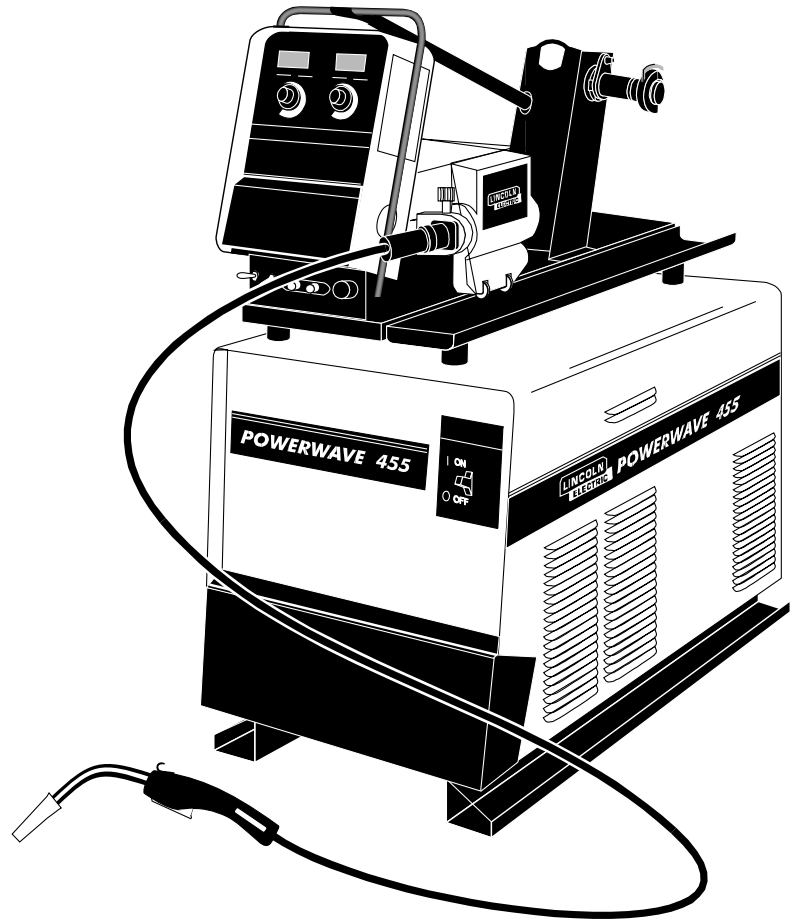


Power Wave 455/Power Feed 10

Safety Depends on You

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



SERVICE MANUAL



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⚠ 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.

Mar '95



ELECTRIC SHOCK can kill.

- 3.a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- 3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.
- In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:**
- Semiautomatic DC Constant Voltage (Wire) Welder.
 - DC Manual (Stick) Welder.
 - AC Welder with Reduced Voltage Control.
- 3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".
- 3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.
- 3.e. Ground the work or metal to be welded to a good electrical (earth) ground.
- 3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
- 3.g. Never dip the electrode in water for cooling.
- 3.h. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
- 3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.
- 3.j. Also see Items 6.c. and 8.



ARC RAYS can burn.

- 4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.
- 4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- 4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



FUMES AND GASES can be dangerous.

- 5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding 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 below Threshold Limit Values (TLV) 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. 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.c. 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.d. 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.e. Also see item 1.b.

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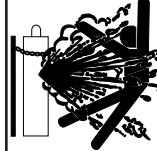


WELDING SPARKS can cause fire or explosion.

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.



CYLINDER may explode if damaged.

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

- 7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- 7.c. Cylinders should be located:
 - Away from areas where they may be struck or subjected to physical damage.
 - A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
- 7.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.
- 7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- 7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.
- 7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association 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.

Mar '95

PRÉCAUTIONS DE SÛRETÉ

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

Sûreté Pour Soudage A L'Arc

1. Protégez-vous contre la secousse électrique:
 - a. Les circuits à l'électrode et à la pièce 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 vêtements mouillés. Porter des gants secs et sans trous pour isoler les mains.
 - b. Faire très attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher métallique ou des grilles métalliques, 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 de fonctionnement.
 - 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 précautions pour le porte-électrode s'appliquent 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 où on reçoit 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 soleil, 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 latéraux 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 un endroit isolé de la masse. Un court-circuit accidentel peut provoquer un échauffement et un risque d'incendie.
8. S'assurer que la masse est connectée le plus près 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 chaînes de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'échauffement des chaînes et des câbles jusqu'à ce qu'ils se rompent.
9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particulièrement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumées 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 phosgène (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 châssis du poste conformément au code de l'électricité et aux recommandations du fabricant. Le dispositif de montage ou la pièce 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 faire des travaux à l'intérieur de poste, la débrancher à l'interrupteur à la boîte de fusibles.
4. Garder tous les couvercles et dispositifs de sûreté à leur place.

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TECHNICAL SPECIFICATIONS – POWER FEED 10 WIRE DRIVE AND CONTROL BOX

WIRE DRIVE OR WIRE DRIVE SECTION OF FEEDER							
SPEC #	TYPE	Speed	Wire Size		Speed	Wire Size	
			Solid	Cored		Solid	Cored
K1540-1	Power Feed 10 Wire Drive	50-800 IPM (1.27-20.3 m/m)	.025 - 3/32 in. (0.6 - 2.4 mm)	.035 - .125 in. (0.9 - 3.2 mm)	75 - 1200 IPM (2.03 - 30.5 m/m)	.025 - 1/16 in. (0.6 - 1.6 mm)	.035 - 5/64 in. (0.9 - 2.0 mm)
K1538-1	Power Feed 10 Boom Package#	50-800 IPM (1.27-20.3 m/m)	.025 - 3/32 in. (0.6 - 2.4 mm)	.035 - .125 in. (0.9 - 3.2 mm)	75 - 1200 IPM (2.03 - 30.5 m/m)	.025 - 1/16 in. (0.6 - 1.6 mm)	.035 - 5/64 in. (0.9 - 2.0 mm)
K1541-1	Power Feed 10 Bench Model Drive and Control Box	50-800 IPM (1.27-20.3 m/m)	.025 - 3/32 in. (0.6 - 2.4 mm)	.035 - .125 in. (0.9 - 3.2 mm)	75 - 1200 IPM (2.03 - 30.5 m/m)	.025 - 1/16 in. (0.6 - 1.6 mm)	.035 - 5/64 in. (0.9 - 2.0 mm)

CONTROL BOX, WIRE DRIVE AND COMPLETE UNITS								
SPEC.#	TYPE	INPUT POWER	PHYSICAL SIZE•			TEMPERATURE RATING		
			Dimensions			Weight	Operating	Storage
Height	Width	Depth						
K1539-1 (Control Box Only)*	Power Feed 10 Control Box	40 VDC	13.0 in. (330 mm)	8.50 in. (215 mm)	4.0 in. (105 mm)	8.5 lbs (3.8 kg)	+40°C to -20°C	+40°C to -40°C
K1540-1 (Wire Drive Only)*	Power Feed 10 Wire Drive	40 VDC	7.6 in. (195 mm)	12.9 in. (325 mm)	13.7 in. (345 mm)	30 lbs (13.6 kg)		
K1541-1 Bench Model Feeder Δ	Power Feed 10 Bench Model Drive and Control Box	40 VDC	18.5 in. (470 mm)	13.5 in. (345 mm)	30.5 in. (775 mm)	62 lbs (28.1 kg.)		

* Included with K1538-1 Boom package and K1541-1 Bench Feeder.

Δ Dimensions do not include wire reel.

For Control Box and Wire Drive dimensions and weights, see individual component listings.

TECHNICAL SPECIFICATIONS – POWER WAVE 455

INPUT AT RATED OUTPUT - THREE PHASE ONLY					
Input Volts	Rated Output @ 100% Duty Cycle	Input Current	Rated Output @ 60% Duty Cycle	Input Current	
208V - 60Hz	450A@38V 100%	70	570A@43V 60%	87	
230V - 60Hz	450A@38V 100%	65	570A@43V 60%	82	
400V - 60Hz	450A@38V 100%	39	570A@43V 60%	50	
460V - 60Hz	450A@38V 100%	35	570A@43V 60%	48	
200V - 50Hz	450A@38V 100%	72	500A@40V 60%	79	
220V - 50Hz	450A@38V 100%	67	500A@40V 60%	74	
400V - 50Hz	450A@38V 100%	40	500A@40V 60%	45	
440V - 50Hz	450A@38V 100%	36	500A@40V 60%	41	
OUTPUT					
Open Circuit Voltage	Current Range	Pulse Frequency	Pulse Voltage Range	Pulse and Background Time Range	Auxiliary Power
75 VDC	5 - 570	0.15 - 1000 Hz	5 - 55 VDC	100 MICRO SEC. - 3.3 SEC.	40 VDC AT 10 AMPS 115 VAC AT 10 AMPS
Process Current Ranges (DC)			Current		
MIG/MAG FCAW SMAW Pulse			50-570 Amps 40-570 Amps 30-570 Amps 5-750 Amps		
RECOMMENDED INPUT WIRE AND FUSE SIZES					
Input Voltage / Frequency	Duty Cycle	Input Ampere Rating on Nameplate (AMPS)	Type 75°C Copper Wire in Conduit AWG[IEC] Sizes (mm ²)	Type 75°C Ground Wire in Conduit AWG[IEC] Sizes (mm ²)	Type 75°C (Super Lag) or Breaker Size (AMPS)
208/60/50	100%	70/72	4 (25)	8 (10)	80
230/60/50	100%	65/67	4 (25)	8 (10)	70
400/60/50	100%	39/40	8 (10)	10 (6)	50
460/60/50	100%	35/36	8 (10)	10 (6)	40
208/60/50	60%*	87/79	4 (25)	8 (10)	90
230/60/50	60%*	82/74	4 (25)	8 (10)	90
400/60/50	60%*	50/45	6 (10)	8 (6)	60
460/60/50	60%*	48/41	6 (10)	8 (6)	50
PHYSICAL DIMENSIONS					
Height 26.10 in. 663 mm		Width 19.86 in. 505 mm		Depth 32.88 in. 835 mm	
Weight 250 lbs 114 kg					
TEMPERATURE RANGES					
Operating Temperature Range 0°C to 40°C			Storage Temperature Range -50°C to 85°C		

*At 60% duty cycle with 50Hz input power, the machine is de-rated to 500 Amps at 40V.

SAFETY PRECAUTIONS

⚠ WARNING



ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this installation.
- Turn off the 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 this equipment.
- Do not touch electrically hot parts.
- Always connect the Power Wave grounding lug (located inside the reconnect input access door) to a proper safety (Earth) ground.

LOCATION AND MOUNTING

Place the welder where clean cooling air can freely circulate in through the rear louvers and out through the case sides and bottom. Dirt, dust, or any foreign material that can be drawn into the welder should be kept at a minimum. Using filters on the air intake to prevent dirt from building up restricts air flow. Do not use such filters. Failure to observe these precautions can result in excessive operating temperatures and nuisance shutdowns.

STACKING

Power Wave machines can be stacked to a maximum of three high. The bottom machine must always be placed on a firm, secure, level surface. There is a danger of machines toppling over if this precaution is not taken.

ENVIRONMENT

The Power Wave power source carries an IP21 environmental rating. If subjected to occasional falling water, such as rain, the machine should be sheltered.

LIFTING

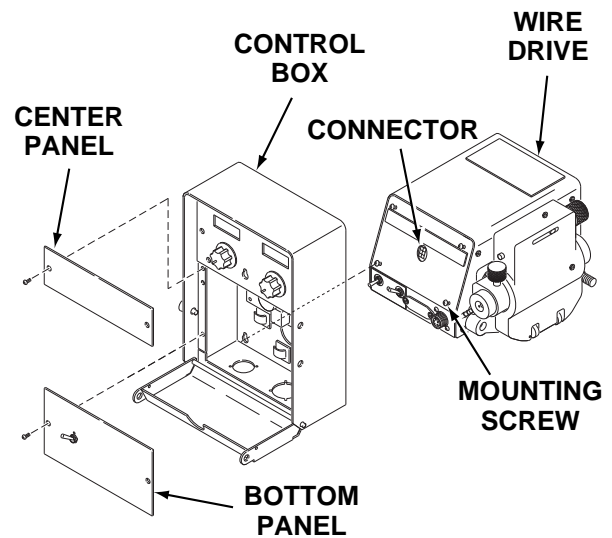
Lift the machine by the lift bail only. The lift bail is designed to lift the power source only. Do not attempt to lift the Power Wave with accessories attached to it.

FEEDER AND CONTROL BOX MOUNTING

SEPARATION FROM BENCH MODEL

The Control Box can be removed from the bench model feeder and mounted in a different location. See Figure A-1.

FIGURE A.1 — SEPARATING CONTROL BOX AND FEEDER.



Complete the following steps to remove the Control Box:

1. Remove the bottom and center option panels from the front of the Control Box.
2. Disconnect the connector between the Control Box and the wire drive located in the middle of the Control Box back near the bottom of the Control Box.

3. Loosen the four screws inside the Control Box located along the sides of the back of the Control Box, two near the bottom and two near the middle.
4. Push the Control Box upwards and then pull the Control Box away from the wire drive.
5. Remove plug button taped to inside of Control Box and insert it into hole on front panel of wire drive.

BOOM MOUNTING

If you wish to convert to a **boom mount**, the following components are required to complete the conversion process:

- Item 1 K1549-1 Receptacle
- Item 2 K1550-1 Receptacle

Assemble the components above as follows:

1. Remove plug button and mount item 1 to the left hole in the bottom of the Control Box.
2. Remove and save plug button and mount item 2 to the right hole in the bottom of the Control Box.
3. Insert connector from item 1 into either 4-pin connector on Control Box motherboard.
4. Insert 6-pin connector that went to wire drive unit into item 2.
5. Connect sense lead from item 1 to sense lead from 6-pin connector that went to wire drive unit.

6. Replace all option panels removed from front of Control Box.
7. Place plug button saved in step 2 into hole in back panel of Control Box.

CONTROL BOX POWER SOURCE MOUNTING

The Power Feed Control Box can be directly mounted on the front of the power source. If this control location is preferred, complete the following steps to mount Control Box on the power source:

1. Remove the bottom and center option panels from the front of the Control Box.
2. Mount Control Box to the power source, following the instructions supplied with that specific power source.
3. If the Control Box has an input Amphenol connector mounted on right side of bottom, then disconnect it's 6-pin electrical connector from the input connector inside the Control Box.

NOTE: This input connector no longer functions.

4. Connect 6-pin connector that comes out of the back of the Control Box to the 6 pin connector. (See specific power source instructions.)
5. 67 sense lead from left bottom connector (if present) should be connected to 67 sense lead connection from 6-pin connector from motherboard.
6. Replace all option panels removed from front of Control Box.

Return to Section TOC
Return to Master TOC


ELECTRICAL CONNECTIONS

WARNING

Only a qualified electrician should connect the input leads to the Power Wave. 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.

Use a three-phase supply line. An access hole for the input supply is located on the upper left case back next to the input access door. Connect L1, L2, L3 and ground according to the Input Supply Connection Diagram decal located on the inside of the input access door or refer to Figure A.2.

GROUNDING

The frame of the welder must be grounded. A ground terminal marked with the symbol  is located inside the reconnect/input access door for this purpose. See your local and national electrical codes for proper grounding methods. Refer to the *Technical Specifications* at the beginning of this chapter for proper cable sizes.

HIGH FREQUENCY INTERFERENCE PROTECTION

If possible, locate the Power Wave away from radio controlled machinery. The normal operation of the Power Wave may adversely affect the operation of RF controlled equipment, which may result in bodily injury or damage to the equipment.

INPUT FUSE AND SUPPLY WIRE CONSIDERATIONS

Refer to the *Technical Specifications* at the beginning of this Installation section for recommended fuse and wire sizes. Fuse the input circuit with the recommended super lag fuse or delay type breakers (also called “inverse time” or “thermal/magnetic” circuit breakers). Choose an input and grounding wire size according to local or national electrical codes. Using 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.

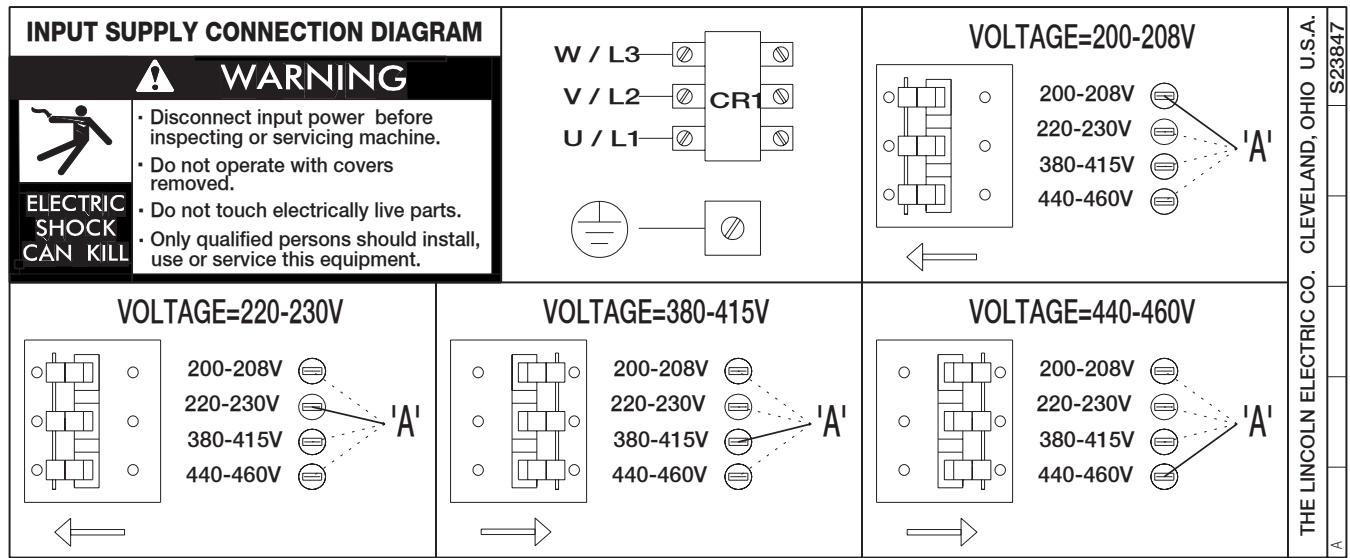
INPUT VOLTAGE RECONNECT PROCEDURE

WARNING

Turn main input power to the machine OFF before performing reconnect procedure. Failure to do so will result in damage to the machine. DO NOT switch the reconnect bar with machine power ON.

Welders are shipped connected for the highest input voltage listed on the rating plate. To connect to a different input voltage, refer to reconnect instructions located on the inside of the input access door or in Figure A.2. If the main reconnect switch is placed in the wrong position, the welder will not produce output power. If the Auxiliary (“A”) lead is placed in the wrong position, there are two possible results. If the lead is placed in a position higher than the applied line voltage, the welder may not come on at all. If the Auxiliary (“A”) lead is placed in a position lower than the applied line voltage, the welder will not come on, and the two circuit breakers in the reconnect area will open. If this occurs, turn off the input voltage, properly connect the “A” lead, reset the breakers, and try again.

FIGURE A.2 — CONNECTION DIAGRAM ON RECONNECT/INPUT ACCESS DOOR.



CABLE CONNECTIONS

CONTROL CABLE CONNECTIONS

- All system control cables are the same but can vary in length.
- All control cables can be connected end to end to extend their length.
- All system equipment must be connected to a control cable.

Welding systems using the Power Feed 10 offer previously unprecedented flexibility in the connection of system components. This system uses the same type of control cable between each of the system components. Connections can be “daisy chained” from one system component to another. Since communication over the control cables is done by a robust communications network, the order of connection of the components makes no difference. The cables can be connected anywhere that there is a mating connector. See the flexible connections part of this section for more details.

NOTE: Maximum cable length between any two nodes is 250 feet.

TYPICAL BENCH FEEDER CONNECTION

Control cable is connected from Power Source (PS) to Feed Head (FH). If the Control Box is separated from the FH, a control cable will connect from the PS to the control box, which will have two control cable connectors. This could be the control box or the FH control box depending on how the units were separated. A second control cable would be connected from the second connector on the control box to the other FH control box.

TYPICAL BOOM FEEDER CONNECTION

Control cable is connected from PS to the control box. A second control cable would be connected from the second connector on the control box to the FH control box.

FLEXIBLE CONNECTION POSSIBILITIES

By using connector kits, a second connector can be added to the Control box or the FH. This allows the user to connect equipment types together in any order.

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CONTROL CABLE SPECIFICATIONS

The cable is a five copper conductor cable in a SO-type rubber jacket. There is one 20 gauge twisted pair for network communications. This pair has an impedance of approximately 120 ohms and a propagation delay per foot of < 2.1 ns. There are two 12 gauge conductors that are used to supply the 40 VDC to the network. The fifth wire is 18 gauge and is used as an electrode sense lead. It is typically connected to the feed plate on the feed head when that feed head is active.

AVAILABLE CABLE ASSEMBLIES

K1543 Control cable only. Available in lengths of 8, 16, 25, 50 and 100 feet.

K1544 Control cable and a 3/0 (85 mm²) electrode cable with stud terminal. It is rated at 600 amps, 60% duty cycle and is available in lengths of 8, 16, 25, and 50 feet.

K1545 Control cable and a 3/0 (85 mm²) electrode cable with Twist-Mate™ connector on one end and a stud terminal on the other. It is rated at 500 amps, 60% duty cycle and is available in lengths of 8, 16, 25, and 50 feet.

CABLE CONNECTIONS

To avoid interference problems with other equipment and to achieve the best possible operation, route all cables directly to the work or wire feeder. Avoid excessive lengths, bundle the electrode and ground cables together where practical, and do not coil excess cable. Be sure the connection to the work makes tight metal-to-metal electrical contact.

Minimum work and electrode cables sizes are as follows:

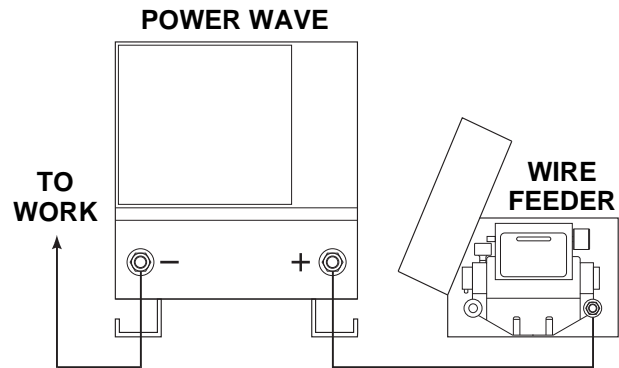
Current 60% Duty Cycle	Minimum Copper Work Cable Size, AWG
	Up to 100 ft Length (30m)
400 Amps	2/0 (67 mm ²)
500 Amps	3/0 (85 mm ²)
600 Amps	3/0 (85 mm ²)

When using an inverter type power source, use the largest welding (electrode and ground) cables that are practical. At least 2/0 copper wire — even if the average output current would not normally require it. When pulsing, the pulse current can reach very high levels. Voltage drops can become excessive, leading to poor welding characteristics, if undersized welding cables are used.

ELECTRODE AND WORK LEADS — ELECTRODE POSITIVE APPLICATIONS

Most welding applications run with the electrode being positive (+). For those applications, connect the electrode cable between the wire feeder and the positive (+) output stud on the power source (located beneath the spring loaded output cover near the bottom of the case front). See Figure A.3.

FIGURE A.3 — ELECTRODE POSITIVE APPLICATION.



A work lead must be run from the negative (-) power source output stud to the work piece. The work piece connection must be firm and secure, especially if pulse welding is planned. Excessive voltage drops at the work piece connection often result in unsatisfactory pulse welding performance.

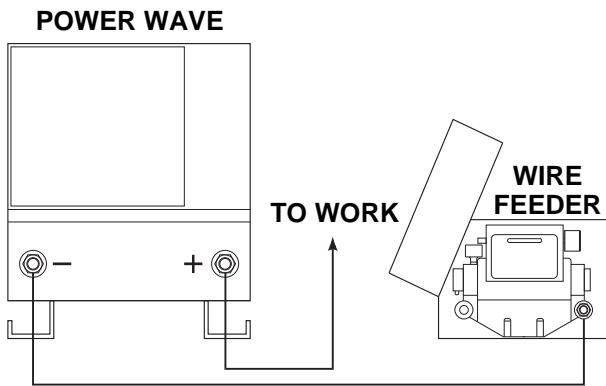
ELECTRODE AND WORK LEADS — ELECTRODE NEGATIVE APPLICATIONS

When negative electrode polarity is required, such as in some Innershield™ applications, install as above, except reverse the output connections at the power source (electrode cable to the negative (-) stud, and work cable to the positive (+) stud). See Figure A.4.

VOLTAGE SENSING AT THE WORK- PIECE

A four-pin voltage sense lead connector is located beneath the output stud cover. In certain installations, where the work connection is poor, arc performance may be improved by the use of an external voltage sensing lead. Contact the factory for information on connecting and using this feature.

FIGURE A.4 — ELECTRODE NEGATIVE APPLICATION.



WIRE FEEDER SETUP

WIRE DRIVE GEAR RATIO (HIGH OR LOW SPEED)

The speed range capability and drive torque of the Power Feed 10 wire drive can be easily and quickly changed by changing the external drive gear. The Power Feed 10 is shipped with both a high speed and a low speed gear. As shipped from the factory, the low speed (high torque) gear is installed on the feeder. If this is the desired gear ratio, no changes need to be made.

SELECTING THE PROPER GEAR RATIO

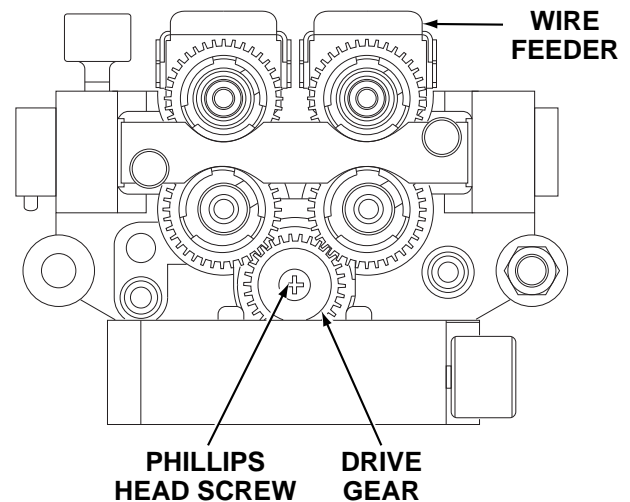
See the Technical Specifications at the front of this section for feed speed and wire size capabilities with high and low speed gear ratios. To determine whether you should be using the high or low speed ratio, use the following guidelines:

- If you need to operate at wire feed speeds greater than 800 IPM (20 m/m), you will need to install the high speed gear (large, 30 tooth, 1.6 inch diameter gear).
- If you need to operate at wire feed speeds less than 800 IPM (20 m/m), you should use the low speed gear (small, 20 tooth, 1.1 inch diameter gear). Using the low speed ratio will provide the maximum available wire driving force. **Note:** If you are feeding only small diameter wires you may, at your option, install the high speed ratio.

CHANGING THE WIRE DRIVE RATIO

Changing the ratio requires a gear change and a switch position change located on the feed head PC Board. The Power Feed 10 is shipped with both a high speed and a low speed gear. As shipped from the factory, the low speed (high torque) gear is installed on the feeder. For identification purposes, the low speed (high torque) gear has 20 teeth and is 1.1 inches in diameter. The high speed gear has 30 teeth and is 1.6 inches in diameter. See Figure A.5.

FIGURE A.5 — CHANGING WIRE DRIVE RATIO.



RATIO CHANGE PROCEDURE

1. Pull open the pressure door.
2. Remove the Phillips head screw retaining the pinion gear to be changed and remove the gear. If the gear is not easily accessible or difficult to remove, remove the feed plate from the gearbox.

To remove feed plate:

- a. Loosen the clamping collar screw using a 3/16 in. Allen wrench. The clamping collar screw is accessed from the bottom of the feed plate. It is the screw which is perpendicular to the feeding direction.
- b. Loosen the retaining screw, which is also accessed from bottom of feeder, using a 3/16 in. Allen wrench. Continue to loosen the screw until the feed plate can be easily pulled off of the wire feeder.
3. Loosen, but do not remove, the screw on the lower right face of the feed plate with a 3/16 in. Allen wrench.
4. Remove the screw on the left face of the feed plate. If changing from high speed (larger gear) to low speed (smaller gear), line the upper hole on the left face of the feed plate with the threads on the clamping collar. Line the lower hole with the threads to install larger gear for high speed feeder. If feed plate does not rotate to allow holes to line up, further loosen the screw on right face of feed plate.
5. Remove the small gear from the output shaft. Lightly cover the output shaft with engine oil or equivalent. Install gear onto output shaft and secure with flat washer, lock washer, and Phillips head screw which were previously removed.

6. Tighten the screw on lower right face of feed plate.
7. Re-attach feed plate to wire feeder if removed in Step 2.
8. Feed plate will be rotated out-of-position due to the gear change. Adjust the angle of the feed plate by loosening the clamping collar screw (Step 2a) and pivoting feed head.
9. Set the High/Low switch code on Feed Head PC board as follows:
 - a. Power down the Power Feed by turning off its companion Power Wave power source. For maximum safety, disconnect the control cable from the Power Feed.
 - b. Remove the cover from the back of the feed head (2 screws).
 - c. Locate the 8-position DIP switch near the top edge of the PC board, centered left to right. The setting will be made on the right most switch, S8.
 - d. Using a pencil or other small object, slide the switch down, to the "0" position, when the low speed gear is installed. Conversely, slide the switch up, to the "1" position, when the high speed gear is installed. Refer to Figure A.6.
 - e. Replace the cover and screws. The PC board will "read" the switch at power up, automatically adjusting all control parameters for the speed range selected.

DIP SWITCH SETUP

SETTING DIP SWITCHES IN THE CONTROL BOX

There are two DIP switch banks on the mother board of the Control Box. They are labeled S1 and S2 and are located and oriented as shown in Figure A.3.

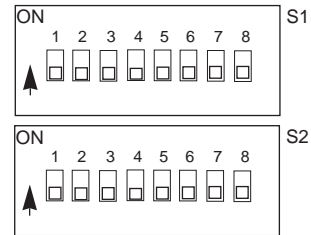


FIGURE A.3

S1 DIP Switch Bank on Control Box Motherboard (For software version S24004-2 only)

Switch	Off	On
1	US 4-Step Trigger Logic	Euro 4-Step Trigger Logic
2	WFS Display = inches/minute	WFS Display = meters/minute
3	Left Display is always preset WFS	Left Display is preset WFS when weld current is not flowing Left Display is actual weld current when weld current is flowing
	CC modes override this switch regardless of position. Left Display is always preset weld current when weld current is not flowing and actual weld current when weld current is flowing	
4	Run-in = Minimum Speed Available	Run-in = weld WFS
	If any option containing a Run-in setting is connected to the motherboard, it automatically overrides this switch regardless of position.	
5	Spare	
6	Acceleration, MSB (Sets acceleration rate for wire drive) see below	
7	Acceleration (Sets acceleration rate for wire drive) see below	
8	Acceleration, LSB (Sets acceleration rate for wire drive) see below	

S2 DIP Switch Bank on Control Box Motherboard (For software version S24004-2 only)

Switch	Off	On
1	Network Group ID, MSB (Assigns Control Box to a specific group) (Off is factory setting)	
2	Network Group ID, LSB (Assigns Control Box to a specific group) (Off is factory setting)	
3	Spare	
4	Spare	
5	Spare	
6	Spare	
7	Spare	
8	Reserved	

Note: the factory shipped settings for all of the S1 and S2 switches is "OFF".

S1 DIP Switch Bank on Control Box Motherboard (For software version S24004-3 & up)

Switch	Off	On
1	Standard speed gearbox limits adjustable	High speed gearbox limits adjustable
2	WFS Display = inches/minute	WFS Display = meters/minute
3	Left Display is always preset WFS	Left Display is preset WFS when weld current is not flowing Left Display is actual weld current when weld current is flowing
CC modes override this switch regardless of position. Left Display is always preset weld current when weld current is not flowing and actual weld current when weld current is flowing		
4	Run-in = Minimum Speed Available	Run-in = weld WFS
If any option containing a Run-in setting is connected to the motherboard, it automatically overrides this switch regardless of position.		
5	Memory change with trigger disabled	Memory change with trigger enabled
6	Acceleration, MSB (Sets acceleration rate for wire drive) see below	
7	Acceleration (Sets acceleration rate for wire drive) see below	
8	Acceleration, LSB (Sets acceleration rate for wire drive) see below	

S2 DIP Switch Bank on Control Box Motherboard (For software version S24004-3 & up)

Switch	Off	On
1	Network Group ID, MSB (Assigns Control Box to a specific group) (Off is factory setting)	
2	Network Group ID, LSB (Assigns Control Box to a specific group) (Off is factory setting)	
3	Spare	
4	Spare	
5	Spare	
6	Must be off for normal operation	Adjust lower limits
7	Must be off for normal operation	Adjust upper limits
8	Must be on for European units only	

Note: the factory shipped settings for all of the S1 and S2 switches is "OFF".

MSB - Most Significant Bit or Byte. This is the bit in a binary number or DIP switch bank that is furthest to the left.

LSB - Least Significant Bit or Byte. This is the bit in a binary number or DIP switch bank that is furthest to the right.

S1 DIP Switch Bank on Control Box Motherboard (For software version S24456)

Switch	Off	On
1	Standard speed gearbox limits adjustable	High speed gearbox limits adjustable
2	WFS Display = inches/minute	WFS Display = meters/minute
3	Left Display is always preset WFS	Left Display is preset WFS when weld current is not flowing Left Display is actual weld current when weld current is flowing
CC modes override this switch regardless of position. Left Display is always preset weld current when weld current is not flowing and actual weld current when weld current is flowing		
4	Run-in = Minimum Speed Available	Run-in = weld WFS
If any option containing a Run-in setting is connected to the motherboard, it automatically overrides this switch regardless of position.		
5	Memory change with trigger disabled	Memory change with trigger enabled
6	Acceleration, MSB (Sets acceleration rate for wire drive) see below	
7	Acceleration (Sets acceleration rate for wire drive) see below	
8	Acceleration, LSB (Sets acceleration rate for wire drive) see below	

Note: the factory shipped settings for the S1 switches are as follows:

PF-10 (and Dual) Domestic - All switches "OFF" PF-10 (and Dual) European - switches 1 & 3-8 "OFF", 2 "ON"
 PF-11 Domestic - switches 2-8 "OFF", 1 "ON" PF-11 European - switches 3-8 "OFF", 1,2 "ON"

S2 DIP Switch Bank on Control Box Motherboard (For software version S24456)

Switch	Off	On
1	Network Group ID, MSB (Assigns Control Box to a specific group) (Off is factory setting)	
2	Network Group ID, LSB (Assigns Control Box to a specific group) (Off is factory setting)	
3	4-Step Domestic Configuration	4-Step European Configuration
4	Power Feed 10 / Dual	Power Feed 11
5	Procedure Change with Trigger "OFF"	Procedure Change with Trigger "ON"
6	Set lower limits	
7	Set upper limits	
8	Must be on for all units (Permits selection of extended modes)	

Note: the factory shipped settings for the S2 switches are as follows:

PF-10 (and Dual) Domestic - switches 1-7 "OFF", 8 "ON" PF-10 (and Dual) European - switches 1,2,4-7 "OFF", 3,8 "ON"
 PF-11 Domestic - switches 1-3,5-7 "OFF", 4,8 "ON" PF-11 European - switches 1,2,5-7 "OFF", 3,4,8 "ON"

MSB - Most Significant Bit or Byte. This is the bit in a binary number or DIP switch bank that is furthest to the left.

LSB - Least Significant Bit or Byte. This is the bit in a binary number or DIP switch bank that is furthest to the right.

Setting Wire Drive Acceleration Rate Using DIP Switch S1 on the Control Box Motherboard (All software versions)

	DIP SWITCH 6	DIP SWITCH 7	DIP SWITCH 8
Acceleration 1 (slow)	Off	Off	On
Acceleration 2	Off	On	Off
Acceleration 3	Off	On	On
Acceleration 4	On	Off	Off
Acceleration 5 (fast) (factory setting)	Off	Off	Off

SETTING DIP SWITCHES IN THE WIRE DRIVE

There is one DIP switch bank on the control board of the wire drive. It's labeled S1 and is located and oriented as shown in Figure A.4.

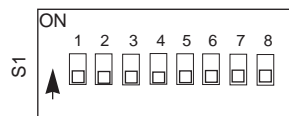


FIGURE A.4

S1 DIP Switch on Wire Drive Control Board (For software version S24029-All & S24467)

Switch	Off	On
1	Network Group ID, MSB (Assigns Wire Drive to a specific group)	
2	Network Group ID, LSB (Assigns Wire Drive to a specific group)	
3	Network Feed Head ID, MSB (Assigns feed head number to wire drive)	
4	Network Feed Head ID (Assigns feed head number to wire drive)	
5	Network Feed Head ID, LSB (Assigns feed head number to wire drive)	
6	Spare	
7	Electrode Sense Polarity = Positive	Electrode Sense Polarity = Negative
	Switch position must match polarity of weld cable attached to feed plate.	
8	Gear Box Ratio = Low	Gear Box Ratio = High
	Switch position must match actual gear box ratio of wire drive.	

Note: the factory shipped settings for all of the S1 switches is "OFF".

GUN AND CABLE ASSEMBLIES

GUN AND CABLE ASSEMBLIES WITH STANDARD CONNECTION

The Power Feed 10 wire feeder is equipped with a factory installed K1500-2 gun connection kit. This kit is for guns having a Tweco™ #2-#4 connector. The Power Feed 10 has been designed to make connecting a variety of guns easily and inexpensively with the K1500 series of gun connection kits. Gun trigger and dual procedure lead connections connect to the single five pin receptacle on the front of the feed head box. See **Gun Adapters** in **Accessories** section.

GENERAL GUN CONNECTION GUIDELINES

The instructions supplied with the gun and K1500 series gun adapter should be followed when installing and configuring a gun. What follows are some general guidelines that are not intended to cover all guns.

- a. Check that the drive rolls and guide tubes are proper for the electrode size and type being used. If not, change them per drive roll installation instructions in the **Operation** section.
- b. Lay the cable out straight. Insert the connector on the welding conductor cable into the brass conductor block on the front of the wire drive head. Make sure it is all the way in and tighten the hand clamp. Keep this connection clean and bright. Connect the trigger control cable polarized plug into the mating five cavity receptacle on the front of the wire drive unit.

NOTE: For Fast-Mate and European connector style guns, connect gun to gun connector making sure all pins and gas tube line up with appropriate holes in connector. Tighten gun by turning large nut on gun clockwise.

- c. For GMA gun cables with separate gas fittings, connect the 3/16 in. I.D. gas hose from the wire drive unit to the gun cable barbed fitting.
- d. For water cooled guns, refer to the instructions supplied with the kit.

GMAW SHIELDING GAS

WARNING



CYLINDER may explode if damaged.

- Keep cylinder upright and chained to support.
- Keep cylinder away from areas where it may be damaged.
- Never lift welder with cylinder attached.
- Never allow welding electrode to touch cylinder.
- Keep cylinder away from welding or other live electrical circuits.



BUILDUP OF SHIELDING GAS may harm health or kill.

- Shut off shielding gas supply when not in use.

SEE AMERICAN NATIONAL STANDARD Z-49.1, "SAFETY IN WELDING AND CUTTING" PUBLISHED BY THE AMERICAN WELDING SOCIETY.

Customer must provide a cylinder of shielding gas, a pressure regulator, a flow control valve, and a hose from the flow valve to the gas inlet fitting of the wire drive unit.

Connect a supply hose from the gas cylinder flow valve outlet to the 5/8-18 female inert gas fitting on the back panel of the wire drive or, if used, on the inlet of the Gas Guard Regulator. See **Accessories** section.

STANDARD PANEL INSTALLATION

CONTROL/DISPLAY PANEL

NOTE: Installation Instructions for the standard equipment panels will be required only if you have removed a standard panel and wish to reinstall it.

The Control/Display Panel fits into the upper or middle slots of the Control Box, and is used to adjust WFS, Amps, Voltage, and Trim. It is also the location of the Status indicator, a diagnostic tool provided for system troubleshooting.

Installation is as follows:

1. Turn off power.
2. Remove the two screws from the front of the blank option panel at the location you choose to install your new panel, (top or middle), of the Control Box cabinet. Discard the blank panel or save for future use and save the screws.
3. Tilt the new panel away from the front opening of the Control Box cabinet. Plug the electrical connector into the proper connector on the right side of the main printed circuit board (14 pin). Make sure the connector latches in place.
4. Position the new panel, taking care not to damage the printed circuit boards on the back and align the screw holes.
5. Replace the two screws and tighten.

CV/GOUGE PANEL

NOTE: Installation Instructions for the standard equipment panels will be required only if you have removed a standard panel and wish to reinstall it.

The CV/Gouge Panel fits into the lower position of the Control Box.

Installation is as follows:

1. Turn off power.
2. Remove the two screws from the front of the Control Box panel. Save the screws, discard the old panel or save for future use.
3. Tilt the new option panel away from the front opening of the Control Box cabinet. Plug the electrical connector into the proper connector on the right side of the main printed circuit board (12 pin). Make sure the connector latches in place.
4. Position the panel to the opening, taking care not to damage the switch connections on the back.
5. Align the screw holes, replace the two screws and tighten.

OPTIONAL PANELS FOR CONTROL BOX

All optional panels for the control box are described in the **Accessories** section of this manual.

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OPERATING INSTRUCTIONS

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

SAFETY INSTRUCTIONS

WARNING



ELECTRIC SHOCK can kill.

- 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 Safety Guidelines detailed in the beginning of this manual.

SYSTEM DESCRIPTION

The Power Wave 455 is a high performance, digitally controlled inverter welding power source capable of complex, high-speed waveform control. The Power Feed 10 is a high performance, digitally controlled, modular wire feeder. Properly equipped, they can support the GMAW, GMAW-P, and FCAW processes.

Operating as a system, each component in the system has special circuitry to “talk with” the other system components, so each component (power source, wire feeder, electrical accessories) knows what the other is doing at all times. This shared information lays the groundwork for a system with superior welding performance.

The Power Feed 10 is a four driven roll feeder that operates on 40 VDC input power, and is available configured in both boom and bench models. In addition, the Control Box and wire feed unit can also be purchased separately. The bench model is designed so that it can easily be converted to a boom feeder.

RECOMMENDED EQUIPMENT

The Power Feed 10 must be used with the Power Wave 455.

DUTY CYCLE AND WELDING CAPABILITIES

The Power Feed 10 wire feeder is capable of welding at a 100% duty cycle (continuous welding). The power source will be the limiting factor in determining system duty cycle capability.

The Power Wave 455 is rated 450 amps at 38 volts, 100% duty cycle, and 570 amps at 43 volts, 60% duty cycle. On 50 Hz, the 60% rating is 500 amps at 40 volts, 60% duty cycle. The duty cycle is based upon a ten minute period. A 60% duty cycle represents six minutes of welding and four minutes of idling in a ten minute period.

If the duty cycle is exceeded, a thermostat will shut off the output until the machine cools to a reasonable operating temperature.

LIMITATIONS

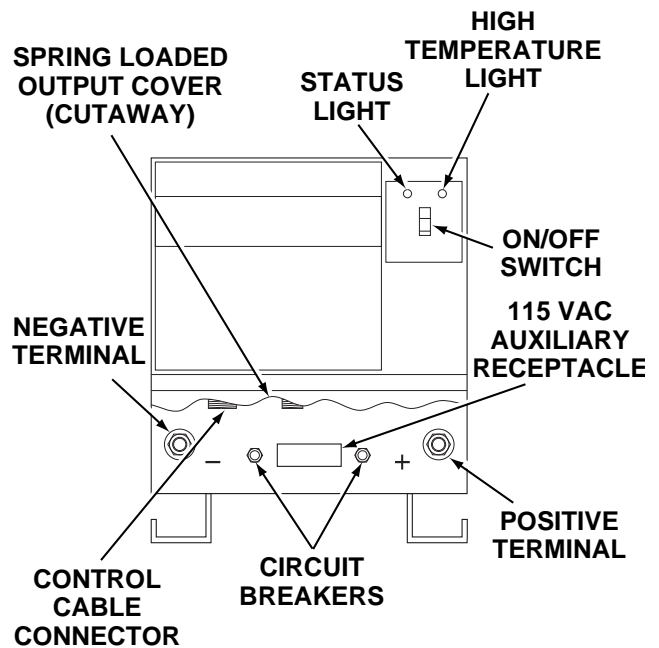
- The Power Wave is not recommended for processes other than those listed.
- The Power Wave can only be used with Power Feed wire feeders. Other models of Lincoln feeders, or any models of non-Lincoln wire feeders, cannot be used.

CONTROLS AND SETTINGS

POWER WAVE CONTROLS AND STATUS LIGHTS

All operator controls and adjustments are located on the case front of the Power Wave. See Figure B.1.

FIGURE B.1 — POWER WAVE CONTROLS AND STATUS LIGHTS.



1. **POWER SWITCH:** Controls input power to the Power Wave.
2. **STATUS LIGHT:** A two color light that indicates system errors. Normal operation is a steady green light. Error conditions are indicated as follows:

NOTE: The Power Wave 455 status light will flash green, and sometimes red and green, for up to one minute when the Power Wave 455 is first turned on. This is a normal situation as the machine goes through a self test at power up.

Light Condition	Meaning
Steady Green	System OK. Power source communicating normally with wire feeder and its components.
Blinking Green	Nothing connected to Wire Feeder Receptacle.
Alternating Green and Red	Recoverable system fault. See Troubleshooting Section.
Steady Red	Non-recoverable system fault. Must turn power source off, find source of error, and turn power back on to reset. See Troubleshooting Section.
Blinking Red	See Troubleshooting Section.

3. HIGH TEMPERATURE LIGHT (thermal overload): 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.
4. 10 AMP WIRE FEEDER CIRCUIT BREAKER: Protects 40 volt DC wire feeder power supply.
5. 10 AMP AUXILIARY POWER CIRCUIT BREAKER: Protects 115 volt AC receptacle.

POWER FEED CONTROLS

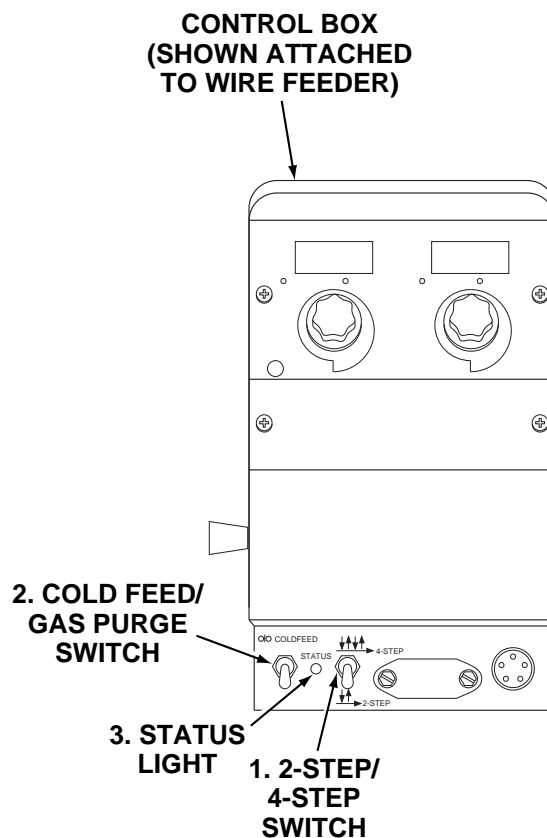
1. 2-STEP/4-STEP SWITCH OPERATION

The Power Feed head unit has a 2-Step/4-Step switch shown in Figure B.2. This switch has no effect in CC modes of operation such as stick welding. When in the 2-step position, the gun trigger functions as follows:

2-Step Operation:

1. Closing the gun trigger initiates gas preflow time followed by run in speed and strike voltage until welding current is established.
2. Opening the gun trigger during a weld stops wire feed and initiates burnback time, followed by gas postflow time.

FIGURE B.2 — WIRE FEEDER CONTROLS.



When the switch is in the 4-step position, the gun trigger functions as follows:

4-Step Operation (Current interlock):

1. Closing trigger initiates gas preflow time followed by run in speed and strike voltage until welding current is established.
2. Once current is established, the trigger may be released and welding will continue.
3. When the trigger is closed again, welding will continue but the current interlock function will be disabled.
4. Releasing the trigger stops the wire feed and initiates burnback followed by gas postflow.

2. COLD FEED/GAS PURGE SWITCH

The Power Feed head unit has a Cold Feed/Gas Purge switch. When left untouched, this switch returns to a center position where no action results.

Cold feed function:

When this switch is held in the up position, the unit automatically feeds wire, but does not activate output to the power source or gas solenoid. The speed of this cold feed is factory preset to 200 IPM. It can be adjusted while the switch is held up, by rotating the WFS encoder knob on the Control Box. Note that this cold feed speed is independent of WFS or run in speeds. When the cold feed switch is released, the cold feed value is memorized for the next time cold feed is activated.

Gas purge function:

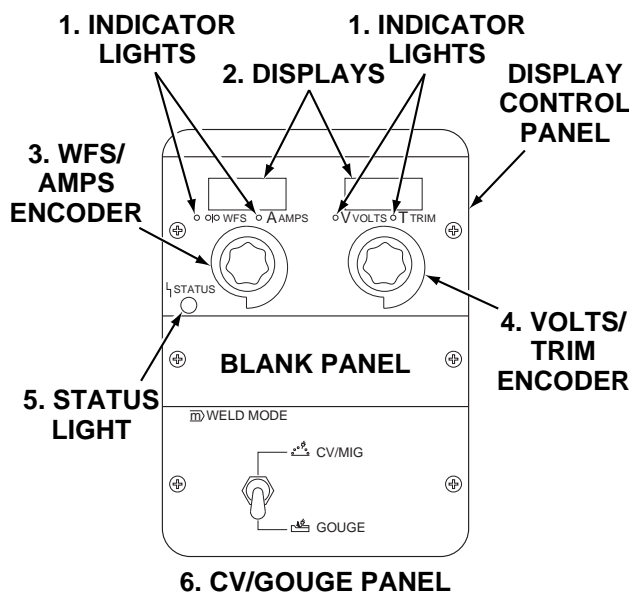
When this switch is held in the down position only the gas solenoid valve is energized.

3. STATUS LIGHT

A two color light that indicates system errors. Normal operation is a steady green light.

DISPLAY CONTROL PANEL

The Display Control panel is the main input to the system. From it, the operator can control WFS, amps, voltage, and trim depending on the active weld mode. It is also the location of the Status indicator, a multicolored diagnostic LED (see *Troubleshooting* section). Refer to Figure B.3.

FIGURE B.3 — CONTROL BOX.**1. Indicator Lights:**

Indicates either WFS or AMPS for the left display, and VOLTS or TRIM for the right display.

2. Displays:

Two extra bright, 3 1/2 digit, red LED displays. The values of the active parameters are displayed, as defined by their associated indicators. The left display is for WFS or Amps, while the right display is for voltage or trim.

3. Left Encoder-Wire Feed Speed or Output Amps:

The left encoder is used to adjust the parameters for either wire feed speed or output amps, dependent upon the process and weld mode being used. Rotating the encoder knob CCW decreases the number value, while rotating the knob CW increases the number value. The ranges and limits are as follows:

WFS - Low Range: 50 to 800 IPM (1.25 to 19.99 MPM)
High Range: 75 to 1200 IPM (2.0 to 30.5 MPM)

AMPS - Limited by the power source based on mode and process.

4. Right Encoder - Trim or Output Volts:

The right encoder operates in the same manner as the left except that either output Volts or Trim is adjusted. The ranges and limits are as follows:

VOLTS - 00.0 to 99.9 volts, limited by power source based on mode and process.

TRIM - 0.50 to 1.50, nominal value is 1.00

When not welding (no output current flow) the displays reflect the preset values. During welding (output current flowing) the displays depict actual values. These actual values are held for a period of five seconds after welding (output current) ceases. This hold feature is canceled if a trigger pull or encoder adjustment occurs during the hold time. The actual value displayed is dependent upon the weld mode and process being used.

5. Status light:

A two color light that indicates system errors. Normal operation is a steady green light.

6. CV/GOUGE PANEL

The CV/Gouge Panel provides a fixed toggle switch selection of two power source modes. The upper position selects the generic CV/MIG mode from the power source while the lower position selects the GOUGE mode.

OPTIONAL PANELS

A number of Optional Features are available for use with the Power Feed 10. Some Installation information is provided in the **ACCESSORIES** section, REFER TO THE INSTRUCTIONS THAT COME WITH EACH KIT FOR DETAILED INFORMATION REGARDING INSTALLATION.

BOARD LEVEL ADJUSTMENTS

The control box motherboard provides the capability to adjust some basic parameters as follows.

BURNBACK

The BURNBACK trimmer (R5) is provided as a basic adjustment for burnback time. The range is 0.0 to 0.25 seconds, CCW limit is minimum, CW limit is maximum. This value is overridden by any option with the ability to independently adjust burnback.

ACCELERATION

See *DIP Switch setup* in the *Installation* section.

RUN IN

See *DIP Switch setup* in the *Installation* section.

WELD MODE DESCRIPTIONS

CONSTANT VOLTAGE (CV/MIG)

For each wire feed speed, a corresponding voltage is preprogrammed into the machine through special softwares at the factory. This preprogrammed voltage is the best average voltage for the procedure at the given wire feed speed. If the wire feed speed is changed on the wire feeder, the voltage automatically changes with it.

In some cases, the operator may want to change the

preprogrammed voltages; for example, to compensate for cable and fixture voltage drops. The preset voltages can be adjusted on the wire feeder's voltage display. When a change is made to the voltage at one wire feed speed, this change is applied to all other wire feed speed settings. For example, if the operator turns up the voltage by 10 percent, the machine automatically increases the preset voltages at all the other wire feed speeds by 10 percent. The preset voltage, programmed at the factory, may be changed with the wire feeder VOLTS adjustment.

ARC GOUGING

Arc gouging can be performed by choosing the arc gouging weld mode. Doing so automatically energizes the output terminals on the Power Wave, making the power source immediately ready to gouge. The output current is set by the AMPS control on the Power Weld wire feeder. The VOLTS/TRIM adjustment has no effect in this mode.

The ARC CONTROL adjusts the arc force. Increasing the ARC CONTROL setting increases the arc force, making the arc more harsh but less likely to stick. Decreasing the ARC CONTROL setting decreases the arc force, making the arc softer and smoother.

ELECTRODE ROUTING

The electrode supply may be either from reels, Readi-Reels, spools, or bulk packaged drums or reels. Observe the following precautions:

- a. The electrode must be routed to the wire drive unit so that the bends in the wire are at a minimum, and also that the force required to pull the wire from the reel into the wire drive unit is kept at a minimum.
- b. The electrode is "hot" when the gun trigger is pressed and must be insulated from the boom and structure.
- c. If more than one wire feed unit shares the same boom and are not sharing the same power source output stud, their wire and reels must be insulated from each other as well as insulated from their mounting structure.

WIRE SPINDLE PLACEMENT

The reel stand provides two mounting locations for the 2 inch diameter wire reel spindle to accommodate various reel sizes. Each mounting location consists of a tube in the center of the reel stand, and a locating pin on the right side (viewed from the front) of the reel stand. The bolt, used with a plain washer and lock washer, slides through the tube from the left side of the reel stand. The large plain washer is placed between the wire spindle hub and the reel stand. The bolt should be threaded into the wire spindle such that the locating pin aligns with the largest of the three holes (the hole that is not recessed) in the back side of the wire spindle base.

The upper location must be used for 50 to 60 lb REDI-Reels, spools and coils.

For smaller coils (44 lb, 30 lb, 10 lb, etc.), the spindle can be placed in either the upper or lower location. The goal is to make the wire path from the coil to the incoming wire guide as straight as possible. This will optimize wire feeding performance.

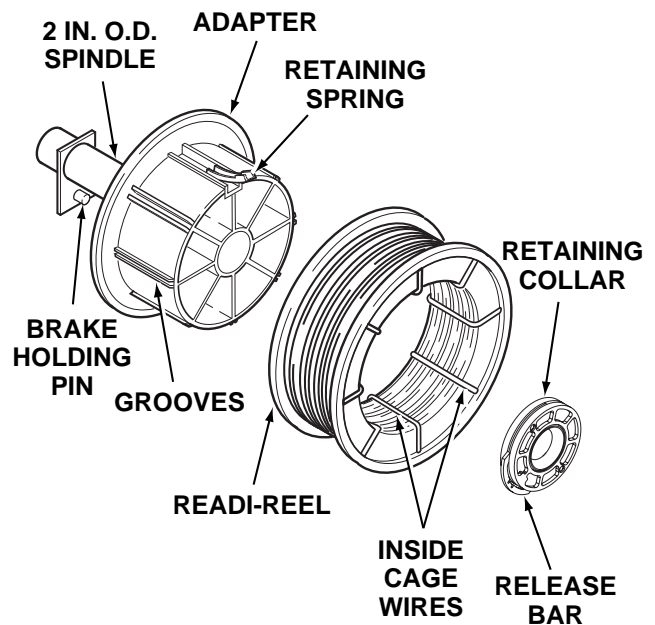
WIRE REEL LOADING - READI-REELS, SPOOLS OR COILS

TO MOUNT A 30 LB (14 KG) READI-REEL PACKAGE (USING THE MOLDED PLASTIC K363-P READI-REEL ADAPTER) (FIGURE B.4):

The spindle should be located in the **LOWER** mounting hole.

1. Depress the release bar on the retaining collar and remove it from the spindle.
2. Place the adapter on the spindle.
3. Re-install the retaining collar. Make sure that the release bar "pops up" and that the collar retainers fully engage the retaining groove on the spindle.
4. Rotate the spindle and adapter so the retaining spring is at the 12 o'clock position.
5. Position the REDI-Reel so that it will rotate in a direction when feeding so as to be de-reeled from the bottom of the coil.

FIGURE B.4 — READI-REEL MOUNTING.



6. Set one of the REDI-Reel inside cage wires on the slot in the retaining spring tab.
7. Lower the REDI-Reel to depress the retaining spring and align the other inside cage wires with the grooves in the molded adapter.
8. Slide cage all the way onto the adapter until the retaining spring "pops up" fully.

⚠ CAUTION

Check to be sure the retaining spring has fully returned to the locking position and has **SECURELY** locked the REDI-Reel cage in place. Retaining spring must rest on the cage, not the welding electrode.

9. To remove REDI-Reel from adapter, depress retaining spring tab with thumb while pulling the REDI-Reel cage from the molded adapter with both hands. Do not remove adapter from spindle.

TO MOUNT 10 TO 44 LB (4.5 TO 20 KG) SPOOLS [12 IN. (300 MM) DIAMETER] OR 14 LB (6 KG) INNERSHIELD COILS (FIGURE B.4):

The spindle should be located in the **LOWER** mounting hole.

(For 8 in. (200 mm) spools, a K468 spindle adapter must first be slipped onto spindle.)

(For 13 to 14 lb (6 kg) Innershield coils, a K435 coil adapter must be used.)

1. Depress the release bar on the retaining collar and remove it from the spindle.
2. Place the spool on the spindle making certain the spindle brake pin enters one of the holes in the back side of the spool. Be certain the wire comes off the reel in a direction so as to de-reel from the bottom of the coil.
3. Re-install the retaining collar. Make sure that the release bar “pops up” and that the collar retainers fully engage the retaining groove on the spindle.

TO MOUNT A 50 TO 60 LB (22.7 TO 27.2 KG) COIL (USING K1504-1 COIL REEL) (FIGURE B.5):

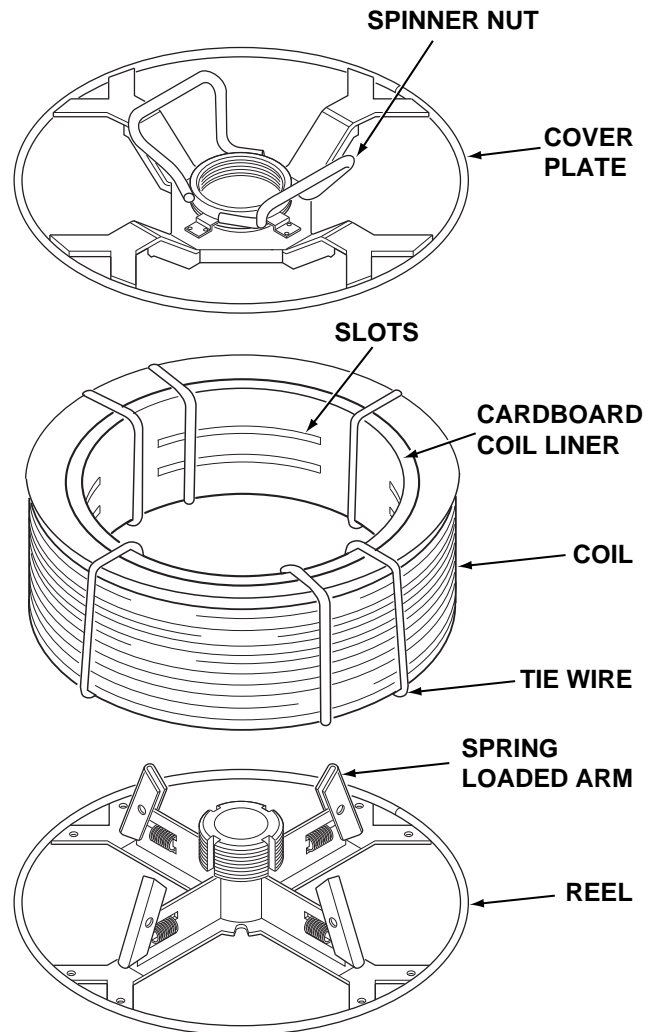
NOTE: (For 50 to 60 lb Readi-Reels a K438 Readi-Reel adapter must be used).

The spindle must be located in the **UPPER** mounting hole.

1. With the K1504-1 coil reel mounted on to the 2 in. (51 mm) spindle (or with reel laying flat on the floor) loosen the spinner nut and remove the reel cover. See Figure B.5.
2. Before cutting the tie wires, place the coil of electrode on the reel so it unwinds from the bottom as the reel rotates. The slots in the cardboard liner should align over the spring loaded arms.
3. Tighten the spinner nut against the reel cover as much as possible by hand using the reel cover spokes for leverage. **DO NOT** hammer on the spinner nut arms.

4. Cut and remove only the tie wire holding the free end of the coil. Hook the free end around the rim of the reel cover and secure it by wrapping it around. Cut and remove the remaining tie wires.

FIGURE B.5 — K1504-1 COIL REEL.



⚠ CAUTION

Always be sure the free end of the coil is securely held while the tie wires are being cut and until the wire is feeding through the drive rolls. Failure to do this will result in “backlashing” of the coil, which may tangle the wire. A tangled coil will not feed so it must either be untangled or discarded.

5. Be sure the coil reel is engaged with the spindle brake pin and the release bar on the retaining collar “pops up” and that the collar retainers fully engage the retaining groove on the spindle.

FEEDING ELECTRODE AND BRAKE ADJUSTMENT

1. Turn the reel or spool until the free end of the electrode is accessible.
2. While tightly holding the electrode, cut off the bent end and straighten the first 6 in. (150 mm). Cut off the first 1 in. (25 mm). (If the electrode is not properly straightened, it may not feed or may jam causing a "birdnest".)
3. Insert the free end through the incoming guide.
4. Press the Cold Feed Switch while pushing the electrode into the incoming wire guide.

WARNING

If feeding with the Gun Trigger, the electrode and wire drive may be electrically "HOT".

5. Feed the electrode through the gun.
6. Adjust the brake tension with the thumbscrew on the spindle hub, until the reel turns freely but with little or no overrun when wire feeding is stopped. Do not overtighten.

DRIVE ROLL KIT INSTALLATION (KP1505-[])

1. Turn off welding power source.
2. Pull open pressure door to expose rolls and wire guides.
3. Remove outer wire guide by turning knurled thumb screws counterclockwise to unscrew them from Feedplate.
4. Remove the drive rolls, if any are installed, by pulling straight off the shaft. Remove the inner guide.
5. Insert the inner wire guide, groove side out, over the two locating pins in the feedplate.
6. Install each drive roll by pushing over the shaft until it butts up against the locating shoulder on the drive roll shaft. (Do not exceed maximum wire size rating of the wire drive).

7. Install the outer wire guide by sliding over the locating pins and tightening in place.
8. Engage the upper drive rolls if they are in the "open" position and close pressure door.

To set drive roll pressure, see *Drive Roll Pressure Setting*.

DRIVE ROLL PRESSURE SETTING

The Power Feed 10 pressure is factory pre-set to about position "2" as shown on the pressure indicator on the front of the feedplate door. This is an approximate setting.

The optimum drive roll pressure varies with type of wire, surface condition, lubrication, and hardness. Too much pressure could cause "birdnesting", but too little pressure could cause wire feed slippage with load and/or acceleration. The optimum drive roll setting can be determined as follows:

1. Press end of gun against a solid object that is electrically isolated from the welder output and press the gun trigger for several seconds.
2. If the wire "birdnests", jams, or breaks at the drive roll, the drive roll pressure is too great. Back the pressure setting out one turn, run new wire through the gun, and repeat above steps.
3. If the only result is drive roll slippage, disengage the gun, pull the gun cable forward about 6 in. (150 mm). There should be a slight waviness in the exposed wire. If there is no waviness, the pressure is too low. Increase the pressure setting one turn, reconnect the gun, tighten locking clamp and repeat the above steps.

PROCEDURE FOR SETTING ANGLE OF FEEDPLATE

1. Loosen the clamping collar screw using a 3/16 in. Allen wrench. The clamping collar screw is accessed from the bottom of the feedplate. It is the screw which is perpendicular to the feeding direction.
2. Rotate feedplate to the desired angle and tighten clamping collar screw.

WIRE FEED OVERLOAD PROTECTION

The wire drive has solid-state overload protection of the wire drive motor. If the wire drive motor becomes overloaded for an extended period of time the wire drive will issue a shutdown command to the Control Box and force its STATUS light to blink between green and red. The Control Box turns off the power source, wire feed and gas solenoid. The status light on the wire drive will continue to blink between green

and red for about 30 seconds before the wire drive will automatically reset. At that time, the wire drive will issue a shutdown over command to the Control Box that will return the system to normal operation. The wire drive will force its STATUS light to solid green.

Overloads can result from improper tip size, liner, drive rolls, or guide tubes, obstructions or bends in the gun cable, feeding wire that is larger than the rated capacity of the feeder or any other factors that would impede normal wire feeding.

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GENERAL

The following is a list of the accessories that can be used with the Power Feed 10 wire feeder and the Power Wave 455. A description of each item is given later in the section.

TABLE C.1 — POWER FEED 10 AND POWER WAVE 455 ACCESSORIES.

K1570-1	DUAL CYLINDER UNDERCARRIAGE
KP1505 Series	DRIVE ROLL AND GUIDE TUBE KITS
K1543	INPUT CABLE ASSEMBLY (CONTROL CABLE ONLY)
K1544	INPUT CABLE ASSEMBLY
K1548-1	RECEPTACLE KIT (INPUT AND OUTPUT)
K162h	WIRE SPINDLE ADAPTER
K1504-1	COIL ADAPTER
K435	COIL ADAPTER
K363P	READI-REEL ADAPTER
K438	READI-REAL ADAPTER
K489-7	FAST-MATE™ GUN ADAPTERS
K489-2	
K466-10	CONNECTOR KIT
K471-21, -22, -23	MAGNUM 400 WELDING GUNS
K497-20, -21	MAGNUM 200 WELDING GUNS
K613-7	MAGNUM 550 WELDING GUN CONNECTOR KIT
K556 (250XA) K556 (400XA) K206 K289 K309	LINCOLN FUME EXTRACTION GUNS
K489-2	FAST-MATE™ ADAPTER KIT
K1500-1	LINCOLN INNERSHEILD GUN STANDARD CONNECTION
K1500-2	TWECO™ #2-#4 CONNECTION
K1500-3	TWECO™ #5 CONNECTION
K1500-4	MILLER CONNECTION
K1546-1	CONDUIT ADAPTER
K1546-2	CONDUIT ADAPTER
K683-1	DUAL PROCEDURE SWITCH
K683-3	DUAL PROCEDURE SWITCH
K590-5	WATER CONNECTION KIT (FOR DRIVE ONLY)
K1536-1	WATER FLOW SENSOR KIT
K659-1	GAS GUARD REGULATOR
K1557-1	SWIVEL MOUNT
K1556-1	LIGHT DUTY CASTER KIT
K1574-1	SECURITY DOOR (LARGE)
K1555-1	INSULATED LIFT HOOK
K1542-5	DUAL PROCEDURE PANEL
K1542-6	"M" PANEL
K1546-7	MX PANEL (LARGE)
K1542-8	MSP PANEL (LARGE)
K1542-9	DUAL PROCEDURE / MEMORY PANEL (SMALL)
K1542-11	MX2 PANEL (LARGE)
K1542-12	MSP2 PANEL (LARGE)

POWER WAVE OPTIONS AND ACCESSORIES

The following is a list of available Power Wave options.

FACTORY INSTALLED

There are no factory installed options available for the Power Wave machines.

FIELD INSTALLED

The following options/accessories are available for your Power Wave from your local Lincoln Distributor.

K1570-1 DUAL CYLINDER UNDERCARRIAGE

This is a platform undercarriage for mounting up to two gas cylinders at the rear of the welder.

WIRE FEEDER OPTIONS AND ACCESSORIES

The following is a list of available Wire Feeder options.

DRIVE ROLL AND GUIDE TUBE KITS

TABLE C.2 — DRIVE ROLL AND GUIDE TUBE KITS.

Wire Size		4-Roll Drive (4-Driven)
Solid Steel Electrode		
in.	mm	
0.023 - 0.025	0.6	KP1505 - 030S
0.030	0.8	KP1505 - 030S
0.035	0.9	KP1505 - 035S
0.040	1.0	KP1505 - 045S
0.045	1.2	KP1505 - 045S
0.052	1.4	KP1505 - 052S
1/16	1.6	KP1505 - 1/16S
5/64	2.0	KP1505 - 5/64
3/32	2.4	KP1505 - 3/32
Cored Electrode		
in.	mm	
0.030	0.8	KP1505 - 035C
0.035	0.9	KP1505 - 035C
0.040	1.0	KP1505 - 045C
0.045	1.2	KP1505 - 045C
0.052	1.4	KP1505 - 052C
1/16	1.6	KP1505 - 1/16C
0.068	1.7	KP1505 - 068
5/64	2.0	KP1505 - 5/64
3/32	2.4	KP1505 - 3/32
7/64	2.8	KP1505 - 7/64H
7/64	2.8	KP1505 - 7/64
0.120	3.0	KP1505 - 120
Aluminum Wire		
.035" (0.9 mm) Aluminum		KP1507-035A
.040" (1.0 mm) Aluminum		KP1507-040A
3/64" (1.2 mm) Aluminum		KP1507-3/64A
1/16" (1.6 mm) Aluminum		KP1507-1/16A
3/32" (2.2 mm) Aluminum		KP1507-3/32A

POWER WAVE 455/POWER FEED 10



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INPUT CABLE ASSEMBLIES

K1543 (Control Cable Only) - Consists of a 5-conductor control cable with a 5-pin control cable plug, without electrode cable, and is available in lengths of 10 ft, 15 ft, 20 ft, 50 ft, and 100 ft.

K1544 - Consists of a 5-conductor control cable with a 5-pin control cable plug and a 3/0 electrode cable. It is rated at 600 amps, 60% duty cycle and is available in lengths of 10 ft, 15 ft, 20 ft, and 50 ft.

With input power disconnected from the power source, install the input cable by performing the following:

CABLE RECEPTACLES

K1548-1 RECEPTACLE KIT (INPUT AND OUTPUT)

This kit contains the contents of both the K1549-1 and K1550-1 kits. Refer to the instructions for each, below.

RECEPTACLE (OUTPUT)

Optional Output Connector installation into the Control Box cabinet and/or into the feed head enclosure.

Control Box Cabinet Procedure

1. Turn off power.
2. Remove the screws from the front of the lower and middle option panels of the Control Box.
3. Tilt the option panels away from the front opening of the Control Box cabinet. If the option panel has an electrical connector, disconnect it from the main printed circuit board (note connection point for re-connection later). Remove the option panel and set aside.
4. Remove the plastic plug (black) from the left hole

in the bottom of the Control Box cabinet and store it in the bottom of the Control Box cabinet for future use, should the Optional Output Connector be removed.

5. Place the Optional Output Connector (Amphenol) through the hole opened by the previous step (place from the inside, out). Rotate the Optional Output Connector so its aligning key is positioned to the front of the Control Box cabinet. Fasten the Optional Output Connector to the bottom wall of the Control Box cabinet with the four screws provided.
6. Secure the choke (large circular component of the Optional Output Connector) by inserting its leads into the white nylon clip located near the Optional Output Connector on the back wall of the Control Box cabinet. Insert the choke leads only.
7. The Optional Output Connector has two internal connectors, a four pin, and a single lead connector. Connect the four pin connector to the unused four pin connector on the main printed circuit board. Connect the single lead connector to a similar connector found on a lead nearby that branches out of the Control Box wiring harness.
8. Re-install the lower and middle option panels by reversing the removal process. While re-installing the option panels, ensure clearance between Optional Output Connector components, Control Box wiring harness, and option panel harness (if any).

Feed Head Enclosure Procedure

1. Turn power off.
2. Remove the Feed Head rear access door. The Feed Head cover can be removed to aid installation, but is not required.
3. Remove the plastic plug (black) from the hole at the right rear of the Feed Head and store it in the left side of the Feed Head rear compartment for future use, should the Optional Output Connector be removed.
4. Disconnect a printed circuit board connector, located at the bottom right corner of the printed circuit board, and position it to the left so as to provide clear access to the lower right corner of the Feed Head enclosure.
5. Place the Optional Output Connector (Amphenol) through the hole opened by the two previous steps (place from the inside, out). Rotate the Optional Output Connector so its aligning key is positioned to the top of the Feed Head enclosure. Fasten the Optional Output Connector to the back wall of the Control Box cabinet with the four screws provided.
6. Secure the choke (large circular component of the Optional Output Connector) by inserting its leads into the white nylon clip located near the Optional Output Connector on the floor of the Feed Head. Insert the long choke leads rather than the short leads that run between the choke and the Output Connector. Insert the choke leads only.
7. The Optional Output Connector has two internal connectors, a four pin, and a single lead connector. Connect the four pin connector to the unused four pin connector on the printed circuit board. Connect the single lead connector to a similar connector found on a lead nearby that branches out of the Feed Head wiring harness.
8. Reconnect the printed circuit board connector that was disconnected earlier.
9. Replace the rear access door and Feed Head cover if removed.

RECEPTACLE (INPUT)**Power Feed Wire Feeder Optional Input Connector Installation into the Control Box Cabinet and Conversion to Fixture Wire Feeder**

1. Turn off power.
2. Remove the screws from the front of the lower and middle option panels of the Control Box cabinet.
3. Tilt the option panels away from the front opening of the Control Box cabinet. If the option panel has an electrical connector, disconnect it from the main printed circuit board (note connection point for re-connection later). Remove the option panel and set aside.
4. Disconnect the connector located at the back wall of the Control Box cabinet.
5. Loosen (do not remove) the four screws located on the back wall of the Control Box cabinet.
6. Lift Control Box cabinet off of the four screws loosened above and set on a work surface. Retighten the four screws to secure for future use.
7. Remove the plastic plug (black) from the right hole in the bottom wall of the Control Box cabinet and insert it into the hole in the front of the Feed Head.
8. Place the Optional Input Connector (Amphenol) through the hole opened by the previous step (place from the inside, out). Rotate the Optional Input Connector so it's aligning key is positioned to the front of the Control Box cabinet. Fasten the Optional Input Connector to the bottom wall of the Control Box cabinet with the four screws provided and connect the option's opposite end to the connector previously disconnected in step 4.
9. Secure the choke (large circular component of the Optional Input Connector) by inserting its leads into the white nylon clip located near the Optional Input Connector on the back wall of the Control Box cabinet. Insert the choke leads only.

10. Install an Optional Output Connector into the Control Box cabinet, if not already present.
11. Mount the Control Box cabinet to the work station fixture at this time, if desired. The four holes in the back wall of the Control Box cabinet can be used for this purpose.
12. Re-install the lower and middle option panels by reversing the removal process. While re-installing the option panels, ensure clearance between Optional Input Connector components, Control Box wiring harness, and option panel wiring harness (if any).

REEL ADAPTERS

K162H - WIRE SPINDLE ADAPTER

Spindle for boom mounting Readi-Reels and 2 in. (51 mm) I.D. spools with up to 60 lb (27.2 kg) capacity. User mounted to appropriately prepared boom framework. Includes an easily adjustable friction brake for control of overrun (a 2 in. spindle is standard on Power Feed 10 bench model).

When a 2 in. (51 mm) spindle is used with Readi-Reels, or coils not on 12 in. (305 mm) O.D. spools, an adapter is required:

K1504-1 - COIL ADAPTER

Permits 50 lb to 60 lb (22.7 to 27.2 kg) coils to be mounted on 2 in. (51 mm) O.D. spindles.

K435 - COIL ADAPTER

Permits 14 lb (6 kg) Innershield coils to be mounted on 2 in. (51 mm) O.D. spindles.

K363P - READI-REEL ADAPTER

Adapts Lincoln Readi-Reel coils of electrode 30 lb (14 kg) and 22 lb (10 kg) to a 2 in. (51 mm) spindle. Durable molded plastic one piece construction. Designed for easy loading; adapter remains on spindle for quick changeover.

K438 - READI-REEL ADAPTER

Adapts Lincoln Readi-Reel coils of electrode 50 to 60 lb (22.7 to 27.2 kg) to a 2 in. (51 mm) spindle.

GUNS AND GUN ADAPTERS

The Power Feed 10 wire feeder is equipped with a factory installed K1500-2 gun connection kit. This kit is for guns having a Tweco™ #2-#4 connector. The Power Feed 10 has been designed to make connecting a variety of guns easy and inexpensive with the K1500 series of gun connection kits. Gun trigger and dual procedure lead connections connect to the single 5 pin receptacle on the front of the Feed Head box.

FAST-MATE™ GUNS (INCLUDING THE MAGNUM 450 WATER COOLED GUN)

A K489-7 adapter will install directly into the wire drive feedplate, to provide for use of guns with Fast-Mate™ or European style gun connections. This K489-7 will handle both standard Fast-Mate™ and Dual Schedule Fast-Mate™ guns.

Another way to connect a gun with a Fast-Mate™ or European style gun connector to the Power Feed 10, is to use the K489-2 Fast-Mate™ adapter kit. Installation of this adapter also requires a K1500-1 gun connector.

MAGNUM 200/300/400 GUNS

The easiest and least expensive way to use Magnum 200/300/400 guns with the Power Feed 10 wire feeder is to order them with the K466-10 connector kit, or to buy a completely assembled Magnum gun having the K466-10 connector (such as the K471-21, -22, and -23 dedicated Magnum 400 guns and the K497-20 and -21 Magnum 200 guns).

MAGNUM 550 GUNS

The easiest and least expensive way to use the Magnum 550 guns with Power Feed 10 wire feeders is to order the gun with the K613-7 connector kit, and install a K1500-3 gun connection kit to the wire feeder.

LINCOLN INNERSHIELD AND SUB ARC GUNS

All of these guns can be connected to the Power Feed by using the K1500-1 Adapter Kit.

LINCOLN FUME EXTRACTION GUNS

The K556 (250XA) and K566 (400XA) guns require that a K489-2 Fast-Mate™ adapter kit be installed. Installation of this adapter also requires a K1500-1 gun connector kit.

The K206, K289, and K309 require only the installation of a K1500-1 connector in the Power Feed wire feeder.

NON-LINCOLN GUNS

Most competitive guns can be connected to the Power Feed by using one of the K1500 series adapter kits.

K1500-1 (LINCOLN INNERSHIELD GUN STANDARD CONNECTION)

Use this kit to connect the following guns: Guns having a Lincoln standard innershield gun connector, Fast-Mate™ guns with K489-2 Fast-Mate™ Adapter Kit, Magnum 200/300/400 with K466-1 connector kit, and Magnum 550 guns with the K613-1 gun connection kit.

K1500-2 (TWECO™ #2-#4 CONNECTION)

The K1500-2 gun adapter comes factory installed on the Power Feed 10 wire feeder. Use this adapter for guns that have a Tweco™ #2-#4 connector. Such guns include Magnum 200/300/400 guns with K466-10 connector kit, and completely factory assembled Magnum guns that are factory equipped with the K466-10 connector (such as the K497-21 dedicated Magnum 400).

K1500-3 (TWECO™ #5 CONNECTION)

The K1500-3 gun adapter is for Magnum 550 guns with a K613-7 connection kit, and any other gun having a Tweco™ #5 connector.

K1500-4 (MILLER CONNECTION) for any gun having a Miller connector.

Install gun adapters per the instructions shipped with them.

CONDUIT ADAPTERS**K1546-1 ADAPTER**

For use with Lincoln Magnum conduit (wire sizes 0.023 to 0.052)

Install the K1546-1 gun adapter at the incoming end of the feed plate, secure with the set screw located at the back of the feed plate. If a brass fitting is supplied with the conduit, remove it from the feeder end of the conduit by unscrewing it. Insert the conduit into the K1546-1, secure the conduit by fastening it to the adapter with the supplied knob screw.

K1546-2 ADAPTER

For use with Lincoln Magnum conduit (wire sizes 1/16 to 0.120)

Install the K1546-2 gun adapter at the incoming end of the feed plate; secure with the set screw located at the back of the feed plate. If a brass fitting is supplied with the conduit, remove it from the feeder end of the conduit by unscrewing it. Insert the conduit into the K1546-2, secure the conduit by fastening it to the adapter with the supplied knob screw.

DUAL PROCEDURE SWITCH OPTIONS

K683-3 DUAL PROCEDURE SWITCH

Kit includes gun switch and mountings for Lincoln Innershield and Magnum guns, with 15 ft (4.5 m) control cable and 5-pin plug with two leads to connect to gun trigger.

Connect the 5-pin plug of the K683-3 Dual Procedure Switch to the Power Feed 10 wire feeder trigger/dual procedure 5-socket receptacle.

The two lead plug cord extending out of the 5-pin plug of the Dual Procedure Switch is to be connected to the two trigger leads of the welding gun per instructions shipped with the kit.

K683-1 DUAL PROCEDURE SWITCH

The K683-3 Dual Procedure Switch is the recommended method of obtaining dual procedure; but if it is desired to use an existing K683-1 with the Power Feed 10, it can be done. A K683-1 Dual Procedure Switch can be used on the Power Feed 10 if a K686-2 adapter is used. The K682-1 kit includes gun switch and mountings for Lincoln Innershield and Magnum guns, with 15 ft (4.5 m) control cable and 3-pin plug. K686-2 adapter permits 3-pin plug and 5-pin gun trigger plug to be connected to Power Feed 10 5-pin trigger/dual procedure receptacle.

GAS AND WATER KITS

K590-5 WATER CONNECTION KIT (FOR DRIVE ONLY)

Install per the instructions shipped with the kit.

K1536-1 WATER FLOW SENSOR KIT

Install per the instructions shipped with the kit.

K659-1 GAS GUARD REGULATOR

Adjustable flow regulator with removable adjuster key for CO₂ and Argon blend gases. Mounts onto feeder inlet, and reduces gas waste and arc start "blow" by reducing surge caused by excess pressure in supply hose.

Install the 5/8-18 male outlet of the regulator to the 5/8-18 female gas inlet on the back panel of the wire drive. Secure fitting with flow adjuster key at top. Attach gas supply to 5/8-18 female inlet of regulator.

CHASSIS OPTIONS

K1557-1 SWIVEL PLATFORM

The K1557-1 Swivel platform attaches to the power source. This kit includes a feeder adapter plate that allows the feeder to rotate on top of the power source. The feeder can be easily separated from the swivel mount at any time. This option is compatible with the K1556-1 Light Duty Caster Kit.

K1556-1 LIGHT DUTY CASTER KIT

This option provides four casters and all required hardware to mount it to the Power Feed 10. This option is compatible with the K1557-1 Swivel Platform.

K1574-1 SECURITY DOOR (LARGE)

K1574-1 Security Door Installation into the Control Box cabinet.

1. Turn off power.
2. Unlatch and swing open the small door. Remove the two screws from the horizontal hinge rod. Save the screws.
3. While holding the door so it doesn't fall, slide the rod out sideways releasing the door.

4. Position the new door between the panel holes and re-install the rod so the screw holes can be accessed.
5. Replace the two screws and tighten.
6. Swing the door into the up position. A lock may be installed through the side holes for security purposes.

K1555-1 INSULATED LIFT BAIL

For applications where an insulated lift bail is required. This kit provides an easily installed, heavy duty insulated lift eye that mounts to the wire reel stand mast. See the instructions provided with the kit for installation.

DESCRIPTION AND INSTALLATION OF OPTIONAL CONTROL BOX PANELS

K1542-5 DUAL PROCEDURE PANEL

The Dual Procedure Panel provides a fixed large toggle switch or the use of a gun switch for the selection of either of two procedures. The upper position of the switch selects PROCEDURE A, while the lower selects PROCEDURE B. The middle position selects the GUN switch, in which case the procedure is determined by the position of the switch located at the gun.

NOTE: Due to the nature of fixed position switches, this option does not allow the indication of a remotely selected procedure. When in the gun mode there is no provision to indicate, at the Control Box, which procedure has been remotely selected (at the gun).

Installation is as follows:

1. Turn off power.
2. Remove the two screws from the front of the blank option panel at the location you choose to install your new option, (middle or top), of the Control Box cabinet. Save the screws, discard the old panel or save for future use.

3. Tilt the new option panel away from the front opening of the Control Box cabinet. Plug the electrical connector into the proper connector on the right side of the main printed circuit board (10 pin). Make sure the connector latches in place.
4. Position the new panel, taking care not to damage the switch connections on the back.
5. Align the screw holes, replace the two screws and tighten.

K1542-6 M PANEL

The M Panel provides a large toggle switch selection of three power source modes. The upper position selects the generic CV/MIG mode from the power source, the middle position selects the CV/FLUX CORED mode, and the lower position selects the CC/STICK/GOUGE mode. Arc control is accomplished through the use of the ARC CONTROL potentiometer. The arc control value is actually a trim with zero being the nominal and the scale ranging from (-10) to (+10). Preflow, postflow, and spot time default to zero or off. Run in defaults to the minimum value, or weld speed depending on the position of its associated DIP switch. See **Installation** section for DIP switch settings. Burnback defaults to the on board trimmer adjustment.

NOTE: Due to the nature of fixed position switches, potentiometers, and default values, this option does not allow the mode, arc control, timers, or burnback values to be included in dual procedure or memory information. They are overridden by the fixed values.

CC/STICK/GOUGE Mode

Selecting the CC/STICK/GOUGE mode on this panel automatically energizes the output terminals on the power source, making the power source immediately ready to weld. In the CC modes, the output current is set by the AMPS control, and the VOLTS/TRIM adjustment has no effect in this mode. In this mode, the ARC CONTROL adjusts the arc force. Increasing the ARC CONTROL setting increases the arc force, making the arc more harsh but less likely to stick. Decreasing the ARC CONTROL setting decreases the arc force, making the arc softer and smoother.

Constant Voltage (CV/MIG and CV/Flux Cored) Procedures

When in this mode, the ARC CONTROL adjusts the inductance. (This adjustment is often referred to as "pinch". Inductance is inversely proportional to pinch.) Increasing the ARC CONTROL setting decreases the inductance, which results in the arc getting colder and pinched tighter. Decreasing the ARC CONTROL setting increases the inductance, which results in the arc getting wider (reduced pinch).

Installation is as follows:

1. Turn off power.
2. Remove the two screws from the front of the blank option panel at the location you choose to install your new option (bottom) of the Control Box cabinet. Save the screws, discard the old panel or save for future use.
3. Tilt the new option panel away from the front opening of the Control Box cabinet. Plug the electrical connector into the proper connector on the right side of the main printed circuit board (12 pin). Make sure the connector latches in place.
4. Position the new panel, taking care not to damage the connections on the back.
5. Align the screw holes, replace the two screws and tighten.

K1542-7 MX PANEL (LARGE PANEL)

The MX Panel provides a selection of four power source modes. In addition, it provides for the adjustment of the following parameters: PREFLOW, RUN IN, ARC CONTROL, BURNBACK, POSTFLOW, and SPOT time.

Descriptions

Indicator Lights - Extra bright red LED's indicate the mode and active parameter being displayed.

Display - Displays the value or status of the active parameter.

Available Modes - CV/MIG
CV/ FLUX CORED
CC/STICK CRISP
CC/STICK SOFT

Due to the nature of the system, the following feature is required for safety reasons. Upon entering any constant current (CC) mode, the right encoder, labeled VOLTS, TRIM, on the Display/Control Panel acts as a "soft" contactor switch. The encoder knob must be turned CW at least 45° to activate the output (turning CCW 45° deactivates the output). This prevents the output from inadvertently becoming "hot" when scrolling through the weld modes. The exception to this rule is when the weld mode is entered by a change in procedure (using a memory panel such as the K1542-9 Memory/Dual Procedure panel). In this case, the state of the contactor is recalled as it was left when the procedure was exited.

In the CC modes, the output current is set by the AMPS control, and the VOLTS/TRIM adjustment has no effect in this mode. In this mode, the ARC CONTROL adjusts the arc force. Increasing the ARC CONTROL setting increases the arc force, making the arc more harsh but less likely to stick. Decreasing the ARC CONTROL setting decreases the arc force, making the arc softer and smoother.

Parameter Ranges

PREFLOW -
0.0 to 2.5 seconds (0.1 sec. increments).
RUN IN -
Low Range: 50 to 150 IPM (1.25 to 3.80 MPM).
High Range: 75 to 150 IPM (2.00 to 3.80 MPM).
ARC CONTROL -
Trim (-10.0) to (+10.0) , (0) is nominal.
BURNBACK -
0.0 to 0.25 sec. (0.01 sec. increments).
POSTFLOW -
0.0 to 2.5 sec. (0.1 sec. increments).
SPOT -
0 to 25 sec. (0.1 sec. increments).

Mode Selection

The MODE SELECT switch is a momentary large three position toggle switch that defaults to the center (off) position. Moving the switch up advances the mode indicator in the upward direction, down advances it in the downward direction. Holding the switch in either direction will result in the indicator advancing at a high rate of speed in that direction, until the switch is released. When the indicator reaches its upper or lower limit, advancing ceases until the direction of the switch is changed.

Parameter Selection

The PARAMETER SELECT switch is a momentary large three position toggle switch that defaults to the center (off) position. Moving the switch up advances the parameter indicator in the upward direction, down advances it in the downward direction. Holding the switch in either direction will result in the indicator advancing at a high rate of speed in that direction, until the switch is released. When the indicator reaches its upper or lower limit, advancing ceases until the direction of the switch is changed.

Parameter Adjustment

The value of the active parameter, as defined by the parameter indicator, is displayed on the parameter display. The PARAMETER SET switch is a momentary large three position toggle switch that defaults to the center (off) position. Moving the switch bat up advances the displayed value in the positive direction, down advances it in the negative direction. Holding the switch in either direction will result in the displayed value advancing at a high rate of speed in that direction, until the switch is released. When the indicator reaches its upper or lower limit, advancing ceases until the direction of the switch is changed.

Installation is as follows:

1. Turn off power.
2. Remove the two screws from the front of the blank option panel at the location you choose to install your new option (bottom) of the Control Box cabinet. Save the screws, discard the old panel or save for future use.

3. Tilt the new option panel away from the front opening of the Control Box cabinet. Plug the electrical connector into the proper connector on the right side of the main printed circuit board (12 pin). Make sure the connector latches in place.
4. Position the new panel, taking care not to damage the connections on the back.
5. Align the screw holes, replace the two screws and tighten.

K1542-8 MSP PANEL (LARGE PANEL)

The MSP Panel provides a selection of numerous process specific and generic power source modes. In addition, it provides for the adjustment of the following parameters: PREFLOW, RUN IN, ARC CONTROL, BURNBACK, POSTFLOW, and SPOT time. Only one parameter, as defined by the parameter indicator, may be displayed and adjusted at a time.

Description

Indicator Lights - Red LED's indicate the active parameter being displayed.

Display - 3 1/2 digit, red LED display. Displays the value or status of the active parameter.

Parameter Ranges

WELD MODE -

Adjustable per mode schedule.

PREFLOW -

0.0 to 2.5 seconds (0.1 sec. increments).

RUN IN -

Low Range: 50 to 150 IPM (1.25 to 3.80 MPM).

High Range: 75 to 150 IPM (2.00 to 3.80 MPM).

ARC CONTROL -

Trim (-10.0) to (+10.0) , (0) is nominal.

BURNBACK -

0.0 to 0.25 sec. (0.01 sec. increments).

POSTFLOW -

0.0 to 2.5 sec. (0.1 sec. increments).

SPOT -

0 to 25 sec. (0.1 sec. increments).

Mode Schedule - Table on the front of the option used by the operator to correlate the displayed mode number to an actual power source mode.

Due to the nature of the system, the following feature is required for safety reasons. Upon entering any constant current (CC) mode, the right encoder, labeled VOLTS, TRIM, on the Display/Control Panel acts as a "soft" contactor switch. The encoder knob must be turned CW at least 45° to activate the output (turning CCW 45° deactivates the output). This prevents the output from inadvertently becoming "hot" when scrolling through the weld modes. The exception to this rule is when the weld mode is entered by a change in procedure (using a memory panel such as the K1542-9 Memory/Dual Procedure panel). In this case, the state of the contactor is recalled as it was left when the procedure was exited.

In the CC modes, the output current is set by the AMPS control, and the VOLTS/TRIM adjustment has no effect in this mode. In this mode, the ARC CONTROL adjusts the arc force. Increasing the ARC CONTROL setting increases the arc force, making the arc more harsh but less likely to stick. Decreasing the ARC CONTROL setting decreases the arc force, making the arc softer and smoother.

Parameter Selection

The PARAMETER SELECT switch is a momentary large three position toggle switch that defaults to the center (off) position. Moving the switch up advances the parameter indicator in the upward direction, down advances it in the downward direction. Holding the switch in either direction will result in the indicator advancing at a high rate of speed in that direction, until the switch is released. When the indicator reaches its upper or lower limit, advancing ceases until the direction of the switch is changed.

Parameter Adjustment

The value of the active parameter, as defined by the parameter indicator, is displayed on the parameter display. The PARAMETER SET switch is a momentary large three position toggle switch that defaults to the center (off) position. Moving the switch up advances the displayed value in the positive direction, down advances it in the negative direction. Holding the switch in either direction will result in the displayed value advancing at a high rate of speed in

that direction, until the switch is released. When the indicator reaches its upper or lower limit, advancing ceases until the direction of the switch is changed.

GMAW Pulse Procedures

In these procedures, the actual voltage greatly depends on the waveform used. The peak currents, background currents, rise times, fall times, and pulse times all affect the actual voltage. The actual voltage for a given wire feed speed is not directly predictable unless the waveform is known. In this case, it is not practical to preset an actual voltage for the procedure. Instead, an arc length adjustment is provided. The machine "knows" what the best arc length is at the given wire feed speed but allows the operator to change it.

The arc length trim (usually referred to simply as "trim") can be adjusted between 0.500 and 1.500 on the Control Box's VOLTS/TRIM display. A trim of 1.000 means that no adjustments will be made to the preset arc lengths. A trim setting less than 1.000 decreases the preset arc lengths. The arc length trim adjustment is factored in at all wire feed speed settings. Increasing the trim by 10 percent at a given wire feed speed also increases all the other arc length trim settings of the procedure by 10 percent.

Lincoln Power Wave power sources utilizes a control scheme known as adaptive control in all pulse modes. Because the Power Wave utilizes adaptive control, it can adjust the pulsing parameters based on changes in the arc due to changes in the electrical stickout of the electrode. (Electrical stickout is the distance from the contact to the workpiece.) The Power Wave is optimized for use with a 0.75 in. stickout. The adaptive behavior is programmed to support a stickout range from 0.5 in. to 1.25 in. In the low and high end of the wire feed speed ranges of most processes, the adaptive behavior may be restricted. This is a physical restriction due to reaching the edge of the operating range for the process.

The ARC CONTROL adjustment allows the pulse frequency to be varied. Increasing the ARC CONTROL causes the frequency setting to increase, while decreasing the ARC CONTROL causes the frequency to decrease. Varying the ARC CONTROL, and hence, the pulse frequency, affects the droplet transfer and allows fine-tuning for different welding positions.

Installation is as follows:

1. Turn off power.
2. Remove the two screws from the front of the blank option panel at the location you choose to install your new option (bottom) of the Control Box cabinet. Save the screws, discard the old panel or save for future use.
3. Tilt the new option panel away from the front opening of the Control Box cabinet. Plug the electrical connector into the proper connector on the right side of the main printed circuit board (12 pin). Make sure the connector latches in place.
4. Position the new panel, taking care not to damage the connections and the printed circuit board on the back.
5. Align the screw holes, replace the two screws and tighten.

K1542-9 DUAL PROCEDURE/MEMORY PANEL (SMALL PANEL)

The Dual Procedure/Memory panel provides for the selection of either of two procedures, or a gun switch for remote selection of the procedure. In addition, there are six permanent memory storage locations for saving commonly used procedures. Procedures A and B are "soft" type memories that record any changes made to them. The six memory locations are "hard" or more permanent type memories. Any changes made must be consciously saved back to them. Furthermore, each memory contains only one procedure, therefore any combination of memories may be recalled to procedure A and B.

Descriptions

Indicator Lights - Red LED's indicate the procedure and active memory and save mode if applicable.

Dual Procedure Selection

The procedure switch is used to scroll the indicator to select PROCEDURE A, PROCEDURE B, or the GUN switch. When the GUN switch is selected, the procedure is determined by the position of the switch located at the gun. Under this condition, indicators will show that the gun switch has been selected and also which procedure the gun switch is requesting.

Memory Selection

RECALL - When a memory key is depressed, its indicator comes on and its contents are copied to the active procedure. As long as no changes are made to the contents of that procedure, the memory indicator will be on any time that procedure is active. This indicates that their contents are the same. Any change to that procedure will cause the memory indicator to go off, indicating that they are no longer equal.

SAVE - The save mode allows "hard" memories to be changed. Pressing the SAVE key will light the save indicator, and enter the save mode. In the save mode, the indicator for the memory that was the source of the active procedure's contents will blink, whether their contents are still equal or not. This feature allows the user to choose to save an active procedure back to its source, or some other location.

To complete the save transaction requires the selection of one of the memory keys. When the memory key is pressed in the save mode, it's contents are overwritten with the contents of the active procedure. This means that the contents of the memory location and the active procedure are now equal, and therefore, by definition, each of their indicators will be lit, and the save mode will be exited. To exit the save mode without saving, depress the save key a second time. This feature allows the operator to determine the source of the active procedure's contents without actually overwriting it.

Installation is as follows:

1. Turn off power.
2. Remove the two screws from the front of the blank option panel at the location you choose to install your new option (bottom) of the Control Box cabinet. Save the screws, discard the old panel or save for future use.
3. Tilt the new option panel away from the front opening of the Control Box cabinet. Plug the electrical connector into the proper connector on the right side of the main printed circuit board (10 pin). Make sure the connector latches in place.
4. Position the new panel, taking care not to damage the connections and the printed circuit board on the back.
5. Align the screw holes, replace the two screws and tighten.

K1542-11 MX2 Panel:

This panel provides a selection of four weld modes: CV/MIG, CV/Flux Cored, CC/Stick/soft and CC/Stick/Crisp through a toggle switch and indicator lights (LEDs). It allows for adjustment of all set up parameters, Preflow, Run In, Arc Control, Burnback, Postflow, and Crater, through an up/down toggle switch, indicator lights and a 3 digit display.

Weld modes are selected with the Mode Select switch, an up/down center-off momentary toggle switch. Moving the switch bat up or down moves the Weld Mode LED in the corresponding direction. Holding the switch in either direction will cause the indicator to move quickly in the corresponding direction until the switch is released, or the upper or lower limit is reached.

To adjust Set Up parameters, first select the Set Up parameter for adjustment, and then adjust the displayed value up or down.

Set Up parameters are selected with the Select switch, an up/down center-off momentary toggle switch. Moving the switch bat up or down moves the Weld Mode LED in the corresponding direction. Holding the switch in either direction will cause the indicator to move quickly in the corresponding direction until the switch is released, or the upper or lower limit is reached.

The value of the active Set Up parameter, as defined by the Set Up LED, is displayed on the MX2 panel Set Up display. The value can be modified with the Set switch. The Set switch is an up/down center-off momentary toggle switch. Moving the switch bat up or down adjusts the displayed value in the corresponding direction. Holding the switch in either direction will cause the display to move quickly in the corresponding direction until the switch is released, or the upper or lower parameter limit is reached.

To energize the output studs in either CC/Stick mode, the right Control/Display panel knob, labeled Volts/Trim, must be used. The Volts/Trim knob must be turned clockwise roughly a quarter revolution to energize the output studs. (The Volts/trim display will indicate 'On' when the studs are energized.) Similarly, turning the knob a quarter turn counter-clockwise de-energizes the output studs. If a CC/Stick weld mode is entered through use of the Dual Procedure, the studs will be in the same state as when they were last used. If a CC/Stick weld mode is entered through a Memory recall, the studs will be de-energized.

K1542-12 MSP2 Panel:

This panel provides a selection of over 25 weld modes, including CV, pulse, FCAW and CC, through a toggle switch and indicator lights (LEDs). It allows for adjustment of all set up parameters, Preflow, Run In, Arc Control, Burnback, Postflow, and Crater, through an up/down toggle switch, indicator lights and a 3 digit display.

To adjust a set up parameter (Weld Mode being one of those parameters), first select one of the set up parameters for adjustment, and then adjust the displayed value up or down.

Set up parameters are selected with the Select switch, an up/down center-off momentary toggle switch. Moving the switch bat up or down moves an LED in the corresponding direction. Holding the switch in either direction will cause the indicator to move quickly in the corresponding direction until the switch is released, or the upper or lower limit is reached.

The value of the active set up parameter is shown on the MSP2 panel digital display. The value can be modified with the Set switch. The Set switch is an up/down center-off momentary toggle switch. Moving the switch bat up or down adjusts the displayed value in the corresponding direction. Holding the switch in either direction will cause the display to move quickly in the corresponding direction until the switch is released, or the upper or lower parameter limit is reached.

To energize the output studs in either CC/Stick mode, the right Control/Display panel knob, labeled Volts/Trim, must be used. The Volts/Trim knob must be turned clockwise roughly a quarter revolution to energize the output studs. (The Volts/trim display will indicate 'On' when the studs are energized.) Similarly, turning the knob a quarter turn counter-clockwise de-energizes the output studs. If a CC/Stick weld mode is entered through use of the Dual Procedure, the studs will be in the same state as when they were last used. If a CC/Stick weld mode is entered through a Memory recall, the studs will be de-energized.

CONTROL BOX PANELS -- SET UP CONTROLS DESCRIPTION

Certain large option panels can modify the set up parameters Preflow, Run In, Arc Control, Burnback, Postflow, and Crater. The meaning of those parameters, and their maximum and minimum values, follows.

Preflow - Time delay after the trigger is pulled, but before weld starts, during which shielding gas flows. Weld start is defined as the time when both the power source is energized and the Wire Drive begins feeding wire. Adjustable from 0.0 (Off) to 2.5 seconds in 0.1s increments.

Run In - Wire feed speed during arc starting. Wire Drive will feed wire at the Run In speed for one second, or until weld current flows. Low speed gear range: Off (Run In speed equals weld wire feed speed) or adjustable from 50 to 150 IPM (1.25 to 3.80 MPM). High speed gear range: Off (Run In speed equals weld wire feed speed) or adjustable from 75 to 150 IPM (2.00 to 3.80 MPM). **NOTE:** Run In settings over 150 IPM produce strange display values used for troubleshooting and service. If encountered, reset Run In to 150 IPM or less.

Arc Control - Unitless characteristic, also known as Inductance or Wave Control. Allows operator to vary the arc characteristics from "soft" to "harsh" in all weld modes. Adjustable from -10.0 to 10.0 in increments of 0.1. Off (0.0) is nominal.

Burnback - Time delay after the trigger is released-during which the power source remains energized but the Wire Drive stops feeding wire. Adjustable from 0.00 (Off) to 0.25 seconds in 0.01 second increments.

Postflow - Time delay after burnback is complete, during which shielding gas flows. Adjustable from 0.0 (Off) to 10.0 seconds in 0.1 second increments.

Crater - Used only when welding with the 4-Step trigger mode. Can be set to Off or On. When On, Adjustments can be made to WFS and Volts/Trim on the Control/Display panel. These settings are then used for 'cratering' when in the 4-Step trigger mode (see explanation of 2 Step and 4 Step operation below). When Off, 'cratering' is not possible.

CONTROL BOX -- PC BOARD ADJUSTMENTS

The Control Box Mother board provides the capability to adjust some wire feeding parameters as follows:

Acceleration: The motor acceleration can be varied in five steps, from slow to fast. See "Setting DIP Switches in the Control Box" section.

Burnback: For the options which cannot adjust the Burnback set up parameter (CV/G and M panels) a PC board adjustment (trimmer R5) is provided. The range is 0.0 to 0.25 seconds, increasing in the clockwise direction. This is ignored by options which have the ability to adjust Burnback (MX2 and MSP2 panels).

Run In: For the options which cannot adjust the Run In set up parameter (CV/G and M panels) a PC board DIP switch setting is provided. In one position, the run in speed will be the minimum Wire Drive WFS. At the other setting, run in will occur at the same speed as set on the WFS knob. This DIP switch setting is ignored by options which have the ability to adjust Run In (MX2 and MSP2 panels). See "Setting DIP Switches in the Control Box" section.

CONTROL BOX -- SETTING OPERATING LIMITS

Upper and lower operating limits can be set for the WFS/Amps setting and the Volts/Trim setting. Doing so requires knowledge of how to set the limits, and access to the PC board in the Control Box.

There are two independent sets of limits, Procedure A limits and Procedure B limits. If a DP/M door option is installed, the A and B limits must be set independently. If there is no DP/M door option, the Control Box defaults to Procedure A, and only Procedure A limits can be set.

With system power on, select the weld mode for which you want to set limits. If a Dual Procedure option is installed, select the procedure A. Turn the system power off. Remove the two screws holding the Control/Display panel to the Control Box, but do not unplug it. Tilt the panel down to allow access to DIP switches S1-1, S2-6 and S2-7. (See "Setting DIP Switches in the Control Box" section.) Do not allow the panel to hang by the wiring harness.

Determine if the Wire Drive is set up for low or high speed. If low speed, S1-1 should be off. If high speed, set S1-1 to on.

To adjust the lower limit, set S2-6 to on. Turn the power on and adjust the WFS/Amps and Volts/Trim knobs to the desired lower limits. Note: You will not be able to adjust the lower limit outside of the minimum and maximum wire feed speed of the Wire Drive, nor above the upper limit. Turn the system power off. Return S2-6 to off.

To adjust the upper limit, set S2-7 to on. Turn the power on and adjust the WFS/Amps and Volts/Trim knobs to the desired upper limits. Note: You will not be able to adjust the upper limit outside of the minimum and maximum wire feed speed of the Wire Drive, nor below the lower limit. Turn the system power off. Return S2-7 to off.

If a Dual Procedure panel is installed, repeat the above procedure with the Procedure B selected. When done, attach the Control/Display panel to the Control Box. The machine is now ready for normal operation with the new limits.

CONTROL BOX -- USING OPERATING LIMITS

Once set, limits apply to all weld modes. Limiting Procedure A to 200 to 300 inches per minute, for example, limits the ability of the operator to adjust his WFS in pulse, CV and FCAW weld modes. Limiting the Volts to 23.0 to 24.5 would limit the ability of the

operator to adjust his Volts in synergic and non-synergic CV modes. Procedure B could be set up with different limits. Limits are absolute -- they will override values stored in the memories. Note that limits do not apply to set up parameters, such a Preflow and Arc Control.

OPERATION WITH PREVIOUS SOFTWARE VERSION

The operation of the previous Control Box software version (S24004-2) is different than described earlier in this section. The differences are as follows:

- The Memory/Dual Procedure panel is not a valid option.
- The MX (K1542-1) and MSP (K1542-8) are used in place of the MX2 and MSP2 options.
- Limits cannot be set.

The key difference in the MX/MSP panels, compared to the MX2/MSP2 panels, is the Spot function. In the old software, a 0.1 to 2.5 second Spot function was available on these two panels. No Crater function was available (Crater replaced Spot in the graphics on these two panels).

An upgrade kit is available to change the software from S24004-2 to the latest version of Control Box software. Once the upgrade is done, the Dual Procedure/ Memory panel becomes a valid option, limits can be set, and Spot is replaced by Crater.

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SAFETY PRECAUTIONS

⚠ WARNING



ELECTRIC SHOCK can kill.

- Do not touch electrically live parts such as output terminals or internal wiring.
- Only qualified personnel should perform maintenance work.

Observe all additional Safety Guidelines detailed throughout this manual.

ROUTINE MAINTENANCE

POWER WAVE

Routine maintenance consists of periodically blowing out the machine, using a low pressure airstream, to remove accumulated dust and dirt from the intake and outlet louvers and the cooling channels in the machine.

WIRE FEEDER

DRIVE ROLLS AND GUIDE TUBES

After feeding every coil of wire, inspect the drive roll section. Clean as necessary. Do not use a solvent for cleaning the drive rolls because it may wash the lubricant out of the bearing. The drive rolls and Inner Wire Guides are stamped with the wire sizes they will feed. If a wire size other than that stamped on the roll(s) is to be used, the roll(s) and Inner Wire Guides must be changed.

All drive rolls have two identical grooves. The rolls may be flipped over to use the other groove.

See *Procedure to Install Drive Rolls and Wire Guides* in the *Operation* section for roll changing instructions.

WIRE REEL MOUNTING - READI-REELS AND 10 THROUGH 30 LB (4.5-14 KG) SPOOLS

No routine maintenance required. Do not lubricate 2 in. (51 mm) spindle.

AVOIDING WIRE FEEDING PROBLEMS

Wire feeding problems can be avoided by observing the following gun handling and feeder set up procedures:

- Do not kink or pull cable around sharp corners.
- Keep the electrode cable as straight as possible when welding or loading electrode through cable.
- Do not allow dolly wheels or trucks to run over cables.
- Keep cable clean by following maintenance instructions.
- Use only clean, rust-free electrode. The Lincoln electrodes have proper surface lubrication.
- Replace contact tip when the arc starts to become unstable or the contact tip end is fused or deformed.
- Do not use excessive wire spindle brake settings.
- Use proper drive rolls, wire guides and drive roll pressure settings.

PERIODIC MAINTENANCE

WIRE DRIVE MOTOR AND GEARBOX

Every year inspect the gearbox and coat the gear teeth with grease. **Do not** use graphite grease. Refer to the *Troubleshooting* section for disassembly of Drive Motor and Wire Feed Assembly.

GUN AND CABLE MAINTENANCE

See appropriate *Operator's Manual*.

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-THEORY OF OPERATION SECTION-

Table listing contents: Theory of Operation, Modular Inverter Based Welding System, System Diagram A, System Diagram B, System Diagram C, Power Source General Description, Input Voltage and Precharge, Switch Boards and Main Transformer, Control Board, Output Rectifier and Choke, Thermal Protection, Protective Circuits, Over Current Protection, Under/Over Voltage Protection, Insulated Gate Bipolar Transistor (IGBT) Operation, Pulse Width Modulation, Minimum Output, Maximum Output, Control Box (User Interface), Power Feed 10 Feed Head. Section E, E-2, E-2, E-3, E-4, E-5, E-5, E-6, E-7, E-8, E-9, E-9, E-9, E-9, E-10, E-11, E-11, E-11, E-12, E-13

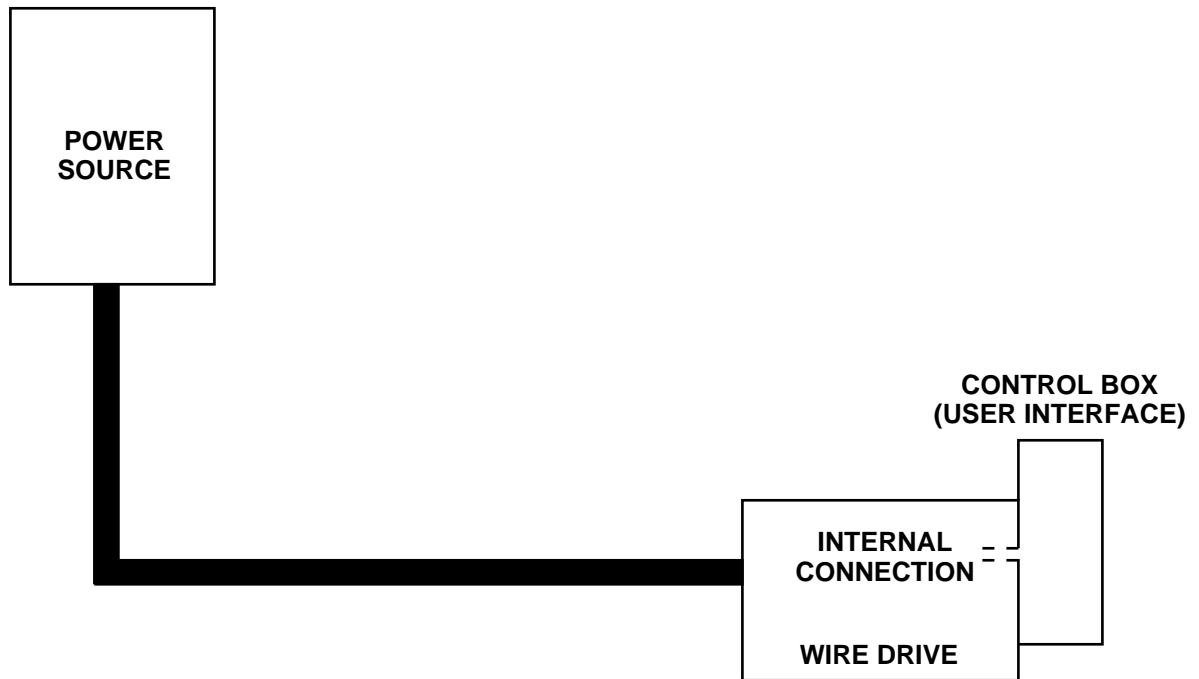
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FIGURE E.1 — SYSTEM DIAGRAM A.



MODULAR INVERTER BASED WELDING SYSTEM

The Welding Network is an assembly of welding equipment joined together by a common network communication cable. These individual welding components consist of a power source (Power Wave 455), a user interface (Power Feed 10 Control Box) and a modular wire drive (Power Feed 10 Wire Drive). Each discrete element in the system is designed to “talk” with the other system components so that all information is shared and the entire system is in sync. This communication and shared information network lays the groundwork for a system with superior welding performance and capabilities.

The equipment can be connected together in a daisy-chain fashion. Lincoln customers can configure a system to meet their

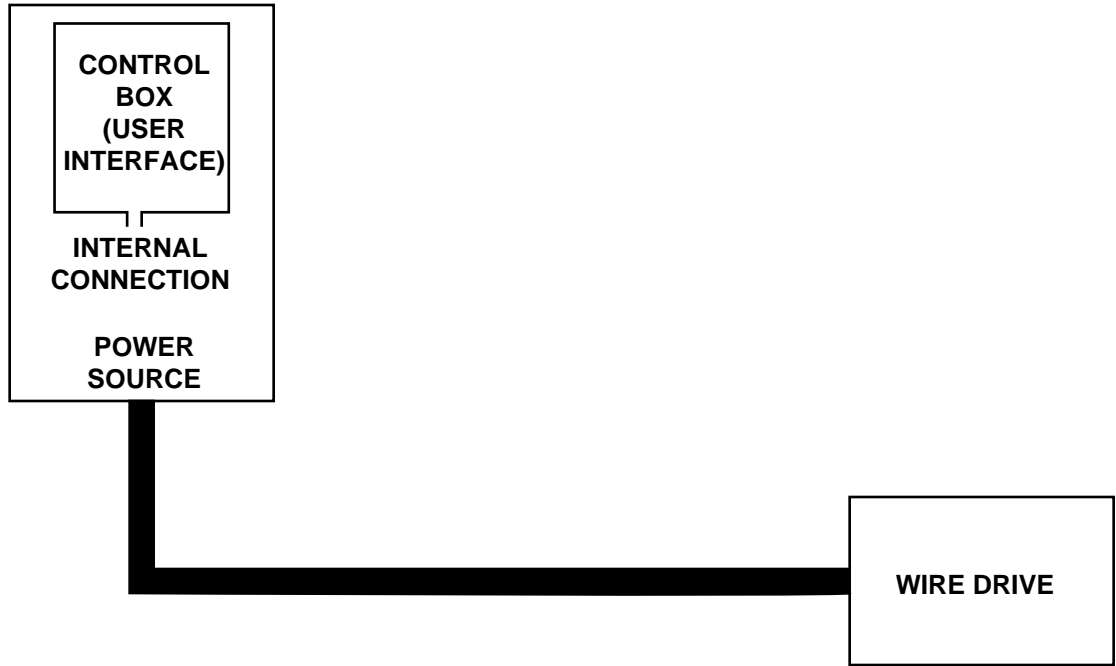
specific requirements and also locate and identify each piece of equipment for maximum efficiency and ease of operation.

SYSTEM DIAGRAM A

This basic system utilizes two physical pieces of equipment. Refer to Figure E.1. The power source (Power Wave 455) and the combination Control Box and wire drive (Power Feed 10) are the two circuit elements. Note the Control Box (user interface) is attached to, and internally connected to, the wire drive unit.

The communication cable is depicted by the heavy black connector line. PC board power, communications and intelligence between the power source and the combination wire drive/control box unit are conveyed through this cable.

FIGURE E.2 — SYSTEM DIAGRAM B.



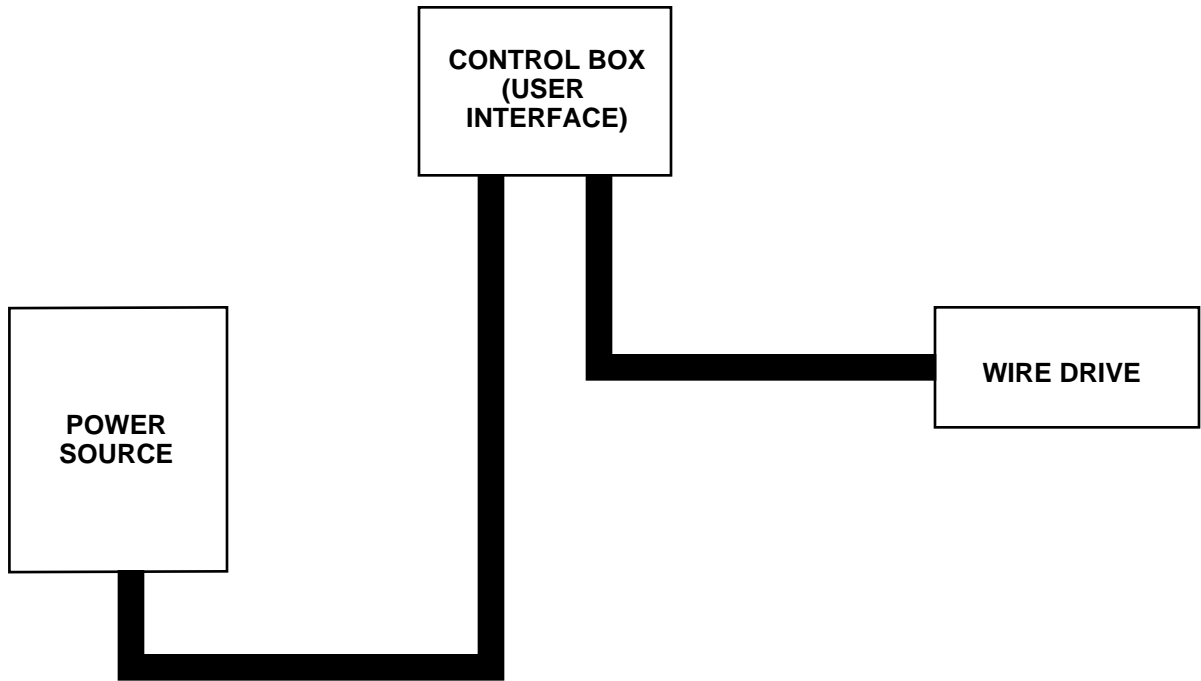
SYSTEM DIAGRAM B

This system utilizes two physical pieces of equipment. Refer to Figure E.2. The combination Control Box (user interface) and power source (Power Wave 455) make up one of the circuit elements. This combination unit is coupled to the wire drive module (Power Feed 10). Note the Control Box is attached to and internally connected to the power source.

The communication cable is depicted by the heavy black connector line. PC board power, communications and intelligence between the wire drive and combination power source/Control Box unit are conveyed through this cable.

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FIGURE E.3 — SYSTEM DIAGRAM C.



SYSTEM DIAGRAM C

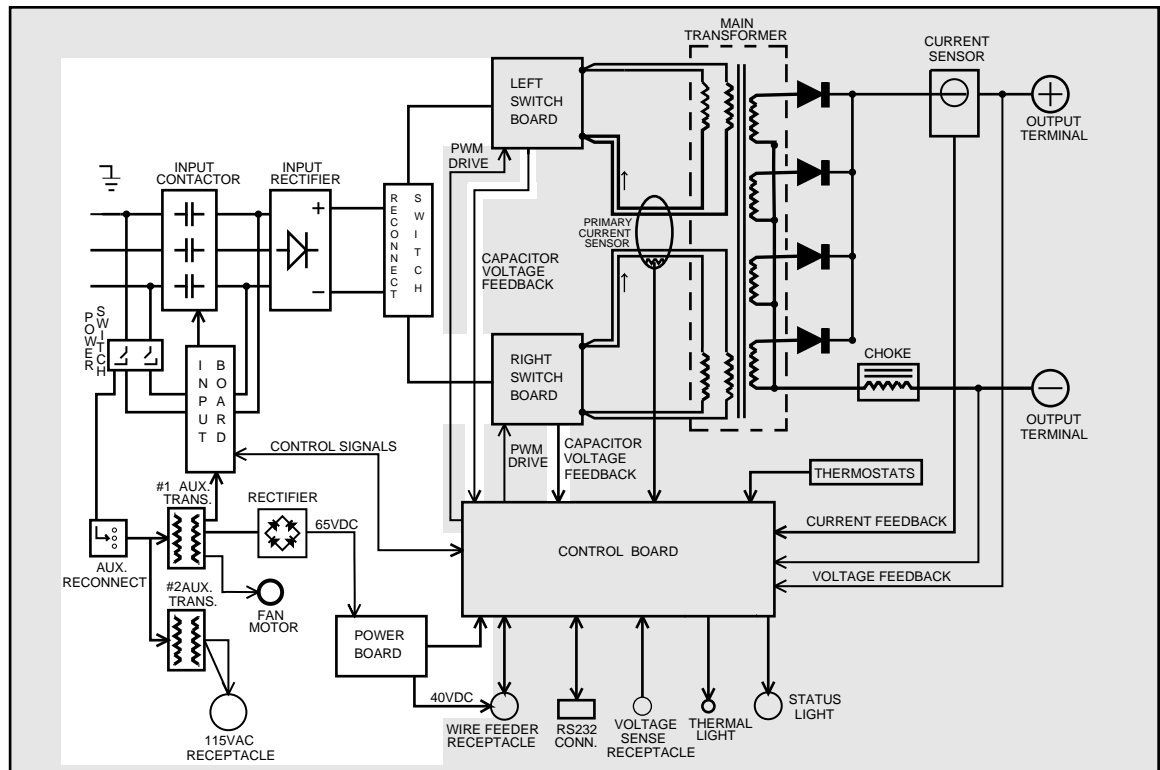
The power source (Power Wave 455), the Control Box (user interface) and the wire drive (Power Feed 10) are the three discrete and physically separate circuit components employed in this configuration. Refer to Figure E.3. The three elements are daisy-chained together via the communication

cables. All PC board power, communications and intelligence are transmitted via the two cables.

This component configuration might be used if the wire drive unit was mounted on a boom and the Control Box located remotely from the power source.

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FIGURE E.4 — INPUT VOLTAGE AND RECHARGE.



POWER SOURCE GENERAL DESCRIPTION

The Power Wave 455 is an inverter based welding power source that is designed to be part of a modular, multi-process welding system. It is a high performance, digitally controlled inverter capable of complex, high-speed waveform control. With the appropriate modular components it can support constant current, constant voltage and pulse welding processes. The output rating is 450 amps at 38 volts with a 100% duty cycle.

INPUT VOLTAGE AND PRECHARGE

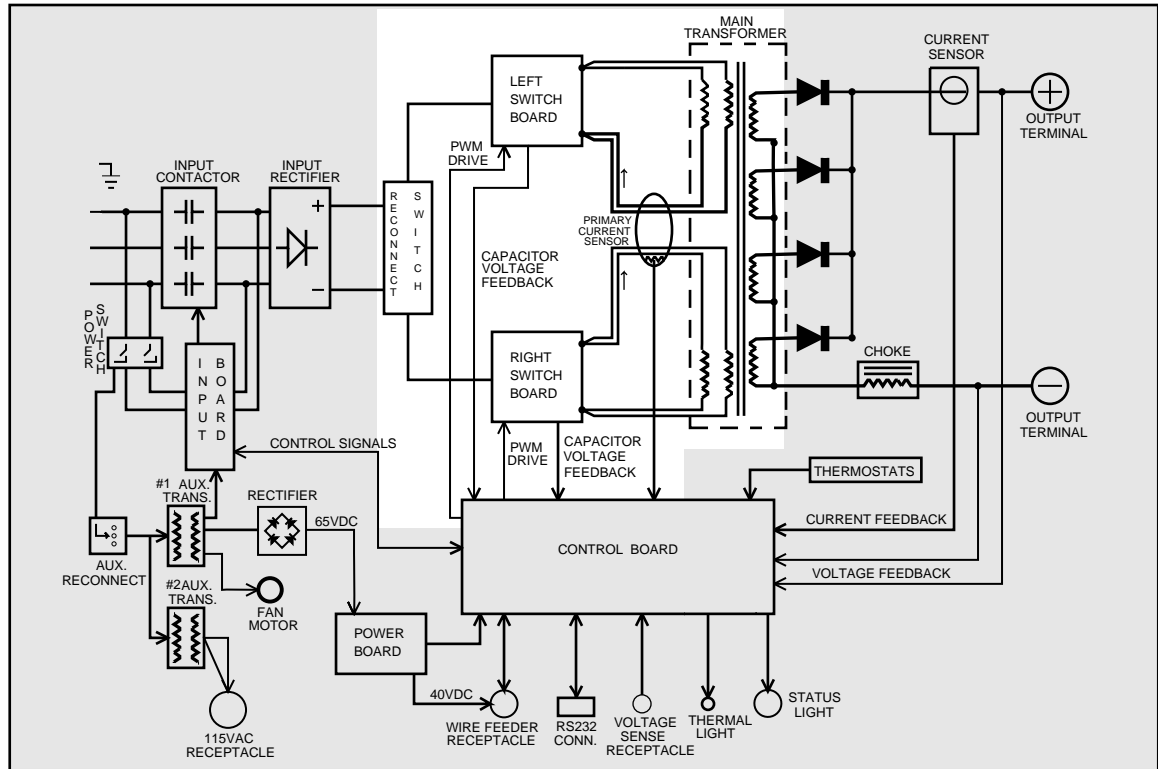
The Power Wave 455 can be connected for a variety of three phase voltages. Refer to Figure E.4. The initial input power is applied to the Power Wave 455 through a line switch located on the front of the machine. Two phases of the three-phase input power is applied to the input board and both auxiliary transformers. The various secondary voltages developed by the #1 auxiliary transformer are applied to the input board, the power board rectifier and the fan motor. The 115 VAC secondary

voltage developed by the No. 2 auxiliary transformer is applied to the 115 VAC receptacle.

The 65 VDC produced from the power board rectifier is utilized by the power board to provide various DC voltages for the control board and wire feeder.

The two phases which are connected to the input board, through the power switch, are connected to the input rectifier. During precharge or "soft start" these two phases are current limited by the input board. This AC input voltage is rectified, and the resultant DC voltage is applied through the reconnect switches to the input capacitors located on the switch boards. The control board monitors the voltage across the capacitors. When the capacitors have charged to an acceptable level, the control board signals the input board to energize the main input contactor making all three phases of input power, without current limiting, available to the input capacitors. At this point, the Power Wave 455 is in the "Run Mode" of operation. If the capacitors become under or overvoltage, the control board will signal the input board to de-energize the main input contactor, and the Power Wave 455 will be disabled.

FIGURE E.5 — SWITCH BOARDS AND MAIN TRANSFORMER.



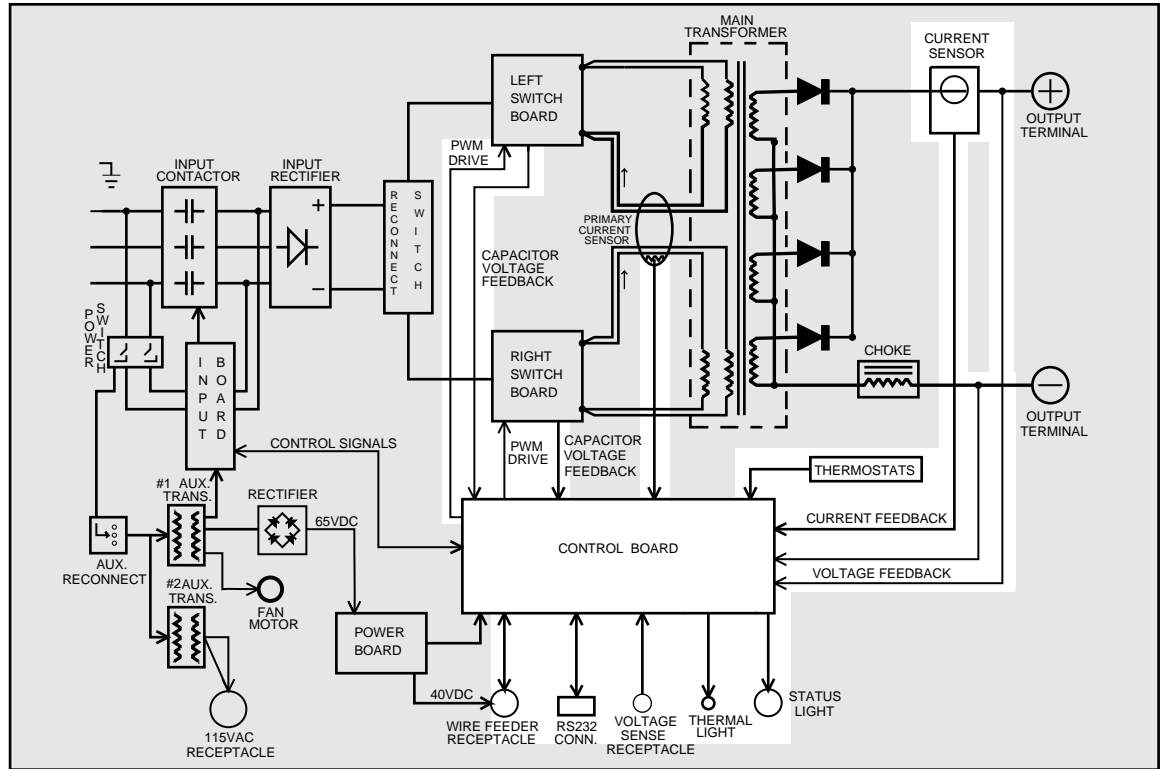
SWITCH BOARDS AND MAIN TRANSFORMER

There are two switch boards in the Power Wave 455, each containing an input capacitor and insulated gate bipolar transistor (IGBT) switching circuitry. Refer to Figure E.5. When the machine reconnect switches are configured for a lower input voltage (below 300 VAC) the input capacitors are connected in parallel. When the machine is configured for higher input voltages (300 VAC and above) the input capacitors are connected in series.

When the input capacitors are fully charged they act as power supplies for the IGBT switching circuit. The Insulated Gate Bipolar Transistors switch the DC power, from the input capacitors, “on and off” thus supplying pulsed DC current to the main transformer primary windings. See *IGBT Operation Discussion and Diagrams* in this section.

Each switch board feeds current to a separate, oppositely wound primary winding of the main transformer. The reverse directions of current flow through the main transformer primaries and the offset timing of the IGBT switch boards induce an AC square wave output signal at the secondary of the main transformer. These primary currents are monitored by the current transformer (CT). If the primary currents become abnormally high, the control board will shut off the IGBTs, thus disabling machine output. The DC current flow through each primary winding is clamped back to each respective input capacitor when the IGBTs are turned off. This is needed due to the inductance of the transformer primary winding. The firing of the two switch boards occurs during halves of a 50 microsecond interval, creating a constant 20 kHz output.

FIGURE E.6 — CONTROL BOARD.



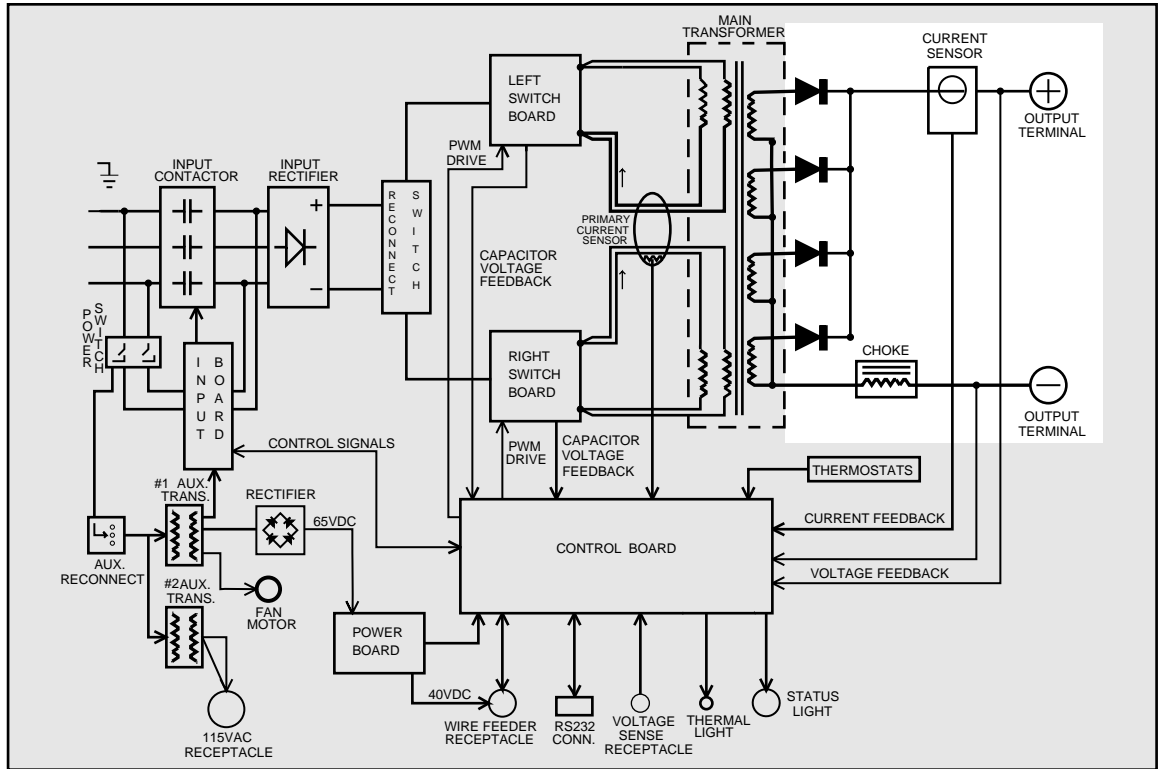
CONTROL BOARD

The control board performs the primary interfacing functions to establish and maintain output control of the Power Wave 455. Refer to Figure E.6. The control board sends and receives digital command information through the wire feeder receptacle and or the RS232 connector. The software that is contained within the control board processes and compares these commands with the voltage and current feedback information it receives from the current sensor and voltage sensing leads. The appropriate

pulse width modulation (PWM) signal (See **Pulse Width Modulation** in this section) is sent to the switch board IGBTs. In this manner, the digitally controlled high-speed welding waveform is created.

The control board also monitors the thermostats, main transformer primary current, and capacitor voltage, and activates either the thermal light and/or the status light. Dependent upon the fault situation, the control board will either disable or reduce machine output, or de-energize the main input contactor.

FIGURE E.7 — OUTPUT RECTIFIER AND CHOKE.



OUTPUT RECTIFIER AND CHOKE

The output rectifier receives the AC output from the main transformer secondary and

rectifies it to a DC voltage level. Since the output choke is in series with the negative leg of the output rectifier and also in series with the welding load, a filtered DC output is applied to the machine output terminals. Refer to Figure E.7.

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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 heat sink of the output rectifier and the other is located near the fan. (On later production machines this thermostat is located on the output choke) 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 yellow 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. On later production machines (above code 10500) the cooling fan runs only when necessary. The F.A.N. (fan as needed) system is controlled by the control board via a solid state relay.

PROTECTIVE CIRCUITS

Protective circuits are designed into the Power Wave 455 to sense trouble and shut down the machine before damage occurs to the machine's internal components.

OVER CURRENT PROTECTION

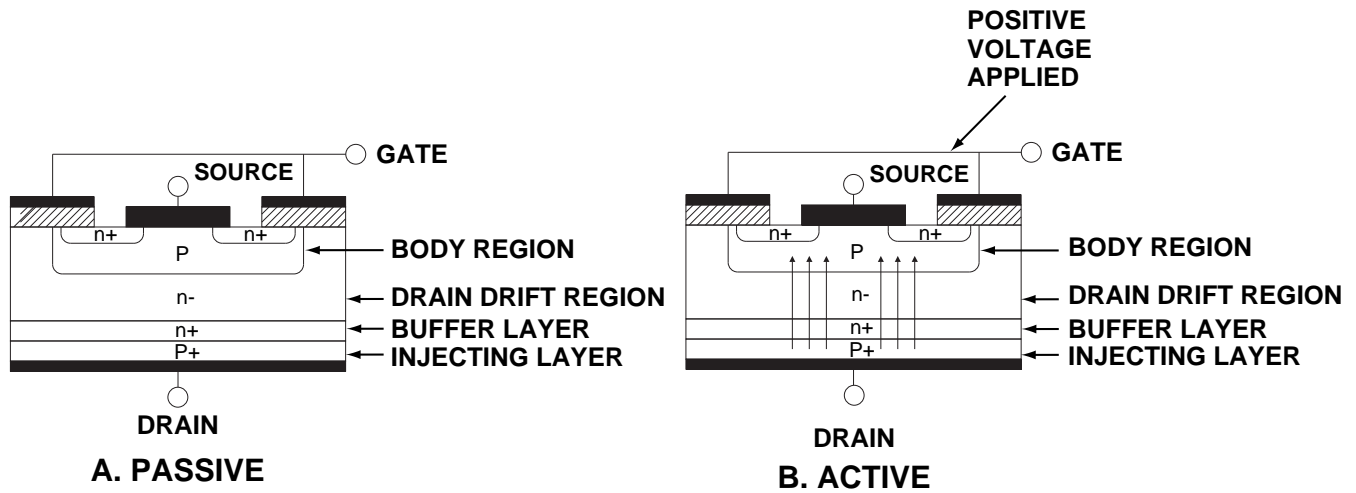
If the average current exceeds 590 amps, then the peak current will be limited to 100 amps until the average current decreases to under 50 amps.

UNDER/OVER VOLTAGE PROTECTION

A protective circuit is included on the control board to monitor the voltage across the input capacitors. In the event that a capacitor voltage is too high, or too low, the protection circuit will de-energize the input contactor. Machine output will be disabled and the "soft start" mode will be repeated. The protection circuit will prevent output if any of the following circumstances occur.

1. Capacitor conditioning is required. (May be required if machine has been off for a long period of time and is connected for high input voltage operation.)
2. Voltage across a capacitor exceeds 390 volts. (High line surges or improper input voltage connections.)
3. Voltage across a capacitor is under 70 volts. (Due to improper input voltage connections.)
4. Internal component damage.

FIGURE E.8 — IGBT OPERATION.



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.8 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 signal, 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.

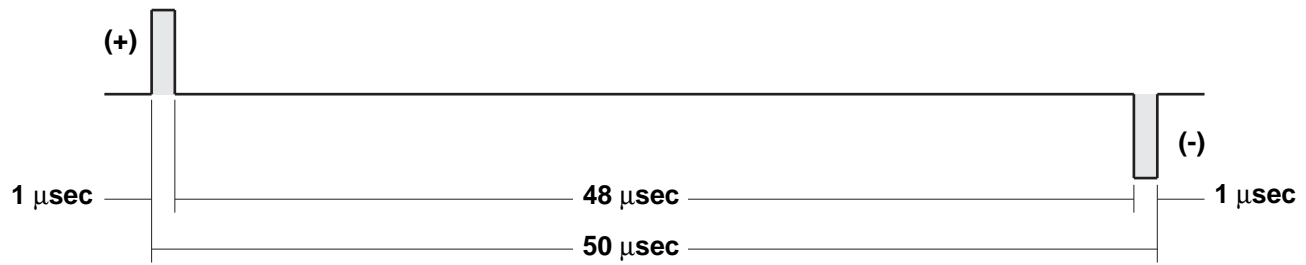
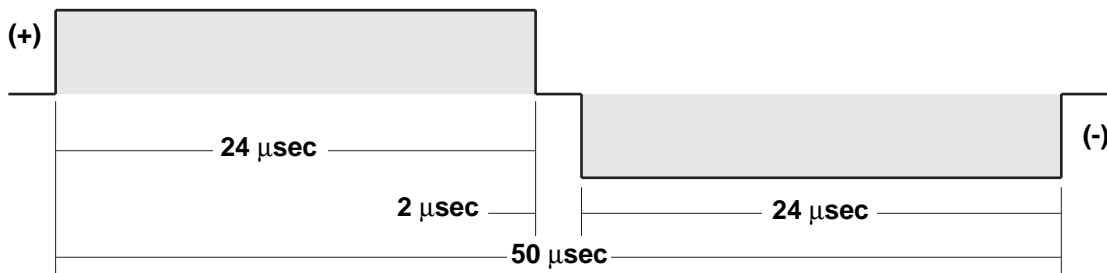
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FIGURE E.9 — TYPICAL IGBT OUTPUTS.

**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.9 shows the minimum output signal possible over a 50-microsecond time period.

The positive portion of the signal represents one IGBT group¹ conducting for one

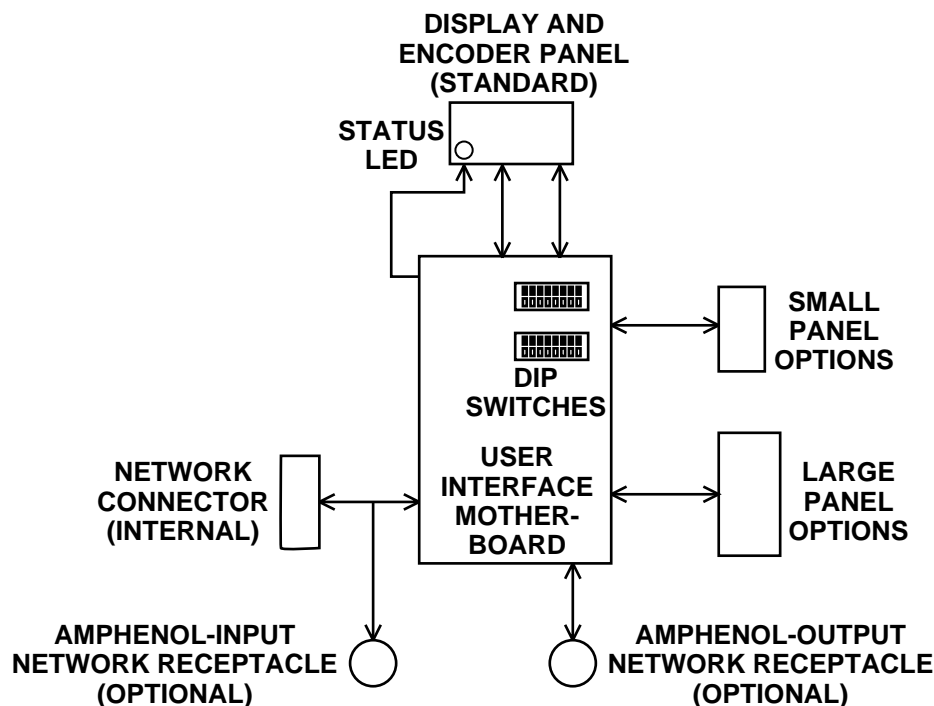
microsecond. The negative portion is the other IGBT group¹. The dwell time (off time) is 48 microseconds (both IGBT groups off). Since only two microseconds of the 50-microsecond time period is devoted to conducting, the output power is minimized.

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.

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

FIGURE E.10 — CONTROL BOX (USER INTERFACE).



CONTROL BOX (USER INTERFACE)

The system Control Box is the main entry point for all system parameters, and from it the user can control both power source and wire feeder functions. Refer to Figure E.10. The user interface motherboard is the heart of the Control Box. Dependent upon the option panels and the information received through the network cable, it directs the entire system as to the options, wire feed speed, and weld cycle requirements and parameters.

The options are divided into two physical size categories. The smaller option, typically installed in the middle section of the control box, is dedicated to dual procedure, head selection, and memory related functions. The larger, or bottom section, is reserved for control of the setup functions for the power source (Power Wave 455) and wire drive (Power Feeder 10) such as mode, arc control, run in and timer set up.

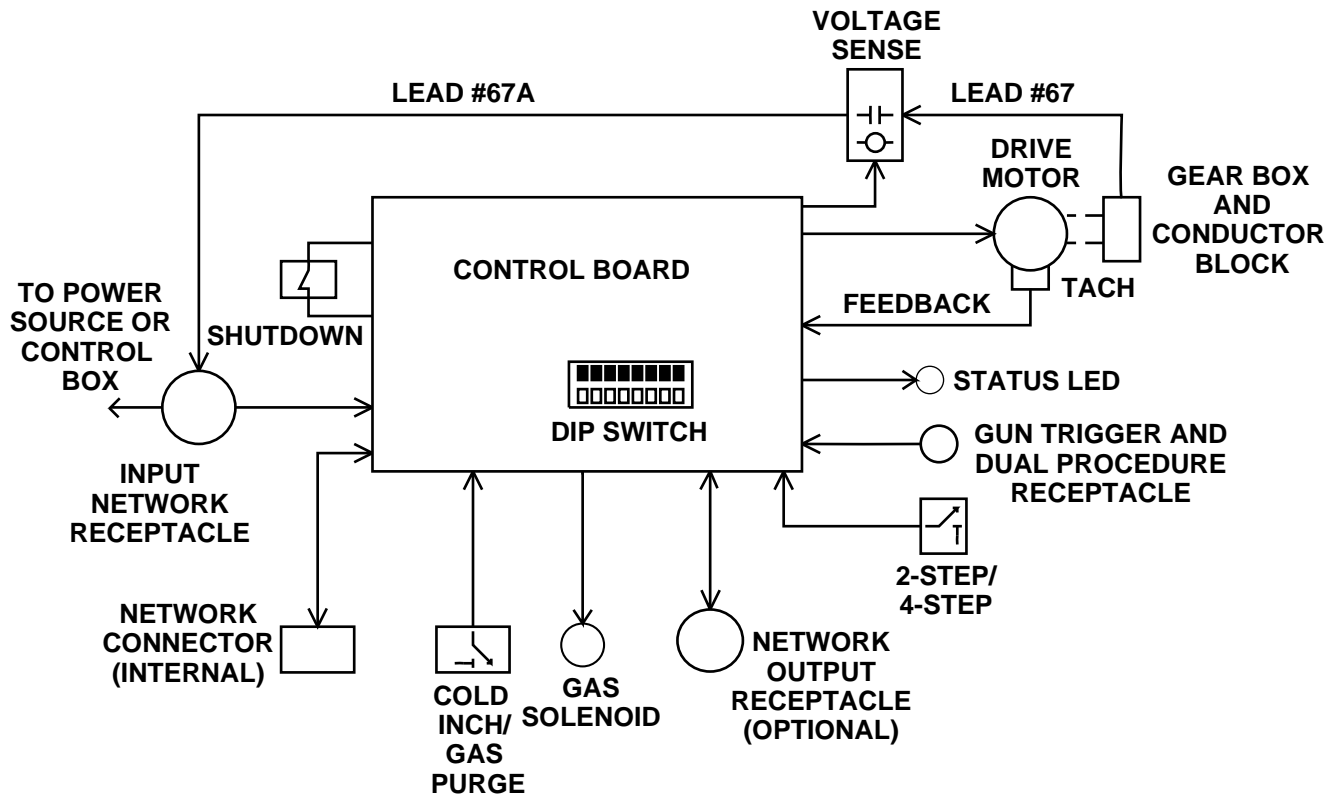
In addition to the large and smaller size options, there is a Display Panel which is standard on the Control Box unit. The Display Panel, typically installed in the upper position of the Control Box assembly, houses the encoder controls and the STATUS LED. The controls are used to adjust the wire feed speed, current, voltage and trim parameters. The STATUS LED is designed to blink a red and green code if a fault should occur.

The internal Network Connector is used when the Control Box is mounted on either the power source or the wire drive units. See **System Diagram A** and **System Diagram B** in this section.

The optional Network Input and Output receptacles are utilized when the Control Box assembly is mounted independently from both the wire drive and power source. See **System Diagram C** in this section.

There are two DIP switch banks located on the motherboard. They are labeled S1 and S2 and are used to set display, trigger, acceleration and run in functions.

FIGURE E.11 — POWER FEED 10 FEED HEAD.



POWER FEED 10 FEED HEAD

The Power Feed 10 is a four roll, high performance, digitally controlled, modular wire feeder that operates on 40 VDC input power. It is designed to be part of a modular, multi-process welding system. Refer to Figure E.11.

Network communications, intelligence, PC board input power, and arc voltage feedback is received and transmitted through the input network receptacle. The internal network connector plug is utilized when the Control Box is mounted directly to the wire drive unit. See **System Diagram A** in this section. The optional network output receptacle is used when the system components are connected in a daisy-chain fashion.

The feed drive control board processes the information it receives from the various user operated switches such as the gun trigger, 2-step/4-step, and cold inch switches and sends this information to other system components. This information is evaluated and

the correct commands are transmitted to the feed drive. The feed drive control board then sends the signals to energize the active components such as the solenoid and wire drive motor. The tach feedback signal is processed on the control board which regulates the motor armature voltage so as to maintain the required wire feed speed.

When the gun trigger is pulled, the voltage sense board relays the electrode sense signal to the input network receptacle for processing by the Control Box.

The optional shutdown feature can be implemented as a means of stopping the wire feeding in the event that the water cooler (if used) is not turned on.

The STATUS LED is designed to blink a red and green code if a fault should occur.

There is one DIP switch bank located on the wire drive control board. It is labeled S1 and is used to set gear ratios, arc polarity, and for network identification purposes.

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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: function problems, feeding problems, and welding 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 216-383-2531 or 1-800-833-9353.

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:

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

**Reusable
Container
Do Not Destroy**

PC board can be damaged by static electricity.

- 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 unpainted, 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 cannot 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.

NOTE: Do not substitute boards that show physical damage.

- 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.

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TROUBLESHOOTING GUIDE

POWER WAVE

Observe all Safety Guidelines detailed throughout 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.	1. Contact your local authorized Lincoln Electric Field Service Facility for technical assistance.	1. Contact the Lincoln Electric Service Department, 216-383-2531 or 1-800-833-9353 (WELD).
The machine is dead -- no output -- no fan -- no LEDs.	<ol style="list-style-type: none"> 1. Make certain the input power switch SW1 is in the ON position. 2. Check the main input fuses. If open, replace. 3. Check the 6 amp circuit breaker (CB4). Reset if tripped. 4. Make certain the reconnect panel is configured correctly for the applied input voltage. 	<ol style="list-style-type: none"> 1. Check the input power switch (SW1) for proper operation. Also check the associated leads for loose or faulty connections. See wiring diagram. 2. Check CB4 for proper operation. 3. Perform the <i>T1 Auxiliary Transformer Test.</i> 4. Perform the <i>Power Board Test.</i>
The main input fuses (or breaker) repeatedly fail.	<ol style="list-style-type: none"> 1. Make certain the fuses or breakers are properly sized. 2. Make certain the reconnect panel is configured properly for the applied input voltage. 3. The welding procedure may be drawing too much input current or the duty cycle may be too high. Reduce the welding current and/or reduce the duty cycle. 	<ol style="list-style-type: none"> 1. Check the reconnect switches and associated wiring. See wiring diagram. 2. Perform the <i>Input Rectifier Test.</i> 3. Perform the <i>Switch Board Test.</i>

 **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 216-383-2531 or 1-800-833-9353.

POWER WAVE

Observe all Safety Guidelines detailed throughout this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS (Continued)		
<p>The Power Wave has no output -- the fan is running -- a "clicking" sound may be heard coming from the machine. The main contactor CR1 is not "pulling in". If the STATUS LED is not steady green, see LED Code Table.</p>	<ol style="list-style-type: none"> 1. Turn the input power OFF immediately. 2. Make certain the reconnect panel is configured correctly for the applied input voltage. 3. If the machine is connected for 380 VAC or higher and has not been used for a long period of time, the capacitors may require "conditioning". Let the Power Wave 455 run at an idle state for 30 minutes. 	<ol style="list-style-type: none"> 1. Perform the T1 Auxiliary Transformer Test. 2. Perform the Main Contactor Test. 3. Perform the Input Rectifier Test. 4. Perform the Switch Board Test. 5. The power board rectifier may be faulty. Check or replace. Also check associated wiring. See wiring diagram. 6. Perform the Power Board Test. 7. The input voltage board may be faulty. 8. The control board may be faulty.
<p>The fan runs slow or intermittently -- low or no weld output.</p>	<ol style="list-style-type: none"> 1. Make certain the reconnect panel is configured correctly. 	<ol style="list-style-type: none"> 1. Perform the T1 Auxiliary Transformer Test. 2. The power board rectifier may be faulty. Check or replace.

 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 216-383-2531 or 1-800-833-9353.

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Observe all Safety Guidelines detailed throughout this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS (Continued)		
The thermal LED is lit. The machine regularly overheats.	<ol style="list-style-type: none"> 1. Welding application may exceed recommended duty cycle. 2. Dirt and 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 machine. 4. Make sure the fan is functioning correctly. 	<ol style="list-style-type: none"> 1. One of the thermostats may be faulty. Check or replace. See wiring diagram.
The Auxiliary Receptacle is "dead". The 115 VAC is missing.	<ol style="list-style-type: none"> 1. Check the 10 amp circuit breaker (CB2) located on the case front. Reset if necessary. 2. Check the 10 amp circuit breaker (CB3) located in the reconnect area. Reset if necessary. 	<ol style="list-style-type: none"> 1. Check the receptacle and associated wiring for loose or faulty connections. See wiring diagram. (Plugs P80 and P81) 2. Perform the Auxiliary Transformer T2 Test.
The Power Wave 455 won't produce full output.	<ol style="list-style-type: none"> 1. The input voltage may be too low, limiting the output capability of the Power Wave 455. Make certain the input voltage is proper for the machine and reconnect panel configuration. 2. Make sure all three phases of input power are being applied to the machine. 	<ol style="list-style-type: none"> 1. Perform the Output Rectifier Test. 2. Perform the Power Board Test. 3. Compare the display voltage reading with an actual voltage reading at the output terminals. If the discrepancy is greater than two volts the control board may be faulty. 4. Perform the Current Transducer Test.

 **CAUTION**

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POWER WAVE

Observe all Safety Guidelines detailed throughout this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
For no apparent reason, the welding characteristics have changed.	<ol style="list-style-type: none"> 1. Check for proper wire feed speed setting. In the MIG/MAG and FCAW modes, check for proper voltage settings. In the MIG/MAG pulse modes, check the arc length trim setting. These controls are on the Control Box (user interface). 2. Check for proper shielding gas and gas flow. 3. Check for loose or faulty welding cables and connections. 	<ol style="list-style-type: none"> 1. If zero arc voltage is displayed on the Control Box while welding, the voltage sense leads may be broken. Check lead #67 at the wire drive. See wiring diagram. Also check leads #202 (Neg. output terminal) and #206 (Pos. output terminal). See Power Wave 455 wiring diagram. If external voltage sensing is utilized, check the #21 lead between the 4-pin receptacle on the Power Wave 455 and the workpiece. 2. Perform the Output Rectifier Test. 3. The control board may be faulty. 4. Perform the Current Transducer Test.
The machine often "noodle welds" with a particular procedure.	<ol style="list-style-type: none"> 1. The machine may be trying to deliver too much power. When the average output current exceeds a maximum limit, the machine will "phase back" to protect itself. Adjust the procedure or reduce the load to lower the current draw from the Power Wave 455 machine. <p>Power Wave 455 - When the average output current exceeds 570 amps, the output current is phased back to 100 amps.</p>	<ol style="list-style-type: none"> 1. Perform the Current Transducer Test. 2. The control board may be faulty.
The arc burns back to the tip.	<ol style="list-style-type: none"> 1. The voltage settings may be too high for the procedure. 2. The voltage sensing lead or connection may be faulty. See the Power Feed 10 Wiring Diagram 	<ol style="list-style-type: none"> 1. Perform the Voltage Sense PC Board Test.

⚠ CAUTION

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Observe all Safety Guidelines detailed throughout this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
<p>The wire feeder won't work. No lights. Apparently the wire feeder is not being powered-up.</p>	<ol style="list-style-type: none"> 1. Make certain the Power Wave 455 is turned on. 2. Check circuit breaker CB1 located on the case front of the Power Wave 455. Reset if necessary. 3. Check the 6 amp circuit breaker (CB4) located on the reconnect panel. Reset if necessary. 4. Check the control cable between the power source and the wire feeder. <p>Check for loose or broken connections. Check continuity on all five leads from one end to the other.</p>	<ol style="list-style-type: none"> 1. Check for 40 VDC on pin "D" (+) and pin "E" (-) at the Power Wave 455 wire feeder receptacle. See wiring diagram. If 40 volts DC is not present at the Power Wave wire feeder receptacle, perform the Power Board Test. 2. Check the power board rectifier. See wiring diagram. 3. Perform the T1 Auxiliary Transformer Test. 4. If the 40 volts DC is present at the Power Wave wire feeder receptacle, the problem is in the control cable or the wire drive/control box. See Wire Drive/Control Box Troubleshooting.

 **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 216-383-2531 or 1-800-833-9353.

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POWER WAVE 455 STATUS LED CHART

STATUS LED CONDITION	POSSIBLE FAULT(S)
LED is solid green (not blinking)	System operating normally.
LED is solid red	<ul style="list-style-type: none"> -- Indicates that nothing is connected to the wire feeder receptacle. Connect a control cable to the Power Wave 455 wire feeder receptacle. The other end of the control cable must be connected to either a Control Box or wire drive unit. -- The control cable may be faulty. Check continuity on all five leads from end to end in the control cable. -- The wire drive and/or Control Box may not be properly configured or connected together. See <i>Installation</i> section of <i>Power Feed 10 Instruction Manual</i>. -- If the wire drive unit and Control Box are properly configured, consult the <i>Status LED Error Code Table</i>.
LED is solid red (not blinking)	<ul style="list-style-type: none"> -- The Power Wave 455 cannot communicate with the wire drive unit and/or the Control Box due to a problem within the Power Wave 455. Consult the three column <i>Troubleshooting Guide</i>. -- The welding software may be corrupt. Contact the Lincoln Electric Service Department.
LED is blinking red and green	<ul style="list-style-type: none"> -- If the Thermal LED is also lit, consult the Power Wave three column <i>Troubleshooting Guide</i> "Thermal LED is lit". -- The input voltage is too high or too low. Make certain the input voltage is proper according to the rating plate located on the rear of the Power Wave 455. -- The Power Wave 455 is having trouble communicating with the wire drive or control box. Turn the Power Wave 455 off. Disconnect the control cable from the wire feeder receptacle on the power source. Turn the Power Wave 455 on. If the status LED then blinks green, the problem is external to the power source. If the LED is still blinking red and green, consult <i>Status LED Error Code Table</i>.


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 216-383-2531 or 1-800-833-9353.

STATUS LED ERROR CODE TABLE

NOTE: The error code signal sequence is always preceded by a 2 second green light. If more than one error code is present, a 4 second off signal will separate the individual error code signals. Note that the [2 sec.green] is only displayed at the beginning of the entire code sequence, not between codes if more than one error code is present.

Example: (Code. #11 “one long red” followed by “one short red”) followed by (Code. #21 “two long reds” followed by “one short red”).

[2 sec.green] [1.2 sec.red] [1.6 sec.off] [0.4 sec.red] [4.0 sec.off] [1.2 sec.red] [0.4 sec.off]
[1.2 sec.red] [1.6 sec.off] [0.4 sec.red]

DIGITAL COMMUNICATION ERRORS	ERROR CODE LED SEQUENCE
#11 CAN bus off (Excessive number of communication errors).	[2 sec.green] [1.2 sec.red] [1.6 sec.off] [0.4 sec.red]
#12 UI time out (Loss of communication to control box).	[2 sec.green] [1.2 sec.red] [1.6 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red]
WELDING FILE ERRORS	ERROR CODE LED SEQUENCE
#21 Unprogrammed mode	[2 sec.green] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [1.6 sec.off] [0.4 sec.red]
#22 Empty weld table	[2 sec.green] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [1.6 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red]
#23 Weld table check sum (table is corrupt)	[2 sec.green] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [1.6 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red]

 **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 216-383-2531 or 1-800-833-9353.

STATUS LED ERROR CODE TABLE (Continued)

POWER SOURCE ERRORS	ERROR CODE LED SEQUENCE
#31 Primary over current	[2 sec.green] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [1.6 sec.off] [0.4 sec.red]
#32 Capacitor "A" under voltage	[2 sec.green] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [1.6 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red]
#33 Capacitor "B" under voltage	[2 sec.green] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [1.6 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red]
#34 Capacitor "A" over voltage	[2 sec.green] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [1.6 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red]
#35 Capacitor "B" over voltage	[2 sec.green] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [1.6 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red]
#36 Thermal overload	[2 sec.green] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [1.6 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red]
#37 Machine failed soft start	[2 sec.green] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [0.4 sec.off] [1.2 sec.red] [1.6 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red] [0.4 sec.off] [0.4 sec.red]

 **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 216-383-2531 or 1-800-833-9353.

POWER FEED

Observe all Safety Guidelines detailed throughout this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
Major physical or electrical damage is evident when the sheet metal cover(s) are removed.	1. Contact your local authorized Lincoln Electric Field Service Facility for technical assistance.	1. Contact the Lincoln Electric Service Department, 216-383-2531 or 1-800-833-9353 (WELD).
No wire feed, solenoid or arc voltage. The STATUS LEDs are steady green.	1. The gun trigger may be faulty. Check or replace. 2. Make certain the Control Box is configured for a wire feeding mode. 3. Check option panel connections and switch(s) for proper operation.	1. Check the continuity of leads #556 and #557 from the gun trigger receptacle to plug J5 pins #11 and #12. See wire drive wiring diagram. 2. The wire drive control board may be faulty. 3. The Control Box control board may be faulty.
No control of wire feed speed. All STATUS LEDs are steady green. The preset wire feed speed is adjustable on the Control Box.	1. Check for a mechanical restriction in the wire feed path.	1. Perform the <i>Tach Feedback Test</i> . 2. The wire drive control board may be faulty.
No welding arc voltage when the gun trigger is activated. The wire feeds normally and the gas solenoid functions properly. The STATUS LEDs are steady green on the wire drive unit and the Control Box.	1. The power source may be unable to produce welding output due to a thermal fault or other malfunction. Check STATUS LED on Power Wave 455 machine. See <i>Power Wave 455 Troubleshooting</i> .	1. Make certain the Power Wave 455 power source is functioning correctly. 2. The wire drive control board may be faulty. 3. The Control Box control board may be faulty.
The wire feed speed does not change when welding current is established. The WFS stays at the run-in speed. The STATUS LEDs are steady green.	1. The run in and weld wire feed speeds may be set to the same value. Set run in speed to a value that gives best starting results.	1. Perform the <i>Current Transducer Test</i> . 2. If the run in wire feed speed cannot be adjusted, perform the <i>Tach Feedback Test</i> and also the <i>Drive Motor Test</i> . 3. The wire drive control 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 216-383-2531 or 1-800-833-9353.

POWER FEED

Observe all Safety Guidelines detailed throughout this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS (Continued)		
The purge switch on the wire drive unit does not activate the gas solenoid, but gun trigger closure in the MIG or Pulse modes does activate the solenoid. The LEDs are steady green on the power source, Control Box and wire drive unit.	<ol style="list-style-type: none"> 1. Make certain the COLD INCH/GAS PURGE switch is operating properly. 2. Check for loose or faulty leads between COLD INCH/GAS PURGE switch and the wire drive control board. See wiring diagram. 	<ol style="list-style-type: none"> 1. If the COLD INCH/GAS PURGE switch is operating correctly and the associated leads are OK, the wire drive control board may be faulty.
The COLD INCH/GAS PURGE switch does not turn on the wire drive motor but gun trigger closure in the MIG or Pulse modes does activate the wire drive motor. The LEDs are steady green on the power source, Control Box and wire drive unit.	<ol style="list-style-type: none"> 1. Make certain the COLD INCH/GAS PURGE switch is operating properly. 2. Check for loose or faulty leads between the COLD INCH/GAS PURGE switch and the wire drive control board. See wiring diagram. 	<ol style="list-style-type: none"> 1. If the COLD INCH/GAS PURGE switch is operating correctly and the associated leads are OK, the wire drive control board may be faulty.
The voltmeter on the Control Box does not function properly even though the STATUS LEDs are steady green.	<ol style="list-style-type: none"> 1. Make sure the DIP switches are configured correctly for the welding polarity being used. See Setting DIP Switches in the Wire Drive in the <i>Installation</i> section of this manual. 2. Check the #67 lead on the wire drive unit. Make sure it is connected to the motor gear box and also the voltage sense PC board. 3. Check the work sensing leads on the Power Wave 455 power source. Check leads #202 (Neg. output terminal) and #206 (Pos. output terminal). See Power Wave 455 wiring diagram. If external voltage sensing is utilized, check the #21 lead between the 4-pin receptacle on the front of the Power Wave 455 and the workpiece. 	<ol style="list-style-type: none"> 1. Check leads #512B and #511 from plug J4 on the wire drive control board to the voltage sense PC board. 2. Perform the Voltage Sense Board Test. 3. The display board may be faulty. 4. The wire drive control board may be faulty. 5. The Control Box control 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 216-383-2531 or 1-800-833-9353.

POWER FEED

Observe all Safety Guidelines detailed throughout this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS (Continued)		
The ammeter on the Control Box does not function properly even though the STATUS LEDs are steady green.	<ol style="list-style-type: none"> 1. Make sure the DIP switches are configured correctly for the welding process and polarity being used. See Setting DIP Switches in the Wire Drive in the Installation section of this manual. 2. Check the following connections on the Power Wave 455 machine. Check for loose or faulty connections between plug J90 at the current transducer and plug J21 on the Power Wave 455 control board. 	<ol style="list-style-type: none"> 1. Perform the Current Transducer Test. 2. The display board, located in the control box, may be faulty. 3. The control board, located in the power source, may be faulty.
The display and/or indicator LEDs do not change when their corresponding switches and or knobs are activated or turned.	<ol style="list-style-type: none"> 1. Check for loose or faulty connections between the encoder panel and the Control Box control board. 2. Check for loose or faulty connections between the appropriate switches and the Control Box control board. 	<ol style="list-style-type: none"> 1. Check suspected potentiometer and/or switches for correct resistances and operation. 2. Perform the Encoder PC Board Test. 3. The Control Box control board may be faulty.
The mode and/or settings change while welding under normal conditions.	<ol style="list-style-type: none"> 1. Contact the Lincoln Electric service dept. for possible software updates 1-800-833-9353. (Please ref. your current software number.) 	
The feeder resets when the gun trigger is activated. The LEDs blink and the displays are intermittent.	<ol style="list-style-type: none"> 1. The auxiliary reconnect (Lead "A") may not be configured correctly. See Figure A.2 in the Installation Section of this manual. 	<ol style="list-style-type: none"> 1. Perform the Power Board Test. 2. Perform the Auxiliary Transformer Test #1.

 **CAUTION**

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POWER FEED

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS (Continued)		
<p>The displays are blank (not lit). The wire feeds when the gun trigger is activated.</p>	<p>1. Check for loose or faulty connections at plug J1 on the display board, to plug J4 on the Control Box control board.</p>	<p>1. Check for 12 VDC at plug J1 pin 7 (lead #512+) to plug J1 pin 8 (lead #500-) on the display board. If the 12 VDC is present, then the display board may be faulty.</p> <p>2. If the 12 VDC is low or not present, check for loose or faulty connections on leads #512 and #500.</p> <p>3. The Control Box control board may be faulty.</p>
<p>The dual procedure is not functional when using the remote Dual Procedure switch. The STATUS LEDs are steady green on the power source, Control Box and wire drive units.</p>	<p>1. Make certain the the bat switch on the Dual Procedure Panel is in the middle position. This enables the gun remote dual procedure switch.</p>	<p>1. The remote Dual Procedure switch may be faulty. Check switch and associated leads.</p> <p>2. The local dual procedure switch may be faulty.</p> <p>Remove power to the machine. Disconnect plug J5 from the Control Box control board. Check for continuity (less than one ohm) between pins 1 and 7 when the Dual Procedure switch is in position "A". Next check for continuity (less than one ohm) between pins 1 and 8 when the Dual Procedure switch is in the "B" position. If either of these continuity tests fail, replace the switch. When the switch is in the center position there should not be any continuity between pins.</p> <p>3. The Control Box control board may be faulty.</p>

 **CAUTION**

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Observe all Safety Guidelines detailed throughout this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS (Continued)		
The Dual Procedure is not functioning when using the local Dual Procedure switch on the Control Box. The STATUS LEDs are steady green on the power source, Control Box and wire drive units.	1. Check the leads and plug J5 between the switch and the Control Box control board for loose or faulty connections. See wiring diagram.	1. The local dual procedure switch may be faulty. Remove power to the machine. Disconnect plug J5 from the Control Box control board. Check for continuity (less than one ohm) between pins 1 and 7 when the Dual Procedure switch is in position "A". Next check for continuity (less than one ohm) between pins 1 and 8 when the Dual Procedure switch is in the "B" position. If either of these continuity tests fail, replace the switch. When the switch is in the center position, there should not be any continuity between pins. 2. The Control Box control board may be faulty.
The wire feed speed is consistent and adjustable, but runs at the wrong speed.	1. The DIP switch on the wire drive unit may not be set for the correct gear ratio. See the <i>Installation</i> section of this manual.	1. The wire drive control board may be faulty.
The unit shuts off while welding or attempting to weld. The STATUS LED is alternating between red and green every second. The unit tries to recover after 30 seconds and may repeat sequence.	1. The shut down circuit in the wire drive unit may be electricaly "open". Make sure leads #570 and #571 are connected together. 2. The drive motor may be overloaded due to a mechanical restriction in the wire feeding path. See <i>Operation</i> section of this manual.	1. Disconnect any shutdown device from leads #570 and #571 (0.25 in. insulated tab terminals). Connect leads #570 and #571 together. If the feeder STATUS LED is now steady green, the problem is in the external shutdown circuit. 2. If there are no restrictions in the wire feeding path, the drive motor or gear box may be faulty. 3. The wire drive control 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 216-383-2531 or 1-800-833-9353.

POWER FEED

Observe all Safety Guidelines detailed throughout this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS (Continued)		
When the gun trigger is activated, the drive rolls do not turn. The arc voltage is present and the solenoid is energized. The STATUS LEDs are steady green.	<ol style="list-style-type: none"> 1. Check plug J3 on the wire drive control board, and leads #550 and #551 for loose or faulty connections. See wiring diagram. 	<ol style="list-style-type: none"> 1. Perform the <i>Drive Motor Test</i>. 2. The wire drive control board may be faulty.
The wire is feeding rough or not feeding, but the drive rolls are turning.	<ol style="list-style-type: none"> 1. The drive roll pressure may be incorrect. Set drive roll pressure. See <i>Operation</i> section in this manual. 2. Check for dirty or rusty electrode wire. 3. Make sure the drive rolls and wire guides are positioned and installed correctly. See <i>Operation</i> section of this manual. 4. Check for mechanical restrictions in the wire feeding path. 	<ol style="list-style-type: none"> 1. Contact the Lincoln Electric Service Department, 216-383-2531 or 1-800-833-9353 (WELD).
When in CC modes with the optional "MX" or "MSP" panels, the output does not energize.	<ol style="list-style-type: none"> 1. Rotate Volts/Trim encoder knob at least 45° clockwise. This is normal. See <i>Accessories</i> section for detailed operation. 	<ol style="list-style-type: none"> 1. Check option panel installation for loose or faulty connections.

 **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 216-383-2531 or 1-800-833-9353.

POWER FEED

Observe all Safety Guidelines detailed throughout this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
The gun tip seizes in diffuser.	<ol style="list-style-type: none"> 1. The tip may be overheating due to prolonged or excessive high current and /or duty cycle. Do not exceed the current and duty cycle rating of the gun. 2. A light application of high temperature antiseize lubricant (such as Graphite Grease) may be applied to tip threads. 	1. Contact the Lincoln Electric Service Department, 216-383-2531 or 1-800-833-9353 (WELD).
Poor arc striking with sticking or "blast-offs". The weld bead may be narrow and ropy with weld porosity.	<ol style="list-style-type: none"> 1. Make sure the weld procedures are correct for the process being used. Check gas, wire feed, speed and arc voltage. 2. Remove the gun liner and check the rubber seal for any sign of deterioration or damage. Be sure the set screw in the connector block is in place and tightened against the liner bushing. 3. Check the welding cables for loose or faulty connections. 	1. Contact the Lincoln Electric Service Department, 216-383-2531 or 1-800-833-9353 (WELD).
The arc is variable and/or hunting. The power source, Control Box and drive units seem to be operating properly.	<ol style="list-style-type: none"> 1. Check the contact tip. It may be worn or the wrong size for the electrode wire being used. 2. Check for loose or faulty welding cables and connections. 3. Make sure the weld procedures are correct for the process being used. Check gas, wire feed speed and arc voltage. 	1. Contact the Lincoln Electric Service Department, 216-383-2531 or 1-800-833-9353 (WELD).

 **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 216-383-2531 or 1-800-833-9353.

POWER FEED ERROR CODE CHART

DISPLAYED CODE	POSSIBLE CAUSE (FAULT)	RECOMMENDED COURSE OF ACTION
CONTROL BOX/WIRE DRIVE ERROR CODE CHART		
Err 011	More than one control box has the same group number.	Make sure the group DIP switch setting is unique for each Control Box. See <i>Installation</i> section of this manual.
Err 003	There are too many objects in the group.	A given group can support a maximum of seven objects. Remove any objects over seven either by changing the group DIP switch settings or physically disconnecting the "extra" objects. See <i>Installation</i> section of this manual.
Err 004	More than one object of the same equipment type with the same group number and feed head number.	Adjust the DIP switch setting to make either the group number or the feed head number unique for all objects of the same equipment type. See <i>Installation</i> section of this manual.
Err 005	A wire drive unit has its DIP switches set to zero. It is in a group that has more than one object.	The appropriate wire drive numbers are 1 through 7. Check the DIP switch setting chart in the <i>Installation</i> section of this manual.
Err 006	The unit did not receive a recognition command from the power source.	Check to see if the STATUS LED on the Power Wave 455 is not steady green. If it is not steady green, refer to the <i>Power Wave 455 Status LED Chart and Code Table</i> . Check the control cables for loose or faulty connections. Also check the continuity of all five leads from one end to the other. The control board in the PW 455 may be faulty.
Err 020	An attempt was made to reprogram the Control Box or the wire drive unit, but the program did not verify.	Check for potential electrical high frequency noise in the surrounding area. Remove any potential HF noise and program the unit again. If the Err 020 still occurs, either replace the EEPROM chip(s) in the board being programmed or replace the entire PC board being programmed.

 **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 216-383-2531 or 1-800-833-9353.

POWER FEED ERROR CODE CHART

Observe all Safety Guidelines detailed throughout this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
CONTROL BOX/WIRE DRIVE ERROR CODE CHART (Continued)		
Err 100	For some reason the Power Wave 455 issued a shutdown command.	See Err 006 in this chart.
Err 200	No response from the Power Wave 455.	See Err 006 in this chart.
Err 201	No response from either the Control Box or wire feed unit.	If this condition occurs while welding, the status LED should be flashing red on the problem unit. Otherwise, check for any units that are flashing green. This indicates that the particular unit has not been recognized and there is a power source problem. See Power Wave 455 Troubleshooting . If the STATUS LED is either flashing red or steady red, there may be a fault in the control cable(s).
Err 210	EEPROM error	The parameter(s) recalled at power up was out of range. Rotate Encoder Knob to reset. Check all settings before proceeding to weld. If this condition persists, replace the Control Box control board.
Err 211	A microprocessor RAM error occurred in the Control Box.	Remove the input power. Wait five seconds. Turn power on. If Err 211 is displayed again, the Control Box control board may be faulty.
- - - (three dashes)	Appears on the control box display.	This is an indication that constant current such as STICK or GOUGE mode has been selected. Turning the right encoder clockwise when in this state will activate output from the Power Wave 455. Turning the right encoder counterclockwise will deactivate output.

 **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 216-383-2531 or 1-800-833-9353.

PW 455 CONTROL BOARD LED DEFINITIONS

LED COLOR AND NUMBER	CIRCUIT INDICATORS
Green LED 1	-15 VDC Supply
Green LED 3	+15 VDC Supply
Green LED 4	+5 VDC Supply
Red LED 5	On when jumper removed from J26
Green 6 LED	+5 VDC Communication Supply
Red LED 7	Fault Error Indicator
Green LED 8	+5 VDC RS232 Supply

NOTE: The only LED that changes state when the machine is running is LED 7 (Fault Indicator). The rest are either on or off depending upon the power supply or jumper status.

TEST PROCEDURES

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE

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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

TEST DESCRIPTION

This “safety” procedure should be performed before any internal maintenance or repair procedures are attempted on the Power Wave 455. Capacitance normally discharges within 2 minutes of removing input power. This procedure is used to check that the capacitors have properly discharged.

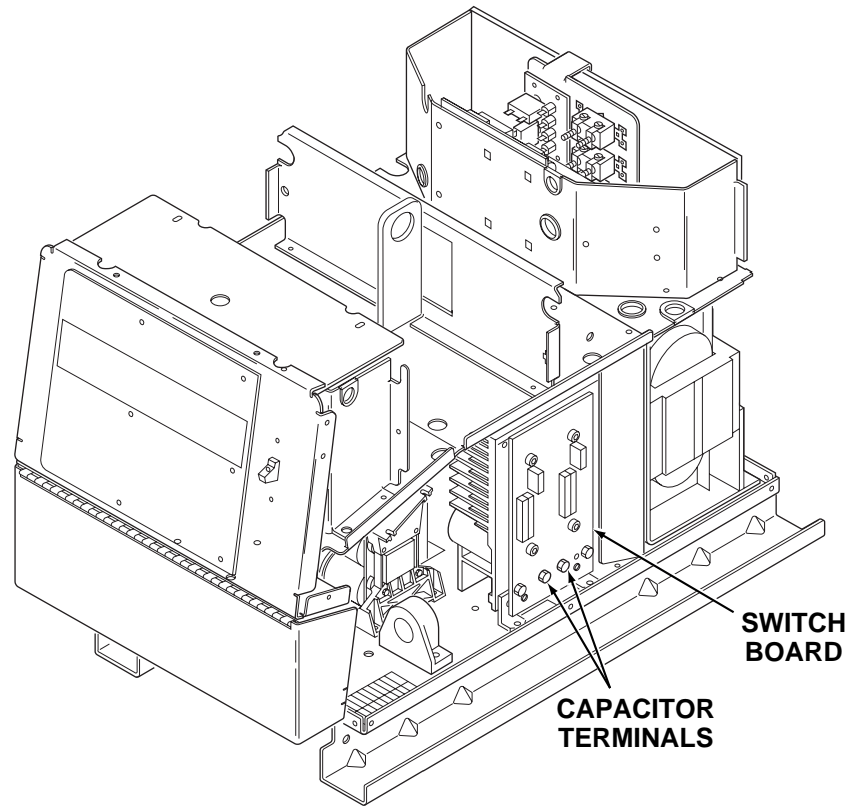
This procedure takes approximately 9 minutes to perform.

MATERIALS NEEDED

3/8 in. nutdriver
Volt-Ohmmeter
25-1000 ohms @ 25 watts (minimum) resistor
Electrically insulated gloves and pliers

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE (continued)

FIGURE F.1 — CAPACITOR DISCHARGE PROCEDURE.



TEST PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8 in. nutdriver, remove the left and right case sides.
3. Be careful not to make contact with the capacitor terminals that are located in the bottom center of the left and right side switch boards. See Figure F.1.
4. Carefully check for a DC voltage at the capacitor terminals on both boards. Note the polarity is marked on the PC board and also lead #19 is positive.
5. If any voltage is present, proceed to Step #6. If no voltage is present, the capacitors are discharged.
6. Using the high wattage resistor (25-1000 ohms @ 25 watts (minimum), electrically insulated gloves and pliers, connect the resistor across the two capacitor terminals. Hold the resistor in place for 10 seconds. DO NOT TOUCH THE CAPACITOR TERMINALS WITH YOUR BARE HANDS. **NEVER USE A SHORTING STRAP FOR THIS PROCEDURE.**
7. Repeat procedure for the other capacitor.
8. Recheck the voltage across the capacitor terminals. The voltage should be zero. If any voltage remains, repeat the discharge procedure.

NOTE: Voltage present after the discharge has been performed is an abnormal condition and may indicate a switch board problem.

SWITCH BOARD TEST

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

TEST DESCRIPTION

This test will help determine if the “power section” of the switch boards are functioning correctly. This test will NOT indicate if the entire PC board is functional. This resistance test is preferable to a voltage test with the machine energized because these boards can be damaged easily. In addition, it is dangerous to work on these boards with the machine energized.

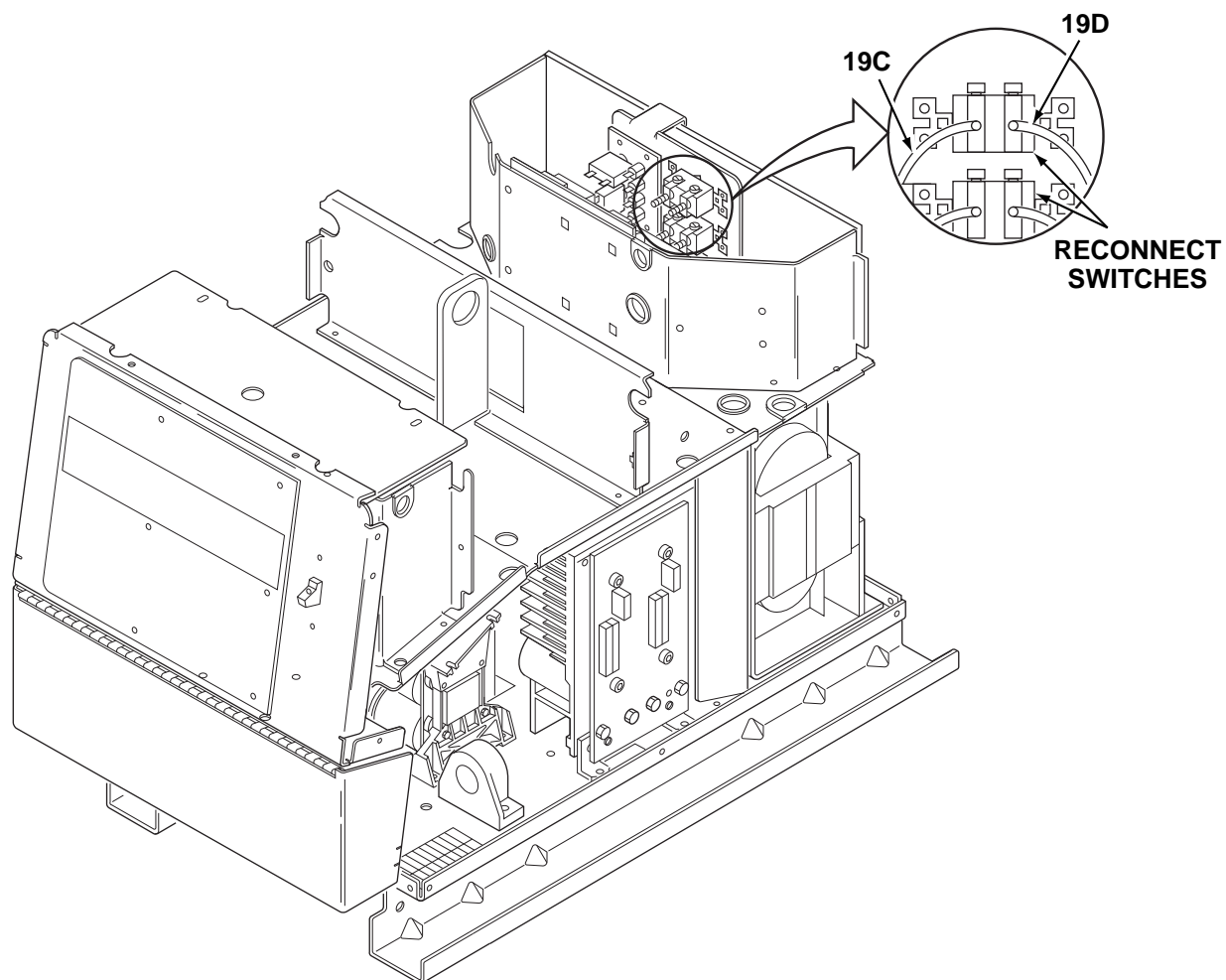
This procedure takes approximately 20 minutes to perform.

MATERIALS NEEDED

3/8 in. nutdriver
3/8 in. wrench
Analog Volt-Ohmmeter

SWITCH BOARD TEST (continued)

FIGURE F.2 — RECONNECT SWITCHES.

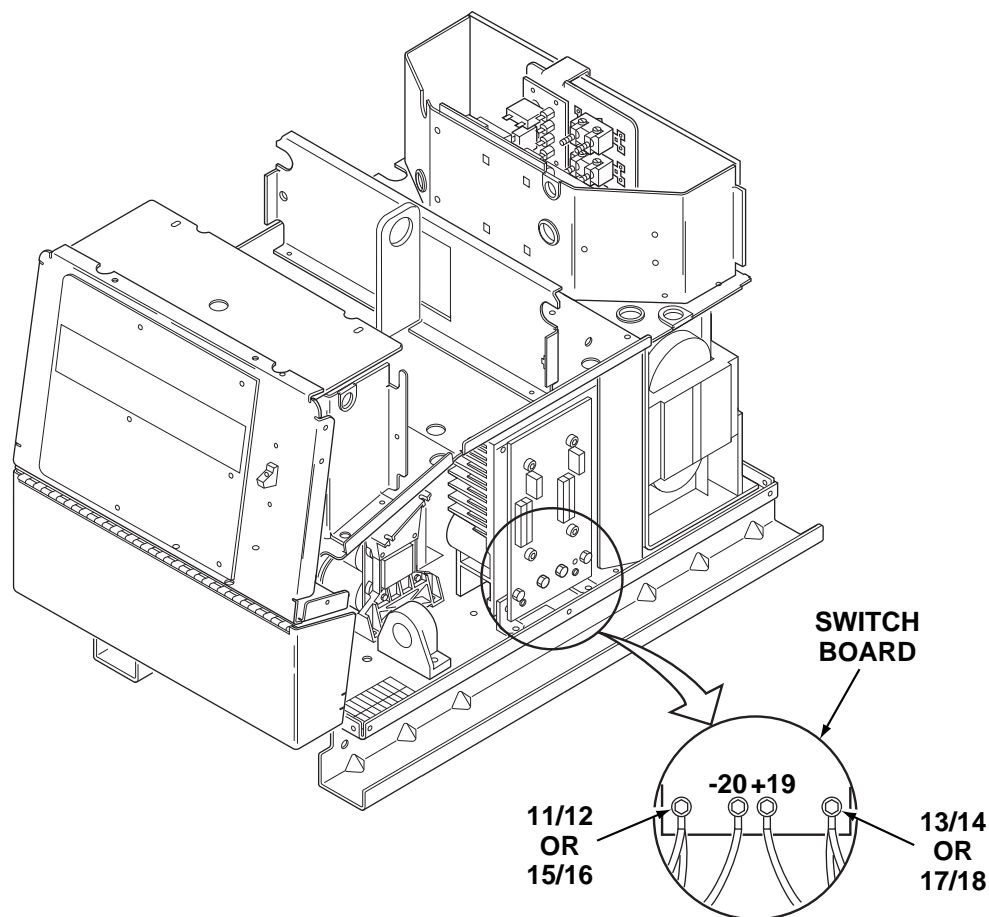


TEST PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8 in. nutdriver, remove the case top and sides.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate label and remove leads 19C and 19D from the reconnect switches with the 3/8 in. wrench. Note lead placement for reassembly. Clear leads. Refer to Figure F.2.
5. Using the Analog ohmmeter, perform the resistance tests detailed in Table F.1. Refer to Figure F.3 for the test points.

SWITCH BOARD TEST *(continued)*

FIGURE F.3 — SWITCH BOARD TEST POINTS.



- 6. If any test fails replace both switch boards. See **Switch Board Removal and Replacement**.
- 7. If the switch board resistance tests are OK, check the molex pin connections and associated wiring from the switch boards to the control board. See wiring diagram.
- 8. Reconnect leads 19C and 19D to the reconnect switches. Ensure that the leads are installed in the same location they were removed from.
- 9. Install the right and left case sides using the 3/8 in. nutdriver.

TABLE F.1 — SWITCH BOARD RESISTANCE TEST.

APPLY POSITIVE TEST PROBE TO TERMINAL	APPLY NEGATIVE TEST PROBE TO TERMINAL	NORMAL RESISTANCE READING
+19	11/12 OR 15/16	Greater than 1000 ohms
+19	13/14 OR 17/18	Greater than 1000 ohms
11/12 OR 15/16	- 20	Greater than 1000 ohms
13/14 OR 17/18	- 20	Greater than 1000 ohms
- 20	11/12 OR 15/16	Less than 100 ohms
- 20	13/14 OR 17/18	Less than 100 ohms
11/12 OR 15/16	+19	Less than 100 ohms
13/14 OR 17/18	+19	Less than 100 ohms

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OUTPUT RECTIFIER TEST

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

TEST DESCRIPTION

The test will help determine if any of the output rectifiers are shorted.

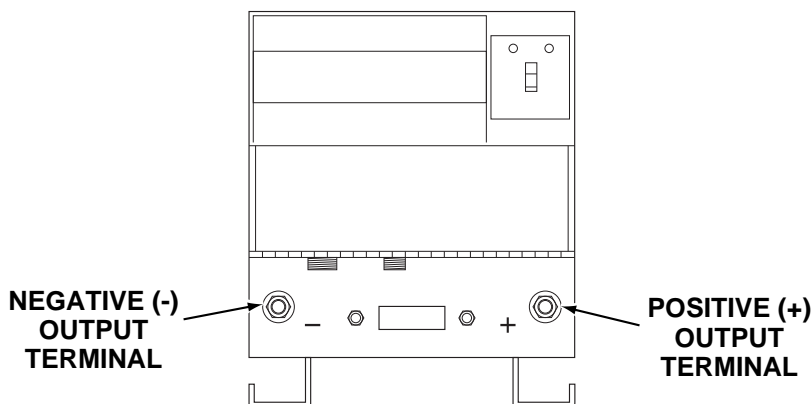
This procedure takes approximately 10 minutes to perform.

MATERIALS NEEDED

Analog Volt-Ohmmeter

OUTPUT RECTIFIER TEST *(continued)*

FIGURE F.4 — OUTPUT RECTIFIER TEST.



TEST PROCEDURE

1. Remove main input supply power to the Power Wave 455.

NOTE: Later code machines have a 50 ohm resistor across the welding output terminals. It will be necessary to remove the case sides and **Perform the Input Filter Capacitor Discharge Procedure**. Remove and insulate one of the resistor leads (# 202A or #206A) from the appropriate welding output terminal. See the wiring diagram.

2. Remove any output load that may be connected to the Power Wave 455.

3. With the analog ohmmeter, measure the resistance between the positive and negative output terminals. Refer to Figure F.4. **IMPORTANT:** The positive (+) meter probe must be attached to the positive (+) output terminal and the negative (-) meter probe must be attached to the negative (-) output terminal.

4. If the reading is more than 200 ohms, the output rectifier modules are not shorted. If the reading is less than 200 ohms, one or more of the rectifier modules are shorted. Refer to the **Output Rectifier Module Replacement Procedure**.

INPUT RECTIFIER TEST

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

TEST DESCRIPTION

This test will help determine if the input rectifier has “shorted” or “open” diodes.

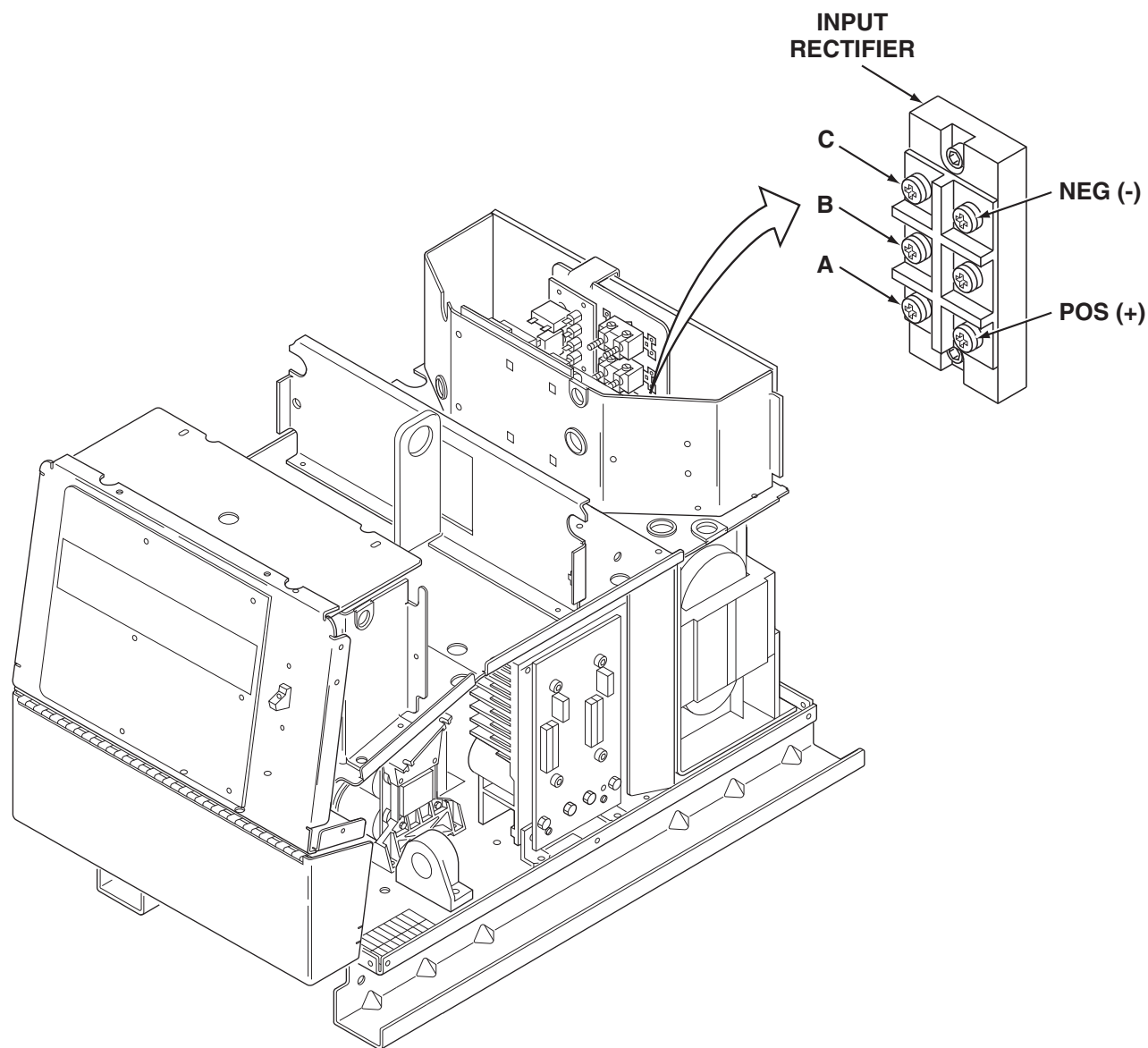
This procedure takes approximately 15 minutes to perform.

MATERIALS NEEDED

Analog Volt-Ohmmeter
Phillips head screwdriver
Wiring diagram
3/8 in. nutdriver

INPUT RECTIFIER TEST (continued)

FIGURE F.5 — INPUT RECTIFIER TEST.



TEST PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8 in. nutdriver, remove the case top.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the Input Rectifier and lead locations. Refer to Figure F.5.
5. With the Phillips head screwdriver remove the positive and negative leads from the rectifier.
6. Use the analog ohmmeter to perform the tests detailed in **Table F.2**.

NOTE: Some RTV sealant may have to be removed from the input rectifier terminals. The RTV should be replaced when test is complete.

INPUT RECTIFIER TEST (continued)

TABLE F.2 — INPUT RECTIFIER TEST POINTS AND ACCEPTABLE READINGS.

TEST POINT TERMINALS		ANALOG METER X10 RANGE
+ Probe	- Probe	Acceptable Meter Readings
A	NEG	Greater than 1000 ohms
B	NEG	Greater than 1000 ohms
C	NEG	Greater than 1000 ohms
A	POS	Less than 100 ohms
B	POS	Less than 100 ohms
C	POS	Less than 100 ohms
NEG	A	Less than 100 ohms
NEG	B	Less than 100 ohms
NEG	C	Less than 100 ohms
POS	A	Greater than 1000 ohms
POS	B	Greater than 1000 ohms
POS	C	Greater than 1000 ohms

7. If the input rectifier does not meet the acceptable readings outlined in the table, the component may be faulty. Replace.

NOTE: Before replacing the input rectifier, perform the **Switch Board Test** and the **Input Contactor Test**.

8. When installing a new input rectifier, see **Input Rectifier Removal and Replacement** procedure.

9. If the input rectifier is good, be sure to reconnect the positive and negative leads to the correct terminals and torque to 31 in/lbs. See wiring diagram.

10. Replace any RTV sealant previously removed.

11. Install the case top.

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Return to Master TOC
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INPUT CONTACTOR TEST

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

TEST DESCRIPTION

This test will help determine if the input contactor is functional and if the contacts are functioning correctly.

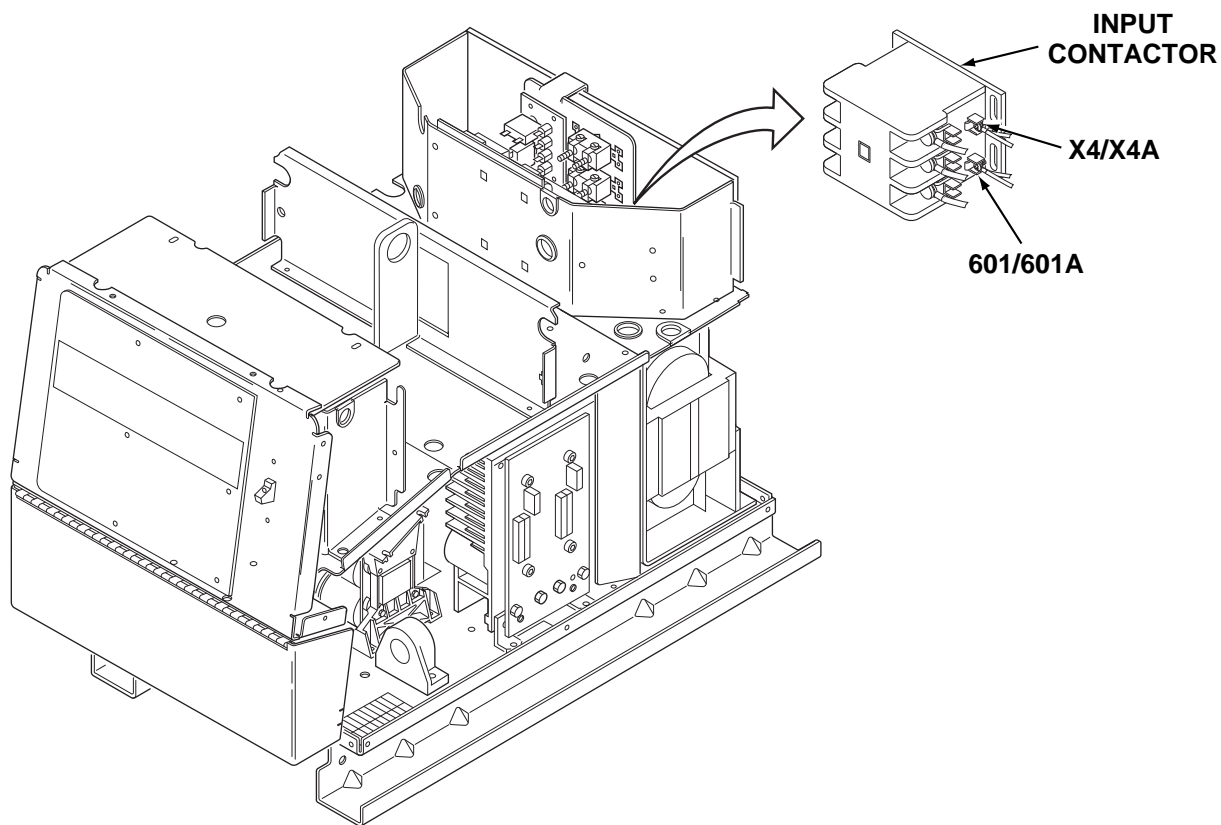
This procedure takes approximately 17 minutes to perform.

MATERIALS NEEDED

3/8 in. nutdriver
Volt-Ohmmeter
External 24 VAC supply

INPUT CONTACTOR TEST (continued)

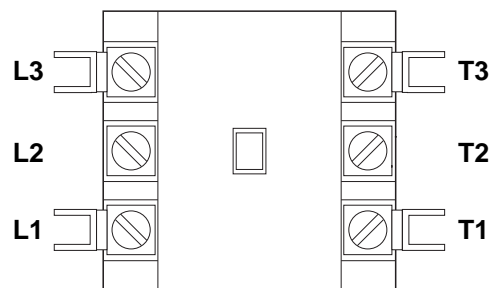
FIGURE F.6 — INPUT CONTACTOR COIL.



TEST PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8 in. nutdriver, remove the input access panel and case top.
3. Locate, mark, and remove the four leads (601, 601A, X4 and X4A) that are connected to the input contactor coil. Refer to Figure F.6.
4. Using the external 24 VAC supply, apply 24 VAC to the terminals of the input contactor coil. If the contactor does NOT activate, the input contactor is faulty. Replace.
5. With the input contactor activated, check the continuity across the three sets of contacts. (Zero ohms or very low resistance is normal). Refer to Figure F.7. If the resistance is high, the input contactor is faulty. Replace the input contactor.

FIGURE F.7 — INPUT CONTACTOR TEST POINTS.



6. When the contactor is NOT activated, the resistance should be infinite or very high across the contacts. If the resistance is low, the input contactor is faulty.
7. Reconnect the four leads (601, 601A, X4, and X4A) to the input contactor coil.
8. Install the input access door and case top using the 3/8 in. nutdriver.

AUXILIARY TRANSFORMER NO. 2 TEST

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

TEST DESCRIPTION

This test will determine if the correct voltage is being applied to the primary of Auxiliary Transformer No. 2 and also if the correct voltage is being induced on the secondary winding of the transformer.

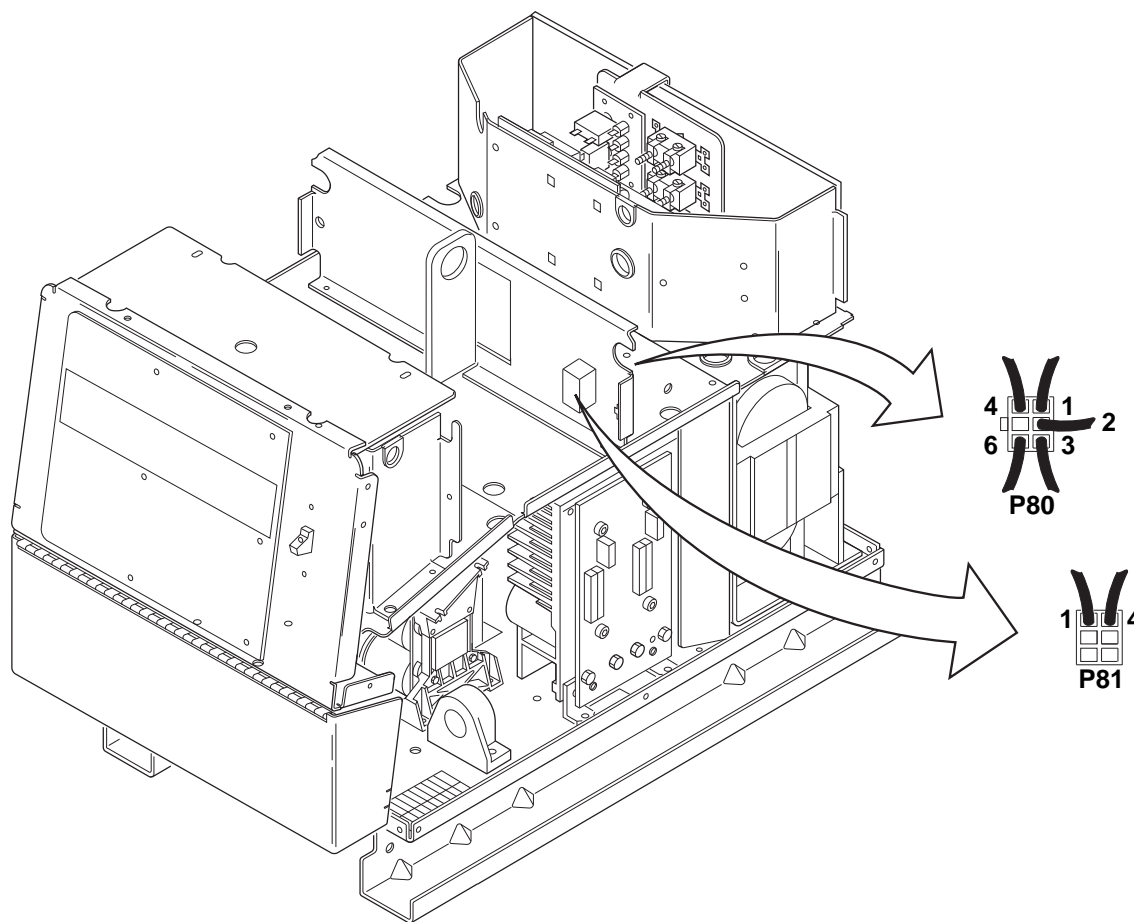
This procedure takes approximately 10 minutes to perform.

MATERIALS NEEDED

Volt-Ohmmeter (Multimeter)
3/8 in. nutdriver
Wiring diagram

AUXILIARY TRANSFORMER NO. 2 TEST (continued)

FIGURE F.8 — AUXILIARY TRANSFORMER NO. 2 TEST.



TEST PROCEDURE

1. Remove the main input supply power to the Power Wave 455 machine.
2. Remove any load that may be connected to the 115 VAC receptacle.
3. Using the 3/8 in. nutdriver, remove the left and right case sides.
4. Perform the **Capacitor Discharge Procedure**.
5. Locate plugs P80 and P81 at the Auxiliary Transformer No. 2. Refer to Figure F.8.
6. Carefully apply the correct input power and check for 115 VAC at plug P81 pins #1 and #4.
7. If 115 VAC is present, the Auxiliary Transformer No. 2 is good.
8. If 115 VAC is not present between pins #1 and #4, check the associated leads and plugs for loose or faulty connections.
9. Carefully test for the correct AC input voltage applied to the primary windings at plug P80. See wiring diagram.
10. If the correct AC input voltage is applied to the primary of the Auxiliary Transformer No. 2 and the secondary voltage is NOT correct, the transformer may be faulty. Replace.
11. Install the left and right case sides using the 3/8 in. nutdriver.

 **WARNING**

High voltage is present at plug P80.

AUXILIARY TRANSFORMER NO. 1 TEST

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

TEST DESCRIPTION

This test will determine if the correct voltage is being applied to the primary of Auxiliary Transformer No. 1 and also if the correct voltage is being induced on the secondary windings of the transformer.

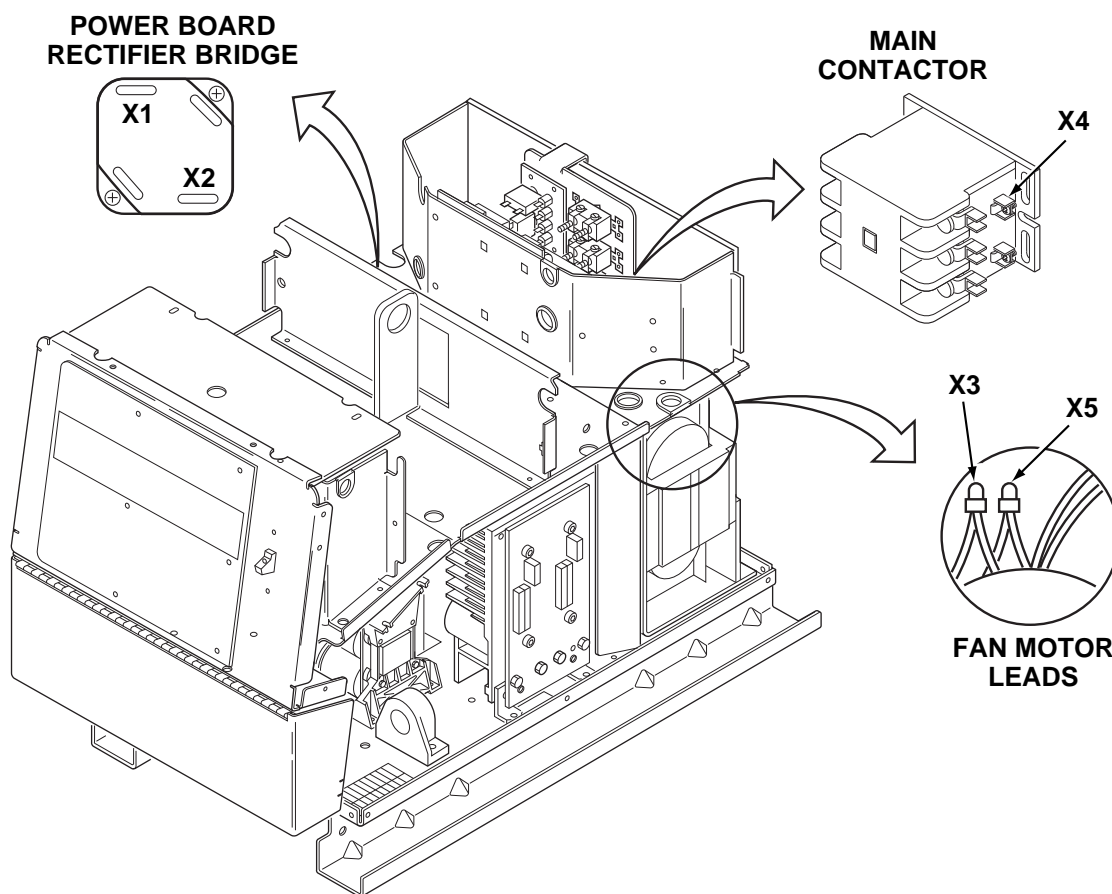
This procedure takes approximately 16 minutes to perform.

MATERIALS NEEDED

Volt-Ohmmeter (Multimeter)
3/8 in. nutdriver
Wiring diagram

AUXILIARY TRANSFORMER NO. 1 TEST (continued)

FIGURE F.9 — AUXILIARY TRANSFORMER NO. 1 TEST.



TEST PROCEDURE

1. Remove the main input supply power to the Power Wave 455 machine.
2. Using the 3/8 in. nutdriver, remove the case sides and top.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate secondary leads X1 and X2 (at power board rectifier bridge). Refer to Figure F.9.
5. Locate secondary leads X3 and X5 (fan motor leads).
6. Locate secondary lead X4 (at main contactor).

AUXILIARY TRANSFORMER NO. 1 TEST (continued)

TABLE F.3 — SECONDARY VOLTAGES.

LEAD IDENTIFICATION	NORMAL EXPECTED VOLTAGE
X1 to X2	52 VAC
X3 to X5	115 VAC
X3 to X4	24 VAC

7. Carefully apply the correct input voltage to the Power Wave 455 and check for the correct secondary voltages per Table F.3.

NOTE: The secondary voltages will vary if the input line voltage varies.

8. If the correct secondary voltages are present, the T1 auxiliary transformer is functioning properly. If any of the secondary voltages are missing or low, check to make certain the primary is configured correctly for the input voltage applied. See wiring diagram.

 **WARNING**

High voltage is present at primary of Auxiliary Transformer.

9. If the correct input voltage is applied to the primary, and the secondary voltage(s) are not correct, the T1 transformer may be faulty.
10. Install the case sides and top using the 3/8 in. nutdriver.

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POWER BOARD TEST

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

TEST DESCRIPTION

This test will help determine if the power board is receiving the correct voltages and also if the power board is regulating and producing the correct DC voltages.

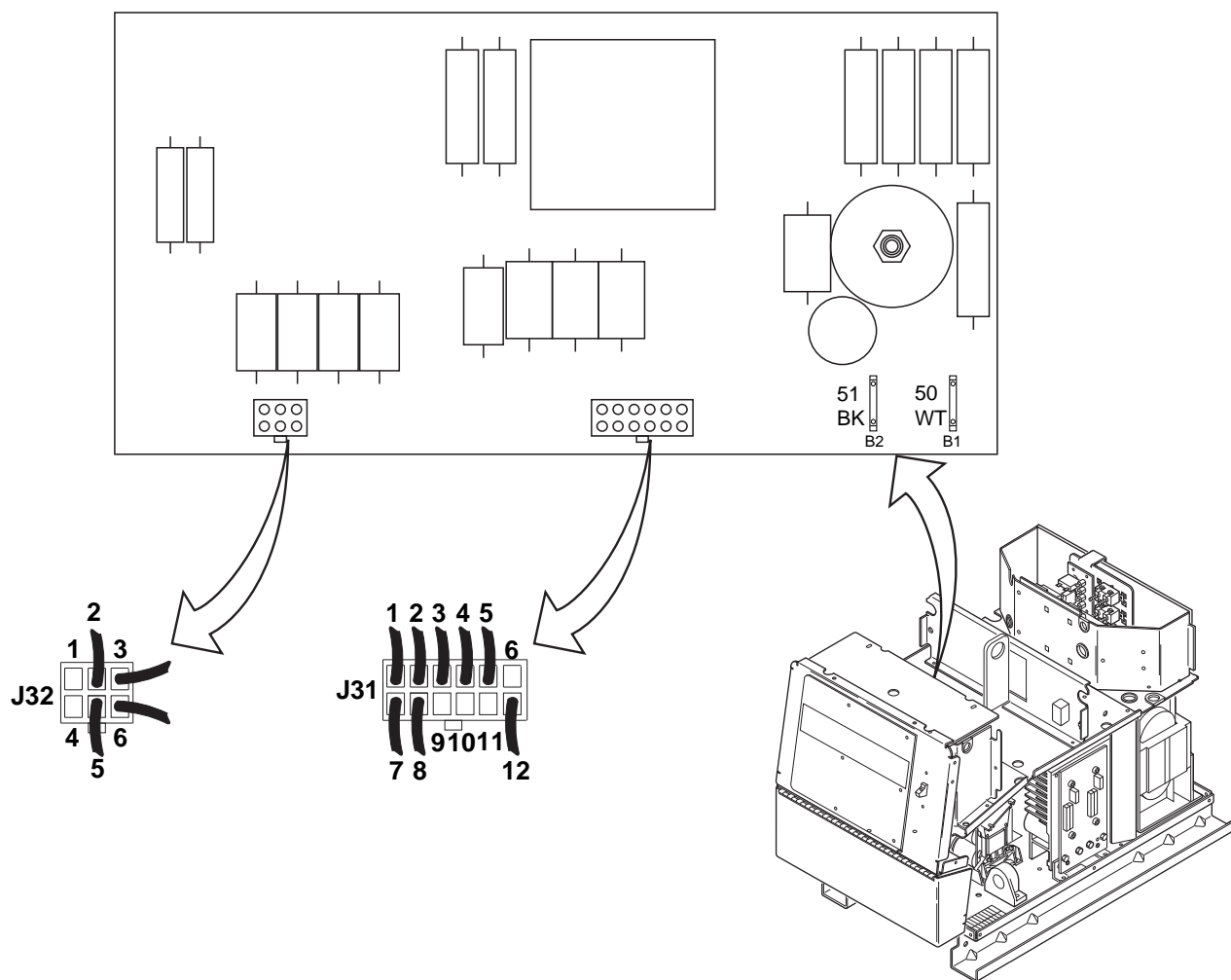
This procedure takes approximately 20 minutes to perform.

MATERIALS NEEDED

3/8 in. nutdriver
Volt-Ohmmeter
Wiring diagram

POWER BOARD TEST (continued)

FIGURE F.10 — POWER BOARD TEST.



TEST PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8 in. nutdriver, remove the case sides and top.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the power board and plugs J31 and J32. Also locate leads #51 (black) and #50 (white). **Do not remove plugs or leads from the power board.** Refer to Figure F.10.
5. Carefully apply the correct input voltage to the Power Wave 455.


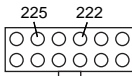
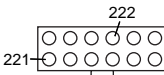
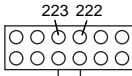
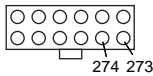
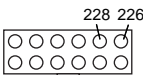
6. Carefully test for the correct voltages at the power board as per Table F.4.

NOTE: Capacitor C3 (25000 mfd/100 V) may hold a charge. **Do not come in contact with the capacitor terminals.**

7. If the 65 VDC is low or not present at plug J32, check the rectifier bridge and C3 filter capacitor. See wiring diagram. Also perform the **T1 Auxiliary Transformer Test**.
8. If any of the DC voltages are low, or not present, at plug J31, the power board may be faulty.
9. Install the case sides and top using the 3/8 in. nutdriver.

POWER BOARD TEST *(continued)*

TABLE F.4 — POWER BOARD VOLTAGE CHECKS.

CHECK POINT LOCATION	TEST DESCRIPTION	CONNECTOR PLUG PIN NO.	LEAD NO. OR IDENTITY	NORMAL ACCEPTABLE VOLTAGE READING
POWER PC BOARD CONNECTOR PLUG J32	CHECK 65 VDC SUPPLY FROM POWER BOARD RECTIFIER BRIDGE	1 & 2(+) 4 & 5(-) 	POS(+) NEG(-)	73 VDC
POWER PC BOARD CONNECTOR PLUG J31	CHECK +15 VDC SUPPLY FROM POWER PC BOARD	2(+) 4(-) 	225(+) 222(-)	15 VDC
POWER PC BOARD CONNECTOR PLUG J31	CHECK +5 VDC SUPPLY FROM POWER PC BOARD	7(+) 4(-) 	221(+) 222(-)	5 VDC
POWER PC BOARD CONNECTOR PLUG J31	CHECK -15 VDC SUPPLY FROM POWER PC BOARD	4(+) 3(-) 	222(+) 223(-)	15 VDC
POWER PC BOARD CONNECTOR PLUG J31	CHECK +5 VDC "CAN" SUPPLY FROM POWER PC BOARD	11(+) 12(-) 	274(+) 273(-)	5 VDC
POWER PC BOARD CONNECTOR PLUG J31	CHECK +5 VDC "RS232" SUPPLY FROM POWER PC BOARD	6(+) 5(-) 	226(+) 228(-)	5 VDC
POWER PC BOARD SPADE TERMINALS	CHECK +40 VDC WIRE FEEDER SUPPLY FROM POWER PC BOARD	#50 TERMINAL TO #51 TERMINAL	WHITE (+) BLACK (-)	40 VDC

Return to Section TOC

Return to Master TOC

Return to Section TOC

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Return to Master TOC



CURRENT TRANSDUCER TEST

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

TEST DESCRIPTION

This test will help determine if the current transducer and associated wiring is functioning correctly.

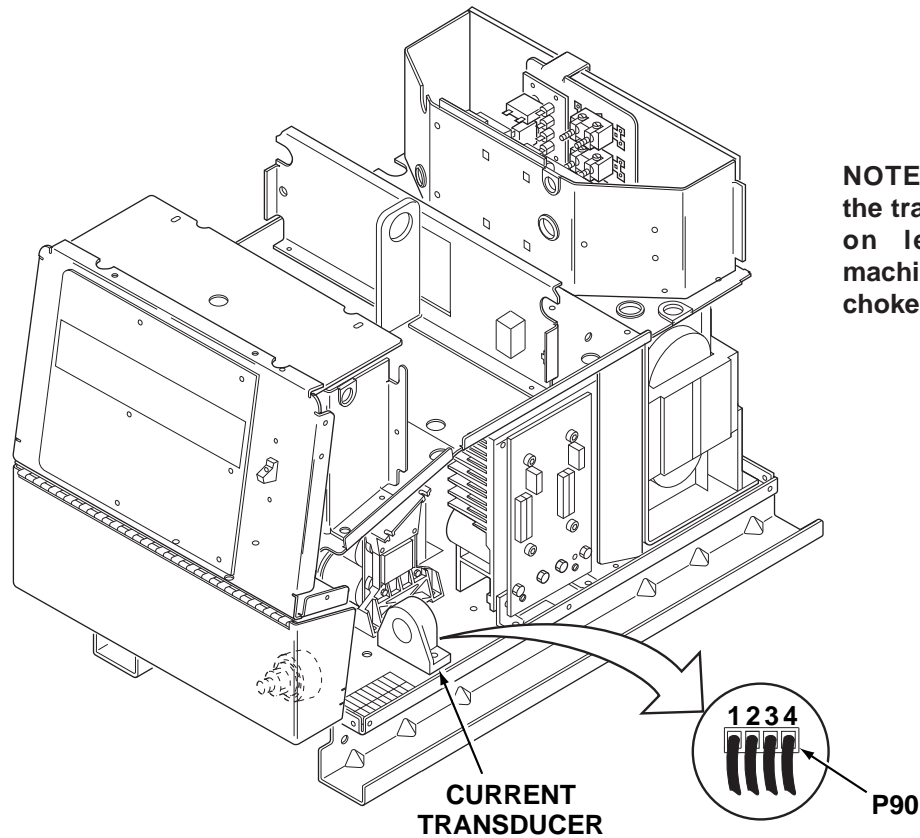
This procedure takes approximately 25 minutes to perform.

MATERIALS NEEDED

3/8 in. nutdriver
Volt-Ohmmeter

CURRENT TRANSDUCER TEST (*continued*)

FIGURE F.11 — CURRENT TRANSDUCER TEST.



NOTE: On later codes the transducer is located on left side of the machine near the output choke.

TEST PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8 in. nutdriver remove the right side case cover.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the current transducer at the lower right front of the machine.
5. Apply the correct input power to the Power Wave 455.
6. Locate plug P90 at the current transducer. Do not remove the plug. Refer to Figure F.11.
7. Check for the correct DC supply voltages to the current transducer at plug P90.
 - A. Pin 1 (lead 212+) to pin 4 (lead 216-) should read +15 VDC.
 - B. Pin 2 (lead 213-) to pin 4 (lead 216+) should read -15 VDC.
8. If either of the supply voltages are low or missing, check the associated leads between the current transducer and the control board. If the leads are OK and the DC supply voltages are not present, the control board may be faulty.

CURRENT TRANSDUCER TEST *(continued)*

TABLE F.5 — CURRENT FEEDBACK AT VARIOUS OUTPUT LOADS.

OUTPUT LOAD CURRENT	EXPECTED TRANSDUCER FEEDBACK VOLTAGE
500	4.0
450	3.6
400	3.2
350	2.8
300	2.4
250	2.0
200	1.6
150	1.2
100	0.8

9. Check the feedback voltage from the current transducer. With the Power Wave system in a constant current mode and the machine loaded to 250 amps, the current feedback voltage can be read at plug P90.
 - A. Pin 3 (lead 211) to pin 4 (lead 216) should read 2.0 VDC (machine loaded to 250 amps).
10. If for any reason the machine cannot be loaded to 250 amps, Table F.5 shows what feedback voltage is produced at various current loads.
11. If the correct supply voltages are applied to the current transducer, and with the machine loaded, the feedback voltage is missing or not correct, the current transducer may be faulty. Also make certain that lead #211 has continuity (zero ohms) between the current transducer and the control board. See wiring diagram.
12. Install the right side case cover using the 3/8 in. nutdriver.

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



DRIVE MOTOR TEST

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

TEST DESCRIPTION

This test will help determine if the wire drive motor is receiving the correct voltage, and if it is capable of running properly.

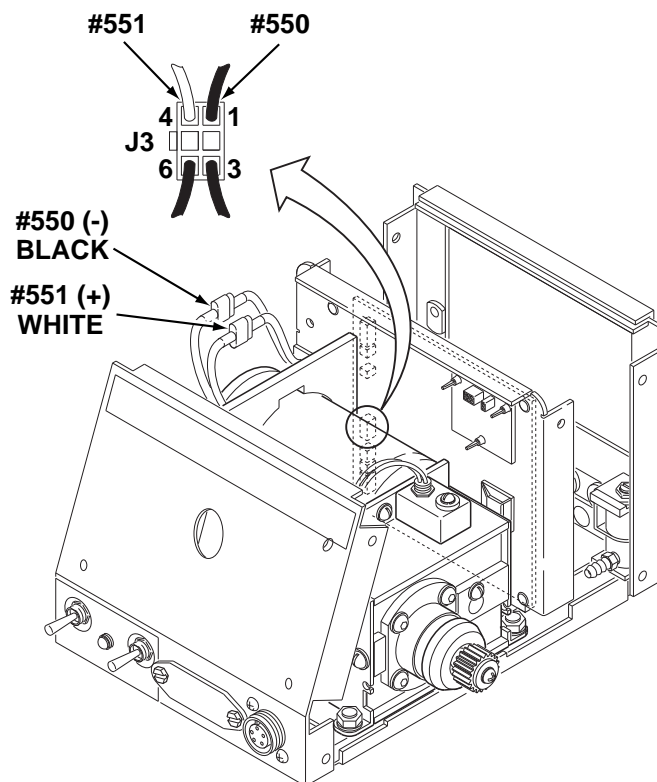
This procedure takes approximately 12 minutes to perform.

MATERIALS NEEDED

3/8 in. nutdriver
Volt-Ohmmeter

DRIVE MOTOR TEST (continued)

FIGURE F.12 — DRIVE MOTOR TEST.



PROCEDURE

1. Remove input power to wire feed unit.
2. Using the 3/8 in. nutdriver, remove the cover from the wire feeder.
3. Locate the two quick connectors in the two motor armature leads. Refer to Figure F.12. Do NOT disconnect the leads.
4. Apply the correct input power (from the Power Wave 455 control cable) to the wire feeder. Activate the gun trigger and with the motor running check at the quick connectors [#551 White (+) to #550 Black (-)] for approximately 1 VDC to 32 VDC dependent upon motor speed. The motor speed should vary with changes in motor armature voltage.
5. If the correct voltages are NOT present at the motor leads, check the associated leads between the motor and plug J3 on the control board. If the leads are OK, the control board may be faulty.
6. If the correct voltages are present at the motor armature leads and the motor does not run and vary speed with changes in armature voltage, the motor or gear box may be faulty. See ***Gear Box and Drive Motor Removal and Replacement***.
7. Install the wire feeder cover using the 3/8 in. nutdriver.

TACH FEEDBACK TEST

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

TEST DESCRIPTION

This test will determine if the tach unit is receiving the correct supply voltage from the control board, and also if the tach unit is sending feedback information to the control board.

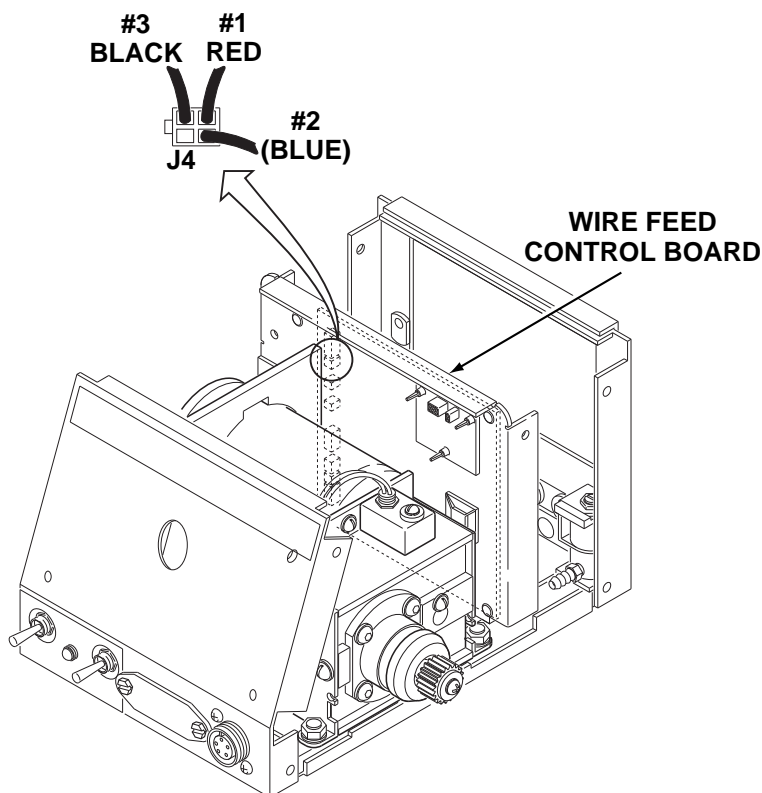
This procedure takes approximately 7 minutes to perform.

MATERIALS NEEDED

3/8 in. nutdriver
Volt-Ohmmeter

TACH FEEDBACK TEST (continued)

FIGURE F.13 — TACH FEEDBACK TEST.



TEST PROCEDURE

1. Remove input power from the wire feeder unit.
2. Using the 3/8 in. nutdriver, remove the cover from the wire feeder.
3. Locate plug J4 on the control board. Refer to Figure F.13. Do NOT remove the plug from the control board.
4. Apply the correct input power (from the Power Wave 455 control cable) to the wire feeder unit and check for approximately 12 VDC from pin #1 (red wire) positive to pin #3 (black wire) negative. This is the supply voltage from the control board to the tach feedback unit. If the 12 VDC is missing or not correct, the wire feeder control board may be faulty. Also check for loose or faulty wires and connections.
5. With the gun trigger activated and the motor running, check the feedback voltage at plug J4 pin #2 (blue wire) positive to pin #3 (black wire) negative. Normal feedback voltage is approximately 5 VDC. If the correct supply voltage is present and the feedback voltage is missing, the tach unit may be faulty. With the motor NOT running, the feedback voltage may be either 0 or 10 VDC depending upon where the motor stopped.
6. Remove input power from the wire feeder unit.
7. Install the wire feeder cover with the 3/8 in. nutdriver.

VOLTAGE SENSE PC BOARD TEST

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

TEST DESCRIPTION

This test will help determine if the voltage sensing board is receiving the correct activation signal from the control board and also if the voltage sensing board is processing arc voltage sensing information.

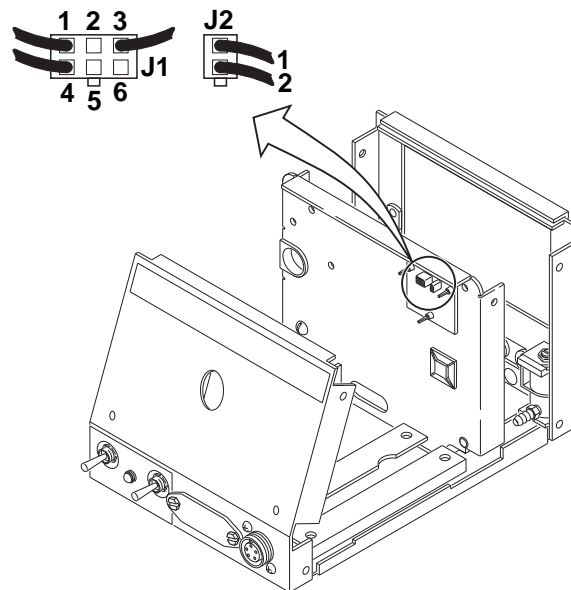
This procedure takes approximately 13 minutes to perform.

MATERIALS NEEDED

3/8 in. nutdriver
Volt-Ohmmeter

VOLTAGE SENSE PC BOARD TEST (continued)

FIGURE F.14 — VOLTAGE SENSING BOARD TEST.



NOTE: Inspect the molex plug connector pins on the Voltage Sense Board. If any of them are gold plated the P.C. board should be replaced

TEST PROCEDURE

1. Remove input power from the wire feed unit.
2. Using the 3/8 in. nutdriver, remove the cover from the wire feeder.
3. Locate the voltage sense PC board and plugs J1 and J2. Do not remove the plugs from the voltage sense PC board. Refer to Figure F.14.
4. Apply the correct input power (from the Power Wave 455 control cable) to the wire feeder. With the gun trigger activated, check for approximately 12 VDC at plug J1 pin 1 (+) to pin 4 (-). If the 12 VDC is NOT present, the control board may be faulty. Also check for loose or faulty wires and connections between the control board (plug J6) and plug J1 on the voltage sense PC board.
5. With the gun trigger activated and arc voltage present at the conductor block, check for arc voltage from plug J1 pin 3 (lead 67) to the workpiece. If actual arc voltage is NOT present, check the continuity of lead 67 from the conductor block to plug J1 pin 3 on the voltage sense PC board.
6. If the actual arc voltage IS present at plug J1 pin 3 (lead 67), then check for arc voltage from plug J2 pin 1 (lead 67A) to the workpiece. See wiring diagram.
7. If the 12 VDC IS present in Step #4 and the arc voltage IS present in Step #5 but the arc voltage is NOT present in Step #6 (lead 67A), the voltage sense PC board may be faulty.
8. Remove all input power from the wire feeder unit.
9. Install the wire feeder cover with the 3/8 in. nutdriver.

DUAL ENCODER PC BOARD TEST

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

TEST DESCRIPTION

This test will help determine if the encoder PC board is functioning properly.

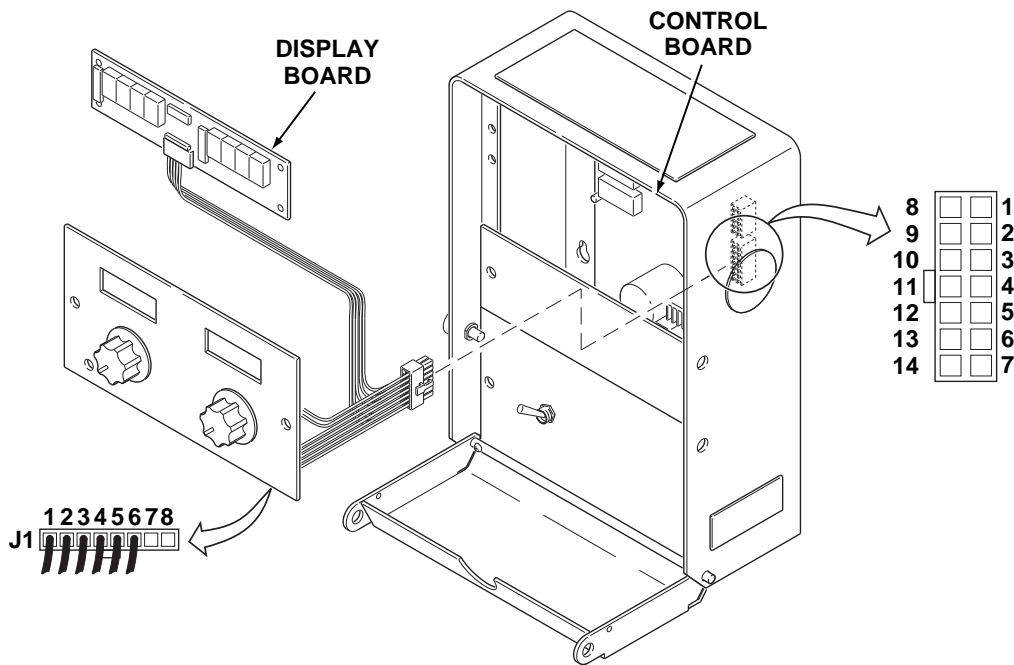
This procedure takes approximately 20 minutes to perform.

MATERIALS NEEDED

Phillips head screwdriver
Volt-Ohmmeter (Analog Recommended)

DUAL ENCODER PC BOARD TEST (continued)

FIGURE F.15 — DUAL ENCODER TEST.



TEST PROCEDURE

1. Remove input power from control box assembly.
2. Using the Phillips head screwdriver, remove the display/encoder assembly panel from the Control Box. Refer to Figure F.15.

NOTE: The panel assembly cannot be removed completely without removing the lead plug from the control board. DO NOT remove the lead plug.

3. Locate the dual encoder PC board and plug J1. Also locate plug J4 on the control board.
4. Apply the correct input power (from the Power Wave 455 control cable) to the Control Box.
5. Check for approximately 12 VDC from plug J1 pin 2+ (lead 512C) to plug J1 pin 1 - (lead 500C). This is the supply voltage from the control board to the encoder board. If this voltage is missing, check the continuity of the leads between the control board (J4) and the encoder board (J1). See wiring diagram. The control board may be faulty.

6. While rotating the wire feed speed (WFS) control check for a “pulsing” 0 to 5 VDC signal at plug J1 pin 5 + (lead 553) to J1 pin 1 - (lead 500C). Also check for a “pulsing” 0 to 5 VDC signal from plug J1 pin 6 + (lead 554) to J1 pin 1 - (lead 500C).
7. While rotating the volts/trim control check for a “pulsing” 0 to 5 VDC signal at plug J1 pin 3 + (lead 555) to J1 pin 1 - (lead 500C). Also check for a “pulsing” 0 to 5 VDC signal at plug J1 pin 4 + (lead 556) to J1 pin 1 - (lead 500C).
8. If the 12 VDC supply in Step 5 is present and any of the 0 to 5 VDC “pulsing”* signals are missing, the encoder PC board may be faulty.

*“Pulsing” means that as the control is rotated the signal will fluctuate from 0 to 5 VDC.

9. Remove input power to the control box assembly.
10. Install the display/encoder assembly panel into the Control Box.

CONTROL CABLE CONTINUITY TEST

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

TEST DESCRIPTION

This test will help determine if the control cable is functional.

This procedure takes approximately 6 minutes to perform.

MATERIALS NEEDED

Volt-Ohmmeter

CONTROL CABLE CONTINUITY TEST *(continued)*

FIGURE F.16 — CABLE CONTINUITY TEST.

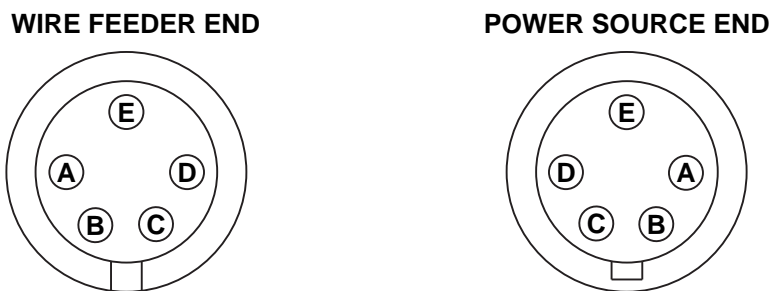


TABLE F.6 CONTROL CABLE PIN AND LEAD DESIGNATIONS.

FIVE PIN AMPHENOL AT POWER SOURCE END	FIVE PIN AMPHENOL AT WIRE FEEDER/CONTROL BOX END
A	A
B	B
C	C
D	D
E	E

TEST PROCEDURE

1. Disconnect the input power to the Power Wave 455 machine.
2. Disconnect the control cable amphe-nols from the power source and the wire feeder.
3. Using the ohmmeter measure the resis-tance of the individual control cable leads from the amphe-nol on the power source end to the amphe-nol on the wire feeder/Control Box end. Refer to Figure F.16 and Table F-6.
4. If any conductor resistance measures greater than 1.0 ohm, the cable is faulty and should be replaced. If the resistance between any two conductors or any conductor and the amphe-nol body is less than 0.5M ohms, the cable is faulty and should be replaced.
5. Connect the control cable amphe-nols to the wire feeder and power source.

COMPONENT REPLACEMENT PROCEDURES**GAS SOLENOID REMOVAL AND REPLACEMENT****⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

DESCRIPTION

This will aid the technician in the removal and replacement of the gas solenoid.

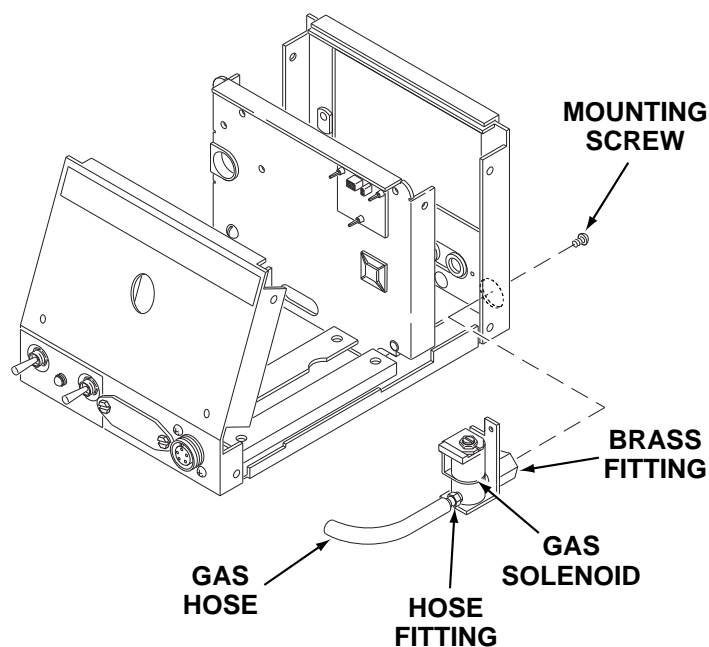
This procedure takes approximately 12 minutes to perform.

MATERIALS NEEDED

3/8 in. nutdriver
Needlenose pliers
5/16 in. nutdriver
3/4 in. wrench

GAS SOLENOID REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.17 — GAS SOLENOID REMOVAL AND REPLACEMENT.



PROCEDURE

1. Remove input power to the wire feeder.
2. Using the 3/8 in. nutdriver, remove the cover from the wire feeder.
3. Locate the gas solenoid on the rear panel of the wire feeder. Refer to Figure F.17.
4. Using the 3/4 in. wrench, remove the external brass fitting.
5. Carefully remove the two leads from the solenoid.
6. Remove the gas hose from the solenoid.
7. Using the 5/16 in. nutdriver, remove the two screws mounting the solenoid to the rear case panel.
8. Carefully remove the gas solenoid from the wire feeder.

INSTALLATION

1. If a new solenoid is to be installed, it may be necessary to remove the hose fitting from the "old" solenoid and install it into the new solenoid using the 1/2 in. wrench.
2. Place the gas solenoid into the wire feeder and secure it to the rear case panel using the two 5/16 in. mounting screws.
3. Install the gas hose onto the solenoid.
4. Connect the two electrical leads to the gas solenoid.
5. Install the external brass fitting onto the gas solenoid using the 3/4 in. wrench.
6. Install the wire feeder cover with the 3/8 in. nutdriver.

WIRE FEEDER CONTROL BOARD REMOVAL AND REPLACEMENT

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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

DESCRIPTION

This will aid the technician in the removal and replacement of the control board.

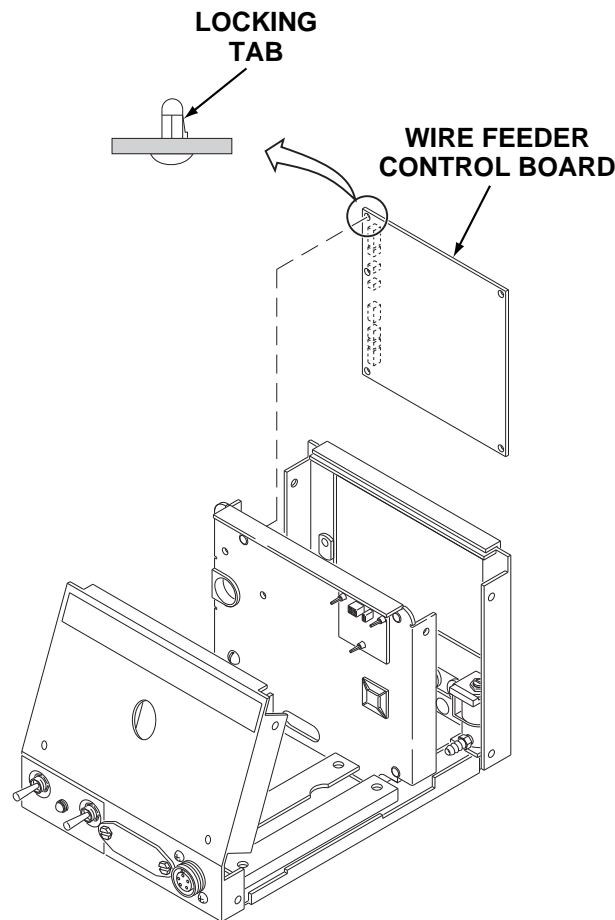
This procedure takes approximately 7 minutes to complete.

MATERIALS NEEDED

3/8 in. nutdriver
Pliers
Anti-static wrist strap

WIRE FEEDER CONTROL BOARD REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.18 — WIRE FEEDER CONTROL BOARD REMOVAL AND REPLACEMENT.

**PROCEDURE**

1. Remove input power to the wire feeder.
2. Using the 3/8 in. nutdriver, remove the cover from the wire feeder.
3. Observe static precautions detailed in ***PC Board Troubleshooting Procedures*** at the beginning of this section.
4. Disconnect the molex type plugs from the control board. Refer to Figure F.18.
5. Disengage the PC board supports by squeezing each support in turn with a pair of pliers and gently pulling out on the board next to the support. When all five supports have been disconnected, carefully remove the control PC board from the wire feeder.

INSTALLATION

NOTE: Press the PC board onto the support by pressing near the mounting hole you are securing. Pressing near the center of the PC board could damage the circuitry within the board.

1. Align the holes on the PC board with the supports attached to the wire feeder and press the PC board until it is held securely in place.
2. Connect the molex type plugs to the control board.
3. Install the wire feeder cover using the 3/8 in. nutdriver.

TACH (HALL EFFECT) ASSEMBLY REMOVAL AND REPLACEMENT

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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

DESCRIPTION

The procedure will aid the technician in the removal and replacement of the tach assembly from the gear box.

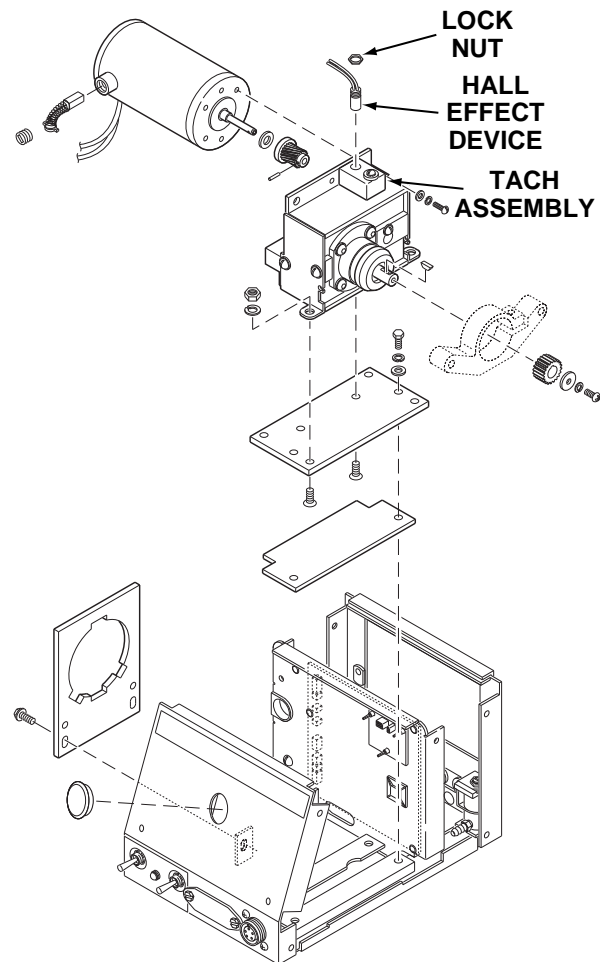
This procedure takes approximately 10 minutes to perform.

MATERIALS NEEDED

3/8 in. nutdriver
9/16 in. wrench

TACH (HALL EFFECT) ASSEMBLY REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.19 — TACH REMOVAL AND REPLACEMENT.

**REMOVAL PROCEDURE**

1. Remove input power to the wire feeder.
2. Using the 3/8 in. nutdriver, remove the case cover.
3. Locate the tach assembly on the top of the gear box. Refer to Figure F.19.
4. Locate and remove plug J4 from the control board.
5. Thread plug J4 and associated leads through the vertical baffle. Cut any necessary cable ties.
6. Using the 9/16 in. wrench, loosen the locking nut on the Hall Effect device.
7. Carefully unscrew the Hall Effect device from the gear box assembly.

REPLACEMENT PROCEDURE

1. Carefully screw the Hall Effect device into the gear box assembly until it gently "bottoms out" on the rotary magnet inside.
2. Unscrew the Hall Effect device 1/2 turn from the rotary magnet. Tighten the locking nut to 8 in/lbs.
3. Thread the J4 leads through the vertical baffle and install cable ties where appropriate.
4. Connect plug J4 into the control board.
5. Install the wire feeder cover using the 3/8 in. nutdriver.

GEAR BOX AND DRIVE MOTOR REMOVAL AND REPLACEMENT

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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

DESCRIPTION

This test will aid the technician in the removal and replacement of the wire feed drive motor.

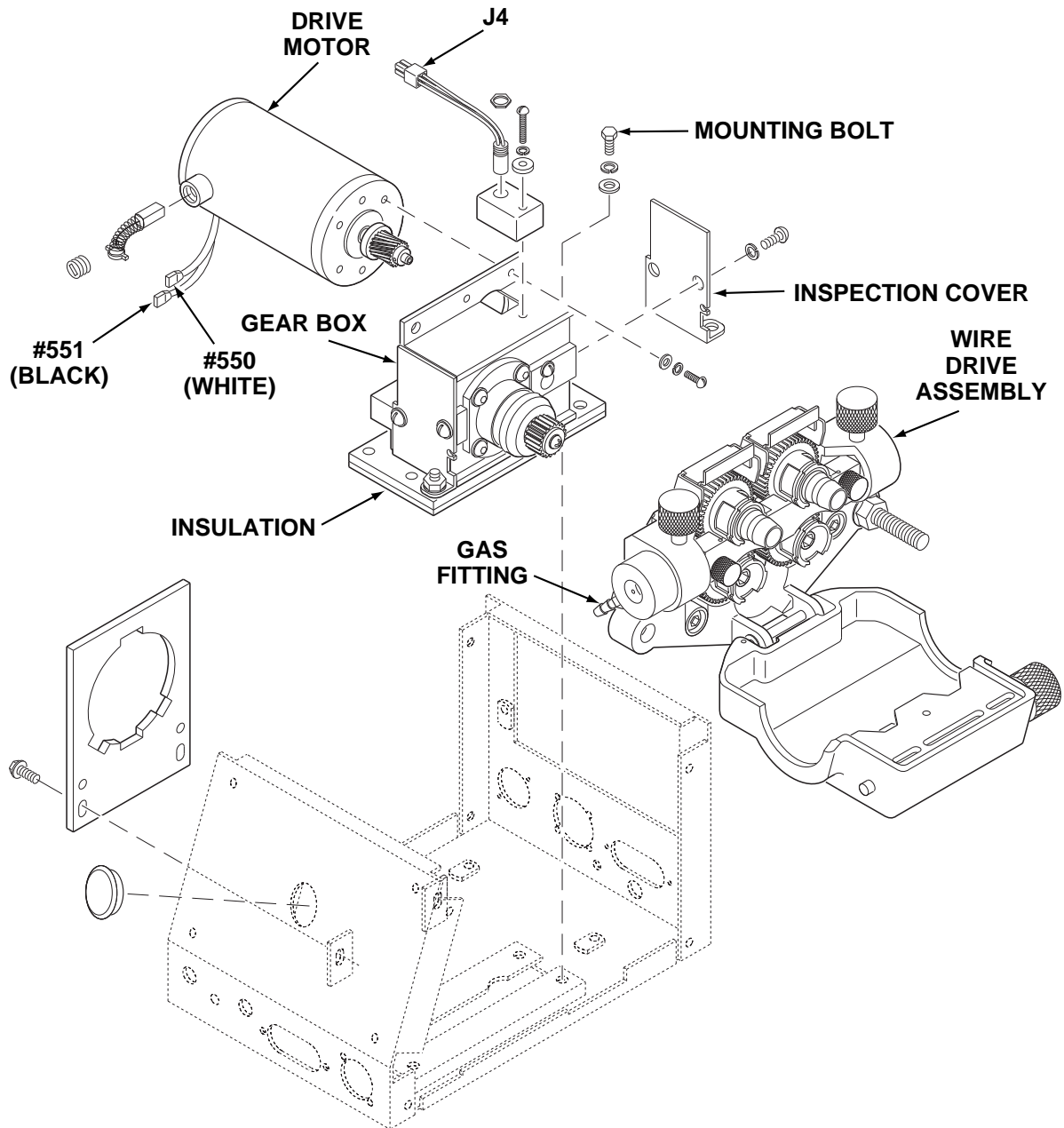
Removal and installation of the gearbox and drive motor assembly takes approximately 20 minutes to perform. Removal and installation of the drive motor takes approximately 10 minutes. Removal and installation of the gearbox takes approximately 4 minutes to complete.

MATERIALS NEEDED

3/8 in. nutdriver
Slot head screwdriver
Phillips head screwdriver
7/16 in. socket wrench with extension
Needlenose pliers
5/16 in. wrench
3/16 in. Allen wrench

GEAR BOX AND DRIVE MOTOR REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.20 — GEAR BOX AND DRIVE MOTOR REMOVAL AND REPLACEMENT.

**PROCEDURE**

1. Remove the input power to the wire drive unit.
2. Using the 3/8 in. nutdriver, remove the case cover.
3. Locate and remove plug J4 from the control board. Refer to Figure F.20.
4. Thread plug J4 and associated leads through the vertical baffle. Cut any necessary cable ties.
5. Locate and disconnect the motor leads (#551 and #550) at the quick connects. Cut any necessary cable ties.
6. Using the Phillips head screwdriver, remove the #67 lead from the conductor block.

GEAR BOX AND DRIVE MOTOR REMOVAL AND REPLACEMENT *(continued)*

7. Using the needlenose pliers, disconnect the gas hose from the brass gun connector block.
8. Using the 7/16 in. socket wrench, remove the four mounting bolts, lock washers, and flat washers from the glastic base insulator.
9. Carefully slide and remove the entire gear box, drive motor, and wire drive assembly from the wire feeder case. Note insulation placement for reassembly.
2. Tighten the two Allen type screws at the bottom of the wire drive unit using the 3/16 in. Allen wrench.
3. Attach lead #67 to the conductor block.
4. Carefully slide the drive motor into the gear box assembly. Be sure to position the motor leads so that they can be properly connected.
5. Install the slot head screws that mount the "top" of the drive motor to the gear box.

TO REMOVE THE DRIVE MOTOR FROM THE GEAR BOX:

10. Using the slot head screwdriver, remove the gear box inspection cover nearest to the drive motor.
11. Using the 5/16 in. wrench, remove the motor mounting screw located inside the gear box.
12. Using the slot head screwdriver, remove the two screws mounting the "top" of the motor to the gear box.
13. Carefully remove the motor from the gear box assembly. Note motor lead placement for reassembly.
6. Install the mounting screw located inside the gearbox using the 5/16 in. wrench.
7. Install the gear box inspection cover and secure it with slot head screws.
8. Properly place insulation in the bottom of the wire feeder case.
9. Place the entire gear box, drive motor and wire drive assembly into the wire feeder case, aligning the holes in the glastic base insulator with the mounting holes in the case.
10. Mount the gear box and drive motor assembly to the wire feeder case using the four mounting bolts, lock washers and flat washers.

TO REMOVE THE WIRE DRIVE ASSEMBLY FROM THE GEAR BOX:

14. Using the 3/16 in. Allen wrench, loosen the two Allen type screws at the bottom of the wire drive unit.
15. Remove lead #67 from the conductor block.
16. Carefully slide and remove the wire drive assembly from the gear box assembly.
11. Connect the gas hose to the brass gun connector block.
12. Connect drive motor leads #550 and #551 to their quick disconnects.
13. Thread plug J4 and associated leads through the vertical baffle and attach it to the control board. Install cable ties as necessary.
14. Install the wire feeder cover using the 3/8 in. nutdriver.

REPLACEMENT PROCEDURES

1. Carefully slide the wire drive assembly and gear box together.

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SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT

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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

DESCRIPTION

This procedure will aid the technician in the removal and replacement of the switch board(s) and/or filter capacitor(s).

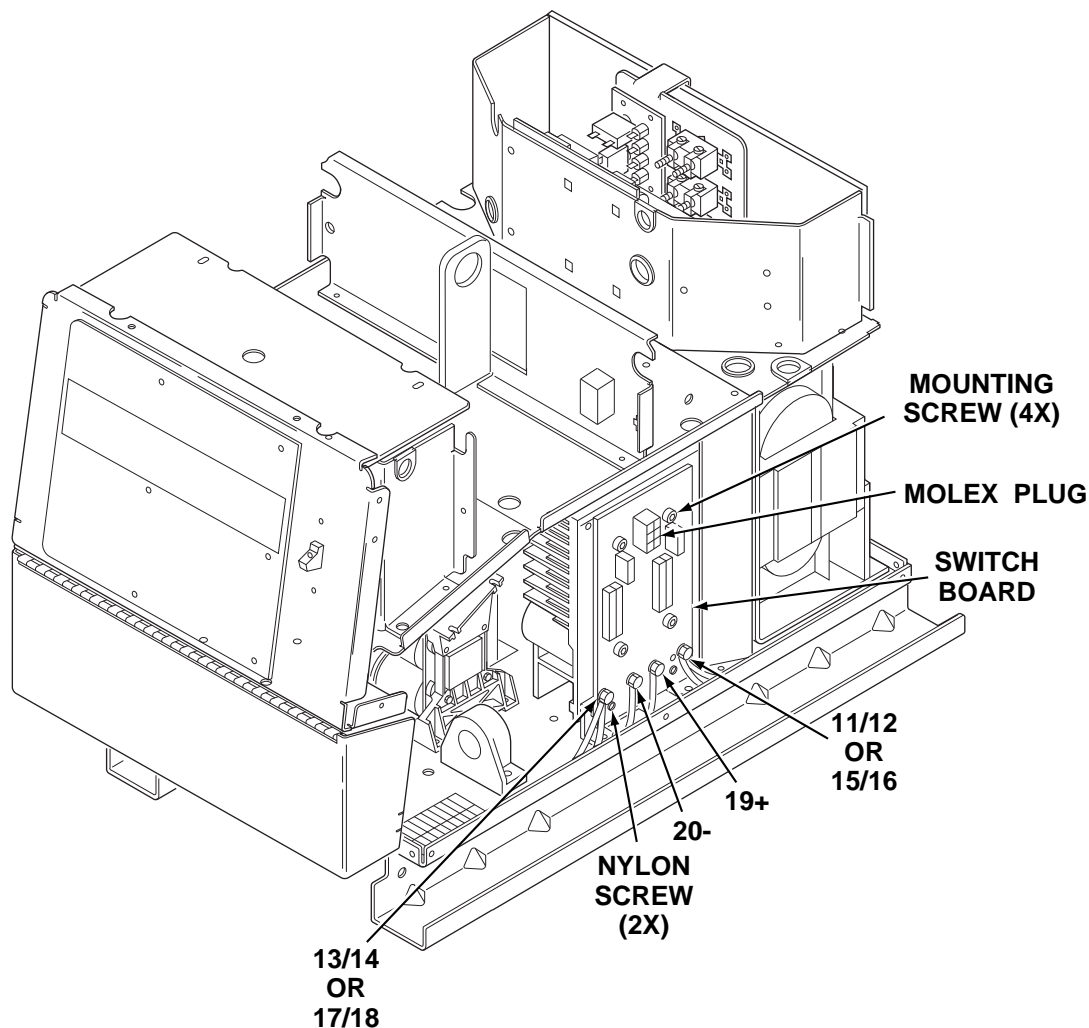
This procedure takes approximately 25 minutes to perform.

MATERIALS NEEDED

3/8 in. nutdriver
7/16 in. wrench
3/16 in. Allen wrench
Slot head screwdriver

SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.21 — SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT.



REMOVAL PROCEDURE

NOTE: Observe all static electricity precautions.

1. Remove input power to the Power Wave 455.
2. Using the 3/8 in. nutdriver, remove the case top and sides.
3. Perform the **Capacitor Discharge Procedure**.
4. Remove the molex plug from the top of the switch board. Refer to Figure F.21.
5. Using the 7/16 in. wrench, remove leads 11/12 or 15/16 from the switch board.
6. Using the 7/16 in. wrench, remove leads 13/14 or 17/18 from the switch board.
7. Using the 7/16 in. wrench, remove leads 19+ and 20- from the switch board capacitor connection bolts.

SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT *(continued)*

8. With the slot head screwdriver, remove the two nylon mounting screws at the bottom of the switch board. Note placement of the shake-proof washers and fiber spacers.
9. Using the 3/16 in. Allen wrench, carefully remove the four cap screws that mount the switch board to the heatsink.
10. Carefully remove the switch board from the heatsink.
11. If the filter capacitor is to be removed, carefully slide it out of the mounting bracket.
5. Mount the new switch board and tighten the four cap head screws in the following manner.
 - Tighten all until snug.
 - Tighten all from 24 to 28 in/lbs.
 - Tighten all from 40 to 48 in/lbs.
6. Make sure the capacitor is positioned correctly. Connect leads 19+ and 20- to the correct terminals. Tighten to 55 in/lbs.
7. Position and mount the two nylon screws, fiber spacers, and washers. Torque from 4 to 8 in/lbs.

REPLACEMENT PROCEDURE

1. If the filter capacitor is to be replaced, carefully slide the new capacitor into the mounting bracket. Position the capacitor so the correct polarity terminal is lined up with the correct hole on the switch board.
2. All heatsink and IGBT mounting surfaces must be clean.
3. Apply a thin coat of thermal compound (Penetrox A13) 0.005 in. to 0.010 in. to the mating surfaces. Do not apply around mounting holes.
4. Apply a thin coat of Penetrox A13 to the capacitor terminals. Be careful not to apply compound to screw threads or threaded area of terminals.
8. Connect leads 11/12 or 15/16 to the correct terminal.
9. Connect leads 13/14 or 17/18 to the correct terminal.
10. Connect the molex plug to the top of the switch board.
11. Install the case top and sides using the 3/8 in. nutdriver.

POWER WAVE 455 / PF-10 METER ACCURACY CHECK

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

DESCRIPTION

This procedure will aid the technician in checking and calibrating meter displays.

This procedure takes approximately 30 minutes to perform.

MATERIAL NEEDED

DC ammeter and meter grade shunt, +/- 1% accuracy
 DC voltmeter, +/- 1% accuracy
 Resistive load bank
 DSP, STT or other PF-10 option panel with mode light and set switch
 PW-455 and PF-10 Operator's manual for reference

METER ACCURACY CHECK

1. With power off, locate DIP switch bank S2 on the PF-10 Control PC board. (There are 8 switches, number 1 on the left, through number 8).
2. Set switch 8 to the up position.
3. Connect a resistive load between the output block of the PF-10 and the work terminal of the PW-455 machine.
4. Turn machine on.
5. Using the Set Control on the PF-10, set the display to mode 200. Turn the right knob of the PF-10 to energize the output.
6. Adjust the resistive load and the left knob of the PF-10 to achieve 300A at 32v. The left knob will adjust the output current. Amps and volts will be displayed on the PF-10 meters.
7. After the load condition is set, accuracy is measured by comparing the meter of the PF-10 to the master meter. At 300A, amperage must agree within +/-10A. At 32V, voltage must agree within +/- 1V.

8. At conclusion of test, turn the power off and set the DIP switch to its original position.

PROCEDURE TO REPAIR IF METERS ARE OUT OF RANGE

If the measured **voltage** is not within the acceptable range, the Control PC board must be replaced. The Control PC board can not be calibrated.

If the measured **current** is not within the acceptable current range, adjust trimmer R126 on the Control PC board. R126 is located on the upper left corner of the Control PC board. If the display is still in error, either the Control PC board or LEM (Current Transducer) may be faulty.

Perform the **Current Transducer Test**.

CONTROL OR POWER BOARD REMOVAL AND REPLACEMENT**⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

DESCRIPTION

This procedure will aid the technician in the removal and replacement of either the power board or the control board.

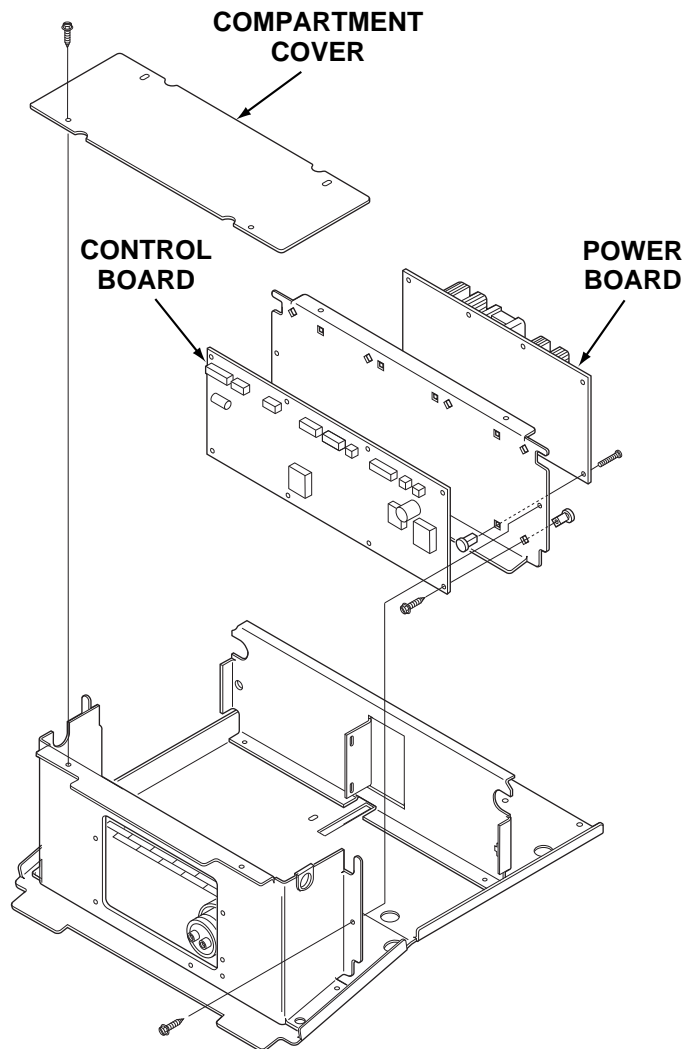
This procedure takes approximately 15 minutes to perform.

MATERIAL NEEDED

3/8 in. nutdriver
Phillips head screwdriver
Anti-static wrist strap

CONTROL OR POWER BOARD REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.22 — CONTROL OR POWER BOARD REMOVAL AND REPLACEMENT.

**REMOVAL PROCEDURE**

1. Remove input power to the Power Wave 455.
2. Using the 3/8 in. nutdriver, remove the case top and sides.
3. Perform the **Capacitor Discharge Procedure**.
4. Observe all static electricity precautions.
5. Using the 3/8 in. nutdriver, remove the PC board compartment cover. Refer to Figure F.22.
6. Remove the eight molex plugs from the control board.
7. Remove the two molex plugs and white and black wires with quick connects from the power PC board.
8. Using the 3/8 in. nutdriver, remove the two screws holding the rear of the Control Box in place.
9. Clear the lead harnesses from the left and right sides and carefully remove the power and control PC board assembly.
10. Using the Phillips head screwdriver, remove either the power or the control board from the PC board assembly.

CONTROL OR POWER BOARD REMOVAL AND REPLACEMENT *(continued)***INSTALLATION PROCEDURE**

1. Install either the power or control board to the PC board assembly and secure it in place using the Phillips head mounting screws.
2. Carefully slide the power and control PC board assembly into place, making sure to clear the lead harnesses on the right and left side of the PC board compartment.
3. Secure the rear of the control box in place using two screws and the 3/8 in. nutdriver.
4. Connect two molex plugs and black and white wires with quick disconnects to the power PC board.
5. Connect the eight molex plugs to the control PC board.
6. Install the PC board compartment cover using the 3/8 in. nutdriver.
7. Install the case top and sides using the 3/8 in. nutdriver.

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AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT PROCEDURE

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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

DESCRIPTION

This procedure will aid the technician in the removal and replacement of auxiliary transformer No. 1.

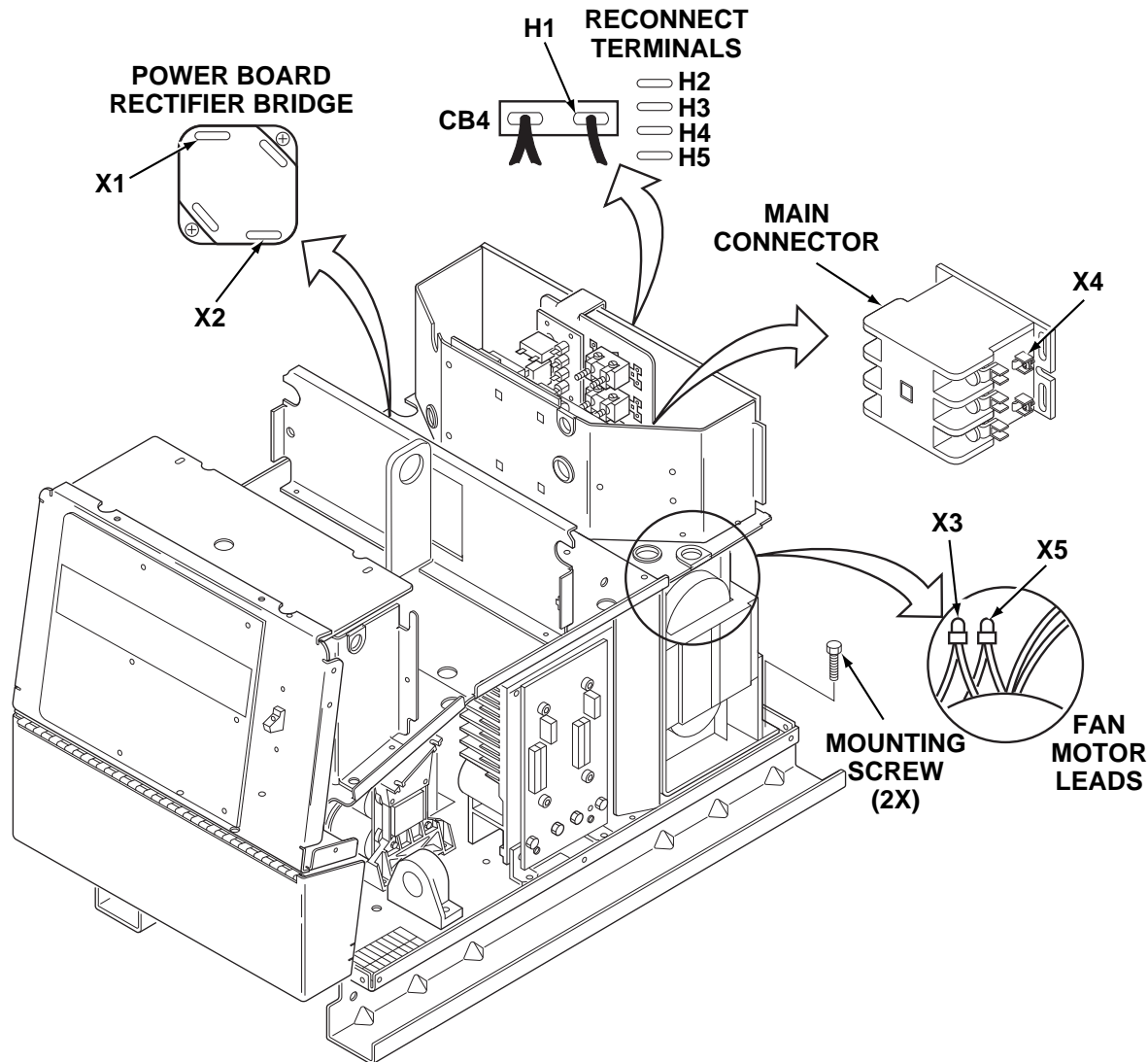
This procedure takes approximately 25 minutes to perform.

MATERIALS NEEDED

3/8 in. nutdriver
Wire cutters
Wire splicer or soldering equipment

AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

FIGURE F.23 — AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT PROCEDURE.



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8 in. nutdriver, remove the case top, sides and input access panel.
3. Perform the **Capacitor Discharge Procedure**.
4. Using the 3/8 in. nutdriver, remove the case back.
5. Remove leads X1 and X2 from the power board rectifier bridge. Refer to Figure F.23.
6. Cut X3 and X5 from the fan motor leads. Leave enough lead length to splice in the new transformer leads.
7. Remove lead X4 from the main contactor coil terminal.

AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

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| <ol style="list-style-type: none"> 8. Cut the X3 lead that is connected to the input board. Leave enough lead length to splice in the new transformer lead. 9. Locate, label, and remove primary lead H1 from circuit breaker CB4. 10. Label and remove primary leads H2, H3, H4, and H5 from the reconnect terminals on the reconnect panel. Note lead placement for reassembly. 11. Using the 3/8 in. nutdriver, remove the two mounting screws that hold the transformer to the fan baffle and the machine base. 12. Cut any necessary cable ties and clear the leads. 13. Carefully remove the transformer from the Power Wave 455. | <ol style="list-style-type: none"> and the machine base using the 3/8 in. nutdriver. 3. Install the primary leads H2, H3, H4, and H5 to the reconnect terminals on the reconnect panel. 4. Connect primary lead H1 to circuit breaker CB4. 5. Splice the new transformer lead with the X3 lead connected to the input board. 6. Connect lead X4 to the main contactor coil terminal. 7. Splice the new transformer fan leads to the fan motor leads X3 and X5. 8. Connect leads X1 and X2 to the power board rectifier bridge. 9. Reposition any wire leads and install wire ties as necessary. 10. Install the case back using the 3/8 in. nutdriver. 11. Install the case top, sides, and input access panel using the 3/8 in. nutdriver. |
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REPLACEMENT PROCEDURE

- | | |
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| <ol style="list-style-type: none"> 1. Carefully place the transformer into the Power Wave 455. 2. Install the two mounting screws that hold the transformer to the fan baffle | <ol style="list-style-type: none"> and the machine base using the 3/8 in. nutdriver. 3. Install the primary leads H2, H3, H4, and H5 to the reconnect terminals on the reconnect panel. 4. Connect primary lead H1 to circuit breaker CB4. 5. Splice the new transformer lead with the X3 lead connected to the input board. 6. Connect lead X4 to the main contactor coil terminal. 7. Splice the new transformer fan leads to the fan motor leads X3 and X5. 8. Connect leads X1 and X2 to the power board rectifier bridge. 9. Reposition any wire leads and install wire ties as necessary. 10. Install the case back using the 3/8 in. nutdriver. 11. Install the case top, sides, and input access panel using the 3/8 in. nutdriver. |
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MAIN INPUT CONTACTOR REMOVAL AND REPLACEMENT

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

DESCRIPTION

This procedure will aid the technician in the removal and replacement of the input contactor.

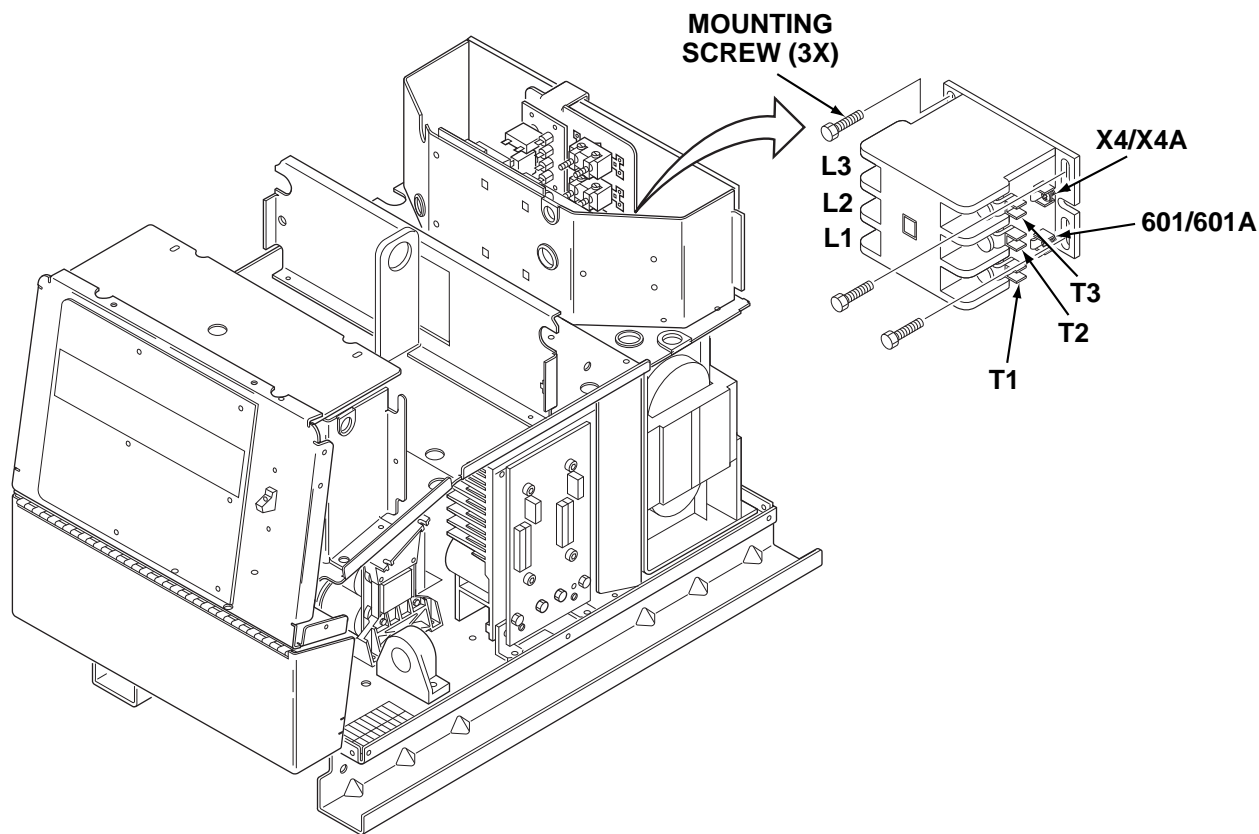
This procedure takes approximately 15 minutes to perform.

MATERIALS NEEDED

3/8 in. nutdriver
5/16 in. nutdriver
Slot head screwdriver

MAIN INPUT CONTACTOR REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.24 — MAIN INPUT CONTACTOR REMOVAL AND REPLACEMENT.



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8 in. nutdriver, remove the case top, sides, and input access panel.
3. Perform the **Capacitor Discharge Procedure**.
4. Using the slot head screwdriver, remove the three input lines (L1, L2, and L3) from the main contactor. Refer to Figure F.24.
5. Using the slot head screwdriver, remove the three heavy leads (T1, T2, and T3) from the input contactor. Also remove the small T2 lead. Label leads for reassembly.
6. Remove the two small leads T1 and T3 from the quick disconnect terminals.
7. Remove leads 601, 601A, and X4, X4A from the contactor coil terminals.
8. Remove leads L1A and L3A from the contactor line side quick-disconnect terminals.
9. Using the 5/16 in. nutdriver, remove the three mounting screws holding the input contactor to the metal housing bracket.
10. Carefully remove the input contactor.

MAIN INPUT CONTACTOR REMOVAL AND REPLACEMENT *(continued)***REPLACEMENT PROCEDURE**

1. Carefully place the input contactor into position.
2. Install the three mounting screws that hold the input contactor to the metal housing bracket using the 5/16 in. nutdriver.
3. Connect leads L1A and L3A to the contactor line side quick-disconnect terminals.
4. Install leads 601, 601A, and X4, X4A to the contactor coil terminals.
5. Install the two small leads T1 and T3 to the quick-disconnect terminals.
6. Install the three input lines (L1, L2 and L3) to the main contactor using the slot head screwdriver.
7. Install the three heavy leads (T1, T2 and T3) from the input contactor using the slot head screwdriver.
8. Install the small T2 lead to the input contactor.
9. Install the case top, sides, and input access panel using the 3/8 in. nutdriver.

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INPUT RECTIFIER REMOVAL AND REPLACEMENT

⚠ 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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

DESCRIPTION

This procedure will aid the technician in the removal and replacement of the input rectifier module.

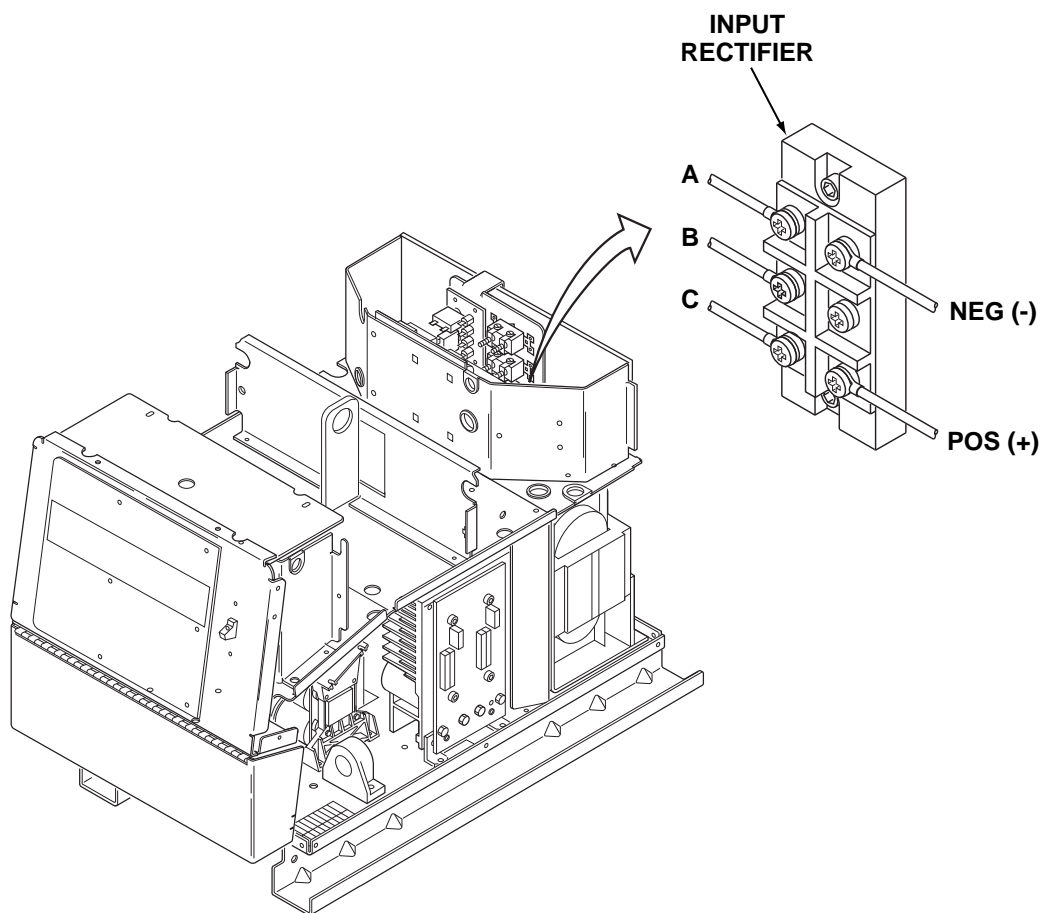
This procedure takes approximately 15 minutes to perform.

MATERIALS NEEDED

3/8 in. nutdriver
3/16 in. Allen wrench
Phillips head screwdriver

INPUT RECTIFIER REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.25 — INPUT RECTIFIER REMOVAL AND REPLACEMENT.

**REMOVAL PROCEDURE**

1. Remove input power to the Power Wave 455.
2. Using the 3/8 in. nutdriver, remove the case top, sides, and input access panel.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate and remove the RTV sealant from the input rectifier connection terminals. Refer to Figure F.25.
5. Label leads and using the Phillips head screwdriver carefully remove the five leads from the input rectifier terminals. Note placement for reassembly.
6. Using the 3/16 in. Allen wrench, remove the two mounting screws and washers from the rectifier module.

7. Carefully remove the module.

REPLACEMENT PROCEDURE

1. Clean heatsink surfaces.
2. Apply an even coating of joint compound (Penetrox A-13) to both the heatsink and module mounting surfaces. The joint compound should be 0.002 in/0.005 in. thick per surface.
3. Mount the module to the heat sink and evenly torque the mounting screws (with washers) to 44 in/lbs.
4. Assembly the leads to the correct module terminals and torque to 26 in/lbs.
5. Apply RTV sealant to the rectifier connection terminals.
6. Install the case top, sides, and input access panel using the 3/8 in. nutdriver.

OUTPUT RECTIFIER AND MODULE REMOVAL AND REPLACEMENT

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 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 technical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353(WELD).

DESCRIPTION

This procedure will aid the technician in the removal and replacement of the output rectifier assembly and individual rectifier module replacement.

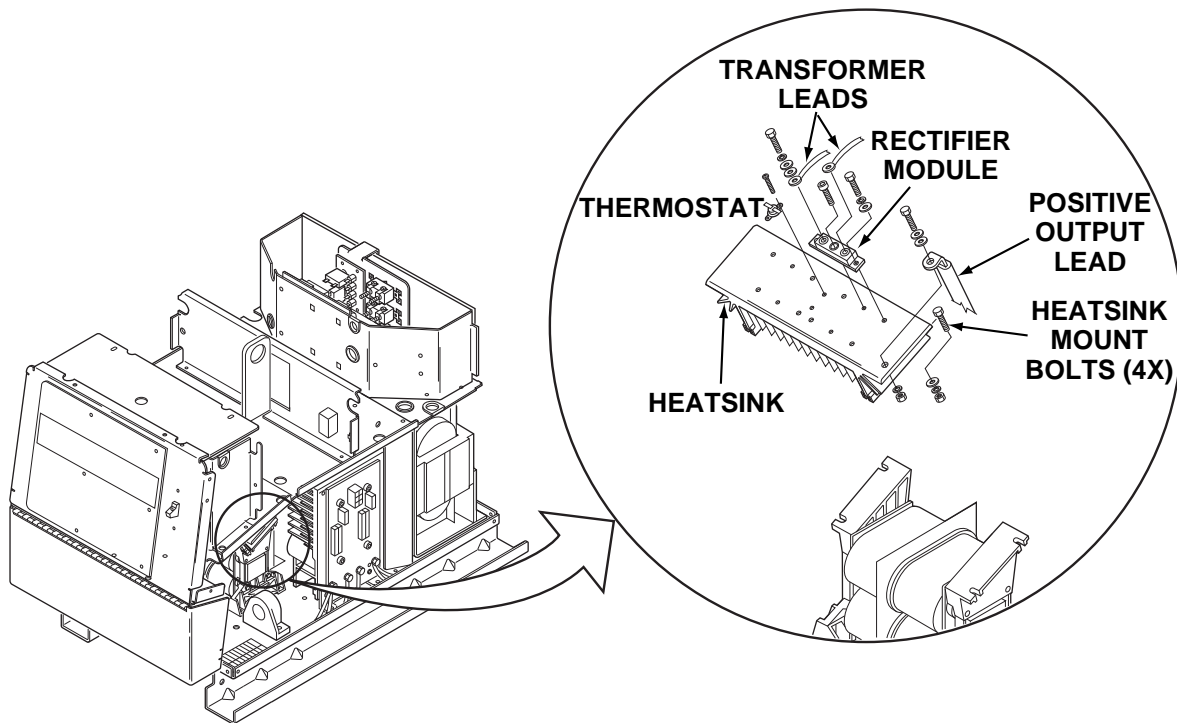
This procedure takes approximately 35 minutes to remove and replace the output rectifier and 5 minutes to remove and replace the rectifier module.

MATERIALS NEEDED

3/8 in. nutdriver
7/16 in. wrench
9/16 in. wrench
9/64 in. Allen wrench

OUTPUT RECTIFIER AND MODULE REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.26 — OUTPUT RECTIFIER AND MODULE REMOVAL AND REPLACEMENT.

**RECTIFIER ASSEMBLY
REMOVAL PROCEDURE**

1. Remove input power to the Power Wave 455.
2. Using the 3/8 in. nutdriver, remove the case top and sides.
3. Perform the **Capacitor Discharge Procedure**.
4. Using the 9/16 in. wrench, remove the positive output lead from the rectifier heatsink. Refer to Figure F.26.
5. Using the 7/16 in. wrench, remove the eight transformer leads from the rectifier modules. Label the leads and take note of lead placement for reassembly. Note that each screw has two flat washers and one lock washer.
6. Remove leads #220 and #290 from the rectifier thermostat.
7. Using the 7/16 in. wrench, remove the four nuts and associated washers from the heatsink mounting bolts. The heatsink assembly can be removed by carefully sliding the assembly forward and removing the mounting bolts.

OUTPUT RECTIFIER AND MODULE REMOVAL AND REPLACEMENT (*continued*)RECTIFIER MODULE REMOVAL
AND REPLACEMENT
PROCEDURE

1. Using the 9/64 in. Allen wrench, remove the cap screw from the center of the rectifier module that is to be replaced.
2. Using the 7/16 in. wrench, remove the two mounting bolts and associated washers from the rectifier module to be replaced.
3. Remove the faulty module.
4. This module requires special mounting considerations to prevent warping of the base plate. The heatsink surfaces must be clean and flat. Apply a thin, even coating of thermal compound, (Penetrox A13) 0.004 to 0.010 inches thick. Keep the compound away from the area of the mounting holes.
5. Press the new module firmly against the heatsink while aligning the mounting holes. Start all three screws two to three turns by hand.
6. Tighten each of the outer screws to between 5 and 10 in/lbs.
7. Tighten the center screw to between 12 and 18 in/lbs.
8. Tighten each of the outer screws again, this time to between 30 and 40 in/lbs.

RECTIFIER ASSEMBLY
REPLACEMENT PROCEDURE

1. Position the assembly in place with the mounting bolts.
2. Assemble the nuts and associated washers to the mounting bolts.
3. Using the 7/16 in. wrench, tighten the four nuts on the mounting bolts.
4. Replace leads #220 and #290 to the thermostat.
5. Connect the eight transformer leads to the correct rectifier modules. Tighten the screws (with two flat washers and one lock washer) to between 30 and 40 in/lbs. **Do not stress the terminals when making these connections.**
6. Apply a thin coat of Penetrox A13 to the heatsink where the positive output lead attaches.
7. Attach the positive output lead to the heatsink using the 9/16 in. wrench.
8. Install the case top and sides using the 3/8 in. nutdriver.

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FLOWCHART - POWER SOURCE ERROR INTERPRETATION GUIDE

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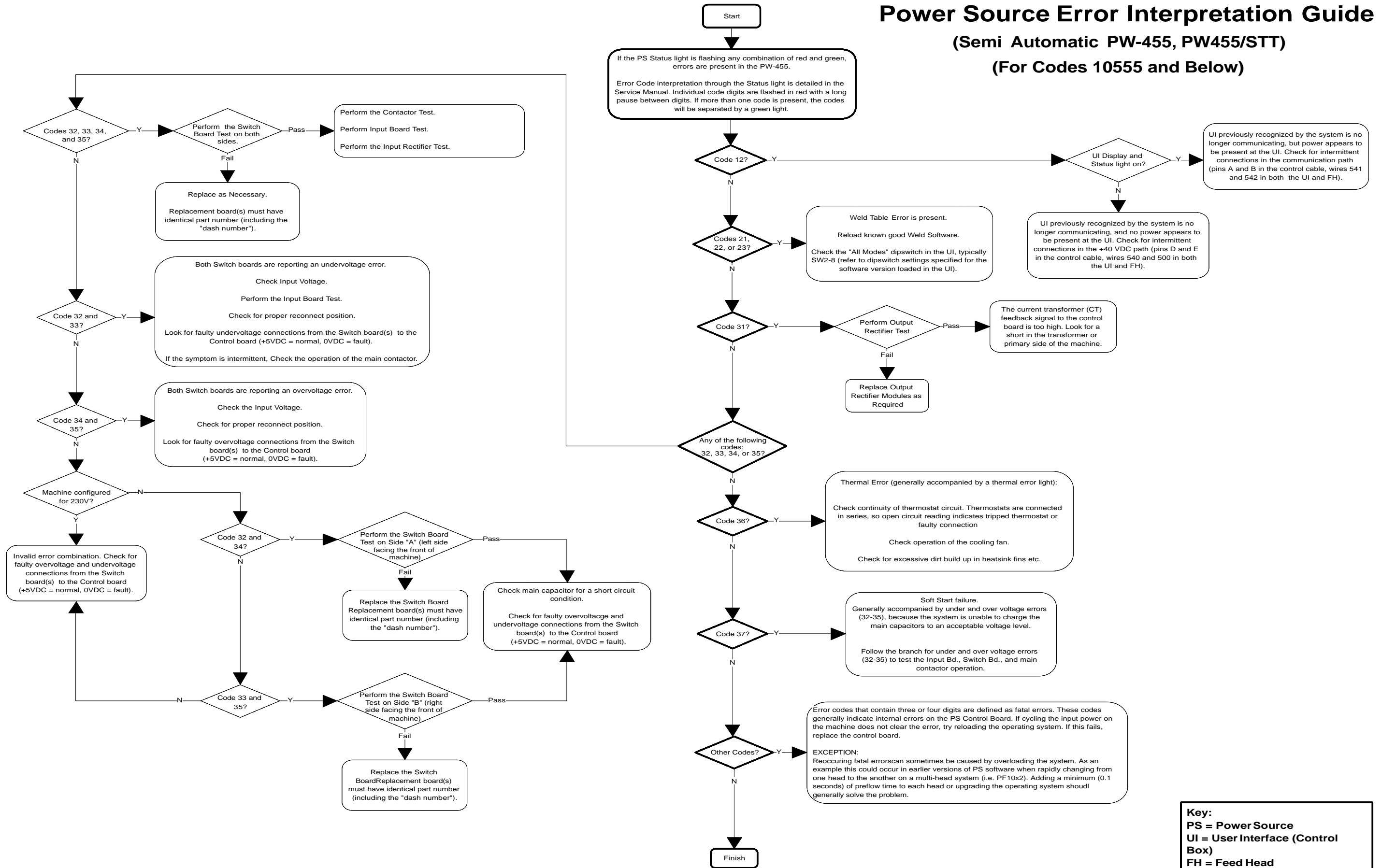
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Power Source Error Interpretation Guide

(Semi Automatic PW-455, PW455/STT)

(For Codes 10555 and Below)



Key:
 PS = Power Source
 UI = User Interface (Control Box)
 FH = Feed Head

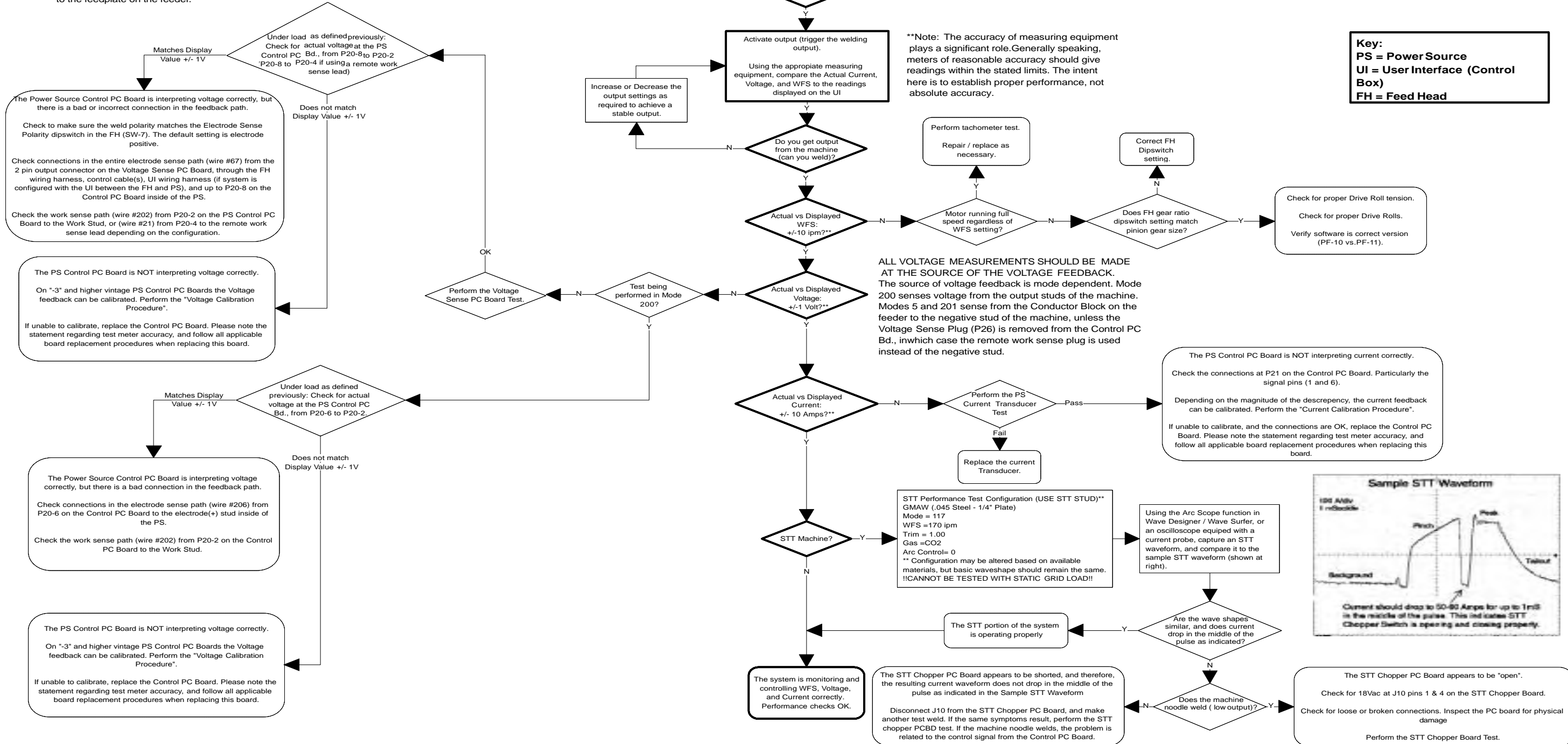
FLOWCHART - PERFORMANCE TROUBLESHOOTING GUIDE

Performance Troubleshooting Guide (Semi Automatic PW-455, PW455/STT) (For Codes 10555 and Below)

A NOTE ON VOLTAGE SENSING:

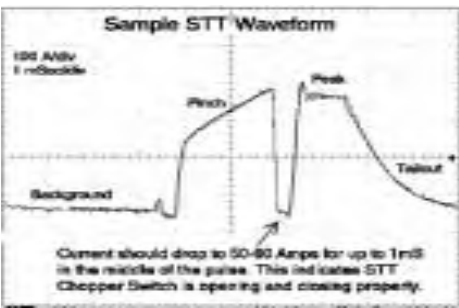
All CV and Pulse modes utilize the electrode sense lead (lead #67) built into the control cable. As with any sense lead it's performance is only as good as the worst connection. For diagnostic purposes, an external sense lead can be used to bypass the entire electrode sense network. This can be accomplished by removing the front cover of the PW-455, and connecting a lead (20 AWG minimum) from pin 5 of the exposed 6 pin UI molex connector (P6), to the feedplate on the feeder.

Alternate CC Configuration: Grid Load (300A / 30V) Mode = 200 Current = 300 Arc Control = 0
Performance Test Configuration (USE STD STUD)** GMAW (.045 Steel - 3/8" Plate) Mode = 5 WFS = 400 ipm Voltage = 28V Gas = 90/10 ArCO2 Arc Control = 0
Alternate CV Configuration: Grid Load (300A / 30V) Mode = 201 Voltage = 30V Arc Control = 0 Note: Mode 201 requires an electrode sense lead (67).



Key: PS = Power Source UI = User Interface (Control Box) FH = Feed Head

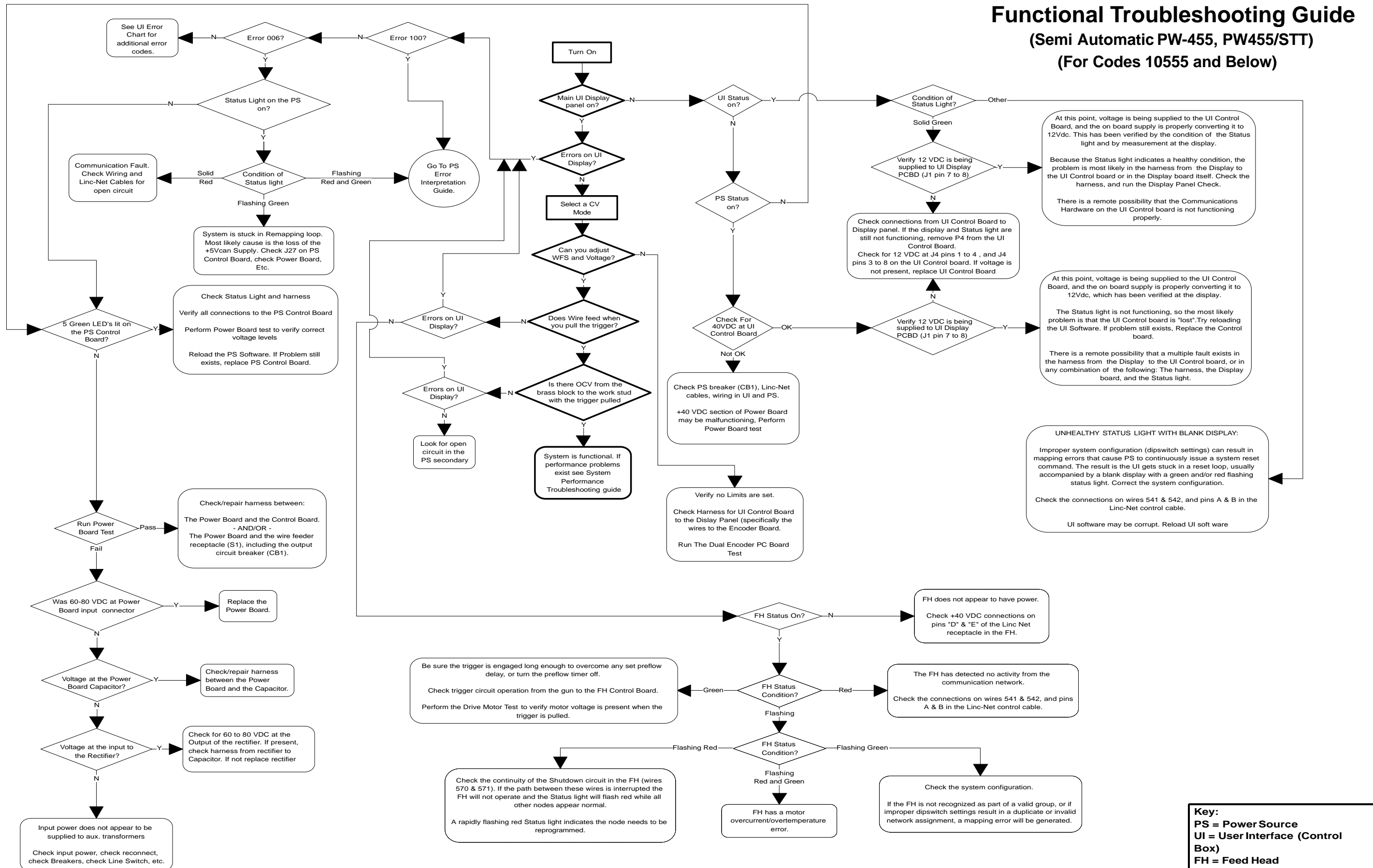
ALL VOLTAGE MEASUREMENTS SHOULD BE MADE AT THE SOURCE OF THE VOLTAGE FEEDBACK. The source of voltage feedback is mode dependent. Mode 200 senses voltage from the output studs of the machine. Modes 5 and 201 sense from the Conductor Block on the feeder to the negative stud of the machine, unless the Voltage Sense Plug (P26) is removed from the Control PC Bd., in which case the remote work sense plug is used instead of the negative stud.



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FLOWCHART - FUNCTIONAL TROUBLESHOOTING GUIDE

Functional Troubleshooting Guide (Semi Automatic PW-455, PW455/STT) (For Codes 10555 and Below)



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



Key:
 PS = Power Source
 UI = User Interface (Control Box)
 FH = Feed Head

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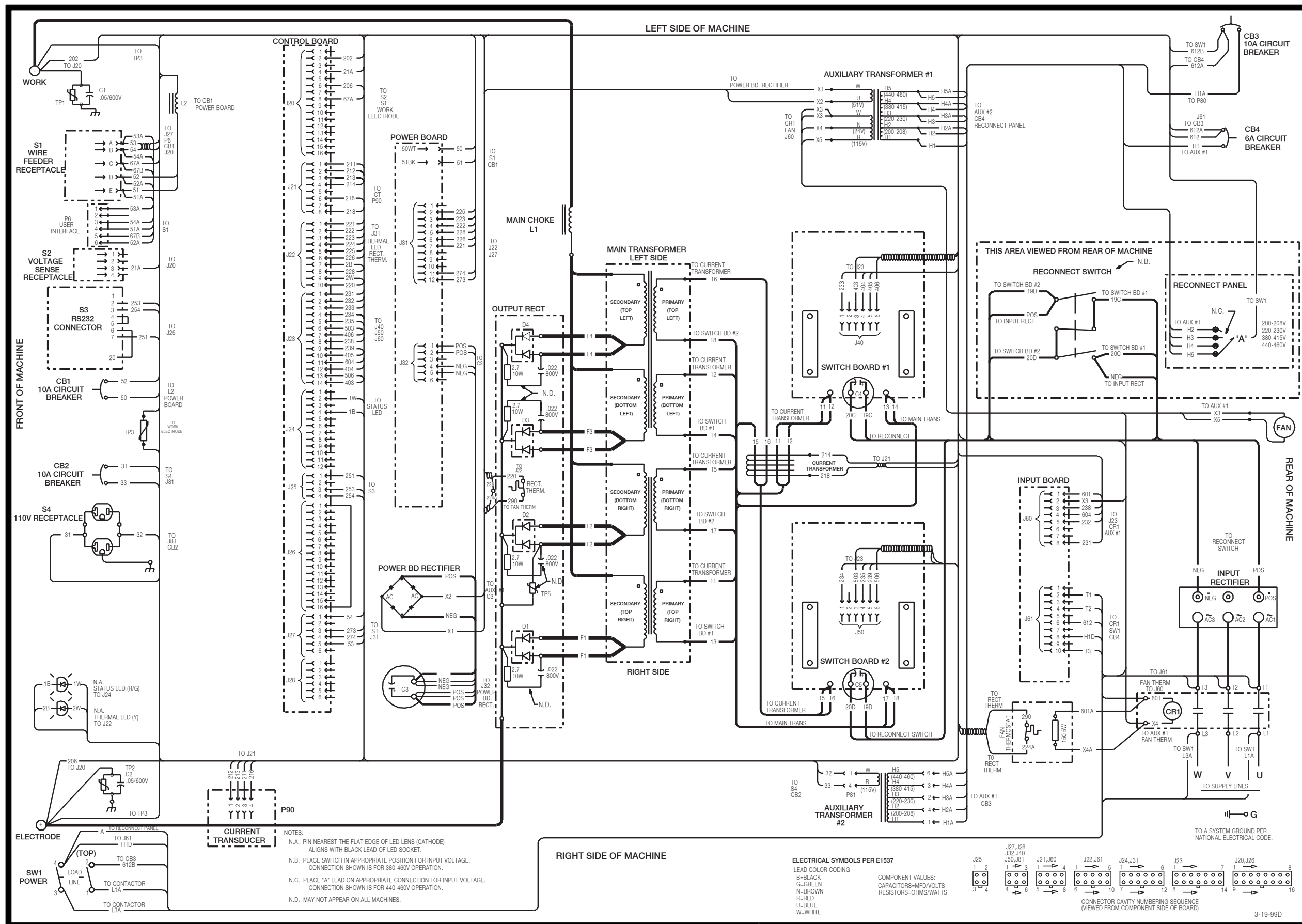
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Return to Master TOC

NOTES

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

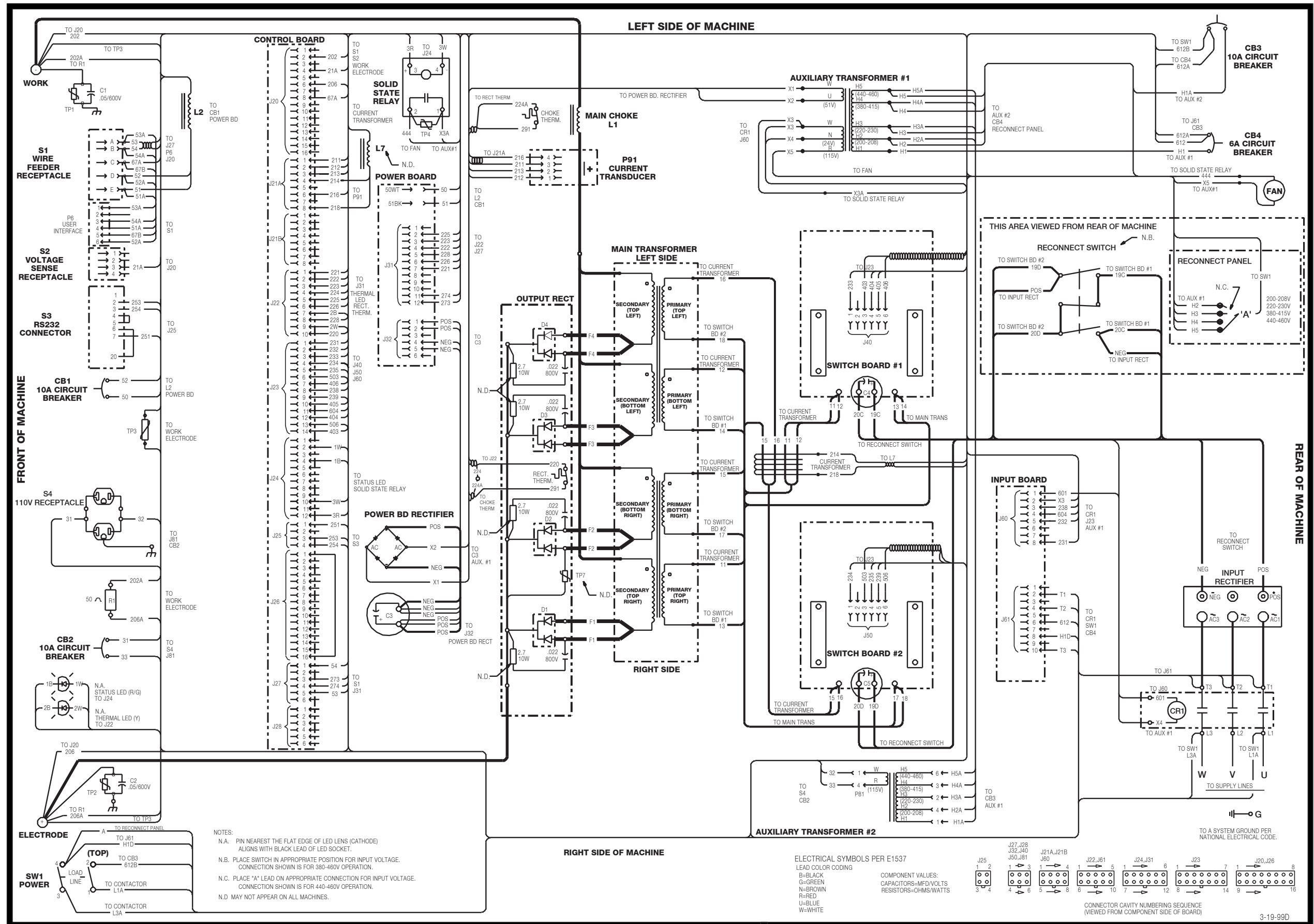
Power Wave 455 Wiring Diagram - Code 10372



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.



Power Wave 455 Wiring Diagram - Code 10555



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

Return to Section TOC

Return to Master TOC

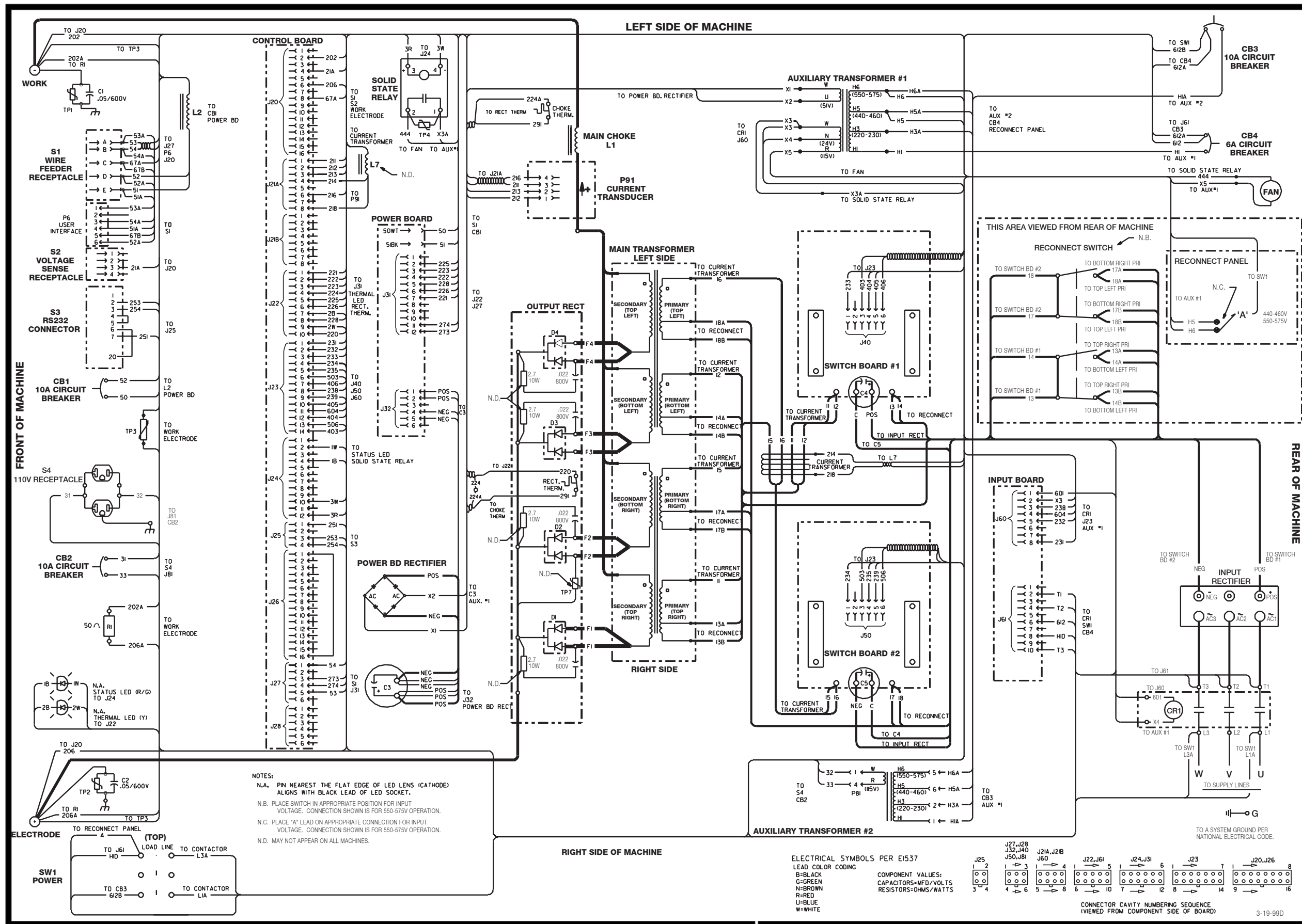
Return to Section TOC

Return to Master TOC

Return to Section TOC

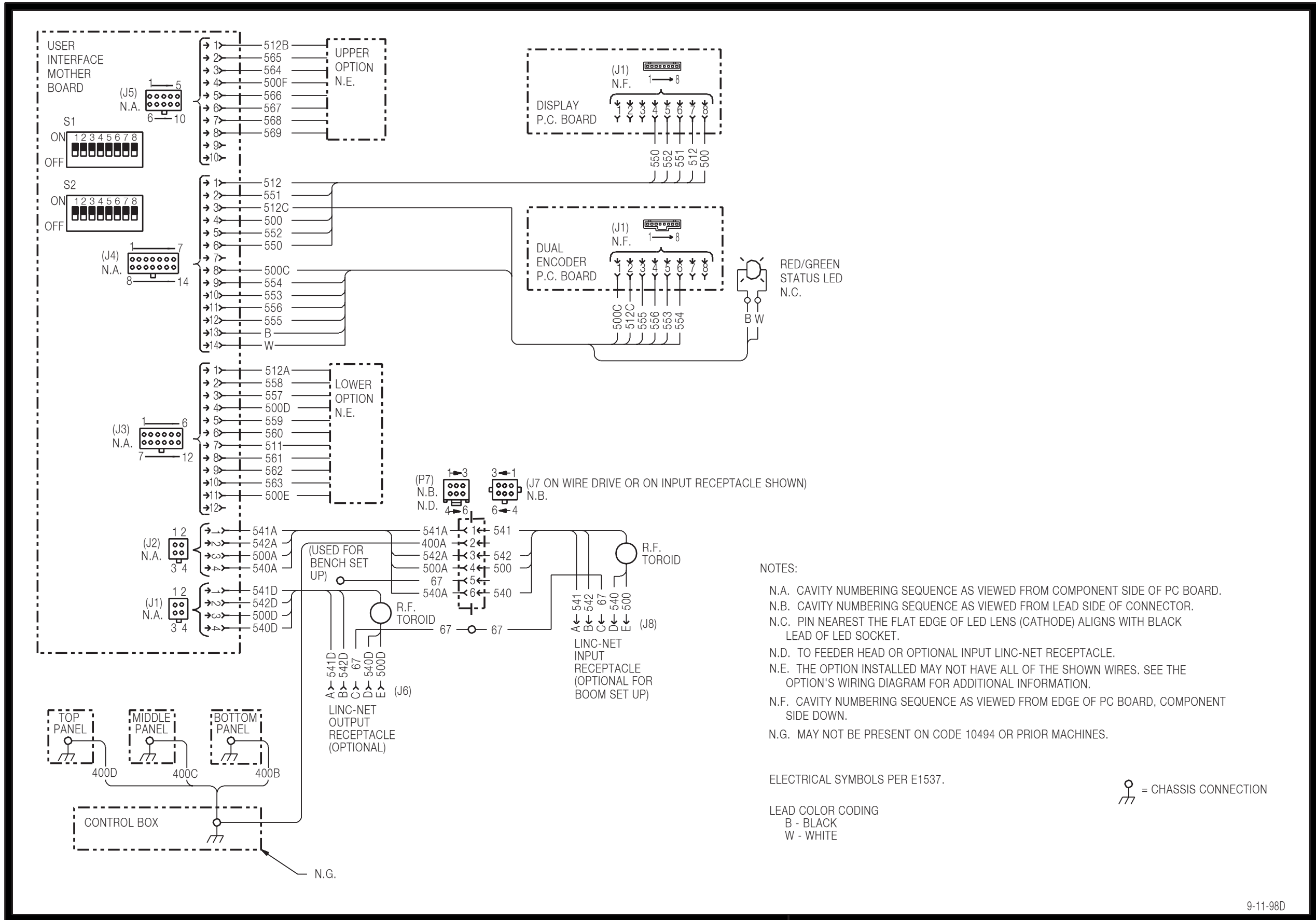
Return to Master TOC

Power Wave 455 Wiring Diagram - Code 10553



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.

Power Feed 10 Control Box Wiring Diagram



- NOTES:
- N.A. CAVITY NUMBERING SEQUENCE AS VIEWED FROM COMPONENT SIDE OF PC BOARD.
 - N.B. CAVITY NUMBERING SEQUENCE AS VIEWED FROM LEAD SIDE OF CONNECTOR.
 - N.C. PIN NEAREST THE FLAT EDGE OF LED LENS (CATHODE) ALIGNS WITH BLACK LEAD OF LED SOCKET.
 - N.D. TO FEEDER HEAD OR OPTIONAL INPUT LINC-NET RECEPTACLE.
 - N.E. THE OPTION INSTALLED MAY NOT HAVE ALL OF THE SHOWN WIRES. SEE THE OPTION'S WIRING DIAGRAM FOR ADDITIONAL INFORMATION.
 - N.F. CAVITY NUMBERING SEQUENCE AS VIEWED FROM EDGE OF PC BOARD, COMPONENT SIDE DOWN.
 - N.G. MAY NOT BE PRESENT ON CODE 10494 OR PRIOR MACHINES.

ELECTRICAL SYMBOLS PER E1537.

LEAD COLOR CODING
 B - BLACK
 W - WHITE

 = CHASSIS CONNECTION

9-11-98D

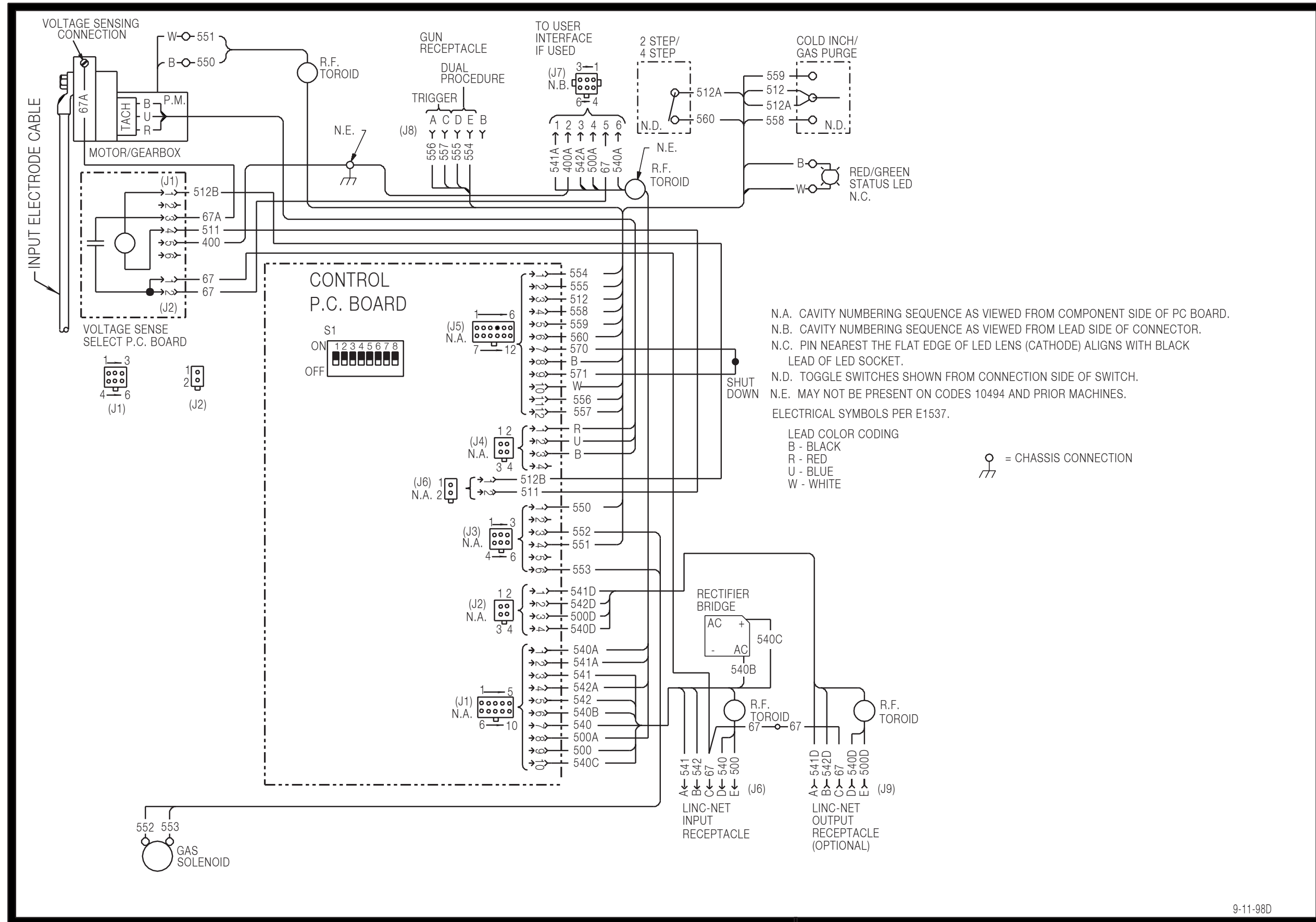
L10586

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

Power Feed 10 Wire Drive Wiring Diagram



9-11-98D

L10587

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.

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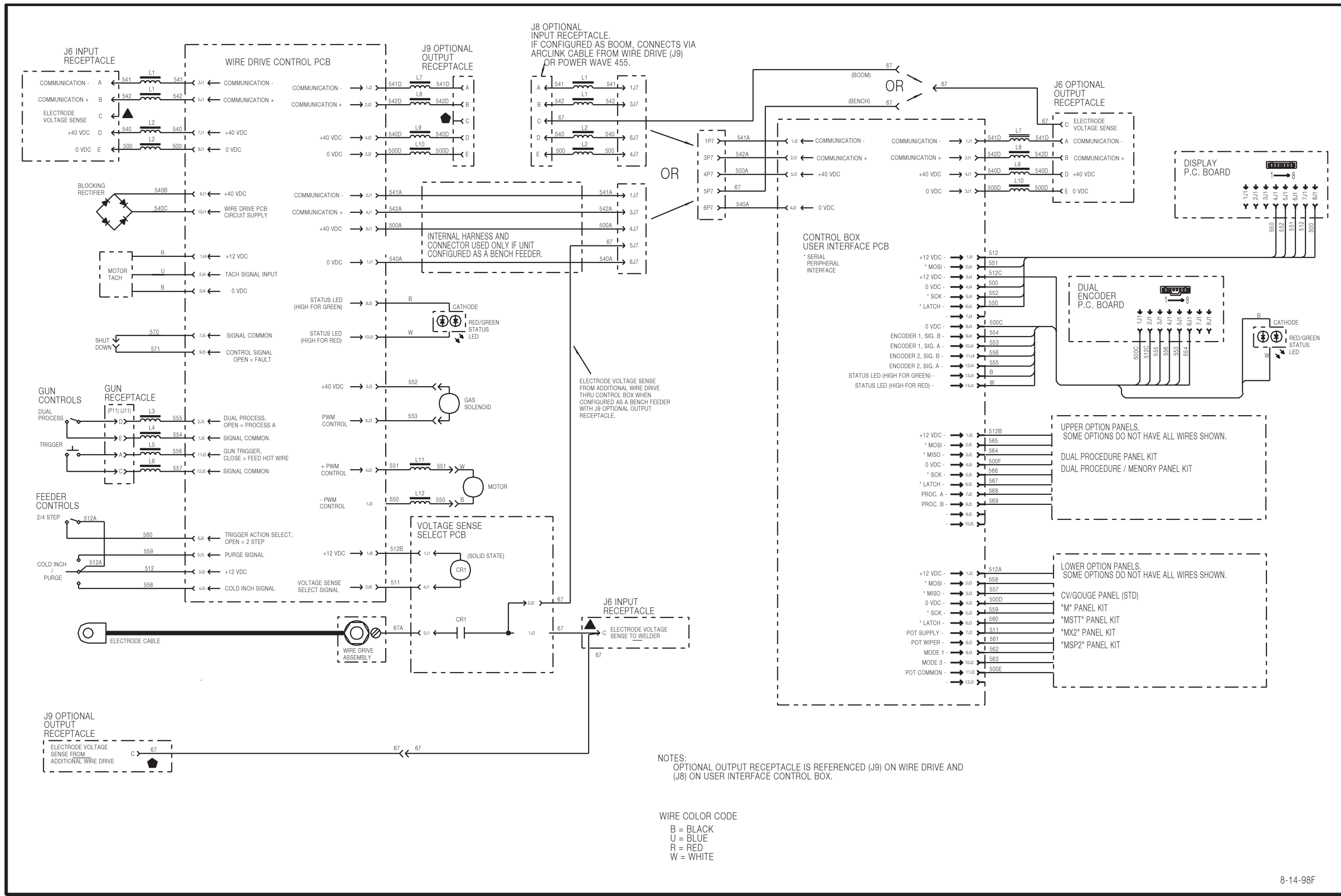
Return to Master TOC

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Return to Master TOC

POWER FEED 10 MACHINE SCHEMATIC



NOTES:
 OPTIONAL OUTPUT RECEPTACLE IS REFERENCED (J9) ON WIRE DRIVE AND (J8) ON USER INTERFACE CONTROL BOX.

WIRE COLOR CODE
 B = BLACK
 U = BLUE
 R = RED
 W = WHITE

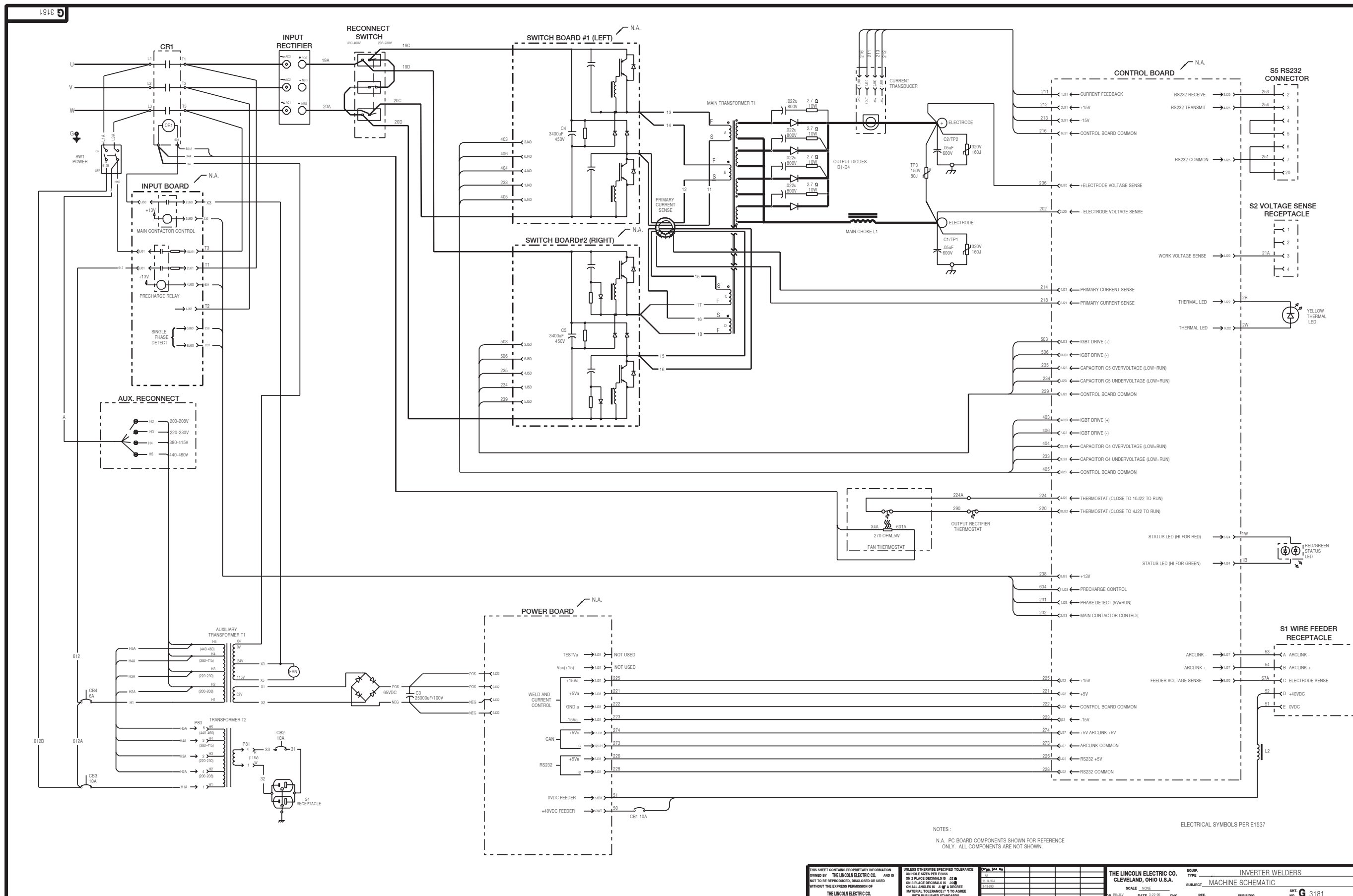
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

8-14-98F

G3602

Return to Section TOC
Return to Master TOC

POWER WAVE 455 MACHINE SCHEMATIC - CODE 10372



NOTES:
 N.A. PC BOARD COMPONENTS SHOWN FOR REFERENCE ONLY. ALL COMPONENTS ARE NOT SHOWN.

ELECTRICAL SYMBOLS PER E1537

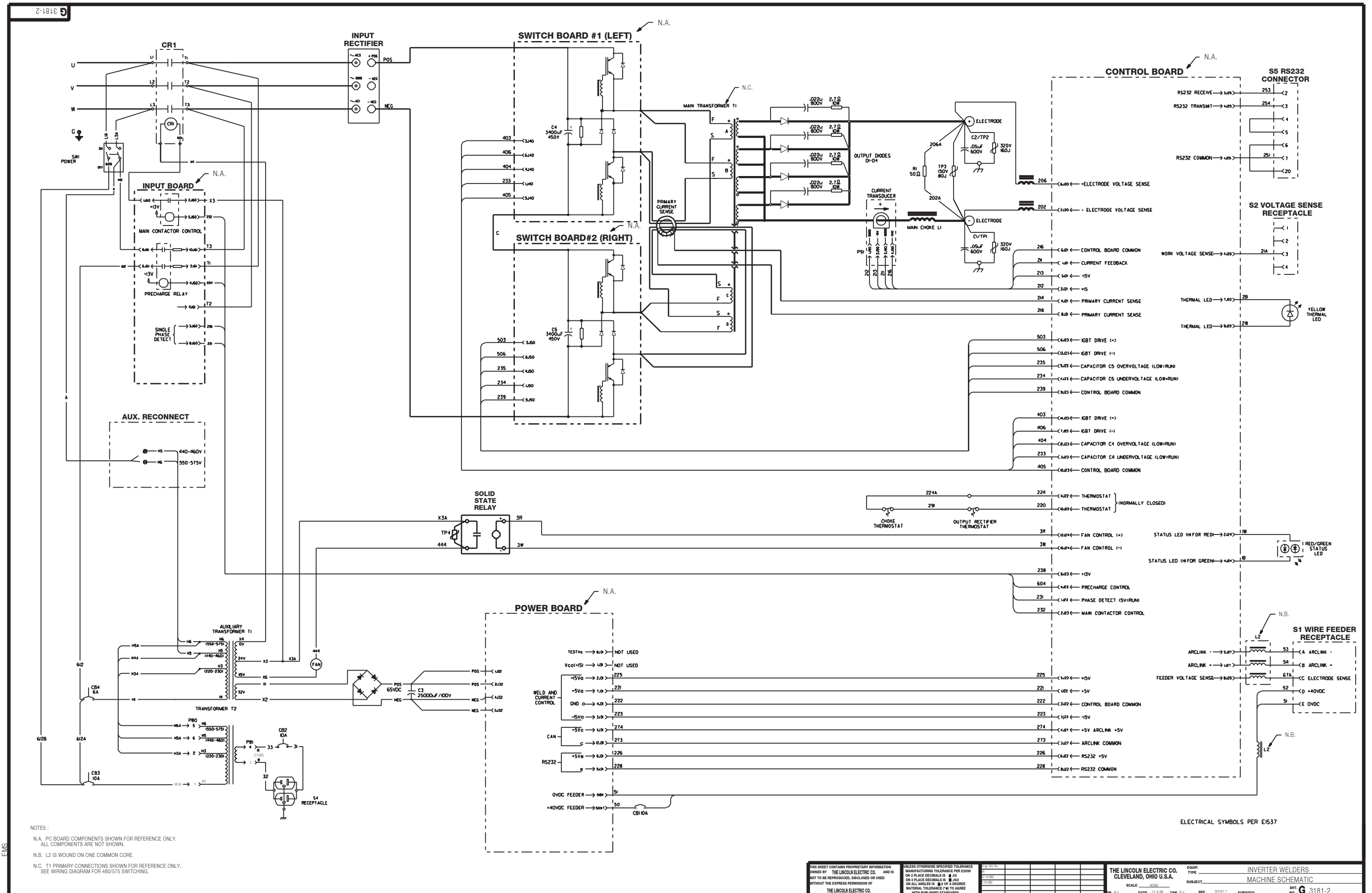
THIS SHEET CONTAINS PROPRIETARY INFORMATION OWNED BY THE LINCOLN ELECTRIC CO. AND IS NOT TO BE REPRODUCED, DISCLOSED OR USED WITHOUT THE EXPRESS PERMISSION OF THE LINCOLN ELECTRIC CO.	UNLESS OTHERWISE SPECIFIED TOLERANCE IS: ON HOLE SIZES PER ASME ON 2 PLACE DECIMALS IS .02 ON 3 PLACE DECIMALS IS .005 ON ALL ANGLES IS 2° ± .5° MATERIAL TOLERANCE IS TO AGREE WITH PUBLISHED STANDARDS.	DATE: 11/12/11 3:15:00	THE LINCOLN ELECTRIC CO. CLEVELAND, OHIO U.S.A. SCALE: NONE DATE: 8-29-09 CHK: REF:	EQUIP. TYPE: INVERTER WELDERS SUBJECT: MACHINE SCHEMATIC SHT. NO.: G 3181
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NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.



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POWER WAVE 455 MACHINE SCHEMATIC - CODE 10553



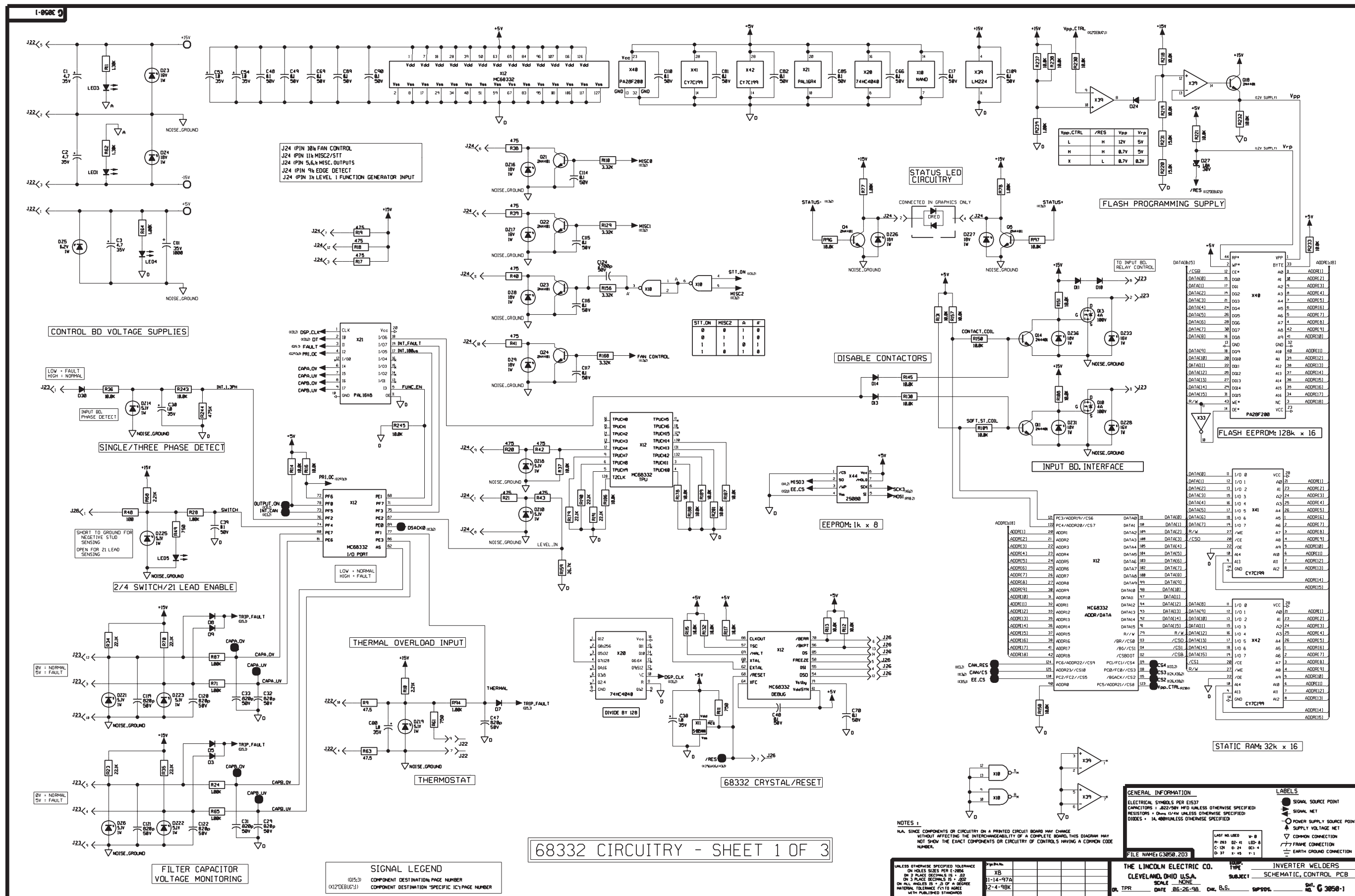
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.



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POWER WAVE 455 CONTROL PC BOARD SCHEMATIC (1 of 3)



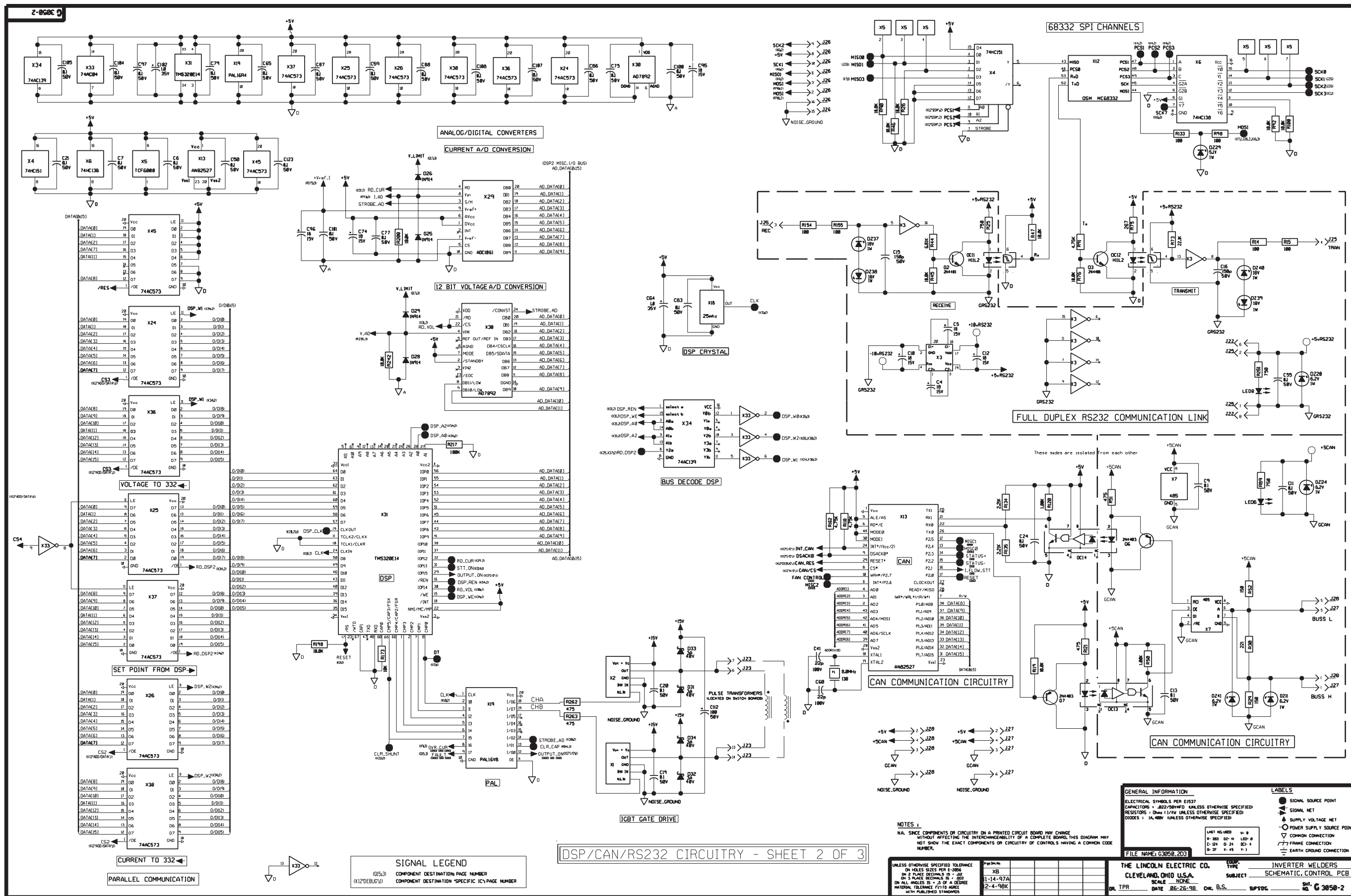
NOTE: Lincoln Electric assumes no responsibility for liabilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.



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POWER WAVE 455 CONTROL PC BOARD SCHEMATIC (2 of 3)



DSP/CAN/RS232 CIRCUITRY - SHEET 2 OF 3

GENERAL INFORMATION

ELECTRICAL SYMBOLS PER EIA337
 CAPACITORS = .022/50V UNLESS OTHERWISE SPECIFIED
 RESISTORS = 0 OHMS 1/4W UNLESS OTHERWISE SPECIFIED
 DIODES = 1A, 400V UNLESS OTHERWISE SPECIFIED

LABELS

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

NOTES

1. UNLESS OTHERWISE SPECIFIED TOLERANCE IS ±1%
 2. ON HOLES SIZES PER #2-DRAWING
 3. ON 2 PLACE DECIMALS IS ±.005
 4. ON 3 PLACE DECIMALS IS ±.0025
 5. ON ALL ANGLES R = .5 OF A DEGREE
 6. MATERIAL TOLERANCES FIVE AGREE WITH PUBLISHED STANDARDS

FILE NAME: G3050.203

THE LINCOLN ELECTRIC CO.
 CLEVELAND, OHIO U.S.A.
 SCALE: NONE
 DATE: 06-26-98
 DR: TPR

INVERTER WELDERS
 SUBJECT: SCHEMATIC, CONTROL PCB
 SHEET NO: G3050-2

NOTE: Lincoln Electric assumes no responsibility for liabilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.



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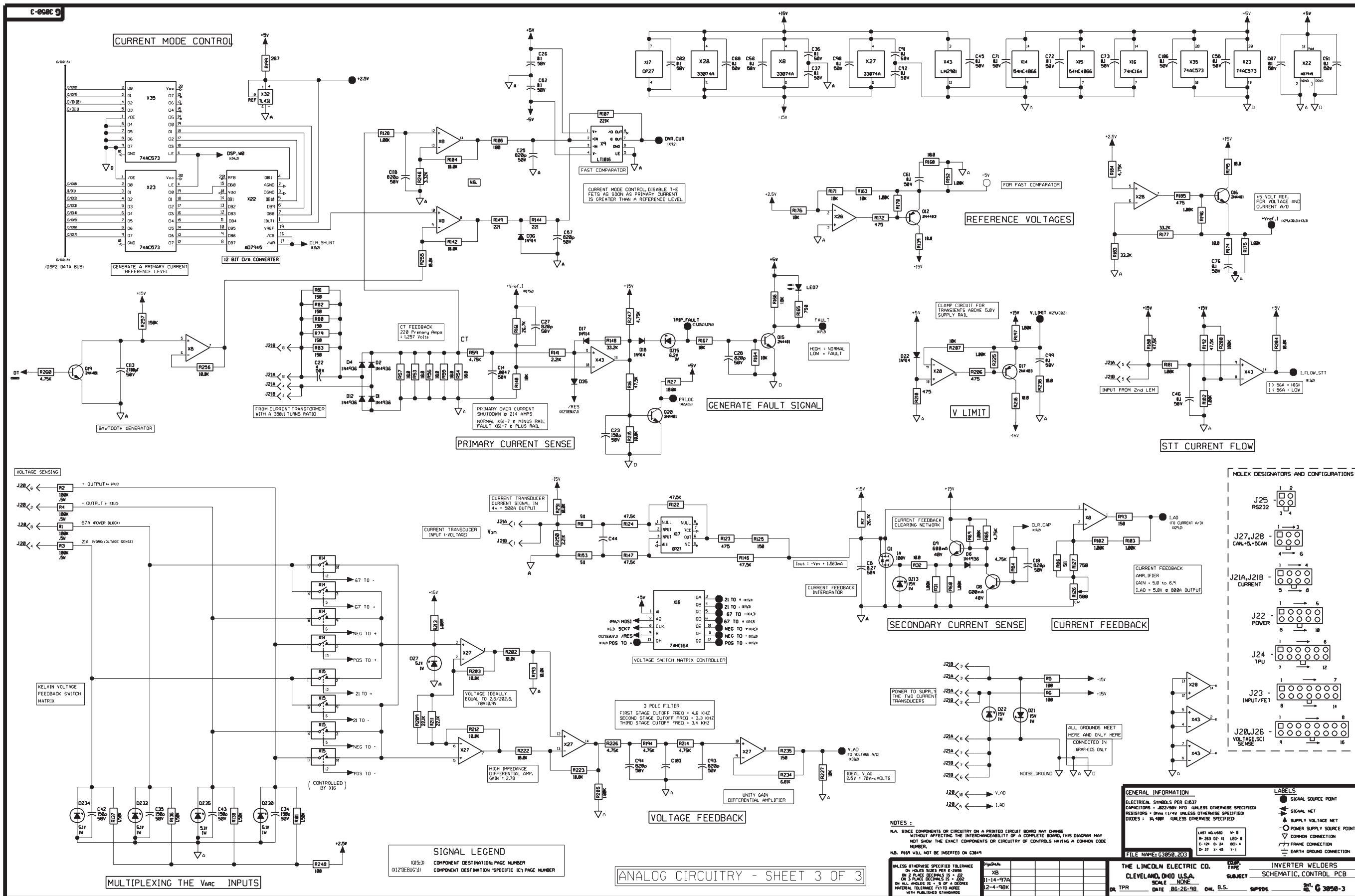
Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC

POWER WAVE 455 CONTROL PC BOARD SCHEMATIC (3 of 3)



NOTE: Lincoln Electric assumes no responsibility for liabilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.



Return to Section TOC

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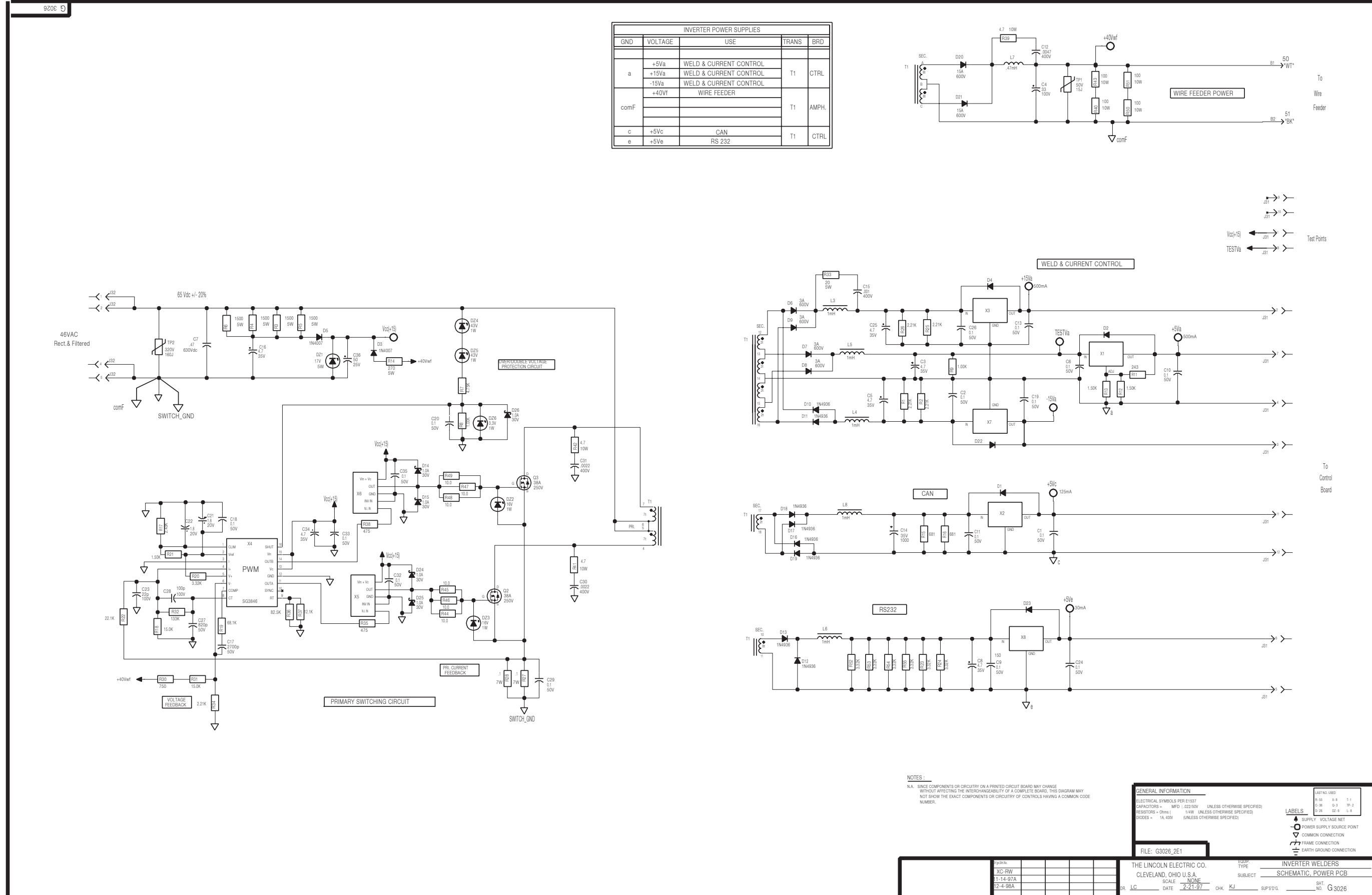
POWER WAVE 455 POWER PC BOARD SCHEMATIC

Return to Section TOC
Return to Master TOC

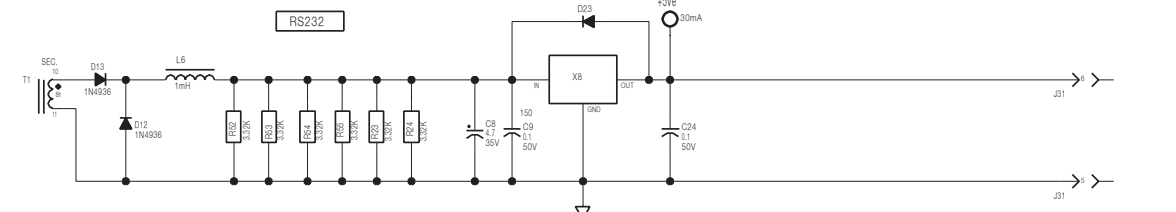
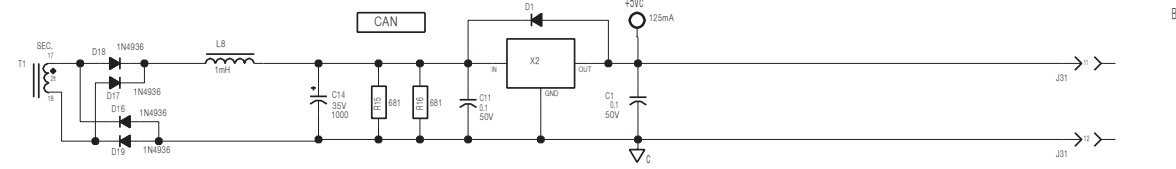
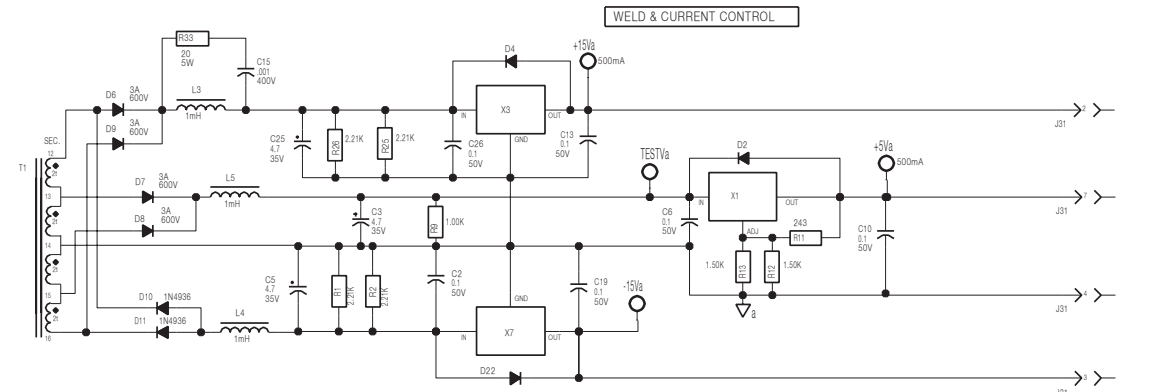
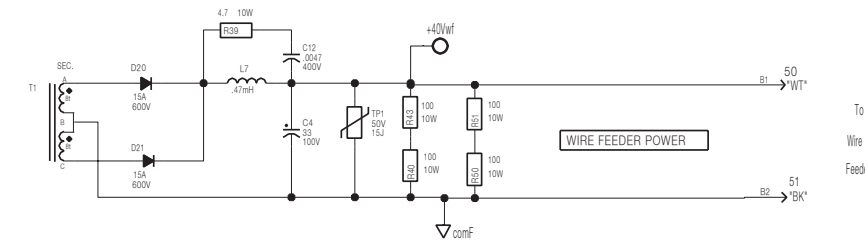
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Return to Master TOC



INVERTER POWER SUPPLIES				
GND	VOLTAGE	USE	TRANS	BRD
a	+5Va	WELD & CURRENT CONTROL	T1	CTRL
	+15Va	WELD & CURRENT CONTROL		
	-15Va	WELD & CURRENT CONTROL		
comF	+40Vf	WIRE FEEDER	T1	AMPH.
c	+5Vc	CAN		
e	+5Ve	RS 232	T1	CTRL



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

GENERAL INFORMATION

ELECTRICAL SYMBOLS PER E1637
 CAPACITORS - MFD (UNLESS OTHERWISE SPECIFIED)
 RESISTORS - Ohms (1/4W UNLESS OTHERWISE SPECIFIED)
 DIODES - 1A, 400V (UNLESS OTHERWISE SPECIFIED)

FILE: G3026_2E1

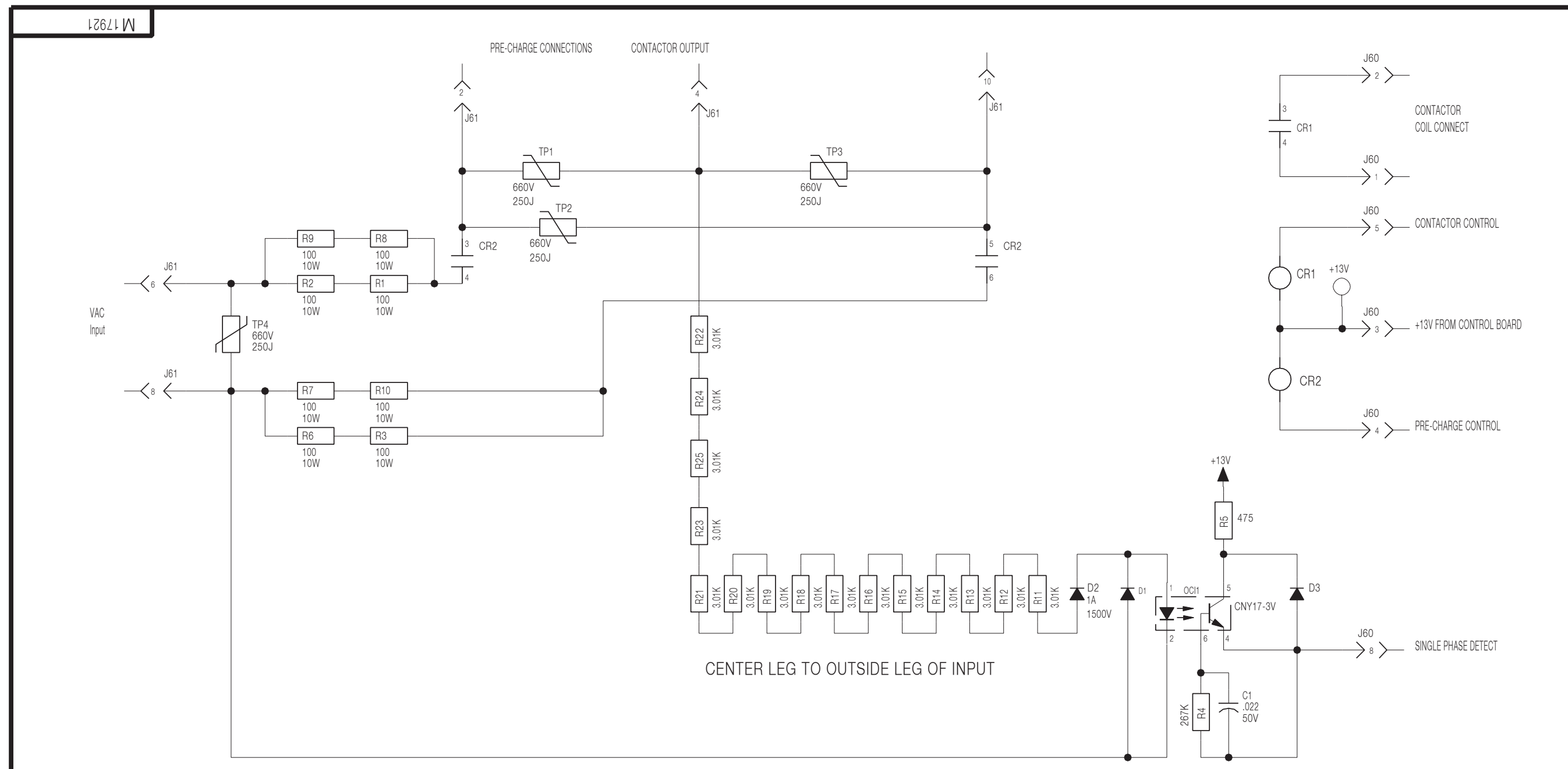
Labels: SUPPLY VOLTAGE NET, POWER SUPPLY SOURCE POINT, COMMON CONNECTION, FRAME CONNECTION, EARTH GROUND CONNECTION

THE LINCOLN ELECTRIC CO.
 CLEVELAND, OHIO U.S.A.
 SCALE: NONE
 DATE: 2-21-97
 CHK: KJ
 SUPP'D: _____
 SHF: _____
 NO: G3026

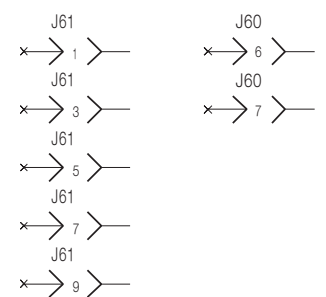
NOTE: Lincoln Electric assumes no responsibility for liabilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.



POWER WAVE 455 INPUT PC BOARD SCHEMATIC



UNUSED PINS



NOTES :

N.A. 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.

GENERAL INFORMATION

ELECTRICAL SYMBOLS PER E1537
 CAPACITORS = MFD (.022/50V UNLESS OTHERWISE SPECIFIED)
 RESISTORS = Ohms (1/4W UNLESS OTHERWISE SPECIFIED)
 DIODES = 1A, 40V (UNLESS OTHERWISE SPECIFIED)

LAST NO. USED	
R- 25	OCI- 1
C- 1	CR- 2
D- 3	TP- 4

LABELS

- ▲ SUPPLY VOLTAGE NET
- POWER SUPPLY SOURCE POINT
- ▽ COMMON CONNECTION
- ▤ FRAME CONNECTION
- ⊥ EARTH GROUND CONNECTION

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FILENAME: M17921_3DA

UNLESS OTHERWISE SPECIFIED TOLERANCE
 ON HOLES SIZES PER E-2056
 ON 2 PLACE DECIMALS IS + .02 -
 ON 3 PLACE DECIMALS IS + .002 -
 ON ALL ANGLES IS + .5 OF A DEGREE
 MATERIAL TOLERANCE (*) TO AGREE
 WITH PUBLISHED STANDARDS

Ch'ge. Sht. No.					
XB-RW					
11-14-97					
2-27-98L					
12-4-98A					

THE LINCOLN ELECTRIC CO.
 CLEVELAND, OHIO U.S.A.
 SCALE NONE
 DR. JLV DATE 5-17-96 CHK. _____ SUP'S'D'G. _____

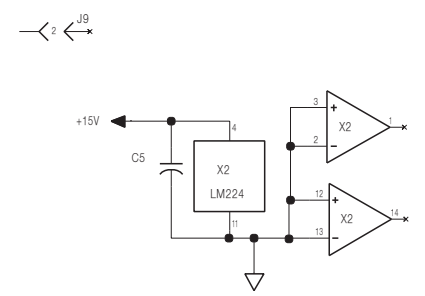
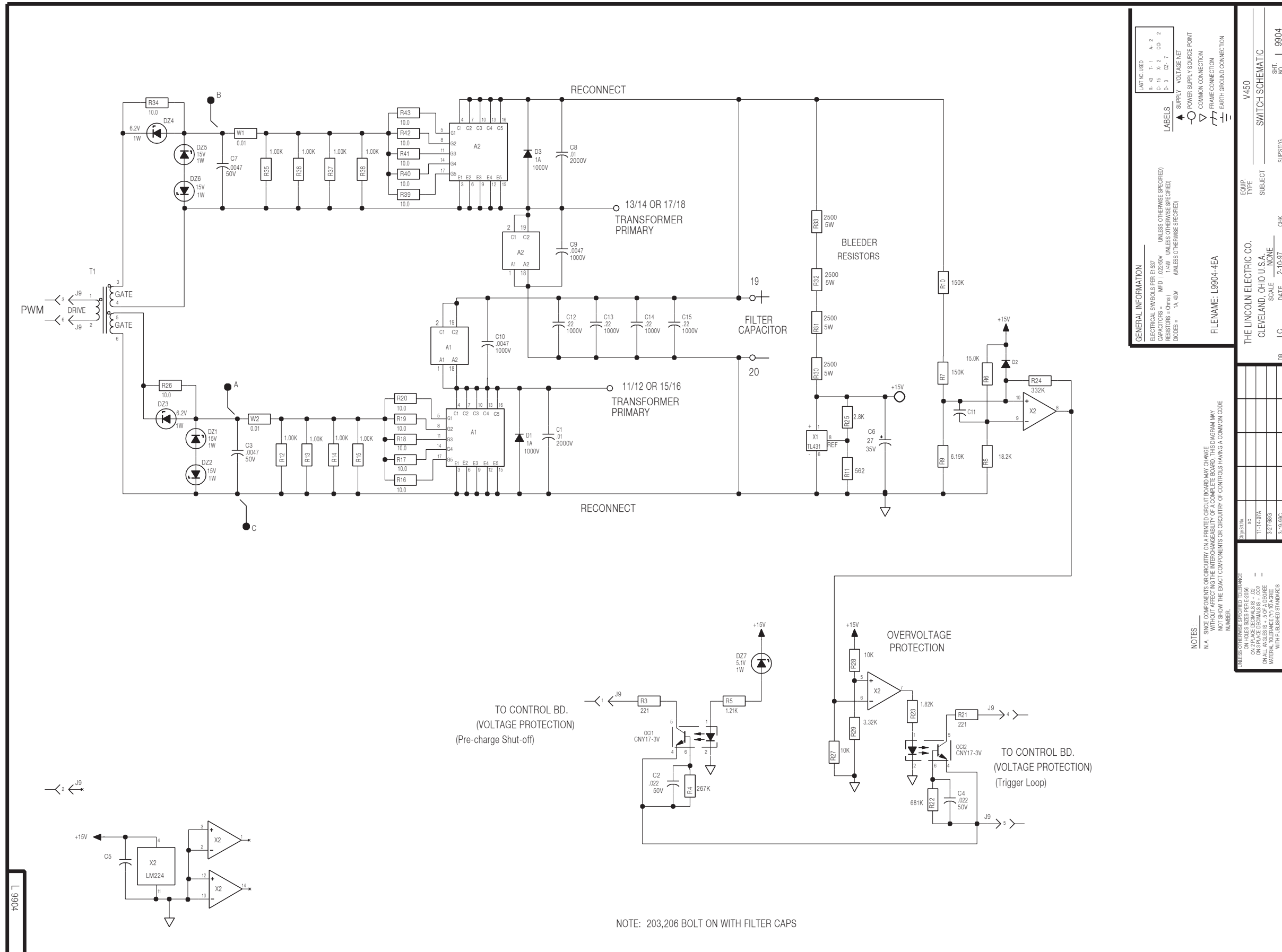
EQUIP. TYPE _____
 SUBJECT INVERTER WELDERS
 SCHEMATIC, INPUT PCB
 SHT. NO. M17921

NOTE: Lincoln Electric assumes no responsibility for liabilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

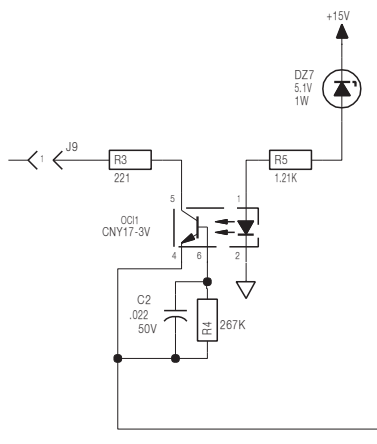


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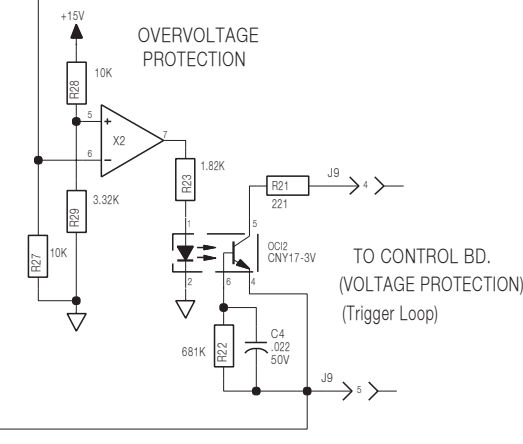
POWER WAVE 455 SWITCH PC BOARD SCHEMATIC - CODE 10372 & 10555



TO CONTROL BD.
(VOLTAGE PROTECTION)
(Pre-charge Shut-off)



OVERVOLTAGE PROTECTION



TO CONTROL BD.
(VOLTAGE PROTECTION)
(Trigger Loop)

NOTE: 203,206 BOLT ON WITH FILTER CAPS

GENERAL INFORMATION

ELECTRICAL SYMBOLS PER E137
RESISTORS: MFD / 1Z220V (UNLESS OTHERWISE SPECIFIED)
CAPACITORS: PPM / 50V (UNLESS OTHERWISE SPECIFIED)
DIMENSIONS: DIMS = 0.001" (UNLESS OTHERWISE SPECIFIED)
ANGLES: 16, 60V (UNLESS OTHERWISE SPECIFIED)

LEGEND

- SUPPLY VOLTAGE NET
- ◊ POWER SUPPLY SOURCE POINT
- COMMON CONNECTION
- ▭ FRAME CONNECTION
- ⊥ EARTH/GROUND CONNECTION

FILENAME: L9904-4EA

EQUIP. TYPE: V450
SUBJECT: SWITCH SCHEMATIC

DR. LC. DATE: 2-10-97 CHK. L 9904

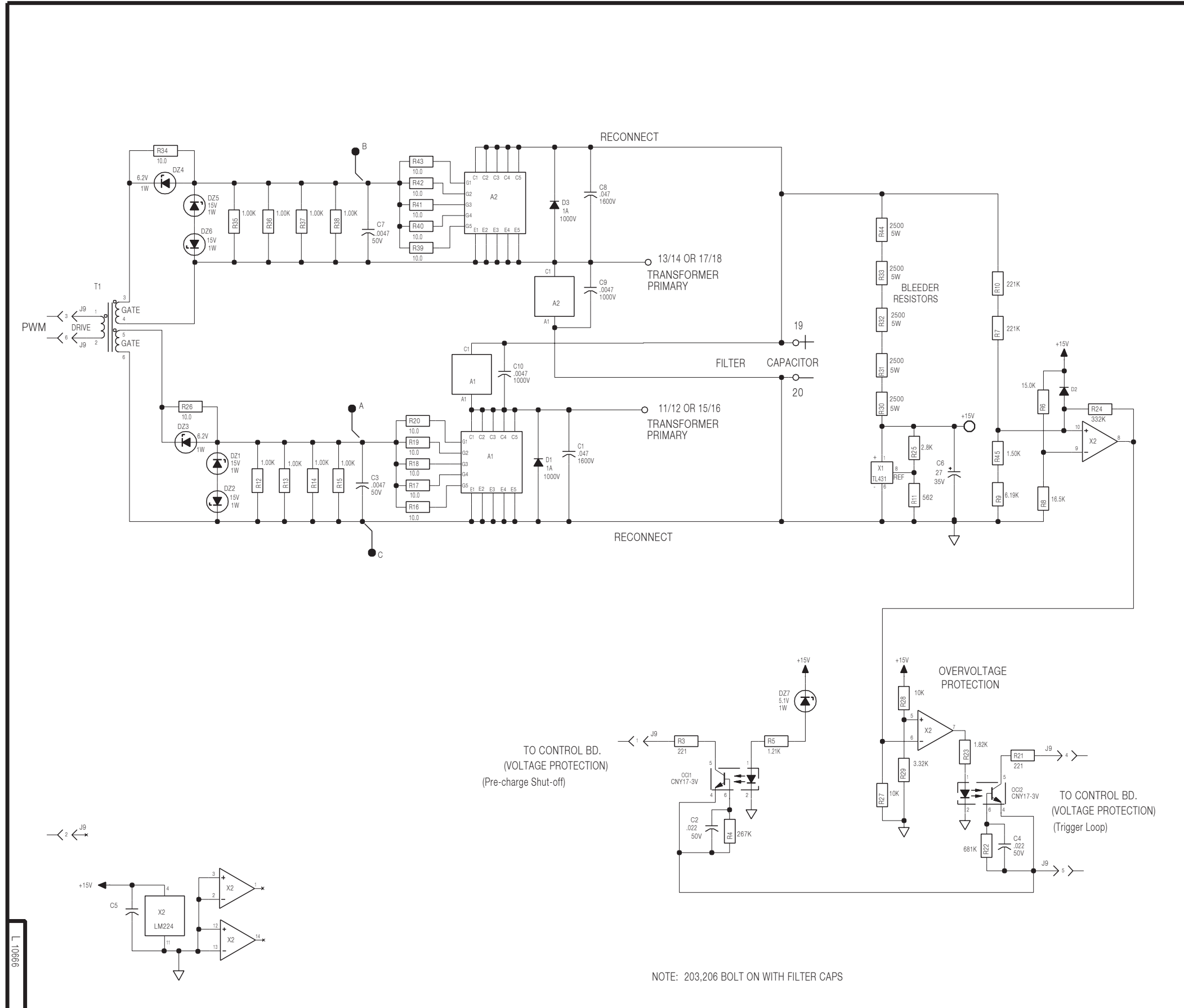
UNLESS OTHERWISE SPECIFIED, TOLERANCE: 20%
ON HOLES SIZES PER 2008
ON 2 PLACE DECIMALS IS + .02
ON 1 PLACE DECIMALS IS + .05
ON ALL ANGLES IS + .002 ANGLE
MATERIAL TOLERANCE (1) TO ABOVE
WITH PUBLISHED STANDARDS

NOTE: Lincoln Electric assumes no responsibility for liabilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.



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POWER WAVE 455 SWITCH PC BOARD SCHEMATIC - CODE 10553



GENERAL INFORMATION

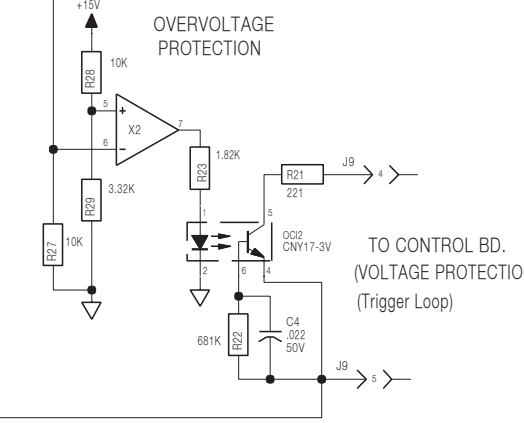
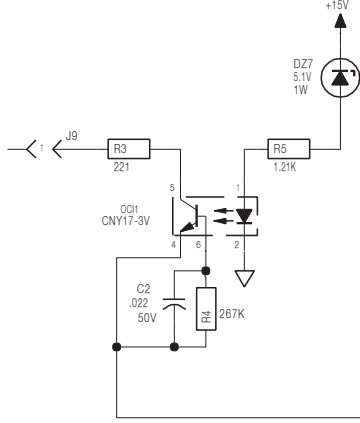
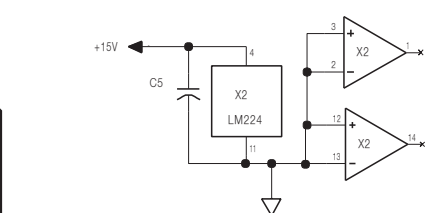
LASTING USED	B-45	T-1	A-2
ELECTRICAL SYMBOLS PER E1537	C-10	X-2	OC-2
CAPACITORS	D-3	OZ-7	
RESISTORS = Ohms (UNLESS OTHERWISE SPECIFIED)			
DC VALUES = 1K, 4.00V (UNLESS OTHERWISE SPECIFIED)			

▲ SUPPLY VOLTAGE NET
 ◯ POWER SUPPLY SOURCE POINT
 ○ COMMON CONNECTION
 ▽ FRAME CONNECTION
 ⊥ EARTH GROUND CONNECTION

EQUIP. TYPE: INVERTER WELDERS
 SUBJECT: SCHEMATIC, SWITCH PCB
 DATE: 2-10-97
 FILENAME: L10666_1AA
 THE LINCOLN ELECTRIC CO.
 CLEVELAND, OHIO U.S.A.
 SCALE: NONE
 DR: LC/JLV
 DATE: 2-10-97
 CHK. B.S.
 SFT. NO. L10666
 SUPP'G. NO.

NOTES:

- N.A. - SIZE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGIBILITY OF A COMPLETE BOARD. THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.
- UNLESS OTHERWISE SPECIFIED TOLERANCE:
 - ON HOLES SIZES PER E-2098
 - ON 2 PLACE DECIMALS .S ± .02
 - ON 3 PLACE DECIMALS .S ± .005
 - ON ALL ANGLES 8 ± .5 OF A DEGREE
 - MINIMUM TOLERANCE (.1) TO AGREE WITH PUBLISHED STANDARDS

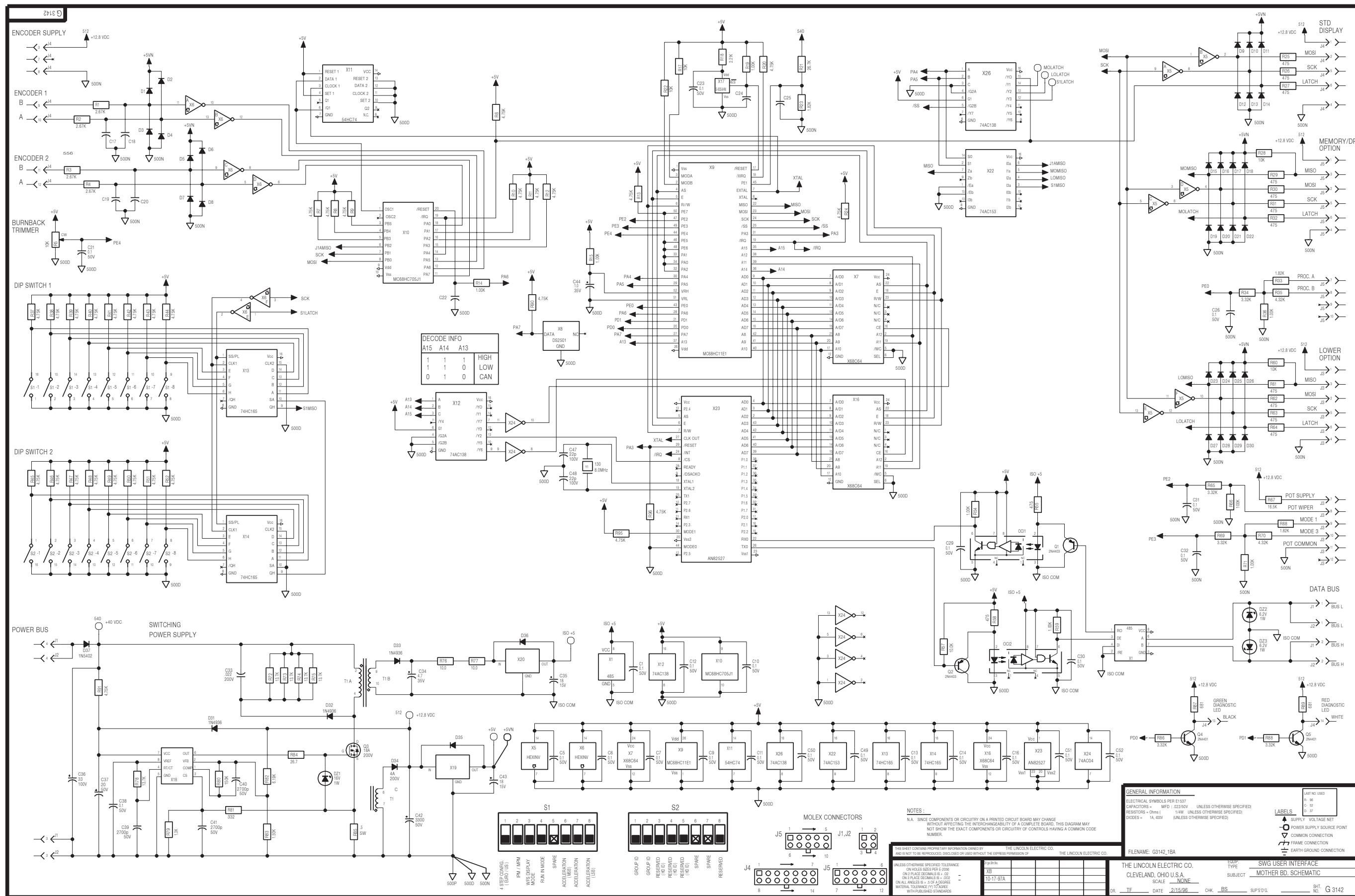


NOTE: 203,206 BOLT ON WITH FILTER CAPS

NOTE: Lincoln Electric assumes no responsibility for liabilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.



POWER FEED 10 MOTHER CONTROL PC BOARD SCHEMATIC



NOTE: Lincoln Electric assumes no responsibility for liabilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.



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POWER FEED 10 CONTROL PC BOARD SCHEMATIC

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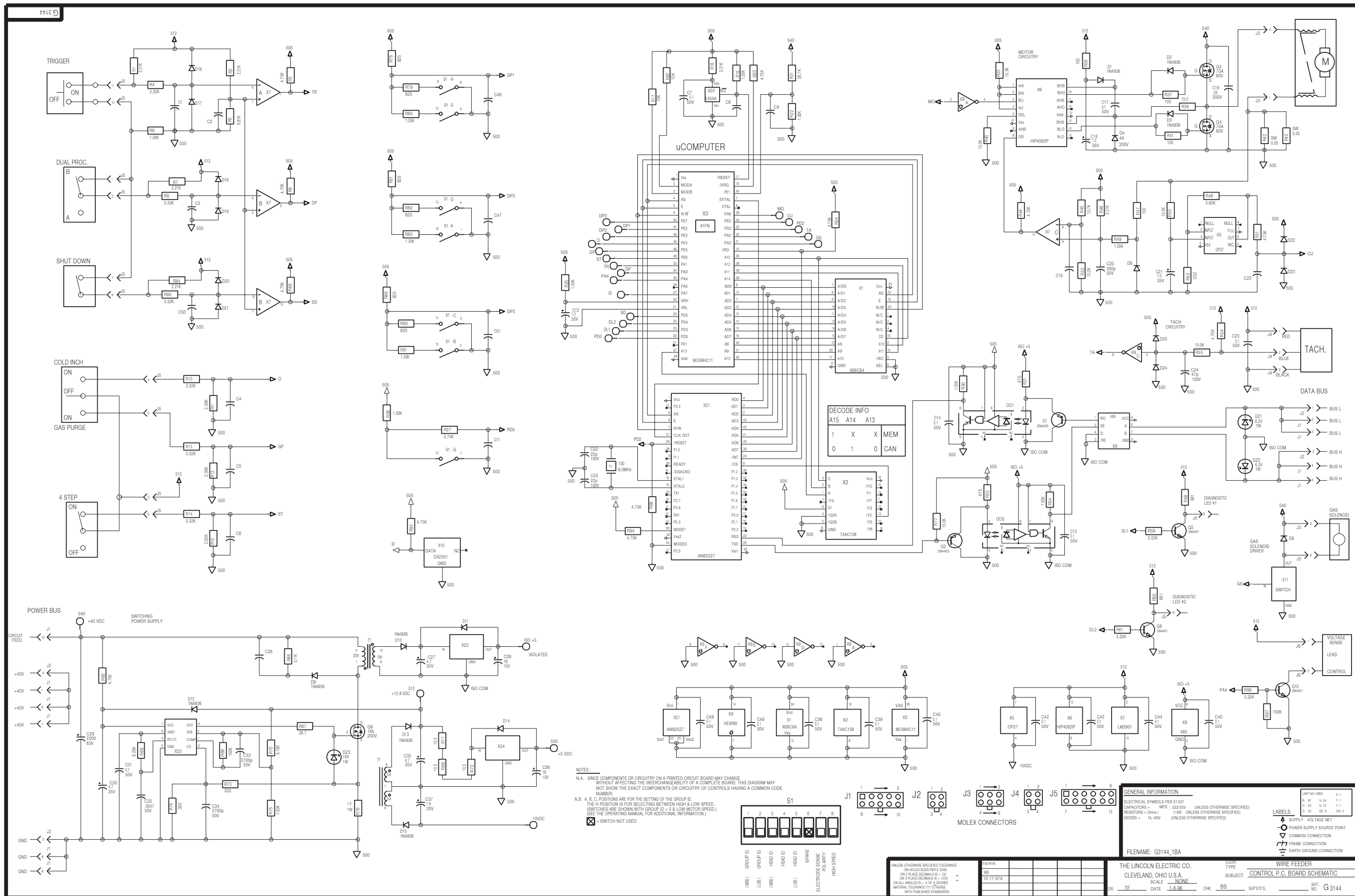
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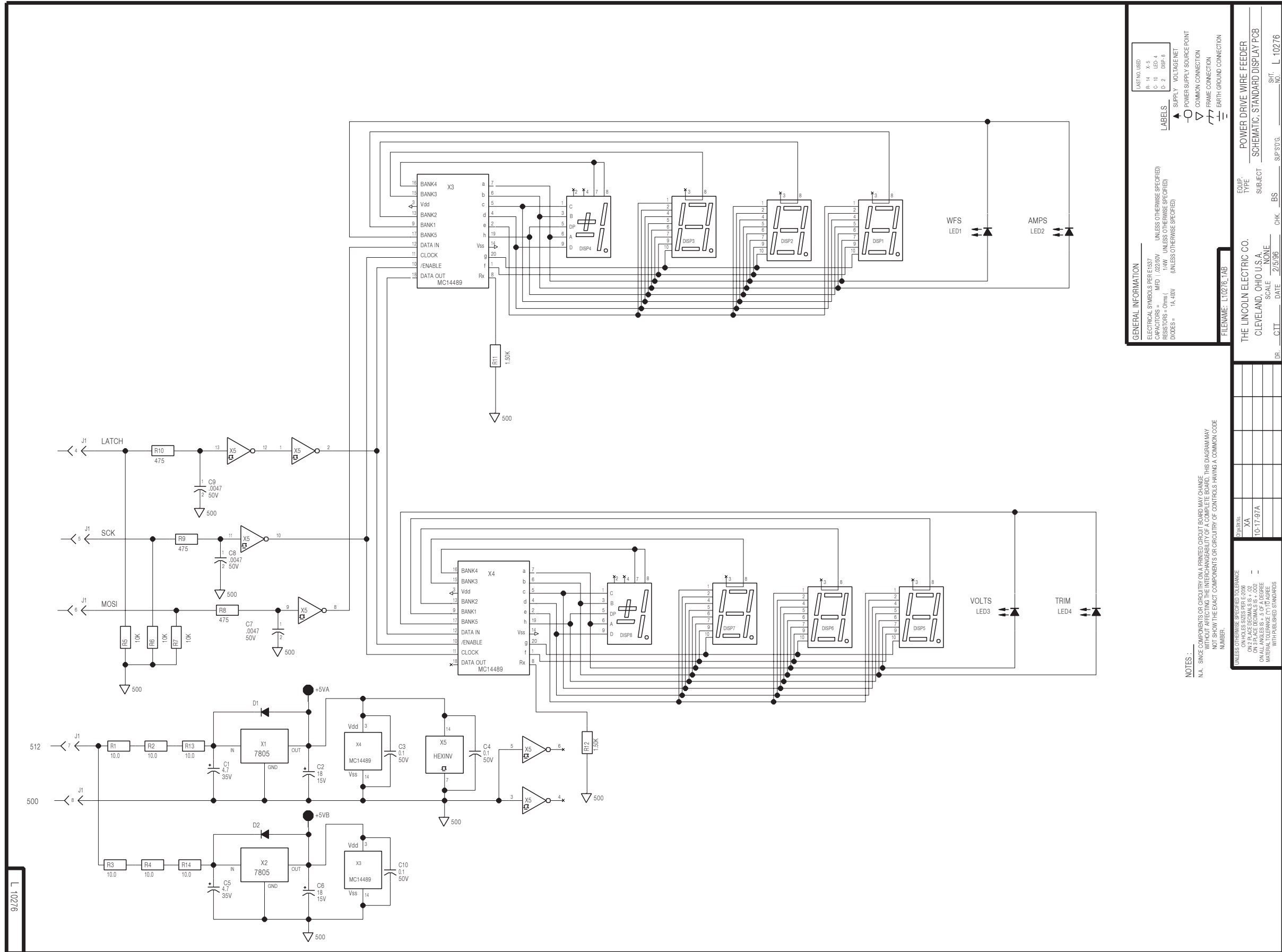
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POWER FEED 10 DISPLAY PC BOARD SCHEMATIC



GENERAL INFORMATION

ELECTRICAL SYMBOLS PER IEC 6137
 CAPACITORS = MFD (UNLESS OTHERWISE SPECIFIED)
 RESISTORS = Ohms (UNLESS OTHERWISE SPECIFIED)
 DIMENSIONS = 1/16, .001 (UNLESS OTHERWISE SPECIFIED)

LABELS

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

FILENAME: L10276.TAB

EQUIP. TYPE: POWER DRIVE WIRE FEEDER
 SUBJECT: SCHEMATIC, STANDARD DISPLAY PCB

THE LINCOLN ELECTRIC CO.
 CLEVELAND, OHIO U.S.A.

DR: BS DATE: 2/25/98 SHT. NO. L 10276

NOTES

N.A. 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.

UNLESS OTHERWISE SPECIFIED TOLERANCE
 ON HOLE SIZES PER E-209B
 ON DIMENSIONS PER ASME Y14.5
 ON ALL ANGLES 8 ± .2 OF A DEGREE
 MATERIALS SHALL BE PER THE
 WITH PUBLISHED STANDARDS

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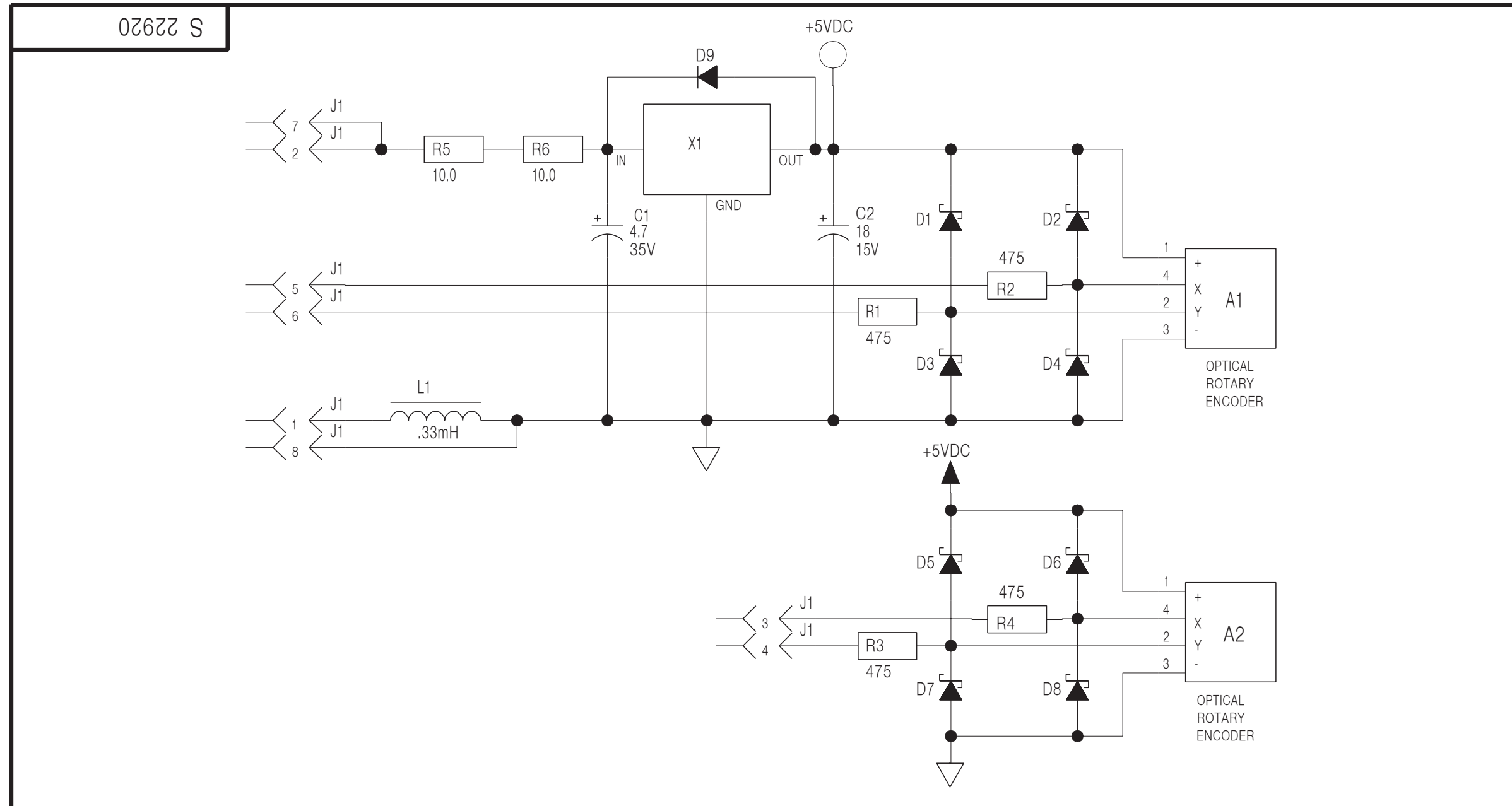
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POWER FEED 10 ENCODER PC BOARD SCHEMATIC



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NOTES :
 N.A. 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.

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)

LABELS
 ▲ SUPPLY VOLTAGE NET
 ○ POWER SUPPLY SOURCE POINT
 ▽ COMMON CONNECTION

FILENAME: S22920_2BB
 ▭▭▭ FRAME CONNECTION
 ≡ EARTH GROUND CONNECTION

UNLESS OTHERWISE SPECIFIED TOLERANCE ON HOLES SIZES PER E-2056 ON 2 PLACE DECIMALS IS + .02_ ON 3 PLACE DECIMALS IS + .002 ON ALL ANGLES IS + .5 OF A DEGREE MATERIAL TOLERANCE ("I") TO AGREE WITH PUBLISHED STANDARDS	Ch'ge.Sht.No.					THE LINCOLN ELECTRIC CO. CLEVELAND, OHIO U.S.A. SCALE NONE DR. JRF DATE 3-11-96 CHK. SUP'S'D'G. _____	EQUIP. TYPE SUBJECT	USER INTERFACE
	XA							DUAL ENCDR PCB SCHEM.
	10-17-97							
	3-27-98D							
							SHT. NO. S 22920	

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