

# **MAX43<sup>®</sup>**

**Plasma Arc  
Cutting System**

**Service Manual  
801680 - Revision 11**



EN50199  
EN50192

**Hypertherm**  
*The world leader in  
plasma cutting technology*

**MAX43<sup>®</sup>**  
**Plasma Arc Cutting System**

**Service Manual**  
**SM-168**  
**(P/N 801680)**

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**Hypertherm, Inc.**  
**Hanover, NH USA**  
**<http://www.hypertherm.com>**  
**email: [info@hypertherm.com](mailto:info@hypertherm.com)**

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## **Hypertherm Offices Worldwide:**

### **Hypertherm, Inc.**

Etna Road, P.O. Box 5010  
Hanover, NH 03755 USA  
Tel.: (603) 643-3441 (Main Office)  
Fax: (603) 643-5352 (All Departments)  
Tel.: (800) 643-9878 (Technical Service – toll-free in USA and Canada)  
Tel.: (800) 737-2978 (Customer Service – toll-free in USA and Canada)  
email: info@hypertherm.com (General Information)  
email: service@hypertherm.com (Technical/Customer Services)

### **Hypertherm Plasmatechnik GmbH**

Technologiepark Hanau  
Rodenbacher Chaussee 6  
D-63457 Hanau-Wolfgang, Germany  
Tel.: 49 6181 58 2100  
Fax: 49 6181 58 2134

### **Hypertherm (S) Pte Ltd**

No. 19 Kaki Bukit Road 2  
K.B. Warehouse Complex  
Singapore 417847  
Tel.: 65 841 2489  
Fax: 65 841 2490

### **Hypertherm UK Ltd**

9 Berkeley Court, Manor Park  
Runcorn, Cheshire, England WA7 1TQ  
Tel.: 44 1928 579 074  
Fax: 44 1928 579 604

### **France**

15 Impasse des Rosiers  
95610 Eragny, France  
Tel.: 33 1 30 37 15 28  
Fax: 33 1 30 37 15 79

### **Hypertherm S.r.L.**

Via Torino 2  
20123 Milan, Italy  
Tel.: 39 02 725 46 312 (Customer Service)  
Tel.: 39 02 725 46 314 (Technical Service)  
Fax: 39 02 725 46 400 (All Departments)

### **Hypertherm B.V.**

Burg, Haverkampstraat 13  
7091 CN Dinxperlo, The Netherlands  
Tel.: 31 315 655 866 (Customer Service)  
Fax: 31 315 655 886

### **European Technical Support Organization (ETSO)**

Edisonstraat 12  
3281 NC Numansdorp, The Netherlands  
Tel.: 00 800 4973 7843 (00 800 Hypertherm) – (toll-free Technical Service)  
Tel.: 31 186 659494  
Fax: 31 186 659495

### **Japan**

Shinjuku Park Tower  
30th Floor  
3-7-1 Nishi-Shinjuku  
Shinjuku-ku, Tokyo  
163-1030, Japan  
Tel.: 81 03 5326 3142  
Fax: 81 03 5326 3001

# ELECTROMAGNETIC COMPATIBILITY (EMC)

## EMC INTRODUCTION

This plasma cutting equipment has been built in compliance with standard EN50199. To ensure that the equipment works in a compatible manner with other radio and electronic systems, the equipment should be installed and used in accordance with the information below to achieve electromagnetic compatibility.

The limits required by EN50199 may not be adequate to completely eliminate interference when the affected equipment is in close proximity or has a high degree of sensitivity. In such cases it may be necessary to use other measures to further reduce interference.

This plasma equipment should be used only in an industrial environment. It may be difficult to ensure electromagnetic compatibility in a domestic environment.

## INSTALLATION AND USE

The user is responsible for installing and using the plasma equipment according to the manufacturers instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the cutting circuit, see *Earthing of Workpiece*. In other cases it could involve constructing an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

## ASSESSMENT OF AREA

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

- a. Other supply cables, control cables, signalling and telephone cables; above, below and adjacent to the cutting equipment.
- b. Radio and television transmitters and receivers.
- c. Computer and other control equipment.
- d. Safety critical equipment, for example guarding of industrial equipment.
- e. Health of the people around, for example the use of pacemakers and hearing aids.

f. Equipment used for calibration or measurement.

g. Immunity of other equipment in the environment. User shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures.

h. Time of day that cutting or other activities are to be carried out.

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

## METHODS OF REDUCING EMISSIONS

### Mains Supply

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

### Maintenance of Cutting Equipment

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

### Cutting Cables

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

### Equipotential Bonding

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

### Earthing of Workpiece

Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, for example, ship's hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitances selected according to national regulations.

Note. The cutting circuit may or may not be earthed for safety reasons. Changing the earthing arrangements should only be authorized by a person who is competent to assess whether the changes will increase the risk of injury, for example, by allowing parallel cutting current return paths which may damage the earth circuits of other equipment. Further guidance is given in IEC TC26 (sec)94 and IEC TC26/108A/CD Arc Welding Equipment Installation and Use.

### Screening and Shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire plasma cutting installation may be considered for special applications.



# WARRANTY

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## ATTENTION



Genuine Hypertherm parts are the factory-recommended replacement parts for your Hypertherm system. Use of other than genuine Hypertherm parts may be cause for invalidation of the Hypertherm warranty.



## ATTENTION



Do not attempt repairs on the power board or control board with the exception of fuses F1 and F2 on the power board. Do not in any way cut away or remove the protective conformal coating from either board. To do so will risk a short between the AC input circuit to the output circuit causing severe damage to the power supply as well as serious injury or death to maintenance personnel.

The power supply and PC boards are subjected to dielectric and insulation resistance tests per applicable CSA and IEC standards for the safety of the operator and maintenance personnel. Removal of the protective conformal coatings and other unauthorized repairs to the PC boards will void the warranty.

# WARRANTY

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## GENERAL

HYPERTHERM, Inc. warrants that Products shall be free from defects in materials and workmanship, under proper and normal use for which such Equipment is recommended, for a period of two (2) years, except only with respect to the Torch, for which the warranty period shall be one (1) year, from the date of its delivery to you or to a customer by you, BUT IN NO EVENT SHALL THIS WARRANTY EXTEND BEYOND 36 MONTHS FROM THE DATE OF ORIGINAL DELIVERY TO YOU BY HYPERTHERM.

HYPERTHERM, at its sole option, shall repair, replace, or adjust, free of charge, any Products covered by this warranty which shall be returned with HYPERTHERM's prior authorization (which shall not be unreasonably withheld), properly packed, to HYPERTHERM's place of business in Hanover, New Hampshire, all costs, insurance and freight prepaid, and which examination proves not to be free from defects in materials and workmanship. HYPERTHERM shall not be liable for any repairs, replacements, or adjustments of Products covered by this warranty, except those made pursuant to this paragraph or with HYPERTHERM's written consent. This warranty shall not apply to any Product which has been mishandled, incorrectly installed, modified or assembled by you or any other person. HYPERTHERM shall be liable for breach of this warranty only if it receives written notice of such breach within the applicable warranty period specified herein above. THE FOREGOING SHALL CONSTITUTE THE SOLE REMEDY TO DISTRIBUTORS OR THEIR CUSTOMERS FOR ANY BREACH BY HYPERTHERM OF ITS WARRANTY.

## PATENT INDEMNITY

Except only in cases of Products not manufactured by HYPERTHERM or manufactured by a person other than HYPERTHERM not in strict conformity with HYPERTHERM's specifications, and in cases of designs, processes, formulae or combinations not developed or purported to be developed by HYPERTHERM, HYPERTHERM agrees to indemnify, protect and hold harmless Distributors and their customers against any and all liability or claims in any manner imposed upon or accruing against Distributors and their customers because of the use in or about the construction or operation of Equipment or any design, system, formula, combination, article or material which infringes or alleges to infringe on any patent or other right. Distributors shall notify HYPERTHERM promptly upon learning of any action or threatened action in connection with any such alleged infringement, and each party may appoint its own counsel for any such action or threatened action.

## DISCLAIMER OF OTHER WARRANTIES

HYPERTHERM MAKES NO WARRANTIES REGARDING PRODUCTS MANUFACTURED BY IT OR OTHERS (INCLUDING WITHOUT IMPLIED LIMITATION WARRANTIES AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), EITHER EXPRESS OR IMPLIED, EXCEPT AS PROVIDED HEREIN. This warranty is in lieu of any and all warranties, express or implied, by law or otherwise; and Distributors are not authorized to give any other warranty purporting to be binding upon HYPERTHERM upon resale of Products to their customers. IN NO EVENT shall HYPERTHERM be liable for incidental or consequential damages or injury to the person or property of anyone by reason of any defect in any Equipment sold hereunder.

# **WARRANTY**

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# TABLE OF CONTENTS

<b>ELECTROMAGNETIC COMPATIBILITY (EMC)</b> .....	i
<b>WARRANTY</b> .....	ii
<b>SECTION 1 SAFETY</b> .....	1-1
About Notes, Cautions and Warnings .....	1-1
Safety Instructions .....	1-2
Eye Protection .....	1-2
Skin Protection .....	1-2
Toxic Fume Prevention .....	1-2
Fire Prevention .....	1-2
Electric Shock Prevention .....	1-2
Explosion Prevention .....	1-3
Compressed Gas Cylinders .....	1-3
Pressure Regulators .....	1-3
Hoses .....	1-3
Noise Protection .....	1-4
Grounding .....	1-4
Input Power .....	1-4
Work Cable .....	1-4
Work Table .....	1-4
Safety Reminders .....	1-4
Electronic Health Support Equipment .....	1-4
<b>SECTION 1a SÉCURITÉ</b> .....	1a-1
Au sujet des Notes, Attention et Avertissements .....	1a-1
Consignes de sécurité .....	1a-2
Protection des yeux .....	1a-2
Protection de la peau .....	1a-2
Prévention des vapeurs toxiques .....	1a-2
Prévention des incendies .....	1a-2
Prévention des chocs électriques .....	1a-2
Prévention des explosions .....	1a-3
Bouteilles de gaz comprimé .....	1a-3
Détendeurs .....	1a-3
Tuyaux .....	1a-3
Protection contre le bruit .....	1a-4
Mise à la masse et à la terre .....	1a-4
Alimentation .....	1a-4
Câble de retour .....	1a-4
Table de travail .....	1a-4
Rappels de sécurité .....	1a-4
Prothèses électroniques .....	1a-4

# TABLE OF CONTENTS

---

<b>SECTION 2 SPECIFICATIONS</b> .....	2-1
General .....	2-2
Description of Equipment .....	2-3
Specifications .....	2-3
MAX43 Power Supplies (Non CE) .....	2-3
MAX43 CE 400V Power Supply .....	2-4
Gas Requirements .....	2-4
PAC125T Trigger Torch .....	2-5
PAC125M Machine Torch (Optional) .....	2-5
PAC121P Pushbutton Torch (Option for Non CE Systems Only) .....	2-5
IEC Symbols Used .....	2-6
<b>SECTION 3 MAINTENANCE</b> .....	3-1
General .....	3-2
Theory of Operation .....	3-2
Troubleshooting .....	3-5
Test Equipment and Tools .....	3-5
Visual Inspection .....	3-5
Troubleshooting Procedures .....	3-5
Initial Resistance Checks .....	3-6
Corrective Maintenance Checks .....	3-16
Sequence of Operation .....	3-25
PAC125T Torch Parts Removal and Replacement .....	3-26
Torch Main Body Removal and Replacement .....	3-26
Torch Switch Removal and Replacement .....	3-26
PAC121P Torch Parts Removal and Replacement .....	3-28
Torch Main Body Removal and Replacement .....	3-28
Torch Switch Removal and Replacement .....	3-28
PAC125M Torch Parts Removal and Replacement .....	3-30
Removal .....	3-30
Replacement .....	3-31
Quick Disconnect O-Ring Removal and Replacement .....	3-32
Filter/Regulator Pressure Adjustment .....	3-33
Filter/Regulator Filter Cleaning Or Replacement .....	3-33
Air Filter Removal, Cleaning and Replacement .....	3-33
Removal .....	3-33
Cleaning .....	3-34
Replacement .....	3-34
<b>SECTION 4 MAX43 PARTS LIST</b>	
<b>NON CE POWER SUPPLY AND TORCH &amp; LEAD ASSEMBLIES</b> .....	4-1
Power Supply, All Voltages - Front, Rear and Right Side .....	4-2
Power Supply, 208/240V - Left Side .....	4-4
Power Supply, 400V and 480V - Left Side .....	4-6
Torch Assemblies and Leads .....	4-8
PAC125T Torch Assembly and Lead .....	4-8
PAC121P Torch Assembly and Lead .....	4-10

# TABLE OF CONTENTS

---

PAC125M Torch Assembly and Lead .....	4-12
On/Off Pendant .....	4-12
Shielded Consumable Parts .....	4-14
Unshielded Consumable Parts .....	4-16
Recommended Spare Parts .....	4-16
Power Supplies .....	4-16
PAC125T Torch Assembly and Leads .....	4-17
Torch Assembly .....	4-17
Lead Assemblies .....	4-17
PAC121P Torch Assembly and Leads .....	4-17
Torch Assembly .....	4-17
Lead Assemblies .....	4-17
PAC125M Torch Assembly and Leads .....	4-17
Torch Assembly .....	4-17
Lead Assemblies .....	4-17
Optional Machine Interface Assembly .....	4-18
<b>SECTION 5 MAX43 CE 400V PARTS LIST .....</b>	<b>5-1</b>
Power Supply - Front, Rear and Right Side .....	5-2
Power Supply - Left Side .....	5-4

# TABLE OF CONTENTS

---

# Section 1 SAFETY

In this section:

About Notes, Cautions and Warnings.....	1-1	Pressure Regulators .....	1-3
Safety Instructions .....	1-2	Hoses.....	1-3
Eye Protection.....	1-2	Noise Protection.....	1-4
Skin Protection .....	1-2	Grounding .....	1-4
Toxic Fume Prevention .....	1-2	Input Power.....	1-4
Fire Prevention.....	1-2	Work Cable .....	1-4
Electric Shock Prevention.....	1-2	Work Table .....	1-4
Explosion Prevention .....	1-3	Safety Reminders.....	1-4
Compressed Gas Cylinders.....	1-3	Electronic Health Support Equipment.....	1-4

## **Before using this plasma arc system. . . .**

**Each person who will operate this equipment, perform service or maintenance, or supervise its use must read the safety instructions and warnings in this manual and the labels on the equipment.**

### About Notes, Cautions and Warnings

Notes: Throughout this manual, useful information for operating the plasma system is presented in "notes", such as shown in this paragraph.

**Cautions: Information in bold type and surrounded by a box describes a situation that may cause damage to the plasma system.**



#### WARNINGS



Warnings describe situations that present a physical danger to the operator, and advice to avoid or correct the situation. Each type of warning includes applicable danger symbols, such as a hand burn, electrical shock, fire, explosion, etc.



#### **WARNING — Instant-On Torches**

Instant-on torches produce a plasma arc immediately after the torch switch is pushed.

Always hold a hand torch away from your body as a precaution against accidental torch firing. Be aware of this hazard, which has potential for serious bodily injury.



#### **WARNING — Electric Shock**



- Never touch the torch body, workpiece or the water in a water table when operating the plasma system.
- When using a water table, be sure that it is correctly connected to earth ground.
- Operating the plasma system completes an electrical circuit between the torch and the workpiece and anything touching the workpiece. The workpiece is part of the electrical circuit.



## SAFETY

### Eye Protection

- Wear dark safety glasses or goggles with side shields, or a welding helmet, in accordance with applicable national or local codes, to protect eyes against the plasma arc's ultraviolet and infrared rays.

Arc Current		Lens Shade	
		AWS (USA)	ISO 4850
Up to 100 A		No. 8	No. 11
100–200 A		No. 10	No. 11-12
200–400 A		No. 12	No. 13
Over 400 A		No. 14	No. 14


- Replace the glasses, goggles or helmet when the lens becomes pitted or broken.
- Warn other people in the area not to look directly at the arc unless they are wearing glasses, goggles or a helmet.
- Prepare the cutting area in a manner that reduces the reflection and transmission of ultraviolet light:
  - Paint walls and other surfaces with dark colors to reduce reflection.
  - Install protective screens or curtains to reduce ultraviolet transmission.

### Skin Protection

- Wear protective clothing to protect against burns caused by ultraviolet light, sparks and hot metal:
  - Gauntlet gloves, safety shoes and hat.
  - Flame-retardant clothing which covers all exposed areas.
  - Cuffless trousers to prevent entry of sparks and slag.


### Toxic Fume Prevention

- Keep the cutting area well ventilated.
- Remove all chlorinated solvents from the cutting area before cutting. Certain chlorinated solvents decompose when exposed to ultraviolet radiation to form phosgene gas.
- Wear proper breathing mask and use proper ventilation when cutting galvanized metal.
- Do not cut containers with toxic materials inside. Clean containers that have held toxic materials thoroughly before cutting.



**WARNING — Toxic Fumes**

Do not cut metal or painted metals containing zinc, lead, cadmium or beryllium unless the operator, or anyone else subjected to the fumes, wears respiratory equipment or an air-supplied helmet.



### Fire Prevention



- Make fire extinguishers available in the cutting area.
- Remove combustible material from the immediate cutting area to a distance of at least 35 feet (10 m).
- Quench freshly cut metal or allow metal to cool before handling it or bringing it into contact with combustible materials.
- Never use a plasma system to cut containers with potentially flammable materials inside. Such containers must be thoroughly cleaned prior to cutting.
- Ventilate potentially flammable atmospheres before cutting with a plasma system. When cutting with oxygen as the plasma gas, an exhaust ventilation system is required.
- Never operate the plasma system in an atmosphere which contains heavy concentrations of dust, flammable gas or combustible liquid vapors unless properly vented.

### Electric Shock Prevention



All Hypertherm plasma systems use high voltage (up to 300 VDC) to initiate the plasma arc. Take the following precautions when operating the plasma system:

- Wear insulated gloves and boots, and keep body and clothing dry.
- Do not stand, sit or lie on—or touch—any wet surface when using the plasma system.
- Maintain proper insulation against electrical shock. If you must work in or near a damp area, use extreme caution.
- Provide a wall-mounted disconnect switch with properly sized fuses close to the power supply. This switch allows the operator to turn the power supply off quickly in an emergency situation.
- Conform to all local electrical codes for primary wiring sizes and types.
- Inspect the primary power cord frequently for damage or cracking of the cover. Bare wiring can kill. Do not use a system with a damaged power cord. Replace a damaged power cord immediately.
- Inspect the torch leads. Replace if frayed or damaged.
- Do not pick up the workpiece, including the waste cutoff, while you cut. Leave the workpiece in place or on the workbench with the work cable attached during the cutting process.

## Electric Shock Prevention (continued)

- Before changing the torch parts, disconnect the main power or unplug the power supply. After changing torch parts and replacing the retaining cap, plug in the power supply again.
- Never bypass or shortcut the safety interlocks.
- Before removing a power supply cover for maintenance, disconnect the main power at the wall disconnect switch or unplug the power supply. To avoid exposure to severe electrical hazard, wait five minutes after disconnecting the main power to allow capacitors to discharge.
- Never operate the plasma system unless the power supply unit covers are in place. Exposed power supply connections present a severe electrical hazard.

## Explosion Prevention



### WARNING — Compressed Gas

The plasma system uses compressed gas. Observe proper precautions when handling and using compressed gas equipment and cylinders.

- Do not use the plasma system if explosive dust or vapors may be present.
- Do not cut pressurized cylinders or any closed container.



### WARNING — Hydrogen Explosion Hazard

If your system uses hydrogen, remember that this is a flammable gas that presents an explosion hazard. Keep flames away from cylinders containing hydrogen mixtures and hoses that carry hydrogen mixtures. Also, keep flames and sparks away from the torch when using argon-hydrogen as the plasma gas.

## Compressed Gas Cylinders

Handle and use compressed gas cylinders in accordance with safety standards published by the U.S. Compressed Gas Association (CGA), American Welding Society (AWS), Canadian Standards Association (CSA) or applicable national or local codes.

- Never use a cylinder that leaks or is physically damaged.

- Never use a cylinder that is not upright and secured in place.
- Never move or transport a cylinder without its protective valve cover in place.
- Never use a gas cylinder or its contents for any purpose other than that for which it is intended.
- Never lubricate cylinder valves with oil or grease.
- Never allow electrical contact between the plasma arc and a cylinder.
- Never expose cylinders to excessive heat, sparks, slag or open flame.
- Never use hammers, wrenches or other tools to open stuck cylinder valves.

## Pressure Regulators

- Be certain that all pressure regulators are in proper working condition.
- Never use a regulator for any gas other than that for which it is intended.
- Never use a regulator that leaks, creeps excessively or is physically damaged in any way.
- Never attempt to lubricate a regulator with oil or grease.



### WARNING — Hydrogen Detonation with Aluminum Cutting

When cutting aluminum underwater, or with the water touching the underside of the aluminum, free hydrogen gas may collect under the workpiece and detonate during plasma cutting operations.

Installing an aeration manifold on the floor of the water table is an effective way to eliminate the possibility of hydrogen detonation when cutting aluminum. Refer to the Appendix section of this manual for instructions on how to fabricate an aeration manifold.

## Hoses

- Label and color-code all gas hoses in order to clearly identify the type of gas in each hose. Consult applicable national or local codes.
- Never use the oxygen hose for any gas other than oxygen.
- Examine hoses at regular intervals for leaks, wear, loose connections or other hazard.
- Replace hose that is damaged in any way.

## SAFETY

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### Hoses (continued)

- Keep hose lengths to a minimum to prevent damage, reduce pressure drop and to prevent possible flow restrictions.
- Prevent kinking by laying out hoses as straight as possible between termination points.
- Coil any excess hose and place it out of the way to prevent damage and to eliminate the danger of tripping.

### Noise Protection



The plasma cutting process can generate high levels of noise. Depending on the arc current, material being cut, acoustics and size of the cutting room, distance from the torch and other factors, acceptable noise levels as defined by national or local codes may be exceeded by your plasma system.

- Always wear proper ear protection when cutting or gouging with the plasma system.

### Grounding

#### Input Power

- Be sure to connect the power cord ground wire to the ground in the disconnect box.
- If installation of the plasma system involves connecting the power cord to the power supply, be sure to properly connect the power cord ground wire. Conform to Canadian Standards Association (CSA) standards by placing the power cord ground wire on the stud first; then place any other ground wires on top of the power cord ground. Fasten the retaining nut tightly.
- Tighten all electrical connections to avoid excessive heating.

#### Work Cable

- Attach the work cable securely to the workpiece or the work table by making good metal-to-metal contact.  
Do not connect it to the piece that will fall away when the cut is complete.

#### Work Table

- Connect the work table to an earth ground, in accordance with appropriate national or local codes.

### Safety Reminders

- Never bypass or shortcut the safety interlocks on any of the plasma system units.
- Except in Hypertherm's largest mechanized systems, all Hypertherm torches are designed with a safety interlock that prevents firing of the plasma arc when the retaining cap is loosened.
- Each Hypertherm plasma system is designed to be used only with specific Hypertherm torches. Do not substitute other torches which could overheat and present a potentially dangerous situation to the operator and any personnel in the area. Hypertherm's warranty does not cover problems caused by the use of torches not made by Hypertherm.
- Use only consumable parts and replacement parts made by Hypertherm. Hypertherm's warranty does not cover problems caused by the use of parts not made by Hypertherm.
- Never operate the plasma system with any of its covers not in place. This would be hazardous to the operator and other people in the area, and prevents the proper cooling of the equipment.

### Electronic Health Support Equipment

Plasma arc cutting and gouging systems create electric and magnetic fields that may interfere with the correct operation of electronic health support equipment, such as pacemakers or hearing aids. Any person who wears a pacemaker or hearing aid should consult a doctor before operating or being near any plasma system when it is in use. To minimize exposure to EMF:

- Keep both the work cable and the torch lead on one side of your body. Keep your body from coming in between the torch lead and the work cable.
- Route torch leads as close as possible to work cable.
- Do not wrap the torch lead or work cable around your body.
- Stay as far away from the power supply as possible.

# Section 1 SÉCURITÉ

Cette section comprend :

Au sujet des Notes, Attention et Avertissements ....	1a-1	Détendeurs .....	1a-3
Consignes de sécurité .....	1a-2	Tuyaux.....	1a-3
Protection des yeux .....	1a-2	Protection contre le bruit .....	1a-4
Protection de la peau .....	1a-2	Mise à la masse et à la terre .....	1a-4
Prévention des vapeurs toxiques.....	1a-2	Alimentation .....	1a-4
Prévention des incendies .....	1a-2	Câble de retour .....	1a-4
Prévention des chocs électriques .....	1a-2	Table de travail .....	1a-4
Prévention des explosions .....	1a-3	Rappels de sécurité.....	1a-4
Bouteilles de gaz comprimé .....	1a-3	Prothèses électroniques .....	1a-4

## Avant d'utiliser ce système de coupage plasma...

*Chaque personne qui utilise, répare ou entretient l'appareil ou en surveille l'emploi, doit lire les consignes de sécurité et les avertissements donnés dans ce manuel et sur les étiquettes du matériel.*

### Au sujet des rubriques Notes, Attention et Avertissements

Notes : Sous cette rubrique, on donne des conseils pratiques pour utiliser le système plasma.

**Attention : Les informations en caractères gras et encadrées décrivent une situation qui risquerait d'endommager le système plasma.**



#### AVERTISSEMENTS



Un avertissement décrit des situations qui présentent un danger physique pour l'opérateur, et donne des conseils pour éviter ou rectifier ce problème. Chaque type d'avertissement est accompagné d'un symbole de danger correspondant, comme une brûlure aux mains, un feu, une explosion, un choc électrique, etc.



#### AVERTISSEMENT — Torches à allumage instantané

Les torches à allumage instantané produisent un arc plasma immédiatement après avoir appuyé sur le bouton d'allumage de la torche.

Par précaution, maintenez toujours la torche éloignée de votre corps en cas d'un allumage accidentel. Prenez garde à ce danger qui risque de provoquer des blessures graves.



#### AVERTISSEMENT — Chocs électriques

- Ne jamais toucher le corps de la torche, la pièce à couper ou l'eau de la table à eau quand on utilise le système plasma.
- Quand on utilise une table à eau, s'assurer qu'elle est bien mise à la terre.
- Quand on utilise le système plasma, on établit un circuit électrique entre la torche et la pièce à couper et avec tout ce qui touche la pièce. La pièce à couper fait partie intégrante du circuit électrique.

# SÉCURITÉ

## Protection des yeux

- Porter des lunettes de sécurité à verres teintés ou des lunettes-masque munies d'écrans latéraux ou encore un masque à serre-tête, conformément aux codes nationaux ou locaux applicables, pour se protéger contre les rayons ultraviolets et infrarouges de l'arc.

Courant de l'arc	Pouvoir obscurcissant des verres	
	AWS (É.-U.)	ISO 4850
Jusqu'à 100 A	N° 8	N° 11
100-200 A	N° 10	N° 11-12
200-400 A	N° 12	N° 13
Plus de 400 A	N° 14	N° 14

- Remplacer les lunettes, les lunettes-masque ou le masque à serre-tête quand les verres sont rayés ou cassés.
- Avertir les autres personnes se trouvant sur les lieux de travail de ne pas regarder directement l'arc, à moins qu'elles ne portent des lunettes, des lunettes-masque ou un masque à serre-tête.
- Préparer le poste de coupage de façon à réduire la réflexion et la transmission des rayons ultraviolets :
  - Peindre les murs et autres surfaces de couleur foncée pour réduire la réflexion.
  - Installer des écrans ou des rideaux protecteurs pour réduire la transmission des rayons ultraviolets.

## Protection de la peau

- Porter des vêtements de sécurité pour se protéger contre les brûlures que peuvent causer les rayons ultraviolets, les étincelles et le métal brûlant :
  - Gants à crispin, chaussures et casque de sécurité.
  - Vêtements ignifuges couvrant toutes les parties du corps exposées.
  - Pantalon sans revers pour éviter que des étincelles ou des scories puissent s'y loger.

## Prévention des vapeurs toxiques

- Tenir le poste de coupage bien aéré.
- Avant le coupage, enlever tous les solvants chlorés du poste de coupage. Certains solvants chlorés se décomposent sous l'effet des rayons ultraviolets et forment du phosgène.
- Porter un masque respiratoire approprié lors du coupage de métaux galvanisés, et s'assurer que la ventilation est efficace.
- Ne pas couper des réservoirs contenant des matières toxiques. Avant le coupage, nettoyer soigneusement les réservoirs qui ont contenu des matières toxiques.

## Prévention des incendies



- S'assurer qu'il y a des extincteurs au poste de coupage.
- Éloigner les matières inflammables d'au moins 10 m du poste de coupage.
- Tremper le métal que l'on vient de couper ou le laisser refroidir avant de le manipuler ou de le mettre en contact avec des matériaux inflammables.
- Ne jamais utiliser un système plasma pour couper des réservoirs contenant des matières potentiellement inflammables. De tels récipients doivent être soigneusement nettoyés avant le coupage.
- Aérer toute atmosphère potentiellement inflammable avant de couper avec un système plasma. Quand on utilise l'oxygène comme gaz plasma, il faut utiliser un système de ventilation par aspiration.
- Ne jamais faire fonctionner le système plasma dans une atmosphère qui contient une forte concentration de poussière, de gaz inflammable ou de vapeurs de liquides inflammables, à moins que l'on utilise une bonne ventilation.

## Prévention des chocs électriques



- Tous les systèmes de coupage Hypertherm utilisent une haute tension (jusqu'à 300 V c.c.) pour amorcer l'arc plasma. On doit prendre les précautions suivantes quand on utilise le système plasma :
- Porter des gants et des bottes isolants et garder le corps et les vêtements au sec.
  - Ne pas se tenir, s'asseoir, se coucher sur une surface mouillée, ni la toucher, quand on utilise le système plasma.
  - Bien s'isoler contre les chocs électriques. Agir avec la plus grande prudence quand l'on doit travailler près ou à l'intérieur d'une zone humide.
  - Installer un sectionneur mural avec fusibles appropriés, à proximité de la source de courant. Ce dispositif permet à l'opérateur d'arrêter rapidement la source de courant en cas d'urgence.
  - Se conformer aux codes électriques de la région au point de vue des types et des grosseurs du câblage primaire.
  - Inspecter fréquemment le cordon d'alimentation primaire pour s'assurer qu'il n'est ni endommagé, ni fissuré. Un câble dénudé peut tuer. Ne pas utiliser le système si le cordon d'alimentation est endommagé. Si tel est le cas, remplacer immédiatement le cordon.
  - Inspecter les câbles ou tuyaux de la torche. Les remplacer s'ils sont effilochés ou endommagés.
  - Ne pas saisir la pièce à couper ni les chutes lors du coupage. Laisser la pièce à couper en place ou sur la table de travail, le câble de retour connecté lors du coupage.



### AVERTISSEMENT — Vapeurs toxiques



Ne pas couper des métaux (peints ou non) qui contiennent du zinc, du plomb, du cadmium ou du béryllium, à moins que l'utilisateur et toute personne exposée aux vapeurs ne portent un appareil respiratoire ou un masque à adduction d'air.



### Prévention des chocs électriques (suite)

- Avant de remplacer les pièces de la torche, couper l'alimentation ou débrancher la source de courant. Après avoir remplacé les pièces de la torche et remis en place la buse de protection, rebrancher la source de courant.
- Ne jamais contourner ou court-circuiter les verrouillages de sécurité.
- Avant d'enlever le capot de la source de courant pour effectuer l'entretien, couper l'alimentation au sectionneur mural ou débrancher. Attendre cinq minutes pour que les condensateurs se déchargent ; sinon on s'expose à des chocs importants.
- Ne jamais faire fonctionner le système plasma sans que le capot de la source de courant soit en place. Les raccords exposés de la source de courant sont extrêmement dangereux.

### Prévention des explosions



#### AVERTISSEMENT — Gaz comprimé

Le système plasma utilise du gaz comprimé. Prendre les précautions nécessaires quand on manutentionne et utilise des appareils et des bouteilles à gaz comprimé.

- Ne pas couper en présence de poussière ou de vapeurs explosives.
- Ne pas couper des bouteilles sous pression ni des réservoirs fermés.



#### AVERTISSEMENT — Risque d'explosion de l'hydrogène

Si le système utilise de l'hydrogène, se rappeler que c'est un gaz inflammable qui présente un danger d'explosion. Tenir toute flamme éloignée des bouteilles et des tuyaux contenant des mélanges d'hydrogène. Tenir également la torche plasma éloignée de toute flamme ou étincelle lorsque le gaz plasma est constitué d'un mélange argon-hydrogène.

### Bouteilles de gaz comprimé

Manipuler et utiliser les bouteilles de gaz comprimé conformément aux normes de sécurité publiées par la Compressed Gas Association (CGA), l'American Welding Society (AWS), l'Association canadienne de normalisation (ACNOR/CSA) ou les codes nationaux ou locaux.

- Ne jamais utiliser une bouteille qui fuit ou est endommagée.

- Ne jamais utiliser une bouteille qui n'est pas placée à la verticale et bien assujettie.
- Ne jamais déplacer ou transporter une bouteille si son chapeau n'est pas en place.
- Ne jamais utiliser une bouteille de gaz ou son contenu à des fins autres que celles pour lesquelles elle est conçue.
- Ne jamais lubrifier le robinet des bouteilles avec de l'huile ou de la graisse.
- Éviter à tout prix le contact électrique entre l'arc plasma et une bouteille.
- Ne jamais exposer des bouteilles à une chaleur excessive, aux étincelles, aux scories ou aux flammes nues.
- Ne jamais utiliser des marteaux, des clés ou d'autres outils pour débloquer le robinet des bouteilles.

### Détendeurs

- S'assurer que tous les détendeurs sont en état de marche.
- Ne jamais utiliser un détendeur avec un gaz autre que celui pour lequel il a été conçu.
- Ne jamais utiliser un détendeur qui fuit, présente une dérive excessive ou est endommagé.
- Ne jamais lubrifier un détendeur en utilisant de l'huile ou de la graisse.



#### AVERTISSEMENT — Détonation de l'hydrogène lors du coupage de l'aluminium

Quand on coupe l'aluminium sous l'eau, ou si l'eau touche la partie inférieure de la pièce d'aluminium, de l'hydrogène libre peut s'accumuler sous la pièce à couper et détoner lors du coupage plasma.

On peut éliminer la possibilité de détonation de l'hydrogène lors du coupage plasma de l'aluminium si l'on place un collecteur d'aération au fond de la table à eau. Voir l'annexe de ce manuel qui donne des directives pour fabriquer un collecteur d'aération.

### Tuyaux

- Étiqueter et coder tous les tuyaux de gaz avec des couleurs différentes pour chaque type de gaz. Consulter les codes nationaux ou locaux applicables.
- Ne jamais utiliser un tuyau à oxygène pour un autre gaz.
- Examiner les tuyaux à intervalles réguliers pour vérifier s'ils présentent des fuites, s'ils sont usés ou si leurs raccords sont desserrés et s'ils présentent d'autres dangers.
- Remplacer un tuyau s'il est endommagé de quelque façon que ce soit.

# SÉCURITÉ

## Tuyaux (suite)

- N'utiliser que la longueur de tuyau nécessaire pour éviter les dégâts, réduire la chute de pression et éviter de réduire le débit.
- Empêcher la formation de coudes brusques en posant les tuyaux le plus possible en ligne droite entre les points de raccordement.
- Enrouler le tuyau en trop et le ranger pour ne pas l'endommager et pour éviter qu'il ne fasse trébucher.

## Protection contre le bruit



Le coupage plasma peut être très bruyant. Selon le courant de l'arc, le matériau coupé, l'acoustique et la grandeur de la salle de coupage, l'éloignement de la torche et autres facteurs, votre système plasma peut dépasser les niveaux de bruit fixés par les codes nationaux et locaux.

- Porter en permanence un protecteur anti-bruit convenable quand on coupe ou gouge avec le système plasma.

## Mise à la masse et à la terre

### Alimentation

- S'assurer que le fil de terre du cordon d'alimentation est connecté à la terre dans le coffret du sectionneur.
- S'il faut brancher le cordon d'alimentation à la source de courant lors de l'installation du système, s'assurer que le fil de terre est correctement branché. Respecter les normes de l'Association canadienne de normalisation (ACNOR/CSA) en plaçant le fil de terre du cordon d'alimentation sur le plot de mise à la terre. Placer ensuite les autres fils de terre par-dessus. Bien serrer l'écrou de retenue.
- S'assurer que toutes les connexions sont bien serrées pour éviter la surchauffe.

### Câble de retour

- Bien fixer le câble de retour (ou de masse) à la pièce à couper ou à la table de travail de façon à assurer un bon contact métal-métal.

Ne pas fixer le câble de retour à la partie de la pièce à couper qui doit se détacher.

### Table de travail

- Raccorder la table de travail à terre, conformément aux codes de sécurité nationaux ou locaux appropriés.

## Rappels de sécurité

- Ne jamais contourner ou court-circuiter les verrouillages de sécurité des systèmes plasma.
- Exception faite des plus gros systèmes mécanisés d'Hypertherm, toutes les torches Hypertherm sont conçues avec un verrouillage de sécurité qui empêche d'amorcer l'arc plasma quand la buse de protection est desserrée.
- Chaque système plasma Hypertherm n'est conçu que pour être utilisé avec les torches Hypertherm particulières. Ne pas les remplacer par d'autres torches qui pourraient surchauffer et présenter un danger pour l'opérateur et le personnel sur les lieux. La garantie d'Hypertherm ne couvre pas les dégâts causés par l'utilisation d'autres torches que celles d'Hypertherm.
- N'utiliser que les pièces consommables ou de rechange d'Hypertherm. La garantie d'Hypertherm ne couvre pas les problèmes causés par l'utilisation d'autres pièces que celles d'Hypertherm.
- Ne jamais faire fonctionner le système de coupage plasma si les capots ne sont pas en place, car cela mettrait en danger l'opérateur et les autres personnes présentes, en plus de compromettre le refroidissement des pièces.

## Prothèses électroniques

Les systèmes de coupage et de gougeage plasma produisent des champs électriques et magnétiques qui peuvent créer des problèmes de fonctionnement pour les prothèses électroniques, comme les stimulateurs cardiaques et les appareils auditifs. Les personnes qui portent de telles prothèses doivent consulter un médecin avant de faire fonctionner un système plasma ou de s'en approcher, quand celui-ci est en marche. Pour réduire l'exposition aux champs électromagnétiques :

- Garder le câble de retour et le faisceau de la torche d'un côté du corps. Ne pas se tenir entre le faisceau de la torche et le câble de retour.
- Faire passer le faisceau de la torche le plus près possible du câble de retour.
- Ne pas entourer le faisceau de la torche ou le câble de retour autour du corps.
- Se tenir le plus loin possible de la source de courant.

## Section 2 DESCRIPTION & SPECIFICATIONS

In this section:

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General .....	2-2
Description of Equipment .....	2-3
Specifications .....	2-3
MAX43 Power Supplies (Non CE) .....	2-3
MAX400 CE 400V Power Supply .....	2-4
Gas Requirements .....	2-4
PAC125T Trigger Torch .....	2-5
PAC125M Machine Torch (Optional) .....	2-5
PAC121P Push-button Torch (Option for Non CE Systems Only) .....	2-5
IEC Symbols Used .....	2-6

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# DESCRIPTION & SPECIFICATIONS

## GENERAL

Hypertherm's MAX43 plasma cutting systems are manufactured in non CE versions and a CE 400V, 3-phase, 50 Hz version (Figure 2-1). These systems are designed for hand cutting of most metals from gauge to 1/2- inch (13 mm) thick. A machine torch option is also available.

The MAX43 provides continuously variable current output from 20 to 40 amps on all thicknesses up to 1/2- inch (13 mm). This allows the operator wide variations in cutting speeds on the same thickness of metal. The 20-amp setting is for metals up to 1/16 inch (1.6 mm) thick, while the 40-amp setting is used for thicker metals.

MAX43 cut quality is superior and the parts life is longer compared to other plasma systems using air as the plasma gas. The inverter design provides smooth output DC voltage contributing to outstanding cut quality.

Air is used as the primary plasma gas, providing low operating costs combined with high-speed performance. Cylinder air or shop air can be used as long as it is free of moisture, oil and particulate matter contamination. For better cut quality on metals such as stainless steel and aluminum, nitrogen can be used as the plasma gas. A regulator and air filter are provided to ensure that the right pressure and air flow are supplied to the system at the proper quality.

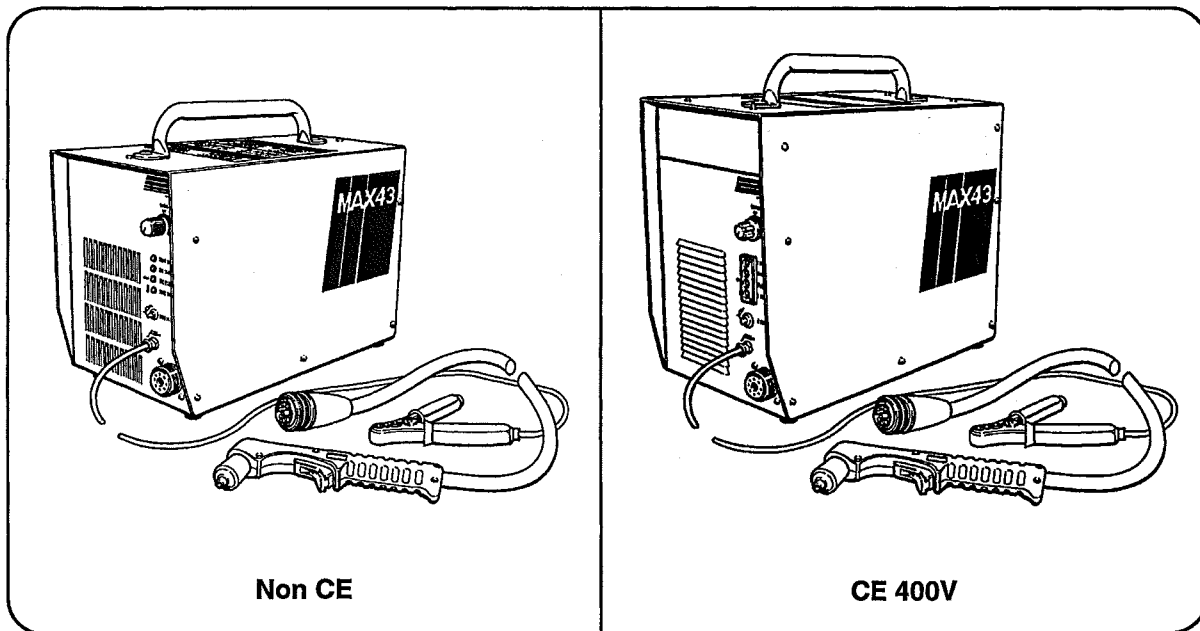


Figure 2-1 MAX43 Plasma Cutting Systems

# DESCRIPTION & SPECIFICATIONS

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## DESCRIPTION OF EQUIPMENT

The MAX43 non CE and CE plasma cutting systems include a PAC125T torch with safety trigger; a torch lead; a work cable with clamp and a consumable parts kit. A PAC125M machine torch is also available for both non CE and CE systems. The machine torch is controlled by an optional on/off pendant. An optional PAC121P push-button torch optional machine interface assembly is also available for non CE systems.

## SPECIFICATIONS

### MAX43 Power Supplies (Non CE)

Maximum OCV ( $U_o$ ) .....	300 VDC at rated input voltage
Rated output current ( $I_2$ ) .....	40 amps (adjustable 20-40 amps)
Rated output voltage ( $U_2$ ) .....	110 VDC
Duty cycle (X) at 40° C .....	50% at 40 amps 60% at 36 amps 100% at 28 amps
Ambient temperature/duty cycle .....	Power supplies will operate between +14° and 104° F (-10° and +40° C). Power supplies operated in an ambient temperature above 86° F (30° C) may show some decrease in duty cycle.
Input line voltage ( $U_1$ ) and input line current ( $I_1$ )	
# 071044 .....	208/240V, 1 Ph, 60 Hz, 38/33 amps
# 071055 .....	400V, 3 Ph, 50 Hz, 11.7 amps
# 071054 .....	480V, 3 Ph, 60 Hz, 9.8 amps
# 071082 (with machine interface) .....	208/240V, 1 Ph, 60 Hz, 38/33 amps
# 071083 (with machine interface) .....	400V, 3 Ph, 50 Hz, 11.7 amps
# 071084 (with machine interface) .....	480V, 3 Ph, 60 Hz, 9.8 amps
Dimensions:	
Width .....	9 -inches (229 mm)
Height .....	12 -inches (305 mm)
Depth .....	17 -inches (432 mm)
Weight .....	42 lbs. (19 kg) 48 lbs. (22 kg) w/25' (7.6m) leads

# DESCRIPTION & SPECIFICATIONS

---

## MAX43 CE 400V Power Supply

Maximum OCV ( $U_0$ ) .....	300 VDC at rated input voltage
Rated output current ( $I_2$ ) .....	40 amps (adjustable 20-40 amps)
Rated output voltage ( $U_2$ ) .....	110 VDC
Cutting	
Duty cycle (X) at 40° C (at 110 arc volts) .....	35% at 40 amps 45% at 45 amps 60% at 31 amps 100% at 24 amps
Gouging	
Duty cycle (X) at 40° C (at 110 arc volts) .....	35% at 40 amps 60% at 31 amps 100% at 24 amps
Ambient temperature/duty cycle .....	Power supplies will operate between +14° and 104° F (-10° and +40° C). Power supplies operated in an ambient temperature above 86° F (30° C) may show some decrease in duty cycle.
Input line voltage ( $U_1$ ) and input line current ( $I_1$ )	
# 071114 .....	400V, 3 Ph, 50 Hz, 11.7 amps
Dimensions:	
Width .....	9 -inches (229 mm)
Height .....	15.25 -inches (388 mm)
Depth .....	17 -inches (432 mm)
Weight .....	56 lbs. (25.4 kg)

## Gas Requirements

Gas Type .....	Shop compressed air, cylinder compressed air, or nitrogen (clean, dry, oil-free)
Shop compressed air .....	270 scfh (127 l/min) @ 80-120 psi (5.5-8.3 bar) supplied to power supply pressure regulator
Cylinder compressed air or nitrogen .....	270 scfh (127 l/min) @ 80 -120 psi (5.5-8.3 bar) supplied to power supply pressure regulator
Power supply pressure regulator setting .....	70 psig (4.8 bar) dynamic (flowing)

# DESCRIPTION & SPECIFICATIONS

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## PAC125T Trigger Torch

Maximum cutting thickness range .....	1/2 inch (13 mm)
Gas Flow .....	270 scfh/4.5 scfm at 70 psi (127 l/min at 4.8 bar)
Weight .....	4.5 pounds (2 kg) with 25 ft. (7.6 m) lead

## PAC125M Machine Torch (Optional)

Maximum cutting thickness range .....	1/2 inch (13 mm)
Gas Flow .....	270 scfh/4.5 scfm at 70 psi (127 l/min at 4.8 bar)
Weight .....	7 pounds (3.2 kg) with 25 ft. (7.6 m) lead














## PAC121P Push-button Torch (Option for Non CE Systems Only)

Maximum cutting thickness range .....	1/2 inch (13 mm)
Gas Flow .....	270 scfh/4.5 scfm at 70 psi (127 l/min at 4.8 bar)
Weight .....	6 pounds (2.7 kg) with 25 ft. (7.6 m) lead

# DESCRIPTION & SPECIFICATIONS

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## IEC SYMBOLS USED

	Direct Current (DC).
	Alternating current (AC).
	Plasma cutting torch.
	AC input power connection.
	The terminal for the external protective (earthed) conductor.
	An inverter-based power source.
	Anode (+) work clamp.
	Temperature switch.
	Pressure switch.
	Plasma torch in the TEST position (cooling and cutting gas exiting nozzle).
	The power is on.
	The power is off.
	Volt/amp curve.

## Section 3 MAINTENANCE

In this section:

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General .....	3-2
Theory of Operation .....	3-2
Troubleshooting .....	3-5
Test Equipment and Tools .....	3-5
Visual Inspection .....	3-5
Troubleshooting Procedures.....	3-5
Initial Resistance Checks.....	3-6
Corrective Maintenance Checks .....	3-16
Sequence of Operation .....	3-25
PAC125T Torch Parts Removal and Replacement .....	3-26
Torch Main Body Removal and Replacement .....	3-26
Torch Switch Removal and Replacement.....	3-26
PAC121P Torch Parts Removal and Replacement .....	3-28
Torch Main Body Removal and Replacement .....	3-28
Torch Switch Removal and Replacement .....	3-28
PAC125M Torch Parts Removal and Replacement.....	3-30
Removal .....	3-30
Replacement .....	3-31
Quick Disconnect O-Ring Removal and Replacement .....	3-32
Filter/Regulator Pressure Adjustment .....	3-33
Filter/Regulator Filter Cleaning Or Replacement .....	3-33
Air Filter Removal, Cleaning and Replacement .....	3-33
Removal .....	3-33
Cleaning .....	3-34
Replacement .....	3-34

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# MAINTENANCE

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## GENERAL

This section provides the technician with the theory of operation and troubleshooting of the non CE and CE 400V power supplies. Also included in this section are the removal and replacement procedures of the PAC125T torch and the optional PAC121P and PAC125M torch parts; quick disconnect O-ring removal and replacement; pressure regulator adjustment; pressure regulator filter replacement; and the power supply air filter removal, cleaning and replacement.

## THEORY OF OPERATION

Refer to the following principles of operation and Figures 3-1 and 3-7, 3-8, 3-9 or 3-11 to understand how the inverter power supply works.

- The in-rush protection circuit consists of relays RL1 and RL2 and resistors R1 and R2 located on the Power PCB. When the power on/off circuit breaker S1 is set to 1 (ON) at the instant the AC line voltage is high, a large pulse of current will surge through the bridge rectifier circuit diodes and possibly destroy them. The bridge rectifier circuit consists of BR1 and BR2 in the 208/240V power supplies and BR1 in the 400V and 480V power supplies. To protect the bridge rectifier diodes, the two 5-ohm resistors, R1 and R2, are used to limit the current during inrush. After a time delay, the Control PCB outputs a signal to energize relays RL1 and RL2 in order to remove the current from resistors R1 and R2.
- The bridge rectifier circuit, BR1 and BR2 in the 208/240V power supplies and BR1 in the 400V and 480V power supplies, converts the input alternating line current (AC) to direct current (DC). The DC current output is 120 pulses per second at 60 Hz or 100 pulses per second at 50 Hz. The DC is input to the filter capacitor circuit.
- The filter capacitor circuit, which consists of capacitors C1 - C6, acts as a filter to smooth out the ripple of the DC pulse output of the bridge rectifier circuit. When the DC pulse output of bridge rectifier circuit begins to fall, the capacitors discharge thereby maintaining a constant DC pulse level for input to the switching circuit (FETs) for conversion into a high frequency square wave.
- The switching circuit, which consists of four sections of FETs (Q8-Q11, Q12-Q15, Q16-Q19 and Q20-Q23), converts the raw DC current from the filter capacitor circuit into a high frequency 50 Khz square wave for input to the isolation power transformer T4.
- Current transformer L2 serves to protect the inverter from overcurrent in case of a control circuit failure.
- The resultant square wave from the switching circuit is fed into isolation power transformer T4, with the resulting secondary voltage being rectified by the output rectifier circuit.
- The secondaries of the isolation power transformer are connected in two parallel full wave rectifier configurations made up of output rectifier diodes D21-D24. This produces a high voltage DC output which is fed to shunt SH1 and through smoothing inductor L1. The SH1 output is fed to the pilot arc relay CR1 which provides current control between the nozzle and electrode. This output is also fed through current sensor TS1 to sense current transfer in the work cable. The SH1 sense output is routed to the Control PCB as part of the feedback circuit.
- The feedback loop, under the control of the Control PCB, transmits the gate drive signals

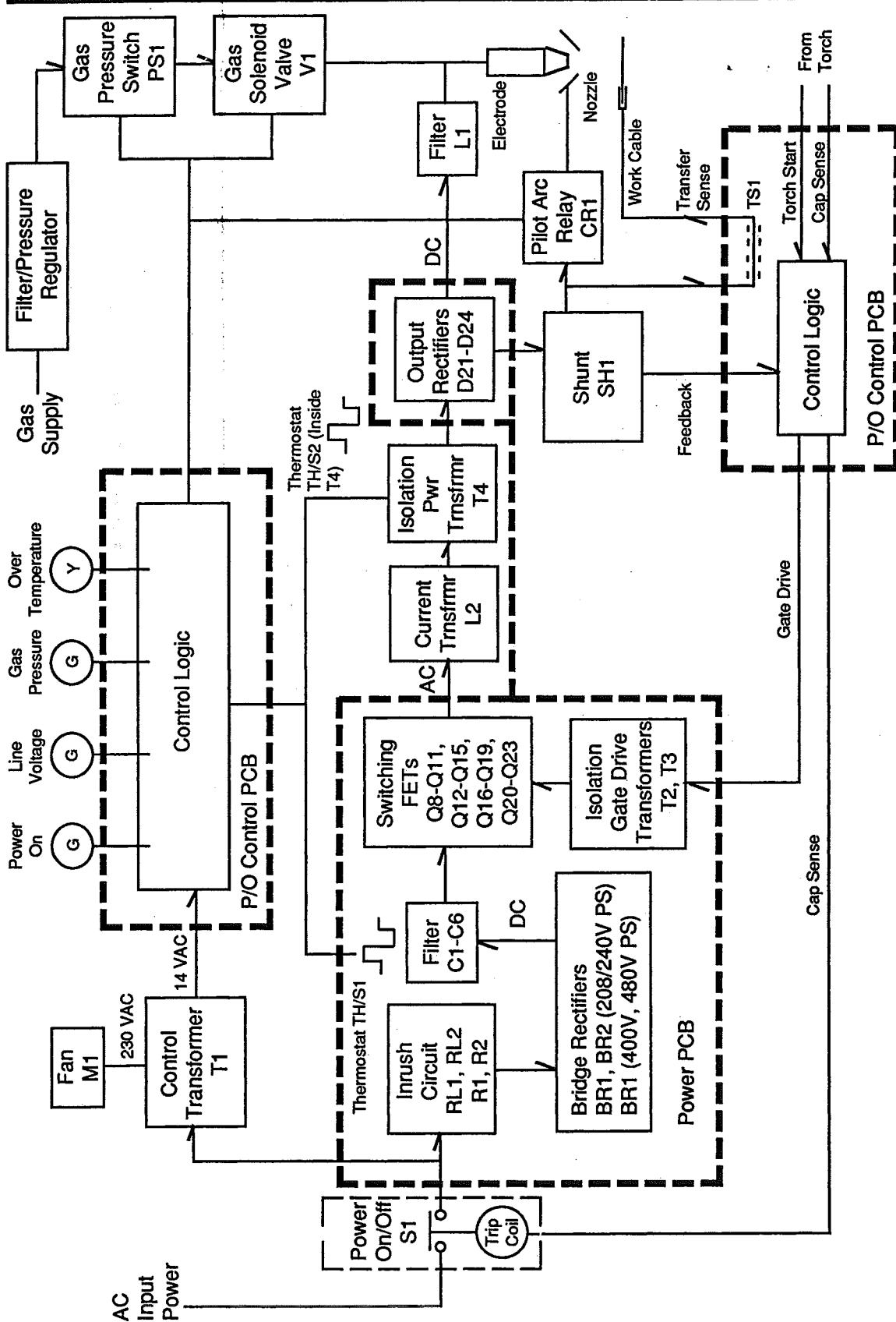


Figure 3-1 MAX43 Non CE and CE 400V Power Supply Block Diagram



# MAINTENANCE

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(switching waveform) to gate drive transformers for input to the switching circuit (gates of the FETs) to vary the pulse width.

The control logic circuits on the Control PCB control all functions of the power supply as follows:

- Monitors the four status indicators: POWER ON (D28), LINE VOLTAGE (D36), GAS PRESSURE (D26), and OVER TEMPERATURE (D38) LEDs.
  - When the line voltage and incoming gas pressure are within operating limits the associated LEDs will light. The GAS PRESSURE LED goes off when either pressure switch PS1 opens because the incoming gas pressure is too low. The LINE VOLTAGE LED goes off when the input voltage is out of limits ( $175 \pm 5$  VAC).
  - When the operating temperature is within limits the OVER TEMPERATURE LED remains off. It lights when thermostat TH/S2 in power transformer T4 opens ( $90^{\circ}\text{C}$ ) because the duty cycle rating was exceeded causing the power supply to overheat or if the FETs in the heatsinks become too hot ( $90^{\circ}\text{C}$ ), thermostat TH/S1 on the Power PCB opens.
- Controls the sequence required to generate plasma as follows:
  - Turns on the inverter when the torch switch button is pressed.
  - After a short delay, turns on the gas solenoid valve V1 to blow back the electrode.
  - Monitors the pilot arc for arc transfer.
  - Ramps the current control command from the pilot arc level (20 amps) to the cut current selected by the operator.
  - Turns the inverter off if the arc transfer does not occur within three seconds.
  - Provides indication to the operator that the power is on and the line voltage, pressure and temperature interlocks are okay.
  - Turns the power supply off when the retaining cap on the torch is loose (cap sense).

## TROUBLESHOOTING

This service manual provides qualified maintenance personnel with the necessary data in order to maintain the cutting systems. The major emphasis of this manual is to access the power unit subassemblies and components and the torch and torch lead subassemblies in order to perform fault isolation procedures. These procedures are supported by wiring diagrams and a parts list. This indexed parts list is supported by exploded view illustrations which provide the user with the ability to locate subassemblies and components for testing and removal and replacement.

The complexity of the circuits and the accessibility of the subassemblies and components require that maintenance personnel have a working knowledge of inverter power supply theory. In addition to being technically qualified, maintenance personnel must perform all testing with safety in mind.

If questions or problems arise during servicing, call the Hypertherm Technical Service at one of the phone numbers listed in the front of this manual.

### Test Equipment and Tools

The test equipment required for the following checkout procedures is a multimeter. There are no special tools required to perform any of the maintenance procedures.

### Visual Inspection

When the power unit is first received, visually inspect the exterior of the unit for damage to the enclosure and exterior components. Also inspect the torch and torch lead for damage.

### Troubleshooting Procedures

The troubleshooting procedures contained in this manual provide service level personnel maintenance for the MAX43 208/240 VAC, 1 PH, 60 Hz; 480 VAC, 3 PH, 60 Hz; 400 VAC, 3 PH, 50 Hz; and MAX43 CE 400V power supplies. Maintenance of the power supplies consists of performing visual inspection and troubleshooting procedures.

The troubleshooting procedures include the *Initial Resistance Checks* and the *Corrective Maintenance Checks*. These procedures are presented in a flow diagram format in order to aid the technician in performing the checkout in the proper sequence.

- Refer to the wiring diagrams, Figures 3-7, 3-8, 3-9 or 3-11 when performing the checkout procedures.
- In order to locate subassemblies and components, Section 4, *Parts List* provides maintenance personnel with an indexed parts list of the major subassemblies which are supported by exploded view illustrations.
- After the malfunction has been located and repaired, refer to the *Sequence of Operation* flow diagram in this section to test the power unit for proper operation.

# MAINTENANCE

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## Initial Resistance Checks



### WARNING



**SHOCK HAZARD:** Always turn off power and unplug cord from wall receptacle before removing the cover for servicing within the power supply. Note that if power is required for servicing, dangerous voltages exist within the power supply which could cause serious injury or death. If questions or problems arise during servicing, call the Hypertherm Technical Service at one of the numbers listed in the front of this manual.



### WARNING



The aluminum heatsink on the power PC board is electrically live when the plasma is on. In case of an electrical failure of the inverter circuit, the heatsink may be live when the power is off.

**SHOCK HAZARD:** The large six electrolytic capacitors, C1-C6, (blue-cased cylinders located on the power PC board) store large amounts of energy in the form of electrical voltage. Even if the power is off, dangerous voltages exist at the capacitor terminals on the PC board and on certain areas of the PC board. Discharge time to 68 volts is 2 minutes. Never discharge the capacitors with a screwdriver or other implement... explosion, property damage and/or personal injury will result. Wait at least 5 minutes after turning the power supply off before touching the PC board or capacitors. If questions or problems arise during servicing, call Hypertherm Technical Service at one of the numbers listed in the front of front this manual.

**STORED ENERGY HAZARD:** After a discharge time of 2 minutes, 68 volts still exist at the capacitor terminals on the PC board, and on certain areas of the PC board. The energy stored at 68 volts may cause personal injury.



## WARNING



**SHOCK HAZARD:** Do not attempt repairs on the power board or control board with the exception of fuses F1 and F2 on the power board. Do not in any way cut away or remove the protective conformal coating from either board. To do so will risk a short between the AC input circuit to the output circuit causing serious injury or death.

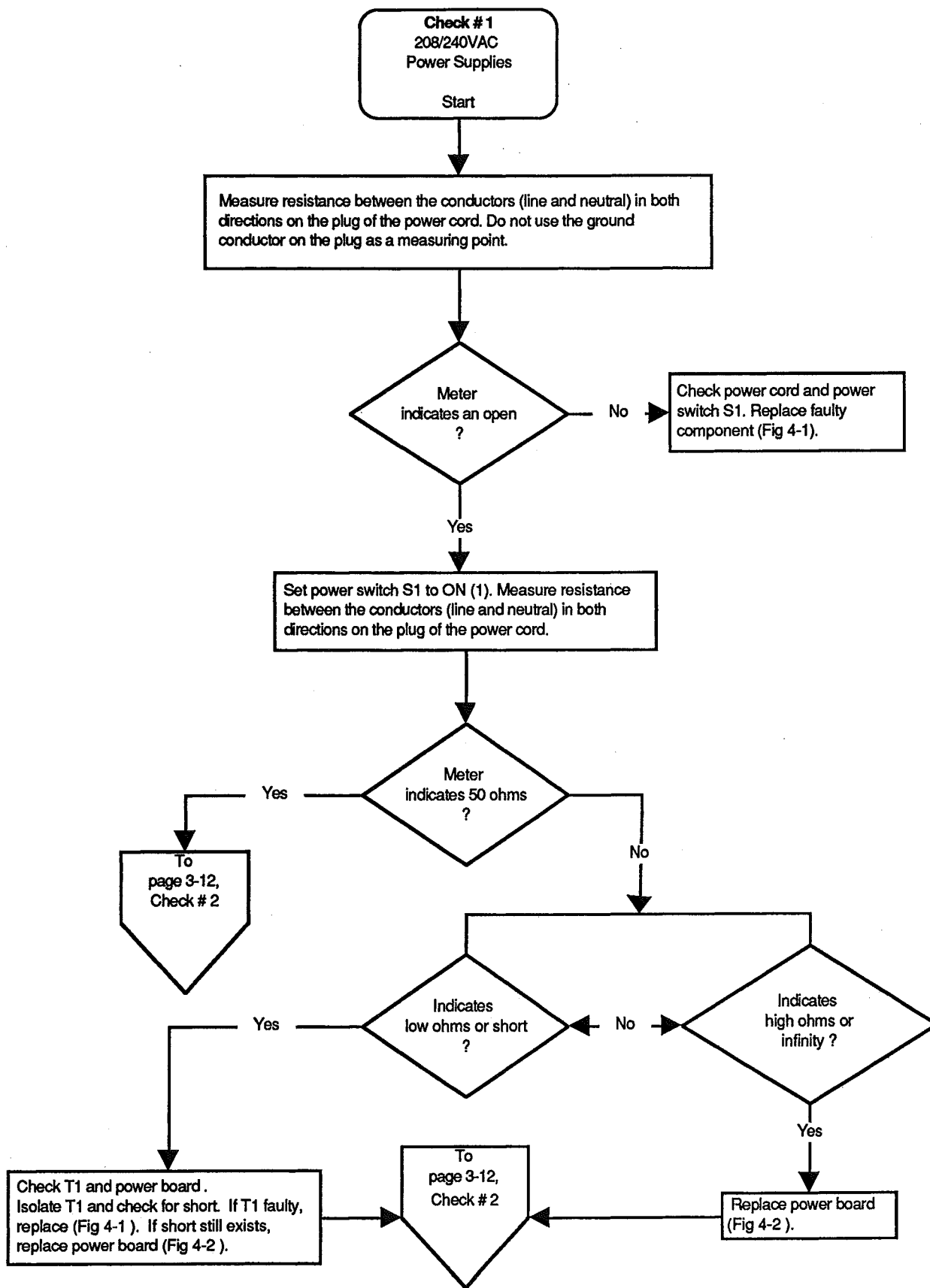
The power supply and PC boards are subjected to dielectric and insulation resistance tests per applicable CSA and IEC standards for the safety of the operator and maintenance personnel.

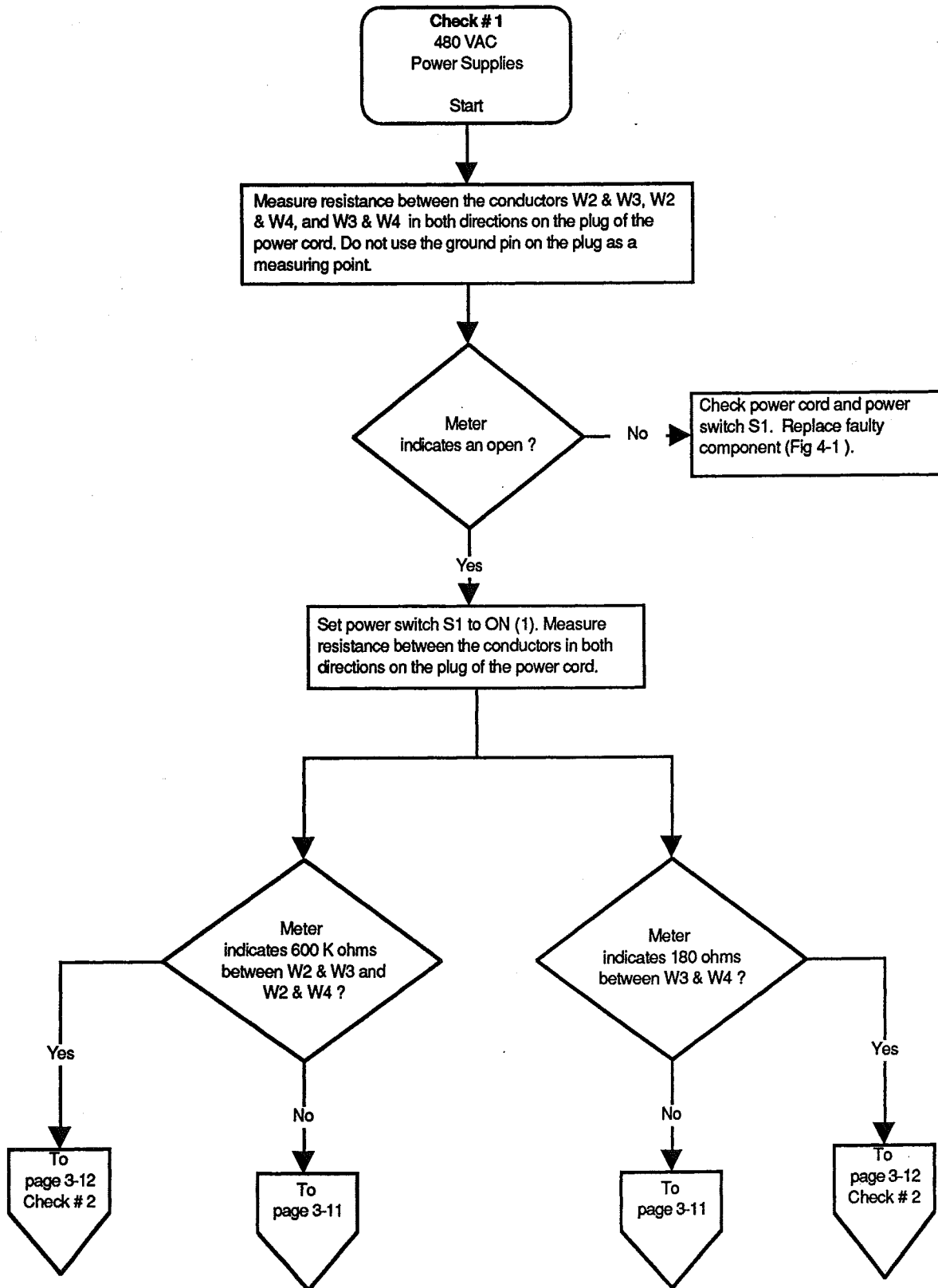
Removal of the protective conformal coatings and other unauthorized repairs to the PC boards will void the warranty.

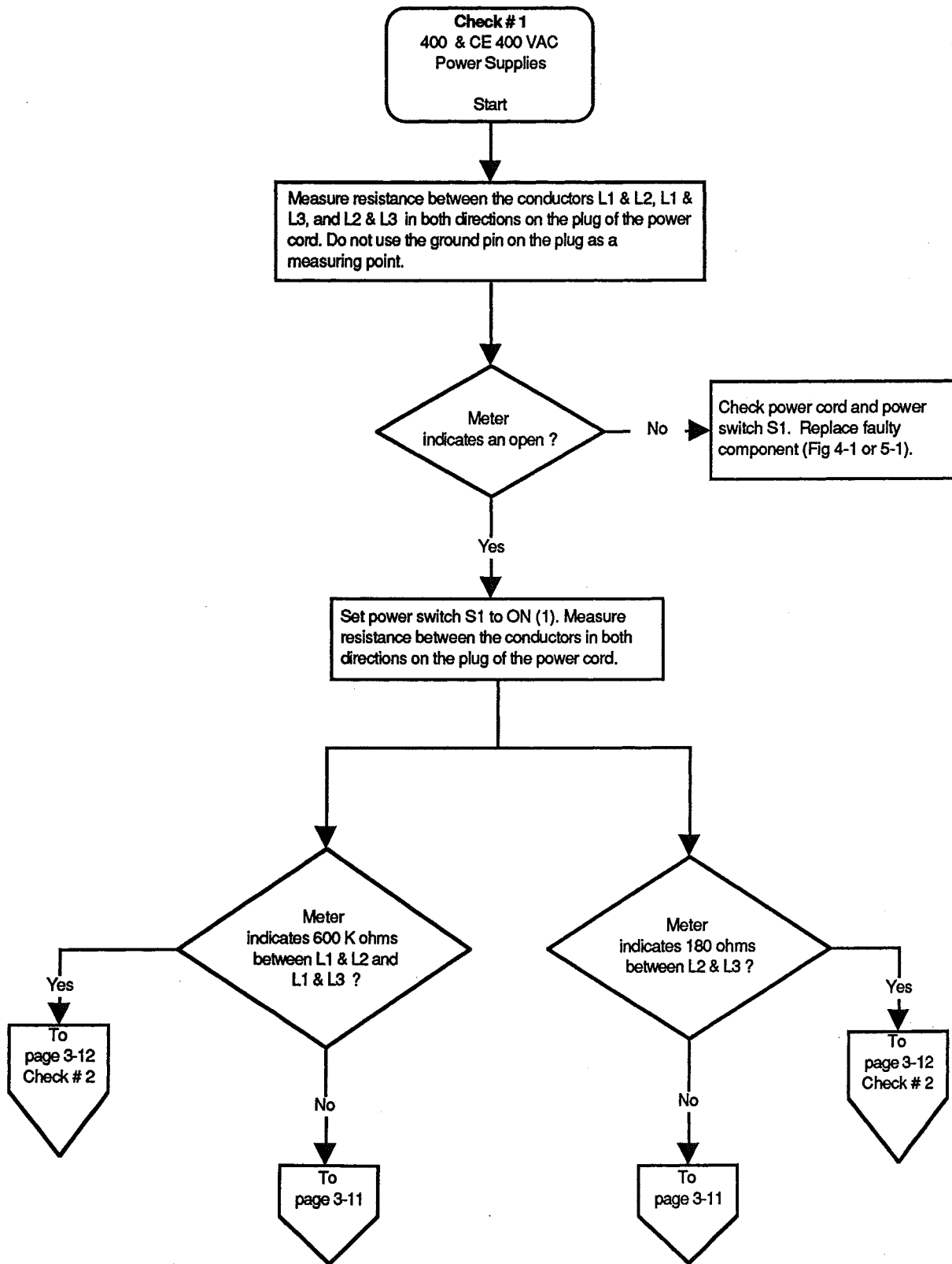
If questions or problems arise during servicing, call the Hypertherm Technical Service at one of the numbers listed in the front of this manual.

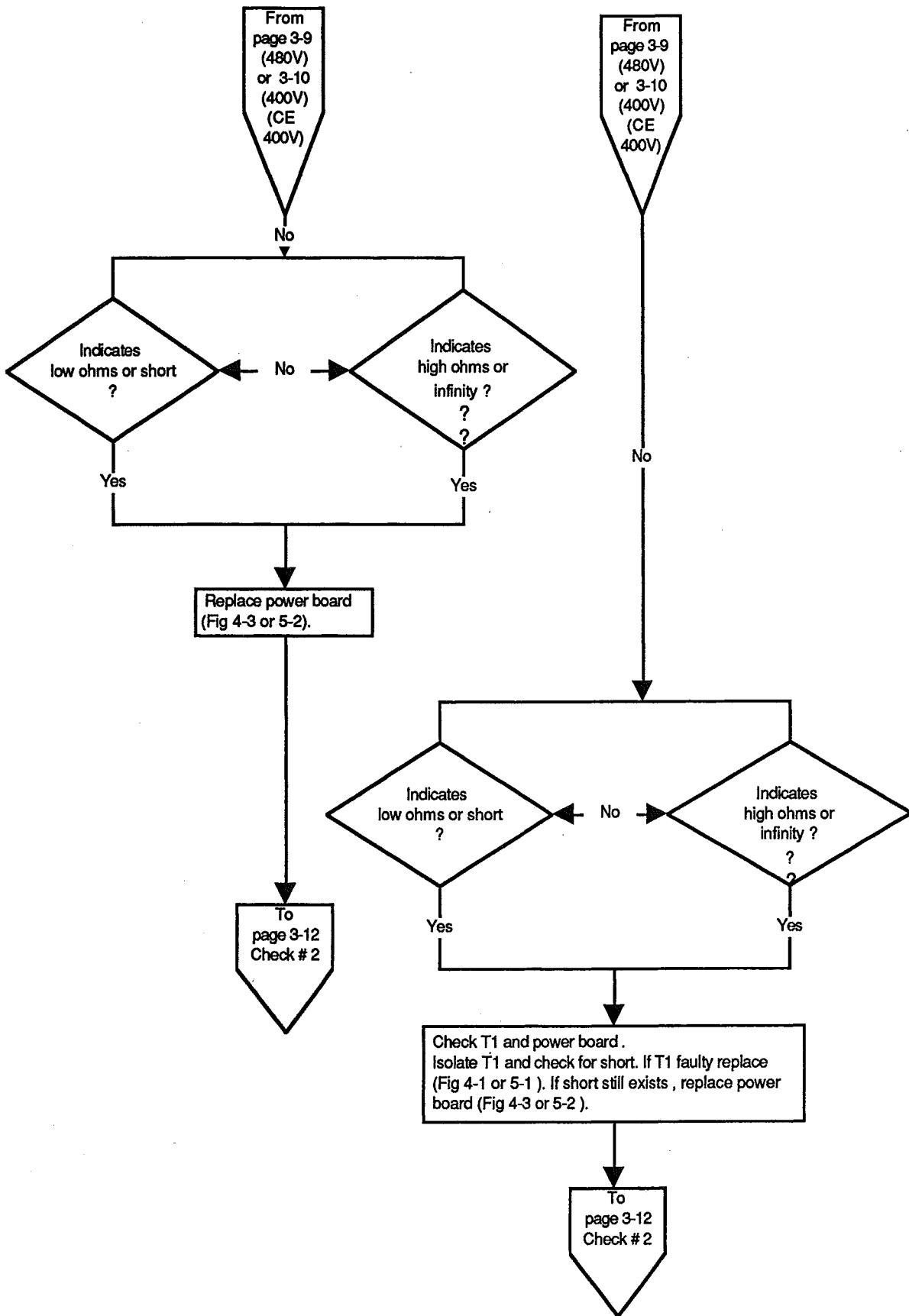
After visually inspecting the exterior of the power supply, always perform the initial resistance checks before applying power to the power supply. **If these checks are not performed prior to power up, further damage to the power supply could result.**

1. Set the MAX43 power switch to OFF (0), unplug the power cord, and disconnect the gas supply.
2. Remove the cover of the power supply by removing the screws.
3. Visually inspect the interior of the power supply, especially on the side with the power board. (See Figures 4-1, 4-2 and 4-3 for non CE units and Figures 5-1 and 5-2 for the CE 400V unit.) Look for broken or loose wiring connections, burn and char marks, damaged components, etc. Repair or replace as necessary.
4. Perform the initial resistance checks.
5. After the problem has been located and repaired, refer to the *Sequence of Operation* later in this section for the normal operation of the power supply from power up to cutting.

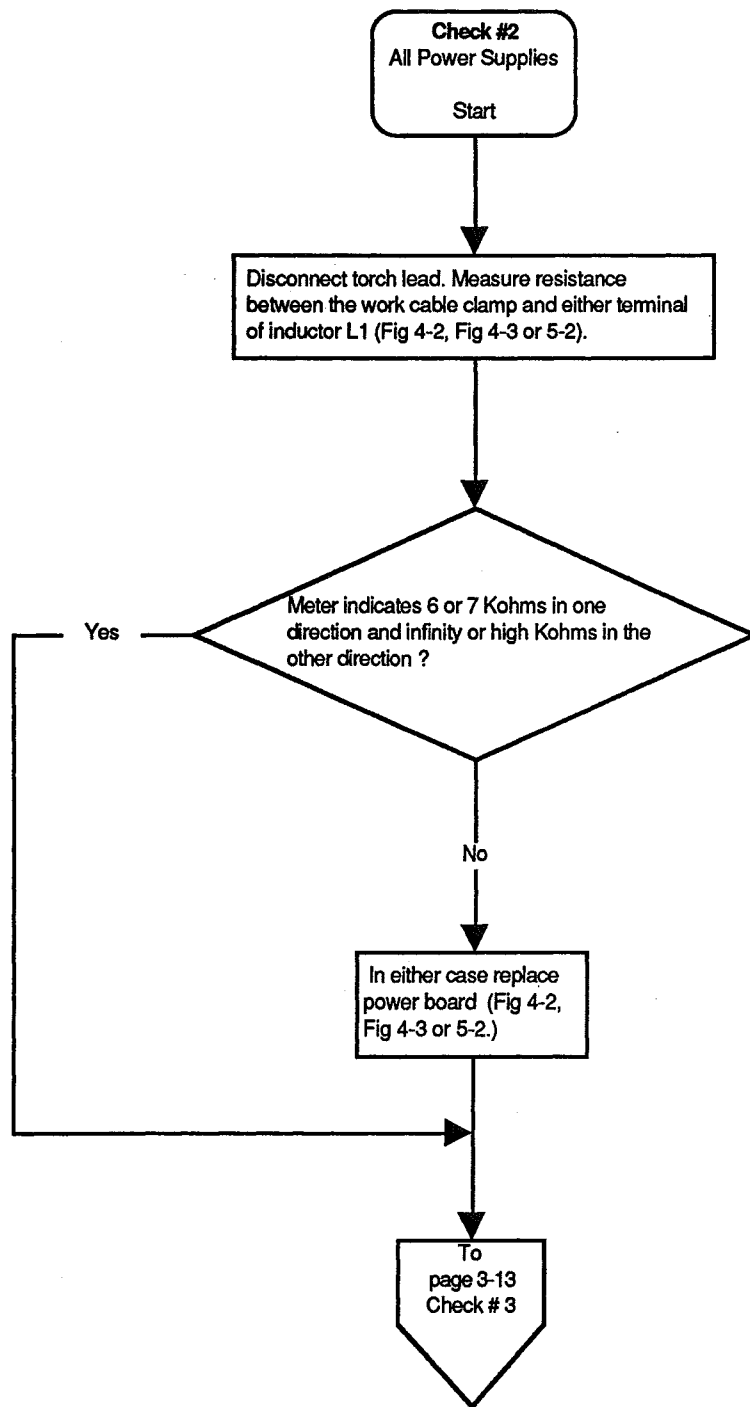


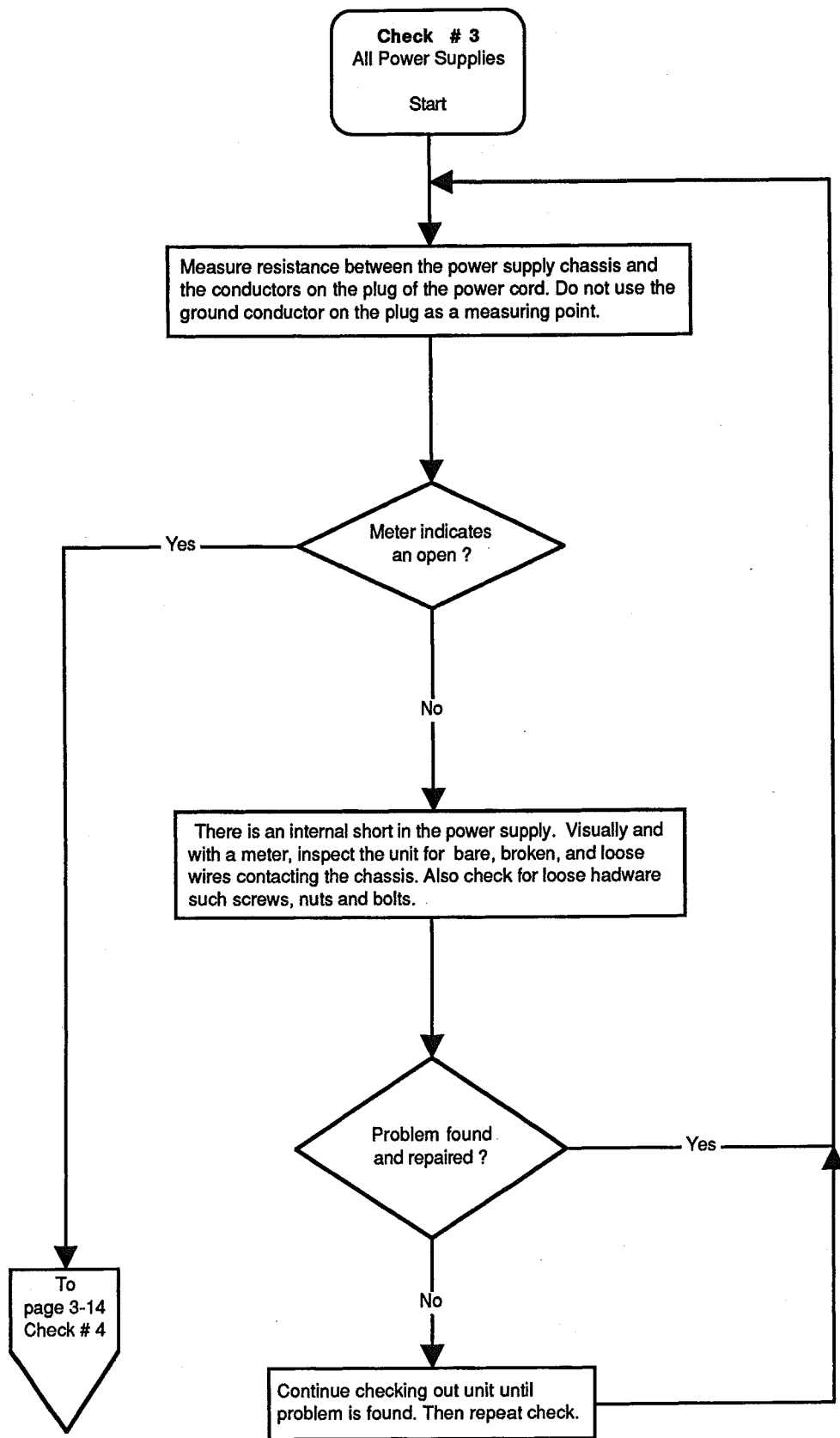


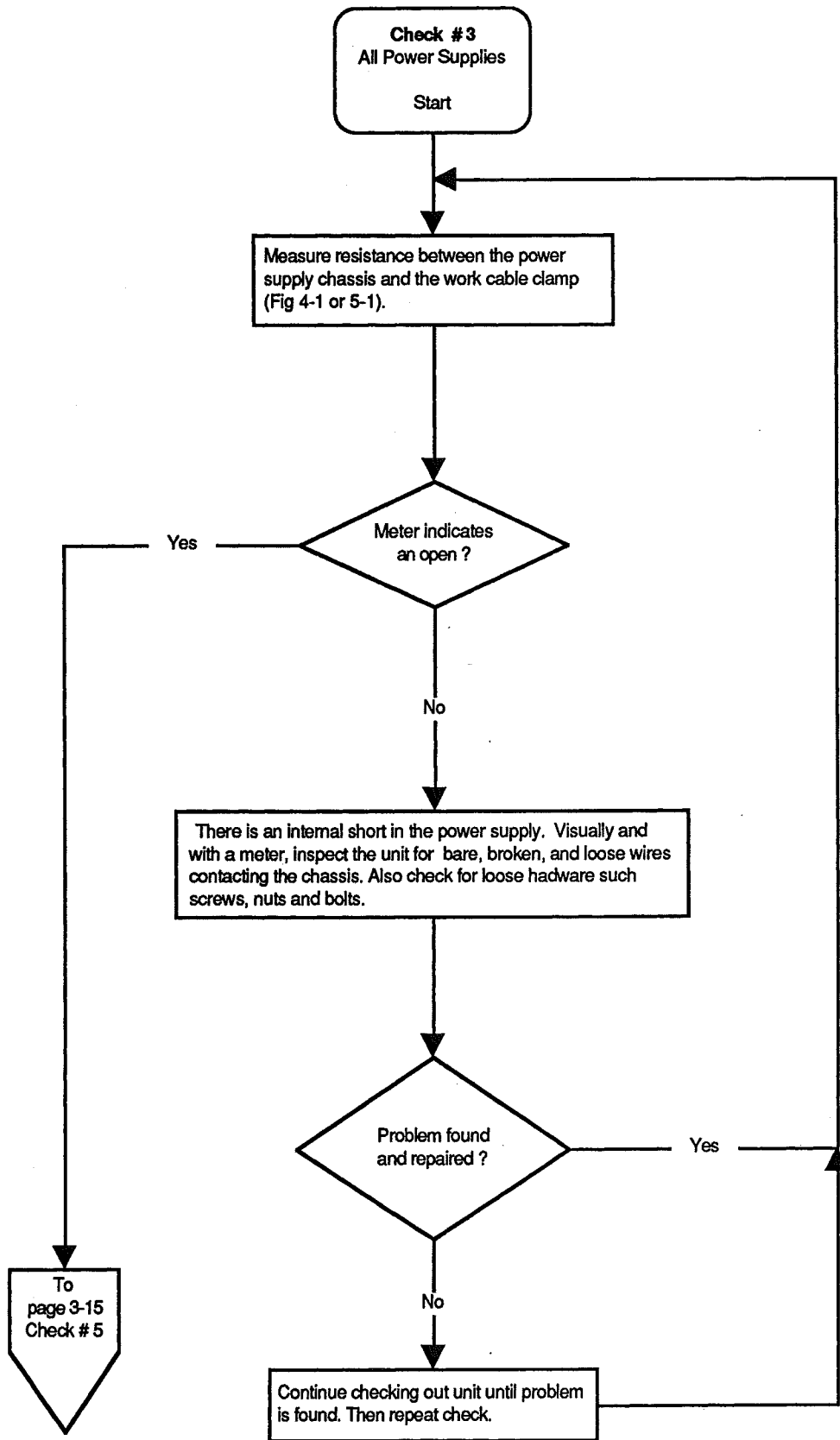


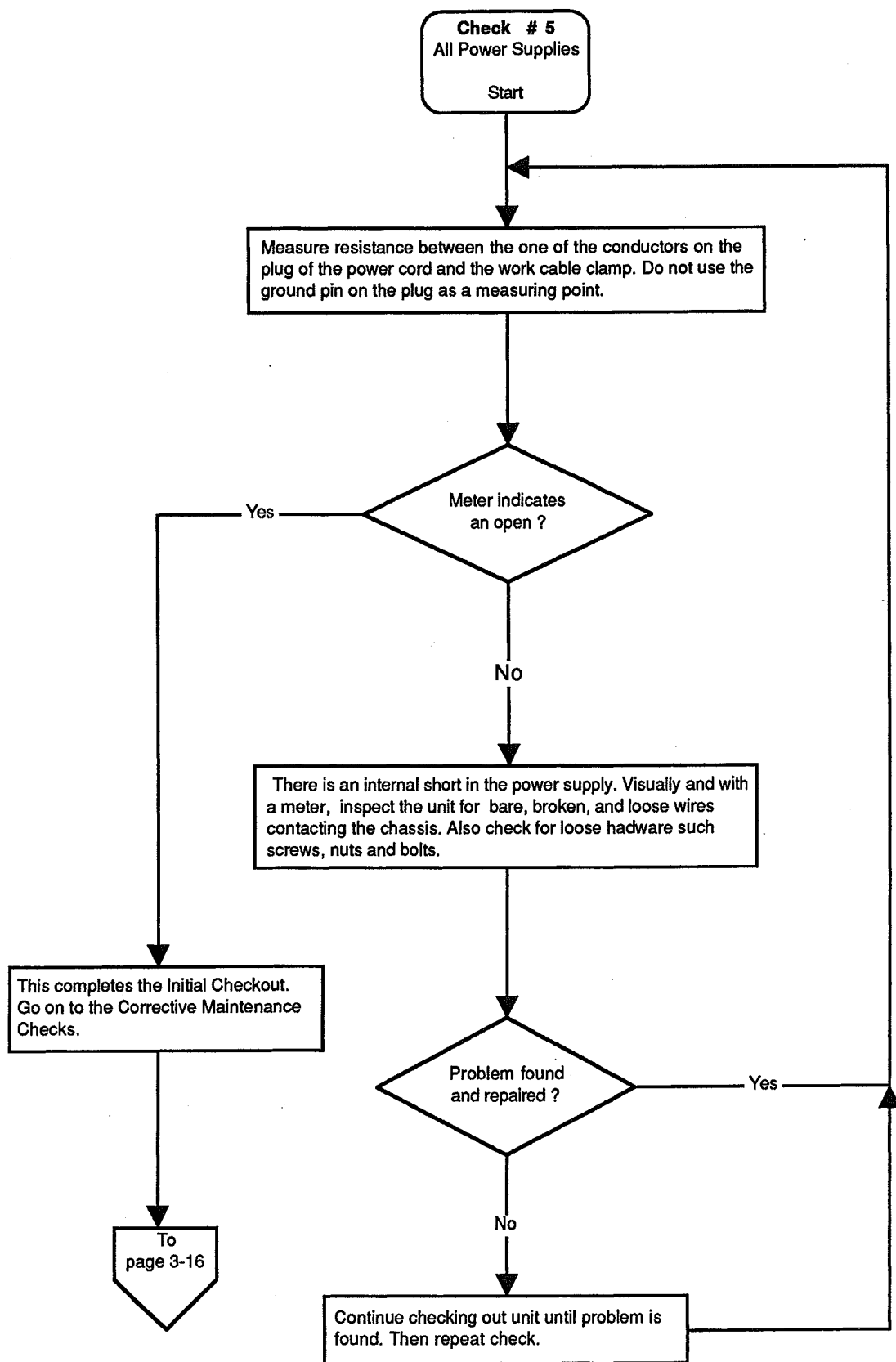












# MAINTENANCE

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## Corrective Maintenance Checks



### WARNING



**SHOCK HAZARD:** Always turn off power and unplug cord from wall receptacle before removing the cover for servicing within the power supply. Note that if power is required for servicing, dangerous voltages exist within the power supply which could cause serious injury or death. If questions or problems arise during servicing, call the Hypertherm Technical Service at one of the numbers listed in the front of this manual.



### WARNING



The aluminum heatsink on the power PC board is electrically live when the plasma is on. In case of an electrical failure of the inverter circuit, the heatsink may be live when the power is off.

**SHOCK HAZARD:** The large six electrolytic capacitors, C1-C6, (blue-cased cylinders located on the power PC board) store large amounts of energy in the form of electrical voltage. Even if the power is off, dangerous voltages exist at the capacitor terminals on the PC board and on certain areas of the PC board. Discharge time to 68 volts is 2 minutes. Never discharge the capacitors with a screwdriver or other implement... explosion, property damage and/or personal injury will result. Wait at least 5 minutes after turning the power supply off before touching the PC board or capacitors. If questions or problems arise during servicing, call Hypertherm Technical Service at one of the numbers listed in the front of this manual.

**STORED ENERGY HAZARD:** After a discharge time of 2 minutes, 68 volts still exist at the capacitor terminals on the PC board, and on certain areas of the PC board. The energy stored at 68 volts may cause personal injury.



### WARNING



**SHOCK HAZARD:** Do not attempt repairs on the power board or control board with the exception of fuses F1 and F2 on the power board. Do not in any way cut away or remove the protective conformal coating from either board. To do so will risk a short between the AC input circuit to the output circuit causing serious injury or death.

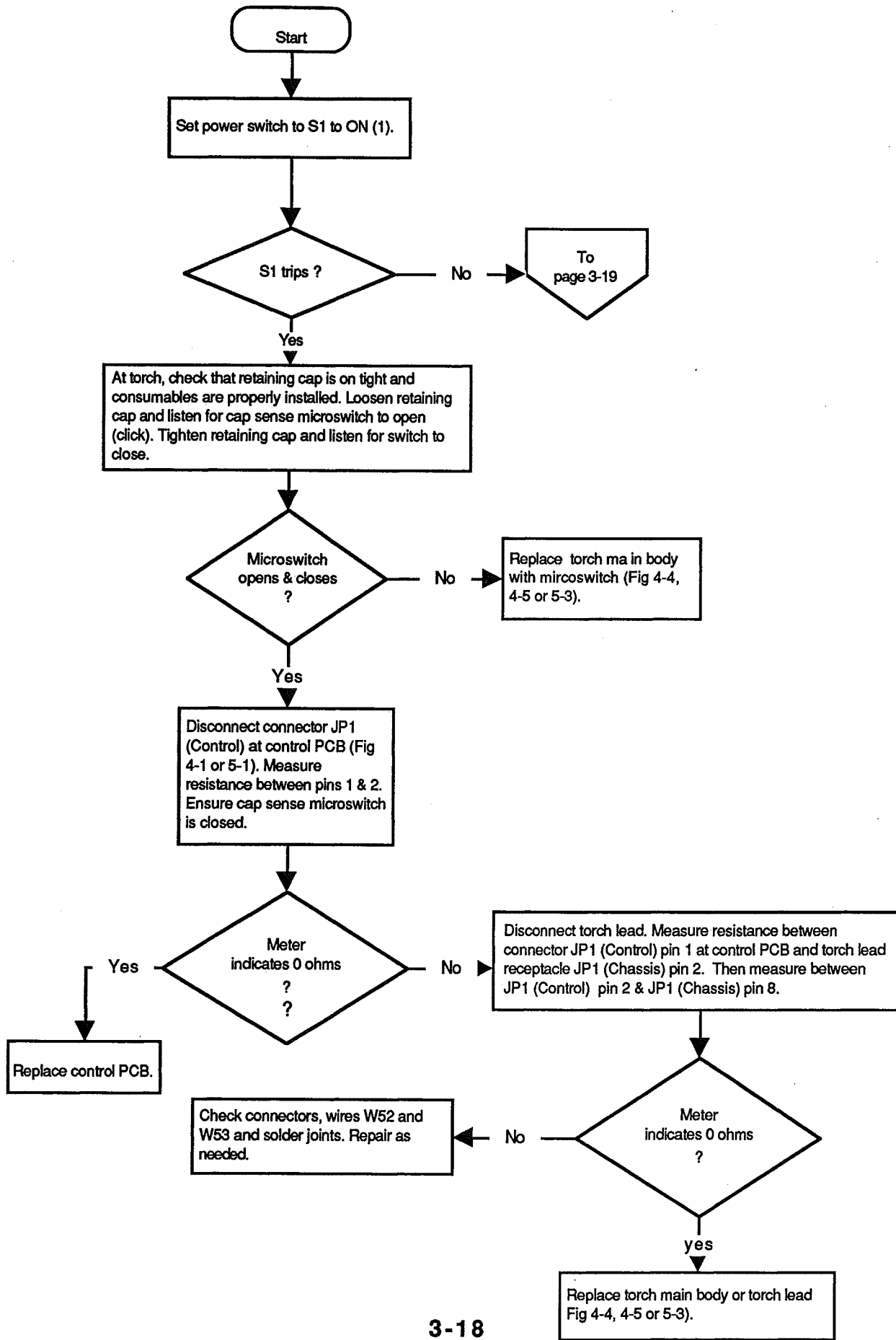
The power supply and PC boards are subjected to dielectric and insulation resistance tests per applicable CSA and IEC standards for the safety of the operator and maintenance personnel.

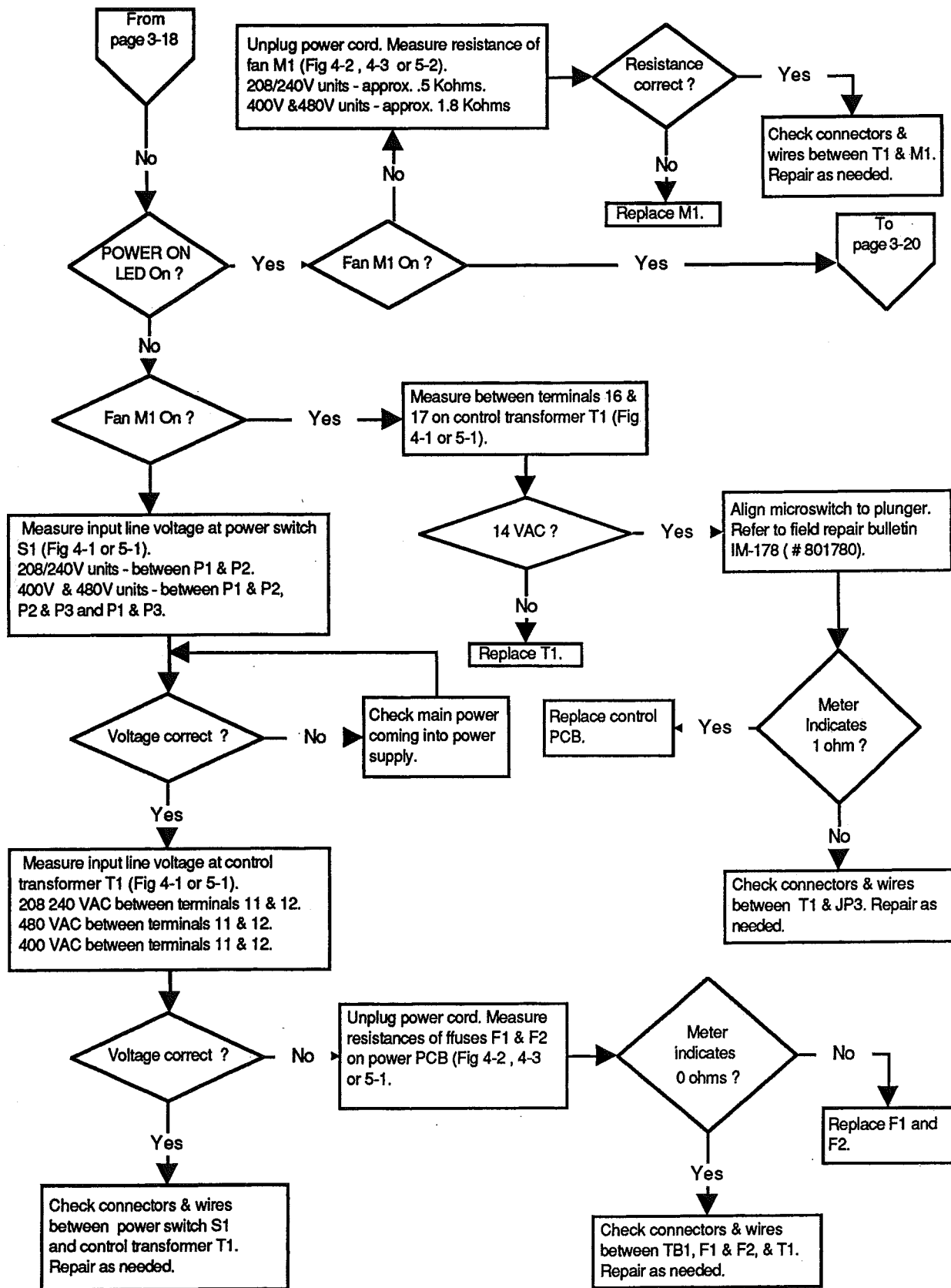
Removal of the protective conformal coatings and other unauthorized repairs to the PC boards will void the warranty.

If questions or problems arise during servicing, call the Hypertherm Technical Service at one of the numbers listed in the front of this manual.

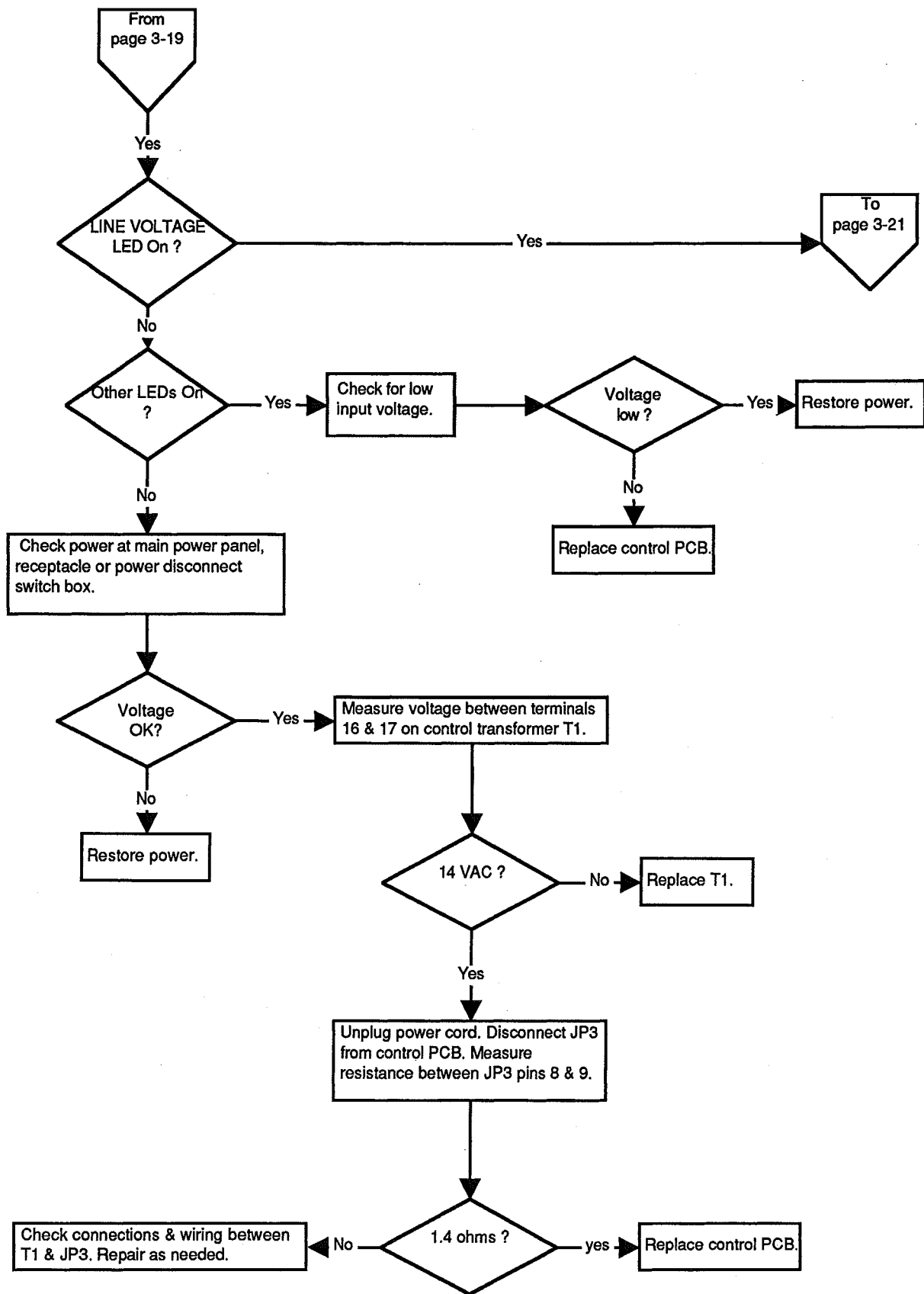
If no problems were found during the initial resistance checks, perform the following corrective maintenance checks:

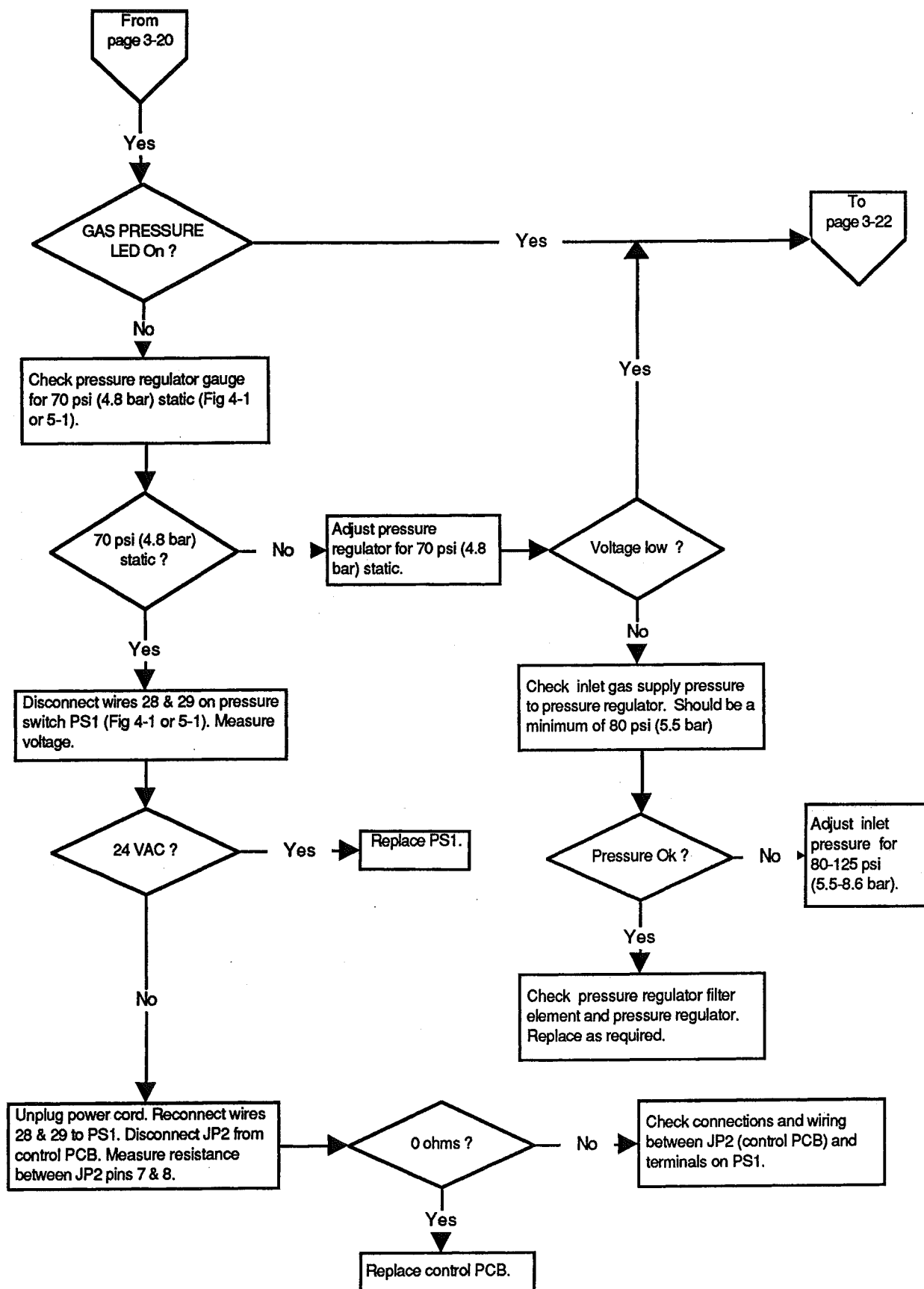
1. Connect the torch lead to the power supply.
2. Connect the power cord into the line voltage disconnect switch box or plug into a properly grounded outlet.
3. Connect the gas supply to the pressure regulator at the rear of the power supply.
4. Perform the corrective maintenance checks.
5. After the problem has been located and repaired, refer to the *Sequence of Operation* later in this section for the normal operation of the power supply from power up to cutting.

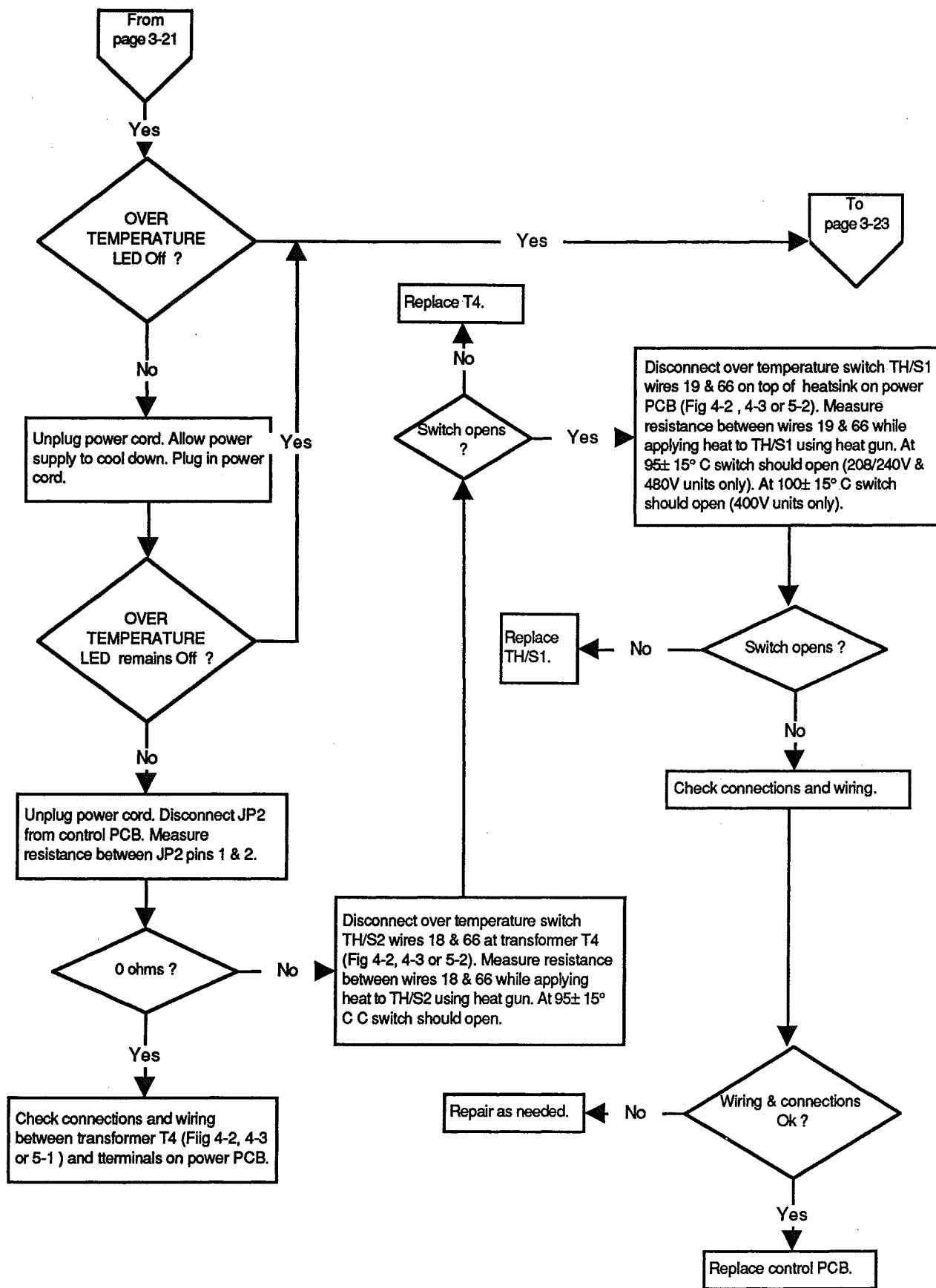


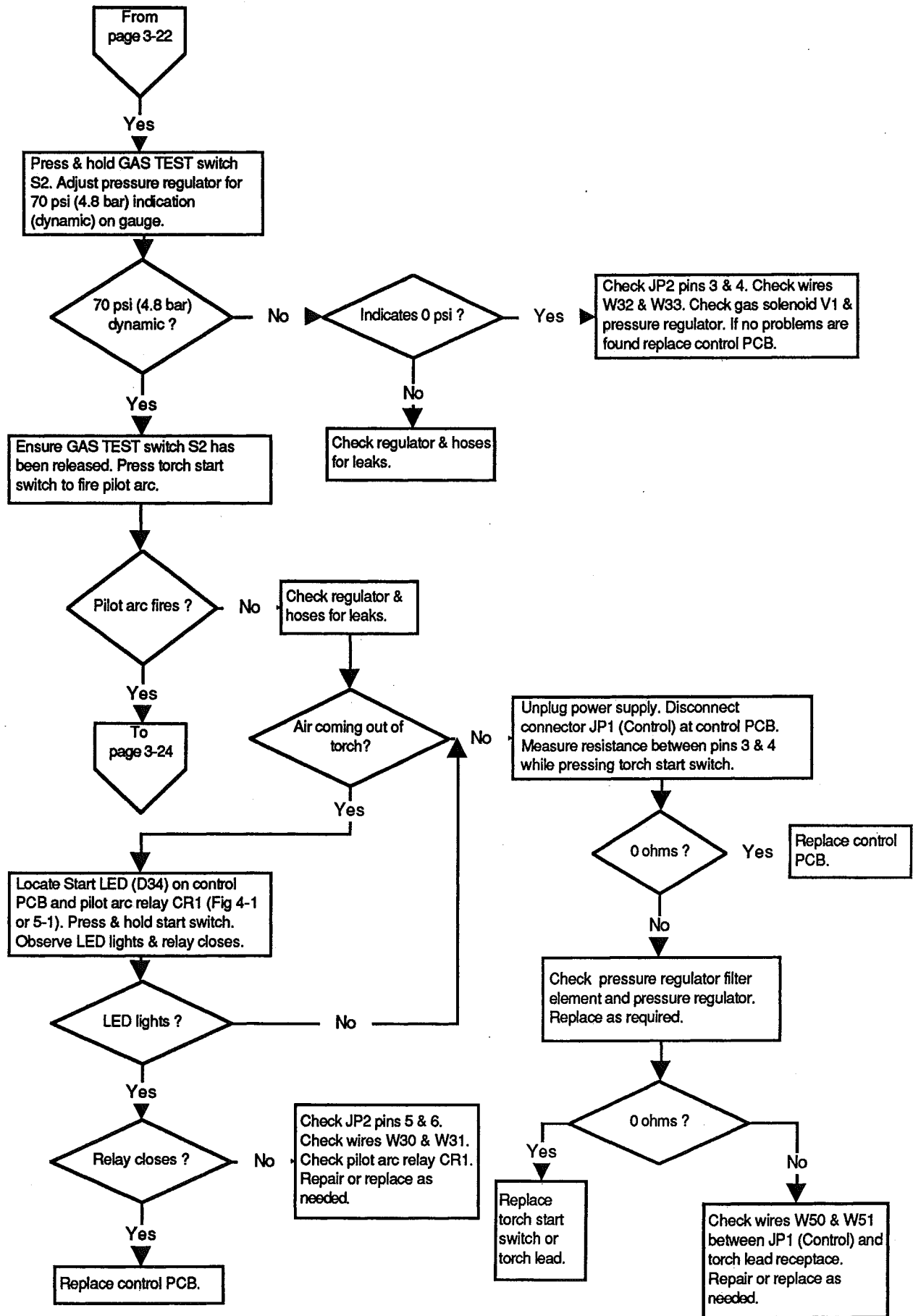


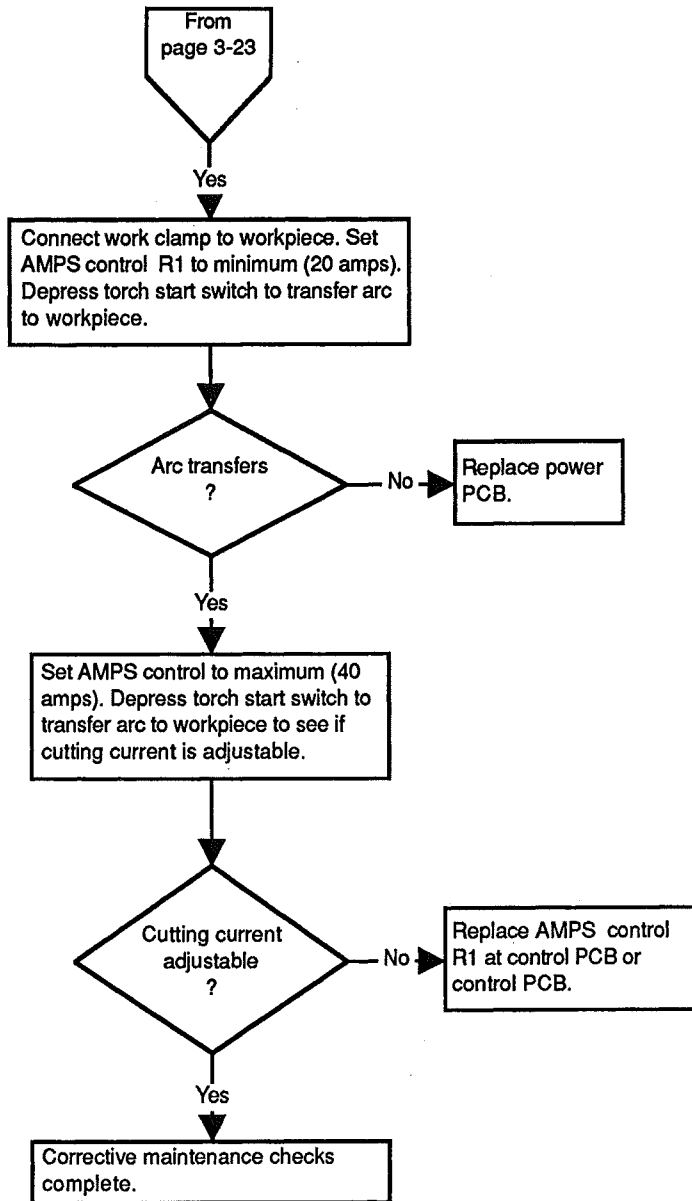




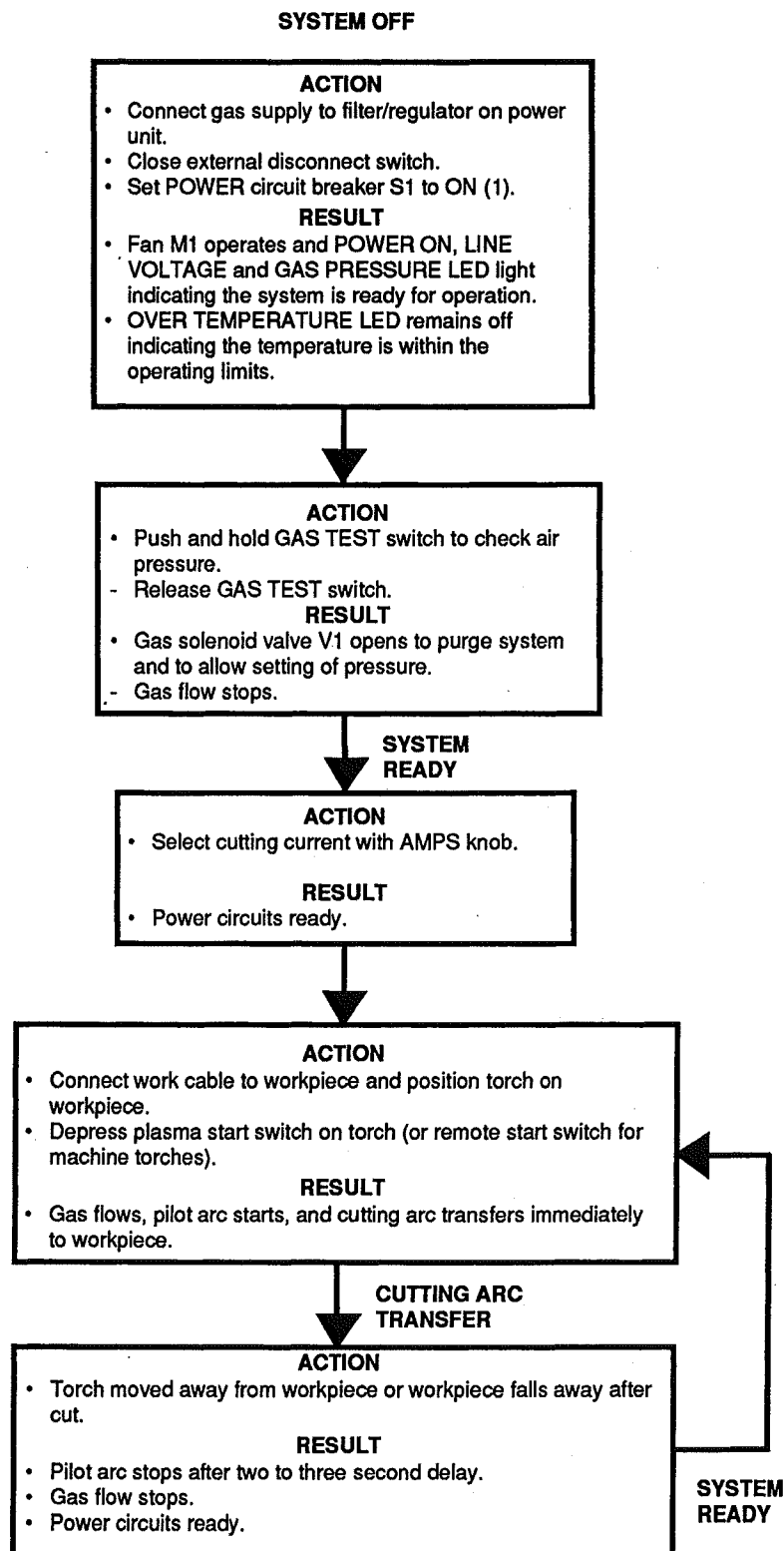








## SEQUENCE OF OPERATION



# MAINTENANCE

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## PAC125T TORCH PARTS REMOVAL AND REPLACEMENT

### Torch Main Body Removal and Replacement

To remove and replace the torch main body, order the torch main body with cap-on sensor switch and refer to the following procedure and Figure 3-2.

1. **Set the MAX43 power switch to O (off), unplug the power cable, and disconnect the gas supply. Disconnect the torch lead quick disconnect from the power supply.**
2. Remove the 5 screws that secure the handle halves together and remove handles from torch main body, torch switch and safety trigger.

Note for step 3: Disconnect wires by pulling on terminals. Do **not** pull on wires.

3. Disconnect the two lead terminals (blue wire in each terminal) from the two wires of the cap sensor microswitch.
4. Disconnect the plunger wire from the torch main body by holding the plunger nut with a 1/4" (6 mm) wrench or nut driver and removing the plunger screw.
5. Disconnect the torch main body and torch lead gas fittings using 3/8" (9.5 mm) and 1/2" (13 mm) open-end wrenches.
6. Replace the new torch main body by reversing these instructions. Note: When connecting the plunger wire, be certain to keep the plunger wire terminal at the proper angle as shown in the Figure 3-2 inset. Tighten the plunger screw with 8 lb-in (9 kg-cm) of torque.
7. Install the torch main body and torch switch back into the handle. Be certain that the torch switch slides into position above the safety trigger, and that trigger movement activates the switch pushbutton and then releases. While positioning the handle halves together, be careful not to pinch any wires.
8. Replace the 5 screws to secure the handle halves together.

### Torch Switch Removal and Replacement

To replace the torch switch, order the torch switch repair kit and refer to the following procedure and Figure 3-2.

1. **Ensure the MAX43 power switch is positioned to O (off), unplug the power cable, and disconnect the gas supply.**
2. Remove the 5 screws that secure the handle halves together.
3. Remove the torch switch from the handle.
4. Remove the torch switch by cutting the 2 splices at the torch lead (violet wires).
5. Replace the torch switch by crimping the switch wires and the violet wires from the torch lead together with the splices.

# MAINTENANCE

6. Install the torch switch back into the handle. Be certain that the torch switch slides into position above the safety trigger, and that trigger movement activates the switch pushbutton and then releases. While positioning the handle halves together, be careful not to pinch any wires.
7. Replace the 5 screws to secure the handle halves together.

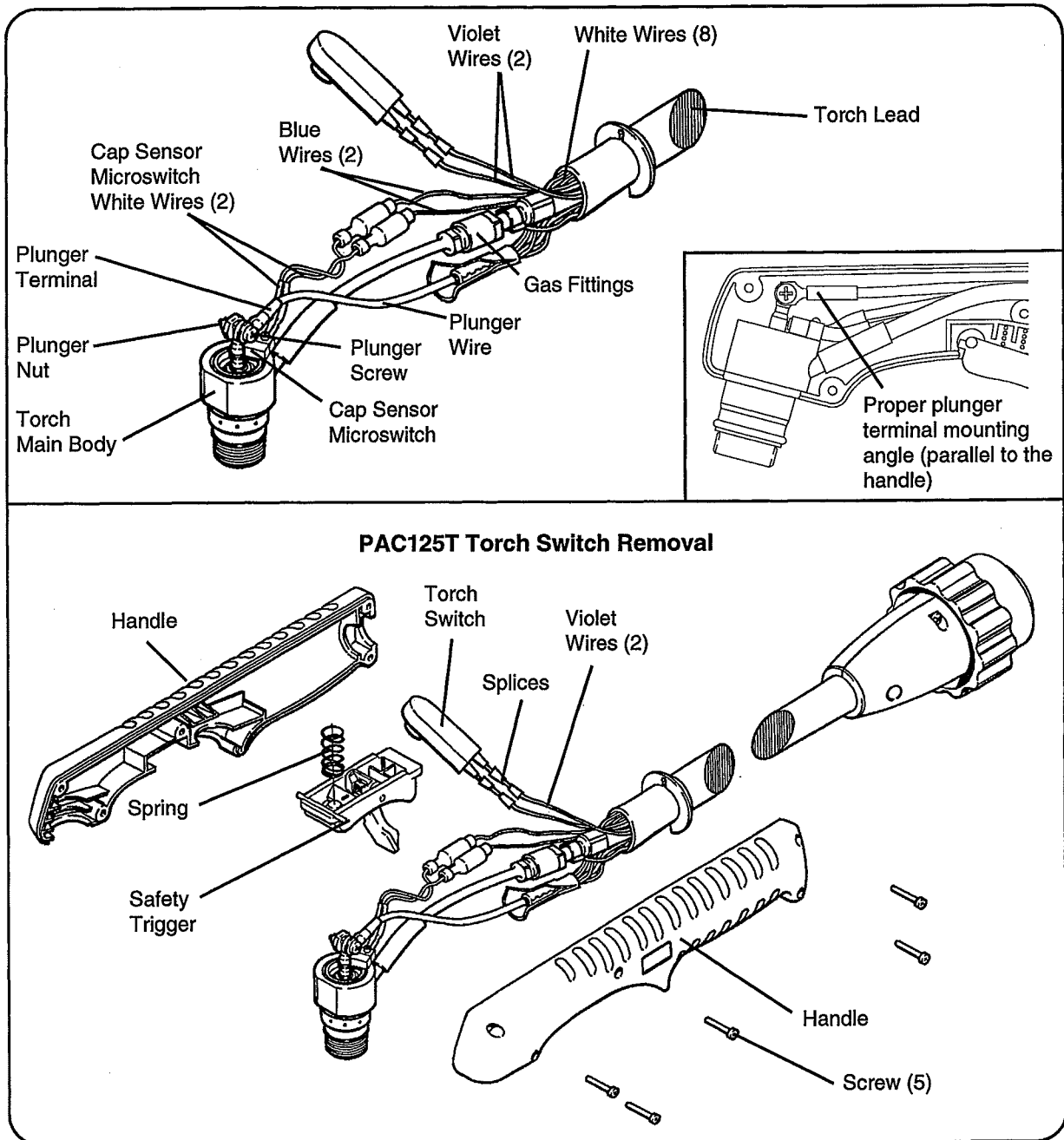


Figure 3-2 PAC125T Torch Parts Replacement



# MAINTENANCE

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## PAC121P TORCH PARTS REMOVAL AND REPLACEMENT

Repair of the PAC121P torch normally requires that either the torch main body or the torch switch be replaced.

### Torch Main Body Removal and Replacement

To remove and replace the torch main body, order the PAC121P torch main body with switch and refer to the following procedure and Figure 3-3.

1. Ensure the MAX43 power switch is positioned to OFF (0), unplug the power cable, and disconnect the gas supply.
2. Remove the 5 screws which secure the handle halves together.
3. Remove the torch main body assembly and torch switch from the handle halves.
4. Slide the protective PVC tubing back away from the connections and disconnect the torch main body wires from the torch lead wires.

Note: Disconnect wires by pulling on terminals. Do **not** pull on wires.

5. Disconnect the torch main body and torch lead gas fitting using the 5/16" (8 mm) and 7/16" (11 mm) open-end wrenches.
6. Connect the new torch main body and torch lead gas fitting using the wrenches.
7. Connect the terminals connecting the 2 white wires from the torch lead to the black plunger wire from the torch main body.
8. Connect the bullet receptacle and plug connecting the red wire from the torch lead to the red wire from the pilot arc fitting.
9. Connect the bullet receptacles and plugs connecting the 2 blue wires from the torch lead to the white wires from the cap sensor microswitch.
10. Slide the protective PVC tubing back over the connections.
11. Install the torch main body and torch switch into 1 of the handle halves. While positioning the handle halves together, be careful not to pinch any wires. Be especially careful around the torch switch retainers.
12. Replace the 5 screws to secure the handle halves together.

### Torch Switch Removal and Replacement

To remove and replace the torch switch, order the torch switch and 2 splices and refer to the following procedure and Figure 3-3.

1. Ensure the MAX43 power switch is positioned to OFF (0), unplug the power cable, and disconnect the gas supply.

## MAINTENANCE

2. Remove the 5 screws which secure the handle halves together.
3. Remove the torch main body assembly, torch switch and wire bundle from the handle halves.
4. Slide the protective PVC tubing back away from the connections.
5. Remove the torch switch by cutting the 2 splices at the torch lead (violet wires).
6. Replace the torch switch by crimping the switch leads and the violet leads from the torch lead together with the splices.
7. Slide the protective PVC tubing back over the connections.
8. Install the torch main body, torch switch and wire bundle into 1 of the handle halves. While positioning the handle halves together, be careful not to pinch any wires. Be especially careful around the torch switch retainers.
9. Replace the 5 screws to secure the handle halves together.

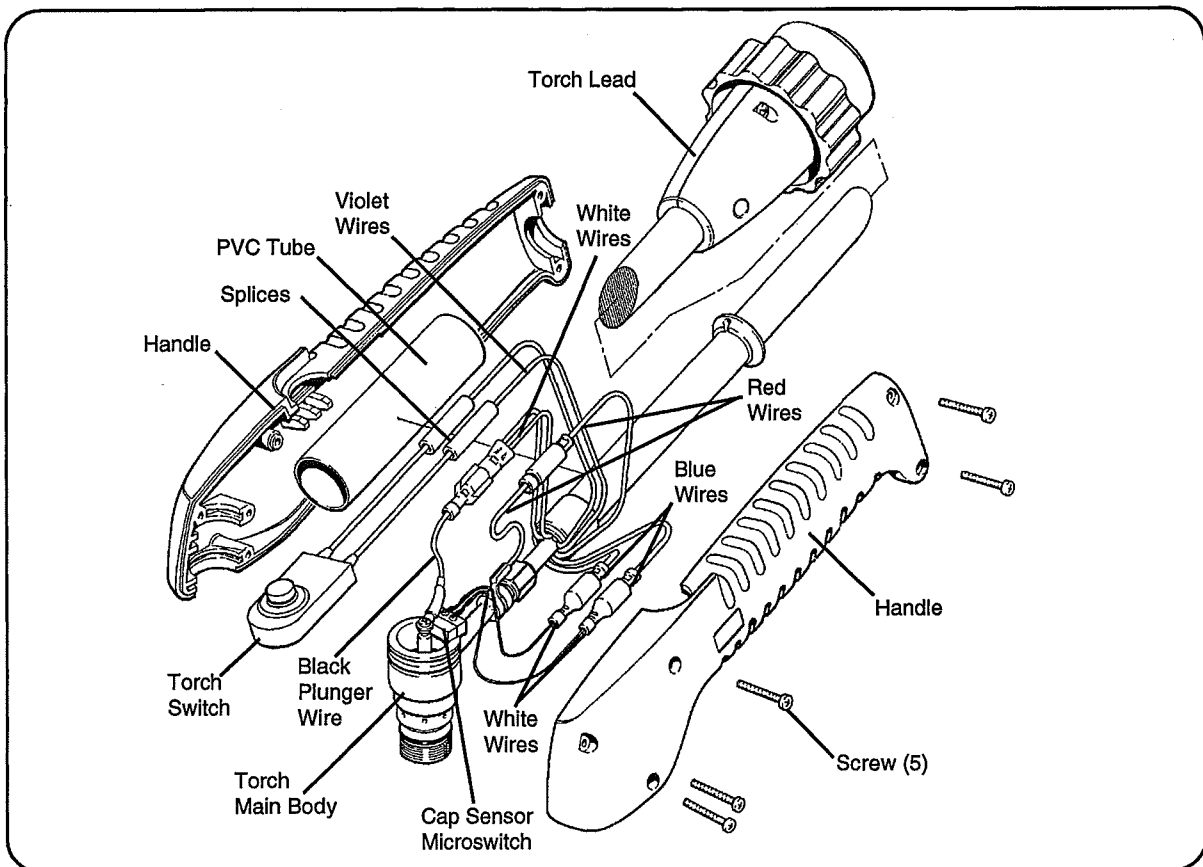


Figure 3-3 PAC121P Torch Assembly

# MAINTENANCE

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## PAC125M TORCH PARTS REMOVAL AND REPLACEMENT

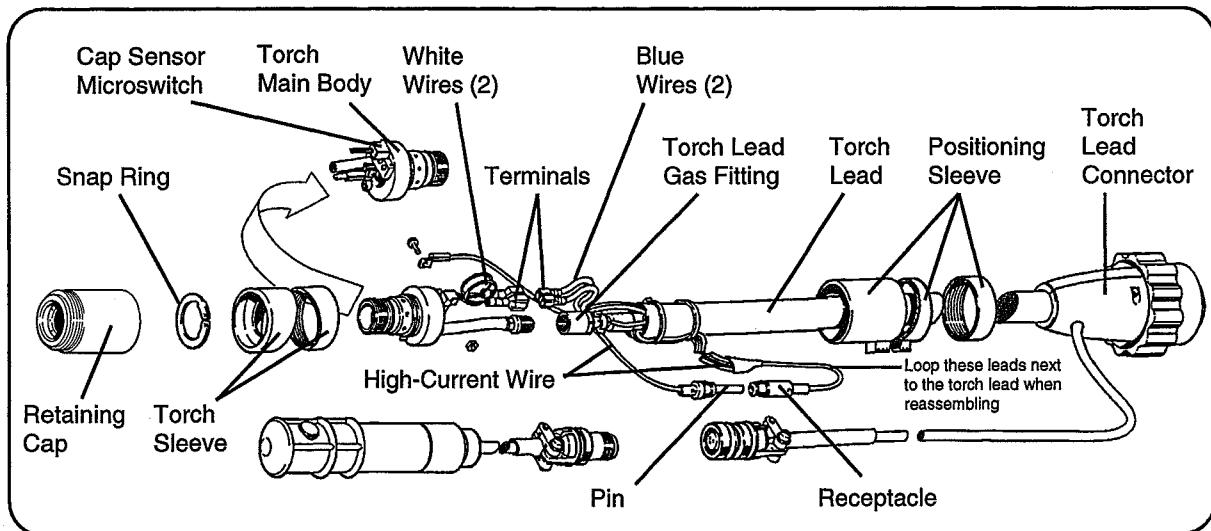
Repair of the PAC125M machine torch normally requires replacement of the torch main body and/or the torch lead. Order the torch main body with switch. Refer to Figure 3-4 and perform the steps below.

### Removal

1. **Set the MAX43 power switch to O (off), unplug the power cable, and disconnect the gas supply. Disconnect the torch lead quick disconnect from the power supply.**
2. Unscrew the retaining cap and remove the remaining parts (nozzle, electrode and swirl ring).
3. Unscrew the positioning sleeve from the torch sleeve and slide it back along the lead and out of the way.
4. Cut the plastic ties holding the high-current wire to the lead. Note the position of the ties for reassembly.
5. Remove the heat shrink to expose the high-current pin and receptacle connection. Disconnect the pin from the receptacle.

Note for step 6: Disconnect wires by pulling on terminals. Do **not** pull on wires.

6. Remove the heat shrink from the cap sensor microswitch connectors (blue wires from the lead and white wires from the microswitch) to expose the terminals. Disconnect the terminals.
7. Disconnect the torch main body and torch lead gas fitting using 3/8" (10 mm) and 1/2" (13 mm) open-end wrenches.
8. Disconnect the torch main body from the torch sleeve by using snap-ring pliers to remove the snap ring that holds the torch head to the sleeve. Remove the torch main body from the torch sleeve.



**Figure 3-4 PAC125M Torch Assembly**

## Replacement

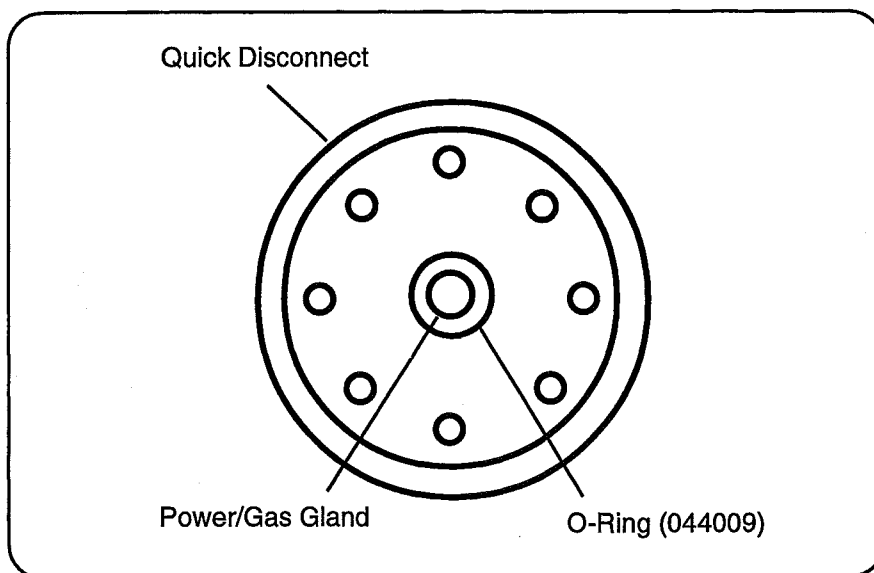
1. To replace the torch main body to the torch sleeve, line up the anti-rotation screw on the torch head to the locating hole in the torch sleeve.
2. Insert the torch main body into the torch sleeve and using the snap-ring pliers, secure the torch body to the sleeve with the snap ring.
3. Connect the torch main body to the torch lead gas fitting using 3/8" (10 mm) and 1/2" (13 mm) open-end wrenches. Torque to 70 in-lbs.
4. Slip 2 small pieces of heat shrink over the cap-sensor microswitch wires and connect the white wires to the blue wire terminals on the torch lead. Slide the heat shrink over the terminals and apply heat.
5. Slip a large piece of heat shrink over the high-current wire and connect the pin to the receptacle. Slide the heat shrink over the pin-receptacle connection and apply heat.
6. Loop the high-current wire next to the torch lead and secure with 2 plastic ties. Be certain that there is slack between the high-current wire and the torch lead gas fitting.
7. Slide the positioning sleeve back down over the torch lead and screw it into the torch sleeve. Be certain not to pinch any wires when screwing sleeves together.
8. Install the proper consumables into the torch. When the retaining cap is tightened, the microswitch will click, indicating that the torch main body has been replaced correctly.

# MAINTENANCE

## QUICK DISCONNECT O-RING REMOVAL AND REPLACEMENT

The quick disconnect O-ring (044009) on the torch leads is required to provide a tight seal between the quick disconnect and receptacle on the power supply, so that the plasma gas does not leak during cutting. To remove and replace the O-ring in the event of damage or wear, proceed as follows and refer to Figure 3-5.

1. **Set the MAX43 power switch to OFF (O), unplug the power cable, and disconnect the gas supply. Disconnect the torch lead quickdisconnect from the power supply.**
2. Disconnect the torch lead quick disconnect from the receptacle on the power supply.
3. Remove the O-ring from the quick disconnect using needle nose pliers, tweezers, etc.
4. Replace O-ring. Ensure it seats properly.



**Figure 3-5 Quick Disconnect O-Ring Removal and Replacement**

## FILTER/REGULATOR PRESSURE ADJUSTMENT

To adjust the filter/regulator pressure, perform the following procedure and refer to Figure 3-6.

1. Ensure the gas supply to the filter/regulator on the power unit is at 70 psi (4.8 bar). If the reading is incorrect adjust the pressure regulator as follows:
2. At the pressure regulator, pull the adjustment knob up to loosen.
3. At the front panel, push the **TEST** switch in and hold and view the pressure gauge while adjusting the adjustment knob. Adjust until the pressure gauge reads 70 psi (4.8 bar).
4. Release **GAS TEST** switch and push adjustment knob down to secure.

## FILTER/REGULATOR FILTER CLEANING OR REPLACEMENT

Look for moisture coming out of torch. If there is moisture, purge the lines. The filter bowl is drained at the bottom by removing the red cap and turning the the knurled drain valve. If the bowl does not drain properly, perform the following procedure and refer to Figure 3-6.

1. Always **disconnect** the gas supply hose from the filter/regulator before unscrewing the filter bowl.
2. Unscrew the filter bowl and then unscrew the filter and clean or replace if required. Refer to Section 4, *MAX43 Parts List (Non CE)* or Section 5, *MAX43 CE 400V Parts List* for for the filter element part number and other related information.
3. Replace the filter and filter bowl.
4. Reconnect the gas supply hose to the filter/regulator.

## AIR FILTER REMOVAL, CLEANING AND REPLACEMENT

To remove, clean and replace a fouled air filter, follow the instructions below.

### Removal

1. Turn the MAX43 power switch to OFF (0), unplug the power cable from the wall receptacle, and disconnect the gas supply.
2. Remove the screws that hold the power unit cover in place.
3. Remove the air filter.

# MAINTENANCE

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## Cleaning

1. Clean the air filter with either soap and water or with low pressure compressed air.

## Replacement

1. Replace the **dry** filter into the power unit with the wire mesh facing the fan.
2. Replace and refasten power unit cover with existing screws.

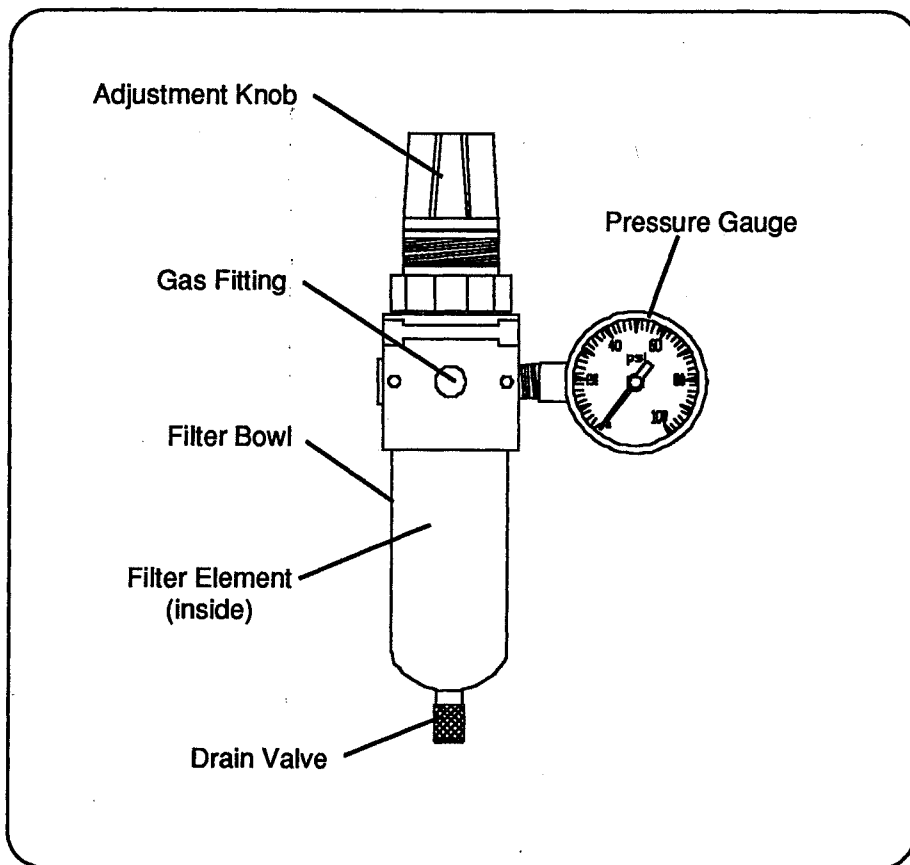


Figure 3-6 Filter/Pressure Regulator Components





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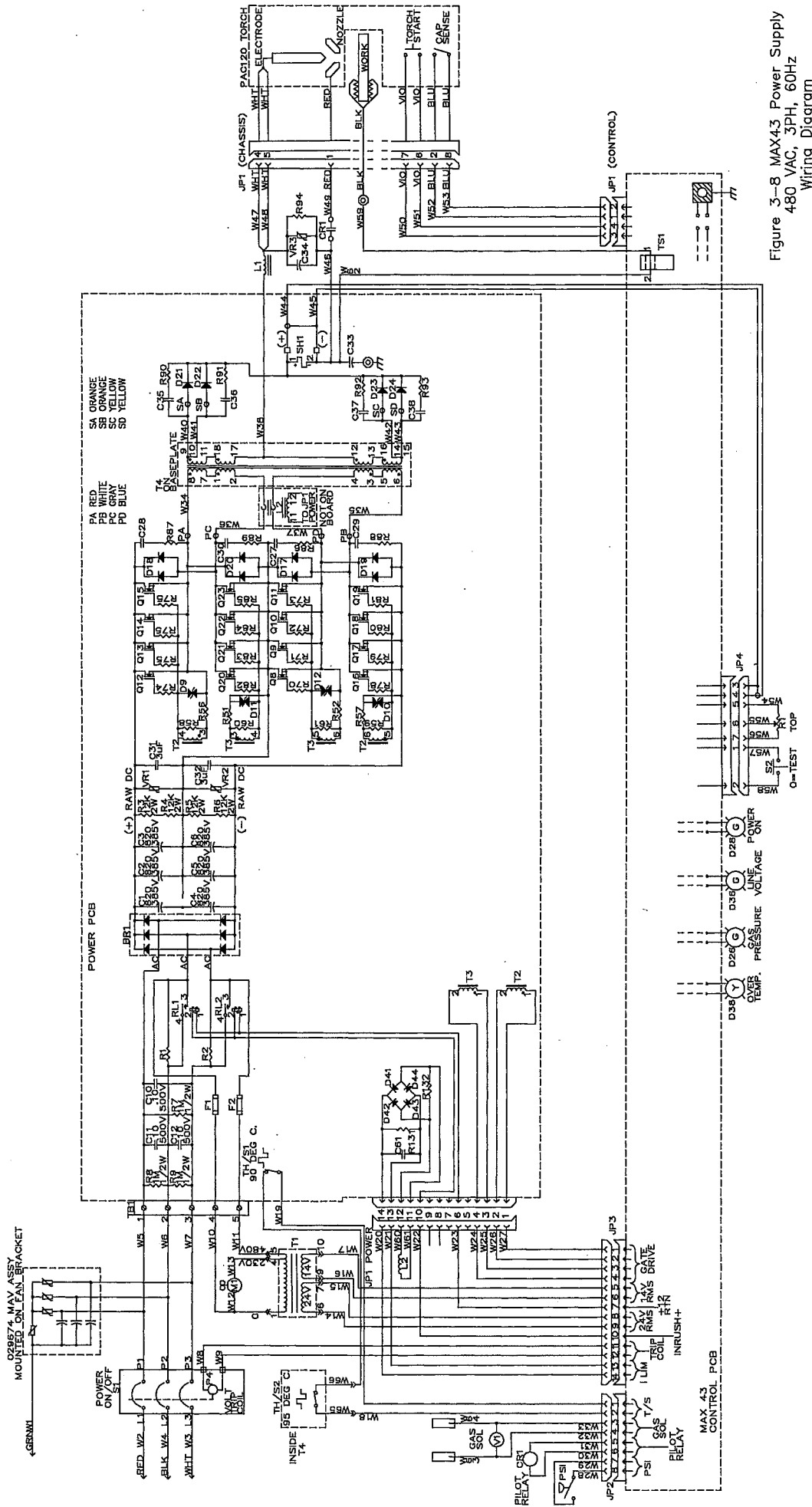


Figure 3-8 MAX43 Power Supply  
480 VAC, 3PH, 60Hz  
Wiring Diagram  
3-37/3-38



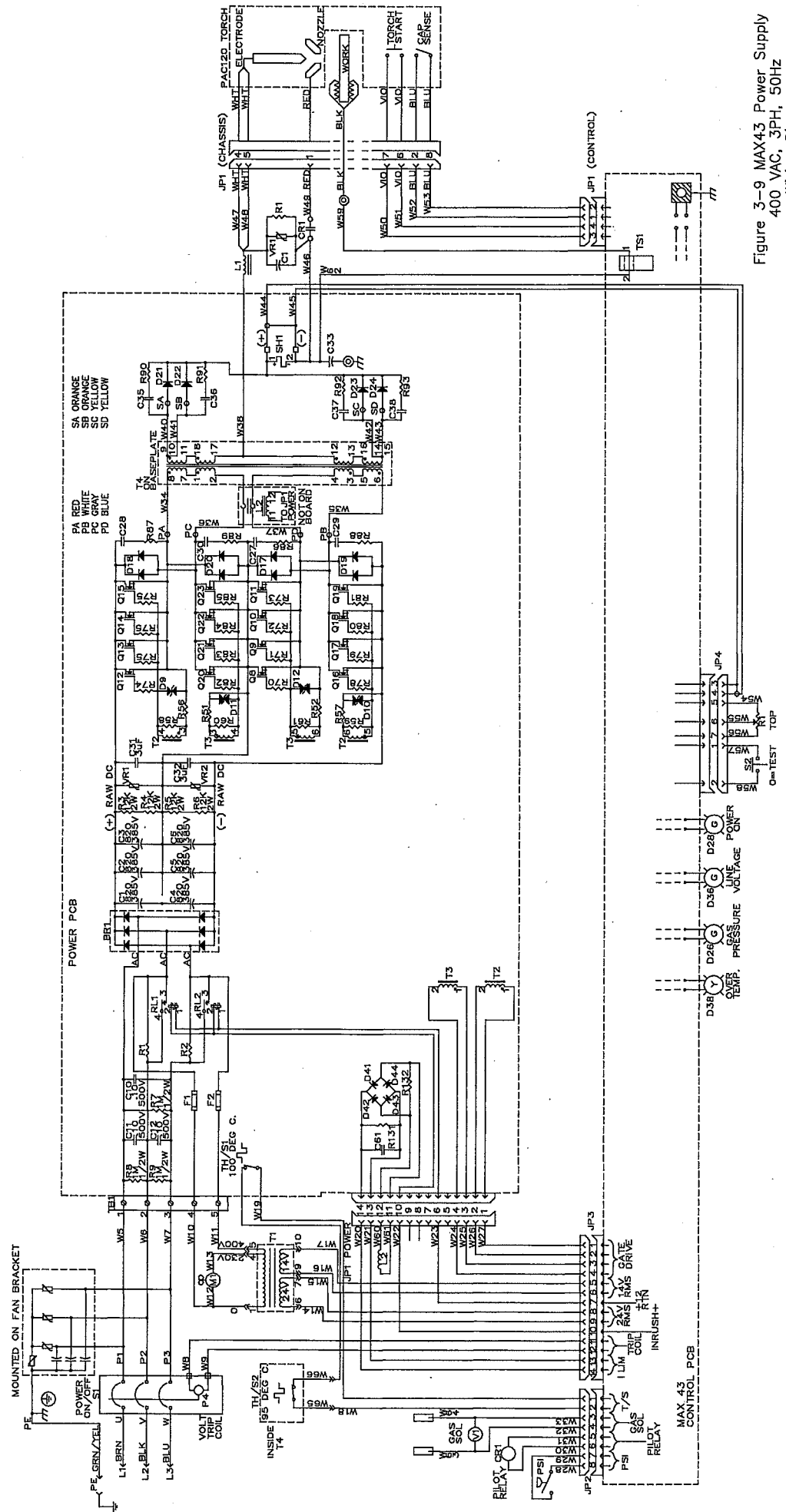


Figure 3-9 MAX43 Power Supply  
400 VAC, 3PH, 50Hz  
Wiring Diagram



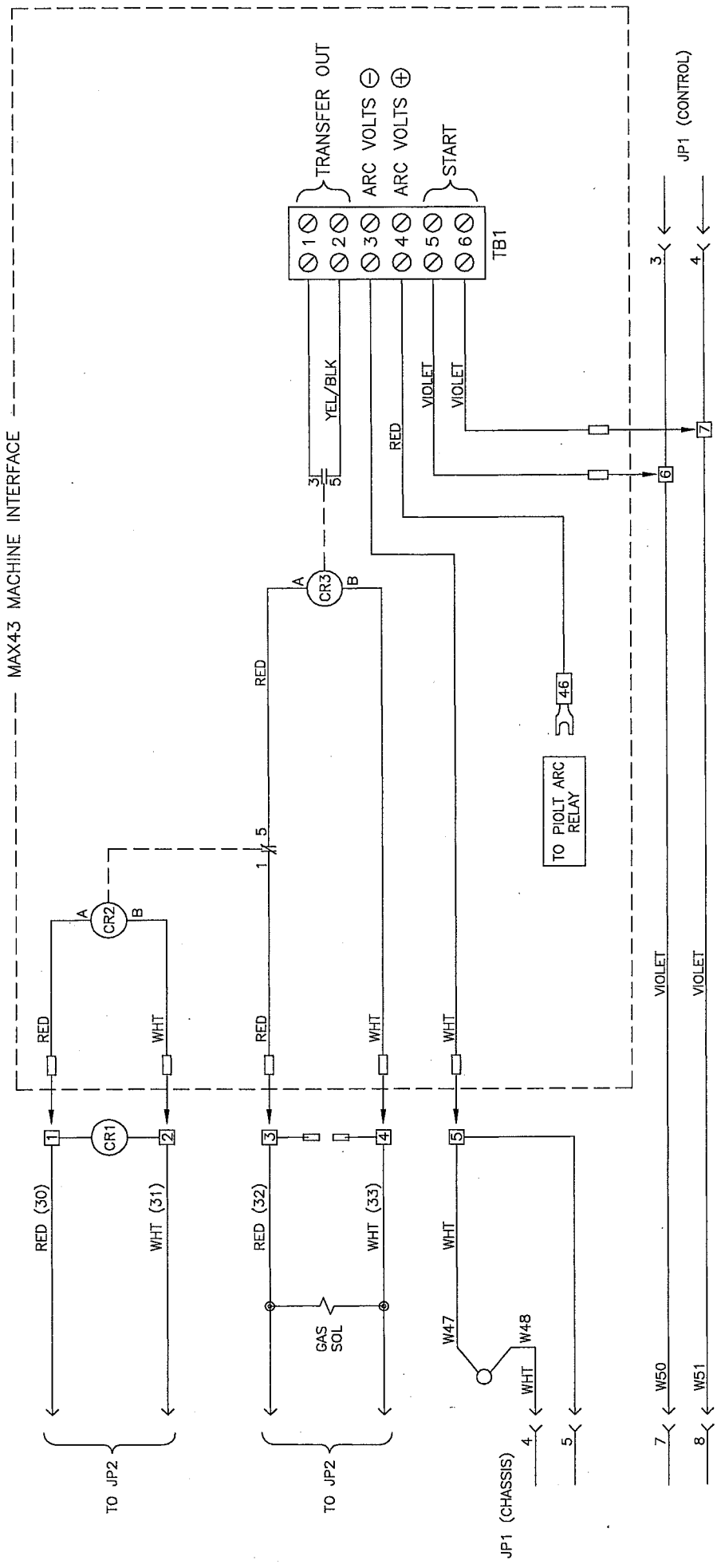


Figure 3-10 MAX43 Power Supply  
Machine Interface  
Wiring Diagram (Optional)



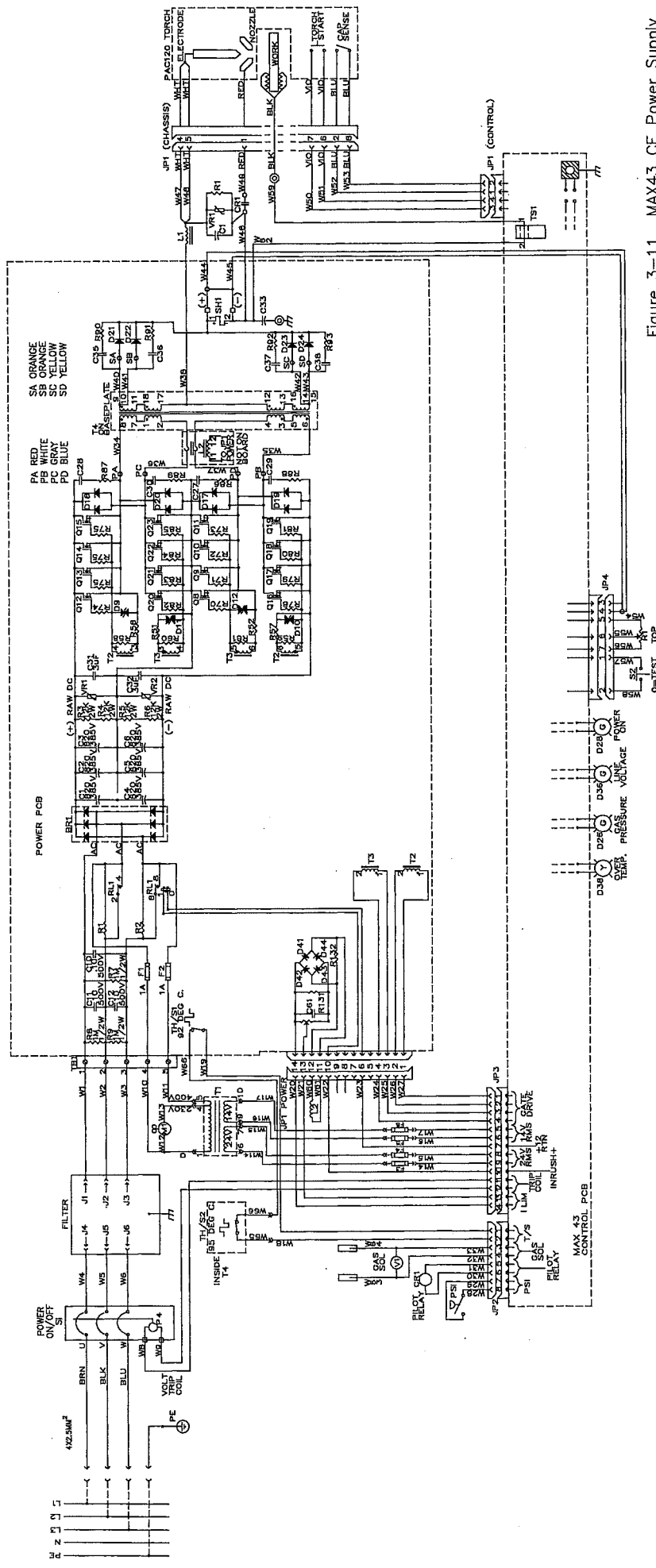


Figure 3-11 MAX43 CE Power Supply  
400 VAC, 3PH, 50Hz  
Wiring Diagram





## Section 4      **MAX43 PARTS LIST** **NON CE POWER SUPPLY** **AND** **TORCH AND LEAD ASSEMBLIES**

In this section:

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Power Supply, All Voltages - Front, Rear and Right Side .....	4-2
Power Supply, 208/240V - Left Side .....	4-4
Power Supply, 400V and 480V - Left Side .....	4-6
Torch Assemblies and Leads .....	4-8
PAC125T Torch Assembly and Lead .....	4-8
PAC121P Torch Assembly and Lead .....	4-10
PAC125M Torch Assembly and Lead .....	4-12
On/Off Pendant .....	4-12
Shielded Consumable Parts .....	4-14
Unshielded Consumable Parts .....	4-16
Recommended Spare Parts .....	4-18
Power Supplies .....	4-18
PAC125T Torch Assembly and Leads .....	4-19
Torch Assembly .....	4-19
Lead Assemblies .....	4-19
PAC121P Torch Assembly and Leads .....	4-19
Torch Assembly .....	4-19
Lead Assemblies .....	4-19
PAC125M Torch Assembly and Leads .....	4-19
Torch Assembly .....	4-19
Lead Assemblies .....	4-19
Optional Machine Interface Assembly .....	4-20

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# PARTS LIST

## POWER SUPPLY, ALL VOLTAGES - FRONT, REAR AND RIGHT SIDE

Index No.	Ref. Desig.	Part No.	Description	Quantity
1		001314	Cover, Top MAX43	1
2		001197	Handle, MAX43	1
3		001315	Base, MAX43	1
4		028488	Torch Lead Receptacle, MAX43	1
5		023452	Cable, Work # 10 w/Clamp 15 ft. (4.6 m)	1
6	S2	005143	Switch, Pushbutton, SPST, NC	1
7	R1	009480	Pot, Cermet 250 Ohm 1T 1W	1
8		008164	Knob	1
9*	S1	003118	Circuit Breaker, 50 Amp w/Trip Coil, 2-Handle	1
10**,***	S1	003132	Circuit Breaker, 4P 480V w/Tch	1
11		029616	Capacitor SA, Shunt Filter	1
12		041414	PC BD Assy, Control, MAX43	1
13		001316	Center Panel, MAX43	1
14*	T1	014139	Transformer, Control 208-240 VAC	1
15**	T1	014152	Transformer, Control 230-480 VAC	1
16***	T1	014153	Transformer, Control 230-400 VAC	1
17**		023519	Line Cord, 480V, MAX43	1
18**		008604	Strain Relief, 2-Screw	1
19***		023520	Line Cord, 400V, MAX43	1
20***		008782	Strain Relief, 3/4" X .375	1
21*		008697	Cord/Plug Set 10/3 SO 7.3 ft. 3 PR	1
22**		008604	Strain Relief, 2-Screw	1
23		001348	Guard, MAX43 Circuit Breaker	1
24	CR1	003078	Relay, 30 Amp NO Mag Blowout AC TM	1
25		011039	Filter/Regulator 5 MIC 120 PSI	1
		015152	Nipple, Quick Connect, Steel, 1/8 NPT (Mounted on regulator, part of spare parts kit)	1
26****		011054	Filter Element	1
27		022019	Gauge, Pressure 0-100 PSI 1-1/2"	1
28		015517	Nipple, 1/8 X CL, Hex	1
29	PS1	005112	Switch, Pressure 39 PSI .013 BAF	1
30		015540	Tee 1/8	1
31		015517	Nipple, 1/8 X CL, Hex	1
32	V1	006054	Valve, Solenoid, 24 VAC, 100 PSI	1
33		015530	Street Elbow 1/8	1
34		015205	Adapter 1/8 NPT X 5/16 Poly	1
35		046040	Tubing, 5/16 OD Poly-Flo	1
36		015204	Adapter 1/8 NPTF X 5/16 Poly	1

\* Used on 208/240V Power Supply (# 071044 & # 071082).

\*\* Used on 480V Power Supply (# 071054 & # 071084).

\*\*\* Used on 400V Power Supply (# 071055 & # 071083).

\*\*\*\* Filter element 011054 can also be obtained by contacting the following sources:

In the USA, contact Watts FluidAir, Inc. Customer Service Department at 207-439-9511 for the name of the nearest authorized Watts FluidAir distributor. Order element replacement kit EK504VY. Overseas customers should contact their local Hypertherm distributor.

# PARTS LIST

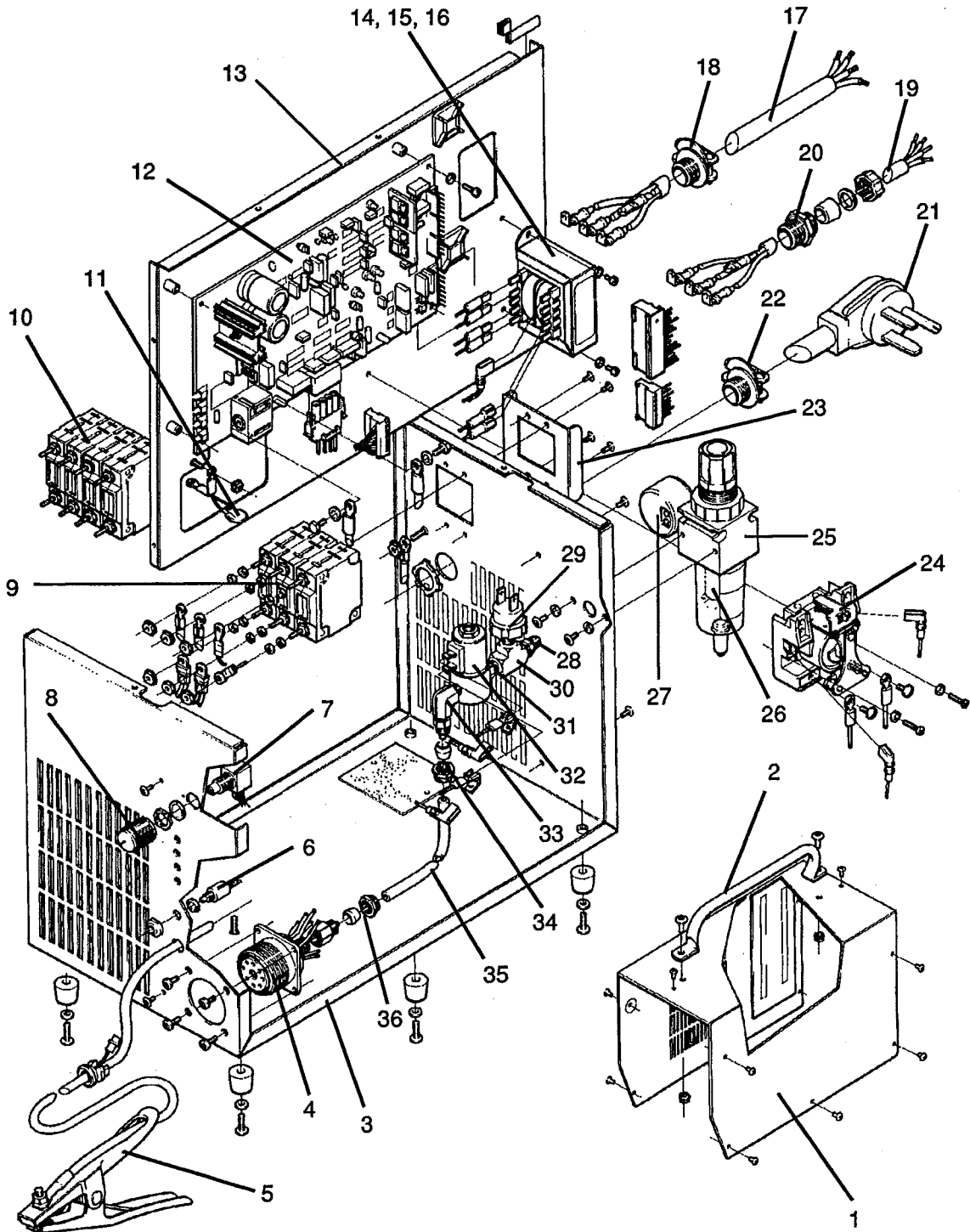


Figure 4-1 Power Supply, All Voltages - Front, Rear and Right Side

# **PARTS LIST**

---

## **POWER SUPPLY, 208/240V - LEFT SIDE**

<b>Index No.</b>	<b>Ref. Desig.</b>	<b>Part No.</b>	<b>Description</b>	<b>Quantity</b>
1		002202	Filter, Air, 6.5" X 10.5" X .5" (165mm X 267mm X 13mm) Blk	1
2		004464	Bracket, Mounting Fan	1
3	M1	027255	Fan, 230 VAC	1
4		041298	PC BD Assy, MOV/Filter	1
5	TH/S1	005145	Temperature Sw 90° C NC	1
6		041228	PC BD Assy, Power, MAX43	1
7	L1	014138	Inductor, Output 2 MHY 40 Amp	1
8	L2	014137	Transformer, Current 40 Amp	1
9	T4	014140	Transformer, 50 KHZ, 4.5 KW, 208-240-480 V (temp sw TH/S2/95° C is inside T4)	1
10	F1, F2	008452	Fuse 2AG, 1/2A 250V	2

# PARTS LIST

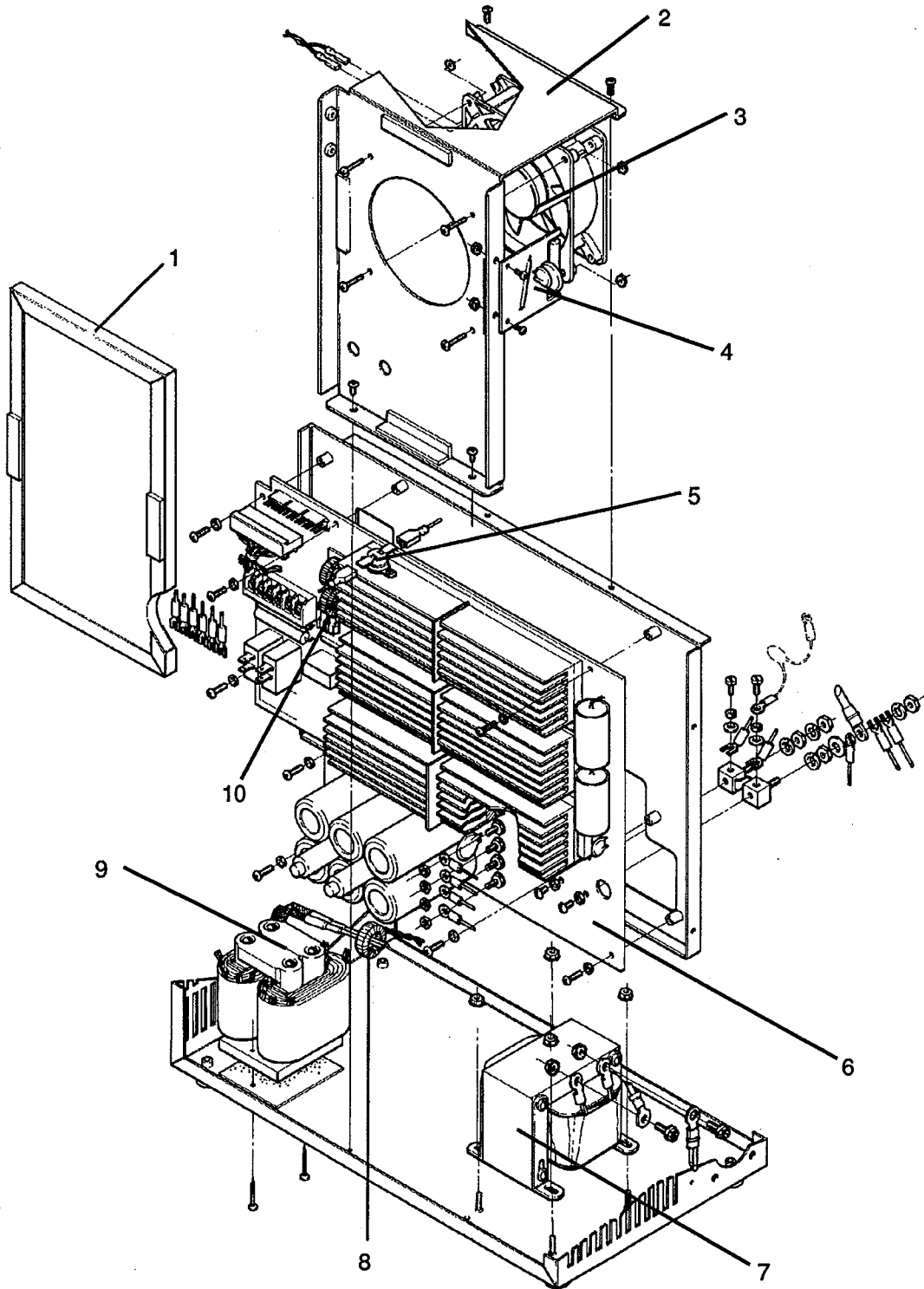


Figure 4-2 Power Supply, 208/240V - Left Side

# **PARTS LIST**

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## **POWER SUPPLY, 400V AND 480V - LEFT SIDE**

<b>Index No.</b>	<b>Ref. Deslg.</b>	<b>Part No.</b>	<b>Description</b>	<b>Quantity</b>
1		002202	Filter, Air, 6.5" X 10.5" X .5" (165 mm X 267 mm X 13 mm) Blk	1
2		029674	MOV/Cap Assembly	1
3		004551	Bracket, Mounting Fan 6-inch	1
4	M1	027272	Fan, 175 SCFM, 230 VAC, 6-inch	1
5		041298	PC BD Assy, MOV/Filter	1
6*	TH/S1	005145	Temperature Switch 90° C NC	1
6**	TH/S1	005159	Temperature Switch 100° C NC	1
7		041249	PC BD Assy, Power, 3 PH, MAX43	1
8	L1	014138	Inductor, Output 2 MHY 40 Amp	1
9	L2	014137	Transformer, Current 40 Amp	1
10*	T4	014140	Transformer, 50 KHZ, 4.5 KW, 208-240-480V	1
10**	T4	014154	Transformer, 50 KHZ, 4.5 KW, 200-400V (temp switch TH/S2/95° C is inside T4)	1
11	F1, F2	008452	Fuse 2AG, 1/2A 250V	2

\* Used on 480V Power Supply (# 071054 & # 071084).

\*\* Used on 400V Power Supply (# 071055 & # 071083).

# PARTS LIST

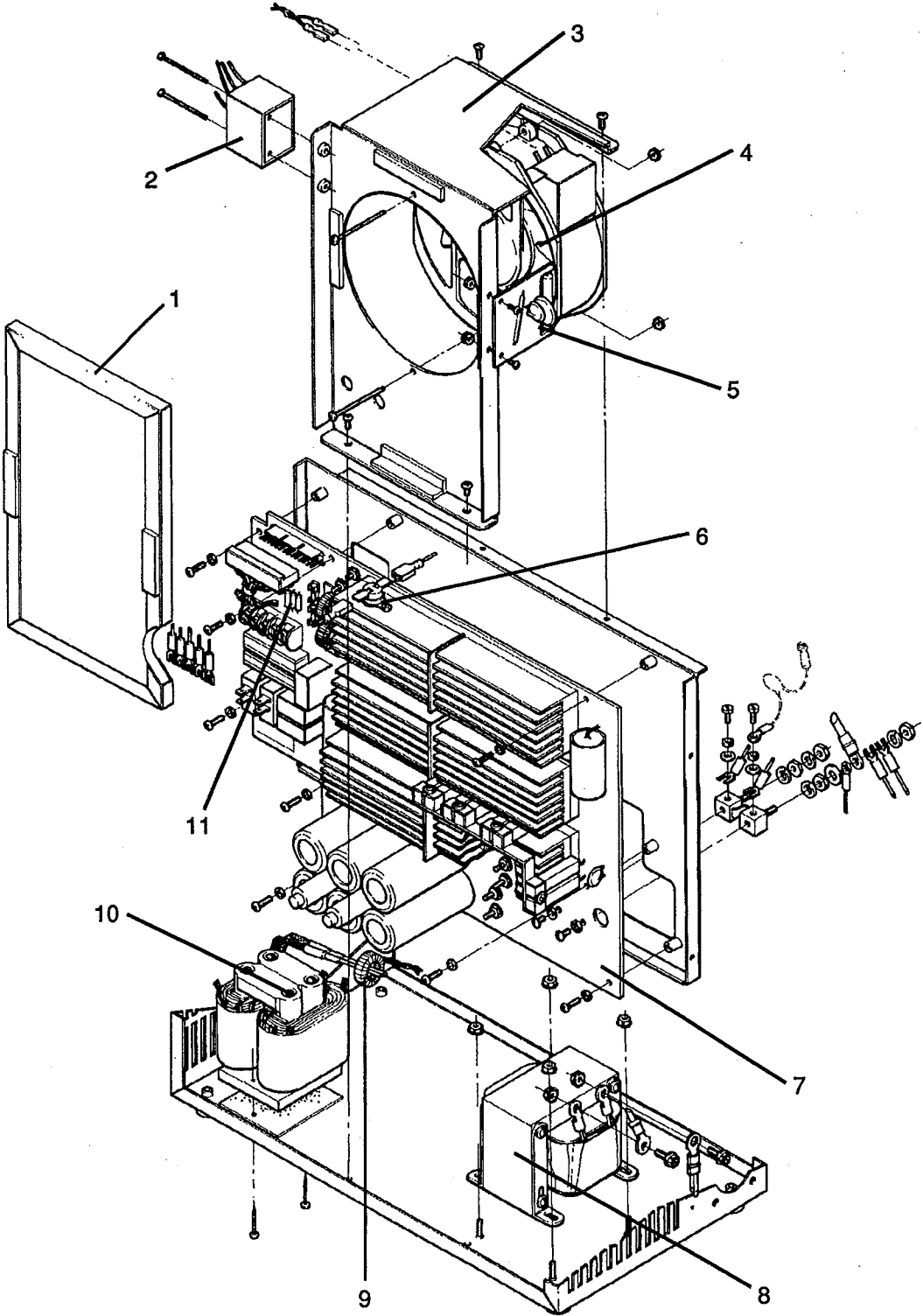


Figure 4-3 Power Supply, 400V and 480V - Left Side



# PARTS LIST

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## TORCH ASSEMBLIES AND LEADS

**PAC125T Torch Assembly and Lead (15 Ft/4.5 M) - 083127\***

**PAC125T Torch Assembly and Lead (25 Ft/7.6 M) - 083128\*\***

**PAC125T Torch Assembly and Lead (50 Ft/15.2 M) - 083129\*\*\***

001288 .....	Handle, PAC125T
075339 .....	Screws, P/S, # 4 x 1/2, PH, RND, S/B
002244 .....	Safety Trigger, PAC125T
027254 .....	Trigger Spring, PAC 125T
128284 .....	Switch Repair Kit
120570 .....	Torch Main Body w/Switch, PAC125T
044016 .....	O-Ring, Torch Main Body
044009 .....	O-Ring, Quick Disconnect
004764 .....	Ring, Gutcha
129479* .....	Torch Lead, 15 ft (4.5 m)
129352** .....	Torch Lead, 25 ft (7.6 m)
129353*** .....	Torch Lead, 50 ft (15.2 m)

The following consumables are also included with the torch assembly.

120438 .....	Nozzle
120573 .....	Electrode
020361 .....	Ring, Swirl
120600 .....	Cap, Retaining
120601 .....	Shield Cap

Consumables shown on Figure 4-7 and 4-8.

# PARTS LIST

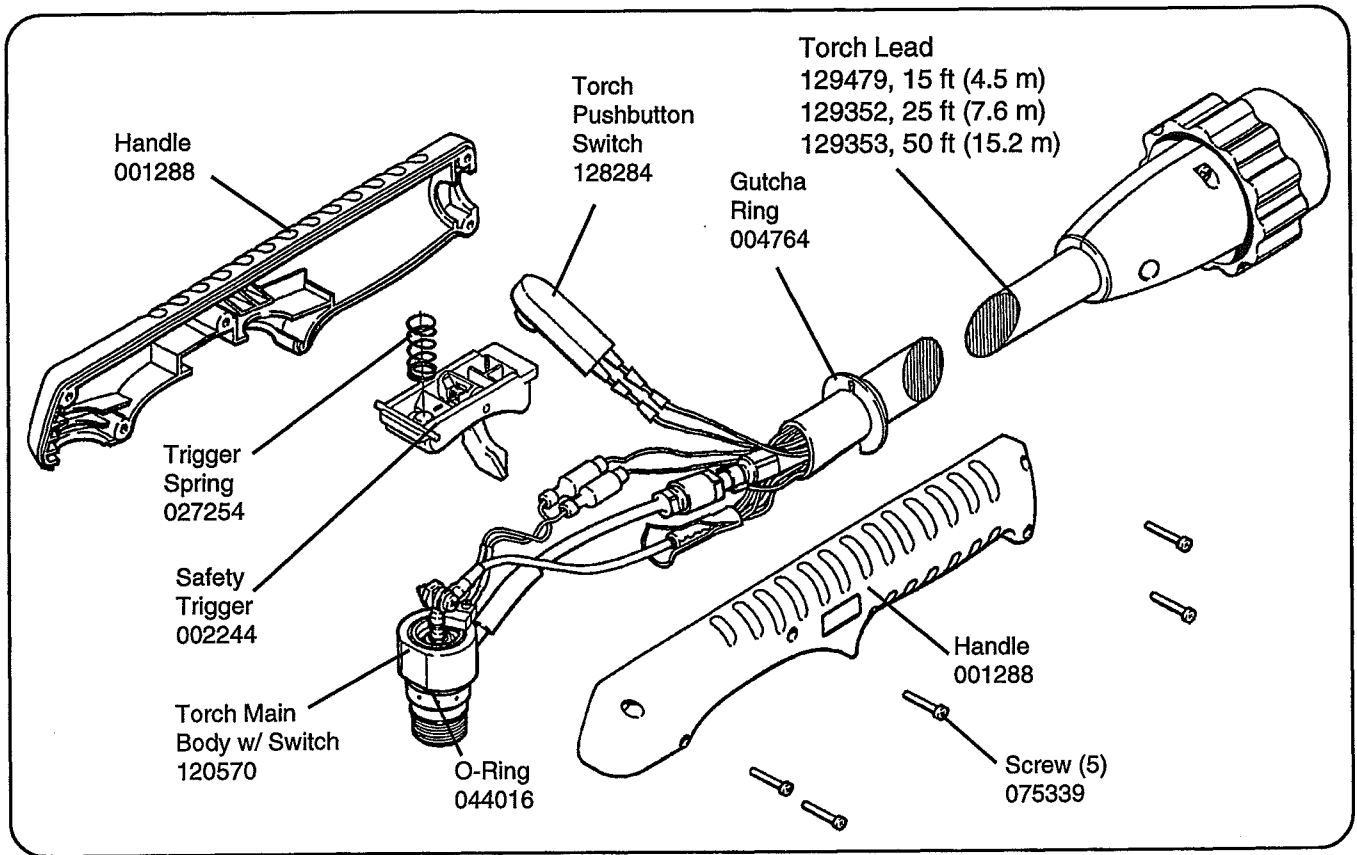


Figure 4-4 PAC125T Torch Assembly and Leads

# PARTS LIST

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## PAC121P Torch Assembly and Lead (25 Ft/7.6 M) - 071069

001215 ..... Handle, PAC121P  
075365 ..... Screws, P/S, # 6 x 3/4, PH, RND, S/B  
005094 ..... Switch, Torch Pushbutton  
120013 ..... Torch Main Body w/Switch, PAC121P  
029391 ..... Torch Lead, 25 ft (7.63 m)  
044009 ..... Quick Disconnect O-Ring  
027283 ..... Ring, Gutcha  
046080 ..... Tubing, 1-1/4" Black PVC  
020350\* ..... Nozzle  
120573\* ..... Electrode, Air  
020361\* ..... Ring, Swirl  
020930\* ..... Cap, Retaining

## PAC121P Torch Assembly and Lead (50 Ft/15.2 M) - 071070

001215 ..... Handle, PAC121P  
075365 ..... Screws, P/S, # 6 x 3/4, PH, RND, S/B  
005094 ..... Switch, Torch Pushbutton  
120013 ..... Torch Main Body w/Switch, PAC121P  
029392 ..... Torch Lead, 50 ft (15.25 m)  
044009 ..... Quick Disconnect O-Ring  
027283 ..... Ring, Gutcha  
046080 ..... Tubing, 1-1/4" Black PVC  
020350\* ..... Nozzle  
120573\* ..... Electrode, Air  
020361\* ..... Ring, Swirl  
020930\* ..... Cap, Retaining

\* Consumables shown on Figure 4-7 and 4-8.

# PARTS LIST

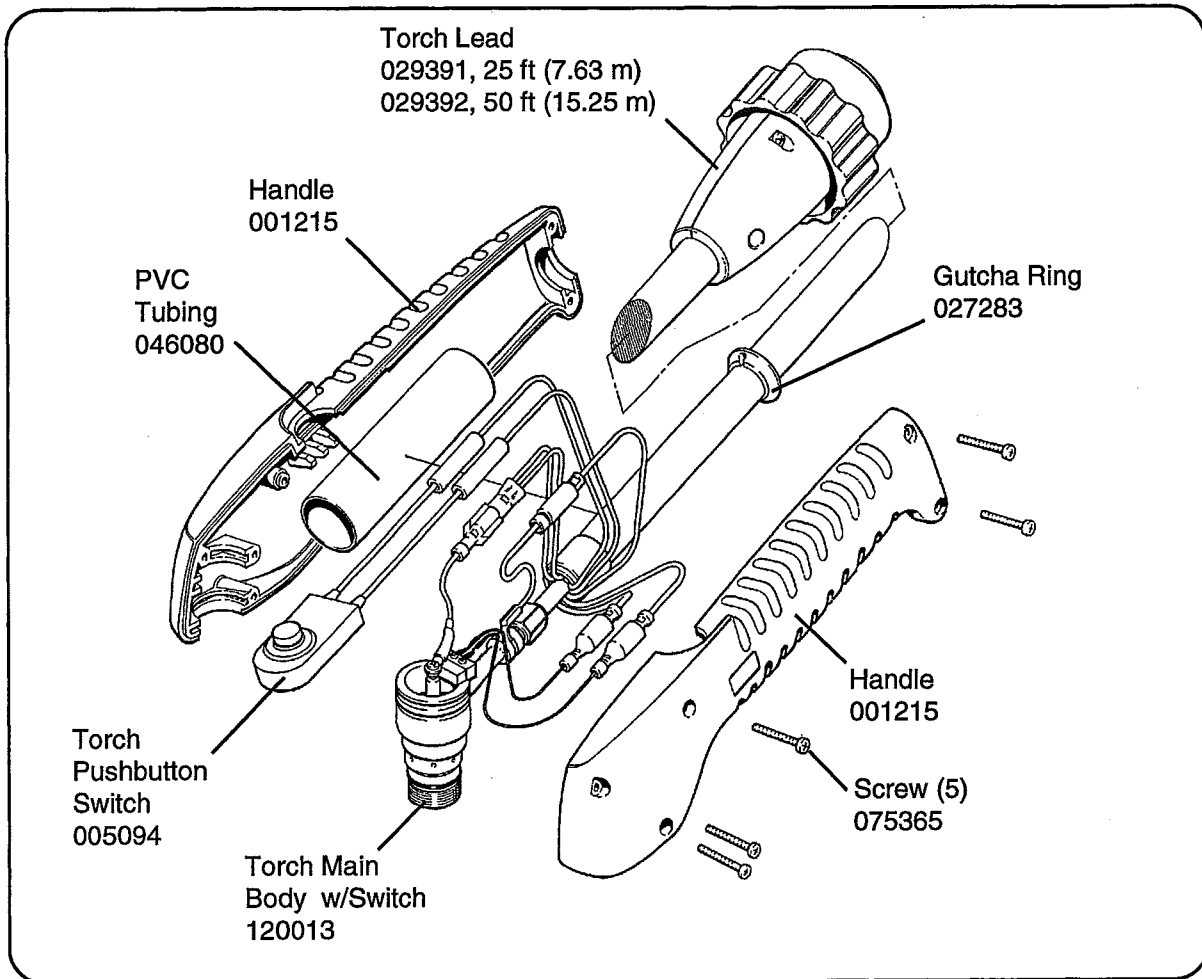


Figure 4-5 PAC121P Torch Assembly and Leads

# PARTS LIST

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## PAC125M Torch Assembly and Lead (25 Ft/7.6 M) - 083133

- 020620 ..... Sleeve, Torch Position, PAC125M
- 120613 ..... Sleeve, Machine Torch, PAC125M
- 120583 ..... Torch Main Body w/Switch, PAC125M
- 044016 ..... O-Ring, Torch Main Body
- 129338 ..... Torch Lead, 25 ft (7.6 m)
- 044009 ..... O-Ring, Quick Disconnect
- 120023\* ..... Nozzle, Pipe Saddle, Extended
- 120574\* ..... Electrode, Extended
- 020361\* ..... Ring, Swirl
- 020930\* ..... Cap, Retaining

## PAC125M Torch Assembly and Lead (50 Ft/15.2 M) - 083135

- 020620 ..... Sleeve, Torch Position, PAC125M
- 120613 ..... Sleeve, Machine Torch, PAC125M
- 120583 ..... Torch Main Body w/Switch, PAC125M
- 044016 ..... O-Ring, Torch Main Body
- 129341 ..... Torch Lead, 50 ft (15.2 m)
- 044009 ..... O-Ring, Quick Disconnect
- 120023\* ..... Nozzle, Pipe Saddle, Extended
- 120574\* ..... Electrode, Extended
- 020361\* ..... Ring, Swirl
- 020930\* ..... Cap, Retaining

## On/Off Pendant - Optional

- 028714 ..... On/Off Pendant w/Lead, 25 ft (7.6 m)
- 128061 ..... On/Off Pendant w/Lead, 50 ft (15.2 m)
- 128062 ..... On/Off Pendant w/Lead, 75 ft (23 m)

\* Consumables shown on Figure 4-7 and 4-8.

# PARTS LIST

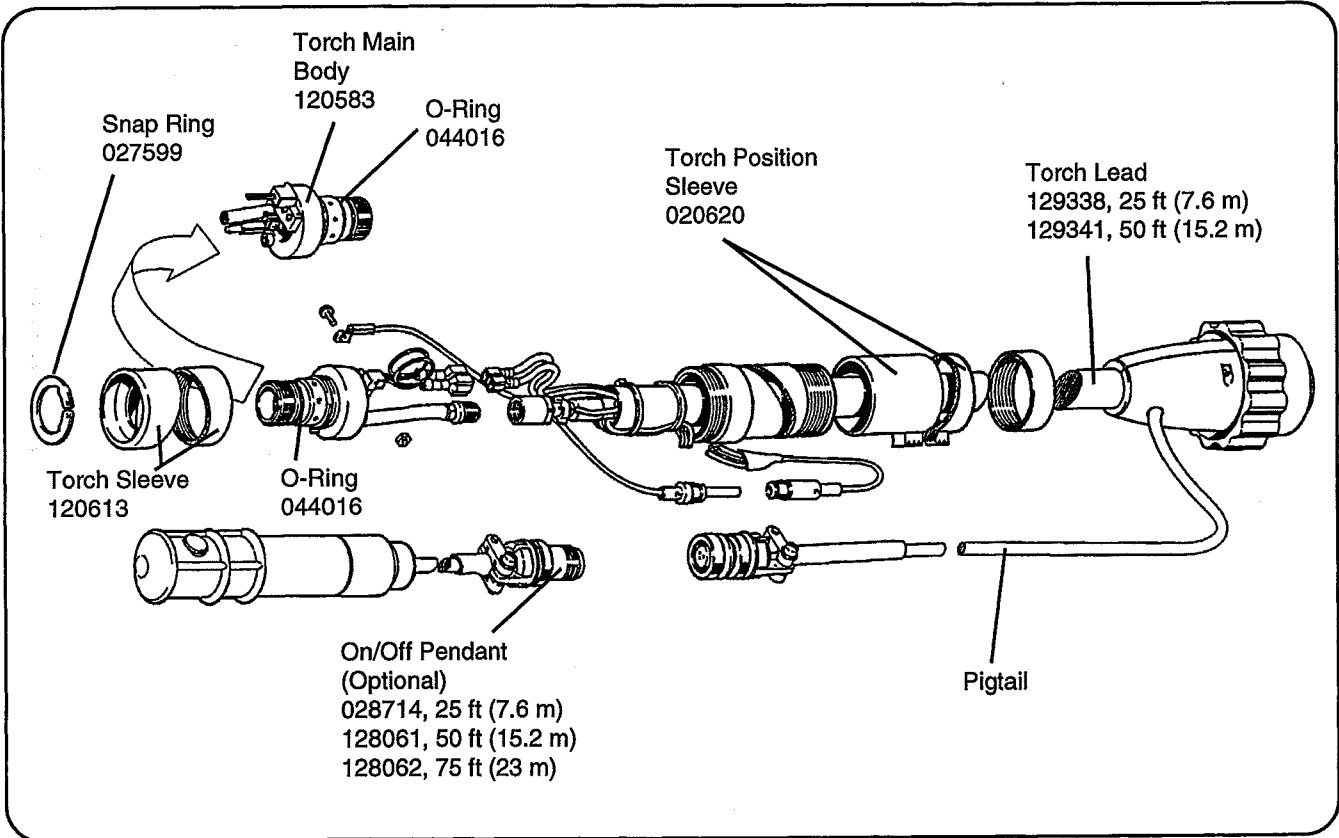


Figure 4-6 PAC125M Torch Assembly with Leads and Optional On/Off Pendant

# PARTS LIST

## SHIELDED CONSUMABLE PARTS

### Shielded Machine Torch Consumable Parts

020930	.....	Cap, Retaining
020361	.....	Ring, Swirl
120573	.....	Electrode
120574	.....	Electrode, Extended
020350	.....	Nozzle
020539	.....	Nozzle, Gouging
120023	.....	Nozzle, Pipe Saddle, Extended
020546	.....	Nozzle, Extended

### \* Shielded Hand Torch Consumable Parts

120601	.....	Shield, Hand Cutting Torch
120602	.....	Shield, Machine Cutting Torch
120608	.....	Shield, Gouging Torch
120600	.....	Cap, Retaining
120438	.....	Nozzle, 40A Shield
020539	.....	Nozzle, Gouging
120573	.....	Electrode
020361	.....	Ring, Swirl

### \* Shielded Torch Consumable Parts Kit - 128112

001285	.....	Box, Consumable Parts (1)
020361	.....	Ring, Swirl (1)
120600	.....	Cap, Retaining (1)
120573	.....	Electrode (3)
120438	.....	Nozzle, 40A Shield (3)
020539	.....	Nozzle, Gouging (1)
120601	.....	Shield, Hand Cutting Torch(1)
120602	.....	Shield, Machine Cutting Torch(1)
120608	.....	Shield, Gouging Torch(1)
044016	.....	O-Ring (3)
015152	.....	Nipple, 1/8 NPT, QDisc, Steel (1)
015570	.....	Bushing, Reducer, 1/4 X 1/8, Brass (1)
015604	.....	Reducer, 1/4 FPT X 1/8 NPT, Brass (1)
027055	.....	Lubricant, Silicone 1/4 Oz Tube (1)

\* CE countries must use shielded consumables when cutting with hand torches.

# PARTS LIST

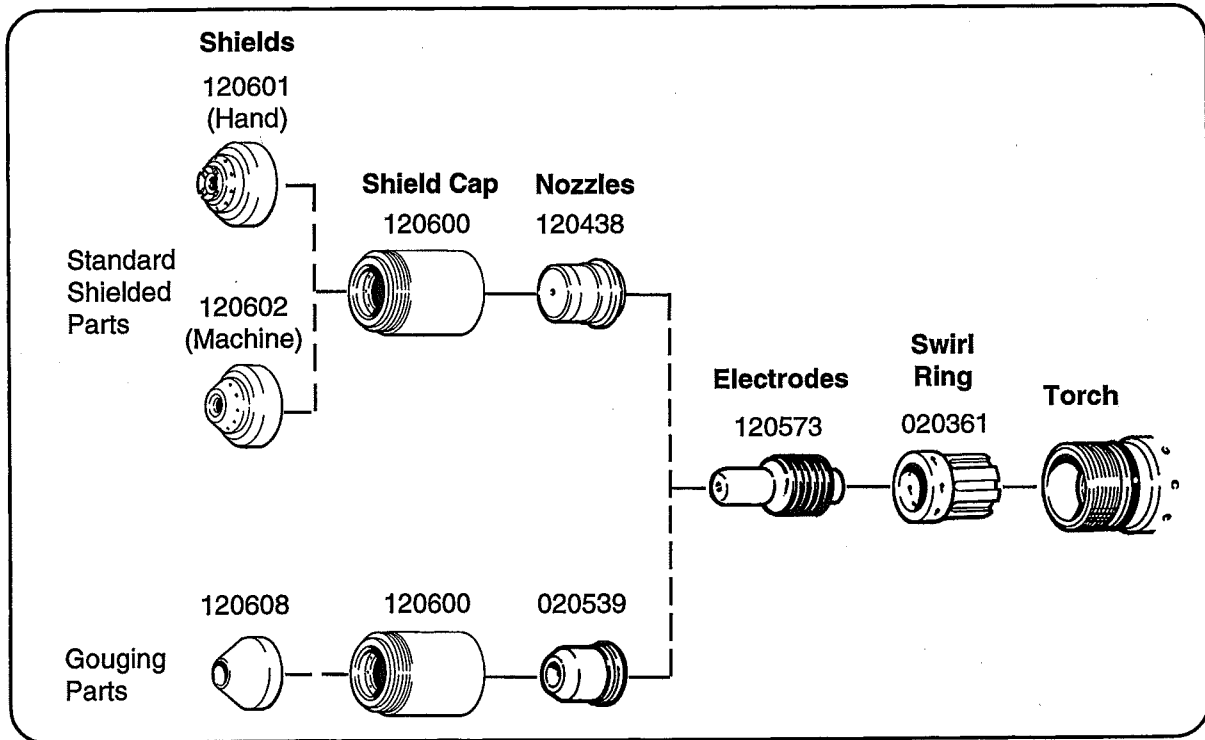


Figure 4-7 Shielded Torch Consumable Parts



# PARTS LIST

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## UNSHIELDED CONSUMABLE PARTS

### \* Unshielded Consumable Parts

020930	.....	Cap, Retaining
020361	.....	Ring, Swirl
120573	.....	Electrode
120574	.....	Electrode, Extended
020350	.....	Nozzle
020539	.....	Nozzle, Gouging
120023	.....	Nozzle, Pipe Saddle, Extended
020546	.....	Nozzle, Extended

### \* Unshielded Hand Torch Consumable Parts Kit - 128038

001285	.....	Box, Consumable Parts (1)
020361	.....	Ring, Swirl (1)
020930	.....	Cap, Retaining (1)
120573	.....	Electrode (3)
020350	.....	Nozzle (3)
020546	.....	Nozzle, Extended (1)
120574	.....	Electrode, Extended (1)
020539	.....	Nozzle, Gouging (1)
120023	.....	Nozzle, Pipe Saddle, Extended (1)
044016	.....	O-Ring (3)
015152	.....	Nipple, 1/8 NPT, QDisc, Steel (1)
015570	.....	Bushing, Reducer, 1/4 X 1/8, Brass (1)
015604	.....	Reducer, 1/4 FPT X 1/8 NPT, Brass (1)
027055	.....	Lubricant, Silicone 1/4 Oz Tube (1)

### Unshielded Machine Torch Consumable Parts Kit - 128039

001285	.....	Box, Consumable Parts (1)
020361	.....	Ring, Swirl (1)
020930	.....	Cap, Retaining (1)
120574	.....	Electrode, Extended (5)
120023	.....	Nozzle, Pipe Saddle, Extended (5)
044016	.....	O-Ring (3)
015152	.....	Nipple, 1/8 NPT, QDisc, Steel (1)
015570	.....	Bushing, Reducer, 1/4 X 1/8, Brass (1)
015604	.....	Reducer, 1/4 FPT X 1/8 NPT, Brass (1)
027055	.....	Lubricant, Silicone 1/4 Oz Tube (1)

\* CE countries must use shielded consumables when cutting with hand torches.  
See page 6-10 for shielded consumables.

# PARTS LIST

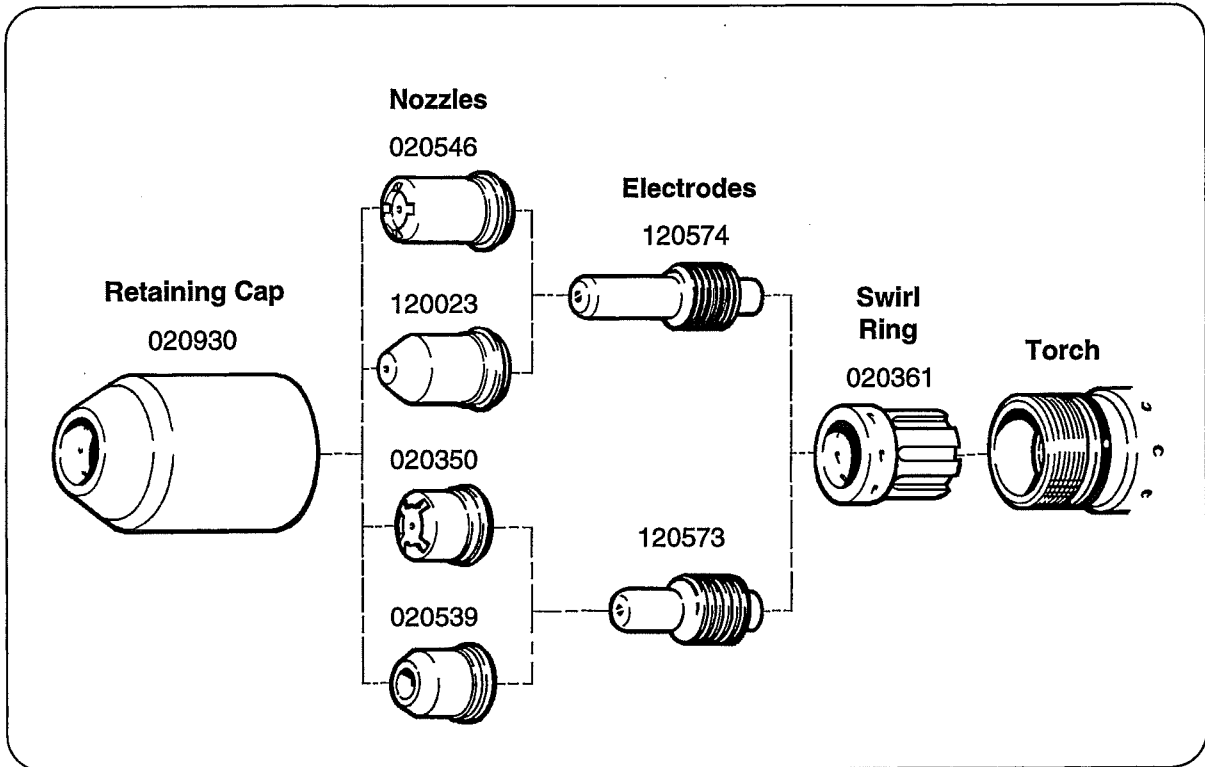


Figure 4-8 Unshielded Torch Consumable Parts

# PARTS LIST

## RECOMMENDED SPARE PARTS

### Power Supplies

Desig.	Part No.	Description	Quantity
R1	009480	Res, Cermet 250 Ohm 1T 1W	1
S2	005143	Switch, Pushbutton, NC	1
	023452	Cable, Work # 10 w/Clamp 15 ft (4.6 m)	1
PS1	005112	Switch, Pressure 39 PSI .013 BAF	1
V1	006054	Valve, Solenoid, 24 VAC, 100 PSI	1
T1*	014139	Transformer, Control 208-240 VAC	1
T1**	014152	Transformer, Control 230-480 VAC	1
T1***	014153	Transformer, Control 230-400 VAC	1
CR1	003078	Relay, 30 Amp NO Mag Blowout AC TM	1
	029616	Capacitor SA, Shunt Filter	1
	041414	PC BD Assy, Control, MAX43	1
M1	027255	Fan, 230 VAC	1
	002202	Filter, Air MAX43	1
*	041228	PC BD Assy, Power, 208/240V	1
**	041317	PC BD Assy, Power, 3 Ph, 480V	1
***	041316	PC BD Assy, Power, 3 Ph, 400V	1
	041298	PC BD Assy, MOV/Filter	1
**,**	029674	MOV/Cap Assy	1
L1	014138	Inductor, Output 2 MHY 40 Amp	1
T4**,**	014140	Transformer, 50 KHZ, 4.5 KW, 208-240-480 V	1
T4***	014154	Transformer, 50 KHZ, 4.5 KW, 200-400 V	1
L2	014137	Transformer, Current 40 Amp	1
S1*	003118	Circuit Breaker, 50 Amp w/Trip Coil 2-Handle	1
S1**,***	003132	Circuit Breaker, 4P 480V w/Tch	1
	008697	Cord/Plug Set 10/3 SO 7.3 ft 3 PR	1
	023519	Line Cord, 480V, MAX43	1
	023520	Line Cord, 400V, MAX43	1
	011039	Filter/Regulator 5 MIC 120 PSI	1
****	011054	Filter Element	1
	022019	Gauge, Pressure 0-100 PSI 1-1/2"	1

\* Used on 208/240V Power Supply (# 071044 & # 071082).

\*\* Used on 480V Power Supply (# 071054 & # 071084).

\*\*\* Used on 400V Power Supply (# 071055 & # 071083).

\*\*\*\* Filter element 011054 can also be obtained by contacting the following sources:

In the USA, contact Watts FluidAir, Inc. Customer Service Department at 207-439-9511 for the name of the nearest authorized Watts FluidAir distributor. Order element replacement kit EK504VY.

Overseas customers should contact their local Hypertherm distributor.

# PARTS LIST

## PAC125T Torch Assembly and Leads

Part No.	Description	Quantity
<b>Torch Assembly</b>		
001288	Handle, PAC125T	1
075339	Screws,P/S, # 4 x 1/2, PH, RND, S/B	5
002244	Safety Trigger, PAC125T	1
027254	Trigger Spring, PAC 125T	1
128284	Switch Repair Kit	1
120570	Torch Main Body w/Switch, PAC125T	1
<b>Lead Assemblies</b>		
129479	Torch Leads, 15 ft (4.5 m)	1
129352	Torch Leads, 25 ft (7.6 m)	1
129353	Torch Leads, 50 ft (15.2 m)	1
044009	Quick Disconnect O-Ring	1

## PAC121P Torch Assembly and Leads

<b>Torch Assembly</b>		
001215	Handle, PAC121P	1
075365	Screws,P/S, # 6 x 3/4, PH, RND, S/B	5
005094	Switch, Torch Pushbutton	1
120013	Torch Main Body w/Switch, PAC121P	1
<b>Lead Assemblies</b>		
029391	Torch Leads, 25 ft (7.6 m)	1
029392	Torch Leads, 50 ft (15.2 m)	1
044009	Quick Disconnect O-Ring	1

## PAC125M Torch Assembly and Leads

<b>Torch Assembly</b>		
020620	Sleeve, Torch Position, PAC125M	1
120613	Sleeve, Machine Torch, PAC125M	1
120583	Torch Main Body w/Switch, PAC125M	1
075321	Socket Cap, 4-40 x 1/2, HX, SS	
075322	M/S, 4-40 x 1/4, SL, SZ	
<b>Lead Assemblies</b>		
129338	Torch Leads, 25 ft (7.6 m)	1
129341	Torch Leads, 50 ft (15.2 m)	1
044009	Quick Disconnect O-Ring	1

# PARTS LIST

## OPTIONAL MACHINE INTERFACE ASSEMBLY

Desig.	Part No.	Description	Quantity
—	029972	Assembly, Machine Interface	1
—	008212	Relief, Strain	1

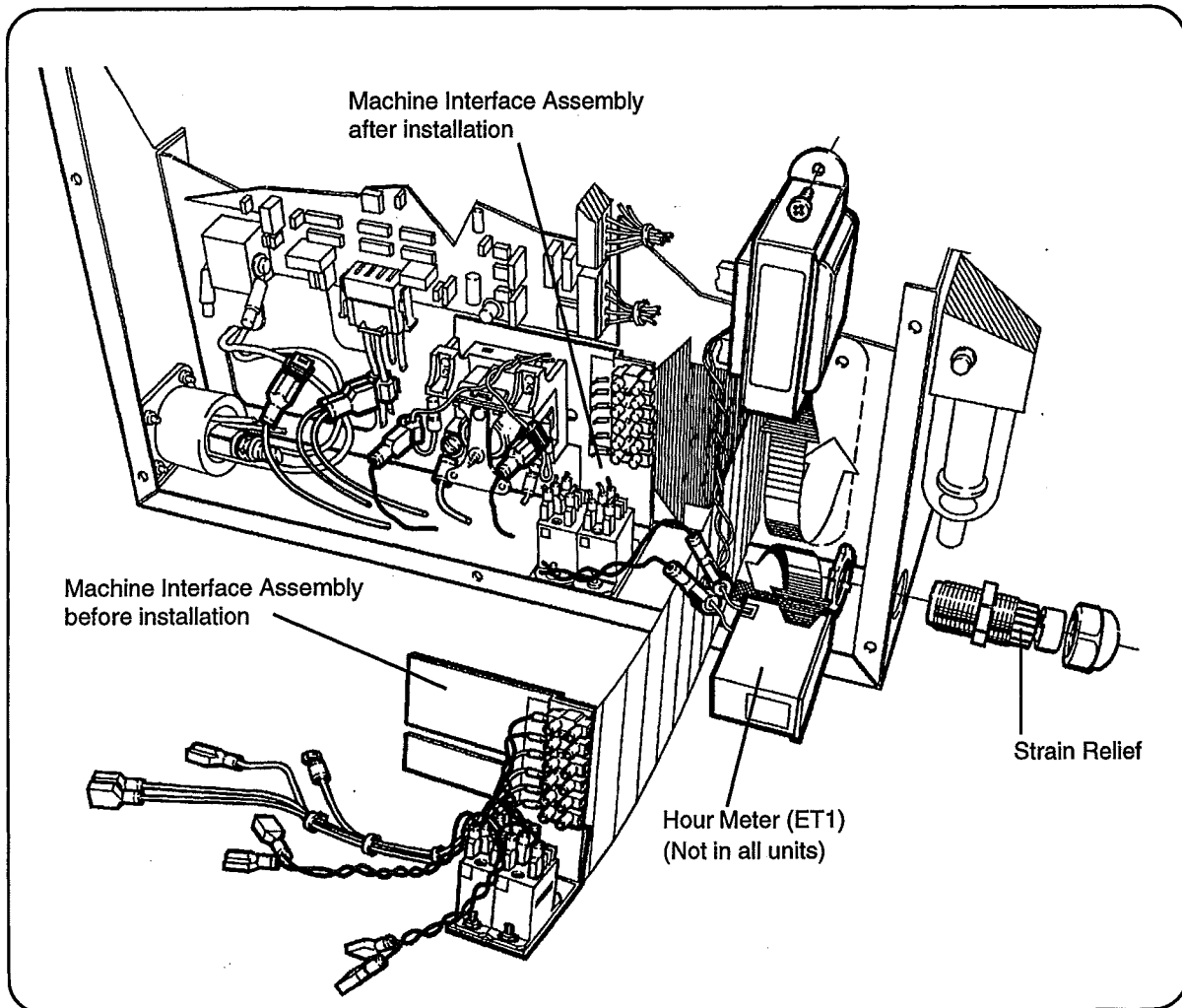


Figure 4-9 Machine Interface Assembly

**Section 5 MAX43 PARTS LIST  
CE 400V POWER SUPPLY**

In this section:

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Power Supply - Front, Rear and Right Side .....	5-2
Power Supply - Left Side .....	5-4

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# PARTS LIST

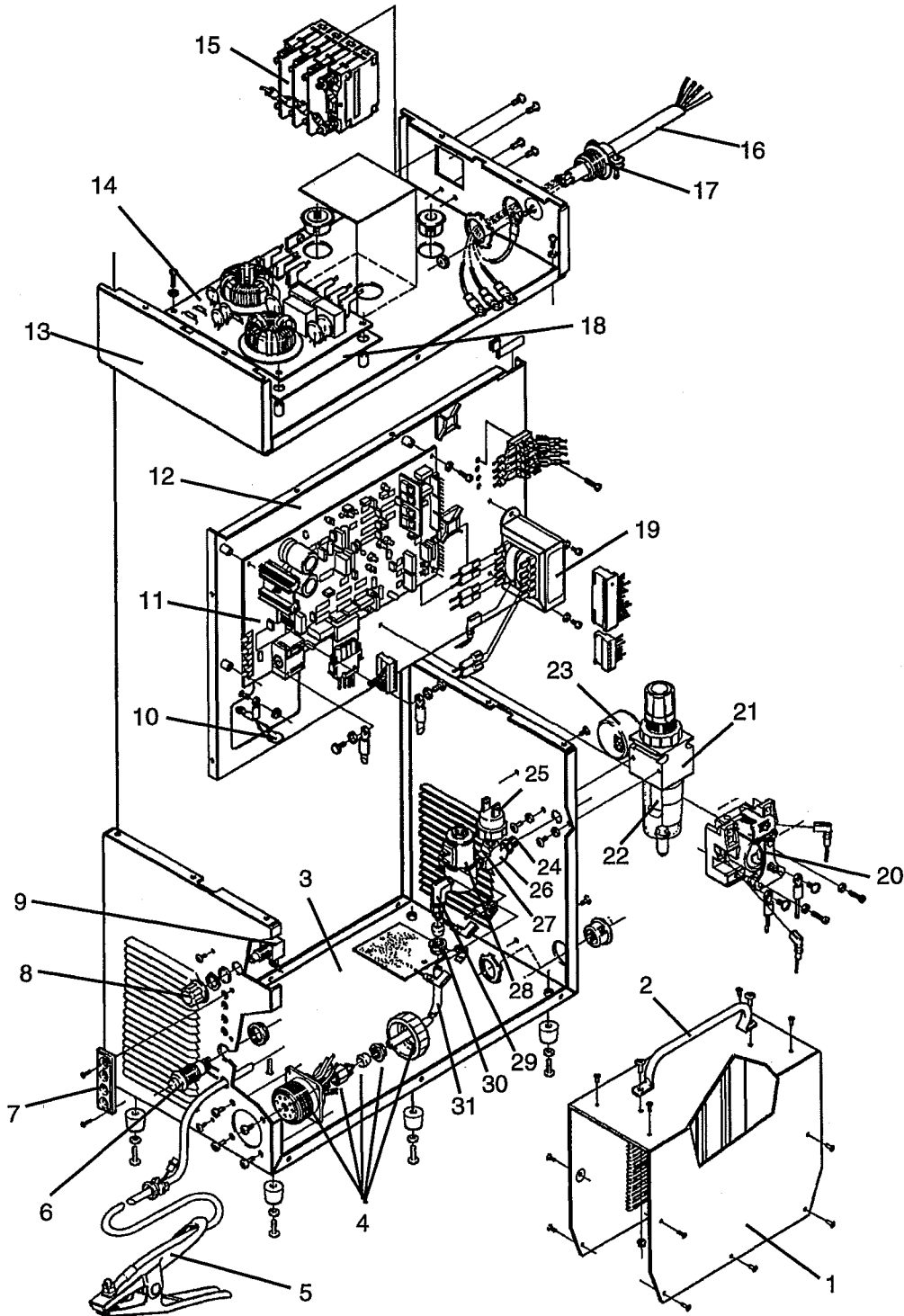
## POWER SUPPLY - FRONT, REAR AND RIGHT SIDE

Index No.	Ref. Desig.	Part No.	Description	Quantity
1		001597	Cover, Top MAX43 CE/LVD	1
2		001197	Handle, MAX43	1
3		001599	Chassis, MAX43 CE/LVD	1
4		028523	Receptacle Assy, Torch Lead MAX43 QDisc	1
5		023452	Cable, Work # 10 w/Clamp 15 ft. (4.6 m)	1
6	S2	005196	Switch, Pushbutton, Blk MOM, NC	1
7		007036	Bezel, MAX43 CE/LVD	1
8		008465	Knob, .850 Diameter 1/4 Shaft Black Silicone	1
9	R1	009480	Pot, Cermet 250 Ohm 1T 1W	1
10		129106	Capacitor SA, MAX43 CE/LVD Shunt Filter	1
11		041414	PC BD Assy, Control, MAX43	1
12		001598	Center Panel, MAX43 CE/LVD	1
13		001596	Enclosure, MAX43 CE/LVD Filter	1
14		041505	PC BD Assy, Pmx800 Line Filter	1
15	S1	003143	Circuit Breaker Assy, MAX43 400V	1
16		123082	Line Cord, MAX43 CE/LVD	1
17		008944	Strain Relief, 3/4 NPT .530 X .750	1
18		002264	Insulator, Pmx800 CE Filter PCB FR	1
19	T1	014205	Transformer, Control MAX43 CE/LVD230-400	1
20	CR1	003078	Relay, 30 Amp NO Mag Blowout AC TM	1
21		011039	Filter/Regulator 5 MIC 120 PSI	1
		015152	Nipple, Quick Connect, Steel, 1/8 NPT (Mounted on regulator, part of spare parts kit)	1
22*		011054	Filter Element	1
23		022019	Gauge, Pressure 0-100 PSI 1-1/2"	1
24		015517	Nipple, 1/8 X CL, Hex	1
25	PS1	005112	Switch, Pressure 39 PSI .013 BAF	1
26		015540	Tee 1/8	1
27		015517	Nipple, 1/8 X CL, Hex	1
28	V1	006054	Valve, Solenoid, 24 VAC, 100 PSI	1
29		015530	Street Elbow 1/8	1
30		015205	Adapter 1/8 NPT X 5/16 Poly	1
31		046040	Tubing, 5/16 OD Poly-Flo	1

\* Filter element 011054 can also be obtained by contacting the following sources:

In the USA, contact Watts FluidAir, Inc. Customer Service Department at 207-439-9511 for the name of the nearest authorized Watts FluidAir distributor. Order element replacement kit EK504VY. Overseas customers should contact their local Hypertherm distributor.

# PARTS LIST





# PARTS LIST

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## POWER SUPPLY- LEFT SIDE

Index No.	Ref. Desig.	Part No.	Description	Quantity
1		002202*	Filter, Air, 6.5" X 10.5" X .5" (165 mm X 267 mm X 13 mm) Blk	1
2		004464	Bracket, Mounting Fan	1
3	M1	027255	Fan, MAX43 230V	1
4		041298	PC BD Assy, MOV/Filter	1
5	TH/S1	005200	Temperature Switch 93° C CER//SST 12 mm HT	1
6		041519	PC BD Assy, Power, MAX43 CE/LVD 3 PH	1
7	L1	014138	Inductor, Output 2 MHY 40 Amp	1
8	L2	014137	Transformer, Current 40 Amp	1
9	T4	014154	Transformer, 50 KHZ, 4.5 KW, 200-400V (temp switch TH/S2/95° C is inside T4)	1
10	F1, F2	008967	Fuse 1A 500V 10 mm X 38 mm GG	2

\* Available only as an option.

# PARTS LIST

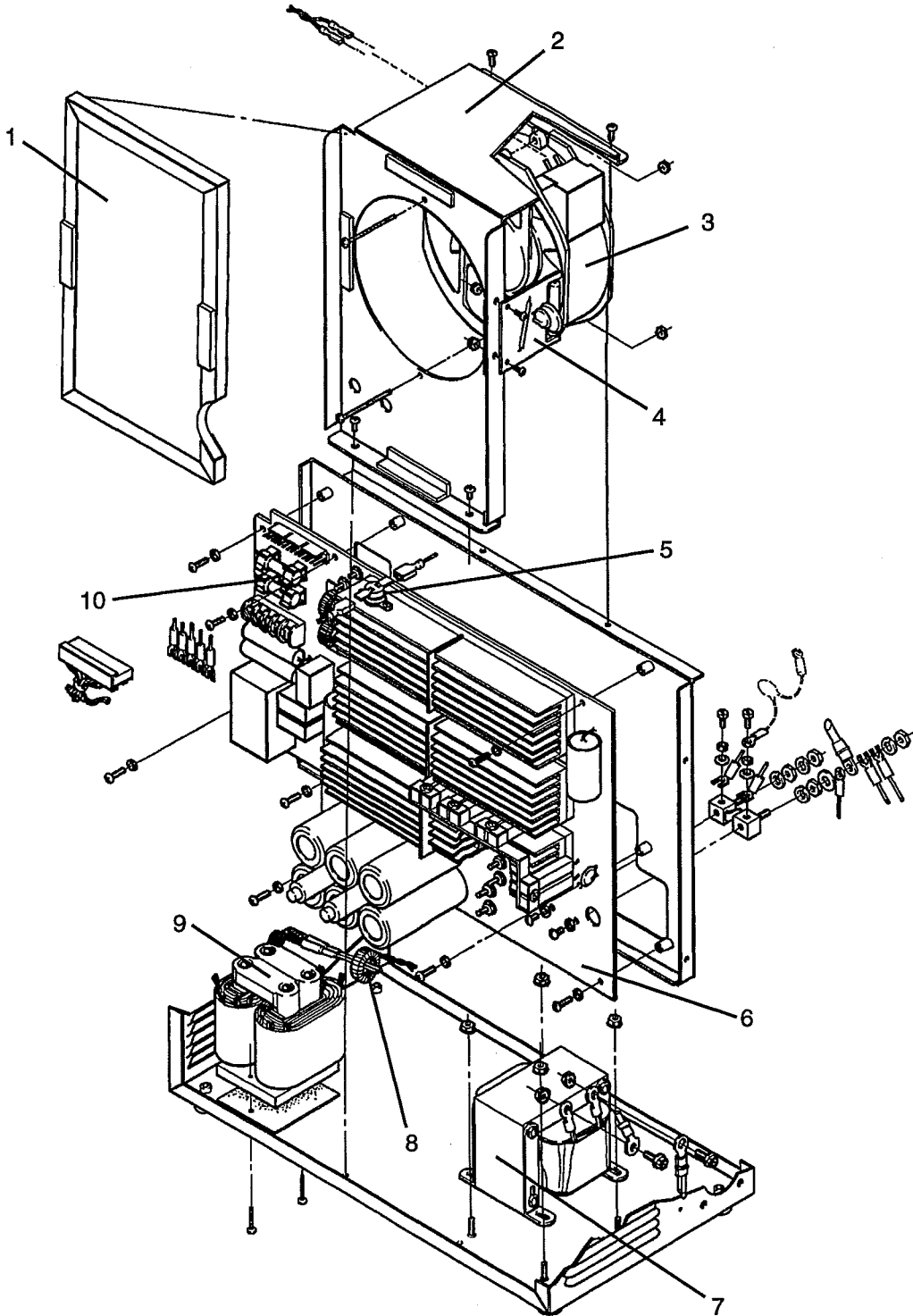


Figure 5-2 Power Supply CE 400V - Left Side

# **PARTS LIST**

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