



**MAX42<sup>®</sup>**

***Plasma Arc  
Cutting System  
Service Manual***

***SM116  
801160 – Rev. 2***

***Hypertherm<sup>®</sup>***  
*The world leader in  
plasma cutting technology*

# ***MAX42***

## **Service Manual (P/N 801160)**

**for systems beginning with serial number  
MX42-8553**

**Revision 2 – May 1995**

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## ATTENTION



**Genuine Hypertherm parts are the factory-recommended replacement parts for your Hypertherm system. Any damage caused by the use of other than genuine Hypertherm parts is not covered by the Hypertherm warranty.**

# WARRANTY

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## GENERAL

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

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## Section a

### SAFETY

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## RECOGNIZE SAFETY INFORMATION

The symbols shown in this section are used to identify potential hazards. When you see a safety symbol in this manual or on your machine, understand the potential for personal injury, and follow the related instructions to avoid the hazard.



## FOLLOW SAFETY INSTRUCTIONS

Read carefully all safety messages in this manual and safety labels on your machine.

- Keep the safety labels on your machine in good condition. Replace missing or damaged labels immediately.
- Learn how to operate the machine and how to use the controls properly. Do not let anyone operate it without instruction.

- Keep your machine in proper working condition. Unauthorized modifications to the machine may affect safety and machine service life.

## DANGER WARNING CAUTION

A signal word DANGER or WARNING is used with a safety symbol. DANGER identifies the most serious hazards.

- DANGER and WARNING safety labels are located on your machine near specific hazards.
- WARNING safety messages precede related instructions in this manual that may result in injury or death if not followed correctly.
- CAUTION safety messages precede related instructions in this manual that may result in damage to equipment if not followed correctly.



## CUTTING CAN CAUSE FIRE OR EXPLOSION

### Fire Prevention

- Be sure the area is safe before doing any cutting. Keep a fire extinguisher nearby.
- Remove all flammables within 35 feet (10 m) of the cutting area.
- Quench hot metal or allow it to cool before handling or before letting it touch combustible materials.
- Never cut containers with potentially flammable materials inside – they must be emptied and properly cleaned first.
- Ventilate potentially flammable atmospheres before cutting.
- When cutting with oxygen as the plasma gas, an exhaust ventilation system is required.

### Explosion Prevention

- Do not use the plasma system if explosive dust or vapors may be present.
- Do not cut pressurized cylinders, pipes, or any closed container.
- Do not cut containers that have held combustible materials.



### WARNING

Explosion Hazard  
Argon-Hydrogen and Methane

Hydrogen and methane are flammable gases that present an explosion hazard. Keep flames away from cylinders and hoses that contain methane or hydrogen mixtures. Keep flames and sparks away from the torch when using methane or argon-hydrogen plasma.



### WARNING

Hydrogen Detonation with Aluminum Cutting

- When cutting aluminum underwater, or with the water touching the underside of the aluminum, free hydrogen gas may collect under the workpiece and detonate during plasma cutting operations.
- Install an aeration manifold on the floor of the water table to eliminate the possibility of hydrogen detonation. Refer to the Appendix section of this manual for aeration manifold details.



## ELECTRIC SHOCK CAN KILL

Touching live electrical parts can cause a fatal shock or severe burn.

- Operating the plasma system completes an electrical circuit between the torch and the workpiece. The workpiece and anything touching the workpiece are part of the electrical circuit.
- Never touch the torch body, workpiece or the water in a water table when the plasma system is operating.

### Electric Shock Prevention

**All Hypertherm plasma systems use high voltage in the cutting process (200 to 400 VDC are common). Take the following precautions when operating this system:**

- Wear insulated gloves and boots, and keep your body and clothing dry.
- Do not stand, sit or lie on – or touch – any wet surface when using the plasma system.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground. If you must work in or near a damp area, use extreme caution.
- Provide a disconnect switch close to the power supply with properly sized fuses. This switch allows the operator to turn off the power supply quickly in an emergency situation.
- When using a water table, be sure that it is correctly connected to earth ground.

- Install and ground this equipment according to the instruction manual and in accordance with national and local codes.
- Inspect the input power cord frequently for damage or cracking of the cover. Replace a damaged power cord immediately. **Bare wiring can kill.**
- Inspect and replace any worn or damaged torch leads.
- Do not pick up the workpiece, including the waste cutoff, while you cut. Leave the workpiece in place or on the workbench with the work cable attached during the cutting process.
- Before checking, cleaning or changing torch parts, disconnect the main power or unplug the power supply.
- Never bypass or shortcut the safety interlocks.
- Before removing any power supply or system enclosure cover, disconnect electrical input power. Wait 5 minutes after disconnecting the main power to allow capacitors to discharge.
- Never operate the plasma system unless the power supply covers are in place. Exposed power supply connections present a severe electrical hazard.
- When making input connections, attach proper grounding conductor first.
- 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 safety hazard.



## CUTTING CAN PRODUCE TOXIC FUMES

Cutting can produce toxic fumes and gases that deplete oxygen and cause injury or death.

- Keep the cutting area well ventilated or use an approved air-supplied respirator.
- Do not cut in locations near degreasing, cleaning or spraying operations. The vapors from certain chlorinated solvents decompose to form phosgene gas when exposed to ultraviolet radiation.
- Do not cut metal coated or containing toxic materials, such as zinc (galvanized), lead, cadmium or beryllium, unless the area is well ventilated and the operator wears an air-supplied respirator. The coatings and any metals containing these elements can produce toxic fumes when cut.
- Never cut containers with potentially toxic materials inside – they must be emptied and properly cleaned first.
- This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer.



**A PLASMA ARC CAN CAUSE INJURY AND BURNS**

**Instant-On Torches**

Plasma arc comes on immediately when the torch switch is activated.

The plasma arc will cut quickly through gloves and skin.

- Keep away from the torch tip.
- Do not hold metal near the cutting path.
- Never point the torch toward yourself or others.



**ARC RAYS CAN BURN EYES AND SKIN**

**Eye Protection** Plasma arc rays produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin.

- Use eye protection in accordance with applicable national or local codes.
- Wear eye protection (safety glasses or goggles with side shields, and a welding helmet) with appropriate lens shading to protect your eyes from the arc's ultraviolet and infrared rays.

**Skin Protection** Wear protective clothing to protect against burns caused by ultraviolet light, sparks and hot metal.

- Gauntlet gloves, safety shoes and hat.
- Flame-retardant clothing to cover all exposed areas.
- Cuffless trousers to prevent entry of sparks and slag.
- Remove any combustibles, such as a butane lighter or matches, from your pockets before cutting.

**Arc Current**  
 Up to 100 A  
 100-200 A  
 200-400 A  
 Over 400 A



Lens Shade	
AWS (USA)	ISO 4850
No. 8	No. 11
No. 10	No. 11-12
No. 12	No. 13
No. 14	No. 14

**Cutting Area** Prepare the cutting area to reduce reflection and transmission of ultraviolet light:

- Paint walls and other surfaces with dark colors to reduce reflection.
- Use protective screens or barriers to protect others from flash and glare.
- Warn others not to watch the arc. Use placards or signs.



**GROUNDING SAFETY**

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

**Work Table** Connect the work table to an earth ground, in accordance with appropriate national or local electrical codes.

**Input Power**

- Be sure to connect the power cord ground wire to the ground in the disconnect box.
- If installation of the plasma system involves connecting the power cord to the power supply, be sure to connect the power cord ground wire properly.
- Place the power cord's ground wire on the stud first, then place any other ground wires on top of the power cord ground. Fasten the retaining nut tightly.
- Tighten all electrical connections to avoid excessive heating.

**COMPRESSED GAS EQUIPMENT SAFETY**

- Never lubricate cylinder valves or regulators with oil or grease.
- Use only correct gas cylinders, regulators, hoses and fittings designed for the specific application.
- Maintain all compressed gas equipment and associated parts in good condition.
- Label and color-code all gas hoses to identify the type of gas in each hose. Consult applicable national or local codes.

**GAS CYLINDERS CAN EXPLODE IF DAMAGED**

Gas cylinders contain gas under high pressure. If damaged, a cylinder can explode.

- Handle and use compressed gas cylinders in accordance with applicable national or local codes.
- Never use a cylinder that is not upright and secured in place.
- Keep the protective cap in place over valve except when the cylinder is in use or connected for use.
- Never allow electrical contact between the plasma arc and a cylinder.
- Never expose cylinders to excessive heat, sparks, slag or open flame.
- Never use a hammer, wrench or other tool to open a stuck cylinder valve.

**NOISE CAN DAMAGE HEARING**

Prolonged exposure to noise from cutting or gouging can damage hearing.

- Use approved ear protection when using plasma system.
- Warn others nearby about the noise hazard.

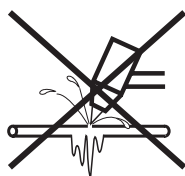
**PACEMAKER AND HEARING AID OPERATION**

Pacemaker and hearing aid operation can be affected by magnetic fields from high currents.

Pacemaker and hearing aid wearers should consult a doctor before going near any plasma arc cutting and gouging operations.

To reduce magnetic field hazards:

- Keep both the work cable and the torch lead to one side, away from your body.
- Route the torch leads as close as possible to the work cable.
- Do not wrap or drape the torch lead or work cable around your body.
- Keep as far away from the power supply as possible.

**A PLASMA ARC CAN DAMAGE FROZEN PIPES**

Frozen pipes may be damaged or can burst if you attempt to thaw them with a plasma torch.

**ADDITIONAL SAFETY INFORMATION**

1. ANSI Standard Z49.1, *Safety in Welding and Cutting*, American Welding Society, 550 LeJeune Road, P.O. Box 351020, Miami, FL 33135
2. ANSI Standard Z49.2, *Fire Prevention in the Use of Cutting and Welding Processes*, American National Standards Institute, 1430 Broadway, New York, NY 10018
3. ANSI Standard Z87.1, *Safe Practices for Occupation and Educational Eye and Face Protection*, American National Standards Institute, 1430 Broadway, New York, NY 10018
4. AWS F4.1, *Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances*, American Welding Society, 550 LeJeune Road, P.O. Box 351040, Miami, FL 33135
5. AWS F5.2, *Recommended Safe Practices for Plasma Arc Cutting*, American Welding Society, 550 LeJeune Road, P.O. Box 351040, Miami, FL 33135
6. CGA Pamphlet P-1, *Safe Handling of Compressed Gases in Cylinders*, Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202
7. CSA Standard W117.2, *Code for Safety in Welding and Cutting*, Canadian Standards Association Standard Sales, 178 Rexdale Boulevard, Rexdale, Ontario M9W 1R3, Canada
8. NFPA Standard 51B, *Cutting and Welding Processes*, National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210
9. NFPA Standard 70-1978, *National Electrical Code*, National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210
10. OSHA, *Safety and Health Standards*, 29FR 1910, U.S. Government Printing Office, Washington, D.C. 20402

## Section b

# SÉCURITÉ

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## IDENTIFIER LES CONSIGNES DE SÉCURITÉ

Les symboles indiqués dans cette section sont utilisés pour identifier les risques éventuels. Si vous trouvez un symbole de sécurité, que ce soit dans ce manuel ou sur l'équipement, soyez conscient des risques de blessures et suivez les instructions correspondantes afin d'éviter ces risques.



## SUIVRE LES INSTRUCTIONS DE SÉCURITÉ

Lire attentivement toutes les consignes de sécurité dans le présent manuel et sur les étiquettes de sécurité se trouvant sur la machine.

- Les étiquettes de sécurité doivent rester lisibles. Remplacer immédiatement les étiquettes manquantes ou abîmées.
- Apprendre à faire fonctionner la machine et à utiliser correctement les commandes. Ne laisser personne utiliser la machine sans connaître son fonctionnement.

- Garder la machine en bon état. Des modifications non autorisées sur la machine peuvent engendrer des problèmes de sécurité et raccourcir la durée d'utilisation de l'équipement.

## DANGER AVERTISSEMENT PRÉCAUTION

Les signaux DANGER ou AVERTISSEMENT sont utilisés avec un symbole de sécurité, DANGER correspondant aux risques les plus sérieux.

- Les étiquettes de sécurité DANGER et AVERTISSEMENT sont situées sur la machine pour signaler certains dangers spécifiques.
- Les messages d'AVERTISSEMENT précèdent les instructions d'utilisation expliquées dans ce manuel et signalent les risques de blessures ou de mort au cas où ces instructions ne seraient pas suivies correctement.
- Les messages de PRÉCAUTION précèdent les instructions d'utilisation contenues dans ce manuel et signalent que le matériel risque d'être endommagé si les instructions ne sont pas suivies correctement.



## LE COUPAGE PEUT PROVOQUER UN INCENDIE OU UNE EXPLOSION

### Prévention des incendies

- Avant de commencer, s'assurer que la zone de coupage ne présente aucun danger. Conserver un extincteur à proximité.
- Éloigner toute matière inflammable à une distance d'au moins 10 m du poste de coupage.
- Tremper le métal chaud ou le laisser refroidir avant de le manipuler ou avant de le mettre en contact avec des matériaux combustibles.
- Ne jamais couper des récipients pouvant contenir des matières inflammables avant de les avoir vidés et nettoyés correctement.
- Aérer toute atmosphère potentiellement inflammable avant d'utiliser un système plasma.
- Lors de l'utilisation d'oxygène comme gaz plasma, un système de ventilation par aspiration est nécessaire.

### Prévention des explosions

- Ne pas couper en présence de poussière ou de vapeurs.
- Ne pas couper de bouteilles, de tuyaux ou autres récipients fermés et pressurisés.
- Ne pas couper de récipients contenant des matières combustibles.



### AVERTISSEMENT

Risque d'explosion argon-hydrogène et méthane

L'hydrogène et le méthane sont des gaz inflammables et potentiellement explosifs. Conserver à l'écart de toute flamme les bouteilles et tuyaux contenant des mélanges à base d'hydrogène ou de méthane. Maintenir toute flamme et étincelle à l'écart de la torche lors de l'utilisation d'un plasma d'argon-hydrogène ou de méthane.



### AVERTISSEMENT

Détonation de l'hydrogène lors du coupage de l'aluminium

- Lors du coupage de l'aluminium sous l'eau, ou si l'eau touche la partie inférieure de la pièce d'aluminium, de l'hydrogène libre peut s'accumuler sous la pièce à couper et détonner lors du coupage plasma.
- Installer un collecteur d'aération au fond de la table à eau afin d'éliminer les risques de détonation de l'hydrogène. Se référer à l'annexe du manuel pour plus de renseignements sur les collecteurs d'aération.





## LES CHOCs ÉLECTRIQUES PEUVENT ÊTRE FATALS

Toucher une pièce électrique sous tension peut provoquer un choc électrique fatal ou des brûlures graves.

- La mise en fonctionnement du système plasma ferme un circuit électrique entre la torche et la pièce à couper. La pièce à couper et tout autre élément en contact avec cette pièce font partie du circuit électrique.
- Ne jamais toucher le corps de la torche, la pièce à couper ou l'eau de la table à eau pendant le fonctionnement du système plasma.

### Prévention des chocs électriques

Tous les systèmes plasma Hypertherm utilisent des hautes tensions pour le coupage (souvent de 200 à 400 V). On doit prendre les précautions suivantes quand on utilise le système plasma :

- Porter des bottes et des gants isolants et garder le corps et les vêtements au sec.
- Ne pas se tenir, s'asseoir ou se coucher sur une surface mouillée, ni la toucher quand on utilise le système plasma.
- S'isoler de la surface de travail et du sol en utilisant des tapis isolants secs ou des couvertures assez grandes pour éviter tout contact physique avec le travail ou le sol. S'il s'avère nécessaire de travailler dans ou près d'un endroit humide, procéder avec une extrême prudence.
- Installer un sectionneur avec fusibles appropriés, à proximité de la source de courant. Ce dispositif permet à l'opérateur d'arrêter rapidement la source de courant en cas d'urgence.
- En cas d'utilisation d'une table à eau, s'assurer que cette dernière est correctement mise à la terre.

- Installer et mettre à la terre l'équipement selon les instructions du présent manuel et conformément aux codes électriques locaux et nationaux.
- Inspecter fréquemment le cordon d'alimentation primaire pour s'assurer qu'il n'est ni endommagé, ni fendu. Remplacer immédiatement un cordon endommagé.  
**Un câble dénudé peut tuer.**
- Inspecter et remplacer les câbles de la torche qui sont usés ou endommagés.
- Ne pas saisir la pièce à couper ni les chutes lors du coupage. Laisser la pièce à couper en place ou sur la table de travail, le câble de retour connecté lors du coupage.
- Avant de vérifier, de nettoyer ou de remplacer les pièces de la torche, couper l'alimentation ou débrancher la prise de courant.
- Ne jamais contourner ou court-circuiter les verrouillages de sécurité.
- Avant d'enlever le capot du système ou de la source de courant, couper l'alimentation électrique. Attendre ensuite 5 minutes pour que les condensateurs se déchargent.
- Ne jamais faire fonctionner le système plasma sans que les capots de la source de courant ne soient en place. Les raccords exposés de la source de courant sont extrêmement dangereux.
- Lors de l'installation des connexions, attacher tout d'abord la prise de terre appropriée.
- Chaque système plasma Hypertherm est conçu pour être utilisé uniquement avec des torches Hypertherm spécifiques. Ne pas utiliser des torches inappropriées qui pourraient surchauffer et présenter des risques pour la sécurité.



## LE COUPAGE PEUT PRODUIRE DES VAPEURS TOXIQUES

Le coupage peut produire des vapeurs et des gaz toxiques qui réduisent le niveau d'oxygène dans l'air et peuvent provoquer des blessures, voire la mort.

- Conserver le poste de coupage bien aéré ou utiliser un masque respiratoire homologué.
- Ne pas procéder au coupage près d'endroits où s'effectuent le dégraissage, le nettoyage ou la vaporisation. Certains solvants chlorés se décomposent sous l'effet des rayons ultraviolets et forment du phosgène.
- Ne pas couper des métaux peints ou contenant des matières toxiques comme le zinc (galvanisé), le plomb, le cadmium ou le béryllium, à moins que la zone de travail

soit très bien ventilée et que l'opérateur porte un masque respiratoire. Les revêtements et métaux contenant ces matières peuvent produire des vapeurs toxiques lors du coupage.

- Ne jamais couper de récipients pouvant contenir des matières inflammables avant de les avoir vidés et nettoyés correctement.
- Quand on utilise ce produit pour le soudage ou le coupage, il dégage des fumées et des gaz qui contiennent des produits chimiques qui, selon l'État de Californie, provoquent des anomalies congénitales et, dans certains cas, le cancer.



## L'ARC PLASMA PEUT PROVOQUER DES BLESSURES OU DES BRÛLURES

### Torches à allumage instantané

L'arc plasma s'allume immédiatement après que la torche soit mise en marche.

L'arc plasma coupe facilement les gants et la peau.

- Rester éloigné de l'extrémité de la torche.
- Ne pas tenir de métal près de la trajectoire de coupe.
- Ne jamais pointer la torche vers soi ou d'autres personnes.



## LES RAYONS DE L'ARC PEUVENT BRÛLER LES YEUX ET LA PEAU

**Protection des yeux** Les rayons de l'arc plasma produisent de puissants rayons visibles ou invisibles (ultraviolets et infrarouges) qui peuvent brûler les yeux et la peau.

- Utiliser des lunettes de sécurité conformément aux codes locaux ou nationaux en vigueur.
- Porter des lunettes de protection (lunettes ou masque muni d'écrans latéraux et encore masque de soudure) avec des verres teintés appropriés pour protéger les yeux des rayons ultraviolets et infrarouges de l'arc.

- Gants à crispin, chaussures et casque de sécurité.
- Vêtements ignifuges couvrant toutes les parties exposées du corps.
- Pantalon sans revers pour éviter que des étincelles ou des scories puissent s'y loger.
- Avant le coupage, retirer de ses poches tout objet combustible comme les briquets au butane ou les allumettes.

**Zone de coupage** Préparer la zone de coupage afin de réduire la réverbération et la transmission de la lumière ultraviolette :

- Peindre les murs et autres surfaces de couleur sombre pour réduire la réflexion de la lumière.
- Utiliser des écrans et autres dispositifs de protection afin de protéger les autres personnes de la lumière et de la réverbération.
- Prévenir les autres personnes de ne pas regarder l'arc. Utiliser des affiches ou des panneaux.

### Courant de l'arc

Jusqu'à 100 A  
100-200 A  
200-400 A  
Plus de 400 A



### Puissance des verres teintés

#### AWS (É.-U.)

N° 8  
N° 10  
N° 12  
N° 14

#### ISO 4850

N° 11  
N° 11-12  
N° 13  
N° 14



**Protection de la peau** Porter des vêtements de sécurité pour se protéger contre les brûlures que peuvent causer les rayons ultraviolets, les étincelles et le métal brûlant :



## MISE À LA MASSE ET À LA TERRE

**Câble de retour** Bien fixer le câble de retour (ou de masse) à la pièce à couper ou à la table de travail de façon à assurer un bon contact métal-métal. Ne pas fixer le câble de retour à la partie de la pièce qui doit se détacher.

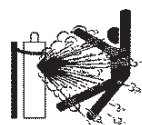
**Table de travail** Raccorder la table de travail à la terre, conformément aux codes de sécurité locaux ou nationaux appropriés.

### Alimentation

- S'assurer que le fil de terre du cordon d'alimentation est connecté à la terre dans le coffret du sectionneur.
- S'il est nécessaire de brancher le cordon d'alimentation à la source de courant lors de l'installation du système, s'assurer que le fil de terre est correctement branché.
- Placer tout d'abord le fil de terre du cordon d'alimentation sur le plot de mise à la terre puis placer les autres fils de terre par-dessus. Bien serrer l'écrou de retenue.
- S'assurer que toutes les connexions sont bien serrées pour éviter la surchauffe.

## SÉCURITÉ DES BOUTEILLES DE GAZ COMPRIMÉ

- Ne jamais lubrifier les robinets des bouteilles ou les régulateurs avec de l'huile ou de la graisse.
- Utiliser uniquement les bouteilles, régulateurs, tuyaux et accessoires appropriés et conçus pour chaque application spécifique.
- Entretenir l'équipement et les pièces d'équipement à gaz comprimé afin de les garder en bon état.
- Étiqueter et coder avec des couleurs tous les tuyaux de gaz afin d'identifier le type de gaz contenu dans chaque tuyau. Se référer aux codes locaux ou nationaux en vigueur.



## LES BOUTEILLES DE GAZ COMPRIMÉ PEUVENT EXPLOSER EN CAS DE DOMMAGES

Les bouteilles de gaz contiennent du gaz à haute pression. Si une bouteille est endommagée, elle peut exploser.

- Manipuler et utiliser les bouteilles de gaz comprimé conformément aux codes locaux ou nationaux.
- Ne jamais utiliser une bouteille qui n'est pas placée à la verticale et bien assujettie.
- Le capuchon de protection doit être placé sur le robinet sauf si la bouteille est en cours d'utilisation ou connectée pour utilisation.
- Éviter à tout prix le contact électrique entre l'arc plasma et une bouteille.
- Ne jamais exposer des bouteilles à une chaleur excessive, aux étincelles, aux scories ou aux flammes nues.
- Ne jamais utiliser des marteaux, des clés ou d'autres outils pour débloquer le robinet des bouteilles.



## LE BRUIT PEUT PROVOQUER DES PROBLÈMES AUDITIFS

Une exposition prolongée au bruit du coupage ou du gougeage peut provoquer des problèmes auditifs.

- Utiliser un casque de protection homologué lors de l'utilisation du système plasma.
- Prévenir les personnes aux alentours des risques encourus en cas d'exposition au bruit.

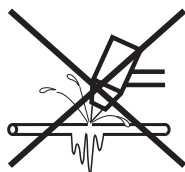


## PACEMAKERS ET PROTHÈSES AUDITIVES

Les champs magnétiques produits par les courants à haute tension peuvent affecter le fonctionnement des prothèses auditives et des pacemakers. Les personnes portant ce type d'appareil doivent consulter un médecin avant de s'approcher d'un lieu où s'effectue le coupage ou le gougeage plasma.

Pour réduire les risques associés aux champs magnétiques :

- Garder loin de soi et du même côté du corps le câble de retour et le faisceau de la torche.
- Faire passer le faisceau de la torche le plus près possible du câble de retour.
- Ne pas s'enrouler le faisceau de la torche ou le câble de retour autour du corps.
- Se tenir le plus loin possible de la source de courant.



## UN ARC PLASMA PEUT ENDOMMAGER LES TUYAUX GELÉS

Les tuyaux gelés peuvent être endommagés ou éclater si l'on essaie de les dégeler avec une torche plasma.

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### RECONOCIMIENTO DE INFORMACIÓN DE SEGURIDAD

Los símbolos que se muestran en esta sección se utilizan para identificar los posibles peligros. Cuando vea un símbolo de seguridad en este manual o en su máquina, recuerde que existe la posibilidad de que se produzcan lesiones personales y siga las instrucciones correspondientes para evitar el peligro.



### SIGA LAS INSTRUCCIONES DE SEGURIDAD

Lea atentamente todos los mensajes de seguridad de este manual y las etiquetas de seguridad en su máquina.

- Mantenga las etiquetas de seguridad de su máquina en buen estado. Reemplace las etiquetas que se pierdan o se dañen inmediatamente.
- Aprenda a utilizar la máquina y a utilizar los controles de la manera correcta. No permita que sea utilizada por alguien que no conozca su funcionamiento.

- Mantenga su máquina en buenas condiciones de funcionamiento. La realización de modificaciones no autorizadas a la máquina puede comprometer la seguridad y la vida útil de la máquina.

### PELIGRO ADVERTENCIA PRECAUCIÓN

Las palabras PELIGRO y ADVERTENCIA se utilizan conjuntamente con un símbolo de seguridad. La palabra PELIGRO se utiliza para identificar los mayores peligros.

- Encontrará etiquetas de seguridad con las inscripciones PELIGRO y ADVERTENCIA en su máquina, junto a peligros específicos.
- En este manual, la palabra ADVERTENCIA va seguida de instrucciones que, si no se siguen correctamente, pueden provocar lesiones e inclusive la muerte.
- En este manual, la palabra PRECAUCIÓN va seguida de instrucciones que, si no se siguen correctamente, pueden provocar daños en el equipo.



### LOS CORTES PUEDEN PROVOCAR INCENDIOS O EXPLOSIONES

#### Prevención ante el fuego

- Asegúrese de que el área sea segura antes de proceder a cortar. Tenga a mano un extinguidor de incendios.
- Retire todos los materiales inflamables, colocándolos a por lo menos 10 metros del área de corte.
- Remoje los metales calientes o permita que se enfríen antes de que entren en contacto con materiales combustibles.
- Nunca corte depósitos que contengan materiales inflamables – primero es necesario vaciarlos y limpiarlos debidamente.
- Antes de realizar cortes en atmósferas potencialmente inflamables, asegúrese de ventilar bien.
- Al realizar cortes utilizando oxígeno como gas plasma, se requiere tener un sistema de ventilación de escape.

#### Prevención ante explosiones

- No corte en atmósferas que contengan polvo o vapores explosivos.
- No corte depósitos o tubos a presión ni cualquier depósito cerrado.
- No corte depósitos que hayan contenido materiales combustibles.



#### ADVERTENCIA

Peligro de explosión  
Argón-Hidrógeno y metano

El hidrógeno y el metano son gases inflamables que suponen un peligro de explosión. Mantenga el fuego lejos de los cilindros y las mangueras que contengan mezclas de hidrógeno o metano. Mantenga la llama y las chispas lejos de la antorcha al utilizar metano o argón-hidrógeno como plasma.



#### ADVERTENCIA

Detonación de hidrógeno con  
el corte de aluminio

- Al cortar aluminio bajo agua o con agua en contacto con el lado inferior del aluminio, puede acumularse gas hidrógeno bajo la pieza a cortar y detonar durante la operación de corte por plasma.
- Instale un múltiple de aireación en el fondo de la mesa de agua para eliminar la posibilidad de la detonación del hidrógeno. Consulte la sección del apéndice de este manual para conocer detalles acerca del múltiple de aireación.



## EL CHOQUE ELÉCTRICO PUEDE PROVOCAR LA MUERTE

El contacto directo con piezas eléctricas conectadas puede provocar un electrochoque fatal o quemaduras graves.

- Al hacer funcionar el sistema de plasma, se completa un circuito eléctrico entre la antorcha y la pieza a cortar. La pieza a cortar es una parte del circuito eléctrico, como también cualquier cosa que se encuentre en contacto con ella.
- Nunca toque el cuerpo de la antorcha, la pieza a cortar o el agua en una mesa de agua cuando el sistema de plasma se encuentre en funcionamiento.

### Prevención ante el electrochoque

Todos los sistemas por plasma de Hypertherm usan alto voltaje en el proceso de corte (son comunes los voltajes CD de 200 a 400). Tome las siguientes precauciones cuando se utiliza el equipo de plasma:

- Use guantes y botas aislantes y mantenga el cuerpo y la ropa secos.
- No se siente, se pare o se ponga sobre cualquier superficie húmeda cuando esté trabajando con el equipo.
- Aíslese eléctricamente de la pieza a cortar y de la tierra utilizando alfombrillas o cubiertas de aislamiento secas lo suficientemente grandes como para impedir todo contacto físico con la pieza a cortar o con la tierra. Si su única opción es trabajar en una área húmeda o cerca de ella, sea muy cauteloso.
- Instale un interruptor de corriente adecuado en cuanto a fusibles, en una pared cercana a la fuente de energía. Este interruptor permitirá al operador desconectar rápidamente la fuente de energía en caso de emergencia.
- Al utilizar una mesa de agua, asegúrese de que ésta se encuentre correctamente conectada a la toma a tierra.

- Instale este equipo y conéctelo a tierra según el manual de instrucciones y de conformidad con los códigos locales y nacionales.
- Inspeccione el cordón de alimentación primaria con frecuencia para asegurarse de que no esté dañado ni agrietado. Si el cordón de alimentación primaria está dañado, reemplácelo inmediatamente. **Un cable pelado puede provocar la muerte.**
- Inspeccione las mangueras de la antorcha y reemplácelas cuando se encuentren dañadas.
- No toque la pieza ni los recortes cuando se está cortando. Deje la pieza en su lugar o sobre la mesa de trabajo con el cable de trabajo conectado en todo momento.
- Antes de inspeccionar, limpiar o cambiar las piezas de la antorcha, desconecte la potencia primaria o desenchufe la fuente de energía.
- Nunca evite o descuide los bloqueos de seguridad.
- Antes de retirar la cubierta de una fuente de energía o del gabinete de un sistema, desconecte la potencia primaria de entrada. Espere 5 minutos después de desconectar la potencia primaria para permitir la descarga de los condensadores.
- Nunca opere el sistema de plasma sin que las tapas de la fuente de energía estén en su lugar. Las conexiones expuestas de la fuente de energía presentan un serio riesgo eléctrico.
- Al hacer conexiones de entrada, conecte el conductor de conexión a tierra en primer lugar.
- Cada sistema de plasma Hypertherm está diseñado para ser utilizado sólo con antorchas Hypertherm específicas. No utilice antorchas diferentes, que podrían recalentarse y ser peligrosas.



## LOS CORTES PUEDEN PRODUCIR HUMOS TÓXICOS

Los cortes pueden producir gases y humos tóxicos que agotan el oxígeno y causan lesiones o inclusive la muerte.

- Mantenga el área de corte bien ventilada o utilice un respirador con suministro de aire aprobado.
- No realice sus cortes en sitios que se hallen cerca de operaciones de desengrasado, limpieza o aplicación de aerosoles. Los vapores de ciertos solventes clorados se descomponen y forman gas fosgeno al quedar expuestos a la radiación ultravioleta.
- No corte metales que contengan materiales tóxicos o que estén recubiertos con ellos, tales como el cinc (galvanizado), el plomo, el cadmio o el berilio, a menos

que el área se halle bien ventilada y el operador lleve puesto un respirador con suministro de aire. Los recubrimientos y todo metal que contenga estos elementos pueden producir gases o humos tóxicos al ser cortados.

- Nunca corte depósitos con materiales potencialmente tóxicos en su interior – primero es necesario vaciarlos y limpiarlos debidamente.
- Este producto, cuando se lo usa para soldar o cortar, produce humo y gases que se conocen en el estado de California como causantes de defectos de nacimiento, y en algunos casos, cáncer.



**EL ARCO DE PLASMA PUEDE CAUSAR LESIONES Y QUEMADURAS**

**Antorchas de encendido instantáneo**

El arco de plasma se enciende inmediatamente después de activarse el interruptor de la antorcha.

El arco de plasma puede cortar a través de guantes y de la piel con rapidez.

- Manténgase alejado de la punta de la antorcha.
- No sostenga el metal junto al trayecto de corte.
- Nunca apunte la antorcha hacia Ud. mismo o hacia otras personas.



**LOS RAYOS DEL ARCO PUEDEN PRODUCIR QUEMADURAS EN LOS OJOS Y EN LA PIEL**

**Protección para los ojos** Los rayos del arco de plasma producen rayos intensos visibles e invisibles (ultravioleta e infrarrojo) que pueden quemar los ojos y la piel.

- Utilice protección para los ojos de conformidad con los códigos locales o nacionales aplicables.
- Colóquese protectores para los ojos (gafas o anteojos protectores con protectores laterales, y bien un casco de soldar) con lentes con sombreado adecuado para proteger sus ojos de los rayos ultravioleta e infrarrojos del arco.

**Protección para la piel** Vista ropa de protección para proteger la piel contra quemaduras causadas por la radiación ultravioleta de alta intensidad, por las chispas y por el metal caliente:

- Guantes largos, zapatos de seguridad y gorro.
- Ropa de combustión retardada y que cubra todas las partes expuestas.
- Pantalones sin dobladillos para impedir que recojan chispas y escorias.
- Retire todo material combustible de los bolsillos, como encendedores a butano e inclusive cerillas, antes de comenzar a cortar.

**Corriente del arco**

**Número del cristal**

**AWS (EE.UU.)**

**ISO 4850**

Hasta 100A  
100-200 A  
200-400 A  
Más de 400 A



No. 8  
No. 10  
No. 12  
No. 14

No. 11  
No. 11-12  
No. 13  
No. 14

**Área de corte** Prepare el área de corte para reducir la reflexión y la transmisión de la luz ultravioleta:

- Pinte las paredes y demás superficies con colores oscuros para reducir la reflexión.
- Utilice pantallas o barreras protectoras para proteger a los demás de los destellos.
- Advierta a los demás que no debe mirarse el arco. Utilice carteles o letreros.



**SEGURIDAD DE TOMA A TIERRA**

**Cable de trabajo** La pinza del cable de trabajo debe estar bien sujeta a la pieza y hacer un buen contacto de metal a metal con ella o bien con la mesa de trabajo. No conecte el cable con la parte que va a quedar separada por el corte.

**Mesa de trabajo** Conecte la mesa de trabajo a una buena toma de tierra, de conformidad con los códigos eléctricos nacionales o locales apropiados.

**Potencia primaria de entrada**

- Asegúrese de que el alambre de toma a tierra del cordón de alimentación está conectado al terminal de tierra en la caja del interruptor de corriente.
- Si la instalación del sistema de plasma supone la conexión del cordón de alimentación primaria a la fuente de energía, asegúrese de conectar correctamente el alambre de toma a tierra del cordón de alimentación primaria.
- Coloque en primer lugar el alambre de toma a tierra del cordón de alimentación primaria en el espárrago luego coloque cualquier otro alambre de tierra sobre el conductor de tierra del cable. Ajuste firmemente la tuerca de retención.
- Asegúrese de que todas las conexiones eléctricas están firmemente realizadas para evitar sobrecalentamientos.

**SEGURIDAD DE LOS EQUIPOS DE GAS COMPRIMIDO**

- Nunca lubrique reguladores o válvulas de cilindros con aceite o grasa.
- Utilice solamente cilindros, reguladores, mangueras y conectores de gas correctos que hayan sido diseñados para la aplicación específica.
- Mantenga todo el equipo de gas comprimido y las piezas relacionadas en buen estado.
- Coloque etiquetas y códigos de color en todas las mangueras de gas para identificar el tipo de gas que conduce cada una. Consulte los códigos locales o nacionales aplicables.



**LOS CILINDROS DE GAS PUEDEN EXPLOTAR SI ESTÁN DAÑADOS**

Los cilindros de gas contienen gas bajo alta presión. Un cilindro dañado puede explotar.

- Manipule y utilice los cilindros de gas comprimido de acuerdo con los códigos locales o nacionales aplicables.
- No use nunca un cilindro que no esté de pie y bien sujeto.
- Mantenga la tapa de protección en su lugar encima de la válvula, excepto cuando el cilindro se encuentre en uso o conectado para ser utilizado.
- No permita nunca el contacto eléctrico entre el arco de plasma y un cilindro.
- No exponga nunca los cilindros a calor excesivo, chispas, escorias o llamas.
- No emplee nunca martillos, llaves u otro tipo de herramientas para abrir de golpe la válvula del cilindro.



**EL RUIDO PUEDE DETERIORAR LA AUDICIÓN**

La exposición prolongada al ruido propio de las operaciones de corte y ranurado puede dañar la audición.

- Utilice un método de protección de los oídos aprobado al utilizar el sistema de plasma.
- Advierta a las demás personas que se encuentren en las cercanías acerca del peligro que supone el ruido excesivo.

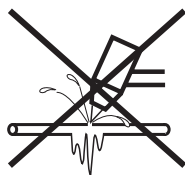


**OPERACIÓN DE MARCAPASOS Y DE AUDÍFONOS**

Los campos magnéticos producidos por las elevadas corrientes pueden afectar la operación de marcapasos y de audífonos. Las personas que lleven marcapasos y audífonos deberán consultar a un médico antes de acercarse a sitios donde se realizan operaciones de corte y ranurado por plasma.

Para reducir los peligros de los campos magnéticos:

- Mantenga el cable de trabajo y la manguera de la antorcha a un lado, lejos del cuerpo.
- Dirija la manguera antorcha lo más cerca posible del cable de trabajo.
- No envuelva el cable de trabajo ni la manguera de la antorcha en su cuerpo.
- Manténgase tan lejos de la fuente de energía como sea posible.



**UN ARCO PLASMA PUEDE DAÑAR TUBOS CONGELADOS**

Se puede hacer daño a los tubos congelados, o se los puede reventar, si uno trata de descongelarlos con una antorcha por plasma.



# Section 1 INTRODUCTION

In this section:

---

Read This First .....	1-2
Safety .....	1-3
Warning - Instant-On Torches .....	1-3
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PAC121M Machine Torch .....	1-6

---

# INTRODUCTION

---

## READ THIS FIRST

This service manual provides qualified maintenance personnel with the necessary data in order to maintain the MAX42 Power Unit (see Figure 1-1). The major emphasis of this manual is to access the power unit subassemblies, printed circuit boards, and components in order to perform fault isolation procedures. These procedures are supported by wiring diagrams, printed circuit board schematics and a parts list. This indexed parts list is supported by exploded view illustrations which provide the user with the ability to locate subassemblies and components for testing and removal and replacement.

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

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

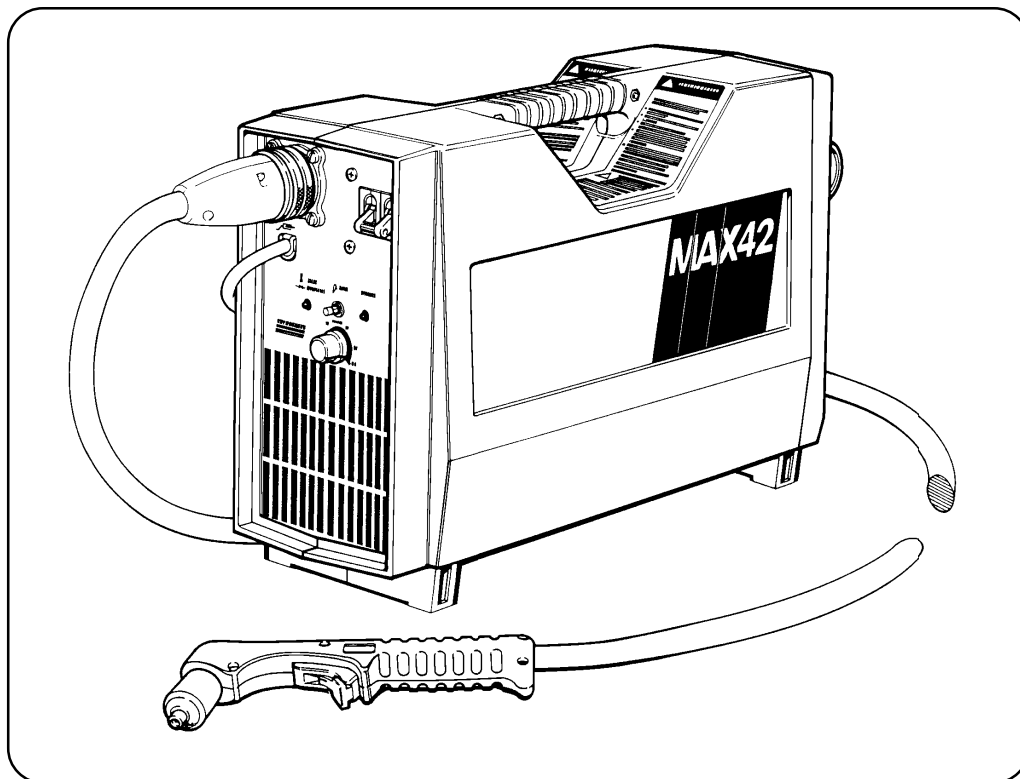


Figure 1-1 MAX42 Power Unit, 208-240 VAC, 1 PH, 60 Hz

## SAFETY

Before maintaining the MAX42 Power Unit, all maintenance personnel should become familiar with all cautions and warnings prior to performing any fault isolation procedure. The following formats are used for each:

Caution: A caution describes a situation that may cause damage to the MAX42, 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, etc.

In addition, if the MAX42 Power Unit must be operated in order to determine if the malfunction was corrected, refer to the MAX42 Instruction Manual IM-85 (part number 800850), Section 1, *Safety* for operating precautions.

## WARNING - INSTANT-ON TORCHES



### WARNING



The PAC121 hand-held torches and machine torch are instant-on torches. These torches fire (produce a plasma arc) immediately after torch switch closure or remote switch closure for a machine torch. Always hold the hand torch away from your body as a precaution against accidental torch firing. Be aware of this hazardous potential, failure to do so can result in serious bodily injury.

The PAC121T torch with safety trigger allows an operator the ability to safely handle the torch before and after the cut and to minimize the possibility of accidental torch firing.

# INTRODUCTION

---

## DESCRIPTION

This manual provides the necessary information to service the MAX42 power unit. The information provided includes the following:

- Section 1 - Description
- Section 2 - Theory of Operation
- Section 3 - Maintenance
- Section 4 - Parts Lists
- Section 5 - Wiring Diagrams & Schematics

## Power Unit

The MAX42 provides continuously variable current output from 20 to 40 amps on all thicknesses up to 1/2 inch. This allows the operator wide variations in cutting speeds on the same thickness of metal. The 15-amp setting is for metals up to 1/16-inch thick, while the 40-amp setting is used for thicker metals. Cylinder air, shop air or nitrogen can be used as long as it is free of moisture, oil and particulate matter contamination.

## Major Subassemblies and Components

The MAX42 Power Unit consists of the following major subassemblies and components listed in Table 1-1.

**Table 1-1 Major Subassemblies & Components of the MAX42 Power Unit (071003)**

Description	Part Number
Right Enclosure	001216
Left Enclosure	002183 (w/line chokes) 001216 (w/o line chokes)
Power On/Off Circuit Breaker	003101
Inverter Subassembly	029289
Front Panel Subassembly	029305
Rear Panel Subassembly	029338
Air Pack Power Supply Bracket Subassembly	029339
Pneumatic Subassembly	029351
Pilot Arc Control PC BD Assembly	041191

## SPECIFICATIONS

### Power Unit

#### Power Requirements

Maximum OCV .....	250 VDC
Output Current .....	40 Amps Maximum
Output Voltage .....	120 VDC @ 40 amps, increasing to 215 VDC @ 0 amps
Duty Cycle Rating .....	80% (on 240V line) @ 4.8 kw (40 amps, arc 120 volts); 100% @ 35 amps
Input Power at rated output (4.8 kw):	
# 071003 .....	208-240V, 1 PH, 50/60 Hz, @ 37-32 amps

#### Grounding

Be sure the power cord is plugged into a properly grounded outlet or that the ground wire is properly connected to the ground in the disconnect box.

#### Gas Requirements

Gas Type .....	Air or Nitrogen
Gas Quality .....	Clean, Dry, Oil-Free
Gas Flow/Pressure (input to regulator) .....	270 scfh/4.5 scfm @ 80-125 psig (127 l/min @ 5.5 - 8.6 bar)
Gas Pressure Setting (at power unit regulator) .	80 psig (5.4 bar)

#### Physical Characteristics

Width .....	8 inches (20 cm)
Height .....	13 inches (33 cm)
Length .....	20 inches (51 cm)
Weight .....	49 pounds (22 kg)

### Disconnect Switch Box

The disconnect box should be sized to the following requirements:

<u>Input Voltage Range</u>	<u>Phase</u>	<u>Input Current Range @ 4.8 kw Output</u>	<u>Recommended Fuse Size</u>
208-240 VAC	1	37-32 amps	50 amps

# INTRODUCTION

---

## PAC121T Trigger Torch

Maximum cutting thickness range .....	1/2 inch (13 mm)
Maximum current at 80% duty cycle @ 40° C .....	40 amps
Gas Flow .....	270 scfh/4.5 scfm at 70 psi (127 l/min at 4.8 bar)
Weight .....	6 pounds (2.7 kg) with 25 ft. (7.6 m) lead

## PAC121P Pushbutton Torch

Maximum cutting thickness range .....	1/2 inch (13 mm)
Maximum current at 80% duty cycle @ 40° C .....	40 amps
Gas Flow .....	270 scfh/4.5 scfm at 70 psi (127 l/min at 4.8 bar)
Weight .....	6 pounds (2.7 kg) with 25 ft. (7.6 m) lead

## PAC121M Machine Torch

Maximum cutting thickness range .....	1/2 inch (13 mm)
Maximum current at 80% duty cycle @ 40° C .....	40 amps
Gas Flow .....	270 scfh/4.5 scfm at 70 psi (127 l/min at 4.8 bar)
Weight .....	6 pounds (2.7 kg) with 25 ft.

## Section 2 THEORY OF OPERATION

In this section:

---

General .....	2-2
Principles of Operation .....	2-2
Circuit Descriptions .....	2-3
Control Circuits .....	2-3
Power Circuits .....	2-4

---

# THEORY OF OPERATION

---

## GENERAL

The theory of operation describes the basic operation of the 208-240 VAC, 1 PH, 60 Hz Power Unit. It is assumed that the technician has a working knowledge of inverter power supply theory.

## PRINCIPLES OF OPERATION

Refer to the following principles and Figure 2-1 to understand how the MAX42 Power Unit works.

1. The incoming 1-phase AC power is converted to DC by the input rectifier board.
2. The DC current is converted back into high frequency AC current (20 KHz) by the inverter.
3. The isolation transformer couples the voltage from the inverter to the secondary rectifier.
4. The secondary rectifier converts the AC back to DC for the output current to the torch and to the pilot arc controller. The pilot arc controller provides current control between the nozzle and electrode.
5. The feedback loop (control board, modulator board, and current sensor) monitors the inverter output and controls it by varying the pulse width to the FET packs.

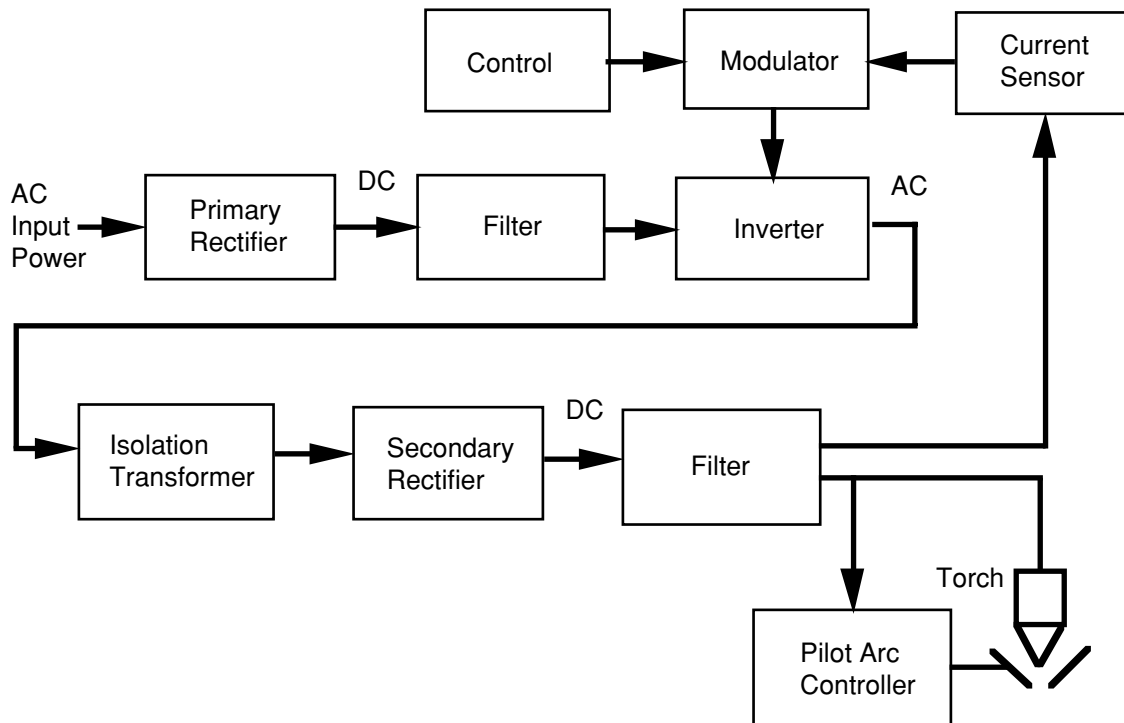


Figure 2-1 MAX42 Power Unit Block Diagram



## CIRCUIT DESCRIPTIONS

The MAX42 Power Unit is functionally divided into control circuits and inverter circuits. Note that some of the printed circuit boards and components serve in both functional areas. Refer to Section 5, *Wiring Diagrams & Schematics*, for all associated wiring diagrams, circuit board schematics, and the pneumatic system flow diagram.

### Control Circuits

- **Power Supplies**

In addition to the main power inverter, there are two control power supplies in the MAX42 power unit. One of the power supplies, on PCB2, has two functions: (1) It supplies power to relays K1 and K2 to bypass the two 5-ohm surge resistors R1 and R2. (2) It supplies power to the inverter control circuitry located on the modulator board PCB12. The other control power supply, comprised of control power supply board PCB13 and T5, supplies +15 VDC power to operate fan M1 and to power the control circuits on control board PCB14.

- **Control Board PCB14**

This circuit board performs the following functions: (1) It monitors the pressure switch PS1 and the thermostat TS1. Indicator LT1 lights when the operating temperature and the incoming gas pressure are within operating limits. It goes out when either pressure switch PS1 opens because the incoming gas pressure is too low or when thermostat TS1 opens because the duty cycle rating was exceeded causing the power unit to overheat. (2) It controls the sequence of function required to generate plasma as follows:

- Turns on the inverter when the torch switch button is pressed.
- After a short delay, turns on the air solenoid valve V1 to blow back the electrode.
- Monitors the pilot arc controller board PCB15 for arc transfer.
- Ramps the current control command from the pilot arc level (18-20 amps) to the cut current selected by the operator.
- Turns the inverter off if the arc transfer does not occur within three seconds.
- Provides indication to the operator that the power is on (LT2 lit) and the pressure and temperature interlocks are okay (LT1 is lit).

- **Feedback**

The output current from the inverter flows through the shunt (R1, R2, and R3) located on I/O board PCB1. The signal from the shunt is sent to the modulator board PCB12.

# THEORY OF OPERATION

---

- **Modulator Board PCB12**

This circuit board compares the operator set current level from the control board PCB14 to the output signal from the shunt (R1, R2, and R3) on I/O board PCB1. It controls the output of the inverter by varying the pulse width of the switching waveform applied to the gates of the FET packs in the inverter power section.

## Power Circuits

- **In-rush Protection Circuit**

The in-rush protection circuit consists of relays K1 and K2 and resistors R1 and R2 located on PCB2. If the power on/off circuit breaker S1 is set to 1 (ON) at the instant the AC line voltage is high, a large pulse of current will surge through the input rectifier diodes (PCB3) and possibly destroy them. To protect the input rectifier diodes, the two 5-ohm resistors, R1 and R2, are used to limit the current during in-rush (approximately 0.020 second). After in-rush, relays K1 and K2 energize to bypass the resistors.

- **Primary Rectifier Circuit**

The input rectifier circuit, PCB3, converts the alternating line current (AC) to direct current (DC). The DC current output is 120 pulses per second at 60 Hz or 100 pulses per second at 50 Hz. The DC output of PCB3 is input to the capacitor bank printed circuit boards PCB4 and PCB5.

- **Capacitor Bank Circuit**

The capacitor bank circuit, which consists of PCB4 and PCB5, acts as a filter to smooth out the ripple of the DC pulse output of PCB3. When the DC pulse output of PCB3 begins to fall, the capacitors discharge thereby maintaining a constant DC pulse level output for input to the switching circuit (FET packs) for conversion into high frequency AC current.

- **Switching Circuit**

The switching circuit, which consists of PCB6 (FET packs 1 and 2) and PCB7 (FET packs 3 and 4), converts the DC voltage/current from the capacitor bank into 20 Khz AC signal for the output transformers T3 and T4. The feedback loop, under the control of the modulator board PCB12, transmits the gate drive signals (switching waveform) to gate drive transformer for input to the gates of the FETs to vary the pulse width.

- **Output Transformer Circuit**

The output transformer circuit, T3 and T4, serves two purposes: (1) to convert the output voltage to approximately 300 volts and (2) to isolate the user and welding circuitry from the potentially dangerous line voltages. The transformers operate synchronously with each transformer passing half the power. In the 208-240 VAC power unit, the transformers are connected in parallel.

# THEORY OF OPERATION

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- **Output Rectifier Circuit**

The output rectifier circuit (PCB8 and PCB9) converts the high frequency AC signal back to a pulsating DC signal for output to filter L1.

- **Pilot Arc Controller Board PCB15**

This circuit provides a path from the electrode to the nozzle for the pilot arc. As the arc is brought closer to the workpiece more current is diverted to the workpiece and less to the nozzle. When the voltage between the workpiece and the nozzle reduces to the preset level, the pilot arc controller turns off the current path to the nozzle and arc transfer is complete.

During cutting, the pilot arc controller monitors the workpiece-to-nozzle voltage. If this voltage increases past the preset level, the current path is turned on and current is diverted to the nozzle. A gradual transition occurs from the cut mode to the pilot arc mode of operation. The pilot arc controller also signals the control board PCB14 to reduce the current to 20 amps whenever the unit is in pilot arc operation.

## Section 3 MAINTENANCE

In this section:

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Torch Switch Removal and Replacement .....	3-19
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Filter/Regulator Pressure Adjustment .....	3-24
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# MAINTENANCE

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## GENERAL

This section provides service level maintenance instructions for the MAX42 single-phase power supply. Maintenance of the power supply consists of performing a visual inspection and checkout procedures.

## TEST EQUIPMENT & TOOLS

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

## VISUAL INSPECTION

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

## CHECKOUT PROCEDURES

The checkout procedures are provided for the 208-240 VAC, 60 Hz, single-phase power supply. These procedures include the *Initial Resistance Checks* and the *Corrective Maintenance Checks*. These checkout procedures are presented in a flow diagram format in order to aid the technician in performing the checkout in the proper sequence.

- Refer to the wiring diagrams, Figures 5-1 and 5-2, when performing the checkout procedures. Printed circuit board schematic diagrams, Figures 5-3 through 5-15 are also provided.
- In order to locate subassemblies and components, Section 4, *Parts List*, provides maintenance personnel with an indexed parts lists of the major subassemblies which are supported by exploded view illustrations.
- After the malfunction has been located and repaired, refer to the *Sequence of Operation* flow diagram in this Section in order to test the power unit for proper operation.

## Initial Resistance Checks

After visually inspecting the exterior of the power supply, perform the following initial resistance checks to isolate malfunctions to replaceable parts and to items that can be repaired. Prior to performing any of the resistance checks, observe the following warning and caution.



### WARNING



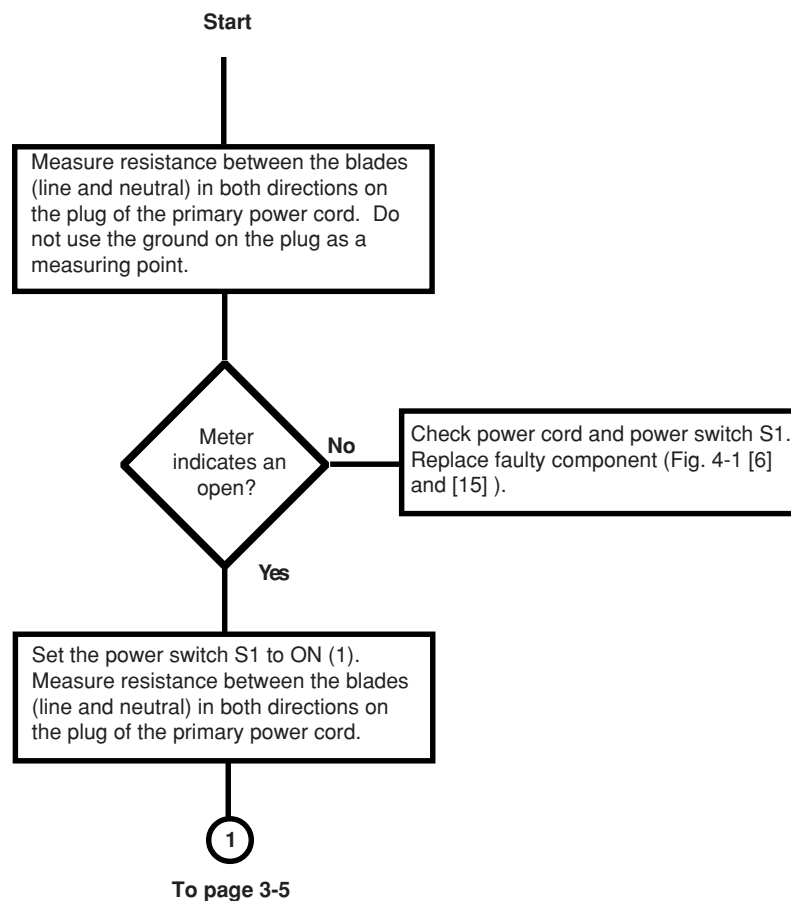
**SHOCK HAZARD:** Always unplug the power supply prior to performing resistance checks in the power unit. Dangerous voltages exist within the power unit which could cause serious injury or death. If questions or problems arise during servicing, call the Hypertherm Technical Services department at 1-800-643-0030.

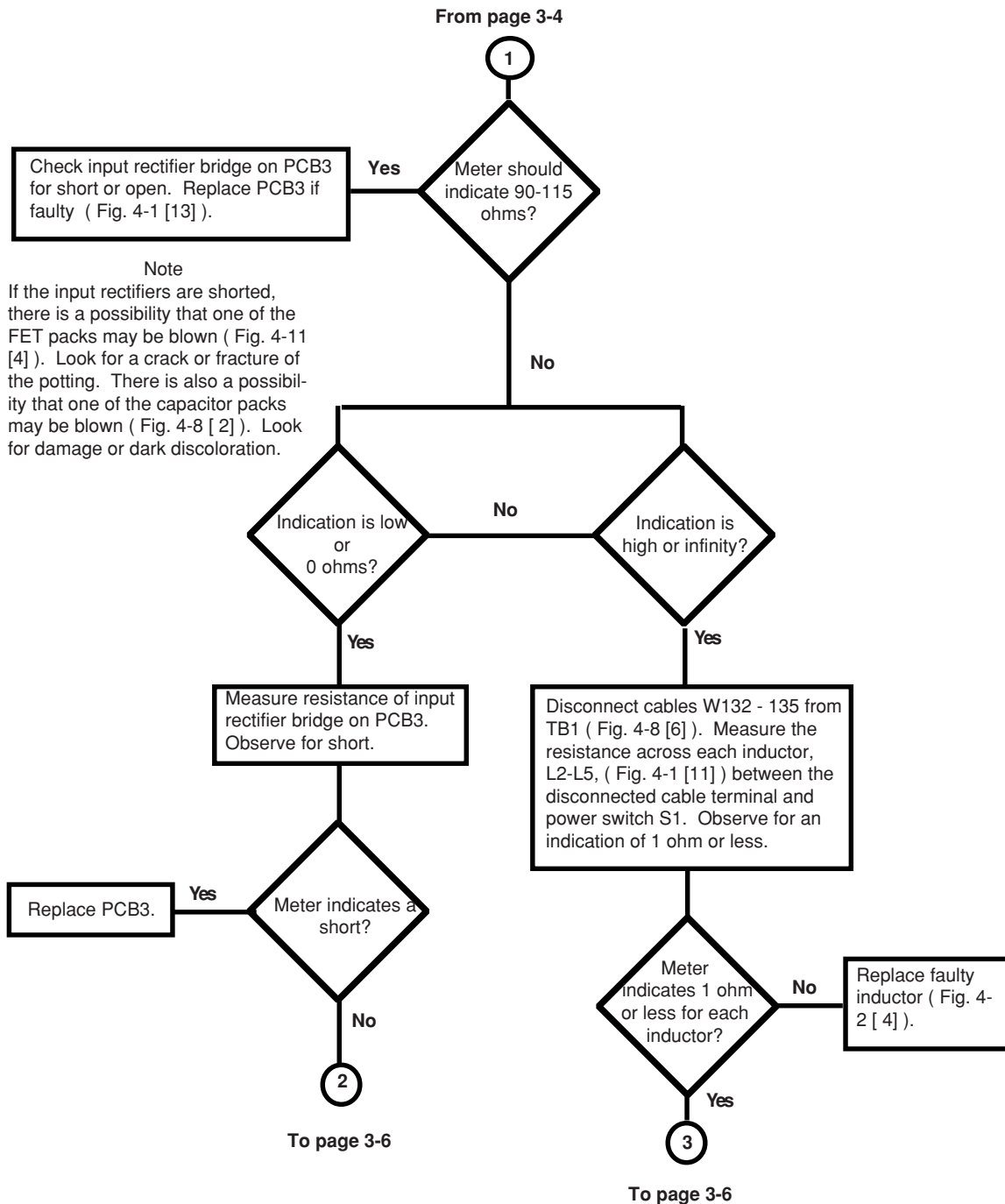
**Caution:** After the power unit has been received for maintenance, always perform the initial resistance checks before applying power to the unit. If these checks are not performed prior to power up, further damage to the power supply could result.

# MAINTENANCE

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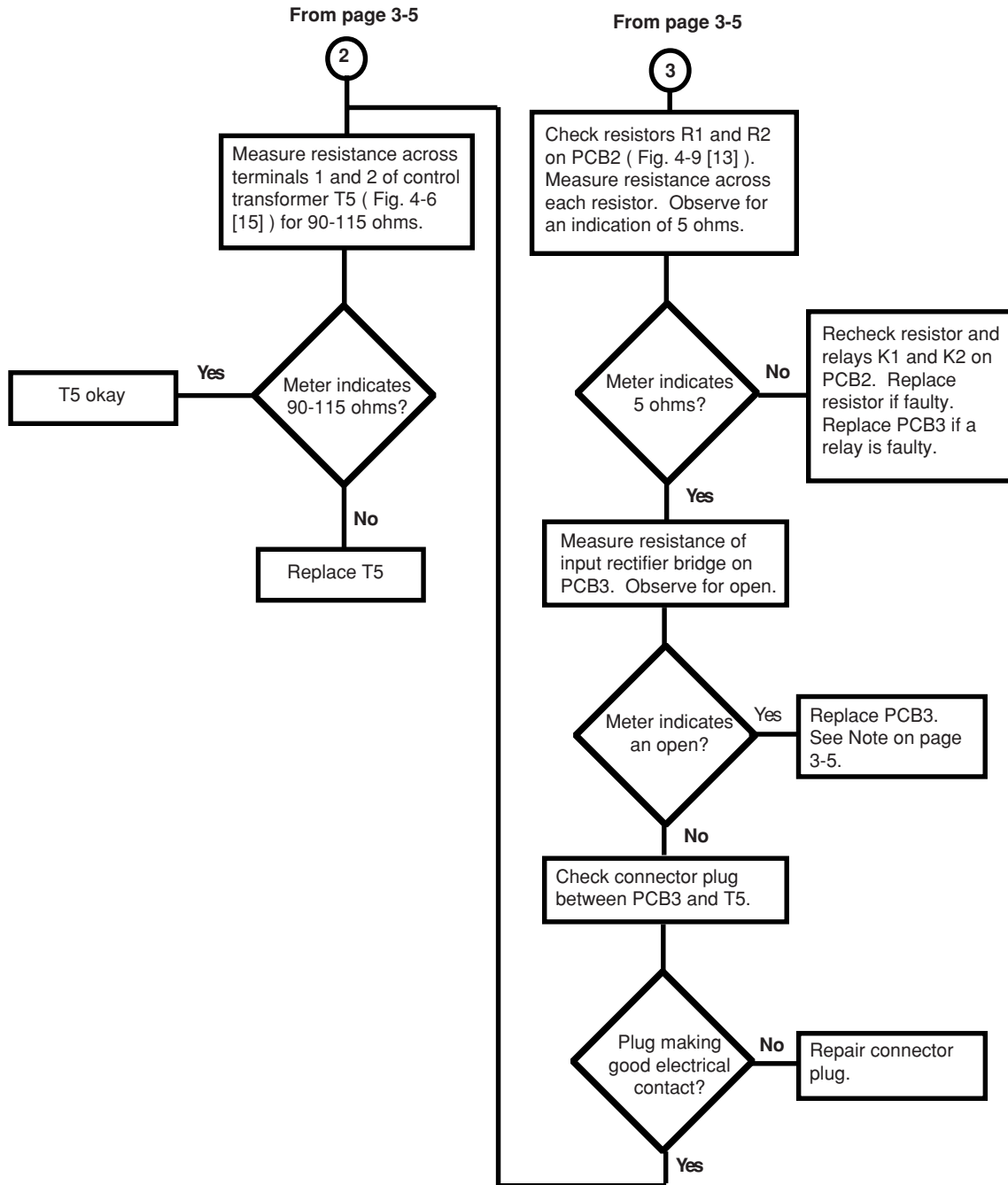
1. Set the MAX42 power switch S1 to OFF (0), unplug the power cord, and disconnect the gas supply.
2. Remove the left and right enclosures of the power supply. To do this, refer to Figure 4-1. Remove the 6 screws (1), 3 screws (2), and 5 nuts (12) from the right enclosure (3) and left enclosure (11) to access the power supply interior.
3. Move the right and left enclosures away from the power supply. **Note that there are inductors attached and wired to the inside of the left enclosure. Use caution when moving the left enclosure to gain access to the power supply.**
4. Visually inspect the interior of the power supply. Look for loose connections, burn and char marks, damaged components, etc.
5. Perform the initial resistance checks.







# MAINTENANCE



## Corrective Maintenance Checks

If no problems were not found during the initial resistance checks, proceed with the following corrective maintenance checks.

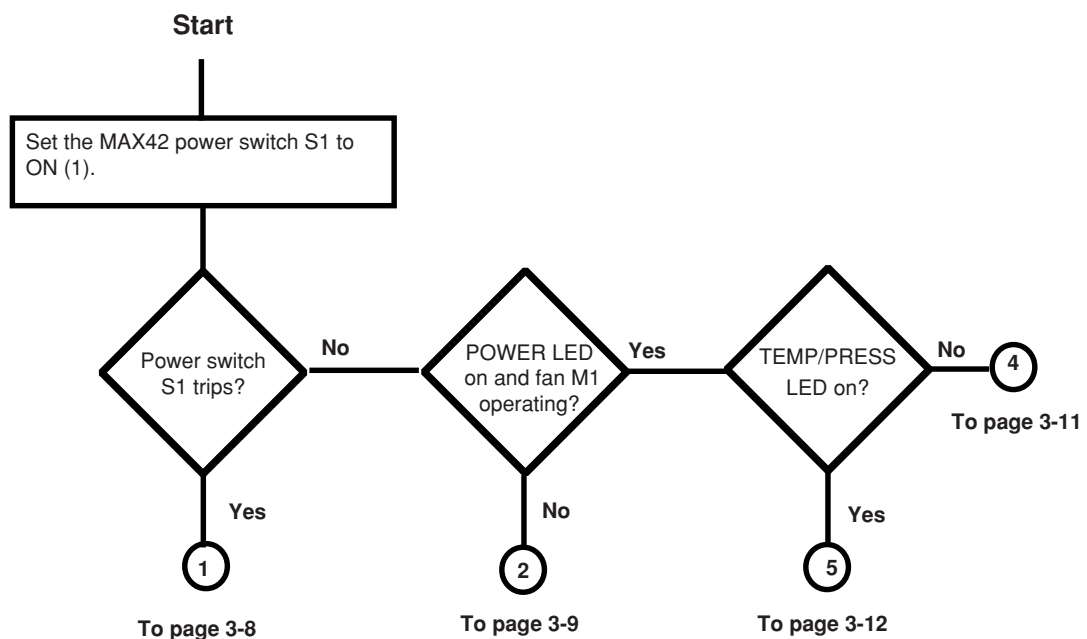


### WARNING



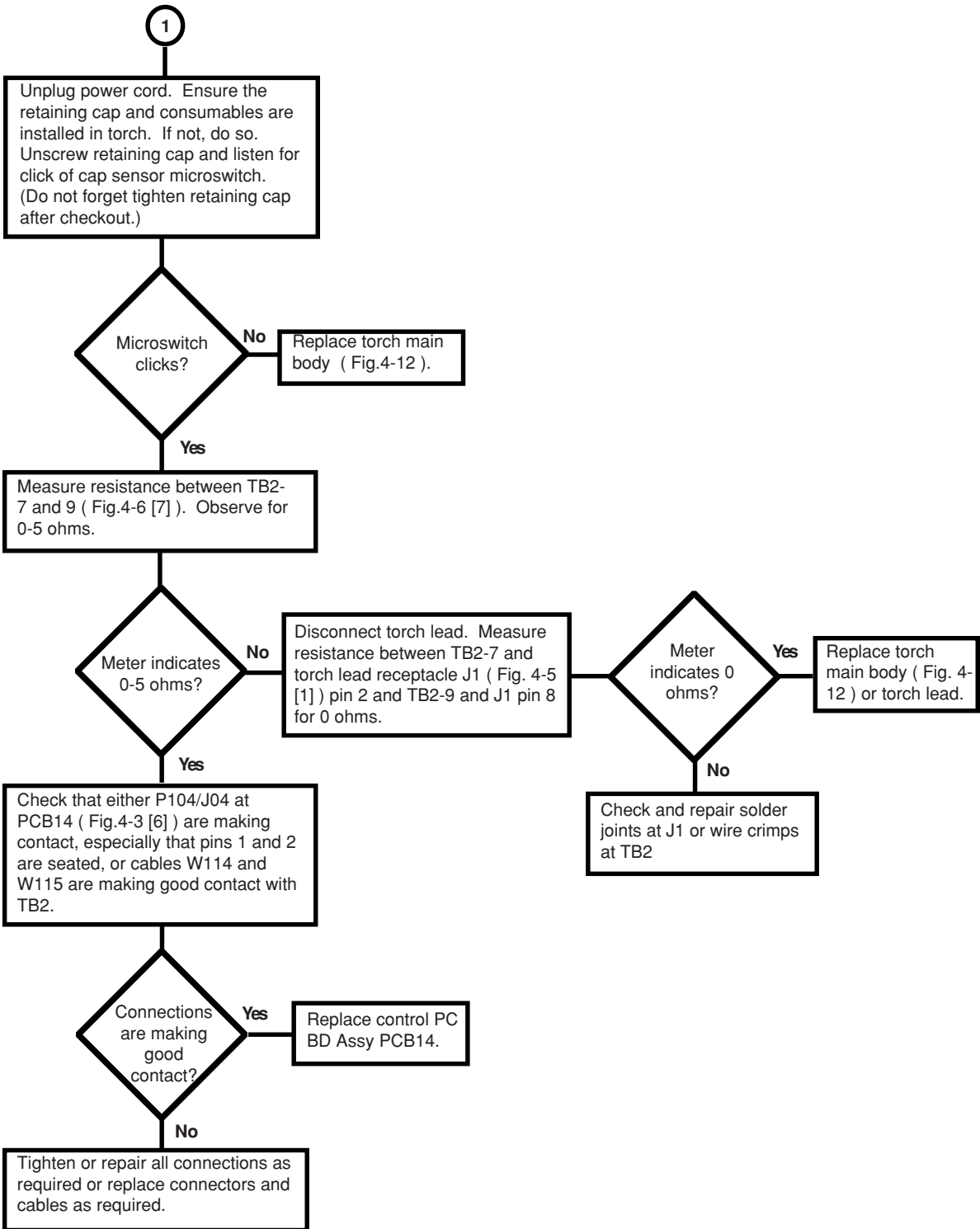
**SHOCK HAZARD:** Always use caution when servicing a power supply when plugged in and the covers are removed. Dangerous voltages exist within the power supply which could cause injury or death. If questions or problems arise during servicing call the Hypertherm Technical Services department at 1-800-643-0030.

1. Plug in the power supply power cord and connect the gas supply.
2. Connect the torch lead.
3. Perform the corrective maintenance checks.

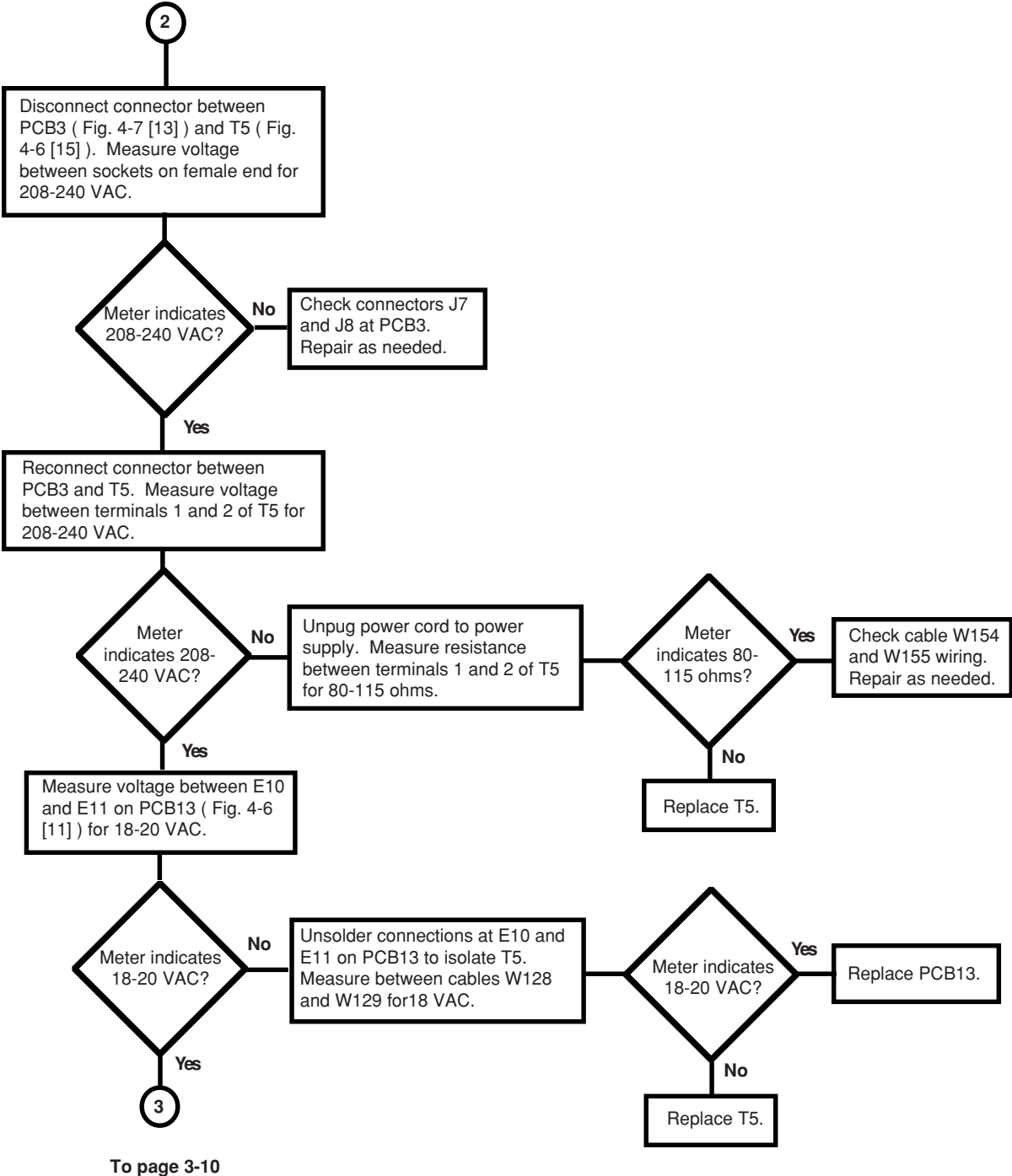


# MAINTENANCE

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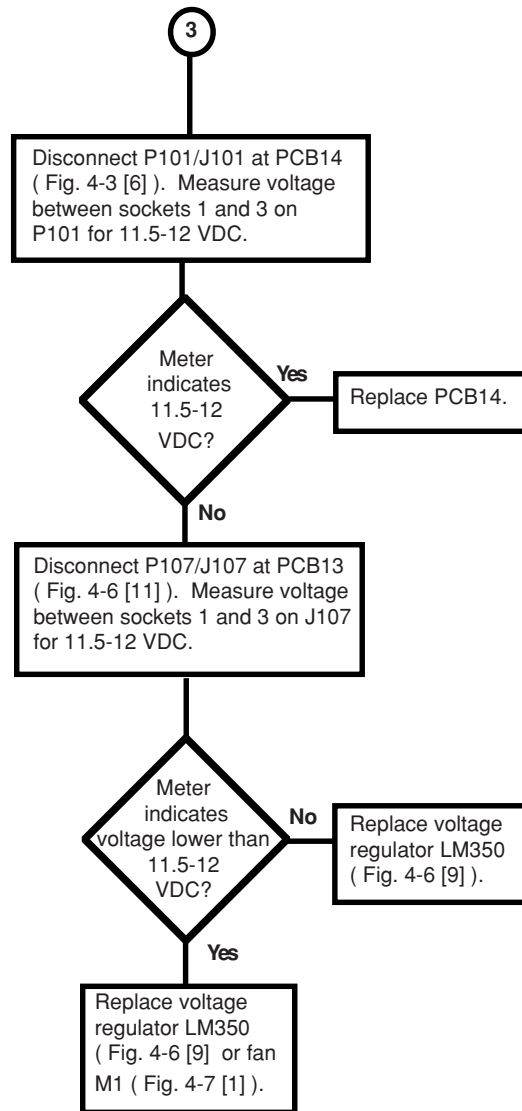


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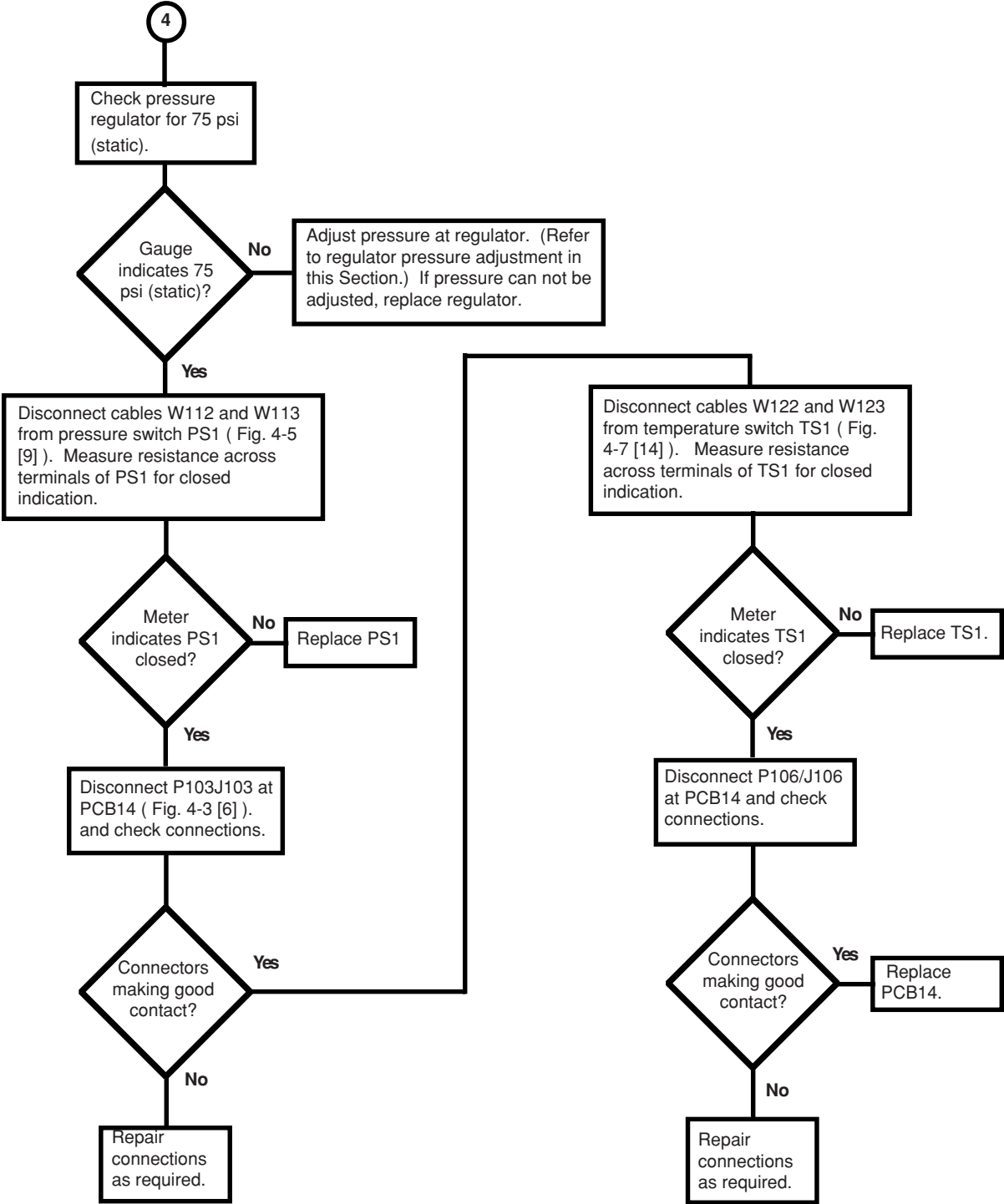


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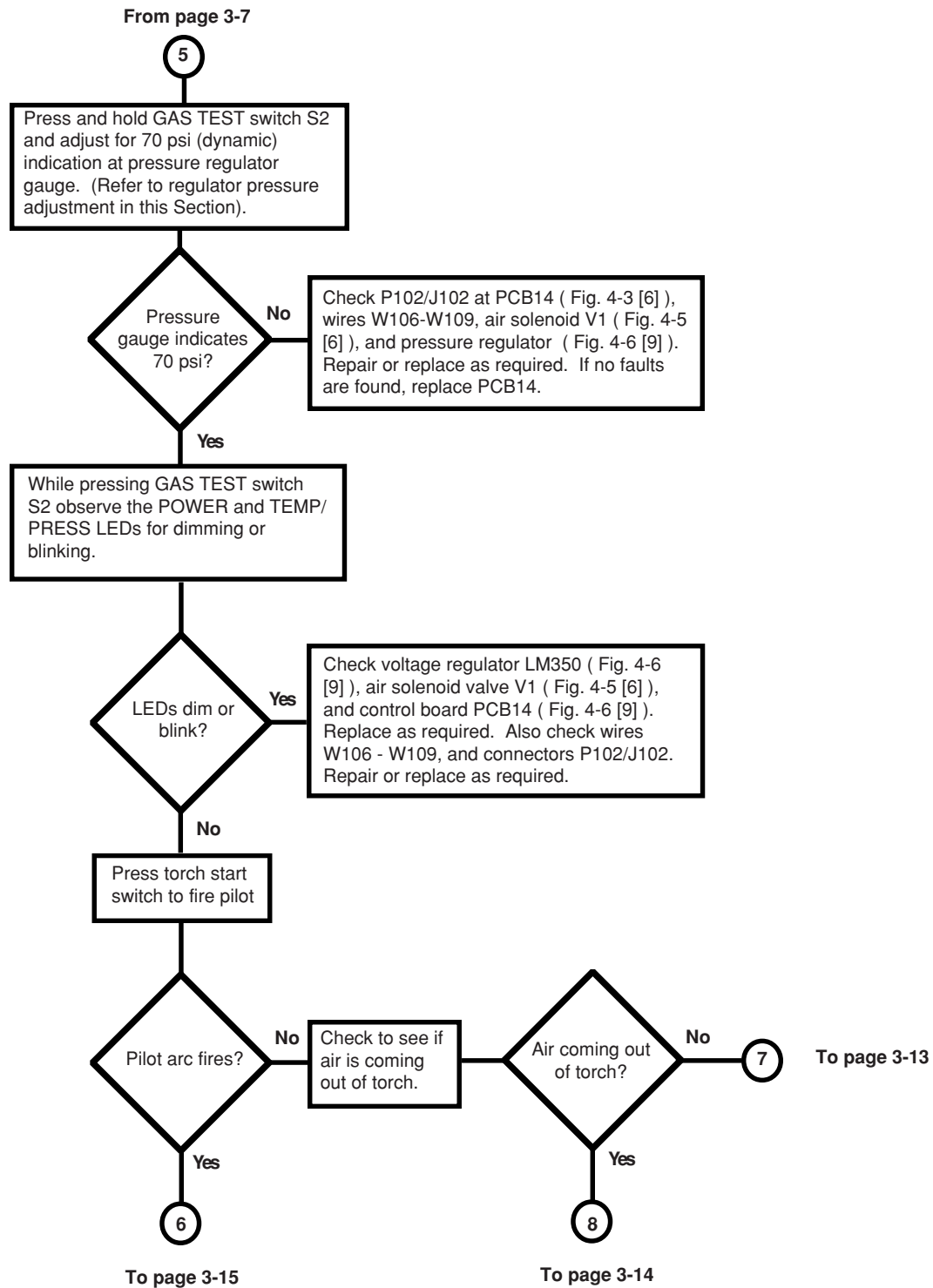
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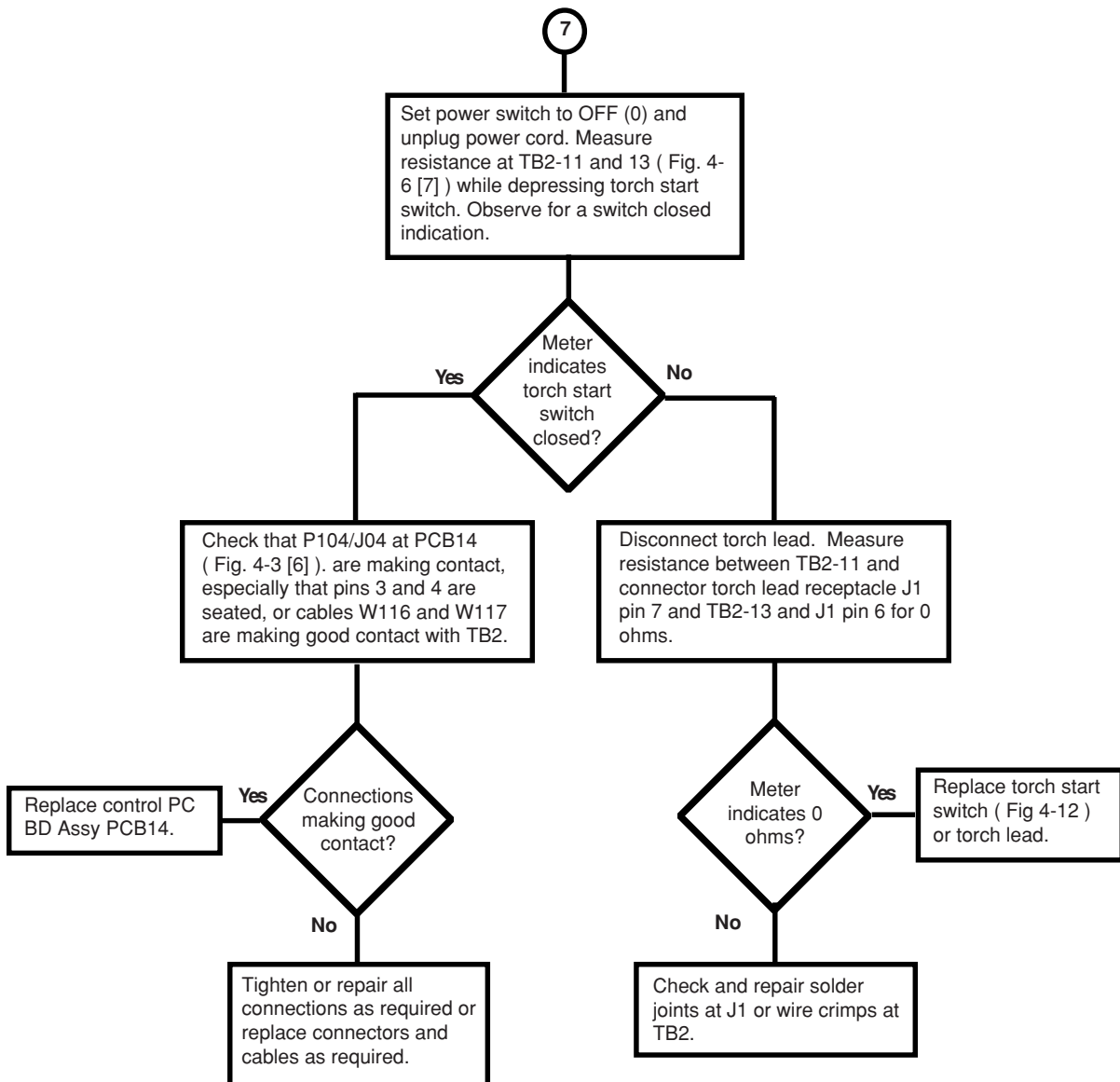
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# MAINTENANCE



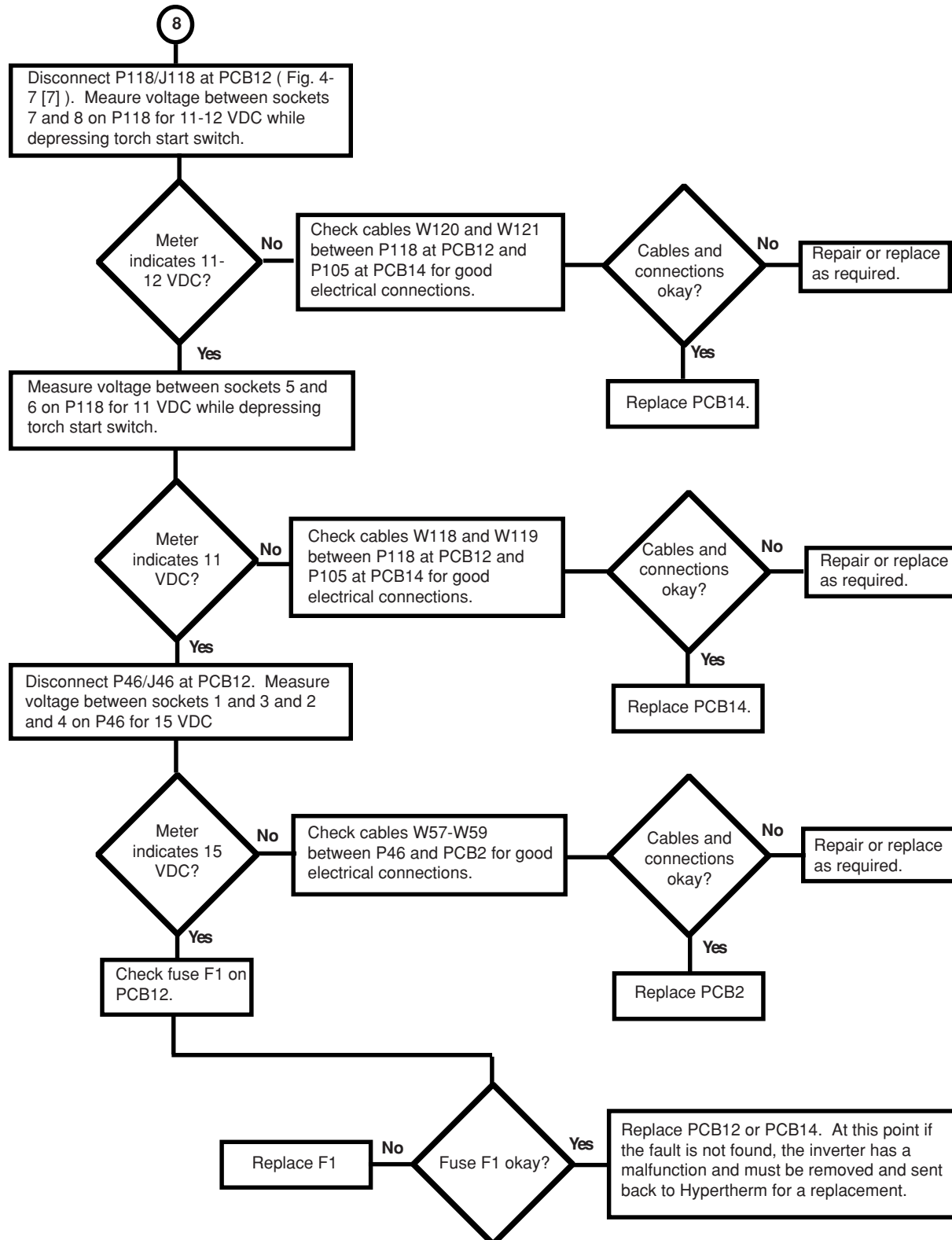
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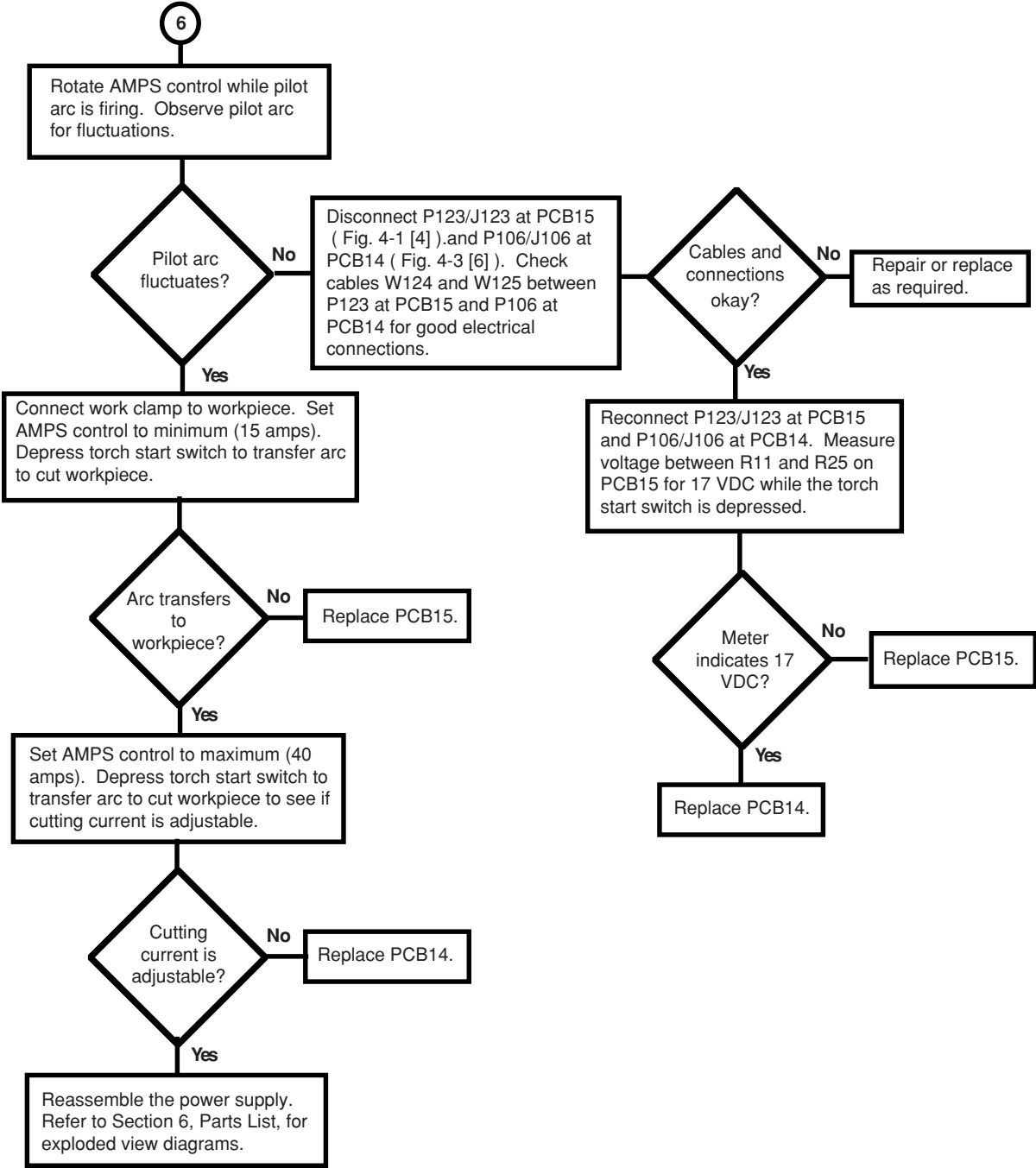


# MAINTENANCE

From page 3-12



From page 3-12



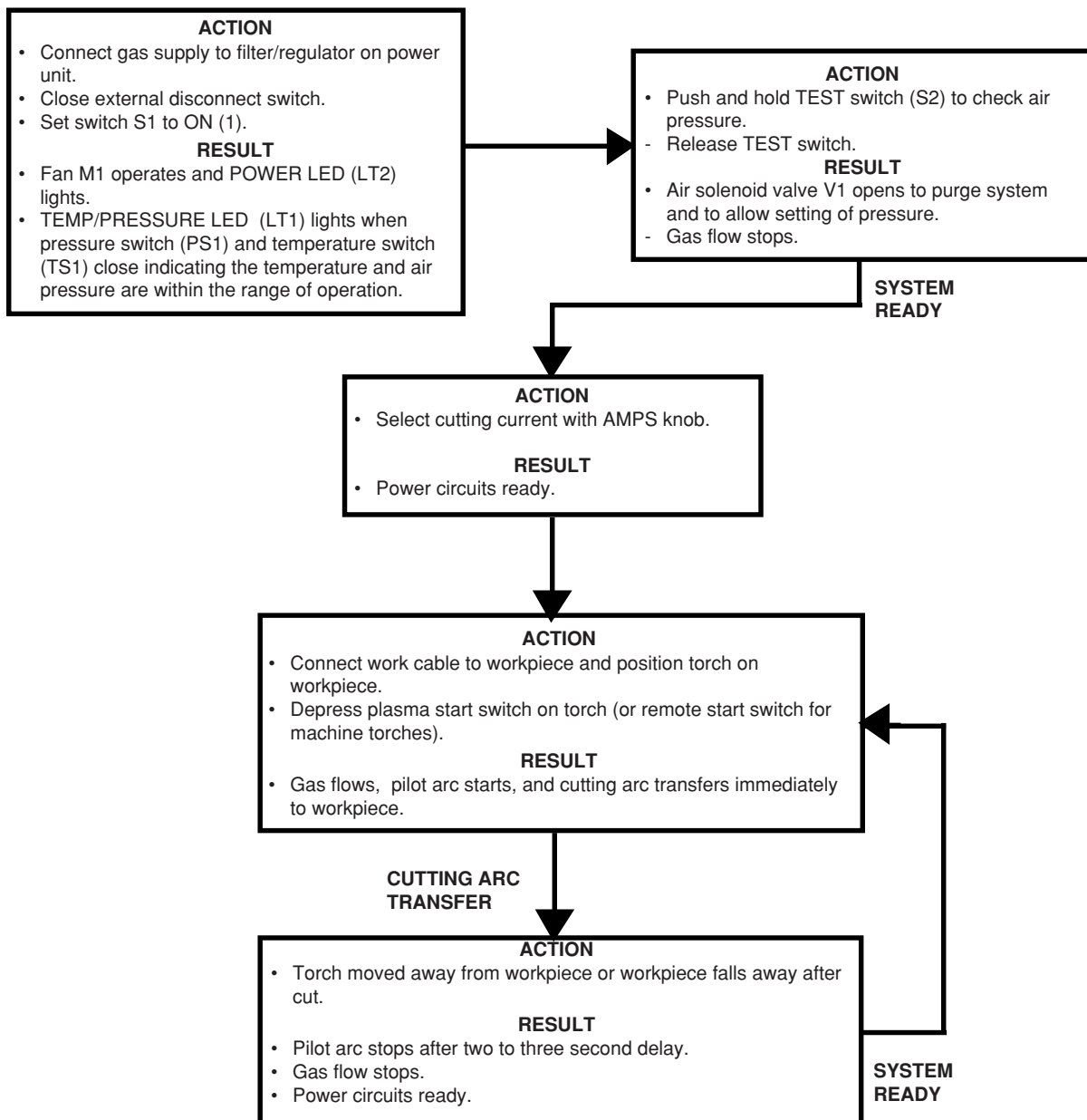
# MAINTENANCE

## SEQUENCE OF OPERATION

After repairing or replacing faulty components, refer to the following sequence of operation procedure to test the power unit and torch assembly for normal operation.

Prior to starting the procedure, ensure that the required eye and body protection is worn.

### SYSTEM OFF



# MAINTENANCE

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## PAC121T TORCH PARTS REMOVAL AND REPLACEMENT

Repair of the PAC121T torch normally requires that either the torch main body or the torch switch be replaced. Refer to Section 4, *Parts List* for a torch parts breakdown.

### Torch Main Body Removal and Replacement

To remove and replace the torch main body, order the PAC121T torch main body with switch (020932) and refer to the following procedure and Figure 3-1.

1. Ensure the MAX42 power switch is positioned to OFF (0), unplug the power cable, and disconnect the gas supply.
2. Remove the five (5) screws which secure the handle halves together.
3. Remove the torch main body and torch switch from the handle halves.
4. Remove the Tyrap that holds wiring bundle in place.
5. Disconnect the black plunger wire and two white wires of the cap sensor microswitch from the torch leads.

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

6. Disconnect the red wire attached to the pilot arc tab.
7. Disconnect torch main body and torch lead gas fittings using 5/16" and 7/16" wrenches.
8. Connect and tighten the new torch main body with the torch lead gas fittings.
9. Connect the terminal of the two white wires from the torch lead to the black plunger wire terminal of the torch main body.
10. Connect the bullet receptacles and plugs connecting the two blue wires from the torch lead to the white wires from the cap sensor microswitch.
11. Connect the red wire from torch leads to the pilot arc tab.
12. Bundle wires and attach Tyrap as necessary.
13. Install the torch main body and torch switch back into handle. Be certain that torch switch slides into position above safety trigger, and that trigger movement activates the button of the switch and then releases.
14. Position the handle halves together (be careful not to pinch any wires) and replace the five (5) screws to secure the handle halves together.

## Torch Switch Removal and Replacement

To remove and replace the torch switch, order the torch switch (005094) and two (2) splices (074069) and refer to the following procedure and Figure 3-1.

1. Ensure the MAX42 power switch is positioned to OFF (0), unplug the power cable, and disconnect the gas supply.
2. Remove the five (5) screws which secure the handle halves together.
3. Remove the torch switch from the handle.
4. Remove the torch switch by cutting the two (2) splices at the torch lead (violet wires).
5. Replace the torch switch by crimping the switch leads and the violet leads from the torch lead together with the splices.
6. Install the torch switch back into handle. Be certain that torch switch slides into position above safety trigger, and that trigger movement activates the button of the switch and then releases.
7. Position handle halves together (be careful not to pinch any wires) replace the five (5) screws to secure the handle halves together.

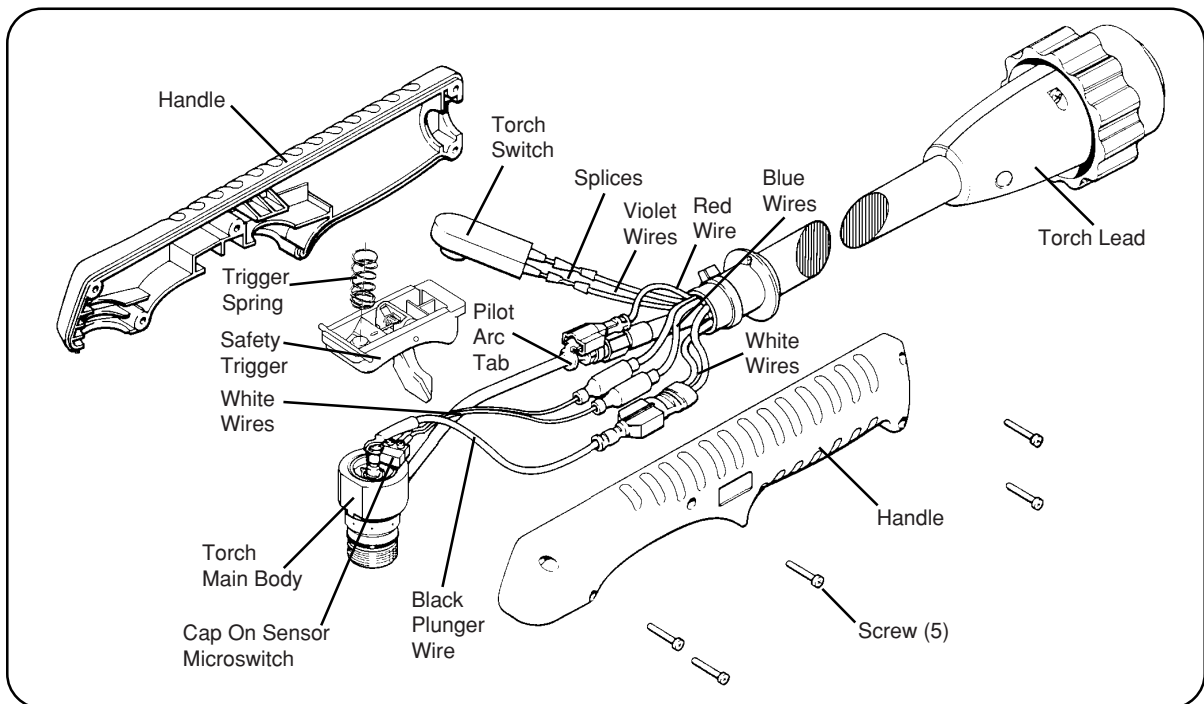


Figure 3-1 PAC121T Torch Assembly

# MAINTENANCE

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## PAC121P TORCH PARTS REMOVAL AND REPLACEMENT

Repair of the PAC121P torch normally requires that either the torch main body or the torch switch be replaced. Refer to Section 4, *Parts List* for a torch parts breakdown.

### Torch Main Body Removal and Replacement

To remove and replace the torch main body, order the PAC121P torch main body with switch (120013) and refer to the following procedure and Figure 3-2.

1. Ensure the MAX42 power switch is positioned to OFF (0), unplug the power cable, and disconnect the gas supply.
2. Remove the five (5) screws which secure the handle halves together.
3. Remove the torch main body assembly and torch switch from the handle halves.
4. Slide the protective PVC tubing back away from the connections and disconnect the torch main body wires from the torch lead wires.

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

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

### Torch Switch Removal and Replacement

To remove and replace the torch switch, order the torch switch (005094) and two (2) splices (074069) and refer to the following procedure and Figure 3-2.

# MAINTENANCE

1. Ensure the MAX43 power switch is positioned to OFF (0), unplug the power cable, and disconnect the gas supply.
2. Remove the five (5) screws which secure the handle halves together.
3. Remove the torch main body assembly, torch switch and wire bundle from the handle halves.
4. Slide the protective PVC tubing back away from the connections.
5. Remove the torch switch by cutting the two (2) splices at the torch lead (violet wires).
6. Replace the torch switch by crimping the switch leads and the violet leads from the torch lead together with the splices.
7. Slide the protective PVC tubing back over the connections.
8. Install the torch main body, torch switch and wire bundle into one of the handle halves.
9. Position the handle halves together (be careful not to pinch any wires) and replace the five (5) screws to secure the handle halves together.

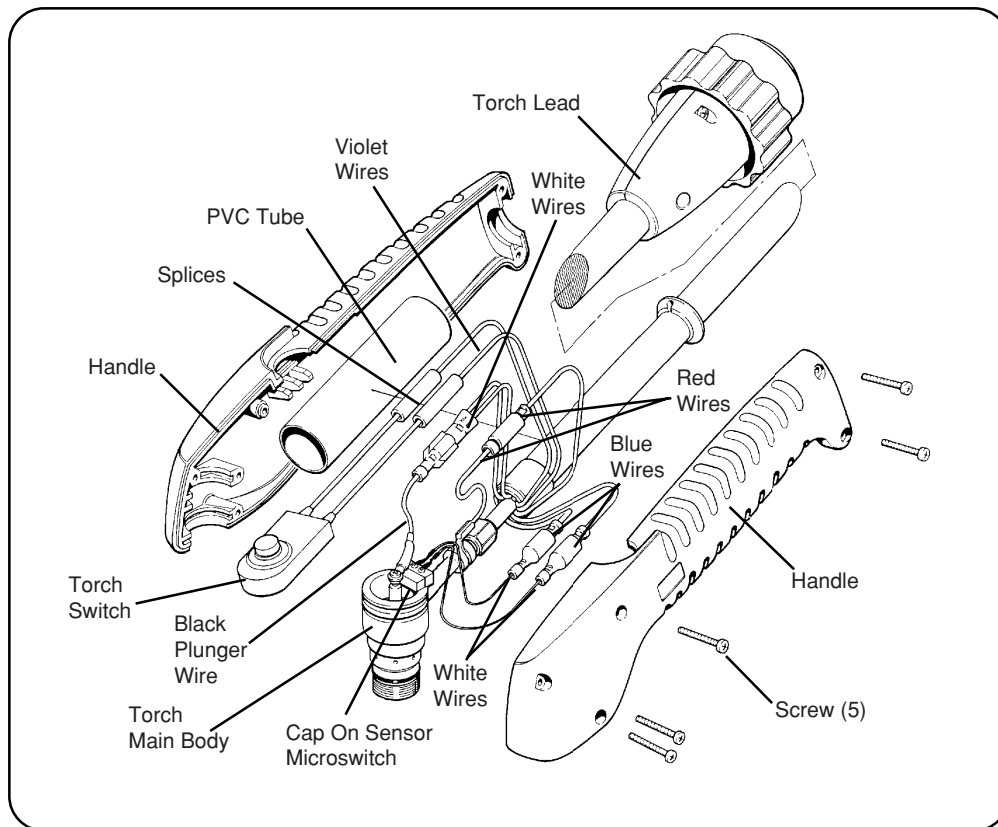


Figure 3-2 PAC121P Torch Assembly

# MAINTENANCE

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## PAC121M TORCH PARTS REMOVAL AND REPLACEMENT

Repair of the PAC121M torch normally requires that the torch main body and/or torch lead be replaced. Refer to Section 4, *Parts List* for a torch parts breakdown.

### Torch Main Body Removal and Replacement

To remove and replace the torch main body, order the PAC121M torch main body with switch (120007) and refer to the following procedure and Figure 3-3.

1. Ensure the MAX42 power switch is positioned to OFF (O), unplug the power cable, and disconnect the gas supply.
2. Disconnect the torch lead quick disconnect from the power supply. Turn the connector securing ring counterclockwise (ccw).
3. Unscrew the retaining cap (020930) and remove the remaining parts (nozzle, electrode and insulator ring).
4. Remove the O-ring (44016) from the torch main body (120007).
5. Remove the three (3) screws (075321) securing the torch sleeve to the torch main body.
6. Unscrew the torch position sleeve (020620) from the torch sleeve (020559) and slide it back out of the way.
7. Remove the screw (075322) securing the red wire from the torch lead to the torch main body.

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

8. Disconnect the terminals between the two (2) white wires from the torch lead and the black plunger wire from the torch main body .
9. Disconnect the terminals between the two (2) white wires from the microswitch and the blue wires from the torch lead.
10. Disconnect torch main body and torch lead gas fitting using 5/16" and 7/16" wrenches.
11. Remove O-ring (044016) from the replacement torch main body (120007). **Use caution when removing the O-ring, it can easily be damaged.**
12. Connect the torch main body and torch lead gas fitting using open-end wrenches.
13. Connect the terminals from the two (2) blue wires from the torch lead to the two (2) white wires from the cap sensor microswitch.
14. Connect the terminals from the two (2) white wires from the torch lead and the black plunger wire from the torch main body.



# MAINTENANCE

15. Secure the red wire from the torch lead to the torch main body with screw (075322).
16. Position the torch sleeve (020559) on to the torch main body and secure it with the three (3) screws (075321).
17. Use caution when Installing O-ring (044016) on to the torch main body, it can be easily damaged. Lightly coat with silicone.
18. Screw the torch position sleeve (020620) and the torch sleeve (020559) together.
19. When the nozzle, electrode and swirl ring are properly in place, replace the retaining cap. When the retaining cap is tightened, the microswitch will click, indicating that the torch main body has been replaced correctly.
20. Align the connector plug key (on torch lead) with the connector receptacle key slot (on power supply) and push it in until the pins seat.
21. Turn the connector securing ring clockwise (cw) to tighten.

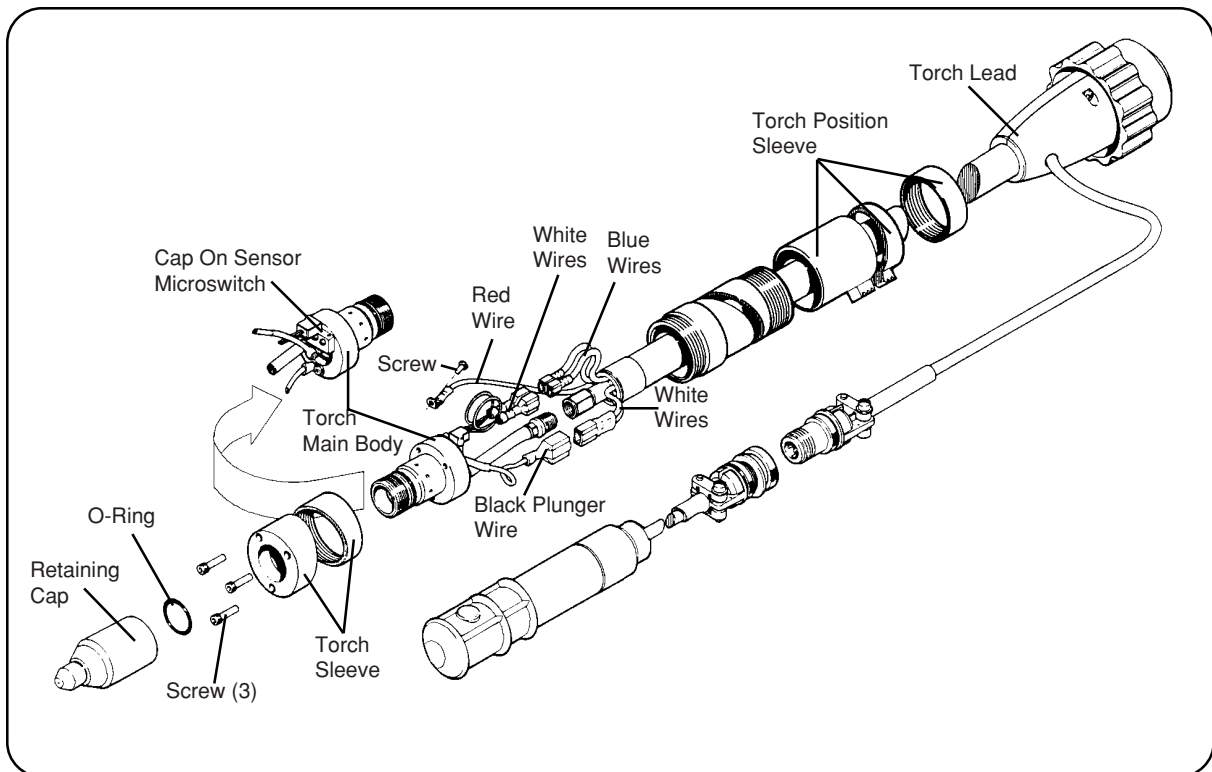


Figure 3-3 PAC121M Torch Assembly

# MAINTENANCE

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## FILTER/REGULATOR PRESSURE ADJUSTMENT

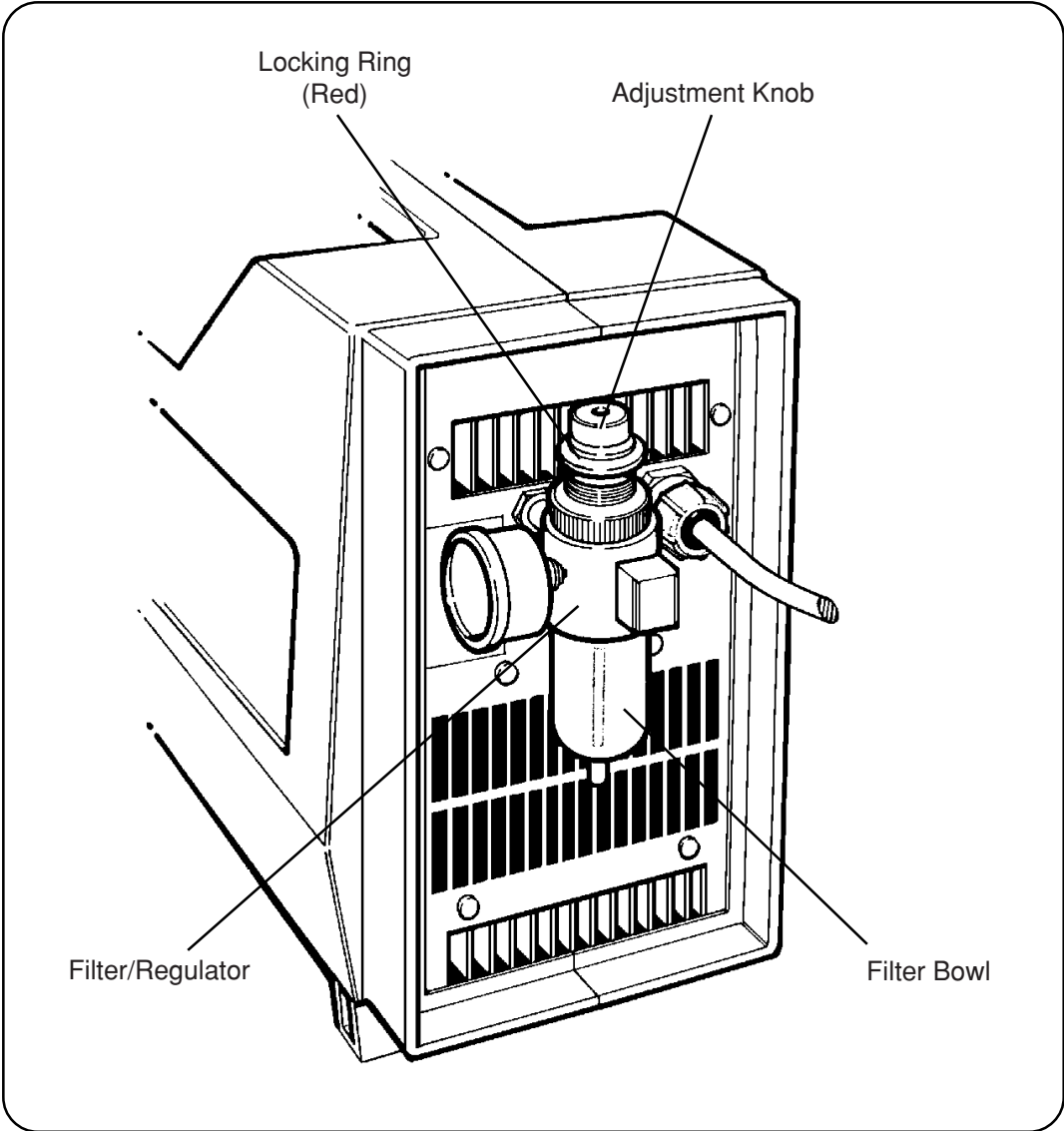
To adjust the filter/regulator pressure, perform the following procedure and refer to Figure 3-4.

1. Ensure the gas supply to the filter/regulator on the power unit is at 80-125 psi (5.5-8.6 bar) with at least 4.5 scfm (127 l/min) flow capacity.
2. At the pressure regulator, pull the locking ring (red) up to free the adjustment knob.
3. At the front panel, push the **TEST** switch in and hold and view the pressure gauge while adjusting the adjustment knob. Adjust until the pressure gauge reads 70 psi (4.8 bar).
4. Release **TEST** switch and push the locking ring down to secure the adjustment knob.

## FILTER/REGULATOR FILTER CLEANING OR REPLACEMENT

To clean or replace the filter/regulator filter, perform the following procedure and refer to Figure 3-4.

1. Always **disconnect** the gas supply hose from the filter/regulator before unscrewing the filter bowl.
2. Unscrew the filter bowl and then unscrew the filter and clean or replace if required.
3. Replace the filter and filter bowl.
4. Reconnect the gas supply hose to the filter/regulator.



**Figure 3-4 Filter/Regulator Pressure Adjustment**

## Section 4 PARTS LIST

In this section:

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# PARTS LISTS

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## MAX42 Power Unit 208-240 VAC, 1 PH, 60 Hz (071003)

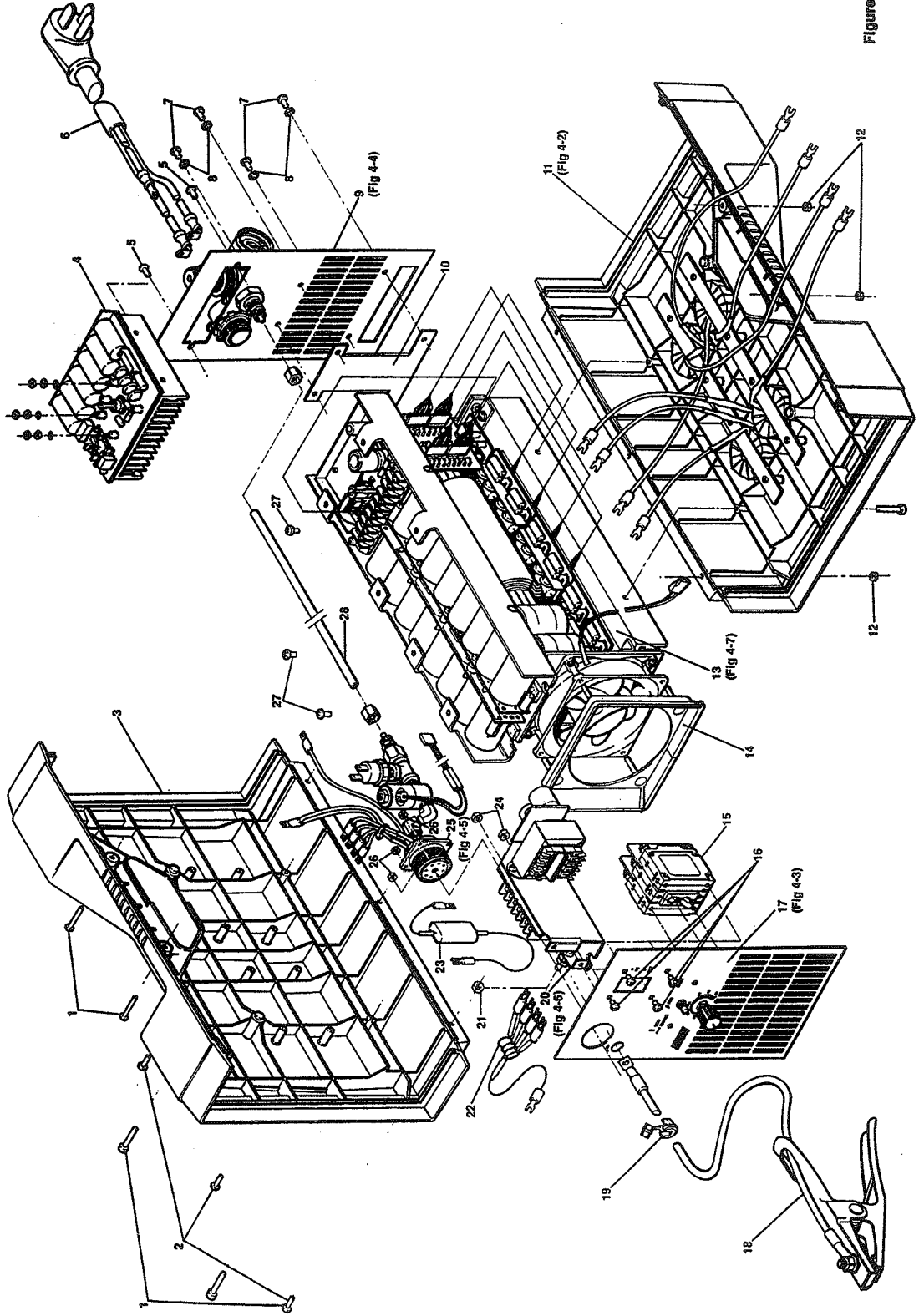
Index No.	Ref. Desig.	Part No.	Description	Quantity
1		075096	M/S, 10-32 X 1-1/4, PH, PAN, S/B	4
2		075095	M/S, 10-32 X 5/8, PH, PAN, S/B	3
3		001216	Enclosure, Right Half	1
4	PCB15	041307	PC BD Assy, Pilot Arc Control	1
5		075236	M/S, 6-32 X 3/8, PH, TRS, S/Z	2
6		023385	Cord, Primary Power 8-3 SO 7.3 Ft.	1
7		075025	M/S, 10-32 X 3/8, PH, PAN, SS	4
8		075182	Lockwasher, # 10, Internal Tooth,SS	4
9		029338	Rear Panel Subassembly	1
10*		001239	Plate, Mounting, Exhaust	1
11***		002183	Enclosure, Left Half 1 PH (w/line chokes)	1
		001216	Enclosure, Left Half 1 PH (w/o line chokes)	1
12		075168	Hexnut, 10-32, Blk Ox, S/B	5
13		029289	Inverter Subsystem Assembly, 208-240V	1
14		004393	Hood, Fan, Inverter	1
15	S1	003101	Circuit Breaker, 1A 240V 40 A 1 PH	1
16		075232	M/S, 6-32 X 1/4, PH, TRS, SS	4
17		029305	Front Panel SA, 1 PH	1
18		023205	Cable, Ground # 8 W/Clamp 15 Ft.	1
19		008590	Strain Relief, 5/8 Hole	1
20		029339	Bracket SA, Air Pack P/S	1
21**		075161	Kepnut, 1/4-20, S/Z	1
22		009251	Capacitor, .01 uf, 1000V	4
23		009224	Capacitor, Pol .22 uf, 1000 WVDC	1
24		075160	Kepnut, 10-32, S/Z	2
25		029351	Pneumatics Subassembly	1
26		075158	Kepnut, 6-32, S/Z	3
27		075086	M/S, 10-32 X 3/8, PH, PAN, S/Z	3
28		046040	Tubing, 5/16 OD Poly-Flo	1

\* Part of Inverter Subassembly

\*\* Part of Air Pack Power Supply Bracket Subassembly

\*\*\* The line chokes have been removed from the left enclosure on the new units.

Figure 4-1 MAX42 Power Unit  
208-240 VAC, 1 PH,  
60 Hz - Exploded View



# PARTS LIST

## Enclosure, Left Half w/Line Chokes (002183), w/o Line Chokes (001216)

Index No.	Ref. Desig.	Part No.	Description	Quantity
1		001216	Enclosure, Left Half	1
2*		004440	Strap, Line ChokeCable	2
3*		075339	P/S, # 4x1/2, PH, Rnd, S/B	8
4*	L2 - L5	014118	Line Choke Subassembly	4

\* Used on left enclosure with line chokes (002183)

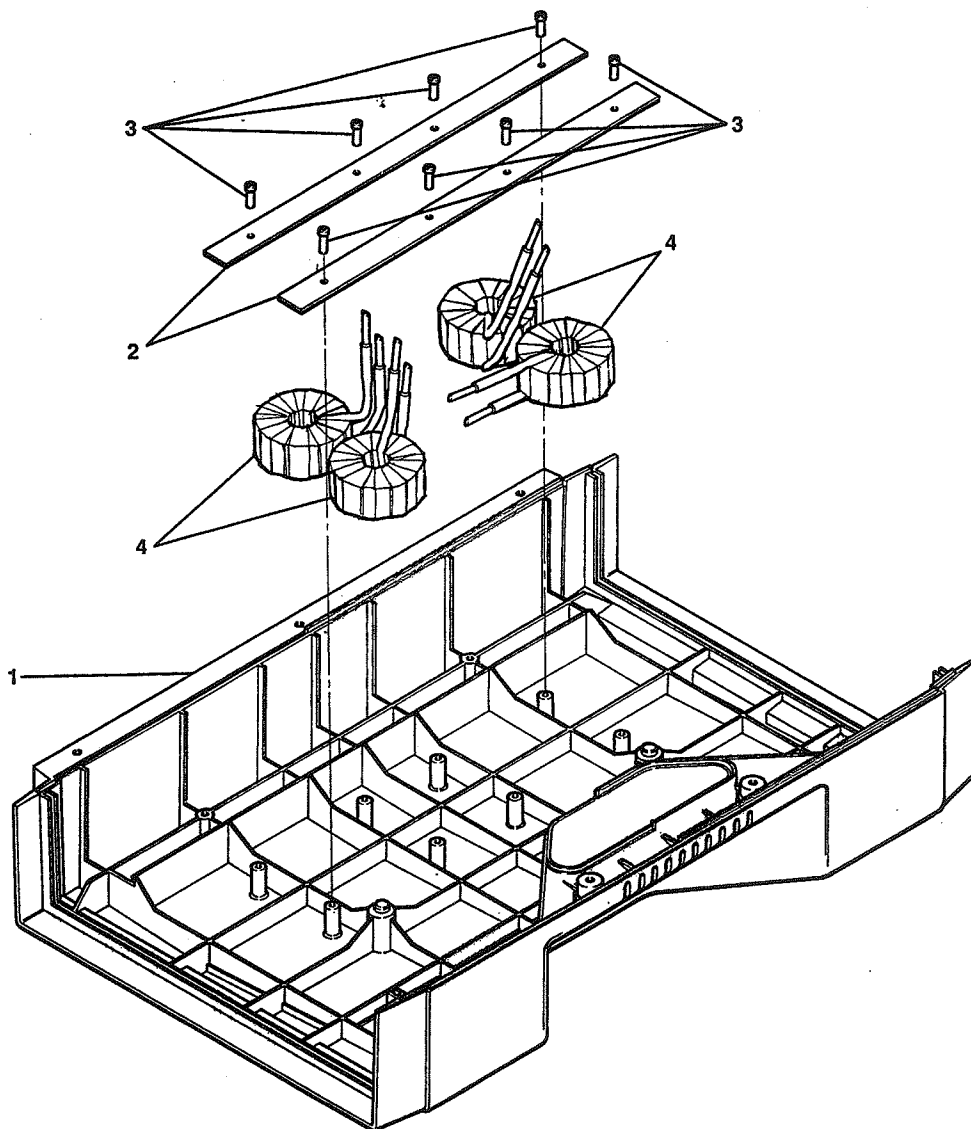


Figure 4-2 Enclosure, Left Half - Exploded View

# PARTS LISTS

## Front Panel Subassembly (029305)

Index No.	Ref. Desig.	Part No.	Description	Quantity
1		008164	Knob	1
2		001253	Panel, Front, 1 PH	1
3		008112	Spacer, HHS 8423 6-32 X 1/2	4
4*		075207	Flatwasher, # 8, .170, .375, .030 Nylon	3
5*		075184	Lockwasher, # 6, Int. Tooth, BRS/BRZ	1
6	PCB14	041189	PC BD Assy, Control Power Supply	1
7**		075158	Kepnut, 6-32, S/Z	4
		075301	Hexnut, 6-32, Nylon	1

\* These items are only used In some units.

\*\* A nylon hexnut is used in place of a kepnut (denoted by asteriks\*\*) in some units.

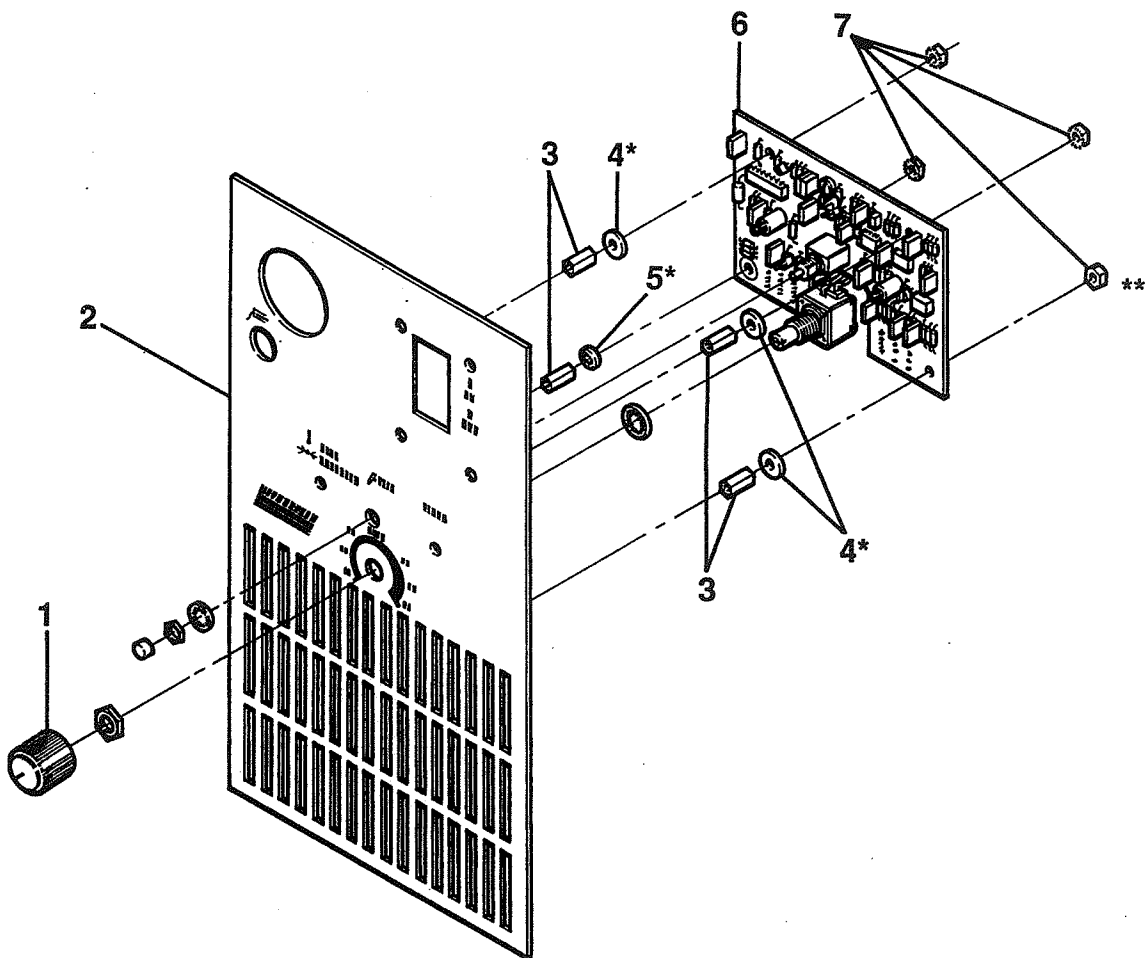


Figure 4-3 Front Panel Subassembly - Exploded View



# PARTS LIST

## Rear Panel Subassembly (029338)

Index No.	Ref. Desig.	Part No.	Description	Quantity
1		015001	Adapter, Bulkhead, 1/4 NPTF	1
2		015123	Adapter, 5/16 Poly X 1/4 NPT	1
3		008228	Strain Relief, Insul UL/CSA	1
4		001252	Panel, Rear	1
5		015502	Nipple 1/4 CL	1
6		011023	Filter/Regulator, Air	1
7		015532	Street Elbow 1/4	1

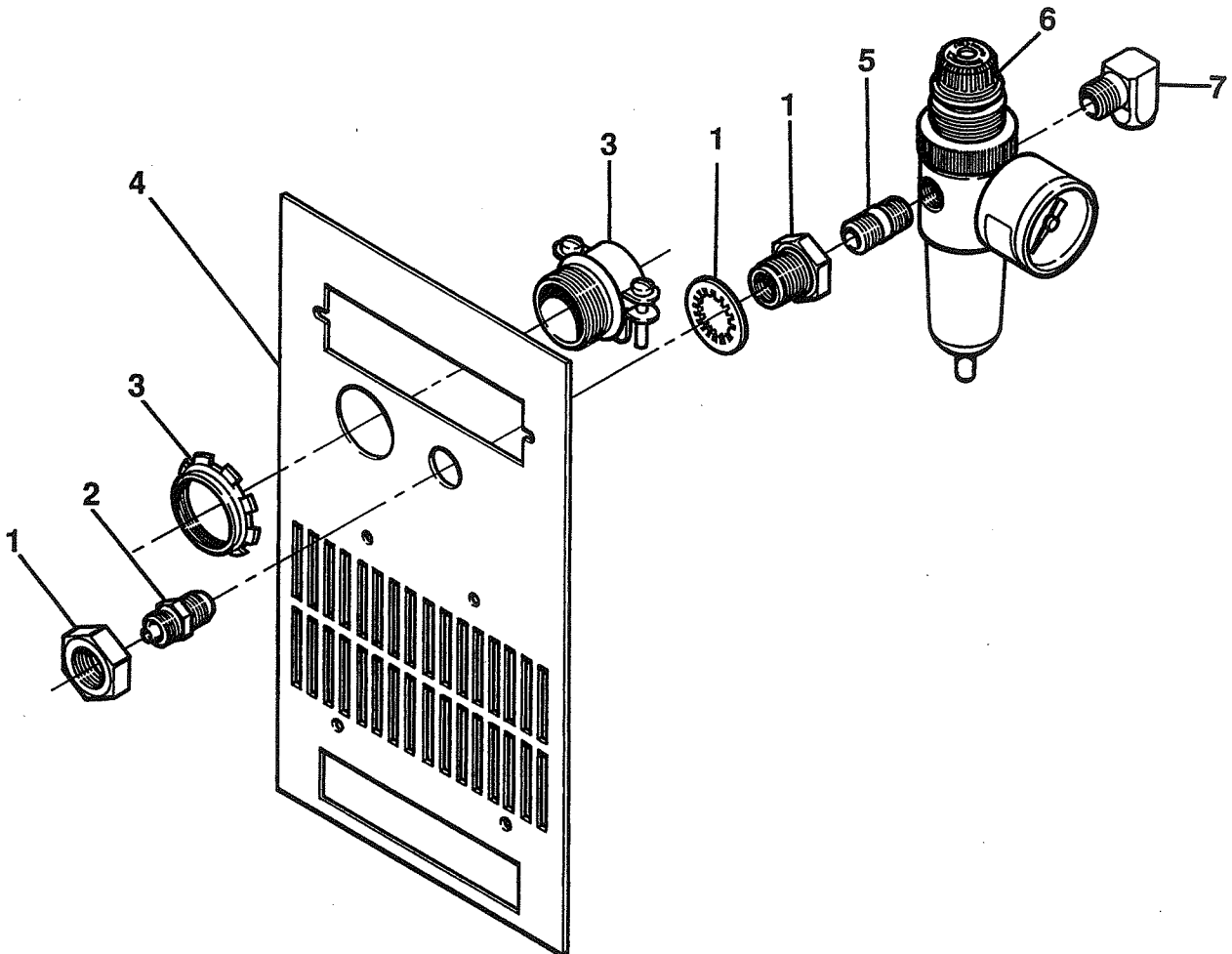


Figure 4-4 Rear Panel Subassembly - Exploded View

# PARTS LISTS

## Pneumatic Subassembly (029351)

Index No.	Ref. Desig.	Part No.	Description	Quantity
1		028417	Torch Lead Receptacle	1
2		075158	Kepnut, 6-32, S/Z	3
3		015520	Elbow 1/8	1
4		015517	Nipple, 1/8 X CL, Hex	1
5		015530	Street Elbow 1/8	1
6	V1	006043	Valve, Solenoid, Air	1
7		015501	Nipple, 1/8 X CL	1
8		015540	Tee 1/8	1
9	PS1	005112	Switch, Pressure 39 PSI .013 BAF	1
10		015604	Red Adapter, 1/4 NPTF X 1/8 NPTM	1
11		015123	Adapter, 5/16 Poly X 1/4 NPT	1

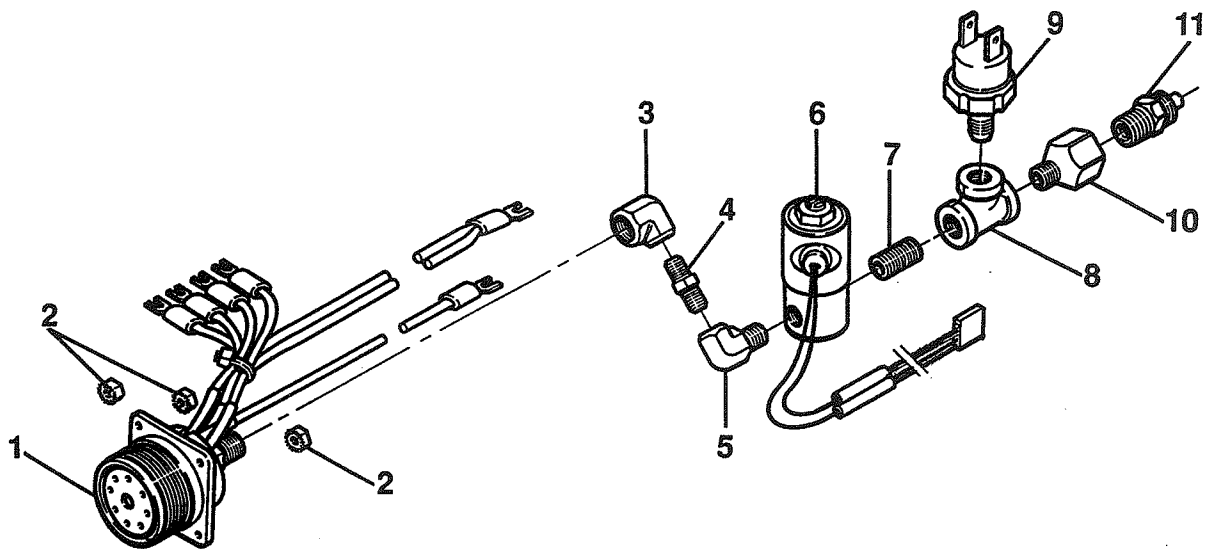


Figure 4-5 Pneumatic Subassembly - Exploded View

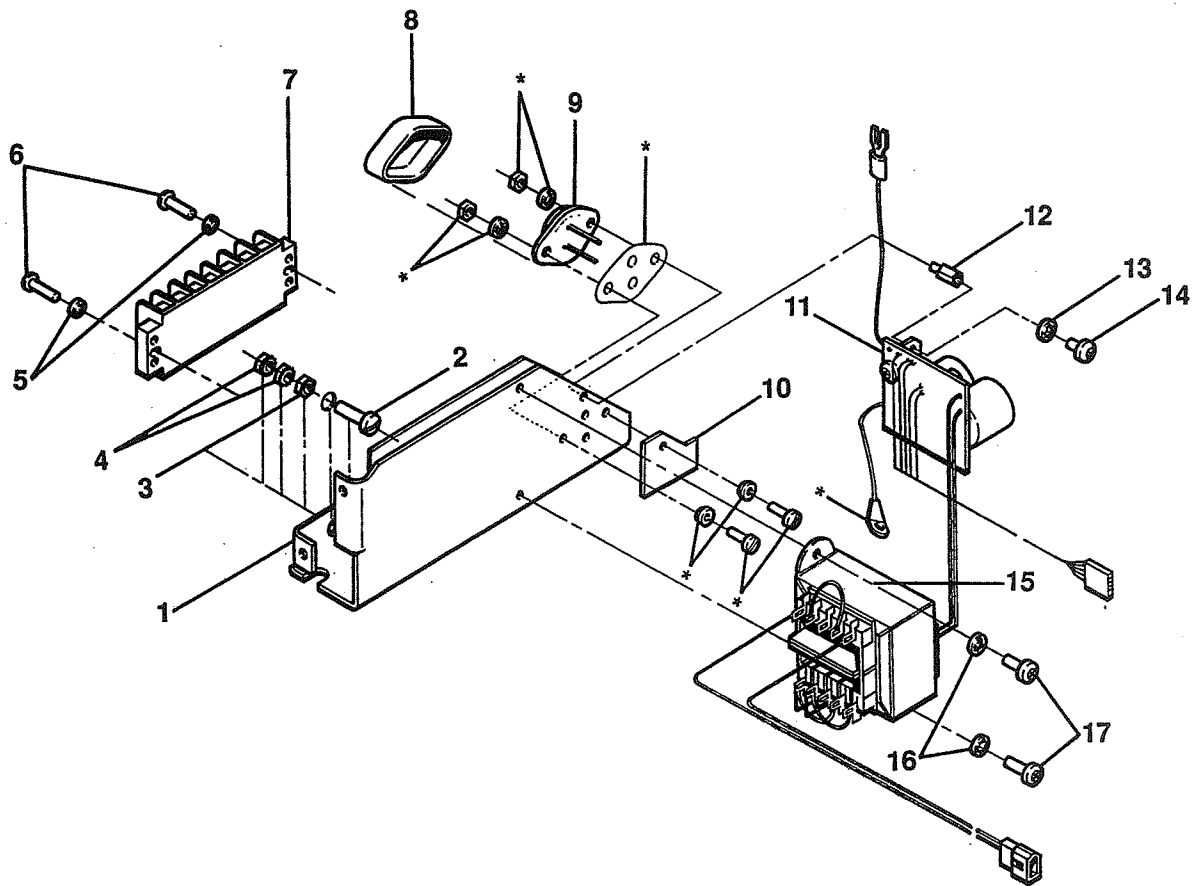
# PARTS LIST

## Bracket Subassembly, Air Pack Power Supply (029339)

Index No.	Ref. Desig.	Part No.	Description	Quantity
1		004339	Bracket, Air Pack P/S	1
2		075337	M/S, 1/4-20 X 1, SL, BIN, Nylon	1
3		075170	Hexnut, 1/4-20, Nylon	1
4		075161	Kepnut, 1/4-20, S/Z	2
5		075180	Lockwasher, # 6, Int Tooth, SS	2
6		075014	M/S, 6-32 X 5/8, PH, PAN, SS	2
7	TB2	008537	Terminal Strip, Blk 7-Pos, 2-Row	1
8		008587	Insulator, Cover, TO-3	1
9		042088	IC, Regulator, Voltage, 3 Amp, LM350K	1
10		041278	PC BD Air Pack P/S	1
11	PCB13	041190	PC BD Assy, Control Power Supply	1
12		008359	Spacer, 6-32 X 3/8, M X F	1
13		075180	Lockwasher, # 6, Int Tooth, SS	1
14		075014	M/S, 6-32 X 5/8, PH, PAN, SS	1
15	T5	014107	Transformer, Cntrl 208-240, 1 PH, 60 Hz	1
16		075022	M/S, 8-32 X 3/8, PH, PAN, SS	2
17		075181	Lockwasher, # 8, Int Tooth, SS	2

# PARTS LISTS

---



\* Part of Insulator Mounting Kit TO-3 # 008543

Figure 4-6 Bracket Subassembly, Air Pack Power Supply - Exploded View

# PARTS LIST

## Inverter Subsystem Assembly (029289)

Index No.	Ref. Desig.	Part No.	Description	Quantity
1	M1	029283	Fan Cooling Assembly	1
2		075180	Lockwasher, # 6, Int. Tooth, SS	4
3		075013	M/S, 6-32 X 3/8, PH, PAN, SS	4
4		075025	M/S, 10-32 X 3/8, PH, PAN, SS	4
5		075182	Lockwasher, # 10, Int. Tooth, SS	4
6		029328	Bracket Assy, Magnetic Tray 208-240V	1
7	PCB12	041171	PC BD Assy, Inverter Modulator	1
8		075307	M/S, 6-32 X 3/8, SL, BIN, Nylon	3
9		075115	SHDCAP, 8-32 X 1-1/4, HX, SSB	2
10		004332	Spacer Phenol	2
11		075031	M/S, 6-32 X 3/8, PH, PAN, BRS	10
12		075184	Lockwasher, # 6, Int. Tooth, BRS/BRZ	34
13	PCB3	041154	PC BD Assy, Input Rectifier	1
14	TS1	005086	Thermostat, 75° C	1
15		029331	Heatsink, Subassembly	1
16		075146	Hexnut, 6-32, BRS	24

# PARTS LISTS

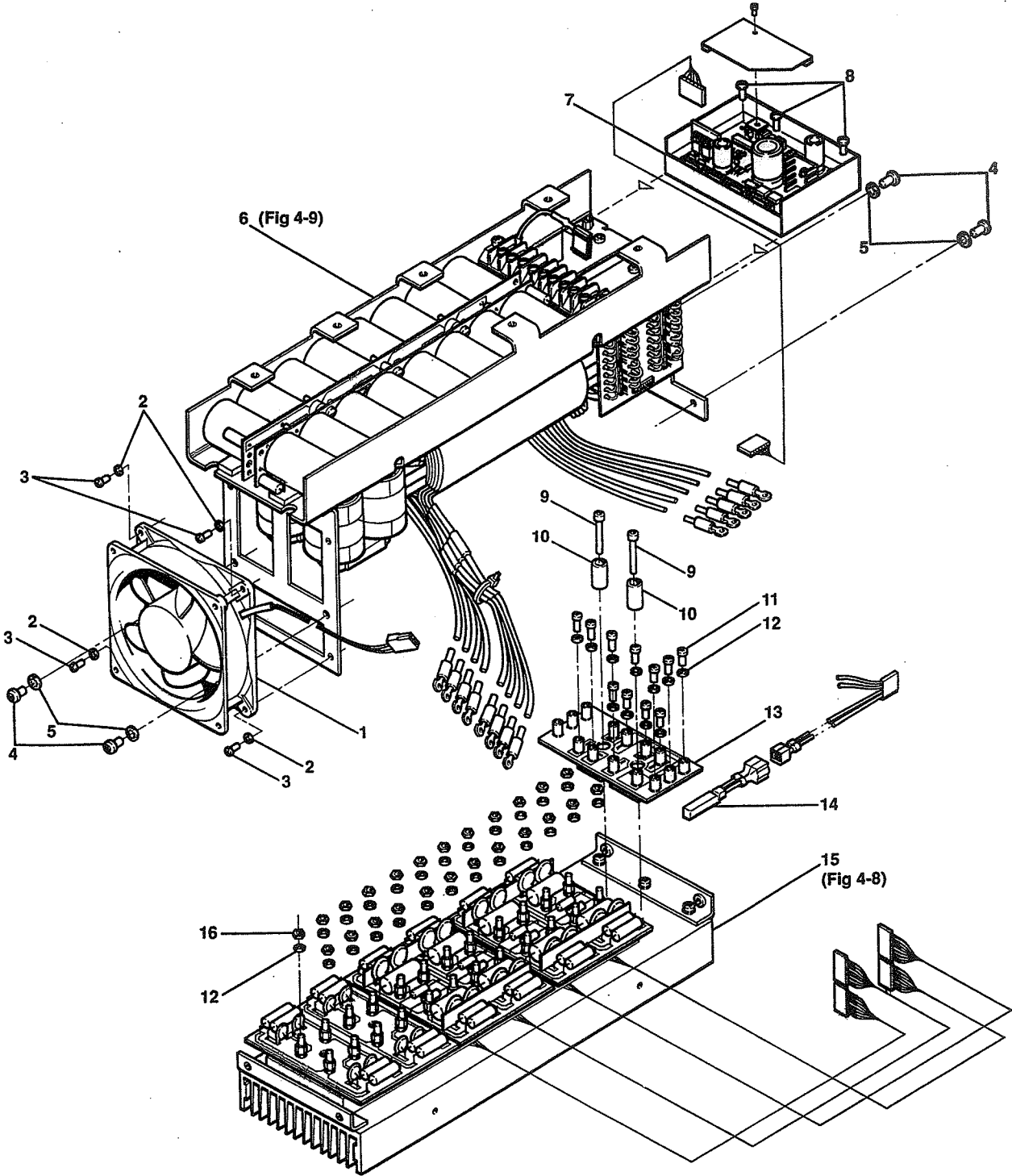


Figure 4-7 Inverter Subsystem Assembly - Exploded View

## Heatsink Subassembly (029331)

Index No.	Ref. Desig.	Part No.	Description	Quantity
1		075022	M/S, 8-32 X 3/8, PH, PAN, SS	5
2		075181	Lockwasher, # 8 Int. Tooth, BRS/BRZ	5
3		004318	Bracket, Heatsink	1
4		029407	FET Pack Module	1
5		004372	Bracket, Heatsink	1
6	PCB8	041214	PC BD Assy, Output Rectifier Snubber	1
7	PCB7	041213	PC BD Assy, FET Pack Snubber	1
8	PCB6	041213	PC BD Assy, FET Pack Snubber	1
9		075184	Lockwasher, # 6 Int. Tooth, BRS/BRZ	24
10		008525	Spacer, Hex Brass 6-32 X 1/4	24

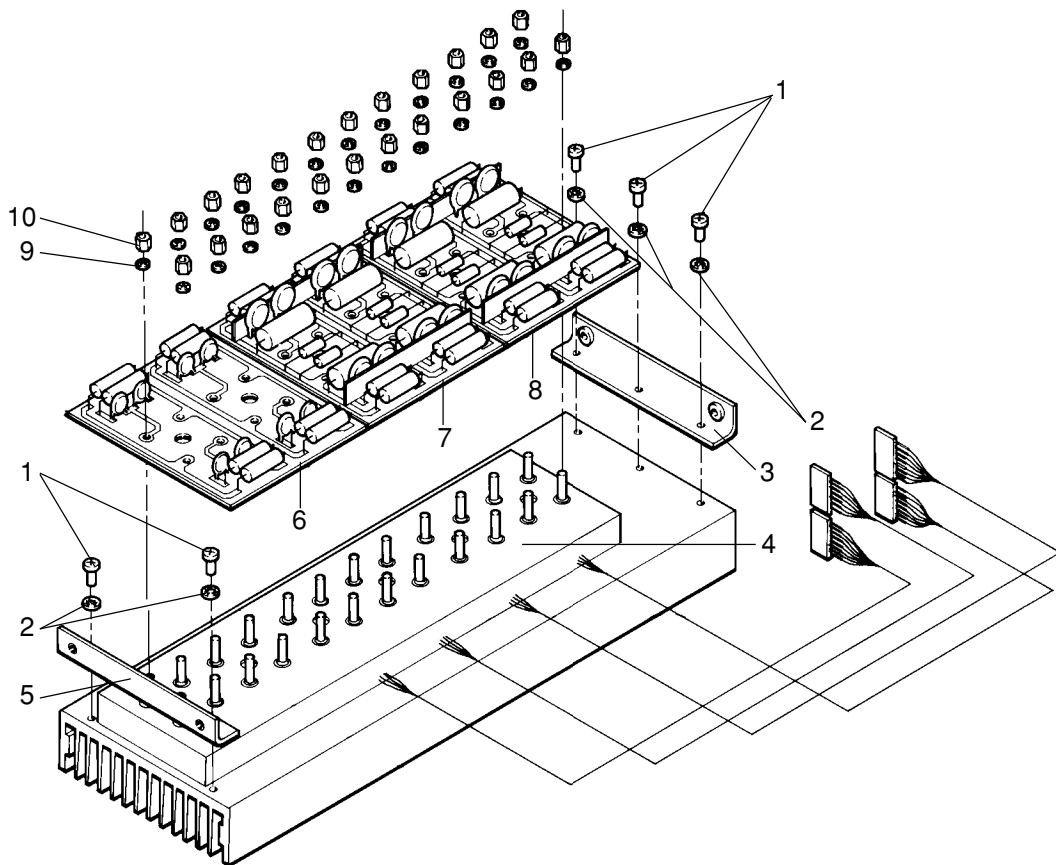


Figure 4-8 Heatsink Subassembly - Exploded View

# PARTS LISTS

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## Bracket Assembly, Magnetic Tray (029328)

Index No.	Ref. Desig.	Part No.	Description	Quantity
1		004317	Bracket, Magnetics Tray	1
2		029298	Input Capacitor Bank, 240/480V	1
3		075267	SHDCAP, 8-32 X 1, HX, NYB	4
4		075024	M/S, 8-32 X 1-1/2, PH, PAN, SS	2
5		075181	Lockwasher, # 8, Int. Tooth, SS	2
6	TB1	004439	Barrier Strip, 42 Repl 004333	1
7		008466	Spacer, # 8 X 1/4 Phenol	1
8*	PCB1	041175	PC BD Assy, Inverter I/O	1
9		008611	Standoff 6-32 X 3/4 LG HX NYL	1
10		008467	Spacer, # 8 X 1/2 Phenol	2
11		075180	Lockwasher, # 6, Int. Tooth, SS	5
12		075012	M/S, 6-32 X 1/4, PH, PAN, SS	5
13	PCB2	041162	PC BD Assy, Inverter P/S 208-240	1
14		075025	M/S, 10-32 X 3/8, PH, PAN, SS	2
15		075182	Lockwasher, # 10, Int. Tooth, SS	6
16	PCB11	041193	PC BD Assy, Gate Drive Transformer	1
17		001242	Plate, Transformer Mounting	3
18		001239	Plate, Mounting, Exhaust	1
19		075026	M/S, 10-32 X 2-1/4, PH, PAN, SS	4
20		004319	Bracket, Mounting, Fan	1
21	T3	029296	Transformer, SA Power, HF # 1, 240/480V	1
22	T4	029297	Transformer, SA Power, HF # 2, 240/480V	1
23		008468	Spacer, # 10 X 3/4	4
24*	L1	014071	Inductor, Output, Power	1
25		075143	Kepnut, 6-32, SS	4
26		029293	Inductor, Power I/O, 240V	1

\* Part of I/O Power Inductor # 029293 (see Figure 4-11)



# PARTS LIST

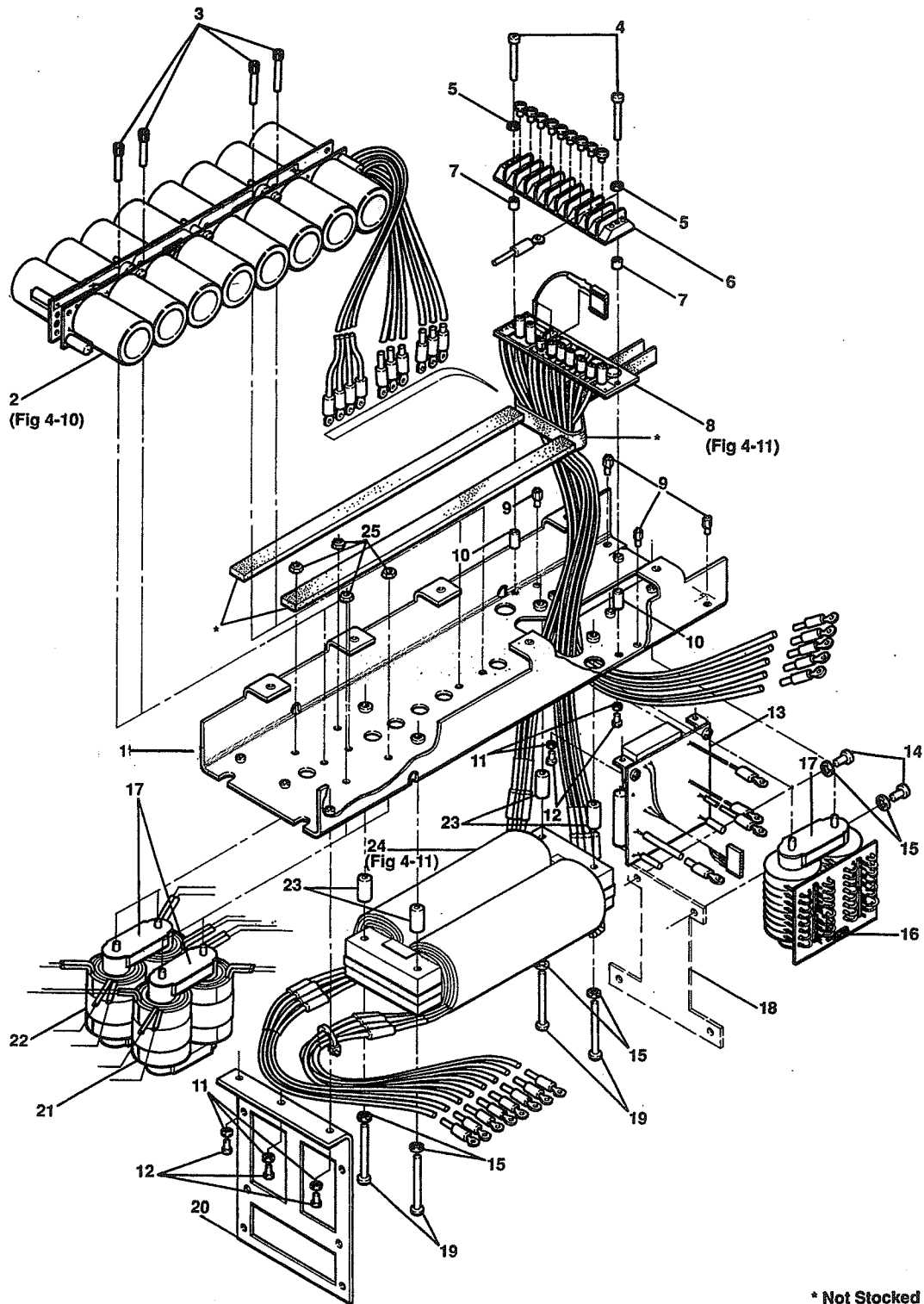


Figure 4-9 Bracket Assembly, Magnetic Tray - Exploded View

# PARTS LISTS

## Input Capacitor Bank (029298)

Index No.	Ref. Desig.	Part No.	Description	Quantity
1	PCB4	041166	PC BD Assy, Capacitor Pack # 1	1
2	PCB5	041194	PC BD Assy, Capacitor Pack # 2	1
3		075301	Hexnut, 6-32, Nyl	6
4		075311	M/S, 6-32 X 3/4, SL, BIN, Nylon	6
5		004316	Spacer, Cap Pack	4
6		008465	Spacer, # 6 X 1/2 Phenol	2

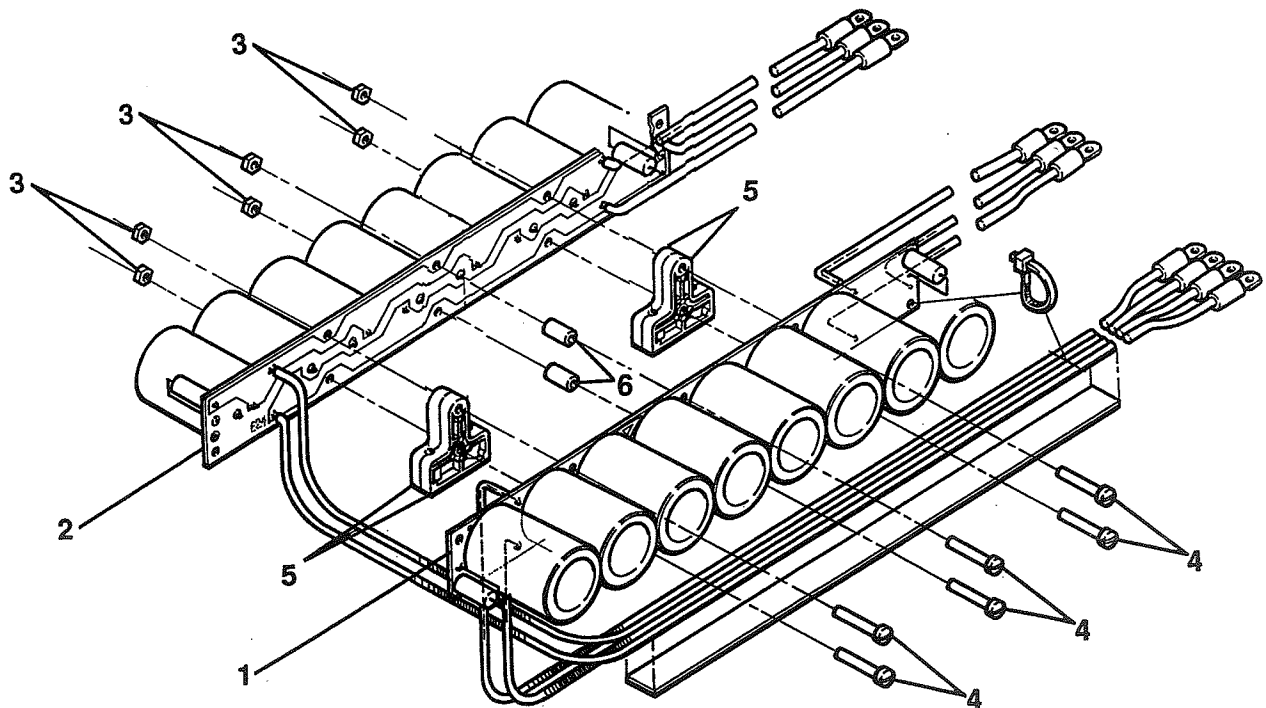


Figure 4-10 Input Capacitor Bank - Exploded View

# PARTS LIST

## Inductor, Power I/O (029293)

Index No.	Ref. Desig.	Part No.	Description	Quantity
1	L1	014071	Inductor, Output, Power	1
2	PCB1	041175	PC BD Assembly, Inverter I/O	1

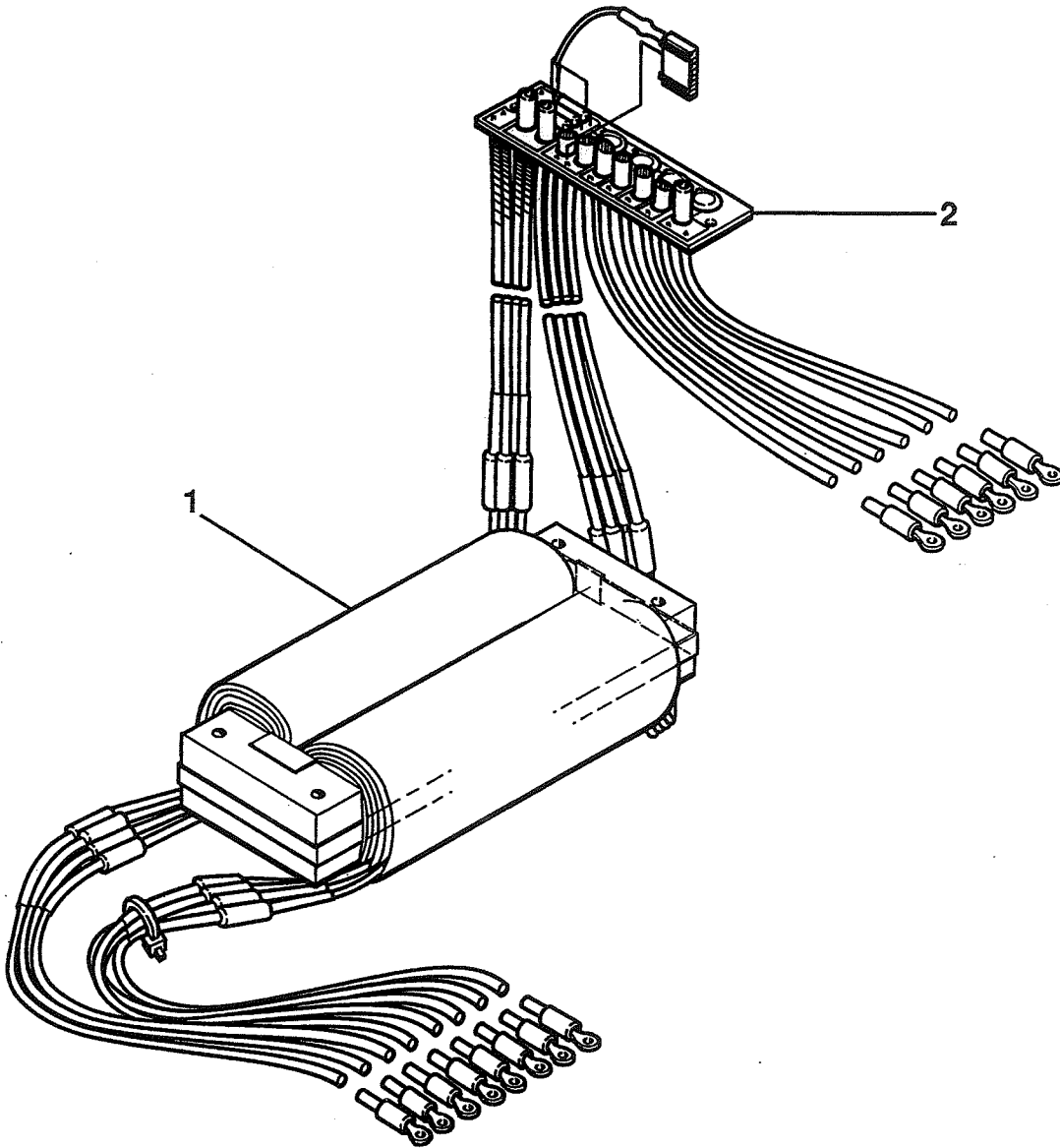


Figure 4-11 Inductor, Power I/O - Exploded View

# PARTS LISTS

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## PAC121 TORCH ASSEMBLIES AND LEADS

### PAC121T Torch Assembly and Lead (25 Ft/7.63 M) - 071065

001288	.....	Handle, PAC121T
075340	.....	Screws, P/S, # 4 x 5/8, PH, RND, S/B
002244	.....	Safety Trigger, PAC121T
027254	.....	Trigger Spring, PAC 121T
005094	.....	Switch, Torch Pushbutton
020932	.....	Torch Main Body w/Switch, PAC121T
029549	.....	Torch Lead, 25 ft. (7.63 m)
044009	.....	Quick Disconnect O-Ring (see Figure 5-8)
027283	.....	Ring, Gutcha
020350	.....	Nozzle
020351	.....	Electrode, Air
020361	.....	Ring, Swirl
020930	.....	Cap, Retaining

### PAC121T Torch Assembly and Lead (50 Ft/15.25 M) - 071066

001288	.....	Handle, PAC121T
075340	.....	Screws, P/S, # 4 x 5/8, PH, RND, S/B
002244	.....	Safety Trigger, PAC121T
027254	.....	Trigger Spring, PAC 121T
005094	.....	Switch, Torch Pushbutton
020932	.....	Torch Main Body w/Switch, PAC121T
029550	.....	Torch Lead, 50 ft. (15.25 m)
044009	.....	Quick Disconnect O-Ring (see Figure 5-8)
027283	.....	Ring, Gutcha
020350	.....	Nozzle
020351	.....	Electrode, Air
020361	.....	Ring, Swirl
020930	.....	Cap, Retaining

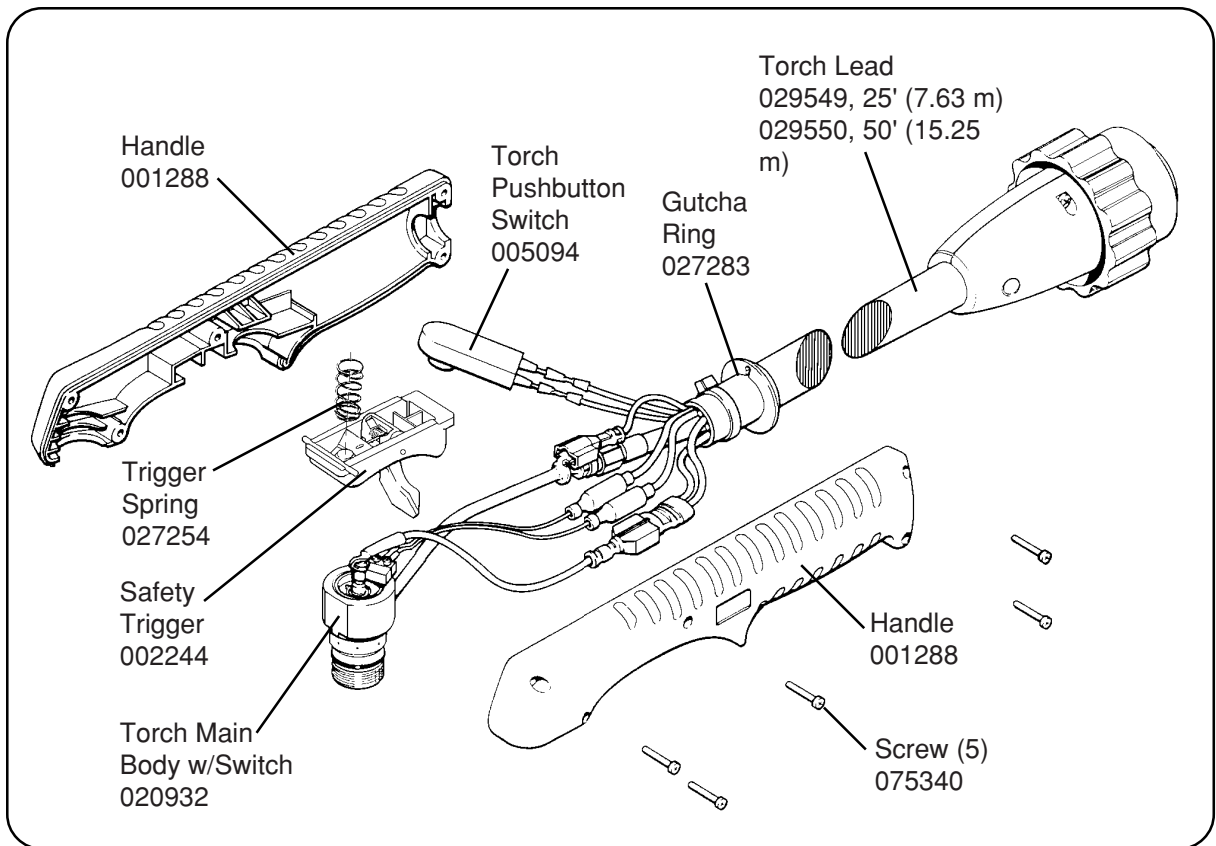


Figure 4-12 PAC121T Torch Assembly and Leads

# PARTS LISTS

---

## PAC121P Torch Assembly and Lead (25 Ft/7.63 M) - 071069

001215	.....	Handle, PAC121P
075365	.....	Screws, P/S, # 6 x 3/4, PH, RND, S/B
005094	.....	Switch, Torch Pushbutton
120013	.....	Torch Main Body w/Switch, PAC121P
029391	.....	Torch Lead, 25 ft. (7.63 m)
044009	.....	Quick Disconnect O-Ring (see Figure 5-8)
027283	.....	Ring, Gutcha
046080	.....	Tubing, 1-1/4" Black PVC
020350	.....	Nozzle
020351	.....	Electrode, Air
020361	.....	Ring, Swirl
020930	.....	Cap, Retaining

## PAC121P Torch Assembly and Lead (50 Ft/15.25 M) - 071070

001215	.....	Handle, PAC121P
075365	.....	Screws, P/S, # 6 x 3/4, PH, RND, S/B
005094	.....	Switch, Torch Pushbutton
120013	.....	Torch Main Body w/Switch, PAC121P
029392	.....	Torch Lead, 50 ft. (15.25 m)
044009	.....	Quick Disconnect O-Ring (see Figure 5-8)
027283	.....	Ring, Gutcha
046080	.....	Tubing, 1-1/4" Black PVC
020350	.....	Nozzle
020351	.....	Electrode, Air
020361	.....	Ring, Swirl
027283	.....	Ring, Gutcha
020350	.....	Nozzle
020351	.....	Electrode, Air
020361	.....	Ring, Swirl
020930	.....	Cap, Retaining

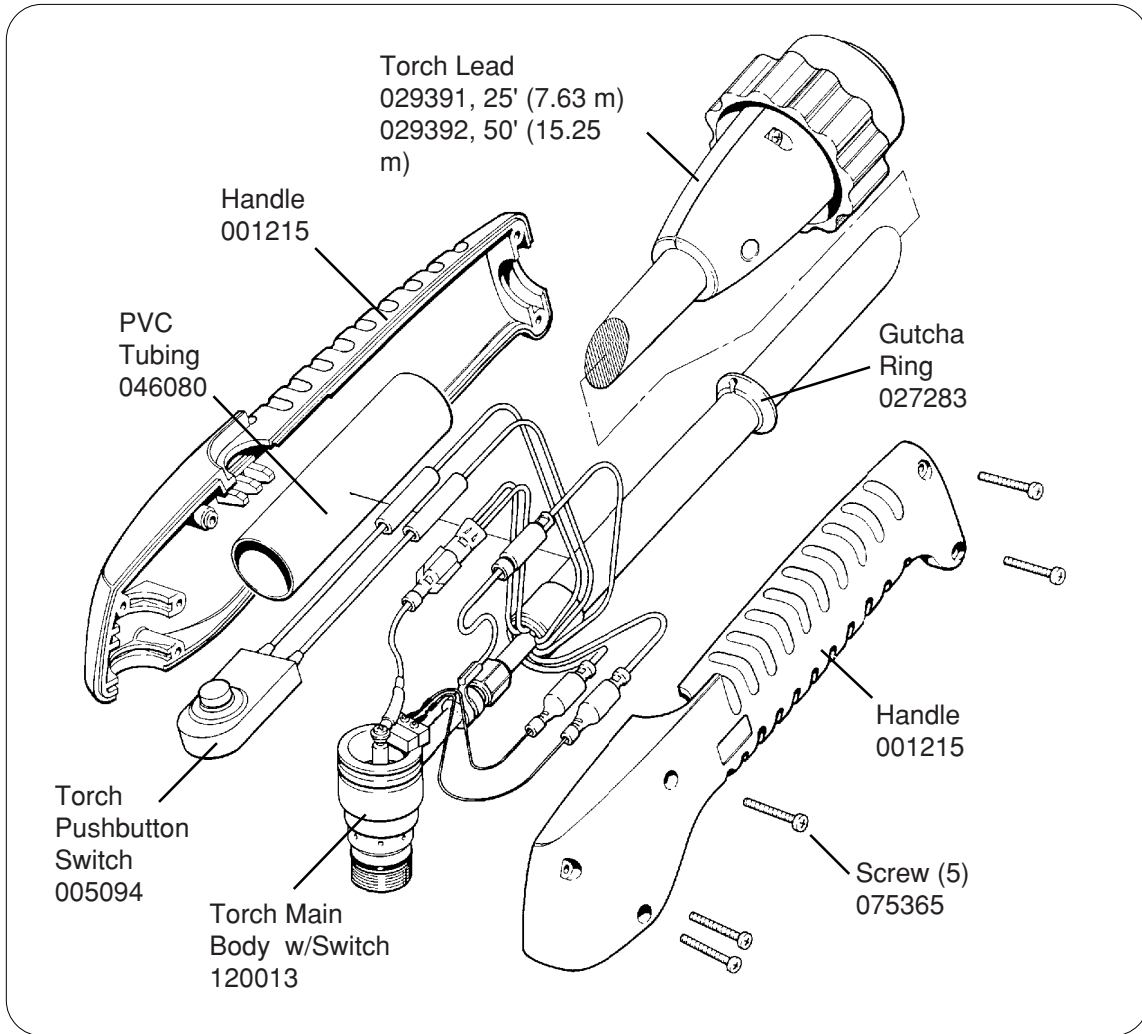


Figure 4-13 PAC121P Torch Assembly and Leads

# PARTS LISTS

---

## PAC121M Torch Assembly and Lead (25 Ft/7.63 M) - 071067

020620	..... Sleeve, Torch Position, PAC121M
020619	..... Sleeve, Insulator, PAC121M
020229	..... Ring, Locking PAC121M
020559	..... Sleeve, Machine Torch, PAC121M
120007	..... Torch Main Body w/Switch, PAC121M
028451	..... Torch Lead, 25 ft. (7.63 m)
044009	..... Quick Disconnect O-Ring (see Figure 5-8)
075321	..... Socket Cap, 4-40 x 1/2, HX, SS
075322	..... M/S, 4-40 x 1/4, SL, SZ
120023	..... Nozzle, Pipe Saddle, Extended
020547	..... Electrode, Extended
020361	..... Ring, Swirl
020930	..... Cap, Retaining

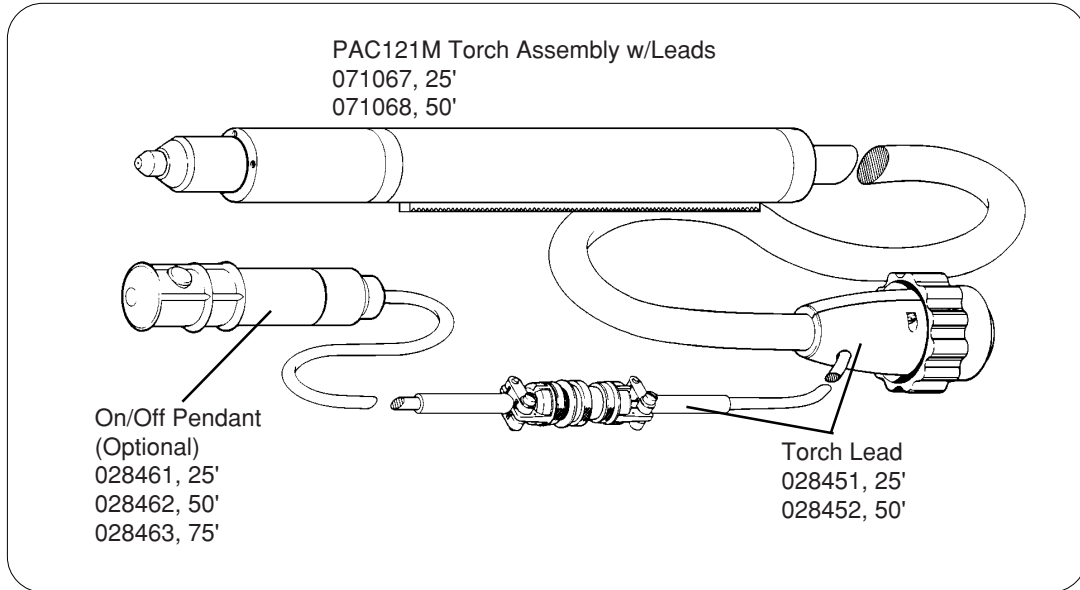
## PAC121M Torch Assembly and Lead (50 Ft/15.25 M) - 071068

020620	..... Sleeve, Torch Position, PAC121M
020619	..... Sleeve, Insulator, PAC121M
020229	..... Ring, Locking PAC121M
020559	..... Sleeve, Machine Torch, PAC121M
120007	..... Torch Main Body w/Switch, PAC121M
028452	..... Torch Lead, 50 ft. (15.25 m)
044009	..... Quick Disconnect O-Ring (see Figure 5-8)
075321	..... Socket Cap, 4-40 x 1/2, HX, SS
075322	..... M/S, 4-40 x 1/4, SL, SZ
120023	..... Nozzle, Pipe Saddle, Extended
020547	..... Electrode, Extended
020361	..... Ring, Swirl
020930	..... Cap, Retaining

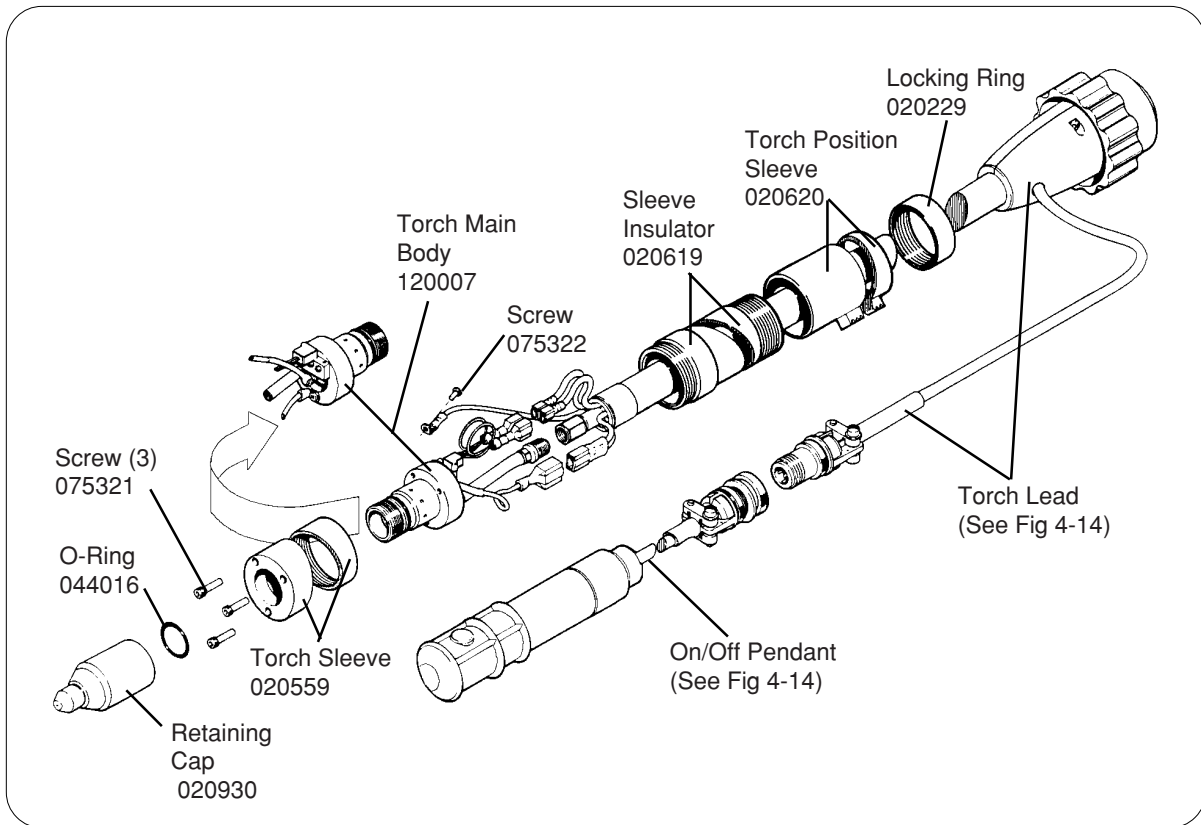
## On/Off Pendant

028461	..... On/Off Pendant w/Lead, 25 ft. (7.63 m)
028462	..... On/Off Pendant w/Lead, 50 ft. (15.25 m)
028463	..... On/Off Pendant w/Lead, 75 ft. (22.9 m)





**Figure 4-14 PAC121M Torch Assembly with Leads and Optional On/Off Pendant**



**Figure 4-15 PAC121M Torch Assembly and Leads**

## Section 5 WIRING DIAGRAMS & SCHEMATICS

In this section:

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# **WIRING DIAGRAMS & SCHEMATICS**

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## **GENERAL**

This section provides maintenance personnel with the wiring diagrams, pneumatic flow diagram, and printed circuit board assembly schematic diagrams required to troubleshoot and maintain the power unit.

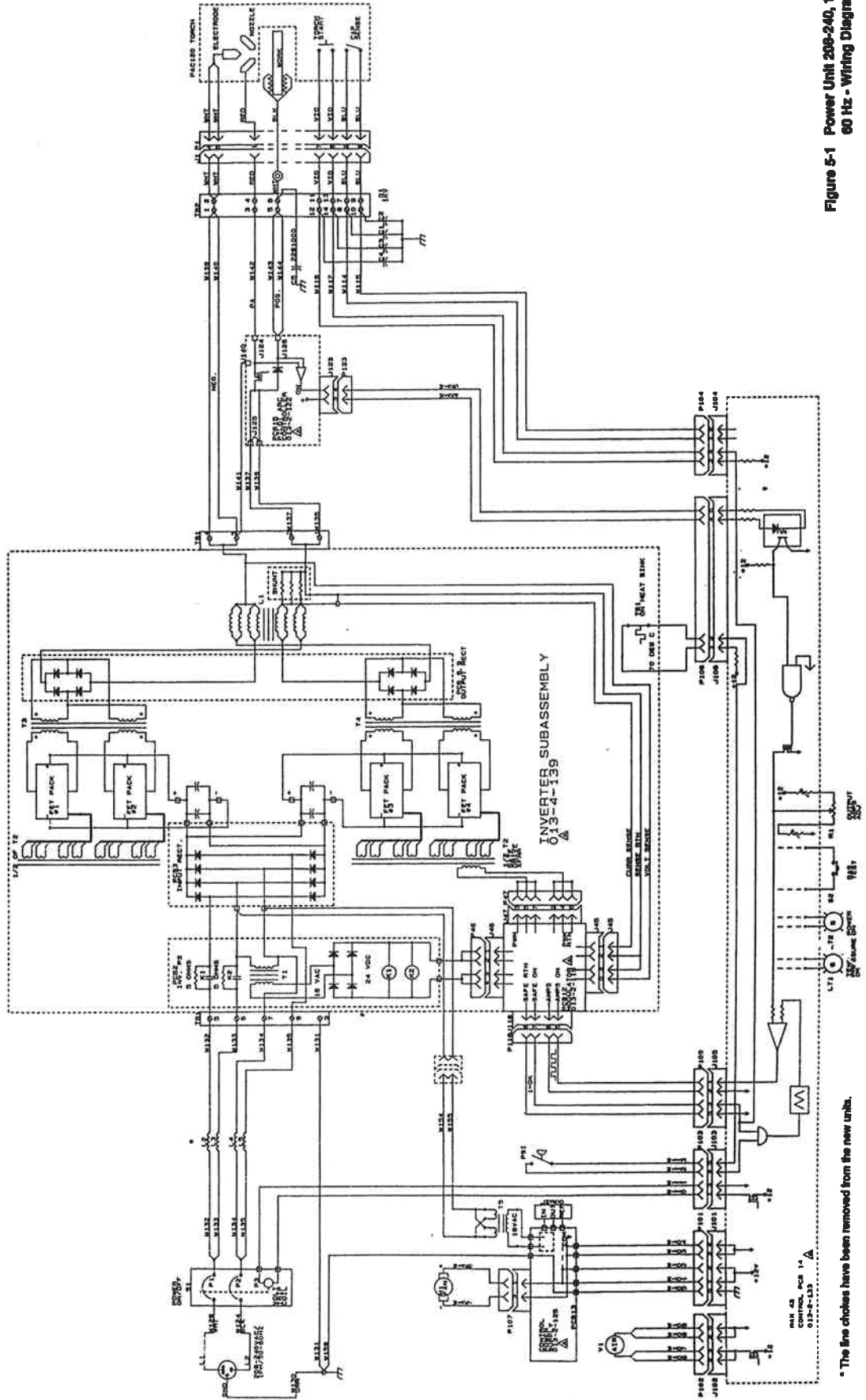


Figure 5-1 Power Unit 208-240, 1 PH,  
60 Hz - Wiring Diagram

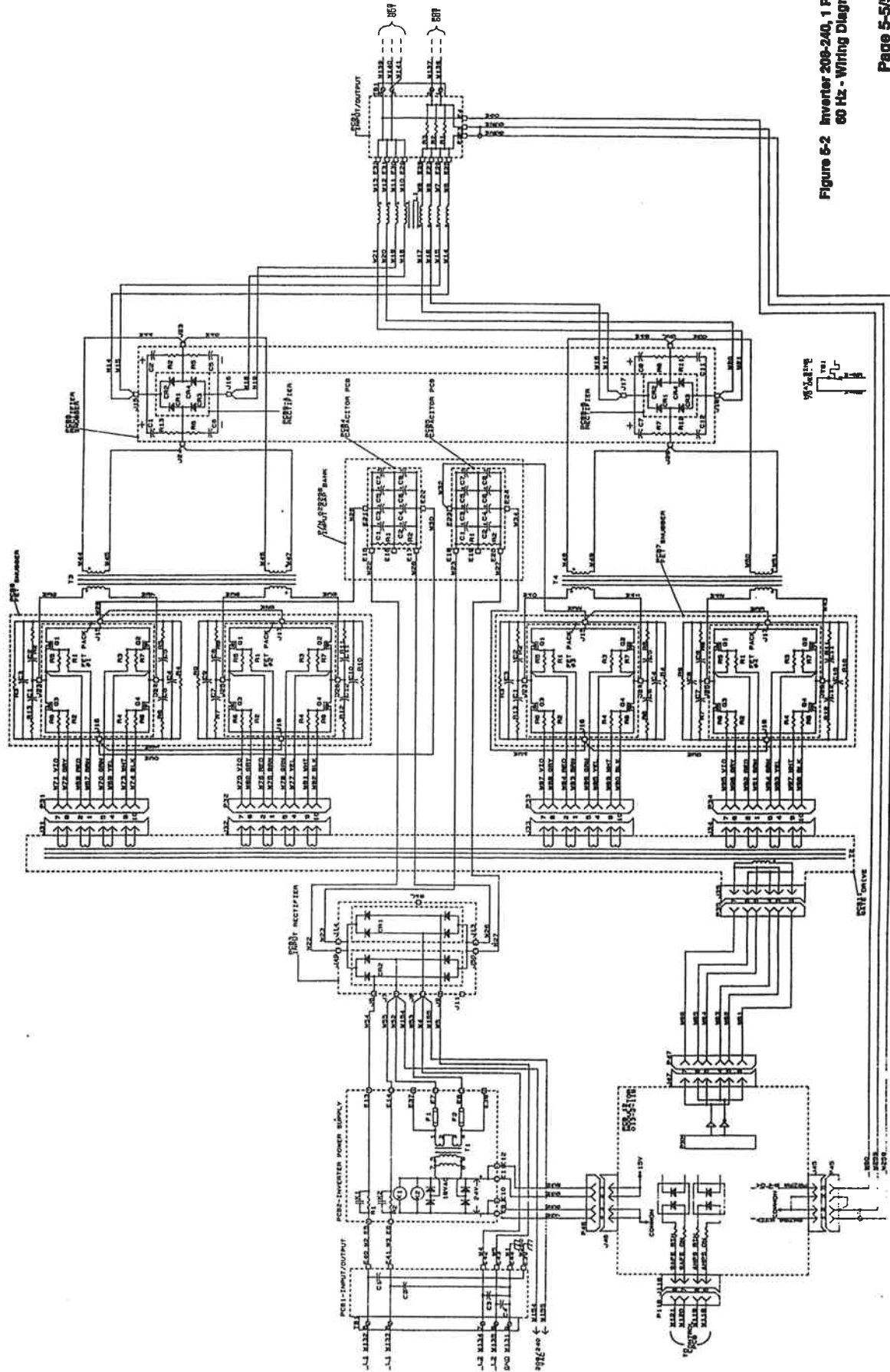


Figure 5-2 Inverter 208-240, 1 PH, 60 Hz - Wiring Diagram

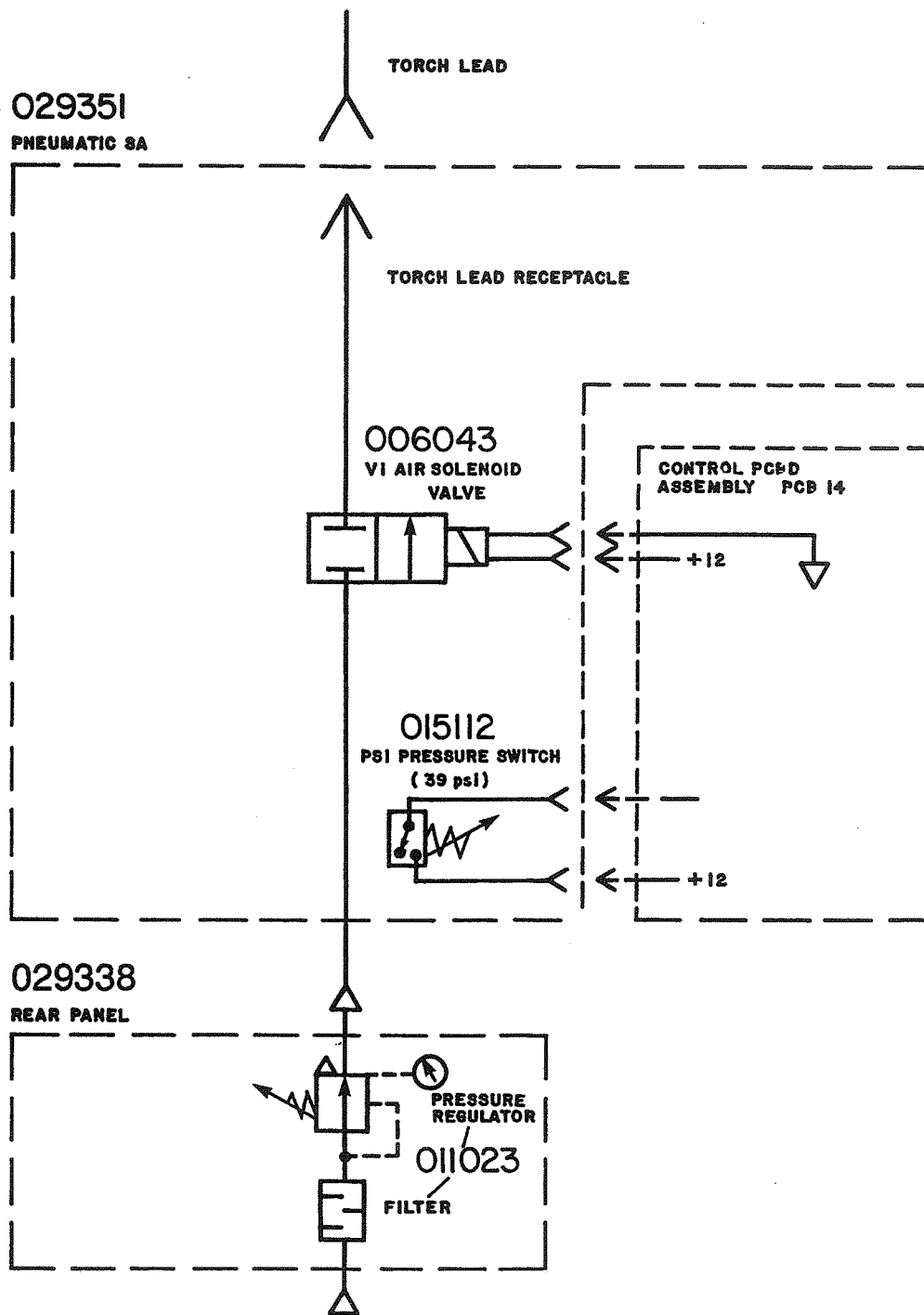
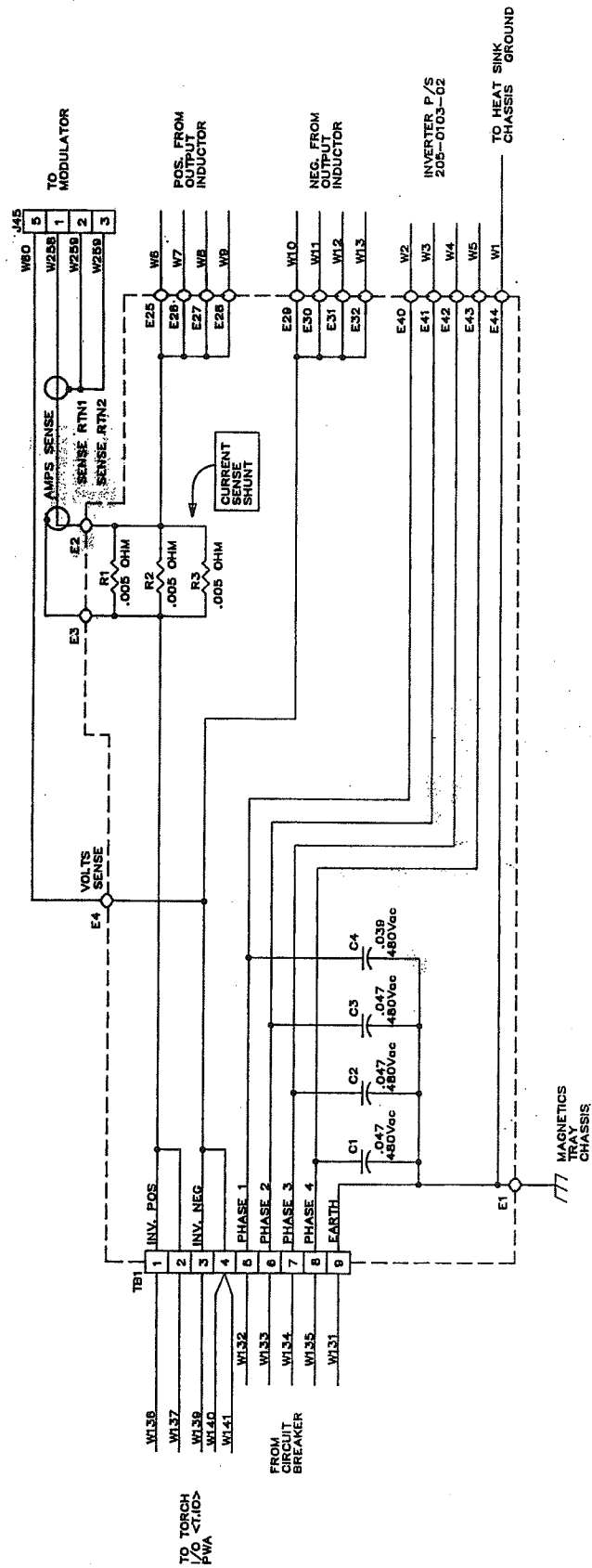


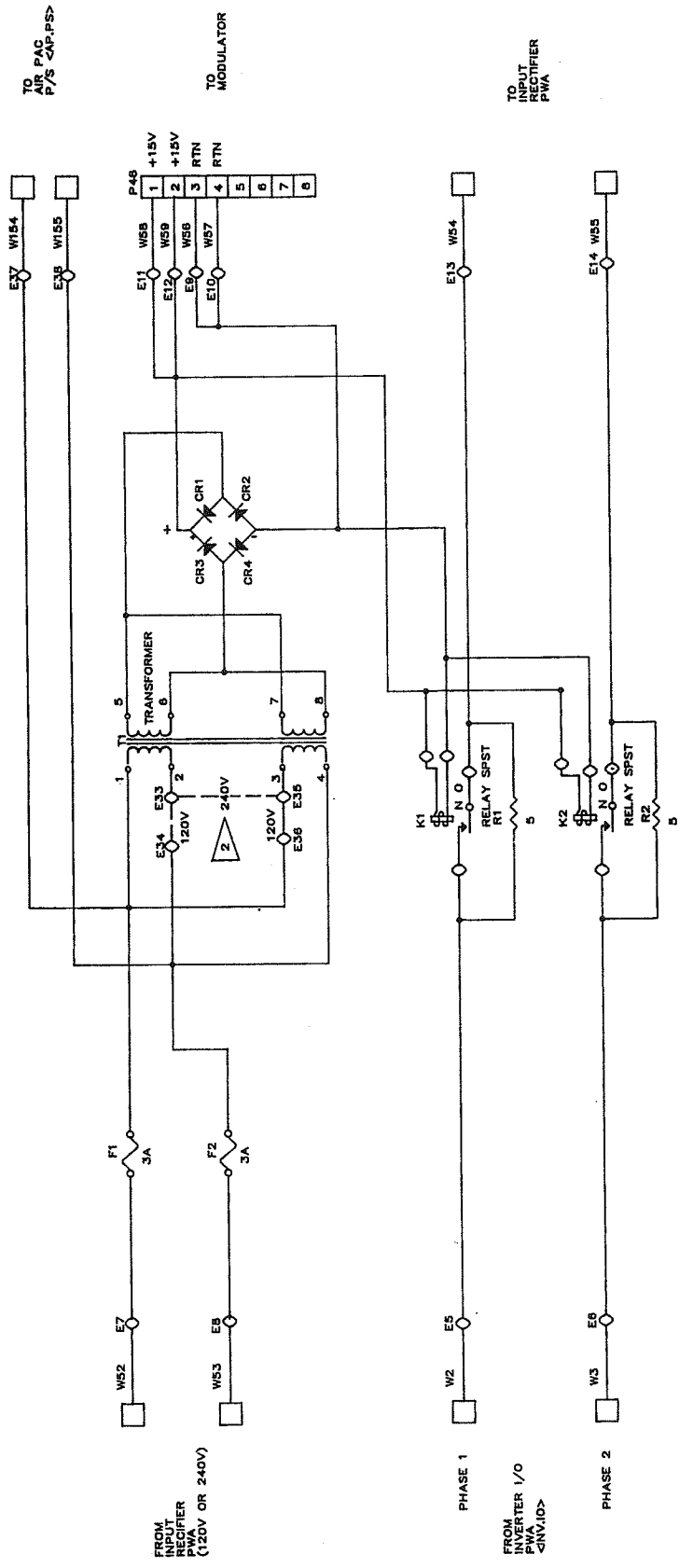
Figure 5-3 Pneumatic System - Flow Diagram



1. RESISTOR VALUES ARE IN OHMS. CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

NOTES:

Figure 5-4 Inverter I/O PC BD Assy, PCB1 - Schematic Diagram



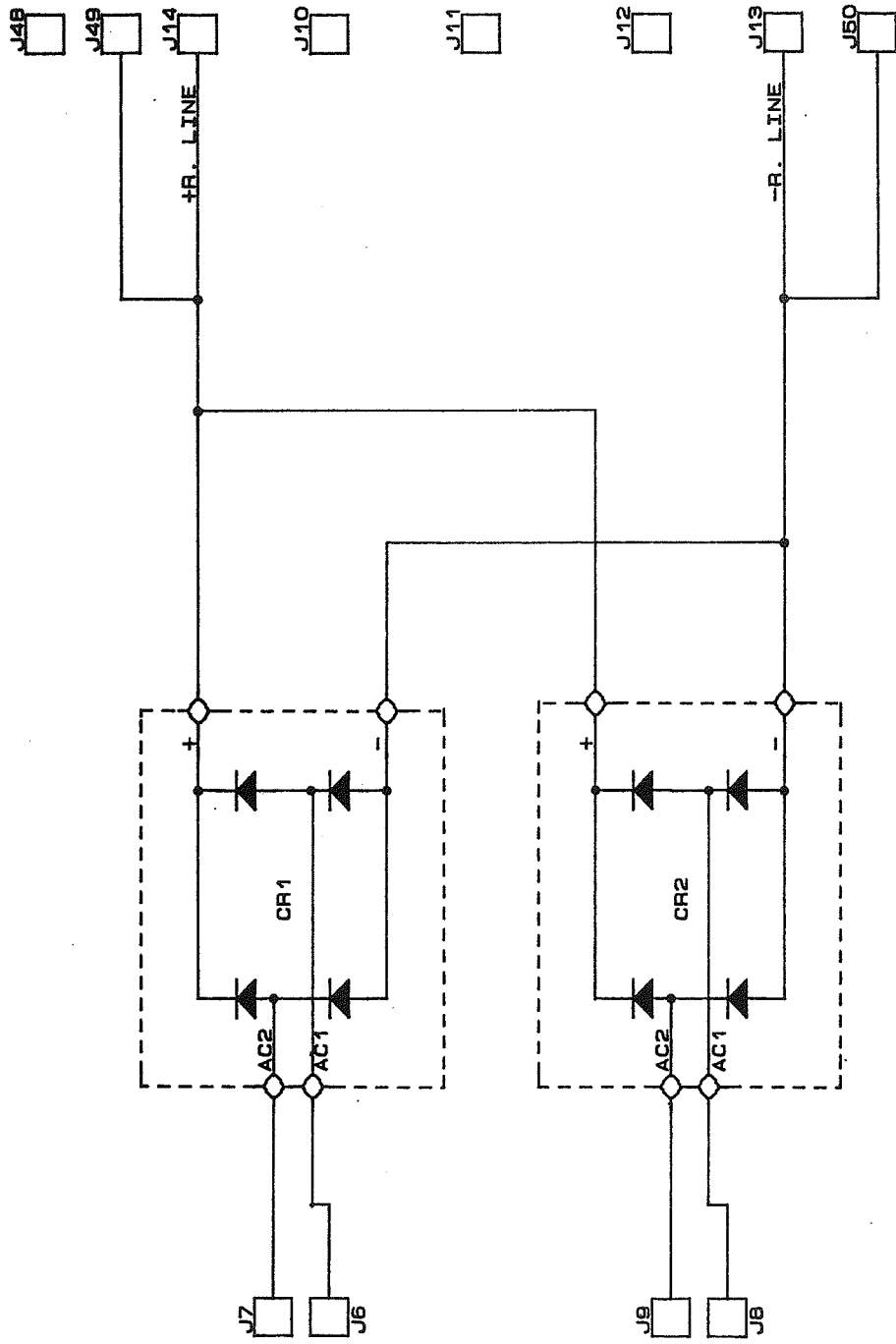
FOR -01 VERSION (120V) - JUMPERS INSTALLED FROM E33 TO E34 AND FROM E35 TO E36.  
 FOR -02 VERSION (240V/280V) - JUMPER INSTALLED FROM E35 TO E33.



1. RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS.  
 UNLESS OTHERWISE SPECIFIED:  
 NOTES:

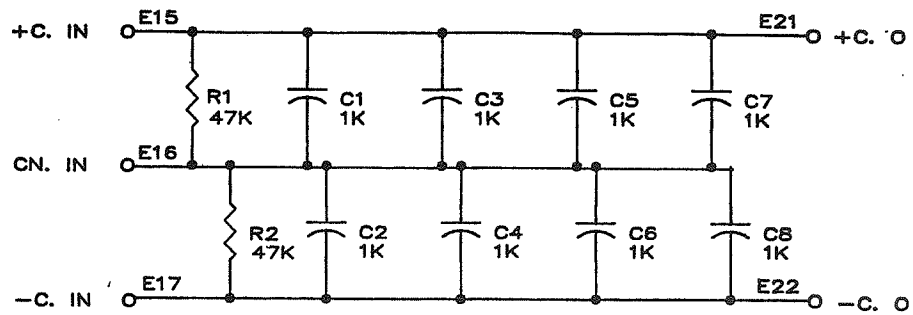
Figure 5-5 Inverter Power Supply PC BD Assy, PCB2 - Schematic Diagram





1. RESISTOR VALUES ARE IN OHMS.  
 CAPACITOR VALUES ARE IN MICROFARADS.  
 UNLESS OTHERWISE SPECIFIED:  
 NOTES:

Figure 5-6 Input Rectifier PC BD Assy, PCB3 - Schematic Diagram

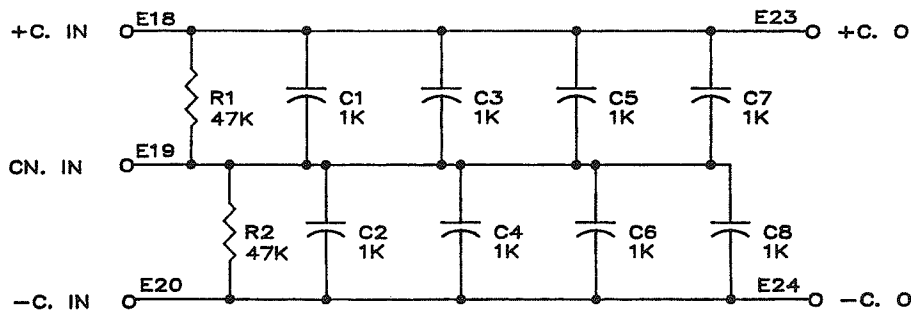


1. RESISTOR VALUES ARE IN OHMS,  
CAPACITOR VALUES ARE IN  
MICROFARADS.

UNLESS OTHERWISE SPECIFIED:

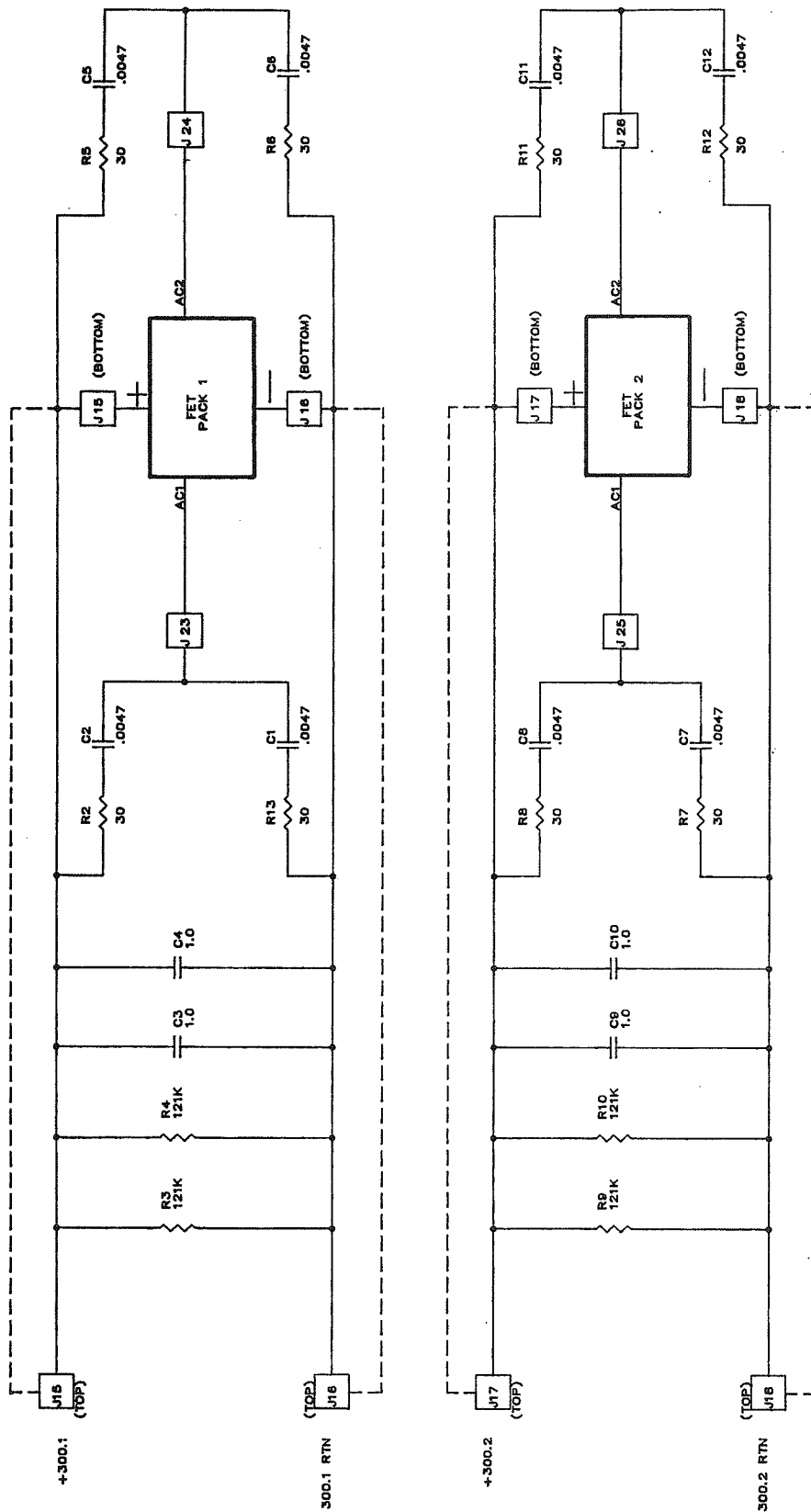
NOTES:

### PCB4



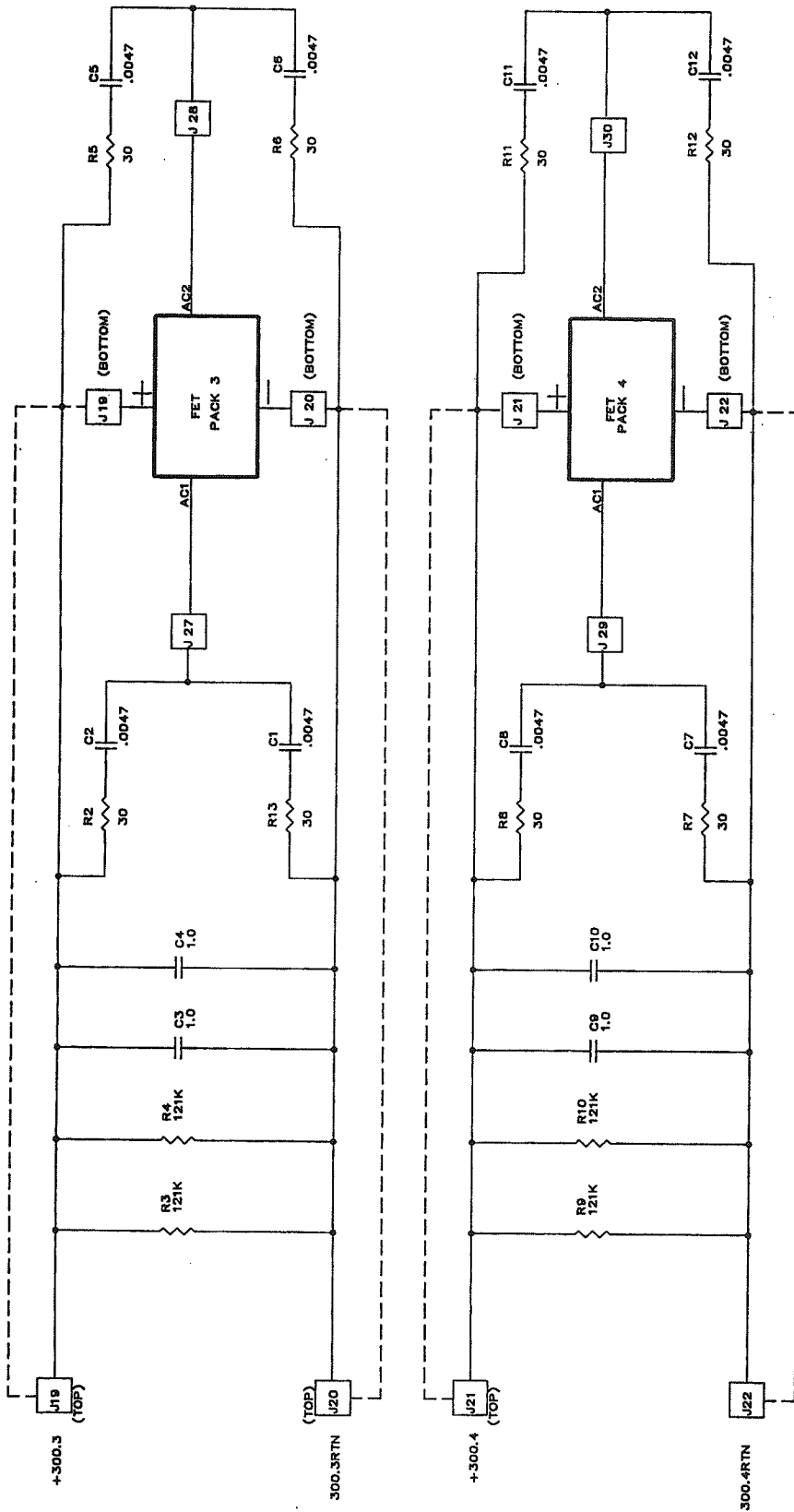
### PCB5

Figure 5-7 Capacitor Packs 1 and 2 PC BD Assy, PCB4 and PCB5 - Schematic Diagrams



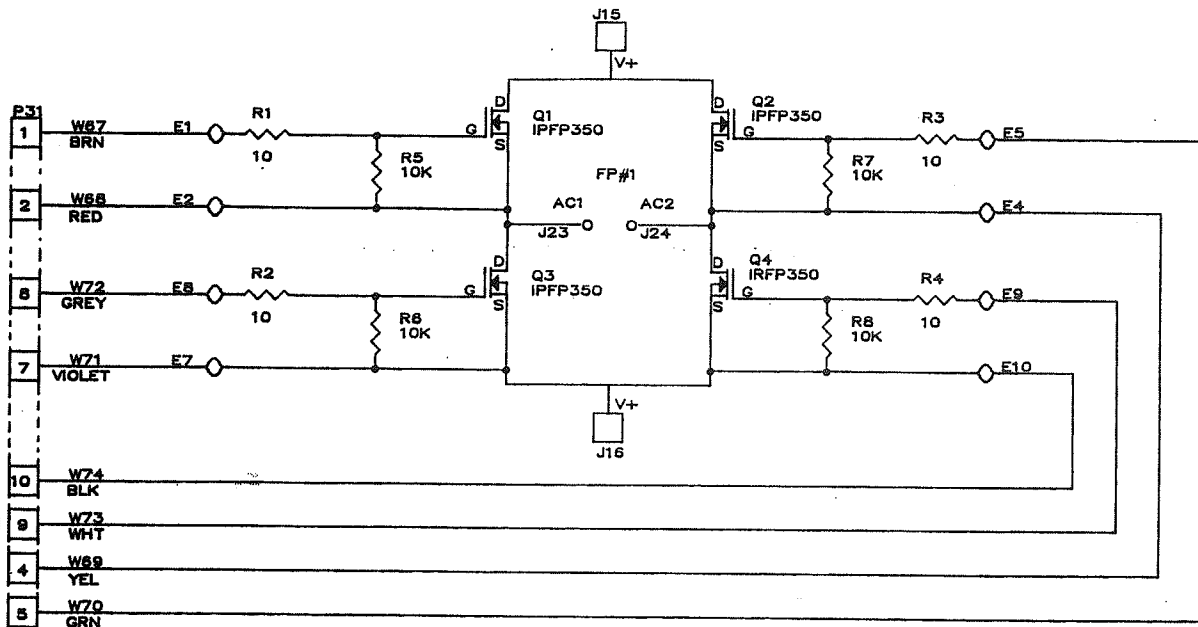
1. FET PACK SNUBBER 1 SHOWN. FET PACK SNUBBER 2 SHOWN ON SHEET 2.
  2. RESISTOR VALUES ARE IN OHMS. CAPACITOR VALUES ARE IN MICROFARADS. UNLESS OTHERWISE SPECIFIED.
- NOTES:

Figure 5-8 FET Pack Snubber 1 and 2, PCB6 - Schematic Diagram



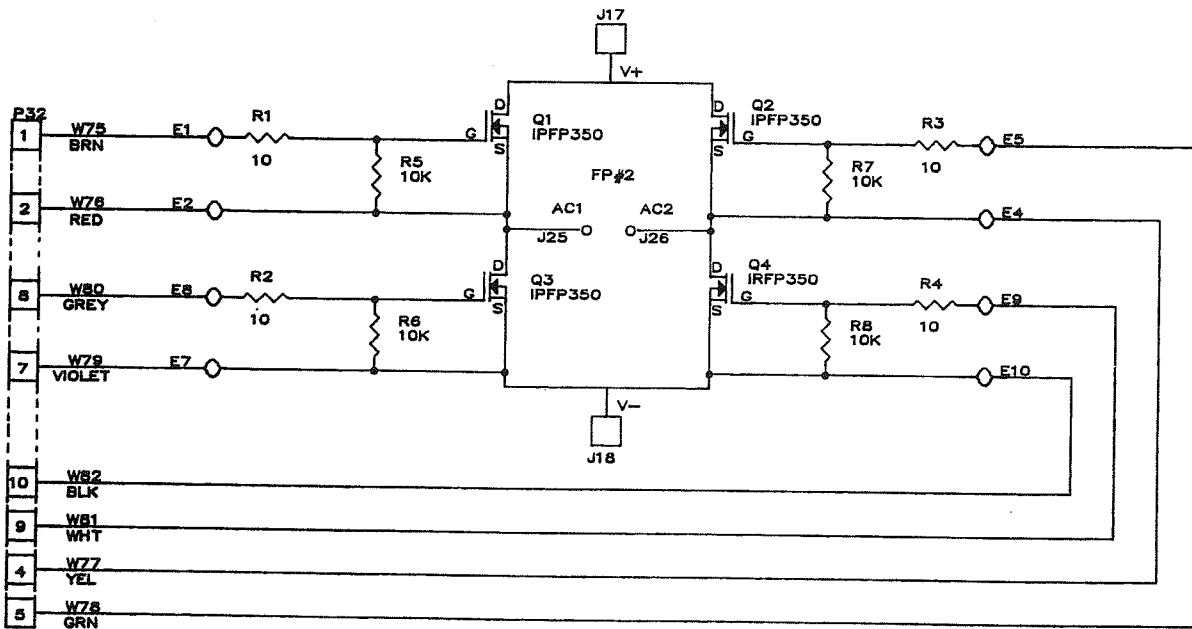
1. RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS.  
UNLESS OTHERWISE SPECIFIED:  
NOTES:

Figure 5-9 FET Pack Snubber 3 and 4, PCB7 - Schematic Diagram



2. WIRE LENGTHS 8" FROM END OF BOARD TO PLUG.
1. RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS.
- UNLESS OTHERWISE SPECIFIED:
- NOTES:

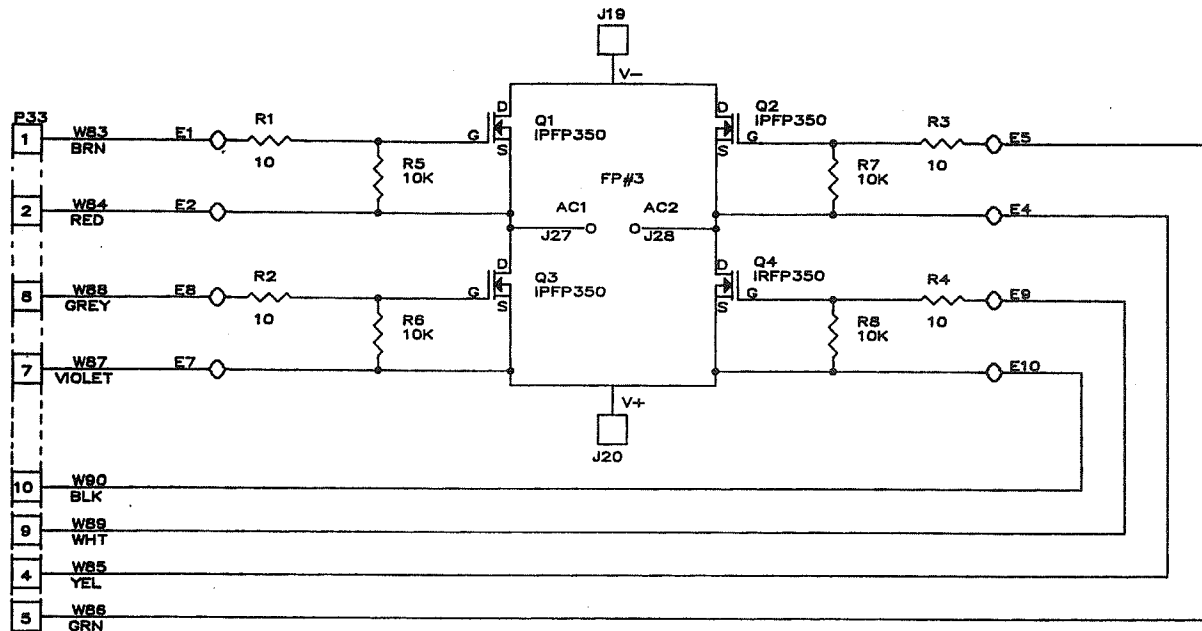
**FET Pack 1**



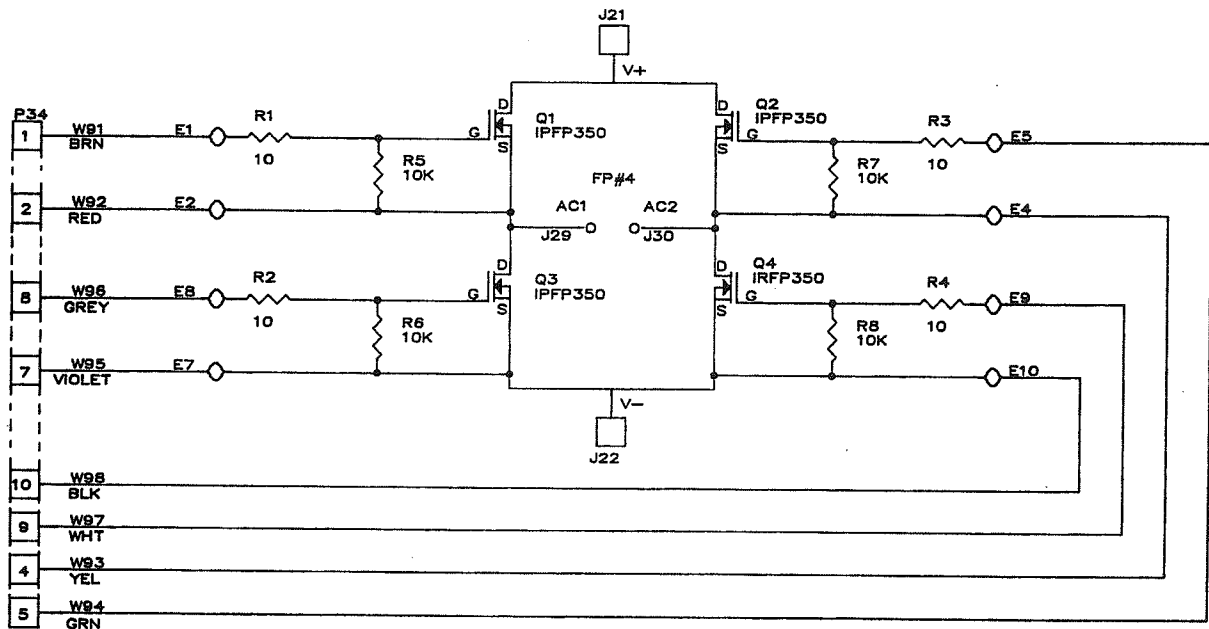
2. WIRE LENGTH 9" FROM END OF BOARD TO PLUG.
1. RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS.
- UNLESS OTHERWISE SPECIFIED:
- NOTES:

**FET Pack 2**

Figure 5-10 FET Packs 1 and 2 - Schematic Diagrams

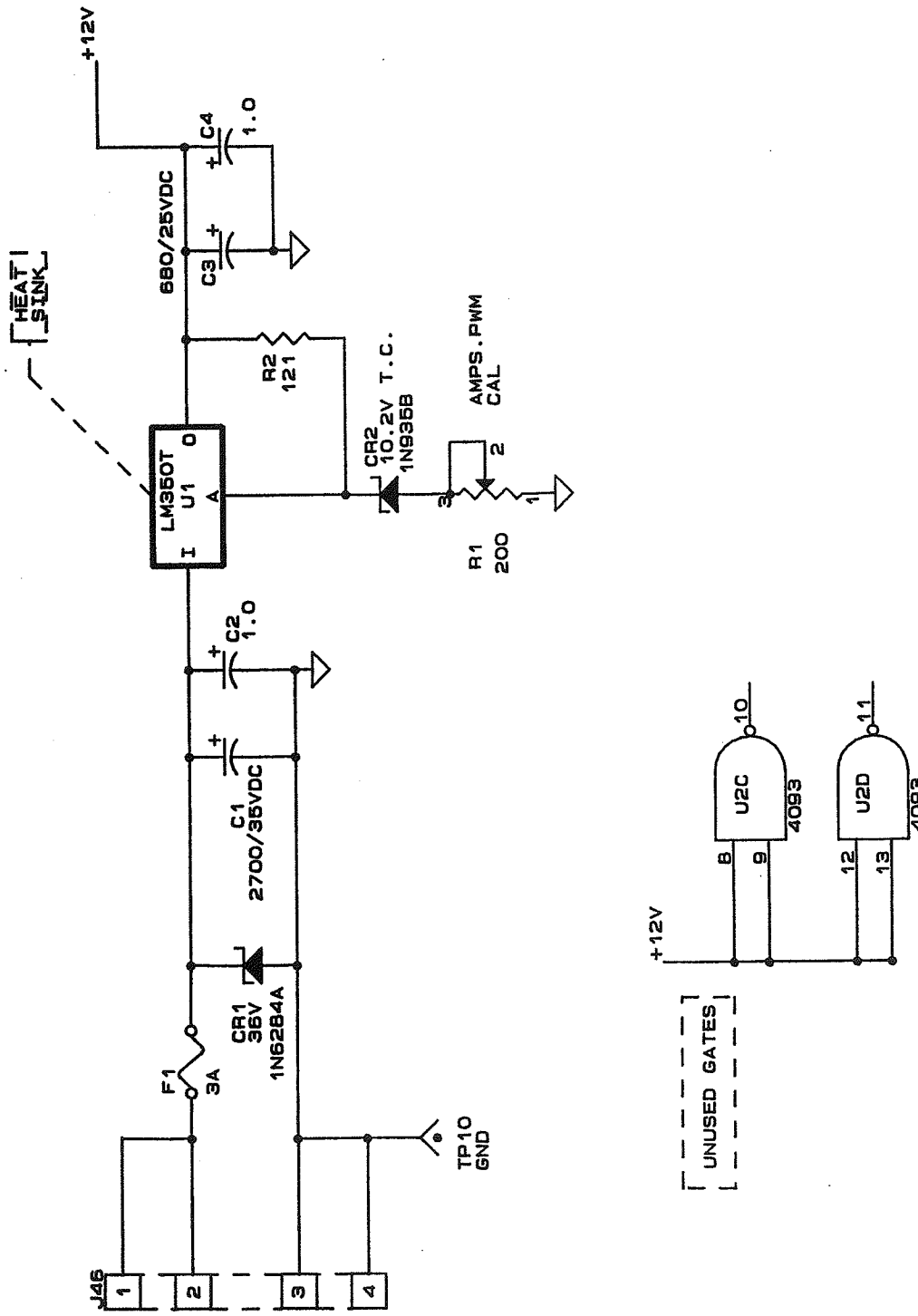


### FET Pack 3



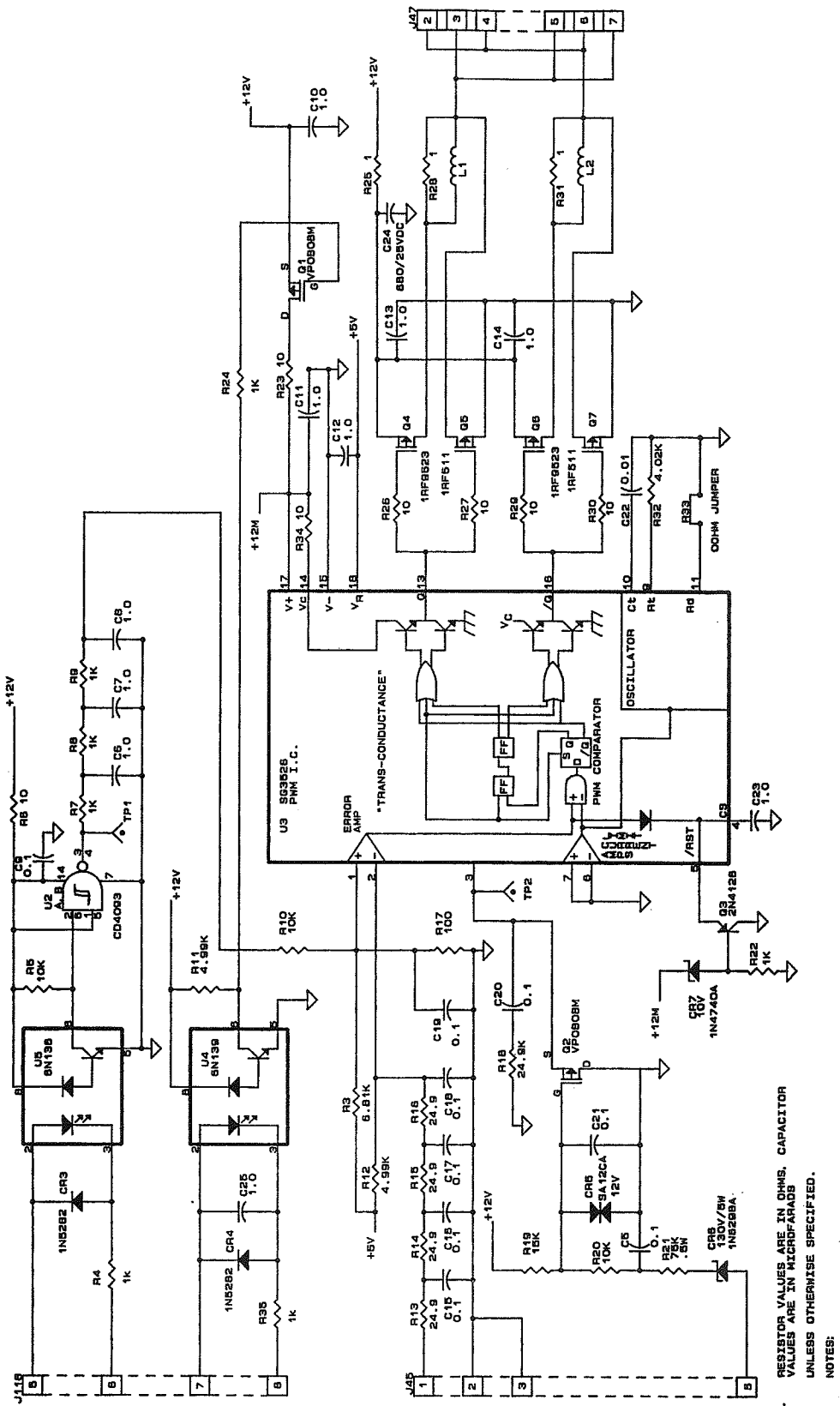
### FET Pack 4

Figure 5-11 FET Packs 3 and 4 - Schematic Diagrams



1. RESISTOR VALUES ARE IN OHMS. CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED:  
NOTES:

Figure 5-12 Inverter Modulator PC BD Assy, PCB12 - Schematic Diagram (Sheet 1 of 2)

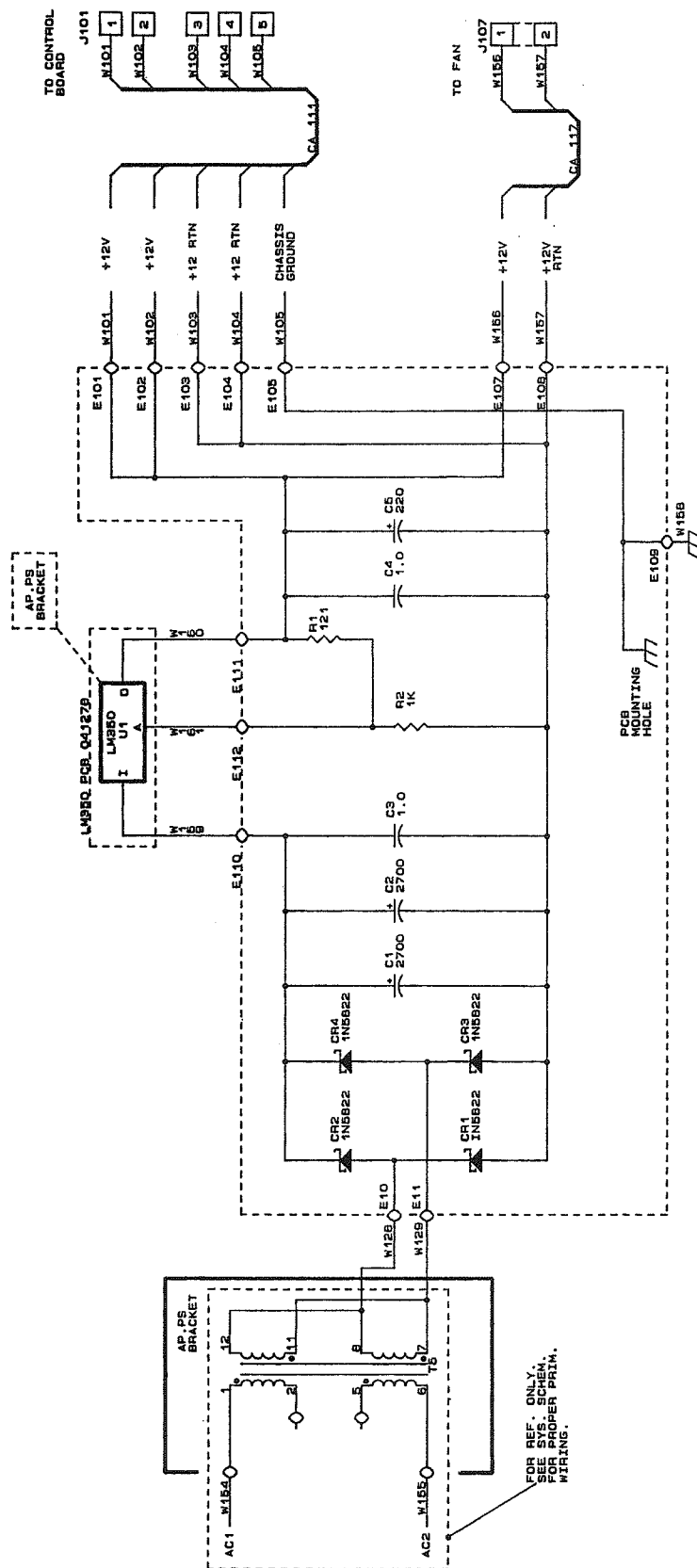


RESISTOR VALUES ARE IN OHMS. CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

NOTES:

Figure 5-12 Inverter Modulator PC BD Assy, PCB12 - Schematic Diagram (Sheet 2 of 2)



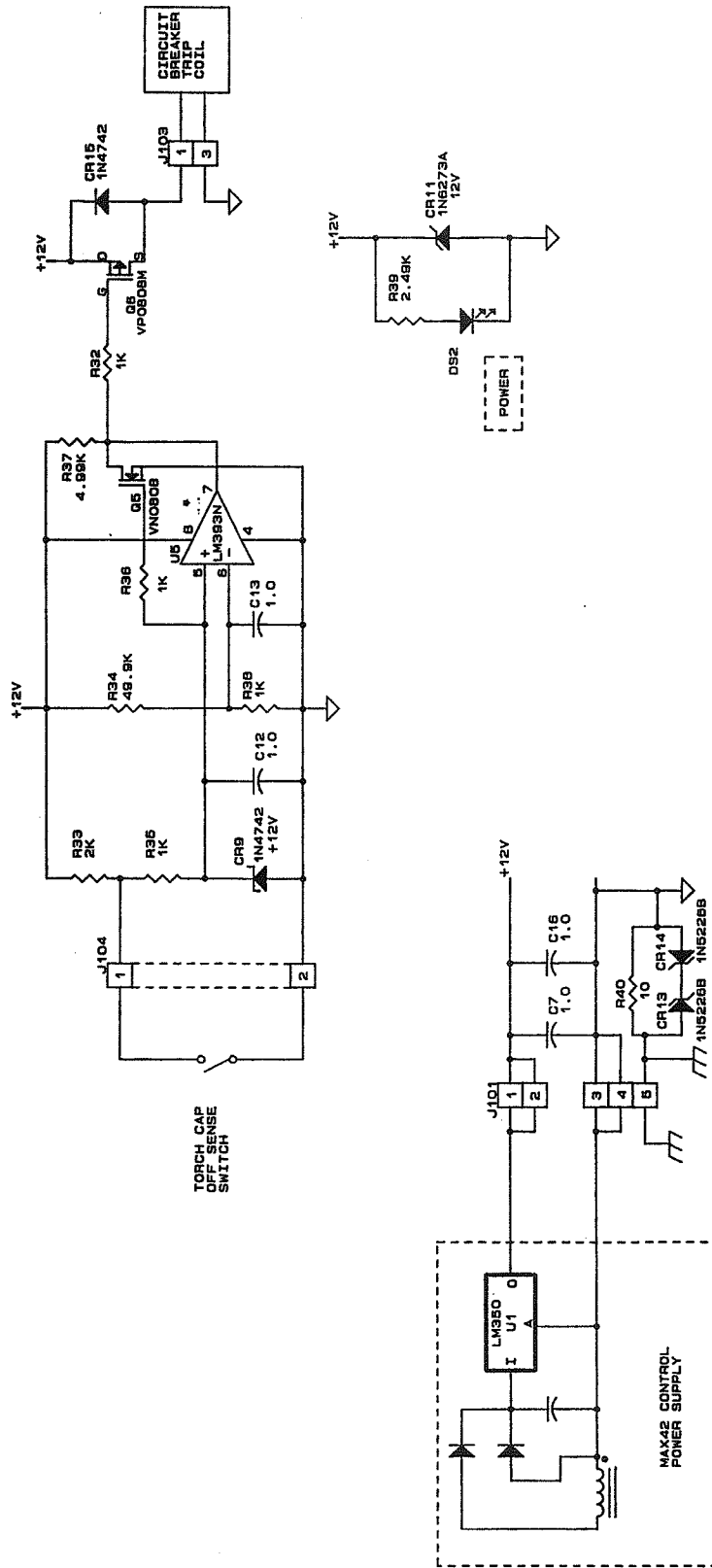


1. RESISTOR VALUES ARE IN OHMS. CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

NOTES:

FOR REF. ONLY. SEE SVS SCHEM. FOR PROPER WIRING.

Figure 5-13 Control Power Supply PC BD Assy, PCB13 - Schematic Diagram



1. RESISTOR VALUES ARE IN OHMS. CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED:

\* U5 not installed on board.

Figure 5-14 Control PC BD Assy, PCB14 - Schematic Diagram (Sheet 1 of 2)

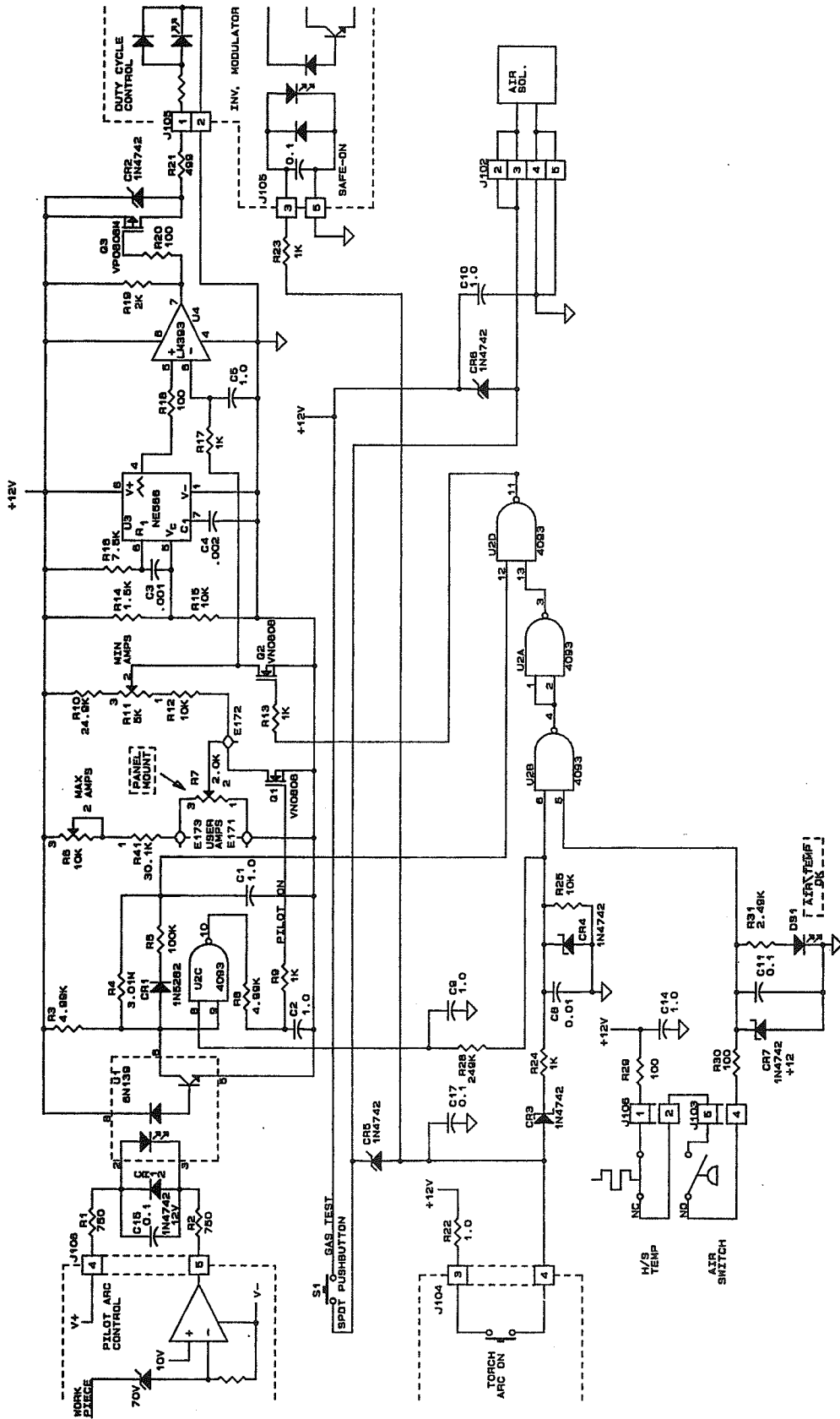
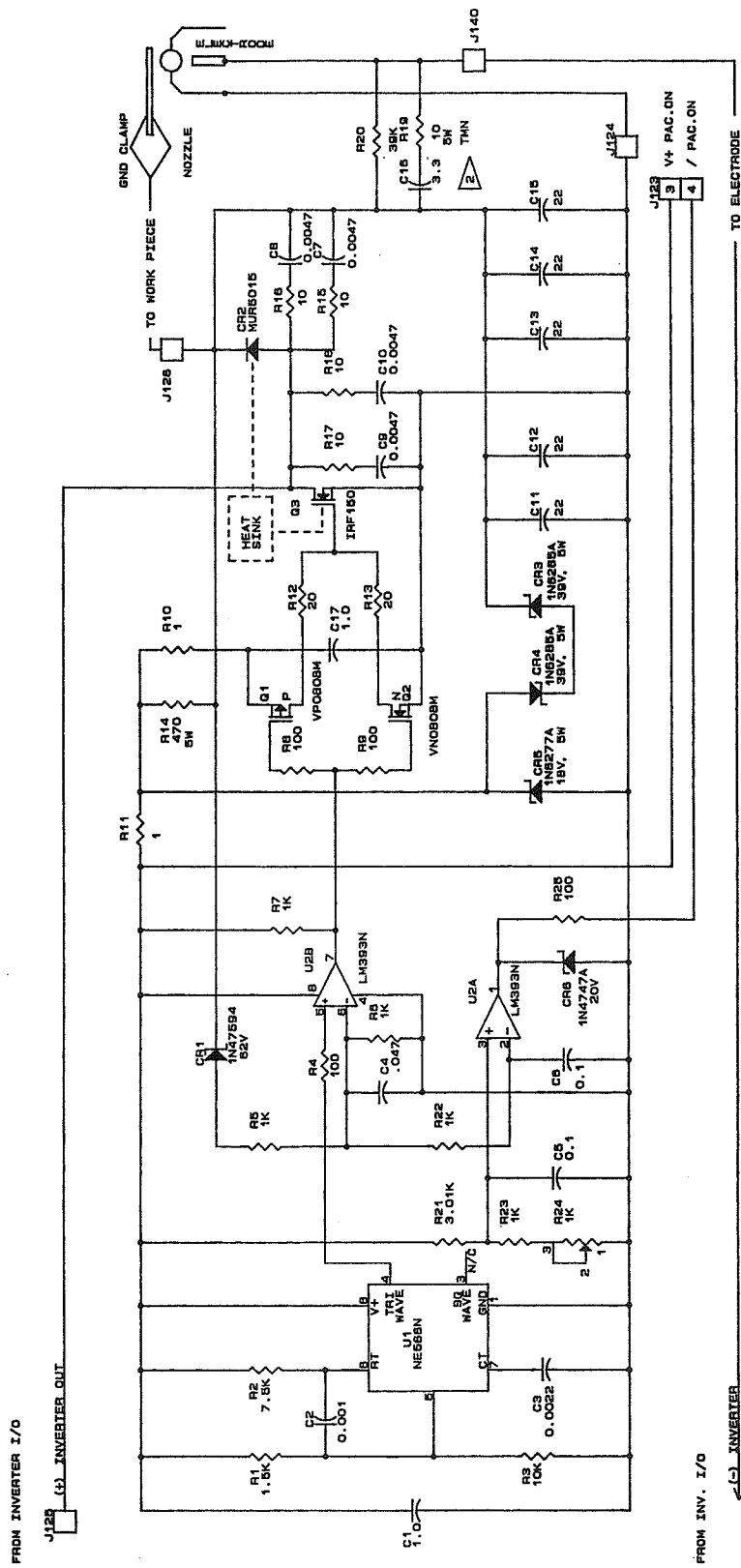


Figure 5-14 Control PC BD Assy, PCB14 - Schematic Diagram (Sheet 2 of 2)



2 TORCH MATCHING NETWORK (TMN) .  
 1. RESISTOR VALUES ARE IN OHMS. CAPACITOR  
 VALUES ARE IN MICROFARADS.  
 UNLESS OTHERWISE SPECIFIED:  
 NOTES:

Figure 5-15 Pilot Arc Controller PC BD Assy, PCB15 - Schematic Diagram