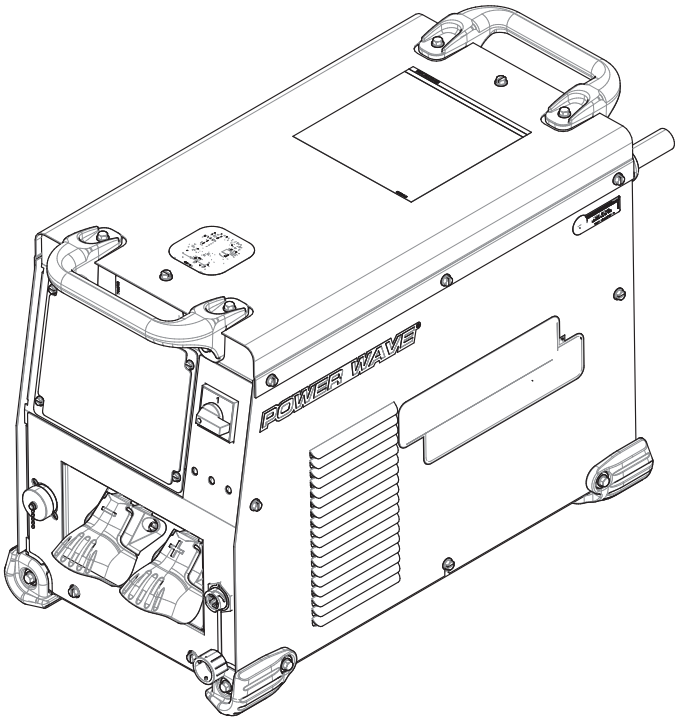
Operator's Manual

Power Wave® E500



For use with machines having Code Numbers:
12643

GENUINE LINCOLN PARTS™

Register your machine:
www.lincolnelectric.com/register

Authorized Service and Distributor Locator:
www.lincolnelectric.com/locator

Save for future reference

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Code: (ex: 10859)

Serial: (ex: U1060512345)

IM10370-A | Issue Date Oct-16

THE LINCOLN ELECTRIC COMPANY
22801 St. Clair Avenue • Cleveland, OH • 44117-1199 • U.S.A.
Phone: +1.216.481.8100 • www.lincolnelectric.com

THANK YOU FOR SELECTING A QUALITY PRODUCT BY LINCOLN ELECTRIC.

PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

SAFETY DEPENDS ON YOU

Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

⚠ WARNING

This statement appears where the information must be followed exactly to avoid serious personal injury or loss of life.

⚠ CAUTION

This statement appears where the information must be followed to avoid minor personal injury or damage to this equipment.

KEEP YOUR HEAD OUT OF THE FUMES.

DON'T get too close to the arc. Use corrective lenses if necessary to stay a reasonable distance away from the arc.

READ and obey the Safety Data Sheet (SDS) and the warning label that appears on all containers of welding materials.

USE ENOUGH VENTILATION or exhaust at the arc, or both, to keep the fumes and gases from your breathing zone and the general area.

IN A LARGE ROOM OR OUTDOORS, natural ventilation may be adequate if you keep your head out of the fumes (See below).

USE NATURAL DRAFTS or fans to keep the fumes away from your face.

If you develop unusual symptoms, see your supervisor. Perhaps the welding atmosphere and ventilation system should be checked.

WEAR CORRECT EYE, EAR & BODY PROTECTION

PROTECT your eyes and face with welding helmet properly fitted and with proper grade of filter plate (See ANSI Z49.1).

PROTECT your body from welding spatter and arc flash with protective clothing including woolen clothing, flame-proof apron and gloves, leather leggings, and high boots.

PROTECT others from splatter, flash, and glare with protective screens or barriers.

IN SOME AREAS, protection from noise may be appropriate.

BE SURE protective equipment is in good condition.

Also, wear safety glasses in work area **AT ALL TIMES.**

SPECIAL SITUATIONS

DO NOT WELD OR CUT containers or materials which previously had been in contact with hazardous substances unless they are properly cleaned. This is extremely dangerous.

DO NOT WELD OR CUT painted or plated parts unless special precautions with ventilation have been taken. They can release highly toxic fumes or gases.

Additional precautionary measures

PROTECT compressed gas cylinders from excessive heat, mechanical shocks, and arcs; fasten cylinders so they cannot fall.

BE SURE cylinders are never grounded or part of an electrical circuit.

REMOVE all potential fire hazards from welding area.

ALWAYS HAVE FIRE FIGHTING EQUIPMENT READY FOR IMMEDIATE USE AND KNOW HOW TO USE IT.

SECTION A: WARNINGS

CALIFORNIA PROPOSITION 65 WARNINGS

WARNING: Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects, or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an exposed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65 warnings.ca.gov/diesel

WARNING: This product, when used for welding or cutting, 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 § 25249.5 *et seq.)*

WARNING: Cancer and Reproductive Harm www.P65warnings.ca.gov

ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

FOR ENGINE POWERED EQUIPMENT.

1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.

1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.

1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

1.d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.

1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

2.d.1. Route the electrode and work cables together - Secure them with tape when possible.

2.d.2. Never coil the electrode lead around your body.

2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.

ELECTRIC SHOCK CAN KILL.

3.a. The electrode and work (or ground) circuits are electrically “hot” when the welder is on. Do not touch these “hot” parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- Semiautomatic DC Constant Voltage (Wire) Welder.
- DC Manual (Stick) Welder.
- AC Welder with Reduced Voltage Control.

3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically “hot”.

3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

3.e. Ground the work or metal to be welded to a good electrical (earth) ground.

3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.g. Never dip the electrode in water for cooling.

3.h. Never simultaneously touch electrically “hot” parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.

3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

3.j. Also see Items 6.c. and 8.

ARC RAYS CAN BURN.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87. I standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

FUMES AND GASES CAN BE DANGEROUS.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding hardfacing (see instructions on container or SDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation unless exposure assessments indicate otherwise. In confined spaces or in some circumstances, outdoors, a respirator may also be required. Additional precautions are also required when welding on galvanized steel.**

5. b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.

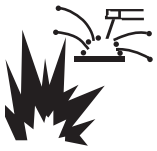
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

5.e. Read and understand the manufacturer’s instructions for this equipment and the consumables to be used, including the Safety Data Sheet (SDS) and follow your employer’s safety practices. SDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.

WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.



6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.

6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned". For information, purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1 from the American Welding Society (see address above).

6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

6.h. Also see item 1.c.

6.I. Read and follow NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work", available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, MA 022690-9101.

6.j. Do not use a welding power source for pipe thawing.

CYLINDER MAY EXPLODE IF DAMAGED.

7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

7.c. Cylinders should be located:

- Away from areas where they may be struck or subjected to physical damage.
- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

7.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.

7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-I, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association, 14501 George Carter Way Chantilly, VA 20151.

FOR ELECTRICALLY POWERED EQUIPMENT.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.

8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.

Refer to http://www.lincolnelectric.com/safety for additional safety information.

Content/details may be changed or updated without notice. For most current Instruction Manuals, go to parts.lincolnelectric.com.

PRODUCT DESCRIPTION

The Power Wave® E500 is a robust power source with feeder control intended for basic CV and CV-Pulse robotic welding applications. The 40-500 amp current range will support a wide variety of welding situations. The interface to the wire feeder and robotic controller are both conveniently located on the front of Power Wave® E500. The wire feeder control interfaces to the wire feeder through a 14-pin MS-style connector. The interface to the robot controller is over ArcLink XT, through a shielded RJ-45 connector.

The case of the Power Wave® E500 has two lifting handles located on the front and rear of the case. The Power Wave® E500 has an IP23 rating that allows the machine to operate reliably in harsh industrial environments.

EQUIPMENT LIMITATIONS

The Power Wave® E500 is only compatible with the Lincoln Electric wire feeders listed in the compatible equipment section. It does not support any semi-automatic welding. The Power Wave® E500 is also compatible only with robotic controllers that support ArcLink XT.

DESIGN FEATURES

- **Compact, Durable Case** – Tough IP23 enclosure rating ensures the ability to withstand extreme field environments.

WELDING PROCESSES		
Process	**Output Range (Amperes)**	**OCV (Uo)**
GMAW	40-500 A	Peak 58 V
GMAW-Pulse		
FCAW-G		

OPERATING TEMPERATURE RANGE
-10° C to + 55° C.
Output is de-rated for temperatures in excess of 40° C.

OUTPUT RATINGS AT 40° C			
Amps	**Duty Cycle**	**Volts**	**Temperature**
450	100%	36.5V	40° C
500	60%	39V	

OUTPUT RATINGS AT 55° C ELEVATED TEMPERATURES			
Amps	**Duty Cycle**	**Volts**	**Temperature**
375	100%	35V	55° C
400	60%	36V	

COMPATIBLE WIRE FEEDERS
AutoDrive 4R220
AutoDrive 4R100
Power Feed 10R

TECHNICAL SPECIFICATIONS

POWER SOURCES - INPUT VOLTAGE AND CURRENT					
Model	**Duty Cycle**	**Input Voltage ± 10%**	**Input Amperes**	**Idle Power (W)**	**Power Factor**
K3457-1	60% rating	380 / 400-415 / 3 / 50 / 60	37 / 35	150W Fan on 70W Fan off	85%
	100% rating		31 / 30		

POWER SOURCES - RECOMMENDED INPUT WIRE AND FUSE SIZES[1]					
Voltage	Input Amperes (100% Rating)	Time Delay Fuse or Breaker Size	Type 75C Copper Wire in Conduit AWG (IEC) Sizes 40C (104°F) Ambient	Type 75C Copper Ground Wire in Conduit AWG (IEC) Sizes	Cord Size AWG Sizes (IEC)
380/3/60/50	31 A	50	10 (6)	10 (6)	8 (8)
400-415/3/60/50	30 A	50	10 (6)	10 (6)	8 (8)

RATED OUTPUT				
Process	**Duty Cycle**	**Volts at Rated Amperes**	**Amperes**	**Efficiency (at Rated Output)**
GMAW (CV) FCAW-G	60%	39 V	500 A	89%
	100%	36.5 V	450 A	
GMAW-P (CV)	60%	39 V	500 A	
	100%	36.5 V	450 A	

PHYSICAL DIMENSIONS				
MODEL	**HEIGHT**	**WIDTH**	**DEPTH**	**WEIGHT**
K3457-1	18.8 in (477 mm)	14 in (356 mm)	26.5 in (673 mm)	126 lbs. (57.1 kg)

TEMPERATURE RANGES	
Operating Temperature	14° F to 131° F (-10° C to 55° C)*
Storage Temperature	-40° F to 185° F (-40° C to 85° C)
Insulation Class	Class H (180° C)

*Output is derated for temperatures in excess of 40° C (104° F).

AGENCY APPROVALS		
MODEL	**CONFORMITY MARK**	**NOTES**
K3457-1	CCC	GB15579.1-2013
K3457-1 with K3129-2 Filter Kit	CE, C-Tick	IEC60974-1 IEC 60974-10 Class A

INSTALLATION

⚠ WARNING

ELECTRIC SHOCK CAN KILL.

ONLY QUALIFIED PERSONNEL SHOULD PERFORM THIS INSTALLATION.

- **Turn off input power to the power source at the disconnect switch or fuse box before working on this equipment. Turn off the input power to any other equipment connected to the welding system at the disconnect switch or fuse box before working on the equipment.**
- **Do not touch electrically hot parts.**
- **Always connect the grounding lug (located inside the reconnect input access door) to a proper safety (earth) ground.**
- **Only a qualified electrician should connect the input leads to the Power Wave machine. Connections should be made in accordance with all local and national electrical codes and the connection diagram located underneath the case top of the machine. Failure to do so may result in bodily injury or death.**

MACHINE GROUNDING

The frame of the welder must be grounded. A ground terminal marked with the symbol shown is located inside the reconnect/input connection area for this purpose. See your local and national electrical codes for proper grounding methods.

LOCATION AND VENTILATION FOR COOLING

Place the welder where clean cooling air can freely circulate in through the rear louvers and out through the case sides and front. Dirt, dust, or any foreign material that can be drawn into the welder should be kept at a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance shutdowns.

This equipment is for industrial use only and it is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There can be potential difficulties in residential locations due to conducted as well as radiated radio-frequency disturbances. The EMC or RF classification of this equipment is Class A.

HIGH FREQUENCY PROTECTION

Locate the Power Wave® E500 away from radio controlled machinery. The normal operation of the machine may adversely affect the operation of RF controlled equipment, which may result in bodily injury or damage to the equipment.

LIFTING

The Power Wave® E500 has two handles that can be used to lift the machine.

Both handles should be used when lifting the machine. When using a crane or overhead device to lift using the handles, a lifting strap should be connected to both handles. Do not attempt to lift the Power Wave® E500 with accessories attached to it.

STACKING

The Power Wave® E500 can only be stacked on top of appropriate accessories. Nothing can be stacked on top of the machine.

TILTING

Place the machine directly on a secure, level surface or on a recommended undercarriage. The machine may topple over if this procedure is not followed.

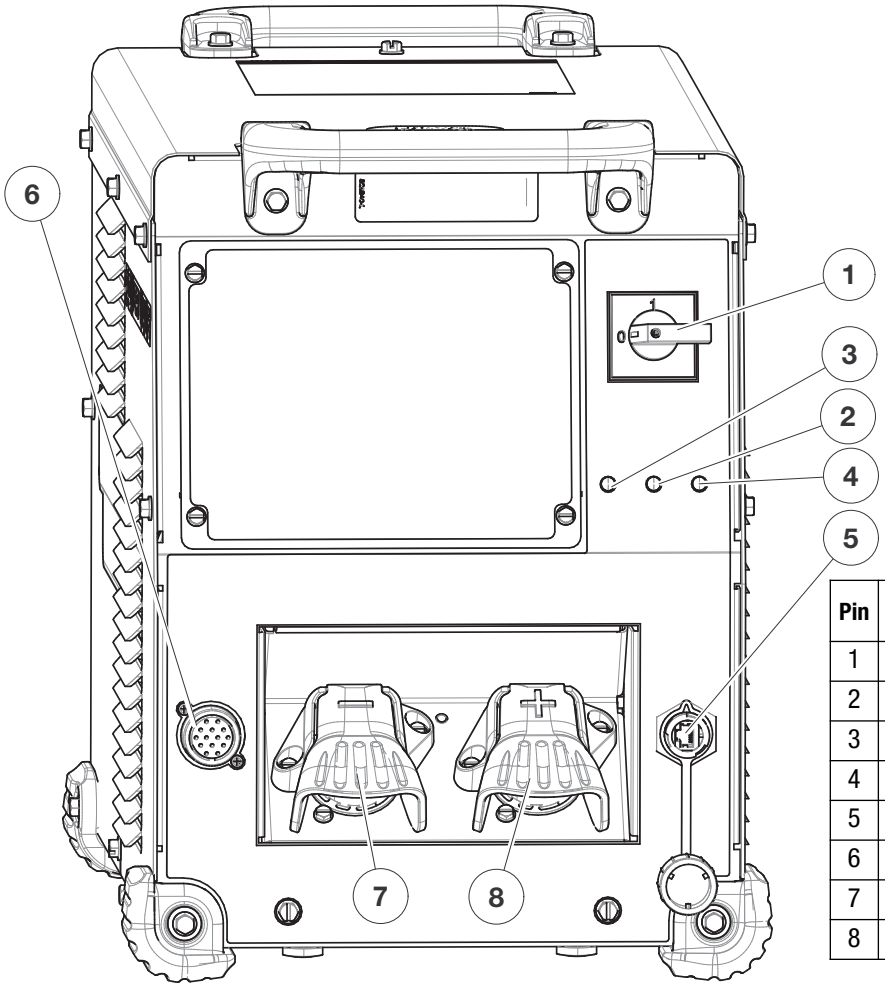
ENVIRONMENTAL LIMITATIONS

The Power Wave® E500 is IP23 rated for use in an outdoor environment. The machine should not be subjected to falling water during use nor should any parts of it be submerged in water. Doing so may cause improper operation as well as pose a safety hazard. The best practice is to keep the machine in a dry, sheltered area.

Do not mount the Power Wave® E500 over combustible surfaces. Where there is a combustible surface directly under stationary or fixed electrical equipment, that surface shall be covered with a steel plate at least .060” (1.6mm) thick, which shall extend not less than 5.90” (150mm) beyond the equipment on all sides.

CASE FRONT CONTROLS

Pin	Leads	Function
A	539	Motor +
B	541	Motor –
C	521	Solenoid +
D	522	Solenoid Common
E	845	Tach 2A differential signal
F	847	Single Tach supply
G	841	+15V Tach Supply
H	844	Tach Common
I	OPEN	Reserved for future use
J	GND-A	Shielding Drain
K	842	Tach 1A differential signal
L	843	Tach 1B differential signal
M	846	Tach 2B differential signal
N	67A / 67B	Electrode Voltage Sense

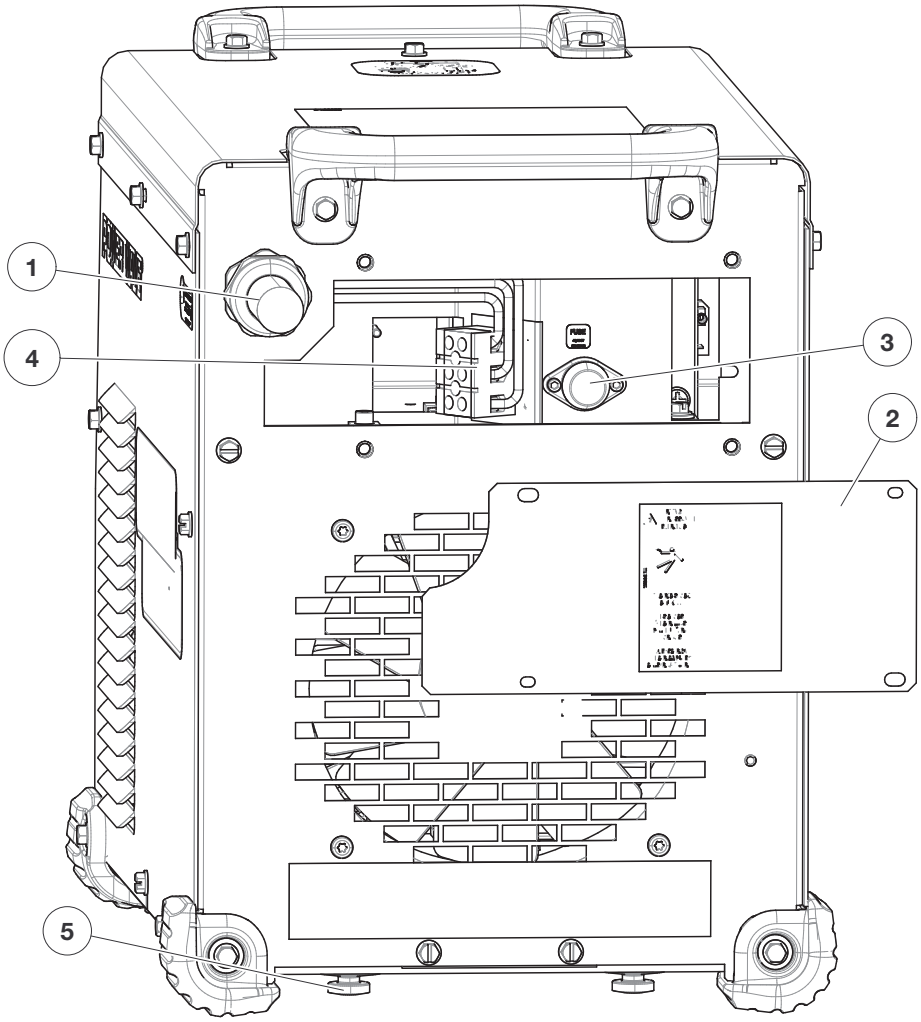


Pin	Function
1	Transmit +
2	Transmit –
3	Receive +
4	---
5	---
6	Receive –
7	---
8	---

1. **Power Switch:**
   Controls input power to the Power Wave® E500.
2. **Thermal LED: A yellow light that comes on when an over temperature situation occurs.**
   Output is disabled until the machine cools down.
   When cool, the light goes out and output is enabled.
3. **Power Source Status LED.** A two color LED that indicates system errors for the inverter power source. Normal operation is a steady green light. For more information and a detailed listing, see the troubleshooting section of this document or the Service Manual for this machine. (See Troubleshooting Section for operational functions.)
4. **Wire Feeder Status LED -** A two color LED that indicates system errors of the feeder control system. Normal operation is a steady green light. For more information and a detailed listing, see the troubleshooting section of this document or the Service Manual for this machine. (See Troubleshooting Section for operational functions.)
5. **Ethernet (Shielded):** Used for ArcLink® XT communication. Also used for diagnostics and reprogramming the POWER WAVE E500
6. **Wire Feeder Receptacle (14-pin): Robotic Wire feeder connector (for 4R100, 4R220, Power Feed 10 Robotic, etc.)**
7. **Negative Output Terminal**
8. **Positive Output Terminal**

CASE BACK CONTROLS

Use a three-phase supply line. A 1.75 inch (45 mm) diameter access hole for the input supply is located on the case back. Remove the reconnect access panel located on the case back and connect L1, L2, L3 and ground according to the Input Supply Connection Diagram decal. **(See Figure B.1)**



1. **Input Power Cord Access Hole**
   - Route input power cable through this hole.
   - Strain relief required. See your local and national electrical codes for proper strain relief.
2. **Access Panel – Allows access for connecting input power**
3. **Auxiliary Power Fuse Protection**
4. **Input Power Connection Terminal Block**
   - A ground terminal with the symbol shown ⏚ is provided separate from this block for connecting the ground lead of the line cord. See your local and national electrical codes for proper grounding methods.
5. **OPTION – Base Mounting Kit**

Input Fuse and Supply Wire Considerations

Refer to ***Page A-1*** for recommended fuse, wire sizes and type of the copper wires. Fuse the input circuit with the recommended super lag fuse or delay type breakers (also called "inverse time" or "thermal/magnetic" circuit breakers). Choose input and grounding wire size according to local or national electrical codes. Using input wire sizes, fuses or circuit breakers smaller than recommended may result in "nuisance" shut-offs from welder inrush currents, even if the machine is not being used at high currents.

RECOMMENDED ELECTRODE AND WORK CABLE SIZES FOR ARC WELDING

General Guidelines

Connect the electrode and work cables between the appropriate output studs of the Power Wave® E500 per the following guidelines:

- Most welding applications run with the electrode being positive (+). For those applications, connect the electrode cable between the wire drive feed plate and the positive (+) output stud on the power source. Connect a work lead from the negative (-) power source output stud to the work piece.
- Negative electrode polarity is not supported.

The following recommendations apply to all weld modes:

- **SELECT THE APPROPRIATE SIZE CABLES PER THE "OUTPUT CABLE GUIDELINES" BELOW.** Excessive voltage drops caused by undersized welding cables and poor connections often result in unsatisfactory welding performance. Always use the largest welding cables (electrode and work) that are practical, and be sure all connections are clean and tight.

  Note: Excessive heat in the weld circuit indicates undersized cables and/or bad connections.
- **ROUTE ALL CABLES DIRECTLY TO THE WORK AND WIRE FEEDER, AVOID EXCESSIVE LENGTHS AND DO NOT COIL EXCESS CABLE.** Route the electrode and work cables in close proximity to one another to minimize the loop area and therefore the inductance of the weld circuit.
- **ALWAYS WELD IN A DIRECTION AWAY FROM THE WORK (GROUND) CONNECTION.**

OUTPUT CABLE GUIDELINES

AMPERES	PERCENT DUTY CYCLE	CABLE SIZES FOR COMBINED LENGTHS OF ELECTRODE AND WORK CABLES [RUBBER COVERED COPPER - RATED 167°F (75°C)]**				
		0 to 50 ft	50 to 100 ft	100 - 150 ft	150 - 200 ft	200 - 250 ft
200	60	2	2	2	1	1/0
200	100	2	2	2	1	1/0
250	30	3	3	2	1	1/0
250	40	2	2	1	1	1/0
250	60	1	1	1	1	1/0
250	100	1	1	1	1	1/0
300	60	1	1	1	1/0	2/0
300	100	2/0	2/0	2/0	2/0	3/0
350	40	1/0	1/0	2/0	2/0	3/0
400	60	2/0	2/0	2/0	3/0	4/0
400	100	3/0	3/0	3/0	3/0	4/0
450	100	3/0	3/0	3/0	3/0	4/0
500	60	2/0	2/0	3/0	3/0	4/0

CONTROL CABLE AND VOLTAGE SENSING CONNECTIONS

Voltage Sensing Overview

The best arc performance occurs when the Power Wave® E500 has accurate data about the arc conditions. Depending upon the process, inductance within the electrode and work cables can influence the voltage apparent at the studs of the welder, and have a dramatic effect on performance. A remote electrode voltage sense lead is used to improve the accuracy of the arc voltage information supplied to the machine. The electrode sense lead is integral to the Wire Feeder control cable.

1. The electrode voltage sense lead (67) is automatically enabled by the weld process, and integral to the 14-pin Wirefeeder control cable.

PROCESS	ELECTRODE VOLTAGE SENSING	WORK VOLTAGE SENSING
GMAW	67 lead	Voltage sense at studs
GMAW-P	67 lead	Voltage sense at studs

Connection Between Power Source and Ethernet Networks

The Power Wave® E500 is equipped with an IP67 rated ODVA compliant RJ-45 Ethernet connector, which is located on the front panel. All external Ethernet equipment (cables, switches, etc.), as defined by the connection diagrams, must be supplied by the customer. It is critical that all Ethernet cables external to either a conduit or an enclosure are solid conductor, shielded cat 5e cable, with a drain. The drain should be grounded at the source of transmission. For best results, route Ethernet cables away from weld cables, wire drive control cables, or any other current carrying device that can create a fluctuating magnetic field. For additional guidelines refer to ISO/IEC 11801. Failure to follow these recommendations can result in an Ethernet connection failure during welding.

DHCP is enabled by default for 3 minutes. If after 3 minutes no address has been assigned by a DHCP server, static IP settings will be used and DHCP will be disabled. Once the machine reverts to static IP settings, if DHCP is desired again, the machine must be power cycled to begin searching for a DHCP server again. When reverting to static settings, the machine will use custom IP address, Subnet Mask, and Default Gateway if they have previously been saved to the machine. If not, then the default settings will be used.

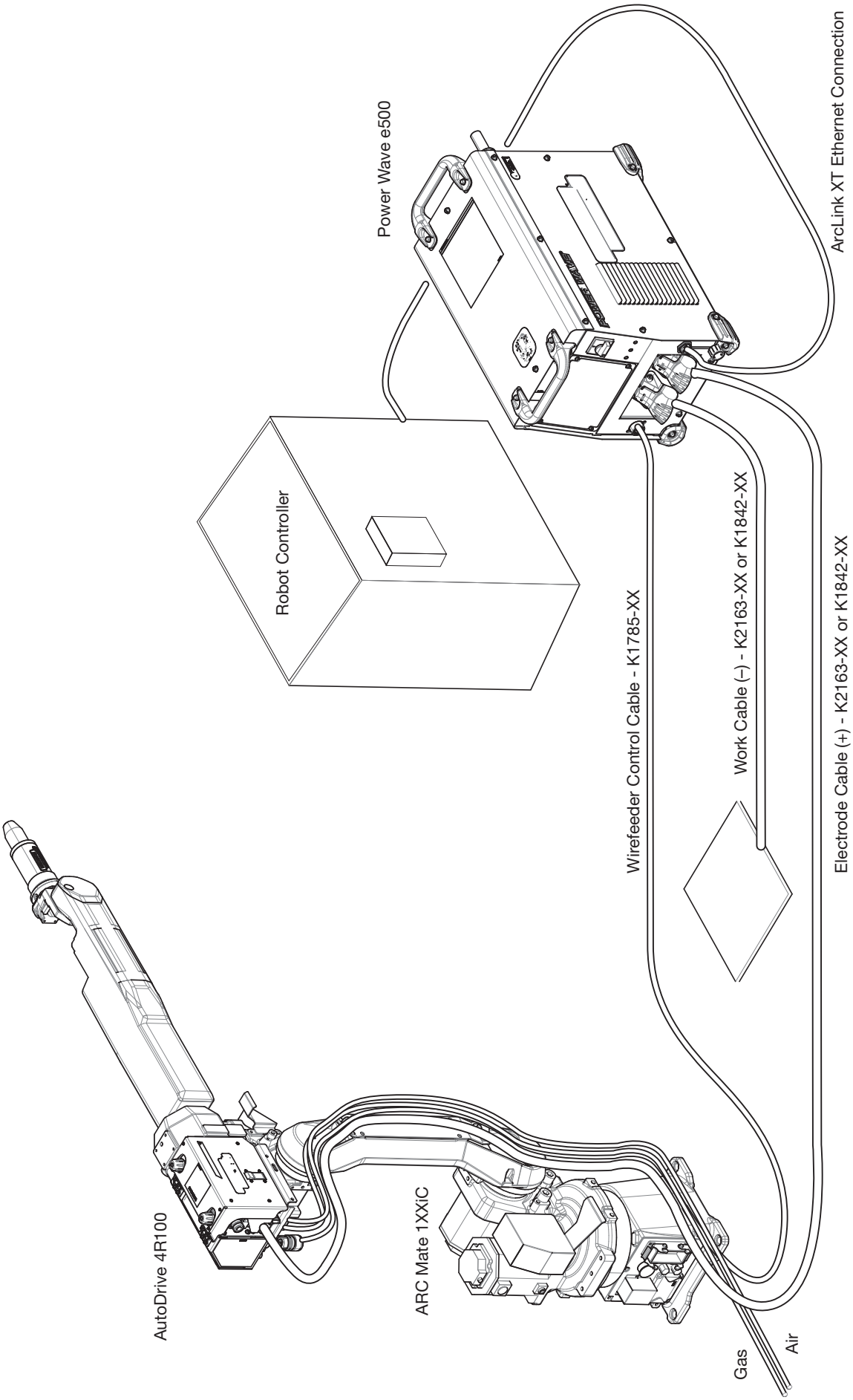
Default static settings are :

IP Address: 192.168.0.2

Subnet Mask: 255.255.192.0

Default Gateway: 192.168.1.1

See Power Wave Manager for additional information


Power Wave e500
ArcLink XT Ethernet Connection
Robot Controller
Wirefeeder Control Cable - K1785-XX
Work Cable (–) - K2163-XX or K1842-XX
Electrode Cable (+) - K2163-XX or K1842-XX
AutoDrive 4R100
ARC Mate 1XXiC
Gas
Air

OPERATION

GRAPHIC SYMBOLS THAT APPEAR ON THIS MACHINE OR IN THIS MANUAL


INPUT POWER

ON


OFF


HIGH TEMPERATURE


MACHINE STATUS


CIRCUIT BREAKER


WIRE FEEDER STATUS


POSITIVE OUTPUT


NEGATIVE OUTPUT

3 PHASE INVERTER


INPUT POWER

3~ THREE PHASE


DIRECT CURRENT


ARCLINK XT


WIREFEEDER

U_r RATED REDUCED NO-LOAD VOLTAGE

U_0 OPEN CIRCUIT VOLTAGE

U_1 INPUT VOLTAGE

U_2 OUTPUT VOLTAGE

I_1 INPUT CURRENT

I_2 OUTPUT CURRENT


PROTECTIVE GROUND


WARNING OR CAUTION


EXPLOSION


DANGEROUS VOLTAGE


SHOCK HAZARD


READ INSTRUCTION MANUAL

POWER-UP SEQUENCE

⚠ WARNING

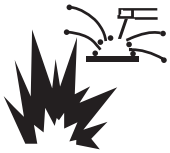
ELECTRIC SHOCK can kill.

Unless using cold feed feature, when feeding with gun trigger, the electrode and drive mechanism are always electrically energized and could remain energized several seconds after the welding ceases.

FUMES AND GASES can be dangerous.

- **Keep your head out of fumes.**
- **Use ventilation or exhaust to remove fumes from breathing zone.**

WELDING SPARKS can cause fire or explosion.



- **Keep flammable material away.**
- **Do not weld on closed containers.**

ARC RAYS can burn eyes and skin.

- **Wear eye, ear and body protection.**

Observe all safety information throughout this manual.

When power is applied to the Power Wave® E500 the machine electronics will complete a power up sequence. The power up sequence will take a minute for the power source and feeder to become ready. During this time the status lights may flash green or red/green. This is a normal situation as the machine goes through the power up sequence.

DUTY CYCLE

The Power Wave® E500 is capable of welding at a 100% duty cycle (continuous welding) at 450 Amps rated output.

The 60% duty cycle rating is 500 amps (based off of a ten minute cycle – 6 minutes on time and 4 minutes off time). The maximum output of the machine is 500 amps.

The Power Wave® E500 is also rated for Desert Duty, elevated temperature operation, in a 55°C ambient. The machine is de-rated for this application.

STATUS LIGHTS	
LIGHT CONDITION	**MEANING**
Steady Green	System OK. Power source is operational, and is communicating normally with all healthy peripheral equipment connected to its ArcLink network.
Blinking Green	Occurs during power up or a system reset, and indicates the POWER WAVE® E500 is mapping (identifying) each component in the system. Normal for first 1-10 seconds after power is turned on, or if the system configuration is changed during operation.
Alternating Green and Red	Non-recoverable system fault. If the Status lights are flashing any combination of red and green, errors are present. **READ THE ERROR CODE(S) BEFORE THE MACHINE IS TURNED OFF.**
	Error Code interpretation through the Status light is detailed in the Troubleshooting section. Individual code digits are flashed in red with a long pause between digits. If more than one code is present, the codes will be separated by a green light.
	To clear the active error(s), turn power source off, and back on to reset.
Steady Red	Not applicable
Blinking Red	Not applicable

COMMON WELDING PROCEDURES

⚠ WARNING

Making a Weld

The serviceability of a product or structure utilizing the welding programs is and must be the sole responsibility of the builder/user. Many variables beyond the control of The Lincoln Electric Company affect the results obtained in applying these programs. These variables include, but are not limited to, welding procedure, plate chemistry and temperature, weldment design, fabrication methods and service requirements. The available range of a welding program may not be suitable for all applications, and the build/user is and must be solely responsible for welding program selection.

Choose the electrode material, electrode size, shielding gas, and process (GMAW, GMAW-P etc.) appropriate for the material to be welded.

Select the weld mode that best matches the desired welding process. The standard weld set shipped with the POWER WAVE® E500 encompasses a wide range of common processes that will meet most needs.

All adjustments are made through the user interface.

Definition of Welding Modes

NON-SYNERGIC WELDING MODES

- A Non-synergic welding mode requires all welding process variables to be set by the operator.

SYNERGIC WELDING MODES

- A Synergic welding mode offers the simplicity of single knob control. The machine will select the correct voltage and amperage based on the Wire Feed Speed (WFS) set by the operator.

Basic Welding Controls

WELD MODE

Selecting a weld mode determines the output characteristics of the Power Wave® power source. Weld modes are developed with a specific electrode material, electrode size, and shielding gas. See www.powerwavesoftware.com for a more complete description or a more complete description of the weld modes programmed into the POWER WAVE® E500 at the factory.

WIRE FEED SPEED (WFS)

In synergic welding modes (synergic CV, GMAW-P), WFS is the dominant control parameter. The user adjusts WFS according to factors such as wire size, penetration requirements, heat input, etc. The POWER WAVE® E500 then uses the WFS setting to adjust the voltage and current according to settings contained in the POWER WAVE®.

In non-synergic modes, the WFS control behaves like a conventional power source where WFS and voltage are independent adjustments. Therefore, to maintain proper arc characteristics, the operator must adjust the voltage to compensate for any changes made to the WFS.

AMPS

In constant current modes, this control adjusts the welding amperage.

VOLTS

In constant voltage modes, this control adjusts the welding voltage.

TRIM

In pulse synergic welding modes, the Trim setting adjusts the arc length. Trim is adjustable from 0.50 to 1.50. 1.00 is the nominal setting and is a good starting point for most conditions.

UltimArc™ Control

UltimArc™ Control allows the operator to vary the arc characteristics. UltimArc™ Control is adjustable from –10.0 to +10.0 with a nominal setting of 0.0.

CONSTANT VOLTAGE WELDING

Synergic CV

For each wire feed speed, a corresponding voltage is preprogrammed into the machine through special software at the factory.

The nominal preprogrammed voltage is the best average voltage for a given wire feed speed, but may be adjusted to preference. When the wire feed speed changes, the POWER WAVE® E500 automatically adjusts the voltage level correspondingly to maintain similar arc characteristics throughout the WFS range.

Non Synergic CV

In non-synergic modes, the WFS control behaves more like a conventional CV power source where WFS and voltage are independent adjustments. Therefore to maintain the arc characteristics, the operator must adjust the voltage to compensate for any changes made to the WFS.

All CV Modes

Pinch adjusts the apparent inductance of the wave shape. The "pinch" function is inversely proportional to inductance. Therefore, increasing Pinch Control greater than 0.0 results in a crisper arc (more spatter) while decreasing the Pinch Control to less than 0.0 provides a softer arc (less spatter).

PULSE WELDING

Pulse welding procedures are set by controlling an overall "arc length" variable. When pulse welding, the arc voltage is highly dependent upon the waveform. The peak current, back ground current, rise time, fall time and pulse frequency all affect the voltage. The exact voltage for a given wire feed speed can only be predicted when all the pulsing waveform parameters are known. Voltage or Trim can be adjusted.

Trim adjusts the arc length and ranges from 0.50 to 1.50 with a nominal value of 1.00. Trim values greater than 1.00 increase the arc length, while values less than 1.00 decrease the arc length. (See figure B.3)

Most pulse welding programs are synergic. As the wire feed speed is adjusted, the POWER WAVE® E500 will automatically recalculate the waveform parameters to maintain similar arc properties.

The POWER WAVE® E500 utilizes "adaptive control" to compensate for changes in the electrical stick-out while welding. (Electrical stick-out is the distance from the contact tip to the work piece.) The POWER WAVE® E500 waveforms are optimized for a 0.75" stick-out. The adaptive behavior supports a range of stick-outs from 0.50 to 1.25". At very low or high wire feed speeds, the adaptive range may be less due to reaching physical limitations of the welding process.

UltimArc™ Control adjusts the focus or shape of the arc. UltimArc™ Control is adjustable from -10.0 to +10.0 with a nominal setting of 0.0. Increasing the UltimArc™ Control increases the pulse frequency and background current while decreasing the peak current. This results in a tight, stiff arc used for high speed sheet metal welding. Decreasing the UltimArc™ Control decreases the pulse frequency and background current while increasing the peak current. This results in a soft arc good for out of position welding. (See Figure B.4)

FIGURE B.3

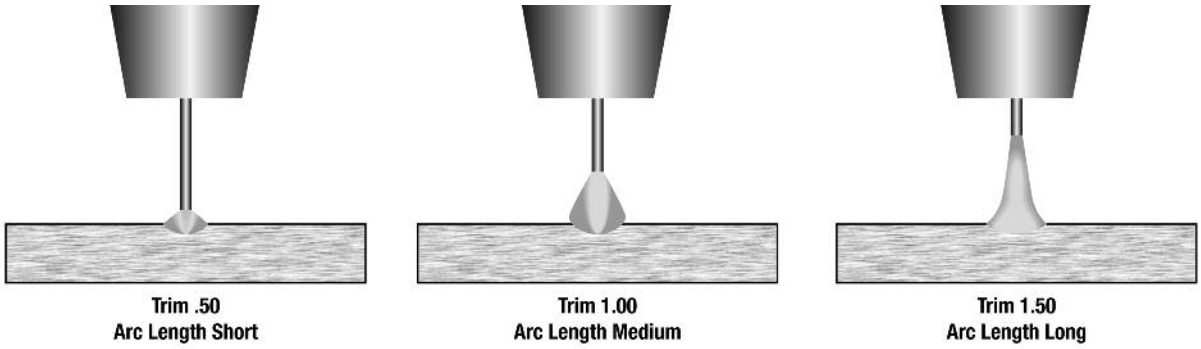
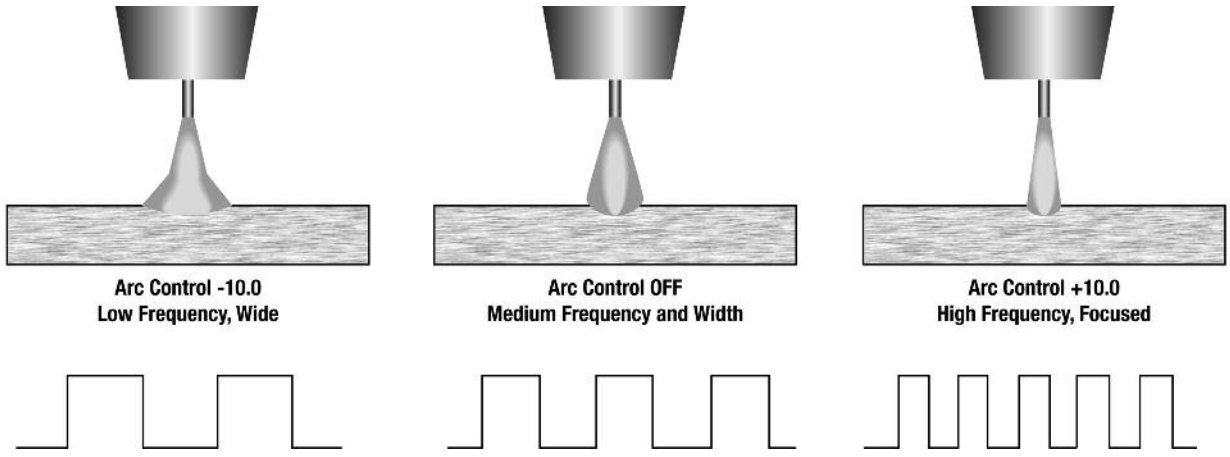


FIGURE B.4



ACCESSORIES

General Options

K2149-1 Work Lead Package. 4/0 cable lugged at one end with work clamp attached at the other end. 15 ft. (4.6 m) length.

K1842-10 Weld Power Cable. Lug to lug, 3/0, 600A, 60% duty cycle. 10 ft. (3.0 m).

K3059-2 Inverter and Wire Feeder Cart. Rear-wheeled cart with front casters and gas bottle platform. Convenient handles allow for easy cable storage. Small footprint fits through 30 in. (762 mm) door. Not intended for use with double head wire feeders.

K3059-3 Dual Cylinder Inverter & Wire Feeder Cart. Rear-wheeled cart with front casters and dual cylinder platform. Convenient handles allow for easy cable storage. Small footprint fits through 30 inch (762mm) door.

K586-1 Deluxe Adjustable Gas Regulator & Hose Kit. Accommodates Argon, or Argon-blend gas cylinders. Includes a cylinder pressure gauge, dual scale flow gauge and 4.3ft (1.3m) gas hose.

K3129-2 CE Filter Kit

3100211 Harris Argon Flowmeter Regulator and Hose Kit

K3019-1 Arc Tracker. The Arc Tracker monitors information regarding your welding arc by connecting it between any DC welding power source and the work clamp.

Weld Fume Control Solutions. Lincoln Electric offers a wide variety of welding fume control solutions, ranging from portable systems easily wheeled around the shop to shop-wide central systems servicing many dedicated welding stations.

MAINTENANCE

WARNING

ELECTRIC SHOCK can kill.

- **Before carrying out service, maintenance and/or repair jobs, fully disconnect power to the machine.**
- **Do not touch electrically hot parts.**

- **Only Qualified personnel should perform this maintenance.**

VISUAL INSPECTION

Clean interior of machine with a low pressure air stream. Make a thorough inspection of all components.

Look for signs of overheating, broken leads or other obvious problems. Many problems can be uncovered with a good visual inspection.

ROUTINE MAINTENANCE

Every six months the machine should be cleaned with a low pressure air stream. Keeping the machine clean will result in cooler operation and higher reliability. Be sure to clean the following areas:

- **All printed circuit boards**
- **Power switch**
- **Main transformer**
- **Input rectifier**
- **Heatsink fins**
- **Auxiliary Transformer**
- **Reconnect Switch Area**
- **Fan (Blow air through the rear louvers)**

Examine the sheet metal case for dents or breakage. Repair the case as required. Keep the case in good condition to ensure that high voltage parts are protected and correct spacing is maintained throughout. All external sheet metal screws must be in place to ensure case strength and electrical ground continuity.

PERIODIC MAINTENANCE

Thermal Protection

Thermostats protect the machine from excessive operating temperatures. Excessive temperatures may be caused by a lack of cooling air or operating the machine beyond the duty cycle and output rating. If excessive operating temperature should occur, the thermostat will disable the output and run the cooling fan. The displays on an attached feeder will remain energized during this time and the thermal light will be illuminated. Thermostats are self-resetting once the machine cools sufficiently. If the thermostat shutdown was caused by excessive output or duty cycle and the fan is operating normally, the Power Switch may be left on and the reset should occur within a 15 minute period.

If for any reason you do not understand the procedures or are unable to perform the maintenance or repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.

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TROUBLESHOOTING

HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

Service and Repair should only be performed by Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

This Troubleshooting Guide is provided to help you locate and repair possible machine malfunctions. Simply follow the three-step procedure listed below.

Step 1. LOCATE PROBLEM (SYMPTOM).

Look under the column labeled "PROBLEM (SYMPTOMS)". This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting.

Step 2. POSSIBLE CAUSE.

The second column labeled "POSSIBLE CAUSE" lists the obvious external possibilities that may contribute to the machine symptom.

Step 3. RECOMMENDED COURSE OF ACTION

This column provides a course of action for the Possible Cause, generally it states to contact your local Lincoln Authorized Field Service Facility.

If you do not understand or are unable to perform the Recommended Course of Action safely, contact your local Lincoln Authorized Field Service Facility.

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.
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USING THE STATUS LED TO TROUBLESHOOT SYSTEM PROBLEMS

The POWER WAVE® E500 is equipped with two externally mounted status lights, one for the power source, and one for the wire drive module contained in the power source. If a problem occurs it is important to note the condition of the status lights. Therefore, prior to cycling power to the system, check the power source status light for error sequences as noted below.

Included in this section is information about the power source and Wire Drive Module Status LED's, and some basic troubleshooting charts for both machine and weld performance.

The STATUS LIGHTS are dual-color LED's that indicate system errors. Normal operation for each is steady green. Error conditions are indicated in the following Table E.1.

TABLE E.1 - STATUS LIGHTS

LIGHT CONDITION	MEANING
Steady Green	System OK. Power source is operational, and is communicating normally with all healthy peripheral equipment connected to its ArcLink network.
Blinking Green	Occurs during power up or a system reset, and indicates the POWER WAVE® E500 is mapping (identifying) each component in the system. Normal for first 1-10 seconds after power is turned on, or if the system configuration is changed during operation.
Fast Blinking Green	Under normal conditions indicates Auto-mapping has failed. Also used by the Diagnostics Utility (included on the POWER WAVE® Utilities or available at www.powerwavesoftware.com) to identify the selected machine when connecting to a specific IP address.
Alternating Green and Red	Non-recoverable system fault. If the Status lights are flashing any combination of red and green, errors are present. **READ THE ERROR CODE(S) BEFORE THE MACHINE IS TURNED OFF.**
	Error Code interpretation through the Status light is detailed in the Service Manual. Individual code digits are flashed in red with a long pause between digits. If more than one code is present, the codes will be separated by a green light. Only active error conditions will be accessible through the Status Light.
	Error codes can also be retrieved with the Diagnostics Utility (included on the POWER WAVE® Utilities and Service Navigator CD's or available at www.powerwavesoftware.com). This is the preferred method, since it can access historical information contained in the error log.
	To clear the active error(s), turn power source off, and back on to reset.
Steady Red	Not applicable
Blinking Red	Not applicable

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.
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ERROR CODES FOR THE POWER WAVE®

The following is a partial list of possible error codes for the POWER WAVE® E500. A complete list of error codes is available in the Diagnostics Utility (included on the POWER WAVE® Utilities or available at www.powerwavesoftware.com).

POWER SOURCE WELD CONTROLLER	
Error Code # (LECO / FANUC / MOTOMAN #)	**Indication**
6 (6) No CAN messages from Power Source	Communication from the Power Source failed before mapping was compete. Check the physical wiring connection of the CAN wires. Verify that the switch board has input power from the auxiliary transformer.
18 (24) ArcLink Auto-Mapping Failed	The machine could not properly configure the devices that are attached to it. This configuration problem could be caused by the type of devices that are connected to the machine or a required device that is not connected. Refer to the operators manual for proper configuration. Verify all devices in the system are properly powered.
21 (33) Device that controls sequence of the welding operation halted due to an error	A component of the system encountered an error during the welding sequence and caused the system to stop. The component with the error could be a wire drive, a user interface or some other part of the system. Read the status LED of the switch board for a detailed fault code. Check the event logs of the various system components to determine the cause of the fault.
31 (49) Primary (Input) overcurrent error.	Excessive Primary current present. May be related to a switch board or output rectifier failure.
36 (54) Thermal error	Indicates over temperature. Usually accompanied by Thermal LED. Check fan operation. Be sure process does not exceed duty cycle limit of the machine.
37 (55) Softstart (pre-charge) error	Capacitor precharge failed. Usually accompanied by codes 32 and 33.
39 (57) Misc. hardware fault	Unknown glitch has occurred on the fault interrupt circuitry. Sometimes caused by primary over current fault, or intermittent connections in the thermostat circuit.
54 (84) Secondary (output) over current	The long term average secondary (weld) current limit has been exceeded. This error will immediately turn off the machine output. NOTE: The long term average secondary current limit is 450 amps.
213 (513) Communication Fault	CAN communication between the User Interface PC board and the Switch PC board has been interrupted. Power must be cycled to the machine to reset the error. Visually inspect the CAN harness to ensure connections and condition. Verify power supply to the Wiredrive and Switch PC boards. Replace defective assemblies as required.
711 (1809) DC Link Capacitor Over/Under Voltage	The voltage on the main DC link capacitors housed on the switchboard has either gone too high or too low. Verify all three phases of the AC input line are connected properly to the machine and that no fuses or breakers are damaged. Verify all power connections to the main switch PC board.
719 (1817) Switch PC Board Error	The Switch PC board experienced an internal error. Power must be cycled to the machine to reset the error. Replace the switchboard if the error persists.
Other - see complete listing available in the Diagnostics Utility	Error codes that contain three or four digits generally indicate internal errors on the Power Source Control Board. If cycling the input power on the machine does not clear the error, contact the Service Department

WIRE DRIVE MODULE	
Error Code # (LECO / FANUC / MOTOMAN #)	**Indication**
81 (129) Motor Overload	Long term average motor current limit has been exceeded. Typically indicates mechanical overload of system. If problem continues consider higher torque gear ratio (lower speed range).
82 (130) Motor Overcurrent	Absolute maximum motor current level has been exceeded. This is a short term average to protect drive circuitry.
83 (131) Shutdown #1	This refers to the jumper wires in J85 on the Feedhead board. Verify the integrity of the connector & jumpers.
84 (132) Shutdown #2	

Observe all Safety Guidelines detailed throughout this manual		
PROBLEMS (SYMPTOMS)	**POSSIBLE CAUSE**	**RECOMMENDED COURSE OF ACTION**
BASIC MACHINE PROBLEMS		
Major physical or electrical damage is evident when the sheet metal covers are removed.	None	Contact your local Lincoln Authorized Field Service Facility.
Input fuses keep blowing	1. Improperly sized input fuses.	1. Make sure fuses are properly sized. See installation section of this manual for recommended sizes.
	2. Improper Weld Procedure requiring output levels in excess of machine rating.	2. Reduce output current, duty cycle, or both.
	3. Major physical or electrical damage is evident when the sheet metal covers are removed.	3. Contact your local authorized Lincoln Electric Field Service facility for technical assistance.
Machine will not power up (no lights)	1. No Input Power.	1. Make sure input supply disconnect has been turned ON. Check input fuses. Make certain that the Power Switch (SW1) on the power source is in the "ON" position.
	2. Fuse F1 (in reconnect area) may have blown.	2. Power Down and replace the fuse.
	3. Circuit breaker CB1 (on the control panel) may have tripped.	3. Power Down and reset CB1.
	4. Improper input voltage selection (multiple input voltage machines only).	4. Power down, check input voltage reconnect according to diagram on reconnect cover.
Machine won't weld, can't get any output. This problem will normally be accompanied by an error code. Error codes are displayed as a series of red and green flashes by the status light(s). See "Status Light" section of this document for additional information.	1. Input voltage is too low or too high.	1. Make certain that input voltage is correct, according to the Rating Plate located on the rear of the machine.
	2. Thermal Error.	2. See "Thermal LED is ON" section.
	3. Primary current limit has been exceeded. (the main contactor drops out when output is initiated – see error 31).	3. Possible short in output circuit. Turn machine off. Remove all loads from the output of the machine. Turn back on, and activate output. If condition persists, turn power off, and contact an authorized Lincoln Electric Field Service facility.
	4. Inverter Fault - switch pc board, contactor problem, etc.	4. Contact your local authorized Lincoln Electric Field Service facility for technical assistance.

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.

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Observe all Safety Guidelines detailed throughout this manual		
PROBLEMS (SYMPTOMS)	**POSSIBLE CAUSE**	**RECOMMENDED COURSE OF ACTION**
BASIC MACHINE PROBLEMS		
Thermal LED is ON.	1. Improper fan operation.	1. Check for proper fan operation. (Fans should run whenever output power is on.) Check for material blocking intake or exhaust louvers, or for excessive dirt clogging cooling channels in machine.
	2. Output Rectifier board or Choke thermostat.	2. After machine has cooled, reduce load, duty cycle, or both. Check for material blocking intake or exhaust louvers and heat sink fins.
	3. DC Bus PC board thermostat.	3. Check for excessive load on 40VDC supply.
	4. Open thermostat circuit.	4. Check for broken wires, open connections or faulty thermostats on the DC Bus and Output Rectifier heat sinks, and Choke assembly.

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.
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Observe all Safety Guidelines detailed throughout this manual		
PROBLEMS (SYMPTOMS)	**POSSIBLE CAUSE**	**RECOMMENDED COURSE OF ACTION**
WELD AND ARC QUALITY PROBLEMS		
General degradation of weld performance.	1. Wire feed problem.	1. Check for feeding problems. Check actual WFS vs. preset. Verify proper wire drive and gear ratio has been selected.
	2. Cabling problems.	2. Check for bad connections, excessive loops in cable, etc. NOTE: The presence of heat in the external welding circuit indicates poor connections or undersized cables.
	3. Loss of, or improper Shielding Gas.	3. Verify gas flow and type are correct.
	4. Verify weld mode is correct for process.	4. Select the correct weld mode for the application.
	5. Machine calibration.	5. Verify the calibration of the output current and voltage.
	6. Secondary current limit has been reached.	6. Adjust procedure to reduce output demand.
Wire burns back to tip when the arc is initiated.	1. Voltage sense lead problem.	1. Check sense lead connections. Check the sense lead configuration and arc polarity. Make sure Electrode and Work connections are not reversed.
	2. Wire feed problem.	2. Check for feeding problems. Verify proper wire drive and gear ratio has been selected.
Wire burns back to tip at the end of the weld.	1. Burnback Time.	1. Reduce burnback time and/or workpoint.
Machine output shuts down during a weld.	1.Inverter or System Fault	1. A non-recoverable inverter fault will interrupt welding, and open the main contactor. This condition will also result in an alternating red and green status light on the control panel. See the Status Light section for more information.
Machine won't produce full output.	1. Input voltage may be too low, limiting output capability of the power source.	1. Make certain that the input voltage is proper, according to the Rating Plate located on the rear of the machine.
	2. Machine calibration.	2. Calibrate secondary current and voltage.

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.

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Observe all Safety Guidelines detailed throughout this manual		
PROBLEMS (SYMPTOMS)	**POSSIBLE CAUSE**	**RECOMMENDED COURSE OF ACTION**
WELD AND ARC QUALITY PROBLEMS		
Excessively long and erratic arc.	1. Wire feed problem.	1. Check for feeding problems. Verify proper wire drive and gear ratio has been selected.
	2. Voltage sensing problem.	2. Check sense lead connections. Check the sense lead configuration and arc polarity. Make sure Electrode and Work connections are not reversed.
	3. Loss of, or improper Shielding Gas.	3. Verify gas flow and type are correct.
	4. Machine calibration.	4. Calibrate secondary current and voltage.
Arc loss fault on robot.	1. Possibly caused by wire feeding problem.	1. Check for feeding problems. Verify proper wire drive and gear ratio has been selected. For larger diameter wire, consider the highest torque / lowest range gear ratio available to suit the application.
	2. Conduit leading to the wire feeder has bends or twists, which can reduce the wire feed speed.	2. Remove bends and twists in conduit leading to the feeder.
	3. Conduit leading up to the wire feeder from the wire reel is too long.	3. Use a shorter piece of conduit.
DEVICENET - PLC CONTROLLED SYSTEM		
Bad Weld Starting.	1. Wire Feed problem	1. Verify Feeders drive roll tension is not too low allowing the wire to slip in the rolls. Verify wire can be pulled easily through the wire conduit. Verify Contact tip is not blocked.
	2. Strike Wire Feed Speed	2. Verify the Strike Wire Feed Speed set correctly.
	3. Incorrect Weld Schedule	3. Verify the correct weld schedule is selected.
	4. Voltage Sense Leads	4. Verify voltage sense leads are properly connected and configured as described in the instruction manual.
	5. Gas	5. Verify Gas is being turned on before the output.
Gas purge not working.	1. Out of gas.	1. Verify there is gas available at the input of the gas solenoid.
	2. Gas Lines.	2. Verify nothing is obstructing the flow of gas.

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.
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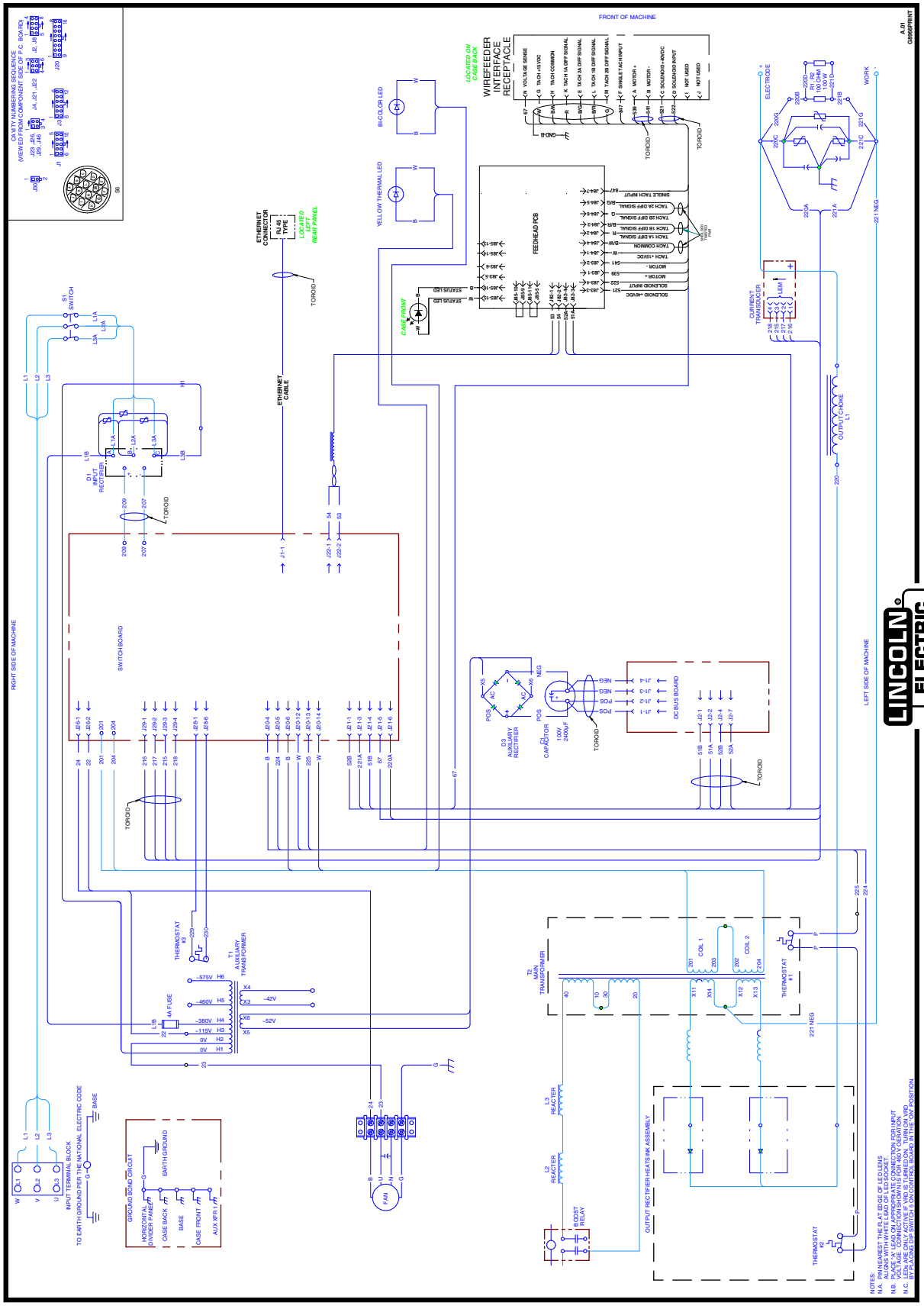
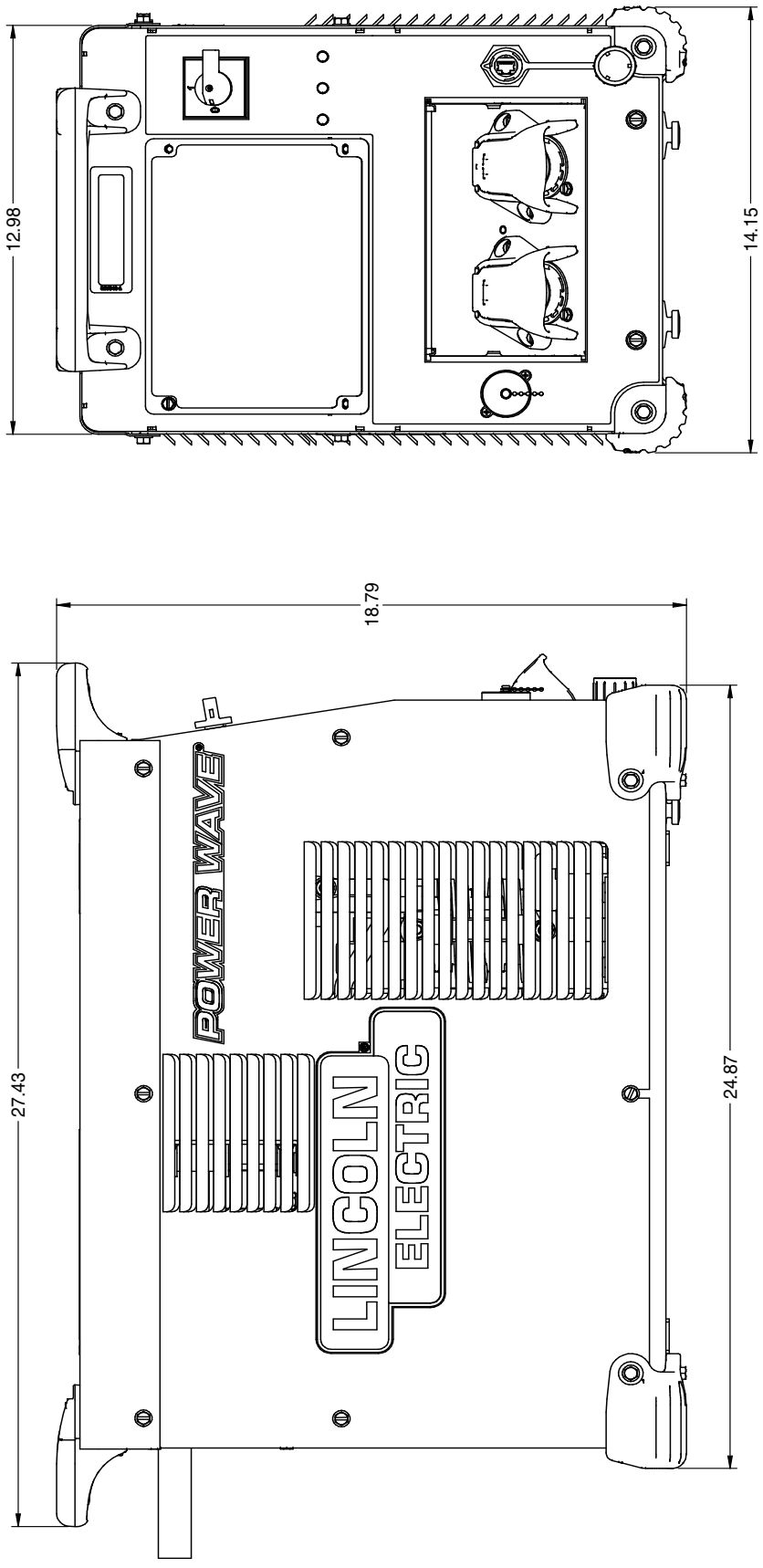
Observe all Safety Guidelines detailed throughout this manual		
PROBLEMS (SYMPTOMS)	**POSSIBLE CAUSE**	**RECOMMENDED COURSE OF ACTION**
ETHERNET		
Cannot Connect.	1. Physical connection.	1. Verify that the correct patch cable or cross over cable is being used (refer to local IT department for assistance). • Verify the cables are fully inserted into the bulk head connector.
	2. IP address information.	2. Use Weld Manager (included on the POWER WAVE® Utilities or available at www.powerwavesoftware.com) to verify the correct IP address information has been entered. NOTE: • The Power Wave E500 has a default static IP address of 192.16.8.0.2. • Verify no duplicate the IP addresses exist on the network.
Connection Drops while welding.	1. Cable Location.	1. Verify Network cable is not located next to current carrying conductors. This would include input power cables and welding output cables.

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.
WWW.LINCOLNELECTRIC.COM/LOCATOR

Power Wave E500 WIRING DIAGRAM



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The specific diagram for a particular code is pasted inside the machine on one of the enclosure panels. If the diagram is illegible, write to the Service Department for a replacement. Give the equipment code number.



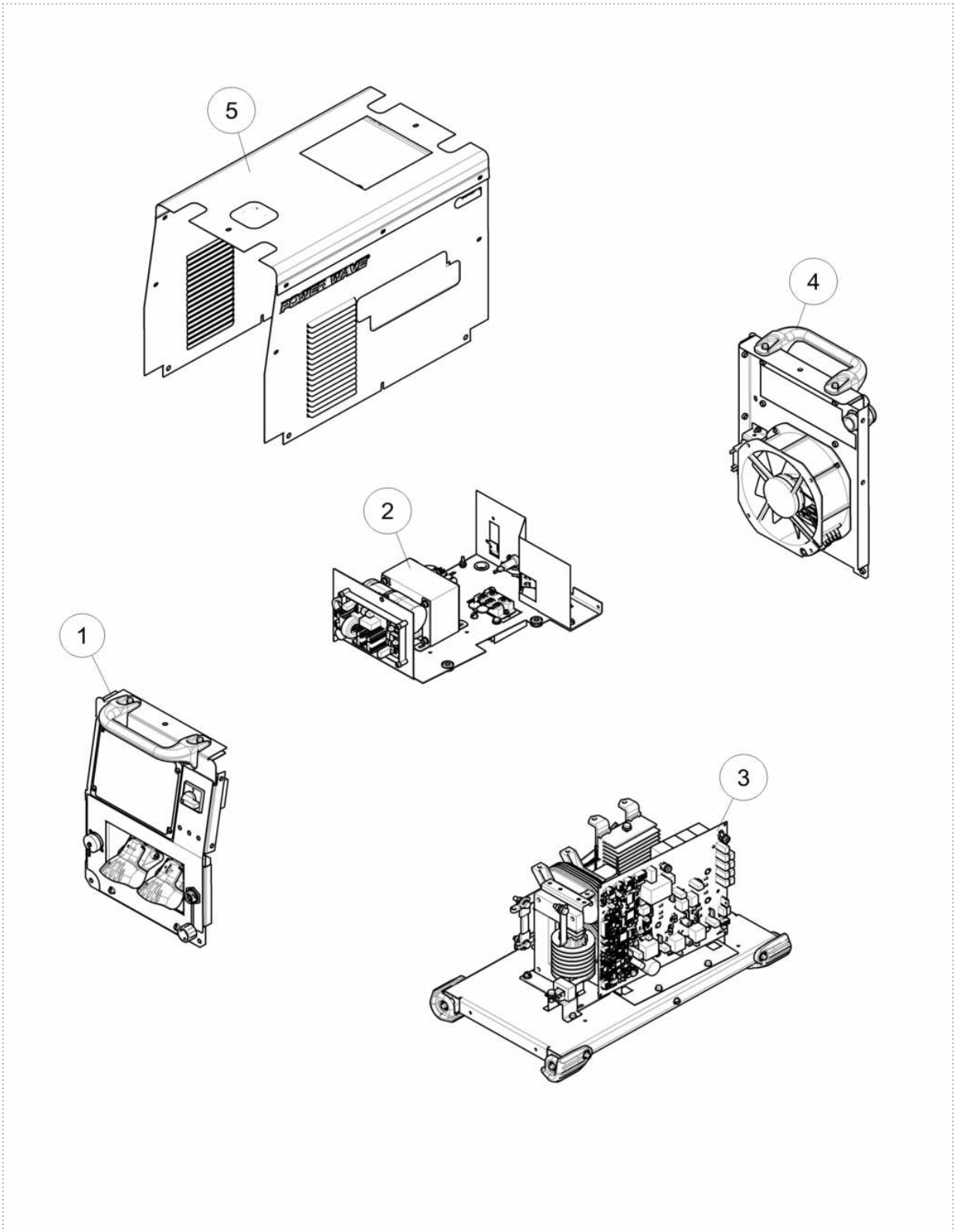
L17181

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The specific diagram for a particular code is pasted inside the machine on one of the enclosure panels. If the diagram is illegible, write to the Service Department for a replacement. Give the equipment code number.

Index of Sub Assemblies - 12643

KEY	PART NUMBER	DESCRIPTION	QTY
	P-1084-A	INDEX OF SUB ASSEMBLIES	AR
1	P-1084-C	CASE FRONT ASSEMBLY	AR
2	P-1084-D	DIVIDER PANEL ASSEMBLY	AR
3	P-1084-E	BASE & CENTER ASSEMBLY	AR
4	P-1084-F	CASE BACK ASSEMBLY	AR
5	P-1084-G	WRAPAROUND ASSEMBLY	AR

Index of Sub Assemblies - 12643



P-1084-A.jpg

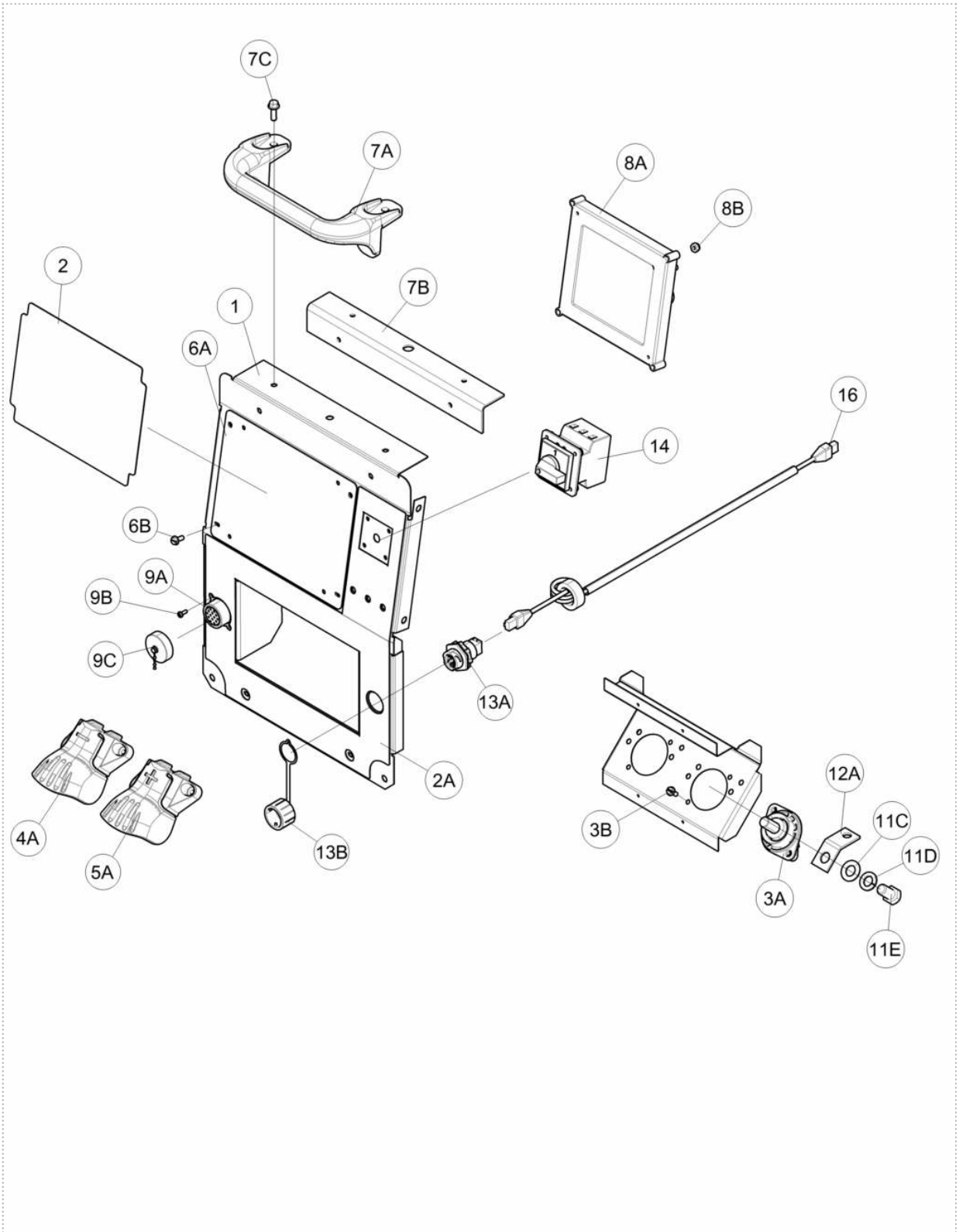
Case Front Assembly

KEY	PART NUMBER	DESCRIPTION	QTY
	9SG8969	CASE FRONT ASSEMBLY	1
1	9SG8959	CASE FRONT	1
2	9SG8970	NAMEPLATE	1
2A	9SG8970	NAMEPLATE	1
3A	9SS16656-4	OUTPUT TERMINAL ASBLY	2
3B	9SCF000371	#10-24X.50HHCS-FULL-GR2-3147	4
4A	9SG6864-1	NEGATIVE OUTPUT STUD COVER	1
	9SS9225-100	SELF TAPPING SCREW	2
	9SS9262-184	WASHER	2
5A	9SG6864-2	POSITIVE OUTPUT STUD COVER	1
	9SS9225-100	SELF TAPPING SCREW	2
	9SS9262-184	WASHER	2
6A	9SS32107	COVER PLATE	1
6B	9SS9225-99	SELF TAPPING SCREW	4
7A	9SG6525-3	HANDLE	1
7B	9SM24995	REAR HANDLE SUPPORT BRACKET	1
7C	9SS9225-66	SELF TAPPING SCREW	4
8A	9SS28626-5	FEEDHEAD PC BD ASBLY	1
8B	9ST9187-13	#10-24HLN-1817/1-NYLON INSERT	4
	9SG8964	MAIN CONTROL HARNESS	1
9A	9SS12021-72	BOX RECEPTACLE SOLID SHELL	1
9B	9SS8025-96	SELF TAPPING SCREW	2
9C	9SS17062-11	CABLE CONNECTOR CAP	1
	9SCF000010	#10-24HN	4
	9SE106A-1	LOCKWASHER	2
	9SS26124	GROUND REFERENCE	1
	9SS28393-3	OUTPUT SNUBBER ASBLY	1
	9SS18858-5	SUPPRESSOR ASBLY	1
11C	9SS9262-1	PLAIN WASHER	1
11D	9SE106A-15	LOCKWASHER	1
11E	9SCF000344	HEX HD SCREW	1
12A	9SS30151	POSITIVE OUTPUT STUD LEAD	1
	9SS18858-5	SUPPRESSOR ASBLY	1
	9SS9262-1	PLAIN WASHER	1

Case Front Assembly

KEY	PART NUMBER	DESCRIPTION	QTY
	9SE106A-15	LOCKWASHER	1
	9SCF000344	HEX HD SCREW	1
13A	9SM19969-9	ETHERNET RECEPTACLE BULKHEAD	1
13B	9SM19969-4	ETHERNET RECEPTACLE COVER	1
14	9SS28834-2	LINE SWITCH LEAD ASSEMBLY	1
	9SS9225-68	THREAD FORMING SCREW (CUTTING)	2
	9SS9262-183	PLAIN WASHER	2
	9SS9225-66	SELF TAPPING SCREW	2
16	9SM19969-16	ETHERNET PATCH CABLE ASSEMBLY	1

Case Front Assembly



P-1084-C.jpg

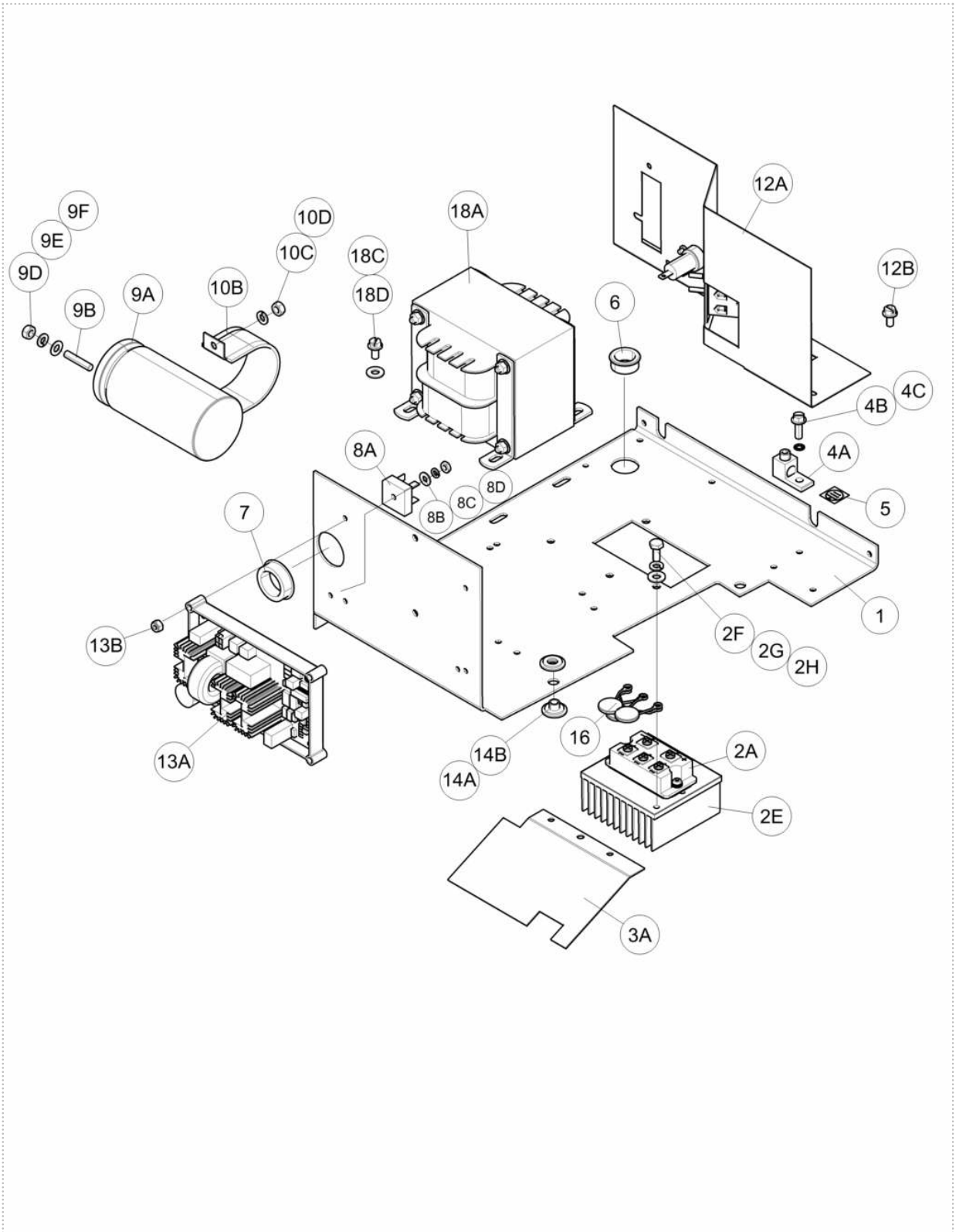
Divider Panel Assembly

KEY	PART NUMBER	DESCRIPTION	QTY
	9SG8962	DIVIDER PANEL ASSEMBLY	1
1	9SG7808	DIVIDER PANEL	1
	9SM22062-2	INPUT RECTIFIER ASSEMBLY	1
2A	9SM15454-18	INPUT RECTIFIER MODULE	1
	9SS9262-3	PLAIN WASHER	2
	9SE106A-1	LOCKWASHER	2
	9SS25930-5	TORX BUTTON HEAD SCREW #10-24X.62	2
2E	9SS24574-1	INPUT HEATSINK	1
2F	9SS9262-98	PLAIN WASHER	2
2G	9SE106A-2	LOCKWASHER	2
2H	9SCF000013	1/4-20X.625HHCS	2
3A	9SM25066	AIR DEFLECTER	1
	9SS9225-68	THREAD FORMING SCREW (CUTTING)	2
4A	9SS28841	GROUND LUG	1
4B	9SS9225-45	THREAD FORMING SCREW	1
4C	9ST9695-17	LOCKWASHER	1
5	9ST13260-4	DECAL-EARTH GROUND CONN	1
6	9ST12380-4	BUSHING	1
7	9ST12380-8	BUSHING	1
8A	9ST13637-6	DIODE-BRIDGE35A400VF-W1-PH	1
8B	9SS9262-27	PLAIN WASHER	1
8C	9SE106A-1	LOCKWASHER	1
8D	9SCF000010	#10-24HN	1
9A	9SS13490-157	CAPACITOR-ALEL24000100V+300/-10%	1
9B	9SS11604-65	SET SCREW	2
	9SS18250-955	PLUG & LEAD ASBLY	1
9D	9SS9262-23	PLAIN WASHER	2
9E	9SE106A-2	LOCKWASHER	2
9F	9SCF000198	1/4-28HN	2
	9SS22745-3	CAPACITOR INSULATION	1
10B	9SS27974	CAPACITOR BRACKET	1
10C	9SE106A-2	LOCKWASHER	2
10D	9SCF000017	1/4-20HN	2
	9SCF000010	#10-24HN	2

Divider Panel Assembly

KEY	PART NUMBER	DESCRIPTION	QTY
	9SE106A-1	LOCKWASHER	1
12A	9SM26272	RECONNECT PANEL ASSEMBLY	1
12B	9SS9225-68	THREAD FORMING SCREW (CUTTING)	3
13A	9SL16423-1	40 V BUS PC BD ASBLY	1
13B	9ST9187-13	#10-24HLN-1817/1-NYLON INSERT	4
14A	9ST11267-A	INSULATOR	2
14B	9ST11267-B	INSULATOR	2
	9ST10728-77	FUSE (4A)	1
16	9SS18491-1	MOV ASBLY	1
	9SS18250-1074	PLUG & LEAD ASBLY	1
	9SM26138	AUXILIARY TRANSFORMER & THERMOSTAT ASSEM	1
18A	9SS13000-129	AUXILIARY TRANSFORMER	1
	9ST13359-15	THERMOSTAT	1
18C	9SS9225-32	THREAD FORMING SCREWS	4
18D	9SS9262-98	PLAIN WASHER	4
	9SS9225-68	THREAD FORMING SCREW (CUTTING)	2

Divider Panel Assembly



P-1084-D.jpg

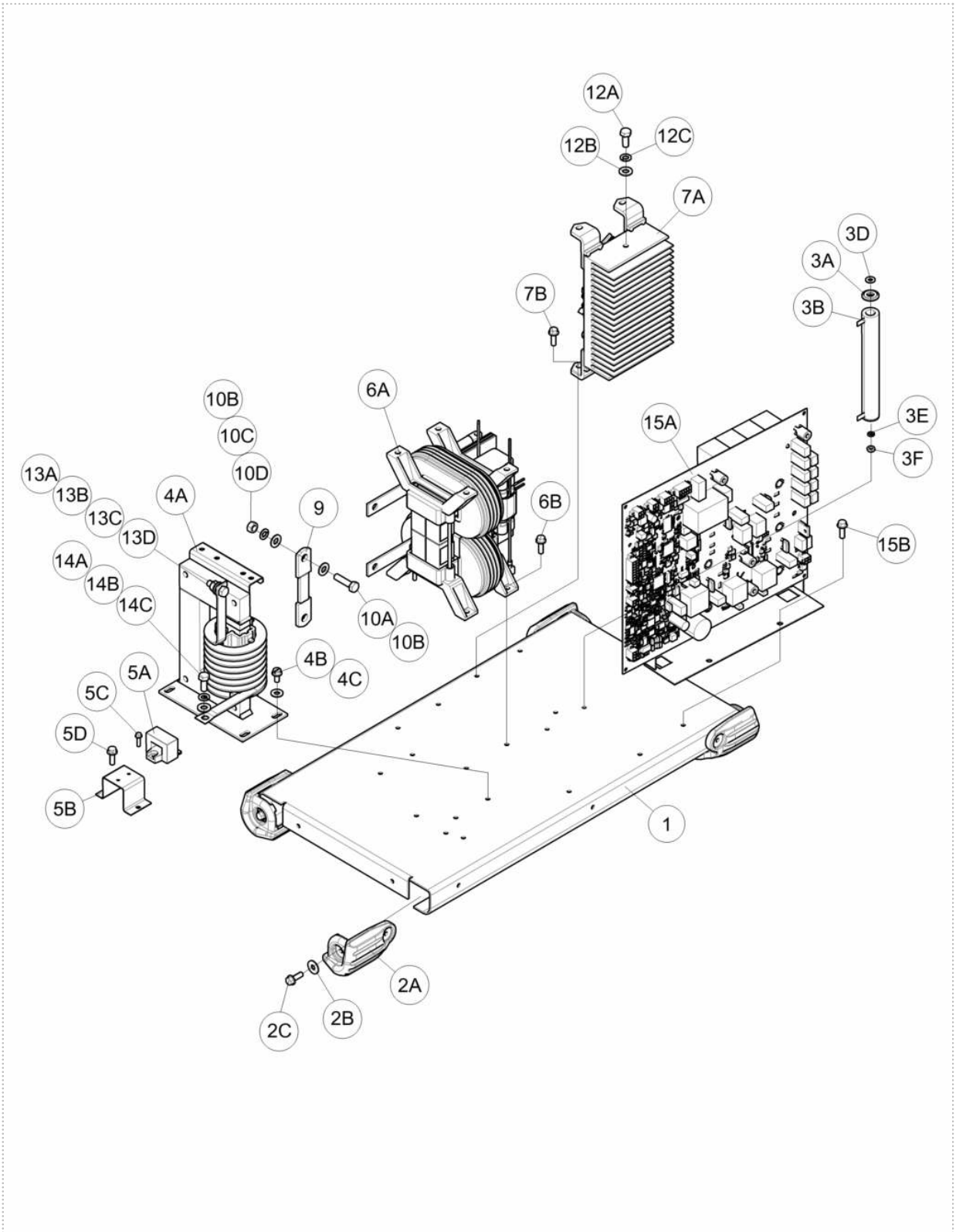
Base & Center Assembly

KEY	PART NUMBER	DESCRIPTION	QTY
	9SG8967	BASE & CENTER ASSEMBLY	1
1	9SG7791	BASE	1
2A	9SL13138	CORNER CAP	4
2B	9SS9262-183	PLAIN WASHER	4
2C	9SS9225-66	SELF TAPPING SCREW	4
3A	9ST11267-A	INSULATOR	4
3B	9SS10404-127	RESISTORWW100W1005%	2
	9SCF000191	#10-24X7.50RHS	2
3D	9SS9262-27	PLAIN WASHER	4
3E	9SE106A-1	LOCKWASHER	2
3F	9SCF000010	#10-24HN	2
4A	9SL16500	CHOKE ASBLY	1
4B	9SS9225-66	SELF TAPPING SCREW	3
4C	9SS9262-98	PLAIN WASHER	3
5A	9SS31590	CURRENT TRANSDUCER ASBLY	1
5B	9SS30871	LEM SUPPORT	1
5C	9SS8025-77	SELF TAPPING SCREW	1
5D	9SS9225-66	SELF TAPPING SCREW	1
	9SL11452-8	PLUG & LEAD ASBLY	2
6A	9SG7848	TRANSFORMER ASBLY	1
6B	9SS9225-66	SELF TAPPING SCREW	3
7A	9SM24999	OUTPUT RECTIFIER ASBLY	1
7B	9SS9225-66	SELF TAPPING SCREW	2
	9SS23730-3	SPACER	2
	9SCF000015	1/4-20X1.00HHCS	2
	9SS9262-98	PLAIN WASHER	2
	9SE106A-2	LOCKWASHER	2
9	9SS28206-13	BRAIDED LEAD	1
10A	9SCF000028	5/16-18X1.25HHCS	1
10B	9SS9262-30	PLAIN WASHER	2
10C	9SE106A-3	LOCKWASHER	1
10D	9SCF000029	5/16-18HN	1
	9SCF000028	5/16-18X1.25HHCS	1
	9SS9262-30	PLAIN WASHER	2

Base & Center Assembly

KEY	PART NUMBER	DESCRIPTION	QTY
	9SE106A-3	LOCKWASHER	1
	9SCF000029	5/16-18HN	1
12A	9SCF000040	5/16-18X.75HHCS	1
12B	9SS9262-30	PLAIN WASHER	1
12C	9SE106A-3	LOCKWASHER	1
13A	9SCF000028	5/16-18X1.25HHCS	1
13B	9SS9262-30	PLAIN WASHER	2
13C	9SE106A-3	LOCKWASHER	1
13D	9SCF000029	5/16-18HN	1
14A	9SCF000040	5/16-18X.75HHCS	1
14B	9SS9262-30	PLAIN WASHER	1
14C	9SE106A-3	LOCKWASHER	1
15A	9SG8986	SWITCHBOARD ASSEMBLY	1
15B	9SS9225-66	SELF TAPPING SCREW	2
	9SS18250-1063	PLUG & LEAD ASBLY	1

Base & Center Assembly

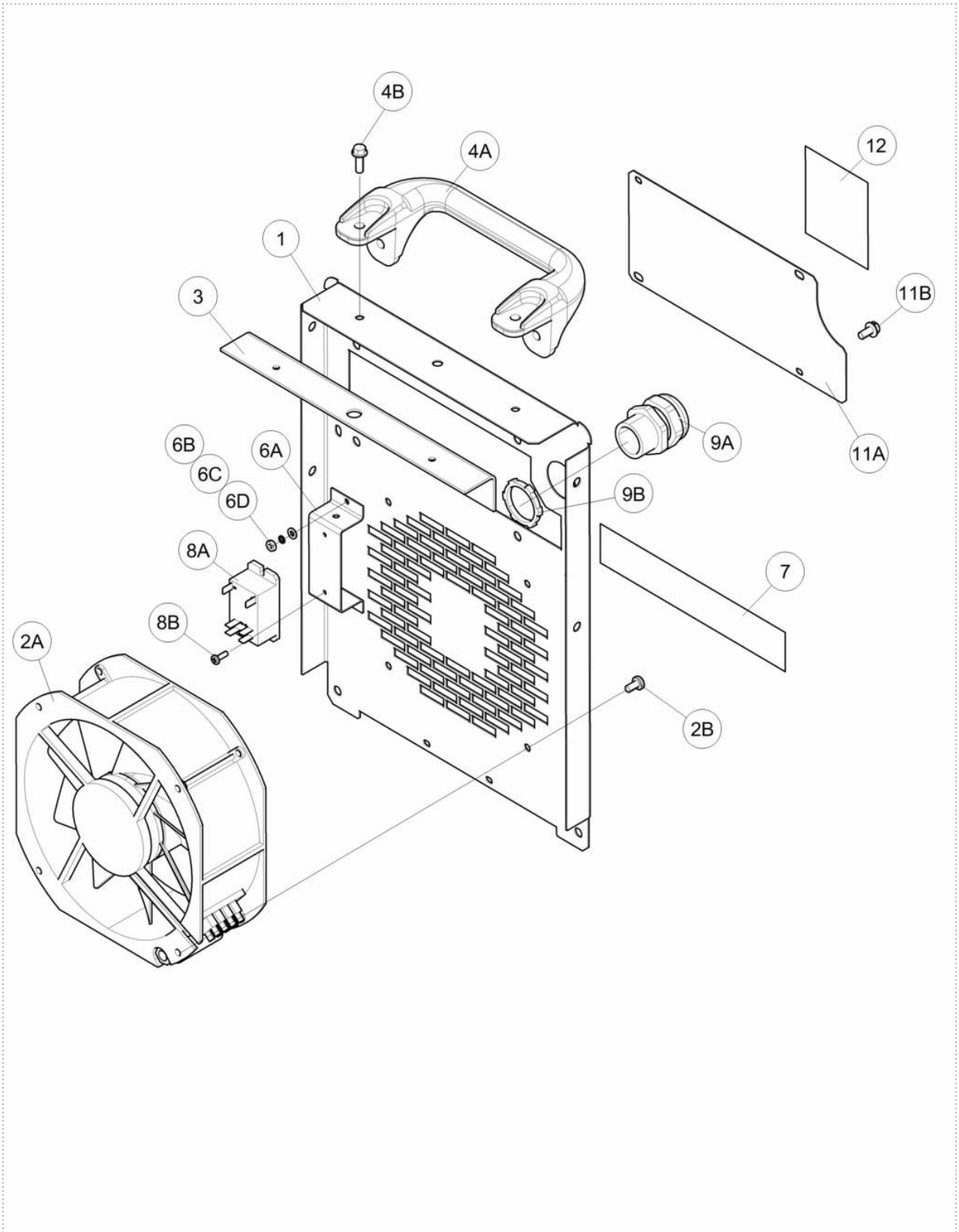


P-1084-E.jpg

Case Back Assembly

KEY	PART NUMBER	DESCRIPTION	QTY
	9SG8992	CASE BACK ASSEMBLY	1
1	9SG7795	CASE BACK	1
2A	9SM25055	FAN	1
2B	9SS25930-14	M6 X 1.00 TBHS-FULL-4554	4
3	9SM24995	REAR HANDLE SUPPORT BRACKET	1
4A	9SG6525-3	HANDLE	1
4B	9SS9225-66	SELF TAPPING SCREW	4
	9SS18250-1062	PLUG & LEAD ASBLY	1
6A	9SS30907	RELAY SUPPORT	1
6B	9SS9262-3	PLAIN WASHER	2
6C	9ST4291-A	LOCKWASHER	2
6D	9SCF000042	#8-32HN	2
7	9SS22752-46	RATING PLATE	1
8A	9SS15122-15	RELAY	1
8B	9SS8025-98	SELF TAPPING SCREW	2
9A	9SS19999	CORD GRIP CONNECTOR	1
9B	9ST14370-3	CONDUIT LOCKNUT	1
	9SS9225-68	THREAD FORMING SCREW (CUTTING)	2
	9SS9262-183	PLAIN WASHER	2
	9SS9225-66	SELF TAPPING SCREW	2
11A	9SS29938	RECONNECT PANEL COVER	1
11B	9SS9225-68	THREAD FORMING SCREW (CUTTING)	4
12	9ST13259-4	GROUNDING DECAL	1

Case Back Assembly

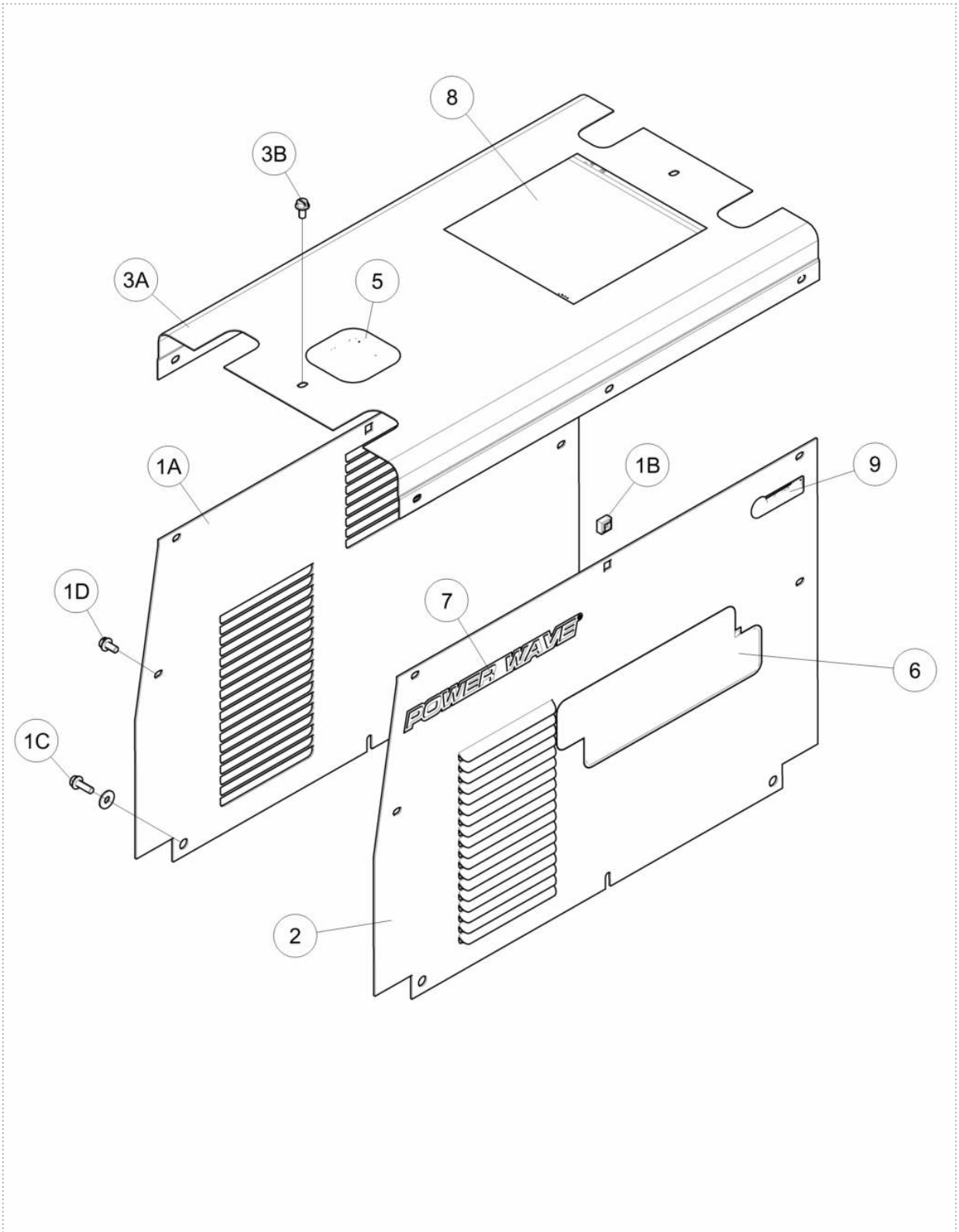


P-1084-F.jpg

Wraparound Assembly

KEY	PART NUMBER	DESCRIPTION	QTY
1A	9SG7801	LEFT CASE SIDE	1
1B	9ST10097-5	SPEED GRIP NUT RETAINER	2
1C	9SS9225-66	SELF TAPPING SCREW	4
1D	9SS9225-68	THREAD FORMING SCREW (CUTTING)	6
1E	9SS9262-183	PLAIN WASHER	2
2	9SG7802	RIGHT CASE SIDE	1
3A	9SG7798	ROOF	1
3B	9SS9225-68	THREAD FORMING SCREW (CUTTING)	3
	9SG8035	WIRING DIAGRAM	1
5	9SS30277-2	WARRANTY DECAL	1
6	9SS27368-4	DECAL LE LOGO	2
7	9SS27468	POWERWAVE LOGO	2
8	9SS20601-6	WARNING DECAL	1
9	9SS28039-2	DECAL GREEN INITIATIVE	1

Wraparound Assembly



P-1084-G.jpg

			
WARNING	● Do not touch electrically live parts or electrode with skin or wet clothing. ● Insulate yourself from work and ground.	● Keep flammable materials away.	● Wear eye, ear and body protection.
Spanish **AVISO DE PRECAUCION**	● No toque las partes o los electrodos bajo carga con la piel o ropa mojada. ● Aislese del trabajo y de la tierra.	● Mantenga el material combustible fuera del área de trabajo.	● Protéjase los ojos, los oídos y el cuerpo.
French **ATTENTION**	● Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension. ● Isolez-vous du travail et de la terre.	● Gardez à l'écart de tout matériel inflammable.	● Protégez vos yeux, vos oreilles et votre corps.
German **WARNUNG**	● Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! ● Isolieren Sie sich von den Elektroden und dem Erdboden!	● Entfernen Sie brennbarres Material!	● Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese **ATENÇÃO**	● Não toque partes elétricas e electrodos com a pele ou roupa molhada. ● Isole-se da peça e terra.	● Mantenha inflamáveis bem guardados.	● Use proteção para a vista, ouvido e corpo.
Japanese **注意事項**	● 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。 ● 施工物やアースから身体が絶縁されている様にして下さい。	● 燃えやすいものの側での溶接作業は絶対にしてはなりません。	● 目、耳及び身体に保護具をして下さい。
Chinese **警 告**	● 皮肤或濕衣物切勿接觸帶電部件及銲條。 ● 使你自己與地面和工件絕緣。	● 把一切易燃物品移離工作場所。	● 佩戴眼、耳及身體勞動保護用具。
Korean **위 험**	● 전도체나 용접봉을 젖은 헝겁 또는 피부로 절대 접촉치 마십시요. ● 모재와 접지를 접촉치 마십시요.	● 인화성 물질을 접근 시키지 마시요.	● 눈, 귀와 몸에 보호장구를 착용하십시요.
Arabic **تحذير**	● لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الالكترود بجلد الجسم أو بالملابس المبللة بالماء. ● ضع عازلا على جسمك خلال العمل.	● ضع المواد القابلة للاشتعال في مكان بعيد.	● ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.

READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.

SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.

LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.

LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.

			
● Keep your head out of fumes. ● Use ventilation or exhaust to remove fumes from breathing zone.	● Turn power off before servicing.	● Do not operate with panel open or guards off.	**WARNING**
● Los humos fuera de la zona de respiración. ● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases.	● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.	● No operar con panel abierto o guardas quitadas.	Spanish **AVISO DE PRECAUCION**
● Gardez la tête à l'écart des fumées. ● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.	● Débranchez le courant avant l'entretien.	● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.	French **ATTENTION**
● Vermeiden Sie das Einatmen von Schweibrauch! ● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!	● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)	● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!	German **WARNUNG**
● Mantenha seu rosto da fumaça. ● Use ventilação e exhaustão para remover fumo da zona respiratória.	● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas.	● Mantenha-se afastado das partes moventes. ● Não opere com os paineis abertos ou guardas removidas.	Portuguese **ATENÇÃO**
● ヒュームから頭を離すようにして下さい。 ● 換気や排煙に十分留意して下さい。	● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切って下さい。	● パネルやカバーを取り外したままで機械操作をしないで下さい。	Japanese **注意事項**
●頭部遠離煙霧。 ●在呼吸區使用通風或排風器除煙。	●維修前切斷電源。	●儀表板打開或沒有安全罩時不準作業。	Chinese **警 告**
● 얼굴로부터 용접가스를 멀리하십시요. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시요.	● 보수전에 전원을 차단하십시요.	● 판넬이 열린 상태로 작동치 마십시요.	Korean **위 험**
● ابعد رأسك بعيداً عن الدخان. ● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها.	● اقطع التيار الكهربائي قبل القيام بأية صيانة.	● لا تشغل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه.	Arabic **تحذير**

LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

請詳細閱讀並理解製造廠提供的説明以及應該使用的銀捍材料，並請遵守貴方的有関勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

اقرأ بتمعن وافهم تعليمات المصنع المنتج لهذه المعدات والمواد قبل استعمالها واتبع تعليمات الوقاية لصاحب العمل.

CUSTOMER ASSISTANCE POLICY

The business of The Lincoln Electric Company is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for advice or information about their use of our products. We respond to our customers based on the best information in our possession at that time. Lincoln Electric is not in a position to warrant or guarantee such advice, and assumes no liability, with respect to such information or advice. We expressly disclaim any warranty of any kind, including any warranty of fitness for any customer's particular purpose, with respect to such information or advice. As a matter of practical consideration, we also cannot assume any responsibility for updating or correcting any such information or advice once it has been given, nor does the provision of information or advice create, expand or alter any warranty with respect to the sale of our products.

Lincoln Electric is a responsive manufacturer, but the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric affect the results obtained in applying these types of fabrication methods and service requirements.

Subject to Change – This information is accurate to the best of our knowledge at the time of printing. Please refer to www.lincolnelectric.com for any updated information.

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