TM-2240G 2005–10

Eff. w/Serial Number LC339215

Processes

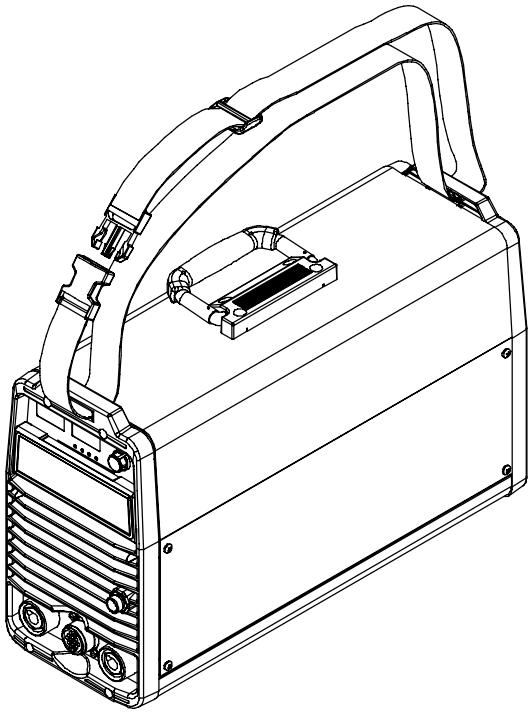
TIG (GTAW) Welding

Stick (SMAW) Welding

Description

115/230/400/460 Volt Models W/Auto-line® Arc Welding Power Source

Dynasty 200® SD And DX



CE And Non-CE Models

TECHNICAL MANUAL

Visit our website at

www.MillerWelds.com

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Declaration of Conformity For European Community (CE) Products

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

Manufacturer's Name: Miller Electric Mfg. Co.

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

Declares that the product: **Dynsaty® 200 SD and DX**

conforms to the following Directives and Standards:

Directives

Low Voltage Directive: 73/23/EEC

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

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

Standards

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

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

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

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

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

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

Telephone: 39(02)98290-1
Fax: 39(02)98290-203

Notes

SECTION 1 – SAFETY PRECAUTIONS FOR SERVICING

1-1. Symbol Usage

Om-2240L - 7/05 safety_stm 8/03

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

▲ **Marks a special safety message.**

☞ *Means "Note"; not safety related.*

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

1-2. Servicing 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.**

▲ **Only qualified persons should service, test, maintain, and repair this unit.**

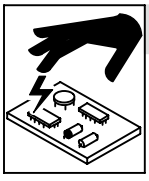
▲ **During servicing, keep everybody, especially children, away.**

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Turn Off welding power source and wire feeder and disconnect and lockout input power using line disconnect switch, circuit breakers, or by removing plug from receptacle, or stop engine before servicing unless the procedure specifically requires an energized unit.
- Insulate yourself from ground by standing or working on dry insulating mats big enough to prevent contact with the ground.
- Do not leave live unit unattended.
- If this procedure requires an energized unit, have only personnel familiar with and following standard safety practices do the job.
- When testing a live unit, use the one-hand method. Do not put both hands inside unit. Keep one hand free.
- Disconnect input power conductors from deenergized supply line BEFORE moving a welding power source.

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

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

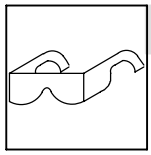


STATIC (ESD) can damage PC boards.

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

FIRE OR EXPLOSION hazard.

- Do not place unit on, over, or near combustible surfaces.
- Do not service unit near flammables.

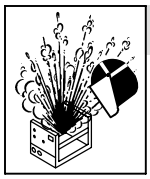


FLYING METAL can injure eyes.

- Wear safety glasses with side shields or face shield during servicing.
- Be careful not to short metal tools, parts, or wires together during testing and servicing.

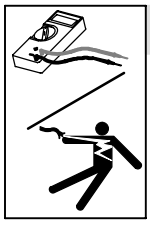
HOT PARTS can cause severe burns.

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



EXPLODING PARTS can cause injury.

- Failed parts can explode or cause other parts to explode when power is applied to inverters.
- Always wear a face shield and long sleeves when servicing inverters.



SHOCK HAZARD from testing.

- Turn Off welding power source and wire feeder or stop engine before making or changing meter lead connections.
- Use at least one meter lead that has a self-retaining spring clip such as an alligator clip.
- Read instructions for test equipment.

FALLING UNIT can cause injury.

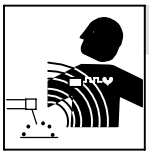
- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.

MOVING PARTS can cause injury.

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

MOVING PARTS can cause injury.

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

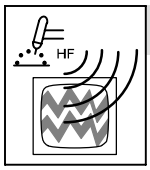


MAGNETIC FIELDS can affect pacemakers.

- Pacemaker wearers keep away from servicing areas until consulting your doctor.

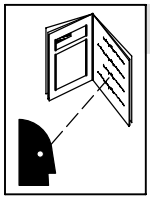
OVERUSE can cause OVERHEATING.

- 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.



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 install, test, and service H.F. producing units.
- 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.



READ INSTRUCTIONS.

- Use MILLER Testing Booklet (Part No. 150 853) when servicing this unit.
- Consult the Owner's Manual for welding safety precautions.
- Use only genuine MILLER replacement parts.

1-3. California Proposition 65 Warnings

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

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

For Gasoline Engines:

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

For Diesel Engines:

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

1-4. EMF Information

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

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

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

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

About Pacemakers:

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

SECTION 2 – DEFINITIONS (CE Models)

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.

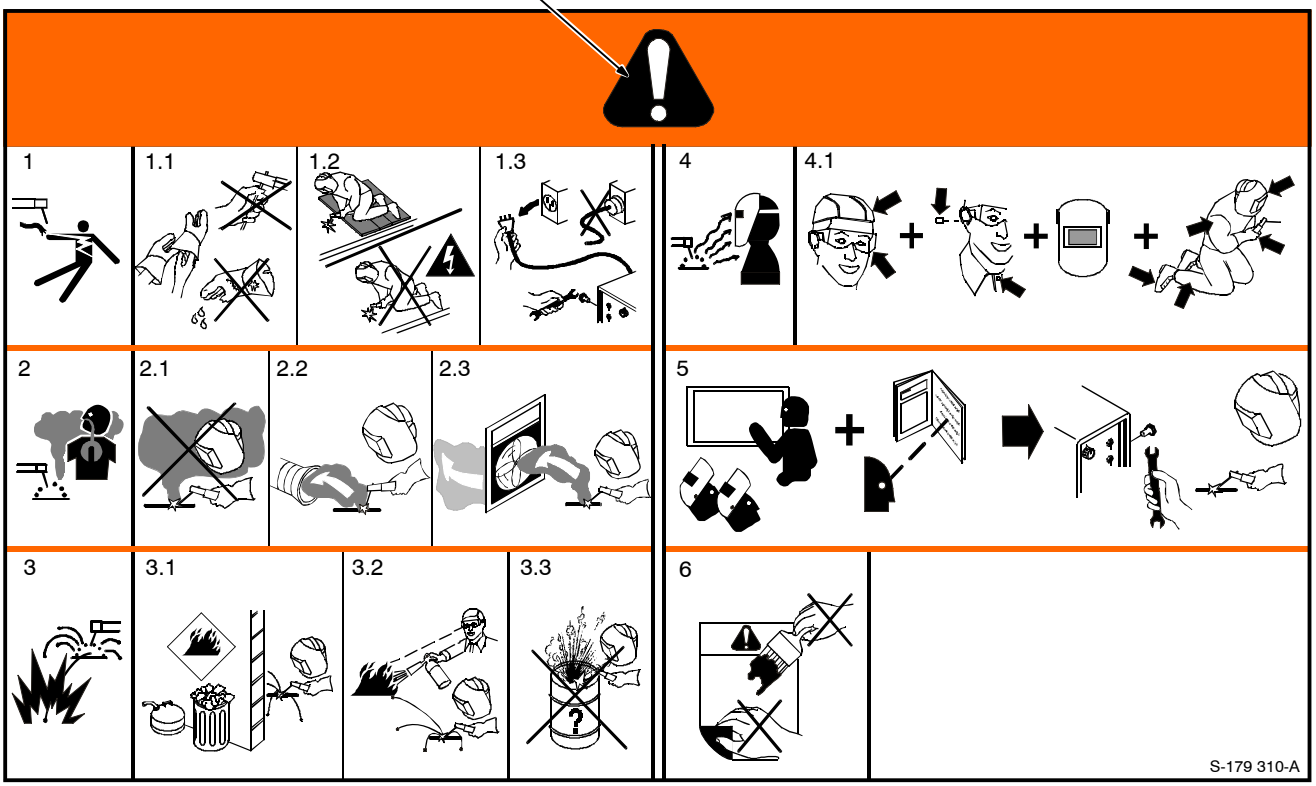
3.3 Do not weld on drums or any closed containers.

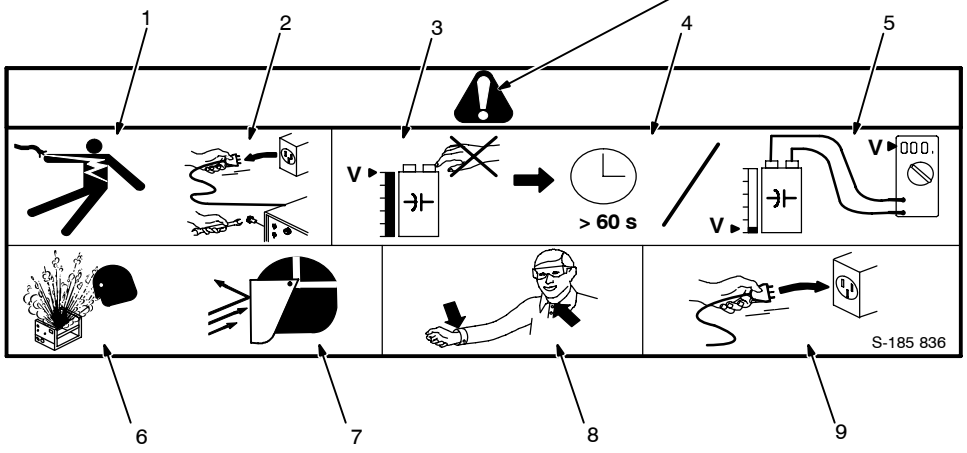
4 Arc rays can burn eyes and injure skin.

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.





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

1 Electric shock from wiring can kill.

2 Disconnect input plug or power before working on machine.

3 Hazardous voltage remains on input capacitors after power is turned off. Do not touch fully charged capacitors.

4 Always wait 60 seconds after power is turned off before working on unit, OR

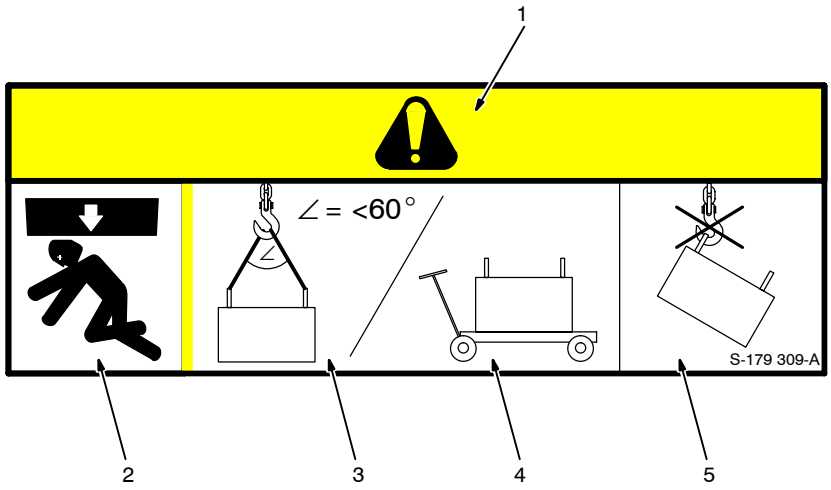
5 Check input capacitor voltage, and be sure it is near 0 before touching any parts.

6 When power is applied failed parts can explode or cause other parts to explode.

7 Flying pieces of parts can cause injury. Always wear a face shield when servicing unit.

8 Always wear long sleeves and button your collar when servicing unit.

9 After taking proper precautions as shown, connect power to unit.



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

2 Falling equipment can cause injury and damage to unit.

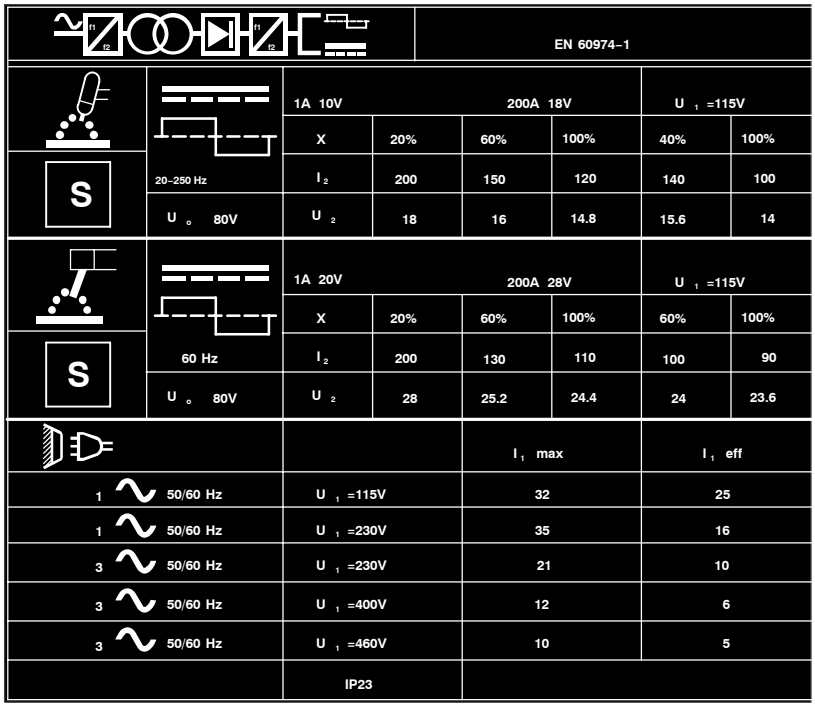
3 Always lift and support unit using both handles. Keep angle of lifting device less than 60 degrees.

4 Use a proper cart to move unit.

5 Do not use one handle to lift or support unit.

1/96

2-2. Manufacturer's Rating Label



		EN 60974–1				
		1A 10V		200A 18V		U_1 =115V
		X	20%	60%	100%	40%	100%
S	20–250 Hz	I_2	200	150	120	140	100
	U_o 80V	U_2	18	16	14.8	15.6	14
		1A 20V		200A 28V		U_1 =115V	
		X	20%	60%	100%	60%	100%
S	60 Hz	I_2	200	130	110	100	90
	U_o 80V	U_2	28	25.2	24.4	24	23.6
				I_1 max		I_1 eff	
1 ~	50/60 Hz	U_1 =115V		32		25	
1 ~	50/60 Hz	U_1 =230V		35		16	
3 ~	50/60 Hz	U_1 =230V		21		10	
3 ~	50/60 Hz	U_1 =400V		12		6	
3 ~	50/60 Hz	U_1 =460V		10		5	
		IP23					

☞ *See Section 3-5 for location.*

☞ *Use rating label to determine input power requirements.*

2-3. Symbols And Definitions

A Amperes	Panel–Local	Gas Tungsten Arc Welding (GTAW)	Shielded Metal Arc Welding (SMAW)
V Volts	Voltage Input	3 Phase Static Frequency Converter-Transformer-Rectifier	
Voltage Output	Circuit Breaker	Remote	Lift-Arc Start (GTAW)
Protective Earth (Ground)	Postflow Timer	Preflow Timer	S Seconds
On	Off	Positive	Negative
Alternating Current	Gas Input	Gas Output	I_2 Rated Welding Current
X Duty Cycle	Direct Current	Line Connection	U_2 Conventional Load Voltage
U_1 Primary Voltage	IP Degree Of Protection	I_{1max} Rated Maximum Supply Current	I_{1eff} Maximum Effective Supply Current
U_0 Rated No Load Voltage (Average)	Pulse Background Amperage	Initial Amperage	Increase/Decrease Of Quantity
Normal Trigger Operation (GTAW)	Two-Step Trigger Operation (GTAW)	Four-Step Trigger Operation (GTAW)	% Percent
Hz Hertz	Recall From Memory	Arc Force (DIG)	HF Impulse Starting (GTAW)
Final Slope	Final Amperage	Pulse Percent On Time	Initial Slope
Contactor Control (Stick)	Pulser On-Off	TIG Weld Amps And Peak Amps While Pulsing	Pulse Frequency
Background Amps	Process	Pulser	Sequence
Output	Adjust	Suitable For Areas Of Increased Shock Hazard	

SECTION 3 – INSTALLATION

3-1. Specifications

Input Power	Rated Output	Welding Amperage Range **	Max. Open-Circuit Voltage	Amperes Input At Rated Output, 50/60Hz				KVA	KW
				115	230	400	460		
Three-Phase Stick Process	130 A @ 25.2 VDC, 60% Duty Cycle	1 – 200	80∇ 5-10♦	--	12.3 0.16*	7.6 0.24*	6.0 0.25*	4.8 0.06*	4.6 0.03*
Three-Phase TIG Process	150 A @ 16 VDC, 60% Duty Cycle	1 – 200	80 5-10♦	--	9.4 0.16*	6.0 0.24*	4.7 0.25*	3.8 0.06*	3.6 0.03*
Three-Phase Stick Process	200 A @ 28 VDC, 20% Duty Cycle	1 – 200	80∇ 5-10♦		20.8 0.16*	13.0 0.24*	10.2 0.25*	8.1 0.06*	7.8 0.03*
Three-Phase TIG Process	200 A @ 18 VDC, 20% Duty Cycle	1 – 200	80 5-10♦		13.7 0.16*	8.7 0.24*	6.9 0.25*	5.5 0.06*	5.2 0.03*
Single-Phase Stick Process	130 A @ 25.2 VDC, 60% Duty Cycle	1 – 200	80∇ 5-10♦	--	20.0 0.23*	--	10.0 .25*	4.7 0.05*	4.7 0.02*
Single-Phase TIG Process	150 A @ 16 VDC, 60% Duty Cycle	1 – 200	80 5-10♦	--	15.8 0.23*	--	7.9 .25*	3.6 0.05*	3.6 0.02*
Single-Phase Stick Process	100 A @ 24 VDC, 60% Duty Cycle	1 – 200	80∇ 5-10♦	31.3 0.42*	--	--	--	3.6 0.05*	3.6 0.03*
Single-Phase TIG Process	140 A @ 15.6 VDC, 40% Duty Cycle	1 – 200	80 5-10♦	31.0 0.42*	--	--	--	3.6 0.05*	3.5 0.03*
Single-Phase Stick Process	90 A @ 23.6 VDC, 100% Duty Cycle	1 – 200	80∇ 5-10♦	27.6 0.42*	--	--	--	3.2 0.05*	3.2 0.03*
Single-Phase TIG Process	100 A @ 14 VDC, 100% Duty Cycle	1 – 200	80 5-10♦	20.7 0.42*	--	--	--	2.3 0.05*	2.3 0.03*

*While idling

** Welding range for AC output is 5–200 amperes

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

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

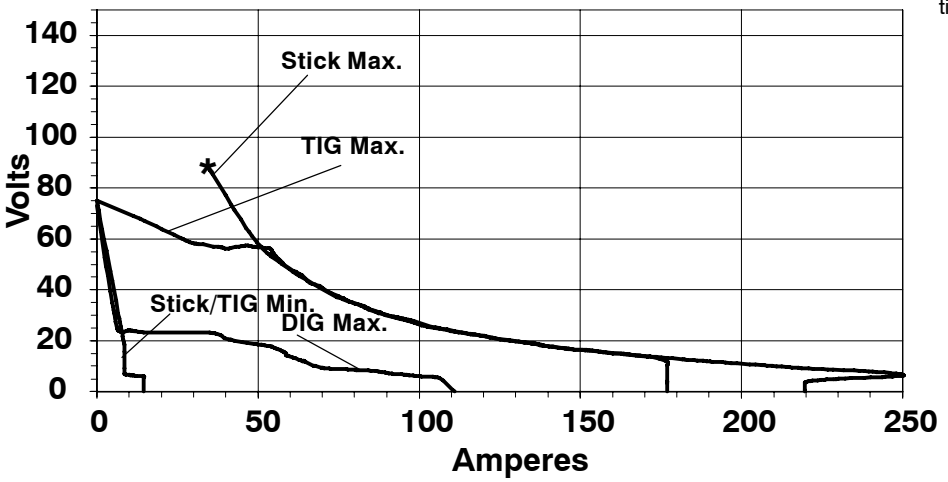
NOTE: Duty cycle limitations on units with 115 volt input power are due to the input power cord supplied with the unit.

NOTE: This unit is equipped with Auto-Line™. The Auto-Line circuitry automatically connects to 120–460 VAC, single- or three-phase power without removing the cover to relink the power source.

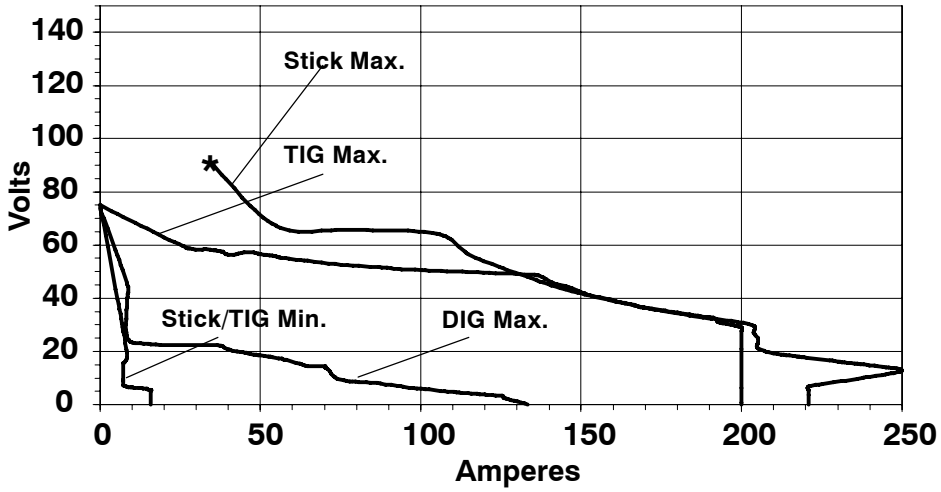
3-2. DC Volt-Ampere Curves

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

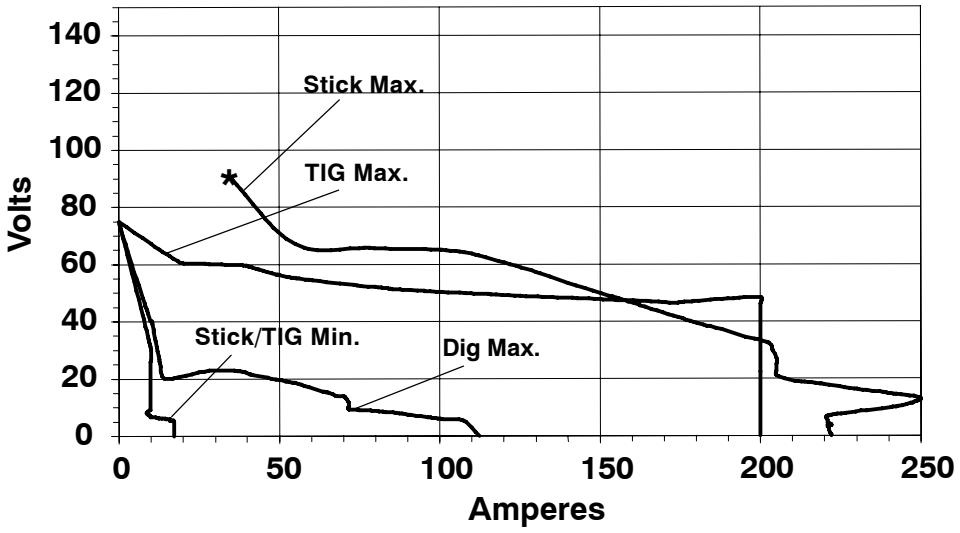
115VAC Input; DC Output



230VAC Single Phase Input; DC Output



3 Phase Voltage Input; DC Output



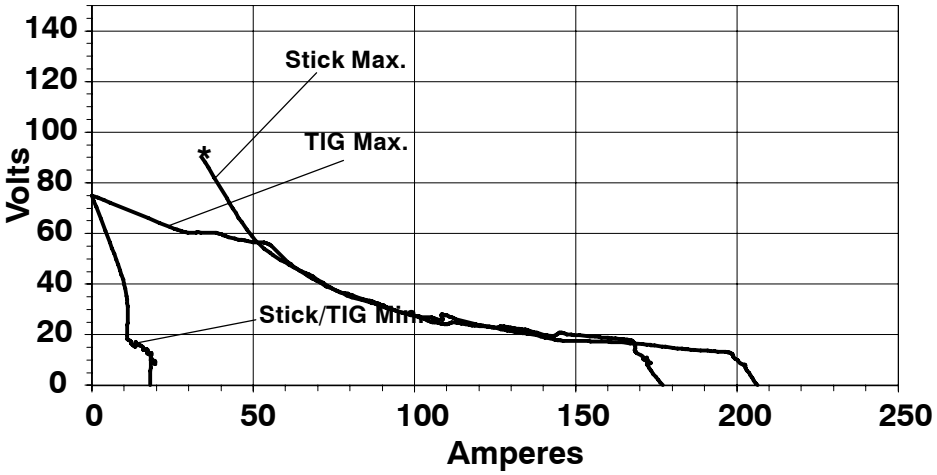
***Amperage setting must be reduced to obtain currents less than highlighted data* point.**

210 168-A

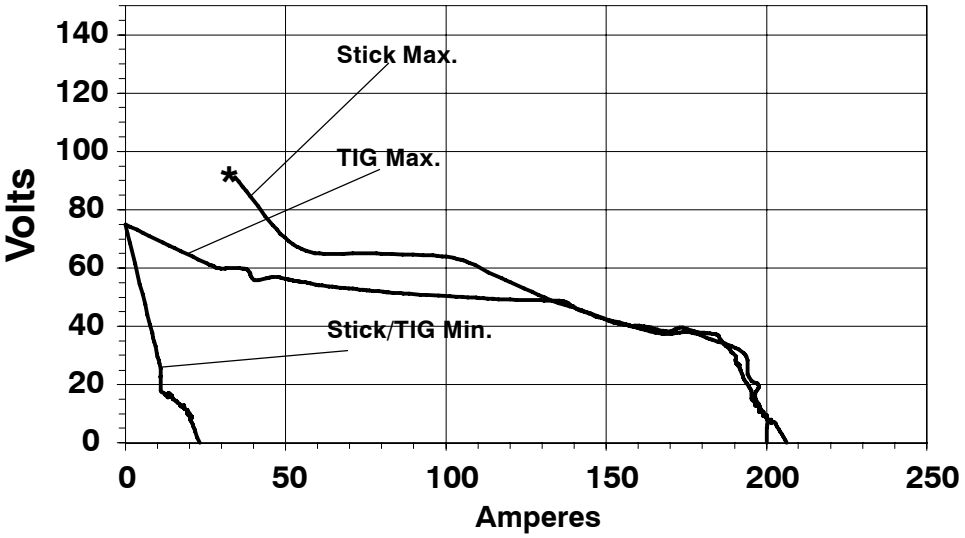
3-3. AC Volt-Ampere Curves

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

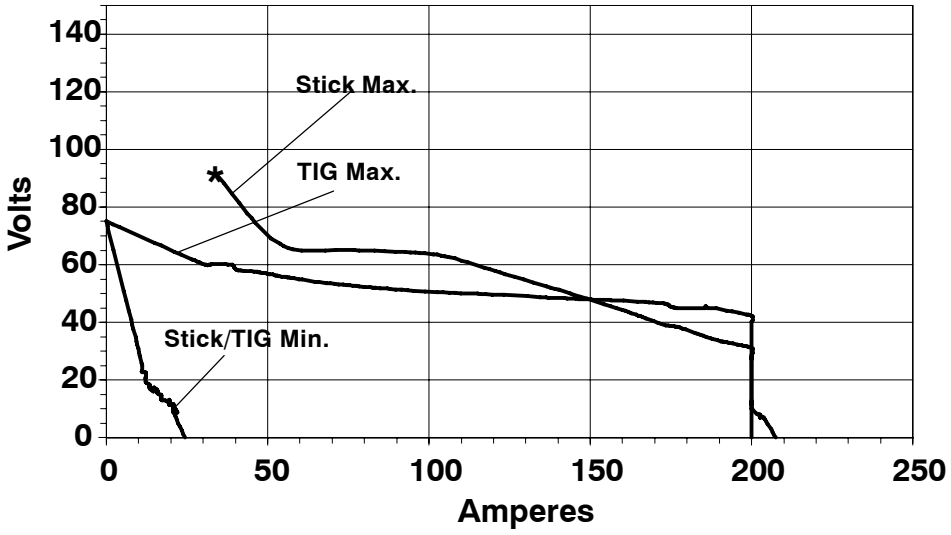
115VAC Input; AC Output



230VAC Single Phase Input; AC Output



3 Phase Voltage Input; AC Output



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

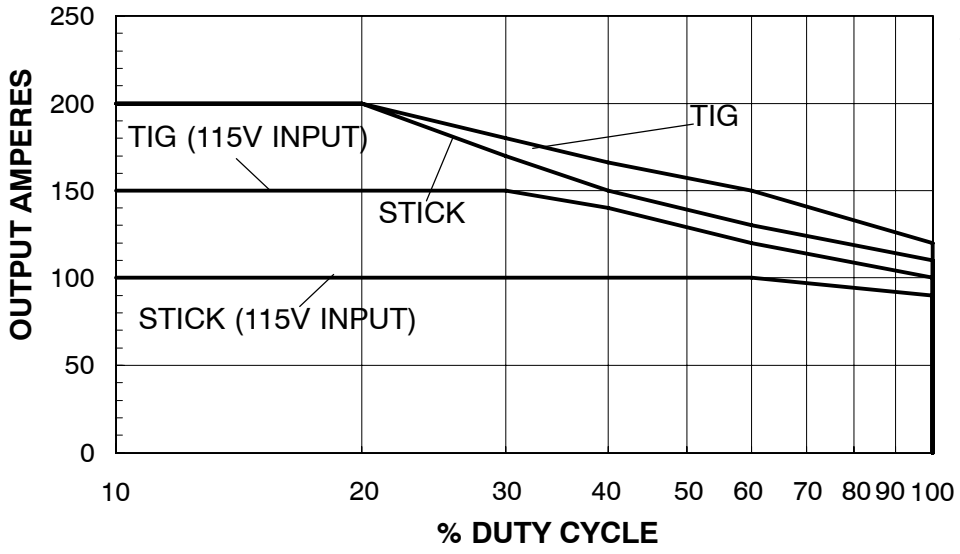
210 168

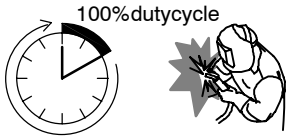
3-4. Duty Cycle And Overheating

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

If unit overheats, output stops, a Help message is displayed (see Section 8-3), and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage or voltage, or duty cycle before welding.

▲ **Exceeding duty cycle can damage unit and void warranty.**

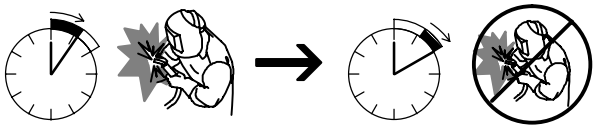




Continuous Welding

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

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

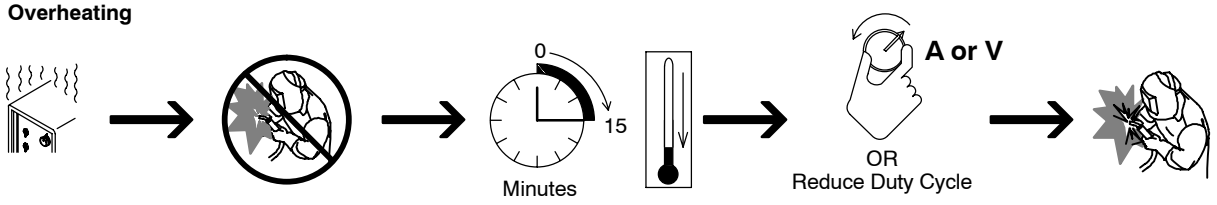


6 Minutes Welding — 4 Minutes Resting

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

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

Overheating

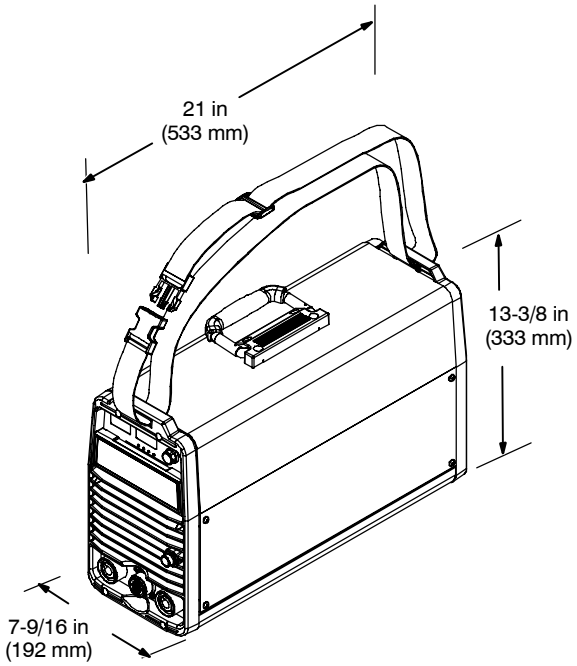


210 167

3-5. Selecting A Location

Dimensions And Weight

48.5 lb (22 kg)



1 Identification Plate

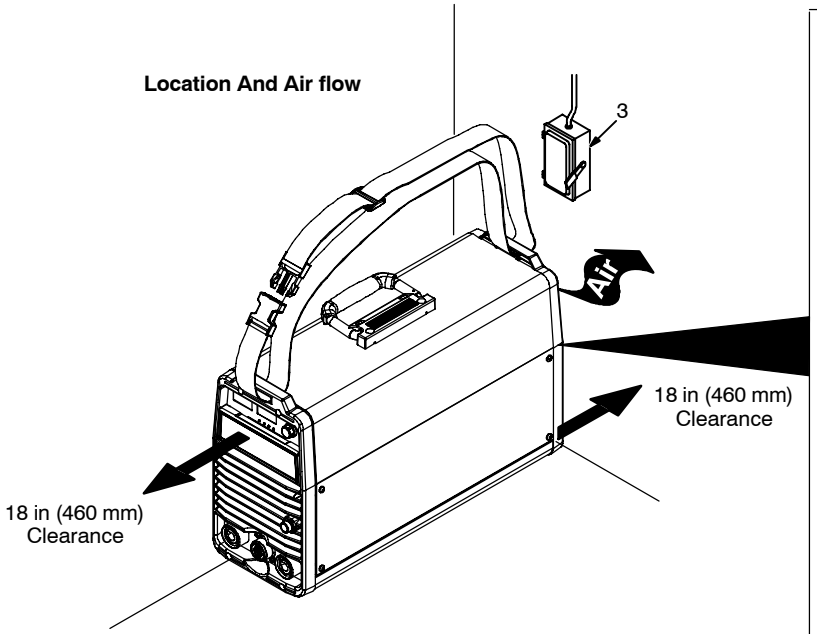
2 Rating Label

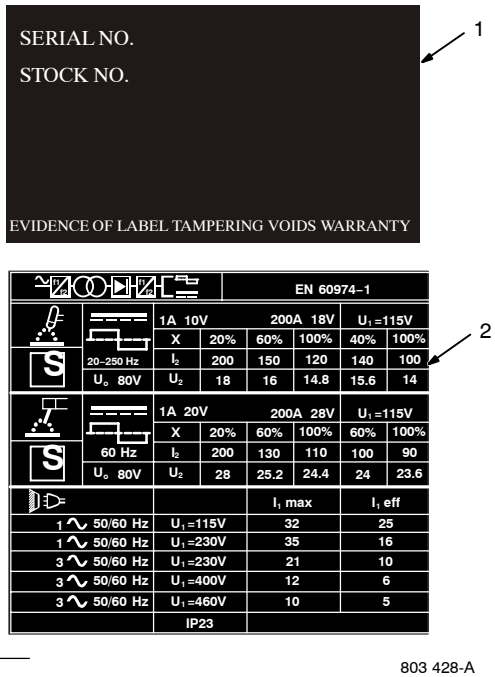
3 Line Disconnect Device

Locate unit near correct input power supply.

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

Location And Air flow





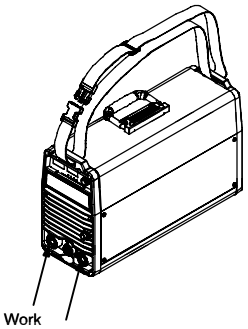
803 428-A

3-6. Weld Output Terminals And Selecting Cable Sizes*

▲ **Turn off power before connecting to weld output terminals.**

▲ **Do not use worn, damaged, undersized, or poorly spliced cables.**

Welding Amperes***	Weld Cable Size** and Total Cable (Copper) Length in Weld Circuit Not Exceeding							
	100 ft (30 m) Or Less		150 ft (45 m)	200 ft (60 m)	250 ft (70 m)	300 ft (90 m)	350 ft (105 m)	400 ft (120 m)
	10 – 60% Duty Cycle	60 – 100% Duty Cycle	10 – 100% Duty Cycle					
100	4 (20)	4 (20)	4 (20)	3 (30)	2 (35)	1 (50)	1/0 (60)	1/0 (60)
150	3 (30)	3 (30)	2 (35)	1 (50)	1/0 (60)	2/0 (70)	3/0 (95	3/0 (95)
200	3 (30)	2 (35)	1 (50)	1/0 (60)	2/0 (70)	3/0 (95)	4/0 (120)	4/0 (120)



Output Receptacles

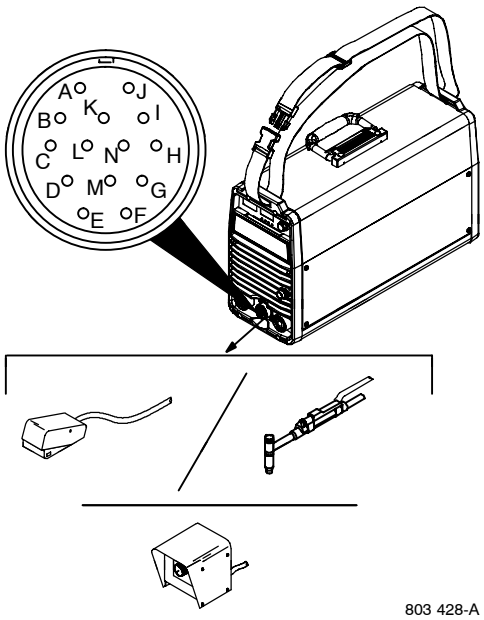
* This chart is a general guideline and may not suit all applications. If cable overheats, use next size larger cable.

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

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

S-0007-E–

3-7. Remote 14 Receptacle Information



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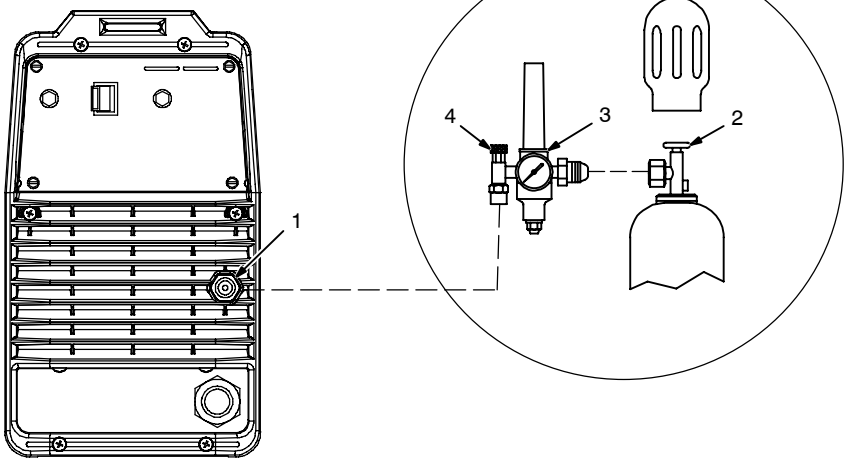
REMOTE 14	Socket*	Socket Information
15 VOLTS DC	A	Contactor control +15 volts dc.
OUTPUT CONTACTOR	B	Contact closure to A completes 15 volts dc contactor control circuit and enables output.
REMOTE OUTPUT CONTROL	C	Output to remote control; +10 volts dc output to remote control.
	D	Remote control circuit common.
	E	0 to +10 volts dc input command signal from remote control.
A/V AMPERAGE VOLTAGE	F	Current feedback; +1 volt dc per 100 amperes.
	H	Voltage feedback; +1 volt dc per 10 volts output.
GND	G	+15 volts dc GND
CHASSIS	K	Chassis common.

*The remaining sockets are not used.

Note: If a remote hand control, like the RHC-14, is connected to the Remote 14 receptacle, some current value above min. must be set on the remote control before the Panel or Remote contactor is turned on. Failure to do so, will cause current to be controlled by the panel control and the remote hand control will not function.

3-8. Gas Connections



1 Gas Fitting

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

2 Cylinder Valve

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

3 Regulator/Flowmeter

4 Flow Adjust

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

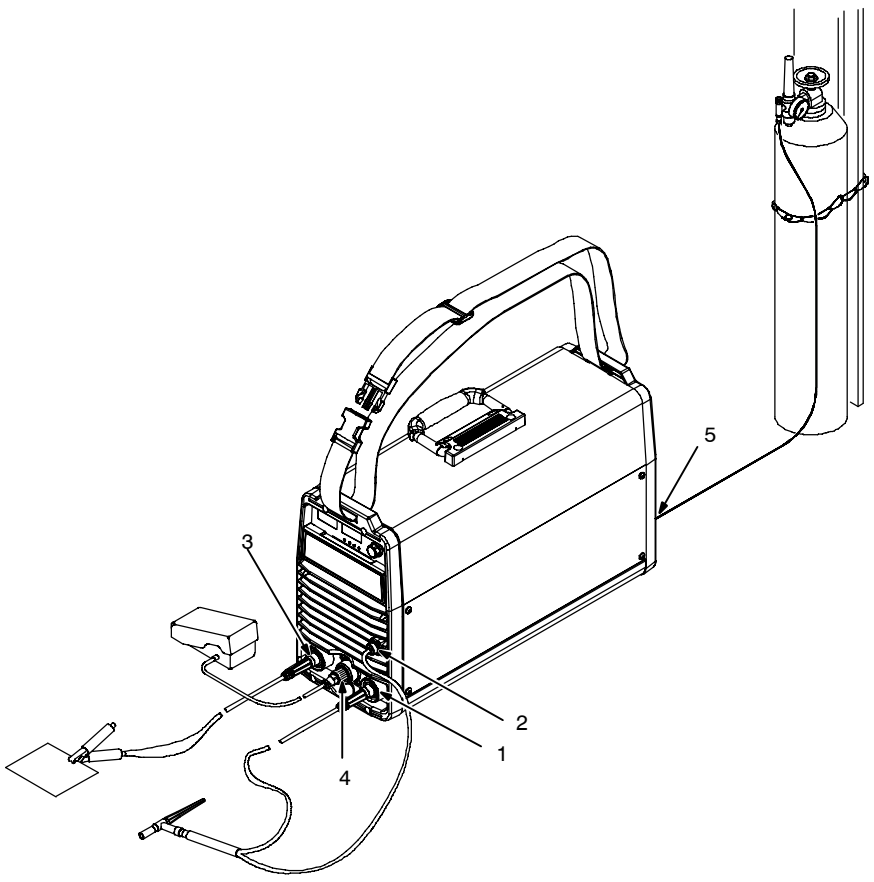
Connect customer supplied gas hose between regulator/flowmeter and gas fitting on rear of unit.

Tools Needed:

11/16, 1-1/8 in, (21, 29 mm)

802 452

3-9. TIG HF Impulse/ Lift-Arc™ Connections



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

1 Electrode Weld Output Terminal

Connect TIG torch to weld output terminal labeled Electrode.

2 Gas Out Connection

Connect torch gas hose to gas out fitting.

3 Work Weld Output Terminal

Connect work lead to weld output terminal labeled Work.

4 Remote 14 Receptacle

Connect desired remote control to Remote 14 receptacle.

5 Gas In Connection

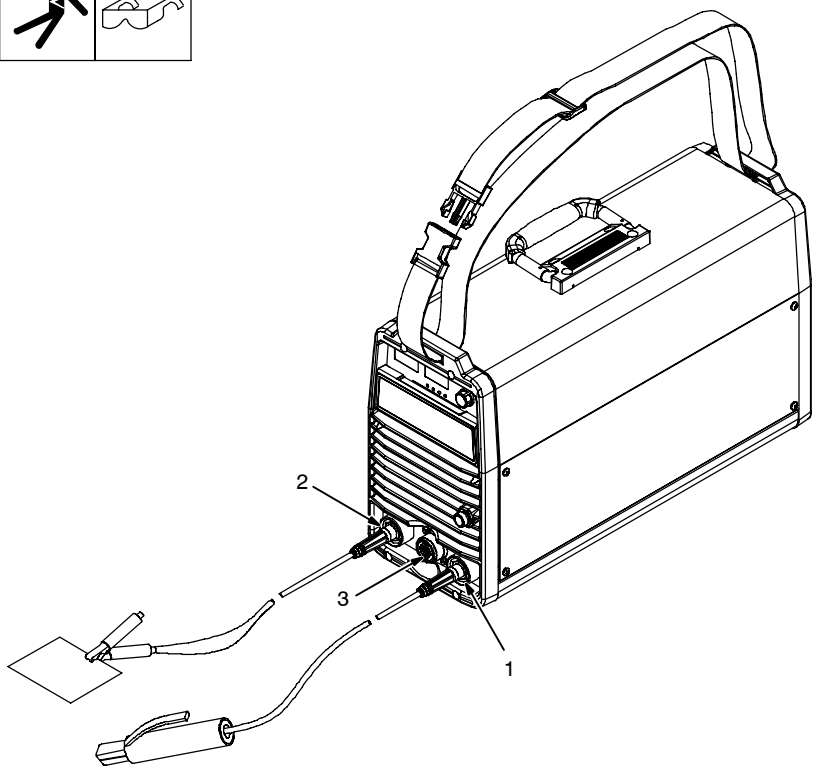
Connect gas hose from gas supply to gas in fitting.

Tools Needed:

11/16 in, (21 mm)

803 430-a

3-10. Stick Connections



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

1 Electrode Weld Output Terminal

Connect electrode holder to weld output terminal labeled Electrode.

2 Work Weld Output Terminal

Connect work lead to weld output terminal labeled Work.

3 Remote 14 Receptacle

If desired, connect remote control to Remote 14 receptacle (see Section 3-7).

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3-11. Electrical Service Guide

NOTE ☞

Actual input voltage should not fall below 103 volts AC or rise above 506 volts AC. If actual input voltage is outside this range, unit may not operate according to specifications.

Input Voltage	Single-Phase, 100% Duty Cycle	Single-Phase, 60% Duty Cycle	Three-Phase, 60% Duty Cycle		
	115	230	230	400	460
Input Amperes At Rated Output	28	20	12.3	7.6	6.0
Max Recommended Standard Fuse Rating In Amperes[1] **Normal Operating [2]**	35	30	20	10	10
Min Input Conductor Size In AWG [3]	10	12	14	14	14
Max Recommended Input Conductor Length In Feet (Meters)	57 (17)	79 (24)	102 (31)	308 (94)	407 (124)
Min Grounding Conductor Size In AWGG [3]	10	12	14	14	14

Reference: 1999 National Electrical Code (NEC)

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

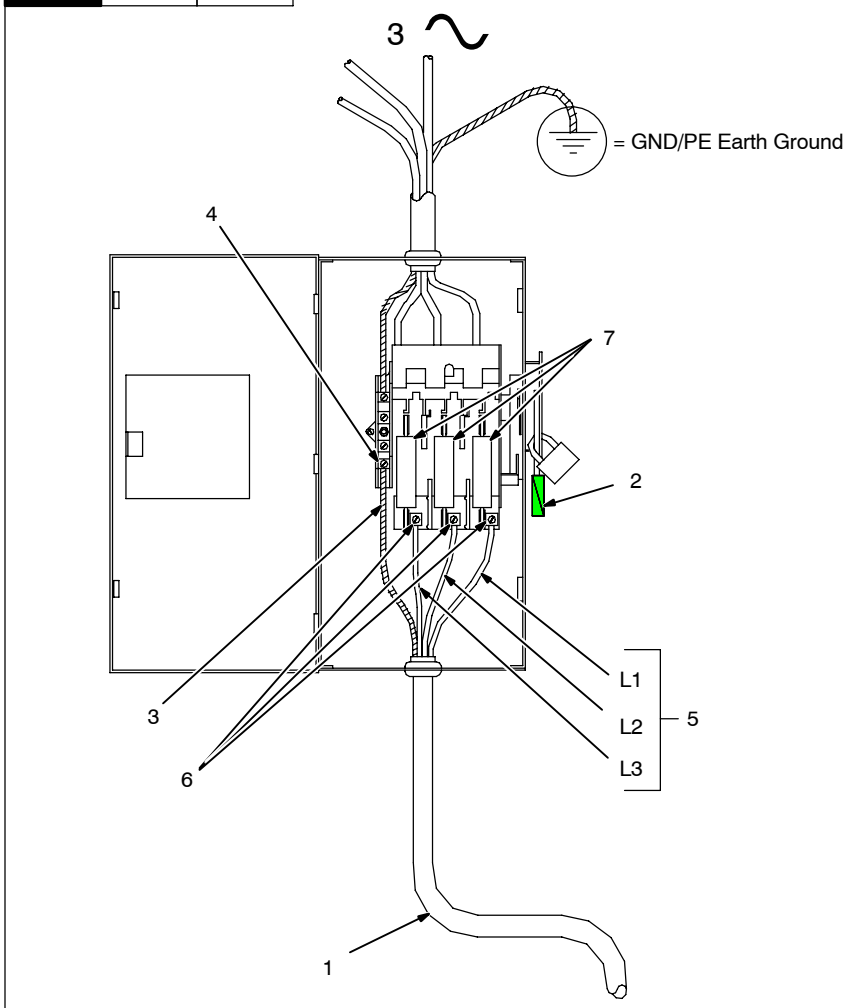
2 "Normal Operating" (general purpose - no intentional delay) fuses are UL class "K5" (up to and including 60 amp), and UL class "H" (65 amp and above).

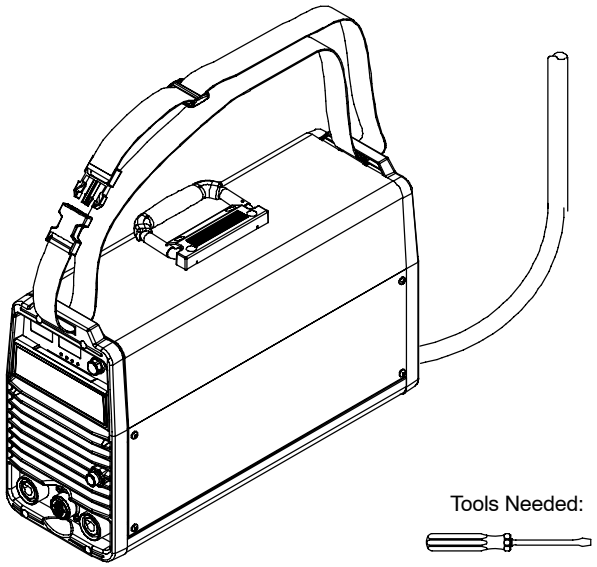
3 Conductor data in this section specifies conductor size (excluding flexible cord or cable) between the panelboard and the equipment per NEC Table 310.16. If a flexible cord or cable is used, minimum conductor size may increase. See NEC Table 400.5(A) for flexible cord and cable requirements.

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

3-12. Connecting Input Power

A. Connecting Three-Phase Input Power





Tools Needed:

▲ **Installation must meet all National and Local Codes – have only qualified persons make this installation.**

▲ **Disconnect and lockout/tagout input power before connecting input conductors from unit.**

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

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

For Three-Phase Operation

1 Input Power Cord.

2 Disconnect Device (switch shown in the OFF position)

3 Green Or Green/Yellow Grounding Conductor

4 Disconnect Device Grounding Terminal

5 Input Conductors (L1, L2 And L3)

6 Disconnect Device Line Terminals

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

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

7 Overcurrent Protection

Select type and size of overcurrent protection using Section 3-11 (fused disconnect switch shown).

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

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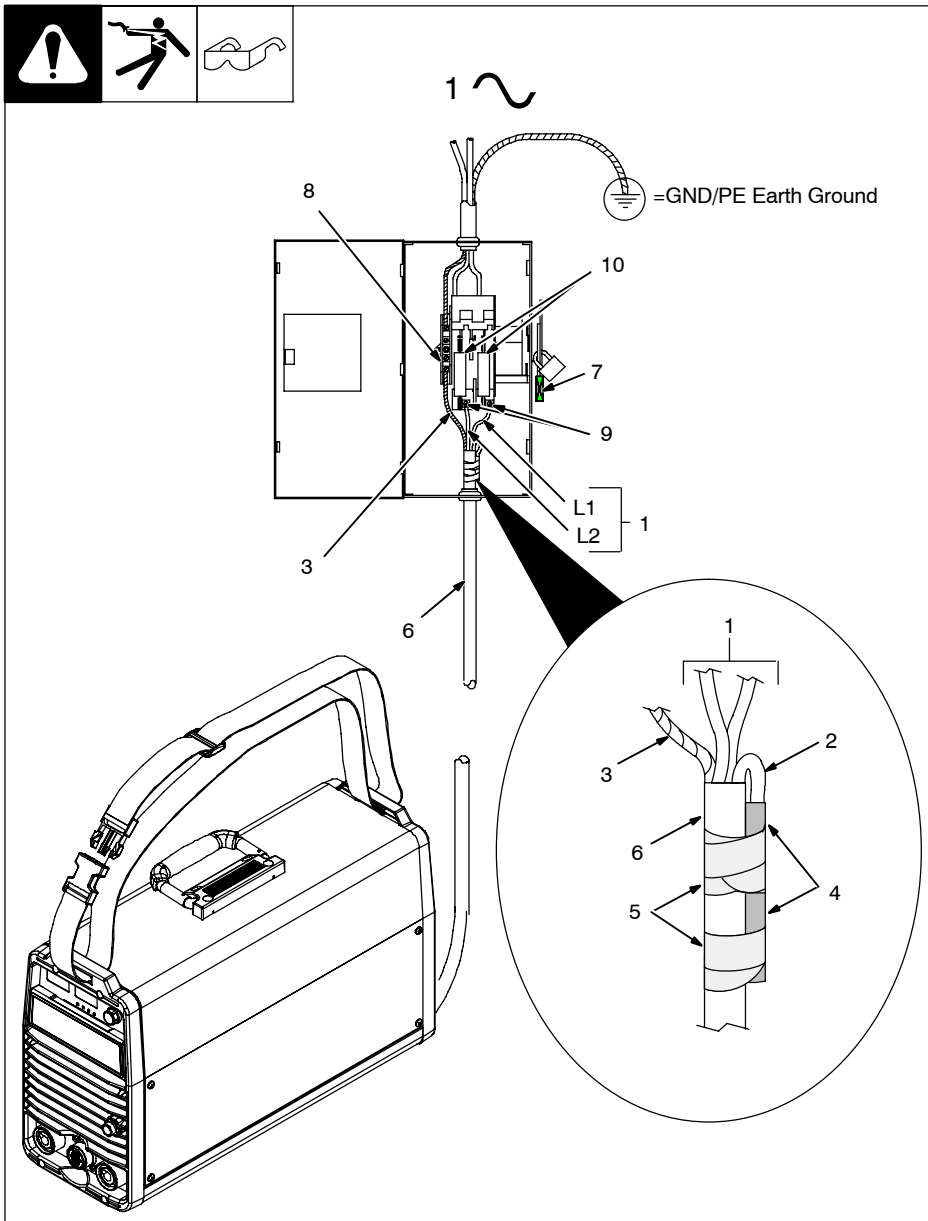
B. Connecting Single-Phase Input Power



▲ **Installation must meet all National and Local Codes – have only qualified persons make this installation.**

▲ **Disconnect and lockout/tagout input power before connecting input conductors from unit.**

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

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

1 Black And White Input Conductor (L1 And L2)

2 Red Input Conductor

3 Green Or Green/Yellow Grounding Conductor

4 Insulation Sleeving

5 Electrical Tape

Insulate and isolate red conductor as shown.

6 Input Power Cord.

7 Disconnect Device (switch shown in the OFF position)

8 Disconnect Device Grounding Terminal

9 Disconnect Device Line Terminals

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

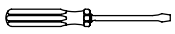
Connect input conductors L1 and L2 to disconnect device line terminals.

10 Overcurrent Protection

Select type and size of overcurrent protection using Section 3-11 (fused disconnect switch shown).

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

Tools Needed:



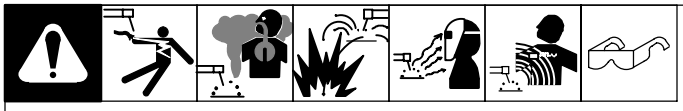
2/04 - Ref. 802 136-A / 803 428-A

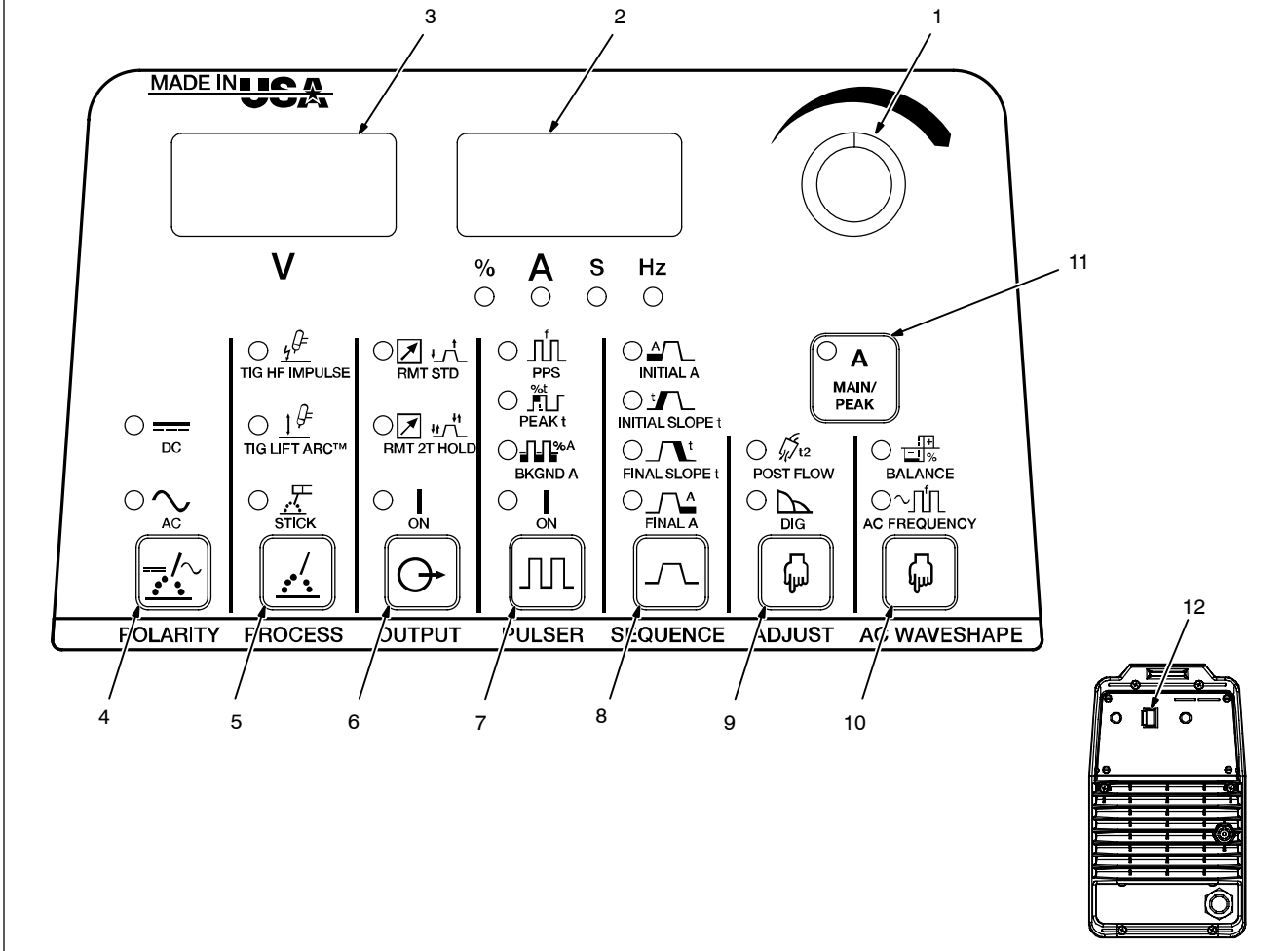
SECTION 4 – OPERATION

NOTE ☞

Section 4 in this manual covers operation of all models of 200 and 300 ampere inverter based TIG machines. Features and options referenced may not be available on your machine. Verify the model you have before using this section.

4-1. Controls





207 694-A / 802 452

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

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

1 Encoder Control

Use encoder control in conjunction with applicable front panel function switch pads to change values for that function. See Section 4-2.

2 Ammeter And Parameter Display

See Section 4-4.

3 Voltmeter

See Section 4-5.

4 Polarity Control

See Section 4-6.

5 Process Controls

See Section 4-7.

6 Output Controls

See Section 4-8.

7 Pulser Controls (DX And LX Models)

See Section 4-9.

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

See Section 4-10.

9 Adjust Controls

See Section 4-11.

10 AC Waveshape Control

See Section 4-12.

11 Amperage And Spot Time Control

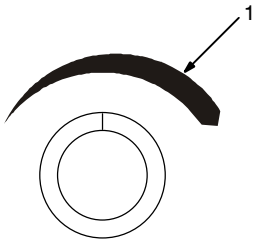
For Amperage control, see Section 4-3.

For Spot Time control, see Section 4-13.

12 Power Switch

Use switch to turn unit On/Off.

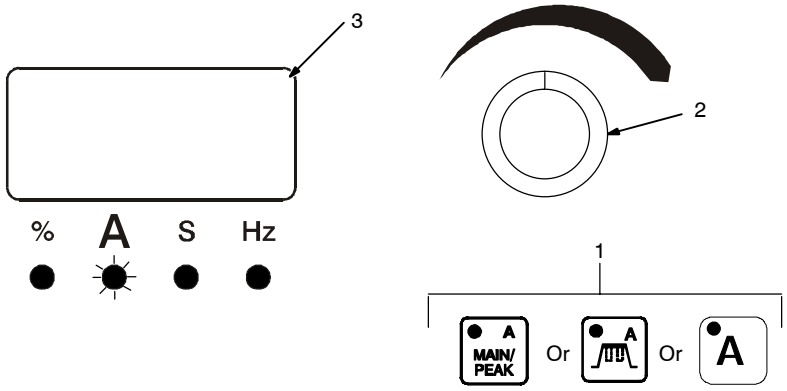
4-2. Encoder Control



1 Encoder Control

Use control in conjunction with applicable front panel function switch pad to set values for that function.

4-3. Amperage Control



A 1 A (Amperage Control)

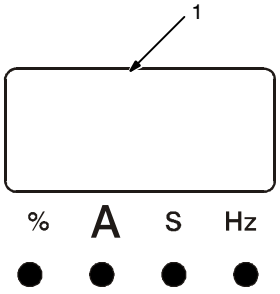
2 Encoder Control

A 3 Ammeter

See Section 4-16 for Amperage control range.

Press Amperage switch pad and turn Encoder control to set weld amperage. Weld amperage setting is also peak amperage when Pulser function is active (see Section 4-9).

4-4. Ammeter And Parameter Display



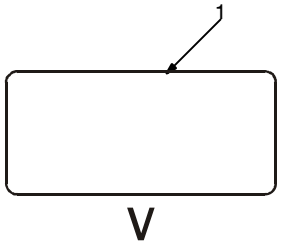
1 Ammeter

Displays actual amperage while welding. Meter also displays preset parameters for any of the following units of measure when they are active: amperage, time, percentage or frequency. The corresponding LED, located directly below the ammeter, will also illuminate.

A

% A S Hz

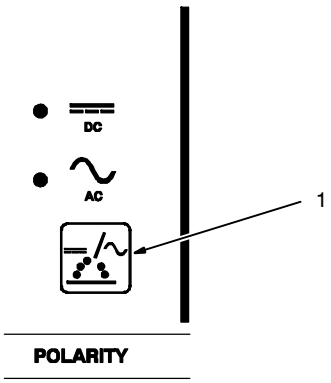
4-5. Voltmeter



V 1 Volt Meter

Displays output or open circuit voltage. If output is off, the voltmeter will display a series of three dashes (---). Open circuit voltage is displayed if power is on and output is available.

4-6. Polarity Control (Dynasty™ Models Only)



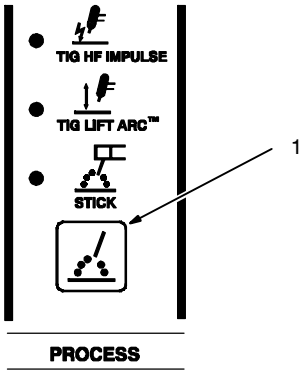
1 Polarity Control

Press switch pad until desired LED is illuminated.

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

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

4-7. Process Control



1 Process Control

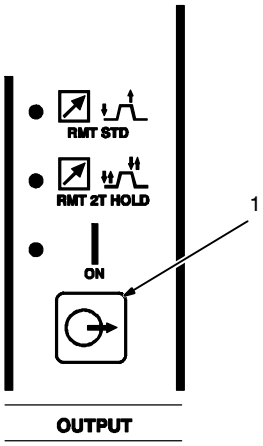
Press switch pad until desired process LED is illuminated:

TIG HF Impulse - When selected, a pulsed HF (non-contact) (see Section 12-3) arc starting method is activated. This method can be used with either AC or DC TIG welding. Make connections according to Section 3-9.

TIG Lift-Arc™ - When selected, is an arc starting method in which the electrode must come in contact with the workpiece to initiate an arc (see Section 12-3). This method can be used with either AC or DC TIG welding. Make connections according to Section 3-9.

Stick (SMAW) - This method can be used with either AC or DC Stick welding. Make connections according to Section 3-10.

4-8. Output Control



1 Output Control

Press switch pad until desired parameter LED is illuminated.

RMT STD (Remote Standard)

Application: Use Remote Trigger (Standard) when the operator desires to use a foot pedal or finger amperage control (see Section 5-2A).

NOTE: When a foot or finger remote current control is connected to the welding power source, initial amps, initial slope, final slope, and final amps are controlled at the remote control, not at the welding power source.

NOTE: If On/Off only type trigger is used, it must be a maintained switch. All Sequencer functions become active, and must be set by the operator.

RMT 2T HOLD

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

If a foot or finger current control is connected to the welding power source, only trigger input is functional (see Section 5-2B).

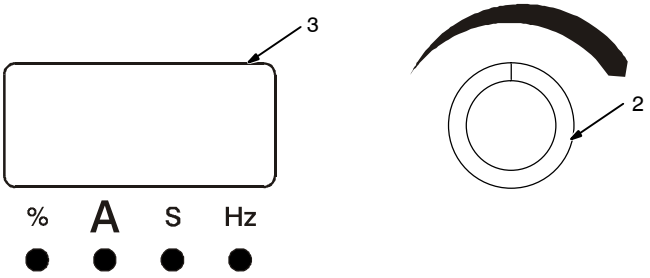
NOTE: This switch function can be reconfigured for 4T, 4T Momentary, Mini Logic, or Spot control See Section 5-2C)

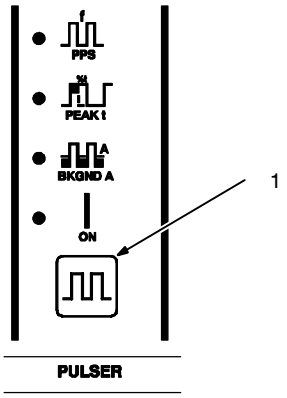
ON

Output will energize two seconds after being selected.

Application: Use Output On for Stick (SMAW) welding, or for Lift-Arc without the use of a remote control (see Section 5-2H).

4-9. Pulser Control (DX And LX Models)





4

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

1 Pulser Control

Pulsing is available only while using the TIG process, it cannot be selected if the Stick process (see Section 4-7) is active. Controls can be adjusted while welding.

Press switch pad to enable pulser.

ON - When illuminated, this LED indicates the pulser is on.

Press switch pad until desired parameter LED is illuminated.

To turn Pulser off, press and release switch pad until the On LED turns off.

2 Encoder Control

3 Ammeter

Turn encoder (see Section 4-2) to select appropriate value for active pulse parameter. Value selected is shown on the ammeter (see Section 4-4). Also, the ammeter LED for the corresponding unit of measure (%, A, s, Hz) of the active parameter will be illuminated.

See Section 4-16 for all Pulser parameter ranges.

PPS (Pulses Per Second or Pulse Frequency) - Control is used to determine appearance of weld bead.

PEAK t - The percentage of each pulse cycle that can be spent at the peak amperage level.

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

4 Pulsed Output Waveforms

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

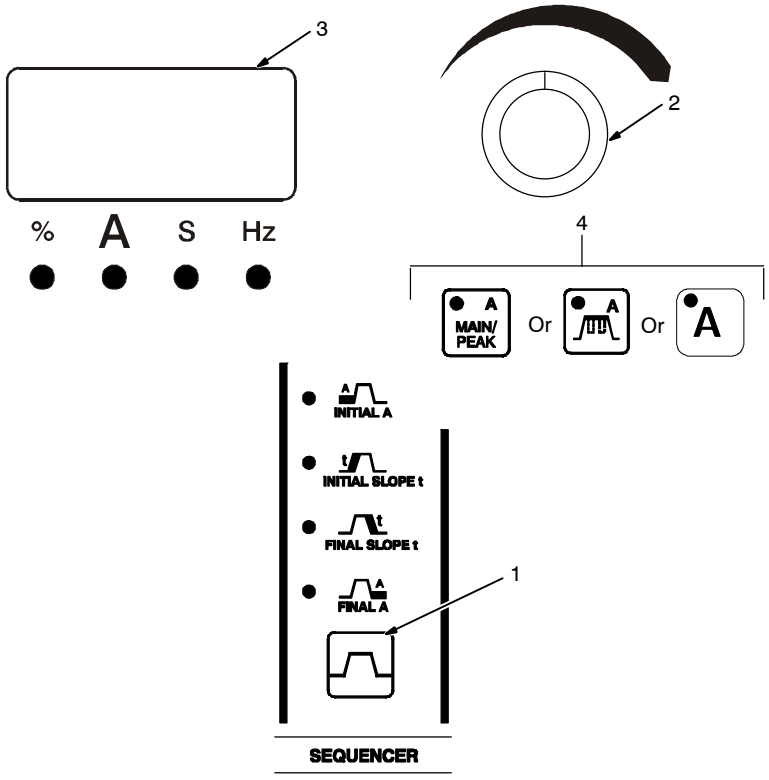
NOTE: Peak amperage is set using the Amperage control (see Section 4-3). Peak amperage is the highest welding amperage allowed to occur in the pulse cycle. Weld penetration varies directly with peak amperage.

Application:

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

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

4-10. Sequencer Controls (DX, LX And All CE Models)



1 Sequencer Control

Sequencing is available only while using the TIG process, but is disabled if a remote foot or finger current control is connected to the Remote receptacle while in the RMT STD mode. Sequencer parameters cannot be selected if the Stick process (see Section 4-7) is active.

Press switch pad until desired parameter LED is illuminated.

2 Encoder Control

3 Ammeter

Turn encoder (see Section 4-2) to set appropriate value for active sequence parameter. Value selected is shown on the ammeter (see Section 4-4). Also, the ammeter LED for the corresponding unit of measure (A, S) of the active parameter will be illuminated.

See Section 4-16 for all Sequencer parameter ranges.

INITIAL A (Initial Amperage) - Use control to select a starting amperage that is different from the weld amperage.

Application:

Initial Amperage can be used while GTAW welding to assist in preheating cold material prior to depositing filler material, or to ensure a soft start.

INITIAL t (Initial Time)**(LX Models Only) -** Press control again and turn Encoder to select amount of time that is needed at the beginning of the weld.

INITIAL SLOPE t (Initial Slope Time) Use control to select amount of time that it takes to slope up/down from initial amperage to weld amperage. To disable, set to 0.

4 Amperage Switch Pad

Weld Time (LX Models Only) - Press Amperage switch pad twice. Set desired length of weld time.

FINAL SLOPE t (Final Slope Time) - Use control to select amount of time that it takes to slope up/down from weld amperage to final amperage. To disable, set to 0.

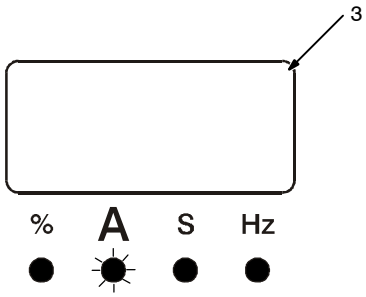
Application:

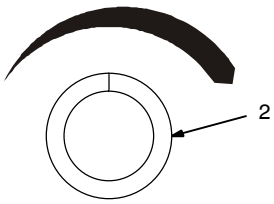
Final Slope should be used while GTAW welding materials that are crack sensitive, and/or the operator wants to eliminate the crater at the end of the weld.

FINAL A (Final Amperage) - Use control to select amperage to which weld amperage has sloped up/down to.

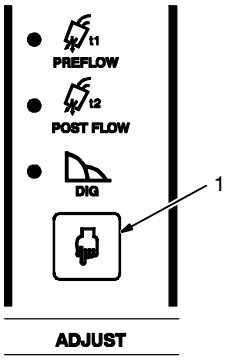
FINAL t (Final Time)**(LX Models Only)** - Press control again and turn Encoder to select amount of time that is needed at the end of the weld.

4-11. Adjust Controls (Preflow/Post Flow/DIG/Purge)





☞ *Some features shown are not available on all models.*



1 Adjust

Press switch pad until desired function LED is illuminated.

2 Encoder Control

3 Ammeter

Turn encoder (see Section 4-2) to set appropriate value for active Adjust parameter. Value selected is shown on the ammeter (see Section 4-4). Also, the ammeter LED for the corresponding unit of measure (S, %) of the active parameter will be illuminated.

See Section 4-16 for all Adjust parameter ranges.

PREFLOW - If the TIG HF process is active (see Section 4-7) and Preflow is shown on the control panel, use control to set length of time gas flows before arc initiation. To set Preflow time for models that do not have Preflow Time control on the front panel, see Section 4-15.

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

POST FLOW - If the TIG process is active (see Section 4-7), use control to set length of time gas flows after welding stops.

Application:

Postflow is required to cool tungsten and weld, and to prevent contamination of tungsten and weld. Increase postflow time if tungsten or weld are dark in appearance.

DIG - If the DC Stick process is active (see Section 4-7), use control to set amount of DIG. When set at 0, short-circuit amperage at low arc voltage is the same as normal welding amperage.

When setting is increased, short-circuit amperage at low arc voltage increases.

Application:

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

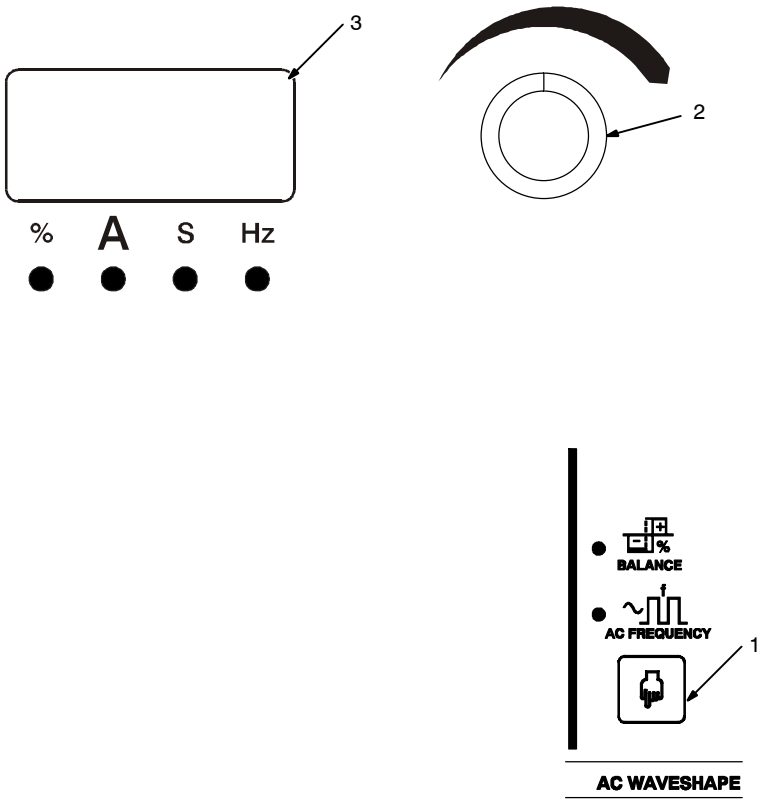
PURGE - While in the TIG process (see Section 4-7), to activate the gas valve and start the purge function, push and hold the Adjust switch pad for the desired amount of purge time. To set from 0 to 50 seconds of additional purge time, continue to hold the Adjust switch pad while turning the encoder control. Factory default setting is 0.

While Purge is active, *{PUR}* is shown in the left display, and purge time is shown in the right display.

Pressing any front panel switch pad will end the purge time display, but gas will continue to flow until the preset time has timed out.

Application: Purge is used to clear the shielding gas lines of contaminates.

4-12. AC Waveshape (Dynasty Models Only)



1 AC Waveshape

2 Encoder Control

A 3 Ammeter

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

See Section 4-16 for all AC Waveshape parameter ranges.

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

Application:

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

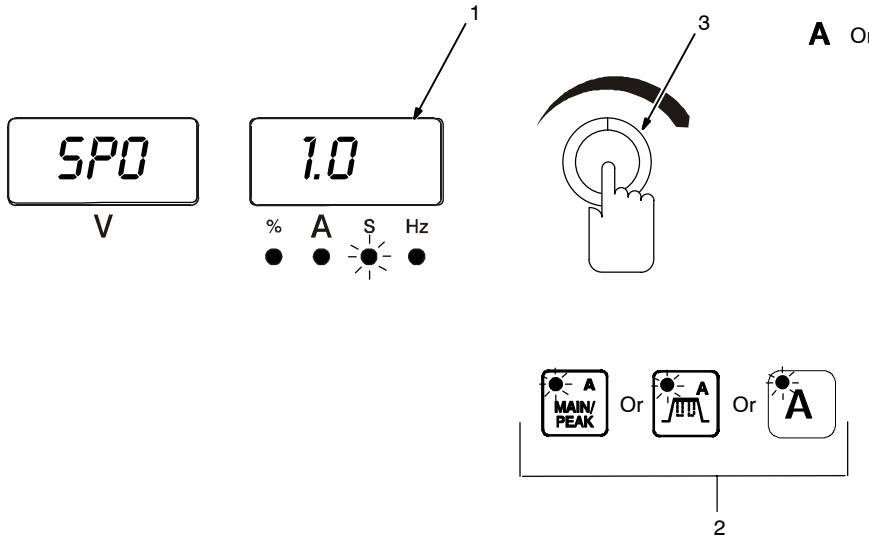
Joint configuration, set-up, process variables, and oxide thickness may affect setting.

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

Application:

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

4-13. Spot Time Control (Reconfigured RMT 2T HOLD Output Selection)



1 Spot Time Meter Display

Select Spot function according to Section 5-2C.

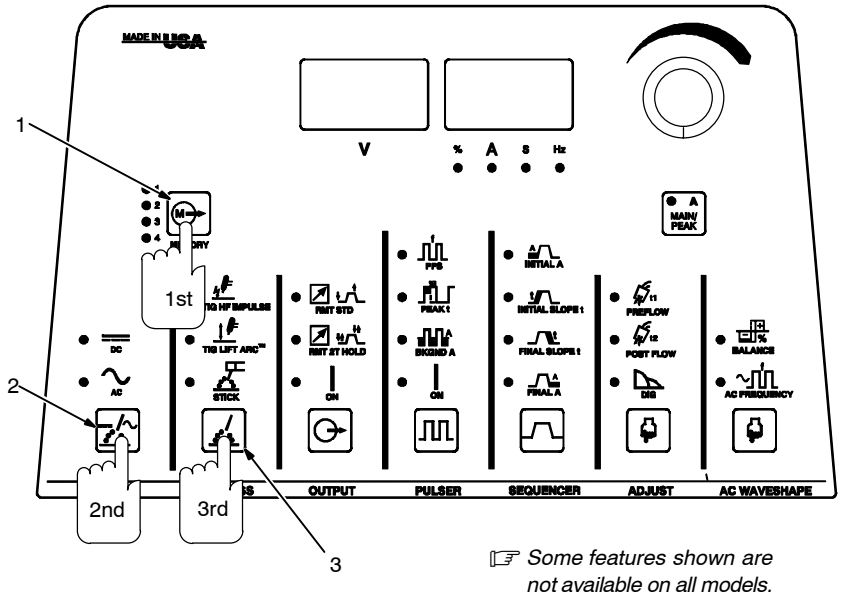
A Or 2 Amperage Switch Pad

3 Encoder Control

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

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

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



☞ *Some features shown are not available on all models.*

1 Memory (Program Storage 1-4) Switch Pad

2 Polarity Switch Pad

3 Process Switch Pad

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

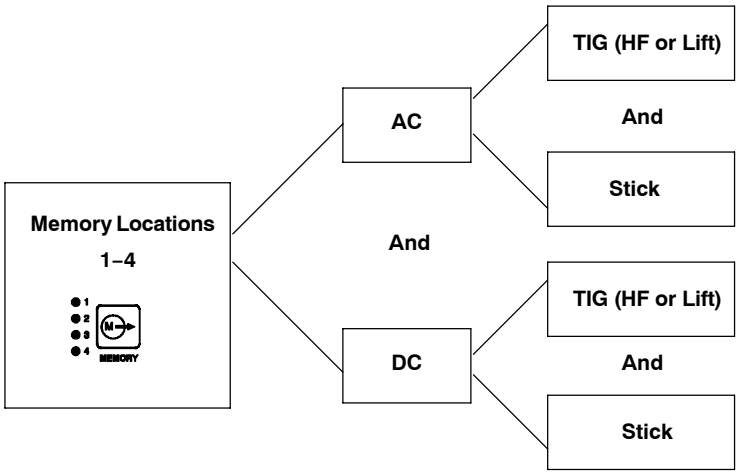
First, press Memory switch pad until the desired program storage location (1-4) LED is illuminated

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

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

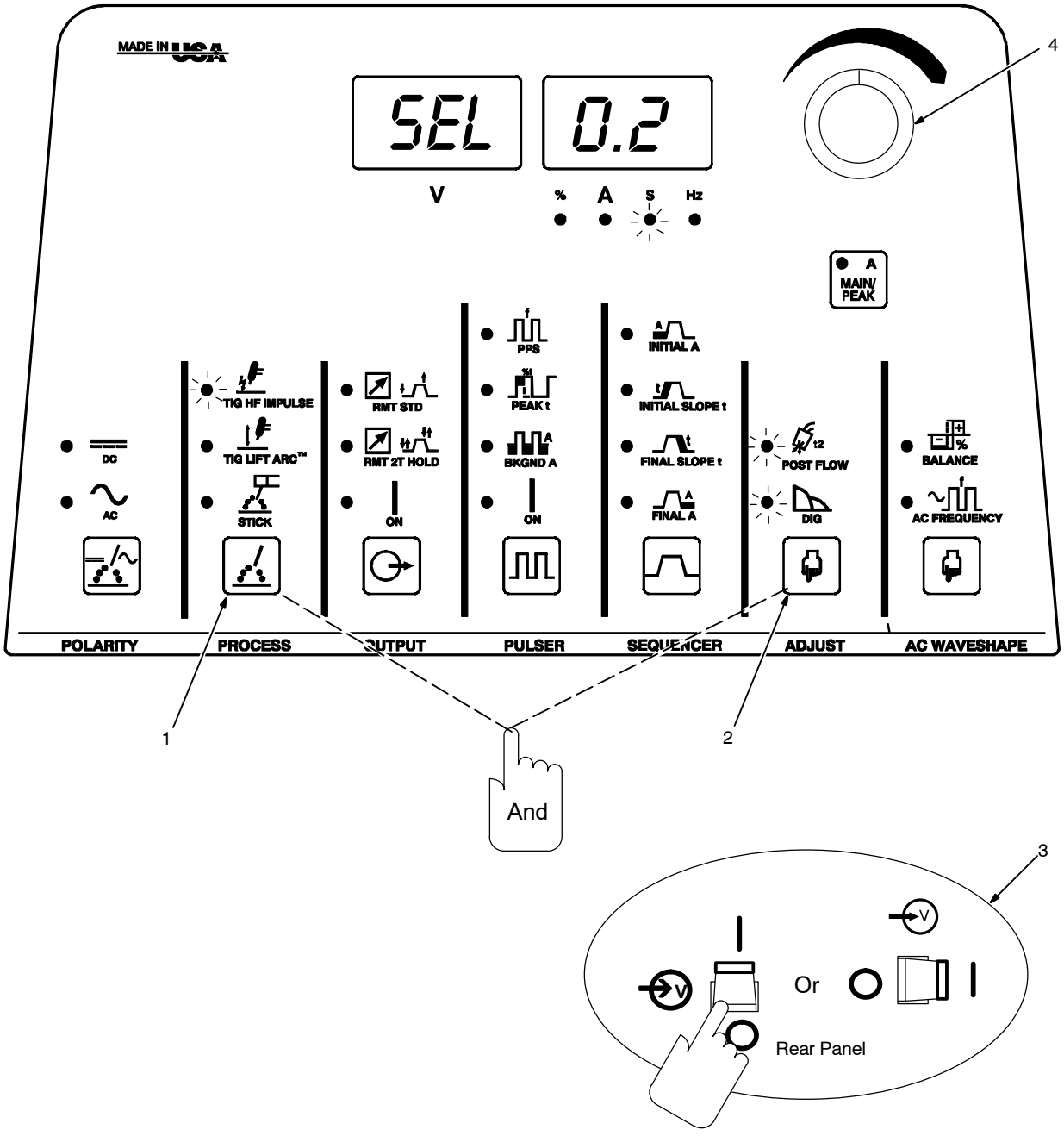
The program at the chosen location, for the desired polarity and process, is now the active program.

Fourth, change or set all desired parameters (see Section 4-1 for parameters).



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

4-15. Setting Preflow Time For Use With TIG HF Impulse On Models That Do Not Have A Preflow Control On The Front Panel



1 Process Control Pad

2 Adjust Control Pad

3 Power Switch

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

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

4 Encoder Control

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

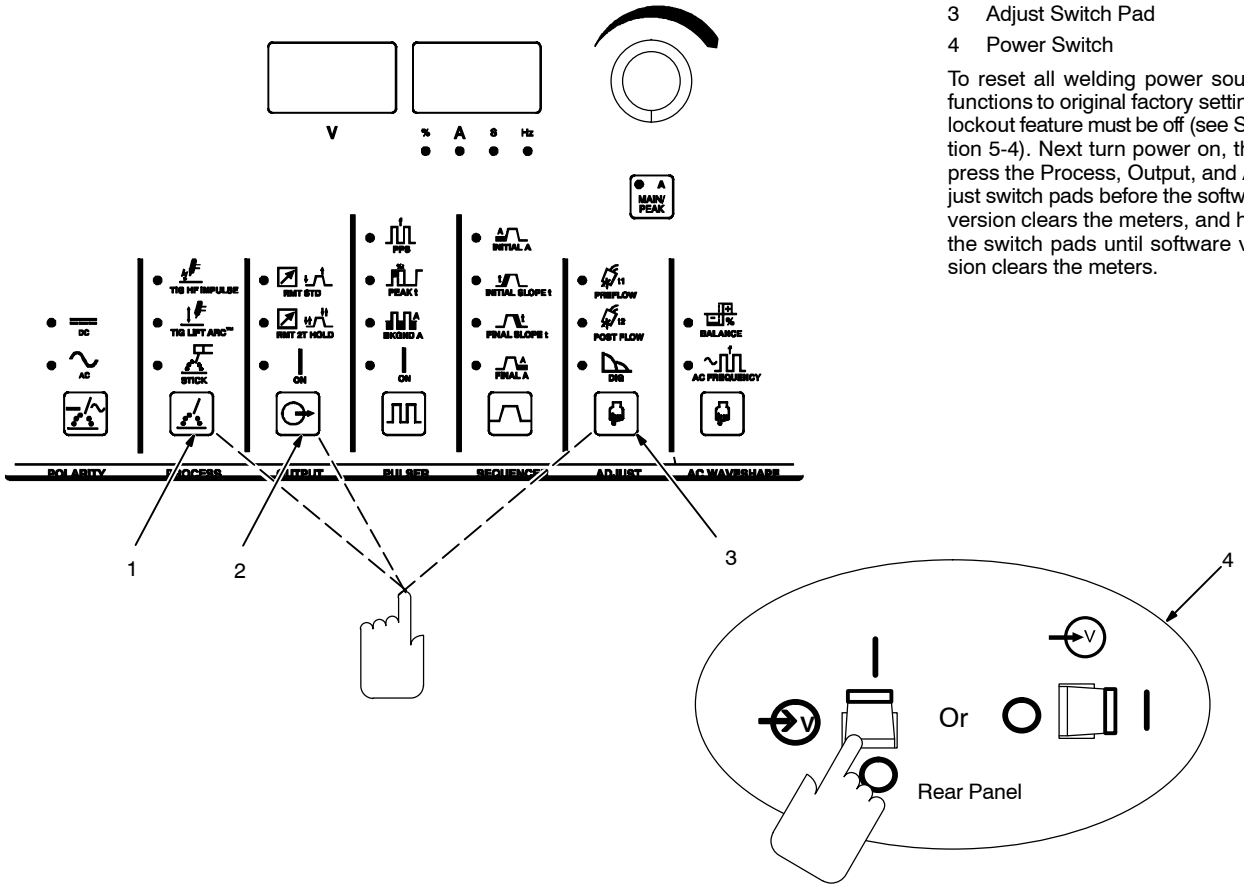
Application: Preflow is used to purge the immediate weld area of atmosphere. Preflow also aids in consistent arc starting.

4-16. Factory Parameter Defaults And Range And Resolution

Parameter	Default	Range And Resolution
POLARITY	DC	AC / DC
PROCESS	TIG HF Impulse	TIG HF Impulse / TIG Lift / Stick
* Stick OCV	Low OCV	Low OCV / Normal OCV
OUTPUT	RMT STD	RMT STD / RMT 2T / ON
*RMT 2T	2T	RMT 2T can be reconfigured for: 2T / 4T / Mini Logic / 4T Momentary / Spot (see Section 5-2C)
A MAIN / PEAK		
AC TIG	150 A	5 – 200 Amps
AC STICK	110 A	5 – 200 Amps
DC TIG	150 A	1 – 200 Amps
DC STICK	110 A	1 – 200 Amps
Spot Time	1.0 S	0.1 – 25.0 Seconds
PULSER	Off	ON / OFF
PPS	100 Hz	Dual Range And Resolution
		0.1 – 9.9 / 10 – 500 Hertz
PEAK t	40%	5 – 95 Percent
BKGND A	25%	5 – 95 Percent
SEQUENCER		
INITIAL A	20 A	5 – 200 Amps AC
		1 – 200 Amps DC
INITIAL SLOPE t	0 S	0.0 – 25.0 Seconds
FINAL SLOPE t	0 S	0.0 – 25.0 Seconds
FINAL A	5 A	5 – 200 Amps AC
		1 – 200 Amps DC
ADJUST		
PREFLOW	0.2 S	0.0 – 25.0 Seconds
POST FLOW	10.0 S	0.0 – 50.0 Seconds @ 0.2 Second Resolution
DIG	30%	0 – 100 Percent
AC WAVESHAPE		
BALANCE	75%	30 – 99 Percent
FREQUENCY	120 Hz	20 – 250 Hertz

DYNASTY:		
DC:		
Polarity	EN	EP / EN
Amperage	25 A	1 – 200 Amps
Time	1 mS	1 – 200 Milliseconds
AC:		
Polarity	EP	EP / EN
Amperage	40 A	5 – 200 Amps
Time	40 mS	1 – 200 Milliseconds
* Parameter adjusted using a power up configuration only		

4-17. Resetting Unit To Factory Default Settings



1 Process Switch Pad
2 Output Switch Pad
3 Adjust Switch Pad
4 Power Switch

To reset all welding power source functions to original factory settings, lockout feature must be off (see Section 5-4). Next turn power on, then press the Process, Output, and Adjust switch pads before the software version clears the meters, and hold the switch pads until software version clears the meters.

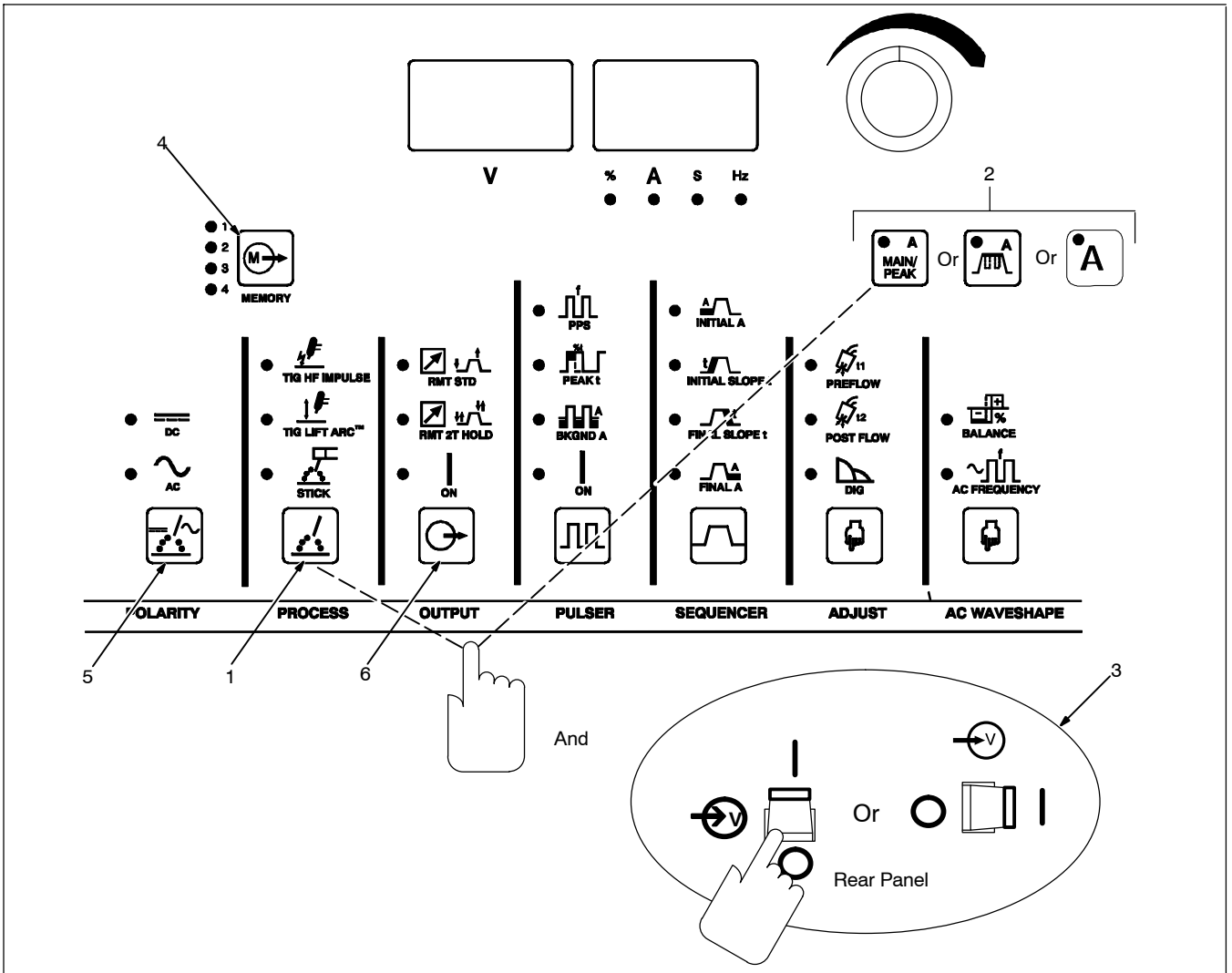
SECTION 5 – ADVANCED FUNCTIONS

5-1. Programmable TIG Start Parameters

NOTE ☞

Section 5 in this manual covers operation of all models of 200 and 300 ampere inverter based TIG machines. Features and options referenced may not be available on your machine. Verify the model you have before using this section.

A. Accessing Programmable TIG Start Parameters



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

1 Process Switch Pad

2 Amperage Switch Pad

3 Power Switch

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

4 Memory Switch Pad (If Equipped)

Press Memory switch pad to select desired memory location (see Section 4-14).

5 Polarity Switch Pad (If Equipped)

Press Polarity switch pad to select AC or DC (see Section 4-6).

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

Press the Process switch pad to select the desired process, TIG HF Impulse or TIG Lift Arc, for your application (see Section 4-7). The parameter values are the same for both processes, and any changes made to the values in one process, are duplicated in the other process.

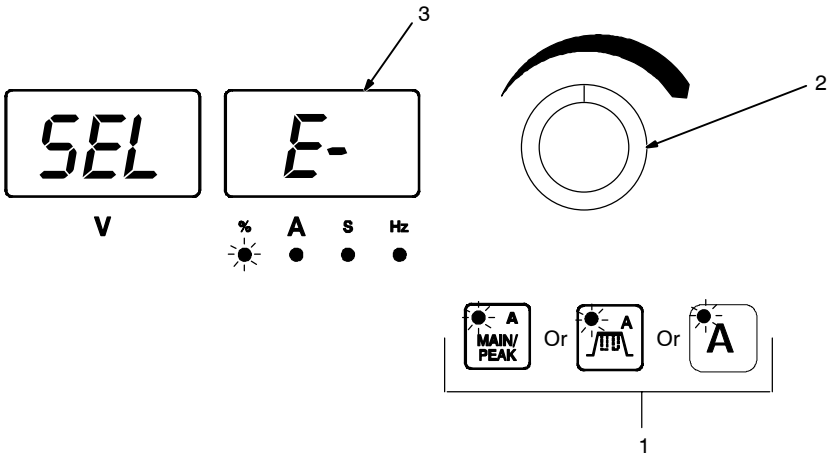
6 Output Switch Pad

Press Output switch pad to select desired type of control (see Section 4-8).

Proceed to Section B, C and/or D.

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

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



A

1 Amperage Switch Pad

2 Encoder Control

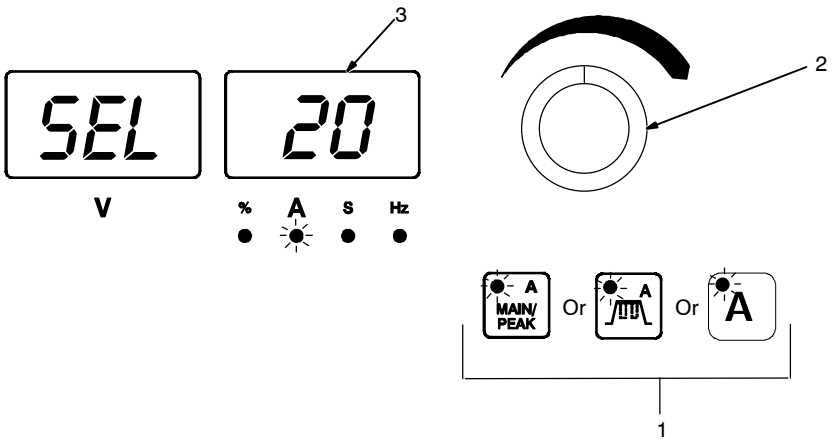
3 Amps Meter

To adjust TIG Start Polarity proceed as follows:

Press Amperage switch pad. Switch pad LED turns on, and meter % LED turns on. The current Start Polarity, *{SEL} {E-}* or *{SEL}* *{EP}* is displayed on meters, and can be adjusted (see Section 4-16) by turning the Encoder control.

To change Start Amperage, proceed to Section C.

C. Changing Programmable TIG Start Amperage (All Models)



A

1 Amperage Switch Pad

2 Encoder Control

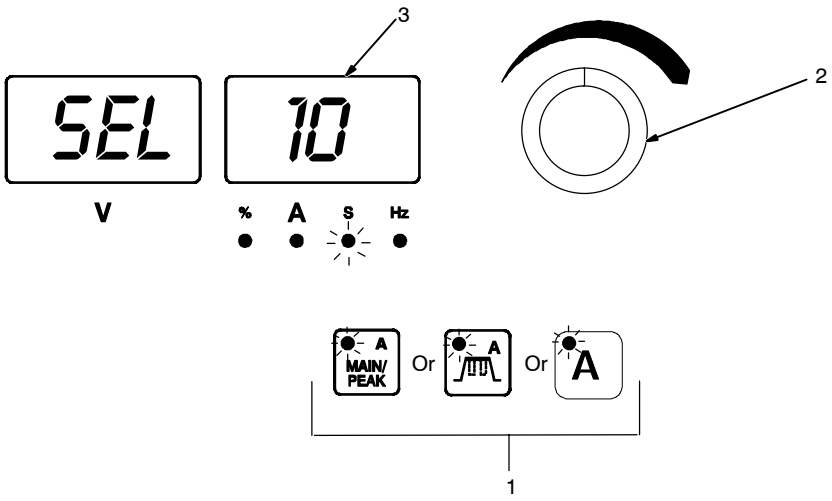
3 Amps Meter

To adjust TIG Start Amperage proceed as follows:

Press Amperage switch pad. Switch pad LED turns on, and meter A LED turns on. The current Start Amperage is displayed on the amps meter, and can be adjusted (see Section 4-16) by turning the Encoder control.

To change Start Time, proceed to Section D.

D. Changing Programmable Start Time (All Models)



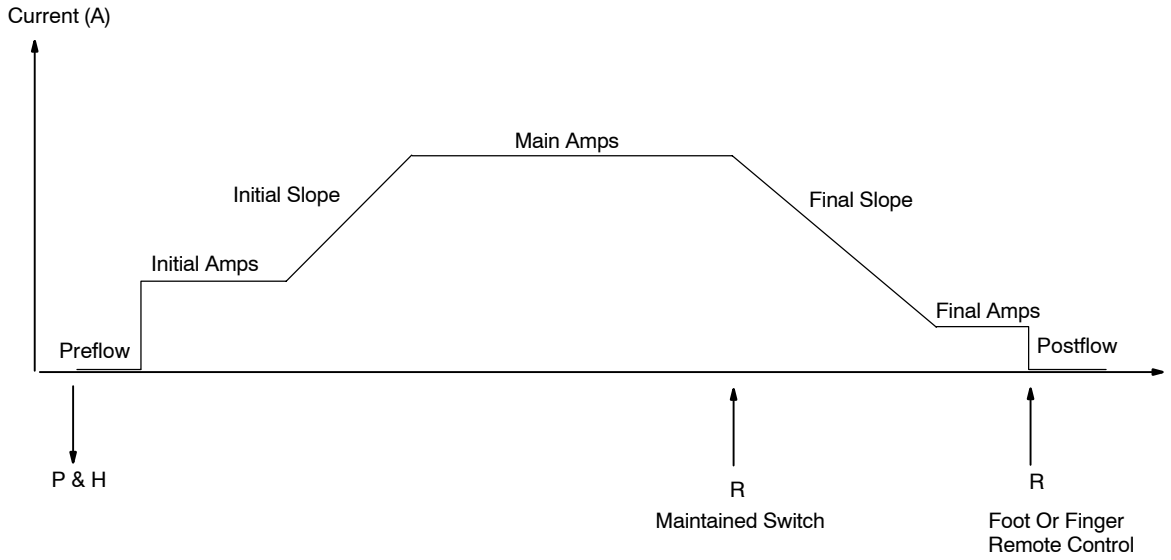
A	1	Amperage Switch Pad
	2	Encoder Control
	3	Amps Meter

To adjust Programmable Start Time proceed as follows:

Press Amperage switch pad, and meter S LED turns on. The current Start Time is displayed on the amps meter, and can be adjusted by turning the Encoder control (see Section 4-16).

5-2. Output Control And Trigger Functions

A. Remote (Standard) Torch Trigger Operation

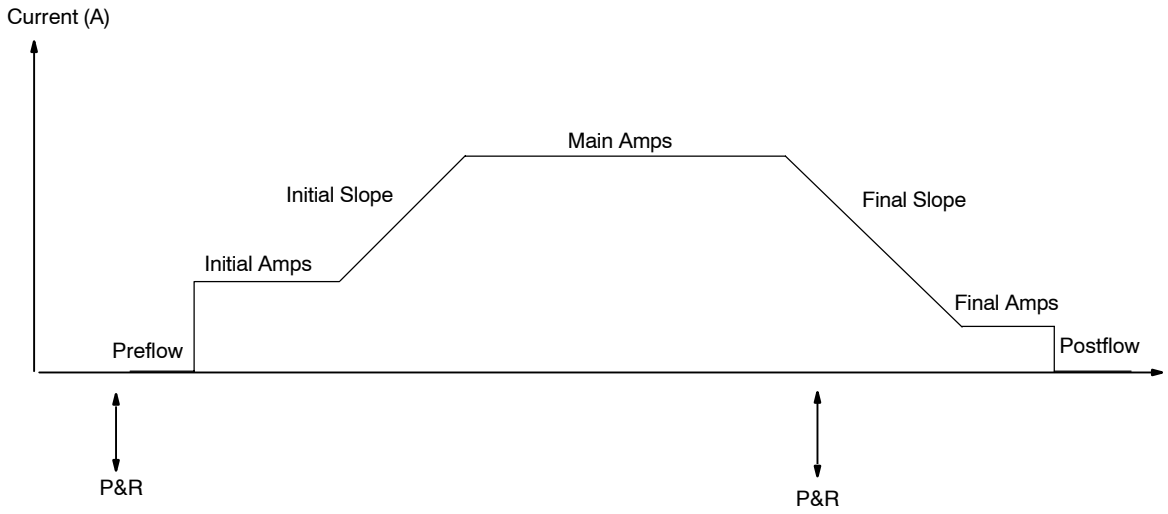


P&H = Push trigger and hold

R = Release trigger.

NOTE: When a foot or finger remote current control is connected to the welding power source, initial amps, initial slope, final slope and final amps are controlled by the remote control, not by the welding power source.

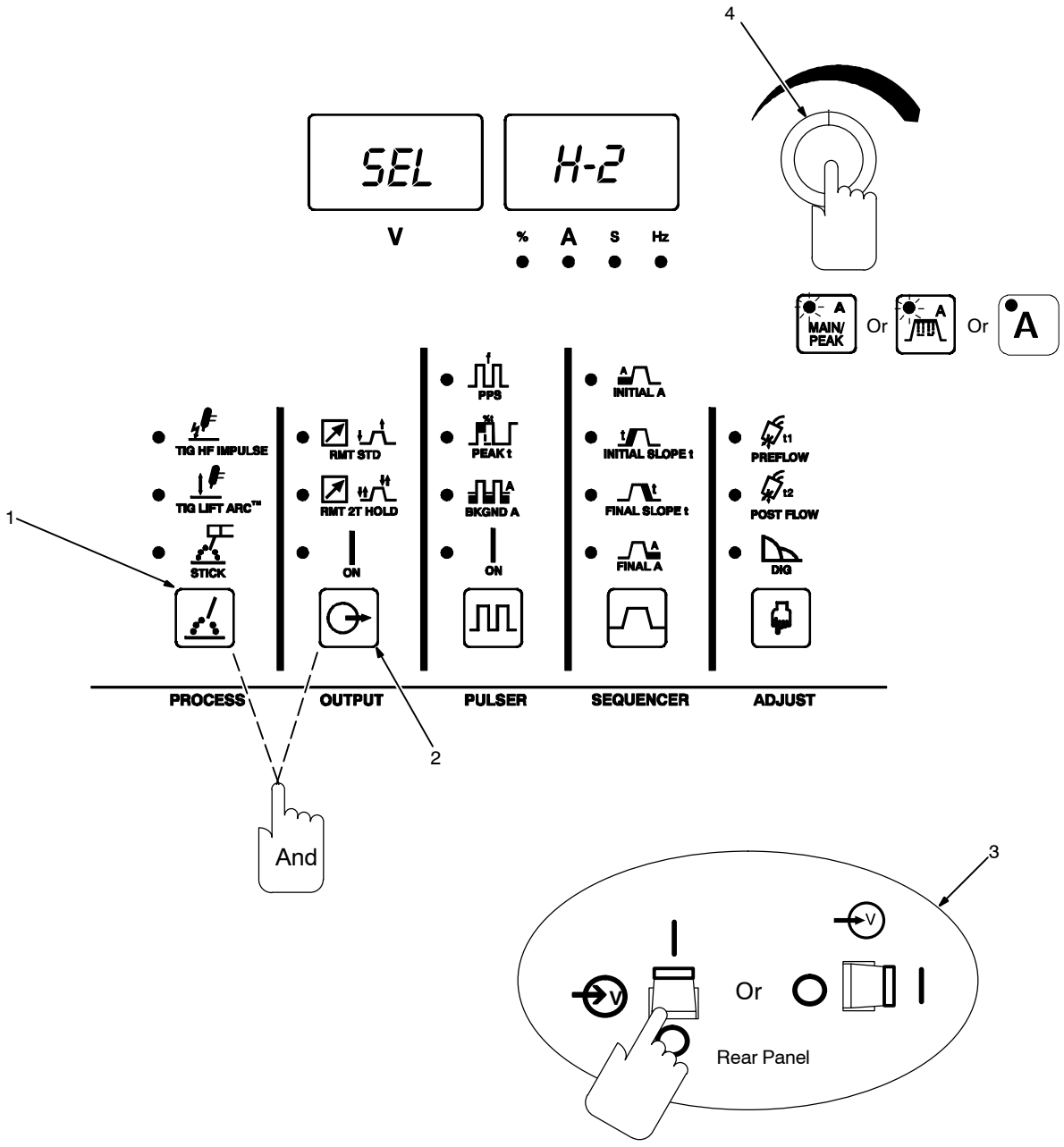
B. Remote 2T Torch Trigger Operation



P&R = Push trigger and release. NOTE: If torch trigger is held more than 3 seconds, operation reverts to RMT STD (Remote Standard) mode.

Notes

C. Reconfiguring RMT 2T HOLD For 2T, 3T, Spot, 4T, 4T Momentary, Or Mini Logic Control



For RMT STD (Remote Standard), RMT 2T Hold (Remote 2T Hold), and On trigger operation, see Section 5-2A, B, and H.

1 Process Switch Pad

2 Output Switch Pad

3 Power Switch

To access the RMT 2T HOLD reconfiguration screen, turn power switch on and then press the Process and Output switch pads before the software version clears the meters. Hold the switch pads until software version clears the meters and *{SEL} {H-2}*, *{SEL} {SPO}*, *{SEL} {H-4}*, *{SEL} {H4L}*, *{SEL} {H-3}*, or *{SEL} {H4E}* appears.

4 Encoder Control

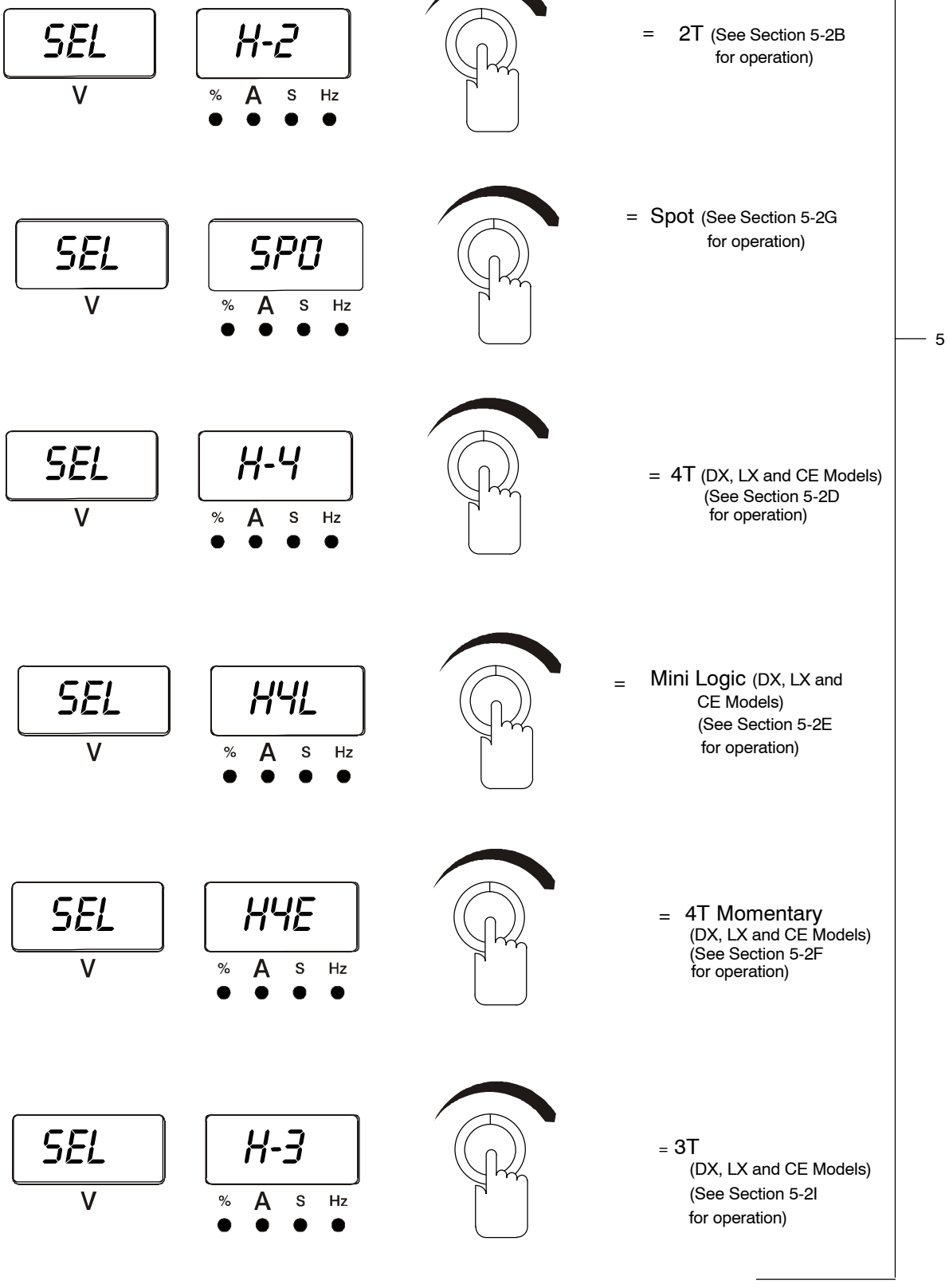
Turn Encoder to change functions. Active function will be displayed on amperage (right) meter.

5 Meter Displays

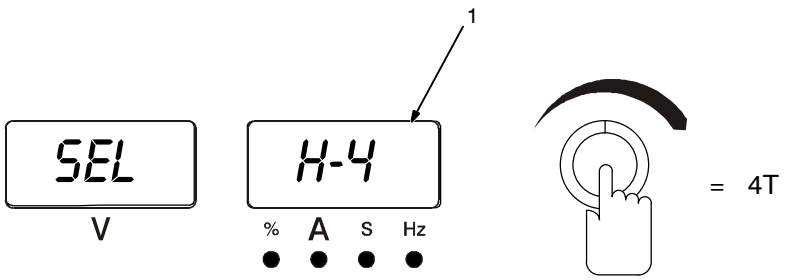
Meter displays for the different functions will be as shown.

Press torch trigger or turn power Off to save setting.

NOTE: After 2T has been reconfigured and one of the reconfigured functions is selected during normal operation, *H-4*, *H4L*, *H4E*, *H-3*, or *SPO* will be displayed for 1 second as a reminder to the operator.


SEL
V
H-2
% A S Hz
= 2T (See Section 5-2B for operation)
SEL
V
SPO
% A S Hz
= Spot (See Section 5-2G for operation)
SEL
V
H-4
% A S Hz
= 4T (DX, LX and CE Models) (See Section 5-2D for operation)
SEL
V
H4L
% A S Hz
= Mini Logic (DX, LX and CE Models) (See Section 5-2E for operation)
SEL
V
H4E
% A S Hz
= 4T Momentary (DX, LX and CE Models) (See Section 5-2F for operation)
SEL
V
H-3
% A S Hz
= 3T (DX, LX and CE Models) (See Section 5-2I for operation)
5

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



1 4T (Specific Trigger Operation)

Sequencer is required to reconfigure for 4T.

Select 4T according to Section 5-2C.

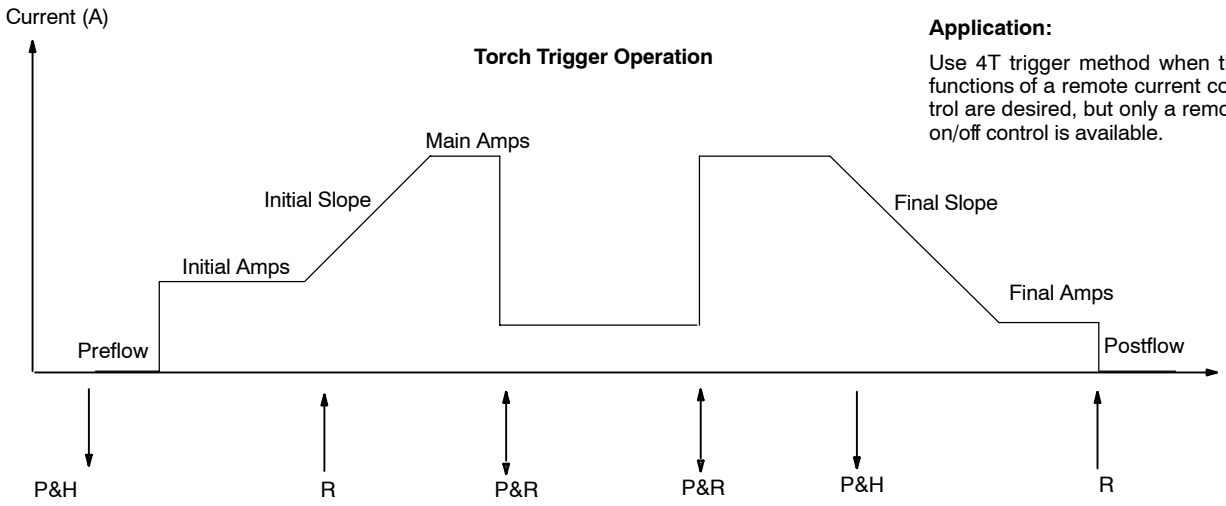
Torch trigger operation is as shown.

While in 4T mode, there is a function available during the main sequence that allows the operator to toggle between weld current and final current without breaking the arc.

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

Application:

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

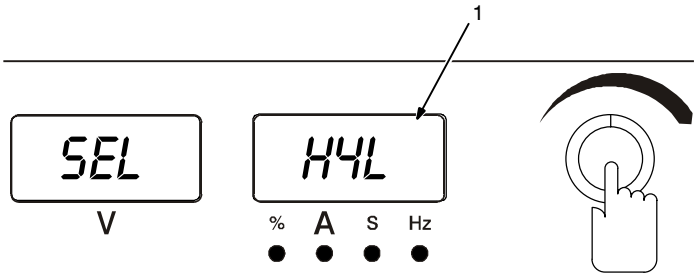


P&H = Push and hold trigger

R = Release trigger

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

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



1 Mini Logic Meter Display

Select Mini Logic according to Section 5-2C.

Torch trigger operation is as shown.

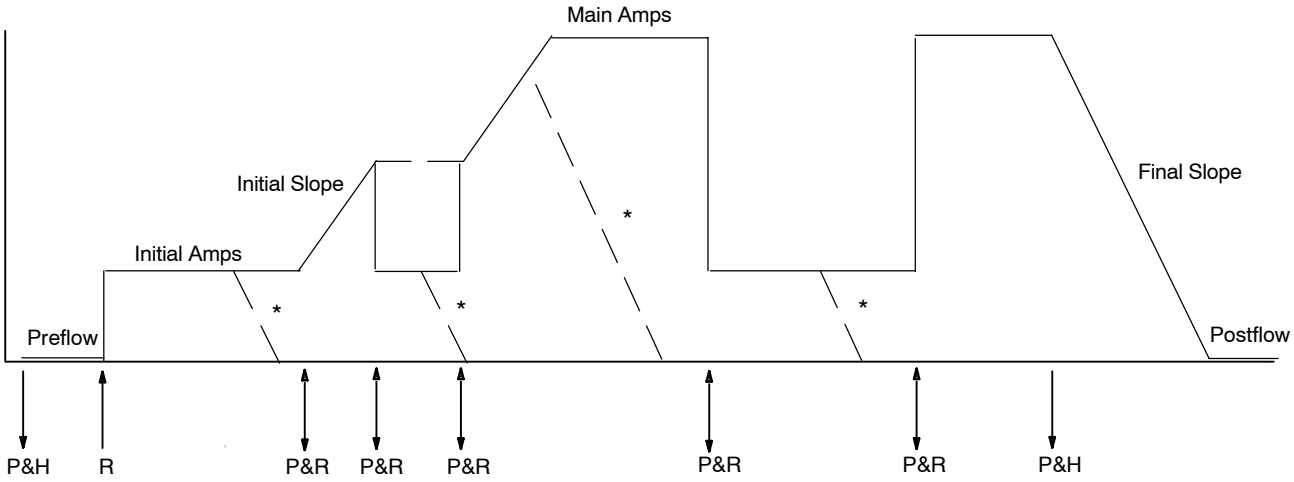
While in mini logic, the operator may use the trigger on the remote device to toggle between initial slope or main amps and initial amps as illustrated.

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

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

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

Torch Trigger Operation



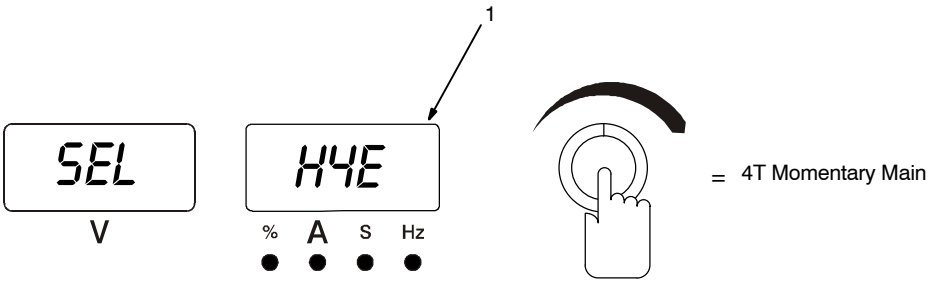
P&H = Push and hold trigger

R = Release trigger

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

* = Arc can be extinguished at final slope rate at any time by pushing and holding trigger.

F. 4T Momentary Operation (DX, LX And All CE Models)



1 4T Momentary Meter Display

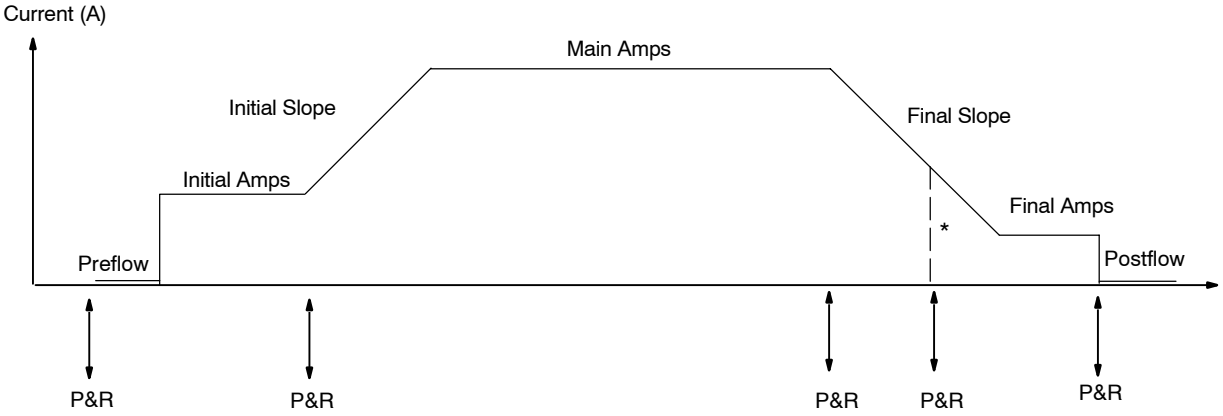
Select 4T Momentary according to Section 5-2C.

4T Momentary torch trigger operation is as shown.

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

Application:

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

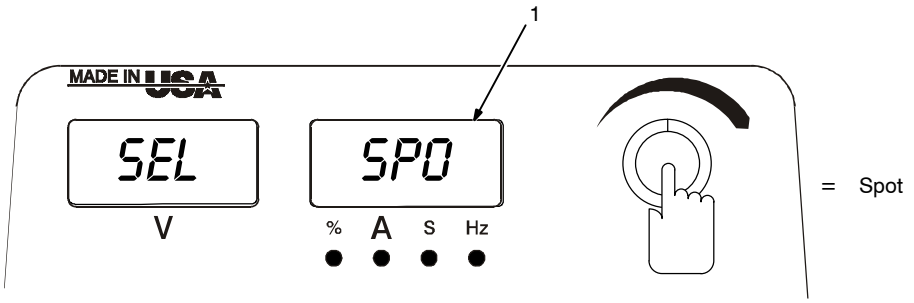


P&R = Push and release trigger.

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

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

G. Spot Control Operation



1 Spot Function Meter Display

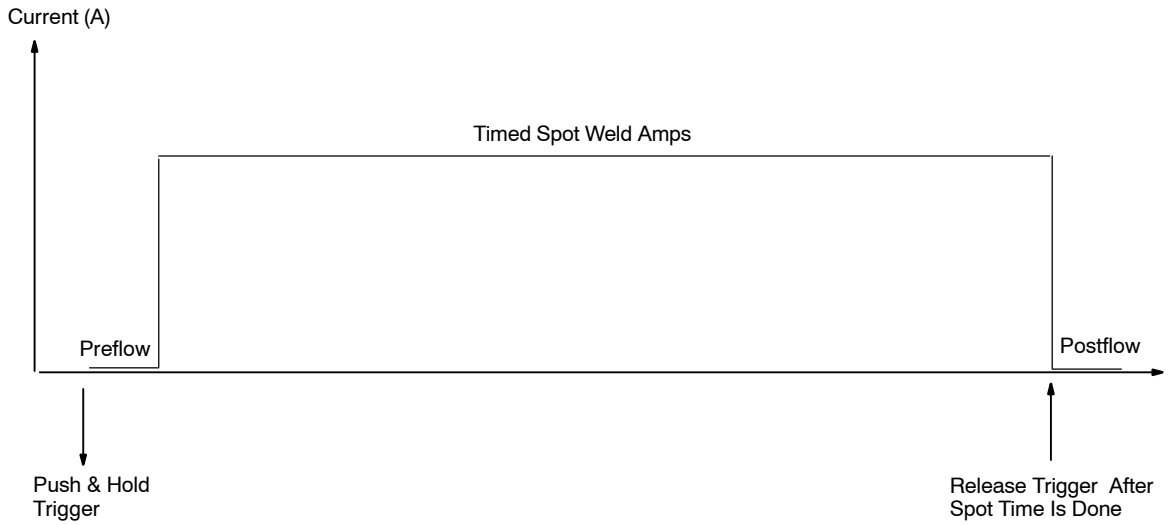
Select Spot function according to Section 5-2C.

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

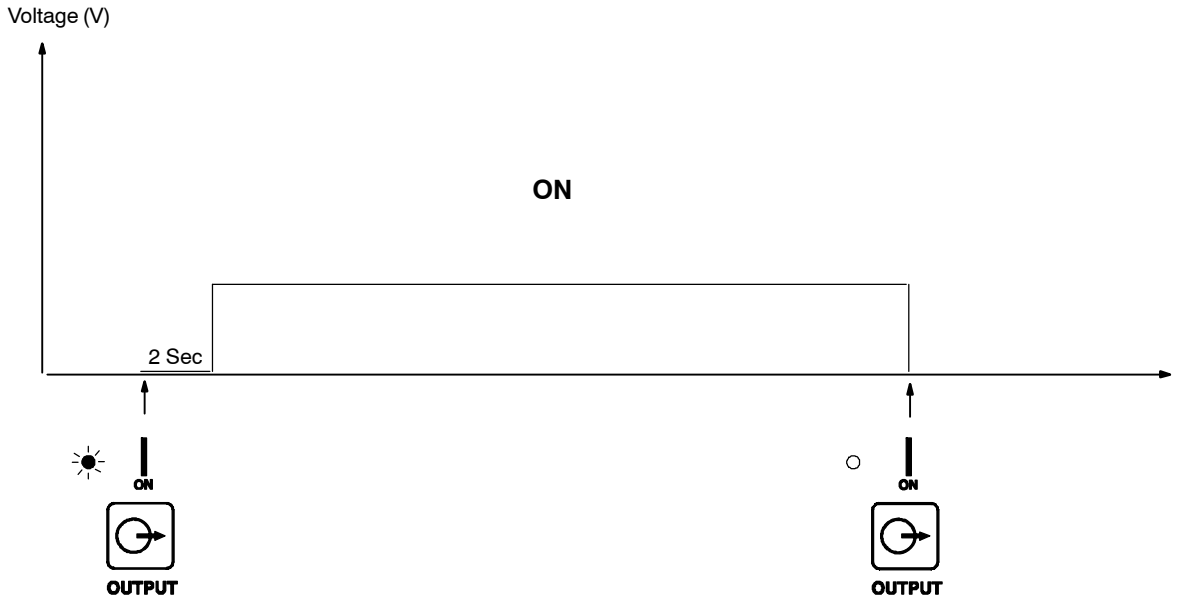
NOTE: When a remote switch is connected to the welding power source, use the remote switch to control the weld cycle. Amperage is controlled by the welding power source.

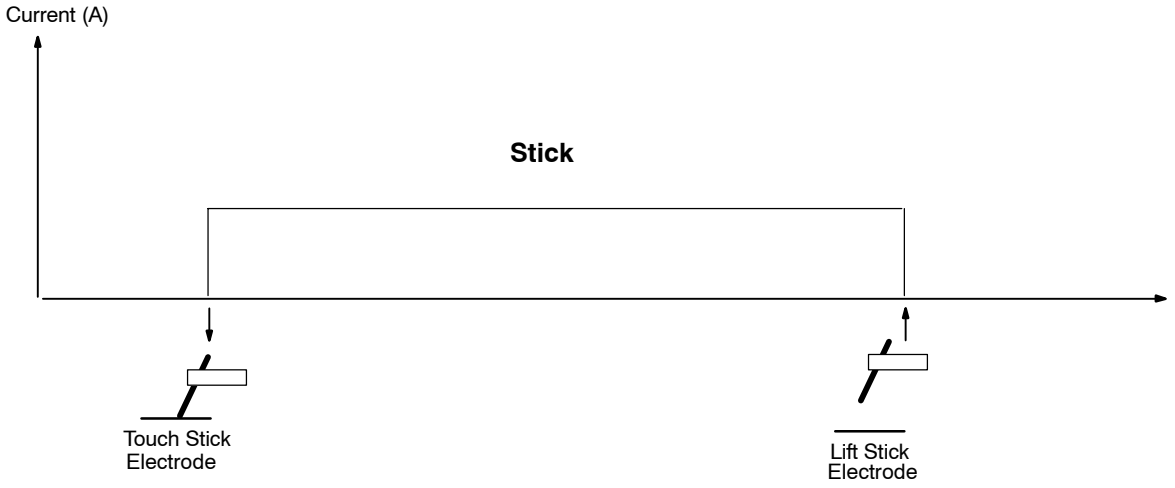
Torch trigger operation is as shown.

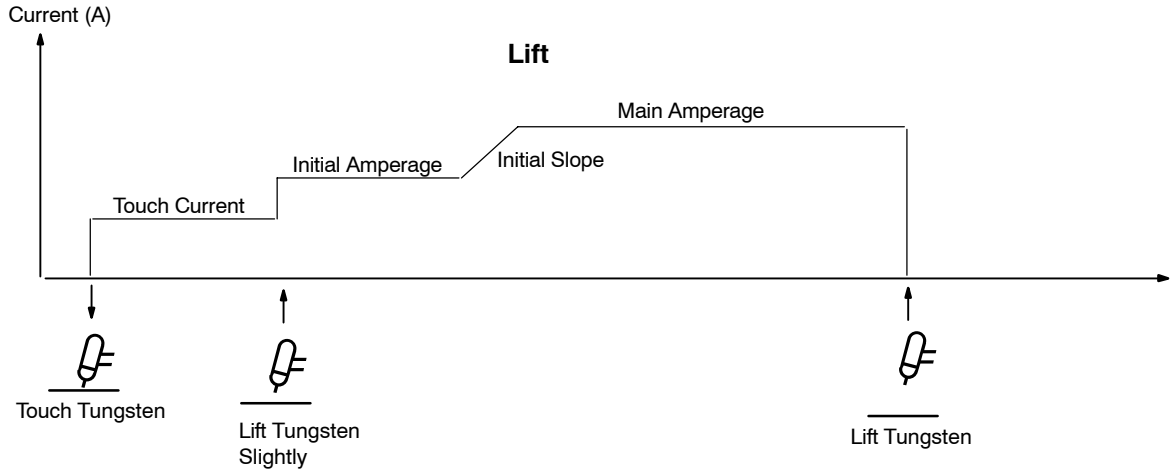
Application: To provide a timed weld. Used for tacking, and thin sheet joining.



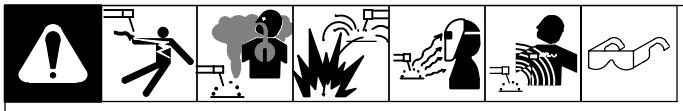
H. On Trigger Operation

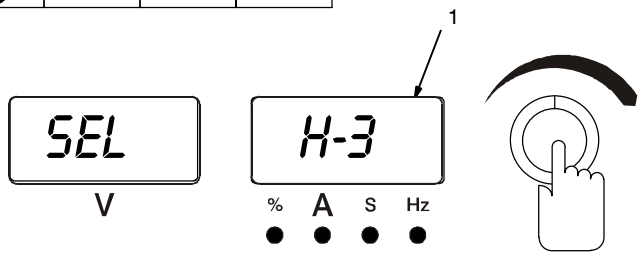


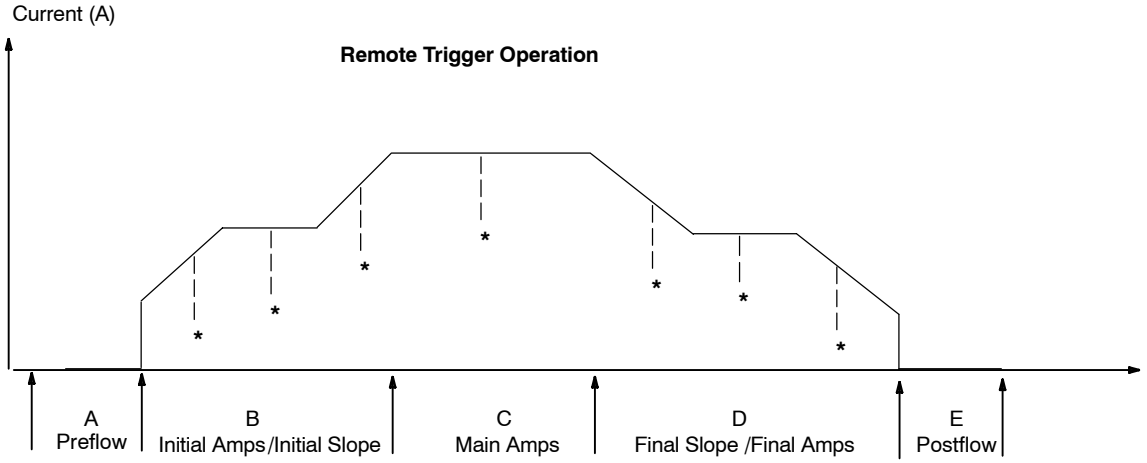




I. 3T Specific Trigger Method (DX, LX And All CE Models Eff W/Serial No. LE304535)







* Arc can be extinguished at any time by pressing and releasing both initial and final switches, or by lifting the torch and breaking the arc.

1 3T (Specific Trigger Operation)

Sequencer is required to reconfigure for 3T.

3T requires two independent momentary-contact switches. One will be designated initial switch, and it must be connected between Remote 14 receptacle pins A and B. The second will be designated as the final switch, and it must be connected between Remote 14 receptacle pins D and E.

Select 3T according to Section 5-2C.

Definitions:

Initial slope rate is the rate of amperage change determined by the initial amperage, initial slope time, and main amperage.

Final slope rate is the rate of amperage change determined by the main amperage, final slope time, and final amperage.

Operation:

A.. Press and release initial switch within 3/4 second to start shielding gas flow. To stop the preflow sequence before preflow time elapses (25 seconds), press and release final switch. The preflow timer will reset and the weld sequence can be started again.

☞ *If an initial switch closure is not made again before preflow time ends, gas flow stops, the timer resets, and an initial switch press and release is necessary to start the weld sequence again.*

B.. Press initial switch to start arc at initial amps. Holding switch will change amperage at initial slope rate (release switch to weld at desired amperage level).

C.. When main amperage level is reached, initial switch can be released.

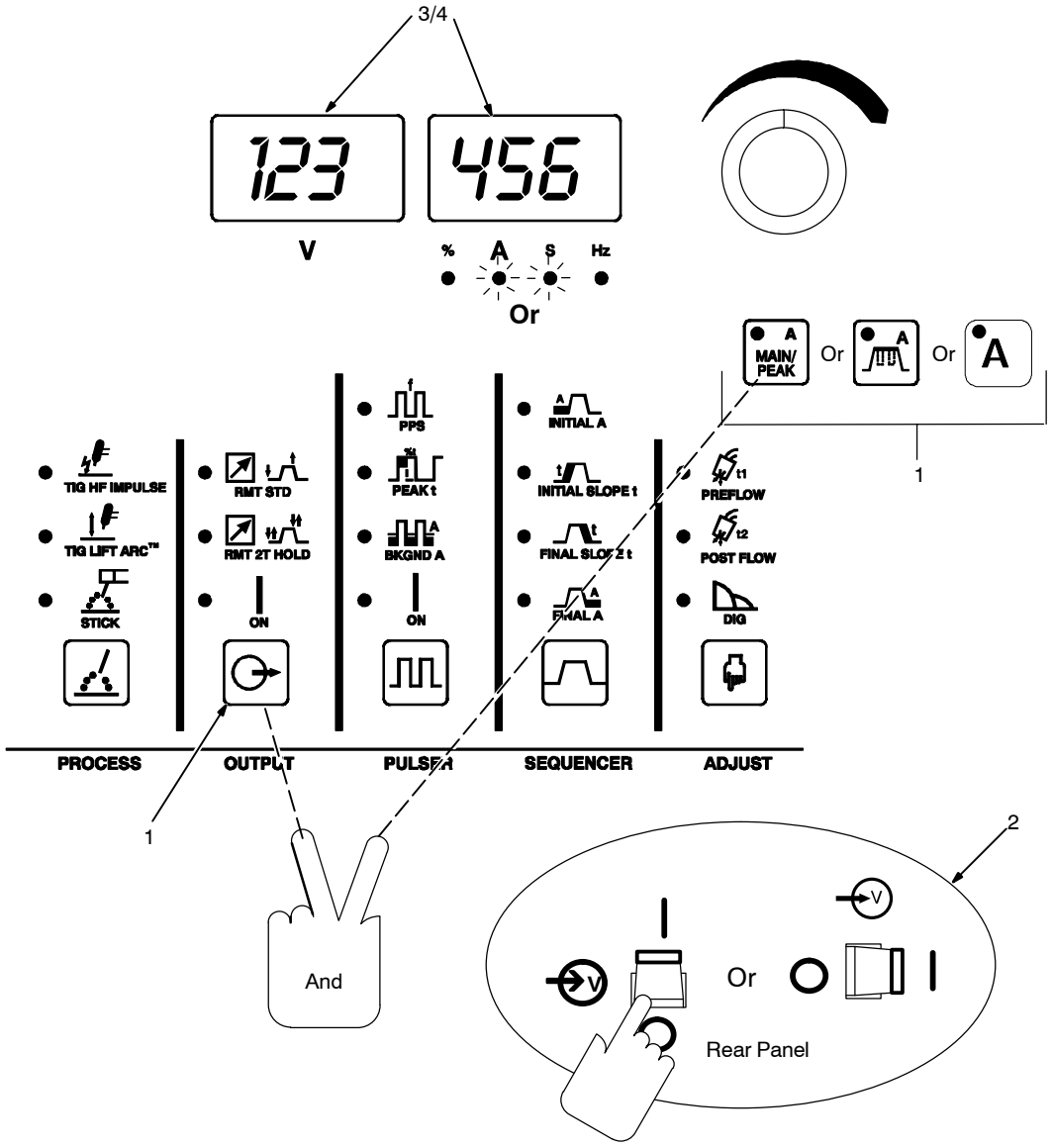
D.. Press and hold the final switch to decrease amperage at final slope rate (release switch to weld at desired amperage level).

E.. When final amperage has been reached, the arc extinguishes and shielding gas flows for the time set on the Postflow control.

Application:

With the use of two remote switches instead of potentiometers, 3T gives the operator the ability to infinitely increase, decrease, or pause and hold amperage within the range determined by the initial, main, and final amperages.

5-3. Arc Timer/Counter Display



A 1 Output And Amperage Controls

V 2 Power Switch

To display the arc timer/counter, turn power switch on, and then press the Amperage Control and Output switch pads before the software version clears the meters, and hold the switch pads until software version clears the meters

3 Arc Timer Display

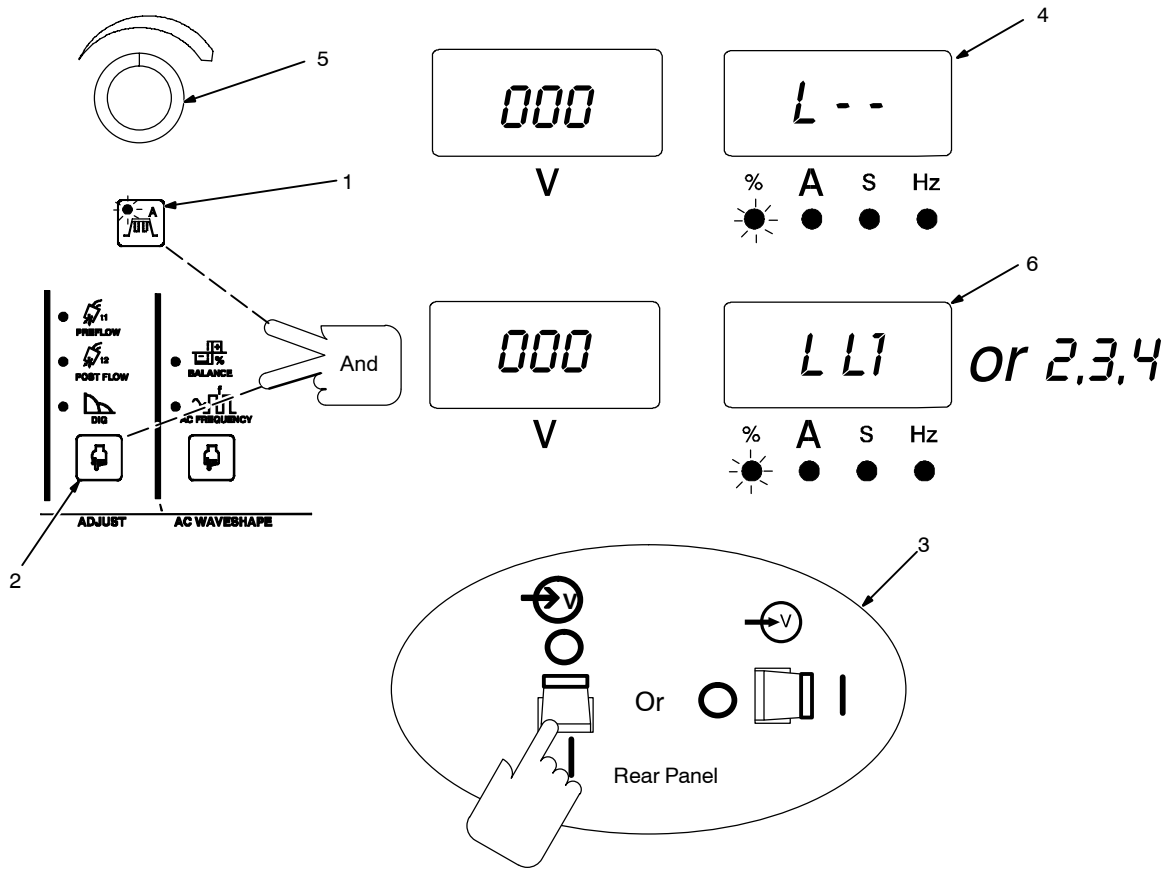
Upon power up as described above, the meter S LED will turn on, and arc time will be displayed for 5 seconds as [*000 000*] to [*999 959*]. The first four numbers indicate hours, and the last two numbers indicate minutes. Arc time shown in example is read as 1,234 hours and 56 minutes. Maximum arc time is 9,999 hours and 59 minutes.

4 Arc Counter

After 5 seconds, the meter A LED turns on, and the arc counter will be displayed for the next 5 seconds as [*000 000*] to [*999 999*]. The maximum arc cycle count is 999 999.

5-4. Lockout Functions

A. Accessing Lockout Capability



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

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

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

1 Amperage (A) Switch Pad

2 Adjust Switch Pad

3 Power Switch

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

4 Lockout Off

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

5 Encoder Control

To turn On the lockout feature, proceed as follows:

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

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

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

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

6 Lockout On

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

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

To turn Off the lockout feature, proceed as follows:

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

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

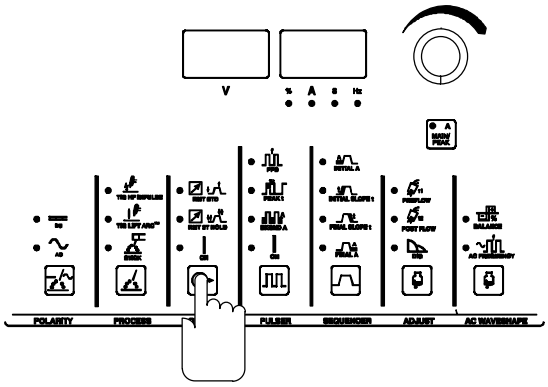
Use Encoder control to enter the same three digits that were used to turn on the lockout feature.

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

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

B. LockOut Levels

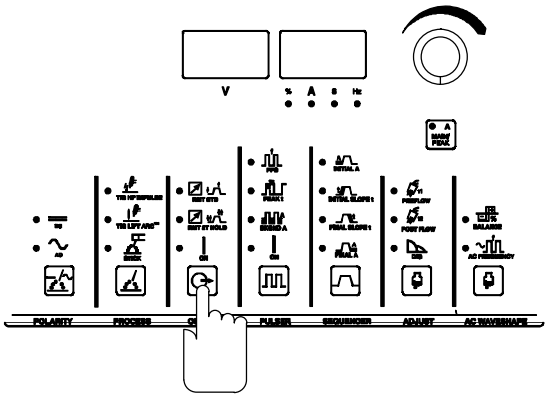
Level 1



Use Output Switch Pad To

Select A Trigger Method

For The TIG Process

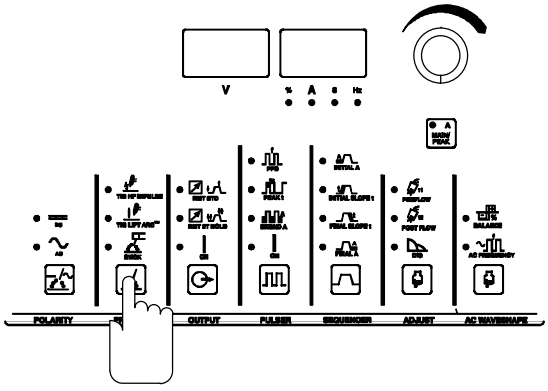


Use Output Switch Pad To

Select A Trigger Method

For The Stick Process

Level 2



Select Process

Process Selection

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

Level 1

NOTE: Remote amperage control is not available in level 1.

TIG Output Selection

If either the TIG HF Impulse or TIG Lift Arc process (see Section 4-7) was active when lockout level 1 was activated, the operator can choose between RMT STD (Remote Standard) or RMT 2T HOLD (Remote 2T Hold). The On function is also available if TIG Lift Arc was active.

If RMT 2T HOLD was reconfigured (see Section 5-2C) prior to lockout level 1 activation, the reconfigured output mode (4T, 4T momentary, mini logic, or spot) is available to the operator instead of RMT 2T.

Stick Output Selection

If the Stick process was active when lockout level 1 was activated, the operator can choose between RMT STD or On.

When parameter change or selection is limited by lock level 1, [*L-1*] is displayed as a reminder.

Level 2

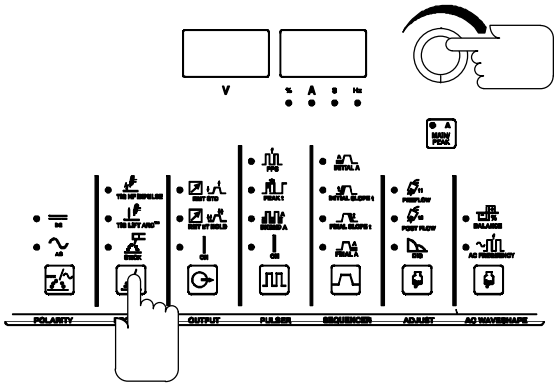
NOTE: Remote amperage control is not available in level 2.

Includes all the functions of level 1 plus Polarity and Process Selection (see Sections 4-6 and 4-7).

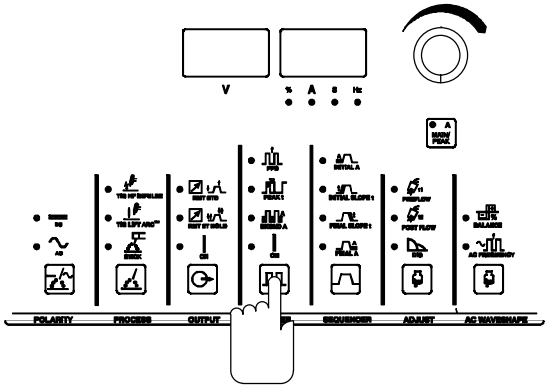
When parameter change or selection is limited by lock level 2, [*L-2*] is displayed as a reminder.

B. Lock Out Levels (Continued)

Level 3



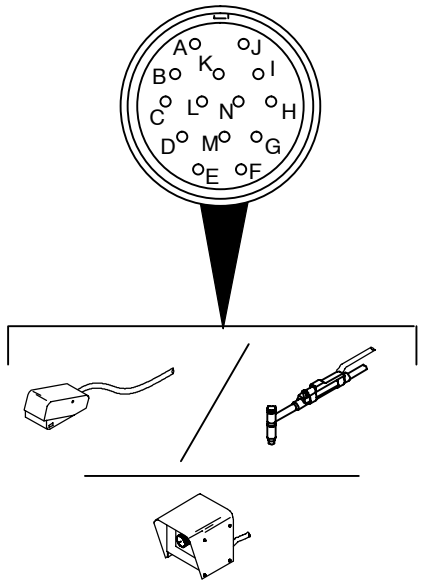
+/– 10 % Amperage Adjust Control



Pulser On/Off Control

Remote Amperage Control

Level 4



Level 3

NOTE: Remote amperage control is not available in level 3.

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

+/– 10% adjustment of preset TIG or Stick Weld Amps

Select desired process, TIG or Stick, and use Encoder control to adjust amperage +/– 10% of preset amperage value, up to the limits of the machine. If operator tries to go beyond the +/– 10%, the amperage (right) meter will display [*L-3*] as a reminder.

Pulser ON/Off Control

Gives operator the ability to turn on/off the Pulser control.

When parameter change or selection is limited by lock level 3, [*L-3*] is displayed as a reminder.

Level 4

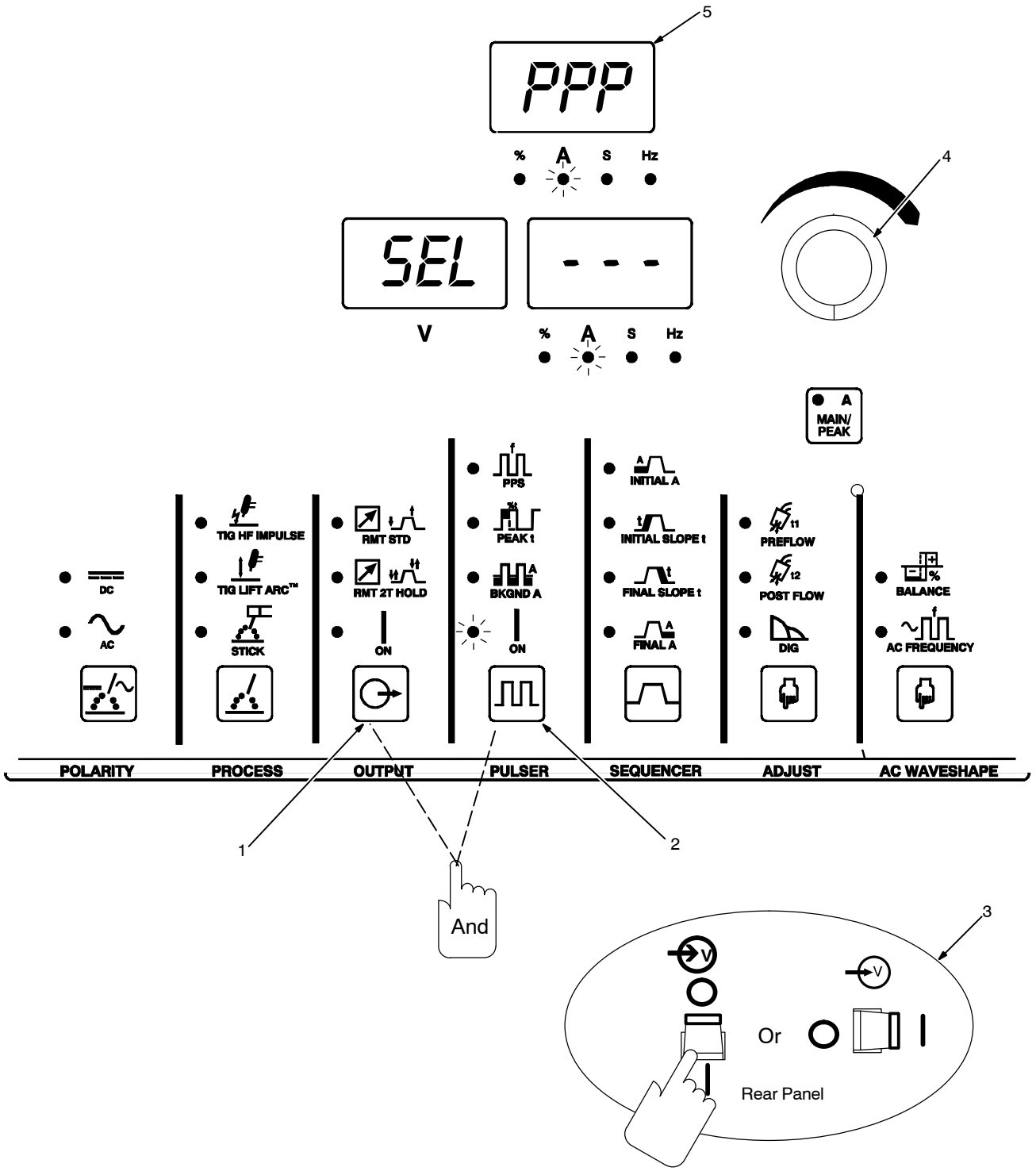
Includes all the functions of levels 1, 2, and 3 plus the following:

Remote Amperage Control

Allows operator to use remote amperage control if desired. Remote control operates from minimum to maximum of preset amperage value. Connect remote control device according to Section 3-7.

When parameter change or selection is limited by lock level 4, [*L-4*] is displayed as a reminder.

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



1 Output Switch Pad

2 Pulser Switch Pad

3 Power Switch

To access the PPP while welding display, turn power switch on, and then press the Output and Pulser switch pads before the software version clears the meters. Hold the switch pads until *{SEL} {---}* or *{SEL} {PPP}* appears.

4 Encoder Control

5 PPP Meter Display

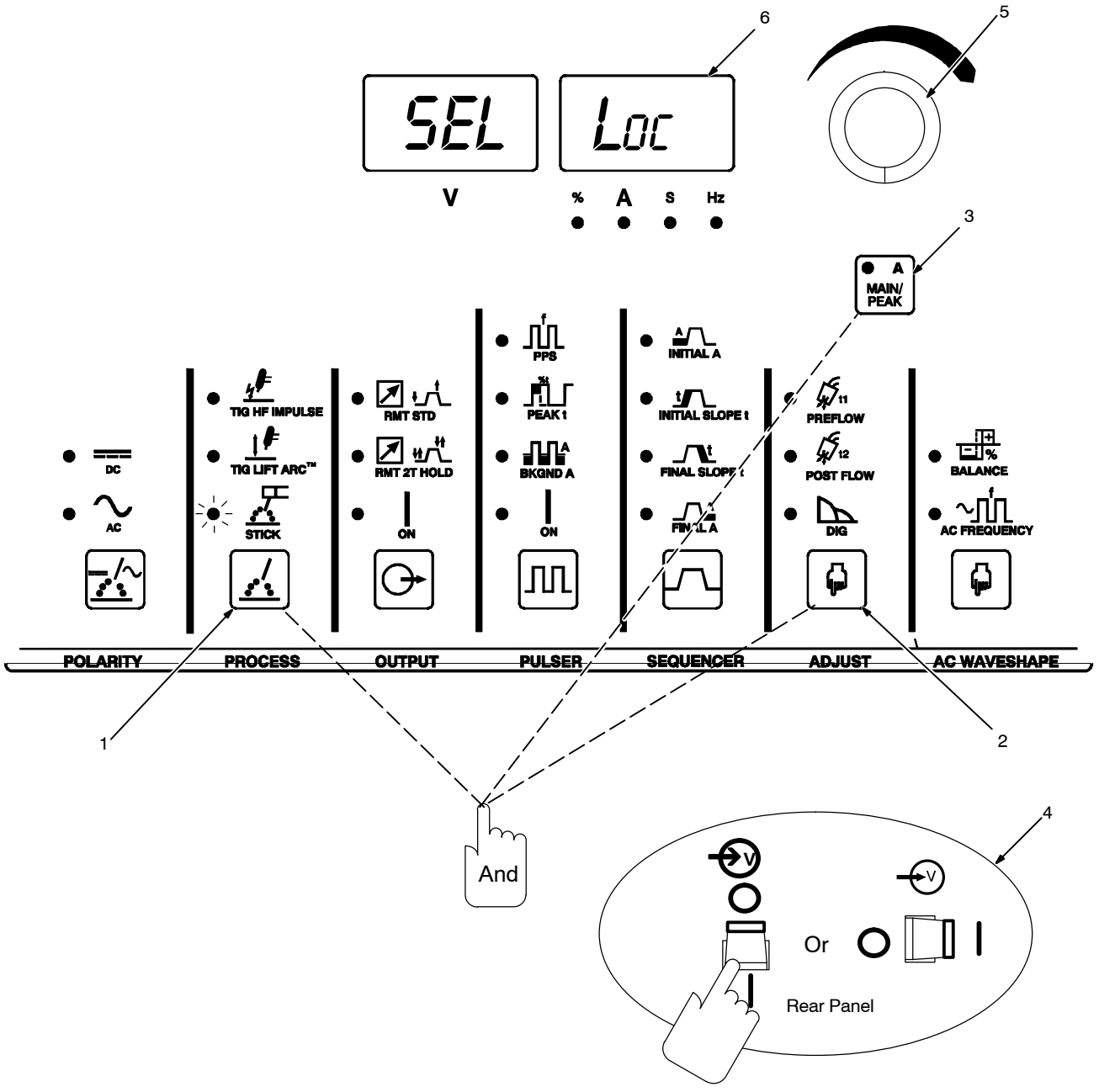
Turn Encoder to change between standard and *{PPP}* meter display.

When the *{PPP}* meter display feature is active while pulse welding, the *{PPP}* will be displayed on the right meter display, and the Meter Hold feature is disabled.

The *{PPP}* meter display feature will not effect the normal amperage display or Meter Hold capabilities when in a non-pulse welding mode.

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

5-6. Stick Open-Circuit Voltage (OCV) Selection (All Models)



1 Process Switch Pad

2 Adjust Switch Pad

3 Amperage Switch Pad

4 Power Switch

To access the Stick OCV selection, turn power switch on and then press the Process, Adjust and Amperage switch pads before the software version clears the meters. Hold the switch pads until *SEL Loc* or *SEL mOC* appears.

5 Encoder Control

6 Meter Display

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

When Stick low OCV is selected, open-circuit voltage is between 9 and 14 volts. When Stick normal OCV is selected, open-circuit voltage is approximately 80 volts.

Application: For most Stick applications use low open-circuit voltage. Use normal open-circuit voltage for hard to start Stick electrodes, or if required for your particular application.

1 Power Switch S1

Provides on/off control of welding power source.

2 Filter Board PC9 (CE Models Only)

Provides filtering on the input line from electrical noise generated by the welding power source.

3 Power Interconnecting Board PC2

Provides electrical connections for S1, PC1, PC10, PM1, PC6, L1 and L2. Input capacitors, precharge relay and resistor, bleed resistors, various filter and snubber components, input current transducer, inverter primary current transformer, and switch-mode power supplies for control power are mounted on PC2.

4 Boost Control Board PC10

Controls and regulates input bus voltage to 810 volts dc. Also controls switch mode power supplies for control power.

5 Power Module PM1

This module contains semiconductor chips (diodes and IGBT's) that rectify the input power, boost the input bus voltage, and invert the bus voltage to drive the main transformer. There is also a thermistor in PM1 to monitor the temperature of PM1.

6 Input Inductor L1

Required to boost input bus voltage.

7 Snubber Inductor L2

Required to ensure soft switching of the boost IGBT within PM1.

8 Inverter Control Board PC1

Controls the inverter IGBT's within PM1 and regulates the output current. Provides power and signals to PC3. Also drives the gas valve, fan motor, boost relay, and provides gate control for output inverter.

9 Fan Motor FM

Provides cooling of internal components. Fan only runs when needed (fan-on-demand™).

10 Gas Valve GV1

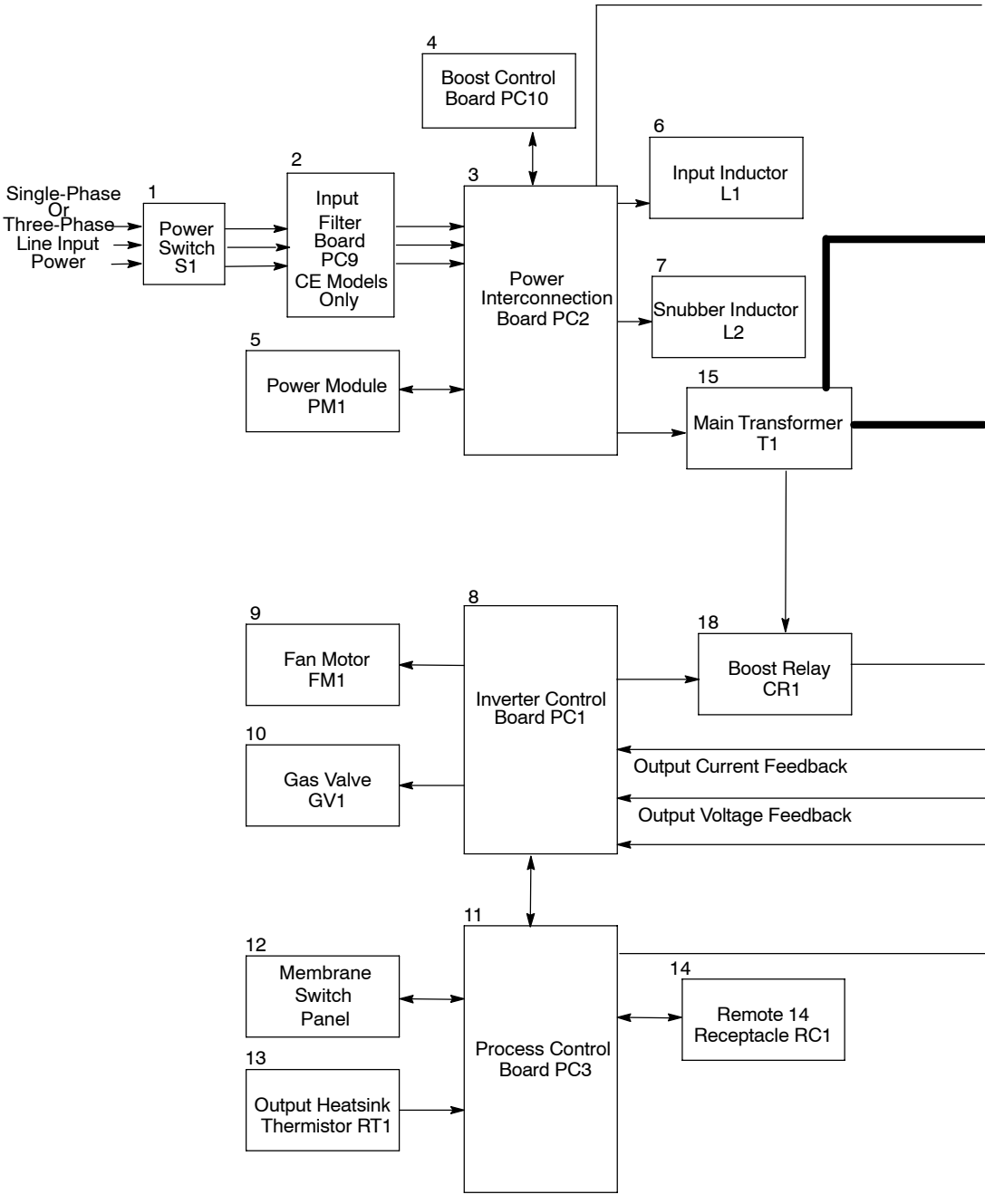
Provides shielding gas to the arc while TIG welding.

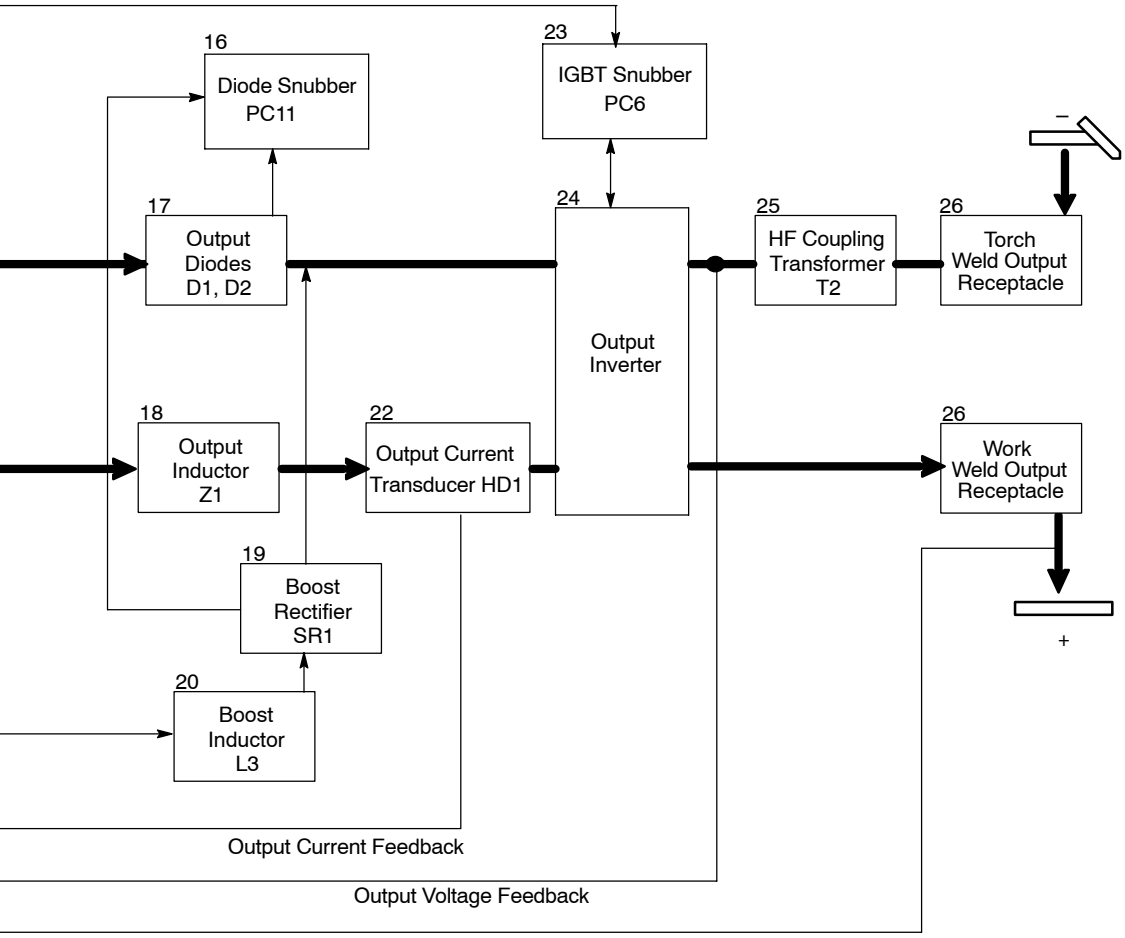
11 Process Control Board PC3

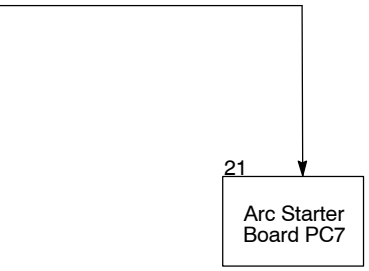
Controls welding process, performs thermal management, and displays various preset values as well as output voltage and amperage. Also controls Arc Starter Board PC7.

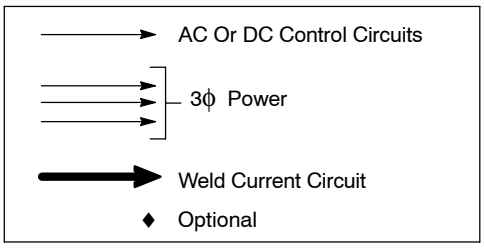
12 Membrane Switch Panel

Allows operator to set machine up for desired welding process.









13 Output Heatsink Thermistor RT1

Monitors temperature of the output heatsink.

14 Remote 14 Receptacle RC1

Receives remote amperage and output contactor signals. Sends output voltage and current feedback. Used to connect remote amperage or voltage, or contactor controls.

15 Main Transformer T1

Driven by IGBT's in PM1. Supplies power to weld output circuit.

16 Diode Snubber Board PC11

EMI filter for diodes D1, D2 and SR1.

17 Output Diodes D1, And D2

Rectifies the main output of T1 to create a DC bus voltage used by the output inverter.

18 Output Inductor Z1

Filters or smooths the DC output or welding current.

19 Boost Rectifier SR1

Rectifies the boost output of T1.

20 Boost Inductor L3

Limits the output boost current while Stick welding.

21 Arc Starter (HF) Board PC7

Creates the high-frequency (HF) energy to start the arc when TIG welding.

22 Output Current Transducer HD1

Provides weld or secondary current feedback to PC1.

23 IGBT Snubber Board PC6

Clamps voltage spikes created by AC switching to protect switching IGBT's. Also provides the drive signals for the IGBT's in the output inverter.

24 Output Inverter

Creates weld output for either DC or AC current.

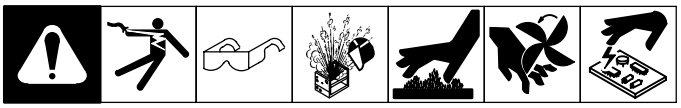
25 HF Coupling Transformer T2

Couples HF energy created by PC7 to the weld output circuit. Required for non-contact TIG arc starting.

26 Torch And Work Weld Output Receptacles

SECTION 7 – TROUBLESHOOTING

7-1. Checking Unit Before Applying Power



☞ *See Section 7-10 for test points and values and Section 14 for parts location.*

☞ *Use MILLER Testing Booklet (Part No. 150 853) when servicing this unit.*

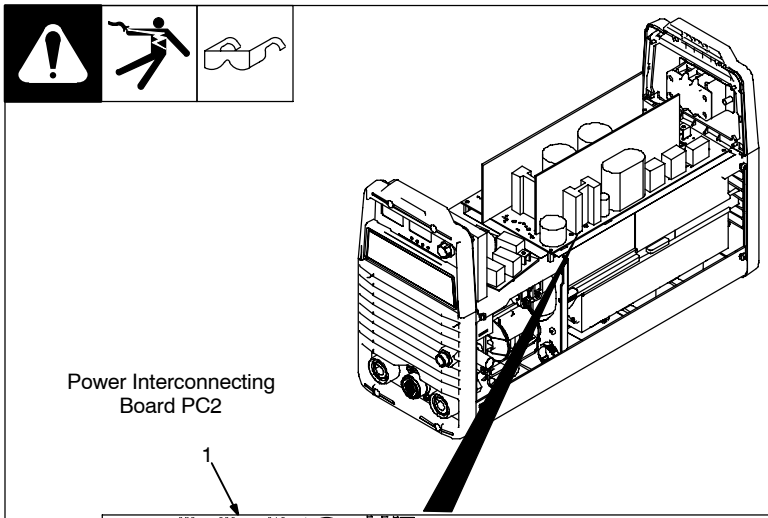
▲ **Discharge input capacitors according to Section 7-2 and be sure voltage is near zero before touching any parts.**

▲ **Before troubleshooting or applying power to unit, complete the following checks to avoid causing further damage.**

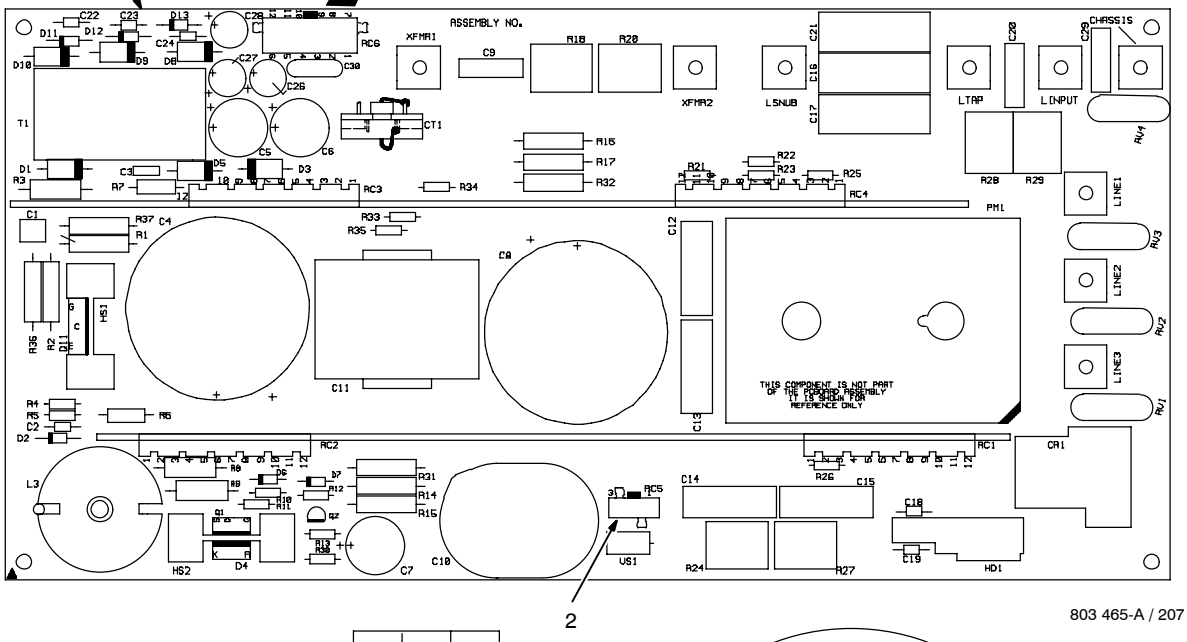
▲ **Although inverter board PC1, power interconnecting board PC2, and boost board PC10 are briefly checked in this procedure, more complete tests may be needed later for these parts. This check is simply to get a basic okay to power up unit.**

Notes

7-2. Measuring Input Capacitor Voltage



Power Interconnecting Board PC2



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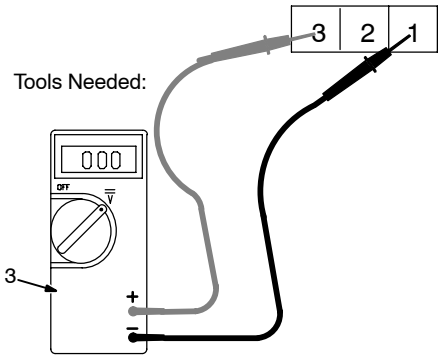
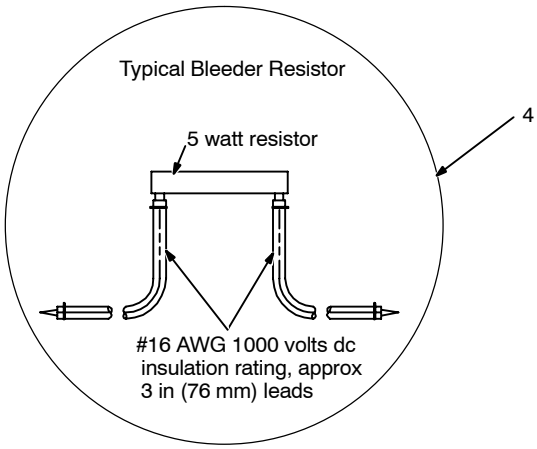
Tools Needed:





▲ Significant DC voltage can remain on capacitors after unit is Off. Always check capacitors as shown to be sure they have discharged before working on unit.

▲ Turn Off welding power source and disconnect input power before measuring input capacitor voltage.

1 Power Interconnecting Board PC2

2 Receptacle RC5

3 Voltmeter

Measure the dc voltage across RC5-1 and RC5-2 sockets until voltage drops to near 0 (zero) volts. Measure the dc voltage across RC5-2 and RC5-3 sockets until voltage drops to near 0 (zero) volts.

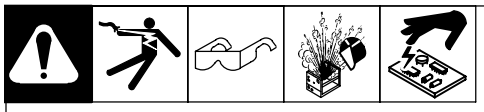
☞ *If the capacitor voltage does not drop to near zero after several minutes, use a bleeder resistor of between 25 and 1000 ohms, at least 5 watts, #16 AWG 1000 volts dc insulating rating wire to discharge the capacitor(s) .*

4 Typical Bleeder Resistor

An example of a typical bleeder resistor is shown on this page.

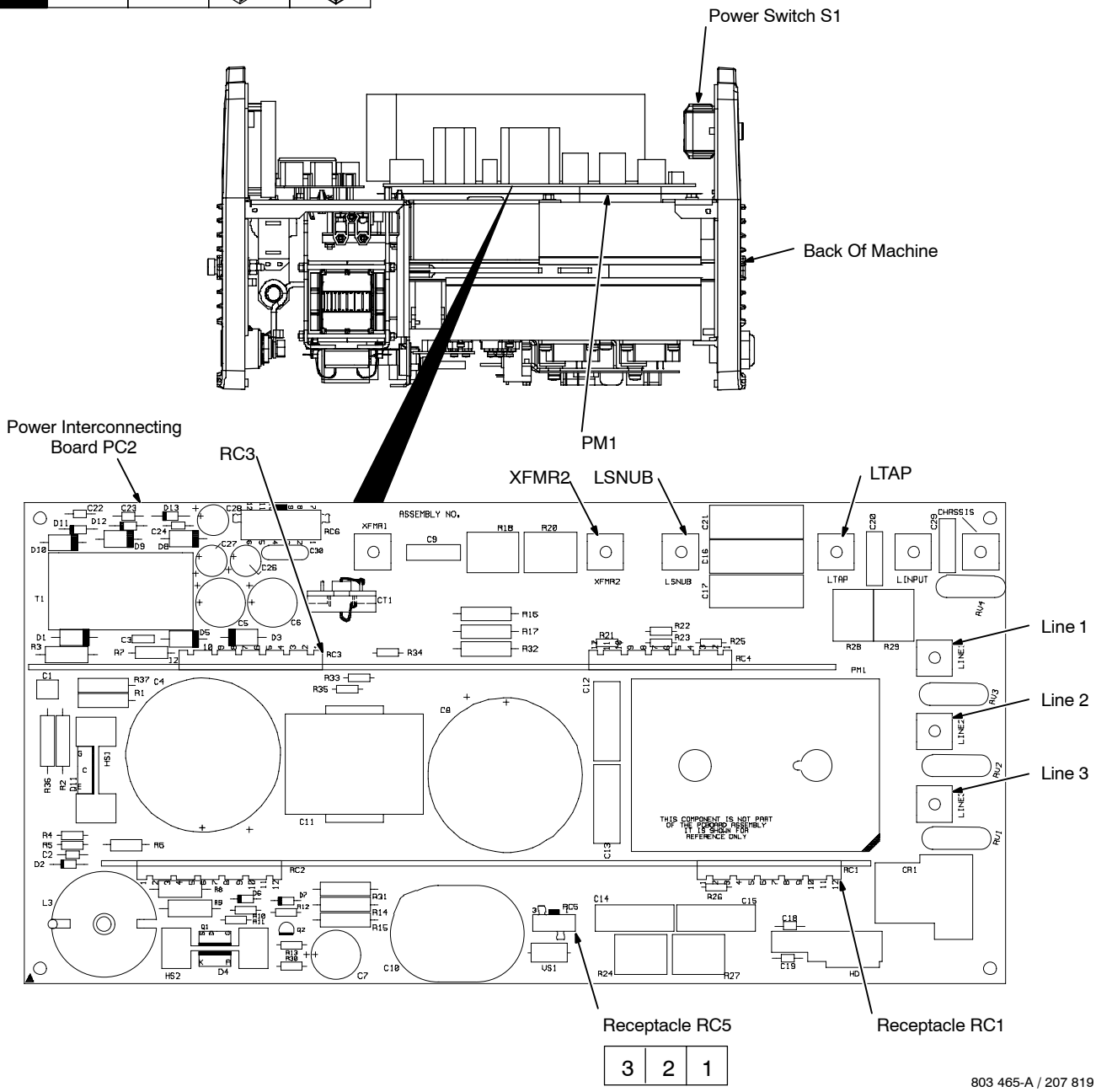
Proceed with job inside unit. Reinstall case when finished.

7-3. Power Module PM1



▲ **Read and follow safety information in Section 7-1 before proceeding.**

☞ *Resistance values are based on in-circuit measurements.*



PRE-POWER CHECKS

▲ Wear an earth grounded wrist strap when performing pre-power checks. Remove wrist strap before performing any checks or procedures with power applied to the machine.

Note: press hard enough with tips of meter probes to penetrate varnish on PC board to make good electrical contact. **If any of the following measurements do not read correctly, PM1 is faulty. Continue to the end of the Pre-Power Checklist before replacing PM1.**

1. Visually inspect PM1 for damage. PM1 is located between the top heatsink and the large horizontal power interconnect board PC2.

2. Check the six input rectifier diodes within PM1 (diode test). Look for a diode drop (.200 to .900 volts) across the following test points on PC2:

Positive Meter Lead	Negative Meter Lead
Line 1	RC1 Pin 12
Line 2	RC1 Pin 12
Line 3	RC1 Pin 12
RC5 Pin 3	Line 1
RC5 Pin 3	Line 2
RC5 Pin 3	Line 3

If the input rectifier diodes are faulty, check the three poles of power switch S1 (switch off=OL, switch on =0 ohms).

3. Check boost IGBT within PM1 (diode test). Look for a diode drop (.200 to .900 volts) across the following test points on PC2:

Positive Meter Lead	Negative Meter Lead
RC5 Pin 3	LTAP

4. Check boost diode within PM1 (diode test). Look for a diode drop (.200 to .900 volts) across the following test points on PC2: NOTE: this test is measuring two diodes in series. Some diode testers may not read this correctly.

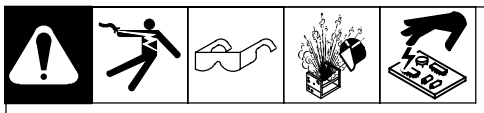
Positive Meter Lead	Negative Meter Lead
LSNUB	RC5 Pin 1

5. Check inverter IGBT's within PM1 (diode test). Look for a diode drop (.200 to .900 volts) across the following test points on PC2:

Positive Meter Lead	Negative Meter Lead
RC5 Pin 3	XFMR2
XFMR2	RC5 Pin 1

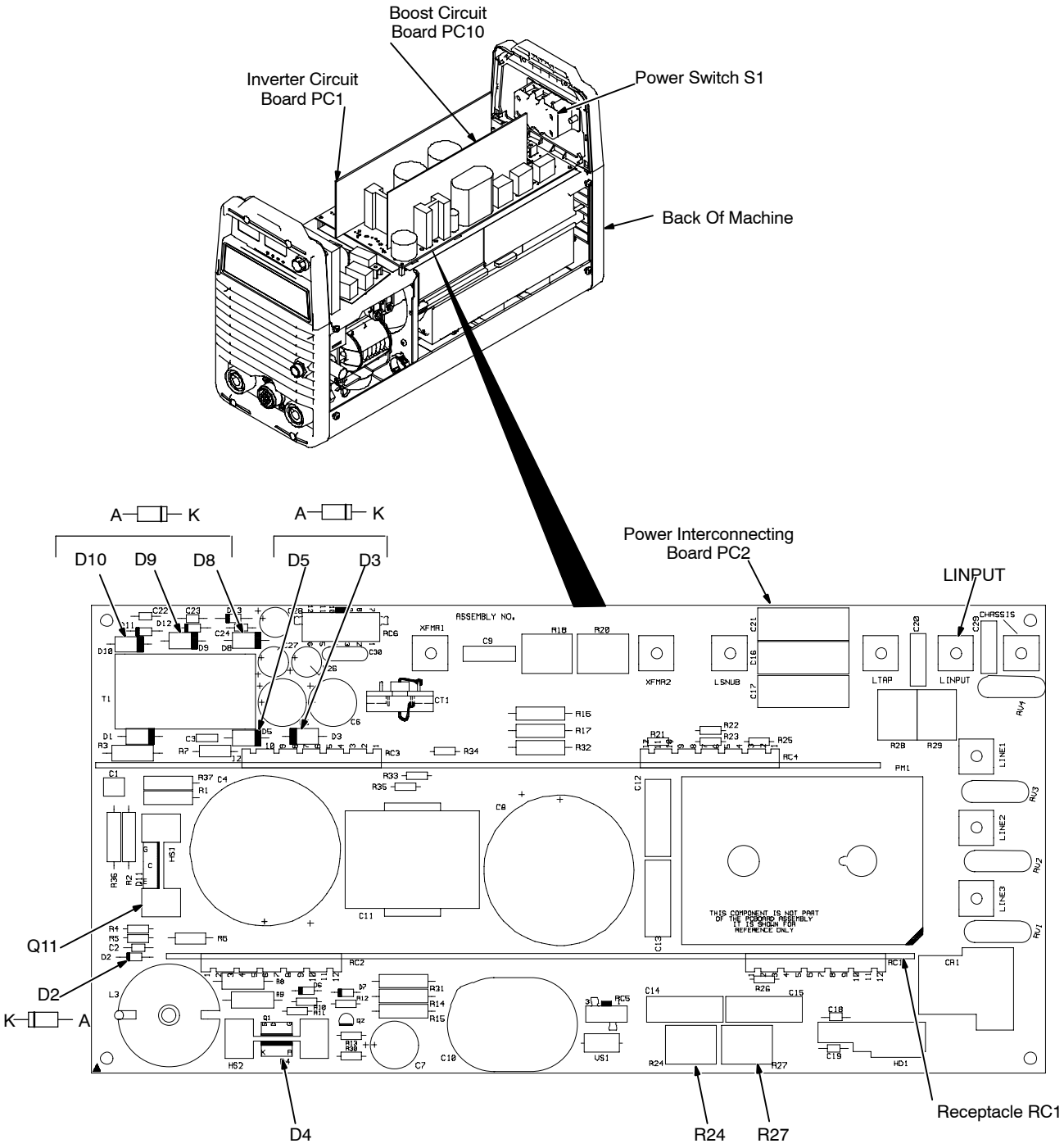
6. Check thermistor within PM1 (resistance test). Measure the resistance on PC2 from RC3 Pin 1 to RC3 Pin 2. The reading should measure 1000 ohms at room temperature. The ohms value rises with increase in temperature.

7-4. Power Interconnecting Board PC2



▲ **Read and follow safety information in Section 7-1 before proceeding.**

☞ *Resistance values are based on in-circuit measurements.*



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PRE-POWER CHECKS

▲ Wear an earth grounded wrist strap when performing pre-power checks. Remove wrist strap before performing any checks or procedures with power applied to the machine.

Note: press hard enough with tips of meter probes to penetrate varnish on PC board to make good electrical contact. **If any of the following measurements do not read correctly, PC2 is faulty. Proceed to Step 4 before replacing PC2.**

1. Visually inspect Power Interconnect Board PC2 for damage. All of the following tests on this page are made on PC2.

2. Check precharge resistors R24 and R27 (resistance test). Measure resistance from LINPUT to RC1 Pin 12. Note: this test is measuring two resistors in series. Resistance should read 200±20 ohms.

3. Check precharge relay CR1 coil resistance (resistance test). Measure resistance from RC1 Pin5 to RC1 Pin 6. Resistance should read 650±50 ohms.

4. Check IGBT Q11 (diode test). Look for a diode drop (.200 to .900 volts) across the following test points on PC2:

Positive Meter Lead	Negative Meter Lead
D2 anode	Q11 center pin
D2 anode	D2 cathode

If any of the measurements in Step 4 do not read correctly, PC2 and PC10 are faulty. Proceed to Step 5 before replacing PC2 and PC10.

5. Check diode D4 and flyback MOSFET Q1 (diode test). Look for a diode drop (.200 to .900 volts) across the following test points on PC2:

Positive Meter Lead	Negative Meter Lead
D4 anode	D4 cathode

6. Check flyback output diodes D3 and D5 (diode test). Look for a diode drop (.200 to .900 volts) across the following test points on PC2:

Positive Meter Lead	Negative Meter Lead
D3 anode	D3 cathode
D5 anode	D5 cathode

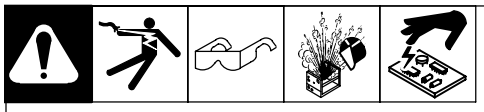
If any of the measurements in Step 5 or Step 6 do not read correctly, replace PC1, PC2 and PC10. Proceed to Step 7.

7. Check flyback output diodes D8, D9, and D10 (diode test). Look for a diode drop (.200 to .900 volts) across the following test points on PC2:

Positive Meter Lead	Negative Meter Lead
D8 anode	D8 cathode
D9 anode	D9 cathode
D10 anode	D10 cathode

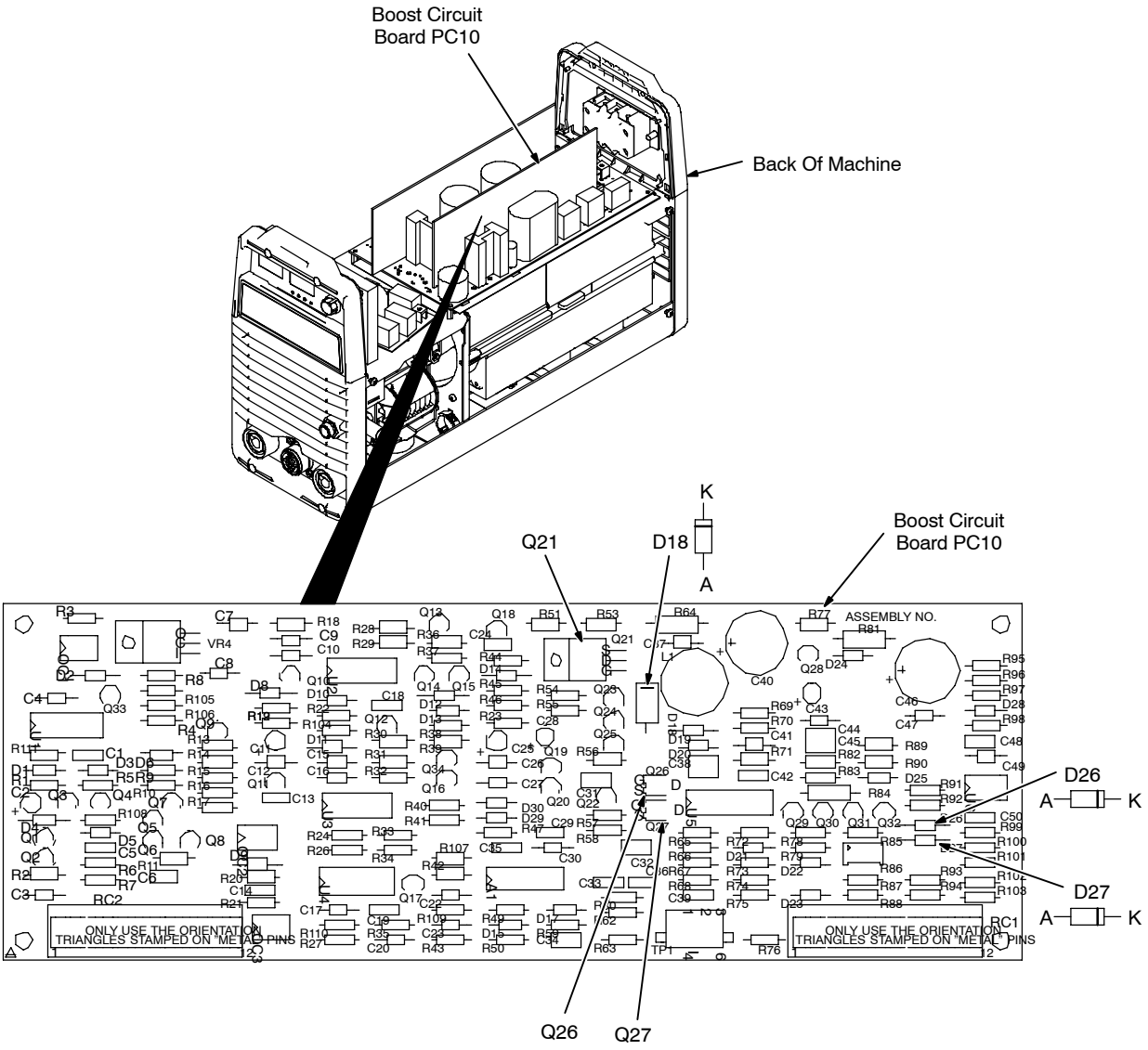
If any of the measurements in Step 7 do not read correctly, replace PC2 and PC6. Continue to the end of the Pre-Power Checklist.

7-5. Boost Control Board PC10



▲ **Read and follow safety information in Section 7-1 before proceeding.**

☞ *Resistance values are based on in-circuit measurements.*



▲ **Wear an earth grounded wrist strap when performing pre-power checks. Remove wrist strap before performing any checks or procedures with power applied to the machine.**

Note: press hard enough with tips of meter probes to penetrate varnish on PC board to make good electrical contact.

1. Visually inspect Boost Control Board PC10 for damage. All of the following tests on this page are made on PC10.

2. Look for a diode drop across the following test points on PC10 (.200 to .900 volts):

Positive Meter Lead	Negative Meter Lead
D18 anode	D18 cathode
D18 cathode	Q21 top pin
D26 anode	D26 cathode
D27 anode	D27 cathode

If any of the above measurements do not read correctly, replace PC10. If D26 or D27 do not read correctly, replace PC10 and PM1. Continue to the end of the Pre-Power Checklist.

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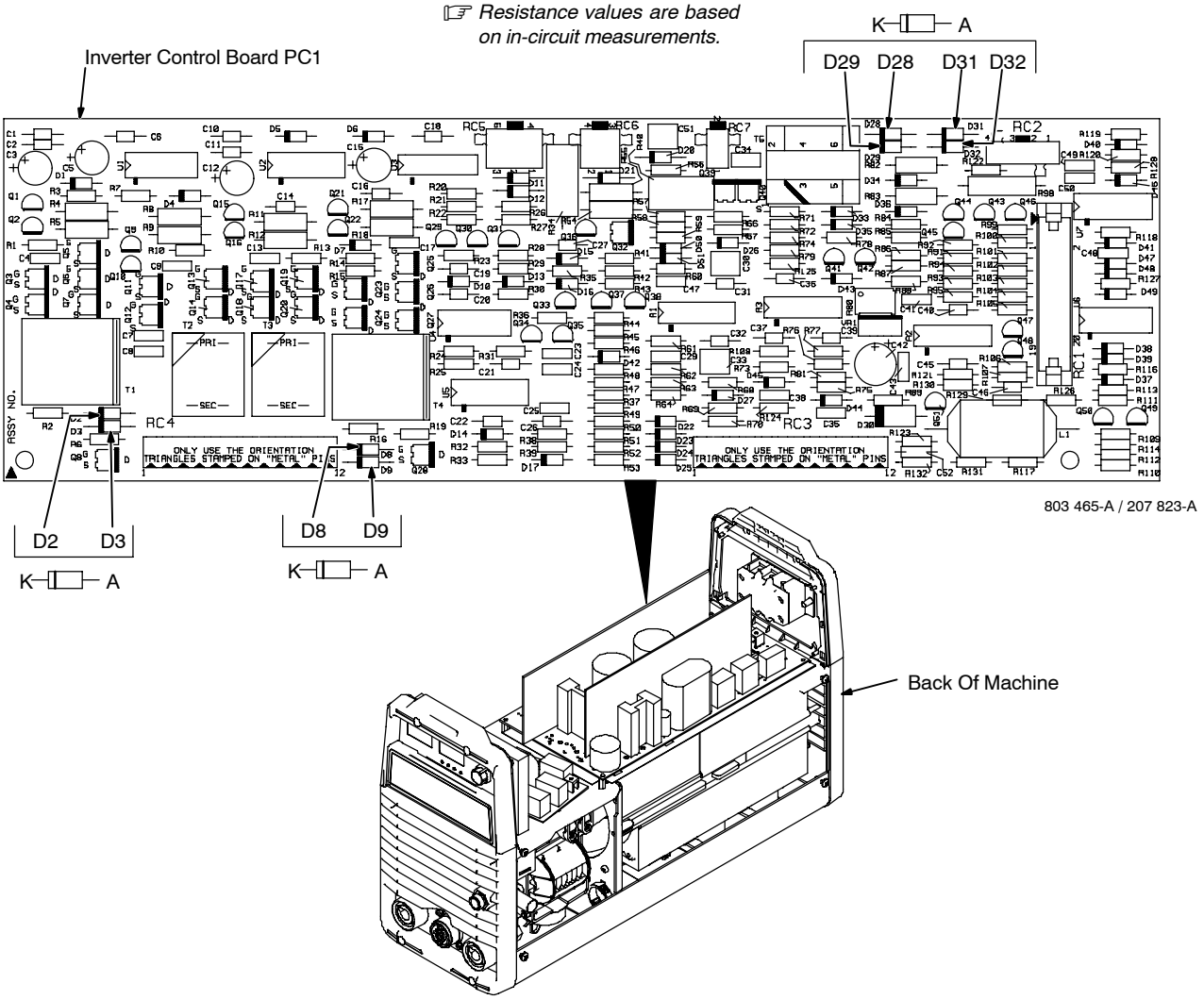
7-6. Inverter Control Board PC1

▲ **Read and follow safety information in Section 7-1 before proceeding.**

☞ *Resistance values are based on in-circuit measurements.*



▲ **Wear an earth grounded wrist strap when performing pre-power checks. Remove wrist strap before performing any checks or procedures with power applied to the machine.**

Note: press hard enough with tips of meter probes to penetrate varnish on PC board to make good electrical contact.

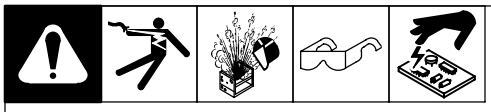
1. Visually inspect Inverter Control Board PC1 for damage. All of the following tests on this page are made on PC1.

2. Look for a diode drop (.200 to .900) volts across the following test points on PC1:

Positive Meter Lead	Negative Meter Lead
D2 anode	D2 cathode
D3 anode	D3 cathode
D8 anode	D8 cathode
D9 anode	D9 cathode
D28 anode	D28 cathode
D29 anode	D29 cathode
D31 anode	D31 cathode
D32 anode	D32 cathode

If any of the above measurements do not read correctly, replace PC1. If D2, D3, D8, or D9 do not read correctly, replace PC1 and PM1. Continue to the end of the Pre-Power Checklist.

7-7. IGBT Snubber Board PC6



▲ **Read and follow safety information in Section 7-1 before proceeding.**

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▲ **Wear an earth grounded wrist strap when performing pre-power checks. Remove wrist strap before performing any checks or procedures with power applied to the machine.**

Note: press hard enough with tips of meter probes to penetrate varnish on PC board to make good electrical contact.

1. Visually inspect IGBT Snubber Board PC6 for damage. All of the following tests on this page are made on PC6.

2. Look for a diode drop (.200 to .900) volts across the following test points on PC6:

Positive Meter Lead	Negative Meter Lead
RC10	RC13
RC13	RC12
RC15	RC11
RC11	RC14

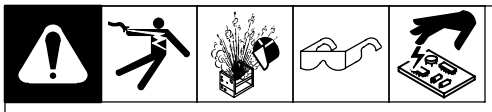
If any of the above measurements do not read correctly, replace PM2, PM3 (see Section 7-8), and PC6. Continue to the end of the Pre-Power Checklist.

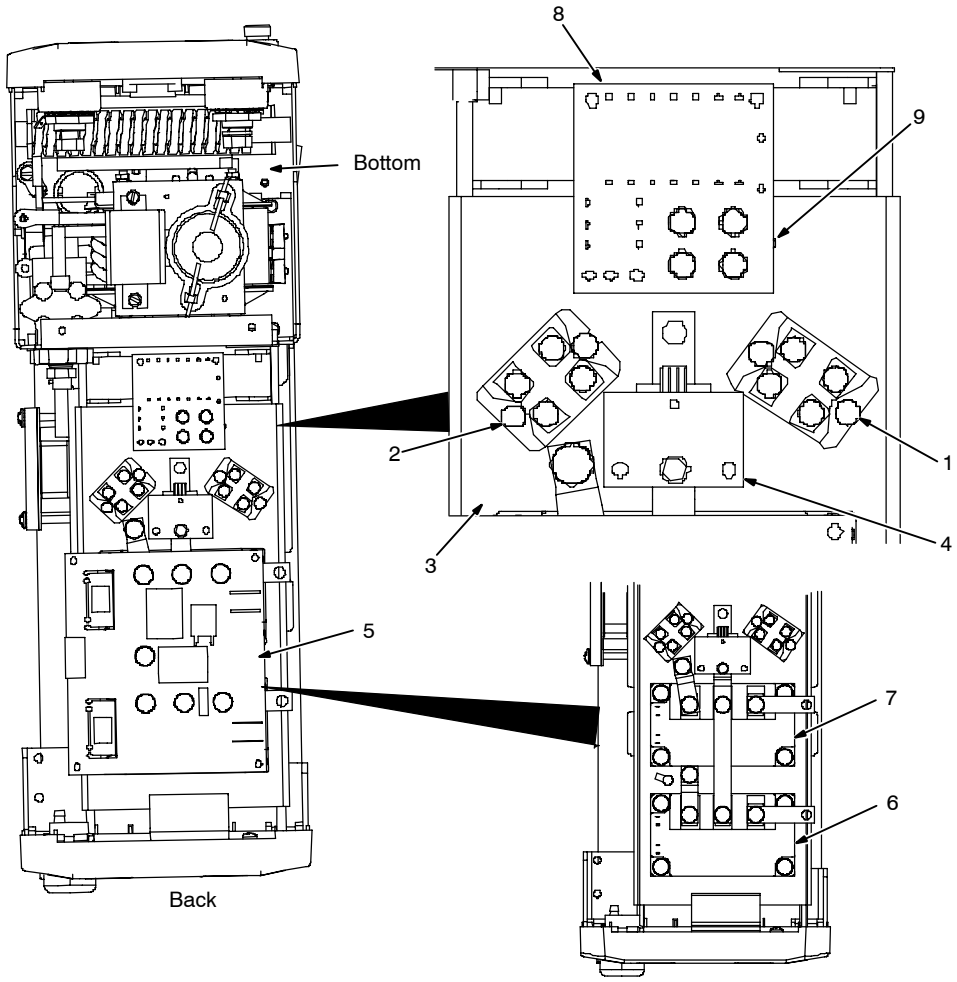
3. Resistance check ±10% :

R22	10 K ohms
R15	700 ohms
R29	10 K ohms
R31	700 ohms

If any of the above measurements do not read correctly, replace PC6. Continue to the end of the Pre-Power Checklist.

7-8. Secondary Heat Sink Components





▲ **Read and follow safety information in Section 7-1 before proceeding.**

▲ **Wear an earth grounded wrist strap when performing pre-power checks. Remove wrist strap before performing any checks or procedures with power applied to the machine.**

1 Output Diode D1

2 Output Diode D2

3 Heat Sink

Symptoms of a failed output diode are a front panel meter display of *HELP-1* (see Section 8-3). Look for a diode drop of approximately .200 to .900 volts between the diodes and the heat sink. Place the black meter probe on the heat sink, and the red meter probe on the transformer lug attached to the corresponding diode. Replace D1 and D2 if the meter reading is 0 volts.

4 HD1

5 IGBT Snubber Board PC6

Power modules PM2 and PM3 are located under PC6.

6 Power Module PM2

7 Power Module PM3

8 Diode Snubber Board PC11

9 SR1 Located Under PC11

▲ **Pre-power checks are now complete. Remove earth grounded wrist strap before performing any checks or procedures with power applied to the machine.**

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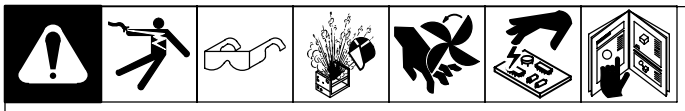
7-9. Troubleshooting Table



☞ *See Section 7-10 for test points and values and Section 14 for parts location.*

☞ *Use MILLER Testing Booklet (Part No. 150 853) when servicing this unit.*

▲ **Remove earth grounded wrist strap before performing any checks or procedures with power applied to the machine.**

Trouble	Remedy
No weld output; unit completely inoperative.	Place line disconnect switch in On position (see Section 3-12).
	Check and replace line fuse(s), if necessary, or reset circuit breaker (see Section 3-12).
	Check for proper input power connections and check condition of power cord (see Section 3-12).
	Check continuity of Power switch S1 (see Section 7-10), and replace if necessary.
No weld output; meter display On.	Unit overheated and HELP 3 or HELP 5 screen is displayed. Allow unit to cool with fan On (see Sections 8-3 and 3-4).
	Check, repair, or replace remote control.
	Check input and output voltages of hall device HD1 (see Section 7-10). Replace HD1 if necessary.
	Check output diodes D1 and D2, and replace if necessary (see Section 7-8).
	Check power module PM1, and replace if necessary (see Section 7-3).
	Check inverter control board PC1 and boost control board PC10, and connections, and replace if necessary (see Section 7-12 and 7-22).
	Check IGBT snubber board PC6 (see Section 7-7 and 7-18), and replace if necessary.
Low weld output with no control.	Check input and output voltages of hall device HD1 (see Section 7-10). Replace HD1 if necessary.
	Check inverter control board PC1 and connections, and replace if necessary (see Section 7-12).
	Check weld control board PC3 and connections, and replace if necessary (see Section 7-16).
Maximum weld output with no control.	Check input and output voltages of hall device HD1 (see Section 7-10). Replace HD1 if necessary.
	Check inverter control board PC1 and connections, and replace if necessary (see Section 7-12).
	Check weld control board PC3 and connections, and replace if necessary (see Section 7-16).
Erratic or improper weld output.	Use proper size and type of weld cable (see Section 3-6).
	Clean and tighten all weld connections.
	Check for proper input and output connections.
	Replace electrode.
	Check resistance and connections of remote amperage control potentiometer, and replace if necessary.
	Check input and output voltages of hall device HD1 (see Section 7-10). Replace HD1 if necessary.
	Check weld control board PC3 and connections, and replace if necessary (see Section 7-16).
Fan motor does not run after approximately four minutes of operation at rated load.	Check and clear blocked fan blade
	Check thermistor RT1 on weld control board PC3 (see Section 7-16).
	Check fan motor FM (see Section 7-10), and replace if necessary.
Wandering arc; poor control of arc direction.	Use proper size tungsten.
	Use properly prepared tungsten.
	Reduce gas flow rate.

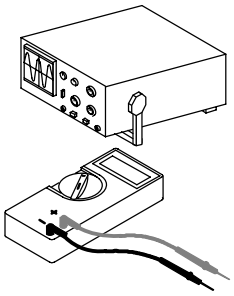
Trouble	Remedy
Tungsten electrode oxidizing and not remaining bright after conclusion of weld.	Shield weld zone from drafts.
	Increase postflow time.
	Check and tighten all gas fittings.
	Water in torch. Refer to torch manual.
No low open circuit voltage in Lift and Stick	Check output diodes D1 and D2 (see Section 7-8), and replace if necessary.
	Check output IGBT's (see Section 7-8), and replace if necessary.
	Check RC2 connection on inverter control board PC1 (see Section 7-12).
No AC output; DC output only	Check IGBT gates on IGBT snubber board PC6 (see Section 7-7). If necessary, replace PC6 and associated IGBT module.

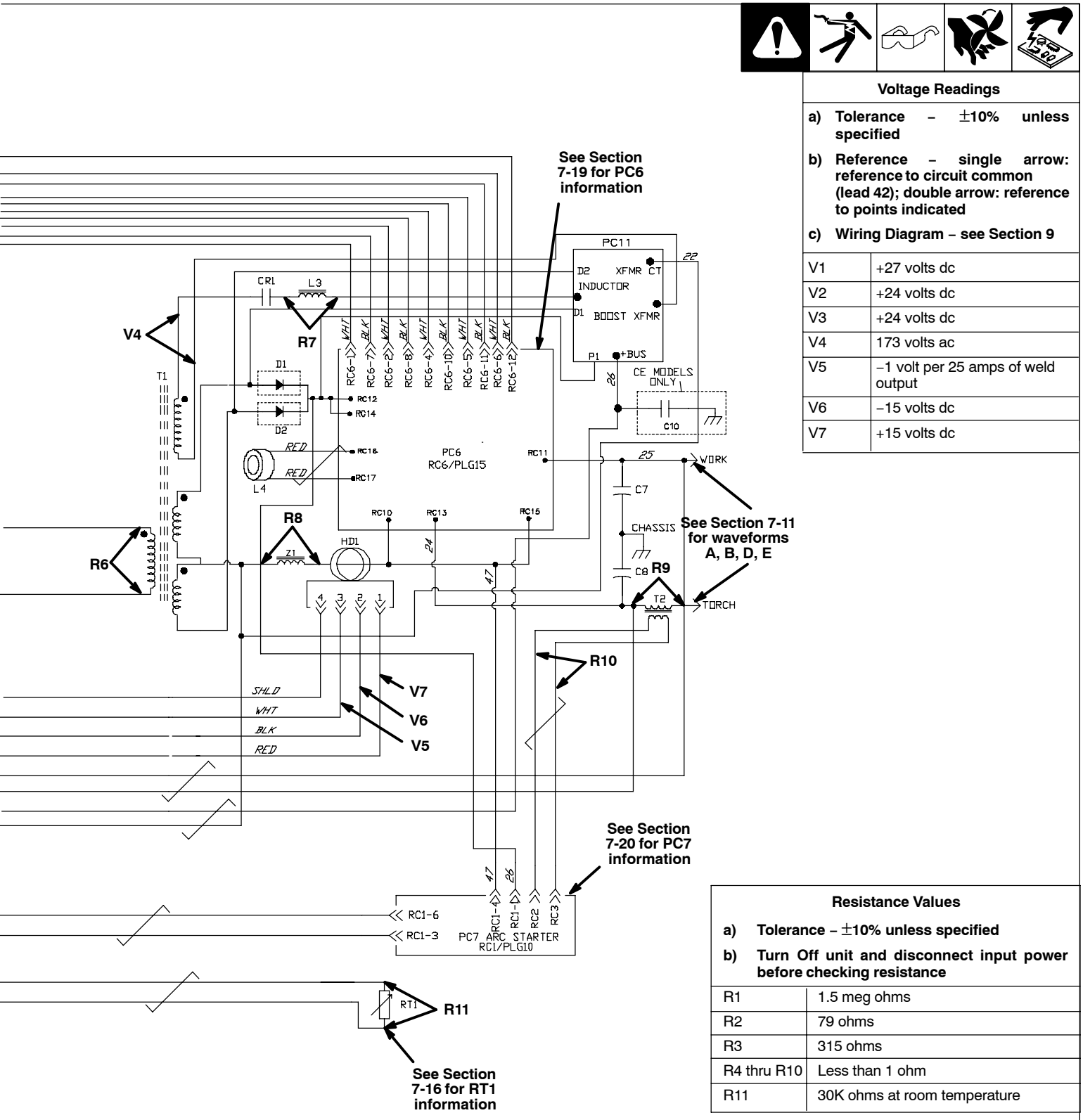
7-10. Troubleshooting Circuit Diagram

▲ **Discharge input capacitors according to Section 7-2, and be sure voltage is near zero before touching any parts.**

☞ *No calibration available for voltmeter V or ammeter A.*

Test Equipment Needed:





Voltage Readings

a) Tolerance – ±10% unless specified

b) Reference – single arrow: reference to circuit common (lead 42); double arrow: reference to points indicated

c) Wiring Diagram – see Section 9

V1	+27 volts dc
V2	+24 volts dc
V3	+24 volts dc
V4	173 volts ac
V5	–1 volt per 25 amps of weld output
V6	–15 volts dc
V7	+15 volts dc

Resistance Values

a) Tolerance – ±10% unless specified

b) Turn Off unit and disconnect input power before checking resistance

R1	1.5 meg ohms
R2	79 ohms
R3	315 ohms
R4 thru R10	Less than 1 ohm
R11	30K ohms at room temperature

- Do not touch live electrical parts.
- Disconnect input power or stop engine before servicing.
- Do not operate with covers removed.
- Have only qualified persons install, use, or service this unit.

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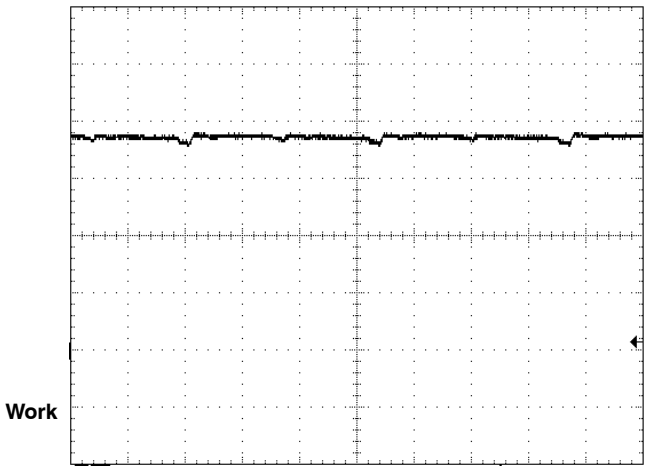
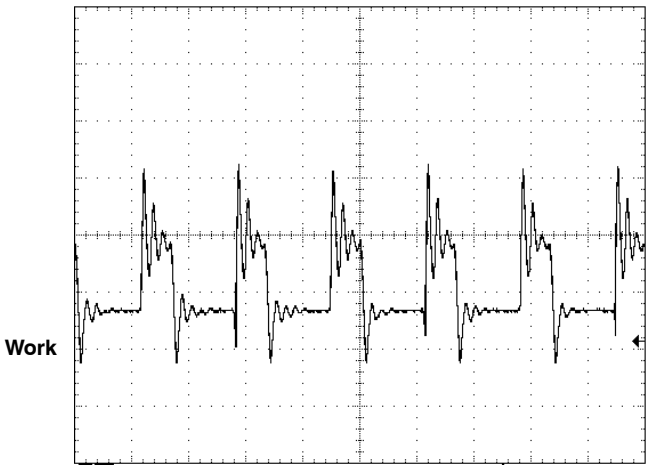
7-11. Waveforms for Sections 7-10

10 µs 2V



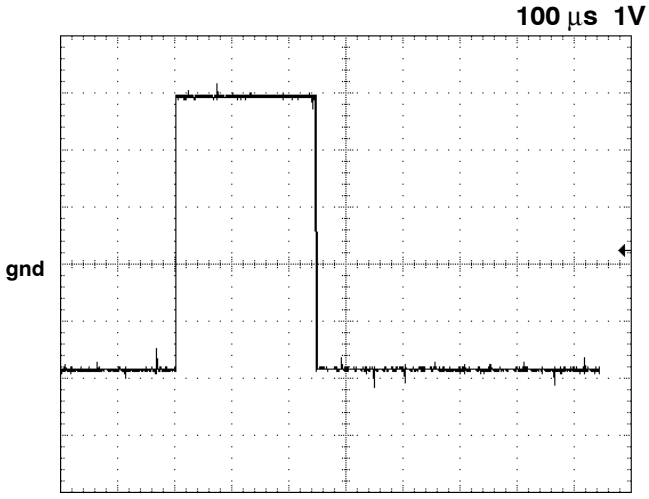
A. DC Open-Circuit Voltage (5-10 VDC)

10 µs 20V



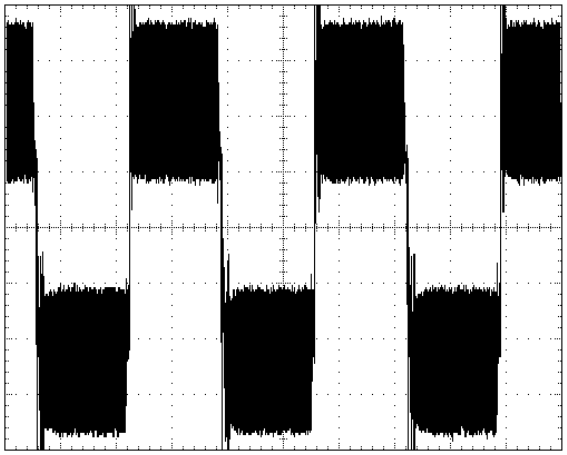
B. 22 Volts DC, 150 Amperes, (Resistive Load)

100 µs 1V



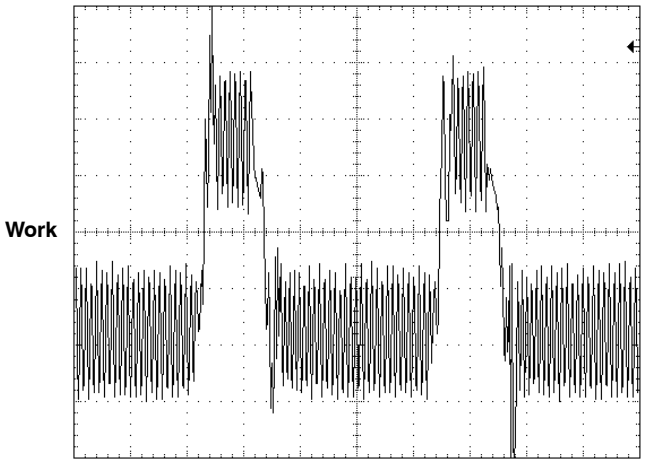
C. Waveform for arc starter is at PC3 RC3-1 to RC3-4 with leads from PC7 disconnected. (NOTE: This pulse occurs every 50 ms.)

5 ms 10V



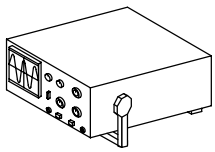
D. AC Stick, 50% Balance, 24 Volts DC, 100 Amps (Resistive Load)

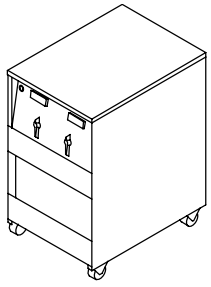
2 ms 10V



E. AC TIG, 75% EN Balance, 18 Volts DC, 100 Amps, 120 Hz (Resistive Load)

Test Equipment Needed:



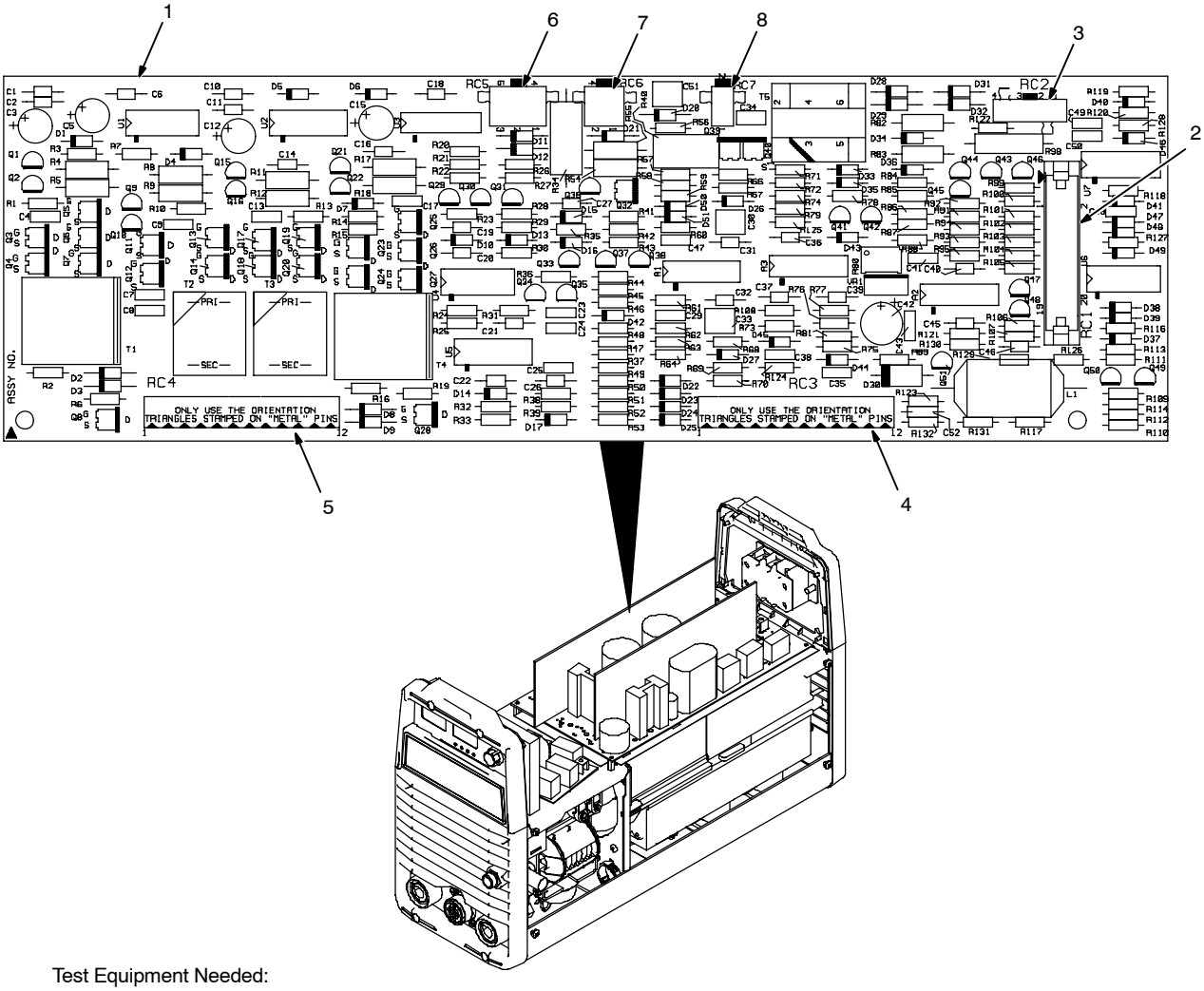


7-12. Inverter Control Board PC1 Testing Information (Use with Section 7-13)

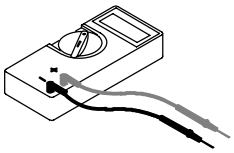
▲ **Discharge input capacitors according to Section 7-2, and be sure voltage is near zero before touching any parts.**

Be sure plugs are secure before testing. See Section 7-13 for specific values during testing.

1 Inverter Control Board PC1
2 Receptacle RC1
3 Receptacle RC2
4 Receptacle RC3
5 Receptacle RC4
6 Receptacle RC5
7 Receptacle RC6
8 Receptacle RC7



Test Equipment Needed:



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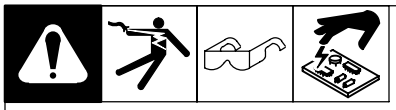
7-13. Inverter Control Board PC1 Test Point Values



PC1 Voltage Readings

a) Tolerance – ±10% unless specified

b) Reference – to circuit common (lead 42) unless noted

Receptacle	Pin	Type	Value
RC1	1	Output	+5 volts dc @ 1A; regulated with respect to ground
	2	Output	+5 volts dc output @ 1A; regulated with respect to ground
	3	Output	+15 volts dc output @ 300 mA; regulated with respect to ground
	4	Output	Module thermistor +; 1000 ohms +/- 1% @ 25° C
	5	Output	Module thermistor - ; 1670 ohms +/- 1% @ 100° C
	6	Input	Lift arc pwm; 15 kHz, 15 V squarewave
	7	Input	Boost enable; 0 volts dc=on, +5 volts dc = off
	8	Input	Gas enable; 0 volts dc=on, +5 volts dc = off
	9	Input	Output enable; 0 volts dc=on, +15 volts dc = off
	10	Input	Fan enable; 0 volts dc=on, +5 volts dc = off
	11	Input	Output reference; 0 volts dc=1 ampere, 10 volts dc=200 amperes
	12	Output	Voltage feedback; 1 volt dc per 10 volts dc of weld output
	13	Output	Power down detect; 0 volts dc=okay, open collector=power down
	14	Output	Over current detect; 0 volts dc=over current, open collector=okay
	15	Output	Current feedback; 1volt dc per 50 amperes of weld output
	16	GND	
	17	GND	
	18	GND	
	19	Input	Polarity; +15 volts dc=EP, 0 volts dc=EN
	20	Output	Over voltage detect; 0 V=over voltage, open collector=okay
RC2	1	Input	Torch weld output terminal; used for output voltage feedback
	2	Input	Work output terminal; used for output voltage feedback
	3	Output	Positive lift voltage output terminal
	4	Output	Negative lift voltage output terminal
RC3	1	Input	Module thermistor +; 1000 ohms +/- 1% @ 25° C
	2	Input	Module thermistor –; 1670 ohms +/- 1% @ 100° C
	3	Input	Primary current transformer; 10 amps per 1 volt dc, 200:1 turns ratio, 20 ohm load
	4	Input	Primary current transformer; 10 amps per 1 volt dc, 200:1 turns ratio, 20 ohm load
	5	Input	–15 volts dc @ 1.5 amps; regulated with respect to ground
	6	Input	+15 volts dc @ 1.5 amps; regulated with respect to ground
	7	Input	Overpower foldback; folds back output if input bus drops
	8	GND	
	9	GND	
	10	Output	Gate control for secondary IGBT; 3 volts dc = on, 0 volts dc = off
	11	Output	Gate control for secondary IGBT; 3 volts dc = on, 0 volts dc = off

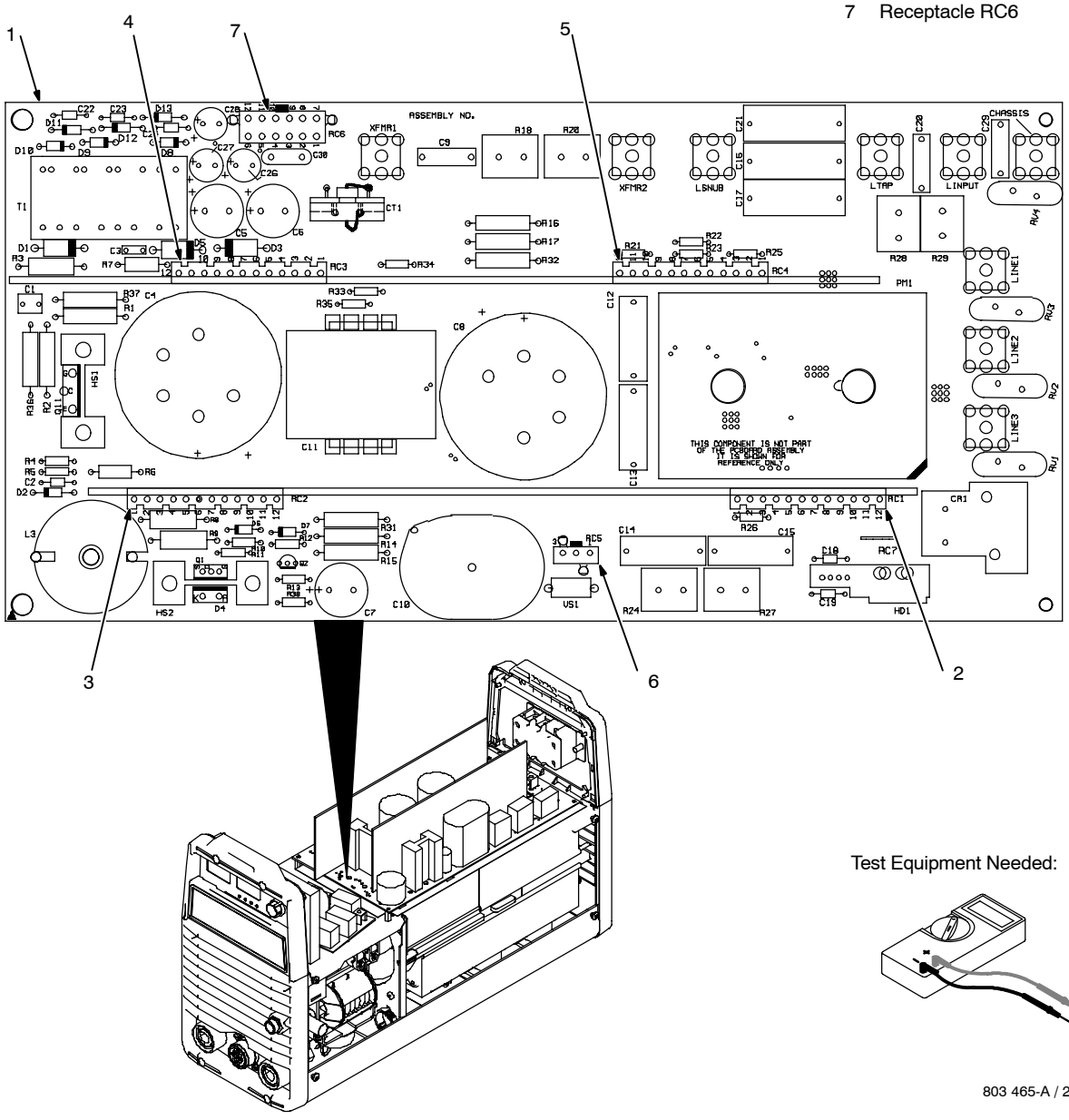
Receptacle	Pin	Type	Value
	12		Not used
RC4			⚠ **High voltage present. Voltages on pins on this receptacle can be more than 800 volts DC from chassis (GND).**
			NOTE: Pins 1 and 2 on this receptacle are referenced to RC4-2
	1	Input	Inverter 1 drive; high side drive for primary inverter
	2		Inverter 1 drive reference
	3		Not used
	4		Not used
			NOTE: Pins 5 through 8 on this receptacle are referenced to RC4-6
	5	Input	Snubber 2 drive; drive signal for primary inverter snubber
	6		Snubber 2 drive reference
	7	Input	Snubber 1 drive; drive signal for primary inverter snubber
	8		Snubber 1 drive reference
	9		Not used
	10		Not used
			NOTE: Pins 11 and 12 on this receptacle are referenced to –Bus (RC5-3)
	11	Input	Inverter 2 drive; low side drive for primary inverter
	12		–Bus; 0 volts dc
RC5	1	Output	+15 volts dc for LEM
	2	Output	–15 volts dc for LEM
	3	Input	–1 volt dc per 25 amps, LEM measure
	4	GND	LEM return
	5	Output	Test point, used to test board only – Do Not Measure
	6	Output	Test point, used to test board only – Do Not Measure
RC6	1	Output	+15 volts dc for gas valve drive
	2	Output	+15 volts dc for boost relay drive
	3	Output	Gas valve drive; +15 volts dc=off, -13 volts dc=on
	4	Output	Boost relay drive; +15 volts dc=off, -13 volts dc=on
RC7	1	Output	Fan motor drive; +15 volts dc
	2	Output	Fan motor drive; +15 volts dc=off, -13 volts dc=on

7-14. Power Interconnect Board PC2 Testing Information (Use with Section 7-15)

▲ **Discharge input capacitors according to Section 7-2, and be sure voltage is near zero before touching any parts.**

Be sure plugs are secure before testing. See Section 7-15 for specific values during testing.

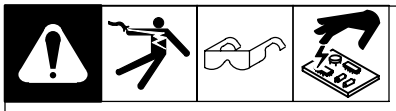
1 Power Interconnect Board PC2
2 Receptacle RC1
3 Receptacle RC2
4 Receptacle RC3
5 Receptacle RC4
6 Receptacle RC5
7 Receptacle RC6



Test Equipment Needed:

803 465-A / 207 819-B

7-15. Power Interconnect Board PC2 Test Point Values



PC2 Voltage Readings

a) Tolerance – ±10% unless specified

b) Reference – to circuit common (lead 42) unless noted

Receptacle	Pin	Type	Value
RC1			**High voltage present. Voltages on this receptacle can be more than 800 volts DC from chassis (GND).**
			NOTE: All pins on this receptacle are referenced to the – Bus (RC5-3)
	1	Output	+Bus; regulated to 810 volts dc
	2		Not Used
	3		–Bus; 0 volts dc
	4	Input	Boost control; drive signal for boost IGBT
	5	Output	+30 volts dc
	6	Input	Precharge; active low drive for precharge relay
	7	Input	+15 volts dc; regulated from +30 volts dc
	8	Input	–15 volts dc, regulated from +30 volts dc
	9	Output	IFB primary; current feedback for boost regulator control
	10		–Bus; 0 volts dc
	11		Not Used
	12	Output	+ Rect; rectified AC input
RC2			**High voltage present. Voltages on pins 1 through 9 on this receptacle can be more than 800 volts DC from chassis (GND).**
			NOTE: Pins 1 through 4 on this receptacle are referenced to RC2-2
	1	Output	+15 volts dc; regulated from bus
	2		Common
	3	Input	Buck drive; drive signal for +30 volts dc regulator
	4	Output	IFB buck; current feedback for +30 volts dc regulator
	5		Not used
			NOTE: Pins 6 through 8 on this receptacle are referenced to –Bus (RC5-3)
	6		–Bus; 0 volts dc
	7	Input	Flyback drive; control signal to derive regulated supplies on RC3
	8	Output	Flyback IFB; current feedback for flyback supply
	9		Not used
	10	Input	Overpower foldback; folds back output if input current is greater than 35 amperes
	11	Output	+15 volts dc; used to regulate +15 volts dc
	12	Output	–15 volts dc; used to regulate –15 volts dc
RC3	1	Output	Module thermistor +; 1000 ohms +/- 1% @ 25° C
	2	Output	Module thermistor –; 1670 ohms +/- 1% @ 100° C
	3	Output	Primary current transformer; 10 amps per 1 volt dc, 200:1 turns ratio, 20 ohm load
	4	Output	Primary current transformer; 10 amps per 1 volt dc, 200:1 turns ratio, 20 ohm load
	5	Output	–15 volts dc @ 1.5 amps; regulated with respect to ground
	6	Output	+15 volts dc @ 1.5 amps; regulated with respect to ground

Receptacle	Pin	Type	Value
	7	Output	Overpower foldback, folds back output if bus droops
	8	GND	Ground
	9	GND	Ground
	10		Gate control for secondary IGBT; 3 volts dc = on, 0 volts dc = off
	11		Gate control for secondary IGBT; 3 volts dc = on, 0 volts dc = off
	12		Not used
RC4			⚠ **High voltage present. Voltages on pins on this receptacle can be more than 800 volts DC from chassis (GND).**
			NOTE: Pins 1 and 2 on this receptacle are referenced to RC4-2
	1	Input	Inverter 1 drive; high side drive for primary inverter
	2		Inverter 1 drive reference
	3		Not used
	4		Not used
			NOTE: Pins 5 through 8 on this receptacle are referenced to RC4-6
	5	Input	Snubber 2 drive; drive signal for primary inverter snubber
	6		Snubber 2 drive reference
	7	Input	Snubber 1 drive; drive signal for primary inverter snubber
	8		Snubber 1 drive reference
	9		Not used
	10		Not used
			NOTE: Pins 11 and 12 on this receptacle are referenced to –Bus (RC5-3)
	11	Input	Inverter 2 drive; low side drive for primary inverter
	12		–Bus; 0 volts dc
RC5			⚠ **High voltage present. Voltages on this receptacle can be more than 800 volts DC from chassis to ground (GND).** **NOTE: All pins on this receptacle are referenced to the – bus (RC5-3)**
	1		+ bus; regulated to 810 VDC
	2		Bus center tap; regulated to 405 VDC
	3		– bus; 0 VDC
RC6	1	Output	Gate control input for secondary IGBT's; 3 volts dc = on, 0 volts dc = off
	2	Output	Gate control input for secondary IGBT's; 3 volts dc = on, 0 volts dc = off
	3		Not used
	4	Output	Isolated +20 volts dc supply (A) for high side of inverter drive
	5	Output	Isolated +20 volts dc supply (B) for low side of inverter drive
	6	Output	Isolated +20 volts dc supply (C) for high side of inverter drive
	7	Output	GND, Reference for pins 1 and 2
	8	Output	GND, Reference for pins 1 and 2
	9		Not used
	10	Output	Reference for pin 4
	11	Output	Reference for pin 5 (–bus secondary)
	12	Output	Reference for pin 6

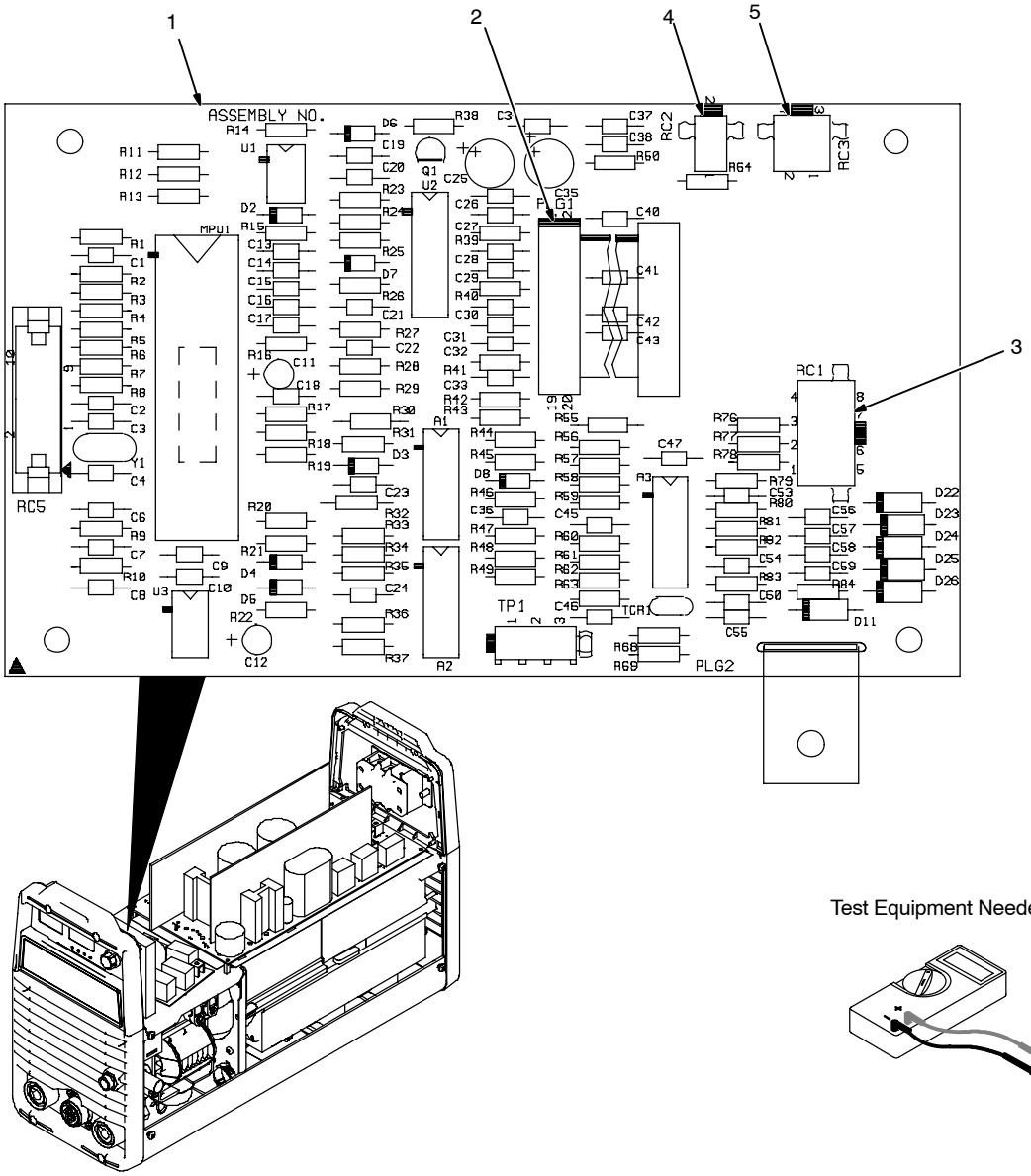
7-16. Weld Control Board PC3 Testing Information (Use with Section 7-17)

▲ **Discharge input capacitors according to Section 7-2, and be sure voltage is near zero before touching any parts.**

Be sure plugs are secure before testing.

See Section 7-17 for specific values during testing.

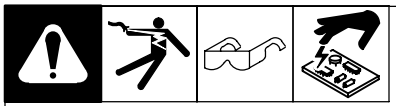
1 Process Control Board PC3
2 Plug PLG1
3 Receptacle RC1
4 Receptacle RC2
5 Receptacle RC3



Test Equipment Needed:

802 883 / 221 138-A

7-17. Weld Control Board PC3 Test Point Values



PC3 Voltage Readings

a) Tolerance – ±10% unless specified

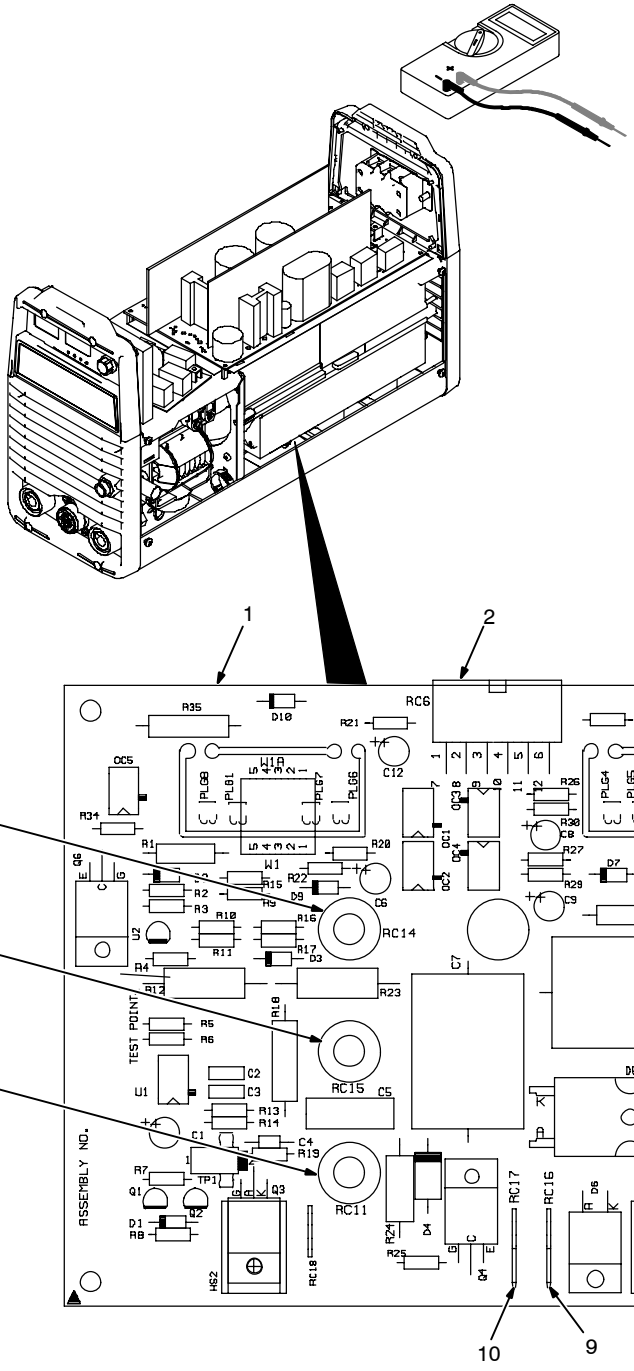
b) Reference – to circuit common (lead 42) unless noted

Receptacle	Pin	Type	Value
PLG1	1	Input	+5 volts dc @ 1 amp; regulated with respect to ground
	2	Input	+5 volts dc @ 1 amp; regulated with respect to ground
	3	Input	+15 volts dc @ 300 mA; regulated with respect to ground

Receptacle	Pin	Type	Value
	4	Input	Module thermistor +; 1000 ohms +/- 1% @ 25° C
	5	Input	Module thermistor –; 1670 ohms +/- 1% @ 100° C
	6	Output	Lift arc power module; 15KHz, 15 volts dc squarewave
	7	Output	Boost enable; 0 volts dc=on, +5 volts dc=off
	8	Output	Gas enable; 0 volts dc–=on, +5 volts dc=off
	9	Output	Output enable; 0 volts dc–=on, +5 volts dc=off
	10	Output	Fan enable; 0 volts dc=on, +5 volts dc=off
	11	Output	Output reference; 0=1 amp, 10 volts=200 amps
	12	Input	Voltage feedback; 1 volt dc per 10 volts dc of weld output
	13	Input	Power down detect; 0 volts dc=okay, open collector=power down
	14	Input	Over current detect; 0 volts dc=over current, open collector=okay
	15	Input	Current feedback; 1 volt dc per 50 amperes of weld output
	16	GND	
	17	GND	
	18	GND	
	19	Output	Polarity; +15 volts dc = EP, 0 volts dc = EN
	20	Input	Over voltage detect; 0 volts dc=over voltage, open collector=okay
RC1	1	Input	output reference; from Remote 14 pin E, 0 – 10 volts dc
	2	GND	
	3		Not used
	4	Output	Current feedback; 1 volt dc per 100 amperes of weld output
	5	Output	Remote reference to Remote 14 receptacle RC1 pin C, 0 – 10 volts dc
	6	Input	Output enable from Remote 14 receptacle RC1 pin B, 15 volts dc=on
	7	Output	Voltage feedback; 1 volt dc per 10 volts of weld output
	8	Output	+15 volts dc to Remote 14 receptacle RC1 pin A (short circuit protection)
RC2	1	Input	Output thermistor RT1; 30K ohms ± 1% @25° C
	2	Input	Output thermistor RT1; 2K ohms ± 1% @100° C
RC3	1	Output	Arc starter drive; 0 volts dc=off, pulse train=HF
	2		Not Used
	3		Not Used
	4	GND	

7-18. IGBT Snubber Board PC6 Testing Information (Use with Section 7-19)

Test Equipment Needed:



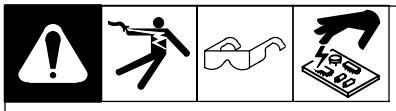
803 465-A / 207 827-B

▲ **Discharge input capacitors according to Section 7-2, and be sure voltage is near zero before touching any parts.**

Be sure plugs are secure before testing. See Section 7-19 for specific values during testing.

1 IGBT Snubber Starter Board PC6
2 Receptacle RC6
3 Receptacle RC10
4 Receptacle RC11
5 Receptacle RC12
6 Receptacle RC13
7 Receptacle RC14
8 Receptacle RC15
9 Receptacle RC16
10 Receptacle RC17

7-19. IGBT Snubber Board PC6 Test Point Values



PC6 Voltage Readings

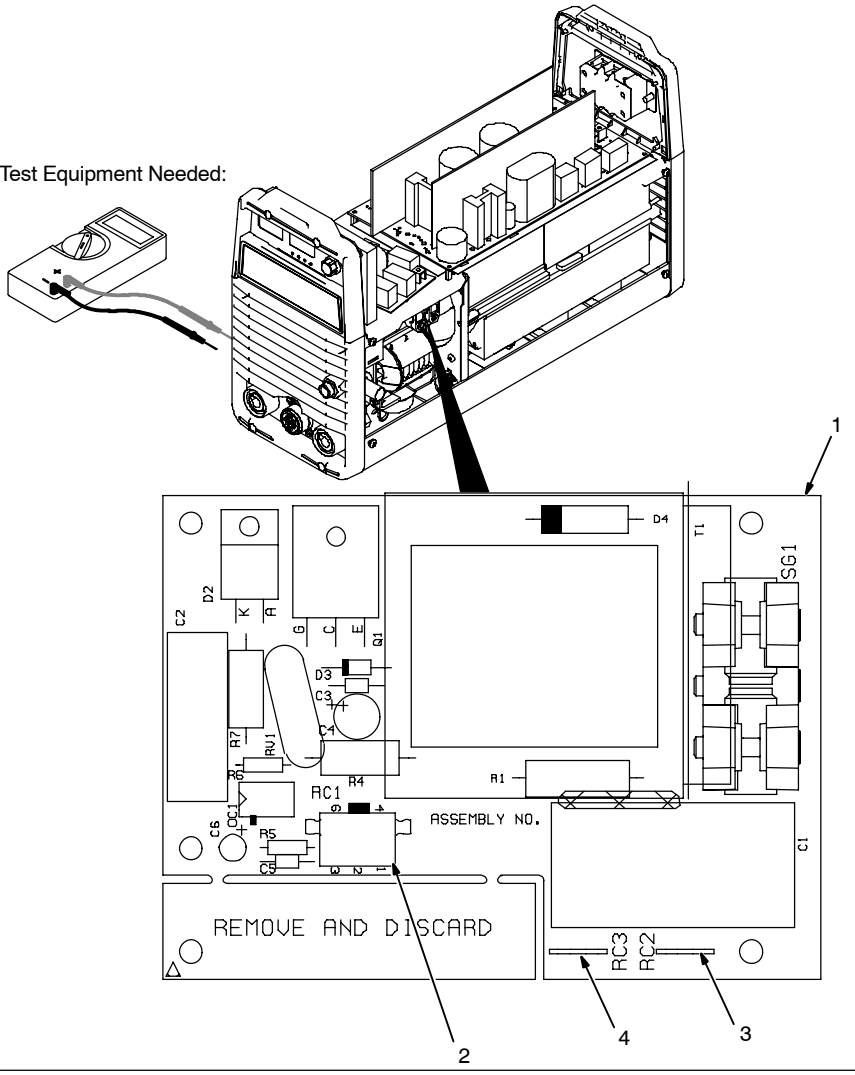
a) Tolerance – ±10% unless specified

b) Reference – to circuit common (lead 42) unless noted - NOTE: pins 4, 5, 6, 10, 11 and 12 are not referenced to lead 42

Receptacle	Pin	Type	Value
RC6	1	Input	Gate control input for secondary IGBT's; 3 volts dc = on, 0 volts dc = off
	2	Input	Gate control input for secondary IGBT's; 3 volts dc = on, 0 volts dc = off
	3		Not used
	4	Input	Isolated +20 volts dc supply (A) for high side of inverter drive
	5	Input	Isolated +20 volts dc supply (B) for low side of inverter drive
	6	Input	Isolated +20 volts dc supply (C) for high side of inverter drive
	7	Input	GND, Reference for pins 1 and 2
	8	Input	GND, Reference for pins 1 and 2
	9		Not used
	10	Input	Reference for pin 4
	11	Input	Reference for pin 5 (–bus secondary)
	12	Input	Reference for pin 6
RC10		I/O	–Bus secondary
RC11		Output	Work output
RC12		I/O	+Bus secondary
RC13		Output	Coupling Coil (Torch) Output
RC14		I/O	+Bus secondary
RC15		I/O	–Bus secondary
RC16		Input	Snubber Inductor (L4)
RC17		Input	Snubber Inductor (L4)

7-20. Arc Starter Board PC7 Testing Information (Use with Section 7-21)

Test Equipment Needed:



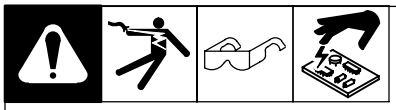
▲ **Discharge input capacitors according to Section 7-2, and be sure voltage is near zero before touching any parts.**

Be sure plugs are secure before testing. See Section 7-21 for specific values during testing.

1 Arc Starter Board PC7
2 Receptacle RC1
3 Receptacle RC2
4 Receptacle RC3

803 465-A / 209 113

7-21. Arc Starter Board PC7 Test Point Values



PC7 Voltage Readings

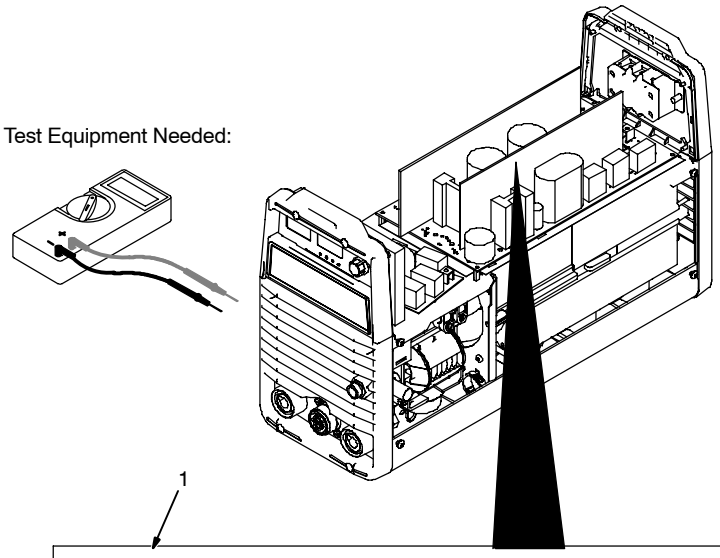
a) Tolerance – ±10% unless specified

b) Reference – to circuit common (lead 42) unless noted

Receptacle	Pin	Type	Value
RC1	1	Input	Positive output
	2		Not used
	3	Input	Arc starter drive; optocoupler cathode
	4	Input	Negative output
	5		Not used
	6	Input	Arc starter drive; optocoupler anode (ac coupled), 0 volts dc=off, pulse train=high frequency
	Do not measure RC2 or RC3 – high voltage present.		
RC2, RC3		Output	To HF coupling coil

7-22. Boost Control Board PC10 Testing Information (Use with Section 7-23)

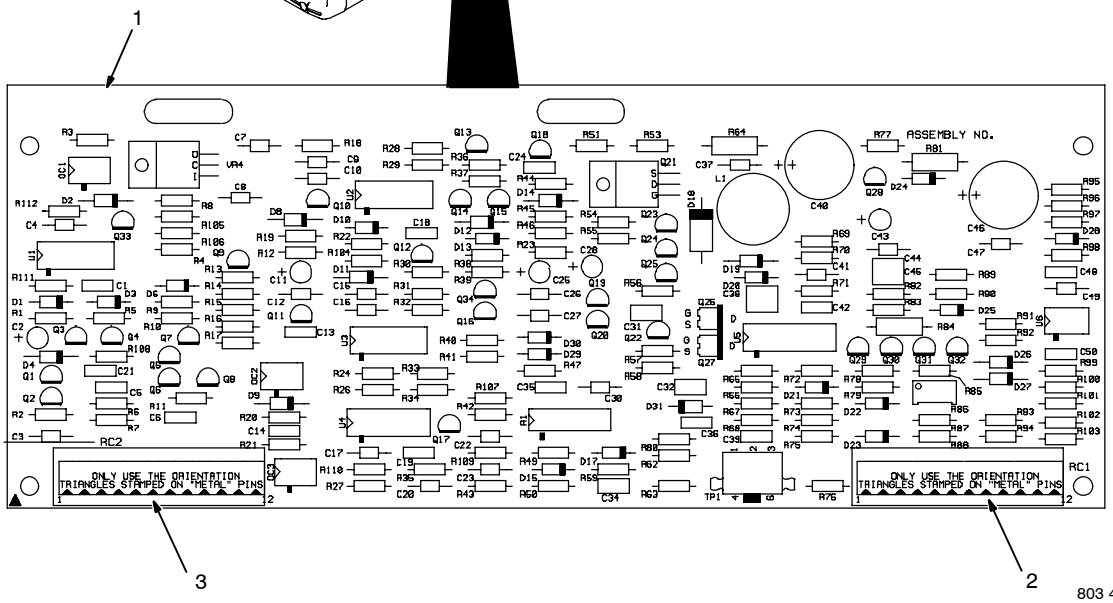
Test Equipment Needed:



▲ **Discharge input capacitors according to Section 7-2, and be sure voltage is near zero before touching any parts.**

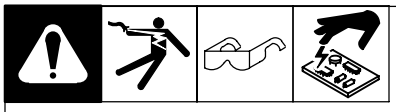
Be sure plugs are secure before testing. See Section 7-23 for specific values during testing.

1 Boost Control Board PC10
2 Receptacle RC1
3 Receptacle RC2



803 465-A / 200 843-F

7-23. Boost Control Board PC10 Test Point Values



PC10 Voltage Readings

a) Tolerance – ±10% unless specified

b) Reference – to circuit common (lead 42) unless noted

Receptacle	Pin	Type	Value
RC1			**High voltage present. Voltages on this receptacle can be more than 800 volts DC from chassis (GND).**
			NOTE: All pins on this receptacle are referenced to the – Bus (RC5-3)
	1	Output	+Bus; regulated to 810 volts dc
	2		Not Used
	3		–Bus; 0 volts dc
	4	Input	Boost control; drive signal for boost IGBT

RC1	5	Output	+30 volts dc
	6	Input	Precharge; active low drive for precharge relay
	7	Input	+15 volts dc; regulated from +30 volts dc
	8	Input	–15 volts dc, regulated from +30 volts dc
	9	Output	IFB primary; current feedback for boost regulator control
	10		–Bus; 0 volts dc
	11		Not Used
	12	Output	+ Rect; rectified AC input
RC2	**High voltage present. Voltages on pins 1 through 9 on this receptacle can be more than 800 volts DC from chassis (GND).**		
	NOTE: Pins 1 through 4 on this receptacle are referenced to RC2-2		
	1	Output	+15 volts dc; regulated from bus
	2		Common
	3	Input	Buck drive; drive signal for +30 volts dc regulator
	4	Output	IFB buck; current feedback for +30 volts dc regulator
	5		Not used
	NOTE: Pins 6 through 8 on this receptacle are referenced to –Bus (RC5-3)		
	6		–Bus; 0 volts dc
	7	Input	Flyback drive; control signal to derive regulated supplies on RC3
	8	Output	Flyback IFB; current feedback for flyback supply
	9		Not used
	10	Input	Overpower foldback; folds back output if input current is greater than 35 amperes
	11	Output	+15 volts dc; used to regulate +15 volts dc
	12	Output	–15 volts dc; used to regulate –15 volts dc

SECTION 8 – MAINTENANCE

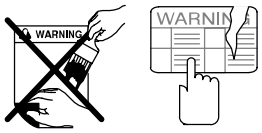
8-1. Routine Maintenance

▲ **Disconnect power before maintaining.**

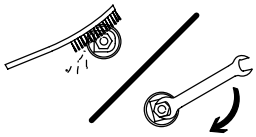
☞ *Maintain more often during severe conditions.*

3 Months

Replace unreadable labels.



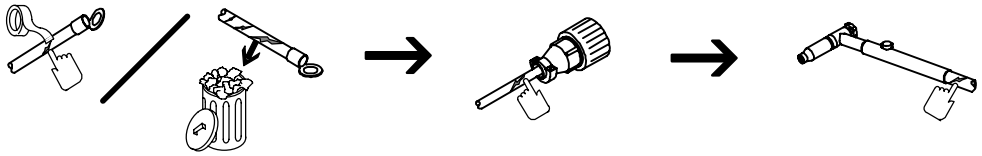
Clean and tighten weld terminals.



Replace Damaged Gas Hose

3 Months

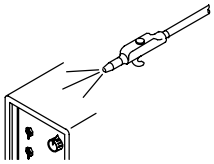
Repair Or Replace Cracked Cables And Cords



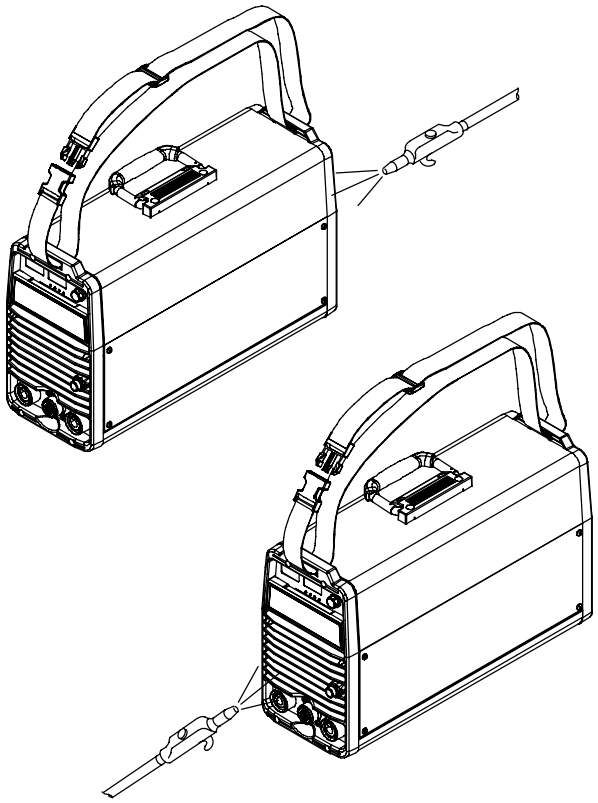
6 Months

▲ **Do not remove case when blowing out inside of unit (see Section 8-2) .**

Blow out inside. During heavy service clean monthly.



8-2. Blowing Out Inside Of Unit

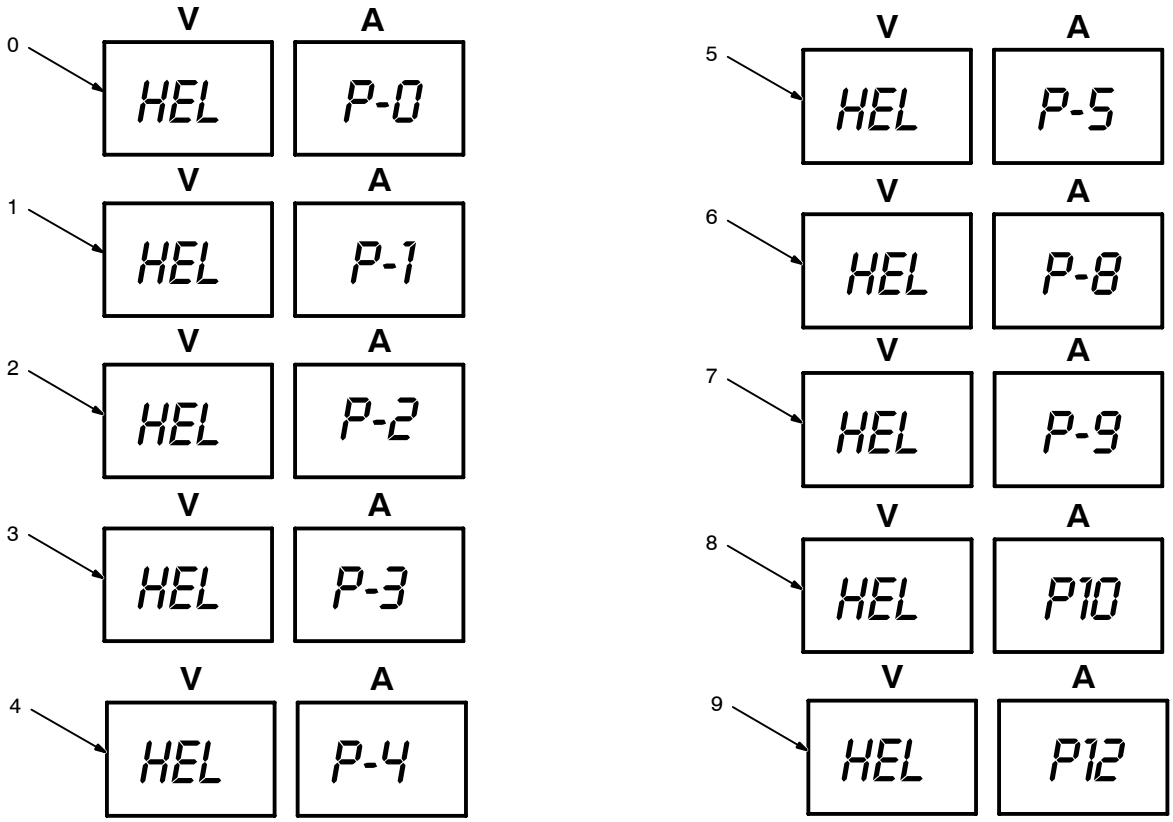


▲ **Do not remove case when blowing out inside of unit.**

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

803 428-A

8-3. Voltmeter/Ammeter Help Displays



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

0 Help 0 Display

Indicates a short in the thermal protection circuitry located on the bottom heat sink (check RT1 per Section 7-16).

1 Help 1 Display

Indicates a malfunction in the primary power circuit caused by an overcurrent condition in the primary IGBT switching circuit. Some possible causes are: shorted output diode (see Section 7-8), shorted output IGBT (see Section 7-7), primary current transformer CT1 located on Power Interconnect board PC2 (see Section 7-14), HD1 (see Section 7-10), PM1 (see Section 7-3), or Inverter Control board PC1 (see Section 7-12).

2 Help 2 Display

Indicates an open in the thermal protection circuitry located on the bottom heat sink (check RT1 per Section 7-16).

3 Help 3 Display

Indicates the bottom heat sink has overheated. The unit has shut down to allow the fan to cool it (see Section 3-4). Operation will continue when the unit has cooled (check RT1 Section 7-16).

4 Help 4 Display

Indicates an open in the thermal protection circuitry located on the top heat sink (check module thermistor per Sections 7-3 or 7-16).

5 Help 5 Display

Indicates the top heat sink has overheated. The unit has shut down to allow the fan to cool it (see Section 3-4). Operation will continue when the unit has cooled (check module thermistor per Sections 7-3 or 7-16).

6 Help 8 Display

Indicates a malfunction in the secondary power circuit of the unit. Some possible causes are: boost relay energized with no output current, Weld Control board PC3 (see Section 7-16), Inverter Control board PC1 (see Section 7-12), IGBT Snuber board PC6 (see Section 7-7), or HD1 showing current feedback with no load applied (see Section 7-10)

7 Help 9 Display

Indicates a short in the thermal protection circuitry located on the top heat sink (check module thermistor per Sections 7-3 or 7-16).

8 Help 10 Display

Indicates torch trigger is depressed. Release trigger to continue.

9 Help 12 Display

Indicates an improper set-up. You are trying to make an adjustment that is not allowed.

Notes

SECTION 9 – ELECTRICAL DIAGRAMS

☞ *The circuits in this manual can be used for troubleshooting, but there might be minor circuit differences from your machine. Use circuit inside machine case or contact distributor for more information.*

The following is a list of all diagrams for models covered by this manual.

Model	Serial Or Style Number	Circuit Diagram	Wiring Diagram
Dynasty 200 SD, DX And Models	LC339215 and following	209 602-D	209 601-B
Circuit Board PC1 Inverter Control	LC339215 and following	207 824-B♦♦	
Circuit Board PC2 Power Interconnect	LC339215 and following	207 820-B♦♦	
Circuit Board PC3 Weld Control/ Operator Interface	LC339215 thru LE304534	209 233B♦♦	
	LE304535 and following	221 139A♦♦	
Circuit Board PC6 IGBT Snubber	LC339215 and following	207 828-B♦♦	
Circuit Board PC7 Arc Starter	LC339215 and following	209 114♦♦	
Circuit Board PC9 Input Filter (CE Models Only)	LC339215 and following	199 509♦♦	
Circuit Board PC10 Boost Control	LC339215 and following	200 845-F♦♦	
Circuit Board PC11 Diode Snubber	LC339215 and following	208 062-B♦♦	

♦♦ Not included in this manual

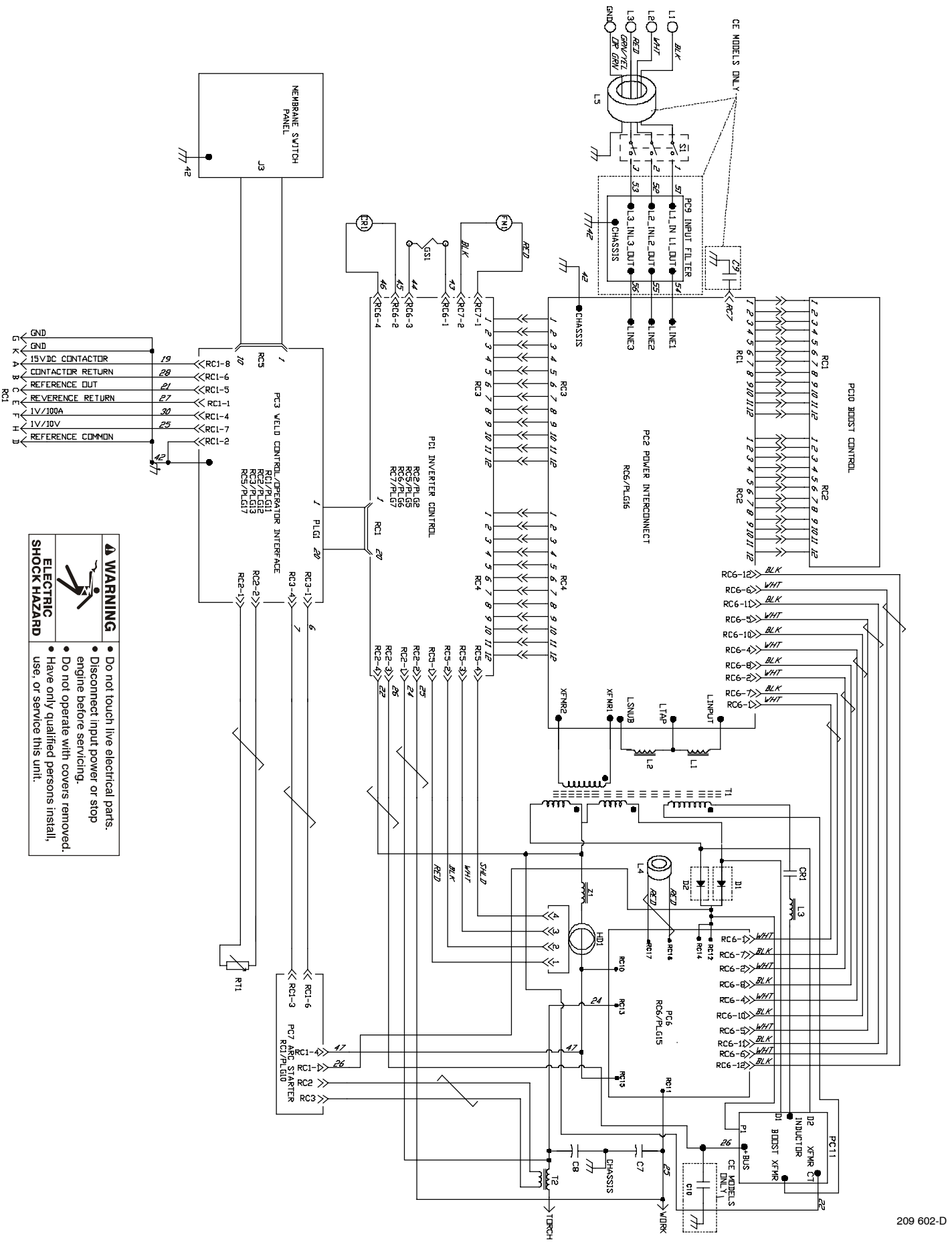


Figure 12-1. Circuit Diagram For Dynasty 200 SD And DX Models Eff w/LC339215 And Following

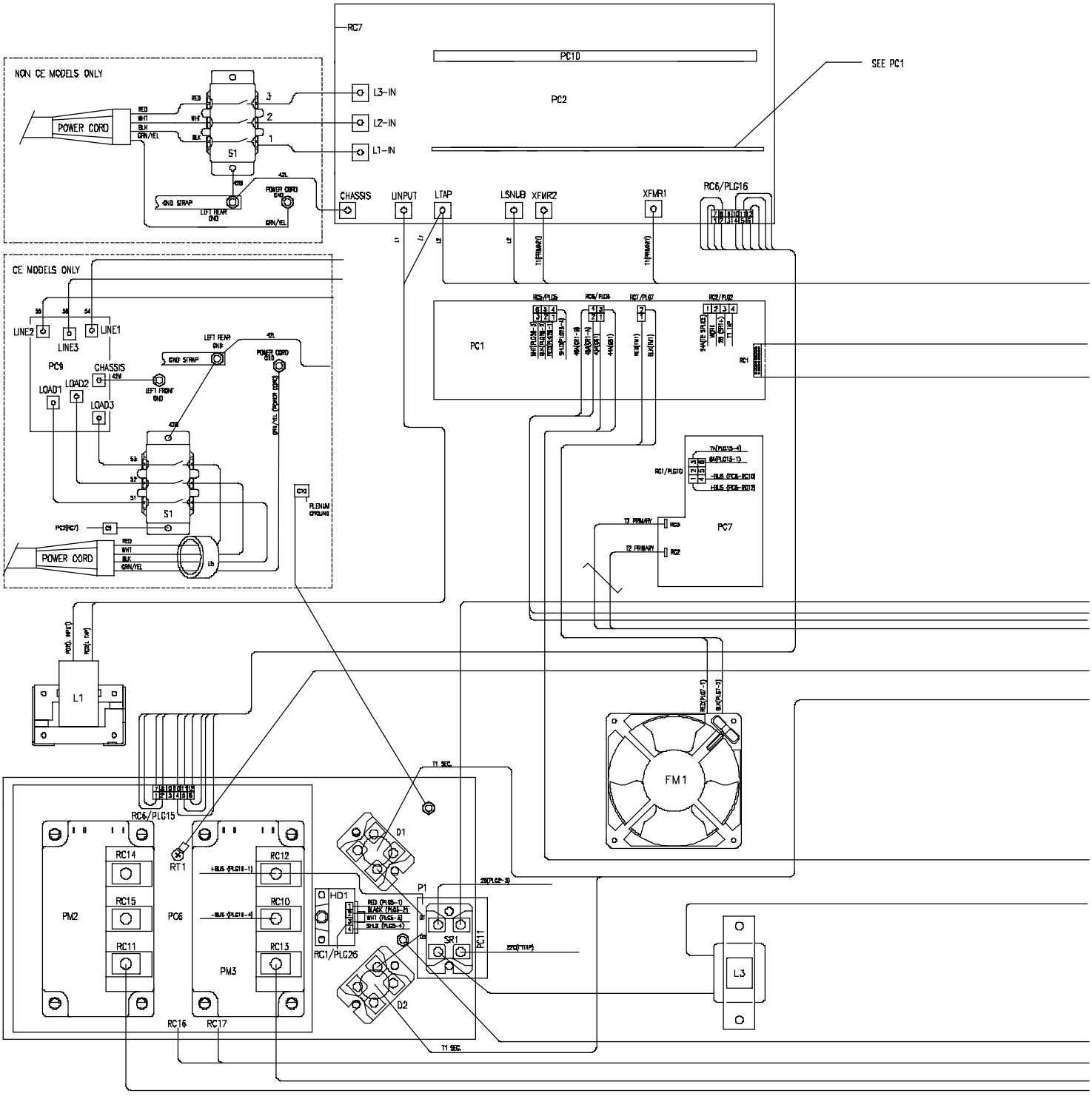
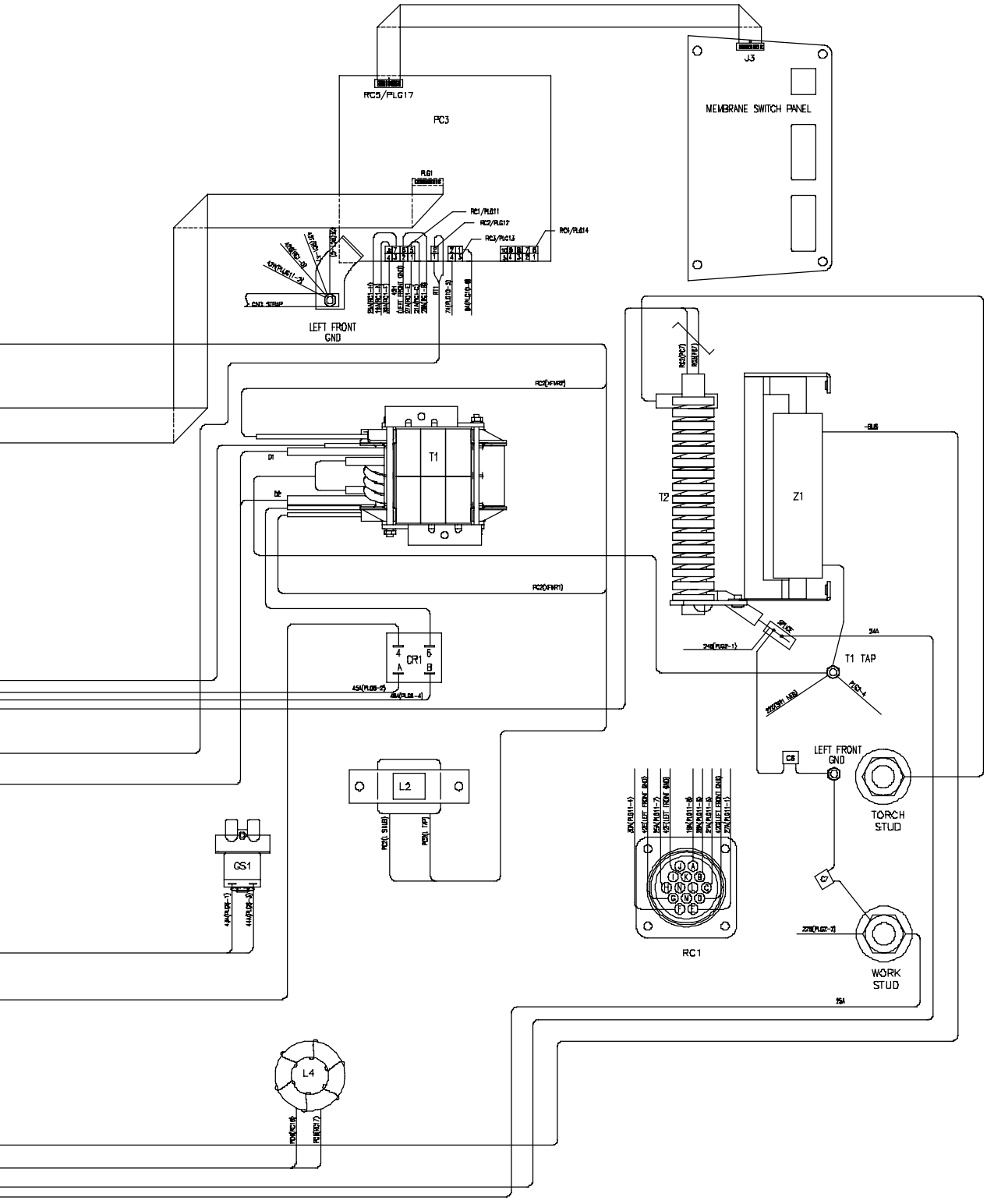


Figure 12-2. Wiring Diagram For Dynasty 200 SD And DX Models Eff w/LC339215 And Following

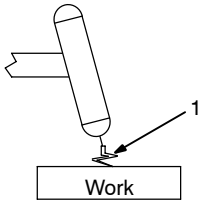


WARNING	
 ELECTRIC SHOCK HAZARD	● Do not touch live electrical parts. ● Disconnect input power or stop engine before servicing. ● Do not operate with covers removed. ● Have only qualified persons install, use, or service this unit.

209 601-B

SECTION 10 – HIGH FREQUENCY

10-1. Welding Processes Requiring High Frequency



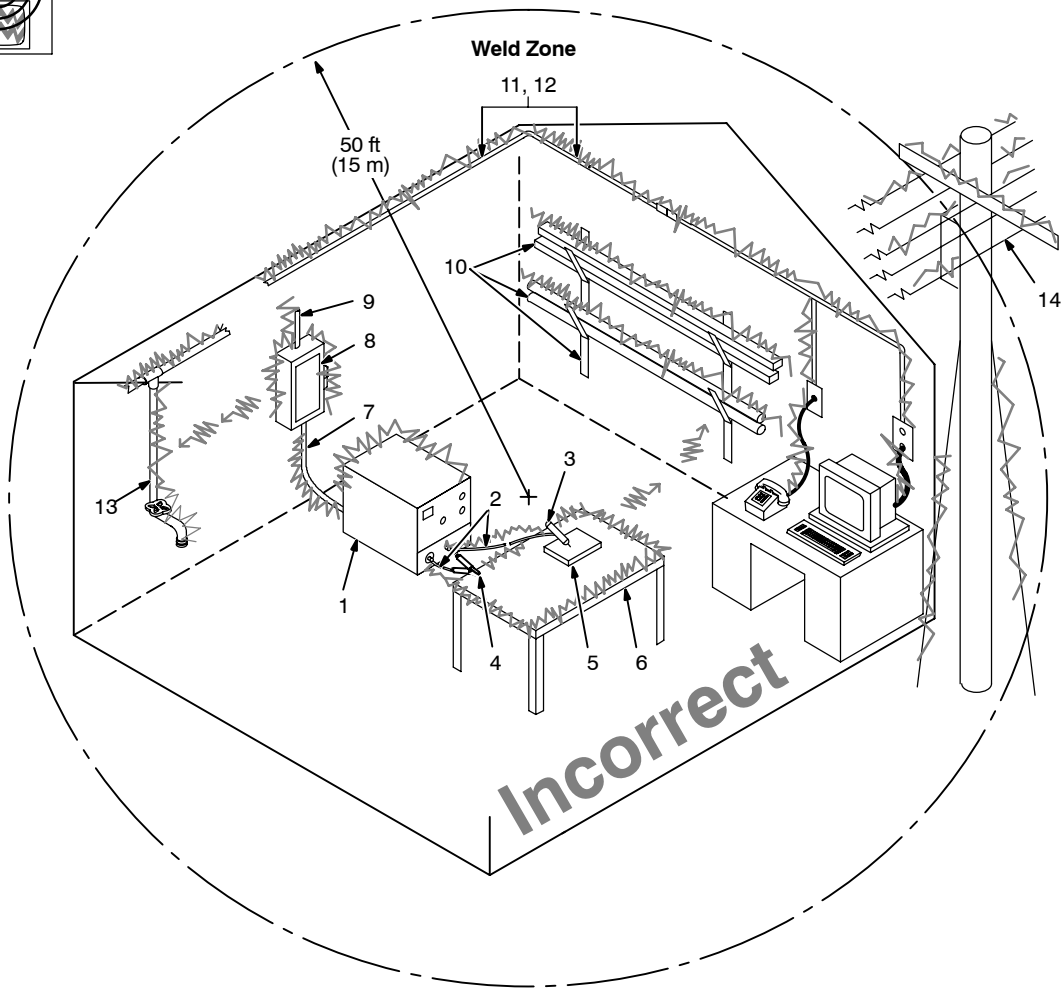
TIG

1 High-Frequency Voltage

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

high_freq 12/96 – S-0693

10-2. Incorrect Installation



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

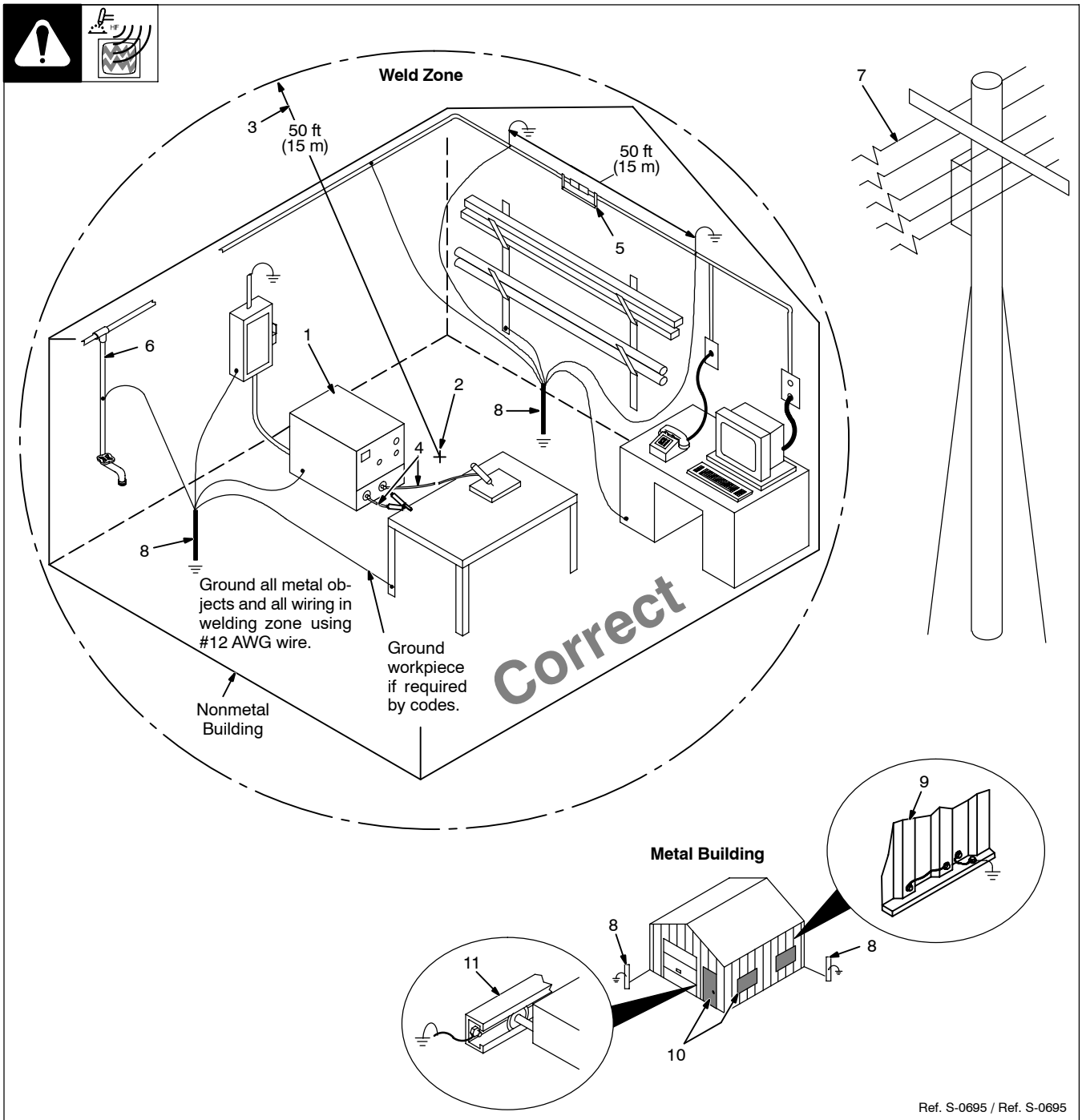
7 Input Power Cable
8 Line Disconnect Device
9 Input Supply Wiring

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

10-3. Correct Installation



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, 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 11 – SELECTING AND PREPARING TUNGSTEN ELECTRODE

gtaw5_8/8/03

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

11-1. Selecting Tungsten Electrode

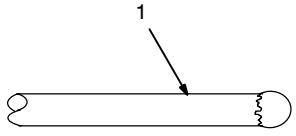
Electrode Diameter	Amperage Range - Gas Type♦ - Polarity			
	DC – Argon – Electrode Negative/Straight Polarity	DC – Argon – Electrode Positive/Reverse Polarity	AC – Argon – Using High Frequency	AC – Argon – Balanced Wave Using High Freq.
2% Thorium Alloyed Tungsten (Red Band)				
.010”	Up to 25	*	Up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

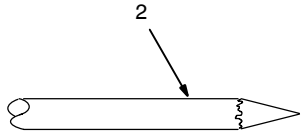
♦ Typical argon shielding gas flow rates are 15 to 35 cfh (cubic feet per hour).

*Not Recommended.

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

11-2. Safety Information About Tungsten





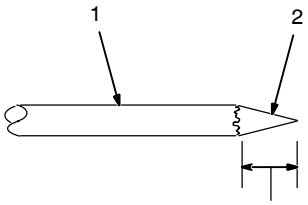
▲ **Grinding the tungsten electrode produces dust and flying sparks which can cause injury and start fires. Use local exhaust (forced ventilation) at the grinder or wear an approved respirator. Read MSDS for safety information. Consider using tungsten containing ceria, lanthana, or yttria instead of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

1 Tungsten Electrode With Balled End

2 Pointed Tungsten Electrode

Ref. S-0161

11-3. Preparing Tungsten For AC Or DC Electrode Negative (DCEN) Welding

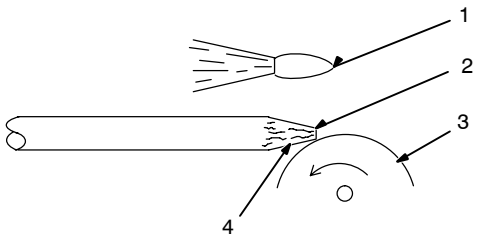


2-1/2 Times
Electrode Diameter

1 Tungsten Electrode

2 Tapered End

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



Ideal Tungsten Preparation – Stable Arc

1 Stable Arc

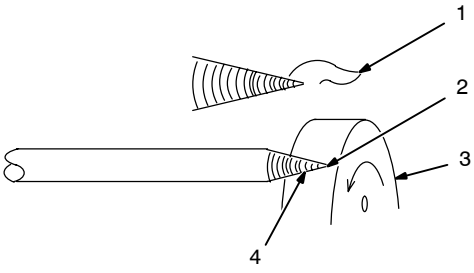
2 Flat

Diameter of this flat determines amperage capacity.

3 Grinding Wheel

Grinding wheel should be dedicated to grinding tungsten only.

4 Straight Ground



Wrong Tungsten Preparation – Wandering Arc

1 Arc Wander

2 Point

3 Grinding Wheel

Grinding wheel should be dedicated to grinding tungsten only.

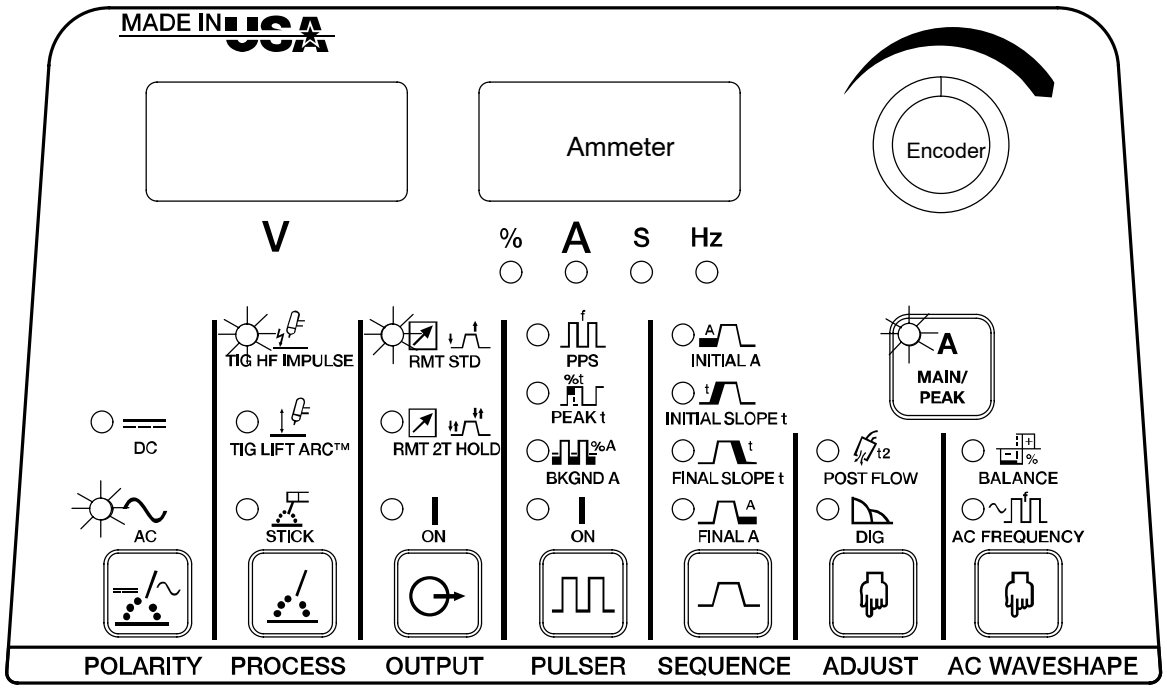
4 Radial Ground

Ref. S-0161 / Ref. S-0162

SECTION 12 – GUIDELINES FOR TIG WELDING (GTAW)

12-1. Typical GTAW Set-Ups

A. AC – GTAW 1/8 in. Aluminum Set-Up



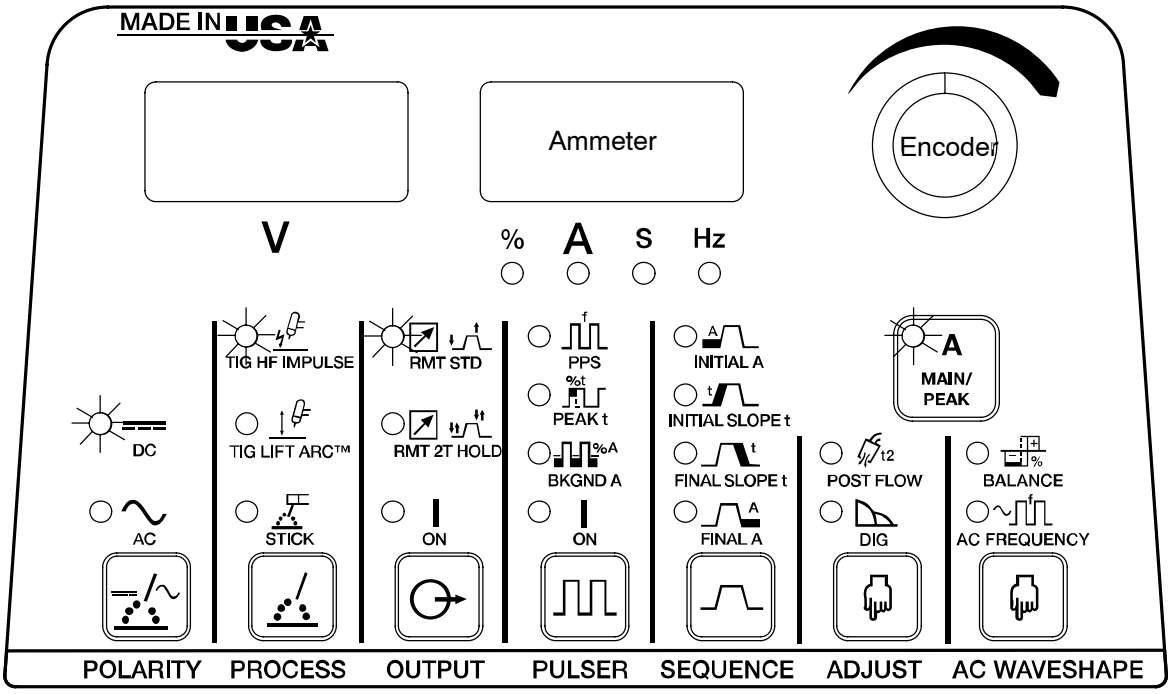
207 694-A

This symbol indicates which functions should be active for aluminum.

- Turn power on (switch located on rear panel)
- Press Polarity switch pad until AC LED is lit
- Press Process switch pad until TIG HF Impulse LED is lit
- Press Output switch pad until RMT STD LED is lit
- Press Adjust switch pad until Post Flow LED is lit
- Turn Encoder control to set 15 seconds of Post Flow time
- Press AC Waveshape switch pad until Balance LED is lit
- Turn Encoder control to set desired Balance (65 - 80%)
- Press AC Waveshape switch pad until AC Frequency LED is lit
- Turn Encoder control to set desired AC Frequency (100 - 150 Hz)
- Press Amperage **A** switch pad until LED is lit
- Turn Encoder control to set desired amperage (125 - 160 amps).

☞ *The ammeter displays the parameter for any of the following units of measure when they are active: amperage, time, percentage, or frequency. The corresponding LED, located directly below the ammeter, will also light up. The ammeter also displays actual amperage while welding.*

B. DC - GTAW 16 Gauge Stainless Steel Set-Up



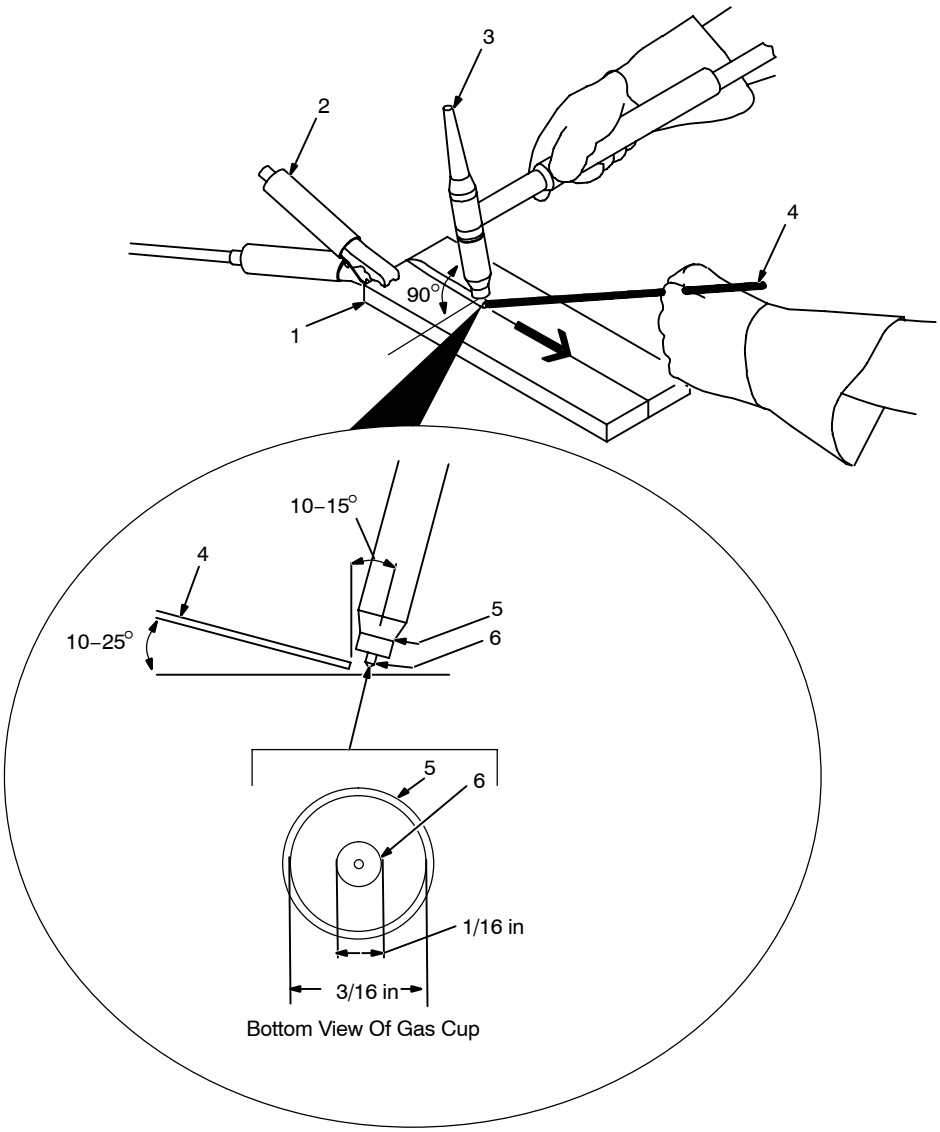
207 694-A

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

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

☞ *The ammeter displays the parameter for any of the following units of measure when they are active: amperage, time, percentage, or frequency. The corresponding LED, located directly below the ammeter, will also light up. The ammeter also displays actual amperage while welding.*

12-2. 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 Sections 11-1 and 11-3.

Guidelines:

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

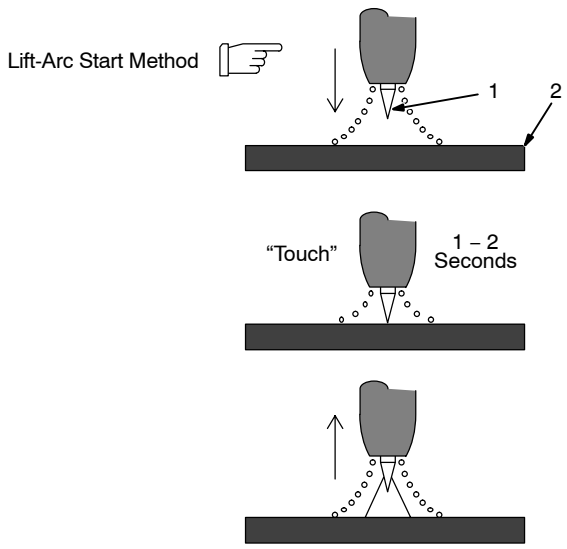
Tungsten extension is the distance the tungsten extends out gas cup of torch.

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

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

Ref. 161 892

12-3. Lift-Arc™ And HF TIG Start Procedures



Lift-Arc Start

When Lift-Arc™ button light is On, start arc as follows:

1 TIG Electrode

2 Workpiece

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

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

Application:

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

HF Start

When HF Start button light is On, start arc as follows:

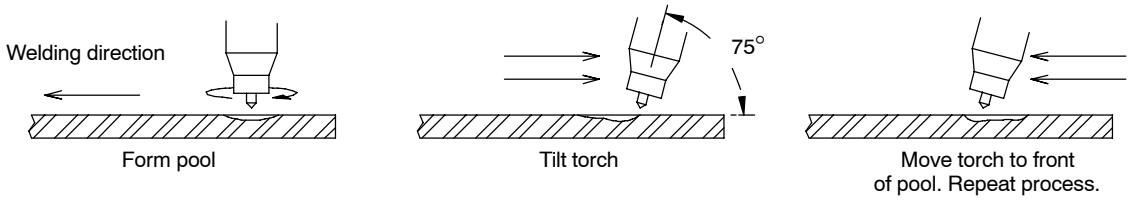
High frequency turns on to help start arc when output is enabled. High frequency turns off when arc is started, and turns on whenever arc is broken to help restart arc.

Application:

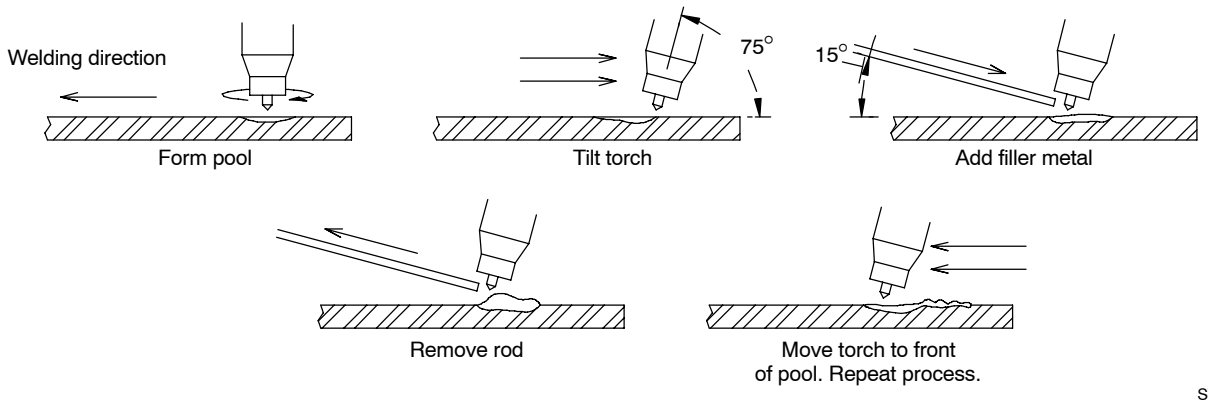
HF start is used for the DCEN GTAW process when a non-contact arc starting method is required.

12-4. Torch Movement During Welding

Tungsten Without Filler Rod



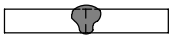
Tungsten With Filler Rod

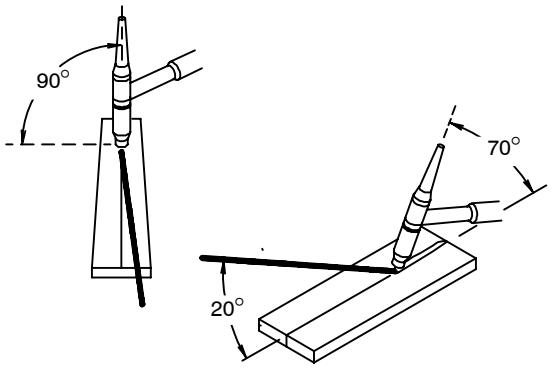


ST-162 002-B

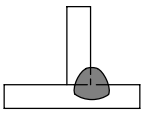
12-5. Positioning Torch Tungsten For Various Weld Joints

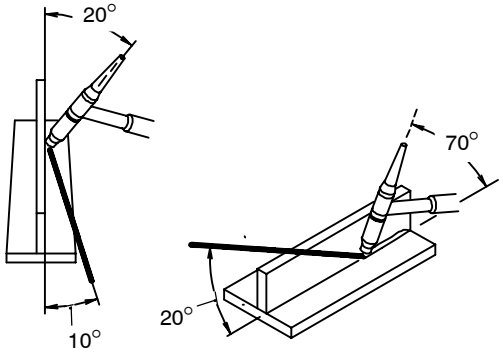
Butt Weld And Stringer Bead



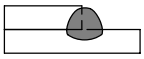


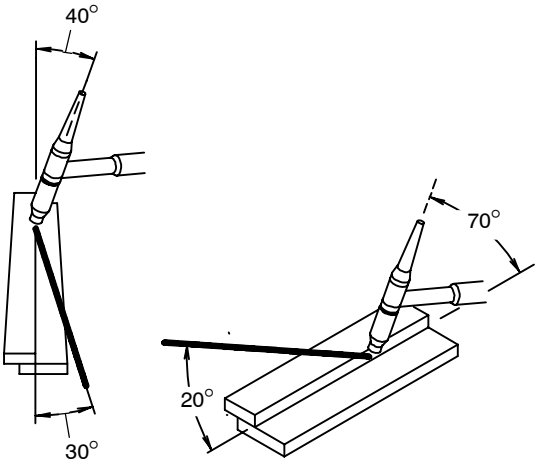
"T" Joint



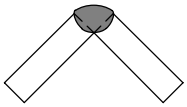


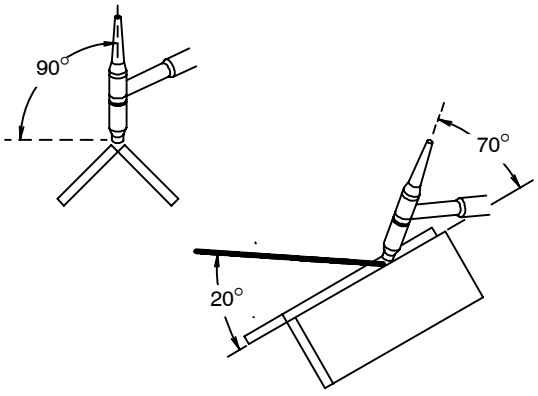
Lap Joint





Corner Joint

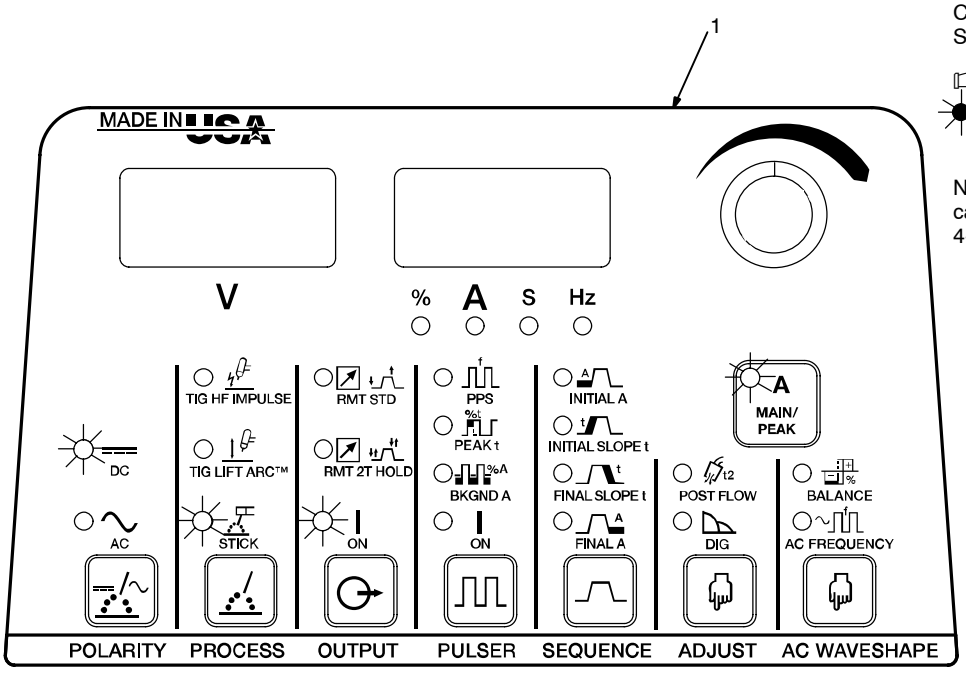




ST-162 003 / S-0792

SECTION 13 – STICK WELDING (SMAW) GUIDELINES

13-1. Front Panel Display For Stick DCEP (Direct Current Electrode Positive)



1 Front Panel

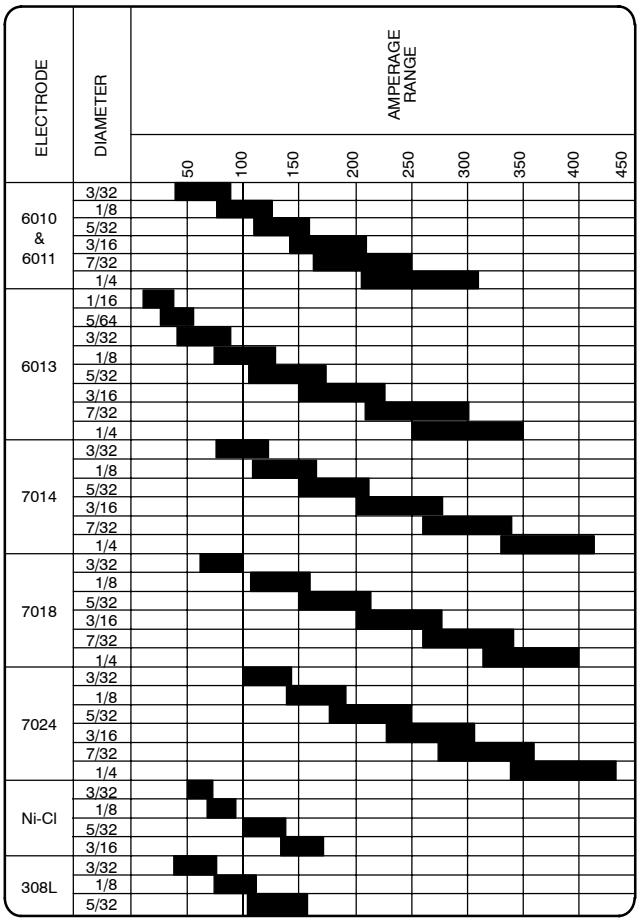
Correct front panel display for basic Stick DCEP welding.

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

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

207 694-A

13-2. Electrode and Amperage Selection Chart

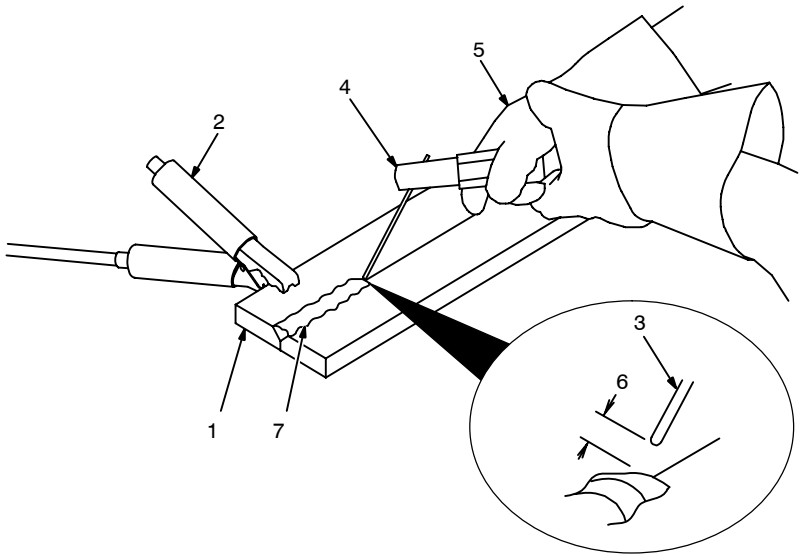


ELECTRODE	DC*	AC	POSITION	PENETRATION	USAGE
6010	EP		ALL	DEEP	MIN. PREP, ROUGH HIGH SPATTER
6011	EP	√	ALL	DEEP	
6013	EP,EN	√	ALL	LOW	GENERAL
7014	EP,EN	√	ALL	MED	SMOOTH, EASY, FAST
7018	EP	√	ALL	LOW	LOW HYDROGEN, STRONG
7024	EP,EN	√	FLAT HORIZ FILLET	LOW	SMOOTH, EASY, FASTER
NI-CL	EP	√	ALL	LOW	CAST IRON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

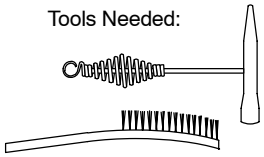
*EP = ELECTRODE POSITIVE (REVERSE POLARITY)
EN = ELECTRODE NEGATIVE (STRAIGHT POLARITY)

Ref. S-087 985-A

13-3. Stick Welding Procedure



Tools Needed:



▲ **Weld current starts when electrode touches workpiece.**

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

1 Workpiece

Make sure workpiece is clean before welding.

2 Work Clamp

3 Electrode

A small diameter electrode requires less current than a large one. Follow electrode manufacturer's instructions when setting weld amperage (see Section 13-2).

4 Insulated Electrode Holder

5 Electrode Holder Position

6 Arc Length

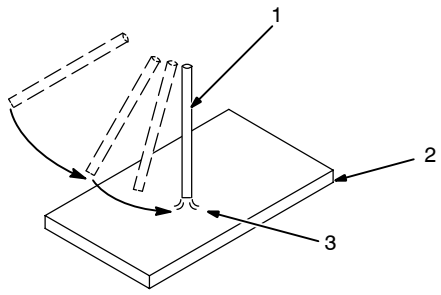
Arc length is the distance from the electrode to the workpiece. A short arc with correct amperage will give a sharp, crackling sound.

7 Slag

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

stick 12/96 – ST-151 593

13-4. Striking an Arc – Scratch Start Technique



1 Electrode

2 Workpiece

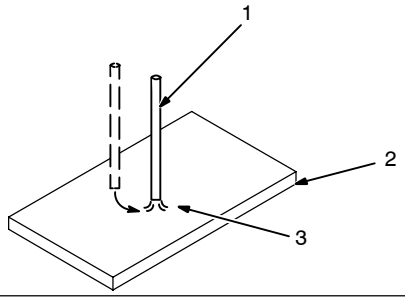
3 Arc

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

▲ **Normal open-circuit voltage (80 volts) is present if normal open-circuit voltage is selected (see Section 5-6).**

S-0049

13-5. Striking an Arc – Tapping Technique



1 Electrode

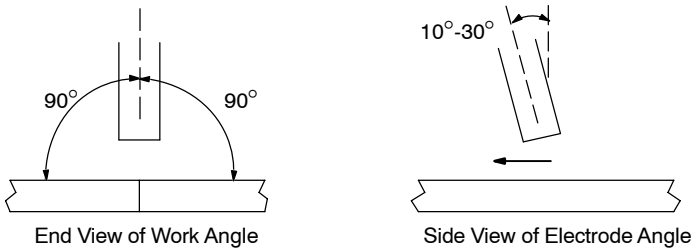
2 Workpiece

3 Arc

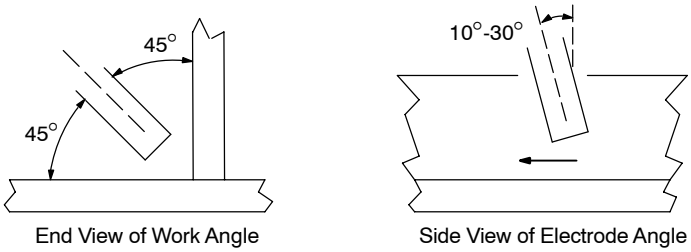
Bring electrode straight down to workpiece; then lift slightly to start arc. If arc goes out, electrode was lifted too high. If electrode sticks to workpiece, use a quick twist to free it.

S-0050

13-6. Positioning Electrode Holder



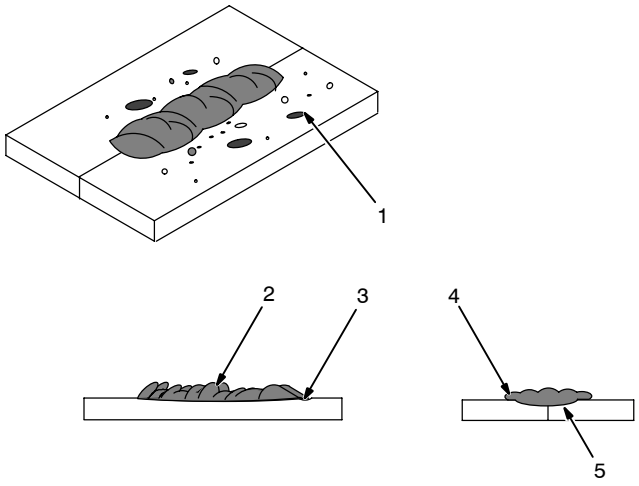
GROOVE WELDS



FILLET WELDS

S-0060

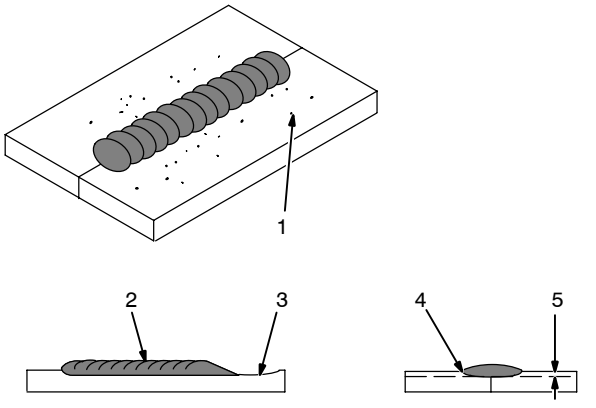
13-7. Poor Weld Bead Characteristics



1 Large Spatter Deposits
2 Rough, Uneven Bead
3 Slight Crater During Welding
4 Bad Overlap
5 Poor Penetration

S-0053-A

13-8. Good Weld Bead Characteristics



1 Fine Spatter
2 Uniform Bead
3 Moderate Crater During Welding

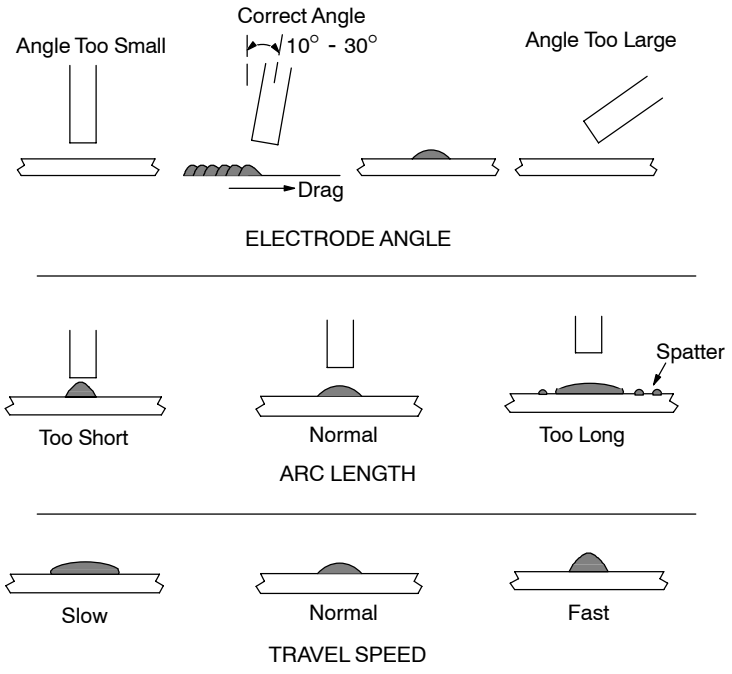
Weld a new bead or layer for each 1/8 in. (3.2 mm) thickness in metals being welded.

4 No Overlap
5 Good Penetration into Base Metal

S-0052-B

13-9. Conditions That Affect Weld Bead Shape

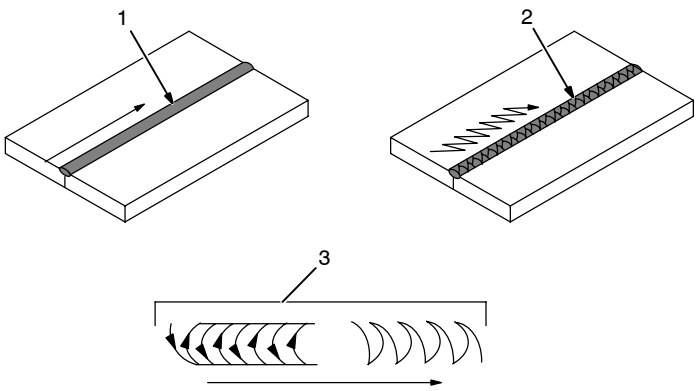
NOTE ☞ *Weld bead shape is affected by electrode angle, arc length, travel speed, and thickness of base metal.*



S-0061

13-10. Electrode Movement During Welding

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



1 Stringer Bead – Steady Movement Along Seam

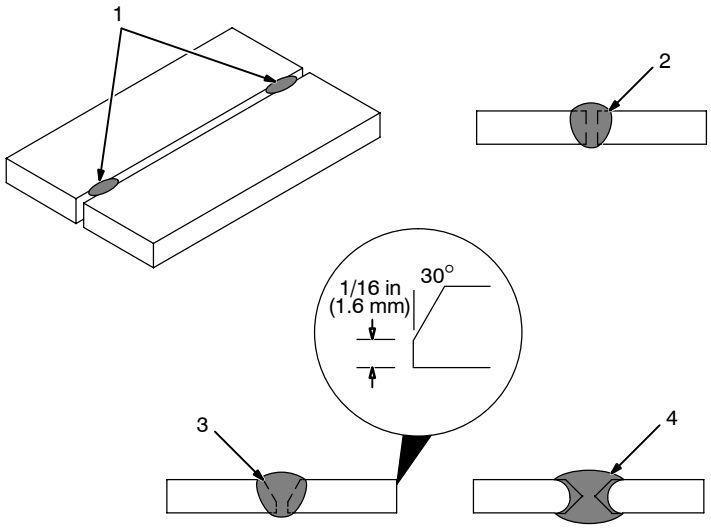
2 Weave Bead – Side to Side Movement Along Seam

3 Weave Patterns

Use weave patterns to cover a wide area in one pass of the electrode. Do not let weave width exceed 2-1/2 times diameter of electrode.

S-0054-A

13-11. Butt Joints



1 Tack Welds

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

2 Square Groove Weld

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

3 Single V-Groove Weld

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

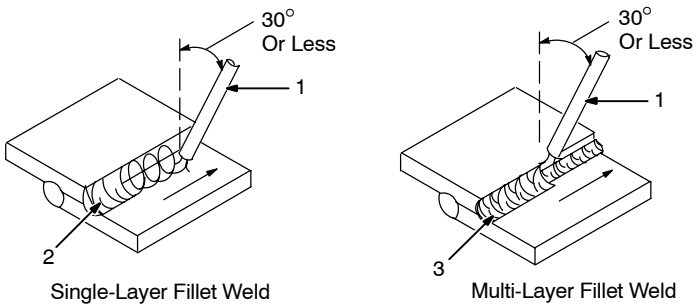
Create 30 degree angle of bevel on materials in V-groove welding.

4 Double V-Groove Weld

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

S-0662

13-12. Lap Joint



1 Electrode

2 Single-Layer Fillet Weld

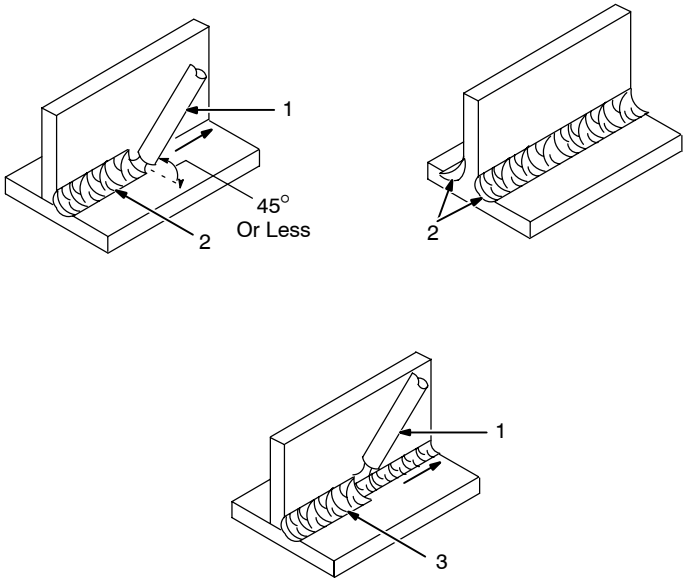
Move electrode in circular motion.

3 Multi-Layer Fillet Weld

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

S-0063 / S-0064

13-13. Tee Joint



1 Electrode

2 Fillet Weld

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

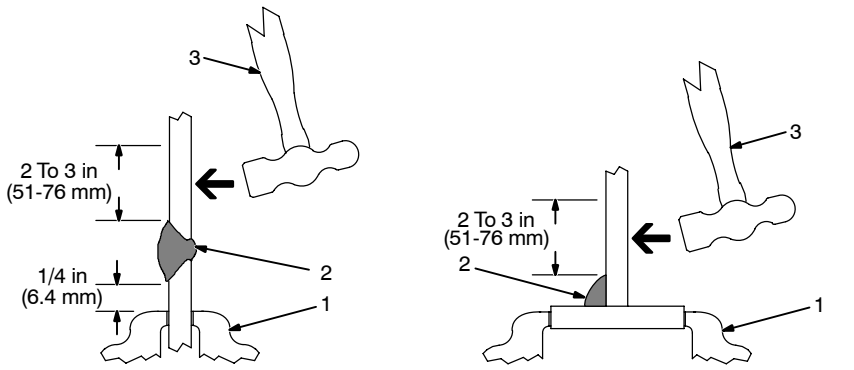
For maximum strength weld both sides of upright section.

3 Multi-Layer Deposits

Weld a second layer when a heavier fillet is needed. Use any of the weaving patterns shown in Section 13-10. Remove slag before making another weld pass.

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

13-14. Weld Test

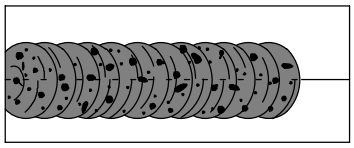


1 Vise
2 Weld Joint
3 Hammer

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

S-0057-B

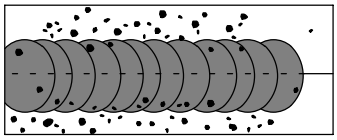
13-15. Troubleshooting – Porosity



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

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

13-16. Troubleshooting – Excessive Spatter



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

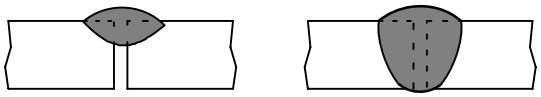
Possible Causes	Corrective Actions
Amperage too high for electrode.	Decrease amperage or select larger electrode.
Arc length too long or voltage too high.	Reduce arc length or voltage.

13-17. Troubleshooting – Incomplete Fusion

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

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

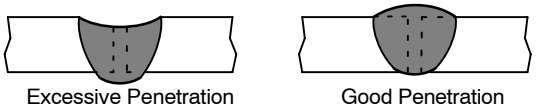
13-18. Troubleshooting – Lack Of Penetration



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

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

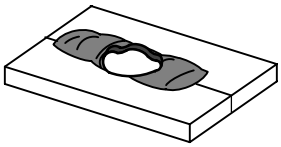
13-19. Troubleshooting – Excessive Penetration



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

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

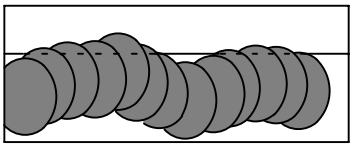
13-20. Troubleshooting – Burn-Through



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

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

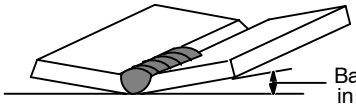
13-21. Troubleshooting – Waviness Of Bead



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

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

13-22. Troubleshooting – Distortion



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

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

TM-2240G 2005–10

Eff. w/Serial Number LC339215

Processes

TIG (GTAW) Welding

Stick (SMAW) Welding

Description

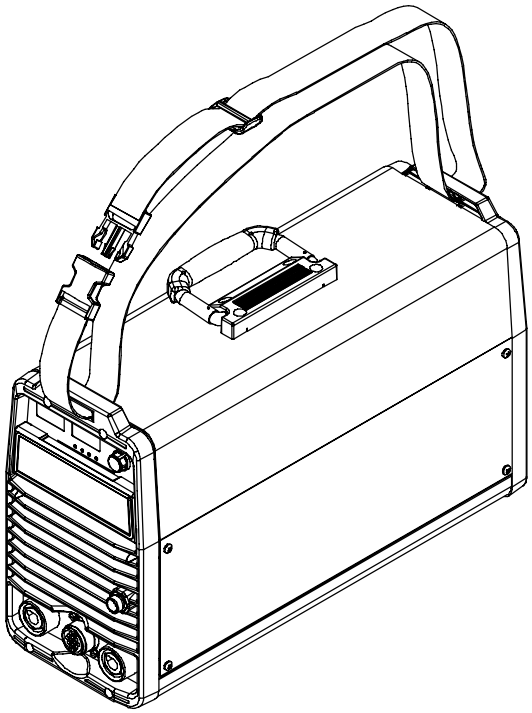
115/230/400/460 Volt Models W/Autoline® Arc Welding Power Source

Dynasty® 200 SD, And DX

PARTS LIST

Eff w/LC339215 And Following

For OM-2240 (207 688 A) And Following



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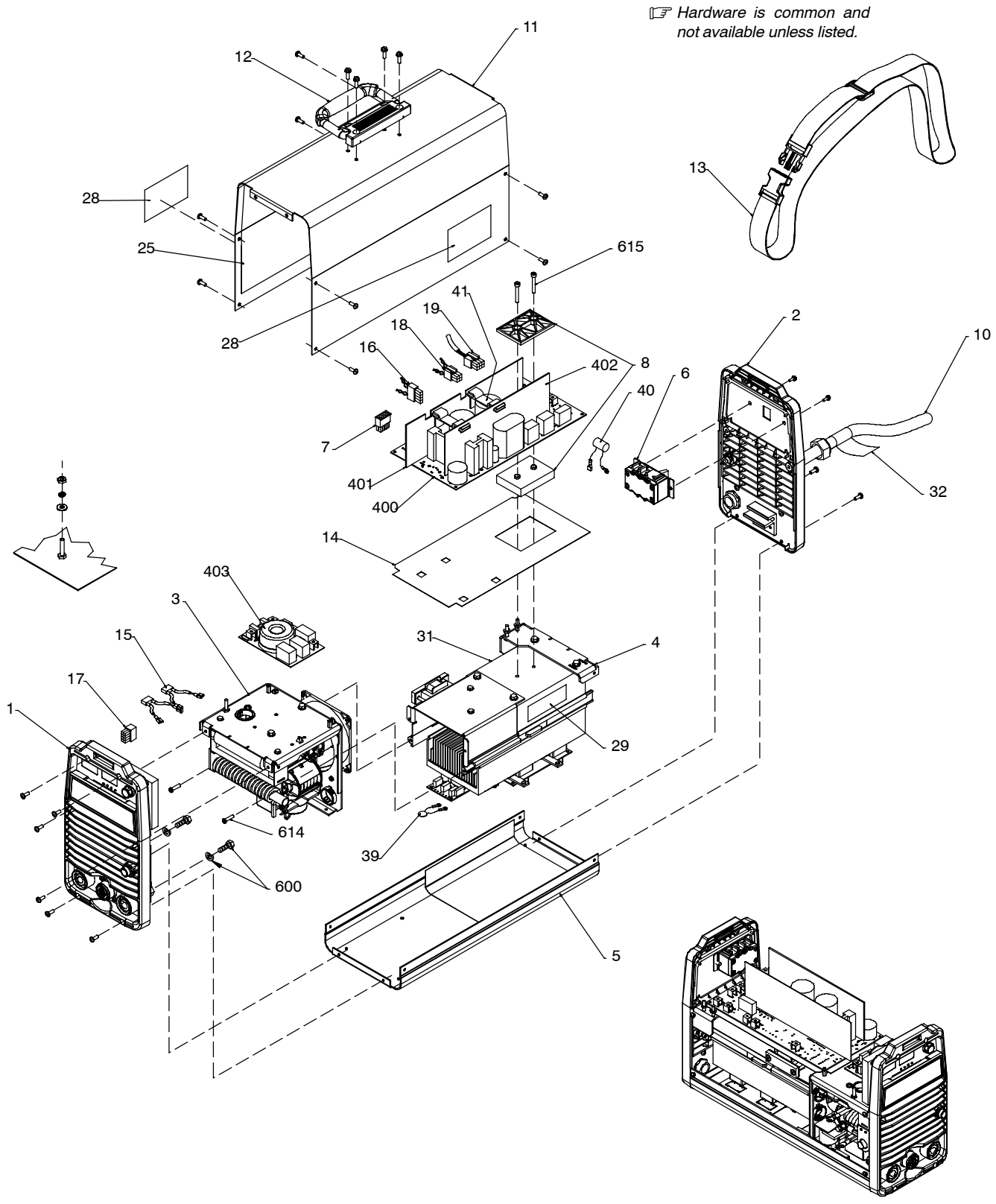

Figure 14-1. Main Assembly

803 395-E

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 14-1. Main Assembly	
1	Fig 14-2		PANEL,FRONT W/CMPNT	1
2	Fig 14-3		PANEL,REAR W/CMPNT	1
3	Fig 14-4		MAGNETICS SUBASSEMBLY	1
4	Fig 14-5		WINDTUNNEL,W/COMPONENTS	1
5	Fig 14-7		BASE ASSY,	1
6	S1	128756	SWITCH,TGL 3PST 40A 600VAC SCR TERM WIDE TGL	1
7		210267	PLUG,W/LEADS SECONDARY GATE	1
8	PM1	204821	KIT, MODULE,INPUT/PRE−REGULATOR/INVERTER	1
10		+196727	CABLE,POWER 10 FT 12GA 4C BLK/RED/WHT/GRNYEL	1
11		+209709	WRAPPER,	1
12		206108	HANDLE,RUBBERIZED CARRYING	1
13		195663	STRAP,SHOULDER 6 FT	1
14		189782	INSULATOR,INTERCONNECT BOARD	1
15	C7, C8	209997	CAPACITOR ASSY (PRIOR TO LC495710)	2
15	C7	213974	CAPACITOR ASSY (EFF W/LC495710)	1
16		209980	PLUG,W/LEADS VFB,LIFT	1
17		209995	PLUG,W/LEADS ARC STARTER	1
18		189768	PLUG,W/LEADS GAS	1
19		189779	CABLE,LEM W/PLUGS	1
25		210166	INSULATOR,WRAPPER	2
28		203990	LABEL,WARNING GENERAL PRECAUTIONARY (NON CE)	2
28		179310	LABEL,WARNING GENERAL PRECAUTIONARY (CE MODELS)	2
29		185835	LABEL,WARNING ELECTRIC SHOCK/EXPLODING PARTS	1
31		155436	LABEL,GROUND/PROTECTIVE EARTH	1
32		182826	LABEL,WARNING ELECTRIC SHOCK POWER CORD	1
39	C9	213911	CAPACITOR ASSY, CER DISC .0033 UF 3000 VAC W/TERMS (CE MODELS ONLY) (EFF W/LC466512	1
40	C10	213912	CAPACITOR, POLYE FILM .1 UF 1000 VDC W/TERMS (CE MODELS ONLY) (EFF W/LC466512)	1
41		215002	CLIP, SUPPORT PC MTG (EFF W/LC642376)	2
403	PC9	213860	CIRCUIT CARD ASSY,INPUT FILTER (CE MODELS ONLY) (EFF W/LC466512)	1
400	PC2	207818	CIRCUIT CARD ASSY,POWER INTERCONNECT	1
401	PC1	207822	CIRCUIT CARD ASSY,INVERTER CONTROL	1
402	PC10	200841	CIRCUIT CARD ASSY,BOOST CONTROL	1
600		200550	SCREW,M10−1.5X 20 HEX HD−PLN 8.8 PLD SEMS	2
614		136343	SCREW,K50X 20 PAN HD−PHL STL PLD PT THREAD FORMING	2
615		200565	SCREW,M 5− .8X 35 PAN HD−PHL STL PLD SEMS	2

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

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

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

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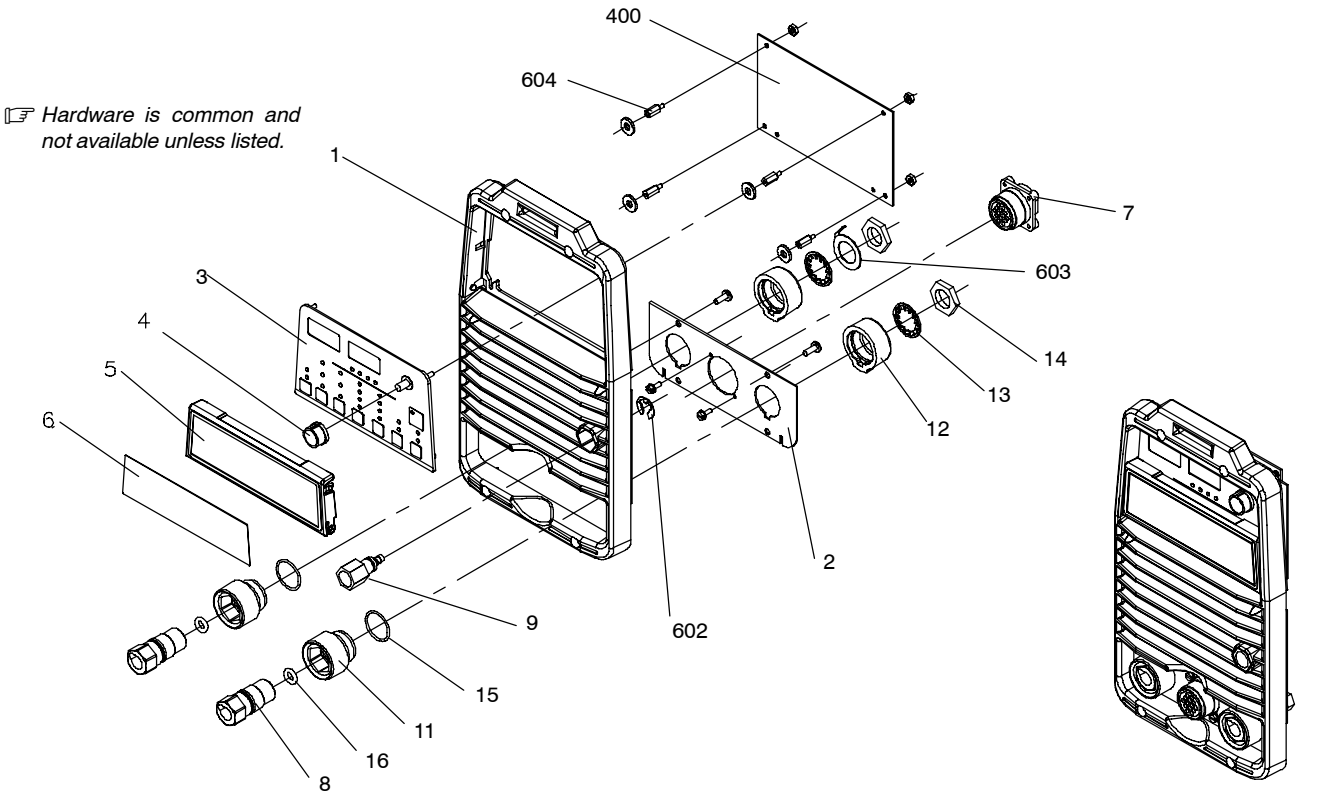

☞ *Hardware is common and not available unless listed.*

Figure 14-2. Panel, Front w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
		207 698	**Figure 14-2. Panel Front w/Components (Figure 14-1 Item 1)**	
1		194242	PANEL,FRONT/REAR	1
2		210171	PANEL,FRONT LOWER	1
3		207696	NAMEPLATE/SWITCH MEMBRANE,DYNASTY 200 SD	1
3		207 694	NAMEPLATE/SWITCH MEMBRANE,DYNASTY 200 DX	1
4		174992	KNOB,POINTER .840 DIA X .250 ID W/SPRING CLIP−.21	1
5		194243	DOOR,	1
6		199008	LABEL,DOOR 200 SD	1
6		199009	LABEL,DOOR 200 DX	1
7	RC1	189771	RECEPTACLE W/LEADS&PLUG,(14 PIN)	1
8		202553	RECEPTACLE,TWIST LOCK(FEMALE)POWER	2
9		193649	FTG,GAS BARBED 1/4 TBG 5/8−18 FEMALE	1
11		185712	INSULATOR,BULKHEAD FRONT	2
12		185713	INSULATOR,BULKHEAD REAR	2
13		185714	WASHER,TOOTH 22MMID X 31.5MMOD 1.310−1MMT INTERN	2
14		185717	NUT,M20−1.5 1.00HEX .19H BRS LOCKING	2
15		185718	O−RING, 0.989 ID X 0.070 H	2
16		186228	O−RING, 0.739 ID X 0.070 H	2
400	PC3	217610	KIT, FIELD PROGRAM UPDATE DYN 200 SD/DX (Prior to LE308824)	1
400	PC3	219817	CIRCUIT CARD ASSY,CONTROL & INTERFACE W/PROGRAM (Eff w/LE308824)	1
602		166560	RING,RTNG EXT .500 SHAFT X .042 THK E STYLE BOWED	1
603		178548	TERMINAL,CONNECTOR FRICTION	1
604		212367	STAND−OFF,NO 6−32 X .625 LG .250 HEX STL M&F	4

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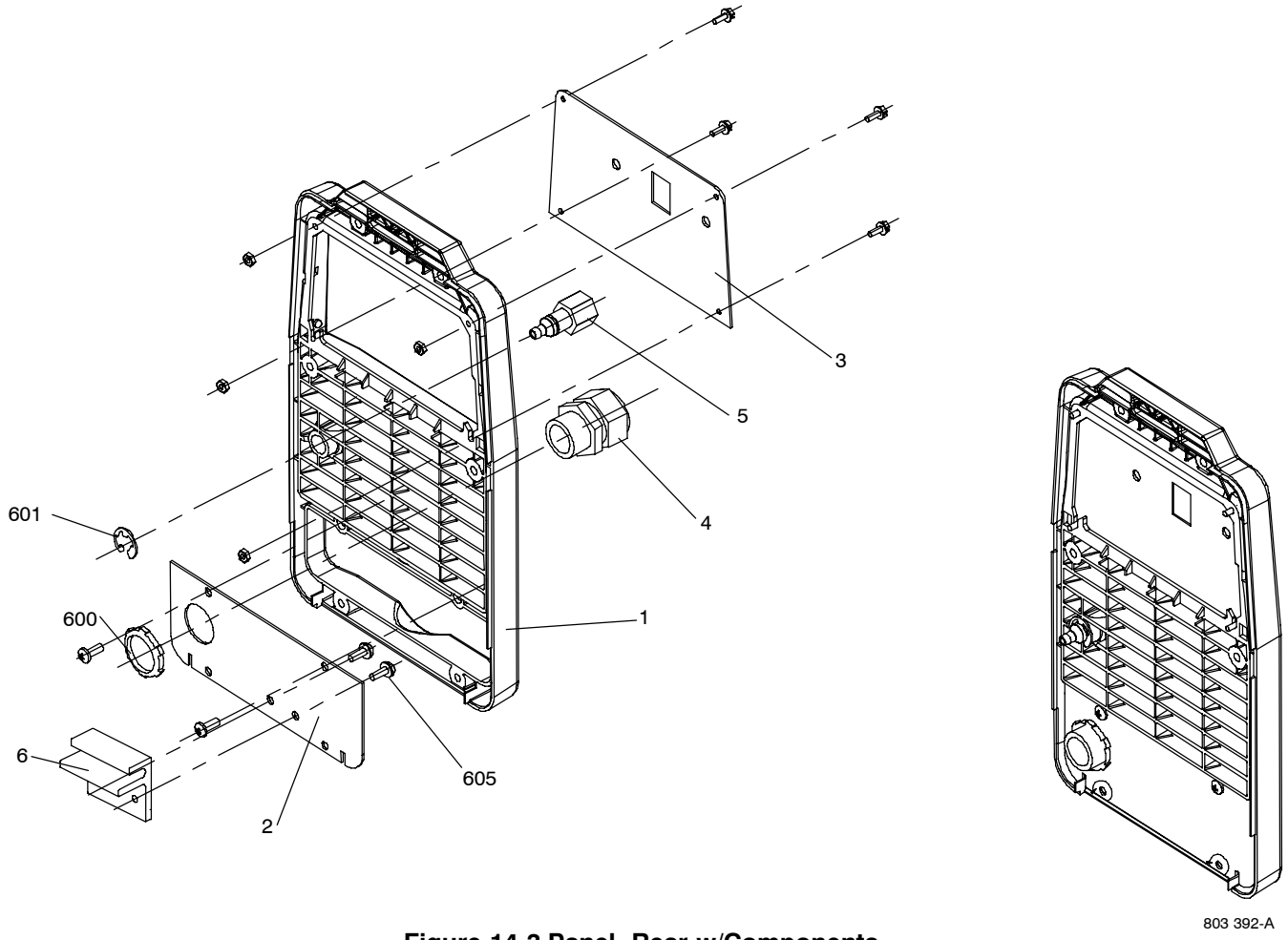

Figure 14-3.Panel, Rear w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
		210 158	**Figure 14-3. Panel, Rear w/Components (Figure 14-1 Item 2)**	
1		194242	PANEL, FRONT/REAR	1
2		206053	PANEL, REAR LOWER	1
3		210159	PANEL, REAR UPPER	1
4		201155	BUSHING, STRAIN RELIEF .450/ .709 ID X1.608 MTG HOL	1
5		193649	FTG, GAS BARBED 1/4 TBG 5/8–18 FEMALE	1
5		193650	FTG, GAS BARBED 1/4 TBG 3/8–19 BSPP MALE (CE MODELS ONLY)	1
6		211165	BRACKET, HEATSINK SUPPORT	1
600		198245	NUT, CONDUIT .750 NPT PLD 1.388 OD X .150 THK	1
601		166560	RING, RTNG EXT .500 SHAFT X .042 THK E STYLE BOWED	1
605		136343	SCREW, K50 X 20 PAN HD-PHL STL PLD THREAD FORMING	2

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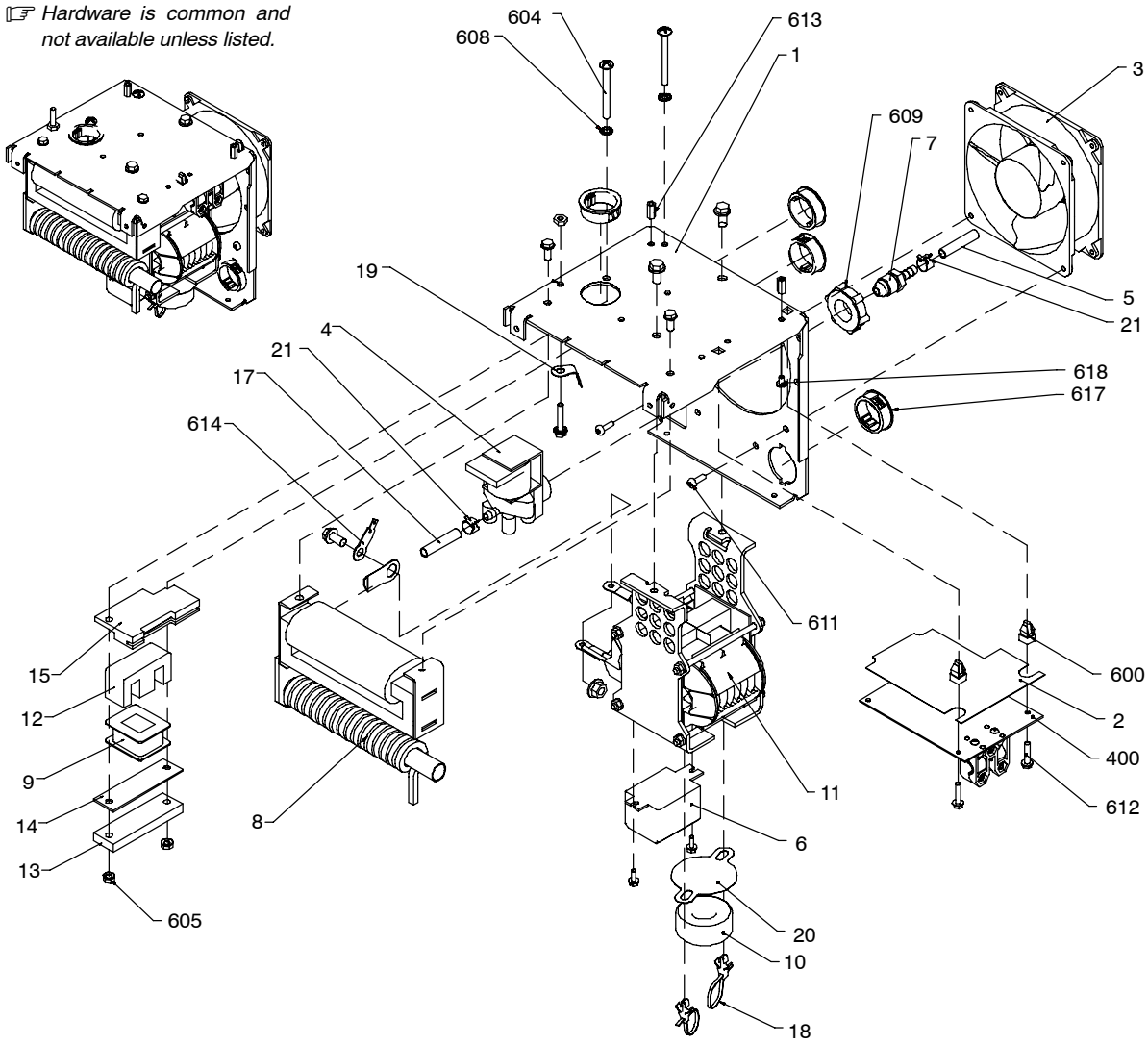

Figure 14-4. Magnetics Assembly w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
		209 936	**Figure 14-4. Magnetics Assembly w/Components (Figure 14-1 Item 3)**	
1		210160	PANEL,PLENUM (PRIOR TO LE258160)	1
1		195649	PANEL,PLENUM (EFF W/LE258160)	1
2		189785	INSULATOR,HF COIL	1
3	FM1	196887	FAN,MUFFIN 24VDC 3000 RPM 130 CFM 4.125 MTG HOLES	1
4	GS1	218494	KIT, VALVE 24VDC 2WAY CUSTOM PORT 1/8 ORF W/FRICT INCLUDES NUT (PRIOR TO LE105040)	1
4	GS1	216607	VALVE 24VDC 2WAY CUSTOM PORT 1/8 ORF (EFF W/LE105040)	1
5		197987	HOSE,NPRN BRD NO 1 X .250 ID X 11.000	1
6	CR1	198549	RELAY,ENCL 24VDC SPST 35A/300VAC 4PIN FLANGE MTG	1
7		112863	FTG,HOSE BRS BARBED M 1/4 TBG X 5/8–18 SAE FLARE	1
8		209991	ASSY,OUTPUT INDUCTOR AND COUPLING COIL	1
9	L2	210599	COIL,INDUCTOR 9T	1
10	L4	208066	INDUCTOR,TOROID 5 AMP 180 UH,12” LEADS W/QUICK CON	1
11	T1	209693	XFMR,HF LITZ/LITZ W/BOOST	1
12		109056	CORE,FERRITE E 2.164 LG X 1.094 HIGH X .826 WIDE	1
13		196512	BRACKET,INDUCTOR MOUNTING	1
14		196514	GASKET,INDUCTOR MOUNTING	1
15		200385	BRACKET,MTG HF	1
17		210610	HOSE,NPRN BRD NO 1 X .250 ID X 12.250	1
18		212168	CABLE TIE,0–.750 BUNDLE DIA. PUSH MOUNT	2

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

Figure 14-4. Magnetics Assembly w/Components (Figure 14-1 Item 3) (Continued)

19		193415	CONNECTOR,FASTON 1/4 RING W/75DEG BEND	1
20		210323	INSULATOR,WASHER INDUCTOR	1
21		149332	CLAMP,HOSE .405 – .485 CLP DIA SLFTTNG OLIVE DRA (PRIOR TO LE258160)	2
21		089120	CLAMP,HOSE .375 – .450 CLP DIA SLFTTNG GREEN (EFF W/LE258160)	2
400	PC7	209112	CIRCUIT CARD ASSY,ARC STARTER	1
600		199538	GROMMET,SCR NO 8/10 PANEL HOLE .281 SQ .250 HIGH	2
604		182737	SCREW,010–32X2.00 RND HD–SLT BRS PLN	2
605		156734	NUT, 010–32 .31HEX .13H STL PLD SEM CONE WSHR.38D	2
608		602204	WASHER,TOOTH.195IDX0.410ODX.025T STL PLD EXT #10 B	2
609		137761	NUT, 750NPT 1.31HEX .27H NYL BLK (EFF W/LE105040)	1
611		136343	SCREW,K50X 20 PAN HD–PHL STL PLD PT THREAD FORMING	2
612		099273	SCREW,008–18X .62 PAN HD–PHL STL PLD SHT MET A	2
613		212167	STANDOFF,NO 8–32 X .625 LG .250 NYL HEX FEM THREADED	2
614		010381	CONNECTOR,RECTIFIER	1
617		210161	GROMMET,OPEN/CLOSED	4
618		207944	SCREW,008–32X .25 PAN–HD PHL STL PLD	2

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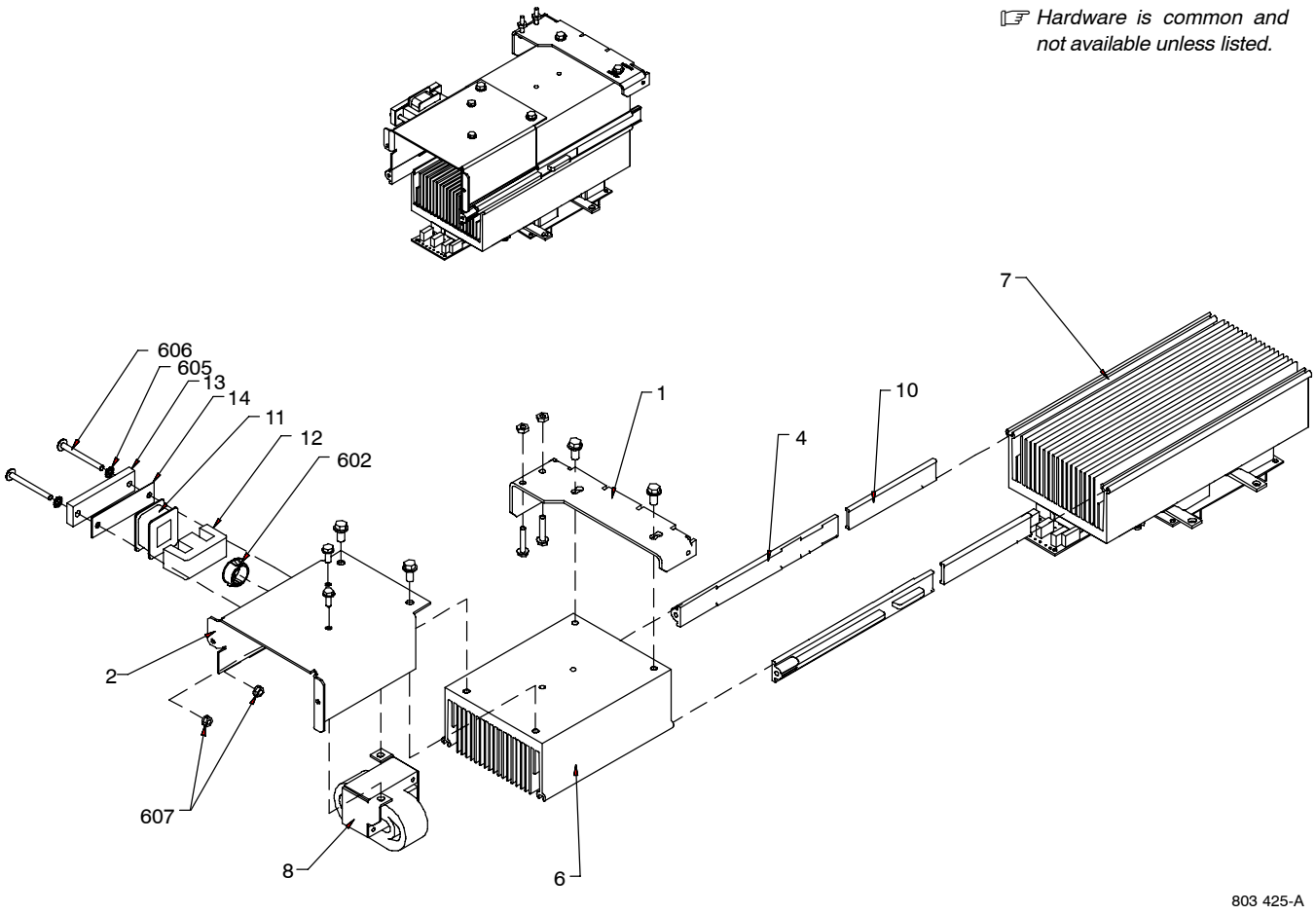

Figure 14-5. Windtunnel w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
		210 162	**Figure 14-5. Windtunnel w/Components (Figure 14-1 Item 4)**	
1		195645	BRACKET,HEATSINK REAR	1
2		210264	BRACKET,FRONT HEATSINK MTG	1
4		211455	RAIL,HEAT SINK	2
6		+209949	HEAT SINK,PRIMARY	1
7		210163	HEAT SINK,SECONDARY ASSEMBLY	1
8	L1	189787	INDUCTOR,INPUT	1
10		211169	RAIL,HEAT SINK	2
11	L3	210568	COIL,INDUCTOR 14T	1
12		109056	CORE,FERRITE E 2.164 LG X 1.094 HIGH X .826 WIDE	1
13		196512	BRACKET,INDUCTOR MOUNTING	1
14		196514	GASKET,INDUCTOR MOUNTING	1
602		154408	BUSHING, SNAP-IN NYL .562 ID X .875 MTG HOLE CENT	1
605		602204	WASHER,TOOTH.195IDX0.410ODX.025T STL PLD EXT #10 B	2
606		182737	SCREW,010−32X2.00 RND HD−SLT BRS PLN	2
607		156734	NUT, 010−32 .31HEX .13H STL PLD SEM CONE WSHR.38D	2

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

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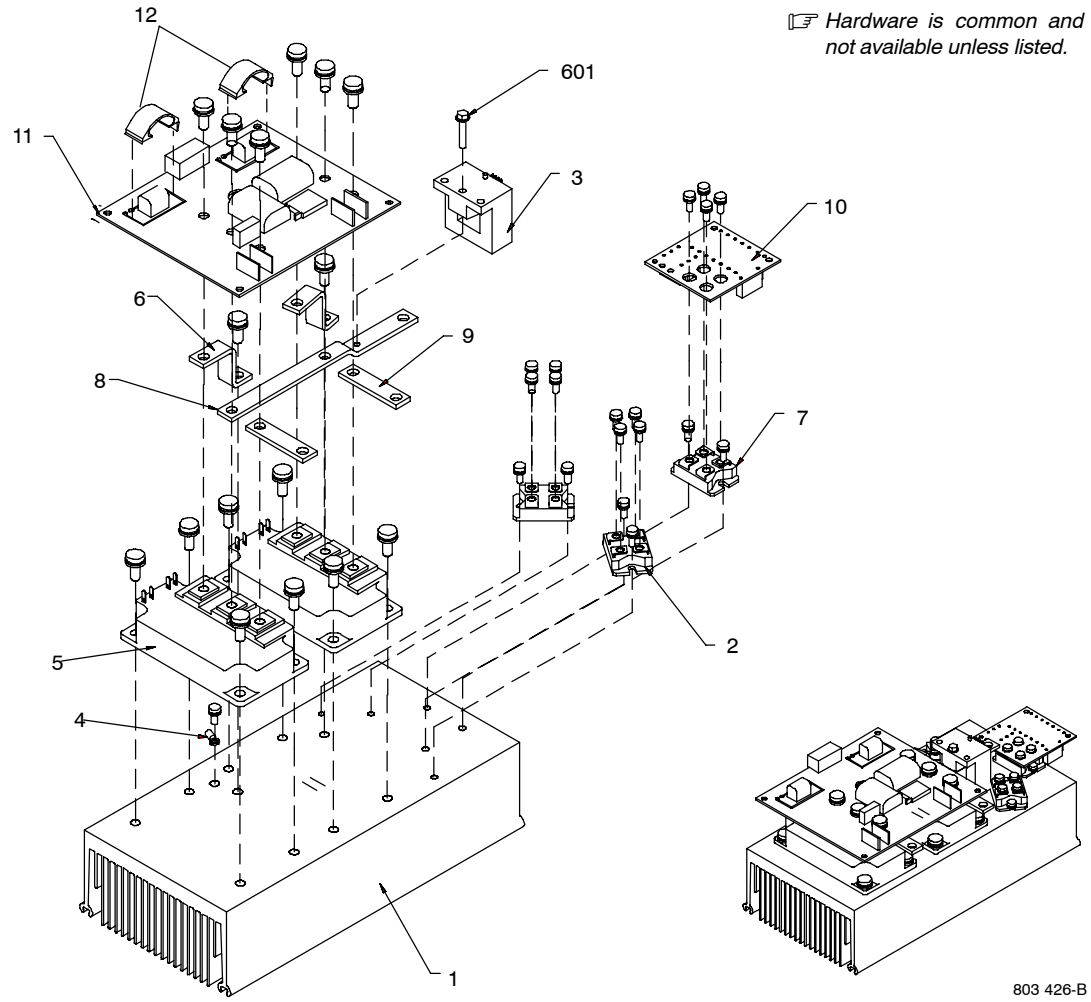

Figure 14-6. Heat Sink, Secondary Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
		210 163	**Figure 14-6. Heat Sink, Secondary Assembly(Figure 14-5 Item 7)**	
1		209984	HEAT SINK,SECONDARY	1
2	D1,D2	212037	KIT, DIODE ULTRA–FAST RECOVERY	1
3	HD1	198028	TRANSDUCER,CURRENT 100A MODULE SUPPLY V+/– 15V	1
4	RT1	199798	THERMISTOR,NTC 30K OHM @ 25 DEG C 18IN LEAD #6 (PRIOR TO LC466512)	1
4	RT1	211124	THERMISTOR,NTC 30K OHM @ 25 DEG C 18IN LEAD #8 (EFF W/LC466512	1
5	PM2,PM3	213179	TRANSISTOR, IGBT KIT	2
6		210278	BUS BAR,POSITIVE	2
7		199952	DIODE,POWER MODULE 50 AMP 600 V 1PH FAST RECOVE	1
8		210280	BUS BAR,NEGITIVE	1
9		210279	BUS BAR,OUTPUT	2
10	PC11	208060	CIRCUIT CARD ASSY,DIODE SNUBBER	1
11	PC6	220384	KIT,FIELD IGBT SNUBBER CIRCUIT CARD ASSY & CLIP (Prior to LE200084)	1
11	PC6	207826	CIRCUIT CARD ASSY,IGBT SNUBBER (EFF W/LE200084)	1
12		218597	CLIP, SUPPORT IGBT GATE DRIVER (EFF W/LE200084)	2
601		602086	SCREW,008–32X1.00 HEXWHD–PLN STL PLD	1

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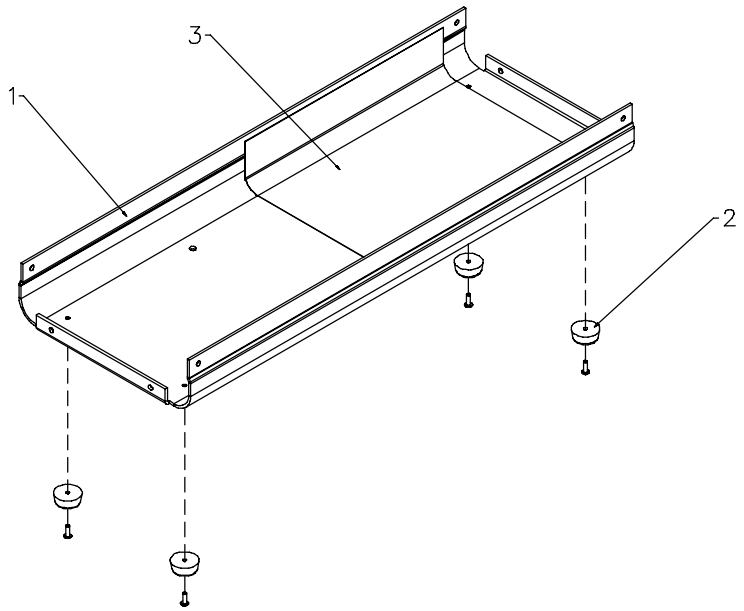


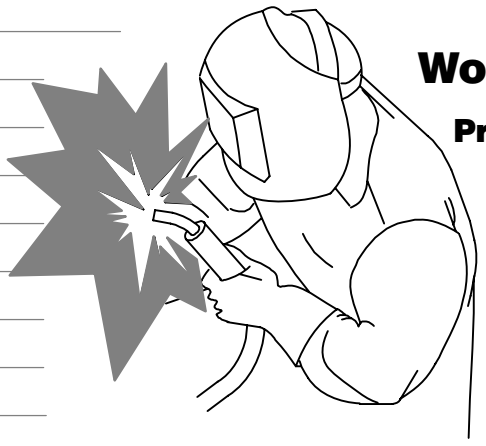
803 394–A

Figure 14-7. Base Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
		207 689	**Figure 14-7. Base Assembly (Figure 14-1 Item 5)**	
1		207255	BASE	1
2		019663	MOUNT, NPRN 15/16ODX3/8REC 3/16X3/8	4
3		211478	INSULATOR, BASE	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.

Notes



Work like a Pro!

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

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