LINCOLN ELECTRIC

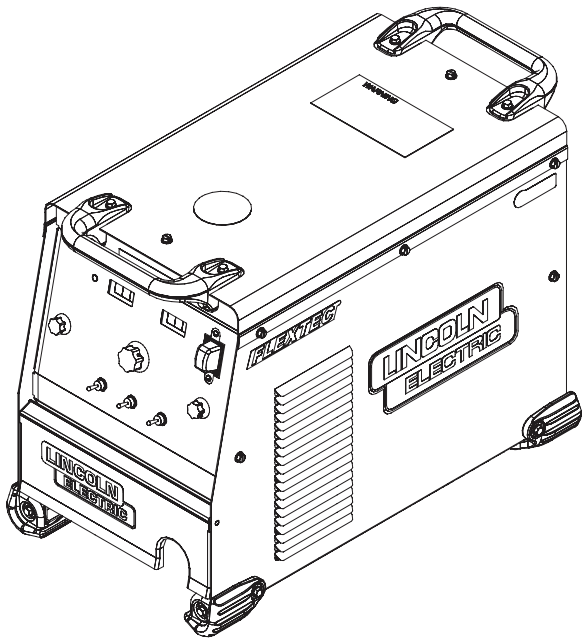
GENUINE LINCOLN PARTS™

FLEXTEC® 450

For use with machines having Code Numbers:

11626, 11754

SERVICE MANUAL



SVM214-A | Issue Date Feb - 20

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

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

⚠ WARNING

⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

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

The Above For Diesel Engines

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

The Above For Gasoline Engines

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.

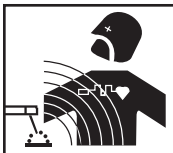
1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

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.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

ELECTRIC SHOCK can kill.

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

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

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

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

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

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

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

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

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

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

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

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

ARC RAYS can burn.

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

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

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

FUMES AND GASES can be dangerous.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases.When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) 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. In confined spaces or in some circumstances, outdoors, a respirator may 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.

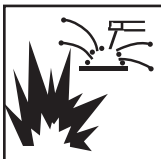
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

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 material safety data sheet (MSDS) and follow your employer's safety practices. MSDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC



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-l, “Precautions for Safe Handling of Compressed Gases in Cylinders,” available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.

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.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté specifiques qui parraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

   a. Les circuits à l'électrode et à la piéce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vétements mouillés. Porter des gants secs et sans trous pour isoler les mains.
   b. Faire trés attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher metallique ou des grilles metalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état defonctionnement.
   d. Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
   f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces precautions pour le porte-électrode s'applicuent aussi au pistolet de soudage.

2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas ou on recoit un choc. Ne jamais enrouler le câble-électrode autour de n'importe quelle partie du corps.

3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:

   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.
   c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.

4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.

5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans lateraux dans les zones où l'on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.

7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidental peut provoquer un échauffement et un risque d'incendie.

8. S'assurer que la masse est connectée le plus prés possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'echauffement des chaines et des câbles jusqu'à ce qu'ils se rompent.

9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particuliérement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumeés toxiques.

10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgéne (gas fortement toxique) ou autres produits irritants.

11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformement au code de l'électricité et aux recommendations du fabricant. Le dispositif de montage ou la piece à souder doit être branché à une bonne mise à la terre.

2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.

3. Avant de faires des travaux à l'interieur de poste, la debrancher à l'interrupteur à la boite de fusibles.

4. Garder tous les couvercles et dispositifs de sûreté à leur place.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

Electromagnetic Compatibility (EMC)

Conformance
Products displaying the CE mark are in conformity with European Community Council Directive of 15 Dec 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility, 2004/108/EC. It was manufactured in conformity with a national standard that implements a harmonized standard: EN 60974-10 Electromagnetic Compatibility (EMC) Product Standard for Arc Welding Equipment. It is for use with other Lincoln Electric equipment. It is designed for industrial and professional use.

Introduction
All electrical equipment generates small amounts of electromagnetic emission. Electrical emission may be transmitted through power lines or radiated through space, similar to a radio transmitter. When emissions are received by other equipment, electrical interference may result. Electrical emissions may affect many kinds of electrical equipment; other nearby welding equipment, radio and TV reception, numerical controlled machines, telephone systems, computers, etc. Be aware that interference may result and extra precautions may be required when a welding power source is used in a domestic establishment.

Installation and Use
The user is responsible for installing and using the welding equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing (grounding) the welding circuit, see Note. In other cases it could involve construction of an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

Note: The welding circuit may or may not be earthed for safety reasons according to national codes. Changing the earthing arrangements should only be authorized by a person who is competent to access whether the changes will increase the risk of injury, e.g., by allowing parallel welding current return paths which may damage the earth circuits of other equipment.

Assessment of Area
Before installing welding equipment the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

a) other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the welding equipment;

b) radio and television transmitters and receivers;

c) computer and other control equipment;

d) safety critical equipment, e.g., guarding of industrial equipment;

e) the health of the people around, e.g., the use of pacemakers and hearing aids;

f) equipment used for calibration or measurement

g) the immunity of other equipment in the environment. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;

h) the time of day that welding or other activities are to be carried out.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

Electromagnetic Compatibility (EMC)

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

Methods of Reducing Emissions

Mains Supply
Welding equipment should be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed welding equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the welding power source so that good electrical contact is maintained between the conduit and the welding power source enclosure.

Maintenance of the Welding Equipment
The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustments covered in the manufacturers instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

Welding Cables
The welding cables should be kept as short as possible and should be positioned close together, running at or close to floor level.

Equipotential Bonding
Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

Earthing of the Workpiece
Where the workpiece is not bonded to earth for electrical safety, not connected to earth because of its size and position, e.g., ships hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

Screening and Shielding
Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications. [1]

---

[1] Portions of the preceding text are contained in EN 60974-10: "Electromagnetic Compatibility (EMC) product standard for arc welding equipment."

- MASTER TABLE OF CONTENTS FOR ALL SECTIONS -

RETURN TO MAIN MENU

TABLE OF CONTENTS - INSTALLATION SECTION

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

TECHNICAL SPECIFICATIONS - FLEXTEC™ 450

POWER SOURCE-INPUT VOLTAGE AND CURRENT					
Model	**Duty Cycle**	**Input Voltage ± 10%**	**Input Amperes**	**Idle Power**	**Power Factor @ Rated Output**
K2882-1	60% rating	380 / 460 / 575 / 3 / 50 / 60	37 / 27 / 22	72 Watts Max. (fan on)	95
	100% rating		29 / 21 / 17		

RATED OUTPUT			
Process	**Duty Cycle**	**Volts at Rated Amperes**	**Amperes**
GMAW (CV)	60%	36.5V	450
	100%	34V	400
GTAW (CC)	60%	28V	450
	100%	26V	400
SMAW (CC)	60%	38V	450
	100%	36V	400
FCAW-GS (CV)	60%	36.5V	450
	100%	34V	400
FCAW-SS (CV)	60%	36.5V	450
	100%	34V	400

RECOMMENDED INPUT WIRE AND FUSE SIZES (1)				
VOLTAGE 50/60Hz	**Input Amperes**	**Type 75°C Copper Wire in Conduit AWG (mm^2)**	**COPPER GROUNDING CONDUCTOR AWG (mm^2)**	Fuse (Super Lag) or Breaker Size (2)
380/3/50	42 A	8 (10)	10 (6)	50
460/3/60	30 A	10 (6)	10 (6)	45
575/3/60	25 A	12 (4)	12 (4)	35

(1) Cord and Fuse Sizes based upon the U.S. National Electric Code and maximum output for 40°C (104°) ambient.

(2) Also called “inverse time” or “thermal/magnetic” circuit breakers; circuit breakers that have a delay in tripping action that decreases as the magnitude of current increases.

WELDING PROCESS		
PROCESS	OUTPUT RANGE (AMPERES)	OCV (U_o)
GMAW (CV)	40-500	60
GTAW (CC)	10-500	24
SMAW (CC)	15-500	60
FCAW-GS (CV)	40-500	60
FCAW-SS (CV)	40-500	60

PHYSICAL DIMENSIONS				
MODEL	HEIGHT	WIDTH	DEPTH	WEIGHT
K2882-1	18.80in (478mm)	14.14in (359mm)	26.66in (677mm)	125lbs (56.6kg)*

TEMPERATURE RANGES	
OPERATING TEMPERATURE RANGE	STORAGE TEMPERATURE RANGE
Environmentally Hardened: 14°F to 131°F (-10°C to 55°C**)	Environmentally Hardened: -40°F to 185°F (-40°C to 85°C)

IP23 155º(F) Insulation Class

* Weight does not include input cord.

** Output De-rated at Temperatures above 40°C.

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.

ONLY QUALIFIED PERSONNEL SHOULD PERFORM THIS INSTALLATION.

- **TURN OFF INPUT POWER TO THE POWER SOURCE AT THE DISCONNECT SWITCH OR FUSE BOX BEFORE WORKING ON THIS EQUIPMENT. TURN OFF THE INPUT POWER TO ANY OTHER EQUIPMENT CONNECTED TO THE WELDING SYSTEM AT THE DISCONNECT SWITCH OR FUSE BOX BEFORE WORKING ON THE EQUIPMENT.**

- **DO NOT TOUCH ELECTRICALLY HOT PARTS.**
- **ALWAYS CONNECT THE FLEXTEC™ 450 GROUNDING LUG (LOCATED INSIDE THE RECONNECT INPUT ACCESS DOOR) TO A PROPER SAFETY (EARTH) GROUND.**

SELECT SUITABLE LOCATION

LOCATION AND VENTILATION FOR COOLING

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

LIFTING

Both handles should be used when lifting the Flextec™ 450. When using a crane or overhead device a lifting strap should be connected to both handles. Do not attempt to lift the Flextec™ 450 with accessories attached to it.

STACKING

The Flextec™ 450 cannot be stacked.

ENVIRONMENTAL LIMITATIONS

The Flextec™ 450 is IP23 rated for use in an outdoor environment. The Flextec™ 450 should not be subjected to falling water during use nor should any parts of it be submerged in water. Doing so may cause improper operation as well as pose a safety hazard. The best practice is to keep the machine in a dry, sheltered area.

⚠ CAUTION

Do not mount the Flextec™ 450 over combustible surfaces. Where there is a combustible surface directly under stationary or fixed electrical equipment, that surface shall be covered with a steel plate at least .060" (1.6mm) thick, which shall extend not less than 5.90" (150mm) beyond the equipment on all sides.

INPUT AND GROUNDING CONNECTIONS

MACHINE GROUNDING

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

HIGH FREQUENCY PROTECTION

Locate the Flextec™ 450 away from radio controlled machinery. The normal operation of the Flextec™ 450 may adversely affect the operation of RF controlled equipment, which may result in bodily injury or damage to the equipment.

HIGH TEMPERATURE OPERATION

WELDER OUTPUT RATINGS AT 55°C ELEVATED TEMPERATURES

AMPS	DUTY CYCLE	VOLTS	TEMPERATURES
340	100%	34VDC	55°C
375	60%	35VDC	
400	40%	36VDC	
450	20%	38VDC	

Return to Section TOC
Return to Master TOC

⚠ WARNING

ELECTRIC SHOCK can kill.

ONLY A QUALIFIED ELECTRICIAN SHOULD CONNECT THE INPUT LEADS TO THE FLEXTEC™ 450. CONNECTIONS SHOULD BE MADE IN ACCORDANCE WITH ALL LOCAL AND NATIONAL ELECTRICAL CODES AND THE CONNECTION DIAGRAM LOCATED ON THE INSIDE OF THE RECONNECT/INPUT ACCESS DOOR OF THE MACHINE. FAILURE TO DO SO MAY RESULT IN BODILY INJURY OR DEATH.

INPUT CONNECTION

(See Figure A.1)

Use a three-phase supply line. A 1.40 inch (36 mm) diameter access hole for the input supply is located on the case back. Connect L1, L2, L3 and ground according to the Input Supply Connection Diagram decal located on the internal horizontal panel.

To access the reconnect/input supply connection blocks, remove the 8 screws that secure the case top of the welder and remove the case top.

INPUT FUSE AND SUPPLY WIRE CONSIDERATIONS

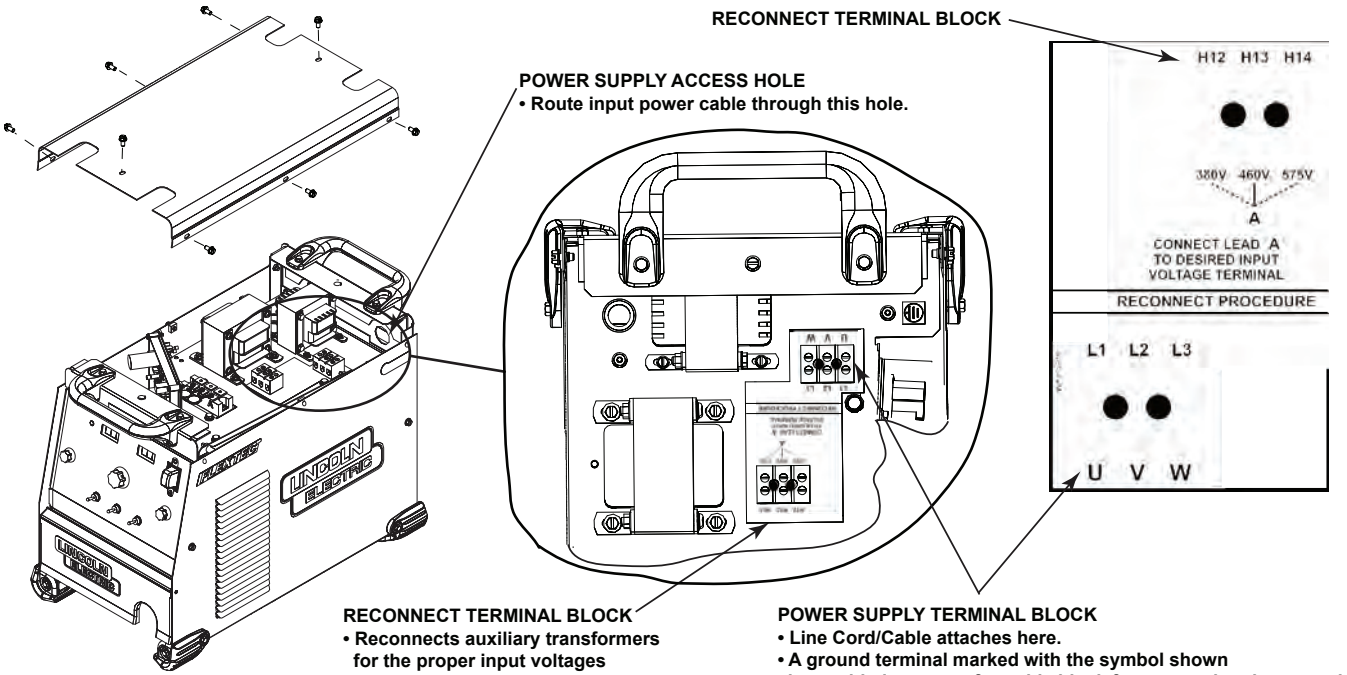
Refer to ***Technical Specification*** in this Installation Section for recommended fuse, wire sizes and type of the copper wires. Fuse the input circuit with the recommended super lag fuse or delay type breakers (also called "inverse time" or "thermal/magnetic" circuit breakers). Choose input and grounding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

INPUT VOLTAGE SELECTION

Welders are shipped connected for 460 Volt input voltage. To move this connection to a different input voltage, see the diagram located on the inside panel in the reconnect/input connection area, also illustrated below. If the Auxiliary lead (indicated as 'A') is placed in the wrong position and power is applied to the machine, the machine will protect itself and display an error message:

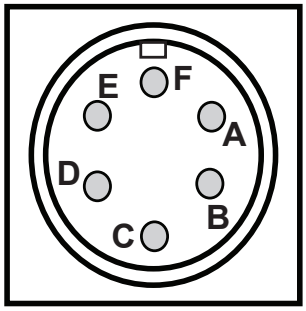
- "Err" "058" will be shown on the display.
- The control board and switch boards will blink out error 58 on their status leds.
- The weld output will be turned off and the control board will force itself into an idle state.
- The machine will need to have the misconnect condition removed before it will recover.

FIGURE A-1

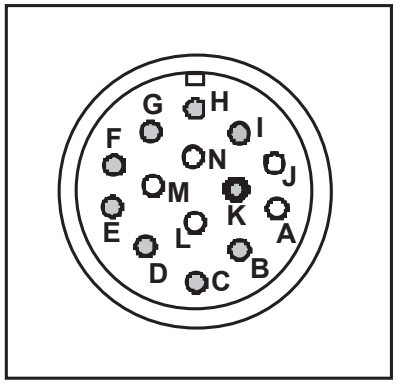


CABLE CONNECTIONS

See **FIGURE A.2** for locating **6-pin** and **14-pin** connectors on the front of the FLEXTEC™ 450.

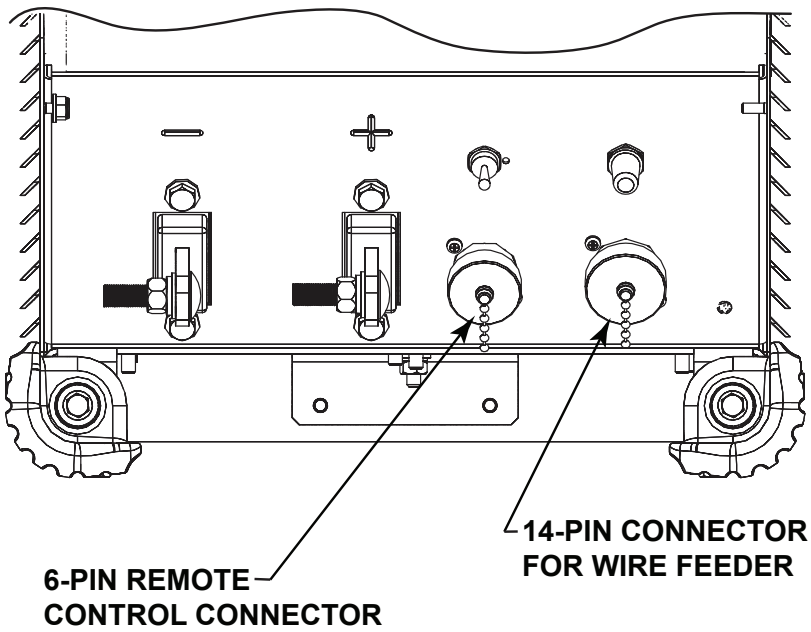


6-PIN REMOTE CONTROL CONNECTOR		
Function	**Pin**	**Wiring**
6-pin remote control connector for remote or hand/foot amptrol.	A	77 Remote potentiometer, 5K
	B	76 Remote potentiometer, wiper
	C	75 Remote potentiometer, common
	D	Trigger, common
	E	Trigger, input
	F	Ground



14-PIN CONNECTOR FOR WIRE FEEDER		
Function	**Pin**	**Wiring**
14 pin connector for wire feeder connectivity.	A	
	B	Ground
	C	Trigger, Common
	D	Trigger input
	E	77 Remote potentiometer, 5K
	F	76 Remote potentiometer, wiper
	G	75 Remote potentiometer, common
	H	Voltage Sense (21)
	I	Motor (42 VAC)
	J	
	K	Motor (42 VAC)
	L	
	M	
	N	

FIGURE A.2



Return to Section TOC
Return to Master TOC

RECOMMENDED ELECTRODE AND WORK CABLE SIZES FOR ARC WELDING

General Guidelines

Connect the electrode and work cables between the appropriate output studs of the Flextec™ 450 per the following guidelines:

- Most welding applications run with the electrode being positive (+). For those applications, connect the electrode cable between the wire drive feed plate and the positive (+) output stud on the power source. Connect a work lead from the negative (-) power source output stud to the work piece.

- When negative electrode polarity is required, such as in some Innershield applications, reverse the output connections at the power source (electrode cable to the negative (-) stud, and work cable to the positive (+) stud).

The following recommendations apply to all output polarities and weld modes:

- **Select the appropriate size cables per the "Output Cable Guidelines"** (See Table A.1). Excessive voltage drops caused by undersized welding cables and poor connections often result in unsatisfactory welding performance. Always use the largest welding cables (electrode and work) that are practical, and be sure all connections are clean and tight.

NOTE: Excessive heat in the weld circuit indicates undersized cables and/or bad connections.

- **Route all cables directly to the work and wire feeder, avoid excessive lengths and do not coil excess cable.** Route the electrode and work cables in close proximity to one another to minimize the loop area and therefore the inductance of the weld circuit.

- **Always weld in a direction away from the work (ground) connection.**

CONTROL CABLE CONNECTIONS

General Guidelines

Genuine Lincoln control cables should be used at all times (except where noted otherwise). Lincoln cables are specifically designed for the communication and power needs of the Flextec™ 450. Most are designed to be connected end to end for ease of extension. Generally, it is recommended that the total length not exceed 100 feet (30.5 m). The use of non-standard cables, especially in lengths greater than 25 feet, can lead to communication problems (system shutdowns), poor motor acceleration (poor arc starting), and low wire driving force (wire feeding problems). Always use the shortest length of control cable possible, and DO NOT coil excess cable.

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

TABLE A.1

OUTPUT CABLE GUIDELINES

AMPERES	PERCENT DUTY CYCLE	CABLE SIZES FOR COMBINED LENGTHS OF ELECTRODE AND WORK CABLES (RUBBER COVERED COPPER - RATED 167°F or 75°C)**				
		0 to 50Ft. (0 to15m)	**50 to 100Ft. (15 to 30m)**	**100 to 150 Ft. (30 to 46m)**	**150 to 200 Ft. (46 to 61m)**	**200 to 250 Ft. (61 to 76m)**
200	60	2	2	2	1	1/0
200	100	2	2	2	1	1/0
250	30	3	3	2	1	1/0
250	40	2	2	1	1	1/0
250	60	1	1	1	1	1/0
250	100	1	1	1	1	1/0
300	60	1	1	1	1/0	2/0
300	100	2/0	2/0	2/0	2/0	3/0
350	40	1/0	1/0	2/0	2/0	3/0
400	60	2/0	2/0	2/0	3/0	4/0
400	100	3/0	3/0	3/0	3/0	4/0
500	60	2/0	2/0	3/0	3/0	4/0

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

NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TABLE OF CONTENTS - OPERATION SECTION

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SAFETY PRECAUTIONS

Read this entire section of operating instructions before operating the machine.

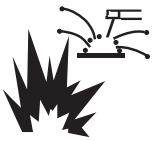
⚠ WARNING

ELECTRIC SHOCK can kill.

- **Unless using cold feed feature, when feeding with gun trigger, the electrode and drive mechanism are always electrically energized and could remain energized several seconds after the welding ceases.**
- **Do not touch electrically live parts or electrodes with your skin or wet clothing.**
- **Insulate yourself from the work and ground.**
- **Always wear dry insulating gloves.**

FUMES AND GASES can be dangerous.

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



WELDING SPARKS can cause fire or explosion.

- **Keep flammable material away.**
- **Do not weld on containers that have held combustibles.**

ARC RAYS can burn.

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

Observe additional guidelines detailed in the beginning of this manual.

GRAPHIC SYMBOLS THAT APPEAR ON THIS MACHINE OR IN THIS MANUAL

INPUT POWER

ON

OFF

HIGH TEMPERATURE

CIRCUIT BREAKER

WIRE FEEDER

POSITIVE OUTPUT

NEGATIVE OUTPUT

3 PHASE INVERTER

INPUT POWER

THREE PHASE

DIRECT CURRENT

Return to Section TOC
Return to Master TOC

GRAPHIC SYMBOLS THAT APPEAR ON THIS MACHINE OR IN THIS MANUAL

U_0	OPEN CIRCUIT VOLTAGE
U_1	INPUT VOLTAGE
U_2	OUTPUT VOLTAGE
I_1	INPUT CURRENT
I_2	OUTPUT CURRENT
	PROTECTIVE GROUND
	WARNING or CAUTION
	Explosion
	Dangerous Voltage
	Shock Hazard

PRODUCT DESCRIPTION

The Flextec™ 450 is a multi-process CC/CV DC inverter and is rated for 450 amps, 38 volts at a 60% duty cycle. The Flextec is intended for both factory and field operation. It comes in a compact, rugged case that is designed for portability and outdoor use with an IP23 environmental rating. The user interface of the Flextec™ 450 is simple and intuitive. Weld modes are selected by a 4 position selector switch. Volts and Amps are displayed on an easy to view LED display, and the amps and volts are set by a large output control knob. A hot start toggle selector switch and an arc control knob allow for finer tuning of the welding arc. The Flextec™ 450 operates on 380V, 460V, or 575V 50hz or 60hz power.

DUTY CYCLE

The Flextec™ 450 is capable of welding at a 100% duty cycle (continuous welding) at 400 amps rated output. The 60% rating is 450 amps base off of a 10 minute cycle - 6 minutes on time and 4 minutes off time. The maximum output of the machine is 500 amps.

The Flextec™ 450 is also rated for Desert Duty, elevated temperature operation, in a 55°C(131°F) ambient. The machine is output de-rated for this application.

DESIGN FEATURES

- Severe Duty Design for outdoor use (IP23 rating).
- Passive Power Factor Correction – reliably gives 95% power factor for lower installation costs.
- 89% Efficiency rating – reduces electrical utility costs.
- Simple user interface - designed with the operator in mind. Getting setup for the weld is several clicks away and even the most novice welder can be confident he is setup properly.
- F.A.N. (fan as needed). Cooling fan runs when the output is energized and for a 5 minute cool down period after output is disabled.
- Thermal protection by thermostats with Thermal Indicator LED.
- Error Codes display on LCD screen for ease of trouble shooting.
- Electronic over current protection.
- Input voltage misconnection protection.
- Utilizes digital signal processing and microprocessor control.

RECOMMENDED PROCESSES AND EQUIPMENT

RECOMMENDED PROCESSES

The Flextec™ 450 is designed for CC-SMAW, CC-GTAW (lift tig), CV-GMAW, CV-FCAW-SS and CV-FCAW-GS welding processes. CAG (arc gouging) is also supported.

PROCESS LIMITATIONS

The Flextec™ 450 is suitable only for the processes listed.

EQUIPMENT LIMITATIONS

Operating Temperature Range is -10° C to + 55° C.
Output De-rated at Temperatures above 40°C.

COMMON EQUIPMENT PACKAGES

Basic Package	
K2882-1	Flextec™ 450
K2327-2	LF-72 Bench Model
K2149-1	Work Lead Package
K1842-10	10 Ft. Weld Power Cable
3100211	Harris Regulator and gas hose

Common Optional Kits	
K857	Remote Output Control (25 feet)
K857-1	Remote Output Control (100 feet)
K870	Foot Amptrol
K963-3	Hand Amptrol

Compatible Wire Feeders	
All Models	LF-72
	LF-74
	LN-10
	DH-10
	LN-25 Pro
	LN-23P

NOTE: The Flextec™ 450 is not compatible with **115V** Wire Feeders.

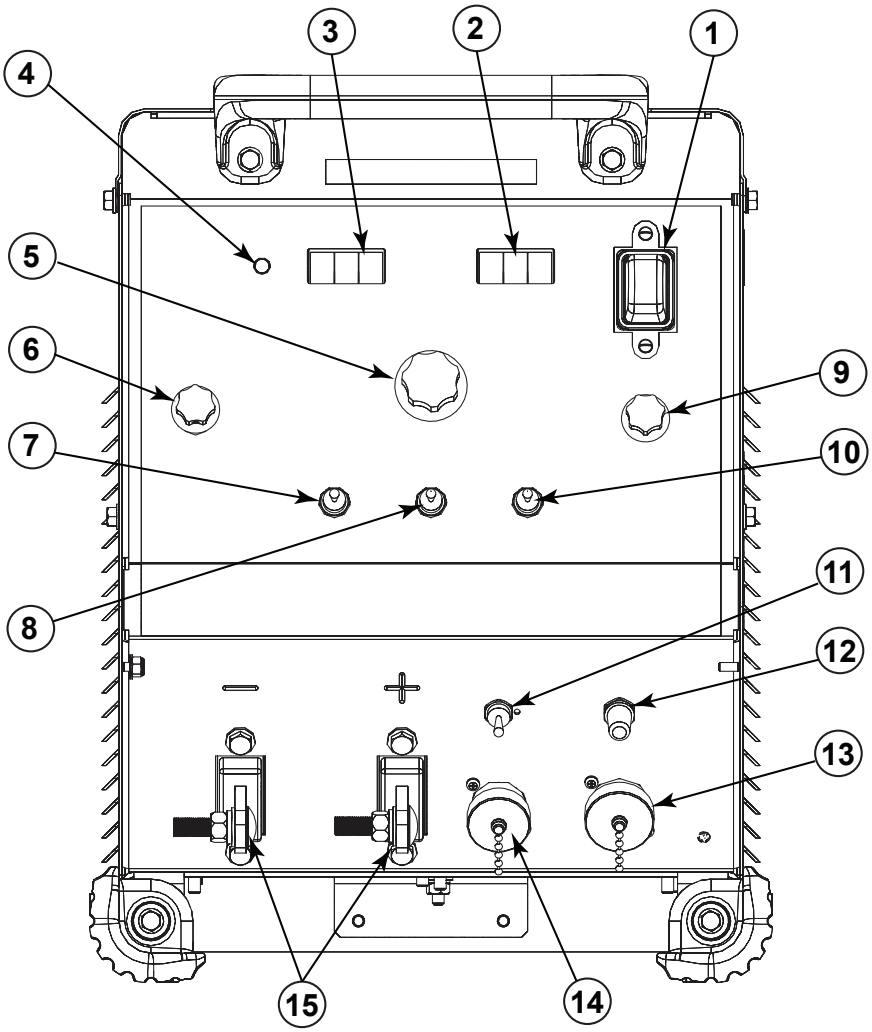
Return to Section TOC
Return to Master TOC

CASE FRONT CONTROL DESCRIPTIONS

(See Figure B.1)

1. **Power Switch:** Controls input power to the Flextec 450.
2. **Voltage Display Meter**
3. **Amperage Display Meter**
4. **Thermal LED:** A yellow light that comes on when an over temperature situation occurs. Output is disabled until the machine cools down. When cool, the light goes out and output is enabled.
5. **Output Control Dial:** Sets the output current or voltage for the selected weld process.
6. **Weld Process Selector Switch:** A rotary switch that toggles through the 4 available weld modes for the Flextec 450 - CC-SMAW; CC-GTAW; CV; CV-Innershield.
7. **Hot Start Toggle Switch:** Enables hot start function.
8. **Output Control Local/Remote Toggle Switch:** Sets the control of the output to local (output control knob) or remote (K857 hand amptrol or K870 foot amptrol).
9. **Arc Control Dial:** Full range selection of arc control from -10 to +10. In CV mode, this control is an inductance control. In stick mode, the control adjusts the arc force.
10. Weld Terminals On/Remote toggle selector switch
11. Wire feeder voltmeter polarity selection toggle switch
12. Circuit breaker reset button for the 14-pin wire feeder connector
13. 14-pin wire feeder circular connector
14. 6-pin remote circular connector
15. Positive and negative welding output studs

FIGURE B.1



Return to Section TOC
Return to Master TOC

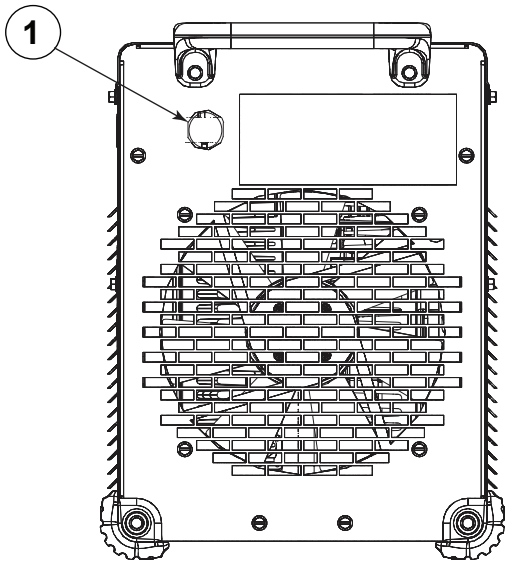
Return to Section TOC
Return to Master TOC

CASE BACK CONTROL

(See Figure B.2)

1. Input Power Cord Access Hole.

FIGURE B.2



POWER-UP SEQUENCE

When power is applied to the Flextec™ 450, the displays will illuminate and display the voltage and/or amperage settings.

COMMON WELDING PROCEDURES

MAKING A WELD

⚠ WARNING

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

The Flextec™ 450 is a multi-process inverter welder. The **Weld Process Selector Switch** is used to set the desired weld mode. The Flextec™ 450 has 4 selectable welding modes:

1. **SMAW –** This is a CC (constant current) weld mode used for the SMAW stick welding process.
2. **GTAW –** This is a CC (constant current) weld mode used for the GTAW TIG welding process.
3. **CV –** This is CV (constant voltage) weld mode used for welding the GMAW MIG welding process and the FCAW-GS, flux cored gas shielded welding process.
4. **CV-Innershield –** This is a CV (constant voltage) weld mode used for welding the FCAW-SS, flux cored self shielded welding process

The Flextec™ 450 is also capable of gouging. Gouging can be done in either the SMAW mode or the CV and CV-Innershield modes.

In addition to the weld process selector switch, a hot start toggle, output control dial and arc control dial are provided to setup and fine tune the welding procedure.

WELD CONTROLS AND DISPLAYS

Weld Process Selector Switch

4 Position switch used to select the welding process.

Hot Start Toggle Switch

The Hot Start control regulates the starting current at arc initiation. Hot Start can be set to **"Off"** and no additional current is added at arc start. When set to the **"On"** position, additional current (relative to the preset current) is added for the first second after arc initiation.

Arc Control Dial

Full range selection of arc control from -10 to +10. In CV mode, this control is an inductance control. In stick mode, the control adjusts the arc force.

Output Control Dial

Output control is conducted by a single turn potentiometer. (Adjustment is indicated by the meters.) When in Remote Mode, this control sets the maximum welding current of the remote device. For example, full depression of a foot or hand amptrol results in the preset level of current.

Voltage Display Meter

- Prior to CV operation (current flow), the meter displays desired preset voltage value.
- Prior to STICK or TIG operation, the meter displays the Open Circuit Voltage of the Power Source or four dashes if the output has not been turned on.
- During welding, this meter displays actual average volts.
- After welding, the meter holds the actual voltage value for 5 seconds. The displays blink indicating that the machine is in the "hold" period.
- Output adjustment while in the "hold" period results in the "prior to operation" characteristics.

Return to Section TOC
Return to Master TOC

Amperage Display Meter

- Prior to STICK or TIG operation (current flow), the meter displays preset current value.
- Prior to CV operation, the meter displays four dashes indicating non-presettable AMPS.
- During welding, this meter displays actual average amps.
- After welding, the meter holds the actual current value for 5 seconds. The displays blink indicating that the machine is in the "hold" period.
- Output adjustment while in the "hold" period results in the "prior to operation" characteristics

Weld Terminals On/Remote Toggle Switch

- This switch determines the trigger location.
- When set to the **"ON"** position, the weld terminals are at OCV (open circuit voltage) and ready to weld.
- When set to the **"REMOTE"** position, output is enabled through a remote trigger.

Control - Local/Remote Toggle Switch

- Set the switch to **"Local"** to control output at the machine by the Output Control dial.
- Set the switch to **"REMOTE"** to control output via a remote device (K857 hand amptrol or K870 foot amptrol) connected to the **6-pin** remote connector or a wire feeder connected to the **14-pin** connector.

Thermal Light

- This status light indicates when the power source has been driven into thermal overload. If the output terminals were **"ON"**, the output will be turned back on once the unit cools down to an acceptable temperature level. If the unit was operating in the **"REMOTE"** mode, the trigger will need to be opened before or after the thermal has cleared and closed after the machine has cooled down to an acceptable temperature to establish output.

BASIC MODES OF OPERATION

SMAW

This weld mode is a constant current (CC) mode featuring continuous control from 20 – 500 amps. It is intended for the SMAW stick welding processes and arc gouging.

Hot Start - The Hot Start control regulates the starting current at arc initiation. Hot Start can be set to **"Off"** and no additional current is added at arc start. When set to the **"On"** position, additional current (relative to the preset current) at arc initiation.

Arc Control - The Arc Control regulates the Arc Force to adjust the short circuit current. The minimum setting (-10) will produce a "soft" arc and will produce minimal spatter. The maximum setting (+10) will produce a "crisp" arc and will minimize electrode sticking.

Weld Terminals On/Remote – Set to **"On"** so the machine is in the ready to weld state.

Voltage Display Meter – This display will display three dashed lines when the machine is in the idle state. This indicates that voltage is not settable in this weld mode. While output is enabled, the actual welding voltage is displayed. After welding, the meter holds the actual voltage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics. The displays blink indicating that the machine is in the "hold" period.

Amperage Display Meter – This display will display the pre-set welding current when the machine is in the idle state. While output is enabled, the actual weld amperage is displayed. After welding, the meter holds the actual amperage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics. The displays blink indicating that the machine is in the "Hold" period.

Output Control Local/Remote – When the control is set to local (no remote potentiometer/control plugged into the **6-pin** or **14-pin** connectors), the output is controlled through the Output Control Dial on the front of the Flextec™ 450. Set this switch to **"REMOTE"** when an external potentiometer/control is connected.

- When a remote potentiometer is connected, the output control on the Flextec™ 450 and the remote act as a master/slave configuration. Use the control dial on the Flextec™ 450 to pre-set the maximum welding current. The remote will control output from minimum to the pre-set maximum.

Output Control Dial

- When the Local/Remote is set to **Local**, this dial sets the welding amperage.
- When the Local/Remote is set to **Remote**, this dial sets the maximum welding amperage. The remote potentiometer than controls the amperage from minimum to this pre-set maximum.

Return to Section TOC
Return to Master TOC

GTAW

This weld mode is a constant current (CC) mode featuring continuous control from 10 – 500 amps. It is intended for the GTAW TIG welding processes.

Hot Start - The Hot Start control regulates the starting current at arc initiation. Hot Start can be set to **"Off"** and no additional current is added at arc start. When set to the **"On"** position, additional current (relative to the preset current) at arc initiation.

Arc Control – This control is not used in the GTAW mode.

Weld Terminals On/Remote

- When set to the **"ON"** position, the weld terminals are at OCV (open circuit voltage) and ready to weld.
- When set to the **"REMOTE"** position, output is enabled through a remote trigger.

Voltage Display Meter – This display will display three dashed lines when the machine is in the idle state. This indicates that voltage is not settable in this weld mode. While output is enabled, the actual welding voltage is displayed. After welding, the meter holds the actual voltage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics. The displays blink indicating that the machine is in the "hold" period.

Amperage Display Meter – This display will display the pre-set welding current when the machine is in the idle state. While output is enabled, the actual weld amperage is displayed. After welding, the meter holds the actual amperage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics. The displays blink indicating that the machine is in the "hold" period.

Output Control Local/Remote – When the control is set to local (no remote potentiometer/control plugged into the **6-pin** or **14-pin** connectors), the output is controlled through the Output Control Dial on the front of the Flextec™ 450. Set this switch to **"REMOTE"** when an external potentiometer/control is connected.

- When a remote potentiometer is connected, the output control on the Flextec™ 450 and the remote act as a master/slave configuration. Use the control dial on the Flextec™ 450 to pre-set the maximum welding current. The remote will control output from minimum to the pre-set maximum.

Output Control Dial

- When the Local/Remote is set to **Local**, this dial sets the welding amperage.
- When the Local/Remote is set to **Remote**, this dial sets the maximum welding amperage. The remote potentiometer controls the amperage from minimum to this pre-set maximum.

CV-GAS

This weld mode is a constant voltage (CV) mode featuring continuous control from 10 to 45 volts.
It is intended for the GMAW, FCAW-GS, MCAW welding processes and arc gouging.

Hot Start – Toggle to **"ON"** position to provide more energy during the start of a weld.

Arc Control – The Arc Control regulates pinch effect (Inductance). At the minimum setting (-10), minimizes pinch and results in a soft arc. Low pinch settings are preferable for welding with gas mixes containing mostly inert gases. At the maximum setting (+10), maximizes pinch effect and results in a crisp arc. High pinch settings are preferable for welding FCAW-GS and GMAW with CO^2.

Weld Terminals On/Remote

- When set to the **"ON"** position, the weld terminals are at OCV (open circuit voltage) and ready to weld. This selection is used for across the arc wire feeders.
- When set to the **"REMOTE"** position, output is enabled through a remote trigger.

Amperage Display Meter – This display will display three dashed lines when the machine is in the idle state. This indicates that amperage is not settable in this weld mode. While output is enabled, the actual welding amperage is displayed. After welding, the meter holds the actual amperage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics. The displays blink indicating that the machine is in the "hold" period.

Voltage Display Meter – This display will display the pre-set welding voltage when the machine is in the idle state. While output is enabled, the actual weld amperage is displayed. After welding, the meter holds the actual voltage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics. The displays blink indicating that the machine is in the "hold" period.

Output Control Local/Remote – When the control is set to local (no remote potentiometer/control plugged into the **6-pin** or **14-pin** connectors), the output is controlled through the Output Control Dial on the front of the Flextec™ 450. Set this switch to **"REMOTE"** when an external potentiometer/control is connected.

Output Control Dial

- When the Local/Remote is set to Local, this dial sets the welding voltage.
- When the Local/Remote is set to Remote, this dial is disabled.

CV-INNERSHIELD

This weld mode is a constant voltage (CV) mode featuring continuous control from 10 to 45 volts. It is intended for the FCAW-SS welding process and arc gouging.

Hot Start – Toggle to **"ON"** position to provide more energy during the start of a weld.

Arc Control – The Arc Control regulates pinch effect. At the minimum setting (-10), minimizes pinch and results in a soft arc. At the maximum setting (+10), maximizes pinch effect and results in a crisp arc.

Weld Terminals On/Remote

- When set to the **"ON"** position, the weld terminals are at OCV (open circuit voltage) and ready to weld. This selection is used for across the arc wire feeders.
- When set to the **"REMOTE"** position, output is enabled through a remote trigger.

Amperage Display Meter – This display will display three dashed lines when the machine is in the idle state. This indicates that amperage is not settable in this weld mode. While output is enabled, the actual welding amperage is displayed. After welding, the meter holds the actual amperage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics. The displays blink indicating that the machine is in the "hold" period.

Voltage Display Meter – This display will display the pre-set welding voltage when the machine is in the idle state. While output is enabled, the actual weld amperage is displayed. After welding, the meter holds the actual voltage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics. The displays blink indicating that the machine is in the "hold" period.

Output Control Local/Remote – When the control is set to local (no remote potentiometer/control plugged into the **6-pin** or **14-pin** connectors), the output is controlled through the Output Control Dial on the front of the Flextec™ 450. Set this switch to **"REMOTE"** when an external potentiometer/control is connected.

Output Control Dial

- When the Local/Remote is set to Local, this dial sets the welding voltage.
- When the Local/Remote is set to Remote, this dial is disabled

Return to Section TOC
Return to Master TOC

NOTES

TABLE OF CONTENTS - ACCESSORIES SECTION

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

OPTIONS / ACCESSORIES

General Options

K2149-1 Work Lead Package.

K1842-10 10ft. Weld Power Cable (Lug to Lug).

Inverter and Wire Feeder Cart Rear-wheeled cart includes front casters and no-lift gas bottle platform. Convenient handles allow for easy cable storage while full length side trays store parts and tools. Shipped fully assembled. Small footprint fits through 30" (762 mm) door.
Order K2945-1.

Fume Extracting Systems

Accessory Kit For stick welding. Includes 35 ft. (10.7 m) 2/0 electrode cable with lug, 30 ft. (9.1 m) 2/0 work cable with lugs, headshield, filter plate, cover plate, work clamp and electrode holder. 400 amp capacity. **Order K704**

Remote Output Control
Consists of a control box with choice of two cable lengths. Permits remote adjustment of output.
Order K857 for 25 ft. (7.6 m)
Order K857-1 for 100 ft. (30 m)

TIG Options

Pro-Torch™ TIG Torches – PTA-9, PTA-17, PTA-26 – 2 piece power cord.

Foot Amptrol®
Provides 25 ft. (7.6 m) of remote current control for TIG welding. (6-pin plug connection).
Order K870

Hand Amptrol® - Provides 25 ft. (7.6 m) of remote current control for TIG welding. (6-pin plug connection).
Order K963-3

Arc Start Switch - May be used in place of the Foot or Hand Amptrol®. Comes with a 25 ft. (7.6m) cable. Attaches to the TIG torch for convenient finger control to start and stop the weld cycle at the current set on the machine.
Order K814

Return to Section TOC
Return to Master TOC

TABLE OF CONTENTS - MAINTENANCE SECTION

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.
- **Only Qualified personnel should perform this maintenance.**
- **Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

See additional warning information throughout this Operator's Manual

VISUAL INSPECTION

Clean interior of machine with a low pressure air stream. Make a thorough inspection of all components. Look for signs of overheating, broken leads or other obvious problems. Many problems can be uncovered with a good visual inspection.

ROUTINE MAINTENANCE

1. Every 6 months or so the machine should be cleaned with a low pressure airstream. Keeping the machine clean will result in cooler operation and higher reliability. Be sure to clean these areas:

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

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

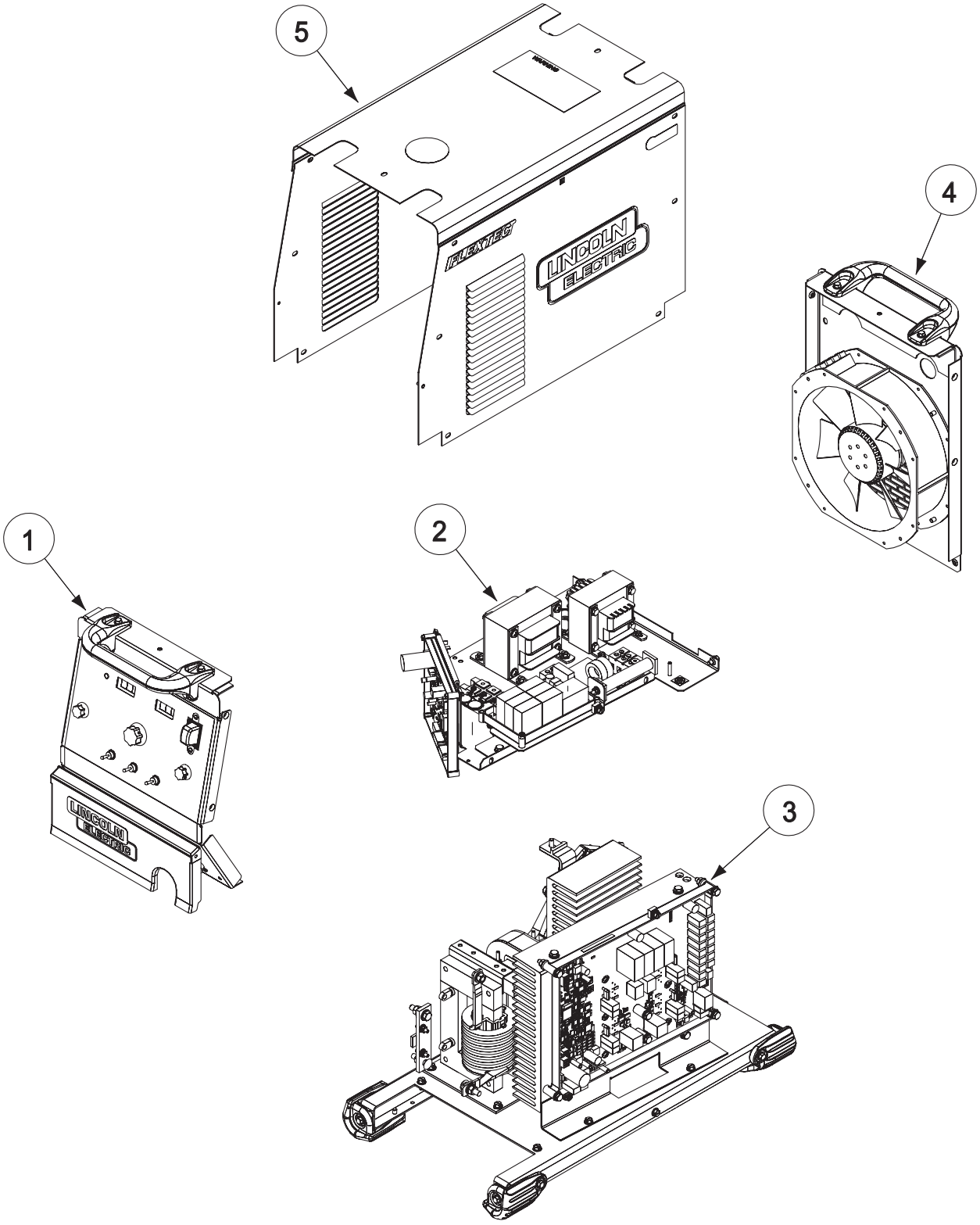
PERIODIC MAINTENANCE

Thermal Protection

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

FIGURE D.1 - MAJOR COMPONENT LOCATIONS

1. Case Front Assembly
2. Divider Panel Assembly
3. Base and Center Assembly
4. Case Back Assembly & Fan
5. Wraparound



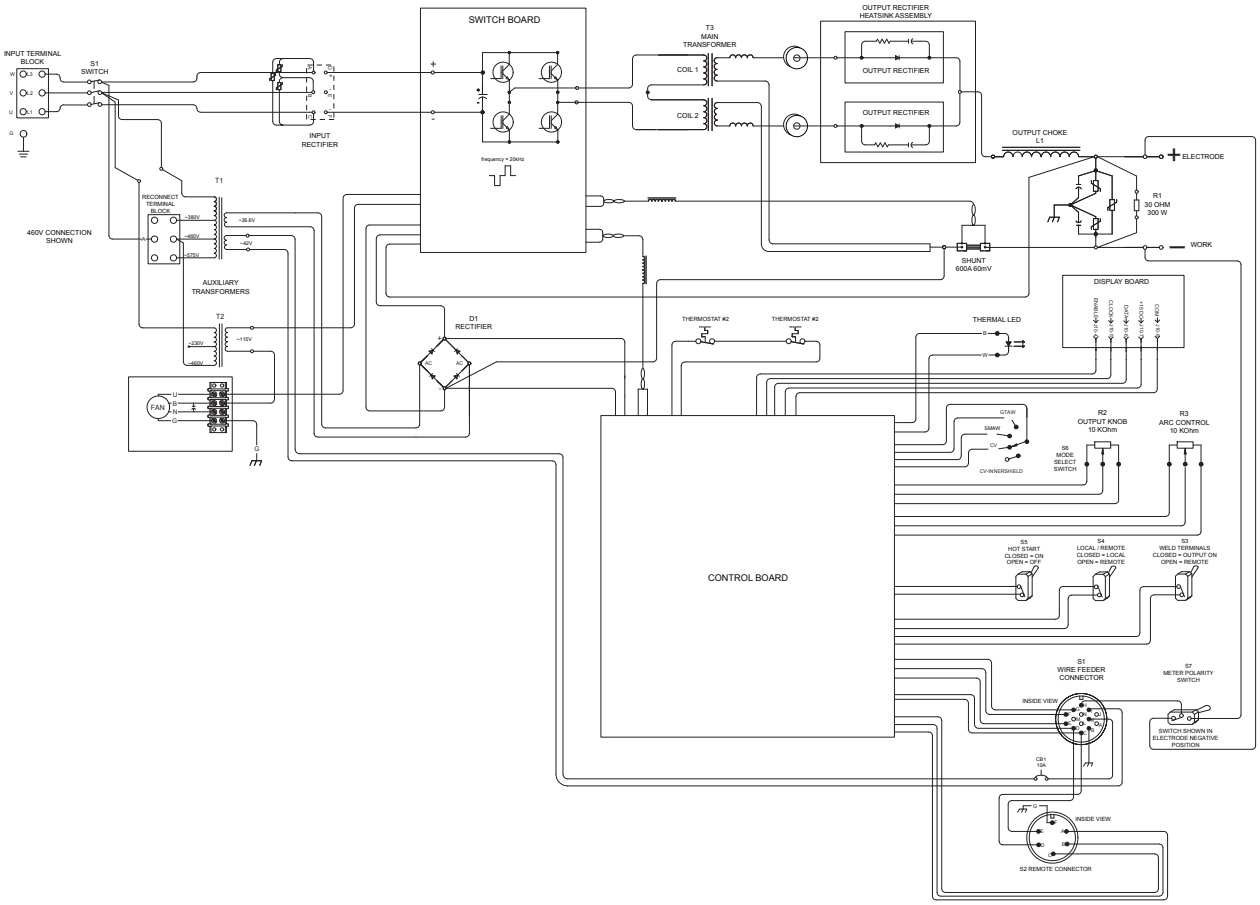
Return to Section TOC
Return to Master TOC

NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

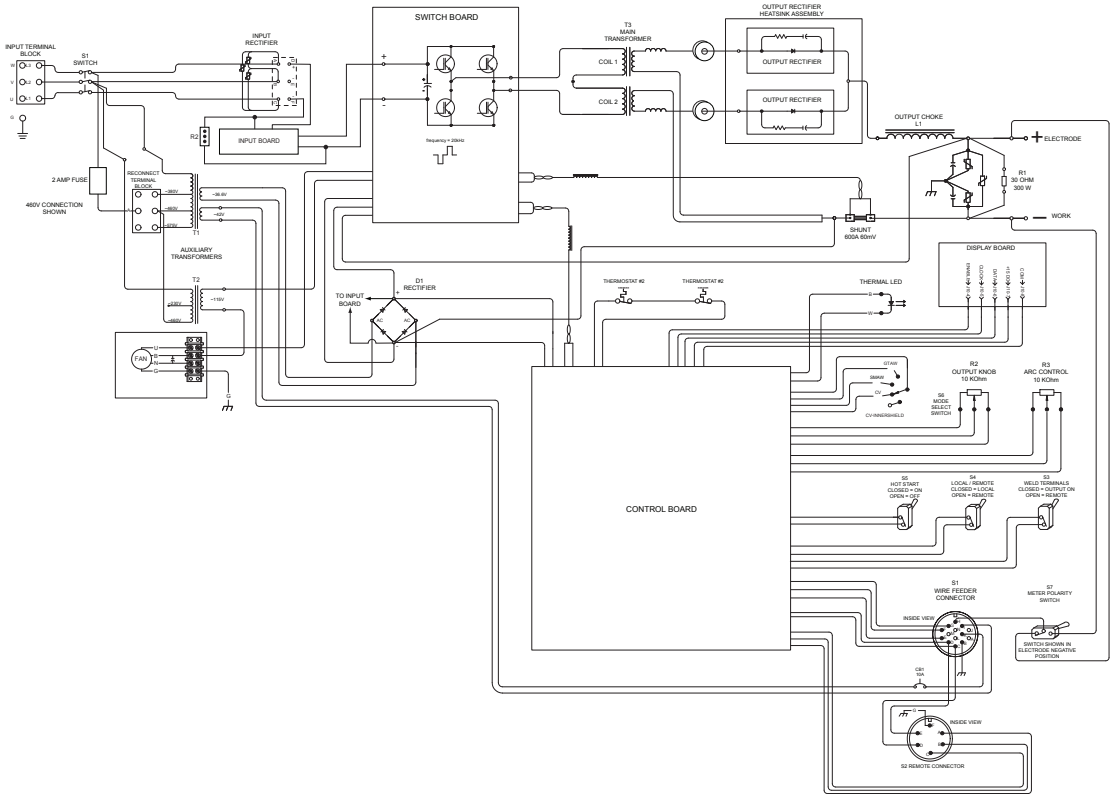
TABLE OF CONTENTS-THEORY OF OPERATION SECTION

FIGURE E.1 BLOCK LOGIC DIAGRAM (CODE 11626)



LINCOLN ELECTRIC

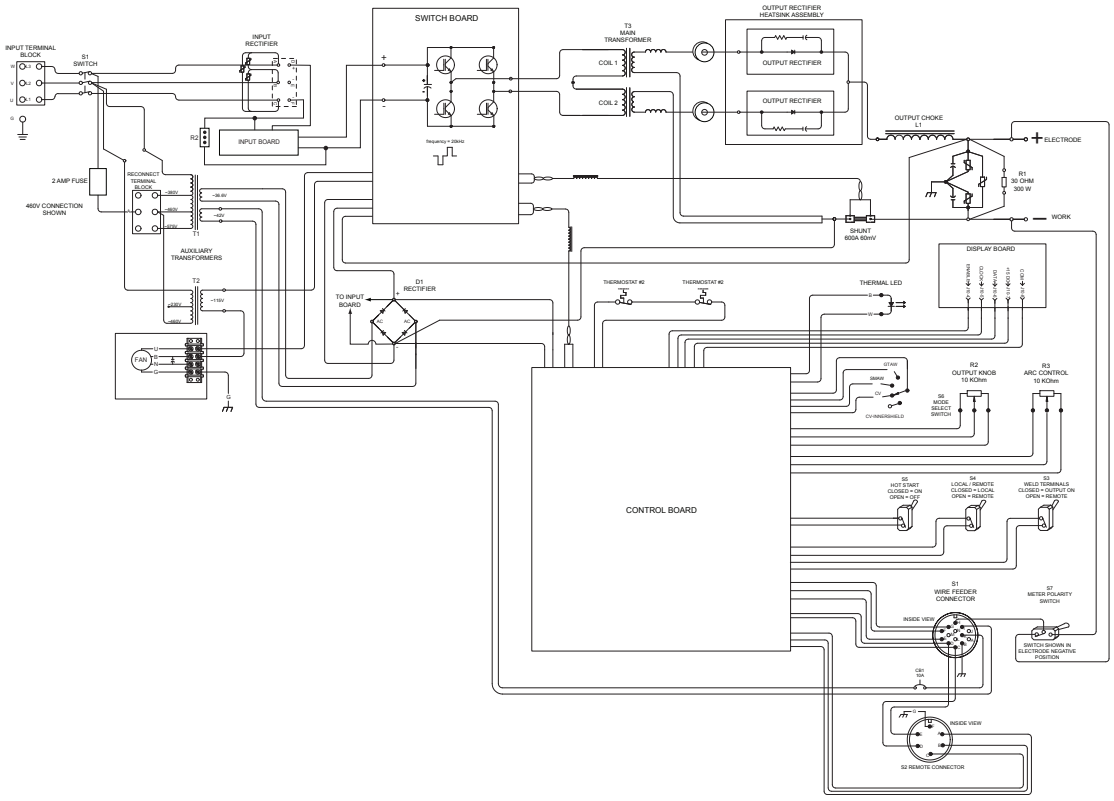
FIGURE E.2 BLOCK LOGIC DIAGRAM (CODE 11754)



NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

Return to Section TOC
Return to Master TOC

FIGURE E.3 - GENERAL DESCRIPTION



GENERAL DESCRIPTION

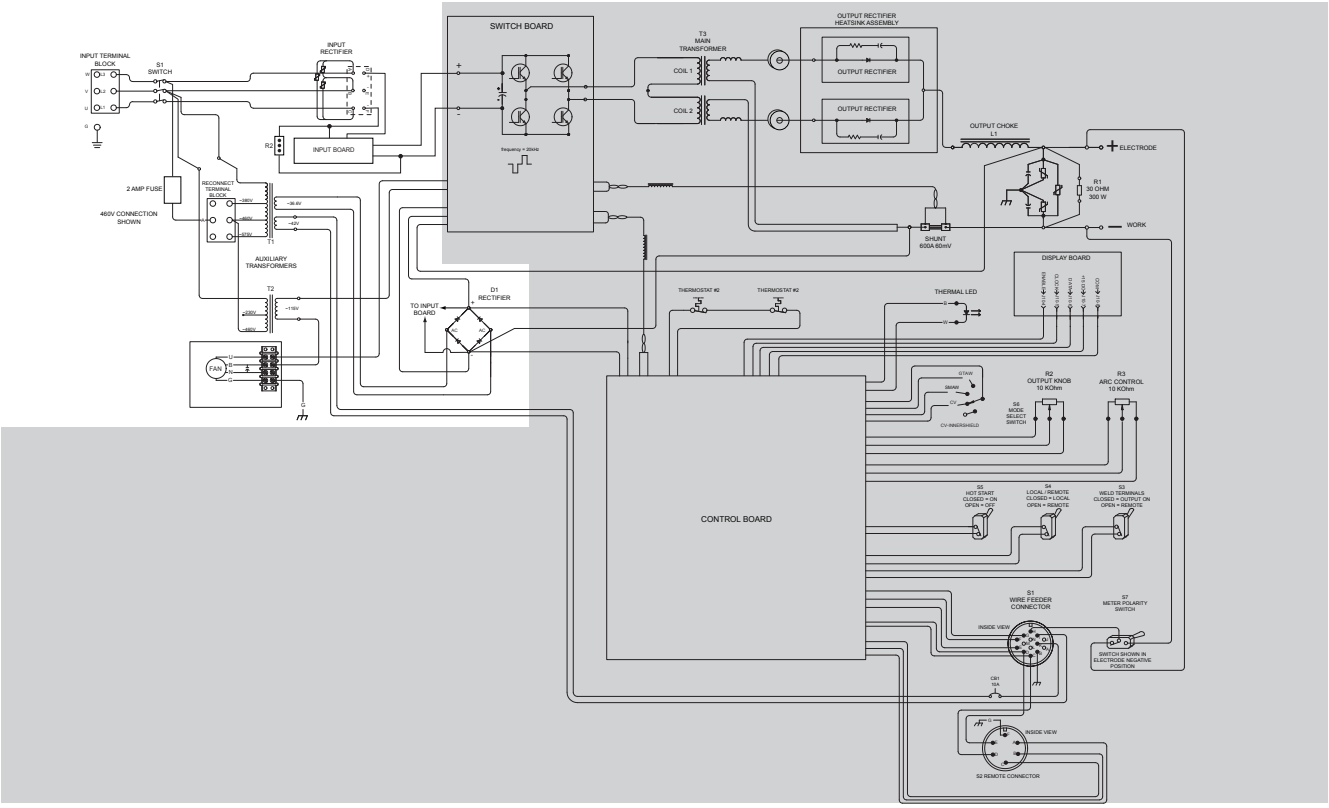
The Flextec 450 is a multi-process CC / CV DC inverter and is rated for 450 Amps, 38 Volts at a 60% duty cycle. The flextec is intended for both factory and field operation. It carries an IP 23 environmental rating. The user interface of the Flextec 450 is simple and intuitive. Weld modes are selected by a four position selector switch. Volts and amps are displayed on an easy to view LED display, and the amps or volts are set by a large output control knob. A hot start toggle selector switch and an arc control knob allow for finer tuning of the welding arc for the application. The Flextec 450 operates on 380, 460, or 575 volts, 60 Hz. Three phase only.

The Flextec 450 has an output rating of 400 amps at 100%, and is also rated for desert duty in elevated temperatures of 55 degrees C (131F) ambient, with a slight de-rating. The Flextec 450 utilizes a passive Power Factor Correction which reliably gives 95% power factor and 86% efficency.

There is also a simple user interface which makes setup quick and easy. And along with input voltage misconnection protection, even the most novice welder can be confident he is setup properly.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

FIGURE E.4 - INPUT SECTION



INPUT SECTION (CODE 11626)

When the correct three-phase input voltage is applied to the Flextec 450, via the input line switch, this AC voltage is applied to the input rectifier and the auxiliary transformers. The DC output voltage from the input rectifier is applied to the link capacitors located on the switch board. Several voltages are created from the secondary windings of the auxiliary transformers.

Transformer T1 generates two secondary voltages. One is 42VAC for the external wirefeeder supply. The other voltage, 36VAC is rectified and filtered and the resultant 50VDC is utilized to power the switch board and the control board.

The 115VAC output of the T2 transformer is coupled through the control board to control and power the cooling fan motor.

INPUT SECTION (CODE 11754)

When the correct three-phase input voltage is applied to the Flextec 450, via the input line switch, this AC voltage is applied to the input rectifier and the auxiliary transformers. The DC output voltage from the input rectifier is applied to the input board and the 500 ohm current limiting resistor (R2). This circuit provides a “soft-start” to the link capacitors located on the switch board. After approximately one second of “soft-start” a relay is energized on the input board and the current limiting resistor is shunted out of the circuit.

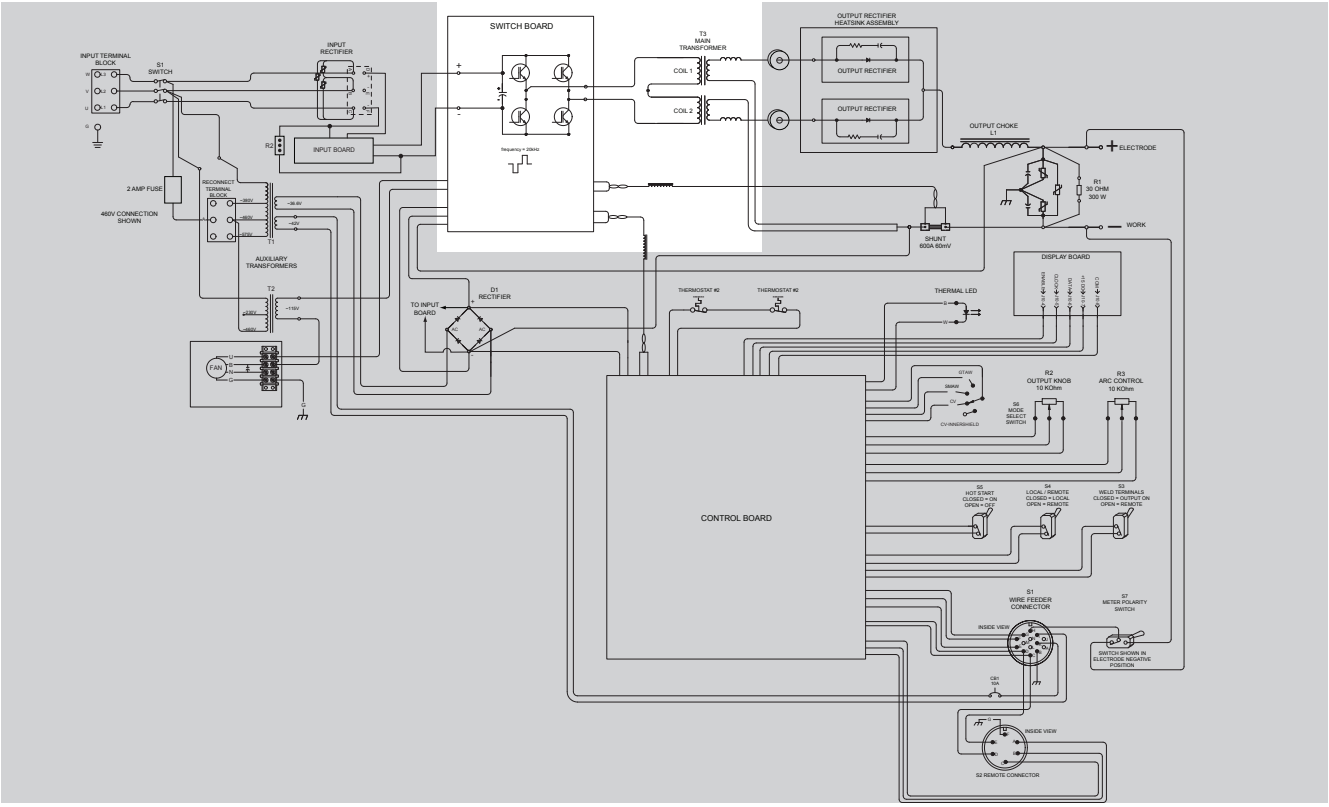
Several voltages are created from the secondary windings of the auxiliary transformers. Transformer T1 generates two secondary voltages. One is 42VAC for the external wirefeeder supply. The other voltage, 36VAC is rectified and filtered and the resultant 50VDC is utilized to power the switch board the control board and the input board.

The 115VAC output of the T2 transformer is coupled through the control board to control and power the cooling fan motor.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

Return to Section TOC
Return to Master TOC

FIGURE E.5 - SWITCH BOARD AND MAIN TRANSFORMER



SWITCH BOARD AND MAIN TRANSFORMER

The main function of the switch board is to receive (from the input rectifier) and process rectified primary power conversion. The operating frequency is 20kHz. The circuitry is designed to function from a three-phase input voltage range from 380VAC to 575VAC. The switch board provides ***Pulse Width Modulated*** power to the primary windings of the main welding transformer.

The switch board also creates power supplies for the CAN communications (Controller Area Network) and the circuitry on the switch board.

- LED 1 indicates the 5VDC supply functioning
- LED 2 indicates CAN power present
- LED 3 indicates communication status information (normally green)
- LED 4 indicates the internal DC supplies for the switch board circuitry are functional

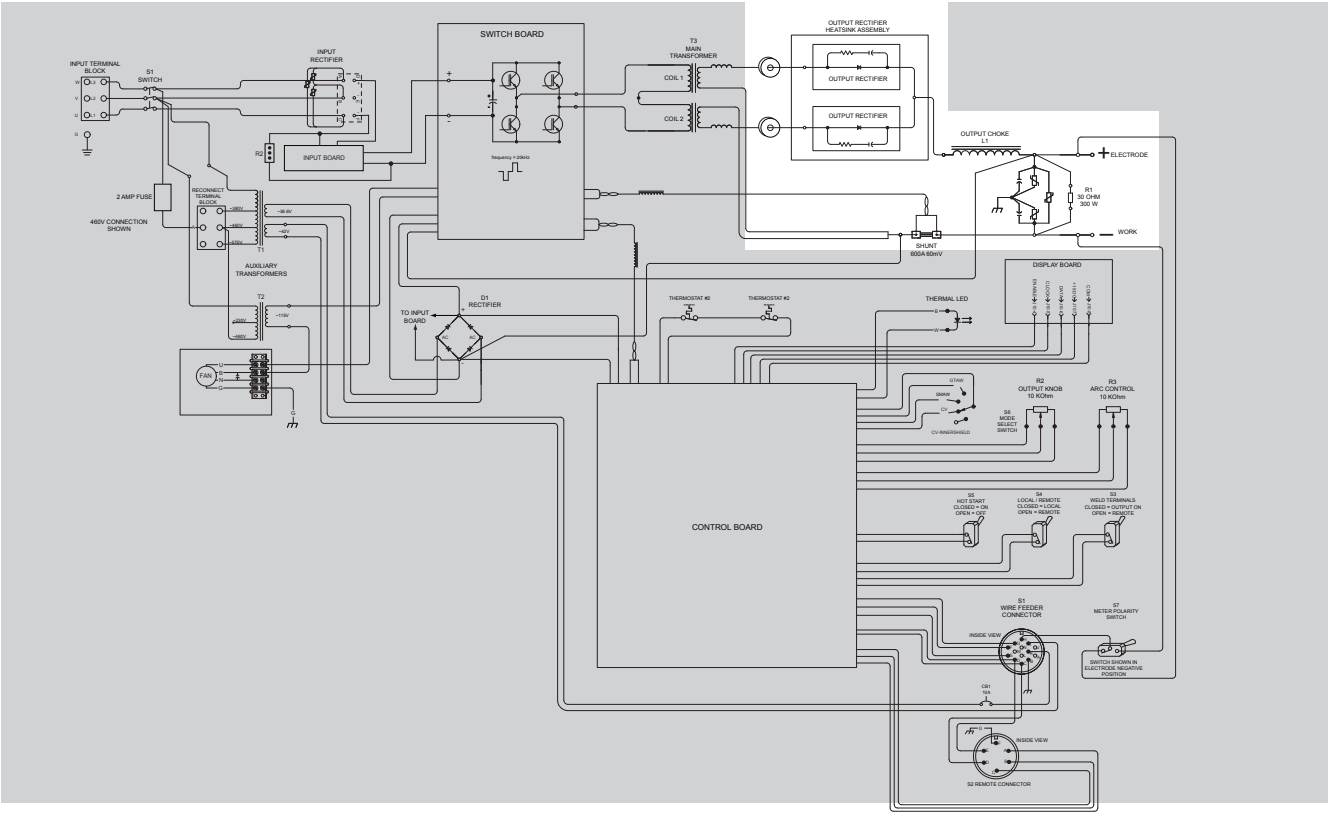
In addition the switch board monitors the voltage and current feedback and compares these to the CAN digital signals received from the control board.

The switch board then sends the appropriate ***Pulse Width Modulated*** power to the main transformer.

The main welding transformer's primary windings receive the ***Pulse Width Modulated*** power from the switch board. The 20kHz. AC output that is created on the secondary windings is applied to the output rectifier.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

FIGURE E.6 - OUTPUT SECTION

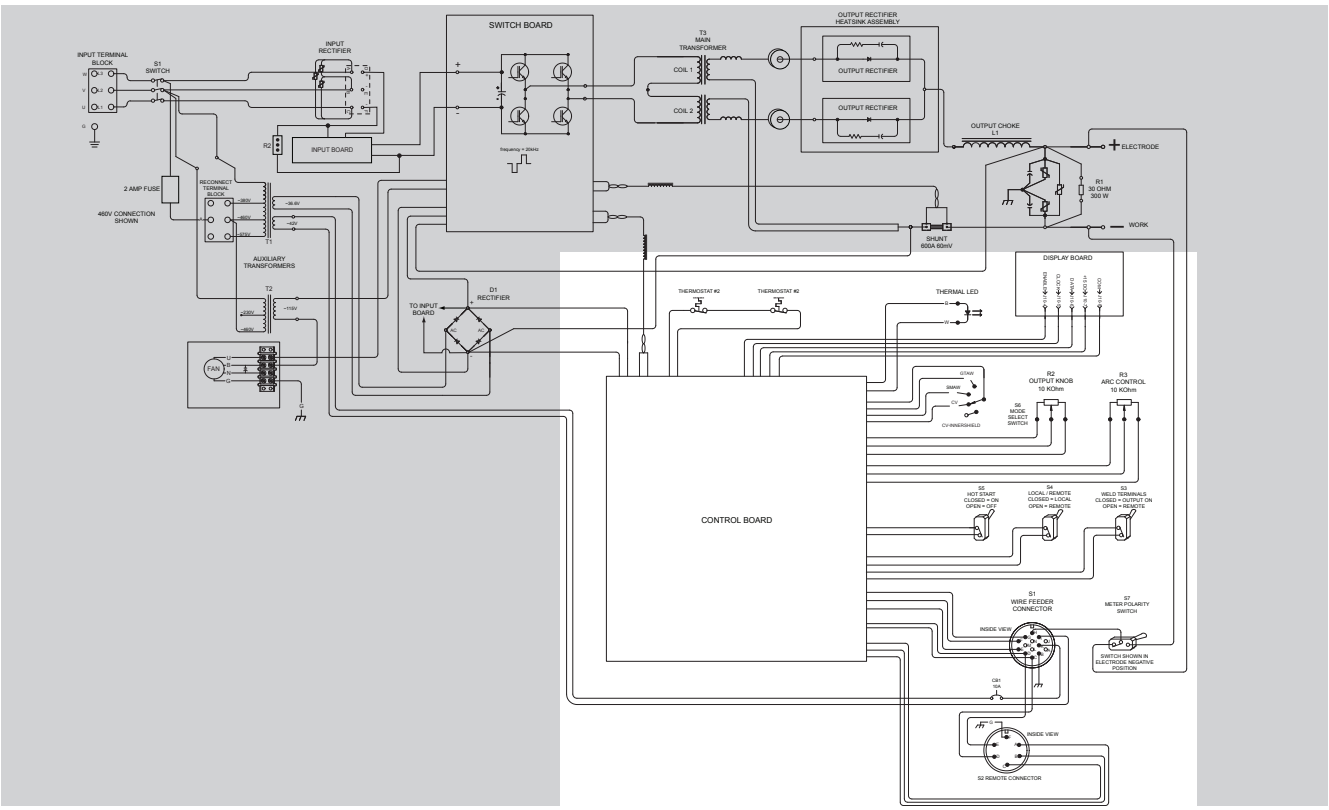


OUTPUT SECTION

The 20kHz. AC output from the main welding transformer is applied to the output rectifier bridge. The resultant DC+ power is coupled, through an output choke, to the positive output terminal. The edge would output choke is an inductor that provides filtering to enhance the arc performance and accurate waveform response. The R1 load resistor also helps to stabilize the open circuit voltage and the winding arc. There is a shunt in series with the negative output terminal. The voltage that is dropped across this shunt (600A @ 60mv) is an accurate indication of output current and is sent to the switch board for processing.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

FIGURE E.7 - CONTROL BOARD, USER INTERFACE CONTROLS AND DISPLAY BOARD



CONTROL BOARD, USER INTERFACE CONTROLS AND DISPLAY BOARD

The user interface controls and switches allow the operator to communicate to the control board the desired processes and welding requirement.

The control board receives power from the D1 rectifier. This 50VDC is utilized by the control board circuitry to create several DC supplies. These supplies are applied to the display board and the user interface controls and switches. The control board also processes the information received from the user interface controls and switches and sends the appropriated digital information to the switch board.

The display board receives power and digital data from the control board. It displays to the user the preset settings and voltage. During welding it displays the actual voltage and output current.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

Return to Section TOC
Return to Master TOC

THERMAL PROTECTION

Two normally closed (NC) thermostats protect the machine from excessive operating temperatures. These thermostats are wired in series and are connected to the control board. One of the thermostats is located on the output rectifier heatsink and the other is located on the main transformer. Excessive temperatures may be caused by a lack of cooling air or operating the machine beyond its duty cycle or output rating. If excessive operating temperatures should occur, the thermostats will prevent output from the machine. The thermal light, located on the front of the machine, will be illuminated. The thermostats are self-resetting once the machine cools sufficiently. If the thermostat shutdown was caused by excessive output or duty cycle and the fan is operating normally, the power switch may be left on and the reset should occur within a 15-minute period. If the fan is not turning or the air intake louvers are obstructed, then the power must be removed from the machine, and the fan problem or air obstruction corrected.

PROTECTIVE CIRCUITS

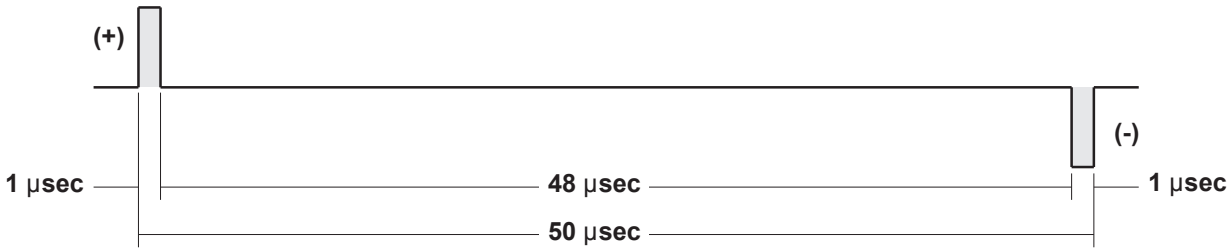
Protective circuits are designed into the Flextec 450 to sense trouble and shut down the machine before damage occurs to the machine's internal components.

UNDER/OVER VOLTAGE PROTECTION

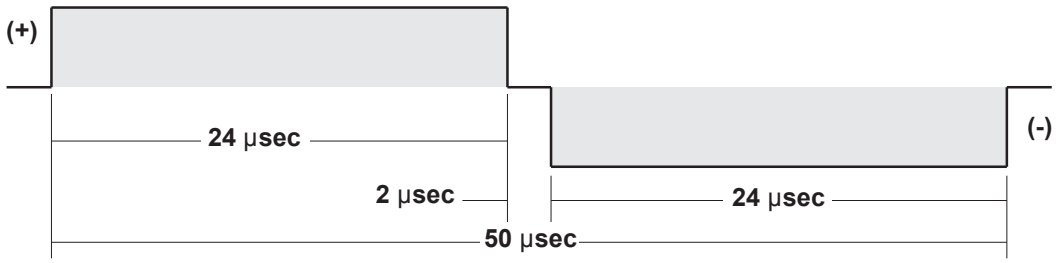
The machine is protected from both over and undervoltage conditions. If the DC voltage being applied to the switch board is lower than 180VDC or higher then 1050VDC the machine's output will be disabled. If the condition persists for more than one second error code 711 will be displayed.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

FIGURE E.8 - TYPICAL IGBT OUTPUTS



MINIMUM OUTPUT



MAXIMUM OUTPUT

PULSE WIDTH MODULATION

The term Pulse Width Modulation is used to describe how much time is devoted to conduction in the positive and negative portions of the cycle. Changing the pulse width is known as modulation. Pulse Width Modulation (PWM) is the varying of the pulse width over the allowed range of a cycle to affect the output of the machine.

MINIMUM OUTPUT

By controlling the duration of the gate signal, the IGBT is turned on and off for different durations during the cycle. The top drawing in Figure E.8 shows the minimum output signal possible over a 50-microsecond time period.

The positive portion of the signal represents one IGBT group[1] conducting for one microsecond. The negative portion is the other IGBT group[1]. The dwell time (off time) is 48 microseconds (both IGBT groups off). Since only two microseconds of the 50-microsecond time period is devoted to conducting, the output power is minimized.

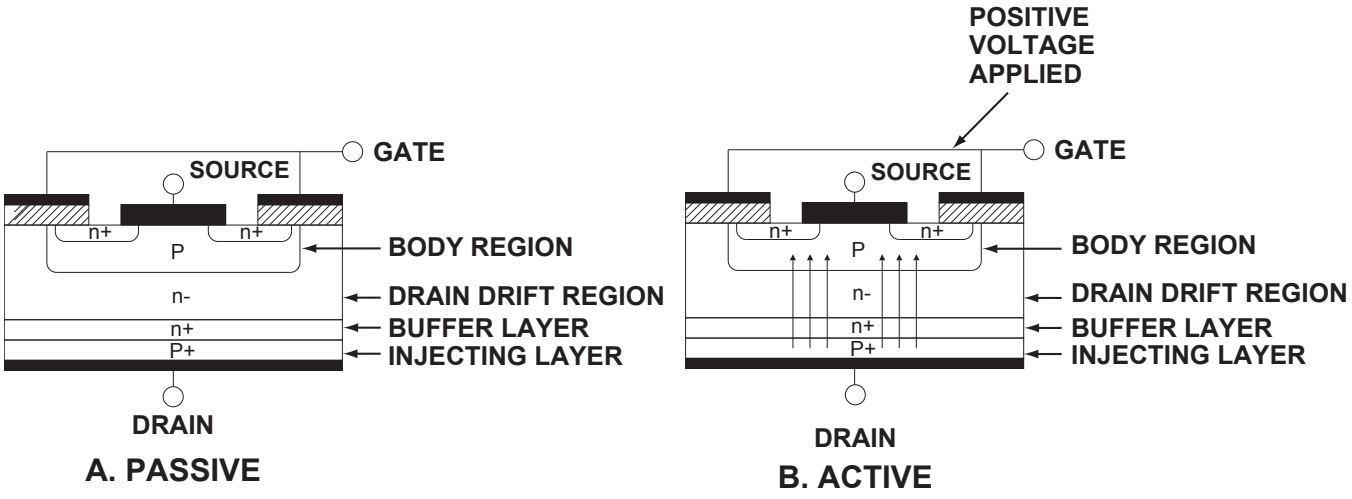
MAXIMUM OUTPUT

By holding the gate signal on for 24 microseconds each, and allowing only two microseconds of dwell time (off time) during the 50-microsecond cycle, the output is maximized. The darkened area under the top curve can be compared to the area under the bottom curve. The more dark area that is under the curve indicates that more power is present.

[1]An IGBT group consists of two IGBT modules feeding one transformer primary winding.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

FIGURE E.9 - IGBT



INSULATED GATE BIPOLAR TRANSISTOR (IGBT) OPERATION

An IGBT is a type of transistor. IGBT are semiconductors well suited for high frequency switching and high current applications.

Example A in Figure E.9 shows an IGBT in passive mode. There is no gate signal, zero volts relative to the source, and therefore, no current flow. The drain terminal of the IGBT may be connected to a voltage supply; but since there is no conduction, the circuit will not supply current to components connected to the source. The circuit is turned OFF like a light switch.

Example B shows the IGBT in an active mode. When the gate signals a positive DC voltage relative to the source, is applied to the gate terminal of the IGBT, it is capable of conducting current. A voltage supply connected to the drain terminal will allow the IGBT to conduct and supply current to the circuit components coupled to the source. Current will flow through the conducting IGBT to downstream components as long as the positive gate signal is present. This is similar to turning ON a light switch.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

Return to Section TOC
Return to Master TOC

TABLE OF CONTENTS - TROUBLESHOOTING AND REPAIR

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

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

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

Step 1. LOCATE PROBLEM (SYMPTOM).
Look under the column labeled "PROBLEM (SYMPTOMS)". This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into the following categories: output problems, weld and arc quality problems.

Step 2. PERFORM EXTERNAL TESTS.
The second column labeled "POSSIBLE AREAS OF MISADJUSTMENT(S)" lists the obvious external possibilities that may contribute to the machine symptom. Perform these tests/checks in the order listed. In general, these tests can be conducted without removing the case wrap-around cover.

Step 3. RECOMMENDED COURSE OF ACTION
The last column labeled "Recommended Course of Action" lists the most likely components that may have failed in your machine. It also specifies the appropriate test procedure to verify that the subject component is either good or bad. If there are a number of possible components, check the components in the order listed to eliminate one possibility at a time until you locate the cause of your problem.

All of the referenced test procedures referred to in the Troubleshooting Guide are described in detail at the end of this chapter. Refer to the Troubleshooting and Repair Table of Contents to locate each specific Test Procedure. All of the specified test points, components, terminal strips, etc. can be found on the referenced electrical wiring diagrams and schematics. Refer to the Electrical Diagrams Section Table of Contents to locate the appropriate diagram.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

PC BOARD TROUBLESHOOTING PROCEDURES

⚠ WARNING

ELECTRIC SHOCK can kill.

- Have an electrician install and service this equipment. Turn the input power OFF at the fuse box before working on equipment. Do not touch electrically hot parts.

⚠ CAUTION

Sometimes machine failures appear to be due to PC board failures. These problems can sometimes be traced to poor electrical connections. To avoid problems when troubleshooting and replacing PC boards, please use the following procedure:

1. Determine to the best of your technical ability that the PC board is the most likely component causing the failure symptom.
2. Check for loose connections at the PC board to assure that the PC board is properly connected.
3. If the problem persists, replace the suspect PC board using standard practices to avoid static electrical damage and electrical shock. Read the warning inside the static resistant bag and perform the following procedures:

PC board can be damaged by static electricity.

ATTENTION Static-Sensitive Devices Handle only at Static-Safe Workstations

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.
- If you don't have a wrist strap, touch an un-painted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.
- Tools which come in contact with the PC board must be either conductive, anti-static or static-dissipative.
- Remove the PC board from the static-shielding bag and place it directly into the equipment. Don't set the PC board on or near paper, plastic or cloth which could have a static charge. If the PC board can't be installed immediately, put it back in the static-shielding bag.
- If the PC board uses protective shorting jumpers, don't remove them until installation is complete.
- If you return a PC board to The Lincoln Electric Company for credit, it must be in the static-shielding bag. This will prevent further damage and allow proper failure analysis.

4. Test the machine to determine if the failure symptom has been corrected by the replacement PC board.

NOTE: It is desirable to have a spare (known good) PC board available for PC board troubleshooting.

NOTE: Allow the machine to heat up so that all electrical components can reach their operating temperature.

5. Remove the replacement PC board and substitute it with the original PC board to recreate the original problem.
   a. If the original problem does not reappear by substituting the original board, then the PC board was not the problem. Continue to look for bad connections in the control wiring harness, junction blocks, and terminal strips.
   b. If the original problem is recreated by the substitution of the original board, then the PC board was the problem. Reinstall the replacement PC board and test the machine.
6. Always indicate that this procedure was followed when warranty reports are to be submitted.

NOTE: Following this procedure and writing on the warranty report, "INSTALLED AND SWITCHED PC BOARDS TO VERIFY PROBLEM," will help avoid denial of legitimate PC board warranty claims.

Observe all Safety Guidelines detailed throughout this manual

USING THE STATUS LED TO TROUBLESHOOT SYSTEM PROBLEMS

Errors are displayed on the user interface. In addition, there are status lights on the control pc board and the switch pc board that contain error sequences.

Included in this section is information about the Status Lights and some basic troubleshooting charts for both machine and weld performance.

The status lights on the main control board and the switch pc board are dual-color LED's. Normal operation for each is steady green.

Error Codes for the FLEXTEC™ 450

Error Code#	Description	Possible Solution
31	**Primary Overcurrent** - Peak current through the transformer primary has exceeded threshold (140 amps).	1. Verify connections to the switchboard, transformer and output rectifier assemblies are made correctly and there are no damaged components in the machine. 2. Replace defective main transformer. 3. Replace defective switchboard assembly (S28443).
36	**Thermal Fault** - Thermostat on output rectifier heat sink or embedded in transformer has tripped.	1. Do not exceed allowable ambient temperature or duty cycle limits. 2. Verify that fan is operating and airflow is not being blocked. 3. Measure thermostats at control board and replace if defective.
711	**Capacitor Fault (Over-Voltage or Under-Voltage)** - Input voltage is less than 160 VDC or more than 1050 VDC.	1. Verify input voltage level, frequency, and quality. Verify that line is not too soft. 2. If problem occurs on a generator, verify proper operation when connected to municipal power lines. 3. Replace defective switchboard assembly (S28443).
712	**CAN Communication Timeout** - CAN communication between switchboard and control board has timed out.	1. Check the physical wiring and connections between control board and switchboard. 2. Verify power supply to control board and switchboard. 3. Replace defective switchboard assembly (S28443) or control board (S28454).
713	**Misconnection - Switchboard Supply Voltage too High** - Switchboard auxiliary supply voltage is higher than 42 DC at machine power-up.	1. Improper input voltage configuration. Verify primary reconnect position, measure input voltage level and check three phase operation. 2. Damaged auxiliary transformer or intermittent "A" lead connection. Verify 42 VAC output at 14 pin connector to determine the source of the problem. 3. Replace defective switchboard assembly (S28443)
714	**Misconnection - Switchboard Supply Voltage too Low** - Switchboard auxiliary supply voltage is lower than 42 DC at machine power-up.	1. Improper input voltage configuration. Verify primary reconnect position, measure input voltage level and check three phase operation. 2. Damaged auxiliary transformer or intermittent "A" lead connection. Verify 42 VAC output at 14 pin connector to determine the source of the problem. 3. Replace defective switchboard assembly (S28443)

⚠ CAUTION

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

Return to Section TOC
Return to Master TOC

Observe all Safety Guidelines detailed throughout this manual

Error Codes for the FLEXTEC™ 450		
Error Code#	**Description**	**Possible Solution**
715	**Switchboard Undervoltage Lock Out** - Switchboard auxiliary supply voltage momentarily drops below 20 VDC.	1. Damaged auxiliary transformer or intermittent “A” lead connection. Verify 42 VAC output at 14 pin connector to determine the source of the problem. 2. Verify input voltage level, frequency, and quality. Verify that line is not too soft. 3. Replace defective switchboard assembly (S28443).
717	**Control Board Misconfiguration** - A jumper on the control board has been placed in the incorrect position.	1. Verify that the wiring to connector J5 on the control board matches the machine wiring diagram. 2. Replace defective control board assembly (S28454).
21, 24, 716, 718	**Internal Control Board Error** - The microprocessor on the control board has experienced a critical internal error and cannot continue.	1. Cycle power to the machine. 2. Replace defective control board assembly (S28454).
719	**Internal Switchboard Error** - The microprocessor on the switchboard has experienced a critical internal error and cannot continue.	1. Cycle power to the machine. 2. Replace defective switchboard assembly (S28443).

⚠ CAUTION

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

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major physical or electrical damage is evident when the sheet metal cover(s) are removed.	Contact your local authorized Lincoln Electric Field Service Facility for technical assistance.	Contact the Lincoln Electric Service Department at 1-888-935-3877.
The input fuses repeatedly fail or the input circuit breakers keep tripping.	1. Make sure the input fuses or circuit breakers are properly sized.	1. Perform the ***Input Rectifier Test***. 2. Perform the ***Switch Board Test***. 3. Check the R2 current limiting resistor. Codes 11754 and above. See the Wiring Diagram.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The machine is 'dead". No lights, no output, the machine appears to have no input power.	1. Make sure the input power switch is in the ON position. 2. Check the main input fuses or breakers to make sure all three phases of the correct input power is present at the machine. 3. Check the lead "A" located at the reconnect block. Make certain it is connected to the proper input voltage position.	1. Check the input switch SW1 for proper operation. Also check the associated leads for loose or faulty connections. See the Wiring Diagram. 2. Perform the ***T1 Auxiliary Transformer Test***. 3. Check Diode D1 for opens or shorts. See the Wiring Diagram. 4. Perform the ***Control Board Test***.
There is no welding output from the Flextec 450 machine. **NOTE:** this problem may be accompanied by an error code.	1. Make sure the S3 weld terminals switch is in the"ON" position. 2. Make certain the correct three phase input power is being applied to the machine. The input may be too high or too low. If this is the case error 711 will be displayed. 3. There may be a thermal shutdown. Check the thermal LED.	1. Perform the ***T1 Auxiliary Transformer Test***. 2. Perform the ***Input Rectifier Test***. 3. Perform the ***Switch Board Test***. 4. Perform the ***Control Board Test***. 5. Perform the ***Output Rectifier Test***. 6. The Input Board may be faulty. Codes 11754 and above. See the Wiring Diagram.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The thermal LED is "ON". The machine regularly overheats.	1. The welding application may be exceeding the recommended duty cycle and /or limits of the machine. 2. Dirt or dust may have clogged the cooling channels inside the machine. Refer to the ***Maintenance Section*** of this manual. 3. Air intake and exhaust louvers may be blocked due to inadequate clearance around the machine. 4. Make sure the fan is functioning correctly. The Flextec 450 is equipped with F.A.N. (fan as needed) circuitry. The fan runs whenever the output current is established and will continue running for approximately five minutes after the output current is disabled.	1. Perform the ***Thermostat Test***.
The machine turns on but the display is not visible, or flickers or has missing digits.	1. Turn the machine off and then back on to re-boot . 2. Check for loose or faulty connections between the control board and the display board. See the Wiring Diagram.	1. Perform the ***Display Board Test***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELD AND ARC QUALITY PROBLEMS		
There is a general degradation of the welding performance.	1. Make sure the correct three phase input is being applied to the machine. 2. Make sure the machine's controls are set correctly for the welding process being used. 3. Check for poor connections or "loops" in the welding cables. 4. If using a wirefeeder check for the correct and consistent wire feed speed at the wirefeeder.	1. Perform the ***Choke Test***. 2. Perform the ***Control Board Test***.
The machine looses output during a weld.	1. A secondary over-current may have occurred. The welding application may have exceeded the current limitations of the machine. 2. Make sure the correct three phase input power is being applied to the machine.	1. The Input Board may be faulty.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

Return to Section TOC
Return to Master TOC

NOTES

INPUT PANEL TERMINAL BLOCK TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

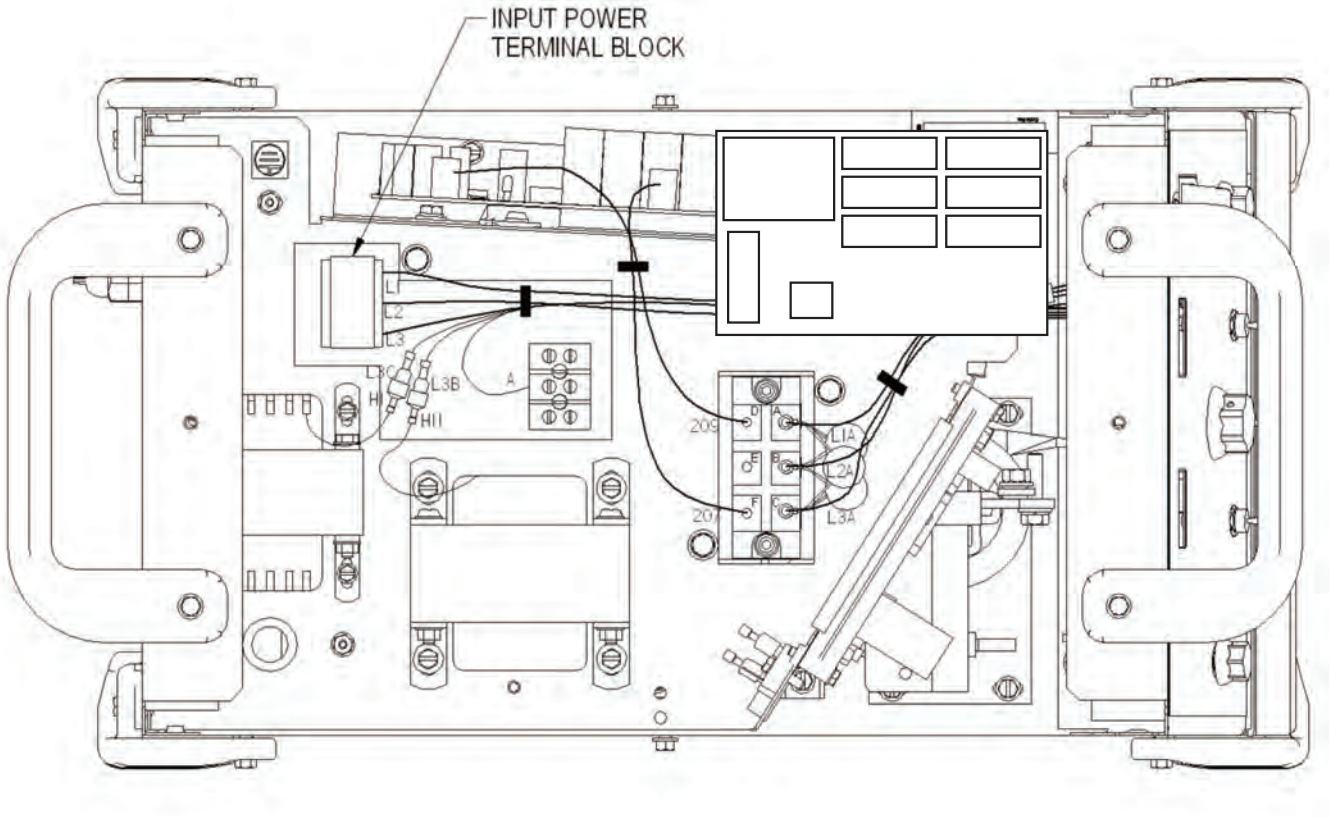
This test will check to make sure the primaries of the Auxiliary Transformers are configured correctly for the three phase input voltage.

MATERIALS NEEDED

3/8" Wrench
Straight Blade Screwdriver

INPUT PANEL TERMINAL BLOCK TEST (continued)

FIGURE F.1 – INPUT POWER TERMINAL BLOCK LOCATION



PROCEDURE

1. Remove input power.
2. Perform ***Case Cover Removal Procedure***.
3. Perform the ***DC Link Capacitor Discharge Procedure***.
4. Locate the Input Power Terminal Block. See Figure F.1.
5. Insure the lead “A” in the reconnect terminal is connected to the correct position for the three phase input voltage.
6. If the reconnection of lead “A” is incorrect the Flextec will present an error 58 on the display of the machine.
7. This machine can only run on three phase input power.
8. Replace case cover previously removed.

DC LINK CAPACITOR DISCHARGE PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will help determine if the DC Link Capacitors are discharged..

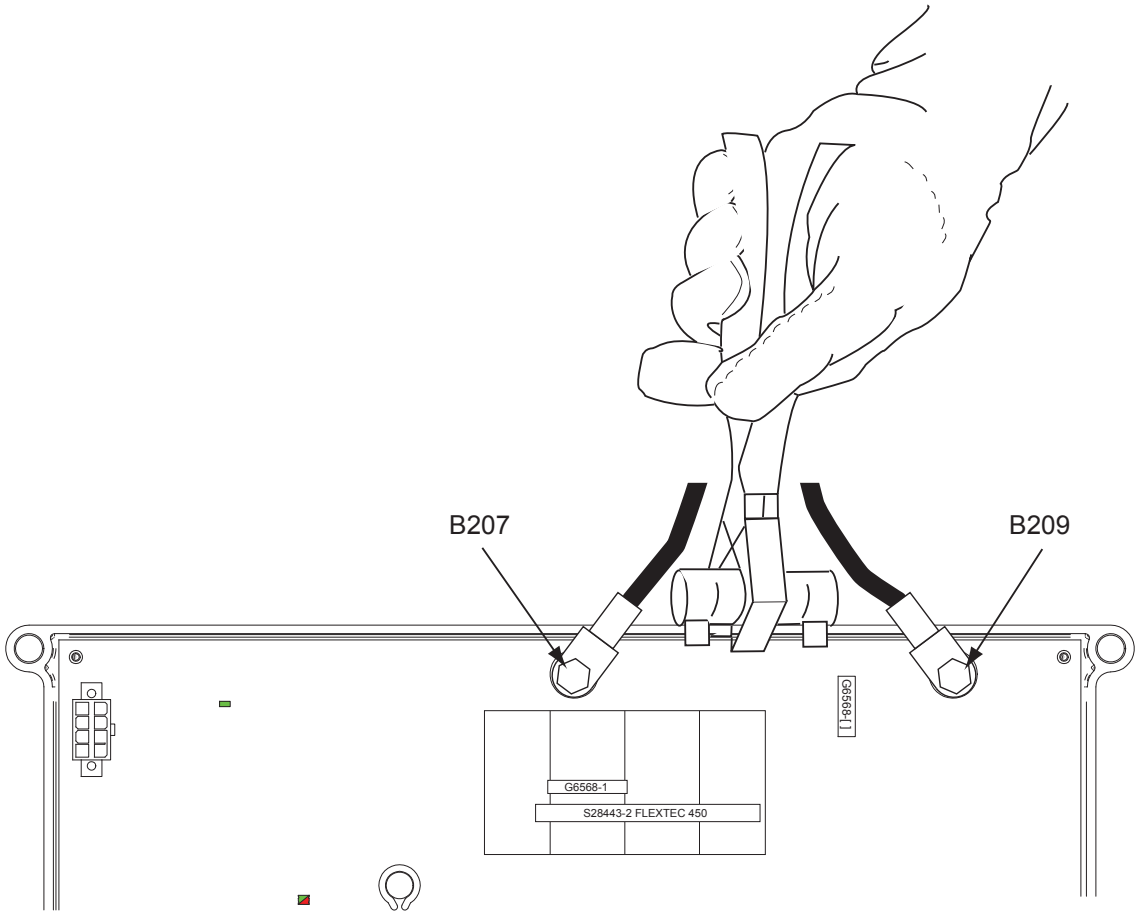
MATERIALS NEEDED

3/8" Wrench
25-1000 Ohm Resistor
Electrical Insulating Gloves
Analog Voltmeter or Digital Multimeter With A Diode Check Position

Return to Section TOC
Return to Master TOC

DC LINK CAPACITOR DISCHARGE PROCEDURE (continued)

FIGURE F.2 – SWITCH BOARD LEADS 207 & 209



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Disconnect input power before servicing.**
- **Do not operate with covers removed.**
- **Do not touch electrically hot parts.**
- **Only Qualified personnel should perform this maintenance.**

Perform Link Capacitor discharge procedure as follows.

1. Remove input power.
2. Perform ***Case Cover Removal Procedure***.
3. Locate the two large bolted connections labeled "207" and "209" on the top edge of the Flextec 450 switchboard. See Wiring Diagram. See Figure F.2.
4. Carefully discharge the link capacitors using a 25 watt or more, 25 to 1000 ohm resistor connected to two test leads.
5. After discharging, use a DC voltmeter to insure the link capacitors are discharged by connecting the probes of the meter to "209" positive, and "207" negative. The voltage should be zero, if not, repeat procedure.

Return to Section TOC
Return to Master TOC

INPUT RECTIFIER TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

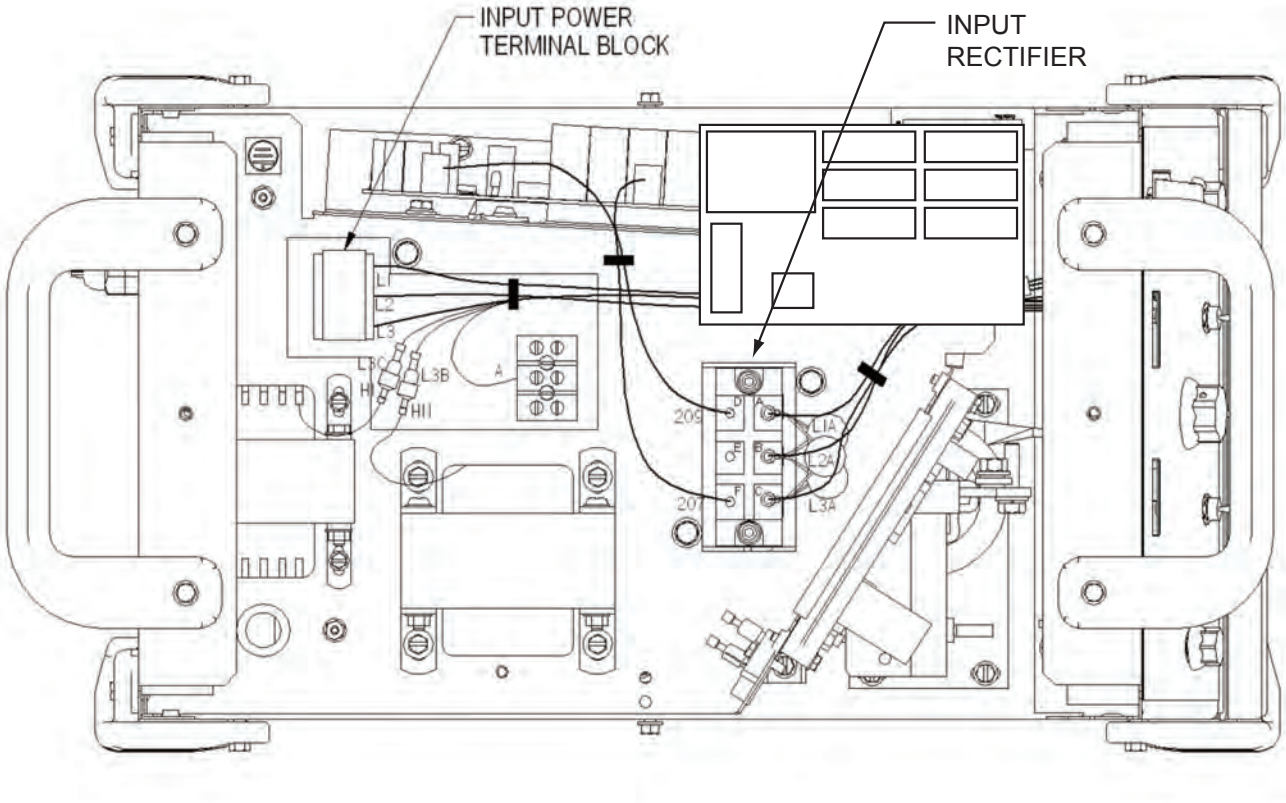
This test will help determine if the Input Rectifier has failed.

MATERIALS NEEDED

3/8" Wrench
Analog Voltmeter or DIgital Multimeter With A Diode Check Position.

INPUT RECTIFIER TEST (continued)

FIGURE F.3 – INPUT RECTIFIER LOCATION



PROCEDURE

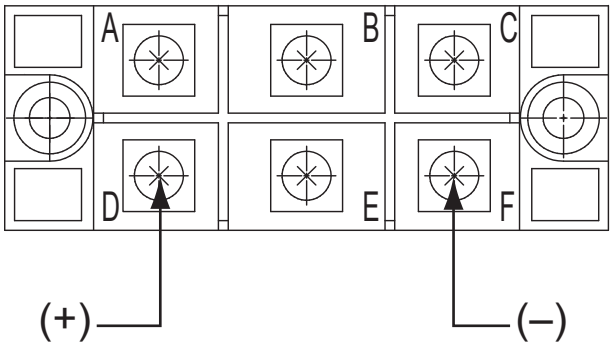
1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***DC Linc Capacitor Discharge Procedure***.
4. Locate the input rectifier assembly. See Figure F.3.
5. Perform the tests detailed in ***Table F.1***. Also ***See Figure F.4***.
6. If the tests results are questionable remove all of the leads from the input rectifier and re-test. See the Wiring Diagram.
7. If any portion of the test fails, the input rectifier may be faulty. Replace.

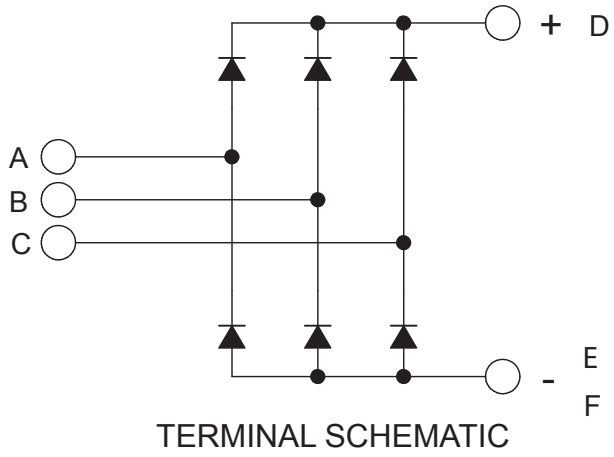
INPUT RECTIFIER TEST (continued)

TABLE F.1 – INPUT RECTIFIER TEST POINTS

+ **Probe** (RED)	- **Probe** (BLACK)	**RESULT**
Terminal A	D (+) Terminal	**0.3V - 1.0V**
Terminal B	D (+) Terminal	**0.3V - 1.0V**
Terminal C	D (+) Terminal	**0.3V - 1.0V**
F (-) Terminal	Terminal A	**0.3V - 1.0V**
F (-) Terminal	Terminal B	**0.3V - 1.0V**
F (-) Terminal	Terminal C	**0.3V - 1.0V**

FIGURE F.4 – INPUT RECTIFIER DETAIL





TERMINAL SCHEMATIC

NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FAN AND F.A.N. CIRCUIT TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in making sure the Fan and Fan Circuitry is functioning properly.

MATERIALS NEEDED

Jumper
Volt/Ohmmeter

FAN AND F.A.N. CIRCUIT TEST (continued)

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Disconnect input power before servicing.**
- **Do not operate with covers removed.**
- **Do not touch electrically hot parts.**
- **Only Qualified personnel should perform this maintenance.**

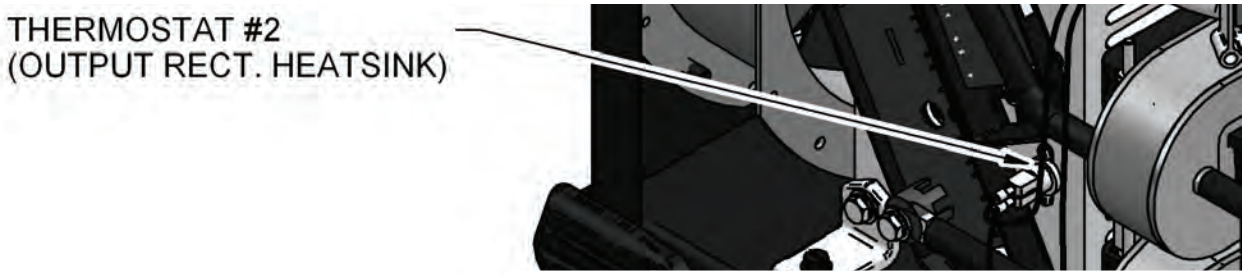
PROCEDURE

1. Remove input power.
2. Perform ***Case Cover Removal Procedure***.
3. Perform the ***DC Link Capacitor Discharge Procedure***.
4. Unplug J26 on the switch board, and insert a jumper wire, carefully into the wire end of the connector to short leads #22 and #23 together.
5. Carefully apply the correct input power (three-phase).
6. When the Flextec 450 is turned on, the fan should start, and run as long as power is on. If this test results in the fan running properly, all components of the fan circuit are OK with the possible exception of the switch board and / or control board.
7. If the above test failed to start the fan, check the 120 volts secondary of the T2 transformer, and the fan itself. Perform ***Transformer T2 Test.*** If the transformer produces the required 120 volts, and the J26 leads are jumped, the fan is suspect and/or fan capacitor are suspect. See Wiring Diagram.

Return to Section TOC
Return to Master TOC

FAN AND F.A.N. CIRCUIT TEST (continued)

FIGURE F.5 – THERMOSTAT #2 (OUTPUT RECTIFIER HEATSINK)



8. If the above test results in a running fan remove the jumper wire between leads #22 and #24 and plug J26 back into the switch board. Remove one of the two quick connect leads on thermostat # 2. See Figure F.5.
9. If removing the lead causes the control board to flash error 36, and the thermo LED turns on, but the fan still does not start, the switch board is suspect.
10. If no error 36 flashes, and the thermo LED does not turn on, the control board is suspect.
11. Replace the suspect component, re-connect the quick connection removed from the # 2 thermostat, and retest by loading the machine on a grid.
12. A properly operating F.A.N. circuit will start the fan as soon as an arc is detected and for five minutes after the load has been removed.
13. Replace fan if necessary.

NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

T1 TRANSFORMER TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

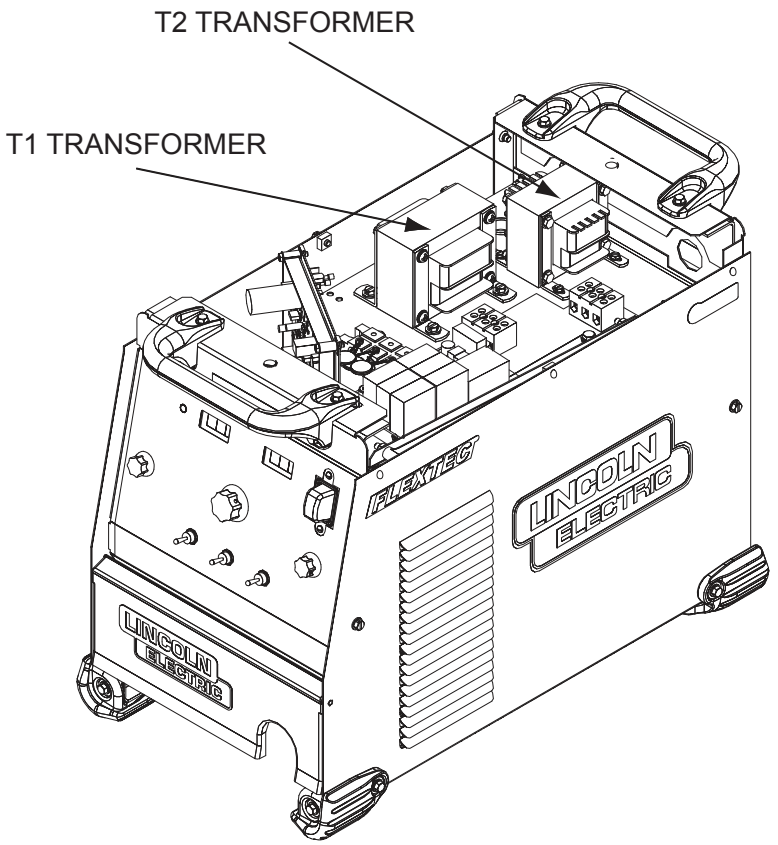
This test will help determine if the T1 Transformer is receiving the correct primary voltage and if it is producing the correct secondary voltages.

MATERIALS NEEDED

Digital Multimeter

T1 TRANSFORMER TEST (continued)

FIGURE F.6 – TRANSFORMER LOCATIONS



PROCEDURE

1. Remove the input power to the Flextec 450 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***DC Link Capacitor Discharge Procedure***.
4. Locate the T1 Transformer. See Figure F.6.
5. Carefully apply the correct three-phase input power to the Flextec 450.
6. At the Reconnect Terminal Block carefully check for the correct primary voltages on the T1 Transformer. ***See Table F.2, Figure F.7*** and the Wiring Diagram.
7. If the correct primary voltages are present check for the presence of the correct secondary voltages. ***See Table F.2***, and the Wiring Diagram.
8. If the primary voltages are correct and the secondary voltages are low or not present the T1 Transformer may be faulty.
9. When testing is complete replace all leads previously removed and the case covers.

Return to Section TOC
Return to Master TOC

T1 TRANSFORMER TEST (continued)

FIGURE F.7 – RECONNECT TERMINAL BLOCK LOCATION

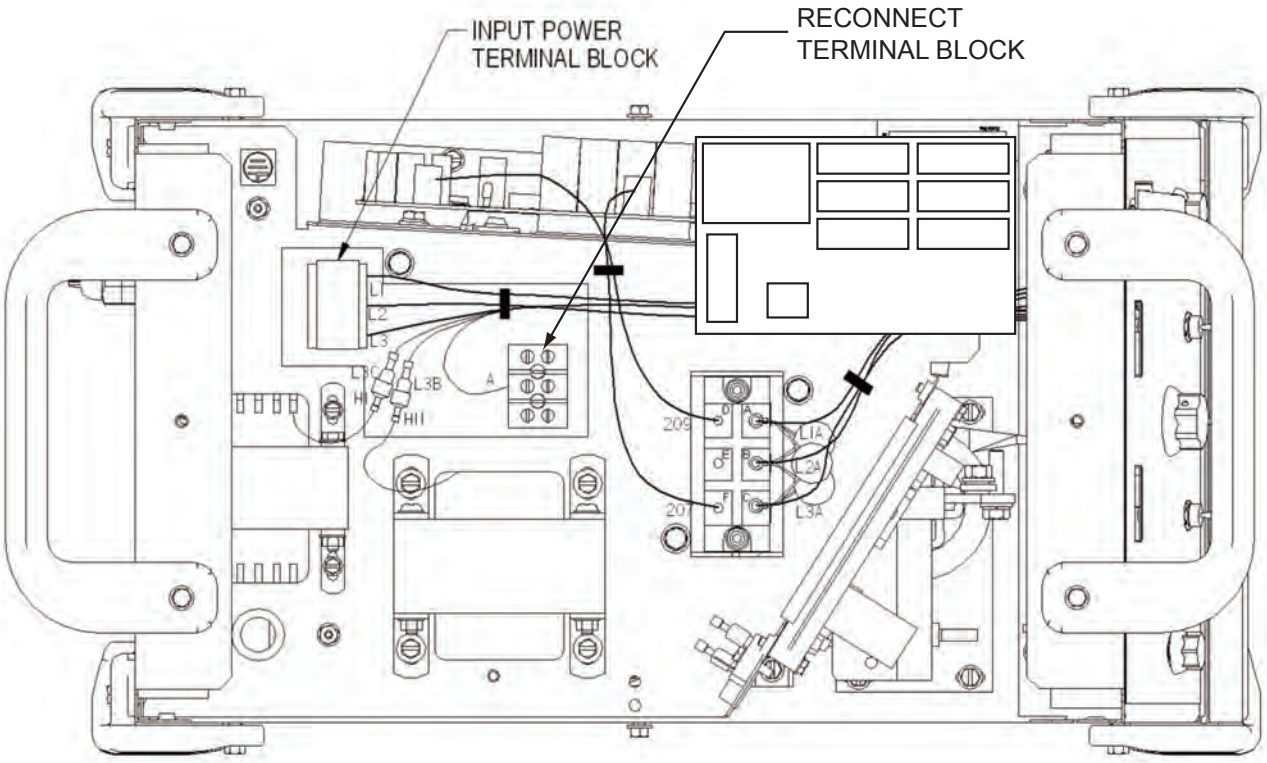


TABLE F.2 – TRANSFORMER T1 TEST POINTS

Description	Test Points	Expected Readings	Conditions/Comments
Primary Voltage	H11 to H12	380VAC	Correct Input Power Applied
Primary Voltage	H11 to H13	460VAC	Correct Input Power Applied
Primary Voltage	H11 to H14	575VAC	Correct Input Power Applied
Secondary Voltage	X11 to X12	36VAC	Correct Input Power Applied
Secondary Voltage	X13 to X14	42VAC	Correct Input Power Applied

Return to Section TOC
Return to Master TOC

NOTES

F-26

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

T2 TRANSFORMER TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

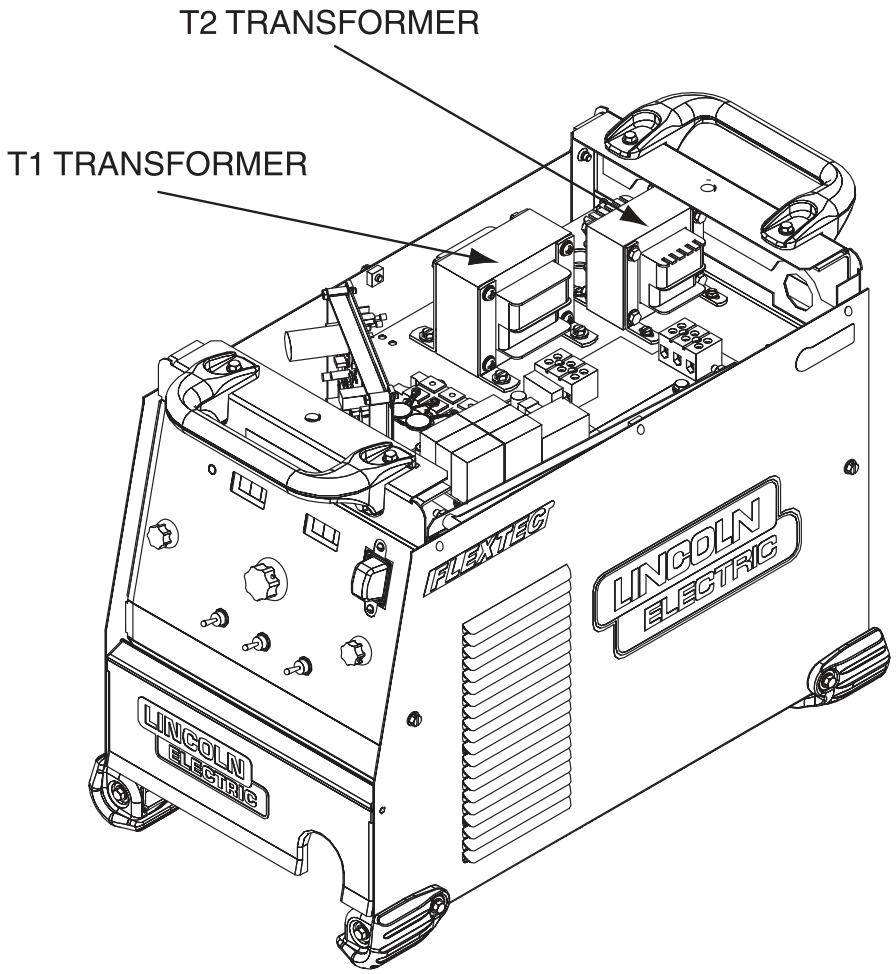
This test will help determine if the T2 Transformer is receiving the correct primary voltage and if it is producing the correct secondary voltage to power the Fan Motor.

MATERIALS NEEDED

3/8" Wrench
Analog Voltmeter or Digital Multimeter

... TRANSFORMER TEST (continued)

FIGURE F.8 – T2 TRANSFORMER TEST



PROCEDURE

1. emo e the in ut o er to the machine.
2. erform the ***Case Cover Removal Procedure.***
3. erform the ***DC Link Capacitor Discharge Procedure.***
4. Locate the T2 transformer. See Figure F.8.
5. The T2 transformer is a a s o ere from the o t rimar in ing in t he T transformer. See the iring iagram. t is critica that the T transformer e ro er connecte . a e cer tain the ea is connecte to the correct osition in the reconnect termina oc to match the three hase in ut o er eing a ie to the F e tec machine. ***See Figure F.9.***
6. f the correct o tage is eing a ie to the rimar in ing of the T2 transformer an the correct secon ar o tage is not resent at the secon ar ea s 2 the transformer ma e fau t . e ace.
7. The T2 transformer secon ar o tage can e chec e at the t o re uic connects ocate on the eft si e rear near the fan ca acitor. ***See Figure F.10.***

T2 TRANSFORMER TEST (continued)

FIGURE F.9 – T2 TRANSFORMER TEST

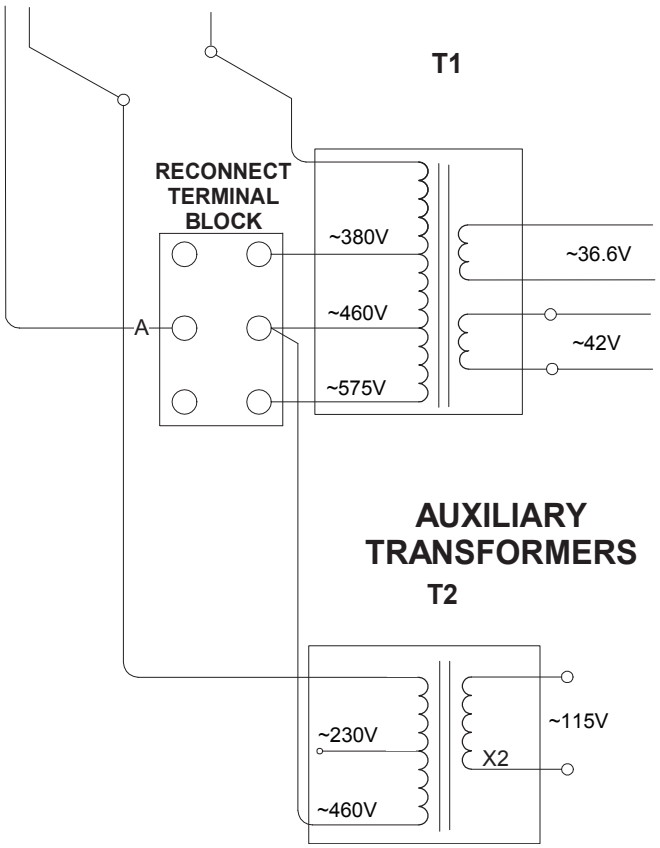
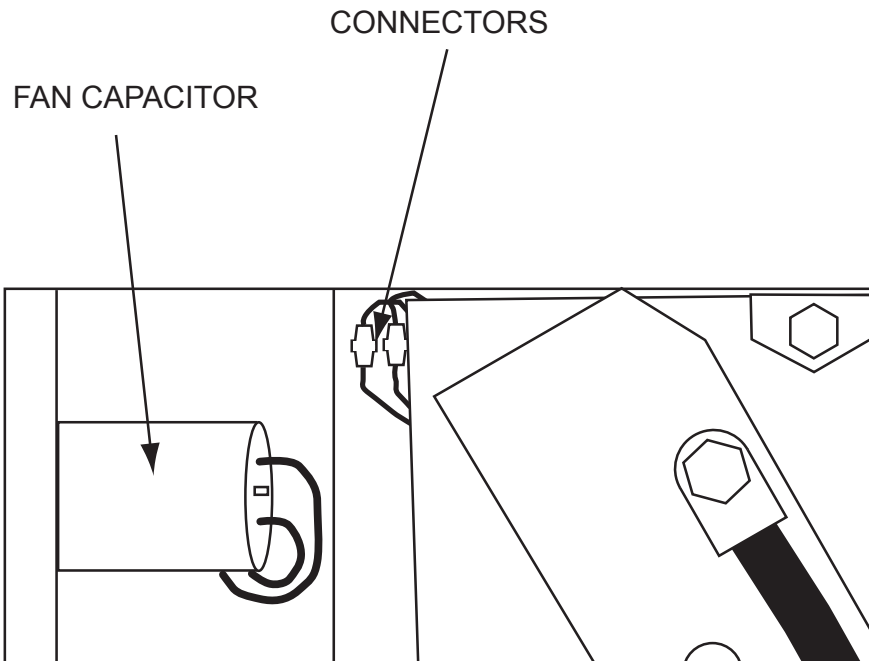


FIGURE F.10 – T2 TRANSFORMER CONNECTIONS



NOTES

F-30

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SWITCH BOARD TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

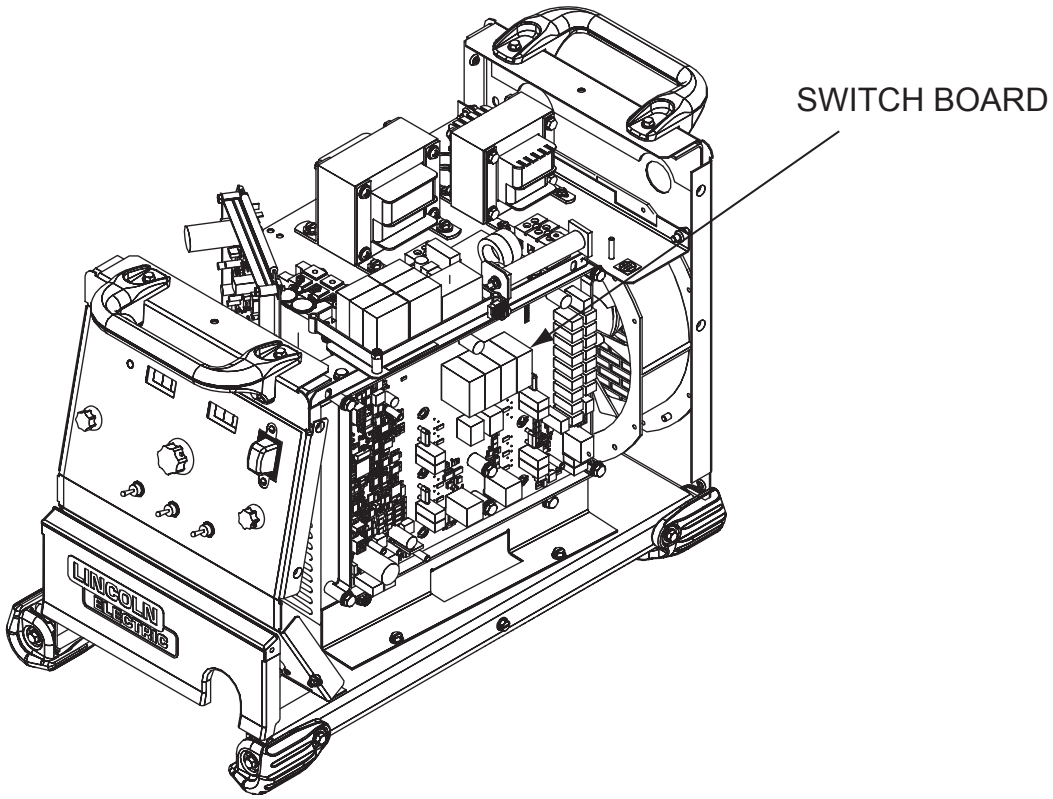
The Switch Board has many functions and components. This test will help determine if the Switch Board is receiving the correct voltages and also if the Switch Board is functioning properly.

MATERIALS NEEDED

Volt / Ohmmeter (Multimeter)
7/16” Wrench

SWITCH BOARD TEST (continued)

FIGURE F.11 – SWITCH BOARD LOCATION



PROCEDURE

1. Disconnect the input power to the Flextec 450 machine.
2. Perform the ***Case Cover Removal Procedure*** and ***DC Link Capacitor Discharge Procedure***.

⚠ WARNING

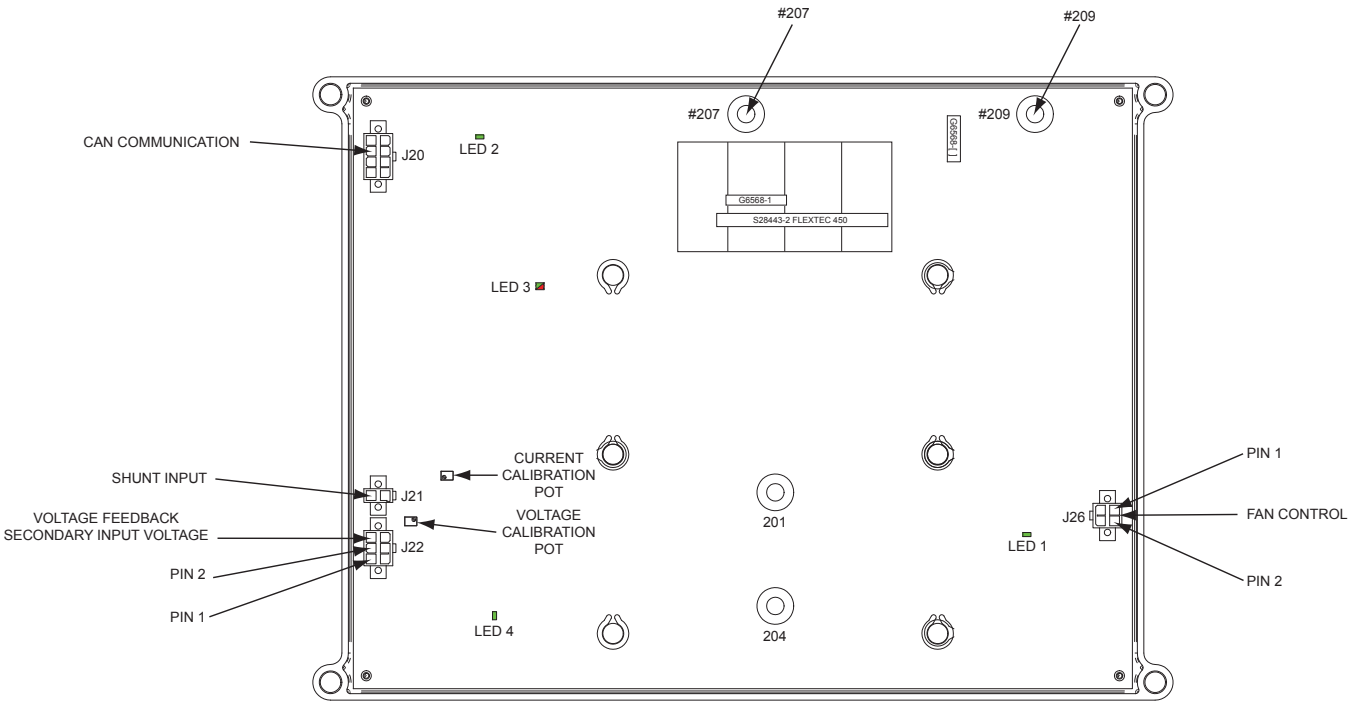
and around the switch board. Take the appropriated safety precautions when performing the following procedures.

3. Locate the switch board on the right side of the machine. See Figure F.11.
4. Carefully apply the correct input power to the Flextec 450 machine. Check the LEDs per ***Table F.3***. ***See Figure F.12*** for LED locations.
5. If the LEDs are not indicating a properly functioning switch board (per ***Table F.3***.) proceed with the following steps.
6. Check the switch board voltages per ***Table F.5***. ***See Figure F.12*** for test point locations.
7. Check the switch board resistances per ***Table F.4***. ***See Figure F.12*** for test point locations.
8. If any of the above tests are not correct the Switch should be replaced.
9. Replace all plugs and leads that may have been disconnected.
10. Replace the case covers.

Return to Section TOC
Return to Master TOC

SWITCH BOARD TEST (continued)

FIGURE F.12 – SWITCH BOARD PRIMARY SIDE



SWITCH BOARD TEST (continued)

TABLE F.3 – SWITCH BOARD LEDs

DESCRIPTION	INDICATES	LIGHT	CONDITIONS
LED 1	+5.0VDC Supply (Green)	ON	Power applied to Flextec 450
LED 2	CAN Communication is Powered (Green)	ON	Power applied to Flextec 450
LED 3	Status LED Indicator (Red or Green)	ON*	Power applied to Flextec 450 *May be blinking
LED 4	+5.0VDC Supply functional for Switch Board Control Circuitry (Green)	ON	Power applied to Flextec 450

LIGHT CONDITION	MEANING
Steady Green	System OK. Switchboard is communicating correctly with control board.
Blinking Green	Occurs during startup or reset, and indicates that the switchboard is waiting for communication from the control board. Normal for the first 1-10 seconds after power is turned on.
Alternating Green and Red	A system fault has occurred. If the switchboard status LED is flashing any combination of red and green, errors are present. **Read the error code before the machine is powered off**. Error code interpretation through the status LED is detailed in the Service Manual. Individual code digits are flashed in red with a long pause between digits. If more than one code is present, the codes will be separated by a green light. To clear the error, turn the power source off, and back on to reset.

ERROR CODE #	INDICATION
31 Primary Overcurrent Error	Excessive primary current present. May be related to switchboard hardware or output rectifier failure.
32 Capacitor Voltage Error	Excessively low or high voltage on the capacitor. May be caused by improper input configuration, or an open/short circuit in the primary side of the machine.
47 Communications Watchdog Timeout	Communication with the control board was lost. May be caused by excessive noise or damage to the CAN connection to the control board.
58 Bad Supply Voltage	The supply voltage to the switchboard was found to be outside of the allowable range. May be caused by an improper input voltage configuration.
Other	Error codes that are not listed are defined as fatal errors. These codes generally indicate internal errors on the switchboard. If cycling power does not clear the error, replace the switchboard.

Return to Section TOC
Return to Master TOC

SWITCH BOARD TEST (continued)

TABLE F.4 – SWITCH BOARD RESISTANCE MEASUREMENTS

DESCRIPTION	METER TEST POINTS AND POLARITY	EXPECTED READINGS	CONDITIONS
Checking for short circuit on the "High Side" IGBTs	B209(+) to B201(-)	Greater Than 100,000 Ohms	Machine "off" no input power applied
Checking for short circuit on the "Low Side" IGBTs	B204(+) to B207(-)	Greater Than 100,000 Ohms	Machine "off" no input power applied
Checking for short circuit on "Primary Side"	B209 (+) to B207(-)	Between 18,000 to 29,000 Ohms	Machine "off" no input power applied
Main Transformer Primary connections and winding	B201 to B204	Very Low Resistance. Approximately 0.5 Ohms	Machine "off" no input power applied

TABLE F.5 – SWITCH BOARD VOLTAGE MEASUREMENTS

DESCRIPTION	TEST POINTS	EXPECTED READINGS	CONDITIONS
Rectified and filtered input voltage	B209(+) to B207(-)	535VDC to 815VDC depending upon the input voltage 380VAC to 575VAC	Correct input power applied to machine and pre-charge completed. If not correct, perform the ***Input Rectifier Test***
Input supply voltage from Auxiliary Transformer T1 and Rectifier D1	Plug J22 Pin 1 (+) To Plug J22 Pin 2 (-)	50VDC	Correct input power applied to machine and pre-charge completed. If not correct, perform the ***Auxiliary T1 Test***. Also check Rectifier D1 for proper operation.
Fan supply voltage from Auxiliary Transformer T2	Plug J26 Pin 1 To Plug J26 Pin 2	115VAC when fan is not energized	Correct input power applied to machine and pre-charge completed. The fan should be energized when welding current is detected by the output shunt. See the Wiring Diagram

Return to Section TOC
Return to Master TOC

NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

OUTPUT RECTIFIER TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

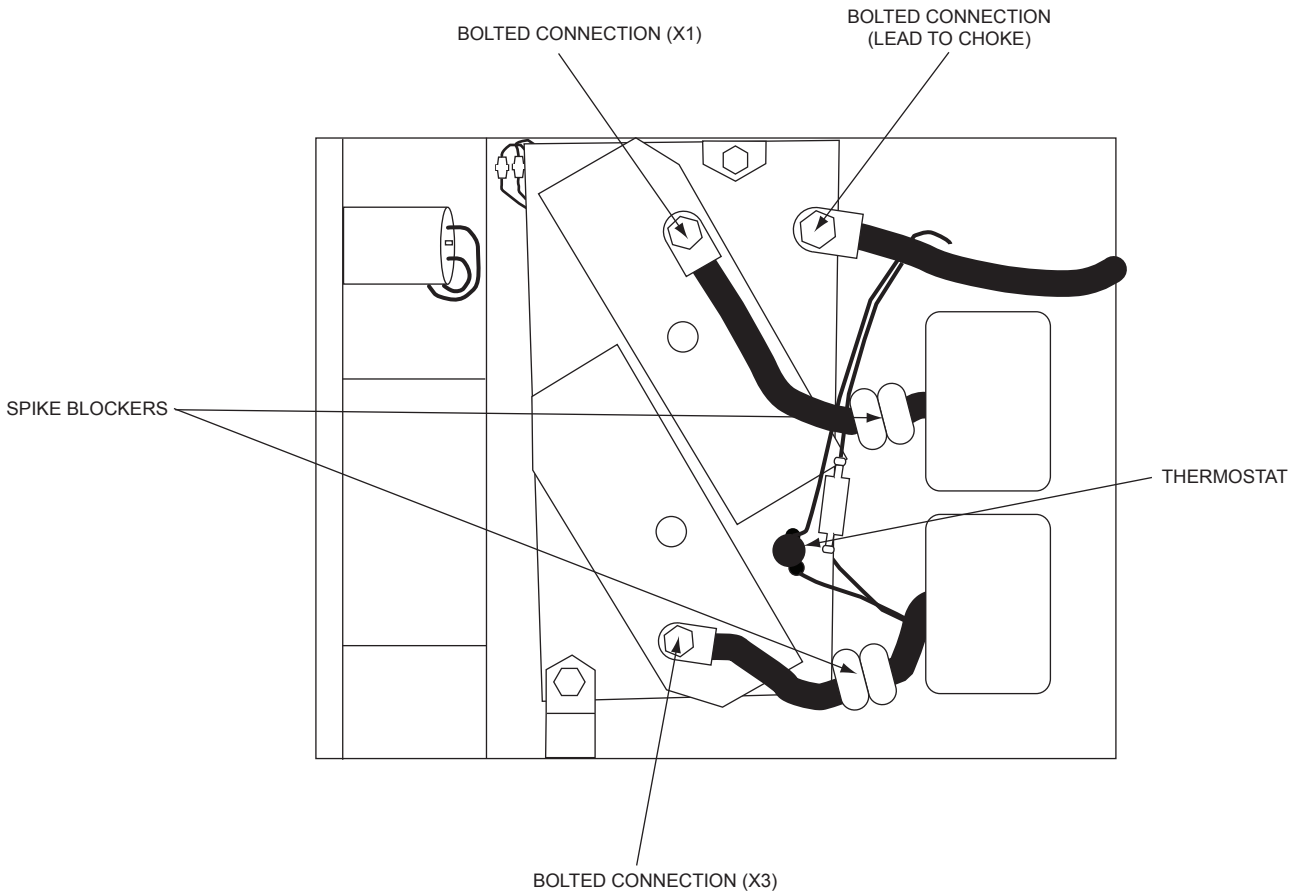
This test will determine if the Output Rectifier Modules are functioning properly.

MATERIALS NEEDED

Digital Multimeter
1/2” Wrench
7/16” Wrench

OUTPUT RECTIFIER TEST (continued)

FIGURE F.13 – OUTPUT RECTIFIER CONNECTIONS



⚠ WARNING

ELECTRIC SHOCK can kill.

- **Disconnect input power before servicing.**
- **Do not operate with covers removed.**
- **Do not touch electrically hot parts.**
- **Only Qualified personnel should perform this maintenance.**

PROCEDURE

1. Remove input power.
2. Perform ***Case Cover Removal Procedure***.
3. Perform the ***DC Link Capacitor Discharge Procedure***.
4. Disconnect the transformer leads (X1 and X3) from the output rectifier assembly terminals and disconnect the lead connecting the heatsink to the output choke. See Wiring Diagram. See Figure F.13.
5. Measure the rectifiers per chart below with your meter set for diode checking.

+ **Probe** (RED)	- **Probe** (BLACK)	**RESULT**
Rectifier PCB Terminal B1 (X1)	Output Rectifier Heatsink	0.2V - 0.7V
Rectifier PCB Terminal B1 (X3)	Output Rectifier Heatsink	0.2V - 0.7V

6. If the tests determine that the diodes are shorted or open replace the output rectifier assembly.
7. When test is complete replace all leads previously removed.

CHOKE TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

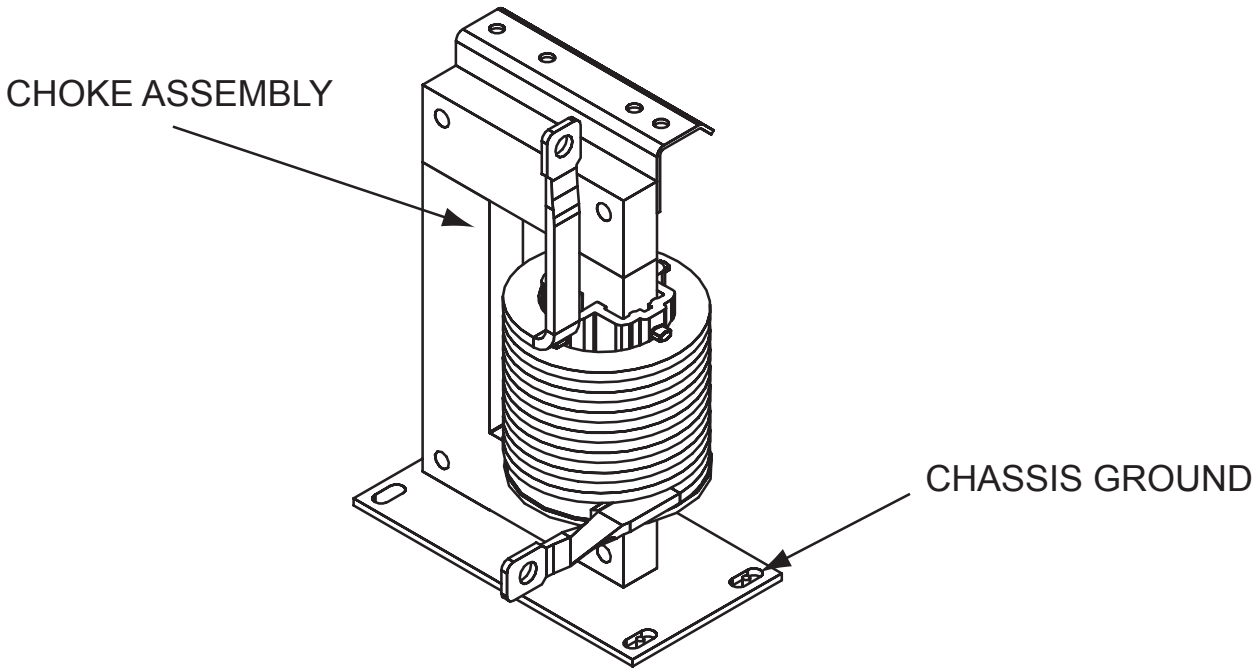
This procedure will determine if the Choke is open, shorted (turn to turn), or grounded.

MATERIALS NEEDED

Volt / Ohmmeter

CHOKE TEST (continued)

FIGURE F.14 – CHOKE



PROCEDURE

1. Remove the Input Power.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***DC Link Capacitor Discharge Procedure***.
4. **OPEN:** No weld output. Check the resistance from the choke lead connected to heat sink of the output rectifier to the positive output terminal. The resistance should be very low (less than one Ohm). See Wiring Diagram. See Figure F.14.
5. **Turn to Turn Short:** Reduced inductance. Arc instability, excessive heating of the choke. Check for physical signs of arcing within the choke assembly. See Figure F.14.
6. **Choke Coil Grounded:** Reduced inductance. Alternate weld current path. Electrically isolate the choke coil by disconnecting both choke leads. (one at the output rectifier and one at the positive output terminal). Check the resistance from the choke coil to chassis ground. It should be at least 500,000 ohms. See the Wiring Diagram. See Figure F.14.

CONTROL BOARD TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

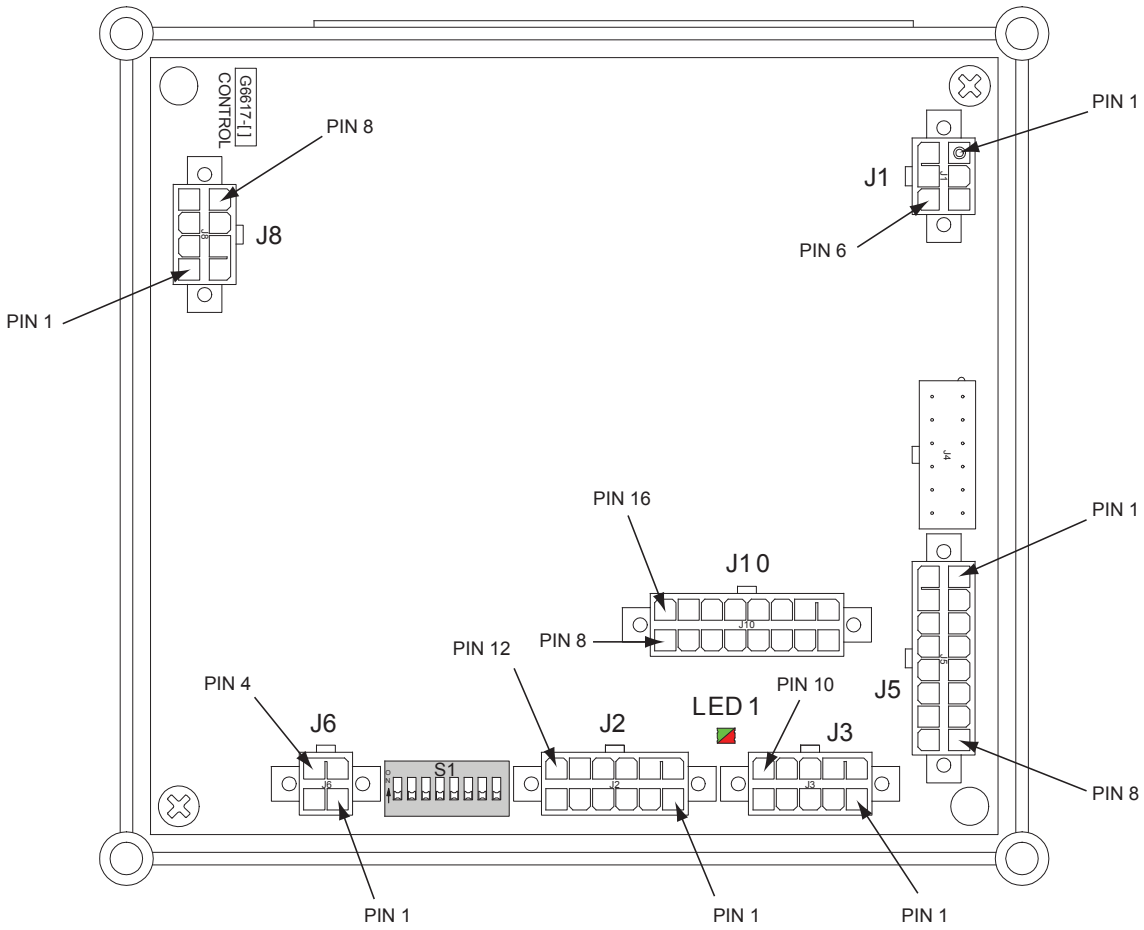
This procedure will determine if the Control Board is receiving the correct input voltage from the D1 Rectifier and if the correct voltages are being created on the Control Board.

MATERIALS NEEDED

Volt / Ohmmeter

CONTROL BOARD TEST (continued)

FIGURE F.15 – CONTROL PC BOARD



PROCEDURE

1. Remove the input power.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***DC Link Capacitor Discharge Procedure***.
4. Apply the correct three phase input voltage to the machine and carefully check the control board voltages per ***Table F.6.*** See Figure F.15.
5. If the correct input voltage is being applied to the control board and any of the output voltages are not correct per ***Table F.6*** the control board may be faulty.
6. For error code information ***See Table F.7***.

CONTROL BOARD TEST (continued)

TABLE F.6 – CONTROL BOARD VOLTAGE TESTS

DESCRIPTION	TEST POINTS	EXPECTED READINGS	CONDITIONS/COMMENT
Input Power from D1 Rectifier	J8 Pin 5 (#82)+ To J8 Pin 2 (#83)-	50VDC	Correct three-phase input power applied to machine
15VDC to Thermostat Circuit	J8 Pin 1 (#225)+ To J8 Pin 2 (#83)-	15VDC	Correct input power from D1 Rectifier applied to Control Board
Thermostat Input	J8 Pin 4 (#224)+ To J8 Pin 2 (#83)-	15VDC	Correct three phase input power applied to machine Thermostats Closed
Power to Display Board	J5 Pin 4 (#359)+ To J5 Pin 8 (#379)-	15VDC	Correct three-phase input power applied to machine
Power for Thermal LED	J3 Pin 2 (#B)+ To J8 Pin 2 (#83)-	15VDC	Correct three-phase input power applied to machine
Mode Switch Power	J10 Pin 8 (#308)+ To J8 Pin 2 (#83)-	10VDC	Correct three-phase input power applied to machine
Power to Output Control	J3 Pin 5 (#251)+ To J3 Pin 1 (#253)-	10VDC	Correct three-phase input power applied to machine. Machine in “Local” control
Power to Arc Control	J5 Pin 15 (#280)+ To J5 Pin 9 (#282)-	10VDC	Correct three-phase input power applied to machine.
Power to Hot Start Switch	J2 Pin 10 (#210)+ To J2 Pin 12 (#212)-	15VDC	Correct three-phase input power applied to machine. Hot Start Off “open”
Power to Local/Remote Switch	J2 Pin 7 (#290)+ To J2 Pin 5 (#289)-	15VDC	Correct three-phase input power applied to machine. Local/Remote switch in remote “open”
Power to Weld Terminals Switch	J10 Pin 16 (#316)+ To J5 Pin 6 (#317)-	15VDC	Correct three-phase input power applied to machine. Weld Terminals Switch in remote “open”
Remote Control Power to the 14 Pin Connector	J2 Pin 2 (#77)+ To J2 Pin 1 (#75)-	10VDC	Correct three-phase input power applied to machine.
Remote Control Power to the 6 Pin Connector	J2 Pin 9 (#277)+ To J2 Pin 4 (#275)-	10VDC	Correct three-phase input power applied to machine.
Remote Trigger Power	J1 Pin 4 (#4)+ To J1 Pin 6 (#2)-	15VDC	Correct three-phase input power applied to machine.

Return to Section TOC
Return to Master TOC

CONTROL BOARD TEST (continued)

TABLE F.7 – CONTROL PC BOARD FUNCTIONS & ERROR CODES

G6617 CONTROL P.C. BOARD		
LED#	COLOR	FUNCTION
1	GREEN	STATUS “OK”
1	RED	STATUS “ERROR” (CHECK CODE FOR SPECIFIC ERROR)

ERROR CODE #	INDICATION
31 Primary Overcurrent Error	Excessive primary current present. May be related to switchboard hardware or output rectifier failure.
32 Capacitor Voltage Error	Excessively low or high voltage on the capacitor. May be caused by improper input configuration, or an open/short circuit in the primary side of the machine.
36 Thermal Error	Indicates over temperature. Usually accompanied by Thermal LED. Check fan operation. Be sure process does not exceed duty cycle limit of the machine.
54 Secondary Overcurrent Error	A high level of output current has caused an overload. When this fault occurs, the machine output will be turned OFF.
58 Improper Supply Voltage	The supply voltage to the switchboard was found to be outside of the allowable range. May be caused by and improper input voltage configuration.
213 CAN Communication Error	Loss of CAN communication between the switchboard and control board. Or corrupt data between control board and switchboard.
Other	Error codes that are not listed are defined as fatal errors. These codes generally indicate internal errors on the switchboard. If cycling power does not clear the error, replace the switchboard.

CONTROL BOARD TEST (continued)

FUNCTIONS

Receives input voltage from 36 Volt auxiliary transformer, T1.

Reads the user selected weld settings from the front panel knobs and switches.

Used to put machine into test modes.

Communicates the user settings to the switch-board.

Reads the thermostat inputs.

Communicates output settings to the display board.

Test modes can be accessed via switch and knob positions upon start up. Details are provided in the Trouble Shooting section.

ERROR LOGS

The left display reads “E00” to “E14”, and the right display reads a number that represents the error that has been logged into memory.

These logged errors are stored in flash memory during power down and will be retained in memory until over written or cleared.

There are 15 memory slots for logging errors. E00 represents the most recent error and E14 would be the oldest.

To clear the error log, Toggle the Local/Remote switch to the Remote position. The left display reads “Err” and the right display reads “---”. When the switch is toggled back to the Local position, the error logs will have been cleared and the display will go back to normal error log display operation.

Multiple consecutive errors of the same type will not be recorded.

NOTES

F-46

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

DISPLAY BOARD TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

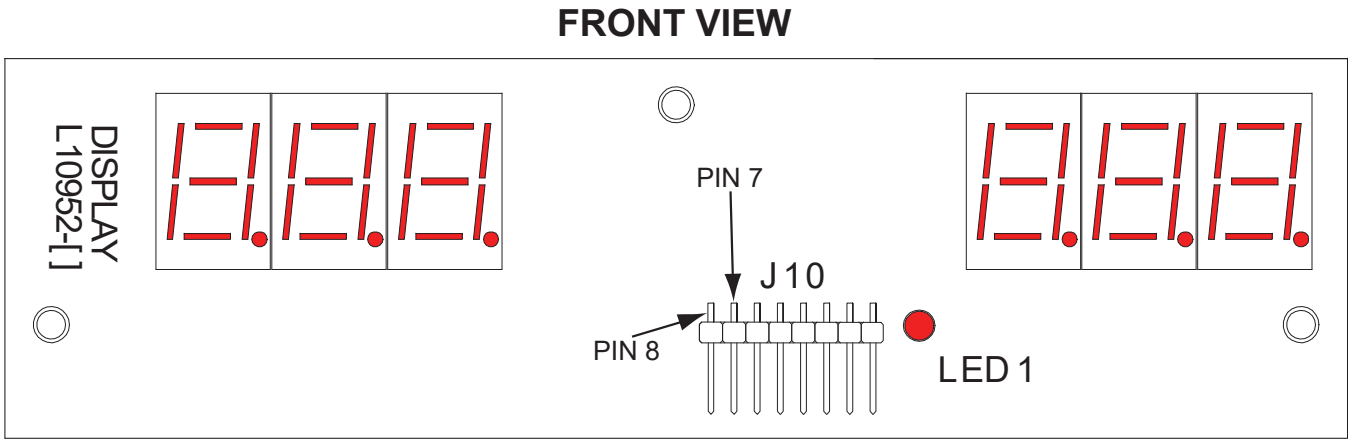
This procedure will determine if the Display Board is receiving the correct input power from the Control Board.

MATERIALS NEEDED

Volt/Ohmmeter

DISPLAY BOARD TEST (continued)

FIGURE F.16 – DISPLAY BOARD



PROCEDURE

1. Remove the input power.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***DC Link Capacitor Discharge Procedure***.
4. Apply the correct three phase input power and carefully check for 15VDC at J10 pin 7 (Lead #359+) to J10 Pin 8 (Lead #379-). See Figure F.16. See Wiring Diagram.
5. If the 15VDC is present at the display board and the display board will not power-up the display board may be faulty.
6. If the 15VDC is not present at the display board. Check for 15VDC at the control board plug J5 Pin 4 (Lead #359+) to J5 Pin 8 (Lead #379-). See Wiring Diagram.
7. If the 15VDC is present at the control board but not at the display board check the continuity of leads #359 and #379. See Wiring Diagram.
8. If the 15VDC is not present at the control board (Plug J5) the control board may be faulty.
9. Also check the continuity of the signal leads between the control board plug J5 and J10 at the display board.

THERMOSTAT TEST - THERMAL PROTECTION

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if a Thermostat is intermittently opening or is fully open.

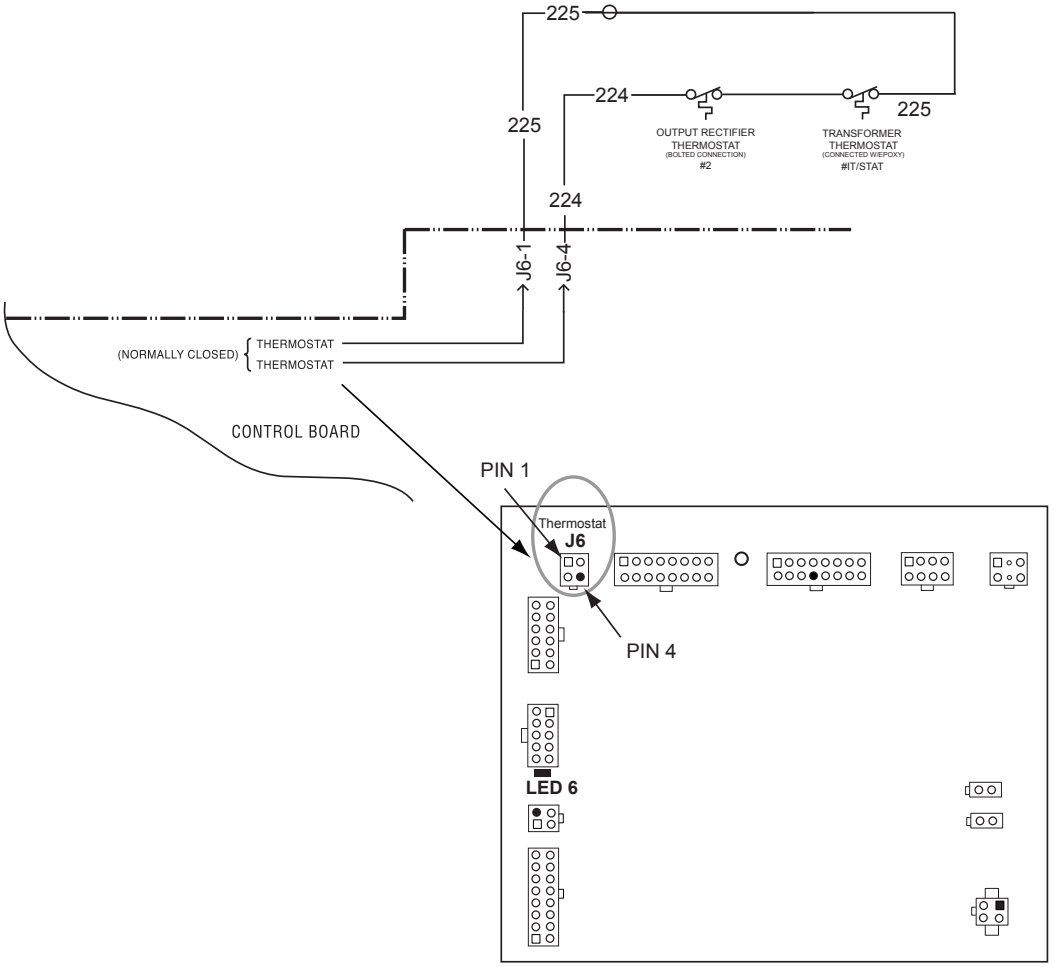
MATERIALS NEEDED

Volt / Ohmmeter

Return to Section TOC
Return to Master TOC

THERMOSTAT TEST - THERMAL PROTECTION (continued)

FIGURE F.17 – THERMOSTAT CIRCUIT



⚠ WARNING

ELECTRIC SHOCK can kill.

- **Disconnect input power before servicing.**
- **Do not operate with covers removed.**
- **Do not touch electrically hot parts.**
- **Only Qualified personnel should perform this maintenance.**

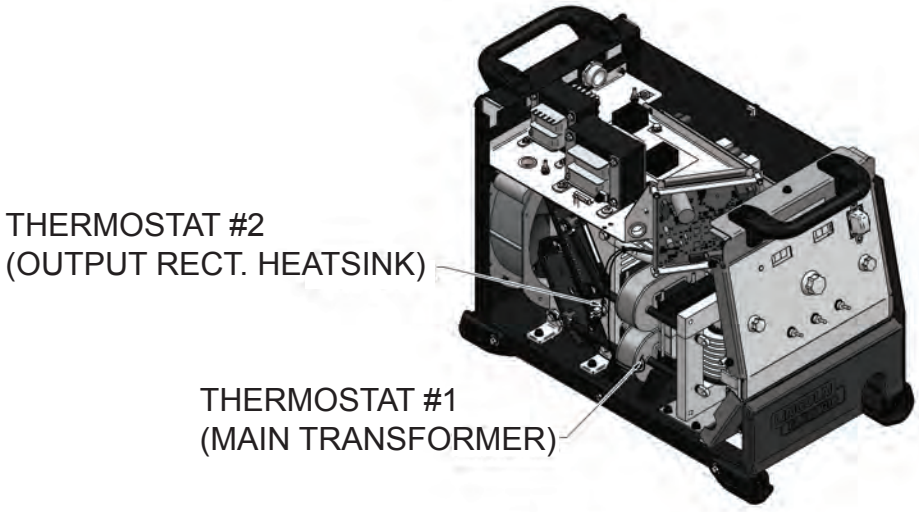
PROCEDURE

1. Remove input power.
2. Perform ***Case Cover Removal Procedure***.
3. Perform the ***DC Link Capacitor Discharge Procedure***.
4. Locate plug J6 on the control board. See Figure F.17.
5. Remove the plug from the control board and check the continuity between Pin 1 (Lead #225) and Pin 4 (Lead #224). See Figure F.17. The resistance should be very low. - Less than one ohm.
6. If the resistance is greater than one ohm check the leads connections, and the two thermostats. See ***Figure F.18*** for locations.

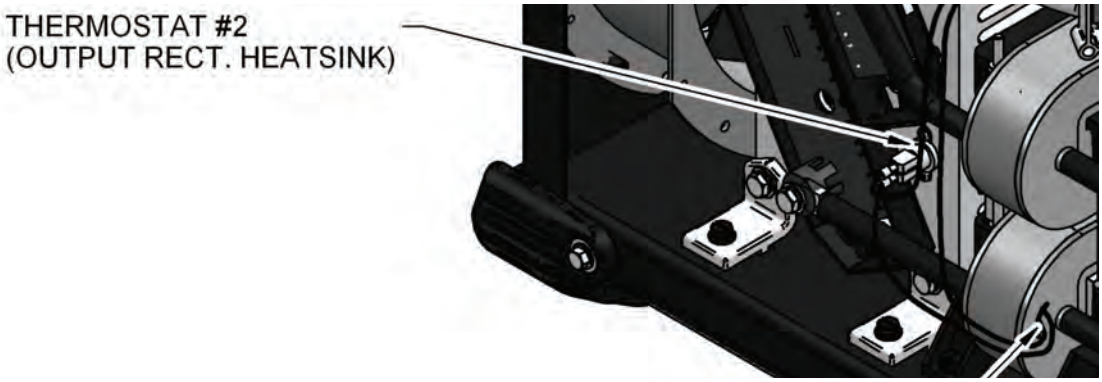
Return to Section TOC
Return to Master TOC

THERMOSTAT TEST - THERMAL PROTECTION (continued)

FIGURE F.18 – THERMOSTAT #2



LEFT SIDE VIEW OF MACHINE



NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

CASE COVER REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Case Sheet Metal Covers.

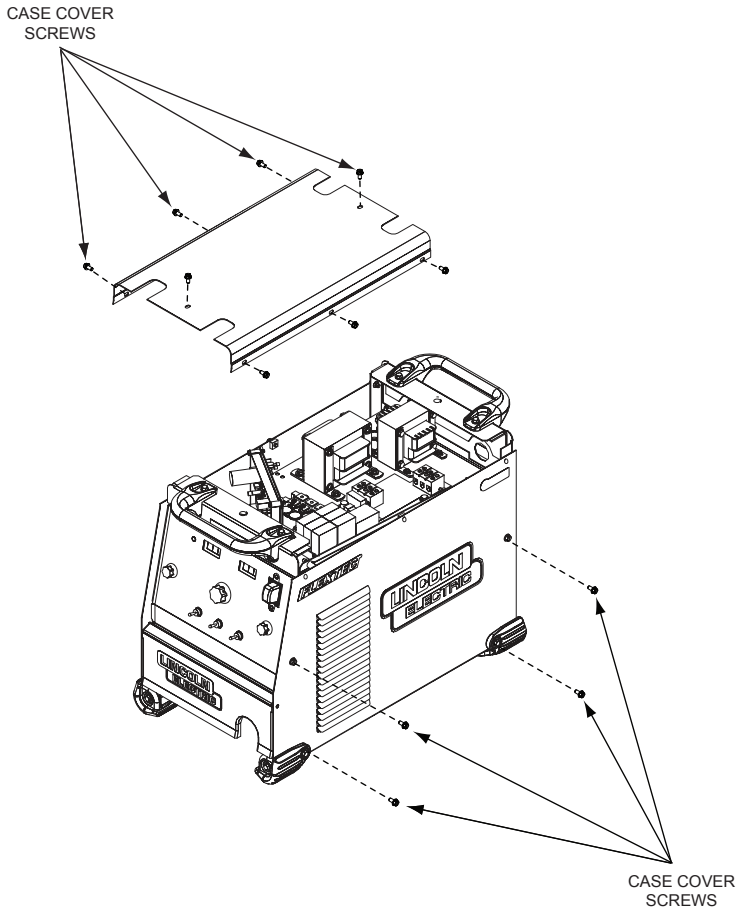
MATERIALS NEEDED

3/8" Wrench

Return to Section TOC
Return to Master TOC

CASE COVER REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.19 – CASE COVER SCREW LOCATIONS



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Disconnect input power before servicing.**
- **Do not operate with covers removed.**
- **Do not touch electrically hot parts.**
- **Only Qualified personnel should perform this maintenance.**

1. Disconnect input power.
2. Turn on/off switch to off position (down).
3. Remove 8 screws from the roof, and remove roof. See Figure F.19.
4. Remove remaining screws from case sides, and screws securing rubber corners (4 screws total). Remove case sides. See Figure F.19.
5. Access to the main switchboard is made by removing the top and right side panels.
6. Access to the output rectifier assembly, transformer, and choke is made by removing the top and left side panels.
7. When servicing is complete replace the case covers.

Return to Section TOC
Return to Master TOC

INPUT BOARD REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid in the removal and replacement of the Input Board.

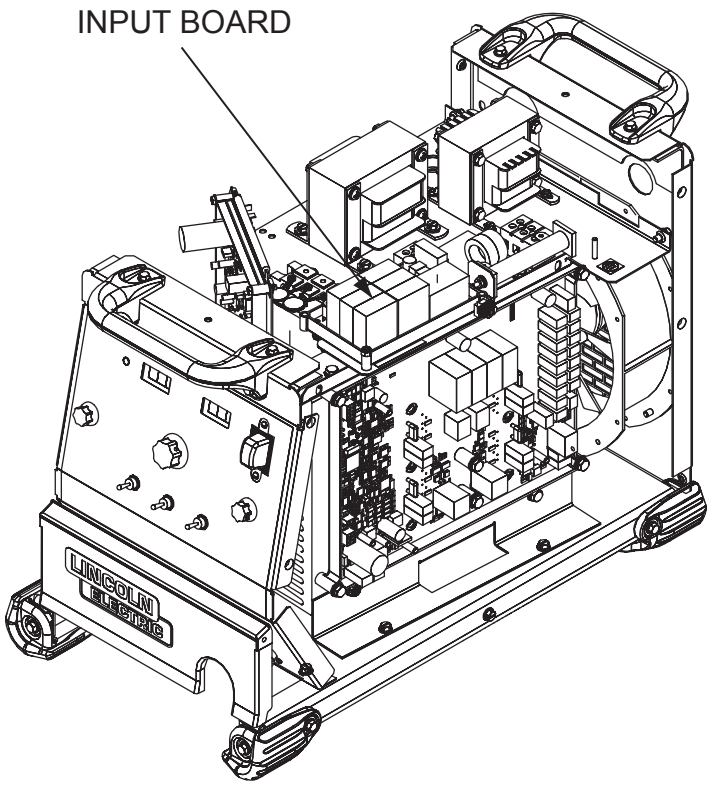
MATERIALS NEEDED

3/8" Nutdriver
Silicon Sealant

Return to Section TOC
Return to Master TOC

INPUT BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.20 – INPUT BOARD LOCATION



PROCEDURE

1. Disconnect the input power to the Flextec 450 machine.
2. Perform the ***Case Cover Removal Procedure***
3. Perform the ***DC Link Capacitor Discharge Procedure***.
4. Locate the Input Board. See Figure F.20.
5. Remove Plug J60 from the Input Board.
6. Using a 3/16 inch Allen wrench, remove the three screws, lock washers, and flat washers securing leads 209 and 209B, 207 and 207B, 209A and 209C to the Input Board connection points. Mark lead placement for reassembly. See the Wiring Diagram. Note the silicon sealant will have to be removed.
7. Using the 3/8 inch wrench, remove the two nuts securing the Input Board to the two mounting studs.
8. Clear the leads and carefully remove the Input Board.

Return to Section TOC
Return to Master TOC

INPUT BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

REPLACEMENT PROCEDURE

1. Place the new Input Board onto the mounting studs. Secure the Input Board using the two nuts previously removed.
2. Replace Plug J60 onto the Input Board.
3. Using the three screws, lock washers, and flat washers assemble leads 209 and 209B, 207 and 207B, 209A and 209C to the Input Board connection points. Make certain the correct leads are connected to the correct connections points. See the Wiring Diagram. Replace the silicon sealant on the connections.
4. Replace the case covers previously removed.

Return to Section TOC
Return to Master TOC

NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

CONTROL BOARD REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid in the removal and replacement of the Control Board.

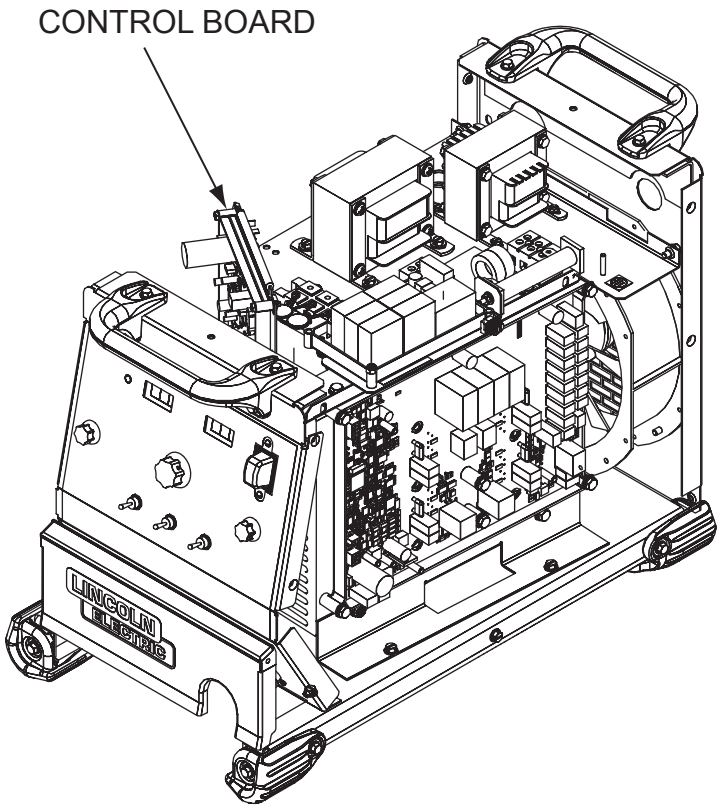
MATERIALS NEEDED

5/16" Nutdriver

Return to Section TOC
Return to Master TOC

CONTROL BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.21 – CONTROL BOARD LOCATION



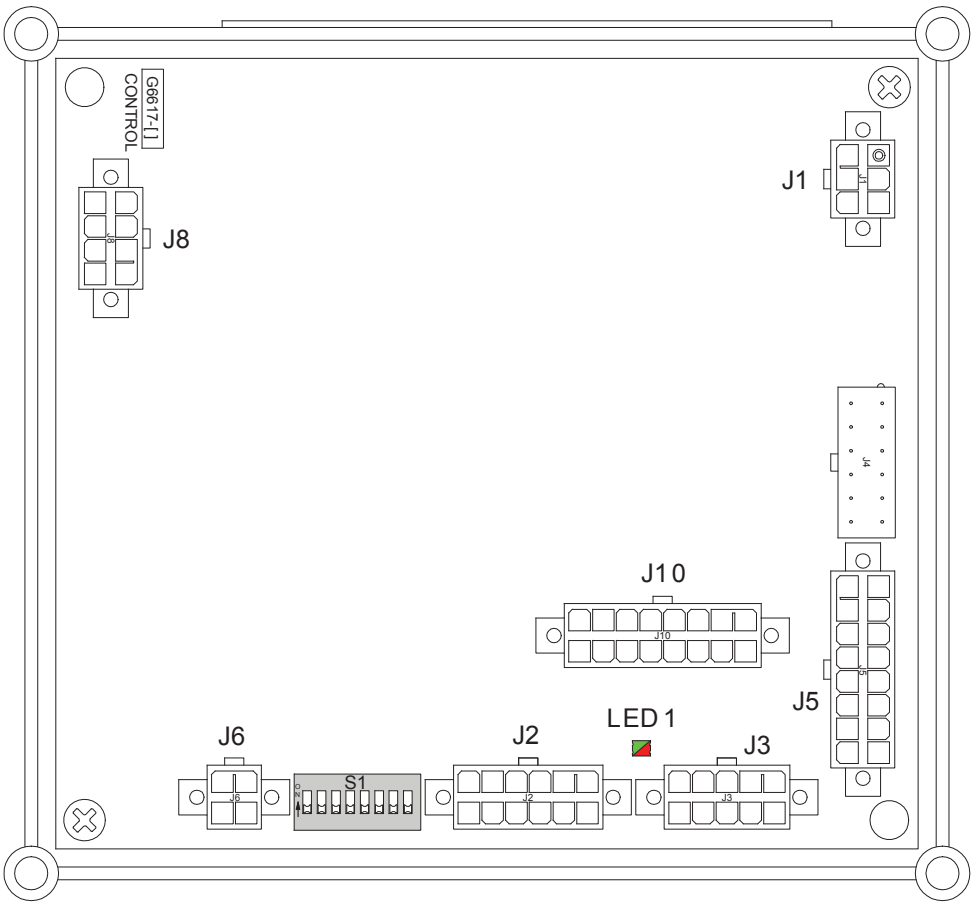
PROCEDURE

1. Disconnect the input power to the Flextec 450 machine.
2. Perform the ***Case Cover Removal Procedure.***
3. Perform the ***DC Link Capacitor Discharge Procedure***.
4. Locate the Control Board. See Figure F.21.
5. Locate and carefully remove the seven molex type plugs from the Control Board. Label plugs for reassembly. ***See Figure F.22***.
6. Using the 5/16 inch nutdriver, remove the two screws mounting the Control Board to the baffle assembly.
7. Clear all leads and remove the Control Board.

Return to Section TOC
Return to Master TOC

CONTROL BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.22 – CONTROL BOARD PLUG LOCATIONS



REPLACEMENT PROCEDURE

1. Mount the new Control Board using the two screws previously removed.
2. Connect the seven molex type plugs previously removed. See Figure F.22. and the Wiring Diagram.
3. Make sure the dip switch settings are all in off position. (Down)
4. Replace the case covers.

NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

DISPLAY BOARD REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid in the removal and replacement of the Display Board.

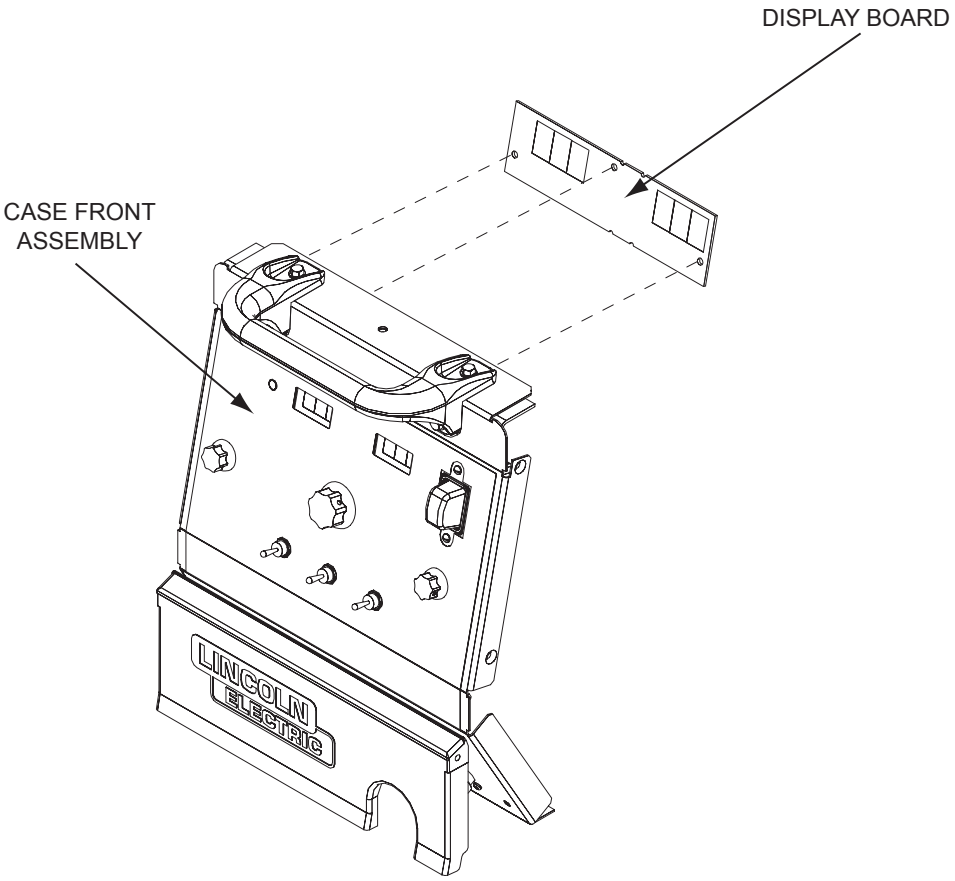
MATERIALS NEEDED

Screwdriver

Return to Section TOC
Return to Master TOC

DISPLAY BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.23 – DISPLAY BOARD LOCATION



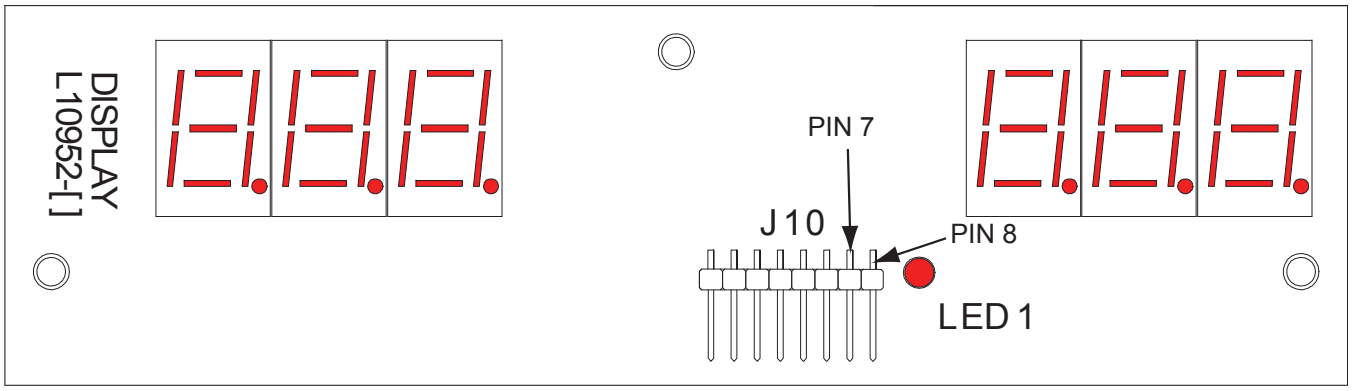
PROCEDURE

1. Disconnect the input power to the Flextec 450 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***DC Link Capacitor Discharge Procedure***.
4. Locate the Display Board. See Figure F.23.
5. Gently remove the Display Board from the three mounting pins.
6. Remove the J10 plug from the Display Board. ***See Figure F.24***.

Return to Section TOC
Return to Master TOC

DISPLAY BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.24 – DISPLAY BOARD



REPLACEMENT PROCEDURE

1. Carefully connect J10 into the new Display Board.
2. Align the Display Board with the three mounting pins and slide the Display Board into place.
3. Replace the case covers previously removed.

NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SWITCH BOARD REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

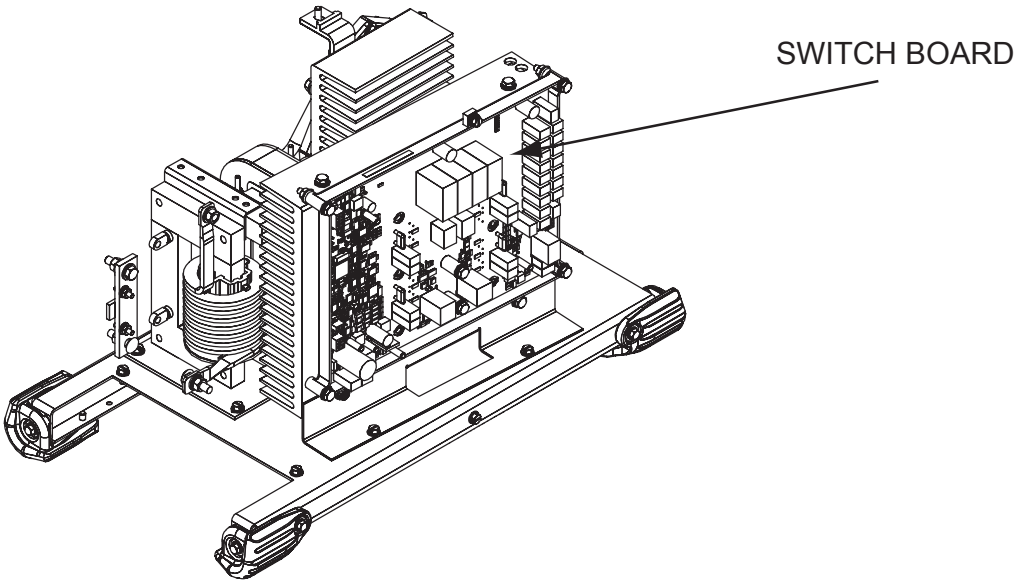
This procedure will aid the technician in the removal and replacement of the Switch Board.

MATERIALS NEEDED

7/16" Wrench
#25 Torx Bit or Wrench
Cardstock or Paper Towels
Rag and Alcohol
Dow Thermal Compound
Torque Wrench (40-48 in-lb)

SWITCH BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.25 – SWITCH BOARD LOCATION



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

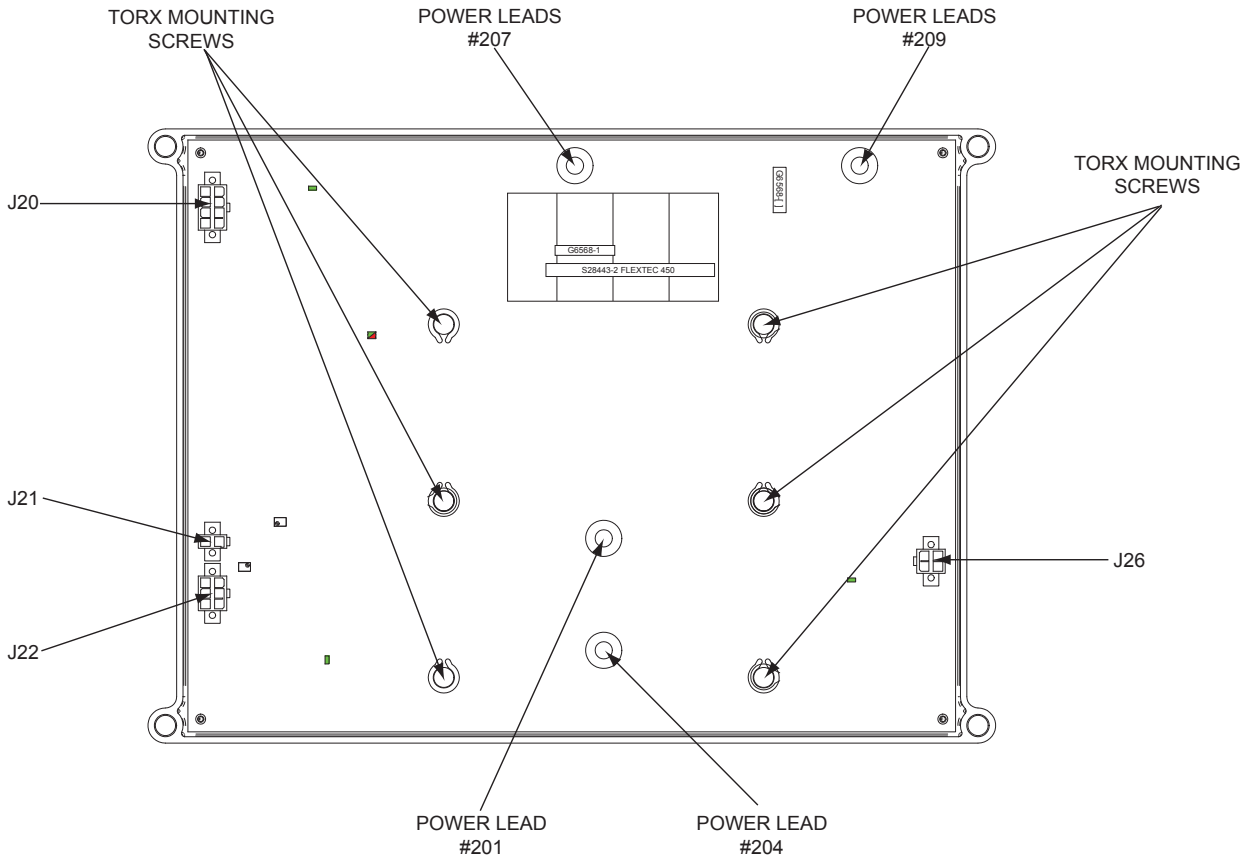
- **Disconnect input power before servicing.**
- **Do not operate with covers removed.**
- **Do not touch electrically hot parts.**
- **Only Qualified personnel should perform this maintenance.**

1. Remove input power to the Flextec 450 machine.
2. Perform ***Case Cover Removal Procedure***.
3. Perform the ***DC Link Capacitor Discharge Procedure***.
4. Locate the Switch Board. See Figure F.25.

Return to Section TOC
Return to Master TOC

SWITCH BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.26 – SWITCH BOARD LEAD LOCATIONS

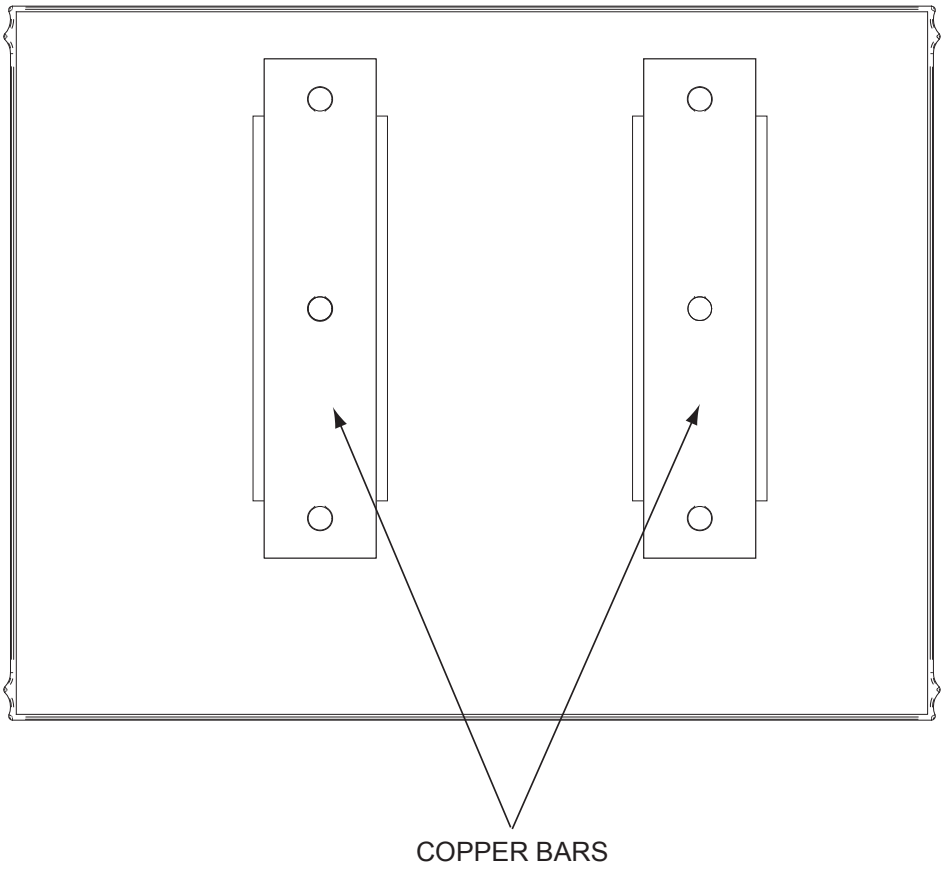


5. Disconnect the four plugs (J20, J21, J22, J26) from the switch board. See Figure F.26.
6. Using the 7/16" wrench, remove the bolts, lock washers and flat washers securing leads #207, #209, #201 and #204 to the switch board. See Figure F.26. **Note lead placement for re-assembly**.
7. Using the #25 Torx wrench, remove the six screws and lock washers mounting the Switch Board to the heat sink. See Figure F.26.
8. Carefully and gently remove the Switch Board from the heat sink.
9. Remove heavy amounts of thermal compound off of heatsink. DO NOT use a metal scraper or anything that can damage the surface of the heatsink. We suggest using cardstock or paper towels.
10. Remove remaining amounts of compound with a rag and alcohol

Return to Section TOC
Return to Master TOC

SWITCH BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.27 – MODULE BAR GREASE REMOVAL AND APPLICATION POINTS



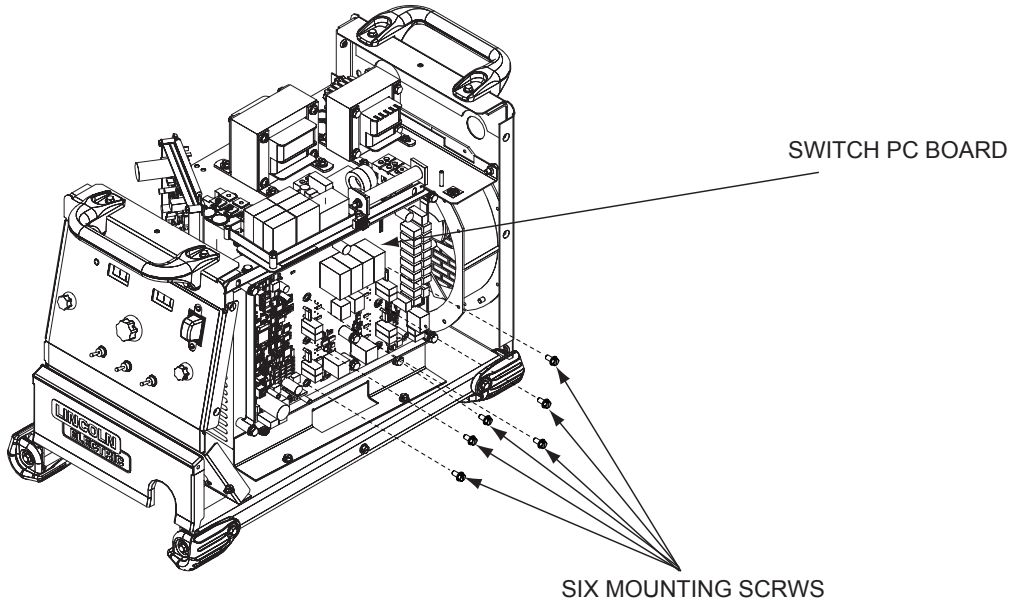
REPLACEMENT PROCEDURE

1. Lay the Flextec 450 on its side so that the heatsink is in a horizontal position. This simplifies the mounting of the replacement switch board.
2. Clean the copper bars on the back side of the switch board with a rag and alcohol. These mating surfaces to the heatsink must be clean and free of debris to ensure good contact and proper thermal transfer. See Figure F.27.
3. Apply a thin layer of thermal compound (Dow Corning 340), (approximately .010" thick), to the copper bars. Cover the bars completely. ONLY use the compound supplied with the replacement board. Substitute compounds may not have the proper thermal transfer properties and can cause the components to fail due to excessive operating temperatures.
   NOTE: Keep the compound away from the mounting holes. Compound is not permitted on the screw threads.

Return to Section TOC
Return to Master TOC

SWITCH BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

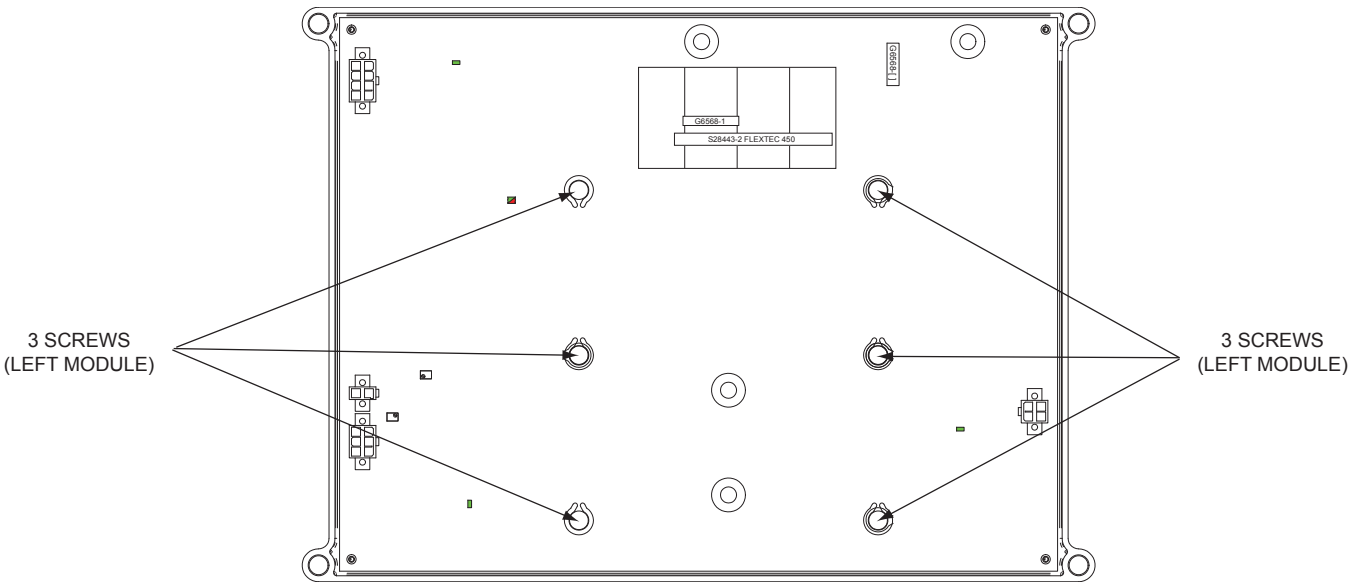
FIGURE F.28 – SWITCH PC BOARD INSTALLATION



4. Position the switch board onto the heatsink. Align the mounting holes in the copper bars with the mounting holes on the heatsink prior to making contact between the heatsink and the copper bars. This will minimize the amount of movement of the switch board after contact and help ensure the thermal compound interface. See Figure F.28.

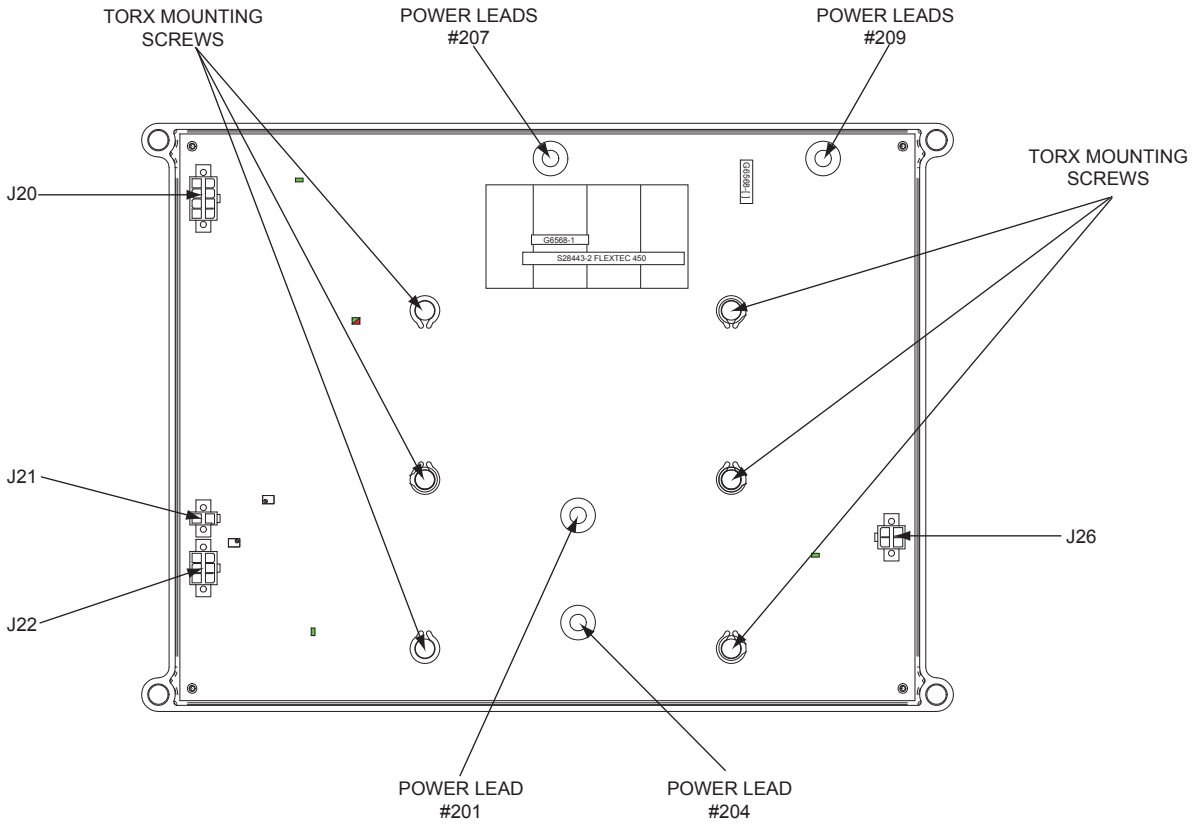
5. Hand tighten the 6 mounting screws. Then, torque each screw to 40-48 in-lbs. This torque is important for a good thermal interface between the switch board and the heatsink. See Figure F.29.

FIGURE F.29 – SWITCH PC BOARD BOLTED CONNECTIONS



SWITCH BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.30 – SWITCH BOARD LEAD LOCATIONS



6. Attach power leads #207 and #209 to the switch board. Torque the connection to 40-48 in-lbs.
7. Attach power leads #201 and #204 to the switch board. Torque the connection to 40-48 in-lbs.

NOTE: It is very important that leads are attached to their corresponding power terminal. The power terminals on the switch board are identified with the lead numbers. Misconnection will cause switch board failure.

8. Plug in the 4 molex connectors from the wiring harness to their corresponding molex header on the switch board.
9. Replace previously removed case covers.

Return to Section TOC
Return to Master TOC

OUTPUT RECTIFIER REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Output Rectifier.

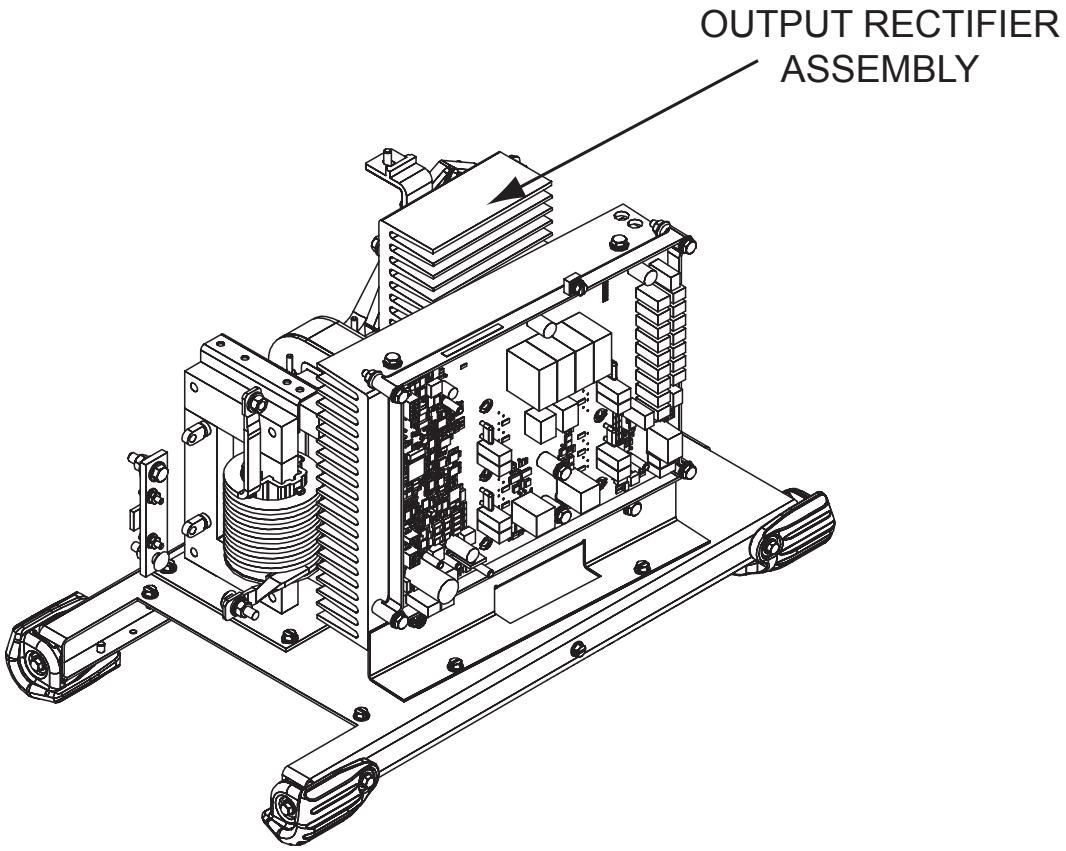
MATERIALS NEEDED

1/2” Wrench
3/8" Wrench
7/16" Wrench
Dow 340 Thermal Compound
Torque Wrench

Return to Section TOC
Return to Master TOC

OUTPUT RECTIFIER REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.31 – OUTPUT RECTIFIER BOLT LOCATIONS



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Disconnect input power before servicing.**
- **Do not operate with covers removed.**
- **Do not touch electrically hot parts.**
- **Only Qualified personnel should perform this maintenance.**

1. Remove input power.
2. Perform ***Case Cover Removal Procedure***.
3. Perform the ***DC Link Capacitor Discharge Procedure***.
4. Locate the Output Rectifier Assembly. See Figure F.31.
5. Using the 1/2” wrench, remove the bolt, lock washer and flat washers securing the choke lead to the output rectifier heat sink. ***See Figure F.32***. See the Wiring Diagram.
6. Using the 7/16” wrench, remove the bolts, lock washers and flat washers securing the two transformer leads (X1 and X3) to the output rectifier modules. ***See Figure F.32***.
7. Remove the two leads from the output heat sink thermostat. ***See Figure F.32***.
8. Using the 7/16” wrench, remove the three bolts, lock washers and flat washers mounting the output rectifier assembly to the three plastic mounting brackets. ***See Figure F.33***.
9. Using the 3/8” wrench, remove the bottom two plastic mounting brackets from the machine base.
10. Carefully remove the output rectifier assembly from the machine.

Return to Section TOC
Return to Master TOC

OUTPUT RECTIFIER REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.32 – OUTPUT RECTIFIER BOLT LOCATIONS

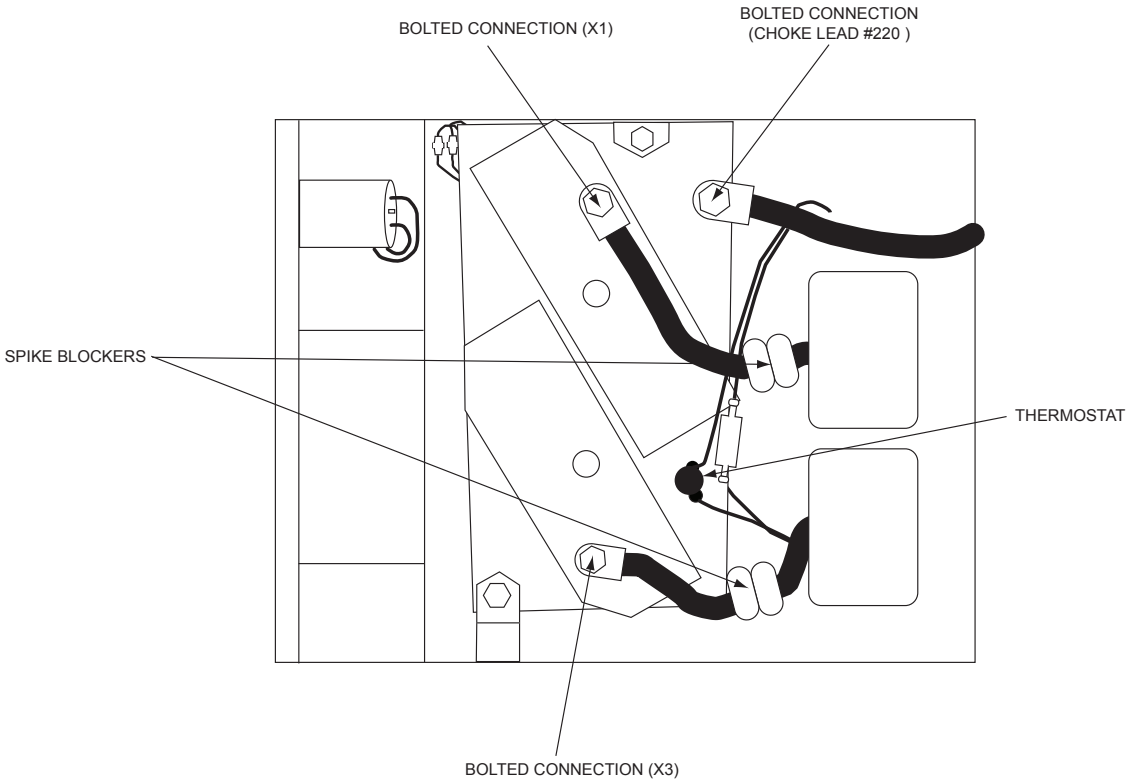
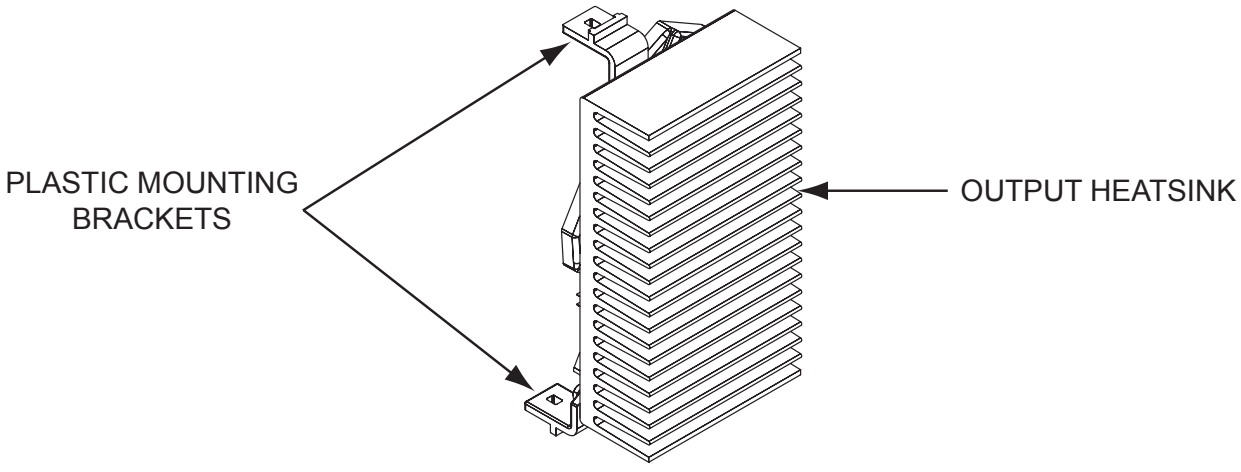


FIGURE F.33 – OUTPUT RECTIFIER PLASTIC MOUNTING BRACKETS



Return to Section TOC
Return to Master TOC

OUTPUT RECTIFIER REMOVAL AND REPLACEMENT PROCEDURE (continued)

REPLACEMENT PROCEDURE

1. Carefully position the new Output Rectifier assembly into place.
2. Using the two bolts and washers previously removed assembly the bottom two plastic mounting brackets onto the machine base.
3. Using the three bolts and washers previously removed assemble the output rectifier assembly onto the three plastic mounting brackets. Tighten all bolts.
4. Connect the two thermostat leads.
5. Apply a thin coating (0.010) of Dow Corning 340 compound to the mating surfaces of the transformer leads (X1 and X3) and the choke lead.
6. Assemble the three leads to the correct connection points using the bolts and washers previously removed. ***See Figure F.32***.
7. Hand tighten the bolts. Then torque each bolt to 40-48 inch pounds. The torque is important for good thermal and electrical contact between the output rectifier, the choke and the transformer.
8. Replace the case covers.

Return to Section TOC
Return to Master TOC

Retest a machine:

If it is rejected under test for any reason that requires you to remove any part which could affect the machine's electrical characteristics.

OR

If you repair or replace any electrical components.

INPUT IDLE AMPS AND WATTS

Input Volts/Hertz	Maximum Idle Amps	Maximum Idle KW
380/50 460/60 575/60	2.1 2.0 1.8	72 Watts (MAX.) 72 Watts (MAX.) 72 Watts (MAX.)

MAXIMUM OUTPUT VOLTAGES

Input Volts/Hertz	Output Terminals - No load
380/50 460/60 575/60	50-70 VDC MAX.

TEST AFTER REPAIR

FLEXTEC – CONSTANT CURRENT GRID LOAD TESTING

Dip Switch #4 in the ON position; All other Dip Switch positions OFF.
Switches and potentiometers:

Weld Terminals On/Remote Switch – REMOTE Position
Process Selection Switch – GTAW Position
Local / Remote Switch – Selects whether the local output control potentiometer or the remote 6 pin connector potentiometer will be used.
Output Control Potentiometer – Controls Current Set (20 to 500 Amps) when Local / Remote switch is in LOCAL position.
Arc Control Potentiometer - Fully Counter-Clockwise
Hot Start Switch – OFF position.
14 pin feeder connector – Not connected
6 pin remote connector – Controls Current Set (20 to 500 Amps) when Local / Remote switch is in REMOTE position.

Turn on Power. Allow at least 10 seconds after power on before running this test to allow for initialization of the switch board.

The right display will read "Cur", and the left display will show the preset for the current set.
Adjust the output control knob to the preset current desired for testing.
Switch the Weld Terminals switch to the ON position (with the machine properly loaded by a grid load), and the machine will show the actual voltage and current on the display.

Switch the Weld Terminals Switch to the REMOTE position, and the output will turn off.

FLEXTEC – CONSTANT VOLTAGE GRID LOAD TESTING

Dip Switch #4 in the ON position; All other Dip Switch positions OFF.
Switches and potentiometers:

Weld Terminals On/Remote Switch – REMOTE Position
Process Selection Switch – CV Position
Local / Remote Switch – Selects whether the local output control potentiometer or the remote 6 pin connector potentiometer will be used.
Output Control Potentiometer – Controls Voltage Set (10.0 to 45.0 Volts) when Local / Remote switch is in LOCAL position.
Arc Control Potentiometer – Fully Clockwise
Hot Start Switch – OFF position.
14 pin feeder connector – Not connected
6 pin remote connector – Controls Voltage Set (10.0 to 45.0 Volts) when Local / Remote switch is in REMOTE position.

Turn on Power. Allow at least 10 seconds after power on before running this test to allow for initialization of the switch board.

The left display will read "U", and the right display will show the preset for the voltage set.
Adjust the Output Control knob or the 6 pin remote potentiometer to set the preset voltage desired for testing.
Switch the Weld Terminals switch to the ON position (with the machine properly loaded by a grid load), and the machine will show the actual voltage and current on the display.
When the Output Control potentiometer is changed quickly while operating, the output may "drop out" during a transition to a new set voltage. This is normal for the special voltage grid load test mode.

Switch the Weld Terminals Switch to the REMOTE position, and the output will turn off.

Test results will point to area of concern, or will indicate unit is fully functional.

Return to Section TOC
Return to Master TOC

NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

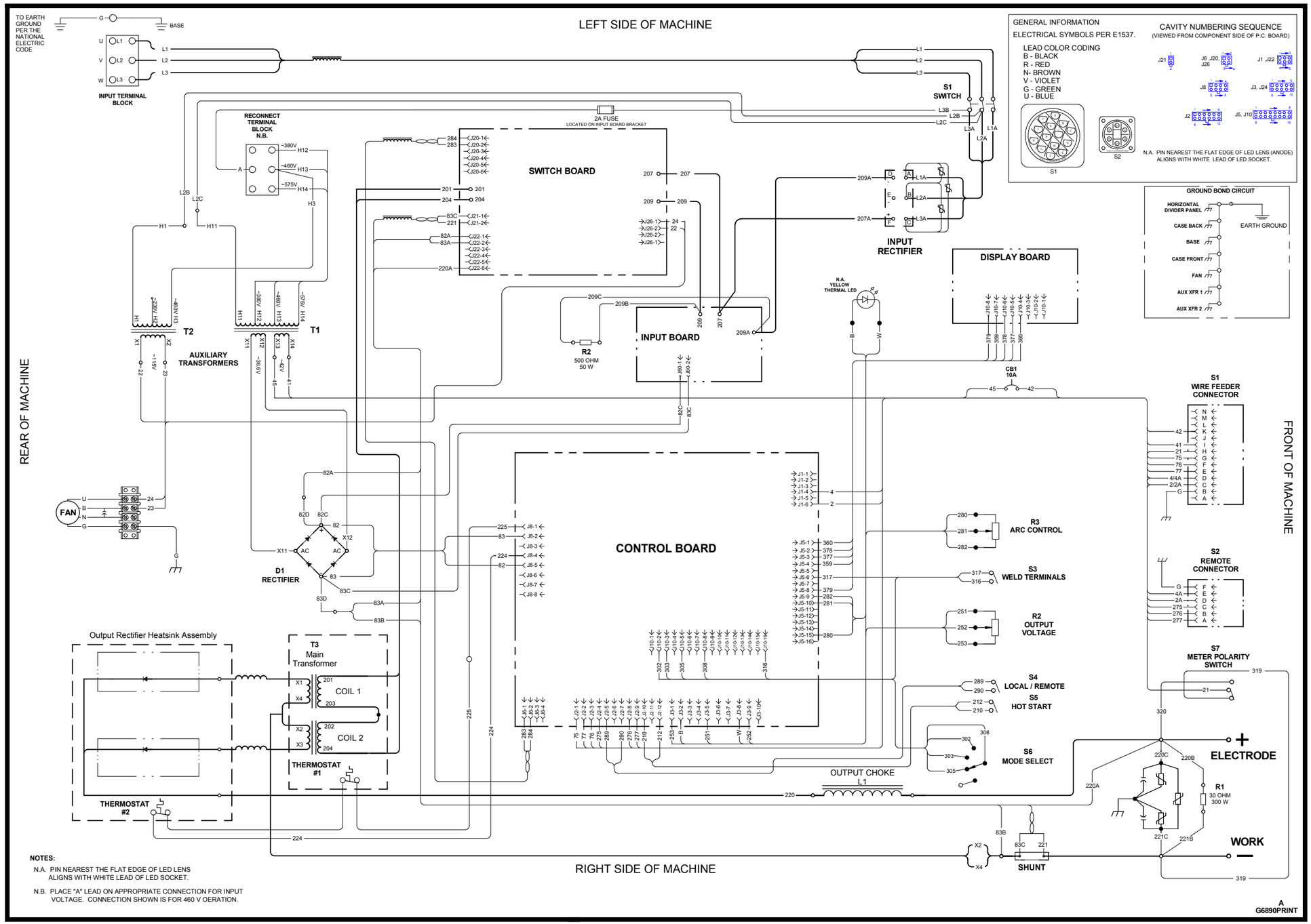
TABLE OF CONTENTS - DIAGRAM SECTION

*** NOTE:** Many PC Board Assemblies are now totally encapsulated, surface mounted and or multi-layered and are therefore considered to be unserviceable. Assembly drawings of these boards are no longer provided.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

WIRING DIAGRAM - (CODE 11626) (G6890)

FLEXTEC 450 WIRING DIAGRAM

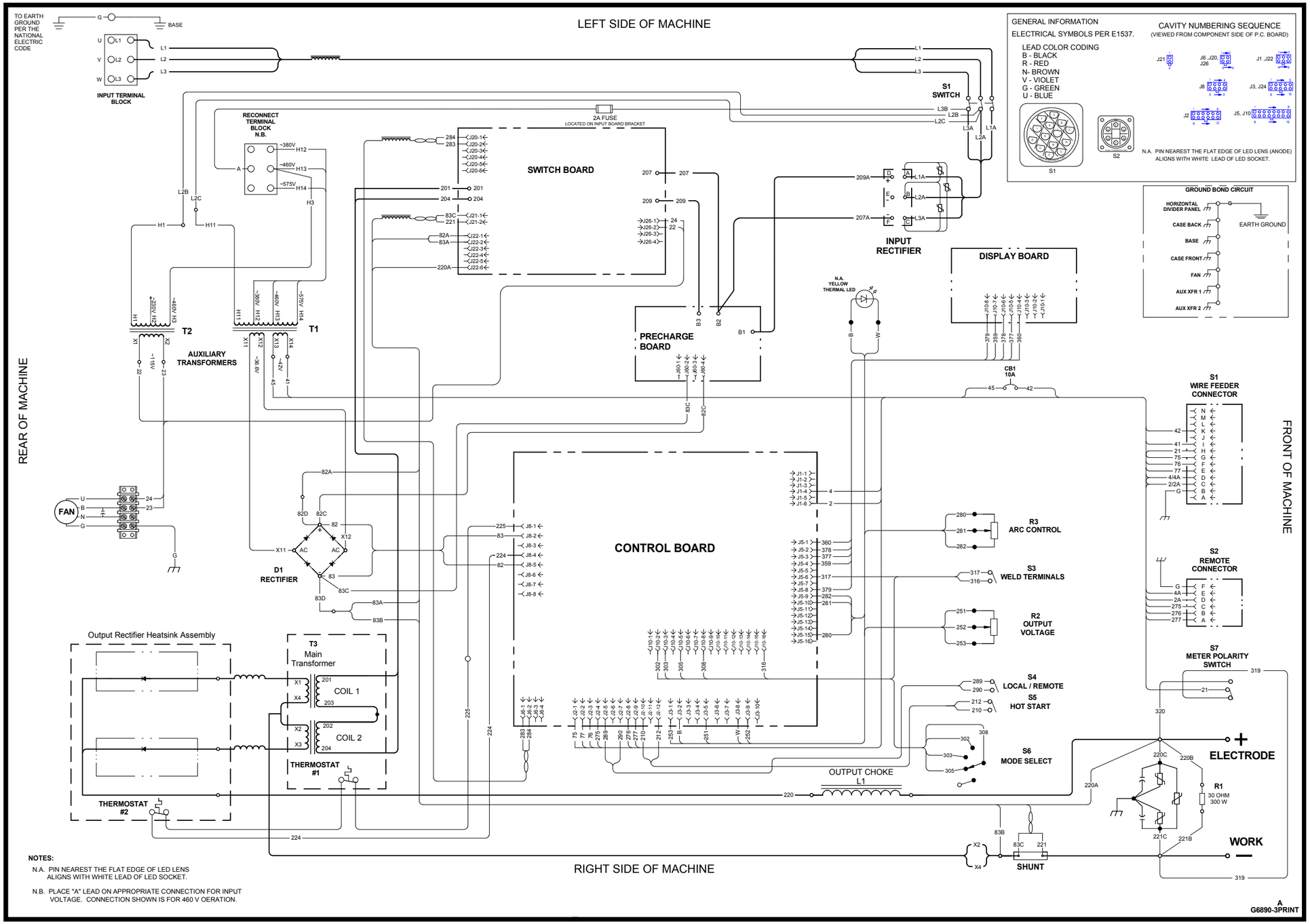


NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

Return to Section TOC
Return to Master TOC

WIRING DIAGRAM - (CODE 11754) (G6890-3)

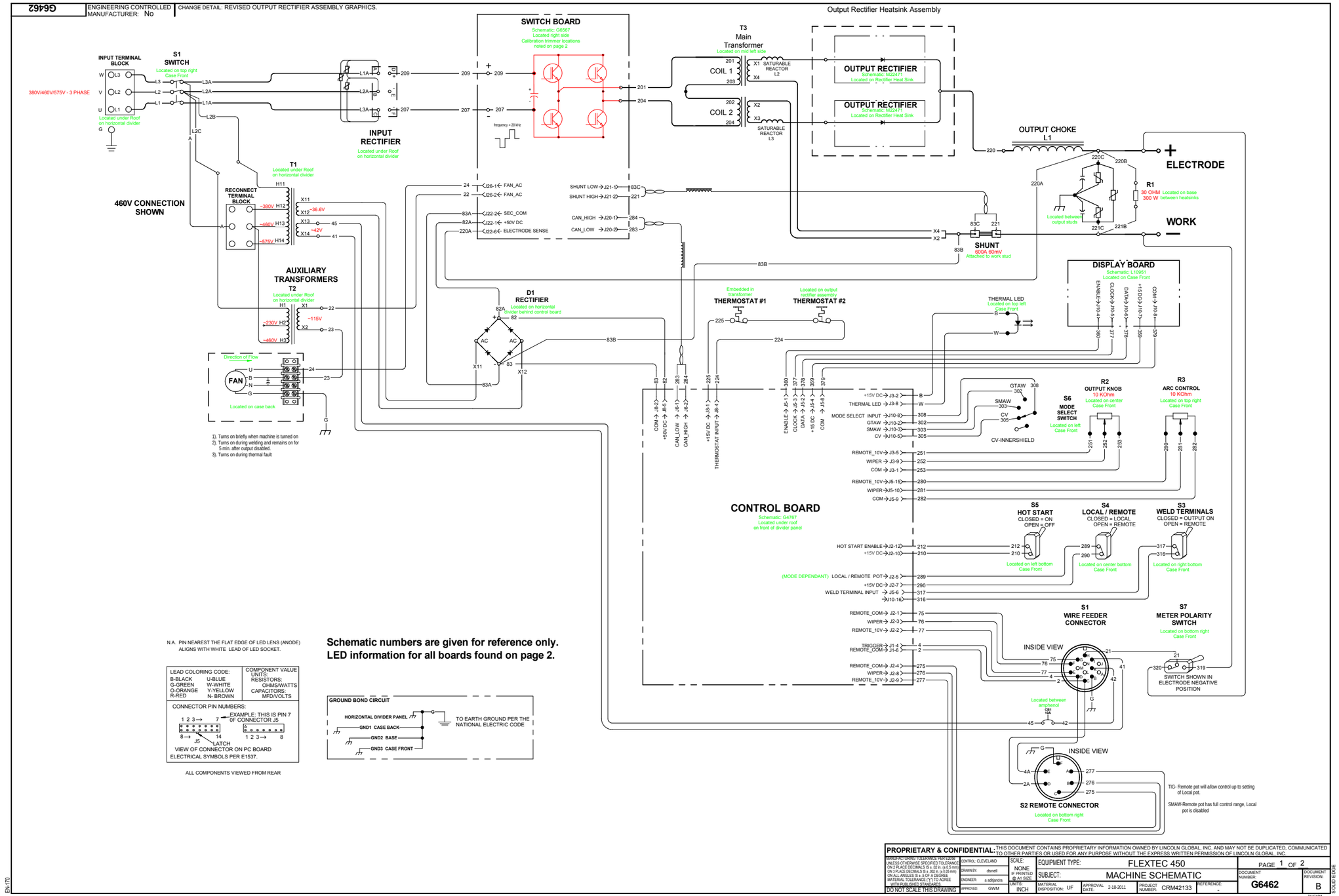
FLEXTEC 450 WIRING DIAGRAM



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

Return to Section TOC
Return to Master TOC

SCHEMATIC - COMPLETE MACHINE (CODE 11626) (G6462) PG 1

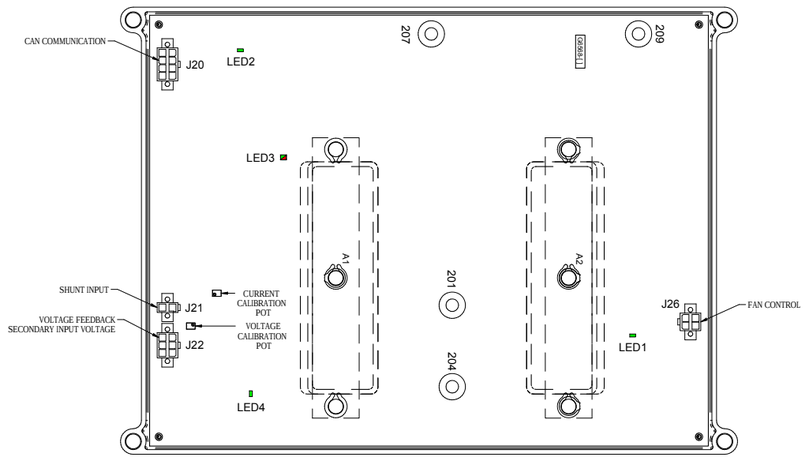


NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - COMPLETE MACHINE (CODE 11626) (G6462) PG 2

G6462 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: REVISED OUTPUT RECTIFIER ASSEMBLY GRAPHICS.

SWITCHBOARD P.C. BOARD



G6568 SWITCHBOARD & CONTROL P.C. BOARD		
LED #	COLOR	FUNCTION
1	GREEN	+5V DC POWER SUPPLY "OK"
2	GREEN	CAN POWER SUPPLY "OK"
3	GREEN	STATUS "OK"
3	RED	STATUS "ERROR" (CHECK CODE FOR SPECIFIC ERROR)
4	GREEN	+15V DC POWER SUPPLY "OK"

TROUBLESHOOTING THE FLEXTEC 450 SWITCHBOARD

USING THE STATUS LED

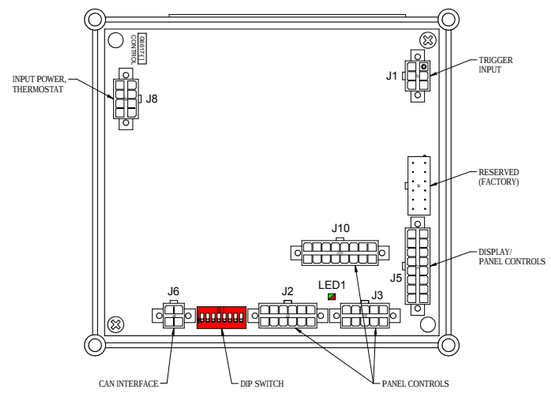
LIGHT CONDITION	MEANING
Steady Green	System OK. Switchboard is communicating correctly with control board.
Blinking Green	Occurs during startup or reset, and indicates that the switchboard is waiting for communication from the control board. Normal for the first 1-10 seconds after power is turned on.
Alternating Green and Red	A system fault has occurred. If the switchboard status LED is flashing any combination of red and green, errors are present. **Read the error code before the machine is powered off.** Error code interpretation through the status LED is detailed in the Service Manual. Individual code digits are flashed in red with a long pause between digits. If more than one code is present, the codes will be separated by a green light. To clear the error, turn the power source off, and back on to reset.

ERROR CODES FOR THE FLEXTEC 450 SWITCHBOARD

ERROR CODE #	INDICATION
31 Primary Overcurrent Error	Excessive primary current present. May be related to switchboard hardware or output rectifier failure.
32 Capacitor Voltage Error	Excessively low or high voltage on the capacitor. May be caused by improper input configuration, or an open/short circuit in the primary side of the machine.
47 Communications Timeout	Communication with the control board was lost. May be caused by excessive noise or damage to the CAN connection to the control board.
58 Improper Supply Voltage	The supply voltage to the switchboard was found to be outside of the allowable range. May be caused by an improper input voltage configuration.
Other	Error codes that are not listed are defined as fatal errors. These codes generally indicate internal errors on the switchboard. If cycling power does not clear the error, replace the switchboard.

EN-170

CONTROL P.C. BOARD



Description of LED functions on Control board

For reference only

G6617 CONTROL P.C. BOARD		
LED #	COLOR	FUNCTION
1	GREEN	STATUS "OK"
1	RED	STATUS "ERROR" (CHECK CODE FOR SPECIFIC ERROR)

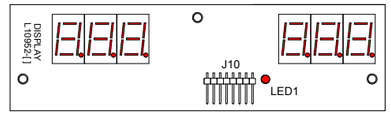
TEST MODE CONFIGURATION

TURN ON PIN FOUR TO ENABLE TEST MODES

ERROR CODES FOR THE FLEXTEC 450 CONTROL BOARD

ERROR CODE #	INDICATION
31 Primary Overcurrent Error	Excessive primary current present. May be related to switchboard hardware or output rectifier failure.
32 Capacitor Voltage Error	Excessively low or high voltage on the capacitor. May be caused by improper input configuration, or an open/short circuit in the primary side of the machine.
36 Thermal Error	Indicates over temperature. Usually accompanied by Thermal LED. Check fan operation. Be sure process does not exceed duty cycle limit of the machine.
54 Secondary Overcurrent Error	A high level of output current(long average) has caused an overload. When this fault occurs, the machine output will be turned OFF.
58 Improper Supply Voltage	The supply voltage to the switchboard was found to be outside of the allowable range. May be caused by an improper input voltage configuration.
213 CAN Communication Error	Loss of CAN communication between the Switchboard and Control board. Or corrupt data between Control board and Switchboard.
Other	Error codes that are not listed are defined as fatal errors. These codes generally indicate internal errors on the switchboard. If cycling power does not clear the error, replace the switchboard.

DISPLAY P.C. BOARD



L10952 DISPLAY P.C. BOARD		
LED #	COLOR	FUNCTION
1	RED	NOT USED

CONSTANT VOLTAGE TEST MODE

To enable Constant Voltage test mode:

- Set dip switch #4 to ON
- Set "WELD TERMINALS" switch to "⊿"
- Set "MODE SELECT" knob to "GTAW"
- Set "LOCAL/REMOTE" switch to "LOCAL"
- Set "ARC CONTROL" knob to "+10"
- Set "HOT START" switch to "OFF"
- Turn on input power.
- Use the "OUTPUT CONTROL KNOB" to adjust the setpoint to a desired value on the right display
- Use the "WELD TERMINALS" switch to enable and disable output

CONSTANT CURRENT TEST MODE

To enable Constant Current test mode:

- Set dip switch #4 to ON
- Set "WELD TERMINALS" switch to "⊿"
- Set "MODE SELECT" knob to "GTAW"
- Set "LOCAL/REMOTE" switch to "LOCAL"
- Set "ARC CONTROL" knob to "-10"
- Set "HOT START" switch to "OFF"
- Turn on input power.
- Use the "OUTPUT CONTROL KNOB" to adjust the setpoint to a desired value on the right display
- Use the "WELD TERMINALS" switch to enable and disable output

ACCESS ERROR LOG

To access the Error Log:

- Set dip switch #4 to ON
- Set "WELD TERMINALS" switch to "⊿"
- Set "MODE SELECT" knob to "GTAW"
- Set "LOCAL/REMOTE" switch to "LOCAL"
- Set "OUTPUT CONTROL KNOB" to "MIN"
- Set "ARC CONTROL" knob to "-10"
- Set "HOT START" switch to "ON"
- Turn on input power. The display will show "8.8.8" "8.8.8" and "THERMAL LED" will light
- The displays will then go to "- - - " "- - -" and "THERMAL LED" will go out.
- Toggle the "HOT START" switch "OFF" and "ON" to step through menu's
- STEP E00 to E14 are error logs in chronological order
- To clear error logs set the "LOCAL/REMOTE" switch to "⊿" then back to "LOCAL"

MANUFACTURING TOLERANCE PER E2056 UNLESS OTHERWISE SPECIFIED TOLERANCE ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm) ON 3 PLACE DECIMALS IS ± .002 in. (± 0.05 mm) ON ALL ANGLES IS ± 5 OF A DEGREE MATERIAL TOLERANCE TO BE AGREE WITH PUBLISHED STANDARDS

DO NOT SCALE THIS DRAWING

CONTROL: CLEVELAND | DRAWN BY: dsnell | ENGINEER: a adejandra | APPROVED: GWM

SCALE: NONE (IF PRINTED @ A1 SIZE) | UNITS: INCH

EQUIPMENT TYPE: FLEXTEC 450

SUBJECT: MACHINE SCHEMATIC

MATERIAL DISPOSITION: UF | APPROVAL DATE: 2-18-2011 | PROJECT NUMBER: CRM42133 | REFERENCE: -

PAGE 2 OF 2

DOCUMENT NUMBER: G6462

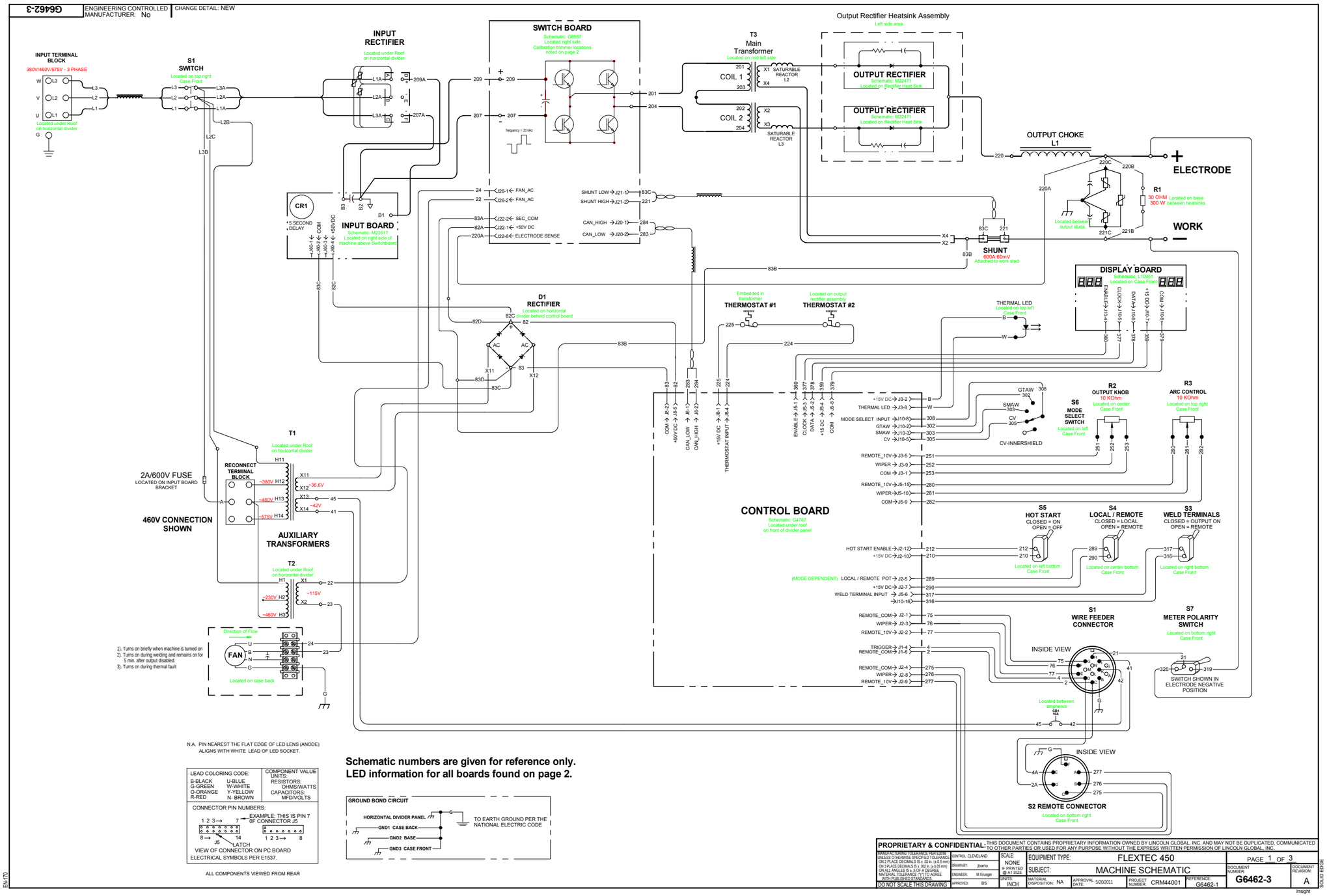
DOCUMENT REVISION: B

SOLID EDGE Insight

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SCHEMATIC - COMPLETE MACHINE (CODE 11754) (G6462-3) PG 1



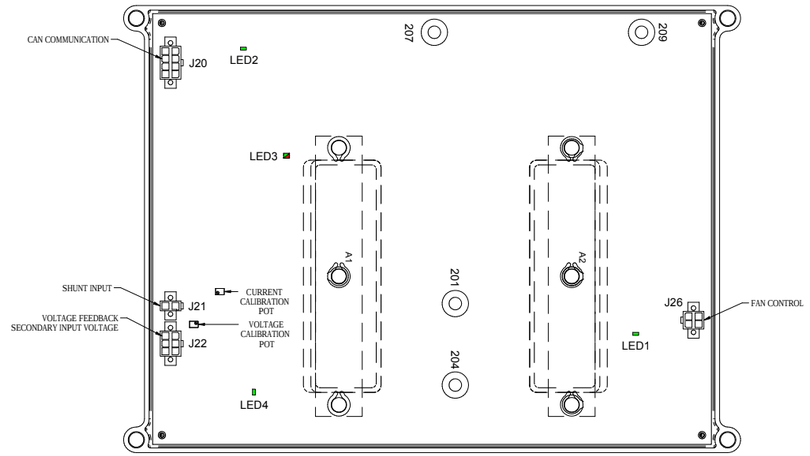
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC
Return to Master TOC

SCHEMATIC - COMPLETE MACHINE (CODE 11754) (G6462-3) PG 2

G6462-3 | ENGINEERING CONTROLLED | CHANGE DETAIL: NEW
MANUFACTURER: No

SWITCHBOARD P.C. BOARD

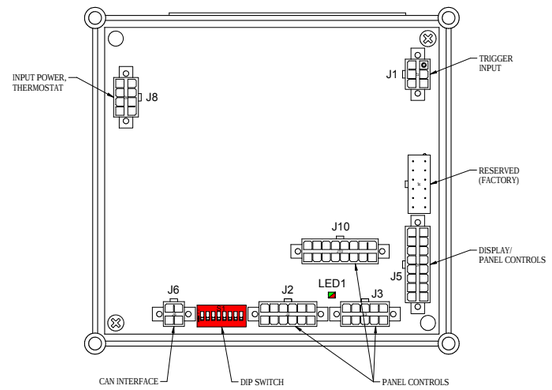


S28443 SWITCHBOARD		
LED #	COLOR	FUNCTION
1	GREEN	+5V DC POWER SUPPLY "OK"
2	GREEN	CAN POWER SUPPLY "OK"
3	GREEN	STATUS "OK"
3	RED	STATUS "ERROR" (CHECK CODE FOR SPECIFIC ERROR)
4	GREEN	+15V DC POWER SUPPLY "OK"

USING THE FLEXTEC 450 SWITCHBOARD STATUS LED

LIGHT CONDITION	MEANING
Steady Green	System OK.
Blinking Green	Occurs during startup or reset, and indicates that the switchboard is waiting for communication from the control board. Normal for the first 1-10 seconds after power is turned on.
Alternating Green and Red	A system fault has occurred. If the switchboard status LED is flashing any combination of red and green, errors are present. Individual code digits are flashed in red with a long pause between digits. If more than one code is present, the codes will be separated by a green light. See Page 3 for an Error Code Troubleshooting Guide.

CONTROL P.C. BOARD



S28454 CONTROL P.C. BOARD		
LED #	COLOR	FUNCTION
1	GREEN	STATUS "OK"
1	RED	STATUS "ERROR" (CHECK CODE FOR SPECIFIC ERROR)

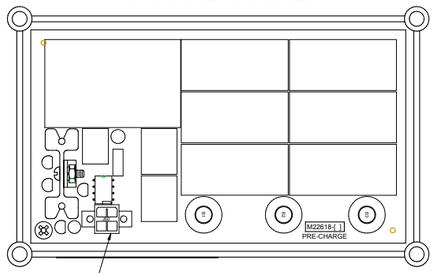
TEST MODE CONFIGURATION

TURN ON PIN FOUR TO ENABLE TEST MODES
ALL SWITCHES ARE OFF BY FACTORY DEFAULT

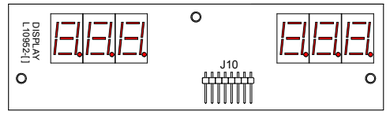
USING THE FLEXTEC 450 CONTROL BOARD STATUS LED

LIGHT CONDITION	MEANING
Steady Green	System OK.
Alternating Green and Red	A system fault has occurred. If the Control Board status LED is flashing any combination of red and green, errors are present. Individual code digits are flashed in red with a long pause between digits. If more than one code is present, the codes will be separated by a green light. See Page 3 for an Error Code Troubleshooting Guide.

PRECHARGE P.C. BOARD



DISPLAY P.C. BOARD



CONSTANT VOLTAGE TEST MODE

To enable Constant Voltage test mode:

- Set dip switch #4 to ON
- Set "WELD TERMINALS" switch to "⊠"
- Set "MODE SELECT" knob to "GTAW"
- Set "LOCAL/REMOTE" switch to "LOCAL"
- Set "ARC CONTROL" knob to "+10"
- Set "HOT START" switch to "OFF"
- Turn on input power.
- Use the "OUTPUT CONTROL KNOB" to adjust the setpoint to a desired value on the right display
- Use the "WELD TERMINALS" switch to enable and disable output

CONSTANT CURRENT TEST MODE

To enable Constant Current test mode:

- Set dip switch #4 to ON
- Set "WELD TERMINALS" switch to "⊠"
- Set "MODE SELECT" knob to "GTAW"
- Set "LOCAL/REMOTE" switch to "LOCAL"
- Set "ARC CONTROL" knob to "-10"
- Set "HOT START" switch to "OFF"
- Turn on input power.
- Use the "OUTPUT CONTROL KNOB" to adjust the setpoint to a desired value on the right display
- Use the "WELD TERMINALS" switch to enable and disable output

ACCESS ERROR LOG

To access the Error Log:

- Set dip switch #4 to ON
- Set "WELD TERMINALS" switch to "⊠"
- Set "MODE SELECT" knob to "GTAW"
- Set "LOCAL/REMOTE" switch to "LOCAL"
- Set "OUTPUT CONTROL KNOB" to "MIN"
- Set "ARC CONTROL" knob to "-10"
- Set "HOT START" switch to "ON"
- Turn on input power. The display will show "8.8.8" "8.8.8" and "THERMAL LED" will light
- The displays will then go to "- - -" "- - -" and "THERMAL LED" will go out.
- Toggle the "HOT START" switch "OFF" and "ON" to step through menu's
- STEP E00 to E14 are error logs in chronological order
- To clear error logs set the "LOCAL/REMOTE" switch to "⊠" then back to "LOCAL"

EM-170

MANUFACTURING TOLERANCE PER ES206
UNLESS OTHERWISE SPECIFIED TOLERANCE
ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm)
ON 3 PLACE DECIMALS IS ± .002 in. (± 0.05 mm)
ON ALL ANGLES IS ± .5 OF A DEGREE
MATERIAL TOLERANCE (.1") TO AGREE WITH PUBLISHED STANDARDS
DO NOT SCALE THIS DRAWING

CONTROL:	CLEVELAND
DRAWN BY:	jbarto
ENGINEER:	M Kroeger
APPROVED:	BS
SCALE:	NONE
IF PRINTED @ A1 SIZE	
UNITS:	INCH
MATERIAL DISPOSITION:	NA
APPROVAL DATE:	5/20/2011
PROJECT NUMBER:	CRM44001
REFERENCE:	G6462-1
EQUIPMENT TYPE:	FLEXTEC 450
SUBJECT:	MACHINE SCHEMATIC
PAGE	2 OF 3
DOCUMENT NUMBER:	G6462-3
DOCUMENT REVISION:	A

SOLID EDGE Insight

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

SCHEMATIC - COMPLETE MACHINE (CODE 11754) (G6462-3) PG 3

ERROR CODE TROUBLESHOOTING GUIDE

31	Primary Overcurrent
Description	Peak current through the transformer primary has exceeded threshold (140 amps).
Possible Solution 1	Verify connections to the switchboard, transformer and output rectifier assemblies are made correctly and there are no damaged components in the machine.
Possible Solution 2	Replace defective main transformer.
Possible Solution 3	Replace defective switchboard assembly (S28443).

36	Thermal Fault
Description	Thermostat on output rectifier heat sink or embedded in transformer has tripped.
Possible Solution 1	Do not exceed allowable ambient temperature or duty cycle limits.
Possible Solution 2	Verify that fan is operating and airflow is not being blocked.
Possible Solution 3	Measure thermostats at control board and replace if defective.

711	Capacitor Fault (Over-Voltage or Under-Voltage)
Description	Input voltage is less than 160 VDC or more than 1050 VDC
Possible Solution 1	Verify input voltage level, frequency, and quality. Verify that line is not too soft.
Possible Solution 2	If problem occurs on a generator, verify proper operation when connected to municipal power lines.
Possible Solution 3	Replace defective switchboard assembly (S28443).

712	CAN Communication Timeout
Description	CAN communication between switchboard and control board has timed out.
Possible Solution 1	Check the physical wiring and connections between control board and switchboard.
Possible Solution 2	Verify power supply to control board and switchboard.
Possible Solution 3	Replace defective switchboard assembly (S28443) or control board (S28454).

713	Misconnection - Switchboard Supply Voltage too High
Description	Switchboard auxiliary supply voltage is higher than 62 VDC at machine power-up.
Possible Solution 1	Improper input voltage configuration. Verify primary reconnect position, measure input voltage level and check three phase operation.
Possible Solution 2	Damaged auxiliary transformer or intermittent "A" lead connection. Verify 42 VAC output at 14 pin connector to determine the source of the problem.
Possible Solution 3	Replace defective switchboard assembly (S28443).

714	Misconnection - Switchboard Supply Voltage too Low
Description	Switchboard auxiliary supply voltage is lower than 42 VDC at machine power-up.
Possible Solution 1	Improper input voltage configuration. Verify primary reconnect position, measure input voltage level and check three phase operation.
Possible Solution 2	Damaged auxiliary transformer or intermittent "A" lead connection. Verify 42 VAC output at 14 pin connector to determine the source of the problem.
Possible Solution 3	Replace defective switchboard assembly (S28443).

715	Switchboard Undervoltage Lock Out
Description	Switchboard auxiliary supply voltage momentarily drops below 20 VDC.
Possible Solution 1	Damaged auxiliary transformer or intermittent "A" lead connection. Verify 42 VAC output at 14 pin connector to determine the source of the problem.
Possible Solution 2	Verify input voltage level, frequency, and quality. Verify that line is not too soft.
Possible Solution 3	Replace defective switchboard assembly (S28443).

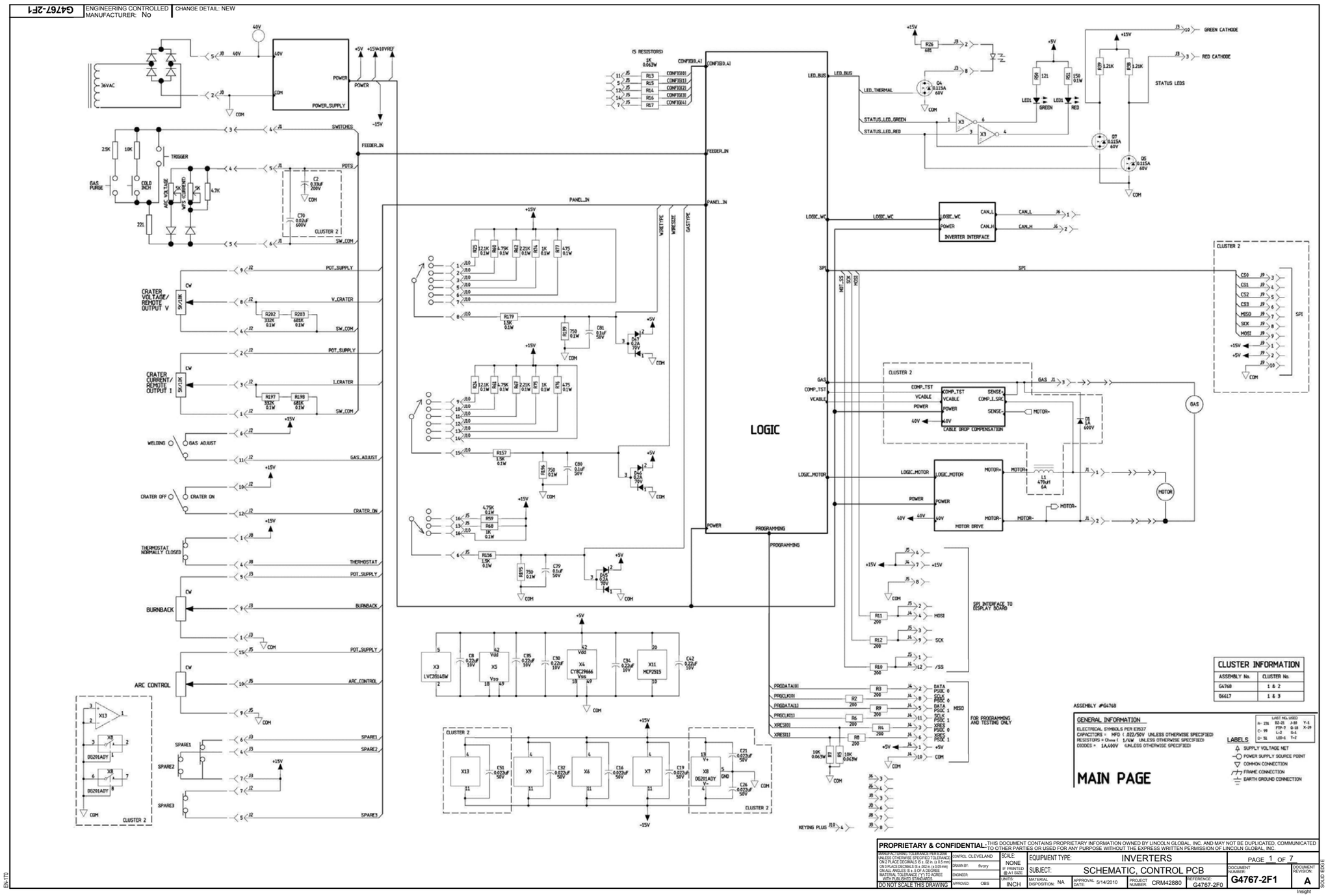
717	Control Board Misconfiguration
Description	A jumper on the control board has been placed in the incorrect position.
Possible Solution 1	Verify that the wiring to connector J5 on the control board matches the machine wiring diagram.
Possible Solution 2	Replace defective control board assembly (S28454).

21, 24, 716, 718	Internal Control Board Error
Description	The microprocessor on the control board has experienced a critical internal error and cannot continue.
Possible Solution 1	Cycle power to the machine.
Possible Solution 2	Replace defective control board assembly (S28454).

719	Internal Switchboard Error
Description	The microprocessor on the switchboard has experienced a critical internal error and cannot continue.
Possible Solution 1	Cycle power to the machine.
Possible Solution 2	Replace defective switchboard assembly (S28443).

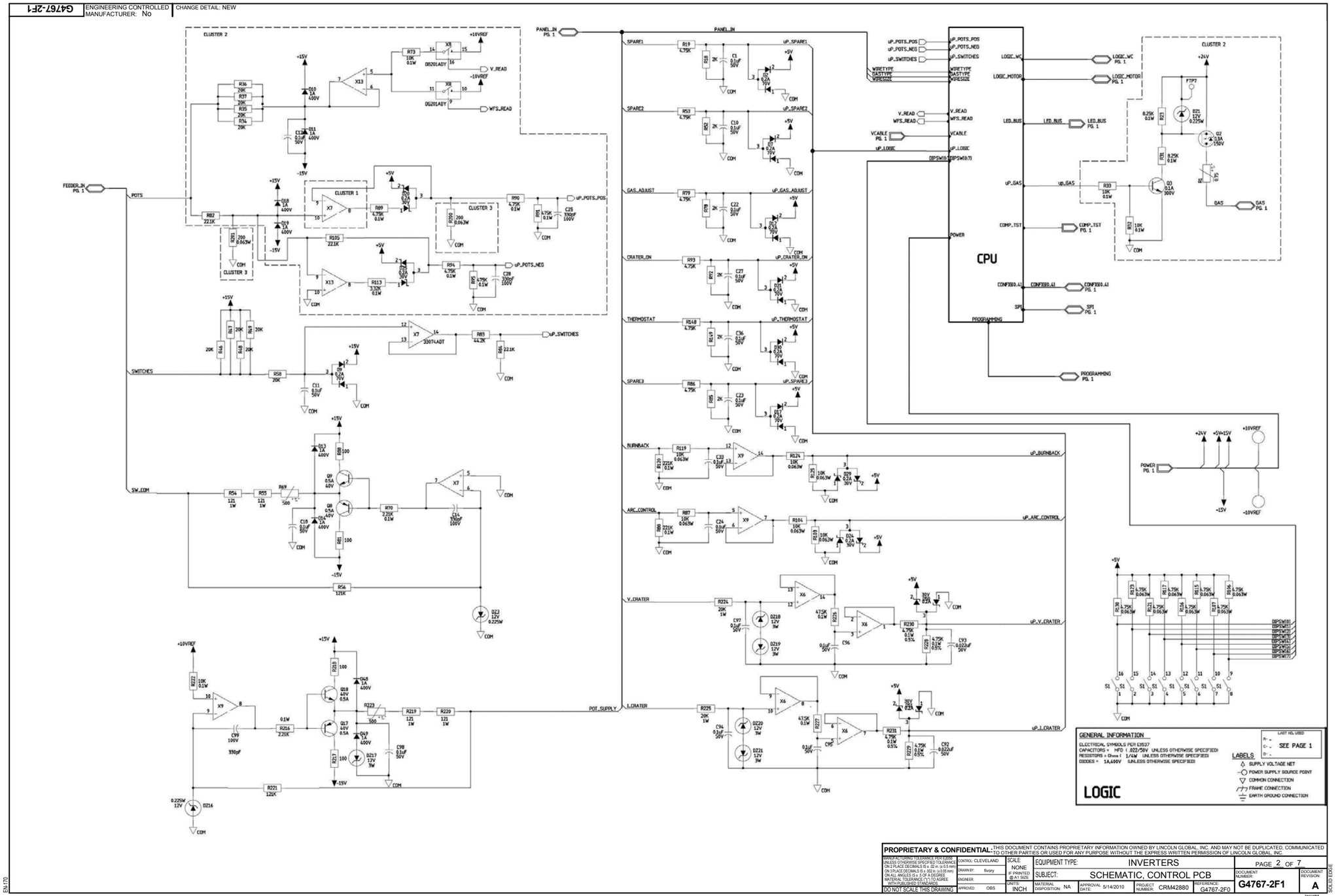
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - CONTROL PC BOARD (G4767-2F1) PG 1



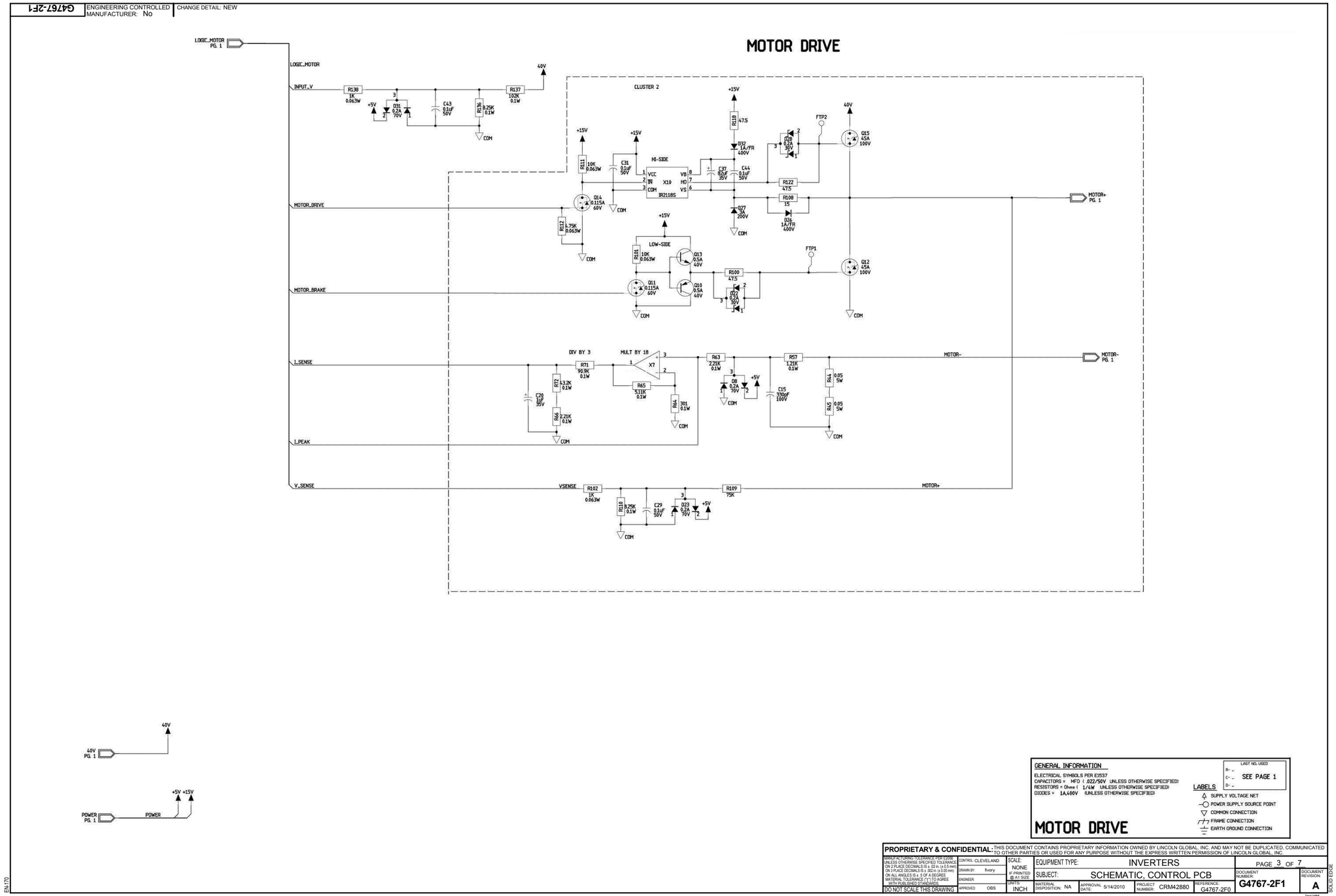
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - CONTROL PC BOARD (G4767-2F1) PG 2



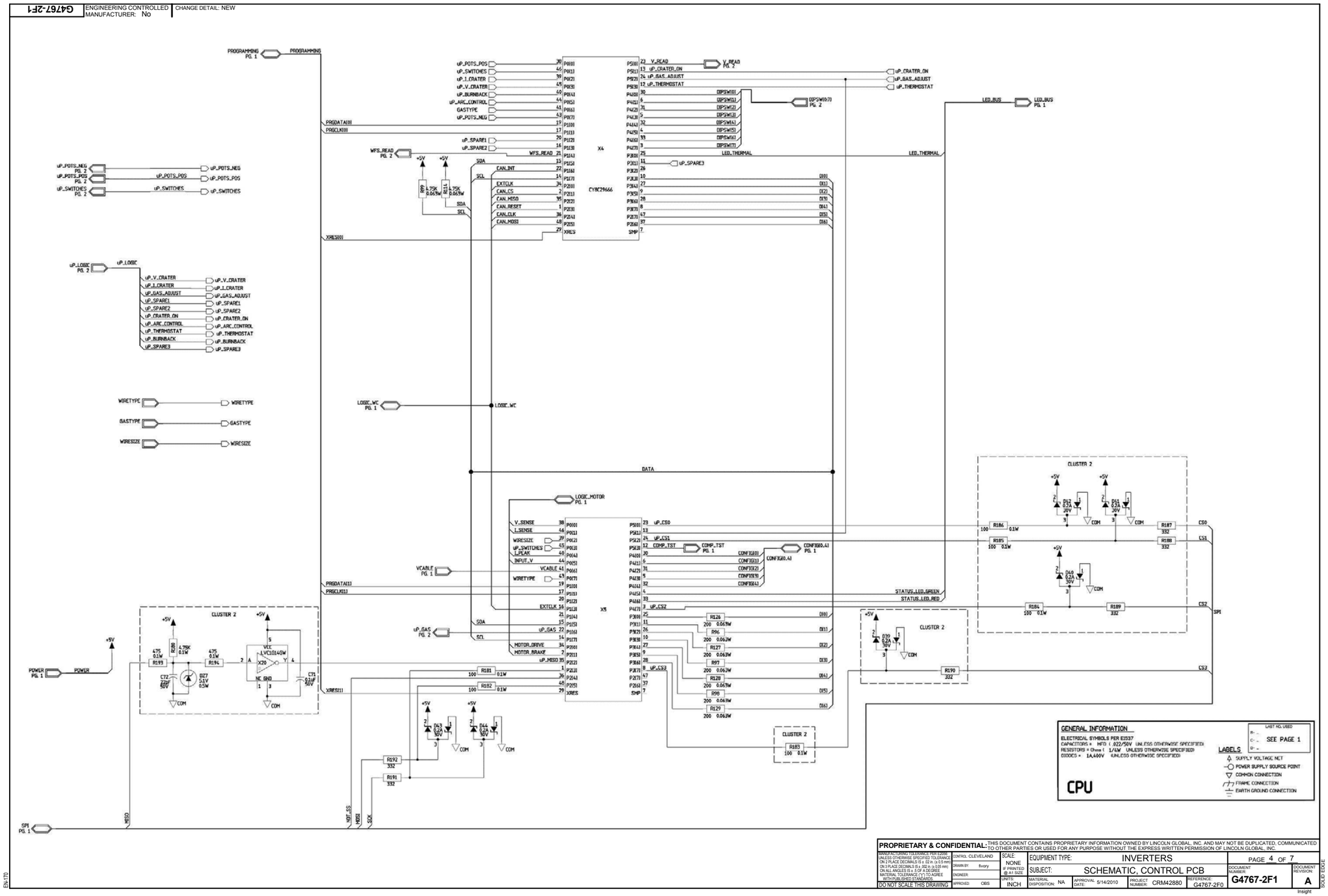
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - CONTROL PC BOARD (G4767-2F1) PG 3



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

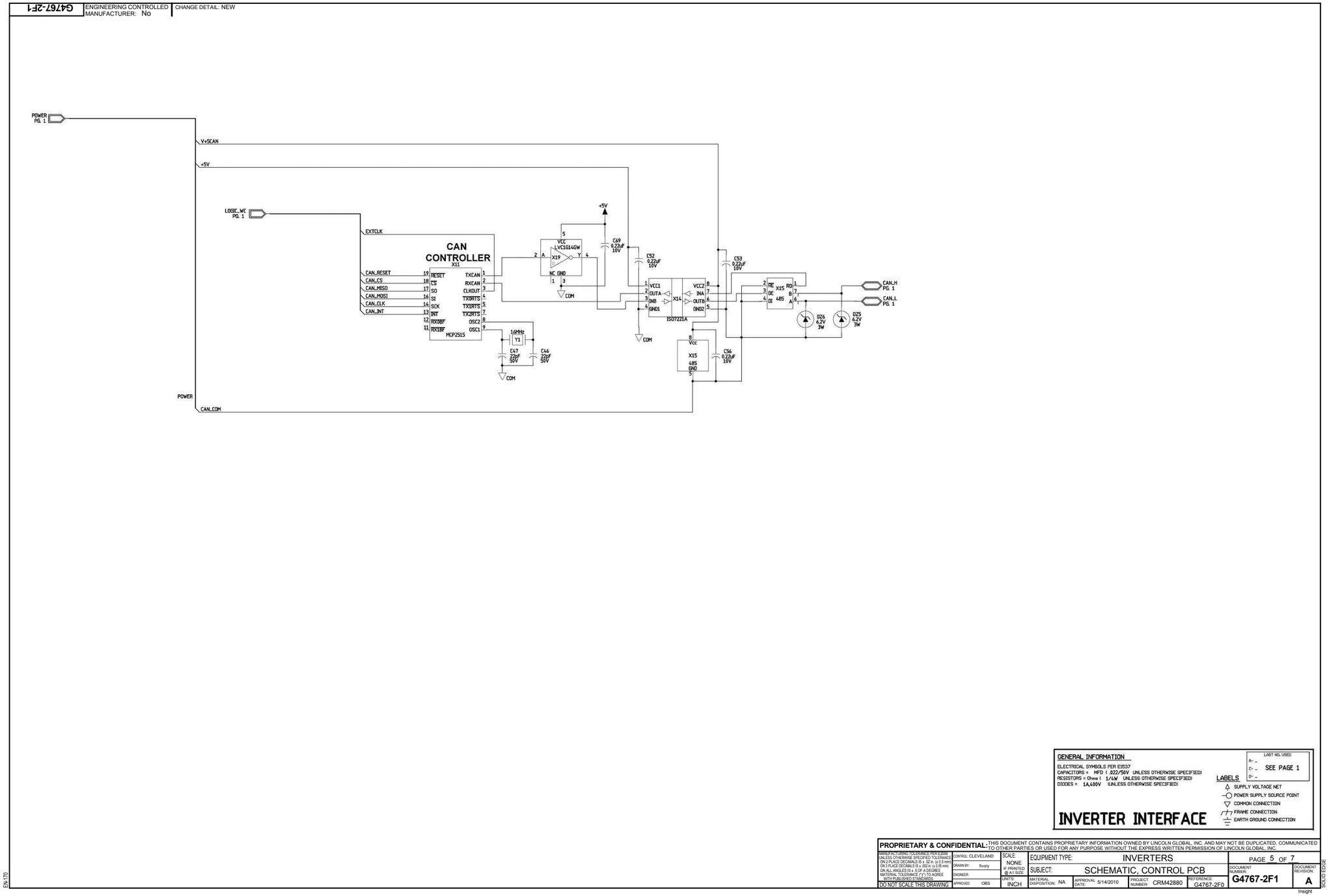
SCHEMATIC - CONTROL PC BOARD (G4767-2F1) PG 4



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

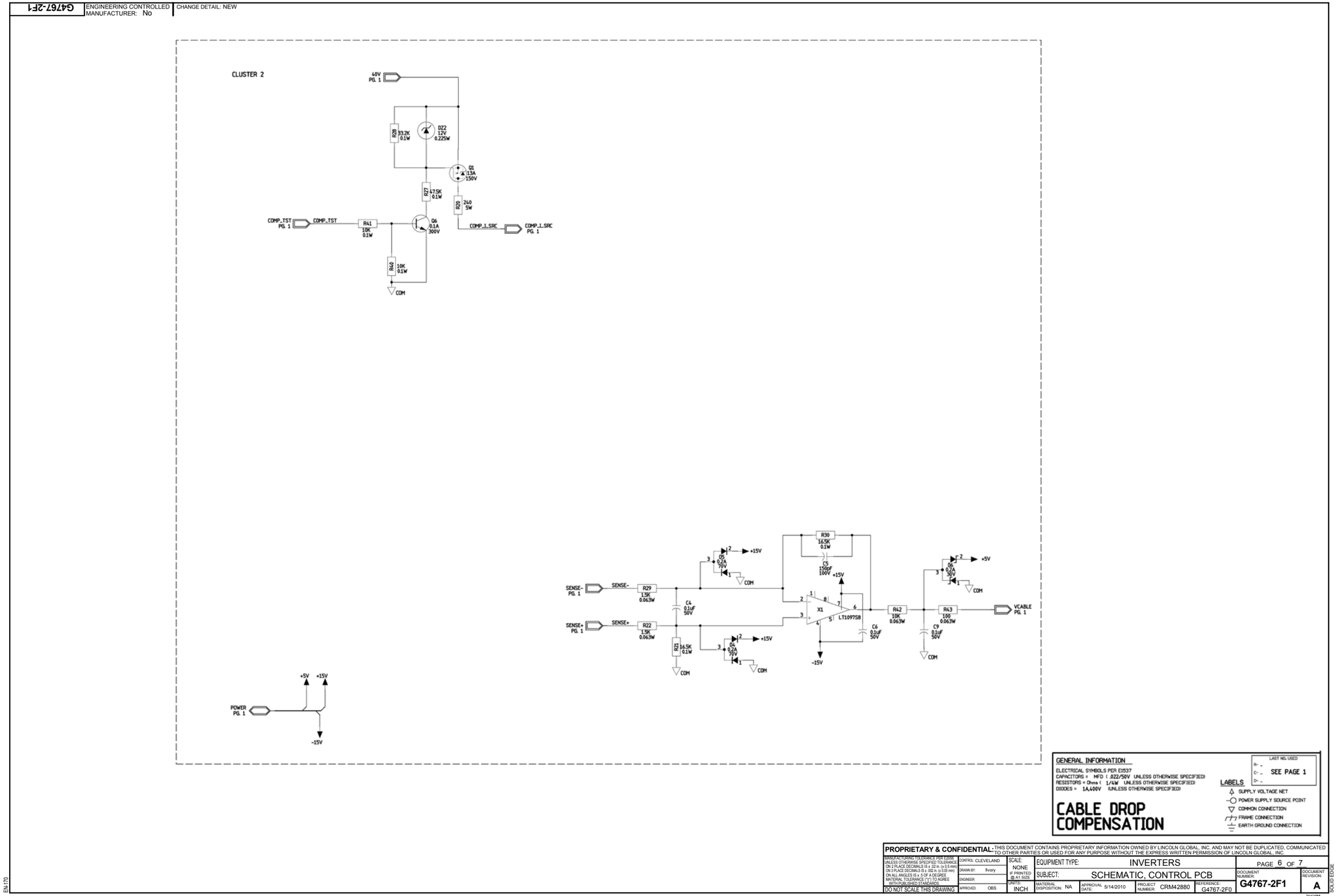
Return to Section TOC
Return to Master TOC

SCHEMATIC - CONTROL PC BOARD (G4767-2F1) PG 5



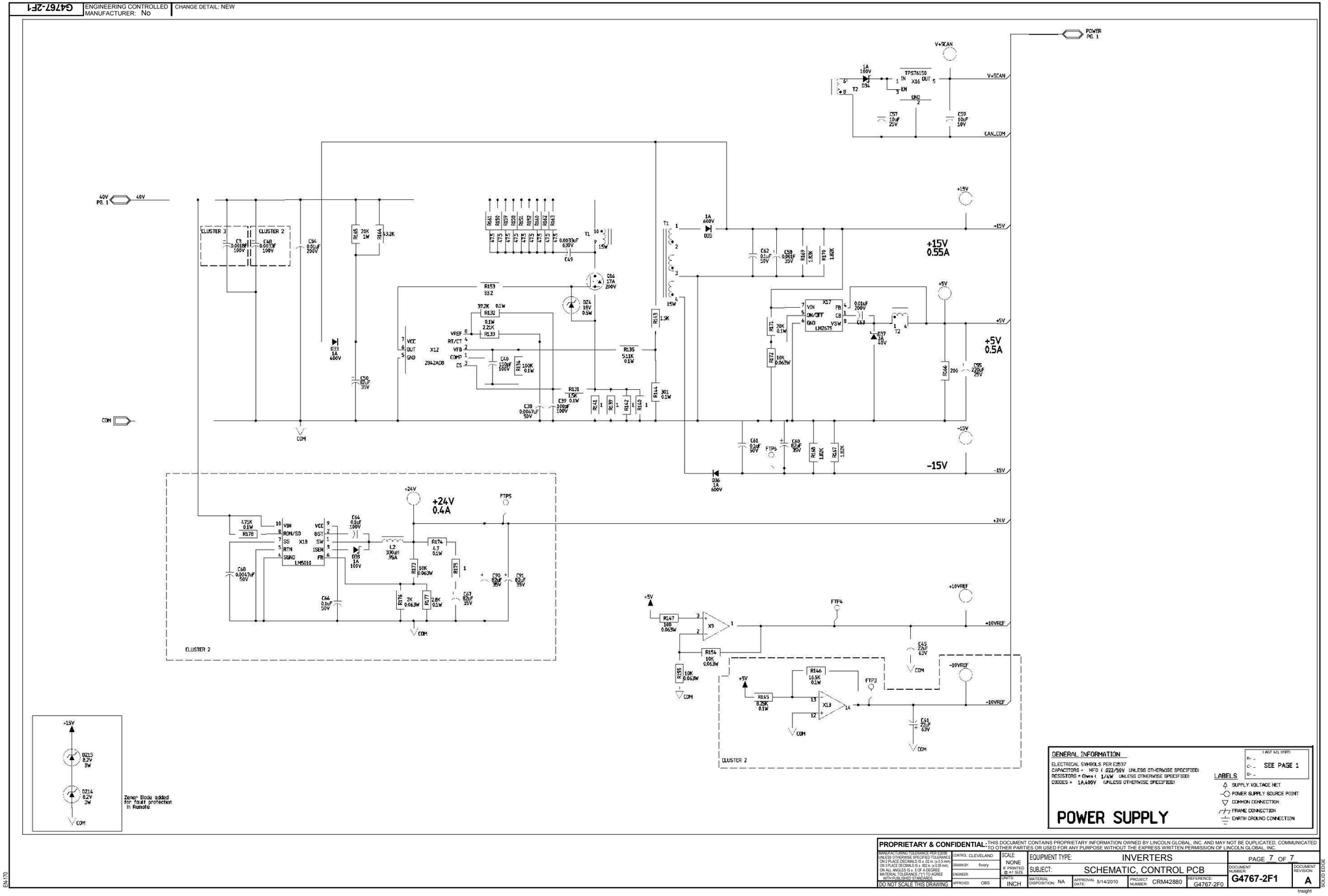
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - CONTROL PC BOARD (G4767-2F1) PG 6



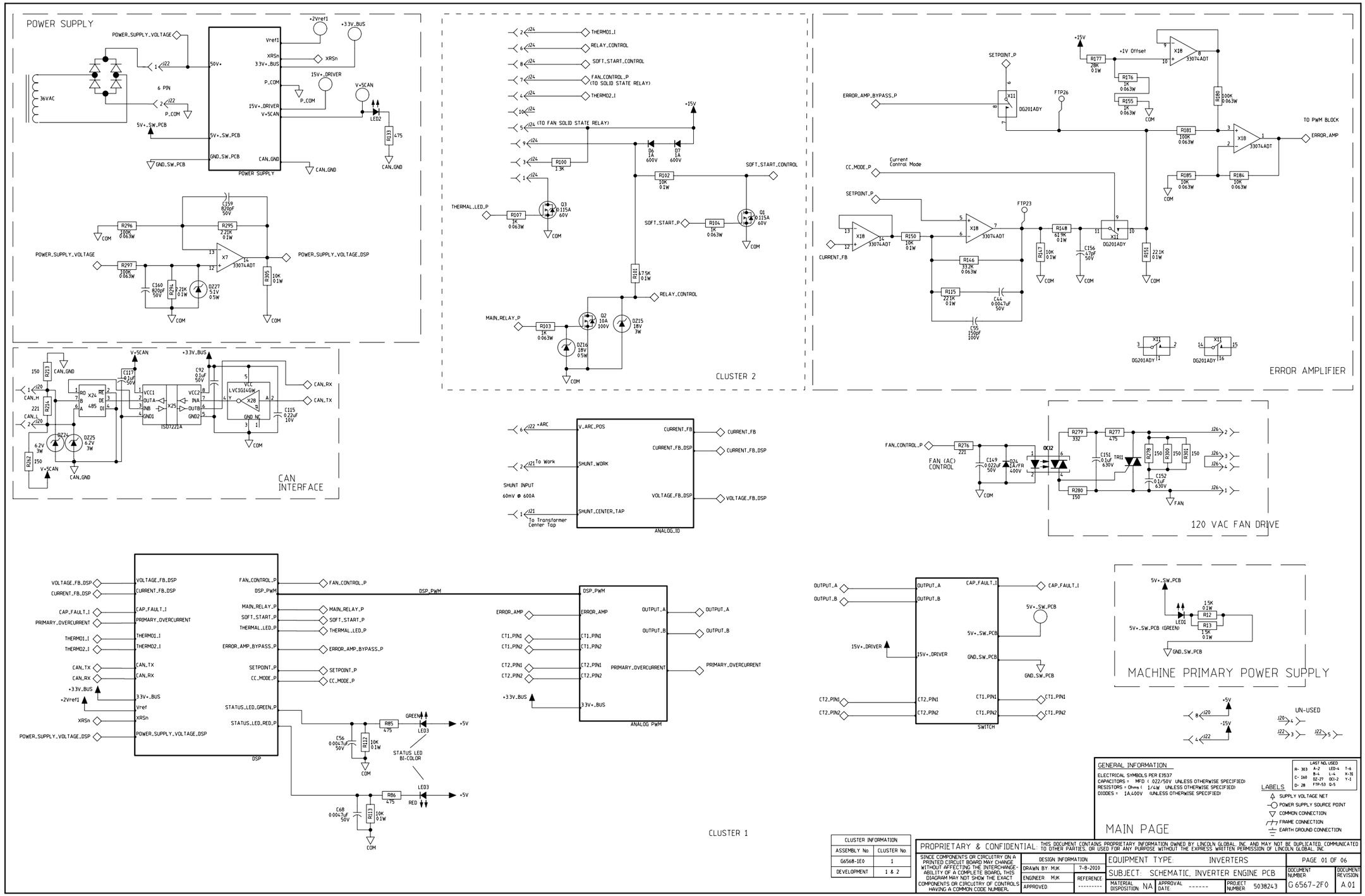
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - CONTROL PC BOARD (G4767-2F1) PG 7



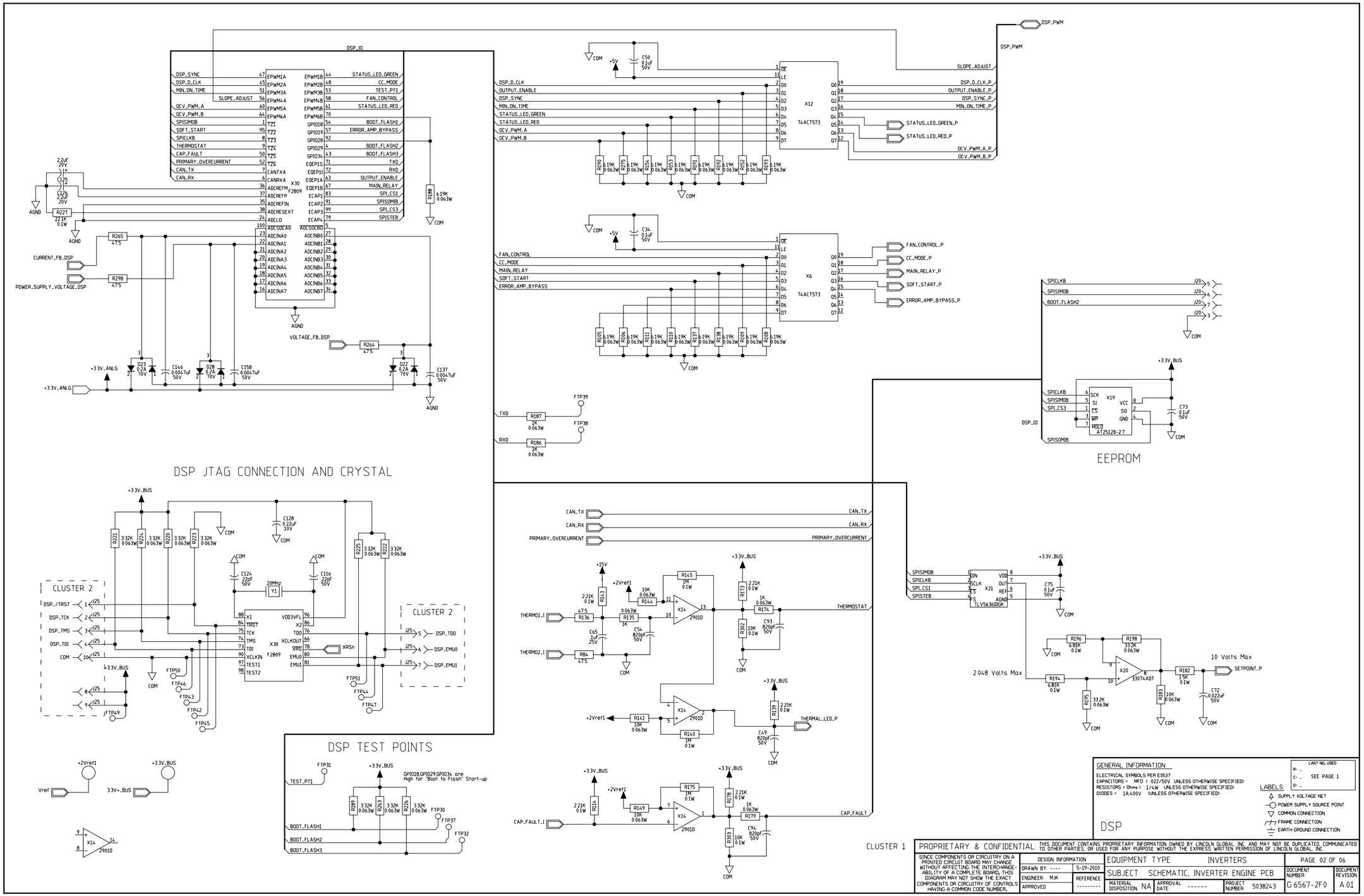
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - SWITCH PC BOARD (G6567-2F0) PG 1



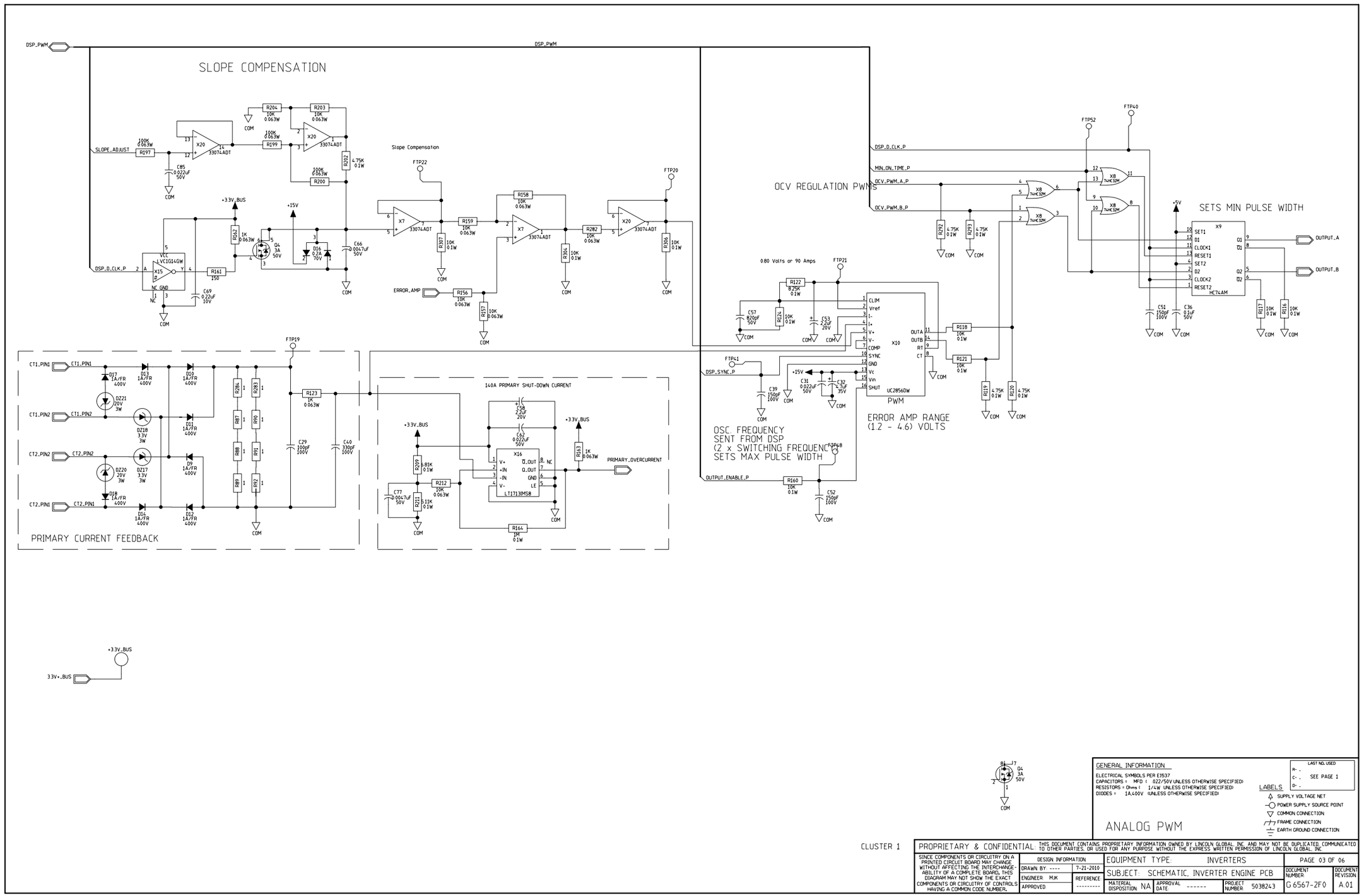
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - SWITCH PC BOARD (G6567-2F0) PG 2



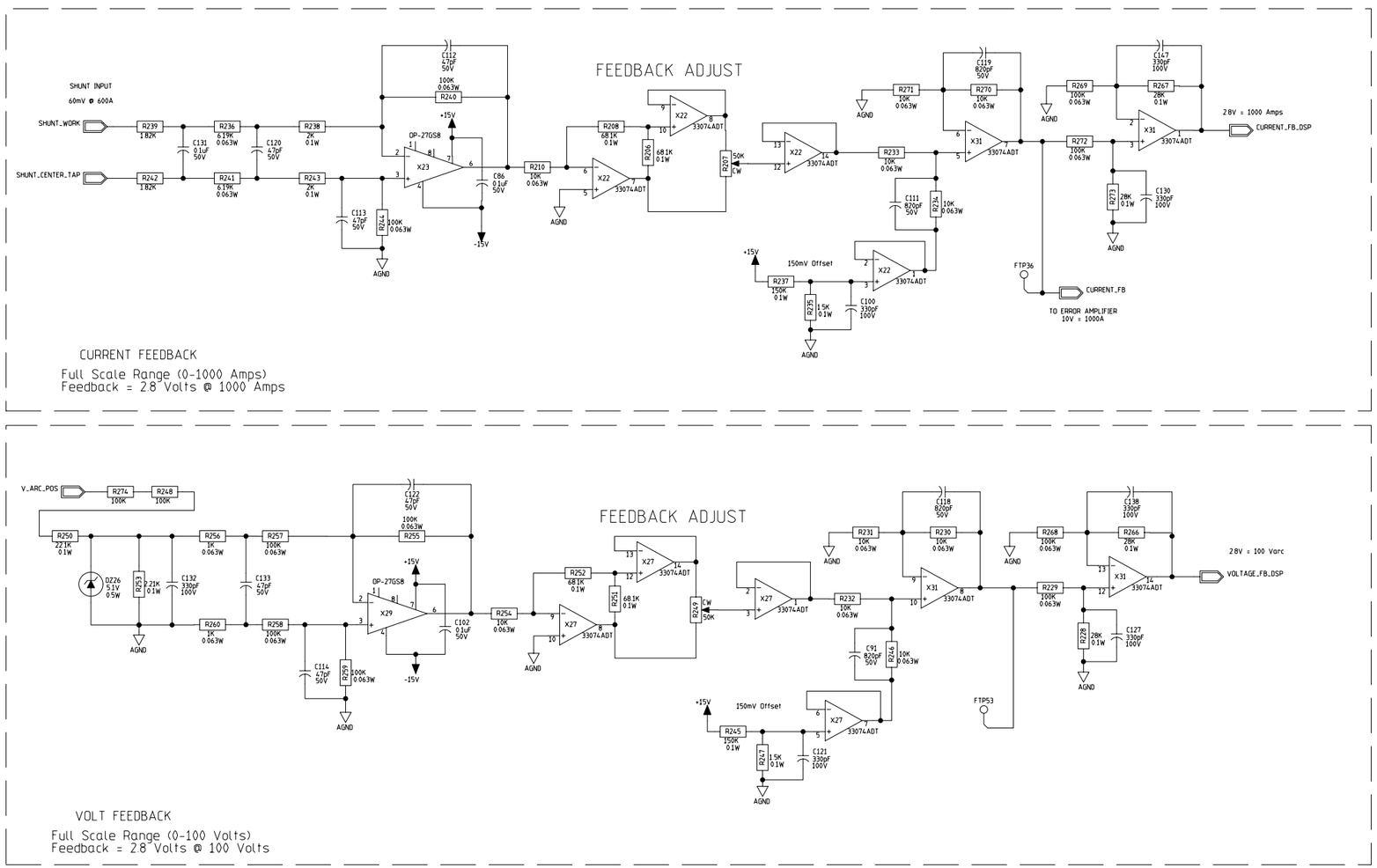
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - SWITCH PC BOARD (G6567-2F0) PG 3



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - SWITCH PC BOARD (G6567-2F0) PG 4



GENERAL INFORMATION

ELECTRICAL SYMBOLS PER E1537
CAPACITORS = MFD (.022/50V UNLESS OTHERWISE SPECIFIED)
RESISTORS = Ohms (1/4W UNLESS OTHERWISE SPECIFIED)
DIODES = 1A,400V (UNLESS OTHERWISE SPECIFIED)

LAST NO. USED
A- -
C- - SEE PAGE 1
D- -

LABELS
- SUPPLY VOLTAGE NET
- POWER SUPPLY SOURCE POINT
- COMMON CONNECTION
- FRAME GROUND CONNECTION
- EARTH GROUND CONNECTION

ANALOG I/O

CLUSTER 1

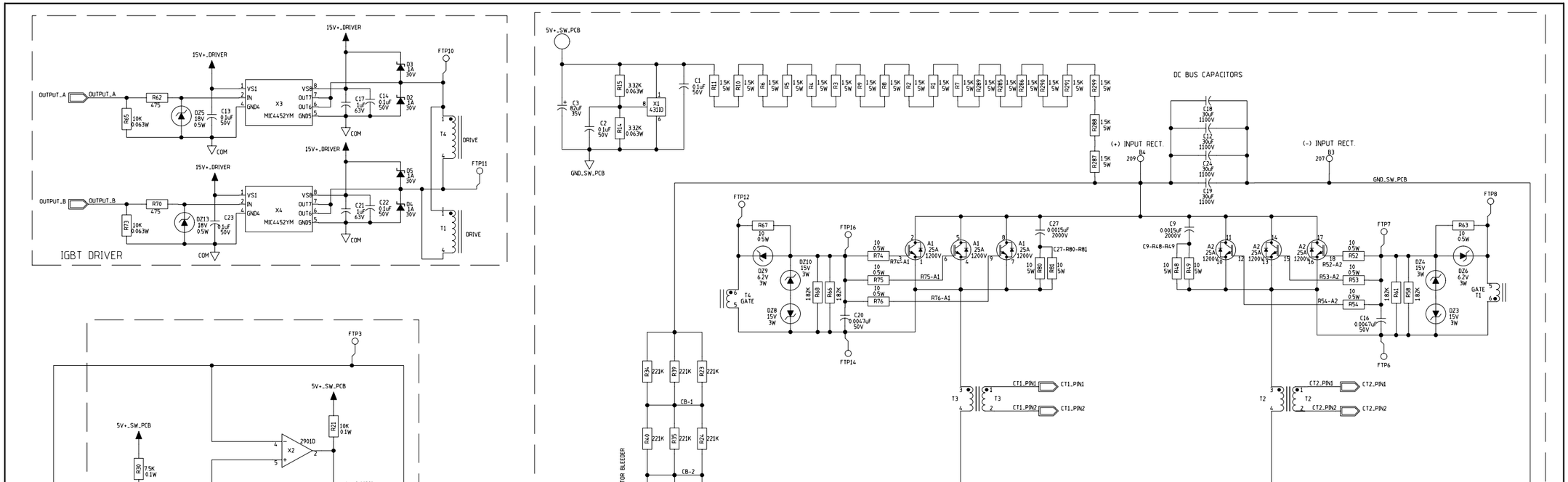
SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGEABILITY OF A COMPLETE BOARD, THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.

DESIGN INFORMATION		EQUIPMENT TYPE: INVERTERS	PAGE 04 OF 06
DRAWN BY: ----	5-19-2010	SUBJECT: SCHEMATIC, INVERTER ENGINE PCB	DOCUMENT NUMBER: G 6567-2F0 / DOCUMENT REVISION: A.01
ENGINEER: MJK	REFERENCE: ---------		
APPROVED:		MATERIAL DISPOSITION: NA / APPROVAL DATE: ------ / PROJECT NUMBER: 5038243	

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

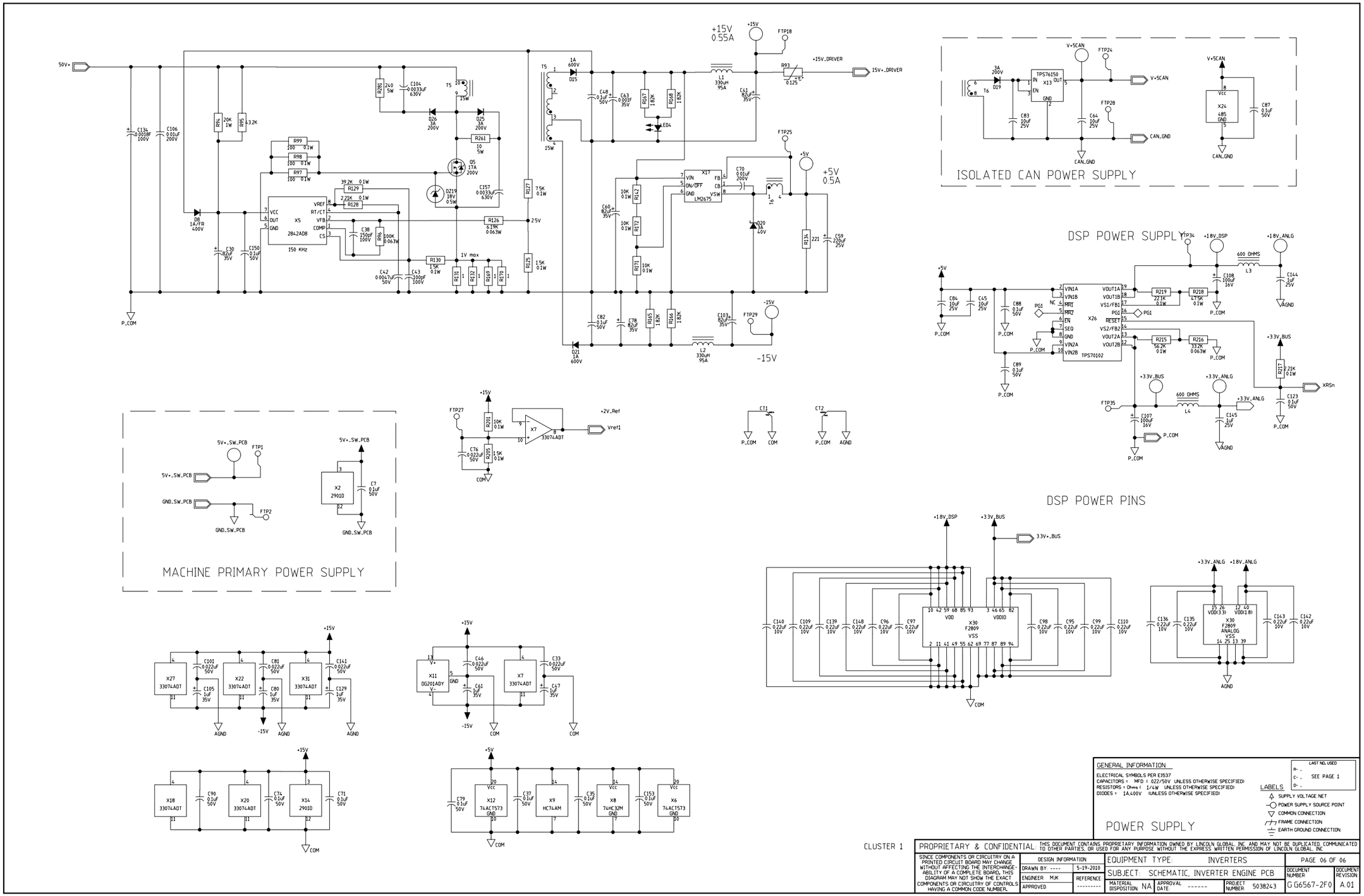
Return to Section TOC
Return to Master TOC

SCHEMATIC - SWITCH PC BOARD (G6567-2F0) PG 5



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

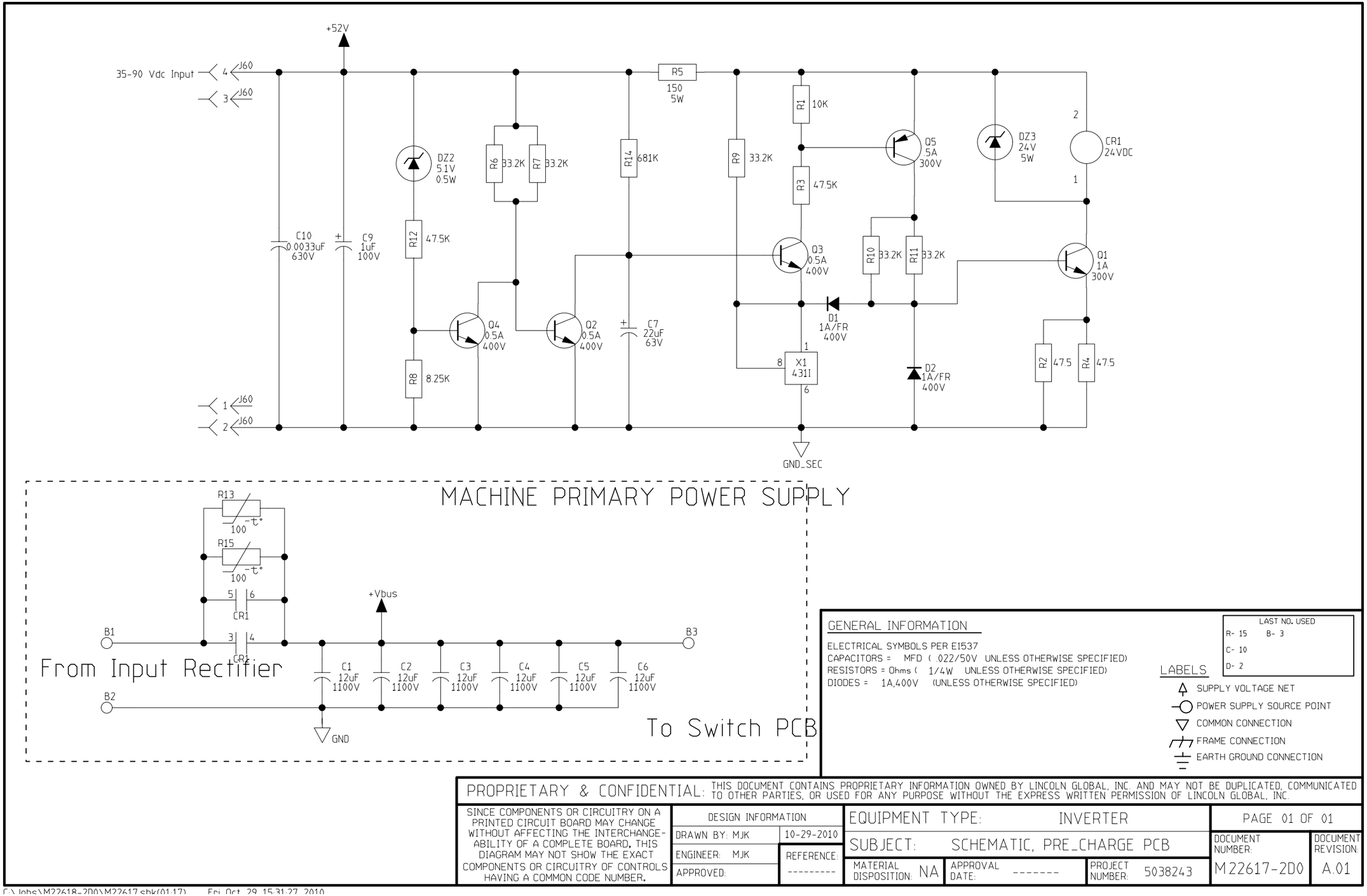
SCHEMATIC - SWITCH PC BOARD (G6567-2F0) PG 6



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC
Return to Master TOC

SCHEMATIC - INPUT PC BOARD (M22617-2D0)



GENERAL INFORMATION

ELECTRICAL SYMBOLS PER E1537
CAPACITORS = MFD (.022/50V UNLESS OTHERWISE SPECIFIED)
RESISTORS = Ohms (1/4W UNLESS OTHERWISE SPECIFIED)
DIODES = 1A,400V (UNLESS OTHERWISE SPECIFIED)

LAST NO. USED	
R- 15	B- 3
C- 10	
D- 2	

LABELS

- SUPPLY VOLTAGE NET
- POWER SUPPLY SOURCE POINT
- COMMON CONNECTION
- FRAME CONNECTION
- EARTH GROUND CONNECTION

SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGE-ABILITY OF A COMPLETE BOARD, THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.

DESIGN INFORMATION	
DRAWN BY: MJK	10-29-2010
ENGINEER: MJK	REFERENCE: --------
APPROVED:	

EQUIPMENT TYPE: INVERTER

SUBJECT: SCHEMATIC, PRE_CHARGE PCB

MATERIAL DISPOSITION: NA | APPROVAL DATE: ------- | PROJECT NUMBER: 5038243

PAGE 01 OF 01

DOCUMENT NUMBER: M22617-2D0

DOCUMENT REVISION: A.01

C:\Jobs\M22618-2D0\M22617.sbk(01:17) Fri Oct 29 15:31:27 2010

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.