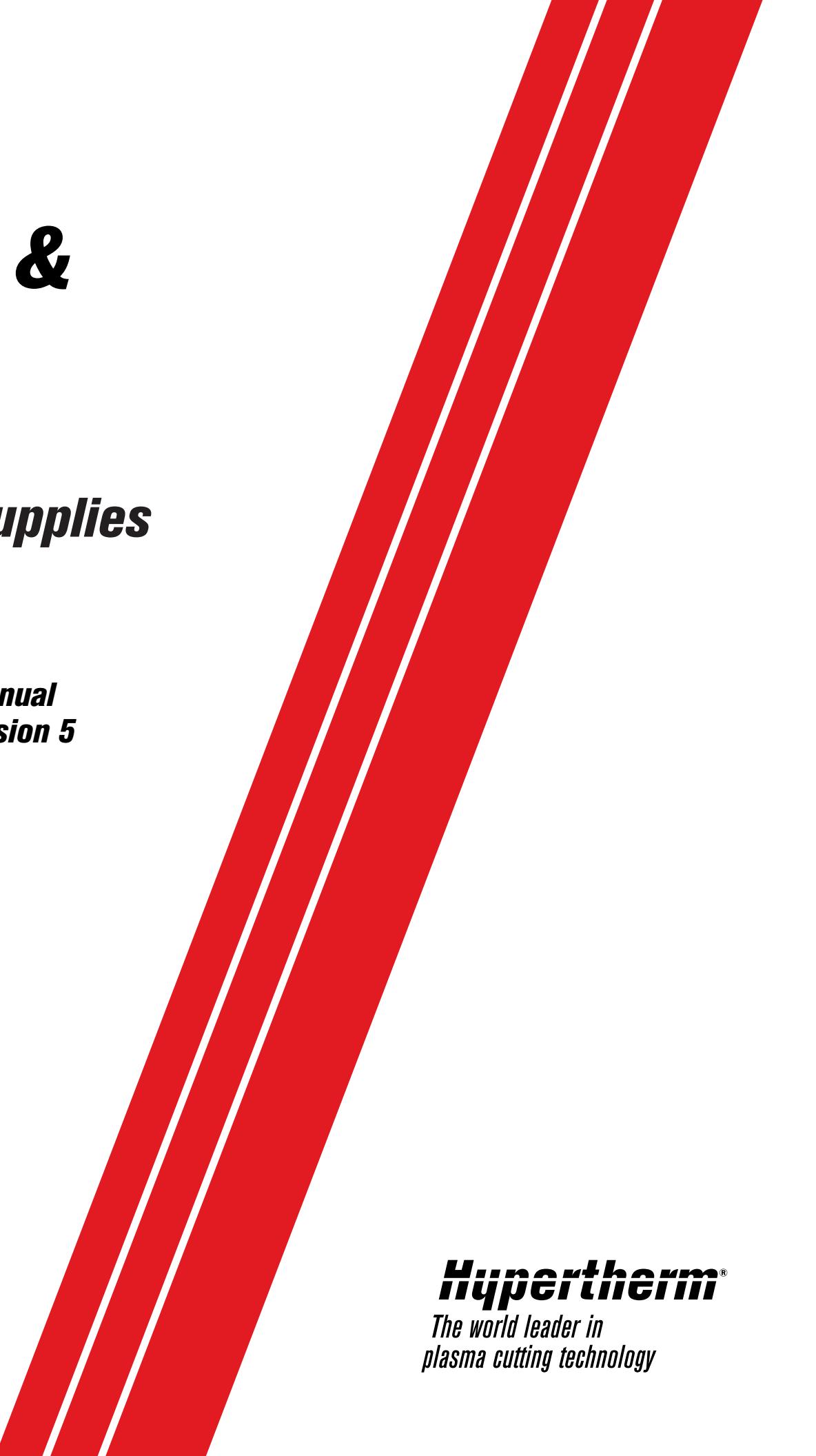


H401 & H601

Power Supplies

***Instruction Manual
800410 – Revision 5***



Hypertherm®
*The world leader in
plasma cutting technology*

Changed Page	Description	Rev 4 to 5
		1/21/02
2.2	Removed reference to using two 401's in parallel. Two <u>601</u> 's can be used in parallel. Added note in chart (235VDC for high current cutting). Changed power factor from 0.90 to 0.47.	
2.3	Added note in chart (235VDC for high current cutting). Changed power factor from 0.90 to 0.47.	
3.2	Added information on preferred power supply placement. Place parallel to rails, or if front must face rails leave 48" (1200mm) of space. Added art to show preferred placement.	
3.3	Reference to strain relief added to Power Cables and Fuses section of text.	
3.4	New picture. Added holes should be modified to accommodate cables to #1.	
3.5	Moved picture of buses from pg 3.4.	
3.6	Added pictures of 401 & 601 shunts. Text change on # 1 under PAC500 with H401 or H601 section	
3.7	Added note about PAC500L cable. Referenced 500L manual 800460. Added picture of terminal strip location and rearranged art.	
3.8	Removed art showing 401/401 parallel hookup. Now shows 401/601 & 601/601. Added reference to Letter designators for terminal strip as called out in other manuals.	
3.10	Corrected art to show jumper between terminals 8 & 9 (was 7 & 8) and wire connected to #9 (was #7). Step 1 references terminals 7 & 8 (was 8 & 9). Step 2 references terminals 8 & 9 (was 7 & 8). Added reference to letter designators of terminal #'s 6-10 (H,J,M,N,G). Added note. Programmable remote will not function, digital remote will function	
5.3	Corrected jumper positions under "current control potentiometer not functioning". From front panel, jumper between 7 & 8 (was 8 & 9). From remote, jumper between 8 & 9 (was 7 & 8).	
Section 6	Parts lists, old sections 6 & 7 combined into one list.	
6.2	Added part # for amber lamp assembly.	
6.6	Added part # for resistors(4) located on capacitors.	
Section 7	This is now the wiring diagrams section. Updated schematics from HDR.	

H401 & H601

Instruction Manual

(P/N 800410)

Revision 5 – January, 2002

**Hypertherm, Inc.
Hanover, NH USA**

www.hypertherm.com

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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
Rodenhacher 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

Hypertherm Brasil Ltda.

Rua Visconde de Santa Isabel, 20 – Sala 611
Vila Isabel, RJ
Brasil CEP 20560-120
55 21 2278 6162 Tel
55 21 2578 0947 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.

CE Safety

Power supplies are intended for an over voltage category III power source. See Section 6.1 of IEC 60974-1.

Power supplies are intended for environmental conditions of pollution degree 3 minimum. See Section 6.1 of IEC 60974-1.

Power supplies must not be used for a pipe-thawing application. See Section 17N of IEC 60974-1.

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, 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.

TABLE OF CONTENTS

Electromagnetic Compatibility (EMC)	i
Warranty	ii
 Section 1 SAFETY	
Recognize Safety Information.....	1-2
Follow Safety Instructions	1-2
Cutting Can Cause Fire or Explosion	1-2
Electric Shock Can Kill.....	1-3
Cutting Can Produce Toxic Fumes.....	1-3
A Plasma Arc Can Cause Injury and Burns.....	1-4
Arc Rays Can Burn Eyes and Skin.....	1-4
Grounding Safety.....	1-4
Compressed Gas Equipment Safety	1-5
Gas Cylinders Can Explode If Damaged	1-5
Noise Can Damage Hearing	1-5
Pacemaker and Hearing Aid Operation	1-5
A Plasma Arc Can Damage Frozen Pipes.....	1-5
Additional Safety Information	1-5
Warning Label.....	1-6
 Section 1a SÉCURITÉ	
Identifier les consignes de sécurité.....	1a-2
Suivre les instructions de sécurité	1a-2
Le coupage peut provoquer un incendie ou une explosion	1a-2
Les chocs électriques peuvent être fatals.....	1a-3
Le coupage peut produire des vapeurs toxiques	1a-3
L'arc plasma peut provoquer des blessures ou des brûlures	1a-4
Mise à la masse et à la terre	1a-4
Les rayons de l'arc peuvent brûler les yeux et la peau.....	1a-4
Sécurité des bouteilles de gaz comprimé	1a-5
Les bouteilles de gaz comprimé peuvent exploser en cas de dommages	1a-5
Le bruit peut provoquer des problèmes auditifs.....	1a-5
Pacemakers et prothèses auditives.....	1a-5
Étiquette de sécurité	1a-6
 Section 2 SPECIFICATIONS	
Introduction	2-2
H401 or H601 with HT4001.....	2-2
H401 or H601 with PAC500	2-2
Specifications.....	2-2
H401 Power Supply	2-2
H601 Power Supply	2-3
H401 & H601 Dimensions	2-4
H401 & H601 Duty Cycle Curves	2-4
H401 & H601 Volt-Amp Curves	2-4
 Section 3 INSTALLATION	
Installation Requirements	3-2
Positioning the Power Supply	3-2
Grounding Requirements.....	3-3
Noise Levels	3-3

TABLE OF CONTENTS

Power Requirements	3-3
Power Cables and Fuses	3-3
Connecting the Primary Power	3-4
Line Disconnect Switch	3-5
Secondary Connections	3-6
PAC500 with H401 or H601	3-6
PAC500 Control Cable with H401 or H601	3-7
Parallel Power Supply Connections	3-8
PAC500 Water Muffler and Water Supply System Connections	3-9
Water supply connections	3-9
Current Control Potentiometer Connections	3-10
HT4001 with H401 or H601	3-10
Section 4 OPERATION	
Controls and Indicators	4-2
Operation	4-3
H401 or H601 with HT4001	4-3
H401 or H601 with PAC500	4-3
Output Current for Power Supply Dial Settings	4-4
Section 5 MAINTENANCE AND TROUBLESHOOTING	
Routine Maintenance	5-2
Power Supply Circuit Description	5-2
Troubleshooting	5-3
Section 6 PARTS LIST – H401 AND H601	
Front Panel Outside	6-2
SCR and Shunt Detail	6-3
Transformer and Inductor	6-4
Temperature Switches	6-5
Upper Inside	6-6
Fans	6-7
PCB Assemblies	6-8
Section 7 WIRING DIAGRAMS 7-1	
Appendix A SYSTEM GROUNDING a-1	
System Grounding Requirements	a-1
Suggested Ground Cable Routing	a-1
Power Supply	a-1
Equipment Grounding	a-1
Work Table Grounding	a-2

Section 1

SAFETY

In this section:

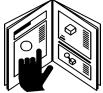
Recognize Safety Information	1-2
Follow Safety Instructions	1-2
Cutting Can Cause Fire or Explosion.....	1-2
Electric Shock Can Kill	1-3
Cutting Can Produce Toxic Fumes.....	1-3
A Plasma Arc Can Cause Injury and Burns.....	1-4
Arc Rays Can Burn Eyes and Skin	1-4
Grounding Safety	1-4
Compressed Gas Equipment Safety.....	1-5
Gas Cylinders Can Explode If Damaged	1-5
Noise Can Damage Hearing	1-5
Pacemaker and Hearing Aid Operation.....	1-5
A Plasma Arc Can Damage Frozen Pipes	1-5
Additional Safety Information	1-5
Warning Label	1-6



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.

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



FOLLOW SAFETY INSTRUCTIONS

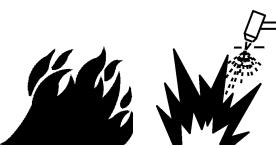
Read carefully all safety messages in this manual and safety labels on your machine.

- 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.

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

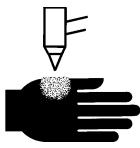
Cutting can produce toxic fumes and gases that deplete oxygen and cause injury or death.

- 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.

SAFETY



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
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

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.

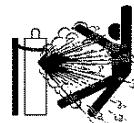
Work Table Connect the work table to an earth ground, in accordance with appropriate national or local electrical codes.

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.

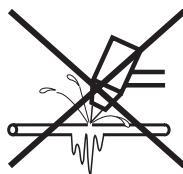
- Handle and use compressed gas cylinders in accordance with applicable national or local codes.
- Never use a cylinder that is not upright and secured in place.
- Keep the protective cap in place over valve except when the cylinder is in use or connected for use.
- Never allow electrical contact between 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

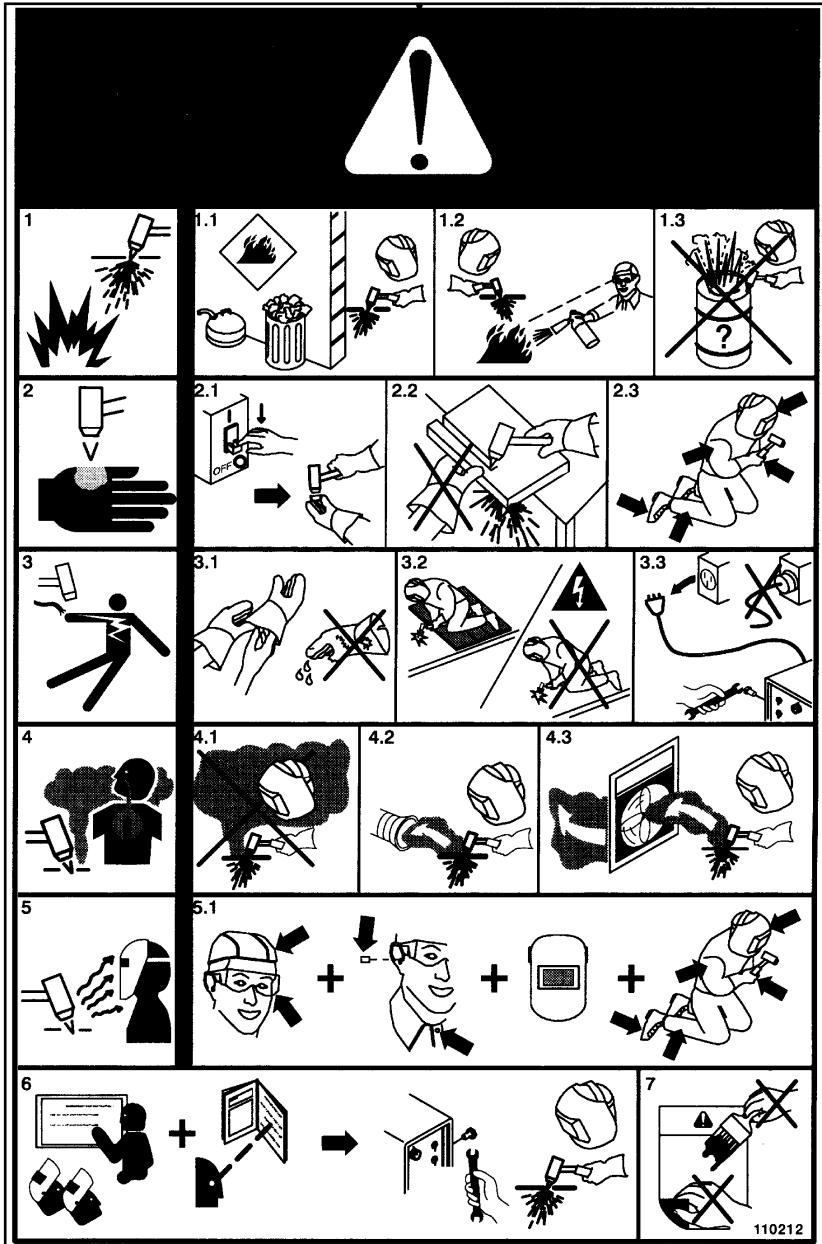
1. ANSI Standard Z49.1, *Safety in Welding and Cutting*, American Welding Society, 550 LeJeune Road P.O. Box 351020, Miami, FL 33135
2. ANSI Standard Z49.2, *Fire Prevention in the Use of Cutting and Welding Processes*, American National Standards Institute 1430 Broadway, New York, NY 10018
3. ANSI Standard 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

SAFETY

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.

Section 1a

SÉCURITÉ

Dans cette section :

Identifier les consignes de sécurité	1a-2
Suivre les instructions de sécurité.....	1a-2
Danger Avertissement Précaution.....	1a-2
Le coupage peut provoquer un incendie ou une explosion.....	1a-2
Prévention des incendies, Prévention des explosions	1a-2
Risque d'explosion argon-hydrogène et méthane	1a-2
Détonation de l'hydrogène lors du coupage de l'aluminium	1a-2
Les chocs électriques peuvent être fatals	1a-3
Prévention des chocs électriques.....	1a-3
Le coupage peut produire des vapeurs toxiques	1a-3
L'arc plasma peut provoquer des blessures ou des brûlures.....	1a-4
Torches à allumage instantané.....	1a-4
Les rayons de l'arc peuvent brûler les yeux et la peau	1a-4
Protection des yeux, Protection de la peau, Zone de coupage	1a-4
Mise à la masse et à la terre	1a-4
Câble de retour, Table de travail, Alimentation	1a-4
Sécurité des bouteilles de gaz comprimé	1a-5
Les bouteilles de gaz comprimé peuvent exploser en cas de dommages.....	1a-5
Le bruit peut provoquer des problèmes auditifs	1a-5
Pacemakers et prothèses auditives	1a-5
Un arc plasma peut endommager les tuyaux gelés	1a-5
Étiquette de sécurité	1a-6

SÉCURITÉ



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.

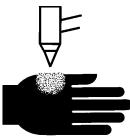
- Conserver le poste de coupage bien aéré ou utiliser un masque respiratoire homologué.
- Ne pas procéder au coupage près d'endroits où s'effectuent le dégraissage, le nettoyage ou la vaporisation. Certains solvants chlorés se décomposent sous l'effet des rayons ultraviolets et forment du phosgène.
-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

SÉCURITÉ



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



Puissance des verres teintés	
AWS (É.-U.)	ISO 4850
N° 8	N° 11
N° 10	N° 11-12
N° 12	N° 13
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 crissipin, chaussures et casque de sécurité.
- Vêtements ignifugés 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.

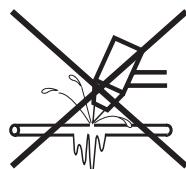


PACEMAKERS ET PROTHÈSES AUDITIVES

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.

SÉCURITÉ

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.

Section 2**SPECIFICATIONS**

In this section:

Introduction	2-2
H401 or H601 with HT4001.....	2-2
H401 or H601 with PAC500.....	2-2
Specifications.....	2-2
H401 Power Supply	2-2
H601 Power Supply	2-3
H401 & H601 Dimensions.....	2-4
H401 & H601 Duty Cycle Curves.....	2-4
H401 & H601 Volt-Amp Curves	2-4

SPECIFICATIONS

Introduction

H401 or H601 with HT4001

Refer to HT4001 instruction manuals 802470 for 200V HT4001 power supplies; or 802000 for all other voltage HT4001 power supplies.

H401 or H601 with PAC500

The H401 provides power to cut stainless steel and non-ferrous metals up to 1-inch thick and mild steel up to 1/2-inch thick. The H601 provides power to cut stainless and non-ferrous metals up to 2-inches thick and mild steel up to 1-inch thick.

One H401 and one H601, or two H601s in parallel can provide the full power capacity of the PAC500 torch and cut at 1000 amps. At 1000 amps, the PAC500 torch can cut stainless steel to 5-inches thick, and aluminum and other non-ferrous metals to 6-inches thick.

Specifications

H401 Power Supply

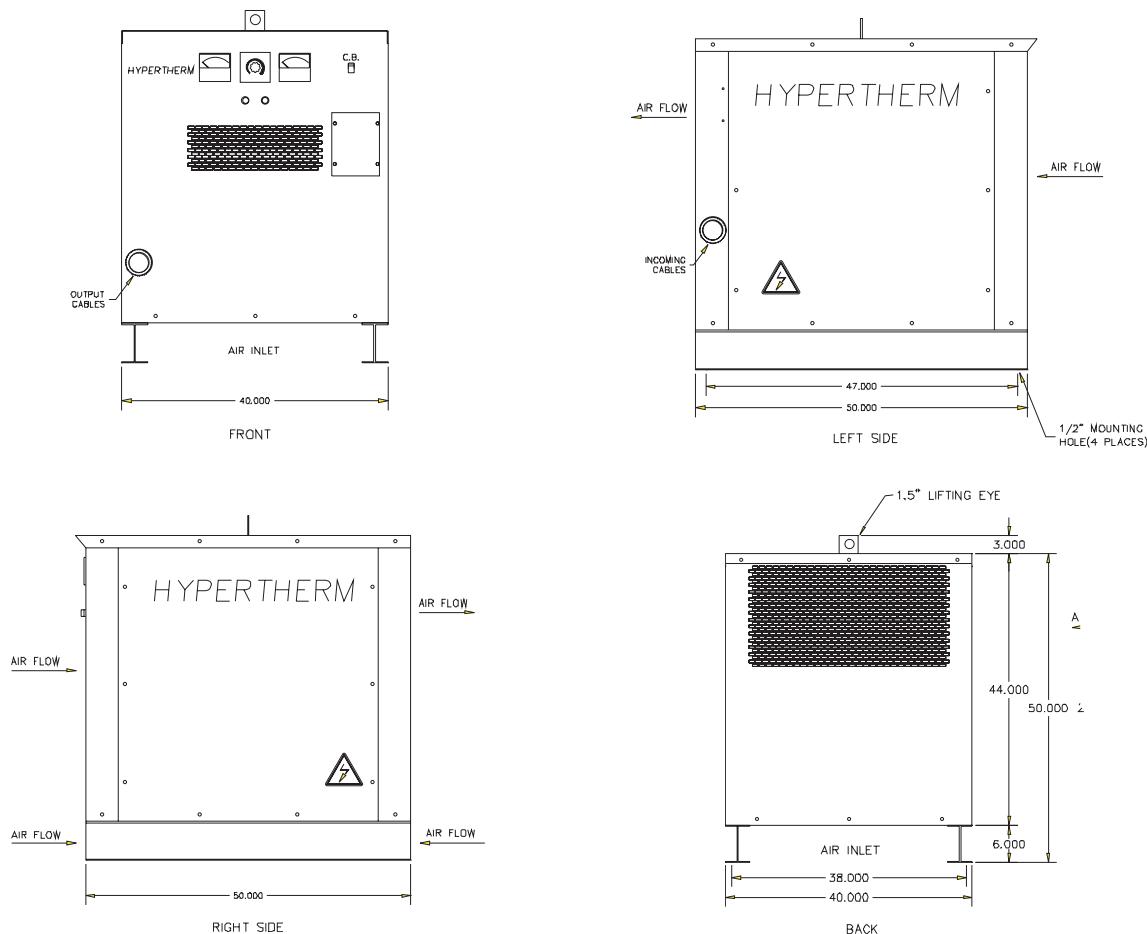
Maximum OCV (U_0)	400 VDC
Current Adjustment Range (I_2)	200 to 500 A
Output Voltage (U_2)	80 to 200 VDC (235VDC for high current cutting)
Duty Cycle Rating (X)	60% @ 100 kW, 104° F (40° C) 100% @ 80 kW, 104° F (40° C)
Temperature Rating	14° F (-10° C) to 104° F (40° C)
Power Factor($\cos\phi$)	0.47
Cooling	Forced Air (Class F)
Input Power (U_1 – Input Voltage; I_1 – Input Current)	
036038	200 VAC (U_1), 3 Phase, 50 Hz, 492 A (I_1)
036036	400 VAC (U_1), 3 Phase, 50 Hz, 247 A (I_1)
036035	480 VAC (U_1), 3 Phase, 60 Hz, 206 A (I_1)
036037	600 VAC (U_1), 3 Phase, 60 Hz, 164 A (I_1)
Dimensions and Weight	
Width	40" (1015 mm)
Maximum Height	53" (1345 mm)
Maximum Depth	50" (1270 mm)
Weight	2250 lbs (1022 kg)

H601 Power Supply

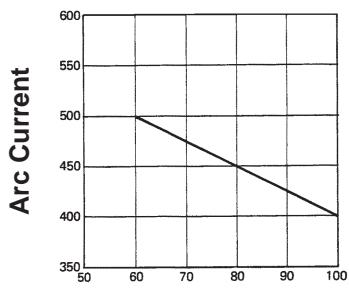
Maximum OCV (U_0)	400 VDC
Current Adjustment Range (I_2)	200 to 750 A
Output Voltage (U_2)	80 to 200 VDC (235VDC for high current cutting)
Duty Cycle Rating (X)	60% @ 150 kW, 104° F (40° C) 100% @ 120 kW, 104° F (40° C)
Temperature Rating	14° F (-10° C) to 104° F (40° C)
Power Factor($\cos\phi$)	0.47
Cooling	Forced Air (Class F)
Input Power (U_1 – Input Voltage; I_1 – Input Current)	
036034	200 VAC (U_1), 3 Phase, 50 Hz, 740 A (I_1)
036032	400 VAC (U_1), 3 Phase, 50 Hz, 370 A (I_1)
036031	480 VAC (U_1), 3 Phase, 60 Hz, 310 A (I_1)
036033	600 VAC (U_1), 3 Phase, 60 Hz, 246 A (I_1)
Dimensions and Weight	
Width	40" (1015 mm)
Maximum Height	53" (1345 mm)
Maximum Depth	50" (1270 mm)
Weight	2250 lbs (1022 kg)

SPECIFICATIONS

H401 & H601 Dimensions

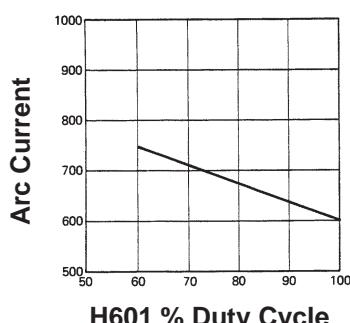


H401 & H601 Duty Cycle Curves

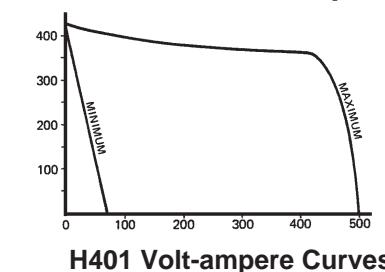


Note:

The duty cycle of a power supply is the percentage of a 10-minute period that a power supply can safely be operated at a given output.

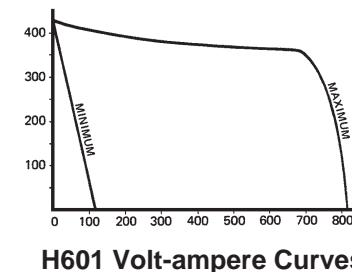


H401 & H601 Volt-Amp Curves



Note:

The voltage/amp curves, show the output voltage available at any given output current within the limits of the minimum and maximum current control settings. Load voltage is determined by arc characteristics and torch height above the workpiece.



Section 3**INSTALLATION**

In this section:

Installation Requirements	3-2
Positioning the Power Supply	3-2
Grounding Requirements.....	3-3
Noise Levels	3-3
Power Requirements	3-3
Power Cables and Fuses	3-3
Connecting the Primary Power	3-4
Line Disconnect Switch	3-5
Secondary Connections.....	3-6
PAC500 with H401 or H601	3-6
PAC500 Control Cable with H401 or H601	3-7
Parallel Power Supply Connections	3-8
PAC500 Water Muffler and Water Supply System Connections.....	3-9
Current Control Potentiometer Connections	3-10
HT4001 with H401 or H601.....	3-10

INSTALLATION

Installation Requirements



WARNING ELECTRICAL SHOCK CAN KILL

All installation and service of the electrical components must conform to national or local electrical codes. This work should be performed only by qualified, licensed personnel.

Direct any technical questions to the nearest Hypertherm Technical Service Department listed in the front of this manual, or your authorized Hypertherm distributor.



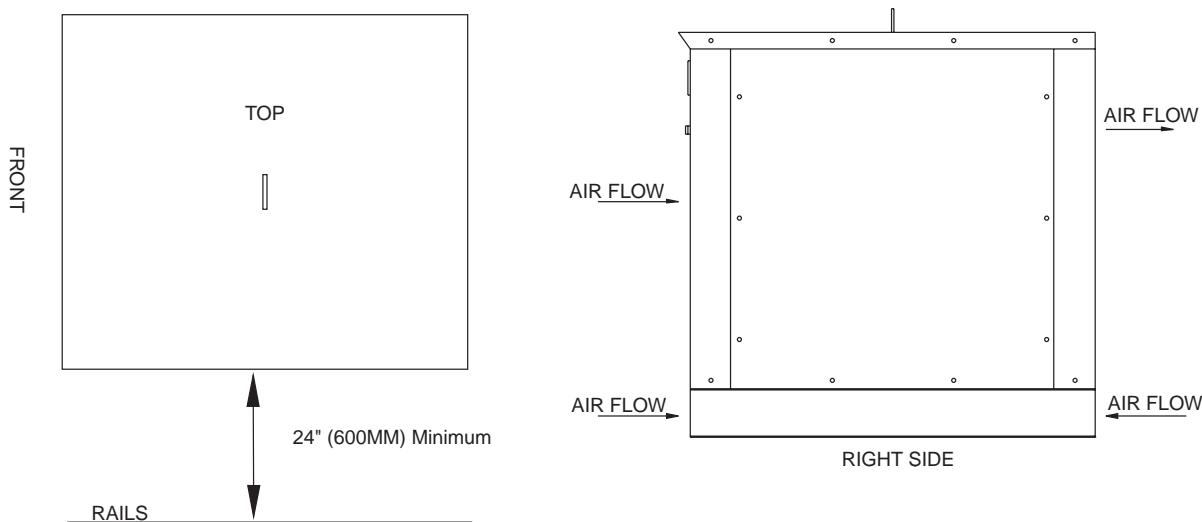
WARNING ELECTRICAL SHOCK CAN KILL

Remove all electrical connections to power supply before moving, positioning or servicing. Transporting the power supply can cause personal injury and equipment damage.

Positioning the Power Supply

Note: A lifting eye is provided for moving the power supply into place with a crane or hoist. It may also be moved by forklift if the forks are long enough to extend the entire length of the base. Take care when lifting with the forks so that the underside of the power supply is not damaged. Do not lift the power supply by the cross members supporting the transformer windings.

- Place the power supply in an area that is free of excessive moisture, has proper ventilation, and is relatively clean. The preferred placement is with the power supply parallel to the rails (see below left). If the front of the machine must face the rails, allow for at least 48" (1200 mm) of open space between them. Allow at least 24" (600 mm) on all other sides of the power supply for free air flow, and for accessing the sides of the power supply for servicing. Do not place any additional filter device over the air intake locations. This reduces cooling efficiency and **VOIDS THE WARRANTY**.



Grounding Requirements

Proper grounding is essential for personal safety and to prevent emission of high-frequency interference. See the Appendix section for system grounding requirements.

Connect the worktable to a high-quality earth ground from within 20 feet (6 m) of the table. A suitable ground consists of a solid copper rod of at least 3/4-inch (19 mm) diameter driven to a depth of at least 8 feet (2.5 m) into the earth below the permanent moisture level. Ensure that all grounding connections are tight to avoid excessive heating. See also *Grounding* in the Safety section. For additional information consult national or local electric codes.

Noise Levels

Acceptable noise levels as defined by national or local codes may be exceeded by this plasma system. Always wear proper ear protection when cutting or gouging. See also Noise Protection in the Safety section of this manual.

Power Requirements

All switches, slow-blow fuses and power cables are customer supplied and must be chosen as outlined by applicable national or local electrical codes. Installation must be performed by a licensed electrician. If slow-blow fuses are not available or not allowed per applicable codes, use a motor-start circuit breaker.

Power Cables and Fuses

Wire sizes vary based on the distance of the receptacle from the main box. Use a 4-conductor Type SO input power cable with a conductor temperature rating of 140°F (60°C). The proper strain relief should be used to prevent damage to input power cables. The cable should be installed only by a licensed electrician. Always connect the power cable to the power supply before connecting to the line disconnect switch.

Refer to the data tag on the rear of the power supply to verify the correct line voltage requirements and to determine the continuous current draw for the unit.

Fuse sizes should never exceed the capacity of the power line conductors. Use FRS type fuses.

Connecting the Primary Power



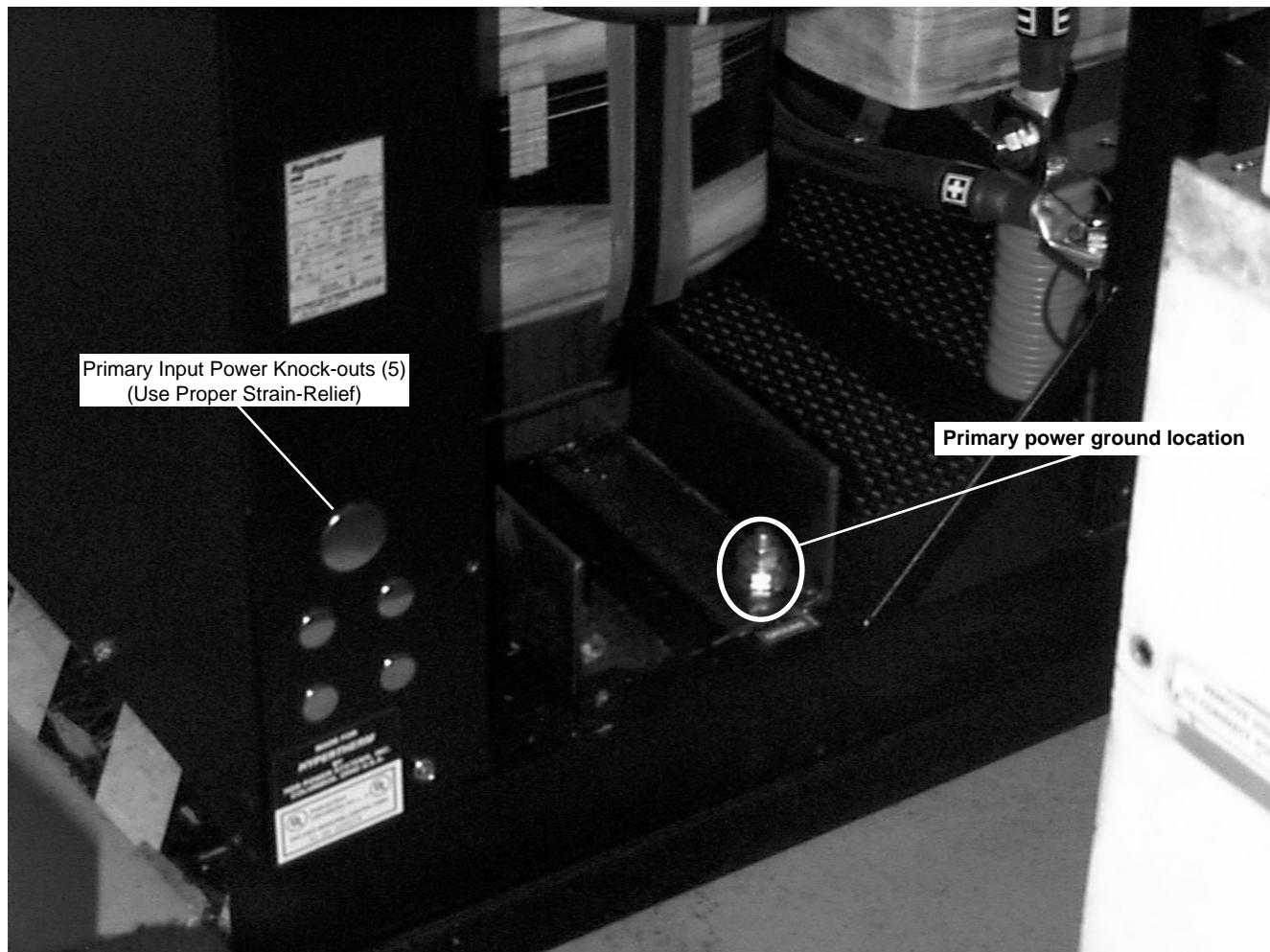
WARNING
ELECTRICAL SHOCK CAN KILL

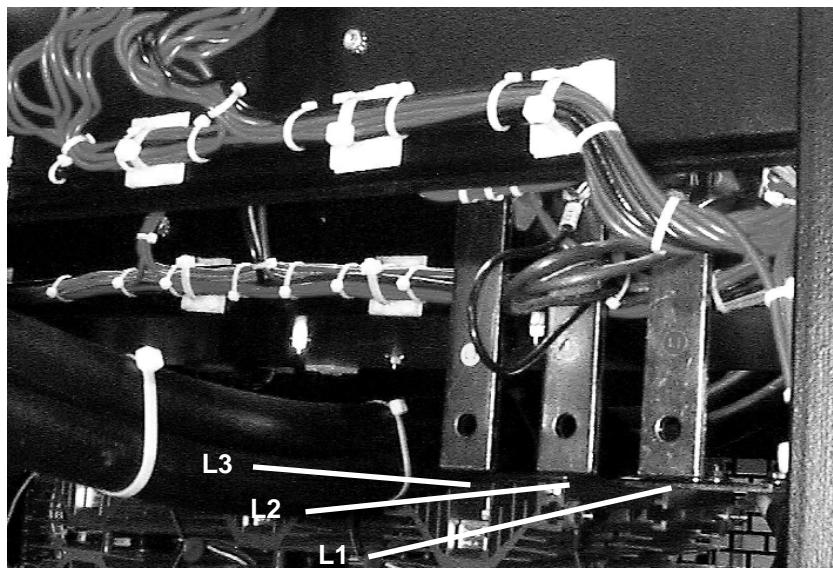
All line disconnect switches for all components of the plasma system must be in the OFF position before making the power cable connections! In the U.S., use a "lock-out/tag-out" procedure until installation is complete. In other countries, follow appropriate local or national safety procedures.

Power Cable to H401 or H601 Power Supply

Run the input conductors of the power cable within a flexible conduit or use heavy rubber jacketed cable.

1. Insert the primary power cables through the access holes on the left side panel of the power supply. Holes should be modified to accommodate cables.
2. Connect the power leads to the L1, L2, and L3 buses located off the contactor and accessible behind the center wall. See picture on next page.
3. Connect the ground to the designated ground point in the power supply. See picture below.





Line Disconnect Switch

The line disconnect switch serves as the supply voltage disconnecting (isolating) device. Install this switch on a wall near the power supply (supplies) for easy accessibility by the operator. **The line disconnect switch must be installed by qualified personnel following all applicable national or local codes.** The switch should:

- isolate the electrical equipment and disconnect all live conductors from the supply voltage when in the "OFF" position
- have one "OFF" and one "ON" position clearly marked with "0" (OFF) and "1" (ON)
- have an external operating handle capable of being locked in the "OFF" position
- contain a power operated mechanism that serves as an emergency stop
- have slow-blow fuses installed for the proper breaking capacity
- have slow-blow fuses installed for the proper breaking capacity
- Provide power to only one power supply (parallel operation requires a separate and unique disconnect switch for each power supply)

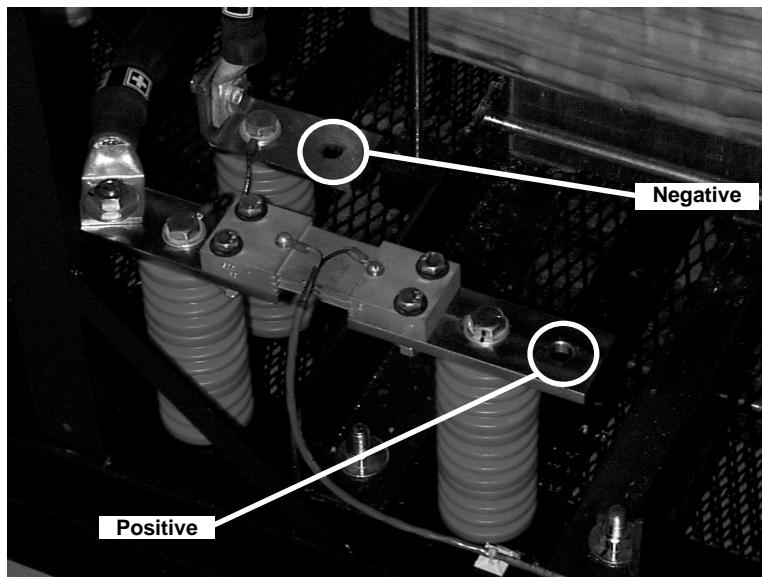
Refer to the data plate on the rear of the power supply to verify the correct line voltage and current draw requirements for the power supply.

		WARNING ELECTRICAL SHOCK CAN KILL
<p>The line disconnect switch must be in the OFF position and remain in the OFF position for the remainder of the installation of the H401 or H601 power supply.</p>		
		WARNING Parallel Systems ELECTRICAL SHOCK CAN KILL
<p>If the power supply is used in parallel with another power supply, or used as a slave unit with another power supply, both line disconnect switches must be in the OFF position and remain in the OFF position during installation and maintenance work.</p>		

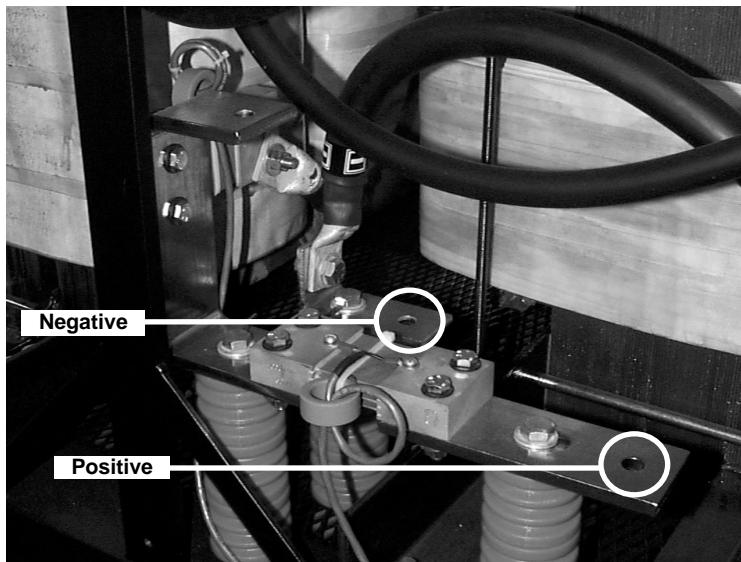
Secondary Connections

1. Use 4/0 gauge (100mm^2), 600 volt welding cable for secondary connections.
2. Pass secondary cables through the front panel access hole of the power supply.
3. Connect the positive and negative cables to the terminals located on the floor of the power supply as shown. If the total arc current will exceed 500 amps, use 4/0 (100mm^2) cables in pairs; 2 cables for the negative and 2 cables for the positive connections.

H401



H601



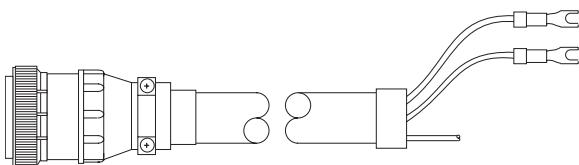
PAC500 with H401 or H601

1. Connect the negative cables to the electrode at the cathode block in the plumbing compartment of the PAC500 plasma console. See instruction manual 800370 Figure 7.
2. Connect the positive cables to the star ground on the water table.

PAC500 Control Cable with H401 or H601

The power supply control cable from the PAC500 console to the H401 or H601 power supply carries signals for the contactor control relay, and the pilot arc ground. Note: For PAC500L use cable as designated in manual 800460.

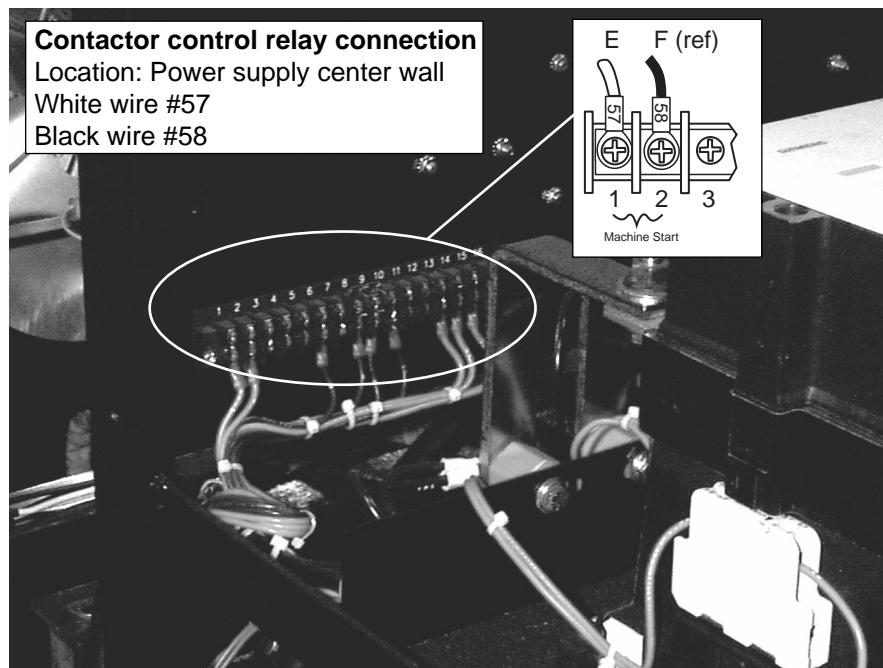
Caution: The power supply contactor (CON) is energized by the control relay (CR1). Energizing the contactor directly with the plasma console circuitry will result in damage to the console flow switches due to excessive inrush currents.



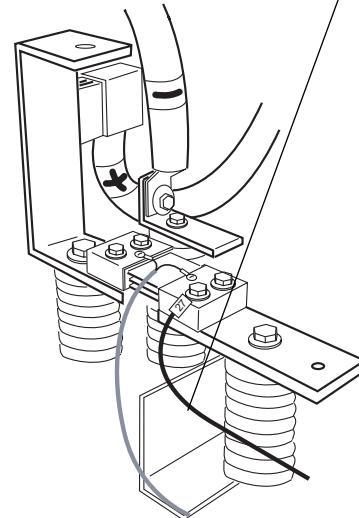
Part No.	Length
028009	50 ft (15 m)
128088	150 ft (46 m)
128089	175 ft (53 m)

PAC500 2RECP End	Color	Wire Terminal End	Connection	Function
2RECP-A	White	57	T-1	Machine Start
2RECP-B	Black	58	T-2	Machine Start
2RECP-C	Red	27	+ DC Output	P.A. Ground
2RECP-D	Green	Gnd	No Connection	Spare

PAC500 Control Cable Connections



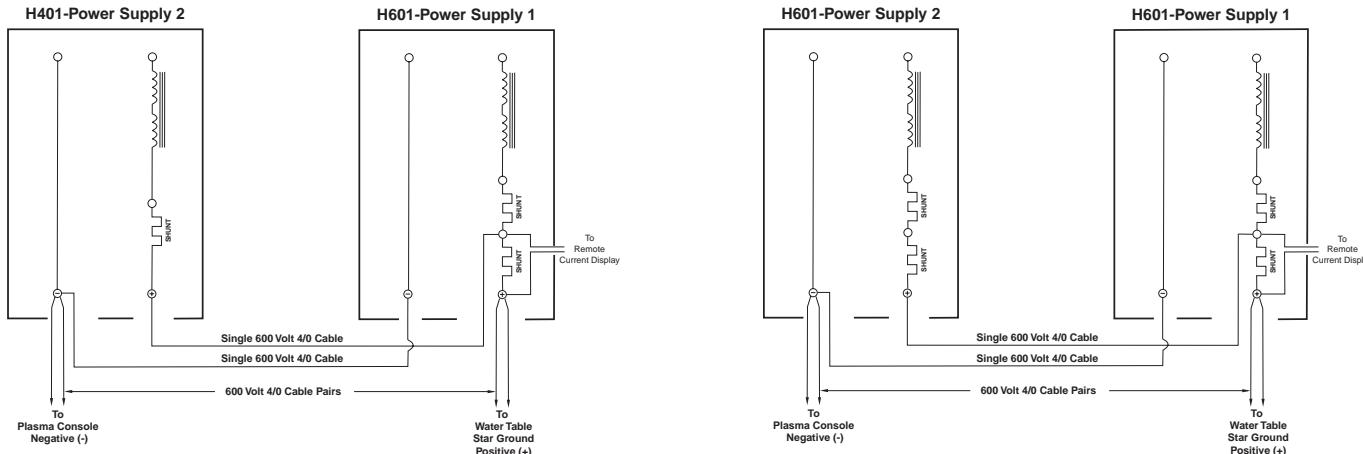
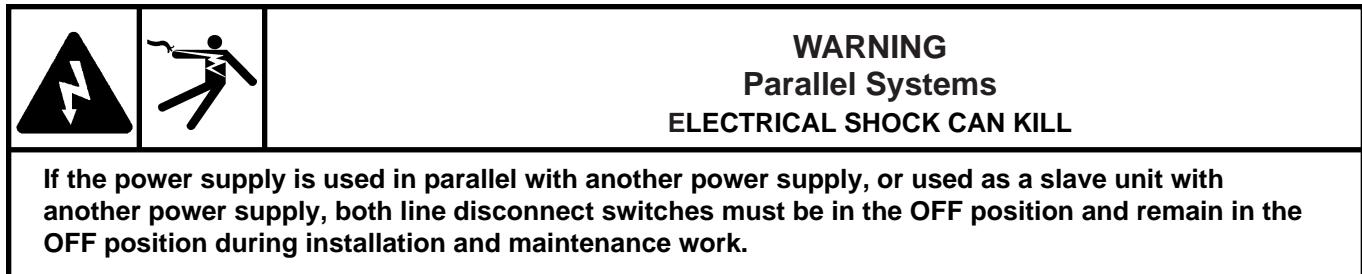
Pilot arc ground connection
Location: +DC output
Red wire #27



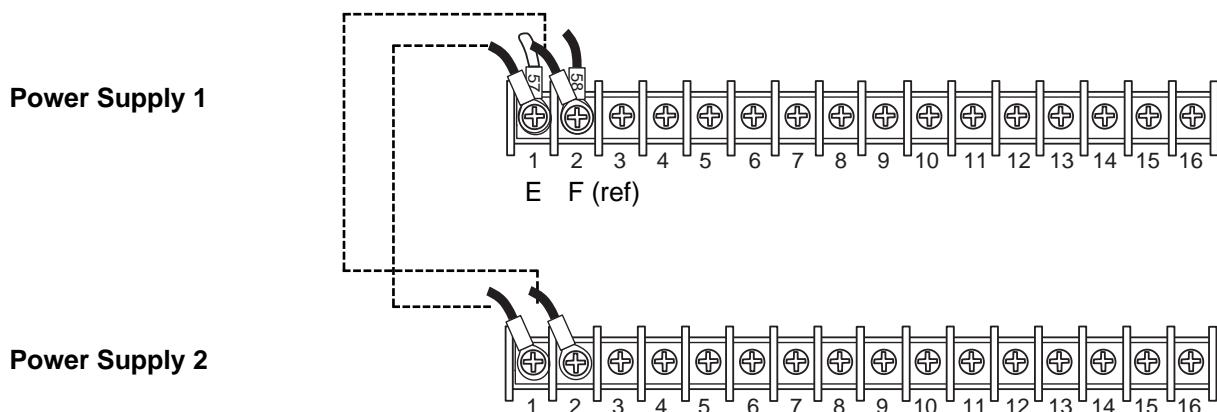
INSTALLATION

Parallel Power Supply Connections

For increased capacity, power supplies may be connected in parallel. See figures below. This arrangement will also cause the panel ammeter on power supply #1 to indicate the total arc current produced by both power supplies. The panel ammeter on power supply #2 will indicate only the part of the arc current produced by power supply #2.



Connect the contactor control relays in parallel.



PAC500 Water Muffler and Water Supply System Connections

Connect each pump to a separate wall-mounted disconnect switch that is also connected to a master line disconnect switch. See *Line Disconnect Switch* earlier in this section.

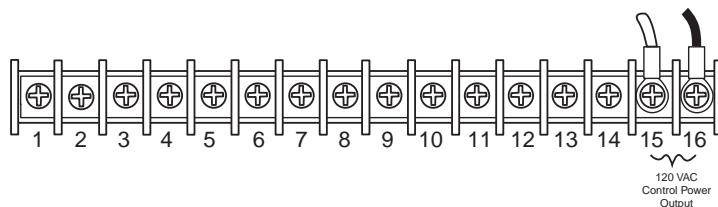
The power supply provides 120VAC for the operation of the water supply system and water muffler pump contactors.

Water Supply System Connections

Connect the water supply system to run continuously when the power supply primary power is turned on.

Water supply connections

Location: Power supply center wall



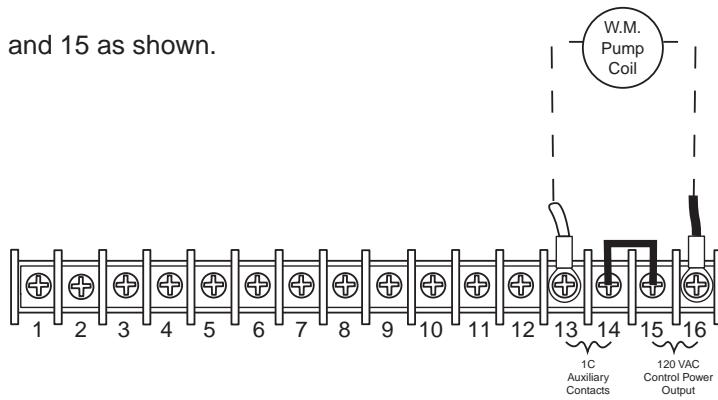
Water Muffler System Connections

Connect the water muffler system to run when the power supply contactor is closed.

Note: Install a jumper between terminals 14 and 15 as shown.

Water muffler pump connections

Location: Power supply center wall



Current Control Potentiometer Connections

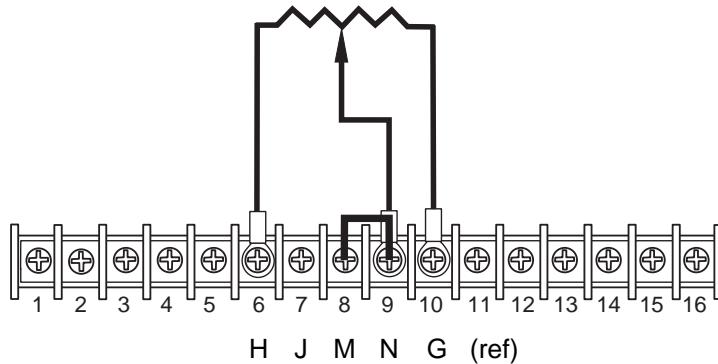
Remote current adjustment of the H401 or H601 power supplies is possible from Hypertherm remote current control and the THC-1/RVC height control system. Refer to the instruction manuals provided with these units for the correct method of wiring.

Note: The programmable remote will not function with the H401/H601. The digital remote will function with the H401/H601.

To operate the current control from a remote potentiometer:

1. Remove the jumper between terminals 7 and 8.
2. Install the jumper between terminals 8 and 9.
3. Make connections as shown below.

Remote current control connections
Location: Power supply center wall



HT4001 with H401 or H601

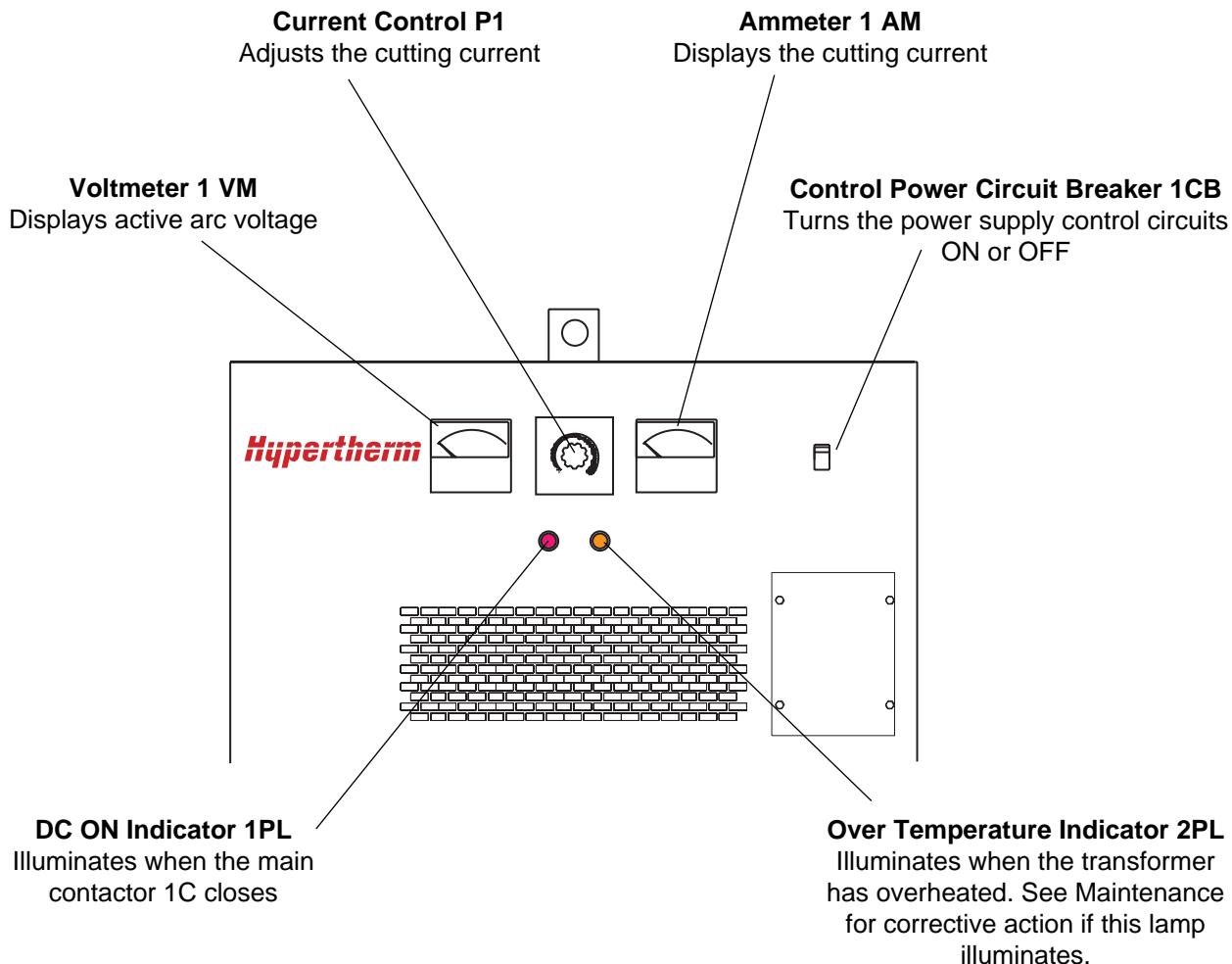
Refer to HT4001 instruction manuals 802470 for 200V HT4001 power supplies, or 802000 for all other voltage HT4001 power supplies.

Section 4**OPERATION**

In this section:

Controls and Indicators	4-2
Operation	4-3
H401 or H601 with HT4001	4-3
H401 or H601 with PAC500	4-3
Output Current for Power Supply Dial Settings	4-4

Controls and Indicators



Operation

H401 or H601 with HT4001

Refer to HT4001 instruction manual 802470 for 200V HT4001 power supplies or 802000 for all other voltage HT4001 power supplies.

H401 or H601 with PAC500

Caution: When primary power is applied to the power supply, the water supply system, if connected, will be energized. Always verify that the water supply line is open to avoid damage to the pump.

1. Turn the line disconnect switch on. When the primary power is applied, the power supply cooling fan(s) and the water supply system will turn on immediately. The DC ON indicator will be extinguished and the power supply voltmeter will read zero volts.
2. Find the correct current setting from the operating data charts in the PAC500 or PAC500L instruction manuals.
3. Determine the proper power supply dial setting from Figure 4-1. After an arc is established, the setting may be readjusted to the exact current desired.
4. The start sequence of the plasma arc control in "RUN" mode will close the power supply contactor.
See the PAC500 instruction manual 800370 or PAC500L instruction manual 800460 to operate the PAC500 system.

When the power supply contactor closes, the red DC ON indicator on the front of the power supply (1PL) will illuminate and the voltmeter will read 400V. After arc ignition, the voltage will drop to 120 – 220 volts, depending on the operating conditions selected.

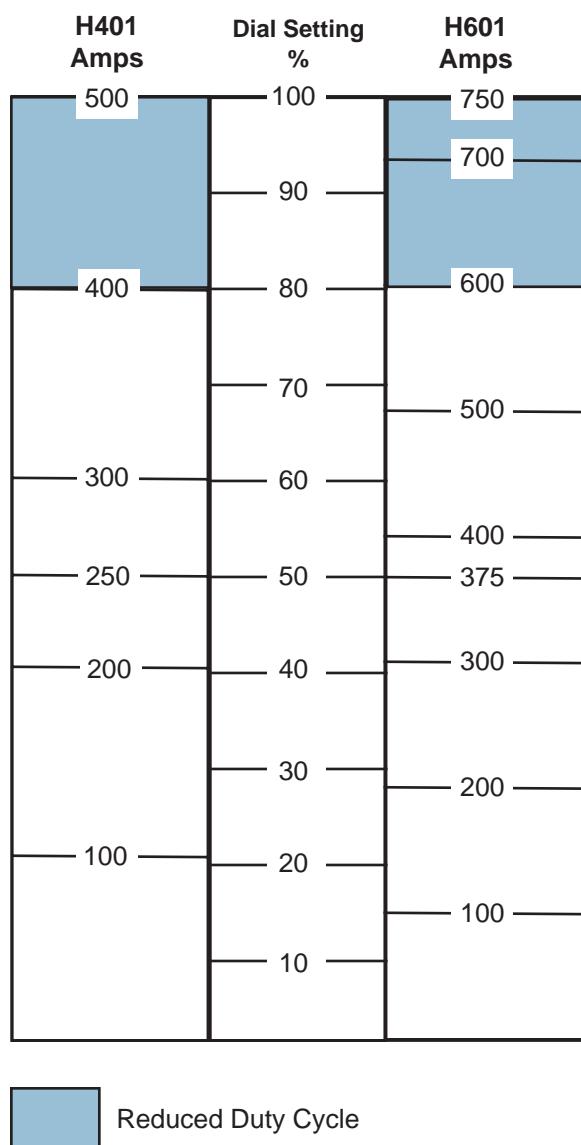


Figure 4-1 Output Current for Power Supply Dial Settings
(Dial Setting is a % of Power Supply Current Output)

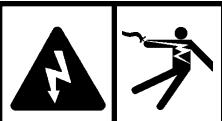
Section 5**MAINTENANCE AND TROUBLESHOOTING**

In this section:

Routine Maintenance	5-2
Power Supply Circuit Description	5-2
Troubleshooting	5-3

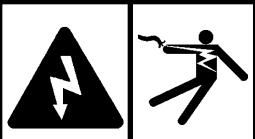
Routine Maintenance

Clean, service and inspect the H401 and H601 power supplies at 6-month intervals.



WARNING ELECTRICAL SHOCK CAN KILL

Shut off all power supplies at their primary disconnect switches. In the U.S., use a “lock-out/tag-out” procedure. In other countries, follow appropriate local or national safety procedures. Shut off all plasma control circuits to prevent control power from entering the power supply. Verify with a voltmeter that no power is present on the power supply primary and control circuit terminals (L1, L2, L3, 1T-1 and 1T-2).



WARNING Parallel Systems ELECTRICAL SHOCK CAN KILL

If the power supply is used in parallel with another power supply, or used as a slave unit with another power supply, both line disconnect switches must be in the OFF position and remain in the OFF position during installation and maintenance work.

- Remove side panels and blow out any dust with a low pressure dry air line.
- Clean air passages and cooling fans.
- Check for loose wiring and components. Make repairs as necessary.
- Lubricate the fan motor(s) every 2 years with SAE 20 weight motor oil.

Power Supply Circuit Description

The H401 and H601 power supplies are 3-phase transformer-rectifier type, D.C. power sources using SCRs in a full-wave bridge rectifier circuit. Low rms ripple current is achieved through use of 6 SCRs into an inductor. Filters are provided to protect the SCRs from high-voltage transients and high-frequency currents from the plasma arc ignition circuit. A thermostat protects transformer windings from overload and overheated conditions. The thermostat resets automatically when the transformers return to safe operating temperatures. Circuit boards control the SCRs. The current can be adjusted from the front panel mounted potentiometer or by a remote potentiometer.

Troubleshooting

Correct malfunctions of the solid-state control circuits by replacing the printed circuit boards.

Current control potentiometer not functioning:

- Jumper is positioned incorrectly. To adjust the current from the front panel potentiometer, place the jumper between terminals 7 and 8. A remote potentiometer requires a jumper between terminals 8 and 9.

DC ON indicator (1PL) is illuminated, but there is no voltage:

- Contactor has failed.

DC ON indicator (1PL) is extinguished during the plasma start sequence:

- PAC500 plasma console is in “TEST” mode.
- DC ON lamp is burned out. If output voltage is indicated on the front panel voltmeter, the lamp is probably burned out.
- Control relay CR1 has failed.
- There is an interface failure. Check the wiring to the PAC500 plasma console and console flow switches.
- The thermal switch is open. If the power supply has been operating above the rated output, the situation will be corrected when the main transformer cools down.

Over-temperature indicator (2PL) is illuminated.

- A transformer or inductor thermal switch is open. If the power supply has been operating above the rated output, allow the main transformer to cool down by letting the fans run for 5 minutes or longer before attempting to cut again.
- Thermal switch failure. Thermal switches are normally closed and open when there is an over temperature condition. Check switches and associated wiring.

Open circuit voltage present, but the arc does not start:

- Surge injection circuit has failed. Check resistor R1 and capacitors C13A and C13B. These components are located across the power supply output. See the *Parts List* section to locate components.
- PAC500 plasma console high frequency generator or pilot arc circuits have failed.

Low output current and/or low open circuit voltage:

- A fuse is open in the 3-phase primary voltage supply.
- A transformer winding is open.
- Line voltage is low.

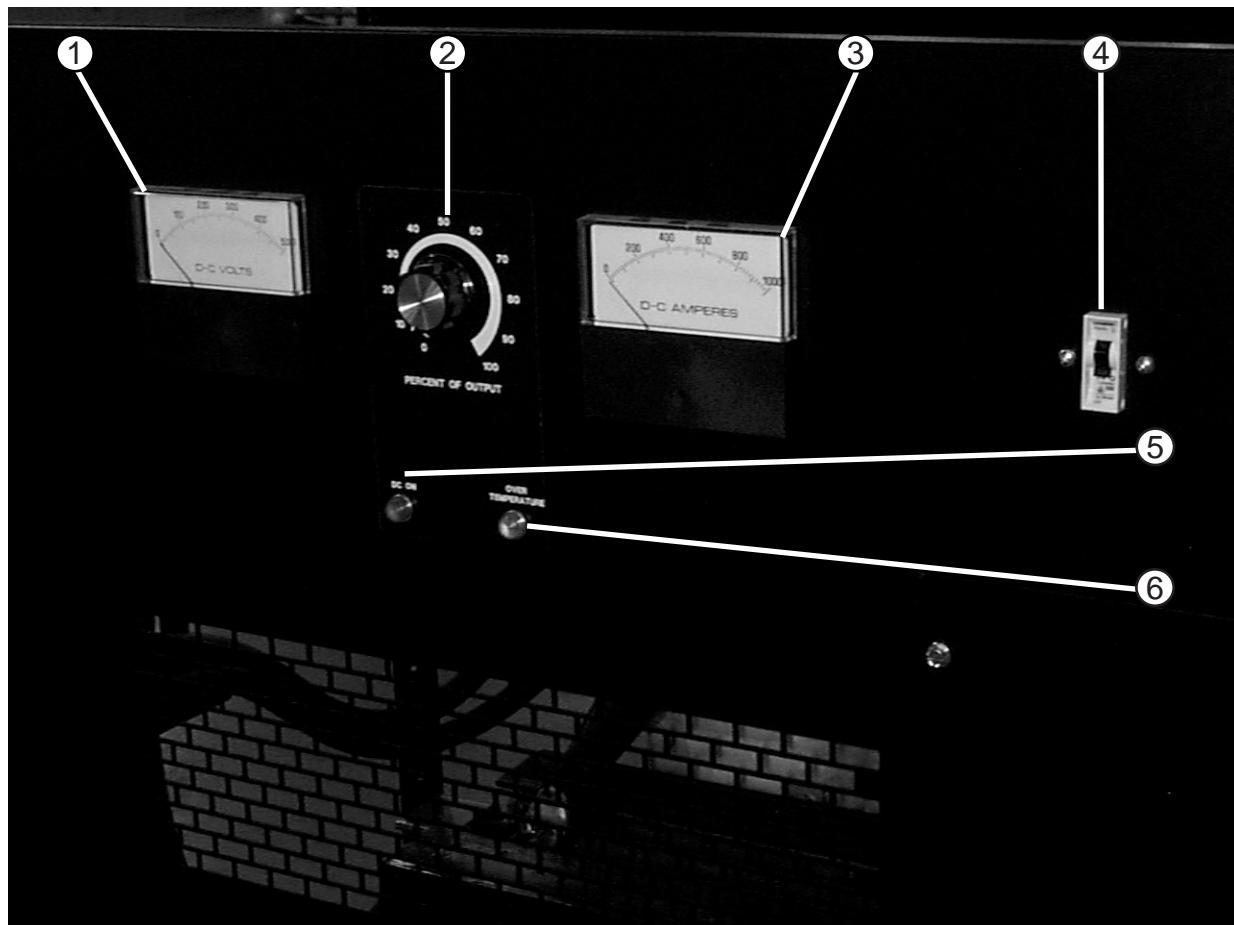
Section 6**PARTS LIST**

In this section:

Front Panel Outside	6-2
SCR and Shunt Detail.....	6-3
Transformer and Inductor	6-4
Temperature Switches	6-5
Upper Inside	6-6
Fans	6-7
PCB Assemblies	6-8

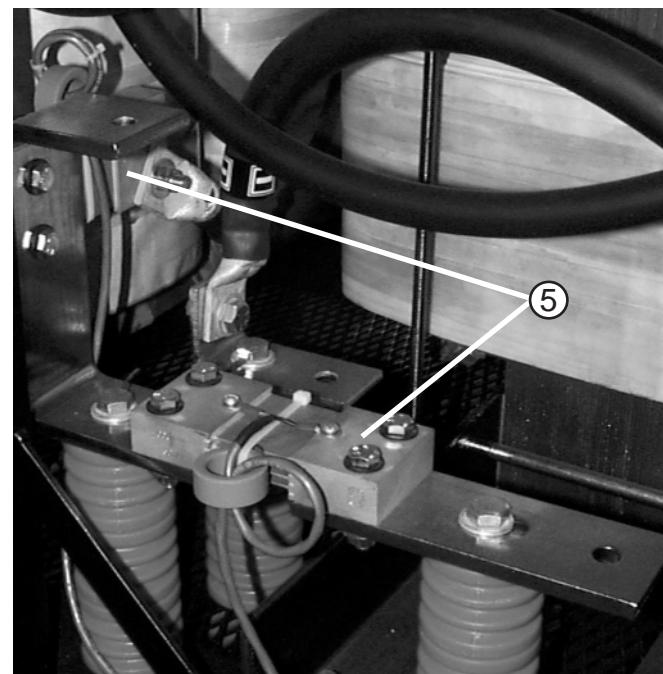
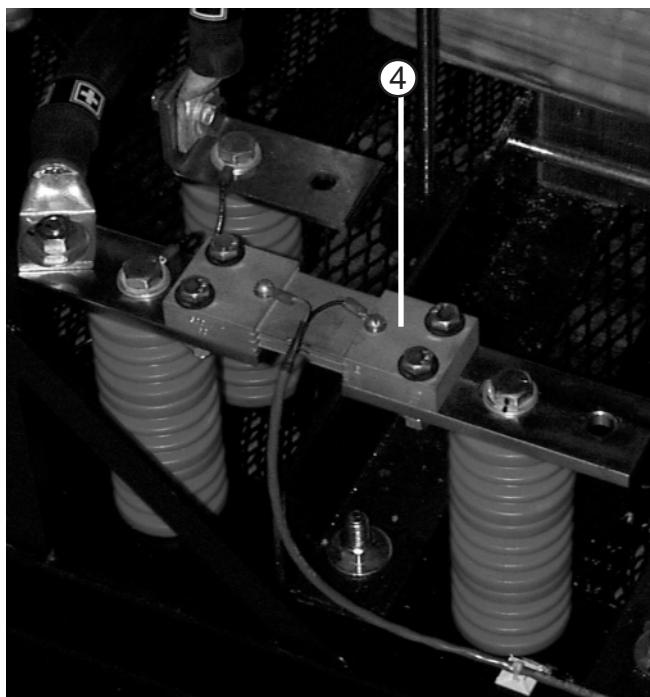
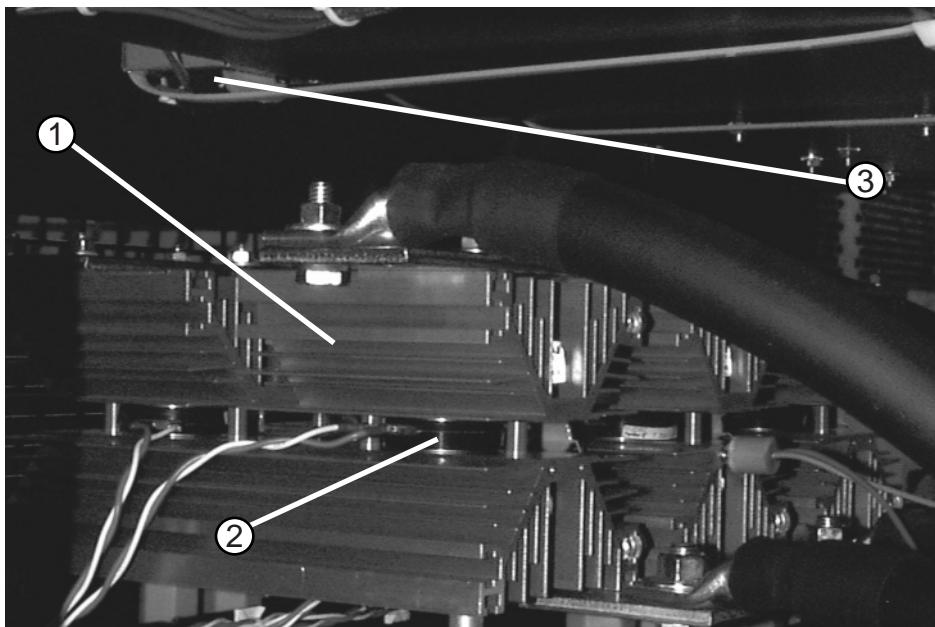
PARTS LIST

Front Panel Outside



Item	Part Number	Description	Designator	Model & Qty.	
				401	601
1	040224	Voltmeter – 0-500 VDC	1 VM	1	1
2	040225	Potentiometer – 1 turn, 5K	P1	1	1
	040226	Knob		1	1
3	040247	Ammeter – 0-600A 50 mv	1 AM	1	1
4	040639	Circuit Breaker – 16A, 1pole	1CB	1	1
5	040223	Lamp Assembly – Red, 120 VAC	1PL	1	1
6	040256	Lamp Assembly – Amber, 120 VAC	2PL	1	1
	040220	Top panel		1	1
	040219	Side panel		2	2

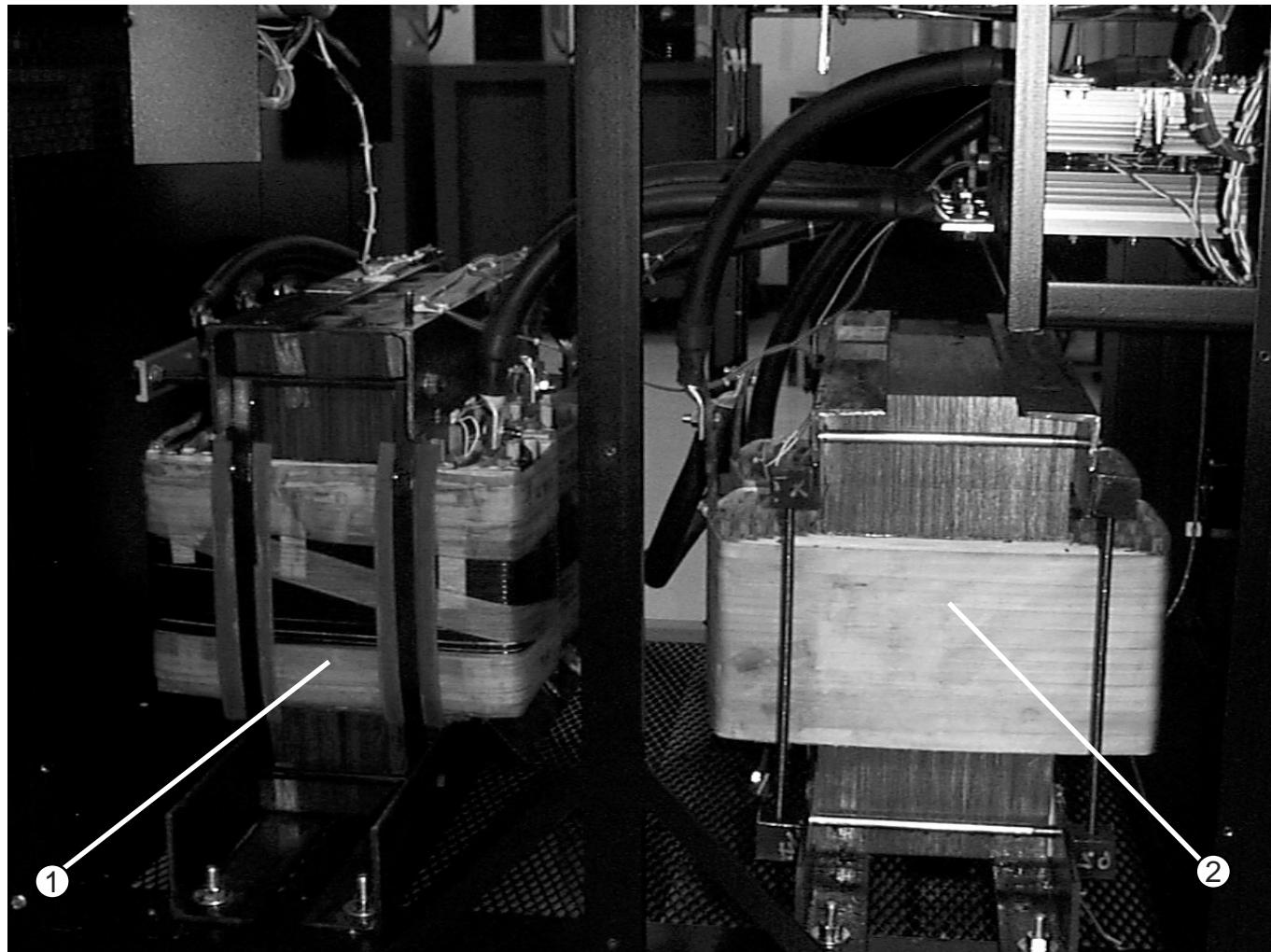
SCR and Shunt Detail



<u>Item</u>	<u>Part Number</u>	<u>Description</u>	<u>Designator</u>	<u>Model & Qty</u>
				<u>401</u> <u>601</u>
1	040254	401 Bridge Assembly		1
	040253	601 Bridge Assembly		1
2	040237	SCR – 600A, 1400V	SCR 1A/B, 2A/B, 3A/B	6 6
3	040230	Transformer – 24 VAC	3T	1 1
4	040248	Shunt - 600A 50 mv	SH 1	1
5	040245	Shunt - 1000A 50 mv	SH 1, SH 2	2

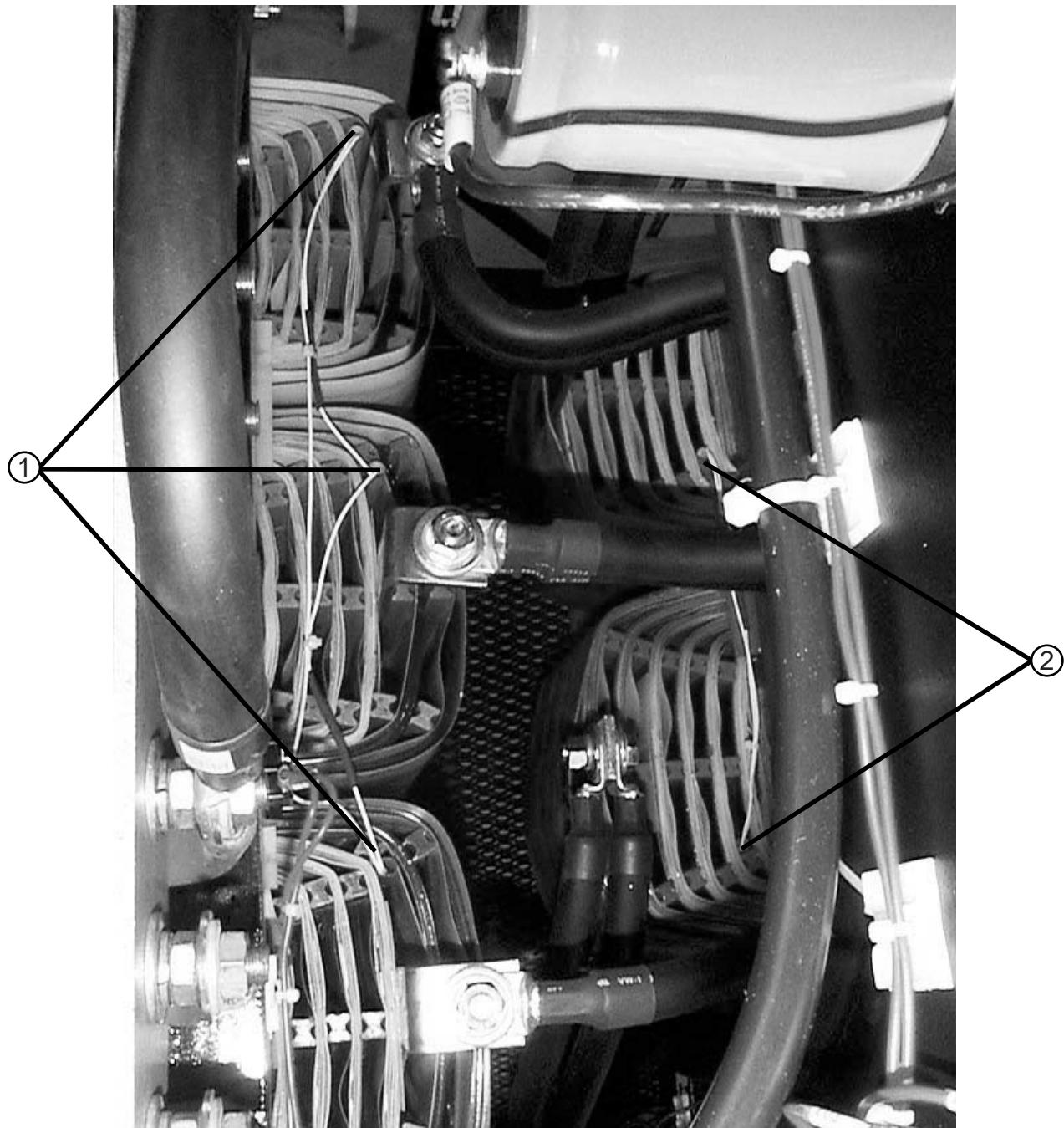
PARTS LIST

Transformer and Inductor



<u>Item</u>	<u>Part Number</u>	<u>Description</u>	<u>Designator</u>	<u>Model & Qty</u>
				<u>401</u> <u>601</u>
1	040249	Transformer, Main Power, 200/400V	1T	1
1	040250	Transformer, Main Power, 480V	1T	1
1	040252	Transformer, Main Power, 600V	1T	1
2	040251	Choke (Inductor)	1 CH	1
1	040241	Transformer, Main Power, 200/400V	1T	1
1	040242	Transformer, Main Power, 480V	1T	1
1	040243	Transformer, Main Power, 600V	1T	1
2	040244	Choke (Inductor)	1 CH	1

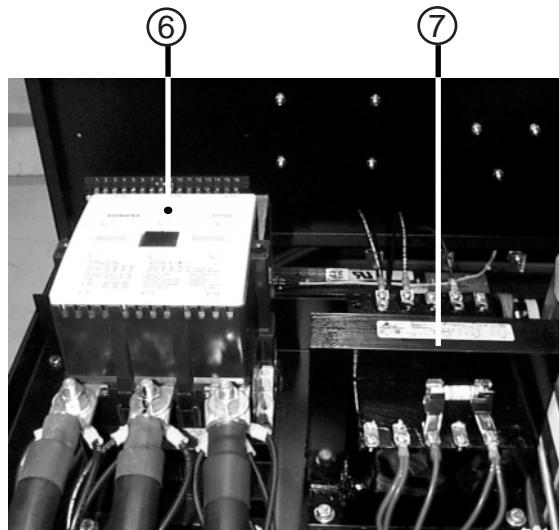
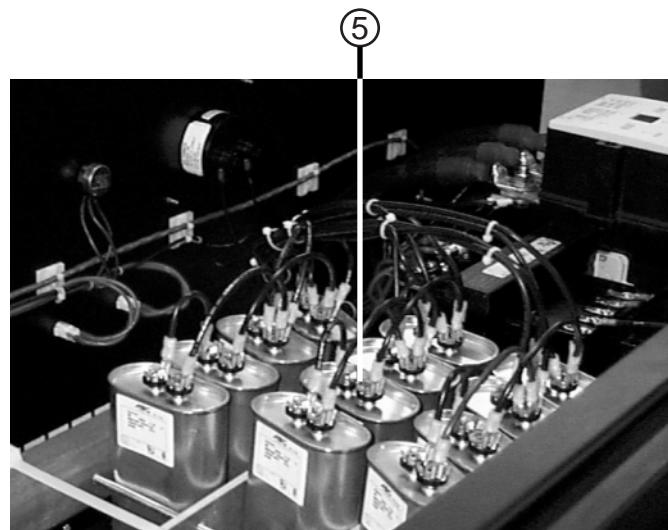
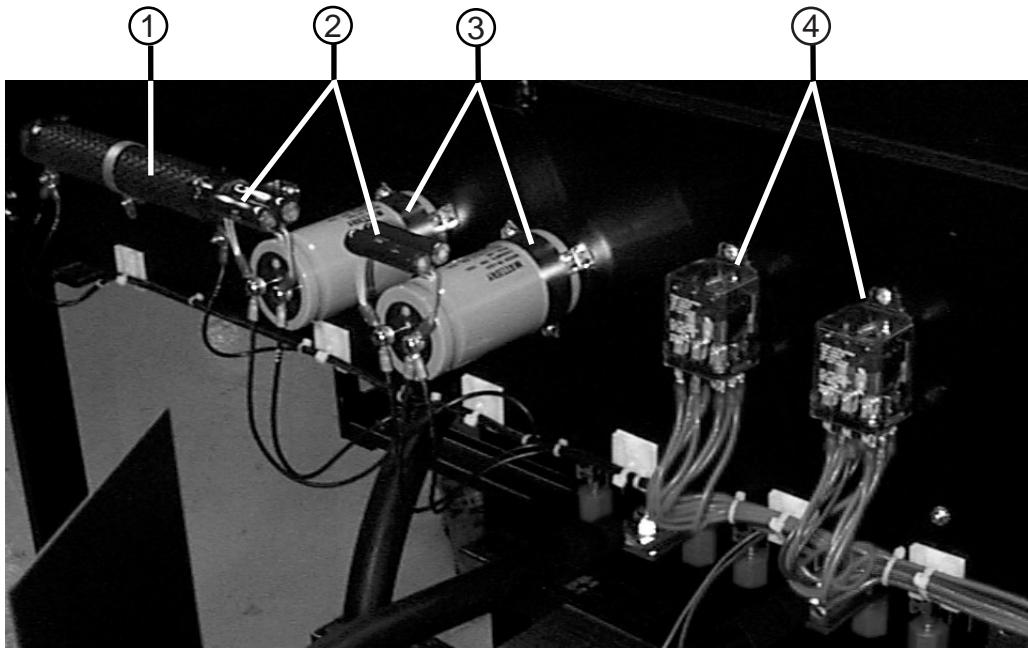
Temperature Switches



Item	Part Number	Description	Designator	Model & Qty	
				401	601
1	040218	Temp. Switch		5	5

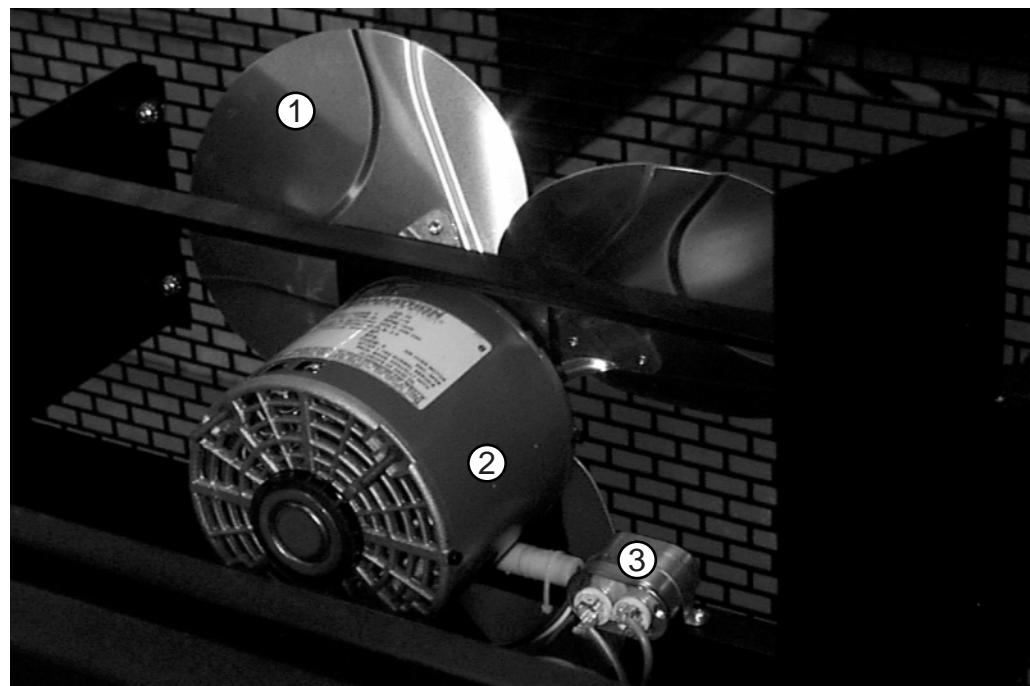
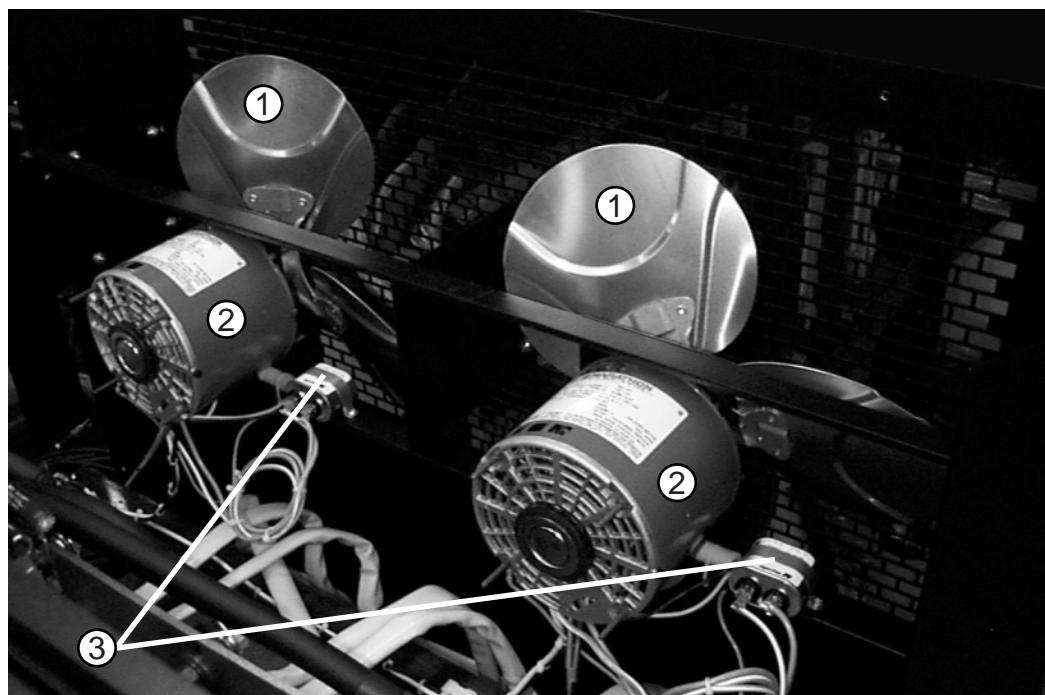
PARTS LIST

Upper Inside



<u>Item</u>	<u>Part Number</u>	<u>Description</u>	<u>Designator</u>	<u>Model & Qty</u>	
				<u>401</u>	<u>601</u>
1	040238	Resistor – 4 ohm, 300W	R1	1	1
2	040255	Resistor – 3000 ohm, 20W	R2A,R2B	4	4
3	040236	Capacitor – 800µF, 350 VDC	C10A, C10B	2	2
4	040234	Relay, 3PDT, 120 VAC	1CR, 2CR	2	2
5	040235	Capacitor – 40µF, 460 VAC	C1, C2, C3	12	12
6	040231	Contactor – 600V, 3 phase, 400A	1C	1	1
7	040229	Transformer – 500 VA	2T	1	1

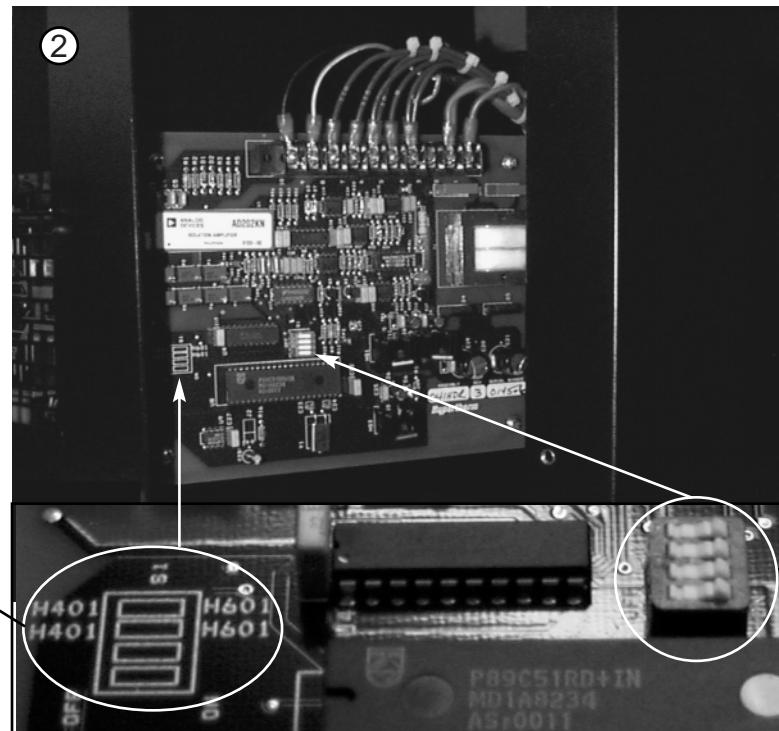
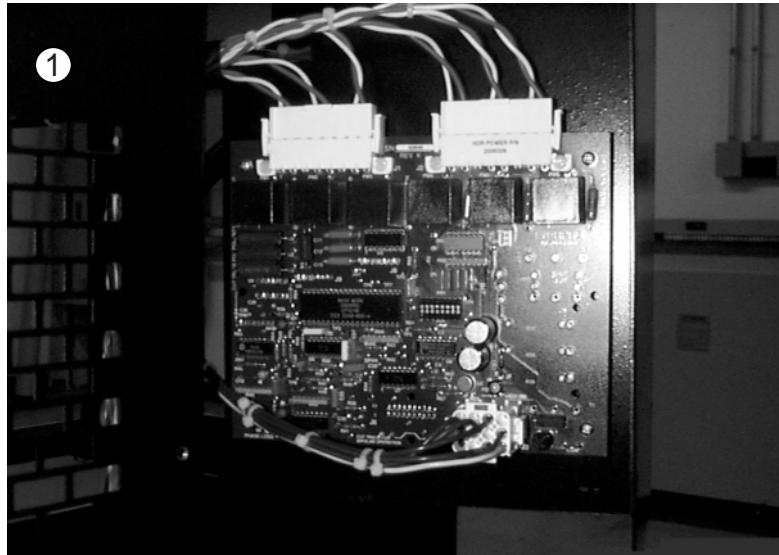
Fans



<u>Item</u>	<u>Part Number</u>	<u>Description</u>	<u>Designator</u>	<u>Model & Qty</u>	
				<u>401</u>	<u>601</u>
1	040228	Fan Blade – 16", 3 wing		1	2
2	040227	Fan Motor – 1/3 hp, 230V, 1625 rpm	1FM, 2FM	1	2
3	040240	Fan Motor Capacitor		1	2

PARTS LIST

PCB Assemblies



Item	Part Number	Description	Designator	Model & Qty	
				401	601
1	040232	PCB Assembly: Firing Circuit	1 PCB	1	1
2	040233*	PCB Assembly: Feedback Circuit	2 PCB	1	1

* When replacing the feedback circuit board, make sure to check the dip switch setting. Use the silkscreen on the board, to the left of the dipswitch, for reference. All switches in the OFF position for H401 (shown above). Switch 1 & 2 in the ON position for H601

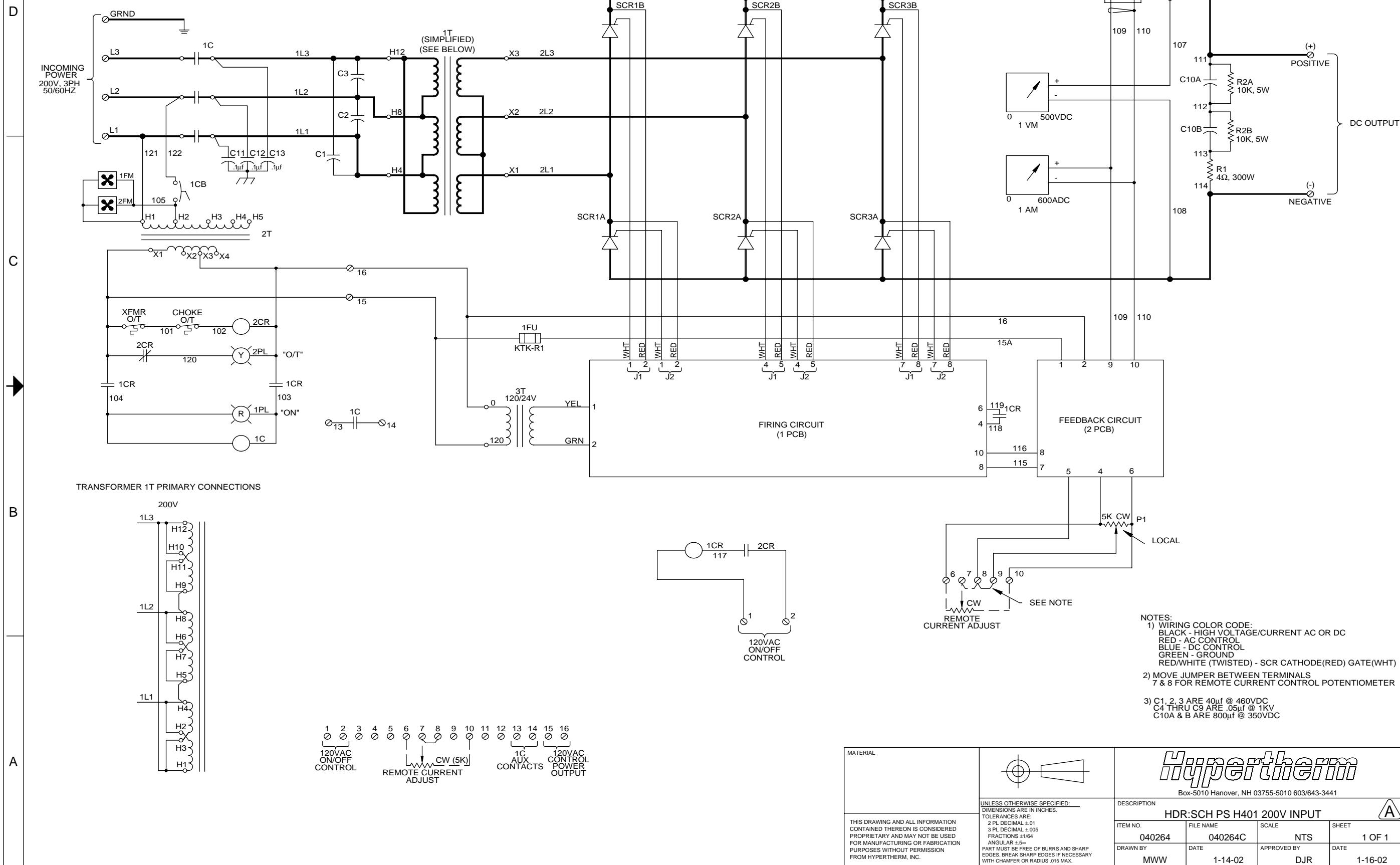
Section 7**WIRING DIAGRAMS**

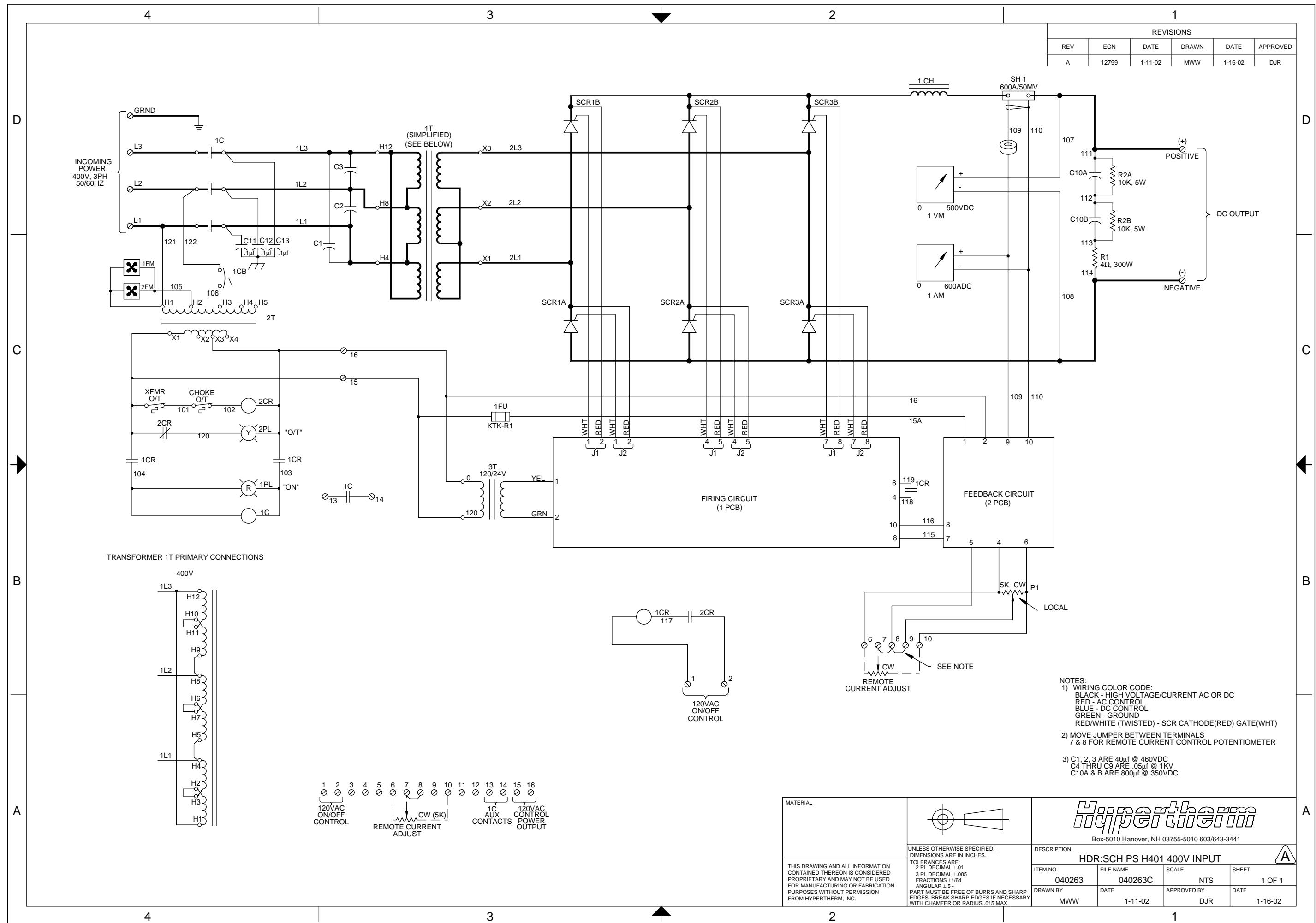
In this section:

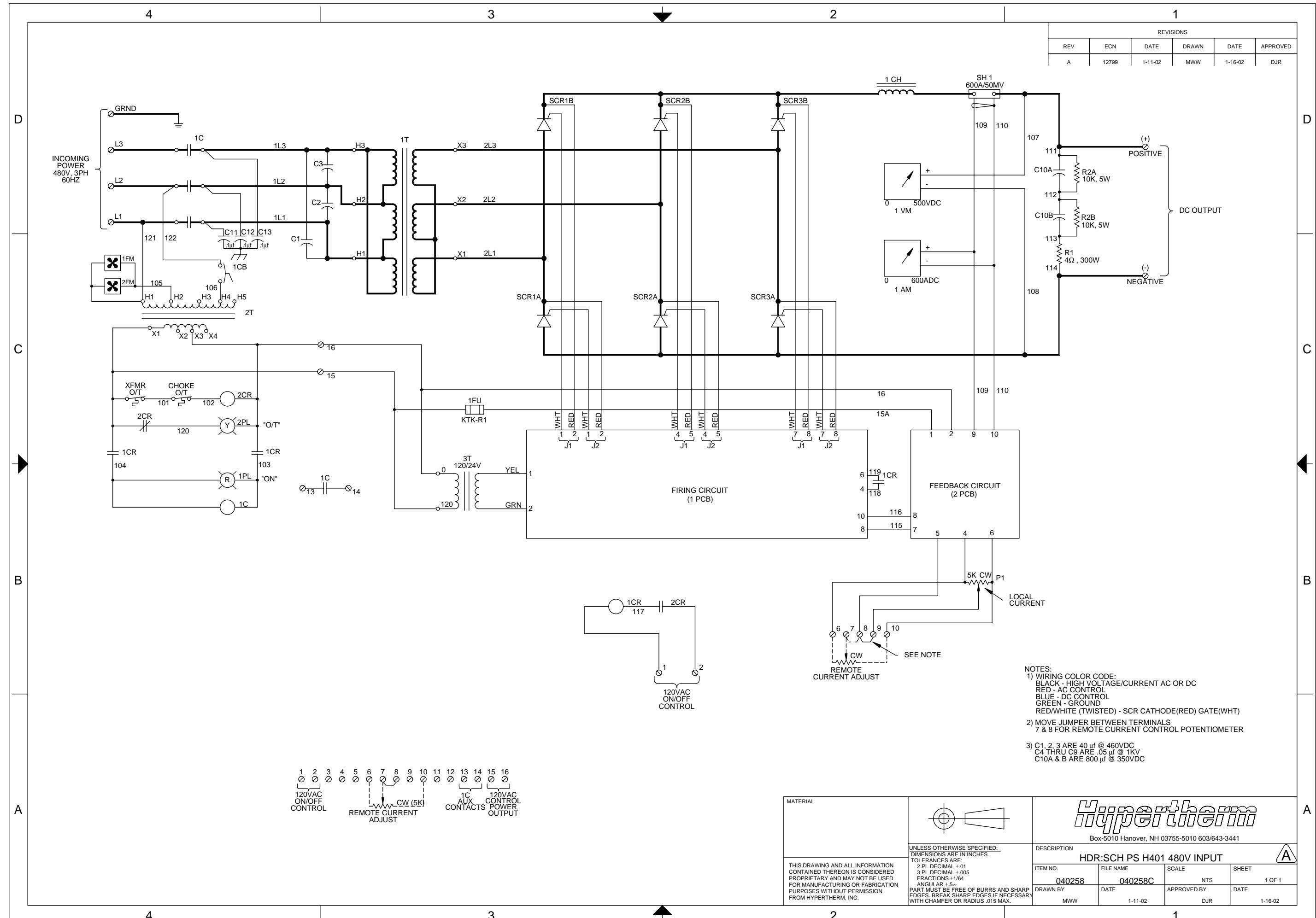
H401-200V.....	7-3
H401-400V.....	7-5
H401-480V.....	7-7
H401-600V.....	7-9
H601-200V.....	7-11
H601-400V.....	7-13
H601-480V.....	7-15
H601-600V.....	7-17

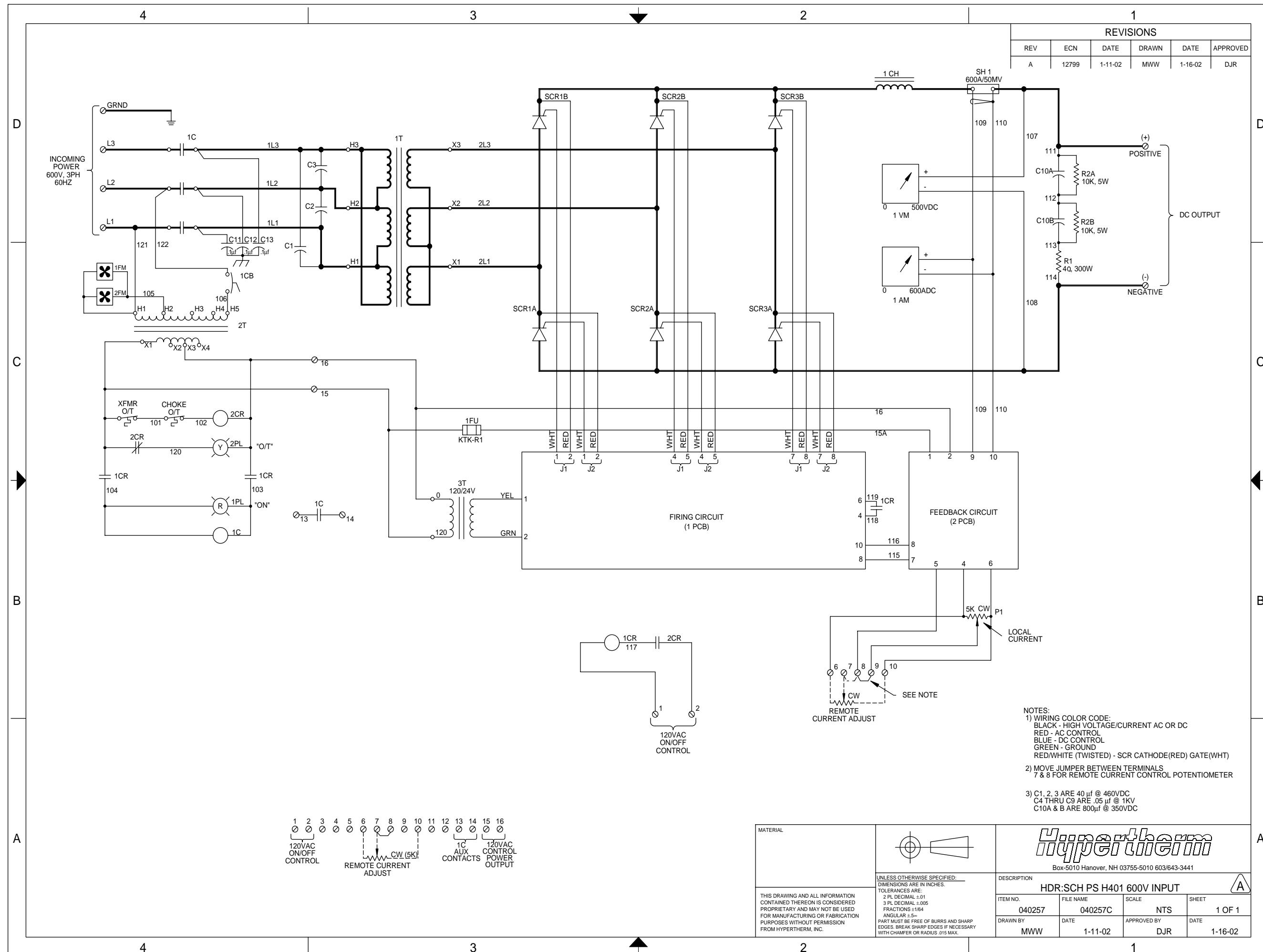
REVISI

REV	ECN	DATE	DRAWN	DATE	APPROVED
A	12799	1-14-02	MWW	1-16-02	DJR

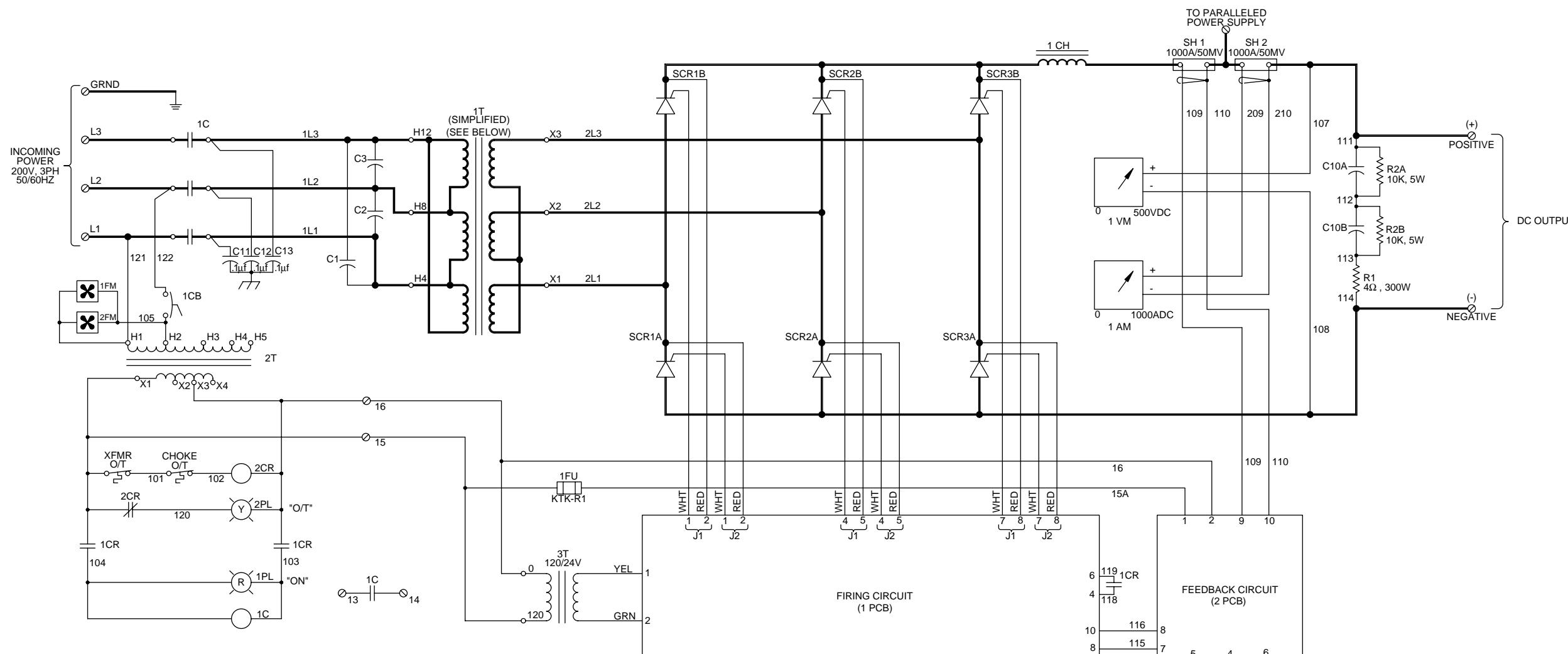




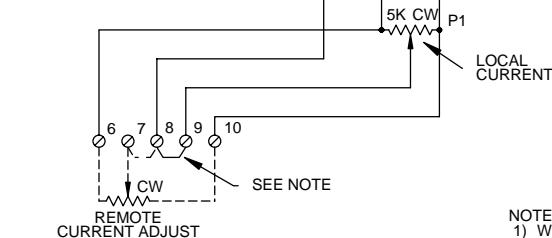
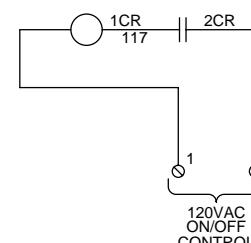
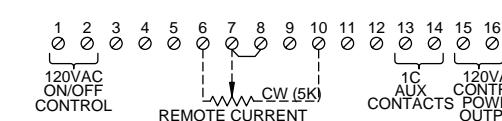
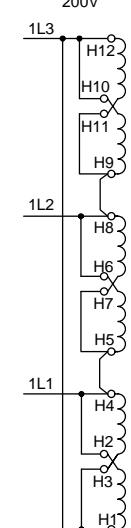




REVISIONS					
REV	ECN	DATE	DRAWN	DATE	APPROVED
A	12799	1-11-02	MWW	1-16-02	DJR



TRANSFORMER 1T PRIMARY CONNECTIONS

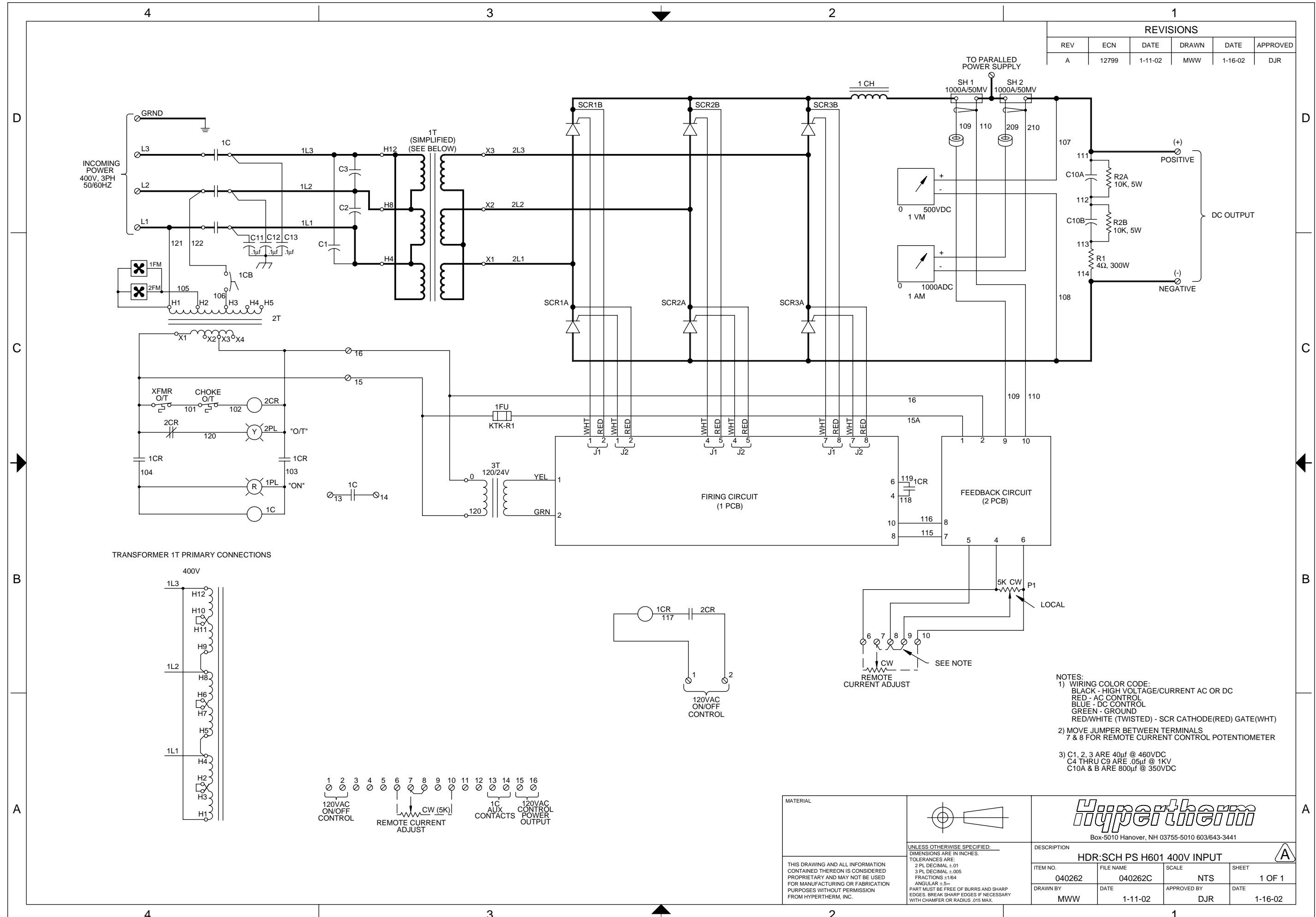


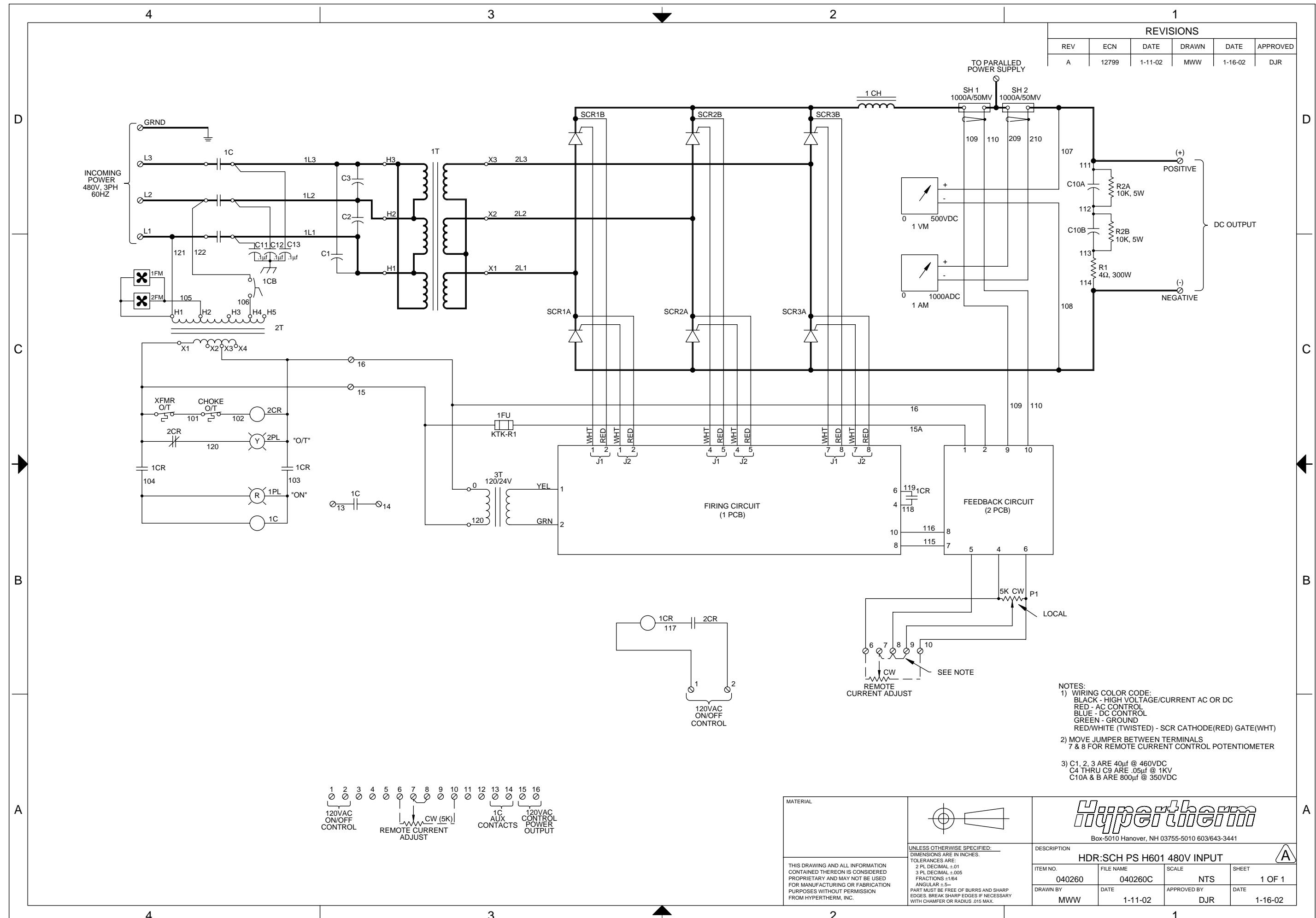
NOTES:
1) WIRING COLOR CODE:
BLACK - HIGH VOLTAGE/CURRENT AC OR DC
RED - AC CONTROL
BLUE - DC CONTROL
GREEN - GROUND

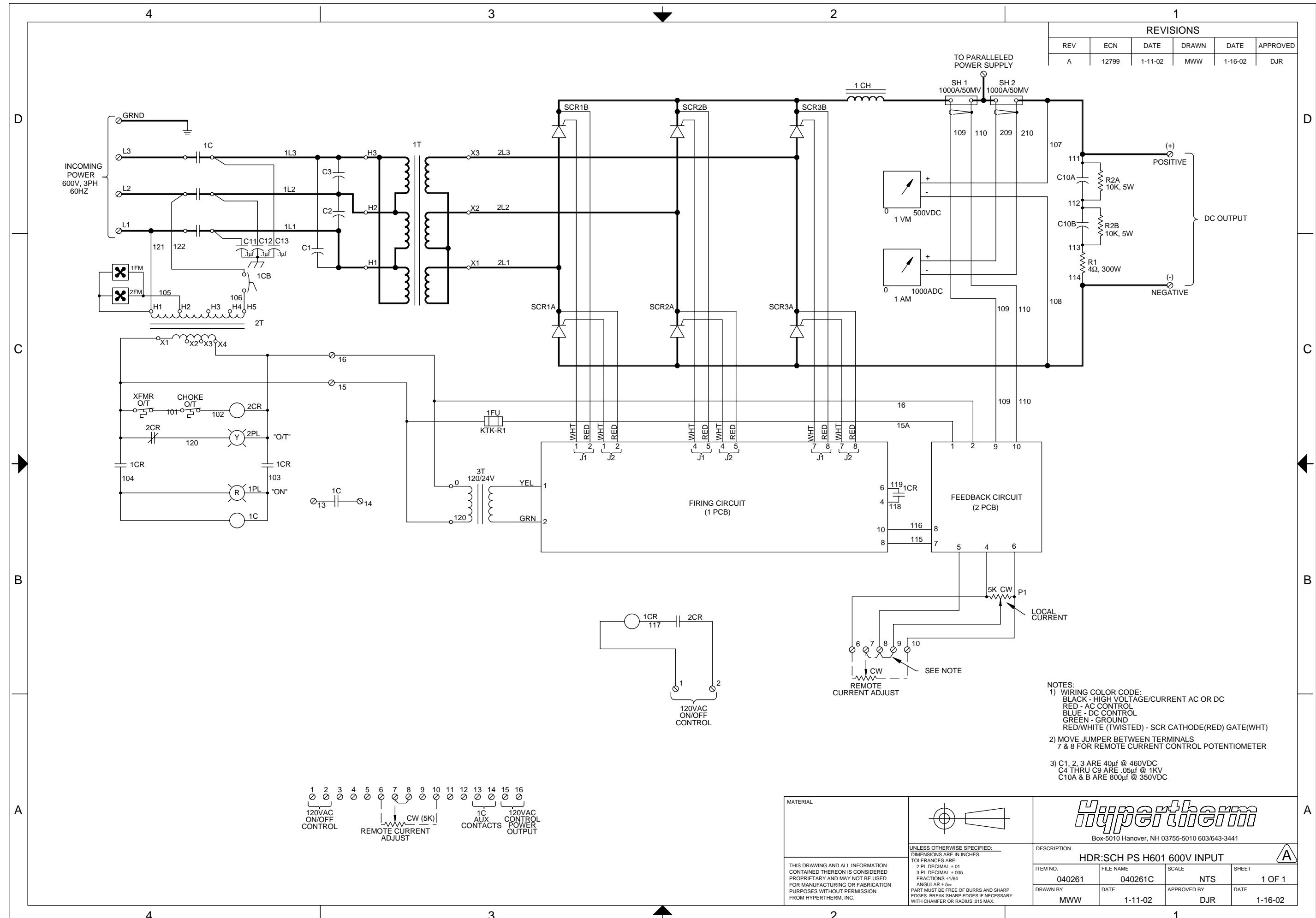
2) MOVE JJ IMPER BETWEEN TERMINALS

3) C1, 2, 3 ARE 40 μ F @ 460VDC
C4 THRU C9 ARE .05 μ F @ 1KV
C10A & B ARE 200 μ F @ 250VDC

MATERIAL		Hypertherm Box-5010 Hanover, NH 03755-5010 603/643-3441
THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS CONSIDERED PROPRIETARY AND MAY NOT BE USED FOR MANUFACTURING OR FABRICATION PURPOSES WITHOUT PERMISSION FROM HYPERTHERM, INC.	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES ARE: 2 PL DECIMAL .±.01 3 PL DECIMAL .±.005 FRACTIONS ±1/64 ANGULAR ±5° PART MUST BE FREE OF BURRS AND SHARP EDGES. BREAK SHARP EDGES IF NECESSARY WITH CHAMFER OR RADIUS .015 MAX.	DESCRIPTION HDR:SCH PS H601 200V INPUT
	ITEM NO. 040259	FILE NAME 040259C







Appendix A

SYSTEM GROUNDING

System Grounding Requirements

The plasma system must be grounded for safety reasons and to suppress EMI:

- *Safety* The entire system—power supply, accessory enclosures, and worktable—must be grounded to protect it and the operator from a ground fault. The protective earth (PE) ground connections must be installed by a licensed electrician and conform to national or local codes.
- *EMI Suppression* If allowed by national or local codes, the ground system can also be used to suppress EMI (electromagnetic interference). Below is a guide to configure the plasma system for minimal EMI. See Electromagnetic Compatibility in this manual for additional information.

Suggested Ground Cable Routing

Power Supply

Connect the power supply to the PE ground terminal, using a properly sized color-coded conductor. This PE ground is connected to the service ground through the line disconnect switch. See the Installation section for further information on the power cord and the line disconnect switch.

Equipment Grounding

All accessory modules that receive power from the plasma power supply must also use the power supply's ground—either by connection to the PE terminal of the power supply, or by direct connection to the equipment ground conductor. Each module should have only one connection to ground to avoid ground loops and stray currents. If any enclosure is grounded to the work table, the work table must be grounded to the power supply.

Effective grounding for EMI reduction is highly dependent upon the installation configuration. Two acceptable configurations are shown in Figures a-1 and a-2.

The ignition console should be installed near the work table, and grounded directly to it. Other modules should be installed near the power supply, and grounded directly to it (Figure a-1).

All modules may also be installed near the work table, and grounded directly to it (Figure a-2). Do not ground the ignition console directly to the power supply.

The customer must furnish all conductors for equipment grounding. Grounding conductors may be purchased through Hypertherm in any length specified by the customer (Part No. 047058). The conductor may also be

APPENDIX A – SYSTEM GROUNDING

purchased locally, using a minimum 8 AWG UL Type MTW cable (USA specification) or the appropriate cable specified by national and local codes.

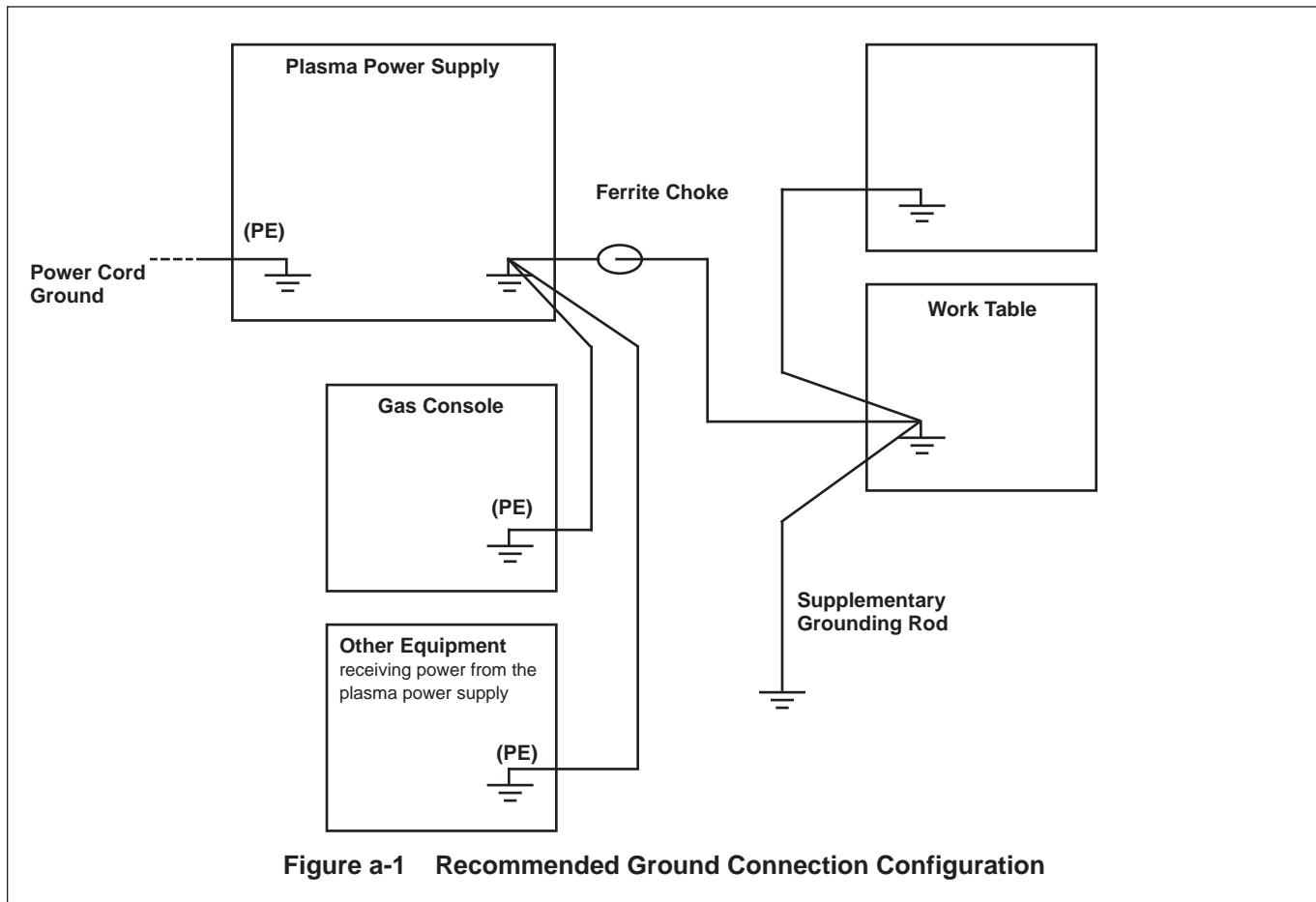
Consult the appropriate manufacturer's instructions to ground equipment that does not receive power from the power supply.

Work Table Grounding

If a supplementary ground rod is installed near the worktable to reduce EMI, it must be connected directly to the PE ground of the building structure, connected to the service ground; or to earth, providing the resistance between the ground rod and the service ground meets national or local codes. Place the supplementary ground rod within 20 ft (6 m) of the worktable according to national or local codes.

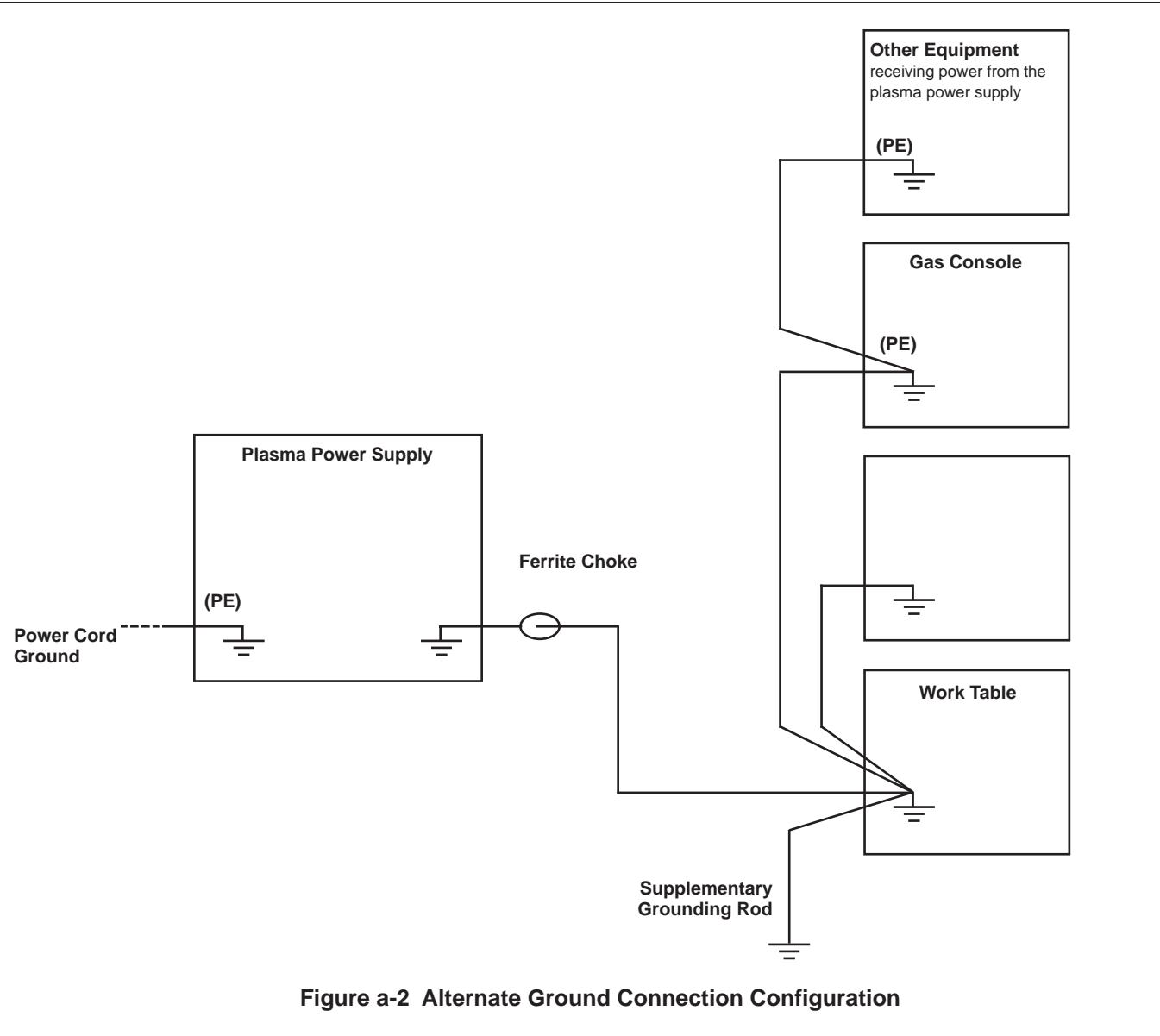
If any module is grounded to the work table, the work table must be grounded to the power supply, or the configuration must be changed to comply with applicable national and local electrical codes.

A ferrite choke can be placed in the conductor between the work table ground rod and the PE ground, with a number of turns through the choke to isolate the safety ground (at 60 Hz) from any electromagnetic interference (frequencies above 150 KHz). The more turns the better. A suitable ferrite choke can be made by wrapping 10 turns or more of the ground lead through Magnetics part number 77109-A7, Fair-Rite part number 59-77011101, or other equivalent ferrite choke. Locate the choke as close as possible to the plasma power supply.



Note: Configuration may vary for each installation and may require a different ground scheme.

APPENDIX A – SYSTEM GROUNDING



The preferred cable routing for this configuration is as shown, but it is acceptable to “daisy-chain” the grounds for the gas console and other equipment to the ignition console.