



OM-363

213117F

November 2004

Processes



TIG (GTAW) Welding



Stick (SMAW) Welding

Description



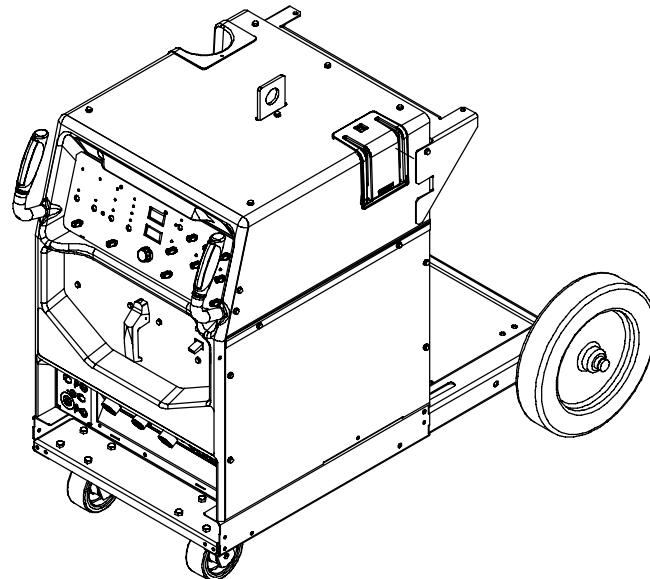
Arc Welding Power Source

Syncrowave[®] 250 DX / 350 LX

And

Syncrowave[®] 250 DX / 350 LX

w/Integrated Cooler



Visit our website at
www.MillerWelds.com

OWNER'S MANUAL

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.

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 the exact part you may need to fix the problem. Warranty and service information for your particular model are also provided.



Miller is the first welding equipment manufacturer in the U.S.A. to be registered to the ISO 9001:2000 Quality System Standard.

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.



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Declaration of Conformity For European Community (CE) Products

NOTE

This information is provided for units with CE certification (see rating label on unit.)

Manufacturer's Name: **Miller Electric Mfg. Co.**

Manufacturer's Address: 1635 W. Spencer Street
Appleton, WI 54914 USA

Declares that the product: **Syncrowave® 250 DX**

conforms to the following Directives and Standards:

Directives

Low Voltage Directive: 73/23/EEC

Electromagnetic compatibility Directives: 89/336/EEC, 92/31/EEC

Machinery Directives: 98/37/EEC, 91/368/EEC, 92/31/EEC, 133/04, 93/68/EEC

Standards

Arc Welding Equipment – Part 10: Electromagnetic Compatibility (EMC) Requirements.
IEC 60974-10 August 2002

Arc Welding Equipment – Part 1: Welding Power Sources. IEC 60974-1 Ed. 2.1

Degrees of Protection Provided By Enclosures (IP Code): IEC 60529 Ed. 2.1

Insulation Coordination For Equipment Within Low-Voltage Systems:
Part 1: Principles, Requirements And Tests. IEC 60664-1 Ed. 1.1

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Telephone: 39(02)98290-1
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Manufacturer's Address: 1635 W. Spencer Street
Appleton, WI 54914 USA

Declares that the product: **Syncrowave® 350 LX**

conforms to the following Directives and Standards:

Directives

Low Voltage Directive: 73/23/EEC

Electromagnetic compatibility Directives: 89/336/EEC, 92/31/EEC

Machinery Directives: 98/37/EEC, 91/368/EEC, 92/31/EEC, 133/04, 93/68/EEC

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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 1-5. 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

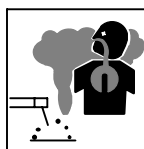
live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- 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.

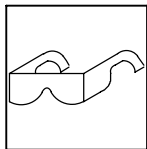
- Wear a welding helmet fitted with a proper shade of filter to protect your face and eyes when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash 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.



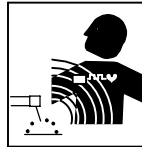
BUILDUP OF GAS can injure or kill.

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



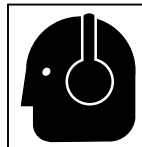
HOT PARTS can cause severe burns.

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



MAGNETIC FIELDS can affect pacemakers.

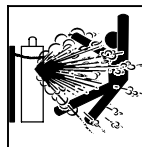
- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.



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.



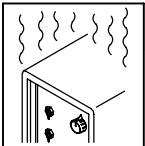
MOVING PARTS can cause injury.

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



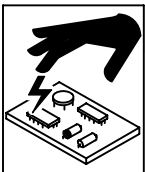
FALLING UNIT can cause injury.

- 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.



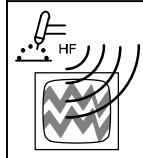
MOVING PARTS can cause injury.

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



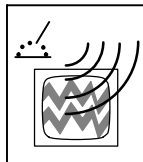
WELDING WIRE can cause injury.

- 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. California Proposition 65 Warnings

- ▲ **Welding or cutting equipment 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.)**
- ▲ **Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.**

For Gasoline Engines:

- ▲ **Engine exhaust contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.**

For Diesel Engines:

- ▲ **Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.**

1-5. Principal Safety Standards

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami FL 33126 (phone: 305-443-9353, website: www.aws.org).

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126 (phone: 305-443-9353, website: www.aws.org).

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269-9101 (phone: 617-770-3000, website: www.nfpa.org and www.sparky.org).

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1735 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102 (phone: 703-412-0900, website: www.cganet.com).

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 (phone: 800-463-6727 or in Toronto 416-747-4044, website: www.csa-international.org).

Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 11 West 42nd Street, New York, NY 10036-8002 (phone: 212-642-4900, website: www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B, from National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269-9101 (phone: 617-770-3000, website: www.nfpa.org and www.sparky.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250 (there are 10 Regional Offices--phone for Region 5, Chicago, is 312-353-2220, website: www.osha.gov).

1-6. 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 2 – CONSIGNES DE SÉCURITÉ – À LIRE AVANT UTILISATION

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2-1. Signification des symboles



Signifie « Mise en garde. Faire preuve de vigilance. » Cette procédure présente des risques identifiés par les 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, Faire preuve de vigilance. » Il y a des dangers liés aux CHOCS ÉLECTRIQUES, aux PIÈCES EN MOUVEMENT et aux PIÈCES CHAUDES. Se reporter aux symboles et aux directives ci-dessous afin de connaître les mesures à prendre pour éviter tout danger.

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

▲ Les symboles ci-après sont utilisés tout au long du présent manuel pour attirer l'attention sur les dangers potentiels et les identifier. Lorsqu'on voit un symbole, faire preuve de vigilance et suivre les directives mentionnées afin d'éviter tout danger. Les consignes de sécurité énoncées ci-après ne font que résumer le contenu des normes de sécurité mentionnées à la section 2-5. Lire et respecter toutes ces normes.

▲ L'installation, l'utilisation, l'entretien et les réparations ne doivent être confiés qu'à des personnes qualifiées.

▲ Pendant l'utilisation de l'appareil, tenir à l'écart toute personne, en particulier les enfants.



LES DÉCHARGES ÉLECTRIQUES peuvent être mortelles.

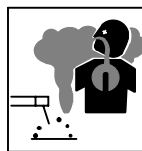
Un simple contact avec des pièces sous tension peut causer une électrocution ou des blessures graves. L'électrode et le circuit de soudage sont sous tension dès que l'appareil est en fonctionnement. Le circuit d'entrée et les circuits internes de l'appareil sont également sous tension. En soudage semi-automatique 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. Tout matériel mal installé ou mal mis à la terre présente un danger.

- Ne jamais toucher aux pièces électriques sous tension.
- Porter des gants et des vêtements de protection secs et exempts de trous.
- S'isoler de la pièce et de la terre au moyen de tapis ou autres dispositifs isolants suffisamment grands pour empêcher tout contact physique avec la pièce ou la terre.
- Ne pas se servir d'une source de courant alternatif dans les zones humides, les endroits confinés ou là où on risque de tomber.
- Ne se servir d'une source de courant alternatif QUE si le procédé de soudage l'exige.
- Si l'utilisation d'une source de courant alternatif 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. Couper/étiqueter l'alimentation selon la norme OSHA 29 CFR 1910.147 (voir les normes de sécurité).
- Installer et mettre à la terre correctement l'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.
- Pour exécuter les branchements d'entrée, fixer d'abord le conducteur de mise à la terre adéquat et contre-vérifier les connexions.
- Vérifier fréquemment le cordon d'alimentation et s'assurer qu'il n'est ni endommagé ni dénudé ; le remplacer immédiatement s'il est endommagé – tout câble dénudé peut causer une électrocution.
- Mettre l'appareil hors tension quand on ne l'utilise pas.
- Ne pas utiliser de câbles usés, endommagés, de calibre insuffisant ou mal épissés.
- Ne pas s'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 d'une autre machine.

- N'utiliser que du matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretien l'appareil conformément au présent 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 sur métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.
- Ne pas connecter plus d'une électrode ou plus d'un câble de masse à un même terminal de sortie.

Il subsiste un 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 énoncées à la section Entretien avant de toucher les pièces.



LES FUMÉES ET LES GAZ peuvent être dangereux.

Le soudage génère des fumées et des gaz dont l'inhalation peut être dangereuse pour la santé.

- Se tenir à distance des fumées et ne pas les inhaler.
- À l'intérieur, ventiler la zone et/ou utiliser un dispositif d'aspiration au niveau de l'arc pour l'évacuation des fumées et des gaz de soudage.
- Si la ventilation est insuffisante, utiliser un respirateur à adduction d'air agréé.
- Lire les fiches techniques de santé-sécurité (FTSS) et les instructions du fabricant concernant les métaux, les consommables, les revêtements, les nettoyeurs et les dégraissateurs.
- Ne travailler dans un espace clos que s'il est bien ventilé ou porter un respirateur à adduction d'air. Demander toujours à un surveillant dûment formé de se tenir à proximité. Des fumées et des gaz de soudage peuvent se substituer à l'air, abaisser la teneur en oxygène et causer des lésions ou des accidents mortels. S'assurer que l'air est respirable.
- Ne pas souder 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 de métaux munis d'un revêtement, tels que la tôle d'acier galvanisée, plombée ou cadmiée, à moins que le revêtement n'ait été enlevé dans la zone de soudage, que l'endroit soit bien ventilé, et si nécessaire, porter un respirateur à adduction d'air. Les revêtements et tous les métaux renfermant ces éléments peuvent dégager des fumées toxiques lorsqu'on les soude.



LES RAYONS DE L'ARC peuvent causer des brûlures oculaires et cutanées.

Le rayonnement de l'arc génère des rayons visibles et invisibles intenses (ultraviolets et infrarouges) susceptibles de causer des brûlures oculaires et cutanées. Des étincelles sont projetées pendant le soudage.

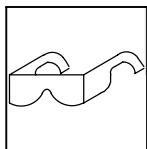
- Porter un masque de soudage muni d'un filtre de la nuance adéquate pour se protéger le visage et les yeux pendant le soudage ou pour regarder (voir les normes de sécurité ANSI Z49.1 et Z87.1).
- Porter des lunettes de sécurité à écrans latéraux sous le masque.
- Utiliser des écrans ou des barrières pour protéger les tiers de l'éclat éblouissant ou aveuglant de l'arc ; leur demander de ne pas regarder l'arc.
- Porter des vêtements de protection en matière durable et ignifuge (cuir ou laine) et des chaussures de sécurité.



LE SOUDAGE peut causer un incendie ou une explosion.

Le soudage effectué sur des récipients fermés tels que des réservoirs, des fûts ou des conduites peut causer leur éclatement. Des étincelles peuvent être projetées de l'arc de soudure. La projection d'étincelles, les pièces chaudes et les équipements chauds peuvent causer des incendies et des brûlures. Le contact accidentel de l'électrode avec tout objet métallique peut causer 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 protéger les tiers de la projection d'étincelles et de métal chaud.
- Ne pas souder à un endroit où des étincelles peuvent tomber sur des substances inflammables.
- Placer 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 agréées.
- Des étincelles et des matières en fusion peuvent facilement passer même par des fissures et des ouvertures de petites dimensions.
- Surveiller tout déclenchement d'incendie et tenir un extincteur à proximité.
- Le soudage effectué sur un plafond, un plancher, une paroi ou une cloison peut déclencher un incendie de l'autre côté.
- Ne pas souder des récipients fermés tels que des réservoirs, des fûts ou des conduites, à moins qu'ils n'aient été préparés conformément à l'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 que le courant ne circule sur une longue distance, par des chemins inconnus, et ne cause des risques d'électrocution et d'incendie.
- Ne pas utiliser le poste de soudage pour dégeler des conduites gelées.
- En cas de non utilisation, enlever la baguette d'électrode du porte-électrode ou couper le fil au raz du tube-contact.
- Porter des vêtements de protection exempts d'huile tels que des gants en cuir, une chemise en tissu épais, des pantalons sans revers, des chaussures montantes et un masque.
- Avant de souder, retirer tout produit combustible de ses poches, tel qu'un briquet au butane ou des allumettes.



LES PARTICULES PROJETÉES peuvent blesser les yeux.

- Le soudage, le burinage, le passage de la pièce à la brosse métallique et le meulage provoquent l'émission d'étincelles et de particules métalliques. Pendant leur refroidissement, les soudures risquent de projeter du laitier.
- Porter des lunettes de sécurité à écrans latéraux agréés, même sous le masque de soudage.



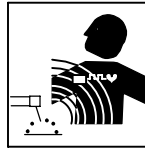
LES ACCUMULATIONS DE GAZ peuvent causer des blessures ou même la mort.

- Couper l'alimentation en gaz protecteur en cas de non utilisation.
- Veiller toujours à bien ventiler les espaces confinés ou porter un respirateur à adduction d'air agréé.



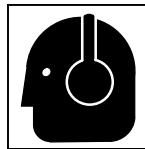
LES PIÈCES CHAUDES peuvent causer des brûlures graves.

- Ne pas toucher les pièces chaudes à main nue.
- Prévoir une période de refroidissement avant d'utiliser le pistolet ou la torche.



LES CHAMPS MAGNÉTIQUES peuvent perturber le fonctionnement des stimulateurs cardiaques.

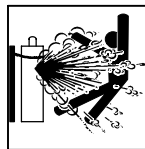
- Les personnes qui portent un stimulateur cardiaque doivent se tenir à distance.
- Ils doivent consulter leur médecin avant de s'approcher d'un lieu où on exécute des opérations de soudage à l'arc, de gougeage ou de soudage par points.



LE BRUIT peut affecter l'ouïe.

Le bruit de certains processus et équipements peut affecter l'ouïe.

- Porter des protecteurs d'oreille agréés si le niveau sonore est trop élevé.



Les BOUTEILLES endommagées peuvent exploser.

Les bouteilles de gaz protecteur contiennent du gaz sous haute pression. Toute bouteille endommagée peut exploser. Comme les bouteilles de gaz font normalement partie du procédé de soudage, les manipuler avec précaution.

- Protéger les bouteilles de gaz comprimé de la chaleur excessive, des chocs mécaniques, du laitier, des flammes nues, 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 poser une torche de soudage sur une bouteille de gaz.
- Ne jamais mettre une électrode de soudage en contact avec une bouteille de gaz.
- Ne jamais souder une bouteille contenant du gaz sous pression – elle risquerait d'exploser.
- N'utiliser que les bouteilles de gaz protecteur, régulateurs, tuyaux et raccords adéquats pour l'application envisagée ; les maintenir en bon état, ainsi que les pièces connexes.
- Détourner la tête lorsqu'on ouvre la soupape d'une bouteille.
- Laisser le capuchon protecteur 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 de la CGA, mentionnées dans les normes de sécurité.

2-3. Autres symboles relatifs à l'installation, au fonctionnement et à l'entretien de l'appareil.



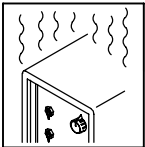
Risque D'INCENDIE OU D'EXPLOSION

- Ne pas placer l'appareil sur une surface inflammable, ni au-dessus ou à proximité d'elle.
- 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.



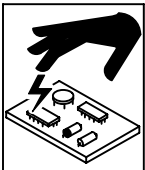
LA CHUTE DE L'APPAREIL peut blesser.

- N'utiliser que l'anneau de levage pour lever l'appareil. NE PAS utiliser le chariot, les bouteilles de gaz ou tout autre accessoire.
- Utiliser un engin de capacité adéquate pour lever l'appareil.
- Si on utilise un chariot élévateur pour déplacer l'unité, s'assurer que les fourches sont suffisamment longues pour dépasser du côté opposé de l'appareil.



L'EMPLOI EXCESSIF peut FAIRE SURCHAUFFER L'ÉQUIPEMENT.

- Prévoir une période de refroidissement ; respecter le cycle opératoire nominal.
- Réduire le courant ou le cycle opératoire avant de reprendre le soudage.
- Ne pas obstruer les orifices ou filtrer l'alimentation en air du poste.



LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

- Mettre un bracelet antistatique 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.



LES PIÈCES MOBILES peuvent causer des blessures.

- Se tenir à l'écart des pièces mobiles.
- Se tenir à l'écart des points de coincement tels que les dévidoirs.



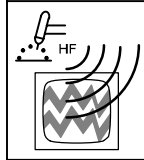
LES FILS DE SOUDAGE peuvent causer des blessures.

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



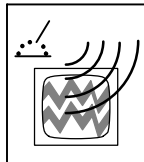
LES ORGANES MOBILES peuvent causer des blessures.

- Se tenir à l'écart des organes mobiles comme les ventilateurs.
- Maintenir fermés et bien fixés les portes, panneaux, recouvrements et dispositifs de protection.



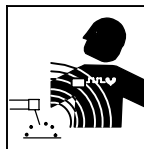
LE RAYONNEMENT HAUTE FRÉQUENCE (H. F.) risque de causer des interférences.

- Le rayonnement haute fréquence peut causer des interférences avec les équipements de radio-navigation et de communication, les services de sécurité et les ordinateurs.
- Ne demander qu'à des personnes qualifiées familiarisées avec les équipements électroniques de faire fonctionner l'installation.
- L'utilisateur est tenu de faire corriger rapidement par un électricien qualifié les interférences causées par l'installation.
- Si la Federal Communications Commission signale des interférences, arrêter immédiatement l'appareil.
- Faire régulièrement contrôler et entretenir l'installation.
- Maintenir soigneusement fermés les panneaux et les portes des sources de haute fréquence, maintenir le jeu d'éclatement au réglage adéquat et utiliser une terre et un blindage pour réduire les interférences éventuelles.



LE SOUDAGE À L'ARC peut causer des interférences.

- L'énergie électromagnétique peut causer des interférences avec 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 au point de vue électromagnétique.
- Pour réduire la possibilité d'interférence, maintenir les câbles de soudage aussi courts que possible, les grouper, et les poser aussi bas que possible (par ex. : à terre).
- Veiller à souder à une distance de 100 mètres de tout équipement électronique sensible.
- Veiller à ce que le poste de soudage soit posé et mis à la terre conformément au présent manuel.
- En cas d'interférences après exécution des directives 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.

2-4. Proposition californienne 65 Avertissements

- ▲ Les équipements de soudage et de coupage produisent des fumées et des gaz qui contiennent des produits chimiques dont l'État de Californie reconnaît qu'ils provoquent des malformations congénitales et, dans certains cas, des cancers. (Code de santé et de sécurité de Californie, chapitre 25249.5 et suivants)
- ▲ Les batteries, les bornes et autres accessoires contiennent du plomb et des composés à base de plomb, produits chimiques dont l'État de Californie reconnaît qu'ils provoquent des cancers et des malformations congénitales ou autres problèmes de procréation. Se laver les mains après manipulation.

Pour les moteurs à essence :

- ▲ Les gaz d'échappement des moteurs contiennent des produits chimiques dont l'État de Californie reconnaît qu'ils provoquent des cancers et des malformations congénitales ou autres problèmes de procréation.

Pour les moteurs diesel :

- ▲ Les gaz d'échappement des moteurs diesel et certains de leurs composants sont reconnus par l'État de Californie comme provoquant des cancers et des malformations congénitales ou autres problèmes de procréation.

2-5. Principales normes de sécurité

Safety in Welding, Cutting, and Allied Processes, norme ANSI Z49.1, de l'American Welding Society, 550 N.W. LeJeune Rd, Miami FL 33126 (téléphone : (305) 443-9353, site Web : www.aws.org).

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping, norme American Welding Society AWS F4.1, de l'American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126 (téléphone : (305) 443-9353, site Web : www.aws.org).

National Electrical Code, norme NFPA 70, de la National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269-9101 (téléphone : (617) 770-3000, sites Web : www.nfpa.org et www.sparky.org).

Safe Handling of Compressed Gases in Cylinders, brochure CGA P-1, de la Compressed Gas Association, 1735 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102 (téléphone : (703) 412-0900, site Web : www.cganet.com).

Code for Safety in Welding and Cutting, norme CSA W117.2, de la Canadian Standards Association, Standards Sales, 178 boulevard

Rexdale, Rexdale (Ontario) Canada M9W 1R3 (téléphone : (800) 463-6727 ou à Toronto : (416) 747-4044, site Web : www.csa-international.org).

Practice For Occupational And Educational Eye And Face Protection, norme ANSI Z87.1, de l'American National Standards Institute, 11 West 42nd Street, New York, NY 10036-8002 (téléphone : (212) 642-4900, site Web : www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, norme NFPA 51B, de la National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269-9101 (téléphone : (617) 770-3000, site Web : www.nfpa.org et www.sparky.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, de l'U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250 (il y a 10 bureaux régionaux – Téléphone pour la Région 5, Chicago : (312) 353-2220, site Web : www.osha.gov).

2-6. Information sur les champs électromagnétiques

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

En parcourant les câbles de soudage, le courant crée des champs électromagnétiques. Les effets potentiels de tels champs restent préoccupants. Cependant, après avoir examiné plus de 500 études qui ont été faites pendant une période de recherche de 17 ans, un comité de spécialistes du National Research Council a conclu : « L'accumulation de preuves n'a pas démontré que l'exposition aux champs magnétiques et aux champs électriques à haute fréquence constitue un risque pour la santé humaine ». Toutefois, les études et l'examen des preuves se poursuivent. En attendant les conclusions finales de la recherche, il serait souhaitable de réduire l'exposition aux champs électromagnétiques pendant le soudage ou le coupage.

Afin de réduire les champs électromagnétiques en milieu de travail, respecter les consignes suivantes :

1. Garder les câbles ensemble en les torsadant ou en les fixant avec du ruban adhésif.
2. Mettre tous les câbles du côté opposé à l'opérateur.
3. Ne pas s'enrouler les câbles autour du corps.
4. Garder le poste de soudage et les câbles le plus loin possible de soi.
5. Placer la pince de masse le plus près possible de la zone de soudage.

Consignes relatives aux stimulateurs cardiaques :

Les personnes qui portent un stimulateur cardiaque doivent avant tout consulter leur médecin. Si ce dernier les déclare aptes, il leur est recommandé de respecter les consignes ci-dessus.

SECTION 3 – DEFINITIONS

3-1. Warning Label Definitions

Warning! Watch Out! There are possible hazards as shown by the symbols.

<p>1 Electric shock from welding electrode or wiring can kill.</p> <p>1.1 Wear dry insulating gloves. Do not touch electrode with bare hand. Do not wear wet or damaged gloves.</p> <p>1.2 Protect yourself from electric shock by insulating yourself from work and ground.</p> <p>1.3 Disconnect input plug or power before working on machine.</p>	<p>2 Breathing welding fumes can be hazardous to your health.</p> <p>2.1 Keep your head out of the fumes.</p> <p>2.2 Use forced ventilation or local exhaust to remove the fumes.</p> <p>2.3 Use ventilating fan to remove fumes.</p> <p>3 Welding sparks can cause explosion or fire.</p> <p>3.1 Keep flammables away from welding. Do not weld near flammables.</p> <p>3.2 Welding sparks can cause fires. Have a fire extinguisher nearby, and have a watchperson ready to use it.</p>	<p>3.3 Do not weld on drums or any closed containers.</p> <p>4 Arc rays can burn eyes and injure skin.</p> <p>4.1 Wear hat and safety glasses. Use ear protection and button shirt collar. Use welding helmet with correct shade of filter. Wear complete body protection.</p> <p>5 Become trained and read the instructions before working on the machine or welding.</p> <p>6 Do not remove or paint over (cover) the label.</p>
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
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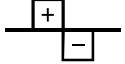








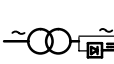



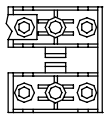
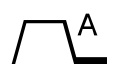


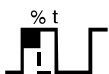



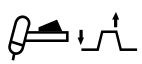



3-2. Torch/Cable Holder Label

<p>1 Warning! Watch Out! There are possible hazards as shown by the symbols.</p> <p>2 Electric shock from wiring can kill.</p> <p>3 Do not operate unit or reach inside when torch/cable holder is removed.</p> <p>4 Do not exceed 25 lb (12.4 kg) maximum load on gun/cable holder or holder may break.</p>
--

206 343

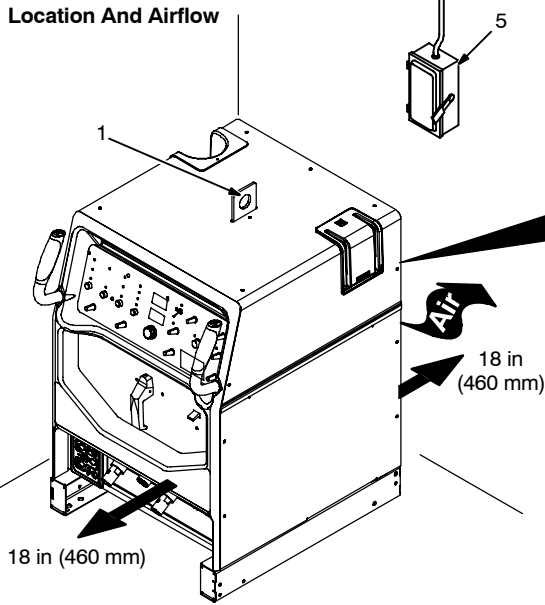
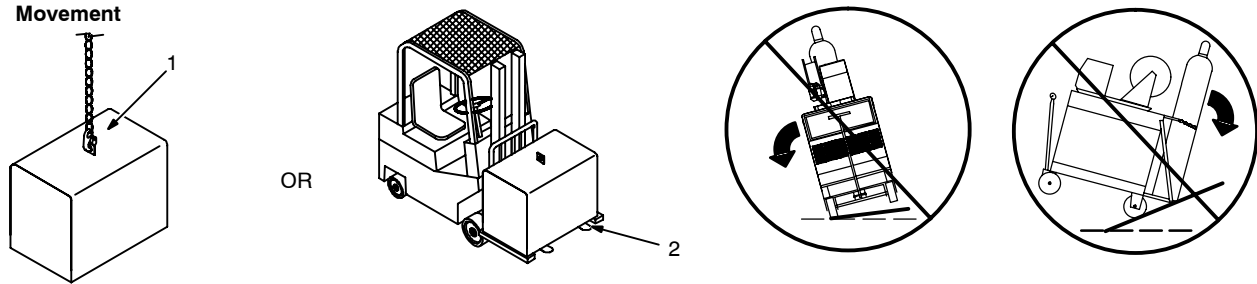
3-3. Symbols And Definitions

NOTE 	<i>Some symbols are found only on CE products.</i>
---	--

A Amperes	 Panel-Local	 Gas Tungsten Arc Welding (GTAW)	 Shielded Metal Arc Welding (SMAW)
V Volts	 Do Not Switch While Welding	 Arc Force (DIG)	 Background Amps
 Output	 Circuit Breaker	 Remote	 Temperature
 Protective Earth (Ground)	 Alternating Current	 High Frequency - Start	 Water Input
 Postflow Timer t_2	 Prewflow Timer t_1	 High Frequency - Continuous	 Water Output
 Gas (Supply)	 Gas Output	 Gas Input	 Increase/Decrease Of Quantity
I On	 Off	% Percent	 Direct Current
 Balance Control	 Maximum Cleaning	 Maximum Penetration	 Electrode Positive
 Electrode Negative	 Final Slope t	 Meter	 Single-Phase
U₀ Rated No Load Voltage (Average)	U₁ Primary Voltage	U₂ Conventional Load Voltage	 Line Connection
I₁ Primary Current	I₂ Rated Welding Current	X Duty Cycle	 Single-Phase Combined AC/DC Power Source
IP Degree Of Protection	I_{1eff} Maximum Effective Supply Current	I_{1max} Rated Maximum Supply Current	Hz Hertz
 Electrode	 Work	 Thickness Gauge	 Spark Gap
S Seconds	 Final Amperage A	 Initial Time t	 Initial Amperage A
 Pulse Percent On Time $\% t$	 Spot Time t	 Lift-Arc™	4T  4 Step Trigger Operation Sequence
 Trigger Hold	 Pulser On-Off	 Pulse Frequency f	 Input V

SECTION 4 – INSTALLATION

4-1. Selecting A Location



250 DX Models

3

SERIAL NO. XXXXXX3 LR5071
 STOCK NO. XXXXXXXXXXXXX4 US

PROTECTED BY ONE OR MORE OF THE FOLLOWING US. PATENTS:

XXXXX05 XXXXX06 XXXXX07 XXXXX09
 XXXXX10 XXXXX11 XXXXX15 XXXXX21
 XXXXX24 XXXXX25 XXXXX26 XXXXX32
 XXXXX42 XXXXX47 XXXXX48

EVIDENCE OF LABEL T AMPERING VOIDS WARRANT

 2A/15V X 25% 40% 60% 100% L 810 260 200 160 U _i =80V U _i 17 16 16.4 16	310A/11V X 25% 40% 60% 100% L 310 280 200 160 U _i =80V U _i 32 30 29 28.4			
	310A/82V X 25% 40% 60% 100% L 310 280 200 160 U _i =80V U _i 32 30 29 28.4			
 1~60 Hz U _i =200V L=110A U _i =230V L=98A U _i =480V L=48A				

4

350 LX Models

3

SERIAL NO. XXXXXX3 LR5071
 STOCK NO. XXXXXXXXXXXXX4 US

PROTECTED BY ONE OR MORE OF THE FOLLOWING US. PATENTS:

XXXXX05 XXXXX06 XXXXX07 XXXXX09
 XXXXX10 XXXXX11 XXXXX15 XXXXX21
 XXXXX24 XXXXX25 XXXXX26 XXXXX32
 XXXXX42 XXXXX47 XXXXX48

EVIDENCE OF LABEL T AMPERING VOIDS WARRANT

 2A/15V X 30% 40% 60% 100% L 400 380 300 280 U _i =80V U _i 17.8 17.2 16.8 16	400A/18V X 30% 40% 60% 100% L 400 380 300 280 U _i =80V U _i 33 34 32 30			
	400A/98V X 30% 40% 60% 100% L 400 380 300 280 U _i =80V U _i 33 34 32 30			
 1~60 Hz U _i =200V L=160A U _i =230V L=131A U _i =480V L=68A				

4

▲ 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.

- 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 Serial Number/Patent Label
- 4 Rating Label

Use rating label to determine input power needs.

- 5 Line Disconnect Device

Locate unit near correct input power supply.

▲ Special installation may be required where gasoline or volatile liquids are present – see NEC Article 511 or CEC Section 20.

▲ Be careful when placing or moving unit over uneven surfaces.

4-2. Dimensions And Weights

Dimensions	
Height	36-1/4 in (921 mm)
Width	23 in (584 mm)
Length	28 in (711 mm)
A	25 in (635 mm)
B	1-25/64 in (35 mm)
C	1-5/8 in (41 mm)
D	22 in (559 mm)
E	20 in (508 mm)
F	22-1/4 (565 mm)
G	1-1/8 in (29 mm)
H	1/2 in (13 mm) Dia
Weight	
400 lbs (181 kg) For 250 DX Models	
496 lbs (225 kg) For 350 LX Models	

4-3. Cooler Specifications

Cooler Specifications	
Cooler Tank Capacity	3 gallons (11.4 L)
Coolant Flow Rate	1 liter per minute (1.1 quart)
Use With Torches Rated Up To 400 Amperes	

4-4. Welding Power Source Specifications

A. For 350 LX Models

Rated Welding Output	PFC **	Amperes Input at AC Balanced Rated Load Output, 50/60 Hz, Single-Phase								KVA	KW	Amperage Range	Max OCV
		200V	220V	230V	400V	440V	460V	520V	575V				
NEMA Class I (60) – 300 Amperes, 32 Volts AC, 60% Duty Cycle	No PFC	125 3.3*	103 2.2*	110 2.0*	57 1.5*	52 1.2*	55 1.7*	43 1.0*	42 1.1*	25.0 0.9*	10.6 0.6*	3 – 400A	80V
	With PFC	92 77*	77 67*	78 69*	40 36*	39 33*	38 34*	33 28*	31 27.2*	18.0 16.6*	10.5 0.6*		
NEMA Class II (40) – 350 Amperes, 34 Volts AC, 40% Duty Cycle	No PFC	146 3.3*	120 2.2*	128 2.6*	66 2.5*	60 1.2*	65 1.7*	51 1.0*	50 1.1*	29.5 0.9*	13.7 0.4*	3 – 400A	80V
	With PFC	114 77*	95 67*	94 69*	49 36*	47 33*	47 34*	40 28*	38 27.2*	21.7 16.6*	13.3 0.6*		

*While idling
**Power Factor Correction

B. For 250 DX Models

Rated Welding Output	PFC**	Amperes Input at AC Balanced Rated Load Output, 60 Hz, Single-Phase				KVA	KW	Amperage Range	Max OCV
		200V	230V	460V	575V				
NEMA Class I (40) – 200 Amperes, 28 Volts AC, 60% Duty Cycle	No PFC	88 *3.3	77 *2.8	38 *1.5	31 *1.1	17.6 *.59	8.6 *.29	3 – 310A	80V
	With PFC	60 *55.3	52 *49.5	26 *24.5	21 *19.6	12.06 *11.2	8.11 *.39	3 – 310A	80V
NEMA Class II (40) – 250 Amperes, 30 Volts AC, 40% Duty Cycle	No PFC	110 *3.3	96 *2.8	48 *1.5	38 *1.1	21.98 *.59	11.76 *.29	3 – 310A	80V
	With PFC	82 *55.3	71 *49.5	35 *24.5	28 *19.6	16.32 *11.2	11.81 *1.93	3 – 310A	80V

*While idling
**Power Factor Correction

Rated Welding Output	PFC**	Amperes Input at AC Balanced Rated Load Output, 50/60 Hz, Single-Phase				KVA	KW	Amperage Range	Max OCV
		220V	400V	440V	520V				
NEMA Class I (40) – 200 Amperes, 28 Volts AC, 60% Duty Cycle	No PFC	82 *3.0	45 *1.6	41 *1.4	35 *1.2	17.6 *.59	8.6 *.29	3 – 310A	80V
	With PFC	61 *45.9	34 *25.1	31 *22.8	26 *23.2	12.06 *11.2	8.11 *.39	3 – 310A	80V
NEMA Class II (40) – 250 Amperes, 30 Volts AC, 40% Duty Cycle	No PFC	100 *3.0	55 *1.6	50 *1.4	42 *1.2	21.98 *.59	11.76 *.29	3 – 310A	80V
	With PFC	81 *45.9	44 *25.1	40 *22.8	34 *23.2	16.32 *11.2	11.81 *1.93	3 – 310A	80V

*While idling
**Power Factor Correction

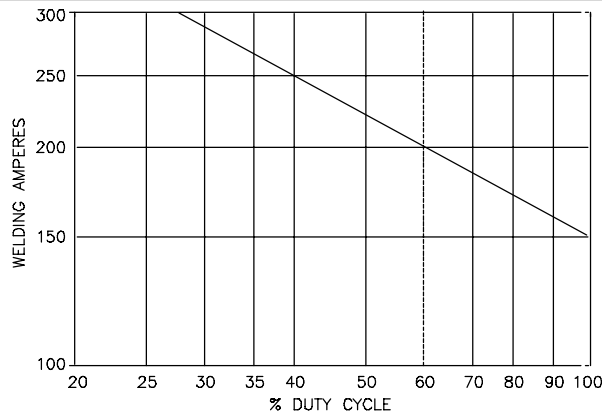
Rated Welding Output	PFC**	Amperes Input at AC Balanced Rated Load Output, 50 Hz, Single-Phase				KVA	KW	Amperage Range	Max OCV
		200V	230V	460V	575V				
NEMA Class I (40) – 175 Amperes, 27 Volts AC, 60% Duty Cycle	No PFC	80 *3.3	69 *2.8	35 *1.5	28 *1.1	15.9 *.59	7.4 *.29	3 – 310A	80V
	With PFC	52 *55.3	45 *49.5	22 *24.5	18 *19.6	10.3 *11.2	7.3 *.39	3 – 310A	80V
NEMA Class II (40) – 225 Amperes, 29 Volts AC, 40% Duty Cycle	No PFC	101 *3.3	88 *2.8	44 *1.5	35 *1.1	20.2 *.59	10.2 *.29	3 – 310A	80V
	With PFC	74 *55.3	64 *49.5	32 *24.5	26 *19.6	14.7 *11.2	10.1 *1.93	3 – 310A	80V

*While idling
**Power Factor Correction

4-5. Duty Cycle And Overheating



250 DX Models

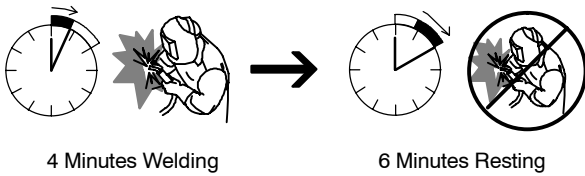


Duty Cycle is the percentage of 10 minutes that the unit can weld at rated load without overheating.

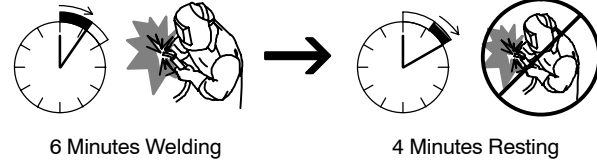
If unit overheats, output stops, front panel voltmeter/ammeter displays a HLP3 or HLP5 message (see Section 7-1), and cooling fans run. Wait fifteen minutes for unit to cool. Reduce amperage or duty cycle before welding.

▲ Exceeding duty cycle can damage unit and void warranty.

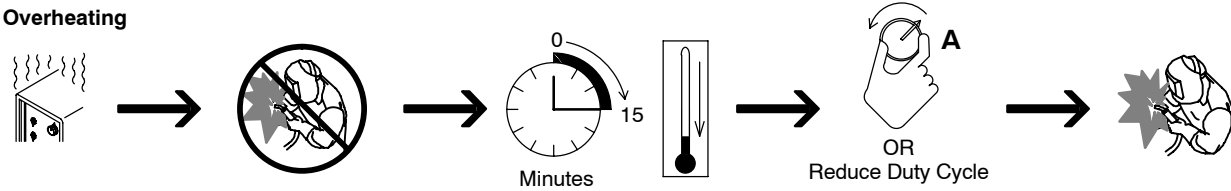
40% Duty Cycle At 250 Amperes



60% Duty Cycle At 200 Amperes

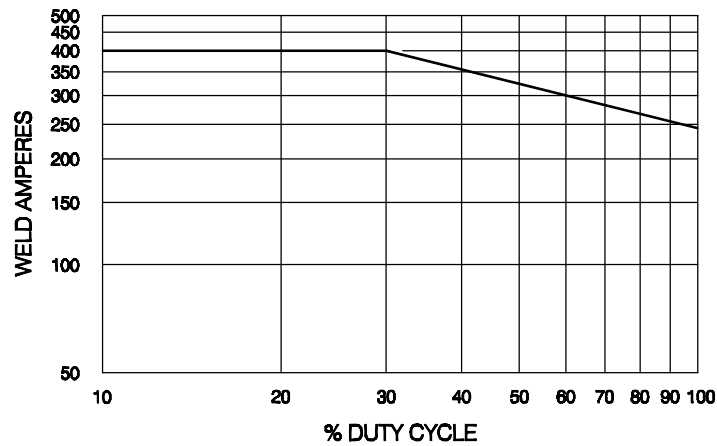


Overheating

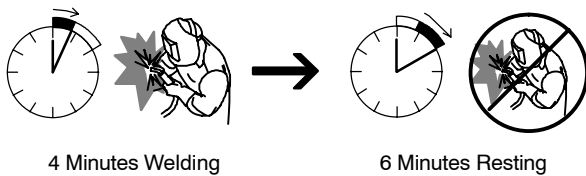


duty1 4/95 / Ref. 116 198

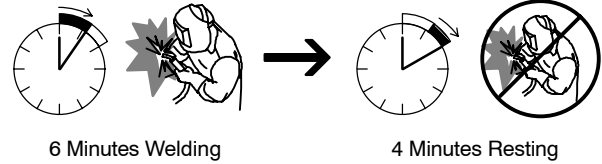
350 LX Models



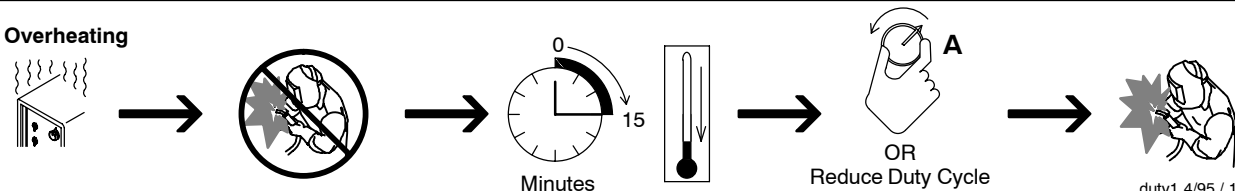
40% Duty Cycle At 350 Amperes



60% Duty Cycle At 300 Amperes



Overheating



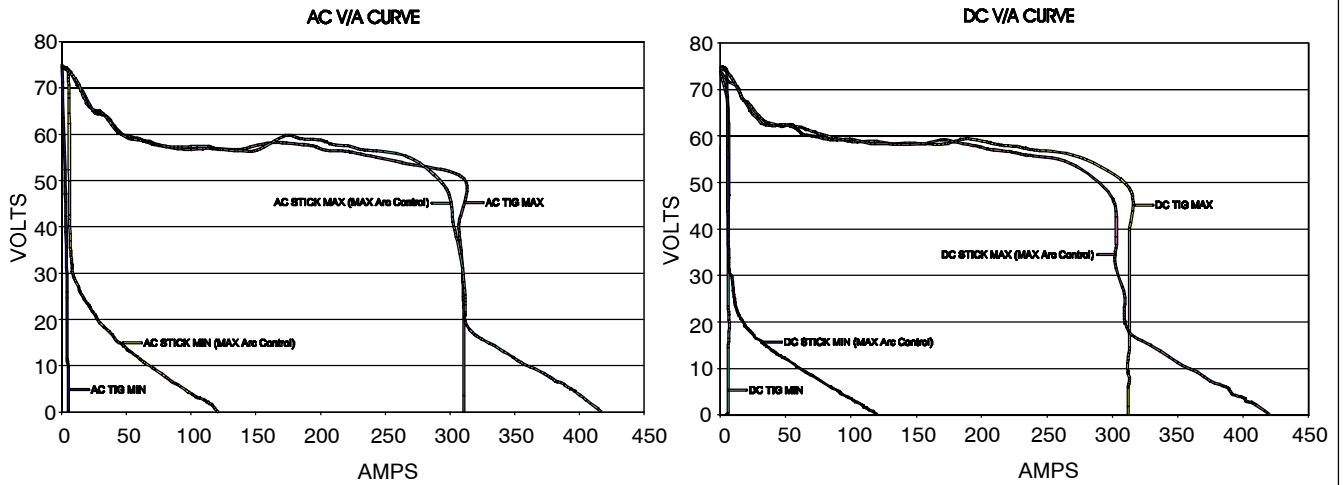
duty1 4/95 / 190 276

4-6. Volt-Ampere Curves

A. For 250 DX Models

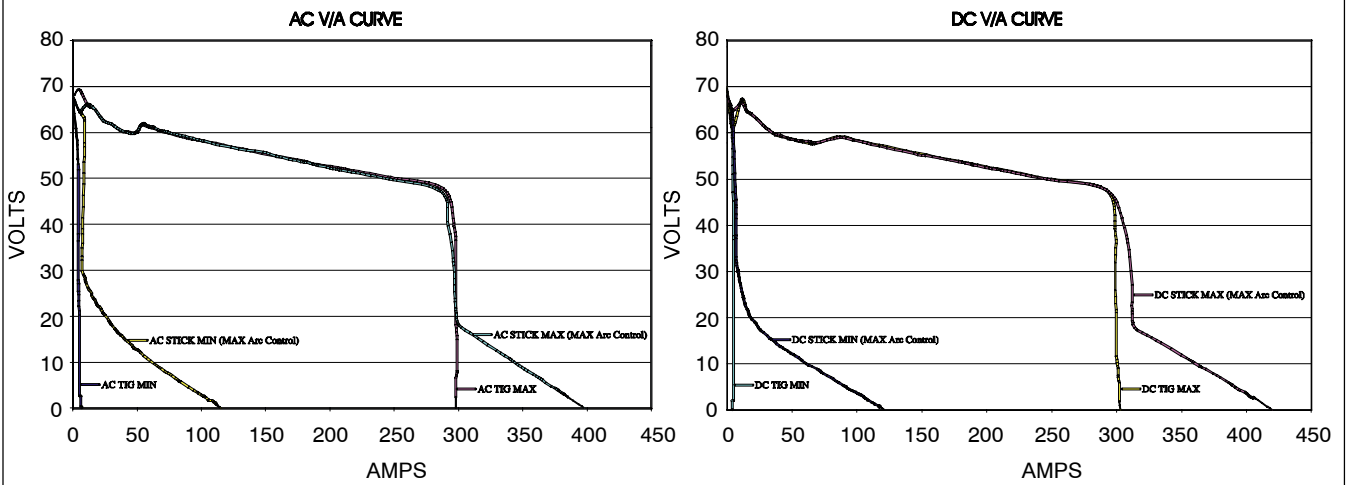
The volt-ampere curves show the minimum and maximum voltage and amperage output capabilities of the welding power source. Curves of other settings fall between the curves shown.

Non CE Models



194 385-A / 194 384-A

CE Models

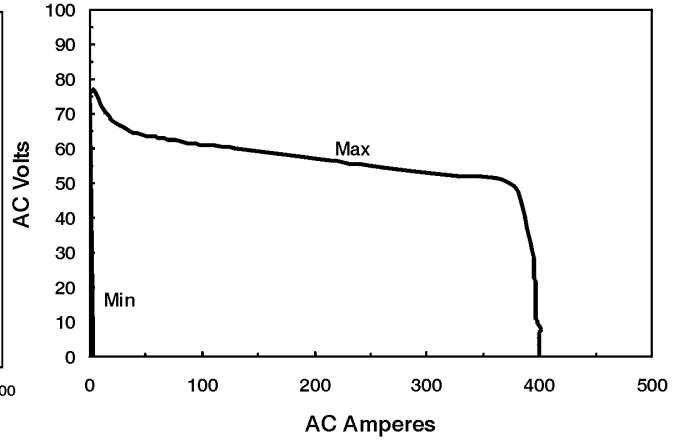
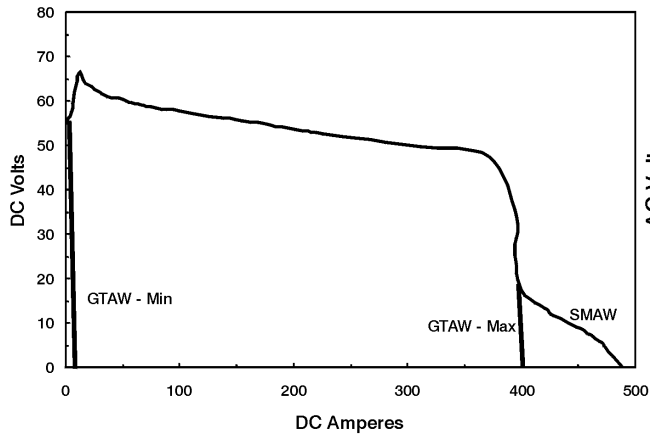


205 631 / 205 632

B. For 350 LX Models

350 Amperes Models

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 - ST-190 277 / ST-190 278

4-7. Weld Output Terminals And Selecting Cable Sizes



▲ ARC WELDING can cause Electromagnetic Interference.

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.

 Weld Output Terminals ▲ Turn off power before connecting to weld output terminals. ▲ Do not use worn, damaged, undersized, or poorly spliced cables.	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)
	Welding Amperes	10 – 60% Duty Cycle	60 – 100% Duty Cycle	10 – 100% Duty Cycle					
 Ref. 803 588-A	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

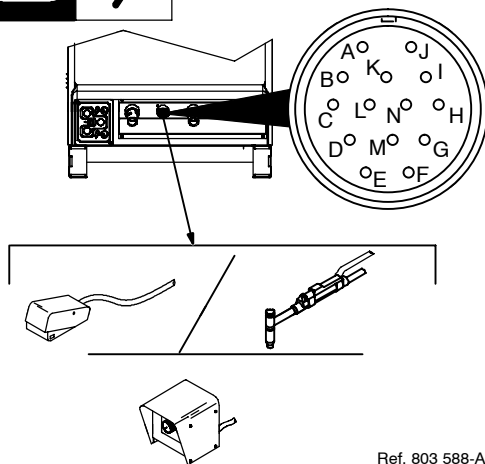
Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of at least 300 circular mils per ampere
 *Select weld cable size for pulsing application at peak amperage value..

S-0007-D

4-8. Remote 14 Receptacle Information



▲ Turn off power before connecting to receptacle.




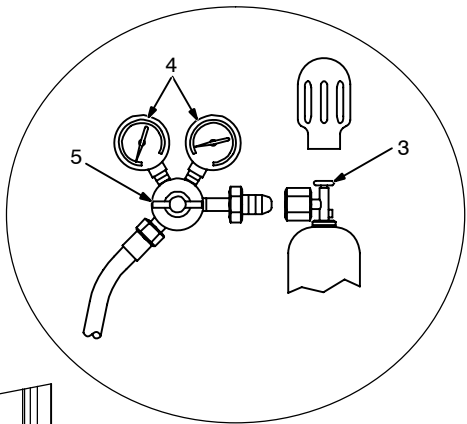
Ref. 803 588-A

REMOTE 14	Socket*	Socket Information
24 VOLTS DC OUTPUT CONTACTOR	A	Contact control 24 volts dc.
	B	Contact closure to A completes 24 volts dc contactor control circuit and enables output.
A REMOTE OUTPUT CONTROL	C	Output to remote control; 0 to +10 volts dc output to remote control.
	D	Remote control/feedback circuit common.
	E	0 to +10 volts dc input command signal from remote control.
A/V AMPERAGE VOLTAGE	F	Current feedback; +1 volt dc per 100 amperes.
	H	Voltage feedback; +1 volt dc per 10 volts output.
GND	K	Chassis common.

*The remaining sockets are not used.

4-9. Shielding Gas Connections And 115 Volts AC Duplex Receptacle




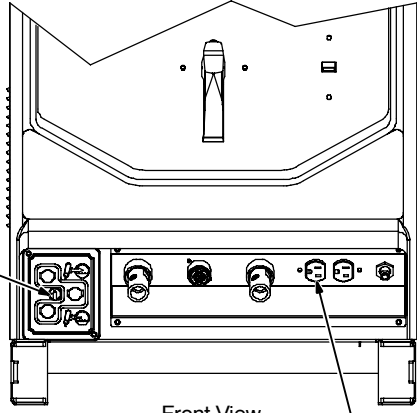


▲ Turn Off power before connecting to receptacle.

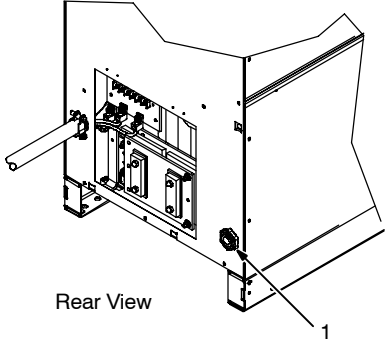
- 1 Gas Valve In Connection
Located on rear of unit.
- 2 Gas Valve Out Connection
Connections have 5/8-18 right-hand threads.
- 3 Cylinder Valve
Open valve slightly so gas flow blows dirt from valve. Close valve.
- 4 Regulator/Flow Gauge
Connect regulator/flow gauge to gas cylinder.
Connect customer supplied gas hose between regulator/flow gauge and gas in fitting.
- 5 Flow Adjust
Typical flow rate is 20 cfh (cubic feet per hour).
- 6 115 V 15 Amp AC Receptacle
Receptacle is protected from overload by circuit breaker CB1 (see Section 6-3).

Tools Needed:

 5/8, 3/4, 1-1/8 in



Front View



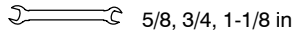
Rear View

Ref. 803 588-A / Ref. 803 585-A / Ref. 157 858

4-10. Cooler Connections And Operation



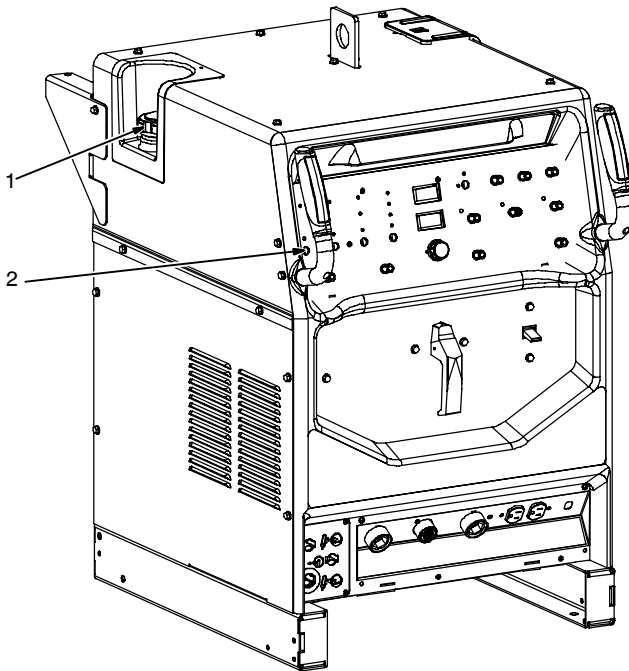
Tools Needed:

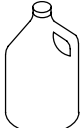


Cooler Tank Capacity: 3 gallons (11.4 L)

Cooler Flow Rate: 1 liter per minute (1.1 qt)

Use With Torches Rated Up To 400 Amperes



Application	GTAW Or Where HF* Is Used
 Coolant	MILLER Low Conductivity Coolant No. 043 810**; Distilled Or Deionized Water OK Above 32° F (0° C)

*HF: High Frequency Current

**MILLER coolants protect to -37° F (-38° C) and resist algae growth.

▲ Use of any coolant other than those listed in the table voids the warranty on any parts that come in contact with the coolant (pump, radiator, etc.).

▲ Turn Off power before connecting to coolant fittings.

1 Coolant Tank Cap

Use table below to select proper coolant. Remove cap and add coolant. Fill to capacity. Keep coolant level full.

Connect torch as shown in Section 4-11.

Priming

Initial setup requires priming of the coolant system before operation. To prime the system, proceed as follows:

2 Process Control Switch

For cooler operation, place Process Control switch in the GTAW (TIG) position according to Section 5-3.

Press and HOLD the Process Control switch. After 2 seconds the volt-meter displays *[CLR]* to indicate system priming has initiated.

Continue to hold the Process Control switch until the amp meter displays *[FLO]* to indicate priming is complete and adequate flow has been detected (approx. 40 seconds).

Operation

Cooler will activate when a valid arc is detected. A system pressure switch will detect and monitor coolant flow. If flow is not detected within 5 seconds of welding, weld output stops, and Help Message 19 is displayed on the volt/amp meters (see Section 7-1).

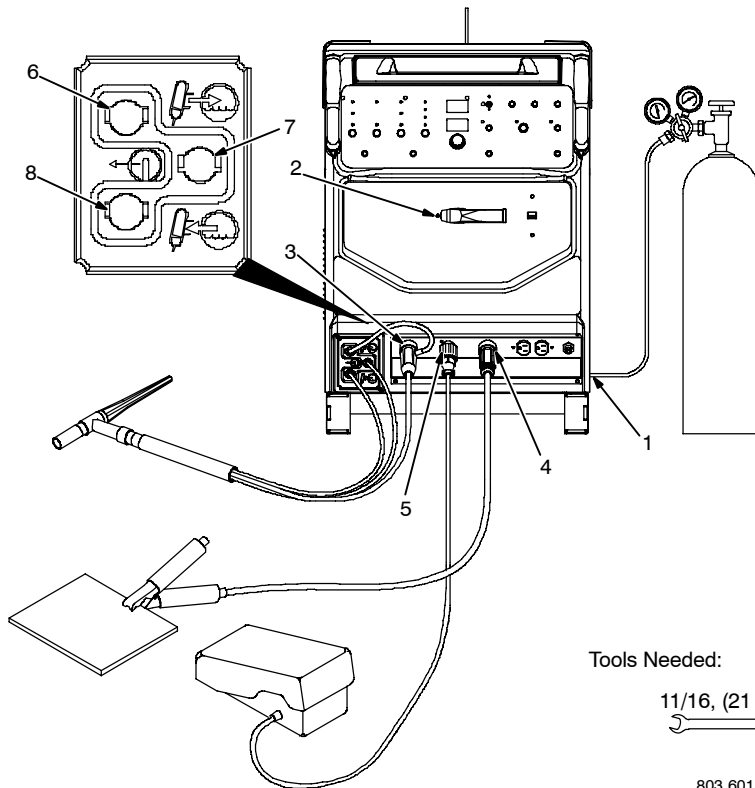
During normal operation cooler will continue to operate for 20 seconds after welding arc ends, or until the coolant temperature is adequately reduced.

Changing A Water-Cooled Torch

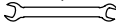
▲ Turn Off power before making torch and coolant connections.

Connect new torch and follow priming procedure described above. To avoid a Help Message Code, press and hold Process Control switch for approximately 20 seconds to ensure the torch is completely primed, even if amp meter displays *[FLO]* sooner.

4-11. TIG Connections With A Water-Cooled Torch



Tools Needed:

11/16, (21 mm)


803 601-B

▲ Turn Off power before making connections.

1 Gas-In Connection

Connect gas hose from gas supply to gas-in connector.

2 Output Selector Switch (See Section 5-2)

Switch is shown in DCEN (direct current electrode negative) position for TIG HF Impulse DCEN welding. For front panel control display, see Section 4-14. For TIG AC welding, place switch in AC position. For TIG AC front panel control display, see Section 4-15.

3 Electrode Weld Output Terminal

Connect TIG torch to electrode weld output terminal.

4 Work Weld Output Terminal

Connect work lead to work weld output terminal.

5 Remote 14 Receptacle

Connect desired remote control to Remote 14 receptacle (see Section 4-8).

6 Water-In (From Torch) Connection

Connect torch water-out (red) hose to welding power source water-in connection.

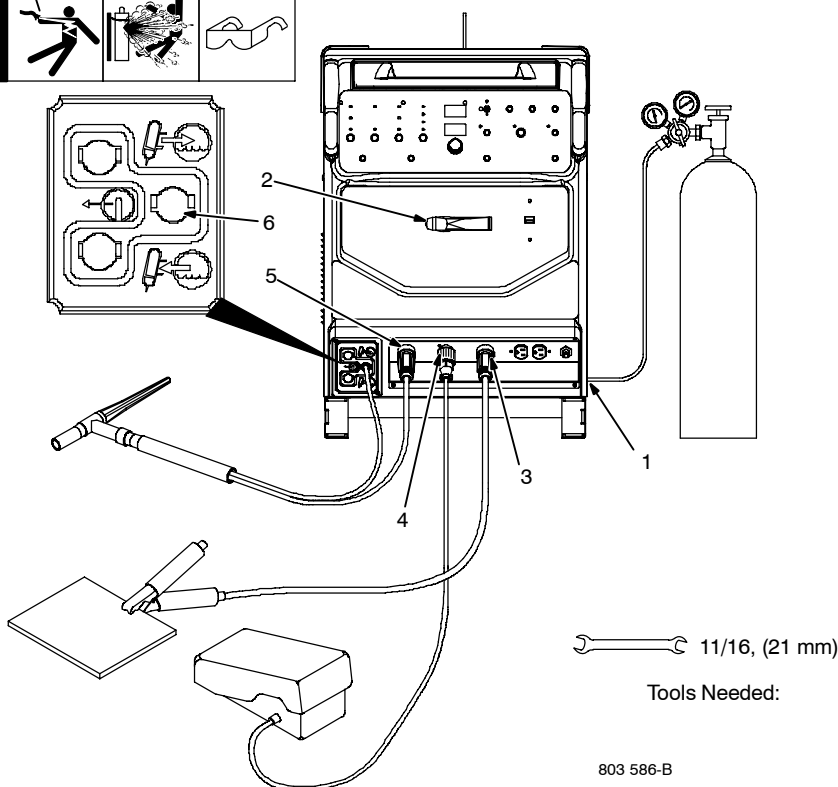
7 Gas-Out Connection

Connect torch gas hose to gas-out fitting.

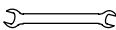
8 Water-Out (To Torch) Connection

Connect torch water-in (blue) hose to welding power source water-out connection.

4-12. TIG Connections With A Two-Piece Air-Cooled Torch



Tools Needed:

 11/16, (21 mm)

803 586-B

▲ Turn Off power before making connections.

1 Gas-In Connection

Connect gas hose from gas supply to gas-in connection.

2 Output Selector Switch (See Section 5-2)

Switch is shown in DCEN (direct current electrode negative) position for TIG HF Impulse DCEN welding. For front panel control display, see Section 4-14. For TIG AC welding, place switch in AC position (see Section 5-2). For TIG AC front panel control display, see Section 4-15.

3 Work Weld Output Terminal

Connect work lead to work weld output terminal.

4 Remote 14 Receptacle

Connect desired remote control to Remote 14 receptacle (see Section 4-8).

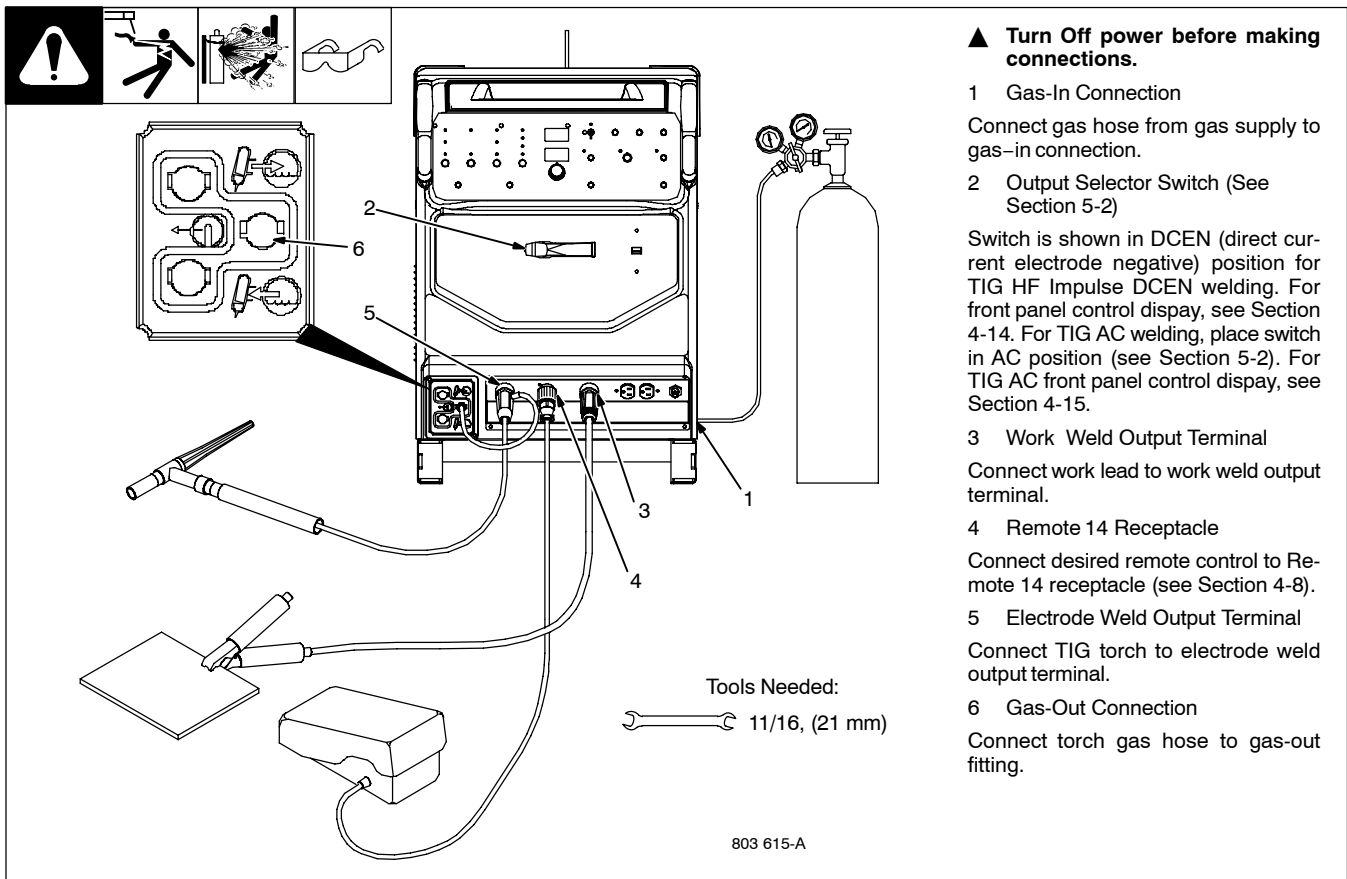
5 Electrode Weld Output Terminal

Connect TIG torch to electrode weld output terminal.

6 Gas-Out Connection

Connect torch gas hose to gas-out fitting.

4-13. TIG Connections With A One-Piece Air-Cooled Torch



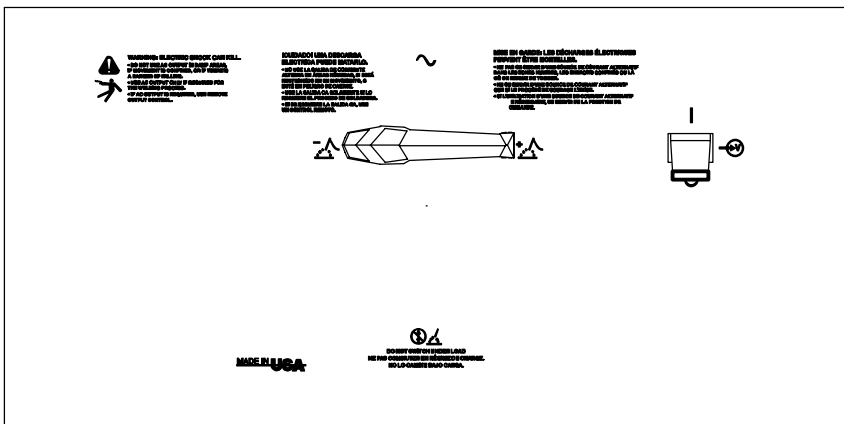
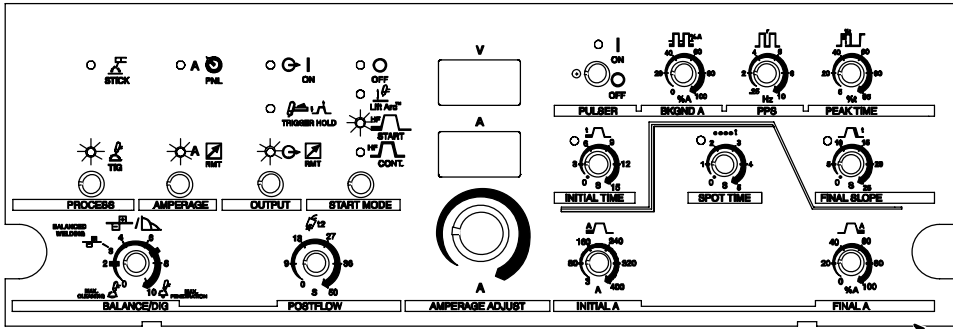
4-14. Front Panel Display For TIG HF Impulse DCEN (Direct Current Electrode Negative)



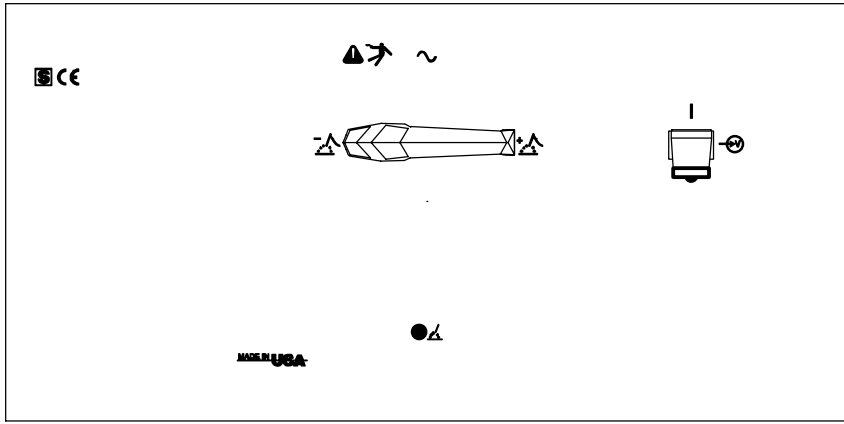
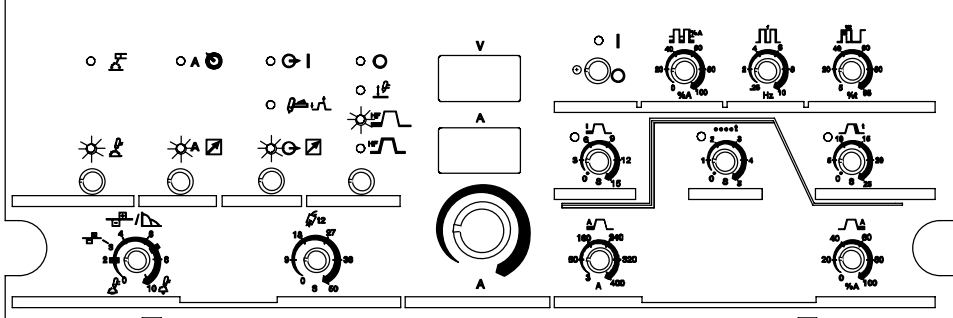
1 Front Panel
 Correct front panel display for basic TIG HF Impulse DCEN welding.

☞ For all front panel switch pad controls: press switch pad to turn on light and enable function.

NOTE: Green on nameplate indicates a TIG function (see Section 5-1 for description of controls).



(CE Nameplate)



4-15. Front Panel Display For TIG AC

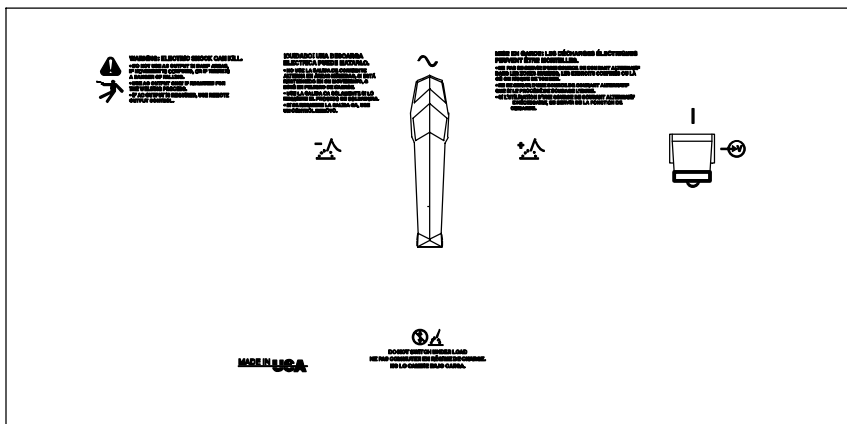
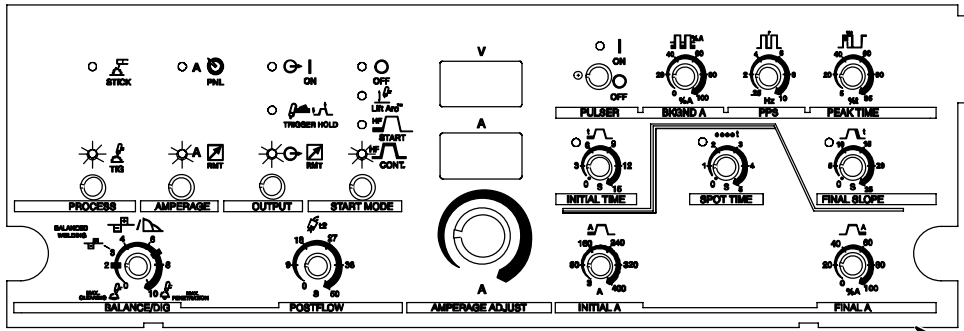


1 Front Panel

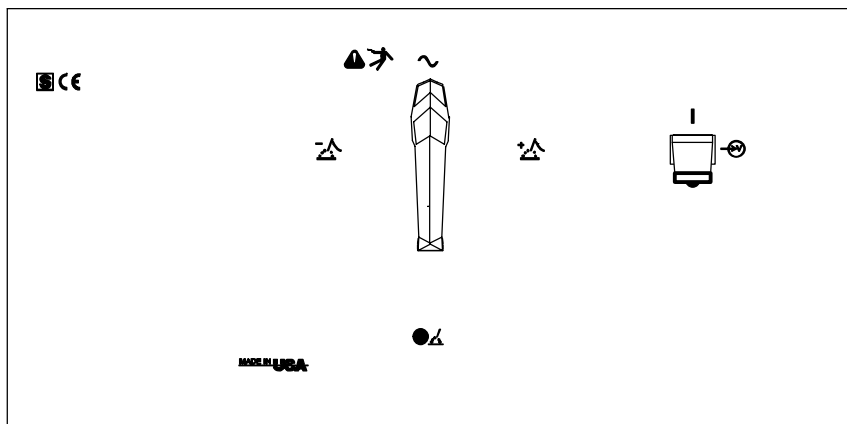
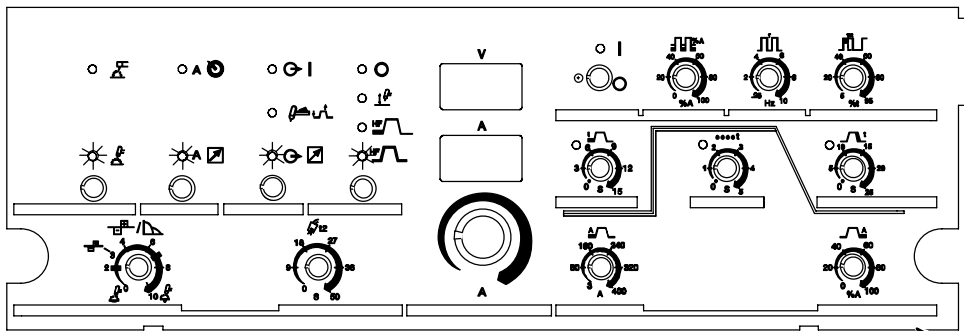
Correct front panel display for basic TIG AC welding.

For all front panel switch pad controls: press switch pad to turn on light and enable function.

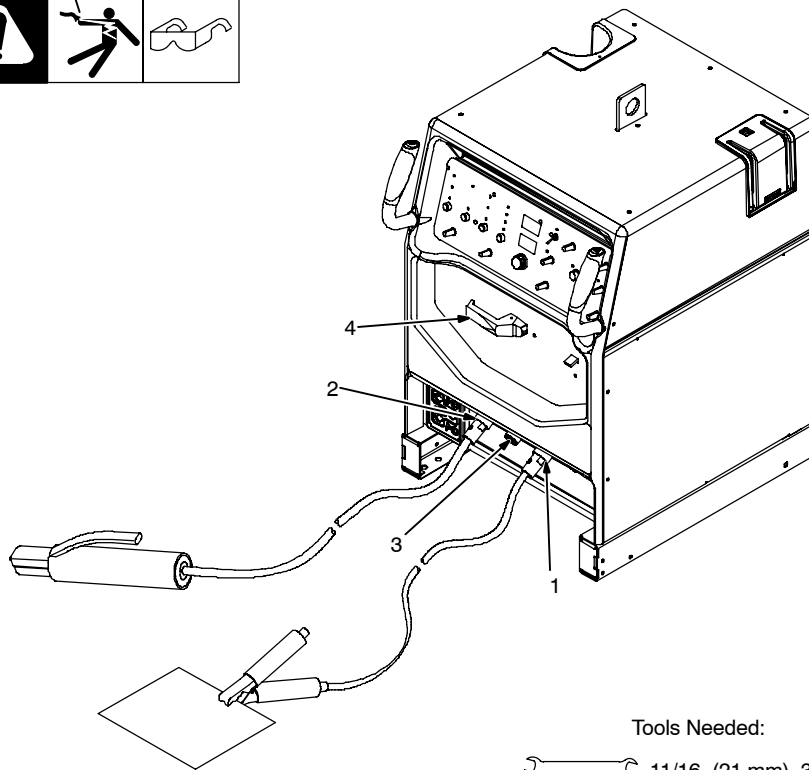
NOTE: Green on nameplate indicates a TIG function (see Section 5-1 for description of controls).




(CE Nameplate)



4-16. Stick Connections



Tools Needed:
 11/16, (21 mm), 3/4 in

▲ Turn Off power before making connections.

1 Work Weld Output Terminal
Connect work lead to work weld output terminal.

2 Electrode Weld Output Terminal

Connect electrode holder to electrode weld output terminal.

3 Remote 14 Receptacle

If desired, connect remote control to Remote 14 receptacle (see Section 4-8).

4 Output Selector Switch (See Section 5-2)

Switch is shown in DCEP (direct current electrode positive) position for Stick DCEP welding. For front panel control display, see Section 4-17. For Stick AC welding, place switch in AC position. For Stick AC front panel control display, see Section 4-18.

803 587-A

4-17. Front Panel Display For Stick DCEP (Direct Current Electrode Positive)

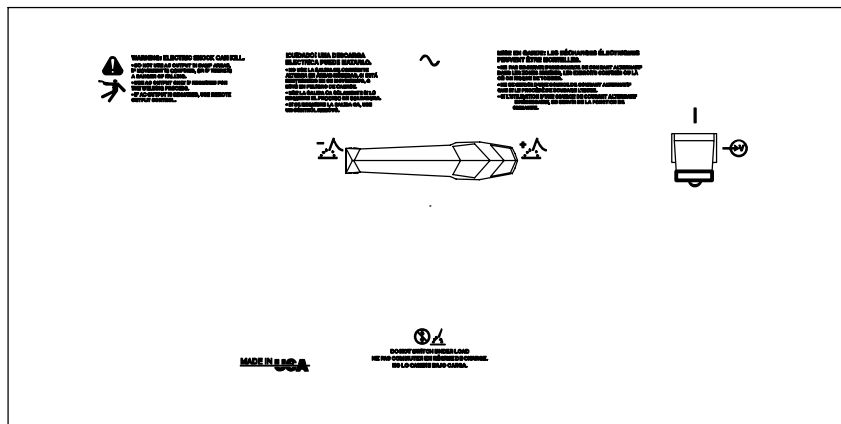
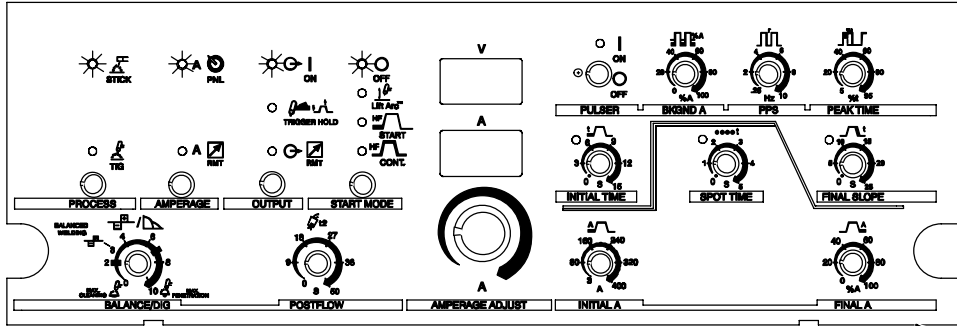


1 Front Panel

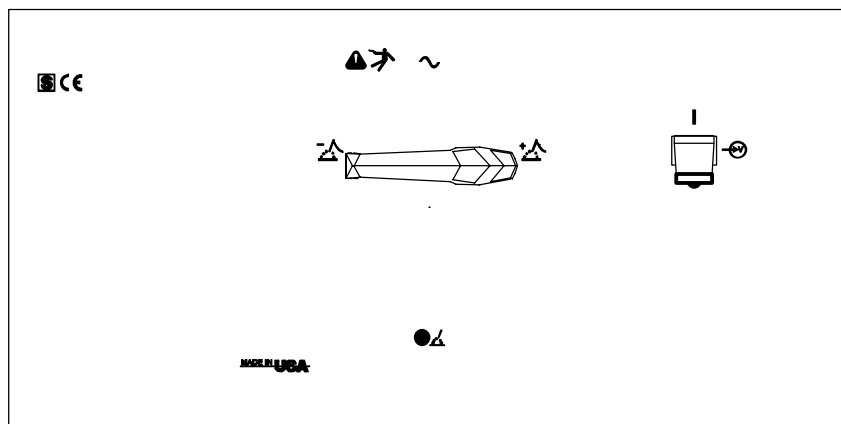
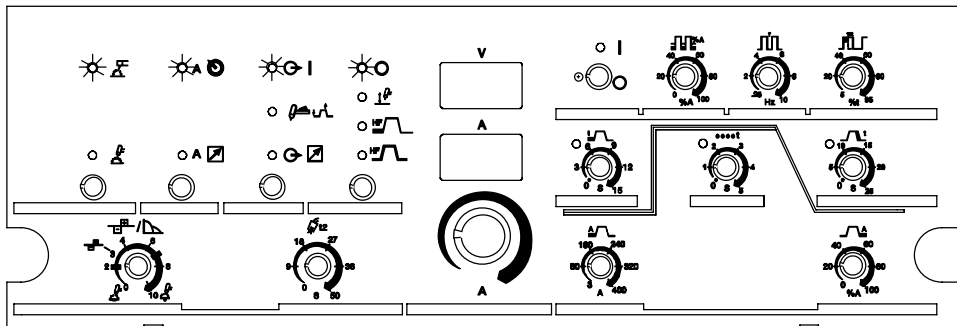
Correct front panel display for basic Stick DCEP welding.

For all front panel switch pad controls: press switch pad to turn on light and enable function.

NOTE: Gray on nameplate indicates a Stick function (see Section 5-1 for description of controls).



(CE Nameplate)



4-18. Front Panel Display For Stick AC

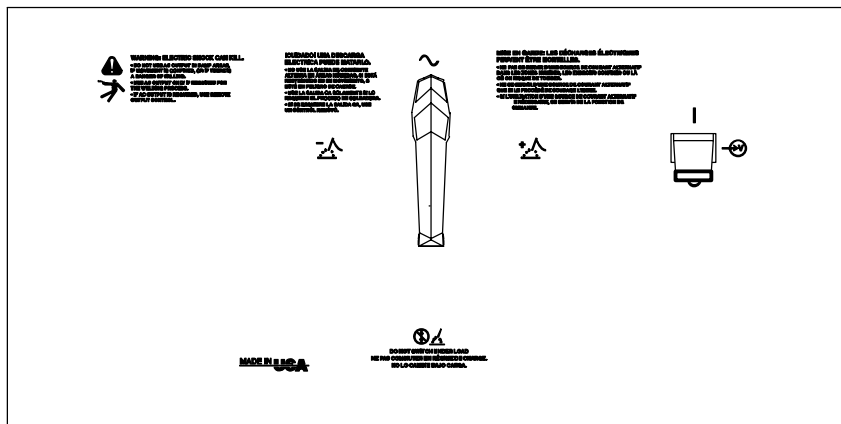
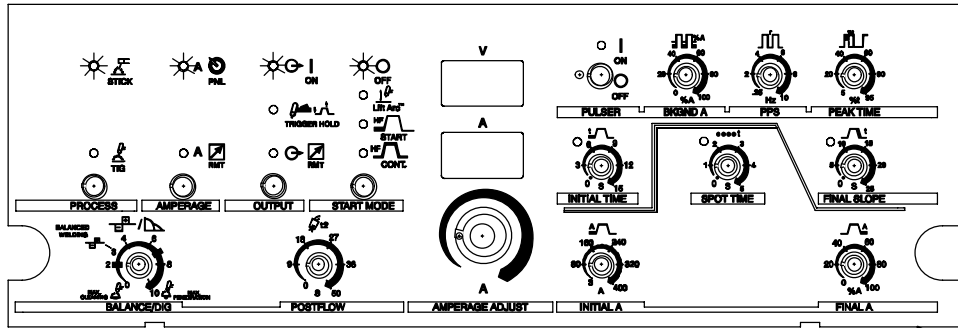


1 Front Panel

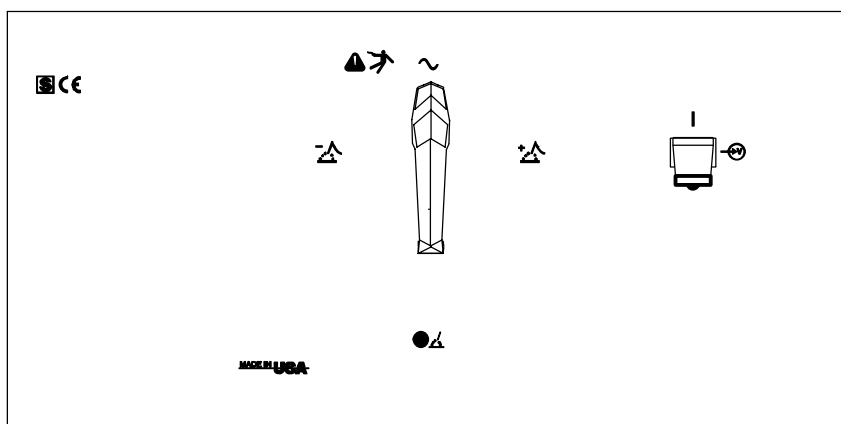
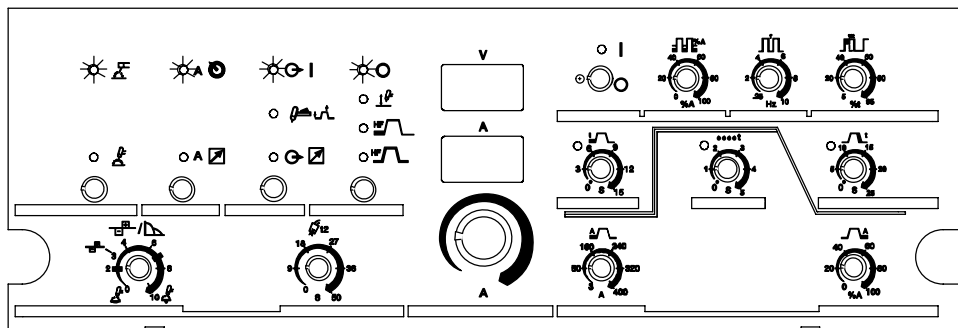
Correct front panel display for basic Stick AC welding.

For all front panel switch pad controls: press switch pad to turn on light and enable function.

NOTE: Gray on nameplate indicates a Stick function (see Section 5-1 for description of controls).



(CE Nameplate)



4-19. Electrical Service Guide

A. For 250 DX Models

NOTE



All values in both tables were calculated at 60% duty cycle.

NOTE



Actual input voltage cannot exceed $\pm 10\%$ of indicated required input voltage shown in both tables. If actual input voltage is outside of this range, damage to unit may occur.

50/60 Hertz Models	Without Power Factor Correction							
Input Voltage	200	220	230	400	440	460	520	575
Input Amperes At Rated Output*	88	82	77	45	41	38	35	31
Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes								
Circuit Breaker ¹								
Time-Delay Fuse ²	125	125	125	70	60	60	50	45
Normal Operating (Fast) Fuse ³	125	125	125	70	60	60	50	45
Min Input Conductor Size In AWG⁴	4	6	6	8	8	10	10	10
Max Recommended Input Conductor Length In Feet (Meters)	167 (51)	137 (42)	153 (47)	305 (93)	369 (112)	281 (86)	352 (107)	439 (134)
Min Grounding Conductor Size In AWG⁴	6	6	6	8	10	10	10	10

* Input amperes at rated output is the amperage draw for that particular input voltage if the machine is run at its rated welding output (see Section 4-4 for rated welding output).

Reference: 1999 National Electrical Code (NEC)

- 1 Choose a circuit breaker with time-current curves comparable to a time-delay fuse.
- 2 "Time-Delay" fuses are UL class "RK5" .
- 3 "Normal Operating" (fast) fuses are UL class "K5" (up to and including 60 amp), and UL class "H" (65 amp and above).
- 4 Conductor data in this section specifies conductor size (excluding flexible cord or cable) between the panelboard and the equipment per NEC Table 310.16. If a flexible cord or cable is used, minimum conductor size may increase. See NEC Table 400.5(A) for flexible cord and cable requirements.

▲ Failure to follow these fuse and circuit breaker recommendations could create an electric shock or fire hazard.

50/60 Hertz Models	With Power Factor Correction							
Input Voltage	200	220	230	400	440	460	520	575
Input Amperes At Rated Output*	60	61	52	34	31	26	26	21
Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes								
Circuit Breaker ¹								
Time-Delay Fuse ²	90	90	80	50	45	40	40	30
Normal Operating (Fast) Fuse ³	90	90	80	50	45	40	40	30
Min Input Conductor Size In AWG⁴	8	8	8	10	10	10	10	12
Max Recommended Input Conductor Length In Feet (Meters)	87 (26)	102 (31)	115 (35)	226 (69)	274 (84)	308 (94)	383 (117)	295 (90)
Min Grounding Conductor Size In AWG⁴	8	8	8	10	10	10	10	12

* Input amperes at rated output is the amperage draw for that particular input voltage if the machine is run at its rated welding output (see Section 4-4 for rated welding output).

Reference: 1999 National Electrical Code (NEC)

- 1 Choose a circuit breaker with time-current curves comparable to a time-delay fuse.
- 2 "Time-Delay" fuses are UL class "RK5" .
- 3 "Normal Operating" (fast) fuses are UL class "K5" (up to and including 60 amp), and UL class "H" (65 amp and above).
- 4 Conductor data in this section specifies conductor size (excluding flexible cord or cable) between the panelboard and the equipment per NEC Table 310.16. If a flexible cord or cable is used, minimum conductor size may increase. See NEC Table 400.5(A) for flexible cord and cable requirements.

▲ Failure to follow these fuse and circuit breaker recommendations could create an electric shock or fire hazard.

B. For 350 LX Models

NOTE	<i>All values in both tables were calculated at 60% duty cycle.</i>
-------------	---

NOTE	<i>Actual input voltage cannot exceed $\pm 10\%$ of indicated required input voltage shown in both tables. If actual input voltage is outside of this range, damage to unit may occur.</i>
-------------	---

50/60 Hertz Models	Without Power Factor Correction							
Input Voltage	200	220	230	400	440	460	520	575
Input Amperes At Rated Output*	125	103	110	57	52	55	43	42
Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes	Circuit Breaker ¹							
	Time-Delay Fuse ²							
	Normal Operating (Fast) Fuse ³							
	150	125	125	70	70	60	60	50
	175	175	175	90	90	80	70	70
Min Input Conductor Size In AWG⁴	3	3	4	8	8	8	8	8
Max Recommended Input Conductor Length In Feet (Meters)	151 (46)	182 (56)	171 (52)	246 (75)	298 (91)	326 (99)	416 (127)	509 (155)
Min Grounding Conductor Size In AWG⁴	6	6	6	8	8	8	8	8

* Input amperes at rated output is the amperage draw for that particular input voltage if the machine is run at its rated welding output (see Section 4-4 for rated welding output).

- Reference: 1999 National Electrical Code (NEC)
- 1 Choose a circuit breaker with time-current curves comparable to a time-delay fuse.
 - 2 "Time-Delay" fuses are UL class "RK5".
 - 3 "Normal Operating" (fast) fuses are UL class "K5" (up to and including 60 amp), and UL class "H" (65 amp and above).
 - 4 Conductor data in this section specifies conductor size (excluding flexible cord or cable) between the panelboard and the equipment per NEC Table 310.16. If a flexible cord or cable is used, minimum conductor size may increase. See NEC Table 400.5(A) for flexible cord and cable requirements.
- ▲ Failure to follow these fuse and circuit breaker recommendations could create an electric shock or fire hazard.**

50/60 Hertz Models	With Power Factor Correction							
Input Voltage	200	220	230	400	440	460	520	575
Input Amperes At Rated Output*	92	77	78	40	39	38	33	31
Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes	Circuit Breaker ¹							
	Time-Delay Fuse ²							
	Normal Operating (Fast) Fuse ³							
	110	100	90	50	50	45	40	35
	125	125	125	70	60	60	50	45
Min Input Conductor Size In AWG⁴	4	6	6	8	8	8	10	10
Max Recommended Input Conductor Length In Feet (Meters)	145 (44)	119 (36)	130 (40)	263 (80)	318 (97)	347 (106)	300 (91)	367 (112)
Min Grounding Conductor Size In AWG⁴	6	6	6	8	10	10	10	10

* Input amperes at rated output is the amperage draw for that particular input voltage if the machine is run at its rated welding output (see Section 4-4 for rated welding output).

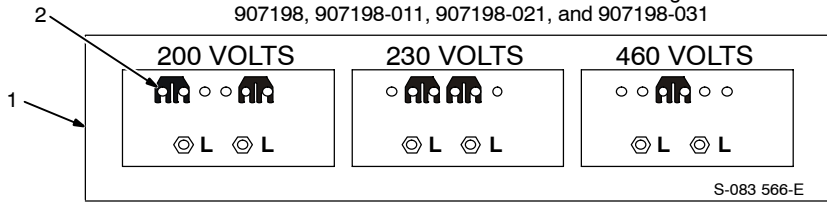
- Reference: 1999 National Electrical Code (NEC)
- 1 Choose a circuit breaker with time-current curves comparable to a time-delay fuse.
 - 2 "Time-Delay" fuses are UL class "RK5".
 - 3 "Normal Operating" (fast) fuses are UL class "K5" (up to and including 60 amp), and UL class "H" (65 amp and above).
 - 4 Conductor data in this section specifies conductor size (excluding flexible cord or cable) between the panelboard and the equipment per NEC Table 310.16. If a flexible cord or cable is used, minimum conductor size may increase. See NEC Table 400.5(A) for flexible cord and cable requirements.
- ▲ Failure to follow these fuse and circuit breaker recommendations could create an electric shock or fire hazard.**

4-20. Placing Jumper Links



Label found on 250 DX models with the following stock numbers:
907194, 907194-021 and, 907194-031

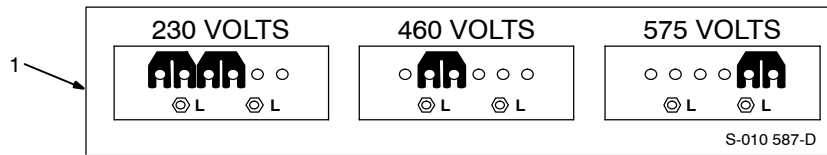
Label found on 350 LX models with the following stock numbers:
907198, 907198-011, 907198-021, and 907198-031



Or

Label found on 250 DX models with the following stock numbers:
907195, 907195-021 and, 907195-031

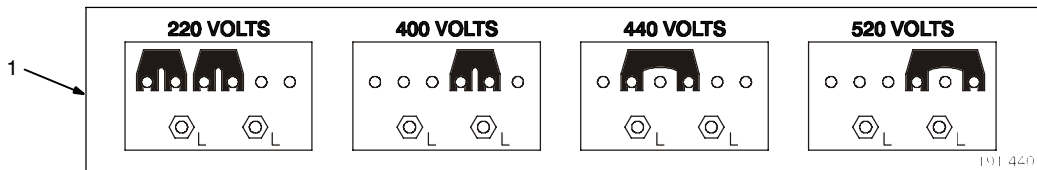
Label found on 350 LX models with the following stock numbers:
907199, 907199-021, and 907199-031



Or

Label found on 250 DX models with stock number 907197

Label found on 350 LX models with stock number 907200



▲ Disconnect and lockout/tag-out input power before installing or moving jumper links.

Check input voltage available at site.

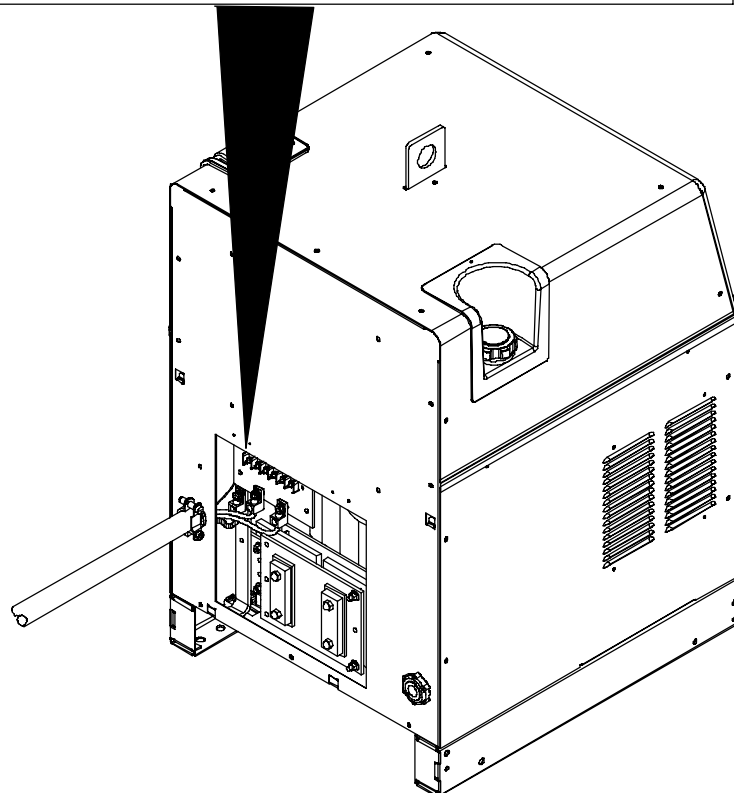
1 Jumper Link Label

Check label – only one label is on unit.

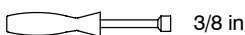
2 Jumper Links

Move jumper links to match input voltage.

Close and secure access door, or go on to Section 4-21.

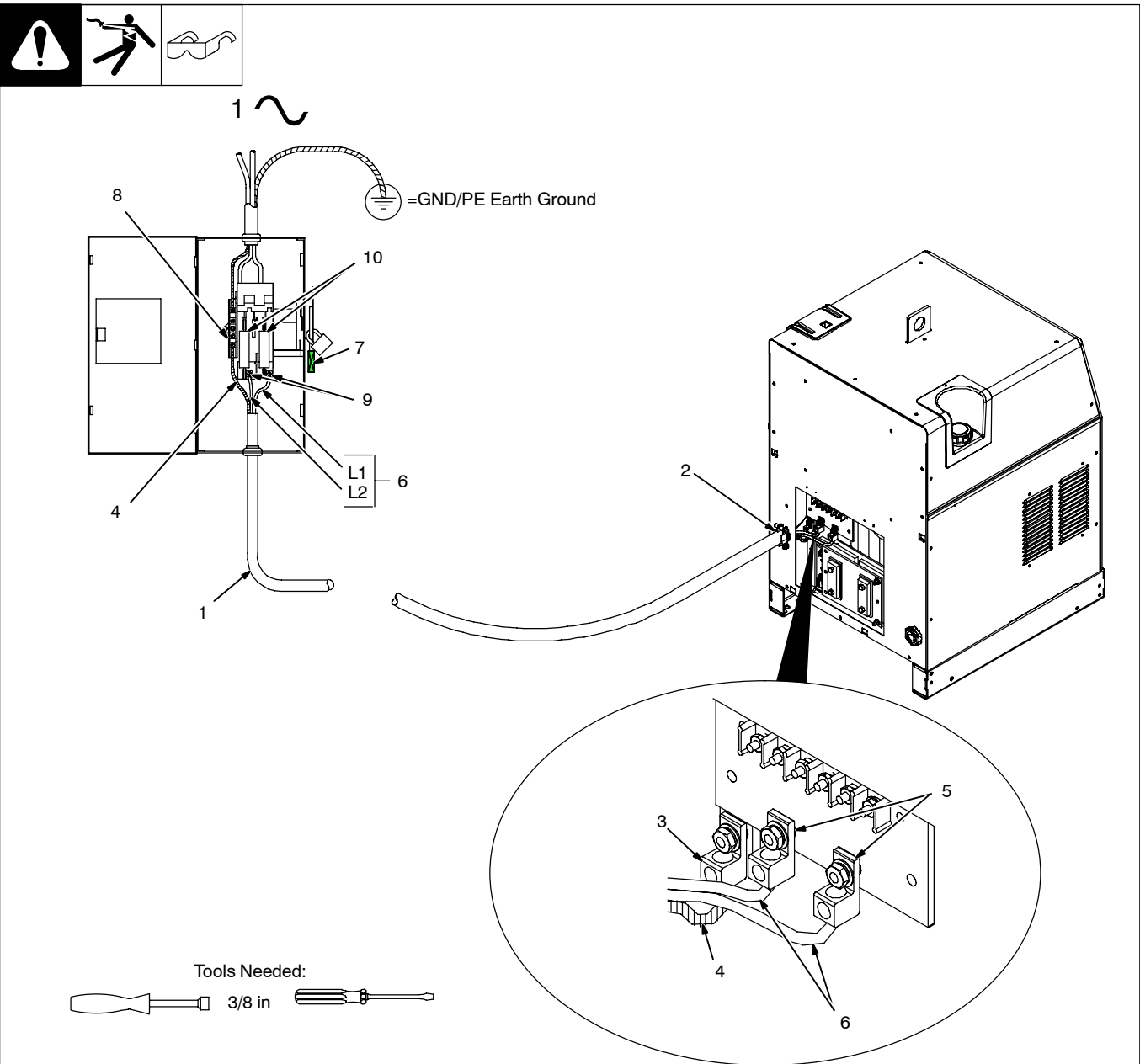


Tools Needed:

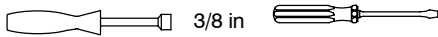


Ref. 803 585-A

4-21. Connecting Input Power



Tools Needed:



Ref. 803 585-A

▲ Installation must meet all National and Local Codes – have only qualified persons make this installation.

▲ Disconnect and lockout/tagout input power before connecting input conductors from unit.

▲ Make input power connections to the welding power source first.

▲ Always connect green or green/yellow conductor to supply grounding terminal first, and never to a line terminal.

See rating label on unit and check input voltage available at site.

1 Input Power Conductors (Customer Supplied Cord)

Select size and length of conductors using Section 4-19. Conductors must comply with national, state, and local electrical codes. If applicable, use lugs of proper amperage capacity and correct hole size.

Welding Power Source Input Power Connections

2 Strain Relief

Route conductors (cord) through strain relief and tighten screws.

3 Machine Grounding Terminal

4 Green Or Green/Yellow Grounding Conductor

Connect green or green/yellow grounding conductor to welding power source grounding terminal first.

5 Welding Power Source Line Terminals

6 Input Conductors L1 And L2

Connect input conductors L1 and L2 to welding power source line terminals.

Close and secure access door on welding power source.

Disconnect Device Input Power Connections

7 Disconnect Device (switch shown in OFF position)

8 Disconnect Device (Supply) Grounding Terminal

Connect green or green/yellow grounding conductor to disconnect device grounding terminal first.

9 Disconnect Device Line Terminals

Connect input conductors L1 and L2 to disconnect device line terminals.

10 Overcurrent Protection

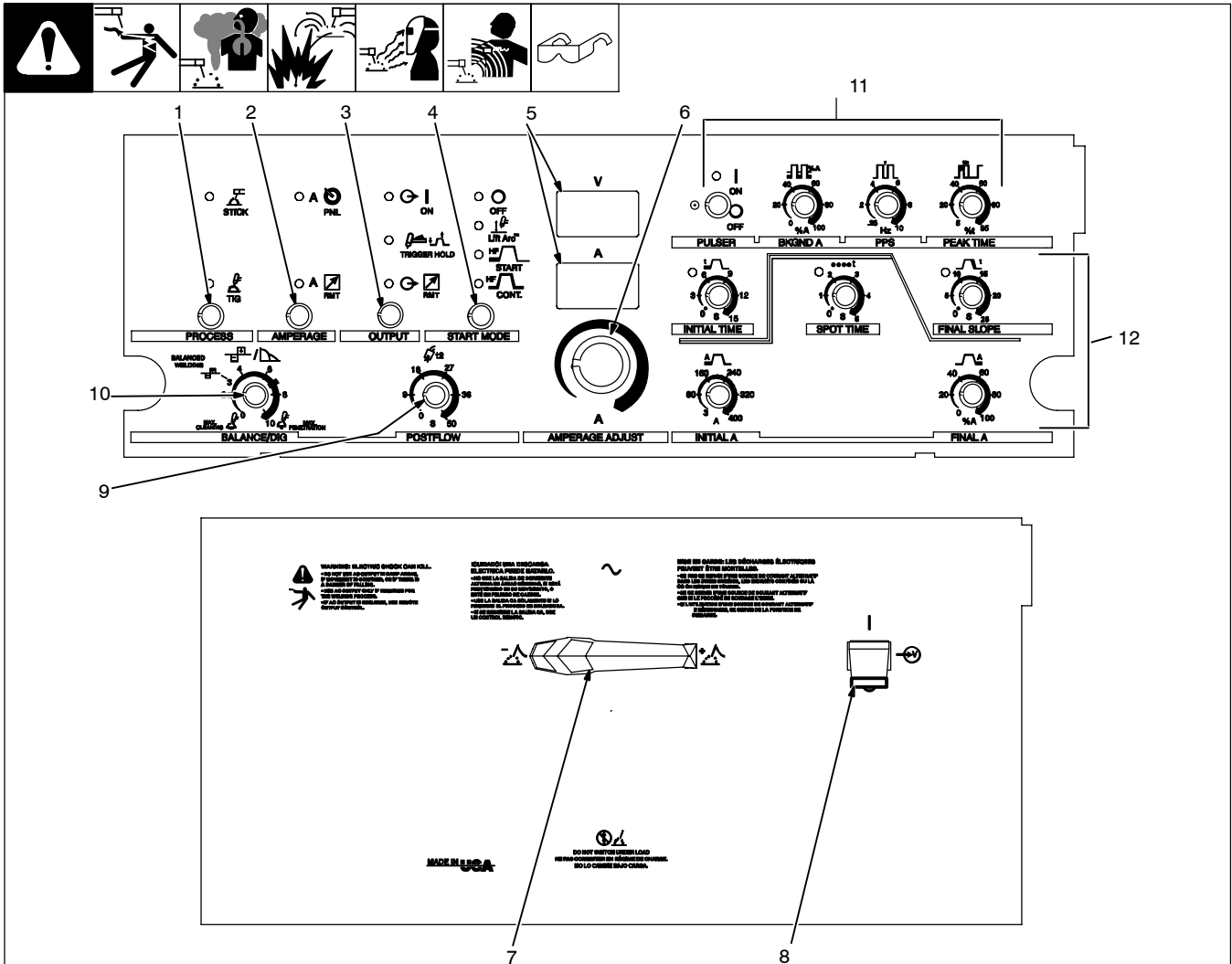
Select type and size of overcurrent protection using Section 4-19 (fused disconnect switch shown).

Close and secure door on line disconnect device. Remove lockout/tagout device, and place switch in the On position.

SECTION 5 – OPERATION

5-1. Controls (350 LX Nameplates Shown)

A. For 200/230/460 Volts And Non CE Units



☐ Top row of lights in upper left corner are On for SMAW. Bottom row are On for GTAW.

Green on nameplate indicates a TIG function, Gray indicates a Stick function.

- 1 Process Control
- See Section 5-3.
- 2 Amperage Control
- See Section 5-4.
- 3 Output Control
- See Section 5-5.
- 4 Start Mode Control
- See Section 5-9.
- 5 Voltmeter And Ammeter

Voltmeter displays average voltage (to the nearest 0.1 V) at the weld output terminals.

Use meter to preset amperage. Meter displays average weld amperage output of unit to nearest ampere when welding.

NOTE: Meters are self-calibrating. No adjust-

ment available.

- 6 Amperage Adjustment Control

Use control to adjust amperage, and preset amperage on ammeter. This control may be adjusted while welding.

For remote amperage control, front panel control setting is the maximum amperage available. For example: If front panel control is set to 200 amps, the range of the remote amperage control is 3 to 200 amps for 250 DX models, and 3 to 200 amps for 350 LX models.

For pulse welding, use Amperage Adjust control to select from 3-300 amps of peak amperage for 250 DX models, or 3-400 amps of peak amperage for 350 LX models (see Section 5-12).

For spot welding, use Amperage Adjust control to select from 3-310 amps for 250 DX models, or 3-400 amps for 350 LX models (see Section 5-16).

- 7 Output Selector Switch
- See Section 5-2.

- 8 Power Switch

Use switch to turn unit Off and On.

- 9 Postflow Time Control

Use control to set length of time (0-50 seconds) gas flows after welding stops. It is important to set enough time to allow gas to flow until after the tungsten and weld puddle has cooled down.

Application:

Postflow is required to cool the tungsten and weld, and to prevent contamination of tungsten and weld. Increase postflow time if tungsten or weld are dark in appearance (approximately 1 second per 10 ampere of welding current).

- 10 Balance/DIG Control

See Section 5-10.

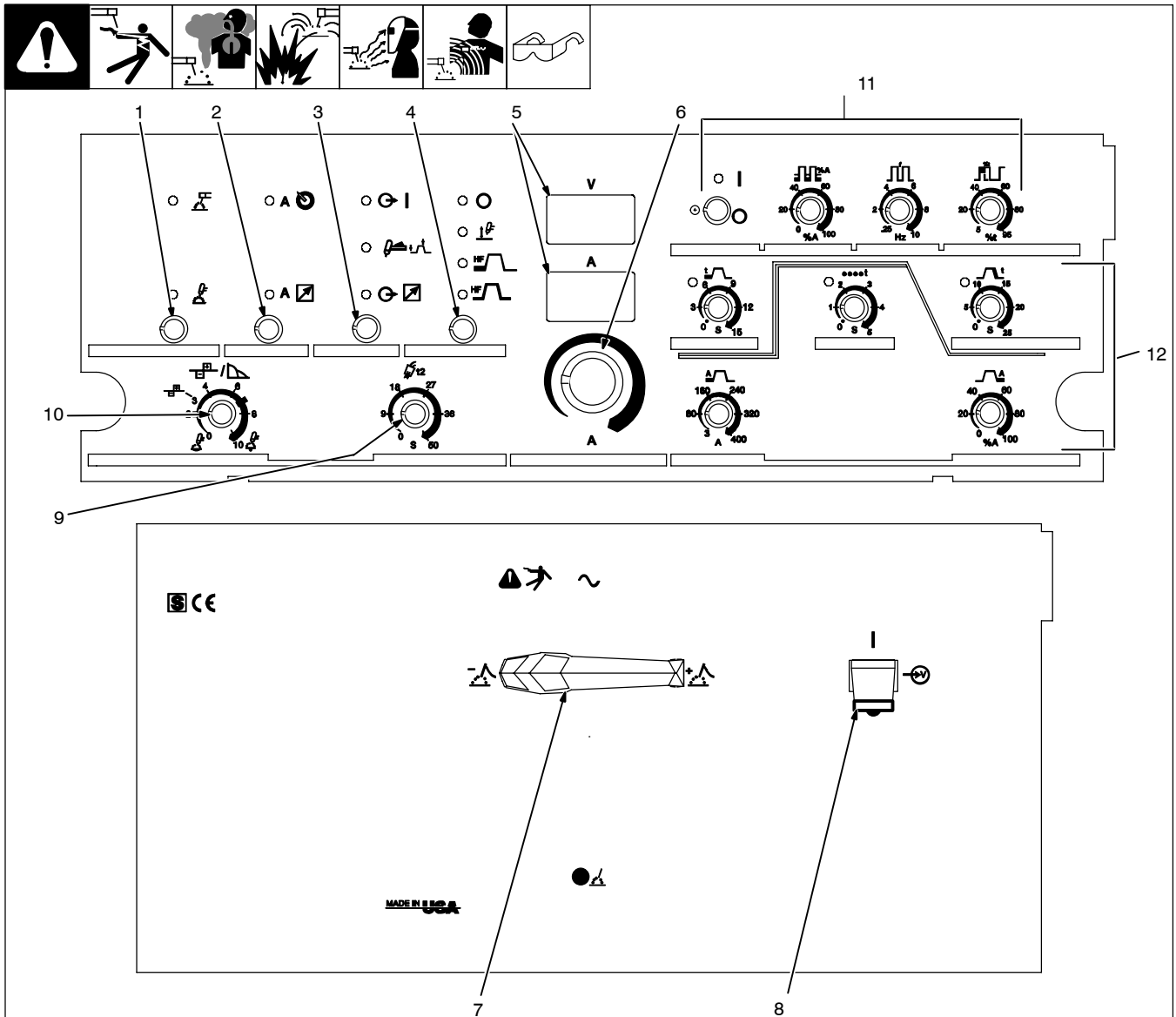
- 11 Pulser Controls (Optional on 250 DX model)

See Section 5-12.

- 12 Sequence Controls (Optional)

See Section 5-13.

B. For CE Units



☞ Top row of lights in upper left corner are On for SMAW. Bottom row are On for GTAW.

Green on nameplate indicates a TIG function, Gray indicates a Stick function.

1 Process Control

See Section 5-3.

2 Amperage Control

See Section 5-4.

3 Output Control

See Section 5-5.

4 Start Mode Control

See Section 5-9.

5 Voltmeter And Ammeter

Voltmeter displays average voltage (to the nearest 0.1 V) at the weld output terminals.

Use meter to preset amperage. Meter displays average weld amperage output of unit to nearest ampere when welding.

NOTE: Meters are self-calibrating. No adjustment available.

6 Amperage Adjustment Control

Use control to adjust amperage, and preset amperage on ammeter. This control may be adjusted while welding.

For remote amperage control, front panel control setting is the maximum amperage available. For example: If front panel control is set to 200 A, the range of the remote amperage control is 3 to 200 amps for 250 DX models, and 3 to 200 amps for 350 LX models..

For pulse welding, use Amperage Adjust control to select from 3-300 amps of peak amperage for 250 DX models, or 3-400 amps of peak amperage for 350 LX models (see Section 5-12).

For spot welding, use Amperage Adjust control to select from 3-310 amps for 250 DX models, or 3-400 amps for 350 LX models (see Section 5-16).

7 Output Selector Switch

See Section 5-2.

8 Power Switch

Use switch to turn unit Off and On.

9 Postflow Time Control

Use control to set length of time (0-50 seconds) gas flows after welding stops. It is important to set enough time to allow gas to flow until after the tungsten and weld puddle has cooled down.

Application:

Postflow is required to cool the tungsten and weld, and to prevent contamination of tungsten and weld. Increase postflow time if tungsten or weld are dark in appearance (approximately 1 second per 10 ampere of welding current).

10 Balance/DIG Control

See Section 5-10.

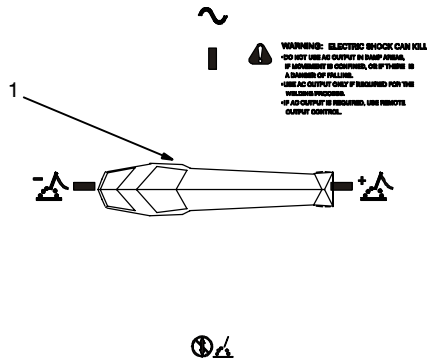
11 Pulsar Controls (Optional on 250 DX model)

See Section 5-12.

12 Sequence Controls (Optional)

See Section 5-13.

5-2. Output Selector Switch



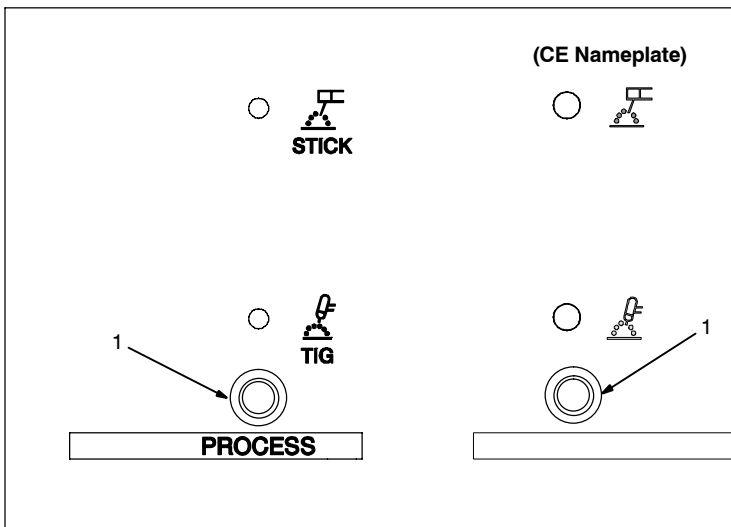
1 Output Selector Switch

- ▲ Do not use AC output in damp areas, if movement is confined, or if there is danger of falling. Use AC output ONLY if required for the welding process, and then use a remote control.
- ▲ Do not change position of switch while welding or while under load.

Use switch to select (DCEN) Direct Current Electrode Negative, AC, or (DCEP) Direct Current Electrode Positive output.

NOTE: Changing position of Output Selector switch may change Process control, Current control, and Start Mode control, and may require changing Output control settings to properly function with latest Output Selector switch setting.

5-3. Process Control



1 Process Control

Use control to select Shielded Metal Arc Welding (SMAW) or Gas Tungsten Arc Welding (GTAW) process.

For SMAW, press button to toggle LED to Stick position.

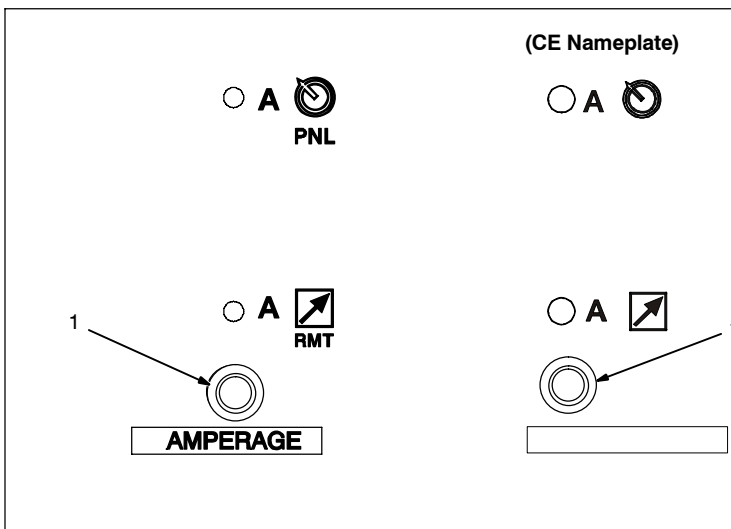
For GTAW, press button to toggle LED to TIG position.

NOTE: Lit LED indicates selected mode.

When Output Selector switch position changes, LED may change position, based upon last selection.

Ref. 217 264-A / Ref. 215 460-A

5-4. Amperage Control



1 Amperage Control

Use control to select front panel or remote amperage control.

For front panel amperage control, press button to toggle LED to Panel position.

For remote amperage control, press button to toggle LED to Remote position (see Section 4-8).

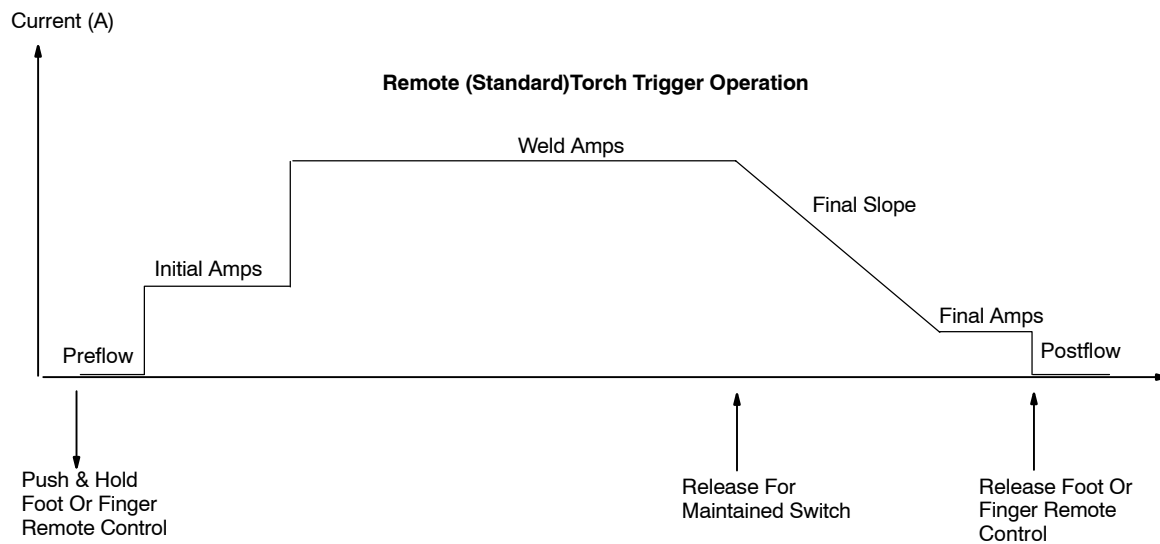
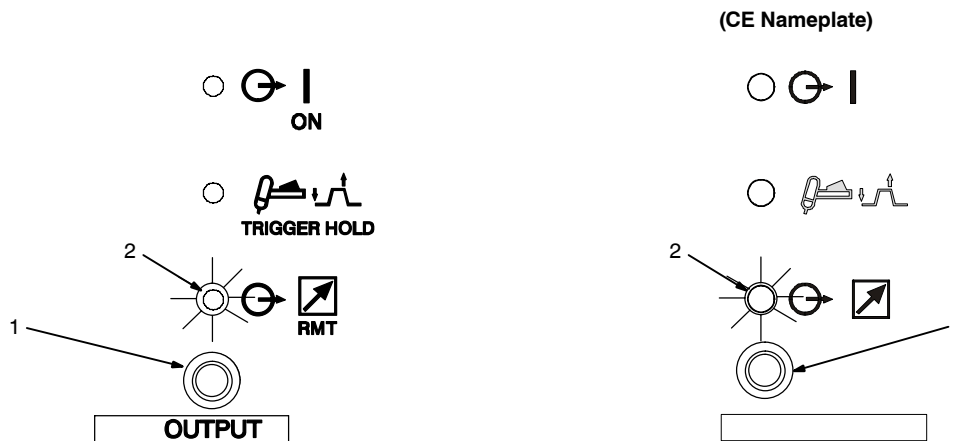
NOTE: Lit LED indicates selected mode.

When Output Selector switch position changes, LED may change position, based upon last selection.

5-5. Output Control



Remote (Standard) Torch Trigger Operation



1 Output Control

▲ **Weld output terminals are energized when power is On, and Output On LED is lit.**

Use control to select front panel, trigger hold, or remote output control.

NOTE: Lit LED indicates selected mode.

▮ For weld output, press button to toggle LED to On position.

2 Remote Trigger (Standard) Operation

▮ For remote output control, press button to toggle LED to Remote position (see Section 4-8).

Torch trigger operation is as shown.

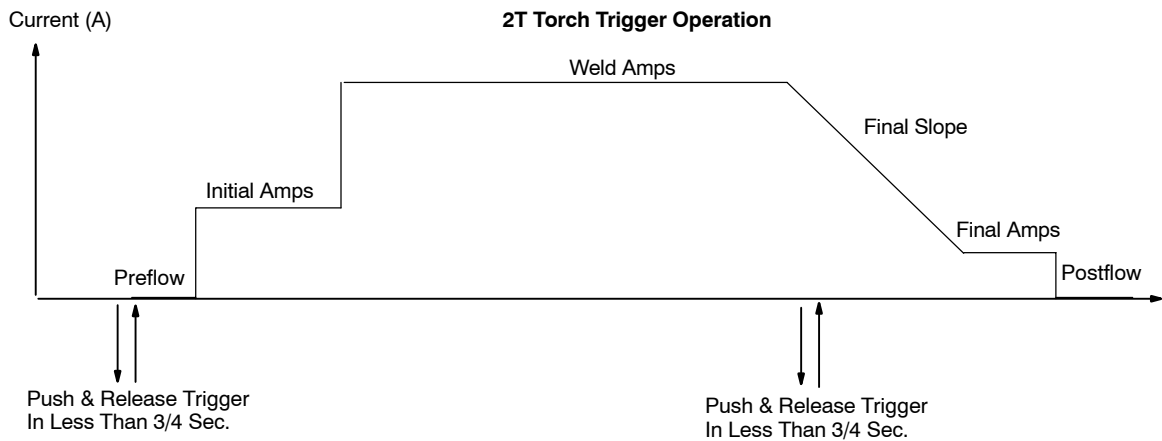
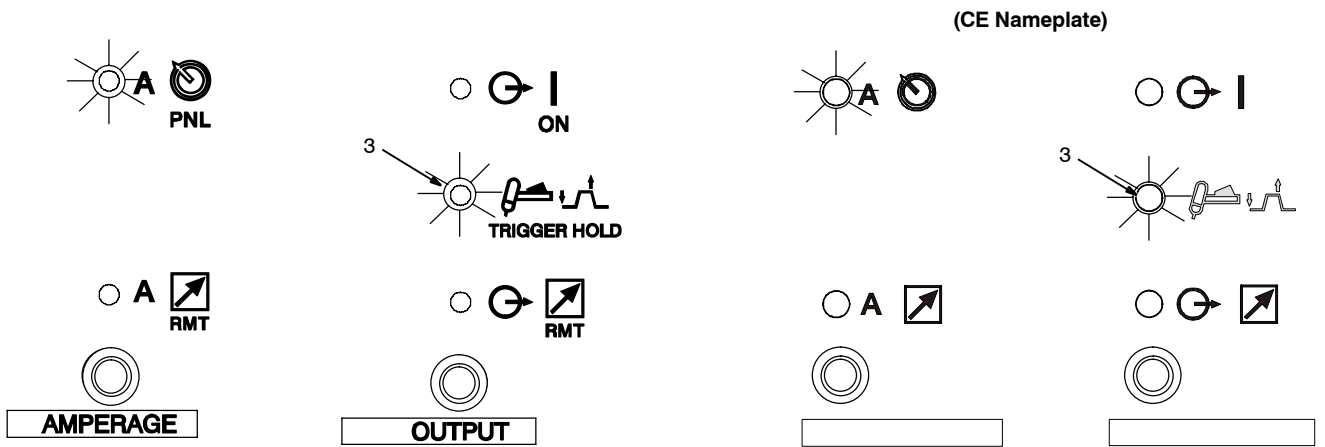
NOTE: Initial weld amperage and final amperage is controlled by the remote device, not by the welding power source.

NOTE: If On/Off only type trigger is used, it must be a maintained switch. All functions become active.

Application: Use Remote Trigger when the operator desires to use a foot pedal or finger amperage control.

When Output Selector switch (see Section 5-2) position changes, Output control LED will always switch to Remote.

Trigger Hold (2T)



NOTE: If torch trigger is held more than 3 seconds, operation reverts to Remote Trigger (Standard) mode (see previous page).
If arc is broken and trigger is depressed, HLP-10 will be displayed (see Section 7-1).



3 Trigger Hold

For trigger hold operation, press button to toggle LED to Trigger Hold position. Torch trigger operation is as shown.

NOTE: When a foot or finger remote control is connected to the welding power source, only trigger input is functional, as amperage is controlled by the welding

power source.

Application: Trigger Hold (2T) can help to reduce operator fatigue when long extended welds are made.

5-6. 4T, 4T Momentary, And Mini Logoic Trigger Operation (Requires Optional Sequence Controls)

4T Torch Trigger Operation

If unit is equipped with optional Sequence Controls (see Section 5-13), 4T trigger method is available.

4T torch trigger operation is as shown.

While in 4T mode, there is a feature available during the main weld sequence that al-

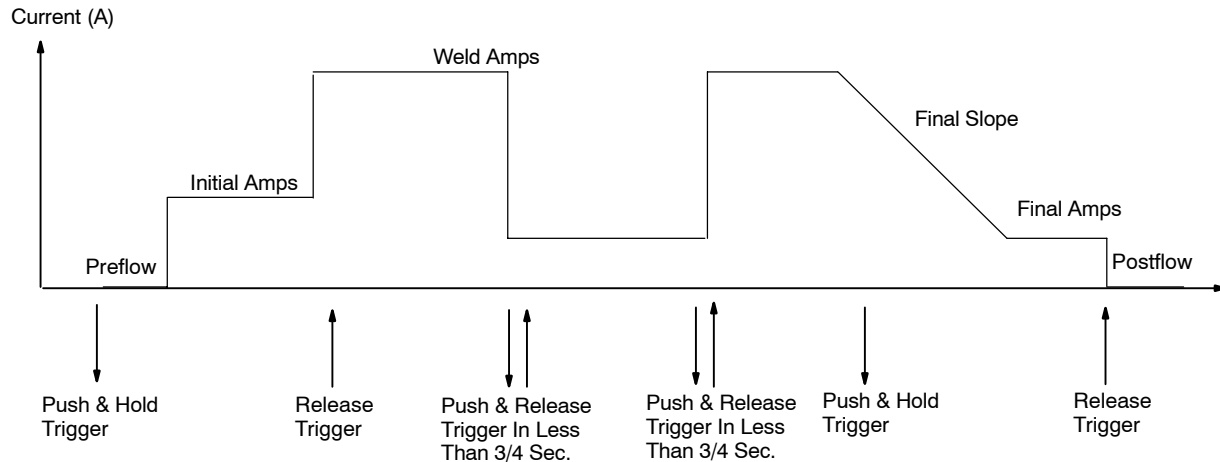
lows the operator to toggle between weld current and final current without breaking the arc.

NOTE: When a remote switch is connected to the welding power source, only trigger input is functional. Amperage is controlled by the welding power source.

Application:

Use 4T trigger method when the functions of a remote current control are desired, but only a remote on/off control is available.

Select 4T trigger method according to Section 5-7.



4T Momentary Torch Trigger Operation

If unit is equipped with optional Sequence Controls (see Section 5-13), 4T Momentary trigger method is available.

4T Momentary torch trigger operation is as shown.

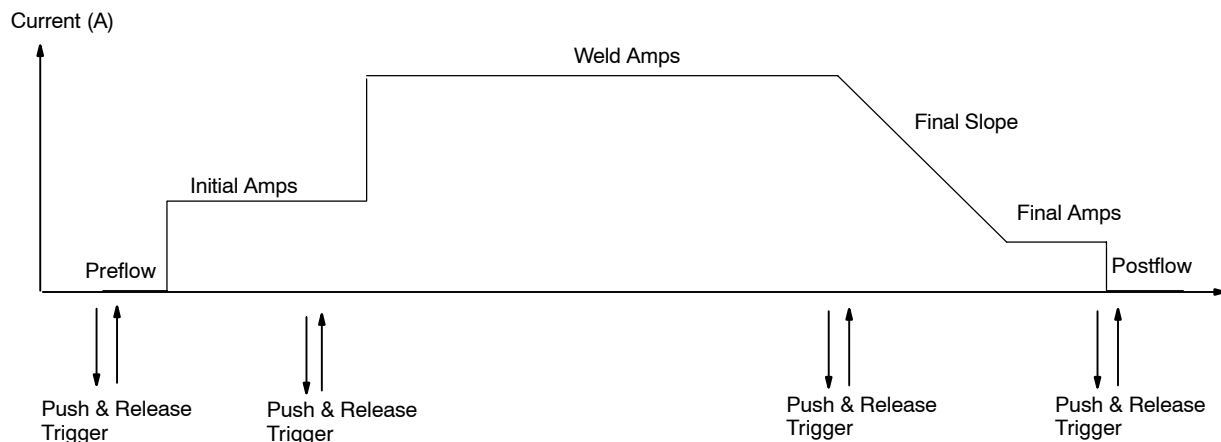
While in 4T Momentary mode, once the operator toggles out of weld current and begins final slope, toggling again will break the arc and go to postflow.

NOTE: When a remote switch is connected to the welding power source, only trigger input is functional. Amperage is controlled by the welding power source.

Application:

Use 4T Momentary trigger method when the functions of a remote current control are desired, but only a remote on/off control is available.

Select 4T Momentary trigger method according to Section 5-7.



Mini Logic Operation

If unit is equipped with optional Sequence Controls (see Section 5-13), Mini Logic operation is available.

Torch trigger operation is as shown.

During Mini Logic welding operation, the weld amperage can be manually changed

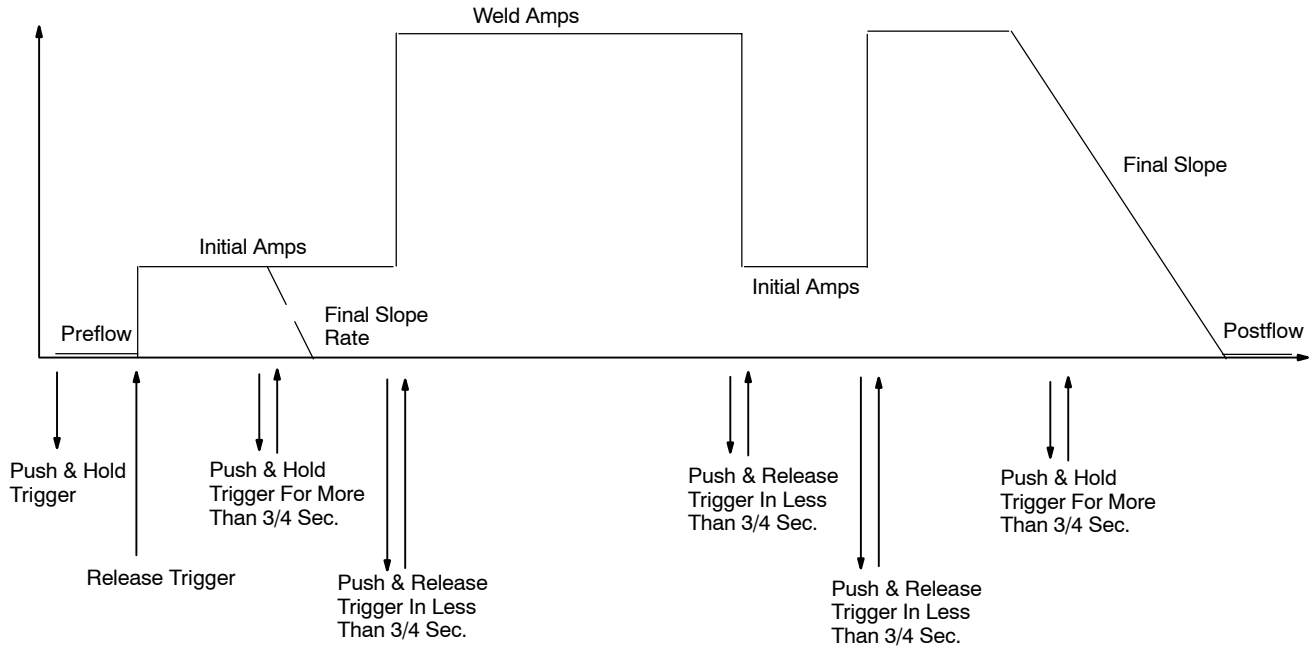
from the initial amps level to the main weld amps level by pressing and releasing the torch trigger in less than 3/4 seconds.

NOTE: When a remote switch is connected to the welding power source, only trigger input is functional. Amperage is controlled by

the welding power source.

Application: This ability to change amperage levels without either initial slope or final slope, gives the operator the opportunity to adjust filler metal without breaking the arc.

Select Mini Logic according to Section 5-7.



5-7. Reconfiguring Trigger Hold For 4T And Mini Logic Control

- 1 Output Control
- 2 Power Switch

To reconfigure Trigger Hold, turn Off power, push and hold Output control button and turn On power switch. Hold button for approximately 7 seconds (or until software version number _____ - _____ clears, and meters display [SEL] [H-2]).

Press Output control button to change functions. Active function will be displayed on amperage (bottom) meter.

3 Meter Displays

Meter displays for the different functions will be as shown.

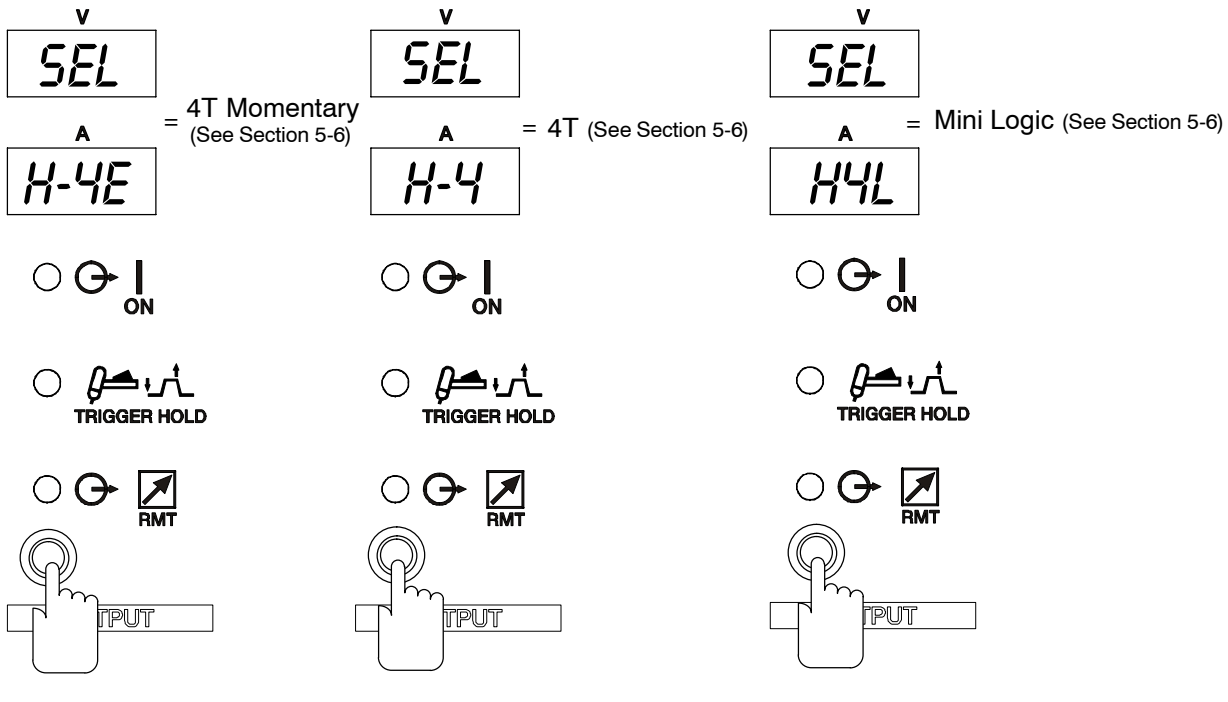
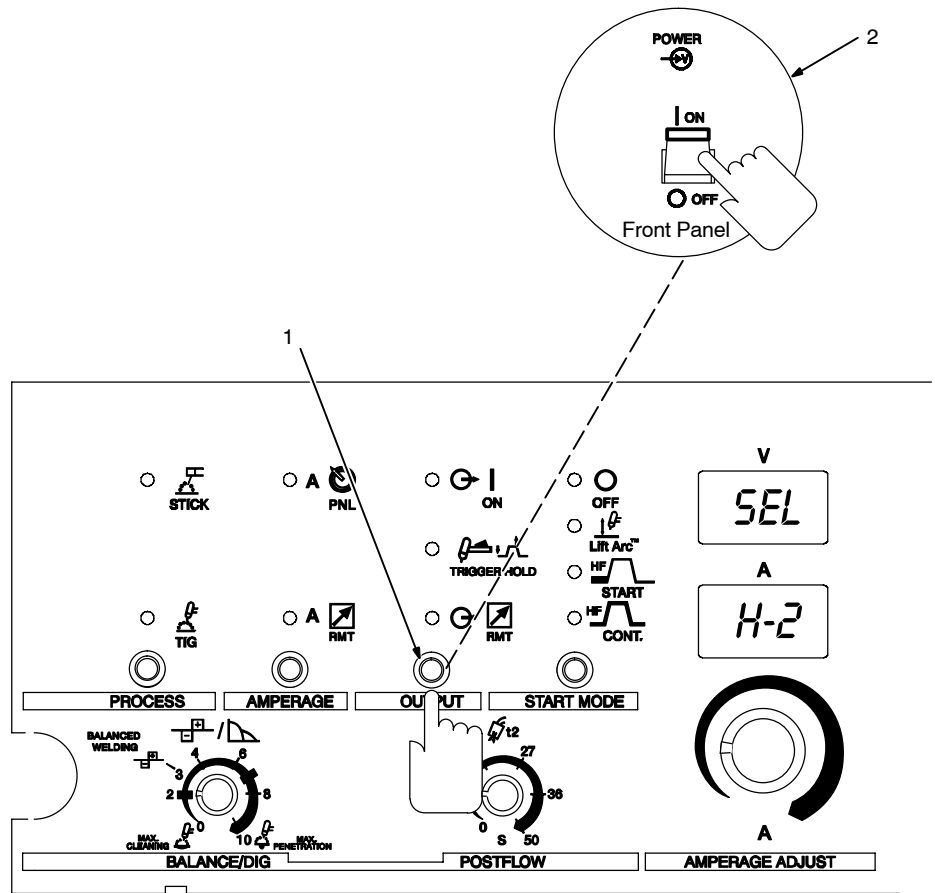
Press torch trigger or turn power Off to save setting.

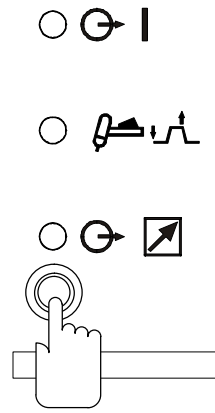
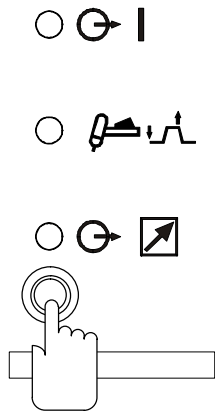
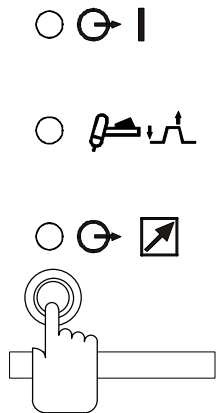
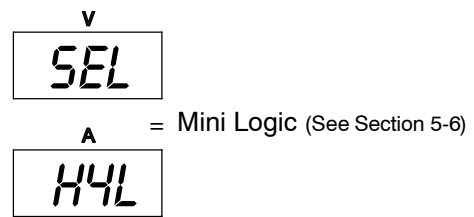
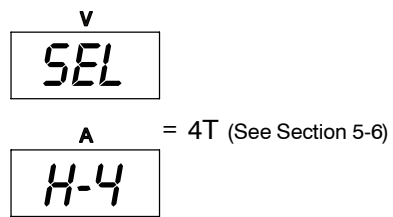
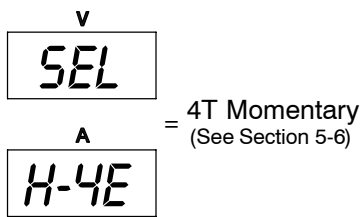
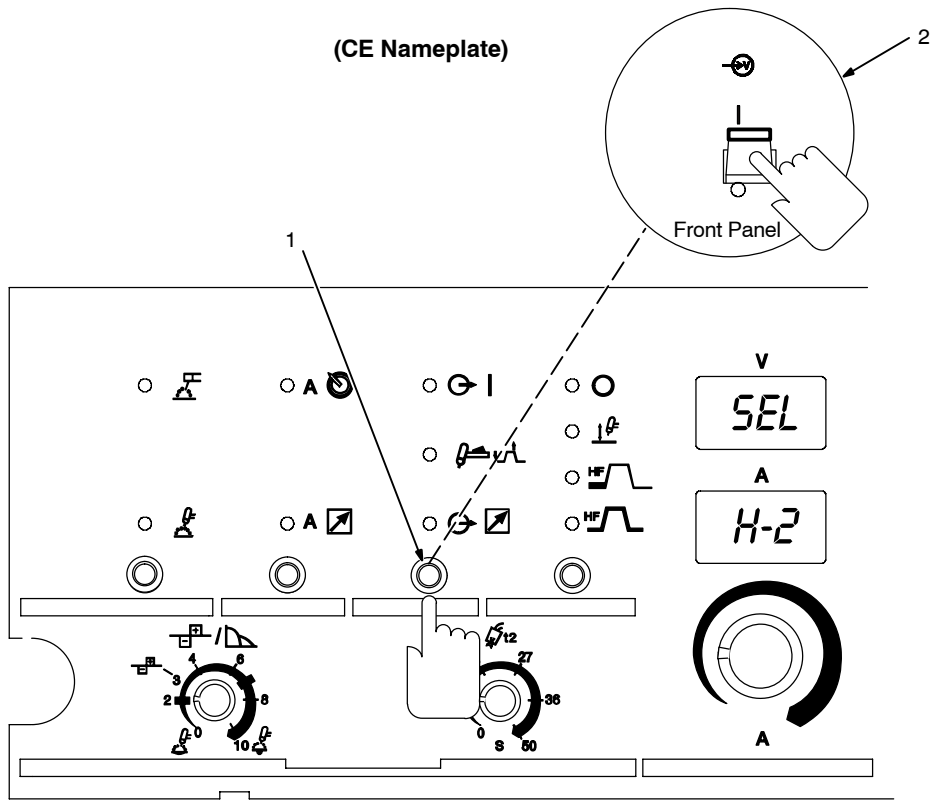
Proceed to Section 5-6 for 4T Operation.

Proceed to Section 5-6 for Mini Logic operation.

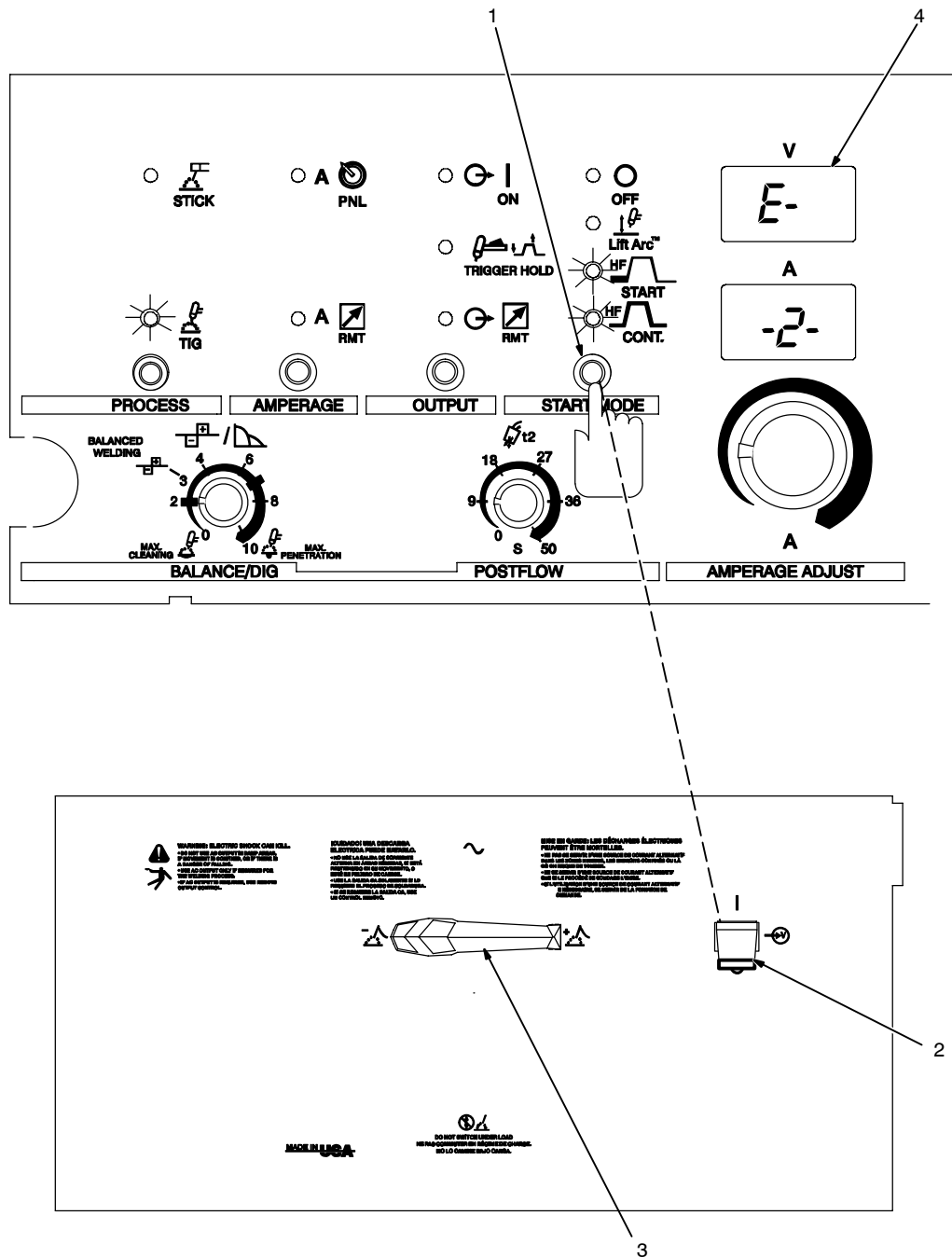
Proceed to Section 5-6 for 4T Momentary operation.

NOTE: These features are only available when optional Sequencer is installed.





5-8. Selecting TIG Starting Characteristics Using Syncro-Start™ Technology



Use this function to select desired TIG starting characteristics.

- 1 Start Mode
- 2 Power Switch
- 3 Output Selector Switch
- 4 Meters

To select or change TIG starting characteristics, proceed as follows: turn Off power. Place Output Selector switch in desired position (each position, DCEN, AC, or DCEP has three applicable start characteristics options). Push and hold Start Mode button and

turn On power. Hold button for approximately 7 seconds (or until software version number _____ clears meters).

The TIG LED and all four Start LEDs will light, and the meters will display [E] [-2-], [AC] [-2-], or [EP] [-2-], depending on position of Polarity switch.

Press Start Mode button again to step through the three start characteristics choices. Amperage (bottom) meter displays active choice 1= light start, 2=medium/normal start, 3=high/hot start.

Press torch trigger or turn Off power to save setting.

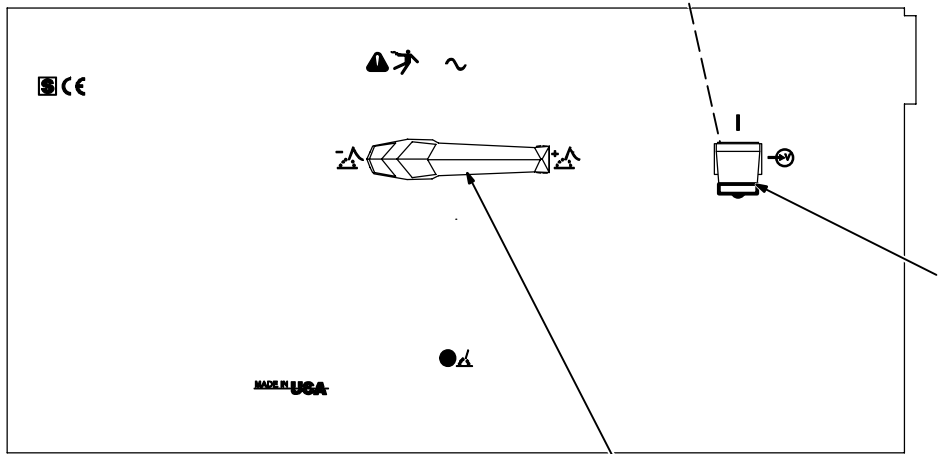
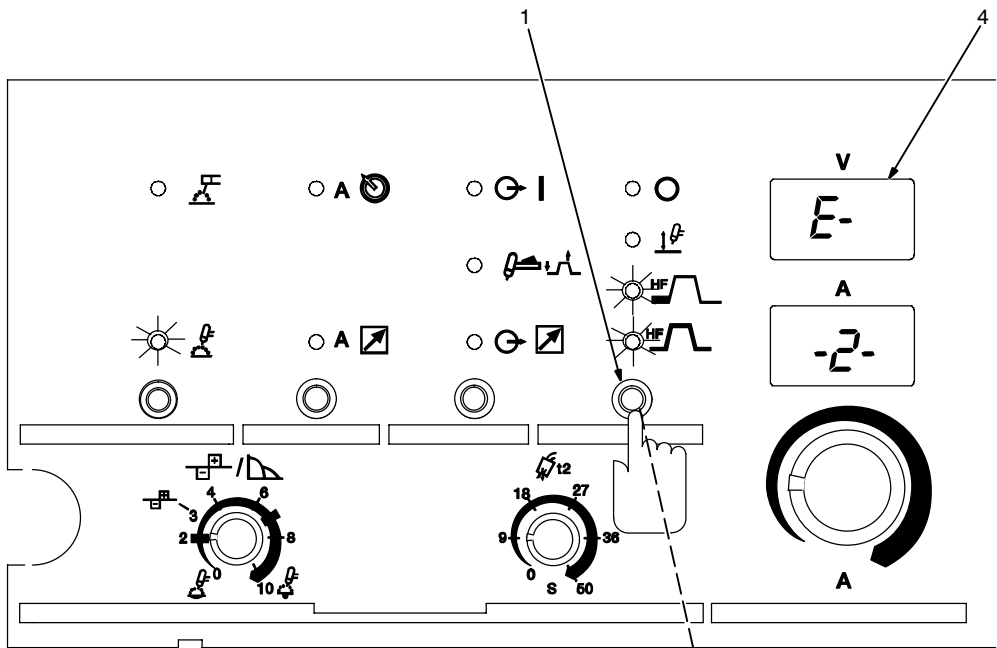
Application:

Select 1 (light/soft start) – when welding at low amperages on thin gauge material.

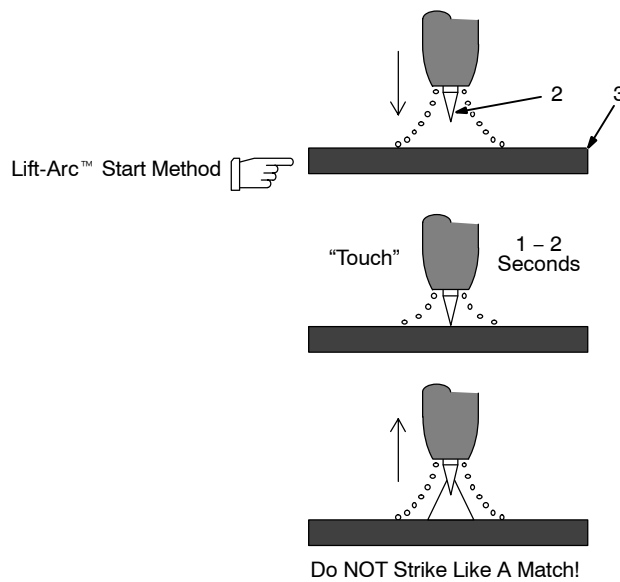
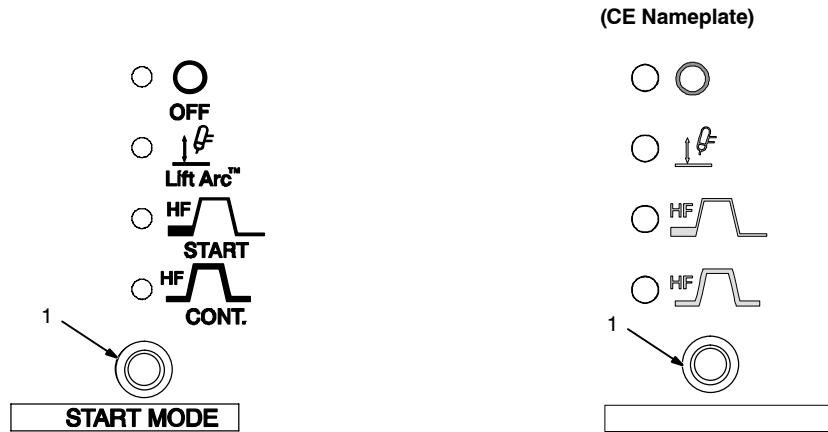
Select 2 (medium/normal start) – factory default setting used for most welding applications.

Select 3 (high/hot start) – when welding at high amperages on thick materials with a large diameter tungsten.

(CE Nameplate)



5-9. Start Mode



1 Start Mode

☀ For SMAW welding, press button to toggle LED to Off position.

For GTAW welding, use control to select Off for no HF, Lift-Arc™, HF for arc starting only, or continuous HF.

Application:

When Off is selected, use the scratch method to start an arc for both the SMAW and GTAW processes.

☞ **When Lift-Arc is selected, start arc as follows:**

- 2 TIG Electrode
- 3 Workpiece

Touch tungsten electrode to workpiece at weld start point, enable output with torch trigger, foot control, or hand control. **Hold electrode to workpiece for 1-2 sec-**

onds, and slowly lift electrode. An arc will form when electrode is lifted.

Shielding gas begins to flow when electrode touches work piece.

Normal open-circuit voltage is not present before tungsten electrode touches workpiece; only a low sensing voltage is present between electrode and workpiece. The solid state output contactor does not energize until after electrode is touching workpiece. This allows electrode to touch workpiece without overheating, sticking, or getting contaminated.

Application:

Lift-Arc is used for the DCEN GTAW process when HF Start method is not permitted, or to replace the scratch method.

☞ **When HF Start is selected, start arc as follows:**

High frequency turns on to help start arc when output is enabled. High frequency

turns off when arc is started, and turns on whenever arc is broken to help restart arc.

Application:

HF Start is used when the DCEN GTAW process is required.

☞ **When HF Continuous is selected, start arc as follows:**

High frequency turns on when output is energized and remains on for duration of weld.

Application:

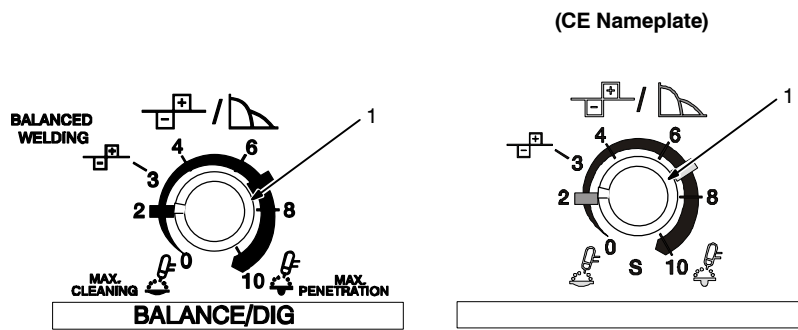
HF Continuous is used when the AC GTAW process is required.

NOTE: Lit LED indicates selected mode.

When Output Selector switch position changes, LED may change position, based upon last selection.

NOTE: Some start methods may not be available for all processes.

5-10. Balance/DIG Control



1 Balance/DIG Control

Balance Control (AC GTAW):

Control changes the AC output square wave. Rotating the control towards 10 provides deeper penetration. Rotating the control towards 0 provides more cleaning action of the workpiece.

When the control is in the Balanced position, the wave shape provides equal penetration and cleaning action.

Application:

When welding on oxide forming materials such as aluminum or magnesium, excess cleaning is not necessary. To produce a good weld, only a minimal amount, approximately a 0.10 in (2.5mm) of etched zone along the weld toes is required.

Set control to 3 and adjust as necessary. Joint configuration, set-up, process variables, and oxide thickness may affect setting.

NOTE: Arc rectification can occur when welding above 200 amps and/or while welding with helium gas. If this condition occurs, increasing the Balance control towards maximum penetration, may help to restabilize the arc.


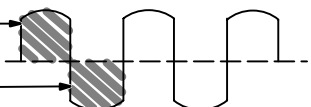

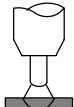

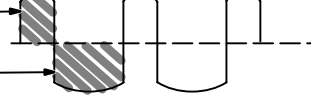
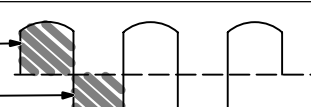
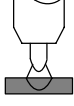

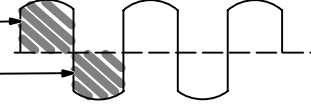

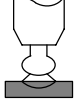
DIG Control (AC And DC SMAW):

When set at 0, short-circuit amperage at low arc voltage is the same as normal welding amperage.

When setting is increased, short-circuit amperage at low arc voltage increases. Set control at 2 and adjust as necessary. Joint configuration, set-up, and process variables may affect setting.

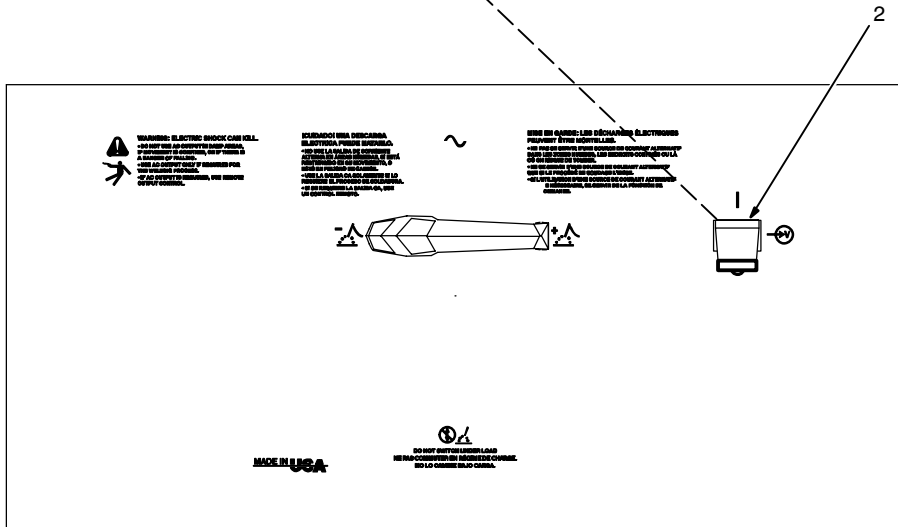
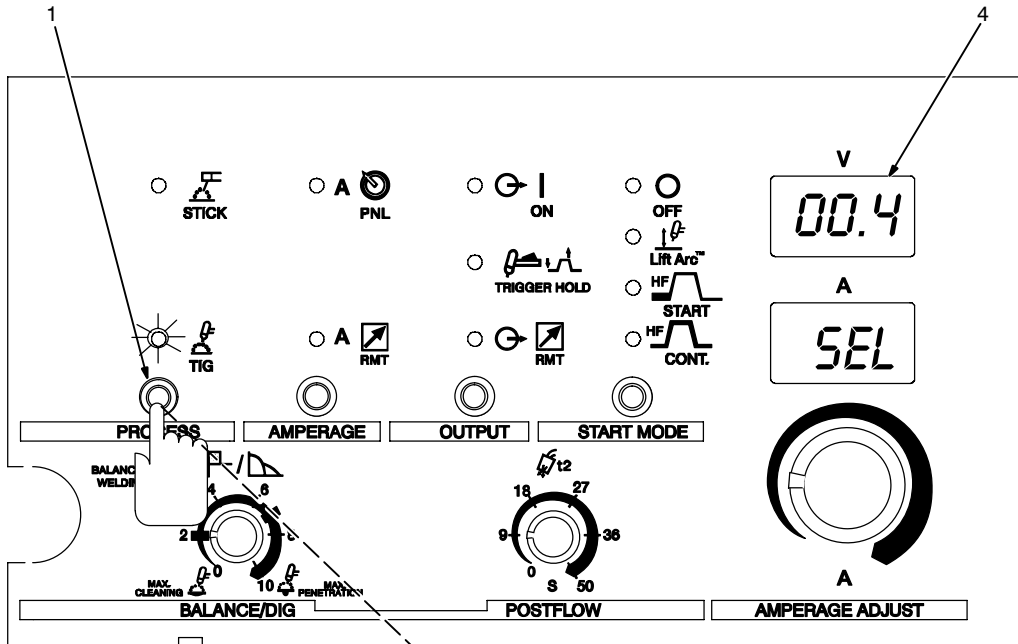
Application:

Control helps arc starting or making vertical, or overhead welds by increasing amperage at low arc voltage, and reduces electrode sticking while welding.

Balance Control Examples		
Setting	Output Waveforms	Arc
Balanced 	50% Electrode Positive  50% Electrode Negative 	
Max Penetration 	32% Electrode Positive  68% Electrode Negative 	
Max Cleaning 	55% Electrode Positive  45% Electrode Negative 	

Ref. S-0795-A

5-11. Preflow Time Control



Use control to set length of time (0.2, 0.4, 0.6, 0.8, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 seconds) gas flows before welding starts.

- 1 Process Control
- 2 Power Switch
- 3 Meters

To change preflow time, proceed as follows:

Turn power off. Push and hold Process Control button and turn On power. Hold button for approximately 7 seconds (or until software version number _____ clears meters).

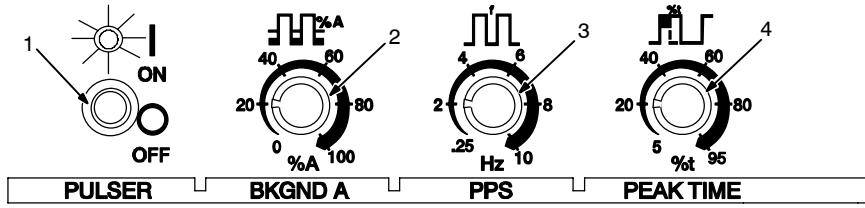
The TIG LED will light and the meters will display [0.4] [SEL]. The factory preflow default setting is 0.4 seconds. To change preflow

time, press and release Process Control button until desired time is displayed on meters.

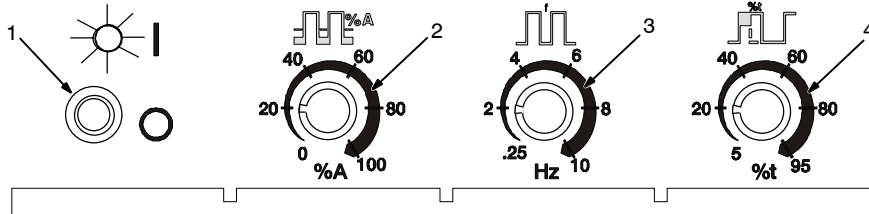
Application:

Preflow is used to purge the immediate weld area of atmosphere. Preflow also aids in consistent arc starting.

5-12. Pulse Controls (Standard On 350 LX Models, Optional On 250 DX Models)



(CE Nameplate)



- 1 On/Off Control
- Use control to turn pulse function On and Off.

- 2 Background Amps
- Use Background Amps control to set the low pulse of the weld amperage, which cools the weld puddle and affects overall heat input. Background Amps is set as a percentage of peak amperage.

- 3 Pulse Frequency
- Ranges from 0.25–10.0 pps (pulses per second). Control is used to determine appearance of weld bead.

- 4 Peak Time
- A range of 5–95% of each pulse cycle can be spent at the peak amperage level.

Peak amperage (3-310 amps for 250 DX models, and 3–400 amps for 350 LX models), is set with the Amperage Adjustment control (see Section 5-1). Peak amperage is the highest welding amperage allowed to occur in the pulse cycle. Weld penetration varies directly with peak amperage.


5 Pulsed Output Waveforms


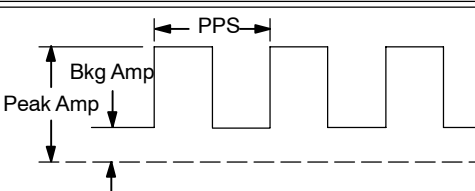

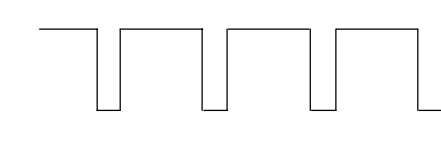

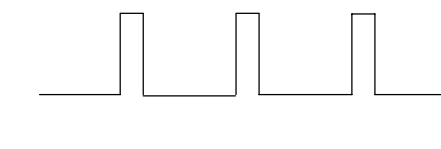
Example shows affect changing the Peak Time control has on the pulsed output waveform.

Application:

Pulsing refers to the alternating raising and lowering of the weld output at a specific rate. The raised portions of the weld output are controlled in width, height, and frequency, forming pulses of weld output. These pulses and the lower amperage level between them (called the background amperage) alternately heat and cool the molten weld puddle. The combined effect gives the operator better control of penetration, bead width, crowning, undercutting, and heat input. Controls can be adjusted while welding.

Pulsing can also be used for filler material addition technique training.

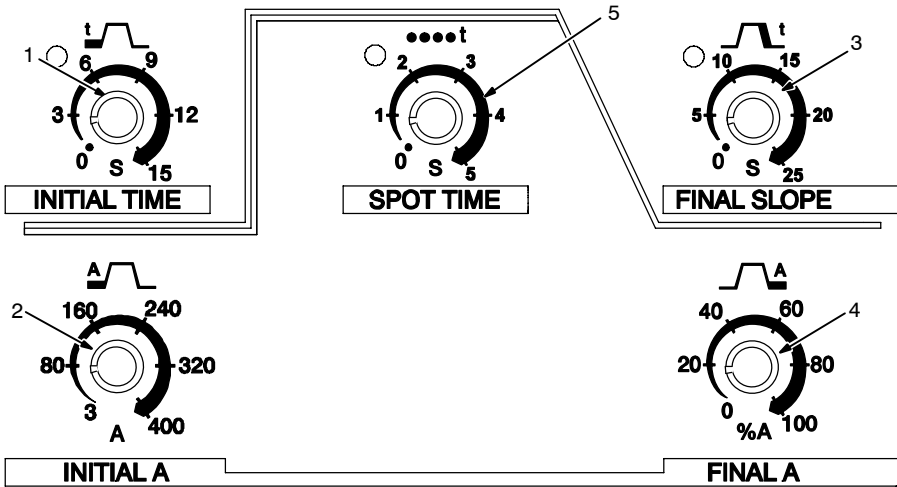
 **NOTE:** Function is enabled, when LED is lit.

Percent (%) Peak Time Control Setting	Pulsed Output Waveforms
Balanced (50%) 	
More Time At Peak Amperage (80%) 	
More Time At Background Amperage (20%) 	

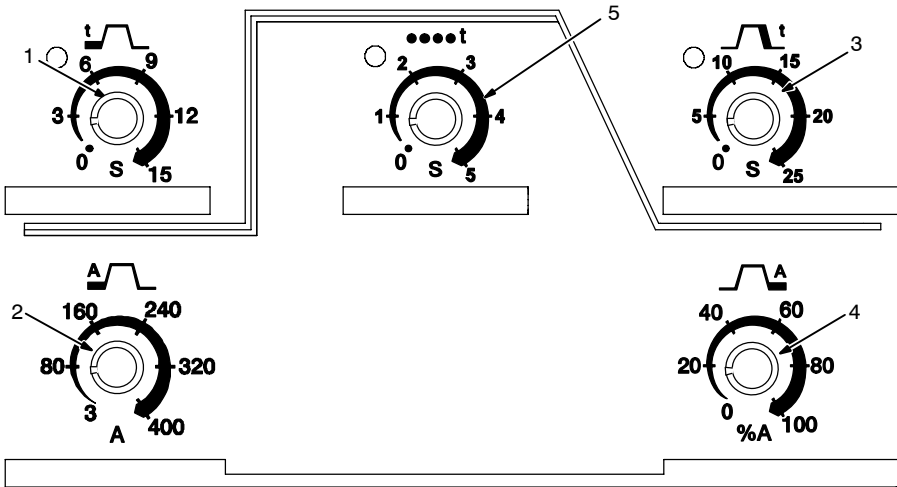
5-13. Sequence Controls (Optional)



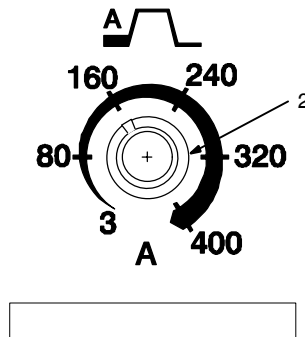
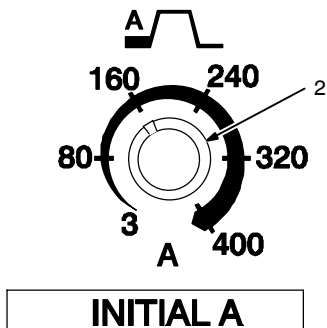
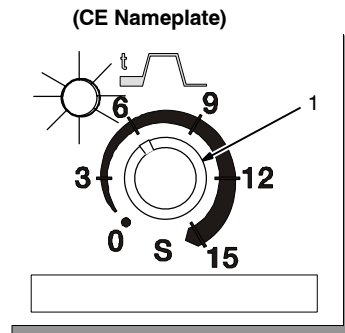
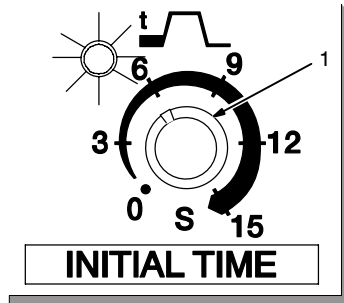
- 1 Initial Time Control
See Section 5-14.
- 2 Initial Amperage Control
See Section 5-14.
- 3 Final Slope Control
See Section 5-15.
- 4 Final Amperage Control
See Section 5-15.
- 5 Spot Time Control
See Section 5-16.



(CE Nameplate)



5-14. Initial Time Control And Initial Amperage Control



- 1 Initial Time Control
 Indicator light is on when Initial Time control function is active.

NOTE: Initial Sequence control function is inactive when Spot Time function is active.

Use control to select 0–15 seconds of start time.

- 2 Initial Amperage Control
 Indicator Light is on when Initial Sequence control function is active.

NOTE: Initial Amperage control function is inactive when Spot Time function is active.

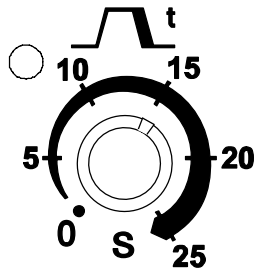
Use control to select a starting amperage (3–400 amps) that is different from the weld amperage. Note: Initial Amperage can be used with or without a remote control (Initial Amperage and Initial Time control settings will override a remote control device).

Application:

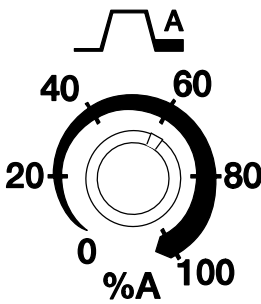
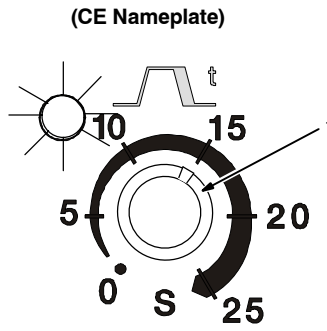
Initial Amperage can be used while GTAW welding to assist in preheating cold material prior to depositing filler material, or to ensure a soft start. Initial Amperage can also be used for SMAW to ensure a more consistent arc strike.

NOTE: Function is enabled, when LED is lit.

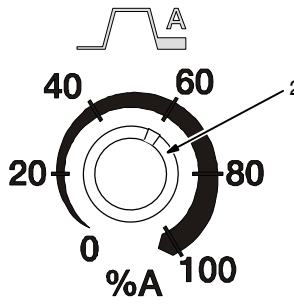
5-15. Final Slope Control And Final Amperage Control



FINAL SLOPE



FINAL A



1 Final Slope Control

Indicator light is on when Final Slope control function is active.

Note: Final Slope control function is inactive when Spot Time function is active.

Use control to reduce amperage over a set period of time (0–15 seconds) at the end of the weld cycle when NOT using a remote current control.



2 Final Amperage Control

Indicator light is on when Final Amperage control function is active.

Note: Final Amperage control function is inactive when Spot Time function is active (see Section 5-16).

Final amperage is the amperage to which weld amperage has sloped down to (0–100% of amperage set on Amperage Adjust control).

Application:

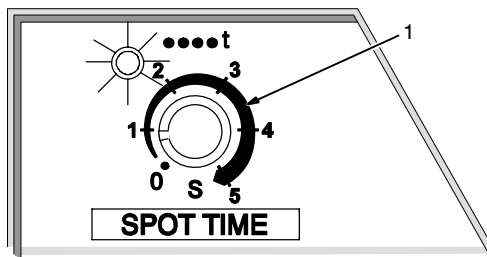
Final Slope should be used while GTAW welding materials that are crack sensitive, and/or the operator wants to eliminate the crater at the end of the weld.

Note: This applies if the operator is using an on/off only type control to start and stop the welding process.

Note: Do not use this function with a foot or finger amperage control.

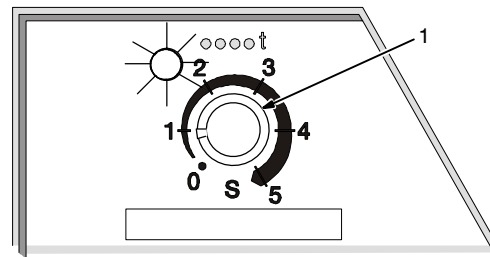
NOTE: Function is enabled, when LED is lit.

5-16. Spot Time Control



SPOT TIME

(CE Nameplate)



○○○○t 1 Spot Time Control



Indicator light is on when Spot Time function is active. When Spot Time function is active, Initial Time, Initial Amperage, Final Slope, and Final Amperage functions are inactive (see Section 5-13).

Used with the (GTAW) TIG Spot process, generally with a direct current electrode negative (DCEN) set-up.

Use control to select 0–15 seconds of spot time.

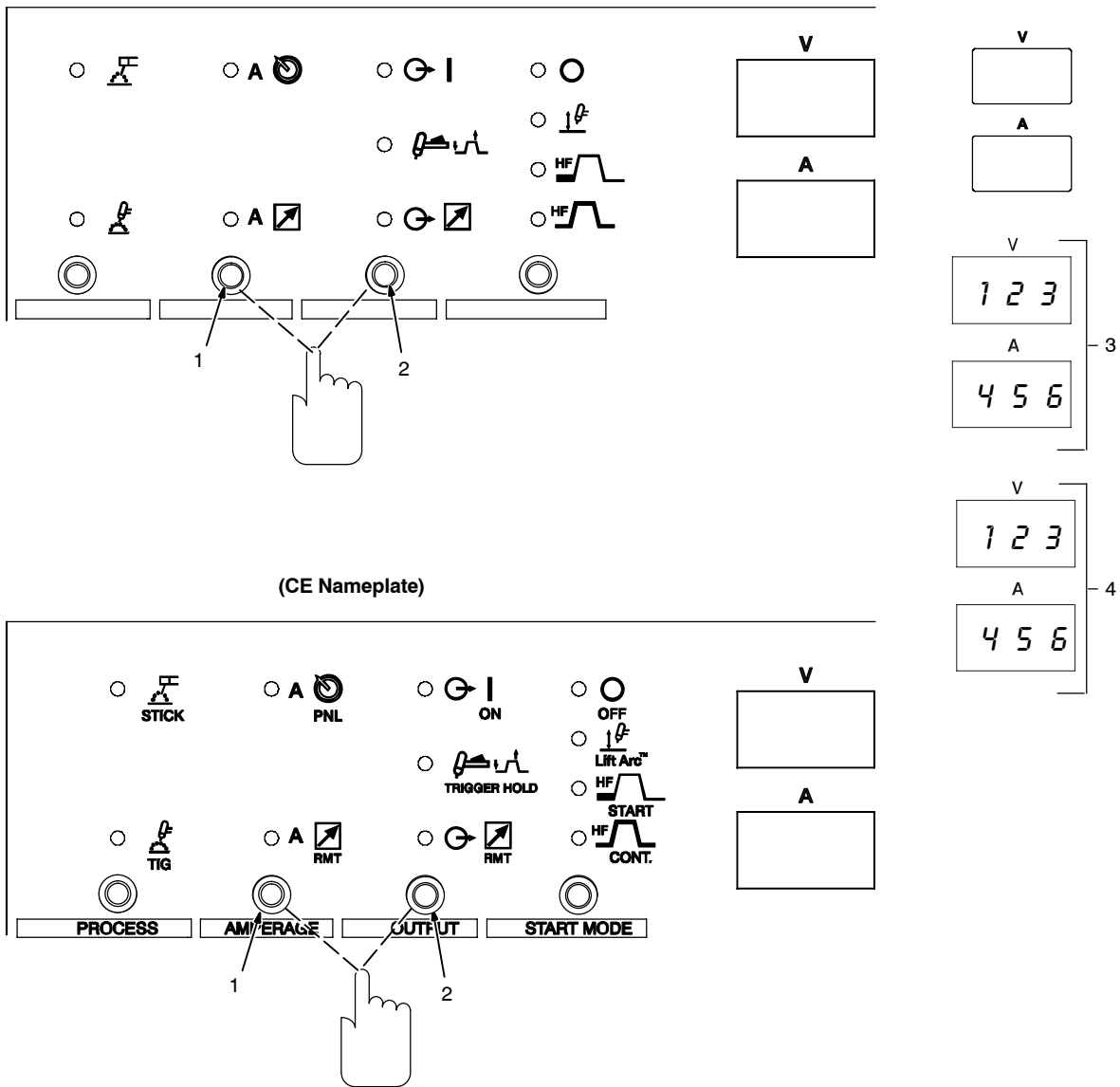
Use Amperage Adjust control (see Section 5-1) to set amperage.

Application:

TIG spot welding is used for joining thinner materials that are in close contact with the fusion method. A good example would be joining coil ends.

NOTE: Function is enabled, when LED is lit.

5-17. Timer/Cycle Counter



- 1 Amperage Control
- 2 Output Control (Contactor)

To read timer/cycle counter, hold Amperage and Output (contactor) buttons while turning on power.

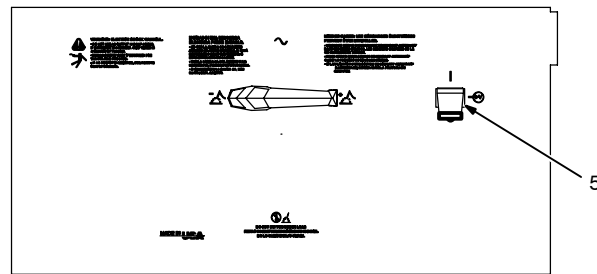
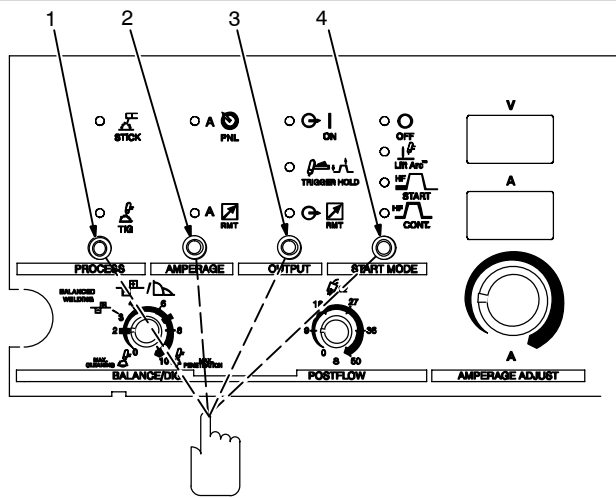
- 3 Timer Display

The hours and minutes are displayed on the volt and amp meters for the first five seconds, and are read as 1, 234 hours and 56 minutes.

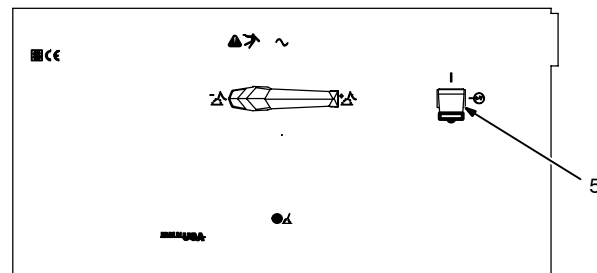
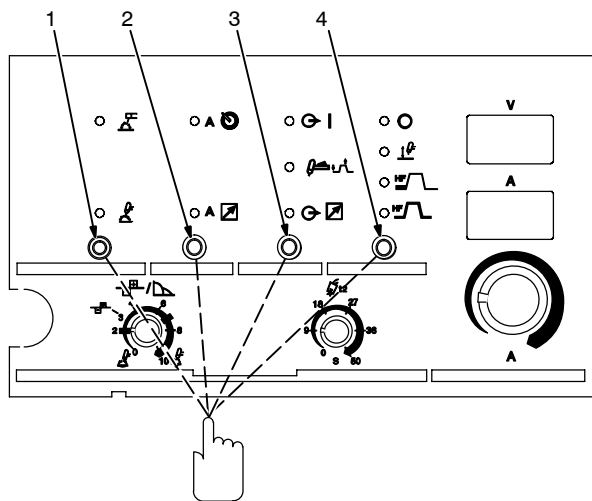
- 4 Cycle Display

The cycles are displayed on the volt and amp meters for the next five seconds, and are read as 123, 456 cycles.

5-18. Resetting Unit To Factory Default Settings (All Models)



(CE Nameplate)




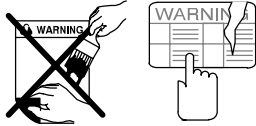
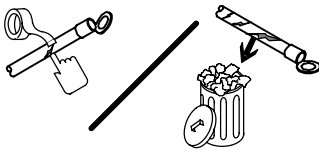
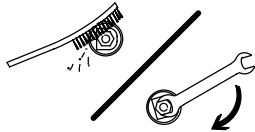
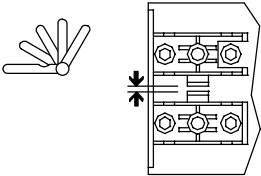
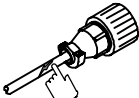

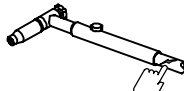
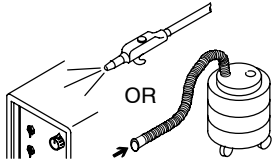
- 1 Process Control
- 2 Amperage Control
- 3 Output Control
- 4 Start Control

- 5 Power Switch
- To reset all welding power source functions to original factory settings, turn power off. Push and hold the Process, Amperage,

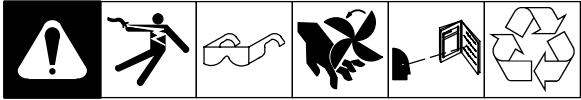

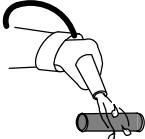
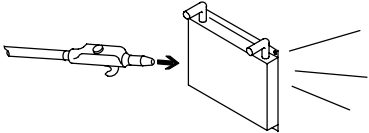
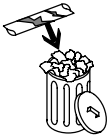
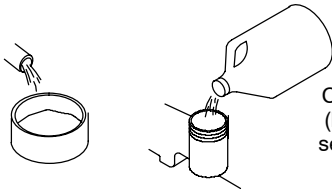
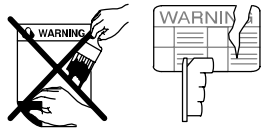
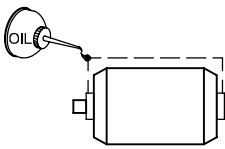
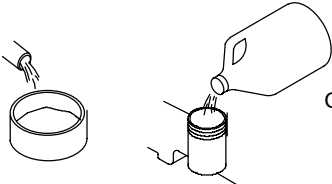
Output, and Start controls and turn On power. Hold switch pads for approximately 7 seconds (or until software version number -----_ clears meters).

SECTION 6 – MAINTENANCE

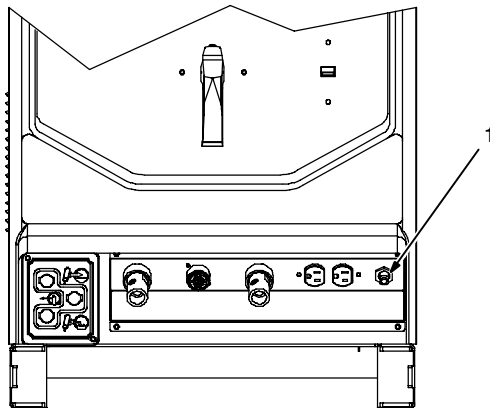
6-1. Routine Welding Power Source Maintenance

		<p>▲ Disconnect power before maintaining.</p>	
<p>3 Months</p>			
 <p>Replace Unreadable Labels</p>	 <p>Repair Or Replace Cracked Weld Cables</p>	 <p>Clean And Tighten Weld Terminals</p>	
 <p>Adjust Spark Gaps</p>	 <p>14-Pin Cord</p>	 <p>Gas Hose</p>	 <p>Torch Cable</p>
<p>6 Months</p>			
 <p>OR</p>		<p>Blow Out Or Vacuum Inside, During Heavy Service, Clean Monthly</p> <p>▲ Warranty is void if machine fails due to contaminates inside.</p>	

6-2. Routine Cooler Maintenance

		 <p>▲ Disconnect power before maintaining.</p>	
<p>1 Month</p>			
 <p>▲ Clean coolant strainer. Severe conditions may require more frequent cleaning (continuous use, high/low temperatures, dirty environment, etc.). Failure to properly clean coolant strainer voids pump warranty.</p>	 <p>Blow Out Heat Exchanger Fins</p>		
<p>6 Months</p>			
 <p>Replace Cracked Hoses</p>	 <p>Change Coolant (If Using Water) see Section 4-10</p>	 <p>Replace Damaged Or Unreadable Labels</p>	
<p>12 Months</p>			
 <p>Oil Motor</p>	 <p>Change Coolant (If Using MILLER Coolant) see Section 4-10</p>		

6-3. Circuit Breaker CB1



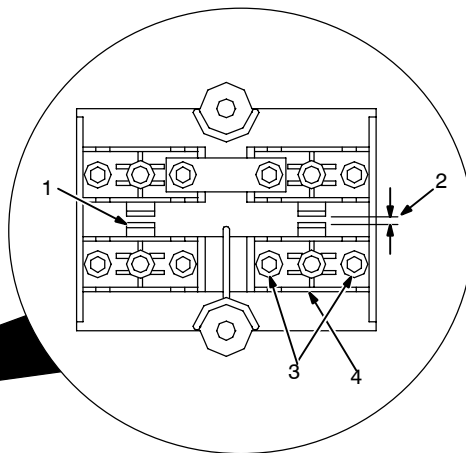
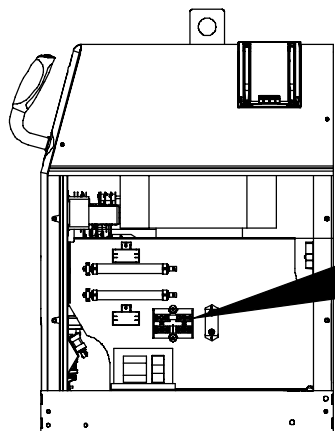
▲ Turn off power before resetting breaker.

1 Circuit Breaker CB1

If CB1 opens, high frequency and output to the 115 volts ac duplex receptacle stop. Press button to reset breaker.

Ref. 803 588-A

6-4. Adjusting Spark Gaps



▲ Turn Off welding power source and disconnect and lockout/tagout input power before adjusting spark gaps.

Remove right side panel..

1 Tungsten End Of Point

Replace point if tungsten end disappears; do not clean or dress tungsten.

2 Spark Gap

Normal spark gap is 0.012 in (0.305 mm).

If adjustment is needed, proceed as follows:

3 Adjustment Screws

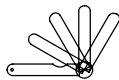
Loosen screws. Place gauge of proper thickness in spark gap.

4 Pressure Point

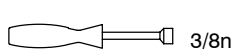
Apply slight pressure at point until gauge is held firmly in gap. Tighten screws. Adjust other gap.

Reinstall right side panel.

Tools Needed:



0.012 in (0.305 mm)



3/8 in

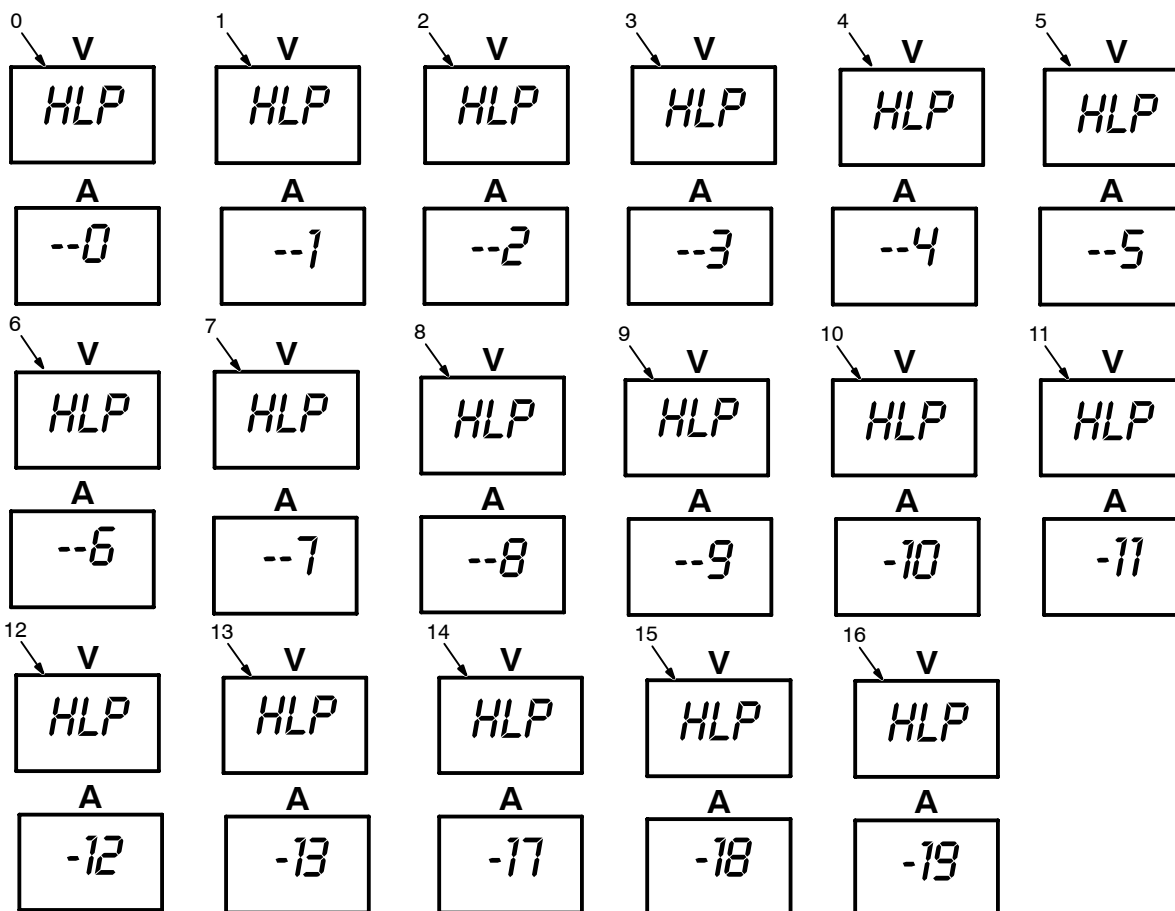


5/32 in

803 592-A

SECTION 7 – TROUBLESHOOTING

7-1. Voltmeter/Ammeter Help Displays



☞ All directions are in reference to the front of the unit. All circuitry referred to is located inside the unit.

0 Help 0 Display

Indicates a short in the thermal protection circuitry located on the transformer/stabilizer of the unit.

1 Help 1 Display

An SCR overcurrent or undercurrent condition has occurred. Turn power off and back on to correct condition.

2 Help 2 Display

Indicates an open in the thermal protection circuitry located on the transformer/stabilizer of the unit.

3 Help 3 Display

Indicates the transformer/stabilizer of the unit has overheated. The unit has shut down to allow the fan to cool it (see Section 4-5). Operation will continue when the unit has cooled.

4 Help 4 Display

Indicates an open in the thermal protection circuitry located on the rectifier assembly of the unit.

5 Help 5 Display

Rectifier assembly has overheated. The unit has shut down to allow the fan to cool unit (see Section 4-5). Operation will continue when the unit has cooled.

6 Help 6 Display

Not used.

7 Help 7 Display

Not used.

8 Help 8 Display

Not used.

9 Help 9 Display

Indicates a short in the thermal protection circuitry located on the rectifier assembly of the unit.

10 Help 10 Display

Indicates Remote Output control is activated. Release Remote Output control to clear help message.

11 Help 11 Display

Output Selector switch is not in correct position (see Section 5-2).

12 Help 12 Display

Indicates a non-allowable set-up of the front panel.

13 Help 13 - 15 Displays

Not used.

14 Help 14 Display

Malfunction in the thermal protection circuitry of the cooler.

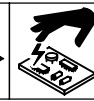
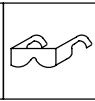
15 Help 15 Display

Coolant system coolant has overheated. The unit has shut down to allow the coolant to cool (see Section 4-5). Operation will continue when the coolant has cooled.

16 Help 16 Display

Indicates low coolant flow in the coolant system. The unit output has shut down and will not start again until the coolant flow level is corrected, and the power is turned off and back on.

7-2. Troubleshooting The Welding Power Source

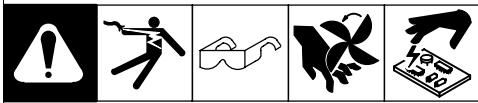


NOTE: The remedies listed below are recommendations only. If these remedies do not fix the trouble with your unit, have a Factory Authorized Service Agent check unit.
There are no user serviceable parts inside unit.

Refer to Section 7-1 for any Help (HLP) message displayed on voltmeter/ammeter.

Trouble	Remedy
No weld output; unit completely inoperative.	Place line disconnect switch in On position (see Section 4-21).
	Check and replace line fuse(s), if necessary (see Section 4-21).
	Check for proper input power connections (see Section 4-21).
	Check for proper jumper link position (see Section 4-20).
No weld output; unit on.	If using remote control, place Output control in Remote 14 position, and make sure remote control is connected to Remote 14 receptacle. If remote is not being used, place Output control in On position (see Section 5-1).
	Check, repair, or replace remote control.
	Have Factory Authorized Service Agent check unit.
Unit provides only maximum or minimum weld output.	Make sure Amperage control is in proper position (see Section 5-1).
	Have Factory Authorized Service Agent check unit.
Erratic or improper weld output.	Use proper size and type of weld cable (see Section 4-7).
	Clean and tighten all weld connections.
	Check position of Output Selector control (see Section Figure 5-1).
	If using remote control, check position of Amperage Adjustment control (see Section 5-1).
No control of weld output.	If using remote control, place Output control in Remote 14 position, and make sure remote control is connected to Remote 14 receptacle. If remote is not being used, place Output control in On position (see Section 5-1).
	Make sure Amperage control is in proper position (see Section 5-1).
No output from duplex receptacle RC2 and no high frequency.	Reset circuit breaker CB1 (see Section 6-3).
Lack of high frequency; difficulty in starting GTAW arc.	Reset circuit breaker CB1 (see Section 6-3).
	Select proper size tungsten (see Section 10).
	Be sure torch cable is not close to any grounded metal.
	Check cables and torch for cracked insulation or bad connections. Repair or replace.
	Check spark gaps (see Section 6-4).
Wandering arc – poor control of direction of arc.	Reduce gas flow rate.
	Select proper size tungsten (see Section 10).
	Properly prepare tungsten (see Section 10).
Tungsten electrode oxidizing and not remaining bright after conclusion of weld.	Shield weld zone from drafts.
	Increase postflow time.
	Check and tighten all gas fittings.
	Properly prepare tungsten.
	Check for water in torch, and repair torch if necessary.
Fan not operating.	Unit equipped with Fan-On-Demand™. Fans run only when necessary. Unit equipped with circuitry to protect against overheating.

7-3. Troubleshooting The Welding Coolant System



NOTE: The remedies listed below are recommendations only. If these remedies do not fix the trouble with your unit, have a Factory Authorized Service Agent check unit.
There are no user serviceable parts inside unit.

Refer to Section 7-1 for any Help (HLP) message displayed on voltmeter/ammeter.

Trouble	Remedy
Coolant system does not work.	Check line fuses or circuit breaker, and replace or reset if necessary.
	Motor overheated. Unit starts running when motor has cooled.
	Have Factory Authorized Service Agent check motor.
Decreased or no coolant flow.	Add coolant (see Section 4-10).
	Check for clogged hoses or coolant filter.
	Disconnect return line and place it in a container of clean coolant. Prime unit according to Section 4-10. Flow rate should be a minimum of 1 liter (1.1 qt) per minute. If flow rate is still low, have Factory Authorized Service Agent check unit.
Decreased cooling ability; coolant too hot.	Clean heat exchanger fins and blower assembly (see Section 6-2).
Foaming Coolant	Check for cracked or loose hoses or loose cover on filter, and tighten or replace.
	Check for loose cap or bad seal on filter assembly, and tighten or replace as necessary.

SECTION 8 - ELECTRICAL DIAGRAM

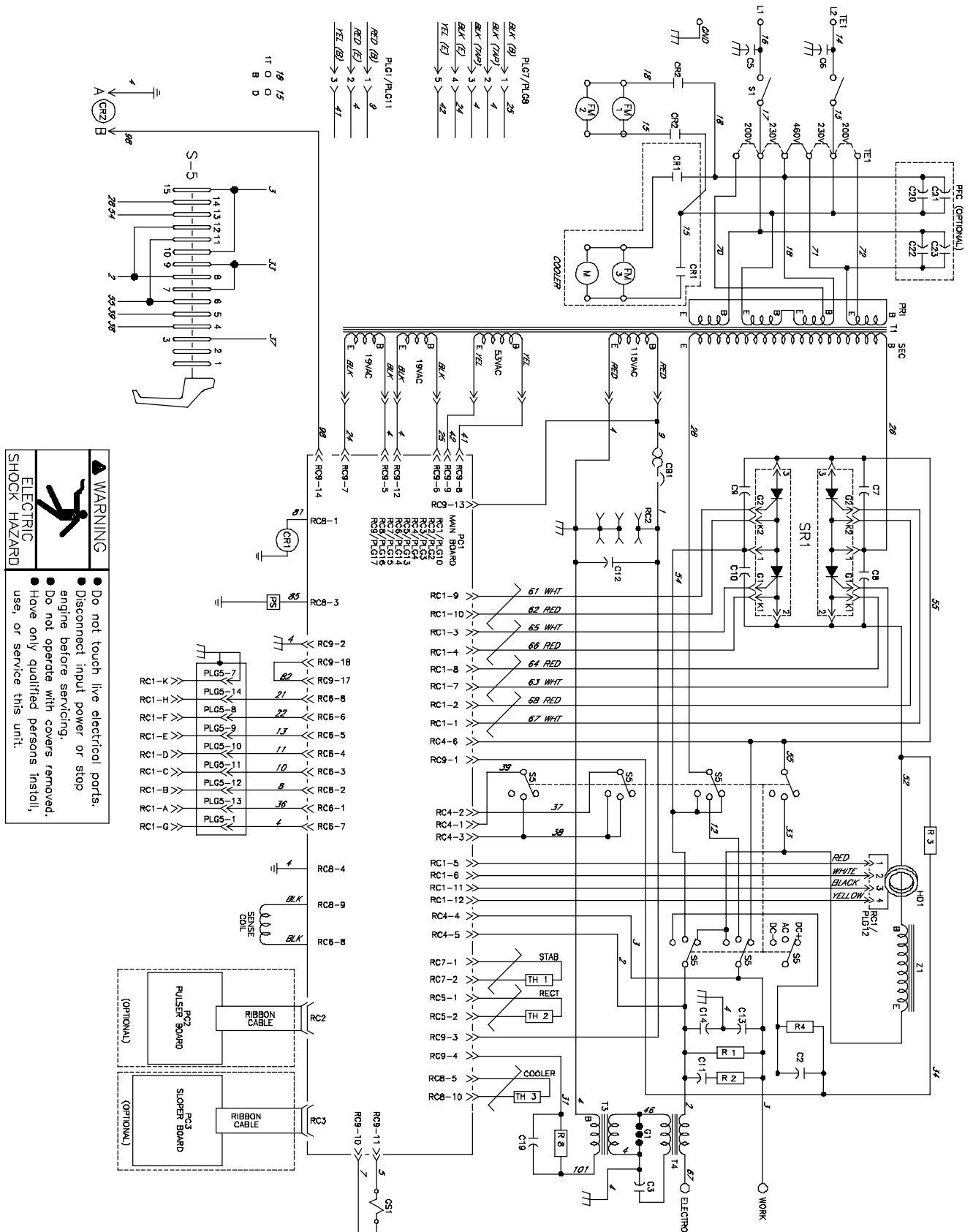


Figure 8-1. Circuit Diagram For 250 DX Models

222 681-A

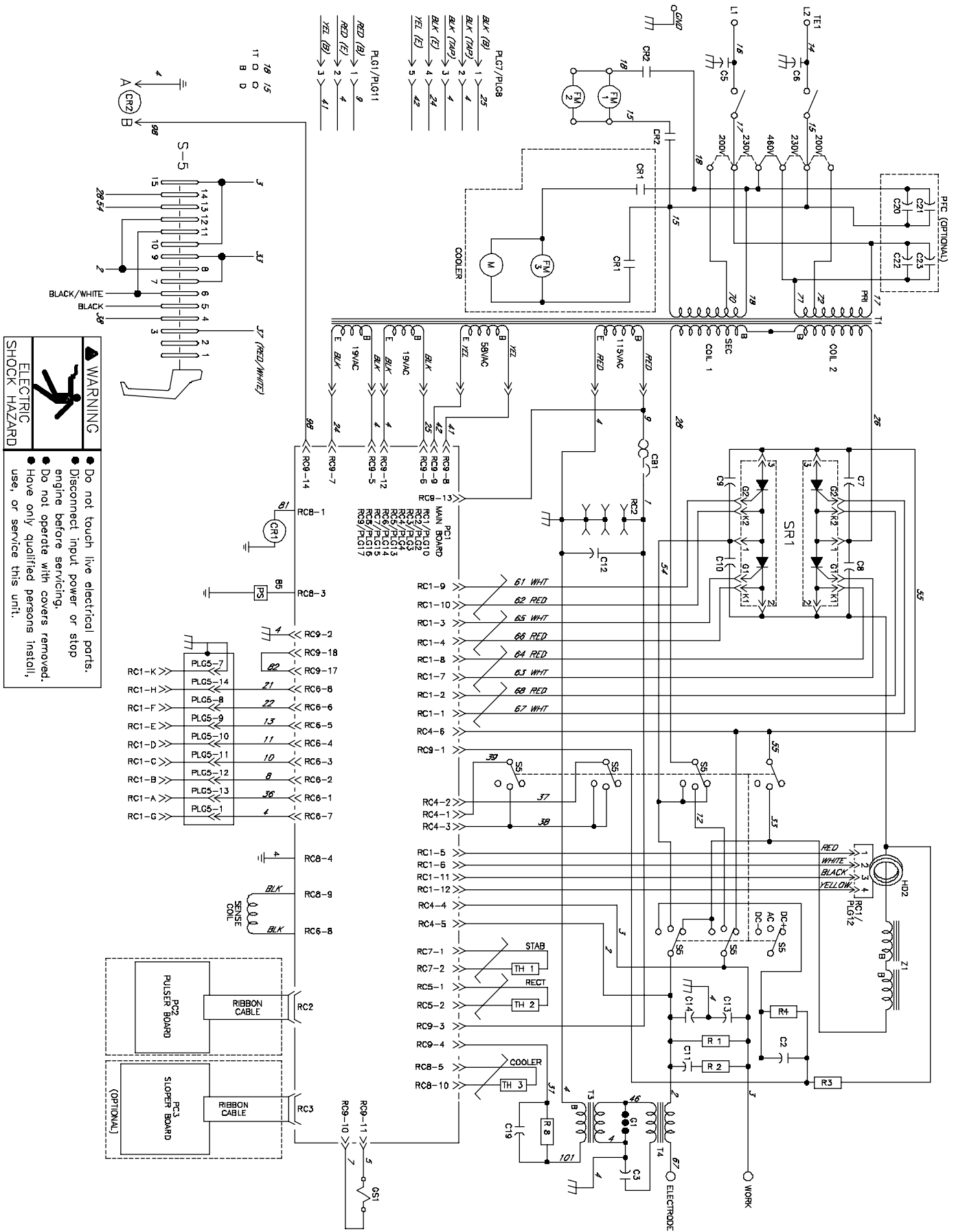
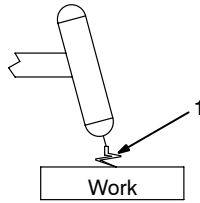


Figure 8-2. Circuit Diagram For 350 LX Models

SECTION 9 – HIGH FREQUENCY

9-1. Welding Processes Requiring High Frequency



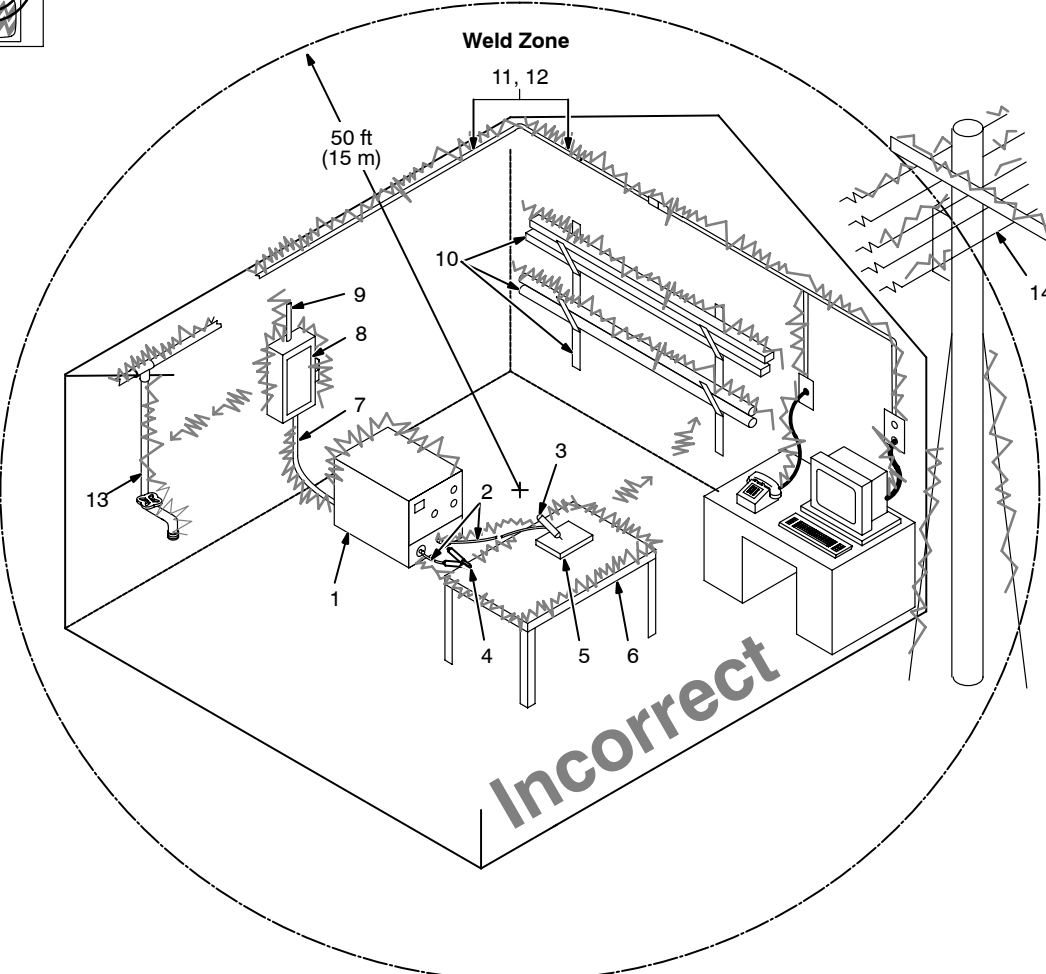
TIG

1 High-Frequency Voltage

TIG – helps arc jump air gap between torch and workpiece and/or stabilize the arc.

high_freq 12/96 – S-0693

9-2. Incorrect Installation



Sources of Direct High-Frequency Radiation

- 1 High-Frequency Source (welding power source with built-in HF or separate HF unit)
- 2 Weld Cables
- 3 Torch
- 4 Work Clamp
- 5 Workpiece
- 6 Work Table

Sources of Conduction of High Frequency

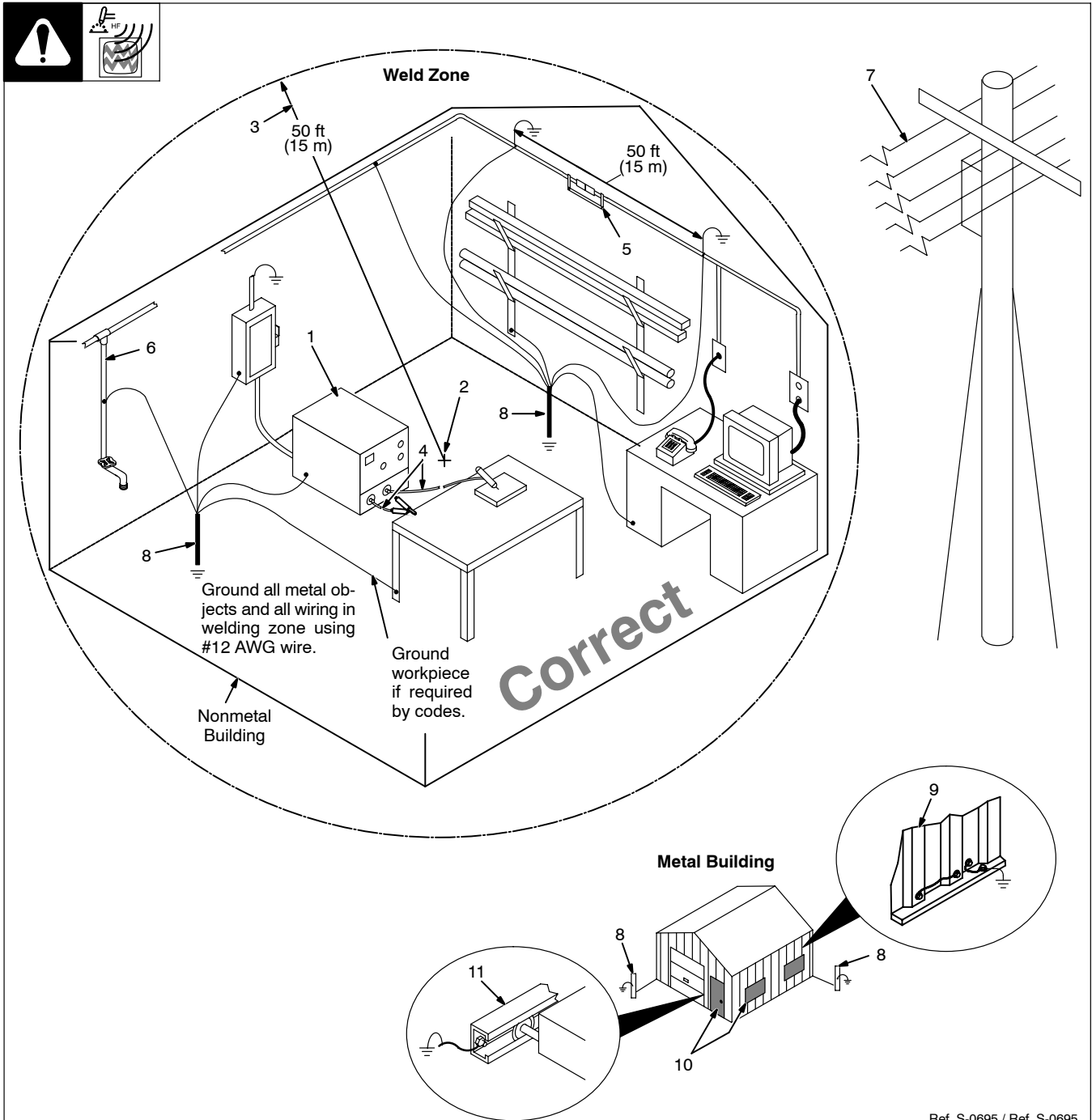
- 7 Input Power Cable
- 8 Line Disconnect Device
- 9 Input Supply Wiring

Sources of Reradiation of High Frequency

- 10 Ungrounded Metal Objects
- 11 Lighting
- 12 Wiring
- 13 Water Pipes and Fixtures
- 14 External Phone and Power Lines

S-0694

9-3. Correct Installation



- 1 High-Frequency Source (welding power source with built-in HF or separate HF unit)
Ground metal machine case, work output terminal, line disconnect device, input supply, and worktable.
- 2 Center Point of Welding Zone
Midpoint between high-frequency source and welding torch.
- 3 Welding Zone
A circle 50 ft (15 m) from center point in all directions.
- 4 Weld Output Cables
Keep cables short and close together.

- 5 Conduit Joint Bonding and Grounding
Electrically join (bond) all conduit sections using copper straps or braided wire. Ground conduit every 50 ft (15 m).
- 6 Water Pipes and Fixtures
Ground water pipes every 50 ft (15 m).
- 7 External Power or Telephone Lines
Locate high-frequency source at least 50 ft (15 m) away from power and phone lines.
- 8 Grounding Rod
Consult the National Electrical Code for specifications.

- Metal Building Requirements**
- 9 Metal Building Panel Bonding Methods
Bolt or weld building panels together, install copper straps or braided wire across seams, and ground frame.
 - 10 Windows and Doorways
Cover all windows and doorways with grounded copper screen of not more than 1/4 in (6.4 mm) mesh.
 - 11 Overhead Door Track
Ground the track.

Ref. S-0695 / Ref. S-0695

SECTION 10 – SELECTING AND PREPARING TUNGSTEN ELECTRODE FOR DC OR AC WELDING

ac/dc_gtaw 2/2000



▲ Whenever possible and practical, use DC weld output instead of AC weld output.

10-1. Selecting Tungsten Electrode (Wear Clean gloves To Prevent Contamination Of Tungsten)

Electrode Diameter	Amperage Range - Gas Type♦ - Polarity	
	(DCEN) – Argon Direct Current Electrode Negative	AC – Argon 65% Electrode Negative
2% Ceria (Orange Band), 1.5% Lanthanum (Gray Band), Or 2% Thorium (Red Band) Alloy Tungstens		
.040" (1 mm)	25-85	20-80
1/16" (1.6 mm)	50-160	50-150
3/32" (2.4 mm)	135-235	130-250
1/8" (3.2 mm)	250-400	225-360
Pure Tungsten (Green Band)		
.040" (1 mm)	Pure Tungsten Not Recommended For DCEN – Argon	10-60
1/16" (1.6 mm)		50-100
3/32" (2.4 mm)		100-160
1/8" (3.2 mm)		150-210

♦ Typical argon shielding gas flow rates are 11 to 35 cfh (cubic feet per hour).

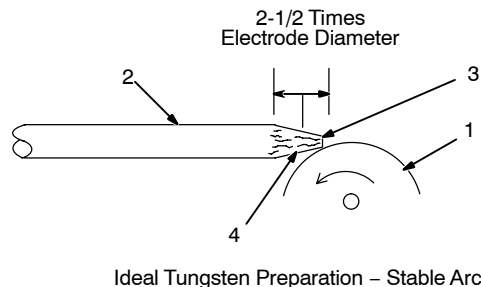
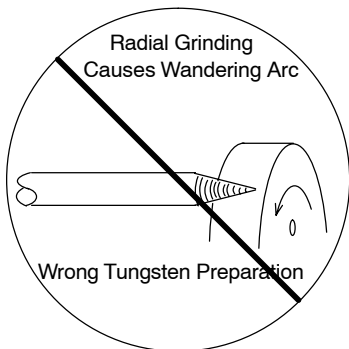
Figures listed are a guide and are a composite of recommendations from American Welding Society (AWS) and electrode manufacturers.

10-2. Preparing Tungsten Electrode For Welding



▲ Grinding the tungsten electrode produces dust and flying sparks which can cause injury and start fires. Use local exhaust (forced ventilation) at the grinder or wear an approved respirator. Read MSDS for safety information. Consider using tungsten containing ceria, lanthana, or yttria instead of thoria. Grinding dust from thoriated electrodes contains low-level radioactive material. Properly dispose of grinder dust in an environmentally safe way. Wear proper face, hand, and body protection. Keep flammables away.

A. Preparing Tungsten For DC Electrode Negative (DCEN) Welding Or AC Welding With Inverter Machines



1 Grinding Wheel

Grind end of tungsten on fine grit, hard abrasive wheel before welding. Do not use wheel for other jobs or tungsten can become contaminated causing lower weld quality.

2 Tungsten Electrode

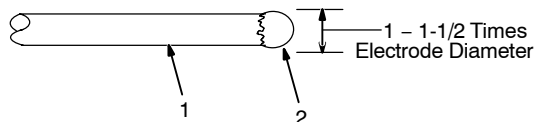
3 Flat

Diameter of this flat determines amperage capacity.

4 Straight Ground

Grind lengthwise, **not radial**.

B. Preparing Tungsten For Conventional AC Welding




1 Tungsten Electrode

2 Balled End

Ball end of tungsten by applying AC amperage recommended for a given electrode diameter (see Section 10-1). Let ball on end of the tungsten take its own shape.

SECTION 11 – PARTS LIST

 Hardware is common and not available unless listed.

350 LX Model Illustrated

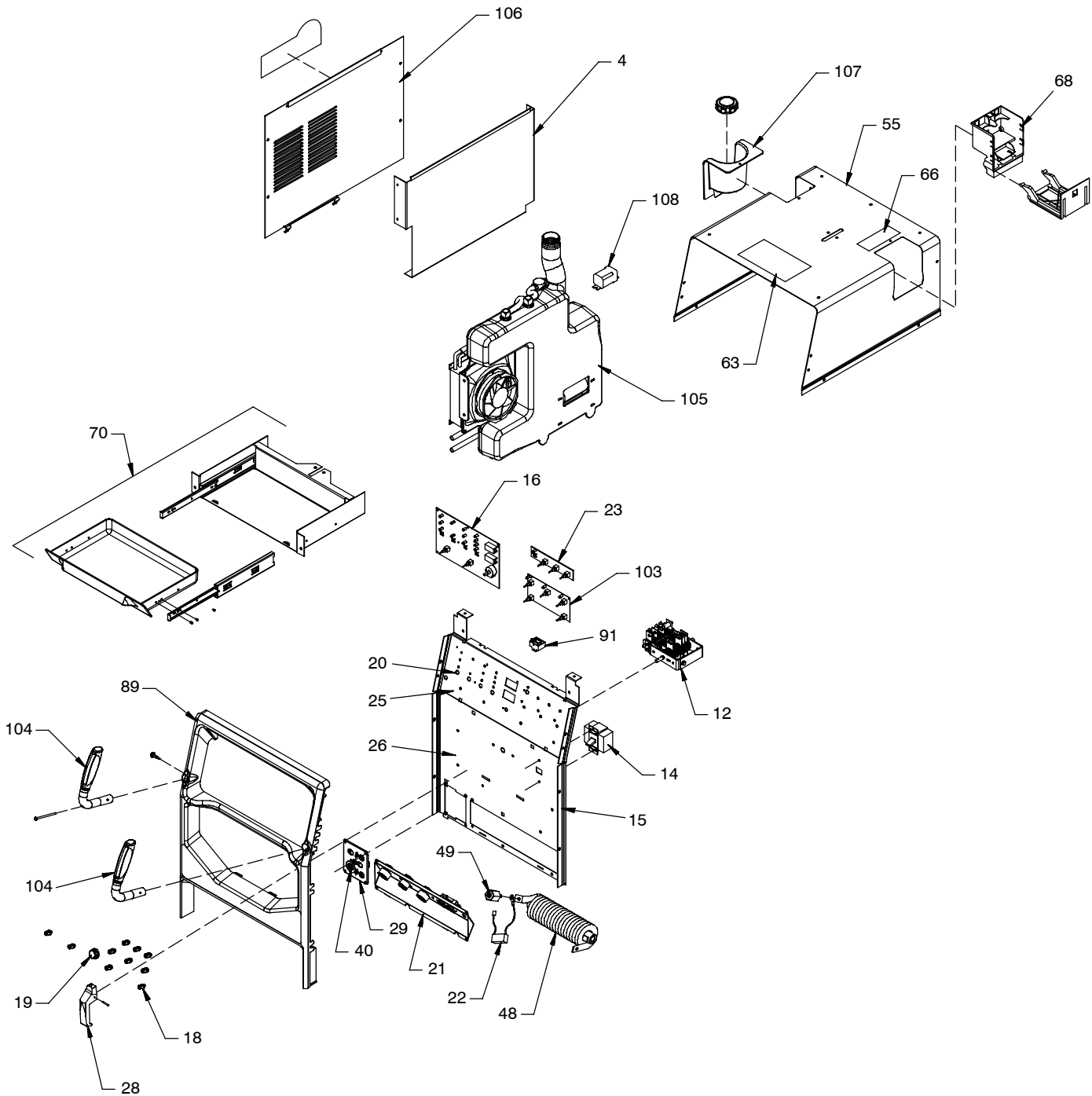
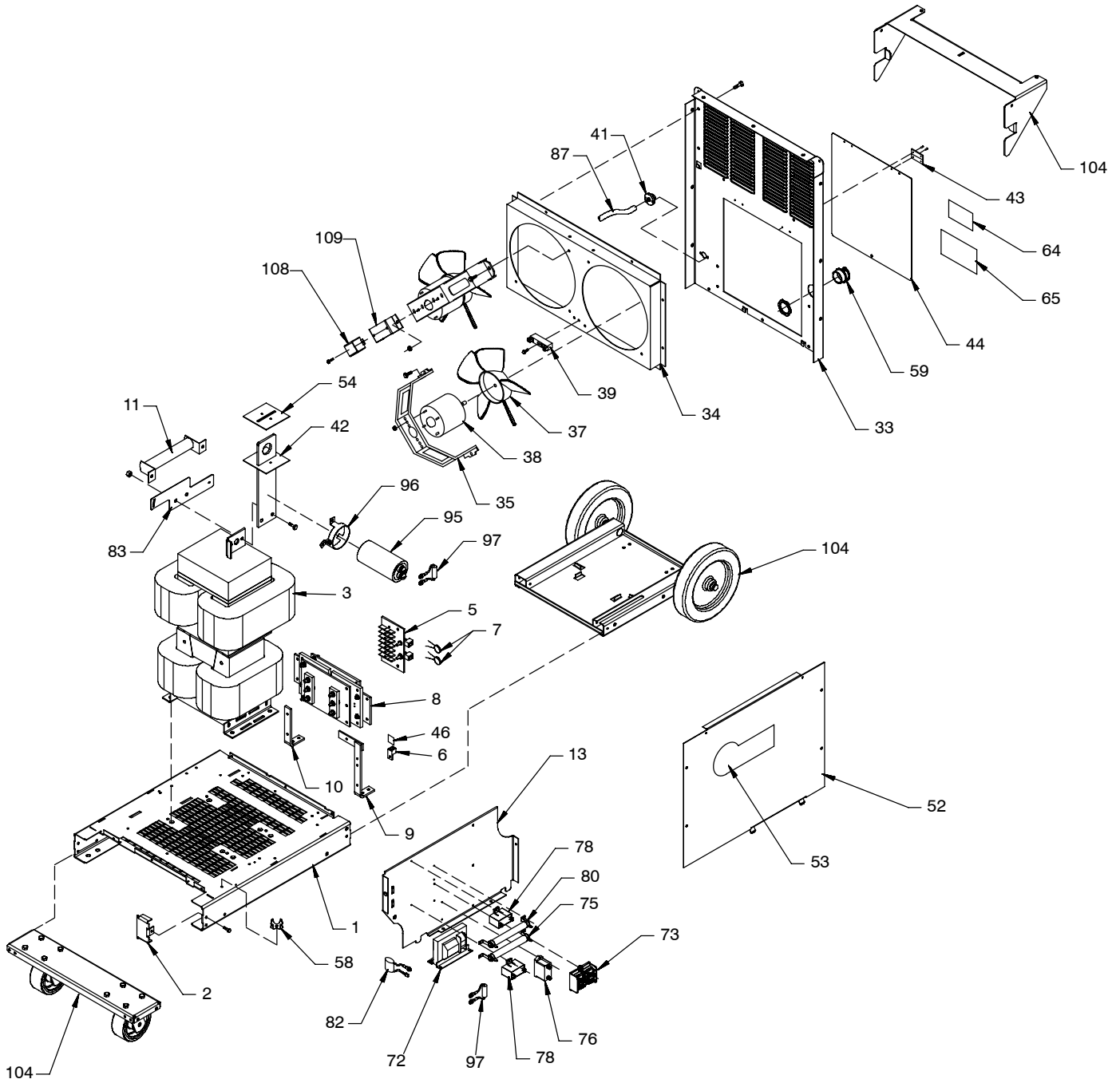


Figure 11-1. Main Assembly

350 LX Model Illustrated



Item No.	Dia. Mkgs.	Part No.	Description	Quantity	
				Model 250 DX	350 LX
Figure 11-1. Main Assembly					
...	1	211038	.. BASE, ASSY	1	1
...	2	215656	.. END CAP,	4	4
...	3	T1/Z1 212555	.. XFMR/STABILIZER ASSY, 200/230/460	1	
...	3	T1/Z1 211041	.. XFMR/STABILIZER ASSY, 230/460/575	1	
...	3	T1/Z1 219652	.. XFMR/STABILIZER ASSY, 220/400/440/520	1	
...	3	T1/Z1 215767	.. XFMR/STABILIZER ASSY, 200/230/460	1	
...	3	T1/Z1 215389	.. XFMR/STABILIZER ASSY, 230/460/575	1	
...	3	T1/Z1 217801	.. XFMR/STABILIZER ASSY, 220/400/440/520	1	
...		TH1 201443	.. THERMISTOR,NTC 10K OHM @ 25 DEG C 27.5IN LEAD	1	1
...	4	212550	.. PANEL, LEFT WINDTUNNEL (for non-TIGRUNNER models)	1	1
...	5	TE1 218175	.. TERM ASSY, PRI 1PH 3V	1	1
...	6	213248	.. LUG, UNIV W/SCREW 2/0-14 WIRE .266STD	1	1
...	7	C5, 6 111634	.. CAPACITOR ASSY,	1	1
...	8	SR1 212558	.. RECTIFIER, SCR MAIN	1	1
...		TH2 217069	.. THERMISTOR,NTC 30K OHM @ 25 DEG C 40IN LEAD	1	1
...	9	218670	.. BRACKET, RECTIFIER RH	1	1
...	10	212559	.. BRACKET, RECTIFIER LH	1	1
...	11	R3 218173	.. RESISTOR, WW FXD 400 W 35 OHM W/MTG BKT	1	1
...	12	S5 215390	.. SWITCH ASSY, POLARITY W/LEADS & HARDWARE (DX)	1	1
...	13	+213105	.. PANEL, RIGHT WINDTUNNEL	1	1
...	14	215937	.. SWITCH, TGL ASSY	1	1
...	15	213114	.. FRONT PANEL ASSY,	1	1
...		117860	.. BLANK, SNAP-IN NYL .187 MTG HOLE BLACK	1	1
...		107983	.. BLANK, SNAP-IN NYL .500 MTG HOLE BLACK	1	1
...		143397	.. BLANK, SNAP-IN NYL .312 MTG HOLE BLACK	8	8
...	16	PC1 209877	.. CIRCUIT CARD ASSY, CONTROL & INTERFACE W/PROGRAM	1	1
...	18	183332	.. KNOB, POINTER .570 DIA X .125 ID W/SPRING CLIP	2	5
...	19	174991	.. KNOB, POINTER 1.250 DIA X .250 ID W/SPRING CLIP-.21	1	1
...	20	195778	.. ACTUATOR PUSH BUTTON ASSY	1	1
...	21	Figure 11-2	.. PANEL,LOWER DINSE CONN ASSY	1	1
...	22	C14 209587	.. CAPACITOR ASSY,	1	1
...	23	PC2◆◆ 195344	.. CIRCUIT CARD ASSY, PULSER,	1	
...	23	PC2 195344	.. CIRCUIT CARD ASSY, PULSER,	1	1
...	25	217264	.. NAMEPLATE, MILLER SYNCROWAVE DX (UPPER) WORD&SYMBOL	1	
...	25	215460	.. NAMEPLATE, MILLER SYNCROWAVE DX (UPPER) CE WORDLESS	1	
...	25	217263	.. NAMEPLATE, MILLER SYNCROWAVE LX (UPPER) WORD&SYMBOL	1	1
...	25	212549	.. NAMEPLATE, MILLER SYNCROWAVE LX (UPPER) CE WORDLESS	1	1
...	26	213106	.. NAMEPLATE, MILLER SYNCROWAVE DX (LOWER)	1	
...	26	218584	.. NAMEPLATE, MILLER SYNCROWAVE DX (LOWER) CE	1	
...	26	213107	.. NAMEPLATE, MILLER SYNCROWAVE LX (LOWER)	1	1
...	26	218585	.. NAMEPLATE, MILLER SYNCROWAVE LX (LOWER) CE	1	1
...	28	175952	.. PLASTIC, HANDLE SWITCH	1	1
...		169136	.. PIN, HANDLE	1	1
...	29	215685	.. PANEL, GAS	1	1
...	29	◆215691	.. PANEL, GAS/WATER	1	1
...	33	212548	.. PANEL, REAR	1	1
...	34	184058	.. FAN, PLENUM	1	1
...	35	187807	.. BRACKET, MTG MOTOR FAN	2	2
...	37	150783	.. BLADE, FAN 9.000 5WG 39DEG .312 BORE CW PLSTC	2	2
...	38	FM1, 2 220393	.. MOTOR, FAN 230V 50/60HZ 1550 RPM .312 DIA SHAFT	2	2
...	39	1T 199312	.. BLOCK, TERMINAL FAST-ON,20 AMP,250 VOLT	1	1
...	40	GS1 215776	.. VALVE, 24VDC 2WAY CUSTOM PORT 1/8 ORF W/FRICT	1	1
...	41	208408	.. FTG, BRS BARBED FEM 1/4 TBG X .625-18 FLANGE MTG	1	1
...		217111	.. PLUG, PROTECTIVE	2	2
...	42	204293	.. SUPPORT, LIFT EYE	1	
...	42	212552	.. SUPPORT, LIFT EYE	1	1
...	43	218280	.. HINGE, CONT POLYOLEFIN	1	1
...	44	+215657	.. DOOR, ACCESS	1	1

Item No.	Dia. Mkgs.	Part No.	Description	Quantity	
				Model 250 DX	Model 350 LX
Figure 11-1. Main Assembly (continued)					
.. 46		217553	.. LABEL,GROUND/PROTECTIVE EARTH	1	1
.. 48	T4	215771	.. COIL, HF COUPLING	1	1
.. 49		207560	.. INSULATOR, STANDOFF WITH STUD	2	2
.. 52		♣211043	.. PANEL, SIDE	2	2
.. 53		199479	.. LABEL, MILLER	2	2
.. 54		026627	.. GASKET ,LIFTING EYE COVER	1	1
.. 55		+211040	.. COVER, TOP	1	1
.. 58		208294	.. CONNECTOR, FASTON MALE 4-PRONG	1	2
.. 59		010467	.. CONN, CLAMP CABLE 1.250	1	1
.. 63		203990	.. LABEL, WARNING GENERAL PRECAUTIONARY STATIC	1	1
.. 64		127363	.. LABEL, WARNING ELECTRIC SHOCK CAN KILL	1	1
.. 65		218598	.. LABEL, WARNING ELECTRIC SHOCK AND INCORRECT INPUT P	1	1
.. 66		201019	.. LABEL, WARNING ELECTRIC SHOCK EXCESS WEIGHT	1	1
.. 68		♣204389	.. HOLDER, TORCH/CABLE	2	2
.. 70		212557	.. DRAWER, ASSY (includes)	1	1
..		213111	.. DRAWER, PLASTIC	1	1
..		213112	.. DRAWER, FRAME	1	1
..		217255	.. SLIDE, DRAWER	2	2
.. 72	T3	219927	.. XFMR, HIGH VOLTAGE 115V PRI 3600V SEC 34 MA W/TERM	1	1
.. 73	G1	199854	.. SPARK GAP ASSY, (includes)	1	1
..		199855	.. BASE	1	1
..		199856	.. HOLDER, POINTS	4	4
..		196455	.. POINTS, SPARK GAP	4	4
.. 75	R8	188067	.. RESISTOR, WW FXD 100 W 200 OHM W/CLIPS	1	1
.. 76	C3	215779	.. CAPACITOR, MICA .002 UF 10000 V PANEL MTG W/LEA	1	1
.. 78	C11, 19	195552	.. CAPACITOR, POLYP MET FILM 20. UF 250 VAC 10%	2	2
.. 80	R1	220808	.. RESISTOR, WW FXD 100 W 50 OHM W/CLIPS	1	1
.. 82	C13	206878	.. CAPACITOR ASSY,	1	1
.. 83		216081	.. BRACKET, RESISTOR	1	1
.. 87		218170	.. HOSE, NPRN BRD NO 1 X .250 ID X 24.000	1	1
.. 89		211039	.. BEZEL, FRONT	1	1
.. 90		192828	.. LABEL, WARNING ELECTRICAL SHOCK ETC	1	1
.. 91	HD1	191941	.. TRANSDUCER, CURRENT	1	1
.. 95	C2	031668	.. CAPACITOR, ELCTLT 4000 UF 100 VDC	1	1
.. 96		108105	.. CLAMP, CAPACITOR	1	1
.. 97	R2, 4	118459	.. RESISTOR, WW FXD 10 W 1K OHM	2	2
.. 103	PC3♦♦	195345	.. CIRCUIT CARD ASSY, SEQUENCER	1	1
.. 104	♦ Figure 11-4		.. TIGRUNNER RUNNING GEAR	1	1
.. 105	♦ Figure 11-3		.. ASSY, COOLER	1	1
.. 106	♦212556		.. PANEL, SIDE	1	1
.. 107	♦211037		.. HOLDER, COOLANT FILLER	1	1
.. 108	CR1 ♦059266		.. RELAY, ENCL 120VAC DPDT 10A/120VAC 8PIN	2	2
..	♦194744		.. RFCS-14HD (FOOT CONTROL)	1	1
.. 109		222451	.. BRACKET, RELAY	1	1

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

♦ Part of TIGRUNNER option.

♦♦ Field option only.

♣ For TIGRUNNER models, the quantity is 1.

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.

☞ Hardware is common and not available unless listed.

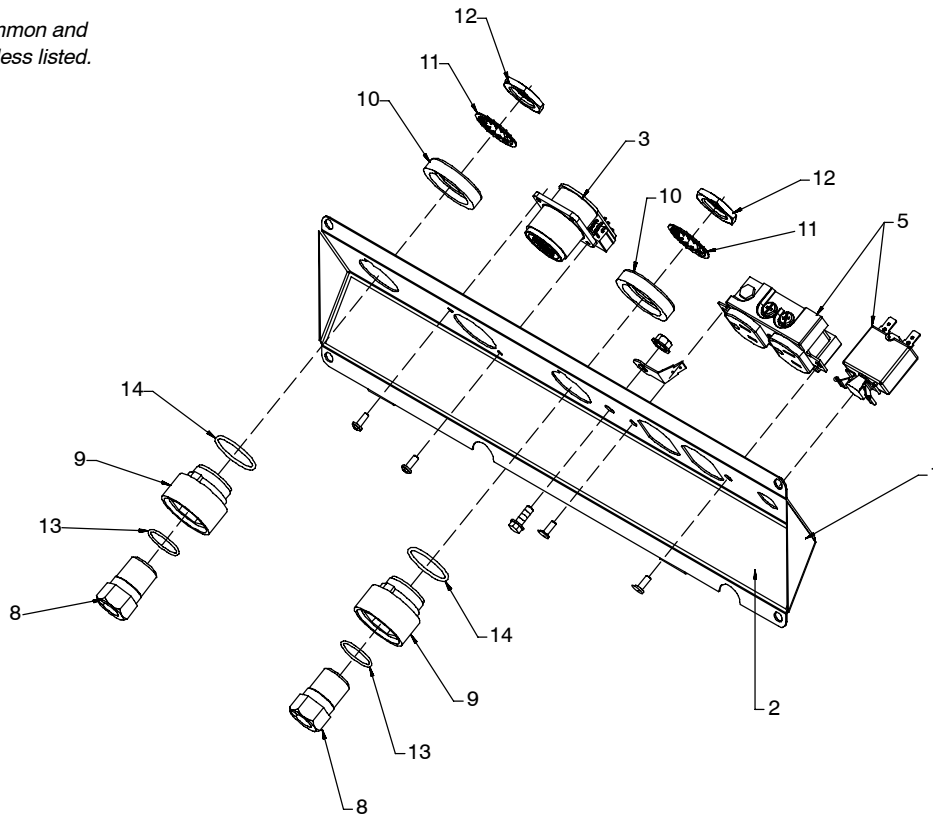


Figure 11-2. Panel, Lower Dinse Connector Assembly

803 775-A

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
220 509 Figure 11-2. Panel, Lower Dinse Connector Assy (Figure 11-1 Item 21)				
...	1	213109	.. PANEL, LOWER DINSE CONN	1
...	2	218784	.. LABEL, COMPONENT IDENTIFICATION	1
...	2	215778	.. LABEL, COMPONENT IDENTIFICATION CE WORDLESS	1
...	3	211911	.. CONN, CIRC MS/CPC 14SKT SIZE 20 RCPT W/FILTERING	1
...	5	218174	.. RECEPTACLE, W/LEADS & CIRCUIT BREAKER	1
...	8	202553	.. RECEPTACLE, TWIST LOCK BRASS POWER (FEMALE)	2
...	9	185712	.. INSULATOR, BULKHEAD FRONT	2
...	10	185713	.. INSULATOR, BULKHEAD REAR	2
...	11	185714	.. WASHER, TOOTH 22MMID X 31.5MMOD 1.310-1MMT INTERN	2
...	12	185717	.. NUT, M20-1.5 1.00HEX .19H BRS LOCKING	2
...	13	186228	.. O-RING, 0.739 ID X 0.070 H	2
...	14	185718	.. O-RING, 0.989 ID X 0.070 H	2

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.

☞ Hardware is common and not available unless listed.

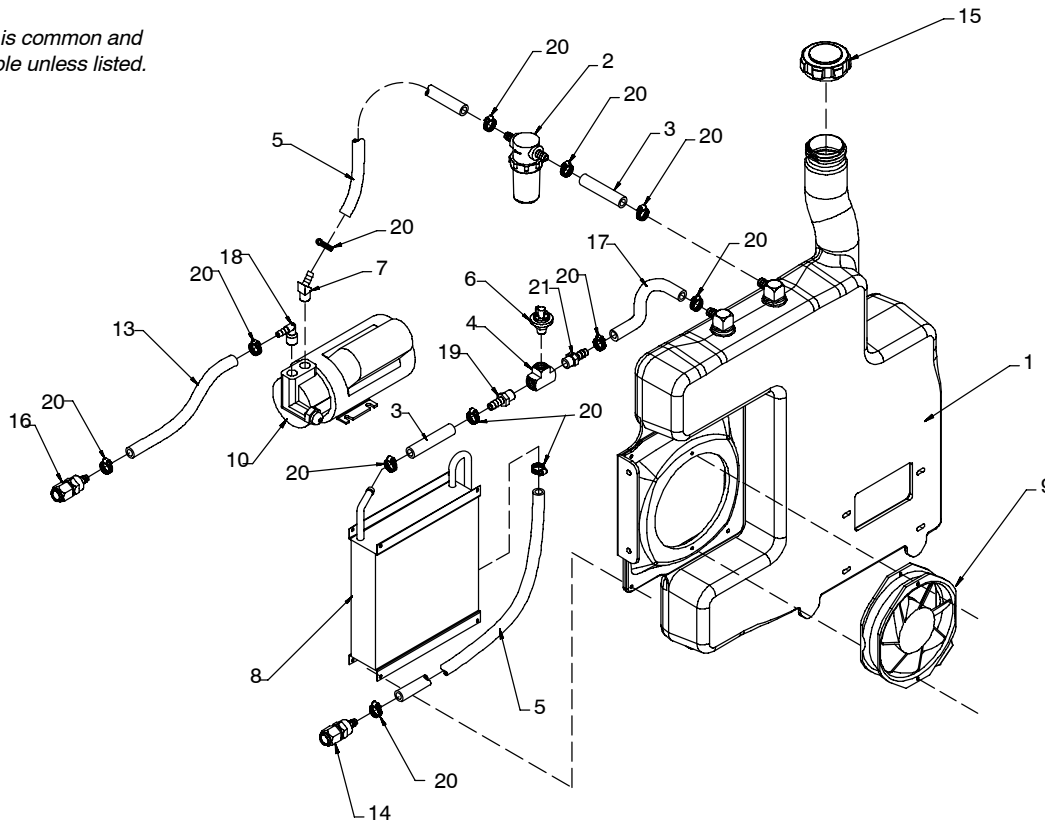


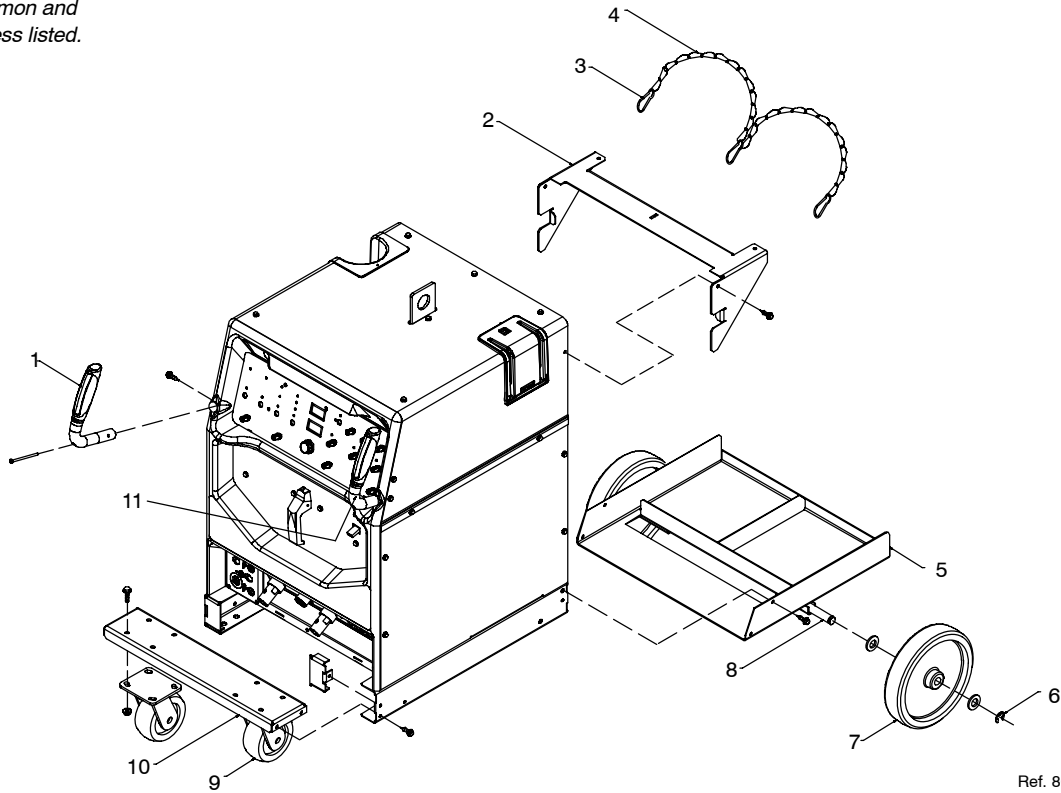
Figure 11-3. Optional Cooler Assembly

803 779-C

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
212 544 Figure 11-3. Cooler Assy (Optional) Figure 11-1 Item 105)				
...	1	211036	.. TANK,COOLANT	1
...	2	215667	.. FILTER,	1
...	3	215669	.. HOSE, RUBBER BRAIDED 3/8 ID X 1/2 OD X 2 IN	2
...	4	215688	.. FITTING,MANIFOLD	1
...	5	215675	.. HOSE, RUBBER BRAIDED 3/8 ID X 5/8 OD X 19 IN	2
...	6	215679	.. SWITCH, PRESSURE	1
...	7	221819	.. FTG, HOSE BRS BARBED 45 DEGREE ELBOW M3/8 X 3/8 NPT	1
...	8	217173	.. RADIATOR, HEAT EXCHANGER	1
...	9	211042	.. FAN, AC 230V BRUSHLESS	1
...	10	211045	.. PUMP, COOLANT	1
...	13	215683	.. HOSE, RUBBER BRAIDED 3/8 ID X 1/2 OD X 13-1/2 IN	1
...	14	215686	.. VALVE, CHECK BIDIRECTIONAL	1
...	TH3	217069	.. THERMISTOR,NTC 30K OHM @ 25 DEG C 40IN LEAD	1
...	15	166608	.. CAP, TANK SCREW-ON W/VENT	1
...	16	220921	.. VALVE, CHECK BIDIRECTIONAL	1
...	17	215690	.. HOSE, RUBBER BRAIDED 3/8 ID X 1/2 OD X 3-1/2 IN	1
...	18	5523	.. FTG, HOSE BRS BARBED ELBOW M 3/8 TBG X 3/8 NPT	1
...	19	126978	.. FTG, BRS BARBED M 3/8 TBG X 3/8 NPT	1
...	20	176746	.. CLAMP, 1-EAR TYPE NOM DIM .656 X .275 WIDE	12
...	21	215673	.. FITTING,	1

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.

☞ Hardware is common and not available unless listed.



Ref. 803 725-A

Figure 11-4. Optional Running Gear

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-4. Running Gear (Optional) (Figure 11-1 Item 104)				
1		218134	HANDLE, LH	1
2		215928	BOTTLE SUPPORT	1
3		168663	HOOK SPRING SNAP	3
4		602387	CHAIN	2
5		191158	BOTTLE TRAY	1
6		121614	RETAINING RING	2
7		163463	WHEEL	2
8		191167	AXLE	1
9		168247	CASTER, SWIVEL	2
10		191163	CASTER MOUNTING BRACKET	1
11		218135	HANDLE, RH	1

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, 2004

(Equipment with a serial number preface of "LE" 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 ...

Service

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 Sources (Unless Otherwise Stated)
 - * Water Coolant Systems (Integrated)
 - * Intelligig
 - * Maxstar 150
 - * Engine Driven Welding Generators
(NOTE: Engines are warranted separately by the engine manufacturer.)
3. 1 Year — Parts and Labor Unless Specified
 - * DS-2 Wire Feeder
 - * Motor Driven Guns (w/exception of Spoolmate Spoolguns)
 - * Process Controllers
 - * Positioners and Controllers
 - * Automatic Motion Devices
 - * RFCS Foot Controls
 - * Induction Heating Power Sources and Coolers
 - * Water Coolant Systems (Non-Integrated)
 - * Flowgauge and Flowmeter Regulators (No Labor)
 - * HF Units
 - * Grids
 - * Maxstar 85, 140
 - * Spot Welders
 - * Load Banks
 - * Arc Stud Power Sources & Arc Stud Guns
 - * Racks
 - * 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 & SAF Model Plasma Cutting Torches
- * Remote Controls
- * Accessory Kits
- * Replacement Parts (No labor)
- * Spoolmate Spoolguns
- * 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. (Exception: brushes, slip rings, and relays are covered on Bobcat, Trailblazer, and Legend models.)**
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.

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.





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

Contact a DISTRIBUTOR or SERVICE AGENCY near you.

Always provide Model Name and Serial/Style Number.

Contact your Distributor for:

- Welding Supplies and Consumables
 - Options and Accessories
 - Personal Safety Equipment
 - Service and Repair
 - Replacement Parts
 - Training (Schools, Videos, Books)
 - Technical Manuals (Servicing Information and Parts)
 - Circuit Diagrams
 - Welding Process Handbooks
- To locate a Distributor or Service Agency visit www.millerwelds.com or call 1-800-4-A-Miller

Contact the Delivering Carrier to:

- 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.

Miller Electric Mfg. Co.

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1635 West Spencer Street
Appleton, WI 54914 USA

International Headquarters—USA

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