

# **MAX70<sup>®</sup>**

**Plasma Arc  
Cutting System**

**Instruction Manual  
801770 - Rev. 5**

**CE**  
EN50199

**HYPERTHERM<sup>®</sup>**

**MAX70<sup>®</sup>**  
**Plasma Arc Cutting System**

**Instruction Manual**  
**IM-177**  
**(P/N 801770)**

**for systems beginning with serial number**  
**MX70-000674**

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## **ELECTROMAGNETIC COMPATIBILITY (EMC)**



### **ATTENTION**



The 400V CE power supplies comply with the EMC European standard EN50199. Information about this standard and other line filtering information pertaining to these power supplies are located in Appendix B of this manual.



# 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.

## 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.

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# SAFETY

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## INTRODUCTION

**Abbreviated safety precautions are printed on the power supply.**

**Before using the plasma arc cutting equipment (including compressed gas), each person operating, maintaining or supervising the use of this equipment must read the following safety instructions.**

## NOTES, CAUTIONS & WARNINGS

Throughout this manual, notes, cautions, and warnings are used to describe situations that require additional information. The following formats are used for each:

Notes: A note offers additional information, such as an operating tip, that aids the user in operating the plasma system.

Caution: A caution describes a situation that may cause damage to the plasma system and offers advice to avoid or rectify the situation.



### WARNING



A warning describes a situation that presents a physical danger to the operator, and offers advice to avoid or rectify the situation. Each type of warning displays an applicable danger symbol, ie. fire, explosion, electrical shock, etc.

## WARNING



### ELECTRIC SHOCK CAN KILL.

- Do not touch live electrical parts.
- Keep all panels and covers in place when the machine is connected to a power source.
- Insulate yourself from work and ground: wear insulating gloves, shoes and clothing.
- Keep gloves, shoes, clothing, work area, torch, and this machinery dry.



### EXPLOSION WILL RESULT IF PRESSURIZED CONTAINERS ARE CUT.



### ARC RAYS CAN INJURE EYES AND BURN SKIN.

- Wear correct eye and body protection.



### NOISE CAN DAMAGE HEARING.

- Wear correct ear protection.



### FUMES AND GASES CAN INJURE YOUR HEALTH.

- Keep your head out of the fumes.
- Provide ventilation, exhaust at the arc, or both to keep the fumes and gases from your breathing zone and the general area.
- If ventilation is inadequate, use an approved respirator.



### HEAT, SPLATTER AND SPARKS CAUSE FIRE AND BURNS.

- Do not cut near combustible material.
- Do not cut containers that have held combustibles.
- Do not have on your person any combustibles such as a butane lighter or matches.
- Pilot arc can cause burns. Keep the torch nozzle away from yourself and others when the switch is depressed.
- Wear correct eye and body protection.



# SAFETY

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## SAFETY INSTRUCTIONS

### Burn Prevention

#### Eye Safety

To protect eyes against burns caused by high-intensity ultraviolet light, sparks and hot metal:

- Wear dark safety glasses/goggles with side shields or a welding helmet. Refer to the chart below for recommended lens shades:

<u>Arc Current</u>		<u>Shield Shade</u>
Up to 100 Amps		Shade No. 8
100 - 200 Amps		Shade No. 10
200 - 400 Amps		Shade No. 12
Over 400 Amps		Shade No. 14

- Replace the glasses/goggles or helmet when the shield becomes pitted or broken.
- Warn other people in the area not to look directly at the arc unless they wear a glasses/goggles or 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 Safety

To protect skin against burns caused by high-intensity ultraviolet light, sparks and hot metal:

- Wear protective clothing:
  - Gauntlet gloves, safety shoes and hat.
  - Flame-retardant clothing which covers all exposed areas.
  - Cuffless trousers to prevent entry of sparks and slag.
- Hold any hand torch away from your body when pressing the start button because the pilot arc may come on immediately.

- Do not touch the front of the torch when starting it. After cutting, allow time for the front of the torch to cool.

### Toxic Fume Prevention



To protect against the danger of toxic fumes which may be produced during cutting:

- 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 when cutting galvanized metal and use proper ventilation.
- Do not cut containers with toxic materials inside or containers that have held toxic materials. Clean such containers thoroughly before cutting.



#### WARNING



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

### Fire Prevention



Cutting with a plasma system produces hot metal, sparks and slag. Take the following precautions against fire:

- 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 meters).
- 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.

# SAFETY

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- Ventilate potentially flammable atmospheres before cutting with a plasma system. Never operate the plasma system in an atmosphere which contains heavy concentrations of dust, flammable gas or combustible liquid vapors.

## 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:

- Keep your body and clothing dry.
- Do not stand in, sit on or lie on 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. Wear insulated gloves and boots.
- Provide a wall-mounted disconnect switch with proper size 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 the system with a damaged power cord. If a power cord is damaged, replace it immediately.
- Inspect the torch leads. Replace if frayed or damaged.
- Never operate the plasma system unless the power supply unit covers are in place. Exposed power supply connections present a severe electrical hazard.
- 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 at all times.
- Before changing the torch parts, disconnect the main power or unplug the power supply. After changing the torch parts and returning the retaining cap to its operating position, plug the power supply in 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 capacitor discharge to occur.

## Explosion Prevention



### WARNING



The plasma system uses compressed gas. Proper precautions must be observed when handling and using compressed gas equipment and cylinders. Refer to the Standards Index in this manual.

When cutting with the plasma system:

- Do not cut in atmospheres containing explosive dust or vapors.
- Do not cut pressurized cylinders or any closed container.

### Pressure Regulators

- Maintain all pressure regulators in proper working condition. Faulty regulators can cause damage or operator injury and must be serviced by trained repair technicians.
- 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.

### Compressed Gas Cylinders

- Handle and use compressed gas cylinders in accordance with safety standards published by the Compressed Gas Association (CGA), American Welding Society (AWS) and Canadian Standards Association (CSA).
- 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 the 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.



# SAFETY

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- 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.

## 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.
- Replace hose that is damaged by physical abuse or by sparks, heat or open flame.
- Lay hose out straight to prevent kinks.
- Coil excess hose and place it out of the way to prevent damage and to eliminate tripping danger.
- Examine hoses at regular intervals for leaks, wear, loose connections or other hazard.
- Keep hose lengths to a minimum to prevent damage, reduce pressure drop and to prevent possible volume flow restriction.

## Grounding

Before operating the plasma system:

### Input Power

- Be sure the power cord is plugged into a properly grounded outlet or that the power cord ground wire is properly connected to the ground in the disconnect box.
- If installation of the plasma system involves connecting the power cord to the power supply, ensure that the power cord ground wire is properly connected. Conform to CSA standards by placing the power cord ground wire on the stud first; then place the other wires on top of the power cord ground. Fasten the retaining nut tightly.
- Make sure that all electrical connections are tight to avoid excessive heating.

### Work Cable

- Clamp the work cable with good metal-to-metal contact to the workpiece (not the portion that will fall away) or to the work table.

### Work Table

- Connect the work table to a good earth ground. Consult the U.S. National Electrical Code, Article 250, Section H *Grounding Electrode System*, or other appropriate national or local codes.

For additional information, refer to the *Standards Index* in this manual.



## **SAFETY REMINDERS**

- All Hypertherm torches are designed with a safety interlock, which turns off the power supply when the retaining cap is loosened.
- Never bypass or shortcut the safety interlocks on any of the plasma system units.
- 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.
- 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.

## **STANDARDS INDEX**

The *Standards Index* contains a list of publications dealing with plasma arc cutting equipment safety practices. For additional information, refer to this *Standards Index*.

## **SAFETY**

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## Section 1-B SÉCURITÉ

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# SÉCURITÉ

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## INTRODUCTION

Des consignes de sécurité condensées sont imprimées sur l'appareil du MAX70. En outre, il est impératif que chaque personne qui utilise, entretient ou surveille l'emploi de cet appareil lise les instructions suivantes.

## NOTES, PRÉVENTION ET AVERTISSEMENT

À travers ce manuel, des indications de prévention sont utilisées pour décrire des situations qui nécessitent de l'information supplémentaire. Les formats suivant sont utilisé pour:

Notes: Une note offre de l'information supplémentaire comme des modes d'emploi qui permettent d'utiliser le MAX70.

Prévention: Un signe de prévention décrit une situation qui risquerait d'endommager le MAX70, et indique comment éviter ou rectifier la situation.



### AVERTISSEMENT



Un signe d'avertissement décrit une situation qui présente un danger à l'opérateur, et permet d'éviter ou rectifier ce problème. Chaque type de danger produit un signe correspondant, comme le feu, l'explosion, le choc électrique, etc.

## AVERTISSEMENT



### LES CHOCS ÉLECTRIQUES PEUVENT ÊTRE MORTELS.



- Ne pas toucher les pièces électriques sous tension.
- Les panneaux et les couvercles de protection doivent être en place lorsque la machine est raccordée au réseau.
- S'isoler de la pièce à couper et du sol en portant des gants, des chaussures et des habits isolants.
- Garder au sec les gants, les chaussures, les habits, la zone de travail et l'appareil.



### RISQUE D'EXPLOSION SI ON COUPE DES RÉSERVOIRS SOUS PRESSION.



### RISQUE DE BRÛLURES AUX YEUX ET À LA PEAU PAR LE RAYONNEMENT DE L'ARC.

- Porter des protecteurs pour les yeux et pour le corps.



### LE BRUIT PEUT ENDOMMAGER L'OUÏE.

- Porter des protecteurs auditifs appropriés.



### LES VAPEURS ET LES GAZ PEUVENT ÊTRE TOXIQUES.

- Éloigner le visage des vapeurs.
- Prévoir une ventilation et/ou une évacuation à proximité de l'arc pour éliminer les vapeurs et gaz de la zone de travail et de ses abords.
- Si la ventilation est inefficace, utiliser un appareil respiratoire agréé.



### LA CHALEUR, LES PROJECTIONS DE MÉTAL ET LES ÉTINCELLES PEUVENT PROVOQUER DES INCENDIES ET DES BRÛLURES.

- Ne pas couper à proximité de matières inflammables.
- Ne pas couper des récipients ou réservoirs ayant servi à des produits inflammables.
- Ne pas porter sur soi des objets (briquets à gaz, allumettes) ou vêtements inflammables.
- L'arc pilote peut causer des brûlures. Éloigner la buse de la torche de soi-même et des autres lorsque l'interrupteur est enclenché.
- Porter des protecteurs appropriés pour les yeux et le corps.



# SÉCURITÉ


## CONSIGNES DE SÉCURITÉ

### Prévention des brûlures

#### Protection des yeux

Pour se protéger les yeux des brûlures que peuvent causer le rayonnement ultraviolet de forte intensité, les étincelles et le métal brûlant:

- Porter des lunettes de sécurité à verres teintés munies d'écrans latéraux. Le tableau ci-dessous indique les pouvoirs obscurcissants recommandés pour les verres.

<u>Courant</u>		<u>Pouvoir obscurcissant des verres</u>
Jusqu'à 100 A		No. 8
100 - 200 A		No. 10
200 - 400 A		No. 12
Plus de 400 A		No. 14

- Remplacer les lunettes quand les verres sont brisés ou endommagés.
- Avertir les autres personnes se trouvant dans l'endroit de travail de ne pas regarder directement l'arc, à moins de porter des lunettes à verres teintés.
- Préparer l'endroit de travail de façon à réduire la réflexion et la transmission du rayonnement ultraviolet:
  - Peindre les murs et autres surfaces de couleur foncée pour réduire la réflexion.
  - Installer des écrans et des rideaux protecteurs pour réduire la transmission du rayonnement ultraviolet.

Pour protéger la peau des brûlures que peuvent causer le rayonnement ultraviolet à haute intensité, les étincelles et le métal brûlant:

#### Protection de la peau

- Porter des habits de sécurité:
  - Des gants à crispin et des chaussures et un casque de sécurité.
  - Des habits en tissu ignifuge couvrant toutes les parties du corps qui sont exposées.
  - Un pantalon sans revers pour éviter que des étincelles ou des scories puissent s'y loger.

- Éloigner la torche du corps à l'amorçage. L'arc pilote jaillit aussitôt que l'on appuie sur le bouton d'amorçage.
- A l'amorçage, ne pas toucher l'extrémité de la torche. Après le coupage, laisser l'extrémité de la torche se refroidir.

## Vapeurs toxiques



Pour se protéger contre les vapeurs toxiques qui peuvent éventuellement se dégager lors du coupage:

- Tenir l'endroit de travail bien aéré.
- Enlever avant le coupage tous les solvants chlorés de l'endroit de coupage. Certains solvants chlorés se décomposent sous l'effet du rayonnement ultraviolet et forment du phosgène.
- Porter un masque approprié lors du coupage de métaux galvanisés, et s'assurer à ce que la ventilation soit efficace.
- Ne pas couper de réservoirs contenant ou ayant servi à des matières toxiques. Nettoyer soigneusement les réservoirs avant le coupage.



### AVERTISSEMENT



Ne pas couper de métaux ni de métaux peints qui contiennent zinc, plomb, cadmium ou béryllium, à moins que l'utilisateur et toute personne exposée au vapeurs ne portent un appareil respiratoire ou un casque ventilé.

## Prévention des incendies



Le coupage avec le MAX70 génère du métal brûlant, des étincelles et des scories. Il faut donc prendre des précautions contre les incendies:

- Des extincteurs d'incendie doivent être accessibles dans l'endroit de coupage.
- Les matières inflammables doivent être maintenues à au moins 10 m (35 pieds) de l'aire du coupage.

# SÉCURITÉ

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- Arroser le métal fraîchement coupé ou le laisser refroidir avant de le manipuler ou de le mettre en contact avec des matériaux inflammables.
- Ne jamais utiliser le MAX70 pour découper des réservoirs contenant des matières potentiellement inflammables. De tels récipients doivent être soigneusement nettoyés avant le coupage.
- Évacuer toute atmosphère potentiellement inflammable avant de faire fonctionner le MAX70. Ne jamais faire fonctionner le MAX70 dans une atmosphère qui comporte une forte concentration de poussière, de gaz inflammables ou de vapeurs de liquides inflammables comme l'essence.

## Prévention des chocs électriques



Le MAX70 produit une forte tension (environ 300 VDC) pour amorcer l'arc-plasma. On doit prendre les précautions suivantes en utilisant cet appareil:

- Garder le corps et les habits à sec.
- Ne pas se tenir, s'asseoir ou se coucher dans une surface mouillée quand on utilise le MAX70.
- S'isoler contre le choc électrique. Prendre garde si l'on travaille près d'un endroit humide. Porter des gants et bottes isolants.
- Installer un interrupteur mural à fusibles, de caractéristiques appropriées, à proximité du bloc d'alimentation du MAX70. Cet interrupteur doit permettre à l'utilisateur d'arrêter rapidement le MAX70 en cas d'urgence.
- Conformer aux codes électriques pour les types et grandeurs de la filerie électrique primaire.
- Inspecter fréquemment le cordon d'alimentation primaire pour s'assurer à ce qu'il ne soit ni endommagé ni fissuré. **Un conducteur peut tuer.** Ne pas utiliser l'appareil si le cordon d'alimentation est endommagé. Remplacer immédiatement le cordon s'il est endommagé.
- Inspecter les câbles de la torche. S'ils sont effilochés ou endommagés, les remplacer.
- S'il faut retirer le couvercle du bloc d'alimentation après usage, couper l'alimentation et attendre cinq minutes pour laisser les condensateurs se décharger, sinon, on s'expose à des chocs électriques importants.
- Ne jamais utiliser le MAX70 si le couvercle du bloc d'alimentation n'est pas en place. Si elles sont exposées, les connexions du bloc d'alimentation sont extrêmement dangereuses.



- Ne pas saisir la pièce à travailler, (y compris la chute) lors du coupage. Laisser la pièce à travailler en place ou sur l'établi, et le câble de masse toujours connecté.
- Avant de changer les pièces de la torche, couper l'alimentation ou débrancher le bloc d'alimentation. Après avoir changé les pièces de la torche et ramené le capuchon de retenue à sa position de marche, rebrancher l'appareil.
- Ne jamais neutraliser les verrouillages de sécurité.

## Prévention des explosions



### AVERTISSEMENT



Cet appareil ne doit être alimenté qu'en gaz comprimé. Prendre les précautions nécessaires lors de la manutention et de l'utilisation des appareils et des bouteilles à gaz sous pression.

Quand on utilise le MAX70:

- Ne pas couper en présence de poussière ou de vapeurs explosives.
- Ne pas couper de réservoirs sous pression.

### Régulateurs de pression

- Bien entretenir les régulateurs de pression. Un régulateur défectueux peut entraîner des dommages et causer des blessures; on doit en confier la réparation à un technicien qualifié.
- Ne jamais utiliser un régulateur avec un autre gaz que celui pour lequel il a été conçu.
- Ne jamais utiliser un régulateur qui fuit, présente une dérive excessive ou est endommagé.
- Ne jamais lubrifier un régulateur à l'aide d'huile ou de graisse.

### Bouteilles de gaz comprimé

- Manipuler et utiliser les bouteilles de gaz comprimé conformément aux normes de sécurité de la CGA, de l'AWS et de la CSA.
- Ne jamais utiliser une bouteille qui fuit ou est endommagée.
- Ne jamais utiliser une bouteille qui n'est pas placée dans le bon sens et bien assujettie.



# SÉCURITÉ

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- Ne jamais transporter une bouteille si le chapeau de protection du robinet n'est pas en place.
- Ne jamais utiliser une bouteille à gaz ou son contenu à des fins autres que celles pour lesquelles elle est conçue.
- Ne jamais lubrifier les valves des cylindres avec de l'huile ou de la graisse.
- Éviter à tout prix le contact électrique entre l'arc de plasma et le cylindre.
- Ne jamais exposer des cylindres à une chaleur excessive, étincelles, scories ou flammes.
- Ne jamais utiliser de marteaux, clés anglaises ou autres outils pour d'ébloquer des valves de cylindres.

## Tuyaux

- Des tuyaux à gaz pour la coupe de plasma à l'arc doivent adhérer aux codes de couleurs suivant:

Vert	Oxygène
Noir	Air et gaz inerte

- Jamais utiliser de tuyau à oxygène vert pour un autre gaz.
- Le tuyau endommagé par l'usure, les étincelles, la chaleur ou la flamme doit être remplacé.
- Poser le tuyau à plat pour éviter des noeuds.
- Enrouler le tuyau en trop et le placer à l'abri pour éviter tout dégât ou encoulement.
- Examiner le tuyaux à intervalles réguliers pour des fuites, de l'usure des mauvaises connections ou d'autres dangers.
- Garder les longueurs de tuyaux à un minimum pour éviter des dégâts, réduire la chute de pression et éviter la pénurie.

## Mise à la masse

Avant de faire fonctionner le MAX70:

## Alimentation du poste

- S'assurer à ce que le fil de terre du cordon d'alimentation soit bien mis à la terre dans le coffret de l'interrupteur.

S'assurer à ce que le fil de terre du cordon d'alimentation soit correctement relié à la cosse de mise à la terre du bloc d'alimentation. Se conformer aux exigences de la CSA en reliant le fil de terre à la cosse de terre avant les autres fils. Bien serrer l'écrou de retenue.

- S'assurer à ce que toutes les connections soient bien serrées pour éviter le surchauffement.

## Dépense d'énergie

- Le câble de masse doit être fixé à la pièce à travailler de façon à assurer un bon contact entre les métaux. Ne pas fixer la câble de masse à la partie de la pièce à travailler qui doit se détacher.
- Mettre le plan de travail à la terre de façon fiable. Consulter le National Electrical Code, Article 250, Section H, intitulée "Grounding Electrical System" (Système de tiges de mise à terre) ou un autre code approprié.

Pour de plus amples renseignements sur la mise à terre, consulter le chapitre *Index des normes*.

## DISPOSITIFS DE SÉCURITÉ

- Le MAX70 comporte un verrouillage de sécurité qui met hors service le bloc d'alimentation lorsque le capuchon de retenue est desserré.
- Ne jamais neutraliser les verrouillages de sécurité.
- Le MAX70 est conçu pour les torches MAX70. Ne pas utiliser d'autre torche.
- Utiliser seulement des pièces de rechange et des pièces fusibles Hypertherm. La garantie de Hypertherm ne couvre pas des dégâts causés par l'utilisation d'autres pièces de rechange que celles de Hypertherm.
- Ne jamais faire fonctionner le MAX70 si tous les couvercles du bloc d'alimentation 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.

## INDEX DES NORMES

L'index des normes énumère des publications traitant des mesures de sécurité à suivre lorsque l'on utilise un appareil de coupage à l'arc-plasma. Cet index peut fournir des renseignements supplémentaires et la norme ACNOR (CSA) W117.2 y figuré.

# **SÉCURITÉ**

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## Section 2 INTRODUCTION & SPECIFICATIONS

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## INTRODUCTION & SPECIFICATIONS

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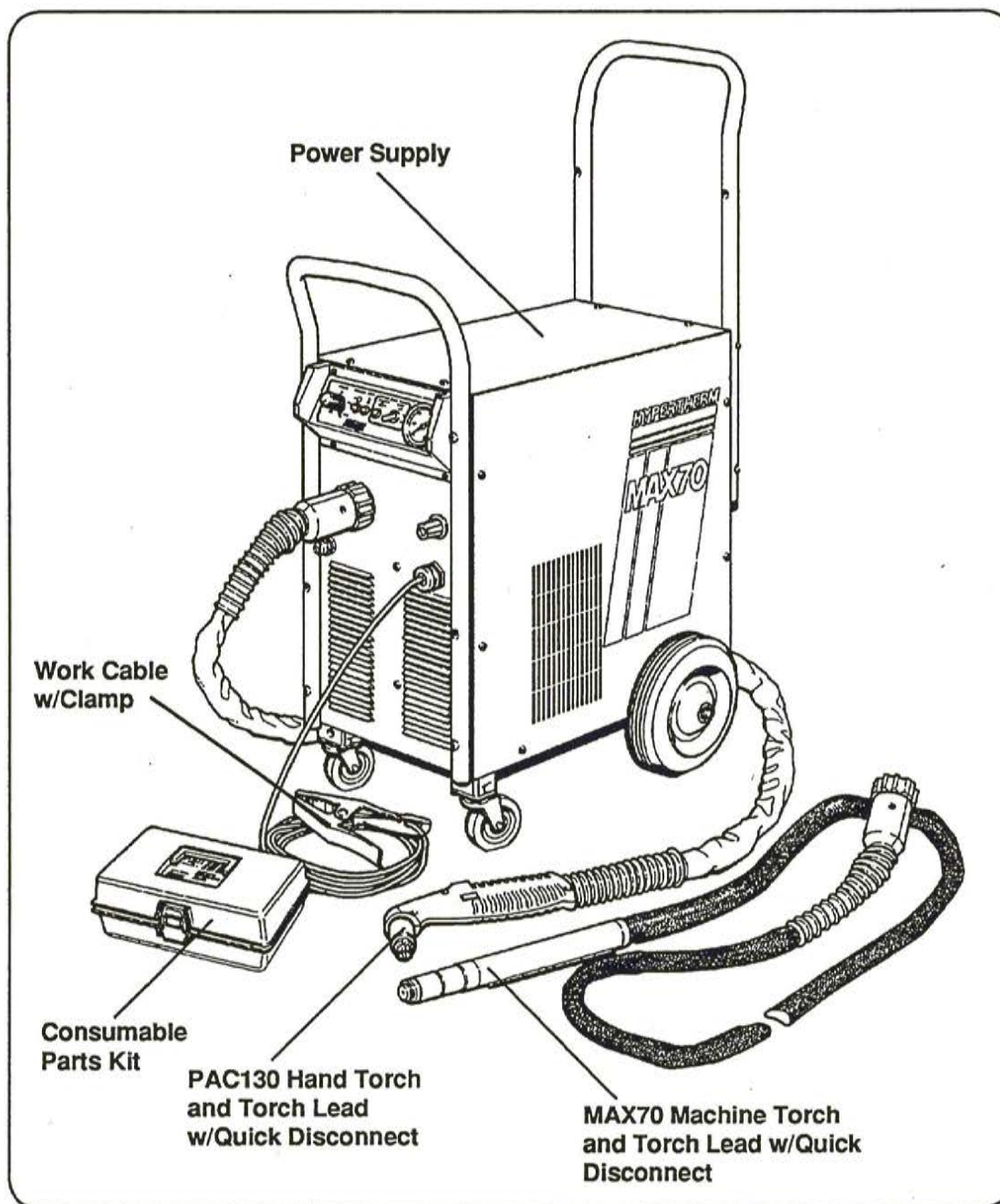


Figure 2-1 MAX70 Plasma Cutting System

# INTRODUCTION & SPECIFICATIONS

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## INTRODUCTION

The MAX70 plasma cutting system, which uses an inverter power supply, provides a smooth DC output voltage which contributes excellent cut and gouge quality on mild steel, stainless steel, aluminum and other non ferrous metals. The MAX70 power supply provides continuously variable current output from 30 to 70 amps for optimum performance on all thicknesses of metal up to 3/4- inch (19 mm) thick. This allows the operator wide variations in cutting speeds on the same thickness of metal. The 30-amp setting is for metals up to 1/4-inch thick (6 mm), while the 70-amp setting is used for thicker metals.

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. The pressure regulator and air filter on the power supply ensure that the correct pressure and air flow rate are supplied to the system at the proper quantity and quality.

## DESCRIPTION OF UNITS AND ASSEMBLIES

The MAX70 plasma cutting system (see Figure 2-1) includes: a MAX70 power supply, a PAC130 torch with a 25 or 50 foot (7.6 or 15.2 m) torch lead with quick disconnect, a consumable parts kit. A machine torch with a 25 or 50 foot (7.6 or 15.2 m) torch lead with quick disconnect is also available. Note that 400V units are also available with torch leads without quick disconnects. A remote on/off switch is also included with the machine torch system.

The instruction manual provides information, so that the user can setup and operate the system and perform maintenance on the torch and limited maintenance on the power supply. The instruction manual also provides in Section 1, a detailed list of safety practices, so that the system can be operated and maintained with safety in mind. **READ THE SAFETY SECTION FIRST.**

The MAX70 CE 400V, 3 Ph, 50 Hz power supplies (072100 and 072101) meet CE standard EN50199. Refer to the Appendix B for requirements, specifications and information specific to the MAX70 CE power supplies. This includes electromagnetic compatibility information, power supply specifications and EMI filter, power cable, and parts information. Except for the specific MAX70 CE information presented in the Appendix B, the CE power supplies are the same as the standard MAX70 power supplies.

# INTRODUCTION & SPECIFICATIONS

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## SPECIFICATIONS

### Power Supplies

The MAX70 is a constant current, inverter-based power supply providing continuously variable amperage from 30 amps to 70 amps. It conforms to the following specifications:

Rated Output Circuit Voltage (OCV) ( $U_0$ )	.....300 VDC
Rated Output Current ( $I_2$ )	.....30-70 amps
Rated Output Voltage ( $U_2$ )	.....140 VDC
Duty Cycle (X) @ 70 amps (9.8 kw)	.....@ 40° C - 50 %; @ 25° C ≈ 80 %
Input Power: (line voltage - $U_1$ and line current - $I_1$ )	
# 072067 (w/QDisc)	.....480V, 3 Ph, 60 Hz @ 21.8 amps
# 072068 (w/QDisc)	.....400V, 3 Ph, 50 Hz @ 26.1 amps
# 072070 (w/o QDisc)	.....400V, 3 Ph, 50 Hz @ 26.1 amps
# 072069 (w/QDisc)	.....208/240V, 1 Ph, 60 Hz @ 74/85 amps
Dimensions	Depth - 26" (660 mm)
	Width - 17-1/2" (444 mm)
	Height - 24-1/2" (622 mm) w/handles off
	Height - 41-1/2" (1054 mm) w/handles @ max height)
Weight	133 pounds (60 kg) w/wheels & handles
	119 pounds (54 kg) power supply only
Gas Type	.....Air
Gas Quality	.....Clean, dry, oil-free
Gas Flow	.....440 scfh/7.4 scfm at 90-120 psi (208 l/min at 6.2 - 8.3 bar) supplied to power supply pressure regulator
Pressure Setting (at power supply)	.....Refer to <i>Cut Charts</i> , Section 4
High Frequency Spark Gap	......020-inch (.508 mm)

### CE Power Supplies

The MAX70 CE 400V, 3 Ph, 50 Hz power supplies (072100 and 072101) meet CE standard EN50199. Refer to the Appendix B for requirements, specifications and information specific to the MAX70 CE power supplies.

# INTRODUCTION & SPECIFICATIONS

---

## PAC130 Hand Torch

The PAC130 torch conforms to the following specifications:

Maximum cutting thickness range ..... 3/4- inch (19 mm)

Gouging metal removal rate (mild steel) ..... 6.6 lbs/hr (3 kg/hr)

Maximum current at 50% duty cycle ..... 70 amps

Gas Flow ..... 440 scfh/7.4 scfm (208 l/min) at a psi/  
bar as determined by the *Cut Charts*

Weight ..... Torch 1 lb. 3 oz. (0.462 kg)  
Torch w/25 ft lead 11 lb (5 kg)

## MAX70 Machine Torch

The machine torch conforms to the following specifications:

Maximum cutting thickness range ..... 3/4- inch (19 mm)

Gouging metal removal rate (mild steel) ..... 6.6 lbs/hr (3 kg/hr)

Maximum current at 50% duty cycle ..... 70 amps

Gas Flow ..... 440 scfh/7.4 scfm (208 l/min) at a psi/  
bar as determined by the *Cut Charts*














Weight ..... Torch 1 lb. 7 oz. (0.604 kg)  
Torch w/25 ft lead 15 lb (7 kg)



# INTRODUCTION & SPECIFICATIONS

---

## 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)
	Power is on
	Power is off
	Volt/amp curve, "drooping" characteristic

# INTRODUCTION & SPECIFICATIONS

## **S** MARK

The MAX70, 400V plasma system without quick disconnect (# 072070) conforms to IEC 974-1. The **S** mark indicates that the power supply and torch are suitable for use in environments with increased hazard of electrical shock. See Figure 2-2. Examples of such environments are as follows:

- In locations in which freedom of movement is restricted, so that the operator is forced to perform the cutting in a cramped (kneeling, sitting, lying, etc.) position with physical contact with conductive parts.
- In locations in which are fully or partially limited by conductive elements, and in which there is a high risk of unavoidable or accidental contact by the operator.
- In wet or damp or hot locations where humidity or perspiration considerably reduces the skin resistance of the human body and the insulating properties of accessories.

Note: Environments with increased hazard of electric shock are not meant to include places where electrically conductive parts in the near vicinity of the operator that can cause the increased hazard have been insulated.

To reduce increased electrical shock hazard as described above, the power supply must form a safe system with the corresponding cutting torch as follows:

- The rated no-load (open circuit) voltage must be less than 400 VDC.
- The no-load (open circuit) voltage shall be switched off automatically not later than two (2) seconds after the cutting circuit is opened.
- The voltage between the tip of the plasma torch and the workpiece (or earth ground) shall not exceed 68 volts peak DC when the arc is extinguished.
- The voltage between the tip of the plasma torch and the workpiece (or earth ground) shall not under any circumstances exceed 113 volts peak DC.

### **Zum Plasma-Schneiden unter erhöhter elektrischer Gefährdung zugelassen, bei Brenner-Normalausrüstung mit Düsenschutz-Schildkappe.\***

Approved for plasma cutting in environments with increased hazard of electric shock. PAC130 torch and shield\* must be used.

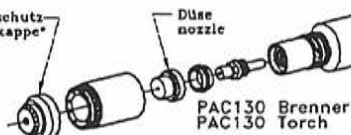


**Leerlaufspannung = 300 V**

Open circuit voltage = 300 V

**Nur für Plasmatorch Hypertherm PAC130**  
Use only Plasmatorch Hypertherm PAC130

Düsenschutz-  
Schildkappe\*  
shield



**S**

Figure 2-2 **S** Mark Label.

## **INTRODUCTION & SPECIFICATIONS**

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## **Section 3    SETUP**

In this section:

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# SETUP

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## UPON RECEIPT

1. The MAX70 system is shipped mounted on a skid, and protected by a heavy carton. Open the carton and remove all packing material and remove the power unit (refer to *Lifting Requirements* before moving power supply) and other items from the skid. The skid and carton are reusable and provide an impact-resistant box for transporting or storing the unit.

The carton should include:

- MAX70 power supply
- PAC130 torch and torch lead assembly
- or
- MAX70 machine torch and torch lead assembly
- MAX70 remote switch ( machine torch only)
- Handles (2)
- Wheels (2), axle, and retaining rings (2)
- Swivel castors (2)
- Consumable parts kit
- Instruction manual IM-177 (P/N 801770)

2. Verify that all parts and items are included. Alert your distributor if any of the parts or items are damaged or missing.
3. Inspect the power supply for any physical damage that may have occurred during shipping. If there is evidence of damage, refer to the *Claims* section below.

All communications regarding this equipment must include the model number and serial number (located on the back of the MAX70).

4. Before setting up and operating the MAX70, read the **Safety** section of this manual.


## CLAIMS

**Claims for damage during shipment** — If your unit was damaged during shipment, you must file a claim with the carrier. Hypertherm will furnish you with a copy of the bill of lading upon request. If you need additional assistance, call Customer Service at 1-800-643-0030.


**Claims for defective or missing merchandise** — All units shipped from Hypertherm undergo rigorous quality control inspections for defects. If any of the merchandise is defective or missing, call your distributor. If you need additional assistance, call Customer Service at 1-800-643-0030.

## LIFTING REQUIREMENTS

In the event that the power supply has to be lifted, read the **warning** first and then perform the following procedure and see Figure 3-1:



### WARNING



The MAX70 power supply weighs 133 pounds (60 kg) alone and between 144 and 148 pounds (65 and 67 kg) with the torch. Use a hoisting machine and lifting strap(s) at all times to lift the power supply. Always lift the power supply with cover in place. Always lift the power supply by both handles in lowest position. Do not lift the power supply by one handle (see Figure 3-1); it is not designed to accept the weight of the power supply. Failure to adhere to this warning could result in personal injury and damage to the power supply.

1. Use lifting straps rated for a minimum lifting weight of 400 pounds (181 kg). Approved lifting straps have attached labels with ratings.
2. Ensure the power supply cover is in place prior to lifting.
3. Ensure that the handles are set to the **lowest position** and that the eight (8) bolts securing the handles to the power supply are tight. Refer to the *Handle Installation* procedure later in this section.
4. Route strap between the two handles. Bring the strap ends together over the center of the power supply and connect to the hoisting machine.
5. Lift and lower the power supply slowly and smoothly.

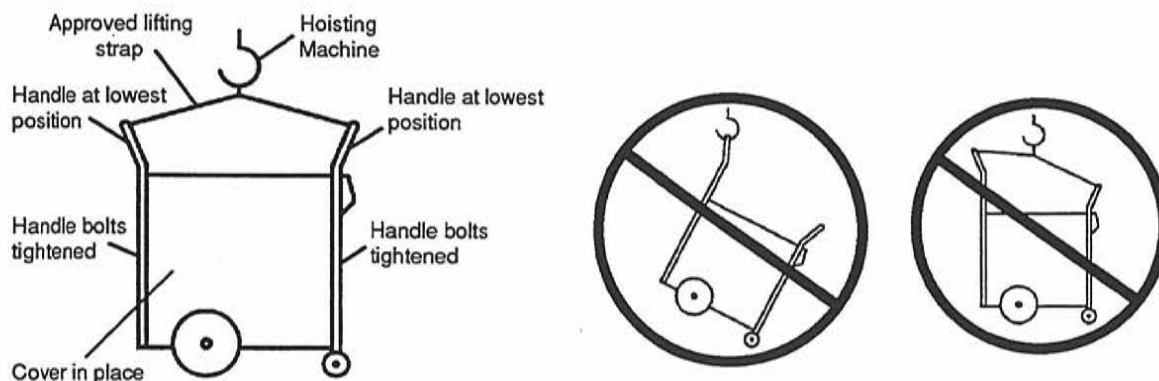


Figure 3-1 MAX70 Power Supply Lifting Setup

# SETUP

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## HANDLE INSTALLATION

Three sets of handle mounting holes are located on both the front and rear of the power supply. To mount the handles perform the following procedure and refer to Figure 3-2

1. Remove the eight (8) mounting bolts from the mounting holes.
2. Position the handle(s) at the desired height and secure to power supply with bolts. Note that if the power supply needs to be lifted, **both handles must be in the lowest position**. Refer to the *Lifting Requirements* at the beginning of this section.

## WHEEL INSTALLATION

To mount the front swivel castors and rear wheels, perform the following procedure and refer to Figure 3-2. Note that if the power supply needs to be lifted to install the wheels, refer to the *Lifting Requirements* at the beginning of this section.

1. At the front, remove the eight bolts lockwashers and flatwashers from the blocks.
2. Align the castor holes and block holes with mounting holes on power supply. Secure with flat washers, lock washers and bolts.
3. At the rear, slide the axle through the blocks, mount wheels onto the axle, and secure wheels with retaining rings.

## POWER SUPPLY PLACEMENT

Position the MAX70 power supply prior to making electrical, gas, and torch lead connections. This allows the operator to better determine cooling requirements, required electrical cable and air/gas hose lengths, and to place the line disconnect switch box close to the power supply for safety purposes.

1. Place the power supply in an area that is free of excessive moisture, has proper ventilation, and is relatively clean.
2. Place the power supply so that the air flow is not blocked in any way. (Cooling air is drawn in through the left and right panel gratings by cooling fans, and is exhausted through the rear and front panel gratings.)
3. Do not place any filter device over the air intake locations. Air intake locations already have filters in place, inside the unit. Additional filtering will reduce cooling efficiency and voids the warranty.
4. After placing the power supply, you can place the the line disconnect box close to it for safety purposes. Refer to *Power Requirements* below for information on the line disconnect switch.

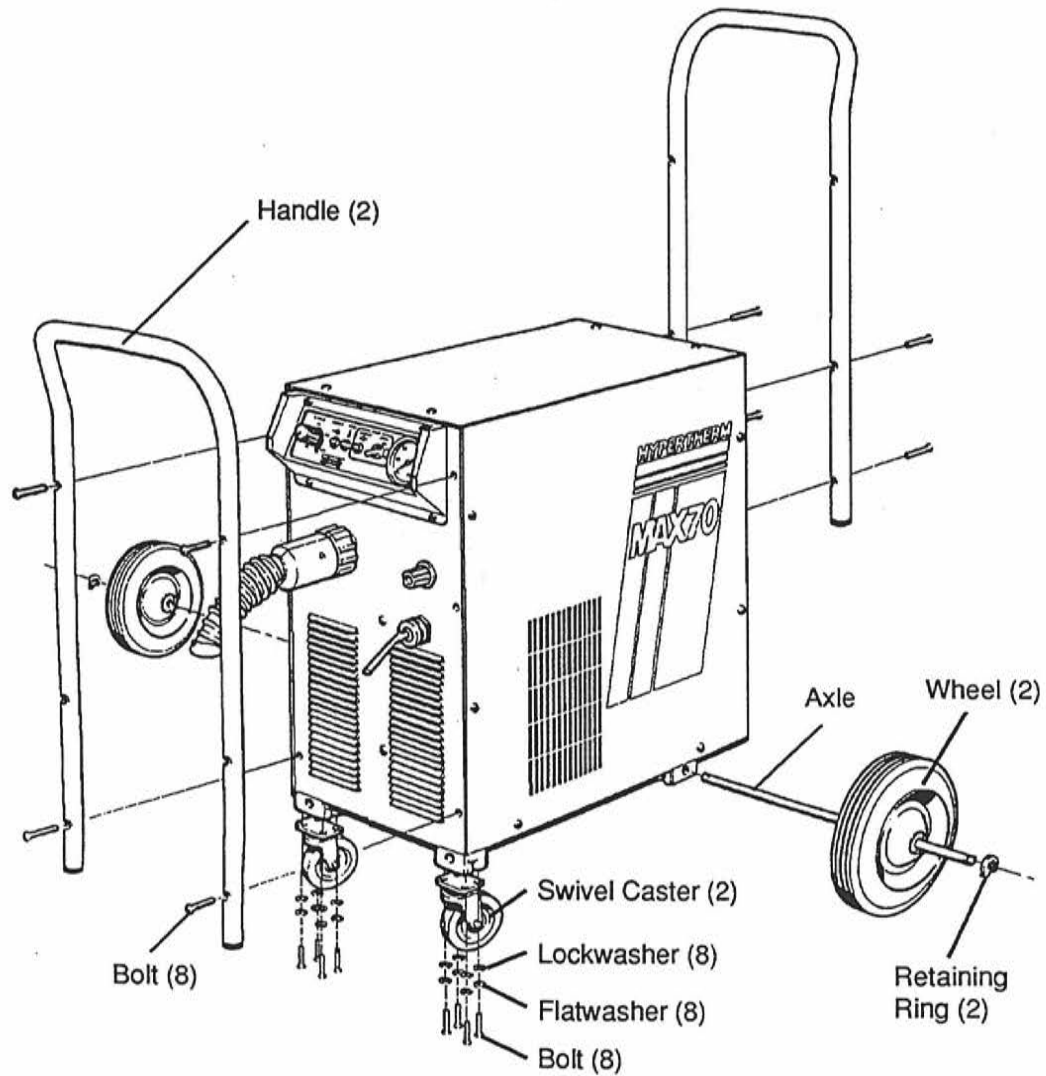


Figure 3-2 Handle and Wheel Installation

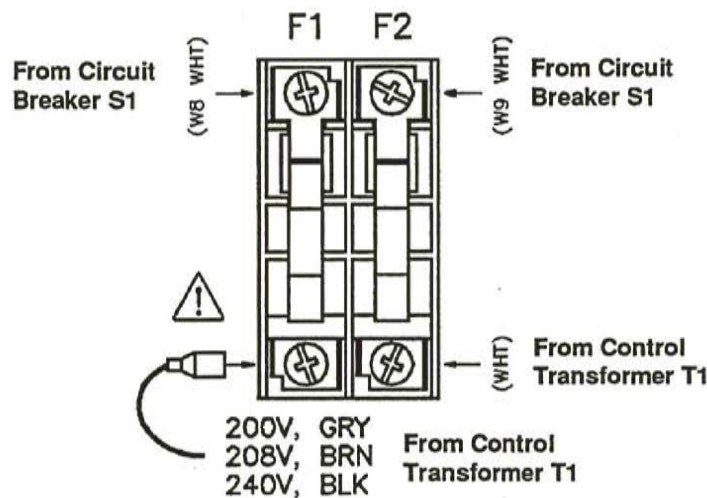


# SETUP

## POWER REQUIREMENTS

### 208/240 Volt Operation

The 208/240V (# 072069) power supply is shipped to operate on 240 volts. To operate at 208 volts, disconnect the black wire (240 volts) from fuse F1 and connect the brown wire (208 volts) from control transformer T1 to fuse F1. See Figure 3-3. Refer to Figure 6-5 index numbers 14 and 20 to locate T1 and F1.



010750 REVA

Figure 3-3 208/240 Volt Operation

### Line Voltage Disconnect Box

Use a line disconnect box for each power supply. This disconnect box allows the operator to turn the power supply off quickly in an emergency situation. The switch should be located on a wall near the power supply, and should be easily accessible to the operator. The interrupt level of the switch must be equal to or exceed the continuous rating of the fuses. Use fuses (class K5) according to the power requirements listed below.

<u>Input Voltage</u>	<u>Phase</u>	<u>Input Current @ 9.8 kw Output</u>	<u>Recommended Fuse Size</u>
208	1	83 amps	110 amp
240	1	74 amps	100 amp
480 VAC	3	21.8 amps	30 amp
400 VAC	3	26.1 amps	40 amp

## Power Cords

- The 480V (# 072067) power supply is shipped with a # 10 AWG/4-conductor (10/4 SO) type power cord without a plug.
- The 400V (# 072068 and # 072070) power supplies are shipped with a # 10 AWG/4-conductor (10/4 SO) type power cord without a plug.
- The 208/240V (# 072069) power supply is shipped with a # 4 AWG/3-conductor (4/3 SO) type power cord without a plug.

If a plug is desired, rather than connecting to the line voltage disconnect box, it must be sized and certified by national and local electrical codes.

- The MAX70 CE, 400V power supplies (# 072100 and # 072101) are shipped without the plug connected to shielded power cord. Refer to Appendix B for power cord information so that a compatible power cord and plug can be obtained that is certified by national and local electrical codes.

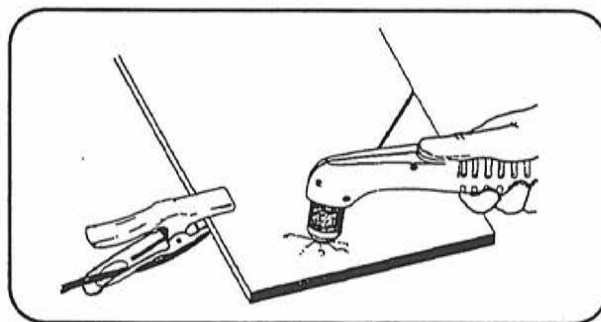
## GROUNDING REQUIREMENTS

To ensure personal safety, proper operation, and to reduce emission of radio frequency interference, the MAX70 must be properly grounded:

- The power supply must be properly grounded through the power cord according to national and local requirements. The power supply cabinet is electrically conductive and can present a shock hazard if it is not properly grounded through the line voltage disconnect box. The service must be of the 3-wire type with a green/yellow wire for protective earth ground. Refer to *Safety*, Section 1, for other grounding information. For more information, refer to the *Standards Index*, Section 7, for other electrical codes.

## WORK CABLE/CLAMP

The work clamp must be attached to the workpiece to perform plasma cutting. Ensure that the work clamp and the workpiece make good metal-to-metal contact. Do not attach the work clamp to the portion of the workpiece being cut away (see Figure 3-4).



**Figure 3-4**  
**Proper Work**  
**Clamp Connection**

# SETUP

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## PAC130 AND MAX70 MACHINE TORCH LEAD CONNECTIONS

### PAC130 and MAX70 Machine Torch Lead w/QDisc

To connect the torch lead quick disconnect to the power supply receptacle, proceed as follows:

1. With the TOP marking facing up and the key tab on the right, align the quick disconnect with the receptacle.
2. Tighten the knob until snug. There should not be any any play or movement. This ensures that the O-rings have made a good seal. **Do not overtighten knob.**
3. If using the machine torch, connect the machine torch remote switch to the power supply. Refer to *MAX70 Remote Switch Installation* later in this section.

### PAC130 Torch Lead w/o QDisc (400V Units Only)

To connect the PAC130 torch lead without a quick disconnect to the power supply, refer to Figure 3-5 and proceed as follows:

1. Route the end of the torch lead to be connected through the brass feedthrough at the front of the power supply.
2. Connect the power lead to the cathode (-) connection.
3. Connect the pilot arc lead to the pilot arc connection.
4. Connect the plasma start switch leads 33 (red), 34 (black) and GND to terminals on TB3.

### MAX70 Machine Torch Lead w/o QDisc (400V Units Only)

To connect the machine torch lead without a quick disconnect to the power supply, refer to Figure 3-6 and proceed as follows:

1. Route the end of the torch lead to be connected through the brass feedthrough at the front of the power supply.
2. Connect the power lead to the cathode (-) connection.
3. Connect the pilot arc lead to the pilot arc connection.
4. Connect the machine torch remote switch to the power supply. Refer to *MAX70 Remote Switch Installation* later in this section.

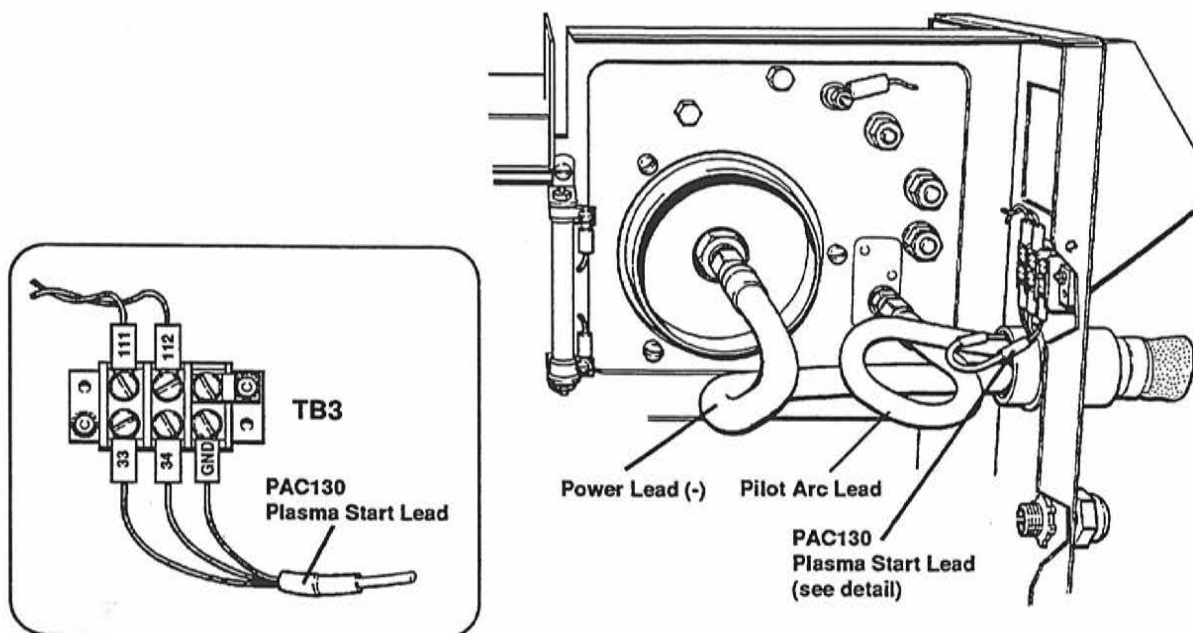


Figure 3-5 PAC130 Torch Lead Connections (w/o QDisc)

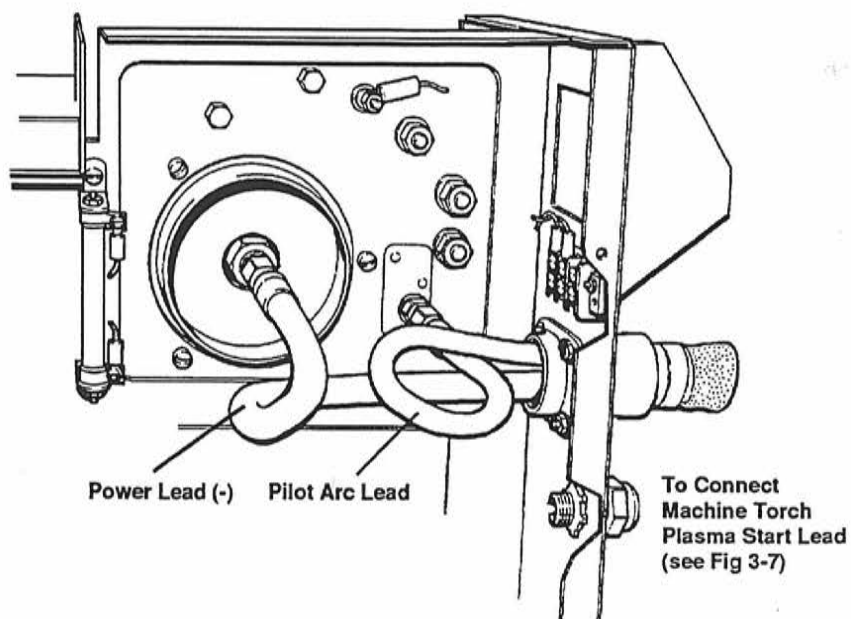


Figure 3-6 MAX70 Machine Torch Lead Connections (w/o QDisc)



# SETUP

## MAX70 REMOTE SWITCH INSTALLATION

To connect the remote switch to the power supply, refer to Figure 3-7 and the following procedure:

1. Route plasma start lead terminal ends (33, 34 and GND) through the strain relief one at a time.
2. Connect terminal ends 33, 34 and GND to TB3.
3. Align the remote switch lead connector key with the connector key slot on the plasma start lead and push in until pins seat.
4. Ensure that the securing ring threads and the connector receptacle threads are aligned prior to tightening. Note that this connector is fine-threaded. Cross threading can easily occur which could cause thread damage.
5. Turn the connector securing ring clockwise (cw) to tighten.

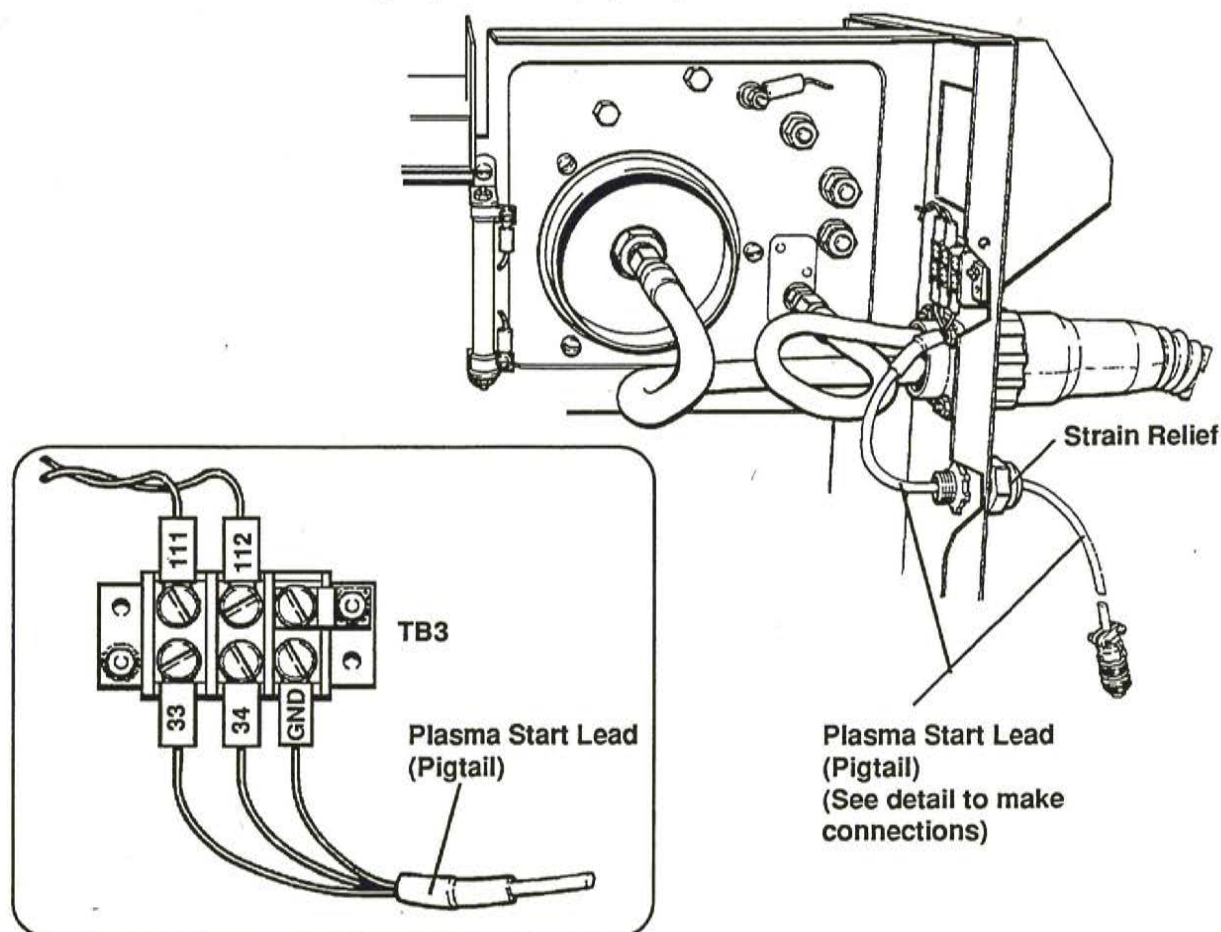


Figure 3-7 Remote Switch - Plasma Start Lead (Pigtail) Connections to TB3

## AIR SUPPLY REQUIREMENTS AND CONNECTIONS

### Cylinder/Shop Compressed Air Supply

The cylinder or shop compressed air supply must be clean, dry and oil-free. A high-pressure regulator on the air supply must be used and must be capable of delivering an output of 440 scfh/7.3 scfm (208 l/min) of air at a pressure of between 90 and 120 psi (6.2 and 8.3 bar) to the filter on the power supply. The filter is mounted at the rear of the MAX70 power supply (see Figure 3-8).



### WARNING



Do not allow the air inlet pressure to the filter on the power supply to exceed 120 psi (8.2 bar). The plastic filter bowl is rated for 150 psi and may explode if this pressure is exceeded. See the warning label on the filter bowl for other safety warnings.

### Air Supply Hose and Air Filter Adapter Connections

Use 3/8-inch ID inert gas hose to connect the air supply to the filter at the rear of the power supply. To connect the air hose to the filter the customer must supply and install a 1/4 NPT adapter/fitting to the filter (see Figure 3-8). Prior to screwing the adapter/fitting into the filter block, apply liquid pipe sealant to the threads to ensure a leak free installation.

**CAUTION:** Never use teflon tape when installing the adapter, bits of tape can break off and enter the air line and harm the pressure regulator, pressure switches and valves.

### Additional Air Filtration

When site conditions introduce moisture, oil, or other contaminants into the air line, additional filtration is required. A three-stage coalescing filtration system is recommended. (Refer to *Appendix A*.) Below is the order in which the filtration components are to be mounted from the air supply towards the MAX70 power supply.

Air Supply	>	Model # 3401.4	>	Model # 1302.4	>	Model # 1502.4	>	Adapter/Fitting
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## SETUP

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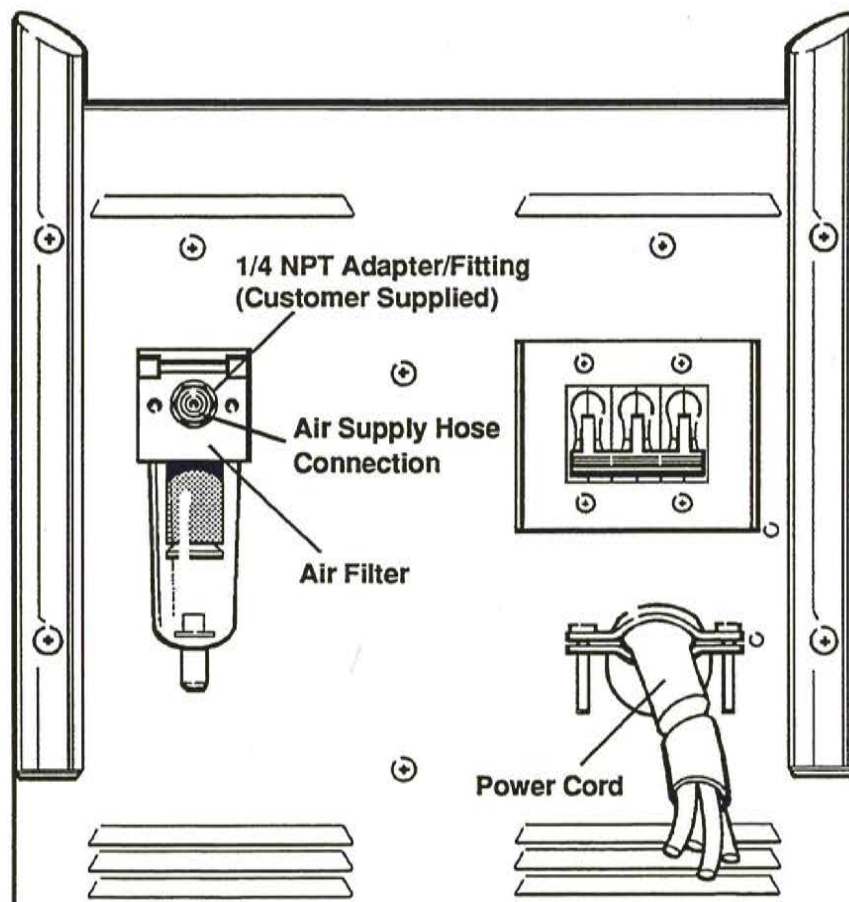


Figure 3-8 Rear Panel, Air Filter Connection and Power Cord

### MAX70 MACHINE TORCH ALIGNMENT

Before cutting with the machine torch, ensure that the torch is mounted at right angles to the workpiece to get a clean, vertical cut. Use a square to align the torch.

## Section 4 OPERATION

In this section:

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Controls and Indicators .....	4-2
Control Panel .....	4-2
Front Panel .....	4-2
Rear Panel .....	4-2
Operating Instructions .....	4-4
Operating Tips .....	4-6
Changing Consumable Parts .....	4-6
Cutting Techniques with Hand Torch .....	4-8
Cutting .....	4-8
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Common Cutting Faults .....	4-12
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Cut Charts .....	4-12
Mild Steel .....	4-13
Stainless Steel .....	4-16
Aluminum .....	4-19
Gouging .....	4-22

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# OPERATION

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## CONTROLS AND INDICATORS

### Control Panel (Fig. 4-1)

- **AMPS adjustment knob (R1)**  
Adjusts output current between 30 and 70 amps.
- **POWER LED**  
Lights green when AC input line voltage is normal and the system is ready to operate. Remains off when voltage is out of tolerance.
- **TEMP LED**  
Remains off when power supply is operating within temperature limits. Lights yellow when temperature has exceeded operating limits.
- **PRESSURE LED**  
Remains off when the air pressure is within operating limits. Lights yellow when air pressure is out of operating limits.
- **TEST - ON/OFF switch (S2)**
  - ON** - Used to set dynamic (flowing) air pressure using the air regulator adjustment knob and pressure gauge.
  - OFF** - Normal operating position.
- **Pressure Gauge**  
Indicates dynamic (flowing) air pressure as set with the air regulator adjustment knob.

### Front Panel (Fig. 4-1)

- **Air Regulator adjustment knob**  
Adjusts dynamic (flowing) air pressure. Pull to adjust.

### Rear Panel (Fig. 4-2)

- **ON/OFF power circuit breaker (S1)**  
Activates the power supply power and control circuits.

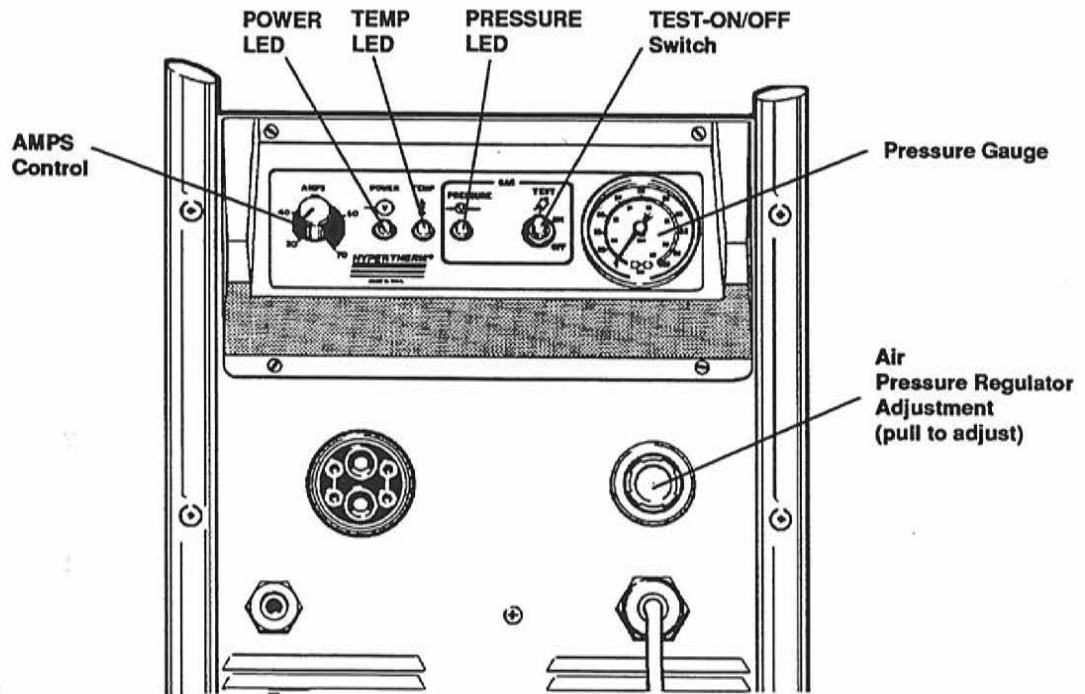


Figure 4-1 Control Panel and Front Panel Controls and Indicators

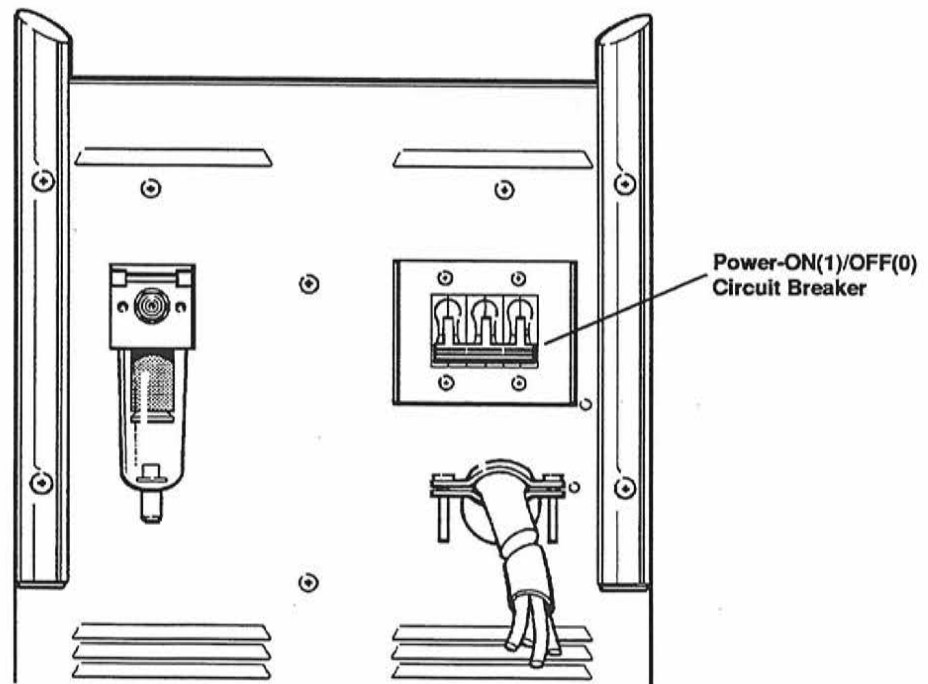


Figure 4-2 Rear Panel Control



# OPERATION

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## OPERATING INSTRUCTIONS



### WARNING



Before operating this system, read and understand the Safety section in this manual.



### WARNING



Never operate the MAX70 plasma system with both the PAC130 hand torch and machine torch remote switch connected at the same time. The torch can be mistakenly fired from the remote switch which could cause serious personal injury.

1. Ensure that the correct consumable parts are in the torch. Also, inspect for worn consumable parts (see Fig. 4-4).
2. Connect the air hose to the adapter fitting on the air filter at the rear of the power supply.

**Note:** Look for moisture in the filter bowl. If there is moisture, drain the bowl at the bottom by removing the red plastic cap and opening the knurled drain valve in a clockwise direction. If the bowl or filter element appear dirty and require cleaning, refer to Section 5, *Maintenance* to clean the bowl and filter element.

3. Turn on the air cylinder or shop compressed air. Ensure the cylinder or compressor air output pressure is between 90 and 120 psi (6.2 and 8.2 bar).



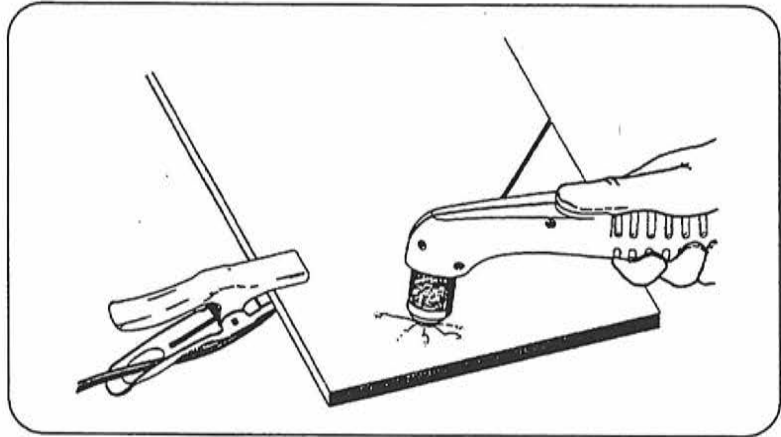
### WARNING



Do not allow the air inlet pressure to the filter on power supply to exceed 120 psi (8.2 bar). The plastic filter bowl is rated for 150 psi (10.3 bar) and may explode if this pressure is exceeded. See warning label on filter bowl for other safety warnings.

4. Attach the work cable clamp to the workpiece. Make sure that the work cable clamp and the workpiece make good metal-to-metal contact. Do not attach the work clamp to the portion of the workpiece that will fall away (see Fig. 4-3).
5. Apply input power to the power supply at the disconnect switch box.
6. Set power circuit breaker (S1) on the rear panel to ON (I). The INPUT POWER LED should light. The TEMP and PRESSURE LEDs should remain off (see Figs. 4-1 and 4-2).
7. With TEST-ON/OFF switch (S2) in the OFF position, the pressure gauge should read 65 psi

**Figure 4-3 Proper Work Clamp Connection**



- (4.5 bar). If the pressure needs to be adjusted, proceed as follows:
- Set TEST-ON/OFF switch (S2) to ON.
  - Pull out Air Regulator adjustment knob to unlock. Adjust knob until pressure gauge reads 65 psi (4.5 bar). Push in knob to lock.
  - Set TEST-ON/OFF switch (S2) to OFF.
8. Set AMPS control (R1) to the cut current of the metal to be cut. Refer to the *Cut Charts* at the end of this section.
  9. Position the torch 1/16-1/8" (1.6 - 3.2 mm) from the workpiece.
  10. Press and hold down the torch start switch to activate the pilot arc. The arc will transfer from the torch to the workpiece after the following occurs:
    - The two-second gas preflow delay starts.
    - After the two-second preflow, the following occurs simultaneously:
      - High frequency energizes and times out after one second.
      - The pilot arc circuit activates.
      - The pilot arc is initiated and transfers to the workpiece if the torch is within 1/8" (3.2 mm) or touching the workpiece. Note that the arc transfer will not occur if:
        - There is no material under the arc.
        - The start switch is not held in.
        - Internal safety interlocks are not satisfied.
        - The work cable is not connected to the workpiece or work table.
  11. When the cut is finished, release the torch start button to stop the arc. Postflow of gas will continue for ten seconds after release the torch start button.



# OPERATION

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## OPERATING TIPS



### WARNING



Always turn off the power supply and unplug before inspecting or changing the torch parts.

## Changing Consumable Parts

The consumable parts in the hand and machine torch need to be monitored periodically for signs of wear. A good rule of thumb is to check the parts after every 150 starts (pierces, edge starts, parts cut, etc.).

To remove and replace the consumables, refer to Figure 4-4 and proceed as follows:

1. Hand torch - Unscrew and remove the retaining cap, the nozzle and swirl ring will slip out easily.

Machine torch - Bring the torch to the edge of the cutting machine with the torch lifter raised to its highest point. Hold your hand under the retaining cap (the nozzle and swirl ring may fall out when removing the retaining cap). Unscrew and remove the retaining cap. If the nozzle and swirl ring remain in the torch, take them out and set them aside.

2. Inspect the retaining cap. It should be undamaged.
3. Check the shield for external signs of wear. The shield should be clean and clear of metal debris. (Debris will cause arcing.) The gas holes along the edge of the shield should not be blocked with debris. The center hole should not have any nicks or gouges and should show no signs of arcing.
4. Unscrew the shield. Inspect the gas holes from the inside. The holes should be clear of metal or other debris. If the gas holes are blocked by debris, try to open them by pushing a pin through each one **from the outside of the shield to the inside**. If the shield is still good, screw it back on to the retaining cap. If it is damaged, replace it with a new one.
5. Inspect the O-ring on the torch. It should be lubricated and undamaged. If it is dry, lubricate it with a thin film of the lubricant provided in the consumable parts kit. If it is damaged, replace it.
6. Inspect the nozzle for damage or signs of wear. The inside of the nozzle should be clean and bright, with no deposits from the electrode. You can clean the inside of the nozzle with steel wool, but be sure to remove any remnants of the steel wool afterward. The hole in the nozzle should not be worn or oval-shaped. If the nozzle is damaged, replace it with a new one.
7. Inspect the swirl ring. It should be clean, and the holes along the side should not be plugged. If the swirl ring is damaged, replace it with a new one.
8. Remove the electrode with the wrench supplied in the consumable parts kit. Inspect it. If the

## OPERATION

center of the electrode has a pit more than 1/16-inch (2 mm) deep, replace it. If the electrode is still good, inspect its O-ring - it should be lubricated and undamaged. If it is dry, lubricate it with a thin film of the lubricant supplied in the spare parts kit. If it is damaged, replace it.

9. Inspect the inside of the torch body. It should be clean and undamaged.
10. Replace the electrode and tighten it with the wrench. **Do not overtighten it.**
11. Install the swirl ring on the electrode with the word "front" facing away from the torch body — it won't fit in properly if it is installed in the wrong direction. Place the nozzle on top of the swirl ring.
12. Replace the retaining cap. Tighten it snugly; if it is loose, it can affect the gas flow.

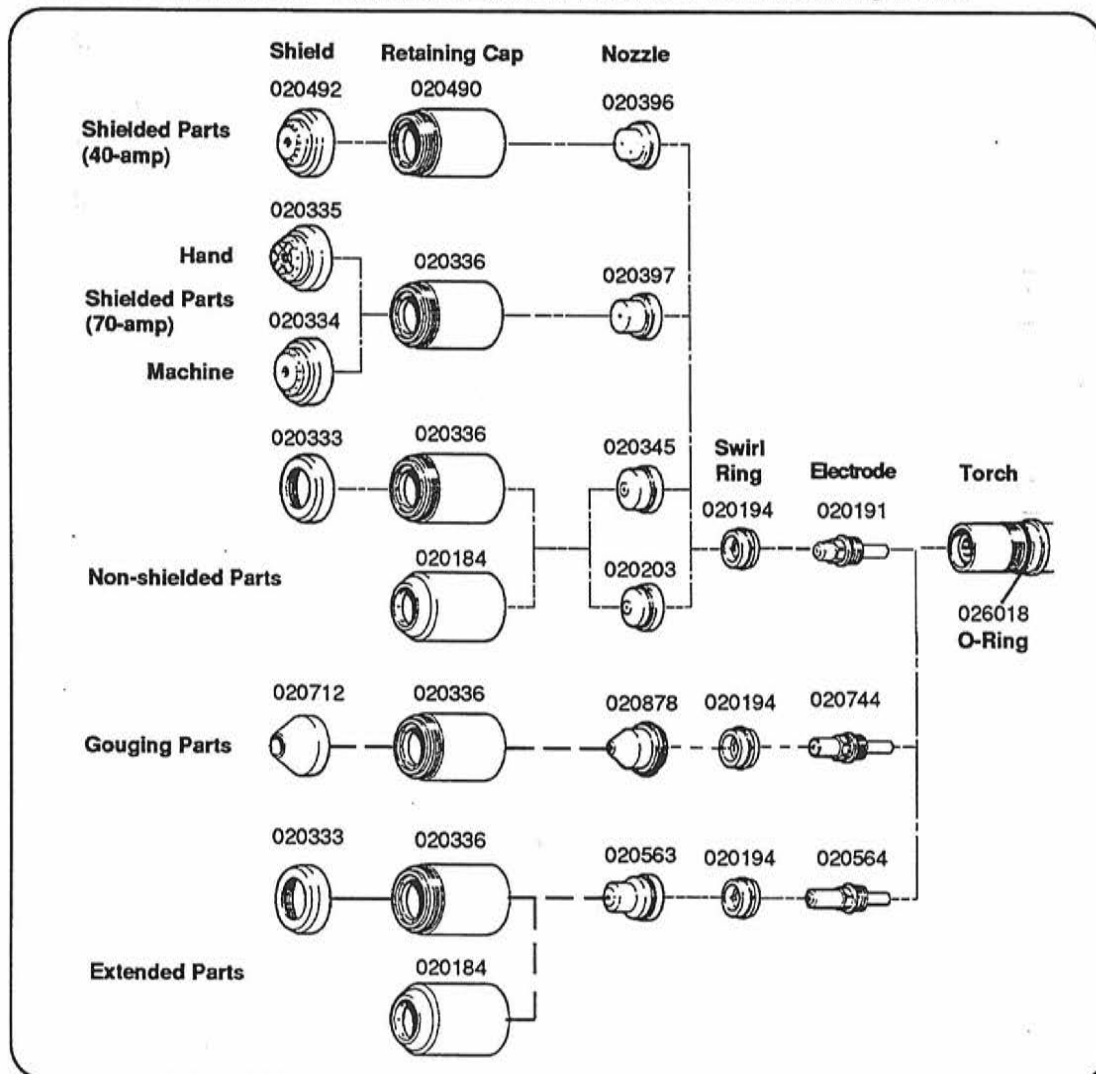


Figure 4-4 PAC130 Hand and MAX70 Machine Torch Consumable Parts

# OPERATION

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## Cutting Techniques with Hand Torch

### Cutting

- Do not fire the pilot arc into the air needlessly — doing so causes a drastic reduction of the nozzle and electrode life.
- Start cutting from the edge of the workpiece (Fig. 4-5) unless you must pierce. For tips on piercing, see *Piercing*.
- When cutting, make sure that the sparks are coming out of the bottom of the workpiece. If they are spraying on top of the workpiece, you are moving the torch too fast, or you do not have sufficient power to fully penetrate the workpiece.
- Hold the torch lightly on the metal or just off the metal. Holding the torch firmly to the workpiece causes the nozzle to stick and makes smooth cutting difficult. The arc transfers once the torch is within 3 mm (1/8 inch) of the workpiece.
- To cut perfect circles for spin fittings, use a template or a radius cutter attachment (Fig. 4-6).
- Pull the torch through the cut. Pulling it is easier than pushing it.
- Hold the torch nozzle at a vertical position and watch the arc as it cuts along the line (Fig. 4-7). By lightly dragging the nozzle on the workpiece, you can maintain a steady cut. For straight-line cuts, use any straight edge as a guide.

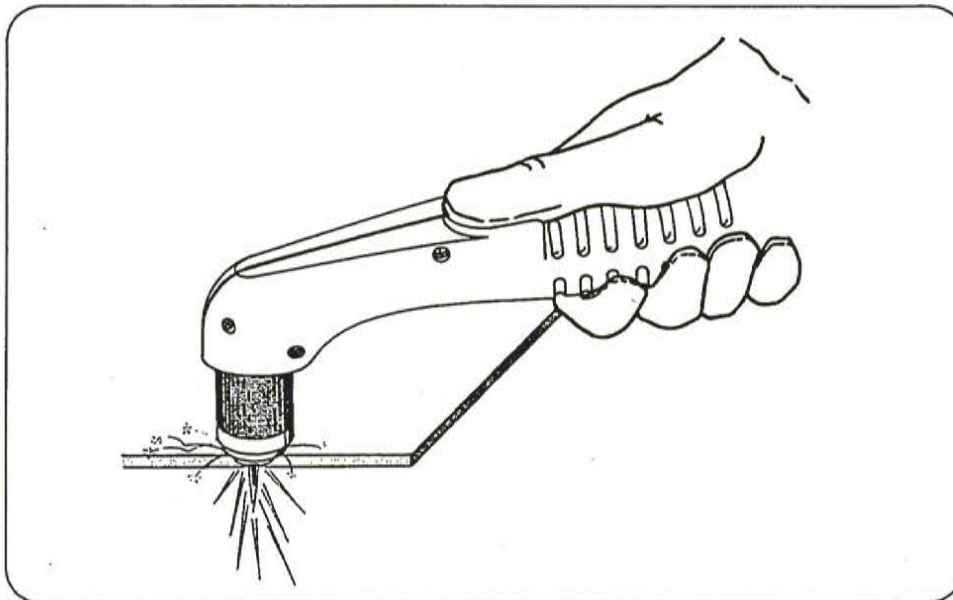


Figure 4-5 Starting a Cut



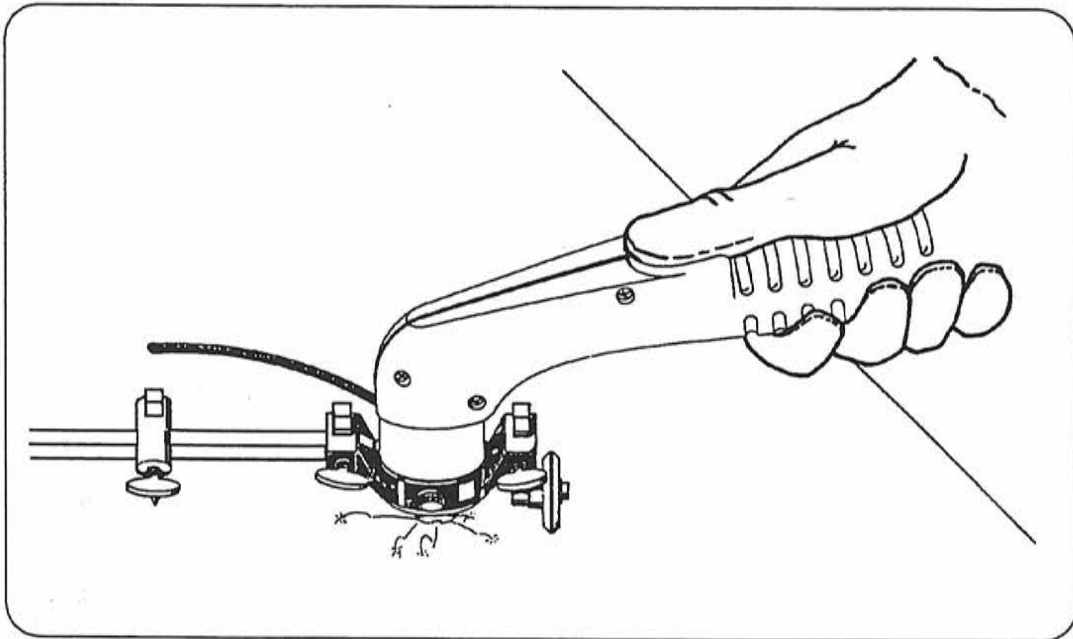


Figure 4-6 Cutting a Circle

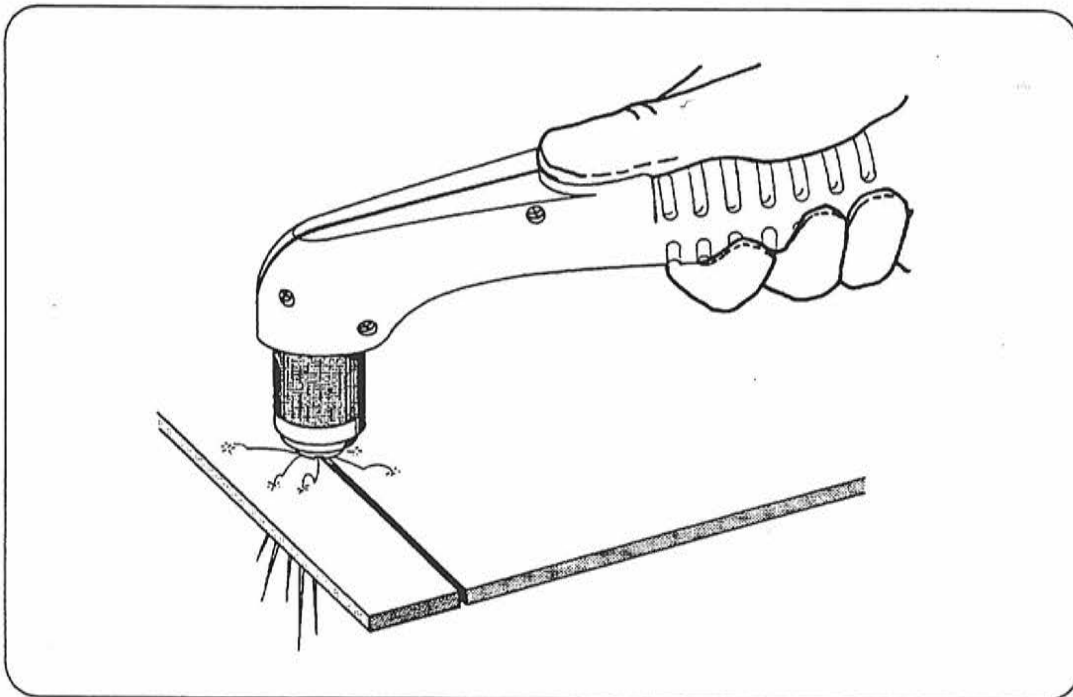


Figure 4-7 Dragging the Torch



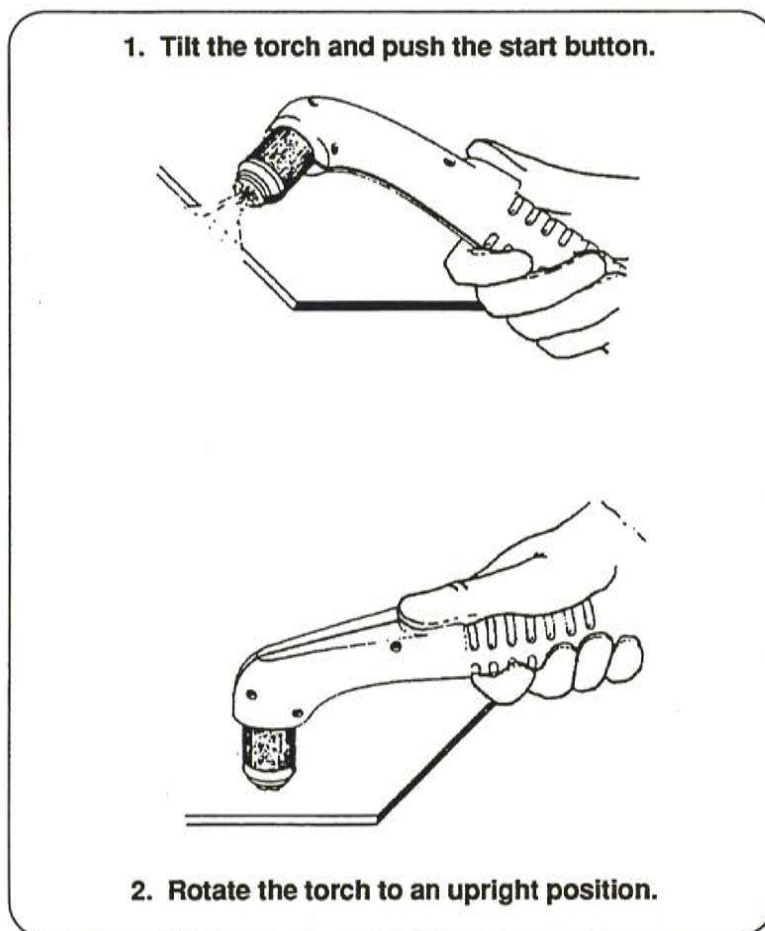
# OPERATION

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## *Piercing*

Note: The MAX70 can pierce metals up to a thickness of 3/4 inch (19 mm).

- Hold the torch so that the nozzle is approximately 1/16 inch (1.6 mm) away from the workpiece before pressing the start button. This method maximizes the life of the nozzle.
- Hold the torch at an angle to the workpiece away from yourself, then slowly roll it to a vertical position. (This is particularly important when cutting thicker material.) Make sure that the torch is pointed away from you and the people around you to avoid any danger from sparks and hot metal.
- Start the cut at an angle rather than in an upright position. This method permits the hot metal to escape to one side rather than splashing back against the nozzle, protecting the operator from the sparks and extending the torch nozzle life (Fig. 4-8).
- When the pierce is complete, proceed with the cut.



**Figure 4-8**  
**Piercing**

## OPERATION

### *Gouging*

The MAX70 can be used for gouging mild steel by using the optional gouging nozzle (# 020878). To gouge refer to the gouging cut chart and the following procedure.

- Wear full protection, a welding helmet with at least a # 6 glass, welding gloves, and a welding jacket. The arc is fully exposed and will cause serious burns if the skin is not covered.
- Install the gouging nozzle just as you would install a standard cutting nozzle.
- Adjust the air pressure at the front panel to 60 psi (4.1 bar) with air flowing at the torch. Note that this is lower than the cutting pressure.
- Tilt the torch approximately 40-45° from the surface to be gouged and feed into the gouge. Try not to allow the nozzle to come into contact with the plate, since this can cause premature wear. Multiple passes or "wearing" may be necessary to gouge wider and deeper sections. (See Figure 4-9.)

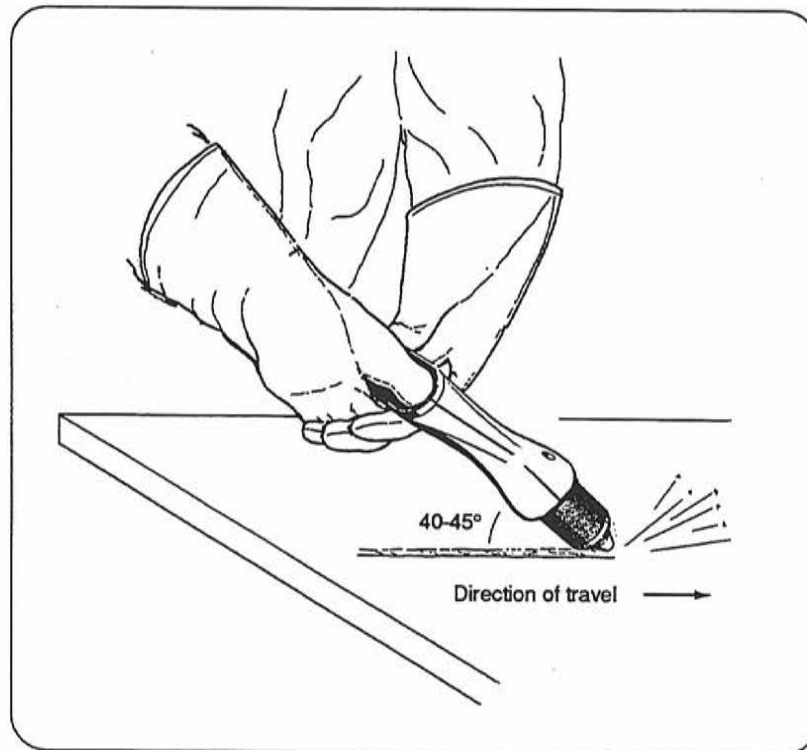


Figure 4-9 Gouging

# OPERATION

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## Common Cutting Faults

- The workpiece is not totally penetrated. Causes can be:
  - The current is too low.
  - The cut speed is too high.
  - The torch parts are worn.
  - The metal being cut is too thick.
- Dross forms on the bottom of the cut. Causes can be:
  - The cutting speed is too slow.
  - The torch parts are worn.
- The duty cycle is reduced if:
  - Input line voltage is less than nominal, due to a long power cord, poor utility supply, etc.
  - Cutting material is greater than 3/4- inch thick.
  - Work clamp is not making a good electrical contact to the workpiece due to paint, rust, etc.

## Duty Cycle

The duty cycle, or the amount of time the pilot or plasma arc can remain "on" in minutes within a 10-minute period, is affected by many factors. When the current is set at 70 amps, the MAX70 has an 50% duty cycle at 40° C (104° F). During normal operation, the plasma arc can remain on 5 minutes out of every 10 minutes without causing the temperature sensors to disable the unit.

## CUT CHARTS

The following *Cut Charts* provide the necessary information in order for the operator to be successful in plasma arc cutting.

**Caution:** Before cutting always check all settings and check for damaged torch parts and worn consumable parts.

# MAX70 Machine/PAC130 Hand Torch

## Mild Steel Cutting

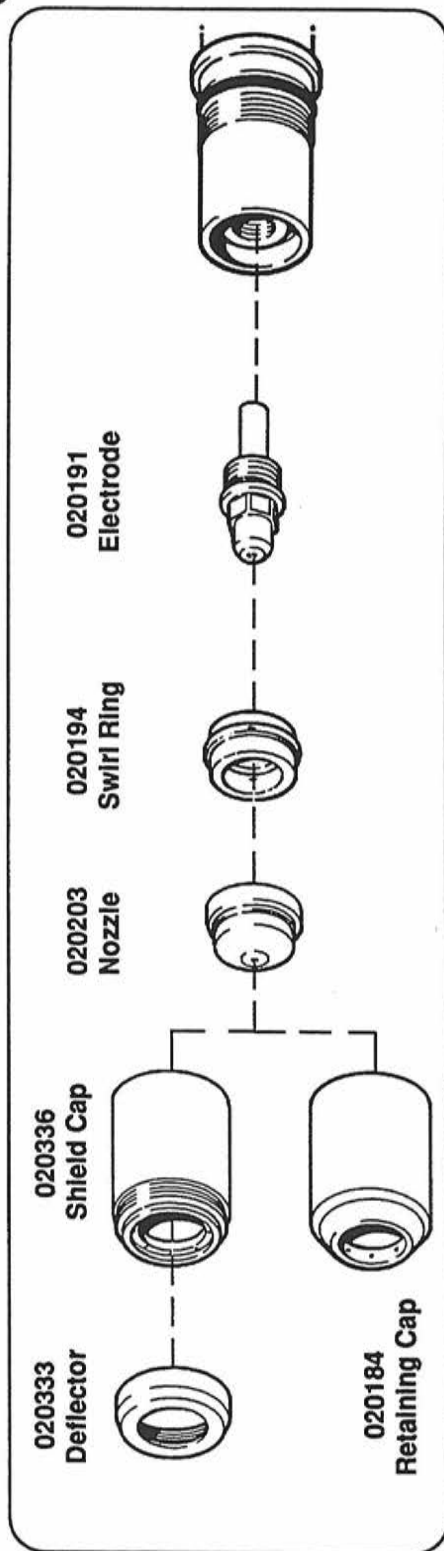
Plasma Gas: Air

Current Setting: 40 Amps

Consumables: Non-Shielded



CUTTING



Material Thickness (Inches) (mm)	Plasma		Torch-to-work Distance (Inches) (mm)	Arc		Duty Cycle (%)	Normal Plate		Pierce Time (sec)	Expanded Metal		Plasma Gas (Air) Inlet Pressure (psi/bar)
	Gas Pressure In TEST (psi/bar)	Gas Pressure (psi/bar)		Current Setting (amps)	Voltage Setting (volts)		Travel Speed (ipm) (mm/min)	Travel Speed (mm/min)		Travel Speed (ipm) (mm/min)	Travel Speed (mm/min)	
.0156 (28 GA)	65/4.5*	65/4.5*	5/64	40	90	100	340	8640		240	6100	90-120/6.2-8.3
.0188 (26 GA)			5/64		90		320	8130		225	5720	
.025 (24 GA)			5/64		95		285	7240		200	5080	
.035 1			5/64		100		235	5970		165	4190	
.050 (18 GA)			5/64		100		170	4320		120	3050	
1/16 1.5			5/64		105		150	3810	0.50	105	2670	
.075 2			5/64		105		130	3300	0.50	90	2290	
1/8 3			5/64		105		85	2160	1.00	60	1520	
.158 4			1/8		110		60	1520	1.50	40	1020	
.197 5			1/8		120		45	1140	1.50	30	760	
1/4 6			1/8		120		30	760	1.75			
3/8 10			1/8		125		08	200	2.00			

1 inch = 25.4 mm; 1 psi = .0689 bar = 6.895 KPa

\* Plasma Gas Pressure setting is for 25-ft. (7.6 m) leads. Add 5 psi (.34 bar) for 50-ft (15 m) leads.



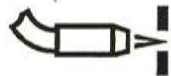
# MAX70 Machine/PAC130 Hand Torch

## Mild Steel Cutting

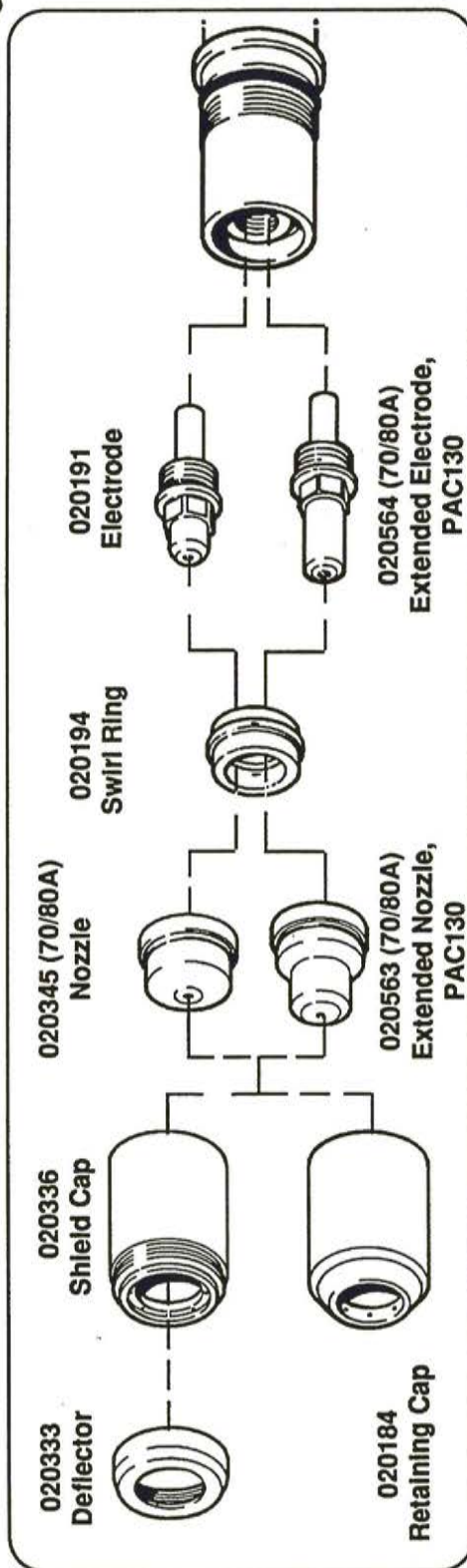
Plasma Gas: Air

Current Setting: 70 Amp

Consumables: Non-Shielded



CUTTING



Material Thickness (Inches) (mm)	Plasma Gas Pressure In TEST (psi/bar)	Torch-to-work Distance (Inches) (mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Normal Plate Travel Speed (ipm) (mm/min)	Pierce Time (sec)	Plasma Gas (Air) Inlet Pressure (psi/bar)
1/8	65/4.5*	1/8	70	100	50	180	0.50	90-120/6.2-8.3
3/16		1/8	70	110		110	0.50	
5		5/32	70	120		85	0.75	
1/4		5/32	70	115		50	1.00	
3/8		5/32	70	125		35	1.25	
1/2		3/16	70	130		20	1.50	
5/8		3/16	70	140		15	1.75	
3/4								

1 inch = 25.4 mm; 1 psi = .0689 bar = 6.895 KPa

\* Plasma Gas Pressure setting is for 25-ft. (7.6 m) leads. Add 5 psi (.34 bar) for 50-ft (15 m) leads.

# MAX70 Machine/PAC130 Hand Torch

## Mild Steel Cutting

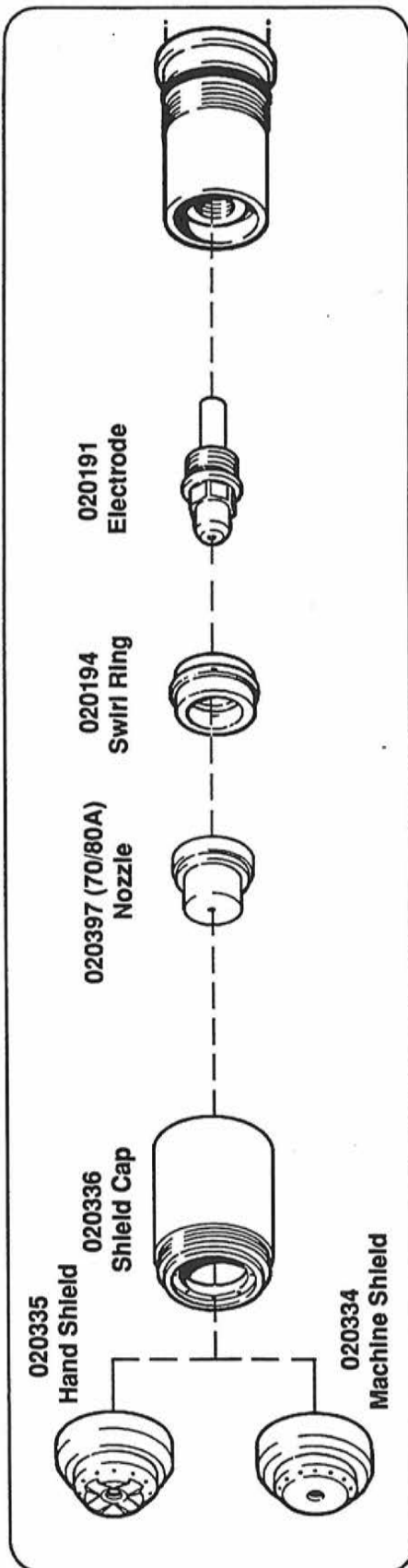
Plasma Gas: Air

Current Setting: 70 Amp

Consumables: Shielded



CUTTING



Material Thickness (Inches) (mm)	Plasma Gas Pressure in TEST (psi/bar)	Torch-to-work Distance (Inches) (mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Normal Plate Travel Speed (ipm) (mm/min)	Pierce Time (sec)	Plasma Gas (Air) Inlet Pressure (psi/bar)
1/4	60/4.1*	1/8	70	130	50	80	0.75	90-120/6.2-8.3
3/8		1/8	70	125		45	1.00	
1/2		1/8	70	130		30	1.25	
5/8		5/32	70	140		20	1.50	
3/4		3/16	70	150		15	1.75	

1 inch = 25.4 mm; 1 psi = .0689 bar = 6.895 KPa

\* Plasma Gas Pressure setting is for 25-ft. (7.6 m) leads. Add 5 psi (.34 bar) for 50-ft (15 m) leads.



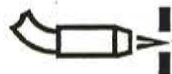
# MAX70 Machine/PAC130 Hand Torch

## Stainless Steel Cutting

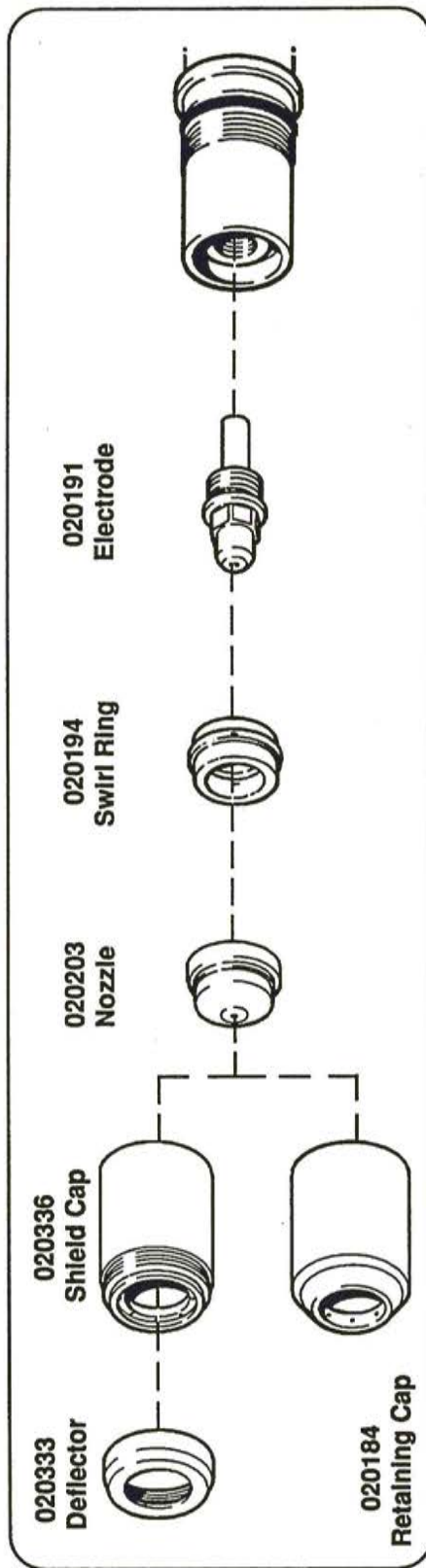
Plasma Gas: Air

Current Setting: 40 Amp

Consumables: Non-Shielded



CUTTING



Material Thickness (Inches) (mm)	Plasma Gas Pressure In TEST (psi/bar)	Torch-to-work Distance (Inches) (mm)	Arc		Duty Cycle (%)	Normal Plate		Pierce Time (sec)	Expanded Metal		Plasma Gas (Air) Inlet Pressure (psi/bar)
			Current Setting (amps)	Voltage Setting (volts)		Travel Speed (lpm) (mm/min)	Travel Speed (lpm) (mm/min)		Travel Speed (lpm) (mm/min)	Travel Speed (lpm) (mm/min)	
.0156 (28 GA)	65/4.5*	5/64	40	100	100	260	6600		200	5080	90-120/6.2-8.3
.0188 (26 GA)		5/64		100		240	6090		190	4830	
.025 (24 GA)		5/64		105		215	5460		170	4320	
1/32 .8		5/64		105		180	4570		140	3560	
.050 (18 GA)		5/64		110		130	3300		100	2540	
1/16 1.5		5/64		110		115	2900	0.50	90	2290	
1/8 3		5/64		120		65	1650	1.00	50	1270	
1/4 6		1/8		130		25	635	1.75			
3/8 10		1/8		135		7	175	2.00			

1 inch = 25.4 mm; 1 psi = .0689 bar = 6.895 KPa

\* Plasma Gas Pressure setting is for 25-ft. (7.6 m) leads. Add 5 psi (.34 bar) for 50-ft (15 m) leads.

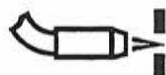
# MAX70 Machine/PAC130 Hand Torch

## Stainless Steel Cutting

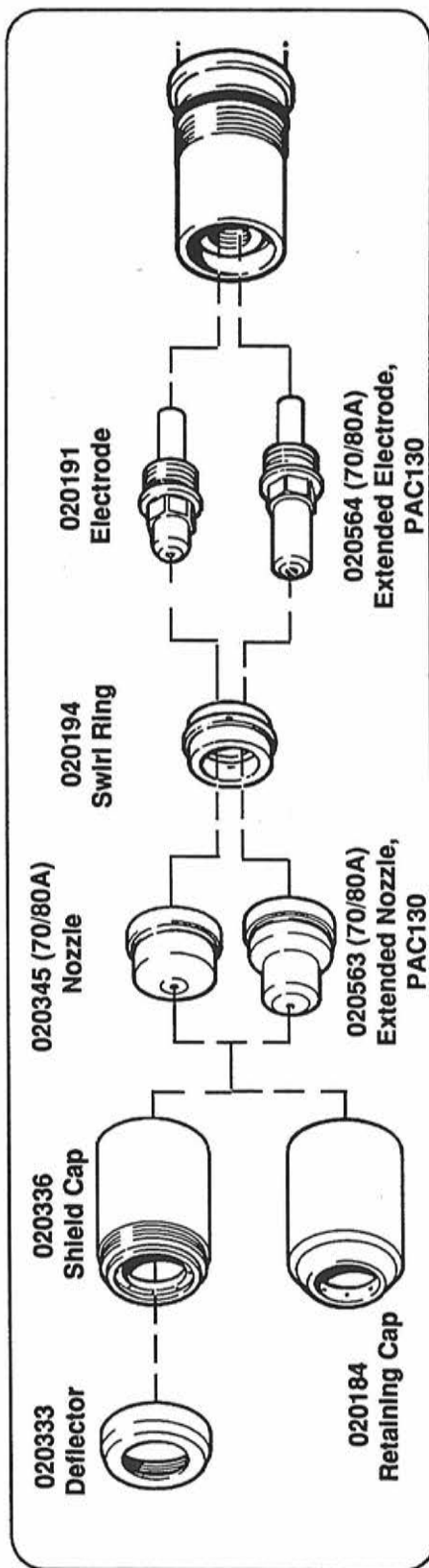
Plasma Gas: Air

Current Setting: 70 Amp

Consumables: Non-Shielded



CUTTING



Material Thickness (inches) (mm)	Plasma Gas Pressure In TEST (psi/bar)	Torch-to-work Distance (inches) (mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Normal Plate Travel Speed (ipm) (mm/min)	Pierce Time (sec)	Plasma Gas (Air) Inlet Pressure (psi/bar)
1/8	65/4.5*	1/8	70	125	50	170	0.50	90-120/6.2-8.3
1/4		5/32	70	125		80	0.75	
3/8		5/32	70	130		45	1.00	
1/2		5/32	70	135		30	1.25	
5/8		3/16	70	135		25	1.50	
3/4		3/16	70	140		15	1.75	

1 inch = 25.4 mm; 1 psi = .0689 bar = 6.895 KPa

\* Plasma Gas Pressure setting is for 25-ft. (7.6 m) leads. Add 5 psi (.34 bar) for 50-ft (15 m) leads.



# MAX70 Machine/PAC130 Hand Torch

## Stainless Steel Cutting

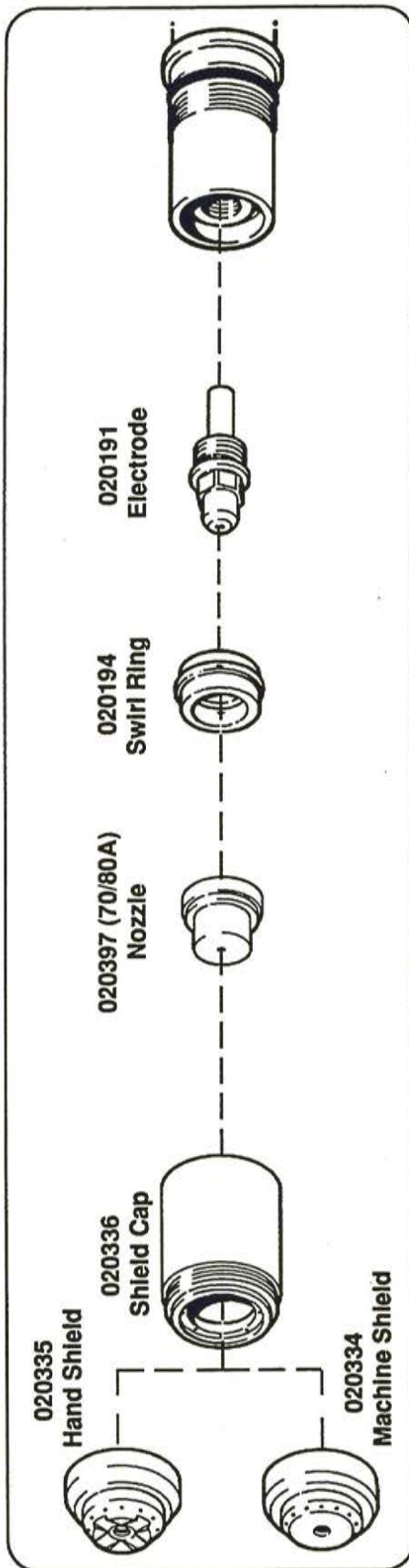
Plasma Gas: Air

Current Setting: 70 Amp

Consumables: Shielded



CUTTING



Material Thickness (inches) (mm)	Plasma Gas Pressure In TEST (psi/bar)	Torch-to-work Distance (inches) (mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Normal Plate Travel Speed (ipm) (mm/min)	Pierce Time (sec)	Plasma Gas (Air) Inlet Pressure (psi/bar)
1/4 6	60/4.1*	1/8 3	70	130	50	65 1650	0.75	90-120/6.2-8.3
3/8 10		1/8 3	70	135		35 890	1.00	
1/2 13		1/8 3	70	140		25 635	1.25	
5/8 15		5/32 4	70	140		20 500	1.50	
3/4 19		3/16 5	70	145		15 380	1.75	

1 inch = 25.4 mm; 1 psi = .0689 bar = 6.895 KPa

\* Plasma Gas Pressure setting is for 25-ft. (7.6 m) leads. Add 5 psi (.34 bar) for 50-ft (15 m) leads.

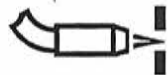
# MAX70 Machine/PAC130 Hand Torch

## Aluminum Cutting

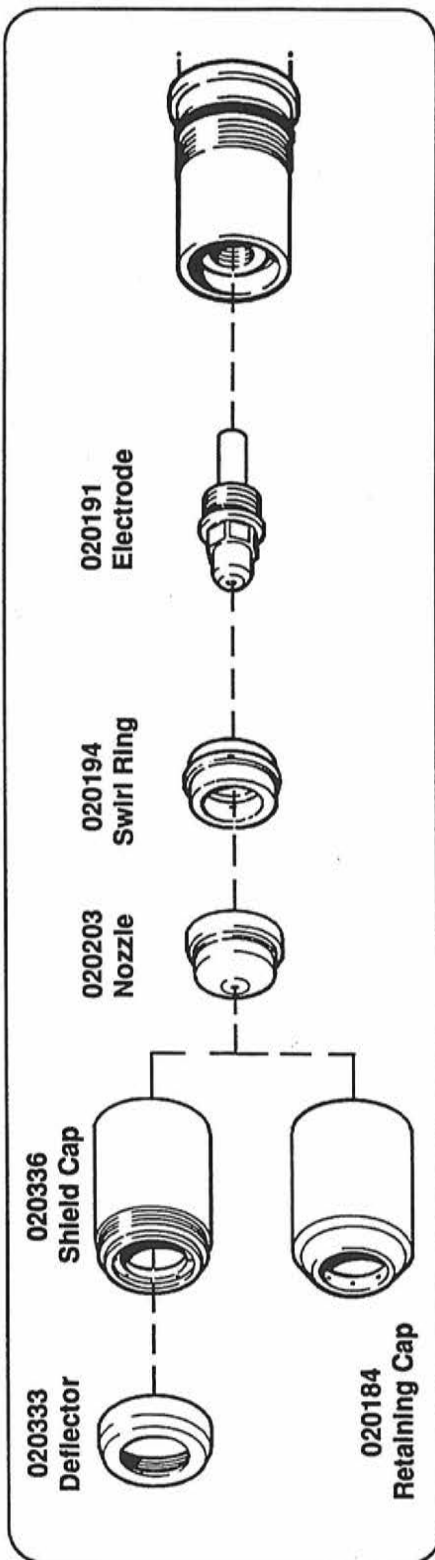
Plasma Gas: Air

Current Setting: 40 Amp

Consumables: Non-Shielded



CUTTING



Material Thickness (Inches) (mm)	Plasma Gas		Torch-to-work Distance (Inches) (mm)	Arc		Duty Cycle (%)	Normal Plate		Pierce Time (sec)	Expanded Metal		Plasma Gas (Air) Inlet Pressure (psl/bar)
	Gas Pressure In TEST (psi/bar)			Current Setting (amps)	Voltage Setting (volts)		Travel Speed (ipm) (mm/min)			Travel Speed (ipm) (mm/min)		
1/32 .8	65/4.5*		5/64 2	40	90	100	240	6100	0.50	165	4190	90-120/6.2-8.3
1/16 1.5			5/64 2		100		150	3810	0.75	105	2670	
3/32 2.4			5/64 2		100		110	2790	1.00	75	1910	
1/8 3			5/64 2		105		85	2160	1.00	60	1520	
1/4 6			1/8 3		120		30	760	1.25			
3/8 10			1/8 3		125		08	200	1.50			

1 inch = 25.4 mm; 1 psi = .0689 bar = 6.895 KPa

\* Plasma Gas Pressure setting is for 25-ft. (7.6 m) leads. Add 5 psl (.34 bar) for 50-ft (15 m) leads.

# MAX70 Machine/PAC130 Hand Torch

## Aluminum Cutting

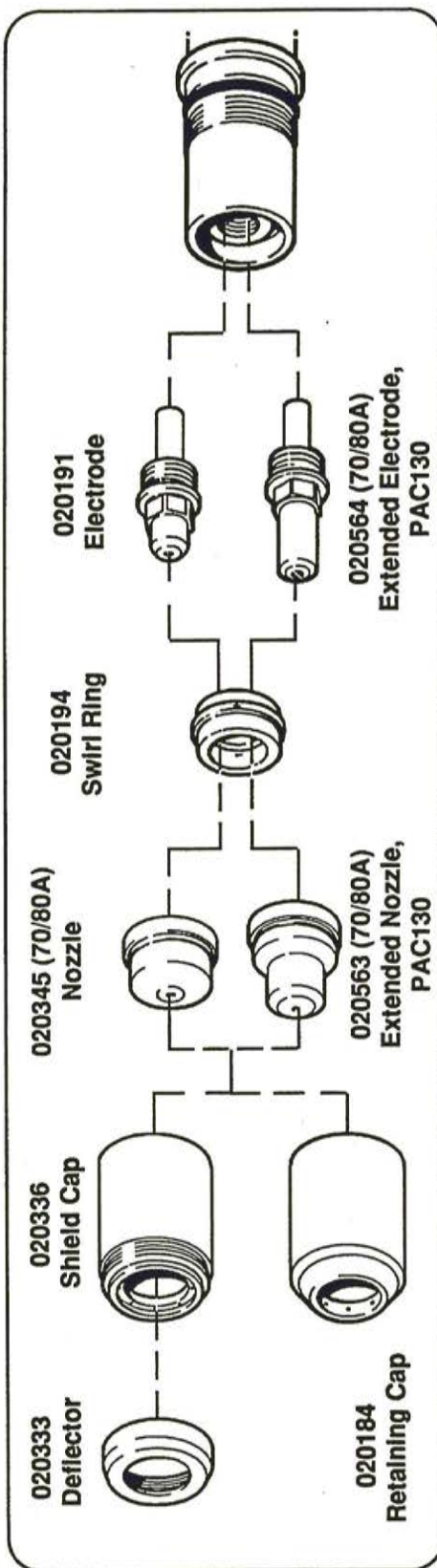
Plasma Gas: Air

Current Setting: 70 Amp

Consumables: Non-Shielded



CUTTING



Material Thickness (Inches) (mm)	Plasma Gas Pressure In TEST (psi/bar)	Torch-to-work Distance (Inches) (mm)	Arc		Duty Cycle (%)	Normal Plate Travel Speed (lpm) (mm/min)	Pierce Time (sec)	Plasma Gas (Air) Inlet Pressure (psi/bar)
			Current Setting (amps)	Voltage Setting (volts)				
1/8 3	65/4.5*	1/8 3	70	110	50	150	0.50	90-120/6.2-8.3
1/4 6		5/32 4	70	125		55	0.75	
3/8 10		5/32 4	70	120		35	1.00	
1/2 13		5/32 4	70	130		25	1.25	
5/8 15		3/16 5	70	135		13	1.50	
3/4 19		3/16 5	70	145		8	1.75	

1 inch = 25.4 mm; 1 psi = .0689 bar = 6.895 KPa

\* Plasma Gas Pressure setting is for 25-ft. (7.6 m) leads. Add 5 psi (.34 bar) for 50-ft (15 m) leads.



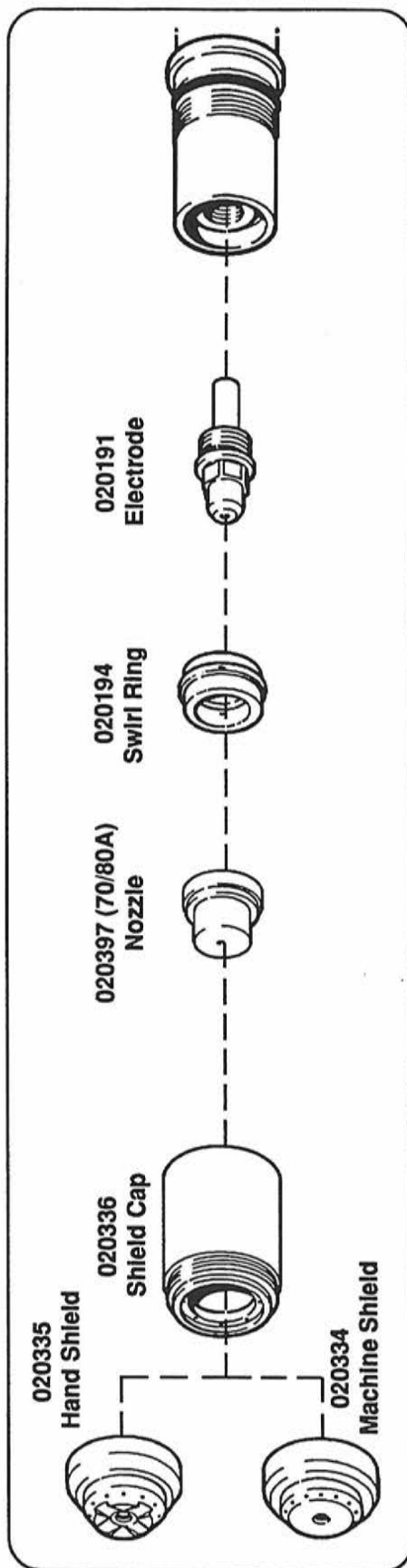
# MAX70 Machine/PAC130 Hand Torch

## Aluminum Cutting

Plasma Gas: Air  
Current Setting: 70 Amp  
Consumables: Shielded



CUTTING



Material Thickness (inches) (mm)	Plasma Gas Pressure In TEST (psi/bar)	Torch-to-work Distance (inches) (mm)	Arc Current Setting (amps)	Arc Voltage Setting (volts)	Duty Cycle (%)	Normal Plate Travel Speed (ipm) (mm/min)	Pierce Time (sec)	Plasma Gas (Air) Inlet Pressure (psi/bar)
1/4 6	60/4.1*	1/8 3	70	130	50	50 1270	0.75	90-120/6.2-8.3
3/8 10		1/8 3	70	130		30 760	1.00	
1/2 13		5/32 4	70	140		20 500	1.25	
5/8 15		5/32 4	70	145		13 330	1.50	
3/4 19		3/16 5	70	155		8 200	1.75	

1 inch = 25.4 mm; 1 psi = .0689 bar = 6.895 KPa

\* Plasma Gas Pressure setting is for 25-ft. (7.6 m) leads. Add 5 psi (.34 bar) for 50-ft (15 m) leads.



# MAX70 Machine/PAC130 Hand Torch

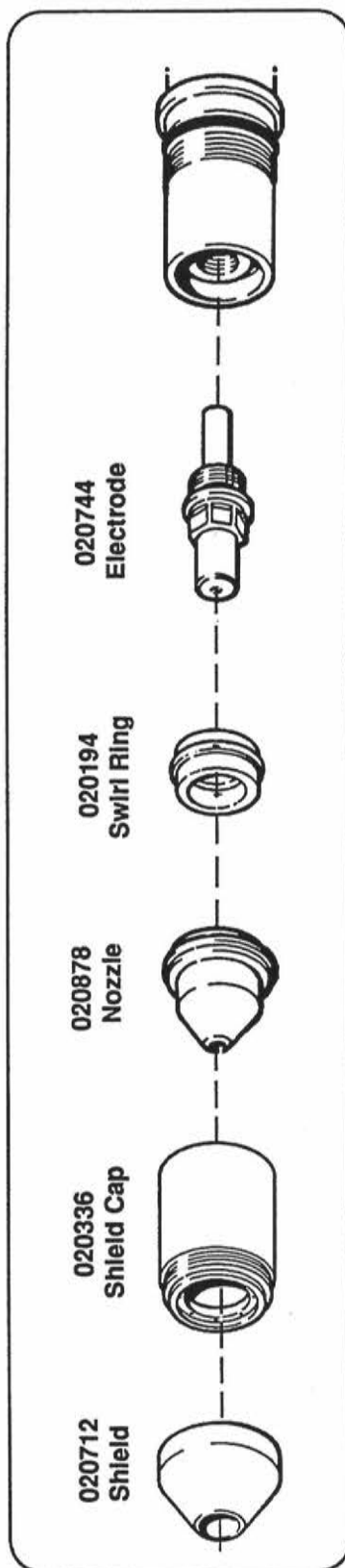
## Gouging

Gas: Air

Current Setting: 70 Amp



GOUGING



Torch-to-work Angle of Inclination $\theta$ (Degrees)	Air Pressure In TEST (psi/bar)	Torch-to-work Distance During Gouging (Inches) (mm)	Arc Current Setting (amps)	Duty Cycle (%)	Travel Speed (ipm) (mm/min)	Air Inlet Pressure (psi/bar)
40-45°	60/4.1	1.0 2.5	70	50	15 380	90-120/6.2-8.3

Metal Removal Rate	lbs/hr (kg/hr)
Mild Steel Plate	6.6 (3)

## Section 5 MAINTENANCE

In this section:

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Introduction .....	5-2
Routine Maintenance .....	5-3
Torch and Torch Leads .....	5-3
Power Supply .....	5-3
Air Filter Cleaning .....	5-3
Filter Bowl and Filter Element Cleaning/Replacement .....	5-3
Sequence of Operation .....	5-5
Initial Checks .....	5-6
Troubleshooting .....	5-7
PAC130 Hand Torch Disassembly .....	5-24
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# MAINTENANCE

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## INTRODUCTION

The MAX70 plasma system undergoes rigorous testing prior to shipment and should require little maintenance if proper setup and operation procedures as outlined in Sections 3 and 4 are followed.

If a problem does arise, this section will familiarize qualified service personnel with the proper operation of the MAX70 system, and will provide guides to troubleshooting problems that may occur during operation. This section contains routine maintenance, a sequence of operation flowchart, an initial checks procedure, a troubleshooting guide, and instructions to remove and replace the torch and leads. **Remember, maintenance personnel must perform all testing with safety in mind. Read and refer to the *Safety* section for operating precautions and warning formats.**

If additional assistance is required or a need to order parts, call Customer Service at 1-800-643-0030 or Technical Service at 1-800-643-9878.



## WARNINGS



**SHOCK HAZARD:** Always turn off power at the power supply and unplug cord from wall receptacle or remove power at the line voltage disconnect box before removing the cover for servicing. Note that if power is required for servicing, dangerous voltages exist within the power supply which could cause serious injury or death.

**SHOCK HAZARD:** The aluminum heatsink on the power PC boards are electrically alive when the plasma is on. In case of an electrical failure of the inverter circuit, the heatsink may be alive when the power is off.

**SHOCK HAZARD:** The large six electrolytic capacitors, C1-C6, (blue-cased cylinders located on the power PC boards) 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 other areas on the board. Never discharge the capacitors with a screwdriver or other implement... explosion, property damage and/or personal injury could result. Wait at least two minutes after turning the power supply off before touching the PC board or capacitors.

If questions or problems arise during servicing, call Technical Services at 1-800-643-9878.



## ROUTINE MAINTENANCE

The MAX70 plasma system is designed to require minimum regular maintenance under normal use. The following torch and power supply routine maintenance checks, are suggested to keep your system in good running condition.

### Torch and Torch Leads

The torch consumable parts and torch main body should always be inspected prior to cutting. Worn or damaged parts will affect the cut quality. Check for pitting and burn marks on the consumable parts and replace, if necessary. Refer to *Changing Consumable Parts* in Section 4.

Torch leads should be checked occasionally for cracking and damage.

### Power Supply

The only routine maintenance necessary on the power supply is to clean the air filters and to check and clean the filter bowl and filter element periodically.

#### Air Filter Cleaning

To remove, clean and replace the air filters, follow the instructions below.

1. Turn the MAX70 power switch to OFF (0) and shut off power at the line voltage disconnect box.
2. Remove the 18 screws that hold the power unit cover in place. Remove cover.
3. Remove air filters. See Figures 6-4 and 6-5.
4. Clean the air filter with either soap and water or blow out filters with low pressure compressed air.
5. Ensure filters are dry before replacing.
6. Replace filters with the wire mesh facing the fan.
7. Replace and refasten power unit cover with screws.

#### Filter Bowl and Filter Element Cleaning/Replacement

If the filter bowl is dirty, clean the bowl or clean or replace the filter element by referring to Figure 5-1 and the following procedure:

1. Set power circuit breaker S1 to OFF (0) and remove power at the line voltage disconnect box.
2. Shut the air supply off at the air supply pressure regulator and disconnect the air hose from the filter block before unscrewing the filter bowl.



## MAINTENANCE

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3. Unscrew the filter bowl and clean.
4. If the filter element needs to be cleaned or replaced, remove the element by unscrewing the element retainer. Refer to Section 6, *Parts List* to order filter element # 011054.
5. Reinstall the filter element and filter bowl.
6. Reconnect the air hose to the hose connection on the filter block.

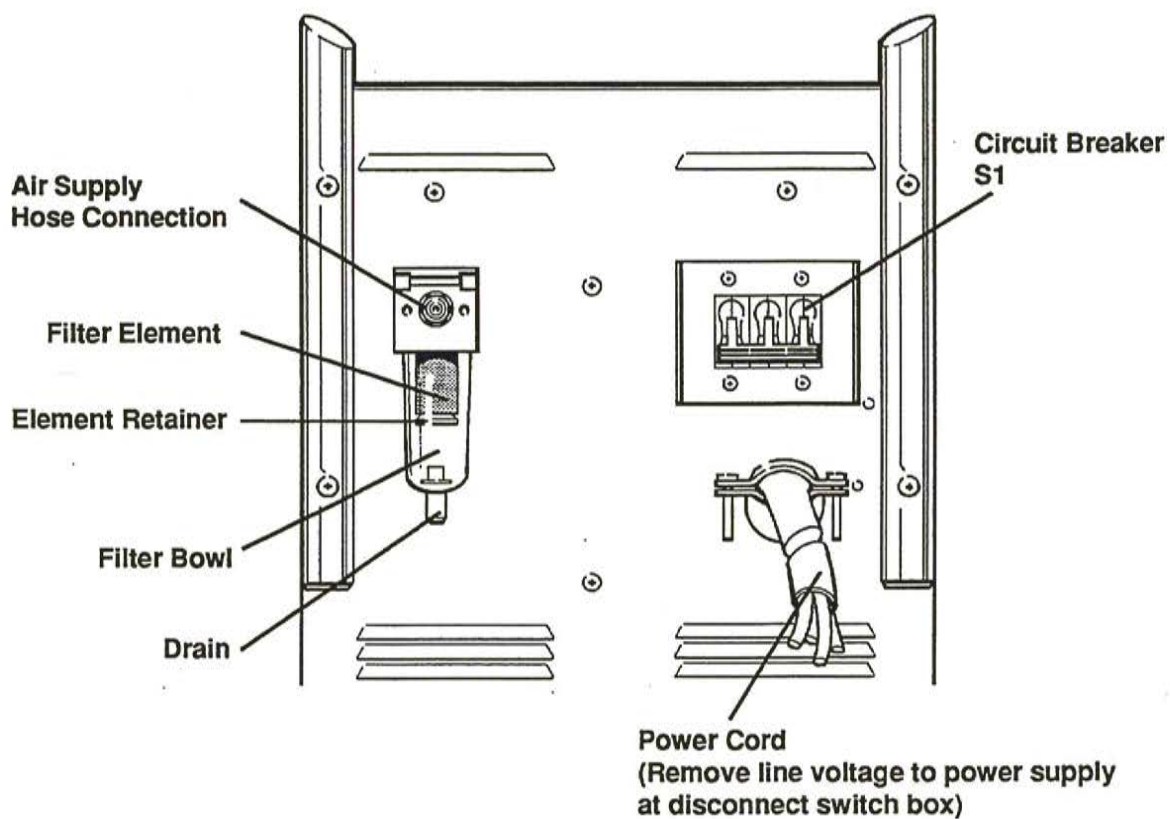
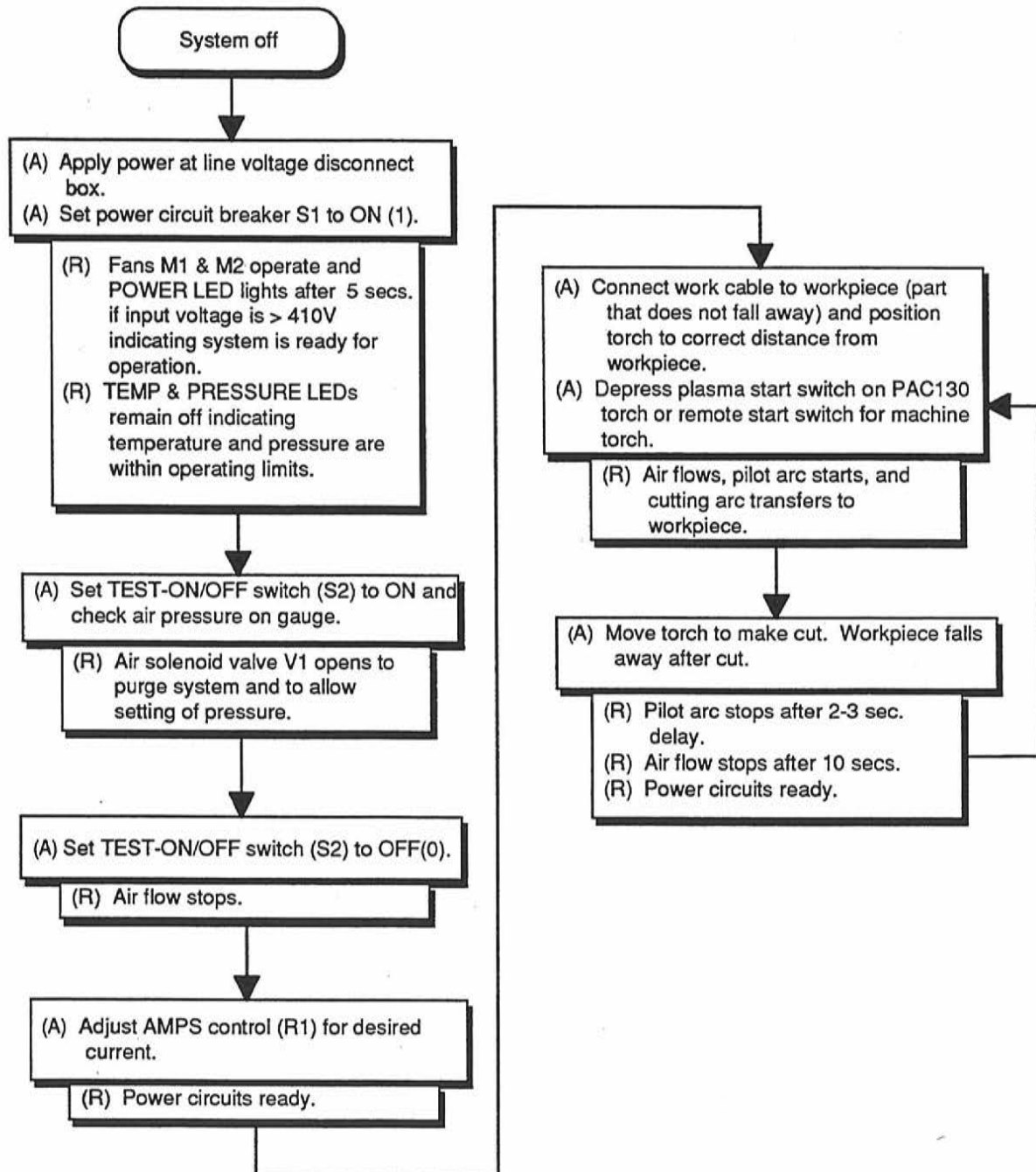


Figure 5-1 Filter Bowl and Filter Element Cleaning/Replacement

## SEQUENCE OF OPERATION

The following is a flow diagram showing the required sequence of operator actions (A) and associated responses (R) during normal MAX70 plasma system operation with a hand or machine torch.





# MAINTENANCE

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## INITIAL CHECKS

Before tracing down specific problems, it is good practice to do a visual check.



### WARNINGS



**SHOCK HAZARD:** Always turn off power at the power supply and unplug cord from wall receptacle or remove power at the line voltage disconnect box before removing the cover for servicing. Note that if power is required for servicing, dangerous voltages exist within the power supply which could cause serious injury or death.

**SHOCK HAZARD:** The aluminum heatsink on the power PC boards are electrically alive when the plasma is on. In case of an electrical failure of the inverter circuit, the heatsink may be alive when the power is off.

**SHOCK HAZARD:** The large six electrolytic capacitors, C1-C6, (blue-cased cylinders located on the power PC boards) 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 other areas on the board. Never discharge the capacitors with a screwdriver or other implement... explosion, property damage and/or personal injury could result. Wait at least two minutes after turning the power supply off before touching the PC board or capacitors.

If questions or problems arise during servicing, call Technical Services at 1-800-643-9878.

1. Set power circuit breaker S1 to OFF (0) and shut off power at the line voltage disconnect box.
2. Remove the 18 screws that hold the power unit cover in place.
3. Inspect interior of unit for discoloration on pc boards or other apparent damage. If a component or module is obviously defective upon visual inspection, remove and replace it before doing any testing. Refer to *Parts List*, Section 6 to identify parts and numbers.
4. If no damage is apparent, turn on power at the line voltage disconnect box.
5. Refer to *Troubleshooting* on next page.

## TROUBLESHOOTING

The following problems and possible causes and solutions provide basic trouble shooting for the technician. Refer to the power supply wiring diagram, Figure 5-4, 5-5, 5-6 or 5-7 and air system schematic, Figure 5-8 if required, to aid in troubleshooting. A technician with a working knowledge of inverter power supply theory is required.

**Set power circuit  
breaker (S1) to  
ON (I)**

Problem	Possible Causes and Solutions
<b>1. The fans are not operating and the green POWER LED does not light.</b>	<p><b>1.1. <i>Input line voltage is missing.</i></b> Check line voltage at power circuit breaker S1 between L1 (U), L2 (V) and L3 (W) for 480 or 400 VAC power supplies. The voltage between any two of the three points should be equal to the input voltage. Check line voltage at power circuit breaker S1 between L1 (U) and L2 (V) for 208/240 VAC power supplies. See Figures 5-2 and 6-5. If voltage is missing, check connections, power cord, and fuses at line voltage disconnect box.</p> <p>To check MAX70 CE line voltage, refer to Appendix B.</p> <p><b>1.2. <i>Power circuit breaker S1 is defective or wiring is loose or defective.</i></b> Check circuit breaker and wiring.</p> <p><b>1.3. <i>Main power fuses F1 and F2 blown or defective.</i></b> Check fuses and wiring. See Figures 5-2 and 6-5.</p> <p><b>1.4. <i>Fuses F1, F2, F3 and F4 on power distribution board PCB1 blown or defective.</i></b> Check fuses and wiring. See Figure 6-5 for location of fuses.</p> <p><b>1.5. <i>Control transformer T1 defective.</i></b> Check transformer and wiring. See Figure 6-5 for location of T1.</p>
<b>2. POWER LED lights, but the fans are not operating.</b>	<p><b>2.1. <i>F1 on the power distribution board PCB1 is defective.</i></b> Check fuse and wiring.</p> <p><b>2.2. <i>Terminals to fans are not seated together securely and/or not getting 120 VAC from power distribution board.</i></b> Check terminals and associated wiring for good continuity. Check for 120 VAC at terminals.</p>



# MAINTENANCE

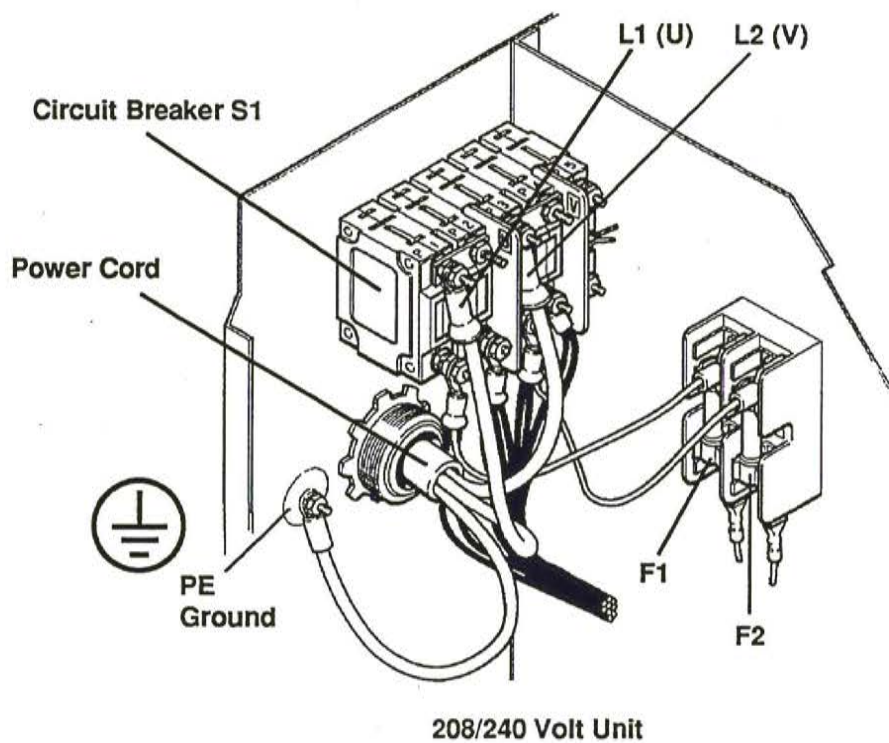
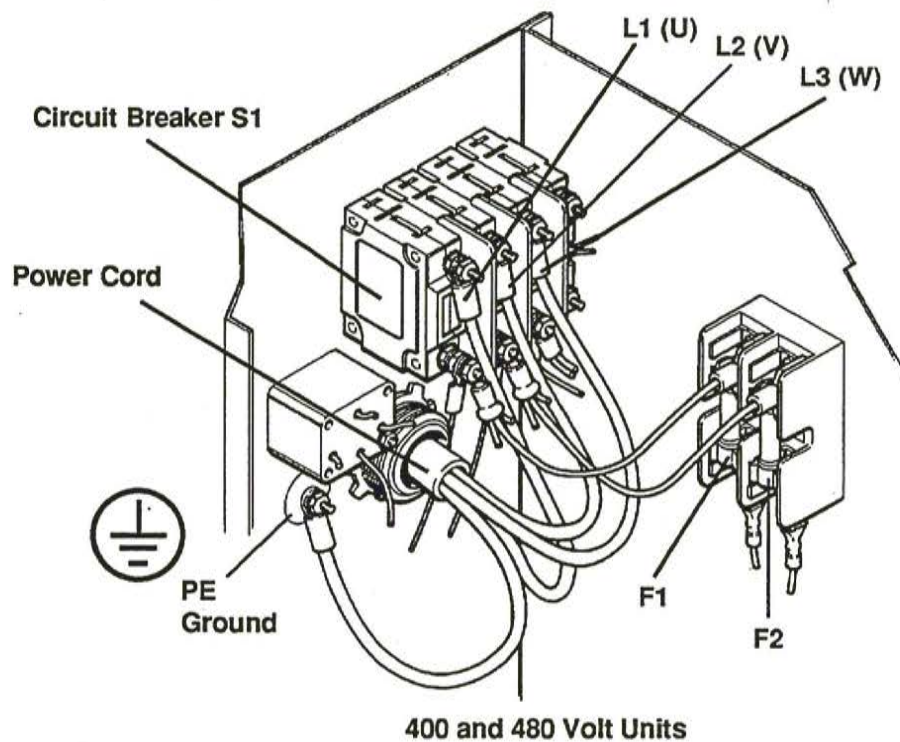


Figure 5-2 Primary Line Voltage Measurement Locations

# MAINTENANCE

Problem	Possible Causes and Solutions
	<p><b>2.3. PD and PL4 on power distribution board PCB1 are not seated well.</b> Check pins, connectors and associated wiring for good continuity. Repair or replace, if necessary.</p>
<b>3. The fans are operating, but POWER LED does not light.</b>	<p><b>3.1. Low input line voltage, less than 410 VAC.</b> Check input power circuits.</p> <p><b>3.2. Fuses F2 and F3 on power distribution board PCB1 blown or defective.</b> Check fuses and replace. Check wiring. See Figure 6-5 for location of fuses.</p> <p><b>3.3. Power distribution board PCB1 defective.</b> Check PCB1. Repair or replace as necessary. See Figure 6-5 for location of PCB1.</p>
<b>4. PRESSURE LED lights.</b>	<p><b>4.1. Air is not on or is set too low.</b> Be certain that the air supply is on and is set between <b>90 and 120 psi (6.2 and 8.3 bar)</b> at air cylinder or shop compressor.</p> <p>Ensure the pressure gauge on the power supply indicates the psi/bar dynamic (flowing) air pressure listed on Cut Charts in Section 4.</p> <p><b>4.2. There is a gas leak somewhere in the system.</b> Be certain that there is no hissing sound coming from the torch (retaining cap), or anywhere between the torch and the gas supply.</p> <p><b>4.3. Pressure switch PS2 not functioning.</b> Check to see that PS2 is not stuck closed. See associated wiring diagram. See Figure 6-4 for location of PS2.</p> <p><b>4.4. Pressure switch PS1 not functioning.</b> PS1 is normally open, and closes when gas pressure of <b>approximately 40 psi (2.7 bar)</b> or greater is sensed. See associated wiring diagram. See Figure 6-4 for location of PS1.</p>
<b>5. TEMP LED lights.</b>	<p><b>51. Main transformer and/or heatsink overheating</b> This LED will light when any of main transformer (T3 and T4) temp. switches TS1 and TS2 and heatsink temp. switches TS3 and TS4 sense an over temperature. See Figure 6-4 and 6-5 for location of transformers.</p>

# MAINTENANCE

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## Problem

## Possible Causes and Solutions

Temperature switches for 480V units will open and turn on TEMP LED when  $>90^{\circ}\text{C}$  is sensed.

Temperature switches for 400V units will open and turn on TEMP LED when  $>90^{\circ}\text{C}$  is sensed by main transformers and when  $>95^{\circ}\text{C}$  is sensed by heatsinks.

Temperature switches for 208/240V units will open and turn on TEMP LED when  $>90^{\circ}\text{C}$  is sensed.

If there is not an overtemperature condition, check temperature switches for continuity. Temperature switches are normally closed. Remove PL3 from PC on power distribution board PCB1. Measure between pins 5 & 6 and 7 and 8 on PL3. Normal reading should be low resistance or closed. Faulty reading is infinity or open condition. See associated wiring diagram.

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Set TEST-ON/OFF  
to  
ON

## Problem

## Possible Causes and Solutions

### 6. Air flow is weak, or not flowing.

6.1. *Air regulator adjustment valve needs to be set.*  
Refer to Operating Instructions, Section 4.

6.2. *Air line(s) from solenoid valves to gas adjustment valve to torch are blocked or leaking.*  
Check hosing and repair or replace if necessary.

6.3. *TEST-ON/OFF switch S2 not functioning.*  
S2 open in ON position. Make continuity check. See Figures 6-3 and 6-4 for location of S2.

6.4. *Solenoid valve V1 not functioning.*  
Check that V1 is getting 120 VAC from control board PCB4. If not, replace PCB4. If V1 is receiving 120 VAC, replace V1. See Figure 6-4 for location of V1.

# MAINTENANCE

Set TEST-ON/OFF  
to  
OFF

Problem	Possible Causes and Solutions
7. Air continues to flow	<p>7.1. <i>TEST-ON/OFF switch S2 not functioning.</i> S2 closed in OFF mode. Make continuity check. See Figures 6-3 and 6-4 for location of S2.</p> <p>7.2. <i>Solenoid valve V1 not functioning.</i> Check that V1 is getting 0 VAC from control board PCB4. If not, replace PCB4. If V1 is receiving 0 VAC, replace V1. See Figure 6-4 for location of V1.</p>

Press PAC130 Torch Start  
Switch or Machine Torch  
Remote Start Switch

Problem	Possible Causes and Solutions
8. POWER LED is lit, but nothing happens when torch switch is pressed.	<p>8.1. <i>Missing start signal.</i> Check that Start LED indicator D2 (see Figure 5-3) on control board PCB4 lights when torch start switch or machine torch remote switch is pressed. If D2 does not light, go to 8.2.</p> <p>8.2. <i>Fuses F1 and/or F2 on I/O board PCB6 blown.</i> Check fuses. Replace as required. See Figure 6-4 for location of fuses.</p> <p>8.3. <i>Power board PCB2 or PCB3 defective</i> Check that Overcurrent indicators D14 (PCB3-(M/I) and D15 (PCB2 - Standard) (see Figure 5-3) on control board PCB4 are off. If either indicator is lit, replace the associated power board. See Figures 6-4 and 6-5 for location of boards.</p> <p>8.4. <i>Torch or remote switch faulty.</i> Check continuity at TB3 between wires 33 and 34 while pressing torch start switch or remote switch. If reading indicates switch is open, replace switch. If reading indicates that switch is closed, check wiring for loose connections.</p>



# MAINTENANCE

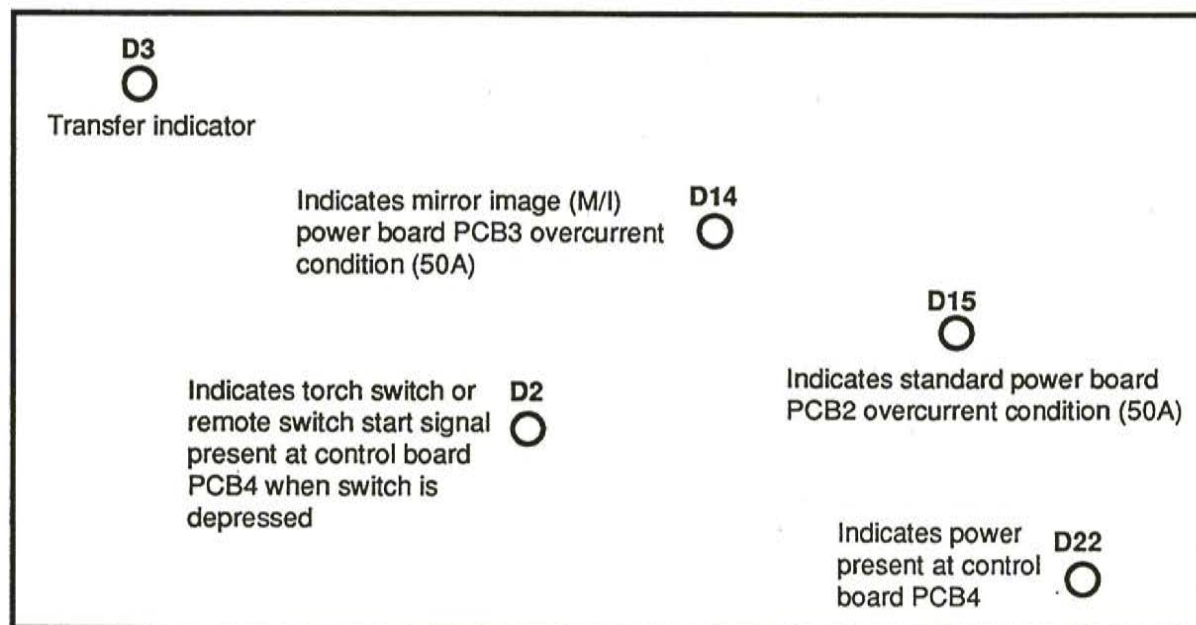


Figure 5-3 Control Board (PCB4) Indicators

Problem	Possible Causes and Solutions
9. There is no high frequency and no pilot arc.	<p><b>9.1. There is no spark between the spark gap electrodes.</b> Clean (with emery cloth), align, and/or regap (.015" per gap) the electrodes, if necessary. Ensure that the electrode surfaces between the gaps are flat. If surfaces are rounded, replace and regap. See Figure 6-4 for location of spark gap assembly SG1.</p> <p><b>9.2. High voltage transformer T5 is overheating.</b> Check T5 overheating. Replace, if necessary. See Figure 6-4 for location of T5.</p> <p><b>9.3. High voltage transformer T5 not getting 120 VAC from Control Board PCB4</b> Check pins, connectors and associated wiring from T5 to PCB4.</p> <p><b>9.4. T5 or capacitor pair C2, C3 in spark gap assembly defective.</b> Shut down system and remove capacitors C2, C3 (see Figure 6-4 for location). Restart system and see if a faint spark is now observed across the gaps. If a spark is not observed at the gaps, replace T5. If there is a spark,</p>

## MAINTENANCE

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replace capacitor pair C2, C3. Always replace the capacitors in pairs. See Figure 6-4 for location of spark gap assembly SG1.

**9.5. *There is no high frequency at the torch***

Check for a shorted torch, a damaged pilot arc lead, or loose lead connections. Replace the torch or pilot arc lead or tighten the lead connections.

**9.6. *Pilot arc relay CR1 is not functioning or not getting 120VAC from the control board PCB4***

See if the CR1 relay contacts close after the START command is given. If CR1 does not close, check to see if CR1 is getting 120VAC from PCB4. If it is, replace CR1. If there is no 120VAC from pins 7 & 8 at JP5 of PCB4, replace control board PCB4. See Figure 6-5 for location of PCB4.

---

### Problem

**10. There is high frequency, but there is no pilot arc.**

### Possible Causes and Solutions

**10.1. *Torch parts are worn***

Check consumable parts and replace, if necessary. See *Changing Consumable Parts* in **Section 4**.

**10.2. *Torch leads are loose or worn***

Replace torch leads as required.

**10.3. *Pilot arc relay CR1 not functioning***

See solution 9.6.

---

**Position torch  
to cut**

### Problem

**11. Arc not transferring to workpiece**

### Possible Causes and Solutions

**11.1. *The work clamp is not connected or it is broken.***

Connect or repair the work clamp.

**11.2. *Transfer of arc not sensed by MAX70.***

Check current sensor CS2 and associated wiring. Repair and replace as necessary. See Figure 6-4 for location of CS2.

## MAINTENANCE

---

**12. The unit stops cutting during cut, or cuts poorly.**

**12.1.** *There is insufficient air or gas pressure.*  
Check that gas inlet pressure is at least **90 psi**.  
Check plasma gas pressures in TEST mode as specified under *Cut Charts* in the **Section 4**.

**12.2.** *Torch is getting insufficient current.*  
Check the arc current setting for the type and thickness of metal you are cutting from the *Cut Charts* in **Section 4**.

**12.3.** *Torch consumable parts are worn.*  
Check consumables and replace if necessary. See *Changing Consumable Parts* in **Section 4**.

**12.4.** *The power supply has overheated.*  
Stop cutting and wait for unit to cool down. Wait for yellow light to go off. If unit will not restart, see **(5)** earlier in this section.

---

**13. The unit stops cutting due to a low line voltage condition. After cutting stops, power supply returns to normal. Note that the POWER LED goes off during cutting and comes on again as soon as the power supply stops cutting.**

**13.1.** *Torch is too far from workpiece when cutting. Arc is too long.*  
Move torch closer to workpiece.

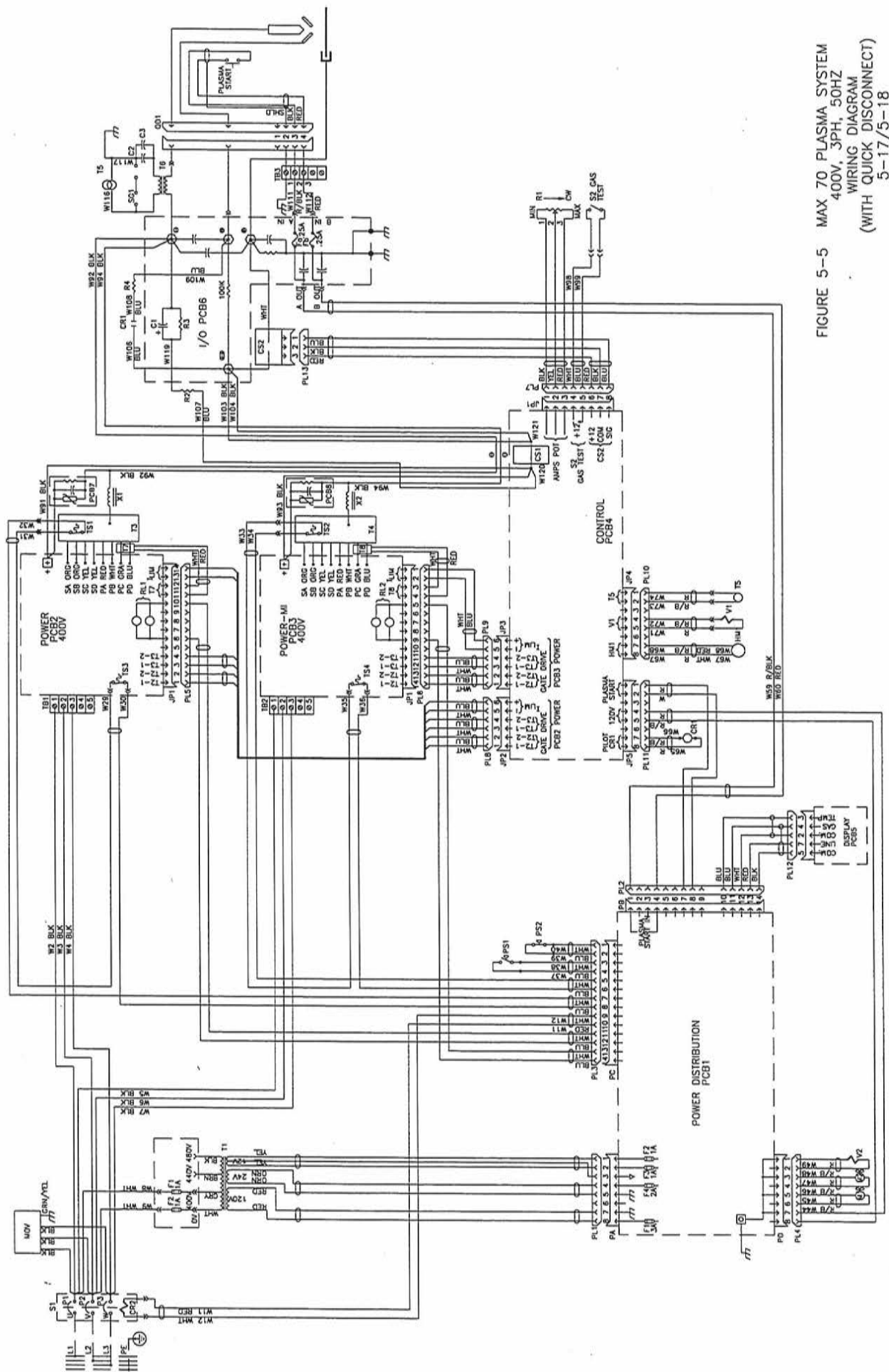
**13.2.** *Power cord inadequately sized.*  
Check *Power Requirements* in **Section 3**.

**13.3.** *Service/line voltage disconnect box inadequately sized.*  
Check *Power Requirements* in **Section 3**.

**13.4.** *Control transformer T1 in 208/240V power supply not connected to line fuse F1 for correct input line voltage.*  
Check *Power Requirements* in **Section 3**.







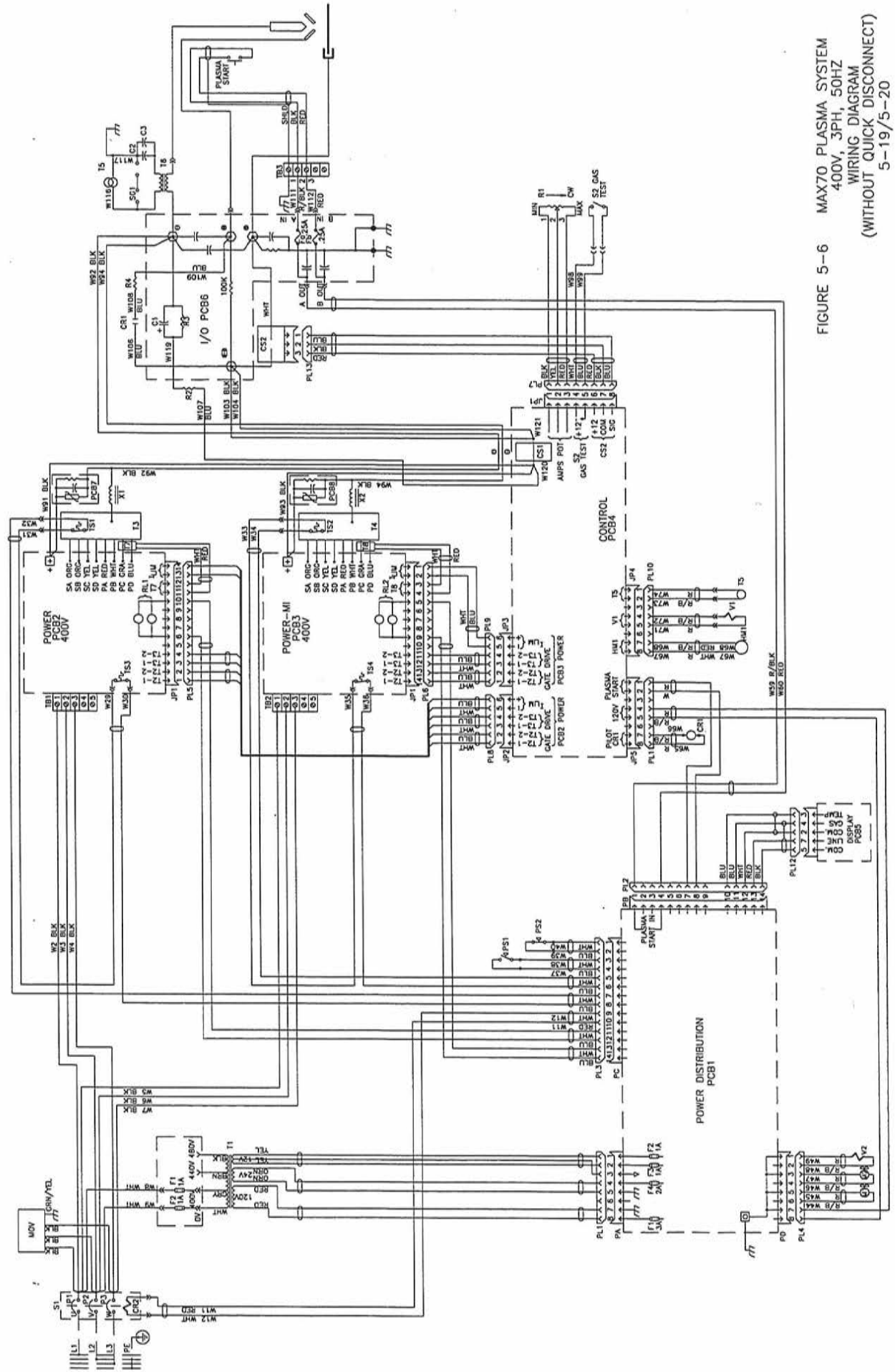


FIGURE 5-6 MAX70 PLASMA SYSTEM  
400V, 3PH, 50HZ  
WIRING DIAGRAM  
(WITHOUT QUICK DISCONNECT)  
5-19/5-20

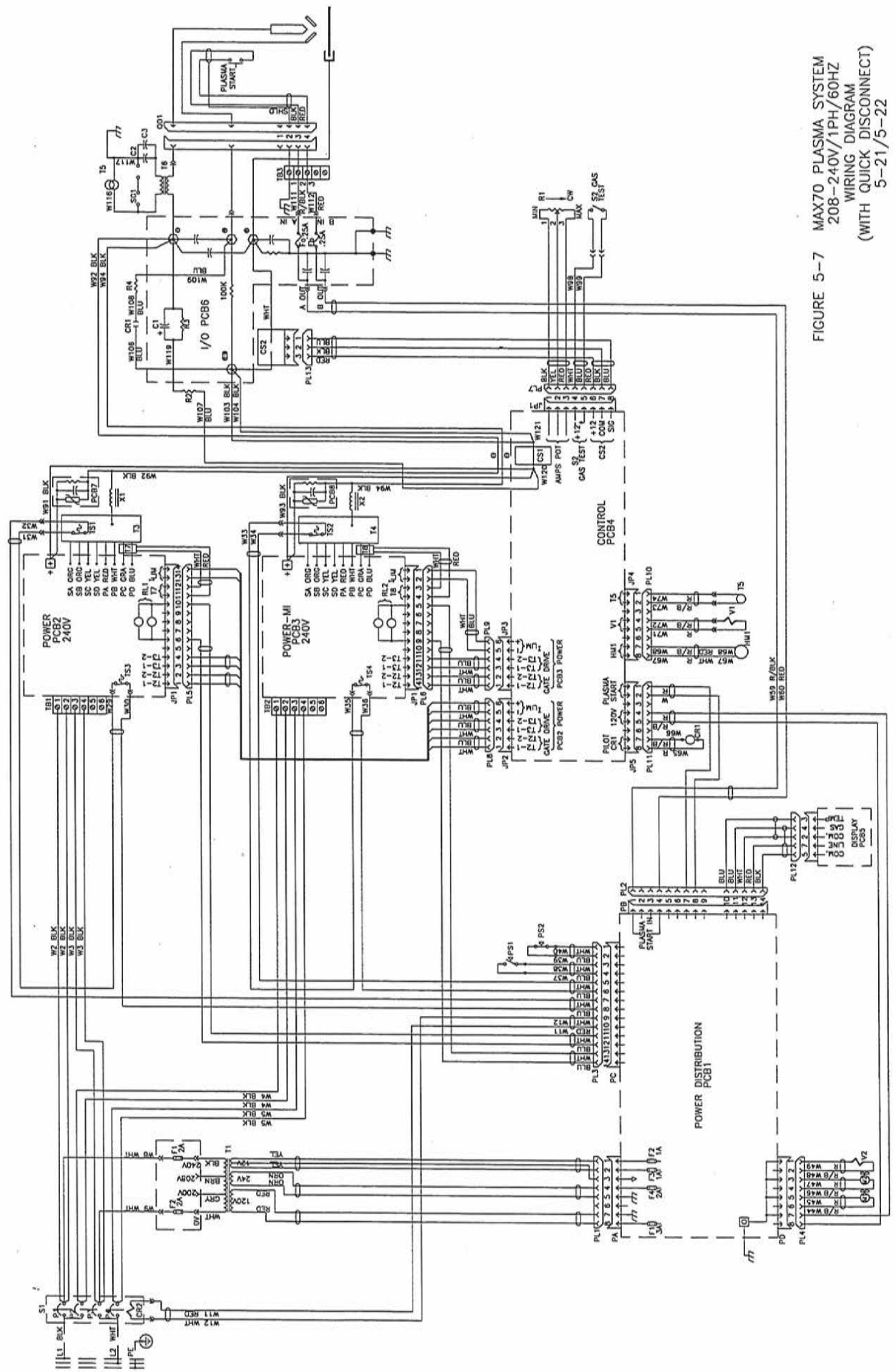


FIGURE 5-7 MAX70 PLASMA SYSTEM  
208-240V/1PH/60HZ  
WIRING DIAGRAM  
(WITH QUICK DISCONNECT)  
5-21/5-22

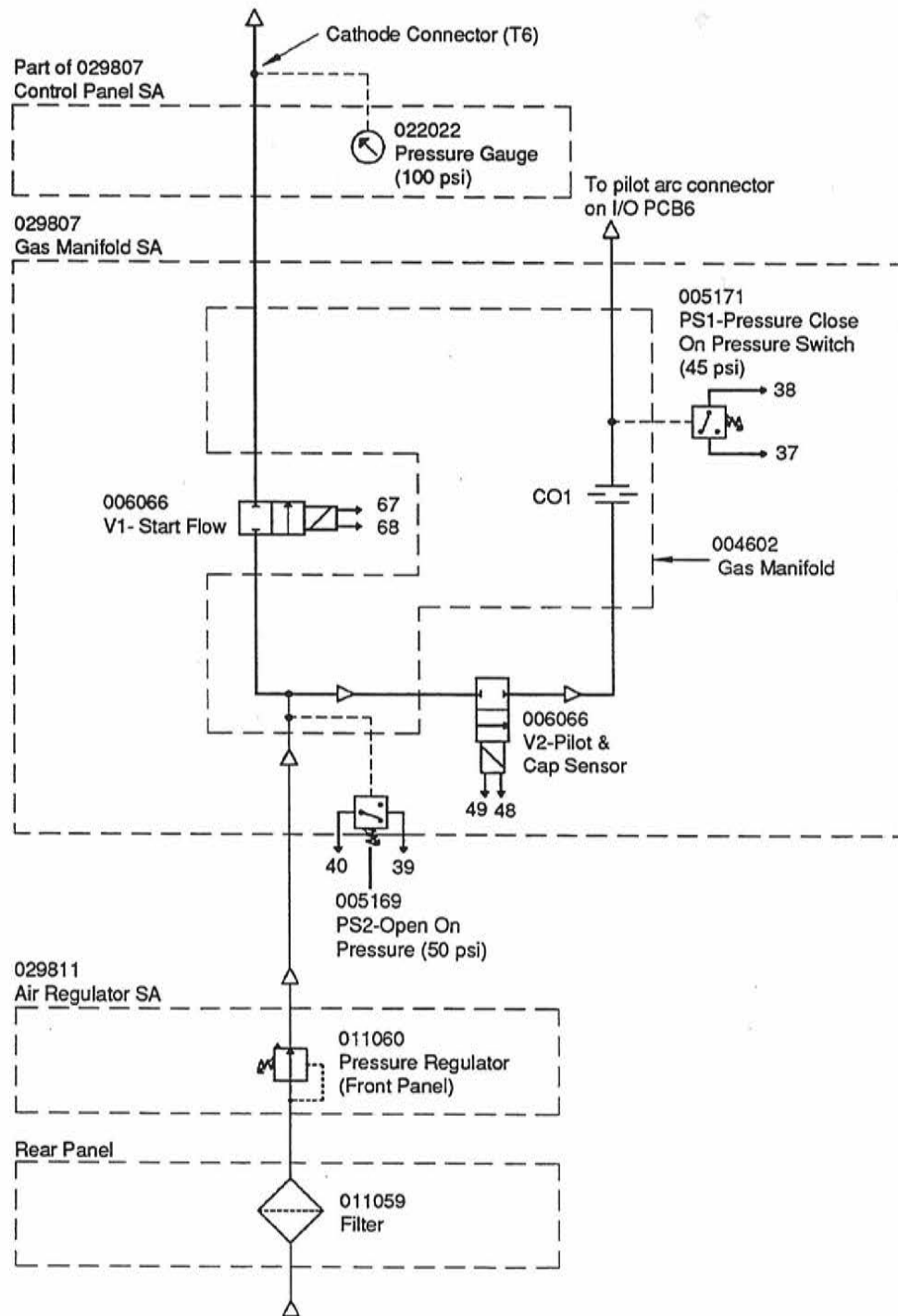


Figure 5-8 MAX70 Air System Schematic



# MAINTENANCE

---

## PAC130 HAND TORCH DISASSEMBLY



### WARNING



Turn off power at power supply and remove power at line voltage disconnect box before working on the torch.

### Tools Required

- 5/16" open-end wrench
- 7/16" open-end wrench
- 3/8" open-end wrench
- 1/2" open-end wrench

To remove and replace the PAC130 torch main body from the torch lead, perform the following procedure. See Figure 5-9.

### Removal

1. Remove the five (5) screws (# 075365) securing the two handle halves (# 001214) and separate.
2. Remove the torch main body (# 020461) and torch switch (# 005094) from the handle.
3. Slide the lead insulators (# 020536, # 020468) away from the torch lead fittings.
4. On the larger lead, use the 3/8-inch open-end wrench and the 1/2-inch open-end wrench to loosen the torch lead fitting. On the smaller lead, use the 5/16-inch open-end wrench and the 7/16-inch open-end wrench to loosen the torch lead fitting. Turn the torch lead fittings counter clockwise (ccw) to loosen the connection.
5. Remove the torch main body from the torch lead.

### Replacement

1. Connect the torch leads to the replacement torch main body. Thread the torch main body fittings and the torch lead fittings together clockwise (cw). On the larger lead, use the 3/8-inch open-end wrench and the 1/2-inch open-end wrench to tighten the torch lead fitting. On the smaller lead, use the 5/16-inch open-end wrench and the 7/16-inch open-end wrench to loosen the torch lead fitting.
2. Slide the lead insulators over the torch lead fittings.
3. Insert the torch main body into one of the handle halves and then align the body in the handle.

## MAINTENANCE

4. Insert the torch switch into the handle switch holder.
5. Insert the top rib of the boot into the handle just above the screw holes.
6. Align both halves of the handle, press together, and secure with the five (5) screws.

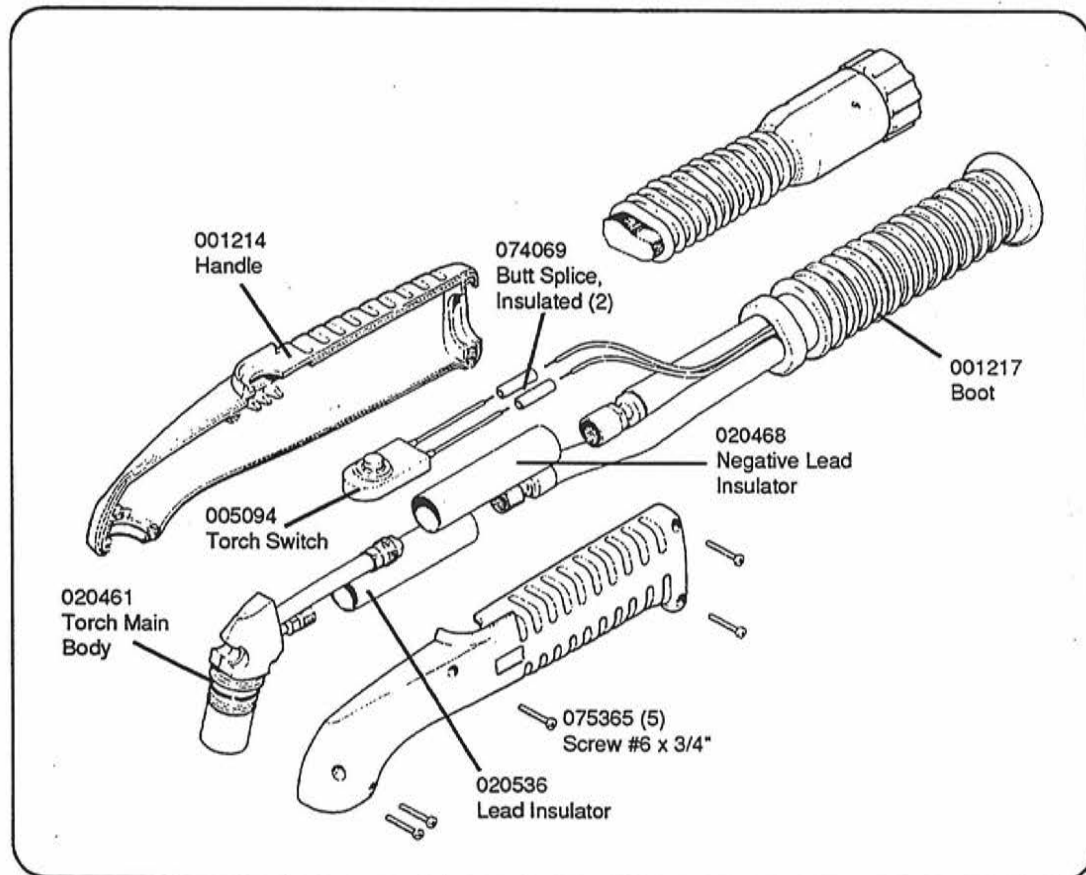


Figure 5-9 PAC130 Hand Torch Disassembly

# MAINTENANCE

---

## MAX70 MACHINE TORCH DISASSEMBLY



### WARNING



Turn off power at power supply and remove power at line voltage disconnect box before working on the torch.

### Tools Required

- 5/16" open-end wrench
- 7/16" open-end wrench
- 3/8" open-end wrench
- 1/2" open-end wrench

To remove and replace the MAX70 machine torch main body from the torch lead, perform the following procedure. See Figure 5-10.

### Removal

1. Unscrew the torch position sleeve (# 020243 or # 020270) from the torch main body (# 020201) and slide the sleeve back to expose the torch lead fittings. Slide the lead insulator (# 024173) forward to expose the pilot arc lead fitting.
2. Disconnect the torch leads from the torch main body. On the larger lead, use the 3/8-inch open-end wrench and the 1/2-inch open-end wrench to loosen the torch lead fitting. On the smaller lead, use the 5/16-inch open-end wrench and the 7/16-inch open-end wrench to loosen the torch lead fitting. Turn the torch lead fittings counterclockwise (ccw) to loosen the connection.
3. Remove the torch main body from the torch lead.

### Replacement

1. Connect the torch leads to the replacement torch main body. Thread the torch main body fittings and the torch lead fittings together clockwise (cw). On the larger lead, use the 3/8-inch open-end wrench and the 1/2-inch open-end wrench to tighten the torch lead fitting. On the smaller lead, use the 5/16-inch open-end wrench and the 7/16-inch open-end wrench to loosen the torch lead fitting.
2. Slide the lead insulator over the pilot arc lead fitting.
3. Slide the torch position sleeve forward to the torch main body and screw together.

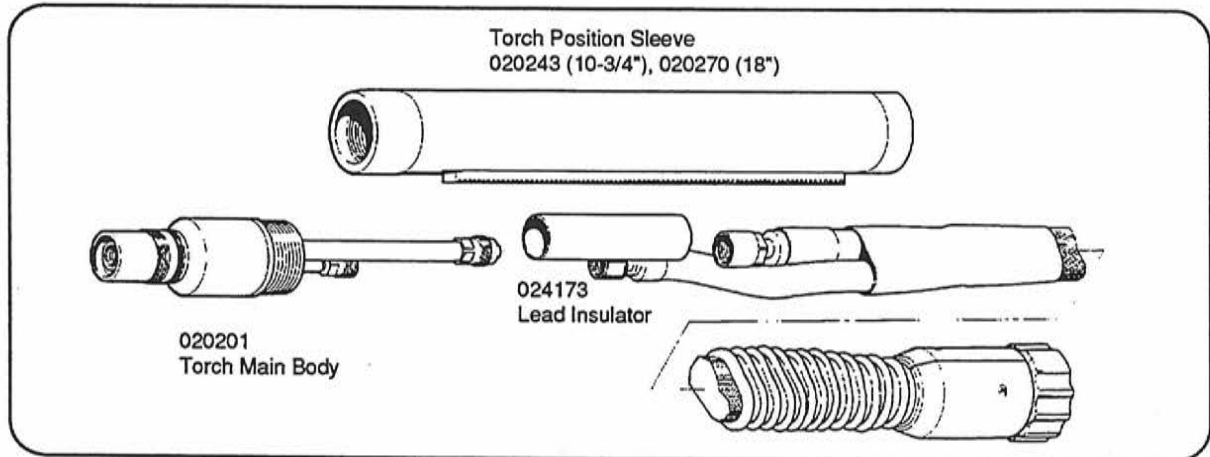


Figure 5-10 MAX70 Machine Torch Disassembly



## **MAINTENANCE**

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In this section:

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# **PARTS LIST**

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## **MAX70 POWER SUPPLIES**

072067 (w/QDisc) .....	480 VAC, 3 Ph, 60 Hz
072068 (w/QDisc) .....	400 VAC, 3 Ph, 50 Hz
072070 (w/o QDisc) .....	400 VAC, 3 Ph, 50 Hz
072069 (w/QDisc) .....	208/240 VAC, 1 Ph, 60 Hz

## **480V SYSTEMS (W/QDISC)**

**Includes PAC130 Torch and Torch Lead w/QDisc**

072074 .....	w/25-ft. (7.6 m) Torch Lead
072075 .....	w/50-ft. (15.2 m) Torch Lead

**Includes Machine Torch and Torch Lead w/QDisc**

072077 .....	w/25-ft. (7.6 m) Torch Lead
072078 .....	w/50-ft. (15.2 m) Torch Lead

## **400V SYSTEMS (W/QDISC)**

**Includes PAC130 Torch and Torch Lead w/QDisc**

072080 .....	w/25-ft. (7.6 m) Torch Lead
072081 .....	w/50-ft. (15.2 m) Torch Lead

**Includes Machine Torch and Torch Lead w/QDisc**

072083 .....	w/25-ft. (7.6 m) Torch Lead
072084 .....	w/50-ft. (15.2 m) Torch Lead

## **400V SYSTEMS (W/O QDISC)**

**Includes PAC130 Torch and Torch Lead w/o QDisc**

072086 .....	w/25-ft. (7.6 m) Torch Lead
072087 .....	w/50-ft. (15.2 m) Torch Lead

**Includes Machine Torch and Torch Lead w/o QDisc**

072089 .....	w/25-ft. (7.6 m) Torch Lead
072090 .....	w/50-ft. (15.2 m) Torch Lead

## **208/240 SYSTEMS (W/QDISC)**

**Includes PAC130 Torch and Torch Lead w/QDisc**

# PARTS LIST

072092 .....w/25-ft. (7.6 m) Torch Lead  
072093 .....w/50-ft. (15.2 m) Torch Lead

**Includes Machine Torch and Torch Lead w/QDisc**

072094 .....w/25-ft. (7.6 m) Torch Lead  
072095 .....w/50-ft. (15.2 m) Torch Lead

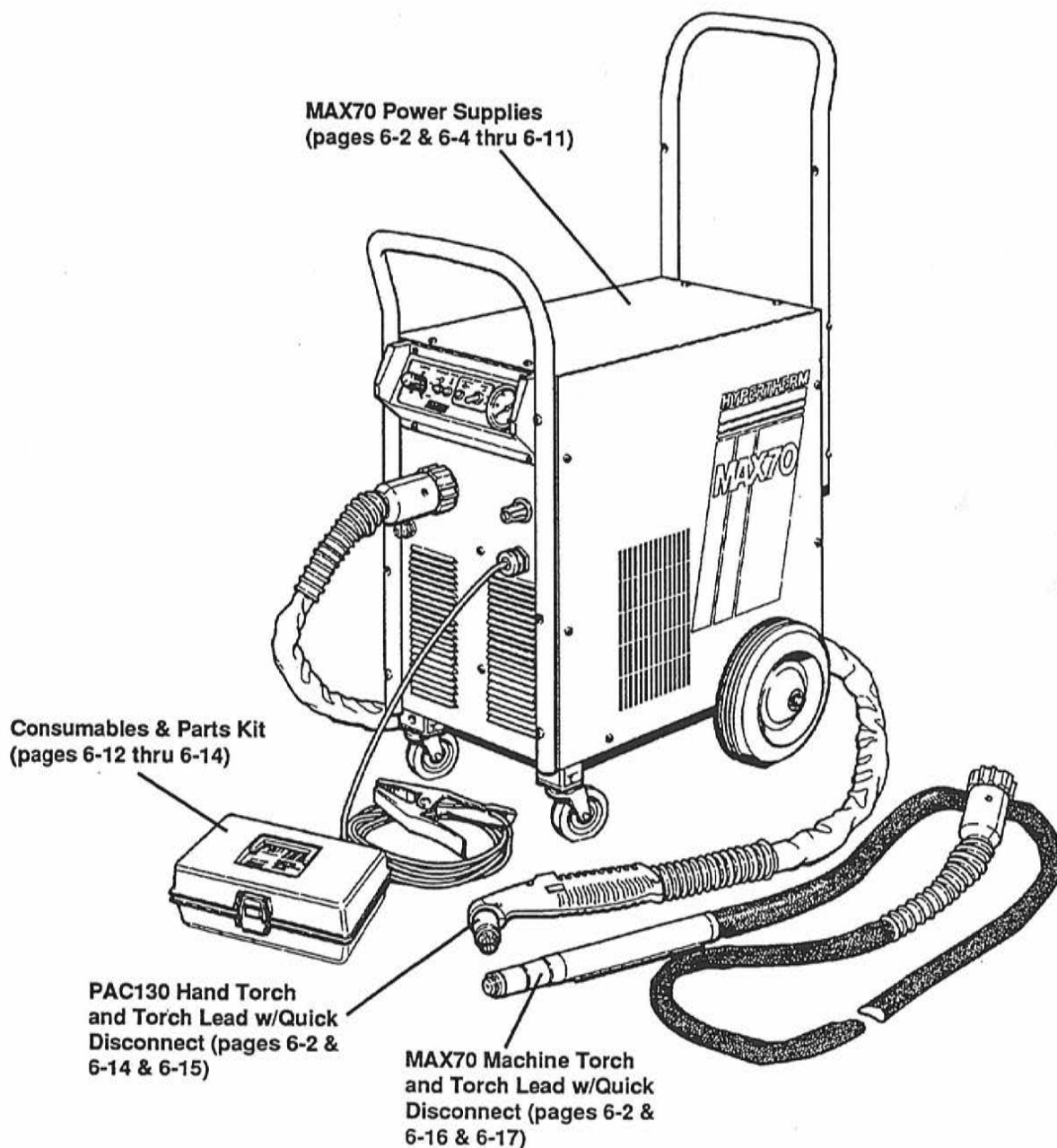


Figure 6-1 MAX70 Plasma Systems



# PARTS LIST

## POWER SUPPLY PARTS LOCATIONS

### Exterior, Wheels and Handles

Index No.	Ref. Desig.	Part No.	Description	Quantity
1		001427	Handle	2
2		075412	M/S 1/4-20 X 1-1/2, PH, RND S/Z	8
3		004594	Axle, MAX70	1
4		027057	Wheel, 8 X 1.75 inches	2
5		027249	Ring, Retaining	2
6		027299	Castor, Swivel	2
7		075202	Flatwasher	8
8		075174	Lockwasher	8
9		075412	M/S 10-32 X 1-1/2, PH, RND S/Z	8
10		029807	Control Panel SA	1
11		001423	Base, MAX70	1
12		001444	Cover, MAX70	1

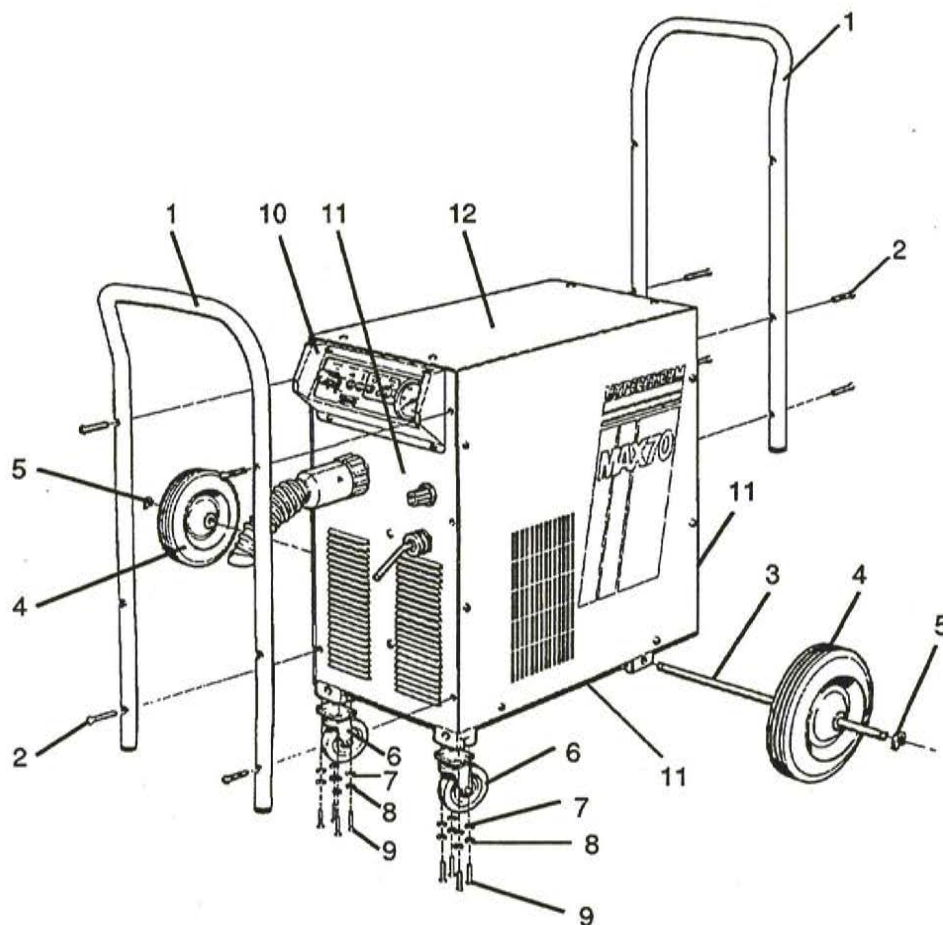


Figure 6-2 Exterior, Wheels and Handles

# PARTS LIST

## Front

Index No.	Ref. Desig.	Part No.	Description	Quantity
		029807	Control Panel SA	1
1		007034	Bezel, Front Panel Plastic	1
2	R1	009480	Res, Cermet 250 Ohm 1T 1W	1
3	PCB5	041333	PC BD Assy, LED Display	1
4	S2	005167	Switch, SPDT MTD Wire Leads .5H	1
5	PG1	022022	Gauge, Pressure 100 Psi/Bar	1
6		029811	Air Regulator SA	1
7		023682	Cable, Work # 8 w/Clamp 15 ft. (4.6 m)	1
8*,**,*		028692	Receptacle Assy, Quick Disconnect	1
8****		004274	Shield Adapter, Torch Lead (Not shown)	1
9		008212	Relief, Strain, 1/2 NPT X .197-.354	1
		008643	Locknut, 1/2 NPT	1

\* Used on 480V Power Supply w/QDisc (# 072067)

\*\* Used on 400V Power Supply w/Qdisc (# 072068)

\*\*\* Used on 208/240V Power Supply w/Qdisc (# 072069)

\*\*\*\* Used on 400V Power Supply w/o Qdisc (# 072070)

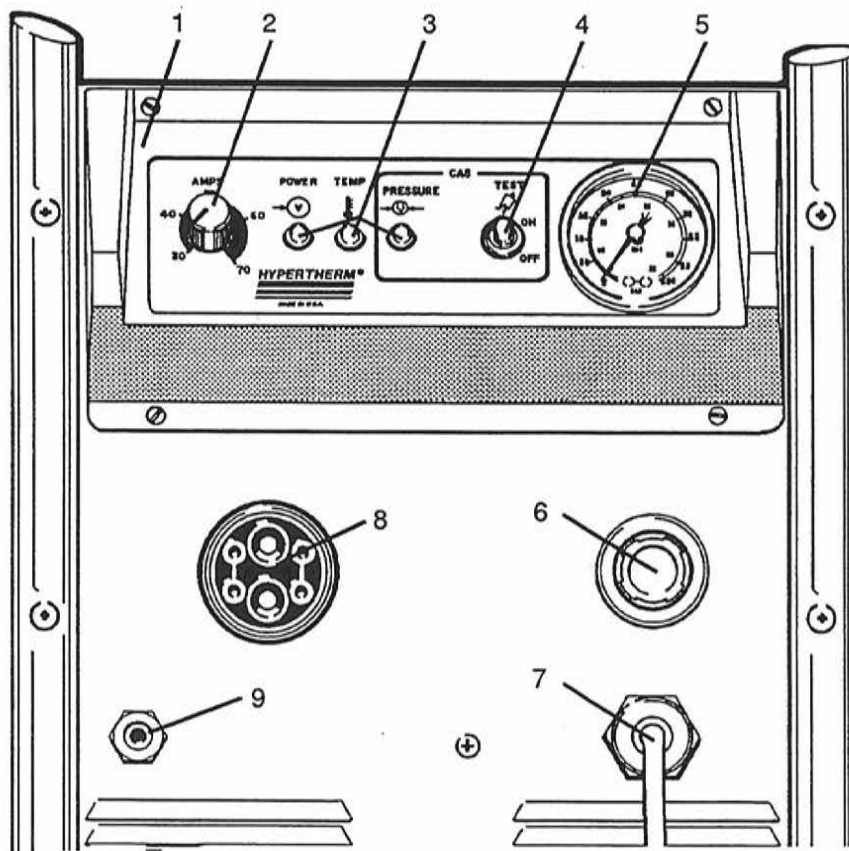


Figure 6-3 Front

# PARTS LIST

## Right Side

Index No.	Ref. Desig.	Part No.	Description	Quantity
1	PCB4	041323	PC BD Assy, Control	1
2	CR1	003021	Relay, Pilot Arc 120 VAC SPST NO	1
3		011059	Filter, 5 MIC 1/4 FPT Qube	1
4	R4	009469	Resistor, Adj 1.0 Ohm 300W	1
		029834	Gas Manifold SA	1
5	PS1	005174	Switch, Pressure 45 ± 1 Psi w/SCR	1
6	SV1	006066	Valve, Solenoid, 150 # 120V @ WNC	1
7	SV2	006066	Valve, Solenoid, 150 # 120V @ WNC	1
8	PS2	005169	Switch, Pressure 50 ± 6 Psi w/Baffle	1
9		001421	Center Panel, Power Supply	1
10		001423	Base, Power Supply	1
11****	T4	014140	Transformer, 4.5 KW, 208-240-480V/50 kHz	1
11**	T4	014154	Transformer, 200-400V/50 kHz	1
12	T8	014137	Transformer, Current 40 Amp	1
13*	PCB3	041336	PC BD Assy, Power, 480V, 3 Ph, M-I	1
13**	PCB3	041351	PC BD Assy, Power, 400V, 3 Ph, M-I	1
13***	PCB3	041340	PC BD Assy, Power, 208/240V, 1 Ph, M-I	1
14	L2	014165	Inductor, Output 2 MHY 35 Amp	1
15		023682	Cable, Work # 8 w/Clamp 15 ft. (4.6 m)	1
16		029811	Air Regulator SA	1
17	CS2	029202	Current Sensor SA	1
18	PCB6	041344	PC BD Assy, HF-I/O (part of HF-I/O Panel SA 029810)	1
19	F1, F2	008816	Fuse, 1/4A, 250V SLO 1/4 X 1-1/4	2
20	SG1	004061	Electrode, Spark Gap 1/8 X 1.6 (part of HF-I/O Panel SA 029810)	3
21****	HM1	027301	Hour Meter, 120 VAC 60 Hz	1
21**	HM1	027302	Hour Meter, 120 VAC 50 Hz	1
22	T5	029809	Transformer, HV SA	1
		029807	Control Panel SA	1
23		007034	Bezel, Front Panel Plastic	1
24	R1	009480	Res, Cermet 250 Ohm 1T 1W	1
25	PCB5	041333	PC BD Assy, LED Display	1
26	S2	005167	Switch, SPDT MTD Wire Leads .5H	1
27	PG1	022022	Gauge, Pressure 100 Psi/Bar	1
28		002202	Filter, Air, 6.5" X 10.5" X .5" (165 mm X 267 mm X 13 mm) Blk	1
29		004609	Plate, Fan Mounting Bracket	1
30		004607	Bracket, 6 inch Fan	1
31	M2	027300	Fan, 6-inch 115 VAC, 50-60 Hz, 160 CFM	1
32	PCB8	041298	PC BD Assy, MOV/Filter	1

\* Used on 480V Power Supply (# 072067)

\*\* Used on 400V Power Supply (# 072068 and # 072070)

\*\*\* Used on 208/240V Power Supply (# 072069)

# PARTS LIST

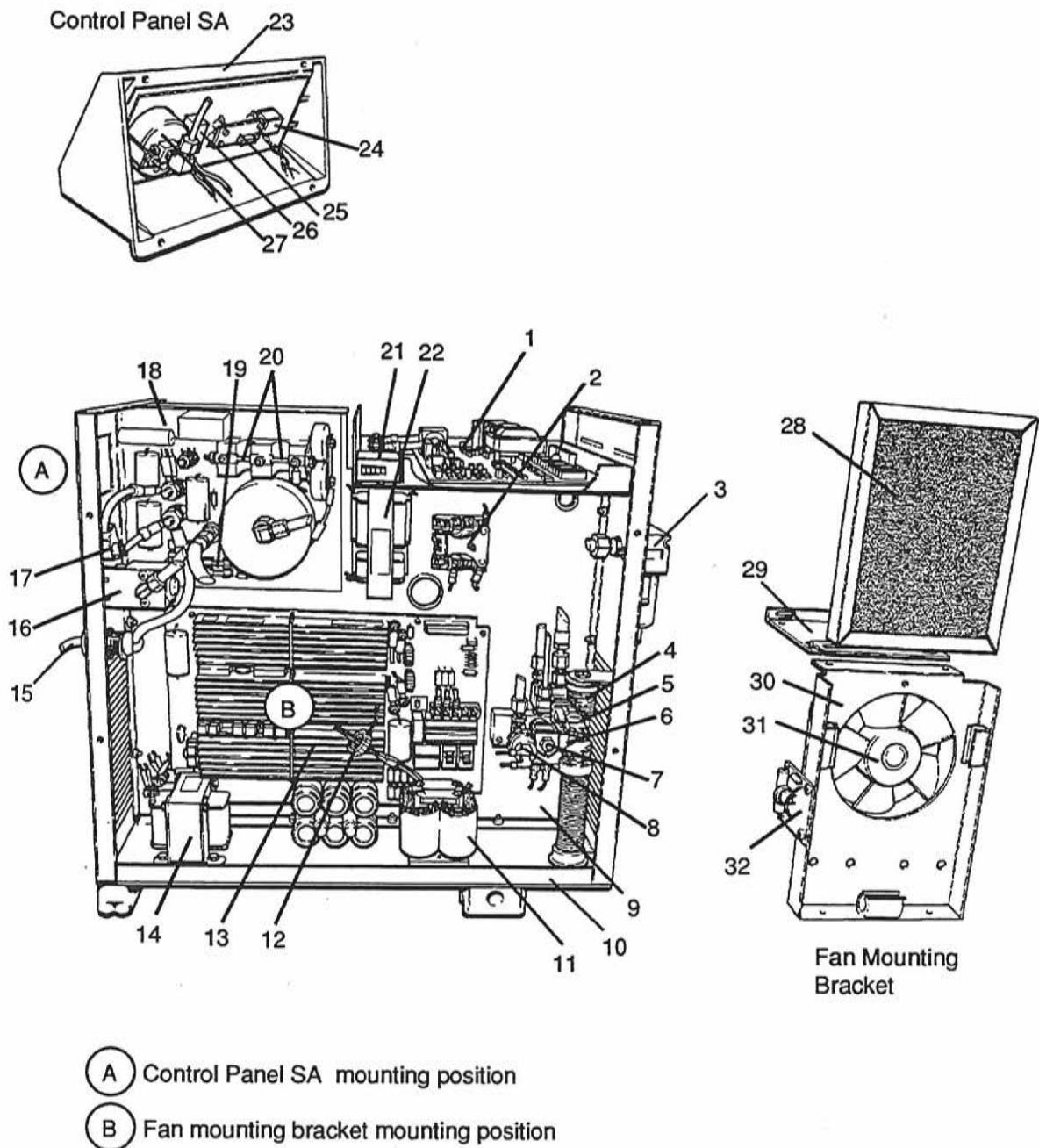


Figure 6-4 Right Side



# PARTS LIST

## Left Side

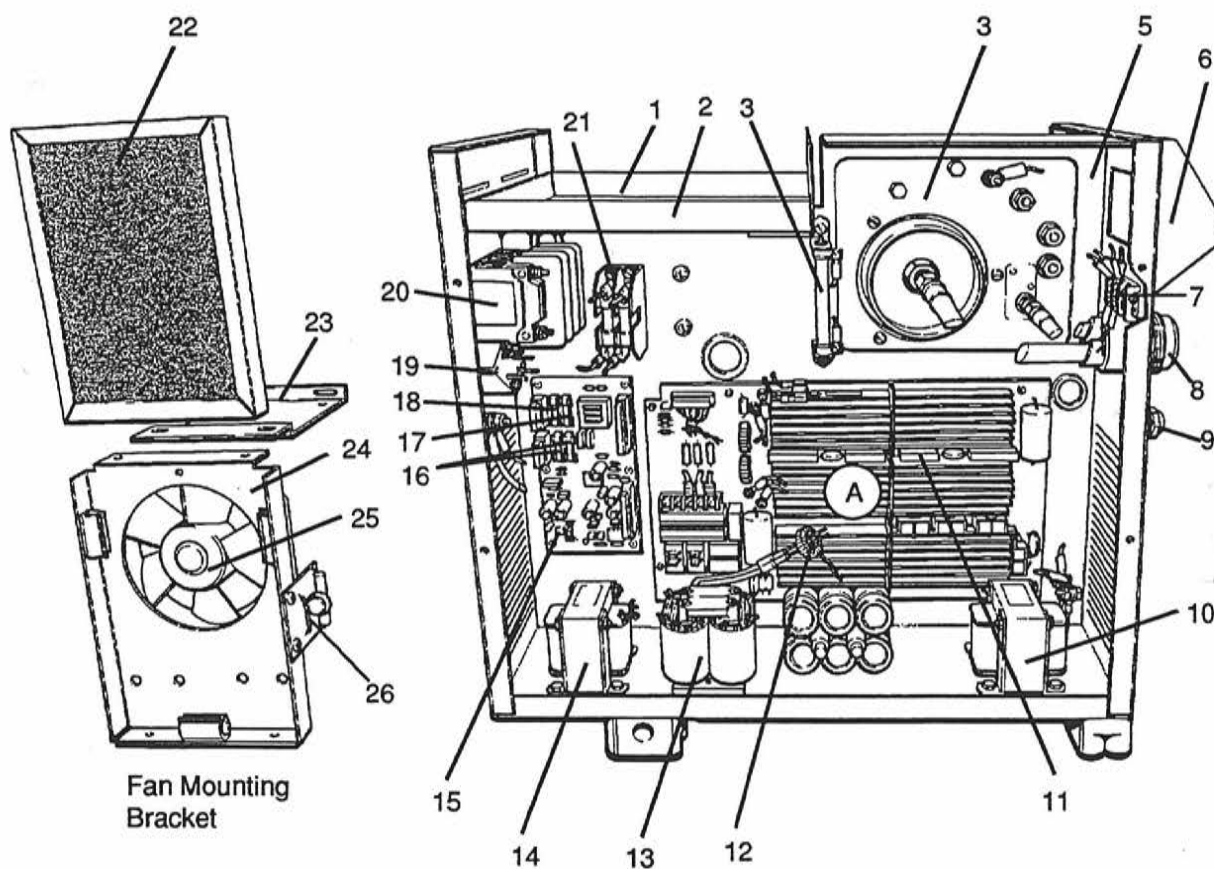
Index No.	Ref. Desig.	Part No.	Description	Quantity
1	PCB4	041323	PC BD Assy, Control	1
2		001422	Enclosure, Control PC BD Assy	1
3	R2	009622	Resistor, 10 Ohm 50W 5% W/L-Brk	1
4	PCB6	041344	PC BD Assy, HF-I/O (part of HF-I/O Panel SA 029810)	1
5		001421	Center Panel, Power Supply	1
6		029807	Control Panel SA	1
7	TB3	008063	Terminal Board, 3 Terminals	1
8*,**,*		028692	Receptacle Assy, Quick Disconnect	1
8****		004274	Shield Adapter, Torch Lead (Not shown)	1
9		008212	Relief, Strain, 1/2 NPT X .197-.354	1
		008643	Locknut, 1/2 NPT	1
10	L1	014165	Inductor, Output 2 MHY 35 Amp	1
11*	PCB2	041337	PC BD Assy, Power, 480V, 3 Ph	1
11**	PCB2	041350	PC BD Assy, Power, 400V, 3 Ph	1
11***	PCB2	041342	PC BD Assy, Power, 208/240V, 1 Ph	1
12	T7	014137	Transformer, Current 40 Amp	1
13*,**,*	T3	014140	Transformer, 4.5 KW, 208-240-480V/50 kHz	1
13**	T3	014154	Transformer, 200-400V/50 kHz	1
14*,**	T1	029808	Transformer, Control SA, 400V & 480V	1
14***	T1	029828	Transformer, Control SA, 208/240V	1
15*,**	PCB1	041346	PC BD Assy, Power Distribution, 400V & 480V	1
15***	PCB1	041348	PC BD Assy, Power Distribution, 208/240V	1
16	F2, F3	008658	Fuse, 1A 250V 1/4 X1-1/4 SLO	2
17	F4	008872	Fuse, 2A 250V 1/4 X1-1/4 SLO	1
18	F1	008259	Fuse, 3A 250V 1/4 X1-1/4 SLO	1
19*,**		029674	Assy, MOV/Cap	1
20*,**	S1	003145	Circuit Breaker, 4P 480V 3-Hdl w/Tch	1
20***	S1	003144	Circuit Breaker, 5P 5A 240V	1
21*,**	F1, F2	008809	Fuse, 1A, 600V SLO	2
21***	F1, F2	008239	Fuse, 2A, 500V SLO	2
22		002202	Filter, Air, 6.5" X 10.5" X .5" (165 mm X 267 mm X 13 mm) Blk	1
23		004609	Plate, Fan Mounting Bracket	1
24		004607	Bracket, 6 inch Fan	1
25	M1	027300	Fan, 6-inch 115 VAC, 50-60 Hz, 160 CFM	1
26	PCB7	041298	PC BD Assy, MOV/Filter	1

\* Used on 480V Power Supply (# 072067)

\*\* Used on 400V Power Supply (# 072068 and # 072070)

\*\*\* Used on 208/240V Power Supply (# 072069)

\*\*\*\* Used on 400V Power Supply (# 072070) only



(A) Fan mounting bracket mounting position.

Figure 6-5 Left Side

## **PARTS LIST**

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# PARTS LIST

## Rear

Index No.	Ref. Desig.	Part No.	Description	Quantity
1***	S1	003145	Circuit Breaker, 4P 480V 3-Hdl w/Tch	1
1***	S1	003144	Circuit Breaker, 5P 5A 240V	1
2**		023203	Cord, Power 10 Awg X 4 SO 10 ft (3 m)	1
2***		023690	Cord, Power 4 Awg X 3 SO 10 ft (3 m)	1
3		011059	Filter, 5 MIC 1/4 FPT Qube	1
4#		011054	Filter Element	1

\* Used on 480V Power Supply (# 072067)

\*\* Used on 400V Power Supply (# 072068 and # 072070)

\*\*\* Used on 208/240V Power Supply (# 072069)

# 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.

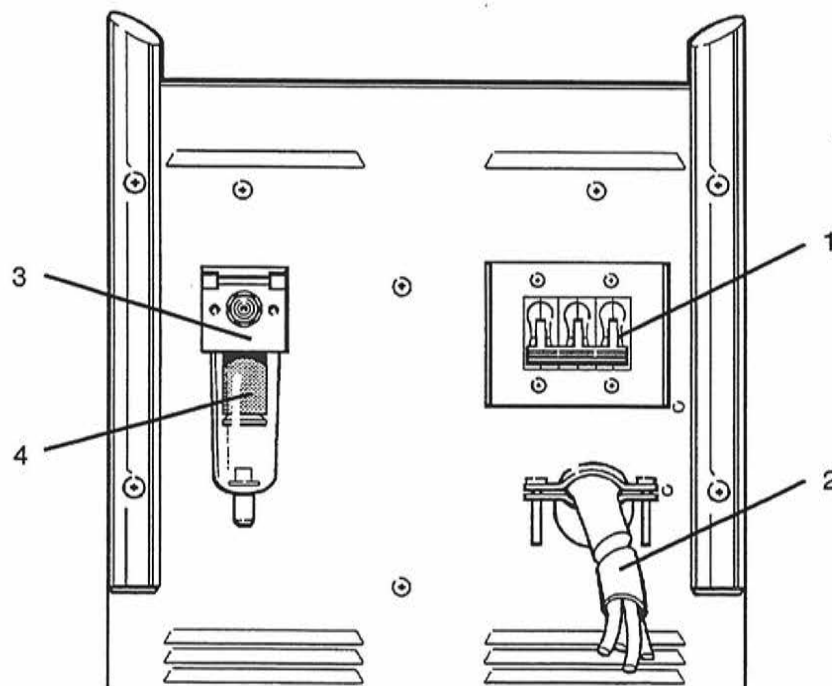


Figure 6-6 Rear



# PARTS LIST

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## PAC130/MAX70 MACHINE TORCH CONSUMABLES

### Consumable Parts

Consumables	Part Number	Description
Shielded Parts (40-amp)	020492	Shield, machine, 40-amp
	020490	Cap, shield, 40-amp
	020396	Nozzle, shield, 40-amp
	020194	Swirl ring
	020191	Electrode, air
Shielded Parts (70-amp)	020335	Shield, hand, 70-amp
	020334	Shield, machine, 70-amp
	020336	Cap, shield, 70-amp
	020397	Nozzle, shield, 70-amp
	020194	Swirl ring
Non-shielded Parts	020191	Electrode, air
	020333	Deflector
	020336	Cap, shield
	020184	Cap, retaining, standard
	020345	Nozzle, standard, 70-amp
Gouging Parts	020203	Nozzle, standard, 40-amp
	020194	Swirl ring
	020191	Electrode, air
	020712	Shield, gouging
	020336	Cap, shield
Extended Parts	020878	Nozzle, gouging
	020194	Swirl ring
	020744	Electrode, air
	020333	Deflector
	020336	Cap, shield
	020184	Cap, retaining, standard
	020563	Nozzle, extended, PAC130
	020194	Swirl ring
	020564	Electrode, extended, PAC130

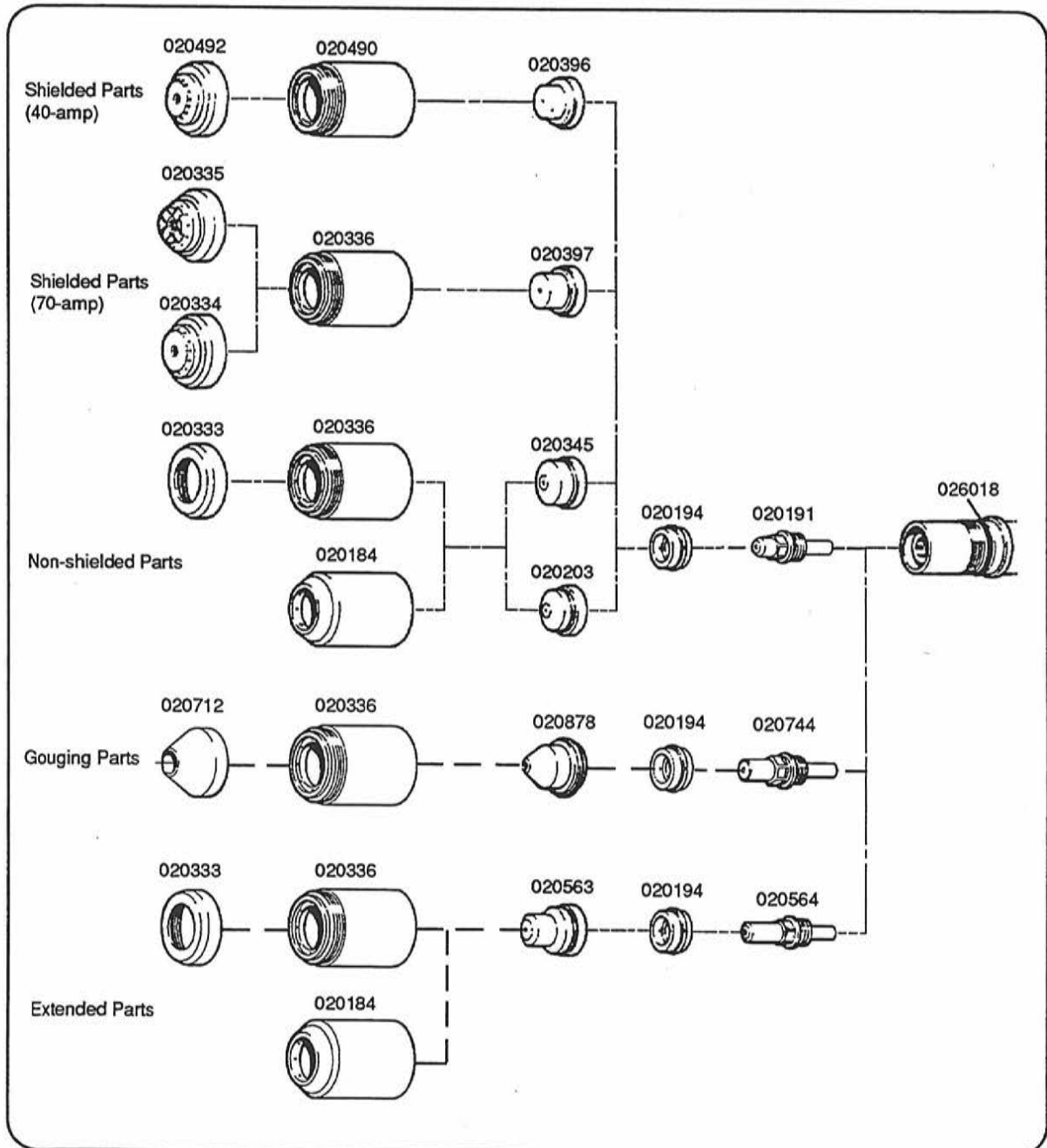


Figure 6-7 PAC130/MAX70 Machine Torch Consumable Parts

# PARTS LIST

---

## PAC130/MAX70 Machine Torch Consumable Spare Parts Kit (028696)

<u>Part Number</u>	<u>Description</u>
001285 .....	Box (1)
020191 .....	Electrode (5)
020194 .....	Swirl ring (1)
020397 .....	.052 Nozzle (5)
026018 .....	O-ring (5)
027055 .....	Silicone (1)
027102 .....	Wrench (1)

## PAC130 TORCH ASSEMBLY AND TORCH LEADS

### Torch Assembly

<u>Part Number</u>	<u>Description</u>
020461 .....	PAC130 Torch Main Body
005094 .....	Switch, Pushbutton, Torch
020468 .....	Negative Lead Insulator
020536 .....	Lead Insulator
074069 .....	Splice, Butt, Insulated (Two required)
001214 .....	Handle, PAC130
075365 .....	Screw # 6 x 3/4"
001217 .....	Boot, PAC130

### Torch Assembly and Torch Lead w/QDisc

<u>Part Number</u>	<u>Description</u>
072037 .....	w/25-ft. (7.6 m) Torch Lead
072038 .....	w/50-ft. (15.2 m) Torch Lead

### Torch Assembly and Torch Lead w/o QDisc

<u>Part Number</u>	<u>Description</u>
072016 .....	w/25-ft. (7.6 m) Torch Lead
072017 .....	w/50-ft. (15.2 m) Torch Lead

### Torch Lead w/QDisc

<u>Part Number</u>	<u>Description</u>
029667 .....	w/25-ft. (7.6 m) Torch Lead
029668 .....	w/50-ft. (15.2 m) Torch Lead

# PARTS LIST

## Torch Lead w/o QDisc

<u>Part Number</u>	<u>Description</u>
029198 .....	w/25-ft. (7.6 m) Torch Lead

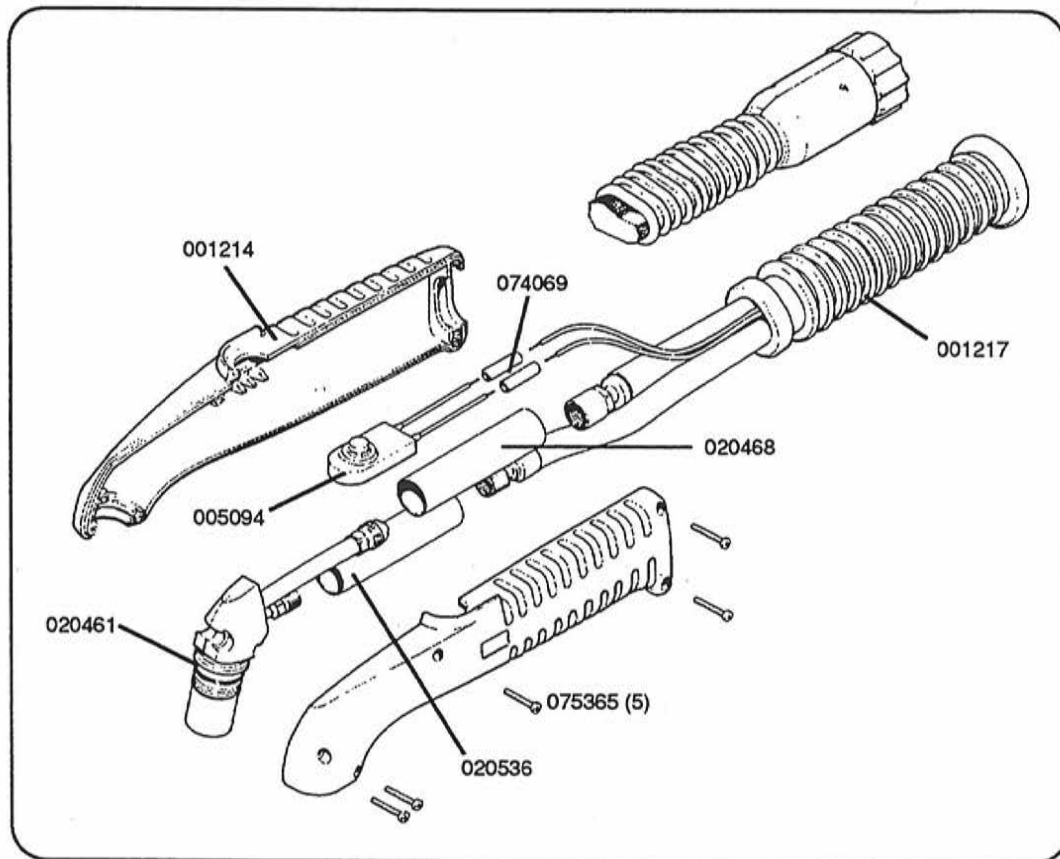


Figure 6-8 PAC130 Torch Assembly

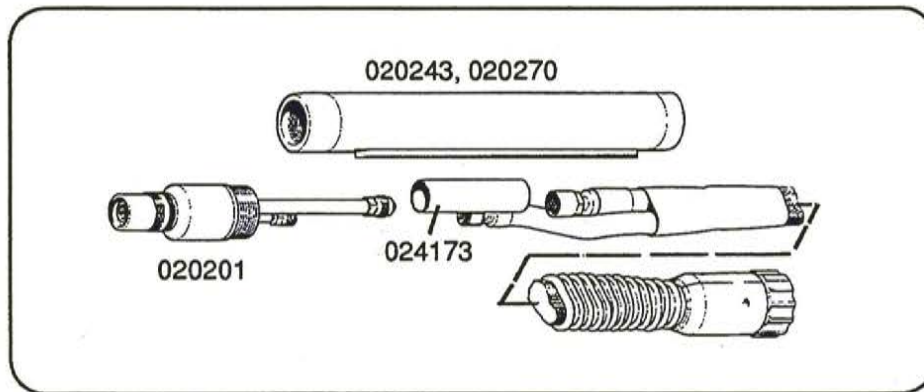


# **PARTS LIST**

## **MAX70 MACHINE TORCH ASSEMBLY AND TORCH LEADS**

### **Torch Assembly**

<u>Part Number</u>	<u>Description</u>
020201 .....	180° Torch Main Body
020243 .....	Sleeve, Torch Position, 10-3/4 inches (273 mm)
020270 .....	Sleeve, Torch Position, 18 inches (457 mm)
024173 .....	Lead Insulator



**Figure 6-9 Machine Torch Assembly**

### **Torch Assembly and Torch Lead w/QDisc**

<u>Part Number</u>	<u>Description</u>
072057 .....	w/25-ft. (7.6 m) Torch Lead
072058 .....	w/50-ft. (15.2 m) Torch Lead

### **Torch Assembly and Torch Lead w/o QDisc**

<u>Part Number</u>	<u>Description</u>
072071 .....	w/25-ft. (7.6 m) Torch Lead
072072 .....	w/50-ft. (15.2 m) Torch Lead

### **Torch Lead w/QDisc**

<u>Part Number</u>	<u>Description</u>
028524 .....	w/25-ft. (7.6 m) Torch Lead
028525 .....	w/50-ft. (15.2 m) Torch Lead

## PARTS LIST

### Torch Lead w/o QDisc

<u>Part Number</u>	<u>Description</u>
028326 .....	w/25-ft. (7.6 m) Torch Lead
028327 .....	w/50-ft. (15.2 m) Torch Lead

### REMOTE PLASMA START SWITCH ASSEMBLY, 25 FT (072096)

<u>Part Number</u>	<u>Description</u>
028714 .....	Rermote Switch w/25-ft. (7.6 m) Lead
023706 .....	Plasma Start Lead 1-ft. (305 mm)

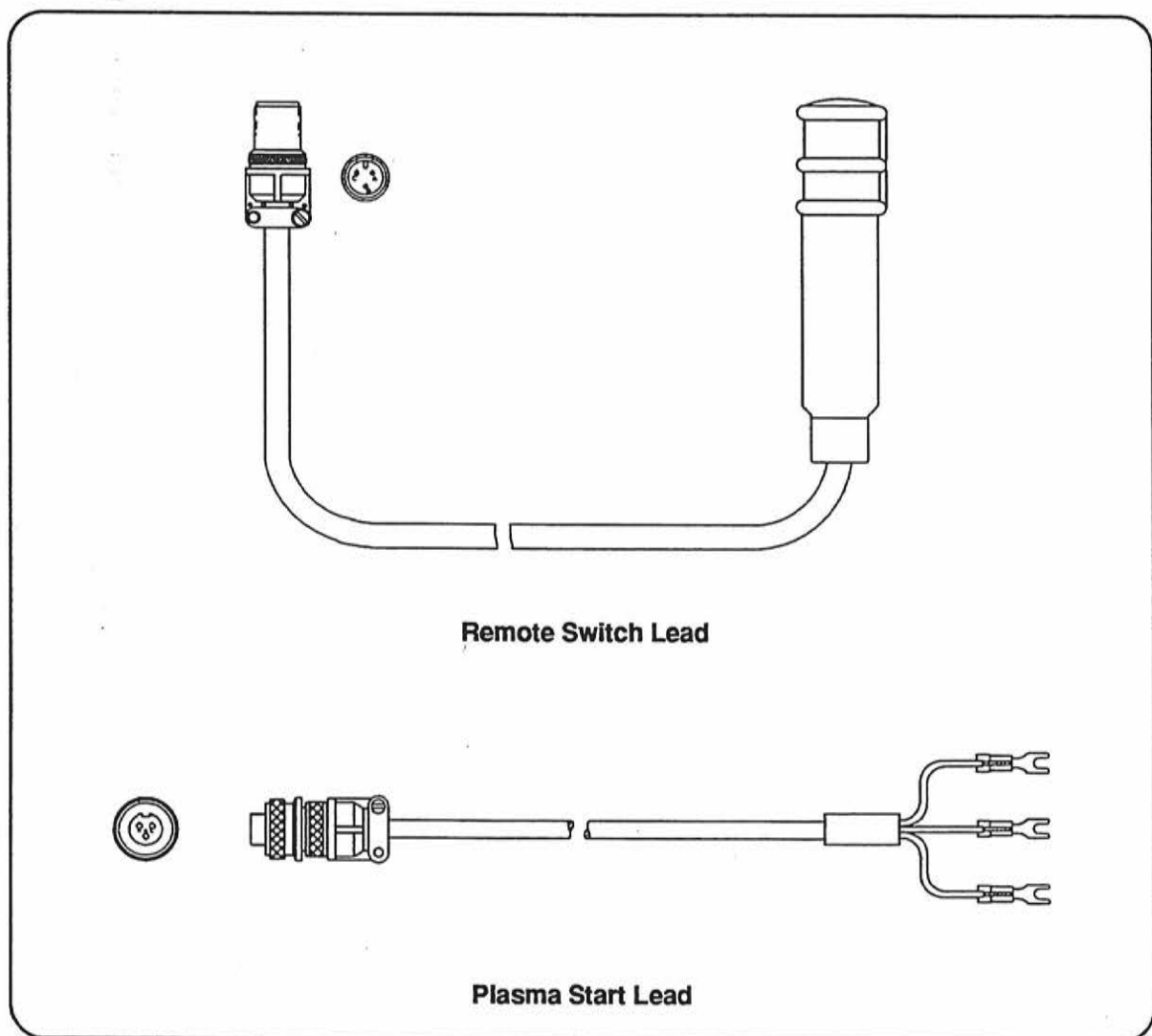


Figure 6-10 Remote Plasma Start Switch Assembly

# PARTS LIST

## RECOMMENDED SPARE PARTS

### Power Supplies

Desig.	Part No.	Description	Quantity
PG1	022019	Gauge, Pressure 100 Psi/Bar	1
R1	009480	Res, Cermet 250 Ohm 1T 1W	1
S2	005167	Switch, SPDT, MTD Wire Leads .5H	1
	023682	Cable, Work # 8 w/Clamp 15 ft. (4.6 m)	1
	029811	Air Regulator SA	1
PCB4	041323	PC BD Assy, Control	1
CR1	003021	Relay, Pilot Arc 120 VAC SPST NO	1
R2	009622	Resistor, 10 Ohm 50W 5% W/L Brk	1
	011059	Filter, 5 MIC 1/4 FPT Qube	1
PS2	005169	Switch, Pressure 50± 6 Psi w/Baffle	1
PS1	005174	Switch, Pressure 45± 1 Psi w/SCR	1
SV1, SV2	006066	Valve, Solenoid, 150 # 120V @ WNC	1
T3, T4***	014140	Transformer, 4.5 KW, 208-240-480V/50 kHz	1
T3, T4**	014154	Transformer, 200-400V/50 kHz	1
T7, T8	014137	Transformer, Current 40 Amp	1
PCB3*	041336	PC BD Assy, Power, 480V, 3 Ph, M-I	1
PCB3**	041351	PC BD Assy, Power, 400V, 3 Ph, M-I	1
PCB3***	041340	PC BD Assy, Power, 208/240V, 1 Ph, M-I	1
L1, L2	014165	Inductor, Output 2 MHY 35 Amp	1
PCB6	041344	PC BD Assy, HF-I/O	1
F1, F2	008816	Fuse, 1/4A, 250V SLO 1/4 X 1-1/4	2
SG1	004061	Electrode, Spark Gap 1/8 X 1.6	3
T5	029809	Transformer, HV SA	1
HM1***	027301	Hour Meter, 120 VAC 60 Hz	1
HM1**	027302	Hour Meter, 120 VAC 50 Hz	1
	002202	Filter, Air, 6.5" X 10.5" X .5" (165 mm X 267 mm X 13 mm) Blk	1
M1, M2	027300	Fan, 6-inch 115 VAC, 50-60 Hz, 160 CFM	1
PCB7, PCB8	041298	PC BD Assy, MOV/Filter, 3 Ph	1
PCB2*	041337	PC BD Assy, Power, 480V, 3 Ph	1
PCB2**	041350	PC BD Assy, Power, 400V, 3 Ph	1
PCB2***	041342	PC BD Assy, Power, 208/240V, 1 Ph	1
T1***	029808	Transformer, Control SA, 400V & 480V	1
T1**	029828	Transformer, Control SA, 208/240V	1
PCB1***	041346	PC BD Assy, Power Distribution, 400V & 480V	1
PCB1**	041348	PC BD Assy, Power Distribution, 208/240V	1
F2, F3	008658	Fuse, 1A 250V 1/4 X1-1/4 SLO	2
F4	008872	Fuse, 2A 250V 1/4 X1-1/4 SLO	1
F1	008259	Fuse, 3A 250V 1/4 X1-1/4 SLO	1
*,**	029674	Assy, MOV/Cap	1
S1***	003145	Circuit Breaker, 4P 480V 3-Hdl w/Tch	1
S1**	003144	Circuit Breaker, 5P 5A 240V	1

## PARTS LIST

F1, F2**	008809	Fuse, 1A, 600V SLO	2
F1, F2***	008239	Fuse, 2A, 500V SLO	2
***	023203	Cord, Power 10 Awg X 4 SO 10 ft (3 m)	1
***	023690	Cord, Power 4 Awg X 3 SO 10 ft (3 m)	1
	011059	Filter, 5 MIC 1/4 FPT Qube	1
#	011054	Filter Element	1

\* Used on 480V Power Supply w/QDisc (# 072067)

\*\* Used on 400V Power Supply w/Qdisc (# 072068)

\*\*\* Used on 208/240V Power Supply w/Qdisc (# 072069)

\*\*\*\* Used on 400V Power Supply w/o Qdisc (# 072070)

# 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.

### PAC130 Torch Assembly

Part No.	Description	Quantity
001214	Handle, PAC130	1
075365	Screws, # 6 x 3/4	5
020468	Negative Lead Insulator	1
020536	Lead Insulator	1
074069	Splice, Butt Insulated	2
005094	Switch, Torch Pushbutton	1
020461	PAC130 Torch Main Body	1
001217	Boot, PAC130	1

### MAX70 Machine Torch Assembly

Part No.	Description	Quantity
020201	180° Torch Main Body	1
020243	Sleeve, Torch Position, 10-3/4 inches (273 mm)	1
020270	Sleeve, Torch Position, 18 inches (457 mm)	1
024173	Lead Insulator	1



## **PARTS LIST**

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# Section 7 STANDARDS INDEX

In this section:

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# STANDARDS INDEX

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For further information concerning safety practices to be exercised with plasma arc cutting equipment, please refer to the following publications:

1. ANSI Standard Z49.1, *Safety in Welding and Cutting*, obtainable from the American Welding Society, 550 LeJeune Road, P.O. Box 351020, Miami, FL 33135.
2. NIOSH, *Safety and Health in Arc Welding and Gas Welding and Cutting*, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
3. OSHA, *Safety and Health Standards*, 29FR 1910, obtainable from the U.S. Government Printing Office, Washington, D.C. 20402.
4. ANSI Standard Z87.1, *Safe Practices for Occupation and Educational Eye and Face Protection*, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
5. ANSI Standard Z41.1, *Standard for Men's Safety-Toe Footwear*, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
6. ANSI Standard Z49.2, *Fire Prevention in the Use of Cutting and Welding Processes*, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
7. AWS Standard A6.0, *Welding and Cutting Containers Which Have Held Combustibles*, obtainable from the American Welding Society, 550 LeJeune Road, P.O. Box 351040, Miami, FL 33135.
8. NFPA Standard 51, *Oxygen — Fuel Gas Systems for Welding and Cutting*, obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
9. NFPA Standard 70-1978, *National Electrical Code*, obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
10. NFPA Standard 51B, *Cutting and Welding Processes*, obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
11. CGA Pamphlet P-1, *Safe Handling of Compressed Gases in Cylinders*, obtainable from the Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.
12. CSA Standard W117.2, *Code for Safety in Welding and Cutting*, obtainable from the Canadian Standards Association Standard Sales, 178 Rexdale Boulevard, Rexdale, Ontario M9W 1R3, Canada.
13. NWSA booklet, *Welding Safety Bibliography*, obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103.
14. American Welding Society Standard AWS F4.1, *Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances*, obtainable from the American Welding Society, 550 LeJeune Road, P.O. Box 351040, Miami, FL 33135.

## STANDARDS INDEX

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15. ANSI Standard Z88.2, *Practices for Respiratory Protection*, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
16. Canadian Electrical Code Part 1, *Safety Standards for Electrical Installations*, obtainable from the Canadian Standards Association, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W1R3.



## **STANDARDS INDEX**

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## Appendix A    FILTERS

In this section:

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Hankison® Centriflex® Filters .....	a-2
Hankison® Aerolescer® Filters .....	a-4
Hankison® Hypersorb® Filters .....	a-6

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# HANKISON® CENTRIFLEX® Compressed Air Separator/Filter



**Efficient Separation and 3 Micron Filtration in One Compact Housing**

## SEPARATION—

### The First Stage

A unique stainless steel separator core, using the principles of centrifugal force and impaction, is 99% efficient in removing particles 10 microns in size and larger.

The reusable cartridge type separator is completely removable for easy cleaning.

## FILTRATION—

### The Second Stage

A replacement filter sleeve, which fits over the separator core, assures absolute removal of solids and liquids 3 microns and larger in size.

### Solids removal — finer filtration at less cost

The filter sleeve, constructed of an in-depth arrangement of glass fibers, has a high percentage of void spaces, allowing it to accumulate 3 to 4 times more particulates than coarser surface (pore) type filter element materials such as porous metal and plastic. Also the in-depth arrangement of fibers resists clogging due to gummy residues and sticky lacquers which are frequently present in compressed air systems and readily adhere to and foul surface type filters. This ability to accumulate large amounts of solid particles and resist clogging means that there is only a gradual increase in pressure drop across the filter, resulting in a long operating life and less operating cost.

### Liquids removal — higher efficiencies from no flow to full flow

By using coalescence to force small droplets to form into larger droplets, the filter media continually collects all liquid droplets 3 microns in size and larger, as well as a portion of smaller droplets. This means that 99% of water droplets and 40% of oil aerosols are collected and discharged from the system.

The combination of filter sleeve and separator core ensures high efficiency liquid separation over a full range of flows. There is no reduction in efficiency at less than rated flows, a common occurrence in purely centrifugal separators.

## FEATURES:

- High efficiency separation — removes 99% of water droplets, 40% of oil aerosols.
- Combination of separator core and filter sleeve maintain high efficiency from no flow to full flow.
- Replaceable filter sleeve removes 100% of particles 3 microns and larger in size — while giving long sleeve life.

## Housing design — features easy installation and maintenance

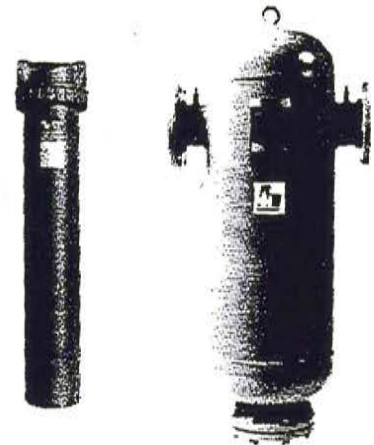
The in-line, inlet and outlet connection design reduces installation time and expense. Additional piping to maintain alignment is not required. Cartridge replacement is made easy by removable bowls for models C15 through C300 and by use of a convenient bottom access for models C400 and larger.

## OPERATION

Air enters the top of the Centriflex separator/filter and flows down through the center of the separator core and radially outward. The air is subjected to a strong centrifugal force as it passes through the separator core which is constructed of a pair of stainless steel perforated tubes. The orifices in the first tube (A) are staggered in relation to those in the second (B). This causes particles 10 microns and larger to continue in a straight course after leaving the inner tube, impacting and impinging on the inside of the outer tube where they form a film which drains to the bottom of the separator core.

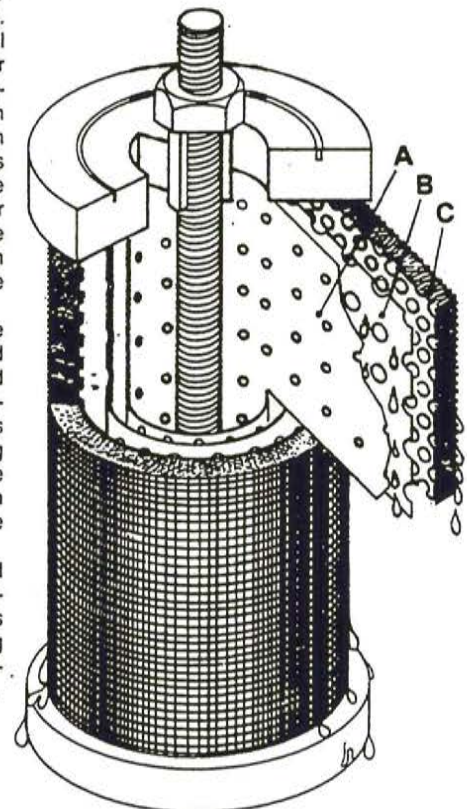
The air then passes into the filter sleeve (C) which is composed of an in-depth bed of resin impregnated glass fibers. Solid particles (to 3 microns absolute) are captured and retained here. Liquid aerosols are coalesced on the glass fibers forming large droplets which move downward to the bottom of the cartridge where they drain by gravity into the filter housing and are removed from the air system.

This combination of separation and coalescence allows the Centriflex separator/filter to handle large inlet liquid loads (up to 25,000 ppm w/w) while removing 99% of water droplets and 40% of oil aerosols over a full range of flow conditions.



MODEL C150

MODEL C6600



## OPERATING CONDITIONS

Flow: maximum air flow for the various models at 100 psig is indicated in Table 1. To determine maximum air flows at inlet pressures other than 100 psig, multiply flow from Table 1 by multiplier from Table 2 that corresponds to the minimum operating pressure at the inlet of the filter.

### EXAMPLE:

Choose a Centriflex separator/filter to handle 705 scfm at 150 psig. From Table 1 pick a C600 with an air flow of 600 scfm @ 100 psig. Multiply 600 scfm by the correction factor 1.43 for 150 psig from Table 2 ( $600 \times 1.43 = 858$ ). A C600 has ample capacity for this requirement.

### CAUTION:

Do not select filters by pipe size. Make selection by flow rate and operating pressure only.

## Pressure Drop:

Initial pressure drop (dry) is less than 1 psi. Increases in pressure drop above this point occur as the cartridge is loaded with solid contaminants. It is recommended that filter cartridge(s) be replaced when pressure drop exceeds 10 psi.

## OPTIONS

### Automatic Drains

Hankison drains automatically discharge liquids collected in the filter sump from the compressed air system. They are available with the drain mechanism mounted internally on smaller models or in their own housings for external mounting on larger models.

## Differential Pressure Alarms

(Optional on models C15 thru C600; standard on models C1200 and larger.) The Hankison differential pressure alarm signals both audibly and visually when a 10 psi differential pressure has been reached, indicating the need for cartridge replacement.

## Stainless Steel Cartridges

Cartridges may be ordered with stainless steel materials for use in systems where corrosive fumes are present in the compressed air system.

**TABLE 1**  
Maximum Air Flow (scfm\*) @ 100 psig

MODEL	C15	C35	C55	C100	C150	C200	C300	C400	C600	C1200	C1800	C2400	C3000	C4800	C6600	C8400	C11400
FLOW	15	35	55	100	150	200	300	400	600	1200	1800	2400	3000	4800	6600	8400	11400

\*Convert scfm to metric units as follows: 1 scfm = 1.736 m<sup>3</sup>/h

**TABLE 2**  
Air Flow Correction Factor

Minimum inlet pressure (psig)	20	30	40	60	80	100	120	150	200	250	300
Multiplier	0.30	0.39	0.48	0.65	0.82	1.00	1.17	1.43	1.87	2.31	2.74

## PHYSICAL DESCRIPTION

Model Number		Housing Type	Maximum Operating Pressure (psig)		Maximum Operating Temperature	Air Inlet/Outlet Conn.	Width (Inlet to Outlet) and Height (in.)	Wt. (lb.)	Replacement Filter Cartridge	
with Manual Drain	with Internal Auto Drain		with Manual Drain	with Internal Auto Drain					No.	Qty. Req'd.
C15-03F-8P	—	8 oz. polycarbonate (2)	50	—	120°F	3/8" NPTF	3 1/4 x 6 1/2	1 5/8	0734-1	1
C15-03F-16P	—	16 oz. polycarbonate (2)	50	—	120°F	3/8" NPTF	3 1/4 x 10 1/2	2 1/2	0734-1	1
C15-03F-16M	C15-03F-16M-D	16 oz. metal	300	175	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0734-1	1
C15-04F-16P	C15-04F-16P-D	16 oz. polycarbonate (2)	50	150	120°F	1/2" NPTF	3 1/4 x 10 1/2	2 1/2	0734-1	1
C15-04F-16M	C15-04F-16M-D	16 oz. metal	300	175	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0734-1	1
C35-03F-16P	C35-03F-16P-D	16 oz. polycarbonate (2)	50	150	120°F	3/8" NPTF	3 1/4 x 10 1/2	2 1/2	0734-2	1
C35-03F-16M	C35-03F-16M-D	16 oz. metal	300	175	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0734-2	1
C35-04F-16P	C35-04F-16P-D	16 oz. polycarbonate (2)	50	150	120°F	1/2" NPTF	3 1/4 x 10 1/2	2 1/2	0734-2	1
C35-04F-16M	C35-04F-16M-D	16 oz. metal	300	175	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0734-2	1
C55-08F-48	C55-08F-48-D	48 oz. metal	300	175	120°F	1" NPTF	4 9/16 x 13 9/16	5 7/8	0734-3	1
C100-08F-48	C100-08F-48-D	48 oz. metal	300	175	120°F	1" NPTF	4 9/16 x 13 9/16	5 7/8	0734-3	1
C150-12F-100	(1)	100 oz. metal	300	—	120°F	1 1/2" NPTF	5 1/4 x 23 1/2	13 1/4	0734-4	1
C200-12F-205	(1)	205 oz. metal	300	—	120°F	1 1/2" NPTF	5 1/4 x 30 5/8	21	0734-5	1
C300-12F-205	(1)	205 oz. metal	300	—	120°F	1 1/2" NPTF	5 1/4 x 30 5/8	21	0734-6	1
C400-16M-5L	(1)	5" pressure vessel	300 (3)	300 (3)	120°F	2" NPTM (4)	10 1/4 x 40 7/8	36	0734-7	1
C600-24M-5L	(1)	5" pressure vessel	300 (3)	300 (3)	120°F	3" NPTM (4)	10 1/4 x 40 7/8	37	0734-7	1
C1200-24M-8L	(1)	8" pressure vessel	225 (3)	—	120°F	3" NPTM (4)	16 x 48	86	0734-7	2
C1800-24M-10L	(1)	10" pressure vessel	225 (3)	—	120°F	3" NPTM (4)	16 1/4 x 49	131	0734-7	3
C2400-4FL-12L	(1)	12" pressure vessel	225 (3)	—	120°F	4" flange (5)	20 x 52 1/4	179	0734-7	4
C3000-4FL-12L	(1)	12" pressure vessel	225 (3)	—	120°F	4" flange (5)	20 x 52 1/4	182	0734-7	5
C4800-6FL-16L	(1)	16" pressure vessel	225 (3)	—	120°F	6" flange (5)	24 x 54 5/8	271	0734-7	8
C6600-6FL-20L	(1)	20" pressure vessel	225 (3)	—	120°F	6" flange (5)	28 x 62 9/16	518	0734-7	11
C8400-6FL-20L	(1)	20" pressure vessel	225 (3)	—	120°F	6" flange (5)	28 x 62 9/16	527	0734-7	14
C11400-8FL-24L	(1)	24" pressure vessel	225 (3)	—	120°F	8" flange (5)	33 x 69 1/8	709	0734-7	19

(1) Drain port is provided. Use externally mounted Hankison® automatic drain. For models C150 thru C600 use a model 505 Trip-L-Trap. For models C1200 and larger use a model 506 Trip-L-Trap. Models C400 and C600 may also be supplied with an internal drain.

(2) Polycarbonate bowls are furnished with bowl guards. Do not use polycarbonate bowls when synthetic lubricants are present.

(3) Units with higher maximum working pressures are available. Models C1200 and larger are ASME code constructed and stamped.

(4) Flanges and couplings are available.

(5) Optional flange sizes are available.



**HANKISON®**

**AEROLESCER®**

## Coalescing Type Oil Removal Filters



99.999+% efficient in removing oil aerosols from compressed air lines.

### Why remove oil?

Compressor oil downstream — it can contaminate the end product, decrease the efficiency of the production process by ruining paint jobs, gumming up air tools, motors, etc., or clog the tiny orifices in instruments or fluid logic components. Oil from a lubricated compressor is subjected to high temperatures during the compression cycle. This alters its characteristics so that it does not adequately lubricate downstream pneumatic components. It's best to take this oil out of the system and add the proper lubricant at the point of use.

### Are special filters required to remove oil?

In a typical 90 psig air system 72% by weight of the oil aerosols present are less than 5 microns in size. 50% are below 1 micron in size. Droplets of this size blow right through a mechanical separator. Air line filters (particulate filters e.g. a 5 micron filter) can't trap the bulk of the aerosols either. To adequately remove oil, a special filter is required. The Hankison Aerolescer filter has been designed to remove oil by means of coalescence.

### The result — an oil free compressed air system

The Hankison Aerolescer filter, when used within its rated design conditions, will eliminate the oil aerosols contained in a compressed air stream. Exhaustive tests verify a liquid oil removal efficiency of 99.999+%. In most instances, this means that the filtered air will contain less than .1 ppm of oil by weight. It assures virtually oil free air without the expense and maintenance headaches of non-lubricated compressors.

### Features:

- Unique continuously stabilized filter media plus outer foam sleeve ensures 99.999+% efficiency for the life of the cartridge
- Removes: 100% of particles .025 micron and larger in size; some particles as small as .01 micron
- Cartridge replacement made easy by removable bowls or convenient bottom flange opening
- Rugged thru-bolt cartridge construction

MODELS from  
10 SCFM to 6000 SCFM



MODEL A300

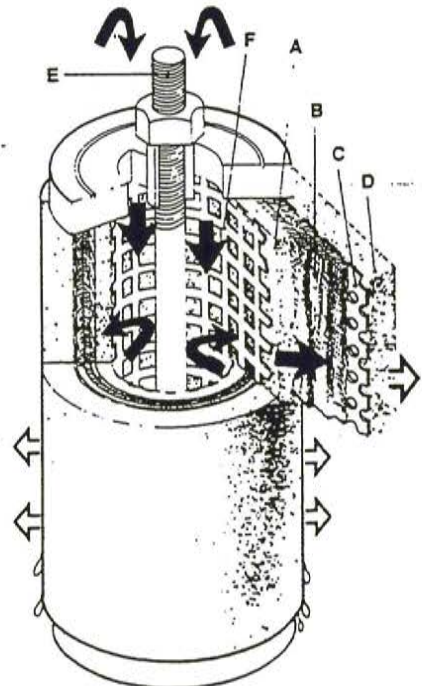


MODEL A900

### The Patented\* AEROLESCER Cartridge — designed for 99.999+% efficiency and long life

#### OPERATION

Oil aerosols moving through the filtering media (B), a maze of submicronic glass fibers with specific densities and diameters, are concentrated and coalesced into large droplets. High efficiency is achieved by stabilizing the filtering media between a rigid perforated cylinder (C) and an inner foam sleeve (A), which compensates for fluctuating flow rate and aerosol concentration. This design assures uniform distribution of oil aerosols which prevents liquid pocketing, fiber clotting, and subsequent air channelling. The coalesced oil droplets are collected by the outer foam sleeve (D). Having an enormous non-absorbing surface area, this sleeve allows oil droplets to drain to the bottom of the sleeve and then drop to the bottom of the housing for removal from the air system. When removing oil the life of the cartridge is indefinite.\*\* The cartridge continuously coalesces and separates oil aerosols from your system. Thru bolt construction (E) assures structural strength and prevents liquid bypassing of the filter media. There is no reliance on adhesives to hold the unit together. An inside support (F) offers positive protection in case flow is accidentally reversed through the cartridge.



\*U.S. Patent No. 3,802,160

\*\*Excessive solid matter accumulation will limit life. Prefilters are available to prolong life. Request Bulletin 3100 covering HANKISON 3100 Series Air Line Filters.

## Operating Conditions

Flow: maximum air flow for the various models at 100 psig is indicated in Table 1. To determine maximum air flows at inlet pressures other than 100 psig, multiply flow from Table 1 by multiplier from Table 2 that corresponds to the minimum operating pressure at the inlet of the filter.

### EXAMPLE:

Choose an Aerolser filter to handle 705 scfm at 150 psig. From Table 1 pick an A500 with an air flow of 500 scfm @ 100 psig. Multiply 500 scfm by the correction factor 1.43 for 150 psig from Table 2 (500 x 1.43 = 715). An A500 has ample capacity for this requirement.

### CAUTION:

Do not select filters by pipe size. Make selection by flow rate and operating pressure only.

**TABLE 1**  
Maximum Air Flow (scfm\*) @ 100 psig

MODEL	A10	A20	A50	A100	A200	A250	A300	A320	A500	A600	A900	A1300	A1600	A2500	A3500	A4400	A6000
FLOW	10	20	50	100	200	250	300	320	500	632	948	1264	1580	2528	3476	4424	6004

\*Convert scfm to metric units as follows: 1 scfm = 1.736 m<sup>3</sup>/h

**TABLE 2**  
Air Flow Correction Factor

Minimum inlet pressure (psig)	20	30	40	60	80	100	120	150	200	250	300
Multiplier	0.30	0.39	0.48	0.65	0.82	1.00	1.17	1.43	1.87	2.31	2.74

## PHYSICAL DESCRIPTION

Model Number		Housing Type	Maximum Operating Pressure (psig)		Maximum Operating Temperature	Air Inlet/Outlet Conn.	Width (Inlet to Outlet) and Height (in.)	Wt. (lb.)	Replacement Filter Cartridge	
with Manual Drain	with Internal Auto Drain		with Manual Drain	with Internal Auto Drain					No.	Qty. Reqd.
A10-03F-8P		8 oz. polycarbonate (2)	150	150	120°F	3/8" NPTF	3 1/4 x 6 1/4	1 5/8	0713-2	1
A10-03F-16P	A10-03F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	3/8" NPTF	3 1/4 x 10 1/4	2 1/2	0713-2	1
A10-03F-16M	A10-03F-16M-D	16 oz. metal	300	175	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0713-2	1
A10-04F-16P	A10-04F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	1/2" NPTF	3 1/4 x 10 1/4	2 1/2	0713-2	1
A10-04F-16M	A10-04F-16M-D	16 oz. metal	300	175	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0713-2	1
A20-03F-16P	A20-03F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	3/8" NPTF	3 1/4 x 10 1/4	2 1/2	0713-3	1
A20-03F-16M	A20-03F-16M-D	16 oz. metal	300	175	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0713-3	1
A20-04F-16P	A20-04F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	1/2" NPTF	3 1/4 x 10 1/4	2 1/2	0713-3	1
A20-04F-16M	A20-04F-16M-D	16 oz. metal	300	175	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0713-3	1
A50-08F-48	A50-08F-48-D	48 oz. metal	300	175	120°F	1" NPTF	4 9/16 x 13 9/16	5 7/8	0713-4	1
A100-08F-100	(1)	100 oz. metal	300		120°F	1" NPTF	4 9/16 x 23 1/4	13 1/4	0713-5	1
A200-12F-205	(1)	205 oz. metal	300		120°F	1 1/2" NPTF	5 1/4 x 30 5/8	21	0713-6	1
A300-12F-381	(1)	381 oz. metal	300		120°F	1 1/2" NPTF	5 1/4 x 36 3/8	29 1/4	0713-7	1
A250-16M-SL	(1)	5" pressure vessel	300 (3)		120°F	2" NPTM (4)	10 1/4 x 40 7/8	36	0713-12	1
A320-16M-SL	(1)	5" pressure vessel	300 (3)		120°F	2" NPTM (4)	10 1/4 x 40 7/8	37	0713-11	1
A500-24M-8L	(1)	8" pressure vessel	225 (3)		120°F	3" NPTM (4)	16 x 48	86	0713-12	2
A600-24M-8L	(1)	8" pressure vessel	225 (3)		120°F	3" NPTM (4)	16 x 48	86	0713-11	2
A900-24M-10L	(1)	10" pressure vessel	225 (3)		120°F	3" NPTM (4)	16 1/4 x 49	131	0713-11	3
A1300-4FL-12L	(1)	12" pressure vessel	225 (3)		120°F	4" flange (5)	20 x 52 1/4	179	0713-11	4
A1600-4FL-12L	(1)	12" pressure vessel	225 (3)		120°F	4" flange (5)	20 x 52 1/4	182	0713-11	5
A2500-6FL-16L	(1)	16" pressure vessel	225 (3)		120°F	6" flange (5)	24 x 54 5/8	271	0713-11	8
A3500-6FL-20L	(1)	20" pressure vessel	225 (3)		120°F	6" flange (5)	28 x 62 9/16	518	0713-11	11
A4400-6FL-20L	(1)	20" pressure vessel	225 (3)		120°F	6" flange (5)	28 x 62 9/16	527	0713-11	14
A6000-8FL-24L	(1)	24" pressure vessel	225 (3)		120°F	8" flange (5)	33 x 69 1/8	709	0713-11	19

(1) Drain port is provided. Use externally mounted Hankison automatic drain. For models A100 thru A1600 use a model 504 Snap-Trap™; for models A2500 thru A6000 use a model 505 Trip-L-Trap™. Models A250 and A320 may also be supplied with an internal drain.

(2) Polycarbonate bowls are furnished with bowl guards. Do not use polycarbonate bowls when synthetic lubricants are present.

(3) Units with higher maximum working pressures are available. Models A500 and larger are ASME code constructed and stamped.

(4) Flanges and couplings are available.

(5) Optional flange sizes are available.



# HANKISON<sup>®</sup> HYPERSORB<sup>®</sup> Activated Carbon Adsorbent Filters



**Eliminates undesirable oily smell/taste from compressed air. Removes oil vapor. Ends product contamination.**

## The final step in oil free air.

The Hypersorb filter is a final stage filter which adsorbs oil vapor (gaseous oil) present in compressed air. The Hypersorb filter will also remove various other gaseous hydrocarbons normally adsorbable by activated carbon. It is designed to be used after a coalescing filter (Hankison Aerolescer<sup>®</sup>) which removes liquid oil aerosols. The liquid oil aerosols must be removed from the air stream before the air enters the Hypersorb in order to prevent saturating of the activated carbon and premature reduction of the adsorptive capacity of the filter.

## How oil free is air that has been filtered by an Aerolescer/Hypersorb Filter System?

At rated flow conditions and reasonable filtration temperatures (50°F to 100°F), the oil concentration in your air system, after being filtered, will be less than .01 ppm w/w. This means that the amount of oil left in your system is lower than the saturation level of oil vapor in atmospheric air (expanded condition) so that even a large drop in temperature downstream will not cause oil vapor to condense and foul your product.

These low concentrations of oil vapor are well below the level where they can be detected by smell or taste.

## Designed for long life.

In contrast to most carbon filters that contain only a bed of carbon particles, the Hypersorb filter contains both a bed of finely divided activated carbon particles and a secondary section of multi-layered fibers to which microfine activated carbon particles are bonded. It is designed to operate for a minimum of 1500 hours at rated capacity without requiring replacement of the cartridge.

## FEATURES:

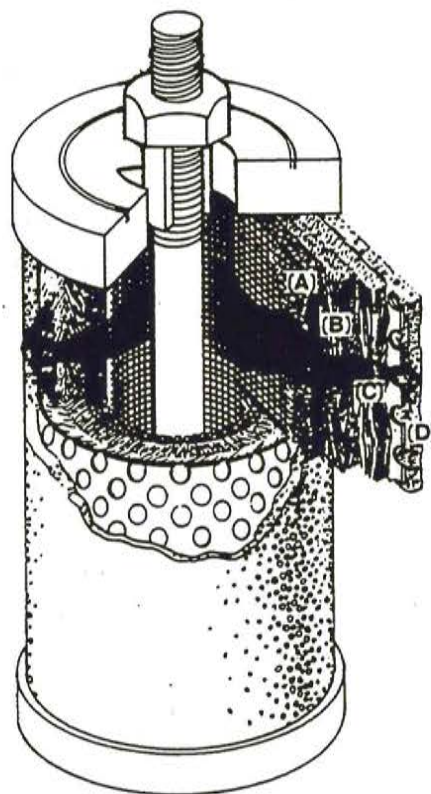
- Protects end processes from gaseous oil contamination and rids compressed air exhausted into worker environments of offensive oily smell
- Removes hydrocarbons for analytical instrument use
- Fine filter media traps 100% of any carbon dust or other particles as small as .025 micron — Ideal as an afterfilter for desiccant dryers
- Cartridge replacement made easy by removable bowls or convenient bottom access.



MODEL H10



MODEL H600



## Elimination of carbon dust carry-over.

Layers of microglass fibers prevent any possible carryover of carbon dust or other fine particulate matter and subsequent product contamination. Also, an outer porous foam sleeve provides protection against filter fiber migration.

## Rugged construction resists vibration, prevents in-line failure.

A thru bolt and rigid metal perforated cylinder provide solid cartridge design that does not rely on an adhesive for structural strength. This minimizes the possibility of the filter media being by-passed.

## OPERATION

Compressed air which has been treated by an air dryer and filtered to remove liquid contaminants enters the inner core of the Hypersorb filter cartridge and moves radially outward. It first passes through a bed of finely divided activated carbon particles (A) where 95% of the oil vapor contained in the air is adsorbed. The air then moves through layers of fibers (B) to which microfine activated carbon particles are bonded by a patented process and the remaining oil vapor is adsorbed. The virtually oil free air then continues through layers of microglass fibers (C) where all solid particles .025 microns in size and larger are captured. This prevents any possible carry over of carbon dust or other fine particulate matter. Finally the air exits through a porous foam outer sleeve (D) which provides protection against fiber migration.

## OPERATING CONDITIONS

Flow: maximum air flow for the various models at 100 psig is indicated in Table 1. To determine maximum air flows at inlet pressures other than 100 psig, multiply flow from Table 1 by multiplier from Table 2 that corresponds to the minimum operating pressure at the inlet of the filter.

### EXAMPLE:

Choose a Hypersorb filter to handle 705 scfm at 150 psig. From Table 1 pick an H500 with an air flow of 500 scfm @ 100 psig. Multiply 500 scfm by the correction factor 1.43 for 150 psig from Table 2 (500 x 1.43 = 715). An H500 has ample capacity for this requirement.

## CAUTION:

Do not select filters by pipe size. Make selection by flow rate and operating pressure only.

## Pressure Drop:

The Hypersorb<sup>2</sup> filter has an initial nominal pressure drop of 1 psi (0.07 bar) which should not change appreciably during the life of the cartridge.

## Cartridge Replacement:

Periodic checks of filtered air should be conducted. A detectable odor indicates that the cartridge should be replaced. The Hypersorb is designed to give a minimum life of 1500 hours of continuous operation at rated capacity.

## OPTIONS

### Stainless Steel Cartridges

Cartridges may be ordered with all stainless steel materials for use where harmful vapors are present in the compressed air system. To order, add -S to unit or cartridge model number.

**TABLE 1**

Maximum Air Flow (scfm\*) @ 100 psig

MODEL	H10	H20	H50	H100	H200	H250	H300	H320	H500	H600	H900	H1300	H1600	H2500	H3500	H4400	H6000
FLOW	10	20	50	100	200	250	300	320	500	632	948	1264	1580	2528	3476	4424	6004

\*Convert scfm to metric units as follows: 1 scfm = 1.736m<sup>3</sup>/h

**TABLE 2**

Air Flow Correction Factor

Minimum inlet pressure (psig)	20	30	40	60	80	100	120	150	200	250	300
Multiplier	0.30	0.39	0.48	0.65	0.82	1.00	1.17	1.43	1.87	2.31	2.74

## PHYSICAL DESCRIPTION

Model Number	Housing Type	Maximum Operating Pressure (psig)	Maximum Operating Temperature	Air Inlet/Outlet Conn.	Width (Inlet to Outlet) and Height (in.)	Wt. (lb.)	Replacement Filter Cartridge	
							No.	Qty. Req.
H10-03F-8P	8 oz. polycarbonate (1)	150	120°F	3/8" NPTF	3 1/4 x 6 1/4	1 5/8	0715-2	1
H10-03F-16P	16 oz. polycarbonate (1)	150	120°F	3/8" NPTF	3 1/4 x 10 1/4	2 1/2	0715-2	1
H10-03F-16M	16 oz. metal	300	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0715-2	1
H10-04F-16P	16 oz. polycarbonate (1)	150	120°F	1/2" NPTF	3 1/4 x 10 1/4	2 1/2	0715-2	1
H10-04F-16M	16 oz. metal	300	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0715-2	1
H20-03F-16P	16 oz. polycarbonate (1)	150	120°F	3/8" NPTF	3 1/4 x 10 1/4	2 1/2	0715-3	1
H20-03F-16M	16 oz. metal	300	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0715-3	1
H20-04F-16P	16 oz. polycarbonate (1)	150	120°F	1/2" NPTF	3 1/4 x 10 1/4	2 1/2	0715-3	1
H20-04F-16M	16 oz. metal	300	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0715-3	1
H50-08F-48	48 oz. metal	300	120°F	1" NPTF	4 9/16 x 13 9/16	5 7/8	0715-4	1
H100-08F-100	100 oz. metal	300	120°F	1" NPTF	4 9/16 x 23 1/4	13 1/4	0715-5	1
H200-12F-205	205 oz. metal	300	120°F	1 1/2" NPTF	5 1/4 x 30 5/8	21	0715-6	1
H300-12F-381	381 oz. metal	300	120°F	1 1/2" NPTF	5 1/4 x 36 3/8	29 1/4	0715-7	1
H250-16M-5L	5" pressure vessel	300 (2)	120°F	2" NPTM (3)	10 1/4 x 40 7/8	36	0715-12	1
H320-16M-5L	5" pressure vessel	300 (2)	120°F	2" NPTM (3)	10 1/4 x 40 7/8	37	0715-11	1
H500-24M-8L	8" pressure vessel	225 (2)	120°F	3" NPTM (3)	16 x 48	86	0715-12	2
H600-24M-8L	8" pressure vessel	225 (2)	120°F	3" NPTM (3)	16 x 48	86	0715-11	2
H900-24M-10L	10" pressure vessel	225 (2)	120°F	3" NPTM (3)	16 1/4 x 49	131	0715-11	3
H1300-4FL-12L	12" pressure vessel	225 (2)	120°F	4" flange (4)	20 x 52 1/4	179	0715-11	4
H1600-4FL-12L	12" pressure vessel	225 (2)	120°F	4" flange (4)	20 x 52 1/4	182	0715-11	5
H2500-6FL-16L	16" pressure vessel	225 (2)	120°F	6" flange (4)	24 x 54 5/8	271	0715-11	8
H3500-6FL-20L	20" pressure vessel	225 (2)	120°F	6" flange (4)	28 x 62 9/16	518	0715-11	11
H4400-6FL-20L	20" pressure vessel	225 (2)	120°F	6" flange (4)	28 x 62 9/16	527	0715-11	14
H6000-8FL-24L	24" pressure vessel	225 (2)	120°F	8" flange (4)	33 x 69 1/8	709	0715-11	19

(1) Polycarbonate bowls are furnished with bowl guards. Do not use polycarbonate bowls when synthetic lubricants are present.

(2) Units with higher maximum working pressures are available. Models H500 and larger are ASME code constructed and stamped.

(3) Flanges and couplings are available.

(4) Optional flange sizes are available.





## **Appendix B ELECTROMAGNETIC COMPATIBILITY (EMC)**

In this appendix:

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EMC Introduction.....	b-2
General.....	b-3
Specifications .....	b-3
MAX70 CE Power Supplies .....	b-3
Power Cable .....	b-4
Line Disconnect Switch .....	b-4
Power Cable Diagram, MAX70 CE 400V, 3 Ph, 50 Hz.....	b-5
MAX70 CE Parts List.....	b-6
Wiring Diagram, MAX70 CE 400V, 3 Ph, 50 Hz (with Quick Disconnect).....	b-8
Wiring Diagram, MAX70 CE 400V, 3 Ph, 50 Hz (without Quick Disconnect).....	b-9

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# APPENDIX B

## 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:

- Other supply cables, control cables, signalling and telephone cables; above, below and adjacent to the cutting equipment.
- Radio and television transmitters and receivers.
- Computer and other control equipment.
- Safety critical equipment, for example guarding of industrial equipment.

- Health of the people around, for example the use of pacemakers and hearing aids.
- Equipment used for calibration or measurement.
- 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.
- 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.

### GENERAL

This appendix provides the user with the physical and electrical information for the MAX70 CE 400 volt power supplies. In particular is the EMI filter, sheet metal, and power cable.

Information on the intalled shielded power cable is also provided to enable a qualified electrician to specify a longer power cable or extension, so that the MAX70 CE complies with standard EN50199.

### SPECIFICATIONS

#### MAX70 CE Power Supplies

Input line voltage ( $U_i$ ) and input line current ( $I_i$ )

# 072100 (with quick disconnect) .....400V, 3 Ph, 50 Hz, 26.1 amps

# 072101 (without quick disconnect) .....400V, 3 Ph, 50 Hz, 26.1 amps

Dimensions:

Width .....9 -inches (229 mm)

Height .....18.50 -inches (471 mm)

Depth .....17 -inches (432 mm)

Weight .....76 lbs. (34.5 kg)

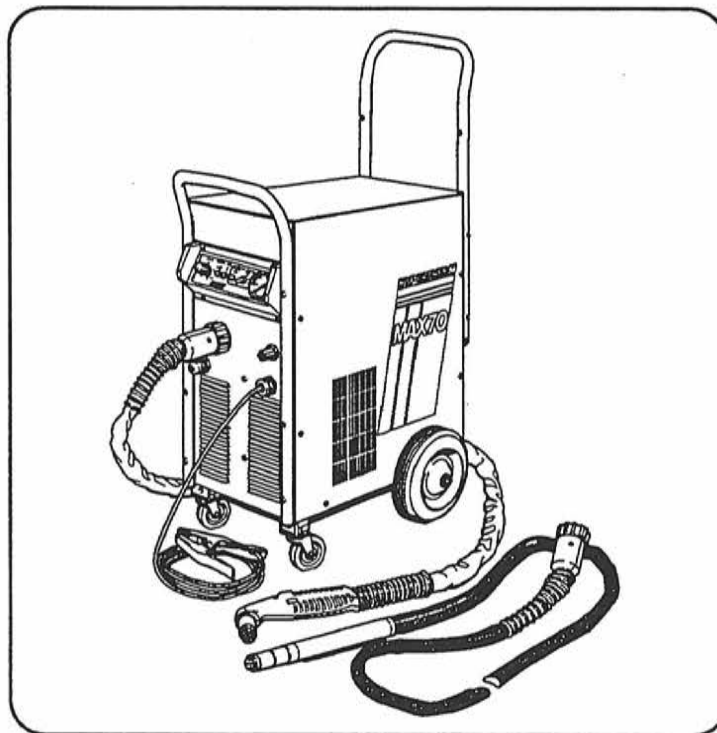


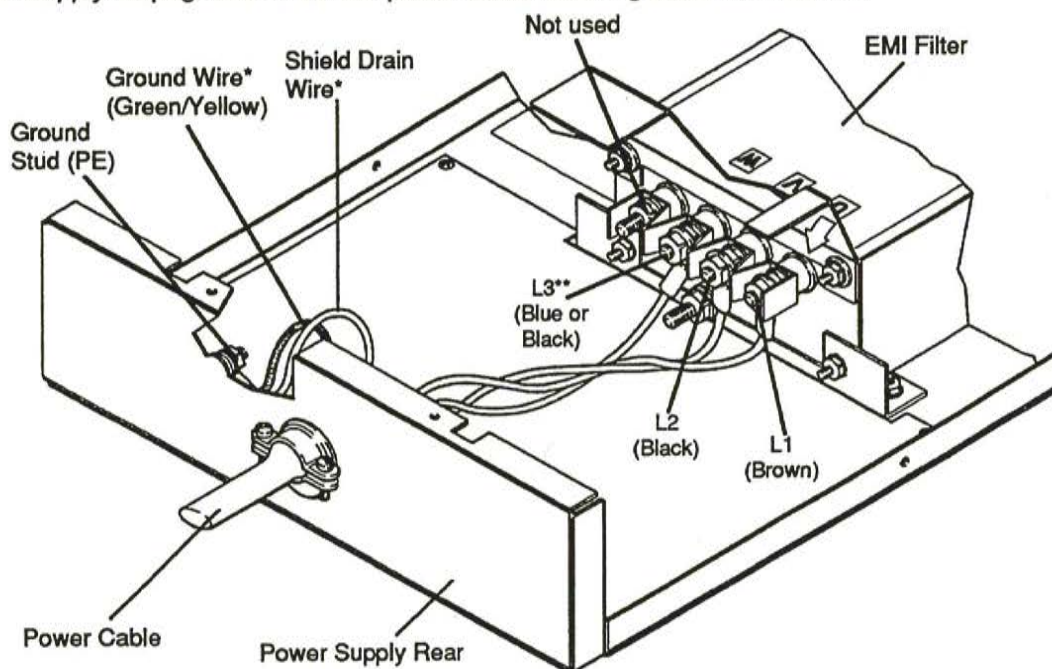
Figure b-1 MAX70 CE Power Supply



## APPENDIX B

### POWER CABLE

The power supply with the installed shielded power cable (123001) complies with standard EN50199. Refer to power cable drawing 123-3-001 for details if a longer power cable or extension is required. Final specification and installation of a new power cable or extension should be made by a licensed electrician in accordance with standard EN50199 and national and local codes. Also, refer to *Mains Supply* on page b-2 for further power cable shielding recommendations.



\*Ground wire and shield drain wire connect to Ground stud (PE).

\*\* L3 is blue in a 4-conductor cable and black in a 5-conductor cable.

Figure b-2 Power Cable Connections to EMI Filter



#### WARNING - HIGH VOLTAGE!



There is line voltage at the filter even if the power switch on the power supply is set to OFF (O). As a common safety practice, ALWAYS verify that the line disconnect switch is set to OFF before installing, disconnecting or servicing in this area.

### LINE DISCONNECT SWITCH

Connecting the power cable to the line disconnect switch must conform to national and local electrical codes. This work should be performed only by qualified, licensed personnel. See *Power Requirements* on page 3-6.



## APPENDIX B

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### MAX70 CE PARTS LIST

#### Power Supplies

072100 (with quick disconnect) .....	400 VAC, 3 Ph, 50 Hz
072101 (without quick disconnect) .....	400 VAC, 3 Ph, 50 Hz

#### Power Supplies with PAC130 Torch and Leads

072102 (with quick disconnect) .....	25-ft. (7.6 m) leads
072103 (with quick disconnect) .....	50-ft. (15.2 m) leads
072104 (without quick disconnect) .....	25-ft. (7.6 m) leads
072105 (without quick disconnect) .....	50-ft. (15.2 m) leads

#### Power Supplies with Machine Torch and Leads

072106 (with quick disconnect) .....	25-ft. (7.6 m) leads
072107 (with quick disconnect) .....	50-ft. (15.2 m) leads
072108 (without quick disconnect) .....	25-ft. (7.6 m) leads
072109 (without quick disconnect) .....	50-ft. (15.2 m) leads

#### Power Supply Components and Assemblies

Below are listed the components and assemblies that are specific to the MAX70 CE power supplies only (Figure b-3). For all other components and assemblies used in the CE power supply, refer to Section 6, *Parts List*.

Index No.	Ref. Desig.	Part No.	Description	Quantity
1		001542	Enclosure, MAX70 CE Line Filter	1
2		001539	Cover, MAX70 CE	1
3		123001	Linecord MAX70 CE 400/3/50 (see page a-5)	1
		047240	Cable, 500V 4.0 mm 4W Ferrite Lead	1
		074083	Terminal, 12-10 # 10-Ring V-Insulated	2
		074087	Terminal, 12-10 1/4- Ring V-Insulated	3
		074121	Tip, wire 10 AWG .472 Insulated	1
		074136	Tip, wire 12 AWG .354 Insulated	3
4		008944	Strain Relief, 3/4 NPT .530 X .750	1
		129035	Filter, Line SA	
5		109042	Filter, 30A, 440 VAC, 3 Ph, 2-Stage Elek	1
6		002250	Barrier, Elek Filter Nomex	1
7		002253	Barrier, Shield CE Filter	2
8		001538	Bracket, MAX70 CE Filter	2



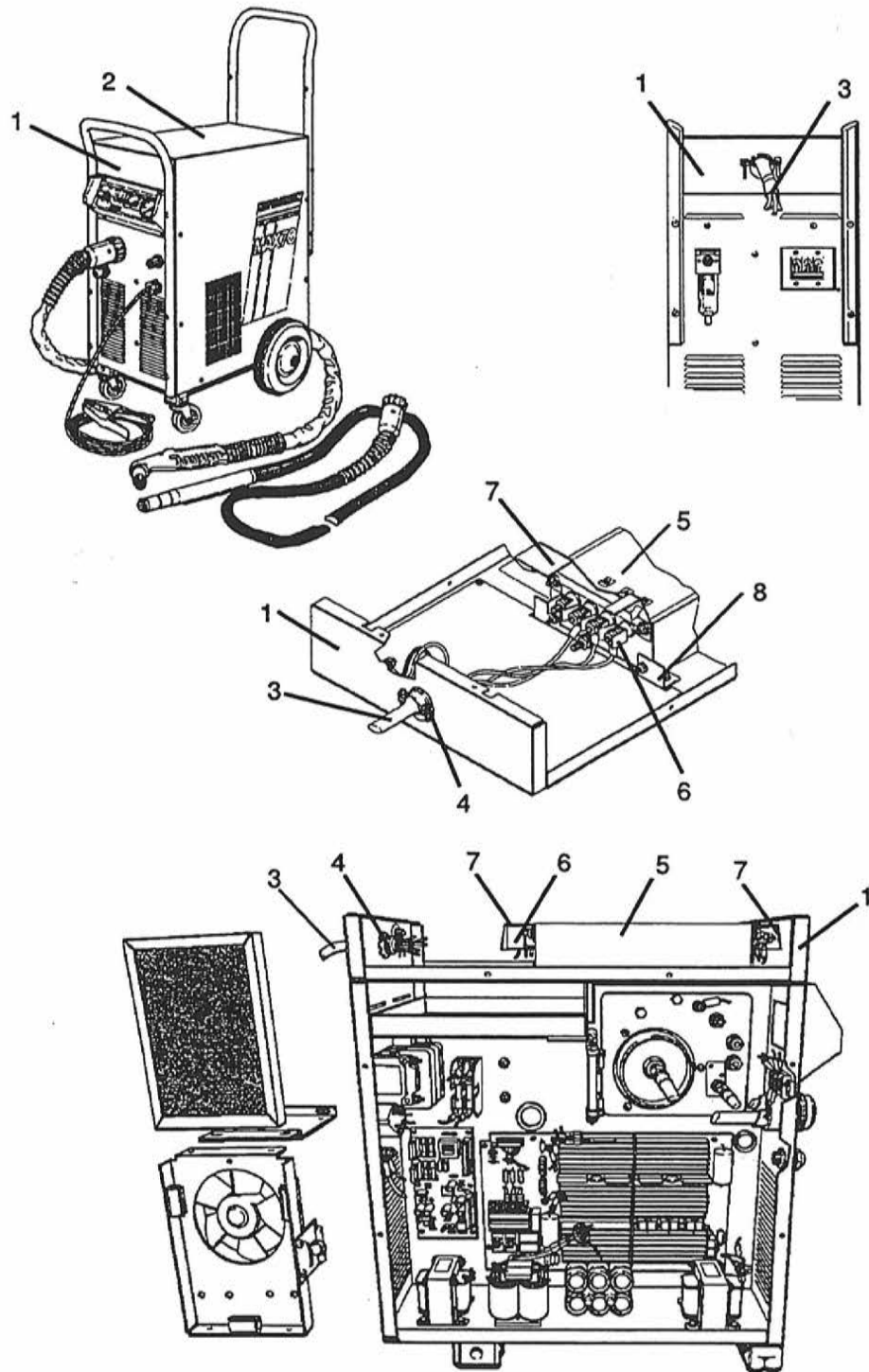
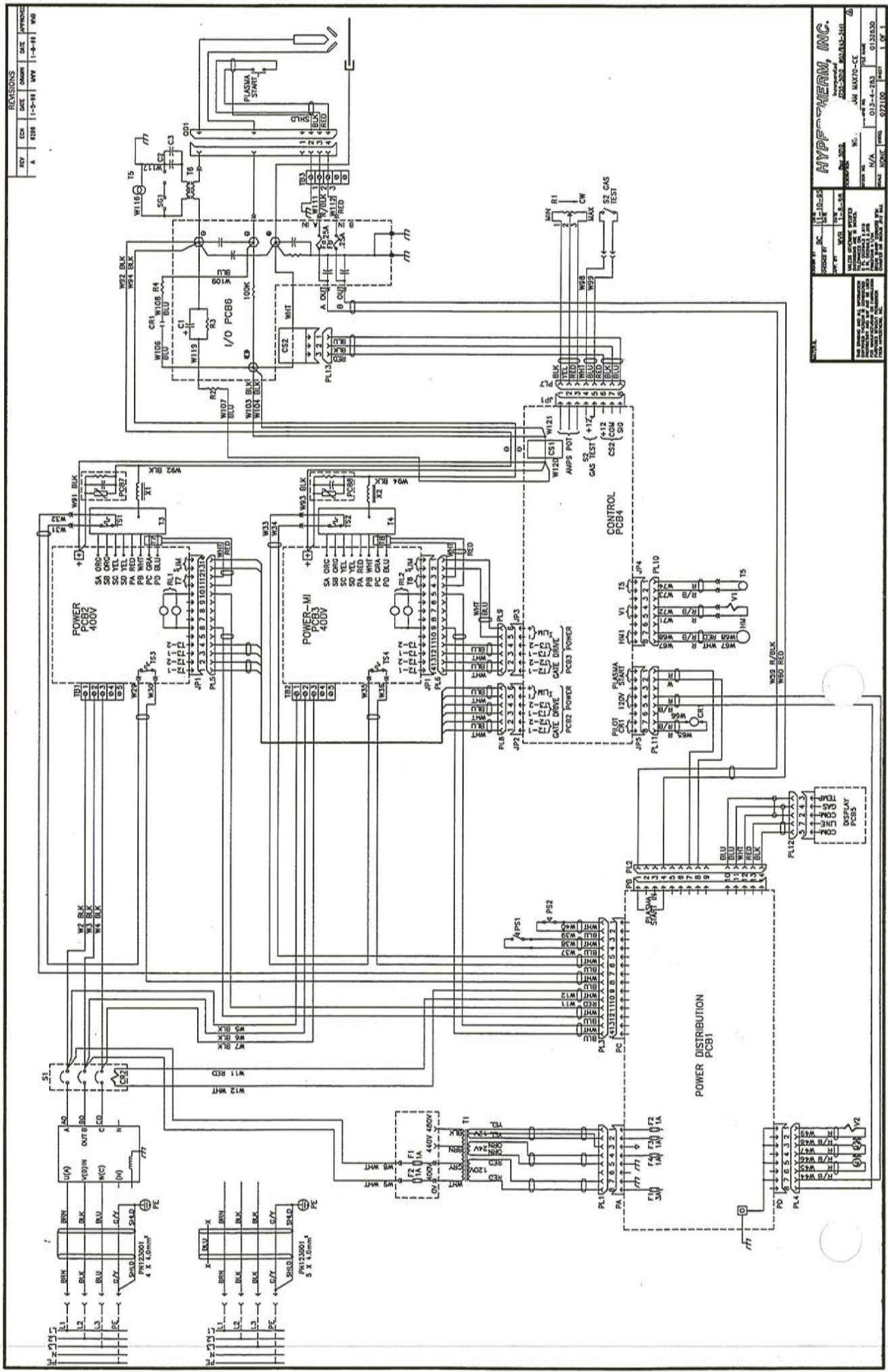


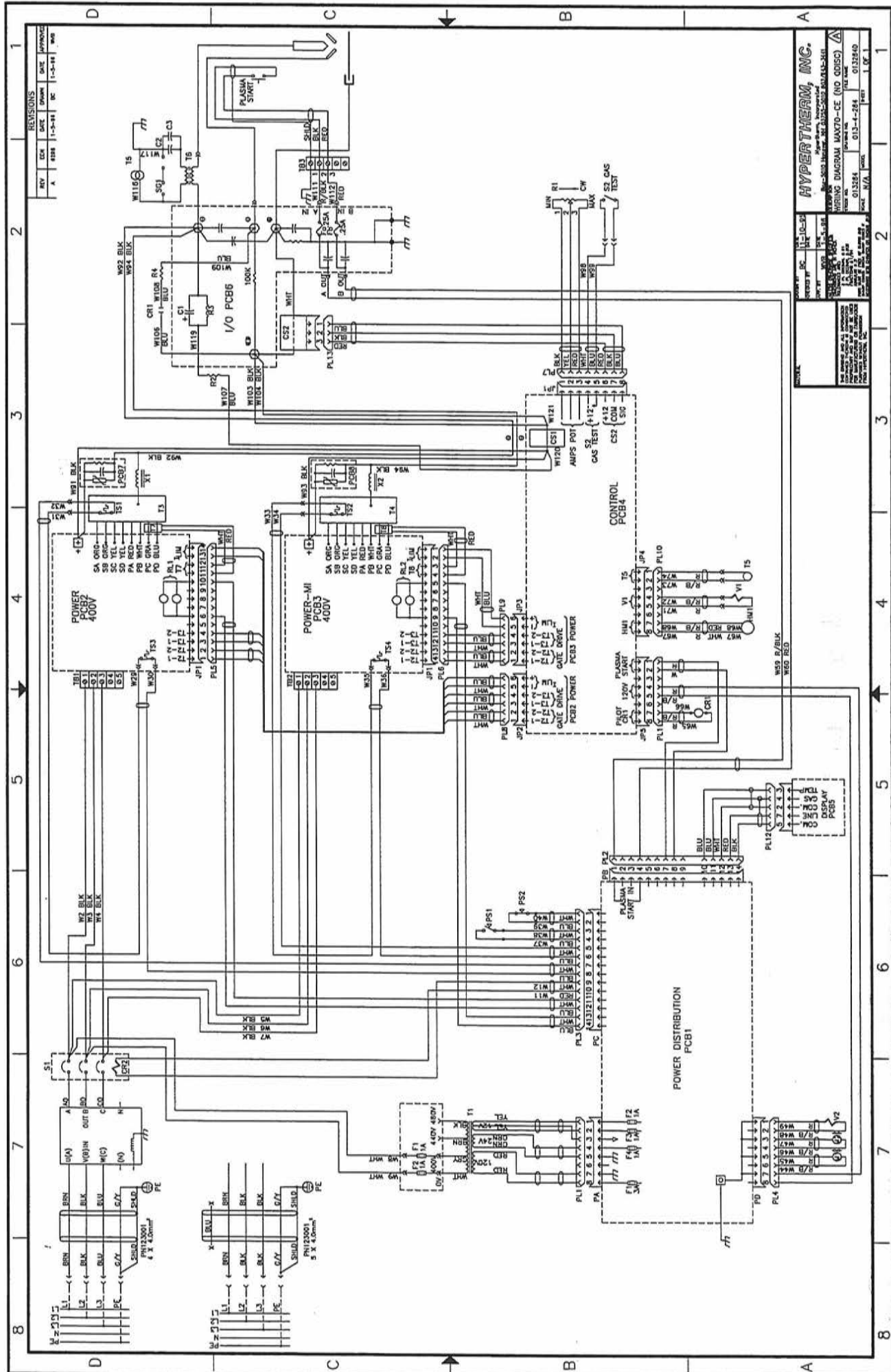
Figure b-3 MAX70 CE Specific Component and Assembly Locations





REVISIONS				
REV	DATE	BY	CHKD	APP'D
1	1-1-81	WV		

HYPERHEM, INC.	
Incorporated	
225-202 WAINESBURG, OHIO 44601	
Part No.	AN MKTD-CE
Rev.	1
Drawn by	WV
Checked by	WV
Approved by	WV
Scale	1:1
Sheet	1 of 1



## **APPENDIX B**

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## GLOSSARY

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<b>AC</b>	<b>Alternating Current.</b> Motion of current alternately in one direction, then the other. The number of times per second the direction changes (the "frequency") is measured in hertz.
<b>amp</b>	<b>Amperes.</b> Measurement of the electron flow (the number of electrons per second) in an electrical circuit.
<b>anode</b>	The "positive" (+) side of a DC power source. Electrons leave the cathode and move toward the anode; ions move in the opposite direction. Plasma cutting requires the work and the nozzle to be the anode, and the electrode to be the cathode.
<b>arc</b>	Motion of electricity in a gas.
<b>AWG</b>	<b>American Wire Gauge.</b> Defines the diameter of wires.
<b>bar</b>	A unit of pressure equal to one million dynes per square centimeter.
<b>breaker</b>	A device which interrupts an electrical current if the current exceeds a preset amperage setting. Breakers can be returned to their conducting (non-interrupting) state by some mechanical action, such as flipping a switch.
<b>cap</b>	Nozzle retaining cap. Holds the swirl ring, electrode and nozzle inside the torch.
<b>capacitor</b>	A device that stores electric energy in the form of voltage.
<b>cathode</b>	The "negative" (-) side of a DC power source. (See anode)
<b>consumable</b>	Electrode, nozzle, swirl ring and retaining cap.
<b>CSA</b>	<b>Canadian Standards Association.</b> A product standards and testing agency.
<b>current</b>	Movement of electricity, measured in amperes. Current is said to move in a direction opposite that of electron flow.
<b>DC</b>	<b>Direct Current.</b> Motion of current in one direction only, from anode (+) to cathode (-).
<b>dross</b>	Globs of metal hanging around the kerf, usually on the bottom side.
<b>duty cycle (X)</b>	Percentage of on-time (measured in minutes) in a 10 minute period in which a device can be operated.
<b>electricity</b>	Fundamental property of atoms that atoms can have their electrons pulled away ("ionized") and then the electrons can move about in metals or gases. An atom missing one or more electrons is called an ion. Both electrons and ions can move about in gases.
<b>electrode</b>	A part inside the torch connected to the cathode (-) of the power supply. Electrons come out of the electrode.



# GLOSSARY

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<b>ferrule</b>	A ring of metal surrounding the end of a cable or wire to strengthen a connection.
<b>fuse</b>	A protective device which melts when the current running through it exceeds the usage rating.
<b>ground</b>	An electrical connection buried in the earth to establish a voltage of zero (0) volts.
<b>Hertz (Hz)</b>	Measurement of "frequency" of an AC voltage or current in cycles per second.
<b>IEC</b>	International Electrotechnical Commission. An international standards organization.
<b>Interlock</b>	A safety device which must be activated before another device can be activated.
<b>ion</b>	An atom which has an excess or shortage of electrons.
<b>IP</b>	International Protection. An IEC designator, describing the degree of protection an enclosure offers against entry of objects and water.
<b>I<sub>1</sub></b>	Rated supply current. The supply current to the power source at a rated cutting condition (given U <sub>1</sub> , U <sub>2</sub> and I <sub>2</sub> ).
<b>I<sub>2</sub></b>	Rated output cutting current.
<b>kerf</b>	Slit made in a workpiece by a cutting torch.
<b>kilowatt</b>	Thousand (kilo) watts. Measurement of electrical power.
<b>LED</b>	Light Emitting Diode. An electronic indicator lamp.
<b>line</b>	As in "line voltage." Utility voltage from a branch circuit (wall outlet).
<b>liters/minute</b>	A measure of gas flow.
<b>nozzle</b>	Tip of the plasma torch, made from copper, out of which the plasma arc comes. The nozzle pinches the plasma arc. It is usually an anode (+).
<b>OCV</b>	Open Circuit Voltage. U <sub>0</sub> . The highest voltage from a electrical power supply. It occurs when the power supply is on and active but not producing a plasma arc.
<b>pilot arc</b>	A plasma arc that attaches to the torch nozzle rather than the work.
<b>plasma</b>	An electrically charged gas is said to be "ionized". A cloud of ionized gas together with its electrons is called "plasma."
<b>plasma arc</b>	Movement of electric current in a plasma (ionized gas). An intensely hot and bright arc which exists between the cathode (-) (electrode) and the anode (+) (either the nozzle or the work).

## GLOSSARY

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<b>pressure</b>	Force per unit area.
<b>psi</b>	Pounds per Square Inch. Measurement of gas pressure.
<b>quench</b>	Put in water to cool.
<b>regulator</b>	A mechanical device to control the outlet pressure of a gas supply.
<b>ripple</b>	Unwanted variations in current or voltage from an electrical power supply.
<b>S mark</b>	Indicates that the power supply and torch are suitable for use in environments with increased electrical shock.
<b>scfm</b>	Standard cubic feet per minute. A measurement of gas flow.
<b>single phase</b>	An alternating current carried by only two wires. In the U.S. the "hot" carries the AC voltage and the "neutral" is at approximately "ground" voltage. The "ground" wire carries current only in fault conditions.
<b>swirl ring</b>	An insulating ring that separates the electrode from the nozzle and causes the air inside the plasma torch to swirl and aid in squeezing the arc.
<b>transfer</b>	A pilot arc <i>transfers</i> to the work when the plasma arc leaves the surface of the nozzle and attaches to the work.
<b><math>U_0</math></b>	Rated Open Circuit Voltage occurring at the rated input voltage ( $U_1$ ).
<b><math>U_1</math></b>	Rated Supply Voltage. The supply voltage for which the power source is constructed.
<b><math>U_2</math></b>	Conventional load voltage. The output load voltage at which rated input current ( $I_1$ ), rated output current ( $I_2$ ) and duty cycle (X) are measured.
<b>VAC</b>	Volts Alternating Current.
<b>VDC</b>	Volts Direct Current.
<b>volt</b>	Measurement of electrical force required to move an electric current through an electrical circuit.
<b>watt</b>	Measurement of electrical power. The ability to heat the work equivalent to a current of one ampere times an electrical force of one volt.
<b>workpiece</b>	The object to be cut.
<b>X</b>	Duty cycle at a given $U_1$ , $U_2$ and $I_2$ .

## **GLOSSARY**

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