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REV01

VANTAGE[®] 410 CE

OPERATOR'S MANUAL



ENGLISH



Lincoln Electric Bester Sp. z o.o.
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**THE LINCOLN ELECTRIC COMPANY
EC DECLARATION OF CONFORMITY**



Manufacturer and technical
documentation holder:

The Lincoln Electric Company
22801 St. Clair Ave.
Cleveland Ohio 44117-1199 USA

EC Company:

Lincoln Electric Europe S.L.
c/o Balmes, 89 - 8⁰ 2^a
08008 Barcelona SPAIN

Hereby declare that welding equipment:

Vantage 410 CE

Product number:

K4178-x (Product number may contain suffixes and prefixes.)

Is in conformity with Council
Directives and amendments:

Machinery Directive 2006/42/EC;
Low Voltage Directive (LVD) 2014/35/EU
Electromagnetic Compatibility (EMC) Directive 2014/30/EU;
Noise emission in the environment by equipment for use outdoors
2000/14/EC; & 2005/88/EC

Standards:

EN 60974-1:2012, Safety requirements for arc welding equipment,
power sources;
EN 60974-10:2014, Arc Welding Equipment-Part 10: Electromagnetic
compatibility (EMC) requirements;
EN ISO 3744:2010, Acoustic – Determination of sound power levels of
noise sources using sound pressure ...2010
EN60204-1 (2006): Safety of machinery – Electrical equipment of
machines, Part 1: General requirements.
EN12100 (2010): Safety of machinery – General principles for design
Risk assessment and risk reduction.

Notified body (for 2000/14/EC
Conformity):

AV Technology LTD
Unit 2 Easter Court
Europa Boulevard, Warrington
Cheshire WA5 7ZB

Guaranteed sound power level:

LWA 97 dB (net power Pel = 9.6 kW)

Measured sound power level:

LWA 94 dB (net power Pel = 9.6 kW)

CE marking affixed in '16

Samir Farah, Manufacturer
Compliance Engineering Manager
15 August 2017

Jacek Stefaniak, European Community Representative
European Product Manager Equipment
29 August 2017

MCD522b

THANKS! For having chosen the **QUALITY** of the Lincoln Electric products.

- Please Examine Package and Equipment for Damage. Claims for material damaged in shipment must be notified immediately to the dealer.
- For future reference record in the table below your equipment identification information. Model Name, Code & Serial Number can be found on the machine rating plate.

Model Name:
Code & Serial number:
Date & Where Purchased:

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Technical Specifications

VANTAGE[®] 410 (CE) (K4178-1) (Codes 12516, 12635)

INPUT – DIESEL ENGINE						
Make/Model	Description	Horse power @1800 RPM	Operating Speed (RPM)	Displacement Cu. In. (ltrs.) Bore x Stroke Inch (mm)	Starting system	Capacities
K4178-1 Kubota* V1505	4 cylinder Naturally aspirated Water Cooled Diesel Engine	22HP	High 1890 Full Load 1800 Low Idle 1350	91.41 (1.5) Bore and Stroke 3.07 x 3.09 (78x78)	12Vdc Battery and Starter (Group 34; Battery 535 cold crank amps) Battery charger	Fuel: 20 gal (75.7l) Oil: 6.4 qts. (6.0l) Radiator Coolant: 7.2 qts. (6.8l)
RATED OUTPUT @ 40°C - WELDER						
Welding Process	Welding Output Current/Voltage/Duty Cycle			Output Range	Max. Weld OCV@Rated Load RPM	
DC Constant Current	300A/32V/100% 350A/28V/100% 410A/23V/100%			30 TO 410 AMPS	60V ⁽²⁾	
DC Pipe Current	300A/32V/100%			40 TO 300 AMPS		
Touch-Start™ TIG	250V/30V/100%			20 TO 250 AMPS		
DC Constant Voltage Arc Gouging	300A/32V/100%			14 TO 32 VOLTS 90 TO 300 AMPS		
RATED OUTPUT @ 40°C - GENERATOR						
Auxiliary Power ⁽¹⁾						
60 Hz 230 Volt, 15A 1-Phase 12.500 Watts Peak, /11.000 Watts Continuous, 60 Hz, 400 Volt, 16A, 3-Phase						

LIFT BAIL WEIGHT RATING 2300LBS. (1043 kg) MAXIMUM

ENGINE			
LUBRICATION	EMISSIONS	FUEL SYSTEM	GOVERNOR
Full Pressure with Full Flow Filter	EPA Tier 4 Interim Compliant	Mechanical Fuel Pump, Auto air bleed system, Electric shutoff solenoid, Indirect fuel injector.	Mechanical Electronic
AIR CLEANER	ENGINE IDLER	MUFFLER	ENGINE PROTECTION
Single Element	Automatic Idler	Low noise Muffler with spark arrester: Made from long life, aluminized steel.	Shutdown on low oil pressure & high engine coolant temperature
ENGINE WARRANTY: 2 years complete (parts and labor) 3 rd . year major components (parts and labor)			
PHYSICAL DIMENSIONS			
Height	Width	Length	Weight
913mm	643 mm	1524 mm	488 kg

⁽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.

*Engine warranty may vary outside of the USA. (See Engine warranty for details).

**To Top of enclosure. Add 7.88" (200.02mm) to top of exhaust pipe. Add 4.012"(101.9mm) to top of Lift Bail.

⁽²⁾Reduced to less than 30V in the stick mode when VRD (Voltage Reduction Device) is on.

MACHINE SPECIFICATIONS		
RECEPTACLES	AUXILIARY POWER CIRCUIT BREAKER	OTHER CIRCUIT BREAKERS
(1) 115V Euro Style (1) 230V Euro Style (1) 400V Euro Style	(2) 30Amp for Single Phase (1) 15Amp for Single Phase (1) 16Amp for Three Phase (3-pole)	10AMP for Engine Battery Charging Circuit 10AMP for 42V Wire Feeder Power
Residual Current Device (RCD)	4-pole, 25AMP x 1 1 Phase, 15AMP x 1 for 230V 30AMP x 2 for 115V	
MISCELLANEOUS		
HARMONIC CONTENT	EMC CLASSIFICATION	
6.2% THF.	THF < 8% : VANTAGE 410 CE IS CLASSIFIED AS A CLASS I MACHINE	
MACHINE AMBIENT OPERATING CONDITIONS		
TEMPERATURE	ALTITUDE	MAX ANGLE OF OPERATION
5°F (-15°C) TO 104°F (+ 40°C)	5997ft (1828m)*	15° ALL DIRECTIONS
* For use above 5997ft (1828m), contact Authorized Field Service Shop.		
TRANSPORTATION & STORAGE TEMPERATURES		
-13°F (-25°C) TO 131°F (+55°C) NOT EXCEEDING 158° (70°C) FOR 24 HOURS		

Electromagnetic Compatibility (EMC)

This machine has been designed in accordance with all relevant directives and standards. However, it may still generate electromagnetic disturbances that can affect other systems like telecommunications (telephone, radio, and television) or other safety systems. These disturbances can cause safety problems in the affected systems. Read and understand this section to eliminate or reduce the amount of electromagnetic disturbance generated by this machine.



This machine has been designed to operate in an industrial area. The operator must install and operate this equipment as described in this manual. If any electromagnetic disturbances are detected the operator must put in place corrective actions to eliminate these disturbances with, if necessary, assistance from Lincoln Electric. This equipment does not comply with IEC 61000-3-12. If it is connected to a public low-voltage system, it is responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment may be connected.

Before installing the machine, the operator must check the work area for any devices that may malfunction because of electromagnetic disturbances. Consider the following.

- Input and output cables, control cables, and telephone cables that are in or adjacent to the work area and the machine.
- Radio and/or television transmitters and receivers. Computers or computer controlled equipment.
- Safety and control equipment for industrial processes. Equipment for calibration and measurement.
- Personal medical devices like pacemakers and hearing aids.
- Check the electromagnetic immunity for equipment operating in or near the work area. The operator must be sure that all equipment in the area is compatible. This may require additional protection measures.
- The dimensions of the work area to consider will depend on the construction of the area and other activities that are taking place.

Consider the following guidelines to reduce electromagnetic emissions from the machine.

- Connect the machine to the input supply according to this manual. If disturbances occur it may be necessary to take additional precautions such as filtering the input supply.
- The output cables should be kept as short as possible and should be positioned together. If possible connect the work piece to ground in order to reduce the electromagnetic emissions. The operator must check that connecting the work piece to ground does not cause problems or unsafe operating conditions for personnel and equipment.
- Shielding of cables in the work area can reduce electromagnetic emissions. This may be necessary for special applications.

WARNING

The Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There can be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radio-frequency disturbances.





WARNING

This equipment must be used by qualified personnel. Be sure that all installation, operation, maintenance and repair procedures are performed only by qualified person. Read and understand this manual before operating this equipment. Failure to follow the instructions in this manual could cause serious personal injury, loss of life, or damage to this equipment. Read and understand the following explanations of the warning symbols. Lincoln Electric is not responsible for damages caused by improper installation, improper care or abnormal operation.

	<p>WARNING: This symbol indicates that instructions must be followed to avoid serious personal injury, loss of life, or damage to this equipment. Protect yourself and others from possible serious injury or death.</p>
	<p>READ AND UNDERSTAND INSTRUCTIONS: Read and understand this manual before operating this equipment. Arc welding can be hazardous. Failure to follow the instructions in this manual could cause serious personal injury, loss of life, or damage to this equipment.</p>
	<p>ELECTRIC SHOCK CAN KILL: Welding equipment generates high voltages. Do not touch the electrode, work clamp, or connected work pieces when this equipment is on. Insulate yourself from the electrode, work clamp, and connected work pieces.</p>
	<p>ELECTRICALLY POWERED EQUIPMENT: Turn off input power using the disconnect switch at the fuse box before working on this equipment. Ground this equipment in accordance with local electrical regulations.</p>
	<p>ELECTRICALLY POWERED EQUIPMENT: Regularly inspect the input, electrode, and work clamp cables. If any insulation damage exists replace the cable immediately. Do not place the electrode holder directly on the welding table or any other surface in contact with the work clamp to avoid the risk of accidental arc ignition.</p>
	<p>ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS: Electric current flowing through any conductor creates electric and magnetic fields (EMF). EMF fields may interfere with some pacemakers, and welders having a pacemaker shall consult their physician before operating this equipment.</p>
	<p>CE COMPLIANCE: This equipment complies with the European Community Directives.</p>
	<p>ARTIFICIAL OPTICAL RADIATION: According with the requirements in 2006/25/EC Directive and EN 12198 Standard, the equipment is a category 2. It makes mandatory the adoption of Personal Protective Equipments (PPE) having filter with a protection degree up to a maximum of 15, as required by EN169 Standard.</p>
	<p>FUMES AND GASES CAN BE DANGEROUS: Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. To avoid these dangers the operator must use enough ventilation or exhaust to keep fumes and gases away from the breathing zone.</p>
	<p>ARC RAYS CAN BURN: 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. Use suitable clothing made from durable flame-resistant material to protect you skin and that of your helpers. Protect other nearby personnel with suitable, non-flammable screening and warn them not to watch the arc nor expose themselves to the arc.</p>
	<p>WELDING SPARKS CAN CAUSE FIRE OR EXPLOSION: Remove fire hazards from the welding area and have a fire extinguisher readily available. Welding sparks and hot materials from the welding process can easily go through small cracks and openings to adjacent areas. Do not weld on any tanks, drums, containers, or material until the proper steps have been taken to insure that no flammable or toxic vapors will be present. Never operate this equipment when flammable gases, vapors or liquid combustibles are present.</p>
	<p>WELDED MATERIALS CAN BURN: Welding generates a large amount of heat. Hot surfaces and materials in work area can cause serious burns. Use gloves and pliers when touching or moving materials in the work area.</p>

	<p>SAFETY MARK: This equipment is suitable for supplying power for welding operations carried out in an environment with increased hazard of electric shock.</p>
	<p>CYLINDER MAY EXPLODE IF DAMAGED: 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. Always keep cylinders in an upright position securely chained to a fixed support. Do not move or transport gas cylinders with the protection cap removed. Do not allow the electrode, electrode holder, work clamp or any other electrically live part to touch a gas cylinder. Gas cylinders must be located away from areas where they may be subjected to physical damage or the welding process including sparks and heat sources.</p>
	<p>EQUIPMENT WEIGHT OVER 30kg: Move this equipment with care and with the help of another person. Lifting may be dangerous for your physical health.</p>

The manufacturer reserves the right to make changes and/or improvements in design without upgrade at the same time the operator's manual.

Installation and Operator Instructions

Read this entire section before installation or operation of the machine.

General Description

The Vantage® 410 CE is a diesel engine powered DC multi-process welding power source and 115/230V 1ph and 400V/3ph AC power generator. The engine drives a generator that supplies three phase power for the DC welding circuit, single phase and three phase power for the AC auxiliary outlets. The DC welding control system uses state of the art Chopper Technology (CT™) for superior welding performance.

VRD (Voltage Reduction Device)

The VRD feature provides additional safety in the CC-Stick mode especially in an environment with a higher risk of electric shock such as wet areas and hot humid sweaty conditions. The VRD reduces the OCV (Open Circuit Voltage) at the welding output terminals while not welding to less than 13VDC 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 control panel by removing 4 front panel screws. (Figure 1)
- Place the VRD switch in the "On or "Off" position. (Figure 1)

With the VRD switch in the "On" position, the VRD lights are enabled.

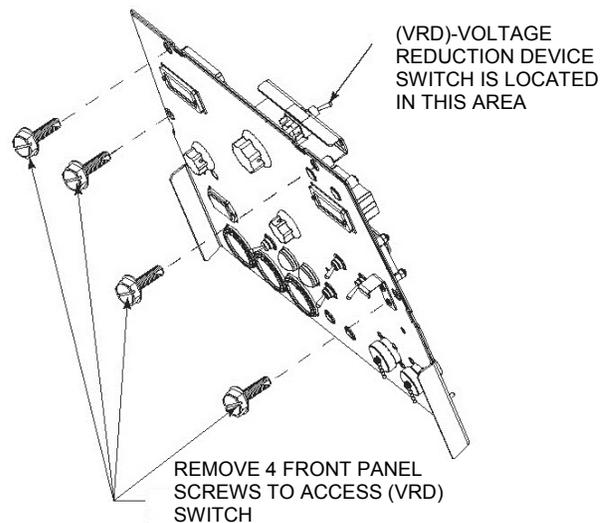


Figure 1

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.

Stacking

VANTAGE® 410 CE machines cannot be stacked.

Angle of Operation

Engines are designed to run in the level condition which is where the optimum performance is achieved. The maximum angle of continuous operation is 20 degrees in all directions, 30 degrees Intermittent (less than 10 minutes continuous) in all directions. If the engine is to be operated at an angle, provisions must be made for checking and maintaining the oil level at the normal (FULL) oil capacity in the crankcase. When operating the welder at an angle, the effective fuel capacity will be slightly less than the amount specified.

The machines maximum angle of operation is 15° in all directions.

Lifting

The VANTAGE® 410 CE weighs approximately 1205lbs (547kg) with a full tank of fuel (1706lbs (488kg) less fuel). A lift bail is mounted to the machine and should always be used when lifting the machine.



⚠ WARNING

Falling equipment can cause injury.

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

High Altitude Operation

At higher altitudes, output derating may be necessary. For maximum rating, derate the machine 2.5% to 3.5% for every 305 m. Due to new EPA and other local emissions regulations, modifications to the engine for high altitude are restricted within the United States. For use above 1828 m an authorized Perkins engine field service shop should be contacted to determine if any adjustments can be made for operation in higher elevations.

High Temperature Operation

At temperatures above 40°C, Welder output derating is necessary. For maximum output ratings, derate the welder output 2 volts for every 10°C above 40°C.

Cold Weather Starting

With a fully charged battery and the proper oil, the engine should start satisfactorily down to -15°C. If the engine must be frequently started at or below -5°C, it may be desirable to install cold starting aides. The use of No. 1D diesel fuel is recommended in place of No. 2D at temperatures below -5°C. Allow the engine to warm up before applying a load or switching to high idle.

Note: Extreme cold weather starting may require longer glow plug operation.

⚠ WARNING

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

Towing

Use a recommended trailer for use with this equipment for road, in-plant and yard towing by a vehicle⁽¹⁾. If the user adapts a non-Lincoln trailer, he 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

⚠ WARNING

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

- Only transport this Equipment 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 over-fill.
- Wipe up spilled fuel and allow fumes to clear before starting engine.
- Keep sparks and flame away from tank.

Oil



The Vantage® 410 CE is shipped with the engine crankcase filled with high quality SAE 10W-30. Oil that meets classification CG-4 or CH-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



DIESEL FUEL ONLY-Low sulphur fuel or ultra low sulphur fuel in U.S.A. and Canada.

⚠ WARNING

Fill the fuel tank with clean, fresh fuel. The capacity of the tank is 20 gals 75.7l. When the fuel gauge reads empty the tank contains approximately 7.6 l of reserve fuel.

Note: A fuel shut off valve is located on 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 & case back. It is important that the intake and exhaust air is not restricted. Allow a minimum clearance of 0.6m from the case back and 406mm from either side of the base to a vertical surface.

Battery Connection

WARNING

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

The Vantage[®] 410 CE 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 10mm socket. Attach the negative battery cable to the negative battery terminal and tighten using a 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")

Spark Arrester

Some 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 standard muffler included with this welder has a spark arrester mounted to the muffler outlet. This device also enables the machine to conform to the sound power requirements of the European Union and should not be removed unless of cleaning. Please note: compliance to CE sound power is achieved with spark arrester installed.

WARNING

An incorrect spark arrester may lead to damage to the engine or adversely affect performance.

Remote Control

The Vantage[®] 410 CE is equipped with a 6-pin and a 14-pin connector. When in the Arc Gouging or CV-WIRE modes and when a remote control is connected to the 6-pin Connector, the auto-sensing circuit automatically switches the OUTPUT control from control at the welder to remote control.

When in TOUCH START TIG mode and when a Amptrol is connected to the 6-Pin Connector, the OUTPUT dial is used to set the maximum current range of the CURRENT CONTROL of the Amptrol.

When in the CC-STICK or DOWNHILL PIPE mode and when REMOTE CONTROL is connected to the 6-Pin or 14-pin Connector, the OUTPUT CONTROL dial is used to set the maximum current range of the OUTPUT CONTROL of the REMOTE.

EXAMPLE: When the OUTPUT CONTROL on the welder is set to 200 amps the current range on the remote control will be Min.- 200 amps, rather than the full Min.-Max. amps. Any current range that is less than the full range provides finer current resolution for more

fine tuning of the output.

The 14-pin connector is used to directly connect a wire feeder control cable. In the CV-WIRE mode, if the feeder being used has a voltage control when the wire feeder control cable is connected to the 14-Pin Connector, the auto-sensing circuit automatically makes OUTPUT CONTROL inactive and the wire feeder voltage control active. Otherwise, the OUTPUT CONTROL is used to preset the voltage.

WARNING

NOTE: When a wire feeder with a built in welding voltage control is connected to the 14-pin connector, do not connect anything to the 6-pin connector.

Electrical Connections

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.).

WARNING

To prevent dangerous electric shock, other equipment to which this engine driven welder supplies power must:

- Be grounded to the frame of the welder using a grounded type plug or be double insulated.
- Be double insulated.
- Do not ground the machine to a pipe that carries explosive or combustible material.

When this welder is mounted on a truck or trailer, its frame must be electrically bonded to the metal frame of the vehicle. Use a 8mm² or larger copper wire connected between the machine grounding stud and the 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 code.

In general, if the machine is to be grounded, it should be connected with a 8mm² or larger copper wire to a solid earth ground such as a metal water pipe going into the ground for at least ten feet and having no insulated joints, or to the metal framework of a building which has been effectively grounded.

The National Electrical 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.

Welding Terminals

The Vantage[®]410 CE is equipped with a toggle switch for selecting "hot" welding terminal when in the "WELD TERMINALS ON" position or "cold" welding terminal when in the "REMOTLY CONTROLLED" position.

Welding Output Cables

With the engine off connect the electrode and work cables to the output studs. The welding process dictates the polarity of the electrode cable. These connections should be checked periodically and tightened with a 19mm wrench.

Table below lists recommended cable sizes and lengths for rated current and duty cycle. Length refers to the distance from the welder to the work and back to the welder. Cable diameters are increased for long cable lengths to reduce voltage drops.

Total Combined Length of Electrode and Work Cables	
Cable Length	Cable Size for 400 A @ 60%Duty Cycle
0-30 meters	2/0 AWG (67,4mm ²)
30-46 meters	2/0 AWG (67,4mm ²)
46-61 meters	3/0 AWG (85mm ²)

Cable Installation

Install the welding cables to your Vantage[®] 410 CE 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.

WARNING

- Loose connections will cause the output terminals to overheat. 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.

Auxiliary Power

The auxiliary power capacity is 12500W Peak, 11000W continuous of 60Hz, 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 400 VAC output is 16A. Output voltage is within ±10% at all loads up to the rated capacity.

Single phase power is:

- 3,500 Watts Peak / 3,500 Watts Continuous, 60 Hz 230 Volts 1-Phase (Euro).

Standby Power Connections

The machine is suitable for temporary, standby or emergency power using the engine manufacturer's recommended maintenance schedule.

The machine can be permanently installed as a standby power unit for 400 VAC, three phase, 16A service

Connections must be made by a licensed electrician who can determine how the power can be adapted to the particular installation and comply with all applicable electrical codes.

- Take necessary steps to assure load is limited to the capacity of the Vantage[®] 410 CE.

Connection of Lincoln Electric Wire Feeders

WARNING

Shut off welder before making any electrical connections.

Connection of the LN-7 or LN-8 to the Vantage[®] 410 CE.

1. Shut the welder off.
2. Connect the LN-7 or LN-8 per instructions on the appropriate Section "Diagram".
3. Set the "WIRE FEEDER VOLTMETER" switch to either "+" or "-" as required by the electrode being used.
4. Set the "MODE" switch to the "CV WIRE" position.
5. Set the "ARC CONTROL" knob to "0" initially and adjust to suit.
6. Set the "WELD TERMINALS" switch to the "REMOTELY CONTROLLED" position.
7. Set the "IDLE" switch to the "HIGH" position.

Connection of LN-15 to the Vantage[®] 410 CE

1. Shut the welder off.
2. 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 to the "-" terminal of the welder and work cable to the "+" terminal of the welder.
3. Choose Model:

Across The-Arc Model:

4. Attach the single lead from the front of the LN-15 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.
5. Set the "WELD TERMINALS" switch to "WELD TERMINALS ON".
6. When the gun trigger is closed, the current sensing circuit will cause the Vantage[®] 410 CE engine to go to the high idle speed, the wire will begin to feed and the welding process started. When welding is stopped, the engine will revert to low idle speed after approximately 12 seconds unless welding is resumed.

Control Cable Model:

4. Connect Control Cable between Engine Welder and Feeder.
5. Set the "WELD TERMINALS" switch to "REMOTELY CONTROLLED".
6. Set the MODE switch to thr "CV-WIRE" position.
7. Set the "WIRE FEEDER VOLTMETER" switch to either "+" or "-" as required by the electrode polarity being used.
8. Set the "ARC CONTROL" knob to "0" initially and adjust to suit.
9. Set the "IDLE" switch to the "AUTO" position.
10. When the gun trigger is closed, the current sensing circuit will cause the Vantage[®] 410 CE engine to go to the high idle speed, the wire will begin to feed and the welding process started. When welding is stopped, the engine will revert to low idle speed after approximately 12 seconds unless welding is resumed.

Connection of the LN-25 to the Vantage[®] 410 CE

The LN-25 with or without an internal contactor may be used with the Vantage[®] 410 CE. See the appropriate "Diagram" Section.

NOTE: The LN-25 (K431) Remote Control Module and (K432) Remote Cable are not recommended for use with the Vantage[®] 410 CE

1. Shut the welder off.
2. For electrode Positive, connect the electrode cable from the LN-25 to the "+" terminal of the welder and work cable to the "-" terminal of the welder. For electrode Negative, connect the electrode cable from the LN-25 to the "-" terminal of the welder and work cable to the "+" terminal of the welder.
3. Attach the single lead from the front of the LN-25 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.
4. Set the MODE switch to the "CV-WIRE " position.
5. Set the "WELD TERMINALS" switch to "WELD TERMINALS ON"
6. Set the "ARC CONTROL" knob to "0" initially and adjust to suit.
7. Set the "IDLE" switch to the "AUTO" position. When not welding, the VANTAGE 400 (CE) engine will be at the low idle speed. If you are using an LN-25 with an internal contactor, the electrode is not energized until the gun trigger is closed.
8. When the gun trigger is closed, the current sensing circuit will cause the VANTAGE 400 (CE) engine to go to the high idle speed, the wire will begin to feed and the welding process started. When welding is stopped, the engine will revert to low idle speed after approximately 12 seconds unless welding is resumed.

⚠ WARNING

If you are using an LN-25 without an internal contactor, the electrode will be energized when the Vantage® 410 CE is started.

Spool Gun (K487-25) and Cobramatic to Vantage® 410 CE

- Shut the welder off.
- Connect per instructions on the appropriate connection diagram in Section "Diagram".

⚠ WARNING

Certain Electrical devices cannot be powered to this Product. See Table below.

ELECTRICAL DEVICE USE WITH THIS PRODUCT	
COMMON ELECTRICAL DEVICES	POSSIBLE CONCERNS
Heaters, toasters, incandescent light bulbs, electric range, hot pan, skillet, coffee maker.	NONE
Single-phase induction motors, drills, well pumps, grinders, small refrigerators, weed and hedge trimmers.	These devices require large current inrush for starting. (See Some synchronous motors may be frequency sensitive to attain maximum output torque, but they SHOULD BE SAFE from any frequency induced failures.
Computers, high resolution TV sets, complicated electrical equipment.	DO NOT USE THESE DEVICES WITH THIS PRODUCT.

The Lincoln Electric Company is not responsible for any damage to electrical components improperly connected to this product.

For Auxiliary Power

Start the engine and set the IDLER control switch to the

desired operating mode. Full power is available regardless of the welding control settings providing no welding current is being drawn.

Engine Operation

Before Starting the Engine:

- Be sure the machine is on a level surface.
- Open side engine doors and remove the engine oil dipstick and wipe it with a clean cloth. Reinsert the dipstick and check the level on the dipstick.
- Add oil (if necessary) to bring the level up to the full mark. Do not overfill. Close engine door.
- Check radiator for proper coolant level. (Fill if necessary).
- See Engine Owner's Manual for specific oil and coolant recommendations.

Add Fuel



⚠ WARNING

DIESEL FUEL CAN CAUSE FIRE



- Stop engine while fueling.
- Do not smoke when fueling.
- Keep sparks and flame away from tank.
- Do not leave unattended while fueling
- Wipe up spilled fuel and allow fumes to clear before starting engine.
- Do not overfill tank, fuel expansion may cause overflow.

DIESEL FUEL ONLY-Low sulphur fuel or ultra low sulphur fuel in U.S.A. and Canada.

NOTE: If fuel other than ULSD (Ultra Low Sulfer Diesel) is used, the oil must be changed every 100 hours. ULSD has a sulfur content of up to 15PPM.

- Remove the fuel tank cap.
- Fill the tank. **DO NOT FILL THE TANK TO THE POINT OF OVERFLOW.**
- Replace the fuel cap and tighten securely.
- See Engine Owner's Manual for specific fuel recommendations.

Break-in Period

The engine will use a small amount of oil during its "break-in" period. Break-in is about 50 running hours. Check the oil every four hours during break-in.

⚠ WARNING

During break-in, subject the Welder to moderate loads. Avoid long periods running at idle. Before stopping the engine, remove all loads and allow the engine to cool several minutes.

Controls and Operational Features

Welding Controls

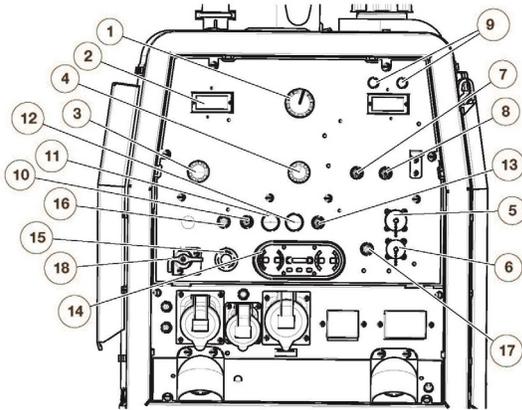


Figure 2

1. **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. When in the ARC GOUGING or CV- WIRE modes and when a remote control is connected to the 6-Pin or 14-Pin CoNnector, the auto-sensing circuit automatically switches the OUTPUT CONTROL from control at the welder to the remote control.

When in the CC-STICK orDOWNHILL PIPE mode and when REMOTE CONTROL is connected to the 6-Pin or 14-Pin Connector, the OUTPUT CONTROL is used to set the maximum current range of the OUTPUT CONTROL of the REMOTE.

Example: when the OUTPUT CONTROL on the welder is set to 200 amps the current range on the REMOTE CONTROL will be Min. 200 A, rather than the full Min.-Max. amps. Any current range that is less than the full range provides finer current resolution for more fine tuning of the output.

In the CV-WIRE mode, if the feeder being used has a voltage control when the wire feeder control cable is connected to the 14Pin Connector, the auto-sensing circuit automatically makes OUTPUT CONTROL inactive and the wire feeder voltage control active. Otherwise, the OUTPUT CONROL is used to preset the voltage.

When in the TOUCH START TIG mode and when an Amptrol is connected to the 6-Pin Connector, the OUTPUT dial is used to set maximum current range of the CURRENT CONTROL of the Amptrol.

2. **Digital Output Meters:** the digital meters allow the output voltage (CV-WIRE mode) or current (CC-STICK, DOWNHILL PIPE, 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 stopped. This allows the operator to read the actual current and voltage just prior to when welding wqas 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%.

3. **Weld Mode Selector Switch:** Provides five selectable welding modes.
 - CV-WIRE;
 - ARC GOUGING;
 - DOWNHILL PIPE
 - CC-STICK
 - TOUCH START TIG
4. **Arc Control:** The ARC CONTROL dial is active in the CV-WIRE, CC-STICK and DOWNHILL PIPE modes, and has different functions in these modes. This control is not active in the TIG mode.
 - **CC-STICK mode:** In this mode, the ARC CONTROL dial sets the short circuit current (arc-force) during stick welding to adjust for a soft or crisp arc. Increasing the dial 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 dial 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.
 - **CV-WIRE mode:** In this mode, turning the ARC CONTROL clock wise 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 a setting of 0.
5. **14-Pin Connector:** For attaching wire feeder control cables. Includes contactor closure circuit, auto-sensing remote control circuit, and 120V and 42V power. The remote control circuit operates the same as the 6 Pin Amphenol.
6. **6-Pin Connector:** For attaching optional remote control equipment. Includes auto-sensing remote control circuit.
7. **Weld Terminals Control Switch:** In the WELD TERMINALS ON position, the output is electrically hot all the time. In the REMOTELY CONTROLLED position, the output is controlled by a wire feeder or amptrol device, and is electrically off until a remote switch is depressed.
8. **Wire Feeder Voltmeter Switch:** Matches the polarity

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

9. **VRD (Voltage Reduction Device) Indicator Lights:** On the front panel of the Vantage® 410 CE 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. In the CC-Stick mode 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 when not welding in the CC-stick mode, 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 your local field service shop for service.

VRD INDICATOR LIGHTS			VRD "OFF"
MODE	VRD "ON"		
CC-STICK	OCV	Green (OCV Reduced)	No Lights
	While Welding	Red or Green (Depends on Weld Voltage)*	
CV-WIRE	OCV	Red (OCV not Reduced) Weld Terminals ON	
		Red (OCV not Reduced) Weld Terminals Remotely controlled Gun trigger Closed	
		Green (No OCV) Weld Terminals Remotely controlled Gun trigger Open	
	While Welding	Red or Green * (Depends on Weld Voltage) *	
PIPE	OCV	Green (No Output)	
	While Welding	Not Applicable (No Output)	
ARC GOUGING	OCV	Green (No Output)	
	While Welding	Not Applicable (No Output)	
TIG	OCV	Green (Process is low voltage)	
	While Welding	Green (Process is low voltage)	
* It is normal for the lights to alternate between colors while welding.			

Engine Controls

10. **Run/Stop Switch:** RUN position energises the engine prior to starting. STOP position stops the engine. The oil pressure interlock switch prevents battery drain if the switch is left in the RUN position and the engine is not operating. 
11. **Glow Plug Push Button:** When pushed activates the glow plugs. Glow plug should not be activated for more than 20 seconds continuously. 
12. **Start Push Button:** Energizes the starter motor to crank the engine.
13. **Idler Switch:** Has two positions:
- In the HIGH  position, the engine runs at the high idle speed controlled by the engine governor.
 - In the AUTO  position, the idler operates as follows:
 - 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.
 - 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.
 - When welding ceases or the AC power load is turned off, a fixed time delay of approximately 12 seconds starts. 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.
 - The engine will automatically return to high idle speed when there is welding load or AC power load reapplied.
14. **Dashboard Gauge:** The dash board gauge displays 5 gauges:
- OIL PRESSURE**
The gauge displays the engine oil pressure when the engine is running. 
 - ENGINE TEMPERATURE**
The gauge displays the engine coolant temperature.
 - 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.
 - FUEL LEVEL** 
Displays the level of diesel fuel in the fuel tank. The operator must watch the fuel level closely to prevent running out of fuel and possibly having to bleed the system.
 - BATTERY VOLTAGE INDICATOR**
Displays the battery voltage and indicates that the charging system is functioning properly.
15. **Engine Stop Switch-** Shuts down engine.
16. **Circuit Breaker-** For protection of Battery Charging

Circuit.

17. **Circuit Breaker-** For protection of 42V & 120V Wire Feeder circuits.
18. **Battery Isolator-** Cuts power to the battery. Lockable with padlock (Not Supplied). Lock when machine is unattended.

Welder Operation

Starting the Engine

1. Remove all plugs connected to the AC power receptacles.
2. Set IDLER switch to AUTO.
3. Press Glow Plug Button and hold 15 to 20 seconds.
4. Set the RUN/STOP switch to RUN.
5. Press START button until the engine starts or for up to 10 seconds. Continue to hold the glow plug button for up to an additional 10 seconds.
6. Release the engine START button immediately when the engine starts.
7. The engine will run at high idle speed for approximately 12 seconds and then drop to low idle speed. Allow the engine to warm up at low idle for several minutes before applying a load and/or switching to high idle. Allow a longer warm up time in cold weather.

NOTE: If the unit fails to start turn run/stop switch to off and repeat step 3 through step 7 after waiting 30 seconds.

WARNING

- Do not allow the starter motor to run continuously for more than 20 seconds.
- Do not push the START button while the engine is running because this can damage the ring gear and/or the starter motor.
- IF the Engine Protection or Battery Charging Lights do NOT turn off shortly after starting the engine, shut off the engine immediately and determine the cause.

NOTE: When starting for the first time, or after an extended period of time of not operating, it will take longer than normal to start because the fuel pump has to fill the fuel system. For best results, bleed the fuel system as indicated in Maintenance Section of this manual.

Stopping the Engine

Remove all welding and auxiliary power loads and allow the engine to run at low idle speed for a few minutes to cool the engine.

STOP the engine by placing the RUN-STOP switch in the STOP position.

NOTE: A fuel shut off valve is located on the fuel pre-filter.

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.

TYPICAL VANTAGE 410 [®] (CE) FUEL CONSUMPTION		
	Kubota V1505 Liters/Hr	Running Time for Hours
Low Idle - No Load 1350 R.P.M. (Kubota)	1.10	68.96

High Idle - No Load 1890 R.P.M. (Kubota)	1.52	49.76
DC Weld Output 150 Amps @ 20 Volts	2.50	30.23
DC Weld Output 250 Amps @ 24 Volts	3.30	22.91
DC Weld Output 300 Amps @ 32 Volts	4.41	17.15
10,000 Watts	4.15	18.23
7,500 Watts	3.36	22.15
5,000 Watts	2.75	27.53
2,500 Watts	2.14	35.41

Note: this data is for reference only. Fuel consumption is approximate and can be influenced by many factors, including engine maintenance, environmental conditions and fuel quality.

Electrode Information

For any electrode the procedures should be kept within the rating of the machine. For information on electrodes and their proper application see www.lincolnelectric.com or the appropriate Lincoln publication.

TheVantage[®] 410 CE can be used with a broad range of DC stick electrodes. The MODE switch provides two stick welding settings as follows:

CONSTANT CURRENT (CC-STICK) Welding

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

The ARC CONTROL dial sets the short circuit current (arc force) during stick welding to adjust for a soft or crisp arc. Increasing the dial 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.

NOTE: Due to the low OCV with the VRD on, a very slight delay during striking of the electrodes may occur. Due to the requirement of the resistance in the circuit to be low for a VRD to operate, a good metal-to-metal contact must be made between the metal core of the electrode and the job.

A poor connection anywhere in the welding output circuit may limit the operation of the VRD. This includes a good connection of the work clamp to the job. The work clamp should be connected as close as practical to where the welding will be performed.

A. For New Electrodes

E6010-Touch, Lift to Start the Arc.

E7018, E7024-Touch, Rock Back and Forth in Joint, Lift. Once the arc is started, normal welding technique for the application is then used.

B. For Re-Striking Electrodes

Some electrodes form a cone at the end of the electrode after the welding arc has been broken, particularly iron powder and low hydrogen electrodes. This cone will need to be broken off in order to have the metal core of the electrode make contact.

E6010-Push, Twist in Joint, Lift.

E7018, E7024-Push, Rock Back and Forth in Joint, Lift.

Once the arc is started, normal welding technique for the application is then used.

For other electrodes the above techniques should be tried first and varied as needed to suit operator preference. The goal for successful starting is good metal to metal contact.

For indicator light operation, see table above "VRD Indicator Lights"

DOWNHILL PIPE Welding

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 dial adjusts the full output range for pipe welding.

The ARC CONTROL dial sets the short circuit current (arc-force) during stick welding to adjust for a soft or 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. This can also increase spatter.

It is recommended that the ARC CONTROL be set to the minimum number without electrode sticking. For indicator light operation, see table above.

NOTE: With the VRD switch in the "ON" position there is no output in the DOWNHILL PIPE mode. For indicator light operation, see table above. "VRD Indicator Lights".

TIG WELDING

The TOUCH START TIG setting of the MODE switch is for DC TIG (Tungsten Inert Gas) welding. To initiate a weld, the OUTPUT CONTROL dial 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, no tungsten contamination. Then, the tungsten is gently lifted off the work in a rocking motion, which establishes the arc.

When in the TOUCH START TIG mode and when an Amptrol is connected to the 6-pin Connector the OUTPUT dial is used to set the maximum current range of the CURRENT CONTROL of the Amptrol.

The ARC CONTROL is not active in the TIG mode. To STOP a weld, simply pull the TIG torch away from the work. When the arc voltage reaches approximately 30 V the arc will go out and the machine will reset the current to the TOUCH START level.

To reinitiate the arc, retouch the tungsten to the work and lift. Alternatively, the weld can be stopped by releasing the Amptrol or arc start switch.

The Vantage[®] 410 CE can be used in a wide variety of DC TIG welding applications. In general the "Touch Start" feature allows contamination free starting without the use of a Hi frequency unit. If desired, the K930-2 TIG Module can be used with the Vantage. The settings are for reference, in the table below.

Vantage[®] 410 CE settings when using the K930-2 TIG Module with an Amptrol or Arc Start Switch:

- Set the MODE Switch to the TOUCH START TIG setting.
- Set the "IDLER" Switch to the "AUTO" 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 Amptrol or Arc Start Switch is pressed.

When using the TIG Module, the OUTPUT CONTROL on the Vantage[®] 410 CE is used to set the maximum range of the CURRENT CONTROL on the TIG Module or an Amptrol if connected to the TIG Module.

TYPICAL CURRENT RANGES ⁽¹⁾ FOR TUNGSTEN ELECTRODES ⁽²⁾					
Tungsten Electrode Diameter mm	DCEN (-)	DCEP (+)	Approximate Argon Gas Flow Flow Rate C.F.H. (l/min)		TIG TORCH Nozzle Size (4), (5)
	1%, 2% Thoriated Tungsten	1%, 2% Thoriated Tungsten	Aluminum	Stainless Steel	
.25	2-15	(3)	2-4	2-4	#4, #5, #6
.50	5-20	(3)	3-5	3-5	
1.0	15-80	(3)	3-5	3-5	
1.6	70-150	10-20	3-5	4-6	#5, #6
2.4	150-250	15-30	6-8	5-7	#6, #7, #8
3.2	250-400	25-40	7-11	5-7	
4.0	400-500	40-55	10-12	6-8	#8, #10
4.8	500-750	55-80	11-13	8-10	
6.4	750-1000	80-125	13-15	11-13	

(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 = 6 mm
 # 5 = 8 mm
 # 6 = 10 mm
 # 7 = 11 mm
 # 8 = 12.5 mm
 #10 = 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.

Wire Welding-CV

Connect a wire feeder to the Vantage® 410 CE according to the instructions in INSTALLATION INSTRUCTIONS Section.

Vantage® 410 CE in the CV-WIRE mode, 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 dial set at 0.

NOTE: In the CV-Mode with VRD "On", the OCV (Open Circuit Voltage) is not reduce. For indicator light operation, see table above "VRD Indicator Lights".

Arc Gouging

Vantage® 410 CE can be used for arc gouging. For optimal performance, set the MODE switch ARC GOUGING.

Set the OUTPUT CONTROL knob to adjust output current to the desired level for the gouging electrode being used according to the ratings in the following table:

Carbon Diameter mm	Current Range (DC, electrode positive) in A
3.2	60 - 90
4.0	90 - 150
4.8	200 - 250
10	300-Max. Amps

The ARC CONTROL is not active in the ARC GOUGING Mode. The ARC CONTROL is automatically set to maximum when the ARC GOUGING mode is selected which provides the best ARC GOUGING performance.

NOTE: with the VRD switch in the "On" position there is no output in the ARC GOUGING Mode. For indicator light operation, see table about "VRD".

Auxiliary Power

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

Simultaneous Welding and Auxiliary Power Loads

The auxiliary power ratings are with no welding load. Simultaneous welding and power leads are specified in the table below. The permissible currents shown assume that current is being drawn from either the 230VAC or 400 VAC supply (not both at the same time).

VANTAGE® 410 Simultaneous Welding and Power Loads									
Weld	PLUS	1 PHASE		OR	3 PHASE		OR	BOTH 1 & 3 PHASE	
A		WATTS	A		WATTS	A		WATTS	A
0		3500	16		10000	16		10000	-
100		3500	16		8500	13		8300	-
200		3500	16		5700	9		5300	-
250		3500	16		3500	5		3500	-
300		400	2		0	0		400	-
400		0	0		0	0		0	0

Vantage® 410 CE Extension Cord Length Recommendations

(use the shortest length extension cord possible sized per the following table)

Current	Voltage	Load	Maximum Allowable Cord Length in m for Conductor Size					
A	V	W	14 AWG	12 AWG	10 AWG	8 AWG	6 AWG	4 AWG
16	220/380	1800	9	12	23	38	53	91

Conductor size is based on maximum 2.0% voltage drop.

Maintenance

WARNING

- Have qualified personnel do all maintenance and troubleshooting work.
- Turn the engine off before working inside the machine or servicing the engine.
- Remove guards only when necessary to perform maintenance and replace them when the maintenance requiring their removal is complete. If guards are missing from the machine, obtain replacements from a Lincoln Distributor. (See Operating Manual Parts List.)
- Read the Safety Precautions in the front of this manual and in the Engine Owner's 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 the gears, fans, and all other moving parts when starting, operating, or repairing the equipment.

Routine Maintenance

At the end of each day's use, refill the fuel tank to minimize moisture condensation in the tank. Running out of fuel tends to draw dirt into the fuel system. Also, check the crankcase oil level and add oil if indicated.

Engine service items Kubota V1505 (22HP)									
	Every day or every 8 hours	First service 50 hours	Every 100h or 3 months	Every 200 h or 4 months	Every 400 h or 9 months	Every 500 h or 12 months	Every 1000h Or 2 years	Maintenance Items	Type or quantity
	I							Coolant level	Check at overflow bottle
						C		Radiator core	
							R	Coolant	50/50 Mixture wthylene glycol/water
	I							Engine Oil level	
		R		R				Engine Oil (1)	6.3 quarts. 6l (including filter)
		R		R				Engine Oil Filter	Kubota# HH160-32093/LECO# S30694-1
					R			Water separator/fuel sedimenter	Kubota# 15831-43380/LECO# S30694-3
					R			Uel filter (in-line)	Kubota# 12581-43012/LECO# S30694-2
		I		I				Fan belt	Kubota# 16282-97010/LECO# S30694-4
				I			R	Air filter element	Donaldson# P822686/LECO# M19801-1A
							I	Battery	BCI Group 34

Legenda:

I = Inspect

C = Clean

R = Replace

(NOTE 1): Consult Engine Operators Manual for oil recommendations.



**See Engine Manual for complete engine care.
Give Engine Specification and Serial Number when ordering parts.**

These preventative maintenance periods apply to average conditions of operation. If necessary use shorter periods.

Engine Oil Change

IMPORTANT: If fuel is used with a higher sulfur content than 15ppm which is the maximum found in Ultra Low Sulfur Diesel (USLD), the oil change interval is 100 hrs.

Drain the engine oil while the engine is warm to assure rapid and complete draining. It is recommended that each time the oil is changed the oil filter be changed as well.

- Be sure the unit is off. Disconnect the negative battery cable to ensure safety.
- Locate oil drain hose and valve in bottom of base and pull through the hole in the battery access panel on the welder.
- Remove the cap from the drain valve. Push valve in and twist counterclockwise. Pull to open and drain the oil into a suitable container for disposal.
- Close the drain valve by pushing in and twisting clockwise. Replace the cap.
- Re-fill the crankcase to the upper limit mark on the dipstick with the recommended oil (see engine operation manual OR engine service items decal OR below). Replace and tighten the oil filler cap securely.
- Push oil drain hose and valve back into unit, re-connect negative battery cable, and close doors and engine top cover before restarting unit. Wash your hands with soap and water after handling used motor oil. Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take it in a sealed container to your local service station or recycling center for reclamation. DO NOT throw it in the trash, pour it on the ground or down a drain.

Use motor oil designed for diesel engines that meets requirements for API service classification CF-4/CG-4 or CH-4.

ACEA E1/E2/E3. Always check the API service label on the oil container to be sure it includes the letters indicated. (**Note:** An S- grade oil must not be used in a diesel engine or damage may result. It IS permissible to use an oil that meets S and C grade service classifications.)

SAE 10W30 is recommended for general, all temperature use, 5F to 104F (-15C to 40C).

See engine owner's manual for more specific information on oil viscosity recommendations.

Oil Filter Change

- Drain the oil
- Remove the oil filter with an oil filter wrench and drain the oil into a suitable container. Discard the used filter. **Note:** Care should be taken during filter removal to not disrupt or damage in any way the fuel lines.
- Clean the filter mounting base and coat the gasket of the new filter with clean engine oil.
- Screw the new filter on by hand until the gasket contacts the mounting base. Using an oil filter wrench, tighten the filter an additional 1/2 to 7/8 of a turn.
- Refill the crankcase with the specified amount of the recommended engine oil. Reinstall the oil filler cap and tighten securely.
- Start the engine and check for oil filter leaks.
- Stop the engine and check the oil level. If

necessary, add oil to the upper limit mark on the dipstick.

WARNING

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

WARNING

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.

Air Cleaner

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 at least every 500 hours of operation. Under dusty conditions, replace sooner.

Cooling System

WARNING

HOT COOLANT can burn skin.

- Do not remove cap if radiator is hot.



Check the coolant level by observing the level in the radiator and recovery bottle. Add 50/50 antifreeze / water solution if the level is close to or below the "LOW" mark. do not fill above the "FULL" mark. Remove radiator cap and add coolant to radiator. Fill up to the top of the tube in the radiator filler neck which includes a connecting hose coming from the thermostat housing.

To drain the coolant, locate the drain hose & valve at the bottom of the radiator. Put hose through hole in bottom of base and into suitable container of approximate volume of 2 gallons. Rotate valve to allow drainage after loosening the radiator cap. Drain system completely. Close the valve and refill with a 50/50 antifreeze/water solution.) Use an automotive grade (low silicate) ethylene glycol antifreeze. The cooling system capacity is 7.2 qts. (6.8L.). Squeeze upper and lower radiator hoses while filling to bleed air from system coolant. Replace and tighten the radiator cap.

WARNING

Always premix the antifreeze and clean tap water before adding to the radiator. It is very important that a precise 50/50 solution be used with this engine year round. This gives proper cooling during hot weather and freezing protection to -37° C.

Cooling solution exceeding 50% ethylene glycol can result in engine overheating and damage to the engine. Coolant solution must be premixed before adding to radiator.

Periodically remove the dirt from the radiator fins.

Periodically check the fan belt and radiator hoses. Replace if signs of deterioration are found.

Tightening the Fan Belt

If the fan belt is loose, the engine can overheat and the battery lose its charge. Check tightness by pressing on the belt midway between the pulleys. It should deflect about 6.4mm under a load of 9 Kg.

Fuel



DIESEL FUEL ONLY- Ultra low sulphur fuel in U.S.A. and Canada.

Low sulfur fuel (up to 500ppm) and fuel as high as 5000ppm insulfur content maybe used outside of U.S.A. and Canada, but the oil change interval goes to every 100 hrs.

At the end of each day's use, refill the fuel tank to minimize moisture condensation and dirt contamination in the fuel line. Do not overfill; leave room for the fuel to expand.

Use only fresh No. 2D diesel fuel, the use of No. 1D diesel fuel is recommended in place of No. 2D at temperatures below -5°C. Do not use kerosene.

See the Engine Operator's Manual for instructions on replacing the fuel filter.

Bleeding the Fuel System

You may need to bleed air from the fuel system if the fuel filter or fuel lines have been detached, the fuel tank has been ran empty or after periods of long storage. It is recommended that the fuel shutoff valve be closed during periods of non-use.

WARNING

To avoid personal injury, do not bleed a hot engine. This could cause fuel to spill onto a hot exhaust manifold, creating a danger of fire.

Bleed the fuel system as follows:

1. Fill the fuel tank with fuel.
2. Open the fuel shut off valve.
3. Open bleed fitting on fuel sedimenter, the sedimenter should gravity fill itself with fuel.
4. Tighten the bleed fitting on fuel sedimenter after sedimenter fills with fuel.
5. Loosen bleed fitting on the fuel injector manifold.
6. Operate hand priming lever until fuel comes out the bleed screw on the injector manifold. This could take 20-30 seconds of rapid operation of the priming lever. Tighten bleed fitting on injector manifold.
7. Follow normal STARTING procedures until engine starts.

Draining the Fuel Tank

The fuel tank is equipped with a drain valve and hose for easy draining when required. This is located in close proximity to fuel sedimenter.

IMPORTANT! Every 100 hours, check the following for thermal and/or vibration induced damage:

- Fuel hoses & connections
- Coolant hoses & connections

Fuel Filter

1. Check the fuel filter and fuel pre-filter for water accumulation or sediment.

2. Replace the fuel filter if it is found with excessive water accumulation or sediment. Empty fuel pre-filter.

Engine Adjustment

WARNING

OVERSPEED IS HAZARDOUS. The maximum allowable high idle speed for this machine is 1890 RPM, no load. Do NOT tamper with governor components or setting or make any other adjustments to increase the maximum speed. Severe personal injury and damage to the machine can result if operated at speeds above maximum.

Adjustments to the engine are to be made only by a Lincoln Service Center or an authorized Field Service Shop.

Battery Maintenance

To access the battery, remove the battery tray from the front of the machine with 3/8" nut driver or flat head screw driver. Pull the tray out of machine far enough to disconnect the negative and then positive battery cables. The tray can then be tilted and lifted to remove the entire tray and battery from the machine for easy service.

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 negative battery lead at 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.



Cleaning the Battery

Keep the battery clean by wiping it with a damp cloth when dirty. If the terminals appear corroded, disconnect the battery cables and wash the terminals with an ammonia solution or a solution of 0.1113 kg of baking soda and 0.9461L of water. Be sure the battery vent plugs (if equipped) are tight so that none of the solution enters the cells.

After cleaning, flush the outside of the battery, the battery compartment, and surrounding areas with clear water. Coat the battery terminals lightly with petroleum jelly or a non-conductive grease to retard corrosion. Keep the battery clean and dry. Moisture accumulation on the battery can lead to more rapid discharge and early battery failure.

Checking the Electrolyte Level

If battery cells are low, fill them to the neck of the filler

hole with distilled water and recharge. If one cell is low, check for leaks.

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® 410 CE 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.

Servicing Optional Spark Arrestor

Clean every 100 hours or twice per year

WARNING

MUFFLER MAY BE HOT.

- Allow engine to cool before installing the spark arrester!
- Do not operate engine while installing the spark arrester!

Welder / Generator Maintenance

Storage: Store in 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.

Brush Removal and Replacement: It's normal for the brushes and slip rings to wear and darken slightly. Inspect the brushes when a generator overhaul is necessary.

WARNING

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

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.

Diagrams

With Optional K857 Remote Control

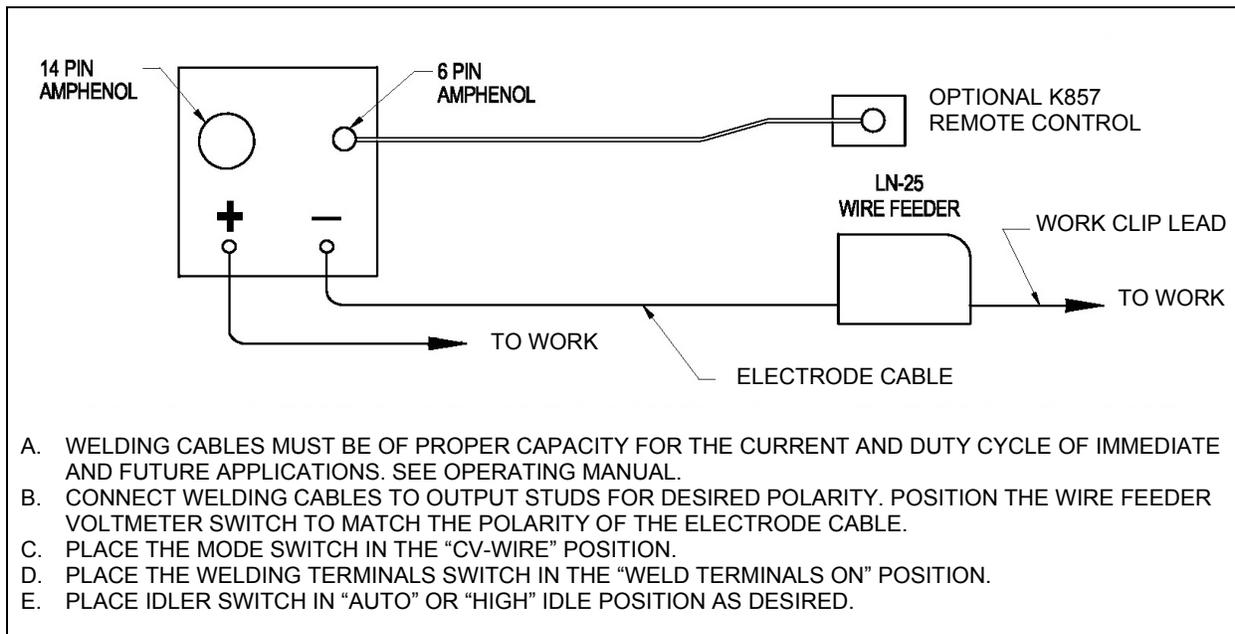
 **WARNING**

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



 **WARNING**

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



S24787-1

Engine Welders/LN-7 Connection Diagram

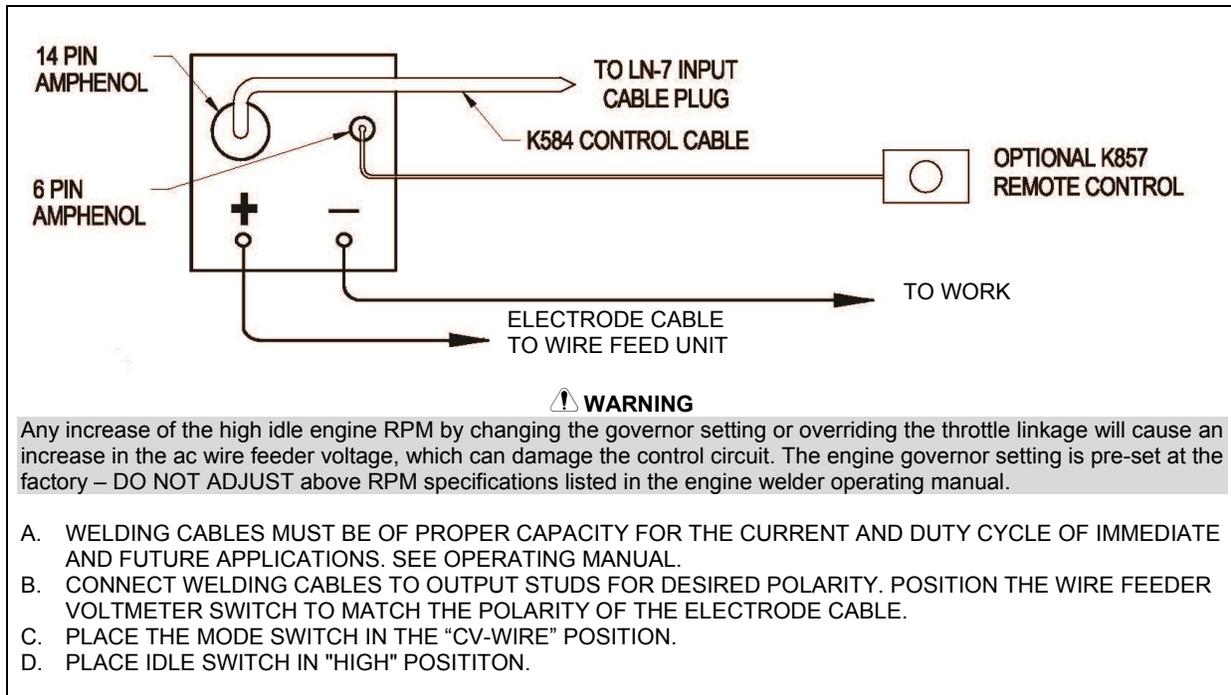
⚠ WARNING

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S24787-4

Engine Welders/LN-742 Connection Diagram

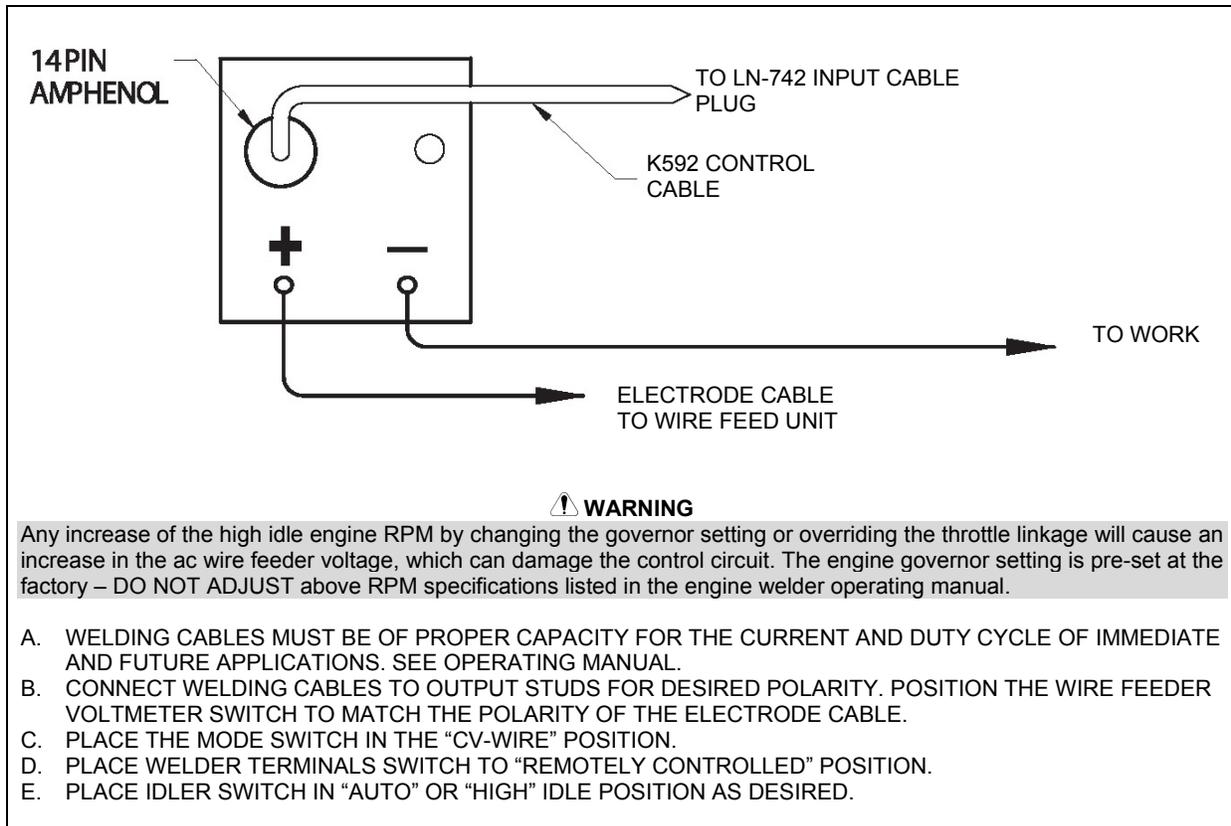
⚠ WARNING

- Do not operate with panels open.
- Disconnect NEGATIVE (-) Battery lead before servicing.
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S24787-5

Engine Welders/LN-8 Connection Diagram

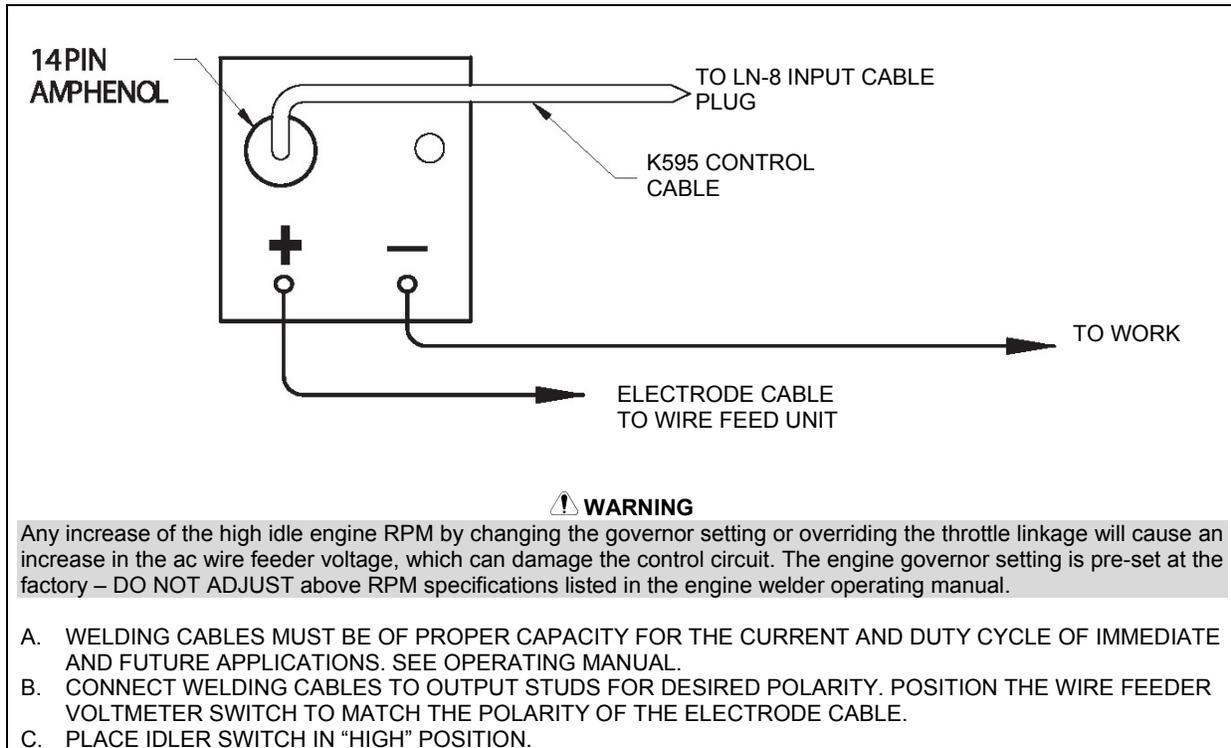
⚠ WARNING

- Do not operate with panels open.
- Disconnect NEGATIVE (-) Battery lead before servicing.
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⚠ WARNING

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S24787-6

Engine Welders to K867 Control Cable Adapter Connection Diagram

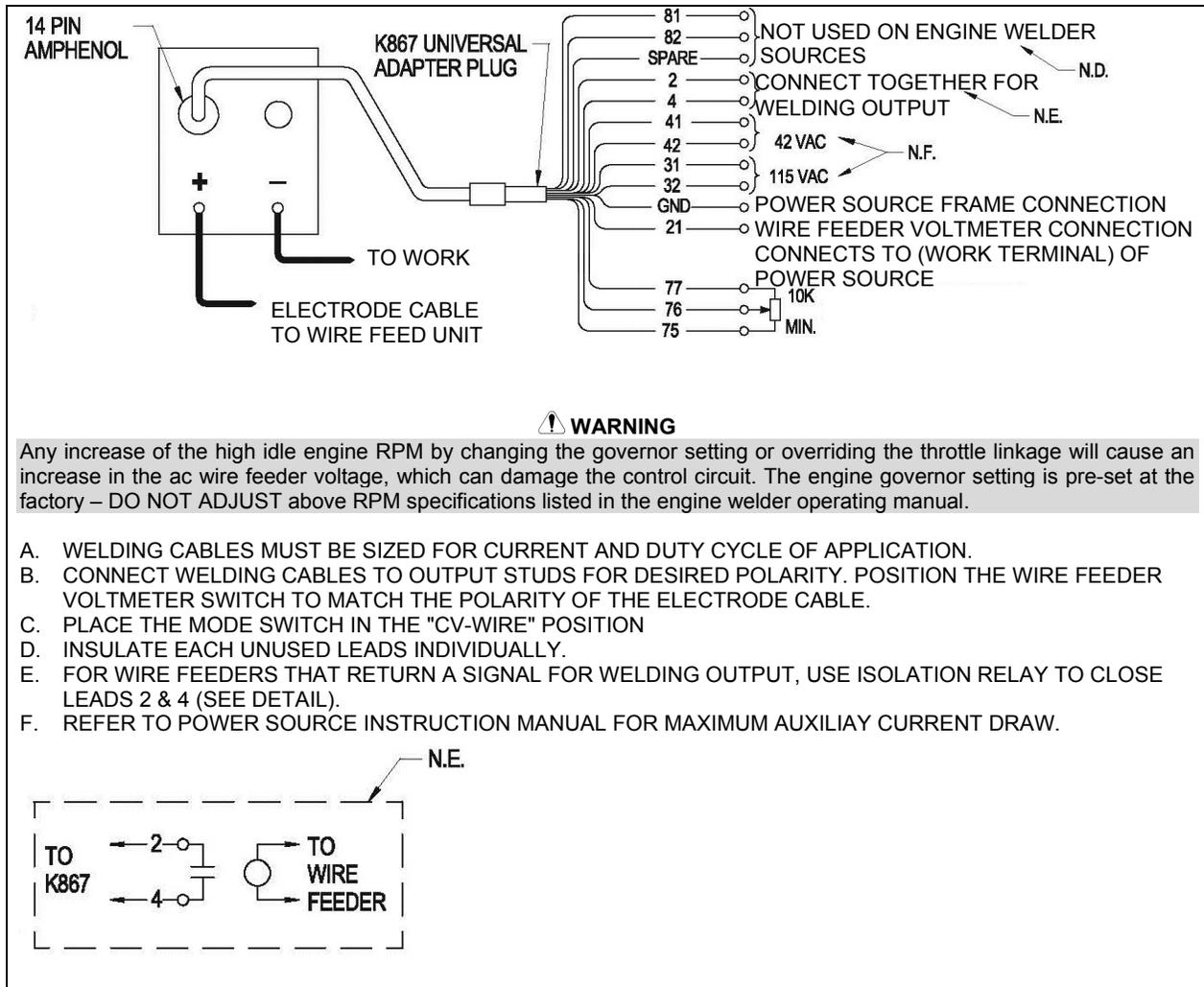
⚠ WARNING

- Do not operate with panels open.
- Disconnect NEGATIVE (-) Battery lead before servicing.
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S24787-7

Engine Welders/K691-10/K488/K487 Spool Gun Connection Diagram

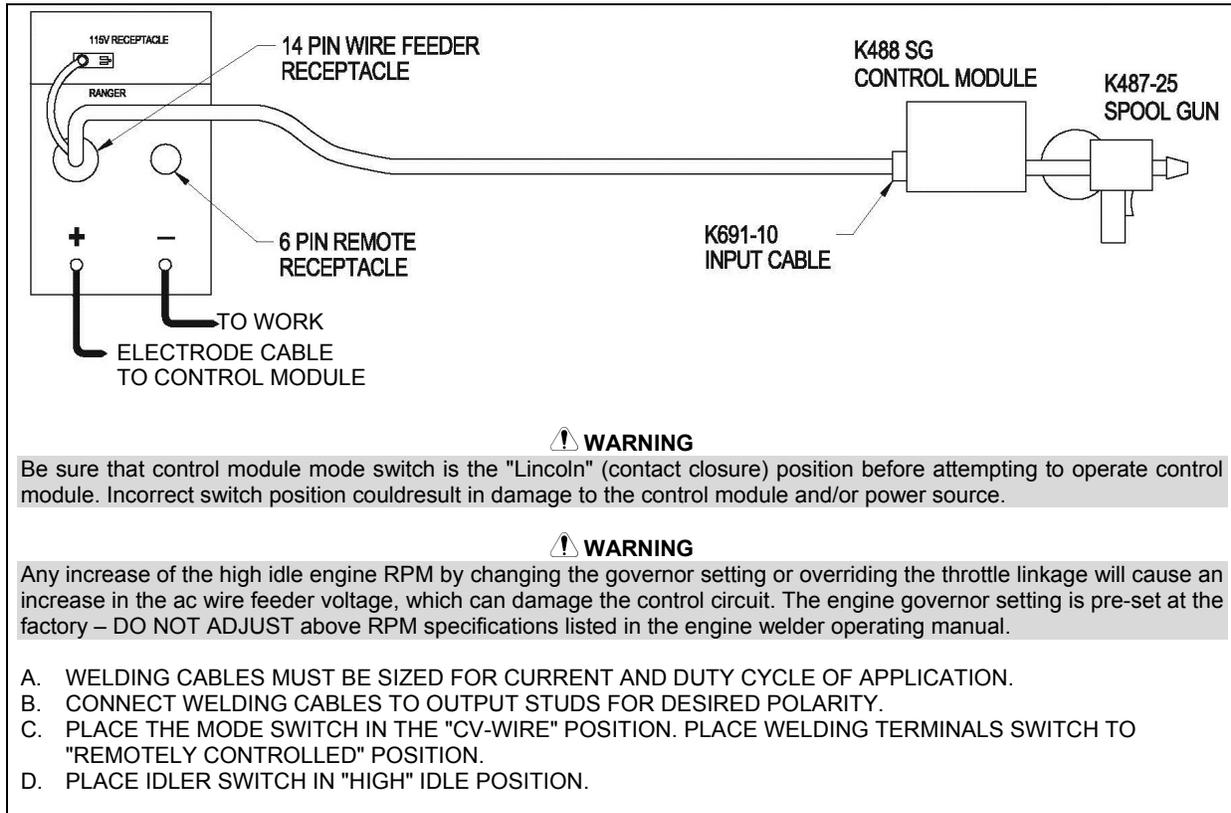
⚠ WARNING

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



⚠ WARNING

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- Only qualified personnel should install, use or service this equipment



⚠ WARNING

Be sure that control module mode switch is the "Lincoln" (contact closure) position before attempting to operate control module. Incorrect switch position could result in damage to the control module and/or power source.

⚠ WARNING

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.

- A. WELDING CABLES MUST BE SIZED FOR CURRENT AND DUTY CYCLE OF APPLICATION.
- B. CONNECT WELDING CABLES TO OUTPUT STUDS FOR DESIRED POLARITY.
- C. PLACE THE MODE SWITCH IN THE "CV-WIRE" POSITION. PLACE WELDING TERMINALS SWITCH TO "REMOTELY CONTROLLED" POSITION.
- D. PLACE IDLER SWITCH IN "HIGH" IDLE POSITION.

S24787-8

Engine Welders/K930 Tig Module Connection Diagram

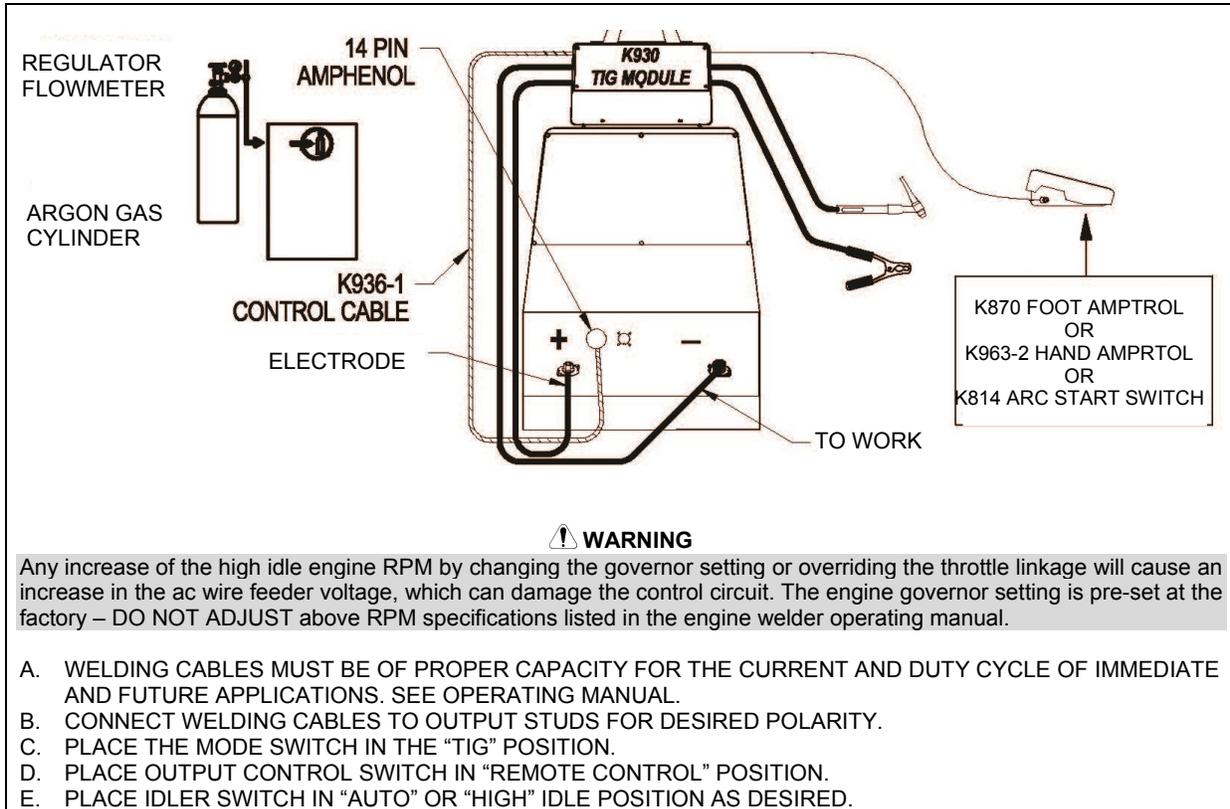
⚠ WARNING

- Do not operate with panels open.
- Disconnect NEGATIVE (-) Battery lead before servicing.
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S24787-9

Engine Welders/K2259-1 Cobramatic Connection Diagram

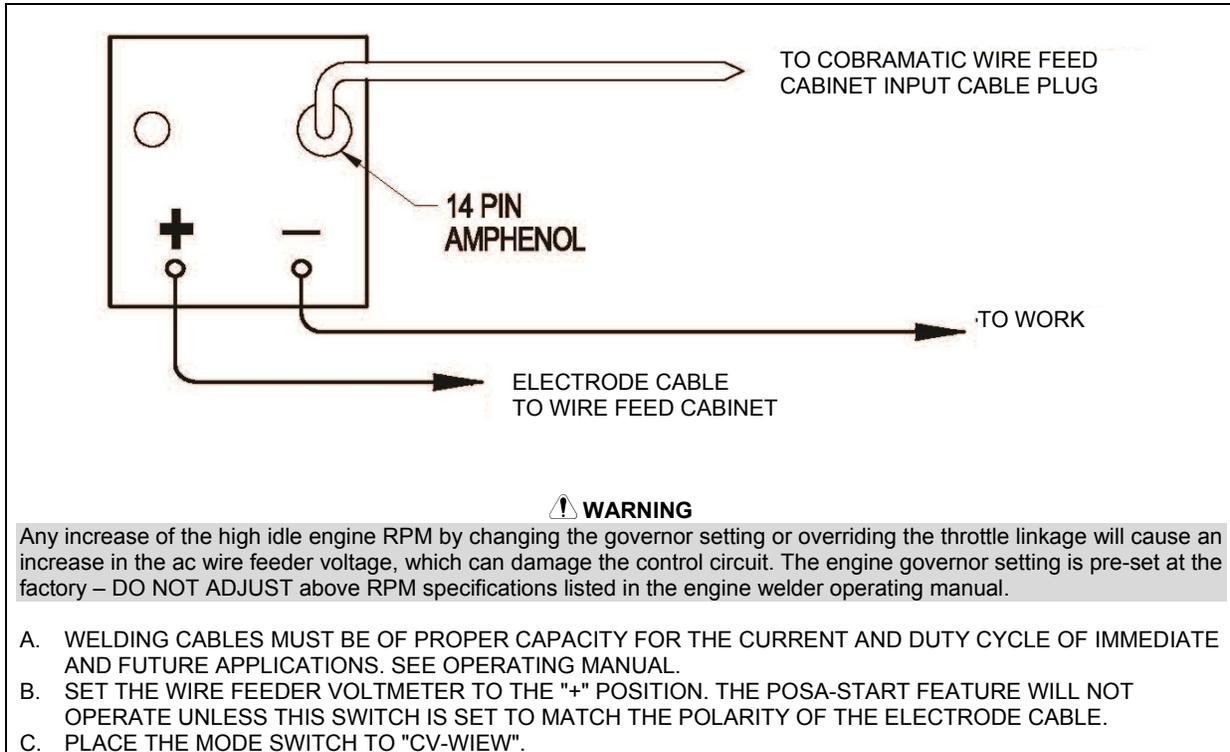
⚠ WARNING

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



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S24787-10

WEEE

07/06

English



Do not dispose of electrical equipment together with normal waste!

In observance of European Directive 2012/19/EC on Waste Electrical and Electronic Equipment (WEEE) and its implementation in accordance with national law, electrical equipment that has reached the end of its life must be collected separately and returned to an environmentally compatible recycling facility. As the owner of the equipment, you should get information on approved collection systems from our local representative.

By applying this European Directive you will protect the environment and human health!

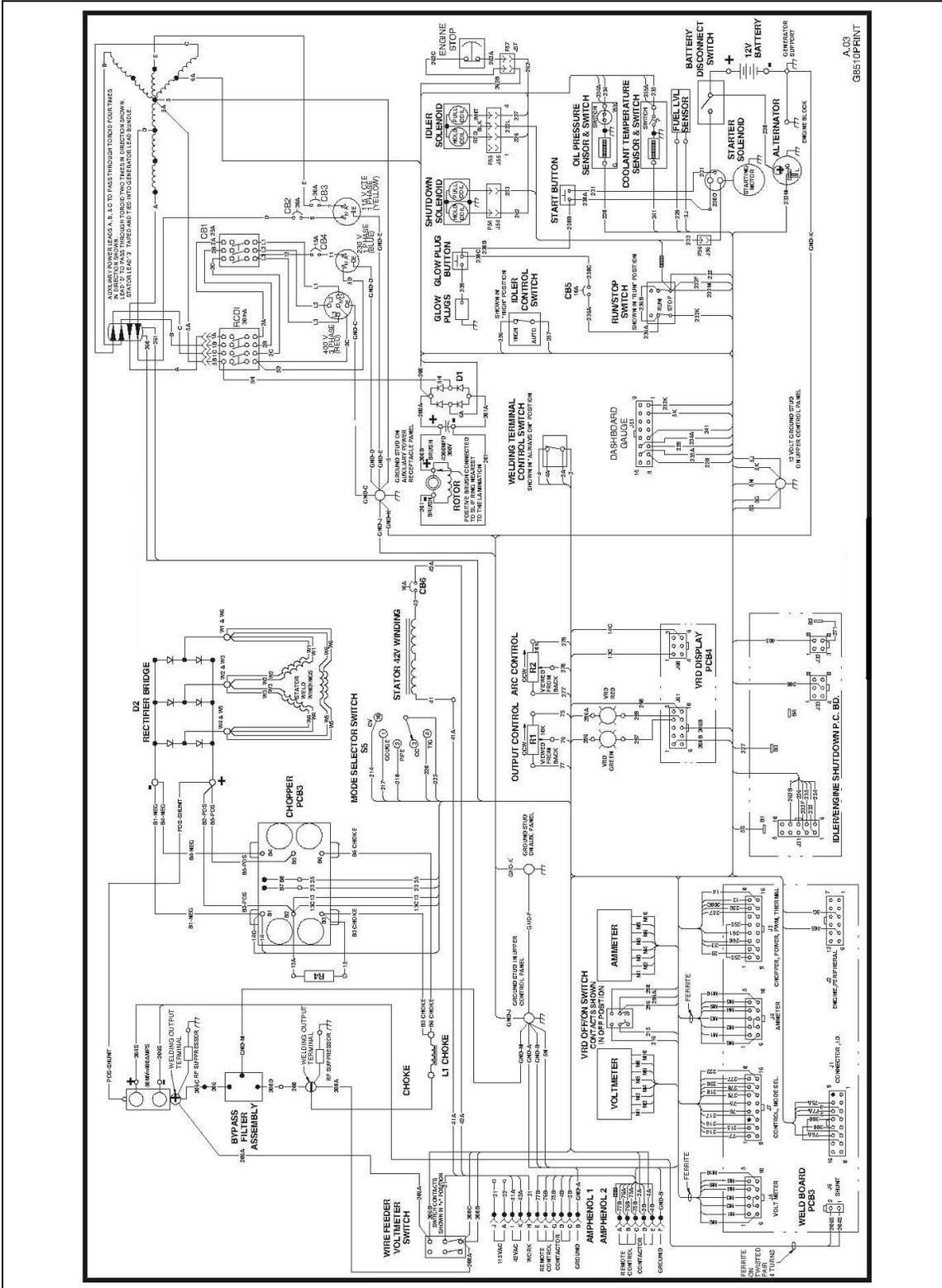
Spare Parts

12/05

For Spare Parts references visit the Web page : <https://www.lincolnelectric.com/LEExtranet/EPC/>

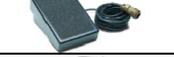
Electrical Schematic

For code 12516, 12635
 ELECTRICAL SYMBOLS PER E1537
 ALL CASEFRONT COMPONENTS SHOWN VIEWED FROM REAR



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 included with the machine. If the diagram is illegible, write to the Service Department for a replacement. Give the equipment code number.

Suggested Accessories

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.
K2636-1		Two Wheeled Trailer - K2636-1 For highway use, consult applicable federal, state, and local laws regarding possible additional requirements.
KIT-400A-70-5M*		Cable kit 400A , 70mm ² , 5m
GRD-400A-70-xM*		Ground cable 400A - 70 mm ² - 5/10/15 m
E/H-400A-70-xM*		Electrode holder 400A - 70 mm ² - 5/10 m
K10376		Adapter M14/Dinse(F)
K10095-1-15M		Remote control - 15 m
K10398		Extension cable for remote control box K10095-1-15M, 15m
K704		ACCESSORY SET 400Amp - Includes 35 ft. (10m) of electrode cable and 30 ft. (9.1m) of work cable, headshield, work clamp electrode holder. Cables are rated at 400 amps, 100% duty cycle.
K857 and K857-1		REMOTE CONTROL – 7.6m/30.4m
K802N		POWER PLUG KIT - Provides four 120 volt plugs rated at 20 amps each and one dual voltage, full KVA plug rated at 120/240 volts, 50 amps.
Wire Feeder Options		
K2613-5		LN-25 PRO Portable Wire Feeder
K2614-8		LN-25 PRO Dual Portable Wire Feeder
KP1697-5/64		Drive Roll Kit - Includes: 2 polished U groove drive rolls, outer wire guide and inner wire guide for solid core wire. (Used on LN-25 Pro)
KP1697-068		Drive Roll Kit - Includes: 2 polished U groove drive rolls, outer wire guide and inner wire guide for solid core wire. (Used on LN-25 Pro)
KP1696-1		Drive Roll Kit - Includes: 2 V groove drive rolls and inner wire guide for Steel Wires. (Used on LN-25 Pro)
Magnum Gun and Magnum Gun Connector Kit are required for gas-shielded welding. Innershield Gun is required for gasless welding.		
K126-1/2		Magnum 350 Innershield Gun 62° 3m/4,6m
K115-2		Magnum 450 Innershield Gun 82° 4,6m
K10413-36PHD-xM K10413-42PHD-xM		Gas cooled gun: LGP 360G (300A@60%) or LGP 420G (350A@60%) available 3m, 4m 5m.
K1500-1		Gun Receiver Bushing (for LN-15 & K126-2)
TIG Options		
K10529-26-4V		Linc Torch Premium LTP 26 GV , manual valve 4m
K870		Foot Amptrol®
K963-3		Hand Amptrol®

Customer Assistance Policy

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

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

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