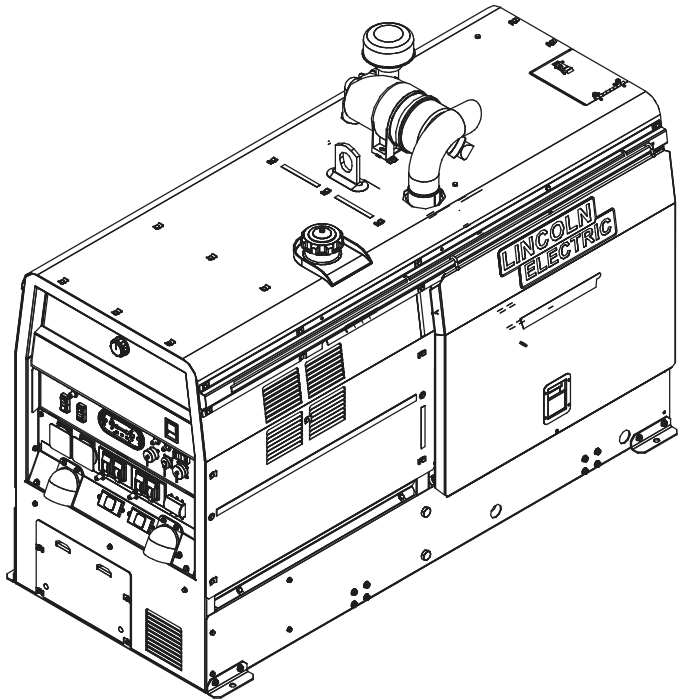


# Operator's Manual

# Vantage<sup>®</sup> 435



For use with machines having Code Numbers:  
**12851**



**Register your machine:**  
[www.lincolnelectric.com/register](http://www.lincolnelectric.com/register)

**Authorized Service and Distributor Locator:**  
[www.lincolnelectric.com/locator](http://www.lincolnelectric.com/locator)

**Save for future reference**

Date Purchased

Code: (ex: 10859)

Serial: (ex: U1060512345)

**Need Help? Call 1.888.935.3877**  
to talk to a Service Representative

**Hours of Operation:**  
8:00 AM to 6:00 PM (ET) Mon. thru Fri.

**After hours?**  
Use "Ask the Experts" at [lincolnelectric.com](http://lincolnelectric.com)  
A Lincoln Service Representative will contact you  
no later than the following business day.

**For Service outside the USA:**  
Email: [globalservice@lincolnelectric.com](mailto:globalservice@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.

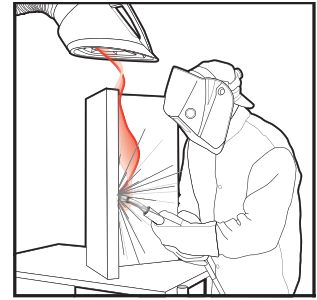
**READ** and obey the Safety Data Sheet (SDS) and the warning label that appears on all containers of welding materials.

**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.P65warnings.ca.gov/diesel](http://www.P65warnings.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](http://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 Z87.1 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.



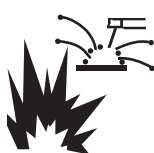
## FUMES AND GASES CAN BE DANGEROUS.



- 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-1, "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.**

<b>Installation</b> .....	<b>Section A</b>
General Description .....	A-1
Technical Specifications .....	A-1
Safety Precautions .....	A-2
VRD (Voltage Reduction Device) .....	A-2
Location and Ventilation .....	A-2
Storing .....	A-2
Stacking .....	A-2
Angle of Operation .....	A-3
Lifting .....	A-3
High Altitude Operation .....	A-3
High Temperature Operation .....	A-3
Cold Weather Starting .....	A-3
Towing .....	A-4
Vehicle Mounting .....	A-4
Pre-Operation Engine Service .....	A-4
Oil .....	A-4
Fuel .....	A-4
Engine Cooling System .....	A-4
Battery Connection .....	A-4
Exhaust Outlet Pipe .....	A-5
Spark Arrestor .....	A-5
Air Cleaner Install .....	A-5
Remote Control .....	A-6
Welding Terminals .....	A-6
Welding Output Cables .....	A-6
Pulse Welding .....	A-6
Cable Installation .....	A-6
Machine Grounding .....	A-7
Auxiliary Power Receptacles .....	A-7
Standby Power Connections .....	A-8
Connection of Vantage® 435 to Premises Wiring .....	A-8
Connection of Lincoln Electric Wire Feeders .....	A-9 - A-10
Connection of LF-72, LF-74, Flex Feed 74 HT, Flex Feed 84 to Vantage® 435 .....	A-9
Connection of Across the Arc Wire Feeders to Vantage® 435 .....	A-10
Cable Inductance and its Effects on Welding .....	A-11
Control Cable Connections .....	A-11
<b>Operation</b> .....	<b>Section B</b>
Safety Instructions .....	B-1
Recommended Applications .....	B-1
Controls and Settings .....	B-2
Engine Controls .....	B-2, B-3
Stop/(Low Idle/Run)/(High Idle/Run) Switch .....	B-2
Start Switch .....	B-3
Dash Board Gauge .....	B-3
Output Control .....	B-3
VRD Indicator Lights .....	B-3
Welder Controls .....	B-4 - B-9
Digital Output Meters .....	B-4
Hidden Menu Button .....	B-4
Hidden Setup Menu Functions .....	B-4
Exiting Hidden Menu Button .....	B-6
Weld Terminals On Switch .....	B-7
Door Latch .....	B-7
Arc Control .....	B-7
Weld Mode Selector Switch .....	B-7
42V / 115V Wire Feeder Voltage Switch .....	B-7
42V and 115V Wire Feeder Breakers .....	B-7
5-Pin Connector .....	B-7
12-Pin Connector .....	B-7
14-Pin Connector .....	B-7
Weld Output Terminals “+” Positive and “-” Negative .....	B-7
Local / Remote Switch .....	B-7
Polarity Switch .....	B-7
20A 120V Auxiliary Breakers .....	B-8
50A 240V 3 Phase Breaker .....	B-8
Battery 20A Breaker .....	B-8
240VAC Three Phase Breaker .....	B-8
120/240 VAC Single Phase Receptacle .....	B-8
10A 42V/40V ArcLink Breakers .....	B-8
Circuit Breakers .....	B-8

	Page
Ground Stud . . . . .	B-8
Diagnostic Plug . . . . .	B-8
Status LED . . . . .	B-9
Welder Operation . . . . .	B-10
Duty Cycle . . . . .	B-10
Stick Welding Mode . . . . .	B-10
CC-Stick Mode . . . . .	B-10
Downhill Pipe Mode . . . . .	B-10
Typical Fuel Consumption . . . . .	B-10
Touch Start TIG Mode . . . . .	B-10
Common Welding Procedures . . . . .	B-11
Making a Weld . . . . .	B-11
Definition of Welding Modes . . . . .	B-11
Non-Synergic Welding Modes . . . . .	B-11
Synergic Welding Modes . . . . .	B-11
Basic Welding Controls . . . . .	B-11
Weld Mode . . . . .	B-11
Wire Feed Speed (WFS) . . . . .	B-11
Amps . . . . .	B-11
Volts . . . . .	B-11
Trim . . . . .	B-11
UltimArc™ Control . . . . .	B-11
Pulse Welding . . . . .	B-11
VANTAGE® Settings when using K930-2 TIG Module . . . . .	B-13
Typical Current Ranges for Tungsten Electrodes . . . . .	B-13
CV-Wire Mode . . . . .	B-14
Constant Voltage Welding . . . . .	B-14
Synergic CV . . . . .	B-14
Non Synergic CV . . . . .	B-14
Arc Gouging . . . . .	B-14
Paralleling . . . . .	B-14
Auxiliary Power Operation . . . . .	B-14
Simultaneous Welding and Auxiliary Power Loads . . . . .	B-14
Extension Cord Length Recommendations Tables . . . . .	B-15
Weld Set Reference Chart . . . . .	B-16
<b>Accessories</b> . . . . .	<b>Section C</b>
Optional Field Installed Accessories . . . . .	C-1
Wire Feeder Options . . . . .	C-2
<b>Maintenance</b> . . . . .	<b>Section D</b>
Safety Precautions . . . . .	D-1
Routine and Periodic Maintenance . . . . .	D-1
Engine Maintenance . . . . .	D-1
Air Filter . . . . .	D-1
Service Instructions- Air Cleaner . . . . .	D-2
Fuel Filters . . . . .	D-3
Cooling System . . . . .	D-3
Battery Handling . . . . .	D-3
Preventing Electrical Damage . . . . .	D-3
Preventing Battery Discharge . . . . .	D-3
Preventing Battery Buckling . . . . .	D-3
Charging the Battery . . . . .	D-4
Nameplates / Warning Decals . . . . .	D-4
Welder / Generator Maintenance . . . . .	D-4
Replacement Service Items . . . . .	D-4
<b>Troubleshooting</b> . . . . .	<b>Section E</b>
How to use Troubleshooting Guide . . . . .	E-1
Safety Warning . . . . .	E-1
Troubleshooting Guide . . . . .	E-2 - E-4
<b>Wiring, Connection Diagrams and Dimension Print</b> . . . . .	<b>Section F</b>
<b>Parts List</b> . . . . .	<b>parts.lincolnelectric.com</b>

Content/details may be changed or updated without notice. For most current Instruction Manuals, go to [parts.lincolnelectric.com](http://parts.lincolnelectric.com).





# GENERAL DESCRIPTION

The Vantage® 435 is a diesel engine-driven welding power source. The machine uses a brush type alternating current generator for DC multi-purpose welding, for 120/240 VAC single phase and 240V three phase auxiliary standby power. The welding control system uses state of the art Chopper Technology™.

## TECHNICAL SPECIFICATIONS

### INPUT - DIESEL ENGINE

Make /Model	Description
(K4107-16) Deutz D2.9L4 Naturally Aspirated Diesel Engine EPA TIER 4 Final Compliant	4 cylinder 34.8HP (25.9 kw) Naturally Aspirated Water Cooled Diesel Engine
Speed (RPM)	Displacement
High Idle 1800 Low Idle 1500 Full Load	177 cu. in. (2.9L) Bore x Stroke 3.6" x 4.3" 92mm x 110mm
Starting System	Capacities
12VDC battery and Starter with Automatic Glow Plugs	Fuel 20 US gal (75.7L) Oil: 2.35 US gal. (8.9L)

### RATED OUTPUT @ 104°F(40°C) - WELDER

Duty Cycle	Welding Output	Volts at Rated Amps
100%	400 Amps (DC multi-purpose)	36 Volts
100%	450 Amps (DC multi-purpose)	32 Volts
60%	520 Amps (DC multi-purpose)	30 volts

### OUTPUT @ 104°F(40°C) - WELDER AND GENERATOR

Welding Range 30 - 520 Amps CC/CV 20 - 250 Amps TIG
Open Circuit Voltage 60 Max OCV @ 1800 RPM
Auxiliary Power <sup>(1)</sup> 120/240 VAC 11,000 WATTS, 60 Hz., Single Phase 17,000 WATTS, 60 Hz., Three Phase

### PHYSICAL DIMENSIONS

Height <sup>(2)</sup>	39.1 in (993.7 mm)
Width <sup>(3)</sup>	28.4 in. (721.0mm)
Depth	65.1 in. (1653.7mm)
Weight	1526 lbs. (692 kg) (Approx.)

- (1) Output rating in watts is equivalent to volt-amperes at unity power factor. Output voltage is within +/- 10% at all loads up to rated capacity. When welding, available auxiliary power will be reduced.
- (2) Top of Enclosure. Add 10.12" (257.0mm) for exhaust and air cleaner.
- (3) Includes Door. Base is 27.0"(685.8mm) wide.

## SAFETY PRECAUTIONS

**WARNING**

Do not attempt to use VANTAGE® 435 until you have thoroughly read all operating and maintenance manuals supplied with your machine. They include important safety precautions, detailed engine starting, operating and maintenance instructions and parts lists.

**ELECTRIC SHOCK can kill.**

- Do not touch electrically live parts such as output terminals or internal wiring.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

**ENGINE EXHAUST can kill.**

- Use in open, well ventilated areas or vent exhaust outside

**MOVING PARTS can injure.**

- Do not operate with doors open or guards off.
- Stop engine before servicing.
- Keep away from moving parts

Only qualified personnel should install, use or service VANTAGE® 435.

**VRD (VOLTAGE REDUCTION DEVICE)**

The VRD reduces the OCV (Open Circuit Voltage) at the welding output terminals while not welding to less than 30VDC when the resistance of the output circuit is above 200Ω (ohms).

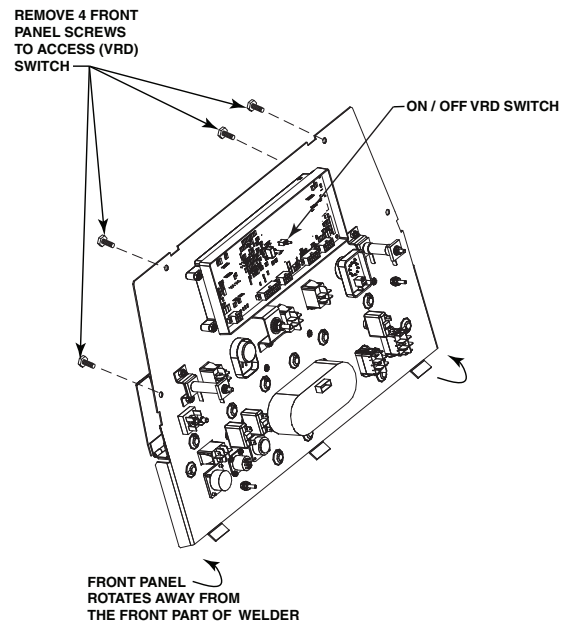
The VRD requires that the welding cable connections be kept in good electrical condition because poor connections will contribute to poor starting. Having good electrical connections also limits the possibility of other safety issues such as heat-generated damage, burns and fires.

The machine is shipped with the VRD switch in the “OFF” position. To turn it “On” or “Off”:

- Turn the engine “Off”.
- Disconnect the negative battery cable.
- Lower the Front panel by removing 4 side panel screws. (See Figure A.1)
- Place the VRD switch in the “On” or “Off” position. (See Figure A.1)

With the VRD switch in the “OFF” position, the VRD lights are deactivated.

FIGURE A.1

**LOCATION AND VENTILATION**

The welder should be located to provide an unrestricted flow of clean, cool air to the cooling air inlets and to avoid restricting the cooling air outlets. Also, locate the welder so that the engine exhaust fumes are properly vented to an outside area.

**DO NOT MOUNT OVER COMBUSTIBLE SURFACES**

Where there is a combustible surface directly under stationary or fixed electrical equipment, that surface should be covered with a steel plate at least .06” (1.6mm) thick, which should extend not less than 5.90” (150mm) beyond the equipment on all sides.

**STORING**

1. Store the machine in a cool, dry place when it is not in use. Protect it from dust and dirt. Keep it where it can't be accidentally damaged from construction activities, moving vehicles, and other hazards.
2. Drain the engine oil and refill with fresh oil. Run the engine for about five minutes to circulate oil to all the parts. See the ENGINE OPERATION section manual for details on changing oil.
3. Remove the battery, recharge it, and adjust the electrolyte level. Store the battery in a dry, dark place.

**STACKING**

Vantage® 435 machines cannot be stacked.

**ANGLE OF OPERATION**

To achieve optimum engine performance the Vantage® 435 should be run in a level position. The maximum angle of operation for the Deutz engine is 15 degrees in all directions. When operating the welder at an angle, provisions must be made for checking and maintaining the oil level at the normal (FULL) oil capacity. Also the effective fuel capacity will be slightly less than the specified 20 gal.(75.7 ltrs.) will be slightly less than the amount specified.

**LIFTING**

The Vantage® 435 weighs approximately 1641 lbs. (744kg.) with a full tank of fuel and 1526 lbs. (692kg) less fuel. A lift bail is mounted to the machine and should always be used when lifting the machine.

**WARNING**



- Lift only with equipment of adequate lifting capacity.
- Be sure machine is stable when lifting.
- Do not lift this machine using lift bale if it is equipped with a heavy accessory such as trailer or gas cylinder.
- Do not lift machine if lift bale is damaged.
- Do not operate machine while suspended from lift bale.

**FALLING EQUIPMENT** can cause injury.

**HIGH TEMPERATURE OPERATION**

At temperatures above 104°F (40°C), output voltage derating may be necessary. For maximum output current ratings, derate welder voltage rating 2 volts for every 21°F (10°C) above 104°F (40°C).

**Cold weather starting:**

With a fully charged battery and 0W40 oil, the engine should start satisfactorily down to -20°F (-29°C). If the engine must be frequently started at or below 0°F (-18°C) cold starting aids are recommended. At temperatures below 23°F (-5°C) fuels in accordance with ASTM S975 Grade 1D diesel fuel is recommended. Allow the engine to idle for 3 to 5 minutes or until the water temperature begins to rise before applying load to switching to high idle.

**WARNING**

**Under no conditions should ether or other starting fluids be used with this engine!**

**HIGH ALTITUDE OPERATION**

At higher altitudes, output derating may be necessary. For maximum rating, derate the welder output in accordance with the guidelines in Table A.1 for this engine model from the manufacturer:

**TABLE A.1 DEUTZ D 2.9 L4**

ALTITUDE		MAXIMUM POWER
METERS	FEET	AVAILABLE (%)
0-750	0-2461	99
1000	3281	95
2000	6562	95
3000	9842	93
4000	13123	88
5000	16404	74
6000	19685	60

## TOWING

Use a recommended trailer for use with Vantage® 435 for road, in-plant and yard towing by a vehicle(1). If the user adapts a non-Lincoln trailer, they must assume responsibility that the method of attachment and usage does not result in a safety hazard or damage the welding equipment. Some of the factors to be considered are as follows:

1. Design capacity of trailer vs. weight of Lincoln equipment and likely additional attachments.
2. Proper support of, and attachment to, the base of the welding equipment so there will be no undue stress to the framework.
3. Proper placement of the equipment on the trailer to insure stability side to side and front to back when being moved and when standing by itself while being operated or serviced.
4. Typical conditions of use, i.e., travel speed; roughness of surface on which the trailer will be operated; environmental conditions; like maintenance.
5. Conformance with federal, state and local laws.(1)

(1) Consult applicable federal, state and local laws regarding specific requirements for use on public highways.

## VEHICLE MOUNTING

**Improperly mounted concentrated loads may cause unstable vehicle handling and tires or other components to fail.**

- Only transport VANTAGE® 435 on serviceable vehicles which are rated and designed for such loads.
- Distribute, balance and secure loads so vehicle is stable under conditions of use.
- Do not exceed maximum rated loads for components such as suspension, axles and tires.
- Mount equipment base to metal bed or frame of vehicle.
- Follow vehicle manufacturer's instructions.

## PRE-OPERATION ENGINE SERVICE

READ the engine operating and maintenance instructions supplied with this machine.

### WARNING

- Stop engine and allow to cool before fueling.
- Do not smoke when fueling.
- Fill fuel tank at a moderate rate and do not overfill.
- Wipe up spilled fuel and allow fumes to clear before starting engine.
- Keep sparks and flame away from tank.

## OIL



The Vantage® 435 is shipped with the engine crankcase filled with high quality SAE 10W-30 Oil that meets classification CJ-4 for diesel engines. Check the oil level before starting the engine. If it is not up to the full mark on the dip stick, add oil as required. Check the oil level every four hours of running time during the first 50 running hours. Refer to the engine Operator's Manual for specific oil recommendations and break-in information. The oil change interval is dependent on the quality of the oil and the operating environment. Refer to the Engine Operator's Manual for more details on the proper service and maintenance intervals.

## FUEL

**USE DIESEL FUEL ONLY-**



**Ultra low sulphur fuel only.**

### WARNING

- Fill the fuel tank with clean, fresh fuel. The capacity of the tank is 20 gallon (75.7 L). When the fuel gauge reads empty the tank contains approximately 2 gallon (7.6 L) of reserve fuel.

**NOTE: A fuel shut off valve is located just before the pre-filter/sediment filter. Which should be in the closed position when the welder is not used for extended periods of time.**

## ENGINE COOLING SYSTEM

### WARNING

Air to cool the engine is drawn in the side and exhausted through radiator and case back. It is important that the intake and exhaust air is not restricted. Allow a minimum clearance of 1ft. (0.6m) from the case back and 16 in. (406mm) from either side of the base to a vertical surface.

## BATTERY CONNECTION

### CAUTION

Use caution as the electrolyte is a strong acid that can burn skin and damage eyes.

The Vantage® 435 is shipped with the negative battery cable disconnected. Make certain that the RUN-STOP switch is in the STOP position. Remove the two screws from the battery tray using a screwdriver or a 3/8"(10mm) socket. Attach the negative battery cable to the negative battery terminal and tighten using a 1/2"(13mm) socket or wrench.

**NOTE: This machine is furnished with a wet charged battery; if unused for several months, the battery may require a booster charge. Be careful to charge the battery with the correct polarity. (See Battery in "Maintenance Section")**

## EXHAUST OUTLET PIPE

Remove cap from DPF outlet pipe protruding from roof. Using the clamp provided secure the exhaust outlet pipe to the outlet tube with the pipe positioned such that it will direct the exhaust in the desired direction away from the air intake. Tighten using a 1/2"(13mm) socket or wrench.

## SPARK ARRESTOR

Some federal, state or local laws may require that gasoline or diesel engines be equipped with exhaust spark arresters when they are operated in certain locations where unarrested sparks may present a fire hazard.

The Diesel Oxidation Catalyst (DOC) on this engine qualifies as a spark arrestor that meets local regulations.

## AIR CLEANER INSTALL

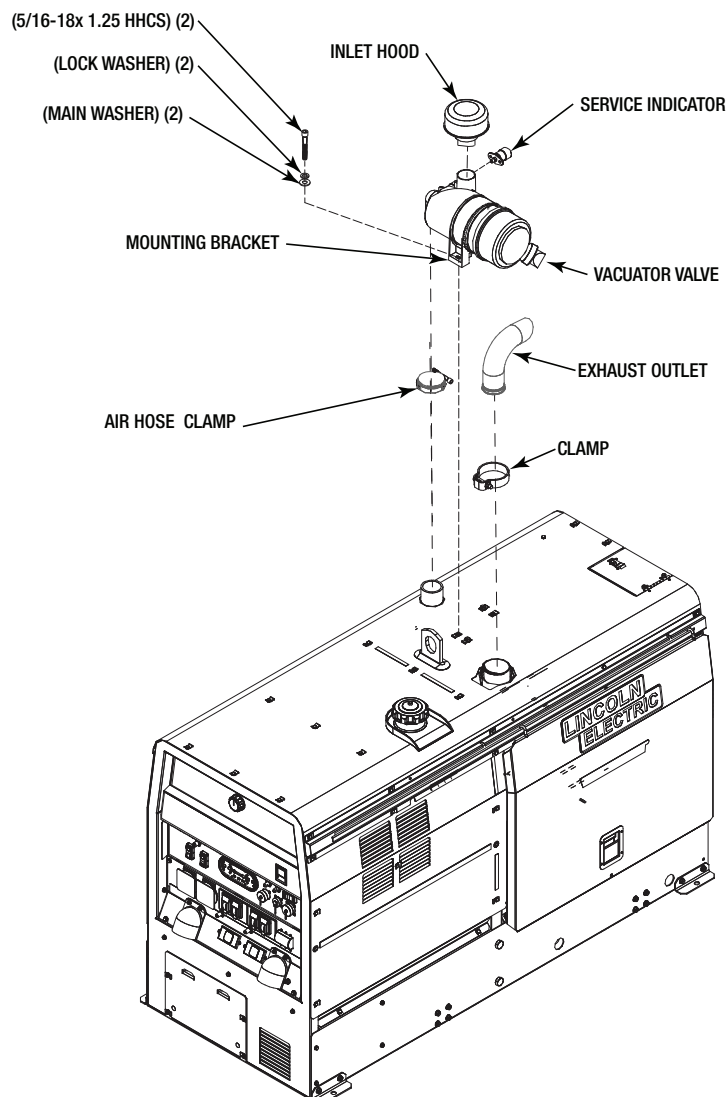
All parts below are shipped with the machine in a separate box attached to the crate. (See Figure A.2)

- Remove cap from air intake hose.
  - Tighten air hose clamp just below service indicator to hold clamp while pushing air cleaner onto hose<sup>(1)</sup>, once hose is in place loosen air hose clamp slide down and tighten clamp.
  - Install 2 hex head screws, washers using a 1/2" (13mm) wrench or socket to mounting bracket securing air cleaner.
  - Unclip air cleaner end cap and rotate "TOP" text to be at approximately 9 o'clock position.
- **SERVICE INDICATOR**

Air cleaner service indicator provides a Go/No-Go visual indication of useful filter service life.

<sup>(1)</sup>Permissible to use a soap water solution as a lubricant to aid in hose installation.

FIGURE A.2



## REMOTE CONTROL

This Vantage® 435 is equipped with a 12-pin and a 14-pin connector, along with a wireless remote control. To enable remote control capabilities, the LOCAL/REMOTE switch must be in the REMOTE position.

Only **STICK** mode output adjustment is controlled by the wireless remote.

For the **DOWNHILL PIPE** or **CC-STICK** weld mode selector switch positions, remote setting of the preset arc current is set through the 12 pin connector or the 14 pin connector depending on the setup menu setting (12 pin connector is the factory default setting). The OUTPUT CONTROL knob is used to set the maximum arc current preset range for the remote input. The left display will show the arc current preset.

For the **TOUCH START TIG** weld mode selector switch position, remote setting of the preset arc current is set through the 12 pin connector (typically using a foot Amptrol). The OUTPUT CONTROL knob is used to set the maximum arc current preset range for the remote input. **The left display will show the maximum setting for the arc current preset range as set by the OUTPUT CONTROL knob.**

**EXAMPLE:** When the OUTPUT CONTROL on the welder is set to 200 amps, the arc current preset range on the remote control will preset over the range from minimum to 200 amps, rather than the full minimum to maximum preset arc current range. Any preset arc current range that is less than the full range provides finer arc current preset resolution for more fine tuning of the output.

For the **ARC GOUGING** weld mode selector switch position, remote setting of the preset arc current is set through the 12 pin connector. The remote input sets the arc current preset over the full range from minimum to maximum. The left display will show the arc current preset.

## WIRELESS REMOTE CONTROL

### Cold Starting Procedure (See Figure B.3)

1. Toggle the ON/OFF toggle to the ON position to activate the remote. The STOP/IDLE switch on the control panel needs to be switched to the HIGH IDLE position to START the Vantage® 435 with the wireless remote.
 

The toggle switch on the receiver box is shipped from the factory in the OFF position. If it is desired to operate the Vantage® 435 using the controls on the front panel and not the wireless controls, leave the receiver toggle switch in the OFF position
2. Push the START/CI button once on the Transmitter. The greeting screen will illuminate.
3. Push the START/CI button a second time. START will appear in the upper left hand corner of the screen. The glow plugs are pre heating . Wait 15 seconds for glow plugs to pre heat.
4. Push the START/CI button a third time to start the Vantage® 435. RUN will appear in the upper right hand side of the screen. The Vantage® 435 will start in the AUTO IDLE position and CI will display on the screen. To go to HIGH IDLE, push the CO button on the Transmitter. The STOP/IDLE switch on the control panel will remain in the HIGH idle position when using the wireless remote.
5. Push the increase button to test the increase function. Push the decrease button to test the decrease function.

### Warm Starting Procedure (See Figure B.3)

1. Same as steps 1 and 2 from cold start procedure.
2. Push the START button on the transmitter a second time to energize the Receiver and Transmitter. The word START will appear in the upper right hand corner of the screen. Push G.P./SEL button to terminate the glow plugs.
3. Same as step 4 and 5 from cold start procedure.

### Shut Down Procedure (See Figure B.3)

1. Push the STOP button on the Transmitter to shut the engine down.
2. Push the STOP/IDLE switch on the control panel to the OFF position.

### Idle Control Operation (See Figure B.3)

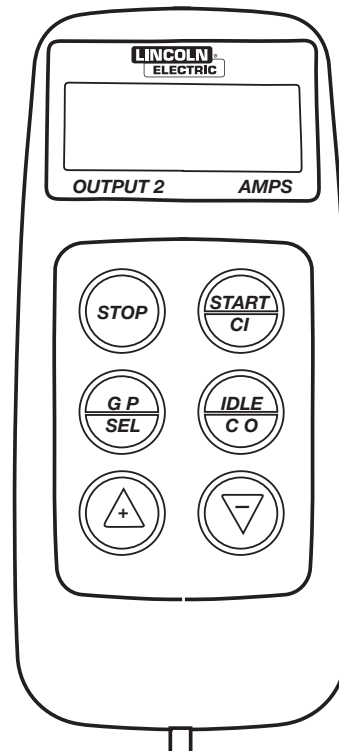
The unit will start and function in AUTO idle. To change the unit to HIGH idle, press the CO button on the transmitter one time. To return the unit to AUTO idle, press the CI button on the transmitter one time.

### Output Adjustment (See Figure B.3)

The output of the welder can be adjusted using the up and down arrow buttons on the transmitter.

Only STICK mode output adjustment is controlled by the wireless remote.

FIGURE B.3



### WARNING

This equipment is capable of remote starting and may start without warning if activated.

Always disconnect battery and turn the Receiver Box Toggle Switch to the "Off" position before servicing this equipment.



**For operation with a control cable wire feeder:**

With the **CV-WIRE** weld mode selector switch position and the **WELD TERMINALS ON** switch in the **REMOTE** position, remote setting of the preset arc voltage is set through the 14 pin connector. The remote input sets the arc voltage preset range from 10.0V to 45.0V. The right display will show the arc voltage preset.

**For operation with an across the arc wire feeder (for example, an LN-25 PRO):**

With the **CV-WIRE** weld mode selector switch position and the **WELD TERMINALS ON** switch in the **ON** position, remote setting of the preset arc voltage is set through the 12 pin connector. The remote input sets the arc voltage preset range from 10.0V to 45.0V. The right display will show the arc voltage preset.

For the **ARCLINK** weld mode selector switch position, remote capability is possible only with an ArcLink compatible digital remote control through the 12 pin connector.

**NOTE: To connect accessories with a 6 pin connector, use the included 12-pin to 6-pin adaptor (K2909-1).**

**TABLE A.2**

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 to 150 Ft.	150 to 200 Ft.	200 to 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
500	60	2/0	2/0	3/0	3/0	4/0
600	60	3/0	3/0	3/0	4/0	2-3/0
600	80	2-1/0	2-1/0	2-1/0	2-2/0	2-3/0
600	100	2-1/0	2-1/0	2-1/0	2-2/0	2-3/0

\*\* Tabled values are for operation at ambient temperatures of 104°F (40°C) and below. Applications above 104°F (40°C) may require cables larger than recommended, or cables rated higher than 167°F (75°C).

**WELDING TERMINALS**

The Vantage® 435 is equipped with a toggle switch for selecting "hot" welding terminals when in the "WELD TERMINALS ON" position or "cold" welding terminals when in the "REMOTELY CONTROLLED" position. When in ArcLink, the output of the weld terminals is controlled by the mode selected.

**WELDING OUTPUT CABLES**

With the engine off, route the electrode and work cables through the strain relief bracket (⊕) provided on the front of the base and connect to the terminals provided. These connections should be checked periodically and tightened if necessary.

Listed in Table A.2 are copper cable sizes recommended for the rated current and duty cycle. Lengths stipulated are the distance from the welder to work and back to the welder again. Cable sizes are increased for greater lengths primarily for the purpose of minimizing cable voltage drop.

**PULSE WELDING**

When pulse welding, always use 4/0 cable. The cables must be sized based upon the peak current of the pulse waveform, not the average current. Do not coil the electrode or work cable. Limit the combined length of the electrode and work cable to 60 feet. Undersized cables, coiled cables and long lengths all increase cable inductance and lower pulse welding performance.

**CABLE INSTALLATION**

Install the welding cables to your VANTAGE® 520 SD as follows.

1. The engine must be OFF to install welding cables.
2. Remove the flanged nuts from the output terminals.
3. Connect the electrode holder and work cables to the weld output terminals. The terminals are identified on the case front.
4. Tighten the flanged nuts securely.
5. Be certain that the metal piece you are welding (the "work") is properly connected to the work clamp and cable.
6. Check and tighten the connections periodically.

**⚠ CAUTION**

- Loose connections will cause the output terminals to over-heat. The terminals may eventually melt.
- Do not cross the welding cables at the output terminal connection. Keep the cables isolated and separate from one another.


## MACHINE GROUNDING

Because this portable engine driven welder creates its own power, it is not necessary to connect its frame to an earth ground, unless the machine is connected to premises wiring (home, shop, etc.).

To prevent dangerous electric shock, other equipment powered by this engine driven welder must:

- a) be grounded to the frame of the welder using a grounded type plug, or
- b) be double insulated.

When this welder is mounted on a truck or trailer, its frame must be securely connected to the metal frame of the vehicle. When this engine driven welder is connected to premises wiring such as that in a home or shop, its frame must be connected to the system earth ground. See further connection instructions in the section entitled “Standby Power Connections” as well as the article on grounding in the latest National Electrical Code and the local codes.

In general, if the machine is to be grounded, it should be connected with a #8 or larger copper wire to a solid earth ground such as a metal ground stake going into the ground for at least 10Ft.(3.1m) or to the metal framework of a building which has been effectively grounded. The National Electric Code lists a number of alternate means of grounding electrical equipment. A machine grounding stud marked with the symbol  is provided on the front of the welder.

## AUXILIARY POWER RECEPTACLES

Start the engine and set the “IDLE/RUN/STOP” switch to the “High Idle” mode. Voltage is now correct at the receptacles for auxiliary power. This must be done before a tripped GFCI can be reset properly. See the MAINTENANCE section for more detailed information on testing and resetting the GFCI. (For location of receptacles see Figure A.3)

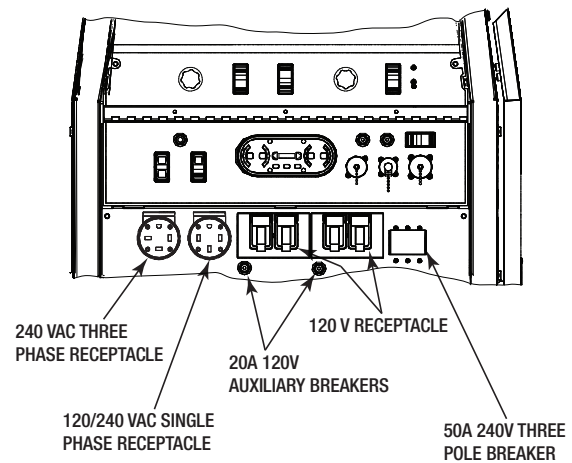
The auxiliary power of the Vantage® 435 consists of two 20 Amp-120 VAC (5-20R) duplex receptacles with GFCI protection, one 50 Amp 120/240 VAC (14-50R) receptacle and one 50 Amp 240VAC Three-Phase (15-50R) receptacle.

The auxiliary power capacity is 11,000 Watts Continuous of 60 Hz, single phase power. The auxiliary power capacity rating in watts is equivalent to volt-amperes at unity power factor. The max permissible current of the 240 VAC output is 50amps.

The 240 VAC output can be split to provide two separate 120 VAC outputs with a max permissible current of 50 Amps per output to two separate 120 VAC branch circuits (these circuits cannot be paralleled). Output voltage is within  $\pm 10\%$  at all loads up to rated capacity.

The Three-Phases auxiliary power capacity is 17,000 watts continuous. The maximum current is 40 amps.

**FIGURE A.3**  
**AUXILIARY POWER RECEPTACLES**



### 120 V DUPLEX RECEPTACLES AND GFCI

A GFCI protects the two 120V auxiliary power receptacles.

A GFCI (Ground Fault Circuit Interrupter) is a device to protect against electric shock should a piece of defective equipment connected to it develop a ground fault. If this situation should occur, the GFCI will trip, removing voltage from the output of the receptacle. If a GFCI is tripped see the MAINTENANCE section for detailed information on testing and resetting it. A GFCI should be properly tested at least once every month.

The 120 V auxiliary power receptacles should only be used with three wire grounded type plugs or approved double insulated tools with two wire plugs. The current rating of any plug used with the system must be at least equal to the current capacity of the associated receptacle.

**NOTE:** The 240 V receptacle has two 120 V circuits, but are of opposite polarities and cannot be paralleled.

All auxiliary power is protected by circuit breakers. The 120V has 20 Amp circuit breakers for each duplex receptacle. The 120/240V Single Phase and the 240V Three-Phases have a 50 Amp 3-pole Circuit Breaker that disconnects both hot leads and all Three Phases simultaneously.



### STANDBY POWER CONNECTIONS

The Vantage® 435 is suitable for temporary, standby or emergency power using the engine manufacturer’s recommended maintenance schedule.

The Vantage® 435 can be permanently installed as a standby power unit for 240 volt-3 wire, 50 amp service. Connections must be made by a licensed electrician who can determine how the 120/240 VAC power can be adapted to the particular installation and comply with all applicable electrical codes. Refer to the connection diagram shown in Figure A.4.

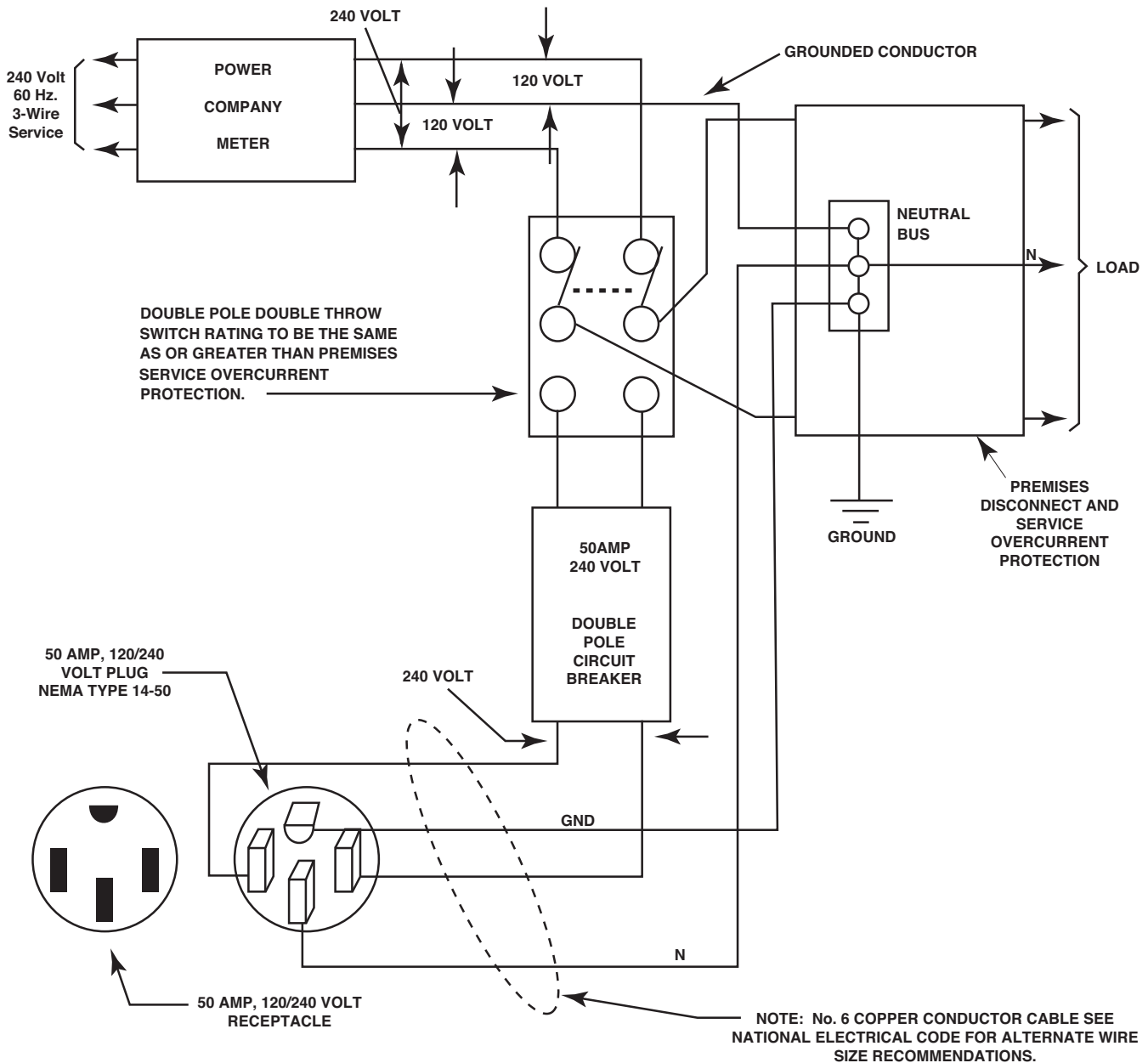
1. Install the double-pole, double-throw switch between the power company meter and the premises disconnect. Switch rating must be the same or greater than the customer’s premises disconnect and service over current protection.

2. Take necessary steps to assure load is limited to the capacity of the Vantage® 435 by installing a 50 amp, 240 VAC double pole circuit breaker. Maximum rated load for each leg of the 240 VAC auxiliary is 50 amps. Loading above the rated output will reduce output voltage below the allowable -10% of rated voltage which may damage appliances or other motor-driven equipment and may result in overheating of the Vantage® 435 engine and / or alternate windings.

3. Install a 50 amp 120/240 VAC plug (NEMA Type 14-50P) to the double-pole circuit breaker using No. 6, 4 conductor cable of the desired length.

4. Plug this cable into the 50 Amp 120/240 Volt receptacle on the Vantage® 435 case front.

**FIGURE A.4 Connection of the VANTAGE® 435 to Premises Wiring**



**CONNECTION OF WIRE FEEDERS WITH CONTROL CABLE (14 PIN)**

**⚠ WARNING**

Shut off welder before making any electrical connections.

**CONNECTION OF LF-72, LF-74, FLEX FEED 74 HT, FLEX FEED 84, LN-25 PRO DUAL POWER TO THE VANTAGE® 435**

- Shut the welder off.
- Set the "WIRE FEEDER VOLTMETER" switch to either "+" or "-" as required by the electrode being used (See Figure A.5).
- For electrode Positive, connect the electrode cable to the "+" terminal of the welder and work cable to the "-" terminal of the welder. For electrode Negative, connect the electrode cable "-" terminal of the welder and work cable to the "+" terminal of the welder.
- Set the "MODE" switch to the "CV-WIRE" position.
- Adjust the "ARC CONTROL" knob to desired Crispness. SOFT for MIG and CRISP for Innershield.
- Set the "WELDING TERMINALS" switch to the "REMOTELY CONTROLLED" position.
- Set the wire feeder voltage switch to 42V.
- Connect the 14 pin control cable from the wire feeder to the engine drive (See Figure A.6).
- Set the "REMOTE/LOCAL" switch to "REMOTE" if the feeder is equipped with a remote output control knob.

FIGURE A.5

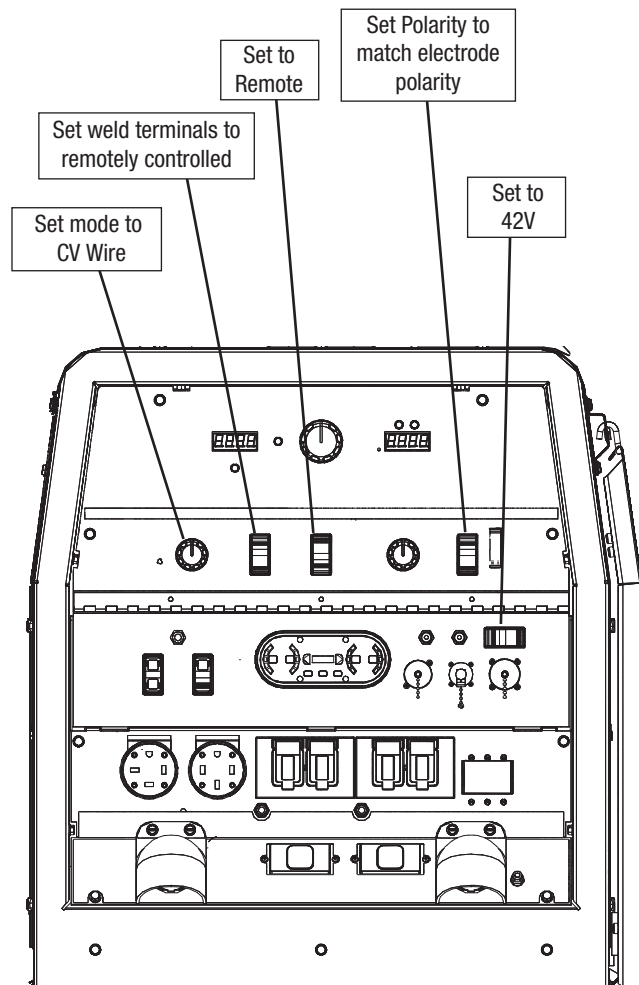
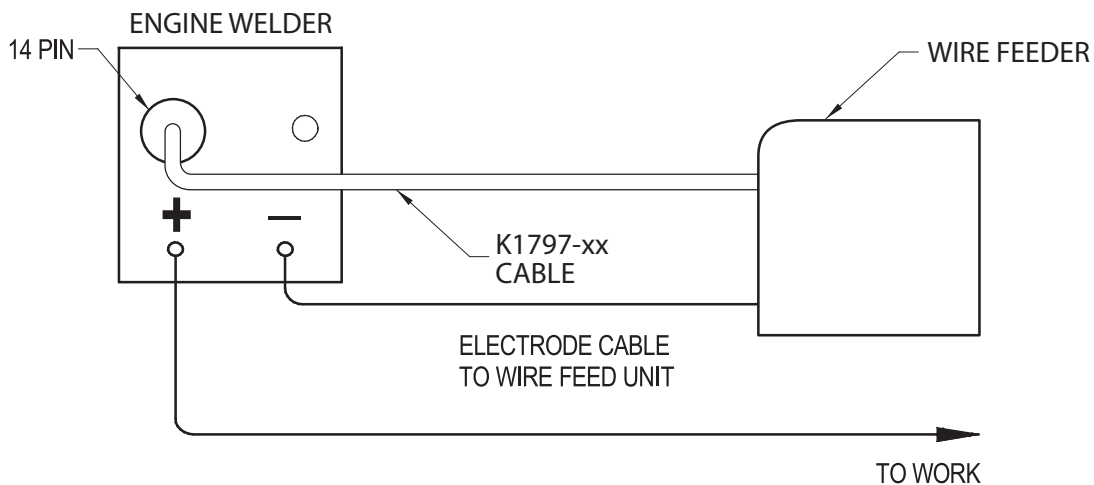


FIGURE A.6



### CONNECTION OF ACROSS THE ARC WIRE FEEDERS TO THE VANTAGE® 435

These connections instructions apply to both the LN-25 Pro and Activ8 models. These feeders have an internal contactor and the electrode is not energized until the gun trigger is closed. When the gun trigger is closed the wire will begin to feed and the welding process is started.

- Shut the welder off.
- For electrode Positive, connect the electrode cable to the "+" terminal of the welder and work cable to the "-" terminal of the welder. For electrode Negative, connect the electrode cable "-" terminal of the welder and work cable to the "+" terminal of the welder.
- Attach the single lead from the front of the feeder to work using the spring clip at the end of the lead. This is a control lead to supply current to the wire feeder motor; it does not carry welding current (See Figure A.8).
- Set the MODE switch to the "CV-WIRE" position (See Figure A.7).
- Set the "WELD TERMINALS" switch to "WELD TERMINALS ON"
- Set the "ARC CONTROL" knob to "0" initially and adjust to suit.
- Set the "REMOTE/LOCAL" switch to "LOCAL" control.

FIGURE A.7

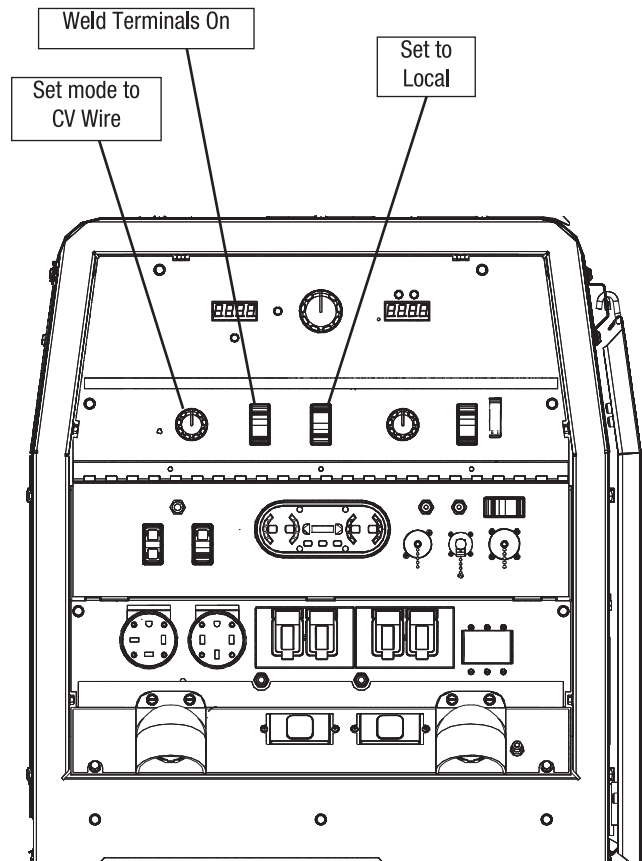
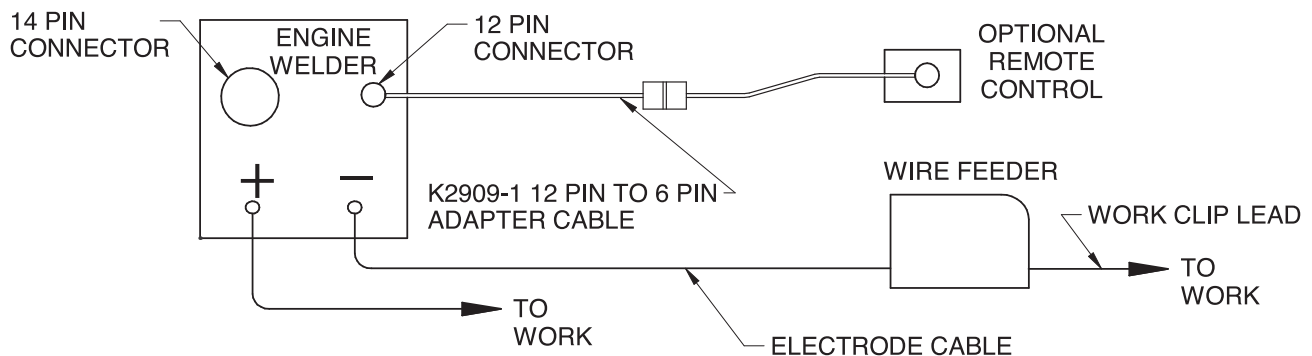


FIGURE A.8



## CABLE INDUCTANCE AND ITS EFFECTS ON WELDING

Excessive cable inductance will cause the welding performance to degrade. There are several factors that contribute to the overall inductance of the cabling system including cable size, and loop area. The loop area is defined by the separation distance between the electrode and work cables, and the overall welding loop length. The welding loop length is defined as the total of length of the electrode cable (A) + work cable (B) + work path (C) (See Figure A.9).

To minimize inductance always use the appropriate size cables, and whenever possible, run the electrode and work cables in close proximity to one another to minimize the loop area. Since the most significant factor in cable inductance is the welding loop length, avoid excessive lengths and do not coil excess cable. For long work piece lengths, a sliding ground should be considered to keep the total welding loop length as short as possible.

### Electrode Voltage Sensing

The remote ELECTRODE sense lead (67) is built into the 5-pin ArcLink control cable and is always connected to the wire drive feed plate when an ArcLink wire feeder is present. Enabling or disabling electrode voltage sensing is application specific, and automatically configured by the active weld mode.

Voltage sense leads requirements are based on the weld process (See Table A.3).

TABLE A.3

Process	Electrode Voltage Sensing <sup>(1)</sup> 67 lead
GMAW	67 lead
GMAW-P	67 lead
FCAW	67 lead
GTAW	Voltage sense at studs
SMAW	Voltage sense at studs

(1) The electrode voltage sense lead (67) is automatically enabled by the weld process, and integral to the 5 pin ArcLink control cable (K1543-xx) or K2683-xx.

## CONTROL CABLE CONNECTIONS

### General Guidelines

Genuine Lincoln control cables should be used at all times (except where noted otherwise). Lincoln cables are specifically designed for the communication and power needs of the Engine Welder and Power Feed™ systems. Most are designed to be connected end to end for ease of extension. Generally, it is recommended that the total length not exceed 200ft. (60.960m). The use of non-standard cables, especially in lengths greater than 25 feet, can lead to communication problems (system shutdowns), poor motor acceleration (poor arc starting), and low wire driving force (wire feeding problems). Always use the shortest length of control cable possible, and **DO NOT coil excess cable.**

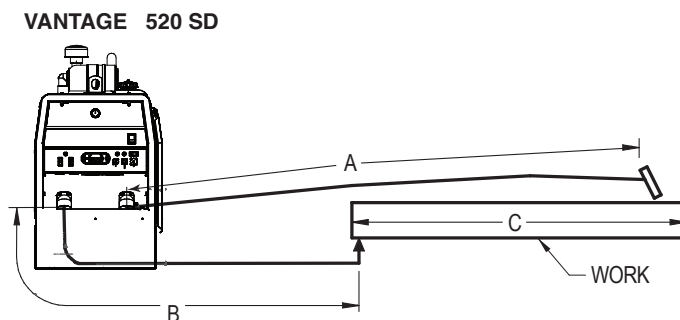
Regarding cable placement, best results will be obtained when control cables are routed separate from the weld cables. This minimizes the possibility of interference between the high currents flowing through the weld cables, and the low level signals in the control cables.

### Product specific Installation Instructions

Connection Between Vantage® 435 and ArcLink® Compatible Wire Feeders (K1543, K2683 – ArcLink® Control Cable)

The 5-pin ArcLink® control cable connects the Vantage® 435 to the wire feeder. The control cable consists of two power leads, one twisted pair for digital communication, and one lead for voltage sensing. The 5-pin ArcLink® connection on the Vantage® 435 is located on control panel. The control cable is keyed and polarized to prevent improper connection. Best results will be obtained when control cables are routed separate from the weld cables, especially in long distance applications. The recommended combined length of the ArcLink® control cable network should not exceed 200ft. (60.960m).

FIGURE A.9





# OPERATION

## SAFETY INSTRUCTIONS

Read and understand this entire section before operating your VANTAGE® 435.

### **WARNING**

Do not attempt to use VANTAGE® 435 until you have thoroughly read all operating and maintenance manuals supplied with your machine. They include important safety precautions, detailed engine starting, operating and maintenance instructions and parts lists.



**ELECTRIC SHOCK** can kill.

- Do not touch electrically live parts such as output terminals or internal wiring.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

**ENGINE EXHAUST** can kill.



- Use in open, well ventilated areas or vent exhaust outside
- Do not stack anything near the engine.

**MOVING PARTS** can injure.



- Do not operate with doors open or guards off.
- Stop engine before servicing.
- Keep away from moving parts

Only qualified personnel should operate VANTAGE® 435.

## ADDITIONAL SAFETY PRECAUTIONS

Always operate the welder with the sliding door closed and the side panels in place as these provide maximum protection from moving parts and insure proper cooling air flow.

## RECOMMENDED APPLICATIONS

### WELDER

The Vantage® 435 provides excellent constant current DC welding output for stick (SMAW) and TIG (GTAW) welding. The Vantage® 435 also provides excellent constant voltage DC welding output for MIG (GMAW), Innershield (FCAW), Outershield (FCAW-G) and Metal Core (GMAW-C) welding. In addition the Vantage® 435 can be used for Arc Gouging with carbons up to 1/2"(13mm) in diameter.

The Vantage® 435 is **not recommended** for pipe thawing.

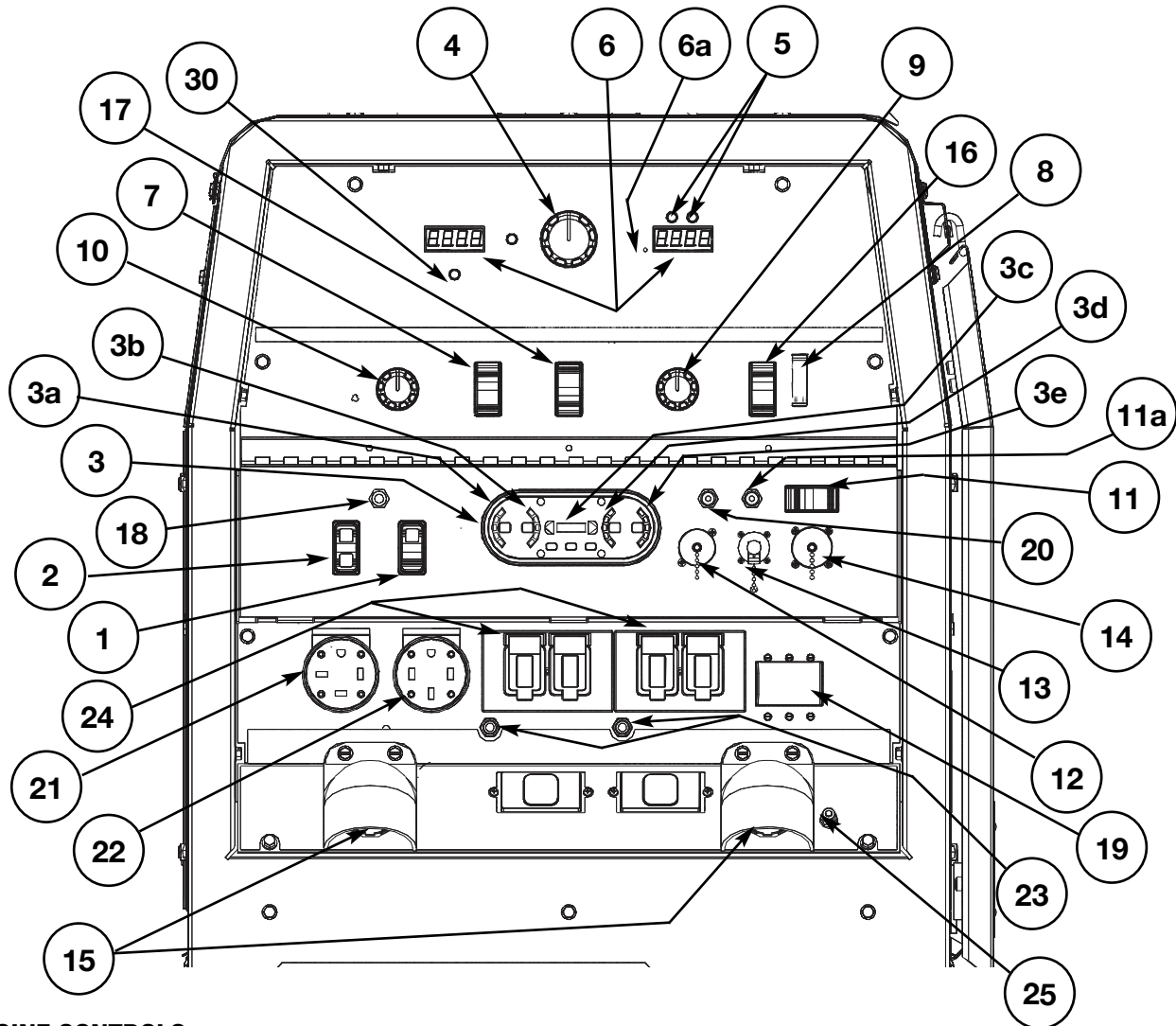
### GENERATOR

The Vantage® 435 provides smooth 120/240 VAC single phase and 240V three phase output for auxiliary power and emergency standby power.

### CONTROLS AND SETTINGS

All welder and engine controls are located on the case front panel. Refer to Figure B.3 and the explanations that follow.

FIGURE B.3 CASE FRONT PANEL CONTROLS






### ENGINE CONTROLS

#### 1. STOP / (LOW IDLE/RUN) / (HIGH IDLE/RUN) SWITCH

Toggleing the switch to the RUN position energizes the fuel solenoid for approximately 30 seconds. The engine must be started within that time or the fuel solenoid will degenerate, and the switch must be toggled to reset the timer.

Has two positions as follows:

- 1) In the "High" position  the engine runs at the high idle speed controlled by the governor.
- 2) In the "Auto"  /  position, the idler operates as follows:

- a. When switched from "High" to "Auto" or after starting the engine, the engine will operate at full speed for approximately 12 seconds and then go to low idle speed.
- b. When the electrode touches the work or power is drawn for lights or tools (approximately 100 Watts minimum) the engine accelerates and operates at full speed.
- c. When welding ceases and the AC power load is turned off, a fixed time delay of approximately 12 seconds starts.
- d. If the welding or AC power load is not restarted before the end of the time delay, the idler reduces the engine speed to low idle speed.
- e. The engine will automatically return to high idle speed when the welding load or A.C. power load is reapplied.

### Idler Operational exceptions

When the WELDING TERMINALS switch is in the “Remotely Controlled” position or the MODE SELECTION switch is in the ArcLink® position the idler will operate as follows:

- When the triggering device (Amptrol, Arc Start Switch, etc.) is pressed the engine will accelerate and operate at full speed provided a welding load is applied within approximately 12 seconds.
- If the triggering device remains pressed but no welding load is applied within approximately 12 seconds the engine may return to low idle speed.
- If the triggering device is released or welding ceases the engine will return to low idle speed after approximately 12 seconds.

## 2. START SWITCH

Energizes the starter motor to crank the engine. With the engine "Run / Stop" switch in the "Run" position, push and release the Start button to start the engine:

- this switch has an amber light (Top of switch) to indicate Glow light, this engine will automatically apply power to the glow circuit and indicator light will turn off when glow is completed. (Engine will crank but will not start until glow cycle is completed)
- this switch also has a red light (Bottom of switch). It will light up when there are faults with the engine. Field Service Shop will need to connect to diagnostic plug to read error codes.

## 3. DASH BOARD GAUGE

The dash board gauge displays 5 gauges:

### 3a. OIL PRESSURE



The gauge displays the engine oil pressure when the engine is running.

### 3b. ENGINE TEMPERATURE

The gauge displays the engine coolant temperature.

### 3c. HOUR METER

The hour meter displays the total time that the engine has been running. This meter is a useful indicator for scheduling preventive maintenance.

### 3d. FUEL LEVEL



Displays the level of diesel fuel in the fuel tank.

### 3e. BATTERY VOLTAGE INDICATOR

Displays the battery voltage and indicates that the charging system is functioning properly.

**4. OUTPUT CONTROL-** The OUTPUT dial is used to preset the output voltage or current as displayed on the digital meters for the five welding modes.

**5. VRD (Voltage Reduction Device) INDICATOR LIGHTS-** On the front panel of the Vantage® 435 are two indicator lights. A red light when lit indicates OCV(Open Circuit Voltage) is equal to or greater than 30V and a green light when lit indicates OCV(Open Circuit Voltage) is less than 30V.

The VRD “On/Off” switch inside the control panel must be “On” for the VRD function to be active and the lights to be enabled. When the machine is first started with VRD enabled, both lights will illuminate for 5 seconds.

These lights monitor the OCV(Open Circuit Voltage) and weld voltage at all times. When not welding the green light will illuminate indicating that the VRD has reduced the OCV to less than 30V. During welding the red light will illuminate whenever the arc voltage is equal to or greater than 30V. This means that the red and green light may alternate depending on the weld voltage. This is normal operation.

If the red light remains illuminated or both VRD lights flash when not welding, the VRD is not functioning properly. Please refer to your local field service shop for service.

If the VRD is turned “On” and the lights don’t come “On”, refer to the trouble shooting section.



**6. DIGITAL OUTPUT METERS**—The digital meters allow the preset arc voltage (CV-WIRE mode) or preset arc current (CC-STICK, DOWNHILL PIPE, ARC GOUGING and TIG modes) to be set prior to welding using the OUTPUT control dial. During welding, the meter display the actual output voltage (VOLTS) and current (AMPS). A memory feature holds the display of both meters on for seven seconds after welding is stopped. This allows the operator to read the actual current and voltage just prior to when welding was ceased.

While the display is being held the left-most decimal point in each display will be flashing. The accuracy of the meters is +/- 3%.

The meters will display all dashes for preset when ArcLink® mode is selected.

### 6a. HIDDEN MENU BUTTON:

The hidden setup menu can be accessed any time the machine is on with the engine running and **not in a welding arc (arc off or OCV)**. To access, press the hidden setup menu push button (Figure B.4.) with the appropriate tool or paper clip, if no tool is readily available.

**NOTE:** The menu system will exit automatically if any of the following conditions are met:

- If no settings are changed for 10 seconds.
- If the mode selection switch position is changed.
- If the arc status changes to arc or short.
- If the entire setup menu sequence is cycled through.

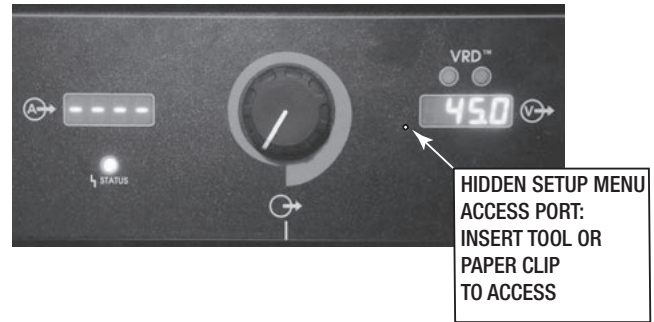


FIGURE B.4

### HIDDEN SETUP MENU FUNCTIONS

- Hot start setting individually settable by mode. Hot start will not display if not applicable. The left display will show “Hot” and “Strt” alternately at 0.5 second intervals. The right display will show a number from 0.0 to 10.0. The default value will be 5, (Figure B.5). This setting will be stored in system memory and will be remembered between machine power cycles.



FIGURE B.5

- Alternate CV mode selection. Default CV mode will be non-synergic FCAW-SS (mode 6). Alternate settings will be non-synergic GMAW (mode 5) and non-synergic FCAW-GS (mode 7). The left display will show “**CV**” and “**type**” alternately at 0.5 second intervals. The right display will show “**FC.SS**”(Figure B.6), “**FC.gs**”(Figure B.7) or “**MIG**”(Figure B.8). This setting will be stored in system memory and will be remembered between machine power cycles. This setting will only be visible if the process selection switch is in the CV Wire position.

FIGURE B.6



FIGURE B.7



FIGURE B.8



- Selection of the remote connector for stick (SMAW) modes. The customer can select between the **12-pin** or the **14-pin** connector for the remote potentiometer input when in the “remote” switch position for stick (SMAW) modes. The default from the factory will be the 12-pin connector. The left display will show “**Pot**”, “**12P**”(Figure B.9) and the right display will show “**Pot**”, “**14P**”(Figure B.10). This setting is stored in system memory and will be remembered between machine power cycles. This selection will only be visible for stick (SMAW) modes.

FIGURE B.9



FIGURE B.10



- Test Modes for grid load testing. The left display will show “**tEST**” and “**LoAd**” alternately at 0.5 second intervals. The right display will show “**CC**” (mode 200)(Figure B.11), “**CV**” (mode 201)(Figure B.12) or “**OFF**” (normal operation)(Figure B.13). This setting is not remembered between machine power cycles and will default to **OFF** at each power on. Moving the position of the weld process selection rotary switch **Item 10** will reset the setting back to **OFF**.

FIGURE B.11



FIGURE B.12



FIGURE B.13



## EXITING HIDDEN MENU BUTTON

Pressing and holding the hidden reset push button for 5 seconds will cause certain stored values to be reset to defaults. The stored hot start values will return to a default setting of 5 on the display (0 at the attribute). The work point values will all be reset to the minimum from the weld table for each respective weld mode. The alternate CV mode selection will revert back to the Flux-Cored Arc Welding-Self Shielding (FCAW-SS) setting. The remote pot connector choice will revert back to the 12-pin connector. When the reset occurs, the left display will show “**deF**”, and the right display will show “**AuLt**” for 3 seconds until the machine exits the menu system.

## 7. WELD TERMINALS ON SWITCH

Output is enabled when in the ON position. Output is remotely controlled when in the REMOTE position. This control is not active in ArcLink® modes.

## 8. DOOR LATCH

## 9. ARC CONTROL

The ARC CONTROL knob is active in the CV-WIRE and CC-STICK modes, and has different functions in these modes. This control is not active in the TOUCH START TIG mode or in ArcLink® mode.

CC-STICK mode: In this mode, the ARC CONTROL knob sets the short circuit current (arc-force) during stick welding. Increasing the number from -10(Soft) to +10(Crisp) increases the short circuit current and prevents sticking of the electrode to the plate while welding.

This can also increase spatter. It is recommended that the ARC CONTROL be set to the minimum number without electrode sticking. Start with a setting at 0.

DOWNHILL PIPE mode: In this mode, the ARC CONTROL knob sets the short circuit current (arc-force) during stick welding to adjust for a soft or a more forceful digging arc (Crisp).

Increasing the number from -10(Soft) to +10(Crisp) increases the short circuit current which results in a more forceful digging arc. Typically a forceful digging arc is preferred for root and hot passes. A softer arc is preferred for fill and cap passes where weld puddle control and deposition ("stacking" of iron) are key to fast travel speeds. It is recommended that the ARC CONTROL be set initially at 0.

## 10. WELD MODE SELECTOR SWITCH:

(Provides six selectable welding modes)

CV-WIRE

DOWNHILL PIPE

CC-STICK

TOUCH START TIG

ARC GOUGES

ARC LINK

## 11. 42V / 115V WIRE FEEDER VOLTAGE SWITCH:

Toggles output of 14-pin connector to voltage requirement of Wire Feeder. (Located above 14-pin connector.)

## 11a. 42V and 115V WIRE FEEDER BREAKERS

## 12. 5-PIN CONNECTOR

For attaching an ArcLink® Wire Feeder control cable.

## 13. 12-PIN CONNECTOR

For attaching optional remote control equipment. The K2909-1 (12-pin to 6-pin) adapter cable is included for attaching to accessories requiring the 6-pin connector.

## 14. 14-PIN CONNECTOR

For attaching wire feeder control cables. Includes contactor closure circuit, work sense leads, remote control circuit, and 120VAC and 42VAC power.

## 15. WELD OUTPUT TERMINALS "+" POSITIVE AND "-" NEGATIVE

These 1/2" - 13 studs with flange nuts provide welding connection points for the electrode and work cables. For positive polarity welding the electrode cable connects to the "+" positive terminal and the work cable connects to this "-" negative terminal. For negative polarity welding the work cable connects to the "+" positive terminal and the electrode cable connects to this "-" negative terminal.

## 16. LOCAL/REMOTE SWITCH-

In the LOCAL position, machine output control is set by the Output Control knob on the front of the machine. In the REMOTE position, the machine output control is set by the remote inputs. This control is not active in ArcLink® modes.

## 17. POLARITY SWITCH:

Matches the polarity of the wire feeder voltmeter to the polarity of the electrode.

**18. 20A 120V AUXILIARY BREAKERS**

**19. 50A 240V 3 PHASE BREAKER**

**20. BATTERY 20A BREAKER**

**21. 240VAC THREE PHASE RECEPTACLE**

This is a 240VAC (15-50R) receptacle that provides 240VAC three phase auxiliary power. This receptacle has a 50 amp rating.

**22. 120/240 VAC SINGLE PHASE RECEPTACLE**

This is a 120/240VAC (14-50R) receptacle that provides 240VAC or can be split for 120VAC single phase auxiliary power. This receptacle has a 50 amp rating. Refer to the AUXILIARY POWER RECEPTACLES section in the installation chapter for further information about this receptacle. Also refer to the AUXILIARY POWER OPERATION section later in this chapter.

**23. 10A 42V/40V ARCLINK BREAKERS**

**24. CIRCUIT BREAKERS**

These circuit breakers provide separate overload current protection for each 120V circuit at the 240V single phase receptacle, each 120V single phase receptacle, the 240V three phase receptacle, the 120VAC in the 14-Pin connector, the 42VAC in the 14-Pin connector and battery circuit overload protection.

**25. GROUND STUD**

Provides a connection point for connecting the machine case to earth ground. Refer to “MACHINE GROUNDING” in the Installation chapter for proper machine grounding information.

**26. DIAGNOSTIC PLUG**

This is used by Field Service shops to connect and troubleshoot engine error codes and is found on the firewall inside the machine on the service side.

**Items 27 thru 30 are found inside the machine by removing the right side panel facing the front.**

(See Figures B.14a and B.14b)

**27. GLOW RELAY / BREAKER (70A)**

**28. FUEL RELAY / BREAKER (20A)**

**29. IDLE RELAY**

**30. ECU (Electronic Control Unit) BREAKER (30A)**

FIGURE B.14a

LOCATION OF ITEMS 27 THRU 30

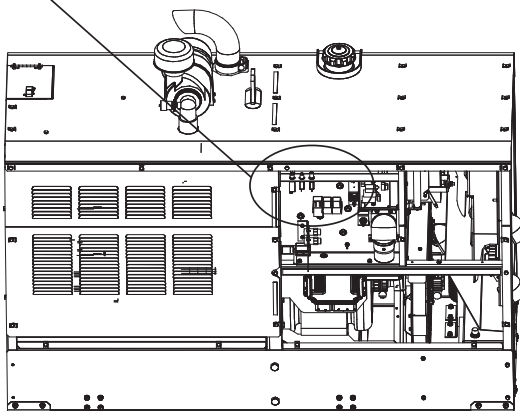
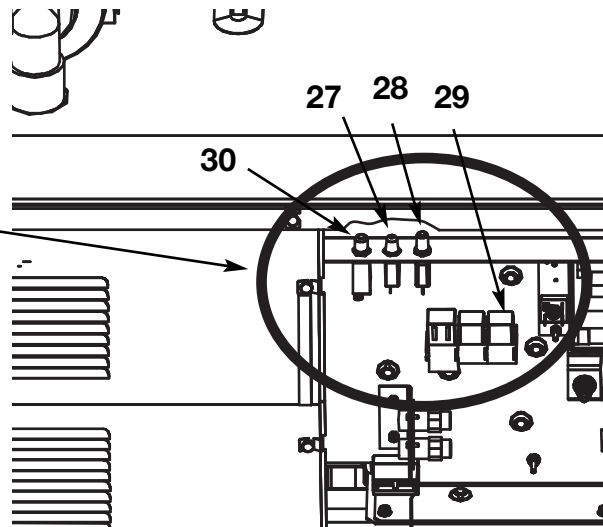


FIGURE B.14b



**31. WIRELESS REMOTE RECEIVER BOX-** located inside engine compartment)

- ON/OFF toggle switch activates / deactivates wireless remote
- Houses wireless remote fuses

**30. STATUS LED**

(See Table B.1a)



The status LED indicates system status. Normal operation is a steady green light.

**Note:** During normal power-up, the LED may flash red and/or green as the equipment performs self tests.

**TABLE B.1a**

<b>LED condition</b>	<b>Definition</b>
Steady green	System is communicating normally.
Blinking green.	Occurs during a reset and indicates the power source is identifying each component in the system. This is normal for up to 15 seconds after power-up, or if the system configuration is changed during operation.
Blinking green, fast	Indicates that one or more pieces of ArcLink equipment are not mapping properly.
Blinking green followed by blinking red.	<p>Non-recoverable system fault. If the power source or wire feeder status LED is flashing any combination of red and green, errors are present in the system. <b>Read the error code before the machine is turned off.</b></p> <p>Instructions for reading the error code are 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.</p> <p>To clear the error, turn the power source OFF, and then back ON to reset.</p>

**WELDER OPERATION**

**DUTY CYCLE**

Duty cycle is the percentage of time the load is being applied in a 10 minute period. For example, a 60% duty cycle represents 6 minutes of load and 4 minutes of no load in a 10 minute period.

**STICK WELDING MODE**

The Vantage® 435 can be used with a broad range of DC stick electrodes.

The MODE switch provides two stick welding settings as follows:

**CC-STICK MODE**

The CC-STICK position of the MODE switch is designed for horizontal, vertical-up and over head welding with all types of electrodes, especially low hydrogen. The OUTPUT CONTROL knob adjusts the full output range for stick welding.

The ARC CONTROL knob sets the short circuit (arc-force) current during stick welding. Increasing the number from -10(Soft) to +10 (Crisp) increases the short circuit current and prevents sticking of the electrode to the plate while welding. This can also increase spatter. It is recommended that the ARC CONTROL be set to the minimum number without electrode sticking. Start with the knob set at 0.

**DOWNHILL PIPE MODE**

This slope controlled setting is intended for “out-of-position” and “down hill” pipe welding where the operator would like to control the current level by changing the arc length. The OUTPUT CONTROL knob adjusts the full output range for pipe welding.

The ARC CONTROL knob sets the short circuit current (arc-force) during stick welding to adjust for a soft or a more forceful digging arc (Crisp). Increasing the number from -10(Soft) to +10(Crisp) increases the short circuit current which results in a more forceful digging arc. Typically a forceful digging arc is preferred for root and hot passes. A softer arc is preferred for fill and cap passes where weld puddle control and deposition (“stacking” of iron) are key to fast travel speeds. It is recommended that the ARC CONTROL be set initially at 0.

**TYPICAL FUEL CONSUMPTION**

Refer to Table B.2 for typical fuel consumption of the Vantage® 435 Engine for various operating scenarios.

**TOUCH START TIG MODE**

The Vantage® 435 can be used in a wide variety of DC TIG welding applications.

The TOUCH START TIG setting of the MODE switch is for DC TIG (Tungsten Inert Gas) welding. To initiate a weld, the OUTPUT CONTROL knob is first set to the desired current and the tungsten is touched to the work. During the time the tungsten is touching the work there is very little voltage or current and, in general, avoids tungsten contamination. Then, the tungsten is gently lifted off the work in a rocking motion, which establishes the arc.

To stop the arc, simply lift the TIG torch away from the work piece. When the arc voltage reaches approximately 30 volts, the arc will go out and the machine will automatically reset to the touch start current level. The tungsten may then be retouched to the work piece to restrike the arc. The arc may also be started and stopped with an Amptrol or Arc Start Switch.

The ARC CONTROL is not active in the TIG mode.

In general the ‘Touch Start’ feature avoids tungsten contamination without the use of a Hi-frequency unit. If the use of a high frequency generator is desired, the K930-2 TIG Module can be used with the Vantage® 435. The settings are for reference.

The Vantage® 435 is equipped with the required R.F. bypass circuitry for the connection of high frequency generating equipment.

The Vantage® 435 and any high frequency generating equipment must be properly grounded. See the K930-2 TIG Module operating manuals for complete instructions on installation, operation, and maintenance.

When using the TIG Module, the OUTPUT control on the Vantage® 435 is used to set the maximum range of the CURRENT CONTROL on the TIG Module Amptrol.

**Table B.2  
(Deutz D 2.9 L4) Fuel Consumption**

	GAL/HR	Liters/Hr	HRS @ 20 GAL(75.7L)
High Idle (1800 RPM)	.54	2.06	36.73
Low Idle (1500 RPM)	.50	1.89	40.14
100A 24V	.70	2.64	28.63
200A 28V	.89	3.38	22.38
300A 32V	1.16	4.39	17.23
400A 36V	1.53	5.79	13.06
520A 30V	1.65	6.26	12.09
Aux power 11,000VA single phase	1.19	4.51	16.78
Aux power 17,000VA three phase	1.62	6.14	12.32

## 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 Vantage® 435 encompasses a wide range of common processes that will meet most needs. If a special weld mode is desired, contact the local Lincoln Electric sales representative.

All adjustments are made through the user interface. Because of the different configuration options your system may not have all of the following adjustments.

See Accessories Section for Kits and Options available to use with the Vantage® 435.

## 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 Vantage® 435 power source. Weld modes are developed with a specific electrode material, electrode size, and shielding gas. For a more complete description of the weld modes programmed into the Vantage® 435 at the factory, refer to the Weld Set Reference Guide supplied with the machine.

### 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 Vantage® 435 then uses the WFS setting to adjust the voltage and current according to settings contained in the Vantage® 435.

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

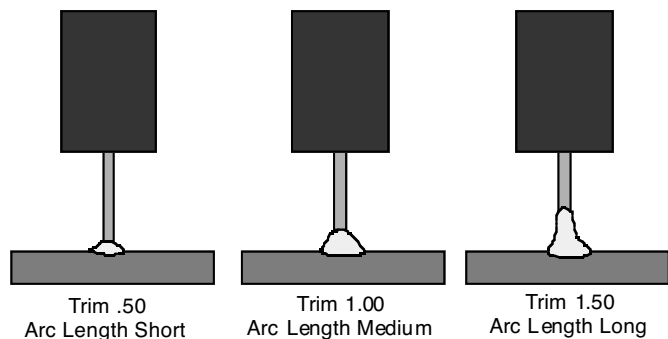
UltimArc™ Control allows the operator to vary the arc characteristics. UltimArc™ Control is adjustable from -10.0 to +10.0 with a nominal setting of 0.0.

## 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.15)

FIGURE B.15



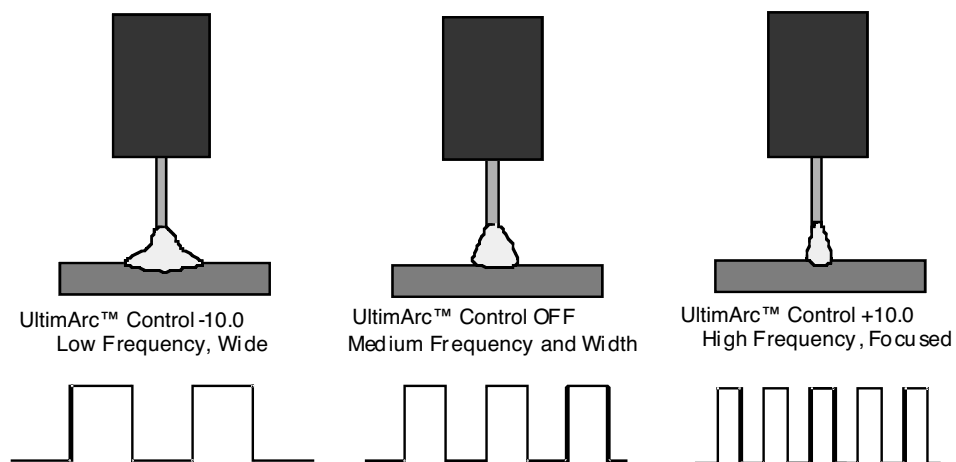


Most pulse welding programs are synergic. As the wire feed speed is adjusted, the Vantage® 435 will automatically recalculate the waveform parameters to maintain similar arc properties.

The Vantage® 435 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 Vantage® 435 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.16)

**FIGURE B.16**



## SETTINGS WHEN USING THE K930-2 TIG MODULE

- Set the WELD MODE switch to the “Touch Start TIG Setting”.
- Set the STOP/AUTO IDLE/HIGH IDLE switch to the “AUTO/RUN” position.
- Set the WELDING TERMINALS switch to the “Remotely Controlled” position. This will keep the solid state contactor open and provide a “cold” electrode until the triggering device (Amptrol or Arc Start Switch) is pressed.

**Table B.3 TYPICAL CURRENT RANGES <sup>(1)</sup>  
FOR TUNGSTEN ELECTRODES <sup>(2)</sup>**

Tungsten Electrode Diameter mm (in)	DCEN (-)	DCEP (+)	Approximate Argon Gas Flow Rate l/min (c.f.m.)		TIG TORCH Nozzle Size (4), (5)
	1%, 2% Thoriated Tungsten	1%, 2% Thoriated Tungsten	Aluminum	Stainless Steel	
.25 (0.010)	2-15	(3)	2-4 (3-8)	2-4 (3-8)	#4, #5, #6
.50 (0.020)	5-20	(3)	3-5 (5-10)	3-5 (5-10)	
1.0 (0.040)	15-80	(3)	3-5 (5-10)	3-5 (5-10)	
1.6 (1/16)	70-150	10-20	3-5 (5-10)	4-6 (9-13)	#5, #6
2.4 (3/32)	150-250	15-30	6-8 (13-17)	5-7 (11-15)	#6, #7, #8
3.2 (1/8)	250-400	25-40	7-11 (15-23)	5-7 (11-15)	
4.0 (5/32)	400-500	40-55	10-12 (21-25)	6-8 (13-17)	#8, #10
4.8 (3/16)	500-750	55-80	11-13 (23-27)	8-10 (18-22)	

- (1) When used with argon gas. The current ranges shown must be reduced when using argon/helium or pure helium shielding gases.
- (2) Tungsten electrodes are classified as follows by the American Welding Society (AWS):
- |              |        |
|--------------|--------|
| Pure         | EWP    |
| 1% Thoriated | EWTh-1 |
| 2% Thoriated | EWTh-2 |
- Though not yet recognized by the AWS, Ceriated Tungsten is now widely accepted as a substitute for 2% Thoriated Tungsten in AC and DC applications.
- (3) DCEP is not commonly used in these sizes.
- (4) TIG torch nozzle “sizes” are in multiples of 1/16ths of an inch:
- |       |          |         |
|-------|----------|---------|
| # 4 = | 1/4 in.  | 6 mm    |
| # 5 = | 5/16 in. | 8 mm    |
| # 6 = | 3/8 in.  | 10 mm   |
| # 7 = | 7/16 in. | 11 mm   |
| # 8 = | 1/2 in.  | 12.5 mm |
| #10 = | 5/8 in.  | 16 mm   |
- (5) TIG torch nozzles are typically made from alumina ceramic. Special applications may require lava nozzles, which are less prone to breakage, but cannot withstand high temperatures and high duty cycles.

## CV-WIRE MODE

Connect a wire feeder to the Vantage® 435 and set welder controls according to the instructions listed earlier in this section.

The Vantage® 435 in the "CV-WIRE" position, permits it to be used with a broad range of flux cored wire (Innershield and Outershield) electrodes and solid wires for MIG welding (gas metal arc welding). Welding can be finely tuned using the "ARC CONTROL". Turning the ARC CONTROL clockwise from -10(soft) to +10(crisp) changes the arc from soft and washed-in to crisp and narrow. It acts as an inductance/pinch control. The proper setting depends on the procedure and operator preference. Start with the knob set at 0.

For any electrodes, including the above recommendations, the procedures should be kept within the rating of the machine. For additional electrode information, See [www.lincolnelectric.com](http://www.lincolnelectric.com) or the appropriate Lincoln publication.

## 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 Vantage® 435 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.

## ARC GOUGING

For optimal performance when arc gouging, set the Vantage® 435 "WELD MODE" switch to the "Arc Gouging" position, and the "ARC CONTROL" to 10.

Set the "OUTPUT" knob to adjust output current to the desired level for the gouging electrode being used according to the ratings in Table B.4.

Maximum current setting is limited to the Vantage® 435 maximum of 525 Amps.

TABLE B.4

ELECTRODE DIAMETER	CURRENT RANGE (DC, electrode positive)
(1/8")	30-60 Amps
(5/32")	90-150 Amps
(3/16")	200-250 Amps
(1/4")	300-400 Amps
(5/16")	350-450 Amps

## PARALLELING

When paralleling machines in order to combine their outputs, all units must be operated in the CC-STICK mode at the same output settings. To achieve this, turn the WELD MODE switch to the CC-STICK position. Operation in other modes may produce erratic outputs, and large output imbalances between the units.

## AUXILIARY POWER OPERATION

Start the engine and set the IDLER control switch to the desired operating mode. Full power is available regardless of the welding control settings, if no welding current is being drawn.

The auxiliary power of the Vantage® 435 consists of two 20 Amp-120VAC single phase (5-20R) GFCI duplex receptacles, one 50 Amp-120/240VAC single phase (14-50R) receptacle and one 50 Amp 240VAC three phase (15-50R) receptacle. The 120/240VAC receptacle can be split for single phase 120 VAC operation.

The auxiliary power capacity is 11,000 watts of 60 Hz, single phase power or 17,000 watts of 60Hz, three phase power. The auxiliary power capacity rating in watts is equivalent to volt-amperes at unity power factor. The maximum permissible current of the 240 VAC output is 50 A. The 240 VAC single phase output can be split to provide two separate 120 VAC outputs with a maximum permissible current of 50 A per output to two separate 120 VAC branch circuits. Output voltage is within  $\pm 10\%$  at all loads up to rated capacity.

**NOTE:** The two 120V GFCI receptacles and the two 120V circuits of the 120/240V receptacle are connected to different phases and cannot be paralleled.

The auxiliary power receptacles should only be used with three wire grounded type plugs or approved double insulated tools with two wire plugs.

The current rating of any plug used with the system must be at least equal to the current capacity of the associated receptacle.

## SIMULTANEOUS WELDING AND AUXILIARY POWER LOADS

It must be noted that the above auxiliary power ratings are with no welding load.

Simultaneous welding and power loads are specified in table B.5. The permissible currents shown assume that current is being drawn from either the 120 VAC or 240 VAC supply (not both at the same time).

**TABLE B.5 VANTAGE® 435 DEUTZ SIMULTANEOUS WELDING AND POWER LOADS**

WELD AMPS	PLUS	1 PHASE		OR	3 PHASE		OR	BOTH 1 AND 3 PHASE	
		WATTS	AMPS		WATTS	AMPS		WATTS	AMPS
0		11,000	46		17,000	41		11,000	-----
100		11,000	46		15,400	37		11,000	-----
200		8000	33		13,000	31		8000	-----
300		4700	20		9400	23		4700	-----
400		1700	7		3400	8		1700	-----
up to 500		0	0		0	0		0	0

**TABLE B.6 VANTAGE® 435 DEUTZ Extension Cord Length Recommendations**

Current (Amps)	Voltage (Volts)	Load (Watts)	Maximum Allowable Cord Length in ft. (m) for Conductor Size											
			14 AWG		12 AWG		10 AWG		8 AWG		6 AWG		4 AWG	
15	120	1800	30	(9)	40	(12)	75	(23)	125	(38)	175	(53)	300	(91)
15	240	3600	60	(18)	75	(23)	150	(46)	225	(69)	350	(107)	600	(183)
20	120	2400			30	(9)	50	(15)	88	(27)	138	(42)	225	(69)
20	240	4800			60	(18)	100	(30)	175	(53)	275	(84)	450	(137)
25	240	6000					90	(27)	150	(46)	225	(69)	250	(76)
30	240	7200					75	(23)	120	(37)	175	(53)	300	(91)
38	240	9000							100	(30)	150	(46)	250	(76)
50	240	12000									125	(38)	200	(61)

Conductor size is based on maximum 2.0% voltage drop.

The following additional modes can be accessed via an ArcLink feeder

<b>Synergic CV Modes</b>									
<b>Dia.</b>	<b>Steel</b>		<b>Stainless</b>		<b>Metal Core</b>	<b>Flux Core</b>		<b>Aluminum</b>	
<b>inches</b>	<b>CO2</b>	<b>Argon Mix</b>	<b>Argon Mix</b>	<b>Tri-Mix</b>	<b>Argon Mix</b>	<b>Argon Mix</b>	<b>CO2</b>	<b>4043</b>	<b>5356</b>
.030	•	•	•	•					
.035	•	•	•	•					
.040	•	•							
.045	•	•	•	•	•	•	•		
3/64								•	•
0.052	•	•			•				
1/16					•			•	•

<b>Pulse Modes</b>				
<b>Dia.</b>	<b>Steel</b>	<b>Stainless</b>	<b>Aluminum</b>	
<b>inches</b>	<b>Argon Mix</b>	<b>Argon Mix</b>	<b>4043</b>	<b>5356</b>
0.035	•	•		
0.045	•	•		
3/64			•	•
0.052	•			
1/16			•	•

# ACCESSORIES

## OPTIONAL FIELD INSTALLED ACCESSORIES

**K802N POWER PLUG KIT** - Provides four 120V plugs rated at **20 amps** each and one dual voltage, full KVA plug rated at 120/240V, 50 amps. 120V plug may not be compatible with NEMA common household receptacles.

**K857 25 ft. (7.5 m) or K857-1 100 ft. (30.4 m) REMOTE CONTROL** - Portable control provides same dial range as the output control on the welder from a location up to the specified length from the welder. Has convenient plug for easy connection to the welder. The Vantage® 435 is equipped with a 12-pin connector for connecting the remote control and 12-pin to 6-pin adapter.

**K704 ACCESSORY SET** - Includes 35 feet (10 m) of electrode cable and 30ft. (9m) of work cable, headshield, Filter plate, work clamp and electrode holder. Cable is rated at 500 amps, 60% duty cycle.

### **K2641-2 FOUR WHEELED STEERABLE YARD TRAILER**

For in plant and yard towing. Comes standard with a Duo-Hitch™, a 2" Ball and Lunette Eye combination hitch.

### **MEDIUM WELDER TRAILER**

For heavy-duty road, off-road, plant and yard use. Includes pivoting jack stand, safety chains, and 13 in. (330 mm) wheels. Stiff .120 in. (3.0 mm) welded rectangular steel tube frame construction is phosphate etched and powder coat painted for superior rust and corrosion resistance. Low sway suspension gives outstanding stability with manageable tongue weight. Wheel bearings are packed with high viscosity, high pressure, low washout Lubriplate® grease. Includes a Duo-Hitch® – a 2 in. (51 mm) Ball/Lunette Eye combination hitch. Overall width 60 in. (1524 mm). Overall length 124 in. (3150 mm).

**K2636-1 Trailer**

**K2639-1 Fender & Light Kit**

**K2640-1 Cable Rack**

### **POLARITY/MULTI-PROCESS SWITCH**

For easy polarity switching. Example: DC-stick root pass on pipe and DC+ stick for hot, fill and cap passes. Also for an easy process change. Example: DC+ stick root pass on pipe and DC- Innershield® self-shielded flux-cored wire for hot, fill and cap passes. 6 and 14-pin remote connections can be made to this unit. For all Lincoln Electric Chopper Technology® engine-driven welders. Mounts on roof with K2663-1 Docking Kit.

**K2642-1**

**K1816-1 Full KVA Adapter Kit** - Plugs into the 120/240V NEMA 14-50R receptacle on the case front (which accepts 4-prong plugs) and converts it to a NEMA 6-50R receptacle (which accepts 3-prong plugs) for connection to Lincoln Equipment with a NEMA 6-50P plug,

**T12153-9 Full-KVA Power Plug** - One dual voltage plug rated at 120/240V, 50 amps, single phase.



## WARNING

**Pipe Thawing with an arc welder can cause fire, explosion, damage to electric wiring or to the arc welder if done improperly. The use of an arc welder for pipe thawing is not approved by the CSA, nor is it recommended or supported by Lincoln Electric.**

### **REMOTE OUTPUT CONTROL WITH 120V AC RECEPTACLES**

Remote weld output control box with two 120V AC receptacles having GFCI (Ground Fault Circuit Interrupter) protection. One cord for both remote and power. 100 ft. (30.5 m) length. Permits remote adjustment of weld output and power for tools (such as a grinder) at the work. 20 amp capacity.

**K2627-2**

### **DOCKING KIT**

Secures the K2642-1 Polarity/Multi- Process Switch to the engine-driven welder roof. Release latch permits removal of K2642-1 Polarity/Multi- Process Switch. Made from stainless steel for rust-free operation. For all Lincoln Electric Chopper Technology® engine-driven welders.

**K2663-1**

### **TIG OPTIONS**

#### **K1783-9 PTA-26V TIG Torch**

Air Cooled 200 amp torch (2 piece) equipped with valve for gas flow control. 25 ft. (7.6m) length.

**K870 Foot Amptrol®**- Varies current while welding for making critical TIG welds and crater filling. Depress pedal to increase current. Depressing pedal fully achieves maximum set current. Fully raising the pedal finishes the weld and starts the after flow cycle on systems so equipped. Includes 25 ft. (7.6m) control cable.

**K963-3 Hand Amptrol®**- Provides 25 ft. (7.6 m) of remote current control for TIG welding. (6-pin plug connection). Velcro straps secure torch. (one size fits all Pro-Torch™ TIG Torches)

## WIRE FEEDER OPTIONS

### LN-25 IRONWORKER™ WIRE FEEDER

Portable CV unit for flux-cored and mig welding with maxtrac® wire drive system. includes digital meters for wire feed speed/amperage and voltage, gas solenoid, internal contactor and 5/64 in. (2.0 mm) drive roll kit for cored wire. has 83% reduced wire feed speed capability for 6 o'clock pipe welding with Innershield® wire.

**K2614-9**

### K126™ PRO Innershield® Gun

For self-shielded wire with 15 ft. (4.5 m) cable. For .062-5/64 in. (1.6-2.0 mm) wire. Includes K466-10 Connector Kit.

**K126-12**

**KP1696-1 Drive Roll Kit** - Includes: 2 V groove drive rolls and inner wire guide for Steel Wires. (Used on LN-25 Pro)

### K487-25 Magnum SG Spool Gun

Hand held semiautomatic wire feeder. Requires SG Control Module and Input Cable.

### K488 SG Control Module

The Interface between the power source and the spool gun. Provides control of the wire speed and gas flow. For use with a spool gun.

### K691-10 Input Cable (For SG Control Module)

For Lincoln engine power sources with 14-pin MS-type connection, separate 115V NEMA receptacles and output stud connections.

### POWER FEED 25M

This compact shop or construction wire feeder is push-pull capable for premium aluminum welding. Featuring our MAXTRAC® drive system, full controls and procedural memory presets, the Power Feed® 25M is ready for advanced process welding on almost any application.

# MAINTENANCE

## SAFETY PRECAUTIONS



### WARNING

- Have a qualified technician do the maintenance and troubleshooting work.
- Turn the engine off before working inside the machine.
- 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.

Read the Safety Precautions in front of this manual and the engine instruction manual before working on this machine.

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 the equipment.

## ROUTINE AND PERIODIC MAINTENANCE

### DAILY

- Check the Engine oil level.
- Refill the fuel tank to minimize moisture condensation in the tank.
- Open the water drain valve located on the bottom of the water separator element 1 or 2 turns and allow to drain into a container suitable for diesel fuel for 2 to 3 seconds. Repeat the above drainage procedure until diesel fuel is detected in the container.

### WEEKLY

Blow out the machine with low pressure air periodically. In particularly dirty locations, this may be required once a week.

### ENGINE MAINTENANCE

Refer to the "SERVICE PLAN" section of the Engine Operator's Manual for the recommended maintenance schedule of the following:

- Engine Oil and Filter
- Air Cleaner
- Fuel Filter - and Delivery System
- Alternator Belt
- Battery
- Cooling System

Refer to Table D.1 at the end of this section for various engine maintenance components.

## AIR FILTER



### CAUTION

- Excessive air filter restriction will result in reduced engine life.



### WARNING

- Never use gasoline or low flash point solvents for cleaning the air cleaner element. A fire or explosion could result.



### CAUTION

- Never run the engine without the air cleaner. Rapid engine wear will result from contaminants, such as dust and dirt being drawn into the engine.

The diesel engine is equipped with a dry type air filter. Never apply oil to it. Service the air cleaner as follows:

Replace the element as indicated by the service indicator. (See Service Instructions and Installation Tips for Engine Air Filter.)



# Service Instructions

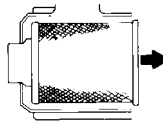
## Single- and Two-Stage Engine Air Cleaners

### 1 Remove the Filter



Rotate the filter while pulling straight out.

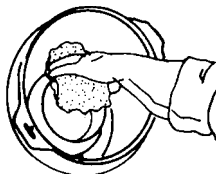
Unfasten or unlatch the service cover. Because the filter fits tightly over the outlet tube to create the critical seal, there will be some initial resistance, similar to breaking the seal on a jar. Gently move the end of the filter back and forth to break the seal then rotate while pulling straight out. Avoid knocking the filter against the housing.



If your air cleaner has a safety filter, replace it every third primary filter change. Remove the safety filter as you would the primary filter. Make sure you cover the air cleaner outlet tube to avoid any unfiltered contaminant dropping into the engine.

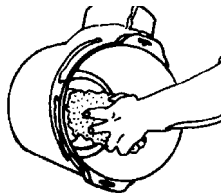
### 2 Clean Both Surfaces of the Outlet Tube and Check the Vacuator™ Valve

Use a clean cloth to wipe the filter sealing surface and the inside of the outlet tube. Contaminant on the sealing surface could hinder an effective seal and cause leakage. Make sure that all contaminant is removed before the new filter is inserted. Dirt accidentally transferred to the inside of the outlet tube will reach the engine and cause wear. Engine manufacturers say that it takes only a few grams of dirt to "dust" an engine! Be careful not to damage the sealing area on the tube.



Outer edge of the outlet tube

Wipe both sides of the outlet tube clean.



Inner edge of the outlet tube

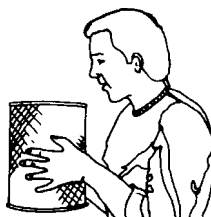
#### If your air cleaner is equipped with a Vacuator Valve

Visually check and physically squeeze to make sure the valve is flexible and not inverted, damaged or plugged.



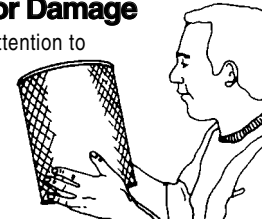
### 3 Inspect the Old Filter for Leak Clues

Visually inspect the old filter for any signs of leaks. A streak of dust on the clean side of the filter is a telltale sign. Remove any cause of leaks before installing new filter.



### 4 Inspect the New Filter for Damage

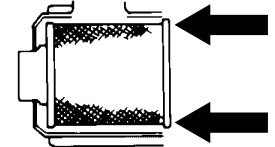
Inspect the new filter carefully, paying attention to the inside of the open end, which is the sealing area. NEVER install a damaged filter. A new Donaldson radial seal filter may have a dry lubricant on the seal to aid installation.



### 5 Insert the New Radial Seal Filter Properly

If you're servicing the safety filter, this should be seated into position before installing the primary filter.

Insert the new filter carefully. Seat the filter by hand, making certain it is completely into the air cleaner housing before securing the cover in place.



The critical sealing area will stretch slightly, adjust itself and distribute the sealing pressure evenly. To complete a tight seal, apply pressure by hand at the outer rim of the filter, not the flexible center. (Avoid pushing on the center of the urethane end cap.) No cover pressure is required to hold the seal. NEVER use the service cover to push the filter into place! Using the cover to push the filter in could cause damage to the housing, cover fasteners and will void the warranty.

If the service cover hits the filter before it is fully in place, remove the cover and push the filter (by hand) further into the air cleaner and try again. The cover should go on with no extra force.

Once the filter is in place, secure the service cover.



#### Caution

**NEVER use the service cover to push the filter into place! Using the cover to push the filter in could cause damage to the housing, cover fasteners and will void the warranty.**



### 6 Check Connectors for Tight Fit

Make sure that all mounting bands, clamps, bolts, and connections in the entire air cleaner system are tight. Check for holes in piping and repair if needed. Any leaks in your intake piping will send dust directly to the engine!

## FUEL FILTERS



### WARNING



When working on the fuel system

- Keep naked lights away, do not smoke!
- Do not spill fuel!

The Vantage® 435 is equipped with a fuel pre-filter / water separator before the electric lift pump and a fuel filter after the lift pump and before the injectors. Open the drain on the fuel pre-filter / water separator and drain out any water daily. Close drain when diesel fuel starts to come out. If excessive water is in the fuel, the engine will not start. The procedure for changing the filter is as follows.

1. Close the fuel shutoff valve.
2. Clean the area around the fuel filter head. Remove the filter. Clean the gasket surface of the filter head and replace the o-ring.
3. Fill the clean filter with clean fuel, and lubricate the o-ring seal with clean lubricating oil.
4. Install the filter as specified by the filter manufacturer.



### WARNING

Over tightening will distort the threads, filter element seal or filter can.

## COOLING SYSTEM

The cooling system of the Deutz engine needs to be checked and cleaned periodically. (Consult the engine Owners Manual for the proper procedures and frequency).

Coolant needs to be added at the radiator filler neck after removing cap when system is cool. Fill to top of filler neck. Engine will not start if coolant level is too low.

The coolant system is equipped with an internal expansion tank located inside the top radiator tank. This allows for normal thermal expansion and contraction of the engine coolant. The system is fitted with a “catch only” reservoir to keep any rejected or excess coolant from entering the environment. Check periodically and empty as required. Do not fill with coolant.

## BATTERY HANDLING



### WARNING



GASES FROM BATTERY can explode.

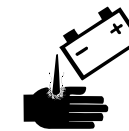
- Keep sparks, flame and cigarettes away from battery.

To prevent EXPLOSION when:

- **INSTALLING A NEW BATTERY** - disconnect negative cable from old battery first and connect to new battery last.



- **CONNECTING A BATTERY CHARGER** - Remove battery from welder by disconnecting negative cable first, then positive cable and battery clamp. When reinstalling, connect negative cable last. Keep well ventilated.



- **USING A BOOSTER** - connect positive lead to battery first then connect negative lead to engine foot.

**BATTERY ACID CAN BURN EYES AND SKIN.**

- Wear gloves and eye protection and be careful when working near battery. Follow instructions printed on battery.

## PREVENTING ELECTRICAL DAMAGE

1. When replacing, jumping, or otherwise connecting the battery to the battery cables, the proper polarity must be observed. Failure to observe the proper polarity could result in damage to the charging circuit. The positive (+) battery cable has a red terminal cover.
2. If the battery requires charging from an external charger, disconnect the negative battery cable first and then the positive battery cable before attaching the charger leads. Failure to do so can result in damage to the internal charger components. When reconnecting the cables, connect the positive cable first and the negative cable last.

## PREVENTING BATTERY DISCHARGE

Turn the RUN/STOP switch to stop when engine is not running.

## PREVENTING BATTERY BUCKLING

Tighten nuts on battery clamp until snug.

**CHARGING THE BATTERY**

When you charge, jump, replace, or otherwise connect battery cables to the battery, be sure the polarity is correct. Improper polarity can damage the charging circuit. The Vantage® 435 positive (+) battery terminal has a red terminal cover.

If you need to charge the battery with an external charger, disconnect the negative cable first, then the positive cable before you attach the charger leads. After the battery is charged, reconnect the positive battery cable first and the negative cable last. Failure to do so can result in damage to the internal charger components.

Follow the instructions of the battery charger manufacturer for proper charger settings and charging time.

**NAMEPLATES / WARNING DECALS MAINTENANCE**

Whenever routine maintenance is performed on this machine - or at least yearly - inspect all nameplates and labels for legibility. Replace those which are no longer clear. Refer to the parts list for the replacement item number.

**WELDER / GENERATOR MAINTENANCE**

**STORAGE**

Store the Vantage® 435 in a clean, dry protected areas.

**CLEANING**

Blow out the generator and controls periodically with low pressure air. Do this at least once a week in particularly dirty areas.

Spray low pressure water through the exterior of the radiator to clean any dust and debris off the cooling fins. Do this once per week or as needed in dirty areas.

**BRUSH REMOVAL AND REPLACEMENT**

It is normal for the brushes and slip rings to wear and darken slightly. Inspect the brushes when a generator overhaul is necessary.

**Do not attempt to polish slip rings while the engine is running.**

-----

REPLACEMENT SERVICE ITEMS			
ITEM	MAKE	PART NUMBER	SERVICE INTERVAL
AIR CLEANER ELEMENT	DONALDSON	P821575	(WITH SERVICE INDICATOR) CLEAN AS NEEDED, REPLACE AS INDICATED BY THE SERVICE INDICATOR (WITHOUT SERVICE INDICATOR) CLEAN AS NEEDED, REPLACE EVERY 200 HOURS.
OIL FILTER	DEUTZ	01174416	REPLACE EVERY 500 HOURS OR 12 MONTHS, WHICHEVER IS LESS
FAN BELT	DEUTZ	04131488	REPLACE EVERY 1500 HOURS
FUEL FILTER	DEUTZ	04131532	REPLACE EVERY 500 HOURS OR 24 MONTHS, WHICHEVER IS LESS
FUEL FILTER/WATER SEPARATOR	DEUTZ	04130241	CLEAN EVERY 100 HOURS OR AS NEEDED, REPLACE EVERY 500 HOURS
BATTERY	—	BCI GROUP 34	INSPECT EVERY 500 HOURS
ENGINE OIL CHANGE	SEE MANUAL	—	CHANGE EVERY 500 HOURS OR 6 MONTHS, WHICHEVER IS LESS. CHECK DAILY.

**WARRANTY WORK PERFORMED ON THE ENGINE CONTAINED IN THIS MACHINE, IF NOT BILLABLE TO THE ENGINE MANUFACTURER, SHOULD BE PRE-APPROVED BY CALLING THE LINCOLN ELECTRIC COMPANY AT 888-935-3877**

S30883 VM

## GFCI TESTING AND RESETTING PROCEDURE

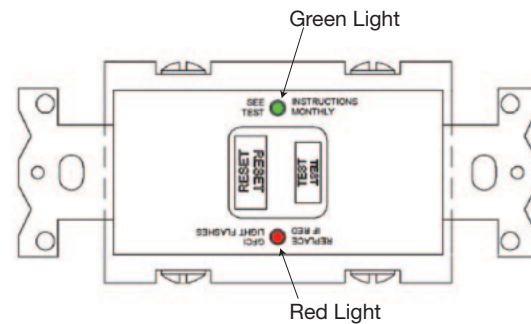
The GFCI should be properly tested at least once every month or whenever it is tripped. To properly test and reset the GFCI:

- If the GFCI has tripped, first carefully remove any load and check it for damage.
- If the equipment has been shut down, it must be restarted.
- The equipment needs to be operating at high idle speed and any necessary adjustments made on the control panel so that the equipment is providing at least 80 volts to the receptacle input terminals.
- The circuit breaker for this receptacle must not be tripped. Reset if necessary.
- Push the "Reset" button located on the GFCI. This will assure normal GFCI operation.
- Plug a night-light (with an "ON/OFF" switch) or other product (such as a lamp) into the Duplex receptacle and turn the product "ON".
- Push the "Test" button located on the GFCI. The night-light or other product should go "OFF".
- Push the "Reset" button, again. The light or other product should go "ON" again.

If the light or other product remains "ON" when the "Test" button is pushed, the GFCI is not working properly or has been incorrectly installed (miswired). If your GFCI is not working properly, contact a qualified, certified electrician who can assess the situation, rewire the GFCI if necessary or replace the device.

For GFCI Models that have the appearance as shown in Figure D.2, please use the following information and troubleshooting guide listed below. For all other GFCI models, please use the GFCI testing and resetting procedure listed previously.

**FIGURE D.2**



- The GFCI automatically monitors ground fault circuit interrupting functionality every (3) hours or less, and it also automatically tests within (5) seconds of power to the device.
- If the GFCI device can no longer provide GFCI protection it will deny power and provide a visual indication that it no longer can provide protection.

### TROUBLESHOOTING GUIDELINES:

- If the line conductor is incorrectly wired to the load terminal, power to the receptacle will be denied. This includes initial installation and any subsequent reinstallations.
- Visual indicators: Green LED on represents power at the face of the receptacle; solid Red LED on indicates a trip condition and load is off. A flashing red LED indicates that the GFCI is no longer functioning and needs replaced.
- Reverse Wire Safety Feature: The GFCI will not have power at both the face and downstream if the line and load are reverse wired. Additionally, the unit will not be able to reset under a reversed wiring condition. If the line conductor is incorrectly wired to the load terminal, power to the receptacle will be denied. This includes initial installation and any subsequent reinstallations.
- (GFCI no longer functioning): A rapid flashing red LED will indicate that the unit can no longer provide ground fault protection. This indication will occur regardless of the specific test mode that is being conducted, automatic or manual.
- If your GFCI is no longer working properly, contact a qualified, certified electrician who can assess the situation and rewire the GFCI if necessary or replace the device.

# 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.

### CAUTION



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](http://WWW.LINCOLNELECTRIC.COM/LOCATOR)**

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
<b>ENGINE PROBLEMS</b>		
Major Physical or Electrical Damage is Evident.	1. Contact your Local Lincoln Authorized Field Service Facility.	If all recommended possible areas of misadjustment have been checked and the problem persists, <b>Contact your local Lincoln Authorized Field Service Facility.</b>
Engine will not crank	1. Battery low. 2. Loose battery cable connections which may need Inspected, cleaned or tighten. 3. Faulty wiring in engine starting circuit. 4. Faulty engine starter. Contact authorized local Engine Service Shop. 5. If check engine light is on contact your Field Service Facility. 6. Check 30A Breaker (ECU).	
Engine will crank but not start.	1. Out of fuel. 2. Fuel shut off valve is in the off position make sure the valve lever is in the open position (lever in-line with the Hose). 3. Engine shut down solenoid not pulling in. 4. On/Off switch on for more than 30 sec. before starting, the On/Off switch will need to be switch off and turned back on. 5. Fuel Filters dirty/clogged, main filter element and/or Inline Fuel Filter may need to be replaced. 6. High oil temperature or low oil pressure. (engine protection light lit)	
Engine shuts down shortly after starting.	1. Low oil pressure (engine protection light lit). Check oil level (Consult engine service dealer). 2. High oil temperature. Check engine cooling system. (engine protection light lit). 3. Faulty oil pressure switch. 4. Faulty oil temperature switch. Contact authorized local Engine Service Shop. 5. Check coolant level.	
Engine shuts down while under a load.	1. High oil temperature.	
Engine runs rough.	1. Dirty fuel or air filters may need cleaned/replaced. 2. Water in fuel.	
Engine will not shut off.	1. Fuel Shutdown solenoid not functioning properly.	

**⚠ CAUTION**



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
Battery does not stay charged.	<ol style="list-style-type: none"> <li>1. Faulty battery.</li> <li>2. Faulty engine alternator.</li> <li>3. Loose or broken lead in charging circuit.</li> <li>4. Loose fan belt may need tightening.</li> </ol>	<p>If all recommended possible areas of misadjustment have been checked and the problem persists, <b>Contact your local Lincoln Authorized Field Service Facility.</b></p>
Engine will not idle down to low speed.	<ol style="list-style-type: none"> <li>1. Idler switch in HIGH idle position, make sure switch is set to AUTO.</li> <li>2. Faulty relay.</li> <li>3. Faulty Weld Control PCB (Printed Circuit Board)</li> </ol>	
Engine will not go to high idle when attempting to weld.	<ol style="list-style-type: none"> <li>1. Poor work lead connection to work.</li> <li>2. Welding Terminals switch in wrong position.</li> <li>3. No open circuit voltage at output studs.</li> <li>4. Faulty Weld Control PCB.</li> </ol>	
Engine will not go to high idle when using auxiliary power.	<ol style="list-style-type: none"> <li>1. Broken wire in auxiliary current sensor wiring.</li> <li>2. Auxiliary power load is less than 100 watts.</li> <li>3. Faulty Weld Control PCB.</li> </ol>	

 **CAUTION**



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
<b>FUNCTION PROBLEMS</b>		
Engine goes to low idle but does not stay at low idle.	1. Faulty Weld Control PCB or Idler relay.	If all recommended possible areas of misadjustment have been checked and the problem persists, <b>Contact your local Lincoln Authorized Field Service Facility.</b>
No welding output or auxiliary output.	1. Broken lead in rotor circuit. 2. Faulty field diode module. 3. Faulty Weld Control PCB. 4. Faulty rotor.	
Welder has some/ no output and no control. Auxiliary output OK	1. Faulty remote kit. 2. Faulty output control potentiometer. 3. Faulty output control wiring. 4. Faulty Weld Control PCB or Chopper PCB.	
No welding output. Auxiliary output OK.	1. WELDING TERMINALS switch in wrong position, be sure switch is in WELDING TERMINALS ALWAYS ON position. 2. Faulty Weld Control PCB or Chopper PCB.	
No auxiliary power.	1. Open breakers may need to be reset. 2. Faulty receptacle. 3. Faulty auxiliary circuit wiring. 4. GFCI tripped.	

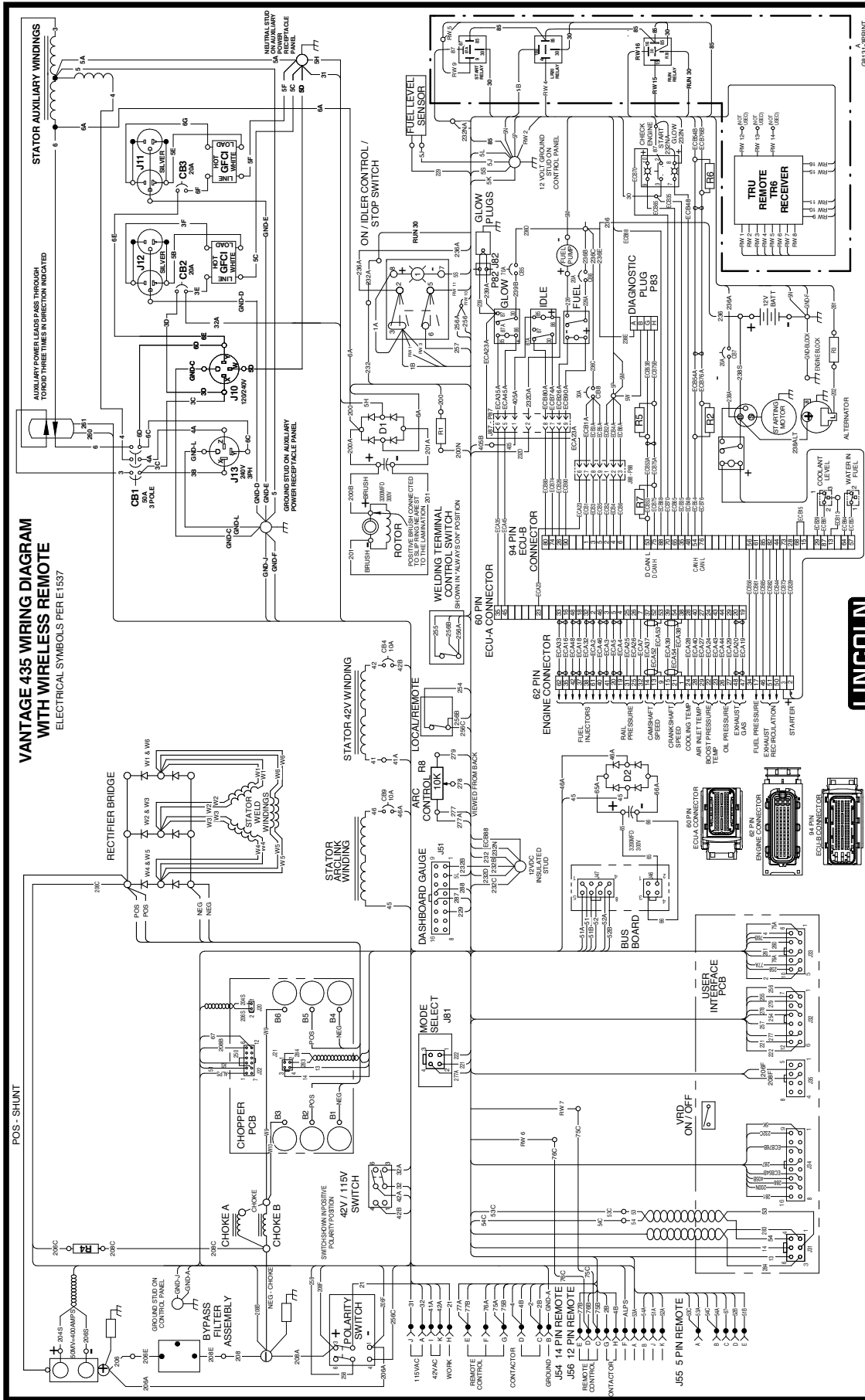
**⚠ CAUTION**



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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**LINCOLN ELECTRIC**  
CLEVELAND, OHIO, U.S.A.

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.

VANTAGE / K867 / K775 / LN-7 CONNECTION DIAGRAM

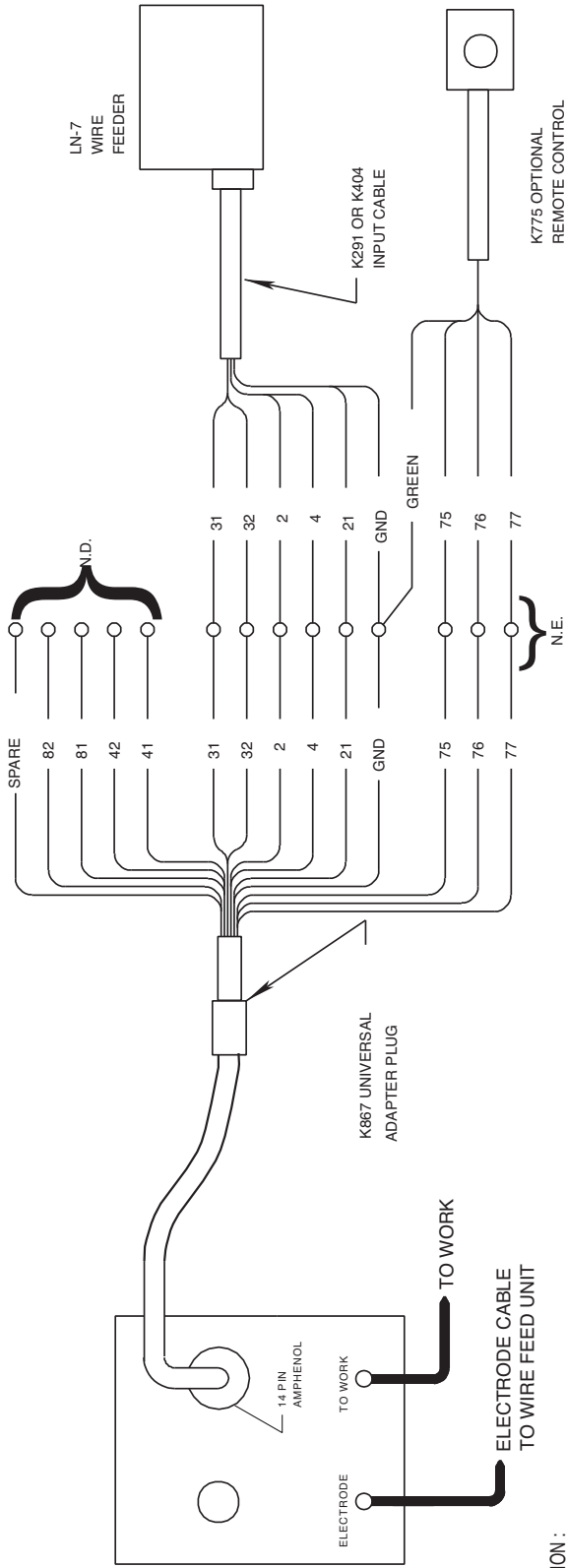
**⚠ WARNING**

**ELECTRIC SHOCK can kill**

- Do not operate with panels open.
- Disconnect **NEGATIVE (-) BATTERY LEAD** before servicing.
- Do not touch electrically live parts.

**MOVING PARTS can injure**

- Keep guards in place.
- Keep away from moving parts.
- Only qualified personnel should install, use or service this equipment.



**CAUTION :**

ANY INCREASE OF THE HIGH IDLE ENGINE RPM BY CHANGING THE GOVERNOR SETTING OR OVERRIDING THE THROTTLE LINKAGE WILL CAUSE AN INCREASE IN THE AC AUXILIARY VOLTAGE. IF THIS VOLTAGE GOES OVER 140 VOLTS, WIRE FEEDER CONTROL CIRCUITS MAY BE DAMAGED. THE ENGINE GOVERNOR SETTING IS PRE-SET AT THE FACTORY - DO NOT ADJUST ABOVE RPM SPECIFICATIONS LISTED IN THE ENGINE WELDER OPERATING MANUAL.

N.A. WELDING CABLE MUST BE OF PROPER CAPACITY FOR THE CURRENT AND DUTY CYCLE OF IMMEDIATE AND FUTURE APPLICATIONS. SEE OPERATING MANUAL.

N.B. USE VOLTMETER SWITCH TO SELECT DESIRED ELECTRODE POLARITY. POSITION THE "SELECTOR" SWITCH TO "WIRE WELDING CV".

PLACE WIRE FEEDER SWITCH TO "WIRE FEEDER WITH CONTROL CABLE POSITION."

N.C. IF OPTIONAL REMOTE CONTROL IS USED, CONTROL IS AUTOMATICALLY SWITCHED TO REMOTE CONTROL.

N.D. INSULATE EACH UNUSED LEAD INDIVIDUALLY.

N.E. SPULCE LEADS AND INSULATE.

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S23983

# ENGINE WELDERS TO K867 CONTROL CABLE ADAPTER CONNECTION DIAGRAM

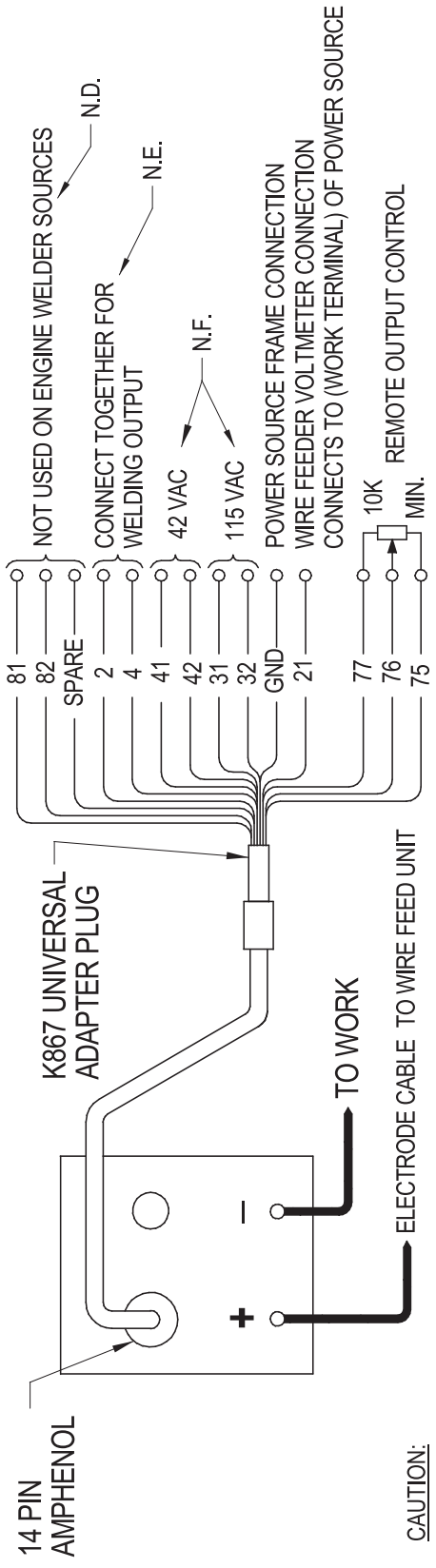
**⚠ WARNING**

**ELECTRIC SHOCK can kill**

- Do not operate with panels open.
- Disconnect NEGATIVE (-) Battery lead before servicing.
- Do not touch electrically live parts.

**MOVING PARTS can injure**

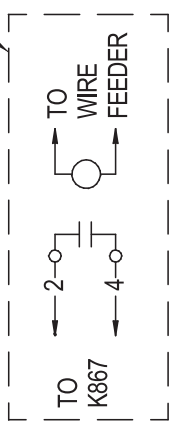
- Keep guards in place.
- Keep away from moving parts.
- Only qualified personnel should install, use or service this equipment.



**CAUTION:**

ANY INCREASE OF THE HIGH IDLE ENGINE RPM BY CHANGING THE GOVERNOR SETTING OR OVERRIDING THE THROTTLE LINKAGE WILL CAUSE AN INCREASE IN THE AC WIRE FEEDER VOLTAGE, WHICH CAN DAMAGE THE CONTROL CIRCUIT. THE ENGINE GOVERNOR SETTING IS PRE-SET AT THE FACTORY – DO NOT ADJUST ABOVE RPM SPECIFICATIONS LISTED IN THE ENGINE WELDER OPERATING MANUAL.

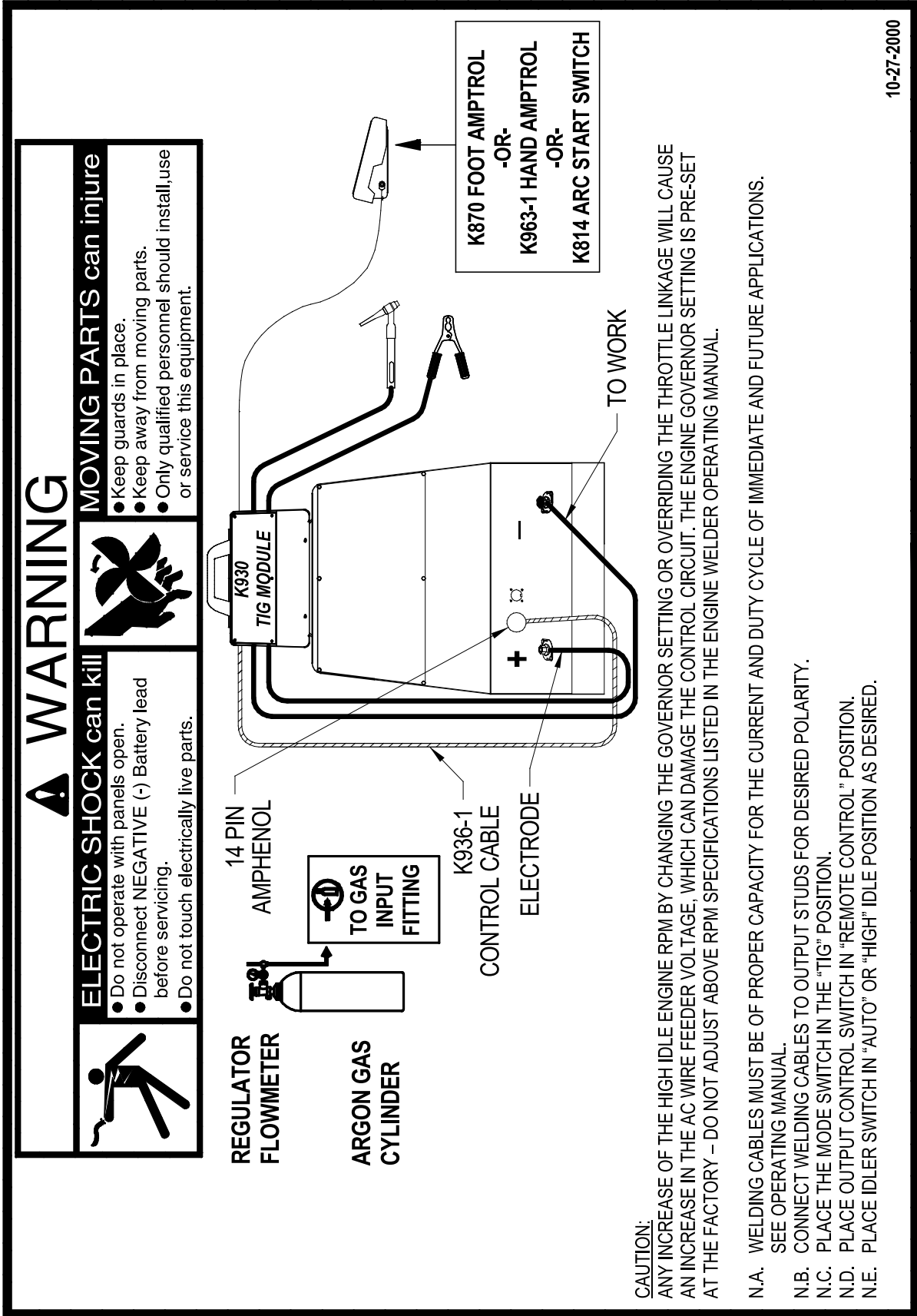
- N.A. WELDING CABLES MUST BE SIZED FOR CURRENT AND DUTY CYCLE OF APPLICATION.
- N.B. CONNECT WELDING CABLES TO OUTPUT STUDS FOR DESIRED POLARITY. POSITION THE WIRE FEEDER VOLTMETER SWITCH TO MATCH THE POLARITY OF THE ELECTRODE CABLE.
- N.C. PLACE THE MODE SWITCH IN THE "CV-WIRE" POSITION.
- N.D. INSULATE EACH UNUSED LEADS INDIVIDUALLY.
- N.E. FOR WIRE FEEDERS THAT RETURN A SIGNAL FOR WELDING OUTPUT, USE ISOLATION RELAY TO CLOSE LEADS 2 & 4 (SEE DETAIL).
- N.F. REFER TO POWER SOURCE INSTRUCTION MANUAL FOR MAXIMUM AUXILIARY CURRENT DRAW.



10-27-2000

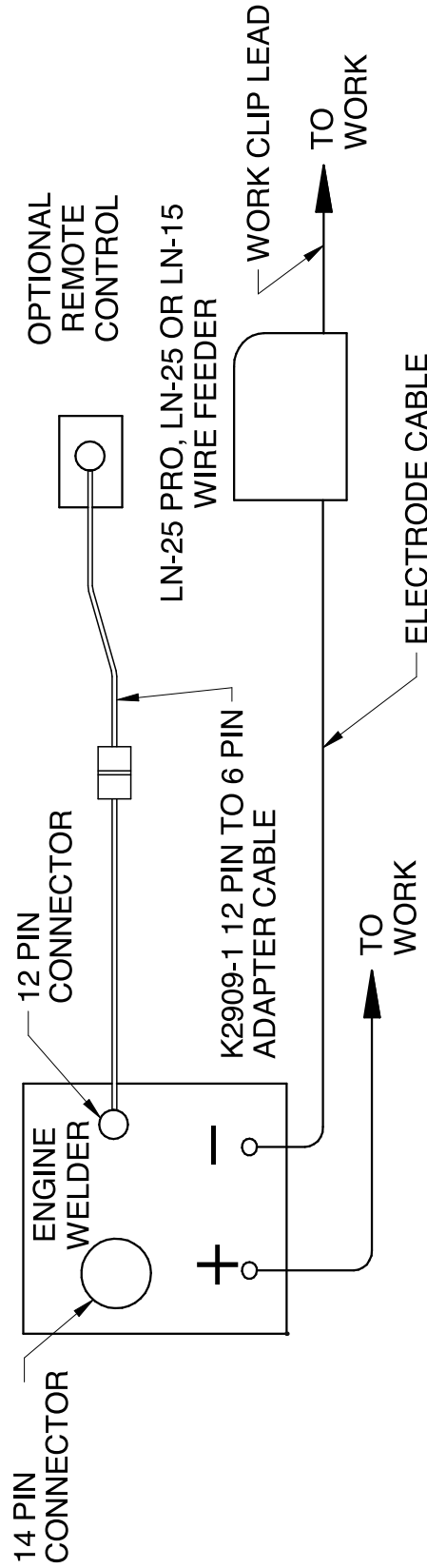
S24787-7

# ENGINE WELDERS / K930 TIG MODULE / CONNECTION DIAGRAM



# TIER 4 FINAL ENGINE WELDERS /LN-25 PRO, LN-25 OR ACTIV8 ACROSS THE ARC CONNECTION DIAGRAM WITH OPTIONAL REMOTE CONTROL

	<h2>WARNING</h2>	
<p><b>ELECTRIC SHOCK can kill</b></p> <ul style="list-style-type: none"> <li>Do not operate with panels open.</li> <li>Disconnect NEGATIVE (-) Battery lead before servicing.</li> <li>Do not touch electrically live parts.</li> </ul>	<p><b>MOVING PARTS can injure</b></p> <ul style="list-style-type: none"> <li>Keep guards in place.</li> <li>Keep away from moving parts.</li> <li>Only qualified personnel should install, use or service this equipment.</li> </ul>	

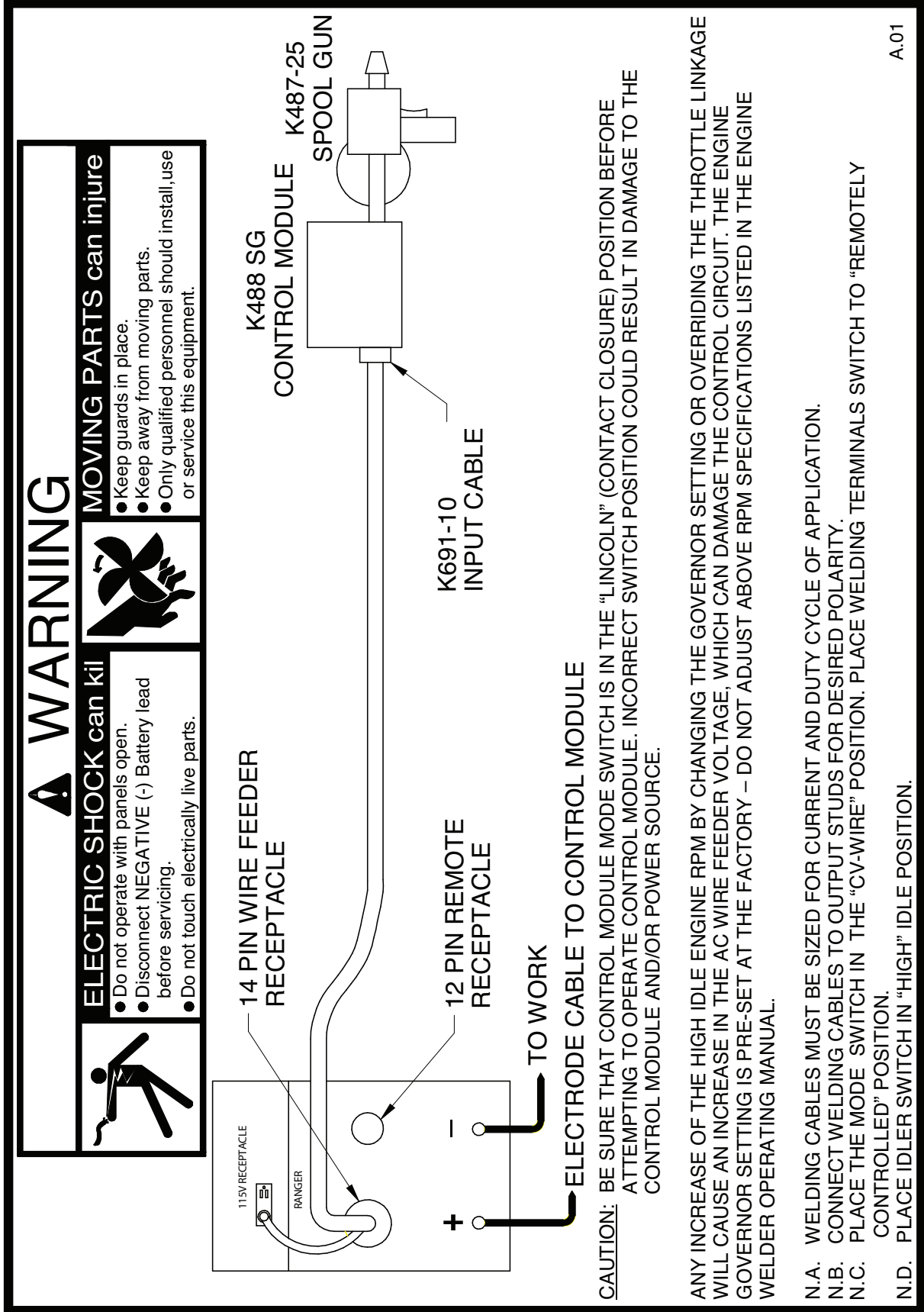


- N.A. WELDING CABLES MUST BE OF PROPER CAPACITY FOR THE CURRENT AND DUTY CYCLE OF IMMEDIATE & FUTURE APPLICATIONS. SEE OPERATING MANUAL.
- N.B. CONNECT WELDING CABLES TO OUTPUT STUDS FOR DESIRED POLARITY. POSITION THE WIRE FEEDER VOLT/METER SWITCH TO MATCH THE POLARITY OF THE ELECTRODE CABLE.
- N.C. PLACE THE MODE SWITCH IN THE "CV-WIRE" POSITION.
- N.D. PLACE THE WELDING TERMINALS SWITCH IN THE "WELD TERMINALS ON" POSITION.
- N.E. PLACE IDLER SWITCH IN "AUTO" OR "HIGH" IDLE POSITION AS DESIRED.

A.01

**S24787-15**

**TIER 4 FINAL ENGINE WELDERS / K691-10 / K488 / K487 SPOOL GUN CONNECTION DIAGRAM**

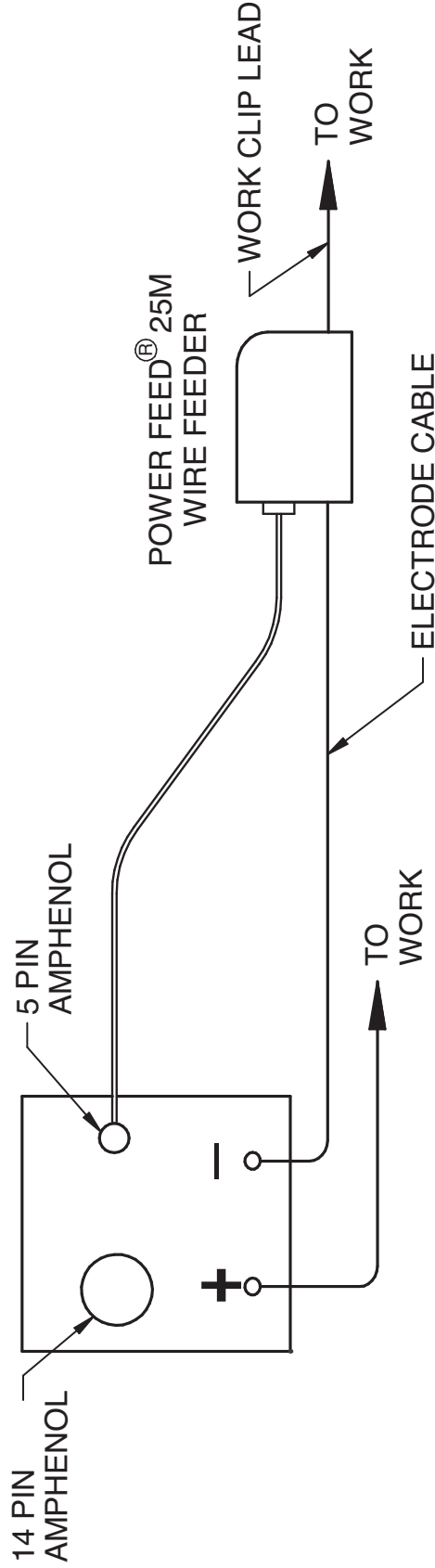


A.01

**S24787-18**

# TIER 4 FINAL ENGINE WELDERS / POWER FEED® 25M WIRE FEEDER

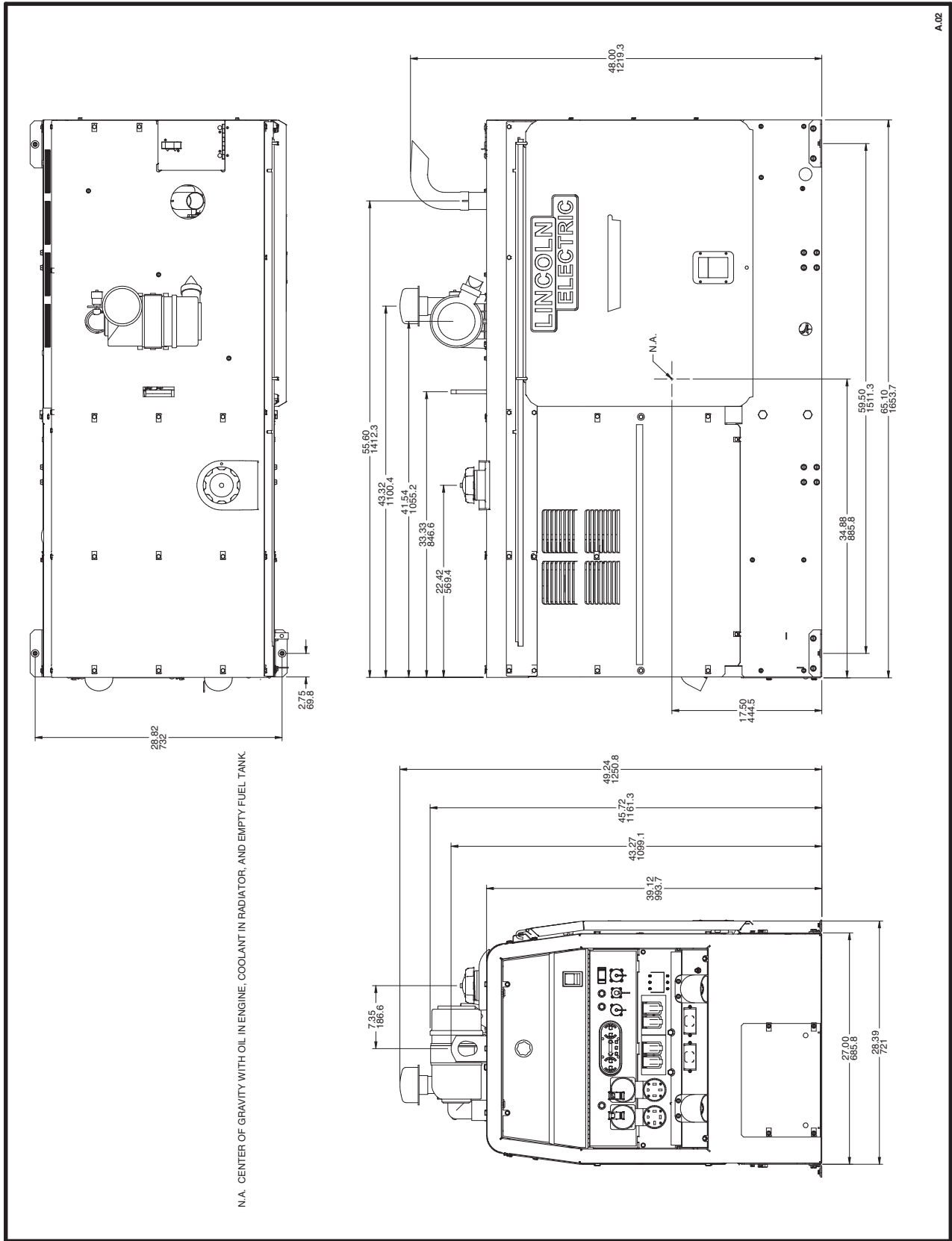
	<h2>WARNING</h2>	
<p><b>ELECTRIC SHOCK can kill</b></p> <ul style="list-style-type: none"> <li>Do not operate with panels open.</li> <li>Disconnect NEGATIVE (-) Battery lead before servicing.</li> <li>Do not touch electrically live parts.</li> </ul>	<p><b>MOVING PARTS can injure</b></p> <ul style="list-style-type: none"> <li>Keep guards in place.</li> <li>Keep away from moving parts.</li> <li>Only qualified personnel should install, use or service this equipment.</li> </ul>	



- N.A. WELDING CABLES MUST BE OF PROPER CAPACITY FOR THE CURRENT AND DUTY CYCLE OF IMMEDIATE & FUTURE APPLICATIONS. SEE OPERATING MANUAL.
- N.B. CONNECT WELDING CABLES TO OUTPUT STUDS FOR DESIRED POLARITY.
- N.C. PLACE THE MODE SWITCH IN THE "ARC-LINK" POSITION.
- N.D. PLACE IDLER SWITCH IN "AUTO" OR "HIGH" IDLE POSITION AS DESIRED.
- N.T. OPERATOR POLARITY SWITCH MUST MATCH DESIRED ELECTRODE POLARITY.

A.01

S24787-19



N.A. CENTER OF GRAVITY WITH OIL IN ENGINE, COOLANT IN RADIATOR, AND EMPTY FUEL TANK.

A.02

I 14503





			
<b>WARNING</b>	<ul style="list-style-type: none"> <li>Do not touch electrically live parts or electrode with skin or wet clothing.</li> <li>Insulate yourself from work and ground.</li> </ul>	<ul style="list-style-type: none"> <li>Keep flammable materials away.</li> </ul>	<ul style="list-style-type: none"> <li>Wear eye, ear and body protection.</li> </ul>
Spanish <b>AVISO DE PRECAUCION</b>	<ul style="list-style-type: none"> <li>No toque las partes o los electrodos bajo carga con la piel o ropa mojada.</li> <li>Aíslese del trabajo y de la tierra.</li> </ul>	<ul style="list-style-type: none"> <li>Mantenga el material combustible fuera del área de trabajo.</li> </ul>	<ul style="list-style-type: none"> <li>Protéjase los ojos, los oídos y el cuerpo.</li> </ul>
French <b>ATTENTION</b>	<ul style="list-style-type: none"> <li>Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension.</li> <li>Isolez-vous du travail et de la terre.</li> </ul>	<ul style="list-style-type: none"> <li>Gardez à l'écart de tout matériel inflammable.</li> </ul>	<ul style="list-style-type: none"> <li>Protégez vos yeux, vos oreilles et votre corps.</li> </ul>
German <b>WARNUNG</b>	<ul style="list-style-type: none"> <li>Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung!</li> <li>Isolieren Sie sich von den Elektroden und dem Erdboden!</li> </ul>	<ul style="list-style-type: none"> <li>Entfernen Sie brennbares Material!</li> </ul>	<ul style="list-style-type: none"> <li>Tragen Sie Augen-, Ohren- und Körperschutz!</li> </ul>
Portuguese <b>ATENÇÃO</b>	<ul style="list-style-type: none"> <li>Não toque partes elétricas e electrodos com a pele ou roupa molhada.</li> <li>Isole-se da peça e terra.</li> </ul>	<ul style="list-style-type: none"> <li>Mantenha inflamáveis bem guardados.</li> </ul>	<ul style="list-style-type: none"> <li>Use proteção para a vista, ouvido e corpo.</li> </ul>
Japanese <b>注意事項</b>	<ul style="list-style-type: none"> <li>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。</li> <li>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。</li> </ul>	<ul style="list-style-type: none"> <li>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。</li> </ul>	<ul style="list-style-type: none"> <li>目、耳及び身体に保護具をして下さい。</li> </ul>
Chinese <b>警告</b>	<ul style="list-style-type: none"> <li>皮肤或湿衣物切勿接触带电部件及焊条。</li> <li>使你自已与地面和工件绝缘。</li> </ul>	<ul style="list-style-type: none"> <li>把一切易燃物品移离工作场所。</li> </ul>	<ul style="list-style-type: none"> <li>佩戴眼、耳及身体劳动保护用具。</li> </ul>
Korean <b>위험</b>	<ul style="list-style-type: none"> <li>전도체나 용접봉을 젖은 형갑 또는 피부로 절대 접촉치 마십시오.</li> <li>모재와 접지를 접촉치 마십시오.</li> </ul>	<ul style="list-style-type: none"> <li>인화성 물질을 접근시키지 마십시오.</li> </ul>	<ul style="list-style-type: none"> <li>눈, 귀와 몸에 보호장구를 착용하십시오.</li> </ul>
Arabic <b>تحذير</b>	<ul style="list-style-type: none"> <li>لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الالكترود بجسد الجسم أو بالملابس المبللة بالماء.</li> <li>ضع عازلا على جسمك خلال العمل.</li> </ul>	<ul style="list-style-type: none"> <li>ضع المواد القابلة للاشتعال في مكان بعيد.</li> </ul>	<ul style="list-style-type: none"> <li>ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.</li> </ul>

**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.**

			
<ul style="list-style-type: none"> <li>● Keep your head out of fumes.</li> <li>● Use ventilation or exhaust to remove fumes from breathing zone.</li> </ul>	<ul style="list-style-type: none"> <li>● Turn power off before servicing.</li> </ul>	<ul style="list-style-type: none"> <li>● Do not operate with panel open or guards off.</li> </ul>	<b>WARNING</b>
<ul style="list-style-type: none"> <li>● Los humos fuera de la zona de respiración.</li> <li>● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases.</li> </ul>	<ul style="list-style-type: none"> <li>● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.</li> </ul>	<ul style="list-style-type: none"> <li>● No operar con panel abierto o guardas quitadas.</li> </ul>	Spanish <b>AVISO DE PRECAUCION</b>
<ul style="list-style-type: none"> <li>● Gardez la tête à l'écart des fumées.</li> <li>● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.</li> </ul>	<ul style="list-style-type: none"> <li>● Débranchez le courant avant l'entretien.</li> </ul>	<ul style="list-style-type: none"> <li>● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.</li> </ul>	French <b>ATTENTION</b>
<ul style="list-style-type: none"> <li>● Vermeiden Sie das Einatmen von Schweißrauch!</li> <li>● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!</li> </ul>	<ul style="list-style-type: none"> <li>● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)</li> </ul>	<ul style="list-style-type: none"> <li>● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!</li> </ul>	German <b>WARNUNG</b>
<ul style="list-style-type: none"> <li>● Mantenha seu rosto da fumaça.</li> <li>● Use ventilação e exaustão para remover fumo da zona respiratória.</li> </ul>	<ul style="list-style-type: none"> <li>● Não opere com as tampas removidas.</li> <li>● Desligue a corrente antes de fazer serviço.</li> <li>● Não toque as partes elétricas nuas.</li> </ul>	<ul style="list-style-type: none"> <li>● Mantenha-se afastado das partes moventes.</li> <li>● Não opere com os painéis abertos ou guardas removidas.</li> </ul>	Portuguese <b>ATENÇÃO</b>
<ul style="list-style-type: none"> <li>● ヒュームから頭を離すようにして下さい。</li> <li>● 換気や排煙に十分留意して下さい。</li> </ul>	<ul style="list-style-type: none"> <li>● 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して下さい。</li> </ul>	<ul style="list-style-type: none"> <li>● パネルやカバーを取り外したまま機械操作をしないで下さい。</li> </ul>	Japanese <b>注意事項</b>
<ul style="list-style-type: none"> <li>● 頭部遠離煙霧。</li> <li>● 在呼吸區使用通風或排風器除煙。</li> </ul>	<ul style="list-style-type: none"> <li>● 維修前切斷電源。</li> </ul>	<ul style="list-style-type: none"> <li>● 儀表板打開或沒有安全罩時不準作業。</li> </ul>	Chinese <b>警告</b>
<ul style="list-style-type: none"> <li>● 얼굴로부터 용접가스를 멀리하십시오.</li> <li>● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시오.</li> </ul>	<ul style="list-style-type: none"> <li>● 보수전에 전원을 차단하십시오.</li> </ul>	<ul style="list-style-type: none"> <li>● 판넬이 열린 상태로 작동치 마십시오.</li> </ul>	Korean <b>위험</b>
<ul style="list-style-type: none"> <li>● ابعد رأسك بعيداً عن الدخان.</li> <li>● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها.</li> </ul>	<ul style="list-style-type: none"> <li>● أقطع التيار الكهربائي قبل القيام بأية صيانة.</li> </ul>	<ul style="list-style-type: none"> <li>● لا تشغيل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه.</li> </ul>	Arabic <b>تحذير</b>

**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說明以及應該使用的銀焊材料，並請遵守貴方的有關勞動保護規定。

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](http://www.lincolnelectric.com) for any updated information.



**THE LINCOLN ELECTRIC COMPANY**

22801 St. Clair Avenue • Cleveland, OH • 44117-1199 • U.S.A.  
Phone: +1.216.481.8100 • [www.lincolnelectric.com](http://www.lincolnelectric.com)