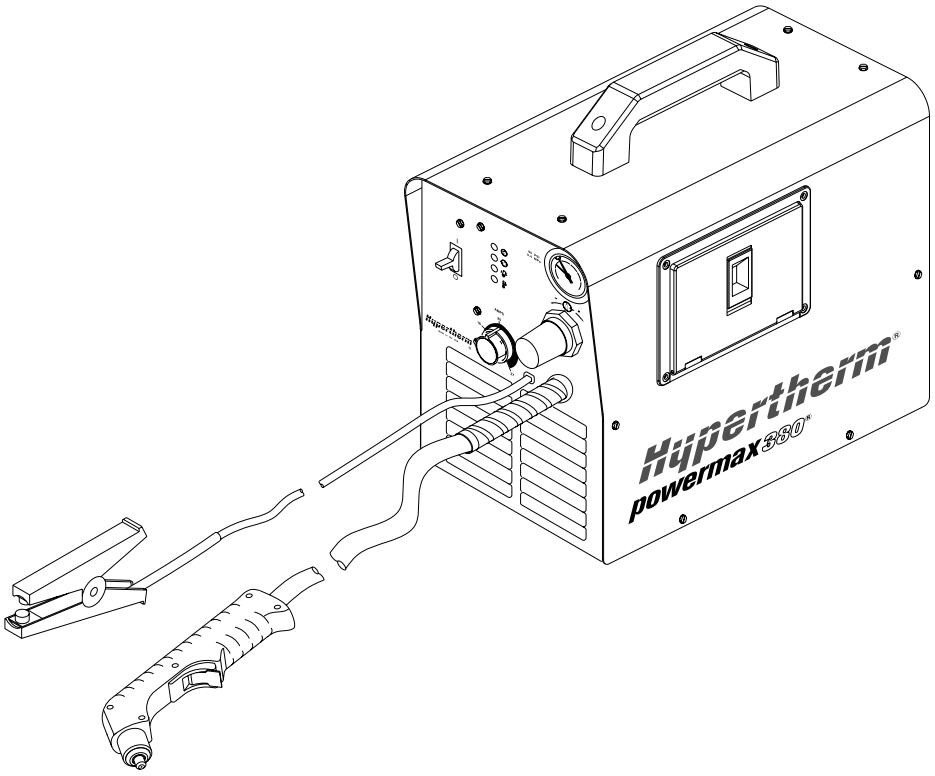
powermax380®

Plasma Arc Cutting System

Service Manual
803990 Revision 0



Hypertherm
The world leader in plasma cutting technology

powermax380

Service Manual

(P/N 803990)

Revision 0 September 2001

Hypertherm, Inc.
Hanover, NH USA
http://www.hypertherm.com
email:info@hypertherm.com

Hypertherm, Inc.
Etna Road, P.O. Box 5010
Hanover, NH 03755 USA
603-643-3441 Tel (Main Office)
603-643-5352 Fax (All Departments)
800-643-9878 Tel (Technical Service)
800-737-2978 Tel (Customer Service)

Hypertherm Automation
5 Technology Drive
West Lebanon, NH 03755 USA
603-298-7970 Tel
603-298-7977 Fax

Hypertherm Plasmatechnik GmbH
Technologiepark Hanau
Rodenbacher Chaussee 6
63457 Hanau-Wolfgang, Deutschland
49 6181 58 2100 Tel
49 6181 58 2134 Fax
49 6181 58 2123 (Technical Service)

Hypertherm Singapore Pte Ltd
No. 19 Kaki Bukit Road 2
K.B. Warehouse Complex
Singapore 417847, Republic of Singapore
65 841 2489 Tel
65 841 2490 Fax
65 841 2489 (Technical Service)

Japan
1952-14 Yata-Natsumegi
Mishima City, Shizuoka Pref.
411-0801 Japan
81 0 559 75 7387 Tel
81 0 559 75 7376 Fax

Hypertherm UK Ltd
9 Berkeley Court, Manor Park
Runcorn, Cheshire, England WA7 1TQ
44 1928 579 074 Tel
44 1928 579 604 Fax

France
15 Impasse des Rosiers
95610 Eragny, France
0805 050 111 Tel
0805 050 222 Fax

Hypertherm S.r.L.
Via Torino 2
20123 Milano, Italia
39 02 725 46 312 Tel
39 02 725 46 400 Fax
39 02 725 46 314 (Technical Service)

Hypertherm B.V.
Burg. Haverkampstraat 13
7091 CN Dinxperlo, Nederland
31 315 655866 Tel
31 315 655886 Fax

Hypertherm B.V. (ETSO)
Vaartveld 9
4704 SE Roosendaal, Nederland
00 800 49 73 7843 – toll-free in Europa
31 165 596900 Tel
31 165 596901 Fax

EMC INTRODUCTION

Hypertherm's CE-marked equipment is built in compliance with standard EN50199. The equipment should be installed and used in accordance with the information below to achieve electromagnetic compatibility.

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

This plasma equipment is designed for use only in an industrial environment.

INSTALLATION AND USE

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

ASSESSMENT OF AREA

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

a. Other supply cables, control cables, signalling and telephone cables; above, below and adjacent to the cutting equipment.
b. Radio and television transmitters and receivers.
c. Computer and other control equipment.
d. Safety critical equipment, for example guarding of industrial equipment.
e. Health of the people around, for example the use of pacemakers and hearing aids.
f. Equipment used for calibration or measurement.
g. Immunity of other equipment in the environment. User shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures.
h. Time of day that cutting or other activities are to be carried out.

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

METHODS OF REDUCING EMISSIONS

Mains Supply

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

Maintenance of Cutting Equipment

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

Cutting Cables

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

Equipotential Bonding

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

Earthing of Workpiece

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

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

Screening and Shielding

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

WARNING

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 may not be covered by the Hypertherm warranty.

WARNING

You are responsible for the safe use of the Product. Hypertherm does not and cannot make any guarantee or warranty regarding the safe use of the Product in your environment.

GENERAL

Hypertherm, Inc. warrants that its Products shall be free from defects in materials and workmanship, if Hypertherm is notified of a defect (i) with respect to the power supply within a period of two (2) years from the date of its delivery to you, with the exception of G3 Series power supplies, which shall be within a period of three (3) years from the date of delivery to you, and (ii) with respect to the torch and leads within a period of one (1) year from its date of delivery to you. This warranty shall not apply to any Product which has been incorrectly installed, modified, or otherwise damaged. Hypertherm, at its sole option, shall repair, replace, or adjust, free of charge, any defective Products covered by this warranty which shall be returned with Hypertherm's prior authorization (which shall not be unreasonably withheld), properly packed, to Hypertherm's place of business in Hanover, New Hampshire, or to an authorized Hypertherm repair facility, all costs, insurance and freight prepaid. Hypertherm shall not be liable for any repairs, replacement, or adjustments of Products covered by this warranty, except those made pursuant to this paragraph or with Hypertherm's prior written consent. **The warranty above is exclusive and is in lieu of all other warranties, express, implied, statutory, or otherwise with respect to the Products or as to the results which may be obtained therefrom, and all implied warranties or conditions of quality or of merchantability or fitness for a particular purpose or against infringement. The foregoing shall constitute the sole and exclusive remedy for any breach by Hypertherm of its warranty**. Distributors/OEMs may offer different or additional warranties, but Distributors/OEMs are not authorized to give any additional warranty protection to you or make any representation to you purporting to be binding upon Hypertherm.

PATENT INDEMNITY

Except only in cases of products not manufactured by Hypertherm or manufactured by a person other than Hypertherm not in strict conformity with Hypertherm's specifications and in cases of designs, processes, formulae, or combinations not developed or purported to be developed by Hypertherm, Hypertherm will defend or settle, at its own expense, any suit or proceeding brought against you alleging that the use of the Hypertherm product, alone and not in combination with any other product not supplied by Hypertherm, infringes any patent of any third party. You shall notify Hypertherm promptly upon learning of any action or threatened action in connection with any such alleged infringement, and Hypertherm's obligation to indemnify shall be conditioned upon Hypertherm's sole control of, and the indemnified party's cooperation and assistance in, the defense of the claim.

LIMITATION OF LIABILITY

In no event shall Hypertherm be liable to any person or entity for any incidental, consequential, indirect, or punitive damages (including but not limited to lost profits) regardless of whether such liability is based on breach of contract, tort, strict liability, breach of warranties, failure of essential purpose or otherwise and even if advised of the possibility of such damages.

LIABILITY CAP

In no event shall Hypertherm's liability, whether such liability is based on breach of contract, tort, strict liability, breach of warranties, failure of essential purpose or otherwise, for any claim action suit or proceeding arising out of or relating to the use of the Products exceed in the aggregate the amount paid for the Products that gave rise to such claim.

INSURANCE

At all times you will have and maintain insurance in such quantities and types, and with coverage sufficient and appropriate to defend and to hold Hypertherm harmless in the event of any cause of action arising from the use of the Products.

NATIONAL AND LOCAL CODES

National and Local codes governing plumbing and electrical installation shall take precedent over any instructions contained in this manual. **In no event** shall Hypertherm be liable for injury to persons or property damage by reason of any code violation or poor work practices.

TRANSFER OF RIGHTS

You may transfer any remaining rights you may have hereunder only in connection with the sale of all or substantially all of your assets or capital stock to a successor in interest who agrees to be bound by all of the terms and conditions of this Warranty.

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Hypertherm

Section 1

SAFETY

In this section:

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, or a welding helmet) with appropriate lens shading to protect your eyes from the arc's ultraviolet and infrared rays.

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

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.

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

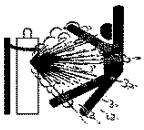
Work Cable Attach the work cable securely to the workpiece or the work table with good metal-to-metal contact. Do not connect it to the piece that will fall away when the cut is complete.

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

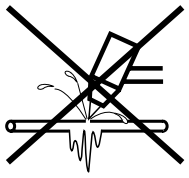
Gas cylinders contain gas under high pressure. If damaged, a cylinder can explode.

- 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.



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.

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:

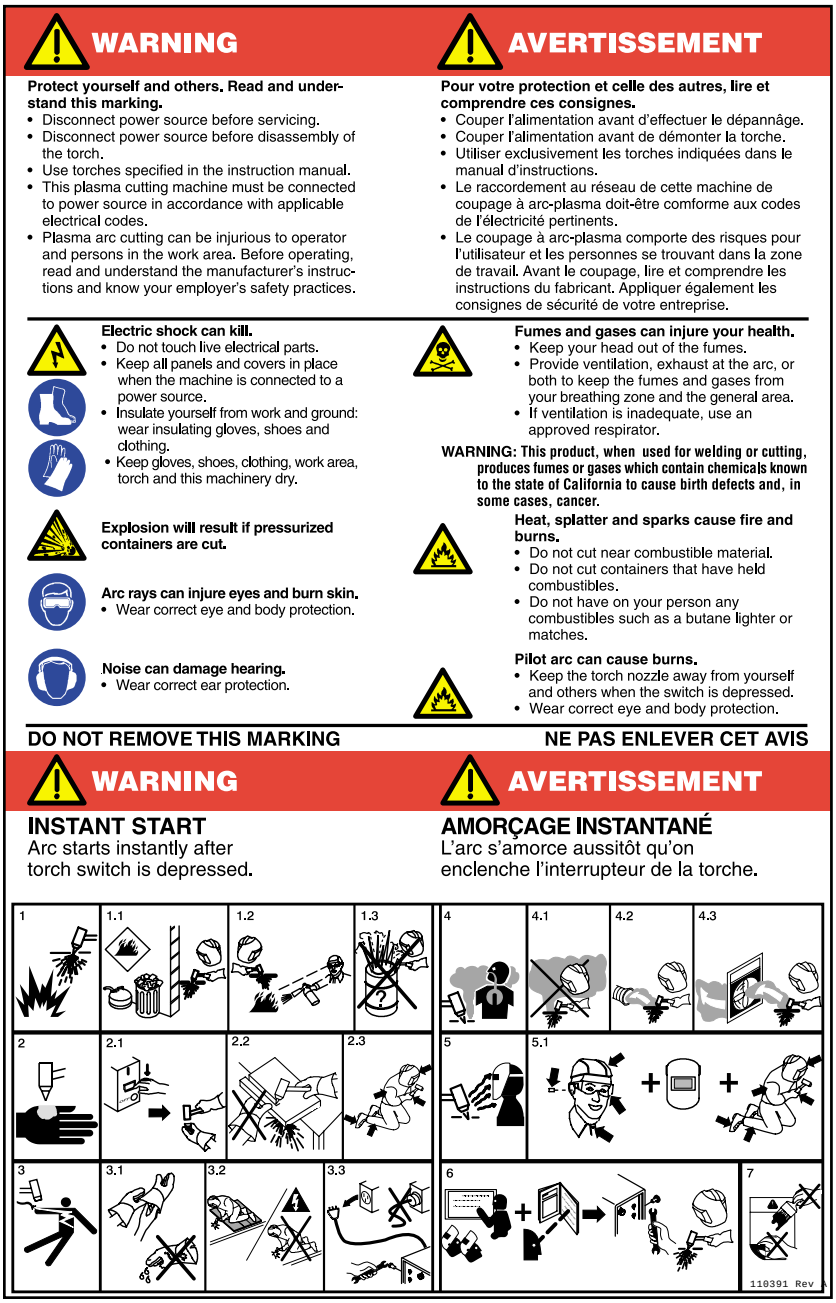
- Keep both the work cable and the torch lead to one side, away from your body.
- Route the torch leads as close as possible to the work cable.
- Do not wrap or drape the torch lead or work cable around your body.
- Keep as far away from the power supply as possible.

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

WARNING LABEL

This warning label is affixed to some power supplies. It is important that the operator and maintenance technician understand the intent of these warning symbols as described. The numbered text corresponds to the numbered boxes on the label.



1. Cutting sparks can cause explosion or fire.

1.1 Keep flammables away from cutting.

1.2 Keep a fire extinguisher nearby, and have a watchperson ready to use it.

1.3 Do not cut on any closed containers.

2. The plasma arc can cause injury and burns.

2.1 Turn off power before disassembling torch.

2.2 Do not hold the material near cutting path.

2.3 Wear complete body protection.

3. Electric shock from torch or wiring can kill. Protect yourself from electric shock.

3.1 Wear insulating gloves. Do not wear wet or damaged gloves.

3.2 Insulate yourself from work and ground.

3.3 Disconnect input plug or power before working on machine.

4. Breathing cutting fumes can be hazardous to your health.

4.1 Keep your head out of the fumes.

4.2 Use forced ventilation or local exhaust to remove the fumes.

4.3 Use ventilating fan to remove the fumes.

5. Arc rays can burn eyes and injure skin.

5.1 Wear hat and safety glasses. Use ear protection and button shirt collar. Use welding helmet with correct shade of filter. Wear complete body protection.

6. Become trained and read the instructions before working on the machine or cutting.

7. Do not remove or paint over (cover) warning labels.

Hypertherm

Section 1

SÉCURITÉ

Dans cette section :

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 ou encore masque de soudure) avec des verres teintés appropriés pour protéger les yeux des rayons ultraviolets et infrarouges de l'arc.

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

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

- Gants à crispin, chaussures et casque de sécurité.
- Vêtements ignifuges couvrant toutes les parties 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.

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.

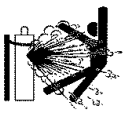
Table de travail Raccorder la table de travail à la terre, conformément aux codes de sécurité locaux ou nationaux appropriés.

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

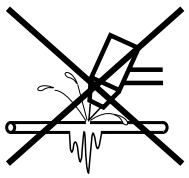
Les bouteilles de gaz contiennent du gaz à haute pression. Si une bouteille est endommagée, elle peut exploser.

- 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.



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.

PACEMAKERS ET PROTHÈSES AUDITIVES

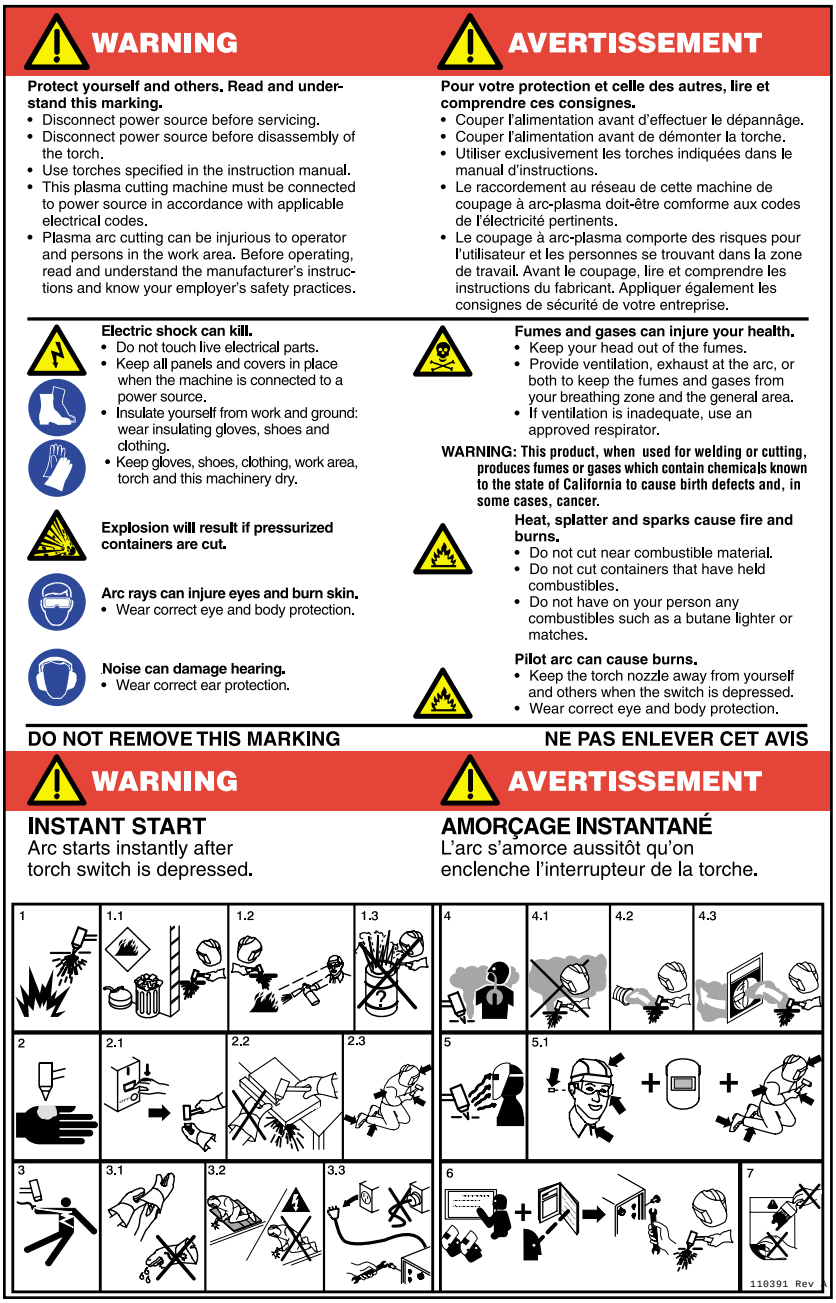
Les champs magnétiques produits par les courants à haute tension peuvent affecter le fonctionnement des prothèses auditives et des pacemakers. Les personnes portant ce type d'appareil doivent consulter un médecin avant de s'approcher d'un lieu où s'effectue le coupage ou le gougeage plasma.

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.

Étiquette de sécurité

Cette étiquette est affichée sur la source de courant. Il est important que l'utilisateur et le technicien de maintenance comprennent la signification des symboles de sécurité. Les numéros de la liste correspondent aux numéros des images.



1. Les étincelles produites par le coupage peuvent provoquer une explosion ou un incendie.

1.1 Pendant le coupage, éloigner toute matière inflammable.

1.2 Conserver un extincteur à proximité et s'assurer qu'une personne soit prête à l'utiliser.

1.3 Ne jamais couper de récipients fermés.

2. L'arc plasma peut provoquer des blessures et des brûlures.

2.1 Couper l'alimentation avant de démonter la torche.

2.2 Ne pas tenir la surface à couper près de la trajectoire de coupe.

2.3 Porter des vêtements de protection couvrant tout le corps.

3. Un choc électrique causé par la torche ou les câbles peut être fatal. Se protéger contre les risques de chocs électriques.

3.1 Porter des gants isolants. Ne pas porter de gants mouillés ou abîmés.

3.2 S'isoler de la surface de travail et du sol.

3.3 Débrancher la prise ou la source de courant avant de manipuler l'équipement.

4. L'inhalation des vapeurs produites par le coupage peut être dangereuse pour la santé.

4.1 Garder le visage à l'écart des vapeurs.

4.2 Utiliser un système de ventilation par aspiration ou d'échappement localisé pour dissiper les vapeurs.

4.3 Utiliser un ventilateur pour dissiper les vapeurs.

5. Les rayons de l'arc peuvent brûler les yeux et provoquer des lésions de la peau.

5.1 Porter un casque et des lunettes de sécurité. Se protéger les oreilles et porter une chemise dont le col peut être déboutonné. Porter un casque de soudure dont la protection filtrante est suffisante. Porter des vêtements protecteurs couvrant la totalité du corps.

6. Se former à la technique du coupage et lire les instructions avant de manipuler l'équipement ou de procéder au coupage.

7. Ne pas retirer ou peindre (recouvrir) les étiquettes de sécurité.

Hypertherm

Section 2

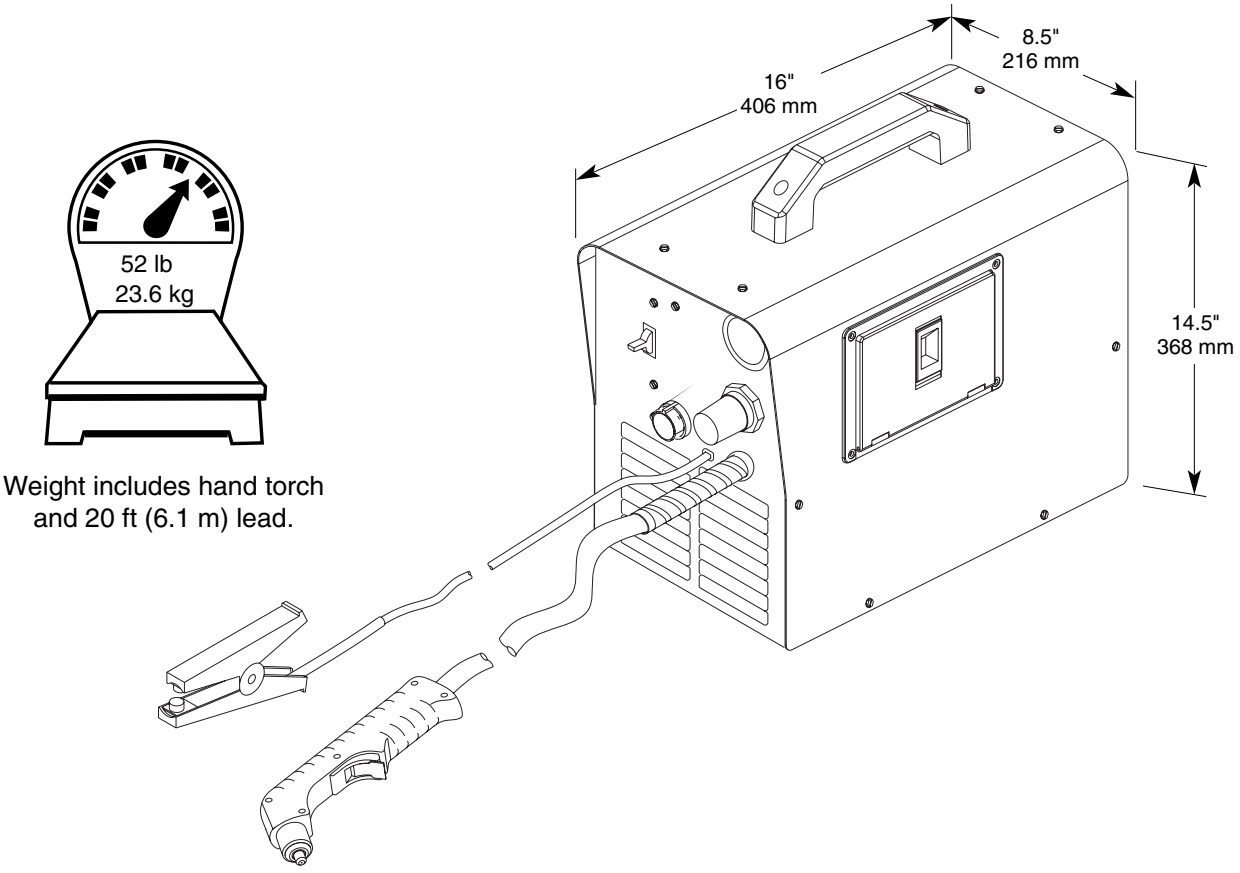
SPECIFICATIONS

In this section:

Specifications – Power Supply

Rated Open Circuit Voltage (U_0)	288 VDC	
Rated Output Current (I_2)	14 A – 27 A	
Rated Output Voltage (U_2)	91 VDC	
Duty Cycle at 40°C (See data plate on power supply for more information on duty cycle.)	35 % (I_2=27 A, U_2=91 V) 60 % (I_2=21 A, U_2=88 V) 100 % (I_2=17 A, U_2=87 V)	
Operating Temperature	-4° to 104° F (-20° to 40°C)	
Storage Temperature	-58° to 131° F (-50° to 55°C)	
Power Factor	0.975	
Rated Pilot Current	12 A	
Input Voltage (U_1)/ Input Current (I_1) at Rated Output ($U_{2\ MAX}$, $I_{2\ MAX}$)	115 V / 28 A 230 V / 14 A	
Gas Type	Air	Nitrogen
Gas Quality	Clean, dry, oil-free	99.995 % pure
Gas Inlet Pressure and Flow	See *Setup,* Section 3	

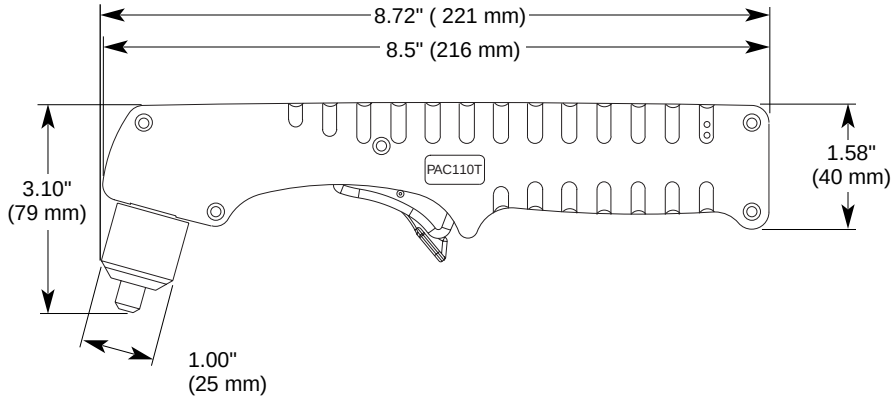
Powermax380 Power Supply Dimensions and Weight



Specifications – PAC110T Torches

Recommended Cutting Capacity	1/4 inch (6 mm) @ 27A (35 % duty cycle)
Maximum Cutting Capacity	3/8 inch (10 mm) @ 27A (35 % duty cycle)
Severance Cutting Capacity	1/2 inch (12 mm) @ 27A (35 % duty cycle)
Gas Flow	270 scfh/4.5 scfm @ 60 psi (127 l/min @ 4.2 bar)
Weight	3 pounds (1.4 kg)

PAC110T Torch Dimensions



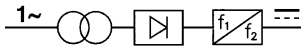
Symbols and Markings

S Mark

The S mark indicates that the power supply and torch are suitable for use in environments with increased hazard of electrical shock.

IEC Symbols Used

The following symbols may appear on the power supply data plate, control labels and switches.

	Direct Current (DC)		A chopper-based power source
	Alternating current (AC)		Plasma torch in the TEST position (cooling and cutting gas exiting nozzle)
	Plasma torch cutting	I	Power is ON
	AC input power connection	O	Power is OFF
	The terminal for the external protective (earth) conductor		Alternating current (AC)
	Light ON		Inlet gas pressure
	Light OFF		Consumables are loose or missing
	Light blinking		Power supply is over heated

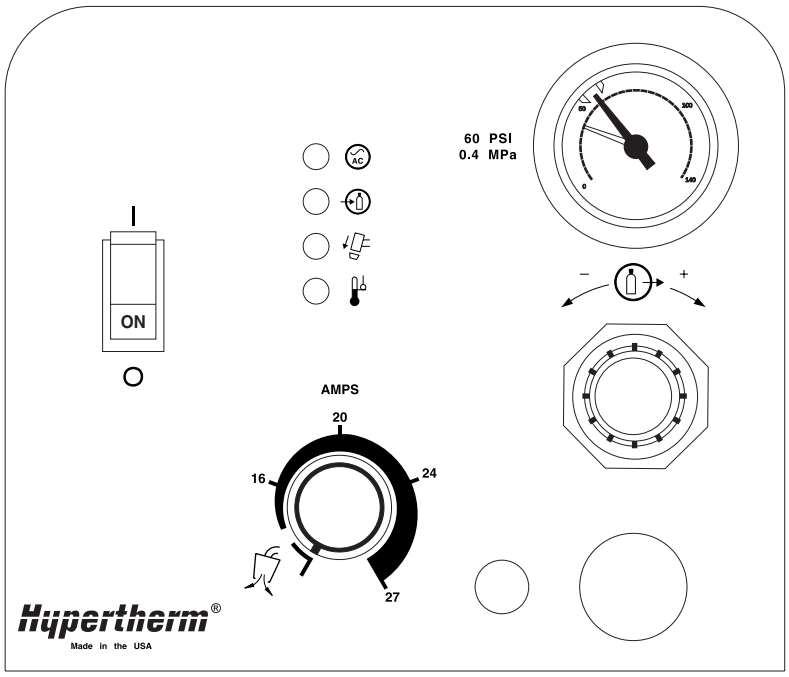
Hypertherm

Section 3

MAINTENANCE

In this section:

Controls and Indicators



Green POWER ON LED
When illuminated, indicates that the Power Switch has been set at I (On) and that the safety interlocks are satisfied.

Yellow GAS PRESSURE LED
When illuminated, indicates that the gas pressure is below 40 psi (2.8 bar).

Yellow TORCH CAP LED
When illuminated, indicates that the torch consumables are loose or not installed.

Yellow OVER-TEMP LED
When illuminated, indicates that the power supply has overheated.

AMPS-GAS TEST/SET Adjustment Knob
Adjusts output current between 14 and 27 amps. The position allows adjustment of the air pressure.

Pressure Regulator Adjustment Knob
Regulates input gas pressure to the power supply.

Pressure Gauge
Indicates gas pressure at the power supply.

ON (I)/OFF (0) Power Switch
Activates the power supply and its control circuits.

Theory of Operation

General

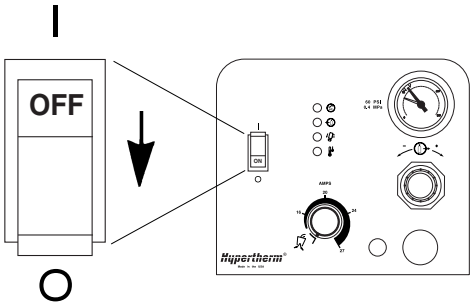
115/230 Volt unit

The 115/230 volt power supplies are shipped to operate at 115 volts. To operate at 230 volts, the input voltage selector switch must be set to the 230 volt position and a 230 volt plug must be installed on the power cord.

CAUTION

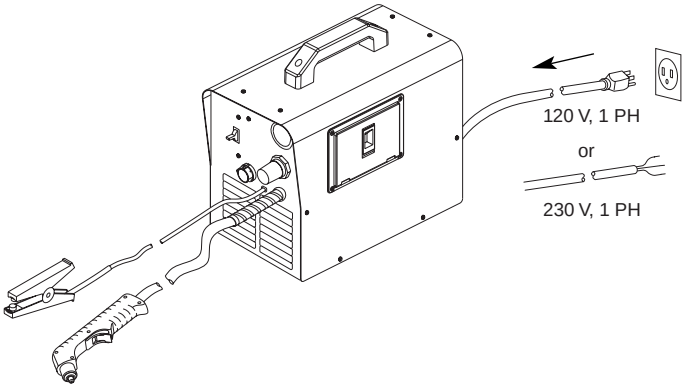
Do not reposition Voltage Selector Switch with power ON. Damage to the power supply will result.

①



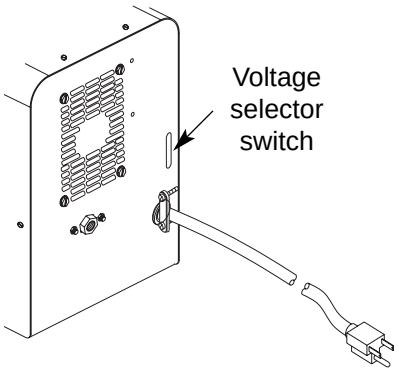
1. Turn power OFF

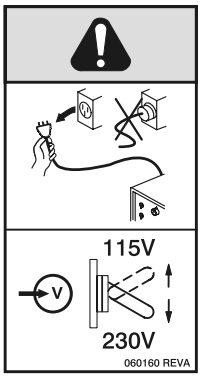
②



2. Remove power cord from power receptacle.

③



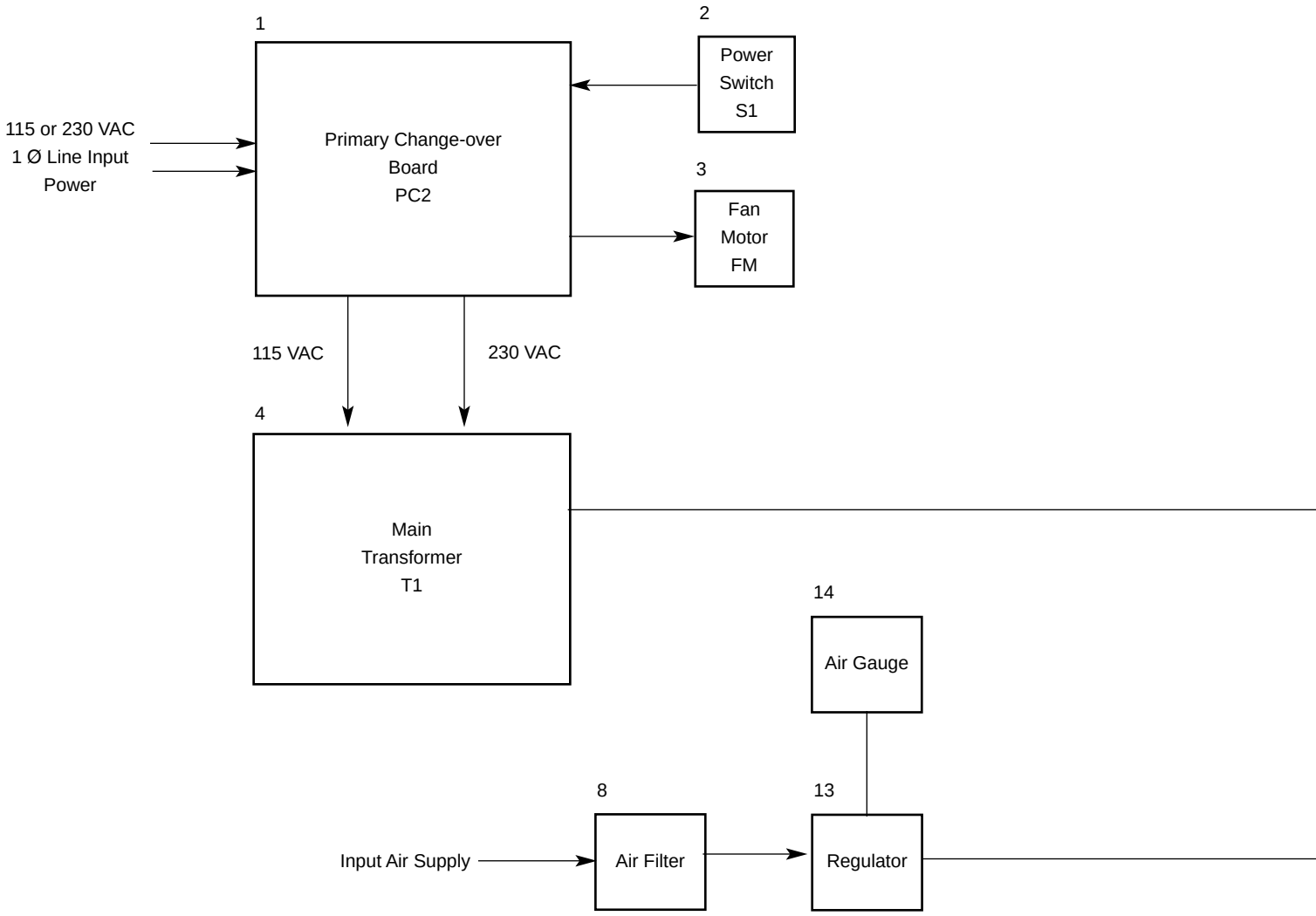


3. Set input voltage
- Determine correct switch position for the voltage required.
- Voltage selector switch is accessible through slot in rear panel.

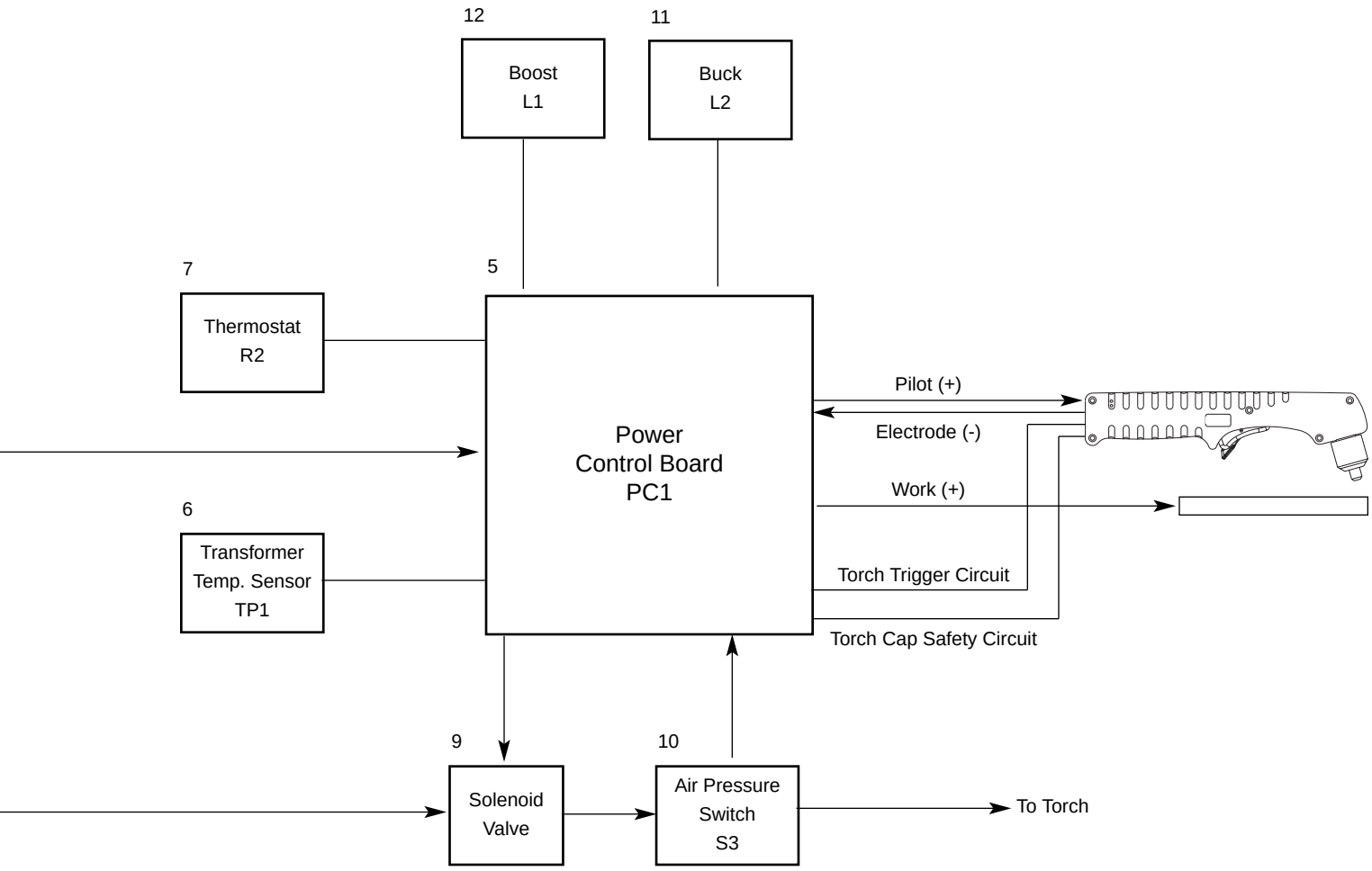
Functional Description

Refer to functional block diagram, sequence of operation and the system wiring diagram.

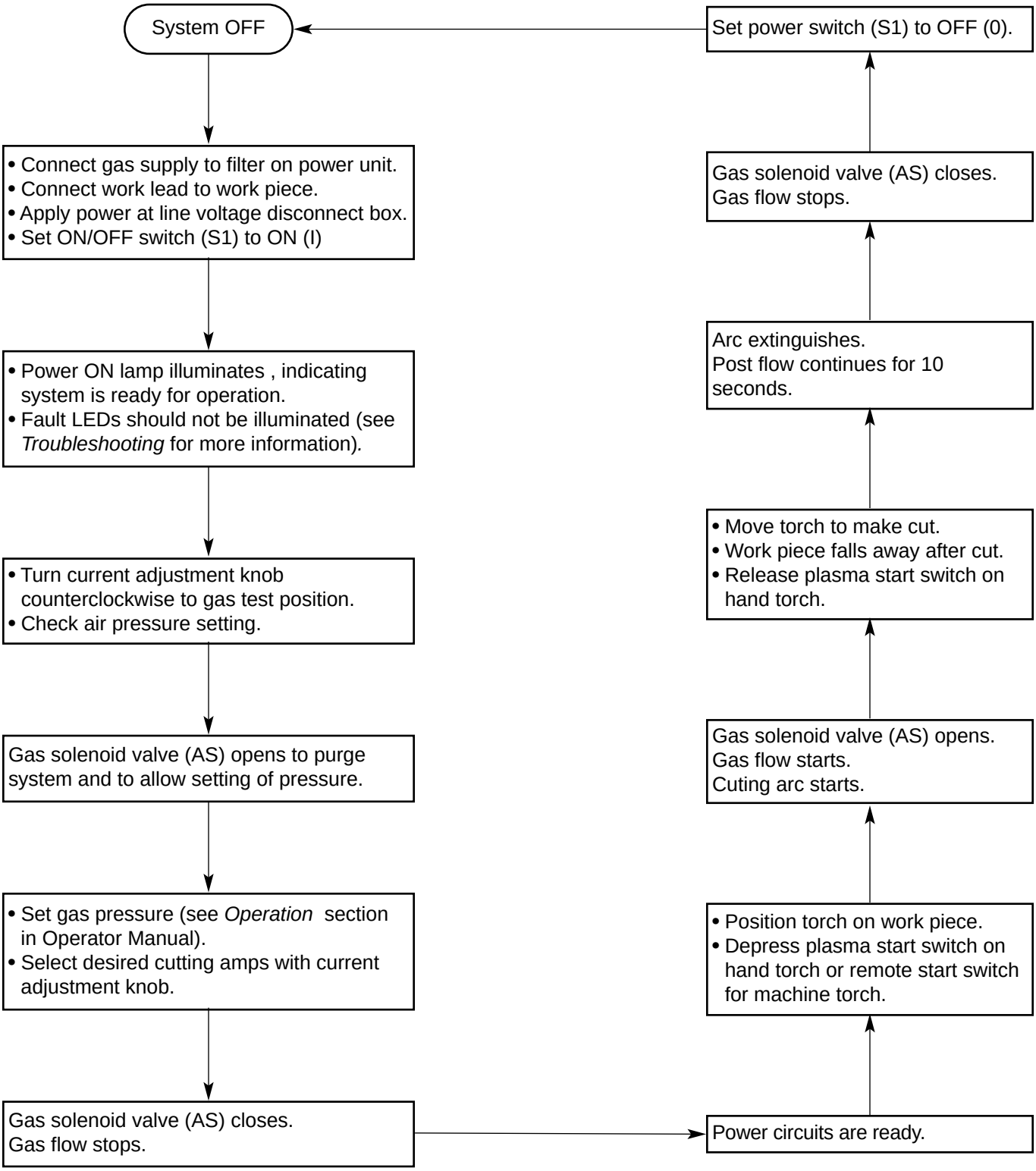
Functional Block Diagram



1. **Primary Change-over Board (PC2)**
2. **Power Switch (S1)**
   Provides ON/OFF control of power to main transformer.
3. **Fan Motor (FM)**
   Provides cooling of internal components.
4. **Main Transformer (T1)**
   Supplies power to output circuit and power control board PC1.
5. **Power Control Board (PC1)**
   Supplies and regulates cutting current to torch. Also provides some timing and control functions.
6. **Transformer Temperature Sensor (TP1)**
   If unit overheats, TP1 opens and stops cutting output.
7. **Thermostat (R2)**
   Temperature switch for the power control board. Switch is mounted on the heatsink.
8. **Air Filter**
   Filters input air supply.
9. **Solenoid Valve**
   Allows airflow for pilot arc, cutting, and postflow.
10. **Air Pressure Switch (S3)**
    Provides a signal to power control board (PC1) to shut down unit if air pressure is too low.
11. **Buck Invertor**
12. **Boost Invertor**
13. **Air Regulator**
    Regulates pressure of input air supply.
14. **Air Gauge**


12
Boost
L1
11
Buck
L2
7
Thermostat
R2
5
Power
Control Board
PC1
Pilot (+)
Electrode (-)
Work (+)
6
Transformer
Temp. Sensor
TP1
Torch Trigger Circuit
Torch Cap Safety Circuit
9
Solenoid
Valve
10
Air Pressure
Switch
S3
To Torch

Sequence of Operation



TROUBLESHOOTING

The complexity of the circuits require that service technicians have a working knowledge of inverter power supply theory. In addition to being technically qualified, technicians must perform all testing with safety in mind.

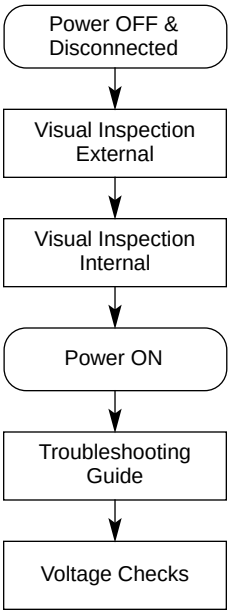
If questions or problems arise during servicing, call the Hypertherm Technical Services Department at the phone numbers listed in the front of this manual.

Test Equipment

- Multimeter

Troubleshooting Procedures and Sequence

- Refer to the system wiring diagram when performing the troubleshooting procedures.
- To locate power supply components refer to Section 4. Refer to Section 5 for torch components.
- After the problem has been located and repaired, refer to the *Sequence of Operation* flow diagram in this section to test the power supply for proper operation.



Visual Inspection – External

1. Inspect the outside of the power supply for damage to the cover and external components.
2. Inspect the torch and the torch lead for damage.

WARNING


ELECTRIC SHOCK CAN KILL

- **Turn off the power and remove the input power plug from its receptacle before removing the cover from the power supply. If the power supply is directly connected to a line disconnect box, switch the line disconnect to OFF (O). In the U.S., use a "lock-out / tag-out" procedure until the service or maintenance work is complete. In other countries, follow appropriate national or local safety procedures.**
- **Do not touch live electrical parts! If power is required for servicing, use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the power supply that can cause serious injury or death.**
- **Do not attempt to repair the power board or control board. Do not cut away or remove any protective conformal coating from either board. To do so will risk a short circuit between the AC input circuit and the output circuit and may result serious injury or death.**

HOT PARTS CAN CAUSE SEVERE BURNS

- **Allow the power supply to cool before servicing.**

MOVING FAN CAN CAUSE INJURY

- **Keep hands away from moving parts.**

STATIC ELECTRICITY CAN DAMAGE CIRCUIT BOARDS

- **Put on a grounded wrist strap BEFORE handling PC boards.**

Visual Inspection – Internal

1. Set the power switch to O (off), unplug the power cord, and disconnect the gas supply.

2. Remove the cover of the power supply by removing the securing screws.

3. Inspect the inside of the power supply, especially on the side with the power board. Look for broken or loose wiring connections, burn and char marks, damaged components, etc. Repair or replace as necessary.

WARNING

ELECTRIC SHOCK CAN KILL

- **Use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the power supply that can cause serious injury or death.**
- **See warnings on page 3-8 before proceeding.**

If no problems were found during the initial resistance checks and the power supply still does not operate correctly, follow the *Troubleshooting Guide.*

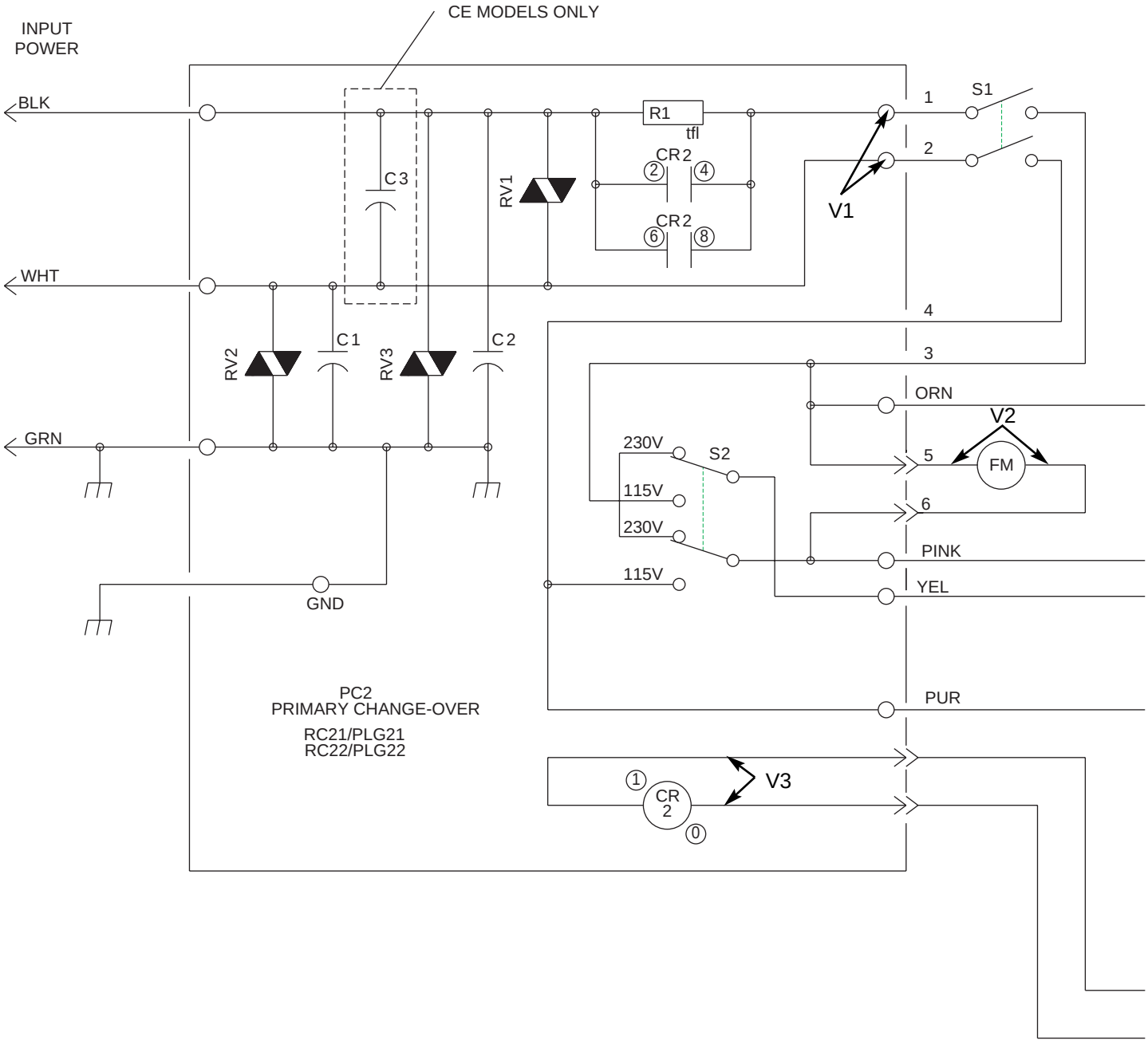
Note: The *Troubleshooting Guide* provides most probable cause and solutions. Study the system wiring diagram and understand the theory of operation before troubleshooting. Before purchasing a major replacement component, verify the problem with Hypertherm Technical Service or the nearest Hypertherm repair facility.

Problem	This May Mean	Cause	Solution
Turn power switch ON and Green Power ON LED does not illuminate	Insufficient voltage to control circuits or shorted power component	No voltage or improper voltage applied to unit	Verify incoming voltage is either 115 or 230 VAC and that the voltage selector switch (S2) is set to match the incoming voltage.
		Defective power switch (S1)	Measure AC voltage at bottom terminals of switch. If no voltage, replace switch.
		Defective transformer (T1)	Check transformer (T1) for signs of winding failure. Check continuity across windings and check connections. Check secondary voltages. Replace if necessary.
Green Power ON LED illuminates and air flows from torch (torch trigger/start switch not pressed)	System is in gas test mode	Current adjustment knob is in gas test position	Turn knob clockwise until above the 14 amp setting.
	Solenoid valve (AS) stuck open	Faulty valve	Disconnect RC6 from power board. If air flow continues, replace valve (AS).
	Defective power board (PC1)	Constant voltage supplied to valve	Disconnect RC6 from power board. If air flow stops, replace power board (PC1).
Yellow Gas Pressure LED illuminates	Insufficient air pressure	No air supplied to unit	Connect air supply.
		Air pressure below operating requirement	60 psi (4.2 bar) is required for system operation. Check that the inlet gas pressure is within 90-120 psi (6.2-8.3 bar).
		Faulty air pressure switch. 39 psi (2.5 bar) is required to activate the pressure switch	If supply pressure is above 39 psi (2.5 bar), check continuity on RC6, pins 1 and 2 on power board (PC1). If open continuity, replace switch.
		Dirty air filter element	Replace air filter element.
Yellow Torch Cap LED illuminates	Safety circuit not satisfied	Consumables not installed, installed improperly, or damaged	Refer to consumable diagram for proper installation. Try new consumables.
		Damage to safety circuit	Install consumables and check continuity on RC1, pins 1 and 2 blue wires on power board (PC1). If open circuit, inspect torch and lead assembly.
Yellow Temp LED illuminates	Temperature sensors not satisfied	Exceeded duty cycle	Allow unit to cool. Stay within duty cycle limits in manual.
		Fan not operating or improperly operating	Disconnect RC2 on primary change-over board (PC2) and jump pins 1 and 2. Fan should operate.
		Defective heatsink temperature switch R2 (check when system is cool, at least 15 min after use)	Check temperature switch R2 by checking resistance of RC2 pins 1 and 2 on primary change-over board (PC2). If less than 5k ohms, replace switch R2.
		Defective power transformer temperature sensor (TP1) (check when system is cool, at least 15 min after use)	Check temperature sensor (TP1) by checking resistance on RC4 pins 1 and 3 on power board (PC1). If greater than 1.5k ohms, replace power transformer (T1).

Problem	This May Mean	Cause	Solution
Green Power ON LED illuminates, all fault LEDs extinguished, but no air flow or firing of torch when torch switch is pressed	Start signal not being received by power supply	Damage to torch and lead assembly	Check RC1 pins 3 and 4 violet wires on power board (PC1) for continuity when torch trigger is depressed. If open circuit, inspect torch and lead assembly.
	Solenoid valve not working	Valve stuck or no voltage to valve	Check voltage at valve. Remove connector RC6 from valve, turn current adjust knob to test flow and check for 24 VDC at connector RC6 pins 1 and 2. If no voltage, replace power board. If voltage, clear air lines or replace valve.
	Damaged torch or lead assembly	Torch plunger stuck open or broken torch leads	Inspect torch and lead assembly.
When pressing torch trigger/start switch, air flows from torch, but no arc	Worn or bad consumables	Overuse or improperly installed consumables	Replace consumables.
	Insufficient air flow	Improper pressure setting	Turn current adjustment knob to test flow and set pressure regulator 60 psi (4.2 bar).
	No output from power board (PC1)	Power board failure, or damaged torch or lead assembly	Inspect torch and lead assembly. If damaged replace torch and lead assembly. If it is not damaged replace power board (PC1).
When pressing torch trigger/start switch, pilot arc starts but goes out within 5 seconds	Worn consumables	Worn-out consumables	Replace consumables
	Improper air pressure setting or low flow	Insufficient supply or air leak on supply line	Turn current adjust knob to test flow and set pressure regulator to 60 psi (4.2 bar). If unable to adjust to proper setting, check external air supply.
	Poor quality air	Moisture or contaminates in air supply	Add appropriate filtration and purge lines with nitrogen to flush out oil and moisture.
	Insufficient input power	Undersized electrical supply installation: - Breaker/fuse - Supply wire - Extension cord	Verify external electrical power is installed per specifications in section 2. Check input voltage while trying to fire torch. Voltage drop indicates undersized electrical supply installation.
Machine will not cut material (does not appear to be operating at full cutting power)	Inadequate ground	Poor work lead connection	Verify work lead is attached to workpiece and workpiece is free of rust, paint, etc.
		Damaged work lead	Check continuity of work lead. Replace or repair as required.
	Low output from power supply	Current adjustment set too low	Verify current adjust knob is at proper setting (turn to max, full clockwise).
		Defective power board current sensor	Replace power board. Can confirm power output by measuring with a DC current clamp meter on work lead.

WARNING
ELECTRIC SHOCK CAN KILL

Disconnect electrical power before performing any maintenance. All work requiring removal of the power supply cover must be performed by a qualified technician.



Resitance Values

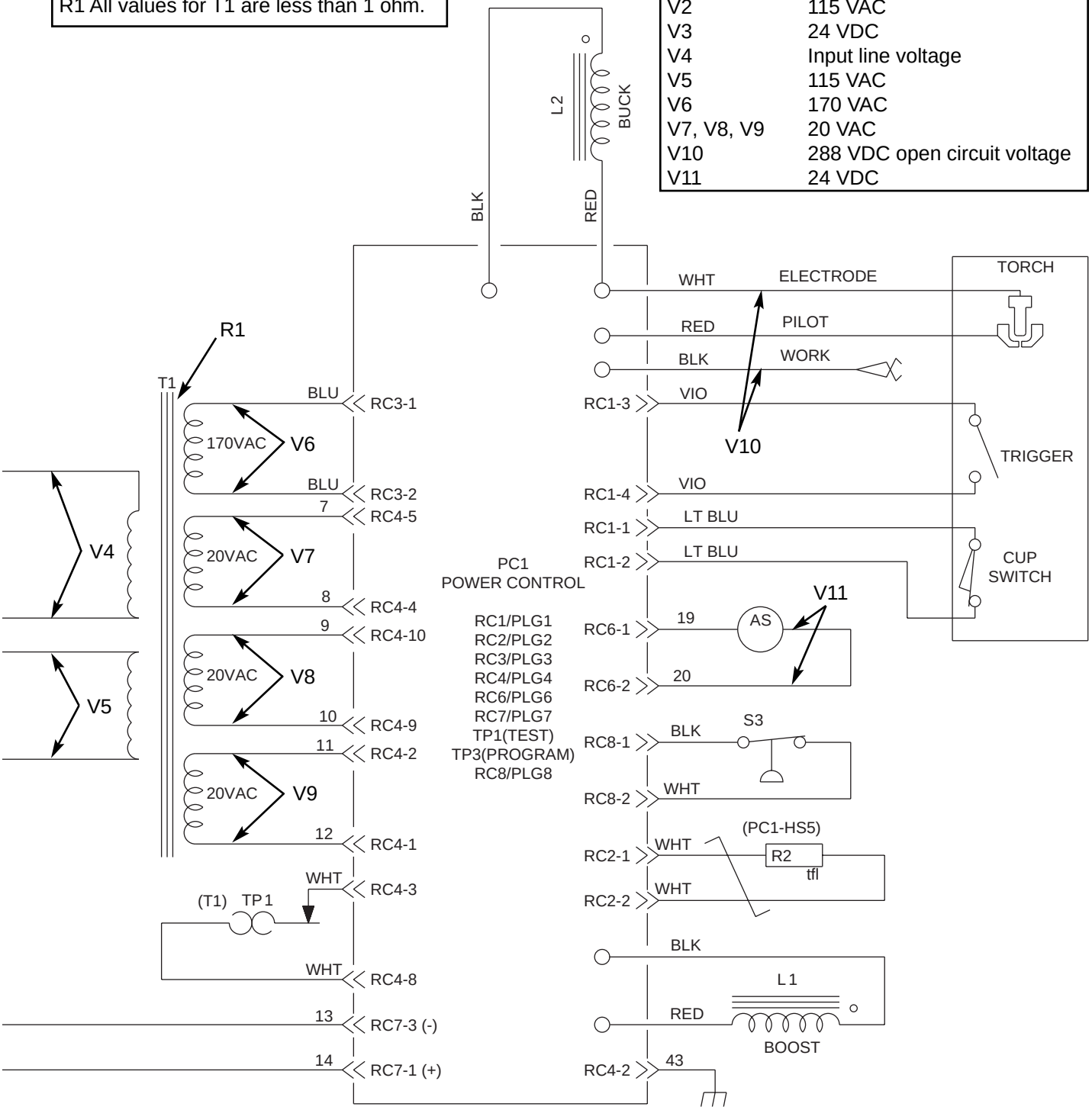
a) Tolerance ± 10% unless specified.
b) Turn OFF (0) and remove input power plug from receptacle before checking resistance.

R1 All values for T1 are less than 1 ohm.

Voltage Readings

a) Tolerance ± 10% unless specified.
b) Reference - to circuit common, lead 43 unless noted.

V1	Input line voltage
V2	115 VAC
V3	24 VDC
V4	Input line voltage
V5	115 VAC
V6	170 VAC
V7, V8, V9	20 VAC
V10	288 VDC open circuit voltage
V11	24 VDC



Component Replacement

WARNING

ELECTRIC SHOCK CAN KILL

- **Use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the power supply that can cause serious injury or death.**
- **See warnings on page 3-8 before proceeding.**

Power Cord Replacement

Disconnect electrical power and gas supply before removing the old power cord.

Installation

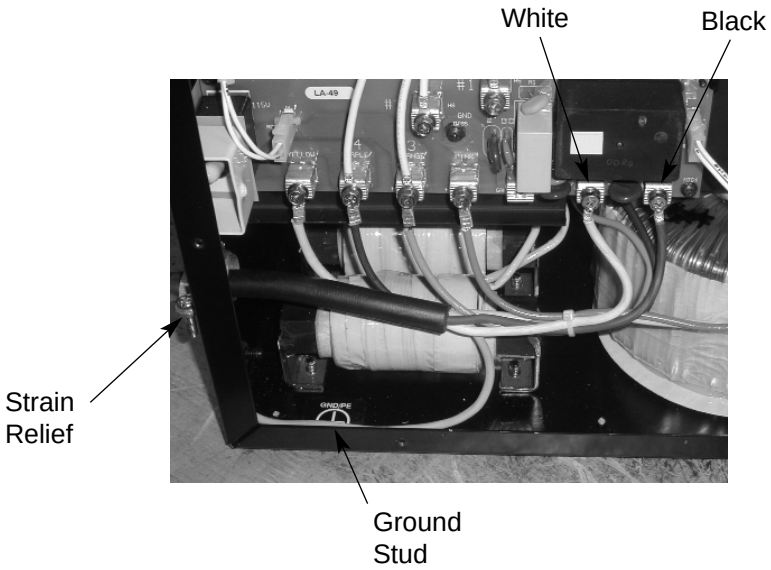
① Insert the new power cord through the strain relief.

② Connect electrical connections to primary change-over board (PC2).
- Black wire to Black.
- White wire to White.
- Green wire to chassis ground stud.

Note: Tighten screws to 10 in-lb (12 kg cm) of torque.

③ Tighten strain relief.

CAUTION: These are high current connections. Proper torque is critical.



Torch Lead Replacement

Disconnect electrical power and gas supply before removing the old torch lead.

Installation

> **CAUTION: Do not tighten the strain relief collar onto the torch lead until the gas fitting is tight, or the gas connection may leak.**

① Push the gas hose fully into the hose fitting.

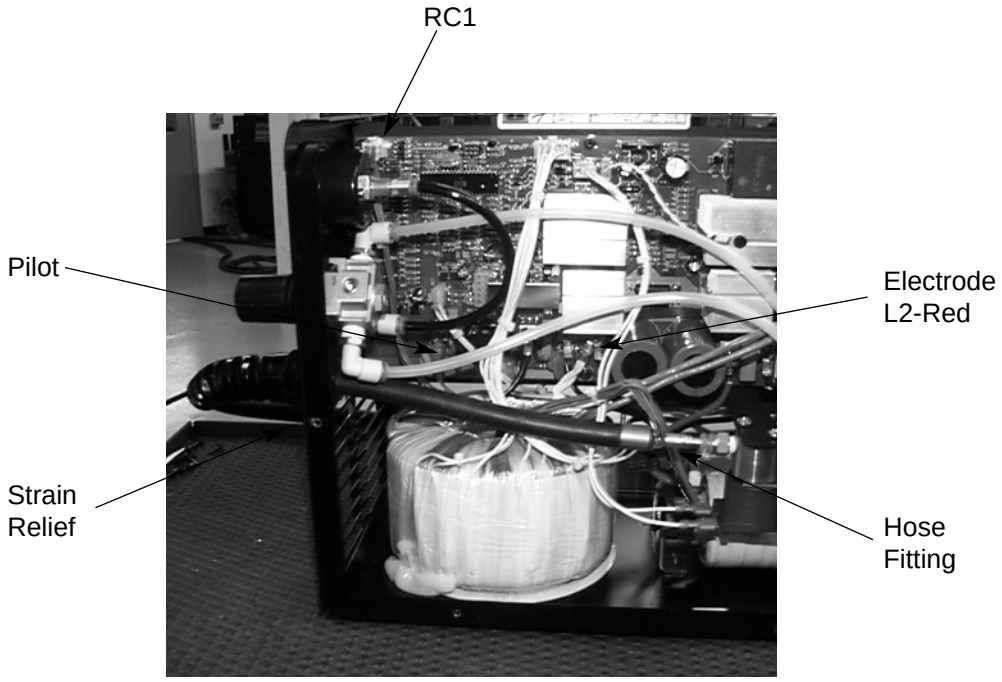
② Tighten the strain relief on to the lead.

③ Connect electrical connections to power board (PC1).
- Purple and Blue wires to RC1.
- Red wires to Pilot.
- White wires to Electrode/L2-red.

Note: Tighten screws to 10 in-lb (12 kg cm) of torque.

④ Install the power supply cover.

> **CAUTION: These are high current connections. Proper torque is critical.**



Air Filter Element Replacement

Removal

- Disconnect electrical power.
- Disconnect gas supply.
- Remove the power supply cover.

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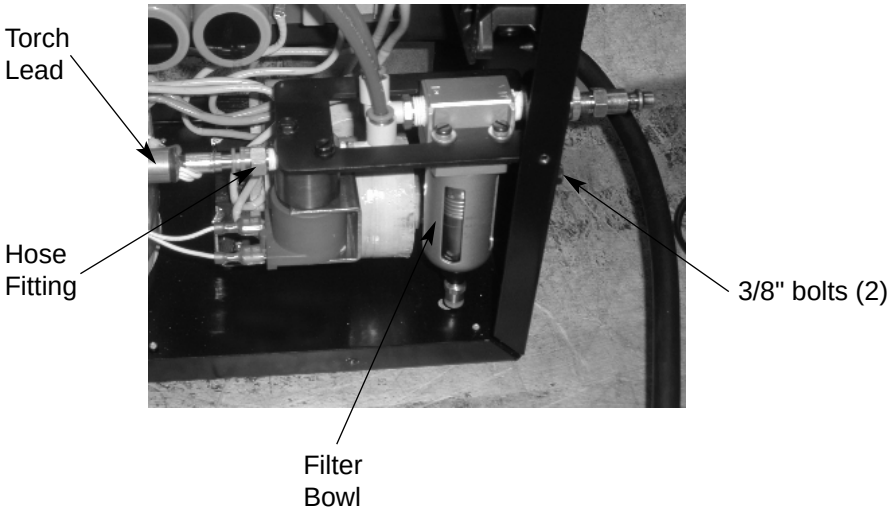
① Compress the hose fitting collar and pull the torch lead gas hose from the hose fitting.

② Remove 3/8" bolts (2) that secure gas manifold bracket to chassis and remove sub-assembly.

③ Unscrew the filter bowl.
Discard the o-ring.
Inspect o-ring. If damaged replace o-ring (060203).

④ Remove the filter element from the filter housing.

NOTE: Do not allow the filter element to turn when loosening the screw.



Air Filter Element Replacement (continued)

Installation

① Install the new filter element (060197) into the filter housing.
Secure with screw and retainer.

② Install the filter bowl and new o-ring (060203) into the filter housing.

③ Secure sub-assembly to chassis using 3/8" bolts.

④ Push the gas hose fully into the hose fitting.

- Install the power supply cover.
- Connect electrical power.
- Connect gas supply.

Work Cable Replacement

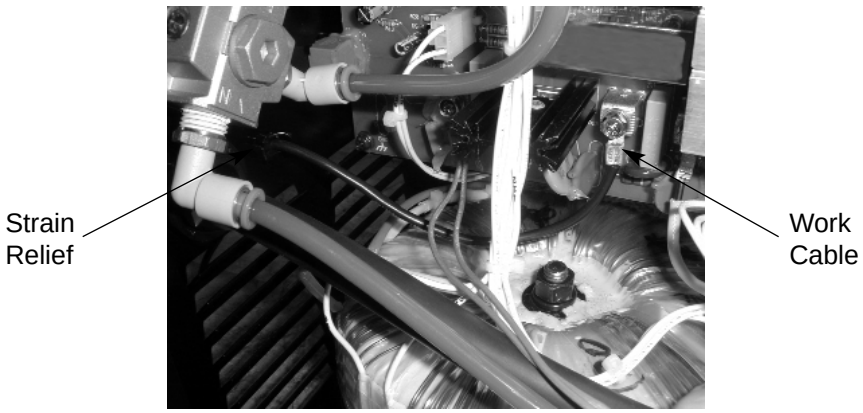
Disconnect electrical power and gas supply before removing the old work cable.

Installation

① Connect the work cable to Work on power board (PC2).
Tighten screw to 10 in-lb (12 kg cm) of torque.

② Secure strain relief to chassis.

CAUTION:	**This is a high current connection. Proper torque is critical.**



Work Cable Replacement

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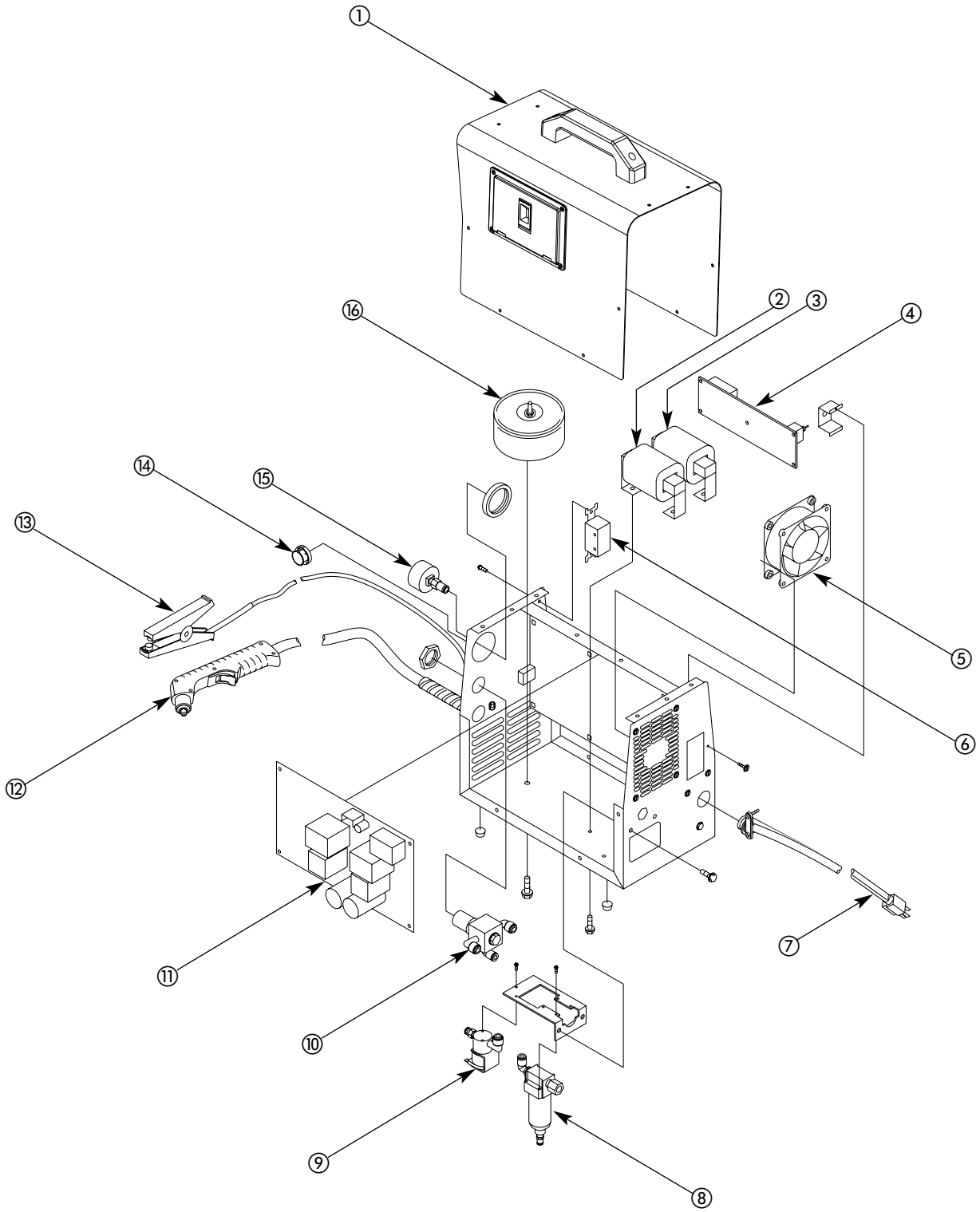
Section 4

PARTS

In this section:

Power Supply

Item	Part Number	Description	Designator	Qty.
1	060207	Cover with handle, lables, and storage box – Domestic		1
1	060206	Cover with handle, lables, and storage box – CE		1
	060204	Labels – Domestic		1
	060212	Labels – CE		1
2	060175	Inductor, Buck	L2	1
3	060174	Inductor, Boost	L1	1
4	060191	Primary Change-over Board – Domestic	PC2	1
4	060214	Primary Change-over Board – CE	PC2	1
5	060006	Fan	FM	1
6	060185	ON/OFF Switch	S1	1
7	060177	Power Cable – Domestic		1
7	060213	Power Cable – CE		1
8	060205	Air Filter		1
	060197	Air Filter Element and O-ring		1
9	060211	Air Valve	AS	1
	060187	Lead Assembly, Air Valve		1
10	060170	Air Regulator		1
11	060190	Power/Control Board – Domestic	PC1	1
11	060201	Power/Control Board – CE	PC1	1
12	070071	PAC110T Hand Torch and Lead Assembly		1
13	060169	Work Cable		1
14	060179	Current Adjustment Knob		1
15	060171	Pressure Gauge		1
16	060176	Transformer – Domestic	T1	1
16	060199	Transformer – CE	T1	1
	060172	Thermistor	R2	1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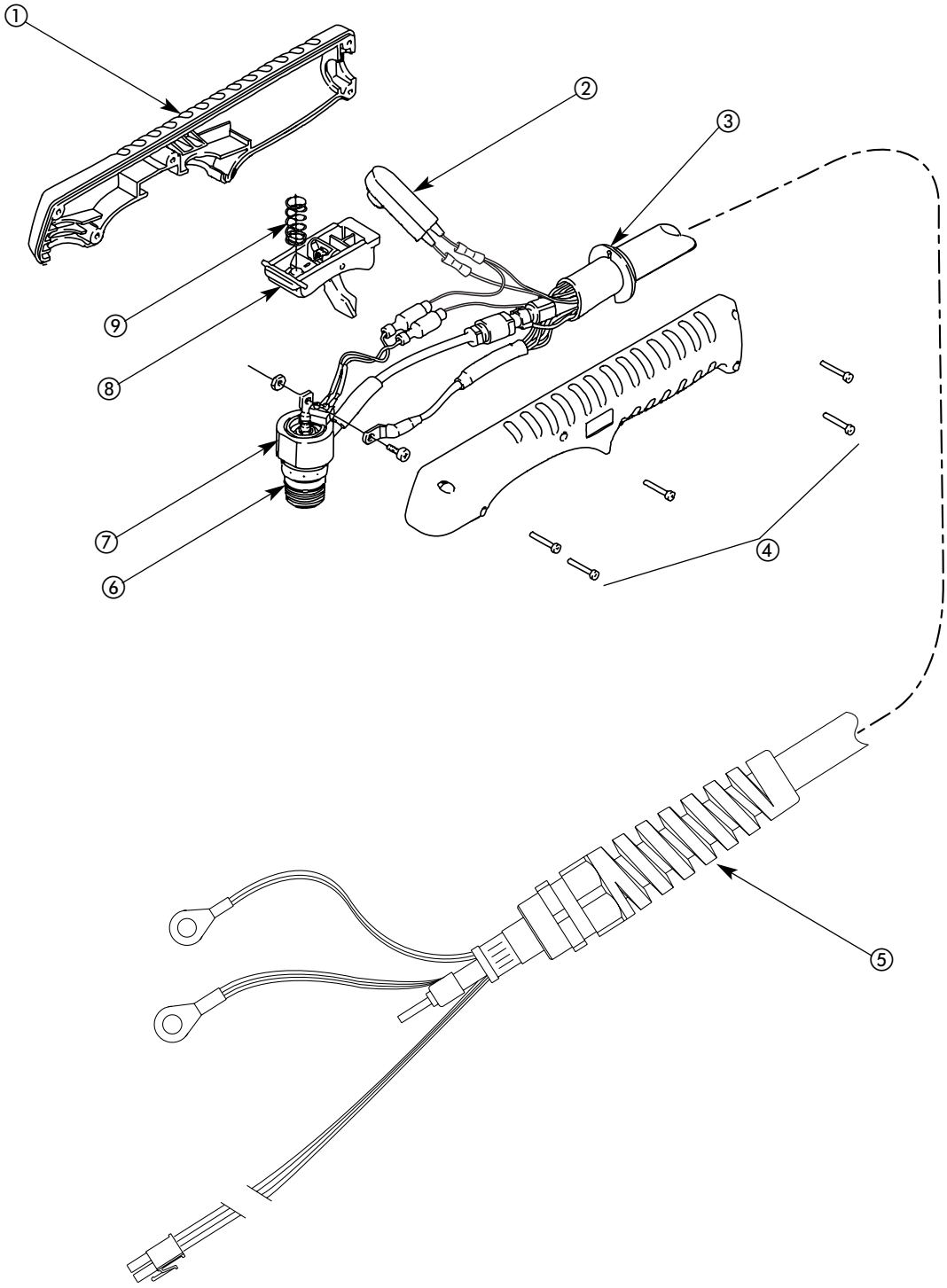
PAC110T Hand Torch Assembly

Item	Part Number	Description	Quantity
	070071*	PAC110T Hand Torch Assembly with 20 ft (6.1 m) Lead	
1	001288	Handle, 2 Sides	1
2	128377	Replacement Start Switch (switch and wire splices)	1
3	004764	Gutcha Retaining Ring	1
4	075339	Screws, P/S, # 4 X 1/2, PH, RND, S/B	5
5	128554	Replacement 20 ft (6.1 m) Torch Lead	1
6	058503	O-Ring: Viton .625 X .070	1
7	120976	Torch Main Body with Safety Switch	1
8	002244	Safety Trigger	1
9	027254	Trigger Spring	1

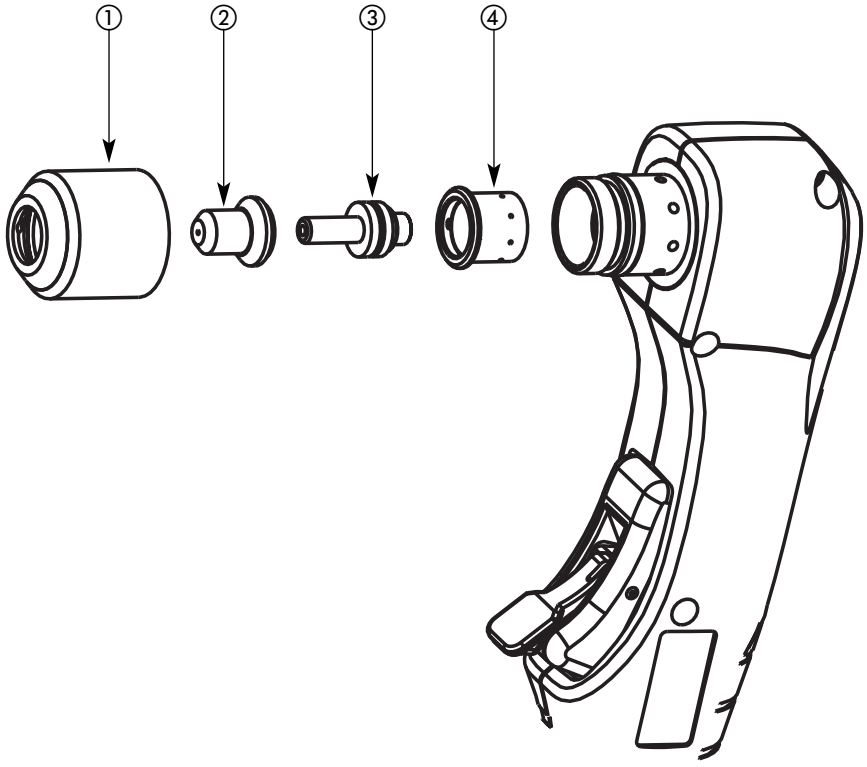
* Top assembly includes the following consumables (See page 4-6 for details of consumable parts):

	020382	Electrode	1
	220013	Swirl Ring	1
	220016	Retaining Cap	1
	120504	Nozzle	1


1
2
3
9
8
7
6
4
5

PAC110T Hand Torch Assembly

Item	Part Number	Description	Quantity
1	220016	Retaining Cap	
2	120504	Nozzle	1
3	020382	Electrode	1
4	220013	Swirl Ring	1



Recommended Spare Parts – Power Supply

Part Number	Description
060207	Cover with handle, lables, and storage box – Domestic
060206	Cover with handle, lables, and storage box – CE
060204	Labels – Domestic
060212	Labels – CE
060175	Inductor, Buck
060174	Inductor, Boost
060191	Primary Power Board – Domestic
060214	Primary Power Board – CE
060006	Fan
060177	Power Cable – Domestic
060213	Power Cable – CE
060205	Air Filter
060197	Air Filter Element and O-ring
060211	Air Valve
060187	Lead Assembly, Air Valve
060170	Air Regulator
060190	Power/Control Board – Domestic
060201	Power/Control Board – CE
070071	PAC110T Hand Torch and Lead Assembly
060169	Work Cable
060179	Current Adjustment Knob
060171	Pressure Gauge
060185	ON/OFF Switch
060176	Transformer – Domestic
060199	Transformer – CE

Recommended Spare Parts – PAC110T torch

Part Number.....Description

001288 .....Handle, 2 Sides
002244 .....Safety Trigger
128377 .....Replacement Start Switch (switch and wire splices)
027254 .....Trigger Spring
004764 .....Gutcha Retaining Ring
075339 .....Screws, P/S, # 4 X 1/2, PH, RND, S/B
120976 .....Torch Main Body with Safety Switch
058503 .....O-Ring: Viton .625 X .070
128554 .....Replacement 20 ft (6.1 m) Torch Lead
129601 .....Replacement Hand Torch Lead, 50 ft / 15 m (with Quick Disconnect)

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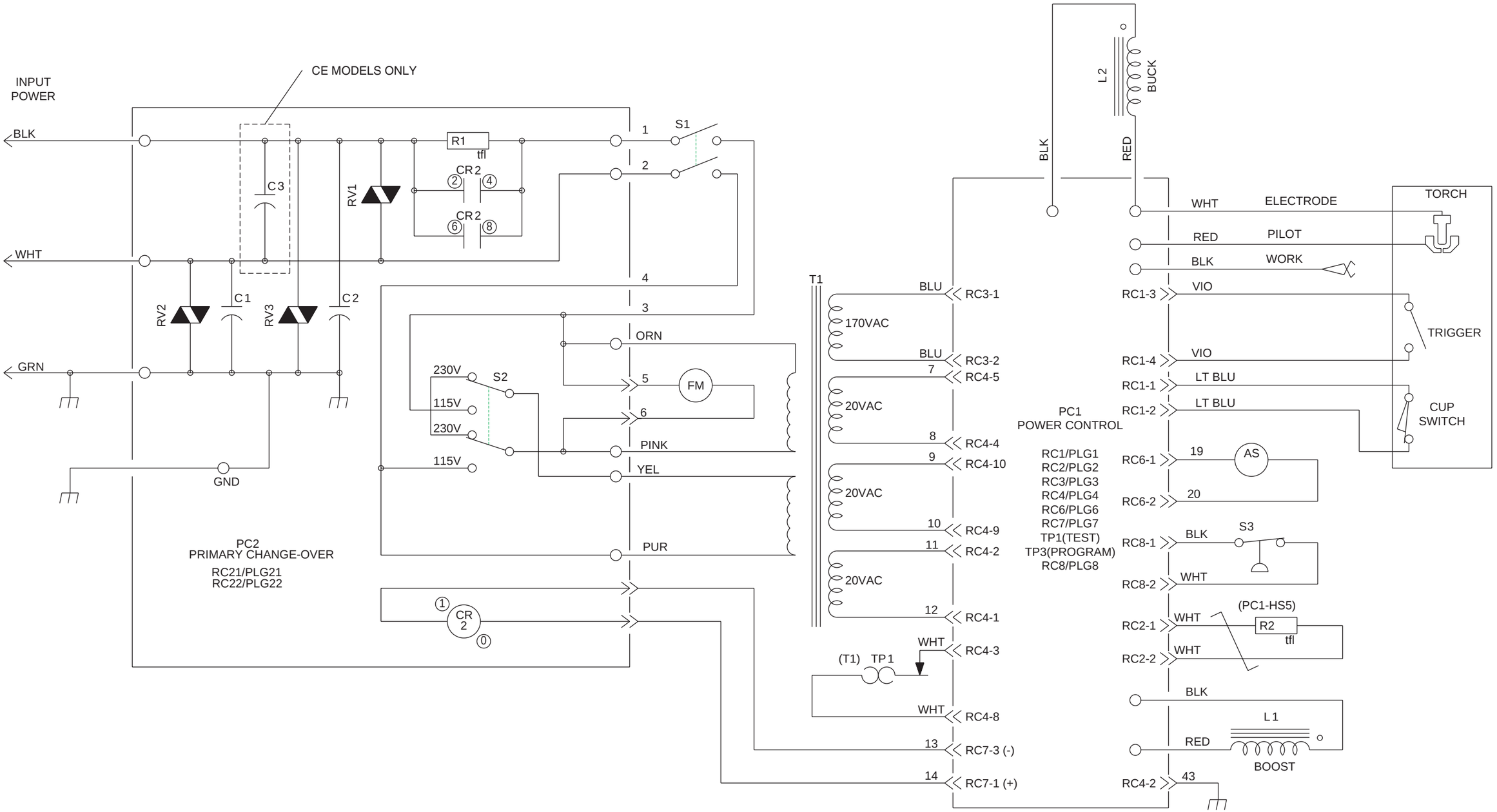
Section 5

WIRING DIAGRAMS

In this section:


INPUT
POWER
CE MODELS ONLY
BLK
WHT
GRN
GND
C3
C1
C2
RV1
RV2
RV3
R1
tfl
CR2
S1
1
2
3
4
ORN
PINK
YEL
PUR
230V
115V
S2
FM
5
6
CR
2
PC2
PRIMARY CHANGE-OVER
RC21/PLG21
RC22/PLG22
T1
170VAC
20VAC
BLU
RC3-1
RC3-2
7
RC4-5
8
RC4-4
9
RC4-10
10
RC4-9
11
RC4-2
12
RC4-1
WHT
RC4-3
(T1)
TP1
RC4-8
13
RC7-3 (-)
14
RC7-1 (+)
L2
BUCK
BLK
RED
TORCH
WHT
ELECTRODE
RED
PILOT
BLK
WORK
RC1-3
VIO
TRIGGER
RC1-4
VIO
RC1-1
LT BLU
RC1-2
LT BLU
CUP
SWITCH
PC1
POWER CONTROL
RC1/PLG1
RC2/PLG2
RC3/PLG3
RC4/PLG4
RC6/PLG6
RC7/PLG7
TP1(TEST)
TP3(PROGRAM)
RC8/PLG8
RC6-1
19
AS
RC6-2
20
RC8-1
BLK
S3
RC8-2
WHT
(PC1-HS5)
RC2-1
WHT
R2
tfl
RC2-2
WHT
BLK
L1
RED
BOOST
RC4-2
43