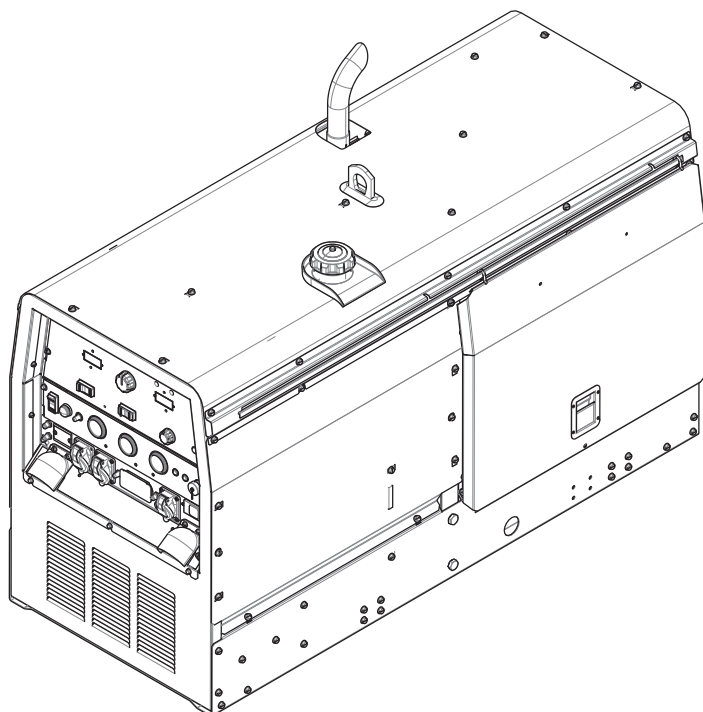


# Operator's Manual

## *Fleet*<sup>™</sup> 650



For use with machines having Code Numbers:

**12512**



**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.**

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CONTENT/DETAILS MAY BE CHANGED OR UPDATED WITHOUT NOTICE. FOR MOST CURRENT INSTRUCTION MANUALS, GO TO PARTS.LINCOLNELECTRIC.COM

**TECHNICAL SPECIFICATIONS - FLEET™ 650  
(K4339-1)**

INPUT - DIESEL ENGINE					
Make/Model	Description	Speed (RPM)	Displacement	Starting System	Capacities
DEUTZ F3L 912 DIESEL ENGINE	3 CYLINDER 44HP (33 KW) @ 1800 RPM.	IDLE 1890 FULL LOAD 1800	173 CU. IN (2.83L)  BORE X STROKE 3.89" X 4.72" (100MM X 120MM)	12VDC BATTERY & STARTER	FUEL (25 US GAL) 94.6L  OIL: 9.5 QTS. 9.0L

RATED OUTPUT @ 104° F (40° C) - WELDER			
Welding Process	Welding Output Current/Voltage/Duty Cycle	Output Range Amps	Max. Weld OCV Voltage @ 1800RPM
DC CONSTANT CURRENT	500A / 40V / 100% 650A / 36V / 60%	30A TO 650A	82 VOLTS PEAK
TIG	250A / 20V / 100%	20A TO 250A	82 VOLTS PEAK

RATED OUTPUT @ 104° F (40° C)- GENERATOR			
Auxiliary Power <sup>1</sup> Single Phase 60 Hz AC			
OUTLETS	VOLTS	AMPS	POWER
1	120	20	2400 WATTS
1	120	15	1800 WATTS
2	240	2 X 15	2 X 3600 WATTS

RECEPTACLES AND CIRCUIT BREAKERS		
RECEPTACLES	AUXILIARY POWER CIRCUIT BREAKER	OTHER CIRCUIT BREAKERS
1 - 120VAC DUPLEX NEMA(5-20R) GFCI PROTECTED	1 - 20 AMP FOR 120 VAC DUPLEX (NEMA)	20AMP FOR BATTERY CHARGING CIRCUIT
1 - 120VAC EUROPEAN (IEC-309)-GFCI PROTECTED	1 - 15 AMP FOR 120 VAC EUROPEAN (IEC-309)	
2 - 240VAC EUROPEAN (IEC-309)	2 - 15 AMP FOR 240 VAC EUROPEAN (IEC-309)	

PHYSICAL DIMENSIONS			
HEIGHT	WIDTH	DEPTH	WEIGHT
36.87(2) IN. 936.5 MM	28.28 IN 718.3 MM	65.1 IN. 1653.5 MM	1510 LBS. (685 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.
2. To Top of enclosure, add 9.63"(244.6mm) to top of exhaust pipe.

# INSTALLATION

## SAFETY PRECAUTIONS



**WARNING**

Do not attempt to use this equipment until you have thoroughly read the engine manufacturer's manual supplied with your welder. It includes important safety precautions, detailed engine starting, operating and maintenance instructions, and parts list

### ELECTRIC SHOCK can kill.

- Do not touch electrically live parts or electrode with skin or wet clothing.
- Insulate yourself from 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.



See additional warning information at front of this operator's manual.

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

## 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. Locate the welder so that the engine exhaust fumes are properly vented to an outside area.

## STACKING

Fleet™ 650 machines cannot be stacked.

## ANGLE OF OPERATION

To achieve optimum engine performance the Fleet™ 650 should be run in a level position. The maximum angle of operation for the Deutz engine is 30 degrees fore and aft, 40 degrees right and 45 degrees left. 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.

## LIFTING

The Fleet™ 650 weighs approximately 1510lbs. (685kg.) with a empty fuel tank. A lift bail is mounted to the machine and should always be used when lifting the machine.

Liftbale max lifting weight = 2600lbs

Do not exceed max lifting weight.



**WARNING**

- 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.



**FALLING EQUIPMENT can cause injury.**

## HIGH ALTITUDE OPERATION

At higher altitudes, output derating may be necessary. For maximum rating, derate the welder output 5% for every 300 meters (984 ft.) above 1500 meters (4920 ft.). For output of 500A and below, derate the welder output 5% for every 300 meters (984 ft.) above 2100 meters (6888 ft.).

Contact a Deutz Service Representative for any engine adjustments that may be required.

## HIGH TEMPERATURE OPERATION

Tested for extreme temperature operation up to 55°C. Output derated above 40°C.

### OUTPUT RATINGS AT TEMPERATURES ABOVE 40°C

AMPS	VOLTS	Duty Cycle	TEMPERATURE
500	33.0	50%	55
570	34.0	60%	50
610	35.0	60%	45



**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.

**FUEL**

**USE DIESEL FUEL ONLY-**

Low Sulphur fuel or ultra low sulphur fuel in USA and CANADA only.



**WARNING**

Fill the fuel tank with clean, fresh fuel. The capacity of the tank is 25 gals. (94.6 ltrs). When the fuel gauge reads empty the tank contains approximately 2 gals. (7.6ltrs.) 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**

The Deutz engine is air cooled by a belt driven axial blower. The oil cooler and engine cooling fins should be blown out with compressed air or steam to maintain proper cooling (See the engine Owners Manual for procedures and frequency).

**BATTERY CONNECTION**



**CAUTION**

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

The Fleet 650 is shipped with the negative battery cable disconnected. Make certain that the RUN-STOP switch is in the STOP position. 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”)

**MUFFLER OUTLET PIPE**

Remove the plastic plug covering the muffler outlet tube. Using the clamp provided secure the outlet pipe to the outlet tube with the pipe positioned such that it will direct the exhaust in the desired direction.

**SPARK ARRESTER**

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 standard muffler included with this welder does not qualify as a spark arrester. When required by local regulations, a suitable spark arrester such as the K2864-1 must be installed and properly maintained.



**WARNING**

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

**REMOTE CONTROL**

The Fleet™ 650 is equipped with a 6-pin. 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.

PIPE / GOUGE mode on low range and in STICK mode on low range and when a remote control is connected to the 6-Pin, the output control is used to set the maximum current range of the remote.

EXAMPLE: When the OUTPUT CONTROL on the welder is set to 205 amps the current range on the remote control will be Min-205 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.

**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.)

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

** WARNING**

- **Be grounded to the frame of the welder using a grounded type plug or 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 #8 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 #8 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 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 3/4"(19mm) wrench.

Table A.1 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.

**TABLE A.1**

**TOTAL COMBINED LENGTH OF ELECTRODE AND WORK CABLES**

<b>Cable Length</b>	<b>Cable Size for 400 Amps 60% Duty Cycle</b>
0-100 FT. (0-30 METERS)	2 / 0 AWG
100-150 FT. (30-46 METERS)	2 / 0 AWG
150-200 FT. (46-61 METERS)	3 / 0 AWG

## Cable Installation

Install the welding cables to your Fleet™ 650 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 RECEPTACLES

One 120VAC NEMA (5-20R) 20 amp duplex receptacle is protected by a 20 amp circuit breaker that provides 2400 watts Peak / 2400 watts Continuous power. Maximum current is 20 amps total.

One 120VAC European (IEC-309) 16 amp receptacle is protected by a 15 amp circuit breaker that provides 1800 watts Peak / 1800 watts Continuous power. Maximum current is 15 amps.

Two 240VAC European (IEC-309) 16 amp receptacle is protected by 2 15 amp circuit breakers that provides 3600 watts Peak / 3600 watts Continuous power. Maximum current is 15 amps.

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## 120 V RECEPTACLES

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.

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## RESIDUAL CURRENT DEVICE READY

The Fleet™ 650 is configured to allow for the addition of a Residual Current Device (RCD) to protect the 2-240V Single Phase Receptacles. The auxiliary power area on the front panel of the Fleet™ 650 has a hole sized and shaped to accept a typical 2-pole RCD along with a protective rubber boot. A cover plate with a label “RCD READY” covers the hole and secures a mounting bracket on the backside of the panel.

Note: The RCD should be rated for at least 30 Amps.

There are many suppliers of RCD's. Examples are Allen Bradley, part number 1492-RCD2A40 or Clipsal, part number 4RC240130.

The protective boot can be obtained from APM-Hexseal, part number HE-1035

See Section G Diagrams of this Operator's Manual for instructions on installing an RCD and protective rubber boot.

# OPERATION

## SAFETY PRECAUTIONS

### WARNING

Do not attempt to use this equipment until you have thoroughly read the engine manufacturer's manual supplied with your welder. It includes important safety precautions, detailed engine starting, operating and maintenance instructions, and parts lists.

### ELECTRIC SHOCK can kill.

- Do not touch electrically live parts or electrode with skin or wet clothing.
- Insulate yourself from work and ground
- Always wear dry insulating gloves.
- Always operate the welder with the hinged door closed and the side panels in place.
- Read carefully the Safety Precautions page before operating this machine. Always follow these and any other safety procedures included in this manual and in the Engine Instruction Manual.



## GENERAL DESCRIPTION

The Fleet™ 650 is a diesel engine powered DC multi-process welding power source and AC power generator. The engine drives a generator that supplies three phase power for the DC welding circuit, single phase power for the AC auxiliary outlets. The DC welding control system uses state of the art Chopper Technology for superior welding performance.

### For Auxiliary Power:

Start the engine and set the Weld Mode Selector 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 door 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.
- See Engine Owner's Manual for specific oil 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 in USA and Canada.

- 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

Lincoln Electric selects high quality, heavy-duty industrial engines for the portable welding machines we offer. While it is normal to see a small amount of crankcase oil consumption during initial operation, excessive oil use, wetstacking (oil or tar like substance at the exhaust port), or excessive smoke is not normal.

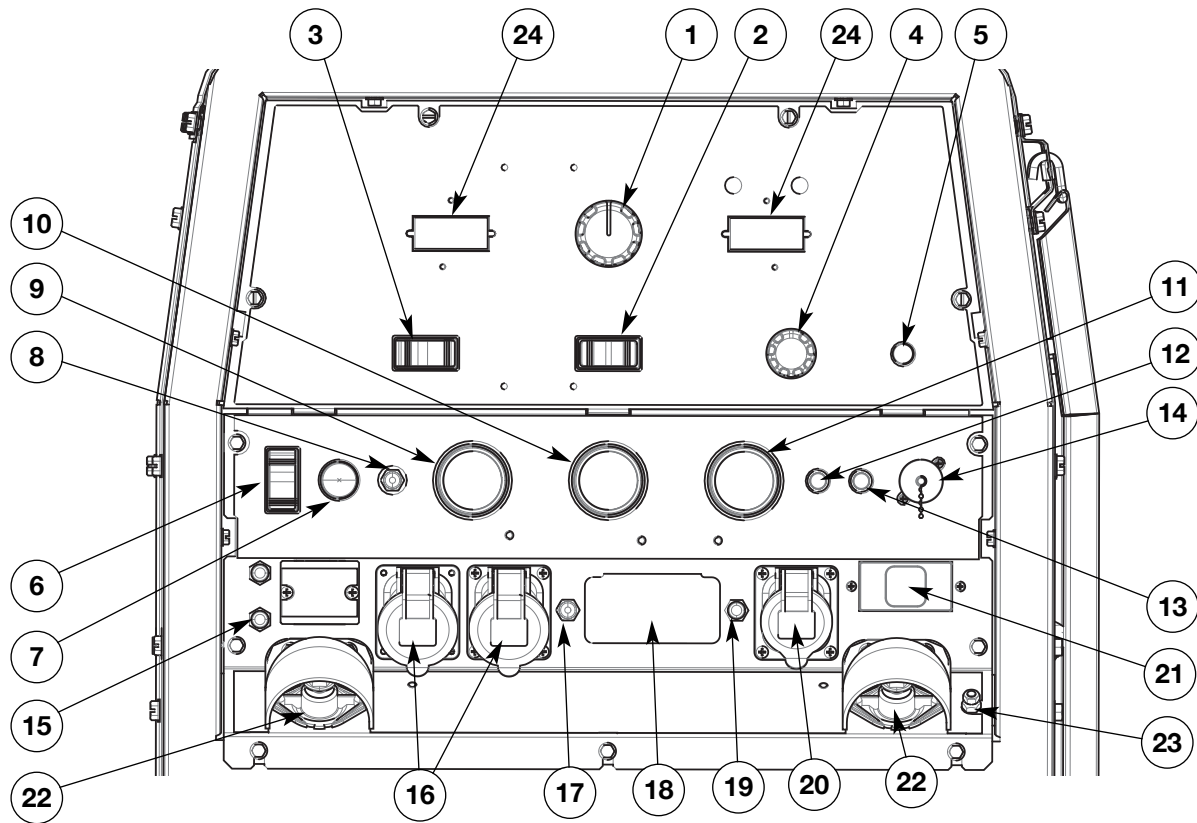
Larger machines with a capacity of 350 amperes and higher, which are operated at low or no-load conditions for extended periods of time are especially susceptible to the conditions described above. To accomplish successful engine break-in, most diesel-powered equipment needs only to be run at a reasonably heavy load within the rating of the welder for some period of time during the engine's early life. However, if the welder is subjected to extensive light loading, occasional moderate to heavy loading of the engine may sometimes be necessary. Caution must be observed in correctly loading a diesel/generator unit.

1. Connect the welder output studs to a suitable resistive load bank. Note that any attempt to short the output studs by connecting the welding leads together, direct shorting of the output studs, or connecting the output leads to a length of steel will result in catastrophic damage to the generator and voids the warranty.
2. Set the welder controls for an output current and voltage within the welder rating and duty cycle. Note that any attempt to exceed the welder rating or duty cycle for any period of time will result in catastrophic damage to the generator and voids the warranty.
3. Periodically shut off the engine and check the crankcase oil level.

### CAUTION

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.

FIGURE B.1



**WELDING CONTROLS**

(Figure B.1)

**1. OUTPUT CONTROL-** The OUTPUT dial is used to preset the output voltage or current. When in the PIPE / GOUGE mode on high range and when a remote control is connected to the 6-Pin, the auto-sensing circuit automatically switches the OUTPUT CONTROL from control at the welder to the remote control.

When in the CC-STICK or PIPE mode and when a remote control is connected to the 6-Pin, the output control is used to set the maximum current range 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.

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.

**2 WELD MODE SELECTOR SWITCH-**

(Provides THREE selectable welding modes)

PIPE/GOUGE

CC-STICK

TOUCH START TIG

**3. PIPE/ GOUGE RANGE selector switch** - Used to select either the LOW range (Black dial settings) or the HIGH range (Red dial settings) on the output control dial when in PIPE/GOUGE. This switch is not used in STICK or TIG modes.

**4. ARC FORCE-** The ARC FORCE dial is active in the PIPE/GOUGE mode when on low range, and in the CC-STICK. This control is not active in the PIPE/GOUGE mode when in high range or when in TIG mode.

CC-STICK mode: In this mode, the ARC FORCE 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 FORCE be set to the minimum number without electrode sticking. Start with a setting at 0.

PIPE mode: In this mode, the ARC FORCE 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 FORCE be set initially at 0.

**5. THERMAL PROTECTION ENGINE LIGHT**

**6. RUN/STOP SWITCH** - RUN position energizes the engine prior to starting. STOP position stops the engine.

**7. START PUSH BUTTON** - Energizes the starter motor to crank the engine.

**8. 20AMP CIRCUIT BREAKER-** For protection of Battery Charging Circuit.

**9. OIL PRESSURE GAUGE-** A indicator of engine Oil Pressure.

**10. ENGINE HOUR METER / FUEL GAUGE-** Displays the total time that the engine has been running. This meter is useful for scheduling prescribed maintenance. Shows fuel level.

**11. ENGINE TEMPERATURE GAUGE-** A indicator of engine temperature.

**12. ENGINE PROTECTION LIGHT-** A warning indicator light for Low Oil Pressure and/or over Temperature. The light is off when the systems are functioning properly. The light will come on and the engine will shutdown when there is Low Oil Pressure and/or the engine is over Temperature.

Note: The light remains off when the RUN-STOP switch is in the "ON" position prior to starting the engine. However if the engine is not started within 60 seconds the light will come on. When this happens the RUN-STOP switch must be returned to the "OFF" position to reset the engine protection system and light.

**13. Battery Charging Light-** A warning indicator light for Low/No battery charge. The light is off when the systems are functioning properly. The light will come on if there is a Low/No battery condition but the machine will continue to run.

Note: The light may or may not come on when the RUN-STOP switch is in the "ON" position. It will come on during cranking and stay on until the engine starts. After starting the engine the light will go off unless a Low/No battery charge condition exists.

**14. 6-PIN CONNECTOR-** For attaching optional remote control equipment. Includes auto-sensing remote control circuit.

**15. 15A CIRCUIT BREAKER-** To protect 240V Euro plugs.

**16. 240V EURO PLUG**

**17. 20A CIRCUIT BREAKER**

**18. DUPLEX 120V NEMA RECEPTACLE**

**19. 20A CIRCUIT BREAKER**

**20. 120V EURO PLUG**

**21. 120V GFCI** - Protects both NEMA duplex 120V receptacle and 120V Euro plug.

**22. OUTPUT STUD** - Provides a connection point for the electrode and work cables..

**23. GROUND STUD-** Provides a connection point for connecting the machine case to earth ground.

**24. DIGITAL OUTPUT METERS (OPTIONAL)** - The digital meters allow the output voltage current (CC-STICK, 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%.

## ENGINE OPERATION

### STARTING THE ENGINE



1. Open the engine compartment door and check that the fuel shut off valve located screwed into the fuel filter housing is in the open position (lever to be in line with the hose).
2. Check for proper oil level. Close engine compartment door.
3. Remove all plugs connected to the AC power receptacles.
4. Set the RUN/STOP switch to "RUN". Observe that the battery charging light is on and fuel is in the fuel tank (see fuel gauge).
5. Within 30 seconds, press and hold the engine START button until the engine starts.
6. Release the engine START button when the engine starts.
7. Check that the engine protection and battery charging lights are off. The engine protection light is on after starting, the engine will shutdown in a few seconds. Investigate any indicated problem.
8. Allow the engine to warm up for several minutes before applying a load. Allow a longer warm up time in cold weather.

### COLD WEATHER STARTING

With a fully charged battery and the proper weight oil, the engine should start satisfactorily even down to about  $-15^{\circ}\text{C}(5^{\circ}\text{F})$ . If the engine must be frequently started below  $-15^{\circ}\text{C}(5^{\circ}\text{F})$ , it may be desirable to install additional starting aids. The use of No. 1D diesel fuel is recommended in place of No. 2D at temperatures below  $-5^{\circ}\text{C}(23^{\circ}\text{F})$ .

### STOPPING THE ENGINE

Switch the RUN/STOP switch to "STOP". This turns off the voltage supplied to the shutdown solenoid. A backup shutdown can be accomplished by shutting off the fuel valve located on the fuel line.

Note: Place the Run/Stop switch in "Stop" position when engine is not running - battery will be discharged otherwise.

**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.

**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.

The Fleet™ 650 can be used with a broad range of DC stick electrodes. The WELD MODE switch provides two stick welding settings as follows:

**Constant Current (CC-STICK) Welding**

The CC-STICK position on the WELD 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 range switch is not used in STICK mode.

The ARC FORCE dial sets the short circuit current (arc-force) during stick welding to adjust for a soft or crisp arc. 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 FORCE be set to the minimum number without electrode sticking. Start with the dial set at 0.

**PIPE / GOUGE 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 dial in conjunction with the range switch are used to adjust the welding output in PIPE / GOUGE mode.

The ARC FORCE 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 FORCE be set to the minimum number without electrode sticking. Start with the dial set at 0.

**TIG Welding**

The TOUCH START TIG setting of the WELD 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 a Amptrol is connected to the 6-Pin connector the OUTPUT CONTROL dial is used to set the maximum current range of the current control of the Amptrol. The range switch is not used in TIG mode.

The ARC FORCE 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 Volts 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 Fleet™ 650 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.

**ARC GOUGING**

The Fleet™ 650 can be used for gouging. For optimal performance, set the WELD MODE switch to PIPE / GOUGE and Range Selector to high.

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 B.4.

**TABLE B.4**

Carbon Diameter	Current Range (DC, electrode positive)
1/8"(3.2MM)	60-90 AMPS
5/32"(4.0MM)	90-150 AMPS
3/16"(4.8MM)	200-250 AMPS
1/4"(6.4MM)	300-400 AMPS
3/8"(10.0MM)	400-MAX.AMPS
1/2"(12.7MM)	550-MAX.AMPS

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

**AUXILIARY POWER:**

Start the engine and set the the WELD MODE 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 loads are specified in Table B.5.

**TABLE B.3**

<b>TYPICAL CURRENT RANGES (1) FOR TUNGSTEN ELECTRODES(2)</b>						
Tungsten Electrode Diameter in. (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		
.010 (.25) 0.020 (.50) 0.040 (1.0)	2-15 5-20 15-80	(3) (3) (3)	3-8 (2-4) 5-10 (3-5) 5-10 (3-5)	3-8 (2-4) 5-10 (3-5) 5-10 (3-5)	#4, #5, #6	
1/16 (1.6)	70-150	10-20	5-10 (3-5)	9-13 (4-6)	#5, #6	
3/32 (2.4) 1/8 (3.2)	150-250 250-400	15-30 25-40	13-17 (6-8) 15-23 (7-11)	11-15 (5-7) 11-15 (5-7)	#6, #7, #8	
5/32 (4.0) 3/16 (4.8) 1/4 (6.4)	400-500 500-750 750-1000	40-55 55-80 80-125	21-25 (10-12) 23-27 (11-13) 28-32 (13-15)	13-17 (6-8) 18-22 (8-10) 23-27 (11-13)	#8, #10	

(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.

**TABLE B.5 FLEET™ 650 SIMULTANEOUS WELDING AND POWER LOADS**

<b>WELD AMPS</b>	<b>PLUS</b>	<b>1 PHASE</b>	
		<b>WATTS</b>	<b>AMPS</b>
300		9,100	43
400		6,900	23
500		2,400	11

**TABLE B.6**

**Fleet™ 650 Extension Cord Length Recommendations**

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

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)
20	120	2400			30	(9)	50	(15)	88	(27)	138	(42)	225	(69)
15	240	3600	60	(18)	75	(23)	150	(46)	225	(69)	350	(107)	600	(183)
20	240	4800			60	(18)	100	(30)	175	(53)	275	(84)	450	(137)
44	240	9500					50	(15)	90	(27)	150	(46)	225	(69)

Conductor size is based on maximum 2.0% voltage drop.



TABLE B.2

<b>TYPICAL FLEET™ 650 FUEL CONSUMPTION</b>	
<b>Test Condition</b>	<b>FUEL CONSUMPTION US gal/hr (litres/hr)</b>
NO LOAD	0.70 (2.64)
200 A @ 28 V 100%	1.01 (3.83)
500 A @ 40 V 100%	1.93 (7.32)
650 A @ 36 V 60%	1.62 (5.74)

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

# ACCESSORIES

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**FIELD INSTALLED OPTIONS / ACCESSORIES  
are available at [www.lincolnelectric.com](http://www.lincolnelectric.com).**

Follow these steps:

1. Go to [www.lincolnelectric.com](http://www.lincolnelectric.com)
2. At the top of the screen to the far left click on Equipment, click on Engine Driven Welders, click on Fleet on next shown scroll down to Fleet™ 650 Engine Driven Welders
3. Click on VIEW DETAILS.
4. The next screen will have an Equipment Details section, click on Accessories. This will show Category, Product Number and Product Name of all currently available accessories.

# MAINTENANCE

## SAFETY PRECAUTIONS

### 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.

### 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 that are no longer clear. Refer to the parts list for replacement items.

### 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 OIL CHANGE



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 case back or side of the base on welder.
- Open oil drain valve by lifting up spring loaded lever and rotate 90° counterclockwise. Pull to open and drain the oil into a suitable container for disposal.
- Close the drain valve by rotating lever 90° clockwise.
- 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 CC/CD/CE/CF/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.

TABLE D.1 ENGINE MAINTENANCE COMPONENTS

ITEM	MAKE	PART NUMBER	SERVICE INTERVAL
AIR CLEANER ELEMENT	DONALDSON	P822768	CLEAN AS NEEDED REPLACE EVERY 200 HOURS
	FLEETGUARD	AF25436	
COOLING BLOWER BELT	DEUTZ	223-5256	SEE DEUTZ MAINTENANCE DECAL
	GATES	7580	
OIL FILTER ELEMENT	DEUTZ	118-2001	
	PUROLATOR	L30255	
	NAPA	1768	
FUEL FILTER ELEMENT	FRAM	PH6923	
	DEUTZ	118-1917	
	PUROLATOR	F53125	
	NAPA	3358	
WATER SEPARATOR ELEMENT	FRAM	P4102	
	LINCOLN	M16890-C	
	STANADYNE	31572	
FUEL PRE-FILTER SCREEN	LINCOLN	M16890-B	INSPECT EVERY 1000 HOURS
	STANADYNE	29575	
BATTERY	-----	BCI GROUP 34.	INSPECT EVERY 500 HOURS

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## 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.

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### 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.

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

# Service Instructions

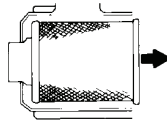
## Single- and Two-Stage Engine Air Cleaners

### 1 Remove the Filter



Rotate the filter while pulling straight out.

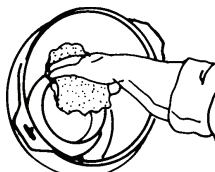
Unfasten or unlatch the service cover. Because the filter fits tightly over the outlet tube to create the critical seal, there will be some initial resistance, similar to breaking the seal on a jar. Gently move the end of the filter back and forth to break the seal then rotate while pulling straight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

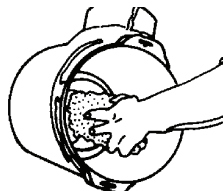
### 2 Clean Both Surfaces of the Outlet Tube and Check the Vacuator™ Valve

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

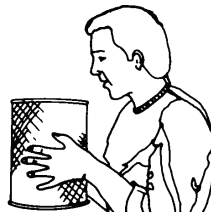
#### If your air cleaner is equipped with a Vacuator Valve

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



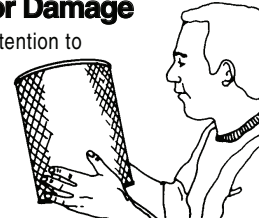
### 3 Inspect the Old Filter for Leak Clues

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

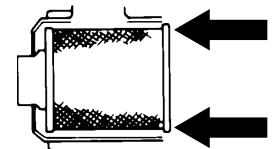
Inspect the new filter carefully, paying attention to the inside of the open end, which is the sealing area. NEVER install a damaged filter. A new Donaldson radial seal filter may have a dry lubricant on the seal to aid installation.



### 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 Fleet™ 650 is equipped with a Fuel Pre-Filter/Water Separator Assembly located before the lift pump and a Secondary Fuel Filter located after the lift pump and before the fuel injectors. The Fuel Pre-Filter/Water Separator is mounted to the engine block just below the lift pump. The Secondary Fuel Filter is mounted directly to the engine just above the oil filter.

## FUEL PRE-FILTER/WATER SEPARATOR ASSEMBLY

The pre-filter is a 150 micron screen designed to protect against gross fuel contamination of the water separator element and the Secondary Fuel Filter. If the pre-filter becomes plugged it may be removed, inspected, cleaned and reinstalled. In general this only needs to be done with each water separator element change (about every 1,000 hrs.) However if at any time excessive fuel contamination is suspected or a sudden fall-off in engine performance is detected the pre-filter screen should be inspected and cleaned. Follow the following procedure:

1. Close the fuel shutoff valve (Lever should be perpendicular to the hose) located on the side of the Fuel Pre-Filter/Water Separator Assembly.
2. Unscrew the cap ring located on the top of the filter header and remove the plastic center cap and O-ring.
3. Remove the large white volume plug located directly under the center cap in the upper cavity of the filter header. Use a small screw driver (or similar device) to lift the plug part way out of the cavity to assist with its removal.

#### **Be careful not to damage the pre-filter screen with the tool used to remove the plug.**

4. Using a pair of pliers, gently tug on the pull tabs of the pre-filter screen in an alternating pattern to gradually remove the pre-filter screen.
5. Brush off any debris and rinse in diesel fuel.
6. Re-install the pre-filter screen into the upper cavity of the filter header making sure the four pull tabs are pointing up. Putting your fingers on the pull tabs, push down evenly until the lower body of the pre-filter screen contacts the floor of the upper cavity.
7. Re-insert the large white volume plug into the upper cavity.
8. Place the O-ring onto the angled seal surface of the filter header and re-install the plastic cap. Make sure its flange rests on the O-ring.
9. Screw on the cap ring and tighten hand tight.
10. Remember to open the fuel shutoff valve (Lever in line with the hose) before starting the engine.

## WATER SEPARATOR ELEMENT

The water separator element is a two stage filter with a special filtration/water separating media, and an expanded water reservoir providing maximum protection against water in the fuel. The recommended change interval for the water separator element is 1,000 hours. The procedure for changing the element is as follows:

1. Close the fuel shutoff valve (Lever should be perpendicular to the hose) located on the side of the Fuel Pre-Filter/Water Separator Assembly.
2. Rotate the quick change ring (located just below filter header) clockwise approximately 1/2 turn and slide it down and off of the element.
3. Grasp the element and pull down with a slight rocking motion to remove the element from the grommet post on the bottom of the filter header.
4. Slide the new element onto the grommet post on the bottom of the filter header until the element no longer easily moves up into the filter header. Now rotate the element (may take almost 1 full turn) with a slight upward pressure until the element begins to further engage the header. With the proper orientation now established apply additional pressure to seat the element in the filter header. You should feel the element "pop" into place when properly seated.

**Note: The element will only go on one way. Never use excessive force when mounting the element to the header.**

## ENGINE ADJUSTMENT

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 1/4 pound (0.1113 kg) of baking soda and 1 quart (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 Fleet™ 650 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.

### 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.

### CAUTION

- 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.

-----

## 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 in 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.



## 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.**

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

#### **Step 1. LOCATE PROBLEM (SYMPTOM).**

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

#### **Step 2. POSSIBLE CAUSE.**

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

#### **Step 3. RECOMMENDED COURSE OF ACTION**

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

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



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

**[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
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, Contact your local Lincoln Authorized Field Service Facility.
Engine will not "crank".	1. Battery is low, Charge Battery.	
	2. Loose battery cable connections. Inspect, clean and tighten terminals.	
	3. Faulty engine starter motor. Contact authorized local Engine Service Shop.	
Engine will "crank" but not start.	1. Fuel shut off valve on in the OFF position. Open valve (vertical) position of handle.	
	2. Fuel Filters dirty/clogged. Check and replace main filter element and/or Inline Fuel Filter.	
	3. Out of fuel. Fill tank and bleed fuel system.	
	4. Faulty fuel shutdown solenoid. Check that shutdown solenoid is functioning properly and not binding/ contact authorized engine service shop.	
	5. Faulty fuel pump. Check for fuel flow through filters. Contact authorized local Engine Service Shop.	
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. (engine protection light lit).	
	3. Faulty oil pressure switch.	
	4. Faulty oil temperature switch. Contact authorized local Engine Service Shop.	
	5. Low output of battery charging alternator (battery charging light lit).	



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Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
Engine shuts down while under a load.	1. High oil temperature	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.
Engine runs rough.	1. Dirty fuel or air filters. Inspect and clean/replace filters as needed. Inspect and clean/replace filters as needed.	
	2. Water in fuel. If water found in tank. Empty fuel tank and refill then purge fuel lines.	
	2. Fuel injector clogged or malfunctioning	
Battery does not stay charged. Engine alternator trouble light is on while machine is running.	1. Faulty battery. Replace.	
	2. Loose connections at battery or alternator. Clean and tighten connections.	
	3. Faulty engine alternator or charger module. Consult authorized Engine Service Shop.	
	4. Loose fan belt may need tightening.	
Loose Engine does not develop full power. Low weld and auxiliary output. Engine runs rough.	1. Fuel filter dirty/clogged. Replace.	
	2. Air filter dirty/clogged. Replace Air Filter Element.	
	3. Fouled fuel injector(s). Contact authorized Engine Service Shop.	
	4. Fuel contaminated with water. Check water separator for water. Clean and replace as needed. Replace fuel in tank.	
	5. Cracked or loose fuel hose. Replace hose and tighten clamps.	
	6. Valves out of adjustment. Contact authorized local Engine Service Shop.	



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Observe all Safety Guidelines detailed throughout this manual

<b>PROBLEMS (SYMPTOMS)</b>	<b>POSSIBLE CAUSE</b>	<b>RECOMMENDED COURSE OF ACTION</b>
Engine does not develop full power. Engine runs rough.	1. Fuel filter clogged, Replace.	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.
	2. Air filter clogged, clean or replace.	
	3. High idle setting incorrect, check and adjust if required.	
	4. Valves out of adjustment.	
	5. Fuel contaminated with water or sediment. Check fuel pre-filter and empty of water, bleed fuel system. Replace fuel in tank if needed.	
Engine does not develop full power. Low weld and auxiliary output. Engine runs rough.	1. Fuel filter dirty/clogged. Replace.	
	2. Air filter dirty/clogged. Replace Air Filter Element.	
	3. Fouled fuel injector(s). Contact authorized Engine Service Shop.	
	4. Fuel contaminated with water. Check water separator for water. Clean and replace as needed. Replace fuel in tank.	
	5. Cracked or loose fuel hose. Replace hose and tighten clamps.	
	6. Valves out of adjustment. Contact authorized local Engine Service Shop.	



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**

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
No welding power output.	<ol style="list-style-type: none"> <li>1. Poor work lead connection to work. Make sure work clamp is tightly connected to clean base metal.</li> <li>2.. Faulty PC Board or welder alternator.</li> </ol>	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.
Welder has output but no control.	<ol style="list-style-type: none"> <li>1. Poor remote/control cable connection to 6-pin connector. Check connections.</li> <li>2. Faulty remote cable Replace if necessary.</li> <li>3. Faulty control potentiometer or PC board.</li> </ol>	
No auxiliary power.	<ol style="list-style-type: none"> <li>1. Open circuit breakers. Reset breakers. If breakers keep tripping reduce power draw.</li> <li>2. GFCI may have tripped. Follow "GFCI Testing and Resetting Procedure" in the MAINTENANCE section of this manual.</li> <li>3. Faulty connections to auxiliary receptacles. Check connections.</li> <li>4. Faulty welder alternator.</li> </ol>	
The welding arc is "cold." The welding arc is not stable or is not satisfactory. the engine runs normally. The auxiliary power is normal.	<ol style="list-style-type: none"> <li>1. Make sure the WELD MODE selector switch is in the correct position for the process being used. (For example, PIPE, CC-STICK.)</li> <li>2. Make sure the electrode (voltage, current etc.) is correct for the process being used.</li> <li>3. Check for loose or faulty connections at the weld output terminals and welding cable connections.</li> <li>4. The welding cables may be too long or coiled, causing an excessive voltage drop.</li> <li>5. Faulty Control Board.</li> </ol>	
No output in PIPE/ GOUGE Mode.	<ol style="list-style-type: none"> <li>1. Poor work lead connection to work. Make sure work clamp is tightly connected to clean base metal.</li> <li>2. "Weld Mode Selector" switch in wrong position. Place switch in PIPE / GOUGE mode and select correct low or high range</li> <li>3. Faulty PC board or welder alternator.</li> </ol>	

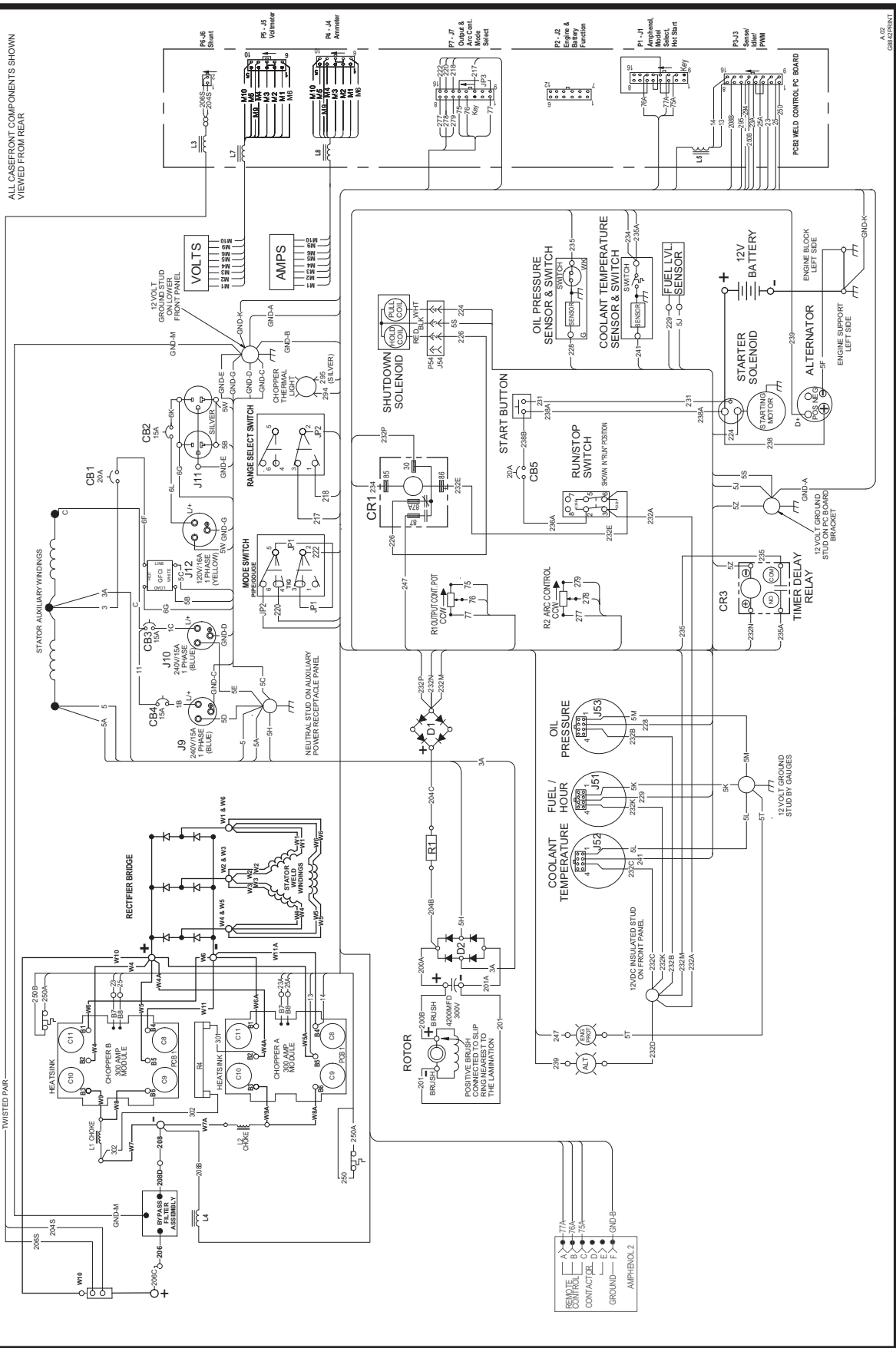


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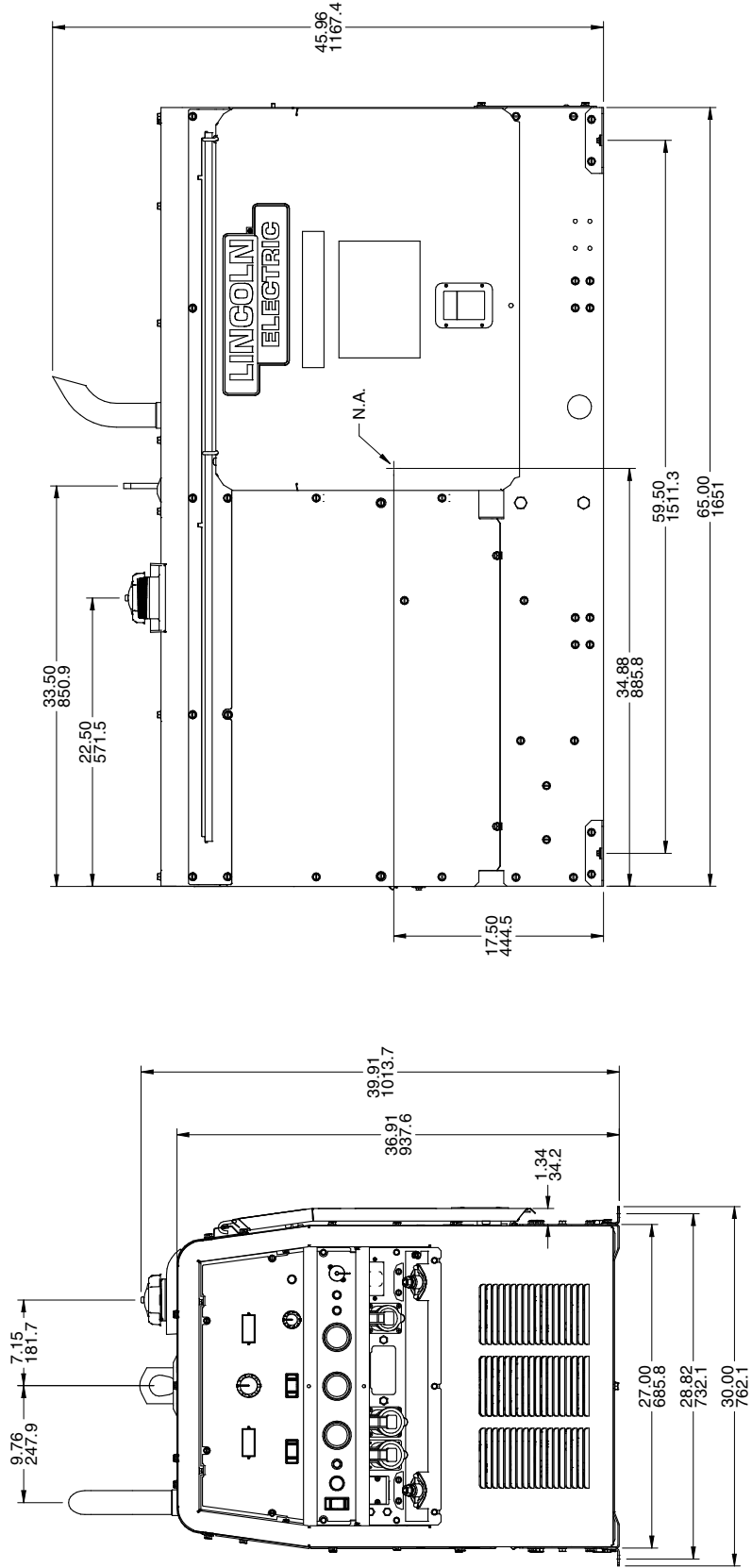
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FLEET 650 (K4339-1) WIRING DIAGRAM

ELECTRICAL SYMBOLS PER E1637  
ALL CASEFRONT COMPONENTS SHOWN  
VIEWED FROM REAR



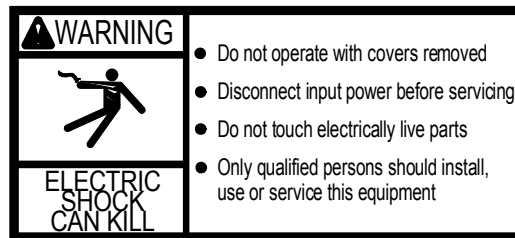
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The specific diagram for a particular code is included with the machine. If the diagram is illegible, write to the Service Department for a replacement. Give the equipment code number.



NOTE:

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

## INSTRUCTIONS FOR INSTALLING A RESIDUAL CURRENT DEVICE TO PROTECT THE 240V SINGLE PHASE RECEPTACLE



1. TURN OFF THE ENGINE AND DISCONNECT THE NEGATIVE BATTERY CABLE.
2. REMOVE THE SCREWS THAT SECURE THE UPPER CONTROL PANEL AND OPEN THE PANEL.
3. WHILE HOLDING THE RCD MOUNTING BRACKET REMOVE THE TWO SCREWS SECURING THE COVER PLATE AND RCD MOUNTING BRACKET. SET THE RCD MOUNTING BRACKET AND SCREWS ASIDE AND DISCARD COVER PLATE. (SEE FIGURE 1).

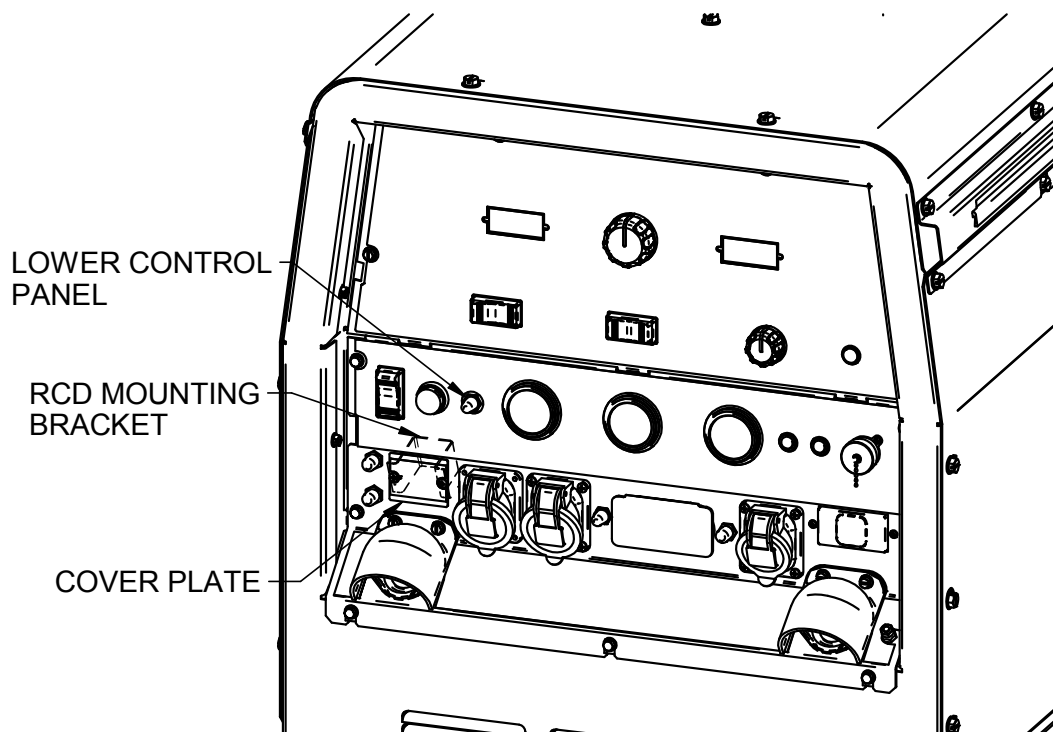
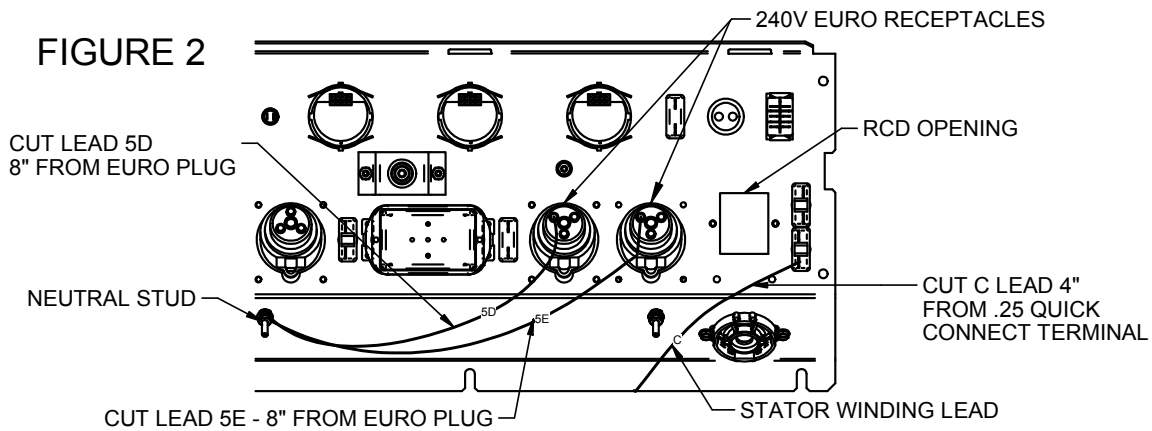


FIGURE 1

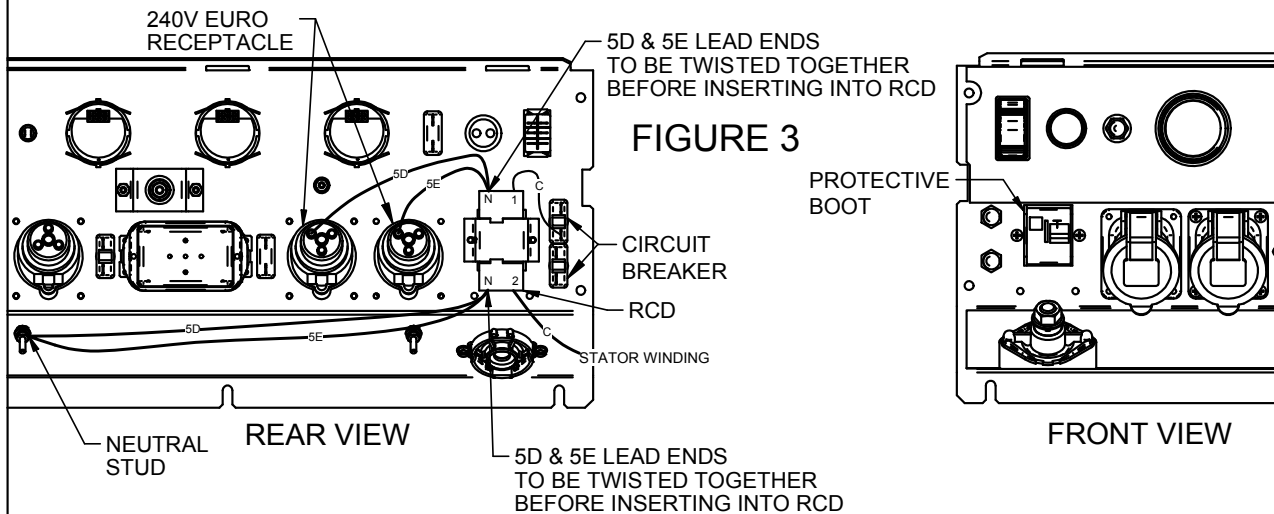




- LOCATE LEADS 5D, 5E & C (SEE FIGURE 2). CUT LEADS AT DISTANCES GIVEN BELOW. STRIP ALL ENDS OF CUT LEADS 13MM (.50 in.)



- CONNECT LEADS 5D & 5E FROM THE 240V EURO RECEPTACLES TO RCD (N – ON TOP) AS SHOWN & TIGHTEN LEADS TO 2.4NM (21 in-lb). (SEE FIGURE 3).
- CONNECT 4” “C” LEAD FROM CIRCUIT BREAKER TO RCD (1)
- CONNECT ORIGINAL “C” LEAD (FROM STATOR) TO RCD (2)
- CONNECT LEADS 5D & 5E CUT LEADS FROM NEUTRAL STUD TO RCD (N - BOTTOM)
- COAT AREA WHERE LEADS CONNECT TO RCD WITH A SILICONE RUBBER RTV SEALANT.
- MOUNT RCD & PROTECTIVE BOOT TO PANEL USING MOUNTING BRACKET & SCREWS SET ASIDE IN STEP 3.



- CHECK WIRING PER FIG.4
- SECURE UPPER CONTROL PANEL IN PLACE.
- RECONNECT NEGATIVE BATTERY CABLE.  
THE UNIT IS NOW READY FOR OPERATION

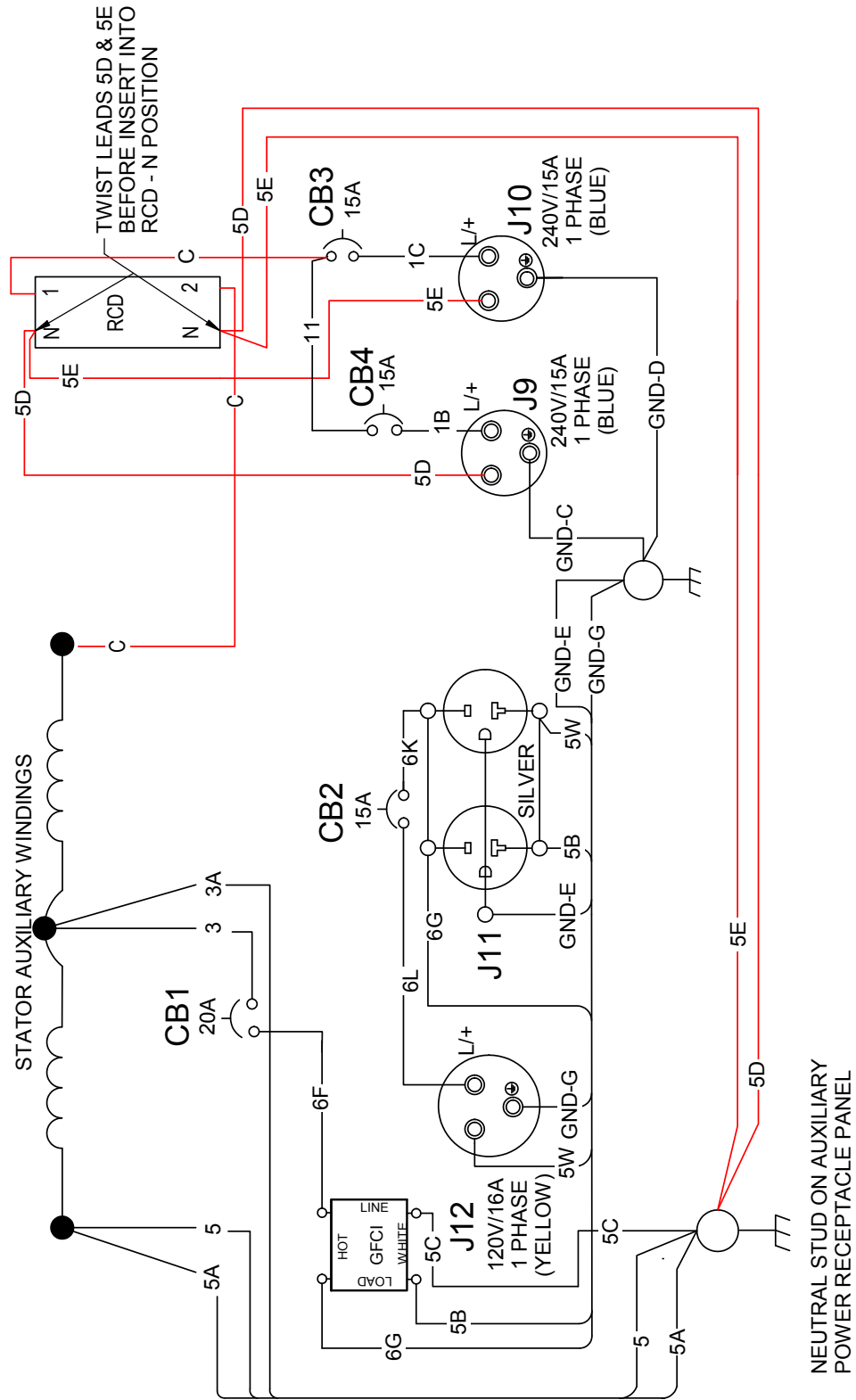


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**A.01  
M25504**

RCD WIRING CONNECTION DIAGRAM - FIG. 4



			
<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 헝겍 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 الألكترود بجسدك 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ってください。</li> </ul>	<ul style="list-style-type: none"> <li>● パネルやカバーを取り外したままで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>● 관널이 열린 상태로 작동치 마십시오.</li> </ul>	Korean <b>위험</b>
<ul style="list-style-type: none"> <li>● ابعء 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，並請遵守貴方的有閣勞動保護規定。

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.

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