OM-2226 189783AS
2012–10

Processes

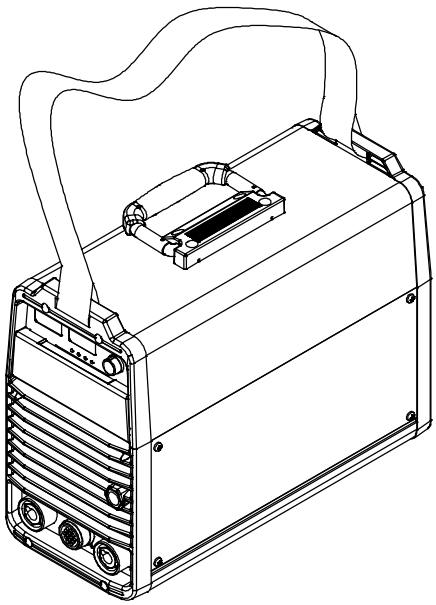
TIG (GTAW) Welding

Stick (SMAW) Welding

Description

115/230/400/460 Volt Models W/Autoline®
Arc Welding Power Source

Maxstar® 200 SD, DX, And LX
(Including Optional Cart And Cooler)
CE And Non-CE Models



OWNER'S MANUAL

Visit our website at
www.MillerWelds.com

From Miller to You

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

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

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

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

ISO 9001 REGISTERED QUALITY SYSTEM

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

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

TRUE BLUE® WARRANTY

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

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.**

Miller®

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WARRANTY

FOR ADDITIONAL WELDING INFORMATION AND RESOURCES, VISIT: http://MillerWelds.com/resources/improving–your skills

DECLARATION OF CONFORMITY

for European Community (CE marked) products.

MILLER Electric Mfg. Co., 1635 Spencer Street, Appleton, WI 54914 U.S.A. declares that the product(s) identified in this declaration conform to the essential requirements and provisions of the stated Council Directive(s) and Standard(s).

Product/Apparatus Identification:

Product	Stock Number
Maxstar 200 DX	907354
Maxstar 200 DX w/Crowbar, CE (NSPR)	907354002

Council Directives:

- 2006/95/EC Low Voltage
- 2004/108/EC Electromagnetic Compatibility
- 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment

Standards:

- IEC 60974-1: 2005 Arc Welding Equipment – Part 1: Welding Power Sources
- IEC 60974-3: 2007 Arc Welding Equipment – Part 3: Arc Striking and Stabilizing Devices
- IEC 60974-10: 2007 Arc Welding Equipment – Part 10: Electromagnetic Compatibility Requirements
- EN 50445:2008 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 – 300Hz)

Signatory:

November 12, 2012

David A. Werba
MANAGER, PRODUCT DESIGN COMPLIANCE

Date of Declaration

241515D

SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

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.

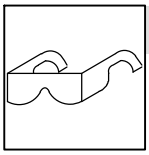
Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

- 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 burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

- 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 by-pass 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.

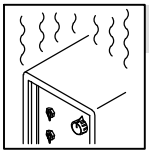
1-3. Additional Symbols For Installation, Operation, And Maintenance

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.

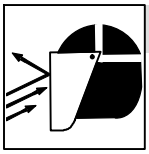
FALLING EQUIPMENT can injure.

- 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.



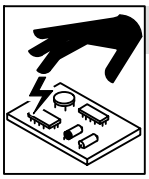
OVERUSE can cause OVERHEATING

- 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.

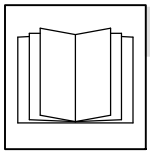
- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.

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.

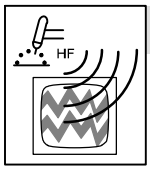
MOVING PARTS can injure.

- 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.cga-net.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).

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

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.*

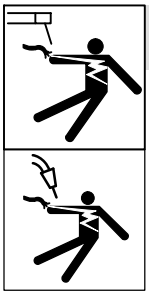
Ce groupe de symboles veut dire Avertissement! Attention! DANGER DE CHOC ELECTRIQUE, PIECES EN MOUVEMENT, et PIECES CHAUDES. Consulter les symboles et les instructions ci-dessous y afférant pour les actions nécessaires afin d'éviter le danger.

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, le faire directement avec un câble distinct.
- Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d'une autre machine.
- 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 dégraisseurs.
- 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.

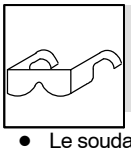
Le rayonnement de l'arc du procédé de soudage génère des rayons visibles et invisibles intenses (ultraviolets et infrarouges) susceptibles de provoquer des brûlures dans les yeux et sur la peau. Des étincelles sont projetées pendant le soudage.

- Porter un casque de soudage approuvé muni de verres filtrants approprié 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 soudure. La projection d'étincelles, des pièces chaudes et des équipements chauds peut provoquer des incendies et des brûlures. Le contact accidentel de l'électrode avec des objets métalliques peut provoquer des étincelles, une explosion, un surchauffement ou un incendie. Avant de commencer le soudage, vérifier et s'assurer que l'endroit ne présente pas de danger.

- Déplacer toutes les substances inflammables à une distance de 10,7 m de l'arc de soudure. En cas d'impossibilité les recouvrir soigneusement avec des protections homologués.
- Ne pas souder dans un endroit là 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 le plus près possible de la zone de soudage pour éviter le transport du courant sur une longue distance par des chemins inconnus éventuels en provoquant des risques d'électrocution, 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 PIECES DE METAL ou DES SALETES peuvent provoquer des blessures dans les yeux.

- Le soudage, l'écaillement, 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.

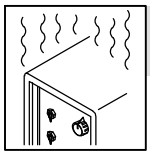
2-3. Dangers supplémentaires en relation avec l'installation, le fonctionnement et la maintenance

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.

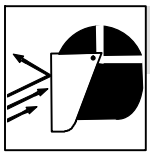
LA CHUTE DE L'ÉQUIPEMENT peut provoquer des blessures.

- 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 Nº94–110) lors du levage manuelle de pièces ou équipements lourds.



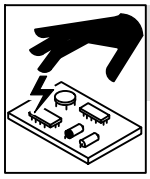
L'EMPLOI EXCESSIF peut SURCHAUFFER L'ÉQUIPEMENT.

- 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.



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 imprimes.

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.

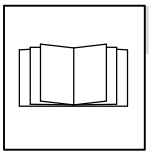
- Ne pas appuyer sur la gâchette avant d'en avoir reçu l'instruction.
- Ne pas diriger le pistolet vers soi, d'autres personnes ou toute pièce mécanique en engageant le fil de soudage.

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.

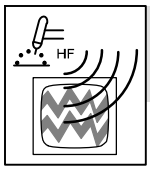
Les PIÈCES MOBILES peuvent causer des blessures.

- 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.



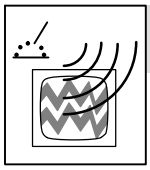
LIRE LES INSTRUCTIONS.

- 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.cga-net.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.

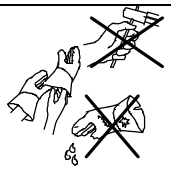
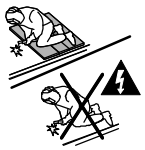
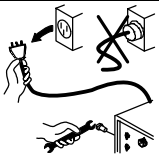
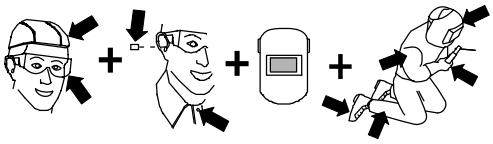
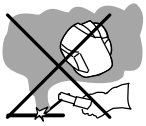
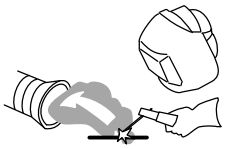
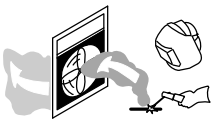
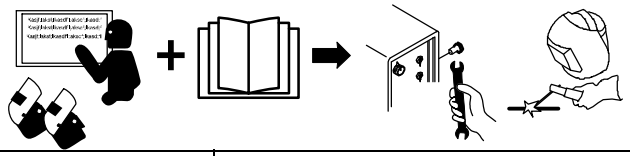
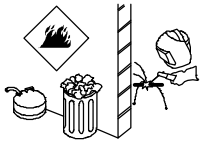
En ce qui concerne les implants médicaux :

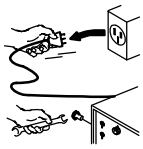
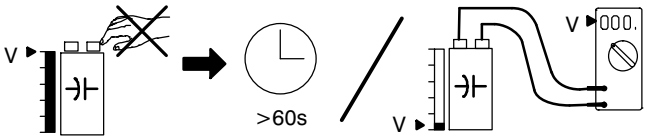
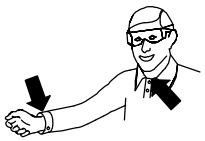
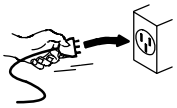
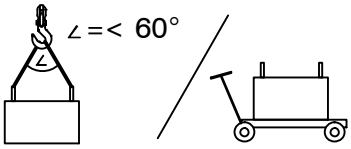
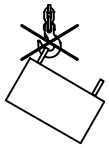
Les porteurs d'implants doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de soudage par points, de gougeage, du coupage plasma ou de chauffage par induction. Si le médecin approuve, il est recommandé de suivre les procédures précédentes.

SECTION 3 – DEFINITIONS (CE Models)

3-1. Additional Safety Symbols And Definitions

☞ *Some symbols are found only on CE products.*

	Warning! Watch Out! There are possible hazards as shown by the symbols. Safe1 2012–05
	Wear dry insulating gloves. Do not touch electrode with bare hand. Do not wear wet or damaged gloves. Safe2 2012–05
	Protect yourself from electric shock by insulating yourself from work and ground. Safe3 2012–05
	Disconnect input plug or power before working on machine. Safe5 2012–05
	Wear hat and safety glasses. Use ear protection and button shirt collar. Use welding helmet with correct shade of filter. Wear complete body protection. Safe38 2012–05
	Keep your head out of the fumes. Safe6 2012–05
	Use forced ventilation or local exhaust to remove the fumes. Safe8 2012–05
	Use ventilating fan to remove fumes. Safe10 2012–05
	Become trained and read the instructions before working on the machine or welding. Safe40 2012–05
	Keep flammables away from welding. Do not weld near flammables. Safe12 2012–05

	Welding sparks can cause fires. Have a fire extinguisher nearby, and have a watchperson ready to use it. Safe14 2012–05
	Do not weld on drums or any closed containers. Safe16 2012–05
	Do not remove or paint over (cover) the label. Safe20 2012–05
	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. Safe37 2012–05
	Disconnect input plug or power before working on machine. Safe30 2012–05
	Hazardous voltage remains on input capacitors after power is turned off. Do not touch fully charged capacitors. Always wait 60 seconds after power is turned off before working on unit, OR check input capacitor voltage, and be sure it is near 0 before touching any parts. Safe42 2012–05
	When power is applied failed parts can explode or cause other parts to explode. Safe26 2012–05
	Always wear long sleeves and button your collar when servicing unit. Safe28 2012–05
	After taking proper precautions as shown, connect power to unit. Safe29 2012–05
	Always lift and support unit using both handles. Keep angle of lifting device less than 60 degrees. Use a proper cart to move unit. Safe44 2012–05
	Do not use one handle to lift or support unit. Safe31 2012–05

3-2. Miscellaneous Symbols And Definitions

A Amperes	Panel–Local	Gas Tungsten Arc Welding (GTAW)	Shielded Metal Arc Welding (SMAW)
V Volts	Voltage Input	3 Phase Static Frequency Converter-Transformer-Rectifier	
Voltage Output	Circuit Breaker	Remote	Lift-Arc Start (GTAW)
Protective Earth (Ground)	t_2 Postflow Timer	t_1 Preflow Timer	S Seconds
I On	O Off	+ Positive	— Negative
∿ Alternating Current	Gas Input	Gas Output	I_2 Rated Welding Current
X Duty Cycle	⎓ Direct Current	Line Connection	U_2 Conventional Load Voltage
U_1 Primary Voltage	IP Degree Of Protection	I_{1max} Rated Maximum Supply Current	I_{1eff} Maximum Effective Supply Current
U_0 Rated No Load Voltage (Average)	A Pulse Background Amperage	A Initial Amperage	Increase/Decrease Of Quantity
Normal Trigger Operation (GTAW)	Two-Step Trigger Operation (GTAW)	Four-Step Trigger Operation (GTAW)	% Percent
Hz Hertz	M Recall From Memory	Arc Force (DIG)	HF Impulse Starting (GTAW)
t Final Slope	A Final Amperage	% Pulse Percent On Time	t Initial Slope
V I Contactor Control (Stick)	Pulser On-Off	A TIG Weld Amps And Peak Amps While Pulsing	f Pulse Frequency
% A Background Amps	Process	Pulser	Sequence
Output	Adjust	S Suitable For Areas Of Increased Shock Hazard	

SECTION 4 – INSTALLATION

4-1. Important Information Regarding CE Products (Sold Within The EU)

A. 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.

B. Information On Electromagnetic Compatibility (EMC)

This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low–voltage supply system. There may be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated disturbances.

This equipment complies with IEC 61000–3–12 provided that the short–circuit power Ssc is greater than or equal to 1,399,985 at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment is connected only to a supply with a short–circuit power Ssc greater than or equal to 1,399,985.

ce-emc 1 2010-10

4-2. Serial Number And Rating Label Location

The serial number and rating information for the power source is located on the rear 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. Specifications

Input Power	Rated Output	IP Rating	Welding Amperage Range	Max. Open-Circuit Voltage (U0)	Rated Peak Striking Voltage (Up)	Amperes Input At Rated Output, 50/60Hz				KVA	KW
						115	230	400	460		
Three-Phase Stick Process	150 A @ 26 VDC, 60% Duty Cycle	23	1 – 200	80∇ 9-14◆	15 KV**	-–	13.1 0.16*	7.4 0.24*	6.4 0.25*	5.2 0.06*	5.0 0.03*
Three-Phase TIG Process	175 A @ 17 VDC, 60% Duty Cycle	23	1 – 200	80 9-14◆	15 KV**	-–	10.5 0.16*	6.0 0.24*	5.2 0.25*	4.2 0.06*	4.0 0.03*
Three-Phase Stick Process	200 A @ 28 VDC, 30% Duty Cycle	23	1 – 200	80∇ 9-14◆	15 KV**		18.4 0.16*	10.3 0.24*	8.9 0.25*	7.3 0.06*	7.0 0.03*
Three-Phase TIG Process	200 A @ 18 VDC, 40% Duty Cycle	23	1 – 200	80 9-14◆	15 KV**		12.7 0.16*	7.2 0.24*	6.2 0.25*	5.1 0.06*	4.9 0.03*
Single-Phase Stick Process	150 A @ 26 VDC, 60% Duty Cycle	23	1 – 200	80∇ 9-14◆	15 KV**	-–	21.7 0.23*	-–	10.6 .25*	5.0 0.05*	5.0 0.02*
Single-Phase TIG Process	175 A @ 17 VDC, 60% Duty Cycle	23	1 – 200	80 9-14◆	15 KV**	-–	17.4 0.23*	-–	8.5 .25*	4.0 0.05*	4.0 0.02*
Single-Phase Stick Process	125 A @ 25 VDC, 50% Duty Cycle	23	1 – 200	80∇ 9-14◆	15 KV**	34.1 0.42*	-–	-–	-–	4.0 0.05*	3.8 0.03*
Single-Phase TIG Process	150 A @ 16 VDC, 70% Duty Cycle	23	1 – 200	80 9-14◆	15 KV**	29.7 0.42*	-–	-–	-–	3.4 0.05*	3.4 0.03*
Single-Phase Stick Process	100 A @ 24 VDC, 80% Duty Cycle	23	1 – 200	80∇ 9-14◆	15 KV**	28.1 0.42*	-–	-–	-–	3.2 0.05*	3.2 0.03*
Single-Phase TIG Process	125 A @ 15 VDC, 100% Duty Cycle	23	1 – 200	80 9-14◆	15 KV**	23.0 0.42*	-–	-–	-–	2.6 0.05*	2.6 0.03*

*While idling

** Arc starting device is designed for manual guided operations.

◆ Low open-circuit voltage while in TIG Lift Arc™, or while in Stick with low open-circuit voltage selected.

∇**Normal open-circuit voltage (80 volts) is present while in Stick with normal open-circuit voltage selected.**

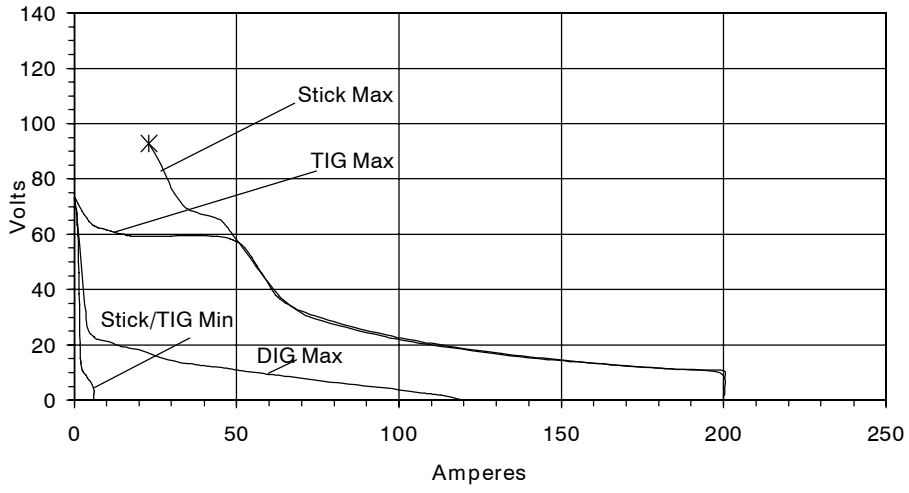
☞ *Duty cycle limitations on units with 115 volt input power are due to the input power cord supplied with the unit.*

☞ *This unit is equipped with Auto-Line ™. The Auto-Line circuitry automatically connects to 120–460 VAC, single- or three-phase power without removing the cover to relink the power source.*

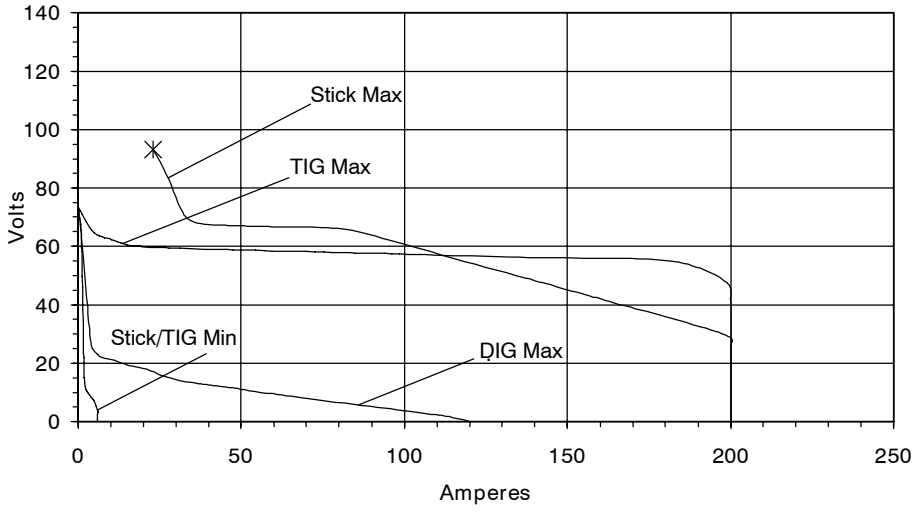
4-4. Volt-Ampere Curves

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

115VAC Input



Other Input Voltages



***Amperage setting must be reduced to obtain currents less than highlighted data* point.**

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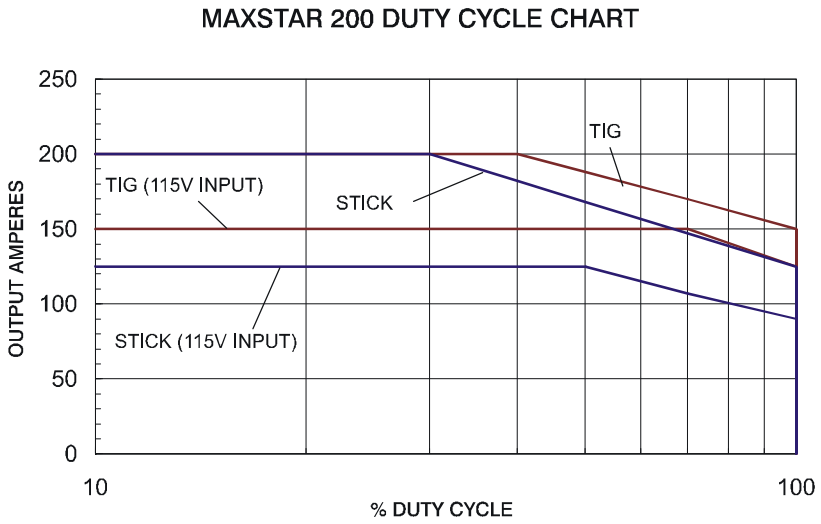
4-5. Duty Cycle And Overheating

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

If unit overheats, output stops, a Help message is displayed (see Section 7-3), and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage or voltage, or duty cycle before welding.

NOTICE *– Exceeding duty cycle can damage unit and void warranty.*

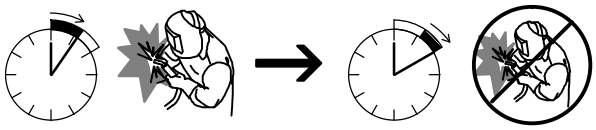


90 A @ 100% Duty Cycle For 115 Volt Single-Phase Stick Process

125 A @ 100% Duty Cycle For 115 Volt Single-Phase TIG Process

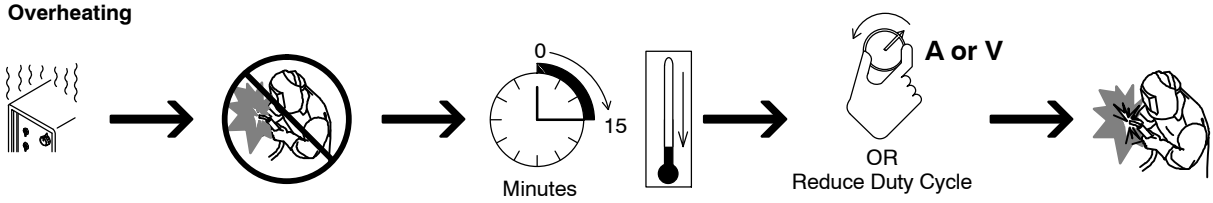
150 A @ 60% Duty Cycle For Stick Process (Other Voltages)

175 A @ 60% Duty Cycle For TIG Process (Other Voltages)



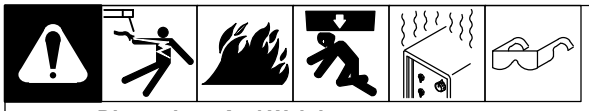
6 Minutes Welding 4 Minutes Resting

Overheating



189 770-A

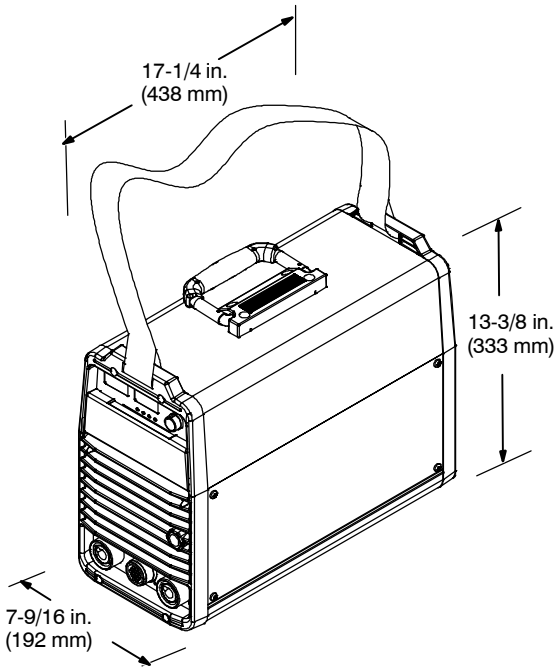
4-6. Selecting A Location



Dimensions And Weight

34.7 lb (15.7 kg) - without power cord

37.3 lb (16.9 kg) - with power cord

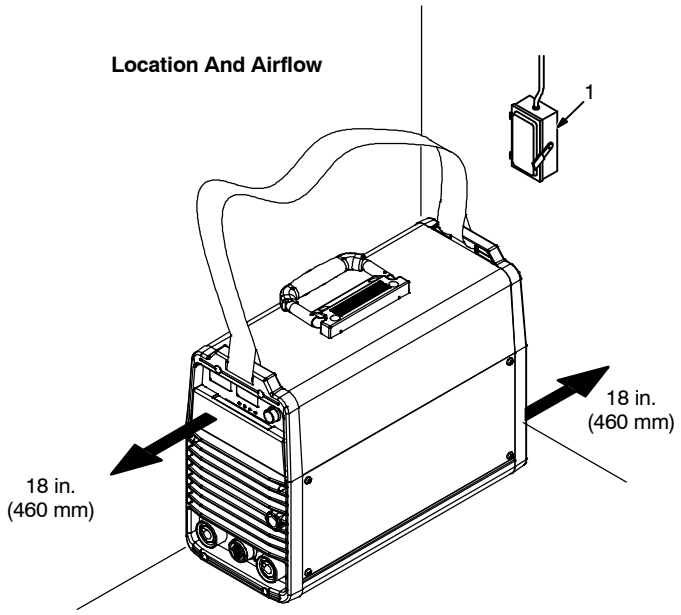


1 Line Disconnect Device

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.

Location And Airflow



802 451

4-7. 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.*

Weld Output Terminals

Turn off power before connecting to weld output terminals.

Do not use worn, damaged, undersized, or poorly spliced cables.

Welding Amperes***	Weld Cable Size** and Total Cable (Copper) Length in Weld Circuit Not Exceeding			
	100 ft (30 m) or Less****		150 ft (45 m)	200 ft (60 m)
	10 – 60% Duty Cycle AWG (mm²)	60 – 100% Duty Cycle AWG (mm²)	10 – 100% Duty Cycle AWG (mm²)	
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)

+ –

Output Receptacles

* This chart is a general guideline and may not suit all applications. If cable overheats, use next size larger cable.

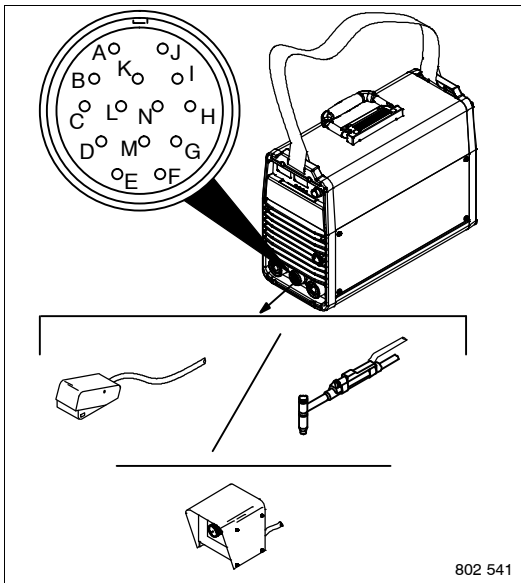
**Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of at least 300 circular mils per ampere.
( ) = mm^2 for metric use

*** 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-G 2011–07 (TIG)

4-8. Remote 14 Receptacle Information



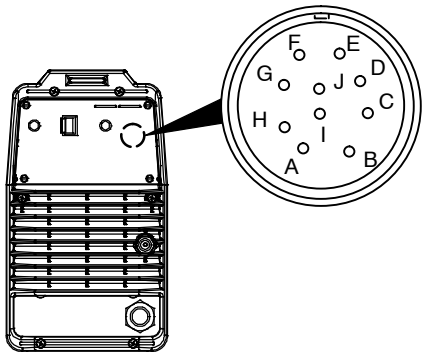
REMOTE 14	Socket*	Socket Information
15 VOLTS DC OUTPUT CONTACTOR	A	Contactor control +15 volts DC.
	B	Contact closure to A completes 15 volts DC contactor control circuit and enables output.
REMOTE OUTPUT CONTROL	C	Output to remote control; 0 to +10 volts DC output to remote control.
	D	Remote control 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	G	+15 volts DC GND
CHASSIS	K	Chassis common.

* The remaining sockets are not used.

☞ *If a remote hand control, like the RHC-14, is connected to the Remote 14 receptacle, some current value above min. must be set on the remote control before the Panel or Remote contactor is turned on. Failure to do so will cause current to be controlled by the panel control, and the remote hand control will not function.*

Notes

4-9. Automation 10-Pin Connection (LX Models)

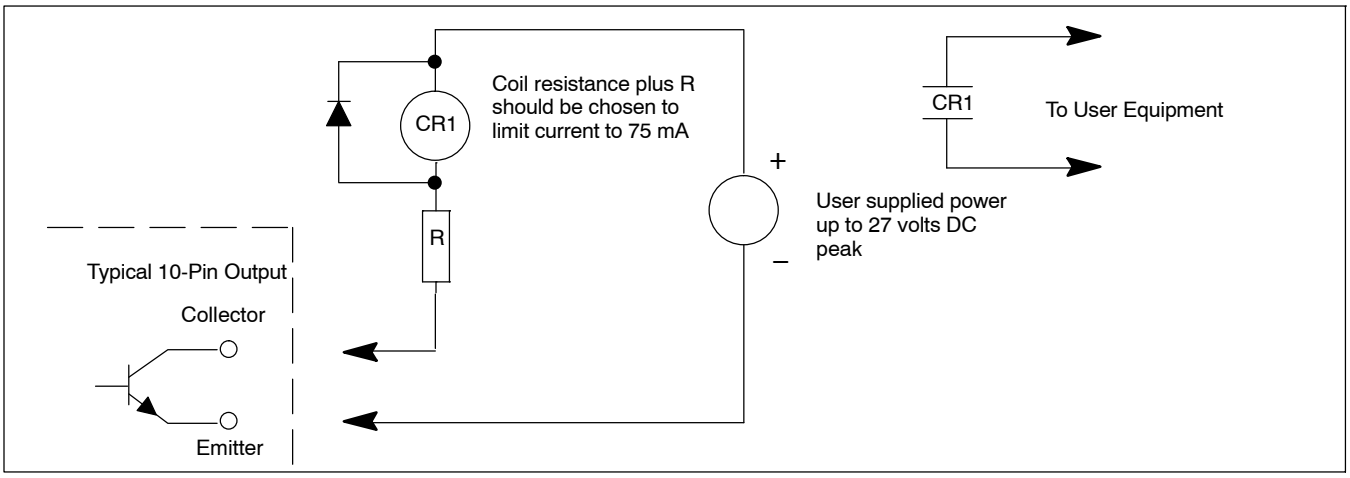


Ref. 802 458

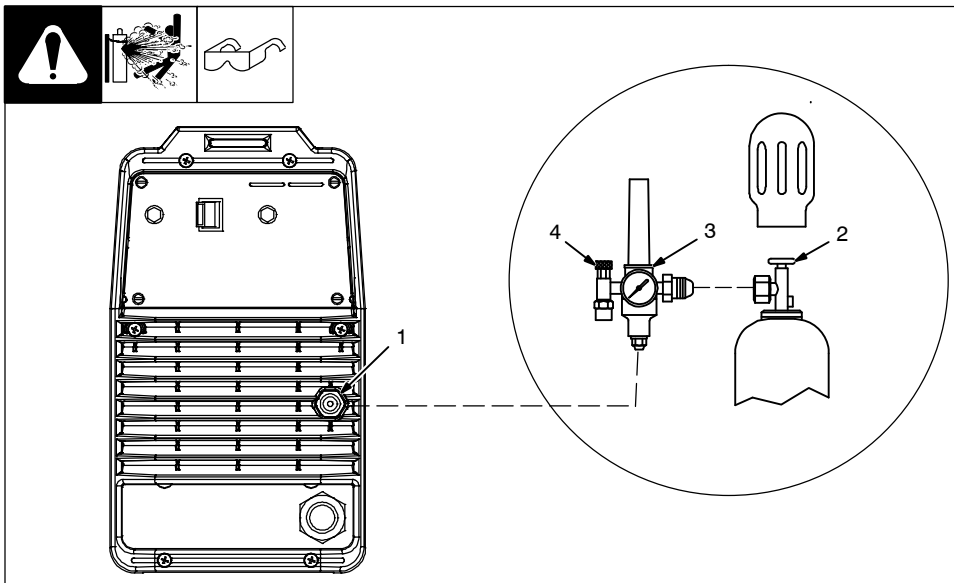
Socket	Socket Information For 10-Pin Receptacle RC2
A	Start/Stop
B	Gas
C	Output enable
D	Chassis ground
E	Final slope – collector
F	Final slope – emitter
G	Pulse lockout – collector
H	Pulse lockout – emitter
I	Valid arc – collector
J	Valid arc – emitter

Definitions Of Inputs And Outputs
Inputs
A - Closure to D starts the weld cycle. Opening closure stops weld cycle. During 2T operation, a momentary closure (greater than 100ms, but less than 3/4 seconds) starts and stops weld output.
B - Closure to D turns on gas. If a preflow time is entered, the preflow cycle will time out before arc initiation. If a post flow time is entered, the post flow cycle will time out at the end of the weld, even if B to D closure is opened.
C - Closure to D must be maintained at all times. If the closure between pins C and D is broken, an output disable occurs, Postflow begins to time out, and HELP 13 will be displayed on the meters.
Outputs
Outputs are isolated open-collector transistor which are able to conduct at least 60 mA of current and 27 VDC peak.
Final Slope - output is on when in Final Slope.
Pulse Lockout - output is on when in Initial Amperage, Initial Slope, Final Slope, Final Amperage, during background time, and when the pulse frequency is less than 10 Hz.
Arc On - output is on when the contactor is on and amperage is greater than 5 amps, or output voltage is greater than 5 volts but less than 50 volts.

4-10. Typical Automation Application



4-11. Gas Connections



1 Gas Fitting

Fittings have 5/8-18 right-hand threads (3/8-19 BSPP on CE units).

2 Cylinder Valve

Open valve slightly so gas flow blows dirt from valve. Close valve.

3 Regulator/Flowmeter

4 Flow Adjust

Typical flow rate is 15 cubic feet per hour (7.1 liters per minute).

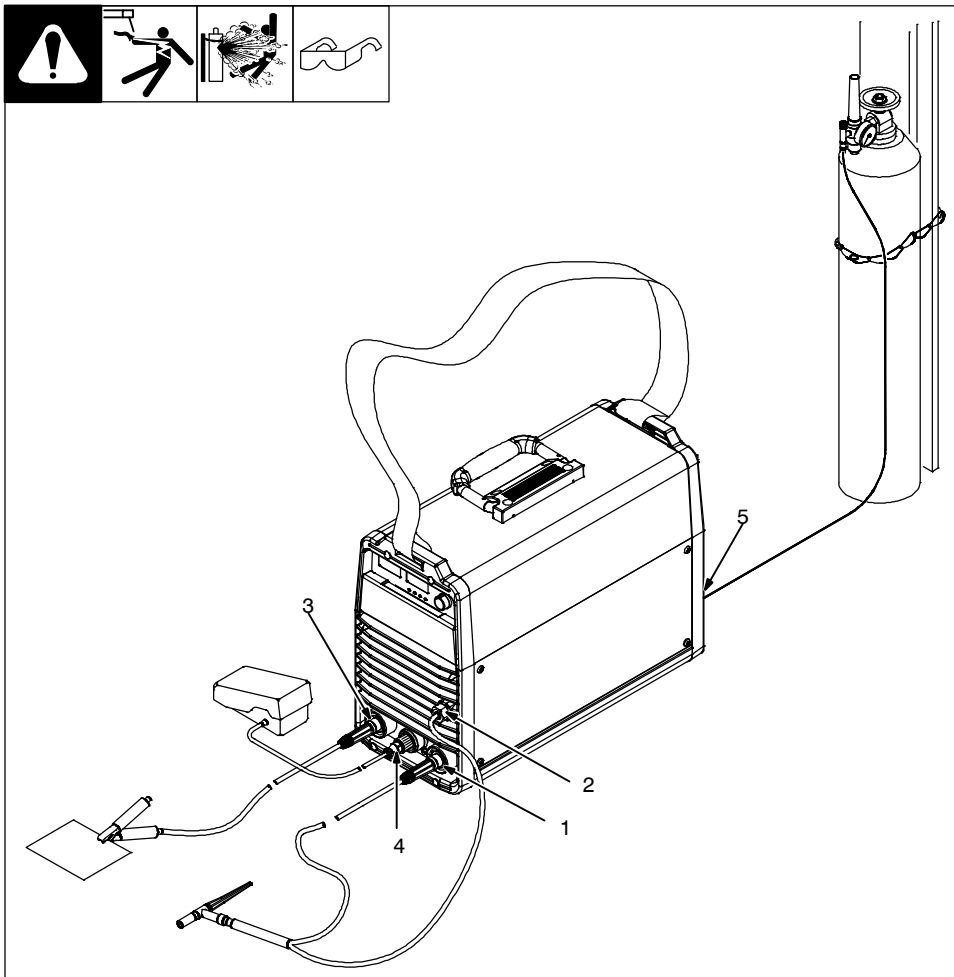
Connect customer supplied gas hose between regulator/flowmeter and gas fitting on rear of unit.

Tools Needed:

11/16, 1-1/8 in., (21 mm)

802 452

4-12. TIG HF Impulse/ Lift-Arc DCEN (Direct Current Electrode Negative) Connections



Turn off power before making connections.

1 Negative (–) Weld Output Terminal

Connect TIG torch to negative weld output terminal.

2 Gas Out Connection

Connect torch gas hose to gas out fitting.

3 Positive (+) Weld Output Terminal

Connect work lead to positive weld output terminal.

4 Remote 14 Receptacle

Connect desired remote control to Remote 14 receptacle.

5 Gas In Connection

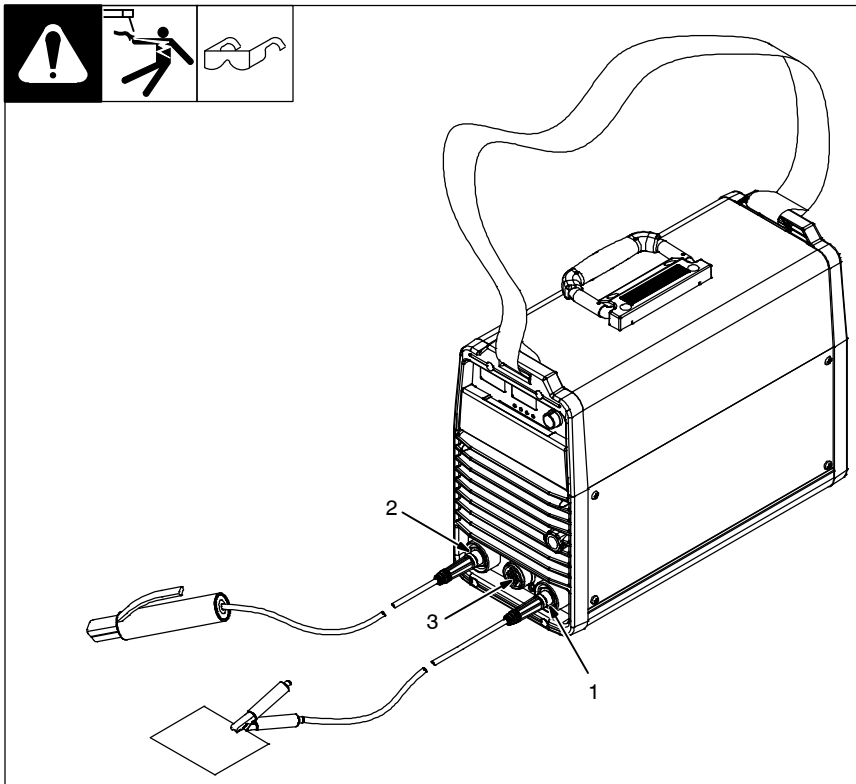
Connect gas hose from gas supply to gas in fitting.

Tools Needed:

11/16 in., (21 mm)

Ref. 802 471

4-13. Stick DCEP (Direct Current Electrode Positive) Connections



Turn off power before making connections.

1 Negative (–) Weld Output Terminal

Connect work lead to negative weld output terminal.

2 Positive (+) Weld Output Terminal

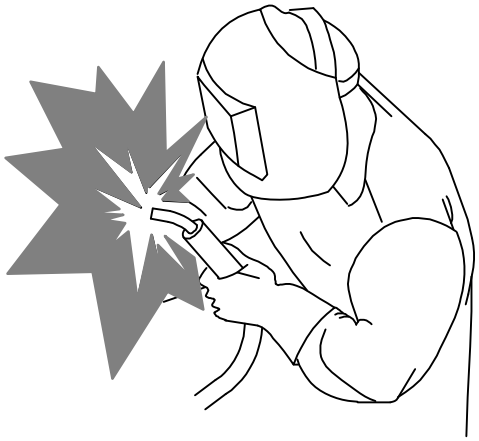
Connect electrode holder to positive weld output terminal.

3 Remote 14 Receptacle

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

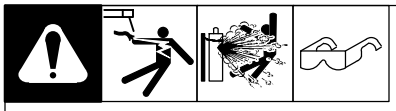
Ref. 802 471

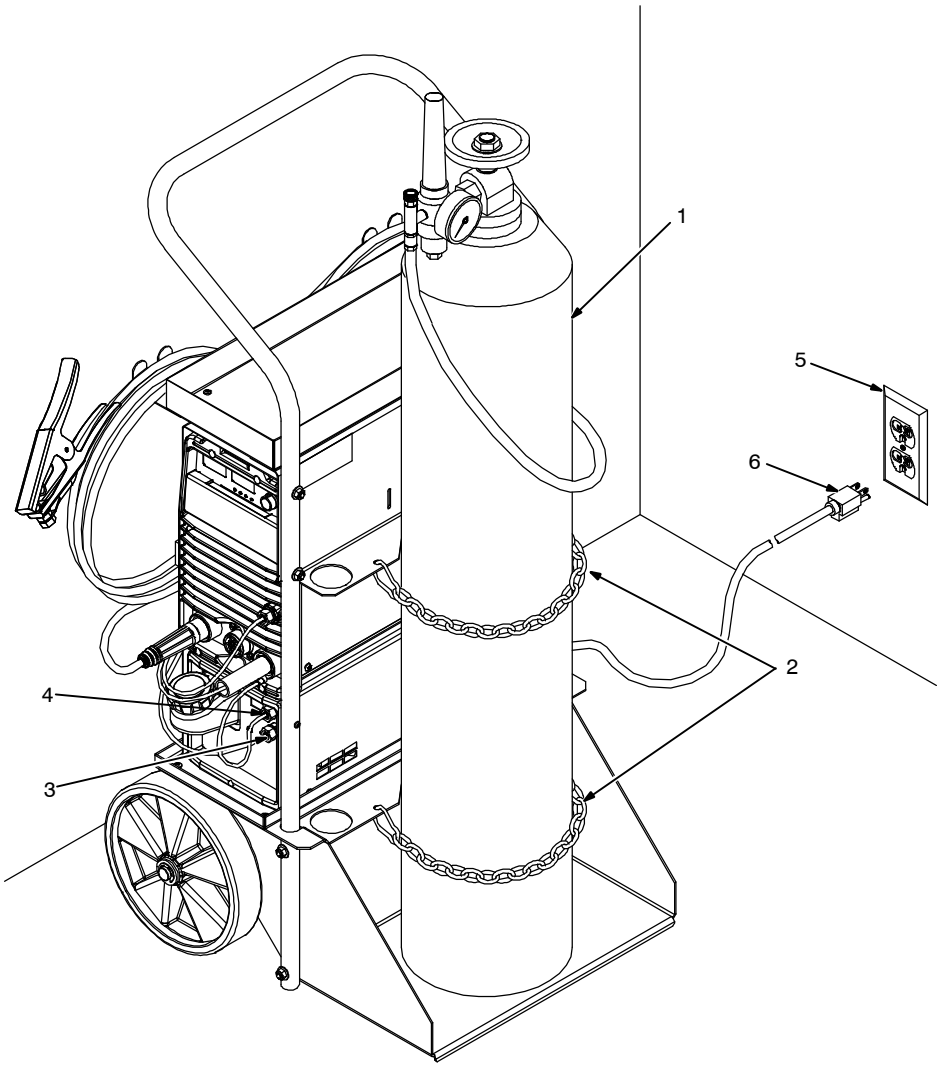
Notes



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

4-14. TIGRunner Connections





Cart and cooler are optional equipment.

1 Gas Cylinder

2 Chains

Secure gas cylinder to cart with chains.

Connect gas hose to welding power source (see Section 4-11).

Connect work lead and torch to welding power source (see Section 4-12).

3 Water-Out (To Torch) Connection

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

4 Water-In (From Torch) Connection

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

5 115 Or 230 Volt AC Grounded Receptacle (Depending On Model)

For 115 volt models, an individual branch circuit capable of carrying 15 amperes and protected by fuses or circuit breakers is recommended. Recommended fuse or circuit breaker size is 15 amperes. For 230 volt models, an individual branch circuit capable of carrying 10 amperes and protected by fuses or circuit breakers is recommended. Recommended fuse or circuit breaker size is 10 amperes.

6 Power Cord

NOTICE *– Do not cut plug from 115 volt cord and attempt to rewire for 230 volts, or do not cut plug from 230 volt cord and attempt to rewire for 115 volts.*

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

Tools Needed:

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

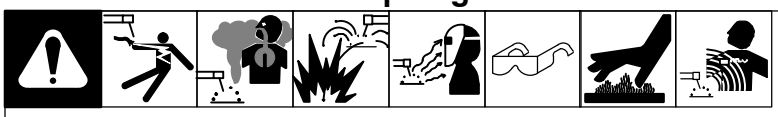
*HF: High Frequency Current

**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.).

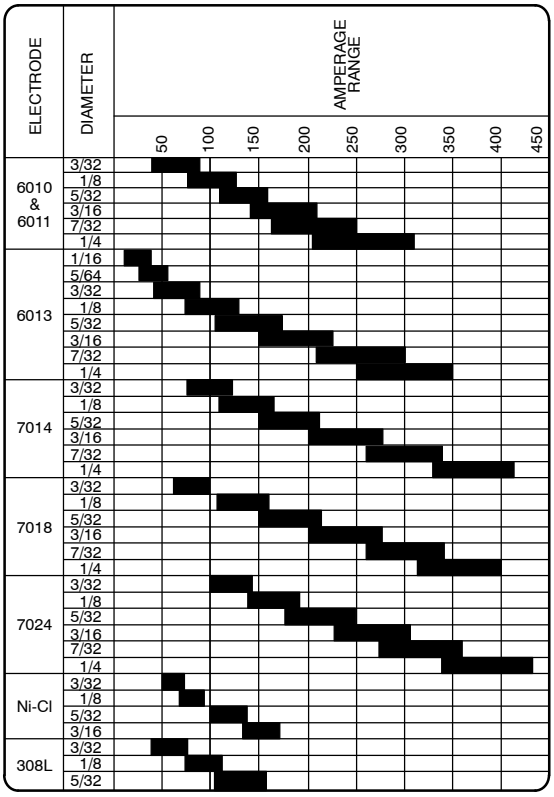
805 338-A

4-15. Electrode and Amperage Selection Chart



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

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



4-16. Electrical Service Guide

☞ *Actual input voltage should not fall below 103 volts AC or rise above 506 volts AC. If actual input voltage is outside this range, unit may not operate according to specifications.*

Failure to follow these electrical service guide recommendations could create an electric shock or fire hazard. These recommendations are for a dedicated branch 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.

	Single-Phase, 100% Duty Cycle	Single-Phase, 60% Duty Cycle	Three-Phase, 60% Duty Cycle		
Input Voltage (V)	115	230	230	400	460
Input Amperes (A) At Rated Output	25	22	13.1	7.4	6.4
Max Recommended Standard Fuse Rating In Amperes [1]					
Time Delay Fuses [2]	25	25	15	8	8
Normal Operating Fuses [3]	35	30	20	10	10
Min Input Conductor Size In AWG [4]	10	12	14	14	14
Max Recommended Input Conductor Length In Feet (Meters)	57 (17)	79 (24)	102 (31)	308 (94)	407 (124)
Min Grounding Conductor Size In AWG [4]	10	12	14	14	14

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.

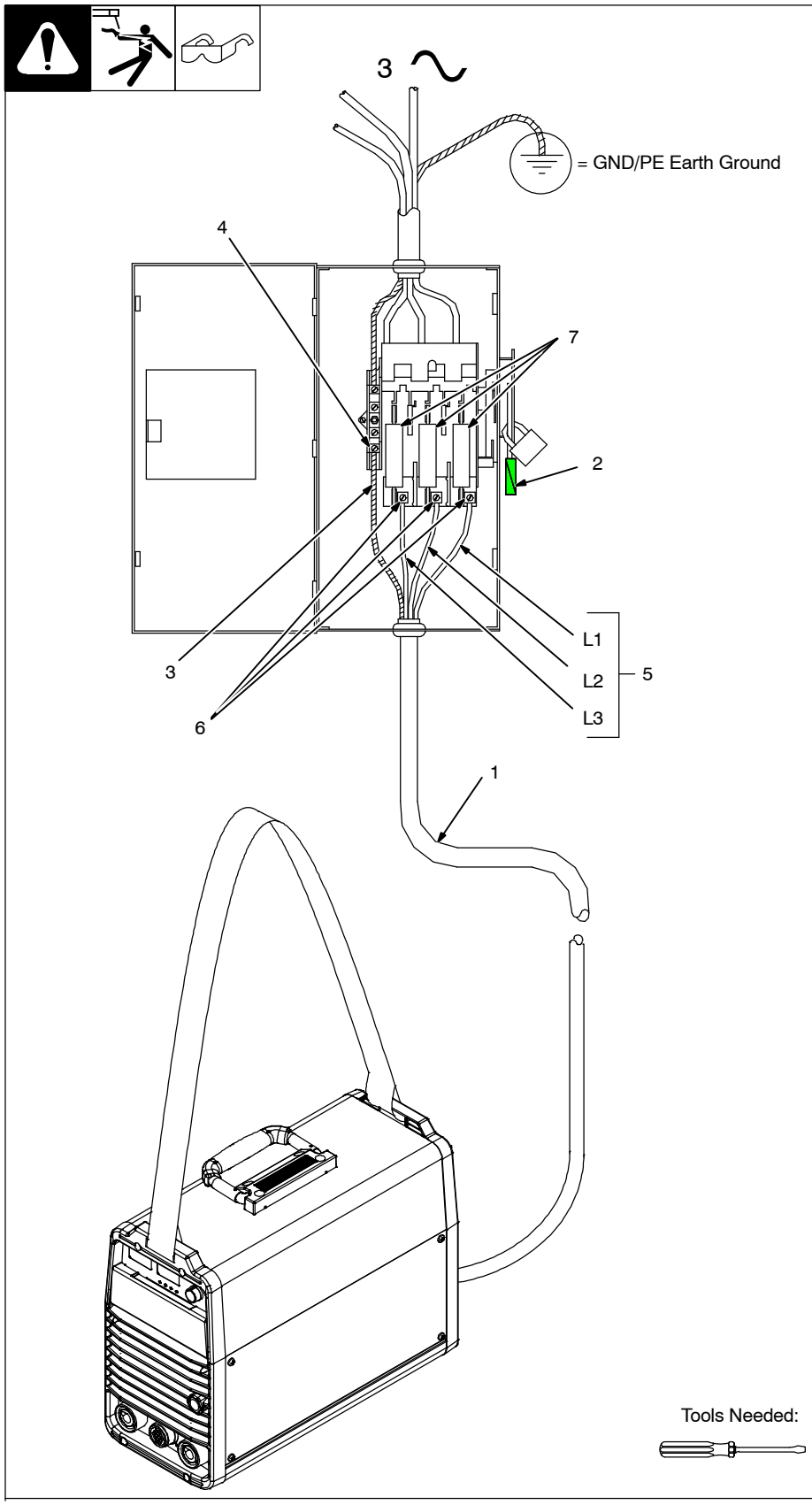
2 “Time-Delay” fuses are UL class “RK5” . See UL 248.

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.

4-17. Connecting Input Power

A. Connecting Three-Phase Input Power



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.

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

☞ *The Auto-Line circuitry in this unit automatically adapts the power source to the primary voltage being applied. Check input voltage available at site. This unit can be connected to any input power between 120 and 460 VAC without removing cover to relink the power source.*

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

For Three-Phase Operation

1 Input Power Cord.

2 Disconnect Device (switch shown in the OFF position)

3 Green Or Green/Yellow Grounding Conductor

4 Disconnect Device Grounding Terminal

5 Input Conductors (L1, L2 And L3)

6 Disconnect Device Line Terminals

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

Connect input conductors L1, L2, and L3 to disconnect device line terminals.

7 Over-Current Protection

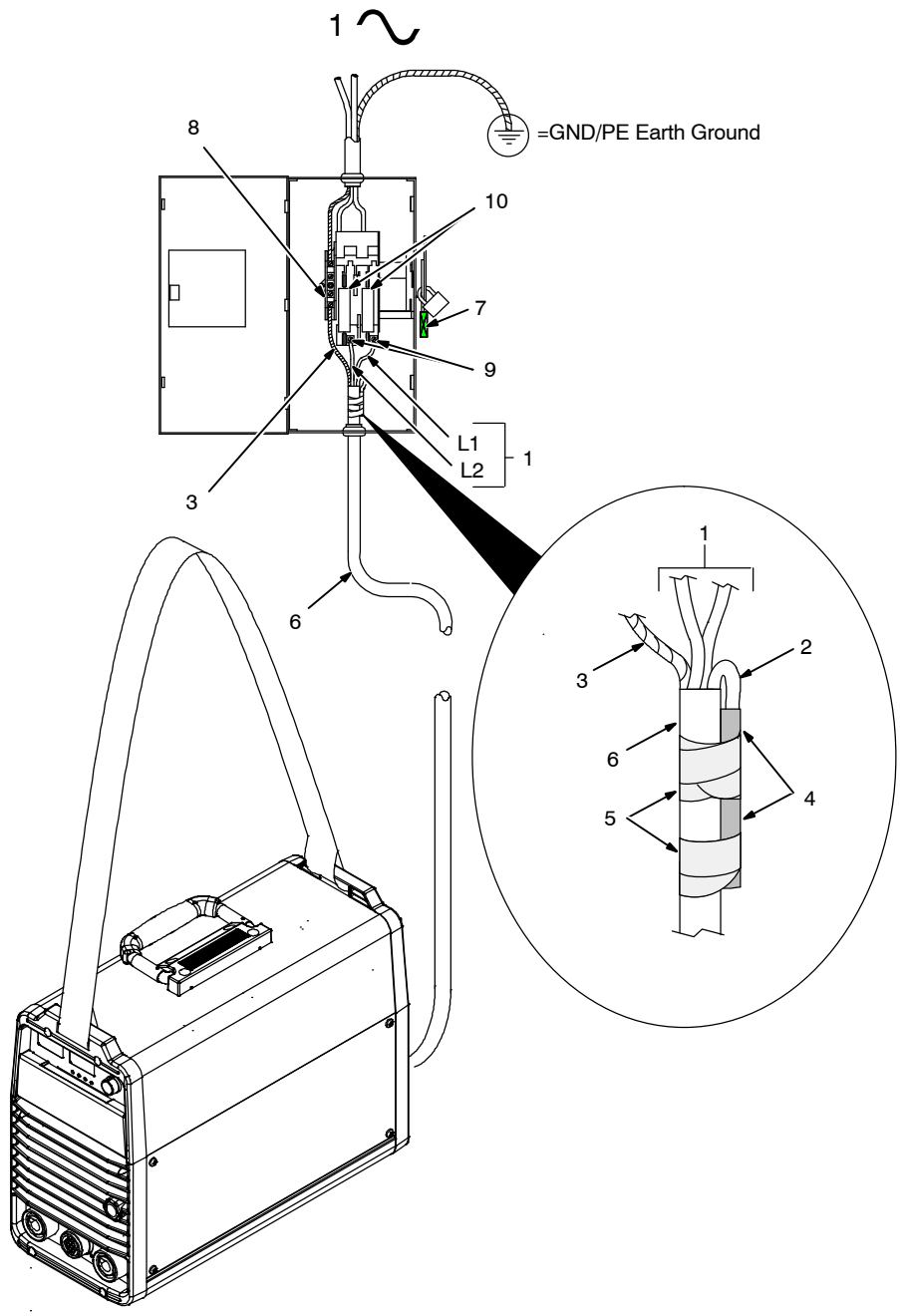
Select type and size of over-current protection using Section 4-16 (fused disconnect switch shown).

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

Tools Needed:

2/04 - Ref. 802 136-A

B. Connecting Single-Phase Input Power



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.

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

☞ *The Auto-Line circuitry in this unit automatically adapts the power source to the primary voltage being applied. Check input voltage available at site. This unit can be connected to any input power between 120 and 460 VAC without removing cover to relink the power source.*

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

1 Black And White Input Conductor (L1 And L2)

2 Red Input Conductor

3 Green Or Green/Yellow Grounding Conductor

4 Insulation Sleeving

5 Electrical Tape

Insulate and isolate red conductor as shown.

6 Input Power Cord.

7 Disconnect Device (switch shown in the OFF position)

8 Disconnect Device Grounding Terminal

9 Disconnect Device Line Terminals

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

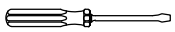
Connect input conductors L1 and L2 to disconnect device line terminals.

10 Over-Current Protection

Select type and size of over-current protection using Section 4-16 (fused disconnect switch shown).

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

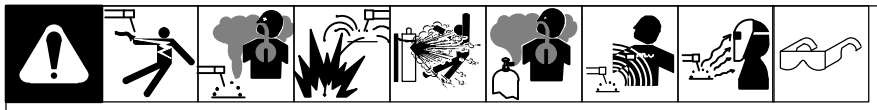
Tools Needed:

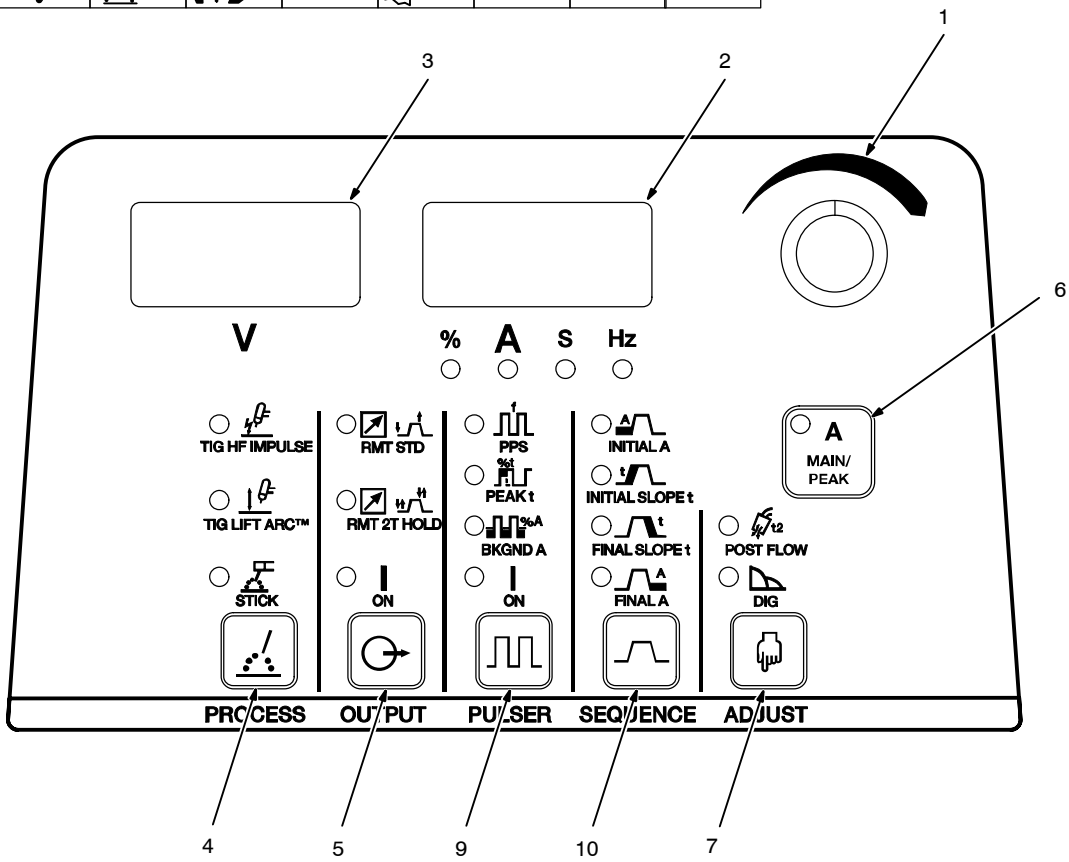


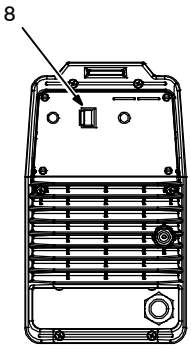
2/04 - Ref. 802 136-A

SECTION 5 – OPERATION

5-1. Controls







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

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

1 Encoder Control

Use encoder control in conjunction with applicable front panel function switch pads to change values for that function. See Section 5-2.

2 Ammeter And Parameter Display

See Section 5-4.

3 Voltmeter

See Section 5-5.

4 Process Controls

See Section 5-6.

5 Output Controls

See Section 5-8.

6 Amperage And Spot Time Control

For Amperage control, see Section 5-3.

For Spot Enable, see Section 6-5.

7 Adjust Controls

See Section 5-11.

8 Power Switch

Use switch to turn unit On/Off.

9 Pulser Controls (DX And LX Models)

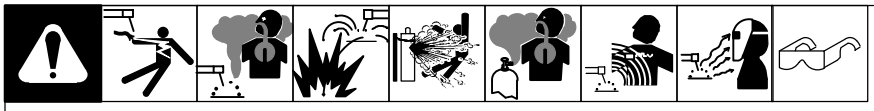
See Section 5-9.

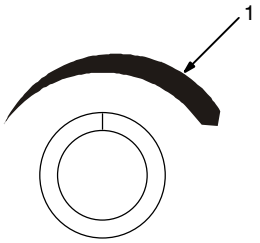
10 Sequencer Controls (DX, LX And All CE Models)

See Section 5-10.

207 690-A / 802 452

5-2. Encoder Control

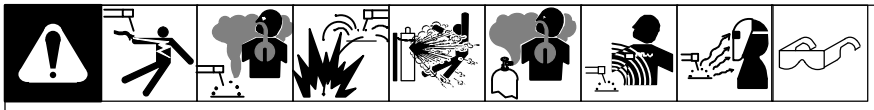


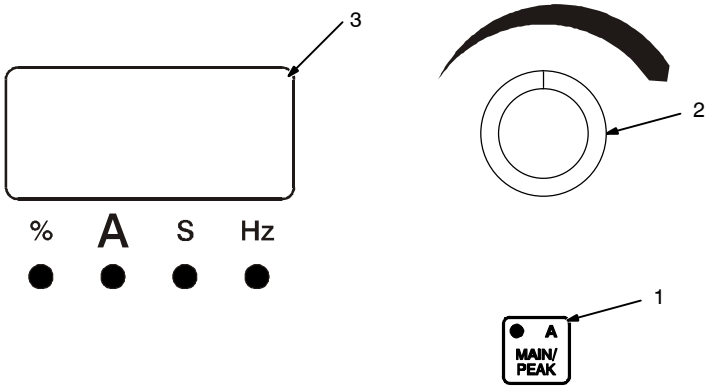


1 Encoder Control

Use control in conjunction with applicable front panel function switch pad to set values for that function.

5-3. Amperage Control





1 A (Amperage Control)

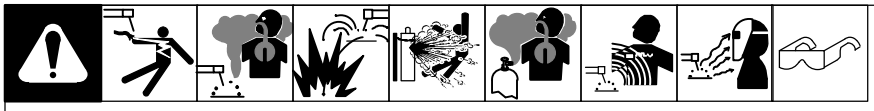
2 Encoder Control

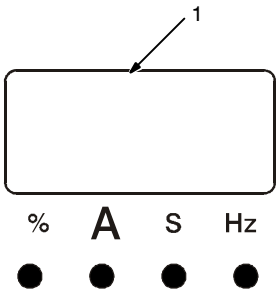
3 Ammeter

See Section 5-12 for Amperage control range.

Press Amperage switch pad and turn Encoder control to set weld amperage. Weld amperage setting is also peak amperage when Pulser function is active (see Section 5-9).

5-4. Ammeter And Parameter Display

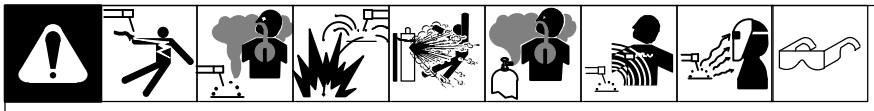


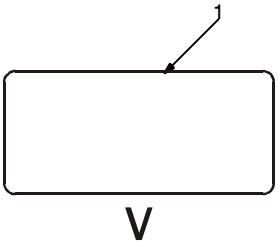


1 Ammeter

Displays actual amperage while welding. Meter also displays preset parameters for any of the following units of measure when they are active: amperage, time, percentage or frequency. The corresponding LED, located directly below the ammeter, will also illuminate.

5-5. Voltmeter

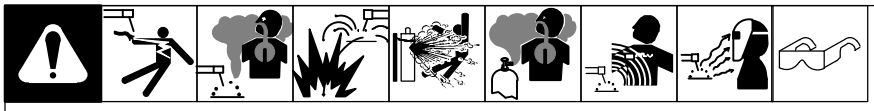


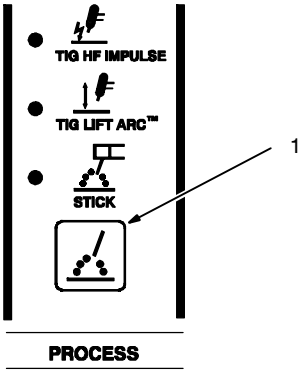


1 Volt Meter

Displays output or open circuit voltage. If output is off, the voltmeter will display a series of three dashes (---). Open circuit voltage is displayed if power is on and output is available.

5-6. Process Control





1 Process Control

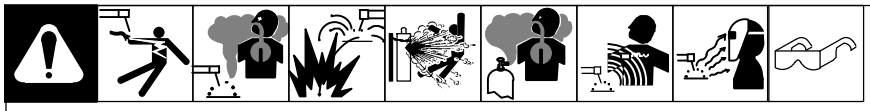
Press switch pad until desired process LED is illuminated:

TIG HF Impulse - When selected, a pulsed HF (non-contact) (see Section 5-7) arc starting method is activated. This method can be used with either AC or DC TIG welding. Make connections according to Section 4-12.

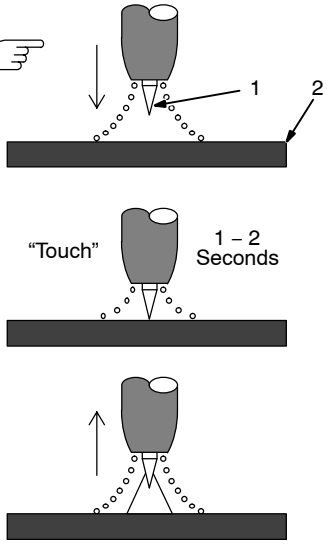
TIG Lift-Arc™ - When selected, is an arc starting method in which the electrode must come in contact with the workpiece to initiate an arc (see Section 5-7). This method can be used with either AC or DC TIG welding. Make connections according to Section 4-12.

Stick (SMAW) - This method can be used with either AC or DC Stick welding. Make connections according to Section 4-13.

5-7. Lift-Arc™ And HF TIG Start Procedures



Lift-Arc Start Method ☞



Do NOT Strike Like A Match!

Lift-Arc Start

When Lift-Arc™ button light is On, start arc as follows:

1 TIG Electrode

2 Workpiece

Touch tungsten electrode to workpiece at weld start point, enable output and shielding gas with torch trigger, foot control, or hand control. **Hold electrode to workpiece for 1-2 seconds**, and slowly lift electrode. Arc is formed when electrode is lifted.

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 or AC GTAW process when HF Start method is not permitted, or to replace the scratch method.

HF Start

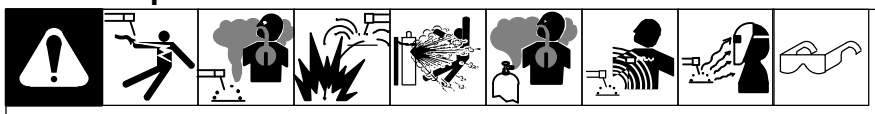
When HF Start button light is On, start arc as follows:

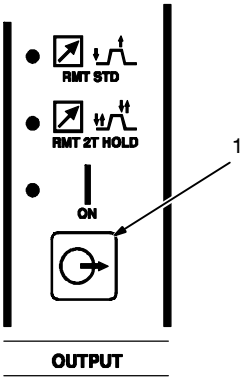
High frequency turns on to help start arc when output is enabled. High frequency turns off when arc is started, and turns on whenever arc is broken to help restart arc.

Application:

HF start is used for the DCEN GTAW process when a non-contact arc starting method is required.

5-8. Output Control





1 Output Control

Press switch pad until desired parameter LED is illuminated.

RMT STD (Remote Standard)

Application: Use Remote Trigger (Standard) when the operator desires to use a foot pedal or finger amperage control (see Section 6-3A).

☞ *When a foot or finger remote current control is connected to the welding power source, initial amps, initial slope, final slope, and final amps are controlled at the remote control, not at the welding power source.*

☞ *If On/Off only type trigger is used, it must be a maintained switch. All Sequencer functions become active, and must be set by the operator.*

RMT 2T HOLD

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

If a foot or finger current control is connected to the welding power source, only trigger input is functional (see Section 6-3B).

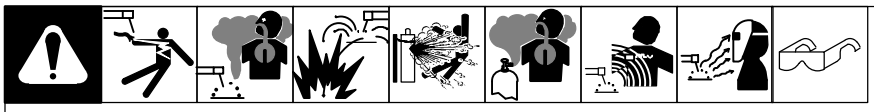
☞ *This switch function can be reconfigured for 4T, 4T Momentary or Mini Logic See Section 6-3)*

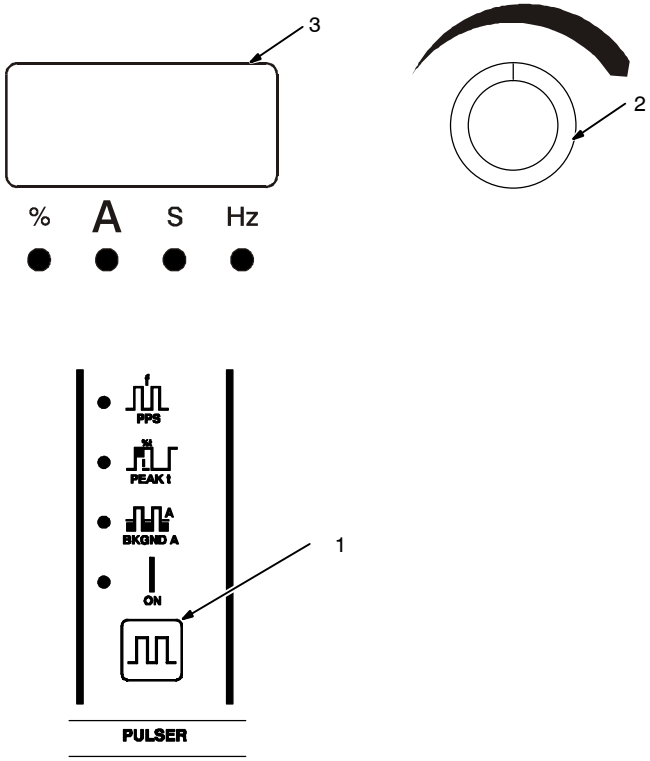
ON

Output will energize two seconds after being selected.

Application: Use Output On for Stick (SMAW) welding, or for Lift-Arc without the use of a remote control (see Section 6-3G).

5-9. Pulser Control (DX And LX Models)





4

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

1 Pulser Control

Pulsing is available only while using the TIG process, it cannot be selected if the Stick process (see Section 5-6) is active. Controls can be adjusted while welding.

Press switch pad to enable pulser.

ON - When illuminated, this LED indicates the pulser is on.

Press switch pad until desired parameter LED is illuminated.

To turn Pulser off, press and release switch pad until the On LED turns off.

2 Encoder Control

3 Ammeter

Turn encoder (see Section 5-2) to select appropriate value for active pulse parameter. Value selected is shown on the ammeter (see Section 5-4). Also, the ammeter LED for the corresponding unit of measure (%, A, s, Hz) of the active parameter will be illuminated.

See Section 5-12 for all Pulser parameter ranges.

PPS (Pulses Per Second or Pulse Frequency) - Control is used to determine appearance of weld bead.

PEAK t - The percentage of each pulse cycle that can be spent at the peak amperage level.

BKGND A (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 Pulsed Output Waveforms

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

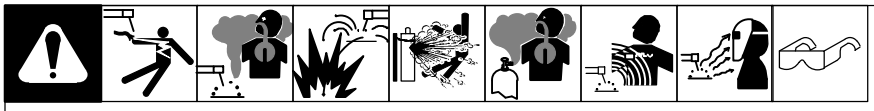
☞ *Peak amperage is set using the Amperage control (see Section 5-3). Peak amperage is the highest welding amperage allowed to occur in the pulse cycle. Weld penetration varies directly with peak amperage.*

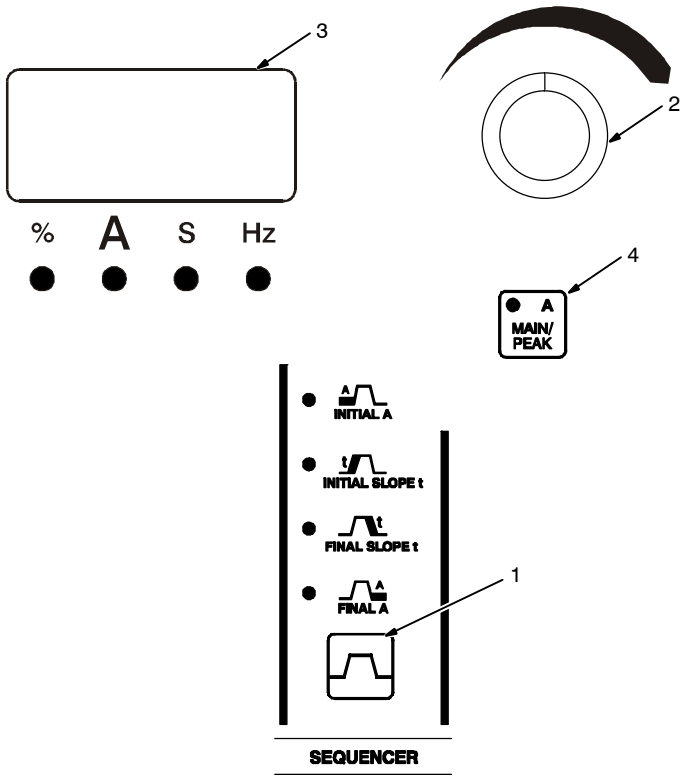
Application:

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.

5-10. Sequencer Controls (DX Models Only)





1 Sequencer Control

Sequencing is available only while using the TIG process, but is disabled if a remote foot or finger current control is connected to the Remote receptacle while in the RMT STD mode. Sequencer parameters cannot be selected if the Stick process (see Section 5-6) is active.

Press switch pad until desired parameter LED is illuminated.

2 Encoder Control

3 Ammeter

Turn encoder (see Section 5-2) to set appropriate value for active sequence parameter. Value selected is shown on the ammeter (see Section 5-4). Also, the ammeter LED for the corresponding unit of measure (A, S) of the active parameter will be illuminated.

See Section 5-12 for all Sequencer parameter ranges.

INITIAL A (Initial Amperage) - Use control to select a starting amperage that is different from the weld amperage.

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 t (Initial Time)**(LX Models Only) -** Press control again and turn Encoder to select amount of time that is needed at the beginning of the weld.

INITIAL SLOPE t (Initial Slope Time) Use control to select amount of time that it takes to slope up/down from initial amperage to weld amperage. To disable, set to 0.

4 Amperage Switch Pad

Weld Time (LX Models Only) - Press Amperage switch pad twice. Set desired length of weld time.

FINAL SLOPE t (Final Slope Time) - Use control to select amount of time that it takes to slope up/down from weld amperage to final amperage. To disable, set to 0.

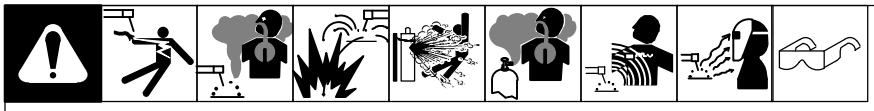
Application:

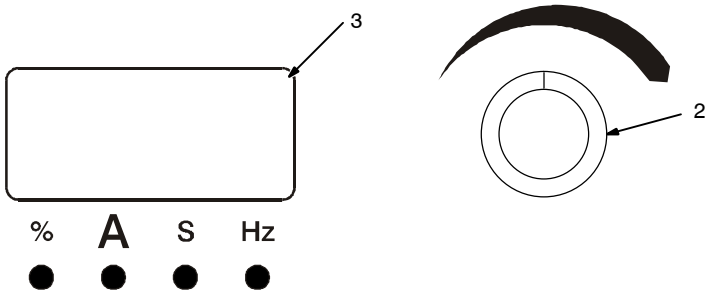
Final Slope should be used while GTAW welding materials that are crack sensitive, and/or the operator wants to eliminate the crater at the end of the weld.

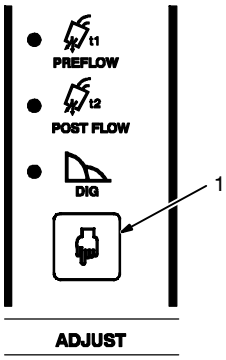
FINAL A (Final Amperage) - Use control to select amperage to which weld amperage has sloped up/down to.

FINAL t (Final Time)**(LX Models Only)** - Press control again and turn Encoder to select amount of time that is needed at the end of the weld.

5-11. Adjust Controls (Preflow/Post Flow/DIG/Purge)







1 Adjust

Press switch pad until desired function LED is illuminated.

2 Encoder Control

3 Ammeter

Turn encoder to set appropriate value for active Adjust parameter. Value selected is shown on the ammeter (see Section 5-4). Also, the ammeter LED for the corresponding unit of measure (S, %) of the active parameter will be illuminated.

See Section 5-12 for all Adjust parameter ranges.

PREFLOW - If the TIG HF process is active (see Section 5-6) and Preflow is shown on the control panel, use control to set length of time gas flows before arc initiation. To set Preflow time for models that do not have Preflow Time control on the front panel, see Section 6-1.

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

POST FLOW - If the TIG process is active (see Section 5-6), use control to set length of time gas flows after welding stops.

AUTO POST FLOW - Creates a post flow time scaled at 1 second per 10 amps amps of the peak weld amperage for a given weld cycle. Auto post flow is limited to an 8 second minimum, or to the maximum preset post flow time.

Application:

Postflow is required to cool tungsten and weld, and to prevent contamination of tungsten and weld. Increase postflow time if tungsten or weld are dark in appearance.

DIG - If the Stick process is active (see Section 5-6), use control to set amount of DIG. 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.

Application:

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

PURGE - While in the TIG process (see Section 5-6), to activate the gas valve and start the purge function, push and hold the Adjust switch pad for the desired amount of purge time. To set from 0 to 50 seconds of additional purge time, continue to hold the Adjust switch pad while turning the encoder control. Factory default setting is 0.

While Purge is active, [PUR] is shown in the left display, and purge time is shown in the right display.

Pressing any front panel switch pad will end the purge time display, but gas will continue to flow until the preset time has timed out.

Application: Purge is used to clear the shielding gas lines of contaminates.

5-12. Factory Parameter Defaults And Range And Resolution

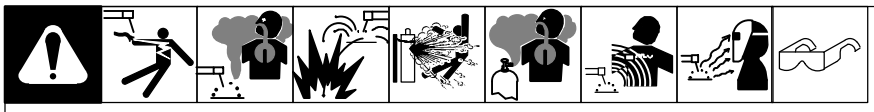
Parameter	Default	Range And Resolution
PROCESS * Stick OCV	TIG HF Impulse Low OCV	TIG HF Impulse / TIG Lift / Stick Low OCV / Normal OCV
*Stick Stuck Check	Scl (On)	Scl (On) / Sc0 (Off)
OUTPUT RMT 2T[1]	RMT STD 2T	RMT STD / RMT 2T / ON RMT 2T can be reconfigured for: 2T / 4T / Mini Logic / 4T Momentary
A MAIN / PEAK DC TIG DC STICK	 150 A 110 A	 1 – 200 Amps 1 – 200 Amps
*Spot Spot Time **Weld Time	Off 0 T 0 T	On/Off 0.0 – 999 Seconds 0.0 – 999 Seconds
PULSER PPS PEAK t BKGND A	Off 100 Hz 40% 25%	ON / OFF Dual Range And Resolution 0.1 – 9.9 / 10 – 500 Hertz 5 – 95 Percent 5 – 95 Percent
*Meter “PPP” Display	––– (Off)	––– (Off) / PPPP (On)
SEQUENCER INITIAL A **Initial Time INITIAL SLOPE t FINAL SLOPE t FINAL A **Final Time	 20 A 0 S 0 S 0 S 5 A 0 S	 1 – 200 Amps 0.0 – 25.0 Seconds 0.0 – 25.0 Seconds 0.0 – 25.0 Seconds 1 – 200 Amps 0.0 – 25.0 Seconds
ADJUST *PREFLOW POST FLOW DIG	 0.2 S Auto 30%	 0.0 – 25.0 Seconds Auto 1.0 – 50.0 Seconds @ 0.2 Second Resolution 0 – 100 Percent
MAXSTAR: *Tungsten ***Amperage ***Time ***Start Slope Time ***Preset Amperage Minimum	 .094 60 1 40 3	 GEN, .020, .040, .062, .094, .125 1 – 200 Amps 1 – 200 Milliseconds 0 – 250 Milliseconds 1 – 20 Amps

* Parameter adjusted using an Advanced Functions configuration only (see Section 6).

** Parameter used with the automation option (LX models only).

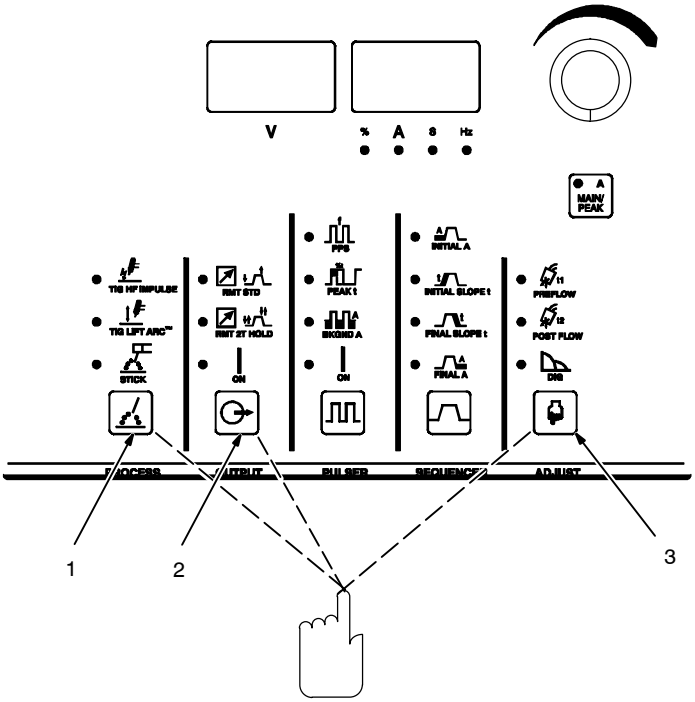
***Parameter adjust using Tungsten GEN only.

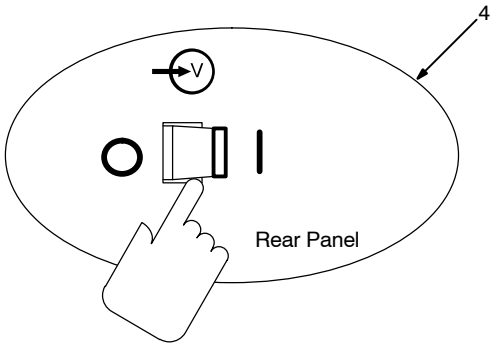
5-13. Resetting Unit To Factory Default Settings (All Models)



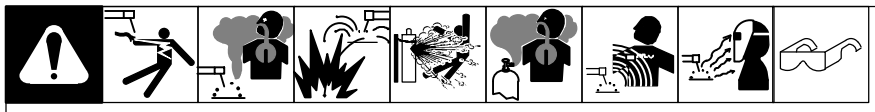
1 Process Switch Pad
2 Output Switch Pad
3 Adjust Switch Pad
4 Power Switch

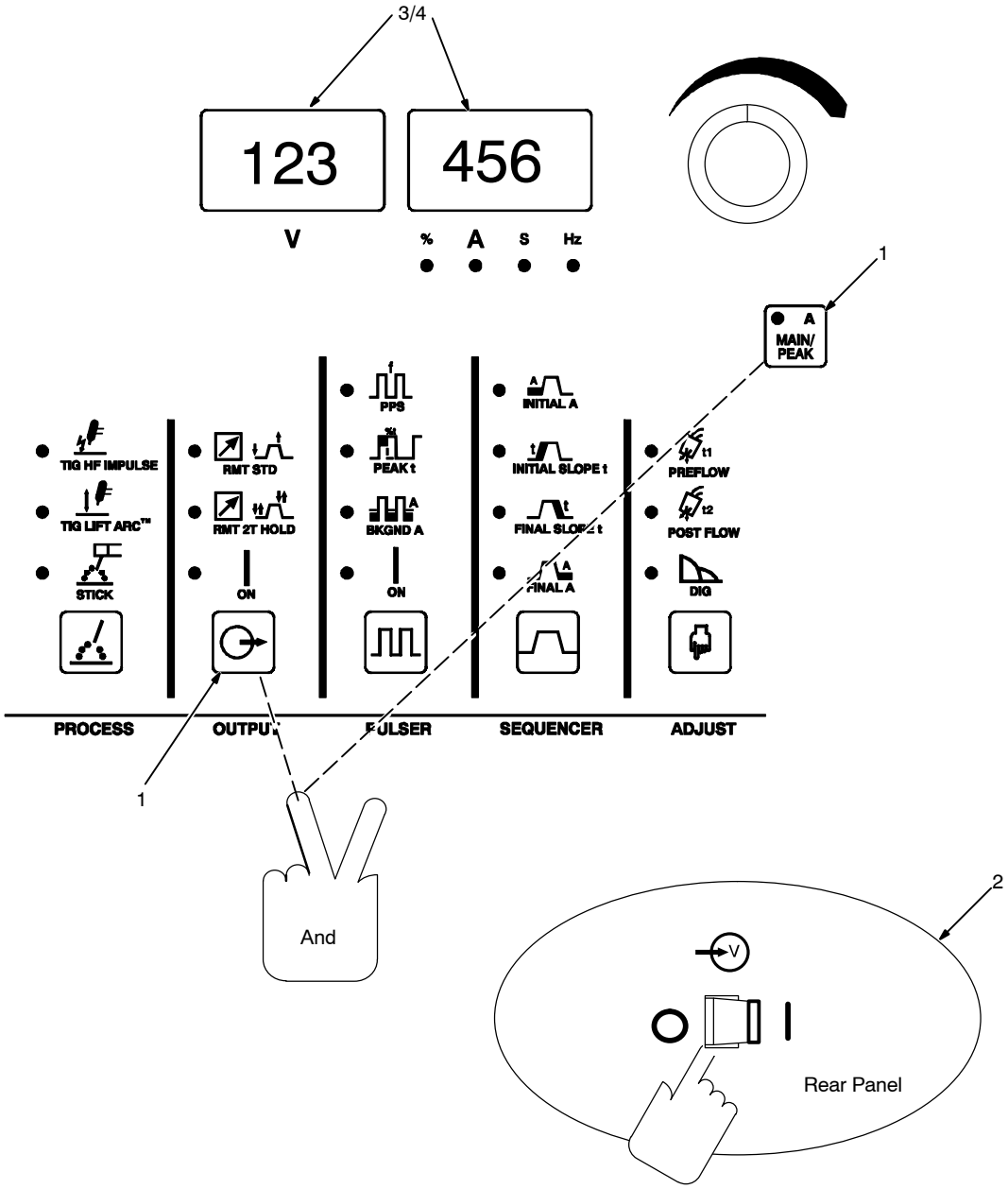
To reset all welding power source functions to original factory settings, lockout feature must be off (see Section 6-8). Next turn power on, then press the Process, Output, and Adjust switch pads before the software version clears the meters, and hold the switch pads until software version clears the meters.





5-14. Arc Timer/Counter Display





1 Output And Amperage Controls

2 Power Switch

To display the arc timer/counter, turn power switch on, and then press the Amperage Control and Output switch pads before the software version clears the meters, and hold the switch pads until software version clears the meters

3 Arc Timer Display

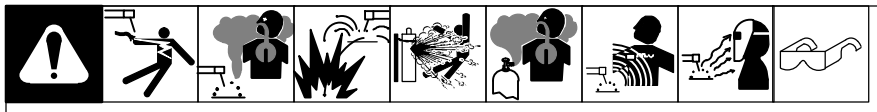
Upon power up as described above, the meter S LED will turn on, and arc time will be displayed for 5 seconds as [000 000] to [999 999]. The first four numbers indicate hours, and the last two numbers indicate minutes. Arc time shown in example is read as 1,234 hours and 56 minutes. Maximum arc time is 9,999 hours and 59 minutes.

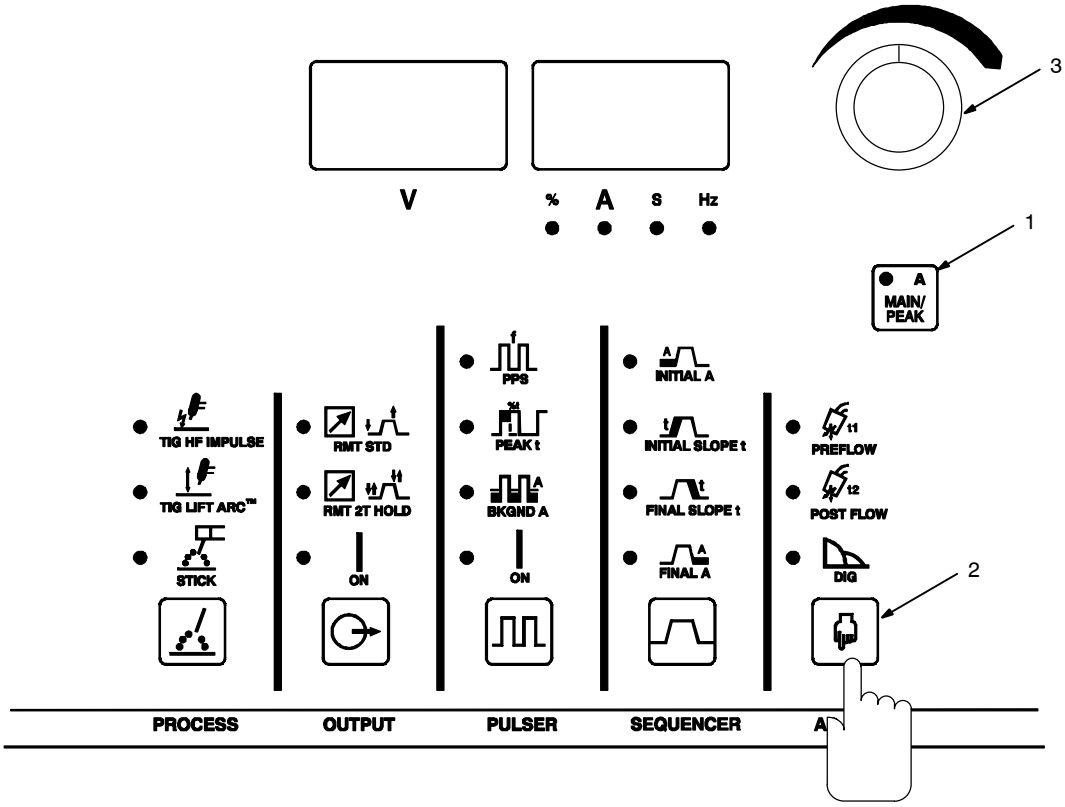
4 Arc Counter

After 5 seconds, the meter A LED turns on, and the arc counter will be displayed for the next 5 seconds as [000 000] to [999 999]. The maximum arc cycle count is 999 999.

SECTION 6 – ADVANCED FUNCTIONS

6-1. Accessing Advanced Functions





1 Amperage Switch Pad
2 Adjust
3 Encoder Control

To access the advanced functions, press and hold the Amperage (A) switch pad and then press the Adjust switch pad. To scroll through the advanced functions, press and release the Adjust switch pad. Use the Encoder control to change parameters for each function.

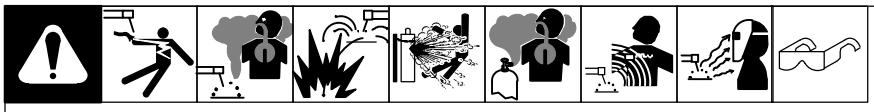
Advanced Functions:

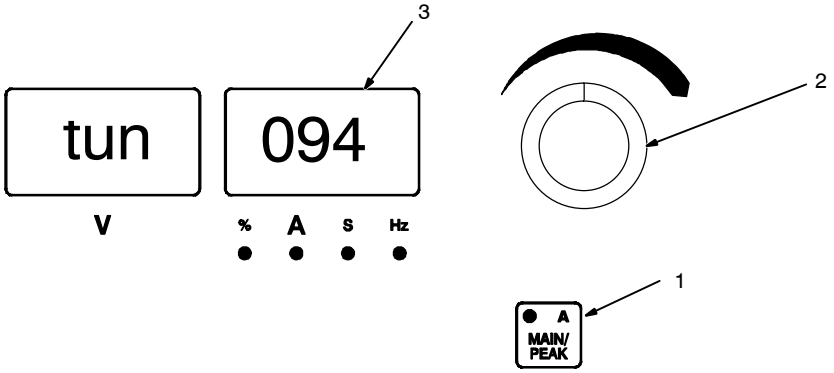
- Programmable TIG Start Parameters (see Section 6-2) – Allows you to set amps, time, and polarity to customize arc starts for different tungstens.
- Output Remote Hold And Trigger Functions (see Section 6-3) – For reconfiguring RMT 2T Hold for 3T, 4T Momentary, or Mini Logic
- Preflow Time (see Section 6-4) – Sets the gas flow time before TIG arc starts.
- Spot Enable (see Section 6-5) – Allows you to turn the spot function on and be available for all programs.
- Stick OCV Selection (see Section 6-6) – Allows you to select either low or normal OCV (open circuit voltage).
- Stick Stuck Check Selection (See Section 6-7) – With Stick Stuck Check on and the welding electrode (rod) stuck, output is turned off in an attempt to save the rod for reuse.
- Lockout Functions (see Section 6-8) – Allows you to turn the lockout function on and off and adjust the lockout levels.
- Meter Displays (see Section 6-9) – Allows you to set meters to display weld voltage and amperage, or blank meters while pulse welding.
- External Pulse Control (see Section 6-10) – Used for external pulse control when external pulse control is desired.

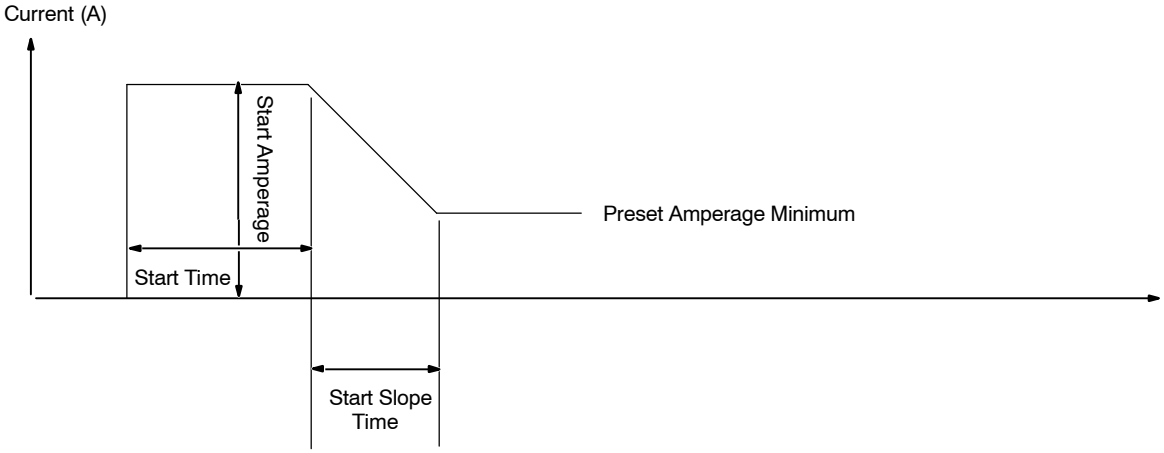
To exit advanced functions, press and hold the Amperage (A) switch pad and then press the Adjust switch pad.

6-2. Programmable TIG Start Parameters

A. Tungsten Selection







1 Amperage Switch Pad

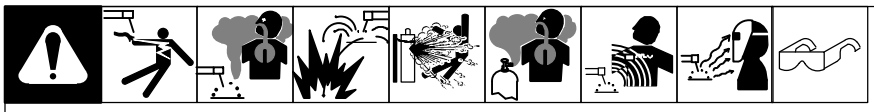
2 Encoder Control

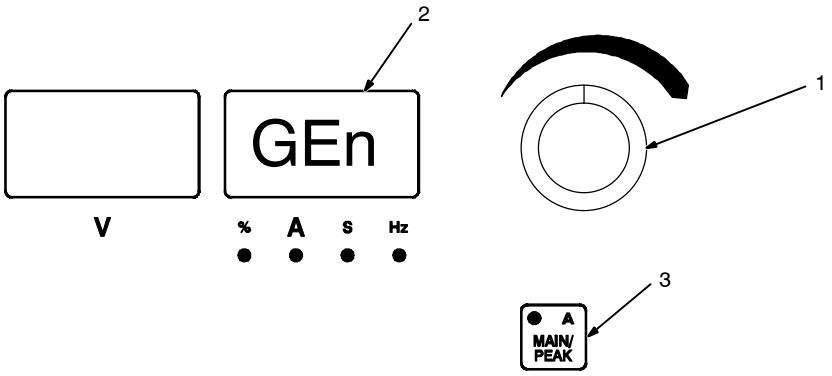
3 Amps Meter

Preset TIG Start Parameters

Use Encoder control to select a tungsten size from the following: .020, .040, .062 (1/16 in.), .094 (3/32 in.), or .125 (1/8 in.) (.094 is the default). When one of the listed tungsten sizes is selected, the following TIG starting parameters are preset: Amperage, Start Time, Start Slope Time, and Preset Amperage Minimum. If it is necessary or desired to manually set the TIG starting parameters, turn the encoder until [GEn] is displayed on the amps meter (see Section B).

B. Selecting GEN

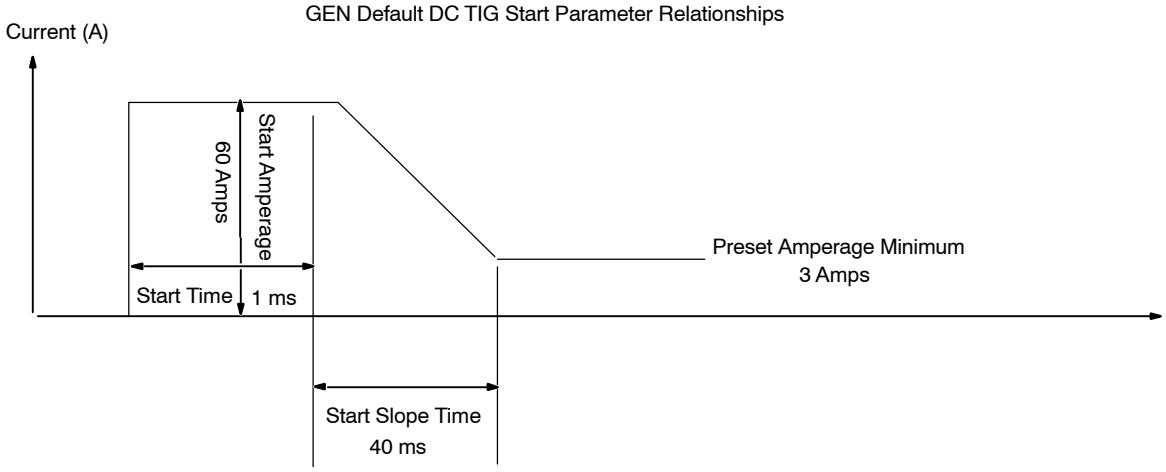




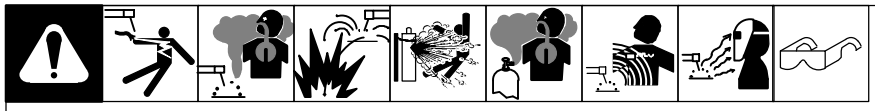
1 Encoder Control
2 Amps Meter
3 Amperage Switch Pad

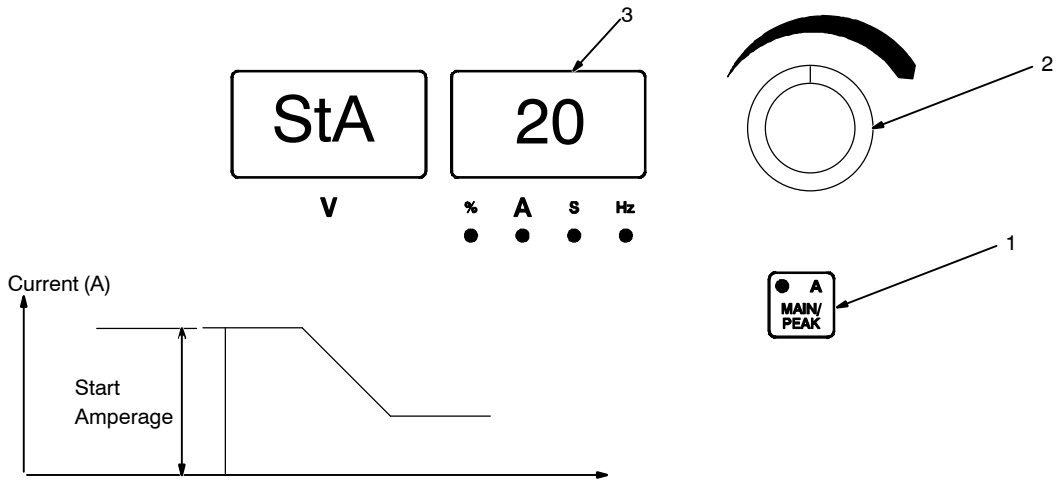
If [GEn] is selected and displayed on the amps meter, the TIG starting parameters for a .094 tungsten are the default: Start Amperage = 60 A, Start Time = 1 ms, Start Slope Time = 40 ms, Preset Minimum Amps = 3 A. These parameters can be manually changed by pressing the Amperage switch pad to step through each adjustable parameter. To change parameters, see Sections C, D, E, and F.

GEN Default DC TIG Start Parameter Relationships



C. Changing Programmable TIG Start Amperage





1 Amperage Switch Pad

2 Encoder Control

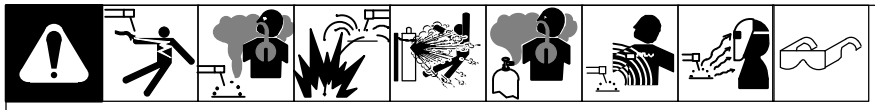
3 Amps Meter

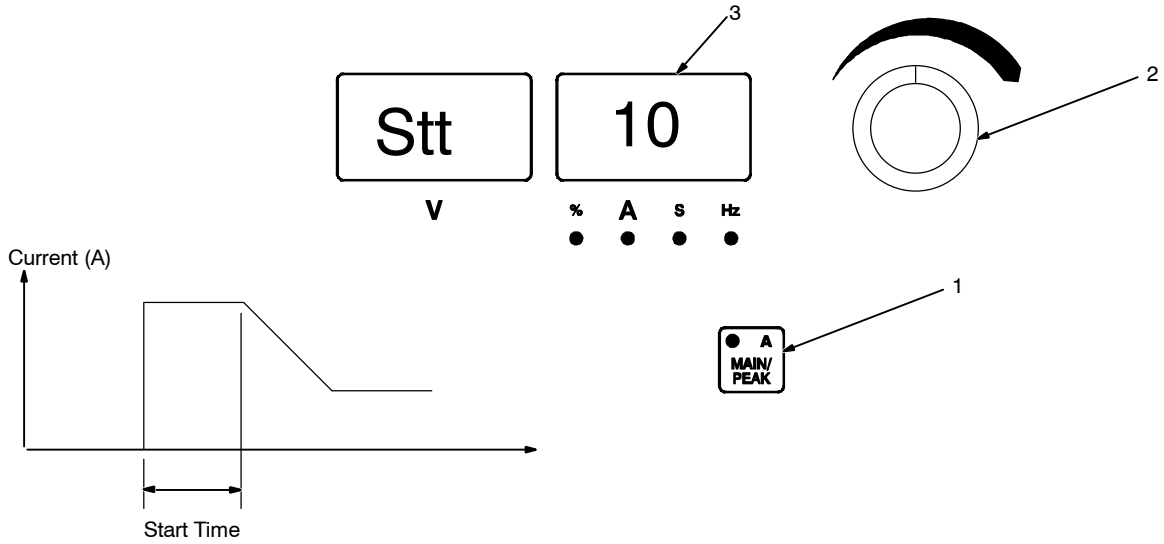
To adjust TIG Start Amperage proceed as follows:

Press Amperage switch pad. Switch pad LED turns on, and meter A LED turns on. The current Start Amperage is displayed on the amps meter, and can be adjusted (see Section 5-12) by turning the Encoder control.

To change Start Time, proceed to Section D.

D. Changing Programmable Start Time





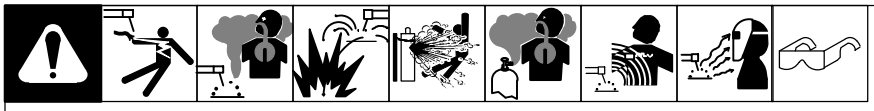
1 Amperage Switch Pad
2 Encoder Control
3 Amps Meter

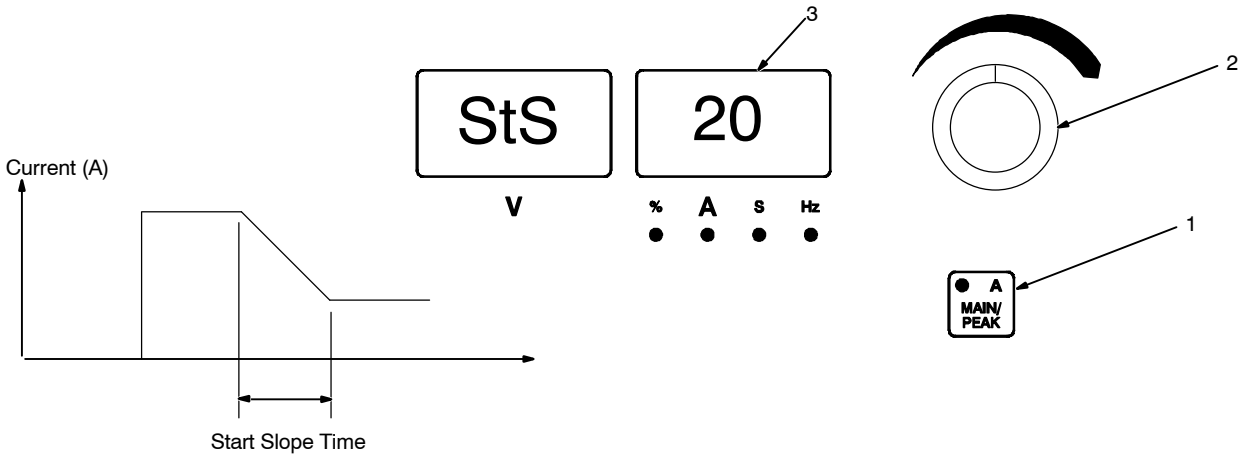
To adjust Programmable Start Time proceed as follows:

Press Amperage switch pad, and meter S LED turns on. The current Start Time is displayed in milliseconds on the amps meter, and can be adjusted by turning the Encoder control (see Section 5-12).

To change Start Slope Time, proceed to Section E.

E. Changing Start Slope Time





1 Amperage Switch Pad

2 Encoder Control

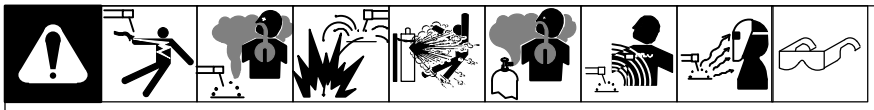
3 Amps Meter

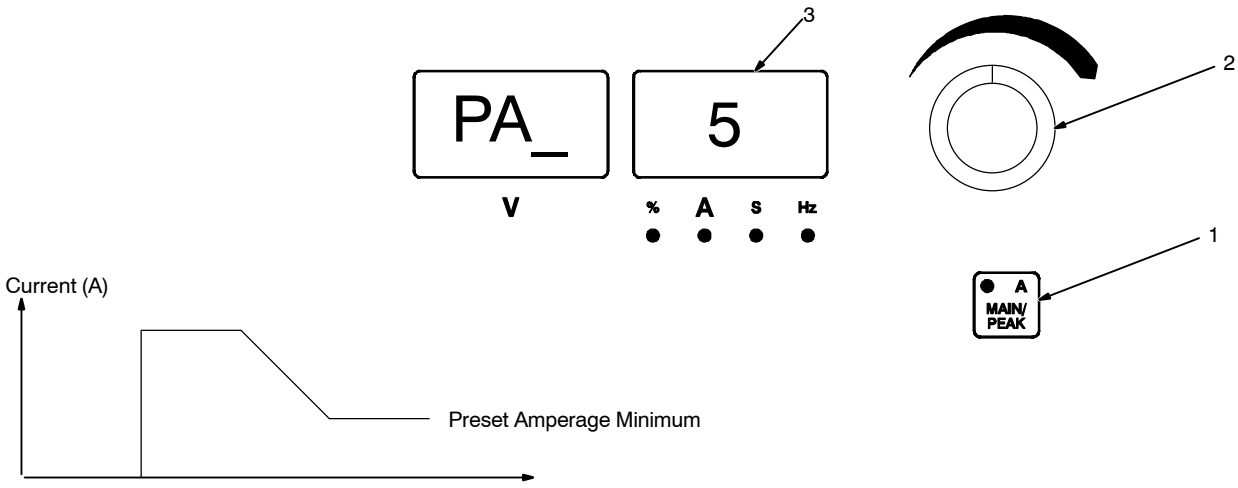
To adjust Start Slope Time proceed as follows:

Press Amperage switch pad. Switch pad LED turns on, and meter S LED turns on. The Start Slope Time is displayed in milliseconds on the amps meter, and can be adjusted (see Section 5-12) by turning the Encoder control.

To change Preset Amperage Minimum, proceed to Section F.

F. Changing Preset Amperage Minimum





1 Amperage Switch Pad

2 Encoder Control

3 Amps Meter

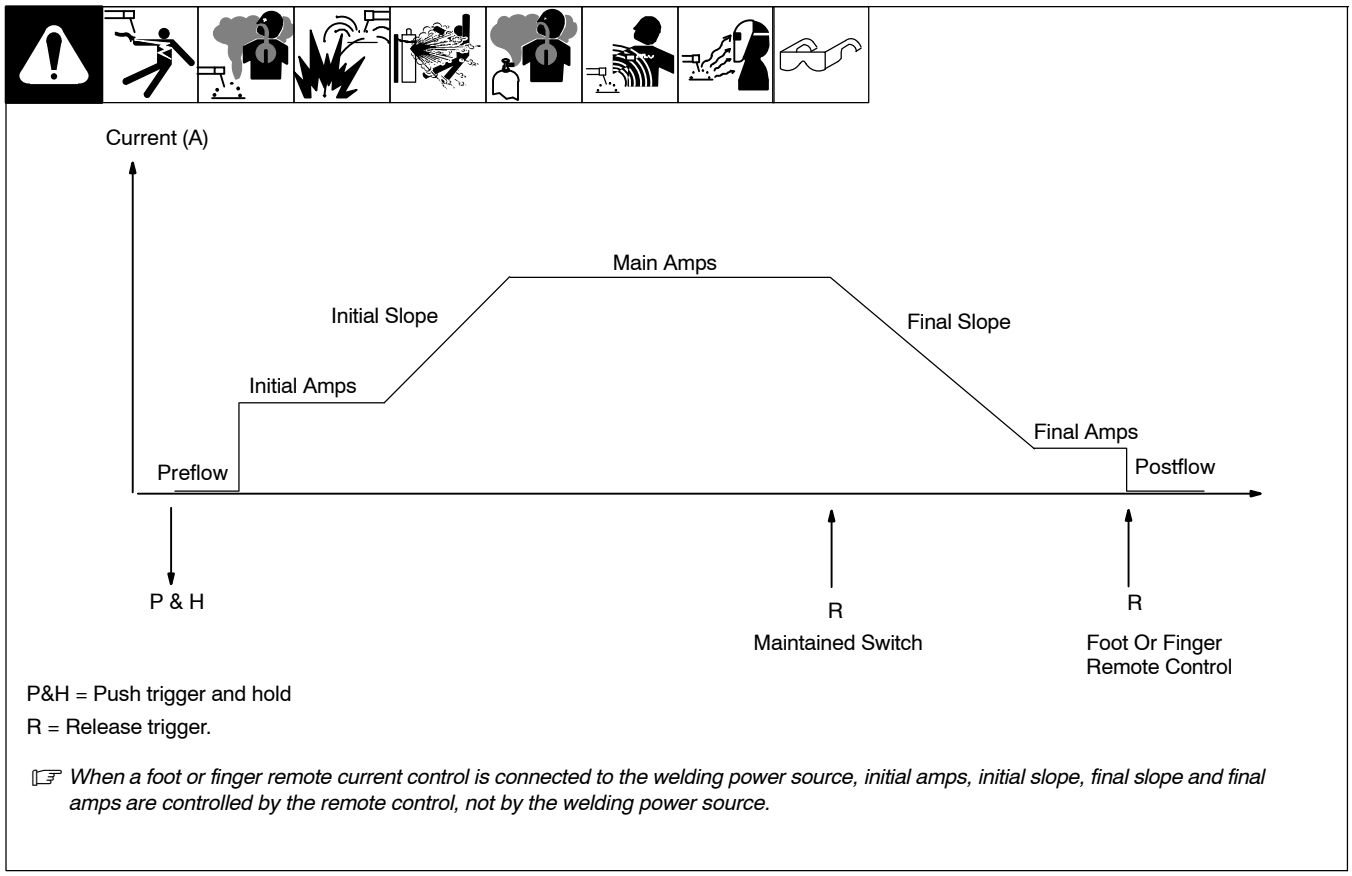
To adjust Preset Amperage Minimum proceed as follows:

Press Amperage switch pad. Switch pad LED turns on, and meter A LED turns on. The Preset Minimum Amperage is displayed on the amps meter, and can be adjusted (see Section 5-12) by turning the Encoder control.

☞ *Whatever amperage is selected as the preset amperage minimum, is the minimum amperage that the machine will provide.*

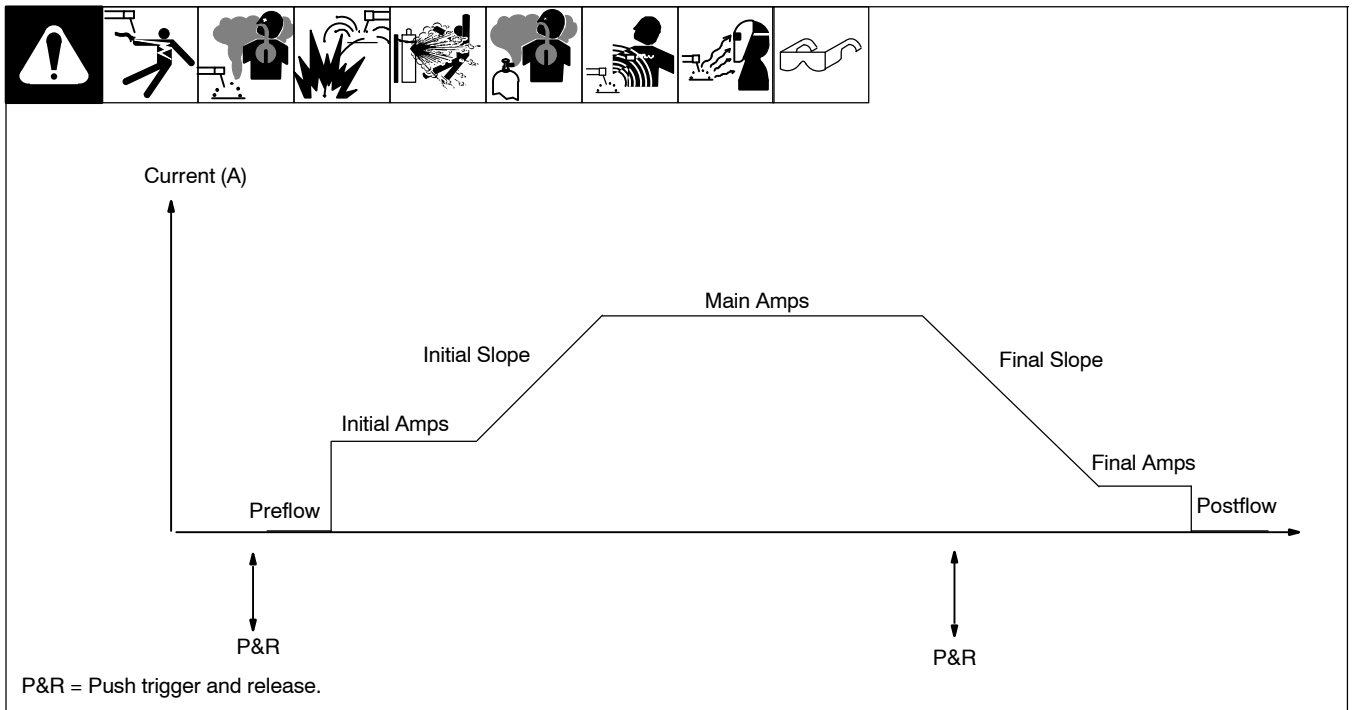
6-3. Output Control And Trigger Functions

A. Remote (Standard) Torch Trigger Operation



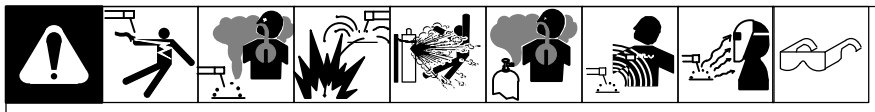
☞ *When a foot or finger remote current control is connected to the welding power source, initial amps, initial slope, final slope and final amps are controlled by the remote control, not by the welding power source.*

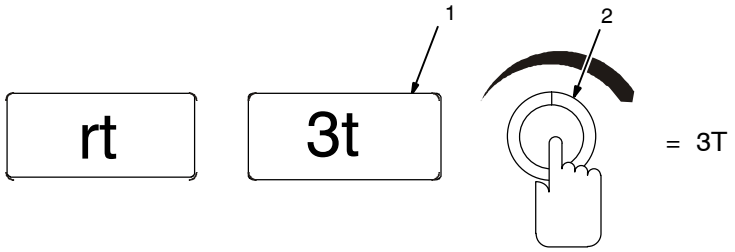
B. Remote 2T Torch Trigger Operation

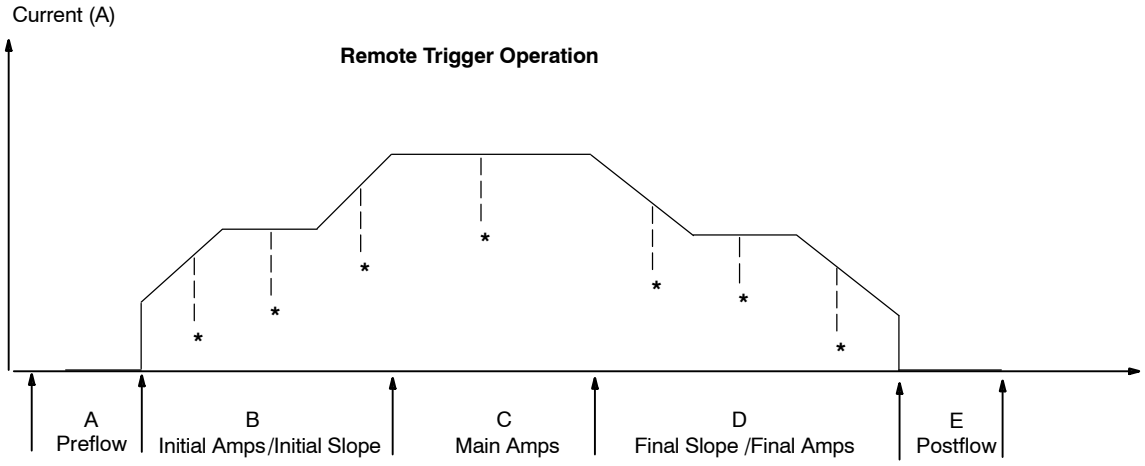


☞ *If torch trigger is held more than 3 seconds, operation reverts to RMT STD (Remote Standard) mode.*

C. 3T Specific Trigger Method







* Arc can be extinguished at any time by pressing and releasing both initial and final switches, or by lifting the torch and breaking the arc.

1 3T (Specific Trigger Operation)

Sequencer is required to reconfigure for 3T.

3T requires a specific type of remote control with two independent momentary-contact switches. One will be designated initial switch, and it must be connected between Remote 14 receptacle pins A and B. The second will be designated as the final switch, and it must be connected between Remote 14 receptacle pins D and E.

2 Encoder Control

To select 3T, turn Encoder control.

Definitions:

Initial slope rate is the rate of amperage change determined by the initial amperage, initial slope time, and main amperage.

Final slope rate is the rate of amperage change determined by the main amperage, final slope time, and final amperage.

Operation:

A. Press and release initial switch within 3/4 second to start shielding gas flow. To stop the preflow sequence before preflow time elapses (25 seconds), press and release final switch. The preflow timer will reset and the weld sequence can be started again.

☞ *If an initial switch closure is not made again before preflow time ends, gas flow stops, the timer resets, and an initial switch press and release is necessary to start the weld sequence again.*

B. Press initial switch to start arc at initial amps. Holding switch will change amperage at initial slope rate (release switch to weld at desired amperage level).

C. When main amperage level is reached, initial switch can be released.

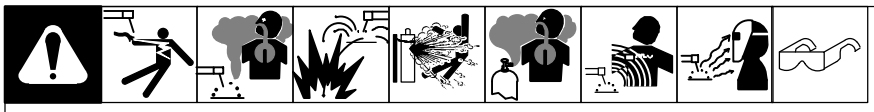
D. Press and hold the final switch to decrease amperage at final slope rate (release switch to weld at desired amperage level).

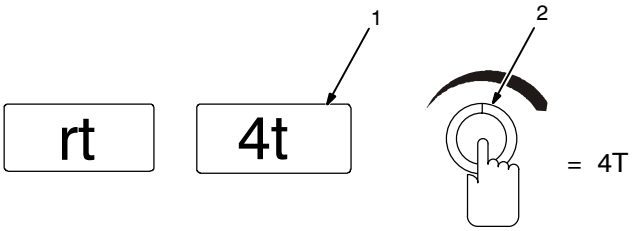
E. When final amperage has been reached, the arc extinguishes and shielding gas flows for the time set on the Postflow control.

Application:

With the use of two remote switches instead of potentiometers, 3T gives the operator the ability to infinitely increase, decrease, or pause and hold amperage within the range determined by the initial, main, and final amperages.

D. 4T Specific Trigger Method





1 4T (Specific Trigger Operation)

2 Encoder Control

To select 4T, turn Encoder control.

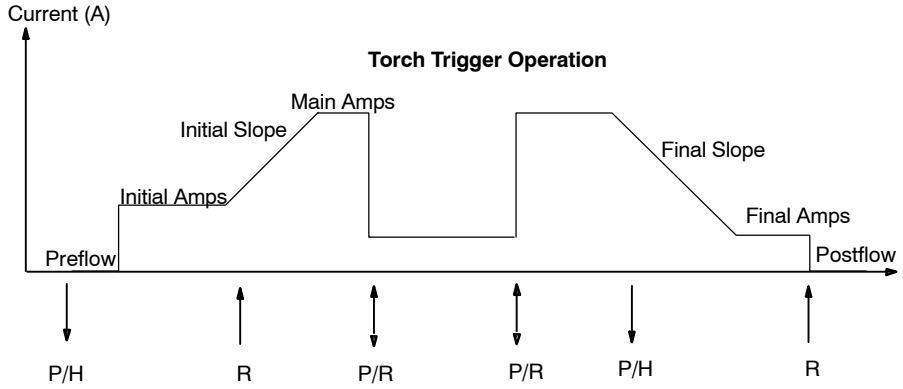
Torch trigger operation is as shown.

4T allows the operator to toggle between weld current and final current.

☞ When a remote switch is connected to the welding power source, use the remote switch to control the weld cycle. Amperage is controlled by the welding power source.

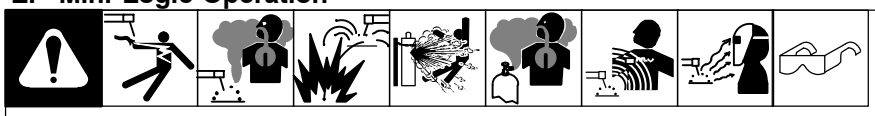
Application:

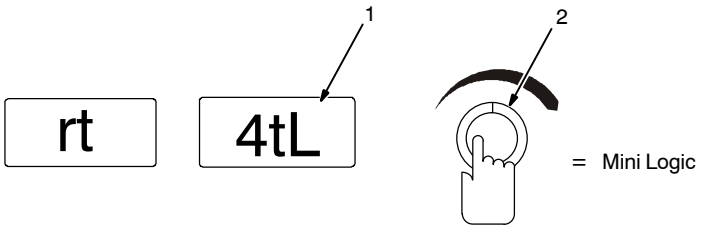
Use 4T trigger method when the functions of a remote current control are desired, but only a remote on/off control is available.



P/H = Push and hold trigger; R = Release trigger; P/R = Push trigger and release in less than 3/4 seconds

E. Mini Logic Operation





1 Mini Logic Meter Display

2 Encoder Control

To select Mini Logic, turn Encoder control.

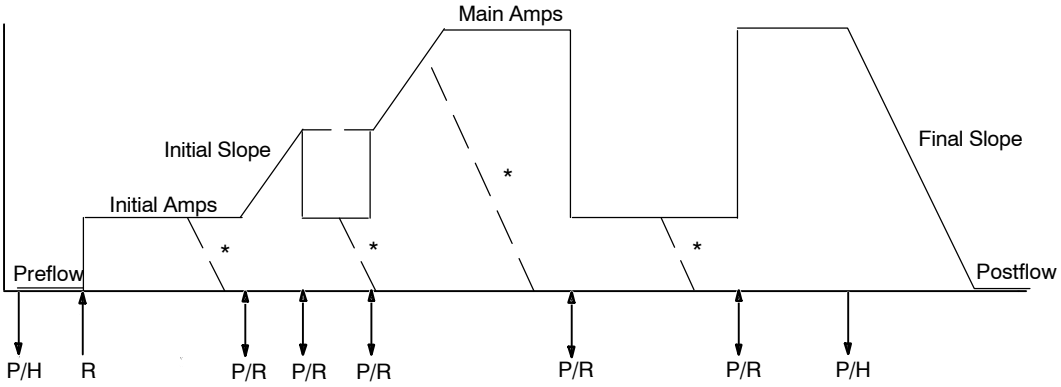
Torch trigger operation is as shown.

Mini logic allows the operator to toggle between initial slope or main amps and initial amps. Final Amperage is not available. Final slope will always slope to minimum amperage and end the cycle.

☞ *When a remote switch is connected to the welding power source, use the remote switch to control the weld cycle. Amperage is controlled by the welding power source.*

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

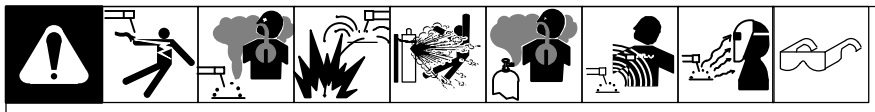
Torch Trigger Operation

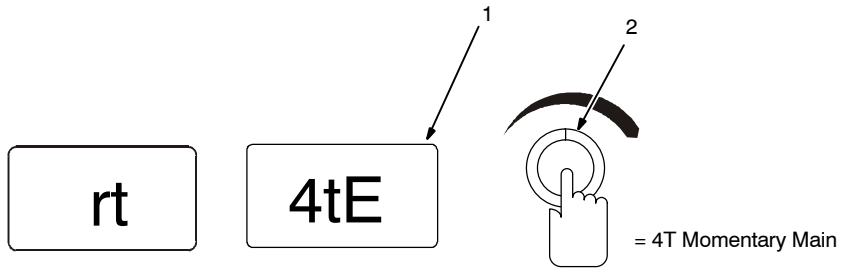


P/H = Push and hold trigger; R = Release trigger; P/R = Push trigger and release in less than 3/4 seconds

* = Arc can be extinguished at final slope rate at any time by pushing and holding trigger

F. 4T Momentary Operation





1 4T Momentary Meter Display

2 Encoder Control

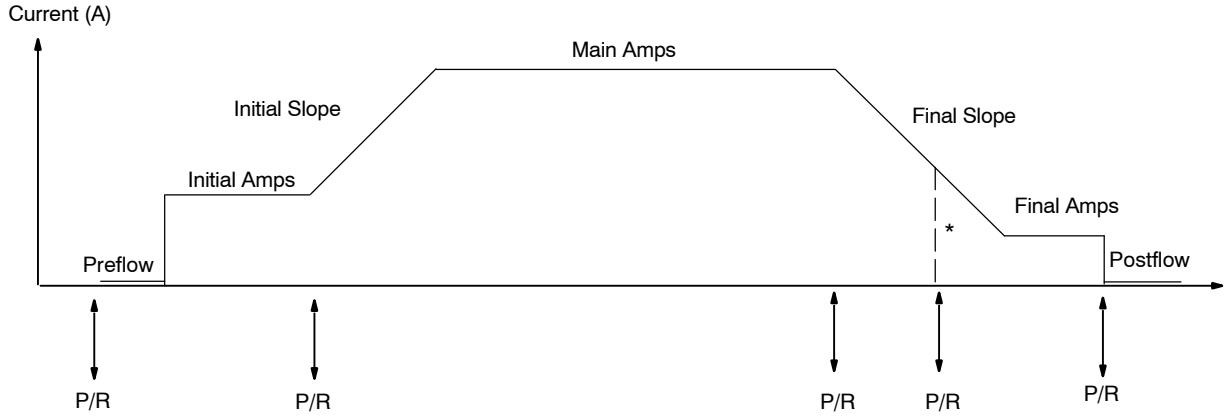
To select 4T Momentary, turn Encoder control.

4T Momentary torch trigger operation is as shown.

☞ *When a remote switch is connected to the welding power source, use the remote switch to control the weld cycle. Amperage is controlled by the welding power source.*

Application:

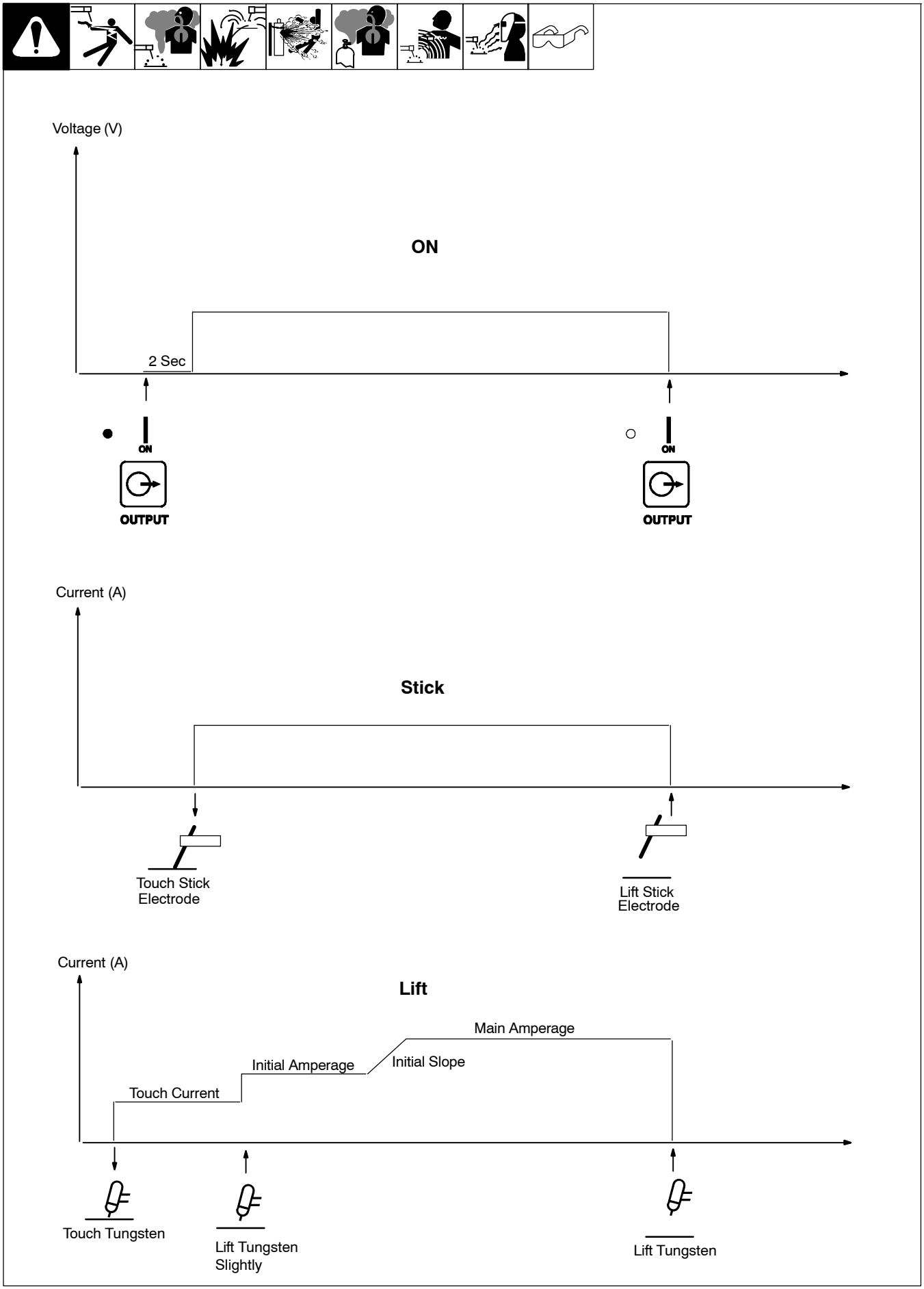
Use 4T Momentary trigger method when the functions of a remote current control are desired, but only a remote on/off control is available.



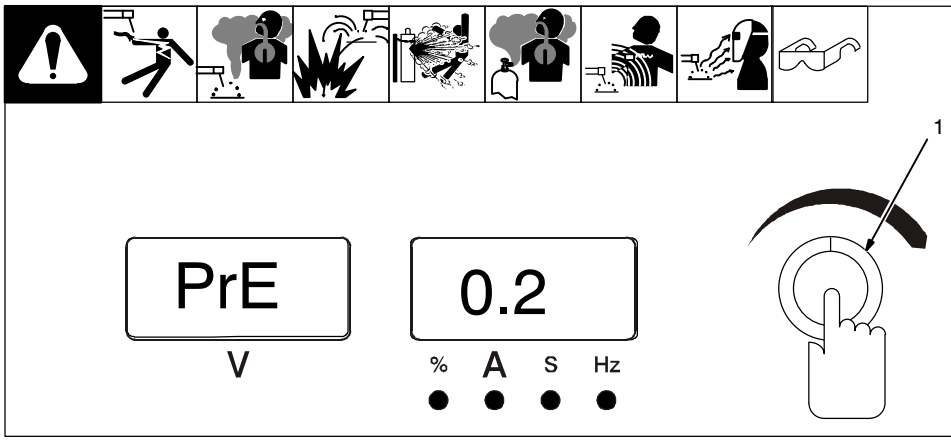
P/R = Push and release trigger; * = Push and releasing during final slope will break the arc and go to postflow

☞ *For first torch trigger push & release, if trigger is held more than 3 seconds, trigger cycle ends.*

G. On Trigger Operation



6-4. Setting Preflow Time

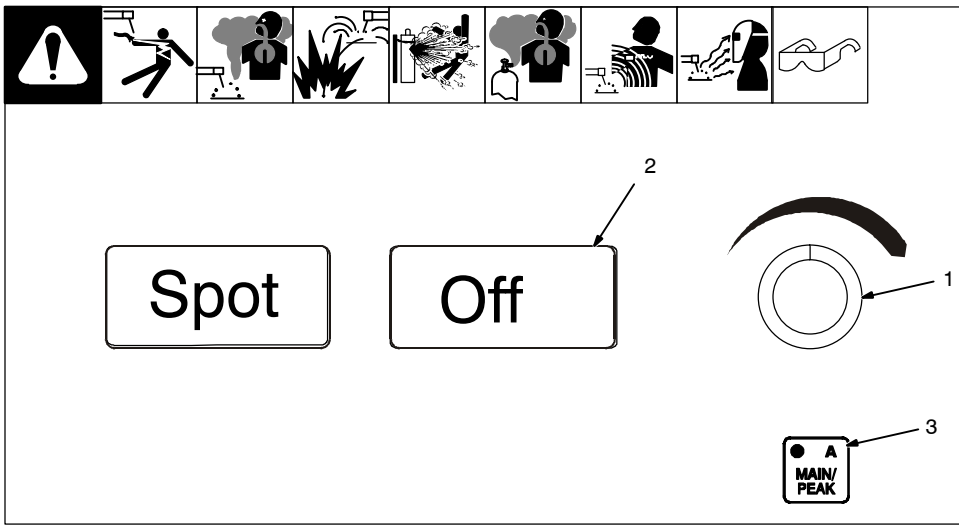


1 Encoder Control

Turn encoder to select from 0 to 25 seconds of preflow. The value selected is displayed on the ammeter.

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

6-5. Spot Enable



1 Encoder Control

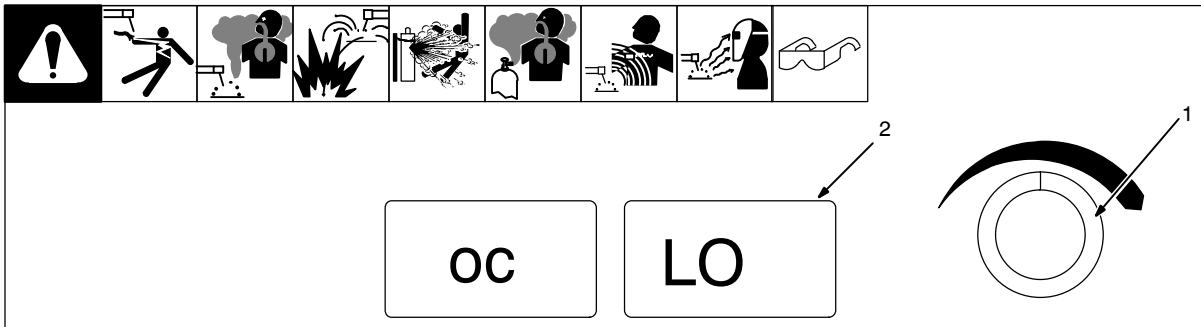
2 Ammeter Parameter Selection

3 Amperage Control Switch Pad

Turn encoder to turn Spot on and off. Once on exist set-up and press Amperage control switch pad twice and turn encoder to set spot time. The spot time default is zero for each program. Spot Enable works in RMT STD and RMT 2T Hold only. When a foot control is connected, amperage is controlled at the machine, not by the remote control.

Application: Used for tacking and thin sheet joining

6-6. Stick Open-Circuit Voltage (OCV) Selection



1 Encoder Control

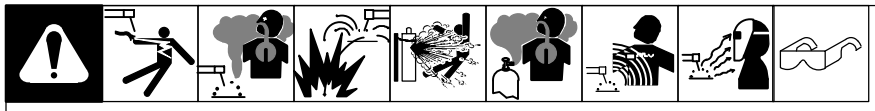
2 Meter Display

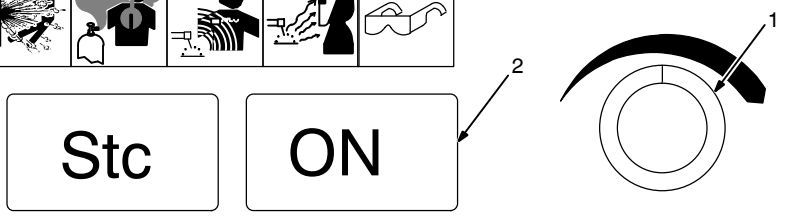
Turn Encoder to change between low OCV and normal OCV. Active selection is displayed on the meters.

When Stick low OCV is selected, open-circuit voltage is between 9 and 14 volts. When Stick normal OCV is selected, open-circuit voltage is approximately 72 volts.

Application: For most Stick applications use low open-circuit voltage. Use normal open-circuit voltage for hard to start Stick electrodes, or if required for your particular application.

6-7. Stick Stuck Check Selection





1 Encoder Control

2 Ammeter Parameters Select Display

Turn Encoder to change between Stick Stuck Check [ON and [OFF] meter display.

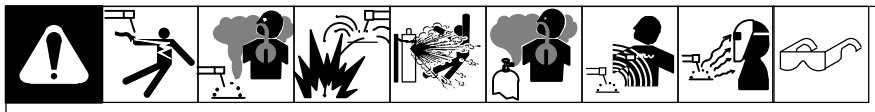
When Stick Stuck Check is on and the welding electrode (rod) is stuck, output is turned off.

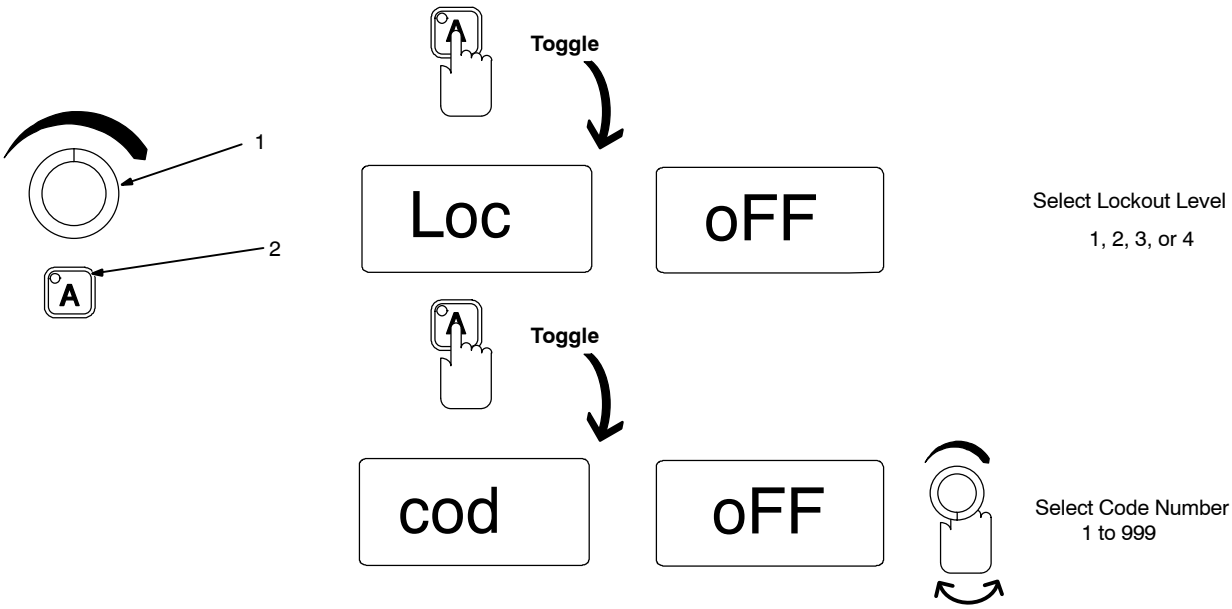
Application: For most Stick applications, use Stick Stuck Check off. With Stick Stuck Check on and the welding electrode (rod) stuck, output is turned off in an attempt to save the rod for reuse. This allows the operator time to un-stick the rod, or disconnect the rod holder from the rod without arc occurring. Turn Stick Stuck Check on when this function is desired.

☞ *Some applications may require Stick Stuck Check to be turned off. For example: Large stick electrodes operating at high amperages would require Stick Stuck Check to be turned off.*

6-8. Lockout Functions

A. Accessing Lockout Capability





See Section 5 for explanation of controls referred to in all of Section 6-8.

There are four (1–4) different lockout levels. Each successive level allows the operator more flexibility.

☞ *Before activating lockout levels, be sure that all procedures and parameters are established. Parameter adjustment is limited while lockout levels are active.*

To turn On the lockout feature, proceed as follows:

1 Encoder Control

2 Amperage (A) Switch Pad

Press Amperage (A) switch pad to toggle between the lock and code displays. Toggle switch pad until code is displayed.

Turn Encoder control to select a lockout code number. The code number will appear on the amp meter. Select any number from [1] thru [999]. **IMPORTANT:** remember this code number, as you will need it to turn the lockout feature off.

Toggle Amperage (A) switch pad until lock is displayed. You may now select a lockout level.

There are four lockout levels available. Turn Encoder control to select a lockout level (see Sections 6-8B for lockout level descriptions).

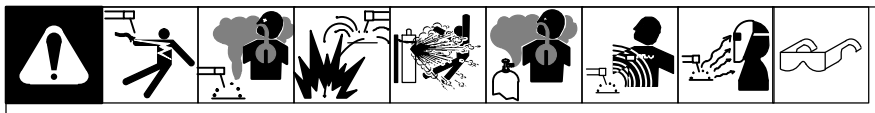
Once the desired three digits have been entered and a lockout level selected, exit advanced functions mode (see Section 6).

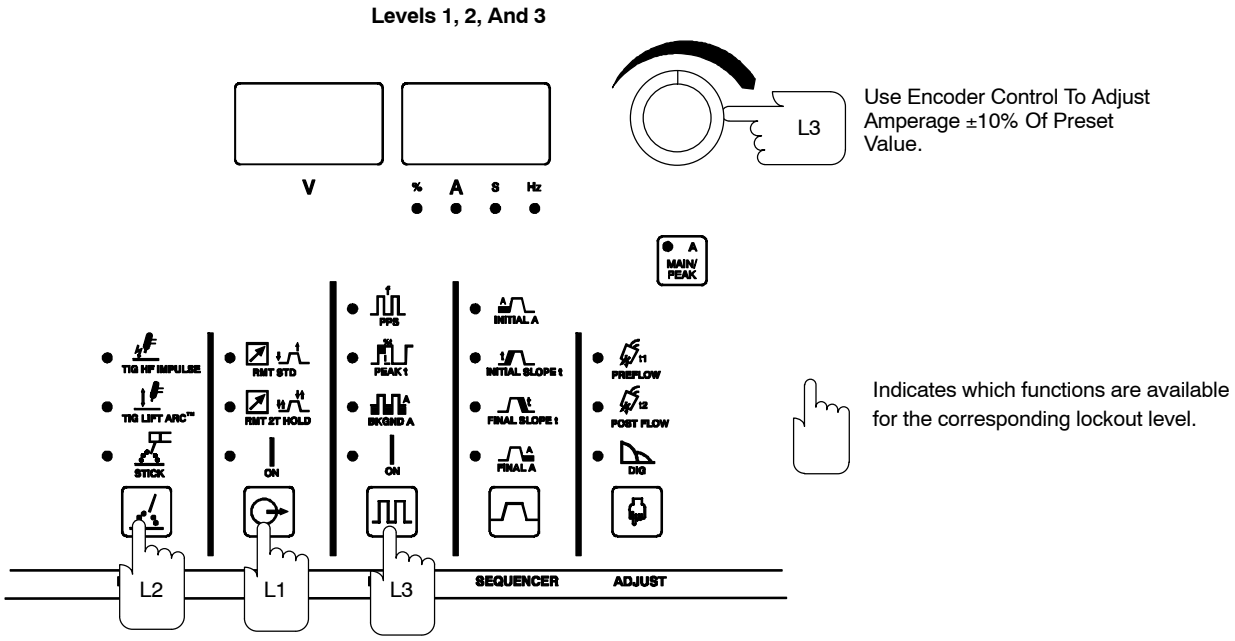
To turn Off the lockout feature, proceed as follows:

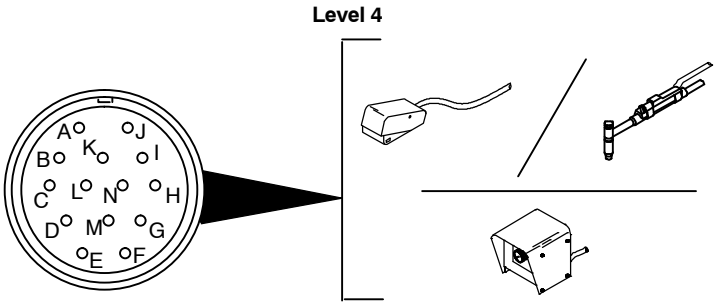
Use Encoder control to enter the same code number that was used to turn on the lockout feature.

Press the Amperage (A) switch pad. The amperage (right) meter display will change to [OFF]. The lockout feature is now off.

B. Lockout Levels







☞ *Before activating lockout levels, be sure that all procedures and parameters are established. Parameter adjustment is limited while lockout levels are active.*

Level 1

☞ *Remote amperage control is not available in level 1.*

TIG Output Selection

If either the TIG HF Impulse or TIG Lift Arc process (see Section 5-6) was active when lockout level 1 was activated, the operator can choose between RMT STD (Remote Standard) or RMT 2T HOLD (Remote 2T Hold) (see Section 5-8). The On function is also available if TIG Lift Arc was active.

Stick Output Selection

If the Stick process was active when lockout level 1 was activated, the operator can choose between RMT STD or On.

When parameter change or selection is limited by lock level 1, [LOCK][LEV1] is displayed as a reminder.

Level 2

☞ *Remote amperage control is not available in level 2.*

Includes all the functions of level 1 plus Process Selection (see Section 5-6).

When parameter change or selection is limited by lock level 2, [LOCK][LEV2] is displayed as a reminder.

Level 3

☞ Remote amperage control is not available in level 3.

Includes all the functions of levels 1 and 2 plus the following:

±10% adjustment of preset TIG or Stick Weld Amps

Select desired process, TIG or Stick, and use Encoder control to adjust amperage +/– 10% of preset amperage value, up to the limits of the machine. If operator tries to go beyond the ±10%, the amperage (right) meter will display [LOCK][LEV3] as a reminder.

Pulser ON/Off Control

Gives operator the ability to turn on/off the Pulser control.

When parameter change or selection is limited by lock level 3, [LOCK][LEV3] is displayed as a reminder.

Level 4

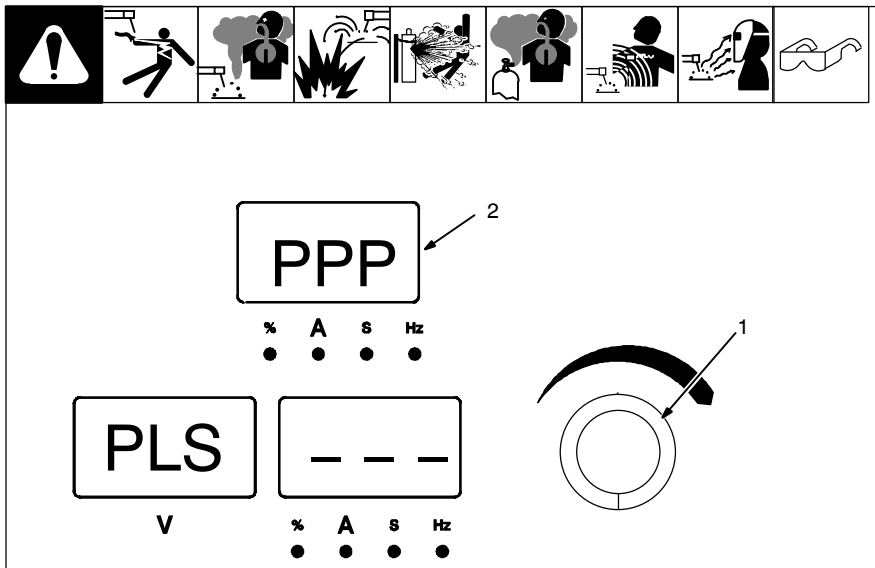
Includes all the functions of levels 1, 2, and 3 plus the following:

Remote Amperage Control

Allows operator to use remote amperage control if desired. Remote control operates from minimum to maximum of preset amperage value. Connect remote control device according to Section 4-8.

When parameter change or selection is limited by lock level 4, [LOCK][LEV4] is displayed as a reminder.

6-9. Setting Unit To Display PPP While Pulse Welding (DX Models Only)



1 Encoder Control

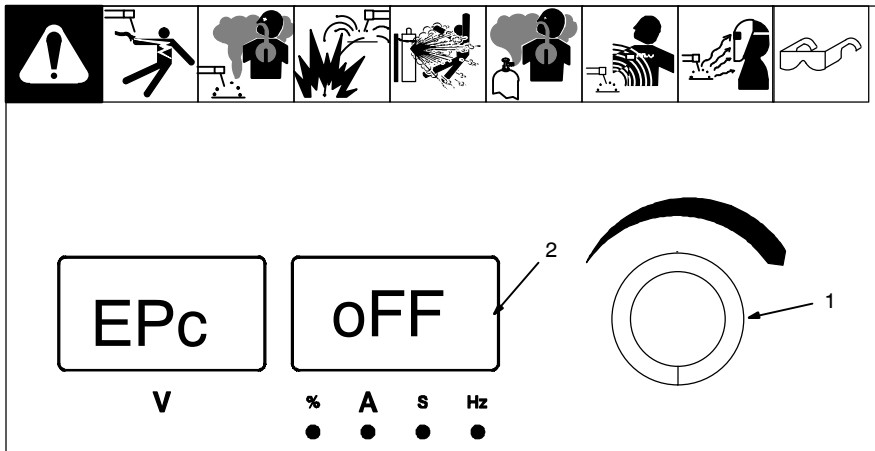
2 PPP Meter Display

Turn Encoder to change between standard and [PPP] meter display.

When the [PPP] meter display feature is active while pulse welding, the [PPP] will be displayed on the right meter display, and the Meter Hold feature is disabled.

The [PPP] meter display feature will not effect the normal amperage display or Meter Hold capabilities when in a non-pulse welding mode.

6-10. External Pulse Control



1 Encoder Control

2 Ammeter Parameter Selection

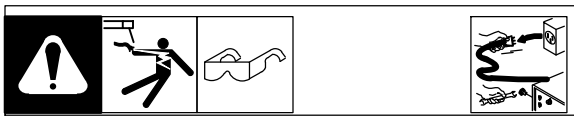
Turn Encoder to select external pulse control on or off (off is the default).

When external pulse control is on: Remote 14-pin amperage control of 0 to 10 volts input will be a minimum 0 amps to the power source, a maximum 200 amps with an external direct amperage control to power source.

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

SECTION 7 – MAINTENANCE AND TROUBLESHOOTING

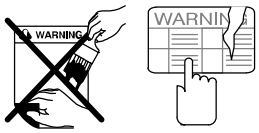
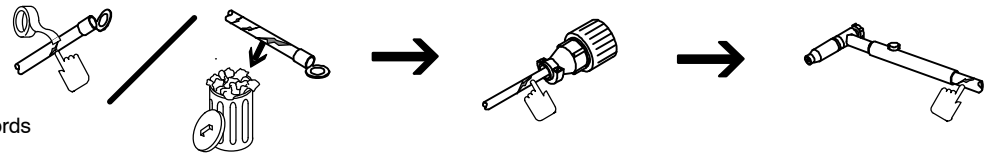
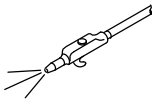
7-1. Routine Maintenance



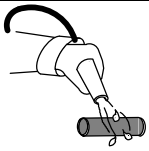
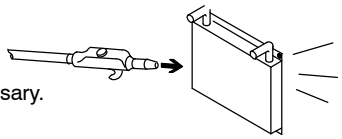
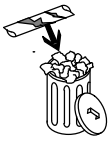
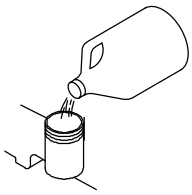
Disconnect power before maintaining.

☞ *Maintain more often during severe conditions.*

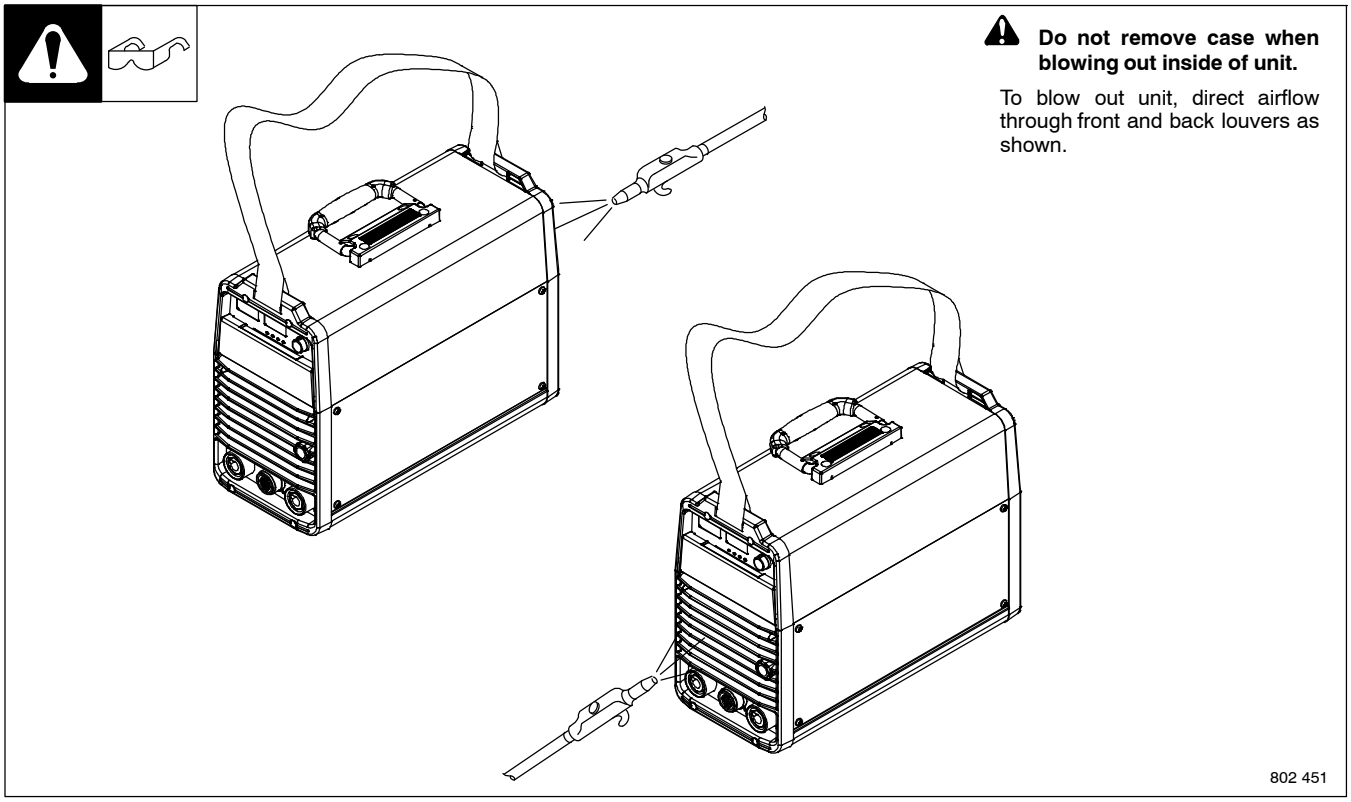
A. Welding Power Source

	✓ = Check ◇ = Change ◯ = Clean Δ = Repair ☆ = Replace * To be done by Factory Authorized Service Agent
Every 3 Months	 ✓☆ Labels ✓ ☆ Gas Hoses
Every 3 Months	 ✓Δ ☆Cables And Cords
Every 6 Months	**Do not remove case when blowing out inside of unit (see Section 7-2) .**  ◯:Durning heavy service, clean monthly.

B. Optional Cooler

	✓ = Check ◇ = Change ◯ = Clean Δ = Repair ☆ = Replace * To be done by Factory Authorized Service Agent
Every 3 Months	 ◯Coolant Strainer, durning heavy service, clean more frequently. ◯ Blow out heat exchanger fins. ✓Check coolant level. Top off with distilled or deionized water if necessary. 
Every 6 Months	 ✓☆Hoses ✓☆ Labels
Every 12 Months	  ◇Replace coolant.

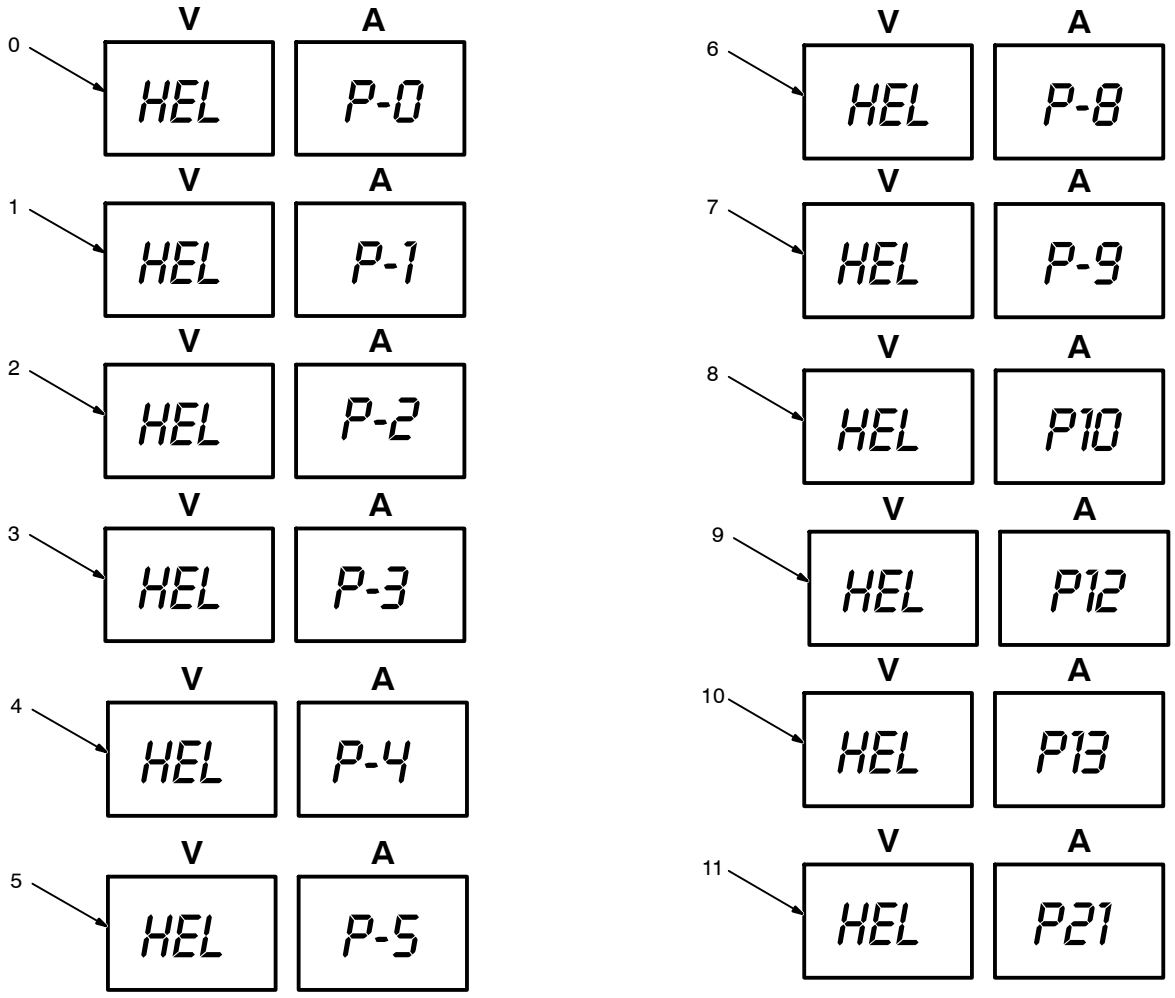
7-2. Blowing Out Inside Of Unit



Do not remove case when blowing out inside of unit.

To blow out unit, direct airflow through front and back louvers as shown.

7-3. 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 bottom heat sink. Contact a Factory Authorized Service Agent if this display is shown.

1 Help 1 Display

Indicates a malfunction in the primary power circuit caused by an overcurrent condition in the primary IGBT switching circuit. Contact a Factory Authorized Service Agent if this display is shown.

2 Help 2 Display

Indicates an open in the thermal protection circuitry located on the bottom heat sink. Contact a Factory Authorized Service Agent if this display is shown.

3 Help 3 Display

Indicates the bottom heat sink has overheated. The unit has shut down to allow the fan to cool it (see Section 4-5). Operation will continue when the unit has cooled.

4 Help 4 Display

Indicates an open in the thermal protection circuitry located on the top heat sink. Contact a Factory Authorized Service Agent if this display is shown.

5 Help 5 Display

Indicates the top heat sink has overheated. The unit has shut down to allow the fan to cool it (see Section 4-5). Operation will continue when the unit has cooled.

6 Help 8 Display

Indicates a malfunction in the secondary power circuit of the unit. There is a high open circuit condition. Contact a Factory Authorized Service Agent if this display is shown.

7 Help 9 Display

Indicates a short in the thermal protection circuitry located on the top heat sink. Contact a Factory Authorized Service Agent if this display is shown.

8 Help 10 Display

Indicates torch trigger is depressed. Release trigger to continue.

9 Help 12 Display

Indicates an improper set-up. You are trying to make an adjustment that is not allowed.

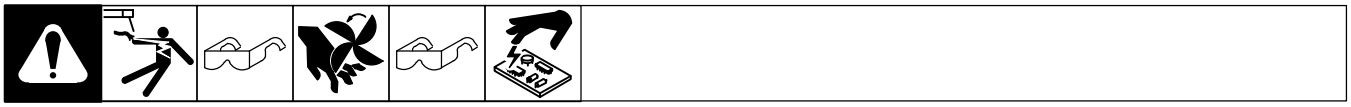
10 Help 13 Display (LX Models Only)

Output enable signal broken causing weld output to stop, but gas continues to flow if Post Flow function is active or gas control on 10-pin is On (see Section 4-9).

11 Help Display 21

Indicates voltage or current feedback has been detected with contactor off. Contact a Factory Authorized Service Agent if this display is shown.

7-4. Troubleshooting



Trouble	Remedy
No weld output; unit completely inoperative.	Place line disconnect switch in On position (see Section 4-17).
	Check and replace line fuse(s), if necessary, or reset circuit breaker (see Section 4-17).
	Check for proper input power connections (see Section 4-17).
No weld output; meter display On.	If using remote control, be sure correct process is enabled to provide output control at Remote 14 receptacle (see Section 4-8 as applicable).
	Input voltage outside acceptable range of variation (see Section 4-16).
	Check, repair, or replace remote control.
	Unit overheated. Allow unit to cool with fan On (see Section 4-5).
Erratic or improper weld output.	Use proper size and type of weld cable (see Section 4-7).
	Clean and tighten all weld connections (see Section 4-7).
Fan not operating.	Check for and remove anything blocking fan movement.
	Have Factory Authorized Service Agent check fan motor.
Wandering arc	Use proper size tungsten (see Section 11).
	Use properly prepared tungsten (see Section 11).
	Reduce gas flow rate (see Section 4-11).
Tungsten electrode oxidizing and not remaining bright after conclusion of weld.	Shield weld zone from drafts.
	Increase postflow time (see Section 5-1).
	Check and tighten all gas fittings (see Section 4-11).
	Water in torch. Refer to torch manual.

SECTION 8 – PARTS LIST

8-1. Recommended Spare Parts

Dia. Mkgs.	Part No.	Description	Quantity
		Recommended Spare Parts	
	239494	Screen, Filter Lp Cyl 100x100x0.0045 SST a	1

SECTION 9 – ELECTRICAL DIAGRAMS

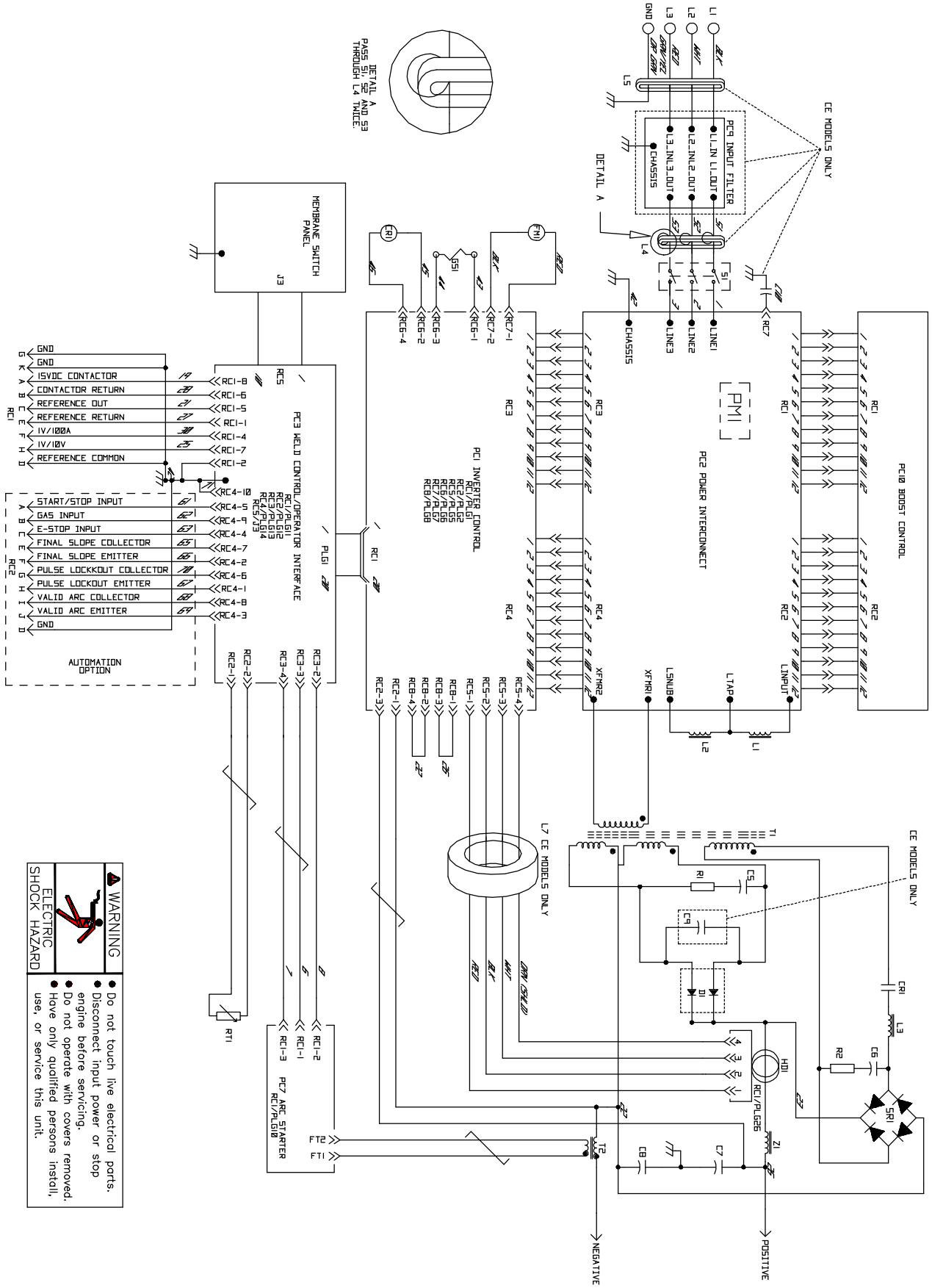
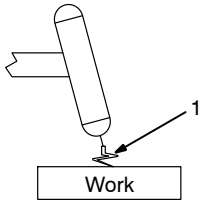


Figure 9-1. Circuit Diagram

237 566-C

SECTION 10 – HIGH FREQUENCY

10-1. Welding Processes Requiring High Frequency



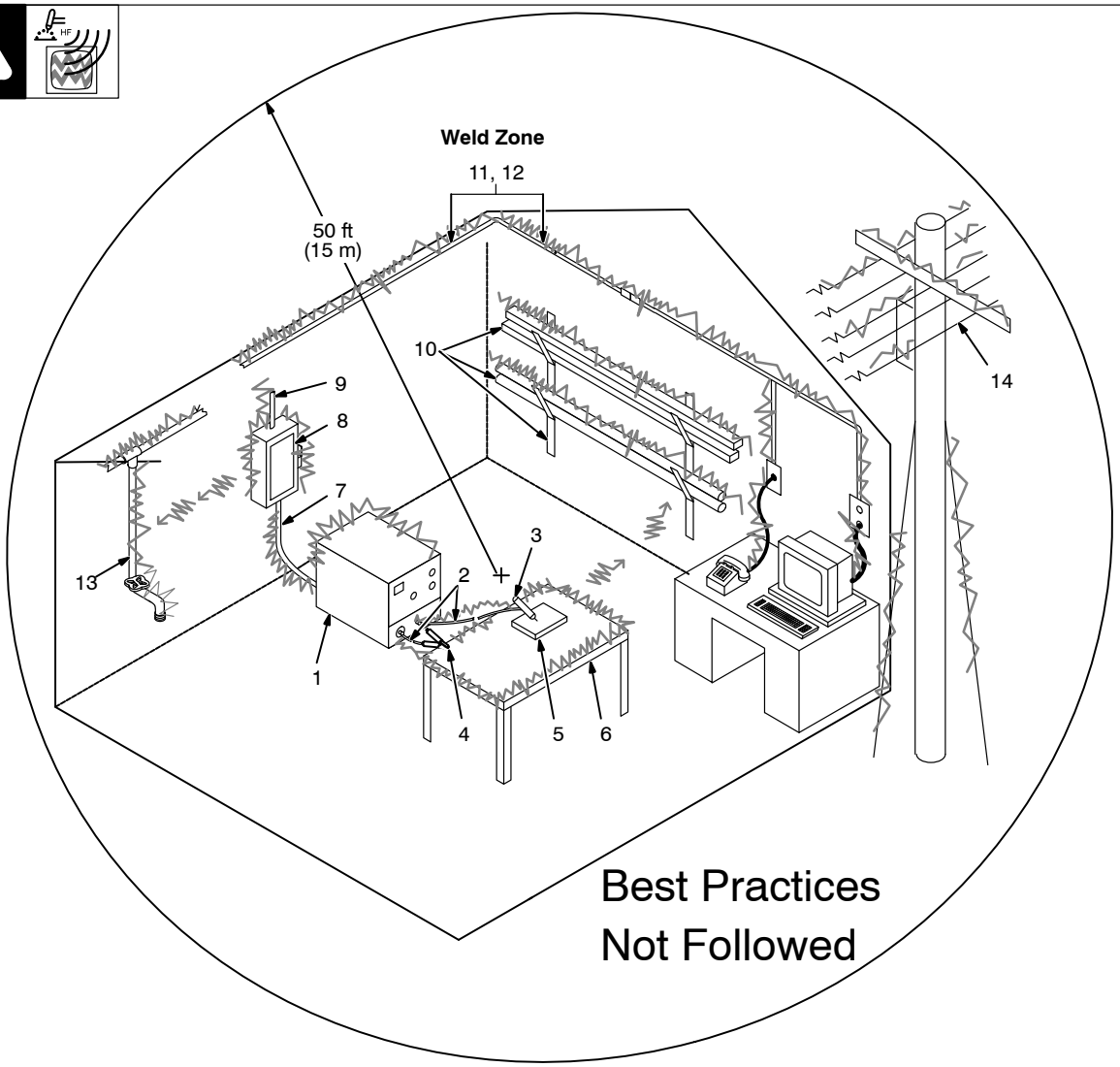
TIG

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

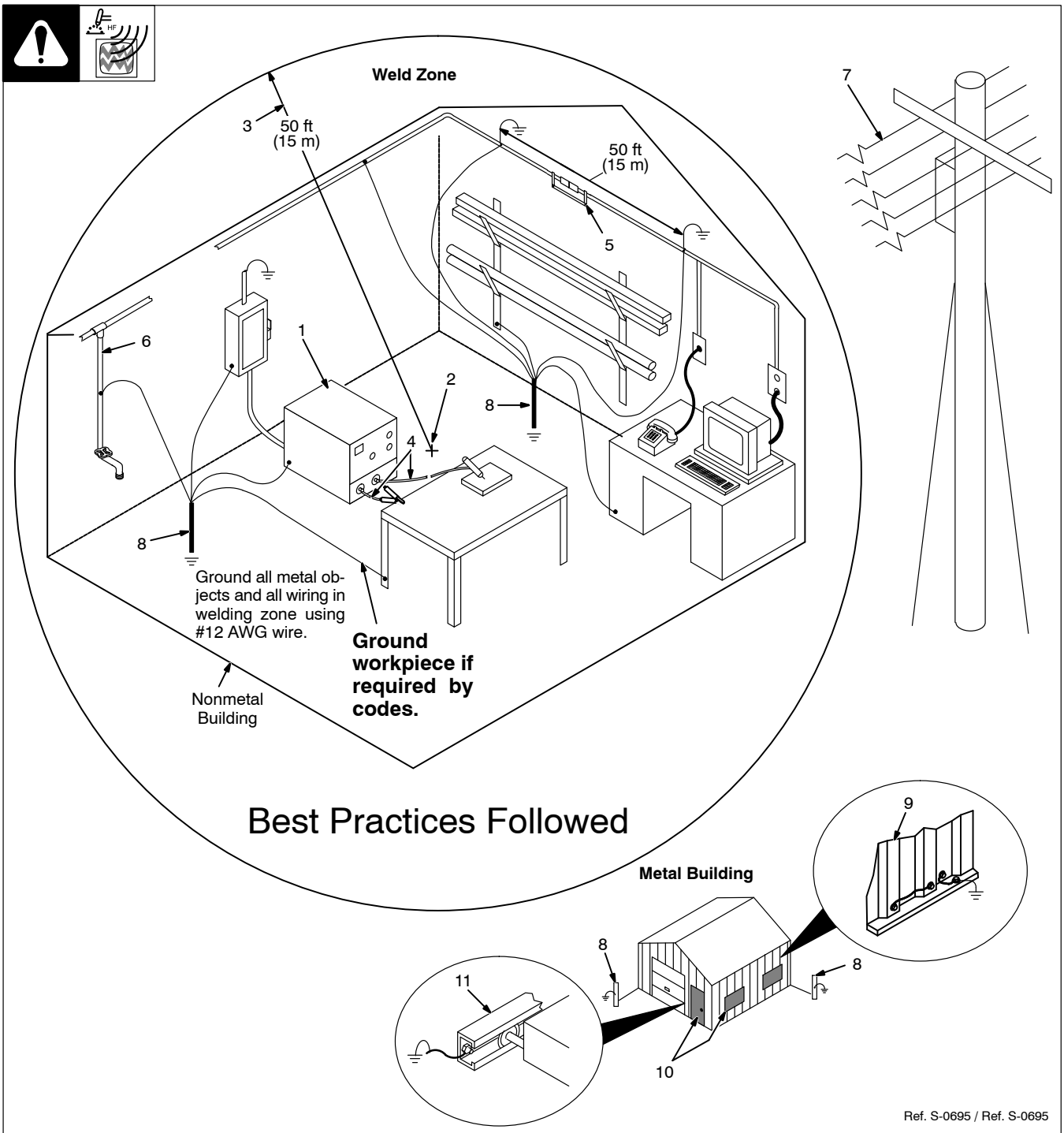
7 Input Power Cable
8 Line Disconnect Device
9 Input Supply Wiring

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



Ref. S-0695 / Ref. S-0695

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 WITH INVERTER MACHINES

gtaw_Inverter_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.*

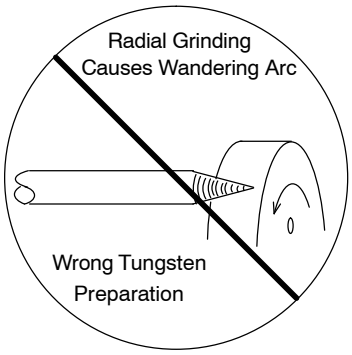
Electrode Diameter	Amperage Range - Gas Type♦ - Polarity	
	(DCEN) – Argon Direct Current Electrode Negative (For Use With Mild Or Stainless Steel)	AC – Argon Balance Control @ 65% Electrode Negative (For Use With Aluminum)
2% Ceria, 1.5% Lanthanum, Or 2% Thorium Alloy Tungstens		
.010 in. (1 mm)	Up to 25	Up to 20
.020 in. (1 mm)	15-40	15-35
.040 in. (1 mm)	25-85	20-80
1/16 in. (1.6 mm)	50-160	50-150
3/32 in. (2.4 mm)	130-250	135-235
1/8 in. (3.2 mm)	250-400	225-360
5/32 in. (4.0 mm)	400-500	300-450
3/16 in (4.8 mm)	500-750	400-500
1/4 in. (6.4 mm)	750-1000	600-800

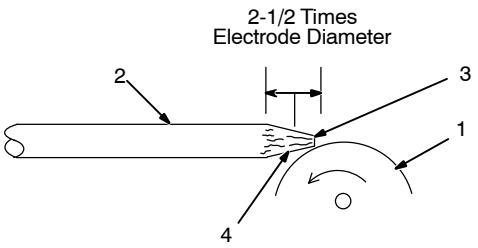
♦Typical argon shielding gas flow rates are 11 to 35 CFH (cubic feet per hour).

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 DC Electrode Negative (DCEN) Welding Or AC Welding With Inverter 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.





Ideal Tungsten Preparation – Stable Arc

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.

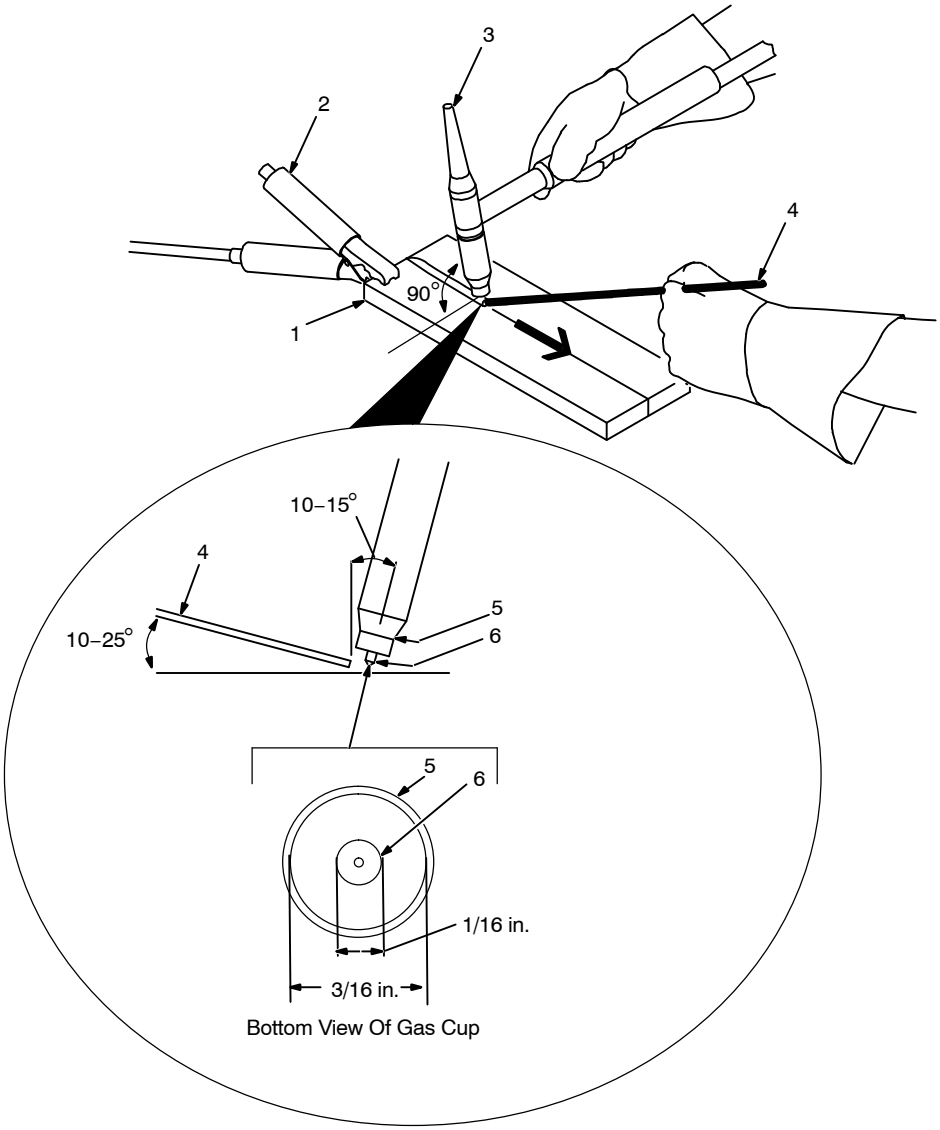
3 Flat

Diameter of this flat determines amperage capacity.

4 Straight Ground

Grind lengthwise, **not radial**.

12-1. Positioning The Torch



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 cerium or lanthanum based tungsten instead of thoriated. Thorium dust 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.

1 Workpiece

Make sure workpiece is clean before welding.

2 Work Clamp

Place as close to the weld as possible.

3 Torch

4 Filler Rod (If Applicable)

5 Gas Cup

6 Tungsten Electrode

Select and prepare tungsten according to Section 11.

Guidelines:

The inside diameter of the gas cup should be at least three times the tungsten diameter to provide adequate shielding gas coverage. (For example, if tungsten is 1/16 in. diameter, gas cup should be a minimum of 3/16 in. diameter.

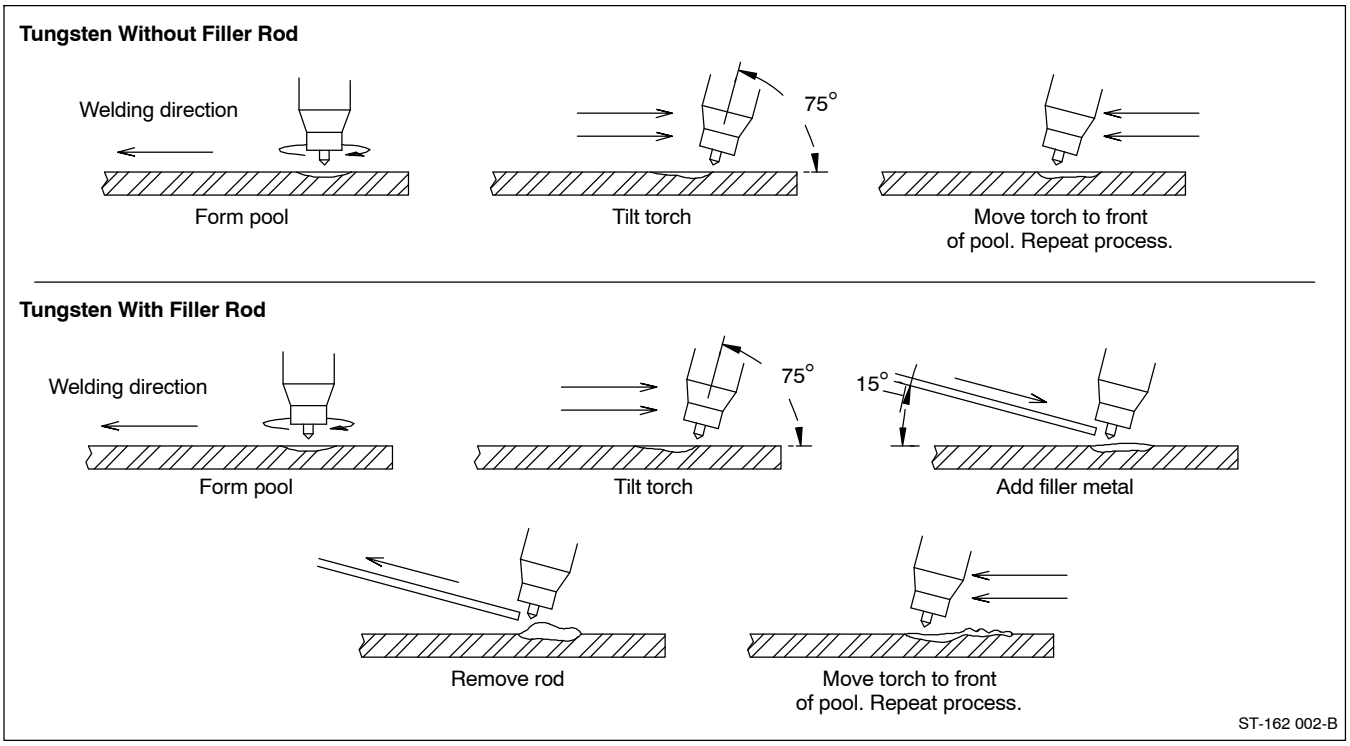
Tungsten extension is the distance the tungsten extends out gas cup of torch.

The tungsten extension should be no greater than the inside diameter of the gas cup.

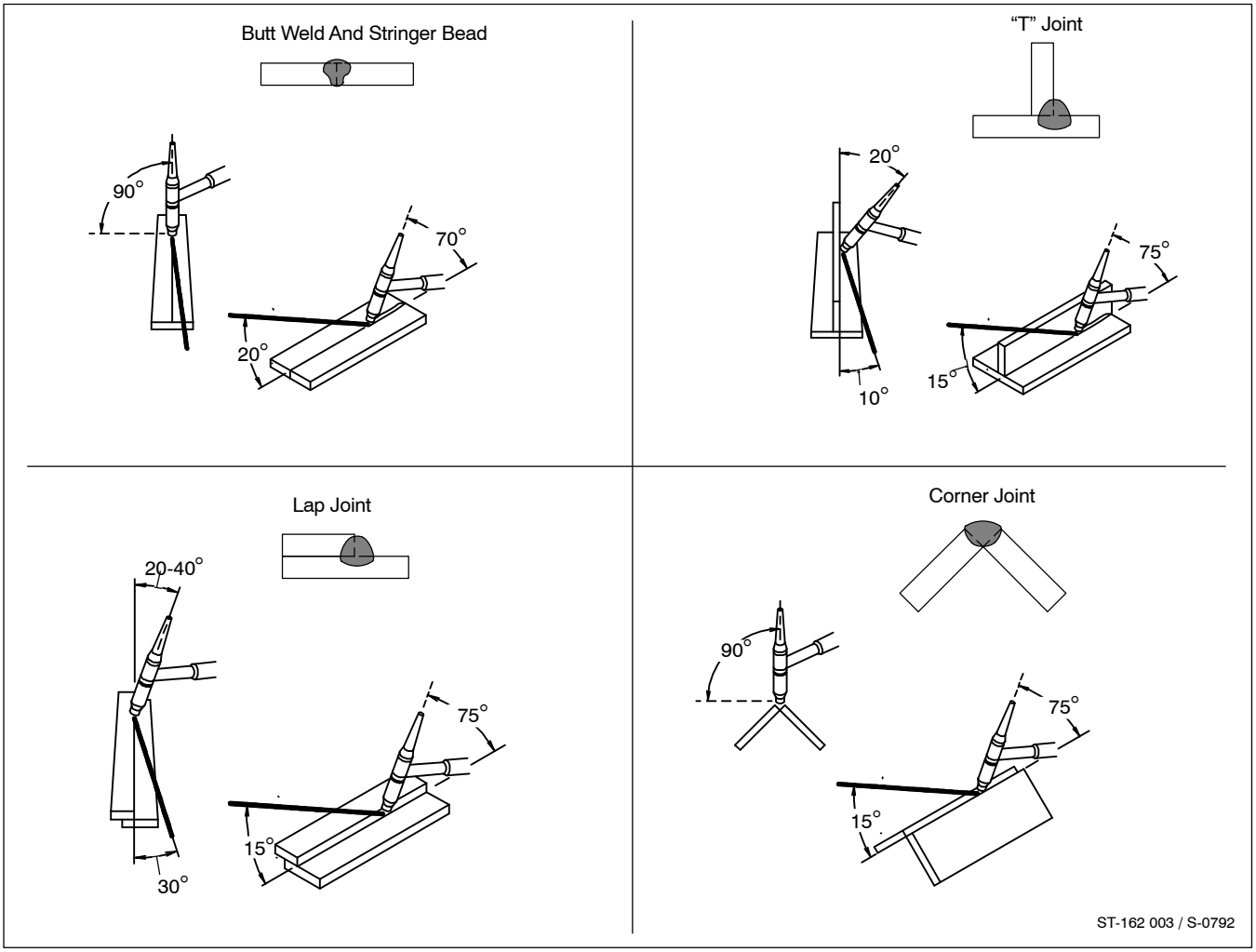
Arc length is the distance from the tungsten to the workpiece.

Ref. ST-161 892

12-2. Torch Movement During Welding

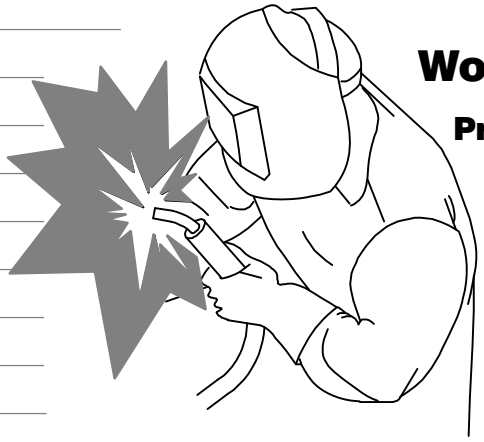


12-3. Positioning Torch Tungsten For Various Weld Joints



Notes

Notes



Work like a Pro!

Pros weld and cut safely. Read the safety rules at the beginning of this manual.

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Effective January 1, 2012
(Equipment with a serial number preface of MC or newer)

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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

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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.)**
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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.

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Owner's Record

Please complete and retain with your personal records.

Model Name Serial/Style Number

Purchase Date (Date which equipment was delivered to original customer.)

Distributor

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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
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