OM-257 798C 2015–05

Processes

MIG (GMAW) Welding
Pulsed MIG (GMAW-P)
Flux Cored (FCAW) Welding

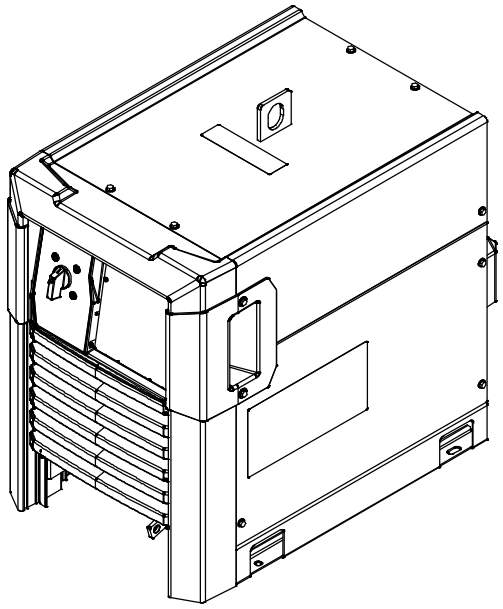
Air Carbon Arc (CAC-A)
Cutting and Gouging

Description

3 Phase DC CV

Arc Welding Power Source

Continuum® 350 And Continuum® 500



OWNER'S MANUAL

File: Advanced Manufacturing Systems

Visit our website at
www.MillerWelds.com

From Miller to You

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

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

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

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

ISO 9001 REGISTERED QUALITY SYSTEM

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

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

TRUE BLUE® WARRANTY

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

Miller®

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SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

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

1-1. Symbol Usage

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

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

NOTICE *– Indicates statements not related to personal injury.*

☞ *Indicates special instructions.*

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

1-2. Arc Welding Hazards

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

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

During operation, keep everybody, especially children, away.

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Additional safety precautions are required when any of the following electrically hazardous conditions are present: in damp locations or while wearing wet clothing; on metal structures such as floors, gratings, or scaffolds; when in cramped positions such as sitting, kneeling, or lying; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, use the following equipment in order presented: 1) a semiautomatic DC constant voltage (wire) welder, 2) a DC manual (stick) welder, or 3) an AC welder with reduced open-circuit voltage. In most situations, use of a DC, constant voltage wire welder is recommended. And, do not work alone!
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install, ground, and operate this equipment according to its Owner's Manual and national, state, and local codes.
- Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first – double-check connections.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect input power cord and ground conductor for damage or bare wiring – replace immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or repaired cables.
- Do not drape cables over your body.
- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Do not touch electrode holders connected to two welding machines at the same time since double open-circuit voltage will be present.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal. Disconnect cable for process not in use.
- Use GFCI protection when operating auxiliary equipment in damp or wet locations.

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

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

HOT PARTS can burn.

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

FUMES AND GASES can be hazardous.

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

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

ARC RAYS can burn eyes and skin.

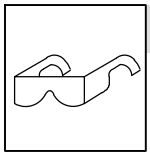
Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

- Wear an approved welding helmet fitted with a proper shade of filter lenses to protect your face and eyes from arc rays and sparks when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash, glare and sparks; warn others not to watch the arc.
- Wear body protection made from durable, flame–resistant material (leather, heavy cotton, wool). Body protection includes oil-free clothing such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.

WELDING can cause fire or explosion.

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

- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Do not weld where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not weld on containers that have held combustibles, or on closed containers such as tanks, drums, or pipes unless they are properly prepared according to AWS F4.1 and AWS A6.0 (see Safety Standards).
- Do not weld where the atmosphere may contain flammable dust, gas, or liquid vapors (such as gasoline).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock, sparks, and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear body protection made from durable, flame–resistant material (leather, heavy cotton, wool). Body protection includes oil-free clothing such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.
- After completion of work, inspect area to ensure it is free of sparks, glowing embers, and flames.
- Use only correct fuses or circuit breakers. Do not oversize or bypass them.
- Follow requirements in OSHA 1910.252 (a) (2) (iv) and NFPA 51B for hot work and have a fire watcher and extinguisher nearby.
- Read and understand the Safety Data Sheets (SDSs) and the manufacturer's instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes, and metals.



FLYING METAL or DIRT can injure eyes.

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

BUILDUP OF GAS can injure or kill.

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

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

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

NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.

CYLINDERS can explode if damaged.

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

- Protect compressed gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames, sparks, and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.
- Never weld on a pressurized cylinder – explosion will result.
- Use only correct compressed gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve. Do not stand in front of or behind the regulator when opening the valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Use the right equipment, correct procedures, and sufficient number of persons to lift and move cylinders.
- Read and follow instructions on compressed gas cylinders, associated equipment, and Compressed Gas Association (CGA) publication P-1 listed in Safety Standards.

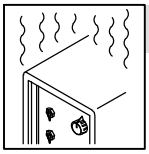
1-3. Additional Symbols For Installation, Operation, And Maintenance

FIRE OR EXPLOSION hazard.

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

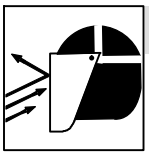
FALLING EQUIPMENT can injure.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.
- Keep equipment (cables and cords) away from moving vehicles when working from an aerial location.
- Follow the guidelines in the Applications Manual for the Revised NIOSH Lifting Equation (Publication No. 94–110) when manually lifting heavy parts or equipment.



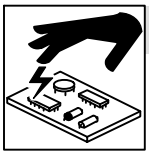
OVERUSE can cause OVERHEATING

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



FLYING SPARKS can injure.

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



STATIC (ESD) can damage PC boards.

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

MOVING PARTS can injure.

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

WELDING WIRE can injure.

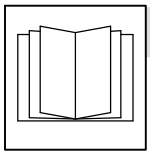
- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.

BATTERY EXPLOSION can injure.

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

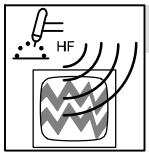
MOVING PARTS can injure.

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



READ INSTRUCTIONS.

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



H.F. RADIATION can cause interference.

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

ARC WELDING can cause interference.

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

1-4. California Proposition 65 Warnings

Welding or cutting equipment produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)

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

1-5. Principal Safety Standards

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

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

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

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

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

Safety in Welding, Cutting, and Allied Processes, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 5060 Spectrum Way, Suite 100, Ontario, Canada L4W 5NS (phone: 800-463-6727, website: www.csa-international.org).

Safe Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 25 West 43rd Street, New York, NY 10036 (phone: 212-642-4900, website: www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.org.

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 (phone: 1-866-512-1800) (there are 10 OSHA Regional Offices—phone for Region 5, Chicago, is 312-353-2220, website: www.osha.gov).

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

1-6. EMF Information

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

1. Keep cables close together by twisting or taping them, or using a cable cover.
2. Do not place your body between welding cables. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around your body.
4. Keep head and trunk as far away from the equipment in the welding circuit as possible.
5. Connect work clamp to workpiece as close to the weld as possible.
6. Do not work next to, sit or lean on the welding power source.
7. Do not weld whilst carrying the welding power source or wire feeder.

About Implanted Medical Devices:

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

SECTION 2 – CONSIGNES DE SÉCURITÉ – LIRE AVANT UTILISATION

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

2-1. Symboles utilisés

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

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

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

☞ *Indique des instructions spécifiques.*

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

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

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

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

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

UNE DÉCHARGE ÉLECTRIQUE peut entraîner la mort.

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

- Ne pas toucher aux pièces électriques sous tension.
- Porter des gants isolants et des vêtements de protection secs et sans trous.
- S'isoler de la pièce à couper et du sol en utilisant des housses ou des tapis assez grands afin d'éviter tout contact physique avec la pièce à couper ou le sol.
- Ne pas se servir de source électrique à courant électrique dans les zones humides, dans les endroits confinés ou là où on risque de tomber.
- Se servir d'une source électrique à courant électrique UNIQUEMENT si le procédé de soudage le demande.
- Si l'utilisation d'une source électrique à courant électrique s'avère nécessaire, se servir de la fonction de télécommande si l'appareil en est équipé.
- D'autres consignes de sécurité sont nécessaires dans les conditions suivantes : risques électriques dans un environnement humide ou si l'on porte des vêtements mouillés ; sur des structures métalliques telles que sols, grilles ou échafaudages ; en position coincée comme assise, à genoux ou couchée ; ou s'il y a un risque élevé de contact inévitable ou accidentel avec la pièce à souder ou le sol. Dans ces conditions, utiliser les équipements suivants, dans l'ordre indiqué : 1) un poste à souder DC à tension constante (à fil), 2) un poste à souder DC manuel (électrode) ou 3) un poste à souder AC à tension à vide réduite. Dans la plupart des situations, l'utilisation d'un poste à souder DC à fil à tension constante est recommandée. En outre, ne pas travailler seul !
- Couper l'alimentation ou arrêter le moteur avant de procéder à l'installation, à la réparation ou à l'entretien de l'appareil. Déverrouiller l'alimentation selon la norme OSHA 29 CFR 1910.147 (voir normes de sécurité).
- Installez, mettez à la terre et utilisez correctement cet équipement conformément à son Manuel d'Utilisation et aux réglementations nationales, gouvernementales et locales.
- Toujours vérifier la terre du cordon d'alimentation. Vérifier et s'assurer que le fil de terre du cordon d'alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- En effectuant les raccordements d'entrée, fixer d'abord le conducteur de mise à la terre approprié et contre-vérifier les connexions.
- Les câbles doivent être exempts d'humidité, d'huile et de graisse; protégez–les contre les étincelles et les pièces métalliques chaudes.
- Vérifier fréquemment le cordon d'alimentation et le conducteur de mise à la terre afin de s'assurer qu'il n'est pas altéré ou dénudé –, le remplacer immédiatement s'il l'est –. Un fil dénudé peut entraîner la mort.
- L'équipement doit être hors tension lorsqu'il n'est pas utilisé.
- Ne pas utiliser des câbles usés, endommagés, de grosseur insuffisante ou mal épissés.
- Ne pas enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, le faire directement avec un câble distinct.
- Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d'une autre machine.
- Ne pas toucher des porte électrodes connectés à deux machines en même temps à cause de la présence d'une tension à vide doublée.
- N'utiliser qu'un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretenir l'appareil conformément à ce manuel.
- Porter un harnais de sécurité si l'on doit travailler au-dessus du sol.
- S'assurer que tous les panneaux et couvercles sont correctement en place.
- Fixer le câble de retour de façon à obtenir un bon contact métal-métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.
- Isoler la pince de masse quand pas mis à la pièce pour éviter le contact avec tout objet métallique.

- Ne pas raccorder plus d'une électrode ou plus d'un câble de masse à une même borne de sortie de soudage. Débrancher le câble pour le procédé non utilisé.
- Utiliser une protection différentielle lors de l'utilisation d'un équipement auxiliaire dans des endroits humides ou mouillés.

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

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

LES PIÈCES CHAUDES peuvent provoquer des brûlures.

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

LES FUMÉES ET LES GAZ peuvent être dangereux.

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

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

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

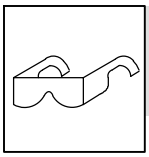
Le rayonnement de l'arc du procédé de soudag génère des rayons visibles et invisibles intense (ultraviolets et infrarouges) susceptibles de provoquer des brûlure dans les yeux et sur la peau. Des étincelles sont projetées pendant l soudage.

- Porter un casque de soudage approuvé muni de verres filtrants approprié pour protéger visage et yeux pour protéger votre visage et vos yeux pendant le soudage ou pour regarder (voir ANSI Z49.1 et Z87.1 énuméré dans les normes de sécurité).
- Porter des lunettes de sécurité avec écrans latéraux même sous votre casque.
- Avoir recours à des écrans protecteurs ou à des rideaux pour protéger les autres contre les rayonnements les éblouissements et les étincelles ; prévenir toute personne sur les lieux de ne pas regarder l'arc.
- Porter un équipement de protection pour le corps fait d'un matériau résistant et ignifuge (cuir, coton robuste, laine). La protection du corps comporte des vêtements sans huile comme par ex. des gants de cuir, une chemise solide, des pantalons sans revers, des chaussures hautes et une casquette.

LE SOUDAGE peut provoquer un incendie ou une explosion.

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

- Déplacer toutes les substances inflammables à une distance de 10,7 m de l'arc de soudage. En cas d'impossibilité les recouvrir soigneusement avec des protections homologués.
- Ne pas souder dans un endroit là où des étincelles peuvent tomber sur des substances inflammables.
- Se protéger et d'autres personnes de la projection d'étincelles et de métal chaud.
- Des étincelles et des matériaux chauds du soudage peuvent facilement passer dans d'autres zones en traversant de petites fissures et des ouvertures.
- Surveiller tout déclenchement d'incendie et tenir un extincteur à proximité.
- Le soudage effectué sur un plafond, plancher, paroi ou séparation peut déclencher un incendie de l'autre côté.
- Ne pas effectuer le soudage sur des conteneurs fermés tels que des réservoirs, tambours, ou conduites, à moins qu'ils n'aient été préparés correctement conformément à AWS F4.1 et AWS A6.0 (voir les Normes de Sécurité).
- Ne soudez pas si l'air ambiant est chargé de particules, gaz, ou vapeurs inflammables (vapeur d'essence, par exemple).
- Brancher le câble de masse sur la pièce le plus près possible de la zone de soudage pour éviter le transport du courant sur une longue distance par des chemins inconnus éventuels en provoquant des risques d'électrocution, d'étincelles et d'incendie.
- Ne pas utiliser le poste de soudage pour dégeler des conduites gelées.
- En cas de non utilisation, enlever la baguette d'électrode du porte-électrode ou couper le fil à la pointe de contact.
- Porter un équipement de protection pour le corps fait d'un matériau résistant et ignifuge (cuir, coton robuste, laine). La protection du corps comporte des vêtements sans huile comme par ex. des gants de cuir, une chemise solide, des pantalons sans revers, des chaussures hautes et une casquette.
- Avant de souder, retirer toute substance combustible de vos poches telles qu'un allumeur au butane ou des allumettes.
- Une fois le travail achevé, assurez–vous qu'il ne reste aucune trace d'étincelles incandescentes ni de flammes.
- Utiliser exclusivement des fusibles ou coupe–circuits appropriés. Ne pas augmenter leur puissance; ne pas les ponter.
- Une fois le travail achevé, assurez–vous qu'il ne reste aucune trace d'étincelles incandescentes ni de flammes.
- Utiliser exclusivement des fusibles ou coupe–circuits appropriés. Ne pas augmenter leur puissance; ne pas les ponter.
- Suivre les recommandations dans OSHA 1910.252(a)(2)(iv) et NFPA 51B pour les travaux à chaud et avoir de la surveillance et un extincteur à proximité.
- Lire et comprendre les fiches de données de sécurité et les instructions du fabricant concernant les adhésifs, les revêtements, les nettoyants, les consommables, les produits de refroidissement, les dégraisseurs, les flux et les métaux.



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

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

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

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

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

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

LE BRUIT peut endommager l'ouïe.

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

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

LES BOUTEILLES peuvent exploser si elles sont endommagées.

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

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

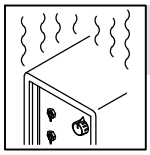
2-3. Dangers supplémentaires en relation avec l'installation, le fonctionnement et la maintenance

Risque D'INCENDIE OU D'EXPLOSION.

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

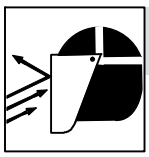
LA CHUTE DE L'ÉQUIPEMENT peut provoquer des blessures.

- Utiliser l'anneau de levage uniquement pour soulever l'appareil, NON PAS les chariots, les bouteilles de gaz ou tout autre accessoire.
- Utiliser un équipement de levage de capacité suffisante pour lever l'appareil.
- En utilisant des fourches de levage pour déplacer l'unité, s'assurer que les fourches sont suffisamment longues pour dépasser du côté opposé de l'appareil.
- Tenir l'équipement (câbles et cordons) à distance des véhicules mobiles lors de toute opération en hauteur.
- Suivre les consignes du Manuel des applications pour l'équation de levage NIOSH révisée (Publication Nº94–110) lors du levage manuelle de pièces ou équipements lourds.



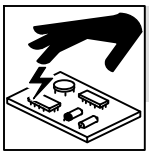
L'EMPLOI EXCESSIF peut SURCHAUFFER L'ÉQUIPEMENT.

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



LES ÉTINCELLES PROJETÉES peuvent provoquer des blessures.

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



LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

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

Les PIÈCES MOBILES peuvent causer des blessures.

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

LES FILS DE SOUDAGE peuvent provoquer des blessures.

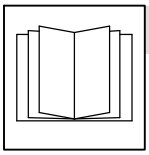
- Ne pas appuyer sur la gâchette avant d'en avoir reçu l'instruction.
- Ne pas diriger le pistolet vers soi, d'autres personnes ou toute pièce mécanique en engageant le fil de soudage.

L'EXPLOSION DE LA BATTERIE peut provoquer des blessures.

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

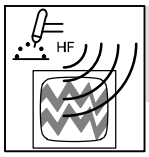
Les PIÈCES MOBILES peuvent causer des blessures.

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



LIRE LES INSTRUCTIONS.

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



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

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

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

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

2-4. Proposition californienne 65 Avertissements

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

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

2-5. Principales normes de sécurité

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

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

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

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

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

Safety in Welding, Cutting, and Allied Processes, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 5060 Spectrum Way, Suite 100, Ontario, Canada L4W 5NS (phone: 800-463-6727, website: www.csa-international.org).

Safe Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 25 West 43rd Street, New York, NY 10036 (phone: 212-642-4900, website: www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.org.

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 (phone: 1-866-512-1800) (there are 10 OSHA Regional Offices—phone for Region 5, Chicago, is 312-353-2220, website: www.osha.gov).

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

2-6. Informations relatives aux CEM

Le courant électrique qui traverse tout conducteur génère des champs électromagnétiques (CEM) à certains endroits. Le courant issu d'un soudage à l'arc (et de procédés connexes, y compris le soudage par points, le gougeage, le découpage plasma et les opérations de chauffage par induction) crée un champ électromagnétique (CEM) autour du circuit de soudage. Les CEM peuvent créer des interférences avec certains implants médicaux comme des stimulateurs cardiaques. Des mesures de protection pour les porteurs d'implants médicaux doivent être prises: Limiter par exemple tout accès aux passants ou procéder à une évaluation des risques individuels pour les soudeurs. Tous les soudeurs doivent appliquer les procédures suivantes pour minimiser l'exposition aux CEM provenant du circuit de soudage:

1. Rassembler les câbles en les torsadant ou en les attachant avec du ruban adhésif ou avec une housse.
2. Ne pas se tenir au milieu des câbles de soudage. Disposer les câbles d'un côté et à distance de l'opérateur.
3. Ne pas courber et ne pas entourer les câbles autour de votre corps.
4. Maintenir la tête et le torse aussi loin que possible du matériel du circuit de soudage.
5. Connecter la pince sur la pièce aussi près que possible de la soudure.
6. Ne pas travailler à proximité d'une source de soudage, ni s'asseoir ou se pencher dessus.
7. Ne pas souder tout en portant la source de soudage ou le dévidoir.

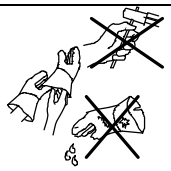
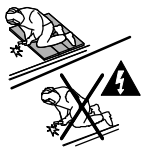
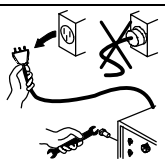
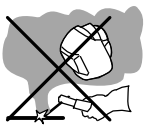
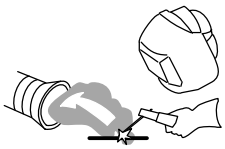
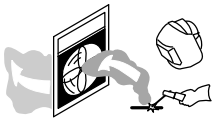
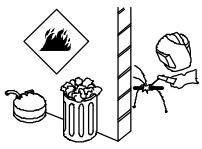
En ce qui concerne les implants médicaux :

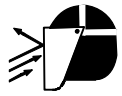
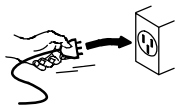
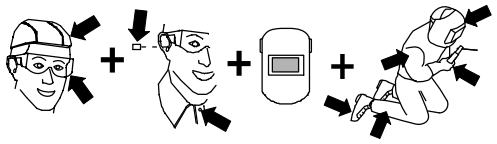
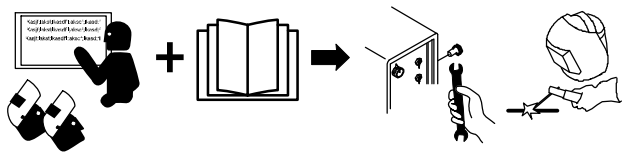
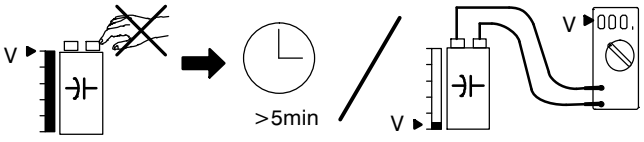
Les porteurs d'implants doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de soudage par points, de gougeage, du coupage plasma ou de chauffage par induction. Si le médecin approuve, il est recommandé de suivre les procédures précédentes.

SECTION 3 – DEFINITIONS

3-1. Additional Safety Symbols And Definitions

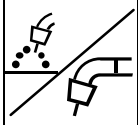
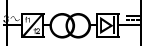
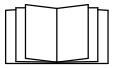
☞ *Some symbols are found only on CE products.*

	Warning! Watch Out! There are possible hazards as shown by the symbols. Safe1 2012-05
	Wear dry insulating gloves. Do not touch electrode with bare hand. Do not wear wet or damaged gloves. Safe2 2012-05
	Protect yourself from electric shock by insulating yourself from work and ground. Safe3 2012-05
	Disconnect input plug or power before working on machine. Safe5 2012-05
	Keep your head out of the fumes. Safe6 2012-05
	Use forced ventilation or local exhaust to remove the fumes. Safe8 2012-05
	Use ventilating fan to remove fumes. Safe10 2012-05
	Keep flammables away from welding. Do not weld near flammables. Safe12 2012-05
	Welding sparks can cause fires. Have a fire extinguisher nearby, and have a watchperson ready to use it. Safe14 2012-05
	Do not weld on drums or any closed containers. Safe16 2012-05

	Do not remove or paint over (cover) the label. Safe20 2012-05
	When power is applied failed parts can explode or cause other parts to explode. Safe26 2012-05
	Flying pieces of parts can cause injury. Always wear a face shield when servicing unit. Safe27 2012-05
	Always wear long sleeves and button your collar when servicing unit. Safe28 2012-05
	After taking proper precautions as shown, connect power to unit. Safe29 2012-05
	Drive rolls can injure fingers. Safe32 2012-05
	Welding wire and drive parts are at welding voltage during operation – keep hands and metal objects away. Safe33 2012-05
	Do not discard product with general waste. Reuse or recycle Waste Electrical and Electronic Equipment (WEEE) by disposing at a designated collection facility. Contact your local recycling office or your local distributor for further information. Safe37 2012-05
	Wear hat and safety glasses. Use ear protection and button shirt collar. Use welding helmet with correct shade of filter. Wear complete body protection. Safe38 2012-05
	Become trained and read the instructions before working on the machine or welding. Safe40 2012-05
	Hazardous voltage remains on input capacitors after power is turned off. Do not touch fully charged capacitors. Always wait 5 minutes after power is turned off before working on unit, OR check input capacitor voltage, and be sure it is near 0 before touching any parts. Safe43 2012-05

3-2. Miscellaneous Symbols And Definitions

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

A	Amperage	⎓	Direct Current (DC)	∿	Alternating Current (AC)	V	Voltage
	Output		Input		Remote	I	On
O	Off	+	Positive	−	Negative		Voltage Input
	Arc Force		Constant Voltage		Variable Inductance		Protective Earth (Ground)
	Increase		Line Connection		Gas Metal Arc Welding (GMAW)		Arc Force
U_0	Rated No Load Voltage (OCV)	U_1	Primary Voltage	U_2	Conventional Load Voltage	X	Duty Cycle
Hz	Hertz	IP	Degree Of Protection	I_2	Rated Welding Current	%	Percent
	Cold Jog (Inch) Away From Workpiece	S	Suitable for Some Hazardous Locations		Three Phase Static Frequency Converter-Transformer-Rectifier	3∿	Three Phase
I_{1max}	Rated Maximum Supply Current	I_{1eff}	Maximum Effective Supply Current		Wire Feed		Cold Jog (Inch) Towards Workpiece
	Purge By Gas		Constant Current		Trigger Hold Off		Read Instructions
	Locked	I_1	Primary Current		Sequence		Program
	Process		Wire Type		Gas Type	t	Time
	Arc Control		Trigger Hold On Indicator Light	O	Trigger Hold Off Indicator Light		

Notes

SECTION 4 – SPECIFICATIONS

4-1. Serial Number And Rating Label Location

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

4-2. 350 Model Specifications

☞ *Do not use information in unit specifications table to determine electrical service requirements. See Sections 5-9 and 5-10 for information on connecting input power.*

Input Power	Rated Welding Output	Voltage Range CV Mode	Amperage Range CC Mode	Max Open Circuit Voltage DC	Amperes Input At Rated Load Output 60 Hz, Three-Phase					Input kVA	Input KW
					230 V	380 V	400 V	460 V	575 V		
Three Phase	350 A @ 34 V DC, 100% Duty Cycle	10-44 V	20-400 A	75	36.7 (0-1A*)	21.8 (0-1A*)	20.8 (0-1A*)	18.8 (0-1A*)	14.6 (0-1A*)	14.4 (0.8*)	13.8 (0.17*)
*While idling; Input amperage fluctuates while idling and is always less than one Ampere. Use one Ampere for power efficiency calculations.											

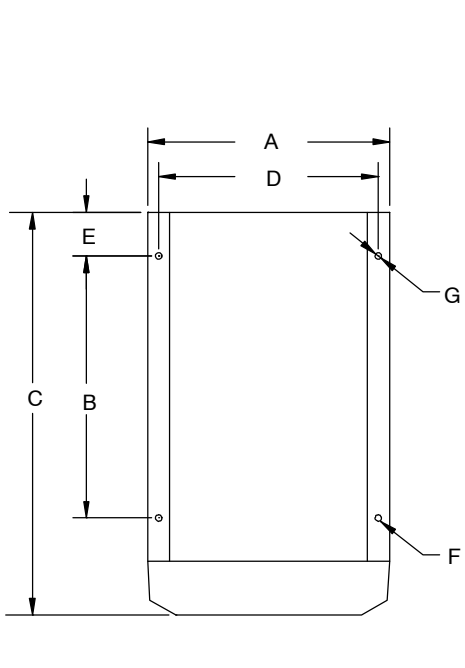
4-3. 500 Model Specifications

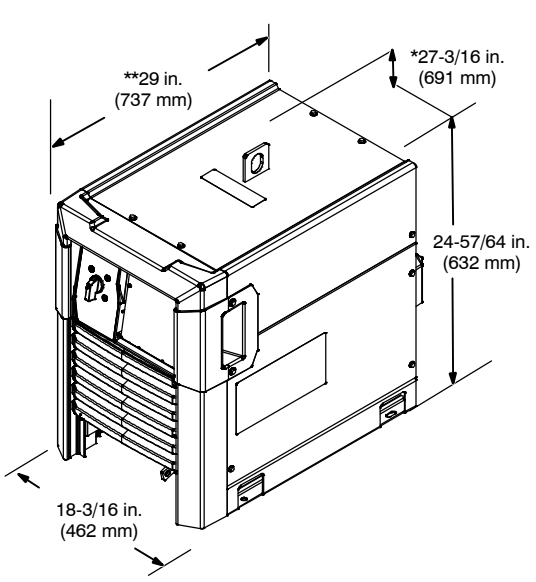
☞ *Do not use information in unit specifications table to determine electrical service requirements. See Sections 5-9 and 5-10 for information on connecting input power.*

Input Power	Rated Welding Output	Voltage Range CV Mode	Amperage Range CC Mode	Max Open Circuit Voltage DC	Amperes Input At Rated Load Output 60 Hz, Three-Phase					Input kVA	Input KW
					230 V	380 V	400 V	460 V	575 V		
Three Phase	500 A @ 40 V DC, 100% Duty Cycle	10-44 V	20-600 A	75	58.7 (0-1A*)	34.9 (0-1A*)	33.2 (0-1A*)	28.9 (0-1A*)	23.3 (0-1A*)	23.1 (0.8*)	21.9 (0.17*)
*While idling; Input amperage fluctuates while idling and is always less than one Ampere. Use one Ampere for power efficiency calculations.											

4-4. Dimensions And Weight

Hole Layout Dimensions	
A	17-33/64 in. (445 mm)
B	17-3/8 in. (441 mm)
C	26-11/64 in. (665 mm)
D	16-3/32 in. (409 mm)
E	2-9/32 in. (58 mm)
F	15/32 in. (12 mm)
G	15/32 x 1 in. (12 x 25mm)
Weight	
350 Model: 127 lb (58 kg) **500 Model:** 148 lb (67 kg)	
Lifting Eye Weight Rating: 1000 lb (453 kg) Maximum	





*Height includes lifting eye

**Length includes boot

Ref. 259 119-C

4-5. Environmental Specifications

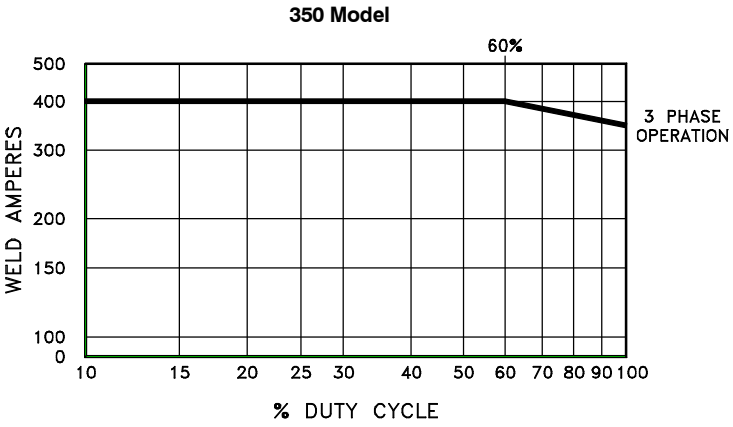
A. IP Rating

IP Rating
IP23S
This equipment is designed for outdoor use. It may be stored, but is not intended to be used for welding outside during precipitation unless sheltered.
IP23S 2014–06

4-6. Static Characteristics

The static (output) characteristics of the welding power source can be described as *flat* during the GMAW process and *drooping* during the CAC–A process. Static characteristics are also affected by control settings (including software), electrode, shielding gas, weldment material, and other factors. Contact the factory for specific information on the static characteristics of the welding power source.

4-7. Duty Cycle And Overheating

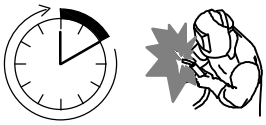


Duty Cycle is percentage of 10 minutes that unit can weld at rated load without overheating.

If unit overheats, thermostat(s) opens, output stops, and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage or duty cycle before welding.

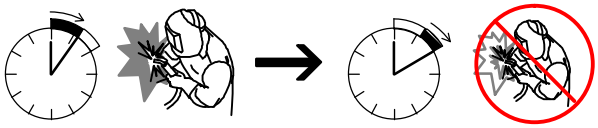
NOTICE – *Exceeding duty cycle can damage unit and void warranty.*

100% Duty Cycle At 350 Amperes



Continuous Welding

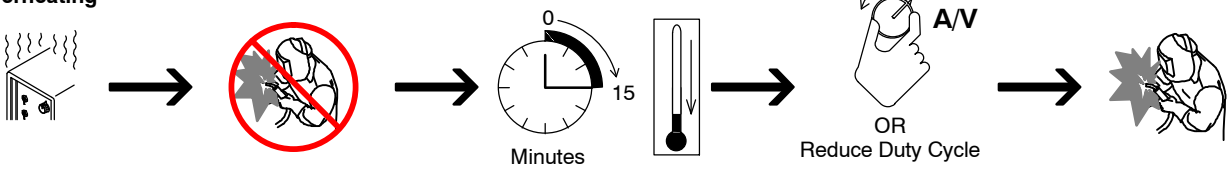
60% Duty Cycle At 400 Amperes

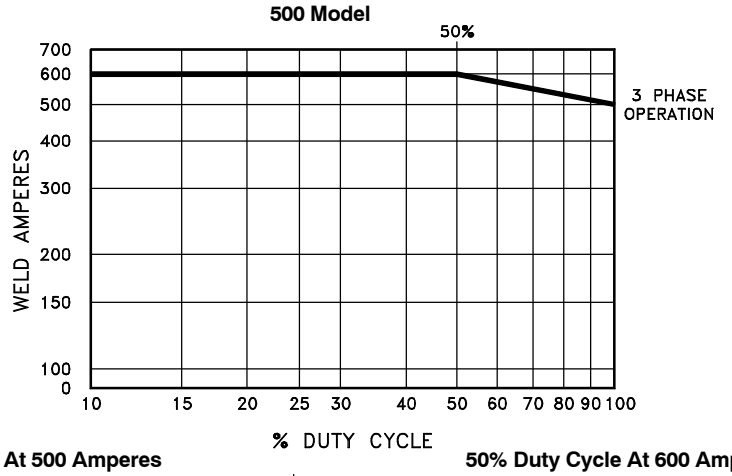


6 Minutes Welding

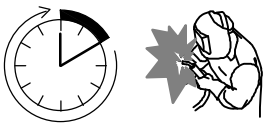
4 Minutes Resting

Overheating



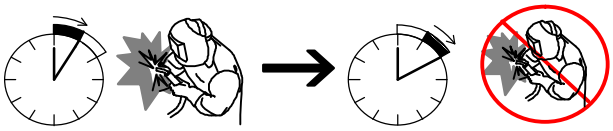


100% Duty Cycle At 500 Amperes



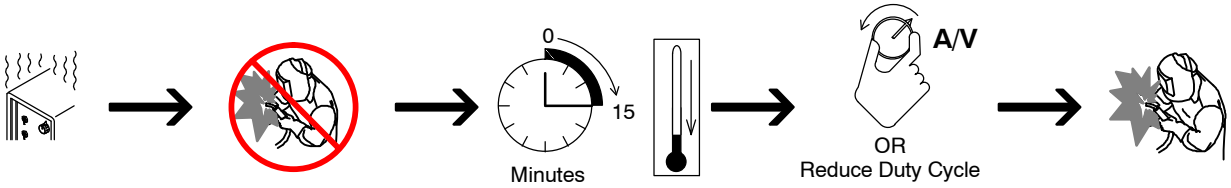
Continuous Welding

50% Duty Cycle At 600 Amperes



5 Minutes Welding

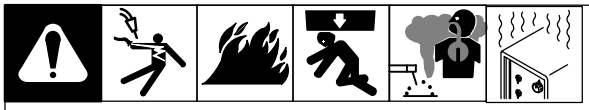
5 Minutes Resting



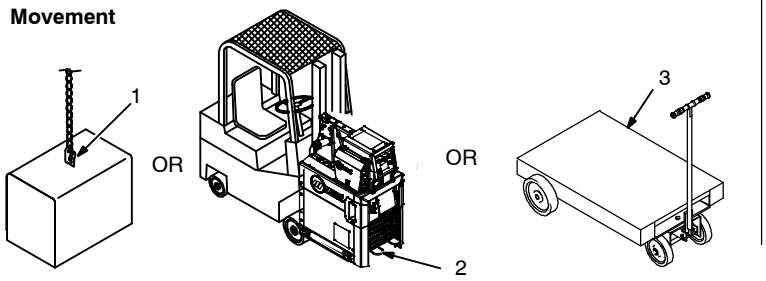
duty1 4/95 – SA-268 499-A / 268 498-A

SECTION 5 – INSTALLATION

5-1. Selecting A Location

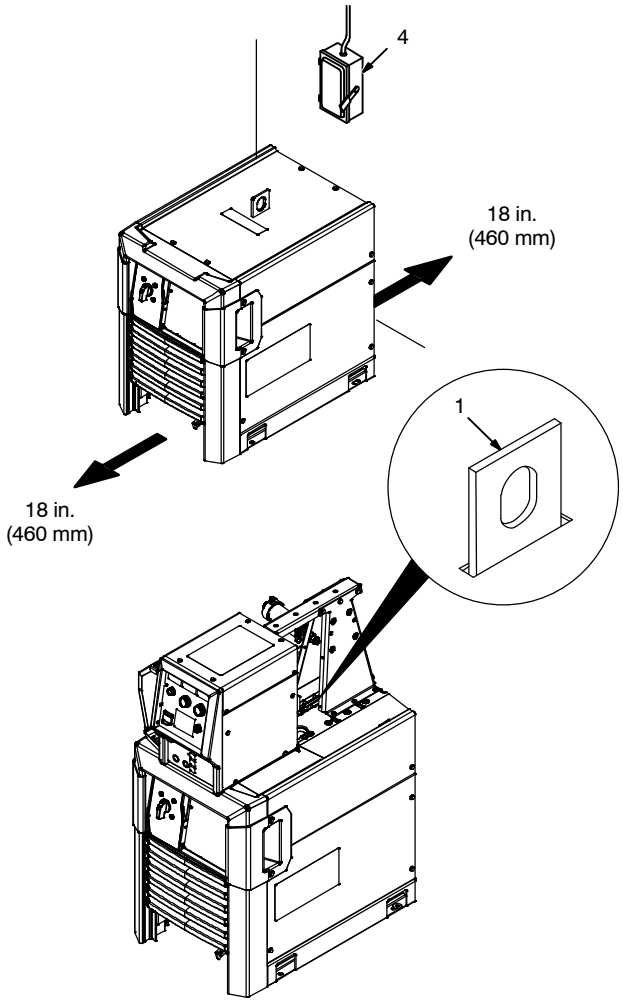


Movement



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

Location And Airflow



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

⚠ **Do not stack units. Beware of tipping.**

1 Lifting Eye

☞ *When a feeder is installed on top of power source, lift eye is inserted through slot in feeder base.*

2 Lifting Forks

Use lifting eye or lifting forks to move unit.

If using lifting forks, extend forks beyond opposite side of unit.

3 Hand Cart

Use cart or similar device to move unit.

4 Line Disconnect Device

Locate unit near correct input power supply.

Ref. 259 119-C

5-2. Weld Output Terminals And Selecting Cable Sizes*

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

Welding Amperes	Weld Cable Size** and Total Cable (Copper) Length in Weld Circuit Not Exceeding***							
	100 ft (30 m) or Less		150 ft (45 m)	200 ft (60 m)	250 ft (70 m)	300 ft (90 m)	350 ft (105 m)	400 ft (120 m)
	10 – 60% Duty Cycle AWG (mm^2)	60 – 100% Duty Cycle AWG (mm^2)	10 – 100% Duty Cycle AWG (mm^2)					
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)
250	2 (35)	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	2x2/0 (2x70)	2x2/0 (2x70)
300	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	2x2/0 (2x70)	2x3/0 (2x95)	2x3/0 (2x95)
350	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	2x2/0 (2x70)	2x3/0 (2x95)	2x3/0 (2x95)	2x4/0 (2x120)
400	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	2x2/0 (2x70)	2x3/0 (2x95)	2x4/0 (2x120)	2x4/0 (2x120)
500	2/0 (70)	3/0 (95)	4/0 (120)	2x2/0 (2x70)	2x3/0 (2x95)	2x4/0 (2x120)	3x3/0 (3x95)	3x3/0 (3x95)
600	3/0 (95)	4/0 (120)	2x2/0 (2x70)	2x3/0 (2x95)	2x4/0 (2x120)	3x3/0 (3x95)	3x4/0 (3x120)	3x4/0 (3x120)

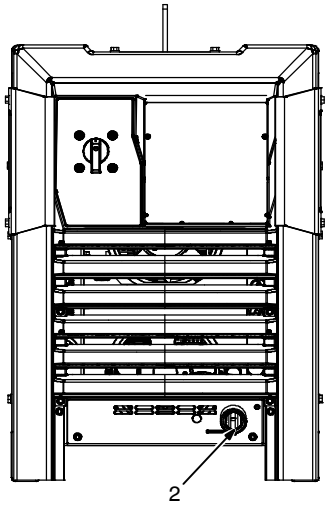
* This chart is a general guideline and may not suit all applications. If cable overheats, use next size larger cable.

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

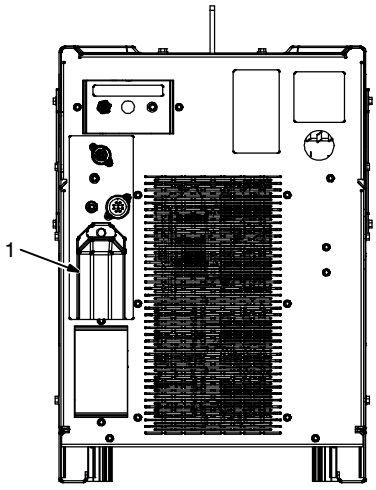
***For distances longer than those shown in this guide, call a factory applications rep. at 920-735-4505 (Miller) or 1-800-332-3281 (Hobart).

Ref. S-0007-L 2015–02

5-3. Weld Output Terminals



Front View



Rear View

Turn off power before connecting to weld output terminals.

Do not use worn, damaged, undersized, or repaired cables.

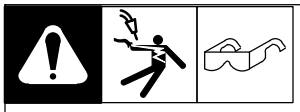
1 Positive (+) Weld Output Terminal

2 Negative (–) Weld Output Terminal

☞ *For welding output terminal connections see Sections 7-1 thru 7-5 for typical connection processes.*

output term1 2015–02 / 259 119-C

5-4. Connecting Weld Output Cables



Turn off power before connecting to weld output tabs or receptacles.

Failure to properly connect weld cables may cause excessive heat and start a fire, or damage your machine.

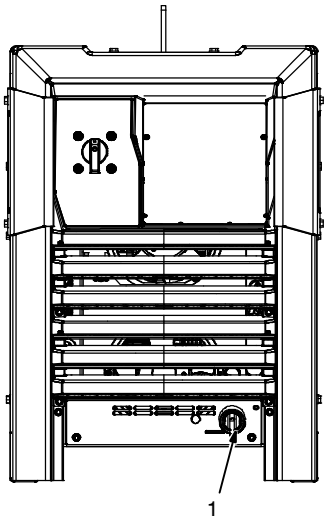
Ensure all connections are tight.

Tab Connection

☞ *Do not place anything between weld cable terminal and output tab. Make sure that the surfaces of the weld cable terminal and output tab are clean.*

1 Negative (–) Tab
2 Positive (+) Tab
3 Correct Weld Cable Connection For Single Feeder
4 Correct Weld Cable Connection For 2/0 And Larger Double Cables
5 Incorrect Weld Cable Connection
6 Weld Output Terminal Bolt
7 Nut
8 Weld Cable Terminal
9 Output Terminal

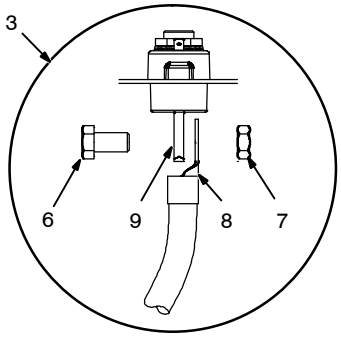
Remove supplied nut and bolt from weld output terminal. Insert bolt through hole in weld cable terminal and hole in weld output terminal. Screw nut onto bolt until weld cable terminal is tight against output terminal.

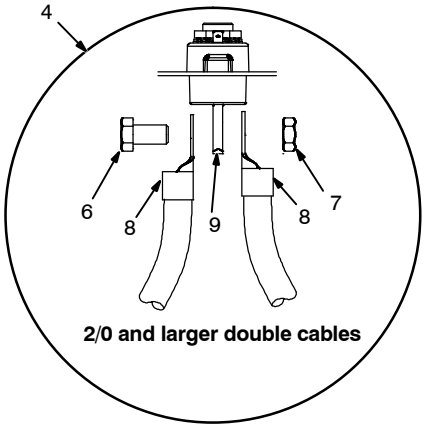


Front View

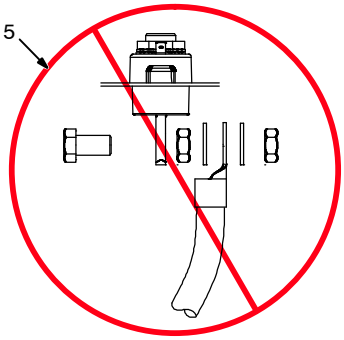
Tools Needed:

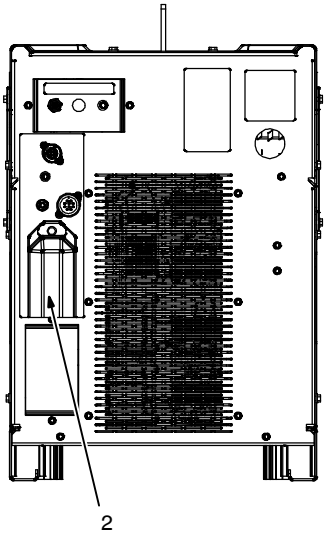
3/4 in. (19 mm) for output terminal type connection





2/0 and larger double cables

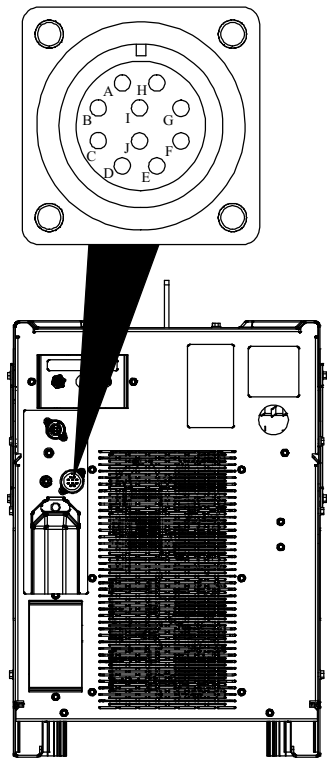




Rear View

Ref. 259 119-C / 259 120-A

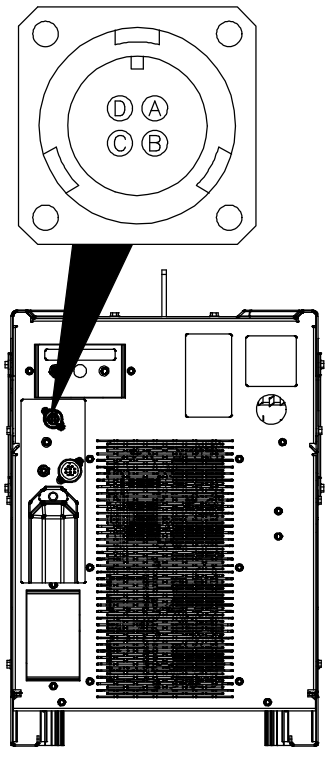
5-5. Remote 10 Wire Feeder Control Receptacle RC2 Information



Ref. 259 119-C

Socket	Socket Information
A	+50 Volts DC Common
B	+50 Volts DC Common
C	Voltage Sense
D	+50 Volts DC Power
E	+50 Volts DC Power
F	ENET Rx –
G	ENET Tx –
H	Drain
I	ENET Tx +
J	ENET Rx +

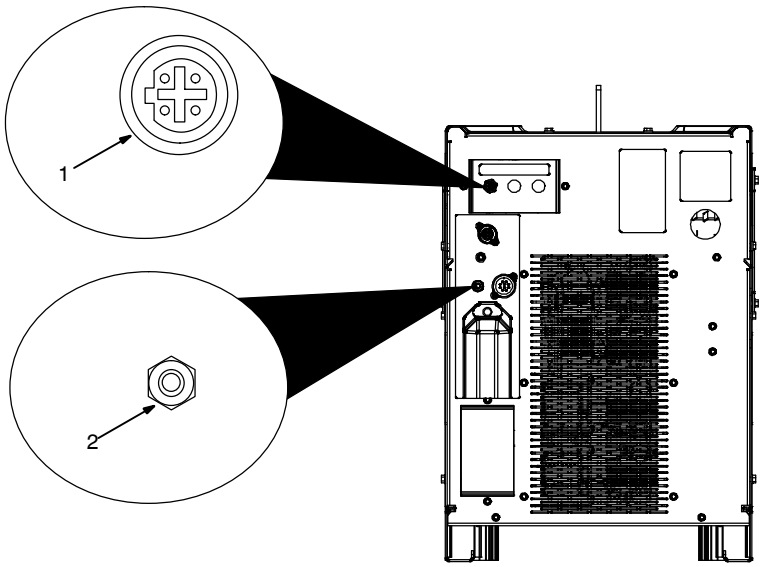
5-6. Volt Sense Receptacle RC3 Information



Ref. 259 119-C

Socket	Socket Information
A	Not Used
B	Volt Sense Negative
C	Not Used
D	Not Used

5-7. Supplementary Protector CB1 And Optional Communication Panel



1 Optional Ethernet Receptacle

Used for connecting a computer directly to the power source to access configuration web pages.

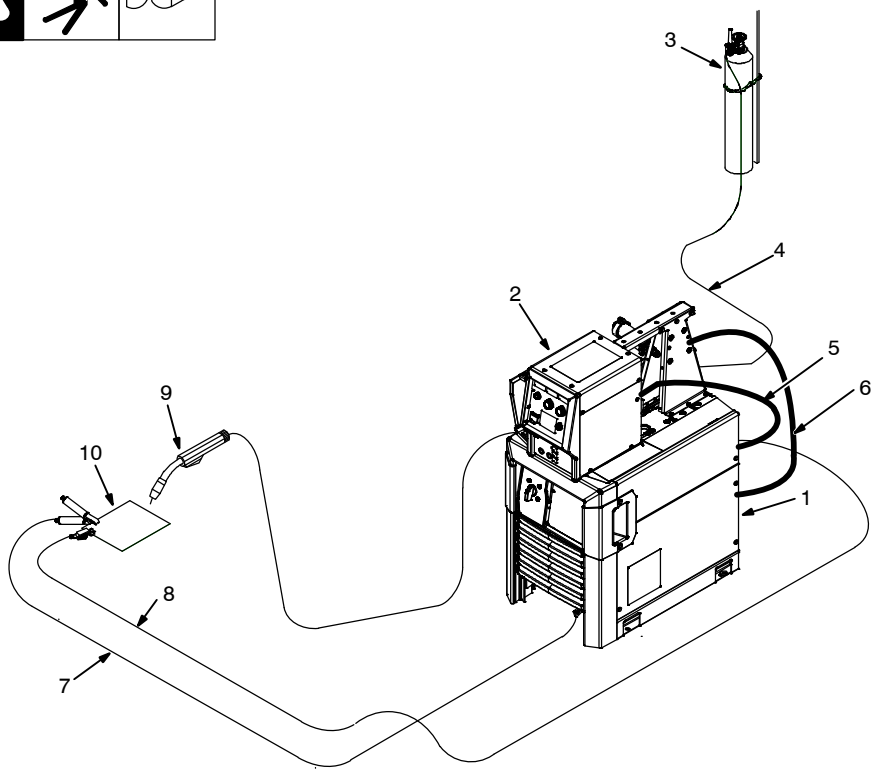
2 Supplementory Protector CB1

CB1 protects the wirefeed motor from overload. If CB1 opens, the wirefeeder does not work.

☞ *Press button to reset breaker. If breaker continues to open, contact a Factory Authorized Service Agent.*

Ref. 259 119-C

5-8. Connection Diagram



1 Welding Power Source
2 Wire Feeder
3 Gas Cylinder
4 Gas Hose
5 Feeder Cable
6 Electrode Cable
7 Work Cable
8 Volt Sense Lead
9 Welding Gun
10 Workpiece

☞ *Shielding gas pressure not to exceed 100 psi (689 kPa).*

Ref. 269790-A

5-9. Electrical Service Guide

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

NOTICE *– INCORRECT INPUT POWER can damage this welding power source. This welding power source requires a CONTINUOUS supply of input power at rated frequency (±10%) and voltage (±10%). Phase to ground voltage shall not exceed +10% of rated input voltage. Do not use a generator with automatic idle device (that idles engine when no load is sensed) to supply input power to this welding power source.*

☞ *Actual input voltage should not exceed ± 10% of indicated required input voltage. If actual input voltage is outside of this range, output may not be available.*

350 Model	60 Hz Three Phase				
Input Voltage (V)	230	380	400	460	575
Input Amperes (A) At Rated Output	34.1	20.4	19.2	16.7	13.3
Max Recommended Standard Fuse Rating In Amperes[1]					
Time-Delay Fuses [2]	50	30	30	25	20
Normal Operating Fuses [3]	70	40	35	30	25
Min Input Conductor Size In AWG [4]	8	10	12	12	14
Max Recommended Input Conductor Length In Feet (Meters)	119 (36)	215 (66)	146 (44)	193 (59)	196 (60)
Min Grounding Conductor Size In AWG [4]	8	10	12	12	14

500 Model	60 Hz Three Phase				
Input Voltage (V)	230	380	400	460	575
Input Amperes (A) At Rated Output	58.7	34.9	33.2	28.9	23.3
Max Recommended Standard Fuse Rating In Amperes[1]					
Time-Delay Fuses [2]	70	40	40	35	25
Normal Operating Fuses [3]	90	50	50	45	35
Min Input Conductor Size In AWG [4]	6	8	8	10	10
Max Recommended Input Conductor Length In Feet (Meters)	142 (43)	247 (75)	273 (83)	237 (72)	371 (113)
Min Grounding Conductor Size In AWG [4]	8	10	10	10	10

Reference: 2014 National Electrical Code (NEC) (including article 630)

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

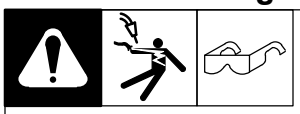
2 “Time-Delay” fuses are UL class “RK5” . See UL 248.

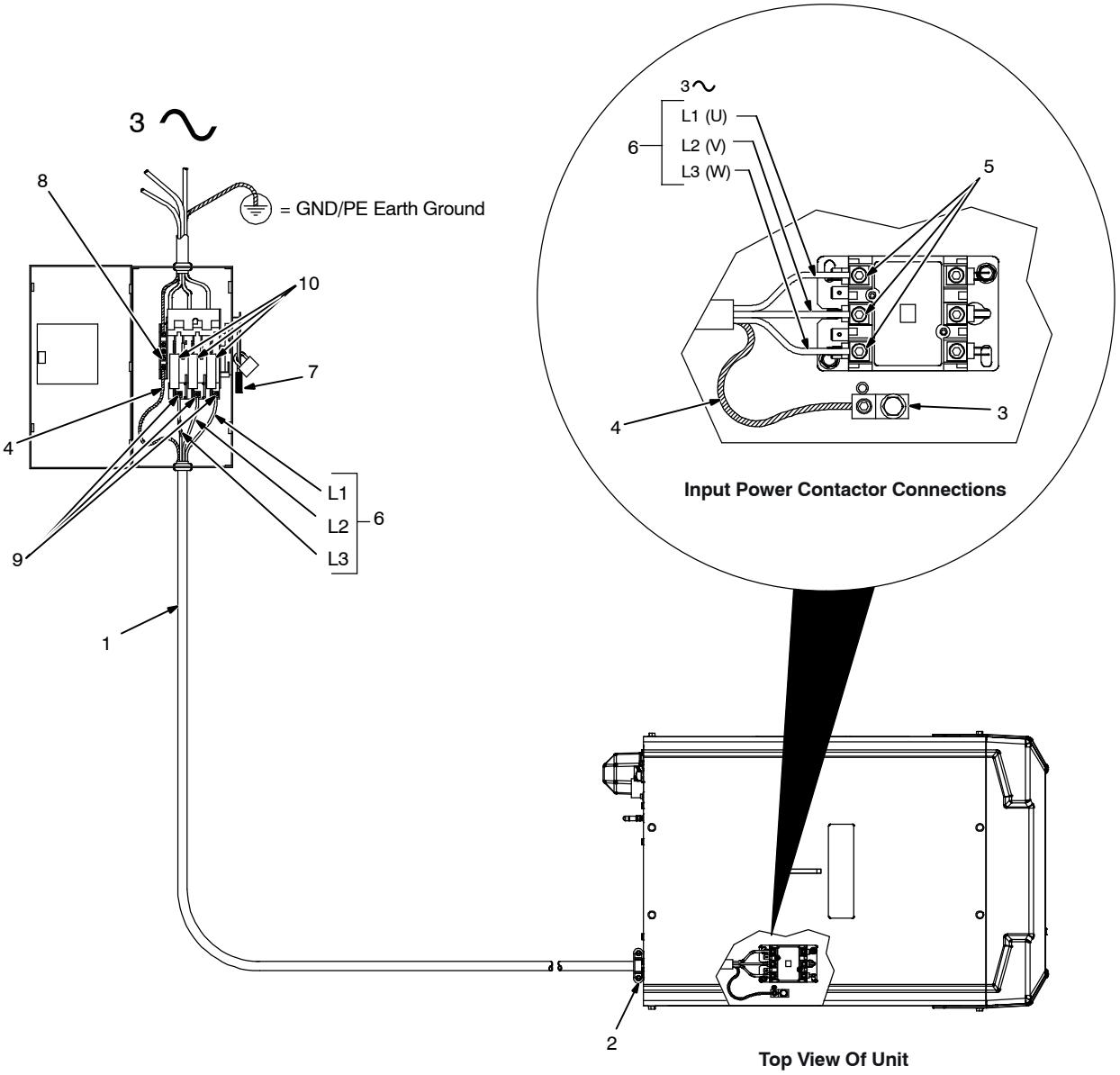
3 “Normal Operating” (general purpose - no intentional delay) fuses are UL class “K5” (up to and including 60 amps), and UL class “H” (65 amps and above).

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

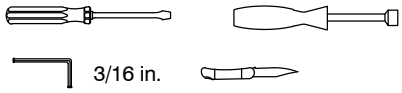
Notes

5-10. Connecting 3-Phase Input Power



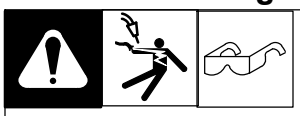


Tools Needed:



input5 2013–04 – 259 121-B / 259 119-C

5-10. Connecting 3-Phase Input Power (Continued)



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. Follow established procedures regarding the installation and removal of lockout/tagout devices.

Make input power connections to the welding power source first.

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

NOTICE *– 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 3-phase input power between 230 and 575 VAC without removing cover to relink the power source.*

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

1 Input Power Conductors (Customer Supplied Cord)

Select size and length of conductors using Section 5-9. Conductors must comply with national, state, and local electrical codes. If applicable, use lugs of proper amperage capacity and correct hole size.

Welding Power Source Input Power Connections

2 Strain Relief (Customer Supplied)

Install strain relief of proper size for unit and input conductors. Route conductors (cord) through strain relief. Tighten strain relief.

3 Welding Power Source Grounding Terminal

4 Green Or Green/Yellow Grounding Conductor

Connect green or green/yellow grounding conductor to machine grounding terminal first.

5 Welding Power Source Line Terminals

6 Input Conductors L1, L2, L3

Connect input conductors L1, L2, and L3 to welding power source line terminals.

Reinstall top cover on welding power source.

Disconnect Device Input Power Connections

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, L2, and L3 to disconnect device line terminals.

10 Over-Current Protection

Select type and size of over-current protection using Section 5-9 (fused disconnect switch shown).

Close and secure door on disconnect device. Follow established lockout/tagout procedures to put unit in service.

Input5 2013–04

Notes

Work like a Pro!

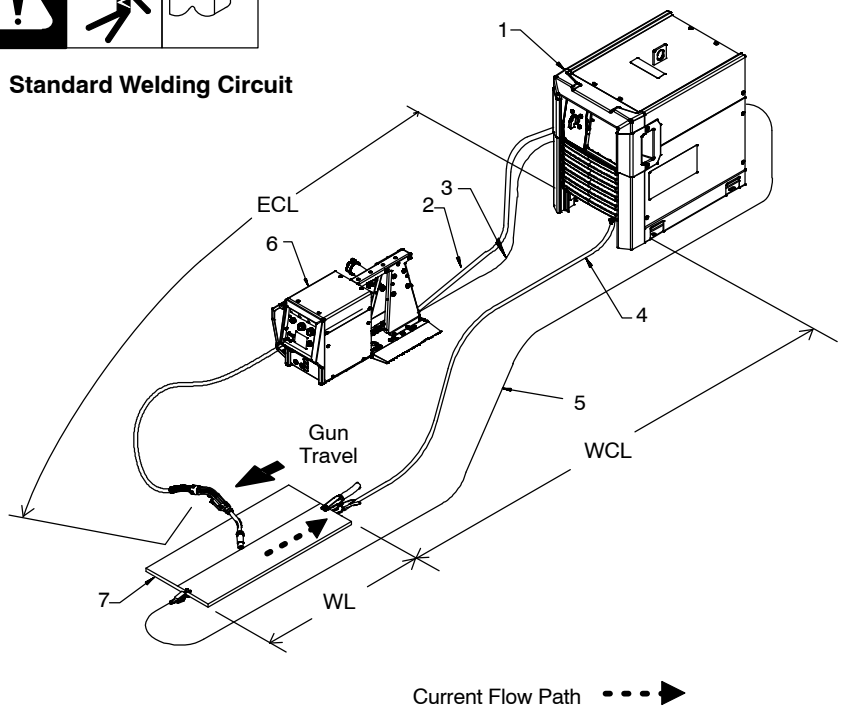
Pros weld and cut safely. Read the safety rules at the beginning of this manual.

SECTION 6 – RECOMMENDED SETUP PROCEDURES

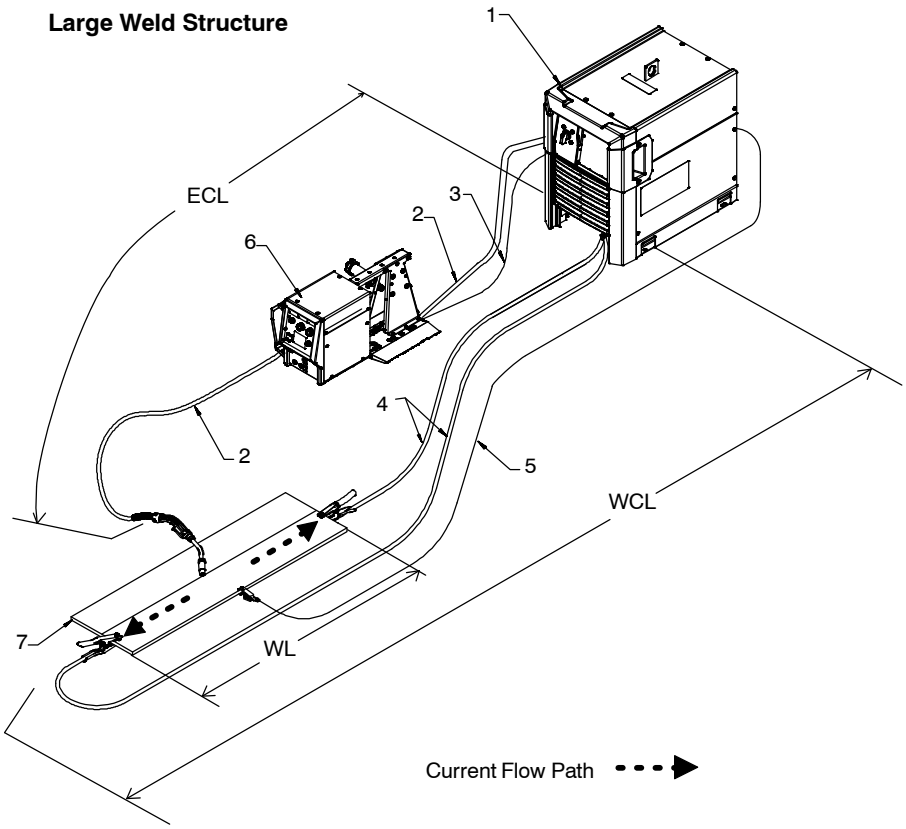
6-1. Welding Circuit

☞ *Minimizing the welding circuit loop can prevent extreme voltage drops that produce poor welding characteristics.*

Standard Welding Circuit



Large Weld Structure



1 Welding Power Source
2 Electrode Cable
3 Feeder Cable
4 Work Cable
5 Volt Sense Lead
6 Wire Feeder
7 Workpiece

In pulse welding applications using inverter power sources, cable resistance can result in less than satisfactory performance. In most cases, a welding circuit length of 50 ft (15 m) or less will provide satisfactory performance with a standard welding circuit connection.

The length of a welding circuit is determined as follows:

Welding Circuit = Electrode Cable Length (ECL) + Work Cable Length (WCL) + Workpiece Length (WL)

See Section 5-2 for weld cable size.

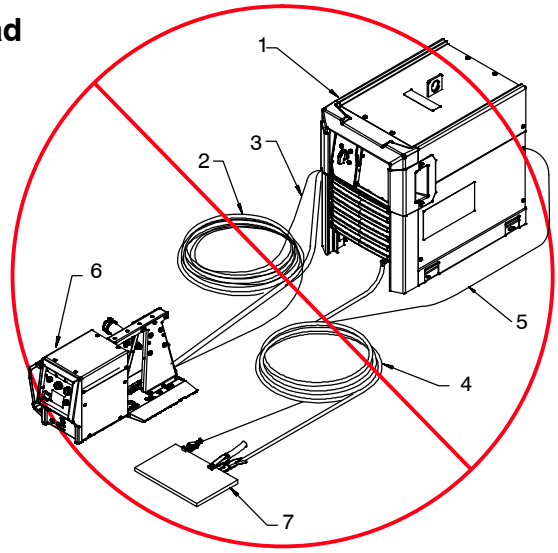
Variations in welding processes and welding circuit resistance can affect apparent voltage at the welding arc. Voltage sensing can improve welding performance by providing accurate feedback to the welding power source.

It is important to connect the voltage sensing lead as near to the weld as possible, but not in the return current path.

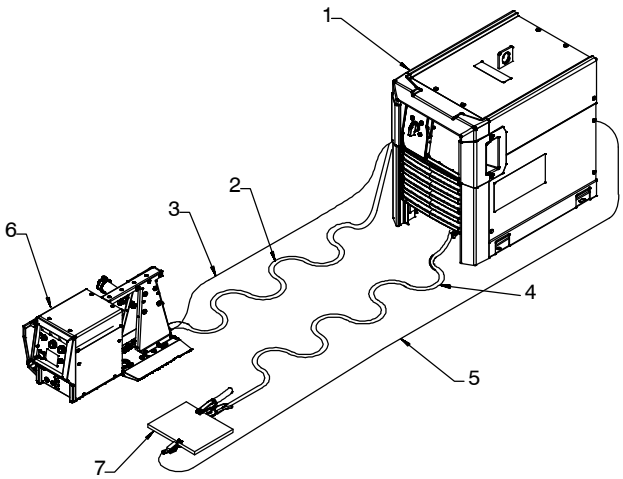
Ref. 245 743-A / Ref. 259 144-A / Ref. 259 119-C

6-2. Arranging Welding Cables To Reduce Welding Circuit Inductance

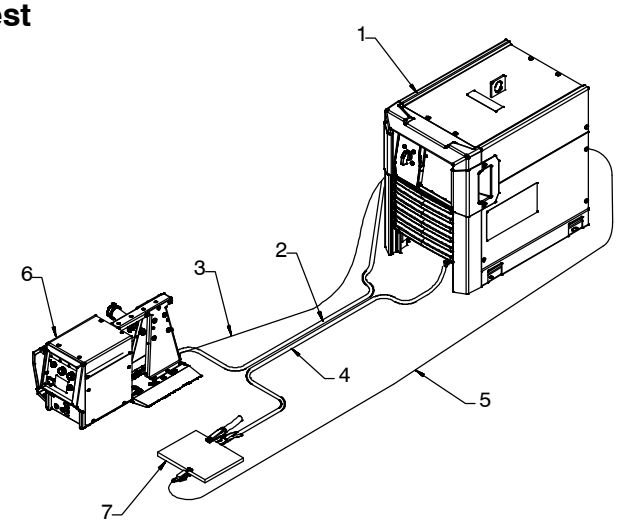
Bad



Better



Best



1 Welding Power Source
2 Electrode Cable
3 Feeder Cable
4 Work Cable
5 Voltage Sense Lead
6 Wire Feeder
7 Workpiece

The arrangement of the cables has an effect that is significant to the welding properties. As an example, Accupulse welding process can produce high welding circuit inductance depending on cable length and arrangement. This can result in limited current rise during droplet transfer into the welding puddle.

The sense lead is contained in the feeder control cable and automatically becomes enabled for all semi-automatic processes. The work sense lead connects to the welding power source 4-pin connector located above the positive output terminal. This work sense lead automatically compensates for work cable voltage drop when connected to the welding power source.

Do not coil excess cables. Use cables that are the appropriate length for the application. Whenever using long weld cables [longer than 50 ft (15 m)] try to arrange positive and negative weld cables together to reduce the magnetic field surrounding the cables. Avoid coupling the feeder and work sense leads with the weld cables.

Ref. 245 744-A / Ref. 259 144-A / Ref. 259 119-C

6-3. 30 Points Of Mechanics In MIG Welding

Primary Power

- Check primary power connection at line disconnect switch or receptacle and/or cord plug.
- Check primary power connection at welding power source.

Secondary Power

- Check secondary weld output connections at welding power source.
- Inspect condition and routing of positive weld cable to wire drive motor.
- Check connection of positive weld cable to wire drive motor.
- Inspect condition and routing of negative weld cable to fixture.
- Check connection of negative weld cable to fixture.
- Inspect condition of any rotary grounds, grounding shoes or other auxiliary grounds.
- Check installation, routing and condition of welding gun.

Shielding Gas

- Check gas hose connection to shielding gas supply regulator.
- Check shielding gas flow rate.
- Check gas hose routing.
- Check gas hose connection at wire drive housing.
- Check gun connection at wire drive and be sure O−rings seal at drive housing.
- Check condition of gas diffuser.
- Check condition of nozzle.
- Check O-ring for proper sealing at nozzle.

Welding Wire

- Inspect condition of de-reeler. Check for wear at quick-connect coupling and replace if necessary.
- Check placement of payoff pack or drum for smooth feed path.
- Inspect condition and routing of input conduit.
- Check installation of quick-connect coupling at rear of wire drive so that it does not contact drive rolls. Check for wear and replace if necessary.
- Check drive rolls and replace if worn.
- Check for drive roll tension setting.
- Check intermediate guide for proper size to match wire size and replace if worn.
- Check for proper length of liner at both ends and be sure it is cut without burrs.
- Check liner for proper size to match wire size.
- Check liner for wear and clean out to prevent plugging.
- Check contact tip for proper size to match wire size.
- Check contact tip for wear and change at regular intervals.
- Check contact tip for a tight fit and secure installation at gun.

6-4. Arc Blow

Arc blow is the deflection of the welding arc from its normal path due to magnetic forces. This condition is usually encountered in direct current welding of magnetic materials, such as iron and nickel. Arc blow can happen in alternating current welding under certain conditions, but these cases are rare and the intensity of the arc blow is always less severe. Direct current flowing through the electrode and base metal will set up a magnetic field around the electrode. This magnetic field tends to deflect the arc to the side at times, but usually the arc deflects either forward or backwards along the joint.

Back blow is encountered when welding toward the work cable connection on a workpiece near the end of a joint or into a corner. Forward blow is encountered when welding away from the work cable connection on a workpiece at the start of a joint. In general, arc blow is the result of two basic conditions:

1. The change of current flow direction as it enters the work and is conducted toward the work cable.
2. The asymmetric arrangement of magnetic material around the arc, a condition that normally exists when welding is performed near the end of ferromagnetic materials.

Although arc blow cannot always be completely eliminated, it can be controlled or reduced to an acceptable level through knowledge of the two conditions listed above.

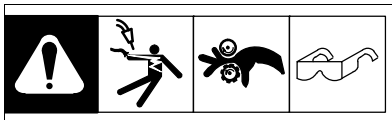
Except in cases where arc blow is unusually severe, certain steps can be taken to eliminate or reduces its severity. Some or all of the following steps may be necessary:

* Place work cable connection as far as possible from joints to be welded.
* If back blow is the problem, place the work cable connection at the start of the joint to be welded and weld toward a heavy tack weld.
* If forward blow is the problem, place the work cable connection at the end of the joint to be welded.
* Position electrode angle so that arc force counteracts arc blow.
* Use the shortest possible arc that maintains good welding practices (this helps arc force to counteract arc blow).
* Reduce welding current if possible.
* Weld toward a heavy tack weld or runoff tab.
* Use the back step sequence of welding.
* Change to an AC welding operation which may require a change in electrode classification.
* Wrap the work cable around the workpiece in the direction that sets up a magnetic field to counteract the magnetic field causing the arc blow.

Notes

6-5. Basic Welding Troubleshooting

Listed below are some problems, causes and remedies related to welding operations; however, this list does not contain every possible condition that could be encountered in welding.



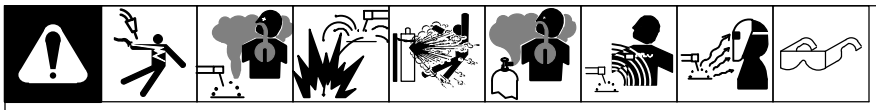
Trouble	Probable Cause	Remedy
No weld output; unit completely inoperative.	Line disconnect switch in Off position.	Place switch in On position.
	Power source switch in Off position.	Place switch in On position.
	Primary power fuse blown or circuit breaker tripped.	Replace fuse or reset circuit breaker and check input voltage.
Weld output is present, but wire stops feeding while welding.	Wire feeder protective fuse blown or circuit breaker tripped.	Replace fuse or reset circuit breaker and find overload condition.
	Wire feeder drive rolls misaligned.	Align drive rolls.
	Wrong size drive rolls.	Replace with proper size drive rolls.
	Too much or too little drive roll pressure.	Adjust drive roll pressure.
	Too much tension set at wire spool.	Reduce wire spool tension.
	Restriction in unspooler or drum adapter.	Replace unspooler or repair restriction.
	Feeder motor burnt out.	Test motor and replace if necessary.
	Gun liner dirty or restricted.	Remove gun liner and clean or replace.
	Wrong type or size of liner.	Install proper size liner.
	Broken or damaged gun or torch.	Replace faulty parts.
	Contact tip opening restricted.	Replace contact tip.
	Wrong size or type of contact tip.	Replace with proper size and type contact tip.
	Sharp bends or kinks in gun cable or liner.	Straighten gun cable and/or replace liner.
	Gun overheating.	Use gun with proper amperage rating.
	Wrong size wire.	Match wire size to liner and contact tip.
	Guides rubbing on drive rolls.	Adjust or position guides properly.
	Drive rolls jammed.	Remove foreign object from gears.
	Motor cable disconnected or damaged.	Connect, repair or replace motor cable.

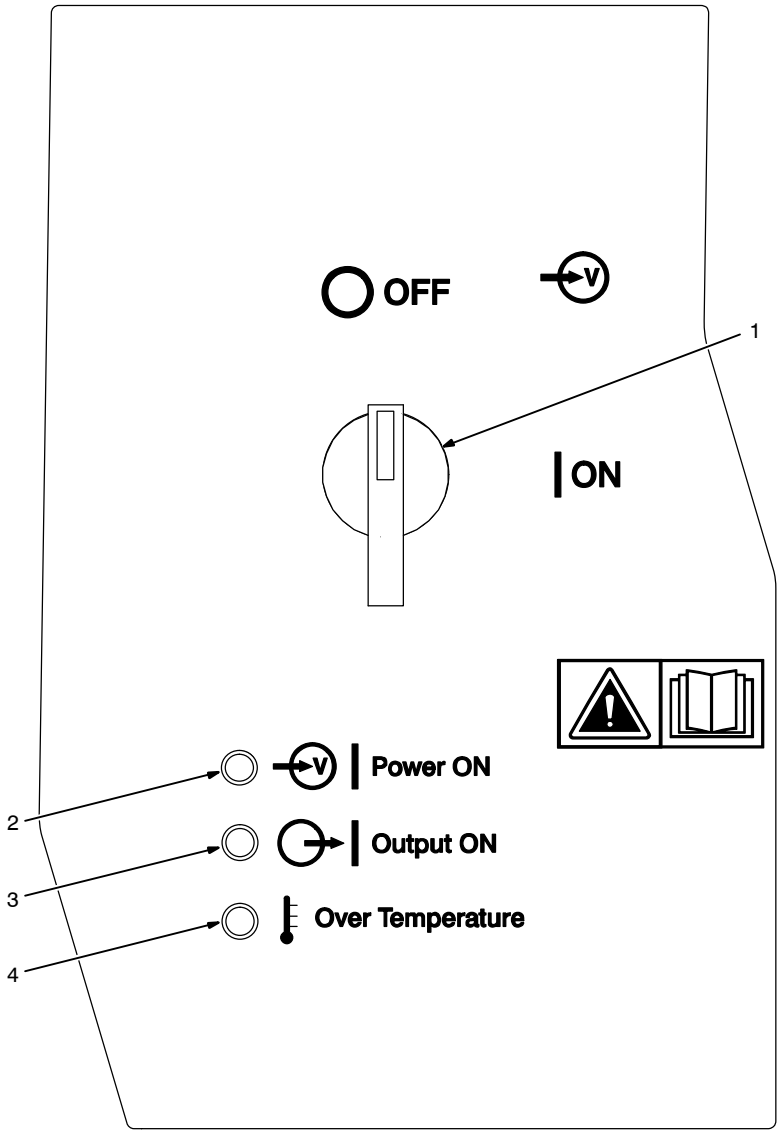
Trouble	Probable Cause	Remedy
Porosity in weld.	Dirty base metal, heavy oxides, mill scale, oil, etc.	Clean base metal by brushing, grinding or use chemical cleansing before welding.
	Regulator/flowmeter faulty.	Adjust or replace regulator/flowmeter.
	Gas cylinder valve closed.	Open gas cylinder valve.
	Gas regulator diaphragm defective.	Replace regulator.
	Flowmeter cracked or broken.	Repair or replace flowmeter.
	Gas hose disconnected or leaking.	Connect or replace gas hose.
	Too much or too little gas flow.	Adjust for proper gas flow.
	Moisture in shielding gas.	Replace gas cylinder or supply.
	Wrong gas for wire type or transfer mode.	Use correct shielding gas.
	Feeder gas solenoid faulty.	Replace solenoid.
	Gun or outlet cable leaking.	Repair or replace faulty parts.
	Wire feed speed setting too high.	Reduce wire feed speed.
	Contact tip extends too far out of nozzle.	Adjust or replace parts (max distance should not exceed 1/8 in (3.2 mm).
	Nozzle to work distance too large.	Reduce nozzle to work distance.
	Incorrect gun or torch angle.	Set proper gun angle (porosity or dirty welds mean gun angle is too large).
	Nozzle restriction.	Clean off spatter or remove restriction.
	Breeze or drafts in weld zone.	Shield weld zone from drafts.
	Low shielding gas cylinder pressure.	Replace gas cylinder.
	Gas leak at gun to feeder connection.	Properly install gun or replace O-rings at gun connector.
Excessive spatter.	Voltage set too high.	Reduce voltage setting (reduce trim or arc adjust for pulse welding).
	Incorrect gun or torch angle.	Set proper gun angle.
	Too much or too little gas flow.	Adjust for proper gas flow.
	Wrong gas for wire type or transfer mode.	Use correct shielding gas.
	Wrong electrode wire type or size.	Use proper electrode wire.
	Wrong inductance setting.	Adjust inductance.
	Electrode wire dirty or old.	Replace with new electrode wire.
	Oily or dirty base metal.	Clean base metal by brushing, grinding or use chemical cleansing before welding.
	Excessive wire stick-out or nozzle to work distance too great.	Adjust wire stick-out or reduce nozzle to work distance.
	Wrong transfer mode.	Set proper transfer mode.
	Travel speed too slow.	Increase travel speed so that arc is on leading edge of weld puddle.

Trouble	Probable Cause	Remedy
Wandering, hunting or erratic arc.	Restriction in unspooler or drum adapter.	Replace unspooler or repair restriction.
	Dirty or worn gun liner or inlet cable.	Remove gun liner or inlet cable and clean or replace.
	Sharp bends or kinks in gun cable or liner.	Straighten gun cable and/or replace liner.
	Loose or worn contact tip.	Tighten or replace contact tip.
	Wrong size or type of contact tip.	Replace with proper size and type contact tip.
	Gun overheating.	Use gun with proper amperage rating.
	Loose power cables or other electrical connections.	Tighten, repair or replace connections or cables, also check all rotary or brush type connections.
	Incorrect gun or torch angle.	Set proper gun angle.
	Too much or too little gas flow.	Adjust for proper gas flow.
	Moisture in shielding gas.	Replace gas cylinder or supply.
	Wrong gas for wire type or transfer mode.	Use correct shielding gas.
	Wrong program selection for pulse welding.	Make proper program selection.
	Improper or unsteady analog command from robot controller.	Check signal from robot controller (as a trouble-shooting aid go to power source control of voltage and wire speed).
	Gun or outlet cable leaking.	Repair or replace faulty parts.
	Incorrect nozzle to work distance.	Set proper distance [3/8 in to 5/8 in (9.5 to 15.9 mm) for short arc, 5/8 in to 1 in (15.9 to 25.4 mm) for pulse welding, and 3/4 in to 1-1/4 in (19.1 to 31.8 mm) for spray welding].
	Voltage sensing leads open or shorted.	Repair or replace voltage sense leads.
	High frequency noise in the area.	Be sure proper grounding methods are followed when TIG or plasma equipment is used in the area.
	Arc blow.	See Section 6-4.
	Drive motor tachometer or motor cable open or shorted.	Check drive motor tachometer and cables, and repair or replace.
	Wrong size drive rolls.	Replace with proper size drive rolls.
	Too much or too little drive roll pressure.	Adjust drive roll pressure.
Welding wire burns back to contact tip at the start of a weld.	Restriction in wire feed system.	Check inlet cable, gun liner and wire guides.
	Worn drive rolls.	Replace drive rolls.
	Wrong size drive rolls.	Replace with proper size drive rolls.
	Improper start parameters.	Adjust start parameters.
	Worn contact tip.	Replace contact tip.
	Wrong size or type of contact tip.	Replace with proper size and type contact tip.
	Not enough cast in welding wire.	Add a wire straightener to put cast in wire.
Welding wire burns back to contact tip during welding.	Restriction in wire feed system.	Check inlet cable, gun liner and wire guides.
	Worn drive rolls.	Replace drive rolls.
	Wrong size drive rolls.	Replace with proper size drive rolls.
	Too much or too little drive roll pressure.	Adjust drive roll pressure.
	Worn contact tip.	Replace contact tip.
	Wrong size or type of contact tip.	Replace with proper size and type contact tip.
	Not enough cast in welding wire.	Add a wire straightener to put cast in wire.
Welding wire burns back to contact tip at the end of a weld.	Welding power source output not shutting off.	Make sure all switches are in correct position, repair power source if necessary.
	Burnback setting too high or too long.	Adjust burnback setting or turn off completely.

SECTION 7 – OPERATION

7-1. Operator Controls





1 Power Switch

Turns unit On or Off.

2 Power On LED

Power LED illuminates when unit is energized.

3 Output On LED

Output LED illuminates when weld output is energized.

4 Over Temperature LED

Over Temperature LED illuminates if unit overheats. Stop welding and allow unit to cool. LED will turn off when unit is within operating temperature range and welding can start again.

☞ *After turning unit off, wait until Power ON LED is off before turning unit back on. Cycling power too quickly can cause software issues on power up.*

Ref. 257 195-C

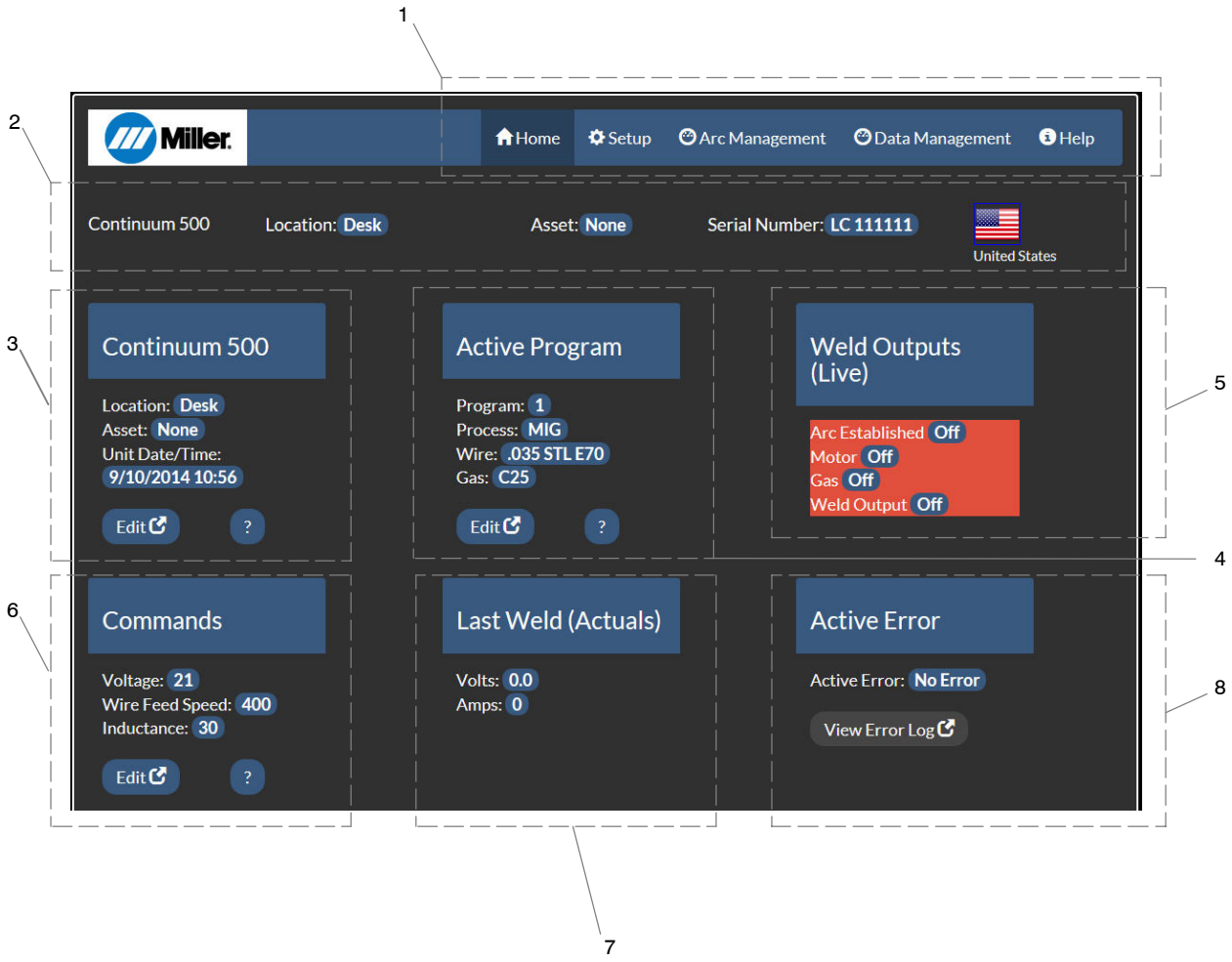
SECTION 8 – CONFIGURATION (IF EQUIPPED)

8-1. Accessing Configuration Web Pages

To access the power source configuration webpages you will need the optional communication panel (See Section 5-7). Connect a PC directly to the jack on the communication panel with a CAT5 or CAT6 Ethernet cable.

Enter the default IP address, 169.254.0.2, into a web browser and the welder configuration web pages will open to the Home screen.

8-2. Home Screen



1 Navigation Bar

Select Home, Setup, Arc Management, Data Management, or Help screens.

2 Information Bar

Displays general information on power source, location, asset number, serial number, and display language.

3 Power Source Information

Displays power source information. Edit button allows these parameters to be changed.

4 Active Program

Displays the program number, process, wire size and alloy, and gas. Edit button allows these parameters to be changed.

5 Weld Outputs (Live)

Displays the weld output conditions of the power source and feeder in real time.

6 Commands

Displays current user changeable commands. Depending on the weld process being used these commands will vary. Edit button allows parameters to be changed.

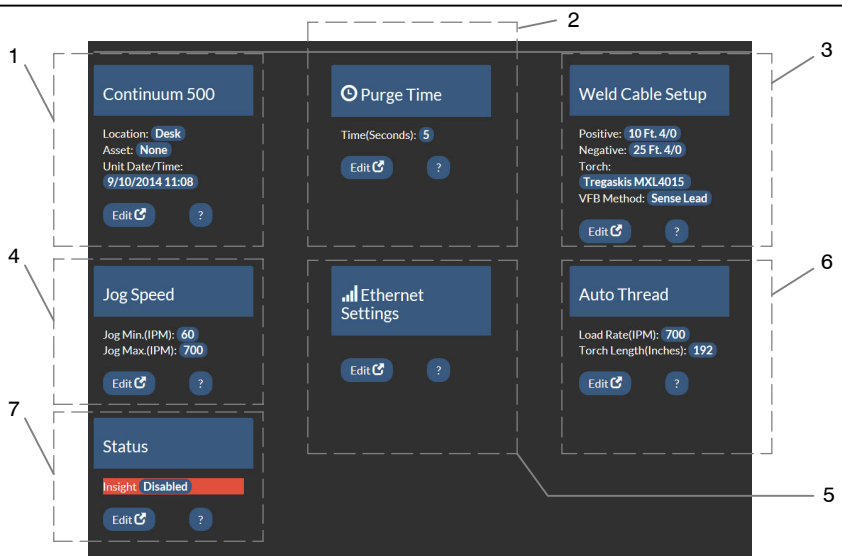
7 Last Weld

Displays the voltage and amperage used during the last weld made.

8 Active Error

Displays any active error messages. View Error Log button will display a list of previous errors and the time at which they occurred.

8-3. Setup Screen



1 Information Bar

Displays general information on power source, location, asset number, serial number, and display language.

2 Purge Time

Displays the length of time gas will flow when the purge button is pressed. Edit button allows time length to be changed.

3 Weld Cable Setup

Displays length and diameter of positive and negative weld leads, torch, and voltage feedback (VFB) method that are selected. Edit button allows these parameters to be changed.

4 Jog Speed

Displays the minimum and maximum Jog speeds in inches per minute (IPM). Edit button allows minimum and maximum jog speed setting to be changed for forward and reverse jog.

5 Ethernet Settings

Edit button allows user to change connectivity settings.

6 Auto Thread

Displays the Load Rate in inches per minute (IPM) and Torch Length (Inches) to determine the length of time for Auto Threading. Edit button allows these parameters to be changed.

7 Status

Displays the status of Insight software. Edit button allows that status to be changed.

8-4. Arc Management Screen

1 Active Program

Displays the program number, process, wire size and alloy, and gas. Edit button allows these parameters to be changed.

2 Commands

Displays current user changeable commands. Depending on the weld process being used these commands will vary. Edit button allows parameters to be changed.

3 Weld Sequence

Displays active weld sequence parameters. Edit button allows changes to these parameters.

4 Lock Status

Displays the current status of system locks. Edit button allows the lock configuration to be changed.

5 Program Enable

Edit button will allow user to select which programs are available for use.

6 Advanced Triggers

Displays the current status of advanced trigger modes. Edit button allows status of trigger modes to be changed.

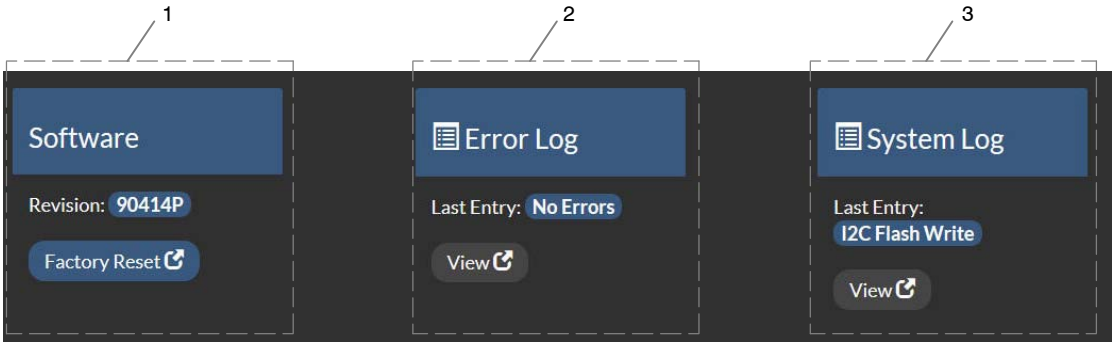
7 Program Naming

Edit button allows program Machine Display and Description to be changed for each numbered program.

8 Weld Processes

Displays available weld processes. Edit button allows processes to be enabled or disabled.

8-5. Data Management Screen



1 Software Information

Displays the software revision.

Factory Reset button will take user to a Factory Reset screen. Read and follow all instructions on Factory Reset screen to perform a Factory Reset.

2 Error Log

Displays the last error experienced by the system.

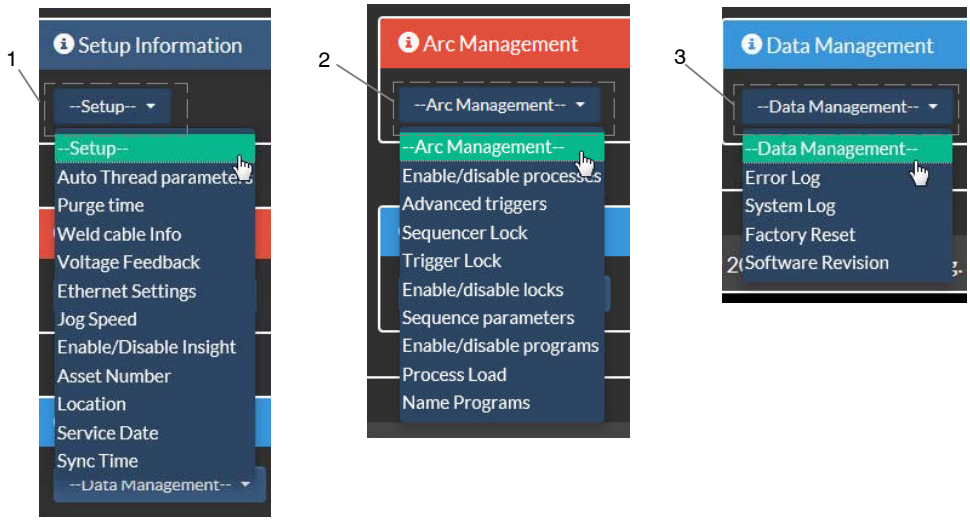
View button displays a list of previous errors and the time at which they occurred.

3 System Log

Displays the last entry into the system log.

View button displays a list of the entries made to the system log and the time at which they occurred.

8-6. Help Screen



☞ *The Help Screen contains three drop down menus which contain the features on the Setup, Arc Management and Data Management screens.*

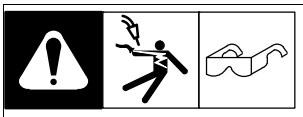
1 Setup Information Drop–Down Menu

2 Arc Management Drop–Down Menu

3 Data Management Drop–Down Menu

SECTION 9 – MAINTENANCE & TROUBLESHOOTING

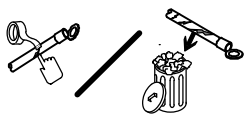
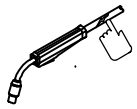
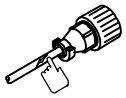
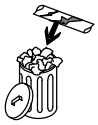
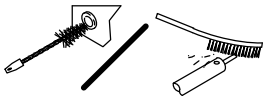
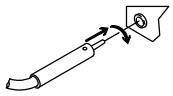
9-1. Routine Maintenance



Disconnect power before maintaining.

☞ *Maintain more often during severe conditions.*

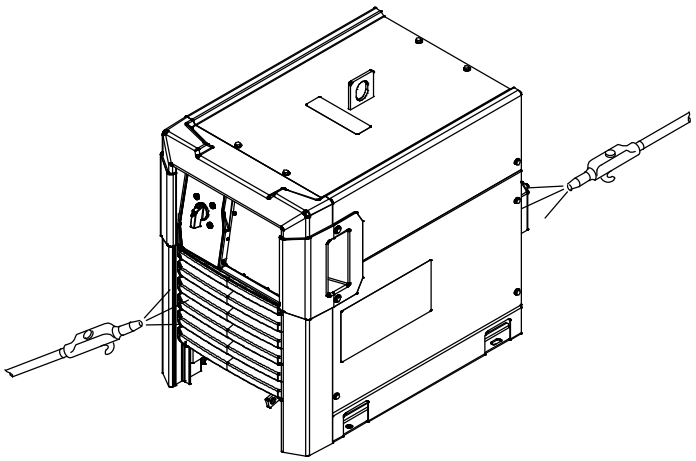
✓ = Check ◇ = Change ◯ = Clean ☆ = Replace
* To be done by Factory Authorized Service Agent

					Reference
Every **3** Months	 ☆ Unreadable Labels	 ◯ Weld Terminals	 ✓☆ Weld Cables	 ✓☆ Gun Cables	
	 ✓☆ Cords	 ✓☆ Cracked Parts	 ◯ Weld Connections	 ✓ Tighten Weld Cable Connections	
Every **6** Months	 OR ◯ Inside Unit				

9-2. 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.



Ref. 259 119-C

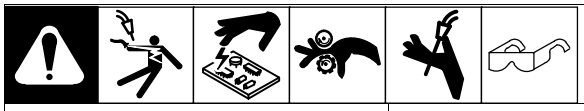
9-3. Error Code Troubleshooting Description And Tables

LED Display Message	Message Type	LCD Display Message	LCD Solution Message	LCD Error Log Message
WELD WAIT	ERROR	Unit was not ready for a weld sequence	Press button to clear error	Weld Wait Error
ERR OVERTEMP	ERROR	Welding power source has overheated	Allow unit too cool then cycle power	Overtemp Error
E STOP	ERROR	Emergency stop activated	Reset the emergency stop button	E Stop
OVER CURRENT	ERROR	Welding power source primary draw too high	Check input primary then cycle power	Primary Overcurrent
CYCLE POWER	MESSAGE	The unit requires a power cycle	Cycle power on the power source	Cycle Power Error
OVER POWER	ERROR			
SLF TST ERR	ERROR	Welder failed self test	Cycle power on the power source	Self Test Error
ERR INPT PWR	ERROR	Input Power Problem	Ensure your primary voltage is correct	Input Power Problem
ERR FDR	ERROR	Feeder Power Problem	Cycle power on the power source	Feeder Power Problem
ERR AUX PWR	ERROR	AUX Power Problem	Cycle power on the power source	AUX Power Problem
ERR THERM	ERROR	Thermal System Problem	Cycle power on the power source	Thermal System Problem
ERR PWR SRC	ERROR	Welder Power Source Problem	Cycle power on the power source	Power Source Problem
ERR WFS	ERROR	Actual WFS does not match command	Press button to clear error	Wire Speed Error
ERR STRT	ERROR	Trigger held too long without arc	Press button to clear error	Arc Start Error
ERR STOP	ERROR	Potential obstruction in wire feed system	Check wire feed and wire drive systems	Arc Stop Error
ERR GAS FLW	ERROR	No gas flow to the gun	Check gas connections	Gas Flow Error
ERR COOL FLW	ERROR	No coolant flow in water system	Check water cooling system	Coolant Flow Error
ERR GND CRNT	ERROR	Weld current detected in earth ground	Check and repair feeder weld connections	Earth Ground Current Error
ERR WIR STUK	ERROR	Wire stick to workpiece at the end of the weld	Break/Cut wire away from workpiece	Wire Stuck Error
ERR ARC	ERROR	Arc Outage occurred	Check wire feeder and power source	Arc Outage Error
ERR TRG STUK	ERROR	Trigger held during power up	Release trigger and cycle power	Trigger Stuck Error
ERR SOFTWARE	ERROR	Incompatible software detected in the system	Update software	Incompatible Software Error
ERR FEEDER	ERROR	Feeder peripheral malfunction	Cycle power on the power source	Feeder EEPROM Error
ERR FEEDER	ERROR	Feeder peripheral malfunction	Cycle power on the power source	Feeder USART1 Error
ERR COMM FDR	ERROR	Feeder Lost Comms to Arc Controller	Check the control cable	Feeder lost comms to AC
ERR FDR PWR	ERROR	Feeder power fault	Cycle power on the power source	Feeder bus overcurrent error
ERR FDR PWR	ERROR	Feeder power fault	Cycle power on the power source	Feeder bus current fault
ERR FDR RLY	ERROR	Feeder power relay stuck open	Cycle power on the power source	Feeder relay stuck open
ERR FDR ETH	ERROR	Feeder Ethernet switch malfunction	Cycle power on the power source	Feeder Ethernet switch error
ERR FEEDER	ERROR	Feeder peripheral malfunction	Cycle power on the power source	Feeder USART3 Error
ERR FEEDER	ERROR	Feeder peripheral malfunction	Cycle power on the power source	Feeder USART2 Error
ERR FEEDER	ERROR	Feeder peripheral malfunction	Cycle power on the power source	Feeder SPI2 Error
ERR FDR TACH	ERROR	Feeder has lost tachometer wire speed feedback		Feeder lost tach signal error

LED Display Message	Message Type	LCD Display Message	LCD Solution Message	LCD Error Log Message
ERR BTN STUK	ERROR	Button on UI stuck	Make sure all buttons are clear	UI Button Stuck
ERR COMM UI	ERROR	UI Lost Comms to the Sequencer	Check the control cable	UI lost comms to Seq
FACTORY RST	ERROR	Factory Reset Complete	Cycle power on the power source	Factory Reset
UNUSED 218	ERROR	Unused Error #218	Cycle power on the power source	Unused Error #218
ERR INPT PWR	ERROR	Must use three phase primary power	Check primary connections	Single Phase Error
ERR INPT PWR	ERROR	Primary input voltage too high	Check primary connections	High Input Voltage Error
ERR INPT PWR	ERROR	Primary input voltage too low	Check primary connections	Low Input Voltage Error
UNUSED 222	ERROR	Unused Error #222	Cycle power on the power source	Unused Error #222
ERR FEEDER	ERROR	Feeder input voltage too high	Cycle power on the power source	Feeder Voltage High Error
ERR FEEDER	ERROR	Feeder input voltage too low	Cycle power on the power source	Feeder Voltage Low Error
UNUSED 225	ERROR	Unused Error #225	Cycle power on the power source	Unused Error #225
ERR AUX PWR	ERROR	Too much current draw from AUX power port	Cycle power on the power source	AUX Power Overcurrent Error
ERR AUX PWR	ERROR	AUX power module overheated	Cycle power on the power source	AUX Power Overtemp Error
ERR AUX PWR	ERROR	AUX power voltage too high	Cycle power on the power source	AUX Voltage High Error
ERR AUX PWR	ERROR	AUX power voltage too low	Cycle power on the power source	AUX Voltage Low Error
UNUSED 230	ERROR	Unused Error #230	Cycle power on the power source	Unused Error #230
ERR THERM 1	ERROR	Thermistor 1 overtemp	Allow welder to cool then cycle power	THERM1 Overtemp Error
ERR THERM 2	ERROR	Thermistor 2 overtemp	Allow welder to cool then cycle power	THERM2 Overtemp Error
ERR THERM 3	ERROR	Thermistor 3 overtemp	Allow welder to cool then cycle power	THERM3 Overtemp Error
ERR THERM 1	ERROR	Thermistor 1 shorted	Cycle power on the power source	THERM1 Shorted Error
ERR THERM 2	ERROR	Thermistor 2 shorted	Cycle power on the power source	THERM2 Shorted Error
ERR THERM 3	ERROR	Thermistor 3 shorted	Cycle power on the power source	THERM3 Shorted Error
ERR THERM 1	ERROR	Thermistor 1 open	Cycle power on the power source	THERM1 Open Error
ERR THERM 2	ERROR	Thermistor 2 open	Cycle power on the power source	THERM2 Open Error
ERR THERM 3	ERROR	Thermistor 3 open	Cycle power on the power source	THERM3 Open Error
UNUSED 240	ERROR	Unused Error #240	Cycle power on the power source	Unused Error #240
ERR PWR SRC	ERROR	Invalid device configuration	Cycle power on the power source	Invalid Power Source Config
ERR PWR SRC	ERROR	Output current sensor malfunction	Cycle power on the power source	Output Current Sensor Error
ERR PWR SRC	ERROR	Inverter –15V power supply out of regulation	Cycle power on the power source	Inverter –15V Power Error
ERR PWR SRC	ERROR	Inverter +15V power supply out of regulation	Cycle power on the power source	Inverter +15V Power Error
ERR PWR SRC	ERROR	Invalid inverter device configuration	Cycle power on the power source	Invalid Inverter Config
ERR PWR SRC	ERROR	Inverter primary CT error	Cycle power on the power source	Inverter Primary CT Error

LED Display Message	Message Type	LCD Display Message	LCD Solution Message	LCD Error Log Message
ERR PWR SRC	ERROR	Boost fault	Cycle power on the power source	Boost Fault Error
ERR PWR SRC	ERROR	Boost contactor error	Cycle power on the power source	Boost Contactor Error
ERR PWR SRC	ERROR	Boost CS1 current error	Cycle power on the power source	Boost CS1 Error
ERR PWR SRC	ERROR	Boost CS2 current error	Cycle power on the power source	Boost CS2 Error
ERR PWR SRC	ERROR	Boost CS3 current error	Cycle power on the power source	Boost CS3 Error
ERR PWR SRC	ERROR	Boost CS4 current error	Cycle power on the power source	Boost CS4 Error
ERR PWR SRC	ERROR	Boost current balance error	Cycle power on the power source	Boost Current Balance Error
ERR PWR SRC	ERROR	Boost overcurrent error	Cycle power on the power source	Boost Overcurrent Error
ERR PWR SRC	ERROR	Boost precharge error	Cycle power on the power source	Boost Precharge Error
ERR PWR SRC	ERROR	Boost bus balance error	Cycle power on the power source	Boost Bus Balance Error
ERR PWR SRC	ERROR	Boost bottom bus cap voltage high	Cycle power on the power source	Boost Bottom Bus Cap V High
ERR PWR SRC	ERROR	Boost top bus cap voltage high	Cycle power on the power source	Boost Top Bus Cap V High
ERR PWR SRC	ERROR	Invalid boost device configuration	Cycle power on the power source	Invalid Boost Config
ERR PWR SRC	ERROR	Boost –15V power supply out of regulation	Cycle power on the power source	Boost –15V Power Error
ERR PWR SRC	ERROR	Boost –24V power supply out of regulation	Cycle power on the power source	Boost –24V Power Error
ERR PWR SRC	ERROR	Boost +15V power supply out of regulation	Cycle power on the power source	Boost +15V Power Error
WRN VSNS LOS	WARNING	Lost volt sense lead feedback	Inspect volt sense lead for break	Vsense Fallback Warning
ERR UNKNOWN	ERROR	An unknown error has occurred	Update software	Unknown Error

9-4. Troubleshooting



Trouble	Remedy
No weld output; completely inoperative	Place line disconnect in On position (see Section 5-10).
	Check and replace line fuse(s), if necessary, or reset circuit breaker (see Section 5-10).
	Check for proper input power connections (see Section 5-10).
No weld output; meter display on with no error displayed.	Check to see if the contactor indicator light is lit when contactor line is asserted on.
Erratic or improper weld output with no errors displayed.	Use proper size and type of weld cable (see Section 5-2).
	Clean and tighten all weld connections.
Wire does not feed.	Check supplementary protector CB1 and reset if necessary.
	Check motor control cable connections.
Wire feeds erratically.	Readjust hub tension.
	Readjust drive roll pressure.
	Clean or replace dirty or worn drive rolls.
	Remove weld spatter around the nozzle opening.
	Replace contact tip or liner. See gun Owner's Manual.
	Check motor control cable connections.
Wire feeds as soon as power is supplied.	Check gun trigger. See gun Owner's Manual.
Wire stubbing on low end using a constant current power source.	Increase output setting of the power source.
	Check voltage sense lead connection, clean and tighten if necessary.
Gas does not flow or does not stop flowing; wire feeds.	Check gas valve and flow meter.
Wire burns back to gun contact tip when using electrode negative (straight polarity) process.	Check to be sure that volt sense lead is connected to the work.

SECTION 10 – ELECTRICAL DIAGRAMS

⚠ WARNING	• 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	

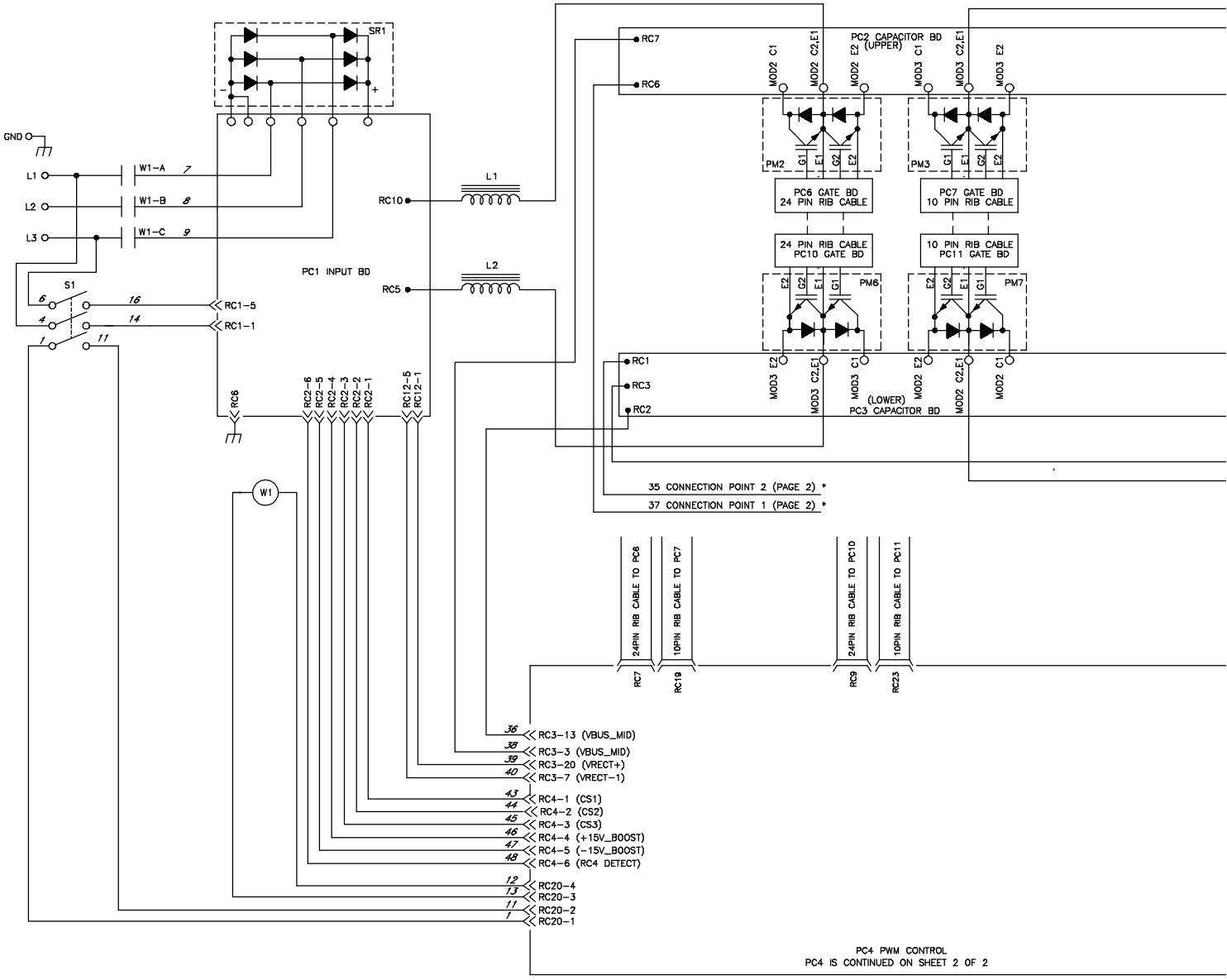
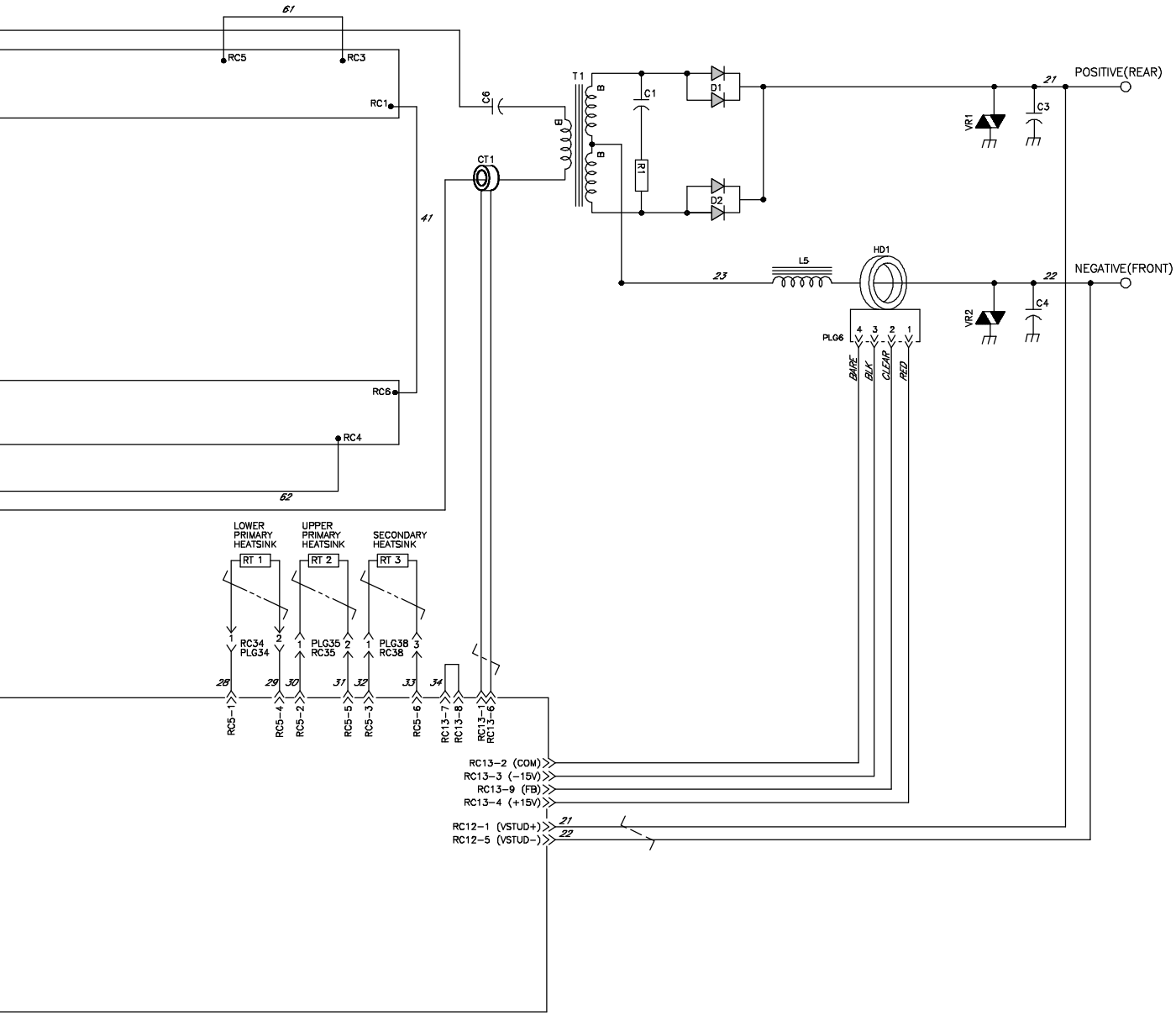


Figure 10-1. Circuit Diagram For Contiuum 350 Model (Page 1 of 2)


61
RC5
RC3
RC1
C6
T1
B
B
C1
D1
D2
R1
CT1
41
POSITIVE(REAR)
21
VR1
C3
L5
HD1
23
NEGATIVE(FRONT)
22
VR2
C4
PLG6
4
3
2
1
BARE
BLK
CLEAR
RED
RC6
RC4
62
LOWER PRIMARY HEATSINK
UPPER PRIMARY HEATSINK
SECONDARY HEATSINK
RT 1
RT 2
RT 3
RC34
PLG34
PLG35
RC35
PLG38
RC38
28
29
30
31
32
33
34
RC5-1
RC5-4
RC5-2
RC5-5
RC5-3
RC5-6
RC13-7
RC13-8
RC13-1
RC13-6
RC13-2 (COM)
RC13-3 (-15V)
RC13-9 (FB)
RC13-4 (+15V)
RC12-1 (VSTUD+)
RC12-5 (VSTUD-)
21
22

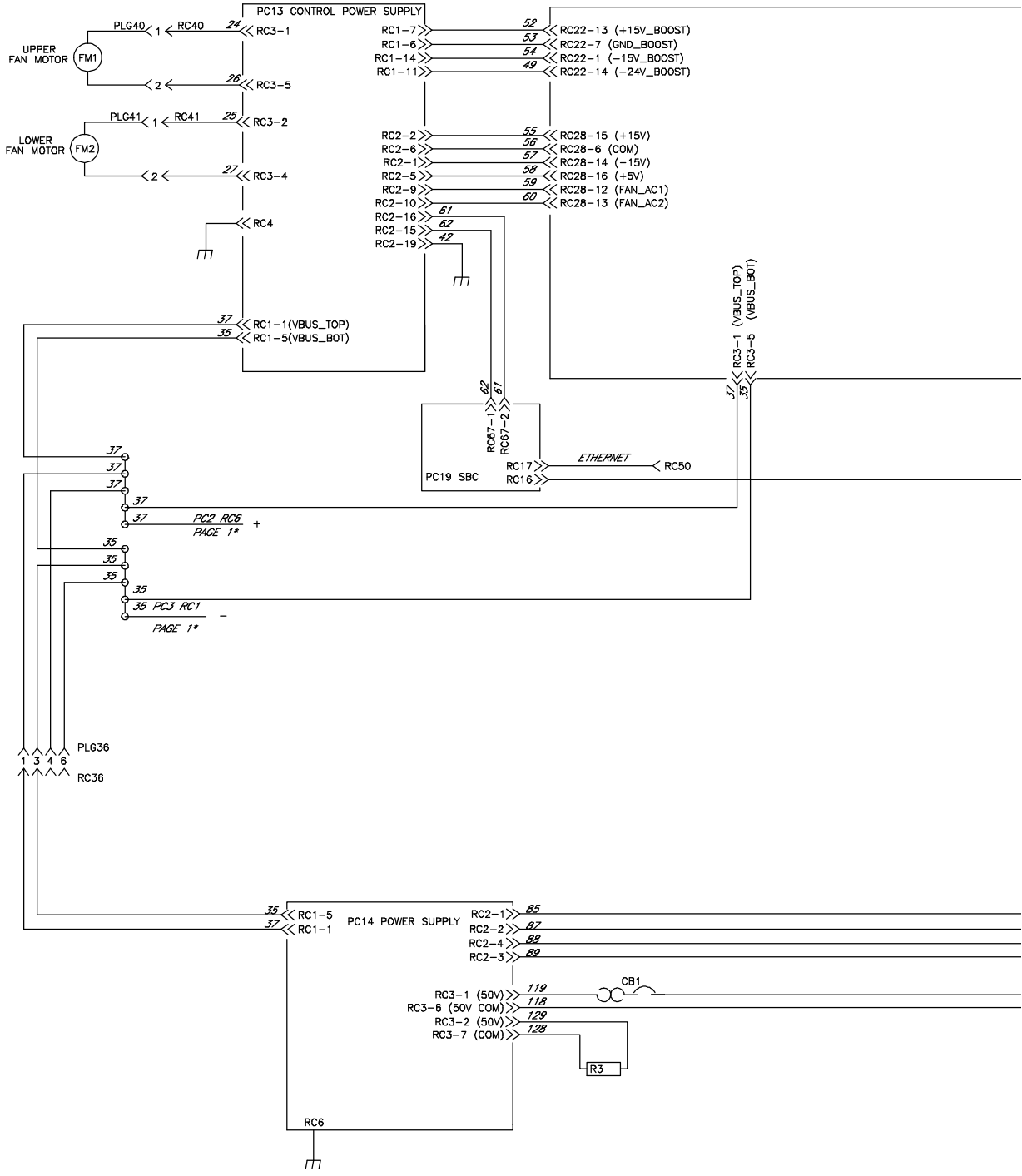
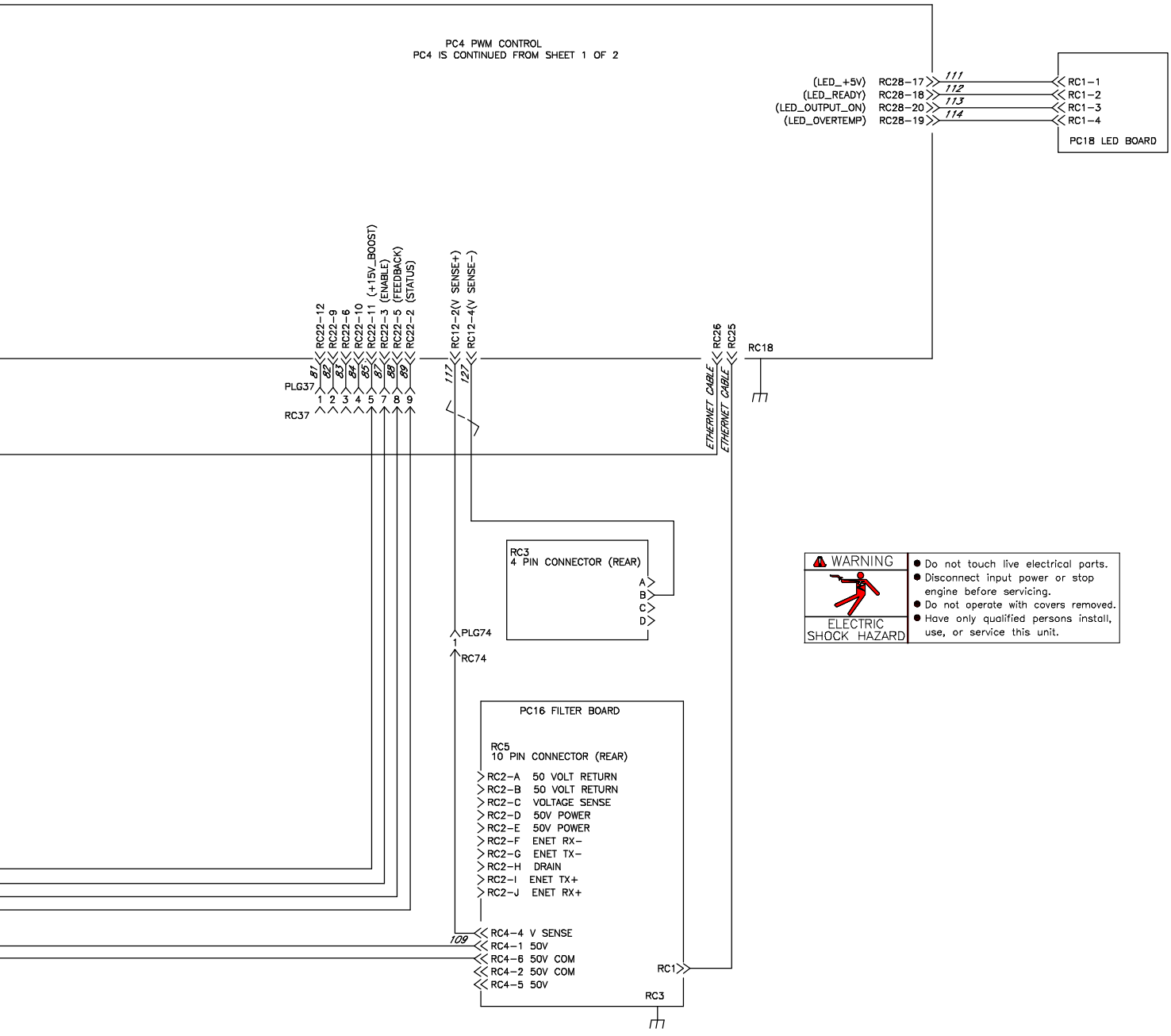


Figure 10-2. Circuit Diagram For Continuum 350 Model (Page 2 of 2)


PC4 PWM CONTROL
PC4 IS CONTINUED FROM SHEET 1 OF 2
(LED_+5V) RC28-17 111 RC1-1
(LED_READY) RC28-18 112 RC1-2
(LED_OUTPUT_ON) RC28-20 113 RC1-3
(LED_OVERTEMP) RC28-19 114 RC1-4
PC18 LED BOARD
RC22-12 81
RC22-9 82
RC22-8 83
RC22-10 84
RC22-11 (+15V_BOOST) 85
RC22-3 (ENABLE) 87
RC22-5 (FEEDBACK) 88
RC22-2 (STATUS) 89
RC12-2(V SENSE+) 117
RC12-4(V SENSE-) 127
PLG37
1 2 3 4 5 7 8 9
RC37
RC26
RC25
RC18
ETHERNET CABLE
ETHERNET CABLE
RC3
4 PIN CONNECTOR (REAR)
A
B
C
D
PLG74
1
RC74
PC16 FILTER BOARD
RC5
10 PIN CONNECTOR (REAR)
RC2-A 50 VOLT RETURN
RC2-B 50 VOLT RETURN
RC2-C VOLTAGE SENSE
RC2-D 50V POWER
RC2-E 50V POWER
RC2-F ENET RX-
RC2-G ENET TX-
RC2-H DRAIN
RC2-I ENET TX+
RC2-J ENET RX+
109
RC4-4 V SENSE
RC4-1 50V
RC4-6 50V COM
RC4-2 50V COM
RC4-5 50V
RC1
RC3
WARNING
ELECTRIC SHOCK HAZARD
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.

⚠ WARNING	• 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	

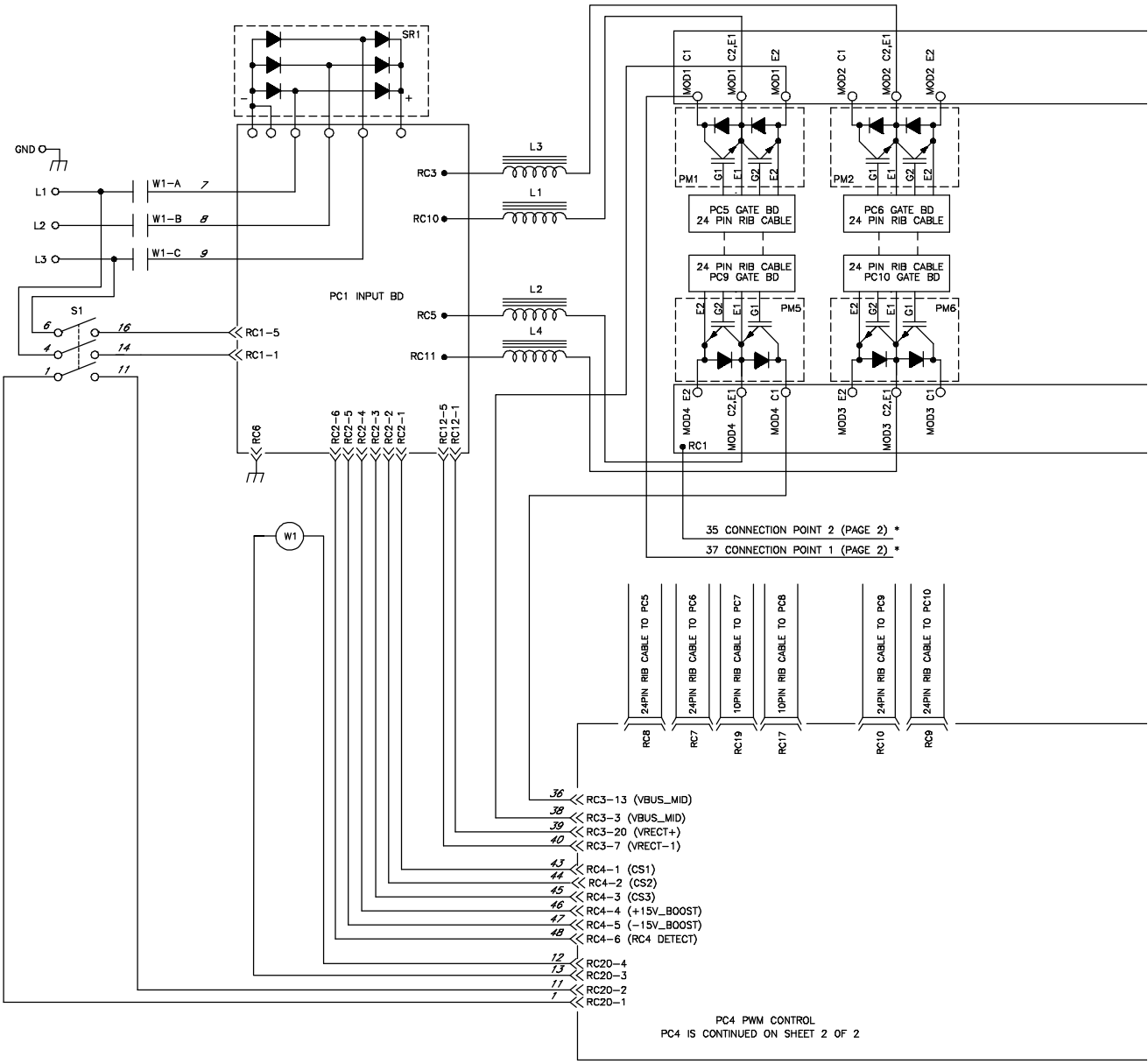
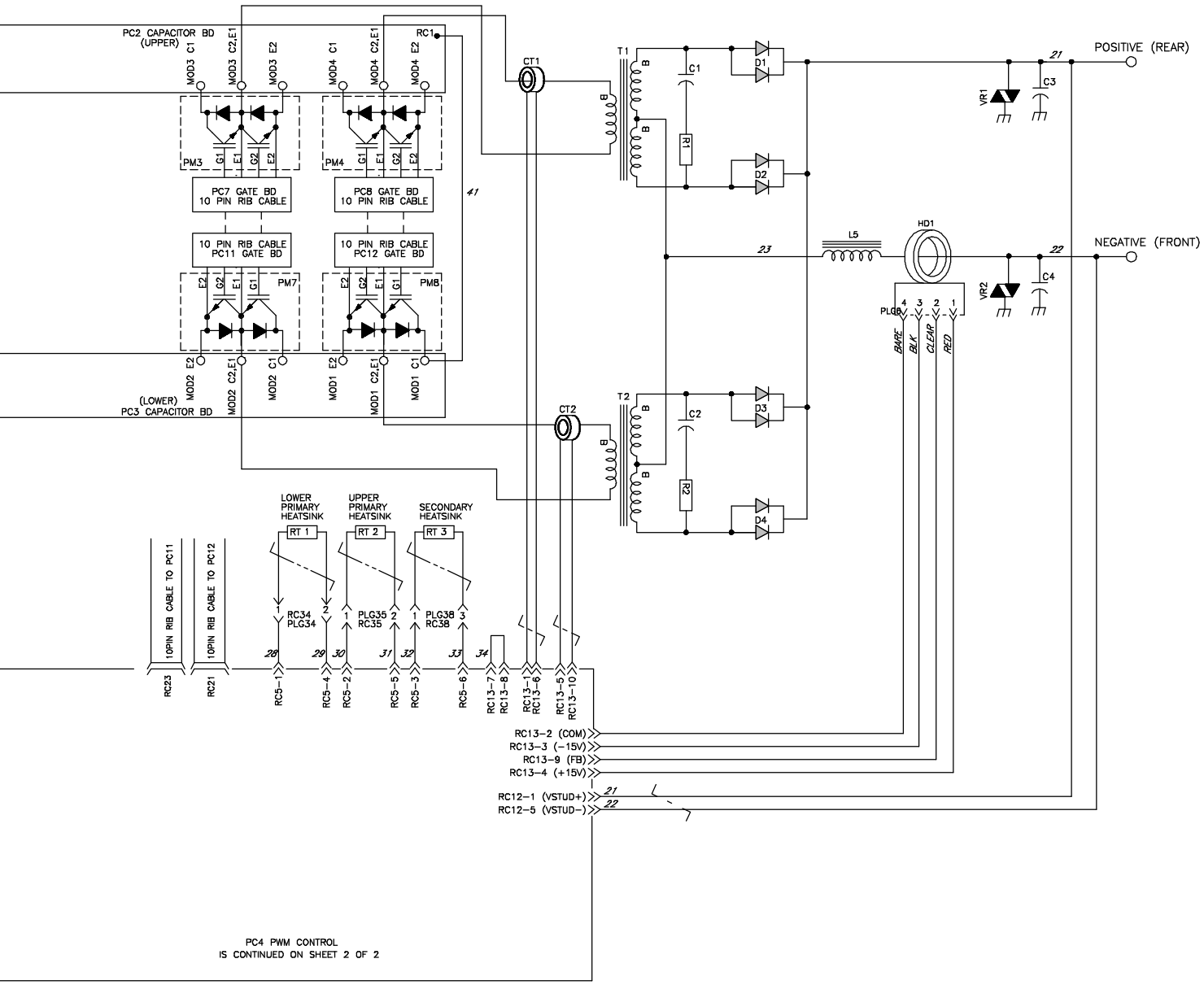


Figure 10-3. Circuit Diagram For Contiuum 500 Model (Page 1 of 2)


PC2 CAPACITOR BD
(UPPER)
(LOWER)
PC3 CAPACITOR BD
RC1
CT1
CT2
T1
T2
D1
D2
D3
D4
C1
C2
C3
C4
R1
R2
VR1
VR2
L5
HD1
POSITIVE (REAR)
NEGATIVE (FRONT)
PM3
PM4
PM7
PM8
PC7 GATE BD
10 PIN RIB CABLE
PC8 GATE BD
10 PIN RIB CABLE
10 PIN RIB CABLE
PC11 GATE BD
10 PIN RIB CABLE
PC12 GATE BD
LOWER
PRIMARY
HEATSINK
UPPER
PRIMARY
HEATSINK
SECONDARY
HEATSINK
RT 1
RT 2
RT 3
10PIN RIB CABLE TO PC11
10PIN RIB CABLE TO PC12
RC34
PLG34
PLG35
RC35
PLG38
RC38
RC23
RC21
RC5–1
RC5–4
RC5–2
RC5–5
RC5–3
RC5–6
RC13–7
RC13–8
RC13–1
RC13–6
RC13–5
RC13–10
RC13–2 (COM)
RC13–3 (–15V)
RC13–9 (FB)
RC13–4 (+15V)
RC12–1 (VSTUD+)
RC12–5 (VSTUD–)
PLG1
BARE
BLK
CLEAR
RED
PC4 PWM CONTROL
IS CONTINUED ON SHEET 2 OF 2

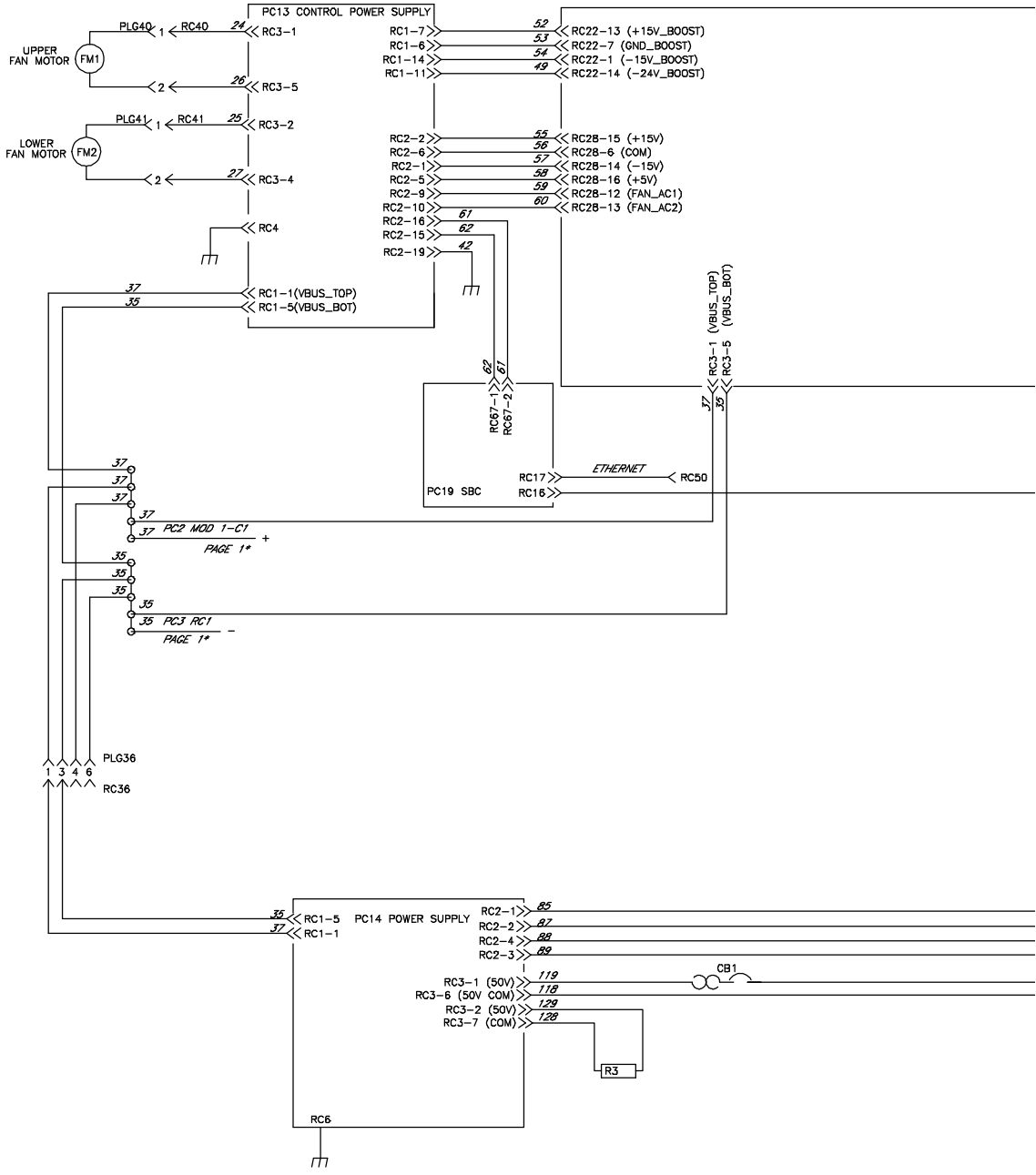
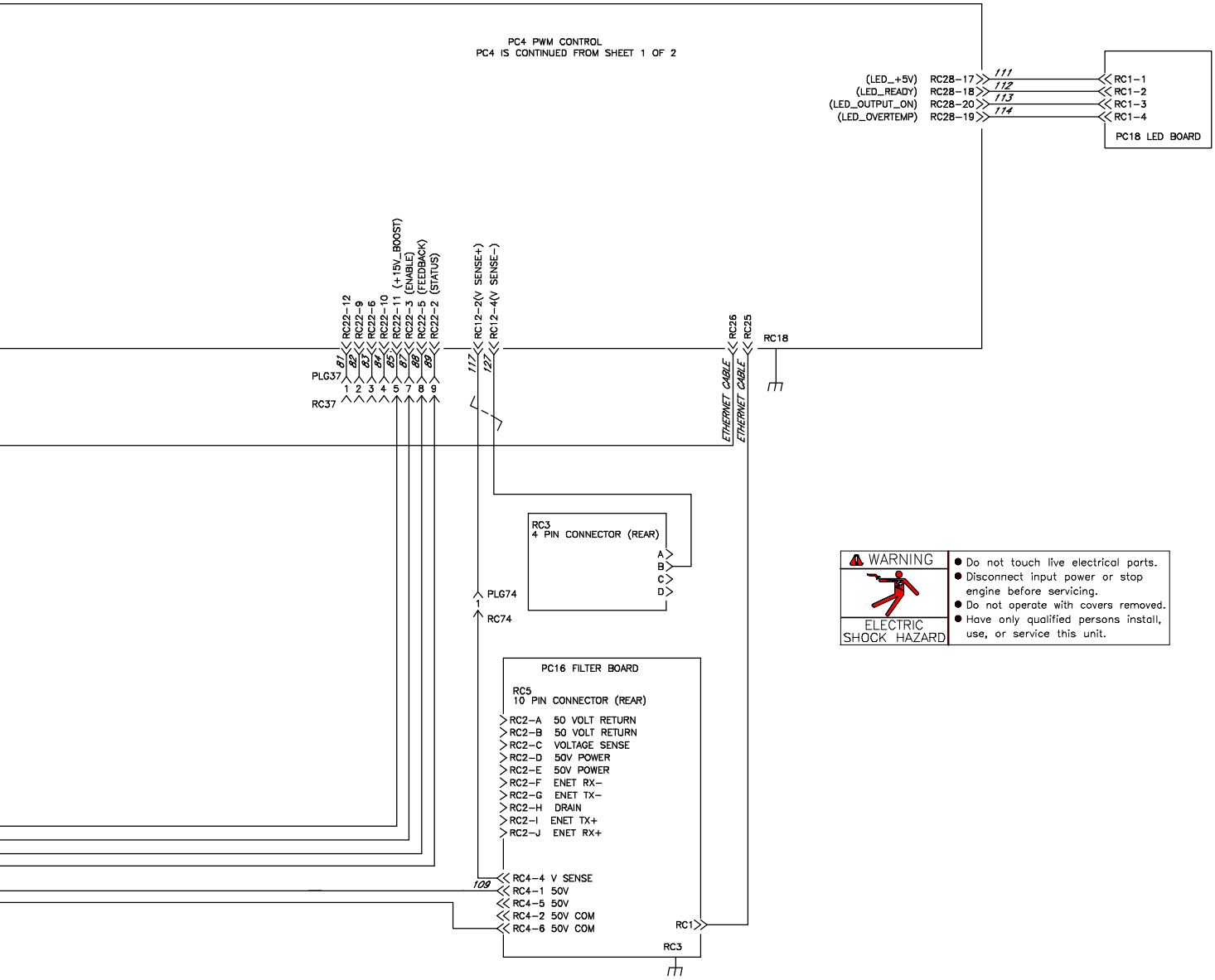


Figure 10-4. Circuit Diagram For Continuum 500 Model (Page 2 of 2)


PC4 PWM CONTROL
PC4 IS CONTINUED FROM SHEET 1 OF 2
(LED_+5V) RC28-17 111 RC1-1
(LED_READY) RC28-18 112 RC1-2
(LED_OUTPUT_ON) RC28-20 113 RC1-3
(LED_OVERTEMP) RC28-19 114 RC1-4
PC18 LED BOARD
RC22-12 81
RC22-9 82
RC22-6 83
RC22-10 84
RC22-11 85 (+15V_BOOST)
RC22-3 87 (ENABLE)
RC22-5 88 (FEEDBACK)
RC22-2 89 (STATUS)
PLG37
1 2 3 4 5 7 8 9
RC37
RC12-2 117 (V SENSE+)
RC12-4 121 (V SENSE-)
RC26
RC25
ETHERNET CABLE
ETHERNET CABLE
RC18
RC3
4 PIN CONNECTOR (REAR)
A
B
C
D
PLG74
1
RC74
PC16 FILTER BOARD
RC5
10 PIN CONNECTOR (REAR)
RC2-A 50 VOLT RETURN
RC2-B 50 VOLT RETURN
RC2-C VOLTAGE SENSE
RC2-D 50V POWER
RC2-E 50V POWER
RC2-F ENET RX-
RC2-G ENET TX-
RC2-H DRAIN
RC2-I ENET TX+
RC2-J ENET RX+
109
RC4-4 V SENSE
RC4-1 50V
RC4-5 50V
RC4-2 50V COM
RC4-6 50V COM
RC1
RC3
WARNING
ELECTRIC SHOCK HAZARD
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.

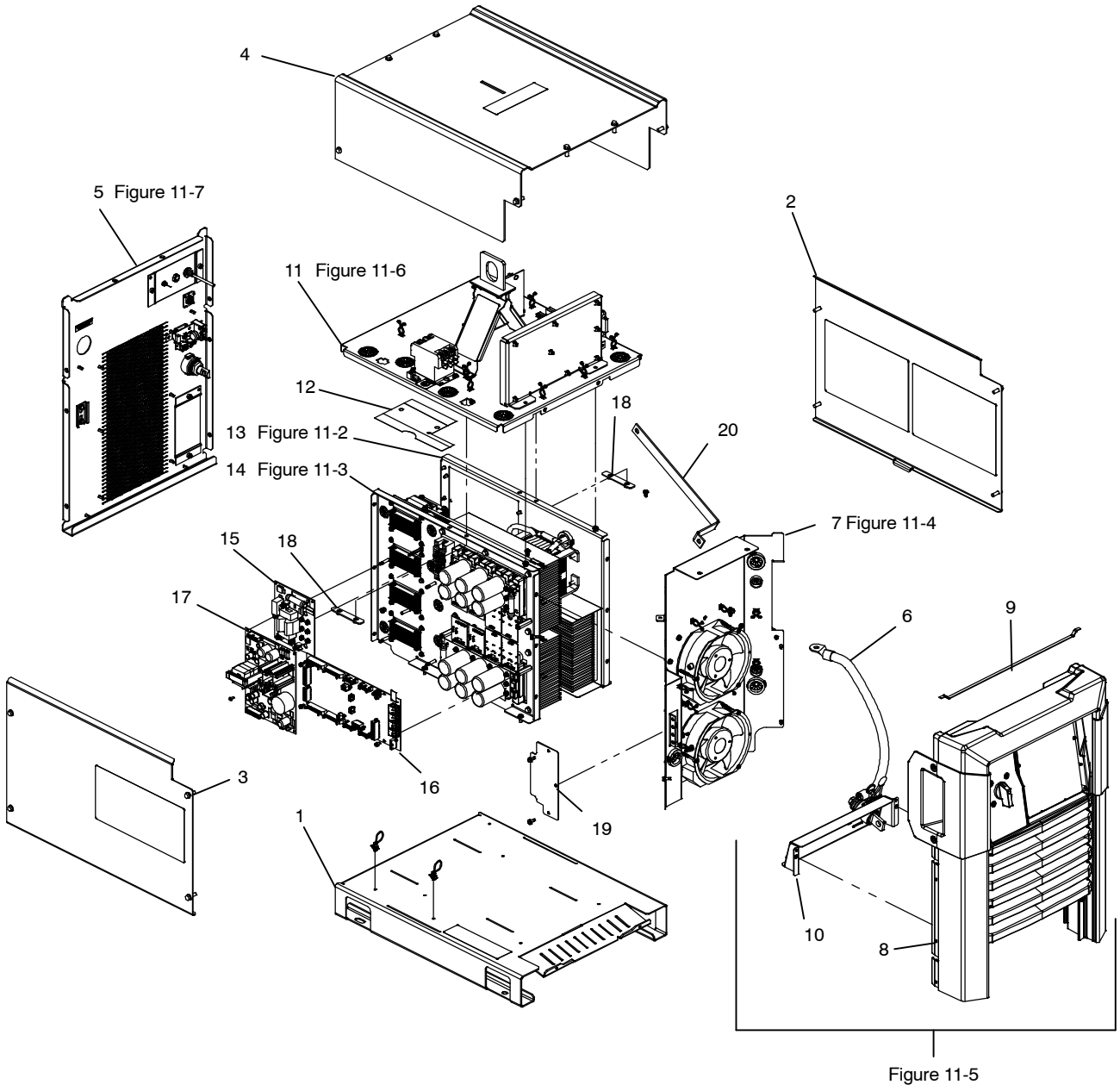


Figure 11-1. Main Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity 350 Model	Quantity 500 Model
			Figure 11-1. Main Assembly		
1		+265236	Base ,Continuum	1	1
		269888	Label, Warning Electric Shock/Exploding Parts	1	1
2		+265245	Panel, Rh	1	1
		258431	Label, Warning General Precautionary (CE/Domestic)	1	1
3		+265246	Panel, Lh	1	1
		258431	Label, Warning General Precautionary (CE/Domestic)	1	1
4		+265240	Cover, Top	1	1
		258427	Label, Warning Falling Equipment	1	1
5		Figure 11-7	Rear Panel Assy, Continuum	1	1
6		267903	Output Terminal Assy, (See Figure 11-5)	1	1
7		Figure 11-4	Fan Panel Assy,	1	1
8		Figure 11-5	Front Panel Assy, Continuum	1	1
9		269472	Gasket, Sealing 17.000L x .250w x .063t	1	1
10		Figure 11-5	Front Panel Assy, Lower Continuum	1	1
11		Figure 11-6	Penthouse Assy	1	1
12		270511	Insulator,.010 Thick X 4.500 X 8.000	1	1
13		Figure 11-2	Windtunnel, Rh W/Cmpnts	1	1
14		Figure 11-3	Windtunnel, Lh W/Cmpnts	1	1
15	PC1	248915	Circuit Card Assy, Input	1	1
16	PC4	265763	Circuit Card Assy, Inverter - Arc Control W/Prog	1	1
17	PC14	265925	Circuit Card Assy, Power Supply	1	1
		258016	Fuse, Mintr Cer 1 Amp 1000V AC/DC	1	1
18		266420	Plate, Lift Eye Mtg	2	2
19		267407	Plate, Shielding	1	1
20		272415	Bus Bar, Output	1	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.

Notes

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

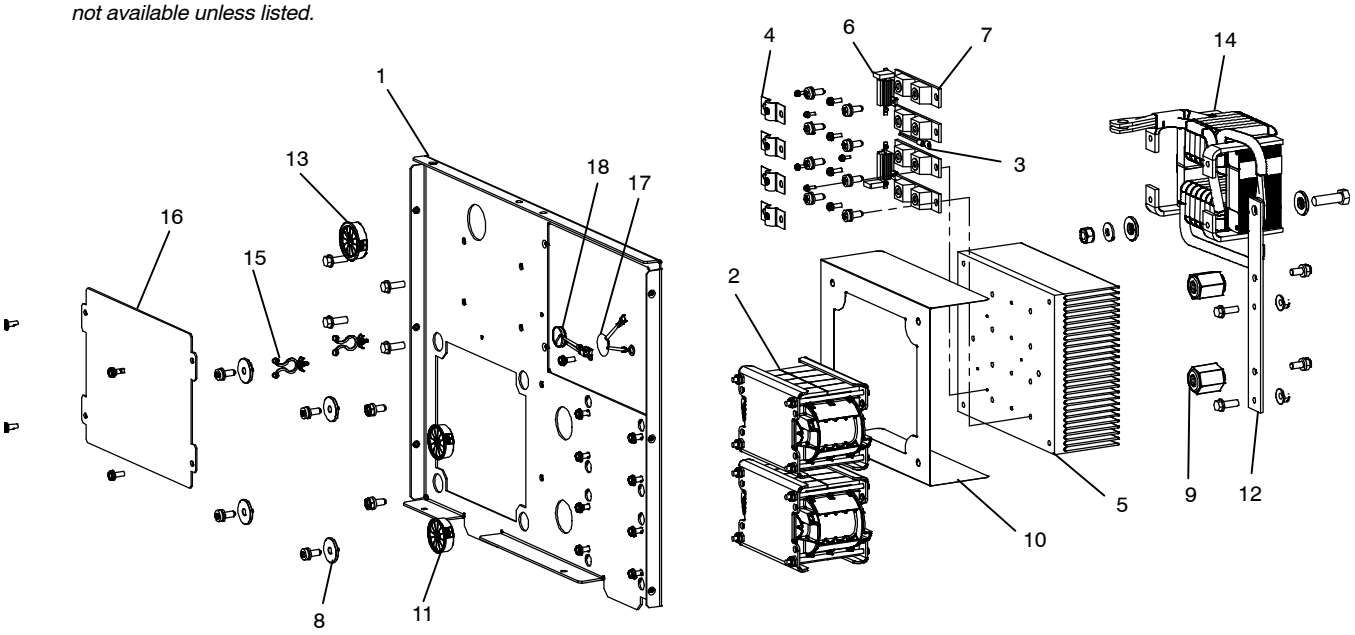


Figure 11-2. Right-Hand Windtunnel w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity 350 Model	Quantity 500 Model
			Figure 11-2. Right-Hand Windtunnel w/Components (Figure 11-1, Item 13)		
1		265243	Windtunnel, Rh	1	1
2	T1-T2	252442	Xfmr, Hf Litz (500)	0	2
2	T1	267776	Xfmr, Hf Litz (350)	1	0
		263299	Heat Sink Assy, Output Diode (500)(Includes Items 3-7)	0	1
		267924	Heat Sink Assy, Output Diode (350)(Includes Items 3-7)	1	0
3		213029	Thermistor, Ntc 30k Ohm @ 25 Deg C 26.00in Lead	1	1
4		199840	Bus Bar, Diode	2	4
5		272416	Heat Sink, Diode	1	1
6		233052	Resistor/Capacitor,	1	2
7	D1–D4	201531	Kit, Diode Power Module	2	4
8		196355	Insulator, Screw	4	4
9		025248	Stand-off, Insul .250-20 X 1.250 Lg X .437 Thd	2	2
10		236727	Insulator, Heat Sink	1	1
11		179276	Bushing, Snap-in Nyl 1.000 Id X 1.375 Mtg Hole Cent	2	2
12		253547	Bus Bar, Xfmr Current	1	1
13		245520	Bushing, Snap-in Nyl 1.062 Id X 1.500 Mtg Hole Cent	1	1
14	L5	242158	Inductor, Output	1	1
15		223343	Clip, Wire Stdf .40-.50 Bndl .156hole .031-.078thk	2	2
16		267438	Plate, Blank Aux	1	1
17	C3	138695	Capacitor, Cer Disc .01 uF 1000 Vdc w/Terms	1	1
18	VR1	269178	Varistor, w/Terminals	1	1
	C5	265285	Capacitor,Polyp Met Film 30. Uf 550 Vdc	1	0
		057360	Blank, Snap-In Nyl 1.375 Mtg Hole Black	1	0
		267870	Plate, Mtg Capacitor	1	0

\+ 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.

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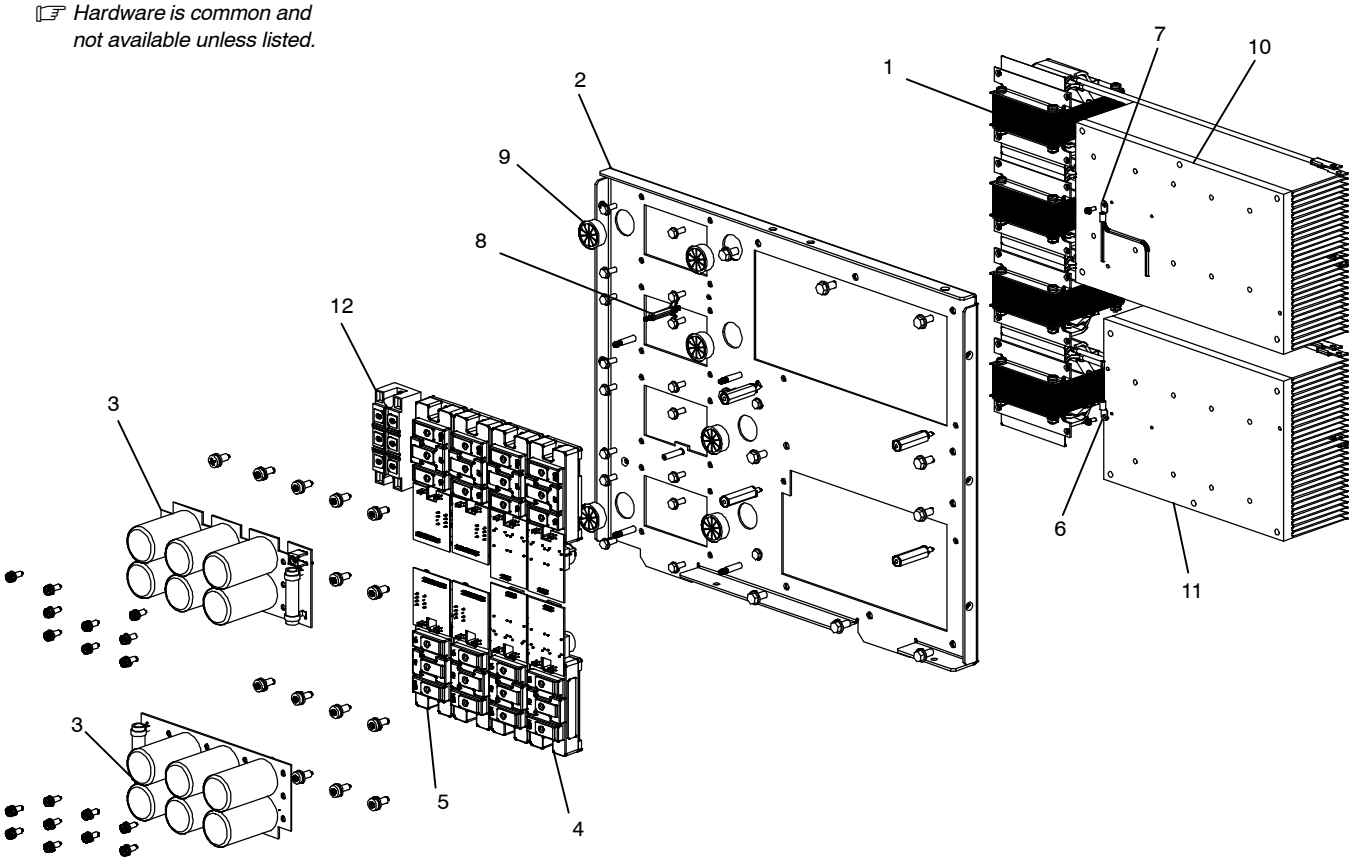


269 781-A

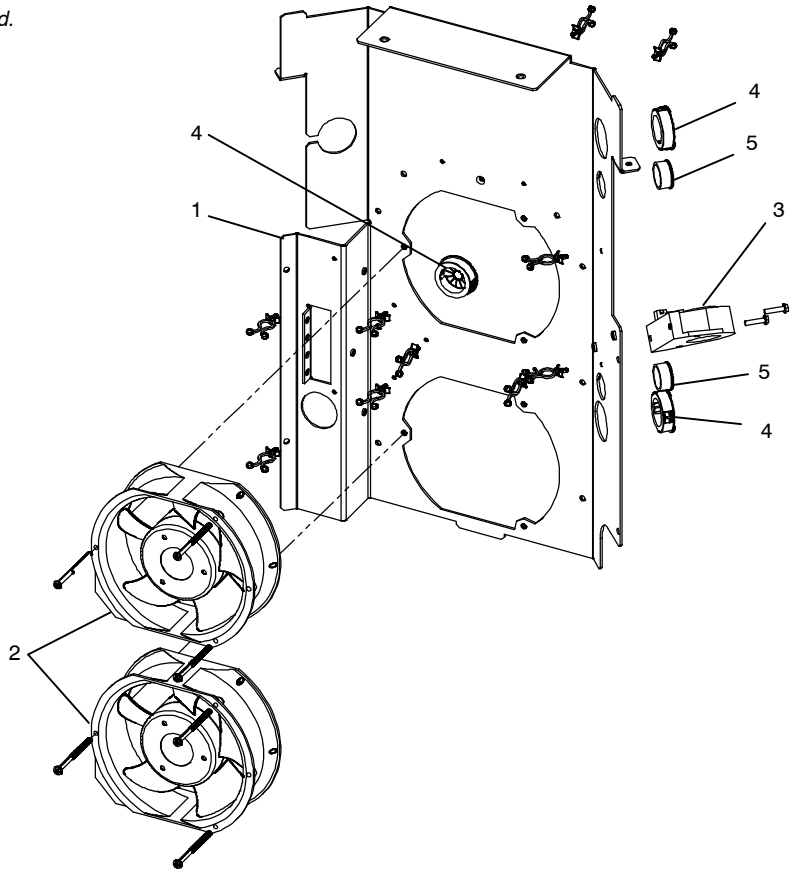
Figure 11-3. Left-Hand Windtunnel w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity 350 Model	Quantity 500 Model
			Figure 11-3. Left-Hand Windtunnel w/Components (Figure 11-1, Item 14)		
1	L1-L4	252375	Inductor, Input	2	4
2		265242	Windtunnel, Lh	1	1
3	PC2-PC3	248920	Circuit Card Assy, Capacitor (500)	0	2
3	PC2-PC3	265947	Circuit Card Assy, Capacitor (350)	2	0
4		259517	Kit, Transistor IGBT Module (Inverter)	2	4
5		259515	Kit, Transistor IGBT Module (Boost)	2	4
6		252449	Thermistor, Ntc 30k Ohm @ 25 Deg C 8.00in Lead	1	1
7		173632	Thermistor, Ntc 30k Ohm @ 25 Deg C 12.00in Lead	1	1
8		262497	Stand-off Support, PC Card .156 Dia W/P&L 1.125	1	1
9		153403	Bushing, Snap-in Nyl .750 Id X 1.000 Mtg Hole Cent	4	6
10		266939	Heat Sink, Igbt Upper	1	1
11		266940	Heat Sink, Igbt Lower	1	1
12		184260	Kit, Diode Power Module	1	1
		047838	Blank, Snap-In Nyl 1.000 Mtg Hole Black	2	0
		267386	Plate, Input Inductor Blank	1	0

\+ 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.*



269 782-A

Figure 11-4. Fan Panel Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-4. Fan Panel Assembly (Figure 11-1, Item 7)				
1		265241	Panel, Fan Motor	1
2	FM1-FM2	213072	Fan, Muffin 115v 60hz 3400 Rpm 6.378 Mtg Holes	2
3	HD1	168829	Transducer, Current 1000a Module Max Open Loop	1
4		245520	Bushing, Snap-in Nyl 1.062 Id X 1.500 Mtg Hole Cent	3
5		153403	Bushing, Snap-in Nyl .750 Id X 1.000 Mtg Hole Cent	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.*

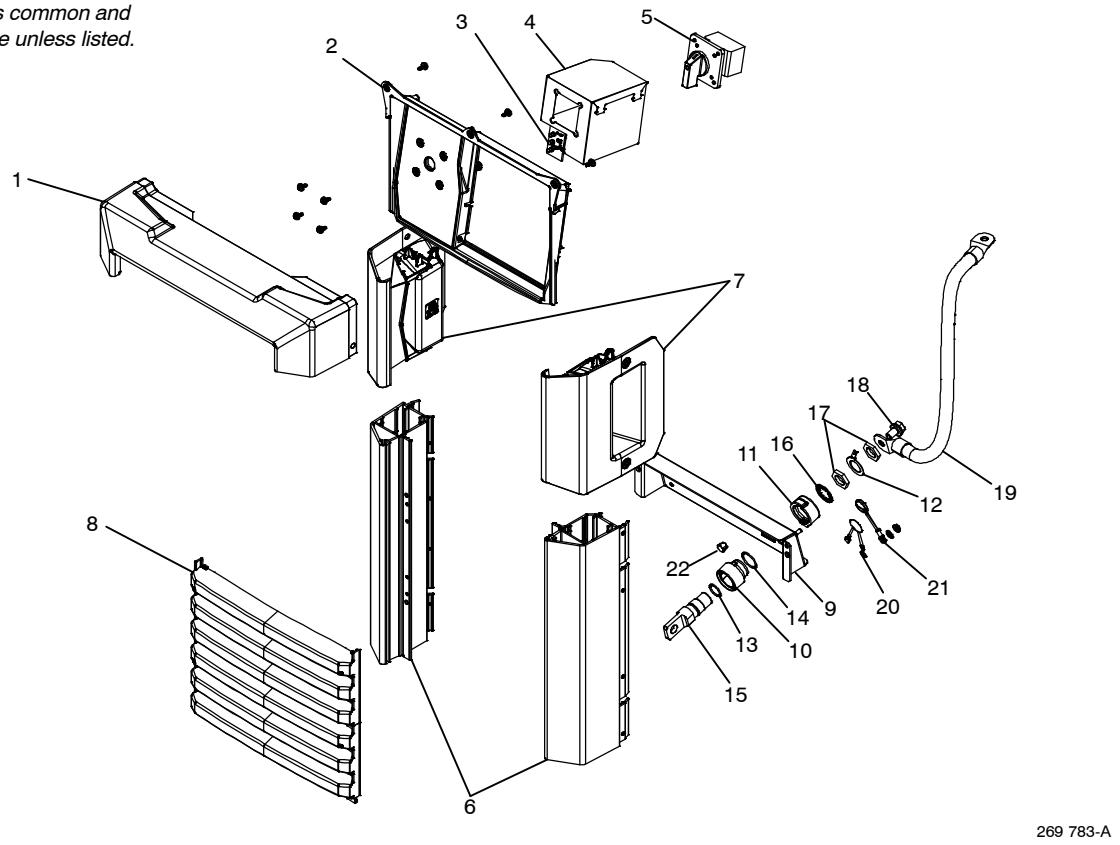


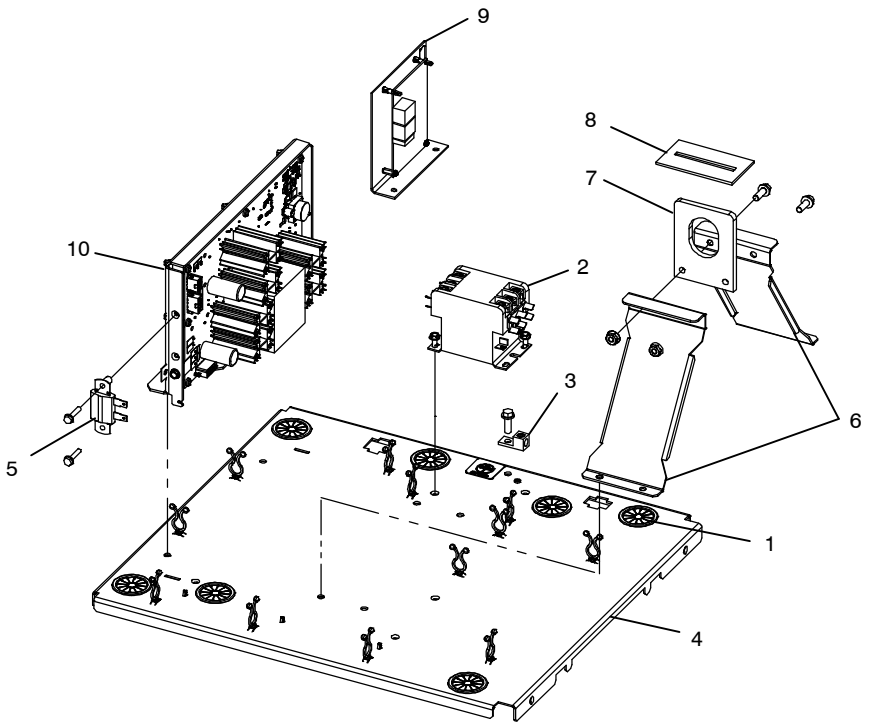
Figure 11-5. Front Panel Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 11-5. Front Panel Assembly (Figure 11-1, Items 6, 8 and 10)	
1		252825	Bezel, Upper	1
2		253548	Panel, Top Front	1
3		256859	Circuit Card Assy, Led	1
4		261870	Cover, Switch	1
5		252445	Switch, Rotary On/Off 3PH 20Amp 600V 2 Layer	1
6		265467	Upright, Front	2
7		252821	Enclosure, Handle	2
8		262325	Panel, Front Grill	2
9		265239	Panel, Output Terminal	1
		269800	Terminal Pwr Assy, Front (Includes)	1
10		250037	Insulator, Bulkhead Front .890 Od	1
11		250039	Insulator, Bulkhead Rear .890 Od	1
12		178548	Terminal, Connector Friction	1
13		186228	O-ring, 0.739 Id X 0.070 H	1
14		185718	O-ring, 0.989 Id X 0.070 H	1
15		252830	Terminal, Pwr Output Front Bolted Rear Int Thread	1
16		185714	Washer, Tooth 22mmid X 31.5mmod 1.310-1mmt Intern	1
17		185717	Nut, M20-1.5 1.00hex .19h Brs Locking	2
18		229333	Screw, M10-1.5x 20 Hex Hd-pln 8.8 Pld Sems	1
19		256961	Lead List, Large	1
20	C4	138695	Capacitor, Cer Disc .01 Uf 1000 Vdc W/Terms	1
21	VR2	269178	Varistor, W/Terminals	1
22		057359	Blank, Snap-in Nyl .375 Mtg Hole Black	1
			Label, Nameplate Continuum (Order By Model & Serial No.)	1

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

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

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



269 784-B

Figure 11-6. Penthouse Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 11-6. Penthouse Assembly (Figure 11-1, Item 11)	
1		245520	Bushing, Snap-in Nyl 1.062 Id X 1.500 Mtg Hole Cent	7
2	W1	180270	Contactor, Def Prp 40a 3p 24vac Coil W/Boxlug	1
3		145743	Lug, Univ W/Scr 600V 2-14 Wire .250 Stud	1
4		+265238	Panel, Upper Windtunnel	1
		155436	Label, Ground/Protective Earth	1
5		136076	Resistor, Ww Fxd 30 W 200 Ohm Faston Te	1
6		+265261	Lift Eye, Formed	2
		266393	Label, Warning Input Connections/Electric Shock	1
7		266232	Lift Eye	1
8		256975	Seal, Lift Eye	1
9	PC19	266413	Circuit Card Assy, Wega SBC W/Bracket	1
10		262090	Feeder Power Board Assy (Includes)	1
	PC13	252512	Circuit Card Assy, Control Feeder Power Pri	1
		258016	Fuse, Mintr Cer 1 Amp 1000V AC/DC	1
		262089	Bracket, Feeder Power Board	1

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

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

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

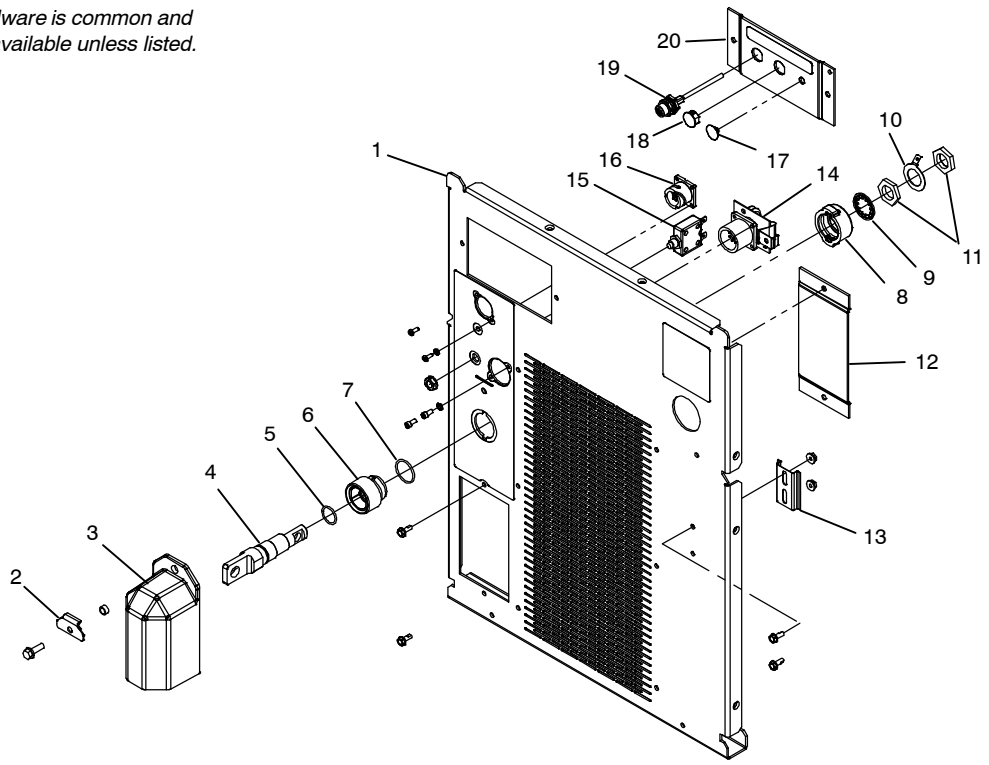


Figure 11-7. Rear Panel Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 11-7. Rear Panel Assembly (Figure 11-1, Item 5)	
1		+272308	Panel, Rear	1
		258429	Label, Warning Electric Shock Can Kill	1
			Label, Nameplate Rear (Order By Model And Serial Number)	1
2		268891	Washer, Output Stud	1
3		264114	Boot, Positive Output Stud	1
		269799	Terminal Pwr Assy, Output (Includes)	1
4		260223	Terminal, Pwr Output Tabbed	1
5		186228	O-ring, 0.739 Id X 0.070 H	1
6		250037	Insulator, Bulkhead Front .890 Od	1
7		185718	O-ring, 0.989 Id X 0.070 H	1
8		250039	Insulator, Bulkhead Rear .890 Od	1
9		185714	Washer, Tooth 22mmid X 31.5mmod 1.310-1mmt Intern	1
10		178548	Terminal, Connector Friction	1
11		185717	Nut, M20-1.5 1.00hex .19h Brs Locking	2
12		257290	Panel, Rear Blank	1
13		263536	Rail, Din 35mm X 7.5mm X 1.969in	1
14	PC16	261838	Circuit Card Assy, Power Source 10 Pin Filter	1
15	CB1	083432	Supplementary Pro, Man Reset 1p 10a 250vac Frict	1
16		269208	Plugs, W/Leads	1
17		♦259416	Blank, Snap−In Nyl .250 Mtg Hole X.700hdx.100hd Ht	1
18		♦184946	Blank, Snap−In Nyl .625 Mtg Hole Black D/D	1
19		♦244257	Cable Assy, Rj45 Male/M12 Female .4m Lg	1
20		♦257291	Panel, Blank Rear Enet	1
		269416	Label,Ethernet/Wireless	1

♦OPTIONAL

\+ 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.

Notes

Warranty Questions?

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

Your distributor also gives you ...

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

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

Miller

TRUE BLUE® WARRANTY

Effective January 1, 2015
(Equipment with a serial number preface of MF or newer)

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

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

Within the warranty periods listed below, Miller will repair or replace any warranted parts or components that fail due to such defects in material or workmanship. Miller must be notified in writing within thirty (30) days of such defect or failure, at which time Miller will provide instructions on the warranty claim procedures to be followed. If notification is submitted as an online warranty claim, the claim must include a detailed description of the fault and the troubleshooting steps taken to identify failed components and the cause of their failure.

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

1. 5 Years Parts — 3 Years Labor
   * Original Main Power Rectifiers Only to Include SCRs, Diodes, and Discrete Rectifier Modules
2. 3 Years — Parts and Labor
   * Auto-Darkening Helmet Lenses (Except Classic Series) (No Labor)
   * Engine Driven Welder/Generators **(NOTE: Engines are Warranted Separately by the Engine Manufacturer.)**
   * Inverter Power Sources (Unless Otherwise Stated)
   * Plasma Arc Cutting Power Sources
   * Process Controllers
   * Semi-Automatic and Automatic Wire Feeders
   * Transformer/Rectifier Power Sources
3. 2 Years — Parts and Labor
   * Auto-Darkening Helmet Lenses – Classic Series Only (No Labor)
   * Fume Extractors – Capture 5, Filtair 400 and Industrial Collector Series
4. 1 Year — Parts and Labor Unless Specified
   * Automatic Motion Devices
   * CoolBelt and CoolBand Blower Unit (No Labor)
   * Desiccant Air Dryer System
   * External Monitoring Equipment and Sensors
   * Field Options (NOTE: Field options are covered for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
   * RFCS Foot Controls (Except RFCS-RJ45)
   * Fume Extractors – Filtair 130, MWX and SWX Series
   * HF Units
   * ICE/XT Plasma Cutting Torches (No Labor)
   * Induction Heating Power Sources, Coolers **(NOTE: Digital Recorders are Warranted Separately by the Manufacturer.)**
   * LiveArc Welding Performance Management System
   * Load Banks
   * Motor-Driven Guns (except Spoolmate Spoolguns)
   * PAPR Blower Unit (No Labor)
   * Positioners and Controllers
   * Racks
   * Running Gear/Trailers
   * Spot Welders
   * Subarc Wire Drive Assemblies
   * Water Coolant Systems
   * TIG Torches (No Labor)
   * Wireless Remote Foot/Hand Controls and Receivers
   * Work Stations/Weld Tables (No Labor)
5. 6 Months — Parts
   * Batteries
   * Bernard Guns (No Labor)
   * Tregaskiss Guns (No Labor)
6. 90 Days — Parts
   * Accessory (Kits)
   * Canvas Covers
   * Induction Heating Coils and Blankets, Cables, and Non-Electronic Controls
   * M-Guns
   * MIG Guns and Subarc (SAW) Torches
   * Remote Controls and RFCS-RJ45
   * Replacement Parts (No labor)
   * Roughneck Guns
   * Spoolmate Spoolguns

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

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

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

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

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

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

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

Owner's Record

Please complete and retain with your personal records.

Model Name	Serial/Style Number
Purchase Date	(Date which equipment was delivered to original customer.)
Distributor	
Address	
City	
State	Zip

For Service

Contact a DISTRIBUTOR or SERVICE AGENCY near you.

Always provide Model Name and Serial/Style Number.

Contact your Distributor for:	Welding Supplies and Consumables Options and Accessories Personal Safety Equipment Service and Repair Replacement Parts Training (Schools, Videos, Books) Technical Manuals (Servicing Information and Parts) Circuit Diagrams Welding Process Handbooks To locate a Distributor or Service Agency visit www.millerwelds.com or call 1-800-4-A-Miller
Contact the Delivering Carrier to:	File a claim for loss or damage during shipment. For assistance in filing or settling claims, contact your distributor and/or equipment manufacturer's Transportation Department.

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Appleton, WI 54914 USA

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