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2007-04

Processes



TIG (GTAW) Welding



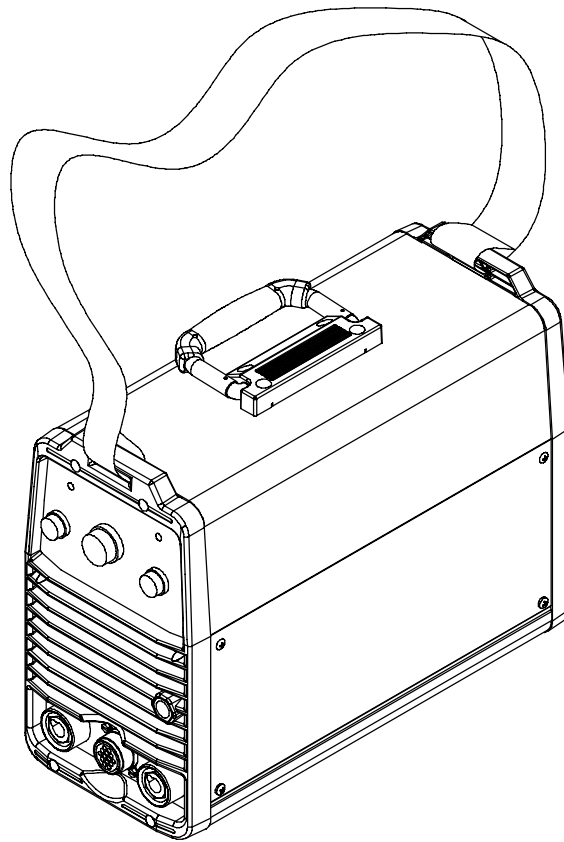
Stick (SMAW) Welding

Description



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

Maxstar[®] 200 STR



 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.

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



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

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



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



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Declaration of Conformity for European Community (CE) Products

NOTE

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

Manufacturer:

Miller Electric Mfg. Co.
1635 W. Spencer St.
Appleton, WI 54914 USA
Phone: (920) 734-9821

European Contact:

Mr. Danilo Fedolfi,
Managing Director
ITW Welding Products Italy S.r.l.
Via Privata Iseo 6/E
20098 San Giuliano
Milanese, Italy
Phone: 39(02)98290-1
Fax: 39(02)98290203

European Contact Signature: _____

Declares that the product:

Maxstar[®] 200 STR

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

SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

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▲ **Warning: Protect yourself and others from injury — read and follow these precautions.**

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

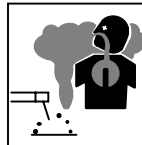
live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- 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.
- Additional safety precautions are required when any of the following electrically hazardous conditions are present: in damp locations or while wearing wet clothing; on metal structures such as floors, gratings, or scaffolds; when in cramped positions such as sitting, kneeling, or lying; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, use the following equipment in order presented: 1) a semiautomatic DC constant voltage (wire) welder, 2) a DC manual (stick) welder, or 3) an AC welder with reduced open-circuit voltage. In most situations, use of a DC, constant voltage wire welder is recommended. And, do not work alone!
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install 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.
- Do not touch electrode holders connected to two welding machines at the same time since double open-circuit voltage will be present.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal.

SIGNIFICANT DC VOLTAGE exists in inverter-type welding power sources after removal of input power.

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



FUMES AND GASES can be hazardous.

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

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



ARC RAYS can burn eyes and skin.

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

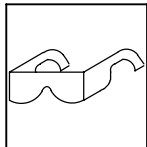
- Wear an approved welding helmet fitted with a proper shade of filter lenses to protect your face and eyes when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect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



WELDING can cause fire or explosion.

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

- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Do not weld where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not weld on 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, sparks, and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.
- Follow requirements in OSHA 1910.252 (a) (2) (iv) and NFPA 51B for hot work and have a fire watcher and extinguisher nearby.



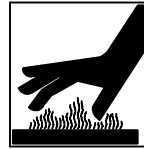
FLYING METAL can injure eyes.

- 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.



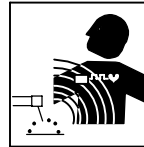
BUILDUP OF GAS can injure or kill.

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



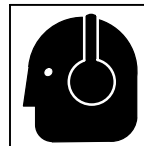
HOT PARTS can cause severe burns.

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



MAGNETIC FIELDS can affect pacemakers.

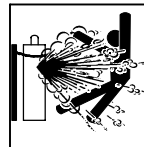
- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.



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, physical damage, slag, open flames, sparks, and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.
- Never weld on a pressurized cylinder – explosion will result.
- Use only correct 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.
- Use the right equipment, correct procedures, and sufficient number of persons to lift and move cylinders.
- Read and follow instructions on compressed gas cylinders, associated equipment, and Compressed Gas Association (CGA) publication P-1 listed in Safety Standards.

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



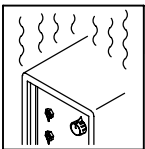
FIRE OR EXPLOSION hazard.

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



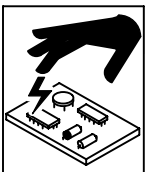
FALLING UNIT can cause injury.

- 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.



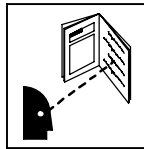
WELDING WIRE can cause injury.

- 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.



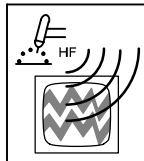
MOVING PARTS can cause injury.

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



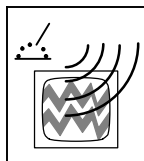
READ INSTRUCTIONS.

- Read Owner's Manual before using or servicing unit.
- Use only genuine Miller/Hobart replacement parts.



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 Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

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

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

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 before welding or going near welding operations. If cleared by your doctor, then following the above procedures is recommended.

SECTION 2 – CONSIGNES DE SÉCURITÉ – LIRE AVANT UTILISATION

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▲ **Avertissement : se protéger et protéger les autres contre le risque de blessure — lire et respecter ces consignes.**

2-1. Symboles utilisés



Symbole graphique d'avertissement ! Attention ! Cette procédure comporte des risques possibles ! Les dangers éventuels sont représentés par les symboles graphiques joints.



Ce groupe de symboles signifie Avertissement ! Attention ! Risques d'ÉLECTROCUTION, ORGANES MOBILES et PARTIES CHAUDES. Consulter les symboles et les instructions afférentes ci-dessous concernant les mesures à prendre pour supprimer les dangers.

▲ **Indique un message de sécurité particulier**

☞ Signifie NOTE ; n'est pas relatif à la sécurité.

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

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

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

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



UNE DÉCHARGE ÉLECTRIQUE peut entraîner la mort.

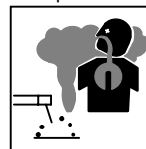
Le contact d'organes électriques sous tension peut provoquer des accidents mortels ou des brûlures graves. Le circuit de l'électrode et de la pièce est sous tension lorsque le courant est délivré à la sortie. Le circuit d'alimentation et les circuits internes de la machine sont également sous tension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

- Ne pas toucher aux pièces électriques sous tension.
- Porter des gants isolants et des vêtements de protection secs et sans trous.
- S'isoler de la pièce à couper et du sol en utilisant des housses ou des tapis assez grands afin d'éviter tout contact physique avec la pièce à couper ou le sol.
- Ne pas se servir de source électrique à courant électrique dans les zones humides, dans les endroits confinés ou là où on risque de tomber.
- Se servir d'une source électrique à courant électrique UNIQUEMENT si le procédé de soudage le demande.
- Si l'utilisation d'une source électrique à courant électrique s'avère nécessaire, se servir de la fonction de télécommande si l'appareil en est équipé.
- D'autres consignes de sécurité sont nécessaires dans les conditions suivantes : risques électriques dans un environnement humide ou si l'on porte des vêtements mouillés ; sur des structures métalliques telles que sols, grilles ou échafaudages ; en position coincée comme assise, à genoux ou couchée ; ou s'il y a un risque élevé de contact inévitable ou accidentel avec la pièce à souder ou le sol. Dans ces conditions, utiliser les équipements suivants, dans l'ordre indiqué : 1) un poste à souder DC à tension constante (à fil), 2) un poste à souder DC manuel (électrode) ou 3) un poste à souder AC à tension à vide réduite. Dans la plupart des situations, l'utilisation d'un poste à souder DC à fil à tension constante est recommandée. En outre, ne pas travailler seul !
- Couper l'alimentation ou arrêter le moteur avant de procéder à l'installation, à la réparation ou à l'entretien de l'appareil. Déverrouiller l'alimentation selon la norme OSHA 29 CFR 1910.147 (voir normes de sécurité).
- Installer le poste correctement et le mettre à la terre convenablement selon les consignes du manuel de l'opérateur et les normes nationales, provinciales et locales.
- Toujours vérifier la terre du cordon d'alimentation. Vérifier et s'assurer que le fil de terre du cordon d'alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- En effectuant les raccordements d'entrée, fixer d'abord le conducteur de mise à la terre approprié et contre-vérifier les connexions.

- Vérifier fréquemment le cordon d'alimentation afin de s'assurer qu'il n'est pas altéré ou à nu, le remplacer immédiatement s'il l'est. Un fil à nu peut entraîner la mort.
- L'équipement doit être hors tension lorsqu'il n'est pas utilisé.
- Ne pas utiliser des câbles usés, endommagés, de grosseur insuffisante ou mal épissés.
- Ne pas enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, le faire directement avec un câble distinct.
- Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d'une autre machine.
- Ne pas toucher des porte électrodes connectés à deux machines en même temps à cause de la présence d'une tension à vide doublée.
- N'utiliser qu'un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretenir l'appareil conformément à ce manuel.
- Porter un harnais de sécurité si l'on doit travailler au-dessus du sol.
- S'assurer que tous les panneaux et couvercles sont correctement en place.
- Fixer le câble de retour de façon à obtenir un bon contact métal-métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.
- Isoler la pince de masse quand pas mis à la pièce pour éviter le contact avec tout objet métallique.
- Ne pas raccorder plus d'une électrode ou plus d'un câble de masse à une même borne de sortie de soudage.

Il reste une TENSION DC NON NÉGLIGEABLE dans les sources de soudage onduleur quand on a coupé l'alimentation.

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



LES FUMÉES ET LES GAZ peuvent être dangereux.

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

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



LES RAYONS D'ARC peuvent entraîner des brûlures aux yeux et à la peau.

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

Des étincelles sont projetées pendant le soudage.

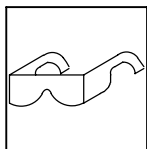
- Porter un casque de soudage approuvé muni de verres filtrants appropriés pour protéger visage et yeux pendant le soudage (voir ANSI Z49.1 et Z87.1 énumérés dans les normes de sécurité).
- Porter des lunettes de sécurité avec écrans latéraux même sous votre casque.
- Avoir recours à des écrans protecteurs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



LE SOUDAGE peut provoquer un incendie ou une explosion.

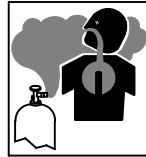
Le soudage effectué sur des conteneurs fermés tels que des réservoirs, tambours ou des conduites peut provoquer leur éclatement. Des étincelles peuvent être projetées de l'arc de soudure. La projection d'étincelles, des pièces chaudes et des équipements chauds peuvent provoquer des incendies et des brûlures.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

- Déplacer toutes les substances inflammables à une distance de 10,7 m de l'arc de soudage. En cas d'impossibilité, les recouvrir soigneusement avec des protections homologuées.
- Ne pas souder dans un endroit où des étincelles peuvent tomber sur des substances inflammables.
- Se protéger, ainsi que toute autre personne travaillant sur les lieux, contre les étincelles et le métal chaud.
- Des étincelles et des matériaux chauds du soudage peuvent facilement passer dans d'autres zones en traversant de petites fissures et des ouvertures.
- Afin d'éliminer tout risque de feu, être vigilant et garder toujours un extincteur à la portée de main.
- Le soudage effectué sur un plafond, plancher, paroi ou séparation peut déclencher un incendie de l'autre côté.
- Ne pas effectuer le soudage sur des conteneurs fermés tels que des réservoirs, tambours, ou conduites, à moins qu'ils n'aient été préparés correctement conformément à AWS F4.1 (voir les normes de sécurité).
- Brancher le câble de masse sur la pièce la plus près possible de la zone de soudage pour éviter le transport du courant sur une longue distance par des chemins inconnus éventuels en provoquant des risques d'électrocution, d'étincelles et d'incendie.
- Ne pas utiliser le poste de soudage pour dégelier des conduites gelées.
- En cas de non-utilisation, enlever la baguette d'électrode du porte-électrode ou couper le fil à la pointe de contact.
- Porter des vêtements de protection exempts d'huile tels que des gants en cuir, une veste résistante, des pantalons sans revers, des bottes et un casque.
- Avant de souder, retirer toute substance combustible de ses poches telles qu'un allumeur au butane ou des allumettes.
- Suivre les consignes de OSHA 1910.252 (a) (2) (iv) et de NFPA 51B pour travaux de soudage et prévoir un détecteur d'incendie et un extincteur à proximité.



DES PARTICULES VOLANTES peuvent blesser les yeux.

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



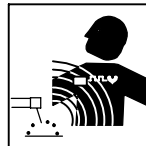
LES ACCUMULATIONS DE GAZ risquent de provoquer des blessures ou même la mort.

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



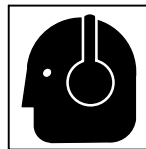
DES PIÈCES CHAUDES peuvent provoquer des brûlures graves.

- Ne pas toucher des parties chaudes à mains nues.
- Prévoir une période de refroidissement avant d'utiliser le pistolet ou la torche.
- Ne pas toucher aux pièces chaudes, utiliser les outils recommandés et porter des gants de soudage et des vêtements épais pour éviter les brûlures.



LES CHAMPS MAGNÉTIQUES peuvent affecter les stimulateurs cardiaques.

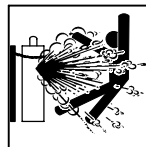
- Porteurs de stimulateur cardiaque, rester à distance.
- Les porteurs d'un stimulateur cardiaque doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de gougeage ou de soudage par points.



LE BRUIT peut endommager l'ouïe.

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

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



LES BOUTEILLES peuvent exploser si elles sont endommagées.

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

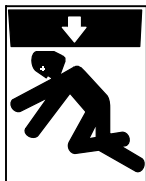
- Protéger les bouteilles de gaz comprimé d'une chaleur excessive, des chocs mécaniques, des dommages physiques, du laitier, des flammes ouvertes, des étincelles et des arcs.
- Placer les bouteilles debout en les fixant dans un support stationnaire ou dans un porte-bouteilles pour les empêcher de tomber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

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



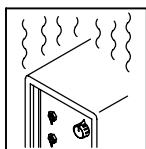
Risque D'INCENDIE OU D'EXPLOSION.

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



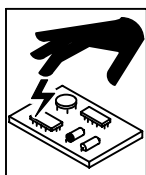
LA CHUTE DE L'APPAREIL peut blesser.

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



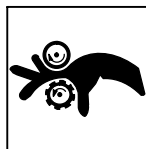
L'EMPLOI EXCESSIF peut SURCHAUFFER L'ÉQUIPEMENT.

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



LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

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



DES ORGANES MOBILES peuvent provoquer des blessures.

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



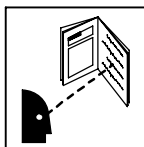
LES FILS DE SOUDAGE peuvent provoquer des blessures.

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



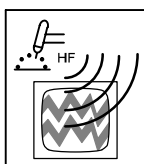
DES ORGANES MOBILES peuvent provoquer des blessures.

- S'abstenir de toucher des organes mobiles tels que des ventilateurs.
- Maintenir fermés et verrouillés les portes, panneaux, recouvrements et dispositifs de protection.
- Seules des personnes qualifiées sont autorisées à enlever les portes, panneaux, recouvrements ou dispositifs de protection pour l'entretien.
- Remettre les portes, panneaux, recouvrements ou dispositifs de protection quand l'entretien est terminé et avant de rebrancher l'alimentation électrique.



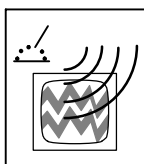
LIRE LES INSTRUCTIONS.

- Lire le manuel d'utilisation avant d'utiliser ou d'intervenir sur l'appareil.
- Utiliser uniquement des pièces de rechange Miller/Hobart.



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

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



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

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

2-4. Proposition californienne 65 Avertissements

▲ Les équipements de soudage et de coupage produisent des fumées et des gaz qui contiennent des produits chimiques dont l'État de Californie reconnaît qu'ils provoquent des malformations congénitales et, dans certains cas, des cancers. (Code de santé et de sécurité de Californie, chapitre 25249.5 et suivants)

▲ Les batteries, les bornes et autres accessoires contiennent du plomb et des composés à base de plomb, produits chimiques dont l'État de Californie reconnaît qu'ils provoquent des cancers et des malformations congénitales ou autres problèmes de procréation. Se laver les mains après manipulation.

Pour les moteurs à essence :

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

Pour les moteurs diesel :

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

2-5. Principales normes de sécurité

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, de Global Engineering Documents (téléphone : 1-877-413-5184, site Internet : www.global.ihs.com).

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

National Electrical Code, NFPA Standard 70, de National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269-9101 (téléphone : 617-770-3000, site Internet : www.nfpa.org).

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

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

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

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

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

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

2-6. Information EMF

Considérations sur le soudage et les effets de basse fréquence et des champs magnétiques et électriques.

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

Pour réduire les champs magnétiques sur le poste de travail, appliquer les procédures suivantes :

1. Maintenir les câbles ensemble en les tordant ou en les enveloppant.
2. Disposer les câbles d'un côté et à distance de l'opérateur.
3. Ne pas courber pas et ne pas entourer pas les câbles autour de votre corps.
4. Garder le poste de soudage et les câbles le plus loin possible de vous.
5. Connecter la pince sur la pièce aussi près que possible de la soudeuse.

En ce qui concerne les stimulateurs cardiaques

Les porteurs de stimulateur cardiaque doivent consulter leur médecin avant de souder ou d'approcher des opérations de soudage. Si le médecin approuve, il est recommandé de suivre les procédures précédentes.

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.

The warning label is a grid of 24 cells (3 rows by 8 columns) with a large orange warning triangle at the top center. The cells contain pictograms and text for various hazards:

- Row 1:**
 - Cell 1: Pictogram of a person being struck by a falling object.
 - Cell 1.1: Pictogram of hands wearing gloves.
 - Cell 1.2: Pictogram of a person insulating themselves from a work surface.
 - Cell 1.3: Pictogram of a power plug being disconnected.
 - Cell 4: Pictogram of a person's head being hit by sparks.
 - Cell 4.1: Pictogram showing a person wearing a hat, safety glasses, ear protection, and a button-down shirt, plus a welding helmet.
- Row 2:**
 - Cell 2: Pictogram of a person breathing in fumes.
 - Cell 2.1: Pictogram of a person's head being protected from fumes.
 - Cell 2.2: Pictogram of a person using a fan for ventilation.
 - Cell 2.3: Pictogram of a person using a local exhaust system.
 - Cell 5: Pictogram showing a person reading instructions, a person working on a machine, and a person using a fire extinguisher.
- Row 3:**
 - Cell 3: Pictogram of a fire.
 - Cell 3.1: Pictogram of a person keeping a fire extinguisher nearby.
 - Cell 3.2: Pictogram of a person watching a fire.
 - Cell 3.3: Pictogram of a person not welding on a drum.
 - Cell 6: Pictogram of a person not removing or covering a label.

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.

S-185 836

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.

S-179 309-A

1/96











3-2. WEEE Label (For Products Sold Within The EU)

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

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

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


















3-3. Manufacturer's Rating Label

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

See Section 4-4 for location.
Use rating label to determine input power requirements.

195 646-B

3-4. Symbols And Definitions

A	Amperes		High Temperature		Gas Tungsten Arc Welding (GTAW)		Shielded Metal Arc Welding (SMAW)
V	Volts		Voltage Input	 3 Phase Static Frequency Converter-Transformer-Rectifier			
%	Percent		Arc Force (DIG)		Remote		Lift-Arc Start (GTAW)
	Protective Earth (Ground)		Alternating Current	I₂	Rated Welding Current	S	Seconds
I	On		Off	+	Positive	-	Negative
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)	Hz	Hertz		Suitable For Areas Of Increased Shock Hazard		Increase/Decrease Of Quantity
	Output		Adjust				

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	80∇ 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	80∇ 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	80∇ 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	80∇ 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	80∇ 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 Lift-Arc™ on all models, and Stick on models with stock numbers 907 036 and 907 037.

∇ Normal open-circuit voltage (80 volts) is present while in the Stick process for models with stock number 907 220.

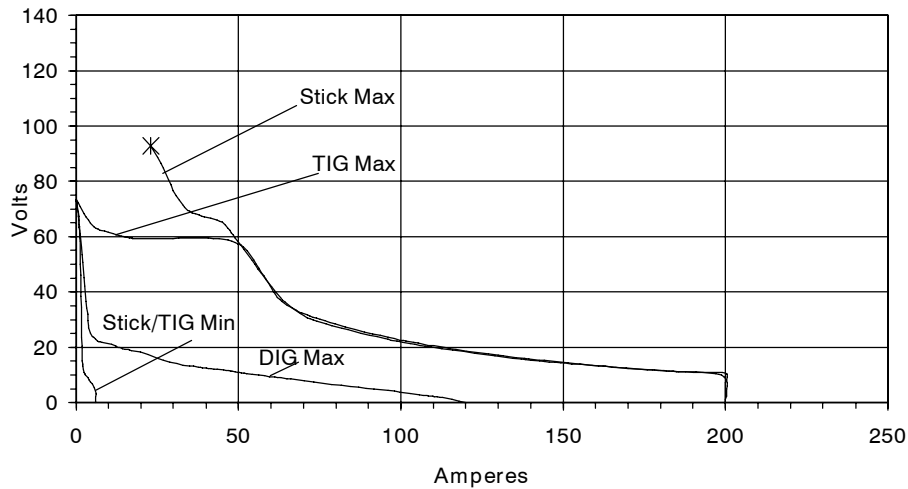
NOTE: Duty cycle limitations on units with 115 volt input power are due to the input power cord supplied with the unit.

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.

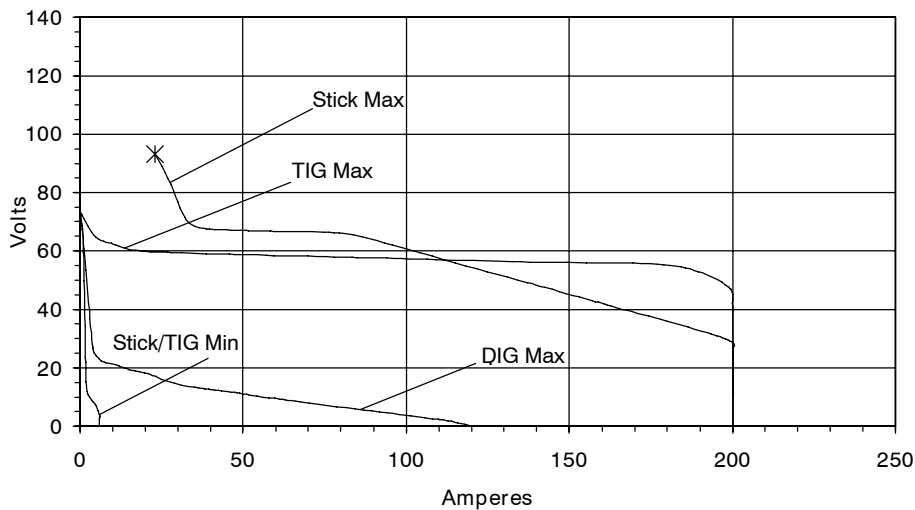
4-2. Volt-Ampere Curves

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

115VAC Input



Other Input Voltages



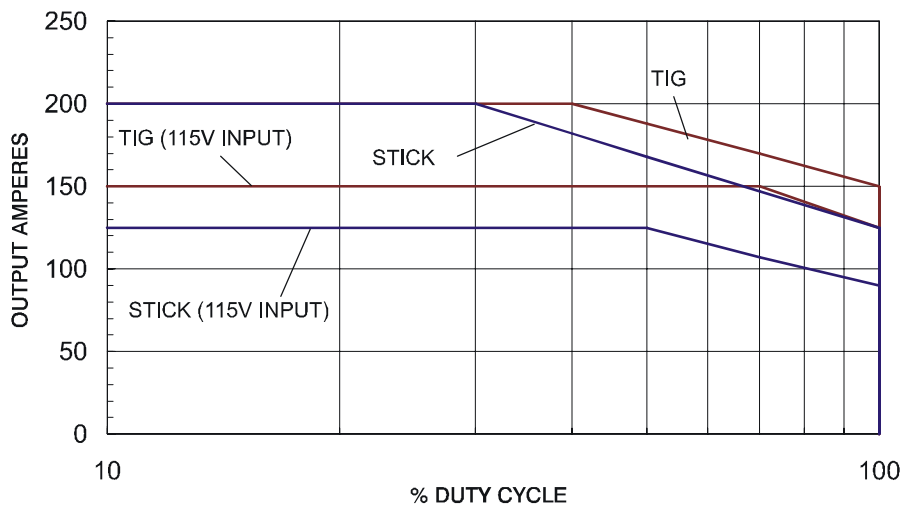
Amperage setting must be reduced to obtain currents less than highlighted data point.

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, and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage or duty cycle before welding.

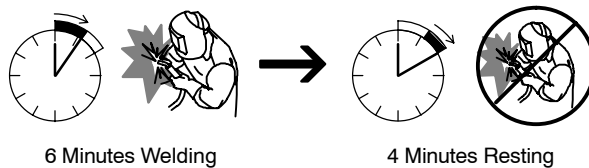
▲ Exceeding duty cycle can damage unit and void warranty.

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

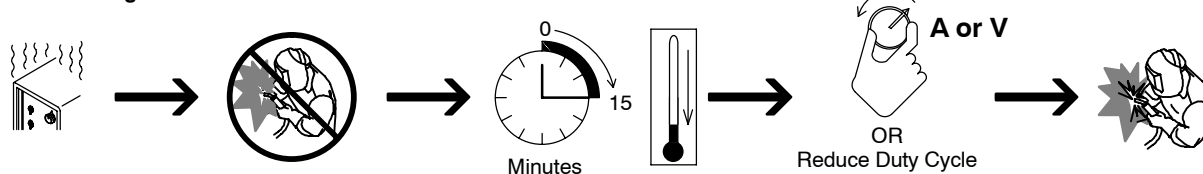
125 A @ 100% Duty Cycle For 115 Volt Single-Phase TIG Process

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

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



Overheating



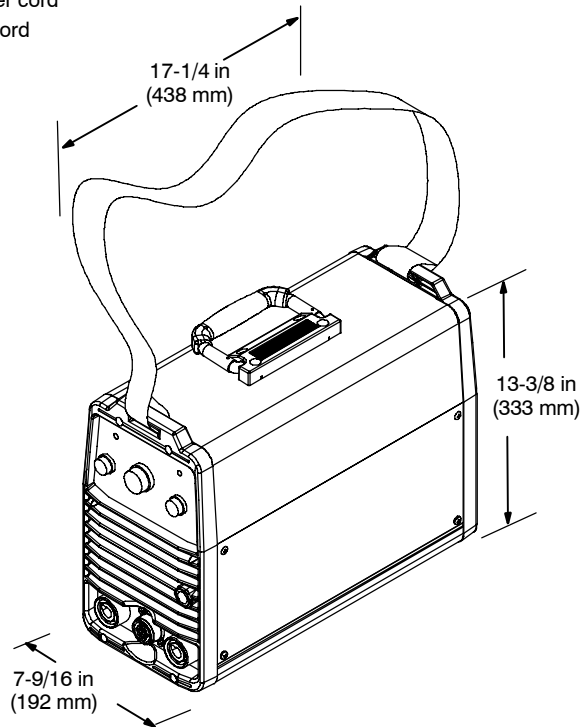
189 770-A

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

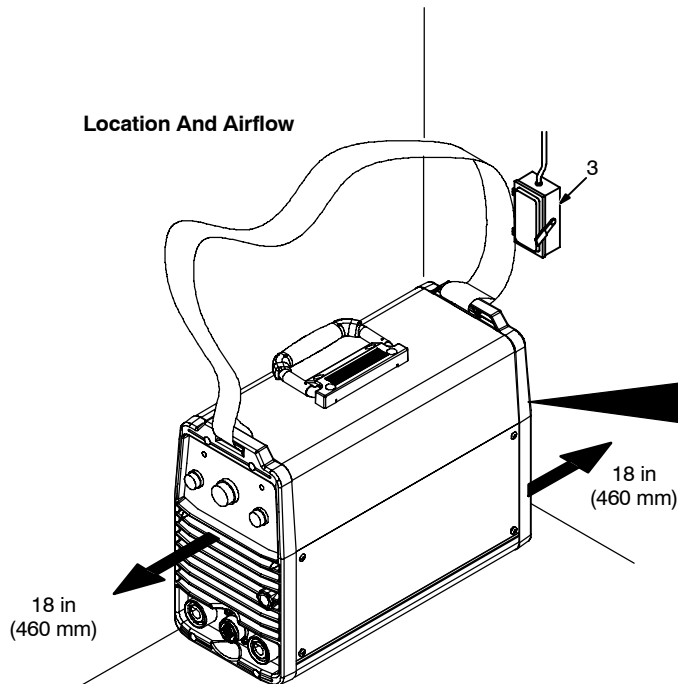


- 1 Identification Plate
- 2 Rating Label
- 3 Line Disconnect Device

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.**


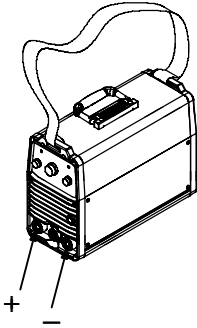
Location And Airflow



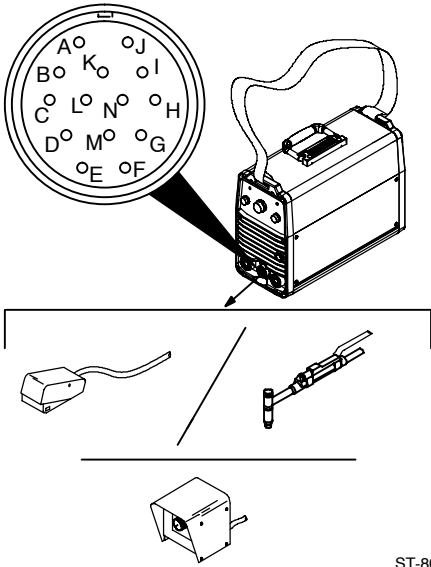

		EN 60974-1			
S	1A 10V		200A 18V		
		X	40%	60%	100%
	I_2	200	175	150	
U_0	80V	U_2	18	17	16
S	1A 20V		200A 28V		
		X	40%	60%	100%
	I_2	175	150	125	
U_0	80V	U_2	27	26	25
			I_1 max	I_1 eff	
	1 ~ 50/60 Hz	$U_1=115V$	35	35	
	1 ~ 50/60 Hz	$U_1=230V$	31	17	
	3 ~ 50/60 Hz	$U_1=230V$	19	11	
	3 ~ 50/60 Hz	$U_1=400V$	11	6	
	3 ~ 50/60 Hz	$U_1=460V$	9	5	
IP23					

802 886-A

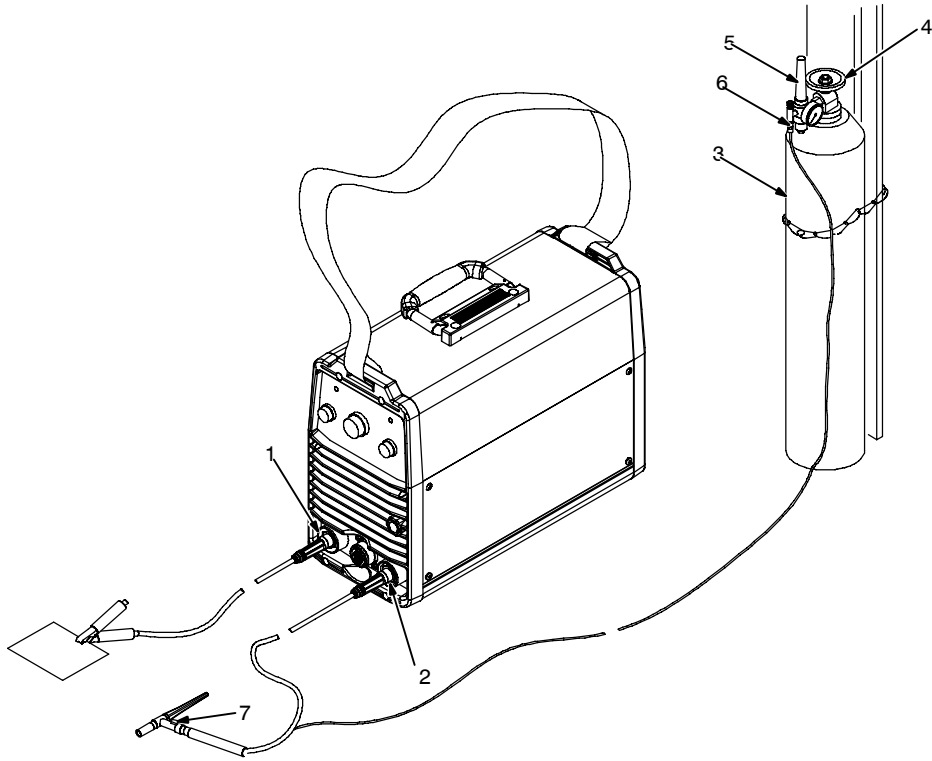
4-5. Weld Output Terminals And Selecting Cable Sizes*

 <p>Weld Output Terminals</p> <ul style="list-style-type: none"> ▲ Turn off power before connecting to weld output terminals. ▲ Do not use worn, damaged, undersized, or poorly spliced cables.  <p>Output Receptacles</p>	Weld Cable Size** and Total Cable (Copper) Length in Weld Circuit Not Exceeding								
			100 ft (30 m) Or Less	150 ft (45 m)	200 ft (60 m)	250 ft (70 m)	300 ft (90 m)	350 ft (105 m)	400 ft (120 m)
	Welding Amperes***	10 – 60% Duty Cycle	60 – 100% Duty Cycle	10 – 100% Duty Cycle					
	100	4 (20)	4 (20)	4 (20)	3 (30)	2 (35)	1 (50)	1/0 (60)	1/0 (60)
150	3 (30)	3 (30)	2 (35)	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)	3/0 (95)	
200	3 (30)	2 (35)	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	4/0 (120)	
<p>* This chart is a general guideline and may not suit all applications. If cable overheats, use next size larger cable.</p> <p>**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</p> <p>***Select weld cable size for pulsing application at peak amperage value.</p> <p style="text-align: right;">S-0007-E-</p>									

4-6. Remote 14 Receptacle Information

 <p style="text-align: right;">ST-802 541</p>	 REMOTE 14	Socket*	Socket Information
	REMOTE OUTPUT CONTROL	C	Output to remote control; 0 to +10 volts dc output to remote control.
		D	Remote control circuit common.
CHASSIS	K	Chassis common.	
<p>*The remaining sockets are not used.</p>			

4-7. TIG Lift-Arc DCEN (Direct Current Electrode Negative) Connections



▲ **Turn off power before making connections.**

1 Positive (+) Weld Output Terminal

Connect work lead to positive weld output terminal.

2 Negative (-) Weld Output Terminal

Connect TIG torch to negative weld output terminal.

3 Gas Cylinder

4 Cylinder Valve

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

5 Regulator/Flowmeter

6 Flow Adjust

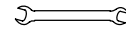
Typical flow rate is 15 cubic feet per hour (7.1 liters per minute).

Connect torch gas hose to regulator/flowmeter.

7 Gas Valve

Valve controls gas preflow and postflow. Open valve on torch just before welding.

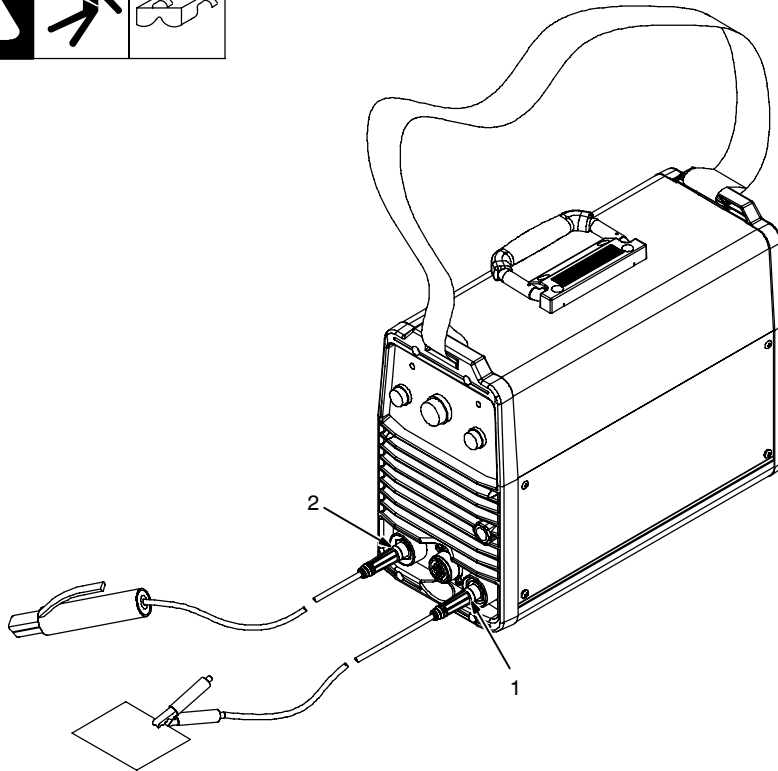
Tools Needed:



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

Ref. 802 888-A

4-8. 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.

Ref. 802 888-A

4-9. 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 Time Delay ²	25	25	15	8	8
	Normal Operating ³	35	30	20	10
Min Input Conductor Size In AWG ⁴	10	12	14	14	14
Max Recommended Input Conductor Length In Feet (Meters)	57 (17)	79 (24)	102 (31)	308 (94)	407 (124)
Min Grounding Conductor Size In AWG ⁴	10	12	14	14	14

Reference: 2005 National Electrical Code (NEC)

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

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

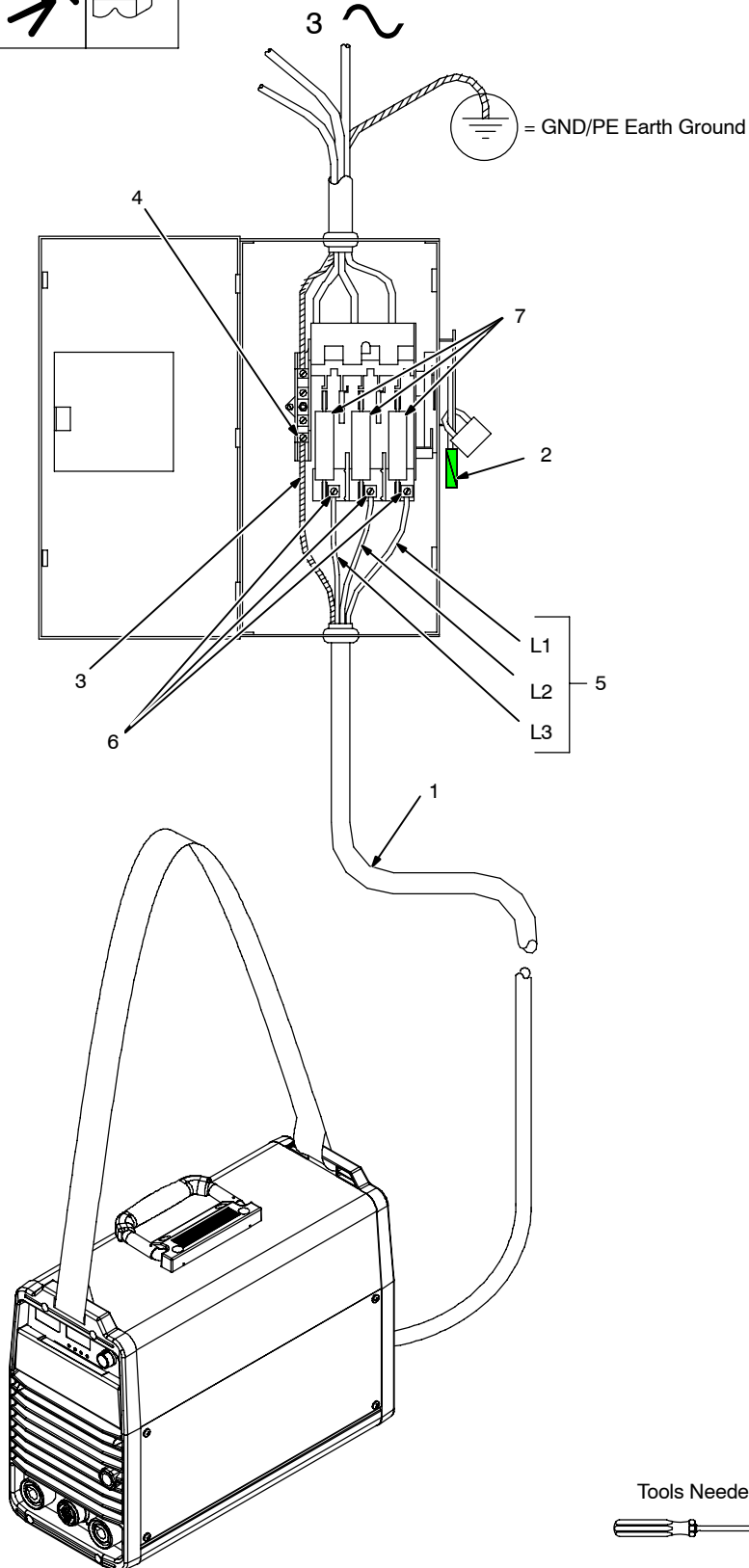
3 "Normal Operating" (general purpose - no intentional delay) fuses are UL class "K5" (up to and including 60 amp), and UL class "H" (65 amp and above).

4 Conductor data in this section specifies conductor size (excluding flexible cord or cable) between the panelboard and the equipment per NEC Table 310.16. If a flexible cord or cable is used, minimum conductor size may increase. See NEC Table 400.5(A) for flexible cord and cable requirements.


4-10. Connecting Input Power



A. Connecting Three-Phase Input Power



- ▲ Installation must meet all National and Local Codes – have only qualified persons make this installation.
- ▲ Disconnect and lockout/tagout input power before connecting input conductors from unit.
- ▲ Always connect green or green/yellow conductor to supply grounding terminal first, and never to a line terminal.

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

For Three-Phase Operation

- 1 Input Power Cord.
- 2 Disconnect Device (switch shown in the OFF position)
- 3 Green Or Green/Yellow Grounding Conductor
- 4 Disconnect Device Grounding Terminal
- 5 Input Conductors (L1, L2 And L3)
- 6 Disconnect Device Line Terminals

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

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

7 Over-Current Protection

Select type and size of over-current protection using Section 4-9 (fused disconnect switch shown).

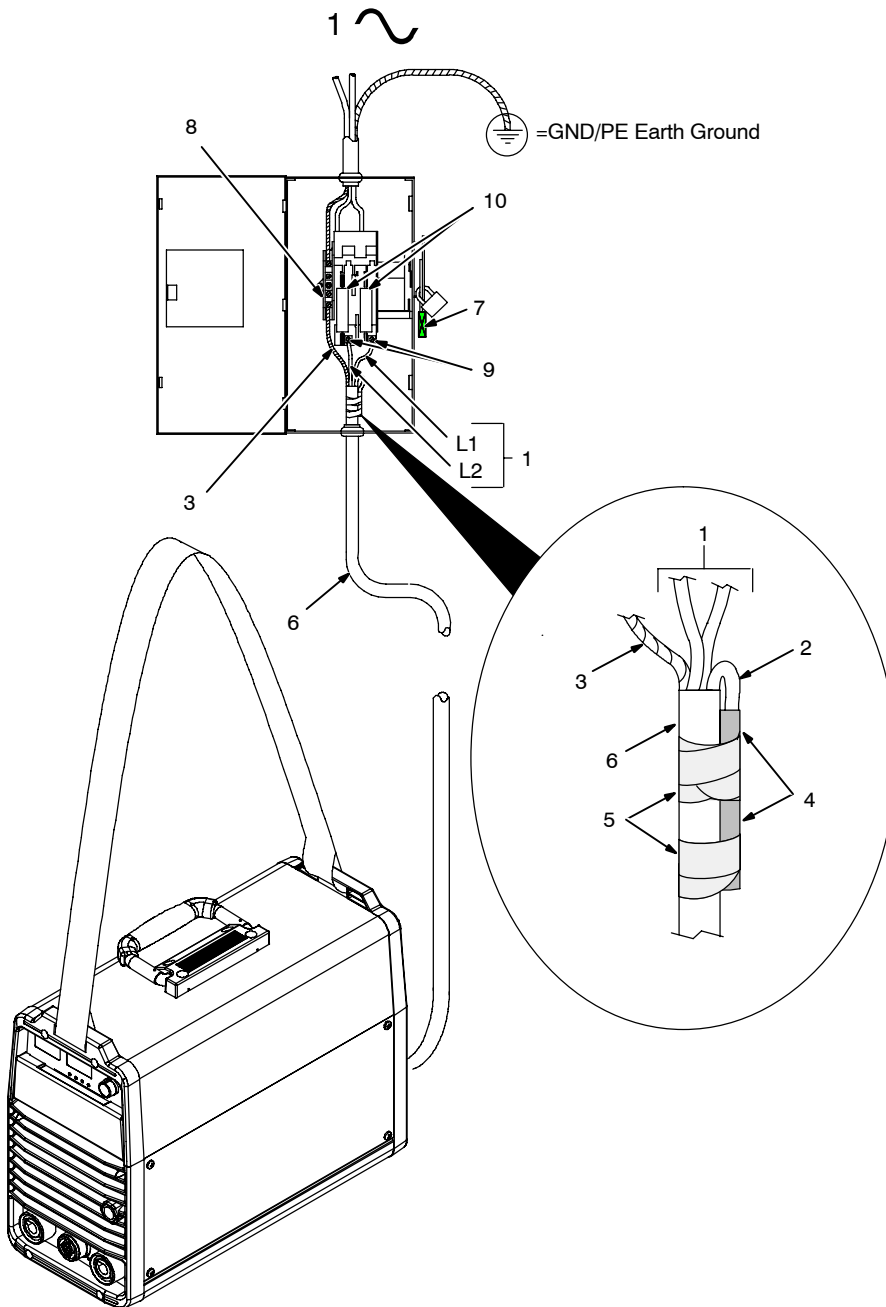
Close and secure door on disconnect device. Remove lockout/tagout device, and place switch in the On position.

Tools Needed:



2/04 - Ref. 802 136-A

B. Connecting Single-Phase Input Power



- ▲ Installation must meet all National and Local Codes – have only qualified persons make this installation.
- ▲ Disconnect and lockout/tagout input power before connecting input conductors from unit.
- ▲ Always connect green or green/yellow conductor to supply grounding terminal first, and never to a line terminal.

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

- 1 Black And White Input Conductor (L1 And L2)
- 2 Red Input Conductor
- 3 Green Or Green/Yellow Grounding Conductor
- 4 Insulation Sleeve
- 5 Electrical Tape

Insulate and isolate red conductor as shown.

- 6 Input Power Cord.
 - 7 Disconnect Device (switch shown in the OFF position)
 - 8 Disconnect Device Grounding Terminal
 - 9 Disconnect Device Line Terminals
- Connect green or green/yellow grounding conductor to disconnect device grounding terminal first.

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

- 10 Over-Current Protection

Select type and size of over-current protection using Section 4-9 (fused disconnect switch shown).

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

Tools Needed:



2/04 - Ref. 802 136-A

SECTION 5 – OPERATION

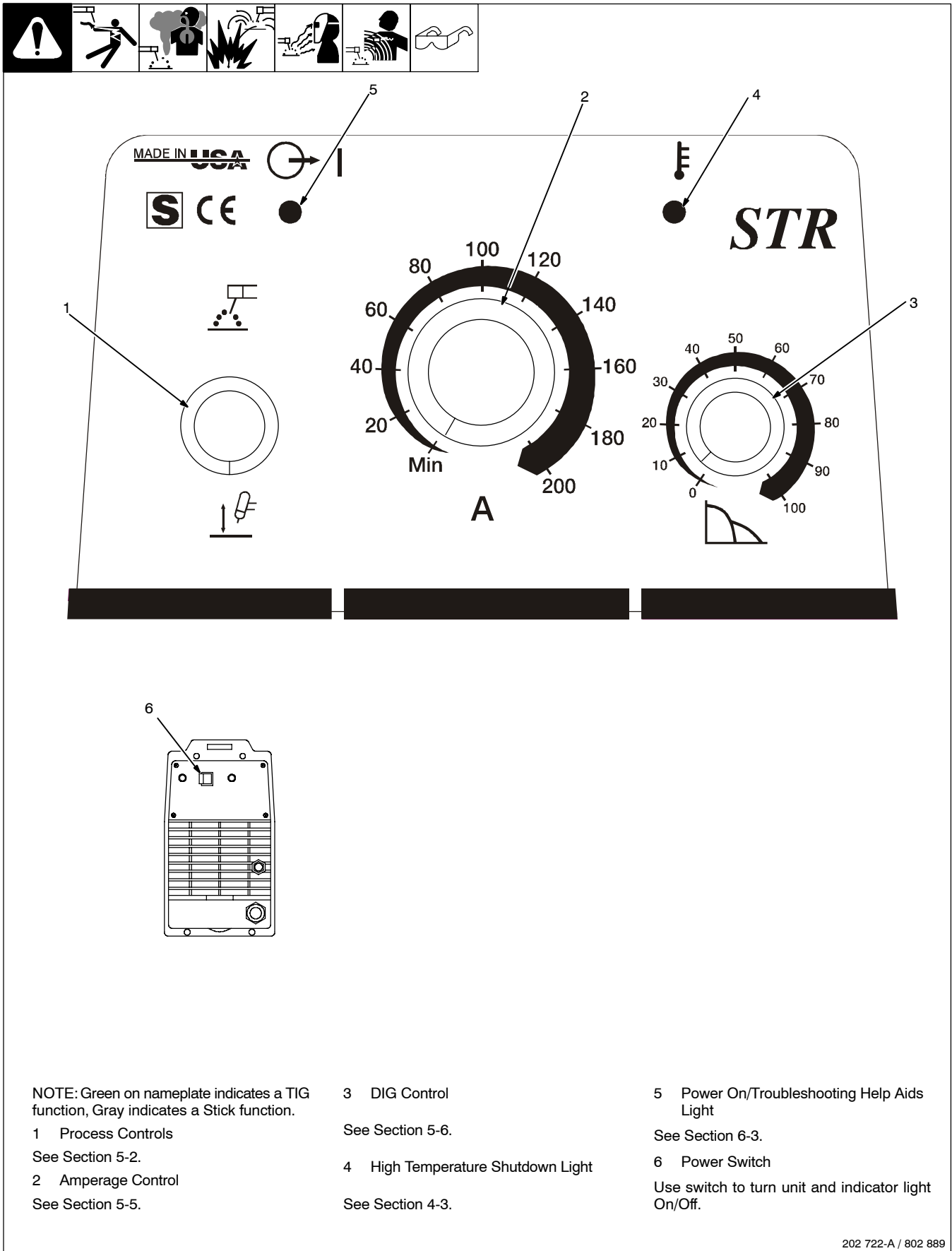
5-1. Controls

A. Non CE Units

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

1 Process Controls See Section 5-2.	3 DIG Control See Section 5-6.	5 Power On/Troubleshooting Help Aids Light See Section 6-3.
2 Amperage Control See Section 5-5.	4 High Temperature Shutdown Light See Section 4-3.	6 Power Switch Use switch to turn unit and indicator light On/Off.

B. For CE Units



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

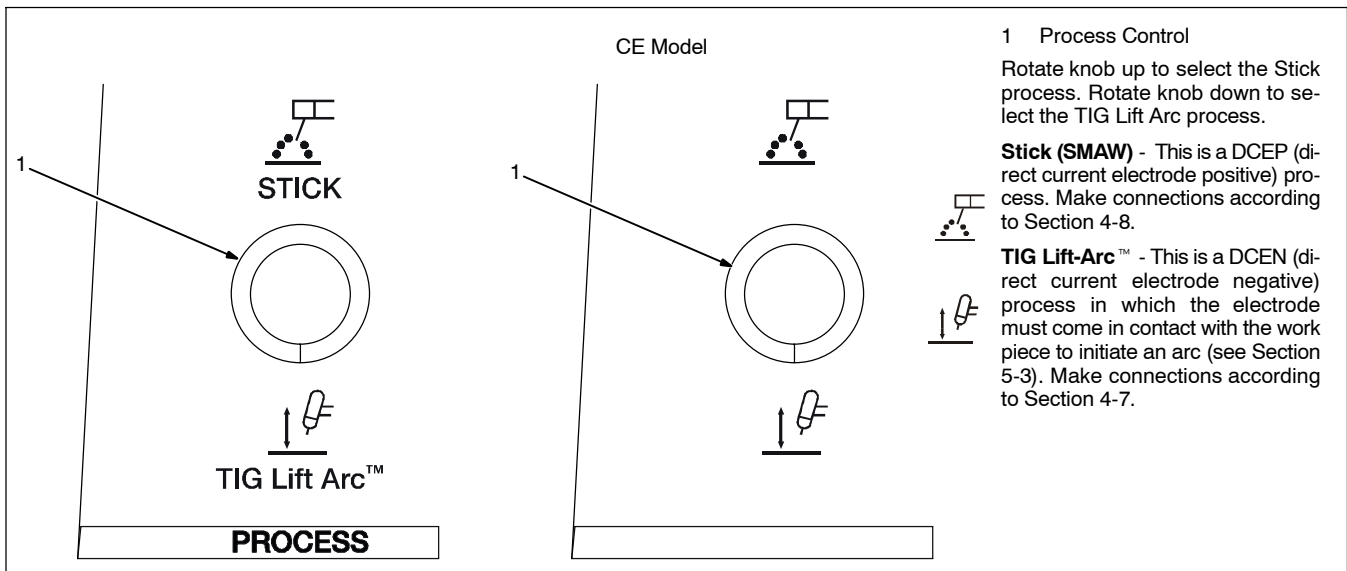
- 1 Process Controls
See Section 5-2.
- 2 Amperage Control
See Section 5-5.

- 3 DIG Control
See Section 5-6.
- 4 High Temperature Shutdown Light
See Section 4-3.

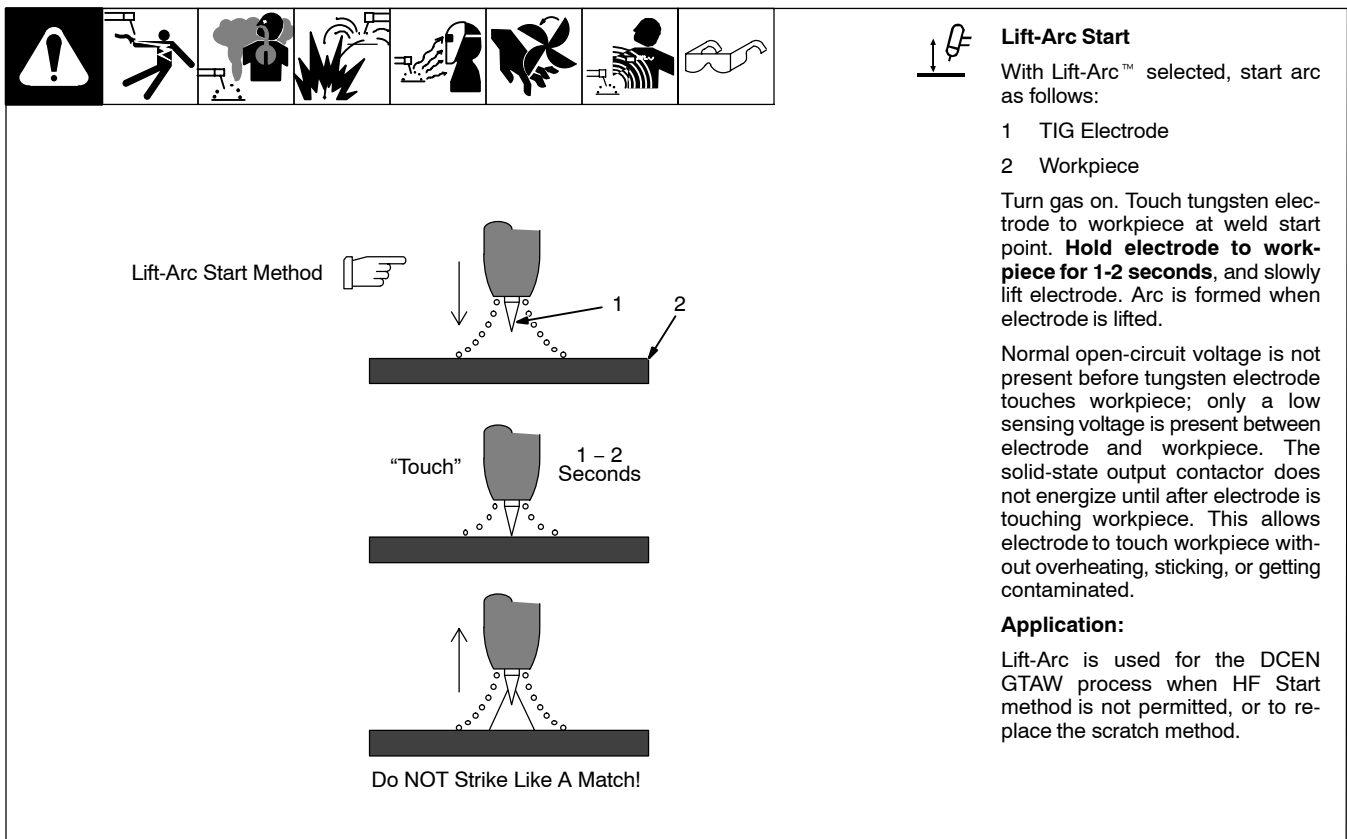
- 5 Power On/Troubleshooting Help Aids Light
See Section 6-3.
- 6 Power Switch
Use switch to turn unit and indicator light On/Off.

202 722-A / 802 889

5-2. Process Control



5-3. Lift-Arc™ Start Procedure



5-4. Stick Start Procedure – Scratch Start Technique



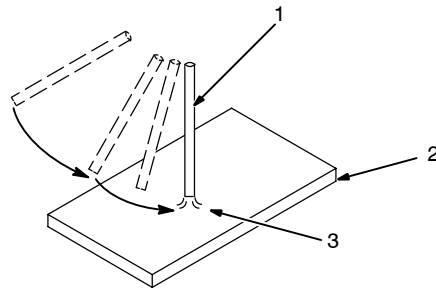
With Stick selected, start arc as follows:

- 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.

▲ For models with stock number 907 220, normal open-circuit voltage (80 volts) is present before electrode touches workpiece.

For models with stock numbers 907 036 and 907 037, normal open-circuit voltage is not present before electrode touches workpiece; only a low sensing voltage is present between electrode and workpiece.



5-5. Amperage Control

AMPERAGE ADJUST

CE Model

AMPERAGE ADJUST

A 1 A (Amperage Control)
 Rotate knob clockwise to increase amperage (Min-200 amps).

5-6. DIG Control

DIG

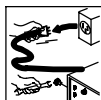
CE Model

DIG

D 1 DIG Control
 Control increases SMAW short-circuit amperage at low arc voltage. This allows the operator to use a very short arc length without sticking the electrode.
 Set control at 0 for normal welding amperage. Turn clockwise to increase short-circuit amperage.

SECTION 6 – MAINTENANCE AND TROUBLESHOOTING

6-1. Routine Maintenance



▲ Disconnect power before maintaining.

☞ Maintain more often during severe conditions.

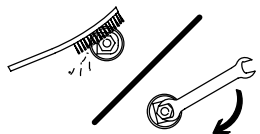


3 Months

Replace unreadable labels.



Clean and tighten weld terminals.

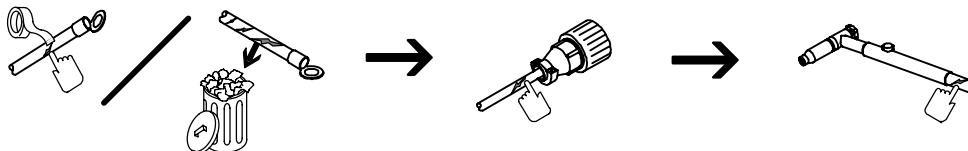


Replace Damaged Gas Hose



3 Months

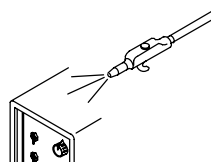
Repair Or Replace Cracked Cables And Cords



6 Months

▲ Do not remove case when blowing out inside of unit (see Section 6-2).

Blow out inside. During heavy service clean monthly.

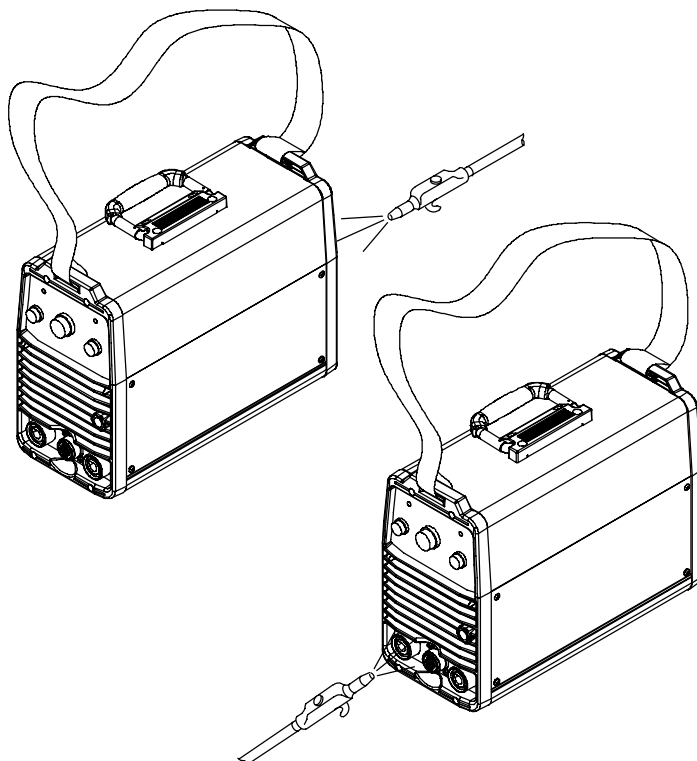


6-2. Blowing Out Inside Of Unit



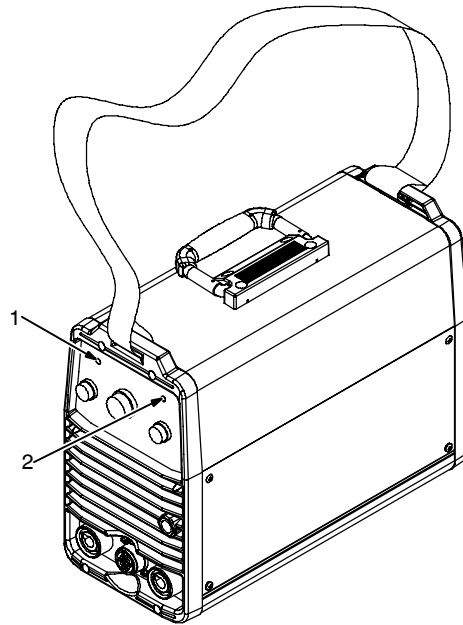
▲ Do not remove case when blowing out inside of unit.

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



802 886-A

6-3. Troubleshooting Help Aids



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

- 1 Output LED
- 2 High Temperature LED

The Output LED turns on when power is turned on. The LED is also used to indicate several machine malfunctions. When one of the malfunctions listed below occurs, the LED will first turn off for 1.5 seconds, and then it will begin to blink. The number of blinks corresponds to a Help message relating to that malfunction. After the LED blinks the appropriate number of times, the LED will again turn off for 1.5 seconds, and the sequence will start again.

The malfunctions that correspond to Help 2, 3, 4, 5, and 9 are thermal related. The High Temperature LED turns on along with the blinking Output LED.

A malfunction relating to Help 0 will cause the the Output LED to turn off and stay off, but the High Temperature LED turns on and

stays on.

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 happens.

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 happens.

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 happens.

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.

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 happens.

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.

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 happens.

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 happens.

6-4. Troubleshooting



Trouble	Remedy
No weld output; unit completely inoperative.	Place line disconnect switch in On position (see Section 4-10).
	Check and replace line fuse(s), if necessary, or reset circuit breaker (see Section 4-10).
	Check for proper input power connections (see Section 4-10).
No weld output; Output LED on.	Input voltage outside acceptable range of variation (see Section 4-9).
	See Section 6-3, Troubleshooting Help Aids.
No weld output; Overtemp LED on.	Unit overheated. Allow unit to cool with fan On (see Sections 4-3 and 6-3).
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 8).
	Use properly prepared tungsten (see Section 8).
	Reduce gas flow rate (see Section 4-7).
Tungsten electrode oxidizing and not remaining bright after conclusion of weld.	Shield weld zone from drafts.
	Allow adequate postflow time to shield tungsten while it cools, after welding stops.
	Check and tighten all gas fittings (see Section 4-7).
	Water in torch. Refer to torch manual.

SECTION 7 – ELECTRICAL DIAGRAMS

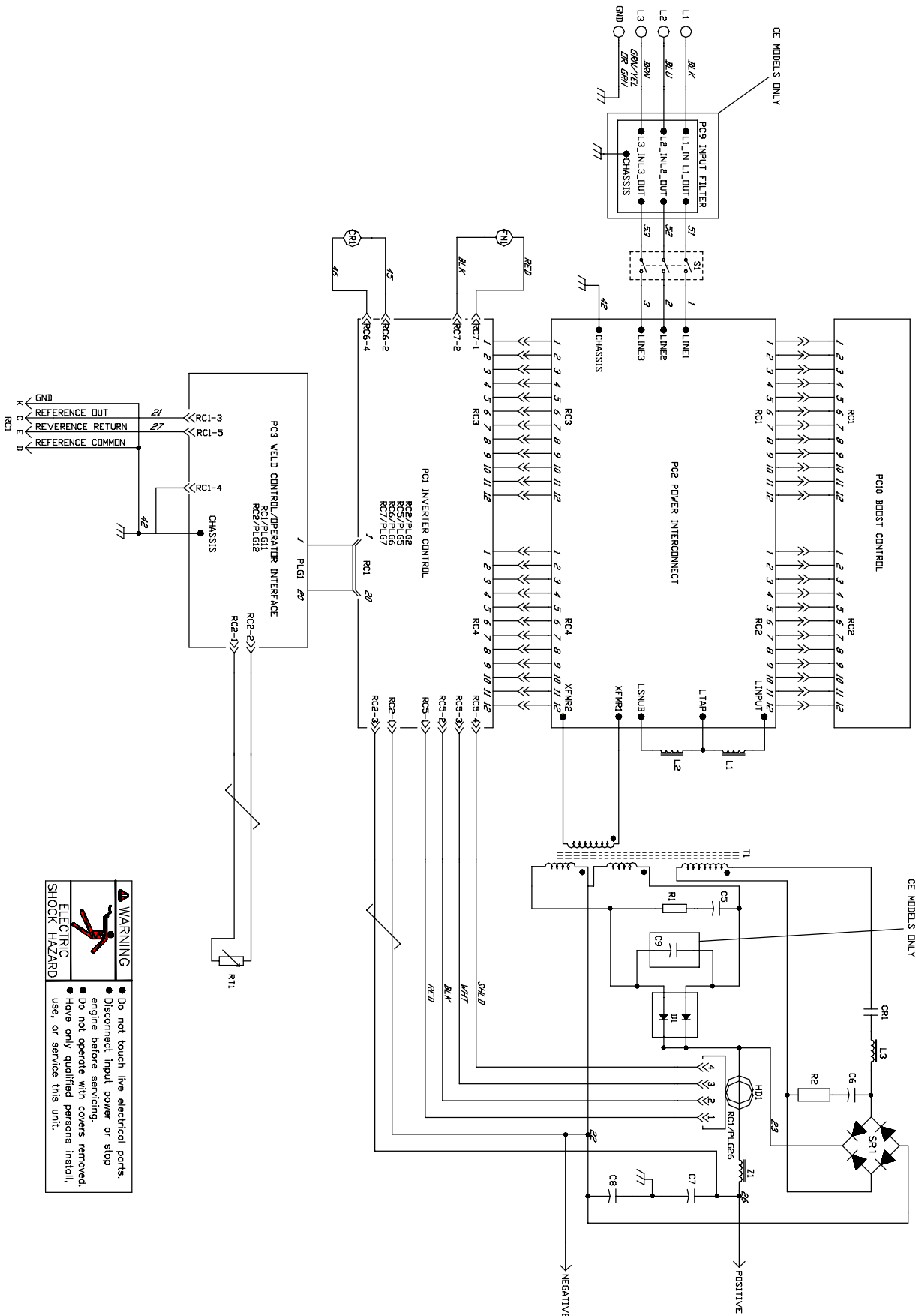


Figure 7-1. Circuit Diagram

202 314-B

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

SECTION 8 – SELECTING AND PREPARING A TUNGSTEN FOR DC OR AC WELDING WITH INVERTER MACHINES

gtaw_Inverter_7/2006



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

8-1. Selecting Tungsten Electrode (Wear Clean gloves To Prevent Contamination Of Tungsten)

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

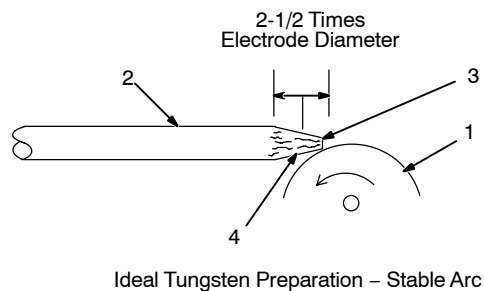
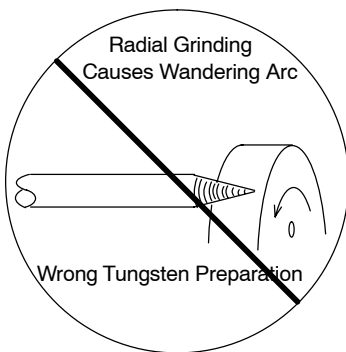
♦ Typical argon shielding gas flow rates are 11 to 35 cfh (cubic feet per hour).

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

8-2. Preparing Tungsten Electrode For DC Electrode Negative (DCEN) Welding Or AC Welding With Inverter Machines



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



1 Grinding Wheel

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

2 Tungsten Electrode

A 2% ceriated tungsten is recommended.

3 Flat

Diameter of this flat determines amperage capacity.

4 Straight Ground

Grind lengthwise, **not radial**.

Ideal Tungsten Preparation – Stable Arc

SECTION 9 – GUIDELINES FOR (GTAW) TIG WELDING

gtaw 7/2006

9-1. Positioning The Torch

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

1 Workpiece
Make sure workpiece is clean before welding.

2 Work Clamp
Place as close to the weld as possible.

3 Torch

4 Filler Rod (If Applicable)

5 Gas Cup

6 Tungsten Electrode

Select and prepare tungsten according to Section 8.

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.

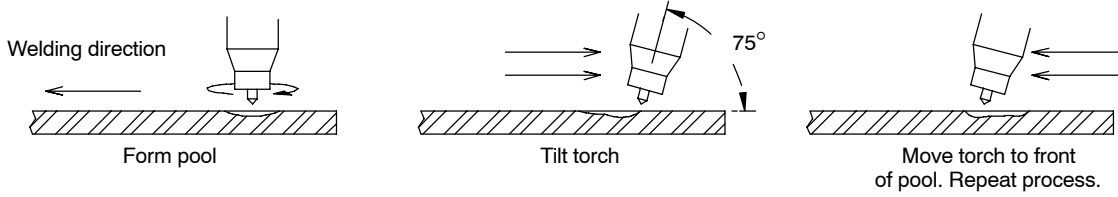
Arc length is the distance from the tungsten to the workpiece.

Bottom View Of Gas Cup

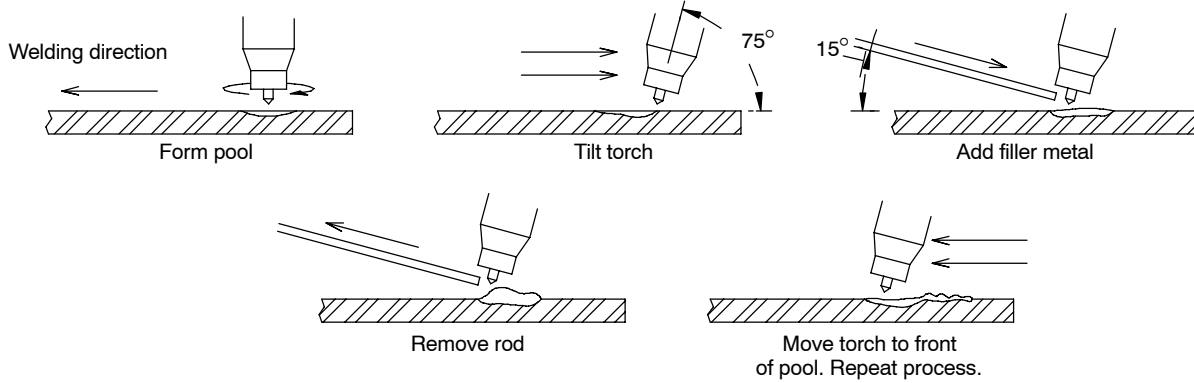
Ref. ST-161 892

9-2. Torch Movement During Welding

Tungsten Without Filler Rod



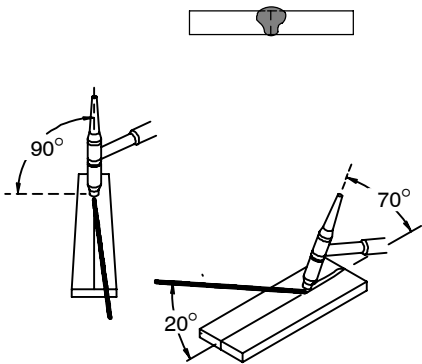
Tungsten With Filler Rod



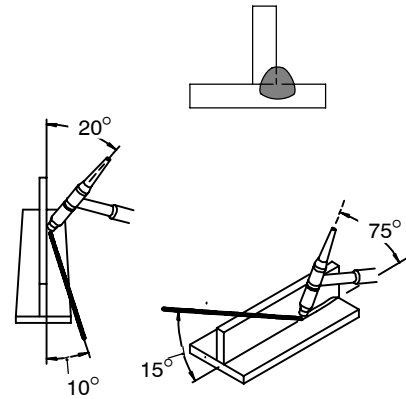
ST-162 002-B

9-3. Positioning Torch Tungsten For Various Weld Joints

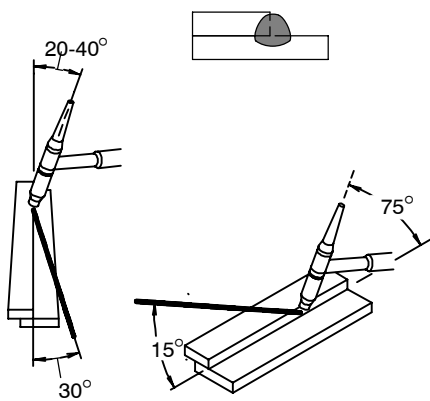
Butt Weld And Stringer Bead



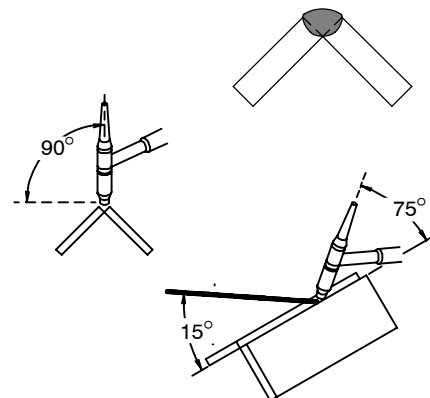
"T" Joint



Lap Joint



Corner Joint

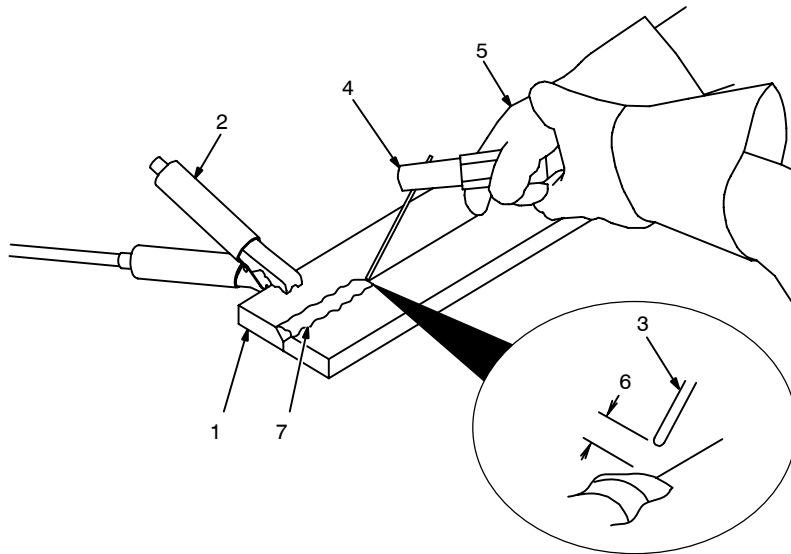


ST-162 003 / S-0792

SECTION 10 – STICK WELDING (SMAW) GUIDELINES



10-1. Stick Welding Procedure



▲ 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 10-2).

4 Insulated Electrode Holder

5 Electrode Holder Position

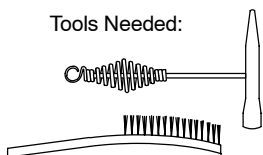
6 Arc Length

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.

Tools Needed:



stick 12/96 – ST-151 593

10-2. Electrode and Amperage Selection Chart

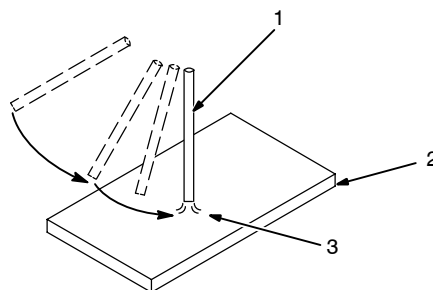
ELECTRODE	DIAMETER	AMPERAGE RANGE								
		50	100	150	200	250	300	350	400	450
6010 & 6011	3/32									
	1/8									
	5/32									
	3/16									
	7/32									
6013	1/4									
	1/16									
	5/64									
	3/32									
	1/8									
	5/32									
	3/16									
7014	7/32									
	1/4						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

ELECTRODE	DC*	AC	POSITION	PENETRATION	USAGE
6010	EP		ALL	DEEP	MIN. PREP, ROUGH
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

10-3. Striking an Arc - Scratch Start Technique

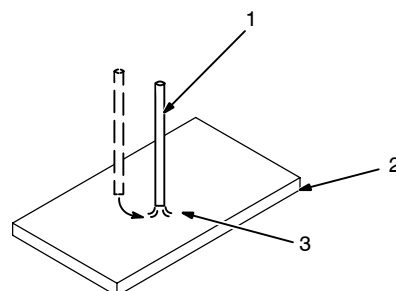


- 1 Electrode
- 2 Workpiece
- 3 Arc

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

S-0049

10-4. Striking an Arc - Tapping Technique

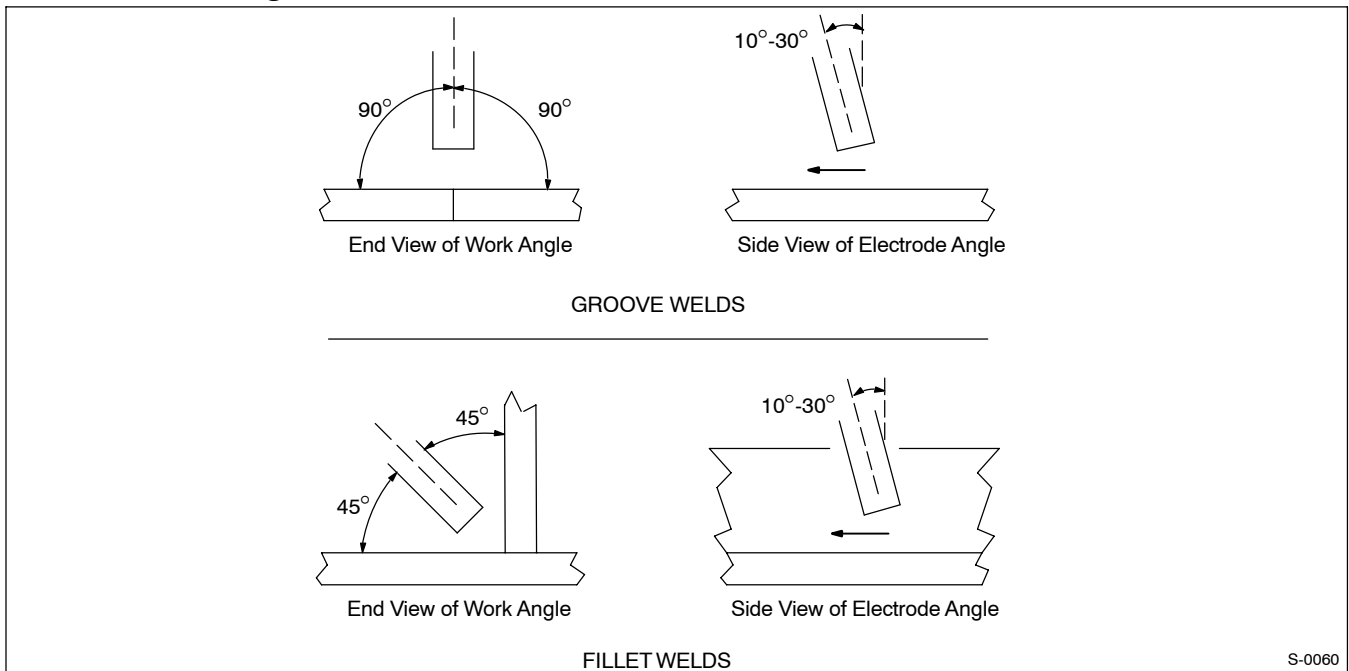


- 1 Electrode
- 2 Workpiece
- 3 Arc

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.

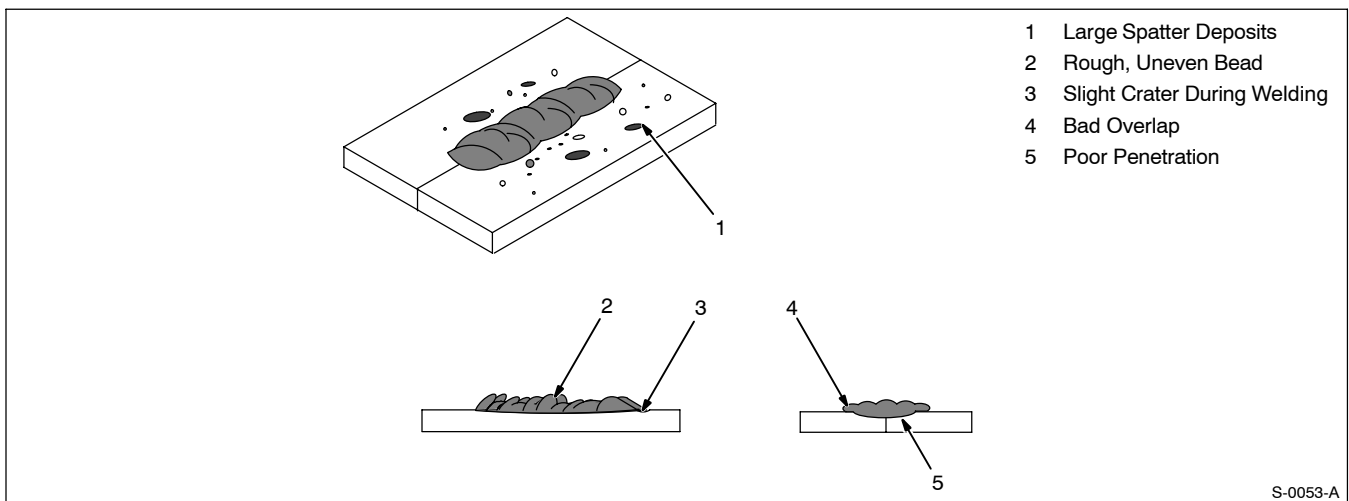
S-0050

10-5. Positioning Electrode Holder



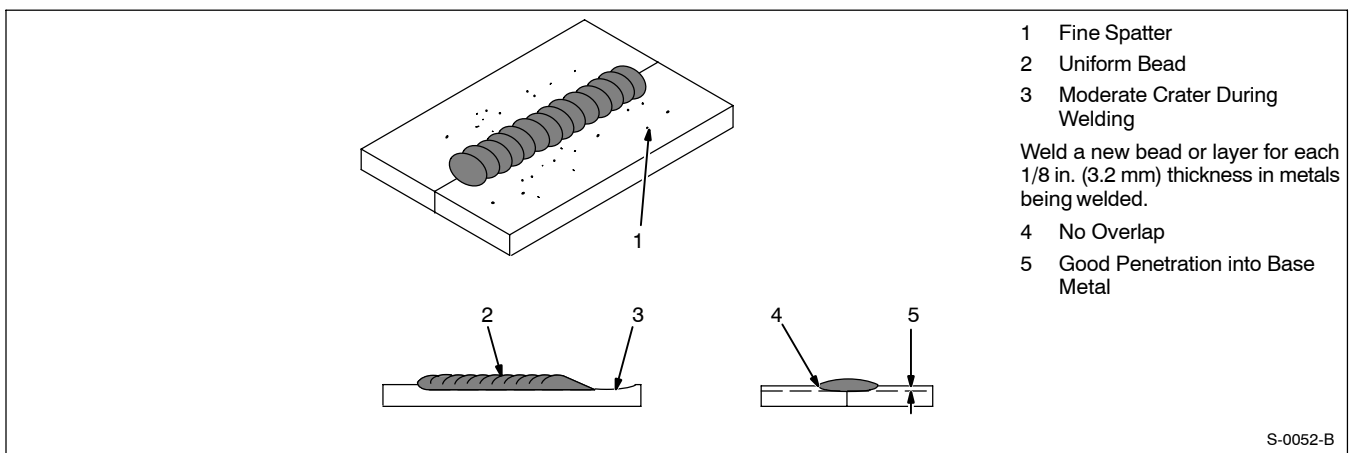
S-0060

10-6. Poor Weld Bead Characteristics



S-0053-A

10-7. Good Weld Bead Characteristics

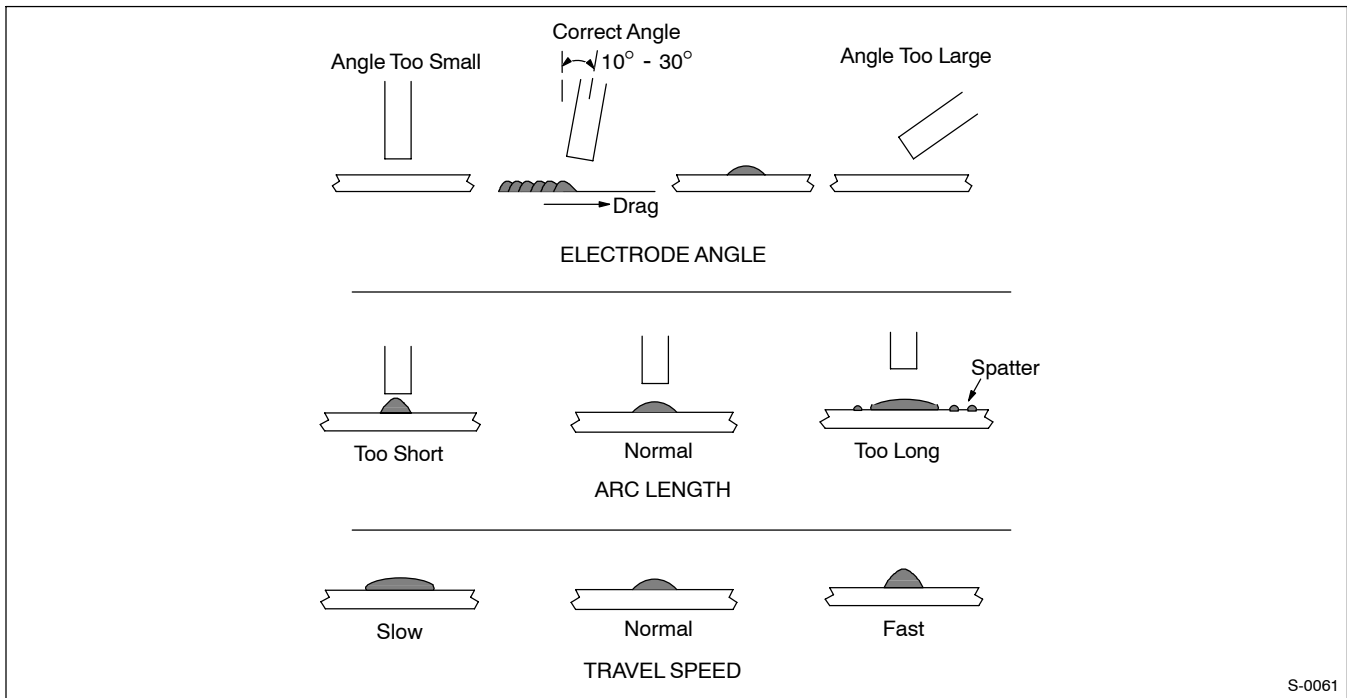


S-0052-B

10-8. Conditions That Affect Weld Bead Shape

NOTE

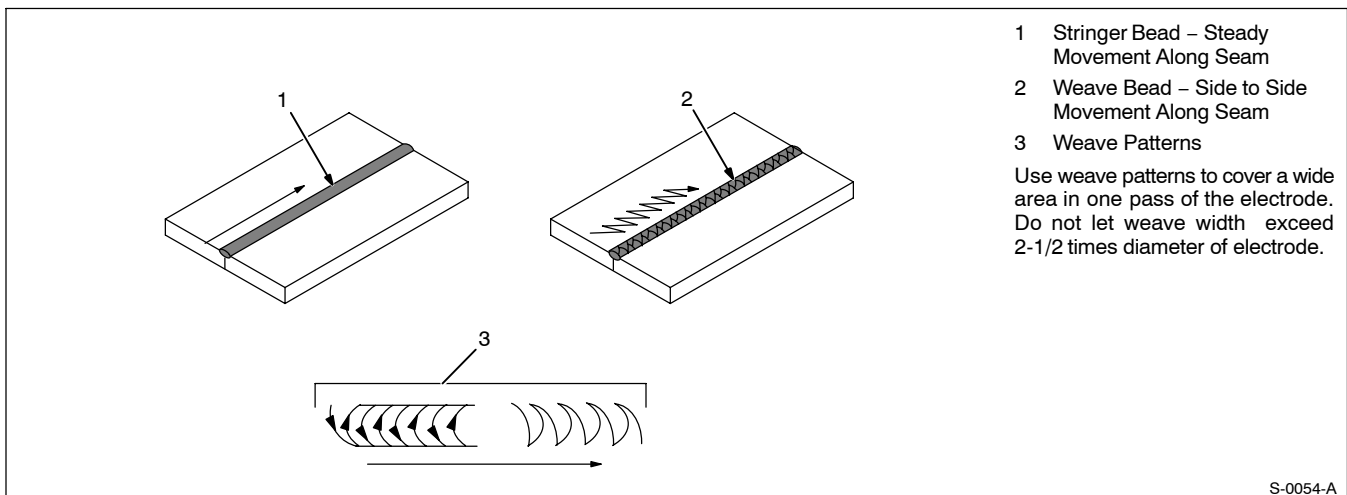
Weld bead shape is affected by electrode angle, arc length, travel speed, and thickness of base metal.



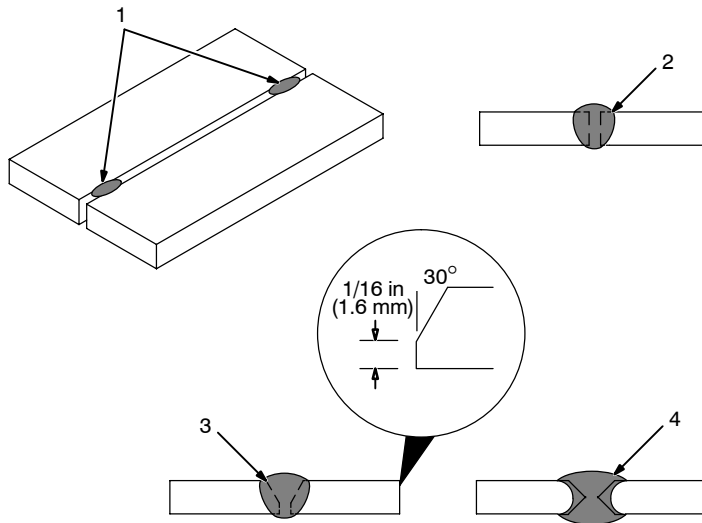
10-9. Electrode Movement During Welding

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.



10-10. 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 – 3/4 in (5-19 mm) thick. Cut bevel with oxy-acetylene or plasma cutting equipment. Remove scale from material after cutting. A grinder can also be used to prepare bevels.

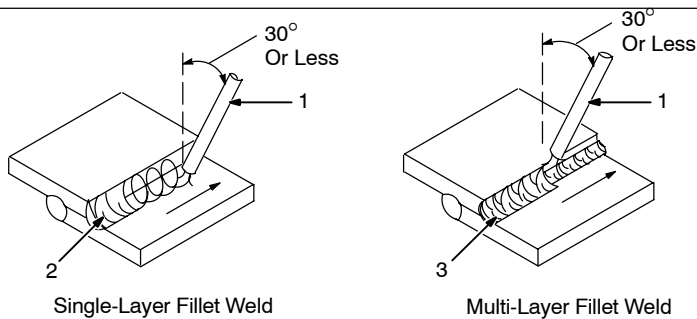
Create 30 degree angle of bevel on materials in V-groove welding.

4 Double V-Groove Weld

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

S-0662

10-11. Lap Joint



Single-Layer Fillet Weld

Multi-Layer Fillet Weld

1 Electrode

2 Single-Layer Fillet Weld

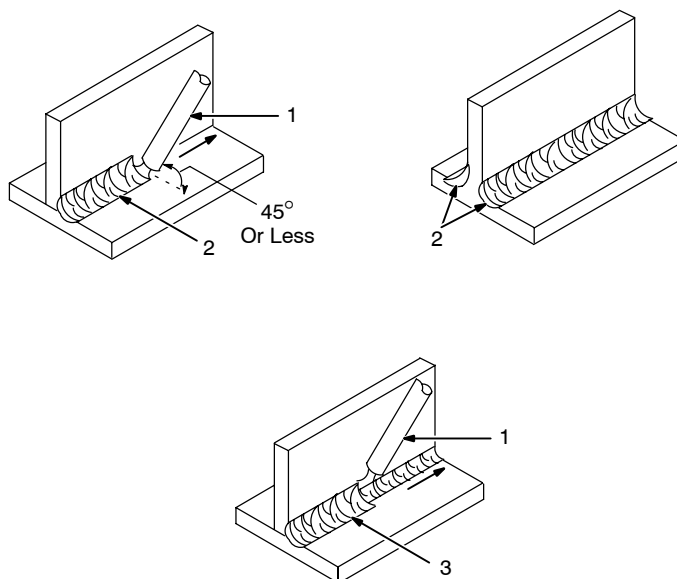
Move electrode in circular motion.

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

10-12. 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 10-9. Remove slag before making another weld pass.

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

10-13. Weld Test

1 Vise
2 Weld Joint
3 Hammer

Strike weld joint in direction shown. A good weld bends over but does not break.

S-0057-B

10-14. Troubleshooting – Porosity

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

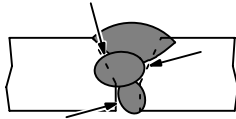
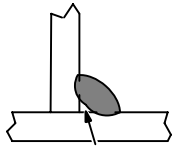
Possible Causes	Corrective Actions
Arc length too long.	Reduce arc length.
Damp electrode.	Use dry electrode.
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, slag, and dirt from work surface before welding.

10-15. 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.

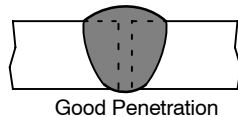
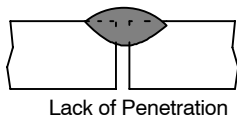
10-16. Troubleshooting – Incomplete Fusion



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.

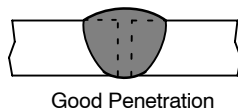
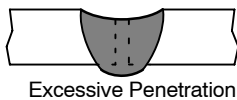
10-17. Troubleshooting – Lack Of Penetration



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.

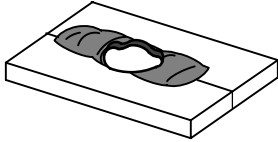
10-18. Troubleshooting – Excessive Penetration



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.

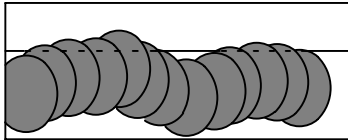
10-19. Troubleshooting – Burn-Through



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.

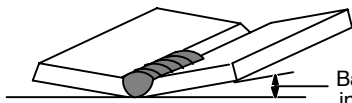
10-20. Troubleshooting – Waviness Of Bead



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.

10-21. 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.

SECTION 11 – PARTS LIST

 Hardware is common and not available unless listed.

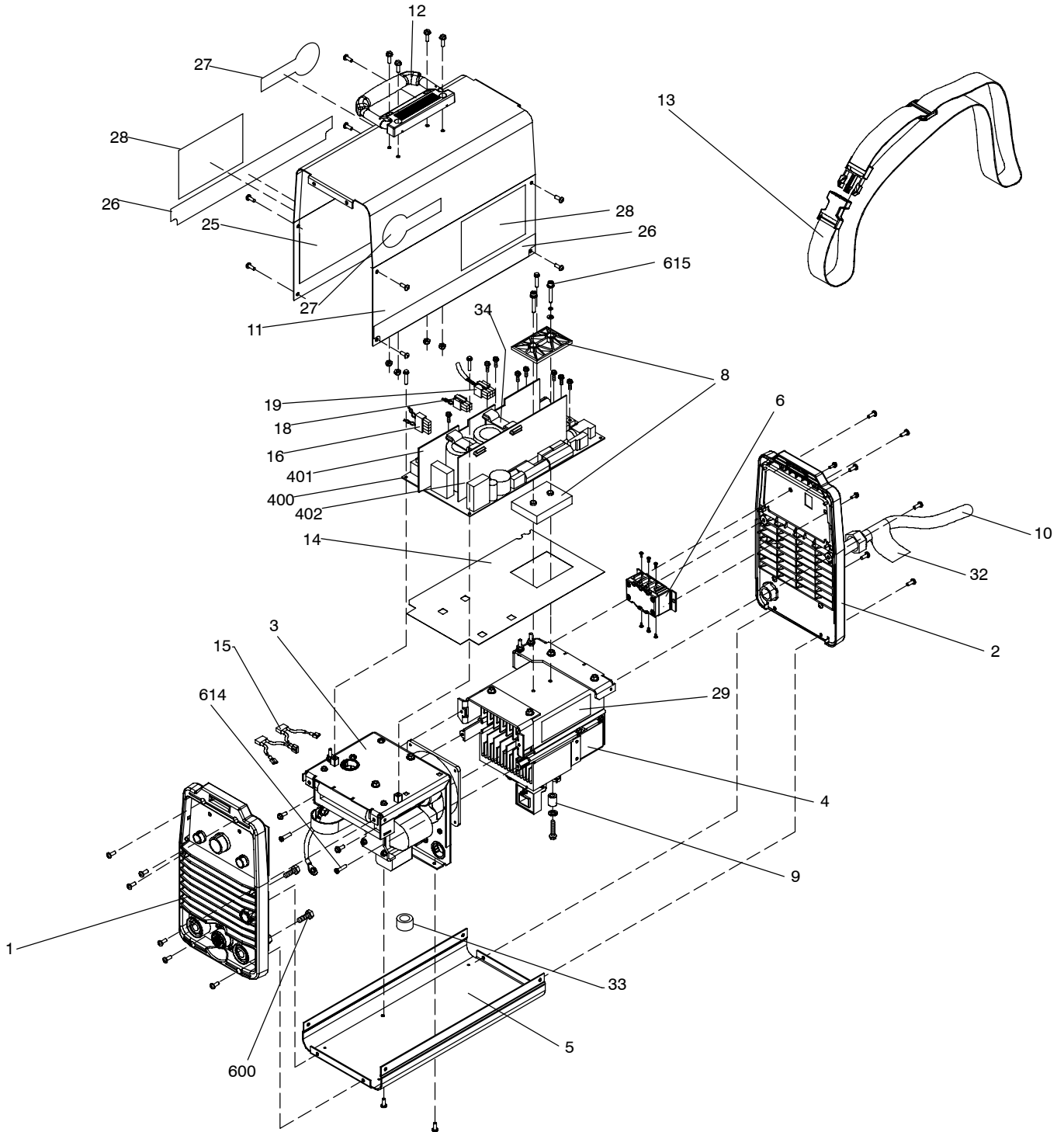


Figure 11-1. Main Assembly

803 107-E

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-1. Main Assembly				
1		Fig11-2	Panel, Front W/Cmpnt	1
2		Fig11-3	Panel, Rear W/Cmpnt	1
3		Fig11-4	Magnetics Subassembly	1
4		Fig11-5	Windtunnel, W/Components	1
5		Fig11-7	Base Assy,	1
6	S1	128756	Switch, Tgl 3pst 40a 600vac Scr Term Wide Tgl	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/Gryyel	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
18		202400	Plug, W/Leads Boost Relay	1
19		189779	Cable, Lem W/Plugs	1
25		189784	Insulator, Wrapper	2
26		198147	Label, Side Maxstar 200	2
27		199478	Label, Miller 6.000 X 2.500 Horizontal	2
28		203990	Label, Warning General Precautionary (Non CE Models)	2
28		179310	Label, Warning General Precautionary (CE Models)	2
29		185835	Label, Warning Electric Shock/Exploding Parts (Non CE Models)	1
29		185836	Label, Warning Electric Shock/Exploding Parts (CE Models)	1
30		208998	Label, Rating Card Code 122 Serial & Stock Number	1
32		182826	Label, Warning Electric Shock Power Cord	1
33		207310	Core, Toroidal (CE Models Only)	1
34		215002	Clip, Support PC Mtg	2
400	PC2	200851	Circuit Card Assy, Power Interconnect	1
400	PC2	230162	Circuit Card Assy, Power Interconnect (CE ROHS)	1
401	PC1	206129	Circuit Card Assy, Inverter Control	1
401	PC1	230166	Circuit Card Assy, Inverter Control (CE ROHS)	1
402	PC10	200841	Circuit Card Assy, Boost Control	1
402	PC10	230170	Circuit Card Assy, Boost Control (CE ROHS)	1
403	PC9	199506	Circuit Card Assy, Input Filter (CE Models Only)	1
403	PC9	230207	Circuit Card Assy, Input Filter (CE ROHS)	1
600		229333	Screw, M10-1.5 x 20 Hex Hd-pln 8.8 Pld Sems	2
601		083883	Washer, Lock .402 id x 0.709 od x.087t Stl Split10mm	2
614		136343	Screw, K50 x 20 Pan Hd-phl Stl Pld Pt Thread Forming	2
615		229334	Screw, M 5-.8 x 35 pan hd phl stl pld sems	2

+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.

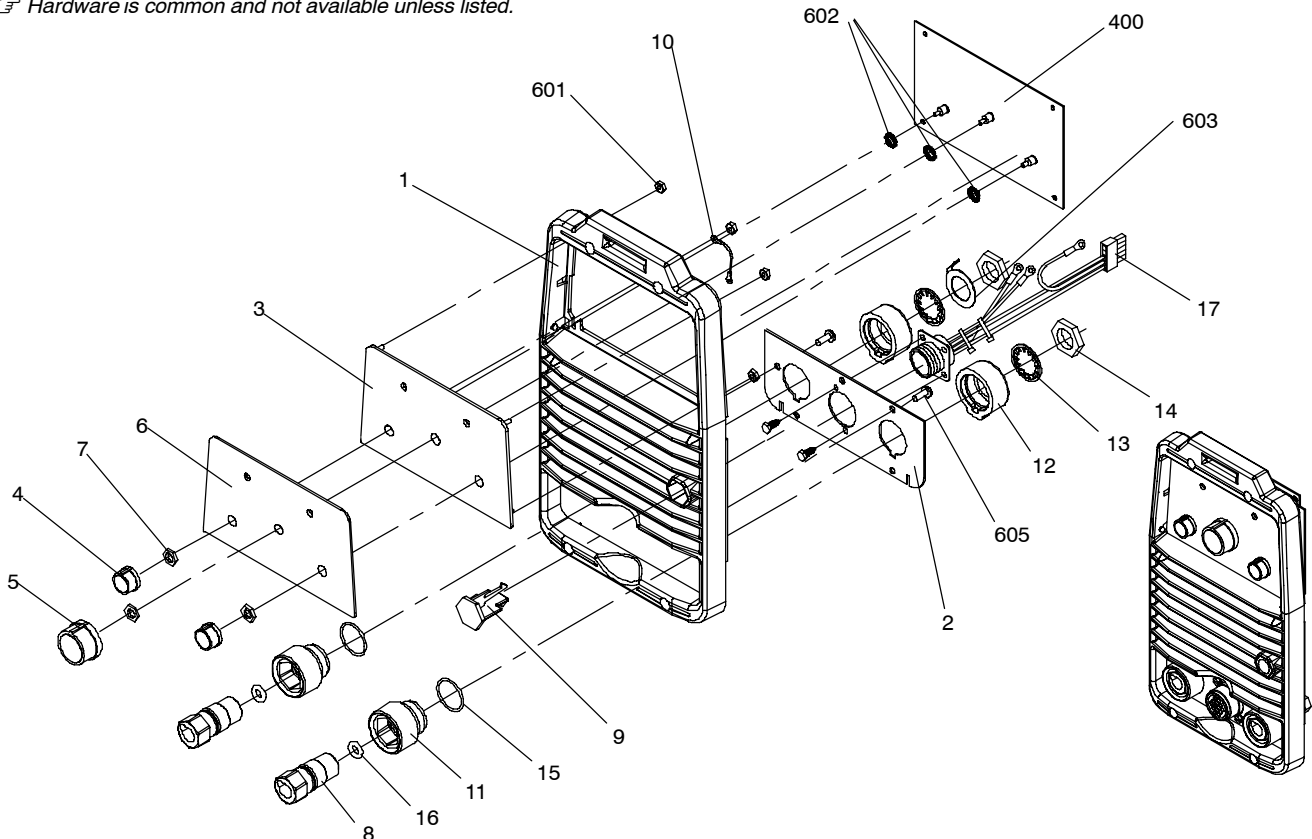


Figure 11-2. Panel, Front w/Components

202 508-E

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
11-2. Panel, Front w/Components (Figure 11-1 Item 1)				
1		194242	Panel, Front/Rear	1
2		195647	Panel, Front Lower	1
3		202325	Panel, Front Upper	1
4		174992	Knob, Pointer .840 Dia X .250 ID w/Spring Clip-.21	2
5		174991	Knob, Pointer 1.250 Dia X .250 ID w/Spring Clip-.21	1
6		202323	Nameplate, Miller Maxstar 200STR	1
6		202722	Nameplate, Miller Maxstar 200STR (CE Models Only)	1
7		178355	Nut, 375-32 .54hex .25h Nyl Flange .62d	3
8		202553	Rcpt, Tw Lk Insul Fem(Dinse Type)50/70 Series Wsl	2
9		207253	Plug, Gas Fitting	1
10		200659	Lead List, Small	1
11		185712	Insulator, Bulkhead Front	2
12		185713	Insulator, Bulkhead Rear	2
13		185714	Washer, Tooth 20MM ID X 32MM OD	2
14		185717	Nut, M20 X 1.5 1.0625 Hex .19 H Locking	2
15		185718	O-Ring 0.989 ID X 0.070 Wall	2
16		186228	O-Ring 0.739 ID X 0.070 Wall	2
17		202326	Recpt w/leads and plug 14-pin	1
400	PC3	217272	Circuit Card Assy, Front Panel Interface W/Program	1
400	PC3	*213922	Circuit Card Assy, Front Panel Interface W/Program	1
400	PC3	**231249	Circuit Card Assy, Front Panel Interface W/Program (CE ROHS)	1
602		231383	Washer, Tooth.377 ID X 0.507 OD X .022T STL PLD INT.375	3
603		178548	Terminal, Connector Friction	1

* For models with stock number 907036 or 907037.

** For models with stock number 907355.

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

☞ Hardware is common and not available unless listed.

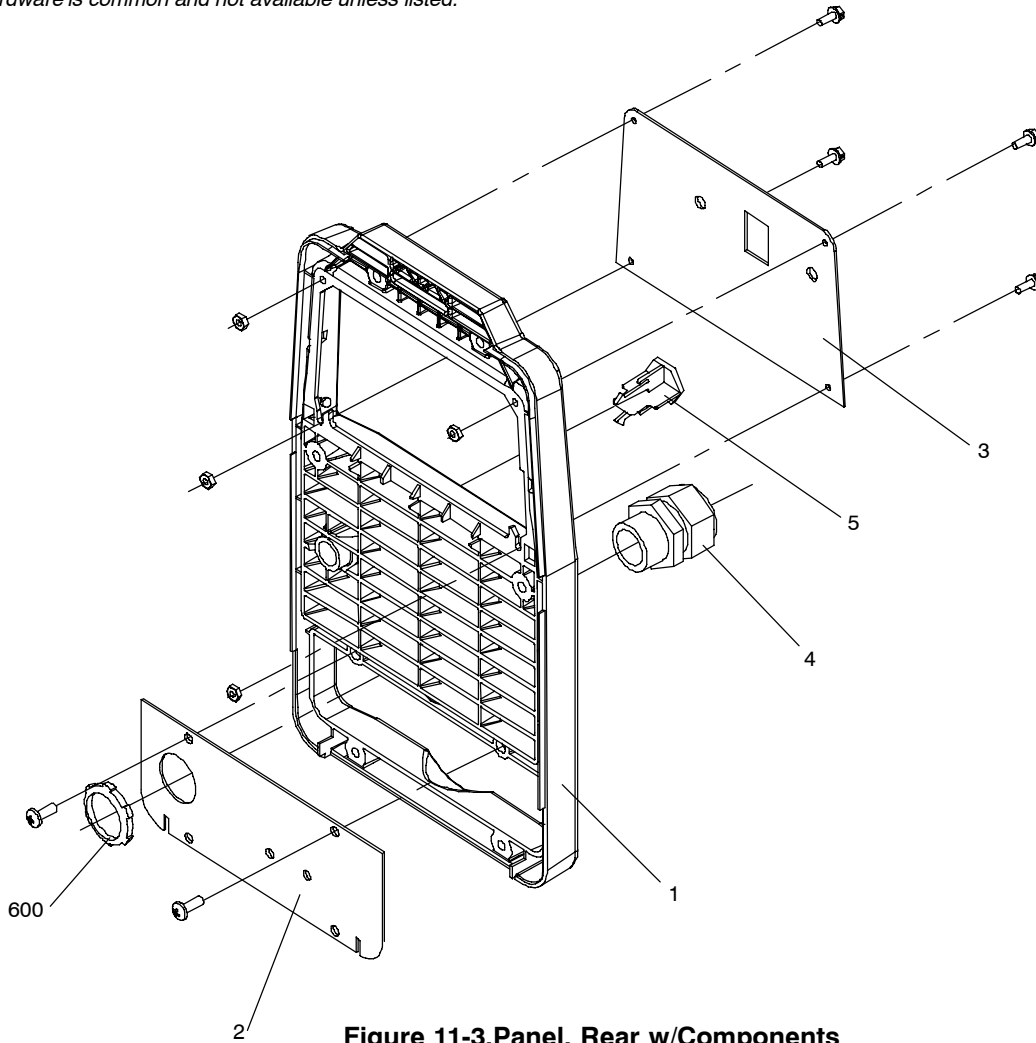


Figure 11-3. Panel, Rear w/Components

202 397-E

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-3. Panel, Rear w/Components (Figure 11-1 Item 2)				
1		194242	Panel, Front/Rear	1
2		206053	Panel, Rear Lower	1
3		195646	Panel, Rear Upper	1
4		201155	Bushing, Strain Relief .450/.709 Id X1.068 Mtg Hole	1
5		207253	Plug, Gas Fitting	1
600		198245	Nut, Conduit .750 Npt Pld 1.388 Od X .150 Thk	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.

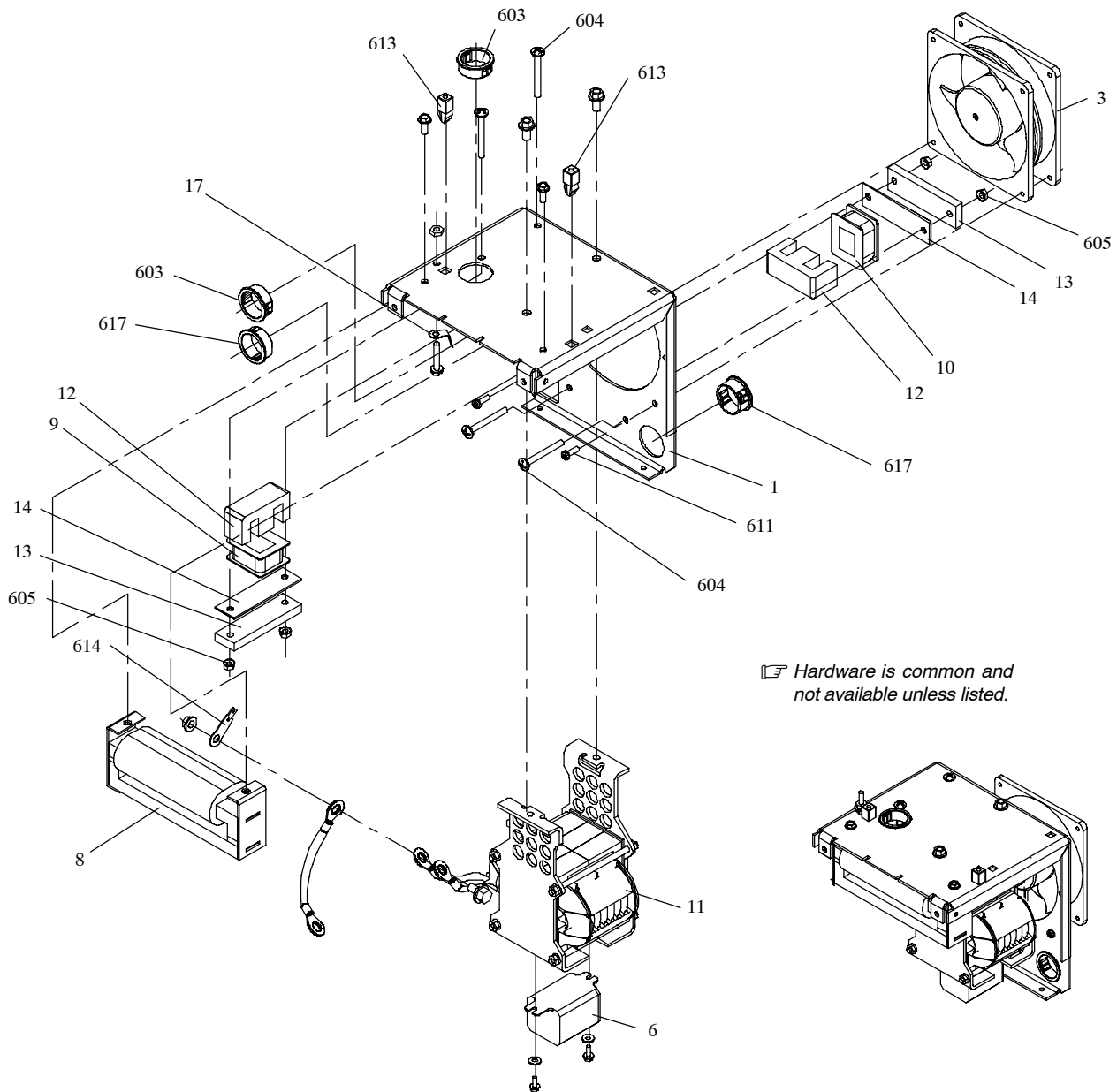


Figure 11-4. Magnetics Assembly w/Components

202 398-H

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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Figure 11-4. Magnetics Assembly w/Components (Figure 11-1 Item 3)

1		195649	Panel, Plenum	1
3	FM1	230808	Fan, Muffin 24vdc 4200 RPM 140 CFM 4.125 MTG HOLES	1
6	CR1	198549	Relay, Encl 24vdc Spst 35a/300vac 4pin Flange Mtg	1
8		189790	Inductor, Output	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

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-4. Magnetics Assembly w/Components (Figure 11-1 Item 3) (Continued)				
17		213208	Connector, Faston Male 1/4 Ring W/75deg Bend	1
603		057357	Bushing, Snap-in Nyl .937 Id X 1.125 Mtg Hole	2
604		182737	Screw, 010-32x2.00 Rnd Hd-slt Brs Pln	4
605		229323	Nut, 010-32 .31hex .13h Stl Pld Sem Cone Wshr.38d	4
611		136343	Screw, K50x 20 Pan Hd-phl Stl Pld Pt Thread Forming	2
613		083147	Grommet, Scr No 8/10 Panel Hole .312 Sq .500 High	2
614		010381	Connector, Rectifier	1
617		170647	Bushing, Snap-in nyl 1.312 ID X 1.500 Mtg Hole	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.

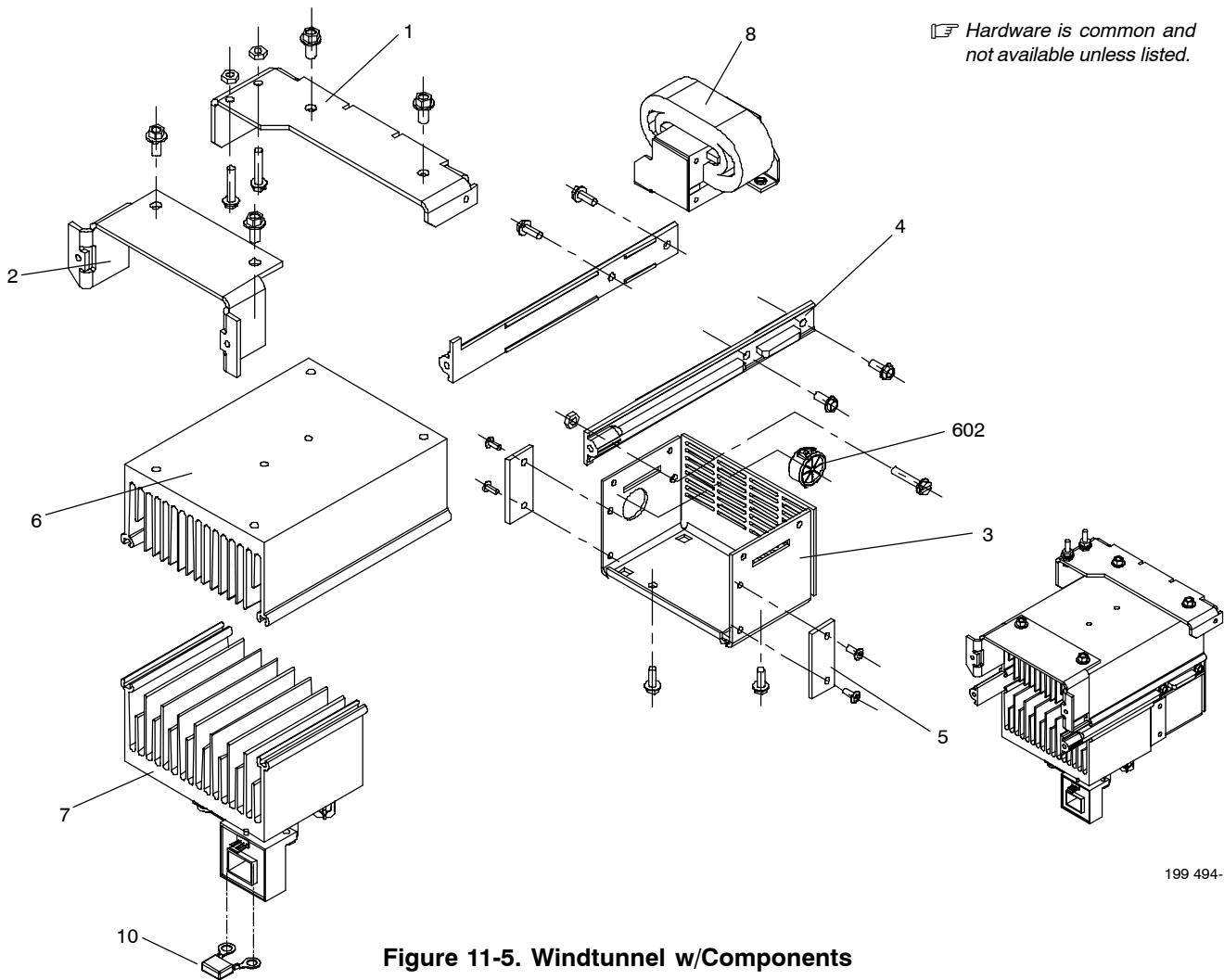


Figure 11-5. Windtunnel w/Components

199 494-F

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-5. Windtunnel w/Components (Figure 11-1 Item 4)				
1		195645	Panel, Midplain Horizontal	1
2		198634	Bracket, Front Heatsink Mtg	1
3		198633	Wind Tunnel	1
4		232856	Rail, Heat Sink	2
5		198652	Bracket, Windtunnel Insulator	2
6		+209949	Heat Sink, Module	1
7		199497	Heat Sink, Secondary Assembly	1
8	L1	189787	Choke, Input	1
10	C9	151328	Capacitor, Polyp Met Film .0047Uf 1000 Vdc W/T (CE Models Only)	1
		083147	Grommet, Scr No 8/10 Panel Hole .312 Sq .500 High (CE Models Only)	4
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.

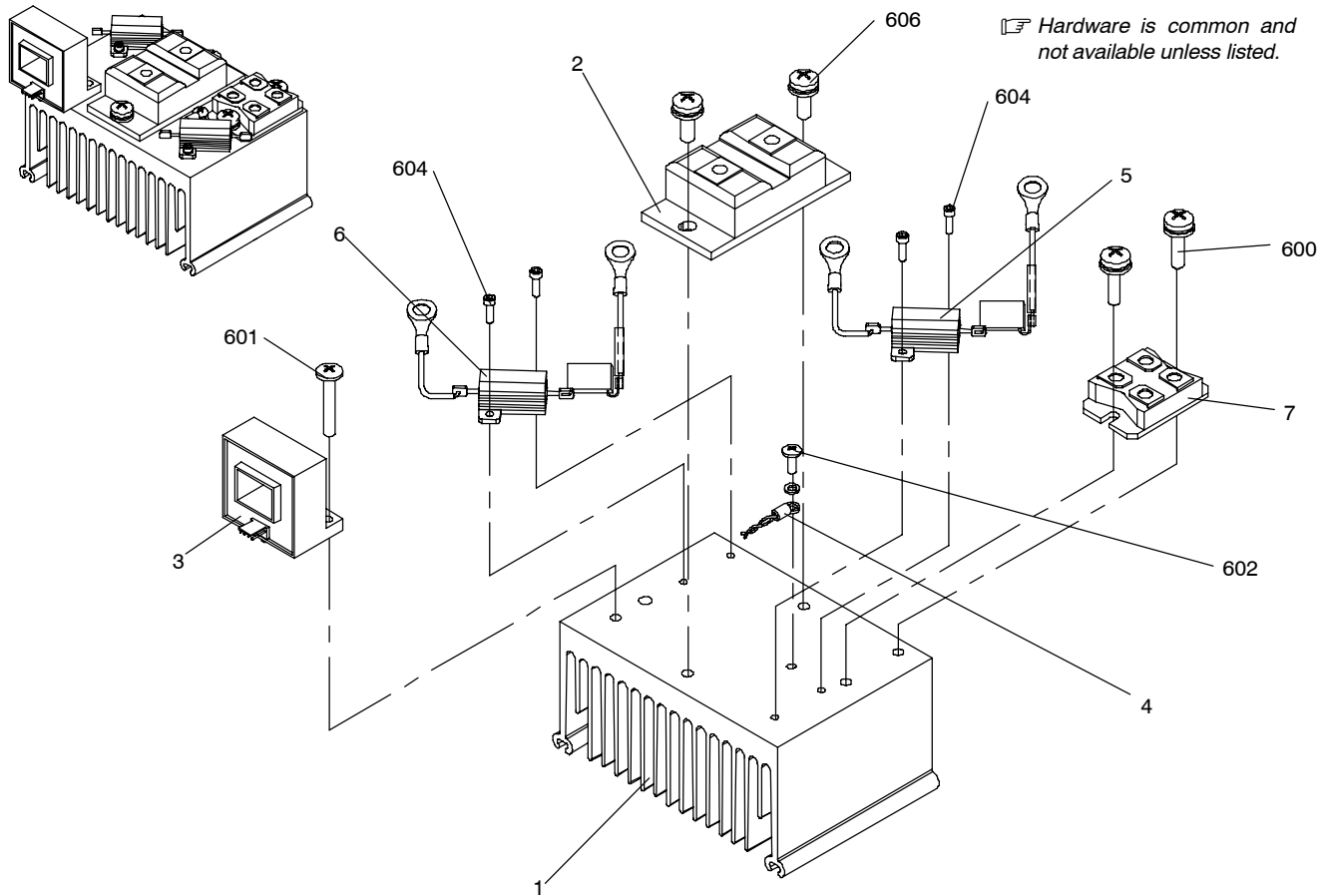


Figure 11-6. Heat Sink, Secondary Assembly

199 497-H

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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Figure 11-6. Heat Sink, Secondary Assembly (Figure 11-5 Item 7)

1		210783	Heat Sink, Diode	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		207451	Screw, 008-32 x .50 Pan Hd-Phl Stl Pld	2
601		231214	Screw, 008-32 x 1.00 Pan Hd-phl Stl Pld	1
602		207451	Screw, 008-32 x .50 Pan Hd Phl Stl Pld Sems	1
604		207450	Screw, 004-40 x .37 Pan Hd-torx Stl Pld Cone Sems	4
606		229331	Screw, M 6-1.0 x 16 Pan Hd-phl Stl Pld Sems	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.

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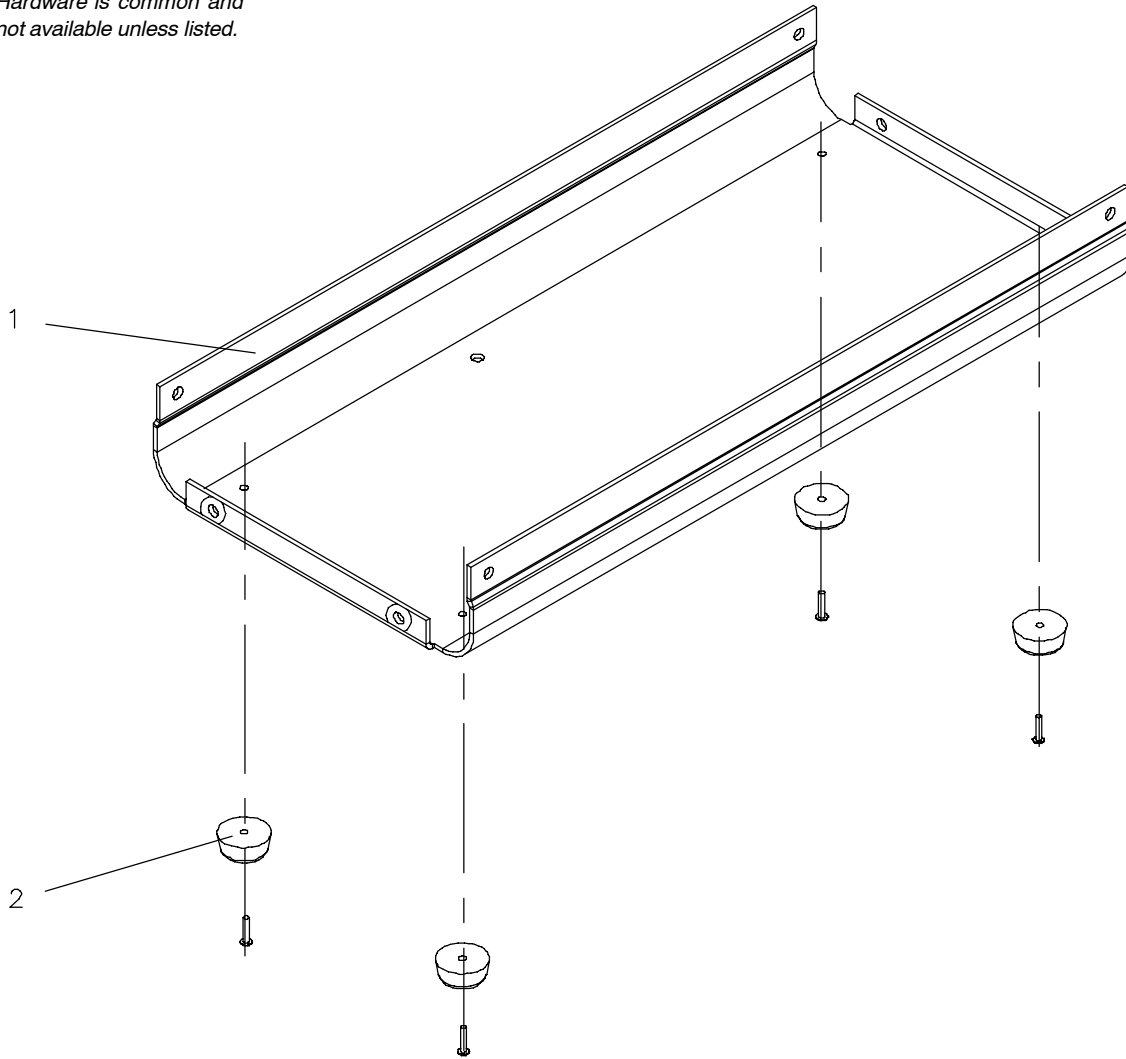


Figure 11-7. Base Assembly

199 493-B

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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Figure 11-7. Base Assembly (Figure 11-1 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[®]

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2. 3 Years — Parts and Labor
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 - * Plasma Arc Cutting Power Sources
 - * Process Controllers
 - * Semi-Automatic and Automatic Wire Feeders
 - * Inverter Power Sources (Unless Otherwise Stated)
 - * Water Coolant Systems (Integrated)
 - * Intellitig
 - * Engine Driven Welding Generators
(NOTE: Engines are warranted separately by the engine manufacturer.)
3. 1 Year — Parts and Labor Unless Specified
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 - * Positioners and Controllers
 - * Automatic Motion Devices
 - * RFCS Foot Controls
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 - * Water Coolant Systems (Non-Integrated)
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 - * HF Units
 - * Grids
 - * Spot Welders
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 - * Plasma Cutting Torches (except APT & SAF Models)
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 - * Bernard-Branded Mig Guns (No Labor)
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 - * Subarc Wire Drive Assemblies
4. 6 Months — Batteries
5. 90 Days — Parts
 - * MIG Guns/TIG Torches and Subarc (SAW) Guns

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

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