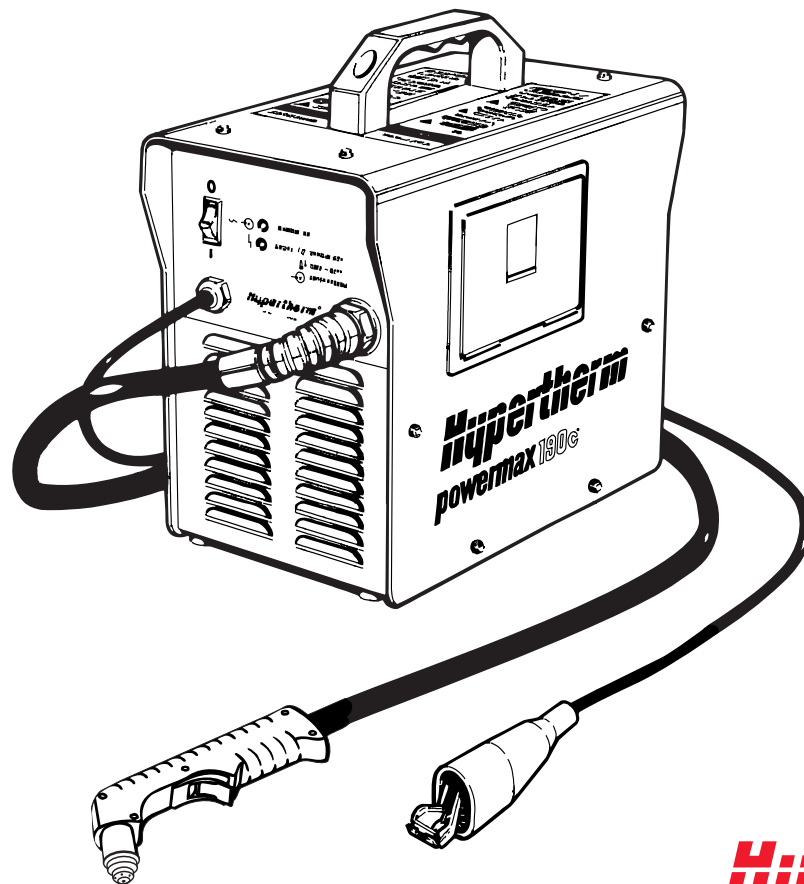


powermax190c[®]

Plasma Arc Cutting System

***Service Manual
803660 Revision 4***



Hypertherm[®]
*The world leader in
plasma cutting technology™*

powermax190c

Service Manual

(P/N 803660)

Revision 4 – June, 2005

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Hanover, NH USA**

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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.

WARRANTY

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 Powermax 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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Section 1

SAFETY

In this section:

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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.

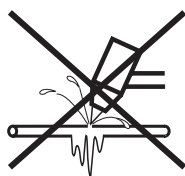
**PACEMAKER AND HEARING AID OPERATION**

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**

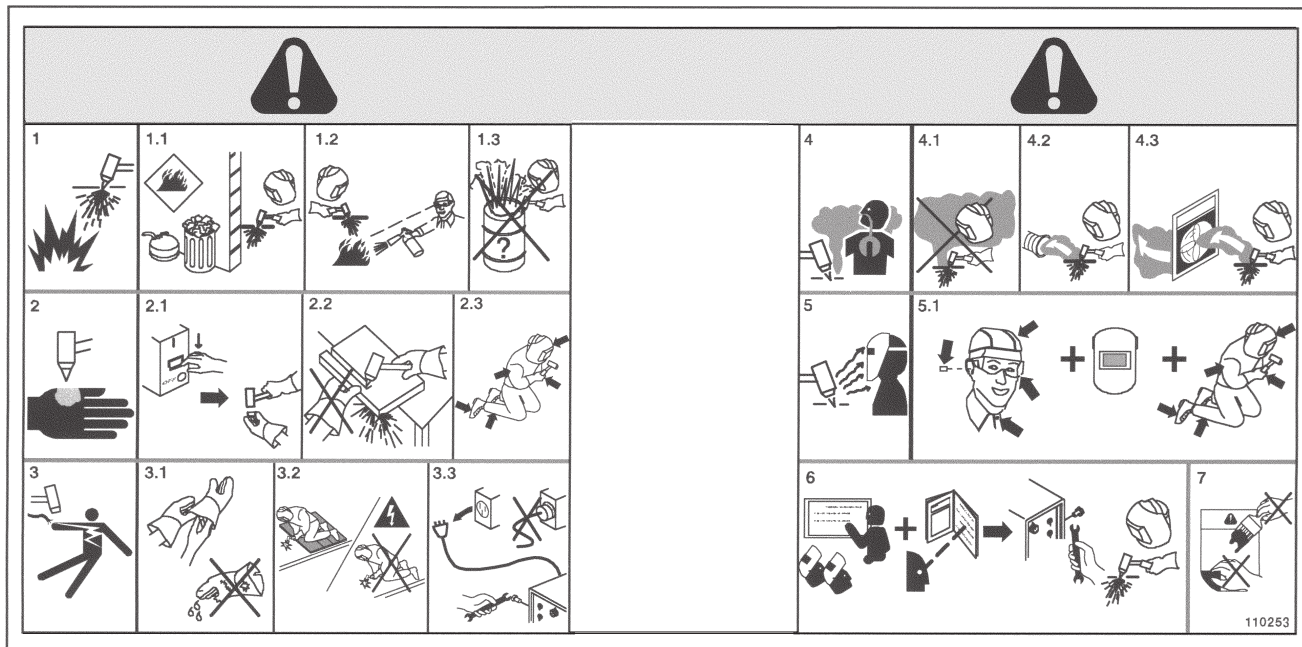
Frozen pipes may be damaged or can burst if you attempt to thaw them with a plasma torch.

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

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.



- | | |
|--|--|
| <p>1. Cutting sparks can cause explosion or fire.</p> <p>1.1 Keep flammables away from cutting.</p> <p>1.2 Keep a fire extinguisher nearby, and have a watchperson ready to use it.</p> <p>1.3 Do not cut on any closed containers.</p> <p>2. The plasma arc can cause injury and burns.</p> <p>2.1 Turn off power before disassembling torch.</p> <p>2.2 Do not hold the material near cutting path.</p> <p>2.3 Wear complete body protection.</p> <p>3. Electric shock from torch or wiring can kill. Protect yourself from electric shock.</p> <p>3.1 Wear insulating gloves. Do not wear wet or damaged gloves.</p> <p>3.2 Insulate yourself from work and ground.</p> | <p>3.3 Disconnect input plug or power before working on machine.</p> <p>4. Breathing cutting fumes can be hazardous to your health.</p> <p>4.1 Keep your head out of the fumes.</p> <p>4.2 Use forced ventilation or local exhaust to remove the fumes.</p> <p>4.3 Use ventilating fan to remove the fumes.</p> <p>5. Arc rays can burn eyes and injure skin.</p> <p>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.</p> <p>6. Become trained and read the instructions before working on the machine or cutting.</p> <p>7. Do not remove or paint over (cover) warning labels.</p> |
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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.

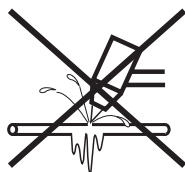


PACEMAKERS ET PROTHÈSES AUDITIVES

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.

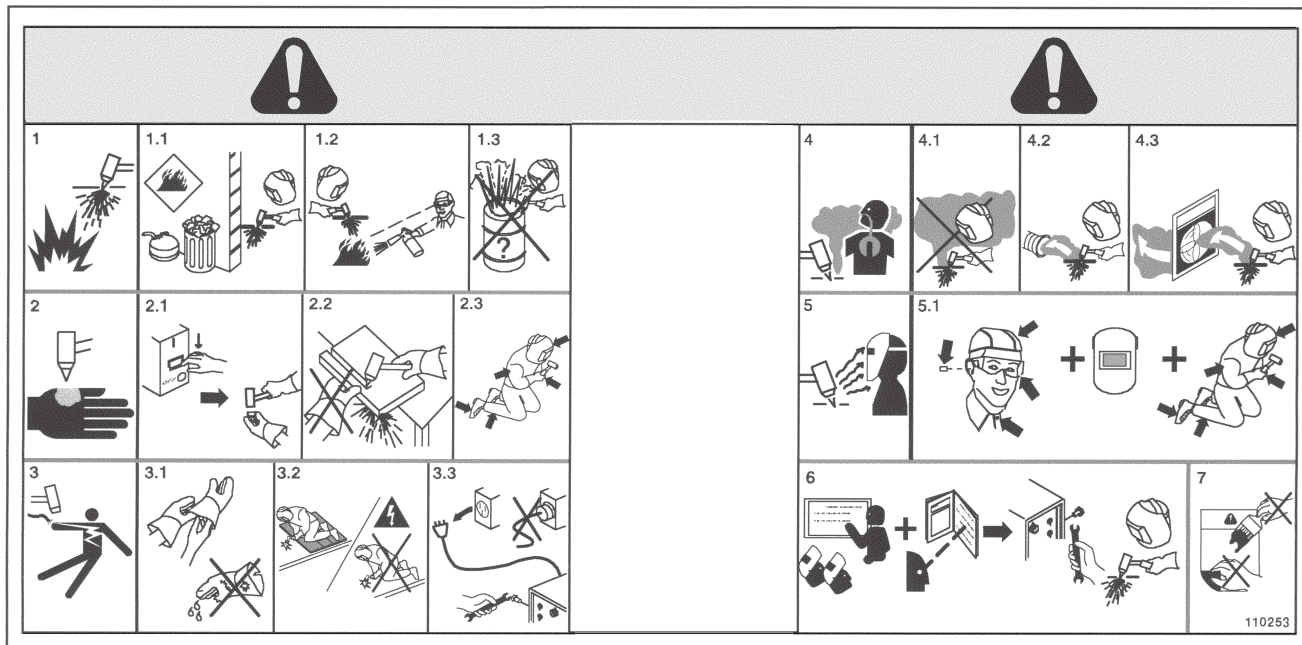


UN ARC PLASMA PEUT ENDOMMAGER LES TUYAUX GELÉS

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

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.

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SPECIFICATIONS

Introduction

The Powermax190c plasma cutting system uses a chopper power supply to cut mild steel, stainless steel, aluminum and other metals.

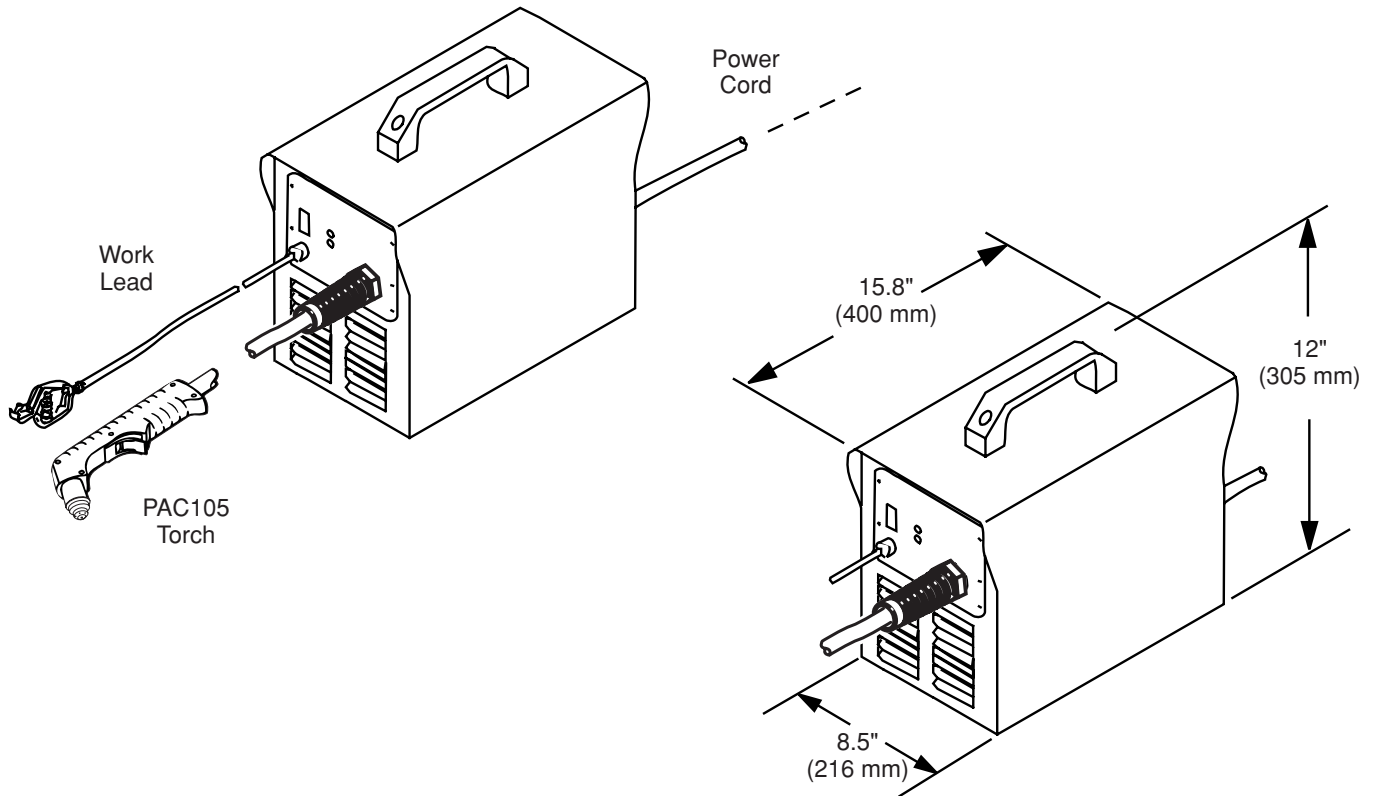
This service manual provides information for qualified service technicians to troubleshoot and repair the power supply and torch. Section 4 contains a parts list of the Powermax190c system. This manual also provides a detailed list of safety practices, so that the system can be safely tested and maintained. **READ THE SAFETY SECTION (Section 1) FIRST!**

The Powermax190c Operator Manual (803650) provides setup and daily operating instructions.

Specifications

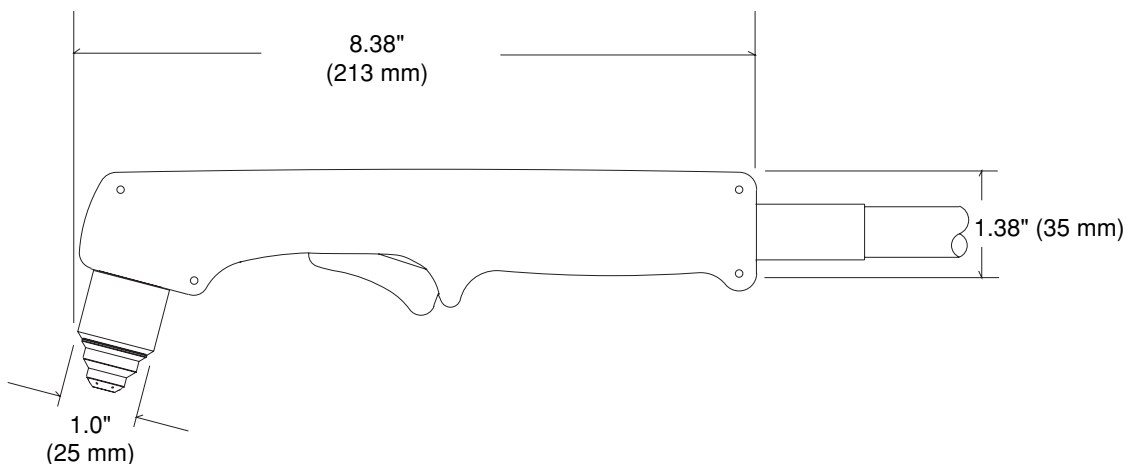
Power Supply

Rated Open Circuit Voltage (OCV) (U_0)	335 VDC @ 120 VAC 320 VDC @ 230 VAC
Rated Output Current (I_2)	12 amps
Duty Cycle (X) at 104° F (40° C), at rated output voltage (U_2), and at rated output current (I_2) using 20-amp service	35% ($U_2=110$ volts, $I_2=12$ amps) See power supply data tag for more information on duty cycle.
Temperature Operating Range	Power supplies will operate between 32° F (0° C) and 104° F (+40° C).
Input Voltage (U_1)/Input Current (I_{1max}) at 1.32 kw Output	120 VAC/20.3 amps 1-Ph, 60 Hz (Non CE) 230 VAC/10.0 amps 1-Ph, 50/60 Hz (CE)
Dimensions	See figure on page 2-3.
Weight:	
Power Supplies with Serial Numbers < 10,000	
120V Power Supply	43 lbs (19.5 kg) 46 lbs (20.9 kg) with torch
230V Power Supply	47 lbs (21.3 kg) 51 lbs (23 kg) with torch
Power Supplies with Serial Numbers \geq 10,000	
120V Power Supply	47 lbs (21.3 kg) 50 lbs (22.7 kg) with torch
230V Power Supply	54 lbs (24.5 kg) 58 lbs (26.3 kg) with torch
Gas Type	Air – (Compressor contained in power supply)
Air Pressure and Flow rate	40 psi (2.8 bar) @ 53.4 scfh/0.89 cfm (25 liters/min)



PAC105 Torch

Recommended Cutting Capacity	1/8 inch (3 mm) @ 12A (35% duty cycle)
Maximum Cutting Capacity	3/16 inch (4.5 mm) @ 12A (35% duty cycle)
Severance Cutting Capacity	1/4 inch (6 mm) @ 12A (35% duty cycle)
Air Pressure and Flow rate	40 psi (2.8 bar) @ 53.4 scfh/0.89 cfm (25 liters/min)
Weight	3 pounds (1.4 kg)



SPECIFICATIONS

S MARK

The 230V Powermax190c system conforms to **CE** standard EN50192. The **S** mark indicates that the power supply and torch are suitable for use in environments with increased hazard of electrical shock.



Direct current (DC).



Alternating current (AC).



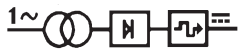
Plasma cutting torch.



AC input power connection.



The terminal for the external protective (earthed) conductor.



An inverter-based power source.



Anode (+) work clamp.



Temperature switch.



Pressure switch.



Plasma torch in the TEST position (cooling and cutting gas exiting nozzle).



The power is on.



The power is off.



Volt/amp curve.

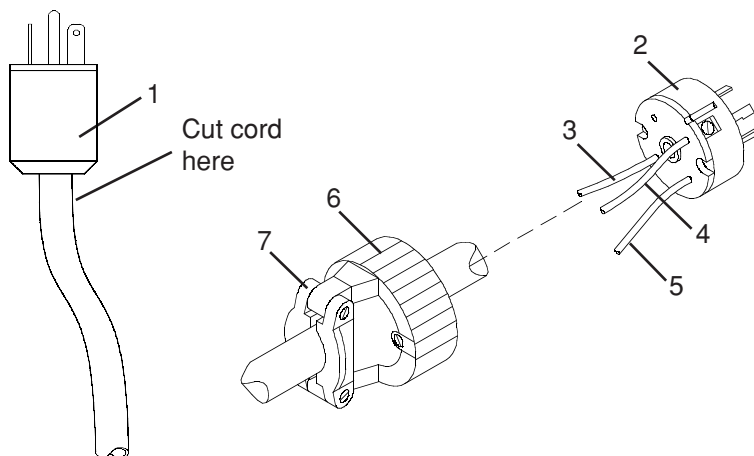
Grounding Requirements

To ensure personal safety, proper operation and to reduce electromagnetic interference (EMI), the power supply must be properly grounded:

- The power supply must be grounded through the power cord according to national or local electrical codes.
- Single-phase service must be of the 3-wire type with a green or green/yellow wire for protective earth ground and must comply with national or local electrical requirements. Do not use a 2-wire cord.
- Also see *Grounding Safety* in the Safety section of this manual.

Power Cord Plugs

The 120V power supplies are shipped with a plug on the power cord. The 230V units are shipped without a plug on the power cord. For the 230V machine, obtain a plug that meets national or local electrical codes. The plug should be connected to the power cord by a licensed electrician. Also, note that some 120V receptacles may require a plug that is different from the plug on the power cord. To install the required plug, refer to the figure below. The installed 120V plug and cords must conform to national or local electrical codes.



- 1 Power cord plug (120V shown)
 - Cut cord close to plug.
- 2 230V plug
- 3 To load 1 (brass) terminal
- 4 To load 2 (brass) terminal
- 5 To ground (green) terminal
- 6 Outer shell
- 7 Cord grip

Strip cord insulation back in order to separate conductors. Strip conductor insulation back in order to make good contact with plug terminals. Make connections, reinstall outer shell and cord grip and secure with screws. Do not overtighten.

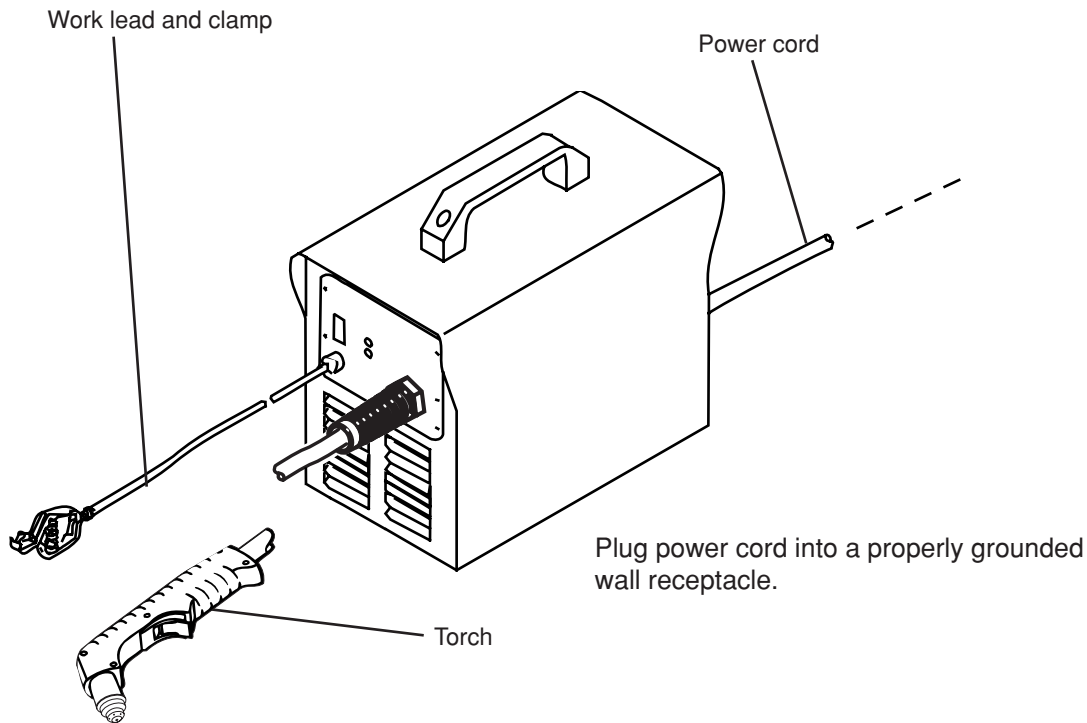
SPECIFICATIONS

Power Hookup

System Circuit Recommendations

120V power supply: An individual 30A branch circuit is recommended, protected by time-delay fuses or circuit breaker

230V power supply: An individual 20A branch circuit is recommended, protected by time-delay fuses or circuit breaker



Extension Cord

Choose an extension cord that is larger in diameter than the power cord provided with the power supply. Actual voltage loss from cord impedance will vary with line and load conditions.

Use a cord that is certified by national or local codes. The cord should be installed by a licensed electrician following national or local codes.

Minimum recommended cord size:

120V power supply: 10 AWG (6 mm²) for up to 75 ft (23 m)
8 AWG (10 mm²) for up to 140 ft (46 m)

230V power supply: 2.5 mm² (14 AWG) for up to 23 m (75 ft)
4 mm² (12 AWG) for up to 46 m (140 ft)

Note: Special installation may be required where gasoline or volatile liquids are present. Consult national or local codes.

In this section:



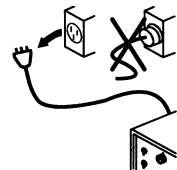
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Introduction

Hypertherm assumes that the service personnel performing the troubleshooting testing are high-level electronic service technicians that have worked with high-voltage electromechanical systems. Knowledge of final isolation troubleshooting techniques is also assumed.

In addition to being technically qualified, maintenance personnel must perform all testing with safety in mind. Refer to the Safety section for operating precautions and warning formats.

Routine Maintenance

		<p>WARNING ELECTRIC SHOCK CAN KILL</p>
	<p>Disconnect electrical power before performing any maintenance. All work requiring removal of the power supply cover must be performed by a qualified technician.</p>	

Under severe conditions, routine maintenance should be performed more frequently.

Before Each Use

- Check the torch and consumables for wear. See *Inspecting and Replacing Consumable Parts* in Section 4 of the Powermax190c Operator manual (803650) if necessary.

Every Week

- Check the torch cap-on sensor system by listening for the micro-switch to “click” when the retaining cap is loosened.

3 Months

- Replace damaged or unreadable labels.
- Replace any cracked parts.
- Check the torch body and torch lead.
- Replace the torch lead if the insulation is broken.

6 Months

- Clean the inside of the power supply with air pressure or vacuum.

Controls and Indicators

Power Switch

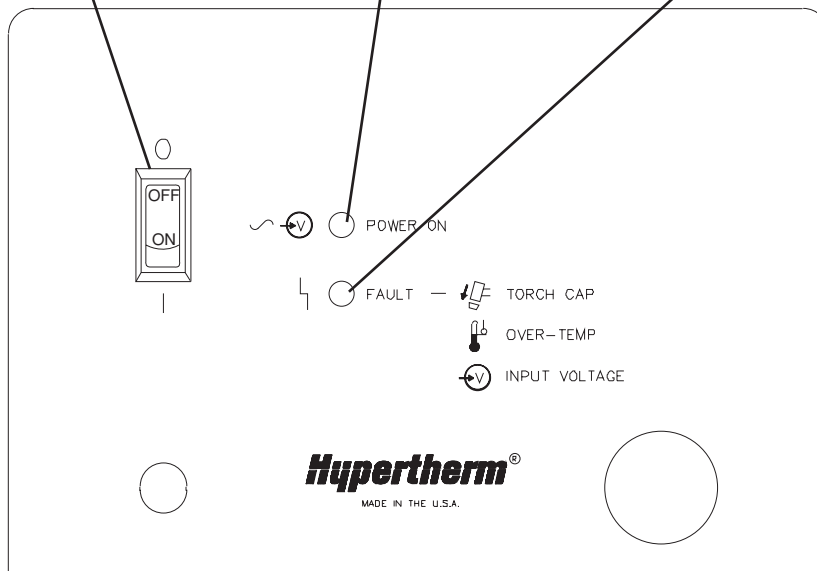
POWER ON

When illuminated, indicates that the power supply is energized and ready to operate. Lamp will extinguish if input power is not within specified range.

FAULT

The fault lamp will illuminate under the following conditions:

1. **The torch retaining cap is removed or not securely screwed down.** In this condition, the power supply must be turned off and then turned on before operation can begin.
2. **The power supply overheats.** In this condition, the fan will continue to run. Wait 15 minutes for the unit to cool, or until the FAULT lamp is extinguished.
3. **The input voltage is not within specification: (120 VAC +/- 20%) or (230 VAC +/- 20%).** After the input voltage has been corrected the power supply must be turned off and then turned on before operation can continue.



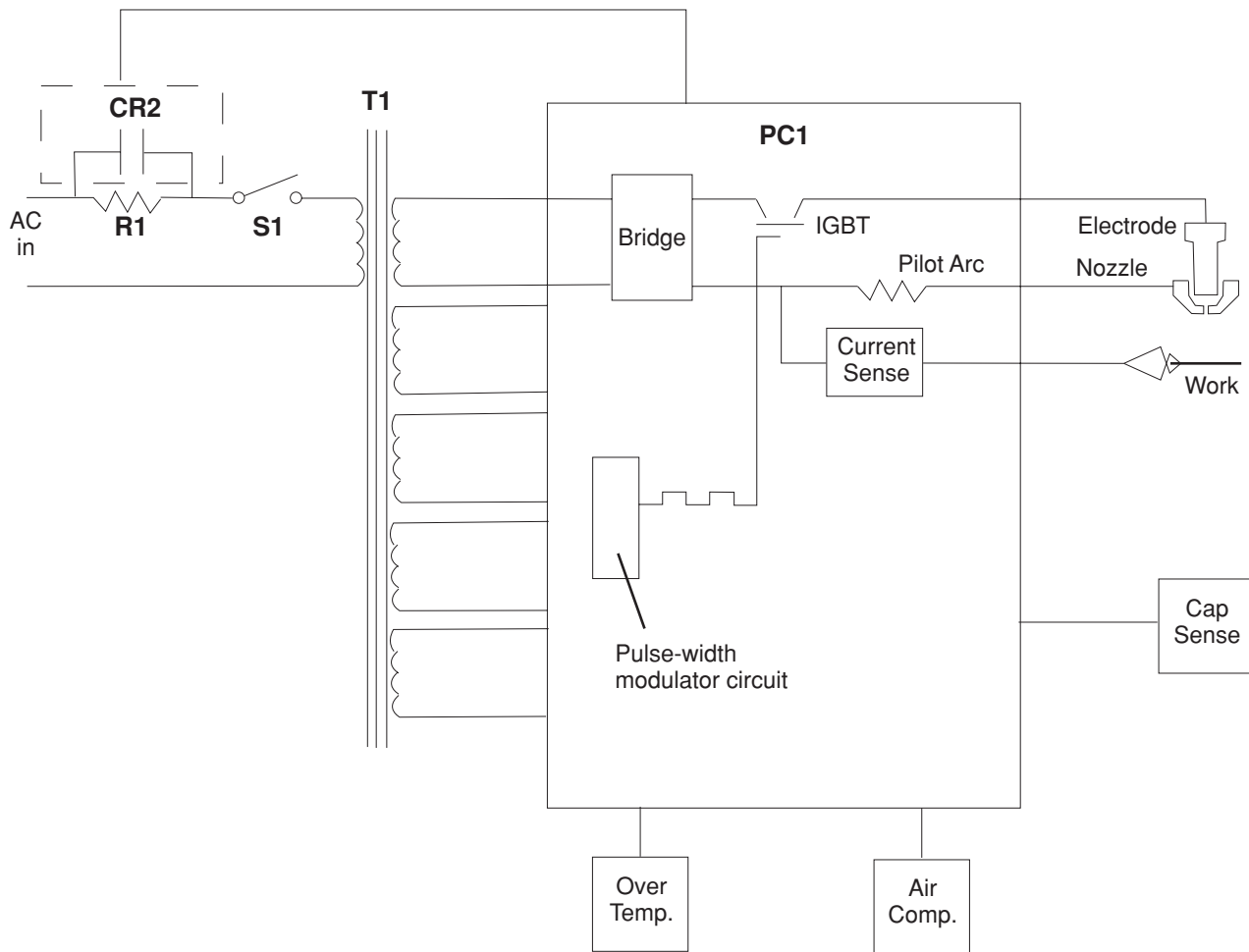
		WARNING
Before operating this system, read the Safety section of this manual thoroughly!		

Theory of Operation

AC power enters the system through inrush resistor R1 into switch S1 then into the main transformer. The main transformer T1 supplies voltage to the control circuitry and to the chopper module. The inrush contactor CR2 is closed by the control circuitry on the power board PC1.

The chopper is incorporated into the power board PC1. The chopper consists of an isolated gate bipolar transistor (IGBT). The IGBT is controlled by a pulse width modulated signal, set internally in the control circuitry on PC1.

The control circuitry regulates the output current, the air compressor, and the safety circuits. The output current is set internally in the control circuitry to 12 amps. The air compressor operates during preflow, cutting, and post flow modes. The compressor unit is set to output 40 psi (2.8 bar). The safety circuits consist of the cap sensor switch, over voltage protection, and over temperature protection.



Powermax190c Block Diagram

Troubleshooting

The complexity of the circuits require that service technicians have a working knowledge of chopper 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 nearest Hypertherm Technical Services Department listed in the front of this manual.

		<p>WARNING ELECTRIC SHOCK CAN KILL</p>
		<p>Disconnect electrical power before performing any maintenance. All work requiring removal of the power supply cover must be performed by a qualified technician.</p>

Test Equipment

- Multimeter

Troubleshooting Procedures



Maintenance of the Powermax190c power supply consists of performing visual inspection and troubleshooting procedures.



- Refer to the system wiring diagram when performing the troubleshooting procedures.
- To locate power supply components refer to **Section 4**.
- After the problem has been located and repaired, refer to the Powermax190c Operator Manual (803650) 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.

Visual Inspection – Internal

		<p style="text-align: center;">WARNING ELECTRIC SHOCK CAN KILL</p>
<p>SHOCK HAZARD: Always turn off power and unplug cord from wall and wait 5 minutes before removing any cover of the power supply. If power supply is directly connected to a line disconnect box, place line disconnect switch to OFF position. 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.</p> <p>If power is required for servicing, be aware that dangerous voltages exist within the power supply which could cause serious injury or death. If questions or problems arise during servicing, call the Hypertherm Technical Services department listed in the front of this manual.</p>		

		<p style="text-align: center;">WARNING ELECTRIC SHOCK CAN KILL</p>
<p>SHOCK HAZARD: Do not attempt repairs on the power board. Do not in any way cut away or remove the protective conformal coating from the board. To do so will risk a short between the AC input circuit to the output circuit and may cause serious injury or death.</p> <p>The power supply and PC boards are subjected to dielectric and insulation resistance tests per applicable CSA and IEC standards for the safety of the operator and service technicians.</p> <p>Removal of the protective conformal coatings and other unauthorized repairs to the PC boards will void the warranty.</p> <p>If questions or problems arise during servicing, call the Hypertherm Technical Services department listed in the front of this manual.</p>		

1. Set the Powermax190c power switch to O (off) and unplug the power cord.
2. Remove the cover of the power supply by removing the securing screws.
3. Visually inspect the inside of the power supply, especially on the side with power board PC1 (see Section 4). Look for broken or loose wiring connections, burn and char marks, damaged components, etc. Repair or replace as necessary.

Powermax190c Troubleshooting Guide

Refer to
Wiring Diagrams

Problem	This May Mean	Cause	Solution
1. Fault LED illuminates	Safety interlock circuit is not satisfied	Consumables are not installed properly When this fault is repaired, power switch S1 needs to be recycled in order to operate.	1.1 Verify that the consumables are installed properly. See <i>Changing Consumable Parts</i> in the Operation section of the Powermax190c operator manual, if necessary. 1.2 Disconnect RC4 from PC1 and measure for continuity between pins 1 and 2. If this shows an open circuit, replace all consumables. If fault condition does not go away, inspect torch microswitch. Verify that the switch clicks when the retaining cap is screwed on. Replace torch body with switch, if necessary.
		Input voltage out of specs When this fault is repaired, power switch S1 needs to be recycled in order to operate.	1.3 Verify that incoming voltage is correct. Measure voltage between 1T and 2T. Verify that line voltage is within +/- 20% of nominal. 1.4 If operating with an extension cord, verify that the cable and line disconnect switch are sized properly.
		Torch leads are damaged or shorted When this fault is repaired, power switch S1 needs to be recycled in order to operate.	1.5 Disconnect RC4, RC7, and RC11 from PC1 and check for continuity from each of the 4 wires in RC4 to the wire in RC11 and to the wire in RC7. If there is continuity to either wire replace the torch leads.
		Over temperature	1.6 Verify that the fan is operating. If not operating, measure for 120 VAC (120V power supplies) or 230 VAC (230V power supplies) at the fan. If there is AC to the fan, replace fan. 1.7 If the system has exceeded the duty cycle, leave system in idle mode for 15 minutes, with fan operating, to cool.

Powermax190c Troubleshooting Guide

Problem	This May Mean	Cause	Solution
2. Machine will not power up	No power to system	Blown fuse or tripped line disconnect switch	2.1 Measure for incoming line voltage at terminals 1T and 2T.
	Faulty component	Faulty inrush resistor (R1)	2.2 Measure for incoming line voltage from the top side of S1 to 2T. If voltage not present, replace R1.
		Faulty power ON switch	2.3 Measure for incoming line voltage from the bottom side of S1 to 2T. If voltage not present, replace S1.
		Faulty control transformer (T1) or power board (PC1)	2.4 Measure voltages from T1: RC1 pins 1 and 2 = 20 VAC RC1 pins 3 and 6 = 20 VAC RC1 pins 4 and 5 = 20 VAC RC10 pins 1 and 2 = 24 VAC RC10 pins 1 and 2 = 24 VAC If all voltages are not present, replace T1. If all voltages are present replace PC1.
	Faulty torch trigger switch	Start switch shorted out or operator trying to fire system during power up	2.5 Disconnect RC4 from PC1 and check for continuity between pins 3 and 4. If circuit is not open, pull the torch handle apart and inspect the switch. Replace faulty component. Do not try to fire the torch during power up. If this happens, the system must remain idle, with system power off, for 2 minutes before continuing operation.

Powermax190c Troubleshooting Guide

Problem	This May Mean	Cause	Solution
3. When firing the torch, the arc spits then goes out	Worn consumables	Over use of consumables	3.1 Replace the consumables.
	Line voltage not within specs	Low incoming power or supply voltage is dropping when trying to fire torch	3.2 Check incoming power when trying to fire the torch. If an extension cord is being used, verify that the cable is the proper size.
	Low gas pressure at torch head	Gas leak	3.3 Verify that o-rings on consumables are not damaged.
		Faulty air compressor	3.4 If there is no air coming out of the torch, measure for 12 VDC (14 VDC if S/N is \geq 10,000) in RC2 pins 1 and 2. If voltage is present, replace compressor.
4. Arc sputtering but continues to cut	Water in torch leads	Humid environment	4.1 Continue to operate until it is possible to move to a less humid environment.
5. No arc	No open circuit voltage (OCV)	Faulty transformer	5.1 Disconnect RC12 and measure for 227 VAC between pins 1 and 3 in RC12 (transformer side). If voltage is present, replace the transformer.
		Faulty CR1	5.2 Disconnect RC3 from PC1 and measure for 227 VAC between pins 1 and 2 when firing the torch. If voltage not present, replace CR1.
		Faulty power board	5.3 Disconnect RC7 and RC11 from PC1 and measure for OCV (335 VDC for 120V power supplies, 320 VDC for 230V power supplies) between RC7 and RC11 (from PC1). If voltage not present, replace power board PC1.

Powermax190c Troubleshooting Guide

Problem	This May Mean	Cause	Solution
5. No arc (cont.)	No open circuit voltage (OCV)	Faulty torch	5.4 Verify that the electrode moves back into the torch body freely. If the torch head has recently been replaced, verify that nothing is obstructing the movement of the plunger. If all appears in order replace torch body and switch.
	No air	Faulty air compressor	5.5 Measure for 12 VDC between pins 1 and 2 in RC2. If voltage is present, replace air compressor. If voltage is not present to air compressor, verify that the system is not in a fault condition. If not in a fault condition, replace power board PC1.
		Over-heated air compressor	5.6 Turn power OFF and check resistance at RC2 between pins 1 and 2. If greater than 2 Ω the compressor has over-heated. Turn power ON and leave system idle with fan running for 15 minutes to cool system.
6. Machine is cutting poorly	Inadequate ground	Poor work lead connection	6.1 Verify that the work lead is attached to work piece and that the material is free of rust, paint, etc.
		Damaged work lead	6.2 Inspect for damage.
		Low incoming power	6.3 Check incoming power when trying to fire the torch. If an extension cord is being used, verify that the cable is the proper size.

Section 4

PARTS LIST

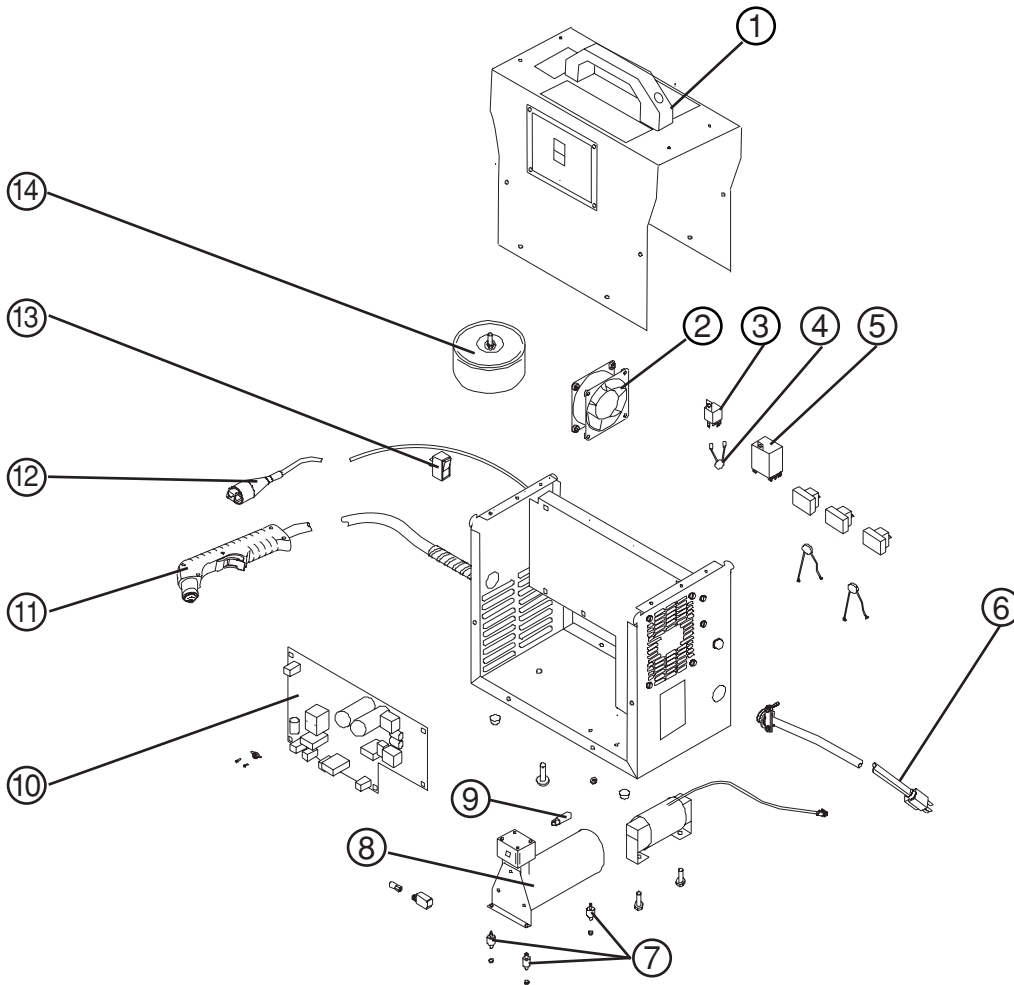
In this section:

Powermax190c 120V Power Supply – 070068	4-2
Powermax190c 230V Power Supply – 070070	4-3
PAC105 Torch Assembly and 20 ft (6.1 m) Torch Lead – 070065	4-4
Consumable O-rings	4-5
Consumable Parts	4-5
Powermax190c Labels	4-6
Optional Parts	4-6
Powermax190c Systems	4-6

PARTS LIST

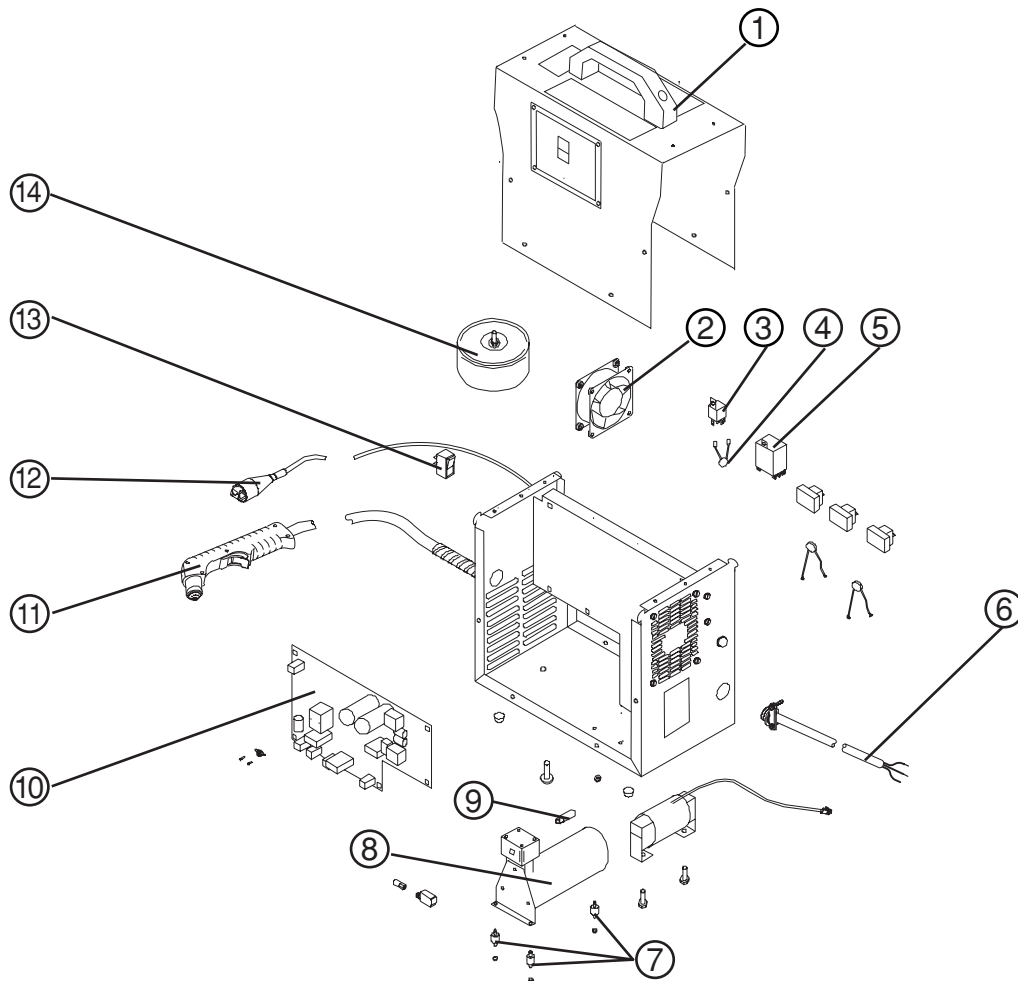
Powermax190c 120V Power Supply – 070068

Index No.	Part No.	Description	Ref. Desig.	Quantity
1	060136	Cover Assembly: Powermax190c		1
2	060006	Fan: Powermax190c 120/60	FM	1
3	060076	Relay: Powermax190c/350 30A 12V SPST	CR2	1
4	060078	Thermistor: Powermax190c	R1	1
5	060135	Relay: Powermax190c	CR1	1
6	060138	Linecord: Powermax190c 120V		1
7	060134	Shock Absorber: Powermax190c		3
8	060131	Compressor	AC1	1
9	011088	Filter: Powermax190c Compressor 1/8 NPT		1
10	060144	PCB Assy: Powermax190c 120V	PC1	1
	060155	Thermostat:PMX190C-120V NC 180F		1
11	070065	PAC105 Hand Torch Assembly (See page 4-4)		1
12	060133	Cable with clamp: Powermax190c work		1
13	060132	Switch: Powermax190c On/Off	S1	1
14	060141	Transformer: Powermax190c 120/1/60	T1	1



Powermax190c 230V Power Supply – 070070

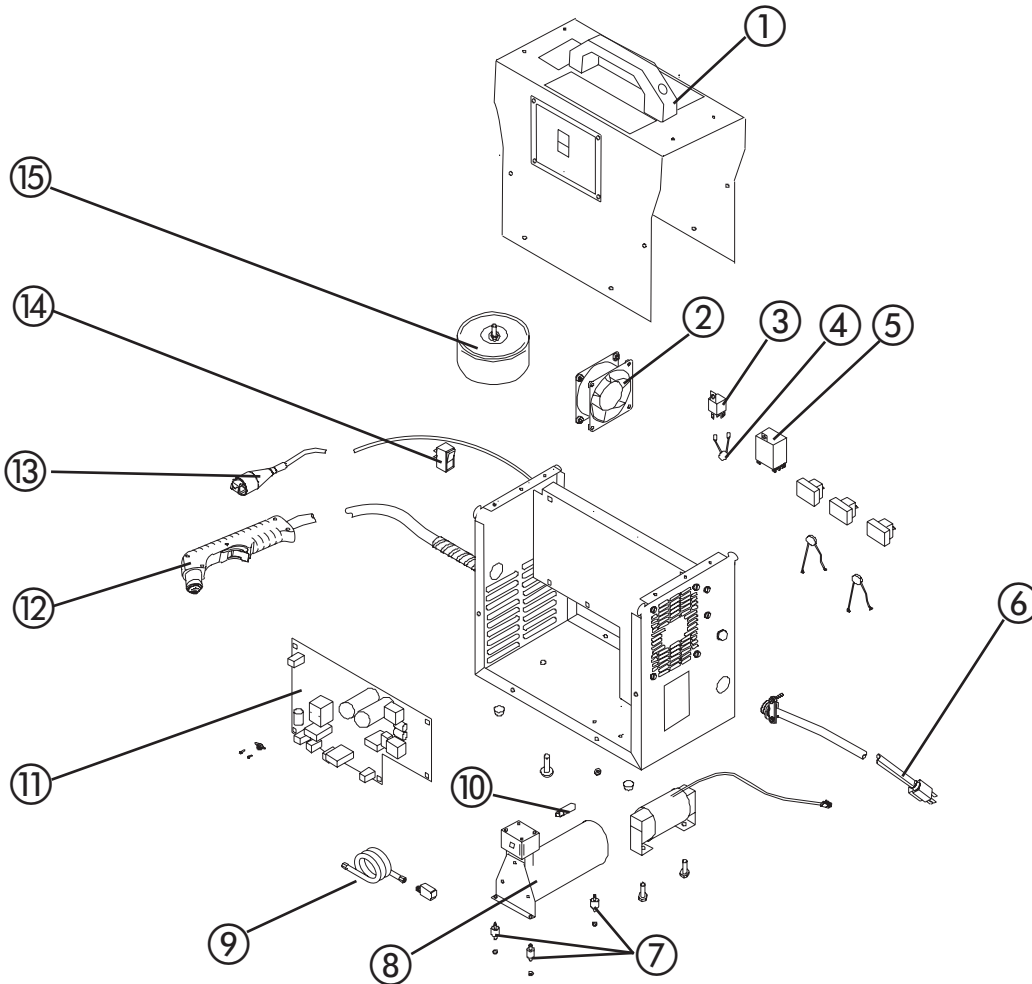
Index No.	Part No.	Description	Ref. Desig.	Quantity
1	060153	Cover Assembly: Powermax190c - 230V (CE)		1
2	060142	Fan: Powermax190c 230/50	FM	1
3	060217	Relay: Powermax190c/350 30A 12V SPST	CR2	1
4	060078	Thermistor: Powermax190c	R1	1
5	060135	Relay: Powermax190c	CR1	1
6	060145	Linecord: Powermax190c 230V		1
7	060134	Shock Absorber: Powermax190c		3
8	060131	Compressor	AC1	1
9	011088	Filter: Powermax190c Compressor 1/8 NPT		1
10	060144	PCB Assy: Powermax190c 230V	PC1	1
	060154	Thermostat:PMX190C-230V [CE] NC 195F		1
11	070065	PAC105 Hand Torch Assembly (See page 4-4)		1
12	060133	Cable with clamp: Powermax190c work		1
13	060151	Switch: Powermax190c On/Off, 230V, 2-pole	S1	1
14	060143	Transformer: Powermax190c 230/1/50	T1	1



PARTS LIST

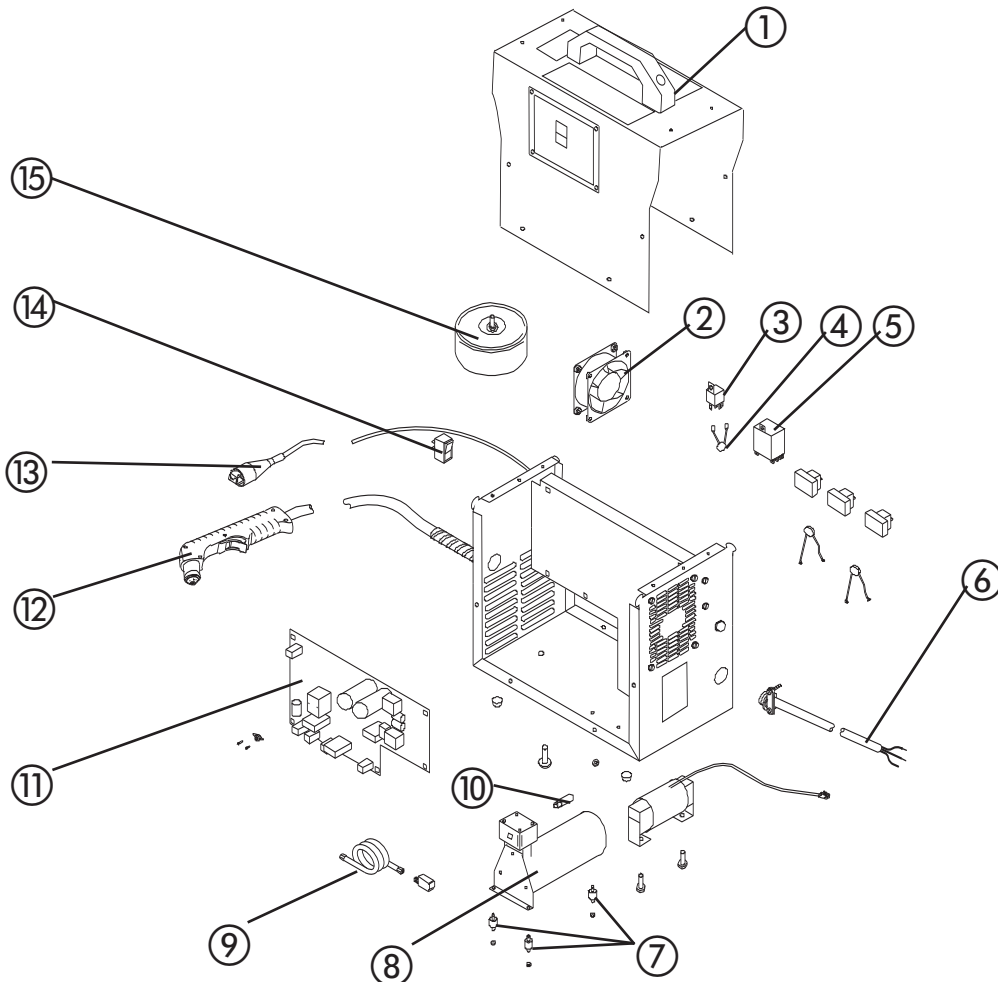
Powermax190c 120V Power Supply – 070784

Index No.	Part No.	Description	Ref. Desig.	Quantity
1	060136	Cover Assembly: Powermax190c		1
2	060006	Fan: Powermax190c 120/60	FM	1
3	060217	Relay: Powermax190c/350 30A 12V SPST	CR2	1
4	060078	Thermistor: Powermax190c	R1	1
5	060135	Relay: Powermax190c	CR1	1
6	060138	Linecord: Powermax190c 120V		1
7	060134	Shock Absorber: Powermax190c		3
8	060215	Compressor	AC1	1
9	128862	Compressor Cooling Coil		1
10	011088	Filter: Powermax190c Compressor 1/8 NPT		1
11	060216	PCB Assy: Powermax190c 120V	PC1	1
	060155	Thermostat:PMX190C-120V NC 180F		1
12	070065	PAC105 Hand Torch Assembly (See page 4-4)		1
13	060133	Cable with clamp: Powermax190c work		1
14	060132	Switch: Powermax190c On/Off	S1	1
15	060141	Transformer: Powermax190c 120/1/60	T1	1



Powermax190c 230V Power Supply – 070786

Index No.	Part No.	Description	Ref. Desig.	Quantity
1	060153	Cover Assembly: Powermax190c - 230V (CE)		1
2	060142	Fan: Powermax190c 230/50	FM	1
3	060217	Relay: Powermax190c/350 30A 12V SPST	CR2	1
4	060078	Thermistor: Powermax190c	R1	1
5	060135	Relay: Powermax190c	CR1	1
6	060145	Linecord: Powermax190c 230V		1
7	060134	Shock Absorber: Powermax190c		3
8	060215	Compressor	AC1	1
9	128862	Compressor Cooling Coil		1
10	011088	Filter: Powermax190c Compressor 1/8 NPT		1
11	060218	PCB Assy: Powermax190c 230V	PC1	1
	060154	Thermostat:PMX190C-230V [CE] NC 195F		1
12	070065	PAC105 Hand Torch Assembly (See page 4-4)		1
13	060133	Cable with clamp: Powermax190c work		1
14	060151	Switch: Powermax190c On/Off, 230V, 2-pole	S1	1
15	060143	Transformer: Powermax190c 230/1/50	T1	1
	060161	Inductor: Powermax 190c		1

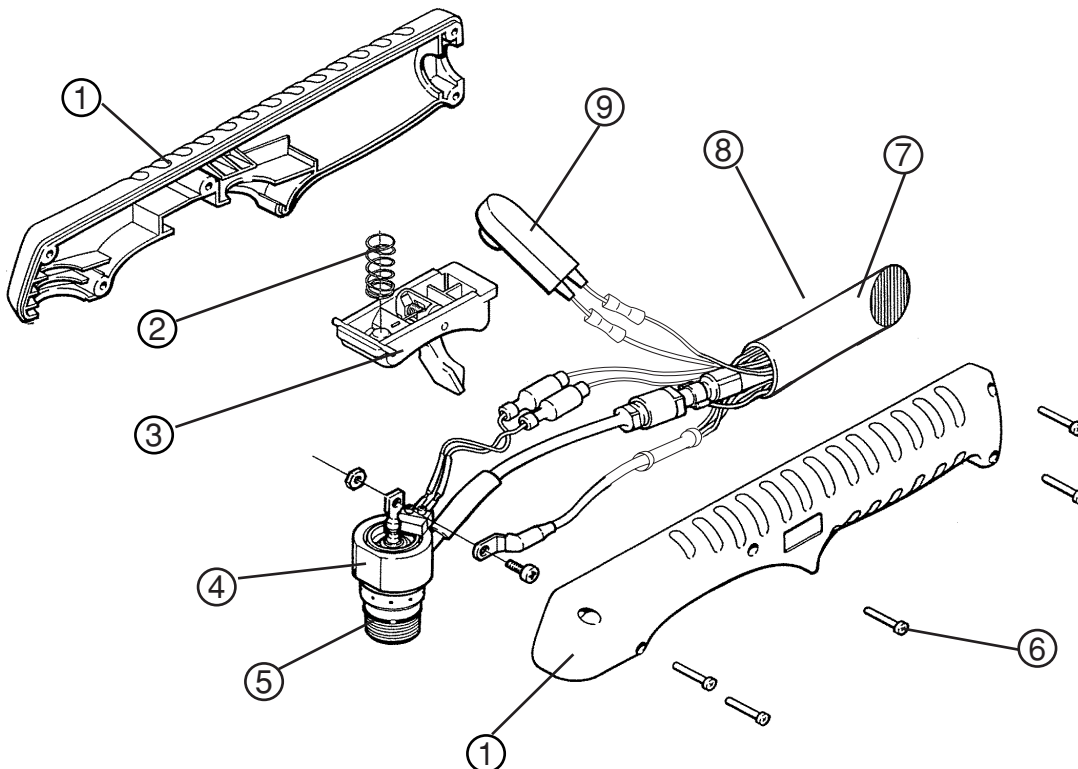


PARTS LIST

PAC105 Torch Assembly and 20 ft (6.1 m) Torch Lead – 070065

Index No.	Part No.	Description
1	001288	Handle
2	027254	Spring
3	002244	Safety Trigger Assembly
4	120874	Torch Main Body with Switch, PAC105
5	058503	O-Ring: VITON .625 X .070
6	075339	Screws (5), P/S, # 4 X 1/2, PH, RND, S/B
7	128883	Torch Lead Replacement Kit, 20 ft (6.1 m)
8	004764	Retaining Ring, Gutcha
9	005202	Switch, Torch Pushbutton
	120880*	Swirl Ring
	120881*	Electrode
	120882*	Nozzle
	120898*	Shielded Retaining Cap
	120884*	Shield

* See page 4-5 for consumable parts.



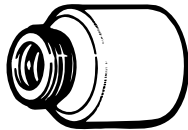
Consumable Parts

Part Number	Description
120880.....	Swirl Ring
120881.....	Electrode
120882.....	Nozzle
120883.....	Retaining Cap
120898.....	Shielded Retaining Cap
120884.....	Shield

**Shield
120884**



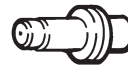
**Shielded Retaining Cap
120898**



**Nozzle
120882**



**Electrode
120881**



**Swirl Ring
120880**



Shielded Consumables

**Retaining Cap
120883**



**Nozzle
120882**



**Electrode
120881**



**Swirl Ring
120880**



Unshielded Consumables

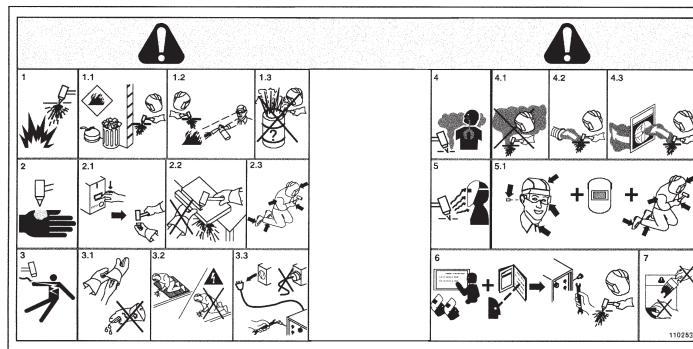
For CE compliance, do not use the unshielded consumables

Consumable O-rings



Powermax190c Labels

<p>⚠ WARNING</p> <p>Project yourself and others. Read and understand this warning.</p> <ul style="list-style-type: none"> • Disconnect power source before working. • Disconnect power source before connecting to the torch. • Use correct procedure in the instruction manual. • This plasma cutting machine must be connected to 200V/230V AC supply. • Plasma arc cutting can be hazardous to operators if the correct work safety application and understanding the manufacturer's instructions and know your employer's safety practices. <p>⚠ Ensure torch can lift. • Do not touch the electrode while it is hot. • Keep all cables and cables in good condition. • Do not connect to a power source.</p> <p>⚠ Maximize ground from work and electrode, torch and cutting.</p> <p>⚠ Make ground, which must be the maximum dry.</p> <p>⚠ Disconnect all input powerlines immediately after use.</p> <p>⚠ Do not use the torch and the torch cable. • Do not connect to a power source. • Do not connect to a power source.</p> <p>DO NOT REMOVE THIS MARKING</p>	<p>⚠ AVERTISSEMENT</p> <p>Plus vous protéger et protéger les autres, plus vous comprendrez les dangers.</p> <ul style="list-style-type: none"> • Déconnectez l'alimentation avant d'effectuer le travail. • Déconnectez l'alimentation avant de connecter la torche. • Utilisez la procédure décrite dans le manuel d'instructions. • Cette machine à découper au plasma doit être connectée à un réseau électrique de 200V/230V. • Le découpage au plasma peut être dangereux pour les opérateurs si les applications et les connaissances des instructions du fabricant et les pratiques de sécurité de votre employeur ne sont pas comprises. <p>⚠ Fermez et coupez sur la torche avant de la soulever. • Ne touchez pas l'électrode pendant qu'elle est chaude. • Gardez tous les câbles et les câbles dans un bon état. • Ne connectez pas la machine à une source d'alimentation.</p> <p>⚠ Réduisez au maximum la résistance de la terre. • Assurez-vous que la terre est la plus grande. • Ne connectez pas la machine à une source d'alimentation.</p> <p>⚠ Ne touchez pas la torche et le câble de la torche. • Ne connectez pas la machine à une source d'alimentation. • Ne connectez pas la machine à une source d'alimentation.</p> <p>NE PAS ENLEVER CET AVS</p>
110124	



110253

Hypertherm powermax190c Plasma Cutting System HANOVER, NH 03755 MADE IN U.S.A.

No. 070068 S/N

12A/110V-12A/110V			
U ₀	I ₂	12A	100%
3.35V	U ₂	110V	-
cos φ = .82			
S ₁	U ₁	I _{1max}	I _{1eff}
2.44kVA	120V	20.3A	12.0A

COOLING [] INSULATION [] 110291 REVA

THIS PRODUCT IS PROTECTED BY PATENT NOS. 4,791,268 5,310,088 5,597,497 5,620,617 4,861,962 5,132,512 5,120,930 AND U.S. PATENTS PENDING

110290
120V Data label
for 070067

Hypertherm powermax190c Plasma Cutting System HANOVER, NH 03755 MADE IN U.S.A.

No. 070070 S/N

12A/110V-12A/110V			
U ₀	I ₂	12A	100%
3.20V	U ₂	110V	-
U ₂ HYP	110V	-	-
U ₂ IEC	-	85V	-
cos φ = .82			
S ₁	U ₁	I _{1max}	I _{1eff}
2.30kVA	230V	10.0A	5.9A

IP23C COOLING [] INSULATION [] 110291 REVA

THIS PRODUCT IS PROTECTED BY PATENT NOS. 4,791,268 5,310,088 5,597,497 5,620,617 4,861,962 5,132,512 5,120,930 AND U.S. PATENTS PENDING

110291
230V Data label
for 070069

Hypertherm powermax190c Plasma Cutting System HANOVER, NH 03755 MADE IN U.S.A.

No. 070784 S/N

12A/110V-12A/110V			
U ₀	I ₂	12A	100%
3.35V	U ₂	110V	-
cos φ = .82			
S ₁	U ₁	I _{1max}	I _{1eff}
2.44kVA	120V	20.3A	12.0A

COOLING [] INSULATION [] 110458 REVA

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF U.S. PATENT NOS. 4,791,268 5,310,088 5,597,497 5,620,617 4,861,962 5,132,512 5,120,930

110458
120V Data label
for 070784

Hypertherm powermax190c Plasma Cutting System HANOVER, NH 03755 MADE IN U.S.A.

No. 070786 S/N

12A/110V-12A/110V			
U ₀	I ₂	12A	100%
3.20V	U ₂	110V	-
U ₂ HYP	110V	-	-
U ₂ IEC	-	85V	-
cos φ = .82			
S ₁	U ₁	I _{1max}	I _{1eff}
2.30kVA	230V	10.0A	5.9A

IP23C COOLING [] INSULATION [] 110458 REVA

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF U.S. PATENT NOS. 4,791,268 5,310,088 5,597,497 5,620,617 4,861,962 5,132,512 5,120,930

110459
230V Data label
for 070786

Optional Parts

Part Number	Description
060133	Work lead with clamp
060138	Power cord, Pmx190c, 120V
060145	Power cord, Pmx190c, 230V

Powermax190c Systems

Part Number	Description
070067	120VAC, 1-PH, 60 Hz, with torch and 20ft (6 m) torch lead
070069	230VAC, 1-PH, 50/60 Hz, with torch and 20ft (6 m) torch lead
070784	120VAC, 1-PH, 60 Hz, with torch and 20ft (6 m) torch lead (S/N ≥ 10,000)
070786	230VAC, 1-PH, 50/60 Hz, with torch and 20ft (6 m) torch lead (S/N ≥ 10,000)

Section 5

WIRING DIAGRAMS

In this section:

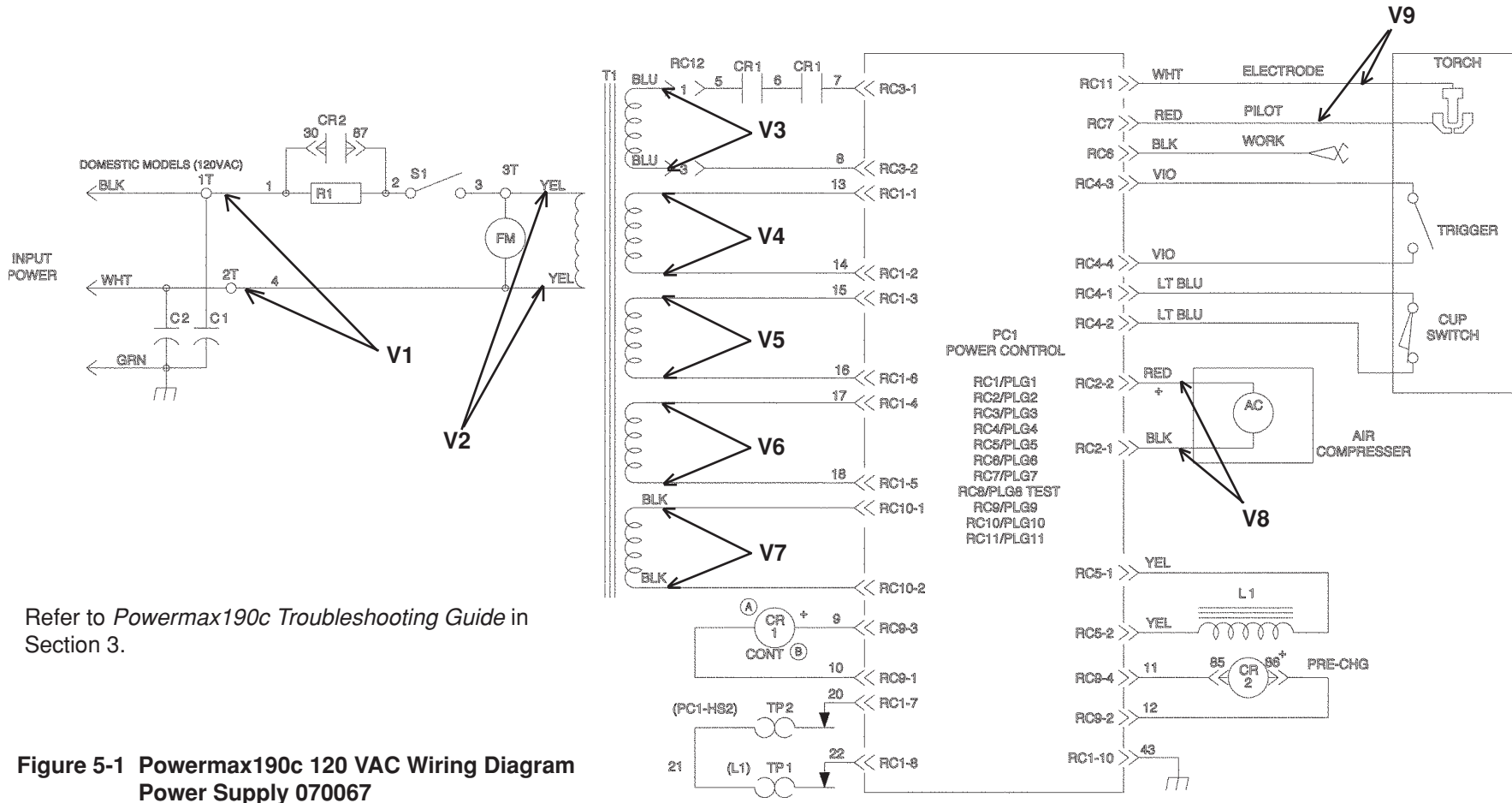
Powermax190c 120V Wiring Diagram	5-2
Powermax190c 230V Wiring Diagram	5-3
Powermax190c 120/230 VAC Wiring Diagram	5-4



WARNING

SHOCK HAZARD: Always turn off the power and unplug the cord or set the line disconnect switch to Off before servicing the unit or changing consumable parts. 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.

Voltage Readings			
a) Tolerance ± 10 % unless specified			
b) Reference - to circuit common, lead 43 unless noted			
V1	120 VAC	V7	24 VAC
V2	120 VAC	V8	12 VDC
V3	227 VAC	V9	335 VDC (open circuit voltage)
V4, V5, V6	20 VAC		



WARNING

SHOCK HAZARD: Always turn off the power and unplug the cord or set the line disconnect switch to Off before servicing the unit or changing consumable parts. 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.

Voltage Readings			
a) Tolerance $\pm 10\%$ unless specified			
b) Reference - to circuit common, lead 43 unless noted			
V1	230 VAC	V7	24 VAC
V2	230 VAC	V8	12 VDC
V3	227 VAC	V9	320 VDC (open circuit voltage)
V4, V5, V6	20 VAC		

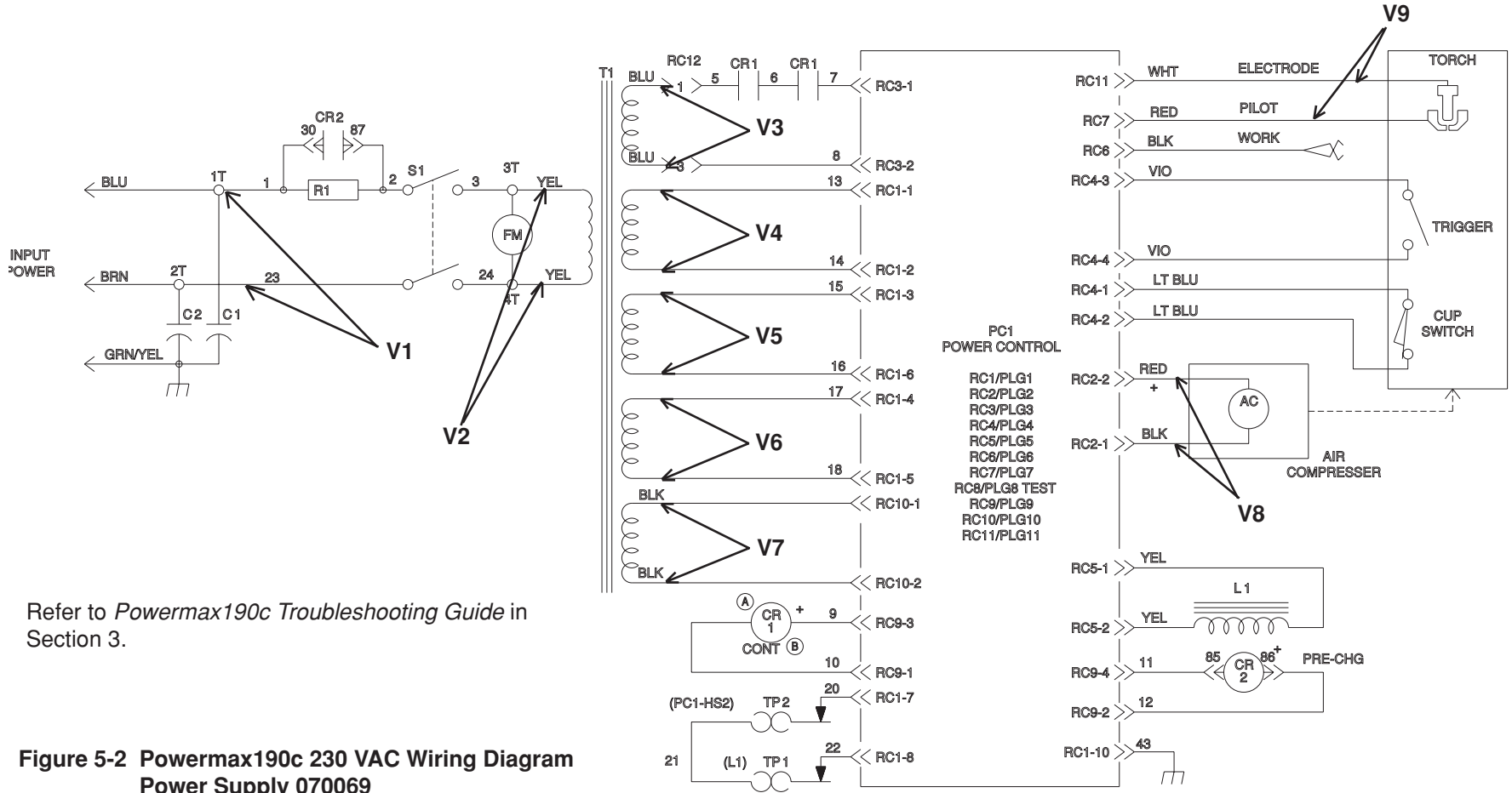


Figure 5-2 Powermax190c 230 VAC Wiring Diagram Power Supply 070069

WARNING

SHOCK HAZARD: Always turn off the power and unplug the cord or set the line disconnect switch to Off before servicing the unit or changing consumable parts. 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.

Voltage Readings			
a) Tolerance ± 10 % unless specified			
b) Reference - to circuit common, lead 43 unless noted			
V1	120 VAC	V7	24 VAC
V2	120 VAC	V8	14 VDC
V3	227 VAC	V9	320 VDC (OCV on 070784)
V4, V5, V6	20 VAC	V9	335 VDC (OCV on 070786)

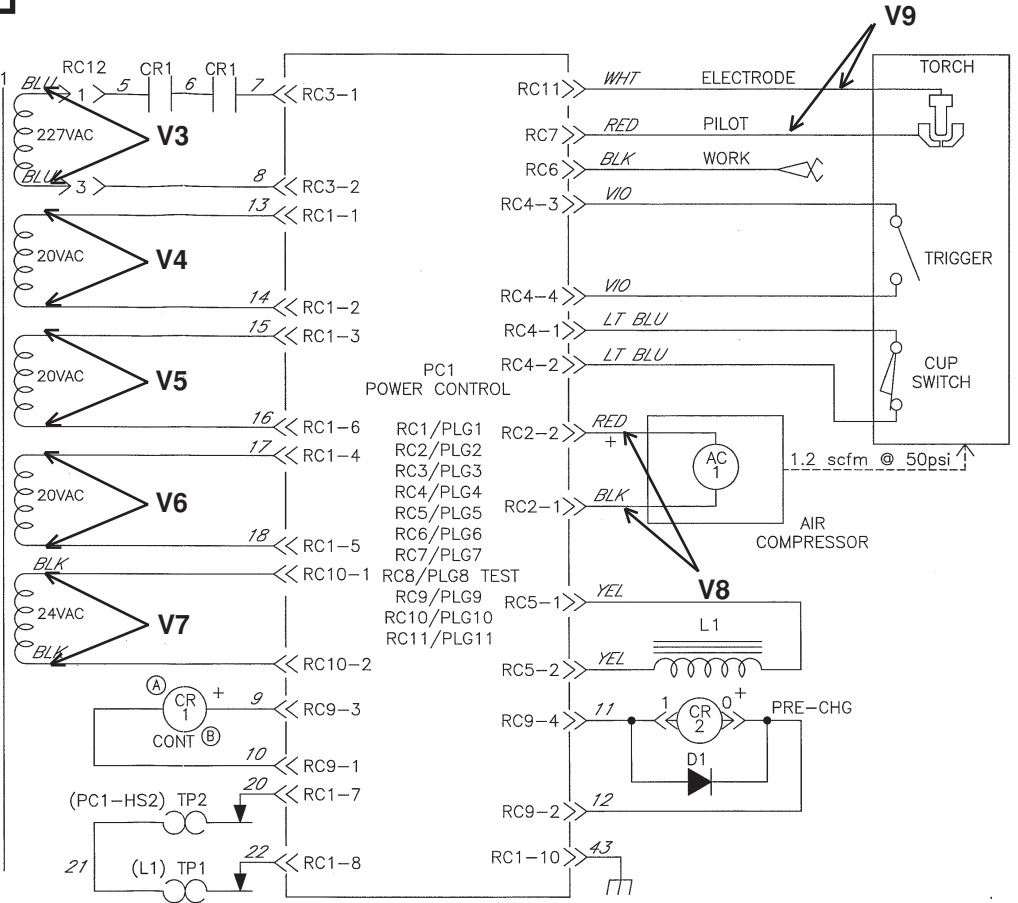
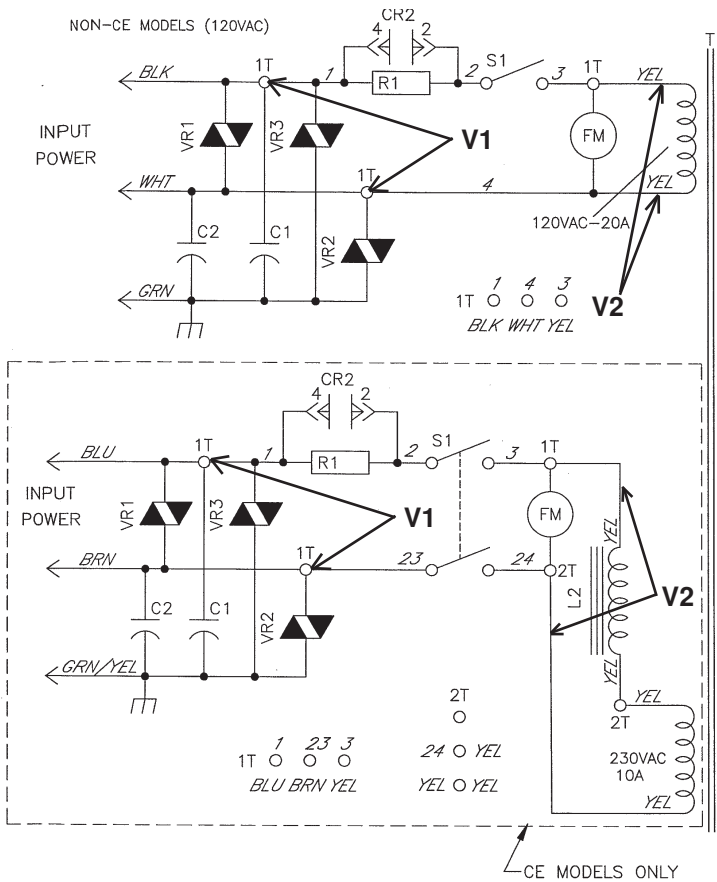


Figure 5-3 Powermax190c 120/230 VAC Wiring Diagram Power Supplies 070784 and 070786

Refer to *Powermax190c Troubleshooting Guide* in Section 3.