



OM-363

213117AG

2010-11

**Processes**



TIG (GTAW) Welding



Stick (SMAW) Welding

**Description**



Arc Welding Power Source

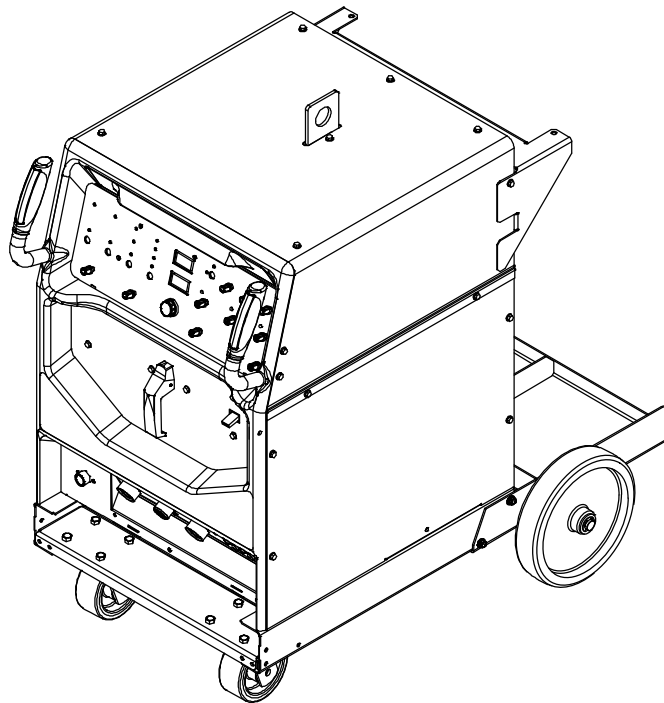
ENGLISH

FRANÇAIS

ESPAÑOL

# Syncrowave<sup>®</sup> 250 DX / 350 LX

## With Optional Running Gear And Cooler



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# OWNER'S MANUAL

File: TIG (GTAW)



# From Miller to You

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

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

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

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

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



Miller is the first welding equipment manufacturer in the U.S.A. to be registered to the ISO 9001 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](http://www.MillerWelds.com) on the web.**



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



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# 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.

## 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

 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.

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.

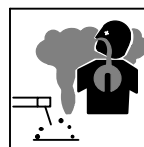
### SIGNIFICANT DC VOLTAGE exists in inverter welding power sources AFTER removal of input power.

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



### HOT PARTS can burn.

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



### FUMES AND GASES can be hazardous.

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

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



### ARC RAYS can burn eyes and skin.

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

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

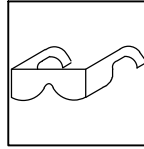


### WELDING can cause fire or explosion.

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

- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Do not weld where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not weld on 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.



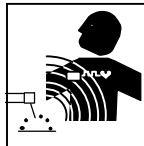
### FLYING METAL or DIRT can injure eyes.

- 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.



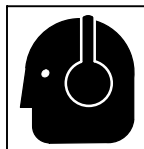
### BUILDUP OF GAS can injure or kill.

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



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

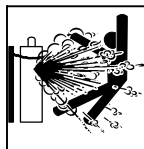
- Wearers of Pacemakers and other Implanted Medical Devices should keep away.
- Implanted Medical Device wearers should consult their doctor and the device manufacturer before going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations.



### 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.

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



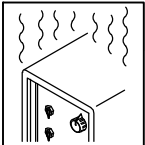
### FIRE OR EXPLOSION hazard.

- 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.



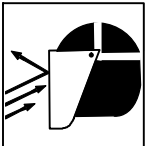
### FALLING EQUIPMENT can injure.

- 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.



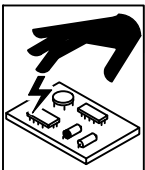
### OVERUSE can cause OVERHEATING

- 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.



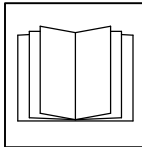
### WELDING WIRE can injure.

- 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.



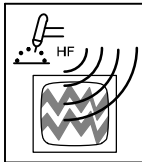
### MOVING PARTS can injure.

- 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.



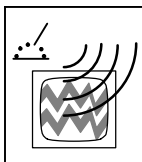
### READ INSTRUCTIONS.

- 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.)**
-  **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.***
-  **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.***

### 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](http://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](http://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](http://www.nfpa.org) and [www.sparky.org](http://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](http://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](http://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](http://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](http://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](http://www.osha.gov)).

U.S. Consumer Product Safety Commission (CPSC), 4330 East West Highway, Bethesda, MD 20814 (phone: 301-504-7923, website: [www.cpsc.gov](http://www.cpsc.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](http://www.cdc.gov/NIOSH)).

## 1-6. EMF Information

Electric current flowing through any conductor causes localized electric and magnetic fields (EMF). Welding current creates an EMF field around the welding circuit and welding equipment. EMF fields may interfere with some medical implants, e.g. pacemakers. Protective measures for persons wearing medical implants have to be taken. For example, access restrictions for passers-by or 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 – DEFINITIONS

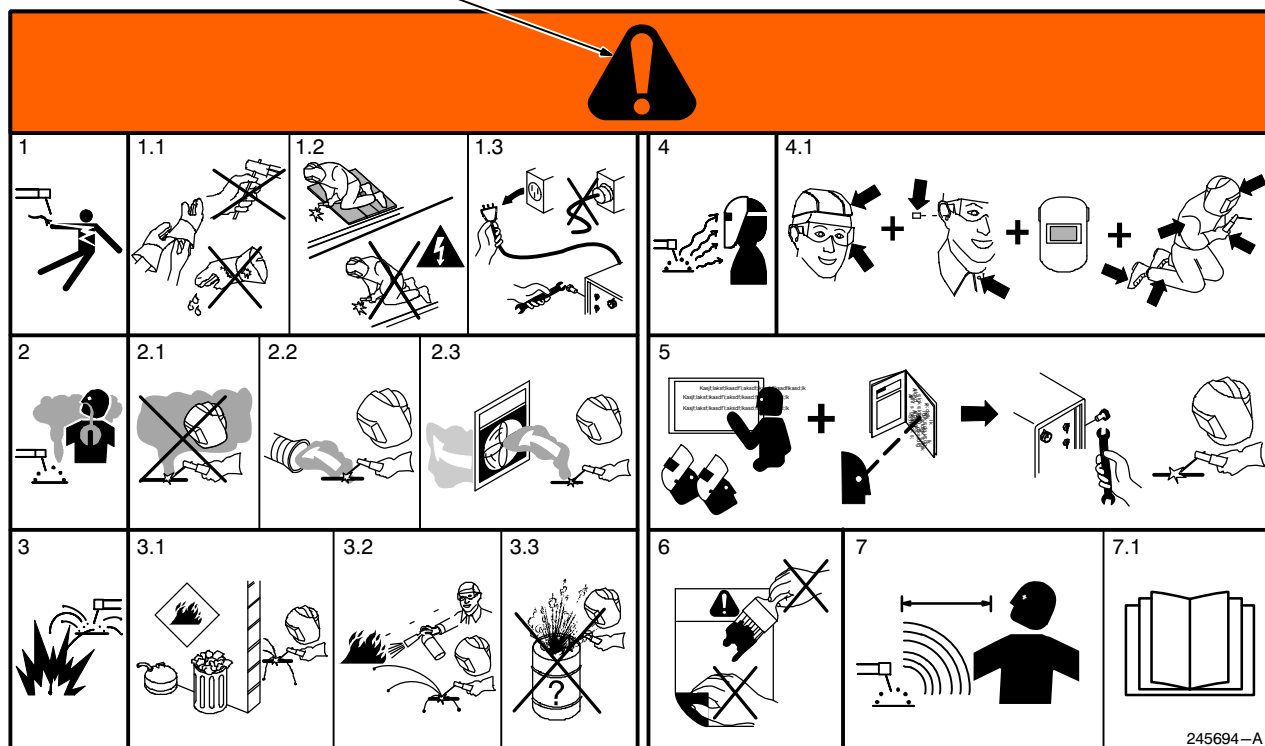
## 2-1. Warning Label Definitions

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

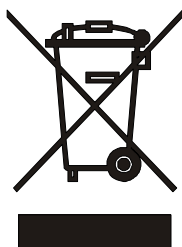
- 1 Electric shock from welding electrode or wiring can kill.
- 1.1 Wear dry insulating gloves. Do not touch electrode with bare hand. Do not wear wet or damaged gloves.
- 1.2 Protect yourself from electric shock by insulating yourself from work and ground.
- 1.3 Disconnect input plug or power before working on machine.
- 2 Breathing welding fumes can be hazardous to your health.
- 2.1 Keep your head out of the fumes.

- 2.2 Use forced ventilation or local exhaust to remove the fumes.
- 2.3 Use ventilating fan to remove fumes.
- 3 Welding sparks can cause explosion or fire.
- 3.1 Keep flammables away from welding. Do not weld near flammables.
- 3.2 Welding sparks can cause fires. Have a fire extinguisher nearby, and have a watchperson ready to use it.
- 3.3 Do not weld on drums or any closed containers.
- 4 Arc rays can burn eyes and injure skin.
- 4.1 Wear hat and safety glasses. Use ear protection and button shirt collar. Use

- welding helmet with correct shade of filter. Wear complete body protection.
- 5 Become trained and read the instructions before working on the machine or welding.
- 6 Do not remove or paint over (cover) the label.
- 7 Welding current creates an electric and magnetic field (EMF) around the welding circuit and welding equipment. Follow compliance boundaries to stay within EMF exposure limits in an occupational environment.
- 7.1 Read the Owner's Manual for EMF information.



## 2-2. WEEE Label



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

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

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

## 2-3. Symbols And Definitions

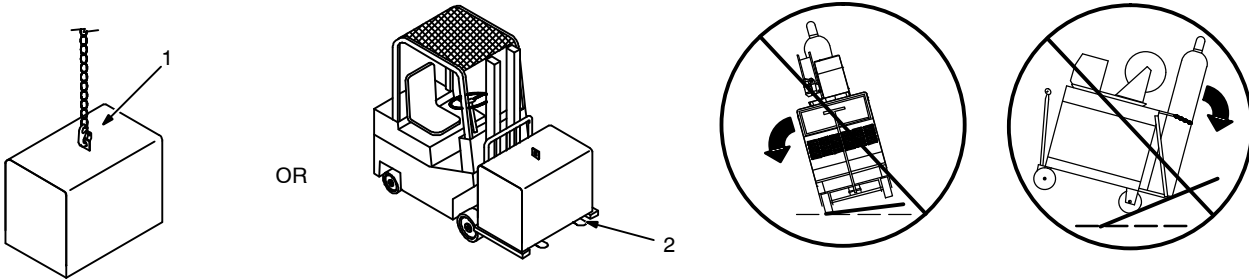
<b>A</b>	Amperes		Panel-Local		Gas Tungsten Arc Welding (GTAW)		Shielded Metal Arc Welding (SMAW)
<b>V</b>	Volts		Do Not Switch While Welding		Arc Force (DIG)		Background Amps
	Output		Circuit Breaker		Remote		Temperature
	Protective Earth (Ground)		Alternating Current		High Frequency - Start		Water Input
	Postflow Timer		Prewflow Timer		High Frequency - Continuous		Water Output
	Gas (Supply)		Gas Output		Gas Input		Increase/Decrease Of Quantity
<b>I</b>	On		Off	<b>%</b>	Percent		Direct Current
	Balance Control		Maximum Cleaning		Maximum Penetration		Electrode Positive
	Electrode Negative		Final Slope		Meter		Single-Phase
<b>U<sub>0</sub></b>	Rated No Load Voltage (Average)	<b>U<sub>1</sub></b>	Primary Voltage	<b>U<sub>2</sub></b>	Conventional Load Voltage		Line Connection
<b>I<sub>1</sub></b>	Primary Current	<b>I<sub>2</sub></b>	Rated Welding Current	<b>X</b>	Duty Cycle		Single-Phase Combined AC/DC Power Source
<b>IP</b>	Degree Of Protection	<b>I<sub>1eff</sub></b>	Maximum Effective Supply Current	<b>I<sub>1max</sub></b>	Rated Maximum Supply Current	<b>Hz</b>	Hertz
	Electrode		Work		Thickness Gauge		Spark Gap
<b>S</b>	Seconds		Final Amperage		Initial Time		Initial Amperage
	Pulse Percent On Time		Spot Time		Lift-Arc™		4 Step Trigger Operation Sequence
	Trigger Hold		Pulser On-Off		Pulse Frequency		Input
<b>U<sub>p</sub></b>	Rated peak starting voltage						



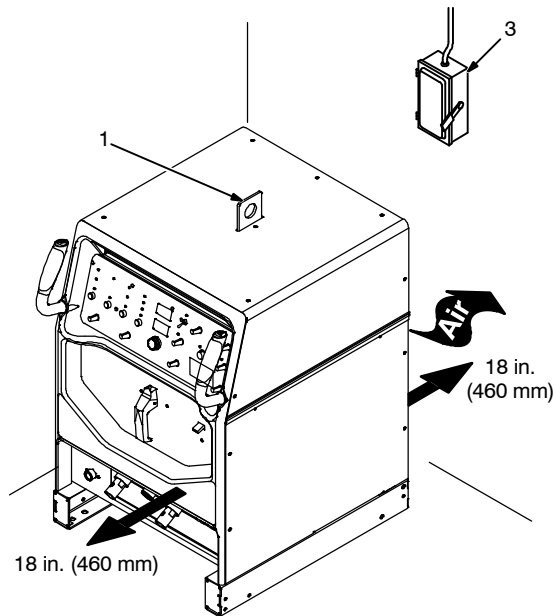
### 3-3. Selecting A Location



#### Movement



#### Location And Airflow



Ref. 117 264-C / 803 584-B

#### **⚠ 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.

- 1 Lifting Eye
- 2 Lifting Forks

Use lifting eye or lifting forks to move unit.

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

- 3 Line Disconnect Device

Locate unit near correct input power supply.

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

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

### 3-4. Dimensions And Weights

Dimensions	
Height	36-1/4 in. (921 mm)
Width	23 in. (584 mm)
Length	28 in. (711 mm)
A	25 in. (635 mm)
B	1-25/64 in. (35 mm)
C	1-5/8 in. (41 mm)
D	22 in. (559 mm)
E	20 in. (508 mm)
F	22-1/4 in. (565 mm)
G	1-1/8 in. (29 mm)
H	1/2 in. (13 mm) Dia
Weight	
400 lbs (181 kg) For 250 DX Models	
496 lbs (225 kg) For 350 LX Models	

### 3-5. Cooler Specifications

Cooler Specifications	
Cooler Tank Capacity	3 gal (11.4 L)
Coolant Flow Rate	1 liter per minute (1.1 quart)
Use With Torches Rated Up To 400 Amperes	

### 3-6. Welding Power Source Specifications

#### A. For 350 LX Models

Rated Welding Output	PFC **	Amperes Input at AC Balanced Rated Load Output, 50/60 Hz, Single-Phase								KVA	KW	Amperage Range	Max OCV (Uo)	Rated Peak Starting Voltage (Up)
		200V	220V	230V	400V	440V	460V	520V	575V					
NEMA Class I (60) – 300 Amperes, 32 Volts AC, 60% Duty Cycle	No PFC	125 3.3*	103 2.2*	110 2.0*	57 1.5*	52 1.2*	55 1.7*	43 1.0*	42 1.1*	25.0 0.9*	10.6 0.6*	3 – 400A	80V	15 KV•
	With PFC	92 77*	77 67*	78 69*	40 36*	39 33*	38 34*	33 28*	31 27.2*	18.0 16.6*	10.5 0.6*			15 KV•
NEMA Class II (40) – 350 Amperes, 34 Volts AC, 40% Duty Cycle	No PFC	146 3.3*	120 2.2*	128 2.6*	66 2.5*	60 1.2*	65 1.7*	51 1.0*	50 1.1*	29.5 0.9*	13.7 0.4*	3 – 400A	80V	15 KV•
	With PFC	114 77*	95 67*	94 69*	49 36*	47 33*	47 34*	40 28*	38 27.2*	21.7 16.6*	13.3 0.6*			15 KV•

\*While idling  
 \*\*Power Factor Correction  
 •Arc striking device is designed for manual guided operations

**B. For 250 DX Models**

Rated Welding Output	PFC **	Amperes Input at AC Balanced Rated Load Output, 60 Hz, Single-Phase				KVA	KW	Amperage Range	Max OCV (Uo)	Rated Peak Starting Voltage (Up)
		200V	230V	460V	575V					
NEMA Class I (40) – 200 Amperes, 28 Volts AC, 60% Duty Cycle	No PFC	88 *3.3	77 *2.8	38 *1.5	31 *1.1	17.6 *59	8.6 *29	3 – 310A	80V	15 KV•
	With PFC	60 *55.3	52 *49.5	26 *24.5	21 *19.6	12.06 *11.2	8.11 *39	3 – 310A	80V	15 KV•
NEMA Class II (40) – 250 Amperes, 30 Volts AC, 40% Duty Cycle	No PFC	110 *3.3	96 *2.8	48 *1.5	38 *1.1	21.98 *59	11.76 *29	3 – 310A	80V	15 KV•
	With PFC	82 *55.3	71 *49.5	35 *24.5	28 *19.6	16.32 *11.2	11.81 *1.93	3 – 310A	80V	15 KV•

\*While idling  
 \*\*Power Factor Correction  
 •Arc striking device is designed for manual guided operations

Rated Welding Output	PFC **	Amperes Input at AC Balanced Rated Load Output, 50/60 Hz, Single-Phase				KVA	KW	Amperage Range	Max OCV (Uo)	Rated Peak Starting Voltage (Up)
		220V	400V	440V	520V					
NEMA Class I (40) – 200 Amperes, 28 Volts AC, 60% Duty Cycle	No PFC	82 *3.0	45 *1.6	41 *1.4	35 *1.2	17.6 *59	8.6 *29	3 – 310A	80V	15 KV•
	With PFC	61 *45.9	34 *25.1	31 *22.8	26 *23.2	12.06 *11.2	8.11 *39	3 – 310A	80V	15 KV•
NEMA Class II (40) – 250 Amperes, 30 Volts AC, 40% Duty Cycle	No PFC	100 *3.0	55 *1.6	50 *1.4	42 *1.2	21.98 *59	11.76 *29	3 – 310A	80V	15 KV•
	With PFC	81 *45.9	44 *25.1	40 *22.8	34 *23.2	16.32 *11.2	11.81 *1.93	3 – 310A	80V	15 KV•

\*While idling  
 \*\*Power Factor Correction  
 •Arc striking device is designed for manual guided operations

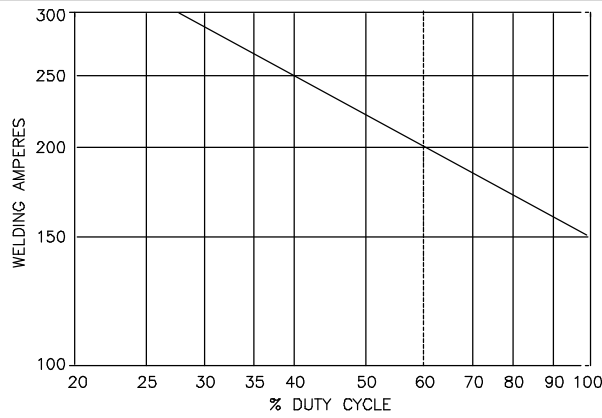
Rated Welding Output	PFC **	Amperes Input at AC Balanced Rated Load Output, 50 Hz, Single-Phase				KVA	KW	Amperage Range	Max OCV (Uo)	Rated Peak Starting Voltage (Up)
		200V	230V	460V	575V					
NEMA Class I (40) – 175 Amperes, 27 Volts AC, 60% Duty Cycle	No PFC	80 *3.3	69 *2.8	35 *1.5	28 *1.1	15.9 *59	7.4 *29	3 – 310A	80V	15 KV•
	With PFC	52 *55.3	45 *49.5	22 *24.5	18 *19.6	10.3 *11.2	7.3 *39	3 – 310A	80V	15 KV•
NEMA Class II (40) – 225 Amperes, 29 Volts AC, 40% Duty Cycle	No PFC	101 *3.3	88 *2.8	44 *1.5	35 *1.1	20.2 *59	10.2 *29	3 – 310A	80V	15 KV•
	With PFC	74 *55.3	64 *49.5	32 *24.5	26 *19.6	14.7 *11.2	10.1 *1.93	3 – 310A	80V	15 KV•

\*While idling  
 \*\*Power Factor Correction  
 •Arc striking device is designed for manual guided operations

### 3-7. Duty Cycle And Overheating



#### 250 DX Models

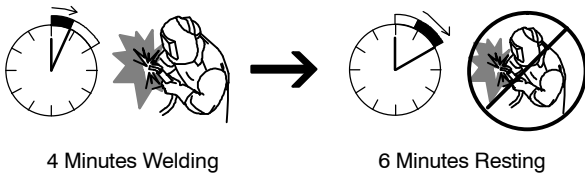


Duty Cycle is the percentage of 10 minutes that the unit can weld at rated load without overheating.

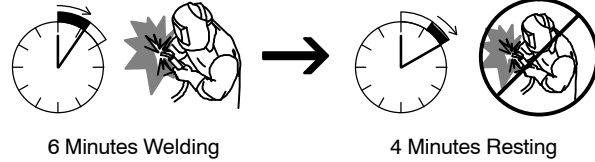
If unit overheats, output stops, front panel voltmeter/ammeter displays a HLP3 or HLP5 message (see Section 6-1), and cooling fans run. Wait fifteen minutes for unit to cool. Reduce amperage or duty cycle before welding.

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

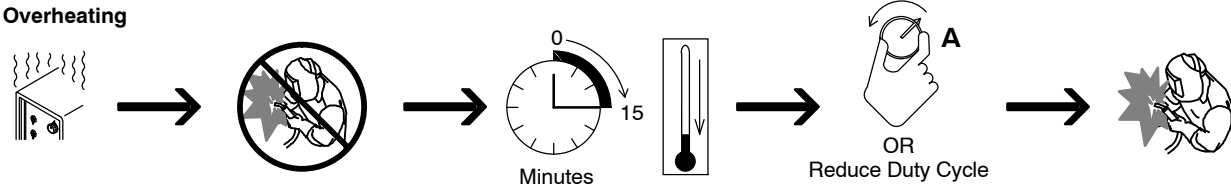
40% Duty Cycle At 250 Amperes



60% Duty Cycle At 200 Amperes

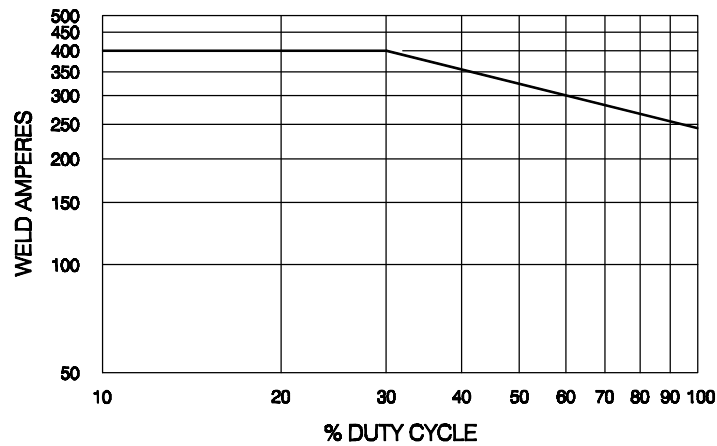


#### Overheating

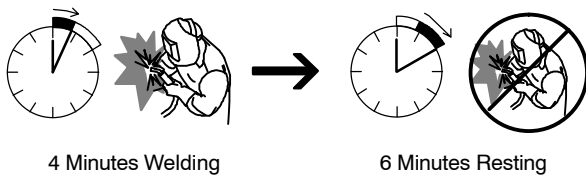


duty1 4/95 / Ref. 116 198

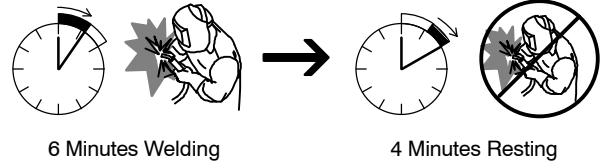
#### 350 LX Models



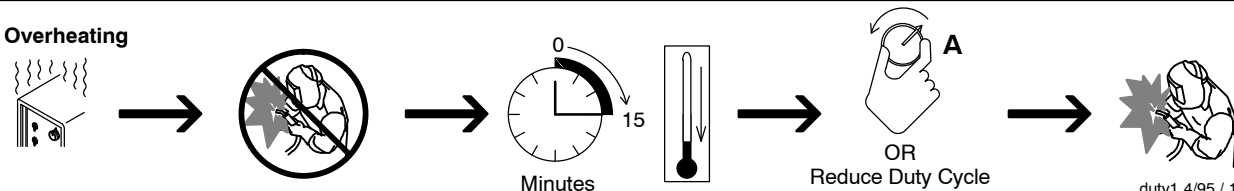
40% Duty Cycle At 350 Amperes



60% Duty Cycle At 300 Amperes



#### Overheating

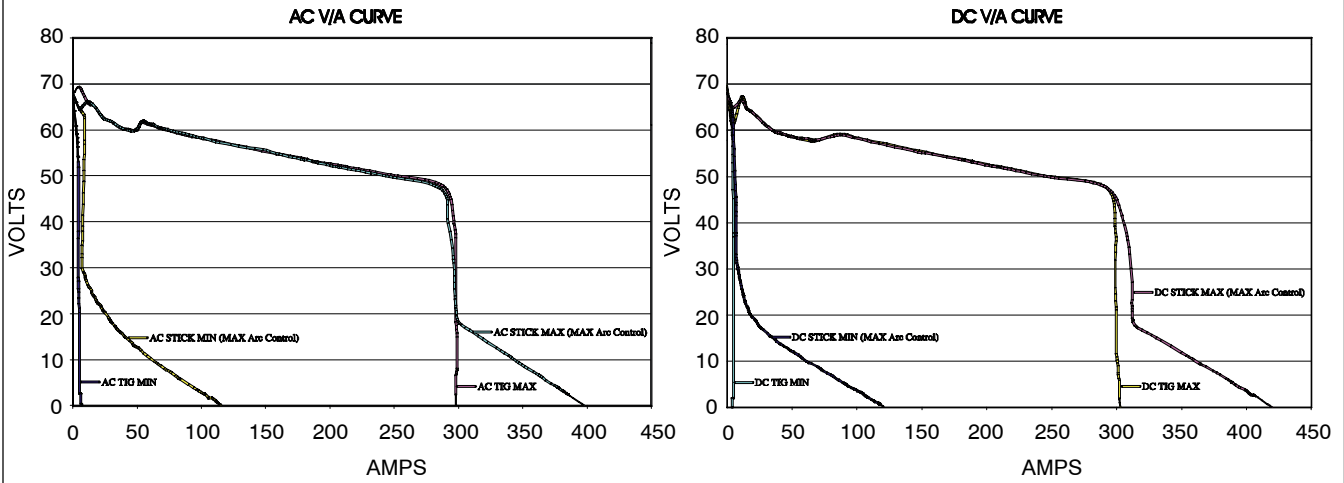


duty1 4/95 / 190 276

### 3-8. Volt-Ampere Curves

#### A. For 250 DX Models

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

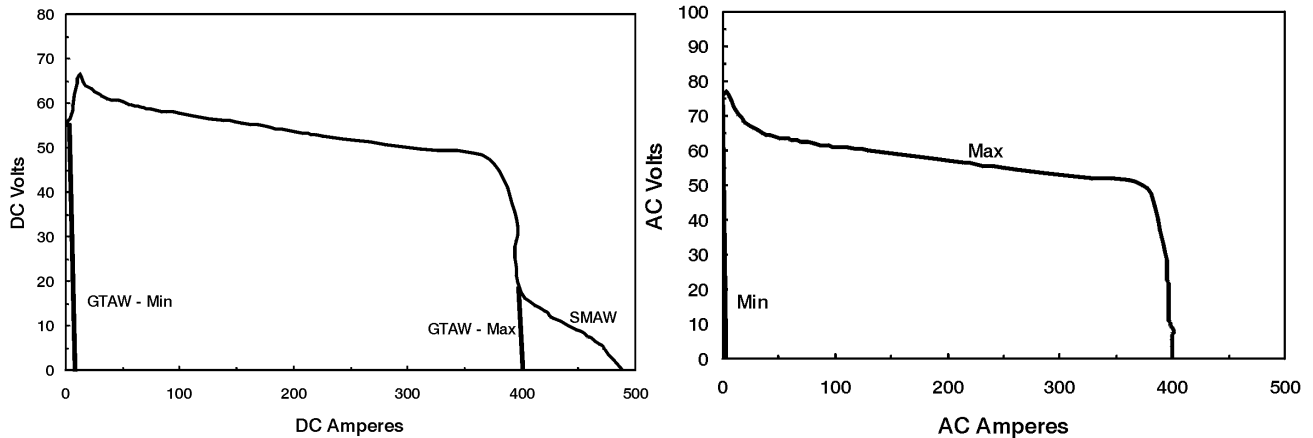


205 631 / 205 632

#### B. For 350 LX Models

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

#### 350 Amperes Models




ssb1.1 10/91 - ST-190 277 / ST-190 278

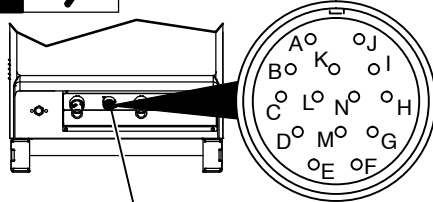
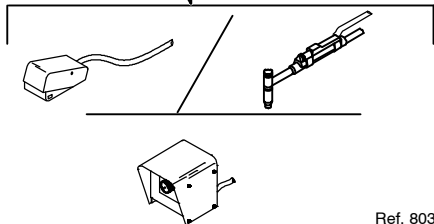




### 3-10. Remote 14 Receptacle Information



Turn off power before connecting to receptacle.





Ref. 803 588-B

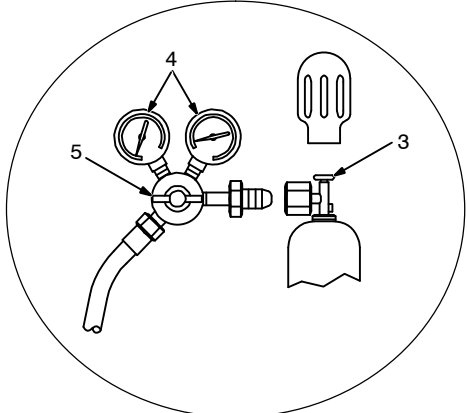
REMOTE 14	Socket*	Socket Information
24 VOLTS DC OUTPUT CONTACTOR	A	Contactator control 24 volts DC.
	B	Contact closure to A completes 24 volts DC contactor control circuit and enables output.
A REMOTE OUTPUT CONTROL	C	Output to remote control; 0 to +10 volts DC output to remote control.
	D	Remote control/feedback circuit common.
	E	0 to +10 volts DC input command signal from remote control.
A/V AMPERAGE VOLTAGE	F	Current feedback; +1 volt DC per 100 amperes.
	H	Voltage feedback; +1 volt DC per 10 volts output.
GND	K	Chassis common.


\*The remaining sockets are not used.

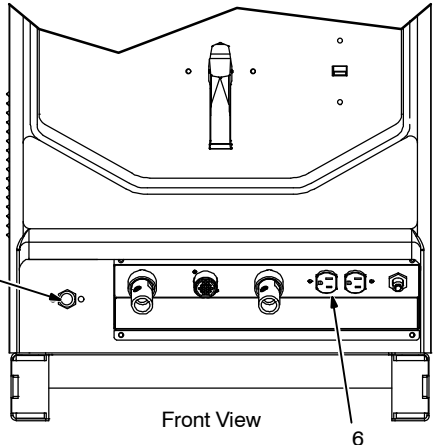
### 3-11. Shielding Gas Connections And 115 Volts AC Duplex Receptacle



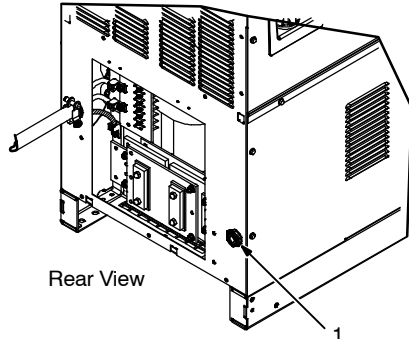
Turn Off power before connecting to receptacle.



Tools Needed:  
 5/8, 3/4, 1-1/8 in.



Front View



Rear View

- 1 Gas Valve In Connection  
Located on rear of unit.
- 2 Gas Valve Out Connection  
Connections have 5/8-18 right-hand threads.
- 3 Cylinder Valve  
Open valve slightly so gas flow blows dirt from valve. Close valve.
- 4 Regulator/Flow Gauge  
Connect regulator/flow gauge to gas cylinder.  
Connect customer supplied gas hose between regulator/flow gauge and gas in fitting.
- 5 Flow Adjust  
Typical flow rate is 20 cfh (cubic feet per hour).
- 6 115 V 15 Amp AC Receptacle  
Receptacle is protected from overload by circuit breaker CB1 (see Section 5-2).

Ref. 803 588-B / Ref. 803 585-B / Ref. 157 858

### 3-12. TIG Connections With A Two-Piece Air-Cooled Torch

**⚠ Turn Off power before making connections.**

- 1 Gas-In Connection**  
Connect gas hose from gas supply to gas-in connection.
- 2 Output Selector Switch (See Section 4-2)**  
Switch is shown in DCEN (direct current electrode negative) position for TIG HF Impulse DCEN welding. For front panel control display, see Section 3-14. For TIG AC welding, place switch in AC position (see Section 4-2). For TIG AC front panel control display, see Section 3-15.
- 3 Work Weld Output Terminal**  
Connect work lead to work weld output terminal.
- 4 Remote 14 Receptacle**  
Connect desired remote control to Remote 14 receptacle (see Section 3-10).
- 5 Electrode Weld Output Terminal**  
Connect TIG torch to electrode weld output terminal.
- 6 Gas-Out Connection**  
Connect torch gas hose to gas-out fitting.

**Tools Needed:**  
 11/16 in., (21 mm)

803 586-C

### 3-13. TIG Connections With A One-Piece Air-Cooled Torch

**⚠ Turn Off power before making connections.**

- 1 Gas-In Connection**  
Connect gas hose from gas supply to gas-in connection.
- 2 Output Selector Switch (See Section 4-2)**  
Switch is shown in DCEN (direct current electrode negative) position for TIG HF Impulse DCEN welding. For front panel control display, see Section 3-14. For TIG AC welding, place switch in AC position (see Section 4-2). For TIG AC front panel control display, see Section 3-15.
- 3 Work Weld Output Terminal**  
Connect work lead to work weld output terminal.
- 4 Remote 14 Receptacle**  
Connect desired remote control to Remote 14 receptacle (see Section 3-10).
- 5 Electrode Weld Output Terminal**  
Connect TIG torch to electrode weld output terminal.
- 6 Gas-Out Connection**  
Connect torch gas hose to gas-out fitting.

**Tools Needed:**  
 11/16 in., (21 mm)

803 615-B



### 3-15. Front Panel Display For TIG AC

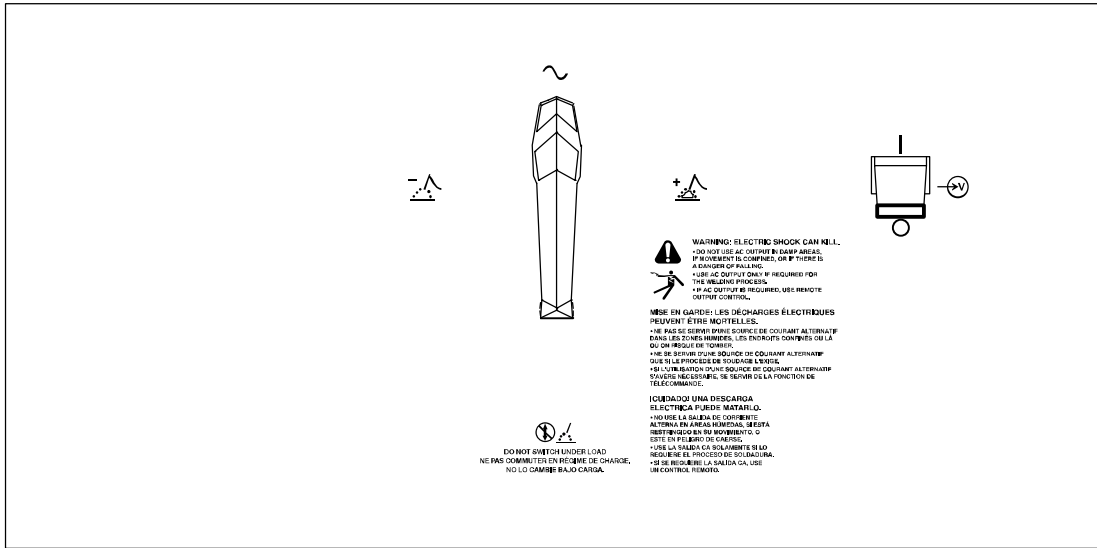
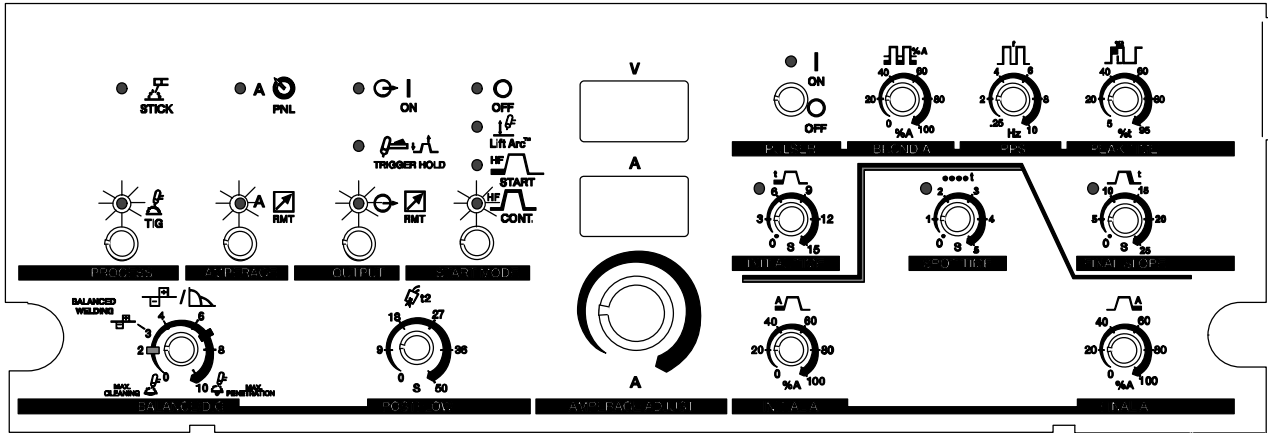


#### 1 Front Panel

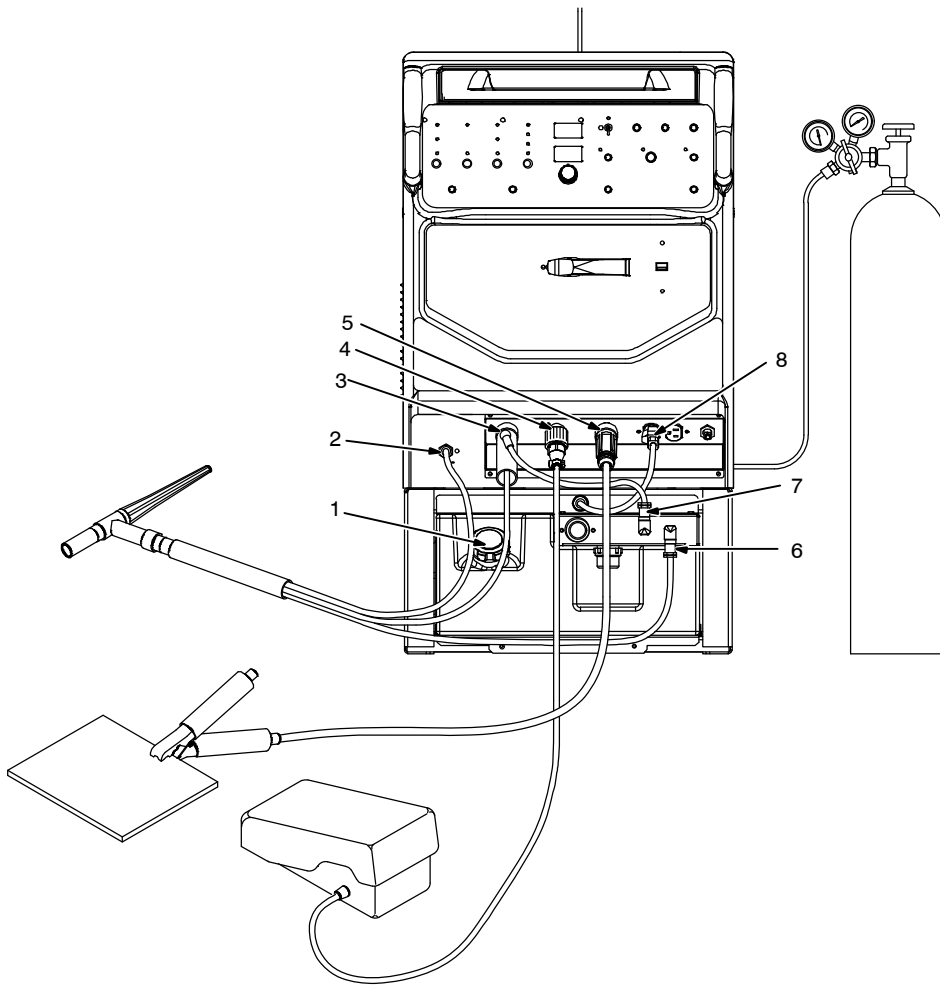
Correct front panel display for basic TIG AC welding.

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

Green on nameplate indicates a TIG function (see Section 4-1 for description of controls).



### 3-16. Optional Cooler Connections



**⚠ Disconnect cooler plug from welding power source receptacle before filling.**

**1 Cap**

Remove cap and fill tank with three gallons of distilled or deionized water for operations above 32°F (0°C), or three gallons of Miller coolant part no. 043 810.

**2 Gas Out Connection**

Connect TIG torch gas hose to gas out fitting.

**3 Electrode Weld Output Terminal**

Connect TIG torch to electrode weld output terminal.

**4 Remote 14 Receptacle**

Connect remote control to receptacle if desired.

**5 Work Weld Output Terminal**

Connect work lead to work weld output terminal.

**6 Water-In (From Torch) Connection**

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

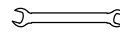
**7 Water-Out (To Torch) Connection**

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

**8 115 VAC Cord**

Connect plug to 115 vac receptacle to provide power to the cooler.

**Tools Needed:**



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

Application	GTAW Or Where HF* Is Used
<p>3-1/2 Gal Coolant</p>	<p>Low Conductivity Coolant No. 043 810**; Distilled Or Deionized Water OK Above 32°F (0°C)</p>

\*HF: High Frequency Current

\*\*Coolant 043 810, a 50/50 solution, protect to -37°F (-38°C) and resist algae growth.

**NOTICE** – Use of any coolant other than those listed in the table voids the warranty on any parts that come in contact with the coolant (pump, radiator, etc.)



### 3-18. Front Panel Display For Stick DCEP (Direct Current Electrode Positive)

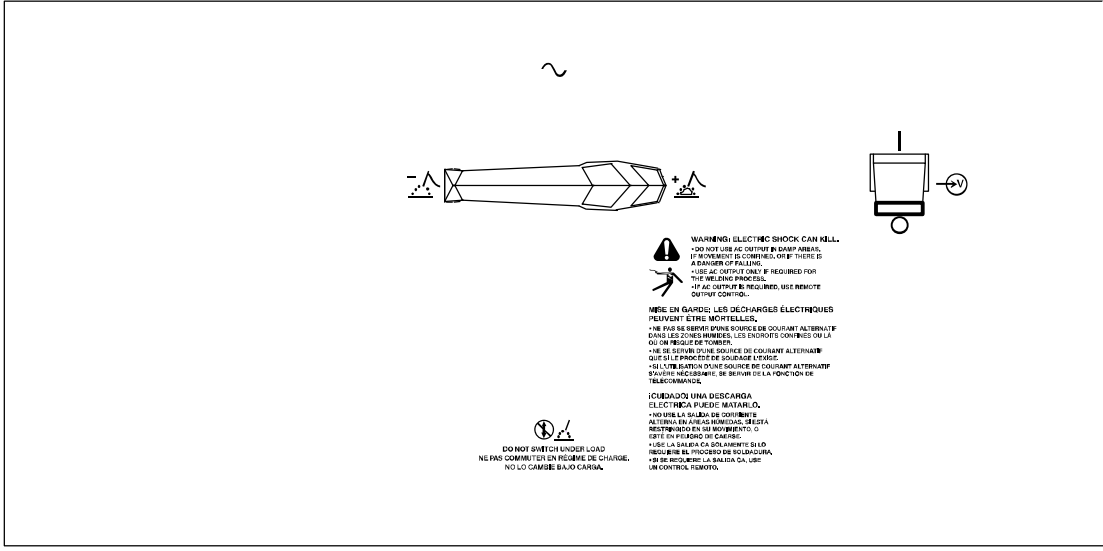
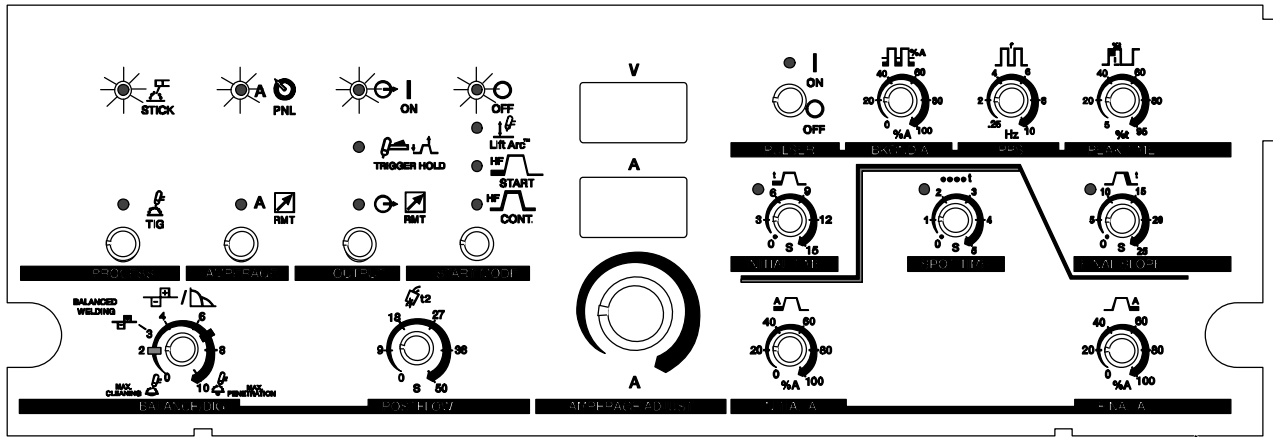


#### 1 Front Panel

Correct front panel display for basic Stick DCEP welding.

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

Gray on nameplate indicates a Stick function (see Section 4-1 for description of controls).





### 3-19. Front Panel Display For Stick AC

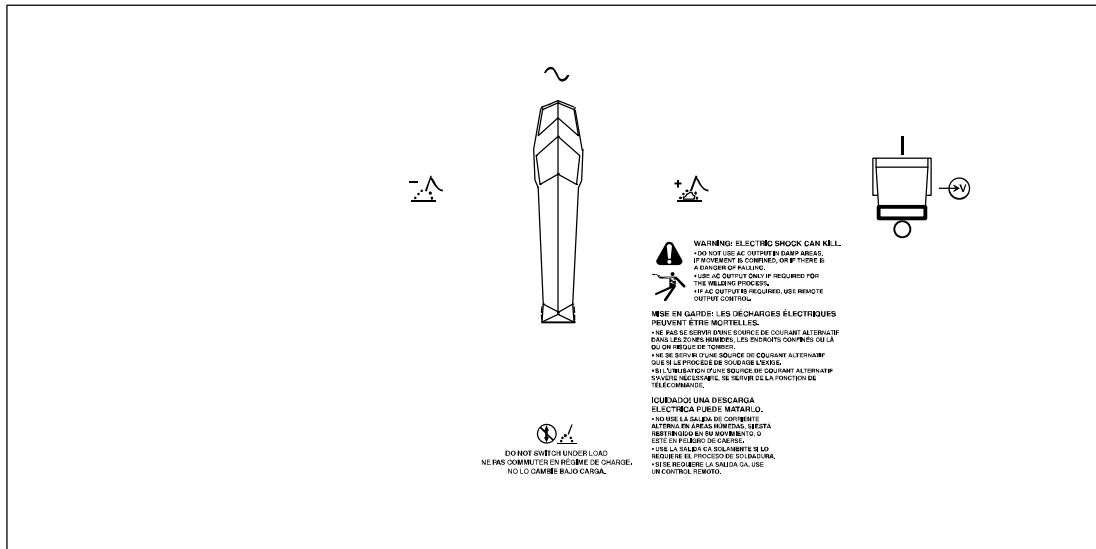
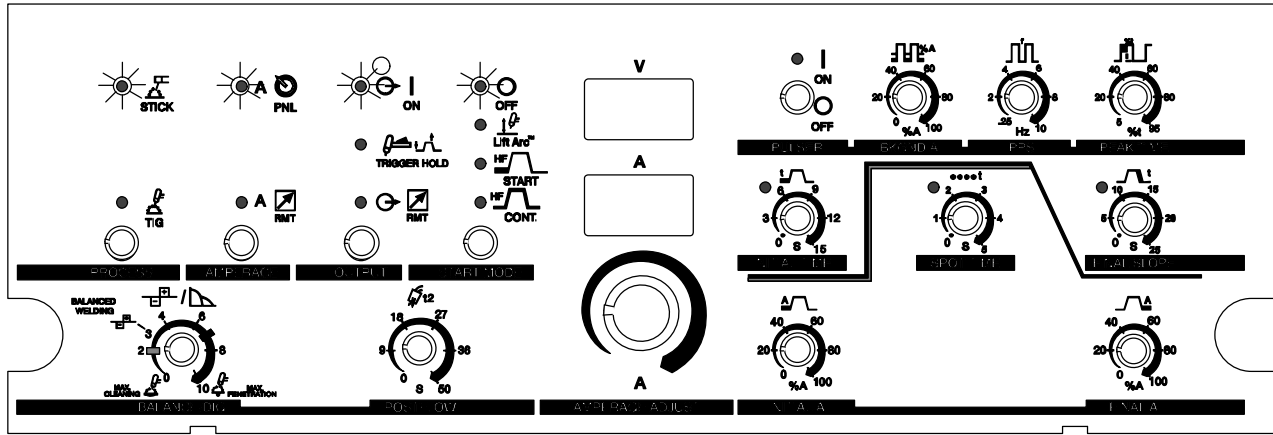


#### 1 Front Panel

Correct front panel display for basic Stick AC welding.

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

Gray on nameplate indicates a Stick function (see Section 4-1 for description of controls).



## 3-20. Electrical Service Guide

### A. For 250 DX Models

☞ Input amperage may be higher than shown in table when Balance Control is in an unbalanced position.

☞ All values in both tables were calculated at 60% duty cycle.

☞ Actual input voltage cannot exceed  $\pm 10\%$  of indicated required input voltage shown in both tables. If actual input voltage is outside of this range, damage to unit may occur.

**⚠ Failure to follow these electrical service guide recommendations could create an electric shock or fire hazard. These recommendations are for a dedicated branch circuit sized for the rated output and duty cycle of the welding power source.**

50/60 Hertz Models	Without Power Factor Correction							
<b>Input Voltage (V)</b>	200	220	230	400	440	460	520	575
<b>Input Amperes (A) At Rated Output</b>	88	82	77	45	41	38	35	31
<b>Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes</b>								
<b>Circuit Breaker <sup>1</sup></b>								
<b>Time-Delay Fuse <sup>2</sup></b>	125	125	125	70	60	60	50	45
<b>Normal Operating (Fast) Fuse <sup>3</sup></b>	125	125	125	70	60	60	50	45
<b>Min Input Conductor Size In AWG<sup>4</sup></b>	4	6	6	8	8	10	10	10
<b>Max Recommended Input Conductor Length In Feet (Meters)</b>	167 (51)	137 (42)	153 (47)	305 (93)	369 (112)	281 (86)	352 (107)	439 (134)
<b>Min Grounding Conductor Size In AWG<sup>4</sup></b>	6	6	6	8	10	10	10	10

Reference: 2008 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 310.16. 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.

**⚠ Failure to follow these electrical service guide recommendations could create an electric shock or fire hazard. These recommendations are for a dedicated branch circuit sized for the rated output and duty cycle of the welding power source.**

50/60 Hertz Models	With Power Factor Correction							
<b>Input Voltage (V)</b>	200	220	230	400	440	460	520	575
<b>Input Amperes (A) At Rated Output</b>	60	61	52	34	31	26	26	21
<b>Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes</b>								
<b>Circuit Breaker <sup>1</sup></b>								
<b>Time-Delay Fuse <sup>2</sup></b>	90	90	80	50	45	40	40	30
<b>Normal Operating (Fast) Fuse <sup>3</sup></b>	90	90	80	50	45	40	40	30
<b>Min Input Conductor Size In AWG<sup>4</sup></b>	8	8	8	10	10	10	10	12
<b>Max Recommended Input Conductor Length In Feet (Meters)</b>	87 (26)	102 (31)	115 (35)	226 (69)	274 (84)	308 (94)	383 (117)	295 (90)
<b>Min Grounding Conductor Size In AWG<sup>4</sup></b>	8	8	8	10	10	10	10	12

Reference: 2008 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 310.16. 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.

## B. For 350 LX Models

☞ Input amperage may be higher than shown in table when Balance Control is in an unbalanced position.

☞ All values in both tables were calculated at 60% duty cycle.

☞ Actual input voltage cannot exceed  $\pm 10\%$  of indicated required input voltage shown in both tables. If actual input voltage is outside of this range, damage to unit may occur.

**⚠ Failure to follow these electrical service guide recommendations could create an electric shock or fire hazard. These recommendations are for a dedicated branch circuit sized for the rated output and duty cycle of the welding power source.**

50/60 Hertz Models	Without Power Factor Correction							
<b>Input Voltage (V)</b>	200	220	230	400	440	460	520	575
<b>Input Amperes (A) At Rated Output</b>	125	103	110	57	52	55	43	42
<b>Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes</b>								
<b>Circuit Breaker <sup>1</sup></b>								
<b>Time-Delay Fuse <sup>2</sup></b>	150	125	125	70	70	60	60	50
<b>Normal Operating (Fast) Fuse <sup>3</sup></b>	175	175	175	90	90	80	70	70
<b>Min Input Conductor Size In AWG<sup>4</sup></b>	3	3	4	8	8	8	8	8
<b>Max Recommended Input Conductor Length In Feet (Meters)</b>	151 (46)	182 (56)	171 (52)	246 (75)	298 (91)	326 (99)	416 (127)	509 (155)
<b>Min Grounding Conductor Size In AWG<sup>4</sup></b>	6	6	6	8	8	8	8	8

Reference: 2008 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 310.16. 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.

**⚠ Failure to follow these electrical service guide recommendations could create an electric shock or fire hazard. These recommendations are for a dedicated branch circuit sized for the rated output and duty cycle of the welding power source.**

50/60 Hertz Models	With Power Factor Correction							
<b>Input Voltage (V)</b>	200	220	230	400	440	460	520	575
<b>Input Amperes (A) At Rated Output</b>	92	77	78	40	39	38	33	31
<b>Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes</b>								
<b>Circuit Breaker <sup>1</sup></b>								
<b>Time-Delay Fuse <sup>2</sup></b>	110	100	90	50	50	45	40	35
<b>Normal Operating (Fast) Fuse <sup>3</sup></b>	125	125	125	70	60	60	50	45
<b>Min Input Conductor Size In AWG<sup>4</sup></b>	4	6	6	8	8	8	10	10
<b>Max Recommended Input Conductor Length In Feet (Meters)</b>	145 (44)	119 (36)	130 (40)	263 (80)	318 (97)	347 (106)	300 (91)	367 (112)
<b>Min Grounding Conductor Size In AWG<sup>4</sup></b>	6	6	6	8	10	10	10	10

Reference: 2008 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).

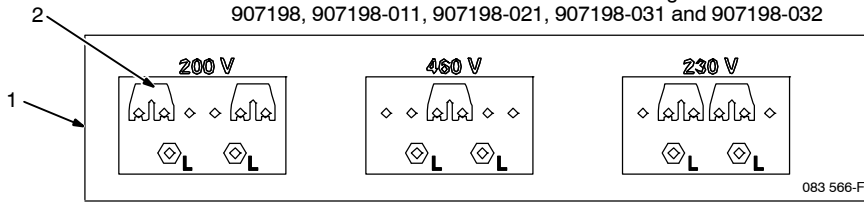
4 Conductor data in this section specifies conductor size (excluding flexible cord or cable) between the panelboard and the equipment per NEC Table 310.16. If a flexible cord or cable is used, minimum conductor size may increase. See NEC Table 400.5(A) for flexible cord and cable requirements.

### 3-21. Placing Jumper Links



Label found on 250 DX models with the following stock numbers:  
907194, 907194-021 907194-031 and, 907194-032

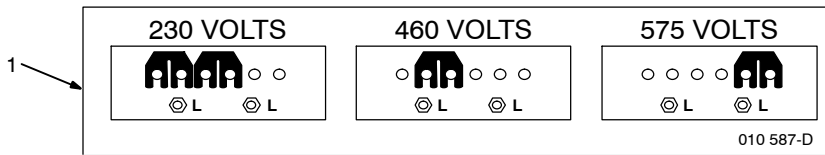
Label found on 350 LX models with the following stock numbers:  
907198, 907198-011, 907198-021, 907198-031 and 907198-032



Or

Label found on 250 DX models with the following stock numbers:  
907195, 907195-021, 907195-031 and, 907195-032

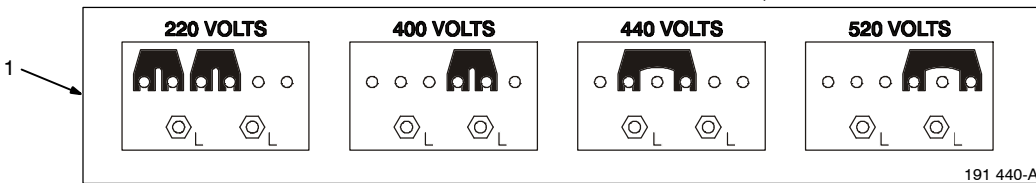
Label found on 350 LX models with the following stock numbers:  
907199, 907199-021, 907199-031 and 907199-032



Or

Label found on 250 DX models with stock number 907408, and 907516

Label found on 350 LX models with stock number 907409, and 907517



**⚠ Disconnect and lockout/tag-out input power before installing or moving jumper links.**

Check input voltage available at site.

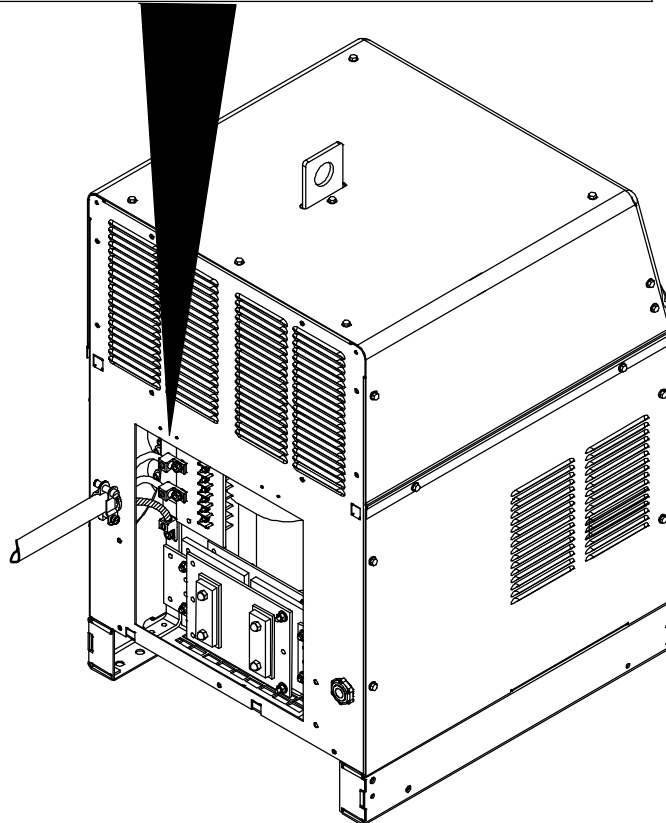
1 Jumper Link Label

Check label – only one label is on unit.

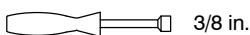
2 Jumper Links

Move jumper links to match input voltage.

Close and secure access door, or go on to Section 3-22.

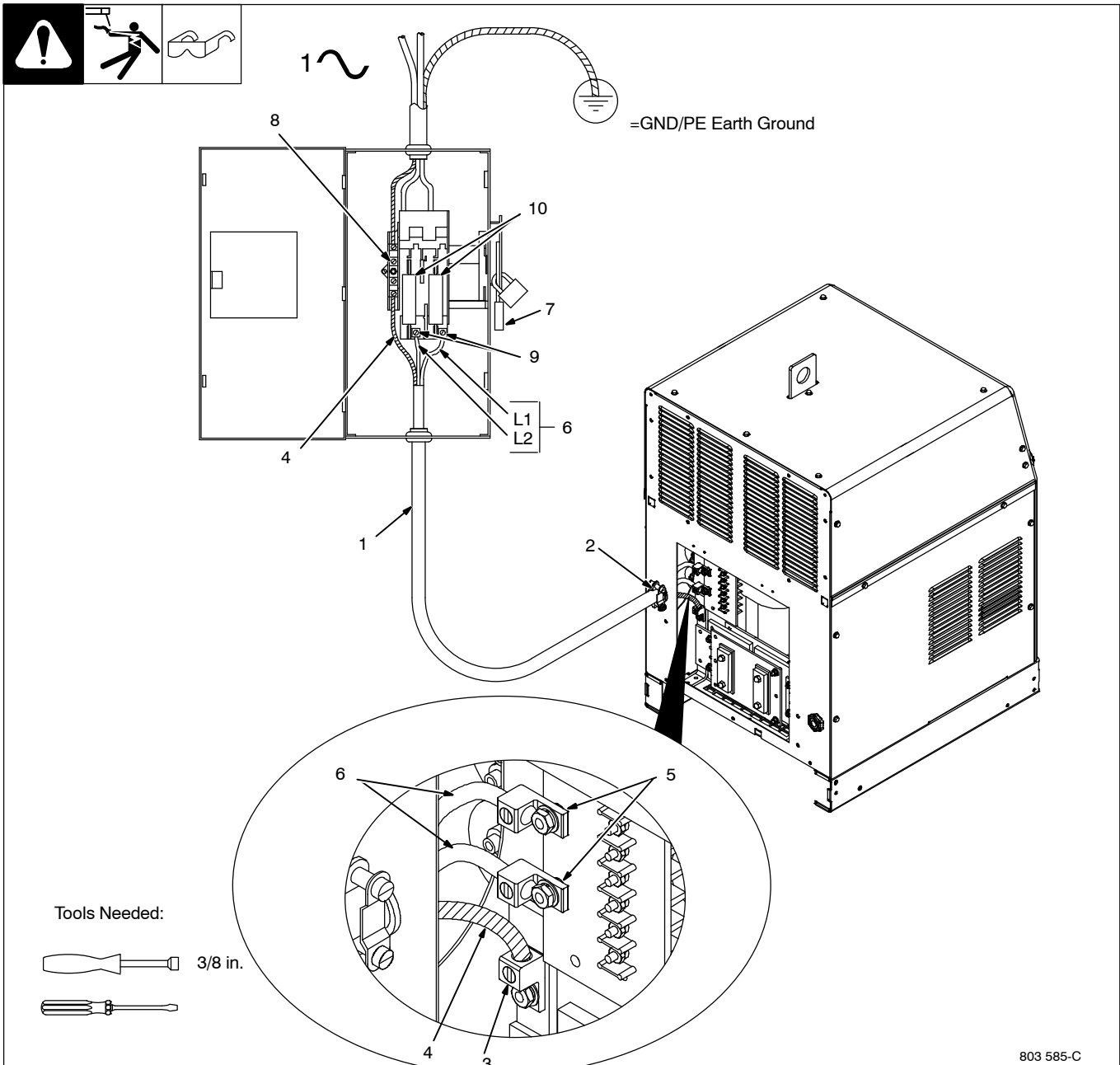


Tools Needed:

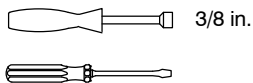


Ref. 803 585-C

### 3-22. Connecting Input Power



Tools Needed:



803 585-C

- ⚠ 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.**
- ⚠ 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.**

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 3-20. 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  
Route conductors (cord) through strain relief and tighten screws.
- 3 Machine Grounding Terminal  
Connect green or green/yellow grounding conductor to welding power source grounding terminal first.
- 4 Green Or Green/Yellow Grounding Conductor
- 5 Welding Power Source Line Terminals
- 6 Input Conductors L1 And L2  
Connect input conductors L1 and L2 to welding power source line terminals.
- Close and secure access door on welding power source.

#### Disconnect Device Input Power Connections

- 7 Disconnect Device (switch shown in OFF position)
- 8 Disconnect Device (Supply) Grounding Terminal  
Connect green or green/yellow grounding conductor to disconnect device grounding terminal first.
- 9 Disconnect Device Line Terminals  
Connect input conductors L1 and L2 to disconnect device line terminals.
- 10 Overcurrent Protection  
Select type and size of overcurrent protection using Section 3-20 (fused disconnect switch shown).  
Close and secure door on line disconnect device. Remove lockout/tagout device, and place switch in the On position.

# SECTION 4 – OPERATION

## 4-1. Controls (350 LX Nameplates Shown)

**Top row of lights in upper left corner are On for SMAW. Bottom row are On for GTAW.**

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

- 1 Process Control  
See Section 4-3.
- 2 Amperage Control  
See Section 4-4.
- 3 Output Control  
See Section 4-5.
- 4 Start Mode Control  
See Section 4-9.
- 5 Voltmeter And Ammeter  
Voltmeter displays average voltage (to the nearest 0.1 V) at the weld output terminals.  
Use meter to preset amperage. Meter displays average weld amperage output of unit to nearest ampere when welding.  
Meters are self-calibrating. No adjustment
- 7 Output Selector Switch  
See Section 4-2.
- 8 Power Switch  
Use switch to turn unit Off and On.
- 9 Postflow Time Control  
Use control to set length of time (0–50 seconds) gas flows after welding stops. It is important to set enough time to allow gas to flow until after the tungsten and weld puddle has cooled down.  
**Application:**  
Postflow is required to cool the tungsten and weld, and to prevent contamination of tungsten and weld. Increase postflow time if tungsten or weld are dark in appearance (approximately 1 second per 10 ampere of welding current).
- 10 Balance/DIG Control  
See Section 4-10.
- 11 Pulsar Controls (Optional on 250 DX model)  
See Section 4-12.
- 12 Sequence Controls (Optional)  
See Section 4-13.

**available.**

**6 Amperage Adjustment Control**  
Use control to adjust amperage, and preset amperage on ammeter. This control may be adjusted while welding.  
**For remote amperage control**, front panel control setting is the maximum amperage available. For example: If front panel control is set to 200 amps, the range of the remote amperage control is 3 to 200 amps for 250 DX models, and 3 to 200 amps for 350 LX models.  
**For pulse welding**, use Amperage Adjust control to select from 3-300 amps of peak amperage for 250 DX models, or 3–400 amps of peak amperage for 350 LX models (see Section 4-12).  
**For spot welding**, use Amperage Adjust control to select from 3-310 amps for 250 DX models, or 3–400 amps for 350 LX models (see Section 4-16).

**8 Power Switch**  
Use switch to turn unit Off and On.

**9 Postflow Time Control**  
Use control to set length of time (0–50 seconds) gas flows after welding stops. It is important to set enough time to allow gas to flow until after the tungsten and weld puddle has cooled down.

**Application:**  
Postflow is required to cool the tungsten and weld, and to prevent contamination of tungsten and weld. Increase postflow time if tungsten or weld are dark in appearance (approximately 1 second per 10 ampere of welding current).

**10 Balance/DIG Control**  
See Section 4-10.

**11 Pulsar Controls (Optional on 250 DX model)**  
See Section 4-12.

**12 Sequence Controls (Optional)**  
See Section 4-13.

**Warnings:**

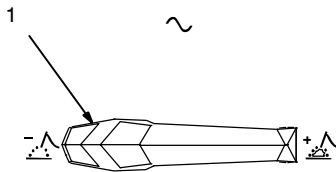
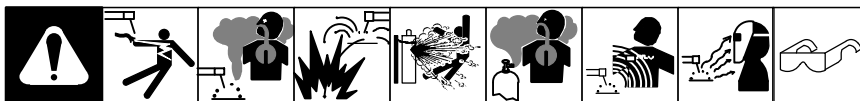
**WARNING: ELECTRIC SHOCK CAN KILL.**  
-NE VERSE EN CONTACT CON PARTES DE MOVIMIENTO O CONTROL SIN ESTAR EN SU POSICIÓN DE CERRADO.  
-NE TOQUE PARTES QUE SE MUEVEN SIN ESTAR EN SU POSICIÓN DE CERRADO.  
-NO TOQUE PARTES QUE SE MUEVEN SIN ESTAR EN SU POSICIÓN DE CERRADO.

**PREVENIR ESTER MORTALES.**  
-NE PUÉS SE SUPERPONGAN PARTES QUE MOVIENTE AL TIEMPO DE SU CERRADO. VERIFICAR SI ESTÁN EN SU POSICIÓN DE CERRADO.  
-NO SE TOQUEN LAS PARTES QUE SE MUEVEN SIN ESTAR EN SU POSICIÓN DE CERRADO.  
-NO SE TOQUEN LAS PARTES QUE SE MUEVEN SIN ESTAR EN SU POSICIÓN DE CERRADO.

**SOBRECARGA UNA DESCARGA ELÉCTRICA PUEDE MORTALIZAR.**  
-NUNQUE LAS PARTES QUE MOVIENTE AL TIEMPO DE SU CERRADO. VERIFICAR SI ESTÁN EN SU POSICIÓN DE CERRADO.  
-NO TOQUE PARTES QUE SE MUEVEN SIN ESTAR EN SU POSICIÓN DE CERRADO.  
-NO TOQUE PARTES QUE SE MUEVEN SIN ESTAR EN SU POSICIÓN DE CERRADO.

**DO NOT SWITCH ON PROFILES.**  
**NE MAS CONECTAR EN FORMA DE CARGA.**  
**NO LO CAMBIE SIN CARGA.**

### 4-2. Output Selector Switch



**WARNING! ELECTRIC SHOCK CAN KILL.**  
 • 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.  
 • AC OUTPUT IS REQUIRED, USE REMOTE OUTPUT CONTROL.

**MISE EN GARDE: LES DÉCHARGES ÉLECTRIQUES PEUVENT ÊTRE MORTELLES.**  
 • NE PAS SE SERVIR D'UNE SOURCE DE COURANT ALTERNATIF DANS LES ZONES HUMIDES, LES ENDROITS CONFINÉS OU LÀ OÙ ON RISQUE DE TOMBER.  
 • NE SE SERVIR D'UNE SOURCE DE COURANT ALTERNATIF QUE SI LE PROCÉDÉ DE SOUDAGE L'exIGE.  
 • UTILISATION D'UNE SOURCE DE COURANT ALTERNATIF SI VÉRIFIÉ NECESSAIRE, SE SERVIR DE LA FONCTION DE TELECOMMANDE.

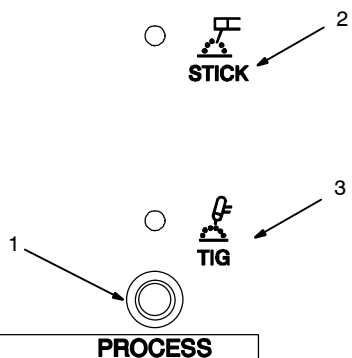
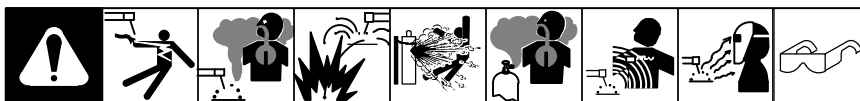
**¡CUIDADO! UNA DESCARGA ELÉCTRICA PUEDE MATARLO.**  
 • NO USE LA SALIDA DE CORRIENTE ALTERNIA EN ÁREAS HÚMEDAS, SI ESTA RESTRICTO EN SU MOVIMIENTO, O SI ESTE ENTORNO DE CAERSE.  
 • USE LA SALIDA CA CORRIENTE SELO REQUIERE EL PROCESO DE SOLDADURA.  
 • SI SE REQUIERE LA SALIDA CA USE UN CONTROL REMOTO.

- 1 Output Selector Switch
- Do not use AC output in damp areas, if movement is confined, or if there is danger of falling. Use AC output ONLY if required for the welding process, and then use a remote control.**
- Do not change position of switch while welding or while under load.**

Use switch to select (DCEN) Direct Current Electrode Negative, AC, or (DCEP) Direct Current Electrode Positive output.

Changing position of Output Selector switch may change Process control, Current control, and Start Mode control, and may require changing Output control settings to properly function with latest Output Selector switch setting.

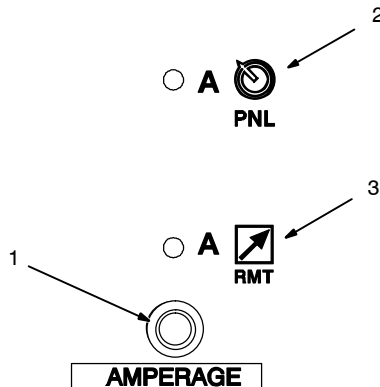
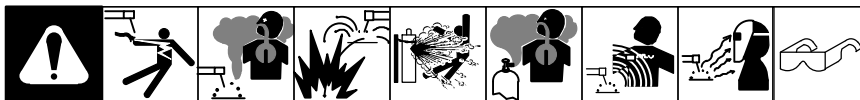
### 4-3. Process Control



- 1 Process Control  
Use control to select Stick or TIG process.
- 2 STICK Process  
For Stick process, press button to toggle LED to Stick position.
- 3 TIG Process  
For TIG process, press button to toggle LED to TIG position.  
Lit LED indicates selected mode.  
When Output Selector switch position changes, LED may change position, based upon last selection.

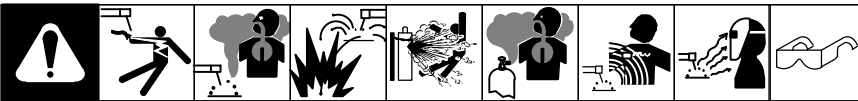
Ref. 217 264-A / Ref. 215 460-A

### 4-4. Amperage Control

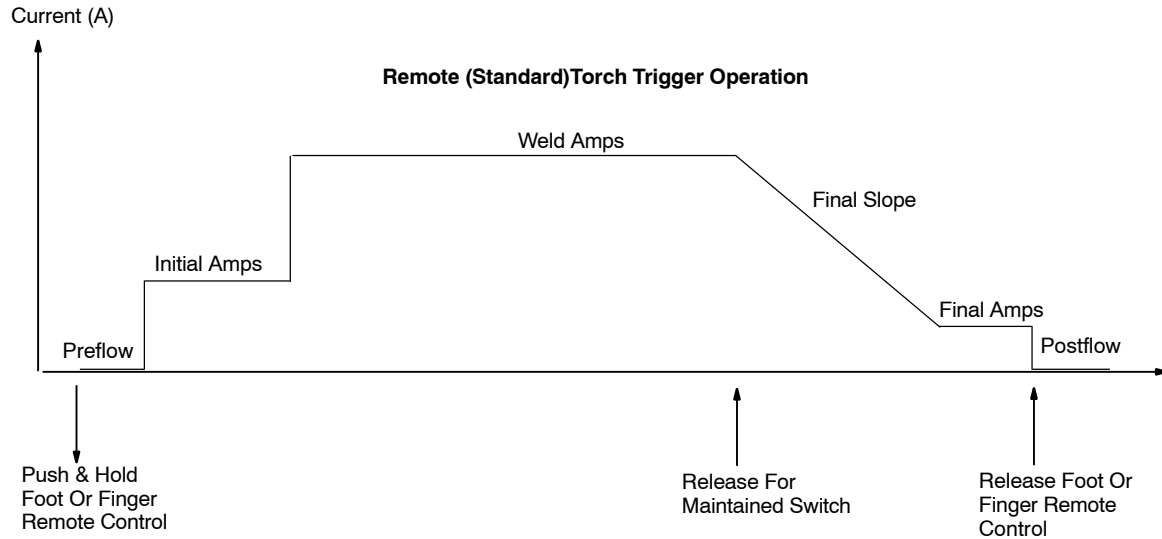
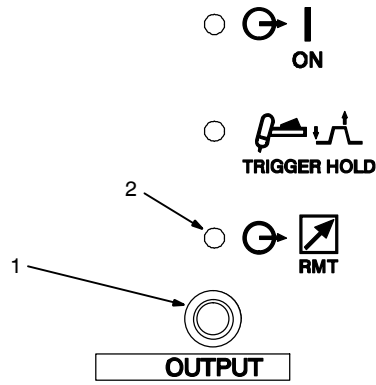


- 1 Amperage Control  
Use control to select front panel or remote amperage control.
- 2 Front Panel Position  
For front panel amperage control, press button to toggle LED to Panel position.
- 3 Remote Amperage Position  
For remote amperage control, press button to toggle LED to Remote position (see Section 3-10).  
Lit LED indicates selected mode.  
When Output Selector switch position changes, LED may change position, based upon last selection.

## 4-5. Output Control



### Remote (Standard) Torch Trigger Operation



#### 1 Output Control

**⚠ Weld output terminals are energized when power is On, and Output On LED is lit.**

Use control to select front panel, trigger hold, or remote output control.

Lit LED indicates selected mode.

For weld output, press button to toggle LED to On position.

#### 2 Remote Trigger (Standard) Operation

For remote output control, press button to toggle LED to Remote position (see Section 3-10).

Torch trigger operation is as shown.

Initial weld amperage and final amperage is controlled by the remote device, not by the welding power source.

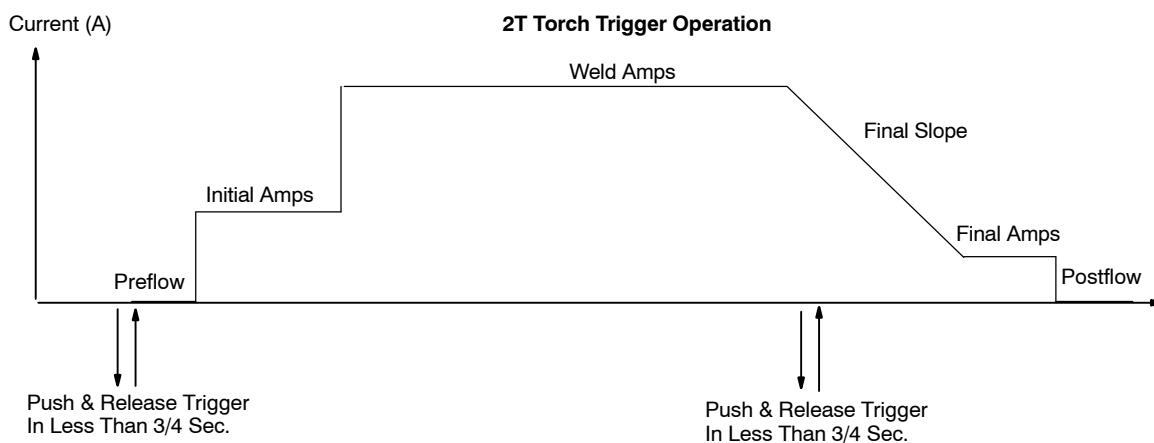
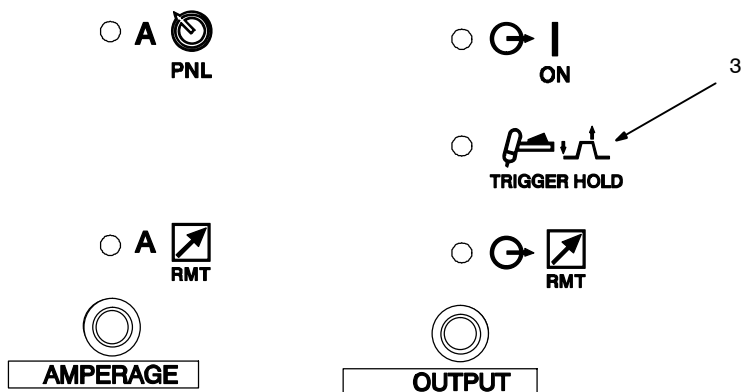
If On/Off only type trigger is used, it must be a maintained switch. All functions become active.

**Application:** Use Remote Trigger when the operator desires to use a foot pedal or finger amperage control.

When Output Selector switch (see Section 4-2) position changes, Output control LED will always switch to Remote.



Trigger Hold (2T)



If torch trigger is held more than 3 seconds, operation reverts to Remote Trigger (Standard) mode (see previous page).  
 If arc is broken and trigger is depressed, HLP-10 will be displayed (see Section 6-1).

3 Trigger Hold

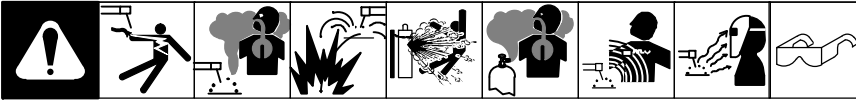
For trigger hold operation, press button to toggle LED to Trigger Hold position. Torch trigger operation is as shown.

When a foot or finger remote control is connected to the welding power source, only trigger input is functional, as amperage is controlled by the welding power

source.

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

## 4-6. 4T, 4T Momentary, And Mini Logic Trigger Operation (Requires Optional Sequence Controls)



### 4T Torch Trigger Operation

If unit is equipped with optional Sequence Controls (see Section 4-13), 4T trigger method is available.

4T torch trigger operation is as shown.

While in 4T mode, there is a feature available during the main weld sequence that al-

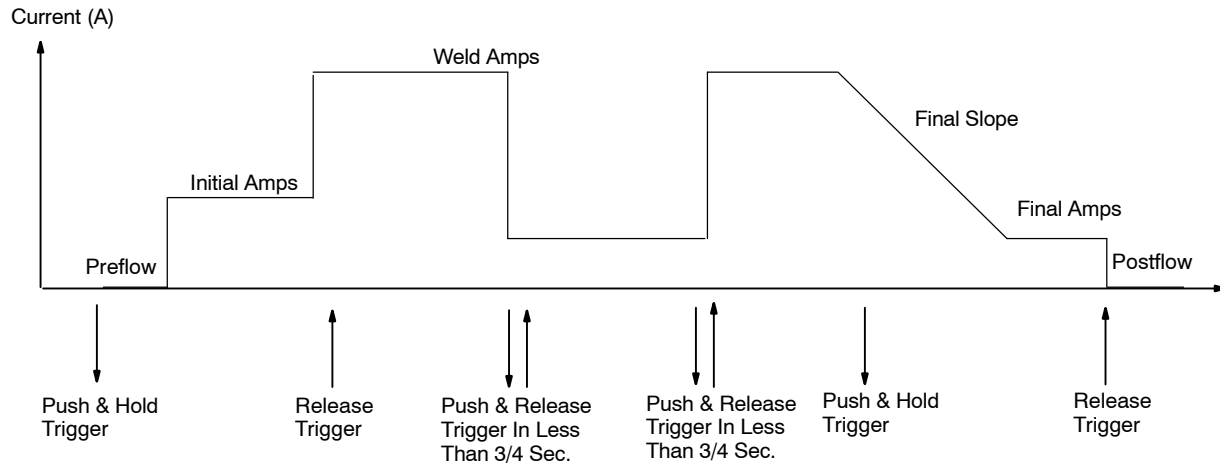
lows the operator to toggle between weld current and final current without breaking the arc.

When a remote switch is connected to the welding power source, only trigger input is functional. Amperage is controlled by the welding power source.

#### Application:

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

Select 4T trigger method according to Section 4-7.



### 4T Momentary Torch Trigger Operation

If unit is equipped with optional Sequence Controls (see Section 4-13), 4T Momentary trigger method is available.

4T Momentary torch trigger operation is as shown.

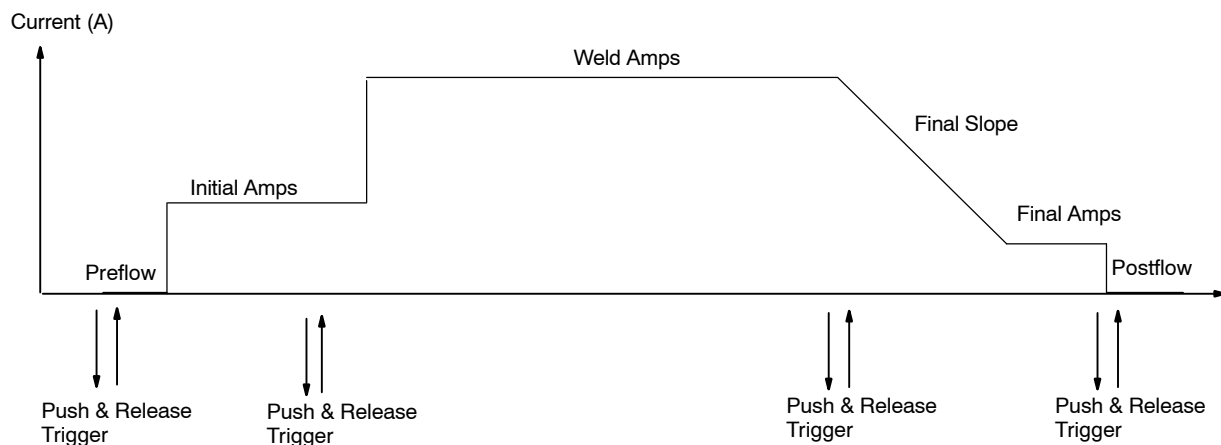
While in 4T Momentary mode, once the operator toggles out of weld current and begins final slope, toggling again will break the arc and go to postflow.

When a remote switch is connected to the welding power source, only trigger input is functional. Amperage is controlled by the welding power source.

#### Application:

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

Select 4T Momentary trigger method according to Section 4-7.



### Mini Logic Operation

If unit is equipped with optional Sequence Controls (see Section 4-13), Mini Logic operation is available.

Torch trigger operation is as shown.

During Mini Logic welding operation, the weld amperage can be manually changed

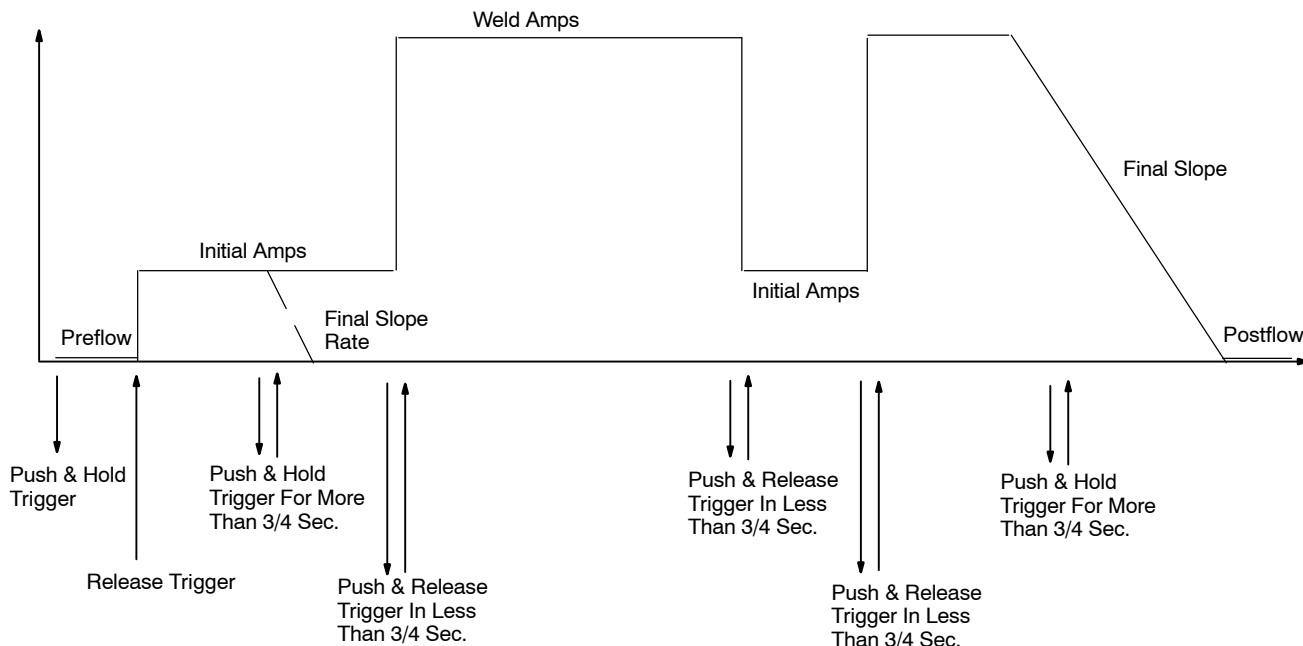
from the initial amps level to the main weld amps level by pressing and releasing the torch trigger in less than 3/4 seconds.

When a remote switch is connected to the welding power source, only trigger input is functional. Amperage is controlled by the

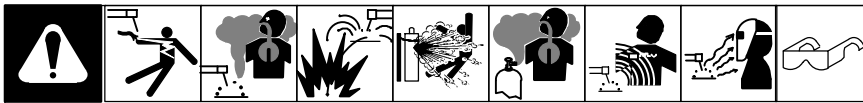
welding power source.

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

Select Mini Logic according to Section 4-7.



## 4-7. Reconfiguring Trigger Hold For 4T And Mini Logic Control



- 1 Output Control
- 2 Power Switch

To reconfigure Trigger Hold, turn Off power, push and hold Output control button and turn On power switch. Hold button for approximately 7 seconds (or until software version number \_\_\_\_\_ - clears, and meters display [SEL] [H-2].

Press Output control button to change functions. Active function will be displayed on amperage (bottom) meter.

- 3 Meter Displays

Meter displays for the different functions will be as shown.

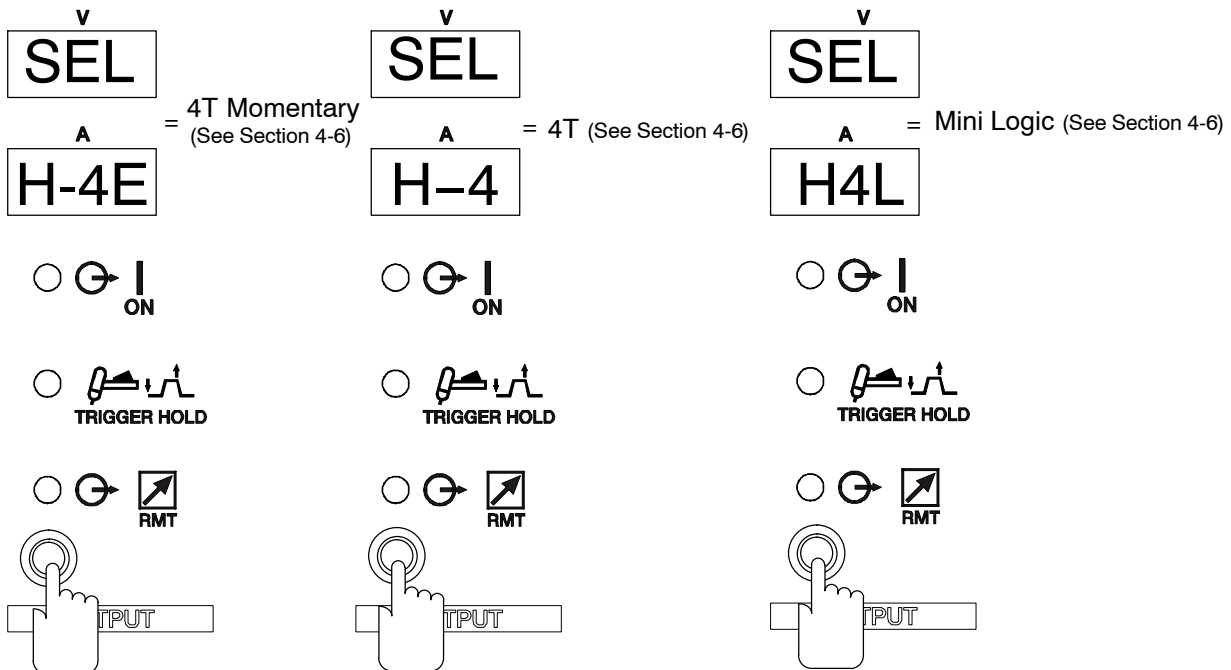
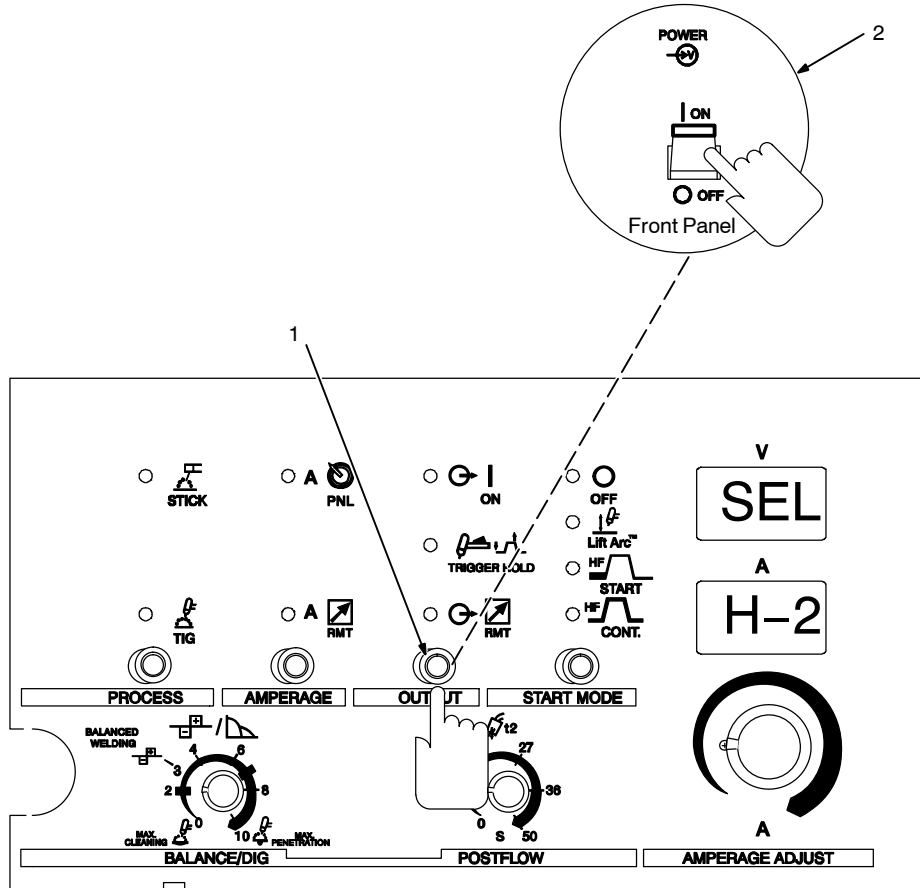
Press torch trigger or turn power Off to save setting.

Proceed to Section 4-6 for 4T Operation.

Proceed to Section 4-6 for Mini Logic operation.

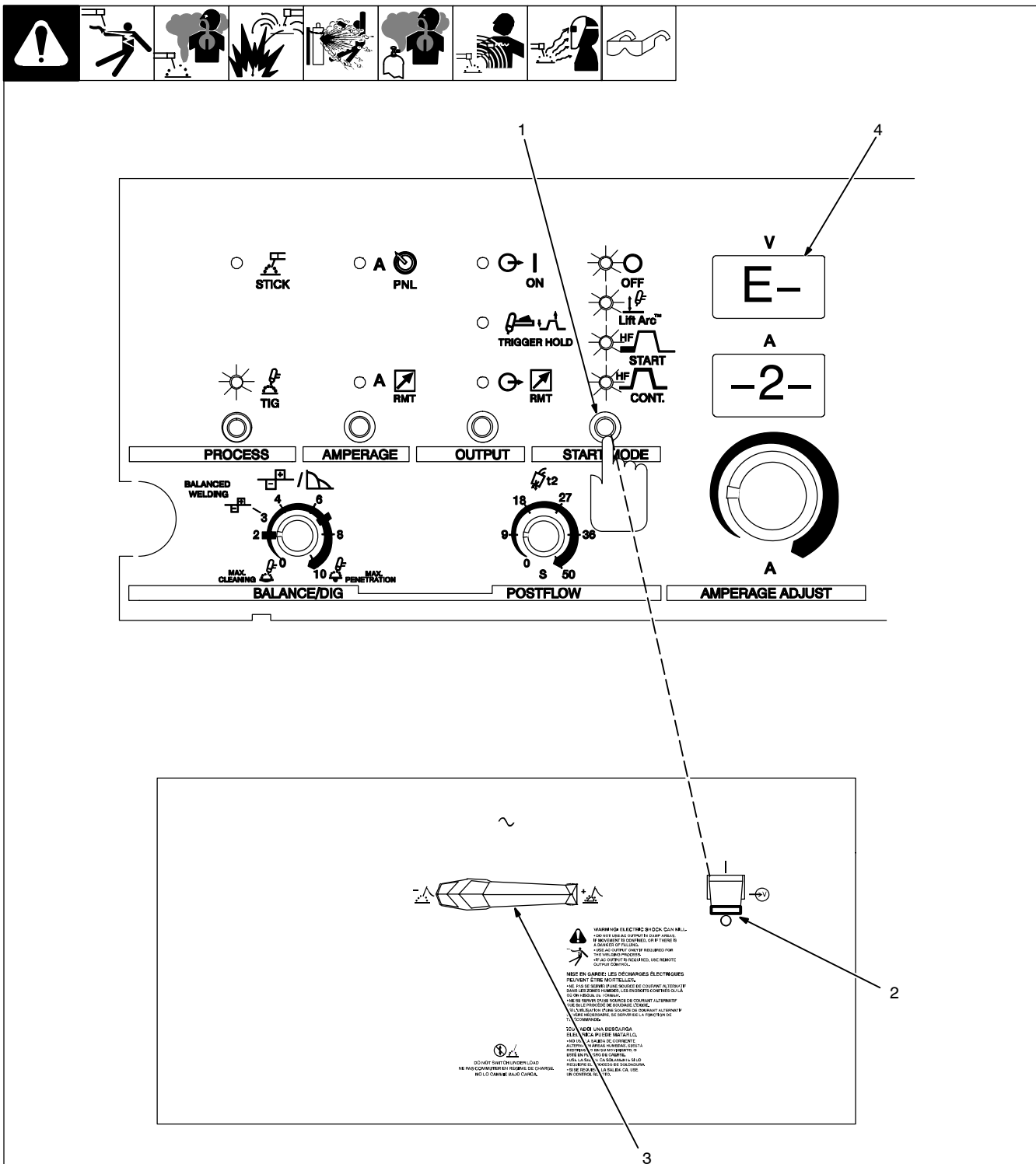
Proceed to Section 4-6 for 4T Momentary operation.

These features are only available when optional Sequencer is installed.



3

### 4-8. Selecting TIG Starting Characteristics Using Syncro-Start™ Technology



Use this function to select desired TIG starting characteristics.

- 1 Start Mode
- 2 Power Switch
- 3 Output Selector Switch
- 4 Meters

To select or change TIG starting characteristics, proceed as follows: turn Off power. Place Output Selector switch in desired position (each position, DCEN, AC, or DCEP has three applicable start characteristics options). Push and hold Start Mode

button and turn On power. Hold button for approximately 7 seconds (or until software version number \_\_\_\_\_ clears meters).

The TIG LED and all four Start LEDs will light, and the meters will display [E-] [-2-], [AC] [-2-], or [EP] [-2-], depending on position of Polarity switch.

Press Start Mode button again to step through the three start characteristics choices. Amperage (bottom) meter displays active choice 1= light start, 2=medium/normal start, 3=high/hot start.

Press torch trigger or turn Off power to save setting.

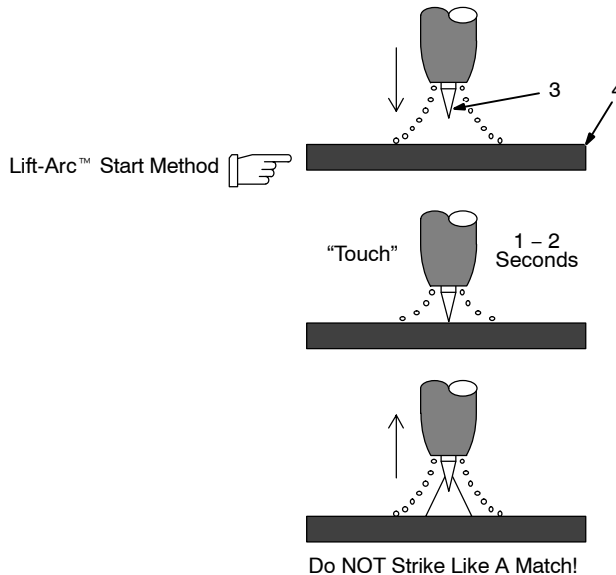
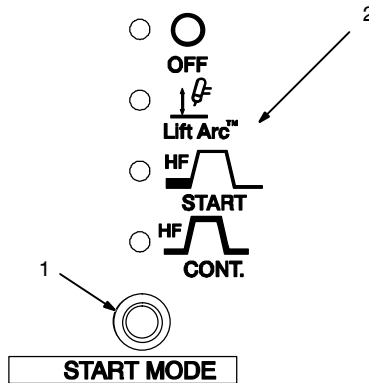
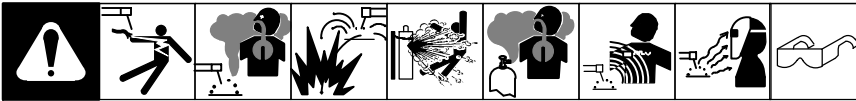
**Application:**

**Select 1** (light/soft start) – when welding at low amperages on thin gauge material.

**Select 2** (medium/normal start) – factory default setting used for most welding applications.

**Select 3** (high/hot start) – when welding at high amperages on thick materials with a large diameter tungsten.

## 4-9. Start Mode



- 1 Start Mode
- 2 OFF Position

For SMAW welding, press button to toggle LED to Off position.

For GTAW welding, use control to select Off for no HF, Lift-Arc™, HF for arc starting only, or continuous HF.

### Application:

When Off is selected, use the scratch method to start an arc for both the SMAW and GTAW processes.

**When Lift-Arc is selected, start arc as follows:**

- 3 TIG Electrode
- 4 Workpiece

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

**onds**, and slowly lift electrode. An arc will form when electrode is lifted.

Shielding gas begins to flow when electrode touches work piece.

Normal open-circuit voltage is not present before tungsten electrode touches workpiece, only a low sensing voltage is present between electrode and workpiece. The solid state output contactor does not energize until after electrode is touching workpiece. This allows electrode to touch workpiece without overheating, sticking, or getting contaminated.

### Application:

Lift-Arc is used for the DCEN GTAW process when HF Start method is not permitted, or to replace the scratch method.

**When HF Start is selected, start arc as follows:**

High frequency turns on to help start arc when output is enabled. High frequency

turns off when arc is started, and turns on whenever arc is broken to help restart arc.

### Application:

HF Start is used when the DCEN GTAW process is required.

**When HF Continuous is selected, start arc as follows:**

High frequency turns on when output is energized and remains on for duration of weld.

### Application:

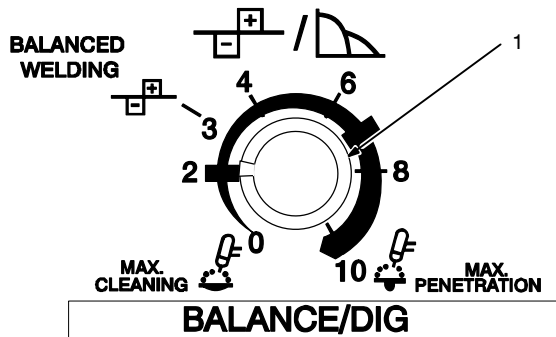
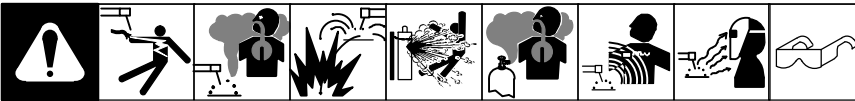
HF Continuous is used when the AC GTAW process is required.

Lit LED indicates selected mode.

When Output Selector switch position changes, LED may change position, based upon last selection.

Some start methods may not be available for all processes.

4-10. Balance/DIG Control



1 Balance/DIG Control

**Balance Control (AC GTAW):**

Control changes the AC output square wave. Rotating the control towards 10 provides deeper penetration. Rotating the control towards 0 provides more cleaning action of the workpiece.

When the control is in the Balanced position, the wave shape provides equal penetration and cleaning action.

**Application:**

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

Set control to 3 and adjust as necessary. Joint configuration, set-up, process variables, and oxide thickness may affect setting.

Arc rectification can occur when welding above 200 amps and/or while welding with helium gas. If this condition occurs, increasing the Balance control towards maximum penetration may help to restabilize the arc.

**DIG Control (AC And DC SMAW):**

When set at 0, short-circuit amperage at low arc voltage is the same as normal welding amperage.

When setting is increased, short-circuit amperage at low arc voltage increases. Set control at 2 and adjust as necessary. Joint configuration, set-up, and process variables may affect setting.

**Application:**

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

Balance Control Examples		
Setting	Output Waveforms	Arc
Balanced 3 	50% Electrode Positive 50% Electrode Negative 	
Max Penetration 10 	32% Electrode Positive 68% Electrode Negative 	
Max Cleaning 0 	55% Electrode Positive 45% Electrode Negative 	

## 4-11. Preflow Time Control

Use control to set length of time (0.2, 0.4, 0.6, 0.8, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 seconds) gas flows before welding starts.

1 Process Control  
2 Power Switch  
3 Meters  
To change preflow time, proceed as follows:

Turn power off. Push and hold Process Control button and turn On power. Hold button for approximately 7 seconds (or until software version number \_\_\_\_\_ - \_\_\_\_\_ clears meters).

4 TIG LED  
The TIG LED will light and the meters will display [0.4] [SEL]. The factory preflow default setting is 0.4 seconds. To change preflow

time, press and release Process Control button until desired time is displayed on meters.

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

**WARNING: ELECTRIC SHOCK CAN KILL.**  
-NEVER USE AC OUTPUTS TO SHAP METALS.  
-BE AWARE OF CONTACTS, OPEN TERMINALS AND ELECTRICAL CONNECTIONS.  
-USE PROTECTIVE GEAR AS REQUIRED FOR YOUR APPLICATION.  
-DO NOT TOUCH ELECTRICAL PARTS WHILE THE POWER IS ON.

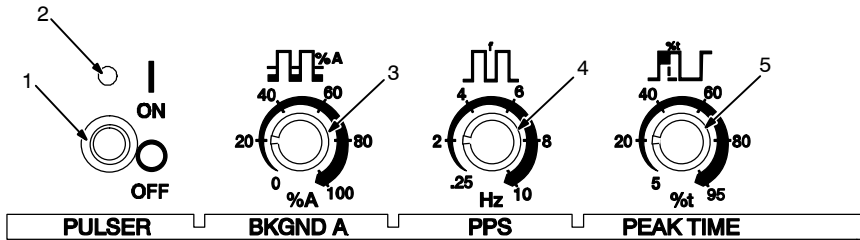
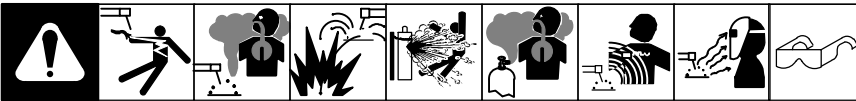
**NEVE EN CAS DE DÉCHARGES ÉLECTRIQUES PEUVENT ÊTRE MORTELLES.**  
-NE JAMAIS SE SERVIR DES SORTIES DE COURANT ALTERNATIF DANS LES CAS D'USAGES NON PRÉVUS.  
-ÊTRE PRÉCAUTIONNEUX EN TOUTES LES SITUATIONS.  
-NE PAS TOUCHER LES PARTIES ÉLECTRIQUES LORSQUE LE SYSTÈME EST ALLUMÉ.  
-NE PAS TOUCHER LES PARTIES ÉLECTRIQUES LORSQUE LE SYSTÈME EST ALLUMÉ.  
-NE PAS TOUCHER LES PARTIES ÉLECTRIQUES LORSQUE LE SYSTÈME EST ALLUMÉ.

**DO NOT SWITCH UNDER LOAD**  
NE PAS COMMUTER EN RÉGIME DE CHARGES.  
NUNCA CAMBIE BLAN CARGA.

**DESCARGAR UNA BATERÍA DE ELECTRICIDAD PUEDEN MATARLO.**  
-NUNCA USAR LA SALIDA DE CORRIENTE ALTERNATIVA PARA USARLA EN OTROS USOS.  
-ESTAR PRECAUCIONADO EN TODAS LAS SITUACIONES.  
-NO TOCAR LAS PARTES ELÉCTRICAS CUANDO EL SISTEMA ESTE ENCENDIDO.  
-NO TOCAR LAS PARTES ELÉCTRICAS CUANDO EL SISTEMA ESTE ENCENDIDO.



## 4-12. Pulse Controls (Standard On 350 LX Models, Optional On 250 DX Models)



### 1 On/Off Control

Use control to turn pulse function On and Off.

### 2 Pulser ON LED

LED is lit when pulser function is enabled.

### 3 Background Amps

Use Background Amps control to set the low pulse of the weld amperage, which cools the weld puddle and affects overall heat input. Background Amps is set as a percentage of peak amperage.

### 4 Pulse Frequency

Ranges from 0.25–10.0 pps (pulses per second). Control is used to determine appearance of weld bead.

### 5 Peak Time

A range of 5–95% of each pulse cycle can be spent at the peak amperage level.

Peak amperage (3-310 amps for 250 DX models, and 3–400 amps for 350 LX models), is set with the Amperage Adjustment control (see Section 4-1). Peak amperage is the highest welding amperage allowed to occur in the pulse cycle. Weld penetration varies directly with peak amperage.

### 6 Pulsed Output Waveforms

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

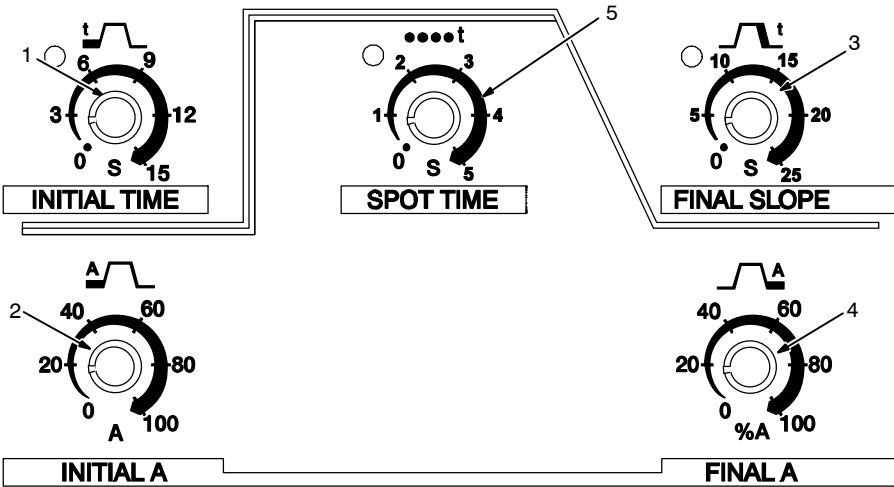
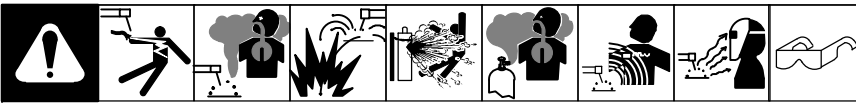
#### Application:

Pulsing refers to the alternating raising and lowering of the weld output at a specific rate. The raised portions of the weld output are controlled in width, height, and frequency, forming pulses of weld output. These pulses and the lower amperage level between them (called the background amperage) alternately heat and cool the molten weld puddle. The combined effect gives the operator better control of penetration, bead width, crowning, undercutting, and heat input. Controls can be adjusted while welding.

Pulsing can also be used for filler material addition technique training.

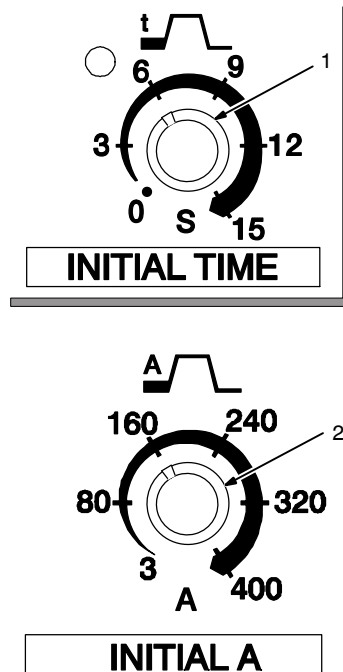
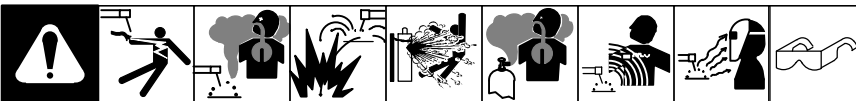
Percent (%) Peak Time Control Setting	Pulsed Output Waveforms
Balanced (50%) 	
More Time At Peak Amperage (80%) 	
More Time At Background Amperage (20%) 	

### 4-13. Sequence Controls (Optional)



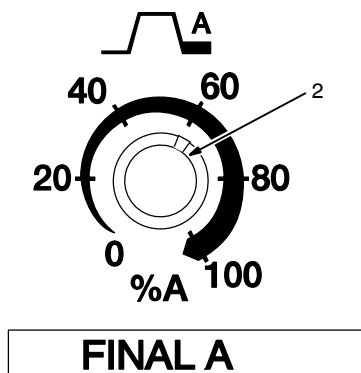
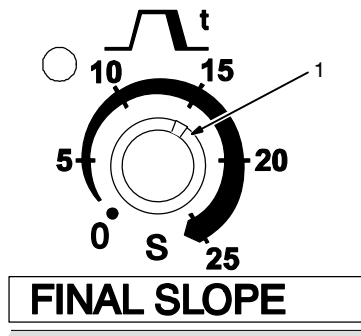
- 1 Initial Time Control  
See Section 4-14.
- 2 Initial Amperage Control  
See Section 4-14.
- 3 Final Slope Control  
See Section 4-15.
- 4 Final Amperage Control  
See Section 4-15.
- 5 Spot Time Control  
See Section 4-16.

### 4-14. Initial Time Control And Initial Amperage Control



- 1 Initial Time Control  
Indicator light is on when Initial Time control function is active.  
  
Initial Sequence control function is inactive when Spot Time function is active.  
  
Use control to select 0–15 seconds of start time.
  - 2 Initial Amperage Control  
Indicator Light is on when Initial Sequence control function is active.  
  
Initial Amperage control function is inactive when Spot Time function is active.  
  
Use control to select a starting amperage (3–400 amps) that is different from the weld amperage. Initial Amperage can be used with or without a remote control (Initial Amperage and Initial Time control settings will override a remote control device).
- Application:**  
Initial Amperage can be used while GTAW welding to assist in preheating cold material prior to depositing filler material, or to ensure a soft start. Initial Amperage can also be used for SMAW to ensure a more consistent arc strike.  
  
Function is enabled, when LED is lit.

### 4-15. Final Slope Control And Final Amperage Control



#### 1 Final Slope Control

Indicator light is on when Final Slope control function is active.

Final Slope control function is inactive when Spot Time function is active.

Use control to reduce amperage over a set period of time (0–15 seconds) at the end of the weld cycle when NOT using a remote current control.

#### 2 Final Amperage Control

Indicator light is on when Final Amperage control function is active.

Final Amperage control function is inactive when Spot Time function is active (see Section 4-16).

Final amperage is the amperage to which weld amperage has sloped down to (0–100% of amperage set on Amperage Adjust control).

#### Application:

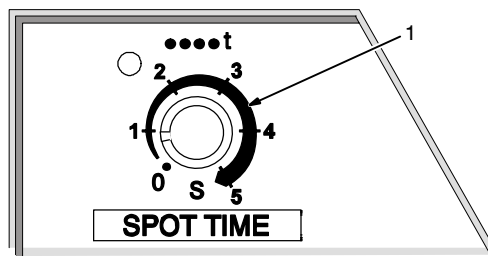
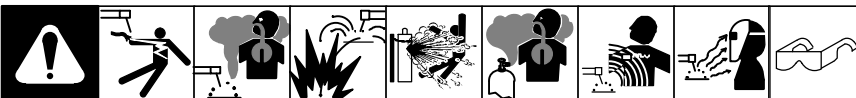
Final Slope should be used while GTAW welding materials that are crack sensitive, and/or the operator wants to eliminate the crater at the end of the weld.

This applies if the operator is using an on/off only type control to start and stop the welding process.

Do not use this function with a foot or finger amperage control.

Function is enabled, when LED is lit.

### 4-16. Spot Time Control



#### 1 Spot Time Control

Indicator light is on when Spot Time function is active. When Spot Time function is active, Initial Time, Initial Amperage, Final Slope, and Final Amperage functions are inactive (see Section 4-13).

Used with the (GTAW) TIG Spot process, generally with a direct current electrode negative (DCEN) set-up.

Use control to select 0–15 seconds of spot time.

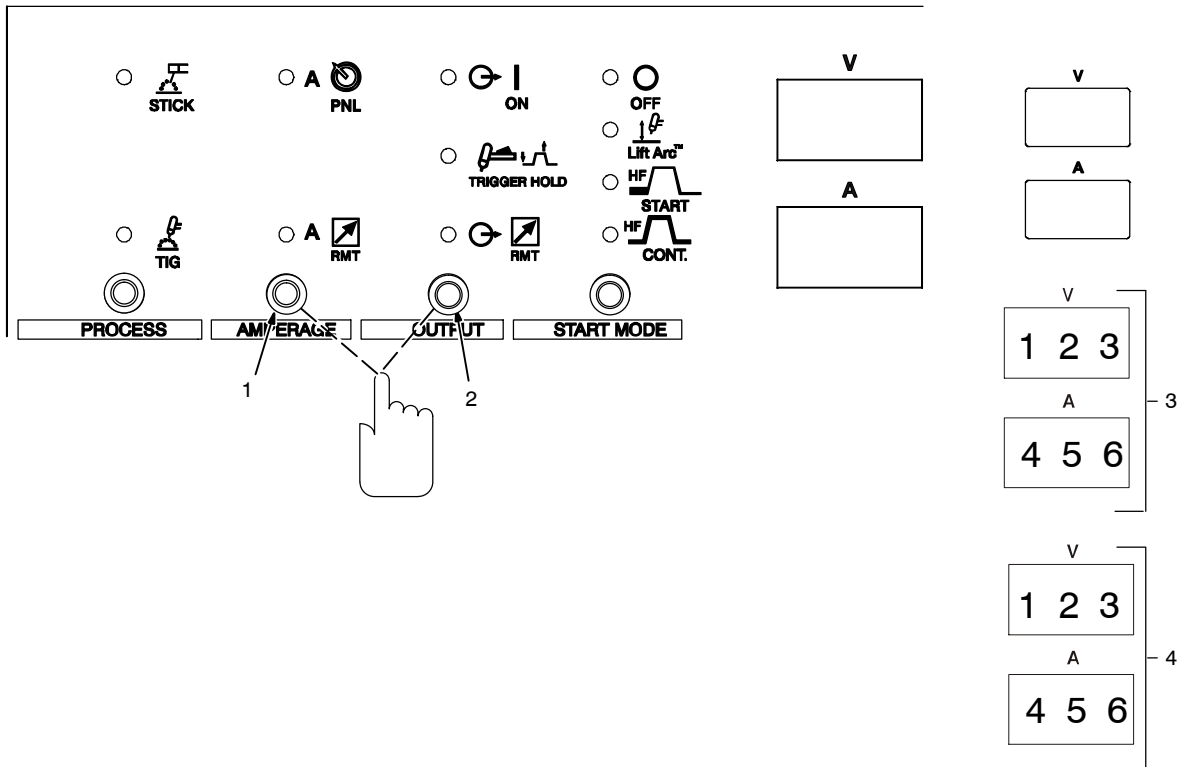
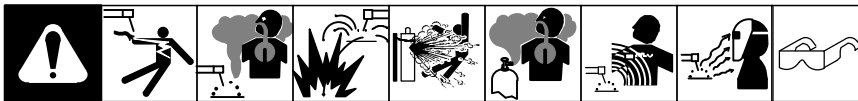
Use Amperage Adjust control (see Section 4-1) to set amperage.

#### Application:

TIG spot welding is used for joining thinner materials that are in close contact with the fusion method. A good example would be joining coil ends.

Function is enabled, when LED is lit.

## 4-17. Timer/Cycle Counter



1 Amperage Control

2 Output Control (Contactor)

To read timer/cycle counter, hold Amperage and Output (contactor) buttons while turning on power. When machine first powers up, the displays will show the

software number and revision for the first seven seconds. It will then show arc time and cycle count.

3 Timer Display

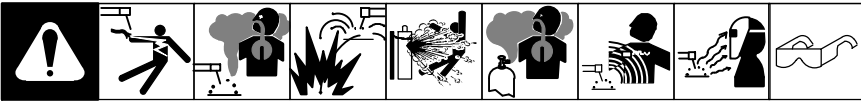
The hours and minutes are displayed on the volt and amp meters for the first five

seconds, and are read as 1, 234 hours and 56 minutes.

4 Cycle Display

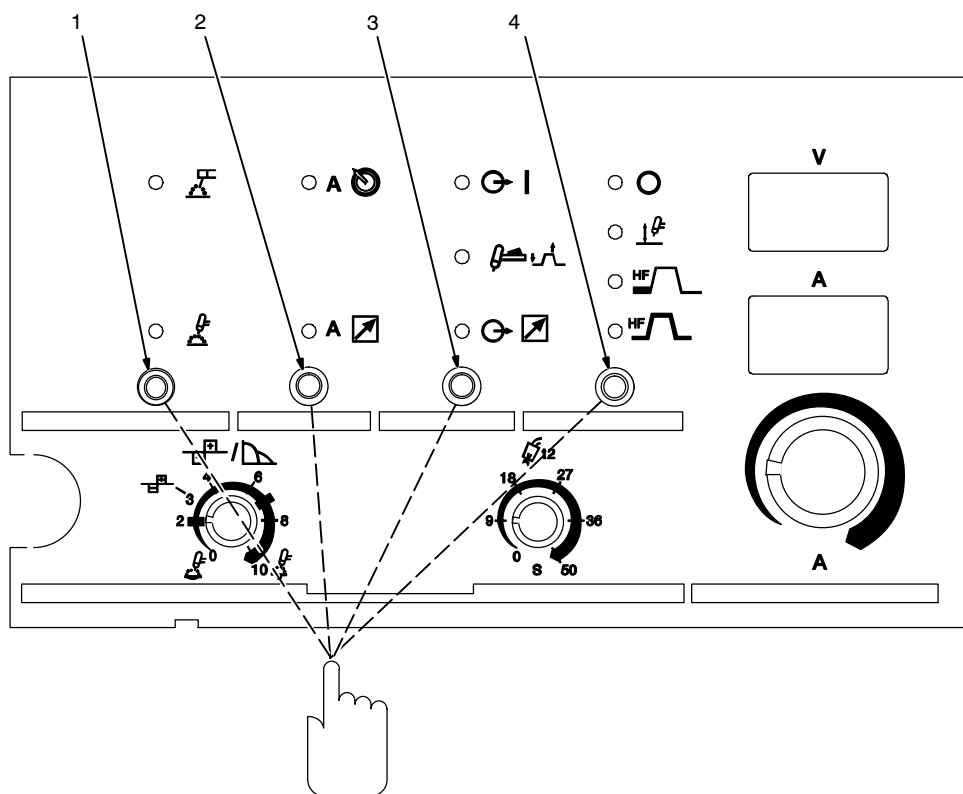
The cycles are displayed on the volt and amp meters for the next five seconds, and are read as 123, 456 cycles.

### 4-18. Resetting Unit To Factory Default Settings (All Models)



- 1 Process Control
- 2 Amperage Control
- 3 Output Control
- 4 Start Control
- 5 Power Switch

To reset all welding power source functions to original factory settings, turn power off. Push and hold the Process, Amperage, Output, and Start controls and turn On power. Hold switch pads for approximately 7 seconds (or until software version number \_\_\_\_\_ clears meters).



**WARNING: ELECTRIC SHOCK CAN KILL.**  
 • DO NOT USE AN OUTPUT DEPART ANGLE.  
 • ALWAYS WEAR PROTECTIVE GEAR.  
 • USE AN OUTPUT ONLY IF REQUIRED FOR THE WELDING PROCESS.  
 • IF AN OUTPUT IS REQUIRED, USE REMOTE CONTROL SYSTEMS.

**MISE EN GARDE: LES DÉCHARGES ÉLECTRIQUES PEUVENT ÊTRE MORTELLES.**  
 • NE PAS SE DÉPLACER D'UNE SOURCE DE COURANT ALTERNATIF DURANT LES OPÉRATIONS. LES ÉLECTRICIENS FORMÉS LE SONT. NE PAS TOUCHER LES ÉLÉMENTS.  
 • NE SE SERVIR D'UNE SOURCE DE COURANT ALTERNATIF QUE SELON LE PROCÉDÉ DE SOUDAGE PRÉVU.  
 • SI UN SORTIE EST REQUISE, UTILISER UN SYSTÈME DE CONTRÔLE À DISTANCE.

**DISCUARDIR EN LA DESCARGA ELÉCTRICA PUEDEN MATAR.**  
 • NO MUEVA LA MANO AL CORRIENTE ALTERNATIVO DURANTE EL PROCESO DE SOLDADURA. LOS ELECTRICISTAS FORMADOS SABEN QUE NO TOQUEN LAS PARTES.  
 • SOLO USAR UNA FUENTE DE CORRIENTE ALTERNATIVO SI EL PROCESO DE SOLDADURA LO REQUIERE.

**DO NOT SWITCH UNDER LOAD.**  
 NE PAS CONVERTIR UN RÉGIME DE CHARGE EN UN CONTRÔLE SANS CHARGE.

5

# SECTION 5 – MAINTENANCE

## 5-1. Routine Welding Power Source Maintenance

				<p><b>⚠ Disconnect power before maintaining.</b></p> <p> <i>Maintain more often during severe conditions.</i></p>
	<p>✓ = Check      ◇ = Change      ● = Clean      Δ = Repair      ☆ = Replace</p> <p>* To be done by Factory Authorized Service Agent</p>			
Every 3 Months	 ✓ ☆ Labels	 ✓ ☆ Gas Hoses	 ● Weld Terminals	
Every 3 Months	 ✓ Δ ☆ Cables And Cords			
Every 6 Months	 ● Durning heavy service, clean monthly.	 * Adjust or clean spark gap	 0.008 (0.203 mm)	

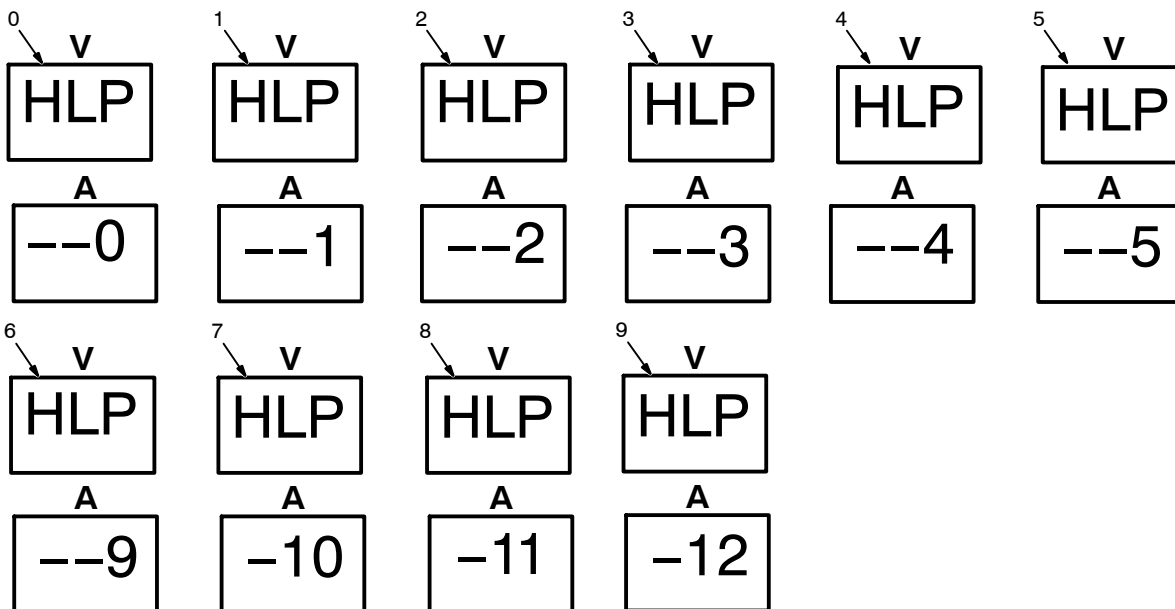
## 5-2. Supplementary Protector CB1


		<p><b>⚠ Turn off power before resetting breaker.</b></p> <p>1 Supplementary Protector CB1</p> <p>If CB1 opens, high frequency and output to the 115 volts AC duplex receptacle stop. Press button to reset CB1.</p>



# SECTION 6 – TROUBLESHOOTING

## 6-1. Voltmeter/Ammeter Help Displays



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

### 0 Help 0 Display

Indicates a short in the thermal protection circuitry located on the transformer/stabilizer of the unit.

### 1 Help 1 Display

An SCR overcurrent or undercurrent condition has occurred. Turn power off and back on to correct condition.

### 2 Help 2 Display

Indicates an open in the thermal protection circuitry located on the transformer/stabilizer of the unit.

### 3 Help 3 Display

Indicates the transformer/stabilizer of the unit has overheated. The unit has shut down to allow the fan to cool it (see Section 3-7). Operation will continue when the unit has cooled.

### 4 Help 4 Display

Indicates an open in the thermal protection circuitry located on the rectifier assembly of the unit.

### 5 Help 5 Display

Rectifier assembly has overheated. The unit has shut down to allow the fan to cool unit (see Section 3-7). Operation will continue when the unit has cooled.

### 6 Help 9 Display

Indicates a short in the thermal protection circuitry located on the rectifier assembly of the unit.

### 7 Help 10 Display

Indicates Remote Output control is activated. Release Remote Output control to clear help message.

### 8 Help 11 Display

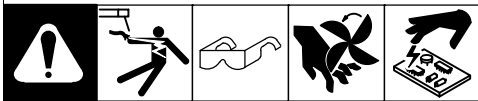
Output Selector switch is not in correct position (see Section 4-2).

### 9 Help 12 Display

Indicates a non-allowable set-up of the front panel.



## 6-2. Troubleshooting The Welding Power Source



**NOTICE** – The remedies listed below are recommendations only. If these remedies do not fix the trouble with your unit, have a Factory Authorized Service Agent check unit. **There are no user serviceable parts inside unit.**

Refer to Section 6-1 for any Help (HLP) message displayed on voltmeter/ammeter.

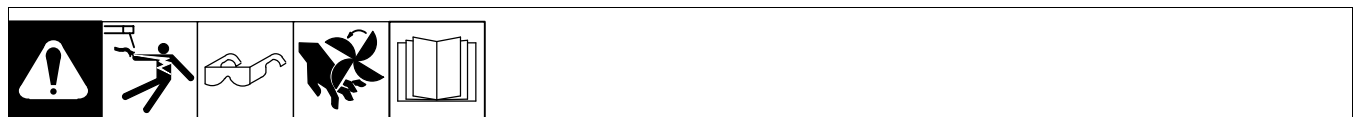
Trouble	Remedy
No weld output; unit completely inoperative.	Place line disconnect switch in On position (see Section 3-22).
	Check and replace line fuse(s), if necessary (see Section 3-22).
	Check for proper input power connections (see Section 3-22).
	Check for proper jumper link position (see Section 3-21).
No weld output; unit on.	If using remote control, place Output control in Remote 14 position, and make sure remote control is connected to Remote 14 receptacle. If remote is not being used, place Output control in On position (see Section 4-1).
	Check, repair, or replace remote control.
	Have Factory Authorized Service Agent check unit.
Unit provides only maximum or minimum weld output.	Make sure Amperage control is in proper position (see Section 4-1).
	Have Factory Authorized Service Agent check unit.
Erratic or improper weld output.	Use proper size and type of weld cable (see Section 3-9).
	Clean and tighten all weld connections.
	Check position of Output Selector control (see Section Figure 4-1).
	If using remote control, check position of Amperage Adjustment control (see Section 4-1).
No control of weld output.	If using remote control, place Output control in Remote 14 position, and make sure remote control is connected to Remote 14 receptacle. If remote is not being used, place Output control in On position (see Section 4-1).
	Make sure Amperage control is in proper position (see Section 4-1).
No output from duplex receptacle RC2 and no high frequency.	Reset circuit breaker CB1 (see Section 5-2).
Lack of high frequency; difficulty in starting GTAW arc.	Reset circuit breaker CB1 (see Section 5-2).
	Select proper size tungsten (see Section 9).
	Be sure torch cable is not close to any grounded metal.
	Check cables and torch for cracked insulation or bad connections. Repair or replace.
	Check spark gaps (see Section 5-3).
Wandering arc – poor control of direction of arc.	Reduce gas flow rate.
	Select proper size tungsten (see Section 9).
	Properly prepare tungsten (see Section 9).
Tungsten electrode oxidizing and not remaining bright after conclusion of weld.	Shield weld zone from drafts.
	Increase postflow time.
	Check and tighten all gas fittings.
	Properly prepare tungsten.
	Check for water in torch, and repair torch if necessary.
Fan not operating.	Unit equipped with Fan-On-Demand™. Fans run only when necessary. Unit equipped with circuitry to protect against overheating.

### 6-3. Routine Maintenance For Optional Cooler



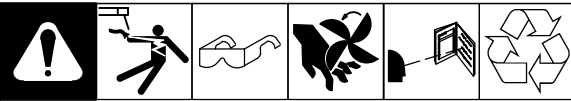
⌚	✓ = Check * To be done by Factory Authorized Service Agent	◇ = Change	● = Clean	Δ = Repair	☆ = Replace
Every Month	 <b>NOTICE – Clean coolant strainer.</b> Severe conditions may require more frequent cleaning (continuous use, high/low temperatures, dirty environment, etc.). <b>Failure to properly clean coolant strainer voids pump warranty.</b>  ● Coolant Strainer				  ● Heat Exchanger Fins
Every Six Months	 ☆ Unreadable Labels	 ✓ ☆ Cracked Hoses			 ◇ Change Coolant If Using Water (See Section 6-5)
Every Twelve Months	 ◇ Change Coolant (If Using Miller Coolant) (See Section 6-5)				

### 6-4. Troubleshooting The Optional Cooler



Trouble	Remedy
Coolant system does not work.	Be sure input power cord is plugged in to energized receptacle.
	Check line fuses or circuit breaker, and replace or reset if necessary.
	Motor overheated. Unit starts running when motor has cooled.
	Have Factory Authorized Service Agent check motor.
Decreased or no coolant flow.	Add coolant.
	Check for clogged hoses or coolant filter.
	Disconnect pump, and check for sheared coupling. Replace coupling if necessary.

## 6-5. Coolant Maintenance



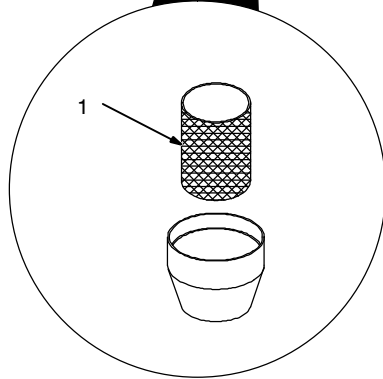
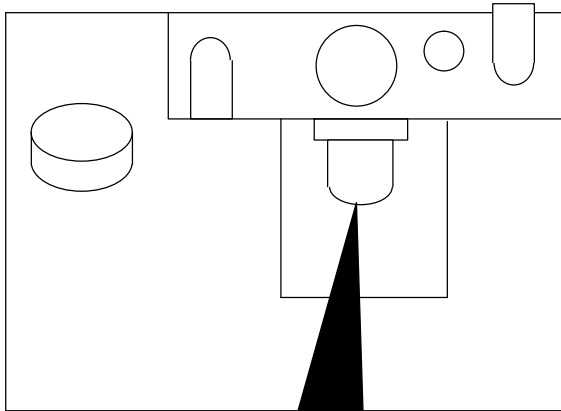
**⚠ Disconnect power before maintaining.**

1 Coolant Filter

Unscrew housing to clean filter.

Changing coolant: Drain coolant by tipping unit forward. Fill with clean water and run for 10 minutes. Drain and refill.

**NOTICE** – If replacing hoses, use hoses compatible with ethylene glycol, such as Buna-n, Neoprene, or Hypalon. Oxy-acetylene hoses are not compatible with any product containing ethylene glycol.



801 195-A / Ref. 801 194

Application	GTAW Or Where HF* Is Used
<p>3-1/2 Gal Coolant</p>	<p>Low Conductivity Coolant No. 043 810**; Distilled Or Deionized Water OK Above 32°F (0° C)</p>

\*HF: High Frequency Current

\*\*Coolant 043 810, a 50/50 solution, protect to -37°F (-38°C) and resist algae growth.

**NOTICE** – Use of any coolant other than those listed in the table voids the warranty on any parts that come in contact with the coolant (pump, radiator, etc.)

# SECTION 7 - ELECTRICAL DIAGRAM

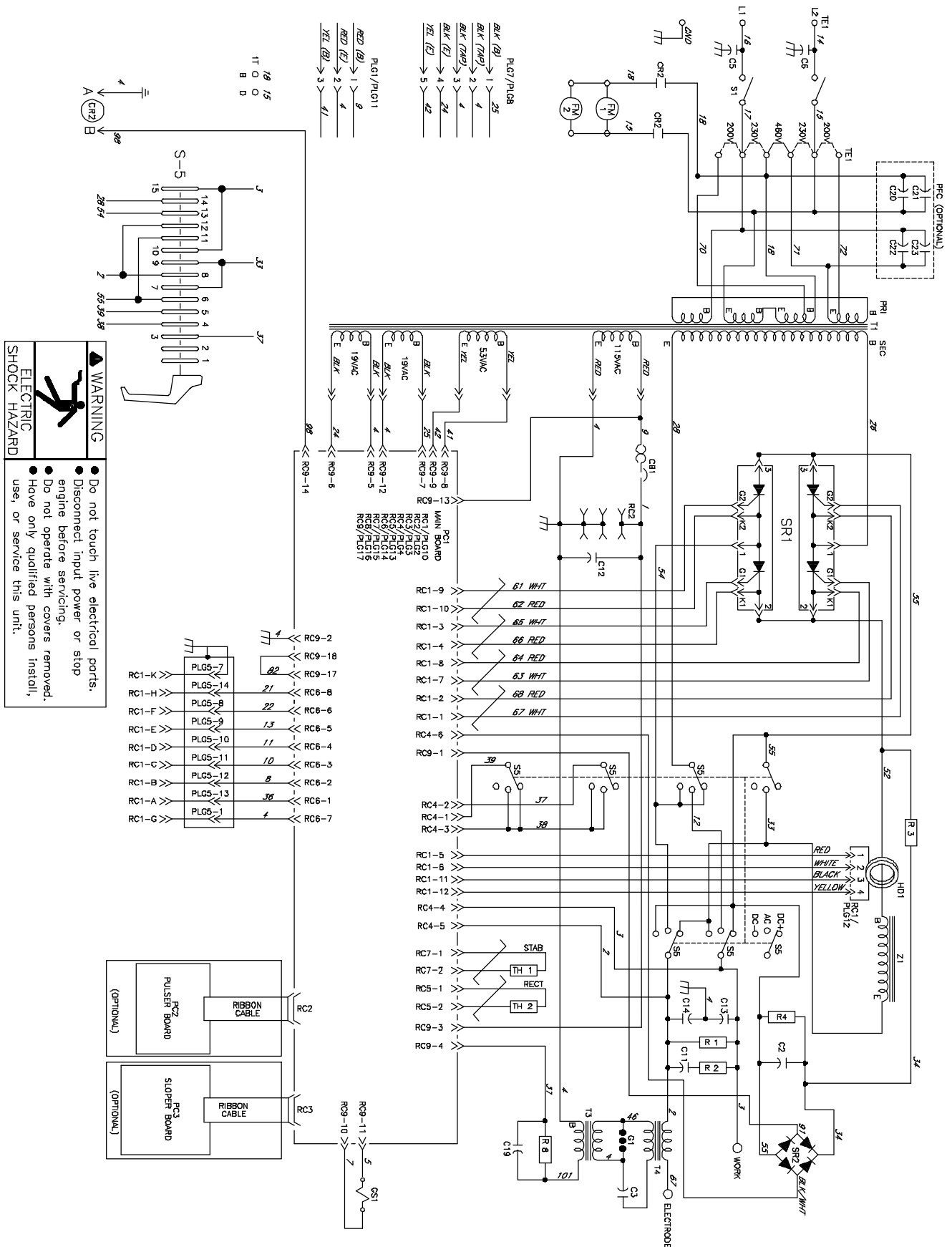


Figure 7-1. Circuit Diagram For 250 DX Models

231 394-B

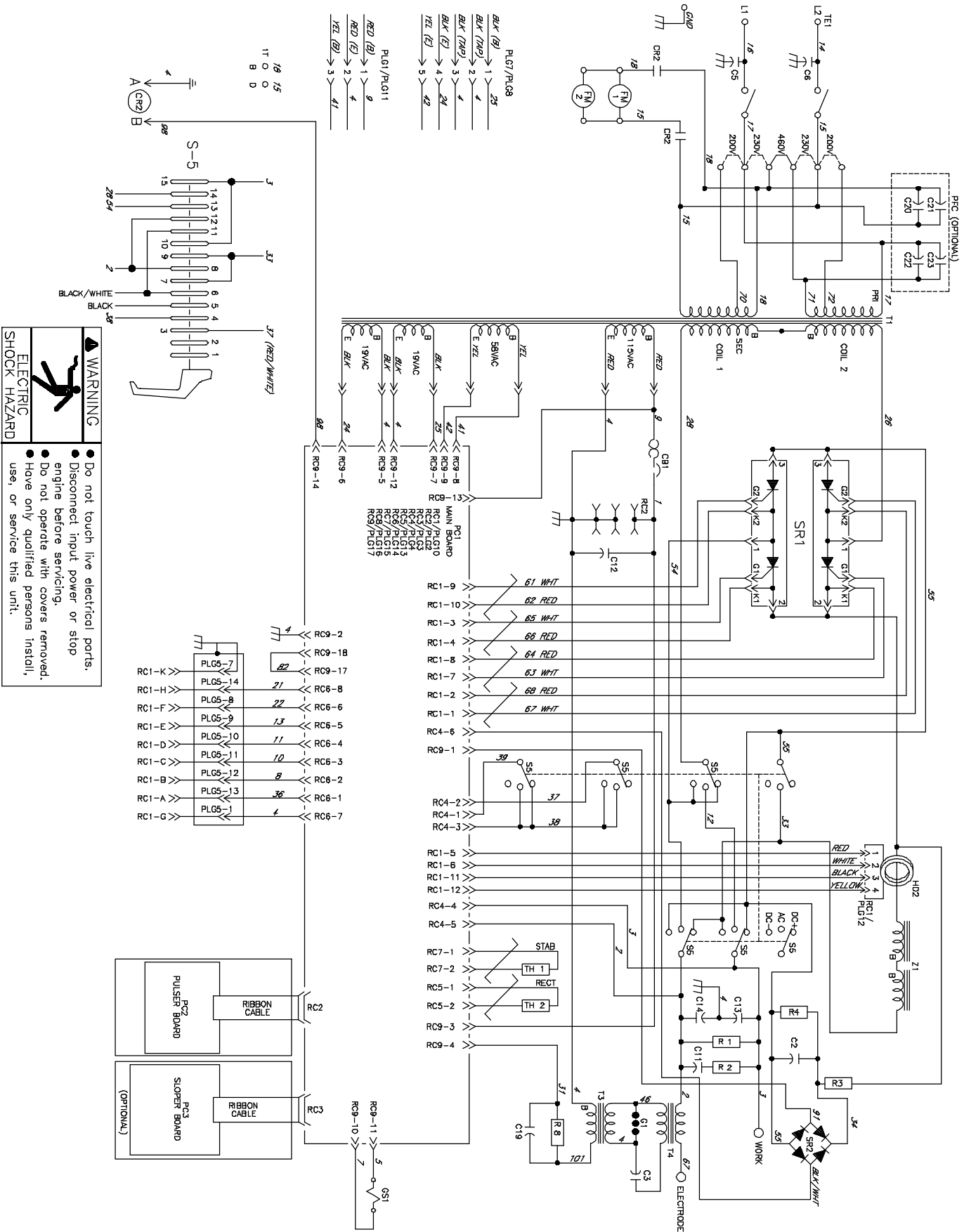


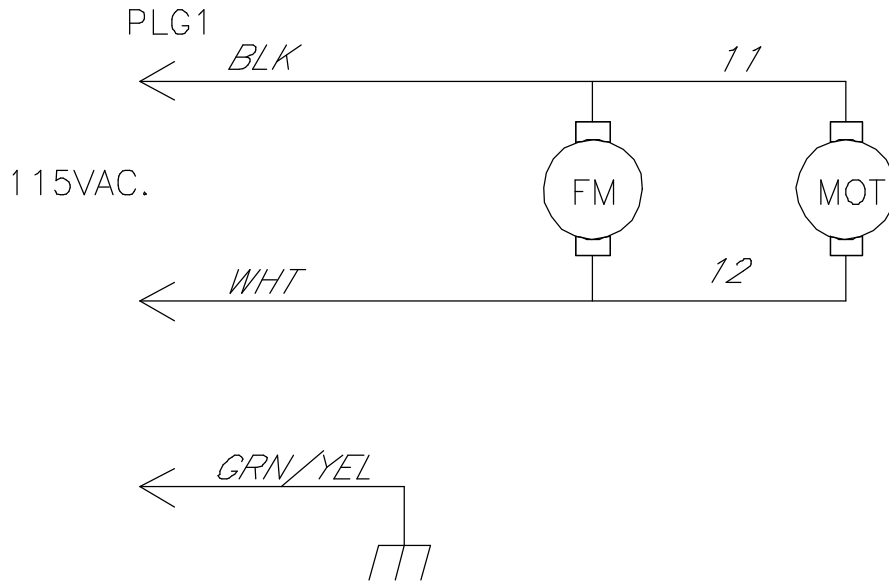


Figure 7-2. Circuit Diagram For 350 LX Models

231 395-B

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




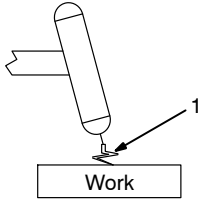
**Figure 7-3. Circuit Diagram For Optional Cooler**

225 650-A

# SECTION 8 – HIGH FREQUENCY

## 8-1. Welding Processes Requiring High Frequency






Work

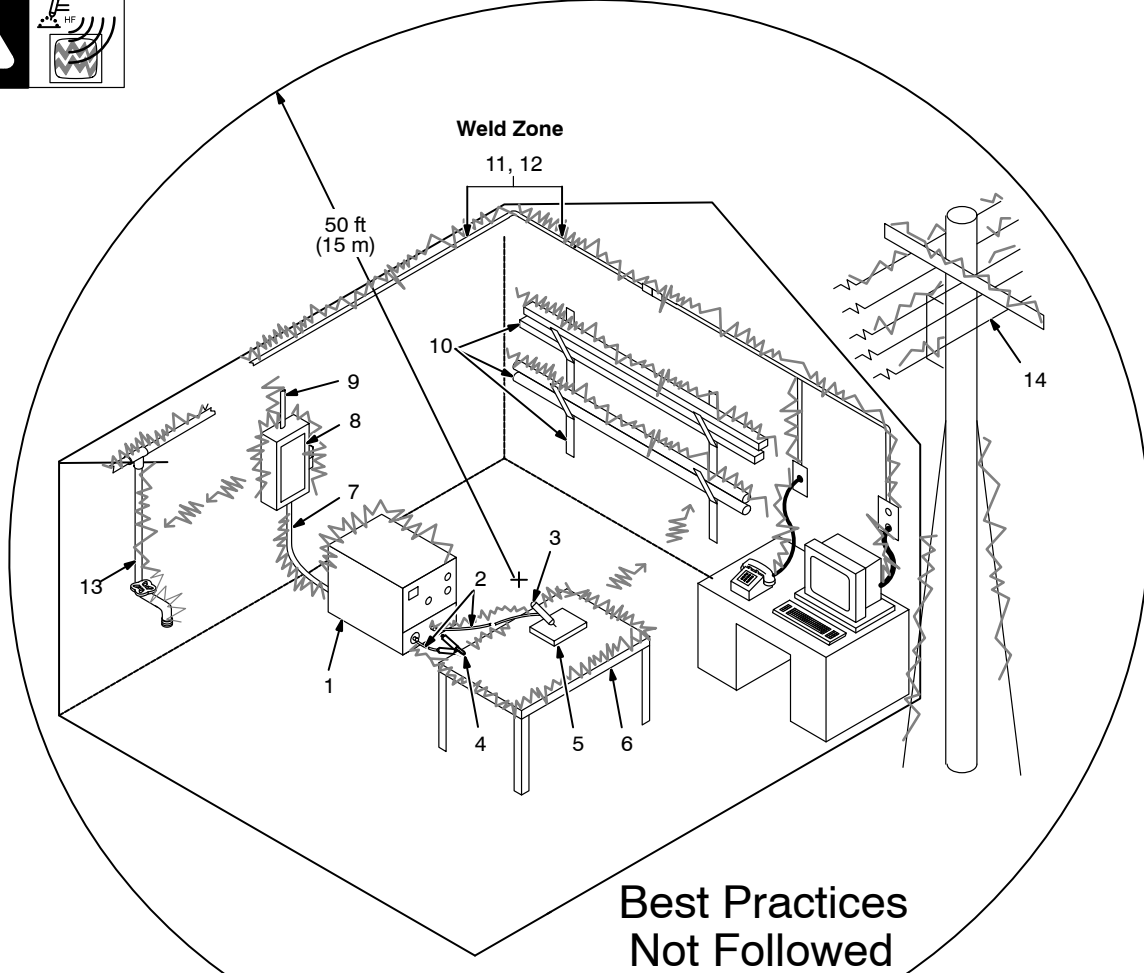
TIG

1 High-Frequency Voltage  
TIG – helps arc jump air gap between torch and workpiece and/or stabilize the arc.

high\_freq 5/10 – S-0693

## 8-2. Installation Showing Possible Sources Of HF Interference





Best Practices  
Not Followed

**Sources of Direct High-Frequency Radiation**

- 1 High-Frequency Source (welding power source with built-in HF or separate HF unit)
- 2 Weld Cables
- 3 Torch
- 4 Work Clamp
- 5 Workpiece
- 6 Work Table

**Sources of Conduction of High Frequency**

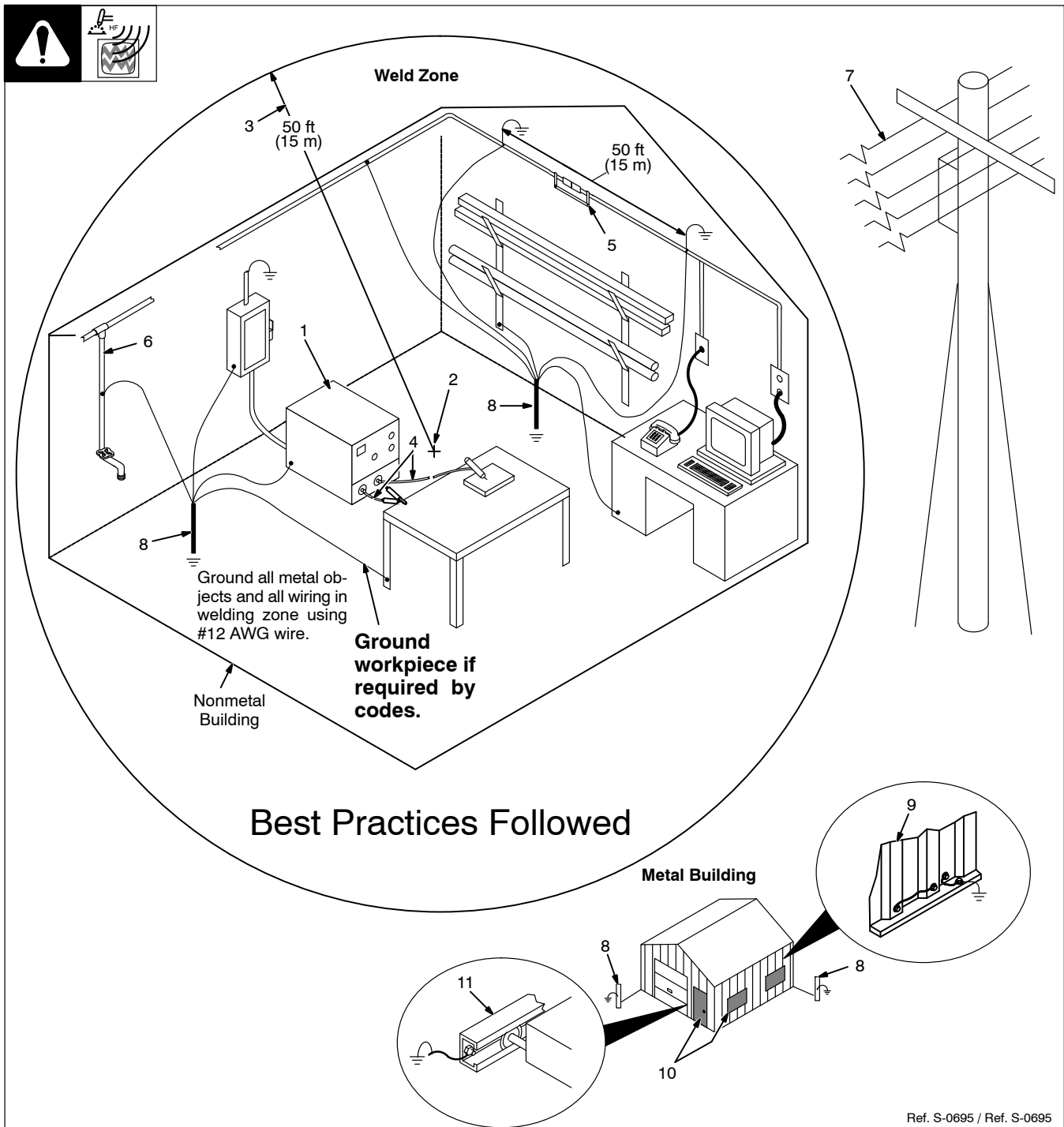
- 7 Input Power Cable
- 8 Line Disconnect Device
- 9 Input Supply Wiring

**Sources of Reradiation of High Frequency**

- 10 Ungrounded Metal Objects
- 11 Lighting
- 12 Wiring
- 13 Water Pipes and Fixtures
- 14 External Phone and Power Lines

S-0694

### 8-3. Recommended Installation To Reduce HF Interference



Ref. S-0695 / Ref. S-0695

- 1 High-Frequency Source (welding power source with built-in HF or separate HF unit)

Ground metal machine case (clean paint from around hole in case, and use case screw), work output terminal, line disconnect device, input supply, and worktable.

- 2 Center Point of Welding Zone  
Midpoint between high-frequency source and welding torch.

- 3 Welding Zone  
A circle 50 ft (15 m) from center point in all directions.

- 4 Weld Output Cables  
Keep cables short and close together.

- 5 Conduit Joint Bonding and Grounding

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

- 6 Water Pipes and Fixtures

Ground water pipes every 50 ft (15 m).

- 7 External Power or Telephone Lines

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

- 8 Grounding Rod

Consult the National Electrical Code for specifications.

#### Metal Building Requirements

- 9 Metal Building Panel Bonding Methods

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

- 10 Windows and Doorways

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

- 11 Overhead Door Track

Ground the track.



# SECTION 9 – SELECTING AND PREPARING A TUNGSTEN FOR DC OR AC WELDING

gtaw\_Phase\_2010-03

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

## 9-1. Selecting Tungsten Electrode (Wear Clean gloves To Prevent Contamination Of Tungsten)

Electrode Diameter	Amperage Range - Gas Type♦ - Polarity	
	(DCEN) – Argon Direct Current Electrode Negative (For Use With Mild Or Stainless Steel)	AC – Argon Balance Control @ 65% Electrode Negative (For Use With Aluminum)
<b>2% Ceria (Orange Band), 1.5% Lanthanum (Gray Band), Or 2% Thorium (Red Band) Alloy Tungstens</b>		
.040" (1 mm)	25-85	20-80
1/16" (1.6 mm)	50-160	50-150
3/32" (2.4 mm)	130-250	135-235
1/8" (3.2 mm)	250-400	225-360
<b>Pure Tungsten (Green Band)</b>		
.040" (1 mm)	Pure Tungsten Not Recommended For DCEN – Argon	10-60
1/16" (1.6 mm)		50-100
3/32" (2.4 mm)		100-160
1/8" (3.2 mm)		150-210

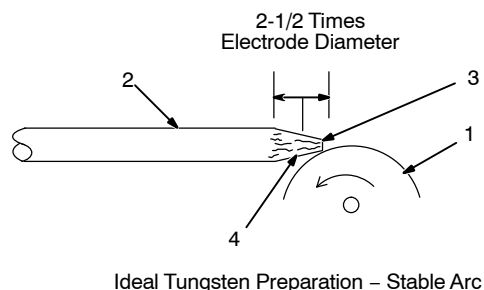
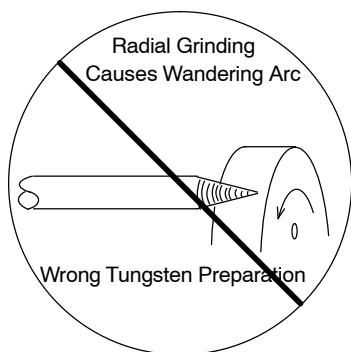
♦Typical argon shielding gas flow rates are 11 to 35 cfh (cubic feet per hour).

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

## 9-2. Preparing Tungsten Electrode For Welding With Phase Control Machines

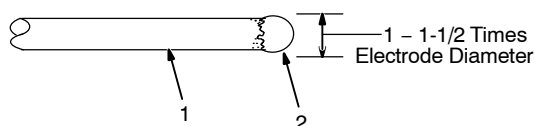
Grinding the tungsten electrode produces dust and flying sparks which can cause injury and start fires. Use local exhaust (forced ventilation) at the grinder or wear an approved respirator. Read MSDS for safety information. Consider using tungsten containing ceria, lanthana, or yttria instead of thoria.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

### A. Preparing Tungsten For DC Electrode Negative (DCEN) Welding



- 1 Grinding Wheel  
Grind end of tungsten on fine grit, hard abrasive wheel before welding. Do not use wheel for other jobs or tungsten can become contaminated causing lower weld quality.
- 2 Tungsten Electrode  
A 2% ceriated tungsten is recommended.
- 3 Flat  
Diameter of this flat determines amperage capacity.
- 4 Straight Ground  
Grind lengthwise, **not radial**.

### B. Preparing Tungsten For AC Welding

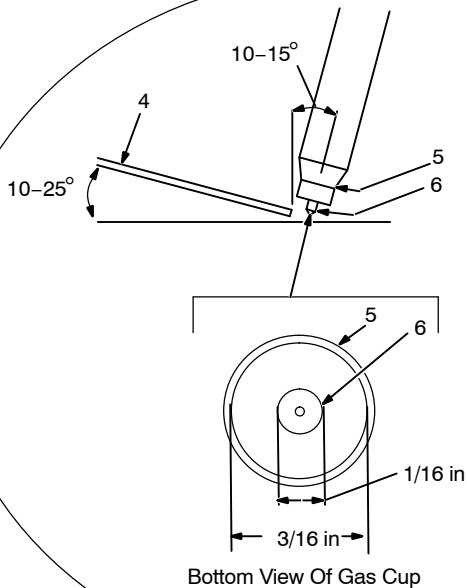
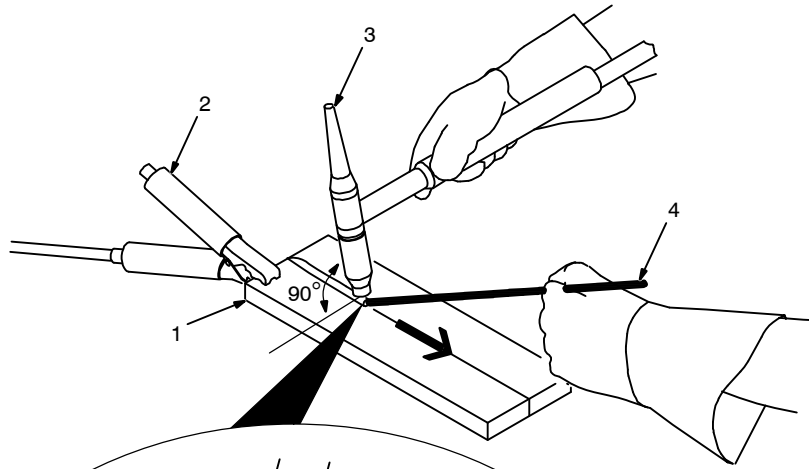


- 1 Tungsten Electrode  
A pure tungsten is recommended..
- 2 Balled End  
Ball end of tungsten by applying AC amperage recommended for a given electrode diameter (see Section 9-1). Let ball on end of the tungsten take its own shape.

# SECTION 10 – GUIDELINES FOR TIG WELDING (GTAW)

2007-04

## 10-1. Positioning The Torch



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

1 Workpiece

Make sure workpiece is clean before welding.

2 Work Clamp

Place as close to the weld as possible.

3 Torch

4 Filler Rod (If Applicable)

5 Gas Cup

6 Tungsten Electrode

Select and prepare tungsten according to Section 9.

### Guidelines:

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

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

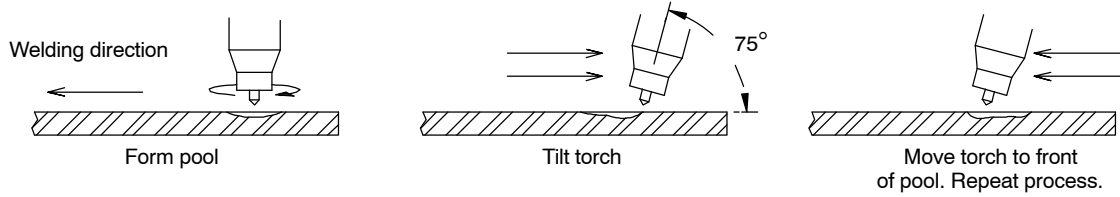
The tungsten extension should be no greater than the inside diameter of the gas cup.

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

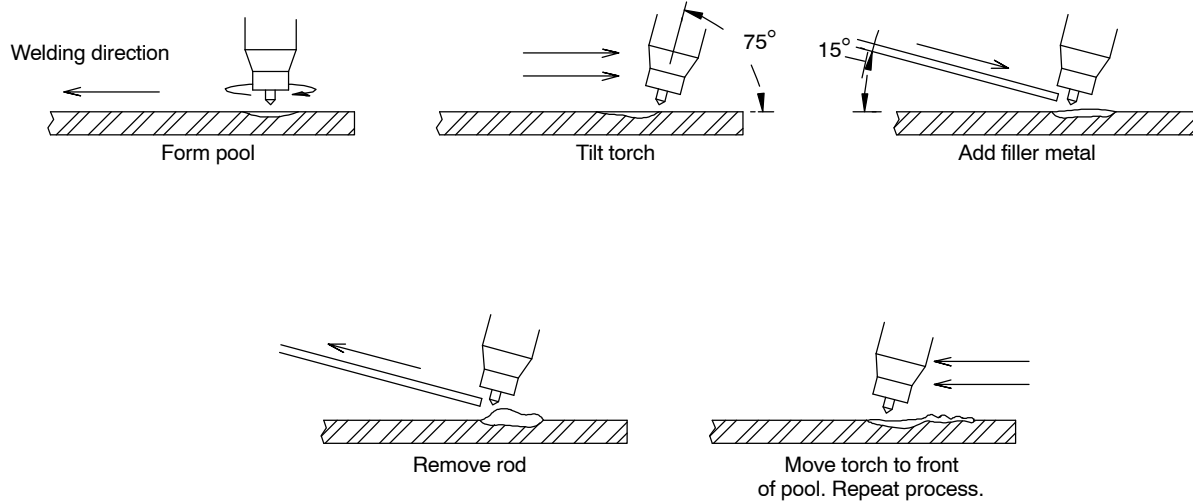
Ref. ST-161 892

## 10-2. Torch Movement During Welding

### Tungsten Without Filler Rod



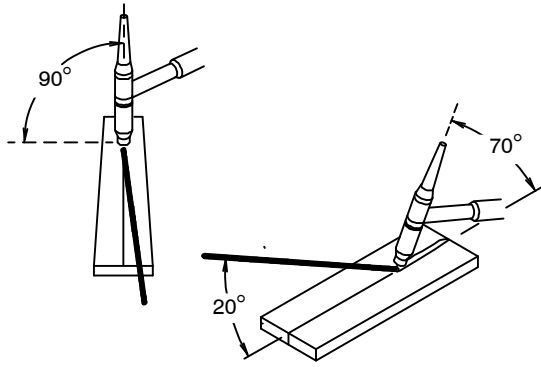
### Tungsten With Filler Rod



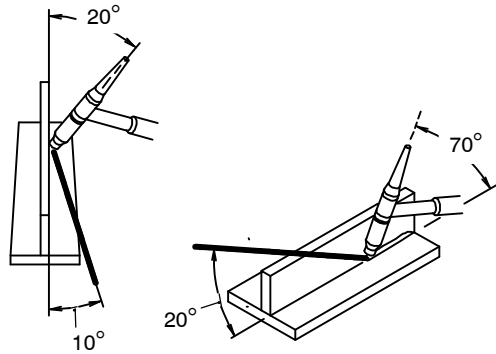
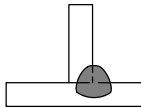
ST-162 002-B

### 10-3. Positioning Torch Tungsten For Various Weld Joints

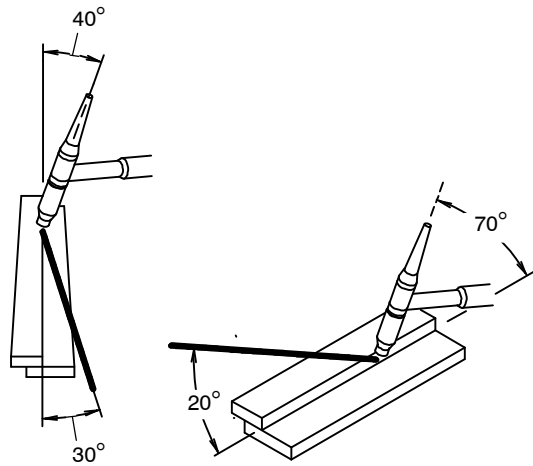
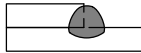
Butt Weld And Stringer Bead



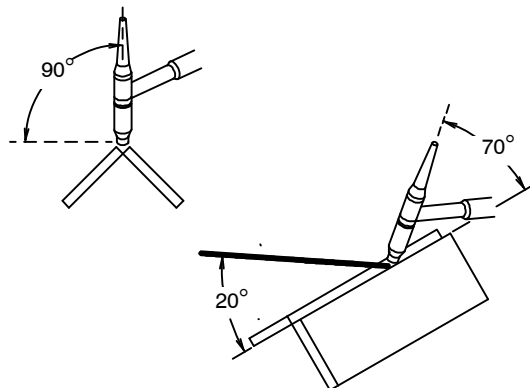
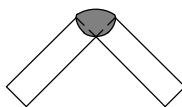
"T" Joint



Lap Joint



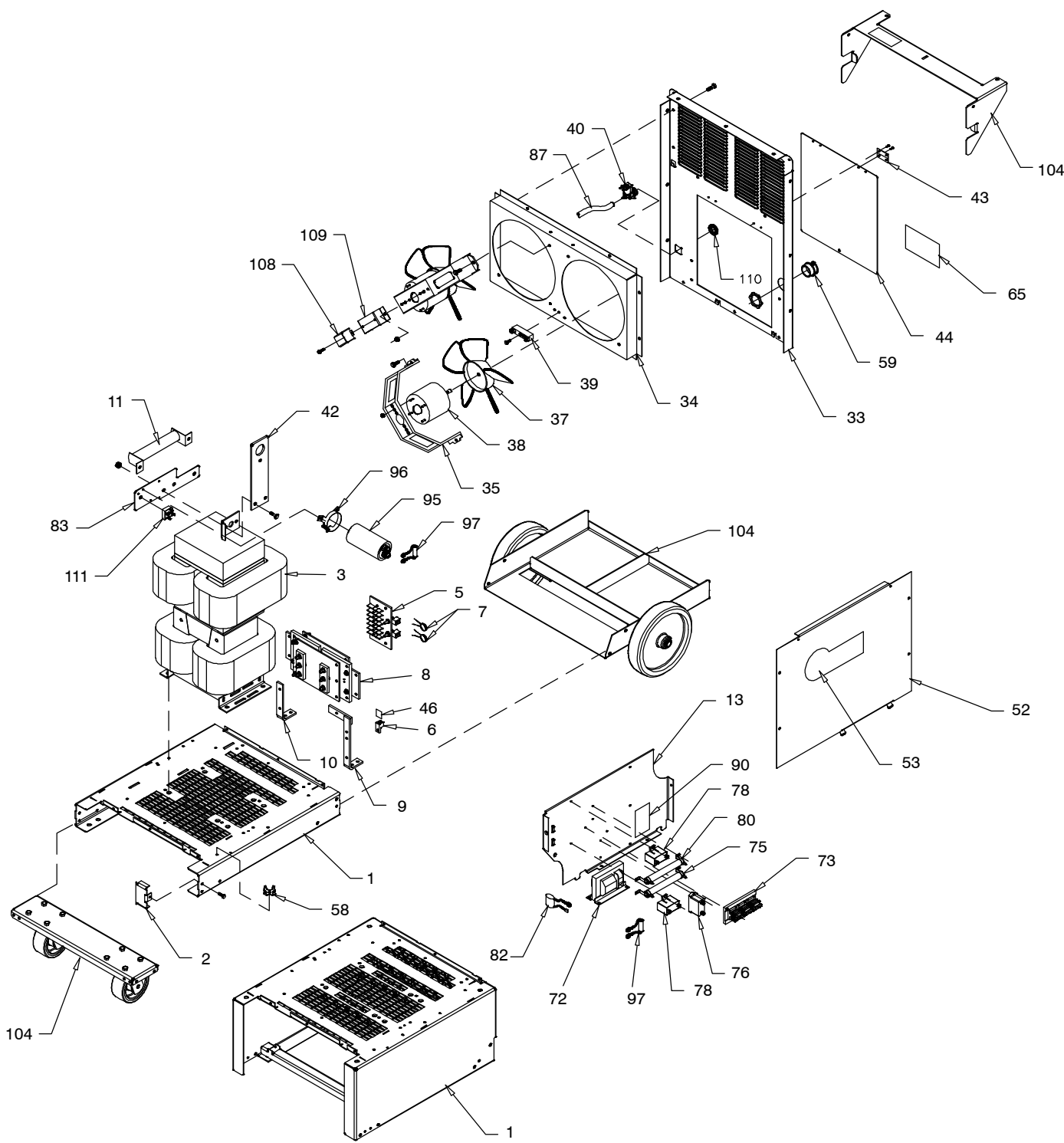
Corner Joint







### 350 LX Model Illustrated



Item No.	Dia. Mkgs.	Part No.	Description	Quantity	
				Model 250 DX	Model 350 LX
<b>Figure 11-1. Main Assembly</b>					
...	1	211 038	.. BASE, ASSY	1	1
...	1	233 120	.. BASE, ASSY FACTORY OPTION FOR USE W/ CS COOLER	1	1
...	2	215 656	.. END CAP,	4	4
...	3	T1/Z1 212 555	.. XFMR/STABILIZER ASSY, 200/230/460	1	
...	3	T1/Z1 211 041	.. XFMR/STABILIZER ASSY, 230/460/575	1	
...	3	T1/Z1 219 652	.. XFMR/STABILIZER ASSY, 220/400/440/520	1	
...	3	T1/Z1 215 767	.. XFMR/STABILIZER ASSY, 200/230/460		1
...	3	T1/Z1 215 389	.. XFMR/STABILIZER ASSY, 230/460/575		1
...	3	T1/Z1 217 801	.. XFMR/STABILIZER ASSY, 220/400/440/520		1
...		TH1 201 443	.. THERMISTOR,NTC 10K OHM @ 25 DEG C 27.5IN LEAD	1	1
...	4	212 550	.. PANEL, LEFT WINDTUNNEL (for non-TIGRUNNER models)	1	1
...	5	TE1 224 127	.. TERM ASSY, PRI 1PH 3V	1	1
...	6	213 248	.. LUG, UNIV W/SCREW 2/0-14 WIRE .266STD	1	1
...	7	C5, 6 111 634	.. CAPACITOR ASSY,	1	1
...	8	SR1 212 558	.. RECTIFIER, SCR MAIN (INCLUDES)	1	1
...		218 581	.. THYRISTOR, SCR 300A 300V HOCKEY PUCK	4	4
...		TH2 218 580	.. THERMISTOR,NTC 30K OHM @ 25 DEG C 40IN LEAD	1	1
...	9	218 670	.. BRACKET, RECTIFIER RH	1	1
...	10	212 559	.. BRACKET, RECTIFIER LH	1	1
...	11	R3 186 949	.. RESISTOR, WW FXD 175 W 20 OHM W/CLIPS	1	1
...	12	S5 207 236	.. SWITCH ASSY, POLARITY (DX)	1	1
...	13	+213 105	.. PANEL, RIGHT WINDTUNNEL	1	1
...	14	S1 246 694	.. SWITCH, TGL ASSY	1	1
...	15	231 281	.. FRONT PANEL ASSY,	1	1
...		117 860	.. BLANK, SNAP-IN NYL .187 MTG HOLE BLACK	1	1
...		107 983	.. BLANK, SNAP-IN NYL .500 MTG HOLE BLACK	1	1
...		143 397	.. BLANK, SNAP-IN NYL .312 MTG HOLE BLACK	8	8
...	16	PC1 231 300	.. CIRCUIT CARD ASSY, CONTROL & INTERFACE W/PROGRAM	1	1
...	18	183 332	.. KNOB, POINTER .570 DIA X .125 ID W/SPRING CLIP	2	5
...	19	174 991	.. KNOB, POINTER 1.250 DIA X .250 ID W/SPRING CLIP-.21	1	1
...	20	195 778	.. ACTUATOR PUSH BUTTON ASSY	1	1
...	21	Figure 11-2	.. PANEL,LOWER DINSE CONN ASSY	1	1
...	22	C14 209 587	.. CAPACITOR ASSY,	1	1
...	23	PC2◆◆300 548	.. KIT PULSER (INCLUDES),	1	
...	23	PC2 300 548	.. KIT PULSER (INCLUDES)		1
...		237 545	.. CIRCUIT CARD, PULSER	1	1
...		183 332	.. KNOB, POINTER .570 DIA X .125 ID W/SPRING CLIP	3	3
...		195 778	.. ACTUATOR, PUSH BUTTON ASSY	1	1
...		190 512	.. STAND-OFF, NO.6-32 X .640 LG .250 HEX AL FEM	1	1
...	25		.. NAMEPLATE, UPPER (ORDER BY MODEL AND SERIAL NUMBER)	1	1
...	26		.. NAMEPLATE, LOWER (ORDER BY MODEL AND SERIAL NUMBER)	1	1
...	28	175 952	.. PLASTIC, HANDLE SWITCH	1	1
...		169 136	.. PIN, HANDLE	1	1
...	33	231 283	.. PANEL, REAR	1	1
...	34	184 058	.. FAN, PLENUM	1	1
...	35	187 807	.. BRACKET, MTG MOTOR FAN	2	2
...	37	150 783	.. BLADE, FAN 9.000 5WG 39DEG .312 BORE CW PLSTC	2	2
...	38	FM1, 2 220 393	.. MOTOR, FAN 230V 50/60HZ 1550 RPM .312 DIA SHAFT	2	2
...	39	1T 199 312	.. BLOCK, TERMINAL FAST-ON,20 AMP, 250 VOLT	1	1
...	40	GS1 238 805	.. VALVE, 24 VDC 2WAY,125 PSI CUSTOM PORT.054 ORF W/FRICTION	1	1
...	41	231 279	.. FITTING, GAS-CLIP MOUNT	1	1
...		217 111	.. PLUG, PROTECTIVE	2	2
...	42	235 413	.. SUPPORT, LIFT EYE	1	
...	42	235 412	.. SUPPORT, LIFT EYE		1
...	43	218 280	.. HINGE, CONT POLYOLEFIN	1	1
...	44	+215 657	.. DOOR, ACCESS	1	1
...	44	+229 068	.. DOOR, ACCESS VENTED (FOR MODELS W/COOLERS ONLY)	1	1
...	46	217 553	.. LABEL,GROUND/PROTECTIVE EARTH	1	1



Item No.	Dia. Mkgs.	Part No.	Description	Quantity	
				Model 250 DX	Model 350 LX
<b>Figure 11-1. Main Assembly (continued)</b>					
... 48	T4	215 771	.. COIL, HF COUPLING	1	1
... 49		207 560	.. INSULATOR, STANDOFF WITH STUD	2	2
... 52		211 043	.. PANEL, SIDE	2	2
... 53		199 479	.. LABEL, MILLER	2	2
... 54		232 914	.. SEAL, LIFT EYE	1	1
... 55		+232 910	.. COVER, TOP	1	1
... 58		208 294	.. CONNECTOR, FASTON MALE 4-PRONG	1	2
... 59		010 467	.. CONN, CLAMP CABLE 1.250	1	1
... 63		203 990	.. LABEL, WARNING GENERAL PRECAUTIONARY STATIC (200/230/460 VOLT)	1	1
... 63		217 136	.. LABEL, WARNING ELECTRIC SHOCK (ENG/FR) (230/460/575 VOLT)	1	1
... 65		245 694	.. LABEL, GENERAL PRECAUTIONARY WORDLESS EMF	1	1
... 65		218 598	.. LABEL, WARNING ELECTRIC SHOCK AND INCORRECT INPUT P (200/230/460 VOLT)	1	1
... 65		219 332	.. LABEL, WARNING ELECTRIC SHOCK AND INCORRECT ENG/FR (230/460/575 VOLT)	1	1
... 65		220 401	.. LABEL, WARNING ELECTRIC SHOCK INPUT CONNECTION CE W (220/400/440/520 VOLT)	1	1
... 70		232 912	.. DRAWER, ASSY (INCLUDES)	1	1
		213 111	.. DRAWER, PLASTIC	1	1
		232 911	.. DRAWER, FRAME	1	1
		217 255	.. SLIDE, DRAWER	2	2
... 72	T3	219 927	.. XFMR, HIGH VOLTAGE 115V PRI 3600V SEC 34 MA W/TERM	1	1
... 73	G1	231 258	.. SPARK GAP ASSY, (INCLUDES)	1	1
		231 259	.. BASE, SPARK GAP	1	1
		231 260	.. HOLDER, POINTS	3	3
		221 736	.. POINTS, SPARK GAP (DUAL)	1	1
		221 737	.. POINTS, SPARK GAP (SINGLE)	2	2
		231 261	.. BUSHING	3	3
... 75	R8	188 067	.. RESISTOR, WW FXD 100 W 200 OHM W/CLIPS	1	1
... 76	C3	239 528	.. CAPACITOR, MICA .002 UF 10000 V PANEL MTG W/LEADS	1	1
... 78	C11, 19	195 552	.. CAPACITOR, POLYP MET FILM 20. UF 250 VAC 10%	2	2
... 80	R1	220 808	.. RESISTOR, WW FXD 100 W 50 OHM W/CLIPS	1	1
... 82	C13	206 878	.. CAPACITOR ASSY,	1	1
... 83		216 081	.. BRACKET, RESISTOR	1	1
... 87		218 170	.. HOSE, NPRN BRD NO 1 X .250 ID X 24.000	1	1
... 89		211 039	.. BEZEL, FRONT	1	1
... 90		224 459	.. LABEL, WARNING HF GAPS/ELECT SHOCK/CE/WORDLESS (220/400/440/520 VOLT)	1	1
... 91	HD1	191 941	.. TRANSDUCER, CURRENT	1	1
... 95	C2	031 668	.. CAPACITOR, ELCTLT 4000 UF 100 VDC	1	1
... 96		108 105	.. CLAMP, CAPACITOR	1	1
... 97	R2, 4	118 459	.. RESISTOR, WW FXD 10 W 1K OHM	2	2
... 103	PC3◆◆	300 547	.. KIT SEQUENCER (INCLUDES)	1	1
		239 373	.. CIRCUIT CARD, SEQUENCER	1	1
		183 332	.. KNOB, POINTER .570 DIA X .125 ID W/SPRING CLIP	5	5
... 104	◆Figure 11-3		.. TIGRUNNER RUNNING GEAR	1	1
... 108	CR2	059 266	.. RELAY, ENCL 120VAC DPDT 10A/120VAC 8PIN	1	1
	◆194 744		.. RFCS-14HD (FOOT CONTROL)	1	1
... 109		222 451	.. BRACKET, RELAY	1	1
... 110		137761	.. NUT, 750 NPT 1.31HEX .27H NYL BLK	1	1
... 111		035 704	.. RECTIFIER, INTEG BRIDGE 40. AMP 800V	1	1
... 112		230 155	.. BRACKET, VALVE MOUNT	1	1

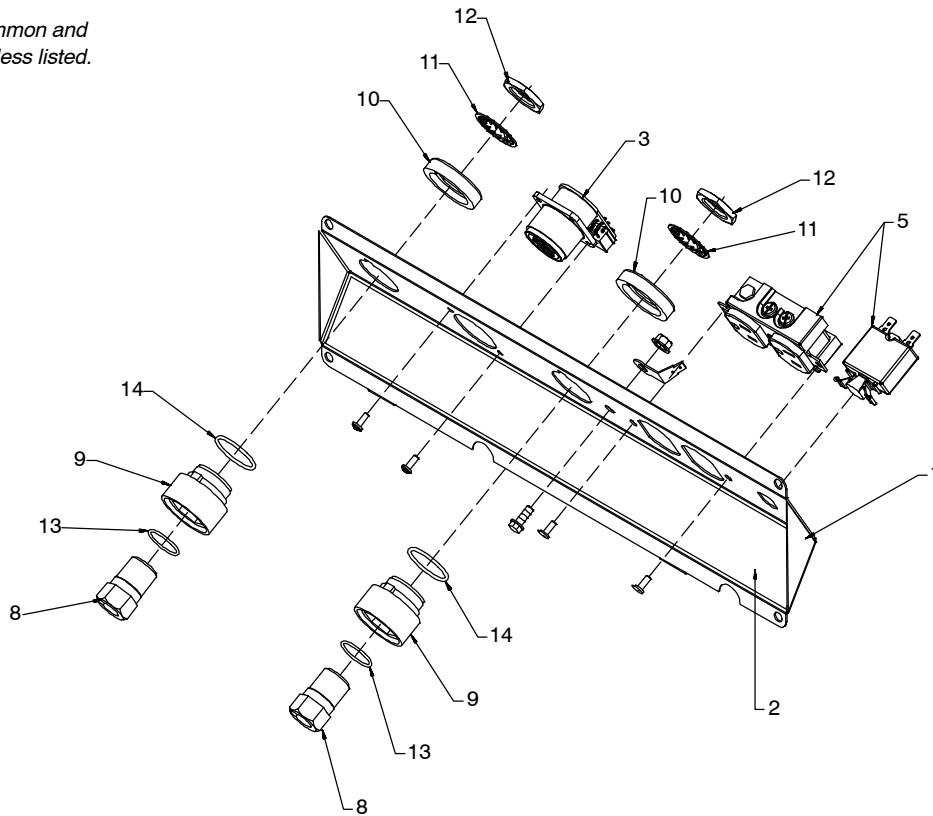
+When ordering a component originally displaying a precautionary label, the label should also be ordered.

◆Part of TIGRUNNER option.

◆◆Field option only.

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

☞ Hardware is common and not available unless listed.



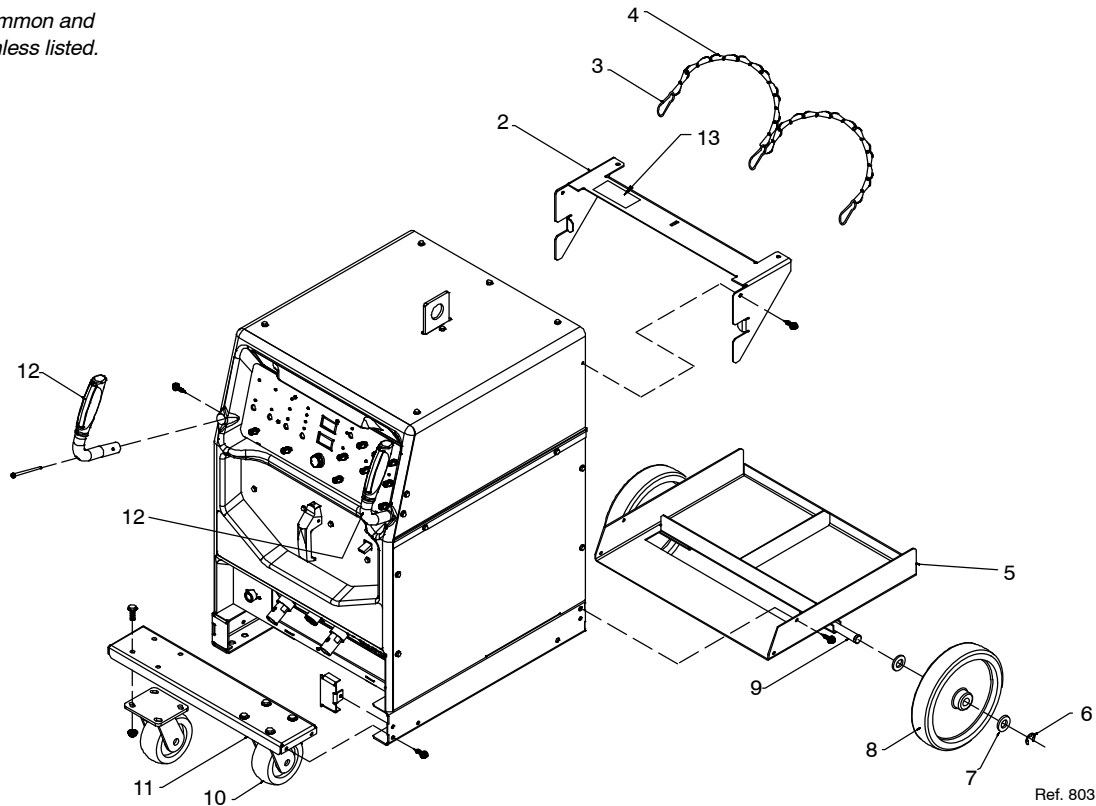
**Figure 11-2. Panel, Lower Dinse Connector Assembly**

803 775-A

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
<b>220 509 Figure 11-2. Panel, Lower Dinse Connector Assy (Figure 11-1 Item 21)</b>				
...	1	213 109	.. PANEL, LOWER DINSE CONN	1
...	2	218 784	.. LABEL, COMPONENT IDENTIFICATION	1
...	3	224 529	.. CONN, CIRC MS/CPC 14SKT SIZE 20 RCPT W/FILTERING	1
...	5	218 174	.. RECEPTACLE, W/LEADS & CIRCUIT BREAKER	1
...	8	202 553	.. RECEPTACLE, TWIST LOCK BRASS POWER (FEMALE)	2
...	9	185 712	.. INSULATOR, BULKHEAD FRONT	2
...	10	185 713	.. INSULATOR, BULKHEAD REAR	2
...	11	229 338	.. WASHER, DOMED LOAD .812 ID X 1.450 OD X .070 THK	2
...	12	185 717	.. NUT, M20-1.5 1.00HEX .19H BRS LOCKING	2
...	13	186 228	.. O-RING, 0.739 ID X 0.070 H	2
...	14	185 718	.. O-RING, 0.989 ID X 0.070 H	2

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

Hardware is common and not available unless listed.



Ref. 803 725-D

Figure 11-3. Optional Running Gear


Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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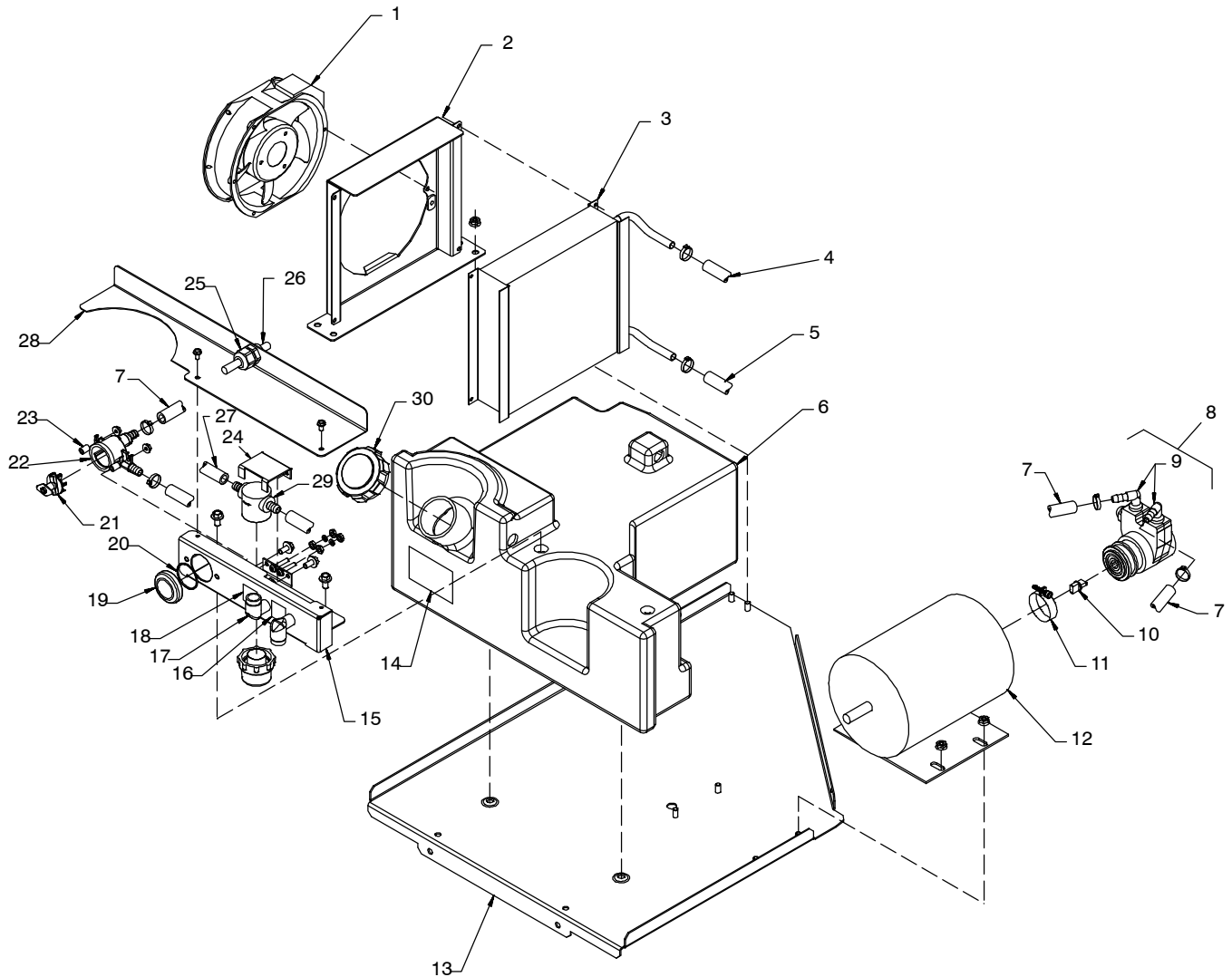
Figure 11-3. Running Gear (Optional) (Figure 11-1 Item 104)

...	2	...	+215 928	.. BOTTLE SUPPORT .....	1
...	3	...	168 663	.. HOOK SPRING SNAP .....	3
...	4	...	602 387	.. CHAIN .....	2
...	5	...	191 158	.. BOTTLE TRAY .....	1
...	6	...	121 614	.. RETAINING RING .....	2
...	7	...	602 250	.. WASHER,FLAT .812IDX1.469ODX.134T STL PLD ANSI.750 .....	4
...	8	...	209 869	.. WHEEL .....	2
...	9	...	191 167	.. AXLE .....	1
...	10	...	168 247	.. CASTER, SWIVEL .....	2
...	11	...	191 163	.. CASTER MOUNTING BRACKET .....	1
...	12	...	242 337	.. HANDLE, UNIVERSAL .....	2
...	13	...	217 140	.. LABEL,WARNING CYL MAY EXPLODE IF DAMAGED (ENG/FR) .. (230/460/575 VOLT MODELS ONLY) .....	1
...	13	...	200 285	.. LABEL,WARNING CYLINDER MAY EXPLODE IF DAMAGED .. (200/230/460 VOLT MODELS ONLY) .....	1

+When ordering a component originally displaying a precautionary label, the label should also be ordered.  
**To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.**

# SECTION 12 – PARTS LIST FOR OPTIONAL COOLER

 Hardware is common and not available unless listed.



804 995-A

Figure 12-1. Main Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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**Figure 12-1. Main Assembly**

... 1	213 072	..	Fan, Muffin 115 V 60 Hz 3400 RPM 6.378 Mtg Holes	1
... 2	231 341	..	Plenum, Air	1
... 3	232 424	..	Radiator, Heat Exchanger	1
... 4	232 842	..	Hose, Rubber Braided .375 ID X .650 OD X 28.000	2
... 5	232 609	..	Hose, Rubber Braided .375 ID X .650 OD X 31.000	2
... 6	200 109	..	Tank, Coolant	1
... 7	231 400	..	Hose, Rubber Braided .375 ID X .650 OD X 17.000	3
... 8	174 042	..	Pump, Coolant (Includes)	1
... 9	5523	..	FTG, Hose Brs Barbed Elbow M 3/8 TBG X 3/8 NPT	2
... 10	134 795	..	Coupler, Drive Pump	1
... 11	023 562	..	Clamp, Hose .312 - .875 Clp Dia	1
... 12	173 263	..	Motor, 1/4 Hp 115 VAC 50/60 Hz 1425/1725 RPM Dual	1
... 13	231 337	..	Base,	1
... 14	232 413	..	Label, Rating Card CSA C US (Less Stock/Serial No)	1
... 15	231 340	..	Panel, Front Component	1
... 16	204 604	..	Label, Coolant In	1
... 17	149 356	..	Ftg, Hose Brs Barbed Elbow M Bhd 3/8 Tbg X .500-20	2
... 18	204 603	..	Label, Coolant Out	1
...	226 934	..	Indicator, Flow (Includes)	1
... 19	186 005	..	Lense, Flow Indicator	1
... 20	166 566	..	O-Ring, 1.301 ID X .070 CS 70 Duro Buna-n	1
... 21	226 936	..	Paddle, Rotor Assy	1
... 22	226 935	..	Housing, Flow Indicator	1
... 23	233 159	..	Spacer, Nylon .312 OD X .194 ID X .500 Lg	2
... 24	178 461	..	Bracket, Filter	1
... 25	139 042	..	Bushing, Strain Relief .270/.470 ID X .804 mtg Hole	1
... 26	188 082	..	Cable, Power 2 Ft 7 In 16 ga 3c	1
... 27	232 621	..	Tube, Pick-Up Coolant	1
... 28	231 339	..	Panel, Front Filler	1
... 29	166 564	..	Filter, In-line Low Profile 100 Screen 3/8 Hose Bar	1
...	225 113	..	Harness, 3CS Cooler (Not Shown)	1
...	141 727	..	Tubing, Gl Acryl .750- .786 ID 4.000 Yel Fa1 (Not Shown)	2
... 30	166 608	..	Cap, Tank Screw-On W/Vent	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, 2010

(Equipment with a serial number preface of MA or newer)

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

### Warranty Questions?

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

Your distributor also gives  
you ...

#### Service

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

#### Support

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

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

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

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

1. 5 Years Parts — 3 Years Labor
  - \* Original main power rectifiers only to include SCRs, diodes, and discrete rectifier modules
2. 3 Years — Parts and Labor
  - \* Engine Driven Welding Generators  
**(NOTE: Engines are warranted separately by the engine manufacturer.)**
  - \* Inverter Power Sources (Unless Otherwise Stated)
  - \* Plasma Arc Cutting Power Sources
  - \* Process Controllers
  - \* Semi-Automatic and Automatic Wire Feeders
  - \* Smith 30 Series Flowgauge and Flowmeter Regulators (No Labor)
  - \* Transformer/Rectifier Power Sources
  - \* Water Coolant Systems (Integrated)
3. 2 Years — Parts
  - \* Auto-Darkening Helmet Lenses (No Labor)
4. 1 Year — Parts and Labor Unless Specified
  - \* Automatic Motion Devices
  - \* CoolBelt and CoolBand Blower Unit (No Labor)
  - \* External Monitoring Equipment and Sensors
  - \* Field Options  
**(NOTE: Field options are covered for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)**
  - \* Flowgauge and Flowmeter Regulators (No Labor)
  - \* RFCS Foot Controls (Except RFCS-RJ45)
  - \* Fume Extractors
  - \* HF Units
  - \* ICE Plasma Cutting Torches (No Labor)
  - \* Induction Heating Power Sources, Coolers, and Electronic Controls/Recorders
  - \* Load Banks
  - \* Motor Driven Guns (w/exception of Spoolmate Spoolguns)
  - \* PAPR Blower Unit (No Labor)
  - \* Positioners and Controllers
  - \* Racks
  - \* Running Gear/Trailers
  - \* Spot Welders
  - \* Subarc Wire Drive Assemblies
  - \* Water Coolant Systems (Non-Integrated)
  - \* Weldcraft-Branded TIG Torches (No Labor)
  - \* Work Stations/Weld Tables (No Labor)
5. 6 Months — Parts
  - \* Batteries
  - \* Bernard Guns (No Labor)
  - \* Tregaskiss Guns (No Labor)

6. 90 Days — Parts
  - \* Accessory (Kits)
  - \* Canvas Covers
  - \* Induction Heating Coils and Blankets, Cables, and Non-Electronic Controls
  - \* M-Guns
  - \* MIG Guns and Subarc (SAW) Guns
  - \* Remote Controls and RFCS-RJ45
  - \* Replacement Parts (No labor)
  - \* Roughneck Guns
  - \* Spoolmate Spoolguns

Miller's True Blue<sup>®</sup> 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.

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

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





# Owner's Record

Please complete and retain with your personal records.

Model Name

Serial/Style Number

Purchase Date

(Date which equipment was delivered to original customer.)

Distributor

Address

City

State

Zip



## For Service

**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

For International Locations Visit  
[www.MillerWelds.com](http://www.MillerWelds.com)

