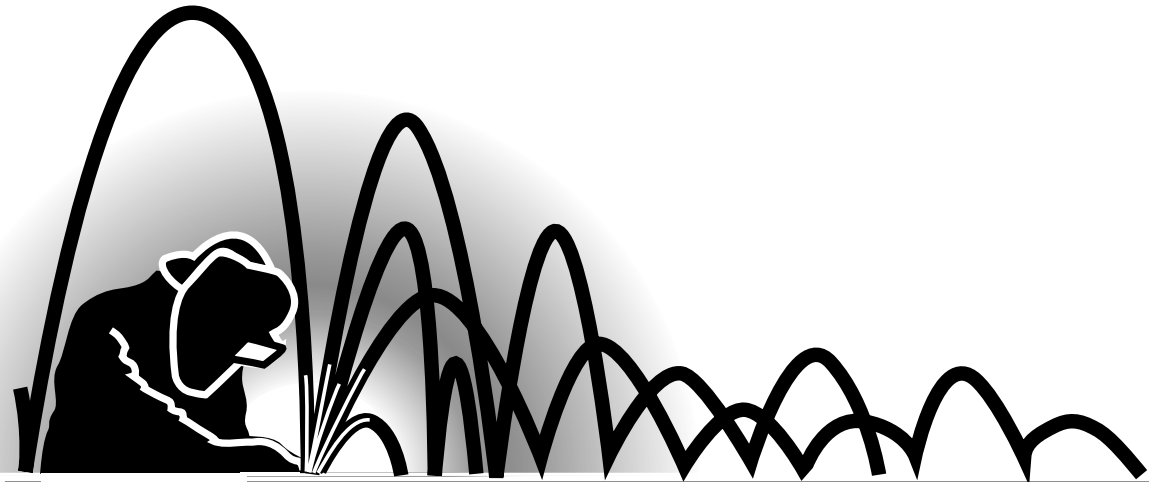


RED-D-ARC PYTHON

IM648-A

February, 1999

For use with machines having Code Numbers: **10627, 10656**



RED-D-ARC Welderrentals

OPERATOR'S MANUAL

Red-D-Arc Spec-Built Welding Equipment

This **RED-D-ARC** cutter is built to **RED-D-ARC Extreme Duty** design specifications by Lincoln Electric.

Safety Depends on You

This cutter 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.

1-800-245-3660

North America's Largest Fleet of Welding Equipment

WARNING

PLASMA CUTTING or GOUGING 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.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.



ELECTRIC SHOCK can kill.

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

- 1.b. When the power source is operating voltages in excess of 250 volts are produced. This creates the potential for serious electrical shock - potentially even fatal.
- 1.c. Insulate yourself from work and ground using dry insulation. When cutting or gouging in damp locations, on metal framework such as floors, gratings or scaffolds and when in positions such as sitting or lying, make certain the insulation is large enough to cover your full area of physical contact with work and ground.
- 1.d. Always be sure the work cable makes a good electrical connection with the metal being cut or gouged. The connection should be as close as possible to the area being cut or gouged.
- 1.e. Ground the work or metal to be cut or gouged to a good electrical (earth) ground.
- 1.f. Maintain the plasma torch, cable and work clamp in good, safe operating condition. Replace damaged insulation.
- 1.g. Never dip the torch in water for cooling or plasma cut or gouge in or under water.
- 1.h. When working above floor level, protect yourself from a fall should you get a shock.
- 1.i. Operate the pilot arc with caution. The pilot arc is capable of burning the operator, others or even piercing safety clothing.
- 1.j. Also see Items 4c and 6.



FUMES AND GASES can be dangerous.

3.a. Plasma cutting or gouging may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When cutting or gouging, keep your head out of the fumes. Use enough ventilation and/or exhaust at the arc

to keep fumes and gases away from the breathing zone. **When cutting or gouging 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.**

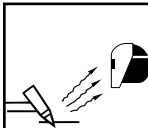
- 3.b. Do not use plasma arc cutting or gouging in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
- 3.c. Gases used for plasma cutting and gouging can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
- 3.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.



CUTTING SPARKS can cause fire or explosion.

4.a. Remove fire hazards from the plasma cutting or gouging area. If this is not possible, cover them to prevent the cutting or gouging sparks from starting a fire. Remember that welding sparks and hot materials from plasma cutting or gouging can easily go through small cracks and openings to adjacent areas. Avoid cutting or gouging near hydraulic lines. Have a fire extinguisher readily available.

- 4.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.
- 4.c. When not cutting or gouging, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- 4.d. Do not cut or gouge 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).
- 4.e. Vent hollow castings or containers before heating, cutting or gouging. They may explode.
- 4.f. Do not fuel engine driven equipment near area where plasma cutting or gouging.



ARC RAYS can burn.

2.a. Use safety glasses and a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when performing or observing plasma arc cutting or gouging. Glasses, headshield and filter lens should conform to ANSI Z87.1 standards.

- 2.b. Use suitable clothing including gloves made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- 2.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.

- 4.g. Sparks and spatter are thrown from the plasma arc. Wear safety glasses, ear protection and oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when cutting or gouging out of position or in confined places. Always wear safety glasses with side shields when in a cutting or gouging area.
- 4.h. Connect the work cable to the work as close to the cutting or gouging area as practical. Work cables connected to the building framework or other locations away from the cutting or gouging area increase the possibility of the 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.



CYLINDER may explode if damaged.

5.a. Use only compressed gas cylinders containing the correct 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.

- 5.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- 5.c. Cylinders should be located:
- Away from areas where they may be struck or subjected to physical damage.
 - A safe distance from plasma cutting or gouging, arc welding operations and any other source of heat, sparks, or flame.
- 5.d. Never allow any part of the electrode, torch or any other electrically "hot" parts to touch a cylinder.
- 5.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- 5.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.
- 5.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.

- 6.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.
- 6.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.
- 6.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.



PLASMA ARC can injure.



7.a. Keep your body away from nozzle and plasma arc.

7.b. Operate the pilot arc with caution. The pilot arc is capable of burning the operator, others or even piercing safety clothing.



ELECTRIC AND MAGNETIC FIELDS may be dangerous

8.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Cutting or gouging current creates EMF fields around torch cables and cutting machines.

- 8.b. EMF fields may interfere with some pacemakers, so operators having a pacemaker should consult their physician before cutting or gouging.
- 8.c. Exposure to EMF fields during cutting or gouging may have other health effects which are now not known.
- 8.d. All operators should use the following procedures in order to minimize exposure to EMF fields from the cutting or gouging circuit:
- 8.d.1. Route the torch and work cables together - Secure them with tape when possible.
 - 8.d.2. Never coil the torch cable around your body.
 - 8.d.3. Do not place your body between the torch and work cables. If the torch cable is on your right side, the work cable should also be on your right side.
 - 8.d.4. Connect the work cable to the workpiece as close as possible to the area being cut or gouged.
 - 8.d.5. Do not work next to cutting power source.

Apr. '93

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.

Mar. '93

Thank You — for selecting this **QUALITY** product. We want you to take pride in operating this product ••• as much pride as we have in bringing this product to you!

Please Examine Carton and Equipment For Damage Immediately

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, Claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

Please record your equipment identification information below for future reference. This information can be found on your machine nameplate.

Model Name & Number _____

Code & Serial Number _____

Date of Purchase _____

Whenever you request replacement parts for or information on this equipment always supply the information you have recorded above.

Read this Operators Manual completely before attempting to use this equipment. Save this manual and keep it handy for quick reference. Pay particular attention to the safety instructions we have provided for your protection. The level of seriousness to be applied to each is explained below:

⚠ WARNING

This statement appears where the information **must** be followed **exactly** to avoid **serious personal injury** or **loss of life**.

⚠ CAUTION

This statement appears where the information **must** be followed to avoid **minor personal injury** or **damage to this equipment**.

Installation.....	Section A
Technical Specifications	A-1
Safety Precautions	A-2
Select Proper Location	A-2
Stacking.....	A-2
Lifting and Moving	A-2
Tilting	A-2
High Frequency Interference Protection.....	A-2
Input Electrical Connections	A-3
Input Power Cord Connector Installation.....	A-3
Cord Removal	A-3
Cord Installation	A-3
Frame Grounding	A-4
Input Voltage Reconnection Procedure.....	A-4
Use on Engine Driven Power Supplies	A-4
Gas Input Connections.....	A-5
Output Connections.....	A-5
Torch Connection.....	A-5

Operation.....	Section B
Safety Precautions	B-1
Description	B-1
Preheat Temperature for Plasma Cutting.....	B-1
User Responsibility.....	B-2
Recommended Processes and Equipment.....	B-2
Operational Features and Controls	B-2
Design Features and Advantages	B-2
Cutting Capability	B-3
Consumable Life	B-3
Limitations	B-4
Controls and Settings	B-4
Pilot Arc Discussion.....	B-6
Procedure Recommendations.....	B-6
General	B-6
Thin Gauge Sheet Metal	B-6
Thick Sections of Metal	B-6
Suggestions for Extra Utility from the PYTHON System.....	B-7
Machine Interface.....	B-7

Accessories	Section C
Genuine Lincoln Parts	C-1
General Options / Accessories	C-1

Maintenance	Section D
Safety Precautions	D-1
Input Filter Capacitor Discharge Procedure	D-1
Routine Maintenance.....	D-2
Periodic Maintenance	D-2

Troubleshooting	Section E
Safety Precautions.....	E-1
How to Use Troubleshooting Guide.....	E-1
Troubleshooting Guide	E-2

Wiring Diagrams	Section F
Wiring Diagram - Code 10627	F-1
Wiring Diagram - Code 10656	F-2
Dimension Print.....	F-3

Parts List	P342 Series
-------------------------	--------------------

TECHNICAL SPECIFICATIONS - PYTHON

INPUT							
THREE PHASE				SINGLE PHASE			
Standard Voltage	Input Current at Rated Output	Model		Standard Voltage	Input Current at Rated Output	Model	
208/230/460 460/575	48/44/25 28/20	50/60 Hz 50/60 Hz		208/230/460	87/81/48	50/60Hz	
RATED OUTPUT							
Duty Cycle	AMPS			VOLTS			
60% Duty Cycle	80			140			
100% Duty Cycle	60			130			
OUTPUT							
Current Range	Open Circuit Voltage			Pilot Current			
35-85 Amps	MAX 335 VDC			20 Amps @ 100% Duty Cycle			
REQUIRED GAS FLOW RATE				REQUIRED GAS INLET PRESSURE			
70 PSI @ 480 SCFH (4.8 Bar. @ 13550 LHR)				80 to 120 PSI (5.4 Bar. to 8.1 Bar.)			
RECOMMEND INPUT WIRE AND FUSE SIZES							
For all plasma cutting applications Based on U.S. National Electrical Code Ambient Temperature 30°C or Less							
RECOMMENDED INPUT WIRE AND FUSE SIZES							
THREE PHASE				SINGLE PHASE			
Input Voltage Frequency ⁽¹⁾	Fuse (Superlag) or Breaker Size	Type 75°C Copper Wire in Conduit AWG (IEC) Sizes	Type 75°C Copper Ground Wire in Conduit AWG (IEC) Sizes	Input Voltage Frequency ⁽¹⁾	Fuse (Superlag) or Breaker Size	Type 75°C Copper Wire in Conduit AWG (IEC) Sizes	Type 75°C Copper Ground Wire in Conduit AWG (IEC) Sizes
208/50/60	60	8 (8.4mm ²)	8 (8.4mm ²)	208/50/60	100	4 (21.1mm ²)	4 (21.1mm ²)
230/50/60	60	8 (8.4mm ²)	8 (8.4mm ²)	230/50/60	100	4 (21.1mm ²)	4 (21.1mm ²)
460/50/60	40	10 (6mm ²)	10 (6mm ²)	460/50/60	60	8 (8.4mm ²)	8 (8.4mm ²)
575/50/60	30	10 (6mm ²)	10 (6mm ²)				
PHYSICAL DIMENSIONS							
Height	Width	Depth	Weight Including Machine, Torch and Torch Cable (Length)				
16.5 in. 419 mm	13.75 in. 349 mm	29.5 in. 749 mm	(25ft/7.6m) 103 lbs. 46.8 kg.				

(1) Input voltage must be within ±10% of rated value.

Read entire Installation Section before installing the PYTHON.

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK CAN KILL.



- Only qualified personnel should install this machine.
- Turn the input power OFF at the disconnect switch or fuse box and discharge input capacitors before working inside the equipment.
- Do not touch electrically hot parts.
- Always connect the PYTHON grounding terminal (located on the side of the Case Back Assembly) to a good electrical earth ground.
- Turn the PYTHON Power Switch OFF when connecting power cord to input power.

SELECT PROPER LOCATION

Place the PYTHON where clean cool air can freely circulate in through the rear louvers and out through the side/bottom openings. Dirt, dust or any foreign material that can be drawn into the machine should be kept at a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance shutdown of the machine.

A source of clean, dry air or nitrogen must be supplied to the PYTHON. Oil in the air is a severe problem and must be avoided. The supply pressure must be between 80 and 120 psi. The flow rate is approximately 8.0 cfm (227 l/min.). Failure to observe these precautions could result in excessive operating temperatures or damage to the torch.

STACKING

The PYTHON cannot be stacked.

LIFTING AND MOVING

Either the front or rear handles or both may be used to lift or move the machine.

DO NOT use the pull handle on the optional undercarriage, if installed, to lift the machine. This handle is not designed to support the full weight of the machine and using it to lift the machine could cause personal injury or damage to the machine.

TILTING

The PYTHON must be placed on a stable, level surface so it will not topple over.

HIGH FREQUENCY INTERFERENCE PROTECTION

The PYTHON employs a touch start mechanism for arc initiation which eliminates high frequency emissions from the machine as compared with spark gap and solid state type high frequency generators. Keep in mind, though, that these machines may be used in an environment where other high frequency generating machines are operating. By taking the following steps, high frequency interference into the PYTHON can be minimized

- (1) Make sure the power supply chassis is connected to a good earth ground. The work terminal ground does NOT ground the machine frame.
- (2) Keep the work ground clamp isolated from other work clamps that have high frequency.
- (3) If the ground clamp cannot be isolated, then keep the clamp as far as possible from other work clamp connections.
- (4) When the machine is enclosed in a metal building, several good earth driven electrical grounds around the periphery of the building are recommended.

Failure to observe these recommended installation procedures may cause improper function of the PYTHON or possibly even damage to the control system or power supply components.

INPUT ELECTRICAL CONNECTIONS

Before installing the machine, check that input supply voltage, phase, and frequency are the same as the machine's voltage, phase, and frequency as specified on the machine's rating plate.

The PYTHON should be connected only by a qualified electrician. Installation should be made in accordance with all local and national codes (eg: U.S. National Electrical Code) and the information detailed below.

POWER INPUT CONNECTION

The PYTHON as received directly from the factory is internally connected for the higher input voltage. Re-connection will be necessary if the lower input voltage is used.

INPUT POWER CORD CONNECTOR INSTALLATION

A cord connector provides a strain relief for the input power cord as it passes through the left rear access hole. The cord connector is designed for a cord diameter of .40 - 1.03 in (10.2 - 26.2mm) if it becomes necessary to install a different input cord.

CORD REMOVAL:

1. Unplug line cord from the receptacle.

NOTE: DO NOT PERFORM THE NEXT STEP UNTIL

WARNING

THE HIGH VOLTAGES INSIDE THE MACHINE HAVE BEEN ALLOWED TO DISSIPATE, APPROXIMATELY TWO MINUTES.

2. Remove wraparound by unscrewing the eleven screws on the case sides and top.
3. Unscrew the four screws that hold the line switch onto the case front.
4. Pull the line switch out of the case front.
5. Angle the line switch so the nuts on the switch can be loosened.
6. Remove the cord from the switch.
7. Remove the nut, lock washer, plain washer and green lead off of the ground screw assembly.
8. Loosen the cable connector on the case back.

9. Pull the line cord out of the machine.

CORD INSTALLATION:

1. Feed the new cord through the cable connector and into the machine.
2. If the ground screw assembly is loose, tighten the assembly to the base before installing the new ground lead. Install the green lead on the ground screw assembly, replace the plain washer and lock washer, then tighten nut. Install in accordance with all local and national electrical codes.
3. Connect the new cord to the switch, observing the color code on the wiring diagram.
4. Feed the line switch back into case front.
5. Replace the four screws that hold the line switch onto the case front.
6. Tighten the cable connector on the case back.
7. Replace wraparound and tighten the eleven screws on the case sides and top.
8. Connect the new input power cord to a fused three phase power supply. Make sure the green lead is connected to the panel and the panel is connected to a good earth ground. Install in accordance with all local and national electric codes.

NOTE: Fusing requirements of the machine input will change, depending on whether the machine is used on single phase or three phase. Use the chart in the TECHNICAL SPECIFICATIONS to change the fuses to the proper value.

FRAME GROUNDING

The frame of the PYTHON must be properly grounded. A ground terminal marked \oplus is mounted on the case bottom directly behind the input power switch for this purpose. The cable that is sent attached to the machine is connected to this ground terminal. See the National Electric Code for details on proper grounding methods. Install in accordance with all local and national electrical codes.

INPUT VOLTAGE RECONNECTION PROCEDURE

To reconnect the PYTHON, follow the directions as outlined below. Follow this procedure **ONLY** while the PYTHON is disconnected from the input power and the capacitors have properly discharged.

1. Open the access door on the side of the machine.
2. For 200 to 230 : Position the large switch to 200-230.
For 400 to 460 : Position the large switch to 400-460.
For 550 to 575 : Position the large switch to 550-575.
3. Move the "A" lead to the appropriate terminal.

USE ON ENGINE DRIVEN POWER SUPPLIES

The PYTHON can be used on engine driven power supplies. However, the following AC Wave Form Voltage and Input Power Restrictions do apply.

AC Wave Form Restrictions

The PYTHON can be operated on engine driven generators as long as the engine drive output meets the following conditions:

The AC wave form frequency is between 45 and 65 Hz.

For 200 - 230 VAC Supplies:

The AC wave form peak voltage must be below 420 volts.

The RMS voltage must be 230VAC +/- 15%.

* The 230 VAC auxiliaries of Lincoln engine drives meet these conditions when run in the high idle mode.

For 460 VAC Supplies:

The AC wave form peak voltage must be below 840 volts.

The RMS voltage of the AC wave form must be 460 VAC +/- 10%.

Input Power Restrictions

The available output current of the PYTHON may be limited due to the output capacity of the engine driven power supply. The following are recommended output current settings when used with various Lincoln engine driven power supplies.

Engine Drive	Auxiliary Power	PYTHON Output	Cut Thickness
RANGER 8	(8KW)	30 Amps	5/16
RANGER 9	(9KW)	40 Amps	3/8
GX271	(8KW)	30 Amps	5/16
RANGER 275	(9KW)	40 Amps	3/8
RANGER 300D	(12KW)	55 Amps	5/8
COMMANDER 300	(10KW)	45 Amps	1/2
COMMANDER 400	(10KW)	45 Amps	1/2
COMMANDER 500	(12KW)	55 Amps	5/8

GAS INPUT CONNECTIONS

Supply the PYTHON with clean compressed air or nitrogen.

- Supply pressure must be between 80 psi and 120 psi.
- Flow rate should be approximately 8.0 cfm (227 l/min.).

NOTE: Oil in the air supply to the PYTHON can cause severe problems. Use only a clean air supply.

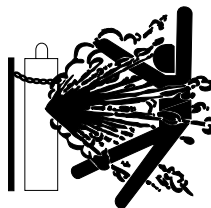
- Connect the gas supply to the PYTHON regulator.
- Compressed gas should be supplied to the fitting connection mounted on the filter at the rear of the machine. If necessary, this fitting can be removed allowing plumbing access through the 1/4" NPT input port on the filter body.

NOTE: When using nitrogen gas from a cylinder, the cylinder must have a pressure regulator.

- Maximum psi from the nitrogen gas cylinder to the PYTHON regulator should never exceed 120 psi.
- Install a hose between the nitrogen gas cylinder regulator and the PYTHON gas inlet.

⚠ WARNING

CYLINDER could explode if damaged.



- Keep cylinder upright and chained to a fixed support.
- Keep cylinder away from areas where it could be damaged.
- Never lift machine with cylinder attached.
- Never allow the cutting torch to touch the cylinder.
- Keep cylinder away from live electrical parts.
- Maximum inlet pressure 120 psi.

OUTPUT CONNECTIONS

Torch Connection

The PYTHON is sent from the factory with a PCT 80 cutting torch. Additional cutting torches can be ordered from the K1571 series. Hand-held and mechanized torches come with 25' or 50' cables.

All torches are connected to the PYTHON with a quick connect on the casefront for easy change over. This feature is excellent for changing between a hand cutting torch and a mechanized torch.

For more information on the torch and its components, refer to the PCT80 Operator's Manual (IM588 latest version).

Read and understand this entire section before operating the machine.

SAFETY PRECAUTIONS

⚠ WARNING



ELECTRIC SHOCK can kill.

- Do not touch electrically live parts or electrode with skin or wet clothing.
- Insulate yourself from work and ground.
- Always wear dry insulating gloves.



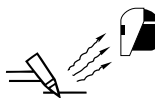
FUMES AND GASES can be dangerous.

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



WELDING, CUTTING and GOUGING SPARKS can cause fire or explosion

- Keep flammable material away.
- Do not weld, cut or gouge on containers that have held combustibles.



ARC RAYS can burn.

- Wear eye, ear and body protection.



PLASMA ARC can injure

- Keep your body away from nozzle and plasma arc.
- Operate the pilot arc with caution. The pilot arc is capable of burning the operator, others or even piercing safety clothing.

Observe additional Safety Guidelines detailed in the beginning of this manual.

DESCRIPTION

The PYTHON is a constant current, continuous control plasma cutting power source. It provides superior and reliable starting characteristics, cutting visibility and arc stability. When cutting expanded metal, the PYTHON out performs the competition due to its quick, clean response to arc transfers. The power supply design provides high transfer-to-cut distances which makes pierce cutting more reliable and with less nozzle wear. The control system has a safety mechanism to insure that the nozzle and electrode are in place before cutting or gouging. This is extremely important due to the high voltages involved.

The PYTHON comes standard with an air regulator, coarse air filter, and pressure gauge. There are six different torch and cable systems to choose from: hand-held torch with 25' or 50' cable, machine and robotic torch both with 25' and 50' cable. Consumables are included so that cutting can begin right out of the box. Consumables can also be ordered as individual packages.

The PYTHON initiates the plasma arc with a simple, yet reliable, touch start mechanism. This system eliminates many of the failure problems associated with high-frequency start systems. The PYTHON is capable of cutting with nitrogen or air.

The PYTHON is controlled by a microprocessor-based control board. The machine performs rudimentary self troubleshooting when powered up which aids in field servicing.

PREHEAT TEMPERATURE FOR PLASMA CUTTING

Preheat temperature control is not necessary in most applications when plasma arc cutting or gouging. Preheat temperature control may be necessary on high carbon alloy steels and heat treated aluminum for crack resistance and hardness control. Job conditions, prevailing codes, alloy level, and other considerations may also require preheat temperature control. The following minimum preheat temperature is recommended as a starting point. Higher temperatures may be used as required by the job conditions and/or prevailing codes. If cracking or excessive hardness occurs on the cut face, higher preheat temperature may be required. The recommended minimum preheat temperature for plate thickness up to 1/2" (12.7mm) is 70°F (21.1°C).

USER RESPONSIBILITY

Because design, fabrication, erection and cutting variables affect the results obtained in applying this type of information, the serviceability of a product or structure is the responsibility of the user. Variation such as plate chemistry, plate surface condition (oil, scale), plate thickness, preheat, quench, gas type, gas flow rate and equipment may produce results different than those expected. Some adjustments to procedures may be necessary to compensate for unique individual conditions. Test all procedures duplicating actual field conditions.

RECOMMENDED PROCESSES AND EQUIPMENT

The PYTHON is capable of all cutting and gouging applications within its output capacity of 35 to 85 amps. These applications include thin gage sheet metal and expanded metal.

OPERATIONAL FEATURES AND CONTROLS

The PYTHON comes with an ON/OFF POWER SWITCH, OUTPUT CURRENT CONTROL, PURGE BUTTON and a SAFETY RESET BUTTON.

DESIGN FEATURES AND ADVANTAGES

The microprocessor controlled PYTHON design makes plasma cutting and gouging tasks uncomplicated. This list of design features and advantages will help you understand the machine's total capabilities so that you can get maximum use from your machine.

- Input over voltage protection.
- Bright 3.0 second timed pilot arc.
- Purge momentary push button.
- Air regulator and pressure gage located on the front of machine for convenience.
- Parts-in-Place mechanism to detect proper installation of consumables and torch.
- Latching Parts-in-Place mechanism. Requires a positive operator reset.
- Automatic detection of faulty output control.
- In line coarse air filter.
- Preflow/Postflow timing. Preflow is eliminated if arc is re-initiated in Postflow.
- Thermostatic Protection.
- Solid state over-current protection.
- Works with pure nitrogen for cutting nonferrous materials.
- Reconnectable for multiple input voltages.
- Quick disconnect torch.
- Dead front display for machine status.
- Unique electrode and Vortech™ nozzle design for optimum cooling and long life.
- Swirl texture inside Vortech™ nozzle for better starting reliability and higher quality cuts.
- Unique drag cup design for durability and elimination of double arcing.
- Portable design for industrial use.
- Continuous output control, 35 - 85 amps.
- Reliable touch start mechanism for plasma arc initiation.
- Unique microprocessor controlled starting sequence for safe and consistent starting.
- Rapid arc transfer for fast cutting of expanded metal.
- High transfer distance for ease of use.
- Soft start of input filter capacitors at start up.

CUTTING CAPABILITY

The PYTHON is rated at 80 amps, at 60% duty cycle on a 10 minute basis or 60 amps, at 100% duty cycle. If the duty cycle is exceeded, a thermal protector will shut off the output of the machine until it cools to the normal operating temperature.

Figure B.1 shows the cut capacity of the PYTHON when cutting mild steel. The graph plots cut thickness vs. torch travel speed with a torch standoff of 0.15". Example: 0.5" material may be cut at a setting of 55 amps at an approximate speed of 25 IPM or at a setting of 80 amps at an approximate speed of 35 IPM.

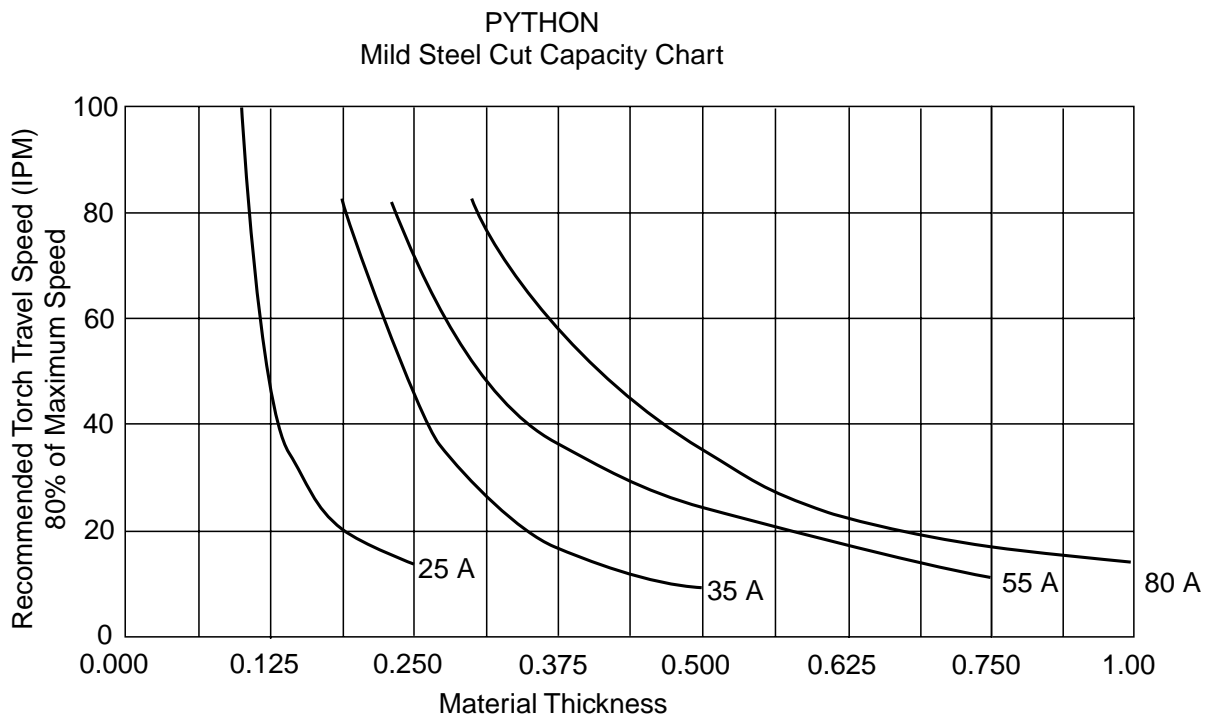


Figure B.1

CONSUMABLE LIFE

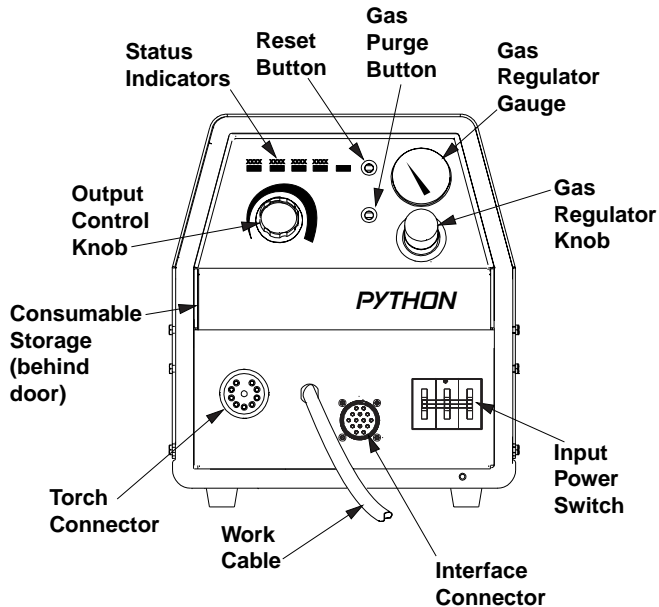
The expected life for the PYTHON's electrode under normal operating conditions is approximately 160 starts/cuts. An erosion of .060" is typical for end of electrode life, however, the electrode life may last longer. A green and erratic arc will indicate definite electrode failure and the electrode should be replaced immediately.

It is recommended that consumables be replaced in complete sets. (Example: Electrode and Nozzle). This will maximize the performance of the PYTHON system.

LIMITATIONS

Do not exceed the output current and duty cycle rating of machine. Do not use the PYTHON for pipe thawing.

CONTROLS AND SETTINGS



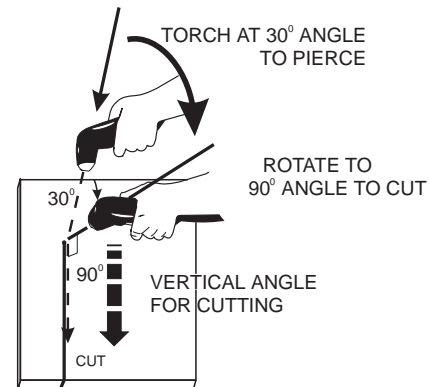
When preparing to cut or gouge, position the machine as close to the work as possible. Make sure you have all materials needed to complete the job and have taken all safety precautions. It is important to follow these operating steps each time you use the machine.

- Turn the machine's ON/OFF POWER SWITCH to OFF position.
- Connect the air supply to the machine.
- Turn the main power and the machine power switch on.
 - The fan should start.
 - The pre-charge circuit will operate for 3 seconds, then the green "Power" LED should turn on.
 - If the "SAFETY" LED is lit, push the "Reset" button. If there is no problem, the LED will go off. If there is a problem, refer to Step "SAFETY LED" in this section.
- Be sure that the work lead is clamped to the workpiece before cutting.
- Set the output current control knob at maximum position for high cutting speed and less dross formation. Reduce the current, if desired to reduce the kerf (cut) width, heat affected zone or travel speed

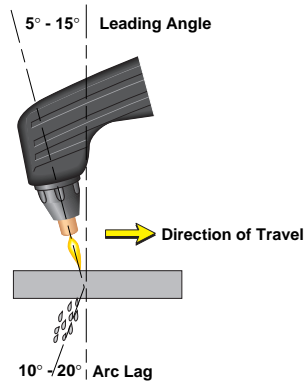
as required.

- Push-in and hold the Purge button to check or set the gas pressure. Pull the pressure regulator cap out and turn it to set the pressure.
 - Adjust the gas regulator for 70 PSI for 25' torches or 75 PSI for 50' torches.
 - Release the Purge button.
 - The gas will immediately turn off. The pressure gage may show an increase in pressure after the air turns off but this is normal. Do NOT reset the pressure while the air is NOT flowing.
- When ready to cut, place the torch near the work, make certain all safety precautions have been taken and pull the trigger.
 - The air will flow for a preflow time of 2 seconds and the pilot arc will start. (This is true unless the machine is in postflow, then the preflow time is skipped and the pilot arc will start immediately.)
 - The pilot arc will run for 3.0 seconds and shut off unless the arc is brought in contact with the work and the arc is transferred. Avoid excessive pilot arc time by transferring the arc to the workpiece quickly to improve parts life.
 - When the arc is brought within 1/4" from the work piece: the arc will transfer, the current will ramp up to the setting on the control panel, and the cut can last indefinitely (or until the duty cycle of the PYTHON is exceeded). Do not touch the nozzle to the work when cutting with the control panel setting above 45 Amps or damage to the consumables will result.

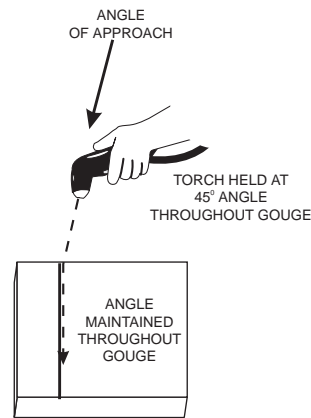
- Pierce the work piece by slowly lowering the torch onto the metal at a 30° angle away from the operator. This will blow the dross away from the torch tip. Slowly rotate the torch to vertical position as the arc becomes deeper.



- Hold the nozzle standoff 1/8" (3.2mm) to 3/16" (4.7mm) above the workpiece during cutting. Do not let the nozzle touch the work or carry a long arc.
- Keep moving while cutting. Cut at a steady speed without pausing. Maintain the cutting speed so that the arc lag is 10° to 20° behind the travel direction.



- Use a 5° - 15° leading angle in the direction of the cut.
- Use the drag cup to maintain constant standoff for better cut quality and to protect the nozzle from spatter.
- Use the drag cup with a metal template to prevent nozzle double arcing.
- Finish the cut and release the trigger.
- When the trigger is released, the arc will stop.
 - The gas will continue to flow for 10 seconds of postflow. If the trigger is activated within this time period, the pilot arc will immediately restart.
- If the dross is difficult to remove, reduce the cutting speed. High speed dross is more difficult to remove than low speed dross.
- The right side of the cut is more square than the left as viewed along the direction of travel.
- Tilt the torch about 45° from the workpiece and hold the nozzle 1/8" (3.2mm) to 3/16" (4.7mm) above the workpiece for gouging.
- Clean spatter and scale from the nozzle and drag cup frequently.



- If the "SAFETY" LED lights at any time, check the following:

⚠ WARNING

ELECTRIC SHOCK CAN KILL.



- Turn off machine at the disconnect switch on the front of the machine before tightening, cleaning or replacing consumables.

- Check the assembly of the torch consumables. If they are not properly in place, the machine will not start. **Make sure that the shield cup is hand tight. Do not use pliers or over tighten.**
- Check the conditions of the inside of the nozzle. If debris has collected, rub the electrode on the inside bottom of the nozzle to remove any oxide layer that may have built up. Refer to "Suggestions for Extra Utility from the PYTHON system".
- Check the condition of the electrode. If the end has a crater-like appearance, replace it along with the nozzle. The maximum wear depth of the electrode is approximately .062". A green and erratic arc will indicate definite electrode failure and the electrode should be replaced immediately.
- Replace the nozzle when the orifice exit is eroded away or oval shaped.
- After the problem is found, or if there is nothing apparently wrong, reset the machine by pressing the "Reset" button. (It is possible for electrical noise to trip the safety circuit on rare occasions. This should not be a regular occurrence.)
- If the machine does not reset or continues to trip, consult the Troubleshooting Section.
- Use the proper cutting or gouging procedures referred to in Procedure Recommendations.

PILOT ARC DISCUSSION

The PYTHON has a smooth, continuous pilot arc. The pilot arc is only a means of transferring the arc to the workpiece for cutting. Repeated pilot arc starts, in rapid succession, is not recommended as these starts will generally reduce consumable life. Occasionally, the pilot arc may sputter or start intermittently. This is aggravated when the consumables are worn or the air pressure is too high. Always keep in mind that the pilot arc is designed to transfer the arc to the workpiece and not for numerous starts without cutting.

When the pilot arc is started, a slight impulse will be felt in the torch handle. This occurrence is normal and is the mechanism which starts the plasma arc. This impulse can also be used to help troubleshoot a "no start" condition.

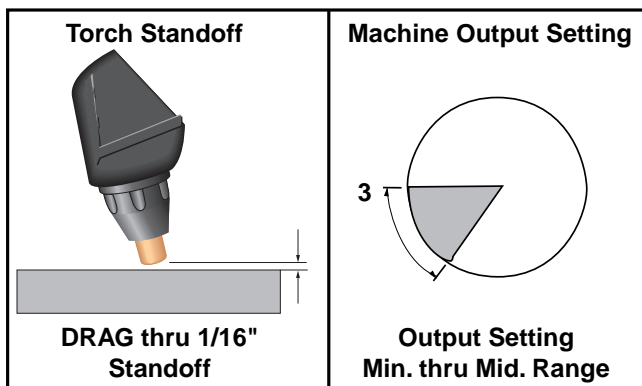
PROCEDURE RECOMMENDATIONS

When properly used, plasma arc cutting or gouging is a very economical process. Improper use will result in a very high operating cost.

General - In All Cases

- Follow safety precautions as printed throughout this operating manual and on the machine.

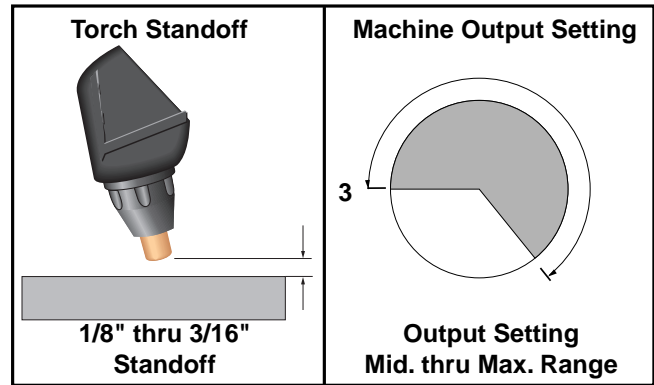
Thin Gauge Sheet Metal:



Output set below 45 Amps. (Approximately 3 on the scale).

- The nozzle may be dragged on the metal surface, touching it lightly to the surface after piercing a hole. Current control should be set below the mid range.
- Do not allow cable or body to contact hot surface.

Thick Sections of Metal



Output set above 45 Amps. (Approximately 3 on the scale).

- The best quality and consumable life will be obtained by holding the torch off the surface about 3/16". Too long an arc may compromise cut quality and consumable life. The nozzle should NOT be dragged on the work.
- Use of the S22151 Drag Cup will maintain the proper standoff and eliminate nozzle double arcing.
- If piercing is required, slowly lower the torch at an angle of about 30° to blow the dross away from the torch tip and slowly rotate the torch to a vertical position as the arc becomes deeper. This process will blow a lot of molten metal and dross. Be careful! Blow the dross away from the torch, the operator and any flammable objects.
- Where possible, start the cut from the edge of the work piece.
- Keep moving! A steady speed is necessary. Do not pause.
- Do not allow torch cable or body to contact hot surface.

Suggestions for Extra Utility from the PYTHON System:

⚠ WARNING



ELECTRIC SHOCK CAN KILL.

- Turn off machine at the disconnect switch on the front of the machine before tightening, cleaning or replacing consumables.

1. Occasionally an oxide layer may form over the tip of the electrode, creating an insulating barrier between the electrode and nozzle. This will result in the tripping of the PYTHON's safety circuit. When this happens turn the power off, remove the nozzle and electrode and use the electrode to rub against the inside bottom surface of the nozzle. This will help remove any oxide buildup. Replace the nozzle, turn on the power and continue cutting. If the Parts-in-Place circuit continues to trip after cleaning the consumables, then replace them with a new set. Do not continue to try and cut with excessively worn consumables as this can cause damage to the torch head and will degrade cut quality.
2. To improve consumable life, here are some suggestions that may be useful:
 - a. Never drag the nozzle on the work surface if the output control knob is set above 3. (Approximately 45 amps output).
 - b. Make sure the air supply to the PYTHON is clean and free of oil. Use several extra in line filters if necessary.
 - c. Use the lowest output setting possible to make a good quality cut at the desired cut speed.
 - d. Minimize dross buildup on the nozzle tip by starting the cut from the edge of the plate when possible.
 - e. Pierce cutting should be done only when necessary. If piercing, angle torch about 30° from the plane perpendicular to the work piece, transfer the arc, then bring the torch perpendicular to the work and begin parallel movement.
 - f. Reduce the number of pilot arc starts without transferring to the work.
 - g. Reduce the pilot arc time before transferring to the work.

- h. Set air pressure to recommended setting. A higher or lower pressure will cause turbulence in the plasma arc, eroding the orifice of the nozzle tip.
- i. Use only Lincoln consumable parts. These parts are patented and using any other replacement consumables may cause damage to the torch or reduce cut quality.

MACHINE INTERFACE

The PYTHON comes standard with a machine interface. Interface signals provided include: arc start, arc initiated, and arc voltage. These signals are accessible through the 14 pin MS connector on the case front.

ARC START:

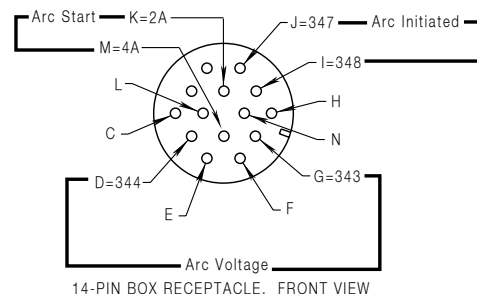
The Arc Start circuit allows for triggering of the power source to commence cutting. This circuit can be accessed through pins K and M of the 14 pin MS connector. The circuit has a 17 VDC nominal open circuit voltage and requires a dry contact closure to activate.

ARC INITIATED:

The Arc Initiated circuit provides information as to when a cutting arc has transferred to the work piece. This circuit can be accessed through pins I and J of the 14 pin MS connector. The circuit provides a dry contact closure when the arc has transferred. Input to this circuit should be limited to 0.3 A for either 120VAC or 30VDC.

ARC VOLTAGE:

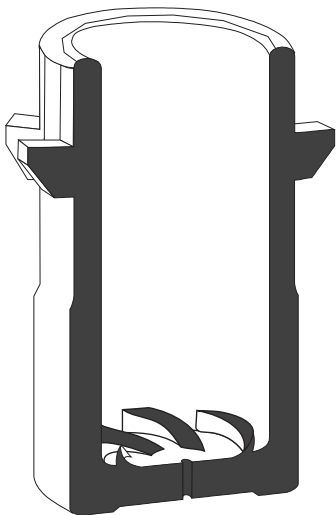
The Arc Voltage circuit can be used for activating a torch height control. This circuit can be accessed through pins D and G of the 14 pin MS connector. The circuit provides full electrode to work arc voltage (no voltage divider, 335VDC maximum).



Users wishing to utilize the Machine Interface can order a K867 Universal Adapter (please adhere to the pin locations stated above) or manufacture a 14 pin MS connector cable assembly.

ALWAYS USE GENUINE LINCOLN ELECTRIC ELECTRODES AND VORTECH™ NOZZLES

- Only Genuine Lincoln Electric consumables yield the best cutting performance for the PYTHON.
- The patent pending VORTECH™ nozzle provides an extra “kick” of swirl as the arc exits the nozzle which improves cutting performance. No other nozzle has this capability or can match its performance.



GENERAL OPTIONS / ACCESSORIES

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

K1681-2 Undercarriage - A valet style undercarriage with pull-out handle for machine only. Provides Torch and Work Cable storage.

S22147-043 - VORTECH™ nozzle with an .043” (1.2 mm) Orifice (for 35 - 60 Amps)

S22147-053 - VORTECH™ nozzle with an .053” (1.3 mm) Orifice (for 60 - 85 Amps)

S22147-082 - VORTECH™ nozzle with an .082” (2.1 mm) Orifice (for Gouging at 60 - 85 Amps)

S22149 - Electrode - replacement electrodes for cutting.

S22150 - Shield Cup - This shields the torch tip and provides more visibility to the workpiece than the drag cup. Note the shield cup does not prevent the torch tip from touching the workpiece.

S22151 - Drag Cup - The drag cup protects the torch by preventing the torch from touching the workpiece.

K1571 Series - PCT 80 Torches come in 25’ and 50’ lengths in either hand held or mechanized versions.

⚠ WARNING

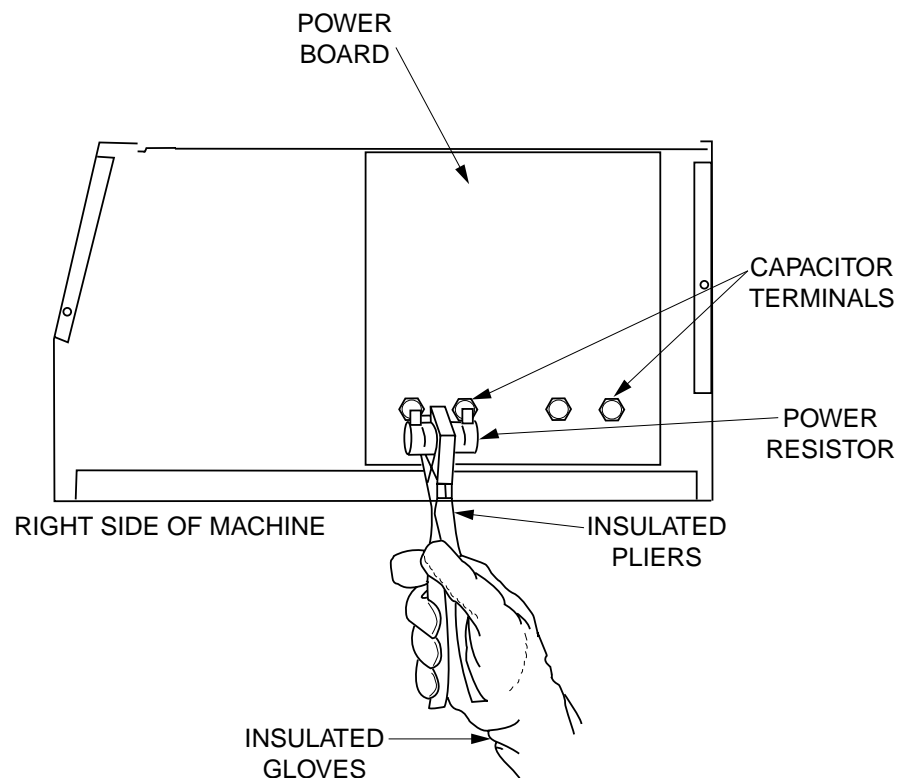
ELECTRIC SHOCK can kill.

- 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.
- Prior to Performing preventative maintenance, perform the following capacitor discharge procedure to avoid electric shock.

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE

1. Turn off input power or disconnect input power lines.
2. Remove the 5/16" hex head screws from the side and top of the machine and remove wrap-around machine cover.
3. Be careful not to make contact with the capacitor terminals that are located on the top and bottom of the Power Board on the right side of the machine.
4. Obtain a high resistance and high wattage resistor (25-1000 ohms and 25 watts minimum). This resistor is not supplied with machine. NEVER USE A SHORTING STRAP FOR THIS PROCEDURE.
5. Locate the two capacitor terminals (large hex head cap screws) on the Power P.C. Board shown in Figure D.1.
6. Use electrically insulated gloves and insulated pliers. Hold body of the resistor and connect resistor leads across the two capacitor terminals. Hold resistor in place for 10 seconds. DO NOT TOUCH CAPACITOR TERMINALS WITH YOUR BARE HANDS.
7. Repeat discharge procedure for the other capacitor .
8. Check voltage across terminals of all capacitors with a DC voltmeter. Polarity of capacitor terminals is marked on PC board above terminals. Voltage should be zero. If any voltage remains, repeat this capacitor discharge procedure.

FIGURE D.1 — LOCATION OF INPUT FILTER CAPACITOR TERMINALS.



ROUTINE MAINTENANCE

1. Keep the cutting or gouging area and the area around the machine clean and free of combustible materials. No debris should be allowed to collect which could obstruct air flow to the machine.
2. Every 6 months or so, the machine should be cleaned with a low pressure airstream. Keeping the machine clean will result in cooler operation and higher reliability. Be sure to clean these areas:
 - Power, Output and Control printed circuit boards and heat sinks
 - Power switch
 - Main Transformer
 - Input Rectifier
3. Examine the sheet metal case for dents or breakage. Repair the case as required. Keep the case in good condition to insure that high voltage parts are protected and correct spacings are maintained. All external sheet metal screws must be in place to insure case strength and electrical ground continuity.
4. Check the air regulator filter to be sure it does not become clogged. The air filter on the machine is self draining and will not have to be emptied.
5. Check the filter element every several months to see if it is clogged (weekly in very dirty environments). Replace if necessary by first removing the two screws that attach the filter cage to the back panel assembly, then slide the cage away from the back of the machine and remove. Next, twist the clear filter bowl until it comes off (be careful not to lose the o-ring seated at the top of the bowl threads). Unscrew the filter element and replace with new element. Assemble parts in reverse order as described above.
6. Inspect the cable periodically for any slits or puncture marks in the cable jacket. Replace if necessary. Check to make sure that nothing is crushing the cable and blocking the flow of air through the air tube inside. Also, check for kinks in the cable periodically and relieve any so as not to restrict the flow of air to the torch.

PERIODIC MAINTENANCE

WARNING



ELECTRIC SHOCK CAN KILL.

- Turn off machine at the disconnect switch on the front of the machine before tightening, cleaning or replacing consumables.

Change consumables as required.

1. Thermal Protection

Two thermostats protect the machine from excessive operating temperatures. Excessive temperatures may be caused by a lack of cooling air or operating the machine beyond the duty cycle and output rating. If excessive operating temperatures should occur, the yellow thermal LED will light and the thermostat will prevent output voltage or current.

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 were obstructed, then the power must be switched off and the fan problem or air obstruction must be corrected.

2. Filter Capacitor Conditioning (PYTHON, 400-460 VAC or 460-575 VAC)

A protection circuit is included to monitor the voltage across filter capacitors C1 and C2. In the event that the capacitor voltage is too high, the protection circuit will prevent output. The protection circuit may prevent output providing all these circumstances are met:

- a. Machine is connected for 400-460 VAC or 460-575 VAC input.
- b. Machine did not have power applied for many months.
- c. Machine will not produce output when power is first switched on.

If these circumstances apply, the proper action is to switch the machine on and let it idle for up to 30 minutes. This is required to condition the filter capacitors after an extended storage time. The protection circuit will automatically reset once the capacitor conditioning and resultant voltage levels are acceptable. It may be necessary to turn the power switch off and back on again after this period.

HOW TO USE TROUBLESHOOTING GUIDE

WARNING

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

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

Step 1. LOCATE PROBLEM (SYMPTOM).

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

Step 2. POSSIBLE CAUSE.

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

Step 3. RECOMMENDED COURSE OF ACTION

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

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

WARNING



ELECTRIC SHOCK CAN KILL.

- Turn off machine at the disconnect switch on the front of the machine and remove main power supply connections before doing any troubleshooting.

CAUTION

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

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
No Status indicators light and the fan does not operate 5 seconds after the power switch is turned on.	<ol style="list-style-type: none"> 1. Check the input power to be sure it is on. 2. Check the power line fuses and machine connection. 3. Disconnect input power at fuse panel and check line switch continuity. Replace line switch if bad. 4. Auxiliary transformer may be faulty. 	<p>If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.</p>
No Status indicators light 5 seconds after the power switch is turned on, but the fan operates.	<ol style="list-style-type: none"> 1. Auxiliary transformer may be faulty. 2. Disconnect input power from the machine. Check that connectors on harness between Control Bd. and Display Bd. are properly seated. 3. Possible faulty Control Board. 	
All Status indicators remain lit immediately after power up.	<ol style="list-style-type: none"> 1. The microprocessor has experienced a memory fault. Consult local Lincoln Field Service shop. 	
All Status indicators begin to blink within 5 seconds after power up. (Overvoltage Protection has been activated)	<ol style="list-style-type: none"> 1. Turn power off. Make sure reconnect is positioned correctly for the input voltage used. Wait at least 1 minute after power down before re-connecting the machine. Reconnect machine, then restore power to PYTHON. 2. Possible faulty Primary board. 3. Possible faulty Control board. 	

⚠ CAUTION

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

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
<p>The PYTHON powers up properly but there is no response when the trigger is pulled and only the POWER LED is lit.</p>	<ol style="list-style-type: none"> 1. Press Purge button on the front of the PYTHON. If air does not flow, then: <ol style="list-style-type: none"> a. Auxiliary transformer may be faulty. b. The main gas solenoid assembly may be faulty. Check or replace. c. Possible faulty Output Power board. d. Possible faulty Control board. 2. (check for continuity from the bulk-head connector to the molex) See Wiring Diagram. 3. Remove the handles (or barrel) of the torch and examine all the connections. Pay attention to location of electrode lead mounting at back of torch head, broken trigger and solenoid leads. 4. Check for proper trigger switch operation. Remove the torch cable assembly from the PYTHON and test for continuity between 9 and 1 at the quick connect when the trigger switch is depressed and no continuity when the switch is not depressed. Replace the trigger switch or torch cable if defective. 5. Possible faulty Control board. 6. Possible faulty Output Power board. 	<p>If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.</p>

 **CAUTION**

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

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
When the trigger is pulled air begins to flow, but there is no pilot arc after at least 3 seconds.	<ol style="list-style-type: none"> 1. Check the torch consumables to be sure they are not dirty or greasy, and are in good shape. Replace the consumables if necessary. 2. Make sure the air pressure is set at 70 psi. 3. Make sure there are no kinks or restrictions for air flow in the torch cable. Replace cable as needed. 4. If a slight thump cannot be felt in the torch when the trigger is pulled, check for loose connection in the torch head and solenoid assembly. 5. With machine turned off - input power removed, and torch and consumables connected - measure resistance on Output Power board between B1 and B21. If $>10\Omega$, possible fault in torch and cable assembly. 6. Possible fault in Output board. 	<p>If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.</p>
The air begins to flow and there is a very brief arc that snaps out consistently with repeated trigger pulls.	<ol style="list-style-type: none"> 1. Check the torch consumables to be sure they are in tight, not dirty or greasy and in good shape. Replace if necessary. 2. Make sure the air pressure is set at 70 psi. 3. Possible fault in Output Power board. 	
The arc starts but sputters badly.	<ol style="list-style-type: none"> 1. Check the torch consumables to be sure they are in tight, not dirty or greasy and in good shape. Replace if necessary. 2. Check air supply for oil or a great deal of water. If there is oil or a great deal of water, the air must be filtered or the machine switched to nitrogen or bottled air. 3. Make sure the air pressure is set at 70 psi. 	

 **CAUTION**

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

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
Pilot arc starts but will not transfer when brought near work.	<ol style="list-style-type: none"> 1. Check work lead connection for clean, secure connection. 2. Plasma will only cut conductive material. Do not attempt to cut fiberglass, plastic, rubber, PVC or any other non-conductive material. 3. Make sure work piece is clean and dry. Remove any scale, rust or dross. 4. Check all connections to Output board. 5. Possible faulty Control board. 	<p>If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.</p>

 **CAUTION**

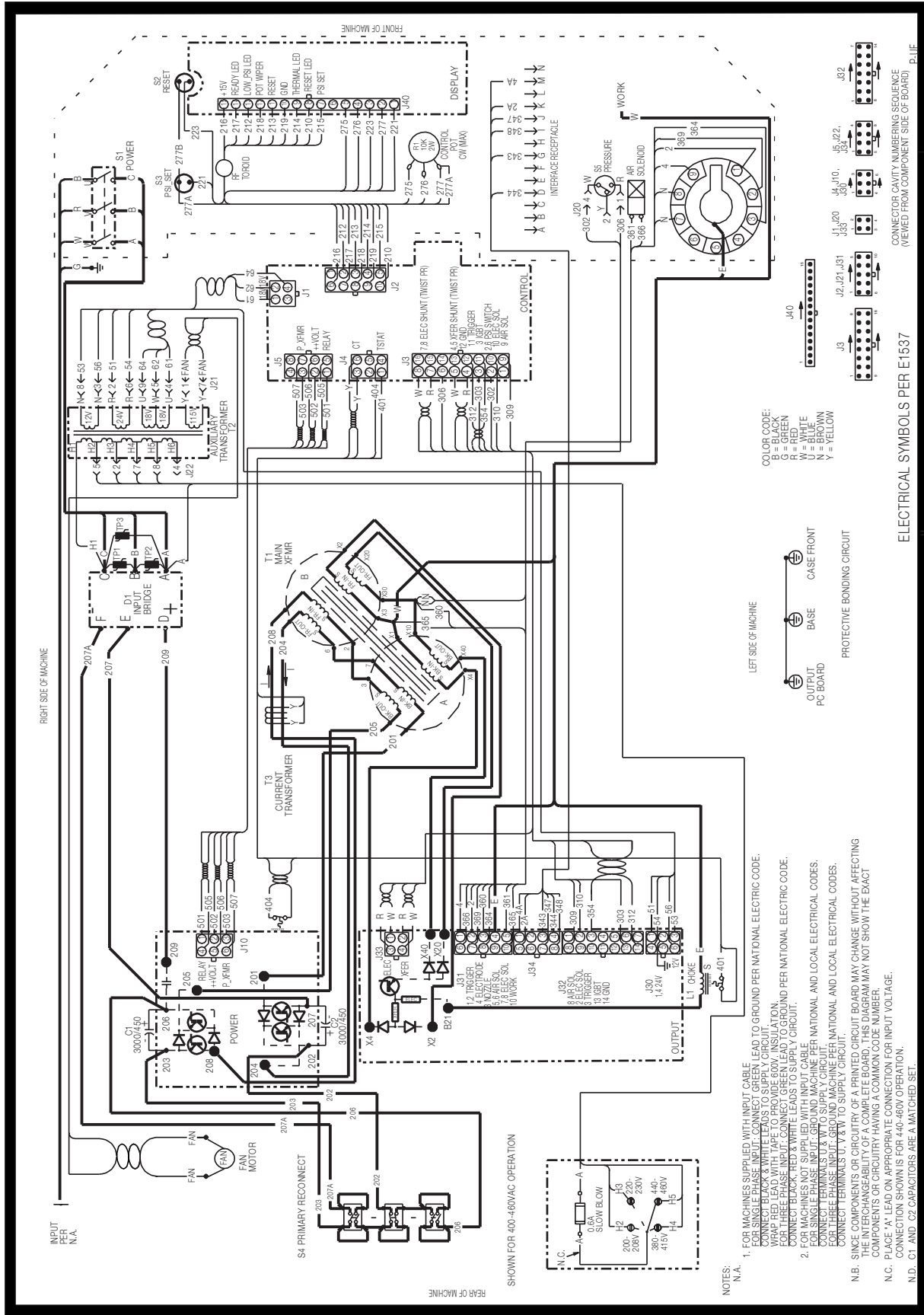
If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.

Observe all Safety Guidelines detailed throughout this manual

STATUS BOARD INDICATORS

SYMPTOM	CHECK
Machine is unresponsive immediately after power-up.	1. There is a 4 second soft start period for pre-charging the input filter capacitors. Wait until that time is up. The Power LED will light when ready. If not, refer to the first part of this section.
The Air Low LED is lit	<ol style="list-style-type: none"> 1. Make sure there is at least 80 psi connected to the gas connection at the back of the machine. 2. Press the Purge button and set the regulator to 70 psi. The pressure may increase when air stops flowing but this is normal. Do not reset the pressure while the air is OFF. 3. Possible faulty Pressure Switch. 4. Possible faulty Control board.
The Safety LED is flashing	<ol style="list-style-type: none"> 1. Make sure there is a Lincoln torch and cable assembly connected properly to the PYTHON bulk head connector. 2. Check consumables for proper installation or excessive wear. Replace if excessively worn. If not, use a piece of fine emery cloth to remove any oxide buildup on the tip of the electrode.
The Safety LED is lit and steady	1. Press the Reset button. If torch and consumables are properly installed, the Safety LED should turn off. Normal cutting or gouging can resume.
The Thermal LED is lit	<ol style="list-style-type: none"> 1. The machine's thermostat has tripped due to exceeded duty cycle limits. Do NOT turn the power off. Allow the machine to cool for 15 - 30 minutes and the thermostat will reset itself. 2. The machine's air louvers or fans are obstructed such that air cannot flow to properly cool the machine. Remove any foreign material that may block air flow. Blow the machine out with a clean, dry air stream. 3. Possible faulty Control board.
The "Ready", "Air Low" and "Thermal" LED's are flashing	<ol style="list-style-type: none"> 1. This is typically caused by connecting the auxiliary transformer input tap to the wrong voltage. Turn machine OFF and change lead to correct input voltage at reconnect panel. 2. Possible faulty Control P. C. Board.

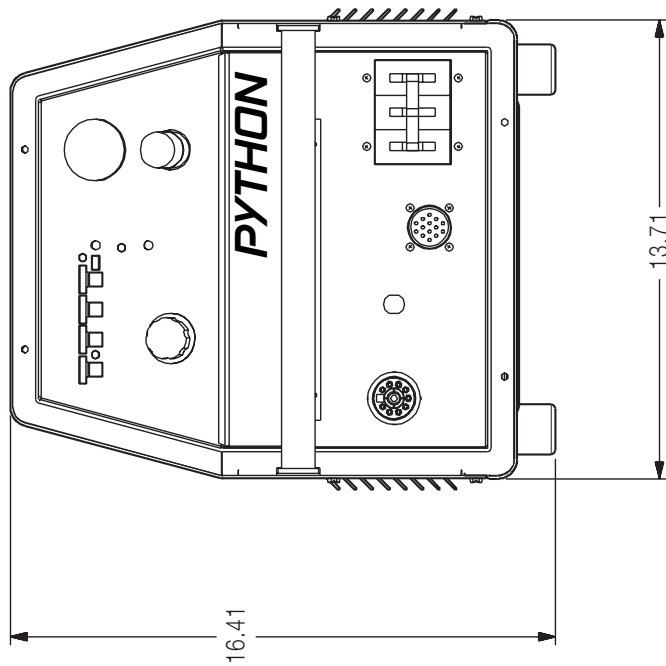
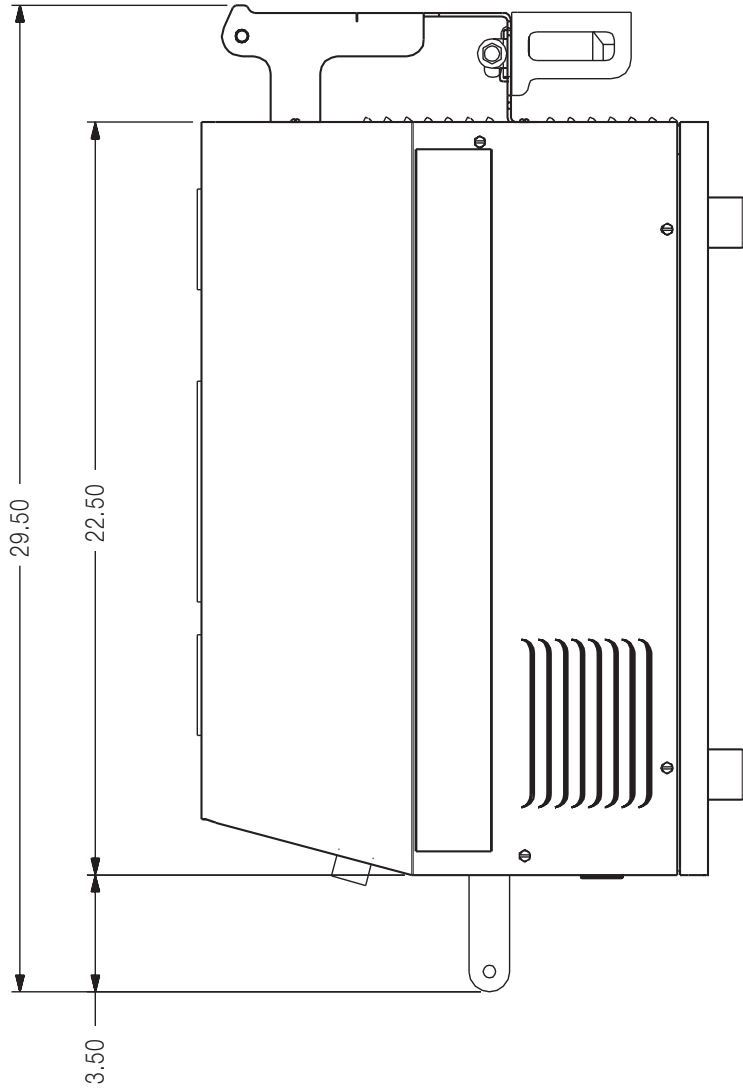
WIRING DIAGRAM - PYTHON CODE 10656



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



DIMENSION PRINT - PYTHON



NOTES

NOTES

NOTES

WARNING	<ul style="list-style-type: none"> ● Do not touch electrically live parts or electrode with skin or wet clothing. ● Insulate yourself from work and ground. 	<ul style="list-style-type: none"> ● Keep flammable materials away. 	<ul style="list-style-type: none"> ● Wear eye, ear and body protection.
Spanish AVISO DE PRECAUCION	<ul style="list-style-type: none"> ● No toque las partes o los electrodos bajo carga con la piel o ropa mojada. ● Aislese del trabajo y de la tierra. 	<ul style="list-style-type: none"> ● Mantenga el material combustible fuera del área de trabajo. 	<ul style="list-style-type: none"> ● Protéjase los ojos, los oídos y el cuerpo.
French ATTENTION	<ul style="list-style-type: none"> ● Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension. ● Isolez-vous du travail et de la terre. 	<ul style="list-style-type: none"> ● Gardez à l'écart de tout matériel inflammable. 	<ul style="list-style-type: none"> ● Protégez vos yeux, vos oreilles et votre corps.
German WARNUNG	<ul style="list-style-type: none"> ● Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! ● Isolieren Sie sich von den Elektroden und dem Erdboden! 	<ul style="list-style-type: none"> ● Entfernen Sie brennbares Material! 	<ul style="list-style-type: none"> ● Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese ATENÇÃO	<ul style="list-style-type: none"> ● Não toque partes elétricas e electrodos com a pele ou roupa molhada. ● Isole-se da peça e terra. 	<ul style="list-style-type: none"> ● Mantenha inflamáveis bem guardados. 	<ul style="list-style-type: none"> ● Use proteção para a vista, ouvido e corpo.
Japanese 注意事項	<ul style="list-style-type: none"> ● 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。 ● 施工物やアースから身体が絶縁されている様にして下さい。 	<ul style="list-style-type: none"> ● 燃えやすいものの側での溶接作業は絶対にしてはなりません。 	<ul style="list-style-type: none"> ● 目、耳及び身体に保護具をして下さい。
Chinese 警告	<ul style="list-style-type: none"> ● 皮肤或湿衣物切勿接触带电部件及焊条。 ● 使你自已与地面和工作件绝缘。 	<ul style="list-style-type: none"> ● 把一切易燃物品移离工作场所。 	<ul style="list-style-type: none"> ● 佩戴眼、耳及身体劳动保护用具。
Korean 위험	<ul style="list-style-type: none"> ● 전도체나 용접봉을 젖은 헝겊 또는 피부로 절대 접촉치 마십시오. ● 모재와 접지를 접촉치 마십시오. 	<ul style="list-style-type: none"> ● 인화성 물질을 접근시키지 마십시오. 	<ul style="list-style-type: none"> ● 눈, 귀와 몸에 보호장구를 착용하십시오.
Arabic تحذير	<ul style="list-style-type: none"> ● لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الألكترود بجسدك أو بالملابس المبللة بالماء. ● ضع عازلا على جسمك خلال العمل. 	<ul style="list-style-type: none"> ● ضع المواد القابلة للاشتعال في مكان بعيد. 	<ul style="list-style-type: none"> ● ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.

READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.

SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.

LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.

LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.

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

LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

請詳細閱讀並理解製造廠提供的說明以及應該使用的銀焊材料，並請遵守貴方的有閣勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

اقرأ بتمعن وافهم تعليمات المصنع المنتج لهذه المعدات والمواد قبل استعمالها واتبع تعليمات الوقاية لصاحب العمل.

LIMITED WARRANTY

STATEMENT OF LIMITED WARRANTY

The Lincoln Electric Company (Lincoln) warrants to the end user (purchaser) of all new welding and cutting equipment, electrode and flux (collectively called the "Goods") that it will be free of defects in workmanship and material.

This warranty is void if Lincoln or its Authorized Service Facility finds that the equipment has been subjected to improper installation, improper care or abnormal operations.

WARRANTY PERIOD ⁽¹⁾ ⁽²⁾ ⁽³⁾

Lincoln will assume both the parts and labor expense of correcting defects during the full warranty period. All warranty periods date from the date of purchase to the original end user and are as follows:

7 Years

- Main power rectifiers on all non-inverter low frequency (50 and 60 Hz) type welders.

3 Years

- All Lincoln welding machines, wirefeeders and plasma cutting machines unless listed below.

2 Years

- Power Arc 4000, Power Arc 5000
Ranger 10, Ranger 10-LX
Weldanpower 125, Weldanpower 150

1 Year

- AC-100
Invertec V100-S, Invertec V130-S, Invertec V200-T
PRO-CUT 20
- All water coolers (internal or external models)
- All stick electrode, welding wire and flux.
- Arc welding and cutting robots and robotic controllers
- All Environmental Systems equipment, including portable units, central units, gun and cable assemblies and accessories. (Does not include consumable items listed under 30 day warranty.)
- All welding and cutting accessories including gun and cable assemblies, TIG and plasma torches, spool guns, wire feed modules, undercarriages, field installed options that are sold separately, unattached options, welding supplies, standard accessory sets, replacement parts, and Magnum products. (Does not include expendable parts listed under 30 day warranty)

30 Days

- All consumable items that may be used with the environmental systems described above. This includes hoses, filters, belts and hose adapters.
- Expendable Parts - Lincoln is not responsible for the replacement of any expendable part that is required due to normal wear.

CONDITIONS OF WARRANTY

TO OBTAIN WARRANTY COVERAGE:

The purchaser must contact Lincoln or Lincoln's Authorized Service Facility about any defect claimed under Lincoln's warranty.

Determination of warranty on welding and cutting equipment will be made by Lincoln or Lincoln's Authorized Service Facility.

WARRANTY REPAIR:

If Lincoln or Lincoln's Authorized Service Facility confirms the existence of a defect covered by this warranty, the defect will be corrected by repair or replacement at Lincoln's option.

At Lincoln's request, the purchaser must return, to Lincoln or its Authorized Service Facility, any "Goods" claimed defective under Lincoln's warranty.

FREIGHT COSTS:

The purchaser is responsible for shipment to and from the Lincoln Authorized Service Facility.

WARRANTY LIMITATIONS

Lincoln will not accept responsibility or liability for repairs made outside of a Lincoln Authorized Service Facility.

Lincoln's liability under this warranty shall not exceed the cost of correcting the defect of the Lincoln product.

Lincoln will not be liable for incidental or consequential damages (such as loss of business, etc.) caused by the defect or the time involved to correct the defect.

This written warranty is the only express warranty provided by Lincoln with respect to its products. Warranties implied by law such as the warranty of merchantability are limited to the duration of this limited warranty for the equipment involved.

This warranty gives the purchaser specific legal rights. The purchaser may also have other rights which vary from state to state.

⁽¹⁾ Equipment manufactured for the Lincoln Electric Company is subject to the warranty period of the original manufacturer.

⁽²⁾ All engines and engine accessories are warranted by the engine or engine accessory manufacturer and are not covered by this warranty.

⁽³⁾ SAE400 WELD N' AIR compressor is warranted by the compressor manufacturer and not covered by this warranty.



June, '98

World's Leader in Welding and Cutting Products

Premier Manufacturer of Industrial Motors

• Sales and Service through Subsidiaries and Distributors Worldwide •

Cleveland, Ohio 44117-1199 U.S.A. TEL: 216.481.8100 FAX: 216.486.1751 WEB SITE: www.lincolnelectric.com