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Processes



TIG (GTAW) Welding



Stick (SMAW) Welding

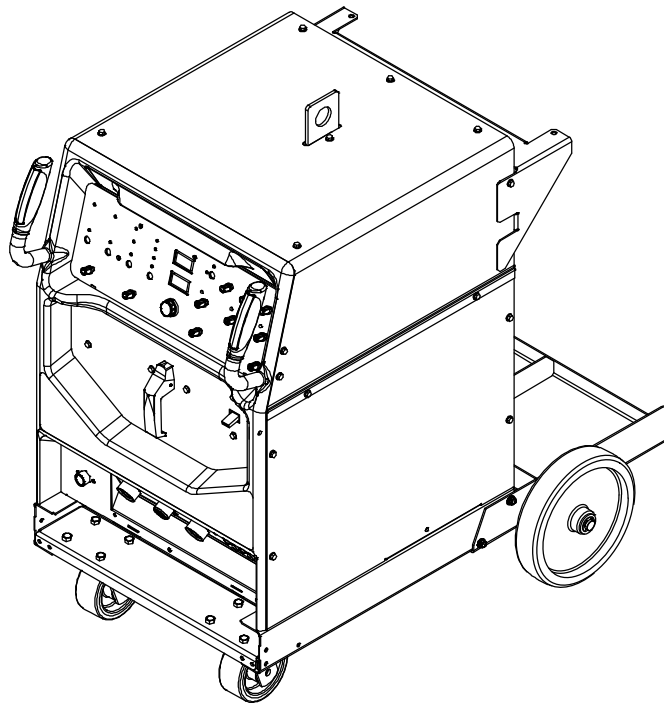
Description



Arc Welding Power Source

Syncrowave[®] 250 DX / 350 LX

With Optional Running Gear And Cooler



Visit our website at
www.MillerWelds.com

OWNER'S MANUAL

File: TIG (GTAW)



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 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 specification 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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OPTIONS AND ACCESSORIES

WARRANTY


FOR ADDITIONAL WELDING INFORMATION AND RESOURCES, VISIT: [http://MillerWelds.com/resources/improving-your skills](http://MillerWelds.com/resources/improving-your-skills)


SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

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 Protect yourself and others from injury — read, follow, and save these important safety precautions and operating instructions.

1-1. Symbol Usage

 **DANGER!** – Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

 Indicates a hazardous situation which, if not avoided, could result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.


NOTICE – Indicates statements not related to personal injury.

 Indicates special instructions.



This group of symbols means Warning! Watch Out! 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.
- Additional safety precautions are required when any of the following electrically hazardous conditions are present: in damp locations or while wearing wet clothing; on metal structures such as floors, gratings, or scaffolds; when in cramped positions such as sitting, kneeling, or lying; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, use the following equipment in order presented: 1) a semiautomatic DC constant voltage (wire) welder, 2) a DC manual (stick) welder, or 3) an AC welder with reduced open-circuit voltage. In most situations, use of a DC, constant voltage wire welder is recommended. And, do not work alone!
- 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, ground, and operate 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.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- 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.
- Do not touch electrode holders connected to two welding machines at the same time since double open-circuit voltage will be present.
- 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. Disconnect cable for process not in use.

SIGNIFICANT DC VOLTAGE exists in inverter welding power sources AFTER removal of input power.

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



HOT PARTS can burn.

- Do not touch hot parts bare handed.
- Allow cooling period before working on equipment.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.



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 local forced ventilation at the arc to remove welding fumes and gases.
- If ventilation is poor, wear an approved air-supplied respirator.
- Read and understand 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 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 an approved welding helmet fitted with a proper shade of filter lenses to protect your face and eyes from arc rays and sparks 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, glare and sparks; warn others not to watch the arc.
- Wear protective clothing made from durable, flame-resistant material (leather, heavy cotton, or wool) and foot protection.

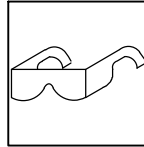


WELDING can cause fire or explosion.

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 explosions. 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.

- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Do not weld where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- 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 containers that have held combustibles, or on closed containers such as tanks, drums, or pipes unless they are properly prepared according to AWS F4.1 and AWS A6.0 (see Safety Standards).
- Do not weld where the atmosphere may contain flammable dust, gas, or liquid vapors (such as gasoline).
- 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, sparks, 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.
- After completion of work, inspect area to ensure it is free of sparks, glowing embers, and flames.
- Use only correct fuses or circuit breakers. Do not oversize or bypass them.
- Follow requirements in OSHA 1910.252 (a) (2) (iv) and NFPA 51B for hot work and have a fire watcher and extinguisher nearby.



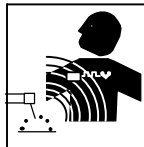
FLYING METAL or DIRT can injure eyes.

- 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.



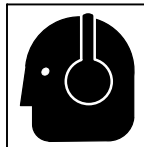
BUILDUP OF GAS can injure or kill.

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



ELECTRIC AND MAGNETIC FIELDS (EMF) can affect Implanted Medical Devices.

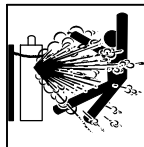
- Wearers of Pacemakers and other Implanted Medical Devices should keep away.
- Implanted Medical Device wearers should consult their doctor and the device manufacturer before going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations.



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.

Compressed 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, physical damage, 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 compressed 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.
- Use the right equipment, correct procedures, and sufficient number of persons to lift and move cylinders.
- Read and follow instructions on compressed gas cylinders, associated equipment, and Compressed Gas Association (CGA) publication P-1 listed in Safety Standards.

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



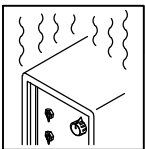
FIRE OR EXPLOSION hazard.

- 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.



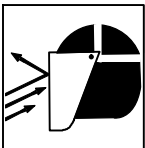
FALLING EQUIPMENT can injure.

- 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.
- Keep equipment (cables and cords) away from moving vehicles when working from an aerial location.
- Follow the guidelines in the Applications Manual for the Revised NIOSH Lifting Equation (Publication No. 94-110) when manually lifting heavy parts or equipment.



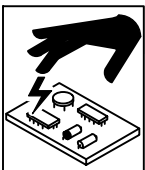
OVERUSE can cause OVERHEATING

- 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.



FLYING SPARKS can injure.

- Wear a face shield to protect eyes and face.
- Shape tungsten electrode only on grinder with proper guards in a safe location wearing proper face, hand, and body protection.
- Sparks can cause fires — keep flammables away.



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.



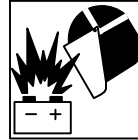
MOVING PARTS can injure.

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



WELDING WIRE can injure.

- 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.



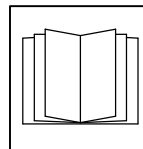
BATTERY EXPLOSION can injure.

- Do not use welder to charge batteries or jump start vehicles unless it has a battery charging feature designed for this purpose.



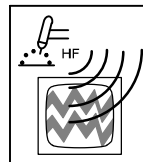
MOVING PARTS can injure.

- Keep away from moving parts such as fans.
- Keep all doors, panels, covers, and guards closed and securely in place.
- Have only qualified persons remove doors, panels, covers, or guards for maintenance and troubleshooting as necessary.
- Reinstall doors, panels, covers, or guards when maintenance is finished and before reconnecting input power.



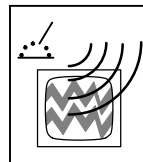
READ INSTRUCTIONS.

- Read and follow all labels and the Owner's Manual carefully before installing, operating, or servicing unit. Read the safety information at the beginning of the manual and in each section.
- Use only genuine replacement parts from the manufacturer.
- Perform maintenance and service according to the Owner's Manuals, industry standards, and national, state, and local codes.



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.)**

 **This product contains chemicals, including lead, known to the state of California to cause cancer, birth defects, or other reproductive harm. Wash hands after use.**

1-5. Principal Safety Standards

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, is available as a free download from the American Welding Society at <http://www.aws.org> or purchased from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

Safe Practices for the Preparation of Containers and Piping for Welding and Cutting, American Welding Society Standard AWS F4.1, from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

Safe Practices for Welding and Cutting Containers that have Held Combustibles, American Welding Society Standard AWS A6.0, from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.org and www.sparky.org).

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 14501 George Carter Way, Suite 103, Chantilly, VA 20151 (phone: 703-788-2700, website: www.cganet.com).

Safety in Welding, Cutting, and Allied Processes, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 5060

Spectrum Way, Suite 100, Ontario, Canada L4W 5N5 (phone: 800-463-6727, website: www.csa-international.org).

Safe Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 25 West 43rd Street, New York, NY 10036 (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, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.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 15250-7954 (phone: 1-866-512-1800) (there are 10 OSHA Regional Offices—phone for Region 5, Chicago, is 312-353-2220, website: www.osha.gov).

Applications Manual for the Revised NIOSH Lifting Equation, The National Institute for Occupational Safety and Health (NIOSH), 1600 Clifton Rd, Atlanta, GA 30333 (phone: 1-800-232-4636, website: www.cdc.gov/NIOSH).

1-6. EMF Information

Electric current flowing through any conductor causes localized electric and magnetic fields (EMF). Welding current creates an EMF field around the welding circuit and welding equipment. EMF fields may interfere with some medical implants, e.g. pacemakers. Protective measures for persons wearing medical implants have to be taken. For example, restrict access for passers-by or conduct individual risk assessment for welders. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

1. Keep cables close together by twisting or taping them, or using a cable cover.
2. Do not place your body between welding cables. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around your body.

4. Keep head and trunk as far away from the equipment in the welding circuit as possible.
5. Connect work clamp to workpiece as close to the weld as possible.
6. Do not work next to, sit or lean on the welding power source.
7. Do not weld whilst carrying the welding power source or wire feeder.

About Implanted Medical Devices:

Implanted Medical Device wearers should consult their doctor and the device manufacturer before performing or going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations. If cleared by your doctor, then following the above procedures is recommended.

SECTION 2 – CONSIGNES DE SÉCURITÉ – LIRE AVANT UTILISATION

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! Pour écarter les risques de blessure pour vous-même et pour autrui — lire, appliquer et ranger en lieu sûr ces consignes relatives aux précautions de sécurité et au mode opératoire.

2-1. Symboles utilisés

! **DANGER!** – Indique une situation dangereuse qui si on l'évite pas peut donner la mort ou des blessures graves. Les dangers possibles sont montrés par les symboles joints ou sont expliqués dans le texte.

! Indique une situation dangereuse qui si on l'évite pas peut donner la mort ou des blessures graves. Les dangers possibles sont montrés par les symboles joints ou sont expliqués dans le texte.

NOTE – Indique des déclarations pas en relation avec des blessures personnelles.

 Indique des instructions spécifiques.



Ce groupe de symboles veut dire Avertissement! Attention! DANGER DE CHOC ELECTRIQUE, PIECES EN MOUVEMENT, et PIECES CHAUDES. Consulter les symboles et les instructions ci-dessous y afférant pour les actions nécessaires afin d'éviter le danger.

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

! Les symboles représentés ci-dessous sont utilisés dans ce manuel pour attirer l'attention et identifier les dangers possibles. En présence de l'un de ces symboles, prendre garde et suivre les instructions afférentes pour éviter tout risque. Les instructions en matière de sécurité indiquées ci-dessous ne constituent qu'un sommaire des instructions de sécurité plus complètes fournies dans les normes de sécurité énumérées dans la Section 2-5. Lire et observer toutes les normes de sécurité.

! Seul un personnel qualifié est autorisé à installer, faire fonctionner, entretenir et réparer cet appareil.

! Pendant le fonctionnement, maintenir à distance toutes les personnes, notamment les enfants de l'appareil.



UNE DÉCHARGE ÉLECTRIQUE peut entraîner la mort.

Le contact d'organes électriques sous tension peut provoquer des accidents mortels ou des brûlures graves. Le circuit de l'électrode et de la pièce est sous tension lorsque le courant est délivré à la sortie. Le circuit d'alimentation et les circuits internes de la machine sont également sous tension lorsque l'alimentation est sur Marche. Dans le mode de soudage avec du fil, le fil, le dérouleur, le bloc de commande du rouleau et toutes les parties métalliques en contact avec le fil sont sous tension électrique. Un équipement installé ou mis à la terre de manière incorrecte ou impropre constitue un danger.

- Ne pas toucher aux pièces électriques sous tension.
- Porter des gants isolants et des vêtements de protection secs et sans trous.
- S'isoler de la pièce à couper et du sol en utilisant des housses ou des tapis assez grands afin d'éviter tout contact physique avec la pièce à couper ou le sol.
- Ne pas se servir de source électrique à courant électrique dans les zones humides, dans les endroits confinés ou là où on risque de tomber.
- Se servir d'une source électrique à courant électrique UNIQUEMENT si le procédé de soudage le demande.
- Si l'utilisation d'une source électrique à courant électrique s'avère nécessaire, se servir de la fonction de télécommande si l'appareil en est équipé.
- D'autres consignes de sécurité sont nécessaires dans les conditions suivantes : risques électriques dans un environnement humide ou si l'on porte des vêtements mouillés ; sur des structures métalliques telles que sols, grilles ou échafaudages ; en position coincée comme assise, à genoux ou couchée ; ou s'il y a un risque élevé de contact inévitable ou accidentel avec la pièce à souder ou le sol. Dans ces conditions, utiliser les équipements suivants,

dans l'ordre indiqué : 1) un poste à souder DC à tension constante (à fil), 2) un poste à souder DC manuel (électrode) ou 3) un poste à souder AC à tension à vide réduite. Dans la plupart des situations, l'utilisation d'un poste à souder DC à fil à tension constante est recommandée. En outre, ne pas travailler seul !

- Couper l'alimentation ou arrêter le moteur avant de procéder à l'installation, à la réparation ou à l'entretien de l'appareil. Déverrouiller l'alimentation selon la norme OSHA 29 CFR 1910.147 (voir normes de sécurité).
- Installez, mettez à la terre et utilisez correctement cet équipement conformément à son Manuel d'Utilisation et aux réglementations nationales, gouvernementales et locales.
- Toujours vérifier la terre du cordon d'alimentation. Vérifier et s'assurer que le fil de terre du cordon d'alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- En effectuant les raccordements d'entrée, fixer d'abord le conducteur de mise à la terre approprié et contre-vérifier les connexions.
- Les câbles doivent être exempts d'humidité, d'huile et de graisse; protégez-les contre les étincelles et les pièces métalliques chaudes.
- Vérifier fréquemment le cordon d'alimentation afin de s'assurer qu'il n'est pas altéré ou à nu, le remplacer immédiatement s'il l'est. Un fil à nu peut entraîner la mort.
- L'équipement doit être hors tension lorsqu'il n'est pas utilisé.
- Ne pas utiliser des câbles usés, endommagés, de grosseur insuffisante ou mal épissés.
- Ne pas enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, la faire directement avec un câble distinct.
- Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d'une autre machine.
- Ne pas toucher des porte électrodes connectés à deux machines en même temps à cause de la présence d'une tension à vide doublée.
- N'utiliser qu'un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretenir l'appareil conformément à ce manuel.
- Porter un harnais de sécurité si l'on doit travailler au-dessus du sol.
- S'assurer que tous les panneaux et couvercles sont correctement en place.
- Fixer le câble de retour de façon à obtenir un bon contact métal-métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.
- Isoler la pince de masse quand pas mis à la pièce pour éviter le contact avec tout objet métallique.
- Ne pas raccorder plus d'une électrode ou plus d'un câble de masse à une même borne de sortie de soudage. Débrancher le câble pour le procédé non utilisé.

Il reste une TENSION DC NON NÉGLIGEABLE dans les sources de soudage onduleur UNE FOIS l'alimentation coupée.

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



LES PIÈCES CHAUDES peuvent provoquer des brûlures.

- Ne pas toucher à mains nues les parties chaudes.
- Prévoir une période de refroidissement avant de travailler à l'équipement.
- Ne pas toucher aux pièces chaudes, utiliser les outils recommandés et porter des gants de soudage et des vêtements épais pour éviter les brûlures.



LES FUMÉES ET LES GAZ peuvent être dangereux.

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

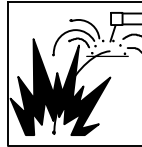
- Eloigner votre tête des fumées. Ne pas respirer les fumées.
- À l'intérieur, ventiler la zone et/ou utiliser une ventilation forcée au niveau de l'arc pour l'évacuation des fumées et des gaz de soudage.
- Si la ventilation est médiocre, porter un respirateur anti-vapeurs approuvé.
- Lire et comprendre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



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

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

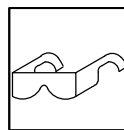
- Porter un casque de soudage approuvé muni de verres filtrants appropriés pour protéger visage et yeux pour protéger votre visage et vos yeux pendant le soudage ou pour regarder (voir ANSI Z49.1 et Z87.1 énuméré dans les normes de sécurité).
- Porter des lunettes de sécurité avec écrans latéraux même sous votre casque.
- Avoir recours à des écrans protecteurs ou à des rideaux pour protéger les autres contre les rayonnements les éblouissements et les étincelles ; prévenir toute personne sur les lieux de ne pas regarder l'arc.
- Porter des vêtements confectionnés avec des matières résistantes et ignifuges (cuir, coton lourd ou laine) et des bottes de protection.



LE SOUDAGE peut provoquer un incendie ou une explosion.

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

- Déplacer toutes les substances inflammables à une distance de 10,7 m de l'arc de soudage. En cas d'impossibilité les recouvrir soigneusement avec des protections homologuées.
- Ne pas souder dans un endroit où des étincelles peuvent tomber sur des substances inflammables.
- Se protéger et d'autres personnes de la projection d'étincelles et de métal chaud.
- Des étincelles et des matériaux chauds du soudage peuvent facilement passer dans d'autres zones en traversant de petites fissures et des ouvertures.
- Surveiller tout déclenchement d'incendie et tenir un extincteur à proximité.
- Le soudage effectué sur un plafond, plancher, paroi ou séparation peut déclencher un incendie de l'autre côté.
- Ne pas effectuer le soudage sur des conteneurs fermés tels que des réservoirs, tambours, ou conduites, à moins qu'ils n'aient été préparés correctement conformément à AWS F4.1 et AWS A6.0 (voir les Normes de Sécurité).
- Ne soudez pas si l'air ambiant est chargé de particules, gaz, ou vapeurs inflammables (vapeur d'essence, par exemple).
- Brancher le câble de masse sur la pièce la plus près possible de la zone de soudage pour éviter le transport du courant sur une longue distance par des chemins inconnus éventuels en provoquant des risques d'électrocution, d'étincelles 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 à la pointe de contact.
- Porter des vêtements de protection dépourvus d'huile tels que des gants en cuir, une chemise en matériau lourd, des pantalons sans revers, des chaussures hautes et un couvre chef.
- Avant de souder, retirer toute substance combustible de vos poches telles qu'un allumeur au butane ou des allumettes.
- Une fois le travail achevé, assurez-vous qu'il ne reste aucune trace d'étincelles incandescentes ni de flammes.
- Utiliser exclusivement des fusibles ou coupe-circuits appropriés. Ne pas augmenter leur puissance; ne pas les ponter.
- Une fois le travail achevé, assurez-vous qu'il ne reste aucune trace d'étincelles incandescentes ni de flammes.
- Utiliser exclusivement des fusibles ou coupe-circuits appropriés. Ne pas augmenter leur puissance; ne pas les ponter.
- Suivre les recommandations dans OSHA 1910.252(a)(2)(iv) et NFPA 51B pour les travaux à chaud et avoir de la surveillance et un extincteur à proximité.



DES PIÈCES DE METAL ou DES SALETES peuvent provoquer des blessures dans les yeux.

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



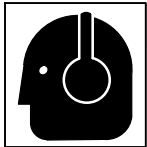
LES ACCUMULATIONS DE GAZ risquent de provoquer des blessures ou même la mort.

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



Les CHAMPS ÉLECTROMAGNÉTIQUES (CEM) peuvent affecter les implants médicaux.

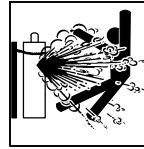
- Les porteurs de stimulateurs cardiaques et autres implants médicaux doivent rester à distance.
- Les porteurs d'implants médicaux doivent consulter leur médecin et le fabricant du dispositif avant de s'approcher de la zone où se déroule du soudage à l'arc, du soudage par points, du gougeage, de la découpe plasma ou une opération de chauffage par induction.



LE BRUIT peut endommager l'ouïe.

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

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



LES BOUTEILLES peuvent exploser si elles sont endommagées.

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

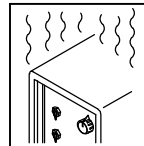
- Protéger les bouteilles de gaz comprimé d'une chaleur excessive, des chocs mécaniques, des dommages physiques, du laitier, des flammes ouvertes, des étincelles et des arcs.
- Placer les bouteilles debout en les fixant dans un support stationnaire ou dans un porte-bouteilles pour les empêcher de tomber ou de se renverser.
- Tenir les bouteilles éloignées des circuits de soudage ou autres circuits électriques.
- Ne jamais placer une torche de soudage sur une bouteille à gaz.
- Une électrode de soudage ne doit jamais entrer en contact avec une bouteille.
- Ne jamais souder une bouteille pressurisée – risque d'explosion.
- Utiliser seulement des bouteilles de gaz comprimé, régulateurs, tuyaux et raccords convenables pour cette application spécifique; les maintenir ainsi que les éléments associés en bon état.
- Détourner votre visage du détendeur-régulateur lorsque vous ouvrez la soupape de la bouteille.
- Le couvercle du détendeur doit toujours être en place, sauf lorsque la bouteille est utilisée ou qu'elle est reliée pour usage ultérieur.
- Utiliser les équipements corrects, les bonnes procédures et suffisamment de personnes pour soulever et déplacer les bouteilles.
- Lire et suivre les instructions sur les bouteilles de gaz comprimé, l'équipement connexe et le dépliant P-1 de la CGA (Compressed Gas Association) mentionné dans les principales normes de sécurité.

2-3. Dangers supplémentaires en relation avec l'installation, le fonctionnement et la maintenance



Risque D'INCENDIE OU D'EXPLOSION.

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



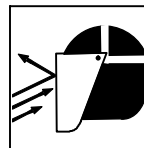
L'EMPLOI EXCESSIF peut SURCHAUFFER L'ÉQUIPEMENT.

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



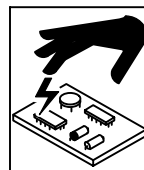
LA CHUTE DE L'ÉQUIPEMENT peut provoquer des blessures.

- Utiliser l'anneau de levage uniquement pour soulever l'appareil, NON PAS les chariots, les bouteilles de gaz ou tout autre accessoire.
- Utiliser un équipement de levage de capacité suffisante pour lever l'appareil.
- En utilisant des fourches de levage pour déplacer l'unité, s'assurer que les fourches sont suffisamment longues pour dépasser du côté opposé de l'appareil.
- Tenir l'équipement (câbles et cordons) à distance des véhicules mobiles lors de toute opération en hauteur.
- Suivre les consignes du Manuel des applications pour l'équation de levage NIOSH révisée (Publication N°94-110) lors du levage manuel de pièces ou équipements lourds.



LES ÉTINCELLES PROJETÉES peuvent provoquer des blessures.

- Porter un écran facial pour protéger le visage et les yeux.
- Affûter l'électrode au tungstène uniquement à la meuleuse dotée de protecteurs. Cette manœuvre est à exécuter dans un endroit sûr lorsque l'on porte l'équipement homologué de protection du visage, des mains et du corps.
- Les étincelles risquent de causer un incendie – éloigner toute substance inflammable.



LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

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



Les PIÈCES MOBILES peuvent causer des blessures.

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



LES FILS DE SOUDAGE peuvent provoquer des blessures.

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



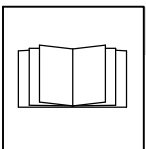
L'EXPLOSION DE LA BATTERIE peut provoquer des blessures.

- Ne pas utiliser l'appareil de soudage pour charger des batteries ou faire démarrer des véhicules à l'aide de câbles de démarrage, sauf si l'appareil dispose d'une fonctionnalité de charge de batterie destinée à cet usage.



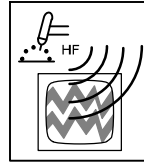
Les PIÈCES MOBILES peuvent causer des blessures.

- S'abstenir de toucher des organes mobiles tels que des ventilateurs.
- Maintenir fermés et verrouillés les portes, panneaux, recouvrements et dispositifs de protection.
- Lorsque cela est nécessaire pour des travaux d'entretien et de dépannage, faire retirer les portes, panneaux, recouvrements ou dispositifs de protection uniquement par du personnel qualifié.
- Remettre les portes, panneaux, recouvrements ou dispositifs de protection quand l'entretien est terminé et avant de rebrancher l'alimentation électrique.



LIRE LES INSTRUCTIONS.

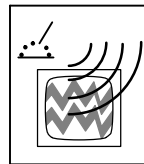
- Lire et appliquer les instructions sur les étiquettes et le Mode d'emploi avant l'installation, l'utilisation ou l'entretien de l'appareil. Lire les informations de sécurité au début du manuel et dans chaque section.
- N'utiliser que les pièces de rechange recommandées par le constructeur.
- Effectuer l'entretien en respectant les manuels d'utilisation, les normes industrielles et les codes nationaux, d'état et locaux.



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

- Le rayonnement haute fréquence (H.F.) peut provoquer des interférences avec les équipements de radio-navigation et de communication, les services de sécurité et les ordinateurs.

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



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

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

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)

! Ce produit contient des produits chimiques, notamment du plomb, dont l'État de Californie reconnaît qu'ils provoquent des cancers, des malformations congénitales ou d'autres problèmes de procréation. *Se laver les mains après utilisation.*

2-5. Principales normes de sécurité

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, is available as a free download from the American Welding Society at <http://www.aws.org> or purchased from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

Safe Practices for the Preparation of Containers and Piping for Welding and Cutting, American Welding Society Standard AWS F4.1, from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

Safe Practices for Welding and Cutting Containers that have Held Combustibles, American Welding Society Standard AWS A6.0, from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.org and www.sparky.org).

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 14501 George Carter Way, Suite 103, Chantilly, VA 20151 (phone: 703-788-2700, website: www.cganet.com).

Safety in Welding, Cutting, and Allied Processes, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 5060

Spectrum Way, Suite 100, Ontario, Canada L4W 5NS (phone: 800-463-6727, website: www.csa-international.org).

Safe Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 25 West 43rd Street, New York, NY 10036 (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, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.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 15250-7954 (phone: 1-866-512-1800) (there are 10 OSHA Regional Offices—phone for Region 5, Chicago, is 312-353-2220, website: www.osha.gov).

Applications Manual for the Revised NIOSH Lifting Equation, The National Institute for Occupational Safety and Health (NIOSH), 1600 Clifton Rd, Atlanta, GA 30333 (phone: 1-800-232-4636, website: www.cdc.gov/NIOSH).

2-6. Informations relatives aux CEM

Le courant électrique qui traverse tout conducteur génère des champs électromagnétiques (CEM) à certains endroits. Le courant de soudage crée un CEM autour du circuit et du matériel de soudage. Les CEM peuvent créer des interférences avec certains implants médicaux comme des stimulateurs cardiaques. Des mesures de protection pour les porteurs d'implants médicaux doivent être prises: Limiter par exemple tout accès aux passants ou procéder à une évaluation des risques individuels pour les soudeurs. Tous les soudeurs doivent appliquer les procédures suivantes pour minimiser l'exposition aux CEM provenant du circuit de soudage:

1. Rassembler les câbles en les torsadant ou en les attachant avec du ruban adhésif ou avec une housse.
2. Ne pas se tenir au milieu des câbles de soudage. Disposer les câbles d'un côté et à distance de l'opérateur.
3. Ne pas courber et ne pas entourer les câbles autour de votre corps.

4. Maintenir la tête et le torse aussi loin que possible du matériel du circuit de soudage.
5. Connecter la pince sur la pièce aussi près que possible de la soudure.
6. Ne pas travailler à proximité d'une source de soudage, ni s'asseoir ou se pencher dessus.
7. Ne pas souder tout en portant la source de soudage ou le dévidoir.

En ce qui concerne les implants médicaux :

Les porteurs d'implants doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de soudage par points, de gougeage, du coupage plasma ou de chauffage par induction. Si le médecin approuve, il est recommandé de suivre les procédures précédentes.

SECTION 3 – DEFINITIONS

3-1. Warning Label Definitions

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

1 Electric shock from welding electrode or wiring can kill.

1.1 Wear dry insulating gloves. Do not touch electrode with bare hand. Do not wear wet or damaged gloves.

1.2 Protect yourself from electric shock by insulating yourself from work and ground.

1.3 Disconnect input plug or power before working on machine.

2 Breathing welding fumes can be hazardous to your health.

2.1 Keep your head out of the fumes.

2.2 Use forced ventilation or local exhaust to remove the fumes.

2.3 Use ventilating fan to remove fumes.

3 Welding sparks can cause explosion or fire.

3.1 Keep flammables away from welding. Do not weld near flammables.

3.2 Welding sparks can cause fires. Have a fire extinguisher nearby, and have a watchperson ready to use it.

3.3 Do not weld on drums or any closed containers.

4 Arc rays can burn eyes and injure skin.

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.

5 Become trained and read the instructions before working on the machine or welding.

6 Do not remove or paint over (cover) the label.

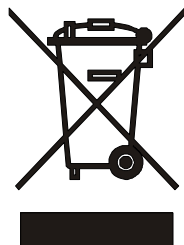
7 Welding current creates an electric and magnetic field (EMF) around the welding circuit and welding equipment. Follow compliance boundaries to stay within EMF exposure limits in an occupational environment.

7.1 Read the Owner's Manual for EMF information.



245694-A

3-2. WEEE Label



Do not discard product (where applicable) with general waste.

Reuse or recycle Waste Electrical and Electronic Equipment (WEEE) by disposing at a designated collection facility.

Contact your local recycling office or your local distributor for further information.

3-3. Symbols And Definitions

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		Prewflow Timer		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		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		Initial Time		Initial Amperage
	Pulse Percent On Time		Spot Time		Lift-Arc™		4 Step Trigger Operation Sequence
	Trigger Hold		Pulser On-Off		Pulse Frequency		Input
U_p	Rated peak starting voltage						

SECTION 4 – INSTALLATION

4-1. Important Information Regarding IEC Products

A. Information On Compliance With Essential Requirements

This equipment conforms to the essential requirements and provisions of the stated Standard(s):

- IEC 60974-1: 2005 Arc Welding Equipment – Welding Power Sources
- IEC 60974-10: 2004 Arc Welding Equipment – Electromagnetic Compatibility Requirements
- EN 50445 Product family standard to demonstrate compliance of equipment for resistance welding, arc welding and allied processes with the basic restrictions related to human exposure to electromagnetic fields (0 Hz – 300 Hz) BS EN 50445:2008

B. Information On Electromagnetic Fields (EMF)



This equipment shall not be used by the general public as the EMF limits for the general public might be exceeded during welding.

This equipment is built in accordance with EN 60974–1 and is intended to be used only in an occupational environment (where the general public access is prohibited or regulated in such a way as to be similar to occupational use) by an expert or an instructed person.

Wire feeders and ancillary equipment (such as torches, liquid cooling systems and arc striking and stabilizing devices) as part of the welding circuit may not be a major contributor to the EMF. See the Owner's Manuals for all components of the welding circuit for additional EMF exposure information.

- The EMF assessment on this equipment was conducted at 0.5 meter.
- At a distance of 1 meter the EMF exposure values were less than 20% of the permissible values.

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4-2. Serial Number And Rating Label Location

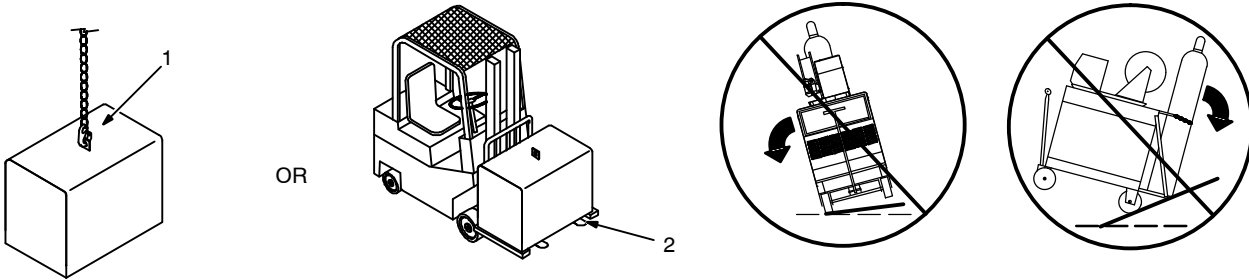
The serial number and rating information for the power source is located on the front of the machine. Use the rating labels to determine input power requirements and/or rated output. For future reference, write serial number in space provided on back cover of this manual.

Notes

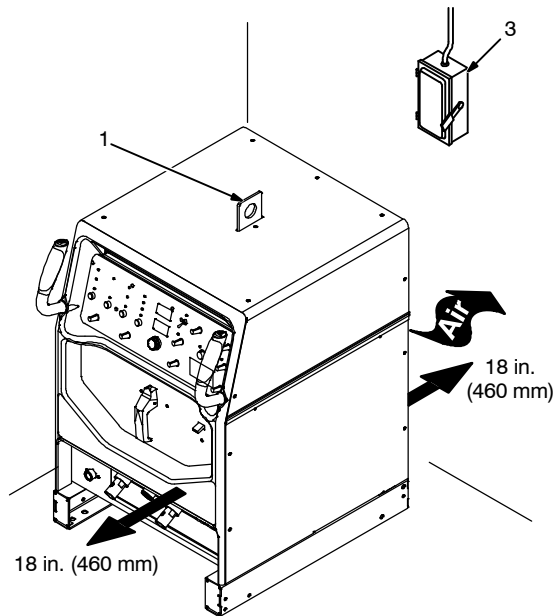
4-3. Selecting A Location



Movement



Location And Airflow



Ref. 117 264-C / 803 584-B

⚠ 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 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.

⚠ Do not move or operate unit where it could tip.

4-4. 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 in. (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	

4-5. Cooler Specifications

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

4-6. 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 (Uo)	Rated Peak Starting Voltage (Up)
		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	15 KV•
	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*			15 KV•
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	15 KV•
	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*			15 KV•

*While idling
 **Power Factor Correction
 •Arc striking device is designed for manual guided operations

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 (Uo)	Rated Peak Starting Voltage (Up)
		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	15 KV•
	With PFC	60 *55.3	52 *49.5	26 *24.5	21 *19.6	12.06 *11.2	8.11 *39	3 – 310A	80V	15 KV•
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	15 KV•
	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	15 KV•

*While idling
**Power Factor Correction
•Arc striking device is designed for manual guided operations

Rated Welding Output	PFC **	Amperes Input at AC Balanced Rated Load Output, 50/60 Hz, Single-Phase				KVA	KW	Amperage Range	Max OCV (Uo)	Rated Peak Starting Voltage (Up)
		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	15 KV•
	With PFC	61 *45.9	34 *25.1	31 *22.8	26 *23.2	12.06 *11.2	8.11 *39	3 – 310A	80V	15 KV•
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	15 KV•
	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	15 KV•

*While idling
**Power Factor Correction
•Arc striking device is designed for manual guided operations

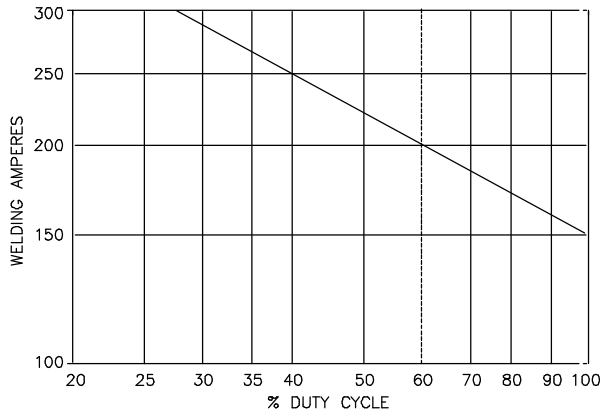
Rated Welding Output	PFC **	Amperes Input at AC Balanced Rated Load Output, 50 Hz, Single-Phase				KVA	KW	Amperage Range	Max OCV (Uo)	Rated Peak Starting Voltage (Up)
		200V	230V	460V	575V					
NEMA Class I (40) – 175 Amperes, 27 Volts AC, 60% Duty Cycle	No PFC	80 *3.3	69 *2.8	35 *1.5	28 *1.1	15.9 *59	7.4 *29	3 – 310A	80V	15 KV•
	With PFC	52 *55.3	45 *49.5	22 *24.5	18 *19.6	10.3 *11.2	7.3 *39	3 – 310A	80V	15 KV•
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	15 KV•
	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	15 KV•

*While idling
**Power Factor Correction
•Arc striking device is designed for manual guided operations

4-7. Duty Cycle And Overheating



250 DX Models

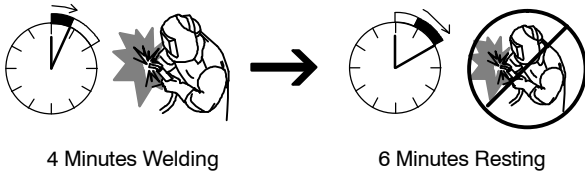


Duty Cycle is the percentage of 10 minutes that the unit can weld at rated load without overheating.

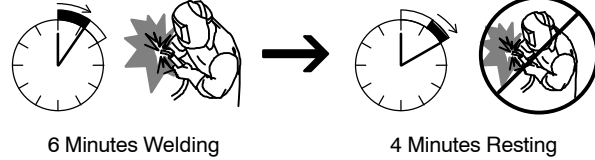
If unit overheats, output stops, front panel voltmeter/ammeter displays a HLP3 or HLP5 message (see Section 7-1), and cooling fans run. Wait fifteen minutes for unit to cool. Reduce amperage or duty cycle before welding.

NOTICE - Exceeding duty cycle can damage unit and void warranty.

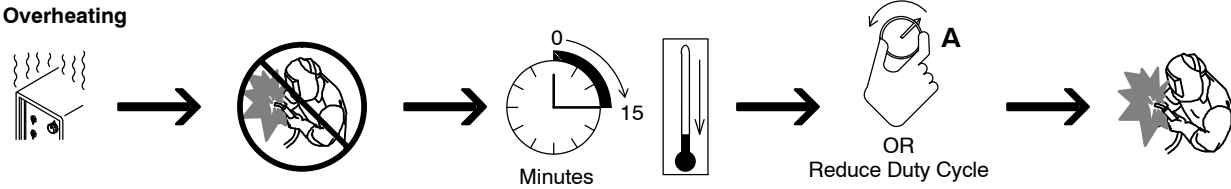
40% Duty Cycle At 250 Amperes



60% Duty Cycle At 200 Amperes

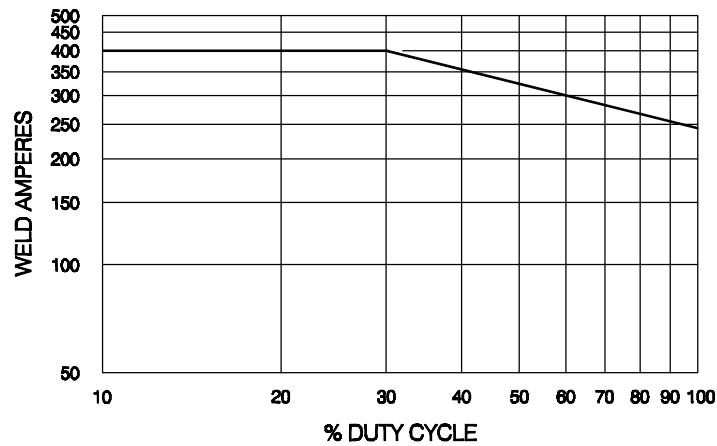


Overheating

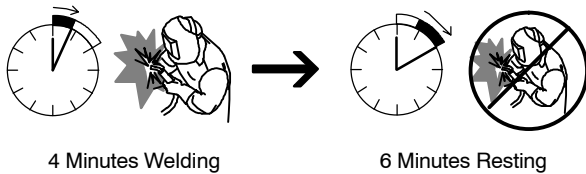


duty1 4/95 / Ref. 116 198

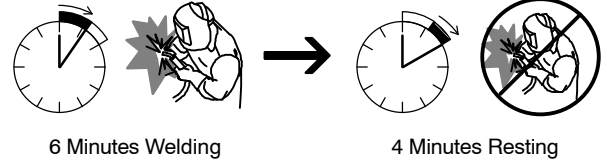
350 LX Models



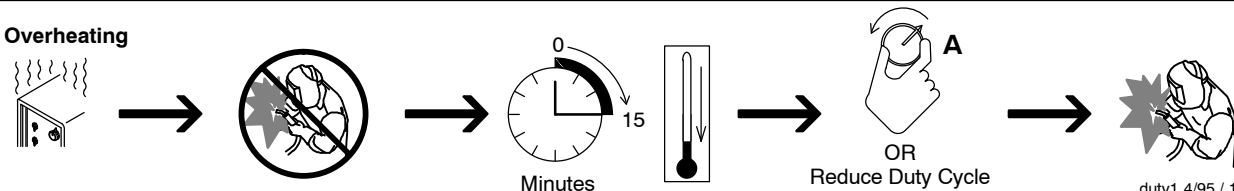
40% Duty Cycle At 350 Amperes



60% Duty Cycle At 300 Amperes



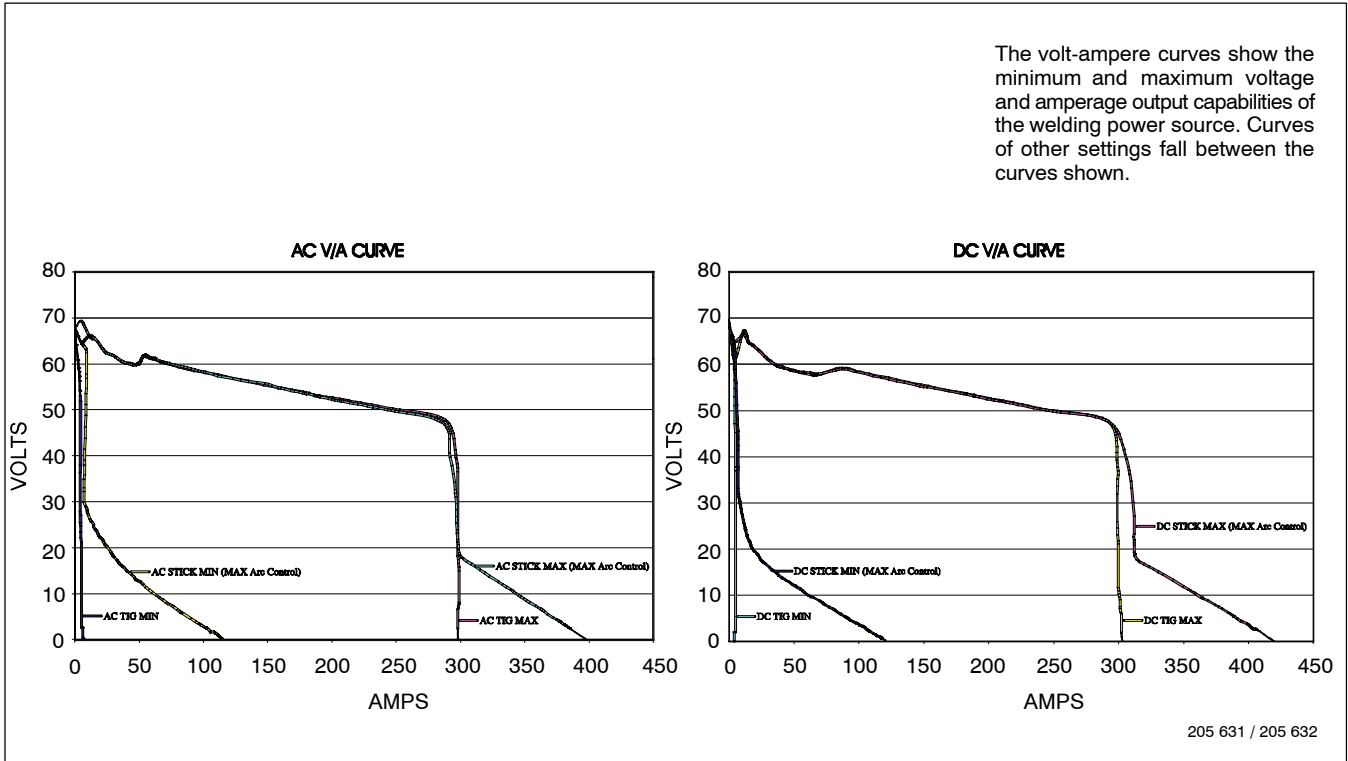
Overheating



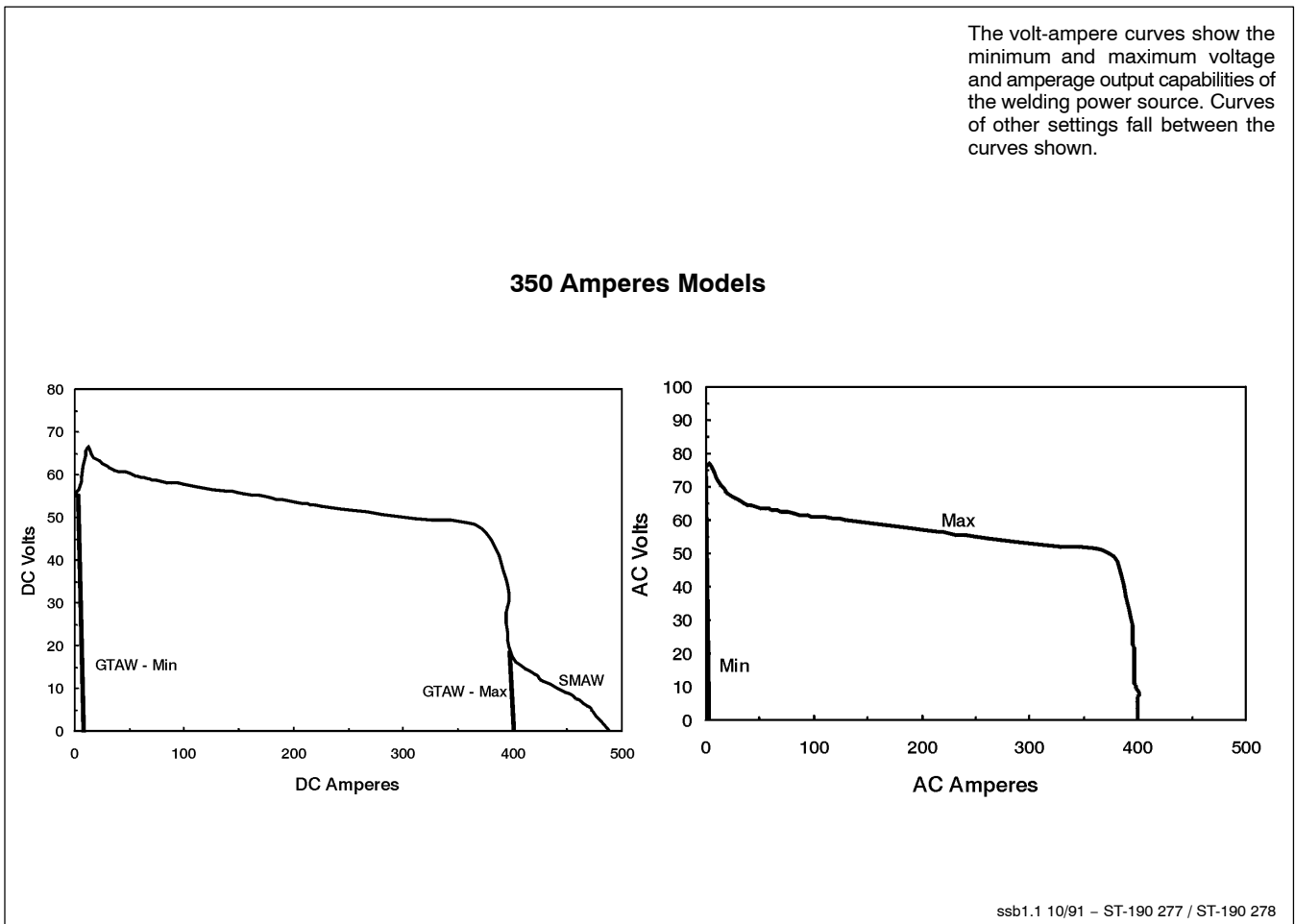
duty1 4/95 / 190 276

4-8. Volt-Ampere Curves

A. For 250 DX Models




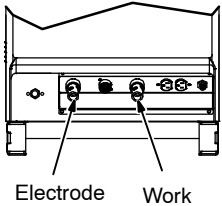
B. For 350 LX Models



4-9. Weld Output Terminals And Selecting Cable Sizes*

NOTICE – The Total Cable Length in Weld Circuit (see table below) is the combined length of both weld cables. For example, if the power source is 100 ft (30 m) from the workpiece, the total cable length in the weld circuit is 200 ft (2 cables x 100 ft). Use the 200 ft (60 m) column to determine cable size.

Select weld cable sizes for pulsing applications at peak amperage value.


 Weld Output Terminals ⚠ Turn off power before connecting to weld output terminals. ⚠ Do not use worn, damaged, undersized, or poorly spliced cables.	Weld Cable Size** and Total Cable (Copper) Length in Weld Circuit Not Exceeding***				
	Welding Amperes***	100 ft (30 m) or Less****		150 ft (45 m)	200 ft (60 m)
		10 – 60% Duty Cycle AWG (mm ²)	60 – 100% Duty Cycle AWG (mm ²)	10 – 100% Duty Cycle AWG (mm ²)	
 Ref. 803 588-B	100	4 (20)	4 (20)	4 (20)	3 (30)
	150	3 (30)	3 (30)	2 (35)	1 (50)
	200	3 (30)	2 (35)	1 (50)	1/0 (60)
	250	2 (35)	1 (50)	1/0 (60)	2/0 (70)
	300	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)
	350	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)
	400	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)
	500	2/0 (70)	3/0 (95)	4/0 (120)	2x2/0 (2x70)

* This chart is a general guideline and may not suit all applications. If cable overheats, use next size larger cable.
 **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.
 () = mm² for metric use
 *** Select weld cable size for pulsing application at peak amperage value.
 ****For distances longer than 100 ft (30 m) and up to 200 ft (60 m), use direct current (DC) output only. For distances longer than those shown in this guide, call a factory applications rep. at 920-735-4505 (Miller) or 1-800-332-3281 (Hobart).

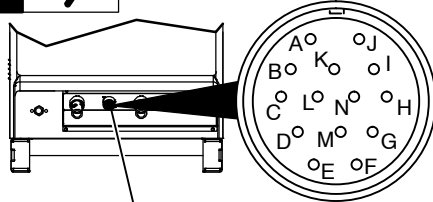
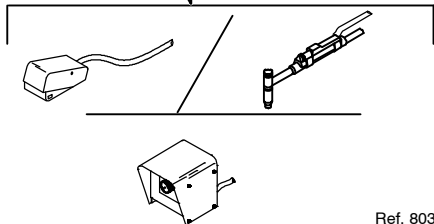
Ref. S-0007-J 2011-07 (TIG)

Notes

4-10. Remote 14 Receptacle Information



Turn off power before connecting to receptacle.





Ref. 803 588-B

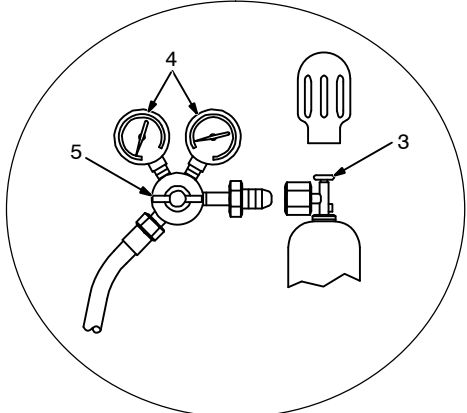
REMOTE 14	Socket*	Socket Information
24 VOLTS DC ➔ OUTPUT CONTACTOR	A	Contactors control 24 volts DC.
	B	Contact closure to A completes 24 volts DC contactor control circuit and enables output.
A REMOTE OUTPUT CONTROL	C	Output to remote control; 0 to +10 volts DC output to remote control.
	D	Remote control/feedback 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.

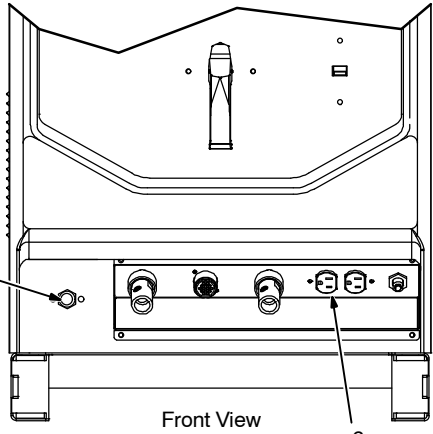
4-11. Shielding Gas Connections And 115 Volts AC Duplex Receptacle



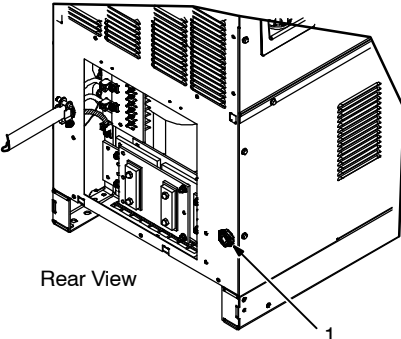
Turn Off power before connecting to receptacle.



Tools Needed:
 5/8, 3/4, 1-1/8 in.



Front View



Rear View

- 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 cfm (cubic feet per hour).
- 6 115 V 15 Amp AC Receptacle
Receptacle is protected from overload by circuit breaker CB1 (see Section 6-2).

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

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

⚠ Turn Off power before making connections.

- Gas-In Connection**
Connect gas hose from gas supply to gas-in connection.
- 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.
- Work Weld Output Terminal**
Connect work lead to work weld output terminal.
- Remote 14 Receptacle**
Connect desired remote control to Remote 14 receptacle (see Section 4-10).
- Electrode Weld Output Terminal**
Connect TIG torch to electrode weld output terminal.
- Gas-Out Connection**
Connect torch gas hose to gas-out fitting.

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

803 586-C

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

⚠ Turn Off power before making connections.

- Gas-In Connection**
Connect gas hose from gas supply to gas-in connection.
- 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.
- Work Weld Output Terminal**
Connect work lead to work weld output terminal.
- Remote 14 Receptacle**
Connect desired remote control to Remote 14 receptacle (see Section 4-10).
- Electrode Weld Output Terminal**
Connect TIG torch to electrode weld output terminal.
- Gas-Out Connection**
Connect torch gas hose to gas-out fitting.

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

803 615-B

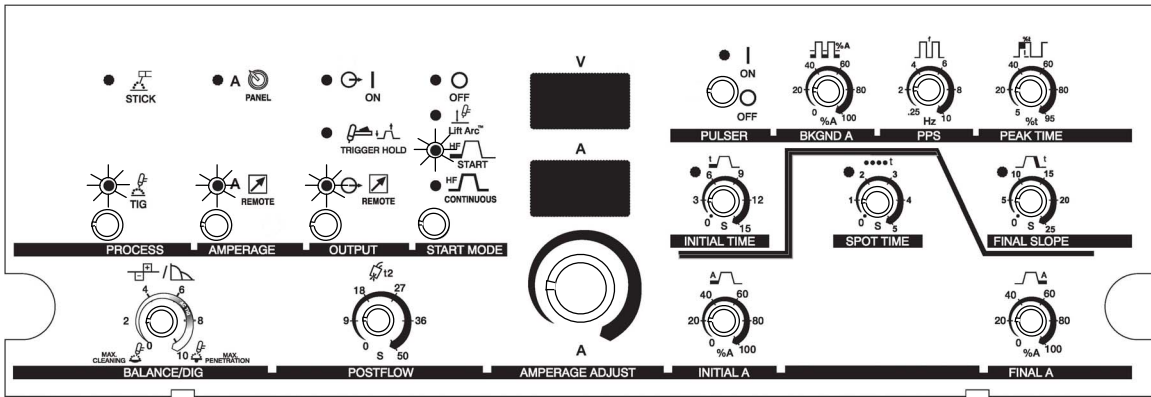
4-14. Front Panel Display For TIG HF Impulse DCEN (Direct Current Electrode Negative)



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.

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



WARNING: ELECTRIC SHOCK CAN KILL.
 • DO NOT USE AC OUTPUT IN DAMP AREAS.
 • PROVIDE B. COVERED, OR IF THERE IS A DANGER OF RAINING.
 • USE AC OUTPUT ONLY IF REQUIRED FOR THE WELDING PROCESS.
 • IF AC OUTPUT IS REQUIRED, USE REMOTE OUTPUT CONTROL.

MISE EN GARDE: LES DÉCHARGES ÉLECTRIQUES PEUVENT ÊTRE MORTELLES.
 • NE PAS SE SERVIR DANS SOURCE DE COURANT ALTERNATIF DANS LES ZONES HUMIDES, LES TOITURES COUVERTES OU LA QUOI RIGIDE DE TOITURE.
 • NE SE SERVIR QU'UNE SOURCE DE COURANT ALTERNATIF QUE SI LE PROCÉDÉ DE SOUDAGE L'exige.
 • S'IL EST NÉCESSAIRE D'UNE SOURCE DE COURANT ALTERNATIF, NECESSAIRE, DE SERVIR DE LA FONCTION DE TELECOMMANDE.

¡CUIDADO! UNA DESCARGA ELÉCTRICA PUEDE MATARLO.
 • NO USE LA SALIDA DE CORRIENTE ALTERNIA EN ÁREAS HÚMEDAS, EN TEJAS CUBIERTAS O EN EL FONDO DE LA CUBIERTA.
 • USE LA SALIDA CA SOLAMENTE SI LO REQUIERE EL PROCESO DE SOLDADURA.
 • SI SE REQUIERE LA SALIDA CA, USE UN CONTROL REMOTO.

DO NOT SWITCH UNDER LOAD
 NE PAS COMMUTER EN RÉGIME DE CHARGE.
 NO LO CAMBIE BAJO CARGA.

4-15. Front Panel Display For TIG AC

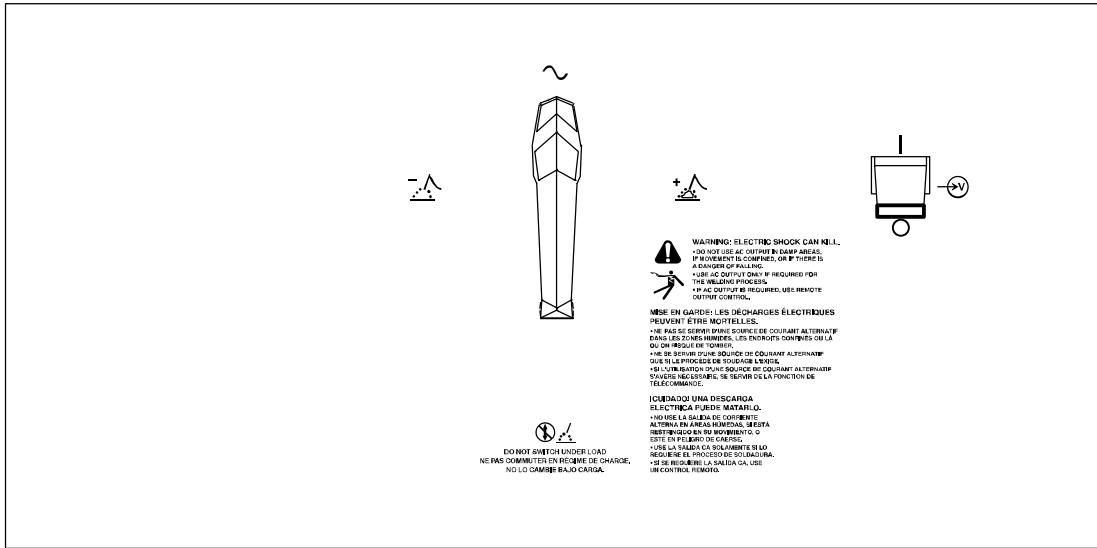
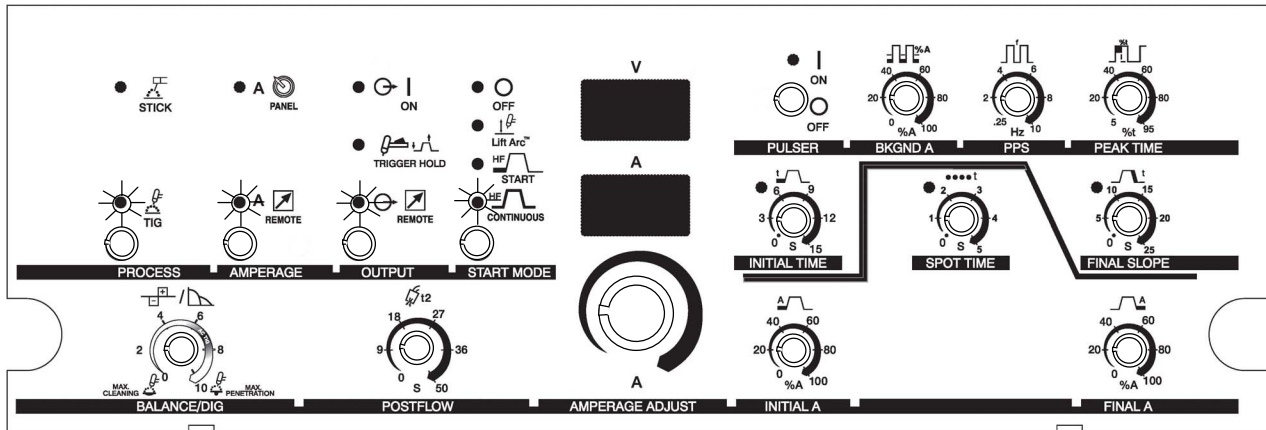


1 Front Panel

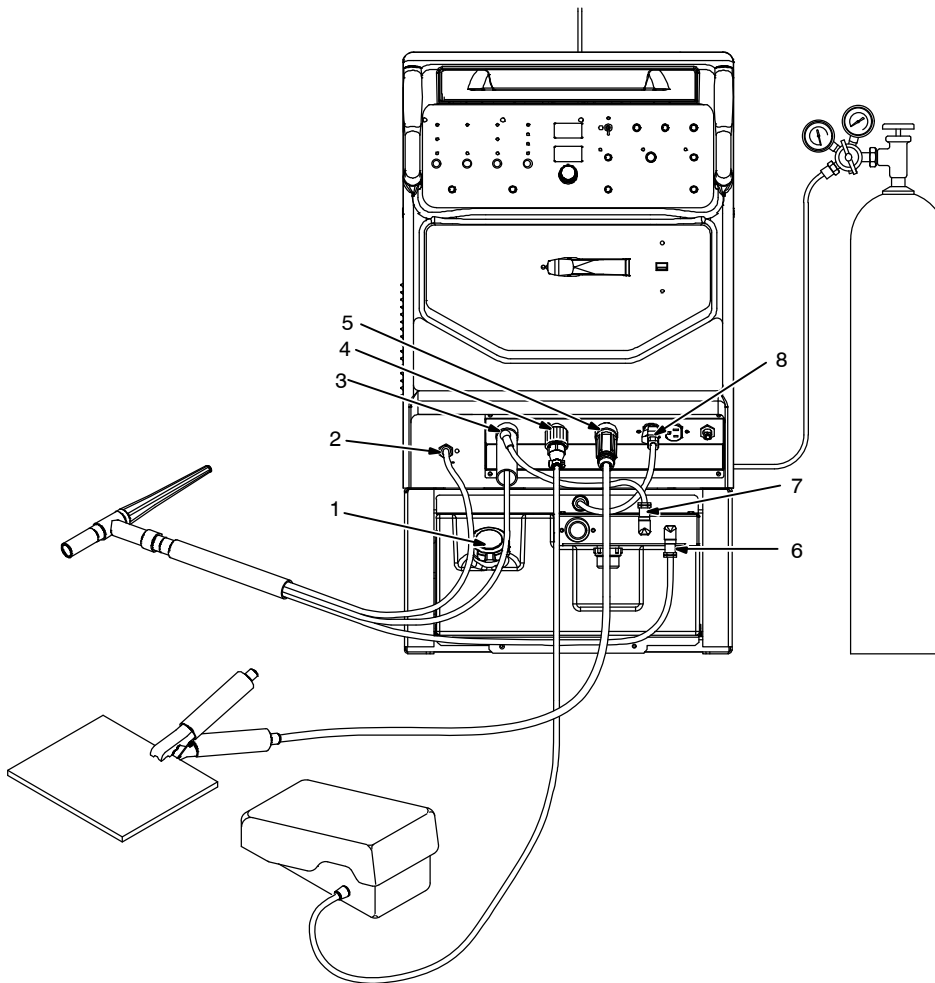
Correct front panel display for basic TIG AC welding.

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

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



4-16. Optional Cooler Connections



⚠ Disconnect cooler plug from welding power source receptacle before filling.

1 Cap

Remove cap and fill tank with three gallons of distilled or deionized water for operations above 32°F (0°C), or three gallons of Miller coolant part no. 043 810.

2 Gas Out Connection

Connect TIG torch gas hose to gas out fitting.

3 Electrode Weld Output Terminal

Connect TIG torch to electrode weld output terminal.

4 Remote 14 Receptacle

Connect remote control to receptacle if desired.

5 Work Weld Output Terminal

Connect work lead to work weld output terminal.

6 Water-In (From Torch) Connection

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

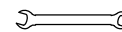
7 Water-Out (To Torch) Connection

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

8 115 VAC Cord

Connect plug to 115 vac receptacle to provide power to the cooler.

Tools Needed:



11/16 in., (21 mm for IEC units)

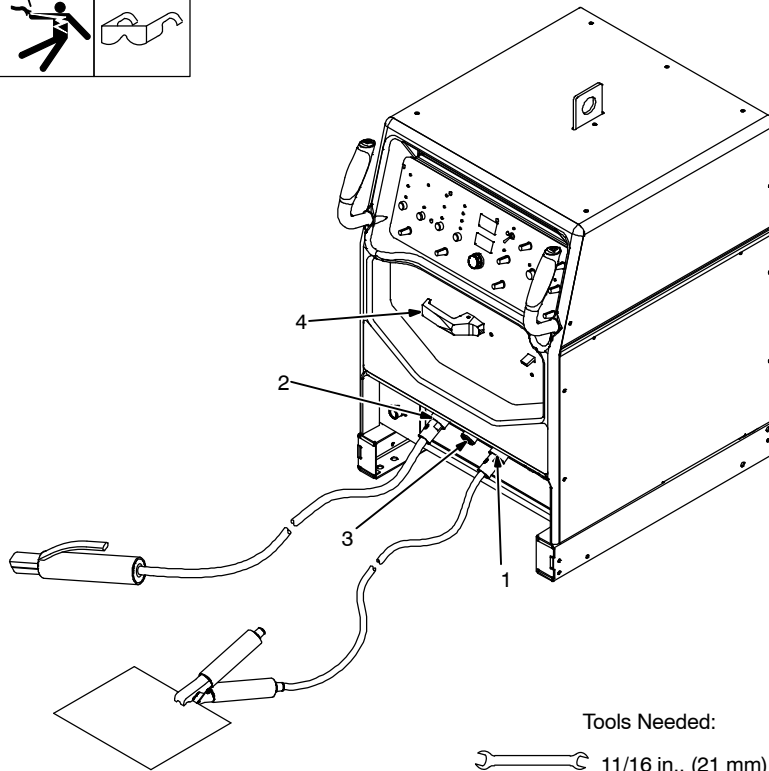
Application	GTAW Or Where HF* Is Used
<p>3-1/2 Gal Coolant</p>	<p>Low Conductivity Coolant No. 043 810**; Distilled Or Deionized Water OK Above 32° F (0° C)</p>

*HF: High Frequency Current

**Coolant 043 810, a 50/50 solution, protect to -37° F (-38° C) and resist algae growth.

NOTICE – 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.)

4-17. Stick Connections



⚠ 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

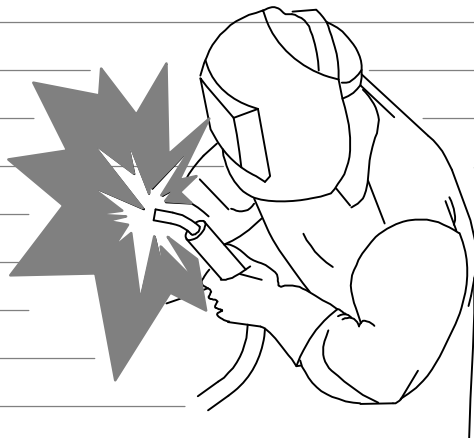
If desired, connect remote control to Remote 14 receptacle (see Section 4-10).

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 4-18. For Stick AC welding, place switch in AC position. For Stick AC front panel control display, see Section 4-19.

803 587-B

Notes



**For additional welding information and resources, visit:
www.MillerWelds.com/resources/improving-your-skills**

4-18. Front Panel Display For Stick DCEP (Direct Current Electrode Positive)

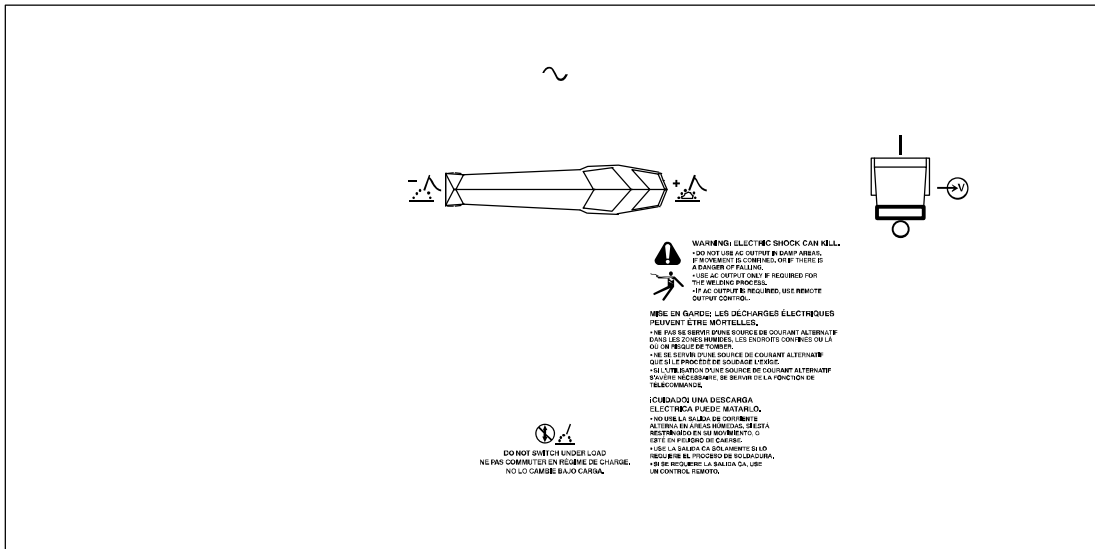
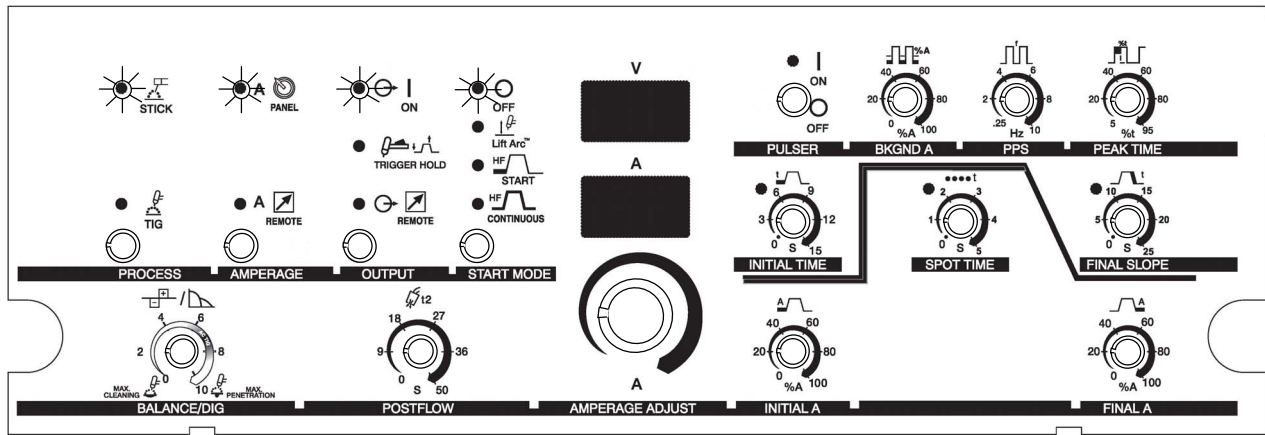


1 Front Panel

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.

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



4-19. Front Panel Display For Stick AC

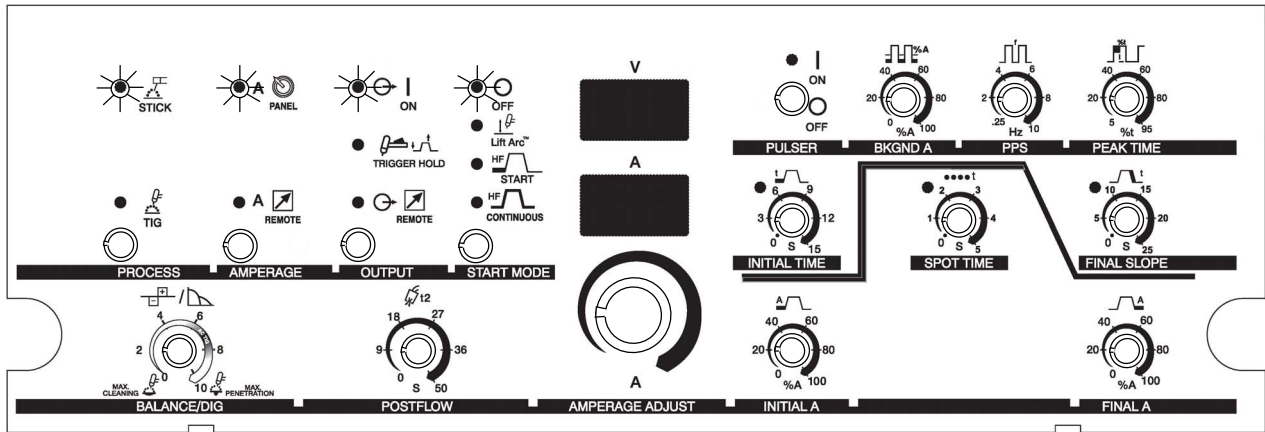


1 Front Panel

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.

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



AC

Stick

WARNING: ELECTRIC SHOCK CAN KILL.
 * DO NOT USE AC OUTPUT IN BARE AREAS. IF PROTECTIVE IS COMPLETED, DO NOT THERE IS A RISK OF FALLING.
 * USE AC OUTPUT ONLY IF REQUIRED FOR THE WELDING PROCESS.
 * IF AC OUTPUT IS REQUIRED, USE REMOTE CONTROL.
 * NE PAS SEPARER UNE SOURCE DE COURANT ALTERNATIF DANS LES ZONES NUBERES, LES ENDROITS COMPLETS OU LA QU ON REQUIRE DE TOMBER.
 * NE SE SEPARER D'UNE SOURCE DE COURANT ALTERNATIF QUE LE PROCES DE SOUDAGE A DEBUTE.
 * SI L'UTILISATION D'UNE SOURCE DE COURANT ALTERNATIF EST NECESSAIRE, SE SERVIR DE LA FONCTION DE TELECOMMANDE.

AC

Stick

DO NOT SWITCH UNDER LOAD
 NE PAS COMMUTER EN REGIME DE CHARGE.
 NO LO CAMBIE EN UN CARGA.

4-20. Electrical Service Guide

A. For 250 DX Models

☞ Input amperage may be higher than shown in table when Balance Control is in an unbalanced position.

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

☞ 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.

⚠ Failure to follow these electrical service guide recommendations could create an electric shock or fire hazard. These recommendations are for a dedicated circuit sized for the rated output and duty cycle of the welding power source. In dedicated circuit installations, the National Electrical Code (NEC) allows the receptacle or conductor rating to be less than the rating of the circuit protection device. All components of the circuit must be physically compatible. See NEC articles 210.21, 630.11, and 630.12.

50/60 Hertz Models	Without Power Factor Correction							
Input Voltage (V)	200	220	230	400	440	460	520	575
Input Amperes (A) At Rated Output	88	82	77	45	41	38	35	31
Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes								
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

Reference: 2011 National Electrical Code (NEC) (including article 630)

- 1 If a circuit breaker is used in place of a fuse, choose a circuit breaker with time-current curves comparable to the recommended fuse.
- 2 "Time-Delay" fuses are UL class "RK5". See UL 248.
- 3 "Normal Operating" (general purpose - no intentional delay) fuses are UL class "K5" (up to and including 60 amps), and UL class "H" (65 amps 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 310.15(B)(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 electrical service guide recommendations could create an electric shock or fire hazard. These recommendations are for a dedicated circuit sized for the rated output and duty cycle of the welding power source. In dedicated circuit installations, the National Electrical Code (NEC) allows the receptacle or conductor rating to be less than the rating of the circuit protection device. All components of the circuit must be physically compatible. See NEC articles 210.21, 630.11, and 630.12.

50/60 Hertz Models	With Power Factor Correction							
Input Voltage (V)	200	220	230	400	440	460	520	575
Input Amperes (A) At Rated Output	60	61	52	34	31	26	26	21
Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes								
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

Reference: 2011 National Electrical Code (NEC) (including article 630)

- 1 If a circuit breaker is used in place of a fuse, choose a circuit breaker with time-current curves comparable to the recommended fuse.
- 2 "Time-Delay" fuses are UL class "RK5". See UL 248.
- 3 "Normal Operating" (general purpose - no intentional delay) fuses are UL class "K5" (up to and including 60 amps), and UL class "H" (65 amps 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 310.15(B)(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.

B. For 350 LX Models

☞ Input amperage may be higher than shown in table when Balance Control is in an unbalanced position.

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

☞ 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.

⚠ Failure to follow these electrical service guide recommendations could create an electric shock or fire hazard. These recommendations are for a dedicated circuit sized for the rated output and duty cycle of the welding power source. In dedicated circuit installations, the National Electrical Code (NEC) allows the receptacle or conductor rating to be less than the rating of the circuit protection device. All components of the circuit must be physically compatible. See NEC articles 210.21, 630.11, and 630.12.

50/60 Hertz Models	Without Power Factor Correction							
Input Voltage (V)	200	220	230	400	440	460	520	575
Input Amperes (A) At Rated Output	125	103	110	57	52	55	43	42
Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes								
Time-Delay Fuse ²	150	125	125	70	70	60	60	50
Normal Operating (Fast) Fuse ³	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

Reference: 2011 National Electrical Code (NEC) (including article 630)

1 If a circuit breaker is used in place of a fuse, choose a circuit breaker with time-current curves comparable to the recommended fuse.

2 "Time-Delay" fuses are UL class "RK5" . See UL 248.

3 "Normal Operating" (general purpose - no intentional delay) fuses are UL class "K5" (up to and including 60 amps), and UL class "H" (65 amps 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 310.15(B)(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 electrical service guide recommendations could create an electric shock or fire hazard. These recommendations are for a dedicated circuit sized for the rated output and duty cycle of the welding power source. In dedicated circuit installations, the National Electrical Code (NEC) allows the receptacle or conductor rating to be less than the rating of the circuit protection device. All components of the circuit must be physically compatible. See NEC articles 210.21, 630.11, and 630.12.

50/60 Hertz Models	With Power Factor Correction							
Input Voltage (V)	200	220	230	400	440	460	520	575
Input Amperes (A) At Rated Output	92	77	78	40	39	38	33	31
Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes								
Time-Delay Fuse ²	110	100	90	50	50	45	40	35
Normal Operating (Fast) Fuse ³	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

Reference: 2011 National Electrical Code (NEC) (including article 630)

1 If a circuit breaker is used in place of a fuse, choose a circuit breaker with time-current curves comparable to the recommended fuse.

2 "Time-Delay" fuses are UL class "RK5" . See UL 248.

3 "Normal Operating" (general purpose - no intentional delay) fuses are UL class "K5" (up to and including 60 amps), and UL class "H" (65 amps and above).

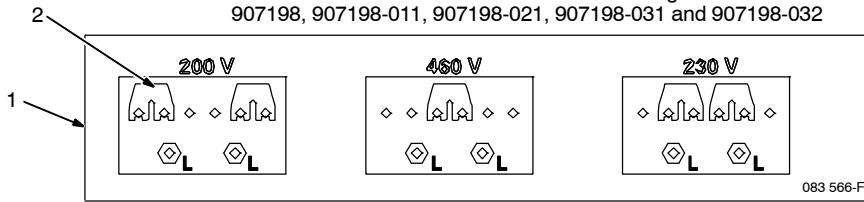
4 Conductor data in this section specifies conductor size (excluding flexible cord or cable) between the panelboard and the equipment per NEC Table 310.15(B)(16). If a flexible cord or cable is used, minimum conductor size may increase. See NEC Table 400.5(A) for flexible cord and cable requirements.

4-21. Placing Jumper Links



Label found on 250 DX models with the following stock numbers:
907194, 907194-021 907194-031 and, 907194-032

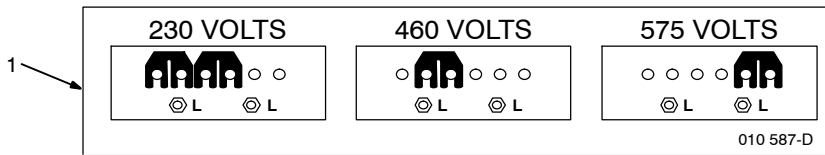
Label found on 350 LX models with the following stock numbers:
907198, 907198-011, 907198-021, 907198-031 and 907198-032



Or

Label found on 250 DX models with the following stock numbers:
907195, 907195-021, 907195-031 and, 907195-032

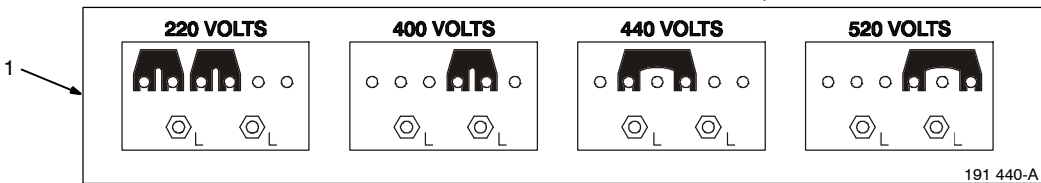
Label found on 350 LX models with the following stock numbers:
907199, 907199-021, 907199-031 and 907199-032



Or

Label found on 250 DX models with stock number 907408, and 907516

Label found on 350 LX models with stock number 907409, and 907517



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

Check input voltage available at site.

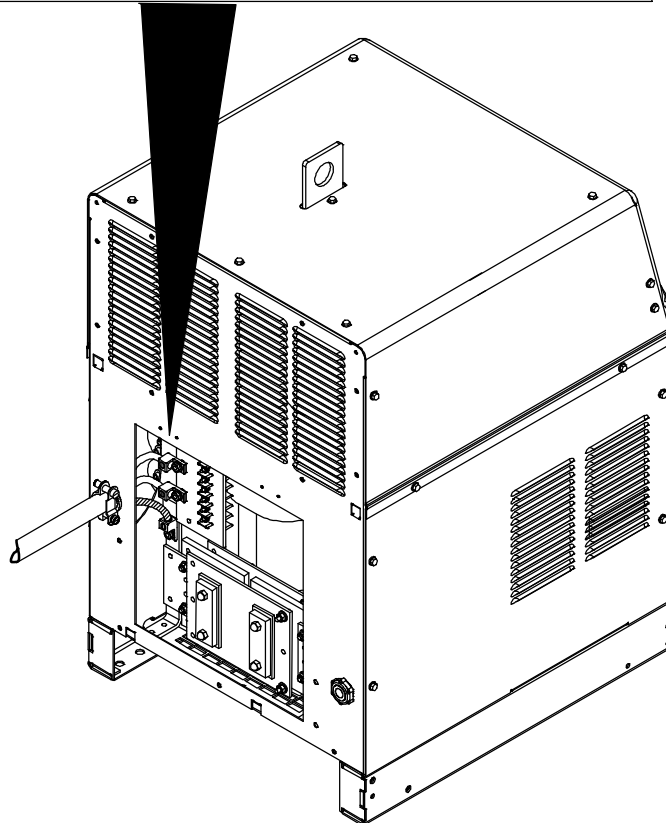
1 Jumper Link Label

Check label – only one label is on unit.

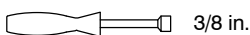
2 Jumper Links

Move jumper links to match input voltage.

Close and secure access door, or go on to Section 4-22.



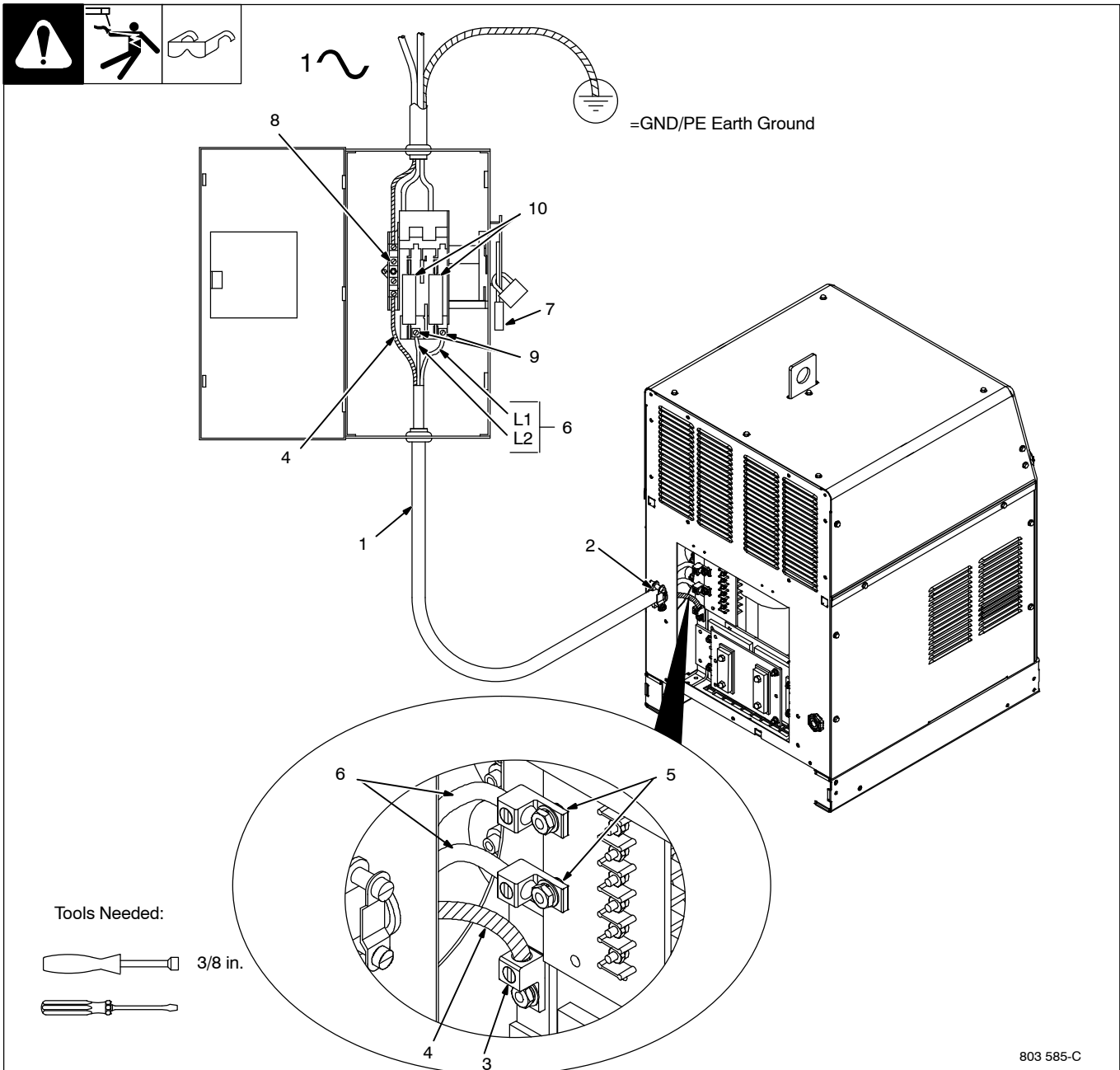
Tools Needed:



3/8 in.

Ref. 803 585-C

4-22. Connecting Input Power



Tools Needed:

 3/8 in.



803 585-C

⚠ 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 4-20. 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.

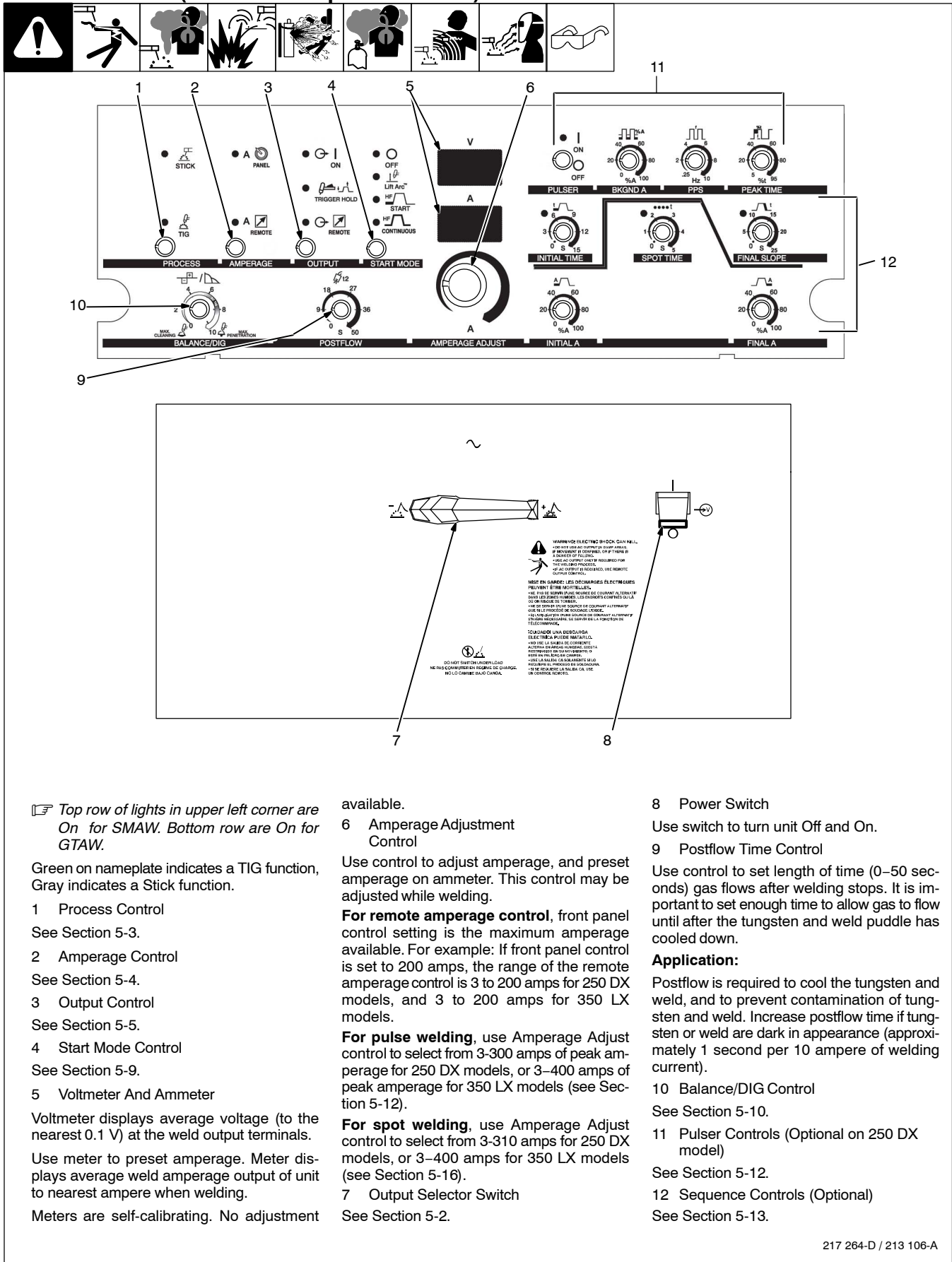
10 Overcurrent Protection

Select type and size of overcurrent protection using Section 4-20 (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)



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.

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 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.

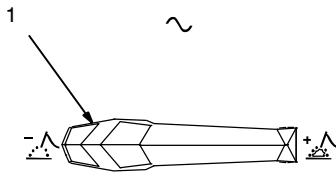
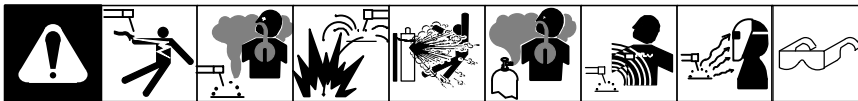
11 Pulsed Arc Controls (Optional on 250 DX model)

See Section 5-12.

12 Sequence Controls (Optional)

See Section 5-13.

5-2. Output Selector Switch



WARNING! ELECTRIC SHOCK CAN KILL.
 • 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.
 • AC OUTPUT IS REQUIRED, USE REMOTE OUTPUT CONTROL.

MISE EN GARDE: LES DÉCHARGES ÉLECTRIQUES PEUVENT ÊTRE MORTELLES.
 • 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.
 • UTILISATION D'UNE SOURCE DE COURANT ALTERNATIF SI VÉRIFIÉE NECESSAIRE, SE SERVIR DE LA FONCTION DE TELECOMMANDE.

¡CUIDADO! UNA DESCARGA ELÉCTRICA PUEDE MATARLO.
 • NO USE LA SALIDA DE CORRIENTE ALTERNIA EN ÁREAS HÚMEDAS, SI ESTÁ RESTRICTO EN SU MOVIMIENTO, O SI ESTE ENTORNO ES PELIGROSO.
 • USE LA SALIDA CA CORRIENTE SI LO REQUIERE EL PROCESO DE SOLDADURA.
 • SI SE REQUIERE LA SALIDA CA USE UN CONTROL REMOTO.

1 Output Selector Switch

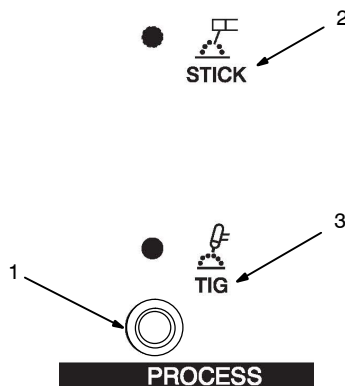
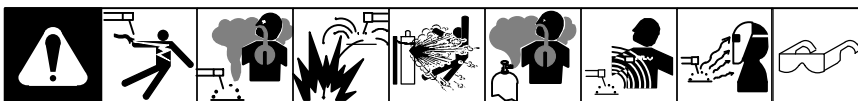
Do not use AC output in damp areas, if movement is confined, or if there is danger of falling. Use AC output ONLY if required for the welding process, and then use a remote control.

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.

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 Stick or TIG process.

2 STICK Process

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

3 TIG Process

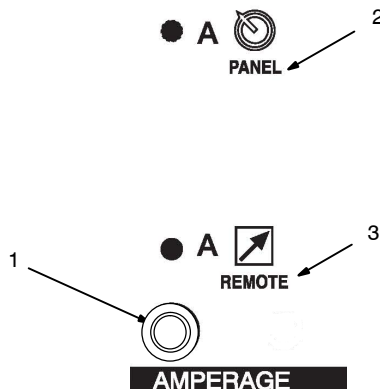
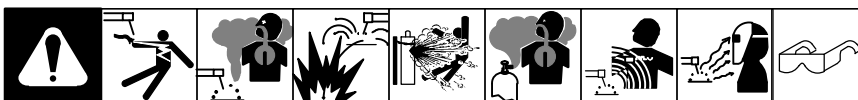
For TIG process, press button to toggle LED to TIG position.

Lit LED indicates selected mode.

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

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

5-4. Amperage Control



1 Amperage Control

Use control to select front panel or remote amperage control.

2 Front Panel Position

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

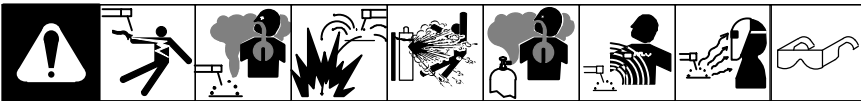
3 Remote Amperage Position

For remote amperage control, press button to toggle LED to Remote position (see Section 4-10).

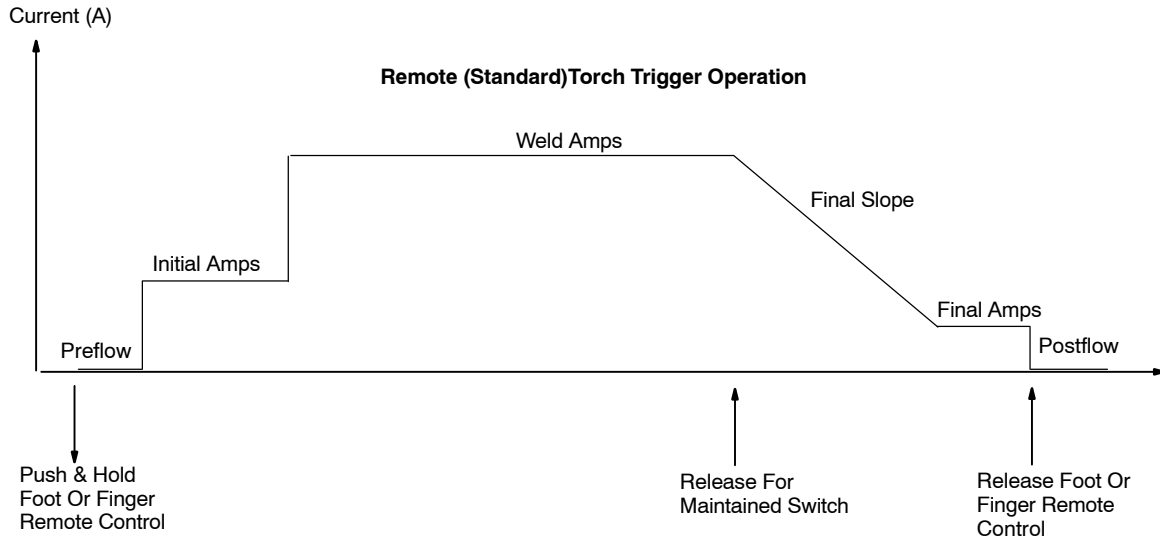
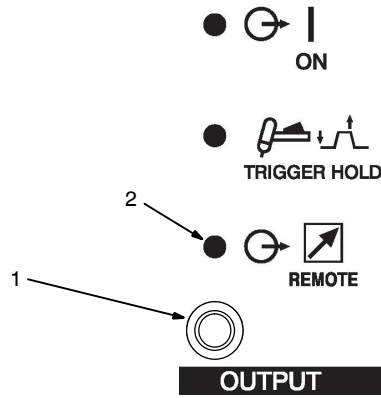
Lit LED indicates selected mode.

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.

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 4-10).

Torch trigger operation is as shown.

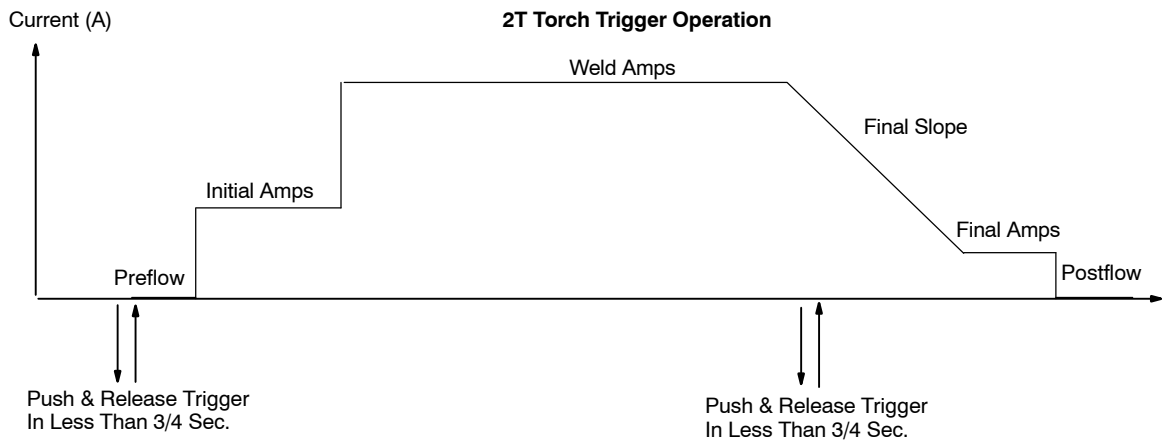
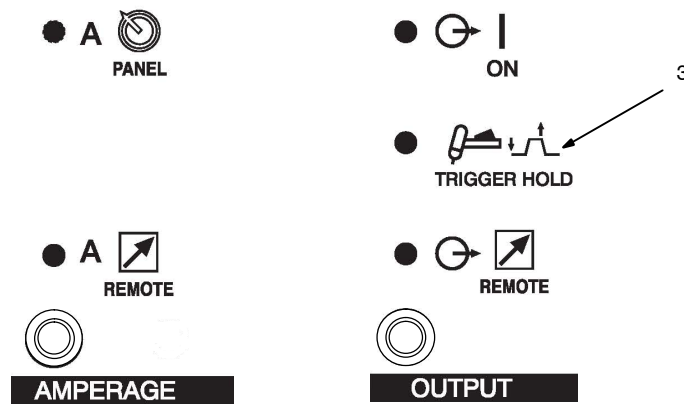
Initial weld amperage and final amperage is controlled by the remote device, not by the welding power source.

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)



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

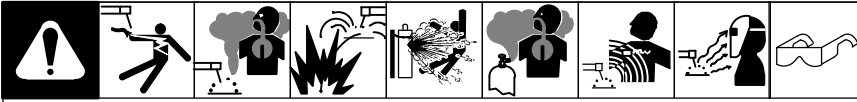
For trigger hold operation, press button to toggle LED to Trigger Hold position. Torch trigger operation is as shown.

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 Logic 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-

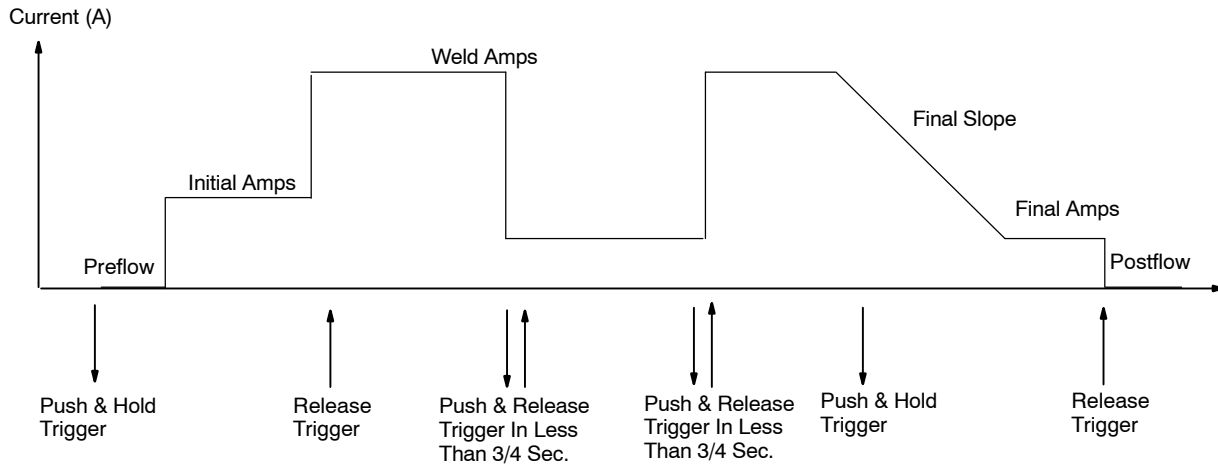
lows the operator to toggle between weld current and final current without breaking the arc.

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.

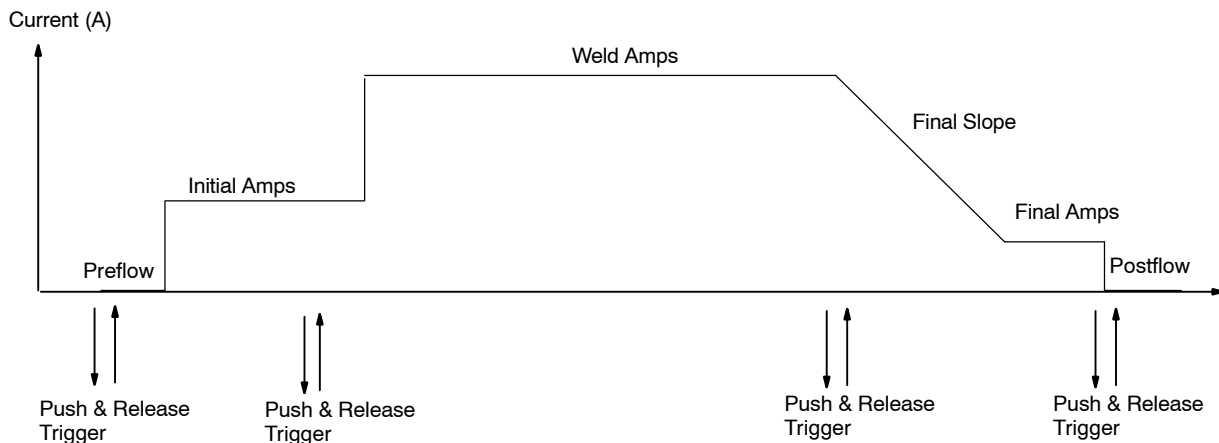
While in 4T Momentary mode, once the operator toggles out of weld current and begins final slope, toggling again will break the arc and go to postflow.

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

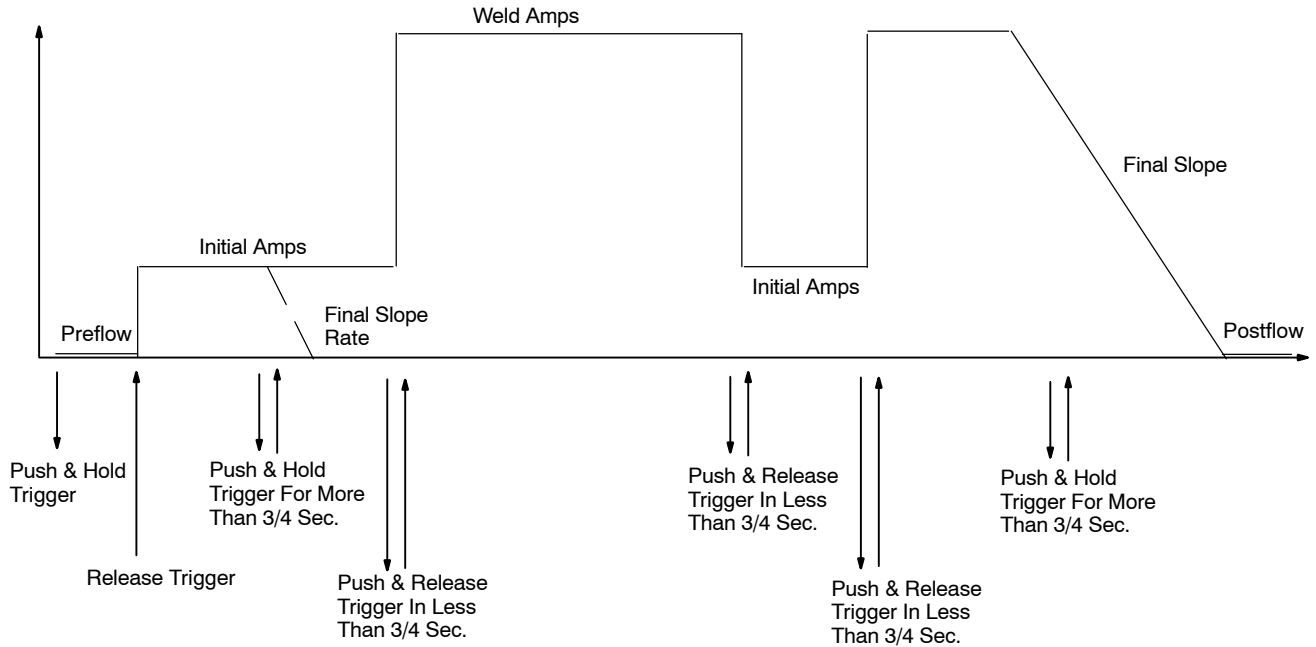
from the initial amps level to the main weld amps level by pressing and releasing the torch trigger in less than 3/4 seconds.

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

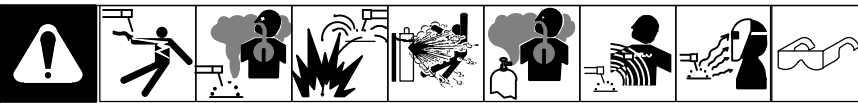
welding power source.

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.

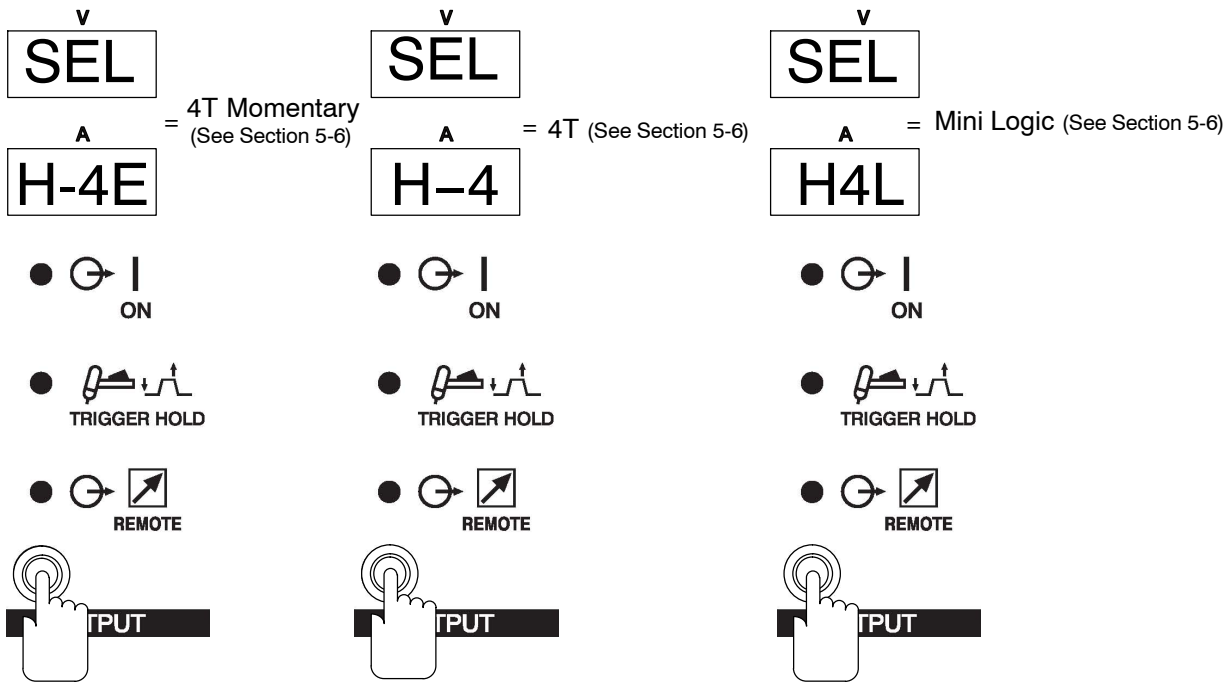
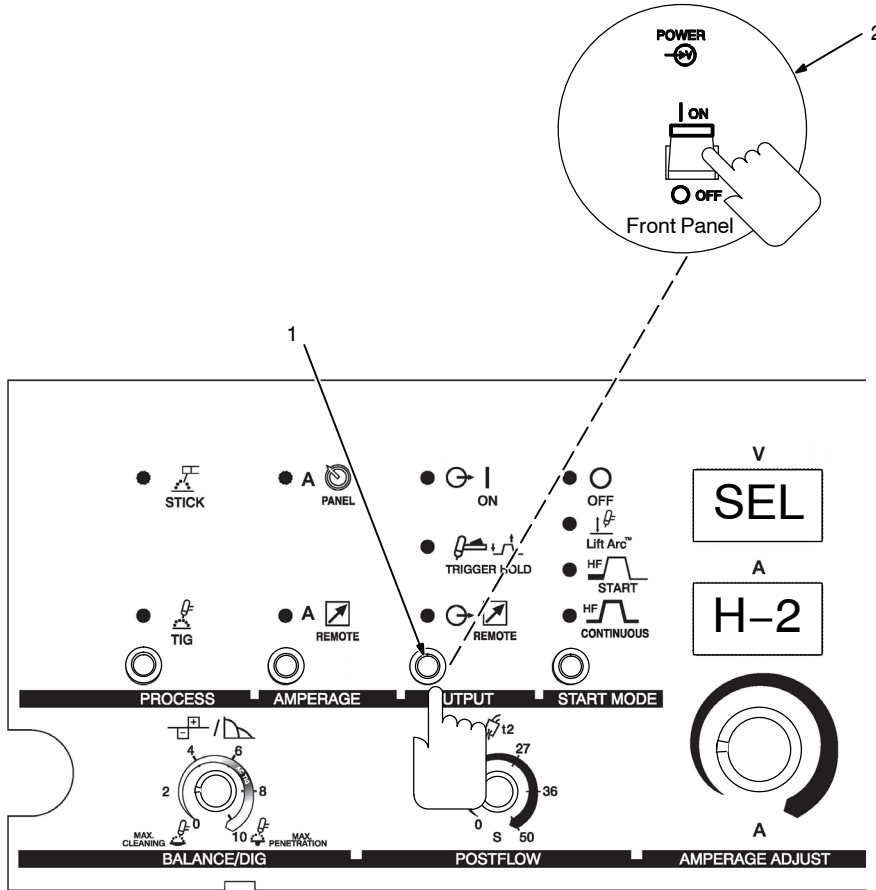
Press torch trigger or turn power Off to save setting.

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.

These features are only available when optional Sequencer is installed.



3

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

1 Start Mode button

2 Power Switch

3 Output Selector Switch

4 Meters

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.

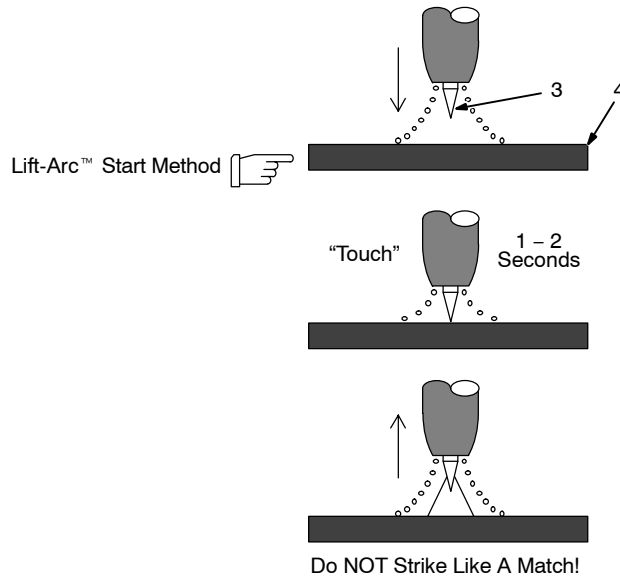
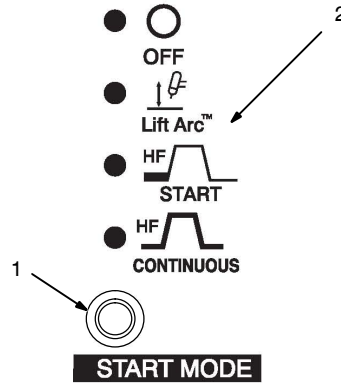
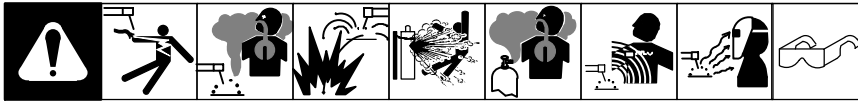
Application:

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.

5-9. Start Mode



- 1 Start Mode
- 2 OFF Position

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:

- 3 TIG Electrode
- 4 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 seconds**, and slowly lift electrode. An arc will form when electrode is lifted.

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:

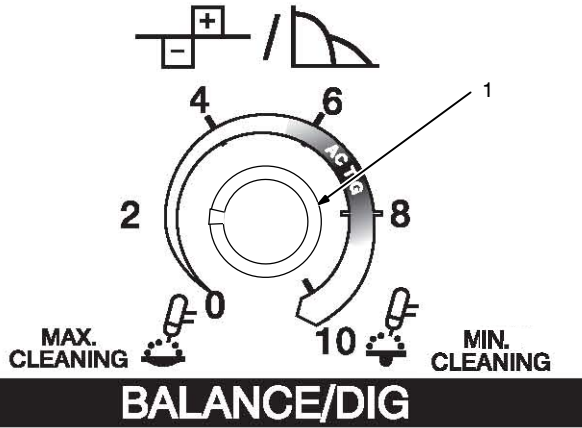
HF Continuous is used when the AC GTAW process is required.

Lit LED indicates selected mode.

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

Some start methods may not be available for all processes.

5-10. Balance/DIG Control



1 Balance/DIG Control

Balance Control (AC GTAW):

AC Balance controls the cleaning action. Increasing the balance setting reduces the oxide cleaning.

Adjusting balance: Set the balance level in the AC TIG zone. Make a test weld. If floating black specs appear in the welding puddle, balance is set too high. Turn balance down and repeat until puddle is clear.


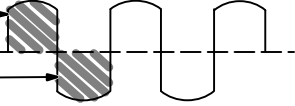
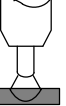

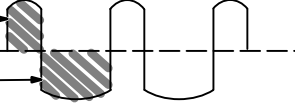
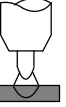

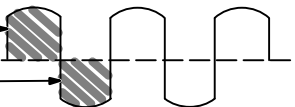

DIG Control (AC And DC SMAW):

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 3 	50% Electrode Positive  50% Electrode Negative	
Min Cleaning 10 	32% Electrode Positive  68% Electrode Negative	
Max Cleaning 0 	55% Electrode Positive  45% Electrode Negative	

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).

4 TIG LED

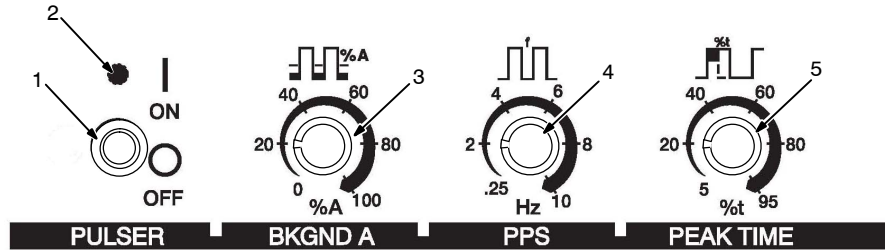
The TIG LED will light and the meters will display [0.4] [SEL]. The factory preflow default setting is 0.4 seconds. To change preflow

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)



1 On/Off Control

Use control to turn pulse function On and Off.

2 Pulser ON LED

LED is lit when pulser function is enabled.

3 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.

4 Pulse Frequency

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

5 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.

6 Pulsed Output Waveforms

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

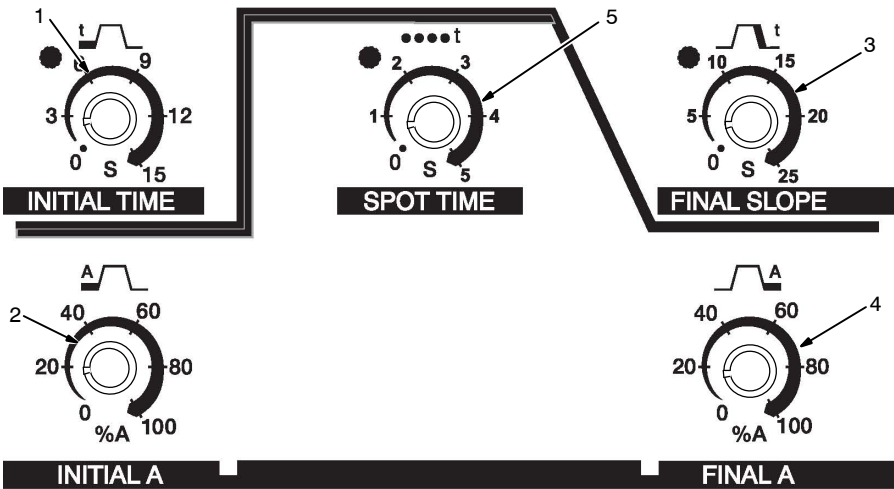
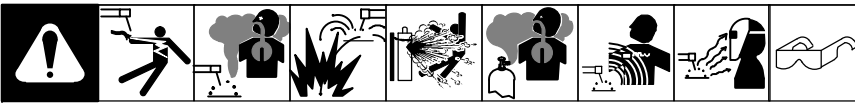
Application:

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.

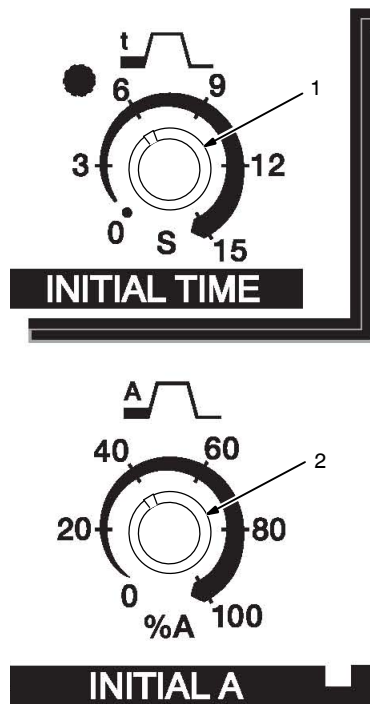
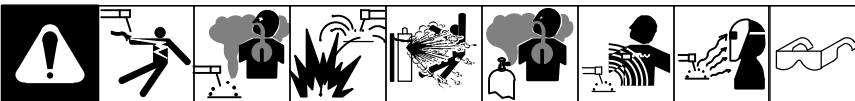
Percent (%) Peak Time Control Setting	Pulsed Output Waveforms
Balanced (50%) 	
More Time At Peak Amperage (80%) 	
More Time At Background Amperage (20%) 	

5-13. Sequence Controls (Optional)



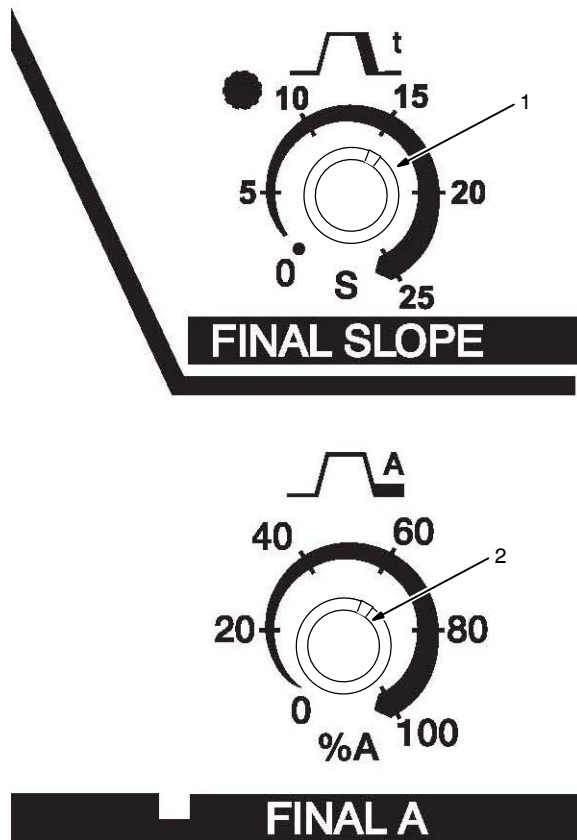
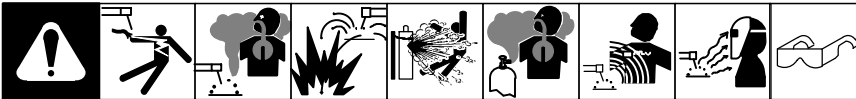
- 1 Initial Time Control
See Section 5-14.
- 2 Initial Amperage Control
See Section 5-14.
- 3 Final Slope Control
See Section 5-15.
- 4 Final Amperage Control
See Section 5-15.
- 5 Spot Time Control
See Section 5-16.

5-14. Initial Time Control And Initial Amperage Control



- 1 Initial Time Control
Indicator light is on when Initial Time control function is active.
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.
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. 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.
- Function is enabled, when LED is lit.

5-15. Final Slope Control And Final Amperage Control



1 Final Slope Control

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

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.

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:

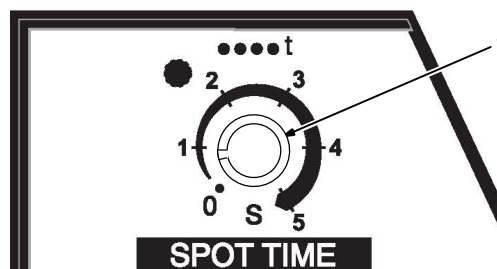
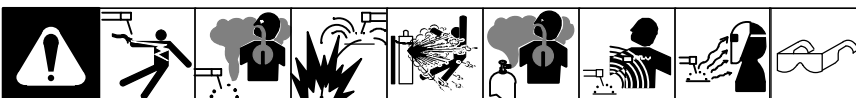
Final Slope should be used while GTAW welding materials that are crack sensitive, and/or the operator wants to eliminate the crater at the end of the weld.

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

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

Function is enabled, when LED is lit.

5-16. Spot Time Control



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.

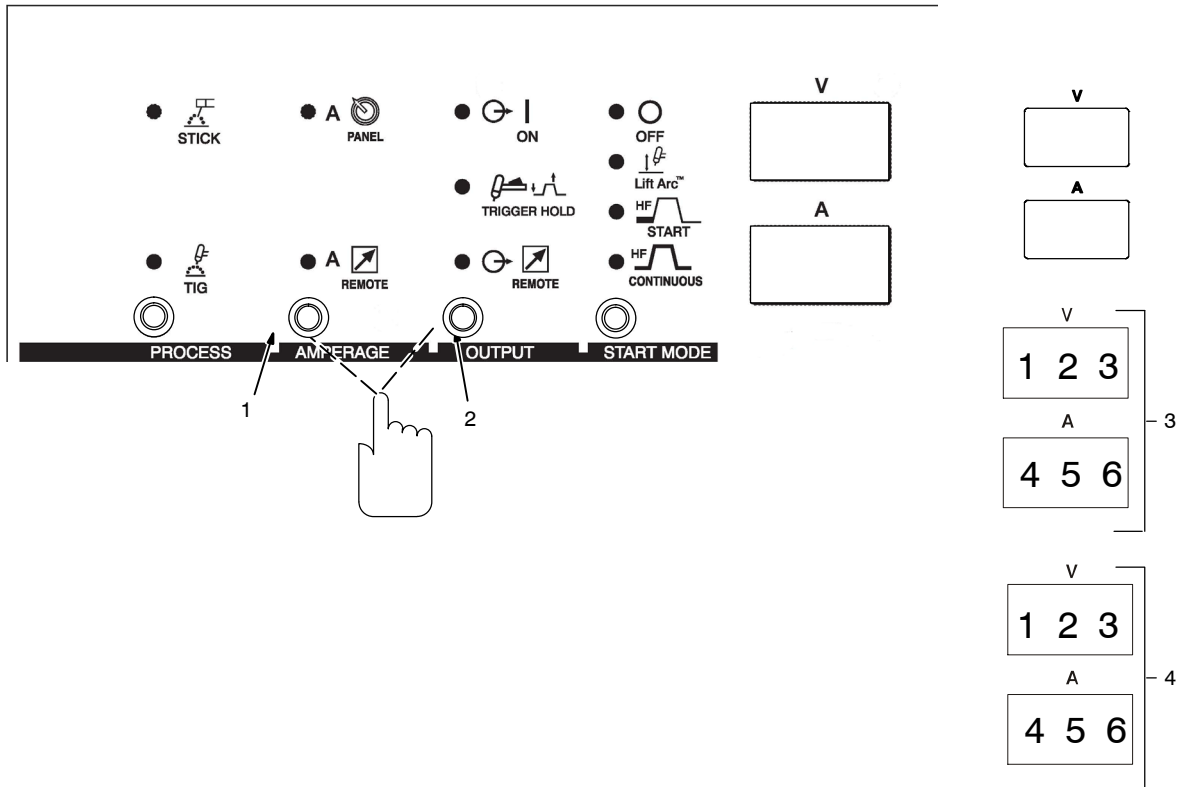
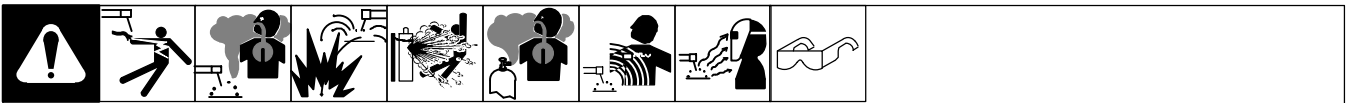
Use Amperage Adjust control (see Section 5-1) to set amperage.

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.

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. When machine first powers up, the displays will show the

software number and revision for the first seven seconds. It will then show arc time and cycle count.

3 Timer Display

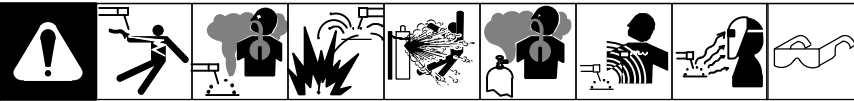
The hours and minutes are displayed on the volt and amp meters for the first five

seconds, and are read as 1, 234 hours and 56 minutes.

4 Cycle Display

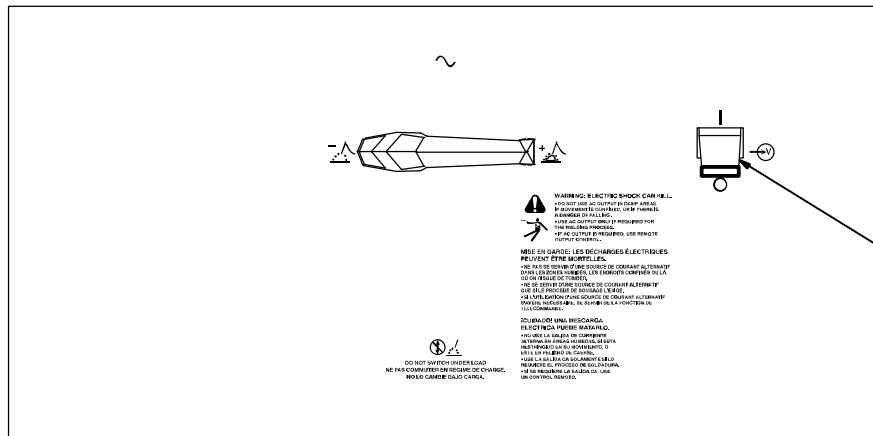
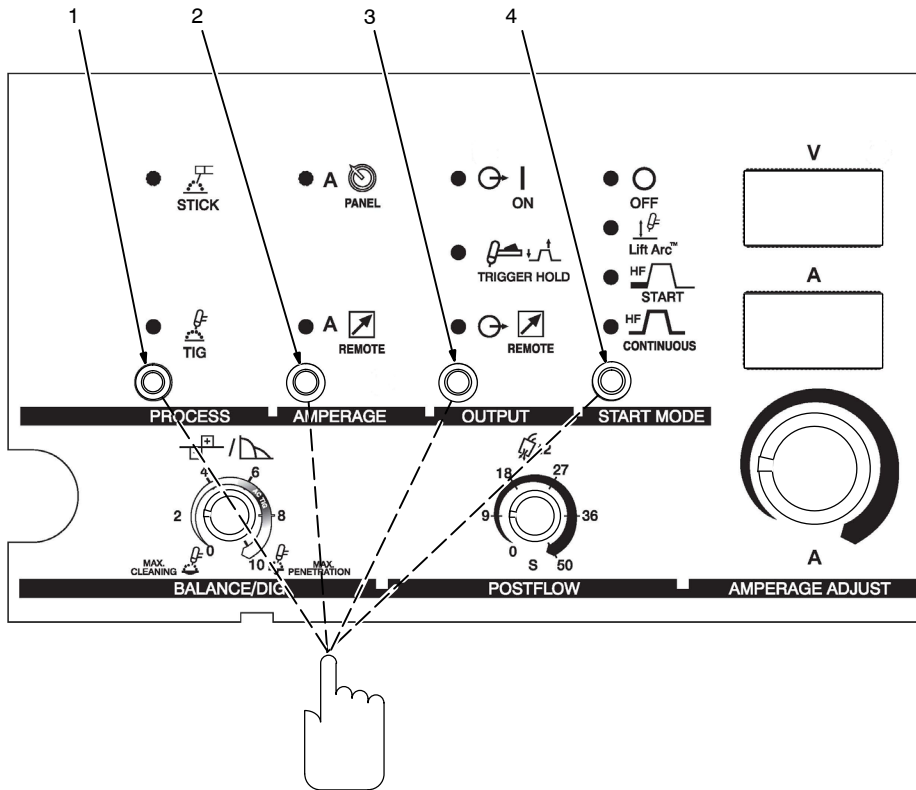
The cycles are displayed on the volt and amp meters for the next five seconds, and are read as 123, 456 cycles.

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



- 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><i>☞ Maintain more often during severe conditions.</i></p>
	<p>✓ = Check ◇ = Change ● = Clean Δ = Repair ☆ = Replace</p> <p>* To be done by Factory Authorized Service Agent</p>			
Every 3 Months	<p>✓ ☆ Labels</p>	<p>✓ ☆ Gas Hoses</p>	<p>● Weld Terminals</p>	
Every 3 Months	<p>✓ Δ ☆ Cables And Cords</p>			
Every 6 Months	<p>● Durning heavy service, clean monthly.</p>	<p>0.008 in. (0.203 mm)</p> <p>* Adjust or clean spark gap</p>		

6-2. Supplementary Protector CB1

		<p>⚠ Turn off power before resetting breaker.</p> <p>1 Supplementary Protector CB1</p> <p>If CB1 opens, high frequency and output to the 115 volts AC duplex receptacle stop. Press button to reset CB1.</p>

6-3. Adjusting Spark Gaps

Tools Needed:
 0.008 in. (0.203 mm)
 3/8 in.
 5/32 in.

⚠ 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 0.008 in (0.203 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.

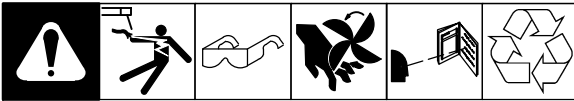
803 592-C

6-4. Routine Maintenance For Optional Cooler

⚠ Disconnect power before maintaining.

	✓ = Check ◇ = Change ● = Clean * To be done by Factory Authorized Service Agent	Δ = Repair	☆ = Replace
Every Month	 NOTICE - 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. ● Coolant Strainer		 ● Heat Exchanger Fins
Every Six Months	 ☆ Unreadable Labels	 ✓ ☆ Cracked Hoses	 ◇ Change Coolant If Using Water (See Section 6-5)
Every Twelve Months	 ◇ Change Coolant (If Using Miller Coolant) (See Section 6-5)		

6-5. Coolant Maintenance



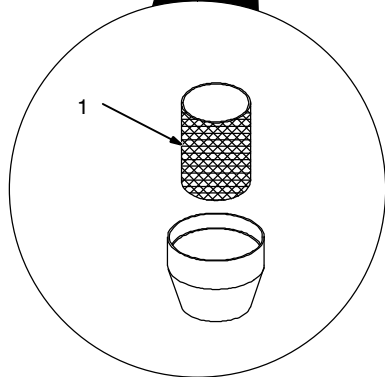
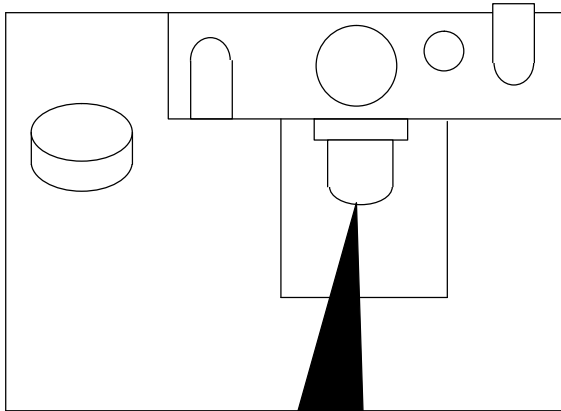
⚠ Disconnect power before maintaining.

1 Coolant Filter


Unscrew housing to clean filter.

Changing coolant: Drain coolant by tipping unit forward. Fill with clean water and run for 10 minutes. Drain and refill.

NOTICE – If replacing hoses, use hoses compatible with ethylene glycol, such as Buna-n, Neoprene, or Hypalon. Oxy-acetylene hoses are not compatible with any product containing ethylene glycol.



801 195-A / Ref. 801 194

Application	GTAW Or Where HF* Is Used
 3-1/2 Gal Coolant	Low Conductivity Coolant No. 043 810**; Distilled Or Deionized Water OK Above 32° F (0° C)

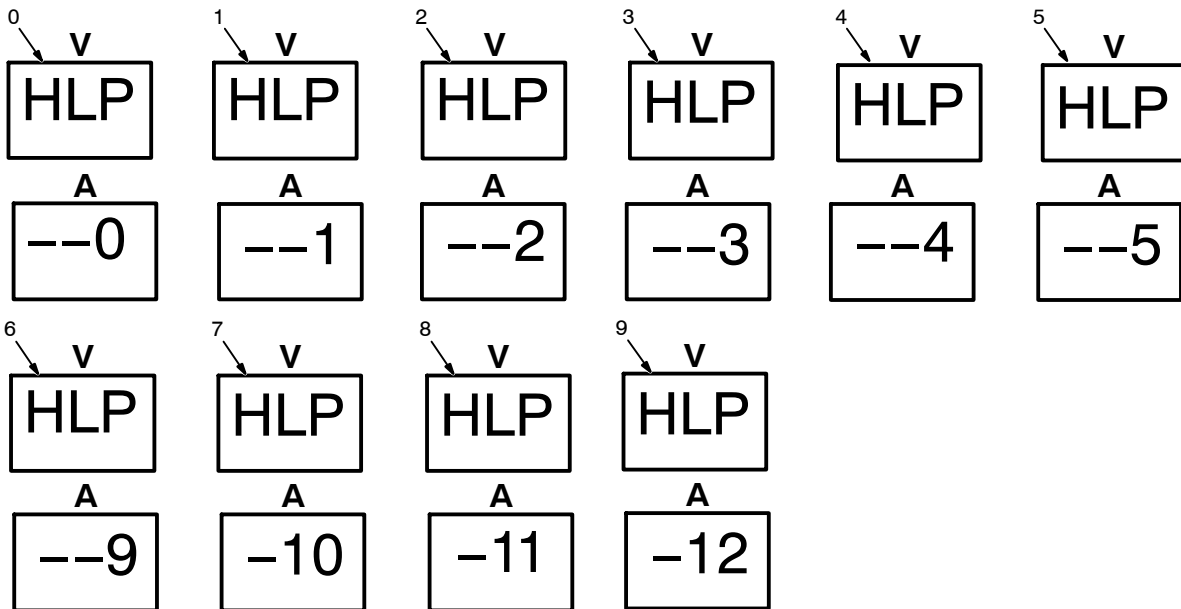
*HF: High Frequency Current

**Coolant 043 810, a 50/50 solution, protect to -37° F (-38°C) and resist algae growth.

NOTICE – 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.)

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 4-7). 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 4-7). Operation will continue when the unit has cooled.

6 Help 9 Display

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

7 Help 10 Display

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

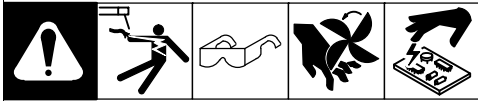
8 Help 11 Display

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

9 Help 12 Display

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

7-2. Troubleshooting The Welding Power Source

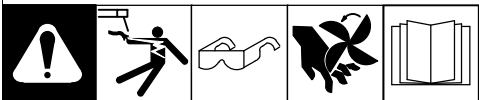


NOTICE – The remedies listed below are recommendations only. If these remedies do not fix the trouble with your unit, have a Factory Authorized Service Agent check unit. **There are no user serviceable parts inside unit.**

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 4-22).
	Check and replace line fuse(s), if necessary (see Section 4-22).
	Check for proper input power connections (see Section 4-22).
	Check for proper jumper link position (see Section 4-21).
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 4-9).
	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 6-2).
Lack of high frequency; difficulty in starting GTAW arc.	Reset circuit breaker CB1 (see Section 6-2).
	Select proper size tungsten (see Section 11).
	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 6-3).
Wandering arc – poor control of direction of arc.	Reduce gas flow rate.
	Select proper size tungsten (see Section 11).
	Properly prepare tungsten (see Section 11).
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 Optional Cooler

				
Trouble		Remedy		
Coolant system does not work.	Be sure input power cord is plugged in to energized receptacle.			
	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.			
	Check for clogged hoses or coolant filter.			
	Disconnect pump, and check for sheared coupling. Replace coupling if necessary.			

SECTION 8 – PARTS LIST

8-1. Recommended Spare Parts

Dia. Mkgs.	Part No.	Description	Quantity	
			DX	LX
Recommended Spare Parts			250	350
.....	221 736 POINTS, SPARK GAP (DUAL)	1	1
.....	221 737 POINTS, SPARK GAP (SINGLE)	2	2
.....	239 494 Screen, Filter Lp Cyl 100x100x0.0045 SST (For Optional Cooler)	1	1

SECTION 9 - ELECTRICAL DIAGRAM

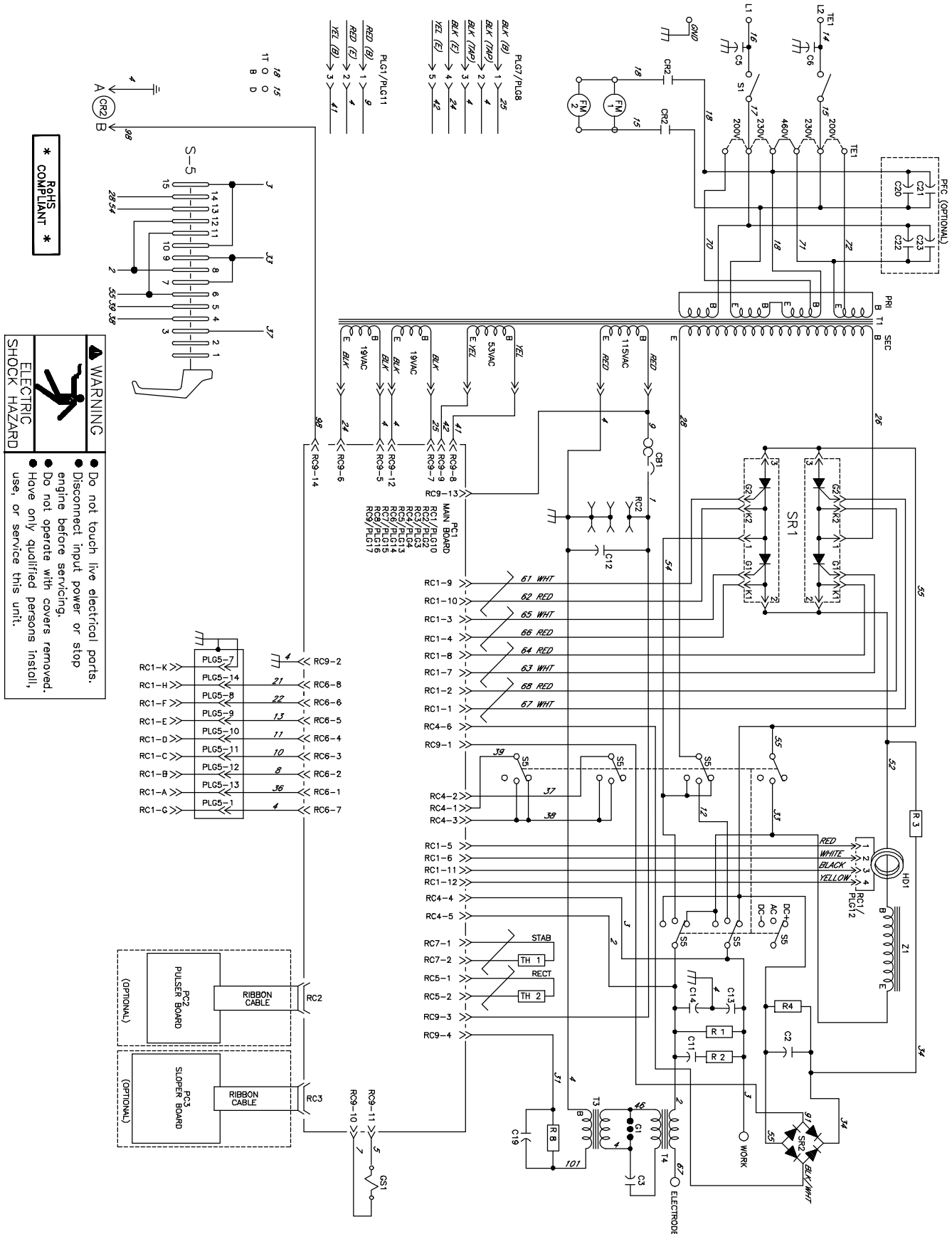


Figure 9-1. Circuit Diagram For 250 DX Models

231 394-C

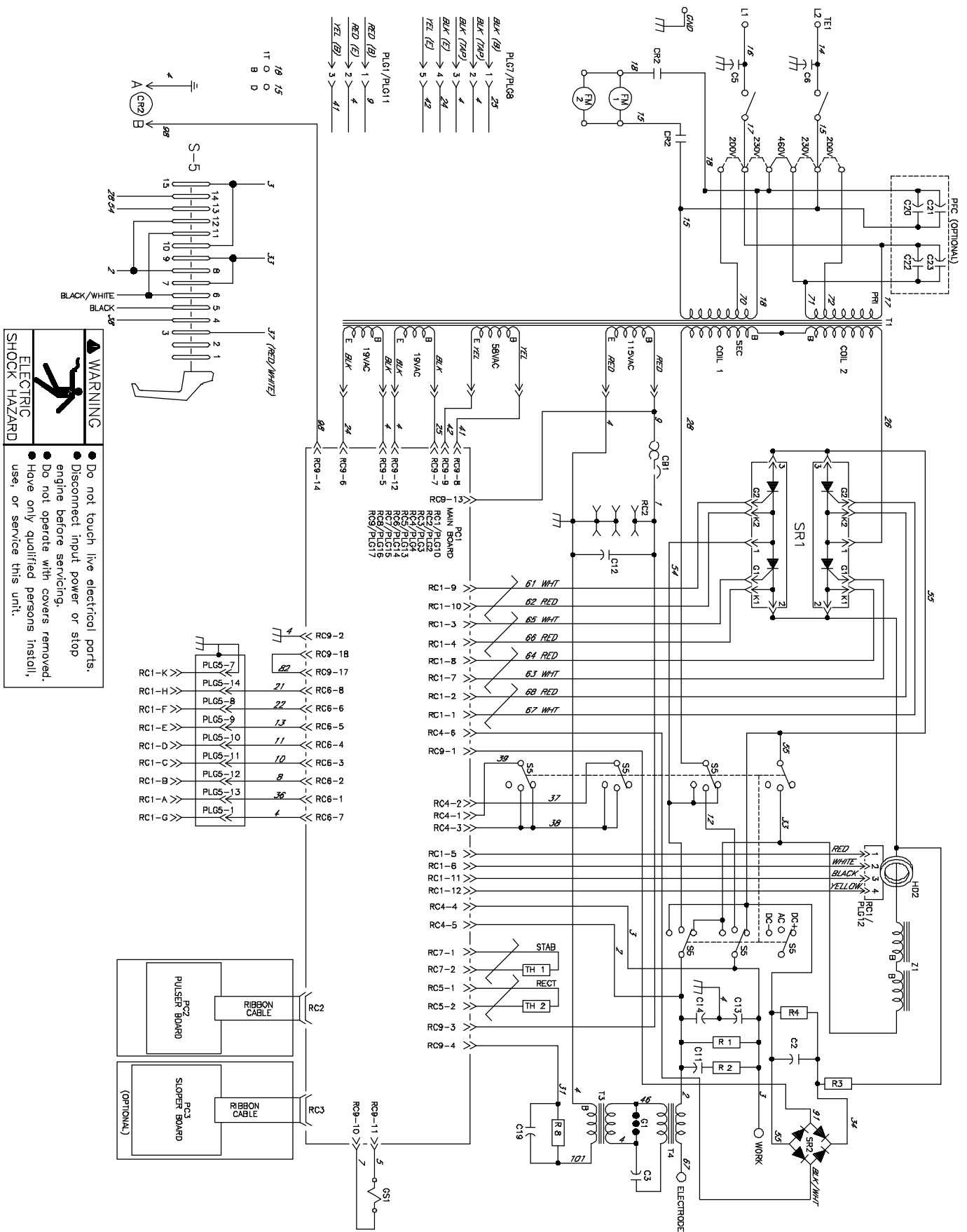


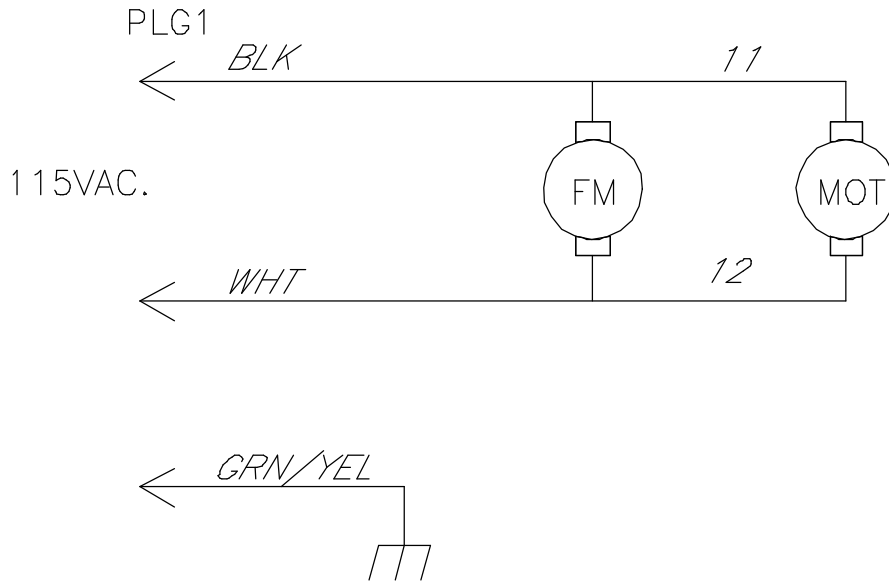


Figure 9-2. Circuit Diagram For 350 LX Models

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

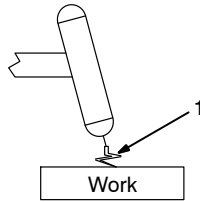


225 650-A

Figure 9-3. Circuit Diagram For Optional Cooler

SECTION 10 – HIGH FREQUENCY

10-1. Welding Processes Requiring High Frequency



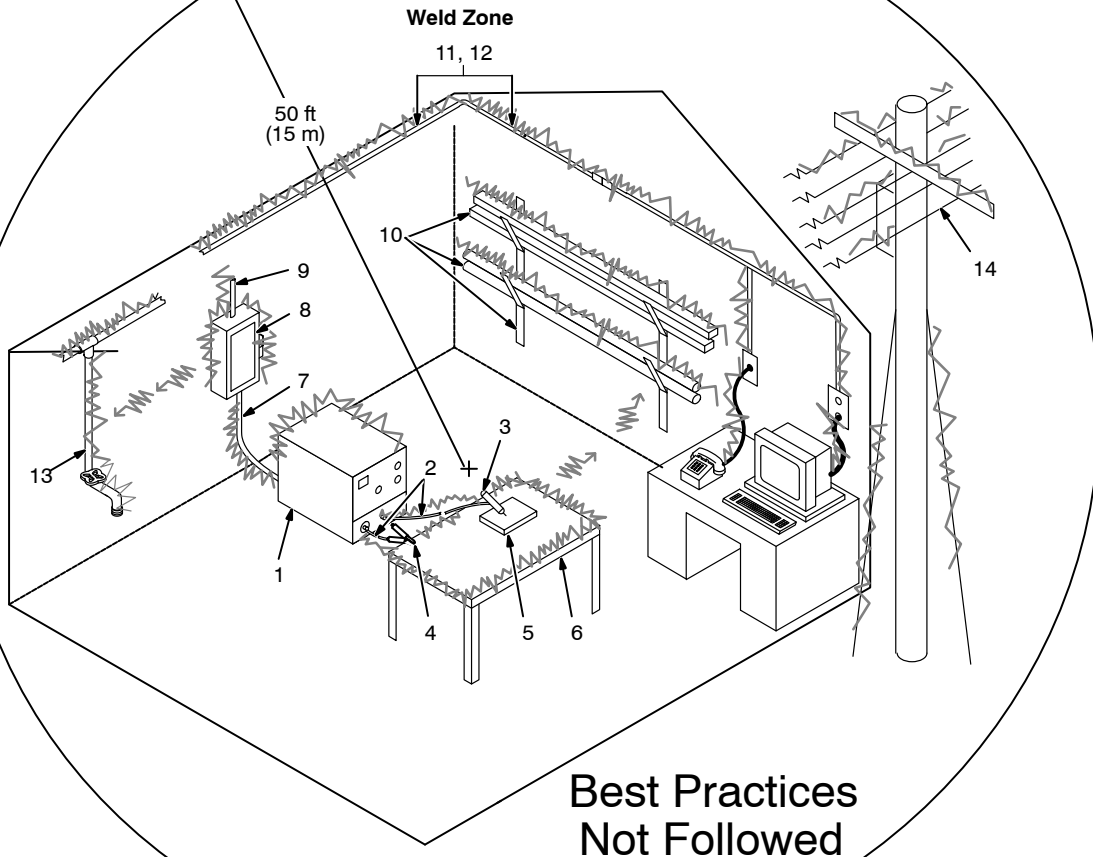
TIG

1 High-Frequency Voltage

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

high_freq 5/10 – S-0693

10-2. Installation Showing Possible Sources Of HF Interference



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

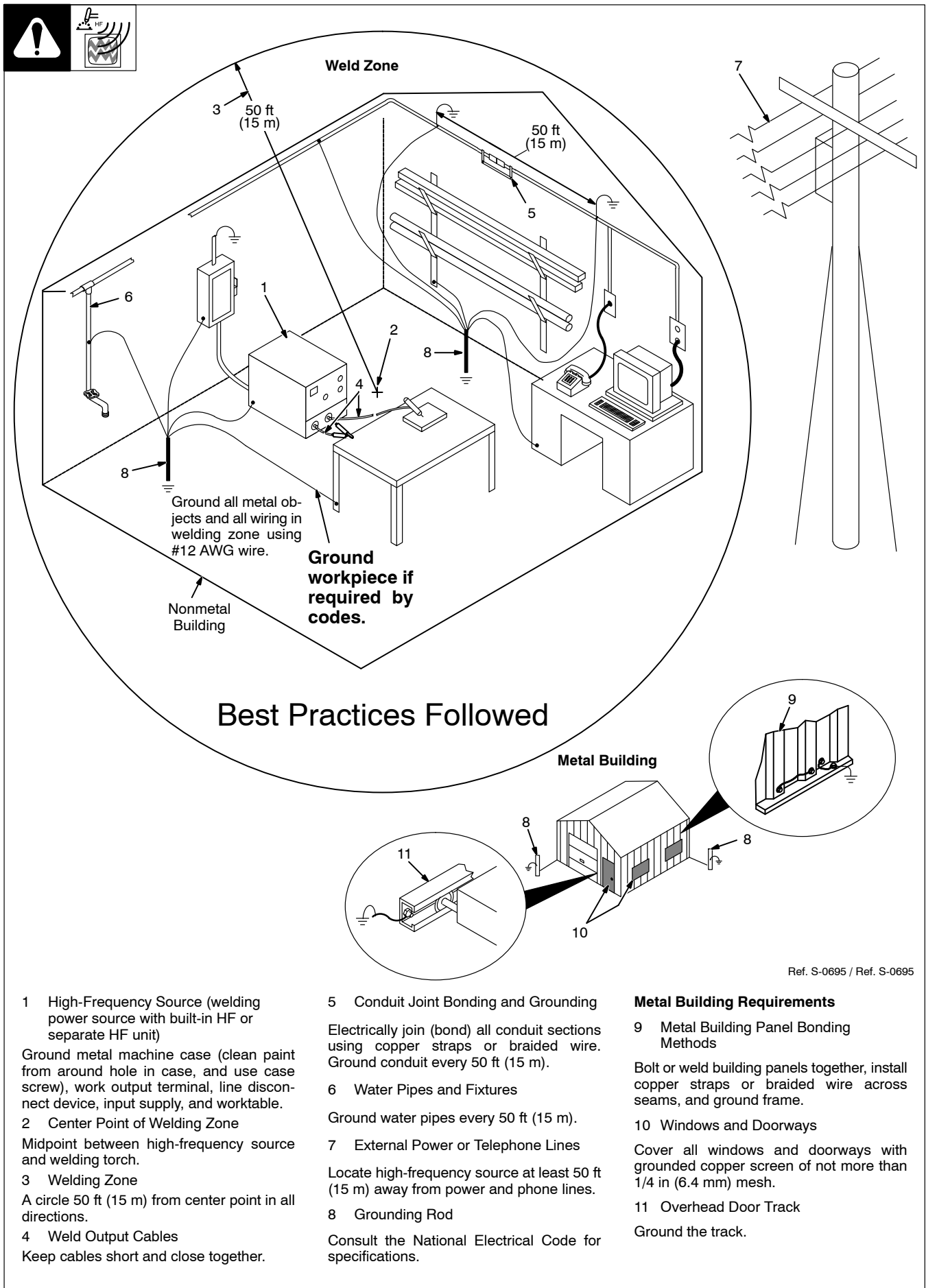
- 7 Input Power Cable
- 8 Line Disconnect Device
- 9 Input Supply Wiring

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

10-3. Recommended Installation To Reduce HF Interference



- 1 High-Frequency Source (welding power source with built-in HF or separate HF unit)

Ground metal machine case (clean paint from around hole in case, and use case screw), 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.

SECTION 11 – SELECTING AND PREPARING A TUNGSTEN FOR DC OR AC WELDING

gtaw_Phase_2011-06



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

11-1. Selecting Tungsten Electrode (Wear Clean Gloves To Prevent Contamination Of Tungsten)

Not all tungsten electrode manufacturers use the same colors to identify tungsten type. Contact the tungsten electrode manufacturer or reference the product packaging to identify the tungsten you are using.

Electrode Diameter	Amperage Range - Gas Type♦ - Polarity	
	(DCEN) – Argon Direct Current Electrode Negative (For Use With Mild Or Stainless Steel)	AC – Argon Balance Control @ 65% Electrode Negative (For Use With Aluminum)
2% Ceria, 1.5% Lanthanum, Or 2% Thorium Alloy Tungstens		
.040" (1 mm)	25-85	20-80
1/16" (1.6 mm)	50-160	50-150
3/32" (2.4 mm)	130-250	135-235
1/8" (3.2 mm)	250-400	225-360
Pure Tungsten		
.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).

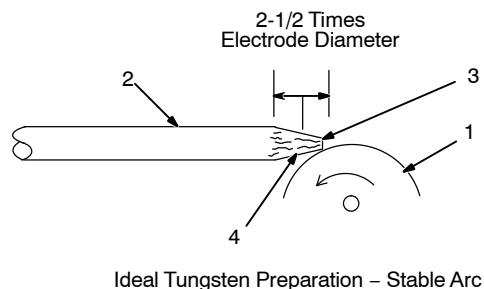
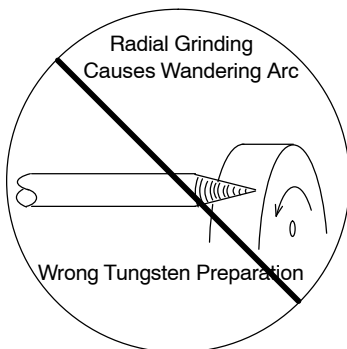
Figures listed are a guide and are a composite of recommendations from American Welding Society (AWS) and electrode manufacturers.

11-2. Preparing Tungsten Electrode For Welding With Phase Control Machines



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



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

A 2% ceriated tungsten is recommended.

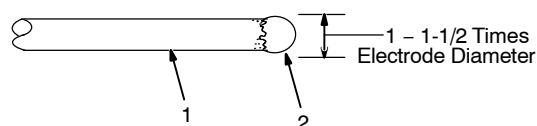
3 Flat

Diameter of this flat determines amperage capacity.

4 Straight Ground

Grind lengthwise, **not radial**.

B. Preparing Tungsten For AC Welding



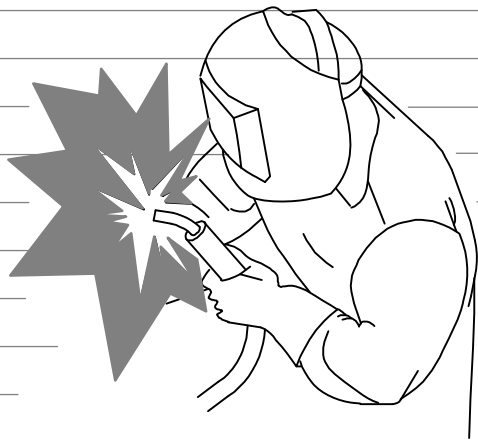
1 Tungsten Electrode

A pure tungsten is recommended..

2 Balled End

Ball end of tungsten by applying AC amperage recommended for a given electrode diameter (see Section 11-1). Let ball on end of the tungsten take its own shape.

Notes



**For additional welding information and resources, visit:
[www.MillerWelds.com/resources/improving-your skills](http://www.MillerWelds.com/resources/improving-your%20skills)**

TRUE BLUE[®]

WARRANTY

Effective January 1, 2012

(Equipment with a serial number preface of MC or newer)

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

Warranty Questions?

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Miller distributor.

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you ...

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

Support

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

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

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

Miller shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the delivery date of the equipment to the original end-user purchaser, and not to exceed one year after the equipment is shipped to a North American distributor or eighteen months after the equipment is shipped to an International distributor.

1. 5 Years Parts — 3 Years Labor
 - * Original Main Power Rectifiers Only to Include SCRs, Diodes, and Discrete Rectifier Modules
2. 3 Years — Parts and Labor
 - * Engine Driven Welding Generators
(NOTE: Engines are Warranted Separately by the Engine Manufacturer.)
 - * Inverter Power Sources (Unless Otherwise Stated)
 - * Plasma Arc Cutting Power Sources
 - * Process Controllers
 - * Semi-Automatic and Automatic Wire Feeders
 - * Smith 30 Series Flowgauge and Flowmeter Regulators (No Labor)
 - * Transformer/Rectifier Power Sources
 - * Water Coolant Systems (Integrated)
3. 2 Years — Parts
 - * Auto-Darkening Helmet Lenses (No Labor)
4. 1 Year — Parts and Labor Unless Specified
 - * Automatic Motion Devices
 - * CoolBelt and CoolBand Blower Unit (No Labor)
 - * External Monitoring Equipment and Sensors
 - * Field Options
(NOTE: Field options are covered for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
 - * Flowgauge and Flowmeter Regulators (No Labor)
 - * RFCS Foot Controls (Except RFCS-RJ45)
 - * Fume Extractors
 - * HF Units
 - * ICE/XT Plasma Cutting Torches (No Labor)
 - * Induction Heating Power Sources, Coolers
(NOTE: Digital Recorders are Warranted Separately by the Manufacturer.)
 - * Load Banks
 - * Motor Driven Guns (w/exception of Spoolmate Spoolguns)
 - * PAPR Blower Unit (No Labor)
 - * Positioners and Controllers
 - * Racks
 - * Running Gear/Trailers
 - * Spot Welders
 - * Subarc Wire Drive Assemblies
 - * Water Coolant Systems (Non-Integrated)
 - * Weldcraft-Branded TIG Torches (No Labor)
 - * Wireless Remote Foot/Hand Controls and Receivers
 - * Work Stations/Weld Tables (No Labor)
5. 6 Months — Parts
 - * Batteries
 - * Bernard Guns (No Labor)
 - * Tregaskiss Guns (No Labor)

6. 90 Days — Parts
 - * Accessory (Kits)
 - * Canvas Covers
 - * Induction Heating Coils and Blankets, Cables, and Non-Electronic Controls
 - * M-Guns
 - * MIG Guns and Subarc (SAW) Guns
 - * Remote Controls and RFCS-RJ45
 - * Replacement Parts (No labor)
 - * Roughneck Guns
 - * Spoolmate Spoolguns

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

1. **Consumable components; such as contact tips, cutting nozzles, contactors, brushes, relays, work station table tops and welding curtains, or parts that fail due to normal wear. (Exception: brushes and relays are covered on all engine-driven products.)**
2. Items furnished by Miller, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer's warranty, if any.
3. Equipment that has been modified by any party other than Miller, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

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

In the event of a warranty claim covered by this warranty, the exclusive remedies shall be, at Miller's option: (1) repair; or (2) replacement; or, where authorized in writing by Miller in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized Miller service station; or (4) payment of or credit for the purchase price (less reasonable depreciation based upon actual use) upon return of the goods at customer's risk and expense. Miller's option of repair or replacement will be F.O.B., Factory at Appleton, Wisconsin, or F.O.B. at a Miller authorized service facility as determined by Miller. Therefore no compensation or reimbursement for transportation costs of any kind will be allowed.

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

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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.

An Illinois Tool Works Company
1635 West Spencer Street
Appleton, WI 54914 USA

International Headquarters—USA

USA Phone: 920-735-4505 Auto-Attended
USA & Canada FAX: 920-735-4134
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