



OM-2226

189783Q

October 2003

Processes



TIG (GTAW) Welding



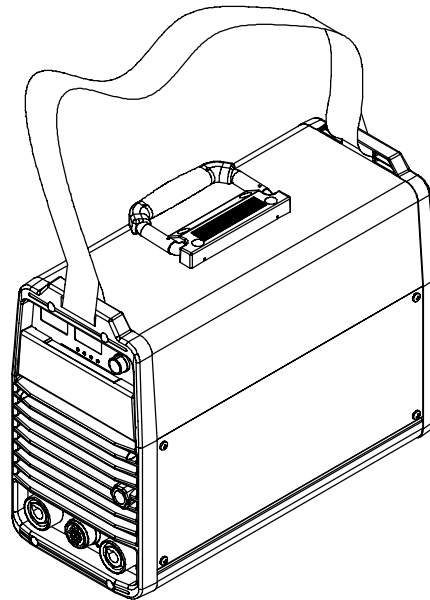
Stick (SMAW) Welding

Description



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

Maxstar® 200 SD, DX, And LX



 And Non-CE Models



Visit our website at
www.MillerWelds.com

OWNER'S MANUAL

From Miller to You

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

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

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

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



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.



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



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



TABLE OF CONTENTS

SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING	1
1-1. Symbol Usage	1
1-2. Arc Welding Hazards	1
1-3. Additional Symbols For Installation, Operation, And Maintenance	3
1-4. California Proposition 65 Warnings	3
1-5. Principal Safety Standards	4
1-6. EMF Information	4
SECTION 2 – CONSIGNES DE SÉCURITÉ – À LIRE AVANT UTILISATION	5
2-1. Signification des symboles	5
2-2. Dangers relatifs au soudage à l'arc	5
2-3. Autres symboles relatifs à l'installation, au fonctionnement et à l'entretien de l'appareil.	7
2-4. Principales normes de sécurité	8
2-5. Information sur les champs électromagnétiques	8
SECTION 3 – DEFINITIONS (CE Models)	9
3-1. Warning Label Definitions	9
3-2. Manufacturer's Rating Label	11
3-3. Symbols And Definitions	12
SECTION 4 – INSTALLATION	13
4-1. Specifications	13
4-2. Volt-Ampere Curves	14
4-3. Duty Cycle And Overheating	15
4-4. Selecting A Location	16
4-5. Weld Output Terminals And Selecting Cable Sizes*	17
4-6. Remote 14 Receptacle Information	17
4-7. Automation 10-Pin Connection (LX Models)	18
4-8. Gas Connections	19
4-9. TIG HF Impulse/ Lift-Arc DCEN (Direct Current Electrode Negative) Connections	19
4-10. Stick DCEP (Direct Current Electrode Positive) Connections	20
4-11. Electrical Service Guide	20
4-12. Connecting Input Power	21
SECTION 5 – OPERATION	22
5-1. Controls	22
5-2. Encoder Control	23
5-3. Amperage Control	23
5-4. Ammeter And Parameter Display	23
5-5. Voltmeter	24
5-6. Polarity Control (Dynasty Models Only)	24
5-7. Process Control	25
5-8. Output Control	25
5-9. Pulser Control (DX And LX Models)	26
5-10. Sequencer Controls (DX, LX And All CE Models)	27
5-11. Adjust Controls (Preflow/Post Flow/DIG/Purge)	28
5-12. AC Waveshape (Dynasty Models Only)	29
5-13. Spot Time Control (Reconfigured RMT 2T HOLD Output Selection) (All Models)	29
5-14. Memory (Program Storage Locations 1-4) (DX And LX Models If Available)	30
5-15. Setting Preflow Time For Use With TIG HF Impulse On Models That Do Not Have A Preflow Control On The Front Panel	31
5-16. Factory Parameter Defaults And Range And Resolution	32
5-17. Resetting Unit To Factory Default Settings (All Models)	33
SECTION 6 – ADVANCED FUNCTIONS	34
6-1. Programable TIG Start Parameters	34
6-2. Output Control And Trigger Functions	37

6-3. Arc Timer/Counter Display	45
6-4. Lockout Functions	46
6-5. Setting Unit To Display PPP While Pulse Welding (DX And LX Models Only)	49
6-6. Stick Open-Circuit Voltage (OCV) Selection (All Models)	50
SECTION 7 – MAINTENANCE AND TROUBLESHOOTING	51
7-1. Routine Maintenance	51
7-2. Blowing Out Inside Of Unit	51
7-3. Voltmeter/Ammeter Help Displays	52
7-4. Troubleshooting	53
SECTION 8 – ELECTRICAL DIAGRAMS	54
SECTION 9 – HIGH FREQUENCY (HF)	55
9-1. Welding Processes Requiring High Frequency	55
9-2. Correct Installation	55
SECTION 10 – SELECTING AND PREPARING TUNGSTEN ELECTRODE	56
10-1. Selecting Tungsten Electrode	56
10-2. Safety Information About Tungsten	56
10-3. Preparing Tungsten For AC Or DC Electrode Negative (DCEN) Welding	57
SECTION 11 – GUIDELINES FOR TIG WELDING (GTAW)	58
11-1. DC - GTAW 16 Gauge Stainless Steel Set-Up	58
11-2. Positioning The Torch	59
11-3. Lift-ArcE And HF TIG Start Procedures	60
11-4. Torch Movement During Welding	61
11-5. Positioning Torch Tungsten For Various Weld Joints	62
SECTION 12 – STICK WELDING (SMAW) GUIDELINES	63
12-1. Front Panel Display For Stick DCEP (Direct Current Electrode Positive)	63
SECTION 13 – PARTS LIST	72
OPTIONS AND ACCESSORIES	
WARRANTY	

Declaration of Conformity For European Community (CE) Products

NOTE

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

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

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

Declares that the product: **Maxstar[®] 200 SD, DX, LX**

conforms to the following Directives and Standards:

Directives

Low Voltage Directive: 73/23/EEC

Machinery Directives: 89/392/EEC, 91/368/EEC, 93/C 133/04, 93/68/EEC

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

Standards

Safety Requirements for Arc Welding Equipment part 1: EN 60974-1: 1990

*Arc Welding Equipment Part 1: Welding Power Sources: IEC 974-1
(December 1996 – Draft revision)*

Degrees of Protection provided by Enclosures (IP code): IEC 529: 1989

*Insulation coordination for equipment within low-voltage systems:
Part 1: Principles, requirements and tests: IEC 664-1: 1992*

*Electromagnetic compatibility (EMC) Product standard for arc welding equipment:
EN50199: August 1995*

European Contact: Mr. Danilo Fedolfi, Managing Director
ITW WELDING PRODUCTS ITALY S.r.l.
Via Privata Iseo 6/E
20098 San Giuliano
Milanese, Italy

Telephone: 39(02)982901
Fax: 39(02)98290-203

SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

som _8/03

1-1. Symbol Usage



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

▲ Marks a special safety message.

☞ Means "Note"; not safety related.



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

1-2. Arc Welding Hazards

▲ The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-5. Read and follow all Safety Standards.

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

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



ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also

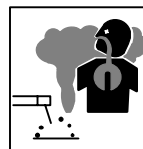
live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
- Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first – double-check connections.
- Frequently inspect input power cord for damage or bare wiring – replace cord immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.
- Do not drape cables over your body.

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

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

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



FUMES AND GASES can be hazardous.

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

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



ARC RAYS can burn eyes and skin.

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

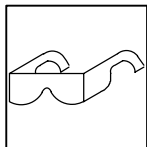
- Wear a welding helmet fitted with a proper shade of filter to protect your face and eyes when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash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



WELDING can cause fire or explosion.

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

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



FLYING METAL can injure eyes.

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



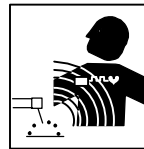
BUILDUP OF GAS can injure or kill.

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



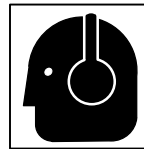
HOT PARTS can cause severe burns.

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



MAGNETIC FIELDS can affect pacemakers.

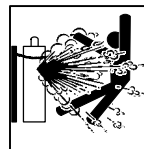
- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.



NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.



CYLINDERS can explode if damaged.

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

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

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



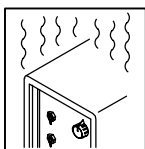
FIRE OR EXPLOSION hazard.

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



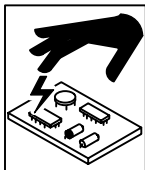
FALLING UNIT can cause injury.

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



OVERUSE can cause OVERHEATING

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



STATIC (ESD) can damage PC boards.

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



MOVING PARTS can cause injury.

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



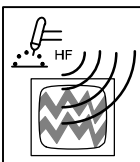
WELDING WIRE can cause injury.

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



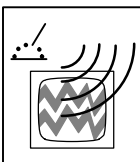
MOVING PARTS can cause injury.

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



H.F. RADIATION can cause interference.

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



ARC WELDING can cause interference.

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

1-4. California Proposition 65 Warnings

- ▲ Welding or cutting equipment produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)
- ▲ Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.

For Gasoline Engines:

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

For Diesel Engines:

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

1-5. Principal Safety Standards

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

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

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

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

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale

Boulevard, Rexdale, Ontario, Canada M9W 1R3 (phone: 800-463-6727 or in Toronto 416-747-4044, website: www.csa-international.org).

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

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

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

1-6. EMF Information

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

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

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

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

About Pacemakers:

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

SECTION 2 – CONSIGNES DE SÉCURITÉ – À LIRE AVANT UTILISATION

som_fre 8/03

2-1. Signification des symboles



Signifie « Mise en garde. Faire preuve de vigilance. » Cette procédure présente des risques identifiés par les symboles adjacents aux directives.

▲ Identifie un message de sécurité particulier.

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



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

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

▲ Les symboles ci-après sont utilisés tout au long du présent manuel pour attirer l'attention sur les dangers potentiels et les identifier. Lorsqu'on voit un symbole, faire preuve de vigilance et suivre les directives mentionnées afin d'éviter tout danger. Les consignes de sécurité énoncées ci-après ne font que résumer le contenu des normes de sécurité mentionnées à la section 2-4. Lire et respecter toutes ces normes.

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

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



LES DÉCHARGES ÉLECTRIQUES peuvent être mortelles.

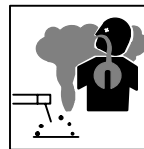
Un simple contact avec des pièces sous tension peut causer une électrocution ou des blessures graves. L'électrode et le circuit de soudage sont sous tension dès que l'appareil est en fonctionnement. Le circuit d'entrée et les circuits internes de l'appareil sont également sous tension. En soudage semi-automatique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

- Ne jamais toucher aux pièces électriques sous tension.
- Porter des gants et des vêtements de protection secs et exempts de trous.
- S'isoler de la pièce et de la terre au moyen de tapis ou autres dispositifs isolants suffisamment grands pour empêcher tout contact physique avec la pièce ou la terre.
- Ne pas se servir d'une source de courant alternatif dans les zones humides, les endroits confinés ou là où on risque de tomber.
- Ne se servir d'une source de courant alternatif QUE si le procédé de soudage l'exige.
- Si l'utilisation d'une source de courant alternatif s'avère nécessaire, se servir de la fonction de télécommande si l'appareil en est équipé.
- Couper l'alimentation ou arrêter le moteur avant de procéder à l'installation, à la réparation ou à l'entretien de l'appareil. Couper/étiqueter l'alimentation selon la norme OSHA 29 CFR 1910.147 (voir les normes de sécurité).
- Installer et mettre à la terre correctement l'appareil conformément à son manuel d'utilisation et aux codes nationaux, provinciaux et municipaux.
- Toujours vérifier la terre du cordon d'alimentation – Vérifier et s'assurer que le fil de terre du cordon d'alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- Pour exécuter les branchements d'entrée, fixer d'abord le conducteur de mise à la terre adéquat et contre-vérifier les connexions.
- Vérifier fréquemment le cordon d'alimentation et s'assurer qu'il n'est ni endommagé ni dénudé ; le remplacer immédiatement s'il est endommagé – tout câble dénudé peut causer une électrocution.
- Mettre l'appareil hors tension quand on ne l'utilise pas.
- Ne pas utiliser de câbles usés, endommagés, de calibre insuffisant ou mal épissés.
- Ne pas s'enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, le faire directement avec un câble distinct.
- Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode d'une autre machine.

- N'utiliser que du matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretenir l'appareil conformément au présent manuel.
- Porter un harnais de sécurité quand on travaille en hauteur.
- Maintenir solidement en place tous les panneaux et capots.
- Fixer le câble de retour de façon à obtenir un bon contact métal sur métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.
- Ne pas connecter plus d'une électrode ou plus d'un câble de masse à un même terminal de sortie.

Il subsiste un COURANT CONTINU IMPORTANT dans les convertisseurs après la suppression de l'alimentation électrique.

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



LES FUMÉES ET LES GAZ peuvent être dangereux.

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

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



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

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

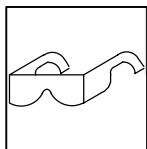
- Porter un masque de soudage muni d'un filtre de la nuance adéquate pour se protéger le visage et les yeux pendant le soudage ou pour regarder (voir les normes de sécurité ANSI Z49.1 et Z87.1).
- Porter des lunettes de sécurité à écrans latéraux sous le masque.
- Utiliser des écrans ou des barrières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



LE SOUDAGE peut causer un incendie ou une explosion.

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

- Se protéger et protéger les tiers de la projection d'étincelles et de métal chaud.
- Ne pas souder à un endroit où des étincelles peuvent tomber sur des substances inflammables.
- Placer toutes les substances inflammables à une distance de 10,7 m de l'arc de soudage. En cas d'impossibilité, les recouvrir soigneusement avec des protections agréées.
- Des étincelles et des matières en fusion peuvent facilement passer même par des fissures et des ouvertures de petites dimensions.
- Surveiller tout déclenchement d'incendie et tenir un extincteur à proximité.
- Le soudage effectué sur un plafond, un plancher, une paroi ou une cloison peut déclencher un incendie de l'autre côté.
- Ne pas souder des récipients fermés tels que des réservoirs, des fûts ou des conduites, à moins qu'ils n'aient été préparés conformément à l'AWS F4.1 (voir les normes de sécurité).
- Brancher le câble sur la pièce la plus près possible de la zone de soudage pour éviter que le courant ne circule sur une longue distance, par des chemins inconnus, et ne cause des risques d'électrocution et d'incendie.
- Ne pas utiliser le poste de soudage pour dégeler des conduites gelées.
- En cas de non utilisation, enlever la baguette d'électrode du porte-électrode ou couper le fil au raz du tube-contact.
- Porter des vêtements de protection exempts d'huile tels que des gants en cuir, une chemise en tissu épais, des pantalons sans revers, des chaussures montantes et un masque.
- Avant de souder, retirer tout produit combustible de ses poches, tel qu'un briquet au butane ou des allumettes.



LES PARTICULES PROJETÉES peuvent blesser les yeux.

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



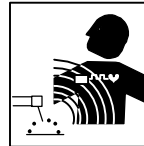
LES ACCUMULATIONS DE GAZ peuvent causer des blessures ou même la mort.

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



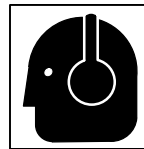
LES PIÈCES CHAUDES peuvent causer des brûlures graves.

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



LES CHAMPS MAGNÉTIQUES peuvent perturber le fonctionnement des stimulateurs cardiaques.

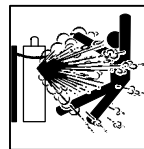
- Les personnes qui portent un stimulateur cardiaque doivent se tenir à distance.
- Ils doivent consulter leur médecin avant de s'approcher d'un lieu où on exécute des opérations de soudage à l'arc, de gougeage ou de soudage par points.



LE BRUIT peut affecter l'ouïe.

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

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



Les BOUTEILLES endommagées peuvent exploser.

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

- Protéger les bouteilles de gaz comprimé de la chaleur excessive, des chocs mécaniques, du laitier, des flammes nues, des étincelles et des arcs.
- Placer les bouteilles debout en les fixant dans un support stationnaire ou dans un porte-bouteilles pour les empêcher de tomber ou de se renverser.
- Tenir les bouteilles éloignées des circuits de soudage ou autres circuits électriques.
- Ne jamais poser une torche de soudage sur une bouteille de gaz.
- Ne jamais mettre une électrode de soudage en contact avec une bouteille de gaz.
- Ne jamais souder une bouteille contenant du gaz sous pression – elle risquerait d'exploser.
- N'utiliser que les bouteilles de gaz protecteur, régulateurs, tuyaux et raccords adéquats pour l'application envisagée ; les maintenir en bon état, ainsi que les pièces connexes.
- Détourner la tête lorsqu'on ouvre la soupape d'une bouteille.
- Laisser le capuchon protecteur sur la soupape, sauf en cas d'utilisation ou de branchement de la bouteille.
- Lire et suivre les instructions concernant les bouteilles de gaz comprimé, les équipements associés et les publications P-1 de la CGA, mentionnées dans les normes de sécurité.

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



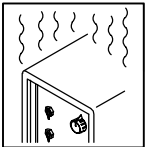
Risque D'INCENDIE OU D'EXPLOSION

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



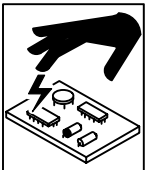
LA CHUTE DE L'APPAREIL peut blesser.

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



L'EMPLOI EXCESSIF peut FAIRE SURCHAUFFER L'ÉQUIPEMENT.

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



LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

- Mettre un bracelet antistatique AVANT de manipuler des cartes ou des pièces.
- Utiliser des pochettes et des boîtes antistatiques pour stocker, déplacer ou expédier des cartes de circuits imprimés.



LES PIÈCES MOBILES peuvent causer des blessures.

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



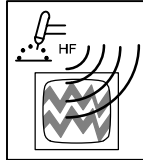
LES FILS DE SOUDAGE peuvent causer des blessures.

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



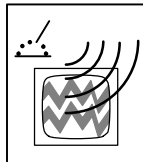
LES ORGANES MOBILES peuvent causer des blessures.

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



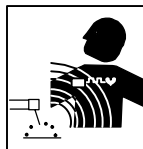
LE RAYONNEMENT HAUTE FRÉQUENCE (H. F.) risque de causer des interférences.

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



LE SOUDAGE À L'ARC peut causer des interférences.

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



LES CHAMPS MAGNÉTIQUES peuvent affecter les stimulateurs cardiaques.

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

2-4. Principales normes de sécurité

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

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

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

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

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

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

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

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

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

2-5. Information sur les champs électromagnétiques

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

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

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

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

Consignes relatives aux stimulateurs cardiaques :

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

SECTION 3 – DEFINITIONS (CE Models)

3-1. Warning Label Definitions

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

1 Electric shock from welding electrode or wiring can kill.

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

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

1.3 Disconnect input plug or power before working on machine.

2 Breathing welding fumes can be hazardous to your health.

2.1 Keep your head out of the fumes.

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

2.3 Use ventilating fan to remove fumes.

3 Welding sparks can cause explosion or fire.

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

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

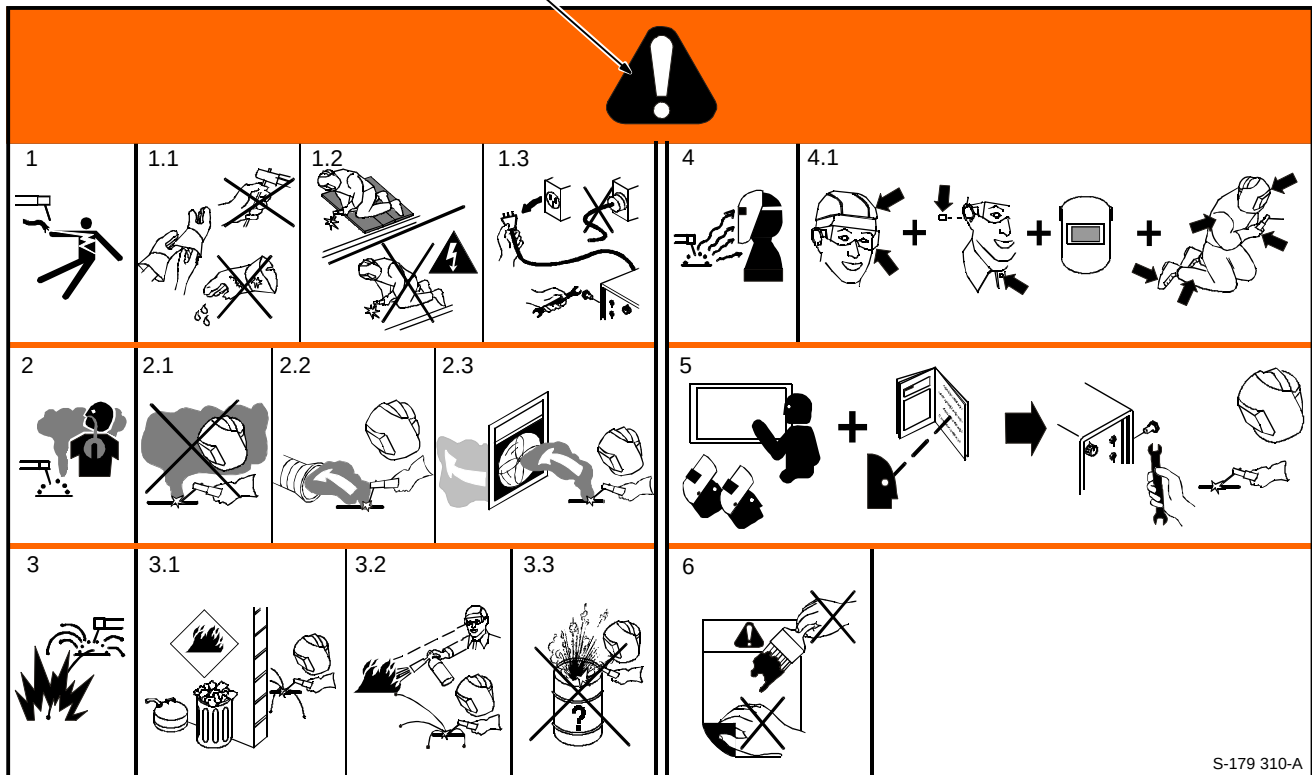
3.3 Do not weld on drums or any closed containers.

4 Arc rays can burn eyes and injure skin.

4.1 Wear hat and safety glasses. Use ear protection and button shirt collar. Use welding helmet with correct shade of filter. Wear complete body protection.

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

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



S-179 310-A

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

- 1 Electric shock from wiring can kill.
- 2 Disconnect input plug or power before working on machine.
- 3 Hazardous voltage remains on input capacitors after power is turned off. Do not touch fully charged capacitors.
- 4 Always wait 60 seconds after power is turned off before working on unit, OR
- 5 Check input capacitor voltage, and be sure it is near 0 before touching any parts.
- 6 When power is applied failed parts can explode or cause other parts to explode.
- 7 Flying pieces of parts can cause injury. Always wear a face shield when servicing unit.
- 8 Always wear long sleeves and button your collar when servicing unit.
- 9 After taking proper precautions as shown, connect power to unit.

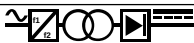
Warning! Watch Out! There are possible hazards as shown by the symbols.

- 1 Warning! Watch Out! There are possible hazards as shown by the symbols.
- 2 Falling equipment can cause injury and damage to unit.
- 3 Always lift and support unit using both handles. Keep angle of lifting device less than 60 degrees.
- 4 Use a proper cart to move unit.
- 5 Do not use one handle to lift or support unit.

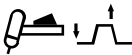
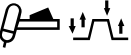
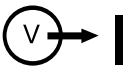
3-2. Manufacturer’s Rating Label

See Section 4-4 for location.

Use rating label to determine input power requirements.

				EN 60974-1			
	1A 10V	200A 18V				U _i =115V	
		X	40%	60%	100%	70%	100%
	I ₂	200	175	150	150	125	
	U _o 80V	U ₂	18	17	16	16	15
	1A 20V	200A 28V				U _i =115V	
		X	40%	60%	100%	50%	80%
	I ₂	175	150	125	125	100	
	U _o 80V	U ₂	27	26	25	25	24
				I ₁ max		I ₁ eff	
1	 50/60 Hz	U _i =115V		35		25	
1	 50/60 Hz	U _i =230V		31		17	
3	 50/60 Hz	U _i =230V		19		11	
3	 50/60 Hz	U _i =400V		11		6	
3	 50/60 Hz	U _i =460V		9		5	
		IP23					

3-3. 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	I₂ Rated Welding Current
X Duty Cycle	 Direct Current	 Line Connection	U₂ Conventional Load Voltage
U₁ Primary Voltage	IP Degree Of Protection	I_{1max} Rated Maximum Supply Current	I_{1eff} Maximum Effective Supply Current
U₀ Rated No Load Voltage (Average)	 Pulse Background Amperage	 Initial Amperage	 Increase/Decrease Of Quantity
 Normal Trigger Operation (GTAW)	 Two-Step Trigger Operation (GTAW)	 Four-Step Trigger Operation (GTAW)	% Percent
Hz Hertz	 Recall From Memory	 Arc Force (DIG)	 HF Impulse Starting (GTAW)
 Final Slope	 Final Amperage	 Pulse Percent On Time	 Initial Slope
 Contactor Control (Stick)	 Pulser On-Off	 TIG Weld Amps And Peak Amps While Pulsing	 Pulse Frequency
 Background Amps	 Process	 Pulser	 Sequence
 Output	 Adjust	 Suitable For Areas Of Increased Shock Hazard	

SECTION 4 – INSTALLATION

4-1. Specifications

Input Power	Rated Output	Welding Amperage Range	Max. Open-Circuit Voltage	Amperes Input At Rated Output, 50/60Hz				KVA	KW
				115	230	400	460		
Three-Phase Stick Process	150 A @ 26 VDC, 60% Duty Cycle	1 – 200	80V 9-14◆	--	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	1 – 200	80 9-14◆	--	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	1 – 200	80V 9-14◆		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	1 – 200	80 9-14◆		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	1 – 200	80V 9-14◆	--	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	1 – 200	80 9-14◆	--	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	1 – 200	80V 9-14◆	34.1 0.42*	--	--	--	4.0 0.05*	3.8 0.03*
Single-Phase TIG Process	150 A @ 16 VDC, 70% Duty Cycle	1 – 200	80 9-14◆	29.7 0.42*	--	--	--	3.4 0.05*	3.4 0.03*
Single-Phase Stick Process	100 A @ 24 VDC, 80% Duty Cycle	1 – 200	80V 9-14◆	28.1 0.42*	--	--	--	3.2 0.05*	3.2 0.03*
Single-Phase TIG Process	125 A @ 15 VDC, 100% Duty Cycle	1 – 200	80 9-14◆	23.0 0.42*	--	--	--	2.6 0.05*	2.6 0.03*

*While idling

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

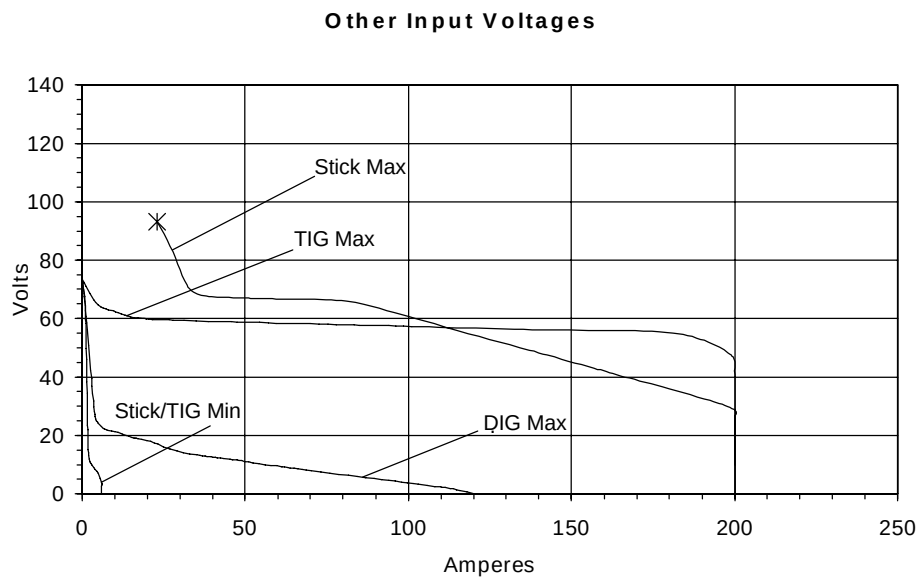
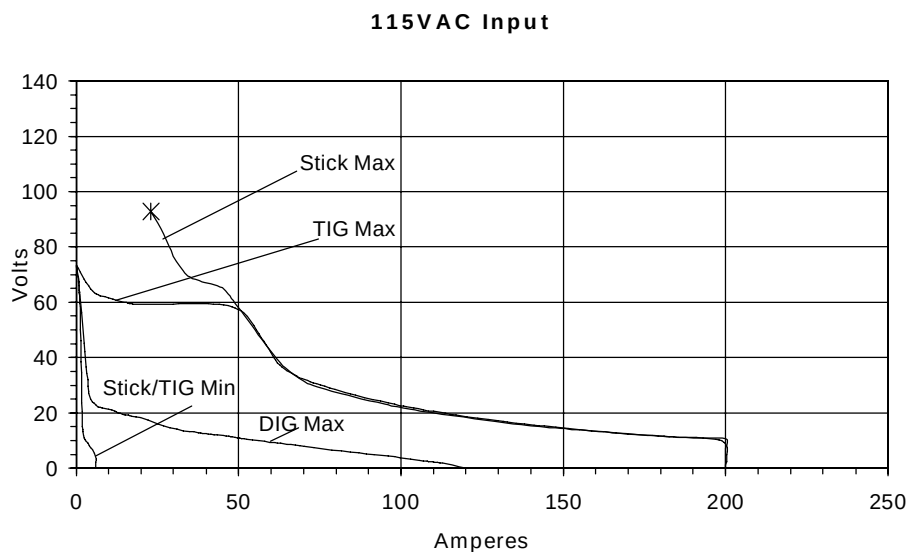
▽Normal open-circuit voltage (80 volts) is present while in Stick with normal open-circuit voltage selected.

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

NOTE: 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.

4-2. 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.



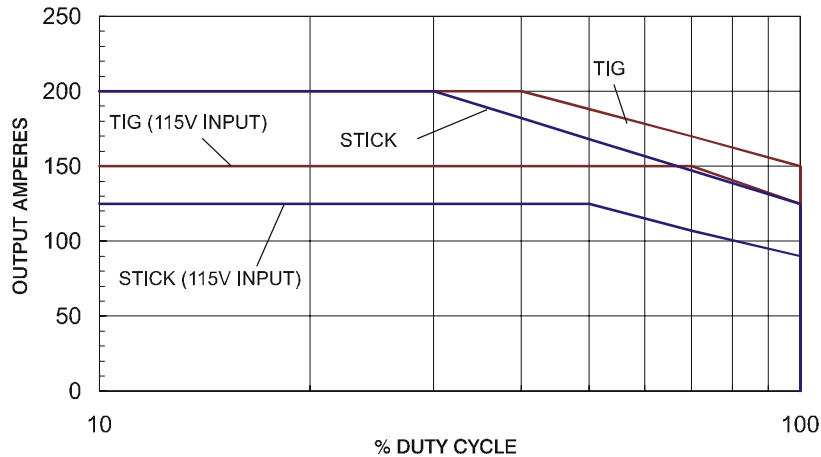
Amperage setting must be reduced to obtain currents less than highlighted data point.

ST- 189 767-A

4-3. Duty Cycle And Overheating



MAXSTAR 200 DUTY CYCLE CHART



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.

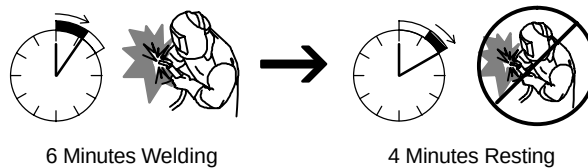
▲ Exceeding duty cycle can damage unit and void warranty.

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

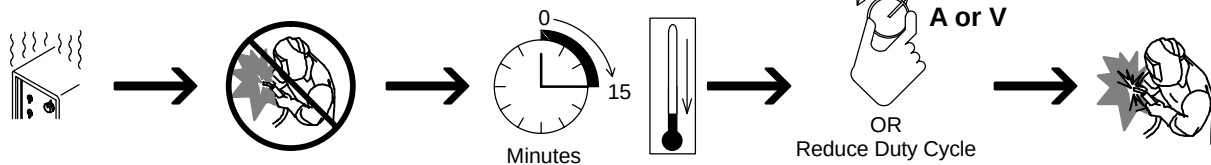
125 A @ 100% Duty Cycle For 115 Volt Single-Phase TIG Process

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

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



Overheating



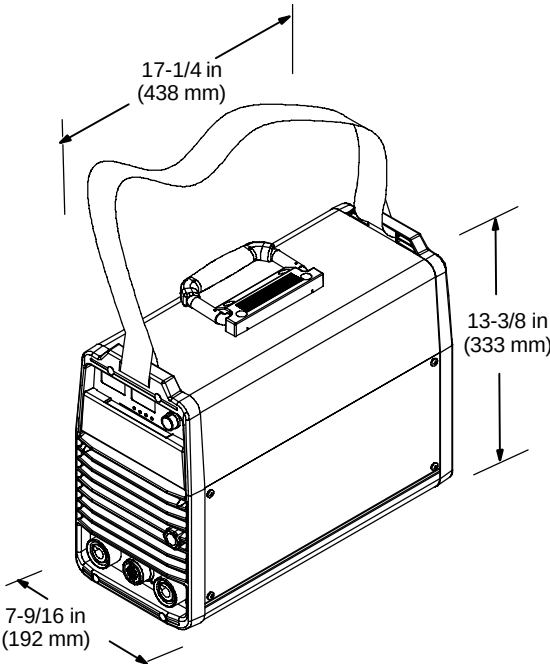
ST-189 770-A

4-4. Selecting A Location



Dimensions And Weight

34.7 lb (15.7 kg) - without power cord
37.3 lb (16.9 kg) - with power cord

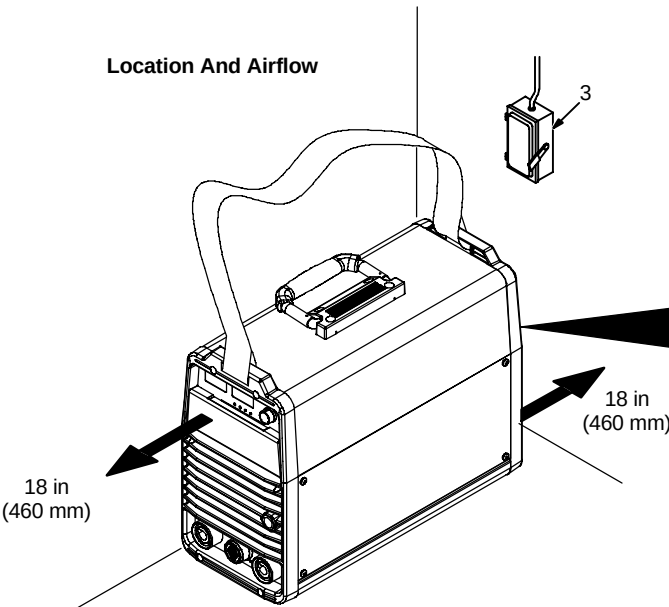


- 1 Identification Plate
- 2 Rating Label
- 3 Line Disconnect Device

Locate unit near correct input power supply.

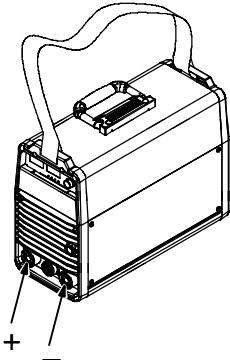
▲ Special installation may be required where gasoline or volatile liquids are present – see NEC Article 511 or CEC Section 20.

Location And Airflow



				EN 60974-1				
	1A 10V		200A 18V				U _i =115V	
	X		40%	60%	100%	70%	100%	
	I ₂		200	175	150	150	125	
	U ₀ 80V		U ₂	18	17	16	16	15
	1A 20V		200A 28V				U _i =115V	
	X		40%	60%	100%	50%	80%	
	I ₂		175	150	125	125	100	
	U ₀ 80V		U ₂	27	26	25	25	24
			I ₁ max			I ₁ eff		
1 ~	50/60 Hz	U _i =115V	35			25		
1 ~	50/60 Hz	U _i =230V	31			17		
3 ~	50/60 Hz	U _i =230V	19			11		
3 ~	50/60 Hz	U _i =400V	11			6		
3 ~	50/60 Hz	U _i =460V	9			5		
IP23								

4-5. Weld Output Terminals And Selecting Cable Sizes*

 ▲ Turn off power before connecting to weld output terminals. ▲ Do not use worn, damaged, undersized, or poorly spliced cables.	Weld Cable Size** and Total Cable (Copper) Length in Weld Circuit Not Exceeding							
	Welding Amperes***	100 ft (30 m) Or Less	150 ft (45 m)	200 ft (60 m)	250 ft (70 m)	300 ft (90 m)	350 ft (105 m)	400 ft (120 m)
		10 – 60% Duty Cycle	60 – 100% Duty Cycle	10 – 100% Duty Cycle				
 Output Receptacles	100	4 (20)	4 (20)	4 (20)	3 (30)	2 (35)	1 (50)	1/0 (60)
	150	3 (30)	3 (30)	2 (35)	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)
	200	3 (30)	2 (35)	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)

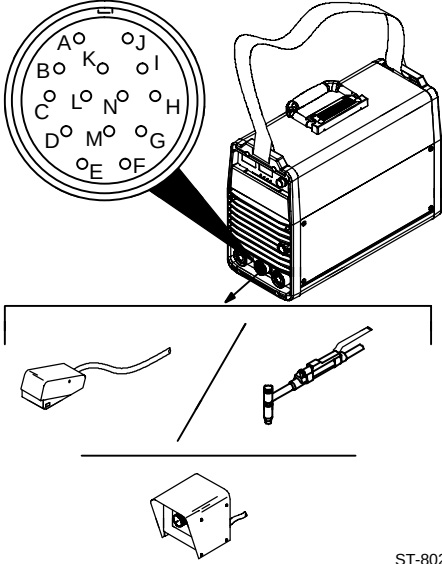
* This chart is a general guideline and may not suit all applications. If cable overheating occurs (normally you can smell it), use next size larger cable.

**Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of at least 300 circular mils per ampere.
() = mm² for metric use

***Select weld cable size for pulsing application at peak amperage value.

S-0007-E-

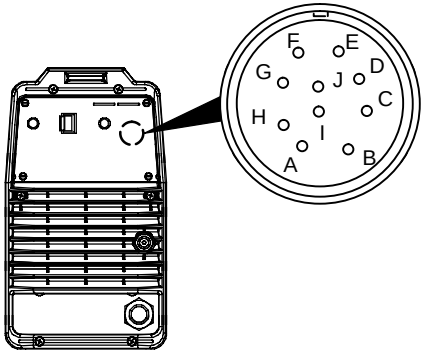
4-6. Remote 14 Receptacle Information

 ST-802 541	 REMOTE 14	Socket*	Socket Information
	15 VOLTS DC  OUTPUT CONTACTOR	A	Contactors 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.

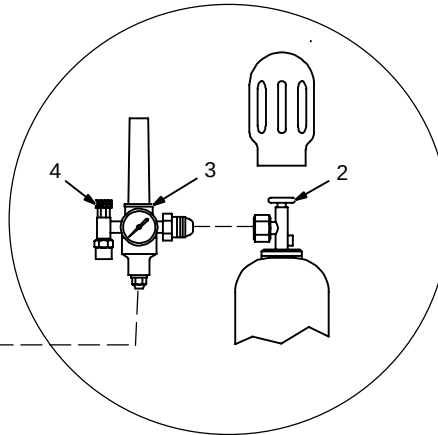
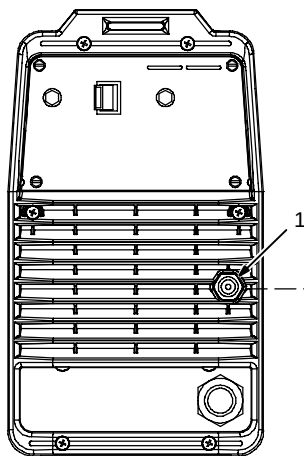
*The remaining sockets are not used.

Note: 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.

4-7. Automation 10-Pin Connection (LX Models)

 Ref. ST-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 <i>HELP 13</i> will be displayed on the meters.		
Outputs		
Outputs are isolated open-collector transistor which are able to conduct at least 6 mA of current, with a maximum of 100 mA of current and 30 VDC.		
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.		

4-8. 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.

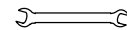
3 Regulator/Flowmeter

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.

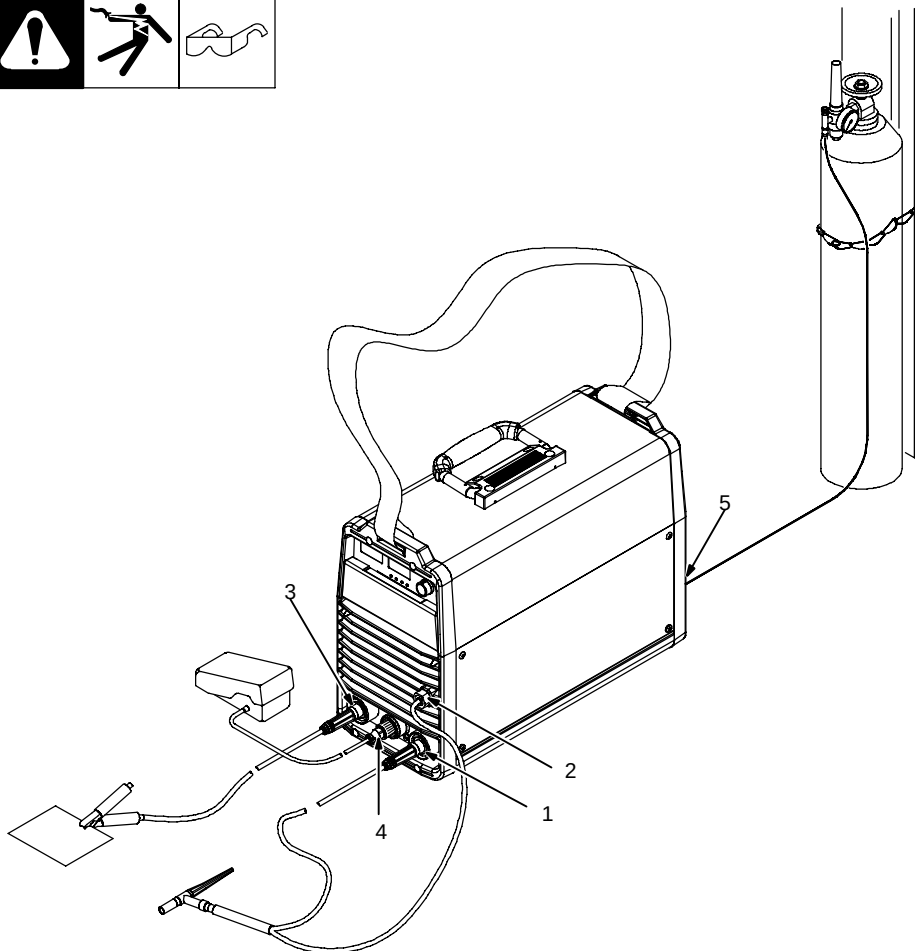
Tools Needed:



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

ST-802 452

4-9. 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.

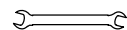
4 Remote 14 Receptacle

Connect desired remote control to Remote 14 receptacle.

5 Gas In Connection

Connect gas hose from gas supply to gas in fitting.

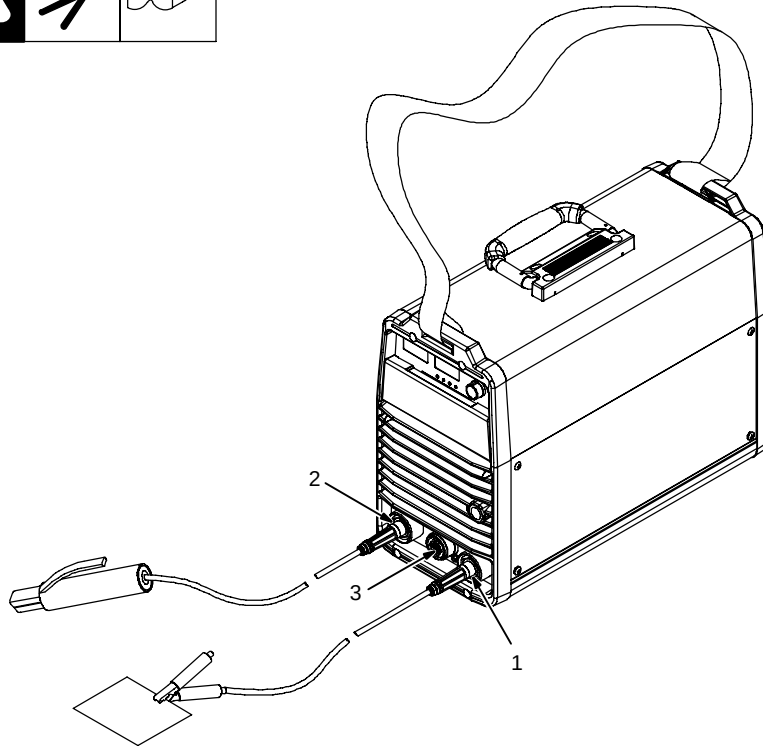
Tools Needed:



11/16 in, (21 mm)

Ref. ST-802 471

4-10. 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 4-6).

Ref. ST-802 471

4-11. Electrical Service Guide

NOTE

Actual input voltage cannot exceed - 10% of minimum or +10% of maximum input voltages indicated in table.

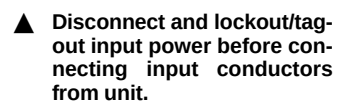
Input Voltage	Single-Phase, 100% Duty Cycle	Single-Phase, 60% Duty Cycle	Three-Phase, 60% Duty Cycle		
	115	230	230	400	460
Input Amperes At Rated Output	25	22	13.1	7.4	6.4
Max Recommended Standard Fuse Rating In Amperes ¹ Normal Operating ²	35	30	20	10	10
Min Input Conductor Size In AWG/Kcmil	10	12	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/Kcmil	10	12	14	14	14

Reference: 1999 National Electrical Code (NEC)

1 Choose a circuit breaker with time-current curves comparable to a time delay fuse. Time delay fuses are UL class RK5.

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

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



- Check input voltage available at site.

- See Section 4-11.

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

Connect black, white, and red wires (L1, L2, L3) to line terminals.

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

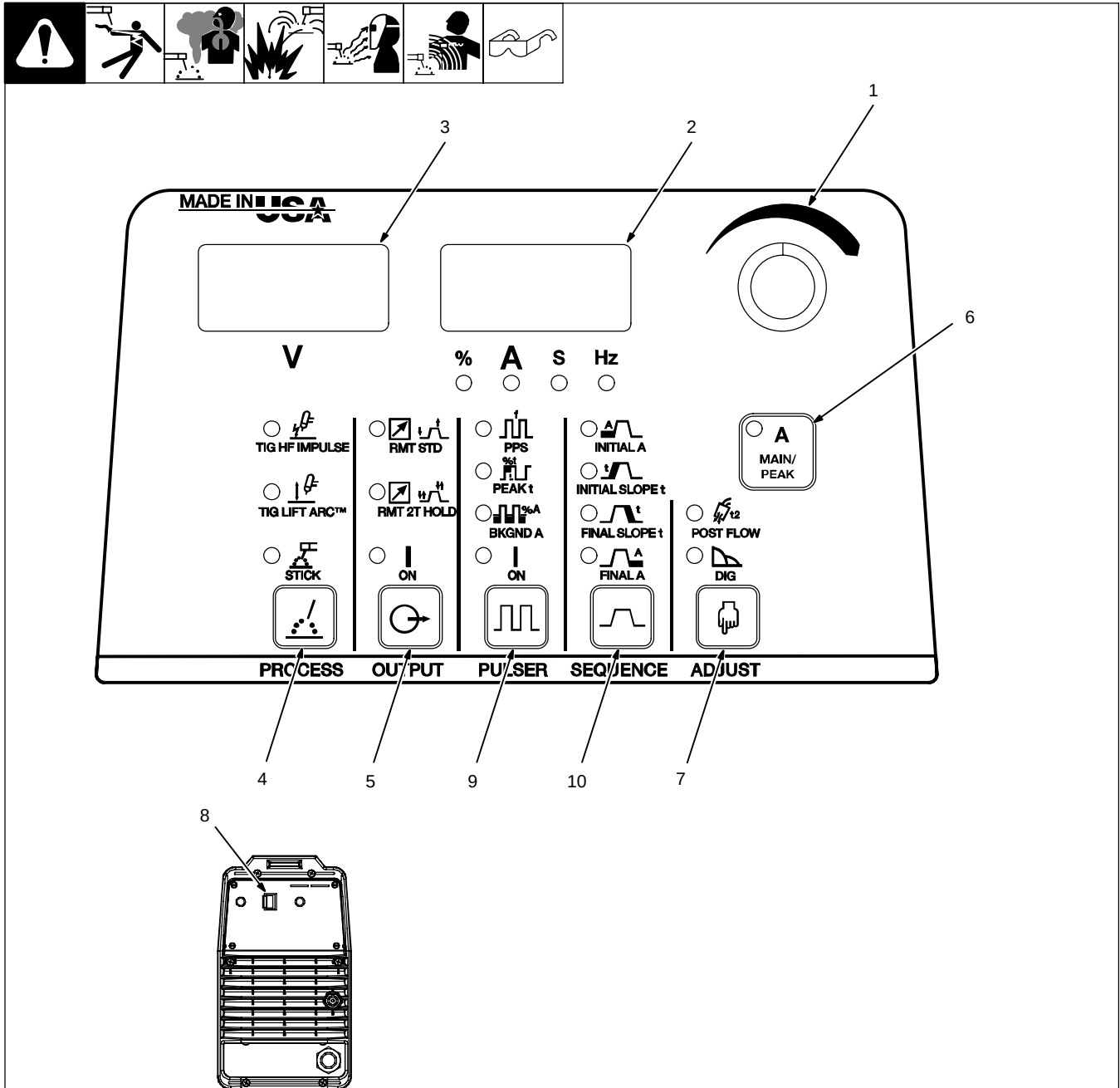
- 3 Black And White Input Conductor
- 4 Red Input Conductor
- 5 Insulation Sleeving
- 6 Electrical Tape

Insulate and isolate red conductor as shown.

Note: 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.

SECTION 5 – OPERATION

5-1. Controls



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

NOTE: Green on nameplate indicates a TIG function, 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 5-7.

5 Output Controls

See Section 5-8.

6 Amperage And Spot Time Control

For Amperage control, see Section 5-3.

For Spot Time control, see Section 5-13.

7 Adjust Controls

See Section 5-11.

8 Power Switch

Use switch to turn unit On/Off.

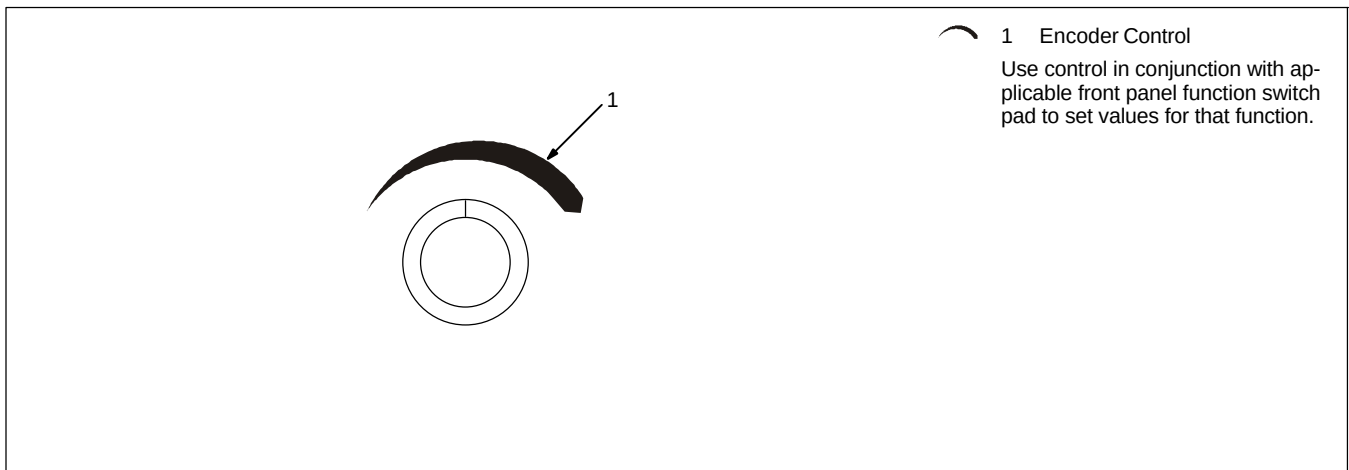
9 Pulser Controls (DX And LX Models)

See Section 5-9.

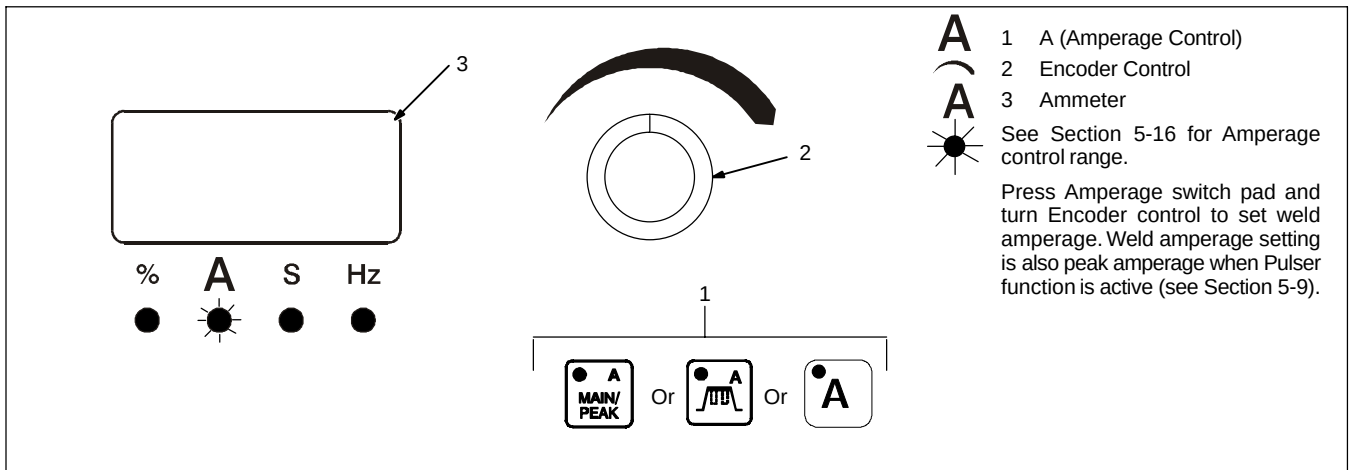
10 Sequencer Controls (DX, LX And All CE Models)

See Section 5-10.

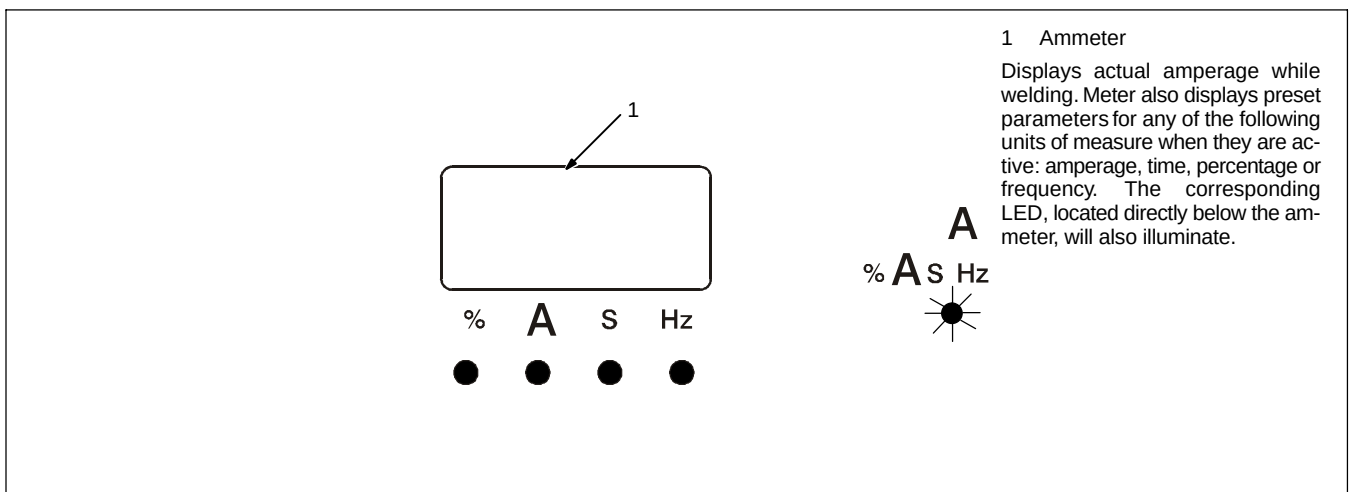
5-2. Encoder Control



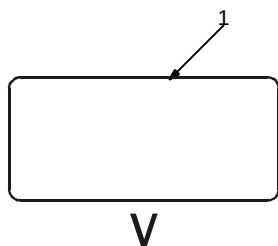
5-3. Amperage Control



5-4. Ammeter And Parameter Display



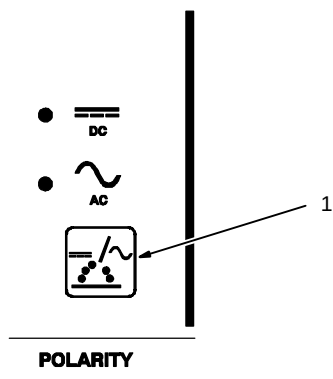
5-5. Voltmeter



V 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. Polarity Control (Dynasty™ Models Only)



1 Polarity Control

Press switch pad until desired LED is illuminated.

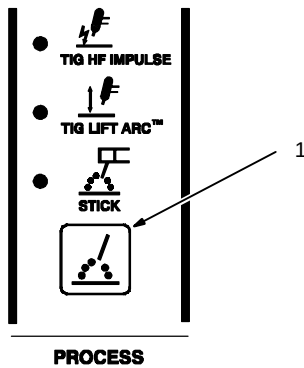


DC - Machine is set to DCEN (direct current electrode negative) for TIG welding, and to DCEP (direct current electrode positive) for Stick welding.



AC - Use AC (alternating current) for TIG and Stick welding.

5-7. 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 11-3) arc starting method is activated. This method can be used with either AC or DC TIG welding. Make connections according to Section 4-9.

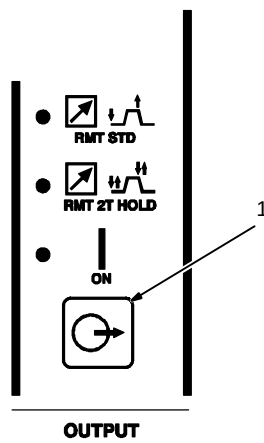


TIG Lift-Arc™ - When selected, is an arc starting method in which the electrode must come in contact with the workpiece to initiate an arc (see Section 11-3). This method can be used with either AC or DC TIG welding. Make connections according to Section 4-9.



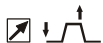
Stick (SMAW) - This method can be used with either AC or DC Stick welding. Make connections according to Section 4-10.

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 6-2A).

NOTE: 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.

NOTE: 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 6-2B).

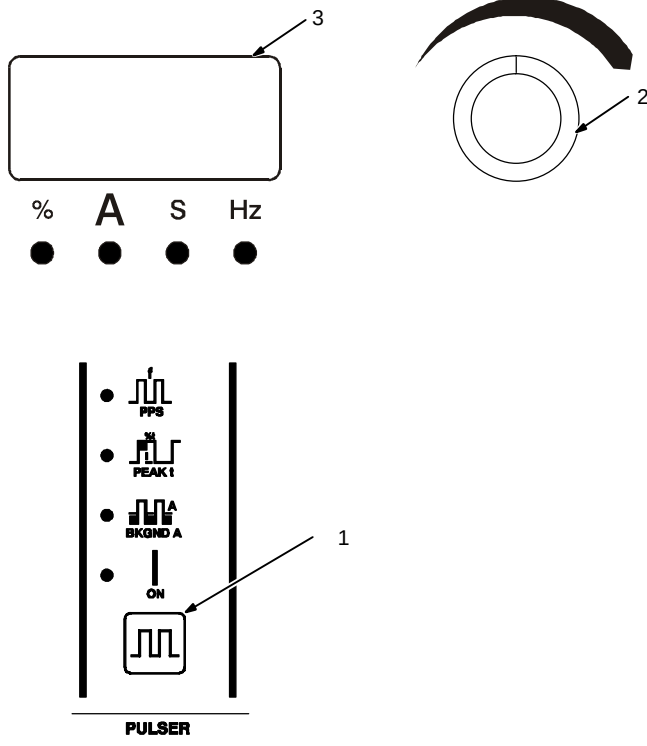
NOTE: This switch function can be re-configured for 4T, 4T Momentary, Mini Logic, or Spot control See Section 6-2C)

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 6-2H).

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



Percent (%) Peak Time Control Setting		Pulsed Output Waveforms
Balanced	(50%)	
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 5-7) 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 5-16 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.

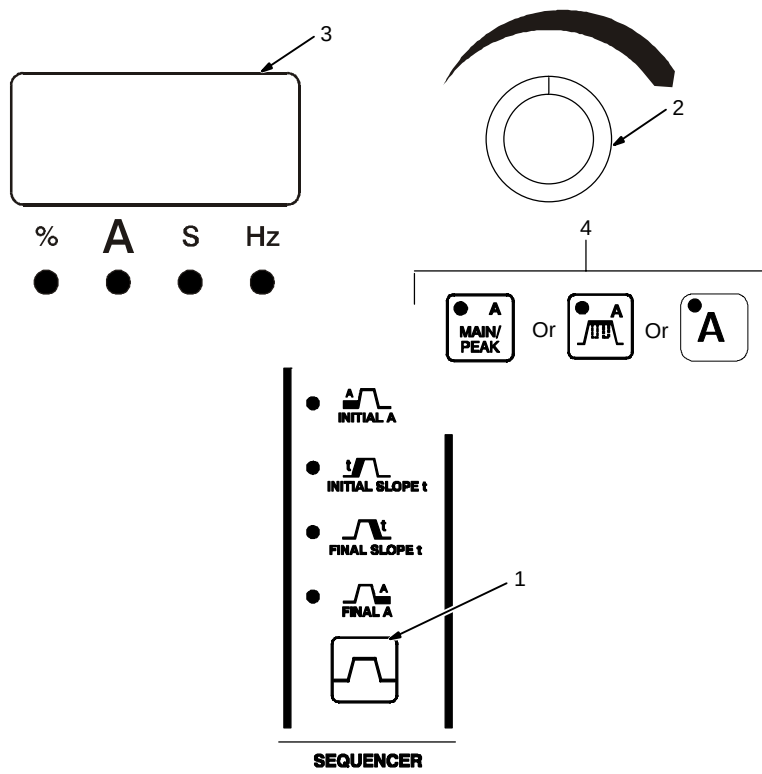
NOTE: Peak amperage is set using the Amperage control (see Section 5-3). Peak amperage is the highest welding amperage allowed to occur in the pulse cycle. Weld penetration varies directly with peak amperage.

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, LX And All CE Models)



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 5-7) 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 5-16 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.

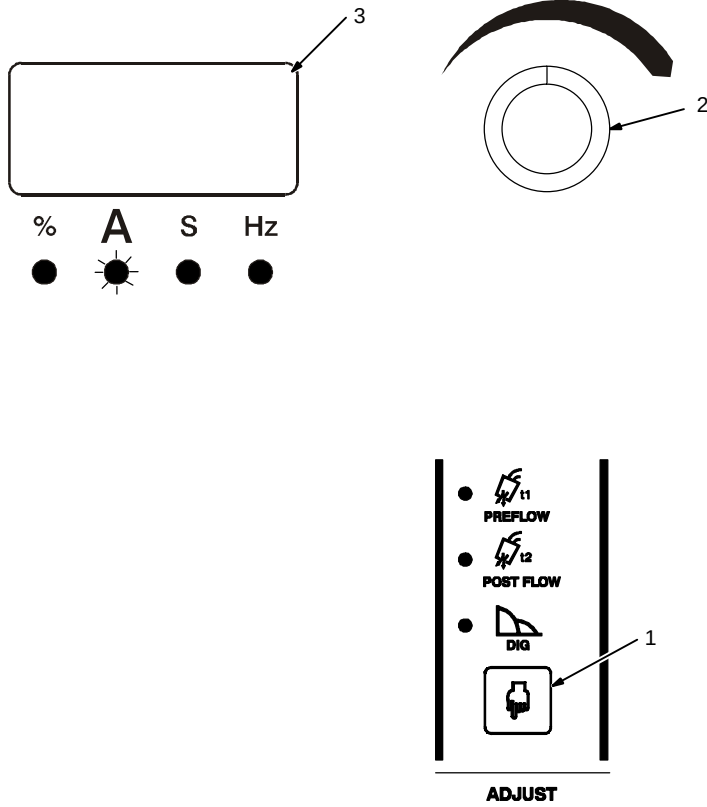
Application:

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 (see Section 5-2) 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 5-16 for all Adjust parameter ranges.



PREFLOW - If the TIG HF process is active (see Section 5-7) 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 5-15.

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 5-7), use control to set length of time gas flows after welding stops.

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 DC Stick process is active (see Section 5-7), 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.

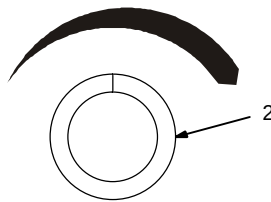
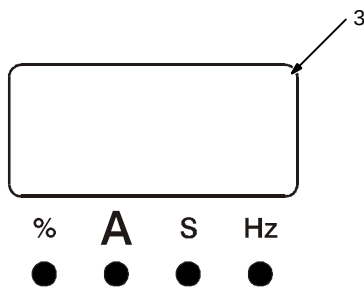
PURGE - While in the TIG process (see Section 5-7), to activate the gas valve and start the purge function, push and hold the Adjust switch pad for the desired amount of purge time. To set from 0 to 50 seconds of additional purge time, continue to hold the Adjust switch pad while turning the encoder 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 contaminants.

5-12. AC Waveshape (Dynasty Models Only)



- 1 AC Waveshape
- 2 Encoder Control
- 3 Ammeter

Turn encoder (see Section 5-2) to set appropriate value for active AC Waveshape parameter. Value selected is shown on the ammeter (see Section 5-4).

See Section 5-16 for all AC Waveshape parameter ranges.

Balance: AC Balance Control is enabled only if AC TIG process is selected. Use control to set percentage of time polarity is electrode negative.

Application:

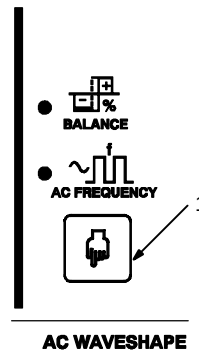
When welding on oxide forming materials such as aluminum or magnesium, excess cleaning is not necessary. To produce a good weld, only a minimal amount, approximately a 0.10 in (2.5mm) of etched zone along the weld toes is required.

Joint configuration, set-up, process variables, and oxide thickness may affect setting.

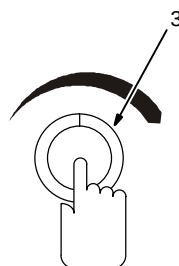
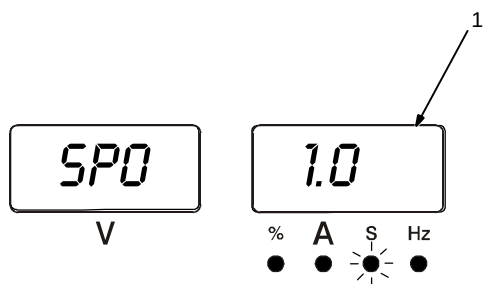
AC Frequency: AC Frequency Control is enabled only if AC TIG process is selected. Use control to set AC frequency (cycles per second).

Application:

AC frequency controls bead width and directional control. As AC frequency decreases, weld bead/puddle gets wider. As AC frequency increases, weld bead/puddle becomes narrower and the arc becomes more focused. Travel speed can increase as AC frequency increases.



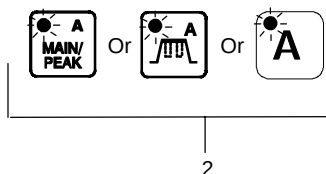
5-13. Spot Time Control (Reconfigured RMT 2T HOLD Output Selection) (All Models)



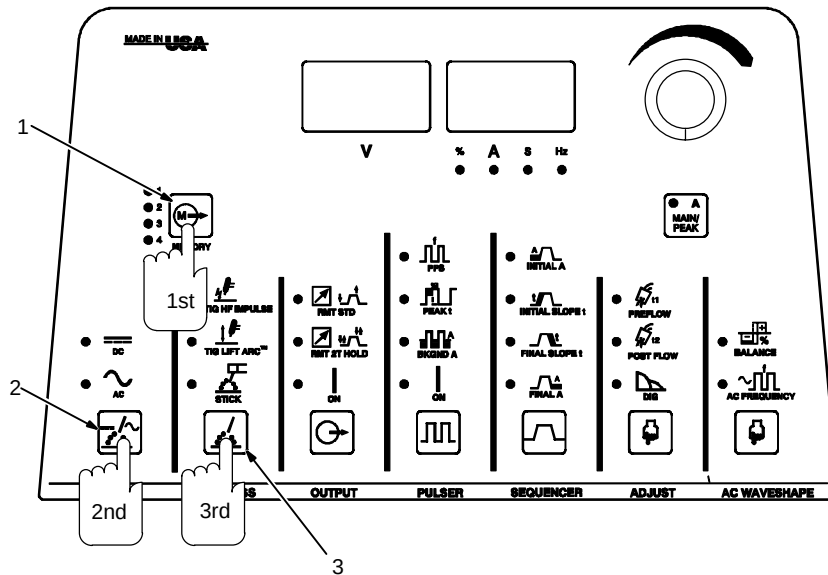
- 1 Spot Time Meter Display
- 2 Amperage Switch Pad
- 3 Encoder Control

Set spot parameters as follows: Press Amperage switch pad once (meter A LED turns on) and turn Encoder to set spot amperage. Press Amperage switch pad again, (meter S LED lights) and turn Encoder to set spot time (.1-25 seconds). Factory default setting is 1 second.

Application: To provide a timed weld. Used for tacking, and thin sheet joining.



5-14. Memory (Program Storage Locations 1-4) (DX And LX Models If Available)



- 1 Memory (Program Storage 1-4) Switch Pad
- 2 Polarity Switch Pad
- 3 Process Switch Pad

To create, change, or recall a welding parameters program, proceed as follows:

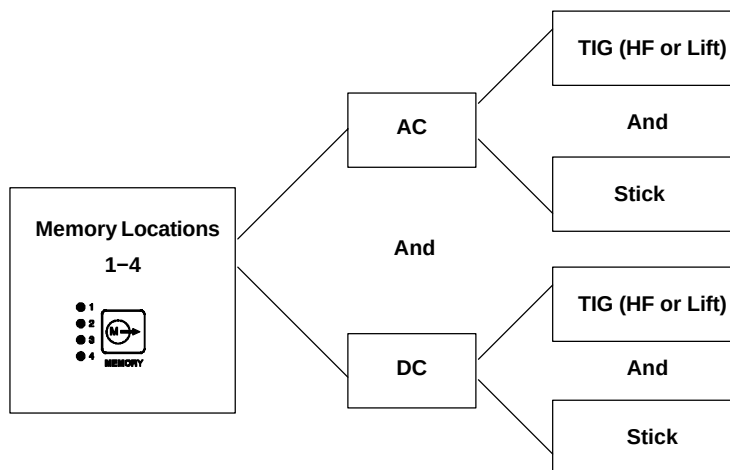
First, press Memory switch pad until the desired program storage location (1-4) LED is illuminated

Second, press Polarity switch pad until the desired polarity, AC or DC, LED is illuminated

Third, press Process switch pad until desired process, TIG HF Impulse, TIG Lift Arc, or Stick, LED is illuminated.

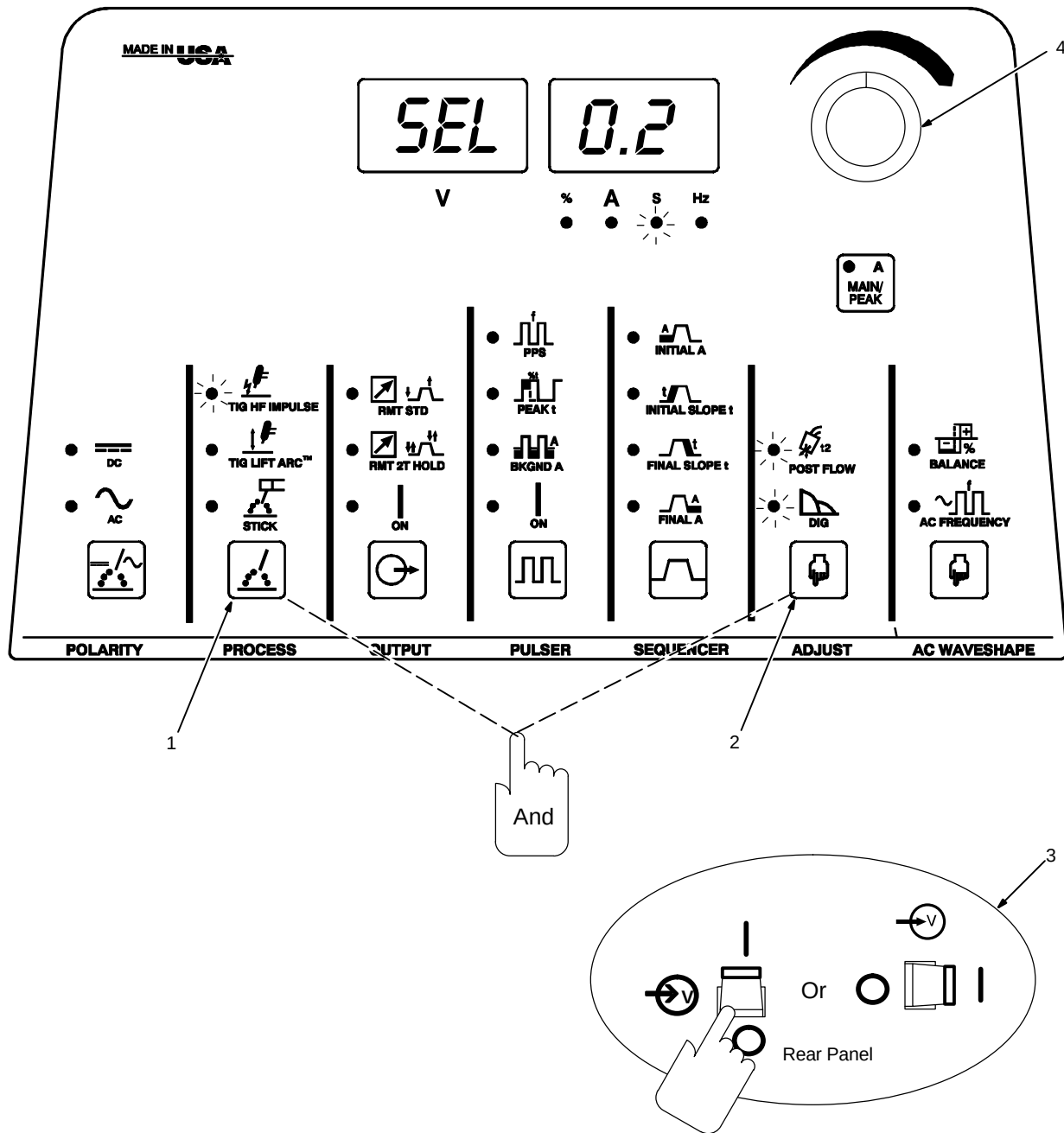
The program at the chosen location, for the desired polarity and process, is now the active program.

Fourth, change or set all desired parameters (see Section 5-1 for parameters).



Each memory location (1 thru 4) can store parameters for both polarities, and each polarity can store parameters for both process (TIG or Stick) for a total of 16 programs.

5-15. Setting Preflow Time For Use With TIG HF Impulse On Models That Do Not Have A Preflow Control On The Front Panel



- 1 Process Control Pad
- 2 Adjust Control Pad
- 3 Power Switch

To adjust preflow, turn power switch on, and then press the Process and Adjust switch pads before the software version clears the meters, and hold the switch pads until software version clears the meters.

Upon power up as described, the TIG Impulse, Postflow, DIG, and meter S LED's turn on, and the factory default setting [SEL] [0.2] will be displayed.

- 4 Encoder Control

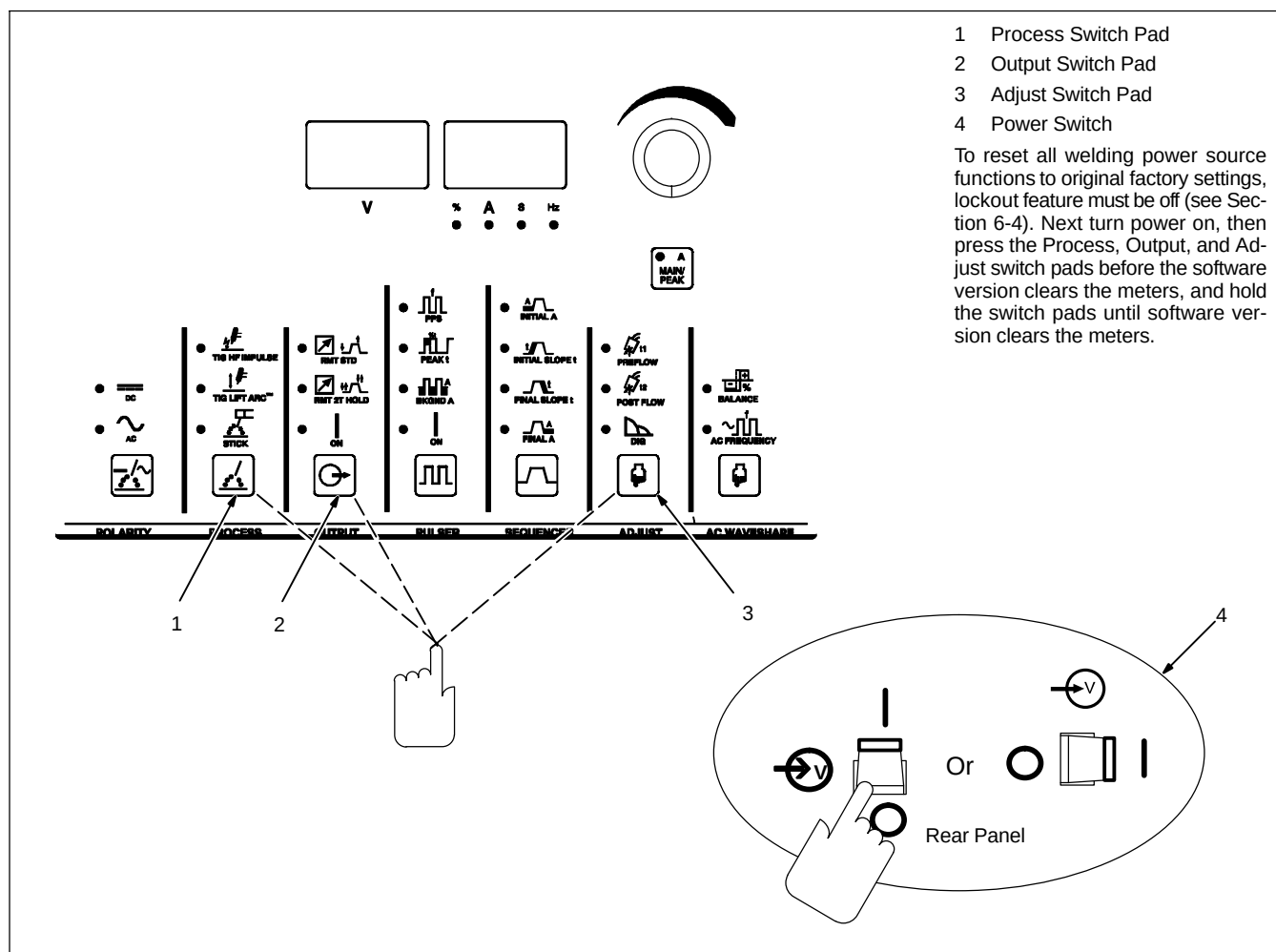
Turn encoder to select from 0 to 25 seconds of preflow. The value selected is displayed on the ammeter.

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

5-16. Factory Parameter Defaults And Range And Resolution

Parameter	Default	Range And Resolution
MEMORY	1	1–4
PROCESS ** Stick OCV	TIG HF Impulse Low OCV	TIG HF Impulse / TIG Lift / Stick Low OCV / Normal OCV
OUTPUT **RMT 2T	RMT STD 2T	RMT STD / RMT 2T / ON RMT 2T can be reconfigured for: 2T / 4T / Mini Logic / 4T Momentary / Spot (see Section 6-2C)
A MAIN / PEAK DC TIG DC STICK	150 A 110 A	1 – 200 Amps 1 – 200 Amps
Spot Time ***Weld Time	1.0 S 0 S	0.1 – 25.0 Seconds Dual Range And Resolution 0.0 – 99.9 / 100 – 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
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 10.0 S 30%	0.0 – 25.0 Seconds 0.0 – 50.0 Seconds @ 0.2 Second Resolution 0 – 100 Percent
MAXSTAR: Amperage Time	25 A 1 mS	1 – 200 Amps 1 – 200 Milliseconds
** Parameter adjusted using a power up configuration only *** Parameter used with the automation option (LX models only)		

5-17. Resetting Unit To Factory Default Settings (All Models)



SECTION 6 – ADVANCED FUNCTIONS



6-1. Programmable TIG Start Parameters

A. Accessing Programmable TIG Start Parameters

NOTE: The welding cycle can be executed while in programmable start mode. Before accessing programmable TIG Start Polarity, Amperage, and Time modes, be sure that all procedures and parameters are established.

- 1 Process Switch Pad
- 2 Amperage Switch Pad
- 3 Power Switch
- 4 Memory Switch Pad (If Equipped)
- 5 Polarity Switch Pad (If Equipped)
- 6 Output Switch Pad

To access the programmable TIG Start Amperage and Time screens, turn power on, and then press the Process and Amperage switch pads before the software version clears the meters. Hold switch pads until software version clears the meters and (SEL) (EP) or (SEL) (EN) appears.

Press Memory switch pad to select desired memory location (see Section 5-14).

Press Polarity switch pad to select AC or DC (see Section 5-6).

Note: Each memory location and each polarity (AC or DC) has its own set of start parameters.

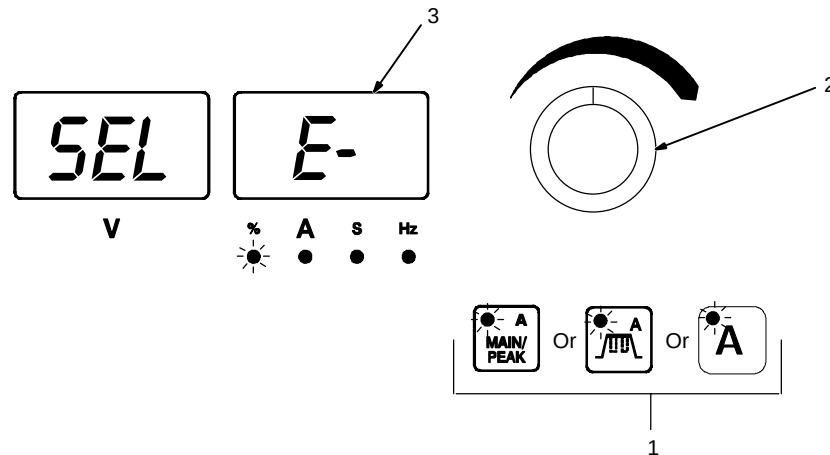
Press the Process switch pad to select the desired process, TIG HF Impulse or TIG Lift Arc, for your application (see Section 5-7). The parameter values are the same for both processes, and any changes made to the values in one process, are duplicated in the other process.

Press Output switch pad to select desired type of control (see Section 5-8).

Proceed to Section B, C and/or D.

To save changes and exit Advanced Functions, turn power off.

B. Changing Programmable TIG Start Polarity (Dynasty Models Only)



- A**
- 1 Amperage Switch Pad
 - 2 Encoder Control
 - 3 Amps Meter

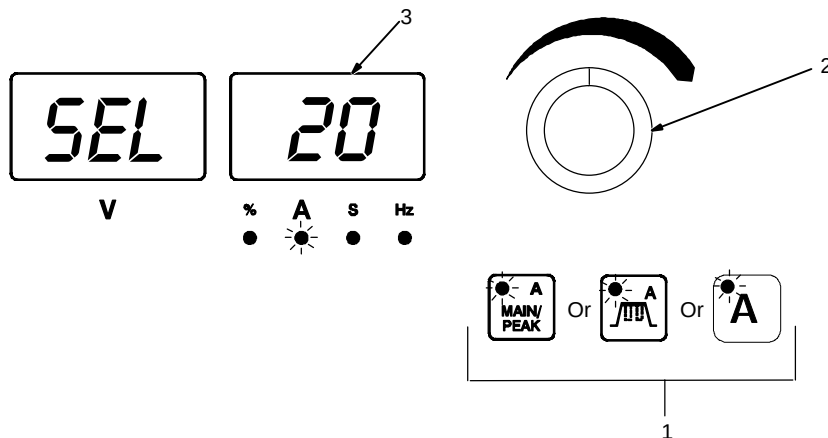
To adjust TIG Start Polarity proceed as follows:

Press Amperage switch pad. Switch pad LED turns on, and meter % LED turns on. The current Start Polarity, (SEL) (E-) or (SEL)

(EP) is displayed on meters, and can be adjusted (see Section 5-16) by turning the Encoder control.

To change Start Amperage, proceed to Section C.

C. Changing Programmable TIG Start Amperage (All Models)



- A**
- 1 Amperage Switch Pad
 - 2 Encoder Control
 - 3 Amps Meter

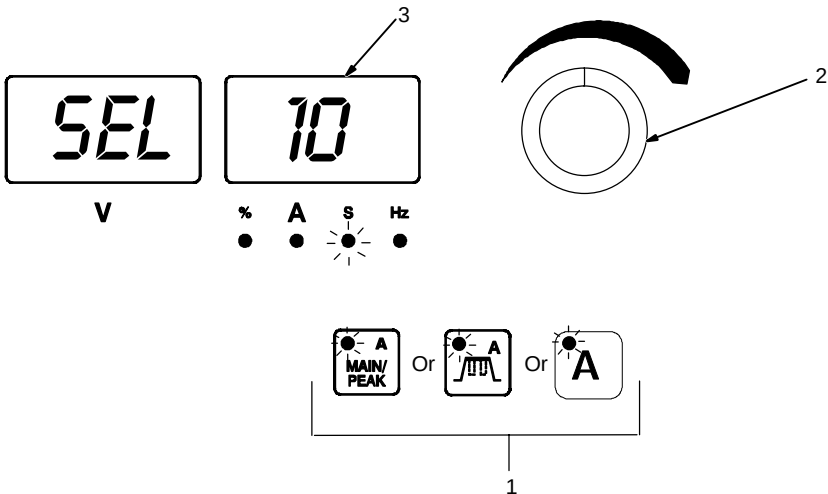
To adjust TIG Start Amperage proceed as follows:

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 5-16) by turning the Encoder control.

To change Start Time, proceed to Section D.

D. Changing Programmable Start Time (All Models)



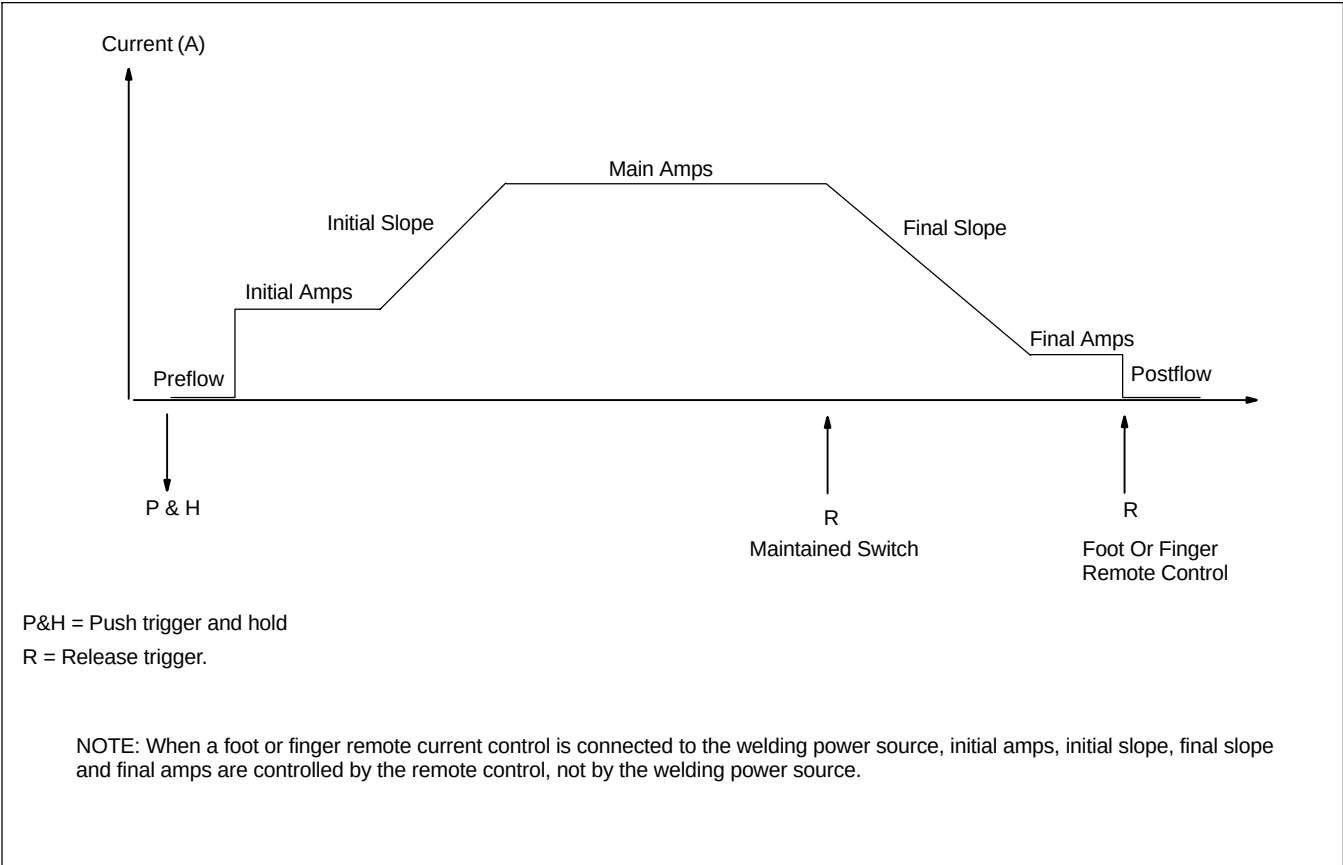
- A** 1 Amperage Switch Pad
2 Encoder Control
3 Amps Meter

To adjust Programmable Start Time proceed as follows:
Press Amperage switch pad, and meter S LED turns on. The current Start Time is

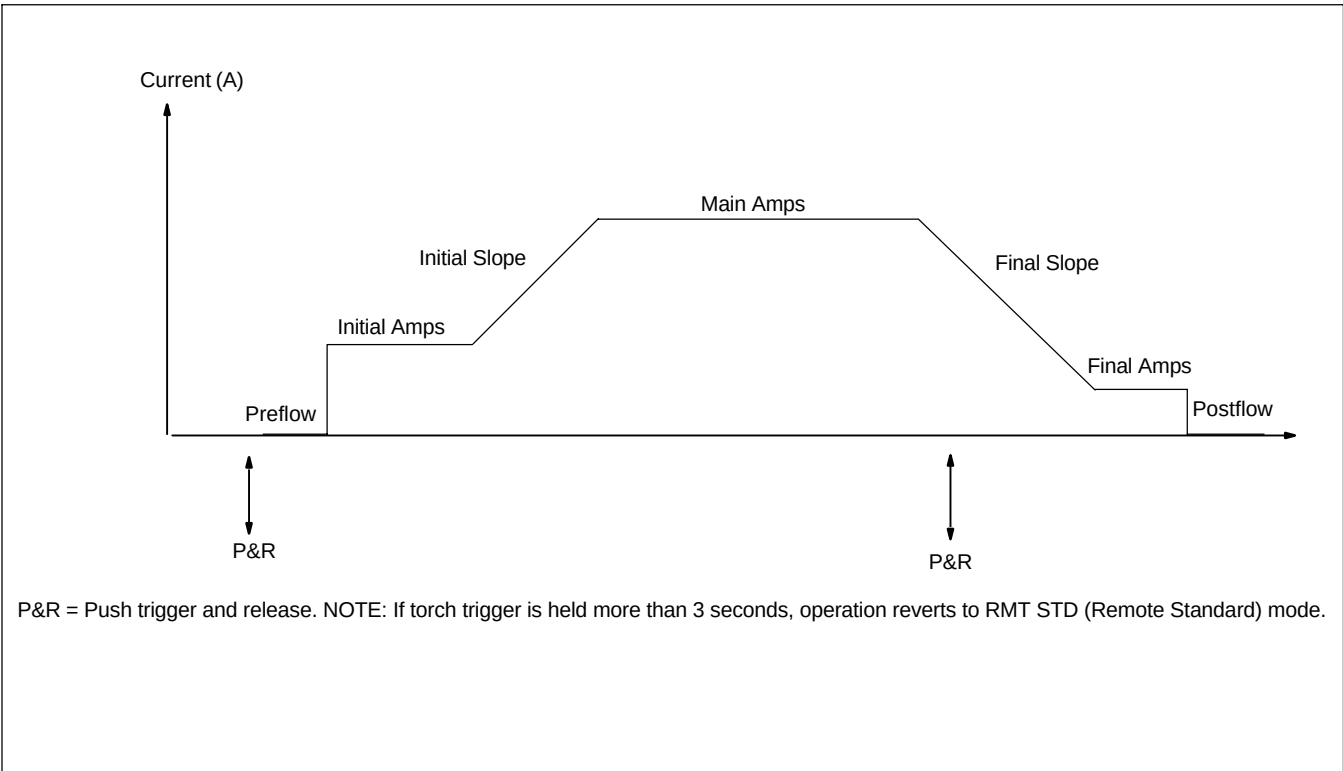
displayed on the amps meter, and can be adjusted by turning the Encoder control (see Section 5-16).

6-2. Output Control And Trigger Functions

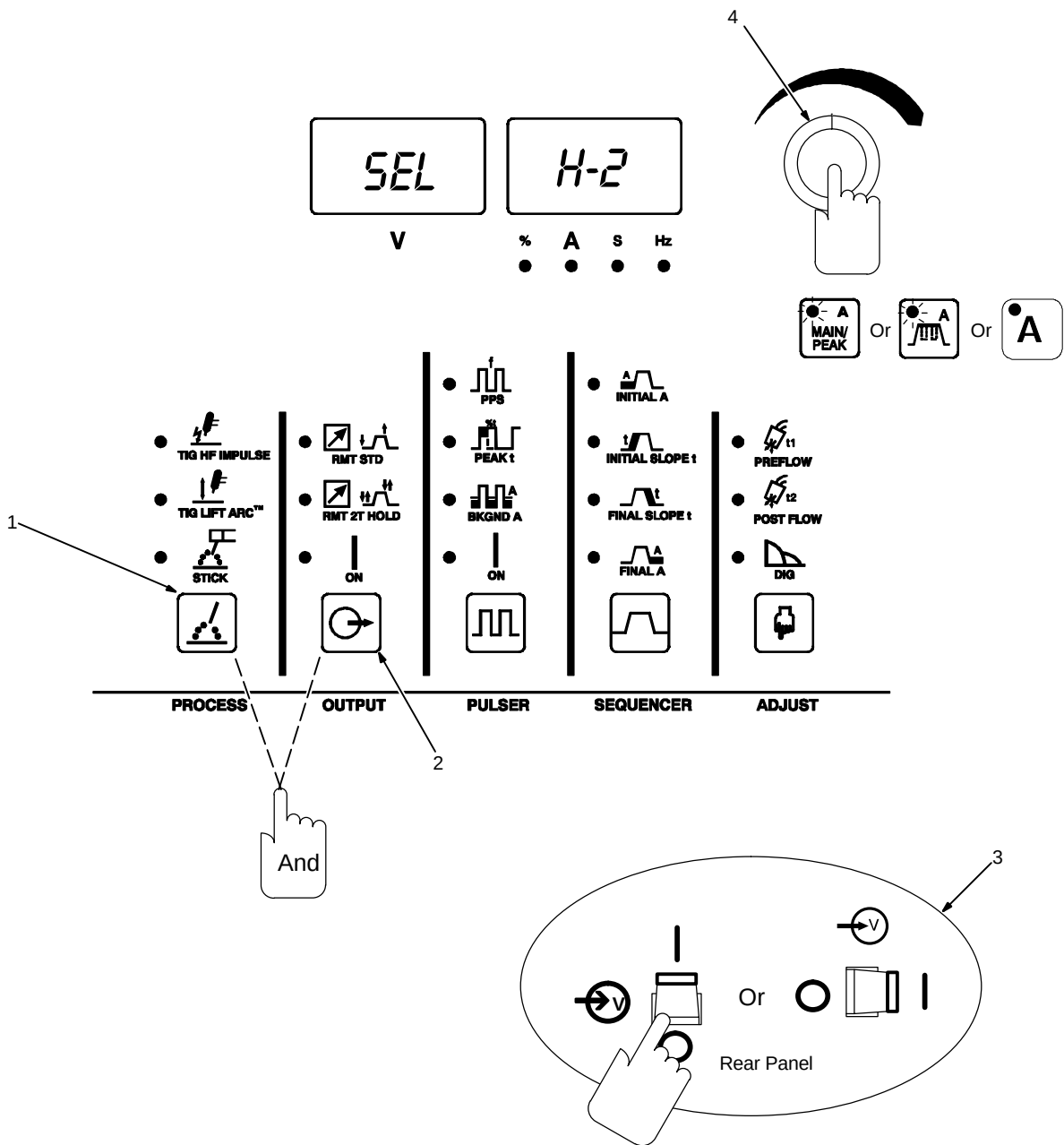
A. Remote (Standard) Torch Trigger Operation



B. Remote 2T Torch Trigger Operation



C. Reconfiguring RMT 2T HOLD For 2T, Spot, 4T, 4T Momentary, Or Mini Logic Control



For RMT STD (Remote Standard), RMT 2T Hold (Remote 2T Hold), and On trigger operation, see Section 6-2A, B, and H.



1 Process Switch Pad



2 Output Switch Pad



3 Power Switch

To access the RMT 2T HOLD reconfiguration screen, turn power switch on and then press the Process and Output switch pads before the software version clears the meters. Hold the switch pads until software version clears the meters and (SEL) (H-2), (SEL) (SPD), (SEL) (H-4), (SEL) (H4L), or (SEL) (H4E) appears.



4 Encoder Control

Turn Encoder to change functions. Active function will be displayed on amperage (right) meter.

5 Meter Displays

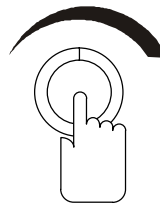
Meter displays for the different functions will be as shown.

Press torch trigger or turn power Off to save setting.

NOTE: After 2T has been reconfigured and one of the reconfigured functions is selected during normal operation, H-4, H4L, H4E or SPD will be displayed for 1 second as a reminder to the operator.

SEL
V

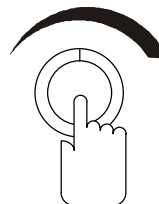
H-2
% A S Hz
● ● ● ●



= 2T (See Section 6-2B
for operation)

SEL
V

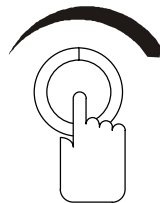
SPD
% A S Hz
● ● ● ●



= Spot (See Section 6-2G
for operation)

SEL
V

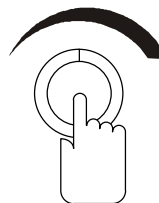
H-4
% A S Hz
● ● ● ●



= 4T (DX, LX and CE Models)
(See Section 6-2D
for operation)

SEL
V

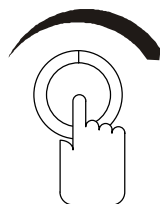
H4L
% A S Hz
● ● ● ●



= Mini Logic (DX, LX and
CE Models)
(See Section 6-2E
for operation)

SEL
V

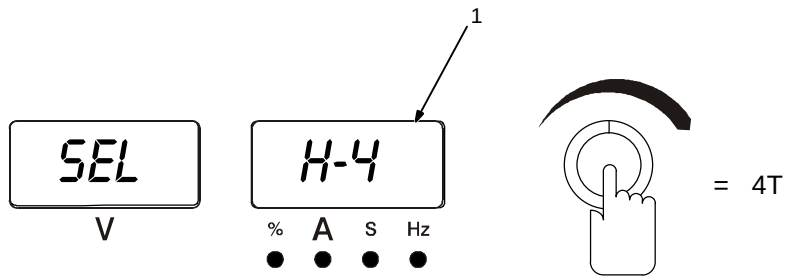
H4E
% A S Hz
● ● ● ●



= 4T Momentary
(DX, LX and CE Models)
(See Section 6-2F
for operation)

5

D. 4T Specific Trigger Method (DX, LX And All CE Models)



1 4T (Specific Trigger Operation)

Sequencer is required to reconfigure for 4T.

Select 4T according to Section 6-2C.

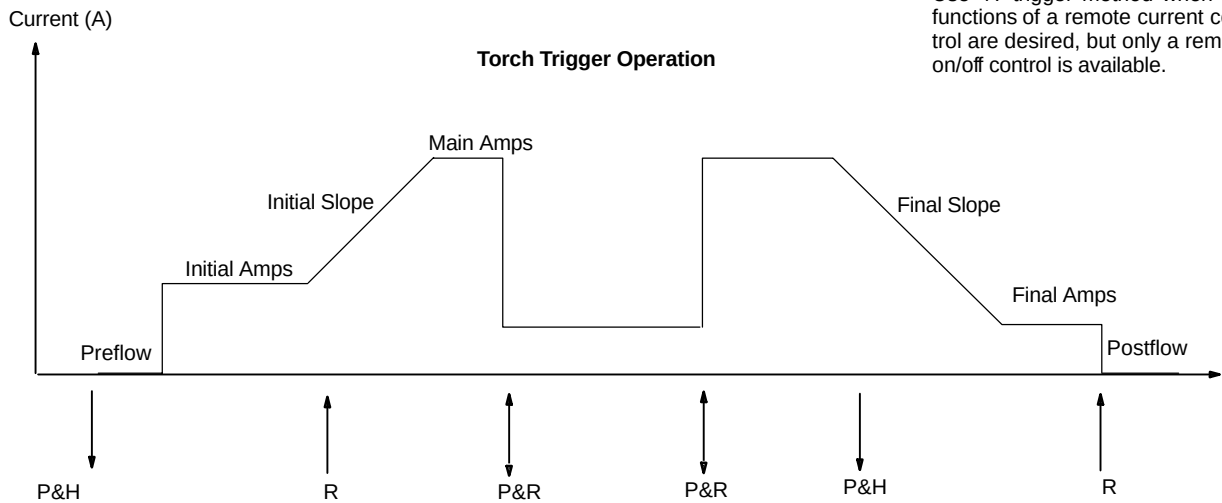
Torch trigger operation is as shown.

4T allows the operator to toggle between weld current and final current without breaking the arc.

NOTE: When a remote switch is connected to the welding power source, 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.

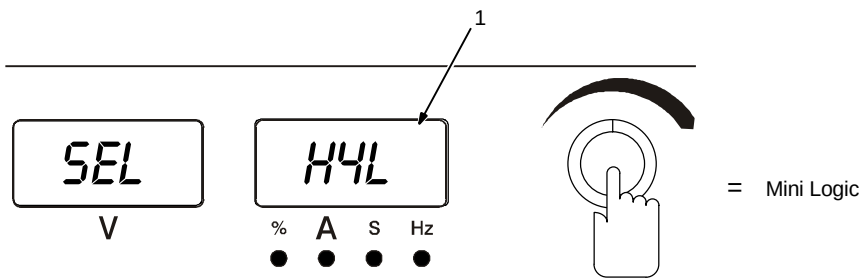


P&H = Push and hold trigger

R = Release trigger

P&R = Push trigger and release in less than 3/4 seconds

E. Mini Logic Operation (DX, LX And All CE Models)



1 Mini Logic Meter Display

Select Mini Logic according to Section 6-2C.

Torch trigger operation is as shown.

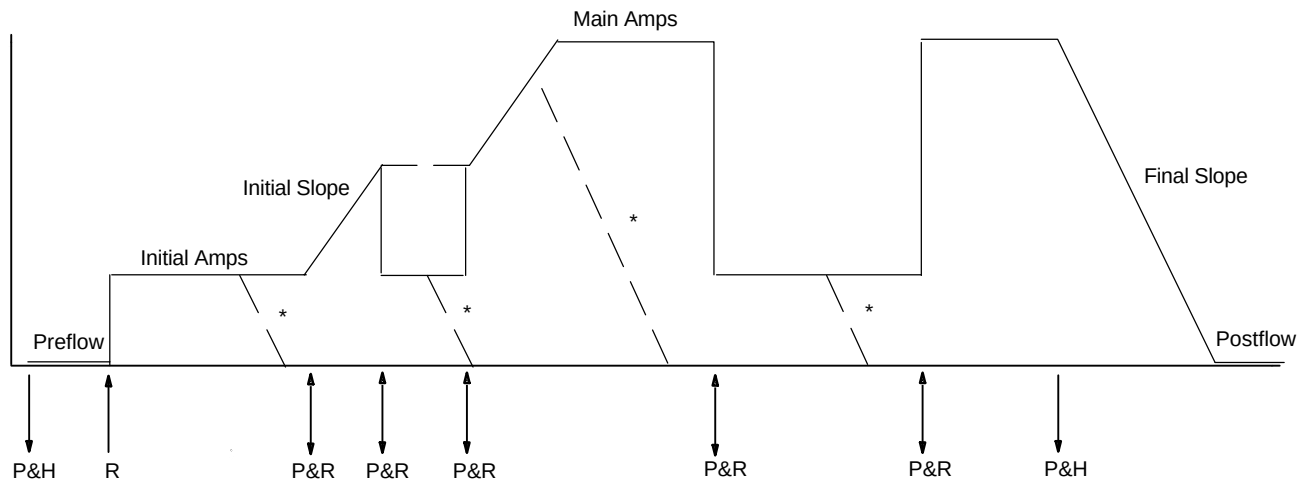
While in mini logic, the operator may use the trigger on the remote device to toggle between initial slope or main amps and initial amps as illustrated.

During Mini Logic, Final Amperage is not available. Final slope will always slope to minimum amperage and end the cycle.

NOTE: 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



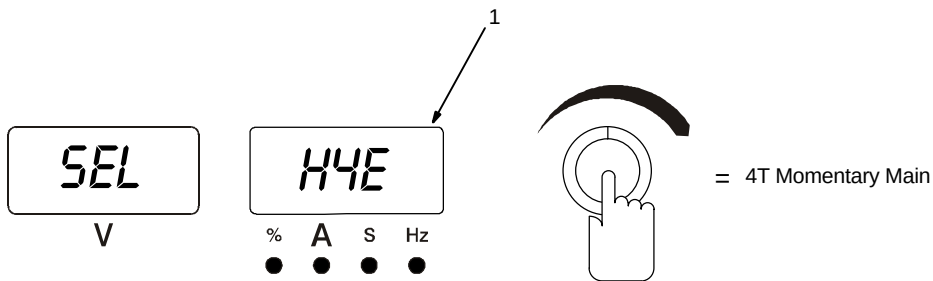
P&H = Push and hold trigger

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 (DX, LX And All CE Models)



1 4T Momentary Meter Display

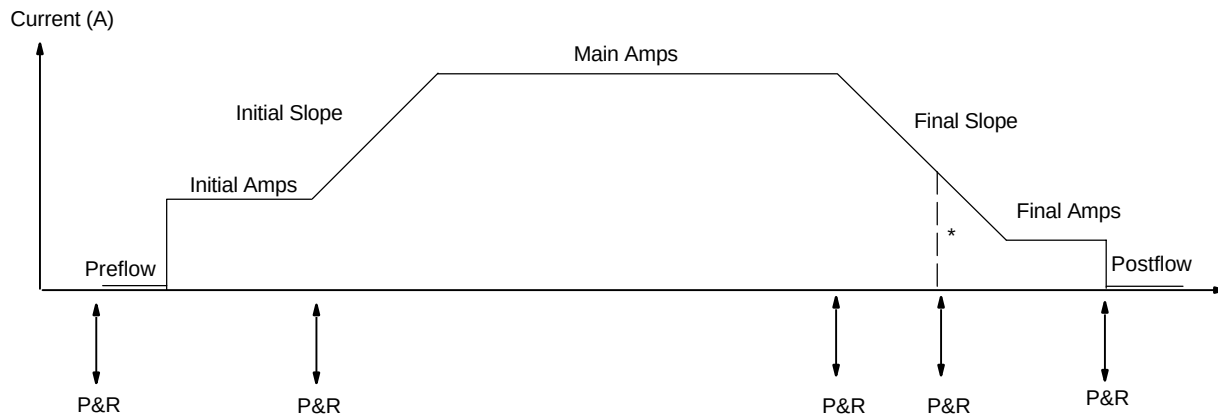
Select 4T Momentary according to Section 6-2C.

4T Momentary torch trigger operation is as shown.

NOTE: 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.

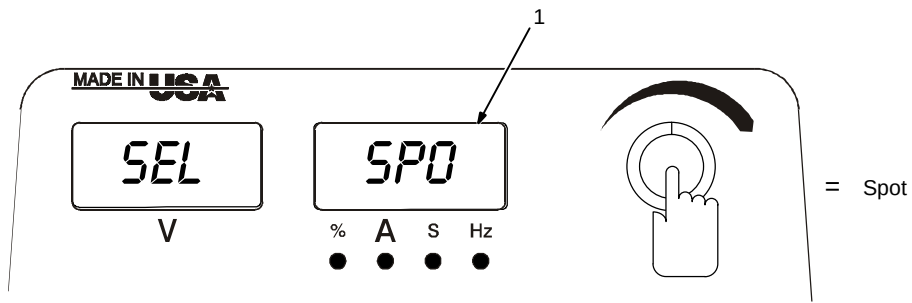


P&R = Push and release trigger.

* = Push and releasing during final slope will break the arc and go to postflow.

NOTE: For first torch trigger push & release, if trigger is held more than 3 seconds, trigger cycle ends

G. Spot Control Operation



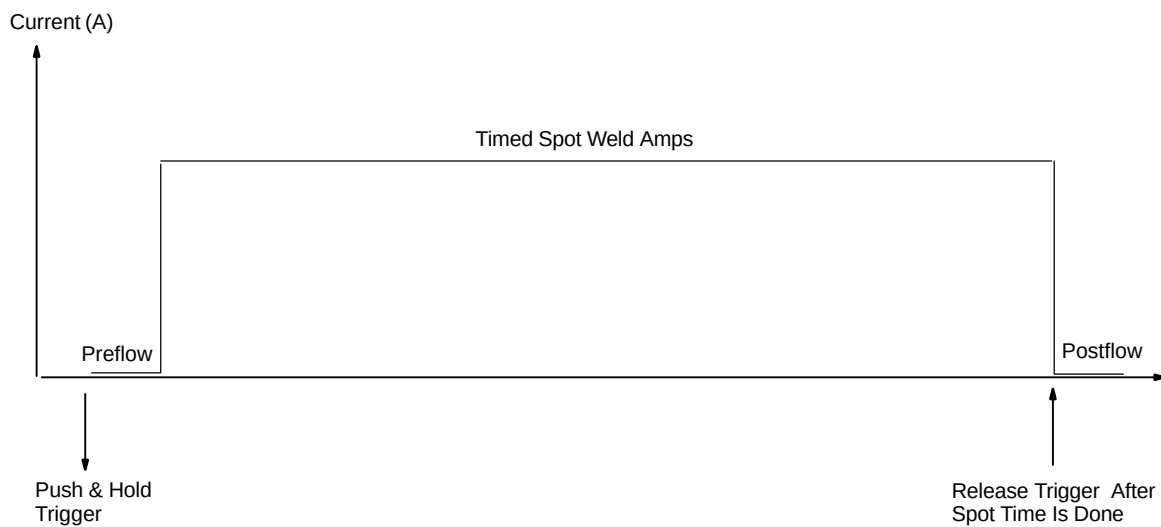
1 Spot Function Meter Display
Select Spot function according to Section 6-2C.

NOTE: While in Spot Control, Sequencer settings will be ignored and will not be programmable.

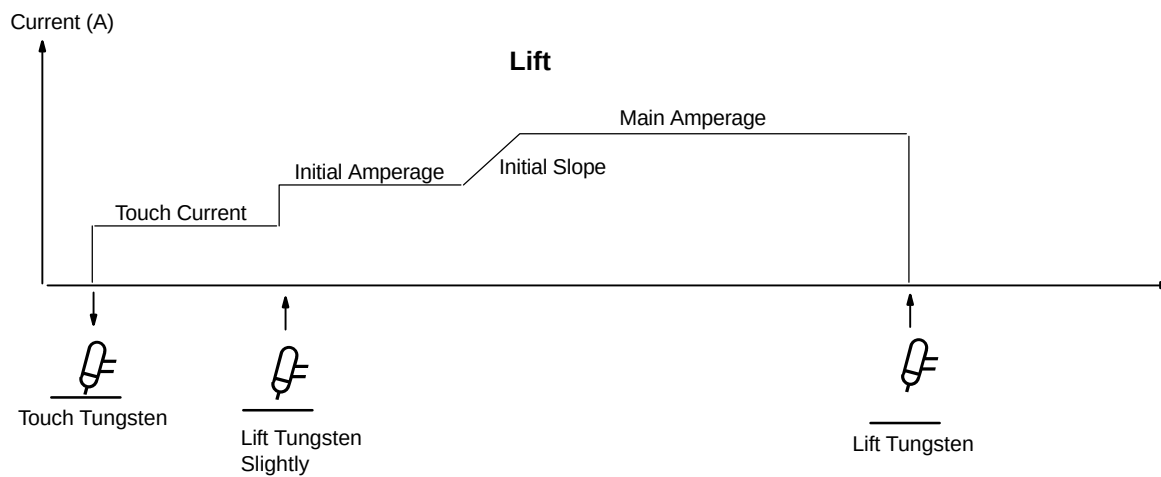
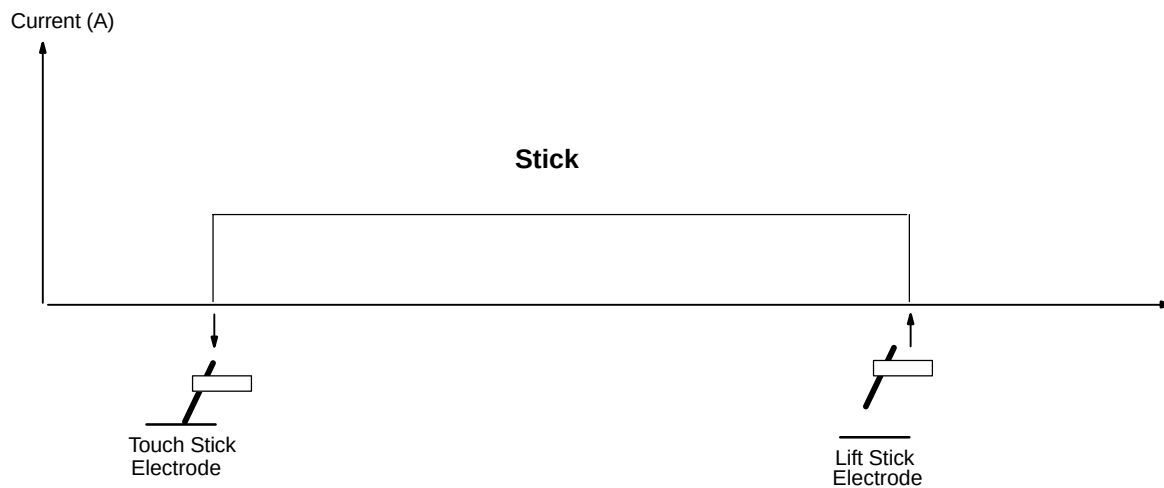
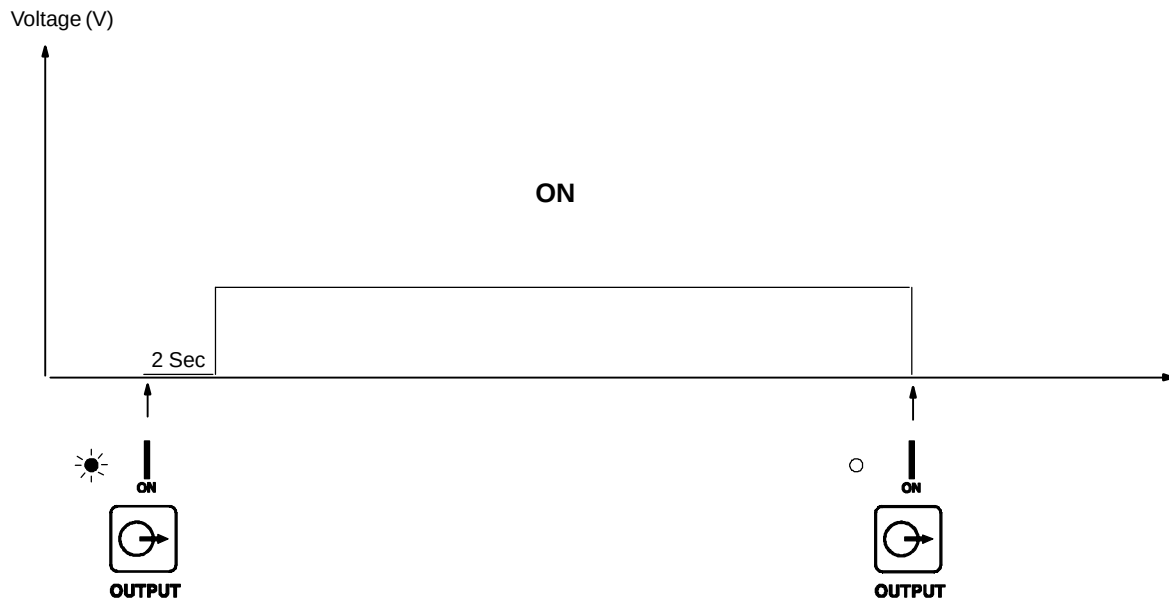
NOTE: When a remote switch is connected to the welding power source, use the remote switch to control the weld cycle. Amperage is controlled by the welding power source.

Torch trigger operation is as shown.

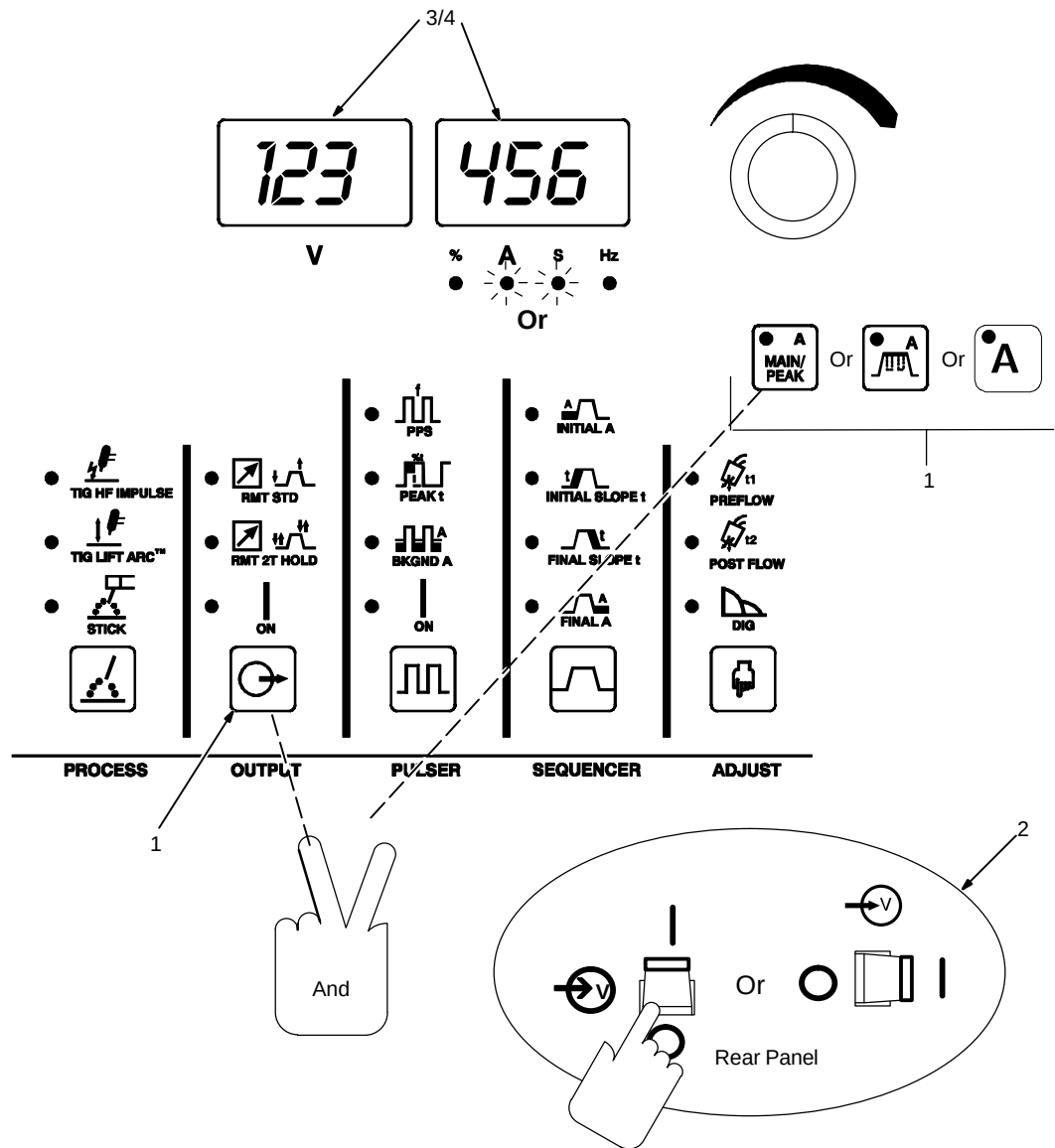
Application: To provide a timed weld. Used for tacking, and thin sheet joining.



H. On Trigger Operation



6-3. 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

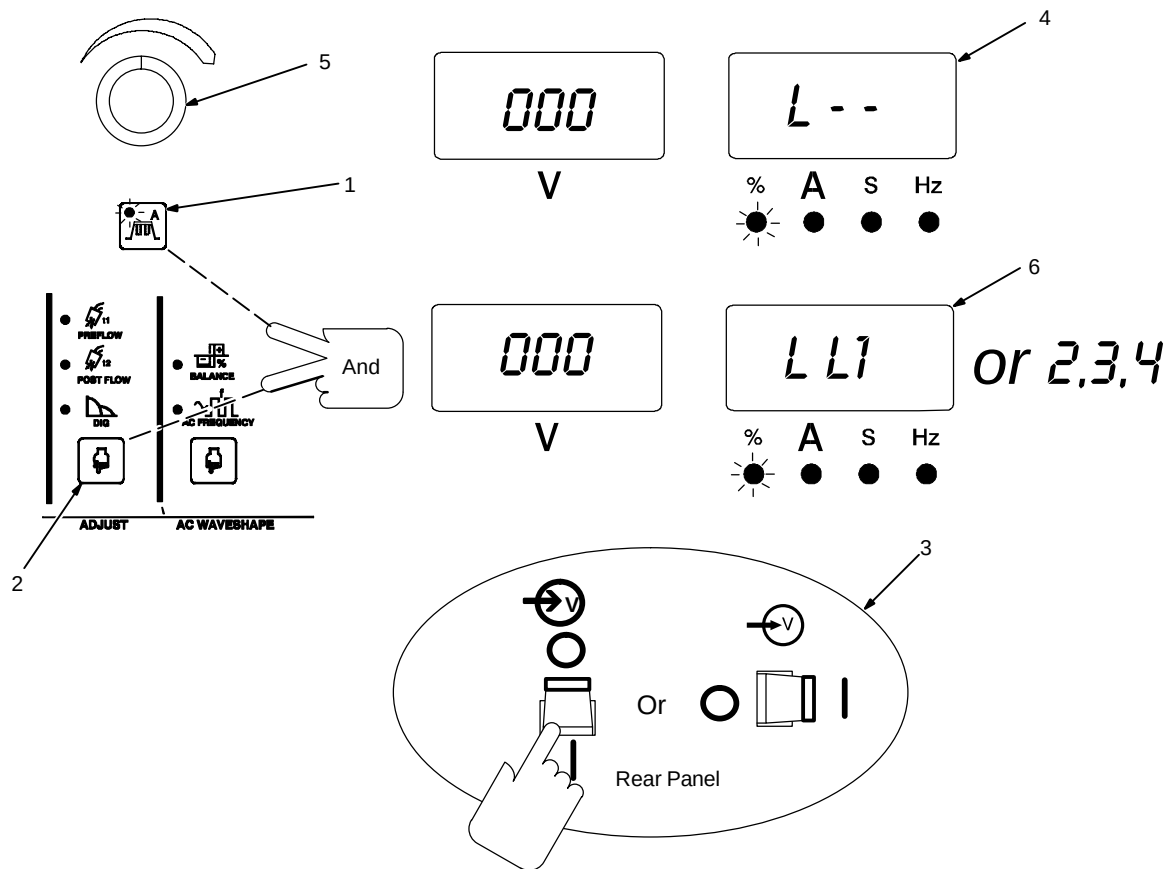
Upon power up as described above, the meter S LED will turn on, and arc time will be displayed for 5 seconds as (000 000) to (999 999). The first four numbers indicate hours, and the last two numbers indicate minutes. Arc time shown in example is read as 1,234 hours and 56 minutes. Maximum arc time is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

6-4. Lockout Functions

A. Accessing Lockout Capability



See Section 5-1 for explanation of controls referred to in all of Section 6-4.

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

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

- 1 Amperage (A) Switch Pad
- 2 Adjust Switch Pad
- 3 Power Switch

To access lockout screens, turn On power switch, and then before the software version clears the meters push, and hold the Amperage and Adjust switch pads until software version number clears meters.

4 Lockout Off

Upon power up as described, the meter % and Amperage (A) switch pad LED's light, and the meter display will be as shown for a lockout off condition.

5 Encoder Control

To turn On the lockout feature, proceed as follows:

Pressing Amperage (A) switch pad will toggle between the meter % and S LED's. Toggle switch pad until % LED is on.

Turn Encoder control to select a three digit lockout number. Number will appear on the voltage (left) meter. Select any number from [001] thru [999]. **IMPORTANT:** remember this three digit number, as you will need it to turn the lockout feature off.

Toggle Amperage (A) switch pad to light the meter S LED. You may now select a lockout level.

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

6 Lockout On

Once the desired three digits have been entered and a lockout level selected, press torch trigger or turn Off power to complete lockout on sequence.

NOTE: Setting a three digit lockout number of [000], or setting a lockout level of [L--] will cause a lockout off condition.

To turn Off the lockout feature, proceed as follows:

To access lockout screens, turn On power switch, and then before the software version clears the meters push and hold the Amperage and Adjust switch pads until software version number clears meters.

Upon power up as described, the meter % and Amperage (A) switch pad LED's will turn on, and the meter display will be as shown for a lockout on (see callout 6) condition.

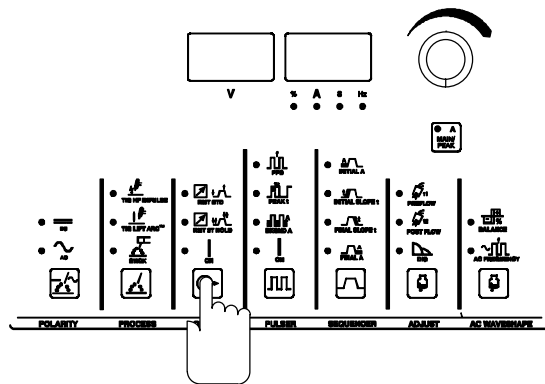
Use Encoder control to enter the same three digits that were used to turn on the lockout feature.

Press the Amperage (A) switch pad. The meter % LED will turn off, and the S LED will light. The amperage (right) meter display will change to [L--]. The lockout feature is now off.

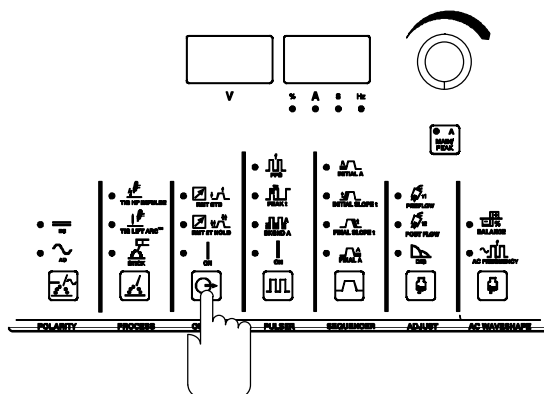
Press torch trigger or turn Off power to complete lock out Off sequence.

B. LockOut Levels

Level 1



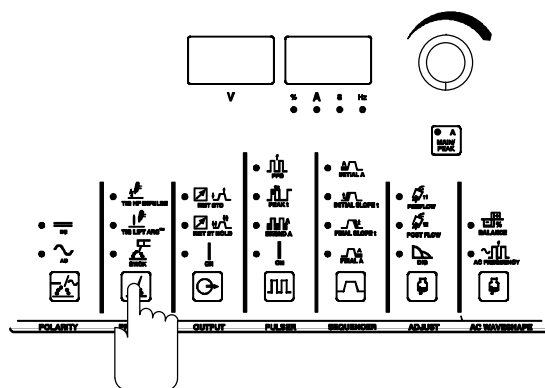
Use Output Switch Pad To
Select A Trigger Method
For The TIG Process



Use Output Switch Pad To
Select A Trigger Method

For The Stick Process

Level 2



Select Process

Process Selection

NOTE: Before activating lock out levels, be sure that all procedures and parameters are established. Parameter adjustment is limited while lock out levels are active.

Level 1

NOTE: 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 5-7) was active when lockout level 1 was activated, the operator can choose between RMT STD (Remote Standard) or RMT 2T HOLD (Remote 2T Hold). The On function is also available if TIG Lift Arc was active.

If RMT 2T HOLD was reconfigured (see Section 6-2C) prior to lockout level 1 activation, the reconfigured output mode (4T, 4T momentary, mini logic, or spot) is available to the operator instead of RMT 2T.

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, (L-1) is displayed as a reminder.

Level 2

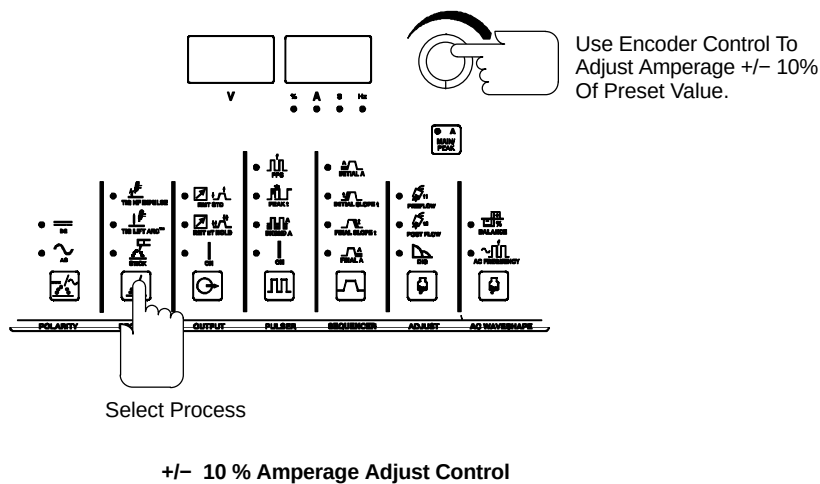
NOTE: Remote amperage control is not available in level 2.

Includes all the functions of level 1 plus Polarity and Process Selection (see Sections 5-6 and 5-7).

When parameter change or selection is limited by lock level 2, (L-2) is displayed as a reminder.

B. Lock Out Levels (Continued)

Level 3



Level 3

NOTE: 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 $\{L-3\}$ 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, $\{L-3\}$ is displayed as a reminder.

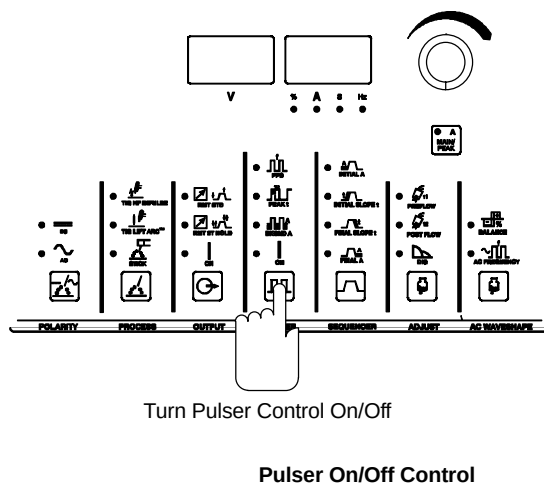
Level 4

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

Remote Amperage Control

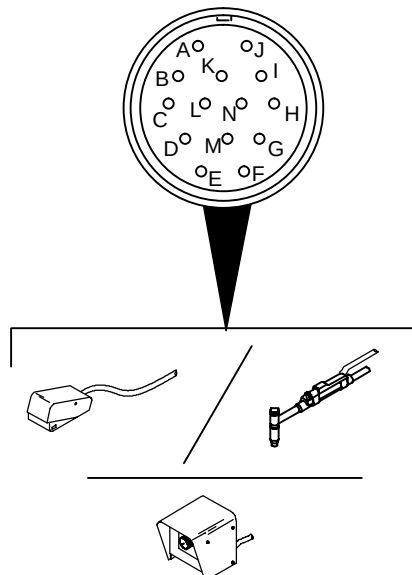
Allows operator to use remote amperage control if desired. Remote control operates from minimum to maximum of preset amperage value. Connect remote control device according to Section 4-6.

When parameter change or selection is limited by lock level 4, $\{L-4\}$ is displayed as a reminder.

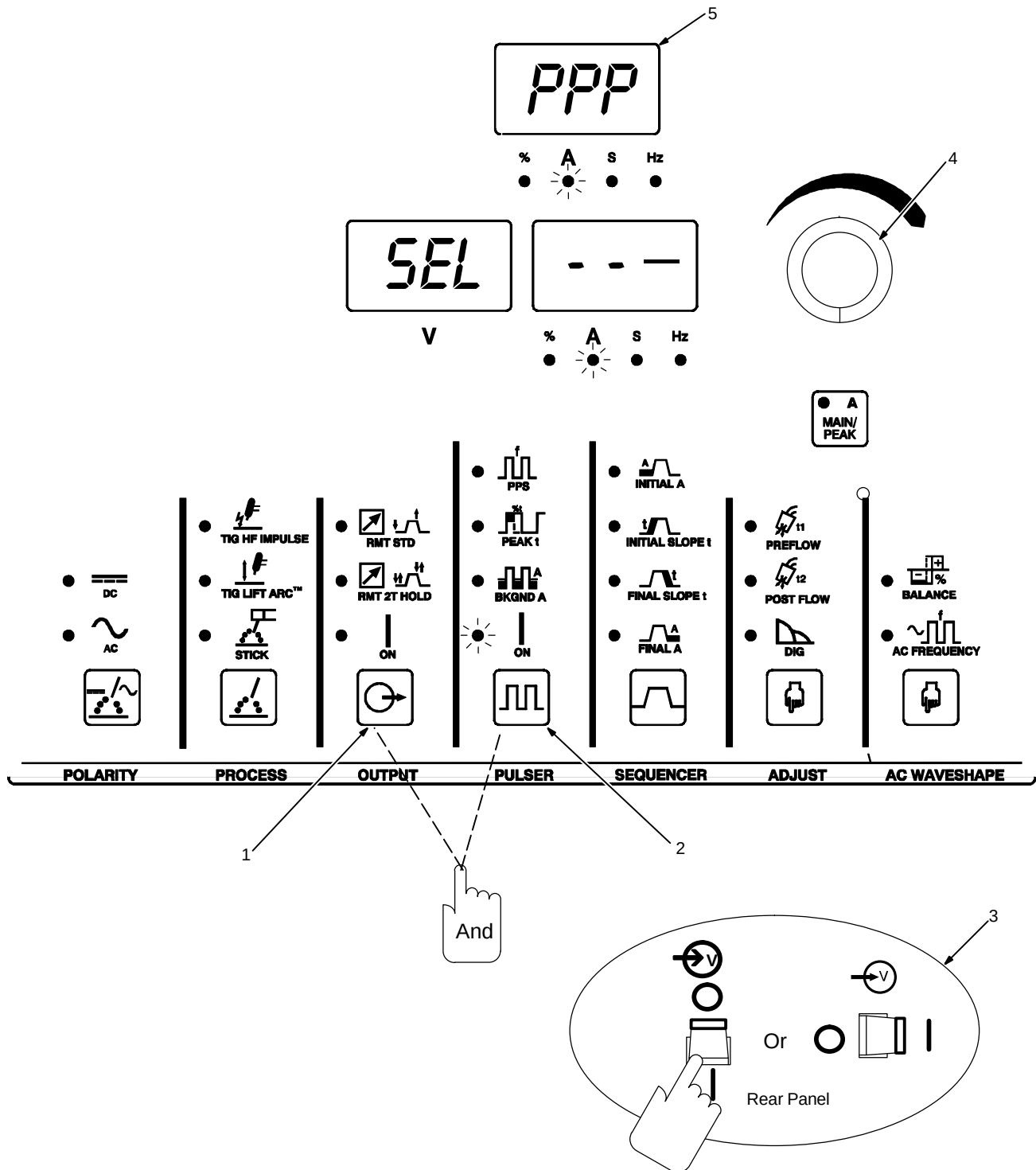


Remote Amperage Control

Level 4



6-5. Setting Unit To Display PPP While Pulse Welding (DX And LX Models Only)



-  1 Output Switch Pad
-  2 Pulser Switch Pad
-  3 Power Switch

To access the PPP while welding display, turn power switch on, and then press the Output and Pulser switch pads before the software version

clears the meters. Hold the switch pads until *(SEL) (---*) or *(SEL) (PPP)* appears.

-  4 Encoder Control

- 5 PPP Meter Display

Turn Encoder to change between standard and *(PPP)* meter display.

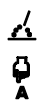
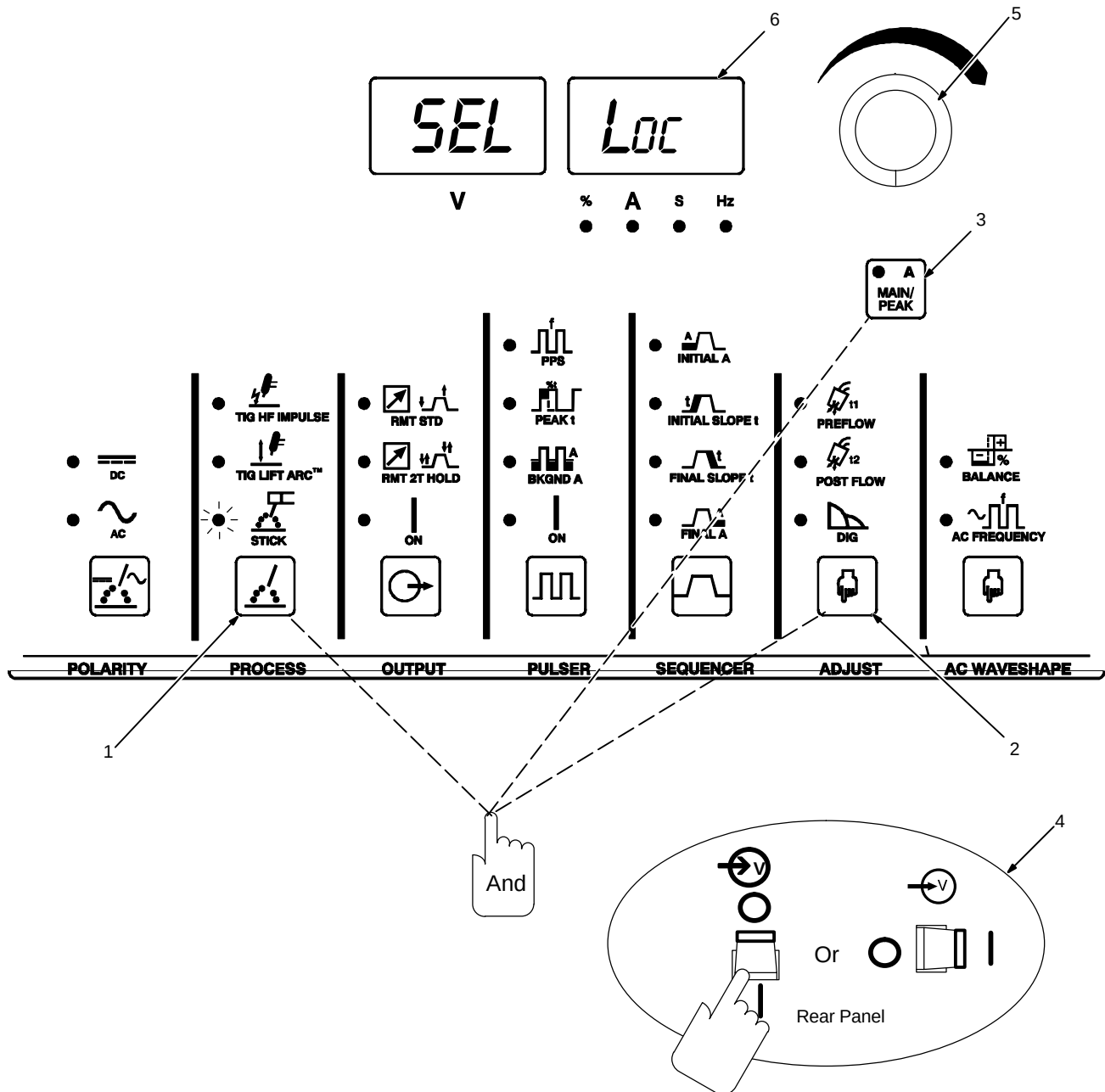
When the *(PPP)* meter display feature is active while pulse welding, the *(PPP)* will

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.

Press torch trigger or turn off power to save setting and end this set-up.

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



- 1 Process Switch Pad
- 2 Adjust Switch Pad
- 3 Amperage Switch Pad
- 4 Power Switch

To access the Stick OCV selection, turn power switch on and then press the Process, Adjust and Amperage switch pads before the software ver-

sion clears the meters. Hold the switch pads until *(SEL) (Loc)* or *(SEL) (noc)* appears.

- 5 Encoder Control
- 6 Meter Display

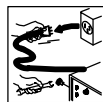
Turn Encoder to change between low OCV *(SEL) (Loc)* and normal OCV *(SEL) (noc)*. Active selection is displayed on the meters.

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 80 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.

SECTION 7 – MAINTENANCE AND TROUBLESHOOTING

7-1. Routine Maintenance



▲ Disconnect power before maintaining.

☞ Maintain more often during severe conditions.

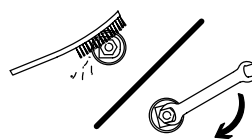


3 Months

Replace unreadable labels.



Clean and tighten weld terminals.

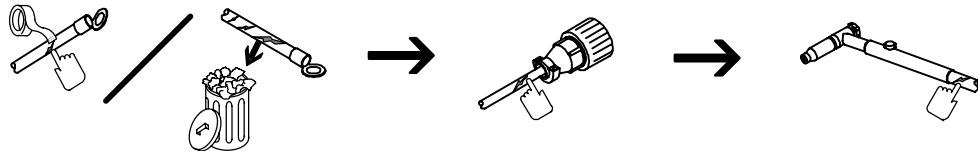


Replace Damaged Gas Hose



3 Months

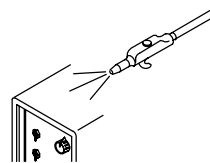
Repair Or Replace Cracked Cables And Cords



6 Months

▲ Do not remove case when blowing out inside of unit (see Section 7-2).

Blow out inside. During heavy service clean monthly.

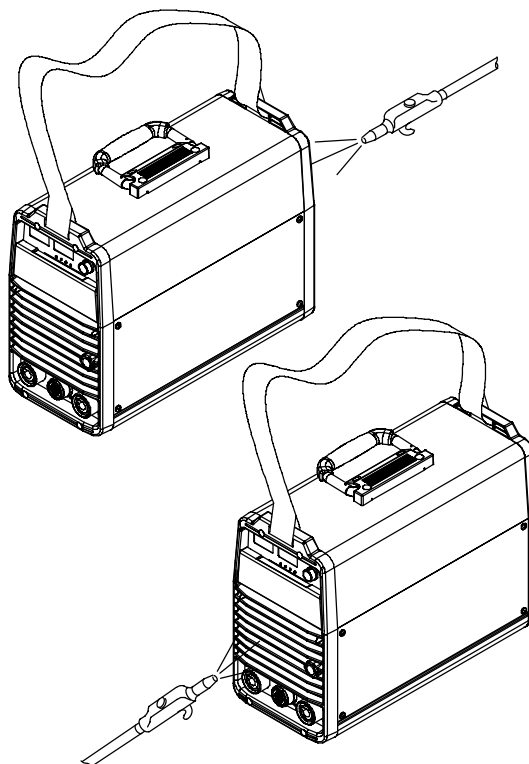


7-2. Blowing Out Inside Of Unit



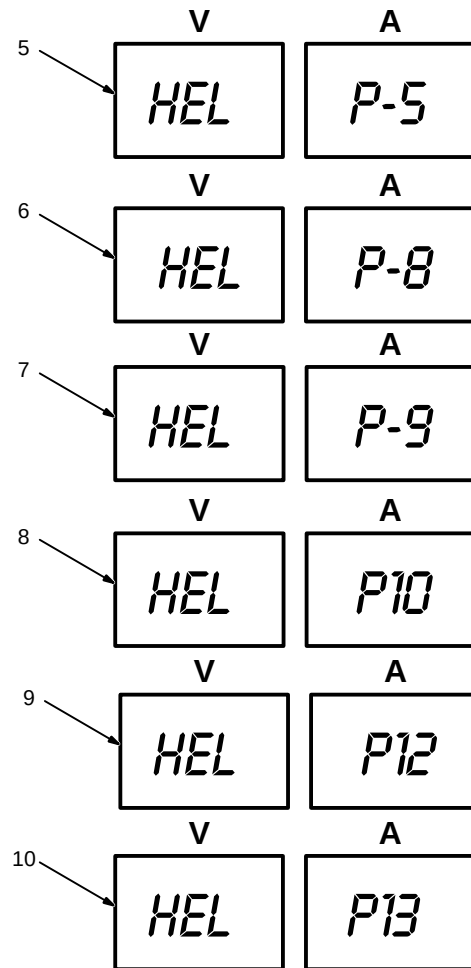
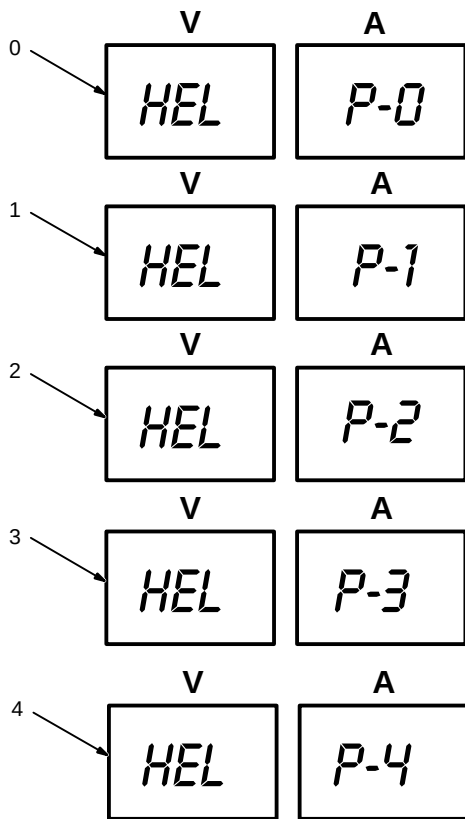
▲ Do not remove case when blowing out inside of unit.

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



ST-802 451

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 4-3). 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 4-3). 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 4-7).

7-4. Troubleshooting



Trouble	Remedy
No weld output; unit completely inoperative.	Place line disconnect switch in On position (see Section 4-12).
	Check and replace line fuse(s), if necessary, or reset circuit breaker (see Section 4-12).
	Check for proper input power connections (see Section 4-12).
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 4-6 as applicable).
	Input voltage outside acceptable range of variation (see Section 4-11).
	Check, repair, or replace remote control.
	Unit overheated. Allow unit to cool with fan On (see Section 4-3).
Erratic or improper weld output.	Use proper size and type of weld cable (see Section 4-5).
	Clean and tighten all weld connections (see Section 4-5).
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 10).
	Use properly prepared tungsten (see Section 10).
	Reduce gas flow rate (see Section 4-8).
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 4-8).
	Water in torch. Refer to torch manual.

SECTION 8 – ELECTRICAL DIAGRAMS

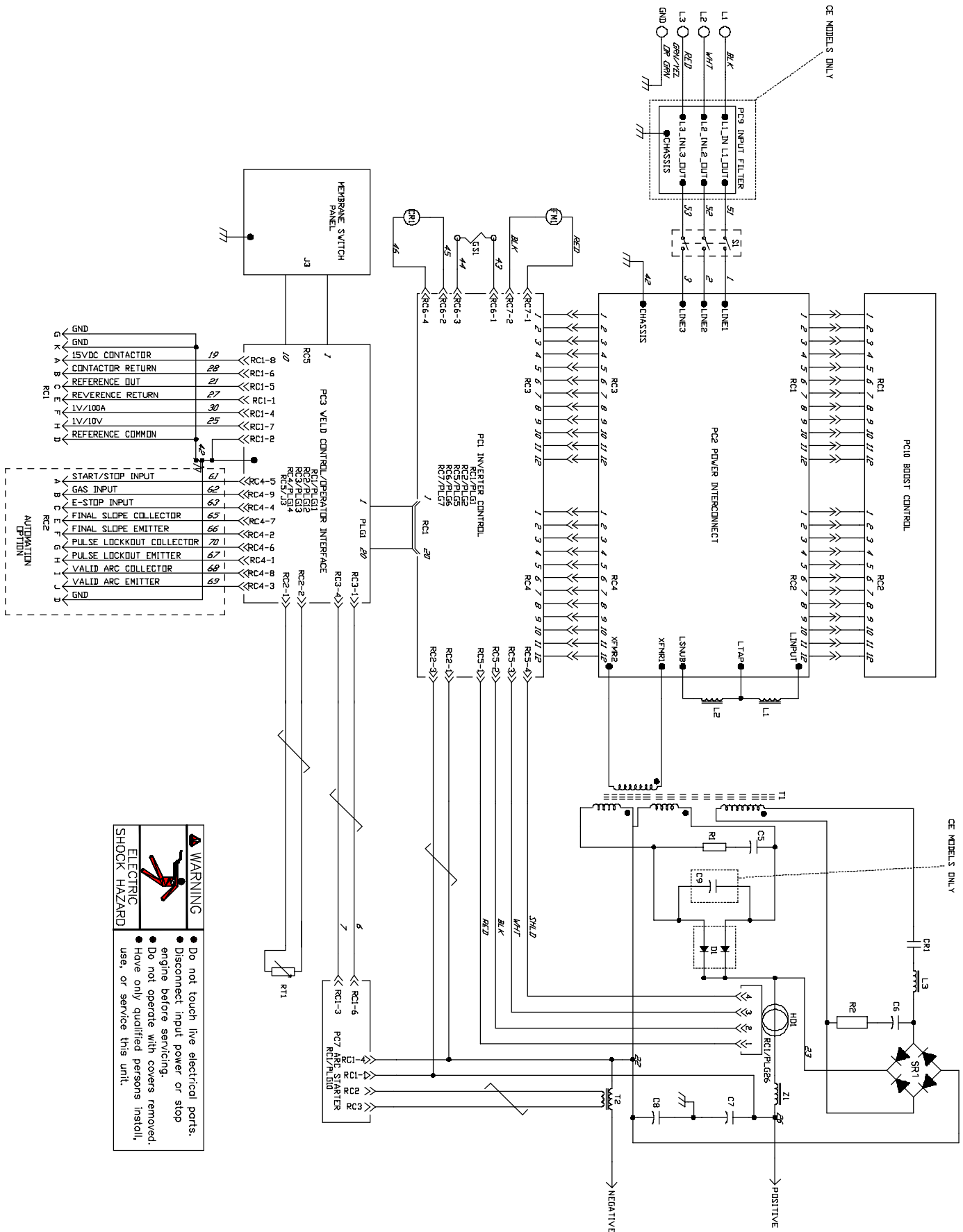
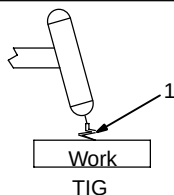


Figure 8-1. Circuit Diagram

SC-189 769-E

SECTION 9 – HIGH FREQUENCY (HF)

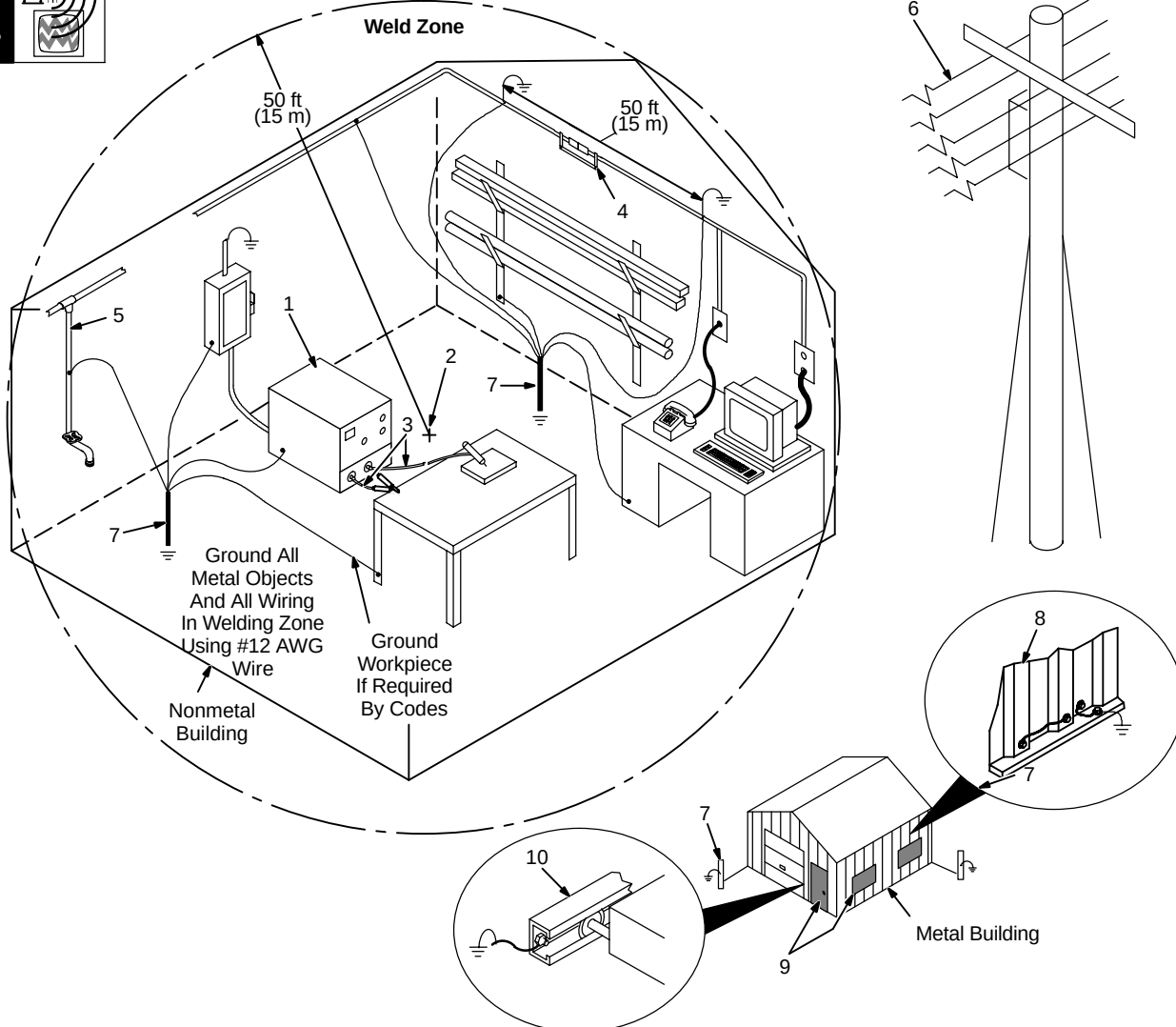
9-1. Welding Processes Requiring High Frequency



1 High-Frequency Voltage

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

9-2. Correct Installation



1 HF Source (Welder With Built-In HF Or Separate HF Unit)

Ground metal machine case, work output terminal, line disconnect device, input supply, and worktable.

2 Welding Zone And Centerpoint

A circle 50 ft (15 m) from centerpoint between HF source and welding torch in all directions.

3 Weld Output Cables

Keep cables short and close together.

4 Conduit Joint Bonding And Grounding

Electrically join (bond) all conduit sections using copper straps or braided wire. Ground conduit every 50 ft (15 m).

5 Water Pipes And Fixtures

Ground water pipes every 50 ft (15 m).

6 External Power Or Telephone Lines

Locate HF source at least 50 ft (15 m) away from power and phone lines.

7 Grounding Rod

Consult the National Electrical Code for specifications.

8 Metal Building Panel Bonding Methods

Bolt or weld building panels together, install copper straps or braided wire across seams, and ground frame.

9 Windows And Doorways

Cover all windows and doorways with grounded copper screen of not more than 1/4 in (6.4 mm) mesh.

10 Overhead Door Track

Ground the track.

SECTION 10 – SELECTING AND PREPARING TUNGSTEN ELECTRODE

gtaw 7/97

NOTE

For additional information, see your distributor for a handbook on the Gas Tungsten Arc Welding (GTAW) process. Wear clean gloves to prevent contamination of tungsten electrode.

10-1. Selecting Tungsten Electrode

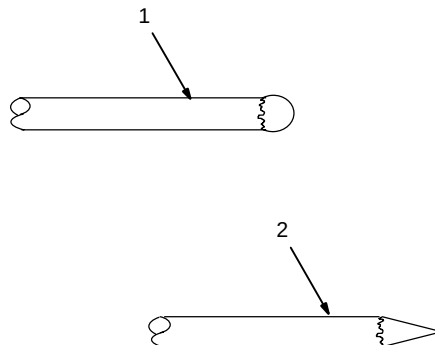
Electrode Diameter	Amperage Range - Gas Type ♦ - Polarity			
	DC – Argon – Electrode Negative/Straight Polarity	DC – Argon – Electrode Positive/Reverse Polarity	AC – Argon – Using High Frequency	AC – Argon – Balanced Wave Using High Freq.
2% Thorium Alloyed Tungsten (Red Band)				
.010"	Up to 25	*	Up to 20	Up to 15
.020"	15-40	*	15-35	5-20
.040"	25-85	*	20-80	20-60
1/16"	50-160	10-20	50-150	60-120
3/32"	135-235	15-30	130-250	100-180
1/8"	250-400	25-40	225-360	160-250
5/32"	400-500	40-55	300-450	200-320
3/16"	500-750	55-80	400-500	290-390
1/4"	750-1000	80-125	600-800	340-525

♦ Typical argon shielding gas flow rates are 15 to 35 cfh (cubic feet per hour).

*Not Recommended.

The figures listed are intended as a guide and are a composite of recommendations from American Welding Society (AWS) and electrode manufacturers.

10-2. Safety Information About Tungsten

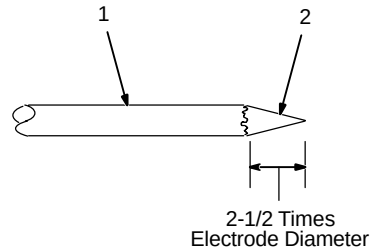


▲ Grinding the tungsten electrode produces dust and flying sparks which can cause injury and start fires. Use local exhaust (forced ventilation) at the grinder or wear an approved respirator. Read MSDS for safety information. Consider using tungsten containing ceria, lanthana, or yttria instead of thoria. 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.

- 1 Tungsten Electrode With Balled End
- 2 Pointed Tungsten Electrode

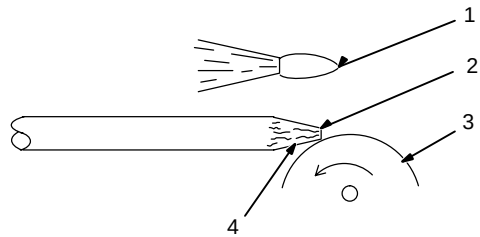
Ref. S-0161

10-3. Preparing Tungsten For AC Or DC Electrode Negative (DCEN) Welding



- 1 Tungsten Electrode
- 2 Tapered End

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.



Ideal Tungsten Preparation – Stable Arc

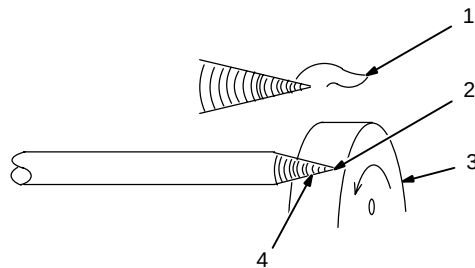
- 1 Stable Arc
- 2 Flat

Diameter of this flat determines amperage capacity.

- 3 Grinding Wheel

Grinding wheel should be dedicated to grinding tungsten only.

- 4 Straight Ground



Wrong Tungsten Preparation – Wandering Arc

- 1 Arc Wander
- 2 Point
- 3 Grinding Wheel

Grinding wheel should be dedicated to grinding tungsten only.

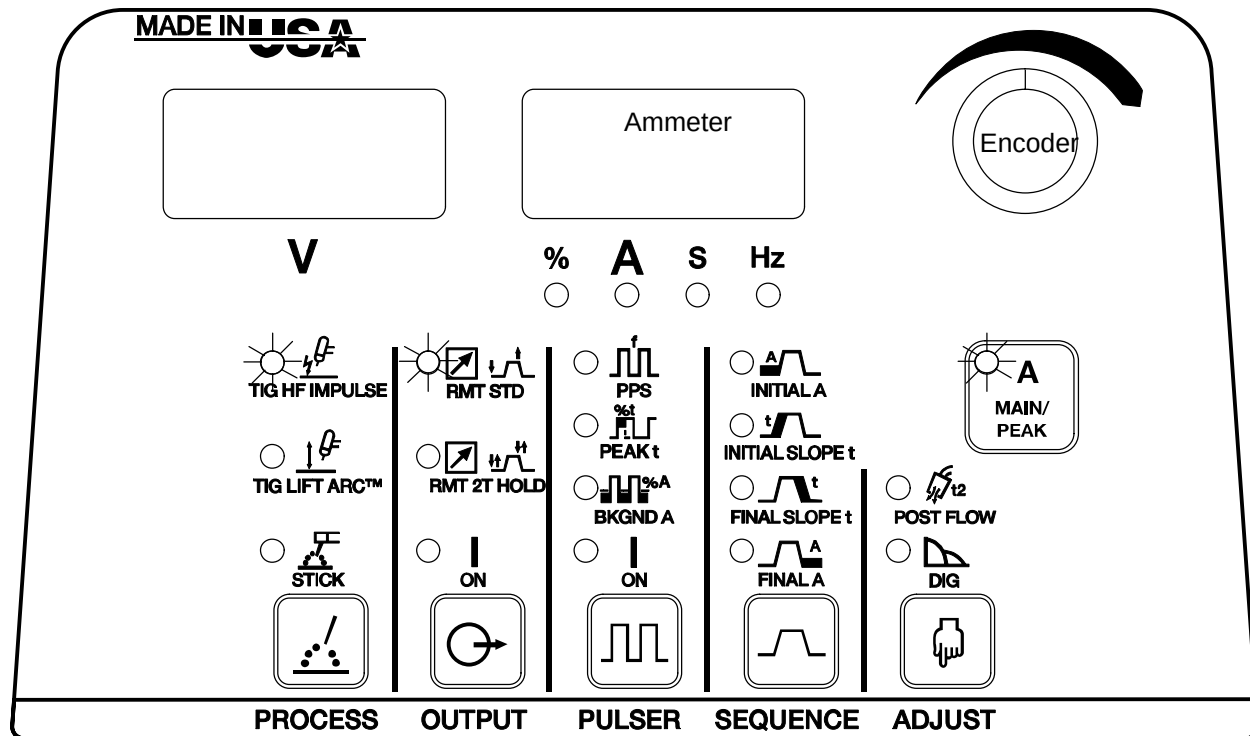
- 4 Radial Ground

Ref. S-0161 / Ref. S-0162

SECTION 11 – GUIDELINES FOR TIG WELDING (GTAW)



11-1. DC - GTAW 16 Gauge Stainless Steel Set-Up



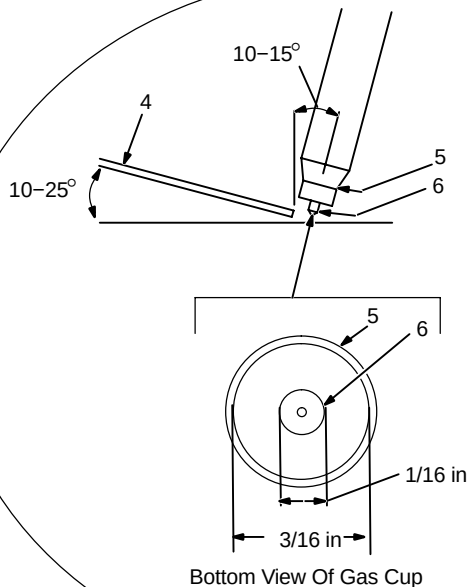
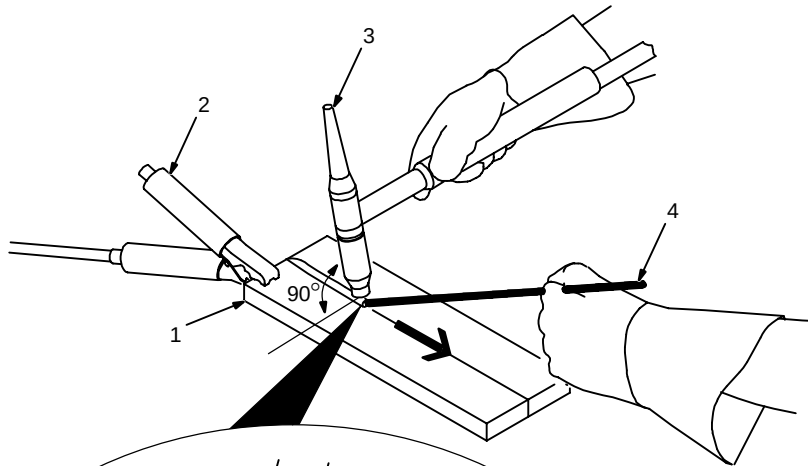
This symbol indicates which functions should be active for stainless steel.

207 690-A

- Turn power on (switch located on rear panel)
- Press Process switch pad until TIG HF Impulse LED is lit
- Press Output switch pad until RMT STD LED is lit
- Press Adjust switch pad until Post Flow LED is lit
- Turn Encoder control to set 8 seconds of Post Flow time
- Press Amperage A switch pad until LED is lit
- Turn Encoder control to set desired amperage (50 - 80 amps).

The ammeter displays the parameter 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 light up. The ammeter also displays actual amperage while welding.

11-2. Positioning The Torch



Bottom View Of Gas Cup

▲ 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 Sections 10-1 and 10-3.

Guidelines:

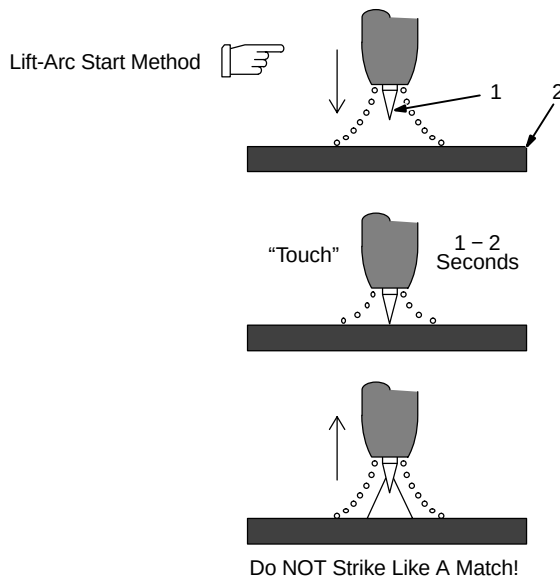
The inside diameter of the gas cup should be at least three times the tungsten diameter to provide adequate shielding gas coverage. (For example, if tungsten is 1/16 in diameter, gas cup should be a minimum of 3/16 in diameter.

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.

11-3. Lift-Arc™ And HF TIG Start Procedures



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:

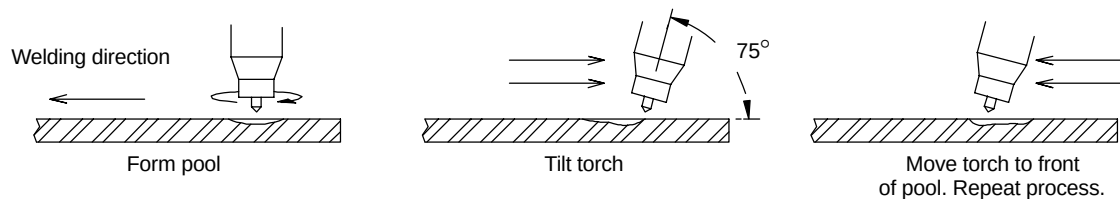
High frequency turns on to help start arc when output is enabled. High frequency turns off when arc is started, and turns on whenever arc is broken to help restart arc.

Application:

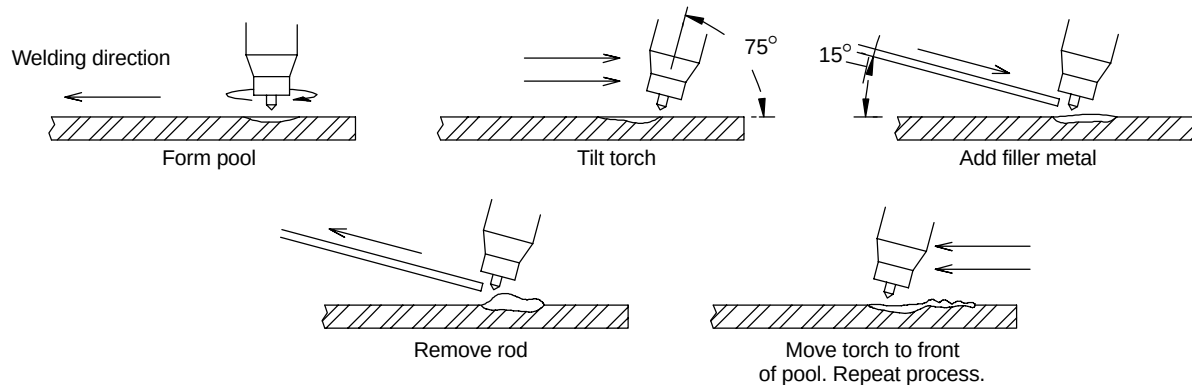
HF start is used for the DCEN GTAW process when a non-contact arc starting method is required.

11-4. Torch Movement During Welding

Tungsten Without Filler Rod



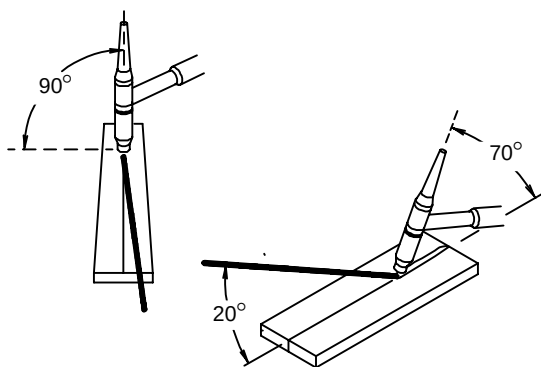
Tungsten With Filler Rod



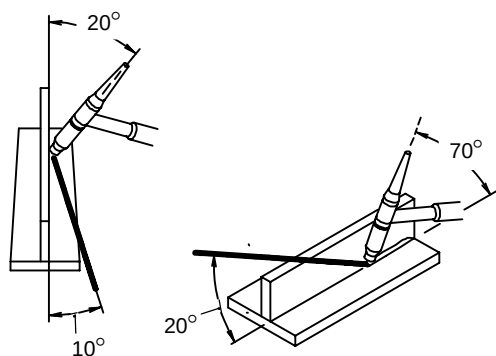
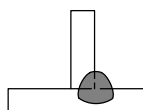
ST-162 002-B

11-5. Positioning Torch Tungsten For Various Weld Joints

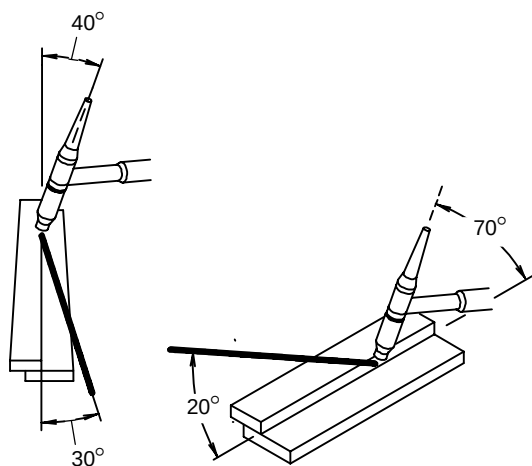
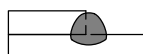
Butt Weld And Stringer Bead



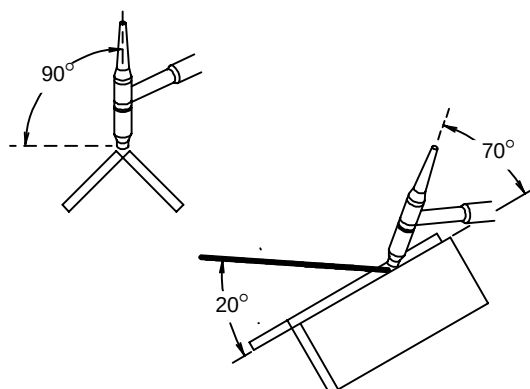
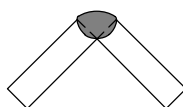
"T" Joint



Lap Joint



Corner Joint



SECTION 12 – STICK WELDING (SMAW) GUIDELINES



12-1. Front Panel Display For Stick DCEP (Direct Current Electrode Positive)

1 Front Panel

Correct front panel display for basic Stick DCEP welding.

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

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

ST-207 690-A

12-2. Electrode and Amperage Selection Chart

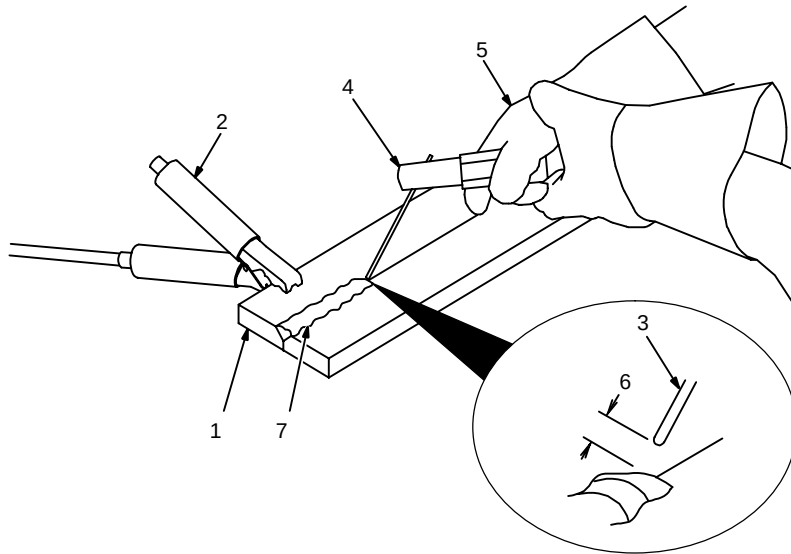
ELECTRODE	DIAMETER	AMPERAGE RANGE									
		50	100	150	200	250	300	350	400	450	
6010 & 6011	3/32										
	1/8										
	5/32										
	3/16										
	7/32										
6013	1/4										
	1/16										
	5/64										
	3/32										
	1/8										
	5/32										
	3/16										
	7/32										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

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

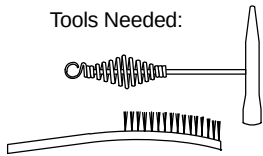
*EP = ELECTRODE POSITIVE (REVERSE POLARITY)
EN = ELECTRODE NEGATIVE (STRAIGHT POLARITY)

Ref. S-087 985-A

12-3. Stick Welding Procedure



Tools Needed:



▲ Weld current starts when electrode touches workpiece.

▲ Weld current can damage electronic parts in vehicles. Disconnect both battery cables before welding on a vehicle. Place work clamp as close to the weld as possible.

1 Workpiece

Make sure workpiece is clean before welding.

2 Work Clamp

3 Electrode

A small diameter electrode requires less current than a large one. Follow electrode manufacturer's instructions when setting weld amperage (see Section 12-2).

4 Insulated Electrode Holder

5 Electrode Holder Position

6 Arc Length

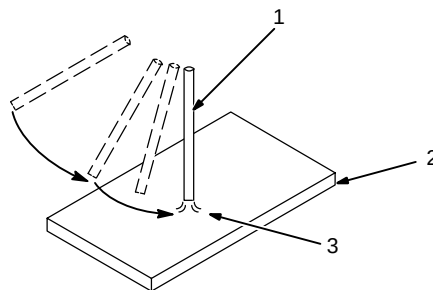
Arc length is the distance from the electrode to the workpiece. A short arc with correct amperage will give a sharp, crackling sound.

7 Slag

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

stick 12/96 – ST-151 593

12-4. Striking an Arc – Scratch Start Technique



1 Electrode

2 Workpiece

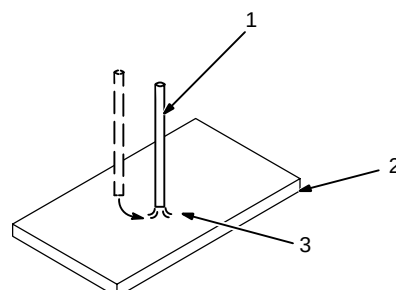
3 Arc

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

▲ Normal open-circuit voltage (80 volts) is present if normal open-circuit voltage is selected (see Section 6-6).

S-0049

12-5. Striking an Arc – Tapping Technique



1 Electrode

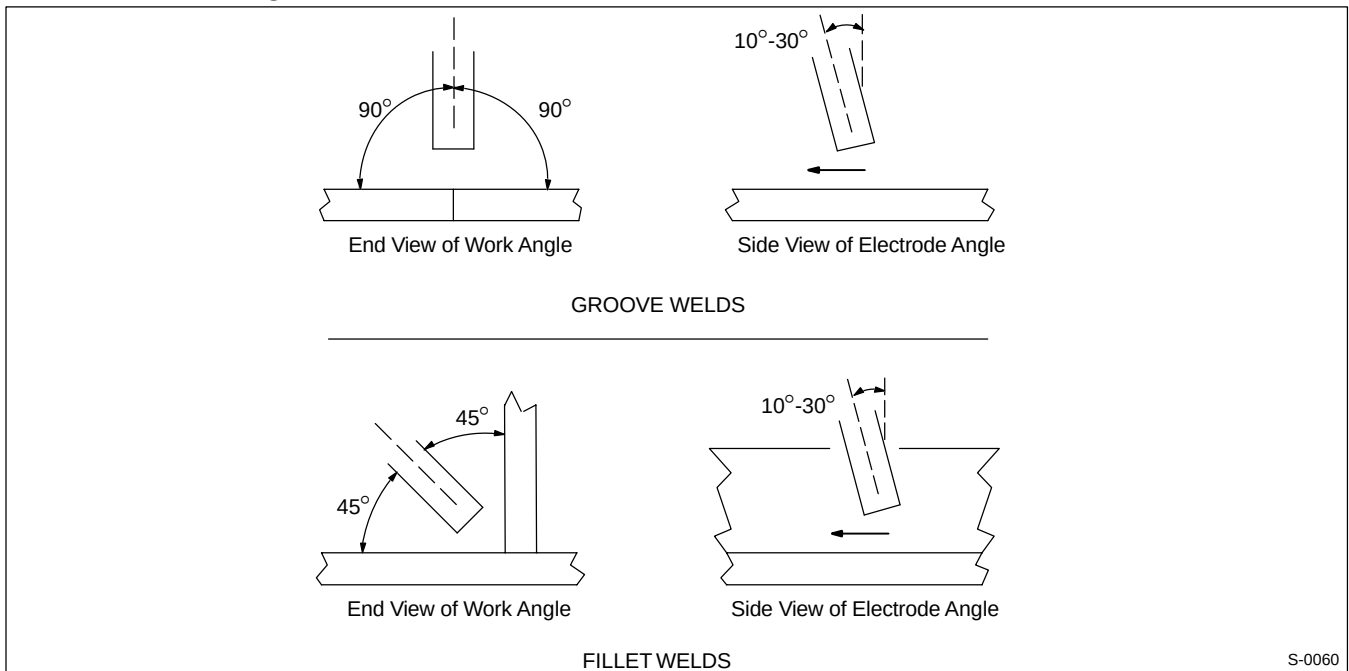
2 Workpiece

3 Arc

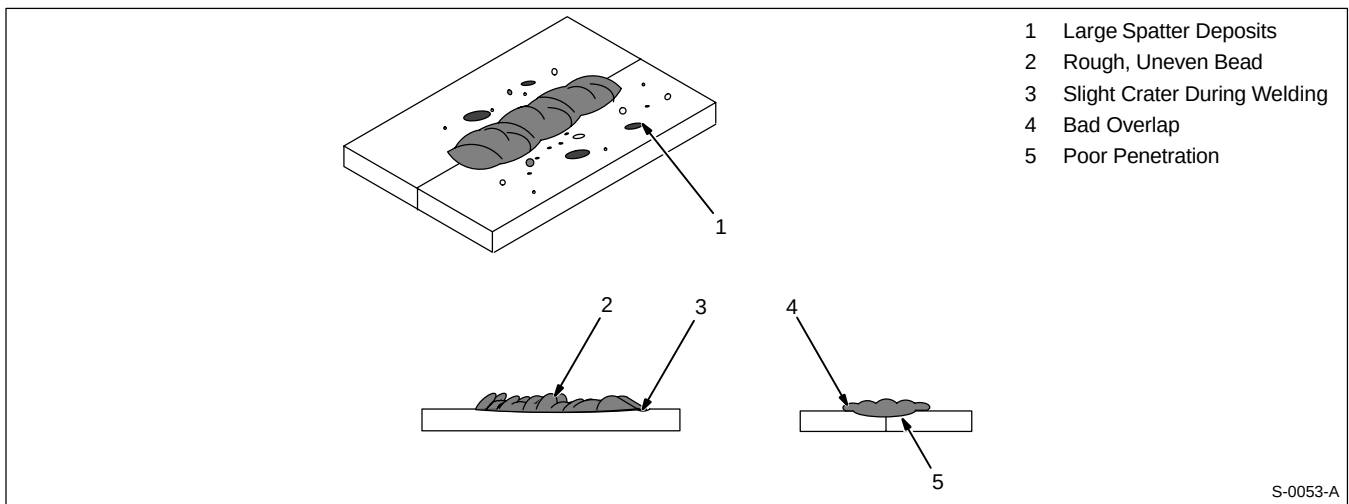
Bring electrode straight down to workpiece; then lift slightly to start arc. If arc goes out, electrode was lifted too high. If electrode sticks to workpiece, use a quick twist to free it.

S-0050

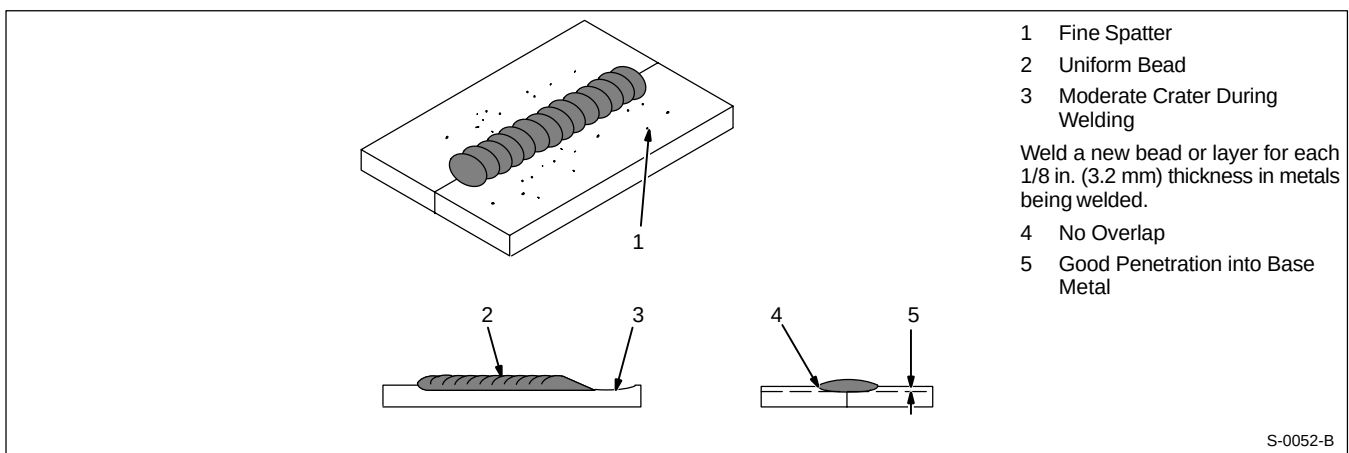
12-6. Positioning Electrode Holder



12-7. Poor Weld Bead Characteristics



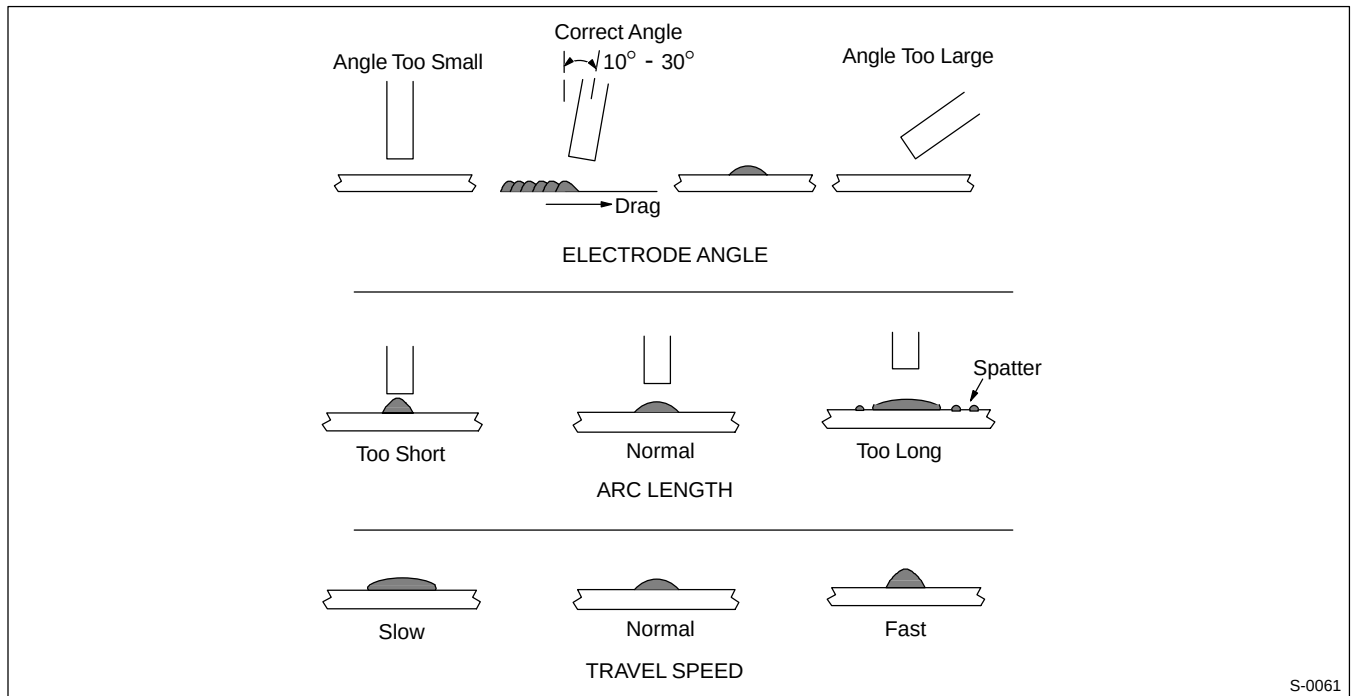
12-8. Good Weld Bead Characteristics



12-9. Conditions That Affect Weld Bead Shape

NOTE

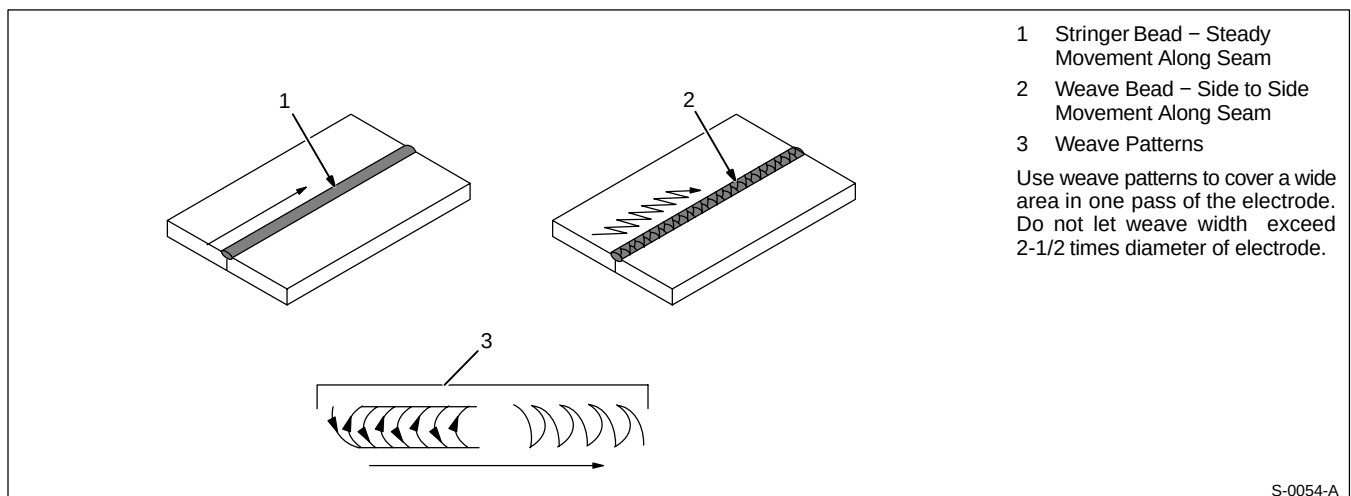
Weld bead shape is affected by electrode angle, arc length, travel speed, and thickness of base metal.



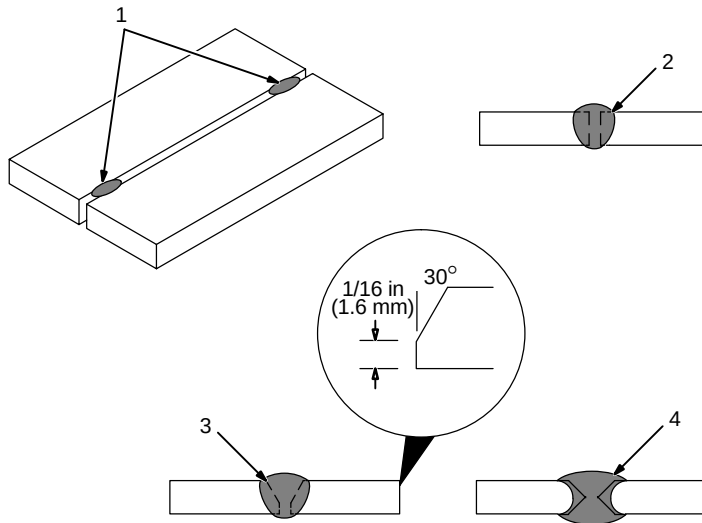
12-10. Electrode Movement During Welding

NOTE

Normally, a single stringer bead is satisfactory for most narrow groove weld joints; however, for wide groove weld joints or bridging across gaps, a weave bead or multiple stringer beads work better.



12-11. Butt Joints



1 Tack Welds

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

2 Square Groove Weld

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

3 Single V-Groove Weld

Good for materials 3/16 – 3/8 in (5-9 mm) thick. Cut bevel with oxyacetylene or plasma cutting equipment. Remove scale from material after cutting. A grinder can also be used to prepare bevels.

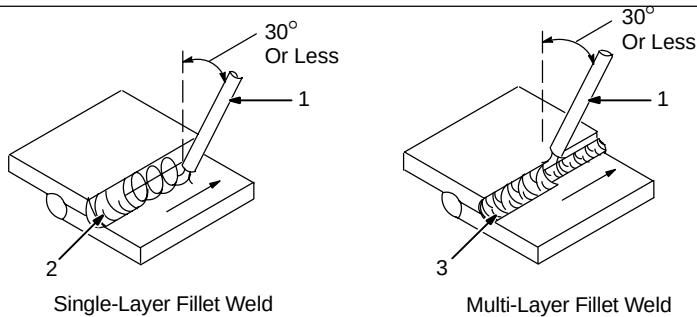
Create 30 degree angle of bevel on materials in V-groove welding.

4 Double V-Groove Weld

Good for materials thicker than 3/8 in (9 mm).

S-0662

12-12. Lap Joint



Single-Layer Fillet Weld

Multi-Layer Fillet Weld

1 Electrode

2 Single-Layer Fillet Weld

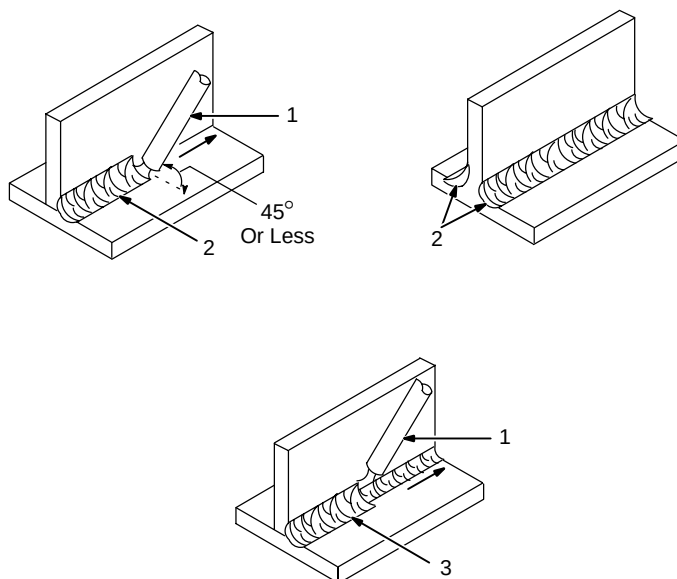
Move electrode in circular motion.

3 Multi-Layer Fillet Weld

Weld a second layer when a heavier fillet is needed. Remove slag before making another weld pass. Weld both sides of joint for maximum strength.

S-0063 / S-0064

12-13. Tee Joint



1 Electrode

2 Fillet Weld

Keep arc short and move at definite rate of speed. Hold electrode as shown to provide fusion into the corner. Square edge of the weld surface.

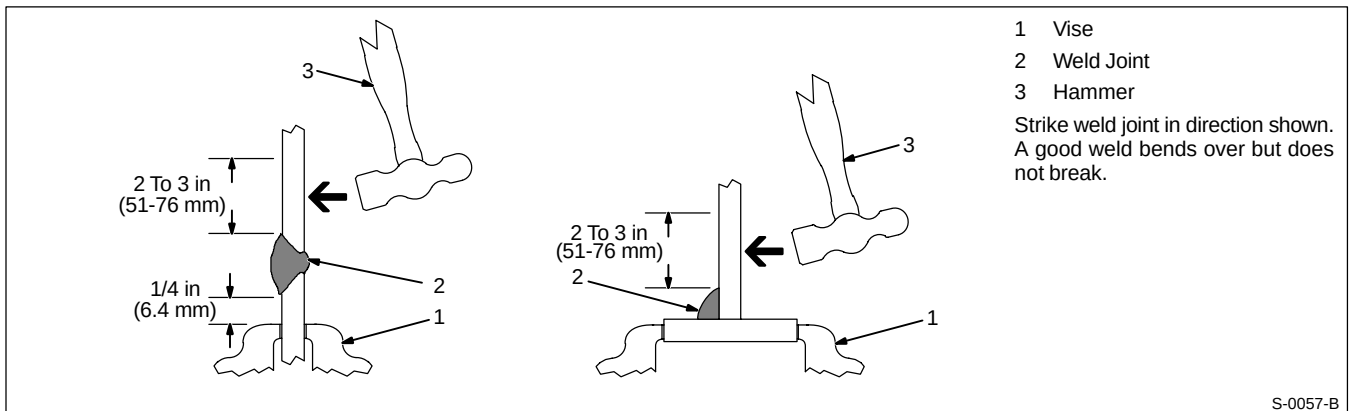
For maximum strength weld both sides of upright section.

3 Multi-Layer Deposits

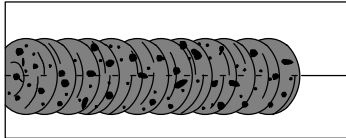
Weld a second layer when a heavier fillet is needed. Use any of the weaving patterns shown in Section 12-10. Remove slag before making another weld pass.

S-0060 / S-0058-A / S-0061

12-14. Weld Test



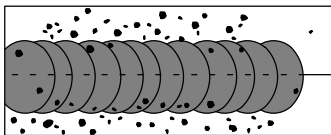
12-15. Troubleshooting – Porosity



Porosity – small cavities or holes resulting from gas pockets in weld metal.

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

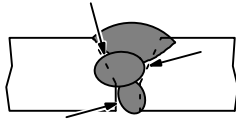
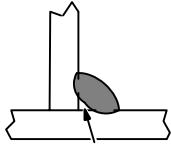
12-16. Troubleshooting – Excessive Spatter



Excessive Spatter – scattering of molten metal particles that cool to solid form near weld bead.

Possible Causes	Corrective Actions
Amperage too high for electrode.	Decrease amperage or select larger electrode.
Arc length too long or voltage too high.	Reduce arc length or voltage.

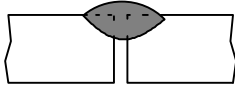
12-17. Troubleshooting – Incomplete Fusion



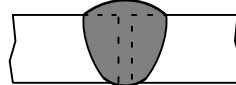
Incomplete Fusion – failure of weld metal to fuse completely with base metal or a preceding weld bead.

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

12-18. Troubleshooting – Lack Of Penetration



Lack of Penetration

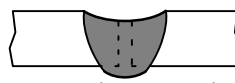


Good Penetration

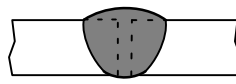
Lack Of Penetration – shallow fusion between weld metal and base metal.

Possible Causes	Corrective Actions
Improper joint preparation.	Material too thick. Joint preparation and design must provide access to bottom of groove.
Improper weld technique.	Keep arc on leading edge of weld puddle.
Insufficient heat input.	Increase amperage. Select larger electrode and increase amperage.
	Reduce travel speed.

12-19. Troubleshooting – Excessive Penetration



Excessive Penetration

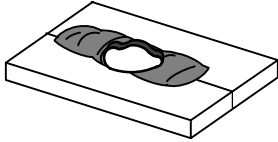


Good Penetration

Excessive Penetration – weld metal melting through base metal and hanging underneath weld.

Possible Causes	Corrective Actions
Excessive heat input.	Select lower amperage. Use smaller electrode.
	Increase and/or maintain steady travel speed.

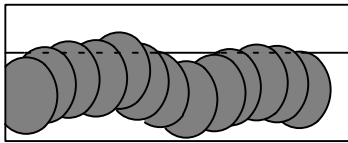
12-20. Troubleshooting – Burn-Through



Burn-Through – weld metal melting completely through base metal resulting in holes where no metal remains.

Possible Causes	Corrective Actions
Excessive heat input.	Select lower amperage. Use smaller electrode.
	Increase and/or maintain steady travel speed.

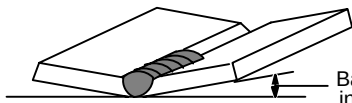
12-21. Troubleshooting – Waviness Of Bead



Waviness Of Bead – weld metal that is not parallel and does not cover joint formed by base metal.

Possible Causes	Corrective Actions
Unsteady hand.	Use two hands. Practice technique.

12-22. Troubleshooting – Distortion



Base metal moves in the direction of the weld bead.

Distortion – contraction of weld metal during welding that forces base metal to move.

Possible Causes	Corrective Actions
Excessive heat input.	Use restraint (clamp) to hold base metal in position.
	Make tack welds along joint before starting welding operation.
	Select lower amperage for electrode.
	Increase travel speed.
	Weld in small segments and allow cooling between welds.

☞ *Hardware is common and not available unless listed.*

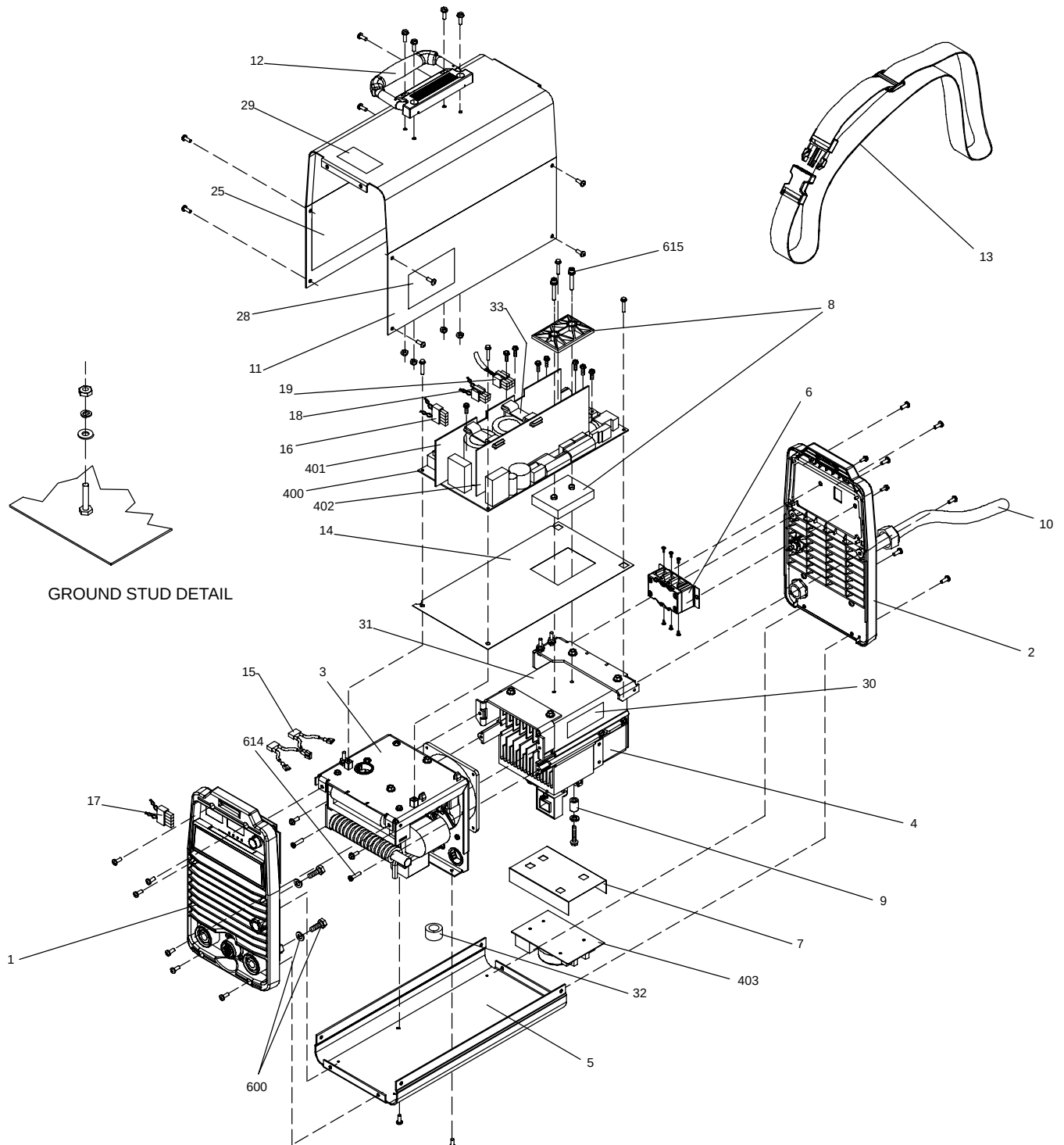


Figure 13-1. Main Assembly

803 227-C

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 13-1. Main Assembly				
1		Fig13-2	Panel, Front W/Cmpnt	1
2		Fig13-3	Panel, Rear W/Cmpnt	1
3		Fig13-4	Magnetics Subassembly	1
4		Fig13-5	Windtunnel, W/Components	1
5		Fig13-7	Base Assy,	1
6	S1	128756	Switch, Tgl 3pst 40a 600vac Scr Term Wide Tgl	1
7		200393	Insulator, filter board (CE models only)	1
8	PM1	204821	Kit, Input/Pre-Regulator Inverter	1
9		049611	Tubing, Cop .540 Od X .123 Wall X .687	1
10		196727	Cable, Power 10 Ft 12ga 4c Blk/Red/Wht/Grnyel	1
11		+195643	Wrapper,	1
12		206108	Handle, Rubberized Carrying	1
13		195663	Strap, Shoulder 6 Ft	1
14		189782	Insulator, Interconnect Board	1
15	C7	213974	Capacitor Assy,	1
16		189778	Plug W/Leads, Vfb	1
17		189773	Plug W/Leads, Arc Starter	1
18		189768	Plug W/Leads, Gas	1
19		189779	Cable, Lem W/Plugs	1
25		189784	Insulator, wrapper	2
28		203990	Label, Warning General Precautionary (Non Ce Models)	2
28		179310	Label, Warning General Precautionary (Ce Models)	2
29		138442	Label, Caution Falling	1
30		185835	Label, Warning Electric Shock/Exploding Parts (Non Ce Models)	1
30		185836	Label, Warning Electric Shock/Exploding Parts (Ce Models)	1
31		185836	Label, GND/PE	1
32		207310	Core, Toroidal (CE Models)	1
33		215002	Clip, Support PC Mtg	2
400	PC2	200851	Circuit Card Assy, Power	1
401	PC1	206129	Circuit Card Assy, Inverter	1
402	PC10	200841	Circuit Card Assy, Boost	1
403		199506	Circuit Card Assy, Filter (CE Models Only)	1
600		200550	Screw, M10-1.5x 25 Hex Hd-pln 8.8 Pld	2
614		136343	Screw, K50x 20 Pan Hd-phl Stl Pld Pt Thread Forming	2
615		200565	Screw, M 5-.8x 35 Soc Pan hd-phl Stl Pls Sems	4

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

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts.

Model and serial number required when ordering parts from your local distributor.

Hardware is common and not available unless listed.

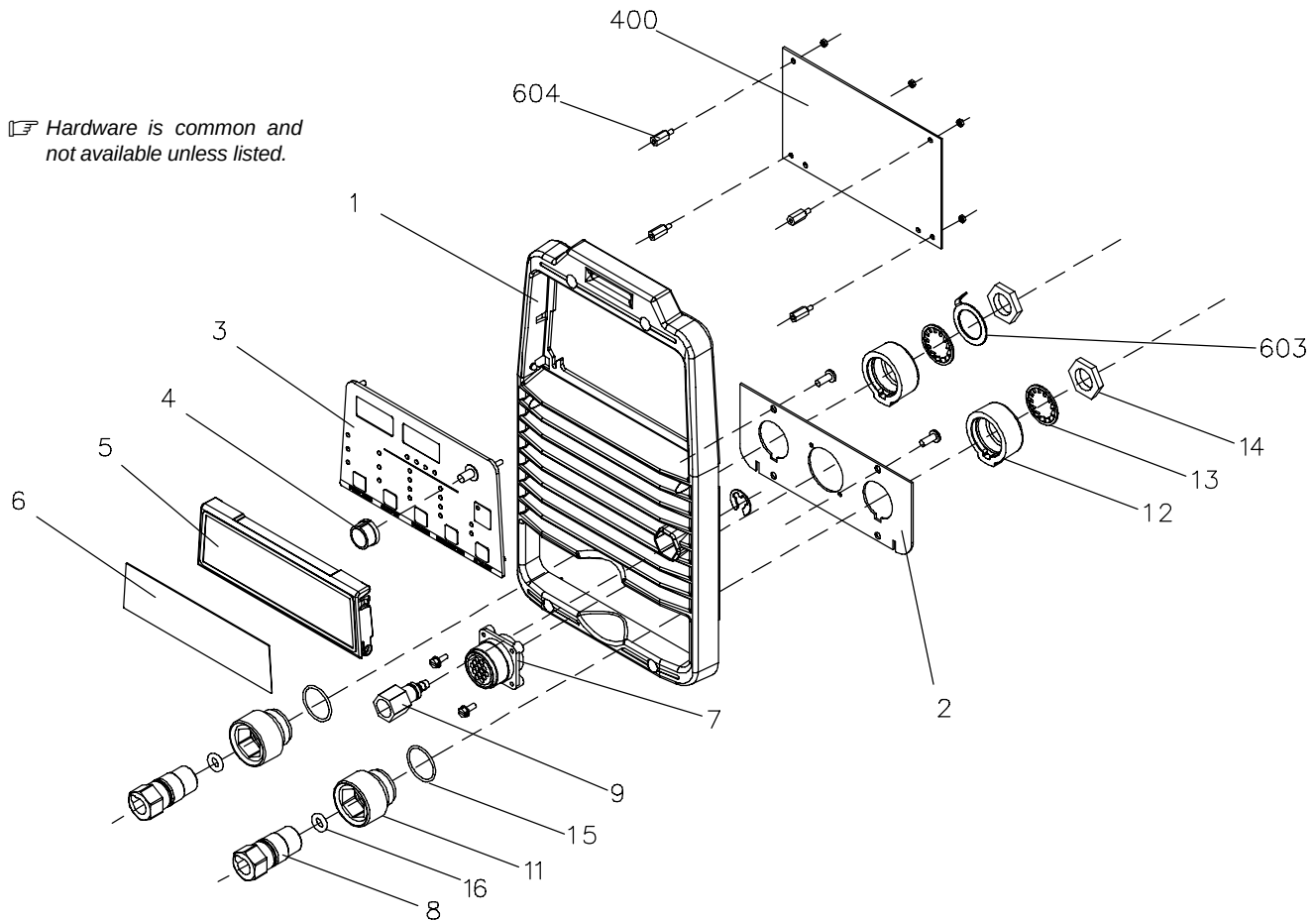


Figure 13-2. Panel, Front w/Components

Ref. 199 491-A

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
13-2. Panel, Front w/Components (Figure 13-1 Item 1)				
1		194242	Panel, Front/Rear	1
2		195647	Panel, Front Lower	1
3		207690	Nameplate/Switch Membrane, Maxstar DX & LX (Non CE Models)	1
3		207692	Nameplate/Switch Membrane, Maxstar SD (Non CE Models)	1
3		207691	Nameplate/Switch Membrane, Maxstar DX & LX (CE Models)	1
3		207693	Nameplate/Switch Membrane, Maxstar SD (CE Models)	1
4		174992	Knob, Pointer .840 Dia X .250 Id W/Spring Clip-.21	1
5		194243	Door,	1
6		199008	Label, Door Maxstar 200 SD	1
6		199009	Label, Door Maxstar 200 DX	1
6		199010	Label, Door Maxstar 200 LX	1
7	RC1	189771	Receptacle W/Leads & Plug (14 Pin)	1
8		202553	Rcpt, Tw Lk Insul Fem(Dinse Type)50/70 Series Wsl	2
9		193649	Ftg, Gas Barbed 1/4 TBG 5/8-18 Female	1
9		193650	Ftg, Gas Barbed 1/4 TBG 3/8-19 BSPP Male (CE Models Only)	1
11		185712	Insulator, Bulkhead Front	2
12		185713	Insulator, Bulkhead Rear	2
13		185714	Washer, Tooth 20MM I.D. X 32MM O.D.	2
14		185717	Nut, M20 X 1.5 1.0625 Hex .19 H Locking	2
15		185718	O-Ring 0.989 I.D. X 0.070 Wall	2
16		186228	O-Ring 0.739 I.D. X 0.070 Wall	2
400	PC3	217679	Circuit Card Assy, Control & Interface (SD & DX Models Only)	1
400	PC3	217678	Circuit Card Assy, Control & Interface (LX Models Only)	1

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
13-2. Panel, Front w/Components (Figure 13-1 Item 1) (continued)				
601		106702	Nut, 006-32 .31hex .20hex .20h Stl Pld (CE Models Only)	4
602		166560	Ring, Rtnng Ext .500 Shaft X .042 Thk E Style Bowed	1
603		178548	Terminal, Connector Friction	1
604		212367	Stand-off, No 6-32 X .625 Lg .250 Hex Stl M&f	4
606		605568	Washer, Flat .140ID x 0.437OD x .04 (CE Models Only)	4
607		201623	Nut, M08-1.0 13MM Hex 4MMT Jam (CE Models Only)	1
608		602211	Washer, Lock .318ID x 0.586OD x .07 (CE Models Only)	1
609		201624	Washer, Flat .342ID x .751OD (CE Models Only)	1
To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.				

☞ Hardware is common and not available unless listed.

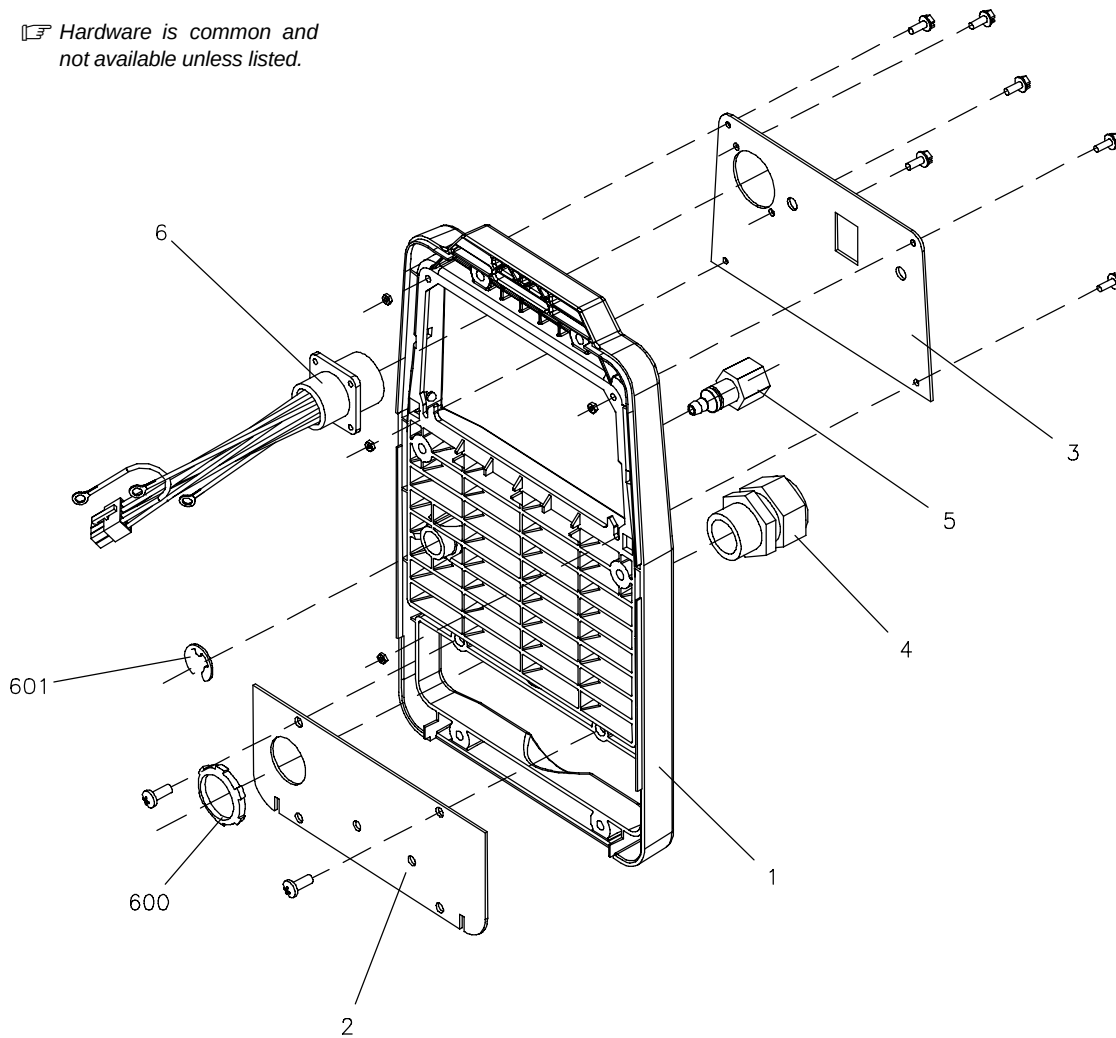


Figure 13-3. Panel, Rear w/Components

Ref. 199 492-A

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
----------	------------	----------	-------------	----------

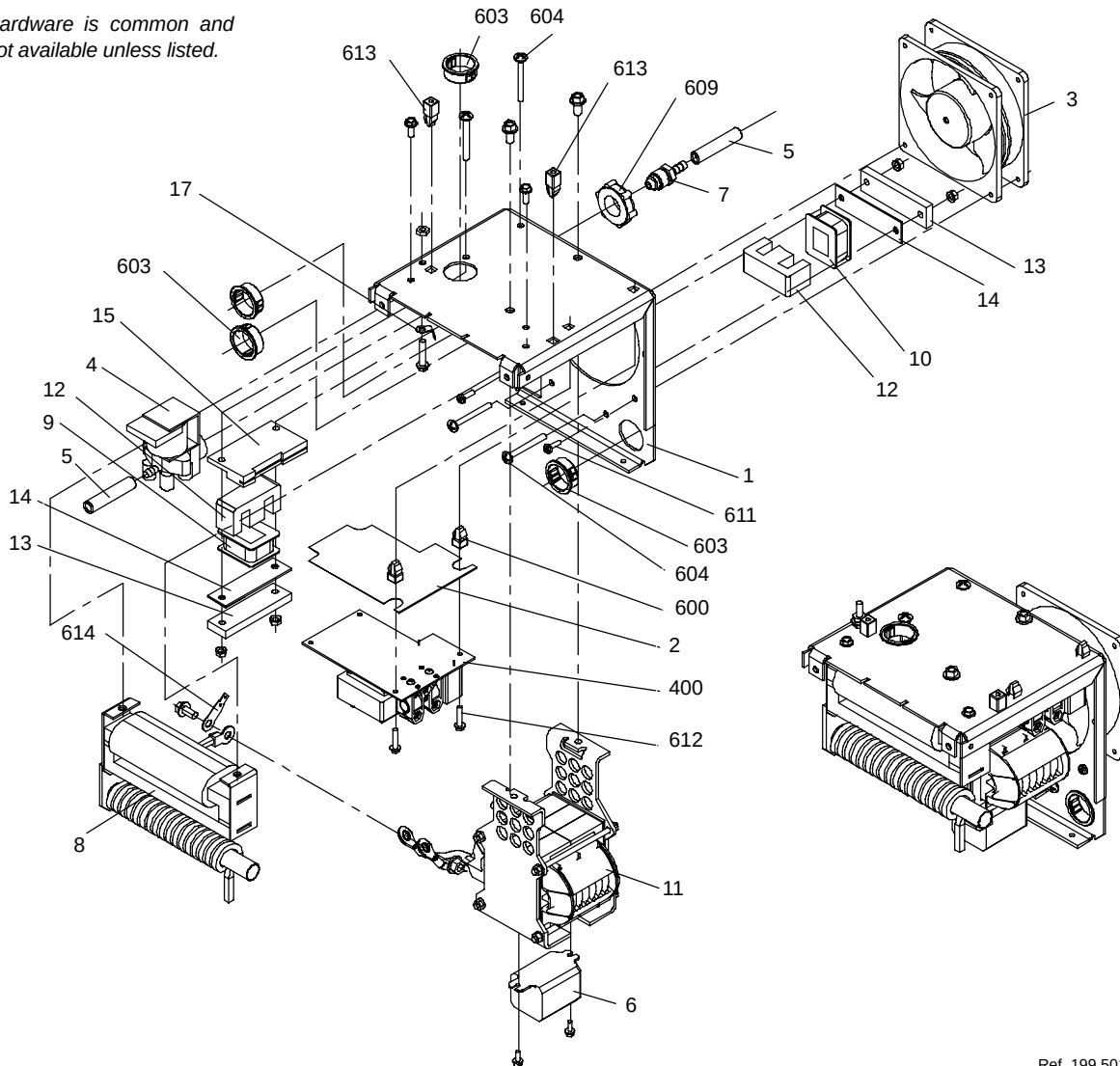
Figure 13-3. Panel, Rear w/Components (Figure 13-1 Item 2)

1		194242	Panel, Front/Rear	1
2		206053	Panel, Rear Lower	1
3		195646	Panel, Rear Upper (SD & DX Models Only)	1
3		197127	Panel, Rear Upper 10-pin (LX Models Only)	1
4		186440	Bushing, Strain Relief .350/ .630 ID X1.050 Mtg Hol	1
4		201155	Bushing, Strain Relief .450/ .709 ID X1.608 Mtg Hol (CE Models Only)	1
5		193649	Ftg, Gas Barbed 1/4 TBG 5/8-18 Female	1
5		193650	Ftg, Gas Barbed 1/4 TBG 3/8-19 BSPP Male (CE Models Only)	1
6		199882	Receptacle, W/Leads 4 Plug 10-pin (LX Models Only)	1
		146 212	Conn, Circ Ms/Met 10Pin Sz 18 Plug Cable Solder (LX Models Only)	1
		073 332	Conn, Circ Ms/Met Clamp Str Rlf Sz 18 (LX Models Only)	1
600		198245	Nut, Conduit .750 Npt Pld 1.388 Od X .150 Thk	1
601		166560	Ring, Rtnng Ext .500 Shaft X .042 Thk E Style Bowed	1
601		201623	Nut, M08-1.0 13MM Hex 4MMT Jam (CE Models Only)	1
605		201624	Washer, Flat .342ID x .751OD .060 BRS (CE Models Only)	1
606		602211	Washer, Lock .318ID x 0.586OD x .07 (CE Models Only)	1

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

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

Hardware is common and not available unless listed.



Ref. 199 501-H

Figure 13-4. Magnetics Assembly w/Components

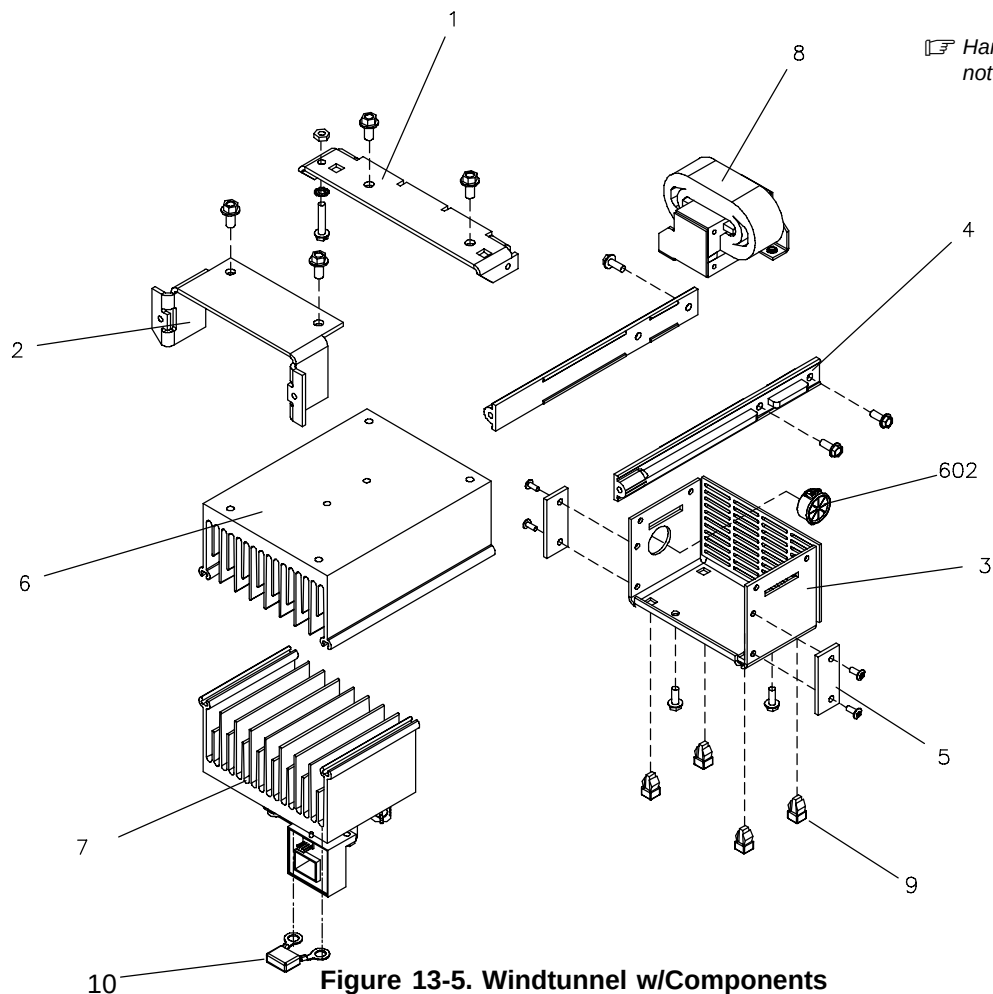
Item No.	Dia. Mkgs.	Part No.	Description	Quantity
----------	------------	----------	-------------	----------

Figure 13-4. Magnetics Assembly w/Components
(Figure 13-1 Item 3)

1		195649	Panel, Plenum	1
2		189785	Insulator, Hf Coil	1
3	FM1	196887	Fan, Muffin 24vdc 3000 Rpm 130 Cfm 4.125 Mtg Holes	1
4	GS1	133873	Valve, 24vdc 2way Custom Port 1/8 Orf W/Frict	1
5		197987	Hose, Nprn Brd No 1 X .250 Id X 10.000	2
6	CR1	198549	Relay, Encl 24vdc Spst 35a/300vac 4pin Flange Mtg	1
7		112863	Ftg, Hose Brs Barbed M 1/4 Tbg X 5/8-18 Sae Flare	1
8		196443	Choke, Output And Coupling Coil Assy	1
9	L2	210599	Coil, inductor 9T	1
10	L3	206020	Coil, inductor 14T	1
11	T1	212268	Xfmr, HF Litz/Litz w/Boost	1
12		109056	Core, Ferrite E 2.164 Lg X 1.094 High X .826 Wide	2
13		196512	Bracket, Inductor Mounting	2
14		196514	Gasket, Inductor Mounting	2
15		200385	Bracket, Mtg HF	1
17		193415	Connector, Faston male	1
400	PC7	189939	Circuit Card Assy, Arc Starter	1
600		199538	Grommet, Scr No 8/10 Panel Hole .281 Sq .250 High	4

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 13-4. Magnetics Assembly w/Components (Figure 13-1 Item 3) (Continued)				
603		057357	Bushing, Snap-in Nyl .937 Id X 1.125 Mtg Hole	4
604		182737	Screw, 010-32x2.00 Rnd Hd-slt Brs Pln	4
609		605227	Nut, 750-14 Knurled1.68dia .41h Nyl	1
611		136343	Screw, K50x 20 Pan Hd-phl Stl Pld Pt Thread Forming	2
612		099273	Screw, 008-18x .62 Pan Hd-phl Stl Pld Sht Met A	4
613		083147	Grommet, Scr No 8/10 Panel Hole .312 Sq .500 High	2
614		010381	Connector, Rectifier	1

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.



Ref. 199 494

Figure 13-5. Windtunnel w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 13-5. Windtunnel w/Components (Figure 13-1 Item 4)				
1		195645	Panel, Midplain Horizontal	1
2		198634	Bracket, Front Heatsink Mtg	1
3		198633	Wind Tunnel	1
4		189777	Rail, Heat Sink	2
5		198652	Bracket, Windtunnel Insulator	2
6		+192450	Heat Sink, Module	1
7		199497	Heat Sink, Secondary Assembly	1
8	L1	189787	Choke, Input	1
9		199538	Grommet, Scr No 8/10 Panel Hole .281 Sq .250 High (CE Models Only)	4
10	C9	151328	Capacitor, Polyp Met Film .0047Uf 1000 Vdc W/T (CE Models Only)	1
602		154408	Bushing, Snap-in Nyl .562 Id X .875 Mtg Hole Cent	1

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

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

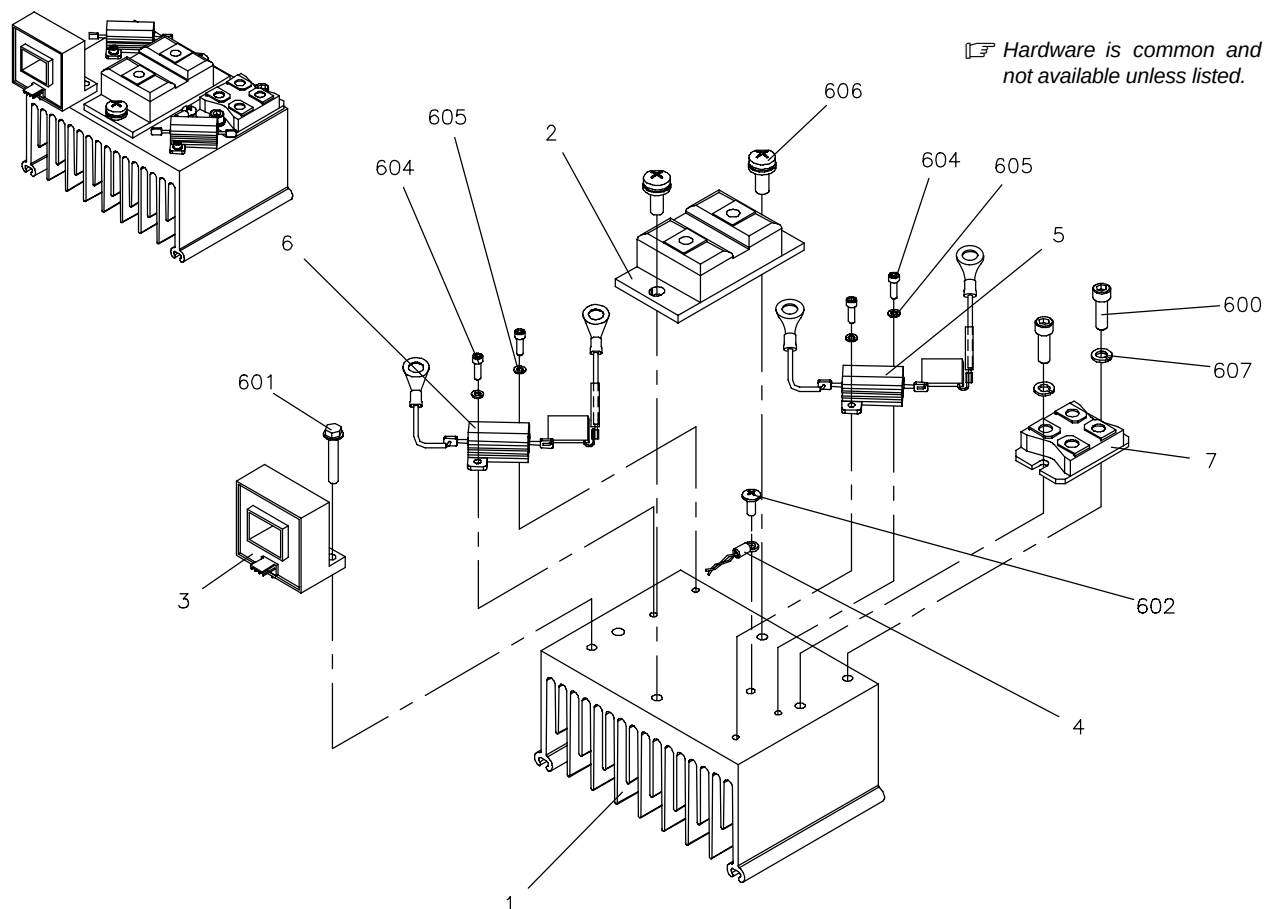


Figure 13-6. Heat Sink, Secondary Assembly

199 497-C

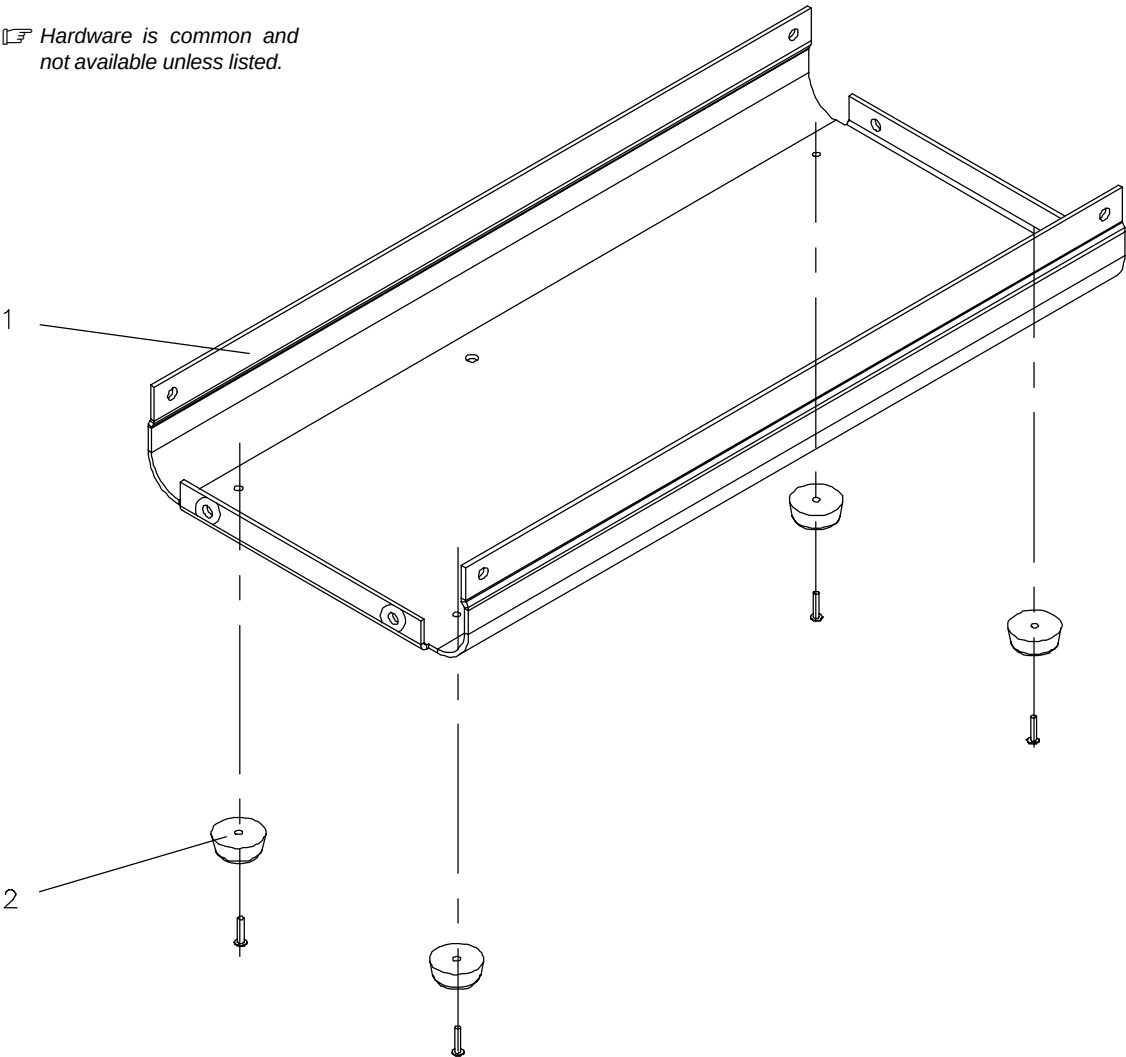
Item No.	Dia. Mkgs.	Part No.	Description	Quantity
----------	------------	----------	-------------	----------

**Figure 13-6. Heat Sink, Secondary Assembly
(Figure 13-5 Item 7)**

1		210783	Heat Sink, Secondary	1
2	D1	204820	Kit, Diode, Ultra Fast	1
3	HD1	198028	Transducer, Current 100a Module Supply V+/- 15v	1
4	RT1	211124	Thermistor, Ntc 30k Ohm @ 25 Deg C 18 in Lead	1
5	R2, C6	206021	Resistor/Capacitor,	1
6	R1, C5	199138	Resistor/Capacitor,	1
7	SR1	199952	Diode, Power Module 50 Amp 600V	1
600		143360	Screw, 008-32x .50 Pan Hd-Phl Stl Pld	2
601		129351	Screw, 008-32x .50 Hexwhd.34d Stl Pld Slffmg Tap-rw	1
602		207451	Screw, 008-32x .50 Pan Hd Phl Stl Pld Sems	1
604		156579	Screw, 004-40x .37 Soc Hd-hex Stl Pld	4
605		156580	Washer, Lock .114idx0.209odx.025t Stl Pld Split #4	4
606		196683	Screw, M 6-1.0x 16 Pan Hd-phl Stl Pld Sems	2
607		602200	Washer, lock .168 ID x .277 OD x .04	2

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

Hardware is common and not available unless listed.



199 493-B

Figure 13-7. Base Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 13-7. Base Assembly (Figure 13-1 Item 5)				
1		195644	Base,	1
2		019663	Mount, Nprn 15/16odx3/8rec 3/16x3/8	4

To maintain the factory original performance of your equipment, use only Manufacturer’s Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

TRUE BLUE[®]

WARRANTY

Effective January 1, 2003
(Equipment with a serial number preface of "LC" or newer)

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

Warranty Questions?

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

Your distributor also gives
you ...

Service

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

Support

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

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

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

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

1. 5 Years Parts — 3 Years Labor
 - * Original main power rectifiers
 - * Inverters (input and output rectifiers only)
2. 3 Years — Parts and Labor
 - * Transformer/Rectifier Power Sources
 - * Plasma Arc Cutting Power Sources
 - * Semi-Automatic and Automatic Wire Feeders
 - * Inverter Power Supplies
 - * Intelligig
 - * Maxstar 150
 - * Engine Driven Welding Generators
(NOTE: Engines are warranted separately by the engine manufacturer.)
3. 1 Year — Parts and Labor Unless Specified
 - * DS-2 Wire Feeder
 - * Motor Driven Guns (w/exception of Spoolmate Spoolguns)
 - * Process Controllers
 - * Positioners and Controllers
 - * Automatic Motion Devices
 - * RFCS Foot Controls
 - * Induction Heating Power Sources
 - * Water Coolant Systems
 - * Flowgauge and Flowmeter Regulators (No Labor)
 - * HF Units
 - * Grids
 - * Maxstar 85, 140
 - * Spot Welders
 - * Load Banks
 - * Racks
 - * Running Gear/Trailers
 - * Plasma Cutting Torches (except APT & SAF Models)
 - * Field Options
(NOTE: Field options are covered under True Blue[®] for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
4. 6 Months — Batteries
5. 90 Days — Parts
 - * MIG Guns/TIG Torches

- * Induction Heating Coils and Blankets
- * APT & SAF Model Plasma Cutting Torches
- * Remote Controls
- * Accessory Kits
- * Replacement Parts (No labor)
- * Spoolmate Spoolguns
- * Canvas Covers

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

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

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

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

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

ANY EXPRESS WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY OR REPRESENTATION AS TO PERFORMANCE, AND ANY REMEDY FOR BREACH OF CONTRACT TORT OR ANY OTHER LEGAL THEORY WHICH, BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION, OPERATION OF LAW, CUSTOM OF TRADE OR COURSE OF DEALING, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE, WITH RESPECT TO ANY AND ALL EQUIPMENT FURNISHED BY MILLER IS EXCLUDED AND DISCLAIMED BY MILLER.

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

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





Owner's Record

Please complete and retain with your personal records.

Model Name

Serial/Style Number

Purchase Date

(Date which equipment was delivered to original customer.)

Distributor

Address

City

State

Zip



For Service

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

Always provide Model Name and Serial/Style Number.

Contact your Distributor for:

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

Contact the Delivering Carrier to:

File a claim for loss or damage during shipment.

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

Miller Electric Mfg. Co.

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

International Headquarters—USA

USA Phone: 920-735-4505 Auto-Attended
USA & Canada FAX: 920-735-4134
International FAX: 920-735-4125

European Headquarters – United Kingdom

Phone: 44 (0) 1204-593493
FAX: 44 (0) 1204-598066

www.MillerWelds.com

