



OM-2245

208 726H

2007-07

**Processes**



Stick (SMAW) Welding



TIG (GTAW) Welding

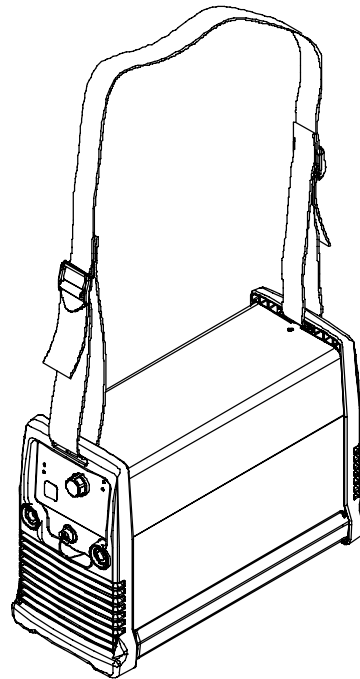
**Description**



Arc Welding Power Source

# Maxstar<sup>®</sup> 150 STL

With Auto-Line™



Visit our website at  
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## OWNER'S MANUAL

File: TIG (GTAW)



ENGLISH

FRANÇAIS

ESPAÑOL

ITALIANO

DEUTSCH

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# SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

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 Protect yourself and others from injury — read and follow these precautions.

## 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 and ground this equipment according to its Owner's Manual and national, state, and local codes.

- Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first – double-check connections.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect input power cord for damage or bare wiring – replace cord immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.
- Do not drape cables over your body.
- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Do not touch electrode holders connected to two welding machines at the same time since double open-circuit voltage will be present.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal.

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

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



### HOT PARTS can cause severe burns.

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



### FUMES AND GASES can be hazardous.

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

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



### ARC RAYS can burn eyes and skin.

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

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

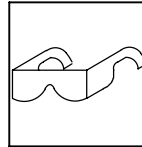


### WELDING can cause fire or explosion.

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

- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Do not weld where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared according to AWS F4.1 (see Safety Standards).
- Do not weld where the atmosphere may contain flammable dust, gas, or liquid vapors (such as gasoline).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock, sparks, and fire hazards.

- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.
- After completion of work, inspect area to ensure it is free of sparks, glowing embers, and flames.
- Use only correct fuses or circuit breakers. Do not oversize or bypass them.
- Follow requirements in OSHA 1910.252 (a) (2) (iv) and NFPA 51B for hot work and have a fire watcher and extinguisher nearby.



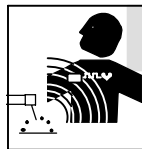
### FLYING METAL or DIRT can injure eyes.

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



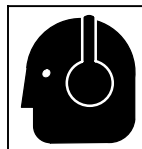
### BUILDUP OF GAS can injure or kill.

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



### MAGNETIC FIELDS can affect Implanted Medical Devices.

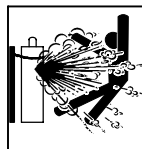
- Wearers of Pacemakers and other Implanted Medical Devices should keep away.
- Implanted Medical Device wearers should consult their doctor and the device manufacturer before going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations.



### 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.

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

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

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



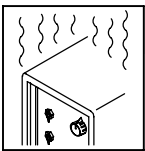
### FIRE OR EXPLOSION hazard.

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



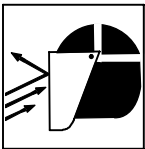
### FALLING UNIT can cause injury.

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



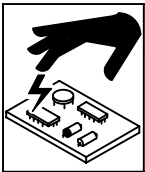
### OVERUSE can cause OVERHEATING

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



### FLYING SPARKS can cause injury.

- 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 cause injury.

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



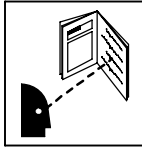
### WELDING WIRE can cause injury.

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



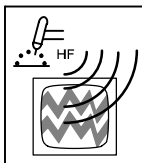
### MOVING PARTS can cause injury.

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



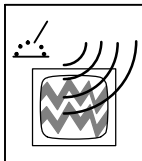
### READ INSTRUCTIONS.

- Read Owner's Manual before using or servicing unit.
- Use only genuine replacement parts from the manufacturer.



### H.F. RADIATION can cause interference.


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




### ARC WELDING can cause interference.


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

## 1-4. California Proposition 65 Warnings


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

 Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.

For Gasoline Engines:

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

For Diesel Engines:

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

## 1-5. Principal Safety Standards

*Safety in Welding, Cutting, and Allied Processes*, ANSI Standard Z49.1, from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

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

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

*Safe Handling of Compressed Gases in Cylinders*, CGA Pamphlet P-1, from Compressed Gas Association, 4221 Walney Road, 5th Floor, Chantilly, VA 20151 (phone: 703-788-2700, website: www.cganet.com).

*Code for Safety in Welding and Cutting*, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 5060 Mississauga,

Ontario, Canada L4W 5NS (phone: 800-463-6727 or in Toronto 416-747-4044, 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 10036-8002 (phone: 212-642-4900, website: www.ansi.org).

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

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

## 1-6. EMF Information

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

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

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

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

### About 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 – DEFINITIONS

## 2-1. Warning Label Definitions

- |   |   |   |
|---|---|---|
| <p>A. Warning! Watch Out! There are possible hazards as shown by the symbols.</p> <p>1 Electric shock from welding electrode or wiring can kill.</p> <p>1.1 Wear dry insulating gloves. Do not touch electrode with bare hand. Do not wear wet or damaged gloves.</p> <p>1.2 Protect yourself from electric shock by insulating yourself from work and ground.</p> <p>1.3 Disconnect input plug or power before working on machine.</p> | <p>2 Breathing welding fumes can be hazardous to your health.</p> <p>2.1 Keep your head out of the fumes.</p> <p>2.2 Use forced ventilation or local exhaust to remove the fumes.</p> <p>2.3 Use ventilating fan to remove fumes.</p> <p>3 Welding sparks can cause explosion or fire.</p> <p>3.1 Keep flammables away from welding. Do not weld near flammables.</p> <p>3.2 Welding sparks can cause fires. Have a</p> | <p>fire extinguisher nearby, and have a watchperson ready to use it.</p> <p>3.3 Do not weld on drums or any closed containers.</p> <p>4 Arc rays can burn eyes and injure skin.</p> <p>4.1 Wear hat and safety glasses. Use ear protection and button shirt collar. Use welding helmet with correct shade of filter. Wear complete body protection.</p> <p>5 Become trained and read the instructions before working on the machine or welding.</p> <p>6 Do not remove or paint over (cover) the label.</p> |
|---|---|---|




















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|  |  |  |  |   |  |   |  |
|--|--|--|--|---|--|---|--|
| <b>⚠ WARNING</b>   |  |  |  | <b>⚠</b>  |  |   |  |
| <b>Do Not Remove, Destroy, Or Cover This Label</b>   |  |  |  | <b>ARC WELDING can be hazardous.</b>  |  |   |  |
| <p><b>ELECTRIC SHOCK can kill.</b></p> <ul style="list-style-type: none"> <li>Always wear dry insulating gloves.</li> <li>Insulate yourself from work and ground.</li> <li>Do not touch live electrical parts.</li> <li>Disconnect input power before servicing.</li> <li>Keep all panels and covers securely in place.</li> </ul> |  | <p><b>WELDING can cause fire or explosion.</b></p> <ul style="list-style-type: none"> <li>Do not weld near flammable material.</li> <li>Watch for fire: keep extinguisher nearby.</li> <li>Do not locate unit over combustible surfaces.</li> <li>Do not weld on closed containers.</li> </ul> |  | <p><b>ARC RAYS can burn eyes and skin; NOISE can damage hearing.</b></p> <ul style="list-style-type: none"> <li>Wear welding helmet with correct filter.</li> <li>Wear correct eye, ear, and body protection.</li> </ul>  |  | <p><b>Read American National Standard Z49.1, "Safety in Welding, Cutting, and Allied Processes," From American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126; OSHA Safety and Health Standards, 29 CFR 1910, from U.S. Gov. Printing Office, P.O. Box 371964, Pittsburgh, PA 15250-7964.</b></p> |  |
| <p><b>FUMES AND GASES can be hazardous.</b></p> <ul style="list-style-type: none"> <li>Keep your head out of the fumes.</li> <li>Ventilate area, or use breathing device.</li> <li>Read Material Safety Data Sheets (MSDSs) and manufacturer's instructions for materials used.</li> </ul>   |  | <p><b>UN CHOC ELECTRIQUE peut être mortel.</b></p> <ul style="list-style-type: none"> <li>Installation et raccordement de cette machine doivent être conformes à tous les pertinents.</li> </ul>   |  | <p><b>SOUDEAGE A L'ARC peut être dangereux.</b></p> <ul style="list-style-type: none"> <li>Lire le manuel d'instructions avant utilisation.</li> <li>Ne pas installer sur une surface combustible.</li> <li>Les fils de soudage et pièces conductrices peuvent être à la tension de soudage.</li> </ul> |  | <p><b>208 627-B</b></p>   |  |

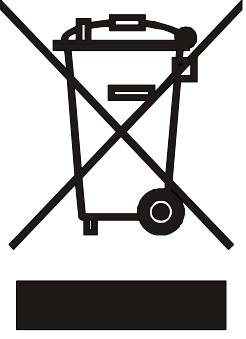
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|------------------|-----|-----|-----|---|-----|-----|-----|
| <b>⚠</b>         |     |     |     |   |     |     |     |
| 1                | 1.1 | 1.2 | 1.3 | 3 | 3.1 | 3.2 | 3.3 |
| 2                | 2.1 | 2.2 | 2.3 | 4 | 4.1 |     |     |
|                  |     |     |     | 5 | 6   |     |     |
| <b>210 674-A</b> |     |     |     |   |     |     |     |

## 2-2. Symbols And Definitions

|   |  |   |                                 |  |                              |   |                                   |   |
|---|--|---|---------------------------------|--|------------------------------|---|-----------------------------------|---|
| <b>A</b>  | Amperes                                      |  | Voltage Input                   |   | Process                      |  | Shielded Metal Arc Welding (SMAW) |   |
| <b>V</b>  | Volts  |  | Increase/Decrease Of Quantity   |  |                              |   |                                   | Single Phase Static Frequency Converter-Transformer-Rectifier |
|  | Output                                       |  | Negative                        |   | Positive                     | <b>Hz</b>   | Hertz                             |   |
|  | Gas Input                                    |  | High Temperature                |   | Direct Current               |  | Line Connection                   |   |
| <b>%</b>  | Percent                                      | <b>X</b>  | Duty Cycle                      | <b>U<sub>1</sub></b>   | Primary Voltage              | <b>U<sub>2</sub></b>  | Conventional Load Voltage         |   |
|  | Alternating Current                          | <b>U<sub>0</sub></b>  | Rated No Load Voltage (Average) | <b>I<sub>1max</sub></b>  | Rated Maximum Supply Current | <b>I<sub>2</sub></b>  | Rated Welding Current             |   |
| <b>I<sub>1eff</sub></b>   | Maximum Effective Supply Current             |  | Remote                          |   | Lift-Arc Start (GTAW)        |  | Gas Tungsten Arc Welding (GTAW)   |   |
|  | Suitable For Areas Of Increased Shock Hazard | <b>I</b>  | On                              |   | Off                          |  | Look under unit for label         |   |

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

|   |   |
|---|---|
|  | <p>Do not discard product (where applicable) with general waste.</p> <p>Reuse or recycle Waste Electrical and Electronic Equipment (WEEE) by disposing at a designated collection facility.</p> <p>Contact your local recycling office or your local distributor for further information.</p> |
|---|---|



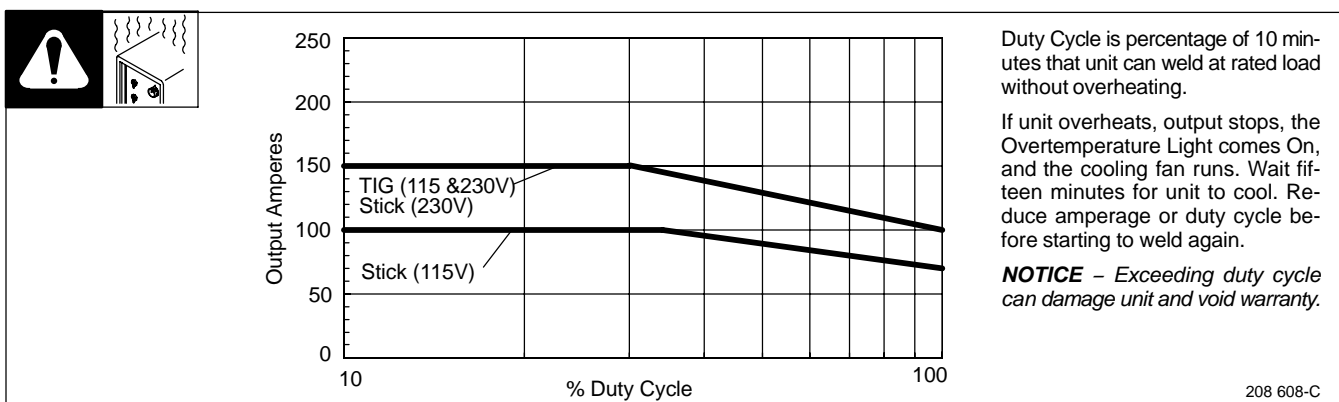
# SECTION 3 – SPECIFICATIONS AND INSTALLATION

## 3-1. Specifications

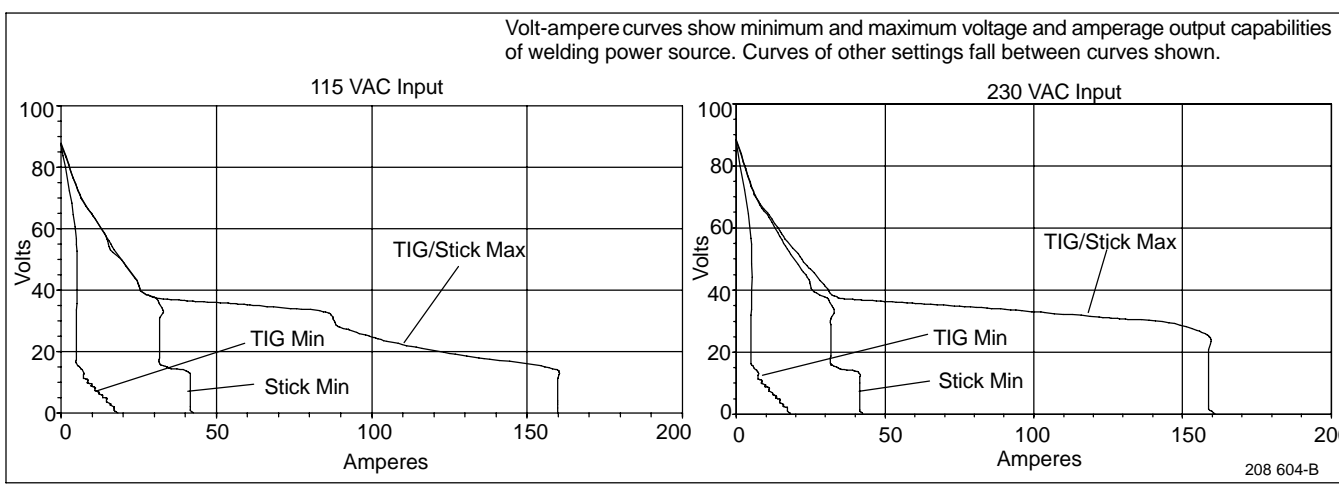
| Input Power Single-Phase AC | Rated Welding Output                  | Welding Amperage Range | Max OCV DC    | Amperes In-put At Rated Load Output, 50/60Hz, Single-Phase | KVA @ Duty Cycle | KW  | Dimensions   | Weight              |
|-----------------------------|---------------------------------------|------------------------|---------------|--|------------------|-----|--|---------------------|
| 115 Volts Stick             | 70A @ 22.8 Volts DC, 100% Duty Cycle  | 20 – 100A              | 90V<br>*12-16 | 17.4   | 2.0              | 1.9 | H: 9 in (229 mm)<br>W: 5.5 in (140 mm)<br>L: 13.25 in (337 mm) | 13.7 lb<br>(6.2 kg) |
|                             | 100A @ 24.0 Volts DC, 35% Duty Cycle  |                        |               | 26.4   | 3.0              | 3.0 |  |                     |
| 115 Volts TIG               | 100A @ 14.0 Volts DC, 100% Duty Cycle | 5 – 150A               | 90V<br>*12-16 | 18.4   | 2.1              | 2.1 |  |                     |
|                             | 150A @ 16.0 Volts DC, 30% Duty Cycle  |                        |               | 28.0   | 3.4              | 3.1 |  |                     |
| 230 Volts Stick             | 100A @ 24 Volts DC, 100% Duty Cycle   | 20 – 150A              | 90V<br>*12-16 | 13.1   | 3.0              | 2.8 |  |                     |
|                             | 150A @ 26.0 Volts DC, 30% Duty Cycle  |                        |               | 21.6   | 4.9              | 4.7 |  |                     |
| 230 Volts TIG               | 100A @ 14.0 Volts DC, 100% Duty Cycle | 5 – 150A               | 90V<br>*12-16 | 8.3  | 2.0              | 1.9 |  |                     |
|                             | 150A @ 16.0 Volts DC, 30% Duty Cycle  |                        |               | 14.2   | 3.2              | 3.1 |  |                     |

\*Sense Voltage For Stick And TIG Lift Arc™

## 3-2. Duty Cycle And Overheating



## 3-3. Volt-Ampere Curves



### 3-4. Installing Shoulder Strap, Selecting A Location, And Connecting Input Power



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

1 Welding Power Source Shoulder Strap

Use strap to lift unit.

2 Rating Label

Label is located on bottom of unit. Use rating label to determine input power needs.

3 Input Power Cord

4 115 or 230 VAC Grounded Receptacle

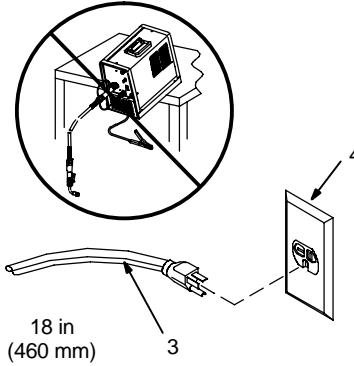
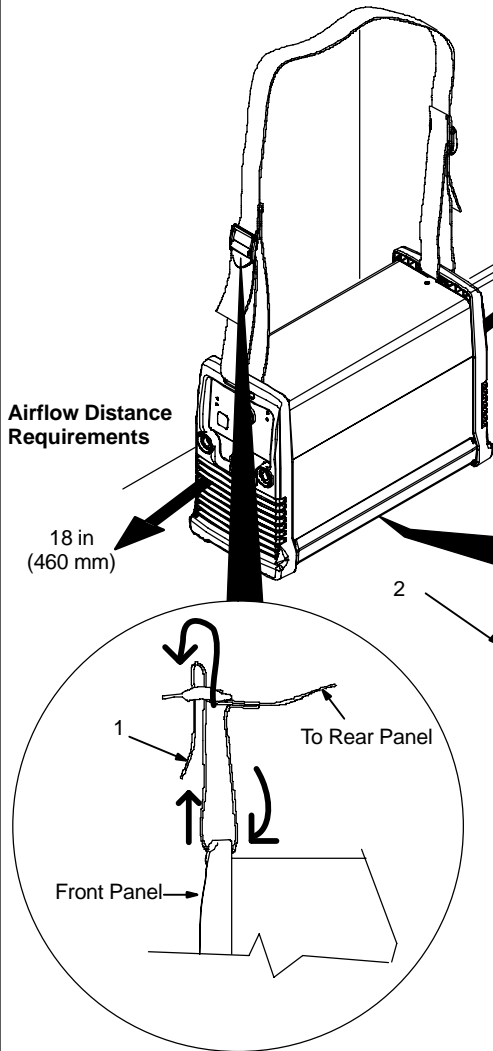
**ℳ** The Auto-Line circuitry in this unit automatically links the power source to the primary voltage being applied, either 115 or 230 VAC.

An individual branch circuit capable of carrying 30 amperes and protected by fuses or circuit breaker is recommended. Recommended fuse or circuit breaker size is 30 amperes.

**⚠ Unit is supplied with a 115 VAC plug (CE models are not supplied with a line cord plug). For 230 VAC operation, have a qualified person obtain a proper plug that meets all applicable codes, and install the plug according to the manufacturer's instructions.**

Connect input power plug to proper receptacle.

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



(BAR CODE)  
(SERIAL NUMBER)

|   |                       |  |     |                    |      |     |      |    |
|---|-----------------------|--|-----|--------------------|------|-----|------|----|
| Miller Electric Mfg. Co.<br>Appleton, WI USA<br>Maxstar 150 STL<br>907135 |                       | S/N:   |     |                    |      |     |      |    |
| 1~  =   |                       |  |     |                    |      |     |      |    |
| <b>S</b>  | 5A/10V                | 150A/16V   |     |                    |      |     |      |    |
|   |                       | U <sub>i</sub> = 115V      U <sub>i</sub> = 230V |     |                    |      |     |      |    |
|   | X                     | 30%  | 60% | 100%               | 30%  | 60% | 100% |    |
|   | I <sub>2</sub>        | 150  | 120 | 100                | 150  | 120 | 100  |    |
|   | U <sub>0</sub> = 90V  | U <sub>2</sub>                                   | 16  | 14.8               | 14   | 16  | 14.8 | 14 |
| <b>S</b>  | 5A/20V                | 150A/26V   |     |                    |      |     |      |    |
|   |                       | U <sub>i</sub> = 115V      U <sub>i</sub> = 230V |     |                    |      |     |      |    |
|   | X                     | 35%  | 60% | 100%               | 30%  | 60% | 100% |    |
|   | I <sub>2</sub>        | 100  | 85  | 70                 | 150  | 120 | 100  |    |
|   | U <sub>0</sub> = 90V  | U <sub>2</sub>                                   | 24  | 23.4               | 22.8 | 26  | 24.8 | 24 |
|   |                       | I <sub>i</sub> max                               |     | I <sub>i</sub> eff |      |     |      |    |
|   | U <sub>i</sub> = 115V | 28   |     | 18                 |      |     |      |    |
|   | U <sub>i</sub> = 230V | 23   |     | 13                 |      |     |      |    |
| 1~ 50/60 Hz   |                       |  |     | IP 23              |      |     |      |    |

Protected by one or more of the following U.S. Patents:  
6426888, 6266257, 6329636, 6103994, 6107602, 6115273,  
6633485, 6590184, 5642260, 6611189, 6239407, 6648698,  
6794976, 6548784, 6750427, 6770846, 6809293

EVIDENCE OF LABEL TAMPERING VOIDS WARRANTY  
208651G

Ref. 803 351-C / 208 651-G

### 3-5. Selecting Extension Cord (Use Shortest Cord Possible)



| Single Phase AC<br>Input Voltage | Conductor Size – AWG [mm <sup>2</sup> ]* |          |          |          |          |
|----------------------------------|--|----------|----------|----------|----------|
|                                  | 4 [21.2]                                 | 6 [13.3] | 8 [8.4]  | 10 [5.3] | 12 [3.3] |
|                                  | Maximum Allowable Cord Length in ft (m)  |          |          |          |          |
| 115                              | 160 (49)                                 | 107 (33) | 71 (22)  | 47 (14)  | 29 (9)   |
| 230                              | 471 (144)                                | 321 (98) | 215 (66) | 146 (45) | 90 (27)  |

\*Conductor size is based on maximum 3% voltage drop

### 3-6. Remote 6 Receptacle Information

|   |  |                 |   |
|---|--|-----------------|---|
|   | REMOTE 6                               | Socket          | Socket Information  |
|   | <b>15 VOLTS DC</b><br>OUTPUT CONTACTOR | 1               | Contact control +13.8 volts DC.   |
|   | <b>REMOTE OUTPUT CONTROL</b>           | 2               | Contact closure to 1 completes contactor control circuit and enables output when Lift-Arc TIG remote is selected. |
|   |  | 3               | Output to remote control; +10 volts DC output to remote control.  |
|   |  | 4               | 0 to +10 volts DC input command signal from remote control.   |
|   | <b>CHASSIS</b>                         | 5               | Remote control circuit common.  |
| 6 |  | Chassis common. |   |

## SECTION 4 – OPERATION

### 4-1. Front Panel Controls And Gas Connection

Rear Panel

Ref. 803 375 / 217 786

**1 Ready Light**  
Light comes on approximately two seconds after power switch is placed in On (I) position if Lift-Arc or Stick has been selected. The light indicates that the unit is energized and ready for welding. A flashing light indicates unit is not ready, or that there is a functional error.

*The fan motor is thermostatically controlled.*

**2 High Temperature Light**  
Light comes on if unit overheats. Once unit has cooled down, welding can resume. If this light flashes, take unit to an Authorized Service Agent.

**3 Amperage Adjustment Control**  
This control adjusts welding amperage.

**4 Process Select Switch**  
See Section 4-2.

**5 Positive Weld Output Receptacle**  
For Stick welding, connect electrode cable to this receptacle. For TIG welding, connect work cable to this receptacle.

**6 Negative Weld Output Receptacle**  
For Stick welding, connect work cable to this receptacle. For TIG welding, connect torch cable to this receptacle.

**7 Remote Receptacle**  
For Lift-Arc TIG, output may be adjusted from min to max of the front panel setting with a remote control. Also enables output in Lift-Arc remote process (see Section 3-6).

**8 Power Switch**  
Place switch in On (I) or Off (O) position as needed.

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

**10 Cylinder Valve**  
Open valve slightly so gas flow blows dirt from valve. Close valve.

**11 Regulator/Flowmeter**

**12 Flow Adjust**  
Typical flow rate is 15 cubic feet per hour (7.1 liters per minute).  
Connect customer supplied gas hose between regulator/flowmeter and gas fitting .

## 4-2. Process Selection

○=Light Off   ●=Light On

1 Process Selector Switch Pad  
Use control to select required welding process. Press switch pad until LED for desired process is illuminated.

2 Lift Arc™ Start  
When selected, a TIG arc starting method in which the electrode must come in contact with the workpiece to initiate an arc is activated (see Section 4-3).

3 Stick (SMAW)  
When selected, Adaptive Hot Start and DIG circuitry are energized.

4 Lift Arc™ Start (Remote)  
A TIG starting method in which the electrode must come in contact with the work and a closure from pin 1 to pin 2 on the remote receptacle (see Section 3-6) is required to initiate an arc.

## 4-3. Lift-Arc™

**Lift-Arc Start**

- 1 TIG Electrode
- 2 Workpiece

Touch tungsten electrode to workpiece, **hold for 1-2 seconds**, slowly lift electrode, and an arc forms.

Open-circuit voltage may be present before electrode touches workpiece.

Do NOT Strike Like A Match!

# SECTION 5 – MAINTENANCE AND TROUBLESHOOTING

## 5-1. Routine Maintenance

**Disconnect power before maintaining.**

*Maintain more often during severe conditions.*

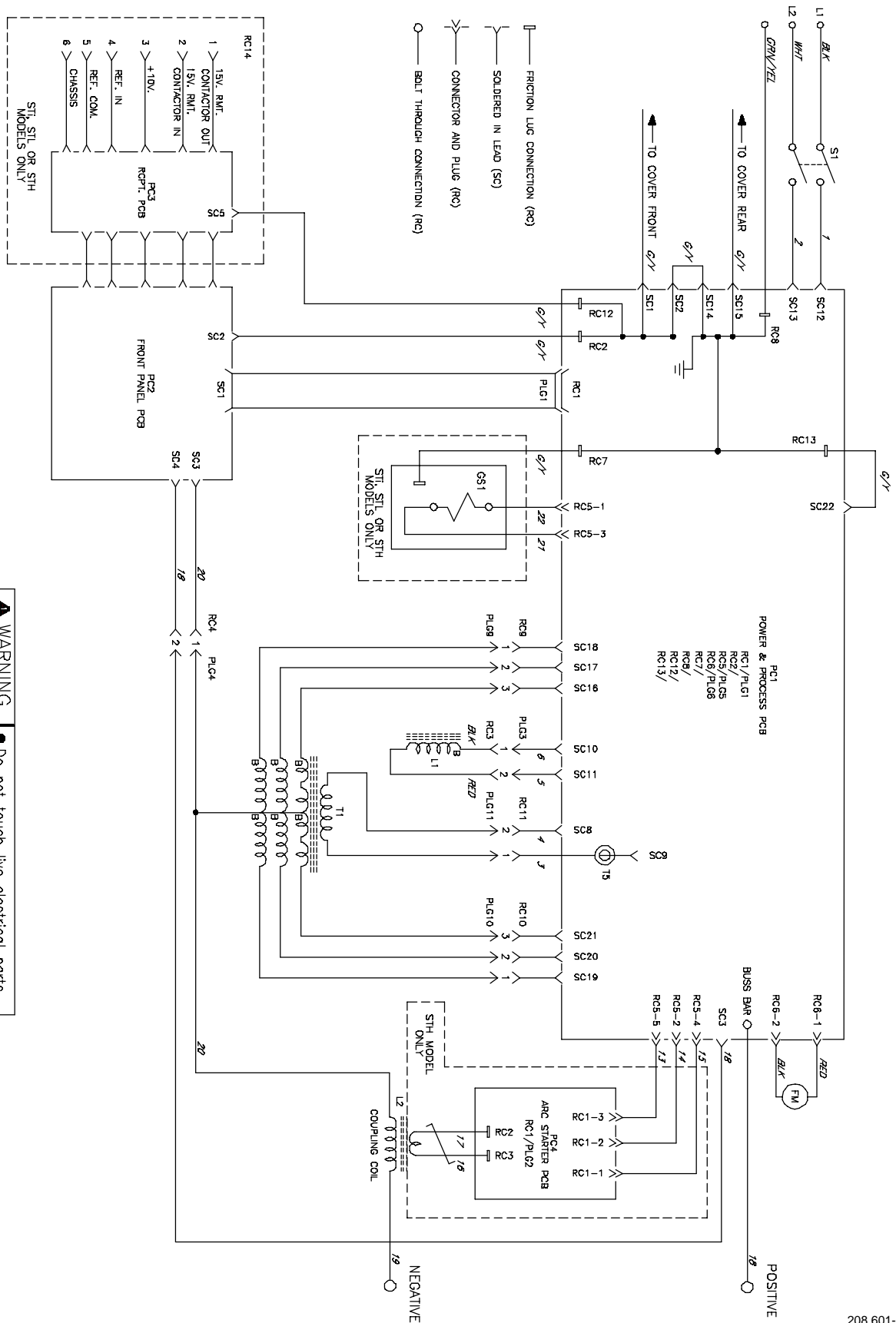
| ⌚              | ✓ = Check<br>* To be done by Factory Authorized Service Agent  | ◇ = Change        | ● = Clean            | Δ = Repair | ☆ = Replace |
|----------------|--|-------------------|----------------------|------------|-------------|
| Every 3 Months | <br>✓ ☆ Labels   | <br>✓ ☆ Gas Hoses | <br>● Weld Terminals |            |             |
| Every 3 Months | <br>✓ Δ ☆ Cables And Cords   |                   |                      |            |             |
| Every 6 Months | <p><b>Do not remove case when blowing out inside of unit.</b><br/>Blow out inside. Direct airflow through front and back louvers.</p> <p>●: During heavy service, clean monthly.</p> |                   |                      |            |             |

## 5-2. Troubleshooting



| Trouble  | Remedy  |
|--|---|
| No weld output; unit completely inoperative; ready light Off.  | Place line disconnect switch in On position.  |
|  | Check and replace line fuse(s), if necessary, or reset circuit breaker.   |
|  | Be sure power cord is plugged in and that receptacle is receiving input power.  |
| No weld output; ready light On.  | Check and secure loose weld cable(s) into receptacle(s).  |
|  | Check and correct poor connection of work clamp to workpiece.   |
| No weld output; high temperature light On.   | Unit overheated causing thermal shutdown. Allow unit to cool with fan On (see Section 3-2).                                 |
|  | Reduce duty cycle or amperage.  |
|  | Check and correct blocked/poor airflow to unit (see Section 3-4).   |
| No weld output; high temperature light Flashing.   | Turn Power Off and back On again. If light continues to flash, check with Factory Authorized Service Agent.                 |
| No weld output. Blue light flashes continuously, yellow LED off.                                     | Line voltage too high or too low. Line voltage must be within $\pm 10\%$ .  |
|  | Unit needs to be reset. Cycle power off and back on. If problem is not corrected, contact Factory Authorized Service Agent. |
| No weld output. Blue LED flashes 3 times repeatedly, yellow LED off.                                 | Remote trigger left on. Turn off remote trigger, wait five seconds, and restart operation.                                  |
| No weld output. Blue LED flashes 4 times repeatedly, yellow LED off.                                 | Unit needs to be reset. Cycle power off and back on. If problem is not corrected, contact Factory Authorized Service Agent. |
| Erratic or improper welding arc or output.   | Use proper size and type of weld cable (see your Distributor).  |
|  | Clean and tighten weld connections.   |
|  | Check and reverse polarity; check and correct poor connections to workpiece.  |
| Fan not operating.   | Unit not warmed up enough to require fan cooling.   |
|  | Check for and remove anything blocking fan movement.  |
|  | Have Factory Authorized Service Agent check fan motor and control circuitry.  |
| Stick welding problems: Hard starts; poor welding characteristics; unusual spattering.               | Use proper type and size of electrode.  |
|  | Check and reverse electrode polarity; check and correct poor connections.   |
|  | Make sure a remote control is not connected.  |
| TIG welding problems: Wandering arc; hard starts; poor welding characteristics; spattering problems. | Use proper type and size of tungsten.   |
|  | Use properly prepared tungsten.   |
|  | Check and reverse electrode polarity.   |
| TIG welding problems: Tungsten electrode oxidizing and not remaining bright after welding.           | Shield weld zone from drafts.   |
|  | Check for correct type shielding gas.   |
|  | Check and tighten gas fittings.   |
|  | Check and change electrode polarity.  |

# SECTION 6 – ELECTRICAL DIAGRAM



|  |                              |
|--|------------------------------|
|  | <b>WARNING</b>               |
|  | <b>ELECTRIC SHOCK HAZARD</b> |

- 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 6-1. Circuit Diagram For Non CE Welding Power Source

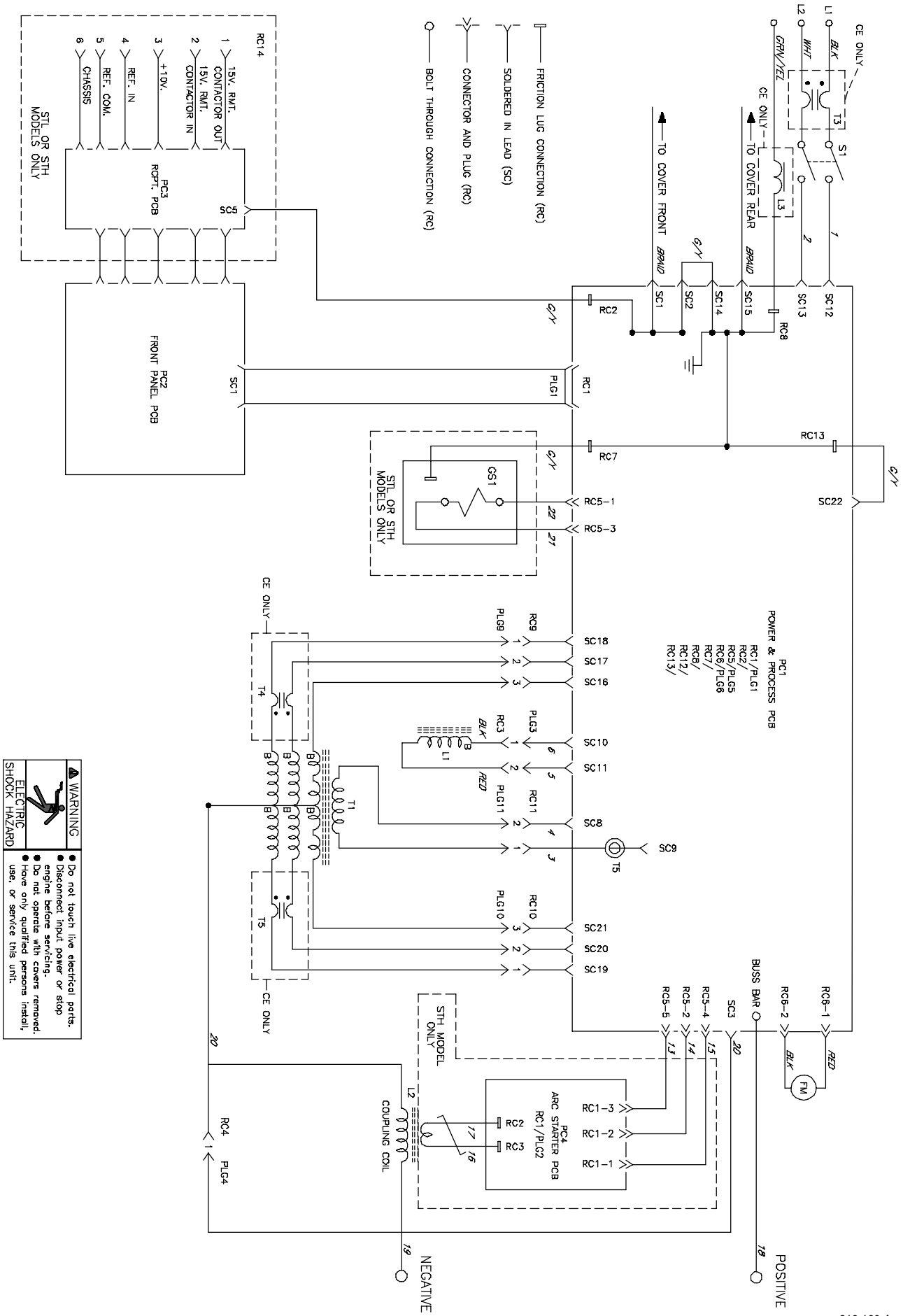

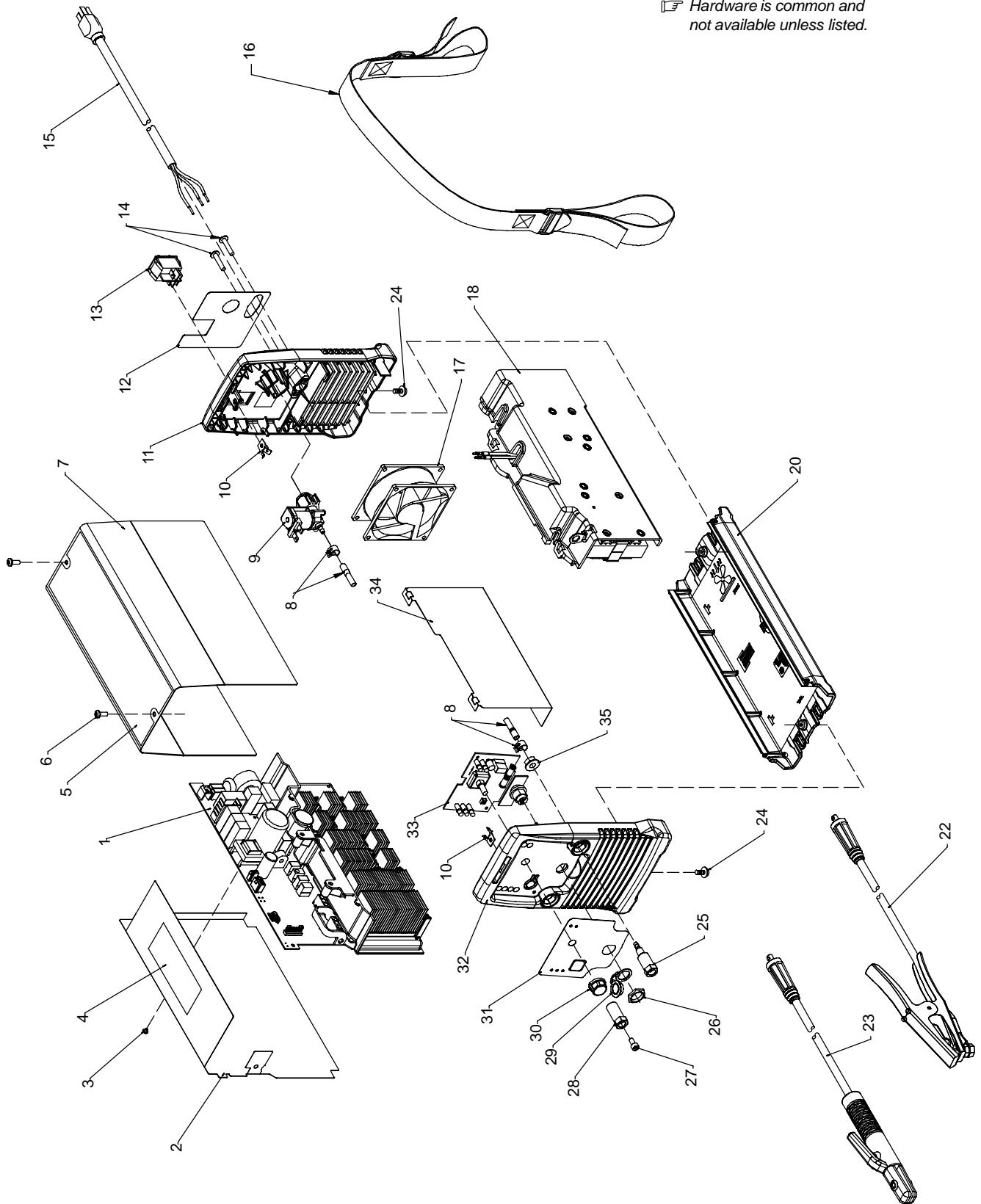


Figure 6-2. Circuit Diagram For CE Model Welding Power Source

219 160-A

# SECTION 7 – PARTS LIST

 Hardware is common and not available unless listed.



803 474-H

Figure 7-1. Parts View



| Item No. | Dia. Mkgs. | Part No. | Description  | Quantity |
|----------|------------|----------|--|----------|
| ... 1    | PC1        | 222 765  | .. Kit, pcb assy (windtunnel w/cmpnts)                 | 1        |
| ... 2    |            | 208 701  | .. Insulator w/label                                   | 1        |
| ... 3    |            | 146 549  | .. Fastener, push-in                                   | 1        |
| ... 4    |            | 208 622  | .. Label, warning                                      | 1        |
| ... 5    |            | 208 627  | .. Label, warning                                      | 1        |
| ... 6    |            | 195 666  | .. Screw, 010-32x .50 torx                             | 2        |
| ... 7    |            | 208 700  | .. Wrapper w/label                                     | 1        |
| ... 8    |            | 208 569  | .. Hose and clamps (2)                                 | 1        |
| ... 9    | GS1        | 219 967  | .. Valve, gas w/fittings                               | 1        |
| ... 10   |            | 208 558  | .. Term, friction .250 x .032                          | 2        |
| ... 11   |            | 208 703  | .. Panel, rear w/label                                 | 1        |
| ... 12   |            | 208 549  | .. Nameplate, rear                                     | 1        |
| ... 13   |            | 208 550  | .. Switch, rocker dpst 16A 250 VAC                     | 1        |
| ... 14   |            | 208 536  | .. Screw, K50 x 25 rnd washer, hd-trx                  | 2        |
| ... 15   |            | 219 167  | .. Cable, power  | 1        |
| ... 16   |            | 208 548  | .. Strap, shoulder                                     | 1        |
| ... 17   | FM         | 208 496  | .. Fan w/leads and plug                                | 1        |
| ... 18   | L1, L2, T1 | 208 538  | .. Windtunnel, magnetics w/cmpnt                       | 1        |
| ... 20   |            |          | .. Base w/label, order by serial number                | 1        |
| ... 22   |            | 208 561  | .. Work Cable  | 1        |
| ... 23   |            | 208 596  | .. Holder, electrode                                   | 1        |
| ... 24   |            | 208 535  | .. Screw, k50 x 12 rnd washer hd-trx                   | 4        |
| ... 25   |            | 208 612  | .. Receptacle, twist lock power/gas                    | 1        |
| ... 26   |            | 208 588  | .. Nut, plastic 625-27.81 hex x .14                    | 1        |
| ... 27   |            | 229 337  | .. Screw, m5-.8 x 12 soc hd -torx                      | 1        |
| ... 28   |            | 208 498  | .. Receptacle, twist lock power                        | 1        |
| ... 29   |            | 208 589  | .. Cover, dust   | 1        |
| ... 30   |            | 174 992  | .. Knob, pointer                                       | 1        |
| ... 31   |            |          | .. Nameplate, front (order by model and serial number) | 1        |
| ... 32   |            | 208 522  | .. Panel, front w/nameplate                            | 1        |
| ... 33   | PC2, PC3   | 217 787  | .. Circuit board, operator interface                   | 1        |
| ... 34   |            | 208 556  | .. Insualtor, heat sink                                | 1        |
| ... 35   |            | 208 497  | .. Nut, m08-1.2 13 mm hex 8.3 mm t semi cone washer    | 1        |

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



# TRUE BLUE<sup>®</sup>

## WARRANTY

Effective January 1, 2007

(Equipment with a serial number preface of "LH" 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.

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

- 5 Years Parts — 3 Years Labor
  - \* Original main power rectifiers
- 3 Years — Parts and Labor
  - \* Transformer/Rectifier Power Sources
  - \* Plasma Arc Cutting Power Sources
  - \* Process Controllers
  - \* Semi-Automatic and Automatic Wire Feeders
  - \* Inverter Power Sources (Unless Otherwise Stated)
  - \* Water Coolant Systems (Integrated)
  - \* Intelligit
  - \* Engine Driven Welding Generators  
**(NOTE: Engines are warranted separately by the engine manufacturer.)**
- 1 Year — Parts and Labor Unless Specified
  - \* Motor Driven Guns (w/exception of Spoolmate Spoolguns)
  - \* Positioners and Controllers
  - \* Automatic Motion Devices
  - \* RFCS Foot Controls
  - \* Induction Heating Power Sources, Coolers, and Electronic Controls/Recorders
  - \* Water Coolant Systems (Non-Integrated)
  - \* Flowgauge and Flowmeter Regulators (No Labor)
  - \* HF Units
  - \* Grids
  - \* Spot Welders
  - \* Load Banks
  - \* Arc Stud Power Sources & Arc Stud Guns
  - \* Racks
  - \* Running Gear/Trailers
  - \* Plasma Cutting Torches (except APT & SAF Models)
  - \* Field Options  
(NOTE: Field options are covered under True Blue<sup>®</sup> for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
  - \* Bernard-Branded Mig Guns (No Labor)
  - \* Weldcraft-Branded TIG Torches (No Labor)
  - \* Subarc Wire Drive Assemblies
- 6 Months — Batteries
- 90 Days — Parts
  - \* MIG Guns/TIG Torches and Subarc (SAW) Guns

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

Miller's True Blue<sup>®</sup> Limited Warranty shall not apply to:

- Consumable components; such as contact tips, cutting nozzles, contactors, brushes, slip rings, relays or parts that fail due to normal wear. (Exception: brushes, slip rings, and relays are covered on Bobcat, Trailblazer, and Legend models.)**
- 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.
- Equipment that has been modified by any party other than Miller, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

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

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

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

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

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

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

miller\_warr 2007-01

### 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.





# 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](http://www.millerwelds.com) or call 1-800-4-A-Miller

Contact the Delivering Carrier to:

File a claim for loss or damage during shipment.

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

### Miller Electric Mfg. Co.

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

### International Headquarters—USA

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

### European Headquarters – United Kingdom

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

[www.MillerWelds.com](http://www.MillerWelds.com)

