style-type: none"> Do not touch live electrical parts. Disconnect input power or stop engine before servicing. Do not operate with covers removed.
	ELECTRIC SHOCK HAZARD	<ul style="list-style-type: none"> Have only qualified persons install, use, or service this unit.

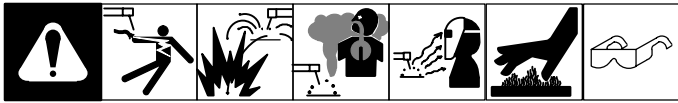
SA-191 367

Figure 5-10. Circuit Diagram For 300 (230/400 Volts) Models

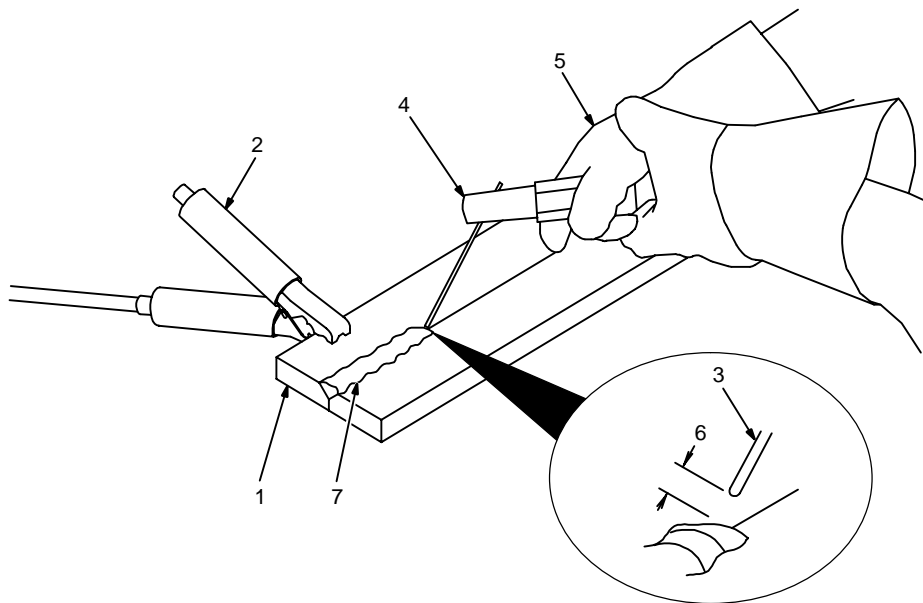
SECTION 6 – WELDING METHODS & TROUBLESHOOTING

mod5.1* 9/92

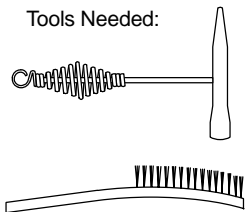
A. Welding Methods



6-1. Shielded Metal Arc Welding (SMAW) Procedure



Tools Needed:



ST-151 593

1 Workpiece

Make sure workpiece is clean before welding.

2 Work Clamp

Place as close to the weld as possible.

3 Electrode

A small diameter electrode requires less current than a large one. Follow recommendations of electrode manufacturer when setting weld amperage (see 6-2).

4 Insulated Electrode Holder

5 Electrode Holder Position

6 Arc Length

Arc length is the distance from the electrode to the workpiece. A short arc with correct amperage will give a sharp, crackling sound.

▲ **Welding current starts as soon as electrode touches the workpiece.**

7 Slag

Use a chipping hammer and wire brush to remove slag. Remove slag and check weld bead before making another weld pass.

6-2. Electrode And Amperage Selection Chart

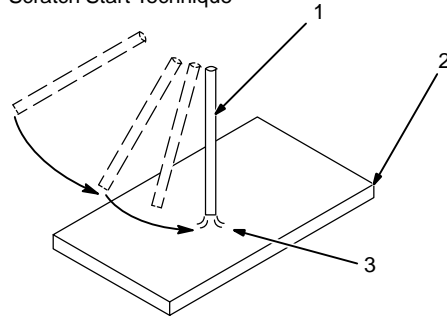
ELECTRODE	DIAMETER	AMPERAGE RANGE								
		50	100	150	200	250	300	350	400	450
6010 & 6011	3/32	■								
	1/8		■							
	5/32			■						
	3/16				■					
	7/32					■				
6013	1/4					■				
	1/16	■								
	5/64		■							
	3/32			■						
	1/8				■					
	5/32					■				
	3/16						■			
7014	7/32						■			
	1/4							■		
	3/32								■	
	1/8									■
	5/32									
7018	3/16									
	7/32									
	1/4									
	3/32									
	1/8									
7024	5/32									
	3/16									
	7/32									
	1/4									
	3/32									
Ni-CI	1/8									
	5/32									
	3/16									
308L	3/32									
	1/8									
	5/32									

ELECTRODE	DC*	AC	POSITION	PENETRATION	USAGE
6010	EP		ALL	DEEP	MIN. PREP, ROUGH HIGH SPATTER
6011	EP	✓	ALL	DEEP	
6013	EP,EN	✓	ALL	LOW	GENERAL
7014	EP,EN	✓	ALL	MED	SMOOTH, EASY, FAST
7018	EP	✓	ALL	LOW	LOW HYDROGEN, STRONG
7024	EP,EN	✓	FLAT HORIZ FILLET	LOW	SMOOTH, EASY, FASTER
NI-CL	EP	✓	ALL	LOW	CAST IRON
308L	EP	✓	ALL	LOW	STAINLESS

*EP = ELECTRODE POSITIVE (REVERSE POLARITY)
EN = ELECTRODE NEGATIVE (STRAIGHT POLARITY)

6-3. Striking An Arc

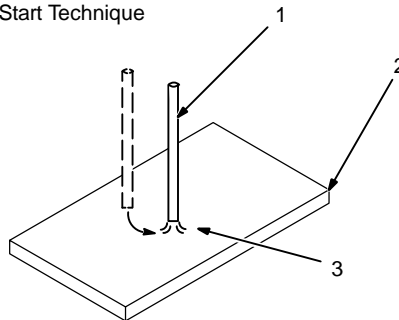
Scratch Start Technique



- 1 Electrode
- 2 Workpiece
- 3 Arc

Drag electrode across workpiece like striking a match; lift electrode slightly after touching work. If arc goes out electrode was lifted too high. If electrode sticks to workpiece, use a quick twist to free it.

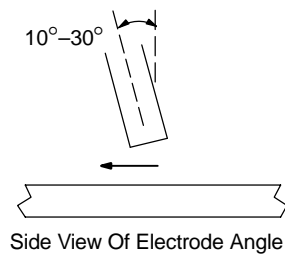
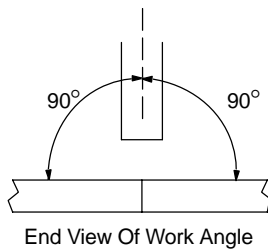
Tap Start Technique



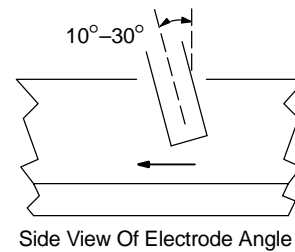
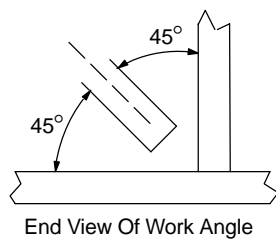
Bring electrode straight down to workpiece; then lift slightly to start arc. If arc goes out, electrode was lifted too high. If electrode sticks to workpiece, use a quick twist to free it.

S-0049 / S-0050

6-4. Positioning The Electrode Holder



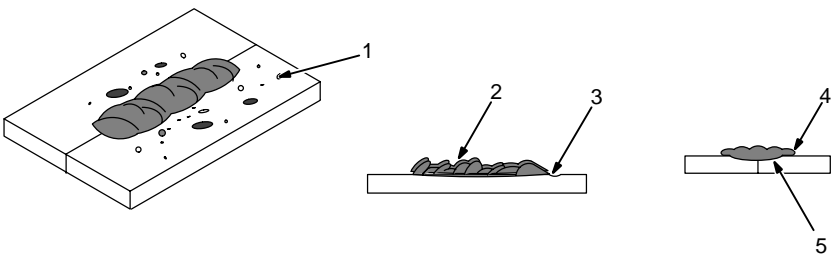
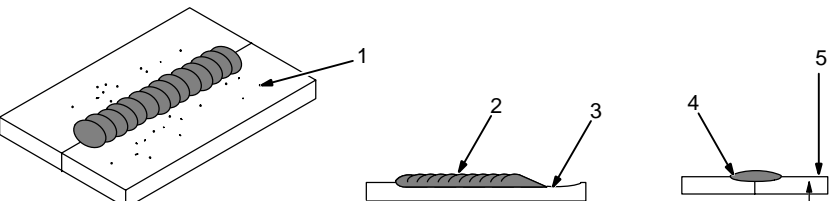
Groove Welds



Fillet Welds

S-0660

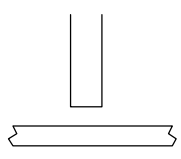
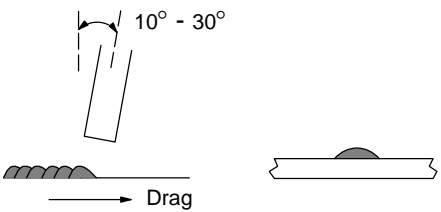
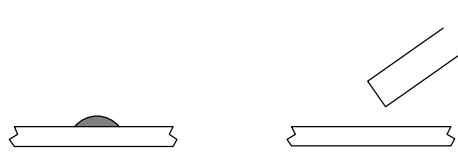
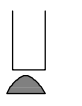
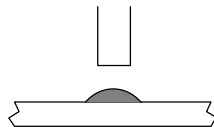
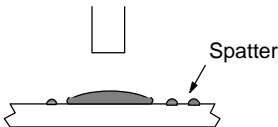



6-5. Weld Bead Characteristics

<p>Poor Weld Bead</p> 	<ol style="list-style-type: none"> 1 Large Spatter Deposits 2 Rough, Uneven Bead 3 Slight Crater During Welding 4 Bad Overlap 5 Poor Penetration
<p>Good Weld Bead</p> 	<ol style="list-style-type: none"> 1 Fine Spatter 2 Uniform Bead 3 Moderate Crater During Welding <p>Weld a new bead or layer for each 1/8 in (3.2 mm) thickness in metals being welded.</p> <ol style="list-style-type: none"> 4 No Overlap 5 Good Penetration Into Base Metal

S-0053-A

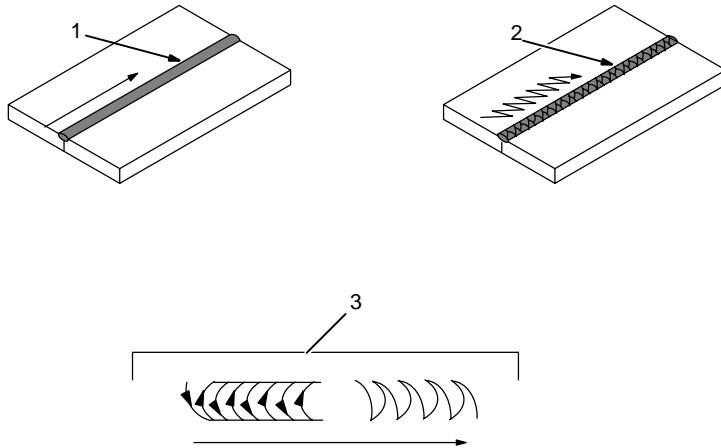
Ref. S-0052-B

6-6. Conditions That Affect Weld Bead Shape

Electrode Angle		
Angle Too Small	Correct Angle 10° - 30°	Angle Too Large
		
Arc Length		
Too Short	Normal	Too Long
		
Travel Speed		
Slow	Normal	Fast
		

S-0061

6-7. Electrode Movement During Welding



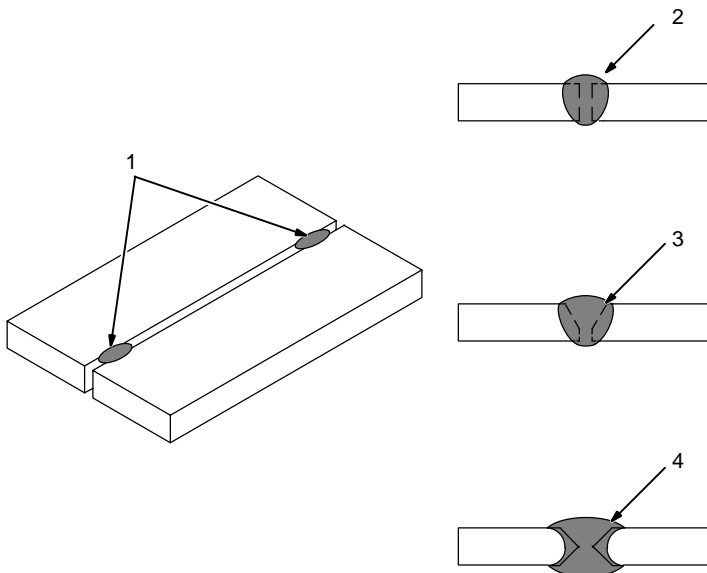
- 1 Stringer Bead – Steady Movement Along Seam
- 2 Weave Bead – Side To Side Movement Along Seam
- 3 Weave Patterns

Use weave patterns to cover a wide area in one pass of the electrode. Do not let weave width exceed 2-1/2 times diameter of electrode.

☞ A single stringer bead is satisfactory for most narrow groove weld joints. For wide groove weld joints or bridging across gaps, a weave bead works better.

S-0054-A

6-8. Butt Joints



- 1 Tack Welds

Prevent edges of joint from drawing together ahead of electrode by tack welding the materials in position before final weld.

- 2 Square Groove Weld

Good for materials up to 3/16 in (5 mm) thick.

- 3 Single V-Groove Weld

Good for materials 3/16 through 3/4 in (5-19 mm) thick. Cut bevel with oxyacetylene or plasma cutting equipment. Remove scale from material after cutting. A grinder can also be used to prepare bevels.

Create 30 degree angle of bevel on materials in V-groove welding.

- 4 Double V-Groove Weld

Good for materials thicker than 3/16 in (5 mm).

S-0662

6-9. Lap Joints

1 Electrode
2 Single-Layer Fillet Weld
Move electrode in circular motion.
3 Multi-Layer Fillet Weld
Weld a second layer when a larger fillet is needed. Remove slag before making another weld pass. Weld both sides of joint for maximum strength.

S-0063 / S-0064

6-10. Tee Joints

1 Electrode
2 Fillet Weld
Keep arc short and move at definite rate of speed. Hold electrode as shown to provide fusion into the corner. Square edge of the weld surface.
For maximum strength weld both sides of upright section.
3 Multi-Layer Deposits
Weld a second layer or more when a larger fillet is needed. Use any of the weaving patterns shown in Section 6-7. Remove slag before making another weld pass.

S-0069 / S-0058-A / S-0061

B. Welding Troubleshooting

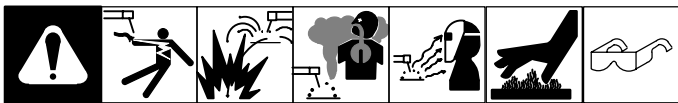


Table 6-1. Porosity

Possible Causes	Corrective Actions
Arc length too long.	Reduce arc length.
Damp electrode.	Use dry electrode.
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, slag, and dirt from work surface before welding.

Table 6-2. Excessive Spatter

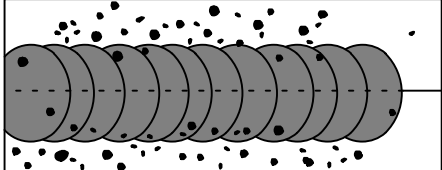
		<p>Excessive Spatter – scattering of molten metal particles that cool to solid form near weld bead.</p>
Possible Causes	Corrective Actions	
Amperage too high for electrode.	Decrease amperage or select larger electrode.	
Arc length too long or voltage too high	Reduce arc length or voltage.	

Table 6-3. Incomplete Fusion

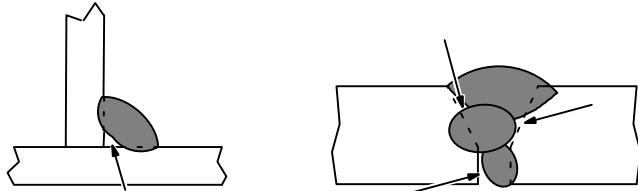
		<p>Incomplete Fusion – failure of weld metal to fuse completely with base metal or a preceding weld bead.</p>
Possible Causes	Corrective Actions	
Insufficient heat input.	Increase amperage. Select larger electrode and increase amperage.	
Improper welding technique.	<p>Place stringer bead in proper location(s) at joint during welding.</p> <p>Adjust work angle or widen groove to access bottom during welding.</p> <p>Momentarily hold arc on groove side walls when using weaving technique.</p> <p>Keep arc on leading edge of weld puddle.</p>	
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, slag, and dirt from work surface before welding.	

Table 6-4. Lack Of Penetration

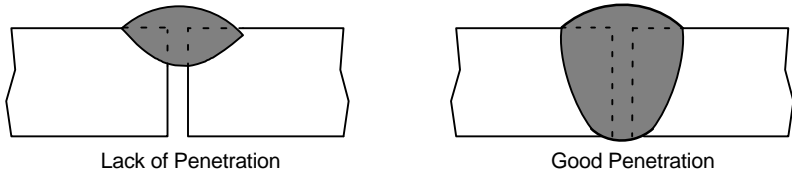
		<p>Lack Of Penetration – shallow fusion between weld metal and base metal.</p>
Possible Causes	Corrective Actions	
Improper joint preparation.	Material too thick. Joint preparation and design must provide access to bottom of groove.	
Improper weld technique.	Keep arc on leading edge of weld puddle.	
Insufficient heat input.	<p>Increase amperage. Select larger electrode and increase amperage.</p> <p>Reduce travel speed.</p>	

Table 6-5. Excessive Penetration

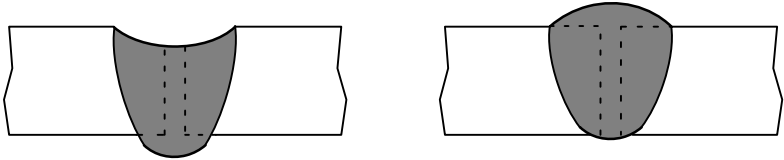
		<p>Excessive Penetration – weld metal melting through base metal and hanging underneath weld.</p>
Excessive Penetration	Good Penetration	
Possible Causes	Corrective Actions	
Excessive heat input.	Select lower amperage. Use smaller electrode. Increase and/or maintain steady travel speed.	

Table 6-6. Burn-Through

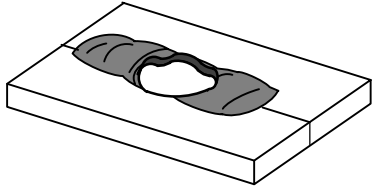
		<p>Burn-Through – weld metal melting completely through base metal resulting in holes where no metal remains.</p>
Possible Causes	Corrective Actions	
Excessive heat input.	Select lower amperage. Use smaller electrode with lower amperage. Increase and/or maintain steady travel speed.	

Table 6-7. Waviness Of Bead

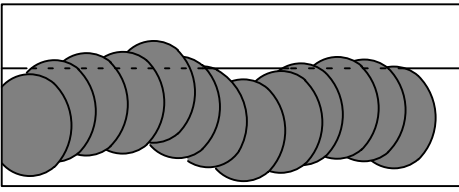
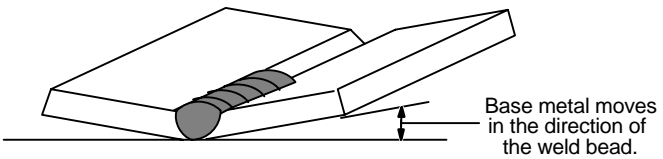
		<p>Waviness Of Bead – weld metal that is not parallel and does not cover joint formed by base metal.</p>
Possible Causes	Corrective Actions	
Unsteady hand.	Use two hands. Practice technique.	

Table 6-8. Distortion

		<p>Distortion – contraction of weld metal during welding that forces base metal to move.</p>
Possible Causes	Corrective Actions	
Excessive heat input.	Use restraint (clamp) to hold base metal in position. Make tack welds along joint before starting welding operation. Select lower amperage for electrode. Increase travel speed. Weld in small segments and allow cooling between welds.	

SECTION 7 – PARTS LIST

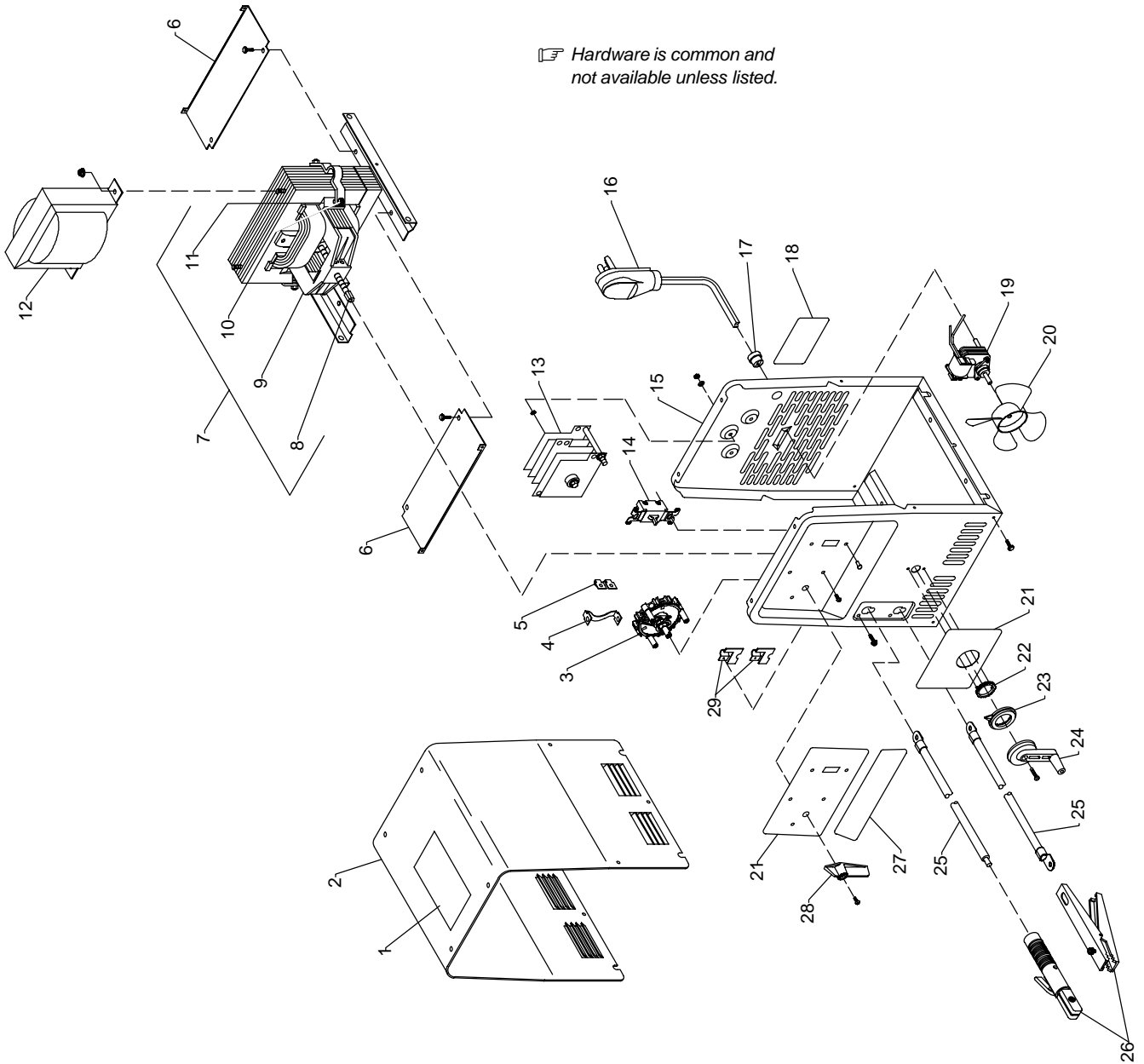


Figure 7-1. Main Assembly (AC/DC model illustrated)

SA-802 245-B

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 7-1. Main Assembly				
.. 1		134 464	.. LABEL, gen precautionary	1
.. 2		190 144	.. WRAPPER	1
.. 3	S2	190 079	.. SWITCH, secondary 2-position (AC 225 model) & (AC 300 model)	1
.. 3	S2	190 080	.. SWITCH, secondary 4-position (AC/DC 225 model) & (AC/DC 300 model)	1
.. 4		190 977	.. BUS BAR, jumper (AC/DC 225 model) & (AC/DC 300 model)	2
.. 5		190 978	.. BUS BAR, jumper (AC/DC 225 model) & (AC/DC 300 model)	1
.. 6		191 122	.. BRACKET, base reinforcing	2
.. 7	T1	190 170	.. TRANSFORMER & SHUNT, (230V 225A model) (consisting of)	1
.. 7	T1	192 467	.. TRANSFORMER & SHUNT, (460V 225A model) (consisting of)	1
.. 7	T1	192 468	.. TRANSFORMER & SHUNT, (115/230V 225A model) (consisting of)	1
.. 7	T1	192 179	.. TRANSFORMER & SHUNT, (220V 300A AC/DC model) (consisting of)	1
.. 7	T1	192 317	.. TRANSFORMER & SHUNT, (220V 300A AC model) (consisting of)	1
.. 7	T1	192 326	.. TRANSFORMER & SHUNT, (230/400V 300A model) (consisting of)	1
.. 7	T1	192 469	.. TRANSFORMER & SHUNT, (460V 300A model) (consisting of)	1
.. 8		190 242	.. SCREW, lead shunt	1
.. 9		190 150	.. SHUNT	1
.. 10		147 907	.. SCREW, 5/16-18 x 1.75 w/loctite	4
.. 11		080 522	.. BLOCK, anti-noise shunt	4
.. 12	Z1	190 145	.. STABILIZER, (AC/DC 225A model)	1
.. 12	Z1	192 177	.. STABILIZER, (AC/DC 300A model)	1
.. 13	SR1	190 303	.. RECTIFIER, (AC/DC 225A model)	1
.. 13	SR1	190 965	.. RECTIFIER, (AC/DC 300A model)	1
.. 14	S1	124 511	.. SWITCH, (all 225A models)	1
.. 14	S1	045 834	.. SWITCH, (all 300A models)	1
.. 15		190 086	.. CASE SECTION	1
.. 16	PLG1	088 297	.. CORD SET (230V 225A model)	1
.. 16		071 906	.. CABLE (460V 225A model) & (115/230V 225A model)	1
.. 16		204 141	.. CABLE (all 300A models)	1
.. 17		111 443	.. BUSHING, strain relief (230V 225A model)	1
.. 17		604 102	.. CONNECTOR (all 300A models), (460V 225A model) & (115/230V model)	1
.. 18		185 759	.. LABEL, warning	1
.. 19	FM	190 234	.. MOTOR, fan (all models except 115/230V)	1
.. 19	FM	191 864	.. MOTOR, fan (115/230V models)	1
.. 20		005 656	.. BLADE, fan	1
.. 21		190 599	.. PANEL, output (AC 225A)	1
.. 21		190 600	.. PANEL, output (AC/DC 225A)	1
.. 21		192 119	.. PANEL, output (AC 300A)	1
.. 21		192 120	.. PANEL, output (AC/DC 300A)	1
.. 22		190 296	.. GEAR, pinion	1
.. 23		190 295	.. GEAR, pointer	1
.. 24		190 241	.. HANDLE, control current	1
.. 25		190 538	.. LEAD LIST	1
.. 26		190 584	.. KIT, electrode holder & gnd clamp	1
.. 27			.. LABEL, brand (order by model & serial no.)	1
.. 28		148 956	.. HANDLE, switch	1
.. 29		190 243	.. CLAMP, weld cable	2

Note: "225A model" and "300A model" refers to the AC output rating of the AC/DC and the AC only machines.
To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

TRUE BLUE® WARRANTY

Effective January 1, 2000

(Equipment with a serial number preface of "LA" or newer)

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

Warranty Questions?

Call
1-800-4-A-MILLER
for your local
Miller distributor.

Your distributor also gives
you ...

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You always get the fast,
reliable response you
need. Most replacement
parts can be in your
hands in 24 hours.

Support

Need fast answers to the
tough welding questions?
Contact your distributor.
The expertise of the
distributor and Miller is
there to help you, every
step of the way.

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
 - * Inverters (input and output rectifiers only)
2. 3 Years — Parts and Labor
 - * Transformer/Rectifier Power Sources
 - * Plasma Arc Cutting Power Sources
 - * Semi-Automatic and Automatic Wire Feeders
 - * Inverter Power Supplies
 - * Intelligig
 - * Engine Driven Welding Generators
(NOTE: Engines are warranted separately by the engine manufacturer.)
3. 1 Year — Parts and Labor
 - * DS-2 Wire Feeder
 - * Motor Driven Guns (w/exception of Spoolmate 185 & Spoolmate 250)
 - * Process Controllers
 - * Positioners and Controllers
 - * Automatic Motion Devices
 - * RFCS Foot Controls
 - * Induction Heating Power Sources
 - * Water Coolant Systems
 - * HF Units
 - * Grids
 - * Maxstar 140
 - * Spot Welders
 - * Load Banks
 - * Miller Cyclomatic Equipment
 - * Running Gear/Trailers
 - * Plasma Cutting Torches (except APT & SAF 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.)
4. 6 Months — Batteries
5. 90 Days — Parts
 - * MIG Guns/TIG Torches
 - * Induction Heating Coils and Blankets

- * APT, ZIPCUT & PLAZCUT Model Plasma Cutting Torches
- * Remote Controls
- * Accessory Kits
- * Replacement Parts (No labor)
- * Spoolmate 185 & Spoolmate 250
- * Canvas Covers

Miller's True Blue® Limited Warranty shall not apply to:

1. **Consumable components; such as contact tips, cutting nozzles, contactors, brushes, slip rings, relays or parts that fail due to normal wear.**
2. 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.
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.

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Owner's Record

Please complete and retain with your personal records.

Model Name

Serial/Style Number

Purchase Date

(Date which equipment was delivered to original customer.)

Distributor

Address

City

State

Zip



For Service

Call 1-800-4-A-Miller or see our website at www.MillerWelds.com to locate a DISTRIBUTOR or SERVICE AGENCY near you.

Always provide Model Name and Serial/Style Number.

Contact your Distributor for:

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Options and Accessories

Personal Safety Equipment

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Replacement Parts

Training (Schools, Videos, Books)

Technical Manuals (Servicing Information and Parts)

Circuit Diagrams

Welding Process Handbooks

Contact the Delivering Carrier for:

File a claim for loss or damage during shipment.

For assistance in filing or settling claims, contact your distributor and/or equipment manufacturer's Transportation Department.

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