HyDefinition® HD3070™

Plasma Arc Cutting System with Automatic Gas Console

Instruction Manual
802180 – Revision 19

Hypertherm®
The world leader in plasma cutting technology

Page of Change	Description of Change	Rev 17 to 18	7/25/02
iv, v, vi, vii, viii	Updated Main Table of Contents to reflect changes below.		
2.1	Updated TOC		
2.10 & 11	Added page after 2-10 with torch art and dimensions for both the straight and 45 degree recepticles. Moved text from 2-10 to 2-11		
3.30	Added warning about vent hose.		
4.1	Updated TOC		
4.17-4.20	Put in updated version of "How to get better cut quality".		
5.7	Was "continued on page 5-7". Changed to 5-9.		
6.1	Updated TOC to match headers		

Page of Change	Description of Change	Rev 16 to 17	4/15/02
Cover	New Revision		
Title Page	New Revision		
2.3	Added figure reference to 2-3		
2.8	Added Aluminum to 100A cutting		
2.12	Moved figures for PAC184 & 186 from last page to the page with cooresponding text. IEC symbols now on 2.12		
5.28	Updated graphic to resemble new board		
5.66	Updated graphic to resemble new board		
5.72	Revised chopper figure to new configuration		
6.4	Changed item # 5 (041580) to 041752 & 081032 to 081077. Updated graphic to resemble new board		
6.6	Revised chopper figure to new configuration		
6.14	Cng P/N from 029618 to 129618		
wiring diagram	Fixed diagrams that had missing lines. Section is now after section 6 instead of at the very end of manual.		

PAGE	SUBJECT
Cover	New Revision
Title Page	New Revision
ii	Added plumbing/electrical code statement to warranty page
1- 1 thru 6	New saftey section
1a- 1 thru 6	New french saftey section
2- 8	General corrections
3- 2	Bolded pre-installation for plumbing/electrical codes
3- 3	Revised hard plumbing statement
3- 4	Shifted text from pg 3-3
3- 29	Revised figure reference
3- 31	revised 14A call out
3- 32	Revised figure reference
3- 33	New blow back hose kit; ECO 10698
3- 38	Correction; pushbutton reference
3- 39	New coolant tank
4- 3	Art enhancement
4- 8	General corrections
4- 13	Correction: figure reference
4- 14	Correction: 120590 swirl ring
4- 21	Correction: Aluminum
4- 32	Correction: Aluminum
4- 36	Correction: Aluminum
5- 74	Correction: PAC186 reference
5- 76	Correction: PAC186 reference
6- 9	Correction: 009015
6- 14/15	New coolant tank
6- 22/23	Added #008890 contact
6- 27	Correction: 120590 swirl ring
6- 28	Correction: 020637
7- 1/2	Deleted section; Information in safety section
f- 5	New coolant tank

PAGE	SUBJECT
Cover	New Revision
Title Page	New Revision
3- 3	Added oxygen warning
3- 4	Revised Hard Plumbing requirements
3- 5.2	Fuse size correction
3- 36	Changed coolant mixture
4- 14	Revise Consumables to include 100A Aluminium
4- 21	Added 100A aluminium cutting
4- 32	Revised 70A aluminium cut chart to remove 1/2"
4- 36	Added 100A aluminium cut chart
5- 3 & 4	General corrections/improvements
5- 15/16	Revised graphics
5- 17	Revised graphics & revised coolant temperature check
5- 18	Revised graphics
6- 9	Added 003065 Aux contact
6- 28/29	Revise Consumables to include 100A Aluminium
Diagrams	Elec Schematic 013-2-325 SHT 1 Rev C
Diagrams	Elec Schematic 013-2-329 SHT 5 Rev E

Cover	New Revision
Title Page	New Revision
3- 3 & 4	Added required gas supply hose ID & deleted P/N reference
3- 18	General correction, part nomenclature
3- 26	Added 023943 Cable
3- 29	General correction, delete reference to section 6
3- 31	General correction
3- 36	General correction
3- 38	General correction
3- 39	Revised figure to show current configuration
4- 17	Added cut-angle graphic and deleted text to improve clarity
4- 18	Text displaced to page
4- 19	Revised drop-part description to improve clarity
4- 20	Text displaced to page
4- 33	General correction, travel speed error
4- 34 & 35	General correction, initial pierce height nomenclature
5- 3 & 4	Deleted P/N from text & improved clarity
5- 18	Revised flow switch FS1 sensing to 0.5 gpm
5- 28	Revised power supply error code #1
5- 30 & 31	Revised power supply error codes and notes
5- 58	General correction
5- 60 thru 64	General correction
5- 65 thru 67	General correction
6- 1	Revised section contents list
6- 6	General correction, spelling error
6- 14 & 15	New flow switch. Added pump coupling & drain valve
6- 20	Revised gas console parts list to reflect availability
6- 23	Revised to 30A consumables
6- 31 thru 36	Deleted. Refer to section 3 for leads, cables & hoses
7- 2	Revised standards index
7- 3 & 4	Deleted
a- 5	General correction, description
f- 5	Revised figure to show current configuration
sd- 1	Corrected drawing title
Diagrams	013-325, all sheets, General correction
Diagrams	129-255, revised to show current configuration
Diagrams	013-329, sht 3 revised to show current configuration

Cover	New Revision
Title Page	New Revision
3- 1	Revised content list
3- 4 & 5	Page shift
3- 5.1 & 5.2	Power requirements clarifications
3- 7	PE cable description/clarification
3- 19	General correction, technical
3- 21	General correction, technical
3- 23	General correction, format
3- 24	Add 100&150 ft. cables
3- 36	Add coolant conductivity
3- 38	Add new figure & delete ref to part list figure
4- 1	Revised content list
4- 8	Add new error code 13; phase loss protection
4- 9	Text shift
4- 14	Add CCW Consumables
4- 19	Ramp down & Drop part clarification
4- 20	Text shift
4- 22–35	Revise cut charts; Add CCW Consumables
5- 1	Revised content list
5- 28	Power supply 1XPCB3 control board update
5- 29	Add new error code 13; phase loss protection
5- 30	New figure, gas console LCD
5- 31	Add new error code 13; phase loss protection
5- 32	Text shift
5- 47	Add new error code 13; phase loss protection
5- 48 - 65	Text shift
5- 66	Power supply 1XPCB3 control board update
5- 67	Gas Console 1A control board update
5- 68 - 76	Text shift
6- 1	Revised content list
6- 6	Add new phase loss protection PCB
6- 7	General correction, format
6- 8	General correction, technical
6- 16 & 17	Add new 3-cap spark gap & PCB to parts list & figure
6- 27	Add CCW Consumables
6- 28	Add CCW Consumables
6- 29	Add CCW Consumables
6- 33	Add 100&150 ft. cables
a- 6	General correction, technical
G- Appendix	New, System grounding
Diagrams	Phase loss protection PCB, New elec. Diagram 013-329 sht 1 & 4

2-1	Removed motion control system reference
2-2	Changed power supply P/N
2-7	Changed power supply & gas console P/N, & gas requirements
2-8	Changed gas console specifications & gas requirements
2-9	Changed off-valve assembly P/N & specifications
2-10	Removed motion control system
3-1	General correction
3-2	Changed off-valve assembly & gas console P/N
3-3	Revised air gas requirement
3-4	Added H35 gas requirements
3-5	Revised fig. 3-1 for new gas console
3-6	Changed 240V & 220V power supply P/N
3-8	Changed 220V power supply P/N
3-9	Removed reference to wiring diagram numbers
3-12	Revised fig. 3-6 & removal instructions
3-15	Revised fig. 3-8; off-valve assembly & gas console
3-17	Revised fig. 3-9; general correction
3-20	Revised fig. 3-16; new gas console
3-21	Revised fig. 3-17; new cable signal names & corrections
3-22	Revised fig. 3-18; new cable signal names
3-23	General correction
3-24	Revised fig. 3-19; new gas console
3-27	Revised fig. 3-23; new cable signal names & corrections
3-31	Revised fig. 3-25; new gas lead, gas console, & off-valve assembly
3-34	Revised gas supply hose connection requirements;
	Revised fig. 3-29; new gas console
3-36	General corrections
4-3	Revised fig. 4-1; new power supply control panel
4-4	Revised gas console description
4-5	Revised fig. 4-2; new gas console
4-6	Revised fig. 4-3; new gas console LED Display
4-8	Revised error message & description
4-9	Revised error message & description
	Revised gas console description & fig. 4-4; new gas console
4-10	Revised local mode operation
4-11	Revised local mode operation
4-12	Revised remote mode operation
4-14	Revised fig. 4-5; added new 100A ss consumables
4-15	General correction
4-16	Revised fig. 4-9; new off-valve assembly
4-17	General correction
4-21	Revised cut chart index; added 100A ss
4-22 thru 34	Revised cut chart format
4-35	Added 100A ss cut chart

5-1	Removed gas console manifold hose connections
5-3	Revised torch reference
5-7	Removed reference to wiring diagram numbers
5-9	Removed reference to wiring diagram numbers
5-11	Removed reference to wiring diagram numbers
5-13	General correction
5-15	Removed reference to wiring diagram & schematic numbers
5-17	Removed reference to wiring diagram numbers & fan ref. numbers
5-18	Removed reference to wiring diagram numbers
5-22	Revised gas console microcomputer P/N
5-28	General correction
5-29	General correction
5-31	Gas system GS-ERR; removed display reference
5-32	Revised error message, code, & description
5-47 thru 50	Removed display reference
5-52 thru 55	Revised motor valve reference
5-56	Added new MV6 flow diagram
5-57	Revised REC 4 pin description
5-58	Revised fig. 5-4; gas descriptions
5-59 thru 61	Revised fig. 5-5; gas descriptions
5-63	Revised REC 3 & 4 pin description
5-64	Revised fig. 5-6; motor valve designations
5-65	General correction
5-67 thru 68	Revised pressure check charts
5-69	Deleted fig. 5-9
5-70	Added pressure check chart for 100A ss
5-71	Repaginate
5-72	Repaginate
5-73 thru 75	Figure reference shift
6-2	Revised power supply P/N
6-3	Revised power supply control panel
6-4	Revised PCB & firmware P/N
6-5 and 6	General clarification
6-8 thru 12	General clarification
6-13 and 14	General clarification
6-16	New spark gap assy
6-18 thru 21	New Gas console
6-22	Update O-ring description
6-25	New off-valve assy
6-26	Kit part update
6-28	Add 100A ss torch consumables
6-29	Add 100A ss torch consumables
6-30	Add 100A ss torch consumables
6-35	Revised fig. 6-34; new gas lead set

a-	6	Revised gas console connector 3X4 signals
c-	1 thru 8	New propylene glycol MSDS
f-	3	Revised power supply P/N
	Diagrams	New gas system schematic 013325
	Diagrams	New power unit diagram 013329
	Diagrams	New gas console elec diagram 013324

Cover	Uprevved manual due to changes below
Title Page	Uprevved manual due to changes below
0.04 & 0.07	Changed PAC184 Torch Assembly wording to Assemblies
2.01	Changed PAC184 Torch Assembly wording to Assemblies
2.03	Changed PAC184 Torch Assembly wording to Assemblies; added text
2.08	Changed PAC184 Torch Assembly (028839) to
	PAC184 Torch Assemblies (028839, 128199)
3.02	Changed PAC184 Torch Assembly (028839) to
	PAC184 Torch Assembly (028839 or 128199)
4.15	Fig. 4-6-Changed Shield Cap part number to 120221/120543
4.22 & 4.23	Changed Shield Cap part number to 120221/120543
6.01	Changed PAC184 Torch Assembly wording to Assemblies
6.11	Fig. 6-8, updated to show new pilot arc circuit 129264 & new fuse
	(F5) 108049
6.12	Fig. 6-9, updated new fuse (F5) 108049
6.22	Added new PAC184 Torch Assy 128199 & new Shield Cap 120543
6.26	Added new Shield Cap 120543
013-4-266	Power Unit Electrical Diagram (2 sheets), Rev V

Cover	Uprevved manual due to changes below
Title Page	Uprevved manual due to changes below
0.07	Added coolant schematic129-2-255 & deleted PS service parts kit
3.38	Changed step 2 to include coolant shutoff valve
5.03	Changed filter element to 027005 under Power Supply Inspection
5.15	Added coolant system schematic number 129-2-255 to text
6.01	Deleted Power Supply Service Parts Kit
6.14	Added new Coolant SA 129255 part numbers
6.15	Changed Power Supply art to show coolant SA changes
6.16	Deleted Power Supply Service Parts Kit
6.22	Item 3- Changed O-ring part number to 044025
f.05	Changed Power Supply art to show coolant SA changes
sd.01	Added coolant system schematic number 129-2-255
129-2-255	Added coolant system schematic, Rev A

Cover	Uprevved manual due to changes below
Title Page	Uprevved manual due to changes below
3.16	Changed 3 & 4 to indicate addition of check valve
3.17	Changed Power Supply art to show new check valves
3.20	Changed Power Supply art to show new check valves
3.24	Removed timer-counter cable 023972 33 ft (10 m) from Fig 3-20
6.14	Added check valve part number 006075, item 13
6.15	Changed Power Supply art to show new check valves, item 13
6.16	New part number for capacitors 009975, item 10
6.16	New part number for 6 kV transformer 129199, item 11
6.33	Removed timer-counter cable 023972 33 ft (10 m) from Fig 6-28

Cover	Uprevved manual due to LVD compliance & other changes
Title Page	Uprevved manual due to LVD compliance & other changes
0.03 - 0.11	updated table of contents
1.01 - 1.04	New Safety section
1a.01 - 1a.04	New French Safety section
2.01	Changed Off-Valve Assembly to Off-Valve Assemblies
2.04	Changed Off-Valve Assemblies paragraph
2.09	Changed Off-Valve Assembly to Off-Valve Assemblies
3.02	Changed Off-Vlve Assy 129056 to Off-Vlve Assy 129056 or 129174
3.15	Changed Off-Vlve Assy 129056 to Off-Vlve Assys 129056/129174
3.18	Added new part number to Fig 3-12
3.19	Added new part number to Fig 3-13
3.24	Added new part numbers to Fig 3-20
3.29	Added new torch lead set part numbers and note* to Fig 3-24
3.31	Added note* to Fig 3-25
3.32	Added note* to page
3.33	Added note* to Fig 3-26
4.01	Change to Blow Back Option to Purge Coolant Hoses
4.02	Changed STATUS LED descriptions
4.16	Change title to Blow Back Option to Purge Coolant Hoses
5.06	Changed STATUS LED information in bottom box
5.11	Changed STATUS LED information in 3.3
5.14	Changed page number reference from 5-68 to 5-70
5.15 - 5.18	Changed STATUS LED Troubleshooting information
5.20	Changed STATUS LED Troubleshooting information
6.01	Changed Off-Valve Assembly to Off-Valve Assemblies
6.02	Changed part no. of PC BD Assy, interlock display
6.05 & 6.06	Changed part no. of chopper. Added temp sw.
6.09	Changed part no. of PC BD Assy, power distribution
6.14	Changed part no. of heat exchanger water/air, item 5
6.25	Changed Off-Valve Assembly to Off-Valve Assemblies
6.31- 6.33	Added new part numbers to Figs 6-23, 6-24 & 6-28
6.34	Changed lenghts to make consistent
6.35	Added new torch lead set part numbers and note* to Fig 6-33
6.36	Added note* to Fig 6-35
013-4-266	Power Unit Electrical Diagram (2 sheets), Rev S
013-4-269	Gas Console Electrical Diagram (2 sheets), Rev C

HyDefinition HD3070

Instruction Manual

(P/N 802180)

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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

220/380/415V CE Power Supplies

The 220/380/415V CE power supply complies with the EMC European standard EN50199.

Information about this standard and other line filtering information pertaining to this power supply is located in Appendix D of this manual.

WARNING

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

WARNING

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

GENERAL

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

PATENT INDEMNITY

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

LIMITATION OF LIABILITY

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

LIABILITY CAP

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

INSURANCE

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

NATIONAL AND LOCAL CODES

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

TRANSFER OF RIGHTS

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

TABLE OF CONTENTS

Hypertherm

Section 1

SAFETY

In this section:

RECOGNIZE SAFETY INFORMATION

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

FOLLOW SAFETY INSTRUCTIONS

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

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

DANGER WARNING CAUTION

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

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

CUTTING CAN CAUSE FIRE OR EXPLOSION

Fire Prevention

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

Explosion Prevention

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

WARNING

Explosion Hazard
Argon-Hydrogen and Methane

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

WARNING

Hydrogen Detonation with Aluminum Cutting

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


ELECTRIC SHOCK CAN KILL

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

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

Electric Shock Prevention

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

- Wear insulated gloves and boots, and keep your body and clothing dry.
- Do not stand, sit or lie on – or touch – any wet surface when using the plasma system.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground. If you must work in or near a damp area, use extreme caution.
- Provide a disconnect switch close to the power supply with properly sized fuses. This switch allows the operator to turn off the power supply quickly in an emergency situation.
- When using a water table, be sure that it is correctly connected to earth ground.
- Install and ground this equipment according to the instruction manual and in accordance with national and local codes.
- Inspect the input power cord frequently for damage or cracking of the cover. Replace a damaged power cord immediately. **Bare wiring can kill.**
- Inspect and replace any worn or damaged torch leads.
- Do not pick up the workpiece, including the waste cutoff, while you cut. Leave the workpiece in place or on the workbench with the work cable attached during the cutting process.
- Before checking, cleaning or changing torch parts, disconnect the main power or unplug the power supply.
- Never bypass or shortcut the safety interlocks.
- Before removing any power supply or system enclosure cover, disconnect electrical input power. Wait 5 minutes after disconnecting the main power to allow capacitors to discharge.
- Never operate the plasma system unless the power supply covers are in place. Exposed power supply connections present a severe electrical hazard.
- When making input connections, attach proper grounding conductor first.
- Each Hypertherm plasma system is designed to be used only with specific Hypertherm torches. Do not substitute other torches which could overheat and present a safety hazard.

CUTTING CAN PRODUCE TOXIC FUMES

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

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

A PLASMA ARC CAN CAUSE INJURY AND BURNS

Instant-On Torches
Plasma arc comes on immediately when the torch switch is activated.

The plasma arc will cut quickly through gloves and skin.
- Keep away from the torch tip.
- Do not hold metal near the cutting path.
- Never point the torch toward yourself or others.

ARC RAYS CAN BURN EYES AND SKIN

Eye Protection Plasma arc rays produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin.
- Use eye protection in accordance with applicable national or local codes.
- Wear eye protection (safety glasses or goggles with side shields, and a welding helmet) with appropriate lens shading to protect your eyes from the arc's ultraviolet and infrared rays.

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

Skin Protection Wear protective clothing to protect against burns caused by ultraviolet light, sparks and hot metal.
- Gauntlet gloves, safety shoes and hat.
- Flame-retardant clothing to cover all exposed areas.
- Cuffless trousers to prevent entry of sparks and slag.
- Remove any combustibles, such as a butane lighter or matches, from your pockets before cutting.

Cutting Area Prepare the cutting area to reduce reflection and transmission of ultraviolet light:
- Paint walls and other surfaces with dark colors to reduce reflection.
- Use protective screens or barriers to protect others from flash and glare.
- Warn others not to watch the arc. Use placards or signs.

GROUNDING SAFETY

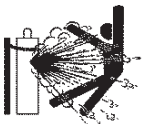
Work Cable Attach the work cable securely to the workpiece or the work table with good metal-to-metal contact. Do not connect it to the piece that will fall away when the cut is complete.

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

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

COMPRESSED GAS EQUIPMENT SAFETY

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



GAS CYLINDERS CAN EXPLODE IF DAMAGED

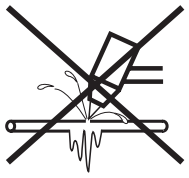
Gas cylinders contain gas under high pressure. If damaged, a cylinder can explode.

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

NOISE CAN DAMAGE HEARING

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

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



A PLASMA ARC CAN DAMAGE FROZEN PIPES

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

PACEMAKER AND HEARING AID OPERATION

Pacemaker and hearing aid operation can be affected by magnetic fields from high currents.
Pacemaker and hearing aid wearers should consult a doctor before going near any plasma arc cutting and gouging operations.

To reduce magnetic field hazards:

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

ADDITIONAL SAFETY INFORMATION

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

WARNING LABEL

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

1. Cutting sparks can cause explosion or fire.

1.1 Keep flammables away from cutting.

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

1.3 Do not cut on any closed containers.

2. The plasma arc can cause injury and burns.

2.1 Turn off power before disassembling torch.

2.2 Do not hold the material near cutting path.

2.3 Wear complete body protection.

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

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

3.2 Insulate yourself from work and ground.

3.3 Disconnect input plug or power before working on machine.

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

4.1 Keep your head out of the fumes.

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

4.3 Use ventilating fan to remove the fumes.

5. Arc rays can burn eyes and injure skin.

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

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

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

Hypertherm

Section 1a

SÉCURITÉ

Dans cette section :

IDENTIFIER LES CONSIGNES DE SÉCURITÉ

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

SUIVRE LES INSTRUCTIONS DE SÉCURITÉ

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

- Les étiquettes de sécurité doivent rester lisibles. Remplacer immédiatement les étiquettes manquantes ou abîmées.
- Apprendre à faire fonctionner la machine et à utiliser correctement les commandes. Ne laisser personne utiliser la machine sans connaître son fonctionnement.
- Garder la machine en bon état. Des modifications non autorisées sur la machine peuvent engendrer des problèmes de sécurité et raccourcir la durée d'utilisation de l'équipement.

DANGER AVERTISSEMENT PRÉCAUTION

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

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

LE COUPAGE PEUT PROVOQUER UN INCENDIE OU UNE EXPLOSION

Prévention des incendies

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

Prévention des explosions

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

AVERTISSEMENT

Risque d'explosion argon-hydrogène et méthane

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

AVERTISSEMENT

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

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


LES CHOCS ÉLECTRIQUES PEUVENT ÊTRE FATALS

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

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

Prévention des chocs électriques

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

- Porter des bottes et des gants isolants et garder le corps et les vêtements au sec.
- Ne pas se tenir, s'asseoir ou se coucher sur une surface mouillée, ni la toucher quand on utilise le système plasma.
- S'isoler de la surface de travail et du sol en utilisant des tapis isolants secs ou des couvertures assez grandes pour éviter tout contact physique avec le travail ou le sol. S'il s'avère nécessaire de travailler dans ou près d'un endroit humide, procéder avec une extrême prudence.
- Installer un sectionneur avec fusibles appropriés, à proximité de la source de courant. Ce dispositif permet à l'opérateur d'arrêter rapidement la source de courant en cas d'urgence.
- En cas d'utilisation d'une table à eau, s'assurer que cette dernière est correctement mise à la terre.
- Installer et mettre à la terre l'équipement selon les instructions du présent manuel et conformément aux codes électriques locaux et nationaux.
- Inspecter fréquemment le cordon d'alimentation primaire pour s'assurer qu'il n'est ni endommagé, ni fendu. Remplacer immédiatement un cordon endommagé. **Un câble dénudé peut tuer**.
- Inspecter et remplacer les câbles de la torche qui sont usés ou endommagés.
- Ne pas saisir la pièce à couper ni les chutes lors du coupage. Laisser la pièce à couper en place ou sur la table de travail, le câble de retour connecté lors du coupage.
- Avant de vérifier, de nettoyer ou de remplacer les pièces de la torche, couper l'alimentation ou débrancher la prise de courant.
- Ne jamais contourner ou court-circuiter les verrouillages de sécurité.
- Avant d'enlever le capot du système ou de la source de courant, couper l'alimentation électrique. Attendre ensuite 5 minutes pour que les condensateurs se déchargent.
- Ne jamais faire fonctionner le système plasma sans que les capots de la source de courant ne soient en place. Les raccords exposés de la source de courant sont extrêmement dangereux.
- Lors de l'installation des connexions, attacher tout d'abord la prise de terre appropriée.
- Chaque système plasma Hypertherm est conçu pour être utilisé uniquement avec des torches Hypertherm spécifiques. Ne pas utiliser des torches inappropriées qui pourraient surchauffer et présenter des risques pour la sécurité.

LE COUPAGE PEUT PRODUIRE DES VAPEURS TOXIQUES

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

- Conserver le poste de coupage bien aéré ou utiliser un masque respiratoire homologué.
- Ne pas procéder au coupage près d'endroits où s'effectuent le dégraissage, le nettoyage ou la vaporisation. Certains solvants chlorés se décomposent sous l'effet des rayons ultraviolets et forment du phosgène.
- Ne pas couper des métaux peints ou contenant des matières toxiques comme le zinc (galvanisé), le plomb, le cadmium ou le béryllium, à moins que la zone de travail soit très bien ventilée et que l'opérateur porte un masque respiratoire. Les revêtements et métaux contenant ces matières peuvent produire des vapeurs toxiques lors du coupage.
- Ne jamais couper de récipients pouvant contenir des matières inflammables avant de les avoir vidés et nettoyés correctement.
- Quand on utilise ce produit pour le soudage ou le coupage, il dégage des fumées et des gaz qui contiennent des produits chimiques qui, selon l'État de Californie, provoquent des anomalies congénitales et, dans certains cas, le cancer.

L'ARC PLASMA PEUT PROVOQUER DES BLESSURES OU DES BRÛLURES

Torches à allumage instantané

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

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

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

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

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

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

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

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

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

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

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

MISE À LA MASSE ET À LA TERRE

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

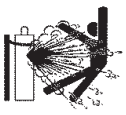
Table de travail Raccorder la table de travail à la terre, conformément aux codes de sécurité locaux ou nationaux appropriés.

Alimentation

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

SÉCURITÉ DES BOUTEILLES DE GAZ COMPRIMÉ

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



LES BOUTEILLES DE GAZ COMPRIMÉ PEUVENT EXPLOSER EN CAS DE DOMMAGES

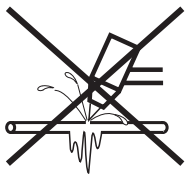
Les bouteilles de gaz contiennent du gaz à haute pression. Si une bouteille est endommagée, elle peut exploser.

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

LE BRUIT PEUT PROVOQUER DES PROBLÈMES AUDITIFS

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

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



UN ARC PLASMA PEUT ENDOMMAGER LES TUYAUX GELÉS

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

PACEMAKERS ET PROTHÈSES AUDITIVES

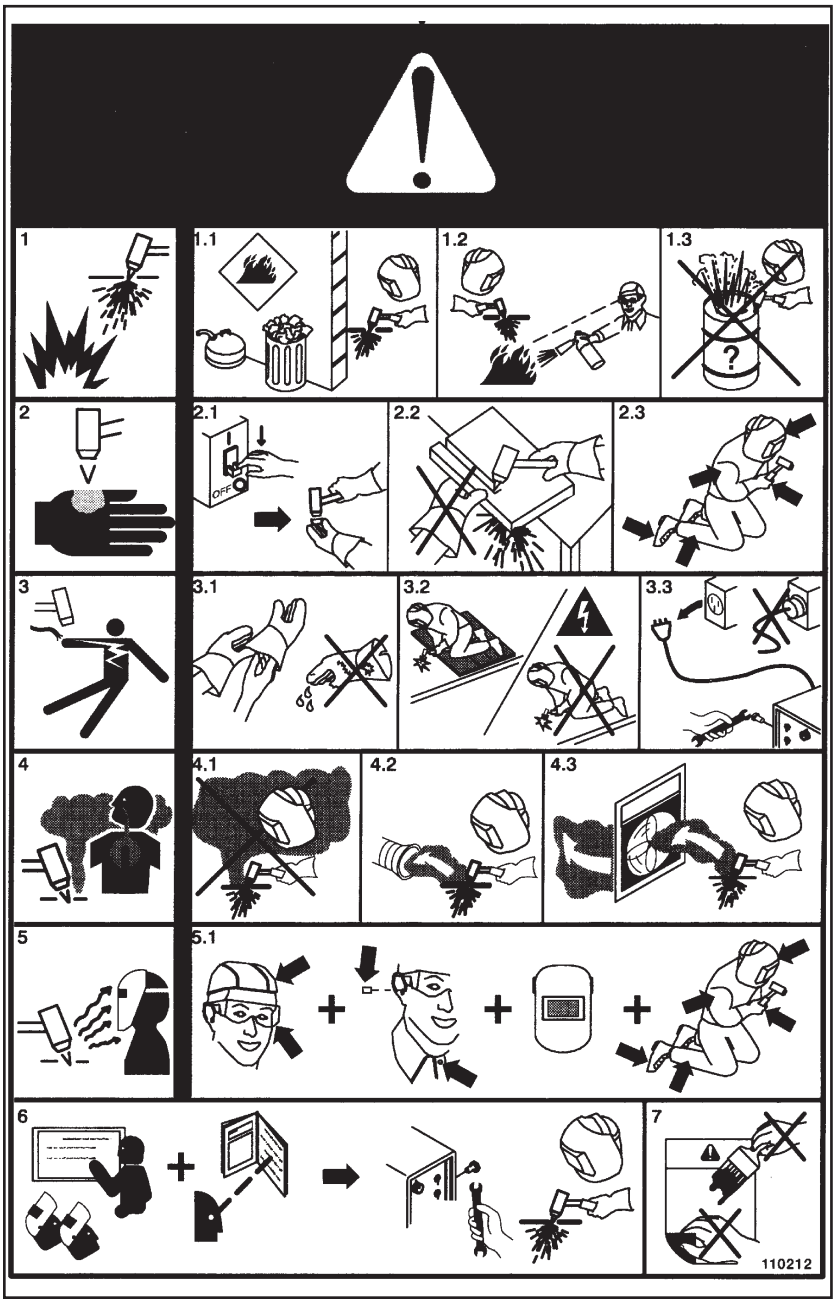
Les champs magnétiques produits par les courants à haute tension peuvent affecter le fonctionnement des prothèses auditives et des pacemakers. Les personnes portant ce type d'appareil doivent consulter un médecin avant de s'approcher d'un lieu où s'effectue le coupage ou le gougeage plasma.

Pour réduire les risques associés aux champs magnétiques :

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

Étiquette de sécurité

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



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

1.1 Pendant le coupage, éloigner toute matière inflammable.

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

1.3 Ne jamais couper de récipients fermés.

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

2.1 Couper l'alimentation avant de démonter la torche.

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

2.3 Porter des vêtements de protection couvrant tout le corps.

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

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

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

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

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

4.1 Garder le visage à l'écart des vapeurs.

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

4.3 Utiliser un ventilateur pour dissiper les vapeurs.

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

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

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

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

Hypertherm

Section 2

SPECIFICATIONS

In this section:

Description

General

This manual provides the information needed to install, operate and maintain the HD3070 plasma cutting system for either robotically controlled or x-y table cutting applications. This precision cutting, dual gas machine-torch system consists of a power supply, RHF console, gas console, torch quick disconnect assembly, off-valve assembly and machine torch assembly. Refer to Figures 2-1 and 2-2.

The HD3070 can be configured for different cutting applications by providing a selectable current output at 15, 30, 50, 70 or 100 amps for optimum performance on cutting most metals from gauge to 1/2-inch (12.7 mm) thick. This allows the operator wide variations in cutting speeds on the same thickness of metal. The gas console provides five inlets for the different plasma and shield gases required for different cutting applications. The HD3070 is designed to cut mild steel, stainless steel, copper and aluminum with the appropriate gases and consumables selected. Plasma gases required for cutting are either oxygen, air or an argon-hydrogen and nitrogen mixture depending on the application. The shield gas aids in assisting cut quality by providing an atmosphere around the plasma arc on the surface of the workpiece. The shield gas also cools the shield at the front end of the torch.

Under microprocessor control, the HD3070 provides extended life (LongLife) for the torch nozzle and electrode. To get long life, all cuts must begin and end on the plate surface; this allows for the proper ramping up and down of gases and DC current.

Power Supply

This unit houses a 100-amp, 15 kw chopper which produces a constant current DC output, variable from 15 to 100 amps. It contains a microprocessor control PCB which regulates all the plasma system functions: start sequence, machine interface functions, gas and cut parameters, and off sequence. The power supply main on/off power is controlled remotely by the CNC machine. The cutting current and pierce delay are also provided by the CNC machine. The power supply also houses the cooling system required to cool the torch. The power supply interconnects with the RHF console, machine interface, gas console, and workpiece.

An EMI filter, standard with all 220/380/415V power supplies (078074), meets the CE requirement for filtering incoming power. Refer to Appendix F to connect incoming power to the filter and for part numbers.

Automatic Gas Console

The gas console is a computer controlled unit which is bolted to the top of the power supply. This unit contains all of the plumbing and valve systems, computer controls for remote operation, and manual controls for local operation. The sequencing of the gas valves is under control of the power supply microcomputer.

In remote mode, this unit allows gas flowrates to be set automatically by the CNC machine without an operator present. The robotic controller interface provides the ability to adjust the metering control of the plasma and shield gas flows to a high degree of accuracy and repeatability.

In local mode, the operator can control of the gas metering valve set-points, select the gas test modes and the gas type to be used, and select the calibration modes.

In both remote and local modes, the LCD display panel will display the following data: local or remote control system operation; plasma and shield gas selections; system errors; gas test or calibrate modes; plasma and shield inlet gas pressures; plasma, shield, and preflow outlet gas pressures; and metering valve set-points.

The gas console interfaces with the power supply through two control cables; with the robotic controller interface through an interface cable; with the torch off-valve assembly through the gas lead set; and receives the plasma and shield gas supplies.

RHF Console

This unit houses the high frequency starting circuit which is needed to fire the torch and permits more effective RF shielding. The RHF Console has a water barrier to separate water and electrical components. Also housed in the console is a door interlock switch and a cathode manifold used to interface power/coolant leads between the power supply and torch. The power/coolant leads and a pilot arc lead make up the shielded torch lead set which connects with the torch.

PAC184 Machine Torch Assemblies

The PAC184 machine torch is a dual gas (plasma and shield) plasma arc cutting torch. The slimmer design allows it to be used primarily in robotic cutting applications. The machine torch assembly includes the torch main body and 15 amp consumables. The torch main body is water cooled by a closed-loop system which distributes the coolant to and from the torch by way of the quick disconnect assembly, RHF console and the cooling subassemblies in the power supply. There are two torch assemblies: one torch assembly comes without an IHS tab on the shield cap; the other torch assembly comes with an IHS tab on the shield cap.

PAC186 Machine Torch Assemblies

The PAC186 machine torch is a dual gas (plasma and shield) plasma arc cutting torch designed for X-Y table cutting applications. The machine torch assembly includes the torch main body and 15 amp consumables. The torch main body is water cooled by a closed-loop system which distributes the coolant to and from the torch by way of the quick disconnect assembly, RHF console and the cooling subassemblies in the power supply. There are two torch assemblies: one torch assembly comes without an IHS tab on the shield cap; the other torch assembly comes with an IHS tab on the shield cap.

45° Torch Quick Disconnect Assembly

The torch quick disconnect assembly is primarily used for robotic cutting applications. Inputs from the RHF console using the torch lead set are: electrode cooling water supply and return, power, and pilot arc. Inputs from the off-valve assembly are for torch blow back and plasma and shield gases.

Straight Torch Quick Disconnect Assembly

The torch quick disconnect assembly allows mechanized changing of torches by the cutting machine. Inputs from the RHF console using the torch lead set are: electrode cooling water supply and return, power, and pilot arc. Inputs from the off-valve assembly are for torch blow back and plasma and shield gases.

Off-Valve Assemblies

Two off-valve assemblies are offered: one with a blow back solenoid valve and the other without a blow back solenoid valve. Both off-valve assemblies provide on/off control between the preflow and operate gas flows. This assembly consists of three solenoid valves which provide inlet and outlet gas connections. The inlet connections (plasma gas, shield gas and preflow gas) are input from the gas console using the gas lead set. The outlet connections (blow back [if desired], plasma gas and shield gas) are output to the torch quick disconnect assembly.

Optional Units

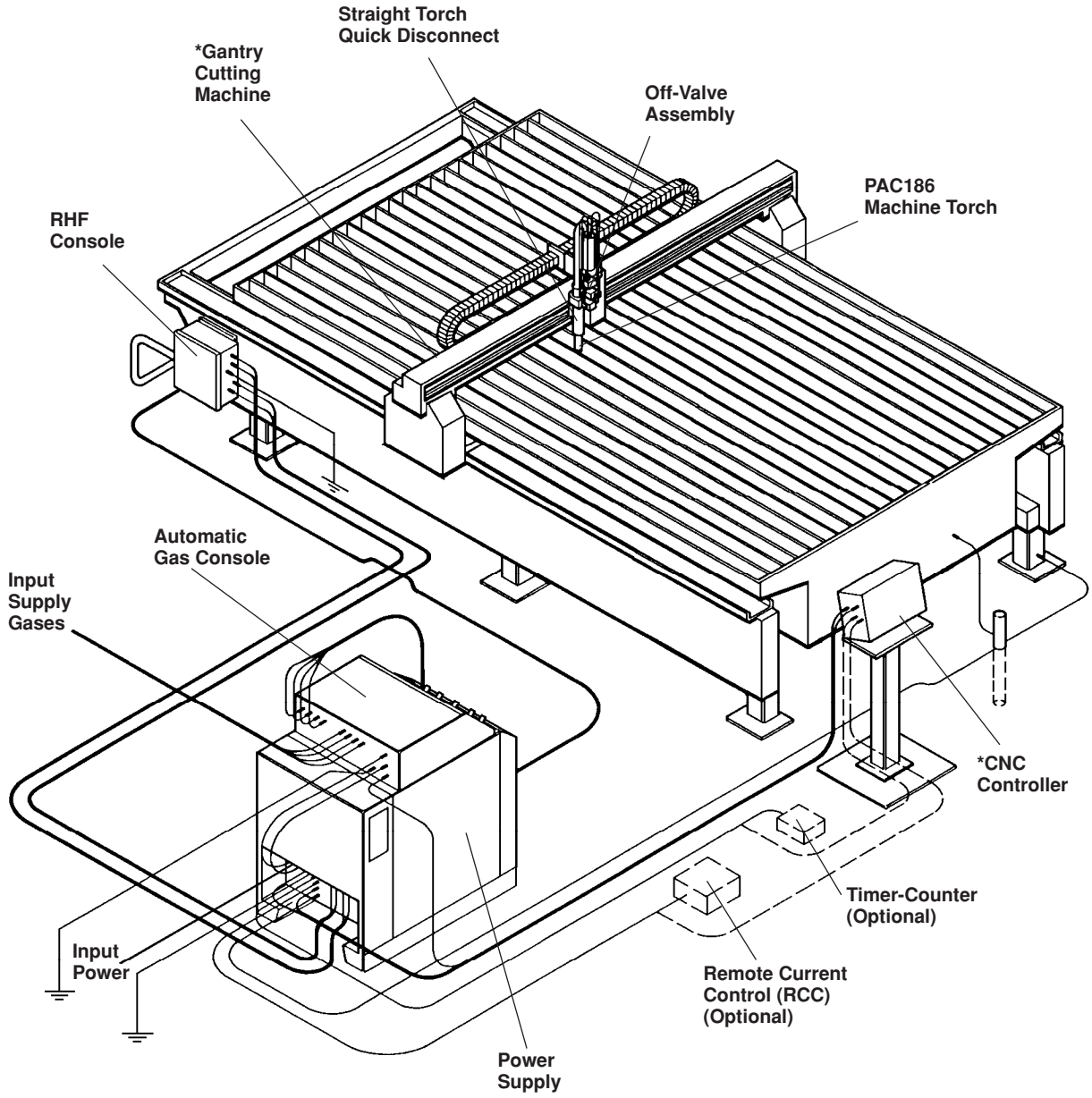
Timer-Counter

The timer/counter allows the operator to monitor the number of arc starts, the cumulative time that the arc is on in hours, and the number of arc blow outs. The arc starts and arc errors LCD counters can be reset. This unit connects with the power supply.

Refer to Appendix D for installation, operation and parts information.

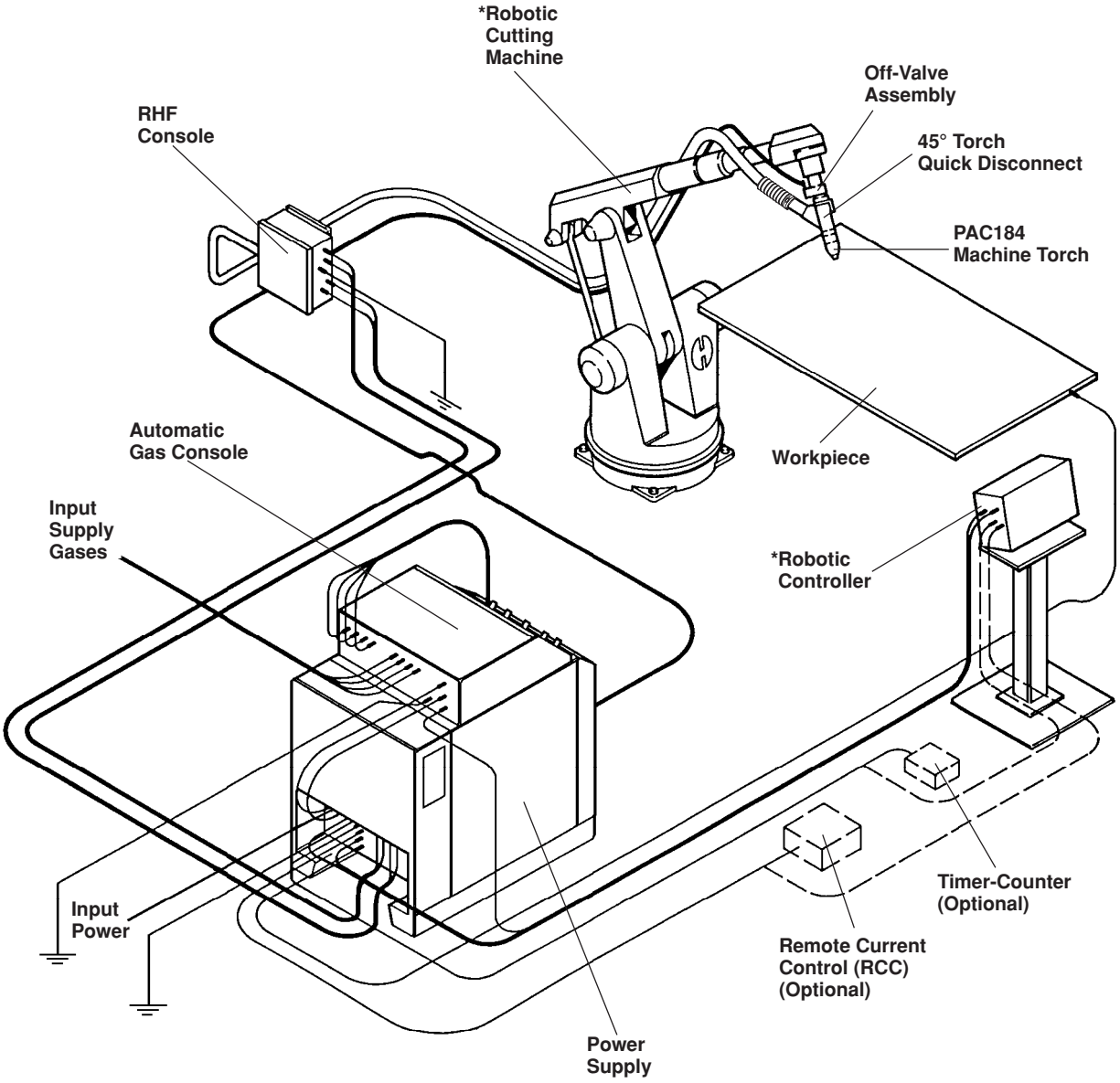
Remote Current Control (RCC)

The RCC allows the operator the ability to select the cutting current from a remote location. This unit connects with the power supply. Refer to Appendix E for installation, operation and parts information.



*** Non Hypertherm Components**

Figure 2-1 HD3070 System Components with Gantry Cutting Machine



*** Non Hypertherm Components**

Figure 2-2 HD3070 System Components with Robotic Cutting Machine

Specifications

Power Supply (078072, 078073, 078074, 078075, 078076)

Maximum OCV (U_0)	280 VDC
Output Current (I_2)	15, 30, 50, 70, and 100 amps
Output Voltage (U_2)	150 VDC
Duty Cycle Rating (X)	80% at 100 amps
Cooling	Forced Air (Class F)
Ambient temperatures/duty cycle	Power supplies will operate between +14° and 104° F (-10° and +40° C). Power supplies operated in an ambient temperature above 86° F (30° C) may show some decrease in duty cycle.

Input Power (U_1 Input Voltage, I_1 Input Current)**:**

078075	240/480 VAC, 3 Ph, 60 Hz, 50/25 amps
078073	208 VAC, 3 Ph, 60 Hz, 58 amps
078074	220/380/415 VAC, 3 Ph, 50/60 Hz, 54/30/28 amps (see Appendix F)
078076	600 VAC, 3 Ph, 60 Hz, 20 amps
078072	200 VAC, 3 Ph, 50/60 Hz, 60 amps

Torch Cooling Requirements:

Coolant Tank Capacity	2.9 gallons (11 liters)
Coolant	Propylene glycol/deionized water/benzotriazole (refer to Section 3, Torch Coolant for specifications, warning, and caution).
Flow Rate	≈ 1 gallon/minute (3.8 liters/minute)
Pressure	150 psi (10.2 bar)

Dimensions and Weight:

Width	24.25 inches (616 mm)
Height	36 inches (914 mm)
Depth	38.25 inches (972 mm)
Weight	545 pounds (247 kg)

Automatic Gas Console (078061)

Input Power from Power Wupply (intrlk'd)	120 VAC
Output Power to Off-Valve Assy	120 VAC
Outputs to CNC	Active (low or closed)

Gas Supply Requirements:

Plasma Gas Types	**Oxygen (O_2)** (15, 30, 50, 70 or 100 amp mild steel cutting) **Air** (30, 50, or 70 amp stainless steel cutting; 70 amp aluminum cutting) **Argon-Hydrogen** (**H35**) and **Nitrogen (N_2) mixture** (100 amp stainless steel cutting)
Shield Gas Type	**Oxygen (O_2)** and **Nitrogen (N_2)** mixture (15, 30, 50, 70 or 100 amp mild steel cutting) **Methane (CH_4)** and **Air** mixture (70 amp stainless steel cutting) **Air** (30 and 50 amp stainless steel cutting) **Methane (CH_4)** (70 amp aluminum cutting) **Nitrogen (N_2)** (100 amp aluminum and stainless steel **cutting)**
Oxygen Gas Quality	99.95 % pure (liquid gas recommended)
H35 Quality (35% Hydrogen/65% Argon)	99.995 % pure (liquid gas recommended)
Nitrogen Gas Quality	99.995 % pure (liquid gas recommended)
Air Quality	Clean, dry and oil-free
Methane Quality	93 % pure (commercial grade)
All Gas and Air Inlet Pressures	120 psi (8.2 bar)
Air Flowrate	81.7 scfh (2313 l/hr) at fullscale
Oxygen Flowrate	77.8 scfh (2203 l/hr) at fullscale
Nitrogen Flowrate	83.1 scfh (2353 l/hr) at fullscale
Methane Flowrate	110 scfh (3114 l/hr) at fullscale
Argon-Hydrogen	85 scfh (2407 l/hr) at fullscale

Dimensions and Weight:

Width	24 inches (610 mm)
Height	8 inches (203 mm)
Depth	22 inches (559 mm)
Weight	83 pounds (37 kg)

RHF Console (078010)

Input Power from Power Supply (intrlk'd)	120 VAC
Output Power	2700 VAC
High Frequency Spark Gap	0.020 ± 0.001 inch (0.51 ± 0.03 mm)

Dimensions and Weight:

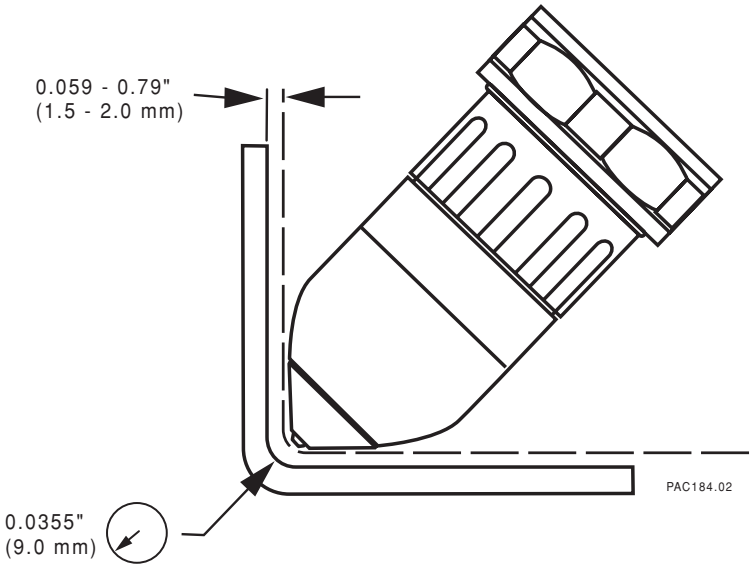
Width	12.63 inches (321 mm)
Height	13.5 inches (343 mm)
Depth	6.5 inches (165 mm)
Weight	20 pounds (9.1 kg)

PAC184 Machine Torch Assemblies (028839, 128199)

Maximum cutting thickness .....1/4 inch (6.4 mm)
Maximum current at 100% duty cycle .....30 amps

Torch Cooling Requirements:
Coolant.....Propylene glycol/deionized water/benzotriazole (refer to Section 3, Torch Coolant Requirements for specifications, warning, and caution)
Flow Rate.....≈ 1 gallon/minute (3.8 liters/minute)
Pressure .....150 psi (10.2 bar)

Dimensions and Weight:
Diameter.....1.75 inches (44 mm)
Length .....3.44 inches (88 mm)
Weight .....1 pound (0.45 kg)



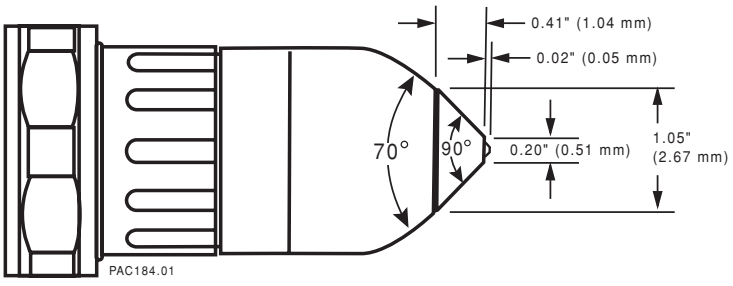


Figure 2-3 PAC184 Torch Assembly

PAC186 Machine Torch Assemblies (128101, 128102)

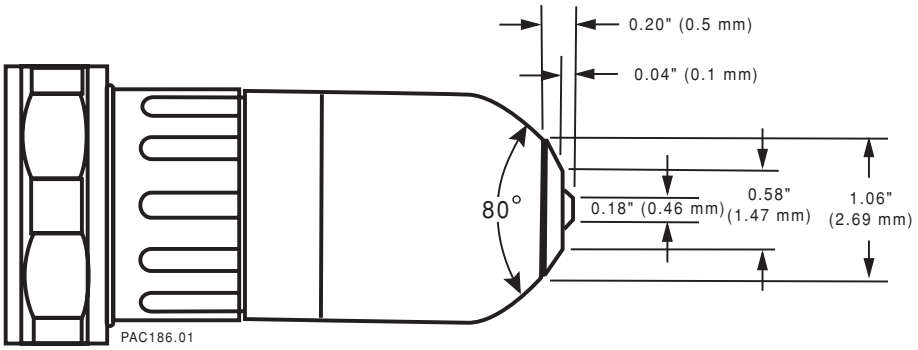
Maximum cutting thickness .....1/2 inch (12.7 mm)
Maximum current at 80% duty cycle .....100 amps

Torch Cooling Requirements:

Coolant .....Propylene glycol/deionized water/benzotriazole (refer to Section 3, Torch Coolant Requirements for specifications, warning, and caution)
Flow Rate .....≈ 1 gallon/minute (3.8 liters/minute)
Pressure .....150 psi (10.2 bar)

Dimensions and Weight:

Diameter.....1.75 inches (44 mm)
Length .....3.44 inches (88 mm)
Weight .....1 pound (0.45 kg)

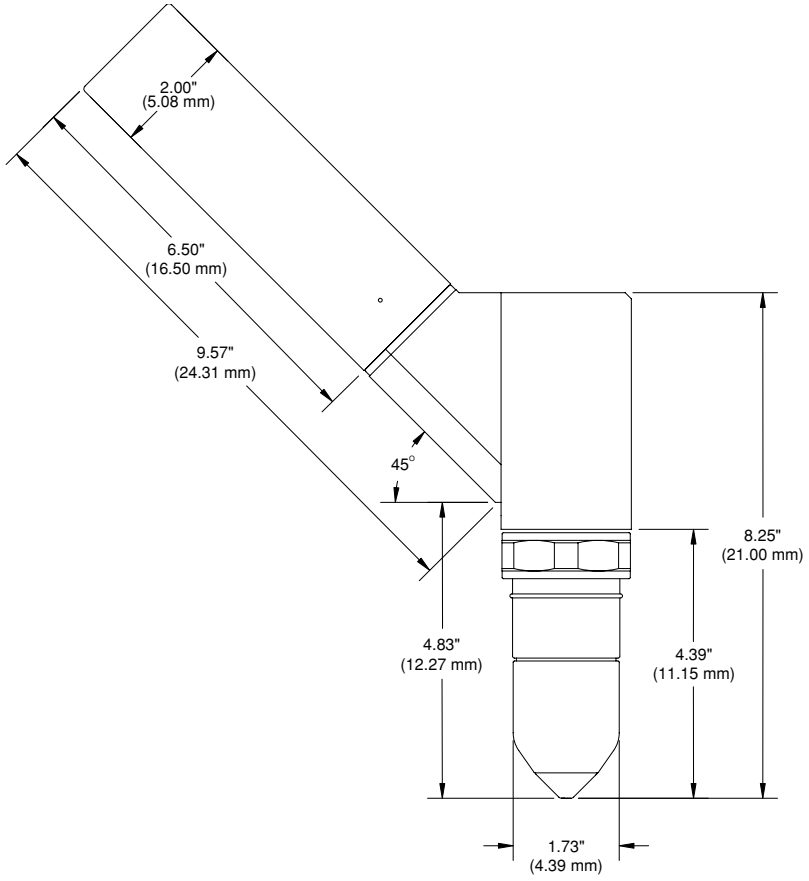


PAC186 Torch Assembly

45° Torch Quick Disconnect Assembly (028840)

Dimensions and Weight:

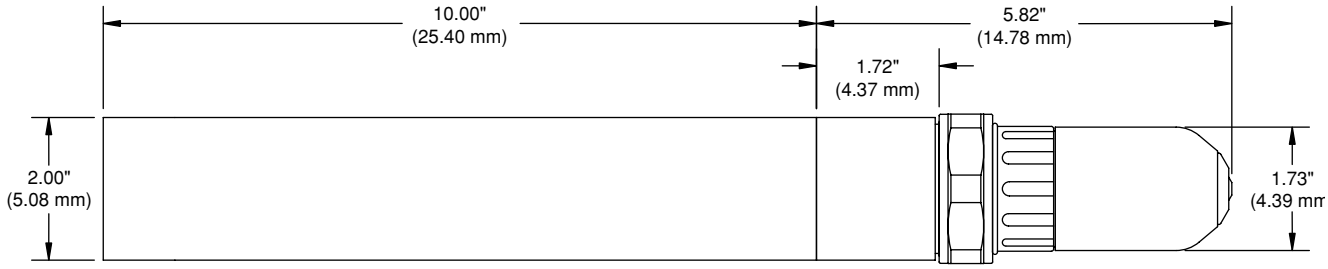
Width .....2.13 inches (54 mm)
Length .....4.19 inches (107 mm)
Depth.....4.56 inches (117 mm)
Weight .....1 pound (0.45 kg)



Straight Torch Quick Disconnect Assembly (028855)

Dimensions and Weight:

Diameter (outer) .....2 inches (51 mm)
Length .....2.5 inches (63 mm)
Weight .....1 pound (0.45 kg)



Off-Valve Assemblies (129239, 129281)

Input Power from Gas Console (intrlk'd) .....120 VAC

Dimensions and Weight:
Diameter (side to side) .....5.75 inches (146 mm)
Diameter (front to back) .....4.25 inches (108 mm)
Weight .....4 pounds (1.8 kg)

Optional Units

Timer-Counter (078049)

Receives error signals and machine arc time and machine start signals from power supply .....Dry contacts

Dimensions and Weight:
Width .....6.5 inches (165 mm)
Height .....2.5 inches (64 mm)
Depth .....8.63 inches (219 mm)
Weight .....3 pounds (1.4 kg)

Refer to Appendix D for installation, operation and parts information.

Remote Current Control (RCC) (078050)

Receives current setpoint signals from power supply

Dimensions and Weight:
Width .....6.3 inches (160 mm)
Height .....2.37 inches (61 mm)
Depth .....8.5 inches (216 mm)
Weight .....3 pounds (1.4 kg)

Refer to Appendix E for installation, operation and parts information.

IEC Symbols Used


Direct Current (DC).


Alternating current (AC).


Plasma cutting torch.


AC input power connection.


The terminal for the external protective (earthed) conductor.

A chopper-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.

Hypertherm

Section 3

INSTALLATION

In this section:

Pre-Installation

Prior to the installation of the HD3070 plasma cutting system, the components must be unpacked and the following requirements must be fulfilled. Their purpose is to aid you in the installation of your plasma cutting system and to allow maximum performance.

Installation and service of the electrical and plumbing systems must conform to national or local electrical and plumbing codes. Have this work performed only by qualified, licensed personnel.

If questions arise at any time, call Technical Service listed in the front of this manual or your authorized Hypertherm distributor.

Upon Receipt

Before unpacking the HD3070 System, inspect the box(es) for evidence of damage during shipment. If there is evidence of damage, refer to *Claims for Damage During Shipment* below for details. Remove all packing material and discard and remove the units and items from the box(es). Verify that the components listed below are included. Alert Hypertherm if any of the items are damaged or missing. All communications regarding this equipment must include the model number and serial number (located on the back of the units). Refer to *Claims* below for details.

HD3070 System Components

- Power Supply (078072, 078073, 078074, 078075 or 078076)
- Automatic Gas Console (078061)
- Remote High Frequency Console (RHF) (078010)
- PAC184 Torch Assembly (028839 or 128199)
  PAC186 Torch Assembly (128101 or 128102)
- 45° Torch Quick Disconnect Assembly (028840) or
  Straight Torch Quick Disconnect Assembly (028855)
- Off-Valve Assembly (129239 or 129281)
- PAC184 Consumable Parts Kit (028842 or 028900)
- PAC186 Consumable Parts Kit (128097 or 128098)
- Power Supply Service Parts Kit (028724)
- System Interconnecting Cables & Hoses
- HD3070 with Automatic Gas Console Instruction Manual (802180)

Optional Units
- Timer-Counter (078049)
- Remote Current Control (RCC) (078050)

Claims

Claims Claims for damage during shipment – If your unit was damaged during shipment, you must file a claim with the carrier. Hypertherm will furnish you with a copy of the bill of lading upon request. If you need additional assistance, call Customer Service listed in the front of this manual or your authorized Hypertherm distributor.

Claims for defective or missing merchandise – If any of the merchandise is defective or missing, call your authorized Hypertherm distributor. If you need additional assistance, call Customer Service listed in the front of this manual or your authorized Hypertherm distributor.

Gas Requirements

The following gases required by the HD3070 plasma system for cutting are provided **by the customer.** Bottled liquid gas is recommended. If the purity level of the gas is too low or if there are leaks in the supply hoses or connections:

- System can be contaminated
- Cut speeds can decrease
- Cut quality can deteriorate
- Cutting thickness capability can decrease
- Parts life can shorten

If making hard plumbing connections, avoid using iron pipe. Never use PTFE tape on any joint preparation. After installation, pressurize the entire system and check for leaks.

Oxygen (O_2)

WARNING
FIRE HAZARD

Oxygen can cause a potential fire hazard. Install an exhaust ventilation system when using oxygen gas.

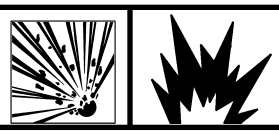
The customer must provide a regulated oxygen supply capable of delivering at a pressure of **120 psi (8.2 bar)** to the gas console at **99.95 %** purity and at a **flowrate of 77.8 scfh (2203 l/hr)**. Connect the oxygen supply with a 3/8-inch ID hose to the **O_2** input adapter (1/4 NPT right handed 'B', male) on the gas console.

Nitrogen (N_2)

The customer must provide a regulated nitrogen supply capable of delivering at a pressure of **120 psi (8.2 bar)** to the gas console at **99.995 %** purity and at a **flowrate of 83.1 scfh (2353 l/hr)**. Connect the nitrogen supply with a 3/8-inch ID hose to the **N_2** input adapter (1/4 NPT right handed "B', inert female) on the gas console.

Methane (CH_4)

The customer must provide a regulated commercial grade methane supply at a pressure of **120 psi (8.2 bar)** to the gas console at **93 %** purity, and at a flowrate of **110 scfh (3114 l/hr)**. Bottled liquid gas is recommended. Connect the methane supply with a 3/8-inch ID hose to the **CH_4** input adapter (1/4 NPT, left handed 'B', male) on the gas console.



WARNING
EXPLOSION HAZARD

Methane is a combustible gas and can be an explosion hazard. Keep open flames away from the methane cylinders and gas hoses.

Air

The customer must provide a regulated air supply capable of delivering at a pressure of **120 psi (8.2 bar)** to the gas console that is clean, dry and oil-free and at a **flowrate of 81.7 scfh (2313 l/hr)**. Connect the air supply with a 3/8-inch ID hose to the **AIR** input adapter (1/4 NPT #6, 9/16-inch 18 thread, male flare) on the gas console.

Argon-Hydrogen (H35)

WARNING
EXPLOSION HAZARD

H35 is a combustible gas and can be an explosion hazard. Keep open flames away from the gas cylinders and gas hoses.

The customer must provide a regulated H35 (35 %hydrogen and 65 % argon) supply at a pressure of **120 psi (8.2 bar)** to the gas console at **99.995 %** purity, and at a flowrate of **85 scfh (2407 l/hr)**. Bottled liquid gas is recommended. Connect the H35 supply with a 3/8-inch ID hose to the **H35** input adapter (1/4 NPT, left handed 'B', male) on the gas console.

Power Supply Placement

Place the power supply with the attached automatic gas console according to the criteria below and the dimensions called out in Figure 3-1.

Note: The units may be moved by forklift, if the forks are long enough to extend more than half way the length of the base of the power supply. Care should be used when lifting with the forks so that the underside of the power supply is not damaged.

- The area must have proper ventilation, be clean and free of excessive moisture. Allow room for accessing the sides of the power supply for servicing. The air flow for power supply cooling must not blocked in any way. Air is drawn in through the front and is exhausted through the rear of the unit by fans. Do not place any filter device over the air intake locations which reduces cooling efficiency and VOIDS THE WARRANTY.

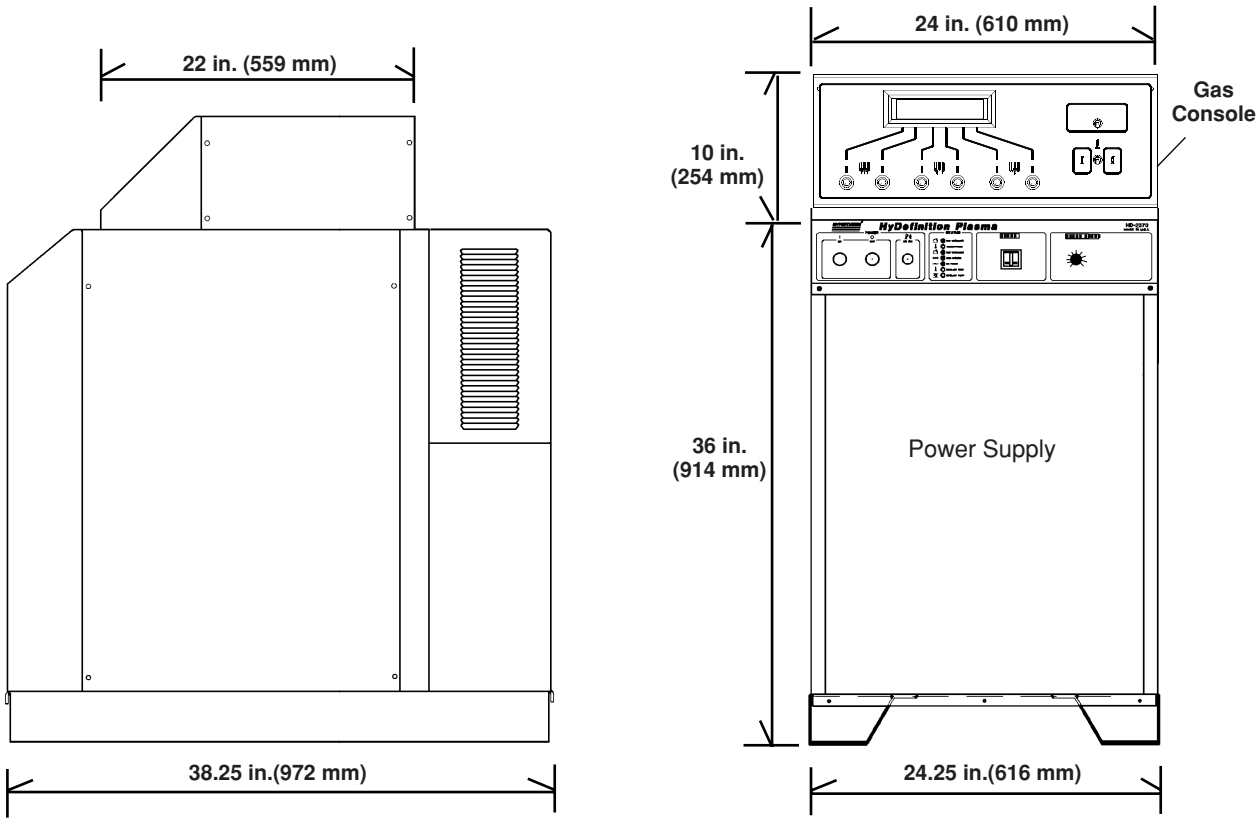


Figure 3-1 HD3070 Power Supply with Automatic Gas Console – Placement Dimensions

Power Requirements

WARNING

Electrical installation must be performed by qualified personnel only.

All switches, slow-blow fuses and power cables are customer supplied and must be chosen as directed by applicable national and/or local electrical codes.

Use a separate primary line disconnect switch for each HD3070 power supply and slave.

Note: Input voltage must not drop below 15% of the values listed below. The power supply will go into an idle mode and display an error on the control board if the input voltage is too low

Size the disconnect box(es) to Table 3-1 requirements for the HD3070 power supply.

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 for easy accessibility by the operator. The line disconnect switch must be installed by qualified personnel following all applicable local and national 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 “I (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 (Table 3-1)

Power Cable

The power cable is customer supplied. Use an 8-4 conductor Type SO input power cable with a conductor temperature rating of 140°F (60°C).

Table 3-1 Line Voltage Disconnect Box Fusing Requirements

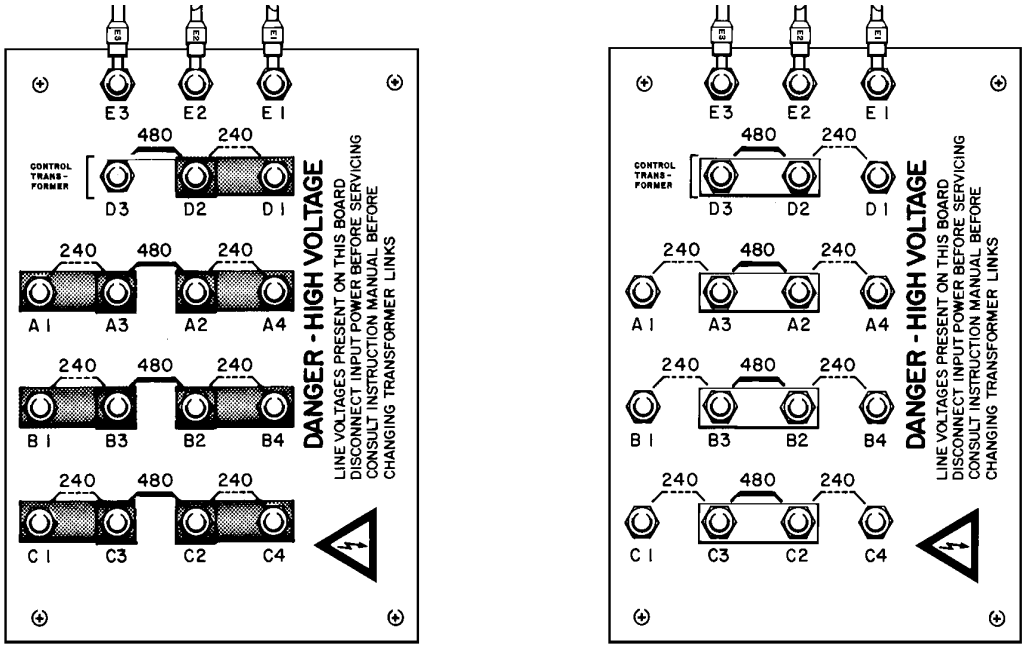
Input Voltage (VAC)	Phase/Hz	Rated Input Current @ 15 kw Output (amps)	Recommended Slow-Blow Fuse Sizes (amps)
200	3/50-60	60	70
208	3/60	58	70
220	3/50-60	54	70
240	3/60	50	60
380	3/50-60	30	40
415	3/50-60	28	35
480	3/60	25	30
600	3/60	20	25

240/480V Power Supply Linkboard Configurations

- The 240/480-volt power supplies (078075) are shipped configured for 480-volt operation. The links must be moved for 240-volt operation (Figure 3-2).

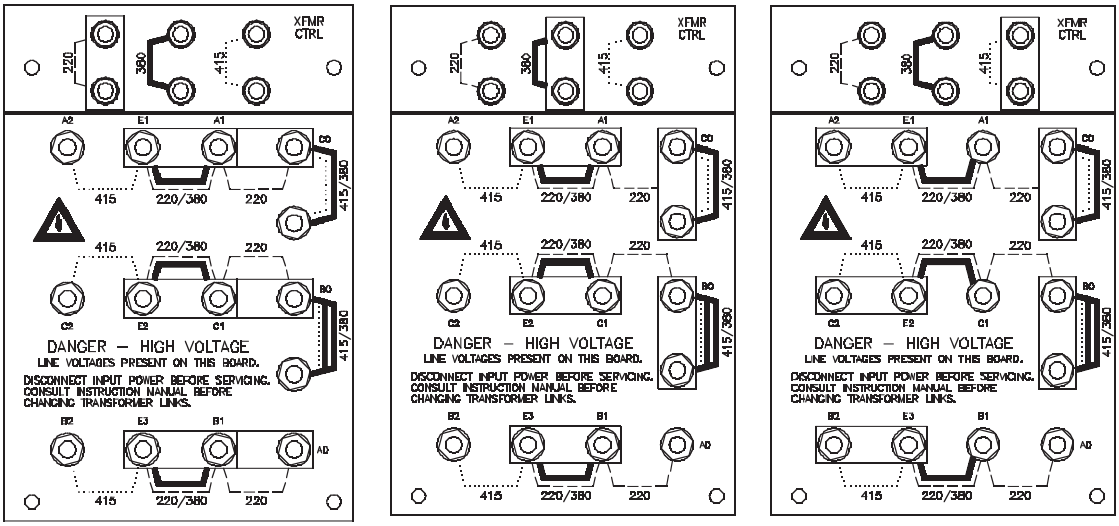
220/380/415V Power Supply Linkboard Configurations

- The 220/380/415-volt, 3PH, 50/60 Hz power supplies (078074) are normally shipped from the factory set up for 380-volt operation, unless otherwise specified. To change the power supply to a different voltage (220 or 415 volts), the links must be moved (Figure 3-3).



240-Volt 480-Volt

Figure 3-2 Dual Voltage 240/480-Volt Linkboard Configurations



220-Volt **380-Volt** **415-Volt**

Figure 3-3 220/380/415V Linkboard Configurations

Work Table Grounding

- The work table must be grounded properly to ensure personal safety, and to reduce the emission of radio-frequency interference.
- See Appendix G for important grounding instructions.

Equipment Grounding

- The power supply, RHF console and gas console provide connections for protective earth (PE) grounding.
- See Appendix G for important grounding instructions.

Connect Power Cable

After the power supply and line voltage disconnect box have been placed, connect the power cable to the power supply first and then connect it to the line disconnect switch.

Power Supply

To connect the power cable to a 220/380/415V power supply (078024), refer to Appendix F. For other power supply voltages use the procedure below.

1. Insert the power cable through the strain relief at the lower right rear of the power supply. Connect the power cable leads to **TB1** on the rear center panel of the right side (see Figure 3-4).

2. Connect the power leads to the **L1 (U)**, **L2 (V)**, and **L3 (W)** terminals of **TB1.** Make sure that all electrical connections are tight to avoid excessive heating.

3. Connect the ground lead to the ground stud.

Line Voltage Disconnect Box

Connecting the power cable to the disconnect box must conform to national and local electrical codes. This work should be performed only by qualified, licensed personnel.

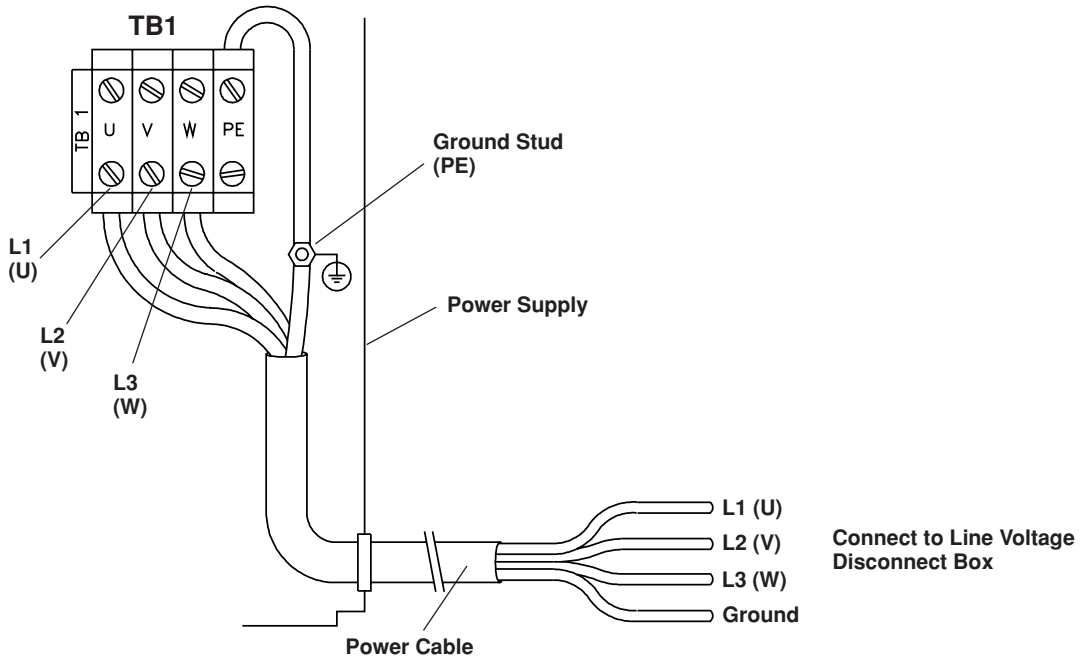


Figure 3-4 Power Supply Power Cable Connections

Local/External Pierce Delay Function

The power supply is shipped with the PIERCE DELAY potentiometer on the power supply control panel enabled. Perform the steps below to enable the external pierce complete function. Refer to Section 6, Figure 6-2, item 5 to locate control board 1XPCB3 and power supply (power unit) wiring diagram for wiring information.

1. Remove the power supply front panel and locate control board 1XPCB3.

2. Disconnect PL10 from REC5 on 1XPCB3.

3. Locate the blue jumper wire connected to PL10 pin 7. Connect the free end of the jumper to PL10 pin 5.

4. Reconnect PL10 to REC5.

To reestablish local control, remove jumper wire from PL10 pin 5.

Local/External Current Set Function

The power supply is shipped with the AMPS thumbwheel switch on the power supply control panel enabled. Perform the steps below to enable the external current set function. Refer to Section 6, Figure 6-2, item 5 to locate control board 1XPCB3 and power supply (power unit) wiring diagram for wiring information.

1. Remove the power supply front panel and locate control board 1XPCB3.

2. Disconnect PL27-B (thumbwheel switch connector) from REC27 and then connect PL27-A (external current set) to REC27.

3. Connect the current setpoint cable (Figure 3-22) between 1X2 (rear of power supply) and CNC Interface.

To reestablish local control, disconnect PL27-A from REC27 and connect PL27-B to REC27. Then disconnect current setpoint cable between 1X2 and CNC Interface.

Torch Lifter Requirement

The HD3070 requires a motorized torch lifter with sufficient vertical travel to cut all required metal thicknesses. Vertical travel must be in increments of 0.010 inch (0.25 mm) and have a travel speed of 200 ipm (5.08 m/min) maximum and braking should be positive. A unit which drifts through the stop point is not acceptable.

Installation

This section provides the user with the necessary information to install the HD3070 system. Installation of the system should not be undertaken unless all of the pre-installation requirements presented in front of this section have been completed. This section includes the following:

- Placing and mounting the system units.
- Interconnecting the units with the electrical control cables, cooling hoses and torch and gas lead sets.
- Mounting the PAC184 or PAC186 torch to the torch quick disconnect.
- Adding the torch coolant.

System Units Placement

Position the RHF console prior to making electrical and coolant connections. Also mount the torch quick disconnect and off-valve assembly. Note that power supply (with the automatic gas console mounted on top of it) placement information is presented in *Pre-Installation* in the front of this section.

Remote High Frequency Console

Place the RHF console in a convenient location to allow easy routing and connection leads, coolant hoses and torch lead set. Bolt the unit to the mounting surface. See Figure 3-5.

Automatic Gas Console

To remove the automatic gas console from the power supply, refer to Figure 3-6. After removal, place the automatic gas console in a convenient location to allow easy routing and connection of the gas hoses, control cables and gas lead set.

Torch Quick Disconnect Assemblies/Off-Valve Assembly

The torch quick disconnect assemblies and off-valve assembly are shipped loose. The 45° quick disconnect, generally used with the PAC184 torch, is normally mounted onto a robotic arm using the four 1/4-20 holes mounting holes. See Figure 3-7 for torch quick disconnect mounting hole dimensions.

The straight quick disconnect assembly, generally used with the PAC186 torch, is normally mounted onto a torch lifter on a x-y cutting table.

The off-valve assembly may be mounted up to a distance of four feet from either of the torch quick disconnects.

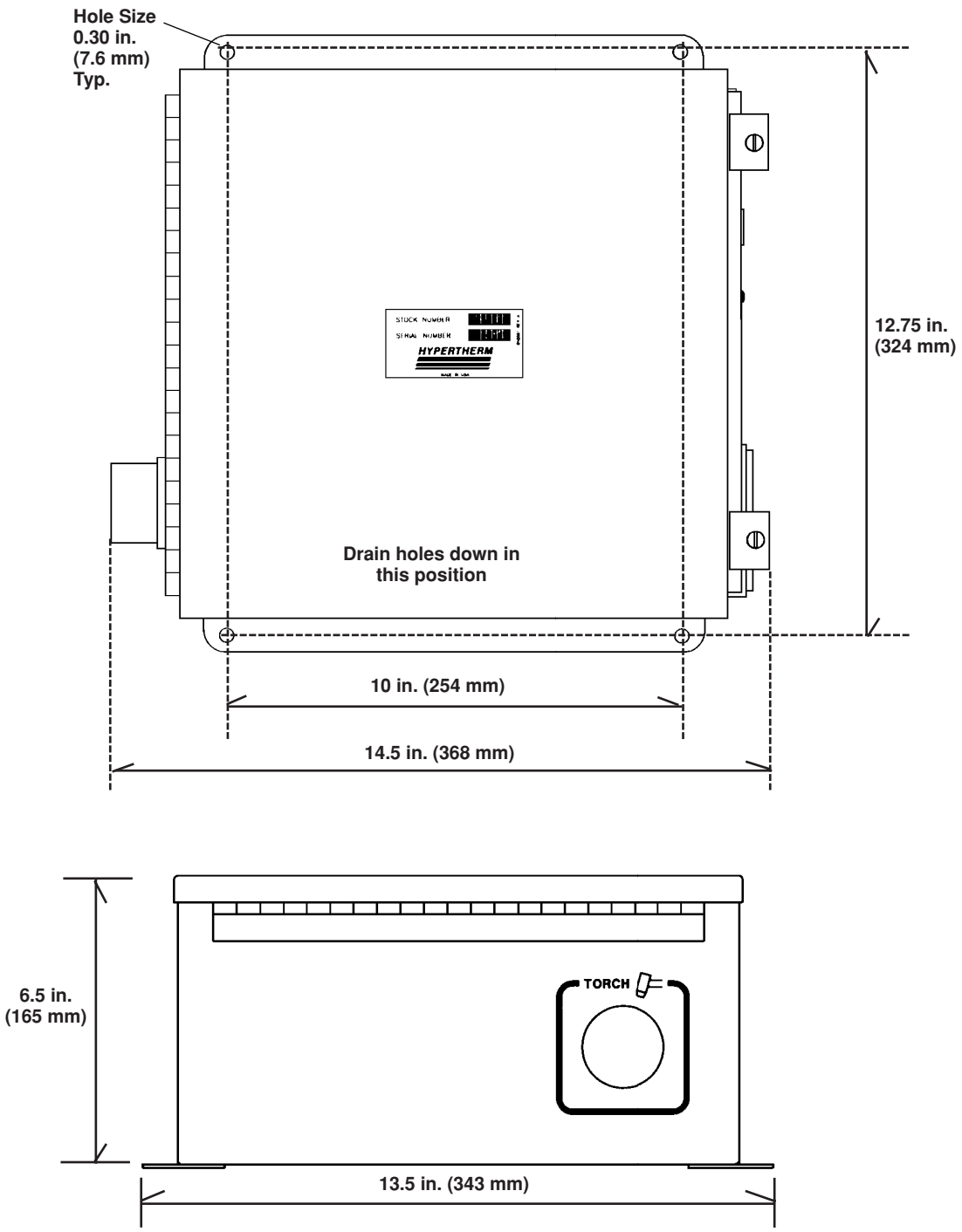
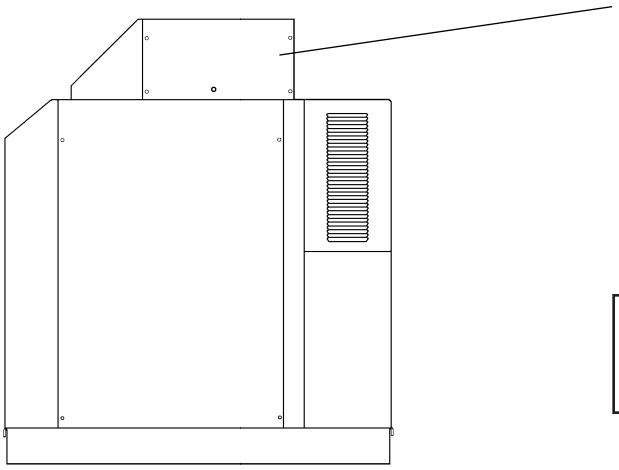


Figure 3-5 RHF Console Mounting Dimensions



To remove the automatic gas console from the power supply:

1. Remove 14 screws securing cover to gas console.
2. Remove cover.
3. Locate and remove four screws securing gas console to power supply.

Caution: The automatic gas console weighs 83 pounds (37.7 kg). Use care when lifting and moving the console.

4. When lifting gas console, note the four flat washers between the power supply and gas console. Reinstall screws with flat washers into screw holes on power supply for future use.

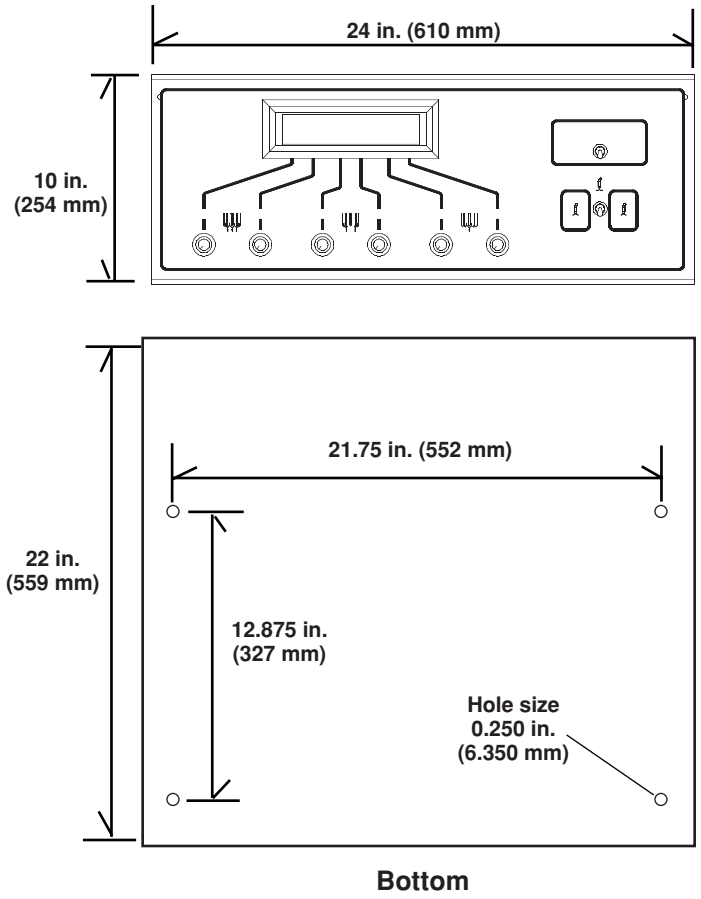


Figure 3-6 Automatic Gas Console Removal Procedure and Mounting Dimensions

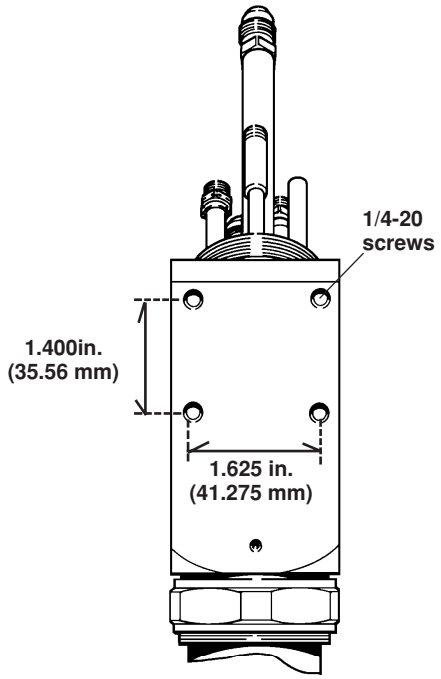


Figure 3-7 45° Torch Quick Disconnect Mounting Hole Dimensions

Cable, Hose & Lead Set Interconnections

The following cable, hose and lead set interconnecting procedures are supported by the system interconnection diagram, Figure 3-8. Also provided are illustrations of each unit showing where the connections are to be made and illustrations of the cables, hoses and lead sets.

Note that these procedures and supporting illustrations are cross referenced (①, ⑨, etc.) to ensure a safe and correct installation. Also note that the cross referencing numbers do not indicate a sequence for interconnecting. It is assumed that in most cases the interconnections will be routed through a power track or festoon system from one point to the other.

IMPORTANT

When interfacing with the CNC, optically isolated I/Os or ground floating interfaces are recommended to avoid ground shift and make the system more immune to EMI noises.

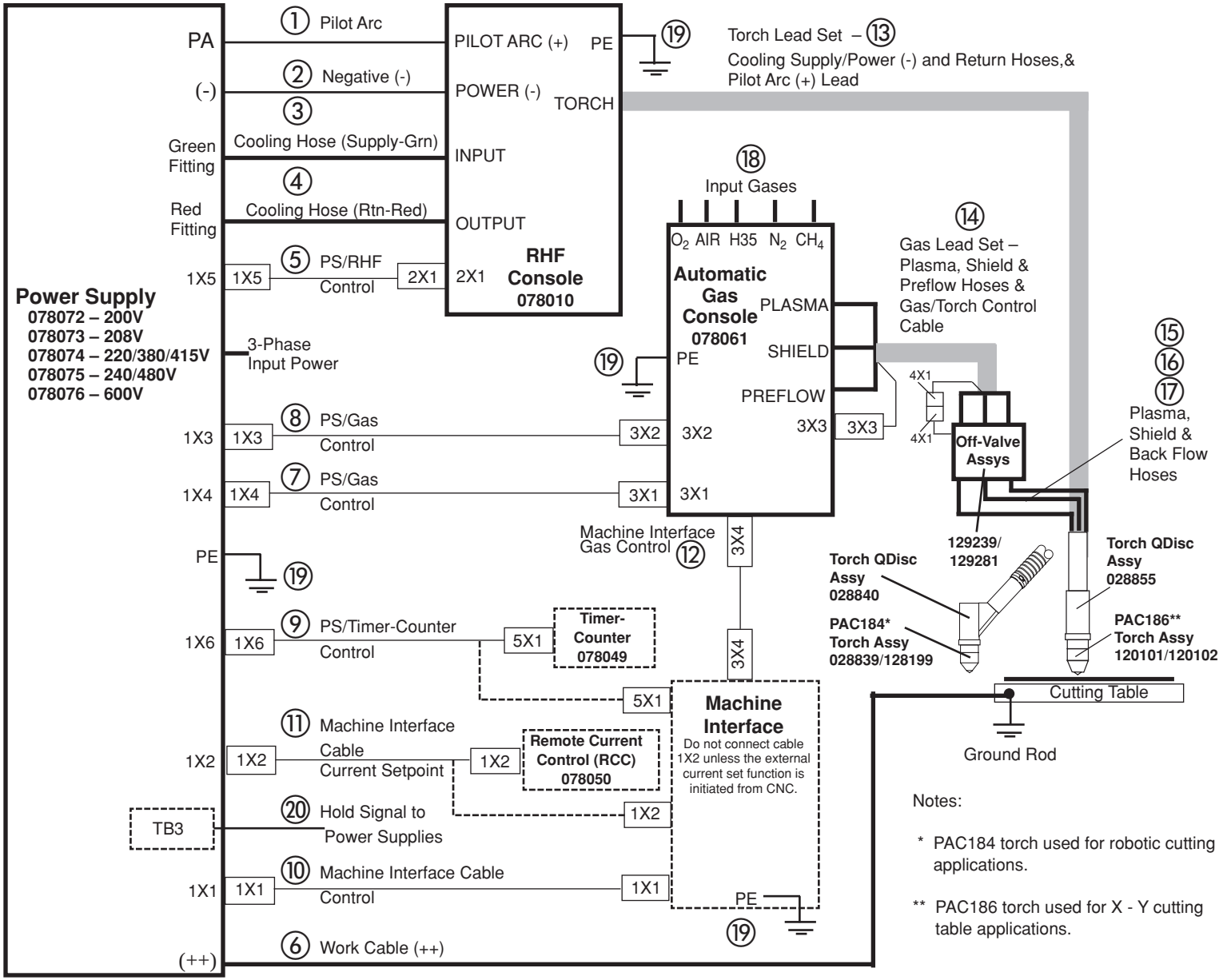


Figure 3-8 HD3070 System with Automatic Gas Console Interconnect Diagram

Power Supply to RHF Console and Work Table Interconnections (Figure 3-9)

① Pilot Arc Lead (+) (Figure 3-10)

1. Route one end of the lead through the feed-through on the rear of the power supply and connect to the pilot arc terminal.

2. Route other end of the lead with strain relief through the **PILOT ARC (+)** on the RHF Console and connect to the pilot arc terminal on the I/O PC BD Assy.

② Negative Lead (-) (Figure 3-11)

1. Route one end of the lead through the feed-through on the rear of the power supply and connect to the negative terminal.

2. Route the other end of the lead with strain relief through the **POWER (-)** on the RHF Console and connect to the negative terminal on the I/O PC BD Assy.

③ Cooling Water Supply Hose /Power Lead (-) (Green) (Figure 3-12)

1. At the rear of the power supply connect the coolant supply hose (green band) to the check valve connector painted green.

2. Route the other end of the hose through the **IN** feed-through on the RHF Console and connect to the manifold adapter painted green.

④ Cooling Water Return Hose (Red) (Figure 3-13)

1. At the rear of the power supply connect the coolant return hose (red band) to the check valve connector painted red.

2. Route the other end of the hose through the **OUT** feed-through on the RHF Console and connect to the manifold adapter painted red.

⑤ Control Cable (Figure 3-14)

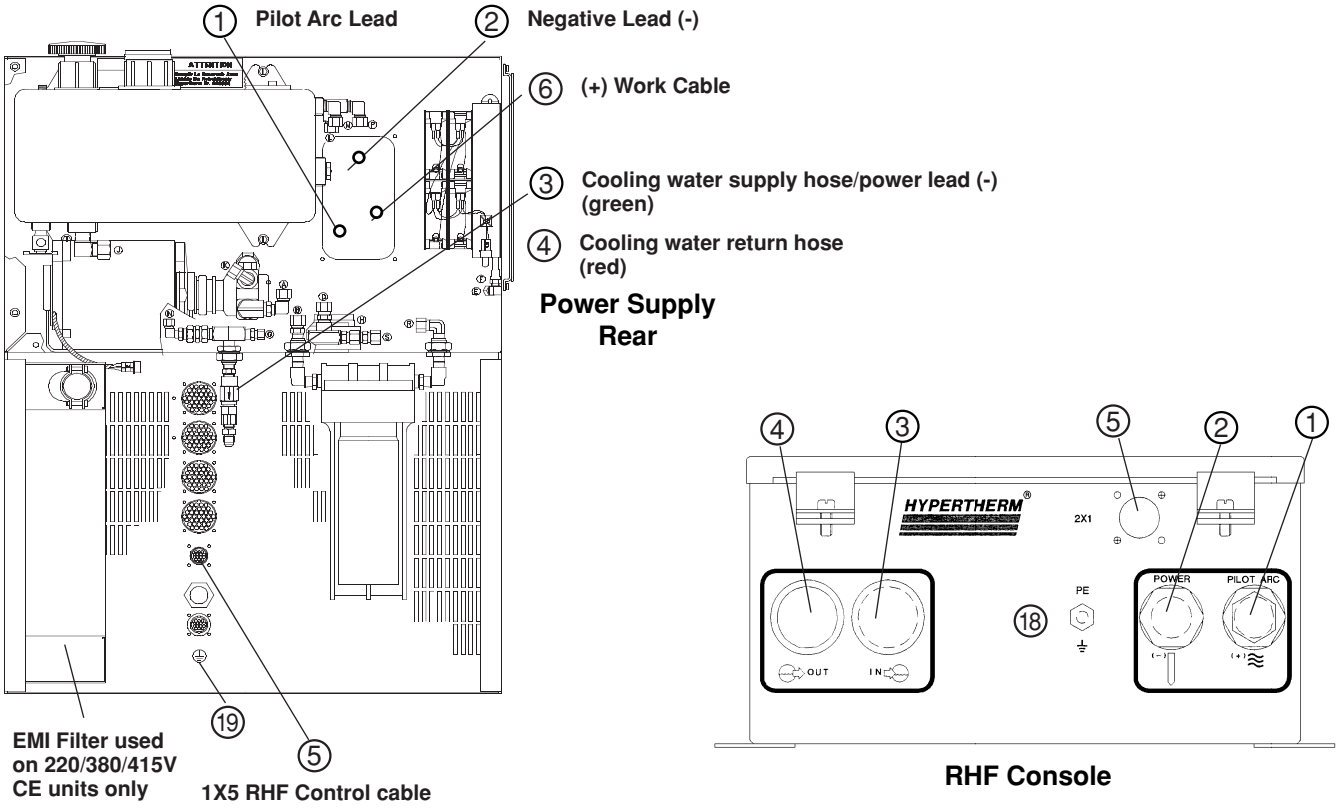
1. Connect the cable plug marked **1X5** to the receptacle marked **1X5** on the rear of the power supply.

2. Connect the other end of the cable marked **2X1** to the receptacle marked **2X1** on the RHF Console.

⑥ Work Cable (Figure 3-15)

1. Route one end of the cable through the feed-through on the rear of the power supply and connect to the work (++) terminal (Figure 3-8).

2. Connect the other end of the cable to the work table ground rod or to the work table. Make sure that good metal-to-metal contact has been made (Figure 3-8).



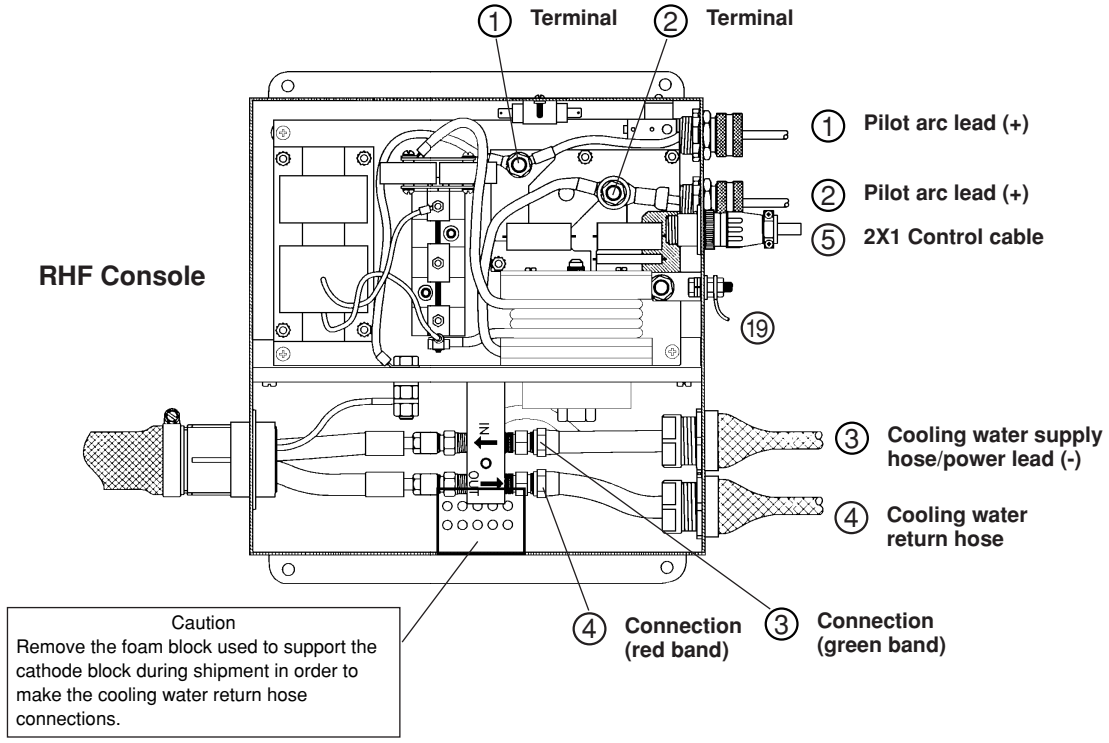


Figure 3-9 Power Supply to RHF Console Interconnections

①

Part Number	Length
023924	4 ft (1.2 m)
023569	15 ft (4.6 m)
023526	25 ft (7.6 m)
023527	50 ft (15.2 m)
023528	75 ft (23 m)
023529	100 ft (30.5m)
023730	115 ft (35 m)
023746	125 ft (38 m)

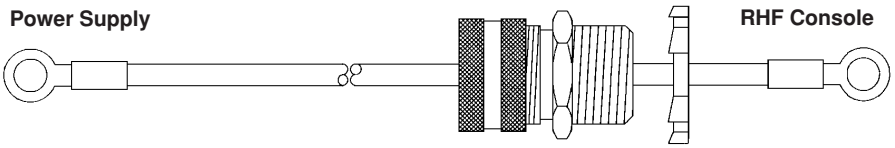


Figure 3-10 Pilot Arc Lead (+)

②

Part Number	Length
023925	4 ft (1.2 m)
023530	15 ft (4.6 m)
023531	25 ft (7.6 m)
023532	50 ft (15.2 m)
023533	75 ft (23 m)
023534	100 ft (30.5 m)
023731	115 ft (35 m)
023747	125 ft (38 m)

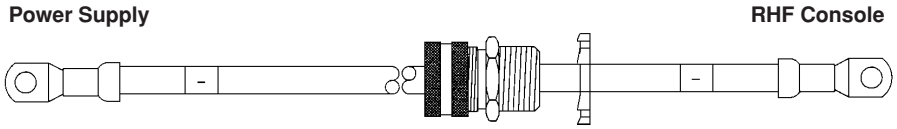


Figure 3-11 Negative Lead (-)

③

Part Number	Length
024421	4 ft (1.2 m)
024290	15 ft (4.6 m)
024291	25 ft (7.6 m)
024263	50 ft (15.2 m)
024264	75 ft (23 m)
024265	100 ft (30.5 m)
024385	115 ft (35 m)
024396	125 ft (38 m)
024459	150 ft (46 m)

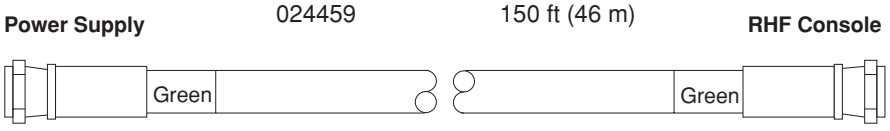


Figure 3-12 Cooling Supply Hose/Power Lead (-)

④

Part Number	Length
024422	4 ft (1.2 m)
024266	15 ft (4.6 m)
024267	25 ft (7.6 m)
024268	50 ft (15.2 m)
024269	75 ft (23 m)
024270	100 ft (30.5 m)
024386	115 ft (35 m)
024397	125 ft (38 m)
024460	150 ft (46 m)

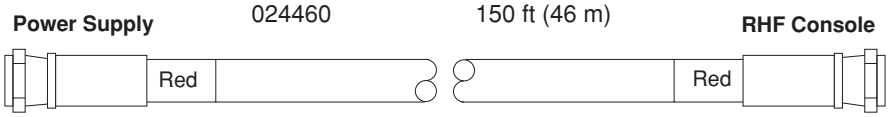
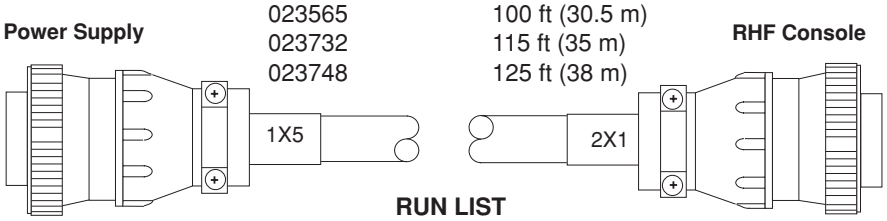


Figure 3-13 Cooling Return Hose

⑤

Part Number	Length
023926	4 ft (1.2 m)
023470	15 ft (4.6 m)
023562	25 ft (7.6 m)
023563	50 ft (15.2 m)
023564	75 ft (23 m)
023565	100 ft (30.5 m)
023732	115 ft (35 m)
023748	125 ft (38 m)



RUN LIST

SIGNAL	PLUG 1X5	COLOR	PLUG 2X1
Door Interlock	1	Black	1
	2	Red	2
Ground	5	Shield	Cut
HV Transformer	6	Red	6
	7	Black	7
Ground	3	Shield	Cut

Figure 3-14 PS/RHF Control Cable

⑥

Part Number	Length
023535	15 ft (4.6 m)
023536	25 ft (7.6 m)
023828	39.4 ft (12 m)
023537	50 ft (15.2 m)
023538	75 ft (23 m)
023539	100 ft (30.5 m)

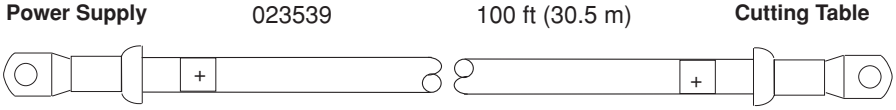


Figure 3-15 Work Cable (+)

Power Supply to Automatic Gas Console Interconnections (Figure 3-16)

⑦ **Gas Console Cable (Figure 3-17)**

1. Connect the cable plug marked **1X4** to the receptacle marked **1X4** on the rear of the power supply.
2. Connect the other end of the cable marked **3X1** to the receptacle marked **3X1** on the gas console.

⑧ **Gas Console Control Cable (Figure 3-18)**

1. Connect the cable plug marked **1X3** to the receptacle marked **1X3** on the rear of the power supply.
2. Connect the other end of the cable marked **3X2** to the receptacle marked **3X2** on the gas console.

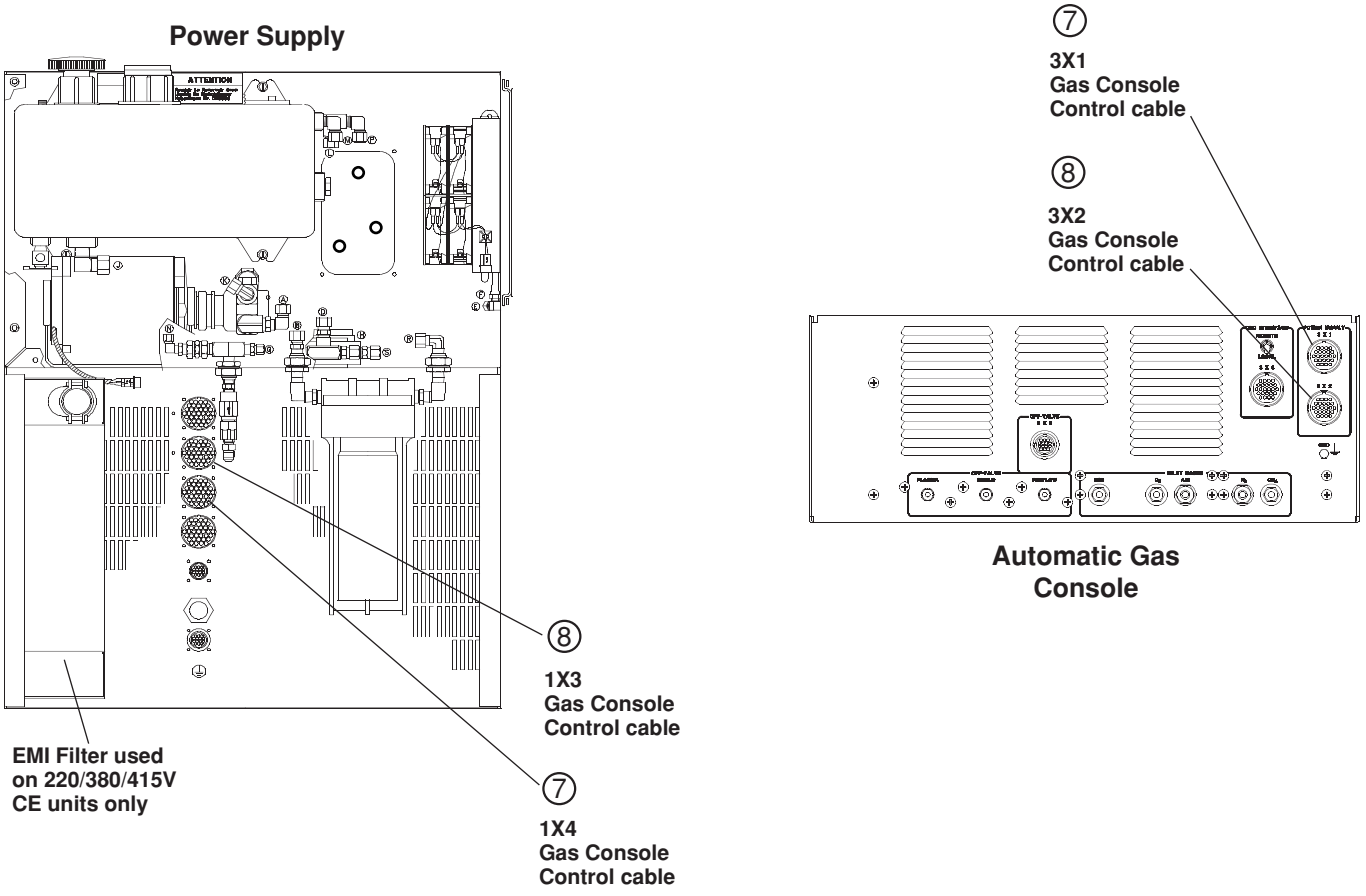
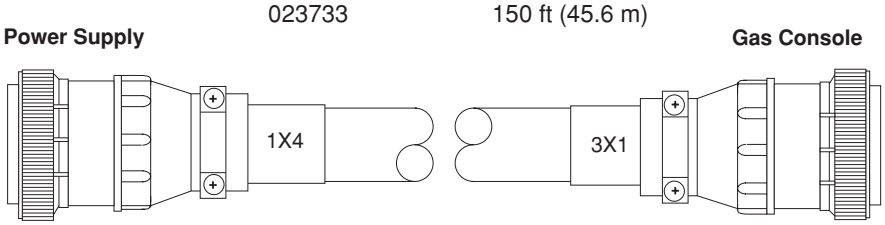


Figure 3-16 Power Supply to Gas Console Interconnections

⑦

Part Number	Length
023673	6 ft (1.8 m)
023558	10 ft (3 m)
023472	25 ft (7.6 m)
023556	50 ft 15 m)
023557	75 ft (23 m)
023760	100 ft (30.5 m)
023744	125 ft (38 m)
023733	150 ft (45.6 m)



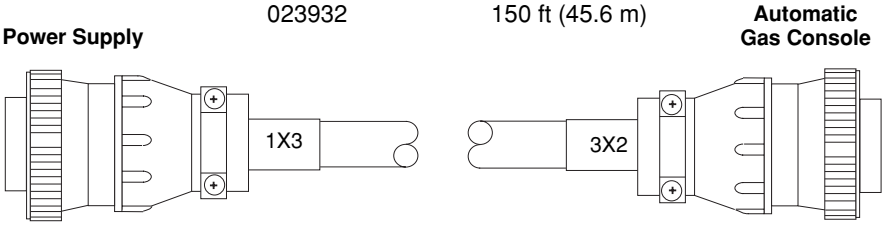
RUN LIST

SIGNAL	PLUG 1X4	COLOR	PLUG 3X1
Message Number	14	Black	14
	15	Green	15
-	9	Shield	9
Shield Operate	12	Black	12
	13	Yellow	13
-	7	Shield	7
Air Plasma	23	Black	23
	24	Blue	24
-	29	Shield	29
Shield Preflow	10	Black	10
	11	Orange	11
-	5	Shield	5
H35 & N_2 Plasma	25	Black	25
	26	White	26
-	31	Shield	31
Plasma On & Off	1	Black	1
	2	Brown	2
-	6	Shield	6
O_2 Plasma	27	Red	27
	28	Brown	28
-	33	Shield	33
Unassigned	3	Black	3
	4	Red	4
-	8	Shield	8
Gas System Power	36	Red	36
	37	Brown	37
-	32	Shield	32
Unassigned	34	Black	34
	35	Red	35
-	30	Shield	30
Key	N/A	N/A	16

Figure 3-17 Gas Console Cable

⑧

Part Number	Length
023671	6 ft (1.8 m)
023927	10 ft (3 m)
023672	25 ft (7.6 m)
023928	50 ft 15 m)
023929	75 ft (23 m)
023930	100 ft (30.5 m)
023931	125 ft (38 m)
023932	150 ft (45.6 m)



RUN LIST

SIGNAL	PLUG 1X3	COLOR	PLUG 3X2
Gas Pressure	1	Red	1
or Contact Closure	2	Black	2
-	6	Shield	6
Gas System	3	White	3
or Contact Closure	4	Black	4
-	8	Shield	8
H35 & N_2 Plasma	10	Green	10
Contact Closure	11	Black	11
-	5	Shield	5
Test Operate Flow	14	Yellow	14
Contact Closure	15	Black	15
-	9	Shield	9
Test Preflow	12	Blue	12
Contact Closure	13	Black	13
-	7	Shield	7
O_2 Plasma	21	Brown	21
Contact Closure	22	Black	22
-	17	Shield	17
DC On Light	23	Red	23
-	24	White	24
-	19	Shield	19
Unassigned	20	Orange	20
Contact Closure	18	Black	18
-	16	Shield	16

Figure 3-18 Gas Console Control Cable

Power Supply to Machine Interface /Timer-Counter Interconnections (Figure 3-19)

⑨ **Timer-Counter Control Cable (Figure 3-20)**

1. Connect the cable plug marked **1X6** to the receptacle marked **1X6** on the rear of the power supply.

2. Connect the other end of the cable to the machine interface or receptacle marked **5X1** on the rear of the timer-counter. (Figure 3-8)

Power Supply to Machine Interface Interconnections (Figure 3-19)

⑩ **Machine Interface Control Cable (Figure 3-21)**

1. Connect the cable plug marked **1X1** to the receptacle marked **1X1** on the rear of the power supply.

2. Connect the other end of the cable to the machine interface. (Figure 3-8)

Power Supply to Machine Interface /RCC Interconnections (Figure 3-19)

⑪ **Machine Interface Current Setpoint Cable (Figure 3-22)**

Do not connect this cable unless the external current set function is going to be initiated from the CNC controller.

1. Connect the cable plug marked **1X2** to the receptacle marked **1X2** on the rear of the power supply.

2. Connect the other end of the cable to the machine interface or receptacle marked **1X2** on the rear of the RCC. (Figure 3-8)

⑫ **Gas Console to Machine Interface Interconnection (Figure 3-19)**

Do not connect this cable unless the external current set function is going to be initiated from the CNC controller.

1. Connect the cable plug marked **3X4** to the receptacle marked **3X4** on the rear of the gas console (Figure 3-8).

2. Connect the other end of the cable to the machine interface (Figure 3-8).

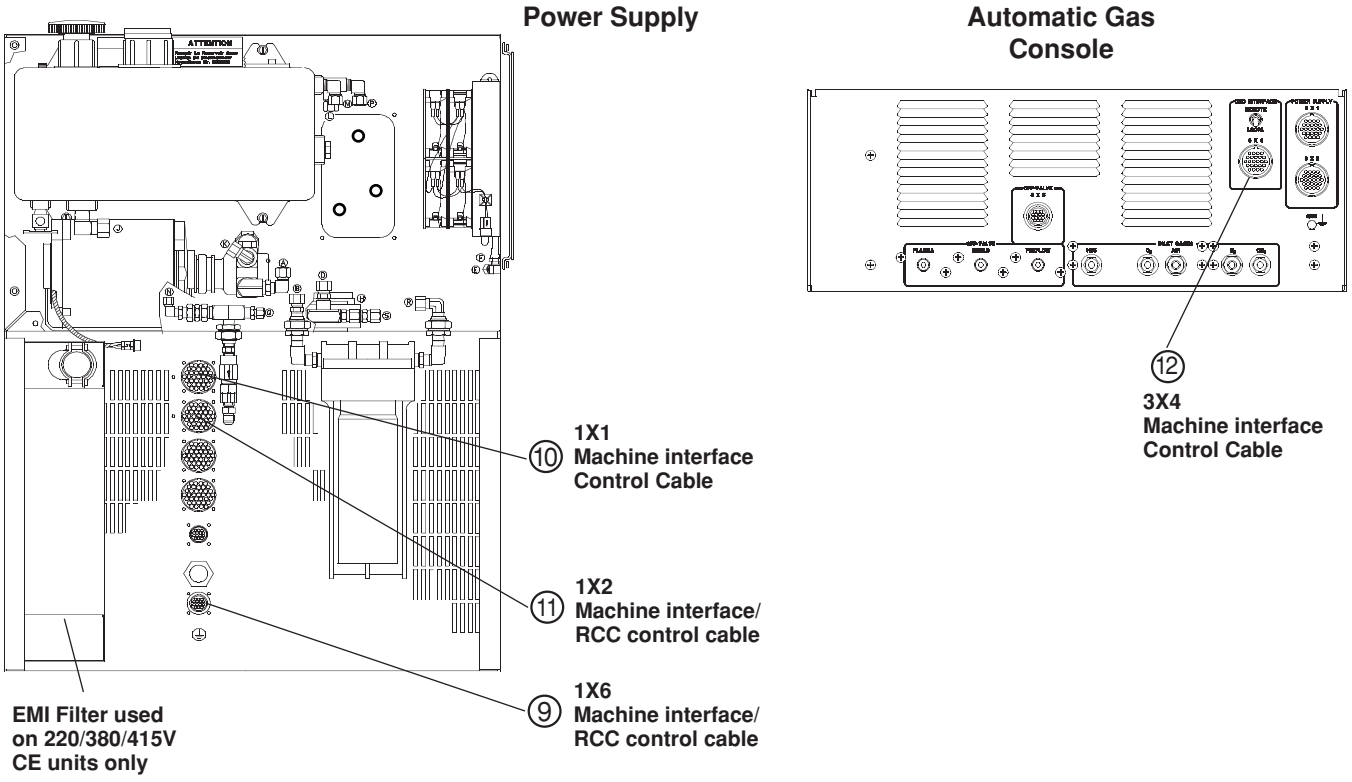
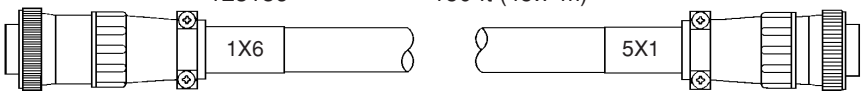


Figure 3-19 Power Supply and Automatic Gas Console Interconnections to Machine Interface

⑨

Part Number	Length
023946	3.5 ft (1.1 m)
023947	5.5 ft (1.7 m)
023948	6 ft (1.8 m)
023949	25 ft (7.6 m)
023721	28.3 ft (8.6 m)
023950	38 ft (11.6 m)
123111	50 ft (15.2 m)
123100	75 ft (23 m)
123328	100 ft (30.5 m)
123186	150 ft (45.7 m)



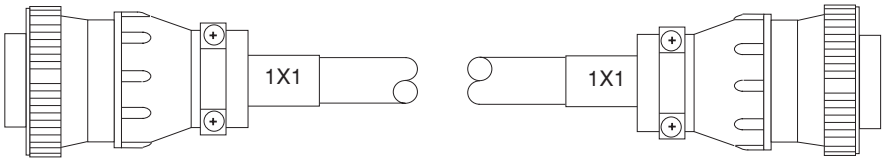
RUN LIST

SIGNAL	PLUG 1X3	COLOR	MACHINE INTERFACE/ TIMER-COUNTER
Starts & Arc Time	2	White	2
Starts & Arc Time	3	Black	3
Drain	4	Drain	4
Error Counter	5	Red	5
Error Counter	6	Black	6
Drain	7	Drain	7

Figure 3-20 PS/Machine Interface or Timer/Counter Control Cable

⑩

Part Number	Length
023707	25 ft (7.6 m)
023829	28.2 ft (8.6 m)
023933	50 ft (15.2 m)
023934	75 ft (23 m)
023935	100 ft (30.5 m)
023936	125 ft (38 m)
023937	150 ft (45.6 m)



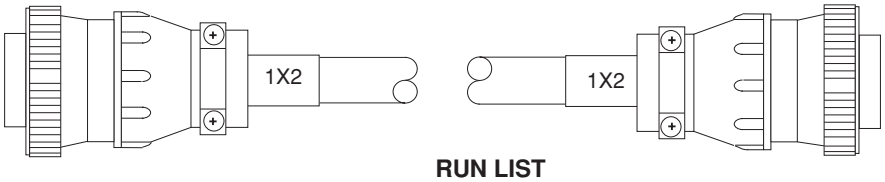
RUN LIST

SIGNAL	PLUG 1X1	COLOR	MACHINE INTERFACE
Hold (Dry)	1	Black	1
Hold (Dry)	5	Red	5
-	10	Drain	10
Pierce Comp (Dry)	2	Black	2
Pierce Comp (Dry)	6	White	6
-	11	Drain	11
Torch Ignition Out (Dry)	3	Black	3
Torch Ignition Out (Dry)	7	Green	7
-	12	Drain	12
Power Off -	4	Black	4
Power Off +	8	Blue	8
-	13	Drain	13
Plasma On (Dry)	9	Black	9
Plasma On (Dry)	15	Yellow	15
-	14	Drain	14
Ext Inter CC (Dry)	16	Red	16
Ext Inter CC (Dry)	17	Blue	17
-	18	Drain	18
Power On Input +	29	Black	29
Power On Input -	34	Brown	34
-	23	Drain	23
1/50 Arc Voltage -	33	Red	33
1/50 Arc Voltage +	28	Green	28
-	27	Drain	27
Power Interlocks (Dry)	35	Red	35
Power Interlocks (Dry)	30	White	30
-	24	Drain	24
Transfer Out (Dry)	37	Black	37
Transfer Out (Dry)	32	Orange	32
-	26	Drain	26

Figure 3-21 PS/Machine Interface Control Cable

(11)

Part Number	Length
023708	25 ft (7.6 m)
023830	28.2 ft (8.6 m)
023943	38 ft (11.6)
023709	50 ft 15 m)
023710	75 ft (23 m)
023711	100 ft (30.5 m)
023944	125 ft (38 m)
023945	150 ft (45.6 m)



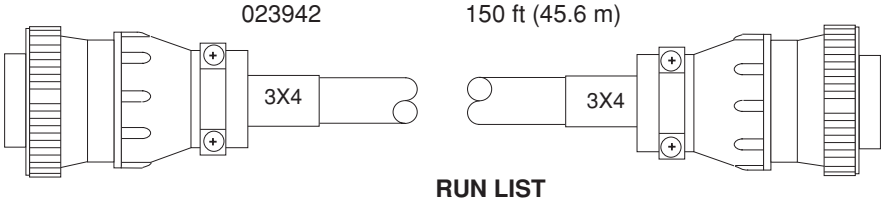
RUN LIST

SIGNAL	PLUG 1X2	COLOR	MACHINE INTERFACE
Shield	10	N/A	10
1 Amp BCD	2	White	2
2 Amp BCD	3	Red	3
4 Amp BCD	4	Green	4
8 Amp BCD	5	Brown	5
10 Amp BCD	6	Blue	6
20 Amp BCD	7	Orange	7
40 Amp BCD	8	Yellow	8
80 Amp BCD	12	Gray	12
100 Amp BCD	13	Violet	13
Common	11	Black	11

Figure 3-22 PS/Machine Interface or RCC Current Setpoint Cable

⑫

Part Number	Length
023667	25 ft (7.6 m)
023831	28.2 ft (8.6 m)
023938	50 ft 15 m)
023939	75 ft (23 m)
023940	100 ft (30.5 m)
023941	125 ft (38 m)
023942	150 ft (45.6 m)



RUN LIST

SIGNAL	PLUG 3X4	COLOR (PAIR)	MACHINE INTERFACE
Gas Flow Set 1 (+)	1	Black	1
Gas Flow Set 2 (+)	2	Red	2
Gas Flow Set 4 (+)	3	Black	3
Gas Flow Set 8 (+)	4	White	4
GFS Common (U) (-)	5	Black	5
Gas Flow Set 10 (+)	6	Green	6
Gas Flow Set 20 (+)	7	Black	7
Gas Flow Set 40 (+)	8	Blue	8
Gas Flow Set 80 (+)	9	Black	9
GFS Common (10) (-)	10	Yellow	10
Gas Flow Set 100 (+)	11	Black	11
Valve Select 1 (+)	12	Brown	12
Valve Select 2 (+)	13	Black	13
Valve Select 4 (+)	14	Orange	14
Valve Select 8 (+)	15	Red	15
Valve Sel Common (-)	16	White	16
Write (+)	17	Red	17
Read Complete Out (+)	18	Green	18
Common (-)	19	Red	19
NC	20	Blue	20
Remote Test/Operate (+)	21	Red	21
Remote Test/Preflow (+)	22	Yellow	22
Remote Air Plasma	23	Red	23
Remote H35 & N_2 Plasma	24	Brown	24
Remote O_2 Plasma	25	Red	25
Common (-)	26	Orange	26
Error Output (+)	27	Green	27
Common (-)	28	White	28
NC	29	Green	29
NC	30	Blue	30
NC	31	Green	31
NC	32	Yellow	32
NC	33	Green	33
NC	34	Brown	34
NC	35	Green	35
NC	36	Orange	36
Shield O/A	37	N/A	37

Figure 3-23 Gas Console/Machine Interface Control Cable

RHF Console to Torch Quick Disconnect Interconnections (Figure 3-24)

(13) The torch lead set interconnections include connecting the torch lead set between the RHF console and the torch quick disconnect.

Torch Lead Set to RHF Console

Route the pilot arc lead and water hoses from the torch lead set through the brass feed-through on the RHF console marked **TORCH**.

(13A) **Pilot Arc Lead (+)**

- Route the ring end of the cable through the hole in the center section and connect to the pilot arc terminal on the I/O PC BD Assy.

(13B) **Cooling Water Hose Supply Hose /Power Lead (-) (Green)**

- Connect cooling supply hose (green band) to the manifold adapter (green).

(13C) **Cooling Water Return Hose (Red)**

- Connect cooling return hose (red band) to the manifold adapter (red).

Torch Lead Set to Torch Quick Disconnect

Route the other end of the torch lead set through the power track or festoon to connect to the torch quick disconnect. Wrap the hose and lead ends together with electrical tape, so that the ends do not catch while routing. Route torch lead set through strain relief and torch mounting sleeve.


WARNING
FIRE AND EXPLOSION HAZARD

The vent tube from the torch head must not discharge into an enclosed area such as a protective sleeve or power track. An accumulation of oxygen will occur and can cause fire or explosion.

(13A) **Pilot Arc Lead (+)**

- Connect the pilot arc cable to the pilot pin fitting.

(13B) **Cooling Water Supply Hose /Power Lead (-) (Green)**

- Connect the cooling supply hose (green band) to the water inlet fitting (RH) at the center of the torch.

Caution: Hold hex fitting on inlet tube with wrench, the tube may snap. Turn fitting on torch lead set only.

(13C) **Cooling Water Return Hose (Red)**

- Connect the cooling return hose (red band) to the water outlet fitting (RH).

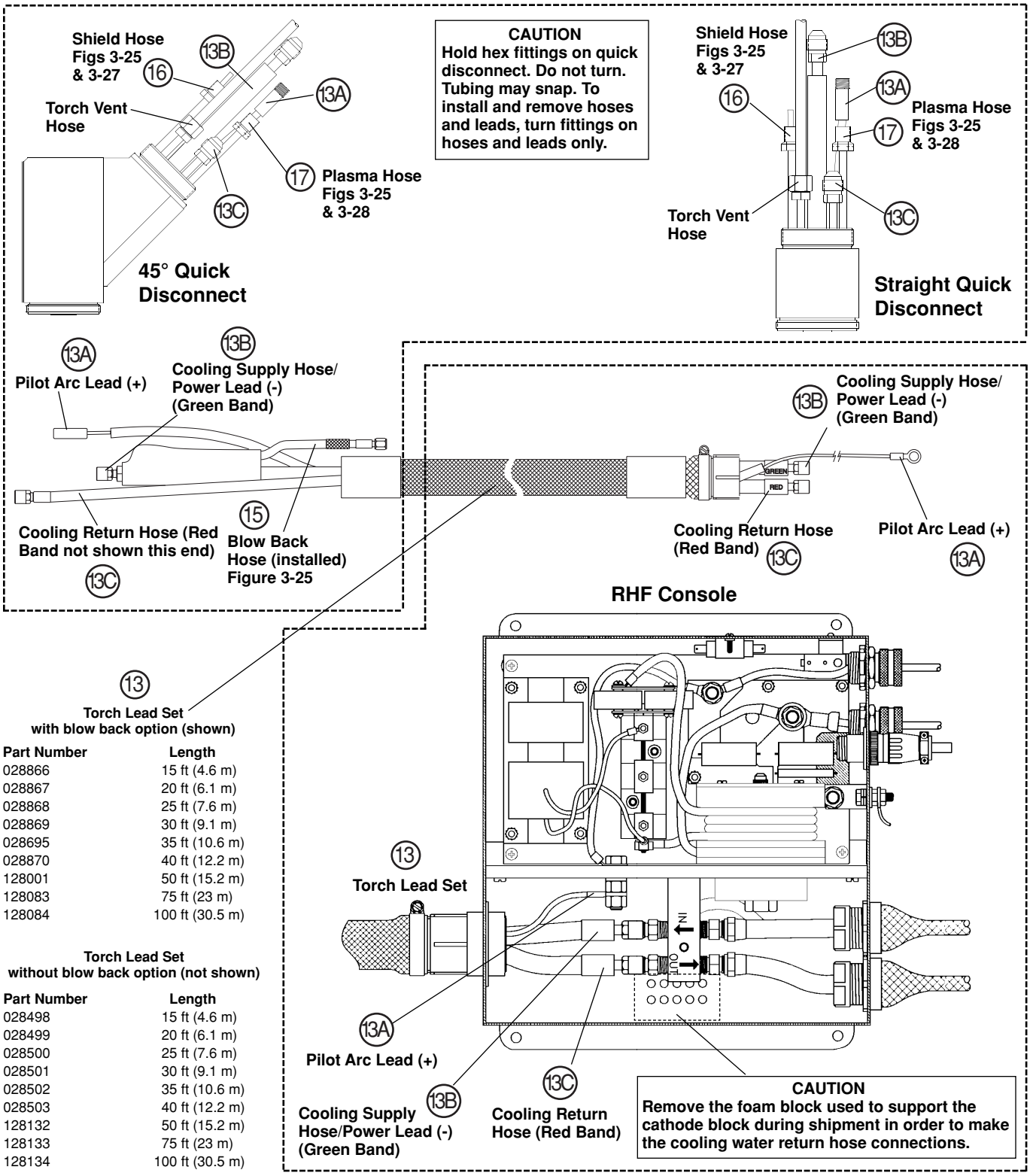


Figure 3-24 RHF Console to Torch Quick Disconnect Interconnections

Gas Console to Off-Valve Assembly Interconnections (Figure 3-25)

(14) The gas lead set interconnections include connecting the torch lead set between the gas console and the off-valve assembly.

Gas Lead Set to Gas Console

Connect the gas lead set to the three fittings and receptacle on the gas console marked **TORCH**.

(14A) **Plasma Gas Hose**

- Connect the hose (clear) to the blue **PLASMA** fitting (LH).

(14B) **Shield Gas Hose**

- Connect the hose (gray) to the green **SHIELD** fitting (RH).

(14C) **Preflow Gas Hose**

- Connect the hose (red) to the red **PREFLOW** fitting (RH).

(14D) **Control Cable**

- Connect the cable plug marked **3X3** to the receptacle marked **3X3.**

Gas Lead Set to Off Valve Assembly

Route the other end of the gas lead set through the power track or festoon to connect to the off-valve assembly. Wrap the hose and lead ends together with electrical tape, so that the ends do not catch while routing.

(14A) **Plasma Gas Hose**

- Connect the hose (clear) to the plasma gas inlet fitting (blue) (LH).

(14B) **Shield Gas Hose**

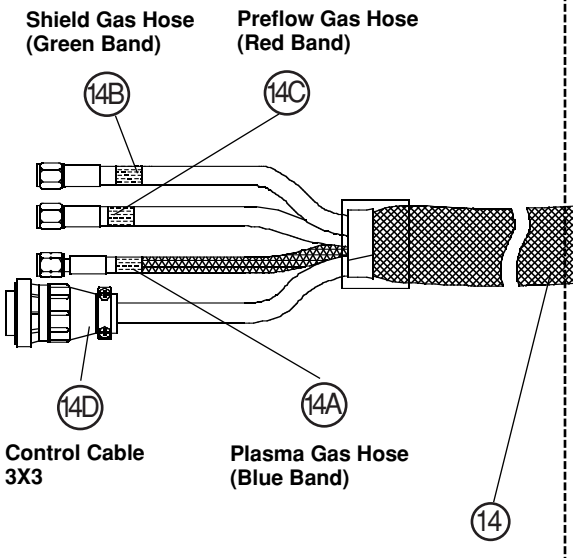
- Connect the hose (gray) to the shield gas inlet fitting (green) (RH).

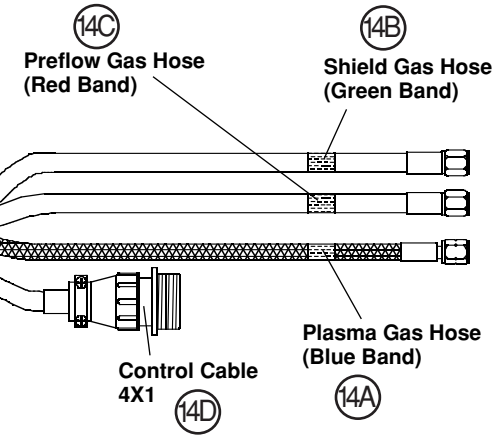
(14C) **Preflow Gas Hose**

- Connect the hose (red) to the preflow gas inlet fitting (red) (RH).

(14D) **Control Cable**

- Connect the gas lead set cable plug marked **4X1** to the receptacle marked **4X1** on the off-valve cable.

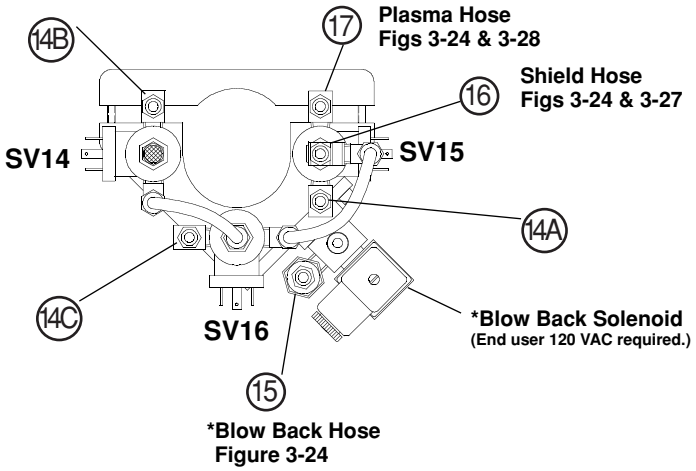




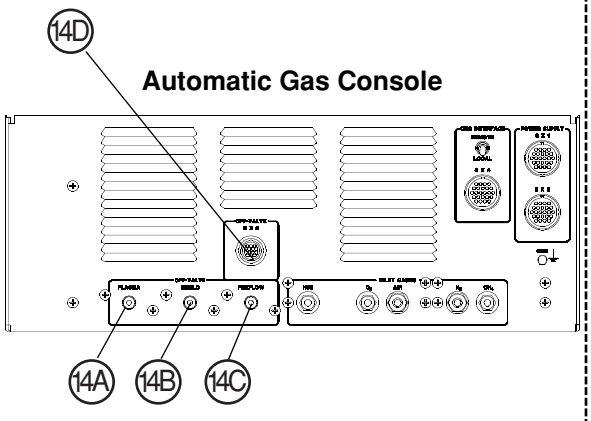
Gas Lead Set

Part Number	Length
128175	15 ft (4.6 m)
128176	20 ft (6.1 m)
128177	25 ft (7.6 m)
128178	30 ft (9.1 m)
128179	35 ft (10.6 m)
128180	40 ft (12.2 m)
128181	50 ft (15.2 m)
128182	75 ft (23 m)
128183	100 ft (30.5 m)

Off-Valve Assembly



*Disregard these items, if system was ordered without the blow back option.



Off-Valve Cable

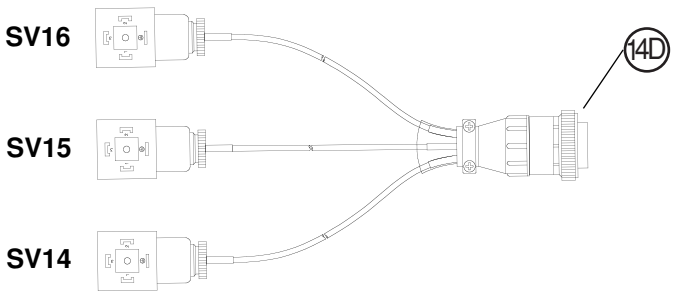


Figure 3-25 Gas Console to Off-Valve Assembly Interconnections

Off-Valve Assembly to Torch Quick Disconnect Interconnections (Figures 3-24 and 3-25)

After the torch lead set and gas lead set have been connected, connect the plasma and shield gas hoses and blow back hose between the off-valve assembly and torch quick disconnect. Route plasma and shield gas hoses and blow back hose through strain relief and torch mounting sleeve.

Off-Valve Assembly

⑮ ***Blow Back Hose (Figure 3-25)**

- Connect the blow back hose (from torch lead set) to blow back solenoid.

⑯ **Shield Gas Hose (Figure 3-27)**

- Connect the gray hose to the shield inlet fitting (RH).

⑰ **Plasma Gas Hose (Figure 3-28)**

- Connect the clear hose to the plasma inlet fitting (LH).

Torch Quick Disconnect

Slide the other hose ends through the torch sleeve and connect to torch quick disconnect.

⑯ **Shield Gas Hose**

- Connect the hose (gray) to the shield inlet fitting (RH).

⑰ **Plasma Gas Hose**

- Connect the hose (clear) to the plasma inlet fitting (LH).

Slide the torch sleeve to the torch quick disconnect, mate threaded ends and tighten.

* Not used, if system was ordered without the blow back option.

15

Part Number	Length
128491	43 in (1.1 m)

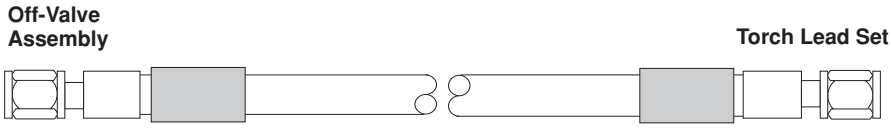


***Figure 3-26 Blow Back Hose Replacement Kit**

16

Part Number	Length
024429	4 ft (1.2 m)

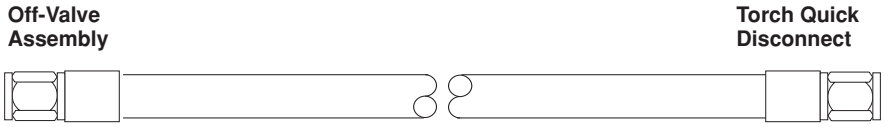


Figure 3-27 Shield Gas Hose Assembly, 3/16 Inch Gray RH "A"

17

Part Number	Length
024430	4 ft (1.2 m)

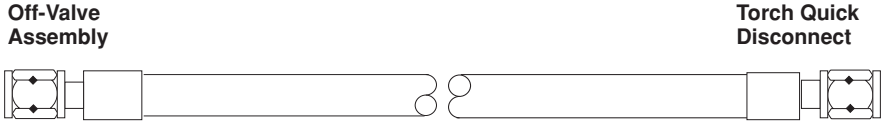


Figure 3-28 Plasma Gas Hose Assembly, LH "A"

* Not used, if system was ordered without the blow back option.

Gas Supply Hose Connections (Figure 3-29)

⑱ Gas Supply Hoses

The gas supply hoses are customer supplied.

- Connect the gas supplies from the high pressure regulators to the gas console fittings as indicated.

H35 input adapter (015230 1/4 NPT, left handed 'B', male)
O_2 input adapter (015009 1/4 NPT, right handed 'B', male)
AIR input adapter (015012 1/4 NPT, right handed male flare)
N_2 input adapter (015103 1/4 NPT, right handed 'B', inert female)
CH_4 input adapter (015230 1/4 NPT, left handed 'B', male)

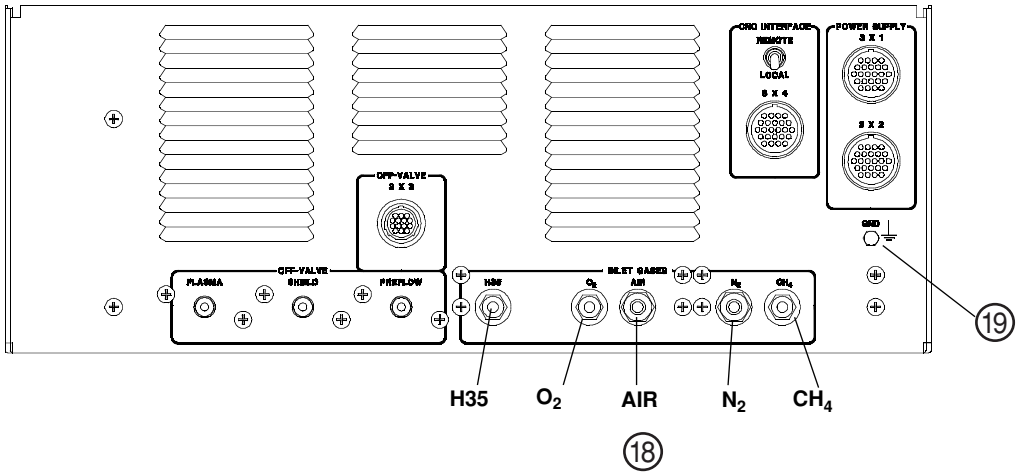


Figure 3-29 Gas Supply Hose and PE Ground Connections

PE Ground Cable Connections (Figures 3-8, 3-9 and 3-29)

⑲ PE Ground Cables

The PE ground cables are customer supplied. The power supply, RHF console and gas console provide connections for protective earth (PE) grounding. Each cable should be connected to the worktable earth ground. Refer to *Pre-Installation, Equipment Grounding* for cable specifications in the front of this section.

Hold Signal Connections (Figures 3-8 and 3-30)

⑳ Hold Signal Terminal Block TB3

The hold signal is used to synchronize the starting of two or more systems. The hold signal is available at TB3 or at the CNC through cable 1X1. Dry contact start. The hold signal cable is customer supplied.

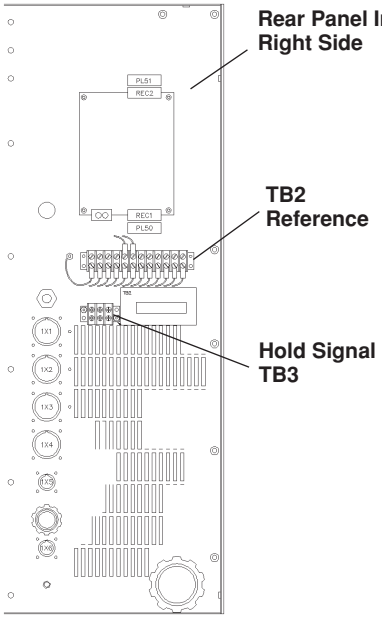


Figure 3-30 TB3 Hold Signal Connection Location

Mount PAC184/PAC186 Torch to Quick Disconnect

1. Align the PAC184 or PAC186 torch ports to the torch quick disconnect receptacle, then push into place. See Figure 3-31.

2. Turn the securing ring clockwise (cw) to lock torch into place.

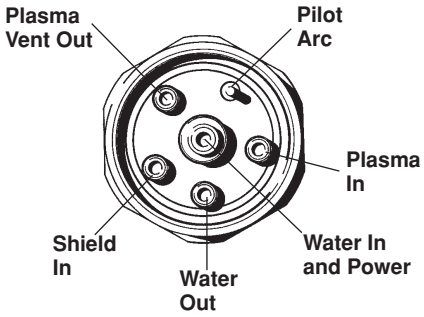


Figure 3-31 PAC184/PAC186 Torch Gas, Coolant and Pilot Arc Port Locations

Torch Coolant Requirements

The power supply is shipped without any coolant in the tank. A standard mixture of propylene glycol (30%), deionized water (69.9%) and benzotriazole (0.1%) is recommended. This mixture resists freezing to +10° F (-12° C) and contains a corrosion inhibitor (benzotriazole) to protect copper surfaces in the coolant loop. This mixture is available in 1-gallon containers by ordering 028872. 100% propylene glycol is available by ordering 028873.

Freezing torch coolant can result in a cracked torch head, leads, or other damage to the torch cooling system. For operating temperatures colder than +10° F (-12° C), the percentage of propylene glycol must be increased. See Figure 3-32.

Coolant will become more conductive the longer it is in service. If the conductivity of the coolant becomes too high, the coolant may conduct torch voltage, resulting in the torch misfiring and can be a shock hazard. Check coolant conductivity whenever the cooling system is serviced.

Conductivity of new coolant mixture should not exceed 10 µ Siemens/cm at 77° F (25° C). Every 6 months, flush the power supply of its torch coolant and replace with new coolant.

Observe the warning and caution below. Refer to the Material Safety Data Sheets in Appendix C for data on safety, handling, storage and disposal of propylene glycol and benzotriazole.

WARNING

Propylene glycol and benzotriazole are irritating to skin and eyes, and harmful or fatal if swallowed. Upon contact, flush skin or eyes with water. If swallowed drink water and call a physician immediately. Do not induce vomiting.

Caution: Always use propylene glycol in the coolant mixture. Do not use antifreeze in place of propylene glycol. Antifreeze contains corrosion inhibitors which will damage the torch coolant system.

Always use purified water in the coolant mixture in order to prevent corrosion in the torch coolant system. The hardness of purified water should be between 0.206 and 8.5 ppm. If using a conductivity meter to measure water purity, the recommended level is between 0.5 and 18 µ Siemens/cm at 77° F (25° C).

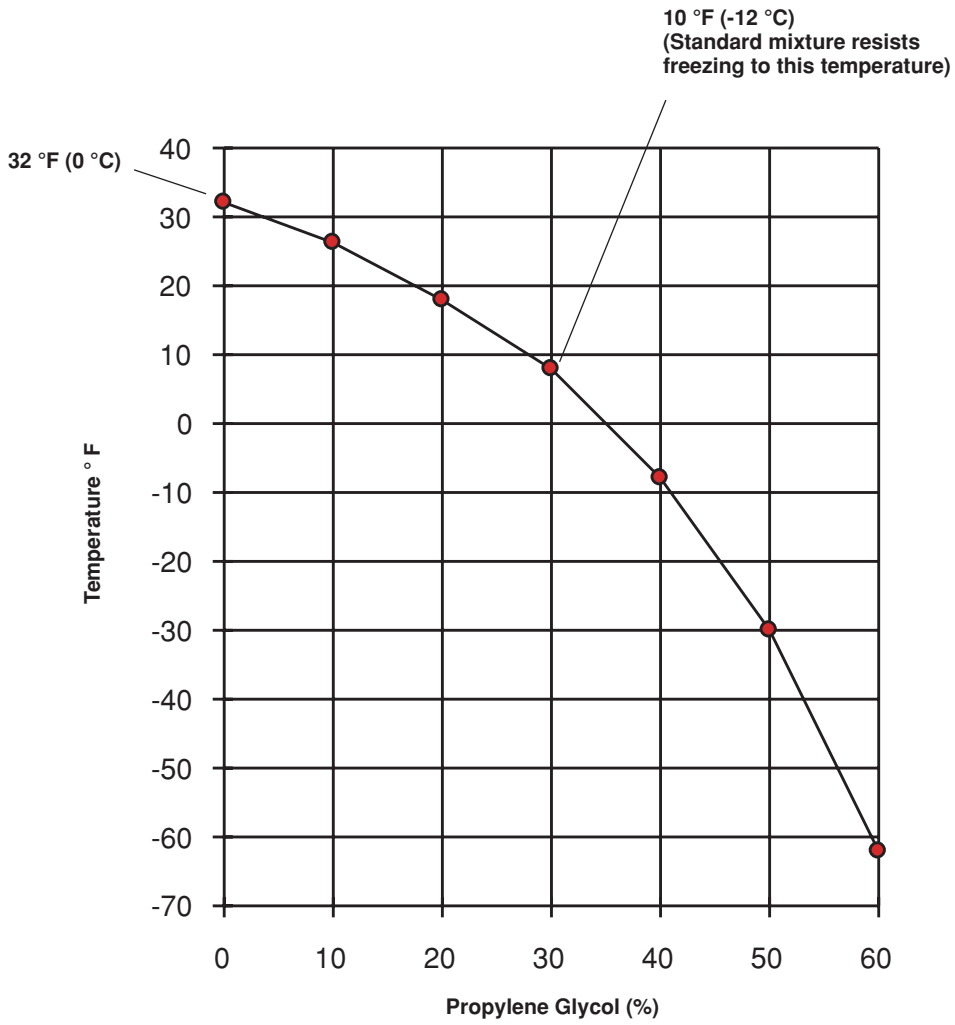


Figure 3-32 Freezing Points of a Mixture of Propylene Glycol (%) and Deionized Water

Filling Torch Coolant System

1. Before proceeding with filling the system with coolant:

   - Ensure that your cutting environment and clothing meet the safety requirements. Refer to *Safety,* Section 1 in this manual.

   - Ensure that all installation requirements in this manual have been met.

   Caution: Never turn the power supply on before filling the tank.

2. Turn on the inlet gas supplies to the gas console. Ensure the gases are available at 120 psi (8.2 bar).

3. At the rear of the power supply, ensure the coolant shutoff valve (1, Figure 3-33) is open and unscrew the filler/vent cap (3) on coolant tank (2). Fill tank with 8.5 quarts (8 liters) of coolant.

   Caution: Do not over fill the tank.

4. At the line voltage disconnect box, set the switch to **On**.

5. Turn on the power supply by depressing and holding the POWER ON (I) pushbutton switch/ indicator (PB1/LT1). The **COOLANT FLOW** LED will remain out until the coolant has pushed all of the air out of the torch cooling hoses and the coolant returns to the tank. This process may take up to 60 seconds.

6. Locate the red button (5, Figure 3-33) on top of the coolant filter (4) at the rear of the power supply. Press the button until a little coolant comes out and no air bubbles are seen in the clear filter housing.

7. When the **COOLANT FLOW** LED illuminates, release the **POWER ON (I)** pushputton (PB1). The green **POWER ON** indicator (LT1) should light, indicating that the system is operating normally.

8. Observe that the coolant gauge indicates F (Full). Refill the tank when the gauge indicates 1/2 or a little under. Do not allow the coolant to get too low. Low coolant will overheat and cause shorter consumable life.

9. Check for coolant leaks at hose connections at the power supply, RHF console, and torch quick disconnect.

Post Installation

To checkout system operation, refer to Section 4 *Operation.*

LEGEND

(1) Shutoff Valve

(2) Coolant Tank

(3) Filler/Vent Cap

(4) Filter

(5) Pressure Release Button

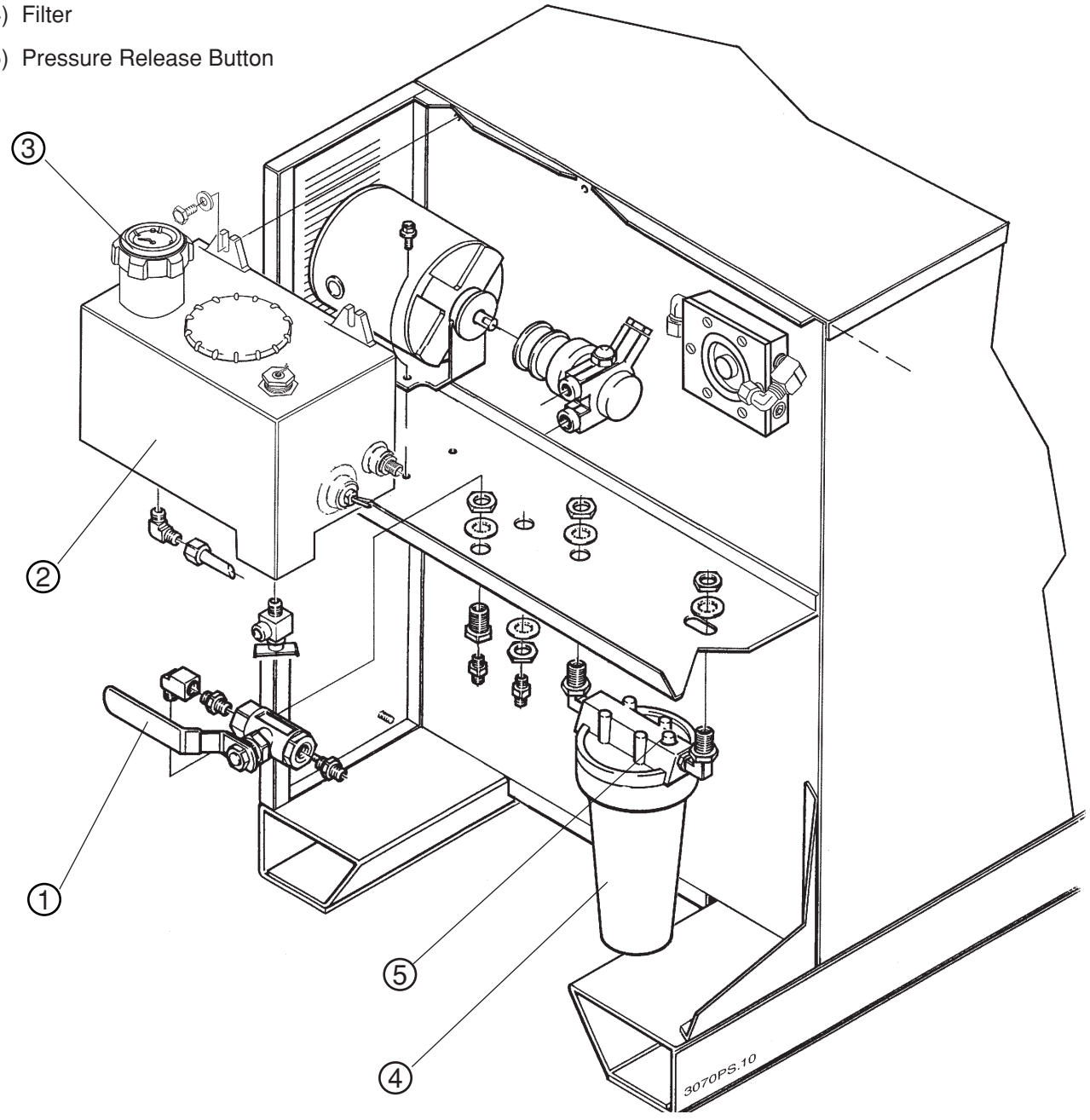


Figure 3-33 Filling Coolant System

Hypertherm

Section 4

OPERATION

In this section:

Controls and Indicators

Power Supply Control Panel (Fig. 4-1)

POWER

- **ON (I)** Pushbutton/indicator switch (PB1/LT1)
  Activates the power supply and its control circuits. Indicator lights when power up is complete.

- **OFF (O)** Pushbutton switch (PB2)
  Shuts the power supply down.

- **DC POWER ON** Indicator (LT2)
  Illuminates when main contactor closes, indicating DC power is being supplied to the torch.

STATUS*

- **RHF INTERLOCK** LED (LT3)
  Illuminates when RHF Console door is closed. Remains extinguished when door is open.

- **OVERTEMP** LED (LT4)
  Illuminates when power supply main transformer or chopper has overheated. Remains extinguished when transformer and chopper are operating within limits.

- **EXT INTERLOCK** LED (LT5)
  Illuminates when customer machine interlock (optional) is closed. Remains extinguished when interlock is open. If not used, the external interlock option must be jumpered (connector 1X1, pins 16 and 17), so that the plasma system will operate.

- **GAS SYSTEM** LED (LT6)
  Illuminates when gas system is operational. Remains extinguished due to gas system error.

- **GAS PRESSURE** LED (LT7)
  Illuminates when plasma and shield gas pressures are above the low level limit of 105 psi (7.2 bar). Remains extinguished when either the plasma or shield gas is below the limit.

- **COOLANT TEMP** LED (LT8)
  Illuminates when coolant temperature is normal. Remains extinguished when coolant temperature is too high.

- **COOLANT FLOW** LED (LT9)
  Illuminates when coolant flow is adequate. Remains extinguished when coolant flow is inadequate.

* All STATUS LEDs extinguish (except for OVERTEMP which illuminates) when the associated fault condition occurs. Most fault conditions will cause the system to shut down causing all STATUS LEDs to extinguish (except for OVERTEMP which illuminates). When this occurs the operator must depress and hold in the POWER ON (1) switch. The first STATUS LED that does not illuminate (except for OVERTEMP which illuminates) indicates the fault condition.

AMPS thumbwheel switch (S1)
Selects the desired cutting current.

PIERCE DELAY potentiometer (P1)
Delays ramp up of current.

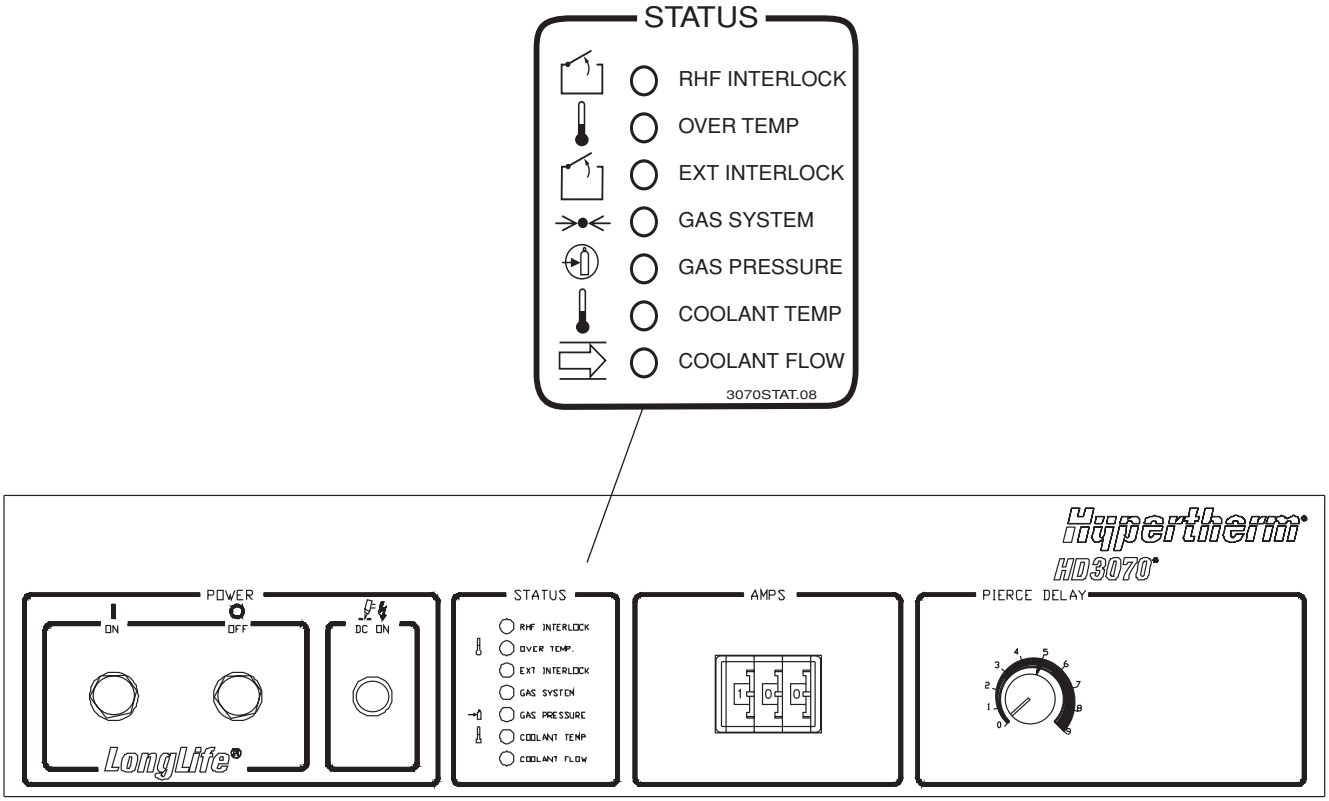


Figure 4-1 HD3070 Power Supply Control Panel Controls and Indicators

Automatic Gas Console Front Panel (Figure 4-2)

The front panel controls, Fig. 4-2, are under manual control only when the **REMOTE/LOCAL** toggle switch on the rear panel is set to the **LOCAL** position. Note that the LCD display is active in either mode.

- **PLASMA GAS SELECTION – O_2/AIR/H35 & N_2** Toggle Switch

  Selects the use of either oxygen (**O_2**), **AIR** or a mixture of argon-hydrogen and nitrogen (**H35** & **N_2**) as the plasma cutting gas.

  Note that changing the switch positions will automatically cause the gas lead hoses to be purged for 40 seconds (preflow for 20 seconds and cutflow gases for 20 seconds) and shown on LCD display.

- **Test Preflow/Run/Test Cut Flow** Toggle Switch

  Flowrates are set either manually in LOCAL or from the CNC in REMOTE. The flowrates are expressed as a percentage of full range (100 %).

  Test Preflow – Used to set the test preflow gas flowrates on the LCD display using **PREFLOW** potentiometers (**1**) and (**2**). Test preflow flowrates are specified in the *Cut Charts*. In this test position the arc cannot be fired.

  Test Cut Flow – Used to set the test cut gas flowrates on the LCD display using the **SHIELD Cut Flow** potentiometers (**3**) and (**4**) and the **PLASMA Cut Flow** potentiometers (**5**) and (**6**). **Potentiometer 6 and associated LCD display field only operate when H35 is selected.** Test cut flowrates are specified in the *Cut Charts.* In this test position the arc cannot be fired.

  Run – This is the normal operating position. This position enables the firing of the arc.

- **LCD Display**

  The LCD display is divided into functional fields. When operating in either the local or remote mode, the following data, as shown in Fig. 4-3, are displayed.

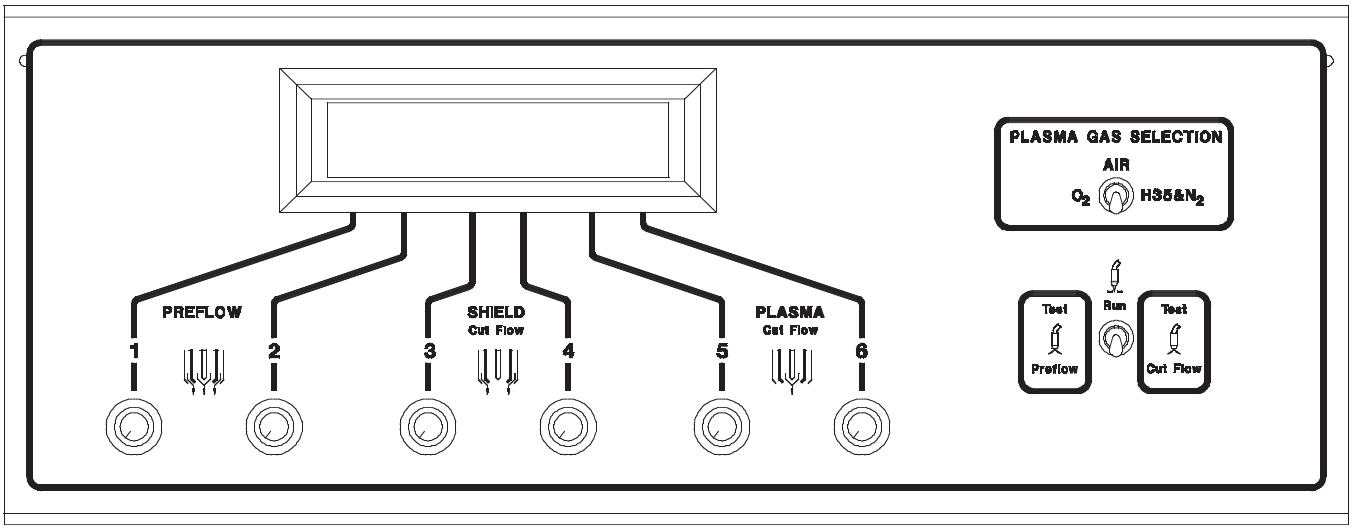


Figure 4-2 Automatic Gas Console Front Panel Controls and Indicators

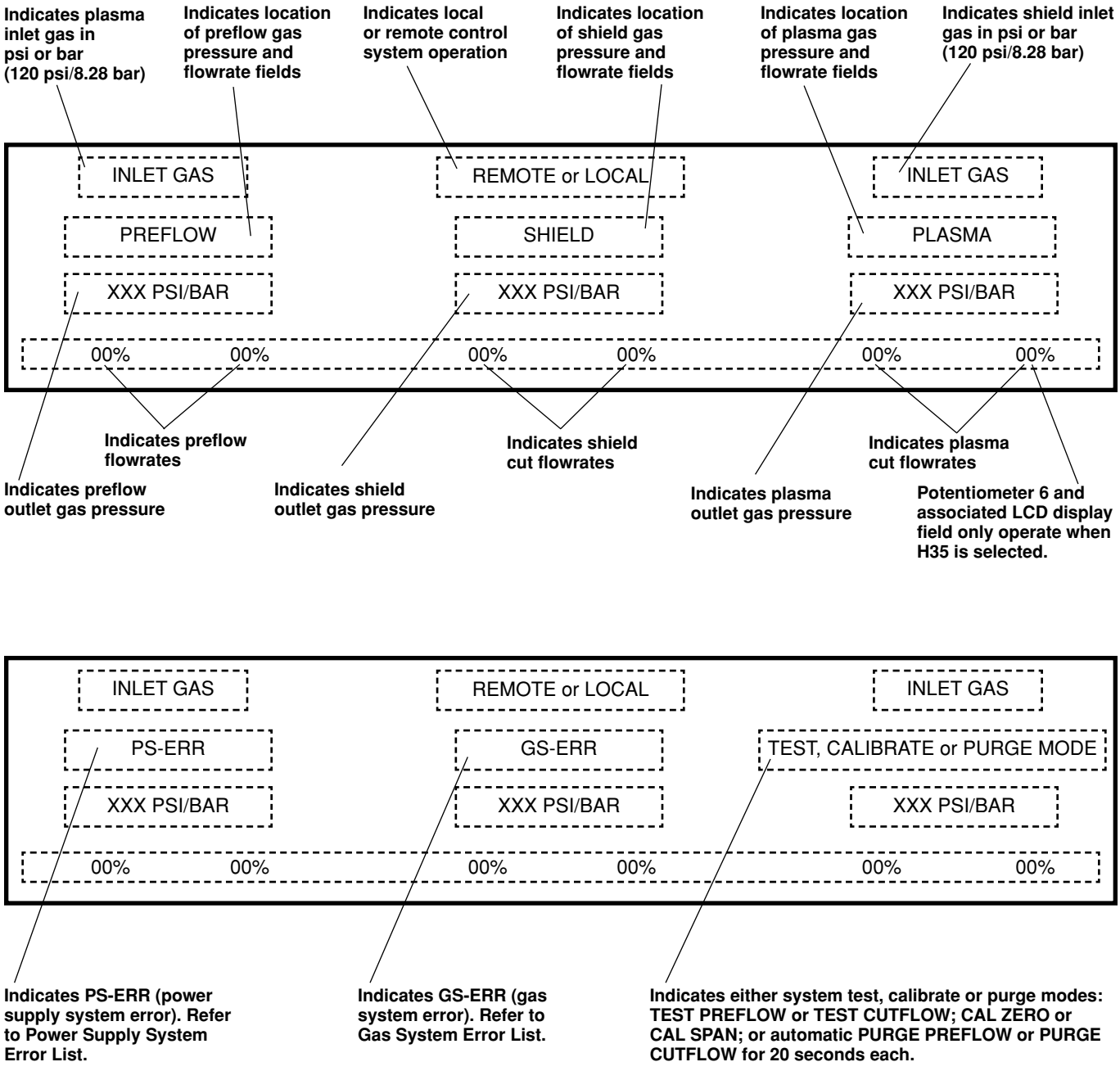


Figure 4-3 Automatic Gas Console Front Panel LCD Display

LCD Display Error Messages

Power Supply System (PS-ERR)

Error Message	Error Code	Description
NO ERROR	0	
LOW COOLANT LEVEL	1	This error signal is issued as a warning to the CNC that the coolant reservoir needs to have coolant added.
INTERLOCK ERR	2	This error is issued during operation when one of the pressure or temperature switches connected to the power distribution PCB is opened. Check STATUS LEDs on power supply.
HOLD TIMEOUT ERR	3	This error signal is issued if the HOLD INPUT signal was not released within 10 seconds after the end of preflow.
NO PILOT TIMEOUT ERR	4	This error signal is issued when the high frequency was unable to ignite the pilot arc within 1 second.
PIERCE DELAY ERR	5	This error signal is issued when the PIERCE COMPLETE signal should have been received within 2 seconds of the transfer signal.
TRANSFER TIMEOUT ERR	6	This error signal is issued when the transfer of current to the work was not sensed within 4 seconds of torch ignition.
RAMPUP BLOWOUT ERR*	7	This error signal is issued when the arc was extinguished after current transfer to the workpiece, but before steady-state operation.
RUNNING ARC BLOWOUT ERR*	8	This error signal is issued when the arc was lost during steady-state operation.
ARC OVER VOLTAGE ERR*	9	This error signal is issued during steady-state operation when the measured arc voltage exceeded the programmed maximum allowable arc voltage (200V).
RAMPDWN ARC BLOWOUT ERR*	10	This error signal is issued when the arc was lost during current ramp down, but before the programmed ramp down time has elapsed.

Power Supply System (PS-ERR) (continued)

Error Message	Error Code	Description
WRONG STATE ERR	12	This error signal should never occur. It indicates that the software has a very serious error that caused it to transfer control to an undefined program state. It is very important to record what the exact operating conditions were prior to the error.
PHASE LOSS ERR	13	This error signal is issued when the phase loss protection circuit has shutdown the system due to voltage phase loss or input voltage dropping below 80% of nominal.

* These errors will also cause the error counter output signal to the CNC to increment.

Gas System (GS-ERR)

Error Message	Error Code	Description
NO ERROR	0	
LOW PLASMA GAS ERR	1	This error signal is issued if the plasma gas inlet pressure is below 105 psig (7.2 bar).
LOW SHIELD GAS ERR	2	This error signal is issued if the shield gas inlet pressure is below 105 psig (7.2 bar).
HIGH PLASMA GAS ERR	3	This error signal is issued if the plasma gas inlet pressure is above 135 psig (9.3 bar).
HIGH SHIELD GAS ERR	4	This error signal is issued if the shield gas inlet pressure is above 135 psig (9.3 bar).
MV1 ERR*	5	This error signal is issued when the MV1 motor valve does not move when commanded. When this error occurs service is required.
MV2 ERR*	6	This error signal is issued when the MV2 motor valve does not move when commanded. When this error occurs service is required.
MV3 ERR*	7	This error signal is issued when the MV3 motor valve does not move when commanded. When this error occurs service is required.

Gas System (GS-ERR) (continued)

Error Message	Error Code	Description
MV4 ERR*	8	This error signal is issued when the MV4 motor valve does not move when commanded. When this error occurs service is required.
MV5 ERR*	9	This error signal is issued when the MV5 motor valve does not move when commanded. When this error occurs service is required.
MV6 ERR*	10	This error signal is issued when the MV6 motor valve does not move when commanded. When this error occurs service is required.

* Plasma system must be powered down and then restarted if any of the motor valve errors occur.

Automatic Gas Console Rear Panel (Figure 4-4)

The rear panel controls are as follows:

- **CNC INTERFACE-REMOTE/LOCAL** Toggle Switch

  Selects either remote or local control of the HD3070 gas console. In **REMOTE** the gas console is under complete control of the CNC machine controller. In **LOCAL** the gas flowrates are set manually on the front panel.

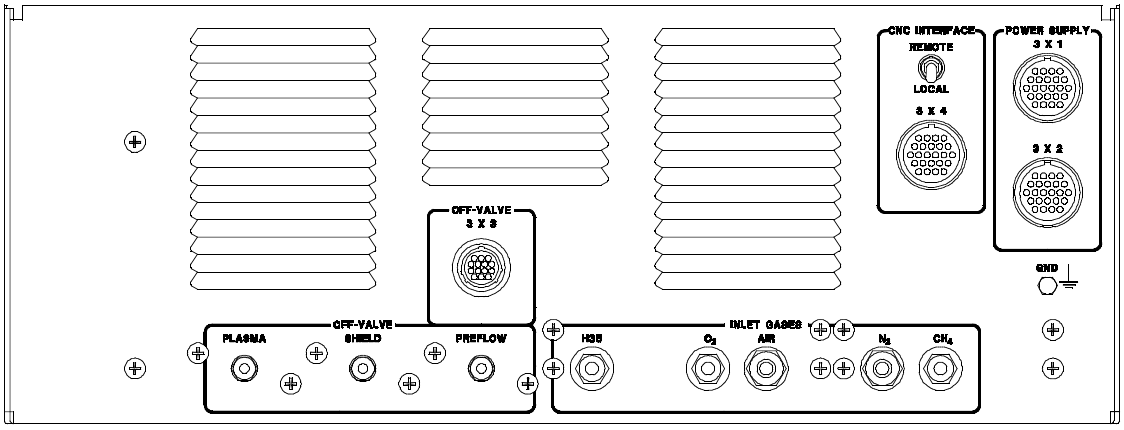


Figure 4-4 Automatic Gas Console Rear Panel Controls

Daily Operating Procedure

The HD3070 system can be operated in either the local or remote mode. Prior to operation, ensure that your cutting environment and that your clothing meet the safety requirements outlined in the *Safety* section of this manual. If problems occur during start up, refer to Section 3, *Installation* and check the installation data.

Local Mode

To start up the HD3070 system on a daily basis, in the local mode, proceed as follows:

1. Select consumables based on the material to be cut. If the consumable parts are to be reused, check for wear or damage. Refer to *Changing Consumable Parts* in this section.

2. Ensure that the torch is perpendicular to the workpiece (0° and 90°) to get a clean, vertical cut. Use a square to align the torch.

3. Select either oxygen (**O_2**), **AIR** or a mixture of argon-hydrogen and nitrogen (**H35 & N_2**) as the plasma cutting gas using the **PLASMA GAS SELECTION** toggle switch.

4. Apply system power by setting the main disconnect switch for the power supply to **On** and turning on the power supply by doing the following:

   - Depress **POWER ON (1)** switch (PB1) until the **STATUS-COOLANT FLOW LED** lights.

   - Ensure the green **POWER ON** indicator (LT1) remains lit. If not check the **STATUS** LEDs on the power supply and check for plasma and gas system error messages on the gas console LCD display. Refer to Figure 4-3 and the *Error Messages* list.

     Note: If the **COOLANT FLOW** LED does not light, unscrew filler/vent cap on coolant tank (item 9, Figure 6-10). Add 2 quarts (1.9 liters) of coolant.

5. Also at initial startup, the gas lines will be automatically purged for 40 seconds total. The gas console LCD display, Figure 4-3 field E will indicate PURGE PRELFOW for 20 seconds and then PURGE CUT FLOW for 20 seconds.

6. Ensure that both the selected plasma and shield inlet gas supplies are available at 120 psi (8.2 bar) dynamic pressure on the gas console LCD display fields (plasma and shield). (See Figure 4-3.)

7. Set the test cut and test preflow gas flowrate percentages. To do this, proceed as follows:

   - Set the test preflow flowrates (1) and (2) as specified in the *Cut Chart.*

   - Set the shield test cut flowrates (3) and (4) and plasma test cut flowrate (5) and (6) as specified in the *Cut Chart.*

   - Set the **Test Preflow**/**Run**/**Test Cut Flow** switch (S2) to **Run.**

- At CNC controller, set cutting current, arc voltage, travel speed, initial pierce height and pierce delay time according to cut charts.

- The system is now ready for cutting.

Note: If the system has been powered up, but not in use for a while, purge the gas lines by positioning the **Test Preflow**/**Run**/**Test Cut Flow** switch (S2) to **Test Cut Flow** for 5 seconds and then to **Test Preflow** for 5 seconds. After purging the gas lines, set the switch to **Run. Failure to purge the lines may result in short consumable life due to contamination of water residue in the torch.**

Remote Mode

To start up the HD3070 on a daily basis, in the remote mode, proceed as follows:

1. Select consumables based on the material to be cut. If the consumable parts are to be reused, check for wear or damage. Refer to *Changing Consumable Parts* in this section.

2. After checking the consumables, ensure that the torch is at right angles to the workpiece (0° and 90°) to get a clean, vertical cut. Use a square to align the torch.

3. Apply system power by setting the main disconnect switch for the power supply to **On.**

4. Initiate the power on control signal from the CNC interface to power up the power supply. This signal should be activated for 15 seconds or until the POWER INTERLOCKS OK signal is returned to the CNC controller.

5. Ensure the POWER INTERLOCKS OK signal is returned to the CNC controller. If not check the **STATUS** LEDs on the power supply and check for plasma and gas system error messages on the gas console LCD display. Refer to Figure 4-3 and the *Error Messages* list.

   Note: If the **COOLANT FLOW** LED does not light, unscrew filler/vent cap on coolant tank (item 9, Figure 6-10). Add 1.9 liters (2 quarts) of coolant.

6. Also at initial startup, the gas lines will be automatically purged for 40 seconds total. The gas console LCD display, Figure 4-3 field E will indicate PURGE- PRELFOW for 20 seconds and then PURGE-CUT FLOW for 20 seconds.

7. Initiate the control signals from the CNC interface to select the required gas cutting process at the gas console.

   Select either oxygen (**O_2**), **AIR** or a mixture of argon-hydrogen and nitrogen (**H35 & N_2**) as the plasma cutting gas.

8. Set the gas flowrate percentages on the gas console metering valves from the CNC interface using BCD set-points. The CNC controller should provide the following sequence to set up the gas metering valves:

   - Selects the BCD code for the valve number (1 - 6) to be set on the four VALVE SELECT lines. These signals should be pulled low (common) to make them active.

- Selects the BCD code for the set- point (0 - 100%) to be set on the nine GAS FLOW SET lines. These signals should be pulled low (common) to make them active.

- Pulls WRITE line low (common) and wait for return of a READ COMPLETE signal.

This process should occur in under 100 milliseconds. At this point the CNC controller should release the WRITE signal. The above process should be completed for the remaining four valves.

Note: The gas console microprocessor stores the gas flow data for each metering valve during normal operation. If power to the gas console is removed for any reason, it will be necessary to re-send the gas flow data from the CNC interface.

9. The CNC controller should now ensure there is no ERROR OUTPUT signal from the gas console and the POWER INTERLOCKS OK signal is still active from the power supply.

10. The system is now ready for cutting.

Note: Initiate the test cut and test preflow control signals from the CNC interface to purge the gas lines if the system has been powered up, but not in use for a while. Hold each position for 5 seconds.

Changing Consumable Parts

WARNING

Always disconnect the power supply from the main power source before inspecting or changing the torch parts.

Inspect torch consumable parts before cutting for wear and damage, and replaced when needed. The PAC184 and PAC186 torch consumable parts kits (refer to Section 6, *Parts List*) contain tools for removal and inspection of the consumable parts. To remove, inspect and replace the consumables, proceed as follows. See Figures 4-5 - 4-8.

Removal and Inspection

1. Remove the shield cap and inspect shield for plugged holes or damage. To remove the shield, push on it until it releases. Check the O-ring for wear and damage.

2. Remove the inner cap and inspect for plugged holes or damage.

3. Remove the nozzle using the removal tool. Check for wear and arcing. Also check the O-rings for wear and damage.

4. Remove the electrode using the removal tool. The electrode should be inspected and replaced if there is a pit 0.040 inch (1 mm) deep. See Figure 4-8 in order to check the pit depth. Check the O-ring for wear and damage.

5. Remove the swirl ring using the removal tool. Insert the tool into the swirl ring until it catches on the lip and then pull back to remove the swirl ring. Inspect the swirl ring for plugged holes or damage. Check O-rings for wear and damage.

Replacement

Do not use an excessive amount of silicone grease when applying to any of the consumable O-rings. Excess grease can easily plug ports and holes, causing improper gas flow during operation. Only apply a light coat of silicone grease.

Avoid touching the tip of the electrode during installation as grease or dirt may affect starting reliability. Check the electrode tip and wipe clean if necessary.

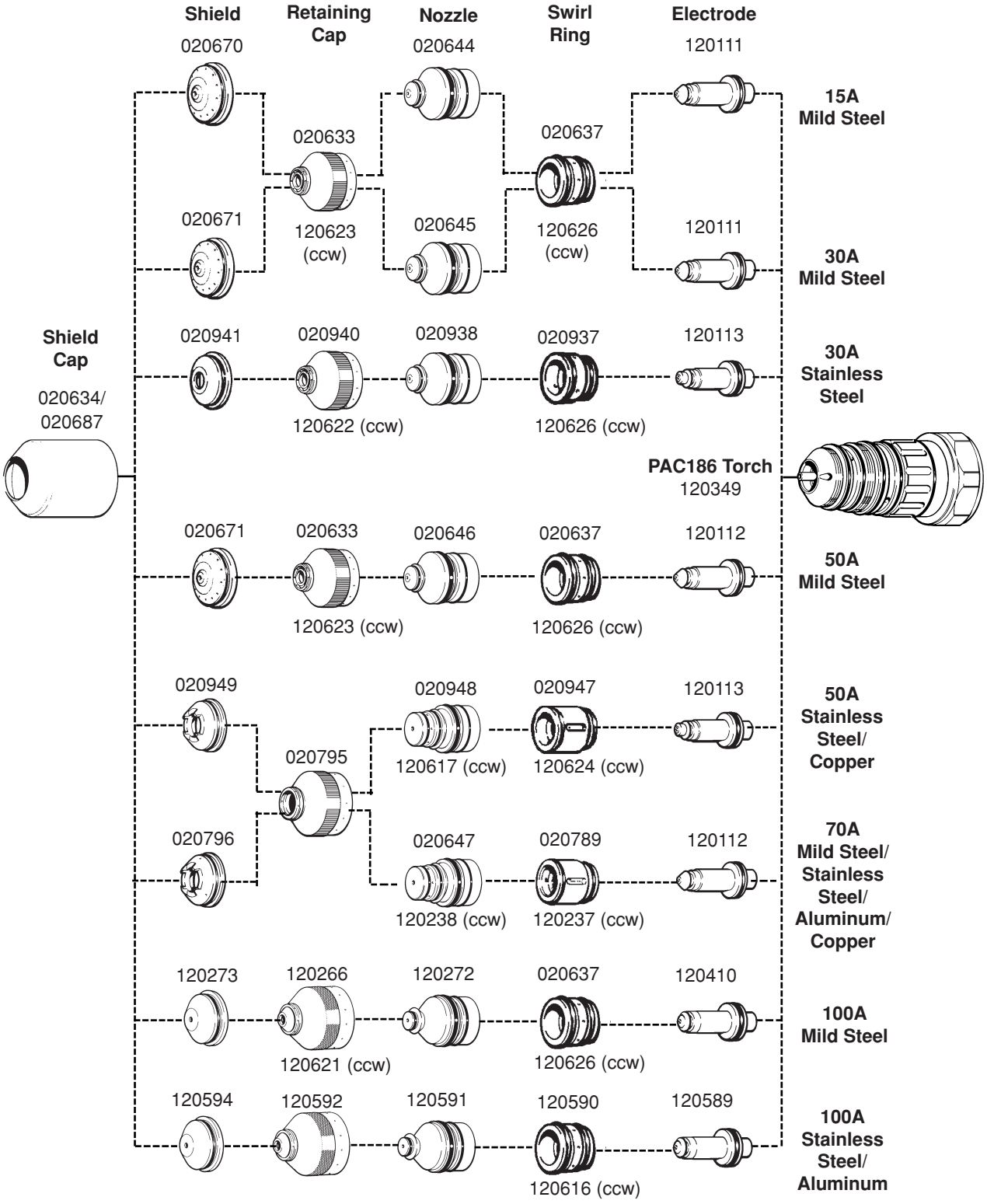
1. Apply silicone to the electrode O-ring and then to both O-rings on the swirl ring.

2. Insert the electrode into the small diameter end of the swirl ring, then insert the swirl ring (large diameter end) into the nozzle. Apply silicone to the nozzle O-rings, then insert the nozzle into the torch and push it into place.

3. Inspect the threads on the torch main body, and clean threads if necessary. Apply silicone to the O-rings on the torch main body.

4. Install the inner cap on to the torch main body. **Hand tighten the inner cap snugly to ensure good electrical contact. Do not overtighten.**

5. Install the shield cap with the shield in place on to the torch main body. If the shield is not in place, apply silicone to the O-ring and insert the shield into the shield cap and push into place. **Hand tighten the shield cap snugly. Failure to tighten the shield cap snugly could result in poor electrical contact and water and gas leaks which will impair cut quality.**



CCW (counter clockwise) consumables are available for mirror image cutting.

Figure 4-5 PAC186 Torch Consumable Parts

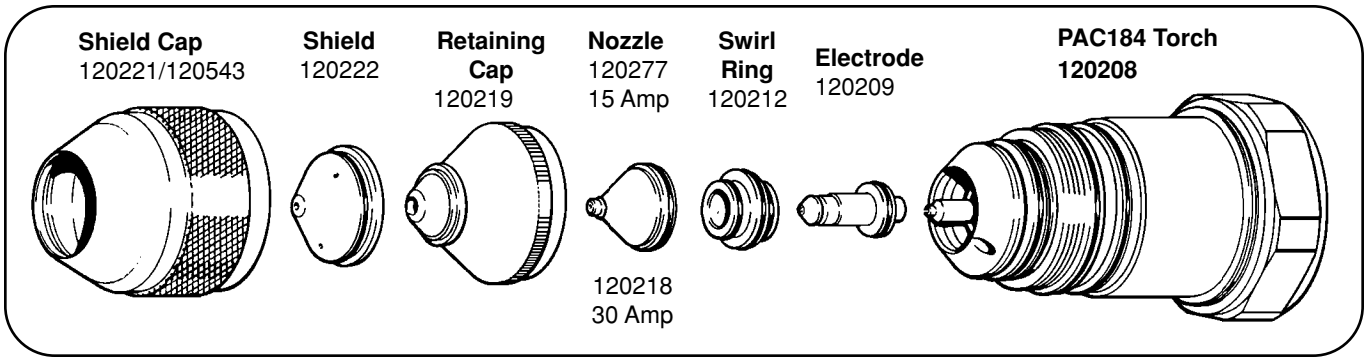


Figure 4-6 PAC184 Torch 15 and 30 Amp Consumable Parts

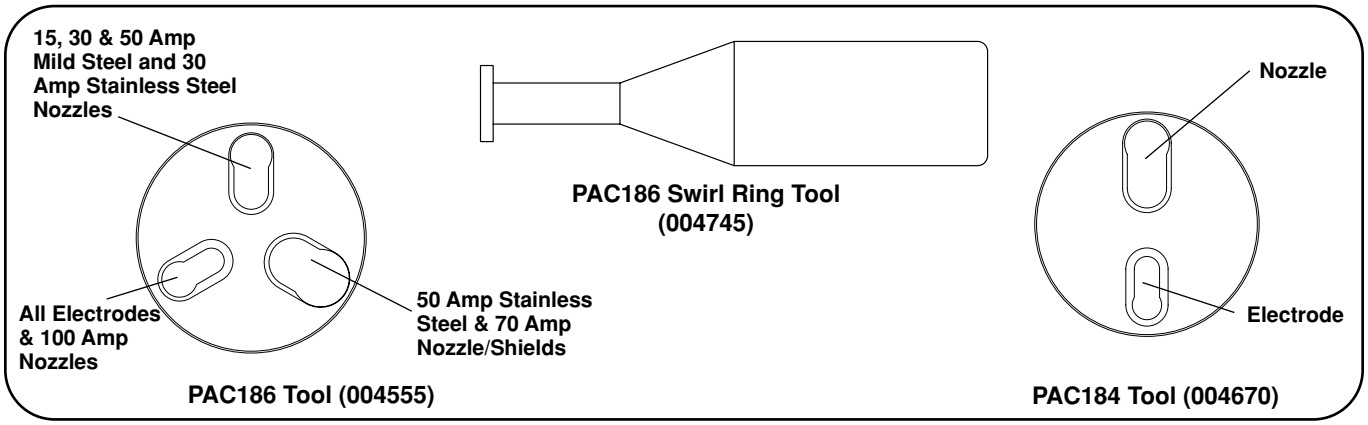
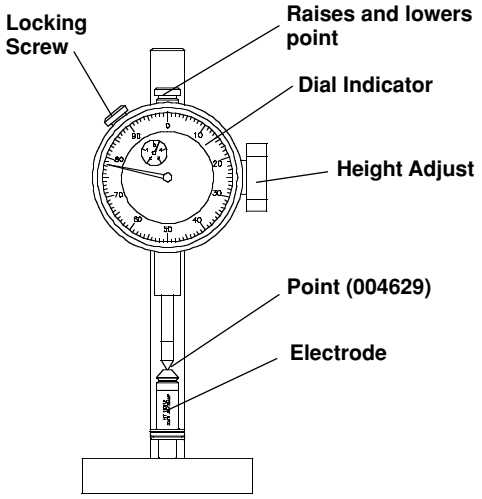


Figure 4-7 Consumable Removal Tools



This tool is used to check the electrode pit depth. To use, proceed as follows:

1. Loosen height adjust and insert electrode as shown. Tighten height adjust.
2. Ensure the point touches the flat surface next to the pit.
3. Loosen the dial indicator locking screw, zero indicator and retighten locking screw.
4. Lower point into pit and read indicator for pit depth.
5. Replace electrodes with indicated pit depths greater than 0.040 inch (1.0 mm).

Figure 4-8 Electrode Pit Depth Gauge (004630)

Blow Back Option to Purge Coolant Hoses

Before removing the PAC184 or PAC186 torch, the operator may want to purge the torch coolant from the coolant hoses back into the coolant tank to minimize the coolant dripping when the torch is disconnected from the quick disconnect. After replacing the torch, the coolant hoses should be refilled with coolant. Refer to the procedures below.

Purge Coolant Hoses (Blow Back)

1. Shut the power supply down at the control panel or CNC.

2. At off-valve assembly (Fig. 4-9) connect 1/4-inch air hose to air inlet.

3. Connect 120 VAC power cable from CNC or other source to blow back solenoid valve.

4. Apply air at approximately 20 psi (1.4 bar) to the air inlet. **Air supply should be clean, dry and oil free in order not to contaminate the coolant.**

5. Apply 120 VAC signal for about 3 seconds to open the solenoid valve in order to purge the coolant from the hoses. I**t is not necessary to purge longer than 3 seconds.**

6. After the coolant hoses have been purged, disconnect the torch from the torch quick disconnect.

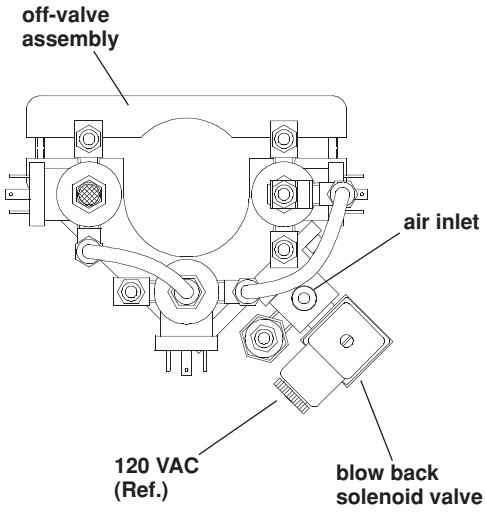


Figure 4-9 Coolant Purging Setup

Refill Coolant Hoses

1. Reconnect torch to the torch quick disconnect.

2. Apply power to the power supply at the control panel or from CNC.

If at the power supply, depress and hold the **POWER ON** pushbutton switch until the **COOLANT FLOW** LED lights. If at the CNC, maintain the Power On signal until the **COOLANT FLOW** LED lights.

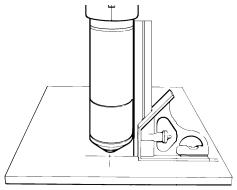
When the **COOLANT FLOW** LED lights, release the **POWER ON** switch at the power supply or the Power On signal at the CNC. The green **POWER ON** indicator should remain on, indicating that the system is operating normally.

(The **COOLANT FLOW** LED will remain out until the coolant has pushed all of the air out of the torch cooling hoses and the coolant returns to the tank. However, coolant hoses with too many bends can have air pockets even though the **COOLANT FLOW** LED lights and the system appears ready for operation. **The trapped air can cause the torch to lose cooling momentarily and potentially cause damage to the torch**.)

How to Optimize Cut Quality

The following tips and procedures will help produce square, straight, smooth and dross-free cuts.

Tips for Table and Torch



- Use a square to align the torch at right angles to the workpiece.
- The torch may travel more smoothly if you clean, check and “tune” the rails and drive system on the cutting table. Unsteady machine motion can cause a regular, wavy pattern on the cut surface.
- The torch must not touch the workpiece during cutting. Contact can damage the shield and nozzle, and affect the cut surface.

Plasma Set-Up Tips

Follow carefully each step in the *Daily Start-Up* procedure described earlier in this section.

Purge the gas lines before cutting.

Maximize the Life of Consumable Parts

Hypertherm’s LongLife® process automatically “ramps up” the gas and current flows at the start and ramps them down at the end of each cut, to minimize erosion of the electrode’s center surface. The LongLife process also requires that cuts start and stop on the workpiece.

- The torch should never fire into the air.
  - Starting the cut at the edge of the workpiece is acceptable, as long as the arc is not fired in the air.
  - To start with a pierce, use a pierce height that is 1.5 to 2 times the torch-to-work distance. See Cut Charts.
- Each cut should end with the arc still attached to the workpiece, to avoid arc blow-outs (ramp-down errors).
  - When cutting drop parts (small parts that drop down after being cut from the workpiece), check that the arc stays attached to the edge of the workpiece, for proper ramp-down.
- If arc blow-outs occur, try one or more of the following:
  - Reduce the cutting speed during the final part of the cut.
  - Stop the arc before the part is completely cut, to allow completion of the cut during the ramp-down.
  - Program the path of the torch into the scrap area for ramp-down.

    Note: Use a “chain cut” if possible, so the path of the torch can lead directly from one cut part into the next, without stopping and starting the arc. However, do not allow the path to lead off the workpiece and back on, and remember that a chain cut of long duration will cause electrode wear.

    Note: It may be difficult to achieve the full benefits of the LongLife process in some conditions.

Additional Factors of Cut Quality

Cut Angle

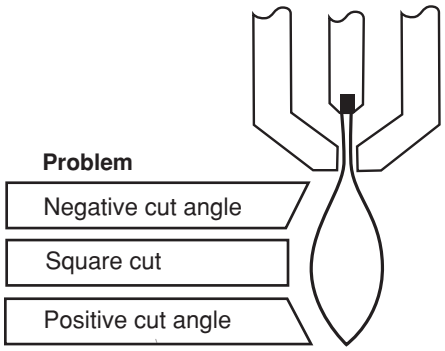
A cut part whose 4 sides average less than 4° of cut angle is considered acceptable.

Note: The squarest cut angle will be on the right side with respect to the forward motion of the torch.

Note: To determine whether a cut-angle problem is being caused by the plasma system or the drive system, make a test cut and measure the angle of each side. Next, rotate the torch 90° in its holder and repeat the process. If the angles are the same in both tests, the problem is in the drive system.

If a cut-angle problem persists after “mechanical causes” have been eliminated (See *Tips for Table and Torch,* previous page), check the torch-to-work distance, especially if cut angles are all positive or all negative.

- A positive cut angle results when more material is removed from the top of the cut than from the bottom.
- A negative cut angle results when more material is removed from the bottom of the cut.



Problem	Cause	Solution
Negative cut angle	The torch is too low.	Increase arc voltage to raise the torch.
Square cut		
Positive cut angle	The torch is too high.	Decrease arc voltage to lower the torch.

Dross

Low-speed dross forms when the torch’s cutting speed is too slow and the arc shoots ahead. It forms as a heavy, bubbly deposit at the bottom of the cut and can be removed easily. Increase the speed to reduce the dross.

High-speed dross forms when the cutting speed is too fast and the arc lags behind. It forms as a thin, linear bead of solid metal attached very close to the cut. It is welded to the bottom of the cut and is difficult to remove. To reduce high-speed dross:

- Decrease the cutting speed.
- Decrease arc voltage, to decrease the torch-to-work distance.
- Increase O_2 in the shield gas to increase the range of dross-free cutting speeds. (Only HyDefinition and HT4400 systems can accommodate mixed-gas shield gases.)

Notes: Dross is more likely to form on warm or hot metal than on cool metal. For example, the first cut in a series of cuts will likely produce the least dross. As the workpiece heats up, more dross may form on subsequent cuts.

Dross is more likely to form on mild steel than on stainless steel or aluminum.

Worn or damaged consumables may produce intermittent dross.

Straightness of the Cut Surface

A typical plasma cut surface is slightly concave.

The cut surface may become more concave, or convex. Correct torch height is required to keep the cut surface acceptably close to straight.

A strongly concave cut surface occurs when the torch-to-work distance is too low. Increase the arc voltage to increase the torch-to-work distance and straighten the cut surface.

A convex cut surface occurs when the torch-to-work distance is too great or the cutting current is too high. First, reduce the arc voltage, then reduce the cutting current. If there is overlap between different cutting currents for that thickness, try the consumables designed for the lower current.

Additional Improvements

Some of these improvements involve trade-offs, as described.

Smoothness of Cut Surface (Surface Finish)

- (HyDefinition and HT4400 only) On mild steel, a higher concentration of N_2 in the O_2-N_2 shield mixture may produce a smoother cut surface.
  Trade-off: This may produce more dross.

- (HyDefinition and HT4400 only) On mild steel, a higher concentration of O_2 in the O_2-N_2 shield mixture may increase the cutting speed and produce less dross.
  Trade-off: This may produce a rougher cut surface.

Piercing

- The pierce delay must be sufficiently long that the arc can pierce the material before the torch moves, but not so long that the arc “wanders” while trying to find the edge of a large hole.

- A higher shield gas preflow may help blow the molten metal away during piercing.
  Trade-off: This may reduce starting reliability.

  Note: When piercing at maximum thicknesses, the ring of dross that forms during the pierce may be high enough to contact the torch when the torch begins to move after the pierce is complete. A “flying pierce,” which makes the pierce while the torch is moving, may eliminate the torch vibration that follows contact between the torch and the ring of dross.

How to Increase Cutting Speed

- Decrease the torch-to-work distance.
  Trade-off: This will increase the negative cut angle

  Note: The torch must not touch the workpiece while piercing or cutting.

Technical Questions

Claims for defective merchandise – All units shipped from Hypertherm undergo quality control testing. However, if your system does not function correctly:

1. Recheck all pre-installation and installation and post-installation requirements and connections in Section 3, *Installation*.

2. If you are unable to solve the problem, call your distributor. They will be able to help you, or refer you to an authorized Hypertherm repair facility.

3. If you need assistance, call Customer Service or Technical Service listed in the front of this manual.

Operating Data (Cut) Charts

The *Cut Charts* on the following pages are optimized to provide the best cut angle, least dross and best cut surface finish. Keep in mind that these charts provide a good starting point and that optimum cutting must be tuned to the application and materials on site. Increasing cut speed, lowering the torch standoff, higher current consumables on thinner metals or increasing the oxygen ratio in the shield mix, for example, all present certain tradeoffs as mentioned in *How to Get Better Cut Quality*. Depending on the cutting application, it is up to the operator to determine if the tradeoffs are acceptable.

The cut chart also provides part numbers and illustrations of the consumables required to cut at a specific amperage. For more detailed information, refer to the gas console control and indicator descriptions and the daily operating procedure at the front of this section.

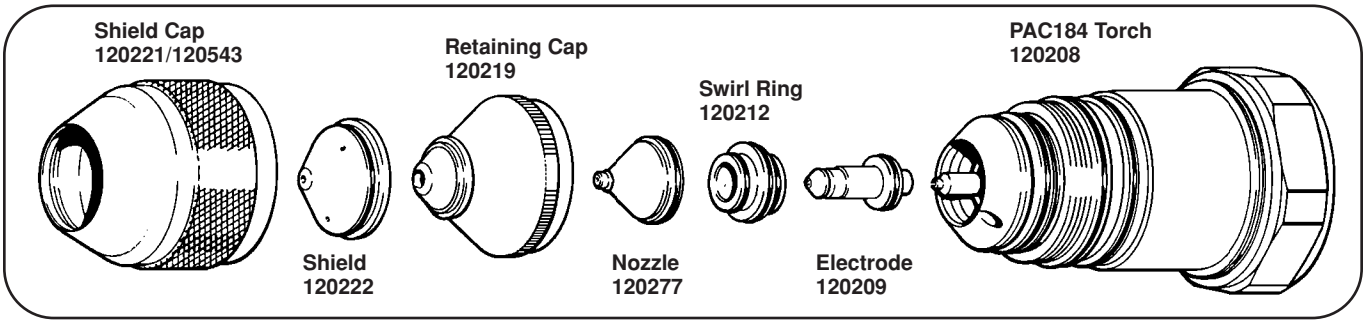
Cut Chart Index

PAC184

Mild Steel

O_2 Plasma / O_2 & N_2 Shield

15 Amp Cutting



Material Thickness (GA)	(in)	(mm)	Test Preflow* Flowrates (%) Preflow O_2 (1)#	N_2 (2)#	Test Cut Flowrates (%) Shield O_2 (3)#	N_2 (4)#	Plasma O_2 (5)#	(6)#	Arc Voltage (volts)	Torch Standoff** (in)	(mm)	Travel Speed (ipm)	(m/min)	Initial Piercing Height (in)	(mm)	Pierce Delay (dial)	(sec)
26	0.018	0.5	5	75	30	10	40	–	134	0.020	0.5	145	3.68	0.040	1.0	0	0.05
24	0.024	0.6	5	75	30	10	40	–	135	0.020	0.5	129	3.28	0.040	1.0	0	0.05
22	0.030	0.8	5	75	30	10	40	–	136	0.020	0.5	115	2.92	0.040	1.0	0	0.05
20	0.036	0.9	5	75	30	10	40	–	136	0.020	0.5	100	2.54	0.040	1.0	0	0.05
18	0.048	1.3	5	75	30	10	40	–	137	0.020	0.5	85	2.16	0.040	1.0	0.5	0.16
16	0.060	1.5	5	75	30	10	40	–	142	0.030	0.8	65	1.65	0.040	1.0	1	0.27
14	0.075	1.9	5	75	30	10	40	–	144	0.040	1.0	45	1.14	0.060	1.5	1.5	0.37
12	0.105	2.7	5	75	30	10	40	–	148	0.040	1.0	35	0.90	0.060	1.5	2	0.50
10	0.135	3.4	5	75	30	10	40	–	151	0.040	1.0	25	0.64	0.060	1.5	2.5	0.60

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Refer to LCD display Figure 4-3.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

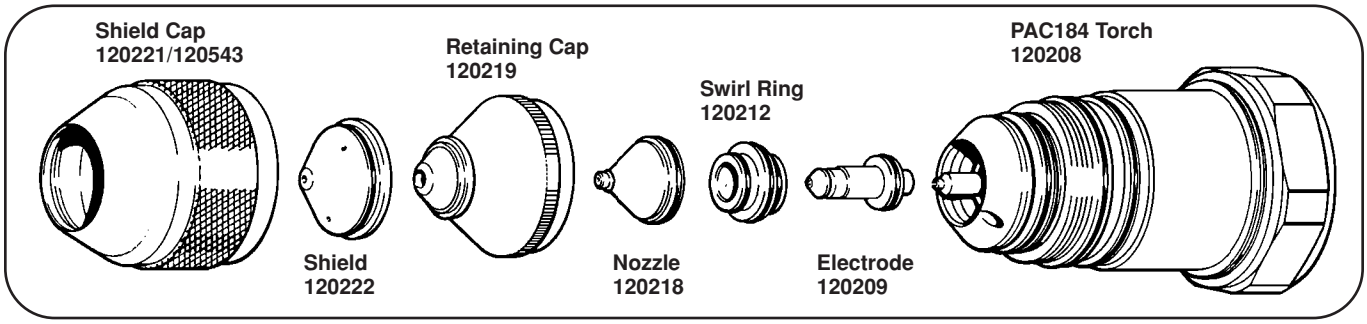
If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC184

Mild Steel

O_2 Plasma / O_2 & N_2 Shield

30 Amp Cutting



Material Thickness			Test Preflow* Flowrates (%)		Test Cut Flowrates (%)				Arc Voltage	Torch Standoff**		Travel Speed		Initial Piercing Height		Pierce Delay	
			Preflow		Shield		Plasma										
(GA)	(in)	(mm)	O_2 (1)#	N_2 (2)#	O_2 (3)#	N_2 (4)#	O_2 (5)#	(6)#	(volts)	(in)	(mm)	(ipm)	(m/min)	(in)	(mm)	(dial)	(sec)
24	0.024	0.6	5	75	15	5	46	—	117	0.030	0.8	200	5.08	0.060	1.5	0	0.05
22	0.030	0.8	5	75	15	5	46	—	121	0.030	0.8	170	4.32	0.060	1.5	0	0.05
20	0.036	0.9	5	75	15	5	46	—	125	0.040	1.0	140	3.56	0.080	2.0	0	0.05
18	0.048	1.3	5	75	15	5	46	—	128	0.040	1.0	110	2.80	0.080	2.0	0	0.05
16	0.060	1.5	5	75	15	5	46	—	128	0.040	1.0	80	2.03	0.080	2.0	0	0.05
14	0.075	1.9	5	75	15	5	46	—	128	0.040	1.0	60	1.52	0.080	2.0	0.5	0.16
12	0.105	2.7	5	75	15	5	46	—	135	0.060	1.5	50	1.27	0.100	2.5	1	0.27
10	0.135	3.4	5	75	15	5	46	—	135	0.060	1.5	35	0.90	0.100	2.5	1.5	0.37
	3⁄16	4.8	5	75	15	5	46	—	135	0.060	1.5	32	0.81	0.100	2.5	2	0.50
	1⁄4	6.4	5	75	30	10	46	—	136	0.040	1.0	25	0.64	0.100	2.5	2.5	0.60

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Refer to LCD display Figure 4-3.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

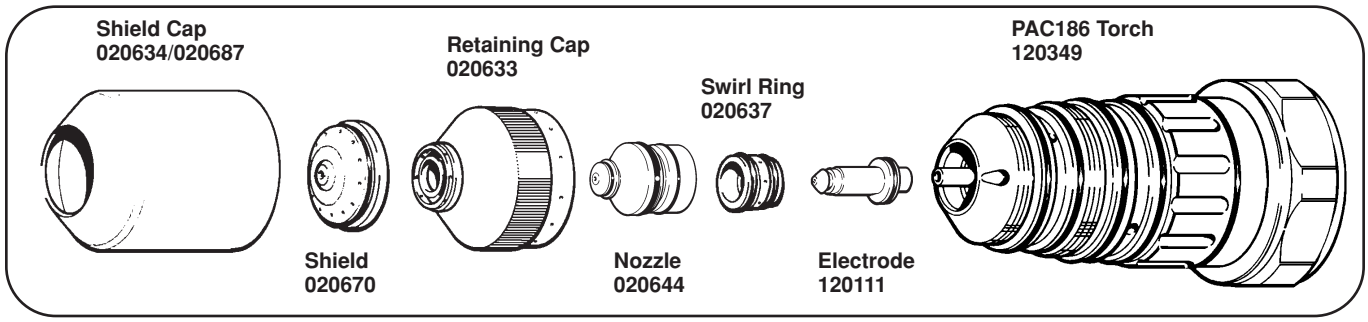
If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back Pressure Checks*.

PAC186

Mild Steel

O_2 Plasma / O_2 & N_2 Shield

15 Amp Cutting



Material Thickness (GA)	(in)	(mm)	Test Preflow* Flowrates (%) Preflow O_2 (1)#	N_2 (2)#	Test Cut Flowrates (%) Shield O_2 (3)#	N_2 (4)#	Plasma O_2 (5)#	(6)#	Arc Voltage *** (volts)	Torch Standoff **, *** (in)	(mm)	Travel Speed (ipm)	(m/min)	Initial Piercing Height (in)	(mm)	Pierce Delay (dial)	(sec)
20	0.036	0.9	5	75	30	10	40	–	120	0.020	0.5	100	2.54	0.040	1.0	0	0.1
18	0.048	1.3	5	75	30	10	40	–	121	0.020	0.5	85	2.16	0.040	1.0	0	0.1
16	0.060	1.5	5	75	30	10	40	–	124	0.030	0.8	65	1.65	0.040	1.0	.5	0.2
14	0.075	1.9	5	75	30	10	40	–	130	0.040	1.0	45	1.14	0.060	1.5	1	0.3
12	0.150	2.7	5	75	30	10	40	–	132	0.040	1.0	35	0.90	0.060	1.5	1.5	0.4
10	0.135	3.4	5	75	30	10	40	–	134	0.040	1.0	25	0.64	0.060	1.5	2	0.50

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Refer to LCD display Figure 4-3.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** To maintain the 0.020 inch (0.5 mm) torch standoff as the electrode wears, the arc voltage may have to be increased to avoid having the torch dive into the plate.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Section 6, *Parts List.*

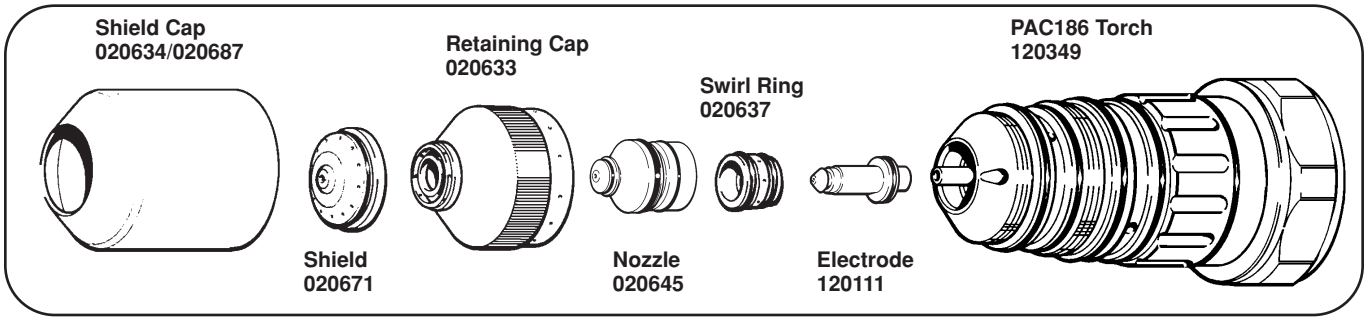
If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Mild Steel

O_2 Plasma / O_2 & N_2 Shield

30 Amp Cutting



Material Thickness			Test Preflow* Flowrates (%)		Test Cut Flowrates (%)				Arc Voltage	Torch Standoff**		Travel Speed		Initial Piercing Height		Pierce Delay	
			Preflow		Shield		Plasma										
(GA)	(in)	(mm)	O_2 (1)#	N_2 (2)#	O_2 (3)#	N_2 (4)#	O_2 (5)#	(6)#	(volts)	(in)	(mm)	(ipm)	(m/min)	(in)	(mm)	(dial)	(sec)
24	0.024	0.6	5	75	15	5	46	–	103	0.030	0.8	200	5.08	0.040	1.0	0	0
22	0.030	0.8	5	75	15	5	46	–	108	0.030	0.8	170	4.32	0.040	1.0	0	0
20	0.036	0.9	5	75	15	5	46	–	110	0.040	1.0	140	3.56	0.060	1.5	0	0
18	0.048	1.3	5	75	15	5	46	–	112	0.040	1.0	110	2.80	0.060	1.5	0	0
16	0.060	1.5	5	75	15	5	46	–	115	0.040	1.0	80	2.03	0.060	1.5	0	0.1
14	0.075	1.9	5	75	15	5	46	–	118	0.040	1.0	60	1.52	0.060	1.5	0	0.1
12	0.105	2.7	5	75	15	5	46	–	121	0.060	1.5	50	1.27	0.080	2.0	.5	0.2
10	0.135	3.4	5	75	15	5	46	–	124	0.060	1.5	35	0.90	0.080	2.0	1	0.3
	3⁄16	4.8	5	75	15	5	46	–	125	0.060	1.5	32	0.81	0.080	2.0	1.5	0.4
	1⁄4	6.4	5	75	30	10	46	–	124	0.040	1.0	25	0.64	0.080	2.0	2	0.5

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Refer to LCD display Figure 4-3.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Section 6, *Parts List.*

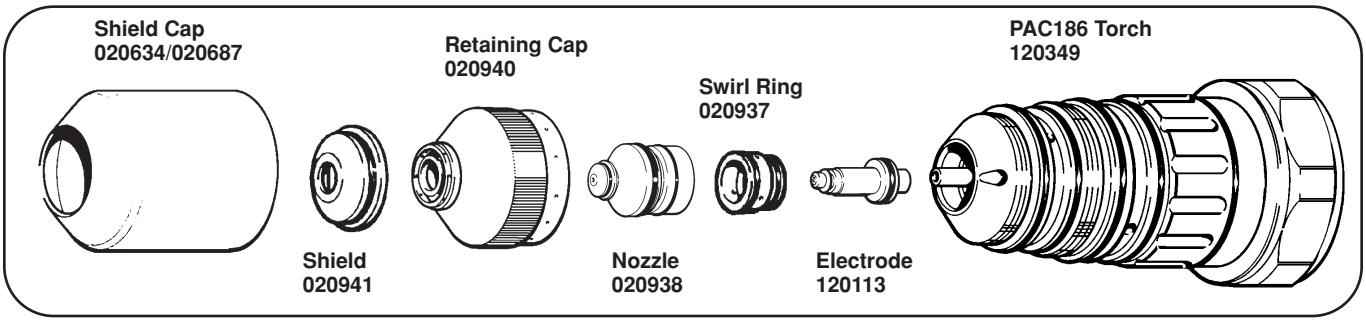
If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Stainless Steel##

Air Plasma / Air Shield

30 Amp Cutting



Material Thickness			Test Preflow* Flowrates (%)		Test Cut Flowrates (%)				Arc Voltage ***	Torch Standoff **, ***		Travel Speed		Initial Piercing Height		Pierce Delay	
			Preflow		Shield		Plasma										
(GA)	(in)	(mm)	Air (1)#	(2)#	Air (3)#	(4)#	Air (5)#	(6)#	(volts)	(in)	(mm)	(ipm)	(m/min)	(in)	(mm)	(dial)	(sec)
27	0.016	0.4	75	0	30	0	60	–	70-75	0.020	0.5	250	6.35	0.040	1.0	0	0
24	0.024	0.6	75	0	30	0	60	–	70-75	0.020	0.5	220	5.59	0.040	1.0	0	0
22	0.030	0.8	75	0	30	0	60	–	70-75	0.020	0.5	200	5.08	0.040	1.0	0	0.1
20	0.036	0.9	75	0	30	0	60	–	70-75	0.020	0.5	180	4.57	0.040	1.0	0	0.1
18	0.048	1.3	75	0	30	0	60	–	73-78	0.020	0.5	150	3.81	0.060	1.5	.5	0.2
16	0.060	1.5	75	0	30	0	60	–	73-78	0.020	0.5	120	3.05	0.060	1.5	.5	0.2

Air inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Refer to LCD display Figure 4-3.

Stainless steel plate sometimes comes with a protective plastic film. Remove film prior to cutting.

* Slightly increasing the test preflow Air flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** To maintain the 0.020 inch (0.5 mm) torch standoff as the electrode wears, the arc voltage may have to be increased to avoid having the torch dive into the plate.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Section 6, *Parts List*.

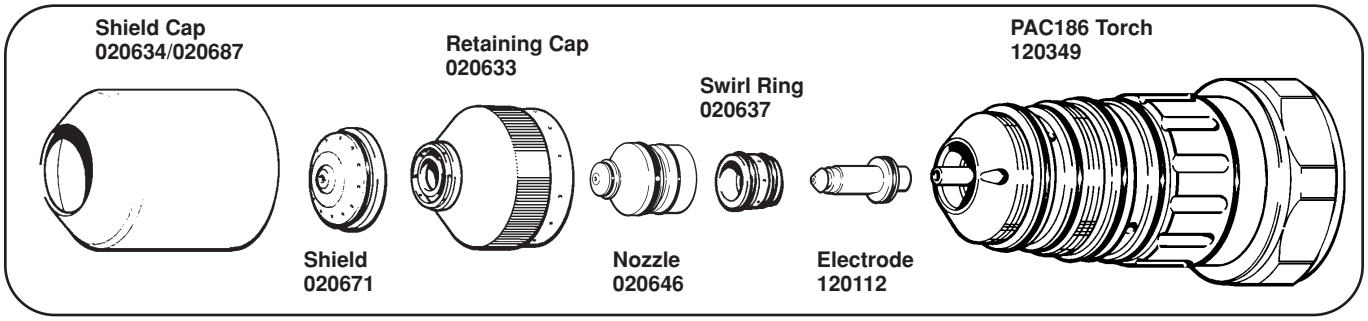
If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Mild Steel

O_2 Plasma / O_2 & N_2 Shield

50 Amp Cutting



Material Thickness			Test Preflow* Flowrates (%)		Test Cut Flowrates (%)				Arc Voltage	Torch Standoff**		Travel Speed		Initial Piercing Height		Pierce Delay	
			Preflow		Shield		Plasma										
(GA)	(in)	(mm)	O_2 (1)#	N_2 (2)#	O_2 (3)#	N_2 (4)#	O_2 (5)#	(6)#	(volts)	(in)	(mm)	(ipm)	(m/min)	(in)	(mm)	(dial)	(sec)
22	0.030	0.8	5	75	40	0	40	–	103	0.040	1.0	270	6.86	0.060	1.5	0	0
20	0.036	0.9	5	75	40	0	40	–	103	0.040	1.0	210	5.33	0.060	1.5	0	0
18	0.048	1.3	5	75	40	0	40	–	104	0.040	1.0	160	4.06	0.060	1.5	0	0
16	0.060	1.5	5	75	40	0	40	–	109	0.050	1.3	120	3.05	0.080	2.0	0	0
14	0.075	1.9	5	75	40	0	40	–	113	0.050	1.3	100	2.54	0.080	2.0	0	0
12	0.105	2.7	5	75	40	0	40	–	119	0.050	1.3	75	1.91	0.100	2.5	0	0.1
10	0.135	3.4	5	75	40	0	40	–	122	0.060	1.5	55	1.40	0.100	2.5	.5	0.2
	3⁄16	4.8	5	75	40	0	40	–	124	0.060	1.5	45	1.14	0.100	2.5	1	0.3
	1⁄4	6.4	5	75	60	0	60	–	127	0.080	2.0	35	0.90	0.120	3.0	2	0.5

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Refer to LCD display Figure 4-3.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Section 6, *Parts List.*

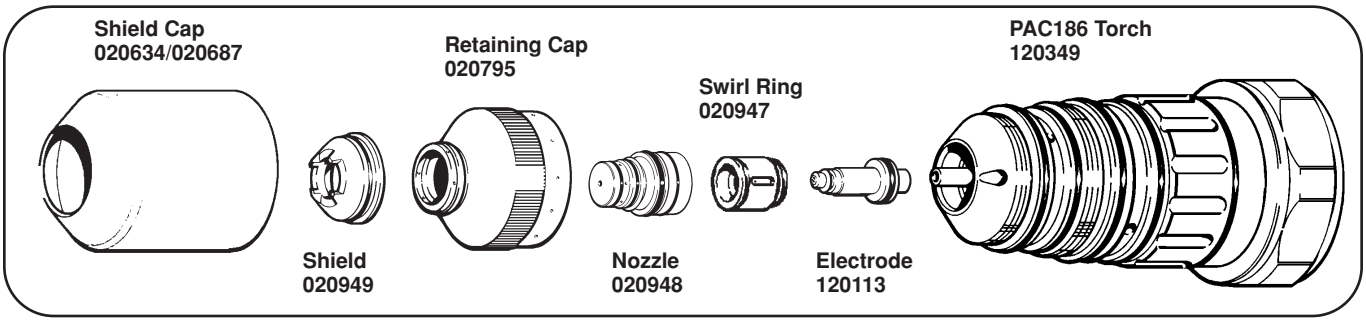
If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Stainless Steel##

Air Plasma / Air Shield

50 Amp Cutting



Material Thickness			Test Preflow* Flowrates (%)		Test Cut Flowrates (%)				Arc Voltage	Torch Standoff**		Travel Speed		Initial Piercing Height ***		Pierce Delay	
			Preflow Air		Shield Air		Plasma Air										
(GA)	(in)	(mm)	(1)#	(2)#	(3)#	(4)#	(5)#	(6)#	(volts)	(in)	(mm)	(ipm)	(m/min)	(in)	(mm)	(dial)	(sec)
14	0.075	1.9	60	0	80	0	40	–	100	0.040	1.0	120	3.05	0.120	3.0	1	0.3
12	0.105	2.7	60	0	80	0	40	–	100	0.040	1.0	80	2.03	0.120	3.0	1.5	0.4
10	0.135	3.4	60	0	60	0	40	–	110	0.060	1.5	55	1.40	0.120	3.0	1.5	0.4
	3⁄16	4.8	60	0	50	0	40	–	115	0.080	2.0	40	1.02	0.160	4.0	2	0.5

Air inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Refer to LCD display Figure 4-3.

Stainless steel plate sometimes comes with a protective plastic film. Remove film prior to cutting.

* Slightly increasing the test preflow Air flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** Measured from tips of shield adapter 020949.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Section 6, *Parts List.*

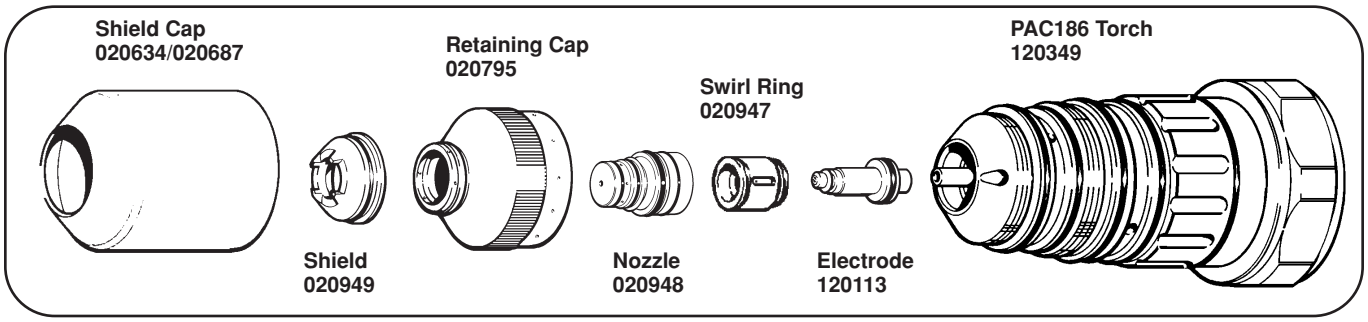
If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Copper##

O_2 Plasma / O_2 & N_2 Shield

50 Amp Cutting



Material Thickness			Test Preflow* Flowrates (%)		Test Cut Flowrates (%)				Arc Voltage	Torch Standoff**		Travel Speed		Initial Piercing Height ***		Pierce Delay	
			Preflow		Shield		Plasma										
(GA)	(in)	(mm)	O_2 (1)#	N_2 (2)#	O_2 (3)#	N_2 (4)#	O_2 (5)#	(6)#	(volts)	(in)	(mm)	(ipm)	(m/min)	(in)	(mm)	(dial)	(sec)
16	0.060	1.5	35	40	20	10	40	–	92	0.080	2.0	70	1.78	0.100	2.5	4	1.0
14	0.075	1.9	35	40	20	10	40	–	92	0.080	2.0	70	1.78	0.100	2.5	4	1.0
12	0.105	2.7	35	40	20	10	40	–	94	0.080	2.0	65	1.65	0.100	2.5	7	1.5
10	0.135	3.4	35	40	20	10	40	–	94	0.080	2.0	65	1.65	0.100	2.5	9	2.0

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Refer to LCD display Figure 4-3.

Copper plate sometimes comes with a protective plastic film. Remove film prior to cutting.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** Measured from tips of shield adapter 020949.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Section 6, *Parts List.*

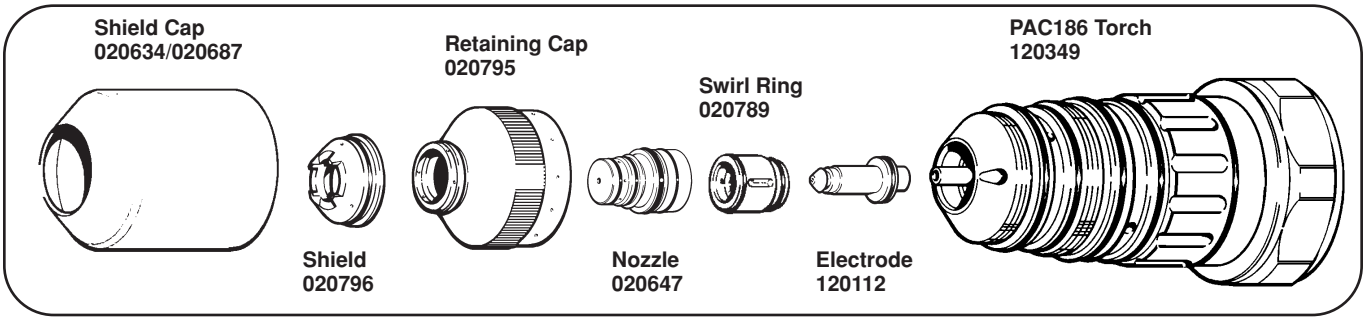
If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Mild Steel

O_2 Plasma / O_2 & N_2 Shield

70 Amp Cutting



Material Thickness			Test Preflow* Flowrates (%)		Test Cut Flowrates (%)				Arc Voltage	Torch Standoff**		Travel Speed		Initial Piercing Height ***		Pierce Delay	
			Preflow		Shield		Plasma										
(GA)	(in)	(mm)	O_2 (1)#	N_2 (2)#	O_2 (3)#	N_2 (4)#	O_2 (5)#	(6)#	(volts)	(in)	(mm)	(ipm)	(m/min)	(in)	(mm)	(dial)	(sec)
16	0.060	1.5	5	75	0	100	25	–	107	0.060	1.5	280	7.11	0.100	2.5	0	0.1
14	0.075	1.9	5	75	0	100	25	–	107	0.060	1.5	230	5.84	0.100	2.5	0	0.1
12	0.105	2.7	5	75	0	100	25	–	109	0.080	2.0	185	4.70	0.120	3.0	0	0.1
10	0.135	3.4	5	75	0	100	25	–	114	0.080	2.0	150	3.81	0.120	3.0	.5	0.2
	3⁄16	4.8	5	75	0	100	25	–	119	0.080	2.0	120	3.05	0.120	3.0	1	0.3
	1⁄4	6.4	5	75	0	100	40	–	129	0.080	2.0	100	2.54	0.120	3.0	2	0.5
	3⁄8	9.5	5	75	0	100	40	–	135	0.100	2.5	65	1.65	0.160	4.0	4	1.0

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Refer to LCD display Figure 4-3.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** Measured from tips of shield adapter 020796.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Section 6, *Parts List*.

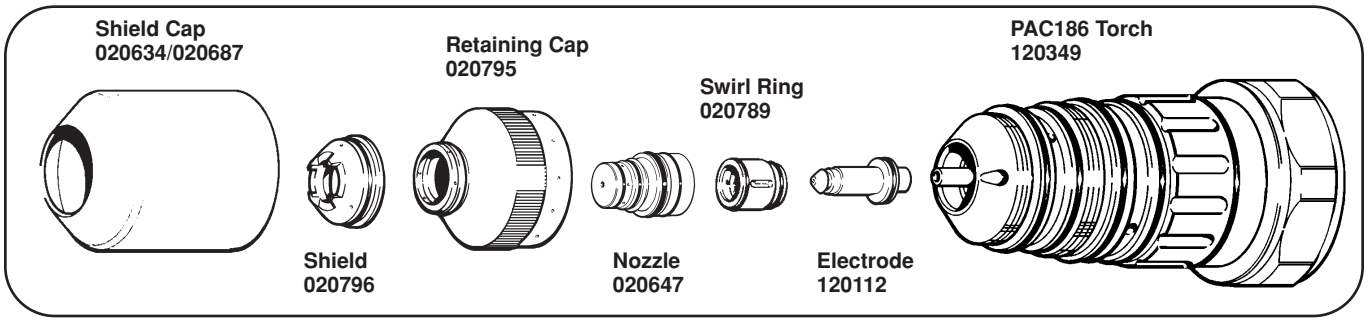
If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Stainless Steel##

Air Plasma / Air & CH_4 Shield

70 Amp Cutting



Material Thickness			Test Preflow* Flowrates (%)		Test Cut Flowrates (%)				Arc Voltage	Torch Standoff**		Travel Speed		Initial Piercing Height ***		Pierce Delay	
			Preflow		Shield		Plasma										
(GA)	(in)	(mm)	Air (1)#	CH_4 (2)#	Air (3)#	CH_4 (4)#	Air (5)#	(6)#	(volts)	(in)	(mm)	(ipm)	(m/min)	(in)	(mm)	(dial)	(sec)
10	0.135	3.4	75	0	100	0	35	–	134	0.060	1.5	100	2.54	0.140	3.5	1	0.3
	3/16	4.8	75	0	60	3	35	–	139	0.080	2.0	80	2.00	0.140	3.5	1.5	0.4
	1/4	6.4	75	0	30	10	35	–	149	0.140	3.5	55	1.40	0.180	4.5	2	0.5
	3/8	9.5	75	0	30	10	35	–	164	0.140	3.5	30	0.76	0.200	5.0	2	0.5
	1/2	12.7	75	0	40	20	50	–	189	0.250	6.3	25	0.64	****		****	

Air and CH_4 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Refer to LCD display Figure 4-3.

Stainless steel plate sometimes comes with a protective plastic film. Remove film prior to cutting.

* Slightly increasing the test preflow Air flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** Measured from tips of shield adapter 020796.

**** Piercing 1/2 inch (12.7 mm) stainless steel is not recommended, it will shorten consumable life. Starting cuts at the edge of the metal is recommended.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Section 6, *Parts List.*

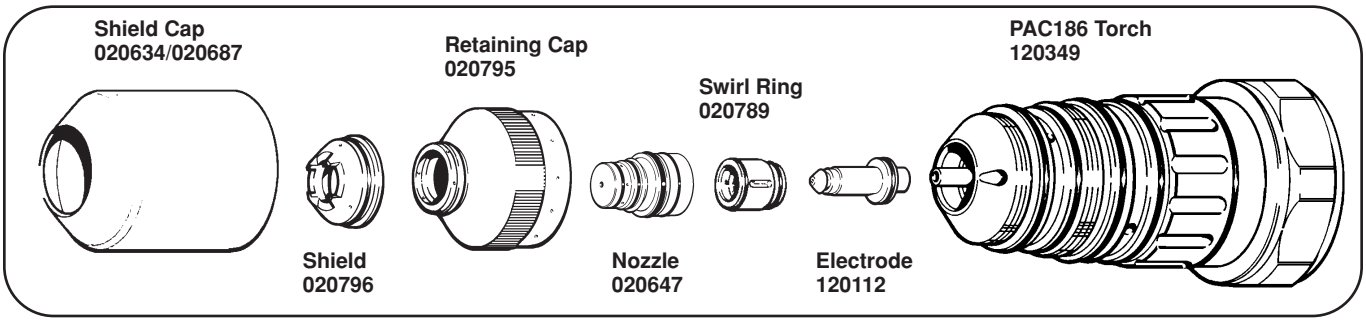
If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back*

PAC186

Aluminum##

Air Plasma / CH_4 Shield

70 Amp Cutting



Material Thickness			Test Preflow* Flowrates (%)		Test Cut Flowrates (%)				Arc Voltage	Torch Standoff**		Travel Speed		Initial Piercing Height ***		Pierce Delay	
			Preflow		Shield		Plasma										
(GA)	(in)	(mm)	Air (1)#	CH_4 (2)#	Air (3)#	CH_4 (4)#	Air (5)#	(6)#	(volts)	(in)	(mm)	(ipm)	(m/min)	(in)	(mm)	(dial)	(sec)
18	0.048	1.2	75	0	0	40	45	–	159	0.100	2.5	150	3.81	0.160	4.0	0	0.1
16	0.060	1.5	75	0	0	40	45	–	159	0.100	2.5	125	3.18	0.160	4.0	0	0.1
14	0.075	1.9	75	0	0	40	45	–	159	0.100	2.5	100	2.54	0.160	4.0	0	0.1
12	0.105	2.7	75	0	0	40	45	–	159	0.100	2.5	85	2.16	0.160	4.0	.5	0.2
	1⁄8	3.2	75	0	0	40	45	–	179	0.180	4.5	70	1.78	0.200	5.0	.5	0.2
10	0.135	3.4	75	0	0	40	45	–	179	0.180	4.5	65	1.65	0.200	5.0	.5	0.2
	1⁄4	6.4	75	0	0	40	45	–	179	0.180	4.5	45	1.14	0.200	5.0	1	0.3
	3⁄8	9.5	75	0	0	40	45	–	179	0.180	4.5	30	0.76	0.200	5.0	1	0.3

Air and CH_4 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Refer to LCD display Figure 4-3.

Aluminum plate sometimes comes with a protective plastic film. Remove film prior to cutting.

* Slightly increasing the test preflow Air flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** Measured from tips of shield adapter 020796.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Section 6, *Parts List.*

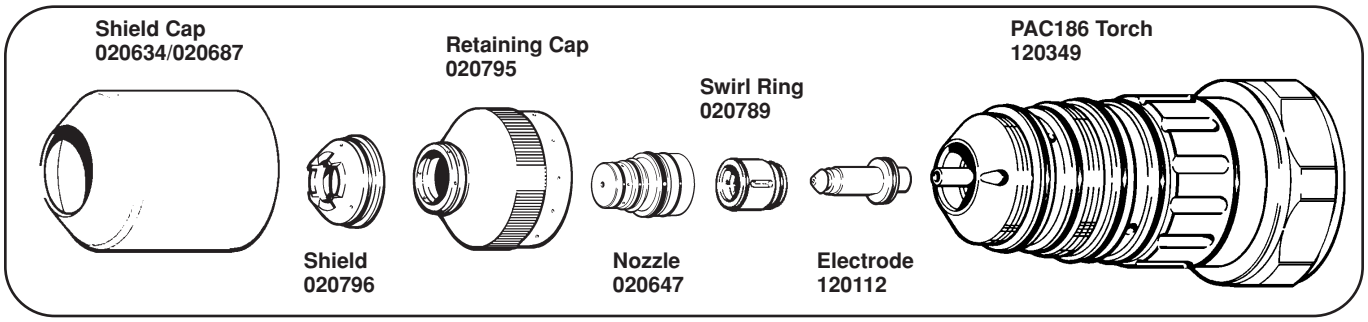
If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back*

PAC186

Copper##

O_2 Plasma / O_2 & N_2 Shield

70 Amp Cutting



Material Thickness (GA)	(in)	(mm)	Test Preflow* Flowrates (%) Preflow O_2 (1)#	N_2 (2)#	Test Cut Flowrates (%) Shield O_2 (3)#	N_2 (4)#	Plasma O_2 (5)#	(6)#	Arc Voltage (volts)	Torch Standoff** (in)	(mm)	Travel Speed (ipm)	(m/min)	Initial Piercing Height *** (in)	(mm)	Pierce Delay (dial)	(sec)
10	0.135	3.4	5	75	75	50	50	–	133	0.120	3.0	60	1.52	0.160	4.0	9	2.0
	3/16	4.8	5	75	75	50	50	–	119	0.120	3.0	55	1.40	0.160	4.0	—	2.5
	1/4	6.4	5	75	75	50	50	–	123	0.120	3.0	55	1.40	0.160	4.0	—	3.0
	3/8	9.5	5	75	75	50	50	–	129	0.120	3.0	25	0.64	0.160	4.0	—	5.0

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Refer to LCD display Figure 4-3.

Copper plate sometimes comes with a protective plastic film. Remove film prior to cutting.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

*** Measured from tips of shield adapter 020796.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Section 6, *Parts List.*

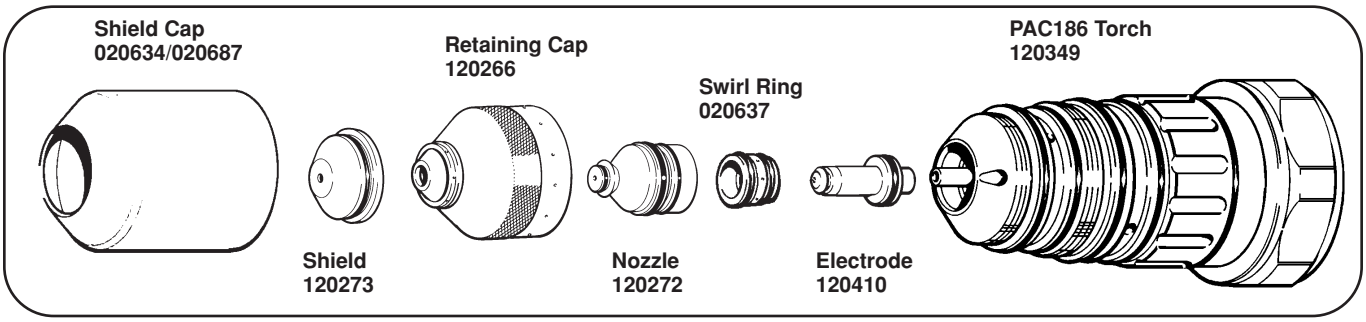
If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back*

PAC186

Mild Steel

O_2 Plasma / O_2 & N_2 Shield

100 Amp Cutting



Material Thickness (in)	Material Thickness (mm)	Test Preflow* Flowrates (%) Preflow O_2 (1)#	Preflow N_2 (2)#	Test Cut Flowrates (%) Shield O_2 (3)#	Shield N_2 (4)#	Plasma O_2 (5)#	Plasma (6)#	Arc Voltage (volts)	Torch Standoff** (in)	Torch Standoff** (mm)	Travel Speed (ipm)	Travel Speed (m/min)	Initial Piercing Height (in)	Initial Piercing Height (mm)	Pierce Delay (dial)	Pierce Delay (sec)
1/8	3.2	10	100	35	90	60	–	137	0.125	3.2	275	7.0	0.180	4.6	0	0.00
1/4	6.4	10	100	35	90	60	–	141	0.125	3.2	135	3.43	0.300	7.6	0.4	0.22
3/8	9.5	10	100	35	90	60	–	145	0.125	3.2	95	2.41	0.300	7.6	0.7	0.27
1/2	12.7	10	100	35	90	60	–	147	0.125	3.2	64	1.62	0.300	7.7	1.0	0.37

O_2 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Refer to LCD display Figure 4-3.

* Slightly increasing the test preflow O_2 and N_2 flowrates may increase piercing capability on the thicker materials listed above. However, increasing the preflow flowrates too much may affect plasma starting reliability (misfiring).

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Section 6, *Parts List*.

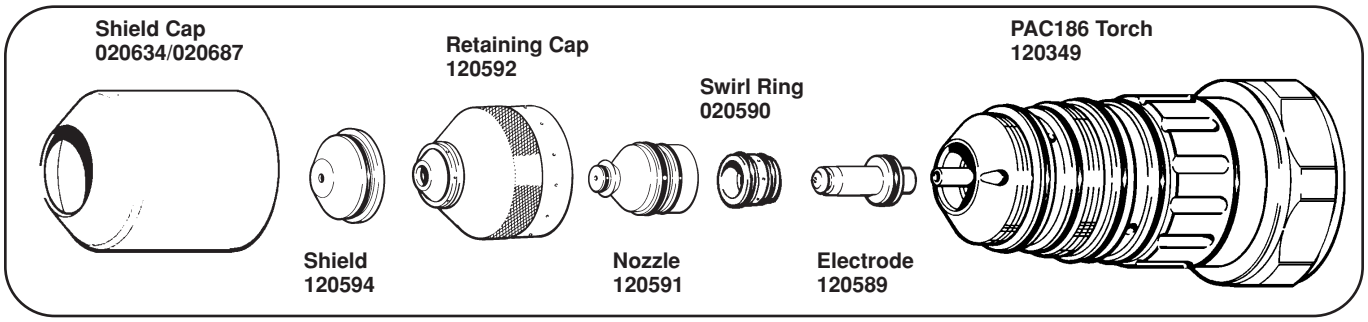
If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Stainless Steel

H35 & N_2 Plasma / N_2 Shield

100 Amp Cutting



Material Thickness (in)	Material Thickness (mm)	Test Preflow* Flowrates (%) Preflow N_2 (1)#	Preflow N_2 (2)#	Test Cut Flowrates (%) Shield N_2 (3)#	Shield N_2 (4)#	Plasma N_2 (5)#	Plasma H35 (6)#	Arc Voltage (volts)	Torch Standoff** (in)	Torch Standoff** (mm)	Travel Speed (ipm)	Travel Speed (m/min)	Initial Piercing Height (in)	Initial Piercing Height (mm)	Pierce Delay (dial)	Pierce Delay (sec)
1/4	6.4	45	45	60	60	30	30	134	0.120	3.0	75	1.9	0.200	5.1	0	0.1
3/8	9.5	45	45	60	60	30	30	144	0.150	3.8	65	1.6	0.200	5.1	0.5	0.2
1/2	12.7	45	45	60	60	50	40	160	0.250	6.4	45	1.1	0.300	7.6	1	0.3

H35 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

Refer to LCD display Figure 4-3.

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

If the part is not completely cut away from the scrap, try modifying the leadout. Stop the cut 0.050 inch (1.3 mm) before the end of the part for 1/4 and 3/8 inch (6.4 and 9.5 mm) material and 0.100 inch (2.5 mm) for 1/2 inch (12.7 mm) material. The ramp down of the current and gases will complete the cut. If your program can not be modified, reduce cutting speed and use no leadout.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Section 6, *Parts List.*

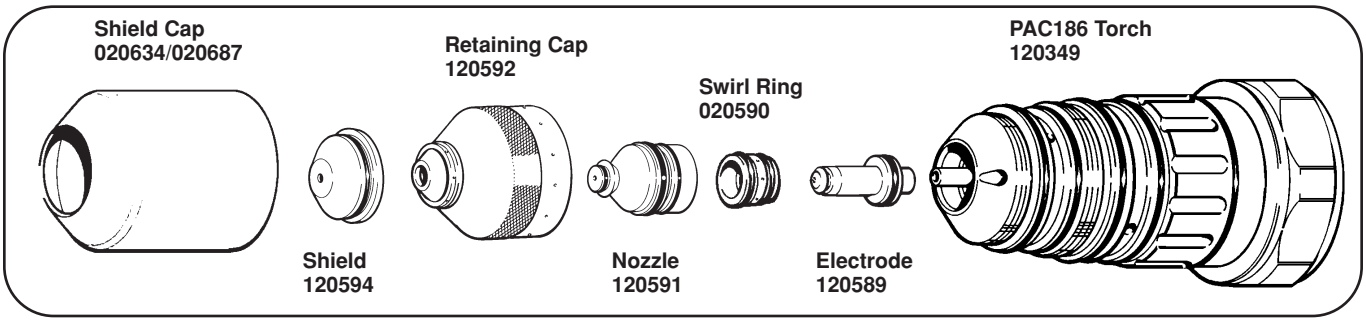
If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back Pressure Checks.*

PAC186

Aluminum

H35 & N_2 Plasma / N_2 Shield

100 Amp Cutting



Material Thickness (in)	Material Thickness (mm)	Test Preflow* Flowrates (%) Preflow N_2 (1)#	Preflow N_2 (2)#	Test Cut Flowrates (%) Shield N_2 (3)#	Shield N_2 (4)#	Plasma N_2 (5)#	Plasma H35 (6)#	Arc Voltage (volts)	Torch Standoff** (in)	Torch Standoff** (mm)	Travel Speed (ipm)	Travel Speed (m/min)	Initial Piercing Height (in)	Initial Piercing Height (mm)	Pierce Delay (dial)	Pierce Delay (sec)
1/4	6.4	45	45	60	60	30	30	145	0.157	4.0	100	2.5	0.236	6.0	0	0.1
3/8	9.5	45	45	60	60	30	30	149	0.157	4.0	70	1.8	0.236	6.0	0.5	0.2
1/2	12.7	45	45	60	60	30	30	155	0.157	4.0	40	1.1	0.236	6.0	1	0.3

H35 and N_2 gas inlet pressures must be between 105 - 135 psi (7.2 - 9.2 bar) for all material thickness.

H35 flowrate must be 85 scfh (2407 l/hr) at fullscale.

Refer to LCD display Figure 4-3.

** Torch standoff tolerances are ± 0.005 inch (± 0.125 mm). When using a THC, tolerances are ± 1 volt.

Counter clockwise (CCW) consumables are available for mirror image cutting. Refer to Section 6, *Parts List*.

If problems occur with the cutting process, and the flowrates are suspect, refer to Section 5, Maintenance, *Gas System Back Pressure Checks.*

Hypertherm

Section 5

MAINTENANCE

In this section:

Introduction

It is assumed that the service personnel performing the troubleshooting testing are high-level electronic service technicians that have worked with high voltage electro-mechanical 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.

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

WARNING

SHOCK HAZARD: The large electrolytic capacitor(s) (blue-cased cylinder(s)) store large amounts of energy in the form of electric voltage. Even if the power is off, dangerous voltages exist at the capacitor terminals, on the chopper, and the diode heatsinks. Never discharge the capacitor(s) with a screwdriver or other implement…explosion, property damage and/or personal injury will result. Wait at least five minutes after turning the power supply off before touching the chopper or the capacitor(s).

Routine Maintenance

The HD3070 system is designed to require minimal regular maintenance under normal use. The following checks are suggested to keep your system in top running condition:

Power Supply

- Check the exterior for any damage. If there is damage, ensure it does not affect safe operation of the power supply.
- Remove power supply covers and inspect the interior.
  - Check wiring harnesses and connections for wear and damage. Check for loose connections and areas of discoloration due to overheating.
  - Check for dust and foreign matter inside the unit. Blow out the unit with compressed air. In an excessively dirty environment, do this weekly.
  - Blow out the fans and heat exchanger at rear of power supply. In an excessively dirty environment, do this weekly.
- At the rear of the power supply, inspect all interconnecting cables, hoses and leads for wear and damage. Check that connections are tight but do not overtighten.
- At the rear of the power supply, inspect the water filter element. A dirty filter element will be a brownish color. Replace the filter element when it gets dirty.
- Every 6 months, flush the power supply torch coolant and replace with new coolant. See Section 3, *Torch Coolant Requirements* and *Filling Torch Coolant System* for details.

RHF Console

- Check the exterior for any damage. If there is damage, ensure it does not affect safe operation of the console.
- Open the cover and inspect the interior. Check all cables and hoses for wear and damage. Check for loose connections, areas discoloration due to overheating and plumbing leaks.
- Inspect the 2 spark gaps between the electrodes. If required, clean with emery cloth, align, and regap to 0.020 ± 0.001 inch (0.51 ± 0.03 mm). Check that the electrode surfaces between the gaps are flat. If the surfaces are rounded, replace and regap.
- Check for dust and foreign matter inside the unit. Blow out the unit with compressed air. In an excessively dirty environment, do this weekly.

Gas Console

- Check the exterior for any damage. If there is damage, ensure it does not affect safe operation of the console.
- Inspect all interconnecting cables, hoses and leads for wear and damage. Check that connections are tight but do not overtighten.
- Inspect the air filter. Replace the filter when it gets dirty.
- Remove cover and inspect the interior:
  - Check wiring harnesses and connections for wear and damage. Check for loose connections. The solenoid valves operate hot and discoloration is normal.
  - Check for dust and foreign matter inside the unit. Blow out the unit with compressed air. In an excessively dirty environment, do this weekly.

Torch, Quick Disconnect/Off-Valve and Torch Leads Inspection

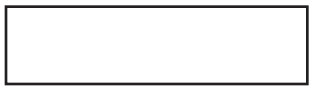
- Inspect the torch main body O-rings and replace, if necessary.
- The torch consumable parts and torch main body should always be inspected prior to cutting. Worn or damaged parts can cause gas and water leaks which can affect the cut quality. Check for pitting and burn marks on the consumable parts and replace, if necessary. Refer to Section 4, *Changing Consumable Parts.*
- Ensure that all connections are tight, but do not overtighten.
- Inspect the torch leads for cracking and damage. Replace if necessary.

Starting Sequence of HD3070

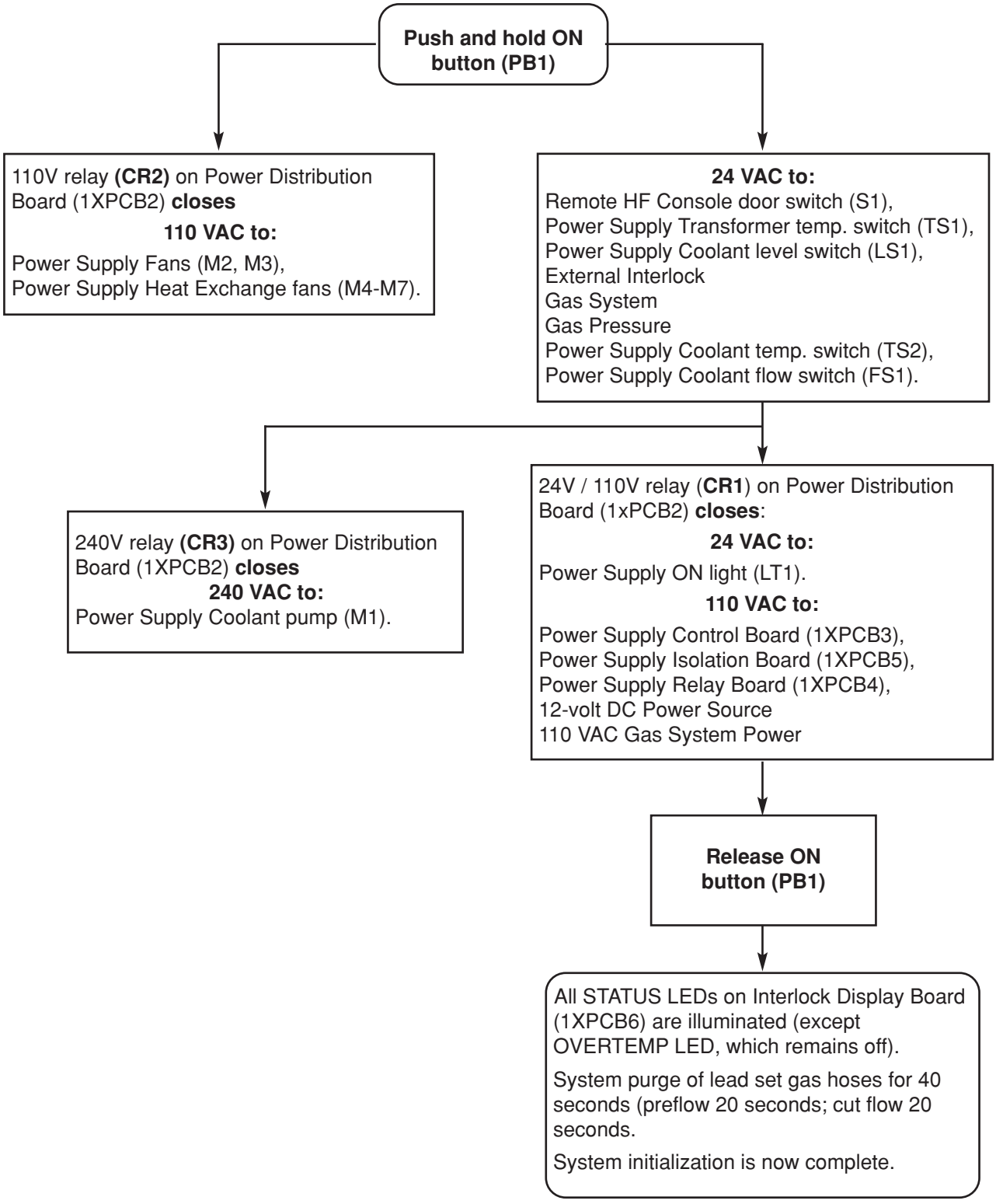
On the following page is a detailed flowchart outlining the starting sequence during proper HD3070 operation. Shaded boxes represent action taken by the operator.

The following symbols used in the flowchart are ANSI standard flowcharting symbols. Their names and definitions are as follows:

Terminus The terminus is used to indicate the beginning or ending point of a flowchart.



Task/Process Box The process or task box is used to indicate any process or task other than an input/output operation or a decision.


Push and hold ON button (PB1)
110V relay (CR2) on Power Distribution Board (1XPCB2) closes
110 VAC to:
Power Supply Fans (M2, M3),
Power Supply Heat Exchange fans (M4-M7).
24 VAC to:
Remote HF Console door switch (S1),
Power Supply Transformer temp. switch (TS1),
Power Supply Coolant level switch (LS1),
External Interlock
Gas System
Gas Pressure
Power Supply Coolant temp. switch (TS2),
Power Supply Coolant flow switch (FS1).
240V relay (CR3) on Power Distribution Board (1XPCB2) closes
240 VAC to:
Power Supply Coolant pump (M1).
24V / 110V relay (CR1) on Power Distribution Board (1xPCB2) closes:
24 VAC to:
Power Supply ON light (LT1).
110 VAC to:
Power Supply Control Board (1XPCB3),
Power Supply Isolation Board (1XPCB5),
Power Supply Relay Board (1XPCB4),
12-volt DC Power Source
110 VAC Gas System Power
Release ON button (PB1)
All STATUS LEDs on Interlock Display Board (1XPCB6) are illuminated (except OVERTEMP LED, which remains off).
System purge of lead set gas hoses for 40 seconds (preflow 20 seconds; cut flow 20 seconds.
System initialization is now complete.

Initial Checks

Before tracking down specific problems, it is good practice to do a visual check, and verify proper voltages are present at the power source, transformer and power distribution board.

WARNING

SHOCK HAZARD: Always use caution when servicing a power supply when plugged in and the covers are removed. Dangerous voltages exist within the power supply which could cause injury or death.

1. Disconnect line power by turning line disconnect switch **Off**.

2. Using a Phillips head screwdriver, remove top plate, two side plates, front plate, and rear plate.

3. Inspect interior of unit for discoloration on pc boards, or other apparent damage. If a component or module is obviously defective upon visual inspection, remove and replace it before doing any testing. Refer to the *Parts List,* Section 6 to identify parts.

4. If no damage is apparent, apply power to power unit by turning on the line disconnect switch **On**.

5. For a 200, 208, 240, 480, or 600- volt power supply measure the voltage at TB1 between L1 (U), L2 (V) and L3 (W). Refer to Figure 5-1 for detail of TB1. Also refer to applicable wiring diagram supplied with manual, if required. The voltage between any two of the three points at TB1 should be equal to the supply voltage (200, 208, 240, 480, or 600 VAC). If there is a problem at this point, disconnect main power and check connections, power cable, and fuses or circuit breaker at line disconnect switch. Repair and/or replace defective component(s) if necessary.

   For a 220/380/415- volt power supply measure the voltage at between the U, V and W studs on the EMI filter. Refer to Appendix F. Also refer to applicable wiring diagram supplied with manual, if required. The voltage between any two of the three studs should be equal to the supply voltage (220, 380, or 415 VAC). If there is a problem at this point, disconnect main power and check connections, power cable, and fuses or circuit breaker at line disconnect switch. Repair and/or replace defective component(s) if necessary.

(Continued on page 5-9)

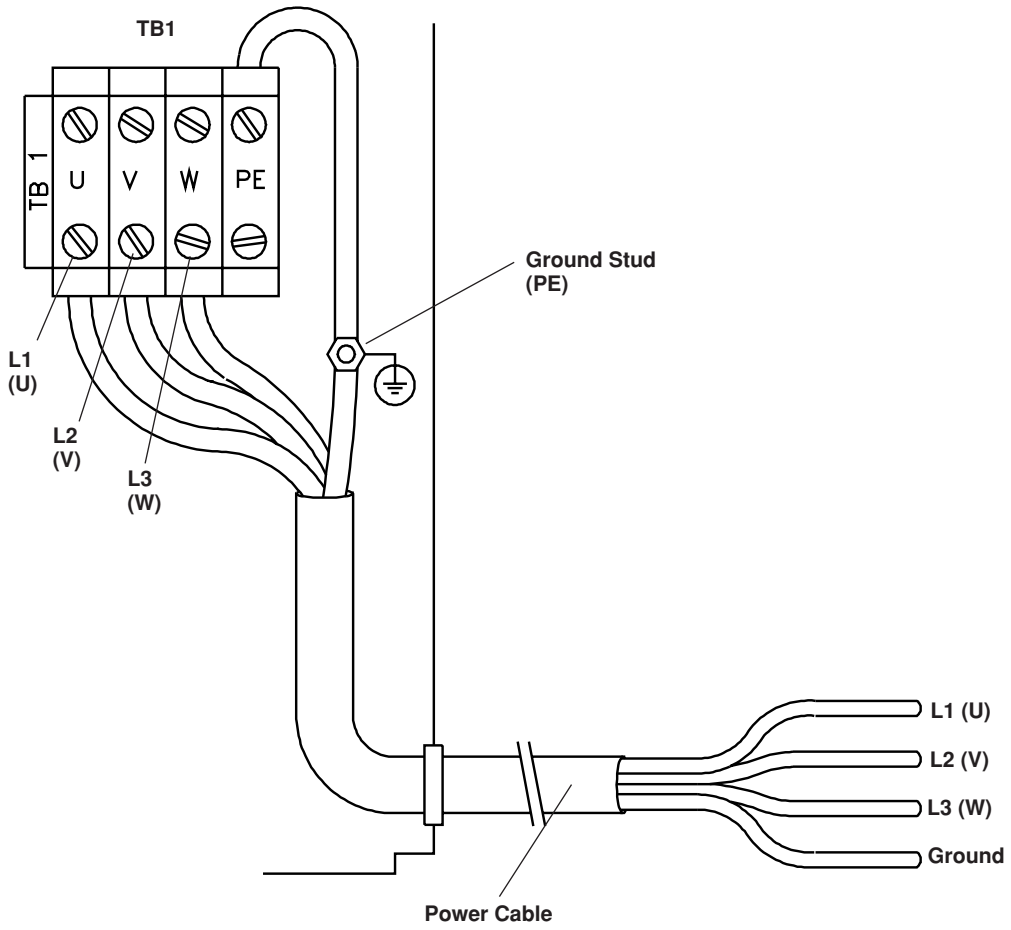


Figure 5-1 Primary Power Measurement Location

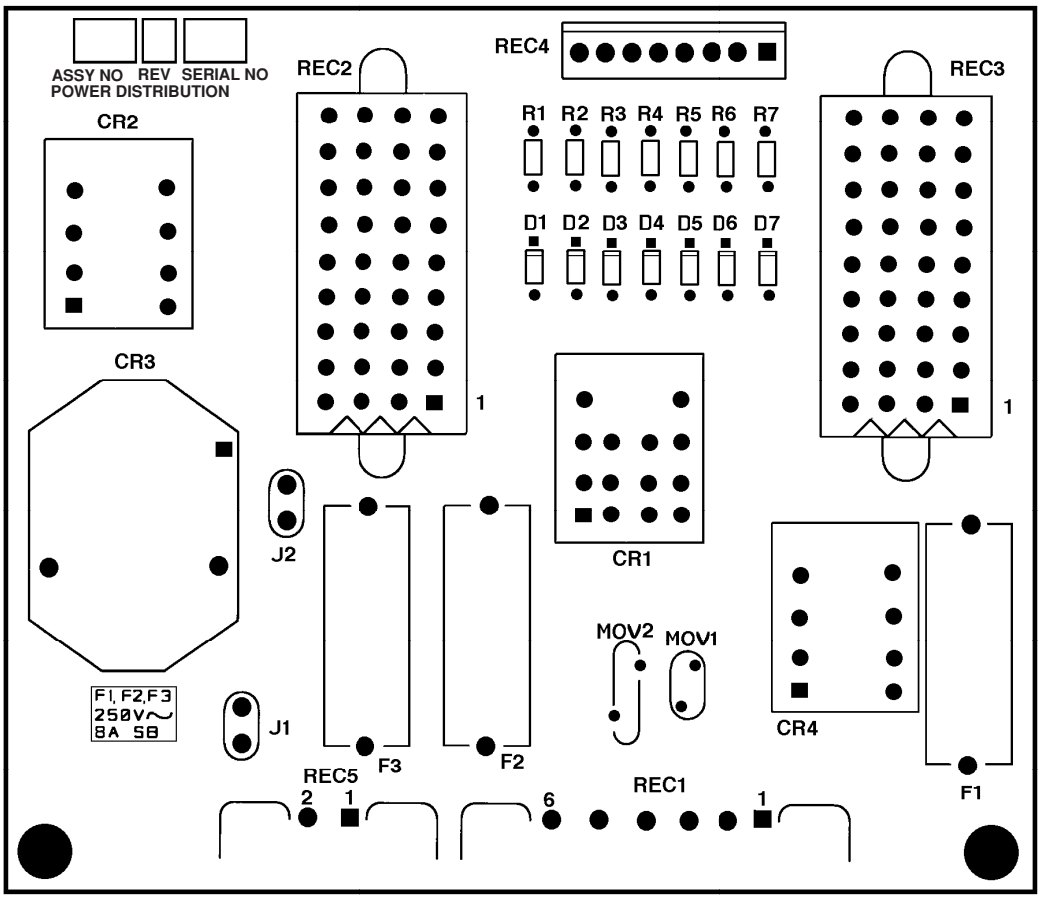


Figure 5-2 Power Distribution Board 1XPCB2

6. Measure voltage at Power Distribution Board 1XPCB2. Refer to Figure 5-2 for detail of 1XPCB2. Also refer to applicable wiring diagram at back of manual, if required. Look on the board for fuses F1, F2, and F3. Measurements between each fuse and chassis ground should be as follows:

   F1: 24VAC
   F2: 120VAC
   F3: 240VAC

   If voltages are not present, or incorrect at one or more of these points, disconnect power and troubleshoot 1XPCB2 fuses and associated pins, connectors and wiring between power distribution board connector REC1 and transformer secondary T1. Refer to Figure 6-7 for location of T1.

   Check main power fuses F1, F2, and F3 located in Figure 6-3, and associated wiring and connections between T1 and L1 and L2 (including linkboard on 240/480V units).

   Repair and/or replace defective component(s) if necessary.

Troubleshooting

The troubleshooting section is presented by following normal operational sequence.

Before troubleshooting for specific problems, be sure that unit passes *Initial Checks* as outlined earlier in this section.

WARNING

SHOCK HAZARD: Always use caution when servicing a power supply when the covers are removed. Dangerous voltages exist within the power supply which could cause injury or death.

Problem	*Possible Causes* / Solutions
1. The green POWER ON push-button switch PB1 is pressed, but the fans are not operating and the green POWER ON indicator does not light.	**1.1.** *The green POWER ON (1) PB1 push button is defective.* Check that switch is operating correctly, and that good contact is being made. The POWER ON switch is normally open. **1.2.** *The red POWER OFF (0) PB2 push button is defective.* Check that switch is operating correctly, and that good contact is being made. The POWER OFF switch is normally closed. **1.3.** *Associated wiring not making good contact.* Check wiring and repair or replace, if necessary.
2. The green POWER ON push-button switch PB1 is pressed, the POWER ON indicator lights, but the fans are not running.	**2.1.** *CR2 on the Power Distribution board is defective.* Check that CR2 switches when POWER ON push button is pressed. See Figure 5-2 for location of CR2. If CR2 is defective, unsolder CR2 and replace. **2.2.** *PL25 and REC20 located near the fans (see Figure 6-2 for location of fans) are not seated together securely and/or not getting 120VAC from Power Distribution Board.* • Check pins, connectors and associated wiring for good continuity. • Check for 120VAC at PL25.

Problem	*Possible Causes* / Solutions
	2.3. *PL2 and REC2 on Power Distribution board* (see Figure 5-2 for location of REC2) *are not seated well.* Check pins, connectors and associated wiring for good continuity. Repair or replace, if necessary.
3. The green POWER ON push-button switch PB1 is pressed, the fans are operating, but the green POWER ON indicator does not light.	**3.1.** *Push button PB1 was not held down long enough.* Press and hold PB1 for a minimum of five seconds. **3.2.** *Relay CR1 on the Power Distribution board is defective.* Check that CR1 switches when POWER ON push button is pressed. See Figure 5-2 for location of CR1. If CR1 is defective, unsolder CR1 and replace. **3.3.** *One or more of the STATUS LEDs does not illuminate (except yellow OVERTEMP LED which illuminates) indicating a fault condition.* To troubleshoot STATUS fault conditions, see *Status LED Troubleshooting* later in this section.
4. The green POWER ON indicator is lit, the START command is given and red DC ON indicator is lit, but there is no high frequency and no pilot arc.	**4.1.** *There is no spark between the spark gap electrodes.* Clean (with emery cloth), align, and/or regap 0.020 ± 0.001 inch (0.51 ± 0.003 mm per gap) the electrodes, if necessary. Ensure that the electrode surfaces between the gaps are flat. If surfaces are rounded, replace and regap. See Figure 6-11 for part number information. • Visually inspect the high voltage transformer T1 in the Remote HF console for leaking oil or overheating. See Figure 6-11 for location of T1. Replace T1 if leaking or overheating. • Check for 120VAC at filter (FL1) after START command is given. • If there is no 120VAC at FL1, use applicable wiring diagram (in back of this manual) and check pins, connectors and associated wiring from FL1 to REC3 of Relay Board 1XPCB4. If connections are OK, there may be a problem with either 1XPCB4 or 1XPCB3.

Problem	*Possible Causes* / Solutions
	See *Relay Board (1XPCB4)* later in this section for location of relays and description of output signals. • If there is 120VAC at FL1, shut down system and remove capacitors C3 and C4. (See Figure 6- 11 for location of C3 and C4) Restart system and see if a faint spark is now observed across the gaps. • If a spark is not observed at the gaps, replace T1. If there is a spark, shut down system, and replace capacitors C3 and C4. **(Always replace the capacitors in pairs).** **4.2.** *There is no high frequency at the torch.* Check for a shorted torch, a damaged pilot arc lead, or loose lead connections. Replace the torch or pilot arc lead or tighten the lead connections.
5. The green POWER ON indicator is lit, the torch START command is given and the red DC ON indicator lights, and there is high frequency, but there is no pilot arc.	**5.1.** *Pilot arc relay CR1 is not closing (not getting 120VAC from the Relay Board 1XPCB4).* See if the CR1 relay contacts close after the START command is given. See Figure 6-7 for location of CR1. If CR1 does not close: • With an AC voltmeter across the relay, see if 120VAC is coming from 1XPCB4 after START command is given. • If there is no 120VAC, check connectors, terminals, pins, and associated wiring to REC3 of 1XPCB4. • If wiring is OK, there is a problem either with 1XPCB4 or 1XPCB3. **5.2.** *Pilot arc relay CR1 is defective.* If there is 120VAC across the relay (see above steps), and CR1 does not close, replace CR1. **5.3.** *Main contactor (CON1) or 1XPCB4 is defective.* • With an AC voltmeter, see if contactor CON1 is getting 120VAC after START command is given. If there is no 120VAC, check pins, connectors and associated wiring from CON1 to pins 5 & 6 of REC3 of 1XPCB4.

Problem	*Possible Causes* / Solutions
	• If wiring is OK, 1XPCB4 or 1XPCB3 may be defective. See *Relay Board (1XPCB4)* later in this section for location of relays and description of output signals. • If CON1 is getting 120VAC from the Relay Board as described above, measure the voltage between all terminals 1A, 1B and 1C of main transformer T2 after the START command is given. See Figure 6-7 for location of T2. The voltage between any two of the three points should be equal to 200VAC. If there is no voltage at any of the above points, replace CON1. If there is voltage at some but not all of the above points, check wiring and connections to and from T2. If wiring checks out OK, return to *Initial Checks* section and repeat steps 1-5. **5.4.** *Chopper is defective or not functioning.* Refer to CH130 Chopper Module Test Procedure later in this section.
6. The unit stops cutting during cut, or cuts poorly.	**6.1.** *The work clamp is not connected or it is broken.* Connect or repair the work clamp. **6.2.** *Arc not transferring to workpiece.* Check work clamp and cable connecting clamp to workpiece. Good contact must be made in order for the arc to transfer to the workpiece. **6.3.** *There is insufficient air or gas pressure.* Check gas inlet pressure specifications under *Cut Chart* in **Operation, Section** 4. Check plasma and shield gas pressures in TEST and RUN modes as specified under *Cut Chart* in **Operation**, Section 4. **6.4.** *Torch is getting insufficient current.* Check the arc current setting for the type and thickness of metal you are cutting from the *Cut Chart* in **Operation**, Section 4.

Problem	*Possible Causes* / Solutions
	6.5. *The power supply has overheated.* Shut down system and wait for unit to cool down. If unit will not restart, see *Status LED Troubleshooting* guide later in this section.
	6.6. *Chopper is defective or not functioning.* Refer to CH130 Chopper Module Test Procedure later in this section.

Status LED Troubleshooting

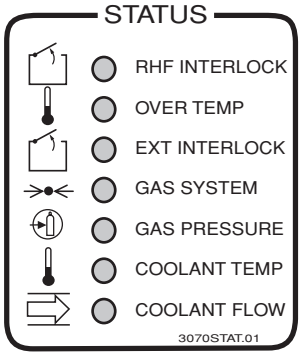
Be certain that the power supply has been through the Initial Checks as outlined earlier in this section before troubleshooting STATUS LEDs. When any one of the STATUS LEDs does not illuminate (except OVERTEMP illuminates) there is a fault condition that must be corrected in order for the HD3070 power supply to become operational. The LEDs are connected in series, so the upper-most LED that does not illuminate (except OVERTEMP does not extinguish) represents the first condition that must be corrected. Refer to the problems and probable causes and solutions and the troubleshooting flow diagrams below. See wiring diagrams and gas and coolant system schematics at back of manual for reference.

☼ LED illuminated

○ LED extinguished

Problem — *Possible Causes* / Solutions

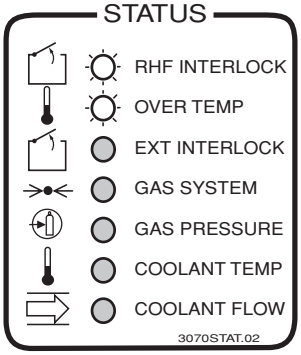
1. RHF INTERLOCK LED extinguished:



1.1. *Door to Remote HF console not completely shut.*
This LED will illuminate when switch S1 located in the Remote HF console is closed. If door is closed, check pins, connectors and associated wiring for good continuity from receptacle 2X1 to 1X5.

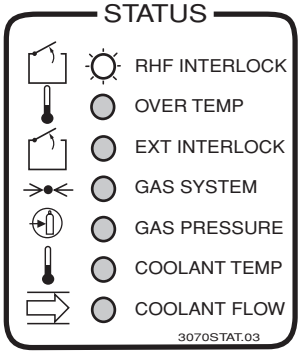
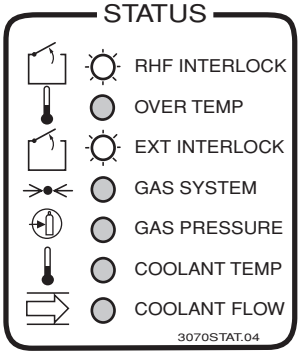
Repair and/or replace defective component(s), if necessary.

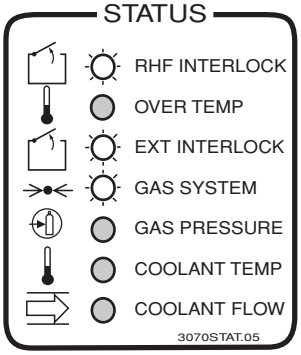
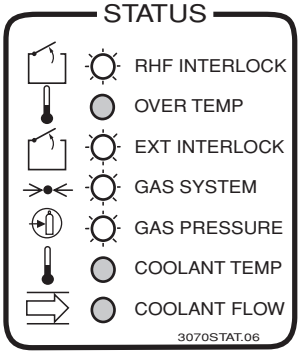
2. OVERTEMP LED illuminated:



2.1. *Main Transformer T2 or chopper is overheating.*
This LED will extinguish when the main transformer (T2) is operating in a normal temperature range((under 165° Ctr) and the chopper is operating in the normal temperature range (under 82° C). Temperature switch TS1 (transformer) or TSW1 (chopper) will open and will cause the LED to illuminate when overheating occurs.

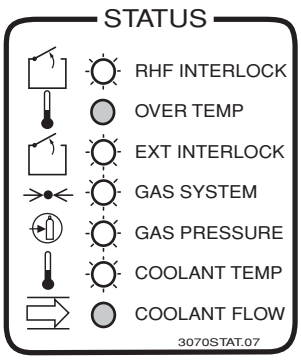
- Check temperature switches TS1 and TSW1 (normally closed).
- Check pins, connectors and associated wiring to temperature switches.
- Leave the fans running, and try restarting the unit after one hour. If the LED still illuminates the transformer or chopper may have to be replaced.

Problem	*Possible Causes* / Solutions
3. EXT INTERLOCK LED extinguished: 	**3.1.** *External interlock supplied for customer use.* **If not used, customer must jumper out signal at CNC machine.**
4. GAS SYSTEM LED extinguished: 	**4.1.** *Gas system malfunction.* This LED will light when the gas system has power applied and is operating correctly. This malfunction is **not** an indication that the gas inlet pressure is out of limits. • Using the wiring diagrams (in back of this manual), check pins, connectors and wiring associated with cables between 1X3 on power supply and 3X2 on gas console and 1X4 on power supply and 3X1 on gas console. • Check PCB control board 1XPCB3. • Check PCB control board A1 in gas console. Repair and/or replace defective component(s), if necessary.

Problem	*Possible Causes* / Solutions
5. GAS PRESSURE LED extinguished: 	**5.1.** *Plasma or shield input gas pressure too low.* This LED will illuminate if the plasma and shield input gas pressures are above 105 psi (7.2 bar). • Check that input plasma and shield gas pressures are 120 psi (8.2 bar).).
6. COOLANT TEMP LED extinguished: 	**6.1**. *Coolant too hot*. This LED will illuminate when temperature switch TS2 senses that the temperature of coolant in the coolant reservoir is under 160°F. • Check to see if water coolant is above **160°F**. If the temperature is 160°F or above, the LED will be extinguished – wait for the system to cool. • Disconnect PL24 (located in the rear of the power supply near the coolant reservoir) from REC24 and check to see if TS2 is open. TS2 is normally closed, and is opened when a temperature above 160°F is reached. • Using the applicable wiring diagram (in back of this manual), check pins, wires and connections from PL24 to REC3 of 1XPCB2. • Check for proper operation of cooling fans. Ensure that the heat exchanger air flow is not obstructed. Repair and/or replace defective component(s), if necessary.

Problem	*Possible Causes* / Solutions

7. COOLANT FLOW LED extinguished:



7.1. *Coolant flow too slow.*
This LED will illuminate when flowswitch (FS1) senses a coolant flow greater than 0.5 gpm to the torch. See Figure 6-10 for location of flowswitch FS1, motor M1, and pump P1.

7.2. *Motor M1 not functioning.*

- Check to see if 240VAC is available at PL21. PL21 is located near the pump.

  Note: The 240VAC relay (CR3) on 1XPCB2 will not close until the first 6 interlocks (STATUS indicators) are satisfied. (See *Starting Sequence of HD3070* flowchart)

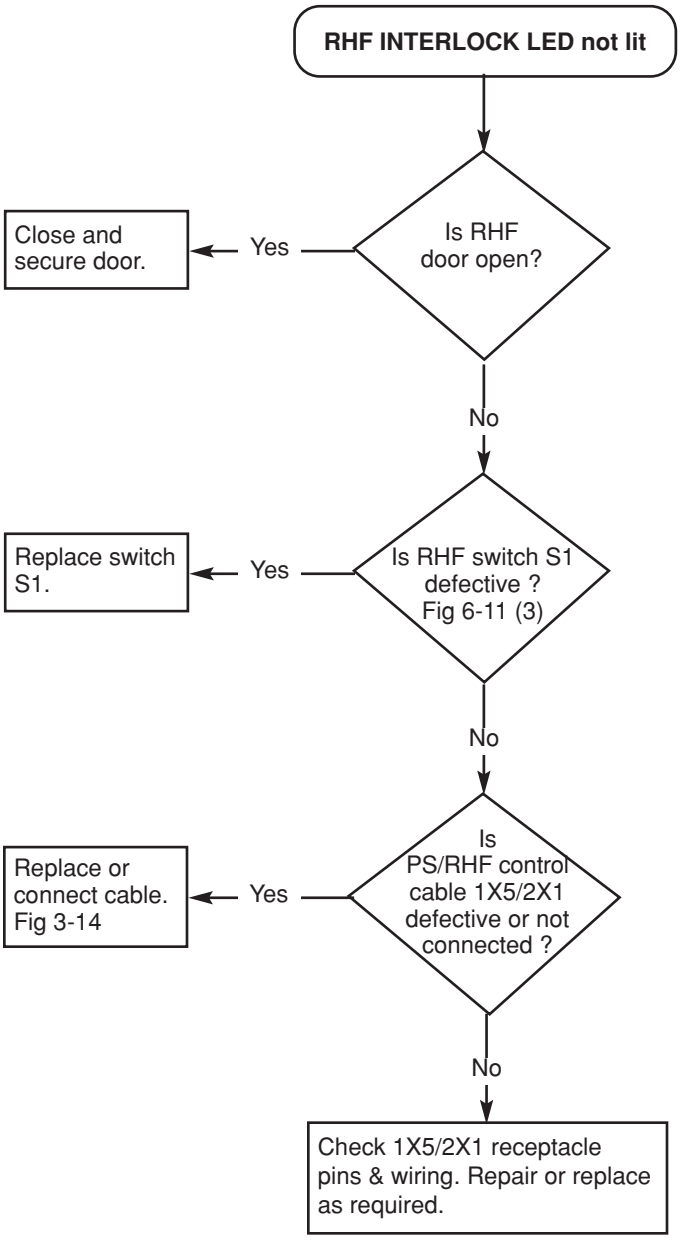
- Using the electrical schematic (in back of this manual), check pins, connections and associated wiring from PL21 to REC5 of 1XPCB2. If 240VAC is not available at REC5, CR3 may be defective. Replace 1XPCB2 if CR3 is defective.

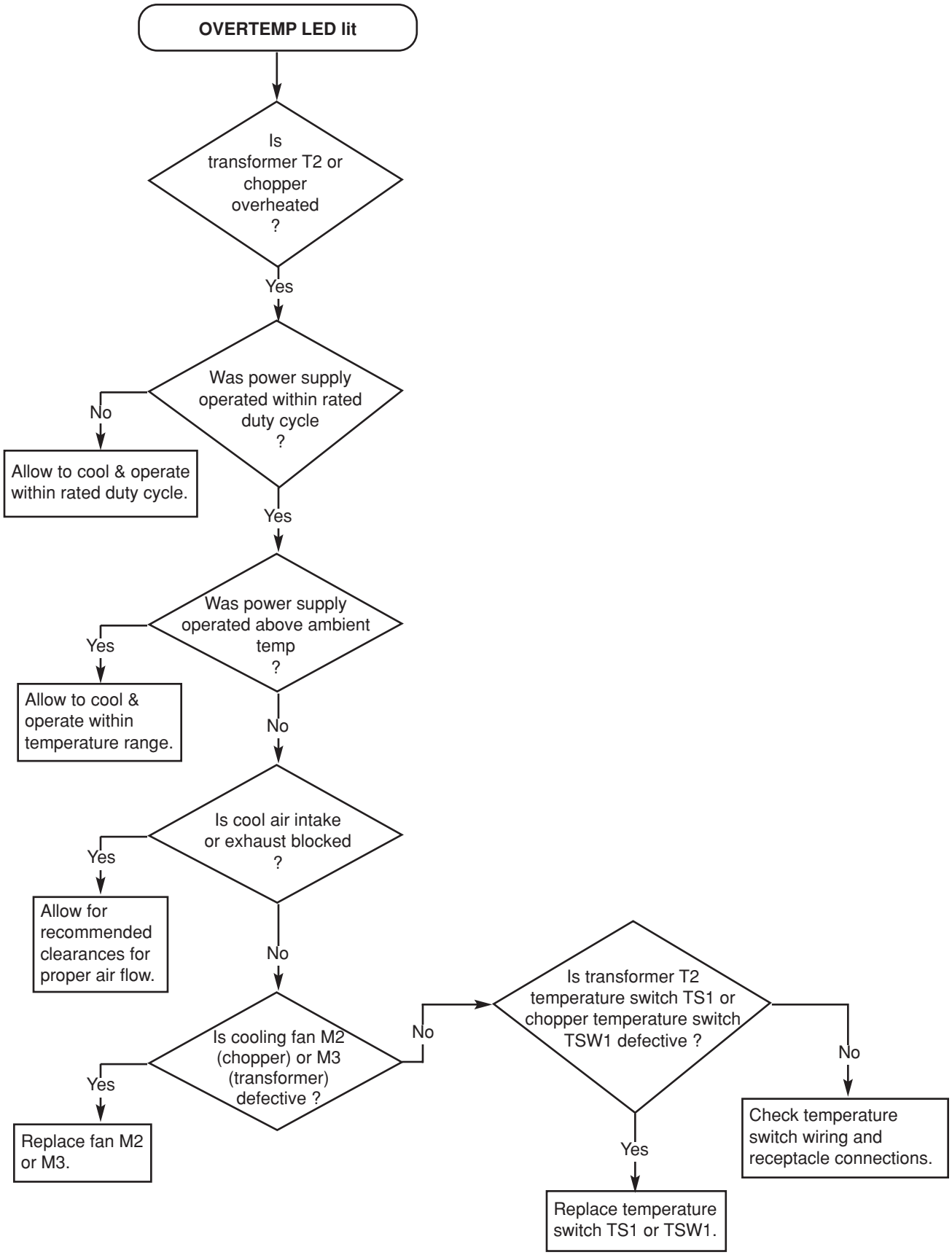
7.3. *Flow switch FS1 not functioning.*
FS1 is a normally open switch that is closed when a flow greater than 0.5 gpm is sensed. When FS1 is closed, 24 VAC lights the COOLANT FLOW LED.

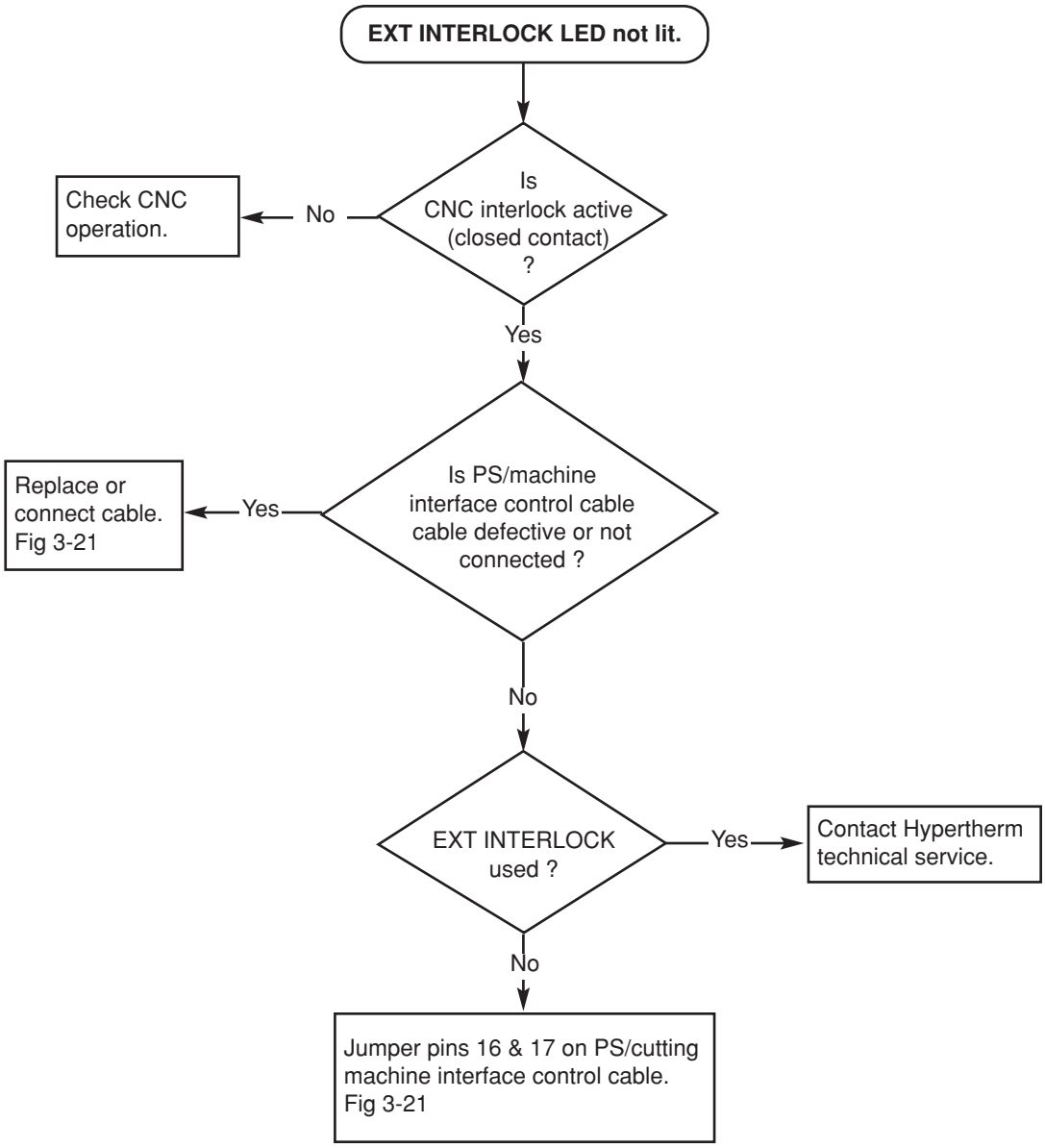
- Check coolant hoses and connections for leaks.

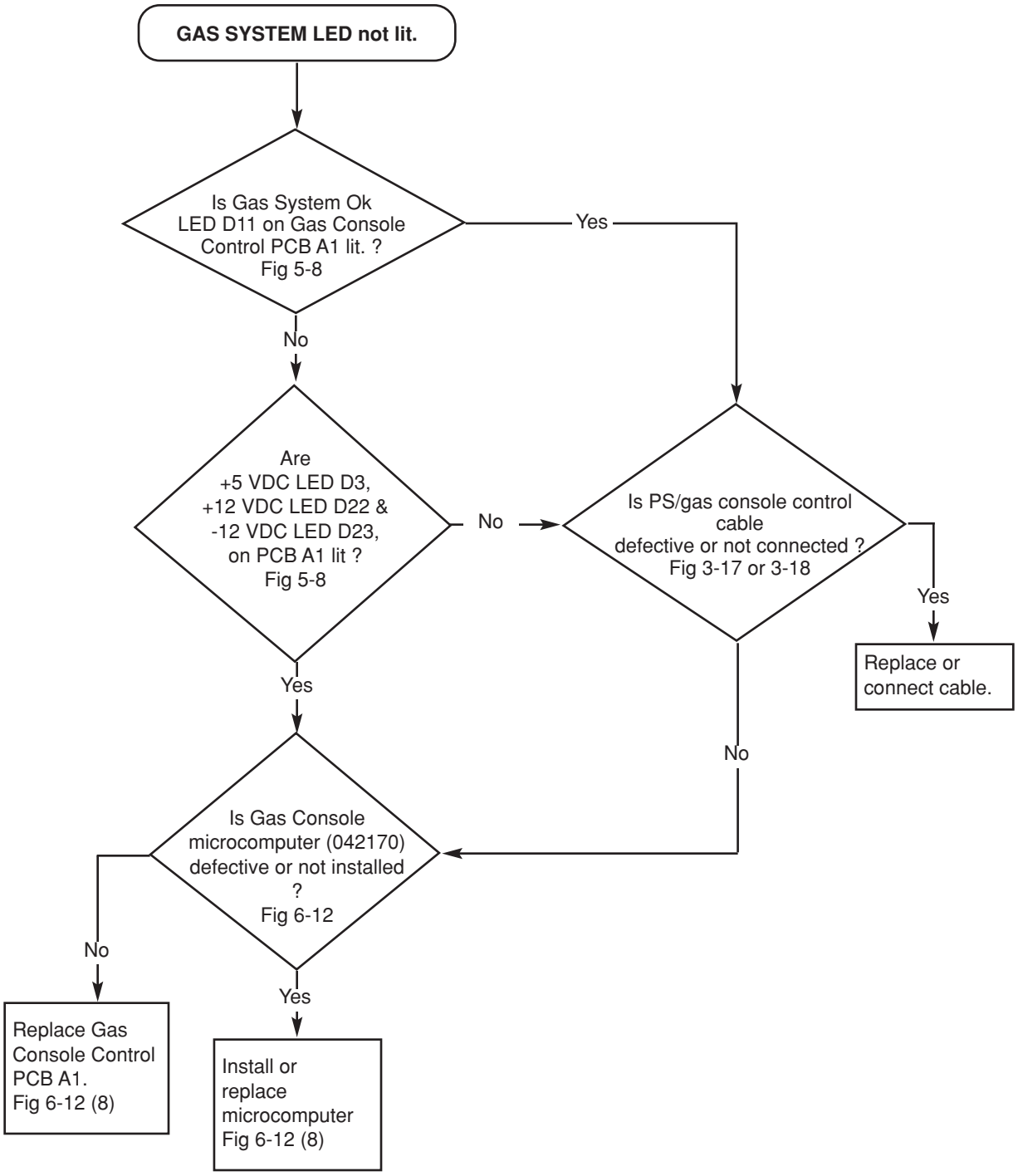
Repair and/or replace defective components, if necessary.

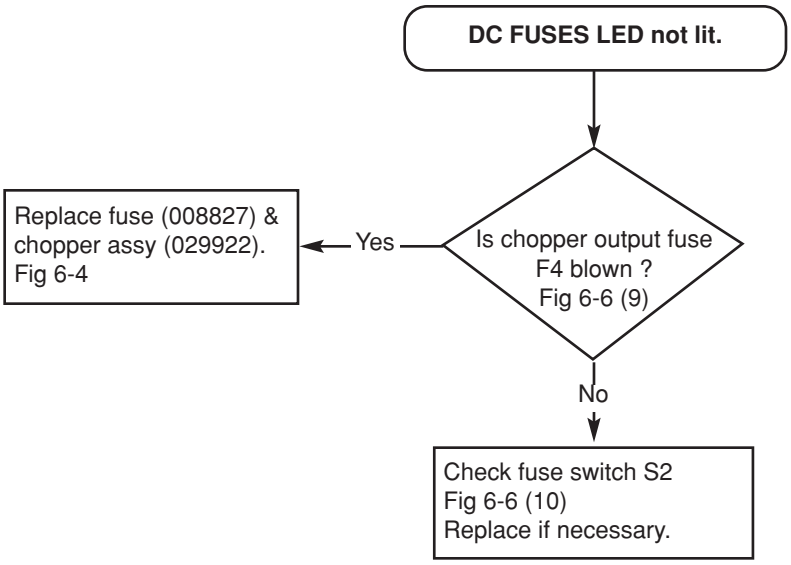
Status LED Troubleshooting Flow Diagrams

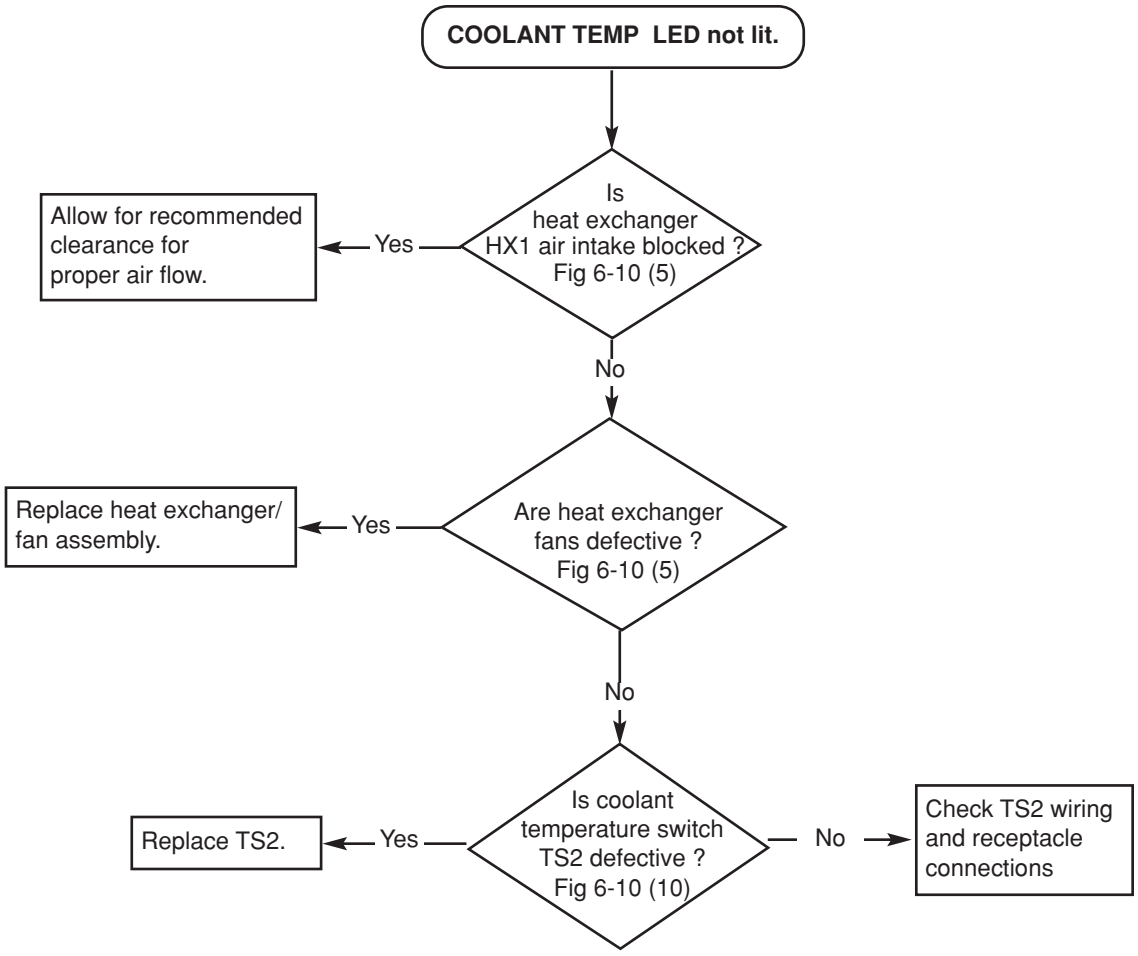


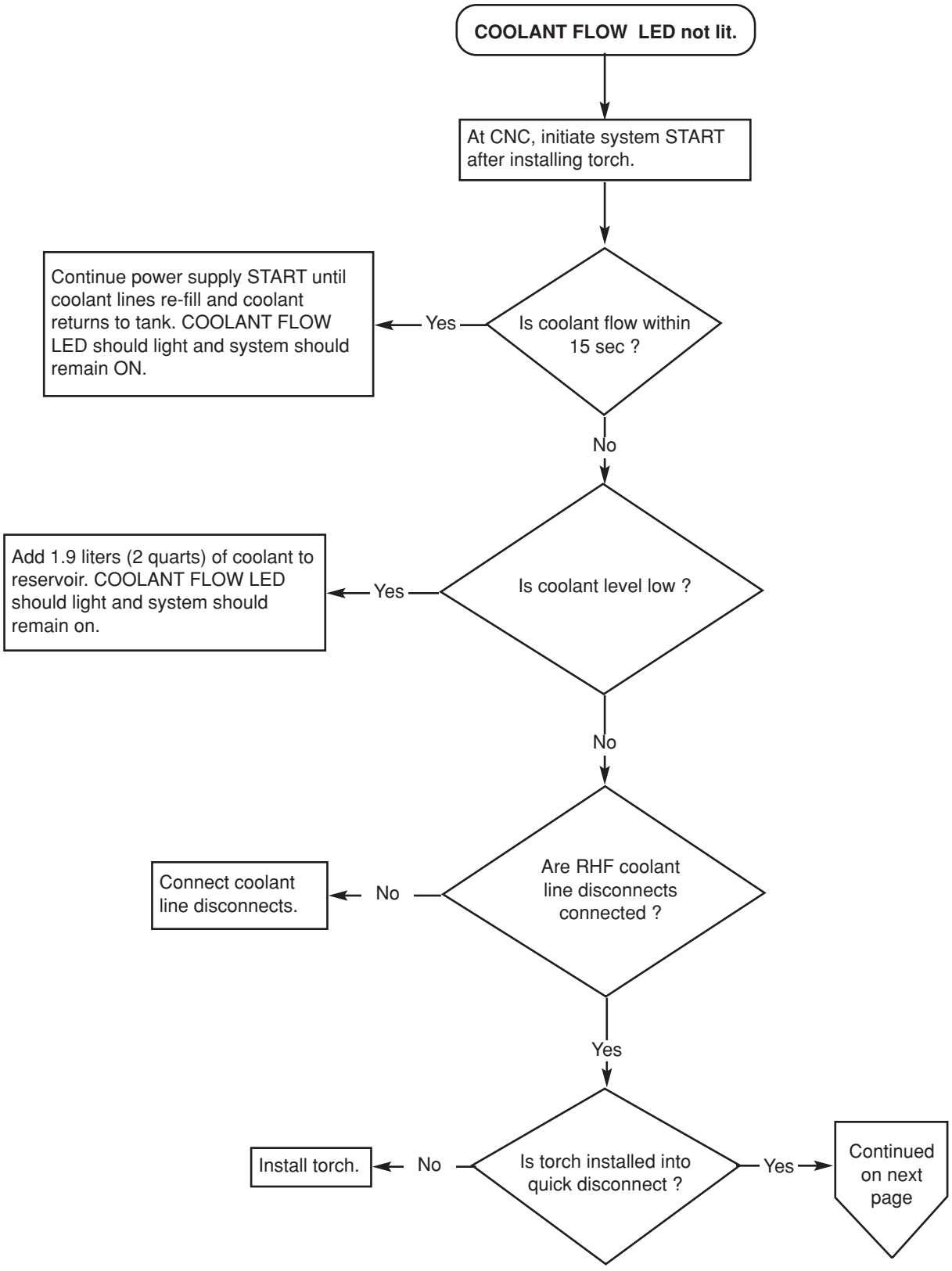

OVERTEMP LED lit
Is transformer T2 or chopper overheated ?
Yes
Was power supply operated within rated duty cycle ?
No
Allow to cool & operate within rated duty cycle.
Yes
Was power supply operated above ambient temp ?
Yes
Allow to cool & operate within temperature range.
No
Is cool air intake or exhaust blocked ?
Yes
Allow for recommended clearances for proper air flow.
No
Is cooling fan M2 (chopper) or M3 (transformer) defective ?
Yes
Replace fan M2 or M3.
No
Is transformer T2 temperature switch TS1 or chopper temperature switch TSW1 defective ?
Yes
Replace temperature switch TS1 or TSW1.
No
Check temperature switch wiring and receptacle connections.

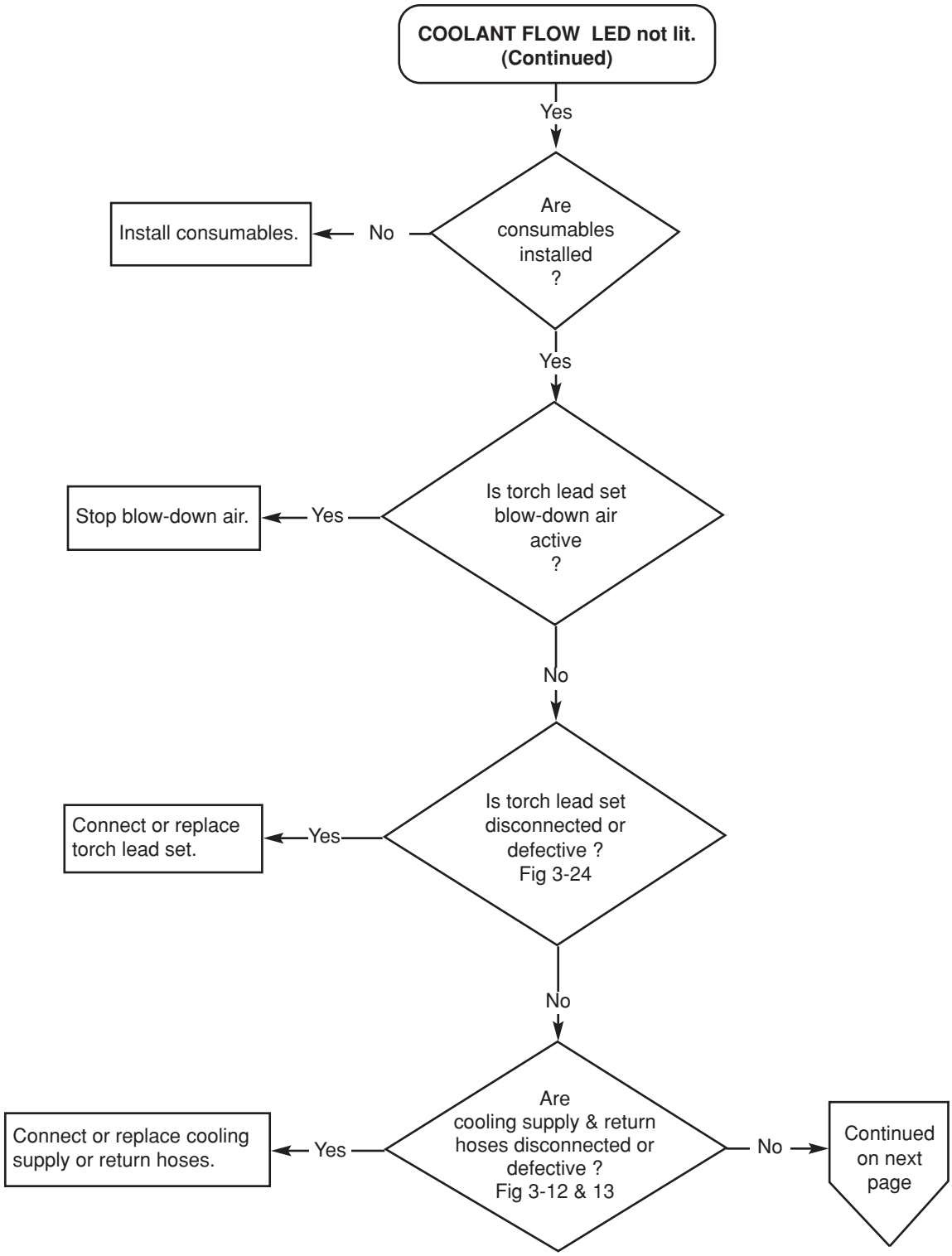

EXT INTERLOCK LED not lit.
Is CNC interlock active (closed contact) ?
No
Check CNC operation.
Yes
Is PS/machine interface control cable cable defective or not connected ?
Yes
Replace or connect cable. Fig 3-21
No
EXT INTERLOCK used ?
Yes
Contact Hypertherm technical service.
No
Jumper pins 16 & 17 on PS/cutting machine interface control cable. Fig 3-21

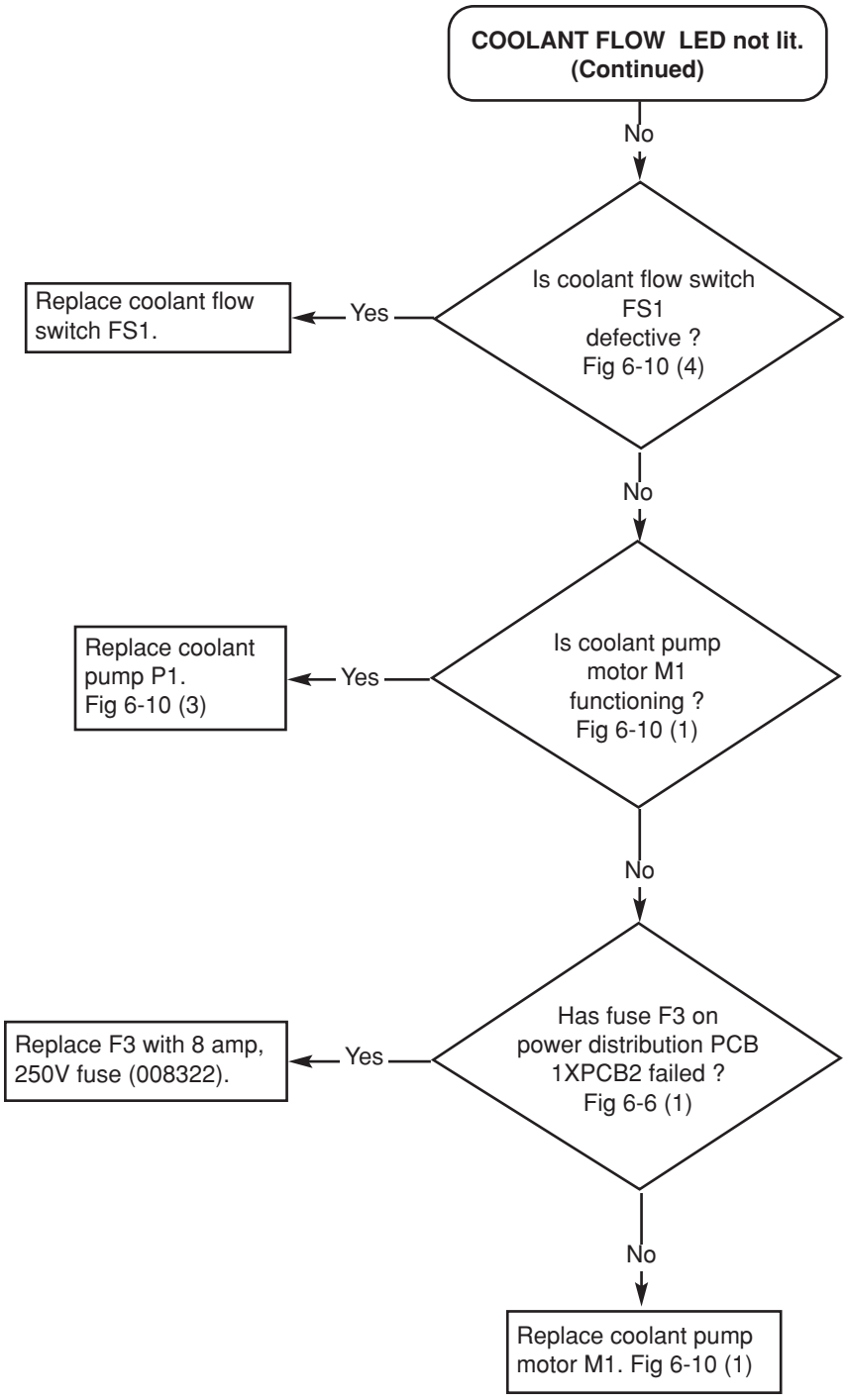

GAS SYSTEM LED not lit.
Is Gas System Ok LED D11 on Gas Console Control PCB A1 lit. ? Fig 5-8
Yes
No
Are +5 VDC LED D3, +12 VDC LED D22 & -12 VDC LED D23, on PCB A1 lit ? Fig 5-8
No
Is PS/gas console control cable defective or not connected ? Fig 3-17 or 3-18
Yes
Replace or connect cable.
Yes
No
Is Gas Console microcomputer (042170) defective or not installed ? Fig 6-12
No
Yes
Replace Gas Console Control PCB A1. Fig 6-12 (8)
Install or replace microcomputer Fig 6-12 (8)


DC FUSES LED not lit.
Is chopper output fuse F4 blown ? Fig 6-6 (9)
Yes
Replace fuse (008827) & chopper assy (029922). Fig 6-4
No
Check fuse switch S2 Fig 6-6 (10) Replace if necessary.


COOLANT TEMP LED not lit.
Is heat exchanger HX1 air intake blocked ? Fig 6-10 (5)
Yes
Allow for recommended clearance for proper air flow.
No
Are heat exchanger fans defective ? Fig 6-10 (5)
Yes
Replace heat exchanger/ fan assembly.
No
Is coolant temperature switch TS2 defective ? Fig 6-10 (10)
Yes
Replace TS2.
No
Check TS2 wiring and receptacle connections


COOLANT FLOW LED not lit.
At CNC, initiate system START after installing torch.
Is coolant flow within 15 sec ?
Yes
Continue power supply START until coolant lines re-fill and coolant returns to tank. COOLANT FLOW LED should light and system should remain ON.
No
Is coolant level low ?
Yes
Add 1.9 liters (2 quarts) of coolant to reservoir. COOLANT FLOW LED should light and system should remain on.
No
Are RHF coolant line disconnects connected ?
No
Connect coolant line disconnects.
Yes
Is torch installed into quick disconnect ?
No
Install torch.
Yes
Continued on next page


COOLANT FLOW LED not lit.
(Continued)
Yes
Are consumables installed ?
No
Install consumables.
Yes
Is torch lead set blow-down air active ?
Yes
Stop blow-down air.
No
Is torch lead set disconnected or defective ?
Fig 3-24
Yes
Connect or replace torch lead set.
No
Are cooling supply & return hoses disconnected or defective ?
Fig 3-12 & 13
Yes
Connect or replace cooling supply or return hoses.
No
Continued on next page


COOLANT FLOW LED not lit.
(Continued)
No
Is coolant flow switch
FS1
defective ?
Fig 6-10 (4)
Yes
Replace coolant flow
switch FS1.
No
Is coolant pump
motor M1
functioning ?
Fig 6-10 (1)
Yes
Replace coolant
pump P1.
Fig 6-10 (3)
No
Has fuse F3 on
power distribution PCB
1XPCB2 failed ?
Fig 6-6 (1)
Yes
Replace F3 with 8 amp,
250V fuse (008322).
No
Replace coolant pump
motor M1. Fig 6-10 (1)

Error Codes and Messages

Power Supply Control Board Error Codes

The microcontroller on control board 1XPCB3 will alert the user when certain errors occur in the HD3070 system, by flashing the **ERROR CODE** LED on the control board. The power supply front cover must be removed to observe control board 1XPCB3 and the **ERROR CODE** LED (Figure 5-3). Note that these error codes are also displayed on the gas console as error numbers.

The **ERROR CODE** LED will blink on for 0.5 second and off for 0.5 second with a 2-second gap before repeating the blinking sequence. The number of blinks between the 2-second gap will indicate 1 of the errors listed below. During error code flashing, all outputs from the control board are turned off, and the power supply is in an idle mode. After the error is corrected, you may resume operation of the system.

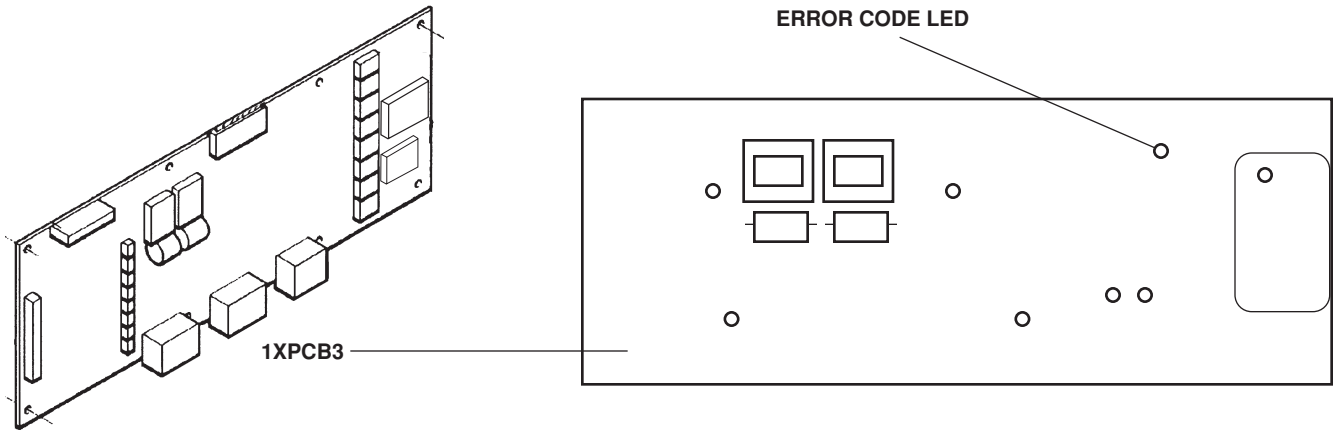


Figure 5-3 Power Supply Control Board Error Code LED Location

Power Supply Control Board Error Code Descriptions

Number of Blinks	Description
on (not blinking)	Indicates that a microcontroller internal RAM or ROM self-check error has occurred (power supply will hang up). Replace microcontroller U9 or control PCB 1XPCB3.
1**	Indicates that the coolant reservoir needs to have coolant added.
2**	Indicate that an “interlock” is not satisfied. Interlock failures are reported by the LEDs on the power supply front panel. Refer to Section 4, *Operation, Controls and Indicators*.
3**	Indicate that the HOLD input (for multi-torch systems) was not released within 10 seconds after the end of preflow.

Number of Blinks	Description
4**	Indicate that the high frequency was unable to ignite the pilot arc within 1 second. Check gas flows and corresponding pressures.
5**	Indicate that the PIERCE COMPLETE signal was not received within 4 seconds after the transfer signal.
6**	Indicate that the transfer of the arc to the workpiece was not sensed within 2 seconds of torch ignition. Check ground clamp to workpiece. Initial torch height may be too high. This will reduce nozzle life.
7*	Indicate that the arc was extinguished after current transferred to the workpiece, but before steady-state operation. The pierce delay may have been too long, and after arc transfer, too much metal was blown away before the X-Y machine moved, leaving the arc no place to transfer to.
8*	Indicate that the arc was lost during steady-state operation. Typically, this error is caused by running the torch off the edge of the plate or by having the cut piece fall out leaving the arc no metal to transfer to.
9*	Indicate that during steady-state operation the measured arc voltage exceeded the programmed maximum. The torch to work distance was too high during a cut, consequently the power supply terminated the arc. Check arc voltage setting and that the torch height control (THC) is working properly.
10*	Indicate that the arc was lost during current ramp down, but before the programmed ramp down time has elapsed. After the start signal was removed from the power supply, it began to ramp down, but did not complete it. The most probable cause is by cutting parts that fall out, leaving the arc no metal to transfer to while the power supply is trying to ramp down. This problem can be improved, if not eliminated, by changing the CNC program. Try different leadouts for different shape cuts. Note: 7,8,9, or 10 blinks in sequence indicate errors that can reduce consumable life, and cause cut quality to erode prematurely.
12**	Indicate that the software has an error. If this error occurs, there is a fatal error in the microprocessor chip and it must be replaced.
13	Indicate that the phase loss protection circuit has shutdown the system due to voltage phase loss or input voltage dropping below 80% of nominal. * These errors will also cause the error counter of the timer/counter to increment. ** These errors will also cause an error count output signal to the CNC.

Gas Console Error Messages

The gas console displays error messages for both the plasma system and gas system (Figure 5-3.1). The plasma system and gas system messages are listed below. Following these error messages, troubleshooting flow diagrams are provided to help resolve the problems causing the error messages.

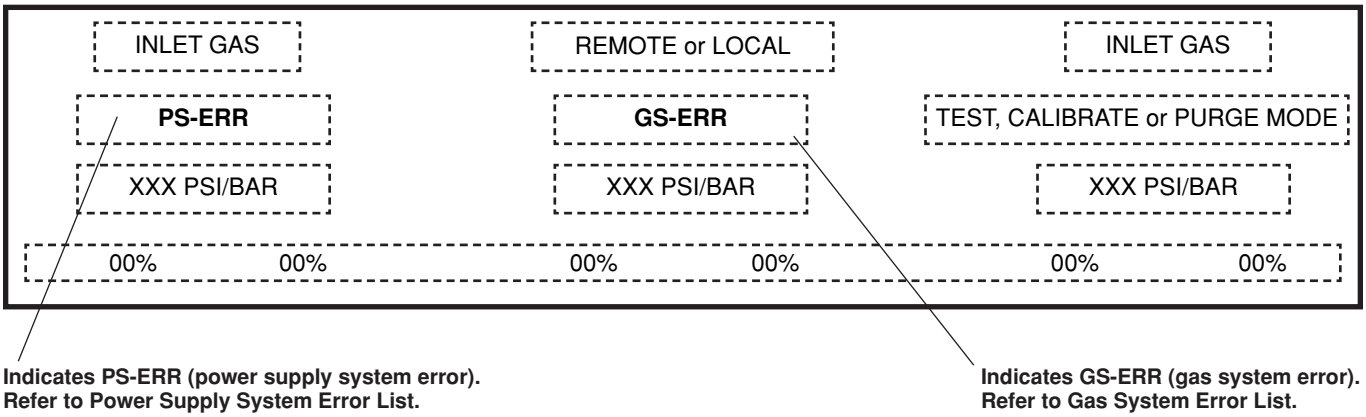


Figure 5-3.1 Automatic Gas Console LCD Display

Power Supply System (PS-ERR)

Error Message	Error Code	Description
NO ERROR	0	
LOW COOLANT LEVEL**	1	Indicates that the coolant reservoir needs to have coolant added.
INTERLOCK ERR**	2	This error is issued during operation when one of the pressure or temperature switches connected to the power distribution PCB is opened.
HOLD TIMEOUT ERR**	3	This error signal is issued if the HOLD INPUT signal was not released within 10 seconds after the end of preflow.
NO PILOT TIMEOUT ERR**	4	This error signal is issued when the high frequency was unable to ignite the pilot arc within 1 second.

Error Message	Error Code	Description
PIERCE DELAY ERR **	5	This error signal is issued when the PIERCE COMPLETE signal was not received within 2 seconds of the transfer signal.
TRANSFER TIMEOUT ERR **	6	This error signal is issued when the transfer of current to the work was not sensed within 4 seconds of torch ignition.
RAMPUP BLOWOUT ERR*	7	This error signal is issued when the arc was extinguished after current transfer to the workpiece, but before steady-state operation.
RUNNING ARC BLOWOUT ERR*	8	This error signal is issued when the arc was lost during steady-state operation.
ARC OVER VOLTAGE ERR*	9	This error signal is issued during steady-state operation when the measured arc voltage exceeded the programmed maximum allowable arc voltage (200V).
RAMPDWN ARC BLOWOUT ERR*	10	This error signal is issued when the arc was lost during current ramp down, but before the programmed ramp down time has elapsed.
WRONG STATE ERR**	12	This error signal should never occur. It indicates that the software has a very serious error that caused it to transfer control to an undefined program state. It is very important to record what the exact operating conditions were prior to the error.
PHASE LOSS ERR	13	This error signal is issued when the phase loss protection circuit has shutdown the system due to voltage phase loss or input voltage dropping below 80% of nominal.

* These errors will also cause the error counter of the timer/counter to increment.

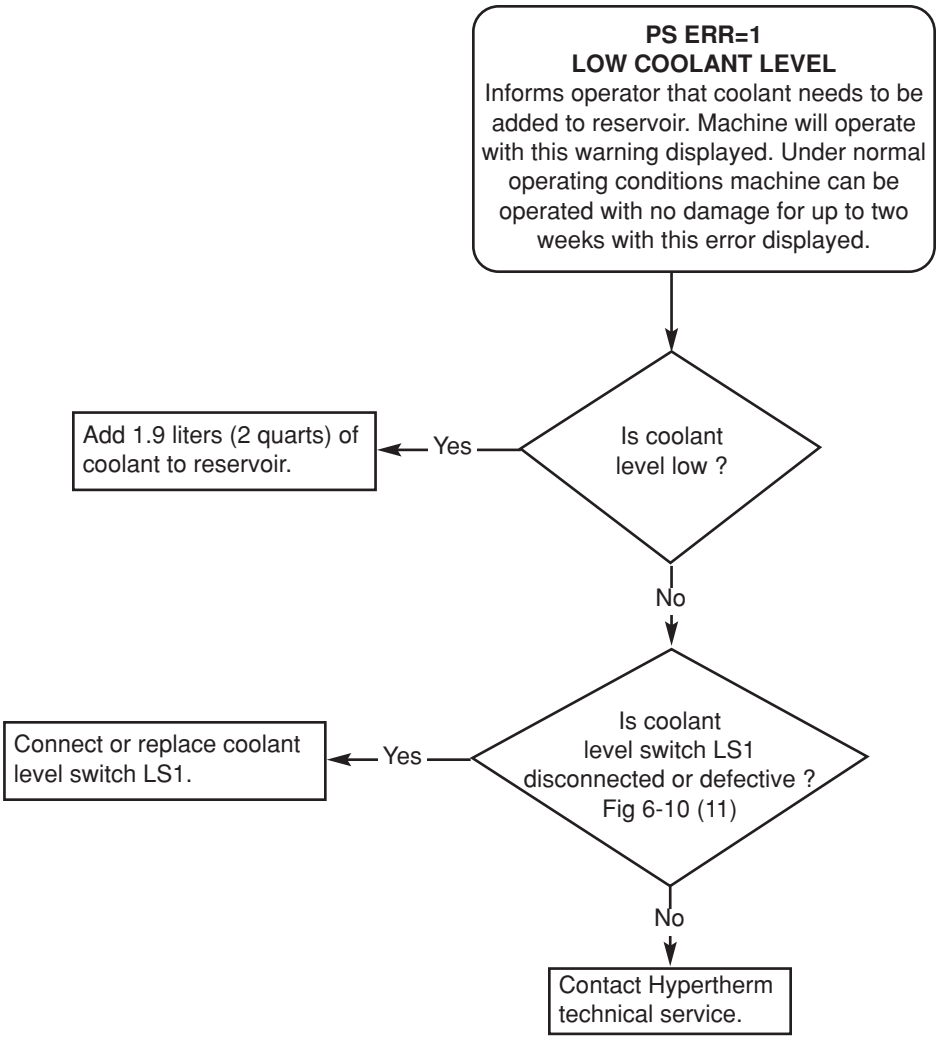
** These errors will also cause an error count output signal to the CNC.

Gas System (GS-ERR)

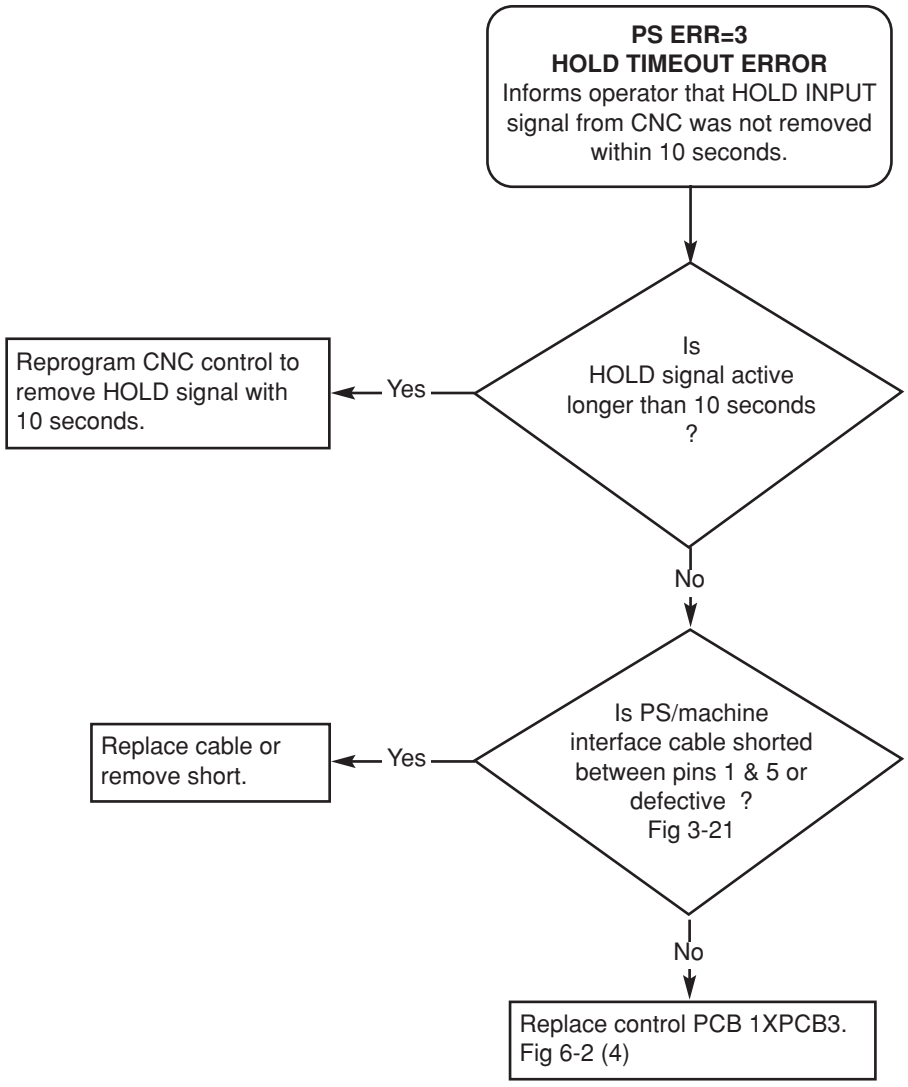
Error Message	Error Code	Description
NO ERROR	0	
LOW PLASMA GAS ERR	1	This error signal is issued if the plasma gas inlet pressure is below 105 psig (7.2 bar).
LOW SHIELD GAS ERR	2	This error signal is issued if the shield gas inlet pressure is below 105 psig (7.2 bar).
HIGH PLASMA GAS ERR	3	This error signal is issued if the plasma gas inlet pressure is above 135 psig (9.3 bar).
HIGH SHIELD GAS ERR	4	This error signal is issued if the shield gas inlet pressure is above 135 psig (9.3 bar).
MV1 ERR*	5	This error signal is issued when the MV1 motor valve does not move when commanded. When this error occurs service is required.
MV2 ERR*	6	This error signal is issued when the MV2 motor valve does not move when commanded. \When this error occurs service is required.
MV3 ERR*	7	This error signal is issued when the MV3 motor valve does not move when commanded. When this error occurs service is required.
MV4 ERR*	8	This error signal is issued when the MV4 motor valve does not move when commanded. When this error occurs service is required.
MV5 ERR*	9	This error signal is issued when the MV5 motor valve does not move when commanded. When this error occurs service is required.
MV6 ERR*	10	This error signal is issued when the MV6 motor valve does not move when commanded. When this error occurs service is required.

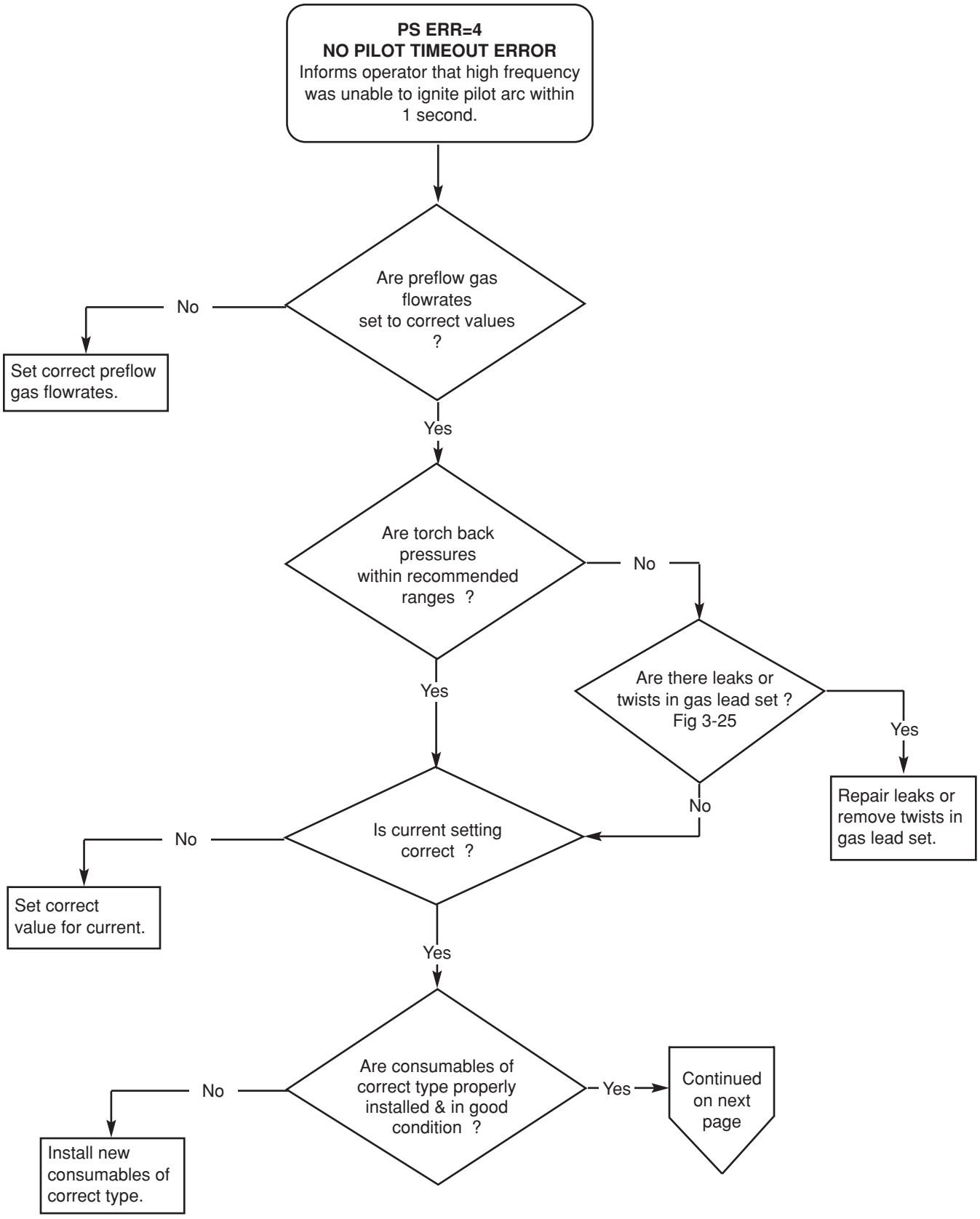
* The plasma system will have to be powered down and then restarted if any of the motor valve errors occur.

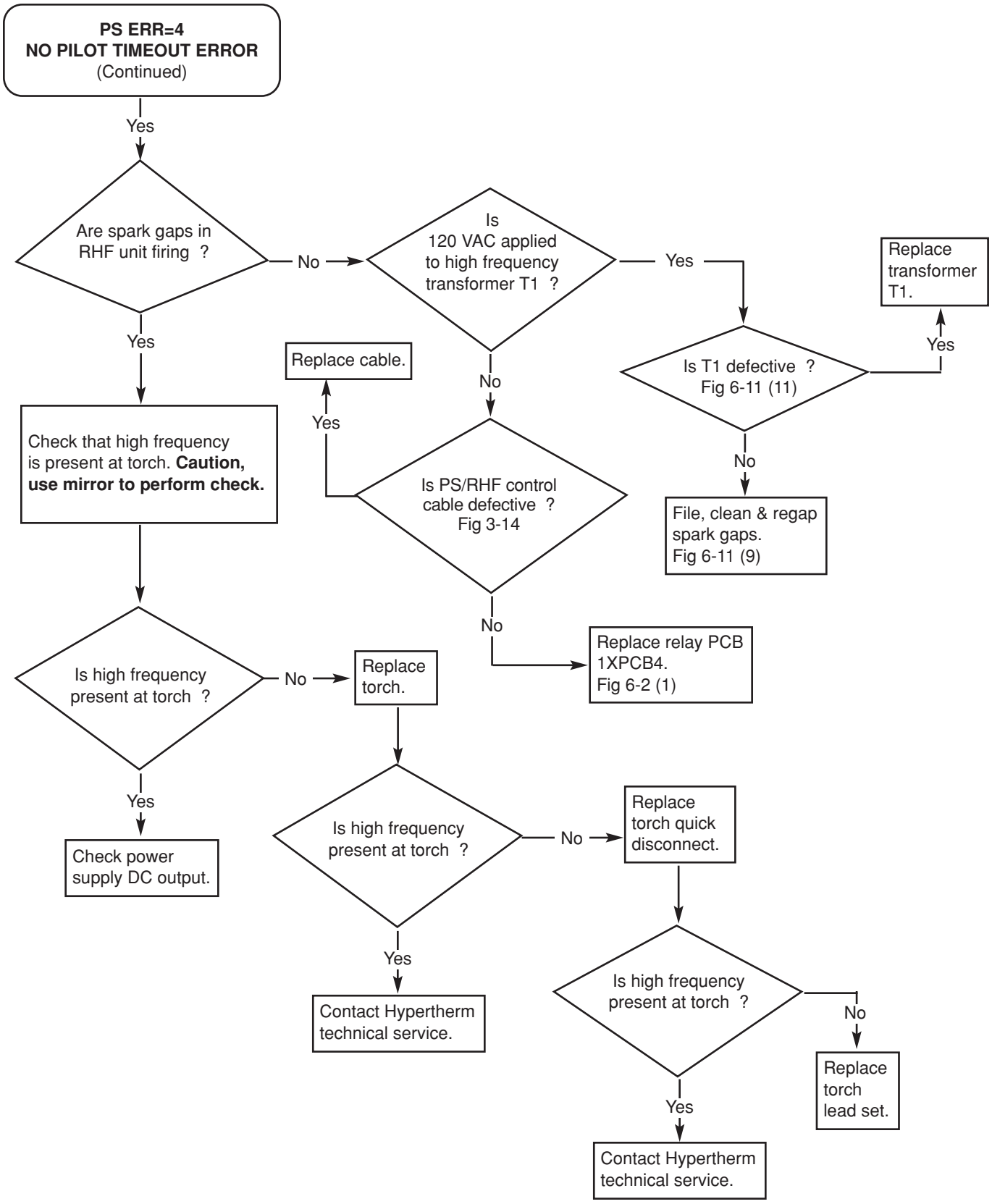
Power Supply System Error Message Flow Diagrams

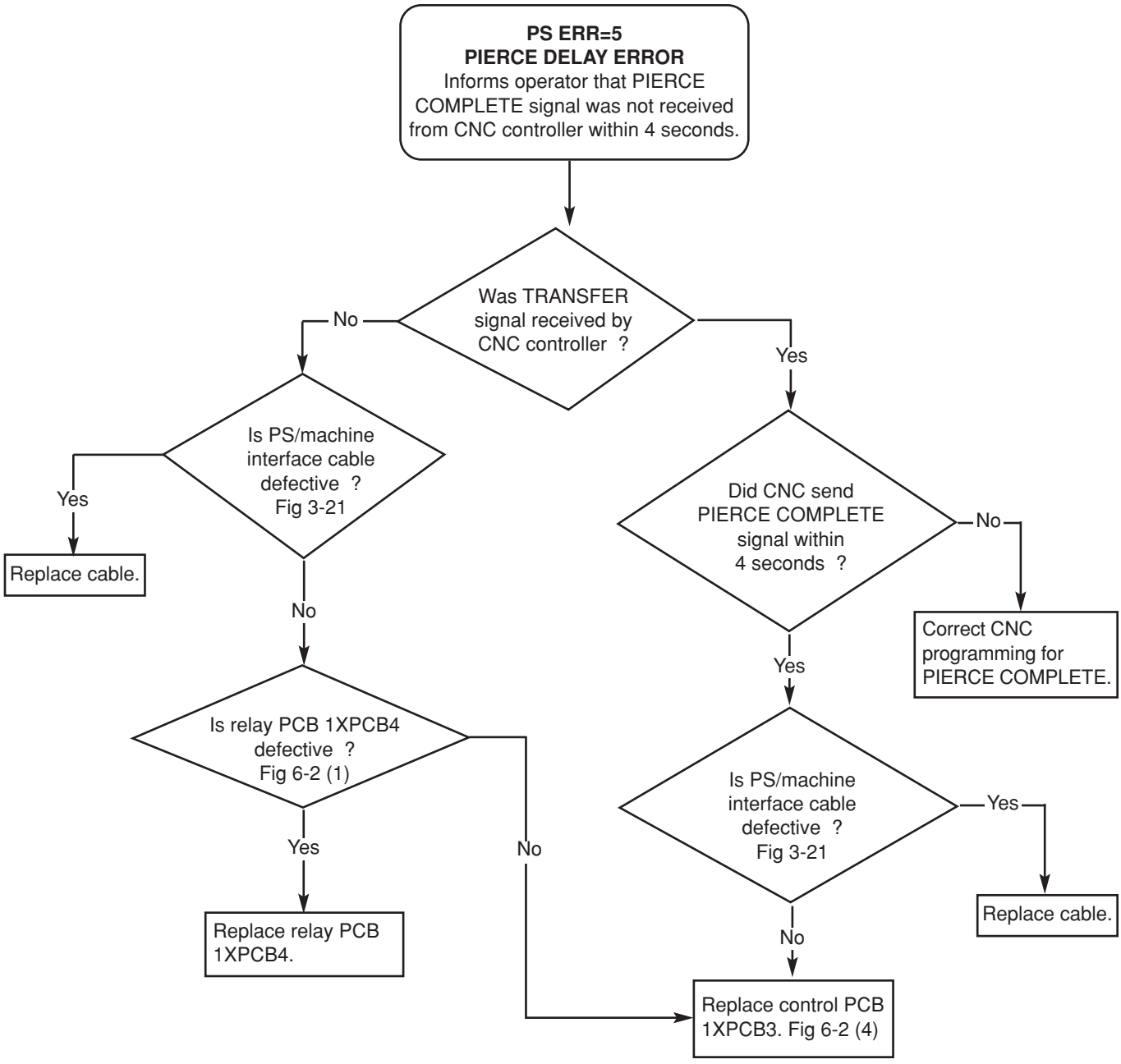


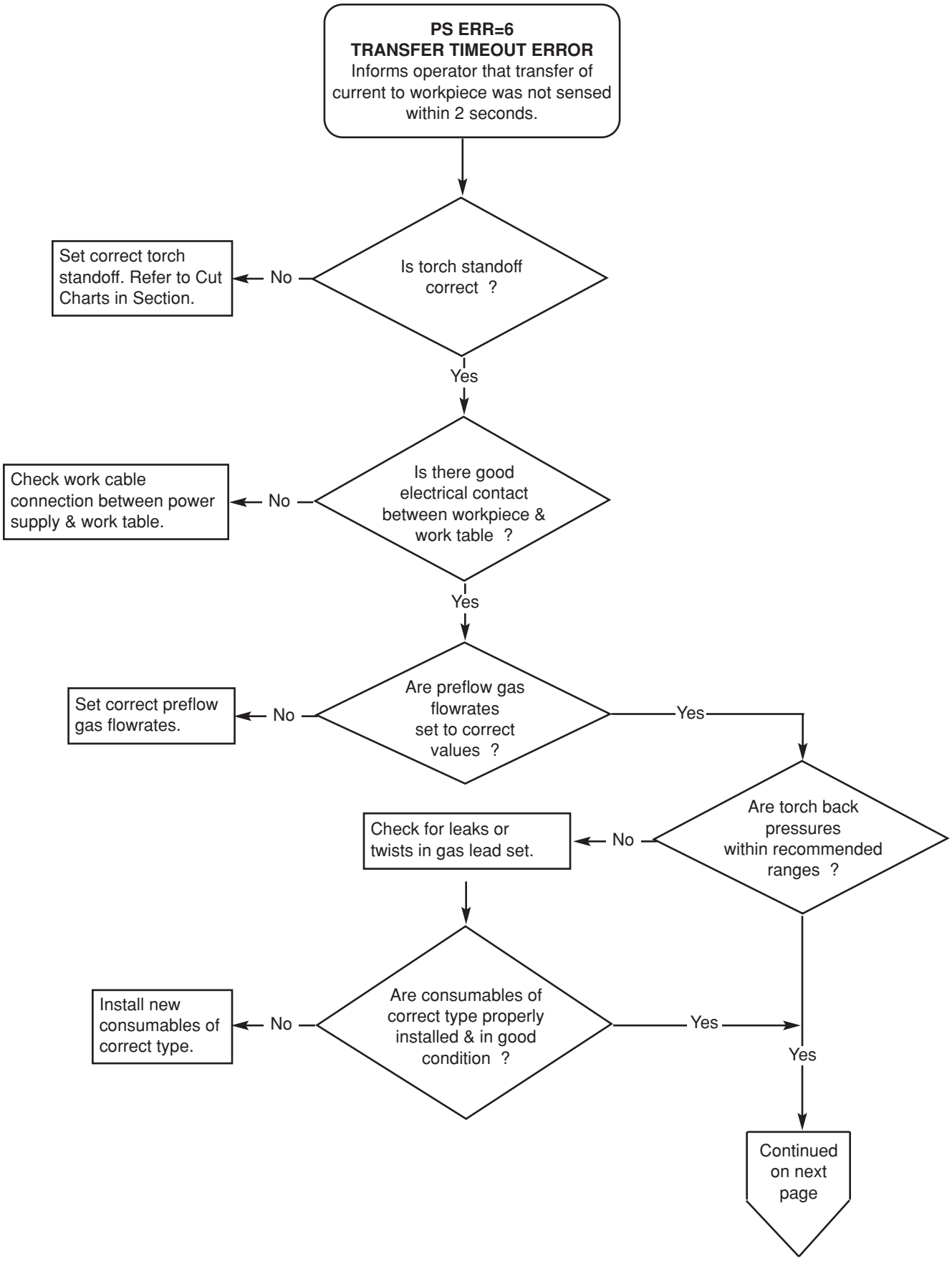
PS ERR=2
INTERLOCK ERROR
Informs operator that one of the power supply interlocks is not satisfied. Refer to the seven power supply status LED troubleshooting flow diagrams.

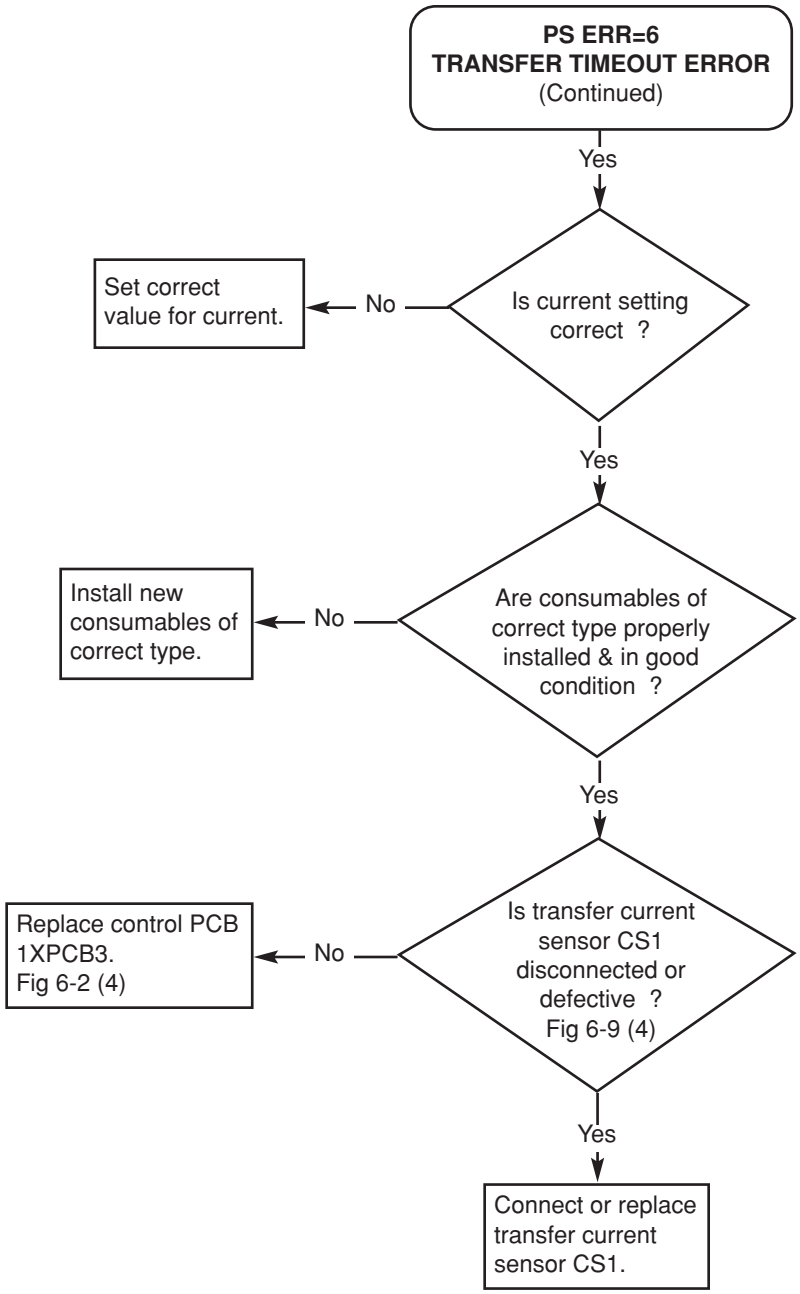

PS ERR=3
HOLD TIMEOUT ERROR
Informs operator that HOLD INPUT signal from CNC was not removed within 10 seconds.
Is HOLD signal active longer than 10 seconds ?
Yes
Reprogram CNC control to remove HOLD signal with 10 seconds.
No
Is PS/machine interface cable shorted between pins 1 & 5 or defective ? Fig 3-21
Yes
Replace cable or remove short.
No
Replace control PCB 1XPCB3. Fig 6-2 (4)

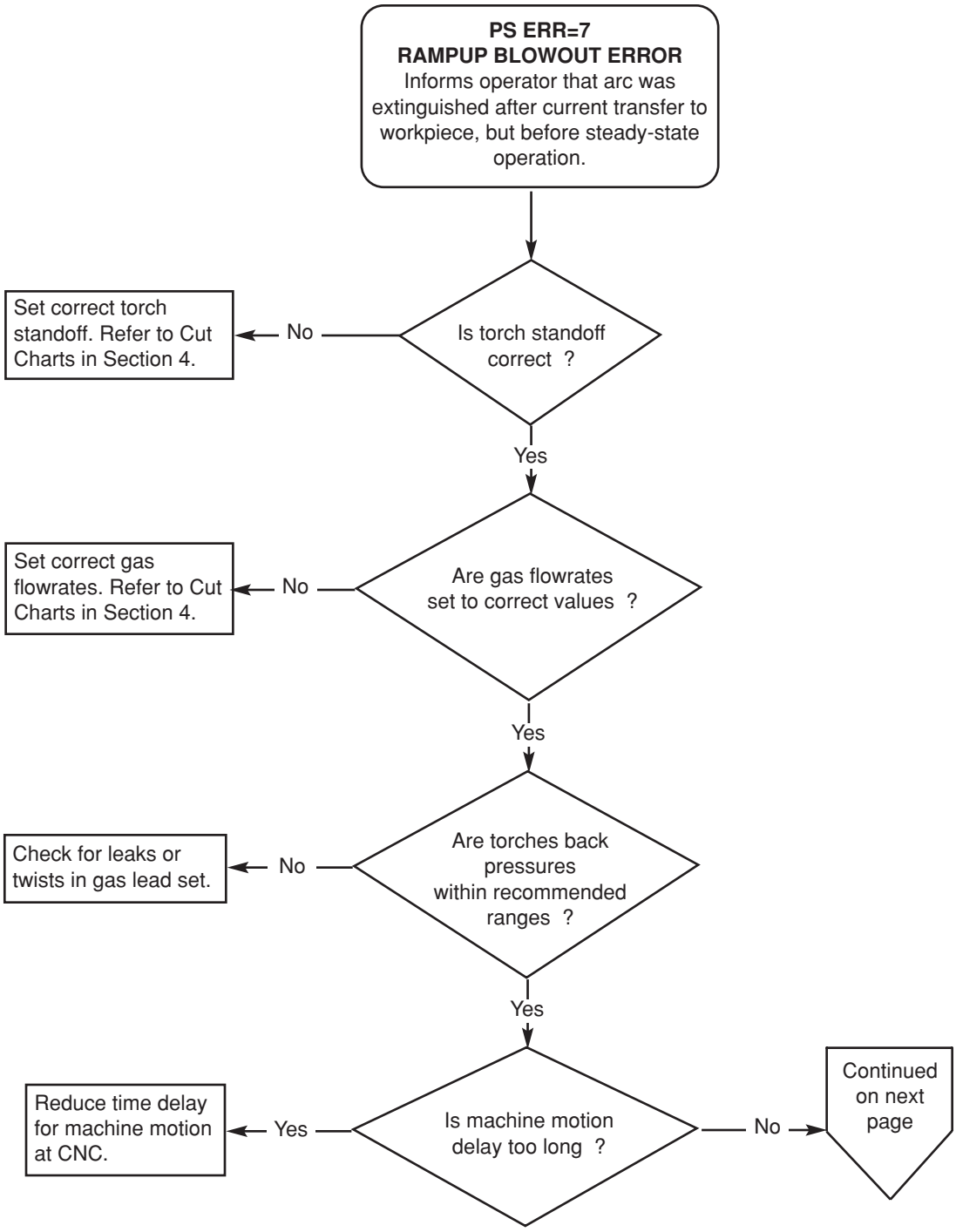

PS ERR=4
NO PILOT TIMEOUT ERROR
Informs operator that high frequency was unable to ignite pilot arc within 1 second.
Are preflow gas flowrates set to correct values ?
No
Set correct preflow gas flowrates.
Yes
Are torch back pressures within recommended ranges ?
No
Are there leaks or twists in gas lead set ? Fig 3-25
Yes
Repair leaks or remove twists in gas lead set.
No
Yes
Is current setting correct ?
No
Set correct value for current.
Yes
Are consumables of correct type properly installed & in good condition ?
No
Install new consumables of correct type.
Yes
Continued on next page

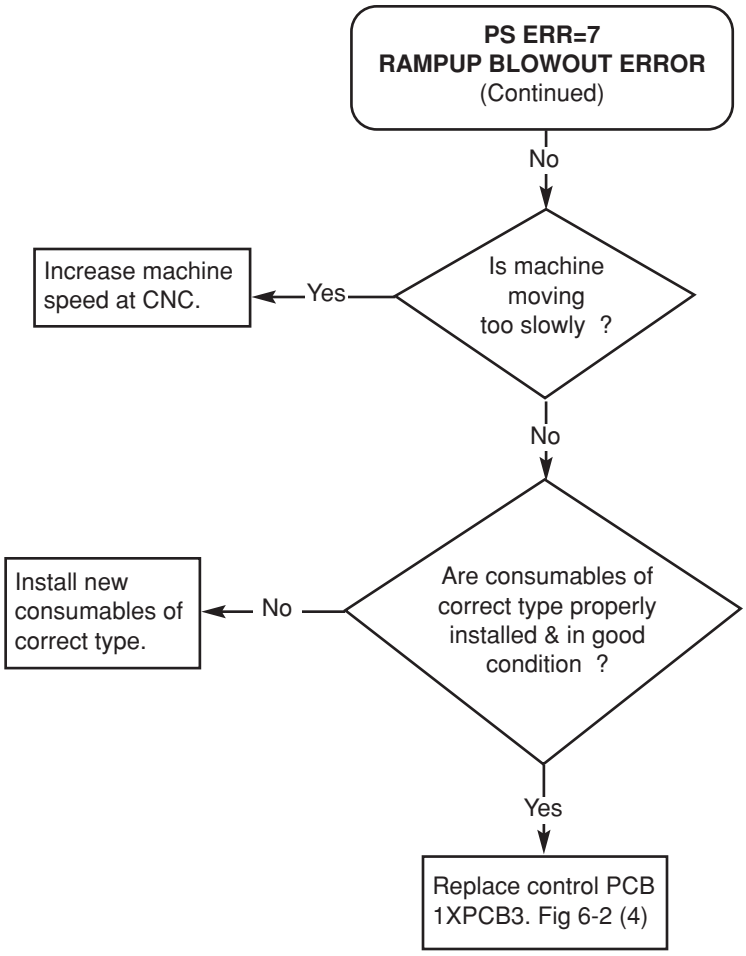

PS ERR=4
NO PILOT TIMEOUT ERROR
(Continued)
Yes
Are spark gaps in RHF unit firing ?
No
Is 120 VAC applied to high frequency transformer T1 ?
Yes
Replace transformer T1.
Yes
Is T1 defective ? Fig 6-11 (11)
No
File, clean & regap spark gaps. Fig 6-11 (9)
Yes
Check that high frequency is present at torch. Caution, use mirror to perform check.
Replace cable.
Yes
No
Is PS/RHF control cable defective ? Fig 3-14
No
Replace relay PCB 1XPCB4. Fig 6-2 (1)
Is high frequency present at torch ?
No
Replace torch.
Yes
Check power supply DC output.
Is high frequency present at torch ?
No
Replace torch quick disconnect.
Yes
Contact Hypertherm technical service.
Is high frequency present at torch ?
No
Replace torch lead set.
Yes
Contact Hypertherm technical service.

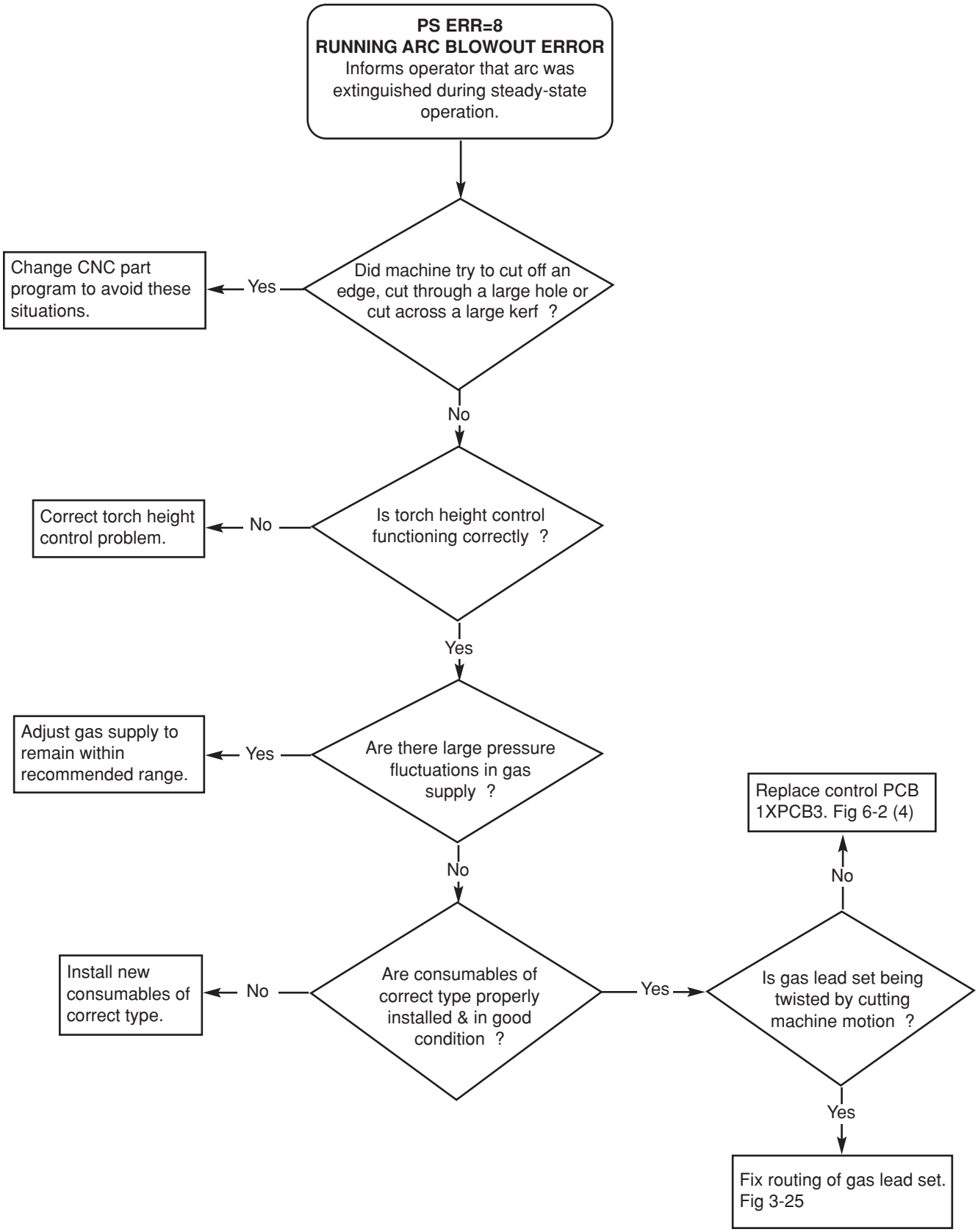

PS ERR=5
PIERCE DELAY ERROR
Informs operator that PIERCE COMPLETE signal was not received from CNC controller within 4 seconds.
Was TRANSFER signal received by CNC controller ?
No
Yes
Is PS/machine interface cable defective ? Fig 3-21
Yes
Replace cable.
No
Is relay PCB 1XPCB4 defective ? Fig 6-2 (1)
Yes
Replace relay PCB 1XPCB4.
No
Did CNC send PIERCE COMPLETE signal within 4 seconds ?
No
Correct CNC programming for PIERCE COMPLETE.
Yes
Is PS/machine interface cable defective ? Fig 3-21
Yes
Replace cable.
No
Replace control PCB 1XPCB3. Fig 6-2 (4)

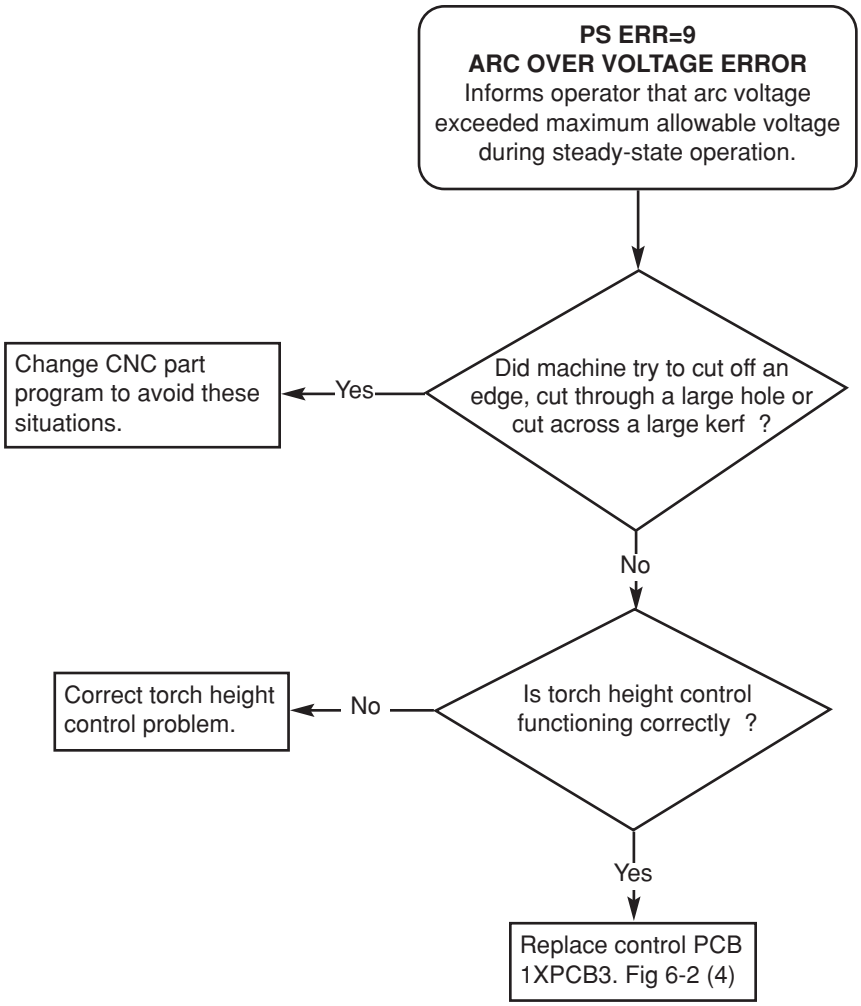

PS ERR=6
TRANSFER TIMEOUT ERROR
Informs operator that transfer of current to workpiece was not sensed within 2 seconds.
Is torch standoff correct ?
No
Set correct torch standoff. Refer to Cut Charts in Section.
Yes
Is there good electrical contact between workpiece & work table ?
No
Check work cable connection between power supply & work table.
Yes
Are preflow gas flowrates set to correct values ?
No
Set correct preflow gas flowrates.
Yes
Are torch back pressures within recommended ranges ?
No
Check for leaks or twists in gas lead set.
Are consumables of correct type properly installed & in good condition ?
No
Install new consumables of correct type.
Yes
Yes
Continued on next page

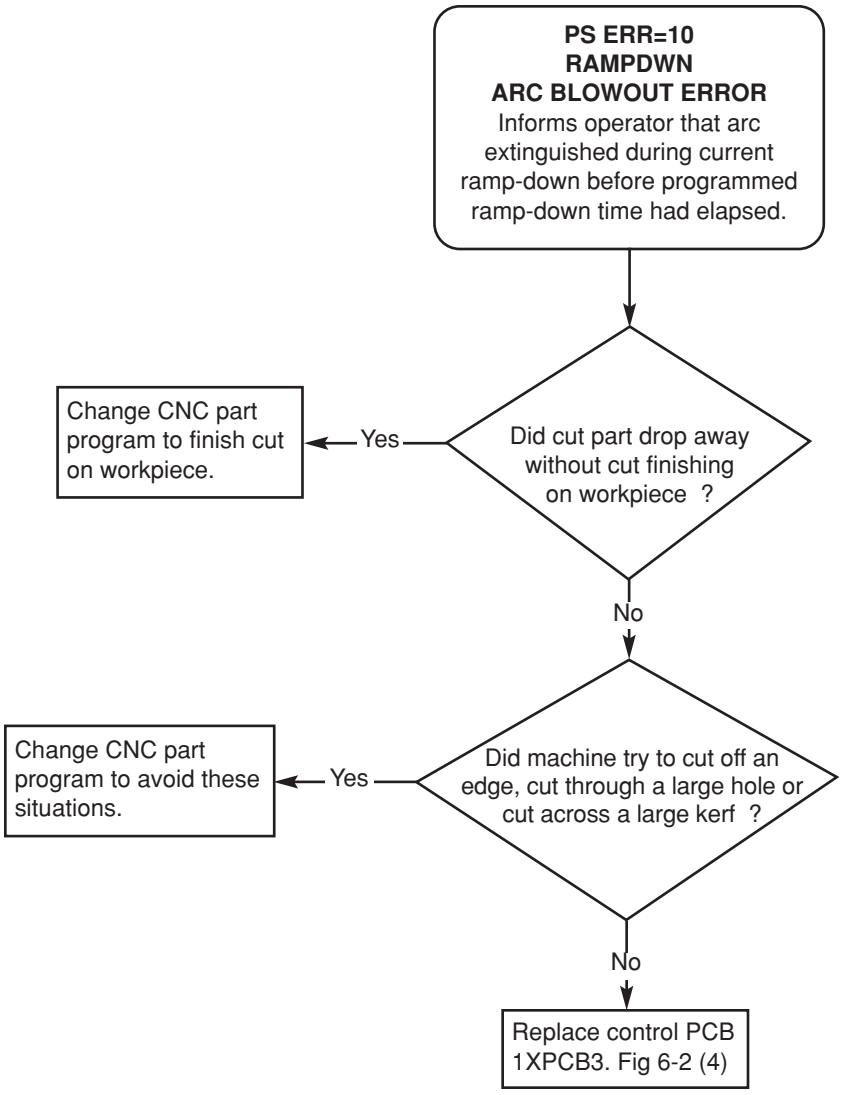

PS ERR=6
TRANSFER TIMEOUT ERROR
(Continued)
Yes
Is current setting correct ?
No
Set correct value for current.
Yes
Are consumables of correct type properly installed & in good condition ?
No
Install new consumables of correct type.
Yes
Is transfer current sensor CS1 disconnected or defective ?
Fig 6-9 (4)
No
Replace control PCB 1XPCB3.
Fig 6-2 (4)
Yes
Connect or replace transfer current sensor CS1.


PS ERR=7
RAMPUP BLOWOUT ERROR
Informs operator that arc was extinguished after current transfer to workpiece, but before steady-state operation.
Is torch standoff correct ?
No
Set correct torch standoff. Refer to Cut Charts in Section 4.
Yes
Are gas flowrates set to correct values ?
No
Set correct gas flowrates. Refer to Cut Charts in Section 4.
Yes
Are torches back pressures within recommended ranges ?
No
Check for leaks or twists in gas lead set.
Yes
Is machine motion delay too long ?
Yes
Reduce time delay for machine motion at CNC.
No
Continued on next page

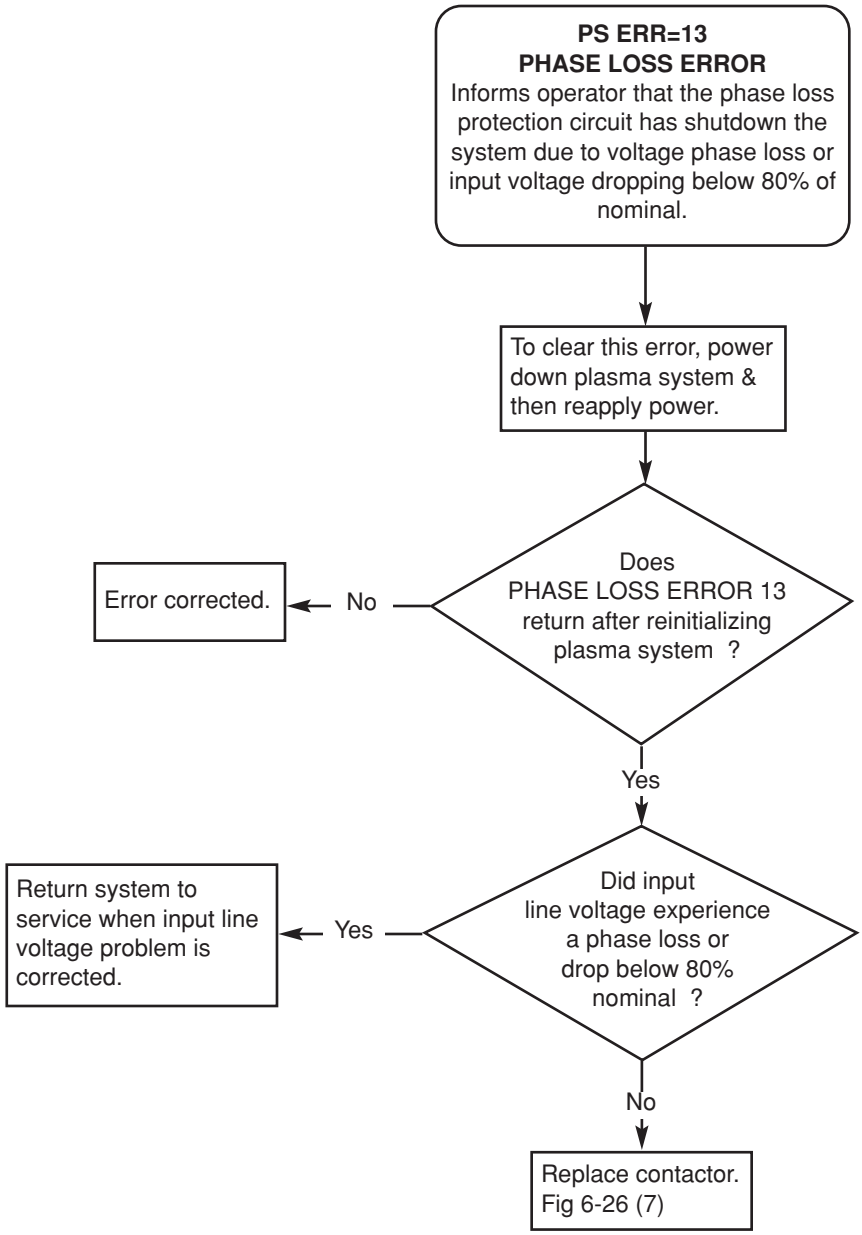

PS ERR=7
RAMPUP BLOWOUT ERROR
(Continued)
No
Is machine moving too slowly ?
Yes
Increase machine speed at CNC.
No
Are consumables of correct type properly installed & in good condition ?
No
Install new consumables of correct type.
Yes
Replace control PCB 1XPCB3. Fig 6-2 (4)


PS ERR=8
RUNNING ARC BLOWOUT ERROR
Informs operator that arc was extinguished during steady-state operation.
Did machine try to cut off an edge, cut through a large hole or cut across a large kerf ?
Yes
Change CNC part program to avoid these situations.
No
Is torch height control functioning correctly ?
No
Correct torch height control problem.
Yes
Are there large pressure fluctuations in gas supply ?
Yes
Adjust gas supply to remain within recommended range.
No
Are consumables of correct type properly installed & in good condition ?
No
Install new consumables of correct type.
Yes
Is gas lead set being twisted by cutting machine motion ?
No
Replace control PCB 1XPCB3. Fig 6-2 (4)
Yes
Fix routing of gas lead set. Fig 3-25

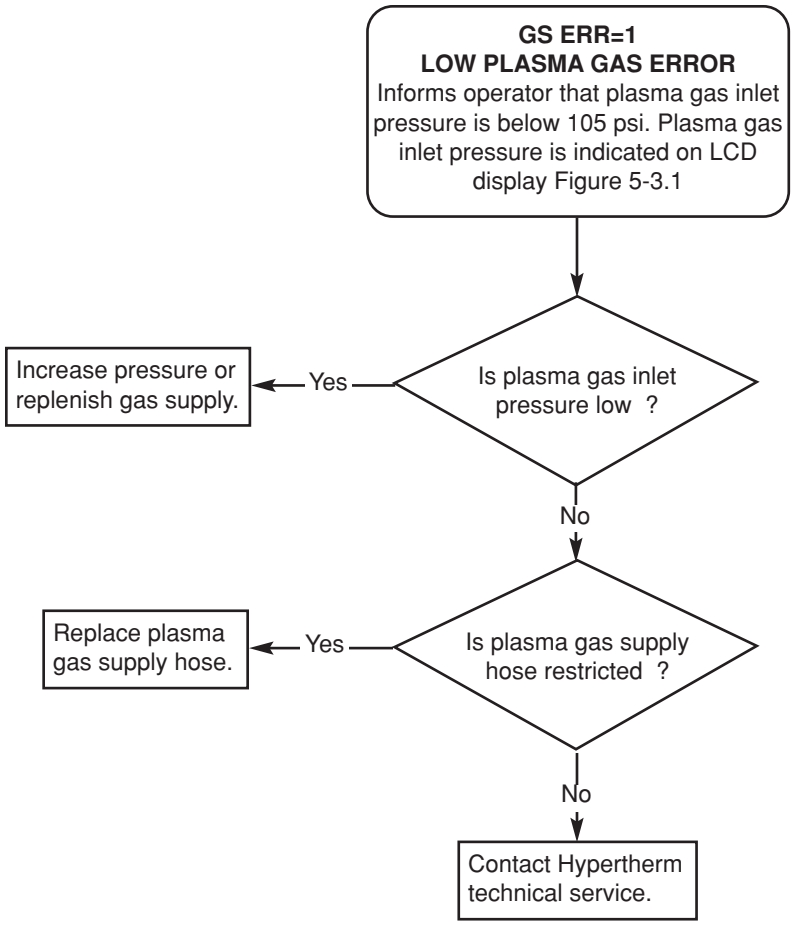

PS ERR=9
ARC OVER VOLTAGE ERROR
Informs operator that arc voltage exceeded maximum allowable voltage during steady-state operation.
Did machine try to cut off an edge, cut through a large hole or cut across a large kerf ?
Yes
Change CNC part program to avoid these situations.
No
Is torch height control functioning correctly ?
No
Correct torch height control problem.
Yes
Replace control PCB 1XPCB3. Fig 6-2 (4)

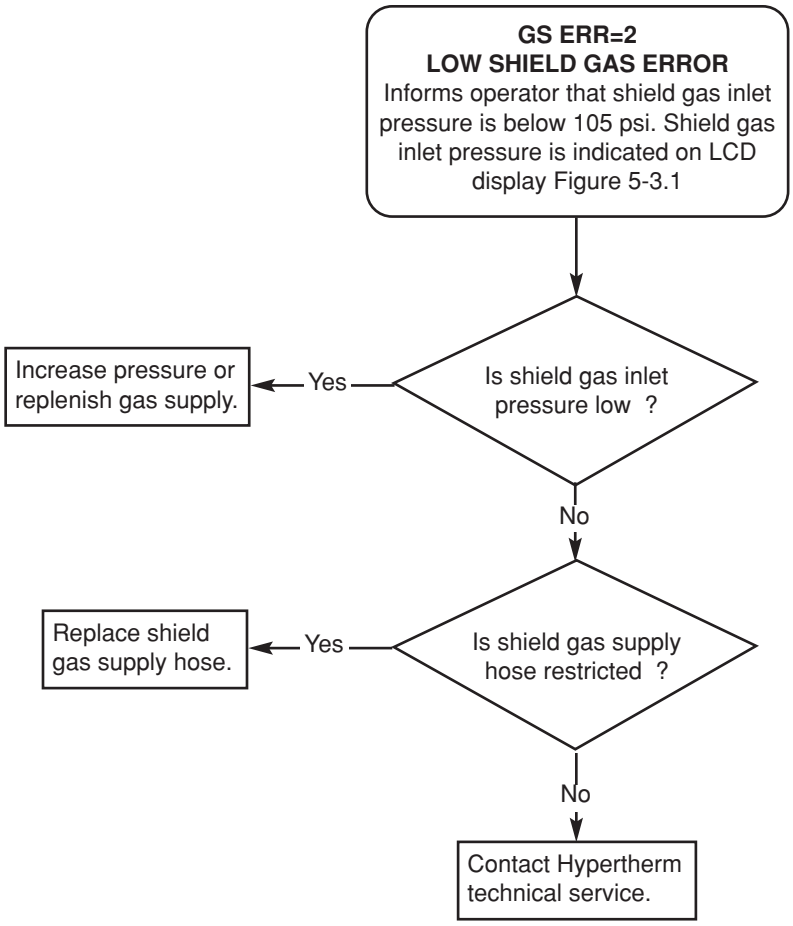

PS ERR=10
RAMPDWN
ARC BLOWOUT ERROR
Informs operator that arc extinguished during current ramp-down before programmed ramp-down time had elapsed.
Did cut part drop away without cut finishing on workpiece ?
Yes
Change CNC part program to finish cut on workpiece.
No
Did machine try to cut off an edge, cut through a large hole or cut across a large kerf ?
Yes
Change CNC part program to avoid these situations.
No
Replace control PCB 1XPCB3. Fig 6-2 (4)

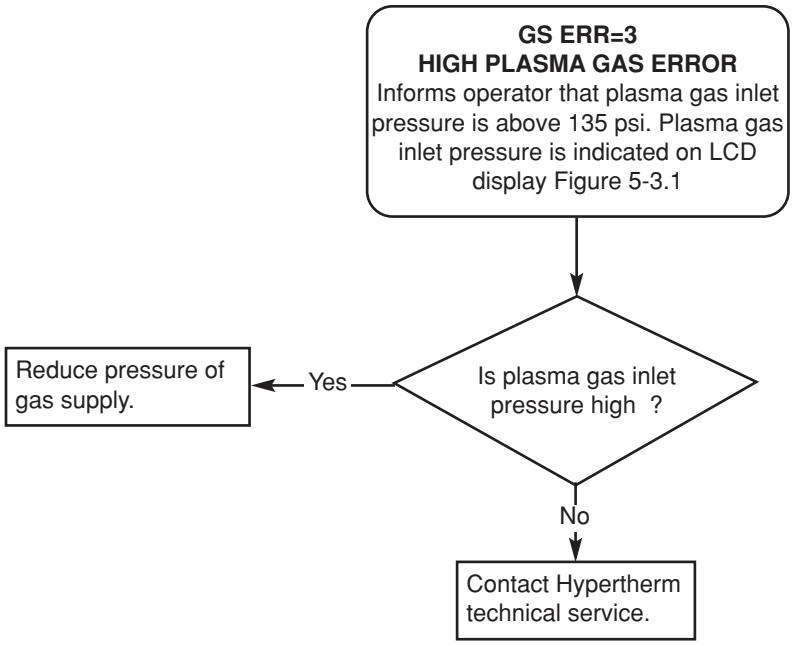
PS ERR=12
WRONG STATE ERROR
Informs operator that software has serious error that caused it to transfer control to an undefined program state. Record the exact operating conditions prior to this error and report them to Hypertherm. Replace power supply control PCB 1XPCB3. Fig 6-2 (4)

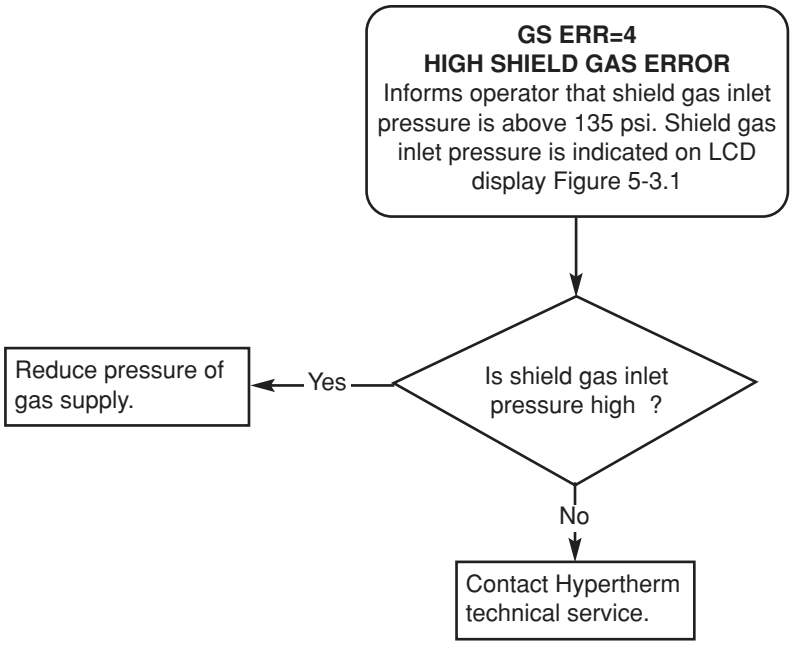

PS ERR=13
PHASE LOSS ERROR
Informs operator that the phase loss protection circuit has shutdown the system due to voltage phase loss or input voltage dropping below 80% of nominal.
To clear this error, power down plasma system & then reapply power.
Does PHASE LOSS ERROR 13 return after reinitializing plasma system ?
No
Error corrected.
Yes
Did input line voltage experience a phase loss or drop below 80% nominal ?
Yes
Return system to service when input line voltage problem is corrected.
No
Replace contactor. Fig 6-26 (7)

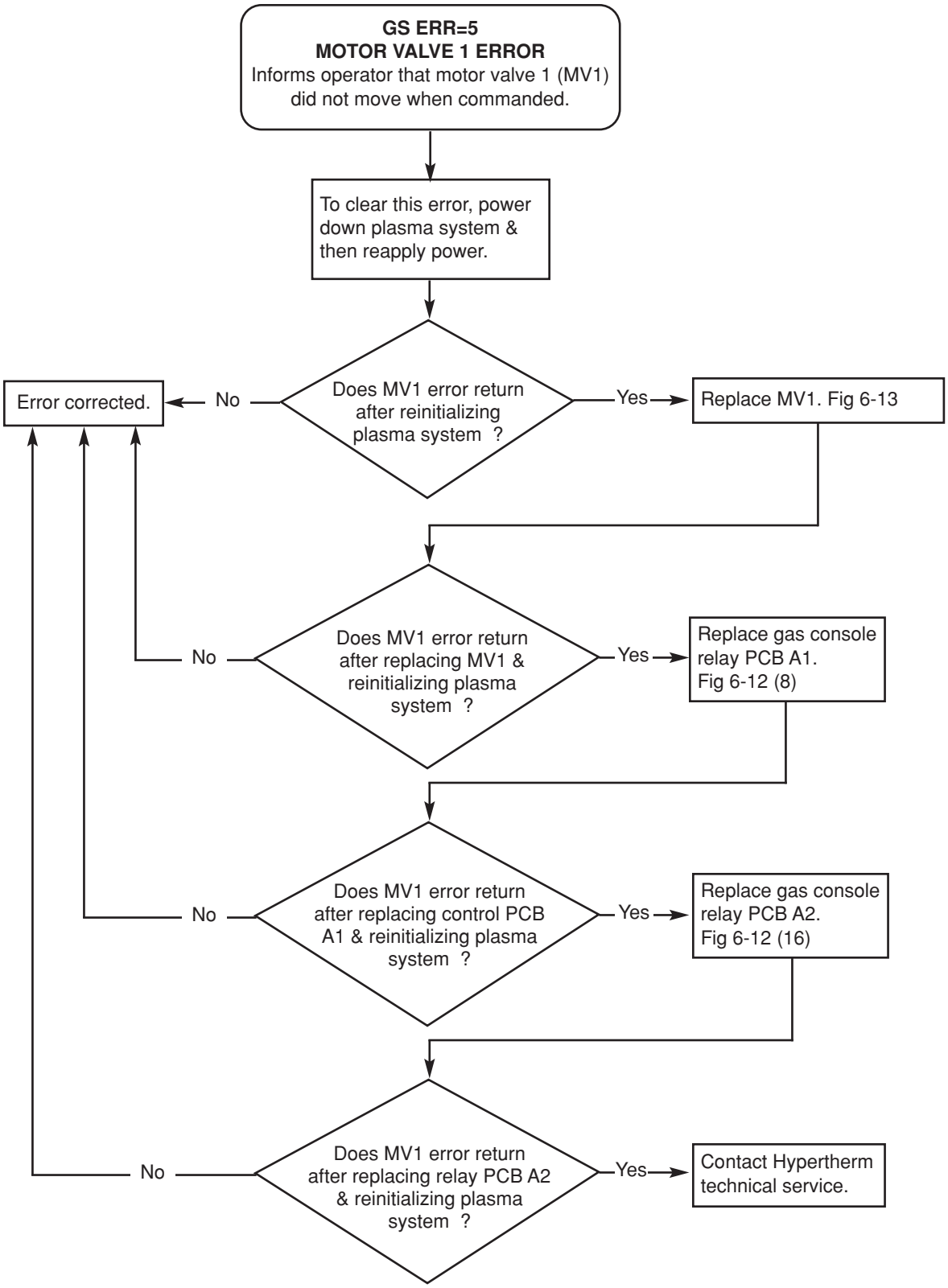
Gas System Error Message Flow Diagrams

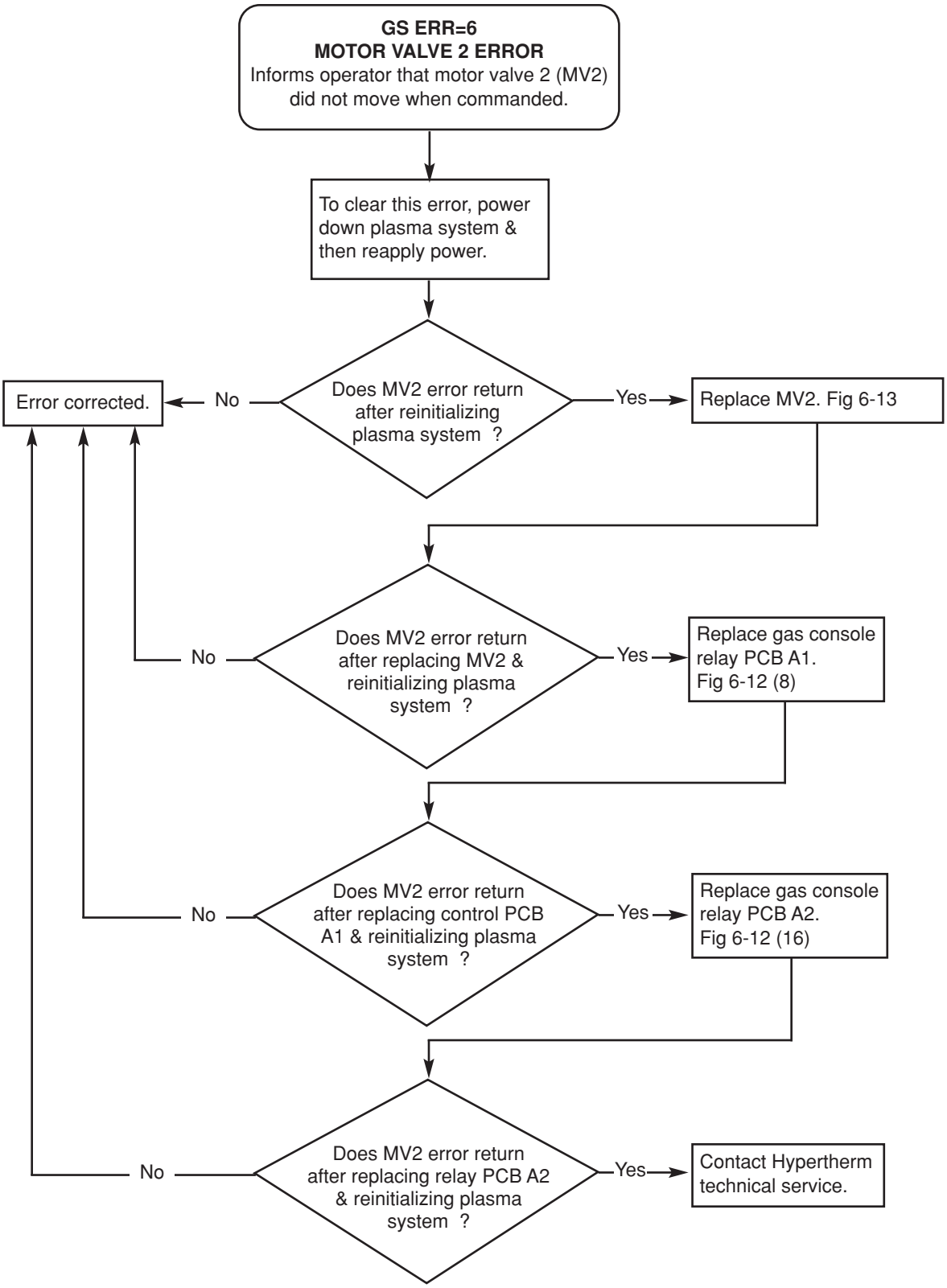


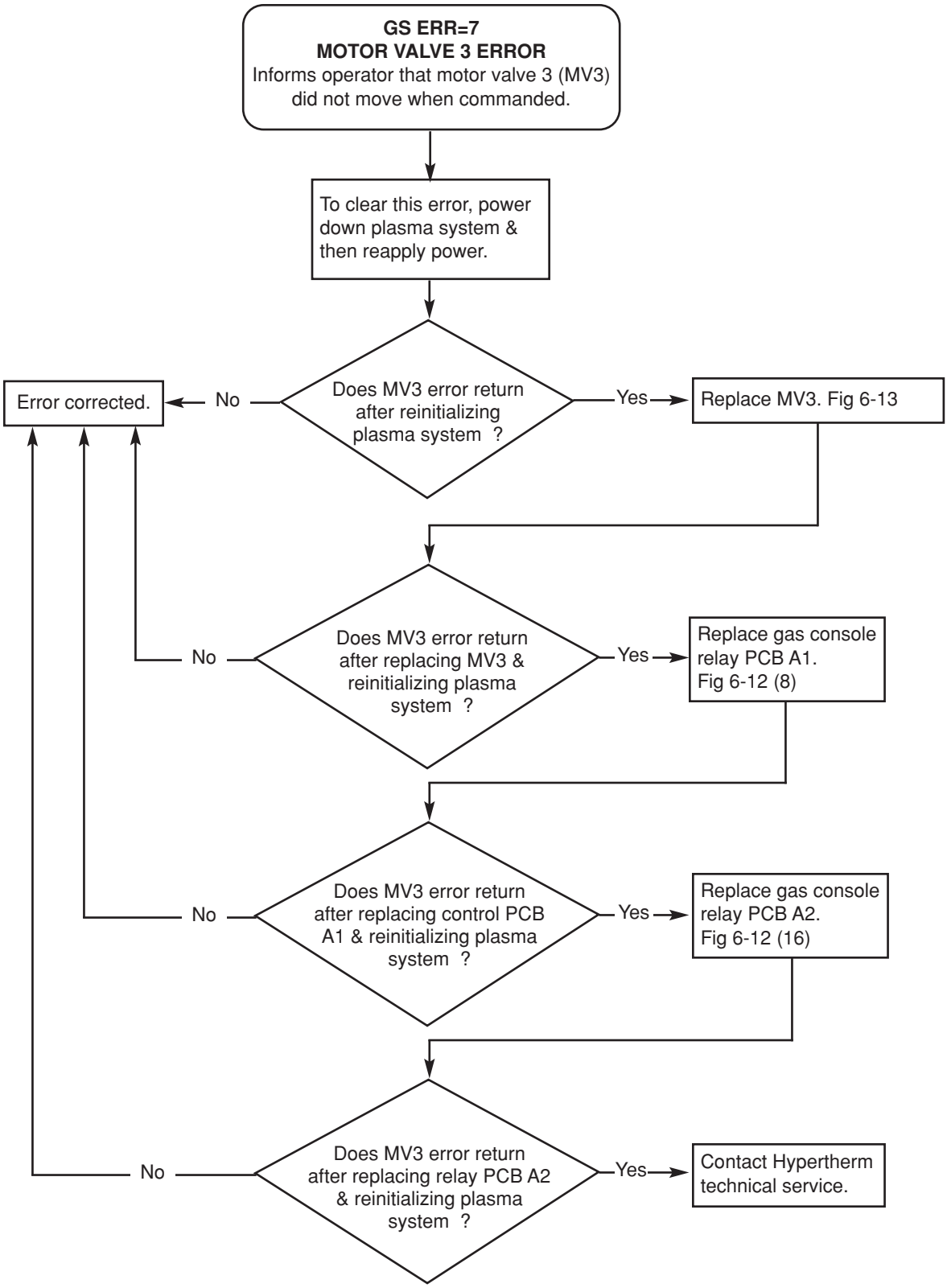

GS ERR=2
LOW SHIELD GAS ERROR
Informs operator that shield gas inlet pressure is below 105 psi. Shield gas inlet pressure is indicated on LCD display Figure 5-3.1
Is shield gas inlet pressure low ?
Yes
Increase pressure or replenish gas supply.
No
Is shield gas supply hose restricted ?
Yes
Replace shield gas supply hose.
No
Contact Hypertherm technical service.

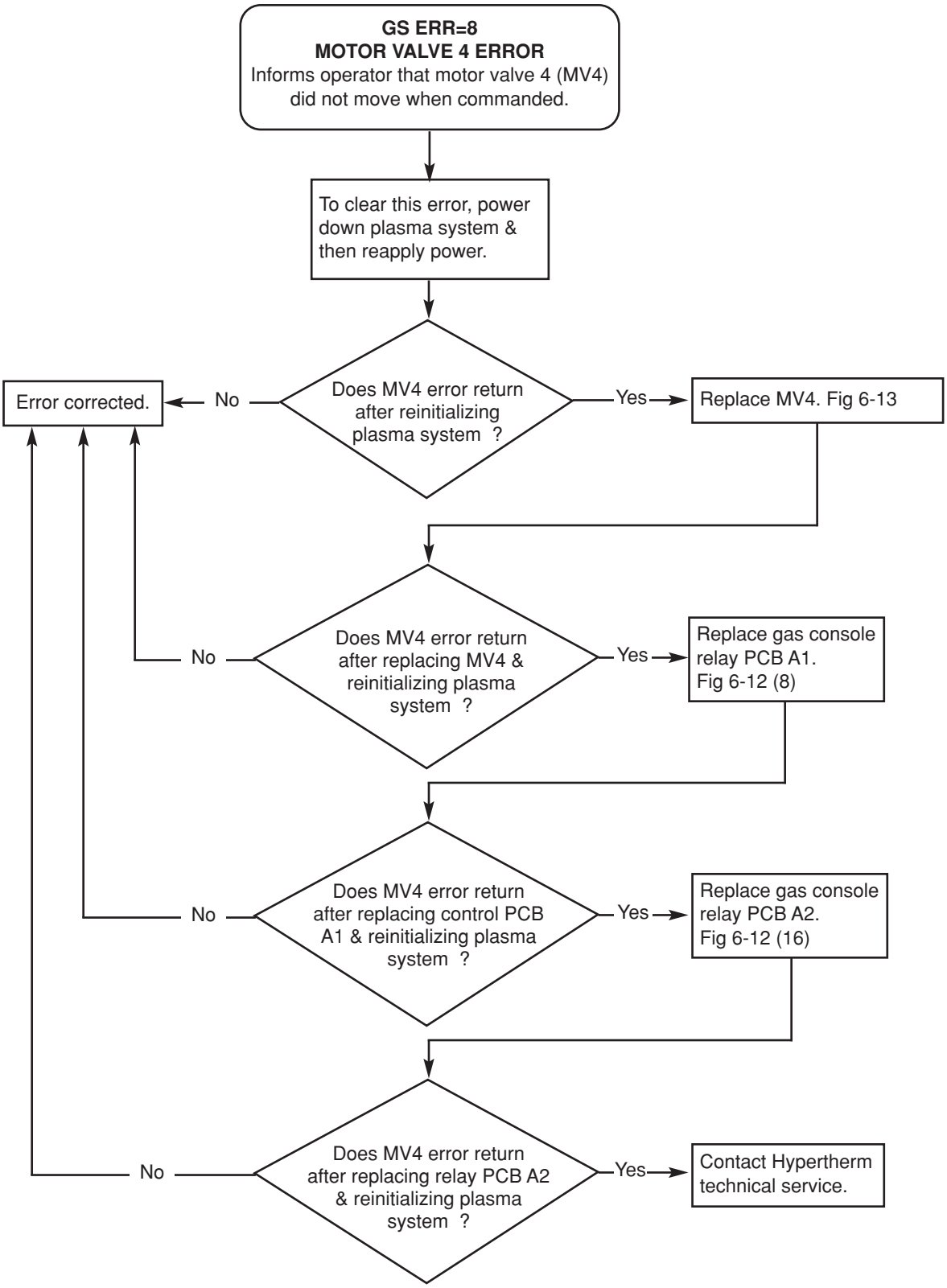

GS ERR=3
HIGH PLASMA GAS ERROR
Informs operator that plasma gas inlet pressure is above 135 psi. Plasma gas inlet pressure is indicated on LCD display Figure 5-3.1
Is plasma gas inlet pressure high ?
Yes
Reduce pressure of gas supply.
No
Contact Hypertherm technical service.

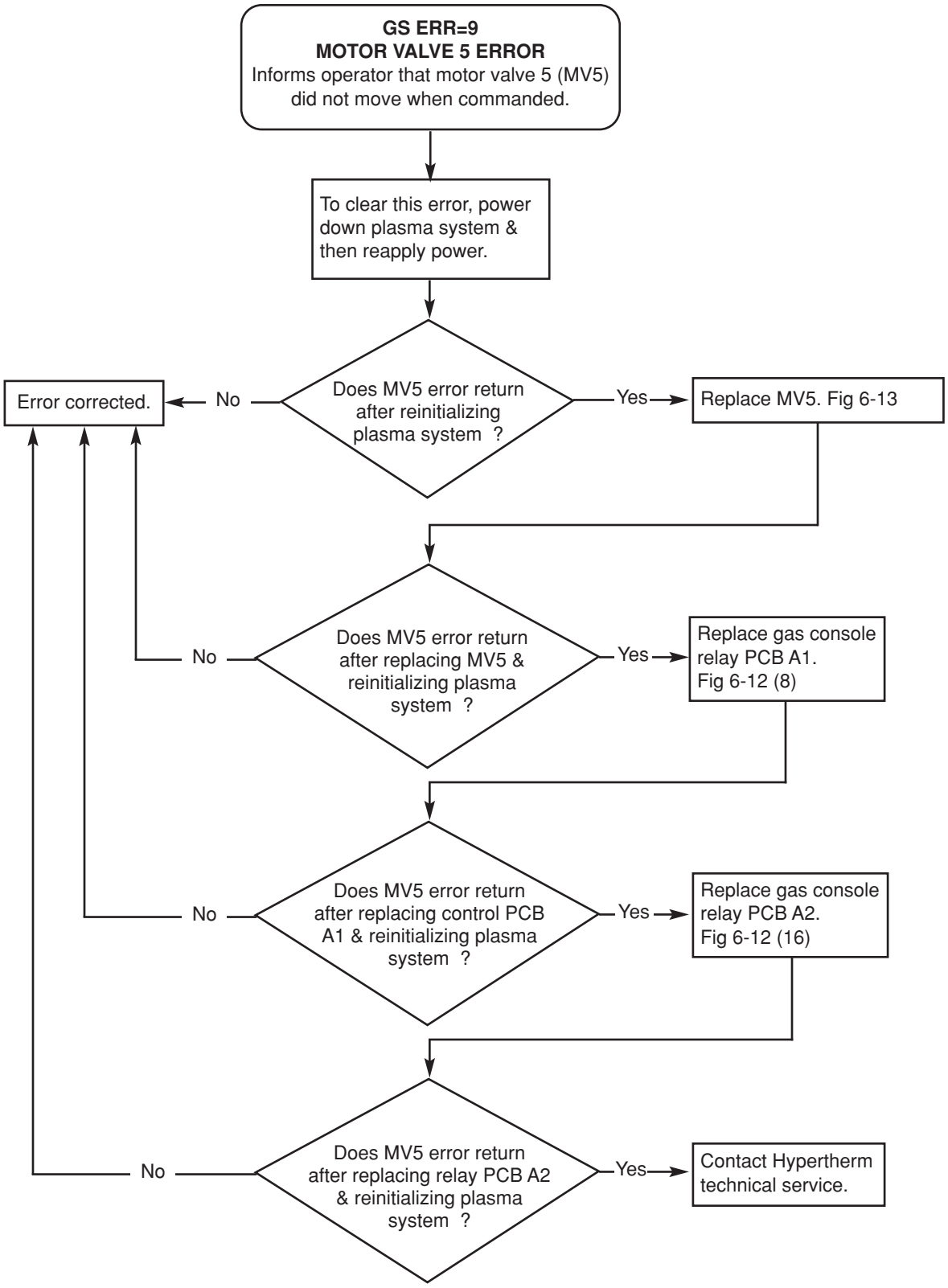

GS ERR=4
HIGH SHIELD GAS ERROR
Informs operator that shield gas inlet pressure is above 135 psi. Shield gas inlet pressure is indicated on LCD display Figure 5-3.1
Is shield gas inlet pressure high ?
Yes
Reduce pressure of gas supply.
No
Contact Hypertherm technical service.

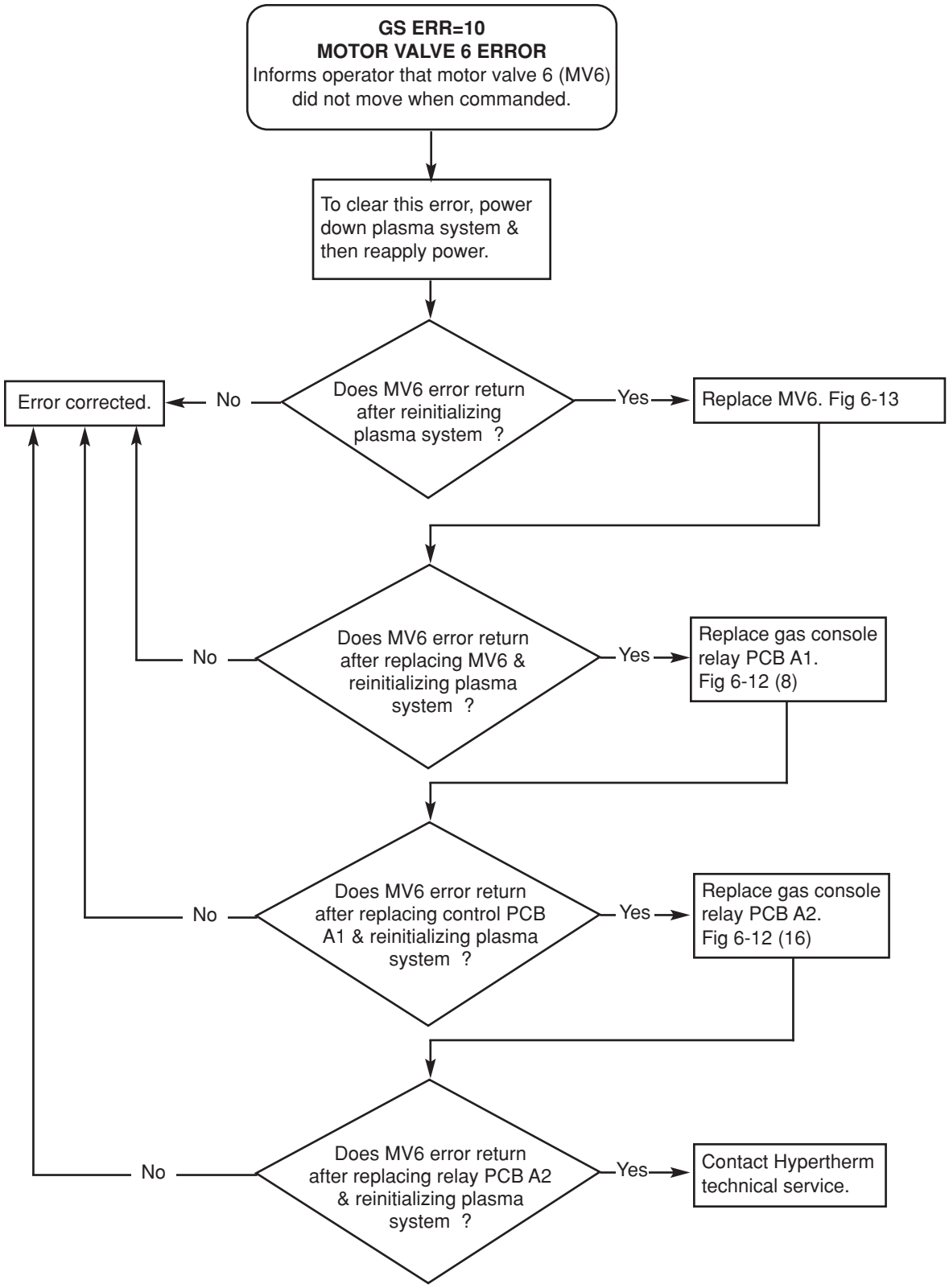

GS ERR=5
MOTOR VALVE 1 ERROR
Informs operator that motor valve 1 (MV1) did not move when commanded.
To clear this error, power down plasma system & then reapply power.
Does MV1 error return after reinitializing plasma system ?
No
Error corrected.
Yes
Replace MV1. Fig 6-13
Does MV1 error return after replacing MV1 & reinitializing plasma system ?
No
Yes
Replace gas console relay PCB A1. Fig 6-12 (8)
Does MV1 error return after replacing control PCB A1 & reinitializing plasma system ?
No
Yes
Replace gas console relay PCB A2. Fig 6-12 (16)
Does MV1 error return after replacing relay PCB A2 & reinitializing plasma system ?
No
Yes
Contact Hypertherm technical service.


GS ERR=6
MOTOR VALVE 2 ERROR
Informs operator that motor valve 2 (MV2) did not move when commanded.
To clear this error, power down plasma system & then reapply power.
Does MV2 error return after reinitializing plasma system ?
No
Error corrected.
Yes
Replace MV2. Fig 6-13
Does MV2 error return after replacing MV2 & reinitializing plasma system ?
No
Yes
Replace gas console relay PCB A1. Fig 6-12 (8)
Does MV2 error return after replacing control PCB A1 & reinitializing plasma system ?
No
Yes
Replace gas console relay PCB A2. Fig 6-12 (16)
Does MV2 error return after replacing relay PCB A2 & reinitializing plasma system ?
No
Yes
Contact Hypertherm technical service.


GS ERR=7
MOTOR VALVE 3 ERROR
Informs operator that motor valve 3 (MV3) did not move when commanded.
To clear this error, power down plasma system & then reapply power.
Does MV3 error return after reinitializing plasma system ?
No
Error corrected.
Yes
Replace MV3. Fig 6-13
Does MV3 error return after replacing MV3 & reinitializing plasma system ?
No
Yes
Replace gas console relay PCB A1. Fig 6-12 (8)
Does MV3 error return after replacing control PCB A1 & reinitializing plasma system ?
No
Yes
Replace gas console relay PCB A2. Fig 6-12 (16)
Does MV3 error return after replacing relay PCB A2 & reinitializing plasma system ?
No
Yes
Contact Hypertherm technical service.


GS ERR=8
MOTOR VALVE 4 ERROR
Informs operator that motor valve 4 (MV4) did not move when commanded.
To clear this error, power down plasma system & then reapply power.
Does MV4 error return after reinitializing plasma system ?
No
Error corrected.
Yes
Replace MV4. Fig 6-13
Does MV4 error return after replacing MV4 & reinitializing plasma system ?
No
Yes
Replace gas console relay PCB A1. Fig 6-12 (8)
Does MV4 error return after replacing control PCB A1 & reinitializing plasma system ?
No
Yes
Replace gas console relay PCB A2. Fig 6-12 (16)
Does MV4 error return after replacing relay PCB A2 & reinitializing plasma system ?
No
Yes
Contact Hypertherm technical service.


GS ERR=9
MOTOR VALVE 5 ERROR
Informs operator that motor valve 5 (MV5) did not move when commanded.
To clear this error, power down plasma system & then reapply power.
Does MV5 error return after reinitializing plasma system ?
No
Error corrected.
Yes
Replace MV5. Fig 6-13
Does MV5 error return after replacing MV5 & reinitializing plasma system ?
No
Yes
Replace gas console relay PCB A1. Fig 6-12 (8)
Does MV5 error return after replacing control PCB A1 & reinitializing plasma system ?
No
Yes
Replace gas console relay PCB A2. Fig 6-12 (16)
Does MV5 error return after replacing relay PCB A2 & reinitializing plasma system ?
No
Yes
Contact Hypertherm technical service.


GS ERR=10
MOTOR VALVE 6 ERROR
Informs operator that motor valve 6 (MV6) did not move when commanded.
To clear this error, power down plasma system & then reapply power.
Does MV6 error return after reinitializing plasma system ?
No
Error corrected.
Yes
Replace MV6. Fig 6-13
Does MV6 error return after replacing MV6 & reinitializing plasma system ?
No
Yes
Replace gas console relay PCB A1. Fig 6-12 (8)
Does MV6 error return after replacing control PCB A1 & reinitializing plasma system ?
No
Yes
Replace gas console relay PCB A2. Fig 6-12 (16)
Does MV6 error return after replacing relay PCB A2 & reinitializing plasma system ?
No
Yes
Contact Hypertherm technical service.

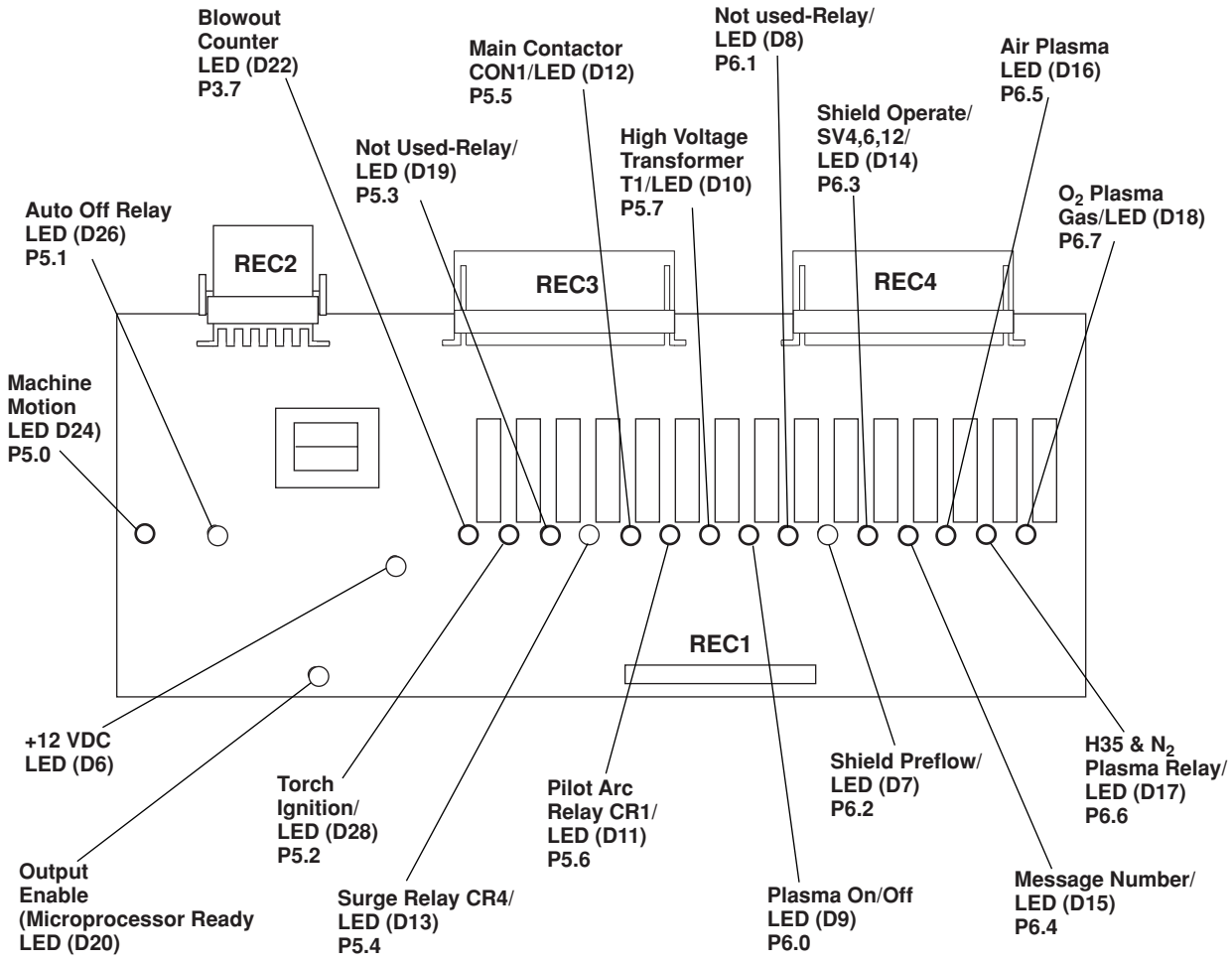
Relay Board LED Status Indicators

Power Supply

The power supply relay board (1XPCB4) is an interface between solenoid valves, relays, the main contactor, and the control board (1XPCB3). An ON or OFF condition is sent from the control board through REC1 at the bottom of the relay board, which switches 1 of the relays on 1XPCB4 to on or off. The corresponding solenoid or external device is then energized or deenergized (output is sent via REC3 or REC4 at the top of the relay board). Figure 5-4 shows the relay locations on 1XPCB4 as well as the light emitting diode indicators (LEDs). Figure 5-5 shows the relay board LED on/off status during system test and run modes.

Listed below are the pin assignments for REC3 and REC4 of relay board 1XPCB4:

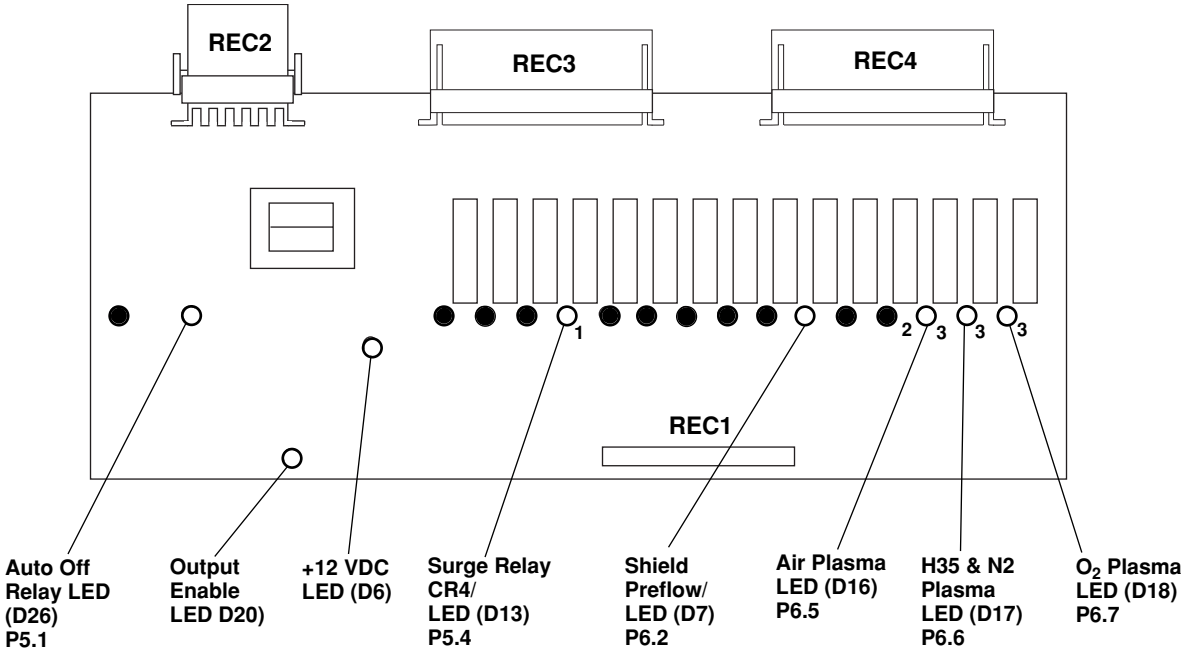
REC3 Pin #	Description
1 & 2	HV Transformer (T1 in Remote HF Console)
3 & 4	Pilot Arc Relay CR1
5 & 6	Main Contactor CON1
7 & 8	Surge Relay CR4
9 & 10	Extra Output
11 & 12	Torch Ignition CRD
13 & 14	Blowout Counter
15 & 16	120 VAC (Input)
REC 4 Pin #	**Description**
1 & 2	O_2 & N_2 Select
3 & 4	H35 & N_2 Select
5 & 6	Air & N_2 Select
7 & 8	Message Number
9 & 10	Shield Operate Valve
11 & 12	Shield Preflow Valve
13 & 14	Not used
15 & 16	Plasma On/Off Valve



Note: The PX.X numbers called out above denote port locations on the microprocessor chip.

Figure 5-4 Power Supply Relay Board (1XPCB4)

Power Supply
Relay Board LED Status – Test Preflow



LED On

LED Off

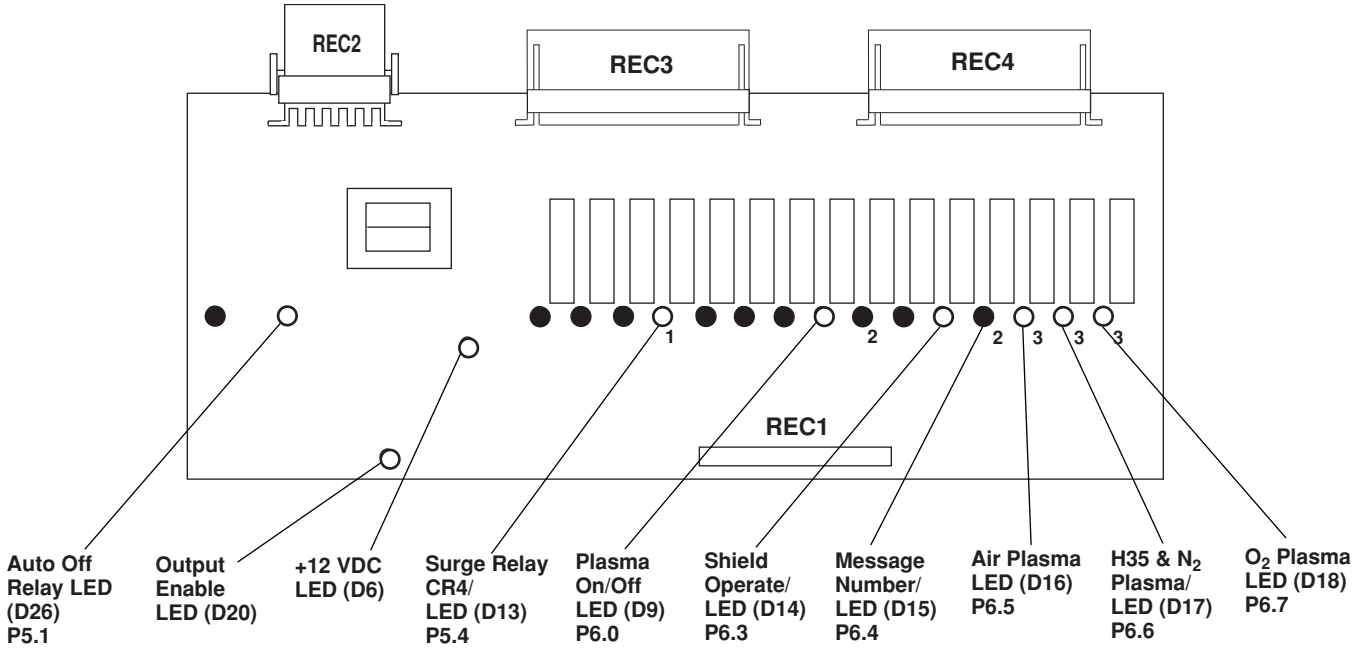
1 – Illuminates when using 50 to 100 amps.

2 – Remains off until any error.

3 – Illuminates when gas is selected.

Figure 5-5 Power Supply Relay Board LED Status (1 of 4)

Power Supply
Relay Board LED Status – Test Cut Flow



LED On

LED Off

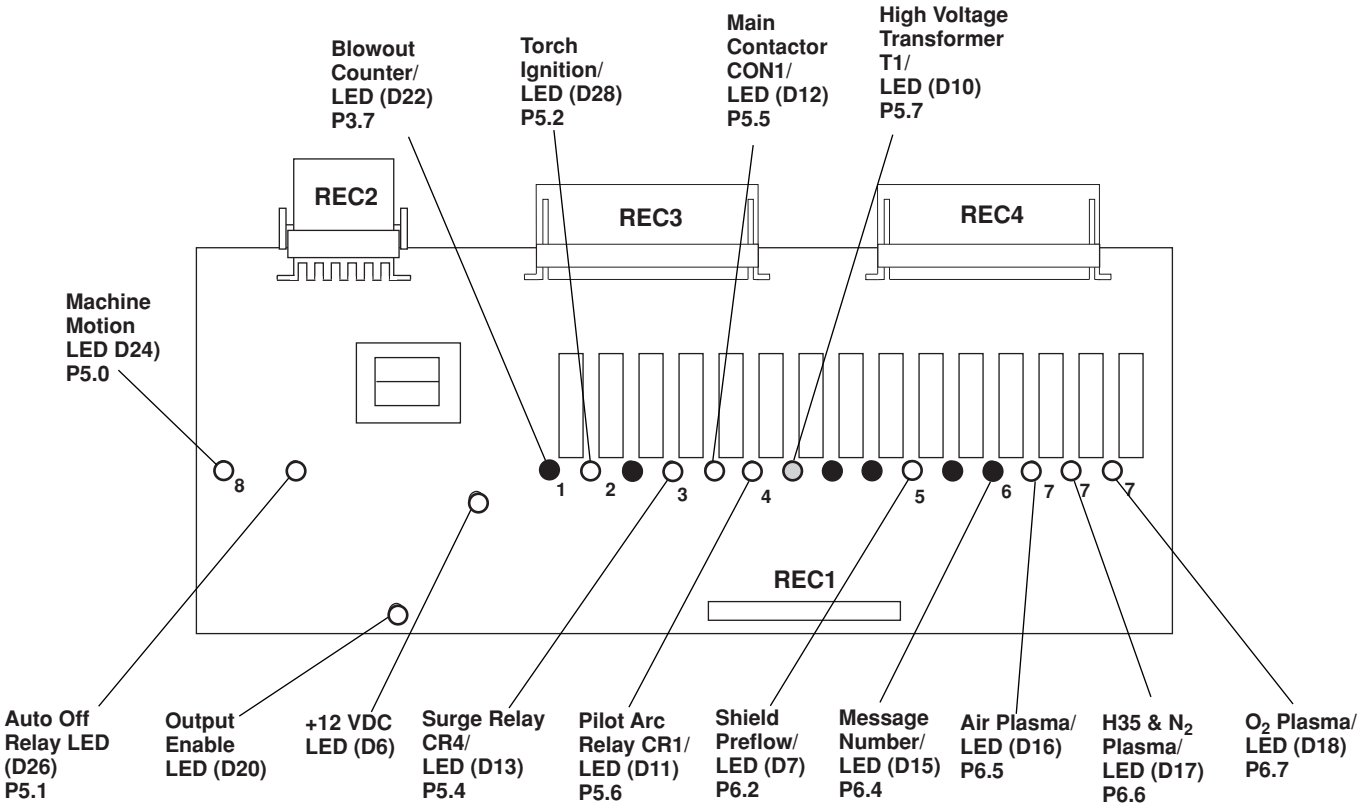
1 – Illuminates when using 50 to 100 amps.

2 – Remains off until any error.

3 – Illuminates when gas is selected.

Figure 5-5 Power Supply Relay Board LED Status (2 of 4)

Power Supply
Relay Board LED Status – Run Preflow



LED On

LED Off

LED Momentarily On

1 – Illuminates when error 7, 8, 9, or 10 occur.

2 – Remains off until any error.

3 – Illuminates when using 50 to 100 amps.

4 – Illuminates at start; goes out after arc transfer.

5 – Illuminates until arc transfer; goes out after arc transfer.

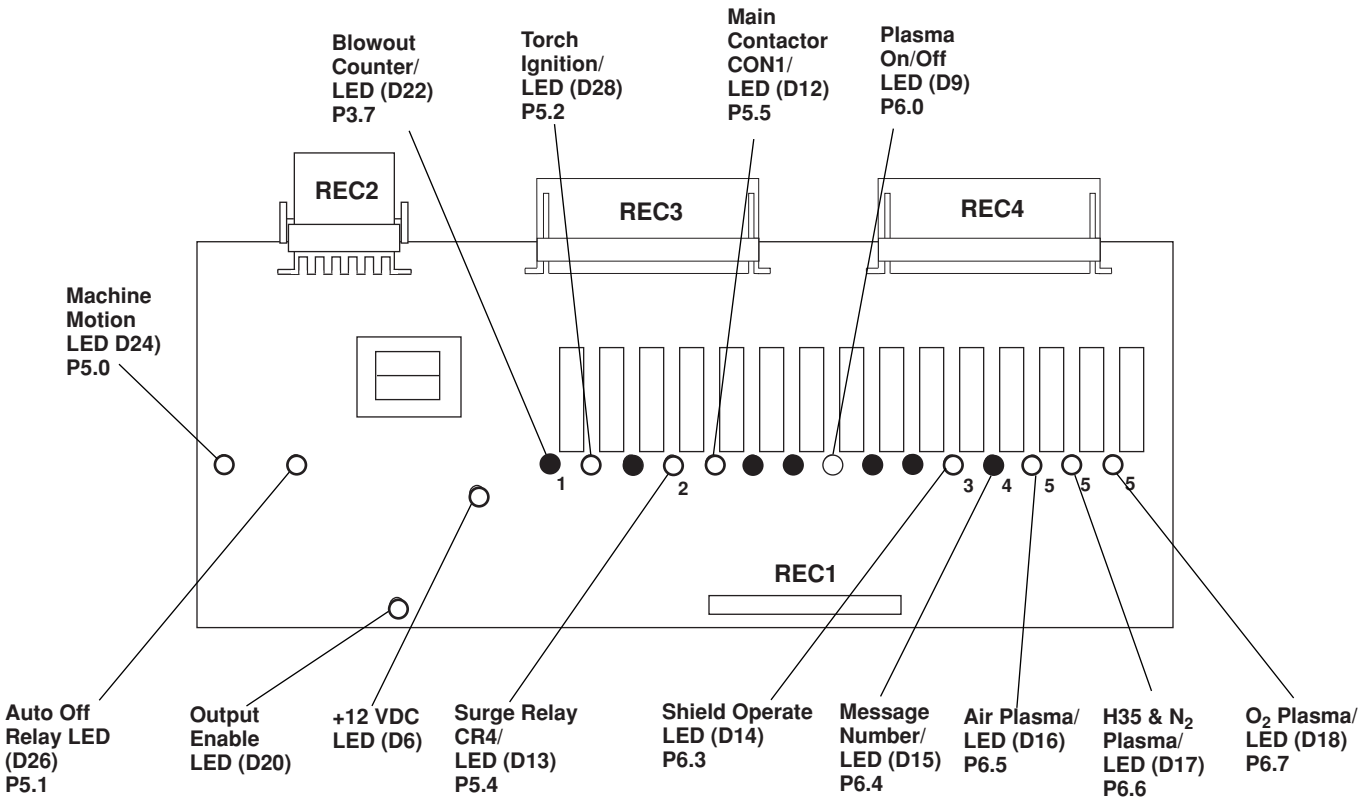
6 – Illuminates at arc transfer.

7 – Illuminates when gas is selected.

8 – Illuminates after arc transfer.

Figure 5-5 Power Supply Relay Board LED Status (3 of 4)

Power Supply
Relay Board LED Status – Run Cutflow



LED On

LED Off

1 – Illuminates when error 7, 8, 9, or 10 occur.

2 – Illuminates when using 50 to 100 amps.

3 – Illuminates after arc transfer and stays on during cut cycle.

4 – Remains off until any error.

5 – Illuminates when gas is selected.

Figure 5-5 Power Supply Relay Board LED Status (4 of 4)

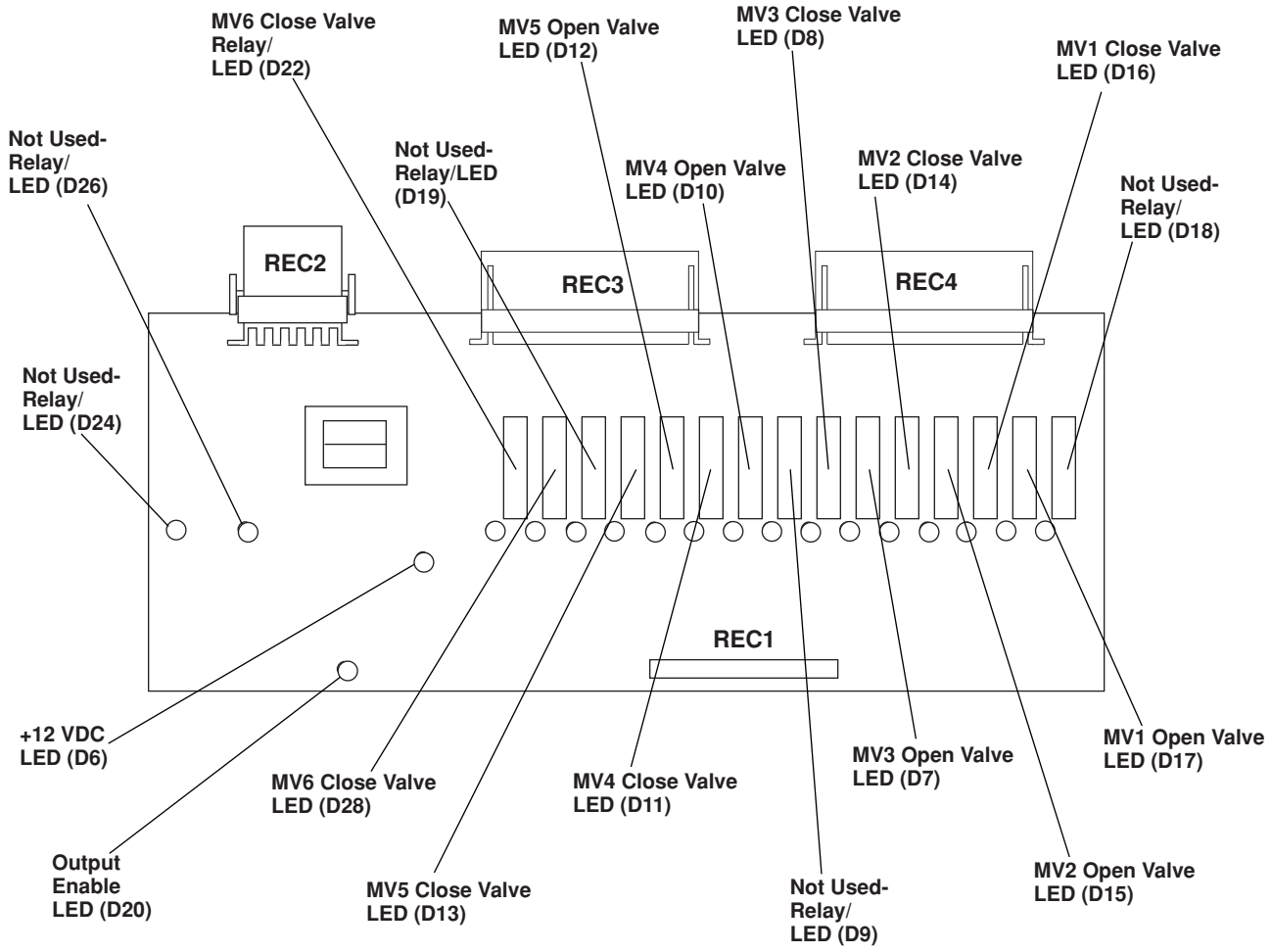
Gas Console

The gas console relay board A2 is an interface between motor valves and the control board (A1). An ON or OFF condition is sent from the control board through REC1 at the bottom of the relay board, which switches one of the relays on A2 to on or off. The corresponding solenoid or external device is then energized or deenergized (output is sent via REC3 or REC4 at the top of the relay board). Figure 5-6 shows the relay locations on (A2) as well as the light emitting diode indicators (LEDs).

Listed below are the pin assignments for REC3 and REC4 of relay board A2:

REC3 Pin #	Description
1	Open MV4 (Out-17) CR4
2	AC Common
3	Close MV4 (Out-16) CR5
5	Open MV5 (Out-15) CR6
6	AC Common
7	Close MV5 (Out-14) CR7
9	CH_4 Gas Sol
10	CH_4 Gas Sol
11	Open MV6 (Out-12) CR18
12	AC Common
13	Close MV6 (Out-11) CR15
15	120 VAC
16	AC Common
REC 4 Pin #	**Description**
3	Open MV1 (Out-24) CR11
4	AC Common
5	Close MV1 (Out-23) CR10
7	Open MV2 (Out-22) CR9
8	AC Common
9	Close MV2 (Out-21) CR8
11	Open MV3 (Out-20) CR1
12	AC Common
13	Close MV3 (Out-19) CR2

Gas Console
Relay Board LED Status



Note: The motor valve (MV) LEDs only illuminates momentarily when valve correction signals are received from the microprocessor.

Figure 5-6 Gas Console Relay Board (A2)

Control Board LED Status Indicators

Power Supply

The control board 1XPCB3 provides LEDs to notify the user when certain voltages are present and when other certain functions occur in the HD3070 system as described below. The power supply front cover must be removed to observe control board and the LEDs (Figure 5-7).

- +5V LED1 – Illuminates to indicate that +5 volts is available to microprocessor.
- Transfer LED2 – Illuminates to indicate that arc current has transferred to workpiece.
- Start LED3 – Illuminates to indicate that a start/run command is active in the system.
- Lock LED4 – Illuminates to indicate that interlocks from power distribution board are okay.
- Error Code LED5 – Flashes to indicate an error, if any, in the last start-stop cycle. The flash is coded to indicate an error number. Refer to *Error Codes and Messages, Power Supply Control Board Error Codes* earlier in this section.
- +12D LED6 – Illuminates to indicate that +12 volts is applied to digital circuitry.
- +12A LED7 – Illuminates to indicate that +12 volts is applied to analog circuitry.
- Current LED8 – Illuminates to indicate that feedback current is at the input to the analog circuit.

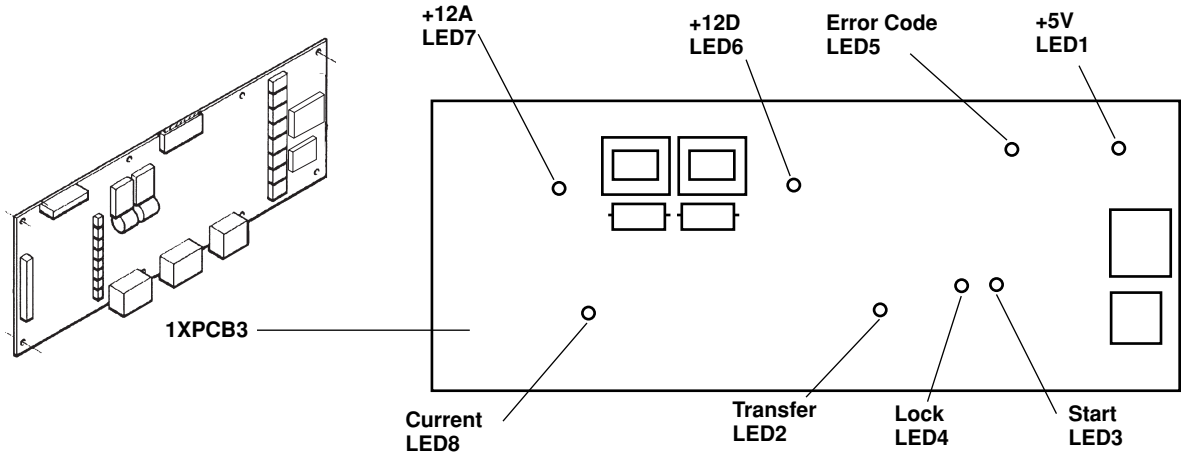


Figure 5-7 Power Supply Control Board LED Locations

Gas Console

The control board A1 provides LEDs to notify the user when certain voltages are present and when other certain functions occur in the HD3070 system as described below. The gas console cover and front panel must be removed to observe the LEDs (Figure 5-8).

- LED1 – Flashes to indicate an error. Refer to *Error Codes and Messages, Gas Console Error Codes* earlier in this section.
- LED2 – Spare (not used.)
- LED3 –Illuminates to indicate that input gas supplies are within correct range of 0.73 – 0.93 MPa, 7.2 – 9.3 bar, 105-135 psig.
- LED4 – Illuminates to indicate that the gas system has no operational errors.
- LED5 – Illuminates to indicate that +12 volts is applied to PCB
- LED6 – Illuminates to indicate that -12 volts is applied to PCB.
- LED7 – Illuminates to indicate that +5 volts is available to microprocessor.

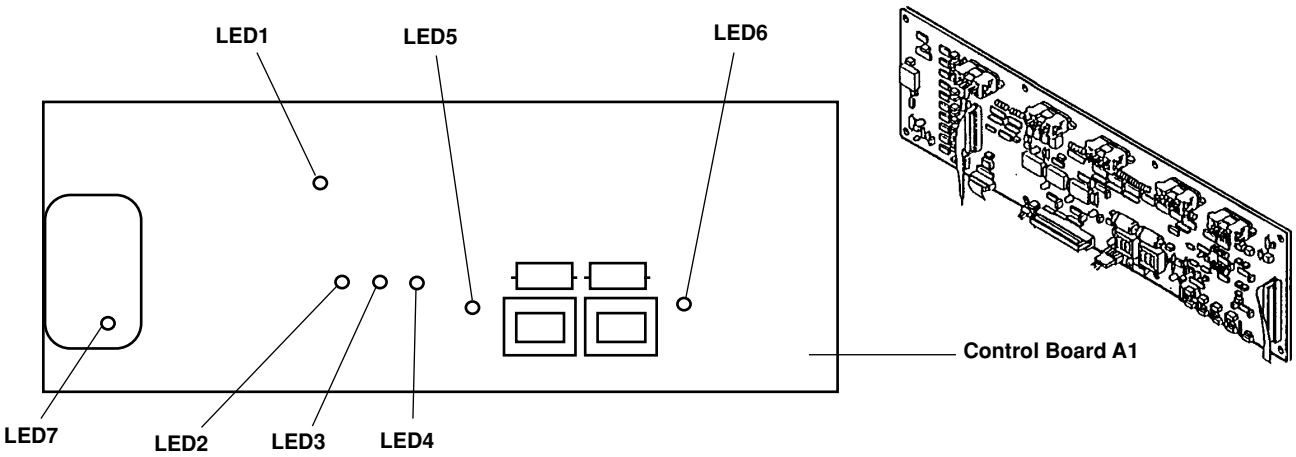


Figure 5-8 Gas Console Control Board LED Locations

Gas System Back Pressure Checks

Use the back pressure checks to find leaks or restrictions in the gas lines and motor valves. The checks can be done when the system is in the test cut or test preflow mode. In the **Test** modes, set the flowrates as indicated below and check the corresponding pressures (± 10% is allowable). The pressures in the **Run** mode are for reference only. **Back pressures in the Run mode may be different than those in the Test modes.** For a low pressure, check for a leak. For a high pressure, check for a restriction in the gas line or a consumable problem. Refer to Figure 4-2 to locate the flowrate set controls; Figure 4-3 for flowrate and pressure readings; *Cut Charts* in Section 4,

Operation for additional information; and to the gas system schematic at rear of manual.

PAC 184 Torch
Mild Steel – Oxygen Plasma – 15 Amp Consumables

	Test Preflow			Test Cut					
	Pressures	Flowrates (%)		Pressures		Flowrates (%)			
						Shield		Plasma	
	Preflow (psi/bar)	O_2 (1) &	N_2 (2)	Plasma (psi/bar)	Shield	O_2 (3) &	N_2 (4)	O_2 (5)	(6)
Test	27/1.9	5	75	70/4.8	17/1.2	30	10	40	—
Run	27/1.9			90/6.2	17/1.2				

PAC 184 Torch
Mild Steel – Oxygen Plasma – 30 Amp Consumables

	Test Preflow			Test Cut					
	Pressures	Flowrates (%)		Pressures		Flowrates (%)			
						Shield		Plasma	
	Preflow (psi/bar)	O_2 (1) &	N_2 (2)	Plasma (psi/bar)	Shield	O_2 (3) &	N_2 (4)	O_2 (5)	(6)
Test	29/2.0	5	75	75/5.2	7/0.5	15	5	46	—
Run	30/2.1			95/6.5	8/0.6				

PAC 186 Torch
Mild Steel – Oxygen Plasma – 15 Amp Consumables

	Test Preflow			Test Cut					
	Pressures	Flowrates (%)		Pressures		Flowrates (%)			
						Shield		Plasma	
	Preflow (psi/bar)	O_2 (1) &	N_2 (2)	Plasma (psi/bar)	Shield	O_2 (3) &	N_2 (4)	O_2 (5)	(6)
Test	25/1.7	5	75	85/5.9	15/1.0	30	10	40	—
Run	26/1.8			99/6.8	15/1.0				

PAC 186 Torch
Mild Steel – Oxygen Plasma – 30 Amp Consumables

	Test Preflow			Test Cut					
	Pressures	Flowrates (%)		Pressures		Flowrates (%)			
						Shield		Plasma	
	Preflow (psi/bar)	O_2 (1) &	N_2 (2)	Plasma (psi/bar)	Shield	O_2 (3) &	N_2 (4)	O_2 (5)	(6)
Test	27/1.9	5	75	77/5.3	9/0.6	15	5	46	—
Run	26/1.8			95/6.5	10/0.7				

PAC 186 Torch
Stainless Steel – Air Plasma – 30 Amp Consumables

	Test Preflow			Test Cut					
	Pressures	Flowrates (%)		Pressures		Flowrates (%)			
						Shield		Plasma	
	Preflow (psi/bar)	Air (1)	(2)	Plasma (psi/bar)	Shield	Air (3)	(4)	Air (5)	(6)
Test	17/1.2	72	0	47/3.2	6/0.4	30	0	60	—
Run	19/1.3			64/4.4	7/0.5				

PAC 186 Torch
Mild Steel – Oxygen Plasma – 50 Amp Consumables

	Test Preflow			Test Cut					
	Pressures	Flowrates (%)		Pressures		Flowrates (%)			
						Shield		Plasma	
	Preflow (psi/bar)	O_2 (1) &	N_2 (2)	Plasma (psi/bar)	Shield	O_2 (3) &	N_2 (4)	O_2 (5)	(6)
Test	27/1.9	5	75	53/3.6	12/0.8	40	0	40	—
Run	28/1.9			78/5.4	12/0.8				

PAC 186 Torch
Stainless Steel – Air Plasma – 50 Amp Consumables

	Test Preflow			Test Cut					
	Pressures	Flowrates (%)		Pressures		Flowrates (%)			
						Shield		Plasma	
	Preflow (psi/bar)	Air (1)	(2)	Plasma (psi/bar)	Shield	Air (3)	(4)	Air (5)	(6)
Test	30/2.1	60	0	70/4.8	59/4.0	80	0	40	—
Run	30/2.1			100/6.9	60/4.1				

PAC 186 Torch
Mild Steel – Oxygen Plasma – 70 Amp Consumables

	Test Preflow			Test Cut				
	Pressures	Flowrates (%)		Pressures		Flowrates (%)		
						Shield		Plasma
	Preflow (psi/bar)	O_2 (1) &	N_2 (2)	Plasma (psi/bar)	Shield	O_2 (3) &	N_2 (4)	O_2 (5) (6)
Test	27/1.9	5	75	79/5.4	42/2.9	0	100	40 —
Run	28/1.9			100/6.9	43/3.0			

PAC 186 Torch
Stainless Steel – Air Plasma – 70 Amp Consumables

	Test Preflow			Test Cut				
	Pressures	Flowrates (%)		Pressures		Flowrates (%)		
						Shield		Plasma
	Preflow (psi/bar)	Air (1)	(2)	Plasma (psi/bar)	Shield	Air (3) &	CH_4 (4)	Air (5) (6)
Test	30/2.1	75	0	64/4.4	13/0.9	40	5	35 —
Run	30/2.1			97/6.7	16/1.1			

PAC 186 Torch
Aluminium – Air Plasma – 70 Amp Consumables

	Test Preflow			Test Cut				
	Pressures	Flowrates (%)		Pressures		Flowrates (%)		
						Shield		Plasma
	Preflow (psi/bar)	Air (1)	(2)	Plasma (psi/bar)	Shield	(3)	CH_4 (4)	Air (5) (6)
Test	30/2.1	75	0	80/5.5	10/0.7	0	40	45 —
Run	30/2.1			105/7.2	13/0.9			

PAC 186 Torch
Mild Steel – Oxygen Plasma – 100 Amp Consumables

	Test Preflow			Test Cut				
	Pressures	Flowrates (%)		Pressures		Flowrates (%)		
						Shield		Plasma
	Preflow (psi/bar)	O_2 (1) &	N_2 (2)	Plasma (psi/bar)	Shield	O_2 (3) &	N_2 (4)	O_2 (5) (6)
Test	37/2.5	10	100	74/5.1	57/3.9	35	90	60 —
Run	38/2.6			99/6.8	58/4.0			

PAC 186 Torch
Stainless Steel – H35 & N_2 Plasma – 100 Amp Consumables

	Test Preflow			Test Cut					
	Pressures	Flowrates (%)		Pressures		Flowrates (%)			
						Shield		Plasma	
	Preflow (psi/bar)	N_2 (1)	& N_2 (2)	Plasma (psi/bar)	Shield	O_2 (3)	& N_2 (4)	H35 (5)	N_2 (6)
Test	22/1.5	45	45	78/5.3	49/3.4	60	60	30	30
Run	24/1.7			95/5.5	50/3.4				

CH130 Chopper Module Test Procedure

Use the following procedure as an aid in troubleshooting the chopper module. Refer to the power unit wiring diagram at rear of this manual.

WARNING

SHOCK HAZARD: Use extreme care when working near the chopper modules. The large electrolytic capacitors (blue-cased cylinders) store large amounts of energy in the form of electric voltage. Even if the power is off, dangerous voltages exist at the capacitor terminals, on the chopper, and the diode heatsinks. Never discharge the capacitor(s) with a screwdriver or other implement…explosion, property damage and/or personal injury will result.

1. Turn all power to the HD3070 OFF.
   Disconnect mating receptacles in the RHF console to disable the high frequency transformer T1. See Figure 6-11 for location of T1.
   Note: RHF console door must be re-shut before attempting to start system.

2. Remove large fuse F4 and check for open. See Figure 6-6 for location of fuse.

3. Place the positive lead to the **+** side of the bridge and the negative lead to the **–** side of the bridge. See Figure 5-9. Note that actual connection points are hidden by the cap support bracket in Figure 5-9.

4. Turn power to the HD3070 ON, and start system up. After the START command has been given, check voltage. The input to the chopper at these points should be about +280 VDC.

   If the input is OK and fuse F4 was blown, replace the chopper module.

   If there is no +280 VDC input, check input to bridge for shorts. Also, check contactor (CON1), connections and associated wiring to the contactor. Repair and/or replace defective component(s) if necessary.

5. If voltage from step 4 is +280 VDC and corresponding fuse is not blown, check the chopper output at TB1 by placing the positive lead of the voltmeter at the (+) WORK terminal (#48A output cable) and the negative lead at the (-) TORCH terminal (#39A output cable). See Figure 5-9.

6. Turn the system on and press the START command. After the START command has been given, check the voltage. If the output from the chopper at these points is +280 VDC, the chopper is OK.

7. If the chopper does not output +280 VDC, check to see if LED1 logic power light is on. If LED1 is not on, check if 120V is going to JP6. If there is no 120V at JP6, check wiring back to power distribution board. Repair or replace defective component(s), if necessary.

   Also check to see if LED3 is turning green when enabled (normal condition). If LED1 is on and LED3 is red when enabled (fault condition), then make sure that JP9 is seated properly. If JP9 is connected, disconnect one side of the thermo switch wire (TS1) and try again. If voltage comes up and LED3 turns green, the unit is either too hot or thermo switch is shorted. Allow unit to cool and repeat test. If LED3 still turns green, replace chopper module.

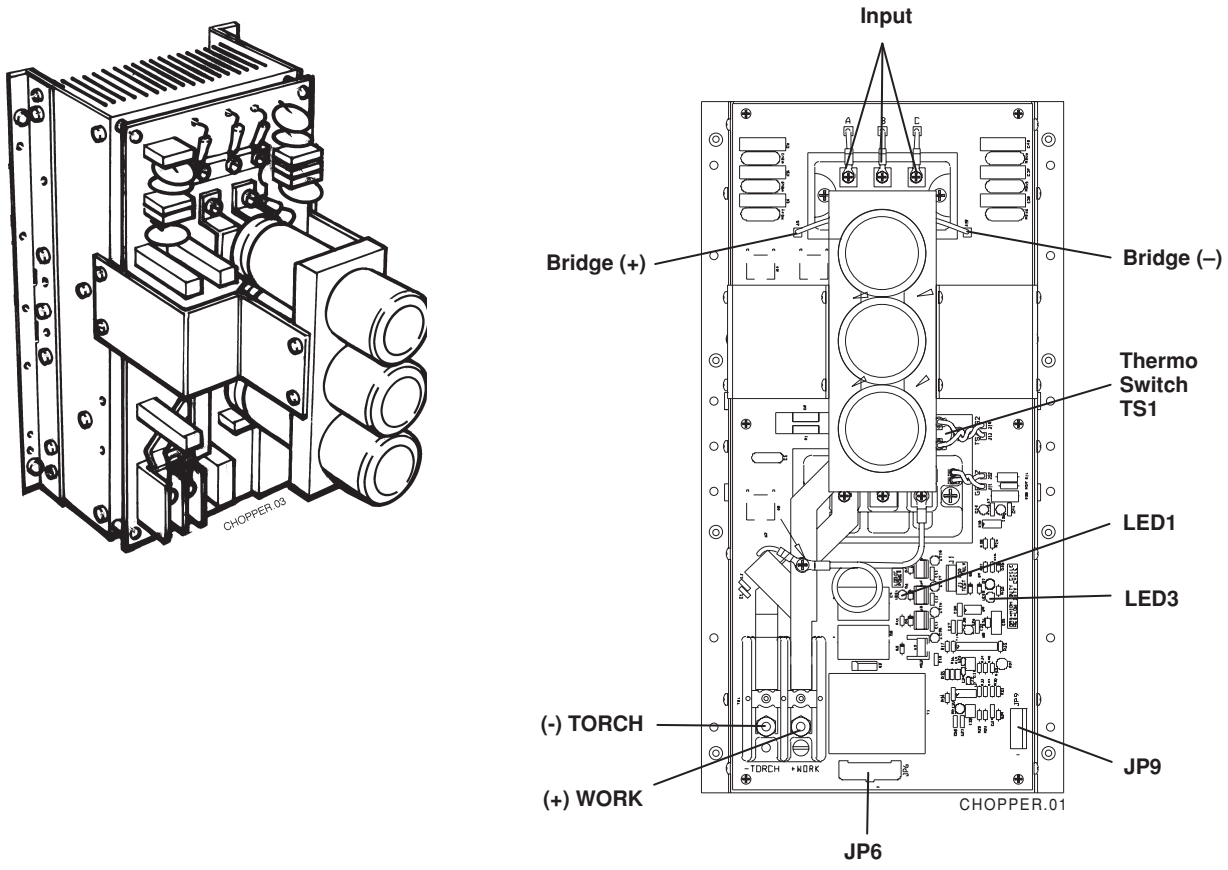


Figure 5-9 CH130 Chopper Module – Front View

8. If chopper still does not output 280V after completing step 7, there may be a problem with the control signal or the chopper module. The chopper drive signal comes from control board 1XPCB3 as an analog level from 0 to +8 VDC, which varies the duty cycle and subsequent output current of the chopper. These analog signals are on pins 5 & 6 of REC3 on control board 1XPCB3. See Figure 6-2 for location of 1XPCB3.

   To determine if there is a problem with the chopper module or control board 1XPCB3, proceed as follows:

   - Ensure that high frequency is still disabled (see step 1).
   - Place voltmeter across output terminals of chopper (positive lead to (+) WORK and negative lead to (-) TORCH and press the START command.
   - If the voltmeter reads +280 VDC, then replace control board 1XPCB3.
   - If the voltmeter reads 0 volts, then replace chopper module.

Torch Maintenance

WARNING

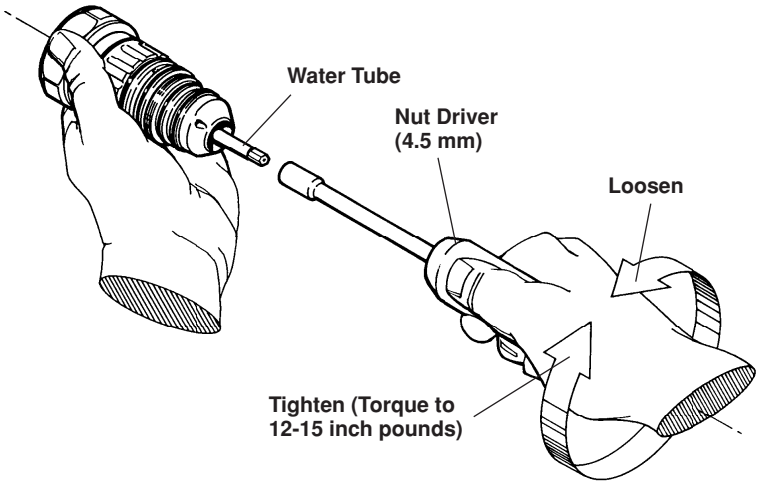
Turn off all power to the HyDefinition system before working on the torch. Always press the power unit OFF (O) pushbutton switch and set the line disconnect switch to OFF. Lock-out and tag-out switch.

PAC186 Water Tube Removal and Replacement

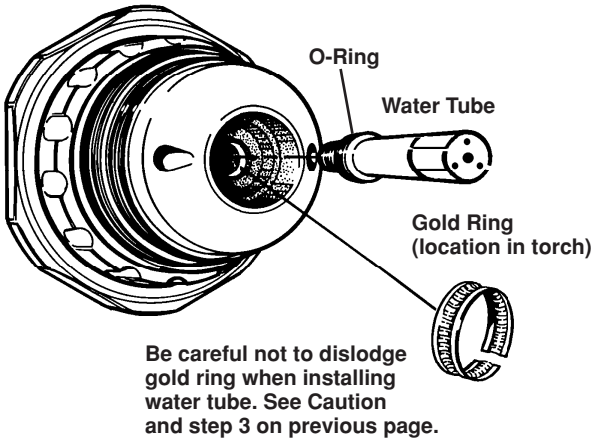
1. Use the nut driver (4.5 mm), located in consumable parts kit, to remove water tube from torch (Figure 5-10).
2. Carefully unscrew the water tube in a counterclockwise (ccw) direction.

Caution: While cleaning the inside of the torch in step 3 below, be very careful not to dislodge the gold band from the groove inside the torch. If this happens internal arcing damage will occur.

3. After the water tube has been removed, clean the inside of the torch using low pressure compressed air or water. Carefully clean out the seat area of the water tube of any residue using a cotton swab. Be careful not to dislodge the gold band from the groove. If the gold ring gets dislodged, reinstall it by referring to Figure 5-10.
4. Apply a light coat of silicone to the O-ring located at the base of the new water tube.
5. Screw the new water tube into the torch clockwise (cw) and tighten with nut driver. Torque to 12-15 inch pounds. **Do not over tighten.**



Loosening and Tightening Water Tube



Install New Water Tube

Figure 5-10 Water Tube Removal and Replacement

Bullet Connector Removal and Replacement

1. If the bullet connector is not broken, use 9/32-inch nut driver to remove the connector (Figure 5-11).

2. If the bullet connector is broken off so that a nut driver cannot be used to remove the connector, use a three-sided file with a tapered end or a similar tool that will provide a grip.

3. Apply a light coat of silicone to the O-rings on the bullet connector.

4. Screw the replacement bullet connector into the receptacle and tighten with nut driver to **3 in - lbs (3.5 kg-cm). Do not over tighten.**

High Current Contact Removal and Replacement

1. Grab the high current contact with the tweezers and pull off stud (Figure 5-11).

2. Replace by pushing the high current contact into the slot on the stud.

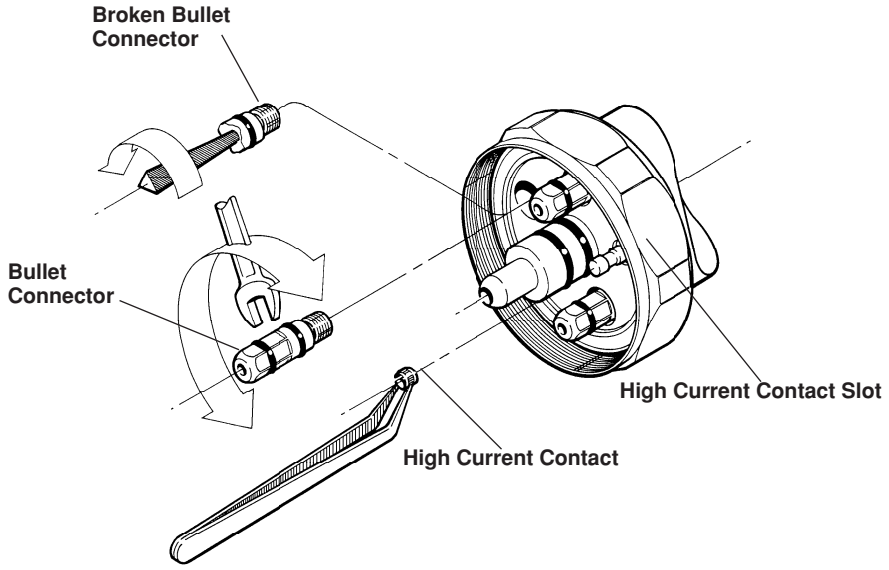


Figure 5-11 Bullet Connector and High Current Contact Removal and Replacement

Hypertherm

Section 6

PARTS LIST

In this section:

Introduction

In this section, a parts breakdown with supporting illustrations for the units which comprise the HD3070 system is given. Part numbers for cables, hoses, and lead sets are also given.

Power Supplies

078072 – 200 VAC, 3 Phase, 50/60 Hz
078073 – 208 VAC, 3 Phase, 60 Hz
078074 – 220/380/415 VAC, 3 Phase, 50/60 Hz
078075 – 240/480 VAC, 3 Phase, 60 Hz
078076 – 600 VAC, 3 Phase, 60 Hz

Power Supply – Control Panel

Item	Part Number	Description	Designator	Qty.
	029947	**HD3070 Enclosure SA**		**1**
	029988	**HD3070 Enclosure SA (for 220/380/415V units)**		**1**
1	001512	Panel, control		1
2	008786	Knob (used on item 11)		1
3	008787	Knob Lock, (used on item 11)		1
4	005088	Holder, lamp		1
5	005168	Bulb, 28VDC, .08 MA T3-1/4		1
6	005091	Cap, red		1
7	005122	Pushbutton, 2 NC, red, extended	PB2	1
8	005121	Pushbutton, 2 NO, green, illmn.	PB1/LT1	1
9	**041545**	**PC BD Assy, interlock display**	**1XPCB5**	**1**
	029977	**Thumbwheel SA, current**		**1**
10	005182	Switch, 3-position BCD	S1	1
	029394	**Potentiometer SA**		**1**
11	009604	Res, variable, 100KΩ, 2W 10% 1 turn	P1	1

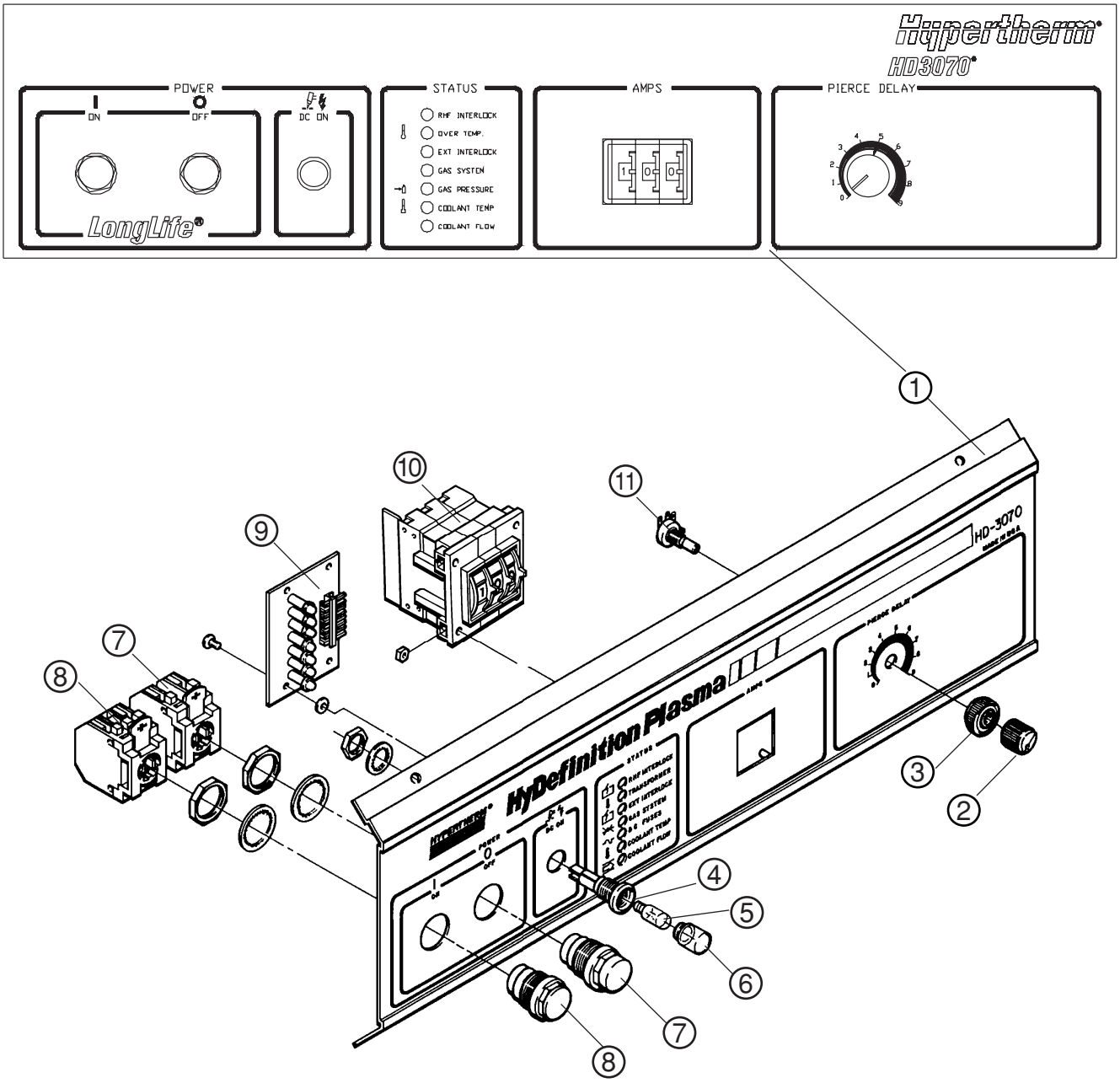


Figure 6-1 Power Supply – Control Panel

Power Supply – Front Exterior

Item	Part Number	Description	Designator	Qty.
	029946	**HD3070 Enclosure SA**		**1**
1	041246	PC BD assy, relay	1XPCB4	1
2	003113	Relay, DPDT, 12V Coil	CRE	1
3	003142	Relay, DPDT, 120 VAC	CRF, CRG	2
4	041349	Power source, 12V 2.1A		1
5	041752	PC BD assy, controller	1XPCB3	1
	081077	Firmware		1
	129307	**Fan Assembly**		**1**
6	027080	Fan, 225 CFM, 120 VAC, 50/60 Hz	M2	1
	027568	Fan Guard (not shown)		1
	129308	**Fan Assembly**		**1**
7	027079	Fan, 450-550 CFM, 120 VAC, 50/60 Hz	M4	1
	027567	Fan Guard (not shown)		1

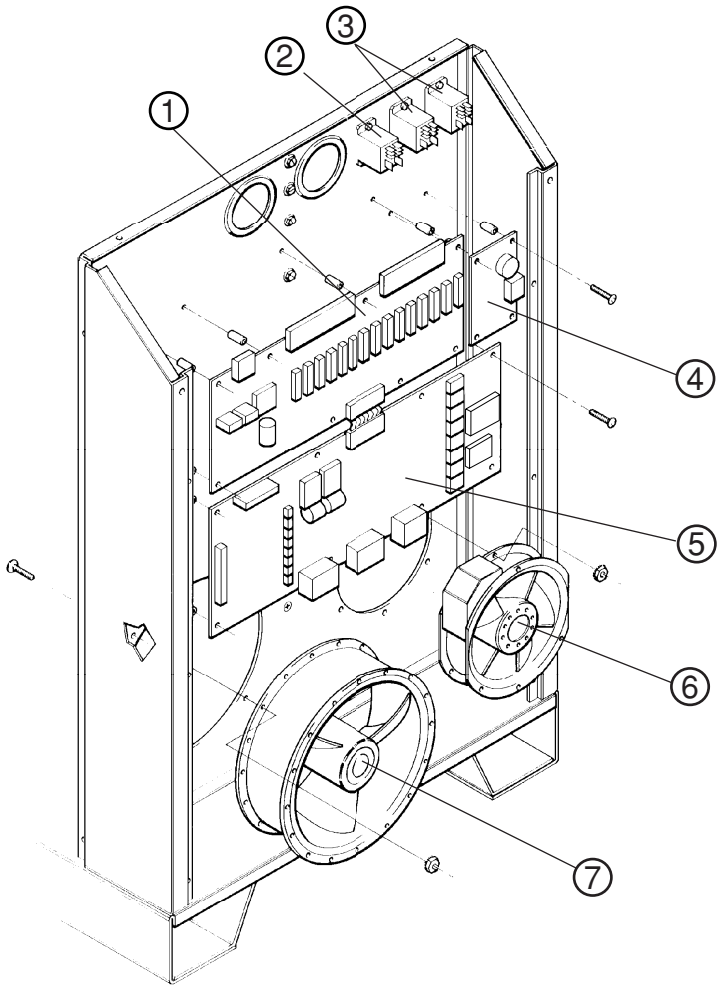
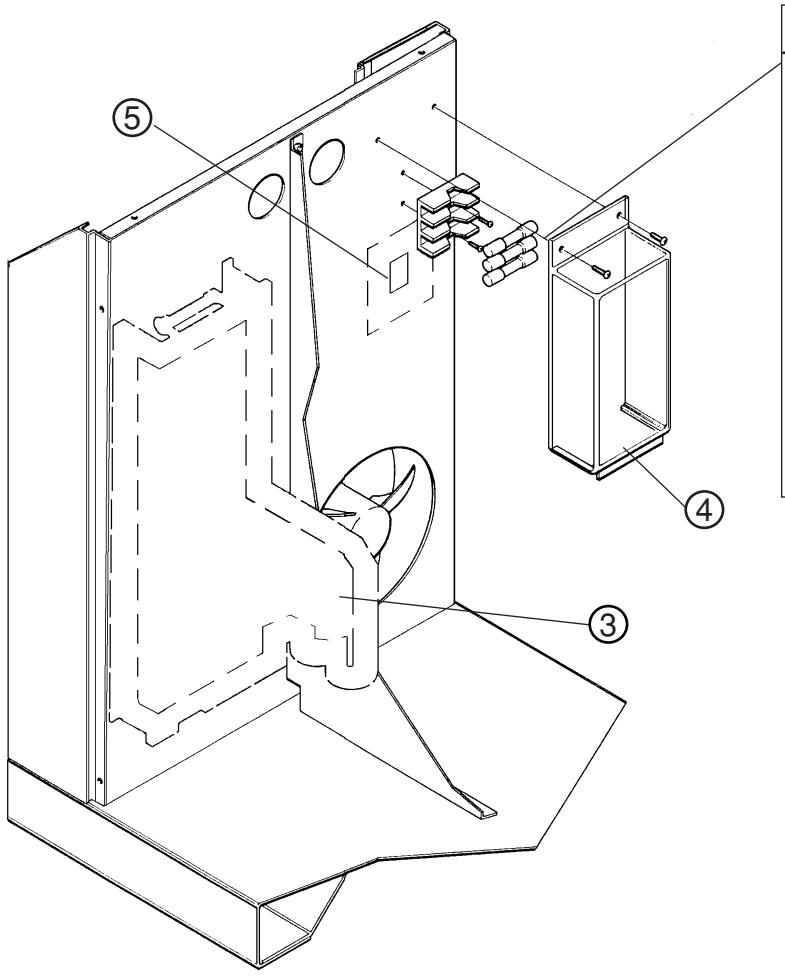


Figure 6-2 Power Supply – Front Exterior

Power Supply – Front Interior, Right and Left Sides

Item	Part Number	Description	Designator	Qty.
1	008709	Fuse, 20A 500V 13/32 X 1-1/2 slow blow	see chart below	
2	008551	Fuse, 7.5A 600V 13/32 X 1-1/2	see chart below	
	029947	**HD3070 Enclosure SA**		**1**
	029988	**HD3070 Enclosure SA (for 220/380/415V units)**		**1**
3	**129118**	**Chopper SA, CE/LVD 15KW (Fig 6-4)**	**CH130**	**1**
4	002217	Shield cover (used with item 5)		1
5	**029626**	**Linkboard SA, 240-480V (see Fig 6-5)**	**LB1**	**1**



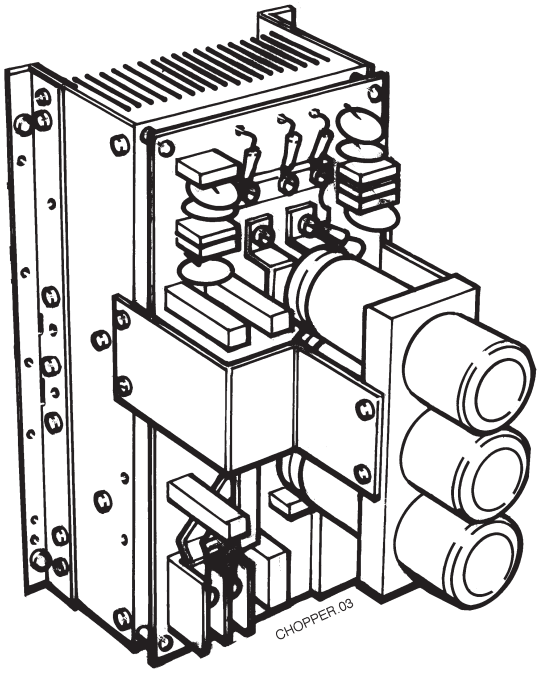
1, 2 Input Power Fuse Chart

Power Unit	F1	F2	F3
240/480V (078020)	20A	20A	7.5A
208V (078026)	20A	20A	
220/380/415V (078027)	20A	7.5A	7.5A
600V (078028)	7.5A	7.5A	
200V (078029)	20A	20A	

Figure 6-3 Power Supply – Front Interior, Right and Left Sides

Power Supply – CH130 Chopper SA

Item	Part Number	Description	Designator	Qty.
	029947	**HD3070 Enclosure SA**		**1**
	029988	**HD3070 Enclosure SA (for 220/380/415V units)**		**1**
	129118	**Chopper SA, CE/LVD 15KW**	**CH130**	**1**
1	005199	Switch, temperature 82° C	TSW1	1
2	041564	PC BD assy, phase loss protection		1



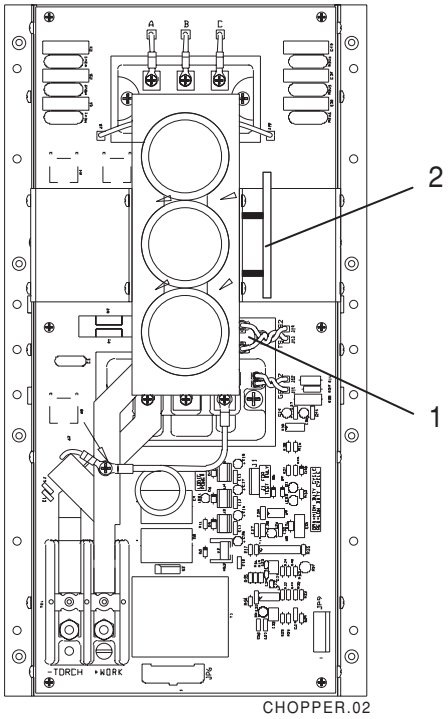
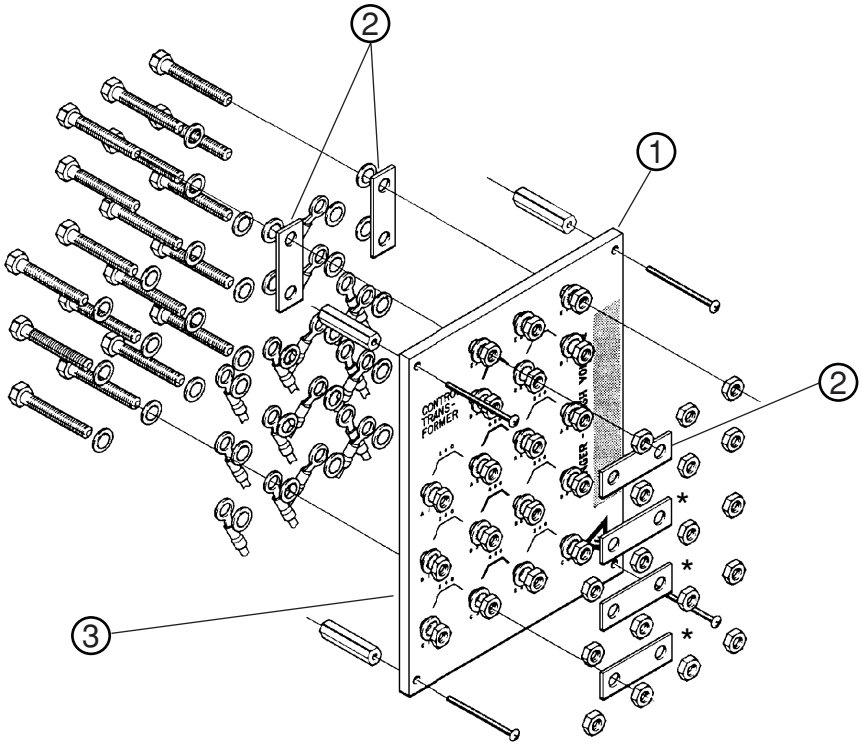


Figure 6-4 Power Supply – CH130 Chopper SA

Power Supply – Linkboard Subassemblies

240/480V Linkboard

Item	Part Number	Description	Designator	Qty.
	029626	**Linkboard SA, 240-480V**	**LB1**	**1**
1	004244	Linkboard, 240-480V		1
2	004245	Link, short		9
3	004246	Link, long (on rear of linkboard)		1



*** The linkboard is shipped with two links in each of the positions denoted by asterik.**

Figure 6-5 Power Supply – Linkboard Subassemblies (Sheet 1 of 2)

Power Supply – Linkboard Subassemblies

220/380/415V Linkboard

Item	Part Number	Description	Designator	Qty.
	029987	**Linkboard SA, 220/380/415V**	**LB1**	**1**
1	004683	Linkboard, 220/380/415V		1
2	004245	Link, short		8
3	004600	Link, MAX70		1
4	004684	Link, long (on back of linkboard		1

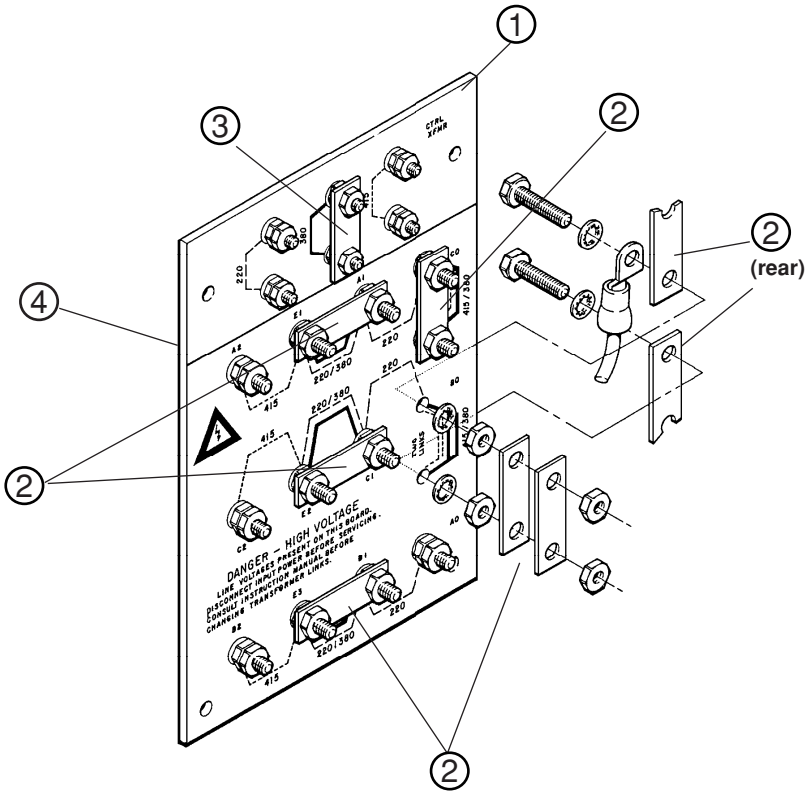


Figure 6-5 Power Supply – Linkboard Subassemblies (Sheet 2 of 2)

Power Supply – Center Panel and Bottom, Right Side

Item	Part Number	Description	Designator	Qty.
	029947	**HD3070 Enclosure SA**		**1**
	029988	**HD3070 Enclosure SA (for 220/380/415V units)**		**1**
1	**041544**	**PC BD assy, power distribution**	**1XPCB2**	**1**
2	003021	Relay, 120 VAC NO SPST	CR4	1
3	009685	Resistor, 15 ohms, 50W, 5%	R2A, R2B	2
4	003113	Relay, DPDT, 12V Coil	CRA, CRB	2
5	003074	Relay, DPDT, 24 VAC, 10A	CRC	1
6	003142	Relay, DPDT, 120 VAC	CRD	1
7	003133	Contactor, HD1070, 50A, 3Ph, 120V coil	CON1	1
	003065	Switch, contact aux, 4A NO		2
8	009296	Capacitor, Ele 100 uf 350 VDC	C1	1
9	009015	Resistor, 10k ohms, 10W, 5%	R1	1
10	008317	Fuse, 125A semiconductor	F4	1
11	**029316**	**Terminal Block SA, incoming power**	**TB1**	**1**
12	014043	Inductor, 4 mh, 100A DC	L1	1
13	007022	Shunt, 100A, 100 MV	R3	1

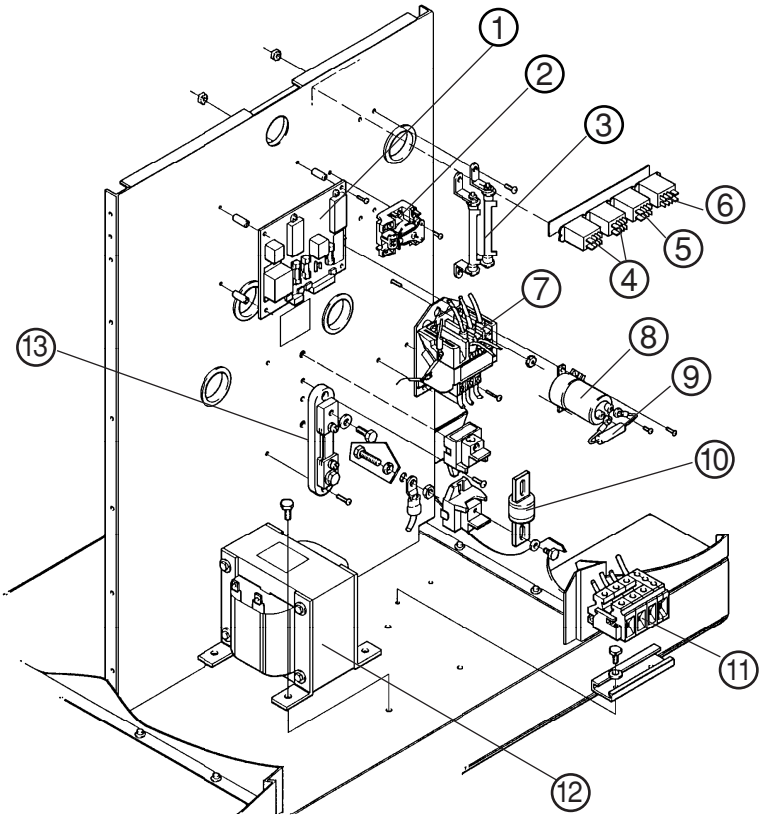


Figure 6-6 Power Supply – Center Panel and Bottom, Right Side

Power Supply – Center Panel and Bottom, Left Side

Item	Part Number	Description	Designator	Qty.
1	014068	Transformer, 15 KW, 240-480/3/60	T2	1
	014065	Transformer, 15 KW, 220-380-415/3/50-60		
	014069	Transformer, 15 KW, 200/3/50-60		
	014066	Transformer, 15 KW, 208/3/60		
	014067	Transformer, 15 KW, 600/3/60		
	029624	**Control Transformer SA, 240-480V**		
2	014079	Transformer, control 240-480V/60	T1	1
	029690	**Control Transformer SA, 220-380-415V**		
	014081	Transformer, control 220-380-415V/50-60		
	029671	**Control Transformer SA, 200V & 208V**		
	014110	Transformer, control 200V/50 Hz & 208/60		
	029711	**Control Transformer SA, 600V**		
	014083	Transformer, control 600V/60		
	029947	**HD3070 Enclosure SA**		**1**
	029988	**HD3070 Enclosure SA (for 220/380/415V units)**		**1**
3	003021	Relay, 120 VAC NO SPST	CR1	1

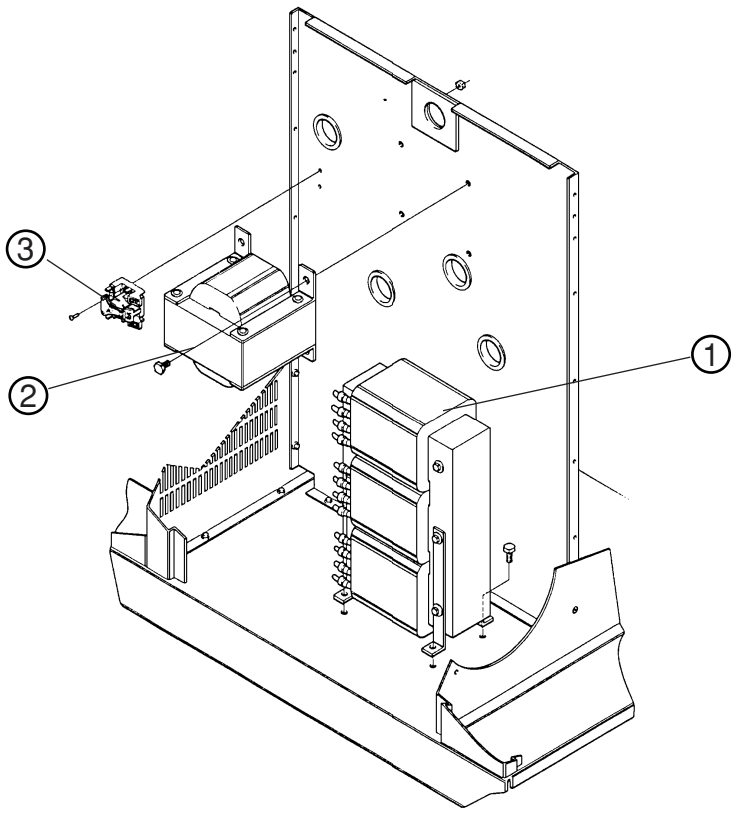


Figure 6-7 Power Supply – Center Panel and Bottom, Left Side

Power Supply – Rear Interior, Right and Left Sides

Item	Part Number	Description	Designator	Qty.
	029947	**HD3070 Enclosure SA**		**1**
	029988	**HD3070 Enclosure SA (for 220/380/415V units)**		**1**
1	041274	PC BD assy, ISO amp	1XPCB5	1
	129172	**Harness SA**		**1**
2	008079	Terminal board, 12 terminals	TB2	1
3	008063	Terminal board, 3 terminals	TB3	1
4	108049	Fuse, FLQ30 time delay, 30 amp	F5	1
5	129264	Assembly, pilot arc circuit		1
6	**029623**	**HF I/O Panel SA (see Fig 6-9)**		**1**

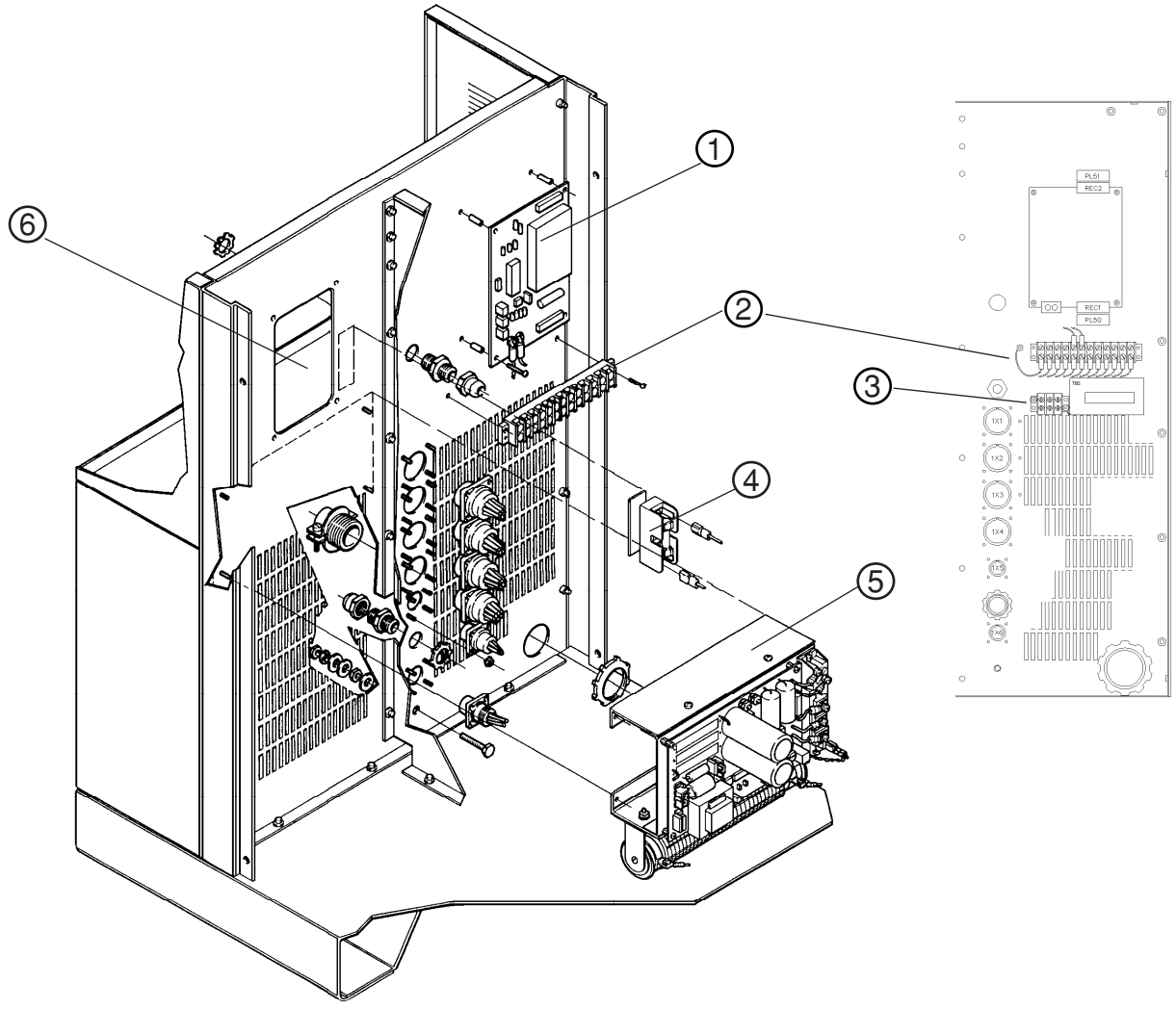


Figure 6-8 Power Supply – Rear Interior, Right and Left Sides

Power Supply – HF I/O Panel SA

Item	Part Number	Description	Designator	Qty.
	029947	**HD3070 Enclosure SA**		**1**
	029988	**HD3070 Enclosure SA (for 220/380/415V units)**		**1**
	029623	**HF I/O Panel SA**		**1**
1	001350	Panel I/O		1
2	**041291**	**PC BD assy, I/O**	**1XPCB1**	**1**
3	108049	Fuse, FLQ30 time delay, 30 amp	F5	1
	029202	**Current Sensor SA**		**1**
4	009373	Current sensor	CS1	1

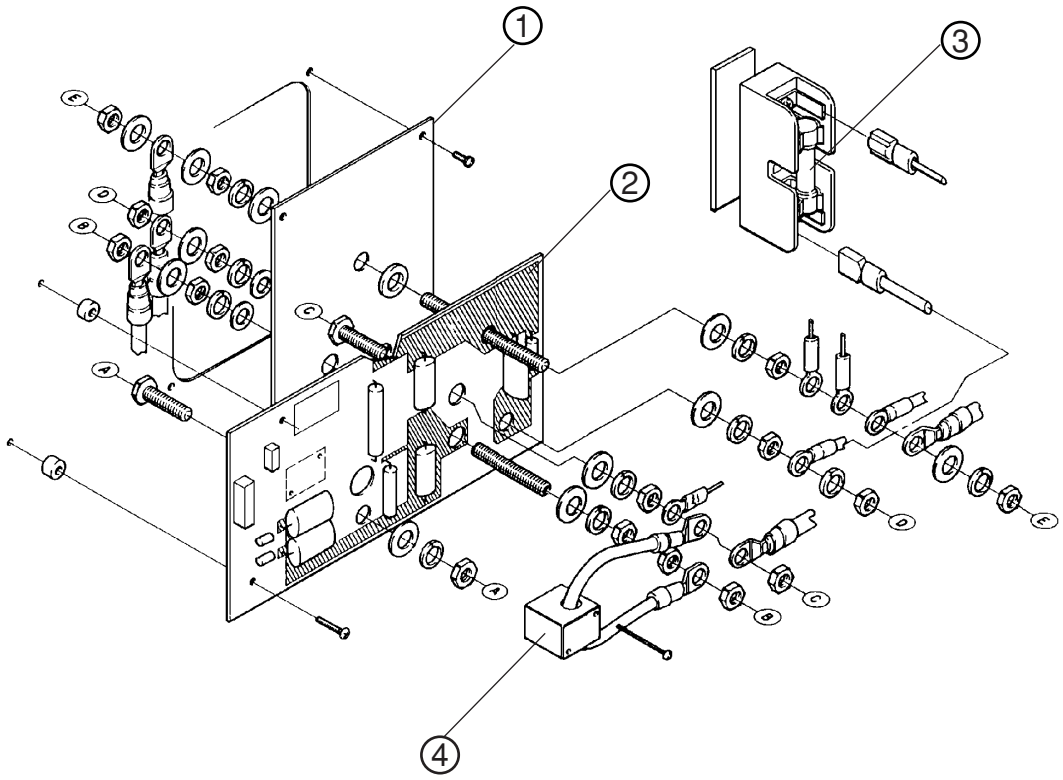


Figure 6-9 Power Supply – HF I/O Panel SA

Power Supply – Rear Exterior

Item	Part Number	Description	Designator	Qty.
	029946	**HD3070 Enclosure SA**		**1**
	029986	**HD3070 Enclosure SA (for 220/380/415V units)**	**1**	
	129252	**Water Pump SA**		**1**
1	128385	Kit, Replacement motor, 1/3 HP	M1	1
2	128384	Kit, Replacement pump, 70 GPM	P1	1
3	031122	Drive coupling, Pump to motor		1
4	129474	Flow switch SA, 0.5 gpm	FS1	1
	029634	**Heat Exchanger SA**		**1**
5	027136	Heat exchanger water/air (includes four fans M4 - M7)	HX1	1
	129253	**Water Filter SA**		**1**
6	027139	Filter housing, 10" X 3/4 NPT		1
7	027005	Filter, element particulate		1
8	002304	Reservoir, coolant		1
9	022036	Gauge, liquid level		1
10	006099	Drain valve, 1/4 NPT		1
11	129618	Level Switch SA (w/ elec connector)	LS1	1
12	029323	Water Temp Switch SA (w/ elec connector)	TS2	1
	129251	**Shutoff Valve SA (includes fittings)**		**1**
13	006108	Shutoff valve, 1/4 FPT		1
14	006075	Check valve, 1/4 NPT		2

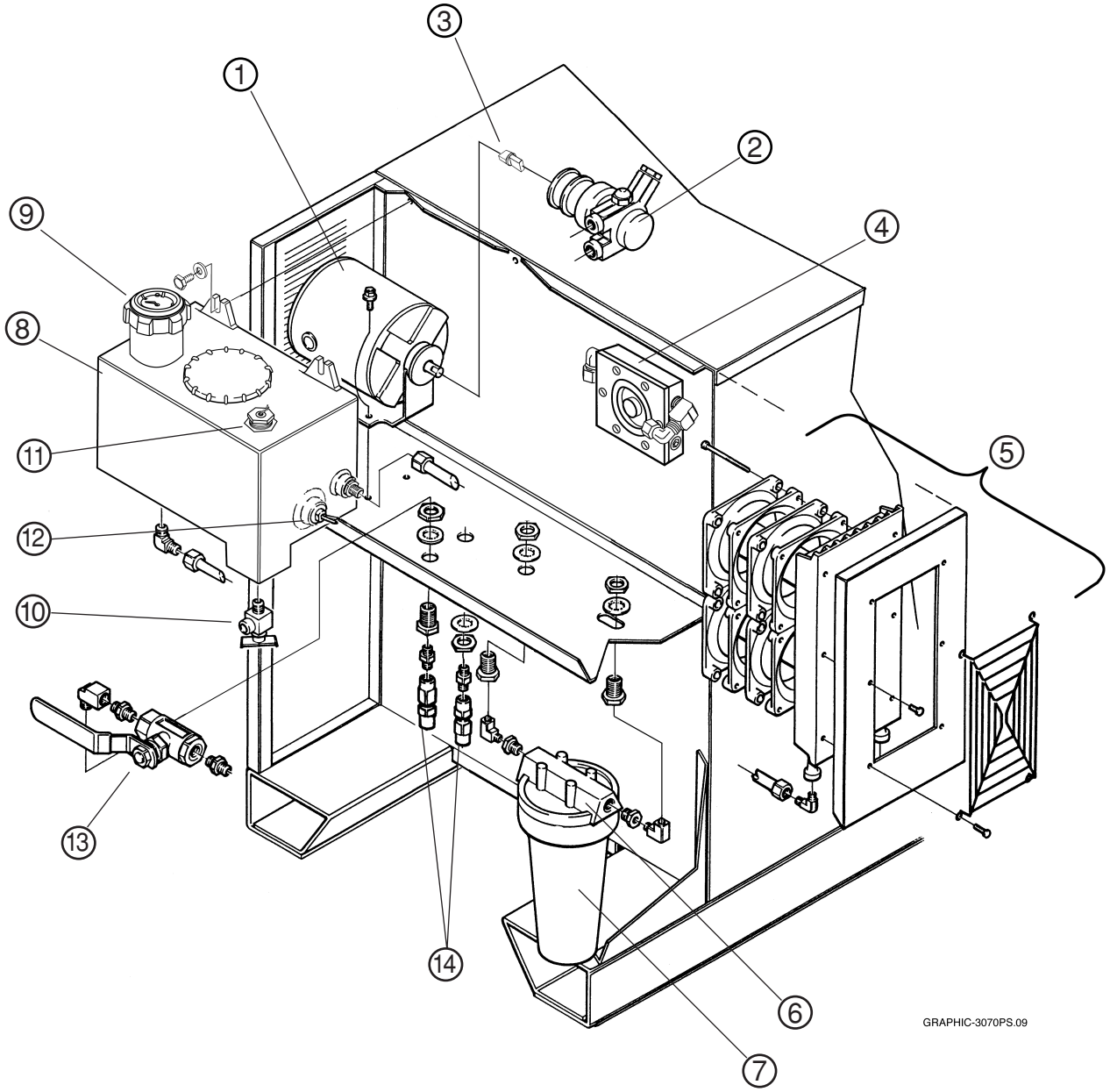
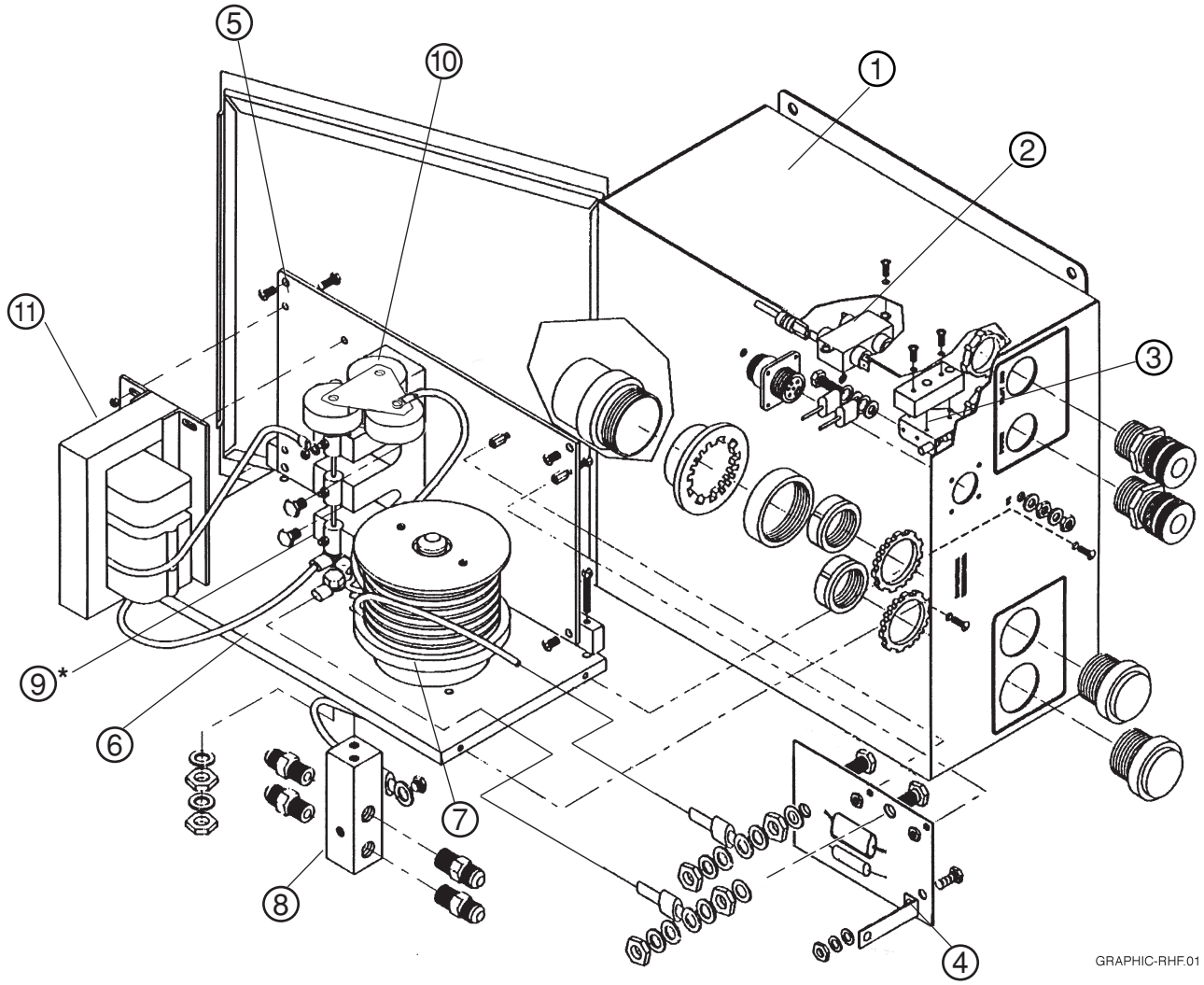


Figure 6-10 Power Supply - Rear Exterior

RHF Console

Item	Part Number	Description	Designator	Qty.
	078010	**Console, RHF**		**1**
1	002227	Enclosure, RHF console		1
2	009045	Filter, AC, 1 amp 1Bl	FL1	1
3	005100	Switch, limit door interlock	S1	1
4	**041578**	**PC BD assy, HD plasma**	**PCB1**	**1**
5	001447	Panel, RHF console		1
6	001429	Panel, RHF console enclosure		1
7	009756	Coil assy, HD plasma	T2	1
8	004502	Manifold, RHF cathode		1
	009979	**Spark Gap Assy**	**SG1**	**1**
9	004061	Electrode, spark gap 1/8 X 1.6		3
10	009995	Capacitor, 4000 pF, 20 kV		3
11	129199	Transformer SA, 6 kV	T1	1



*** Set spark gap with clean feeler gauge to 0.020 ± 0.001 inch (0.51 ± 0.03 mm). Clean electrodes a with diamond file.**

Figure 6-11 RHF Console

Automatic Gas Console – Front Panel

Enclosure, Front Panel and Interior

Item	Part Number	Description	Designator	Qty.
	078061	**Console, automatic gas**		
1	001653	Panel, control		1
2	005156	Switch, toggle SPDT, ON/OFF/ON		1
3	005156	Switch, toggle SPDT, ON/OFF/ON		1
4	029862	LCD display subassembly	A10	1
5	007032	Bezel, LCD display module		1
	129292	**Harness subassembly (ref.)**		1
6	009807	Potentiometer, 500 Ω 2W 5% 10T WW	P1 thru P6	6
7	008786	Knob, .007 dia 1/4 SFT matte		6
	008787	Knob lock (for 008786)		6
8	041579	PCB assy, gas control	A1	1
	081033	Firmware, Rev A	U1	1
9	001652	Enclosure		1
	001651	Enclosure cover		1
10	027327	Fan, muffin 3-5/8 inch, 120V	M1	1
11	027328	Filter (for 027327)		1
12	014162	Transformer, 24 VCT @ 0.25A, 120V	T1	1
13	041329	PCB assy, LCD display	A9	1
14	041559	PCB assy, gas valve	A8	1
15	041246	PCB assy, relay	A2	1

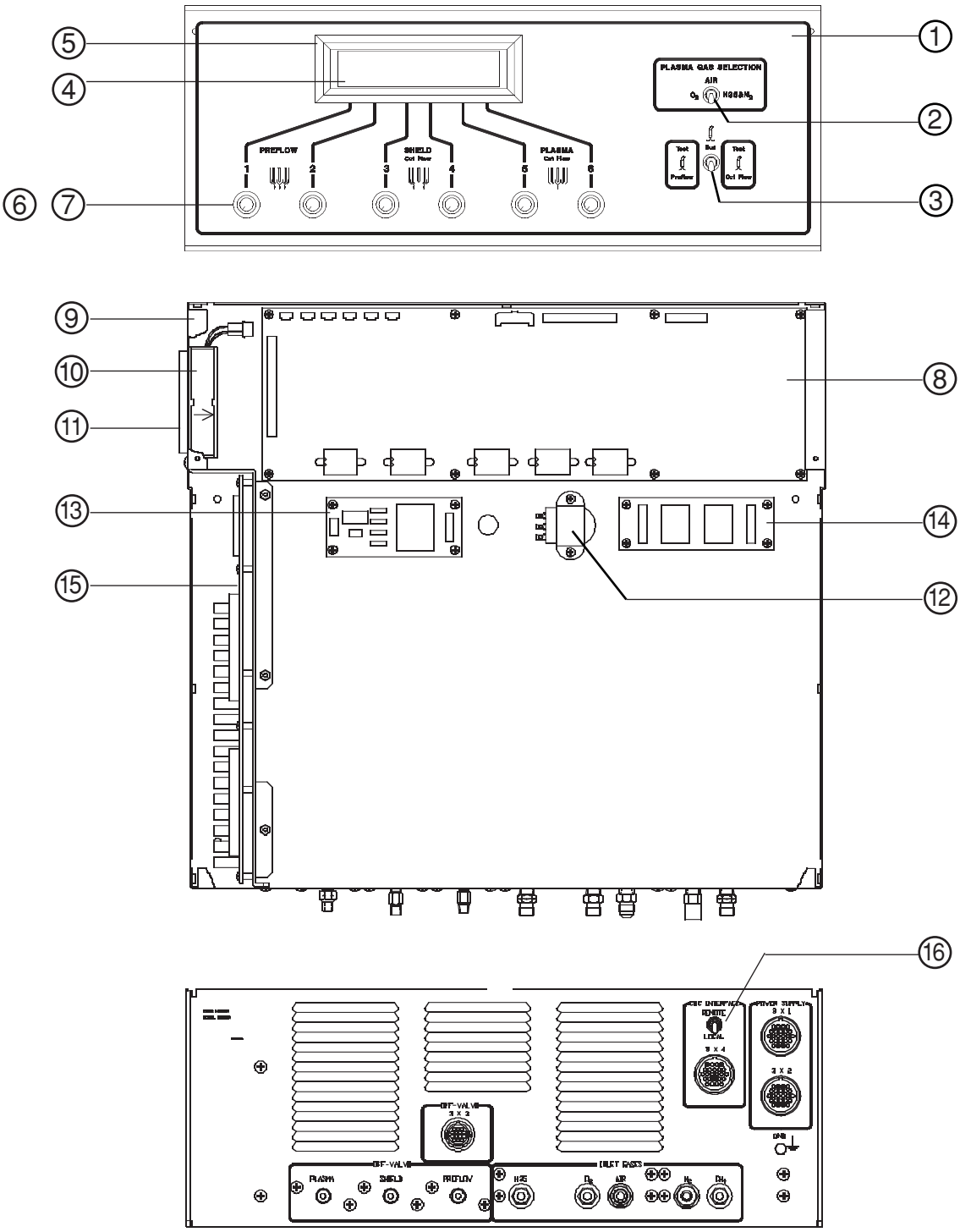


Figure 6-12 Enclosure Front Panel and Interior

Automatic Gas Console (continued)

Manifold Subassemblies and Motor-Valve Subassembly

Item	Part Number	Description	Designator	Qty.
1	**129294**	**Motor-valve subassembly**	**MV1 thru MV6**	**6**
2	*	PCB assy, valve calibration		1
3	*	Bracket, motor-valve		1
4	*	Valve, meter 1/8 FPT		1
5	006106	Valve, solenoid 120#, 1/8 FPT 120V 3W	SV7 thru SV12	1
	129295	**Manifold subassembly**		**1**
6	004758	Manifold block		1
7	004759	Manifold block		1
8	029855	Transducer subassembly	PT1 thru PT3	3
9	006109	Valve, sol120#, 1/8 FPT 120V 3W	SV1 thru SV6	6
	129296	**Manifold subassembly**		**1**
10	004760	Manifold block		1
11	029855	Transducer subassembly	PT6	1
	129297	**Manifold subassembly**		**1**
12	004760	Manifold block		1
13	029855	Transducer SA	PT5	1
14	006077	Valve, Check, 1/8 FPT		2
	129298	**Manifold subassembly**		**1**
15	004760	Manifold block		1
16	029855	Transducer SA	PT4	1
17	006077	Valve, Check, 1/8 FPT		2

* Motor-valve subassemblies (129294) are sold as calibrated subassemblies only.

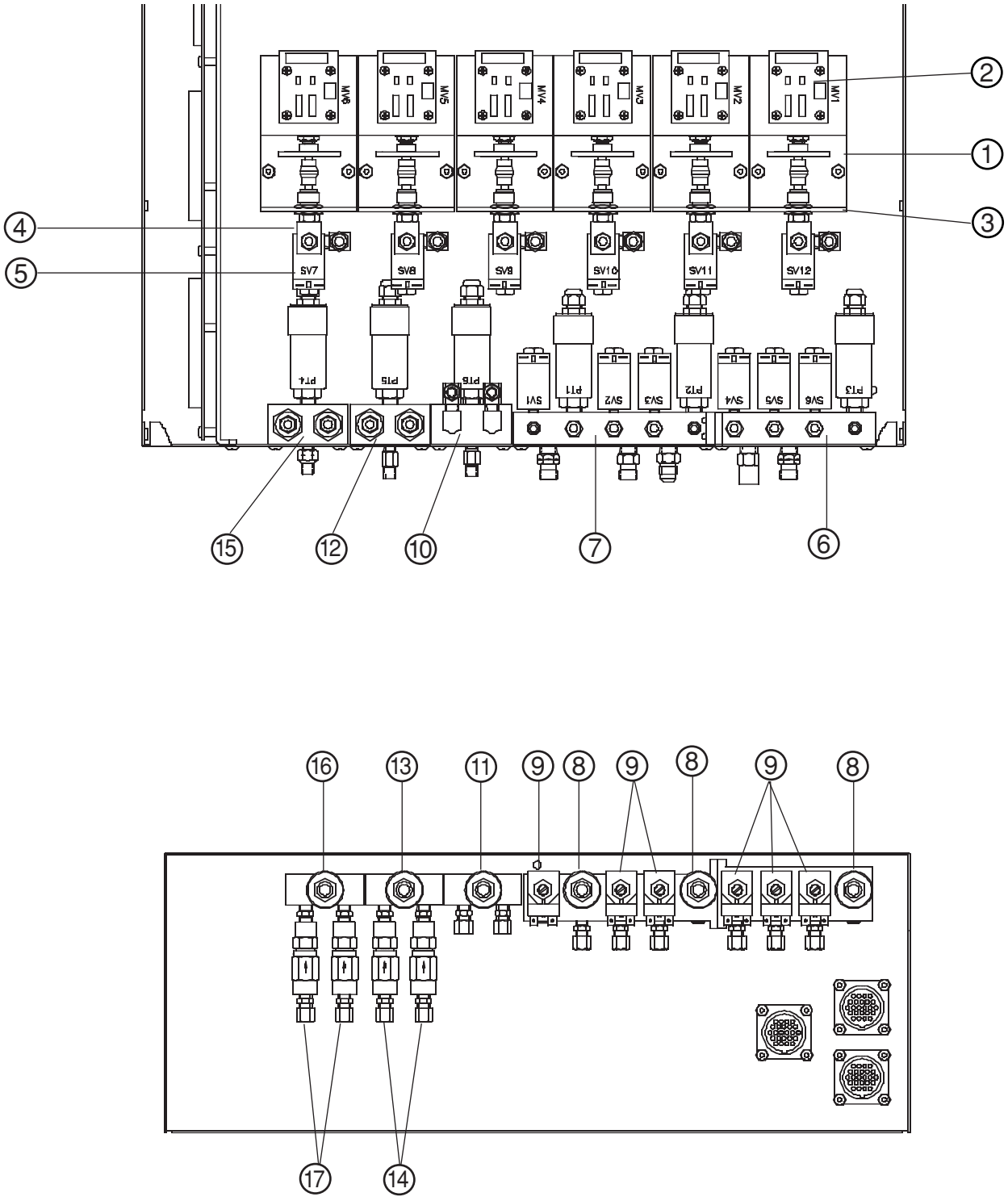


Figure 6-13 Manifold SA, Motor-Valve SA & Rear

PAC184 Machine Torch Assemblies

Torch Assembly with IHS tab on Shield Cap (128199)*
Torch Assembly without IHS tab on Shield Cap (028839)**

Item	Part Number	Description	Designator	Qty.
1	120208	Torch Main Body		1
2	044507	O-Ring, Buna, 70 Duro 1.424 X .070		2
3	044025	O-Ring, Buna, 70 Duro 1.176 X .070		1
4	044012	O-Ring, Buna, 70 Duro 0.364 X .070		2
5	044508	O-Ring, Buna, 70 Duro 0.216 X .053		4
6	120204	Connector, Bullet Brass		4
6A	008890	Contact, high current		1
7	120209	Electrode, 15/30 amp		1
8	120212	Swirl Ring, 15/30 amp		1
9	120218	Nozzle, 30 amp		1
10	120219	Cap, inner nozzle, 15/30 amp		1
11	120222	Shield, 15/30 amp		1
12	120543	Shield Cap (with IHS tab)*		1
	120221	Shield Cap (without IHS tab)**		1

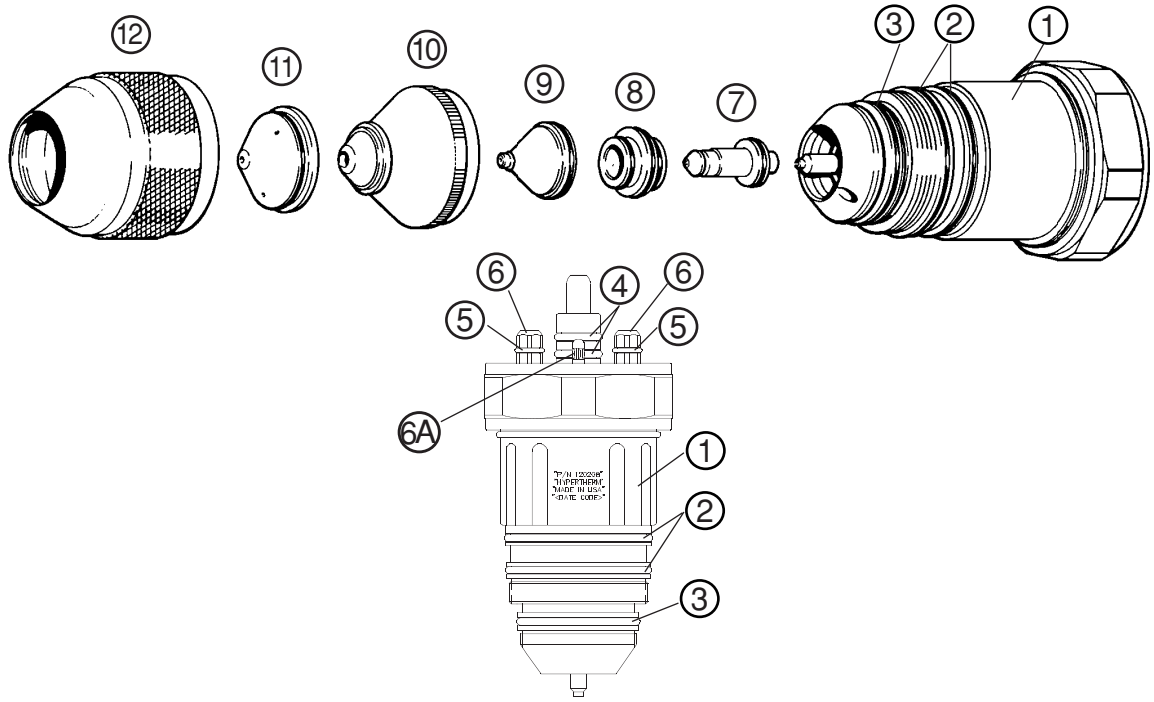


Figure 6-14 PAC184 Machine Torch Assembly

PAC186 Machine Torch Assemblies

Torch Assembly with IHS tab on Shield Cap (128101)*
Torch Assembly without IHS tab on Shield Cap (128102)**

Item	Part Number	Description	Designator	Qty.
1	120349	Torch Main Body		1
2	044507	O-Ring, Buna, 70 Duro 1.424 X .070		2
3	044026	O-Ring, Buna, 70 Duro 1.239 X .070		1
4	044025	O-Ring, Buna, 70 Duro 1.176 X .070		1
5	044012	O-Ring, Buna, 70 Duro 0.364 X .070		2
6	044508	O-Ring, Buna, 70 Duro 0.216 X .053		4
7	120204	Connector, Bullet Brass		4
7A	008890	Contact, high current		1
8	120377	Tube, Water Electrode Cooling		1
9	120111	Electrode		1
10	020637	Swirl Ring		1
11	020645	Nozzle, 30A		1
12	020633	Cap, inner nozzle retainer		1
13	020671	Shield, 30A		1
14	020687	Shield Cap (with IHS tab)*		1
	020634	Shield Cap (without IHS tab)**		1

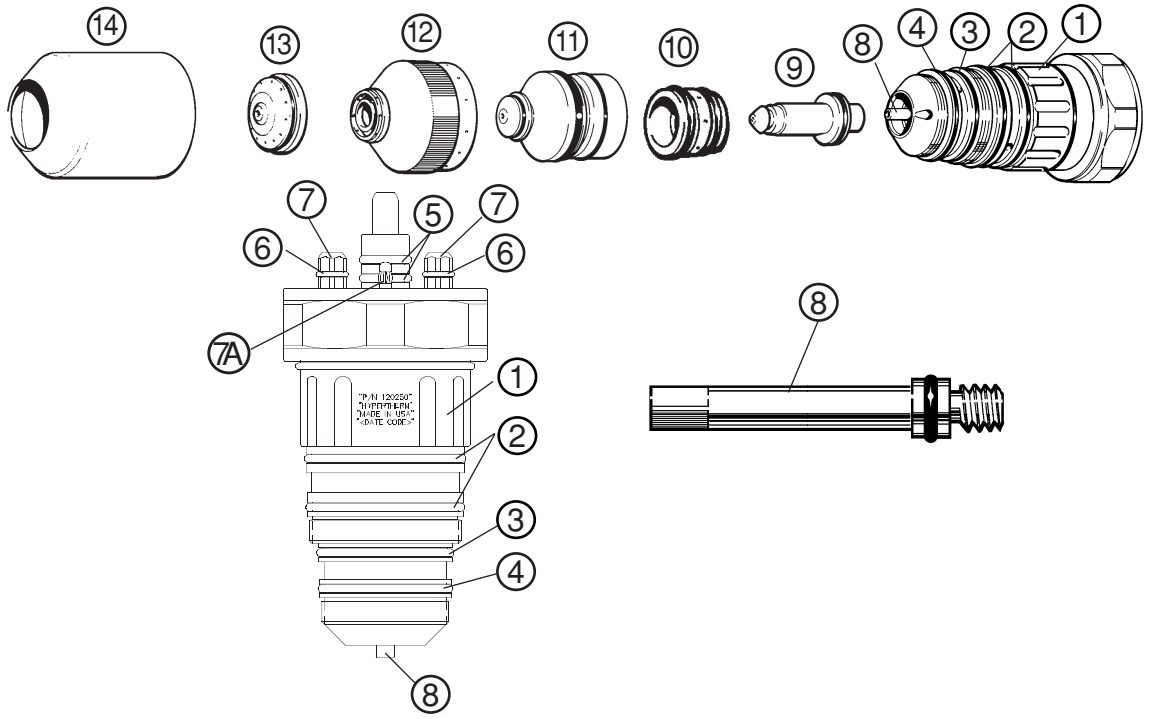


Figure 6-14 PAC186 Machine Torch Assembly

45° Torch Quick Disconnect Assembly, Mounting Sleeve and Torch Vent Hose

Item	Part Number	Description	Designator	Qty.
1	**028840**	Assy, 45° torch quick disconnect		1
2	120256	Sleeve, mounting		1
3	024485	Assembly, torch vent hose		1
4	015090	Hose clamp: 1-5/16 x 2-1/4		1
5	004908	Strain relief		1

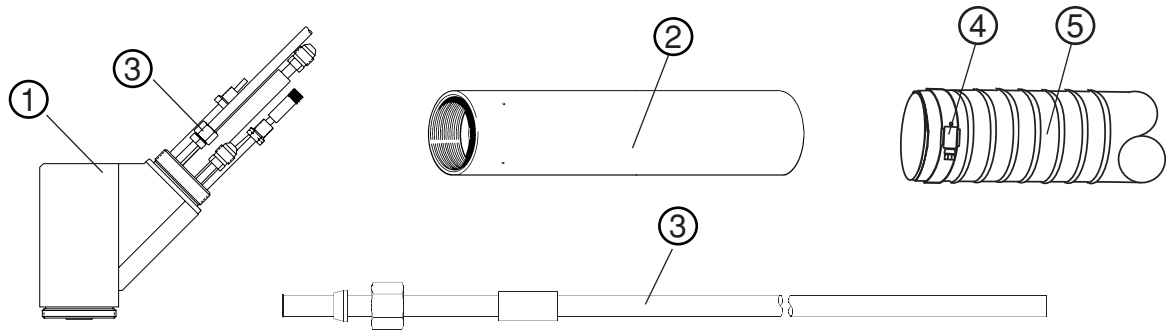


Figure 6-16 45° Torch Quick Disconnect Assembly, Mounting Sleeve and Torch Vent Hose

Straight Torch Quick Disconnect Assembly, Mounting Sleeve, Spacer and Torch Vent Hose

Item	Part Number	Description	Designator	Qty.
1	**028855**	Assembly, straight torch quick disconnect		1
2	020668	Sleeve, mounting		1
3	120317	Spacer, 2" ID/2-1/4" OD (for mounting off-valve to sleeve)		1
4	024485	Assembly, torch vent hose		1

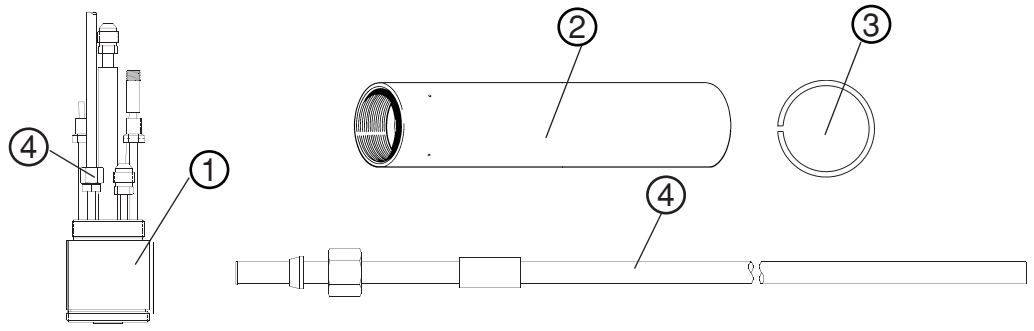


Figure 6-17 Straight Torch Quick Disconnect Assembly, Mounting Sleeve, Spacer and Torch Vent Hose

Off-Valve Assemblies

Item	Part Number	Description	Designator	Qty.
	129239	**Assembly, off-valve**		
	129281	**Assembly, off-valve (with blow back valve assy)**		
1	006107	Valve, solenoid 1/8 FPT 120V	SV14, 15, 16	3
2	120524	Bracket, torch valve mounting		1
3	046078	Tubing, 1/4" OD X .040 blk nyl		1.7 ft.
	123256	**Assembly, cable**		**1**
4	008192	Receptacle, shell, off-valve		1
5	008202	Plug, shell CPC 17-14 rvs sex		1
	008176	Pin, 24-20 Awg type lll + CRP		9
6	108025	Connector, din, 3p ra		3
	129282	**Assembly, blow back valve (used with 129281 only)**		**1**
7	006100	Valve, solenoid 1/8 FPT 120V	SV17	1
8	108025	Connector, din, 3p ra		1
9	006077	Valve, check		1
10	120544	Bracket, blow back valve mounting		1

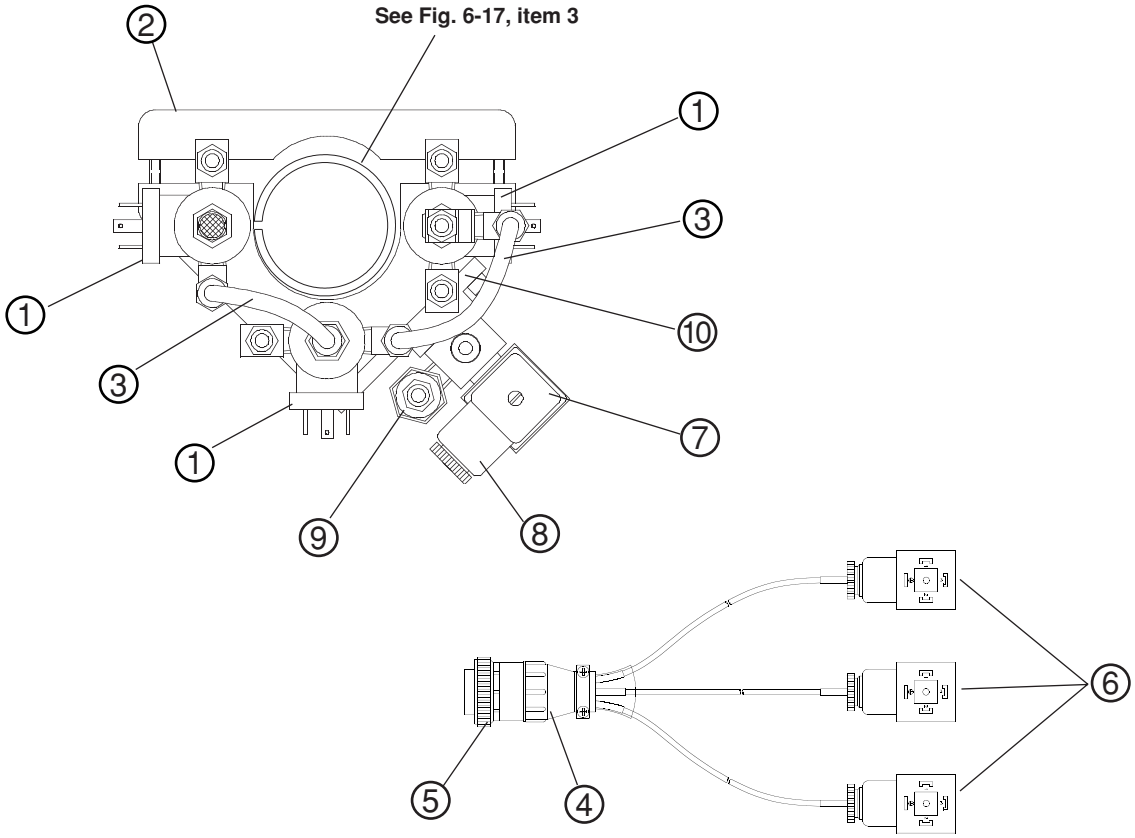


Figure 6-18 Off-Valve Assembly

PAC184 Torch Consumable Parts

15 and 30 Amp (Mild Steel)

Part Number	Description	Qty.
120543	Cap, shield (with IHS tab)	1
120221	Cap, shield (without IHS tab)	1
120222	Shield, 15/30 amp	1
120219	Cap, inner nozzle retainer, 15/30 amp	1
120277	Nozzle, 15 amp	1
120218	Nozzle, 30 amp	1
120212	Swirl ring, 15/30 amp	1
120209	Electrode, 15/30 amp	1

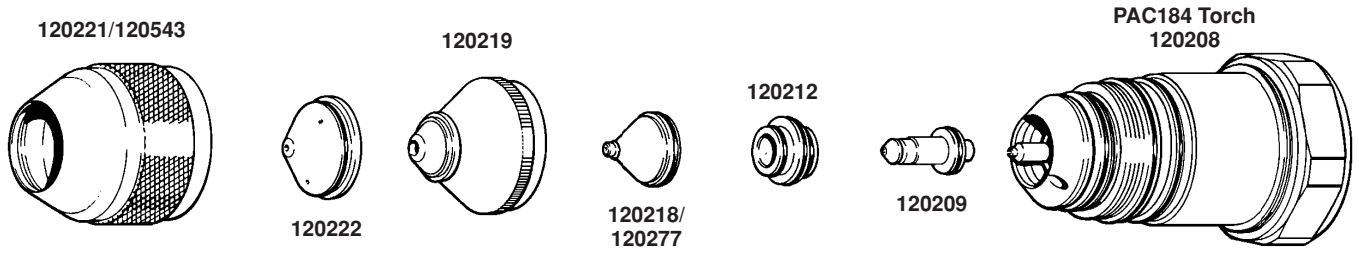
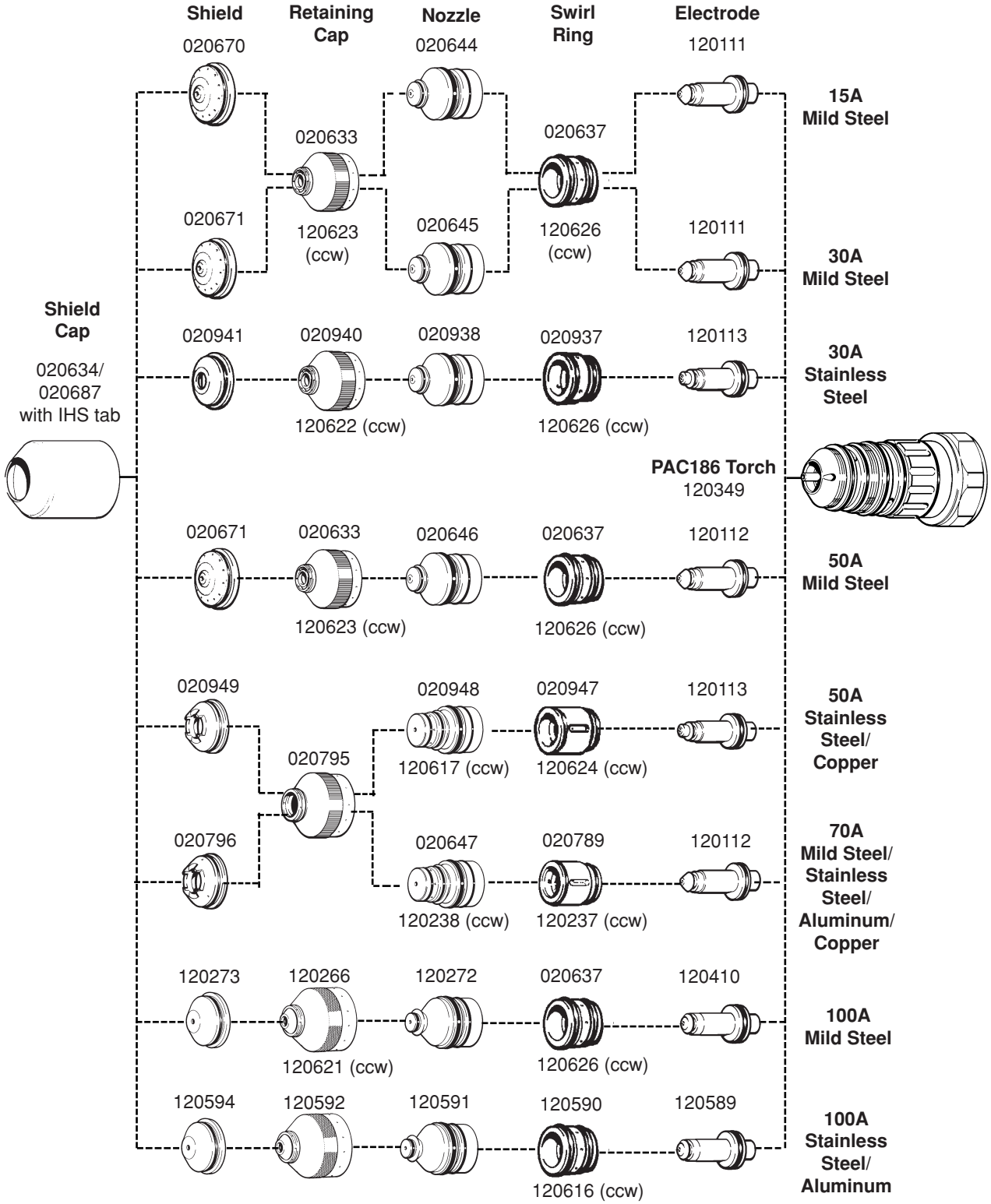


Figure 6-19 PAC184 Torch 15 and 30 Amp Mild Steel Consumable Parts

PAC184 Consumable Parts Kits

Part Number	Description	Qty.
028842	**Kit (includes spare PAC184 torch)**	**1**
028900	**Kit (less spare PAC184 torch)**	**1**
001579	Box, gray plastic	1
120208	Torch, PAC184 (028842 kit only)	1
120219	Cap, inner nozzle retainer, 15/30 amp	1
120212	Swirl ring, 15/30 amp	1
120209	Electrode, 15/30 amp	3
120277	Nozzle, 15 amp	3
120218	Nozzle, 30 amp	3
120222	Shield, 15/30 amp	3
026518	O-Ring, silicon cmpsn 1.176 X .070	1
044026	O-ring, Buna 70 Duro 1.239 X .070	1
044507	O-ring, Buna 70 Duro 1.424 X .070	2
004670	Tool, consumable parts	1
004630	Electrode gauge assembly	1
027343	Magnifier, loupe, 10X	1
027055	Lubricant, silicone 1/4 oz tube	1

PAC186 Torch Consumable Parts



CCW (counter clockwise) consumables are available for mirror image cutting.

Figure 6-20 PAC186 Torch Consumable Parts

PAC186 Consumable Parts Kits

Part Number	Description	Qty.
128097	**Kit (includes spare PAC186 torch)**	**1**
128098	**Kit (less spare PAC186 torch)**	**1**
001579	Box, gray plastic	1
120349	Torch, PAC186 (Kit 128097 only)	1
020633	Cap, inner retaining, 15/30 amp	1
020637	Swirl ring, 15/30/50 amp mild steel	1
120111	Electrode, 15/30 amp mild steel	3
020644	Nozzle, 15 amp	1
020645	Nozzle, 30 amp	2
020646	Nozzle, 50 amp mild steel	2
020670	Shield, 15 amp	1
020671	Shield, 30/50 amp mild steel	2
020796	Adapter, shield, 70 amp	2
020795	Cap, inner retaining, 70 amp	1
020647	Assembly, nozzle/shield, 70 amp	2
020789	Swirl ring, 70 amp	1
120112	Electrode, 50 amp mild steel, 70 amp	3
120266	Cap, inner retaining, 100 amp mild steel	1
120410	Electrode, 100 amp mild steel	2
120272	Nozzle, 100 amp mild steel	2
120273	Shield, 100 amp mild steel	1
120589	Electrode, 100 amp	1
120590	Swirl ring, 100 amp	1
120591	Nozzle, 100 amp	1
120592	Cap, inner retaining, 100 amp	1
120594	Shield, 100 amp	1
044025	O-ring, Buna 70 Duro 1.176 X .070	1
044026	O-ring, Buna 70 Duro 1.239 X .070	1
044507	O-ring, Buna 70 Duro 1.424 X .070	1
120377	Tube, water electrode cooling	1
027055	Lubricant, silicone, 1/4 oz tube	1
004555	Tool, consumable parts	1
004745	Tool, swirl ring	1
004630	Electrode gauge assembly	1
027343	Magnifier, loupe, 10X	1
027503	Nut driver 4.5 mm	1

Hypertherm

Section 7

WIRING DIAGRAMS

In this section:

Battery

Cap, polarized

Cap, non-polarized

Cap, feed-thru

Circuit breaker

Coax shield

Current Sensor

Current sensor

DC supply

Diode

Door interlock

Fan

Feedthru LC

Filter, AC

Fuse

Ground Clamp

Ground, Chassis

Ground, Earth

IGBT

Inductor

LED

Light

MOV

Pin

Plug

PNP Transistor

Potentiometer

Push Button, Normally Closed

Push Button, Normally Open

Receptacle

Relay, Coil

Relay, Normally Closed

Relay, Normally Open

Relay, Solid State, AC

Relay, Solid State, DC

Relay, Solid State, Dry

Resistor

SCR

Shield

Shunt

Spark Gap

Switch, Flow

Torch Symbols

Electrode

Nozzle

Shield

Torch

Torch, HyDefinition™

Time Delay Closed, NO/Off

Transformer

Transformer, Air Core

Transformer Coil

Triac

VAC Source

Valve, Solenoid

Voltage Source

Zener Diode

Switch, Level, Normally Closed

Switch, Pressure, Normally Closed

Switch, Pressure, Normally Open

Switch, 1 Pole, 1 Throw

Switch, 1 Pole, 2 Throw

Switch, 1 Pole, 1 Throw, Center Off

Switch, Temperature, Normally Closed

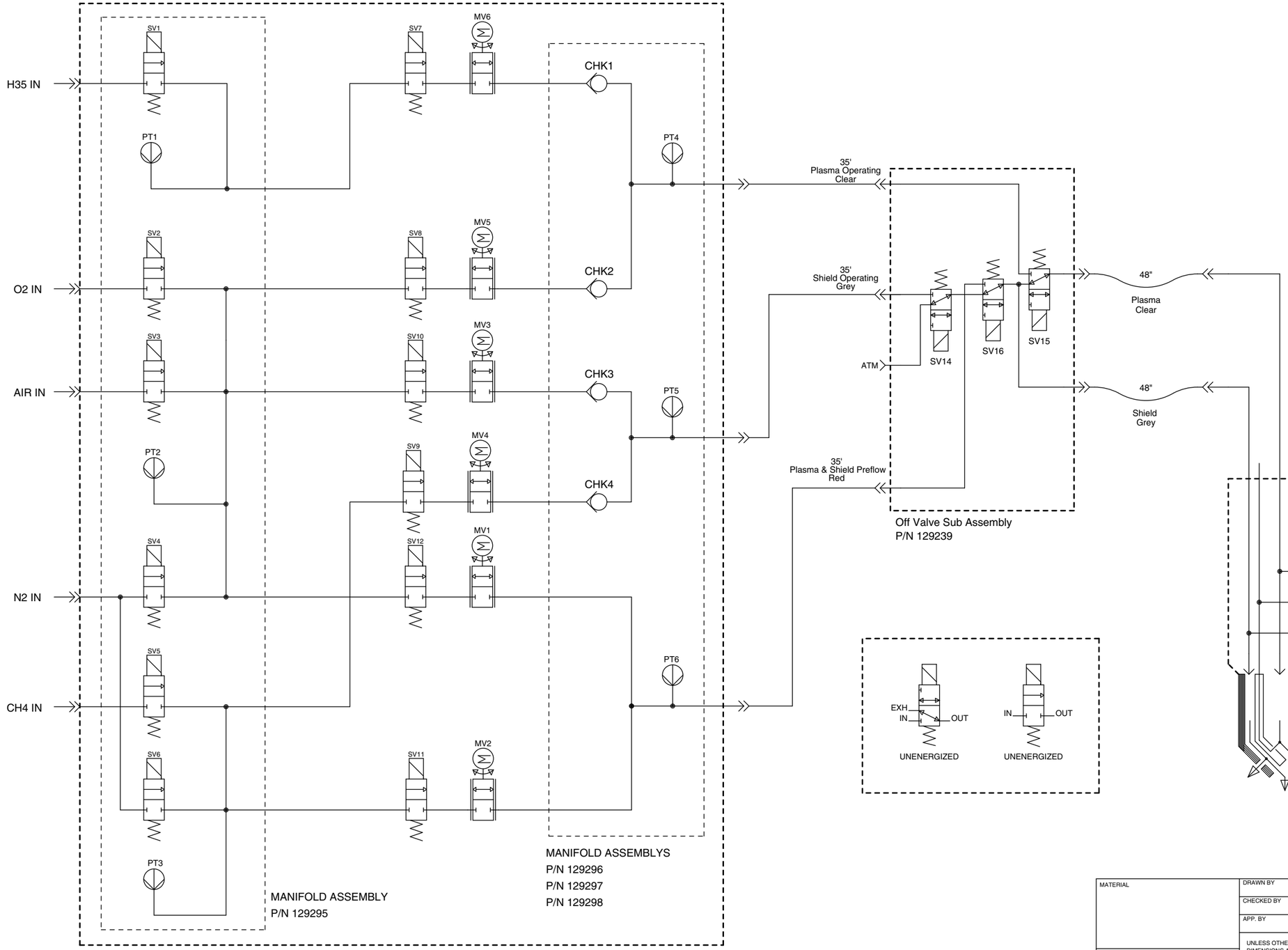
Switch, Temperature, Normally Open

Terminal Block

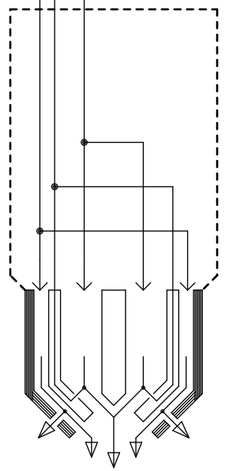
Time Delay Closed, NC/Off

Time Delay Open, NO/Off

Time Delay Open, NC/On



SV1	Solenoid Valve, H35
SV2	Solenoid Valve, O2
SV3	Solenoid Valve, Air
SV4	Solenoid Valve, N2
SV5	Solenoid Valve, CH4
SV6	Solenoid Valve, N2
SV7	Solenoid Valve, Plasma
SV8	Solenoid Valve, Plasma
SV9	Solenoid Valve, Shield
SV10	Solenoid Valve, Shield
SV11	Solenoid Valve, Preflow
SV12	Solenoid Valve, Preflow
PT1	Pressure Transducer, H35 Inlet
PT2	Pressure Transducer, O2 or Air Inlet
PT3	Pressure Transducer, N2 or CH4 Inlet
PT4	Pressure Transducer, Plasma Operating
PT5	Pressure Transducer, Shield Operating
PT6	Pressure Transducer, Preflow
MV6	Metering Valve, H35 Plasma
MV5	Metering Valve, Air, O2 or N2 Plasma
MV4	Metering Valve, N2 or CH4 Shield
MV3	Metering Valve, Air, O2, or N2 Shield
MV2	Metering Valve, N2 or CH4 Preflow
MV1	Metering Valve, Air, O2, or N2 Preflow



PAC186 Torch Assembly
P/N 128101 (15A)

MATERIAL

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DRAWN BY	JLF	DATE 2-4-98
CHECKED BY		DATE
APP. BY	JLF	DATE 4-10-98

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
2 PL DECIMALS ±.015
3 PL DECIMALS ±.005
FRACTIONS ±1/64
BREAK SHARP CORNERS WITH CHAMFER OR RADIUS .015 MAX.

HYPERTHERM, INC.

Hypertherm, Incorporated
Box-5010 Hanover, NH 03755-5010 603/643-3441

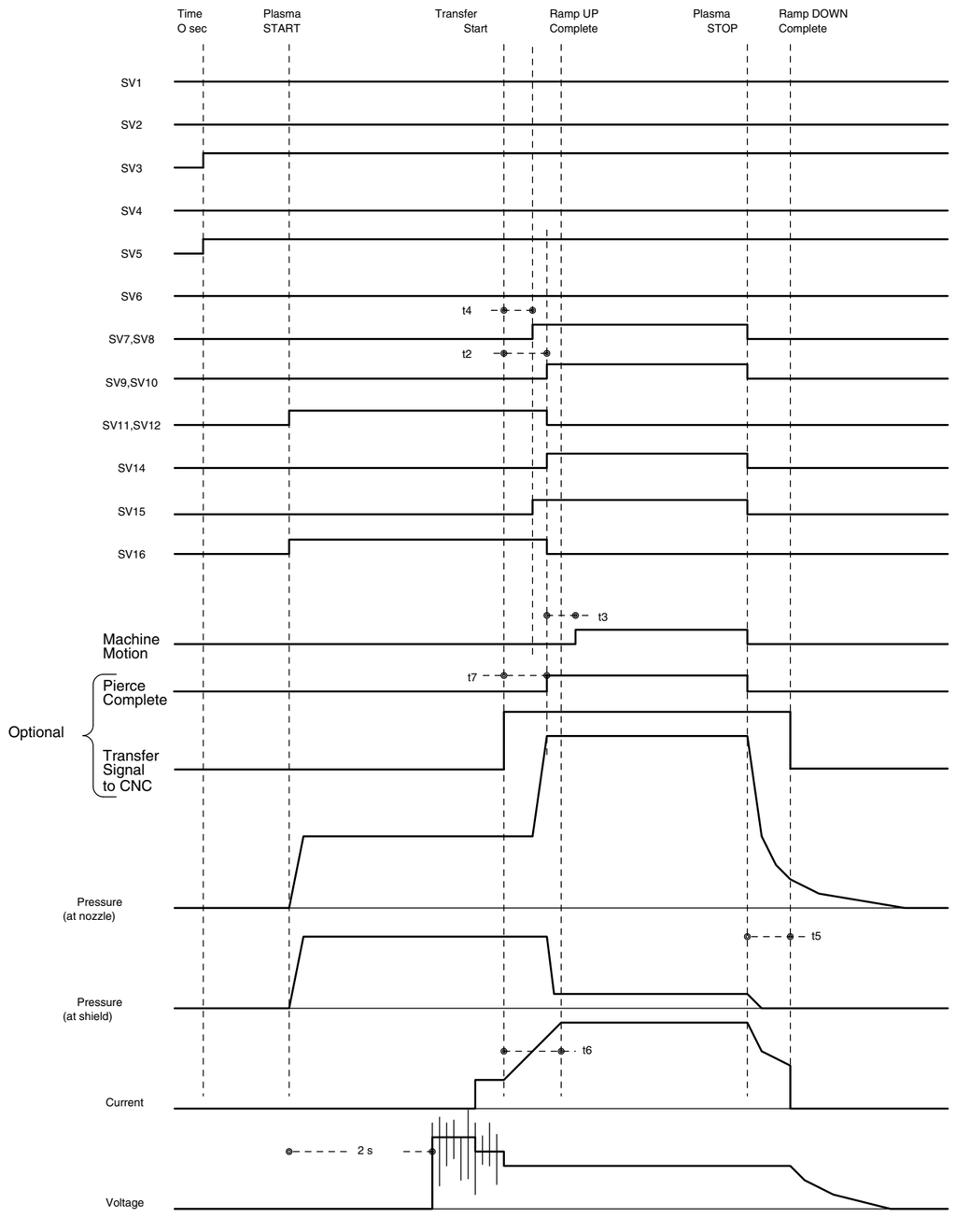
DESCRIPTION: ELEC SCHEM:HD3070 GAS CSL AUTO

STOCK NO.	DRAWING NO.	FILE NAME
013325	013-2-325	013325B1

SCALE	MODEL	SHEET
N/A		1 OF 4

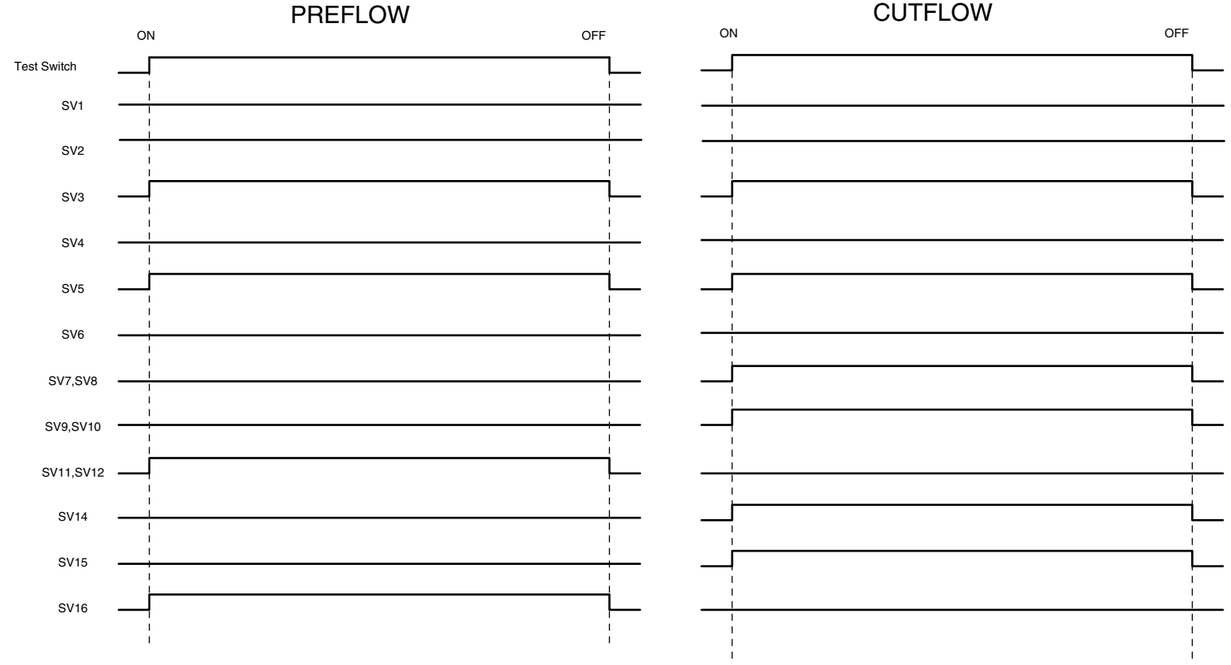
TIMING DIAGRAM
(FOR AIR PLASMA GAS ONLY)

RUN



Note: All "t" times are SET current dependent

TEST



t2 = Transfer to Shield Gas
t3 = Transfer to Machine Motion
t4 = Transfer to Plasma Gas
t5 = Torch Ramp-Down (Gas & Current)
t6 = Ramp-up of Current From Pilot to Operate Current
t7 = Optional Pierce Complete

*WHEN MV2=0% AND MV4=0%, SV5 WILL BE OFF.

SV1	Solenoid Valve, H35 Plasma Gas Select
SV2	Solenoid Valve, O2 Gas Select
SV3	Solenoid Valve, Air Gas Select
SV4	Solenoid Valve, N2 Plasma Gas Select
SV5	Solenoid Valve, CH4 Shield Gas Select
SV6	Solenoid Valve, N2 Shield Gas Select
SV7,SV8	Solenoid Valve, Plasma Gas Operate
SV9,SV10	Solenoid Valve, Shield Gas Operate
SV11,SV12	Solenoid Valve, Preflow Gas Operate
SV14	Solenoid Valve, Shield Gas Vent
SV15	Solenoid Valve, Palsma Preflow/Operate
SV16	Solenoid Valve, Shield Preflow/Operate

MATERIAL

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DRAWN BY	JLF	DATE 2-4-98
CHECKED BY		DATE
APP. BY	JLF	DATE 4-10-98

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
2 PL DECIMALS ±.015
3 PL DECIMALS ±.005
FRACTIONS ±1/64
BREAK SHARP CORNERS WITH CHAMFER OR RADIUS .015 MAX.

HYPERTHERM, INC.
Hypertherm, Incorporated
Box-5010 Hanover, NH 03755-5010 603/643-3441

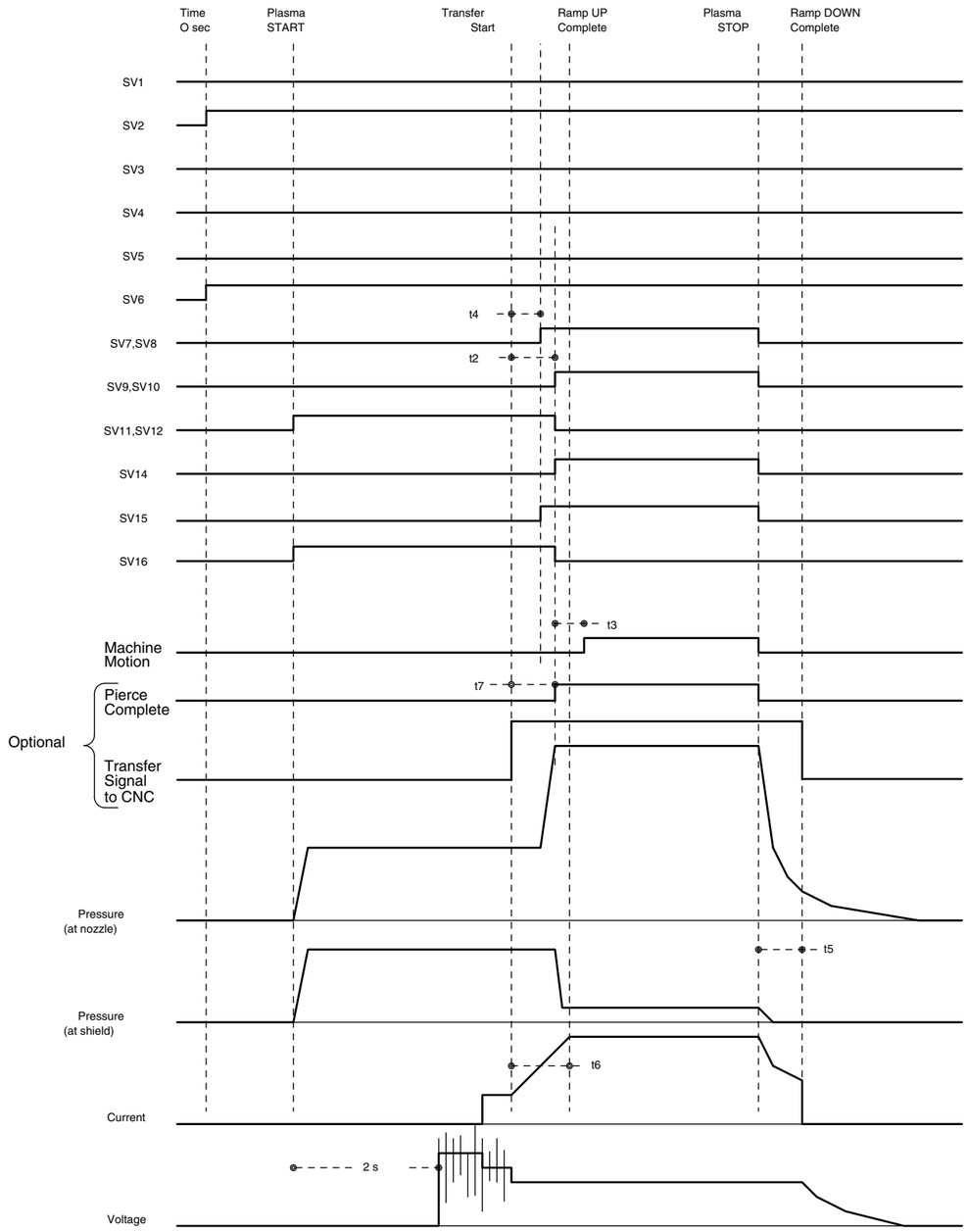
DESCRIPTION: ELEC SCHEM:HD3070 GAS CSL AUTO

STOCK NO.	DRAWING NO.	FILE NAME
013325	013-2-325	013325B2

SCALE	MODEL	SHEET
N/A		2 OF 4

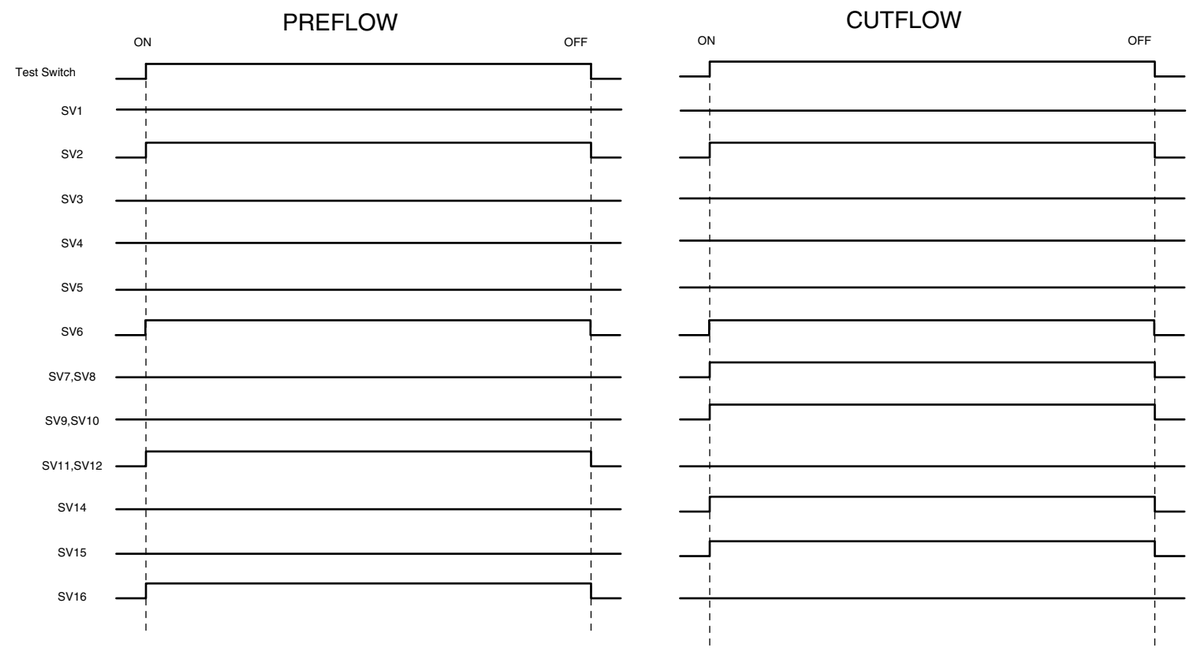
TIMING DIAGRAM
(FOR O2 PLASMA GAS ONLY)

RUN



Note: All "t" times are SET current dependent

TEST



t2 = Transfer to Shield Gas
t3 = Transfer to Machine Motion
t4 = Transfer to Plasma Gas
t5 = Torch Ramp-Down (Gas & Current)
t6 = Ramp-up of Current From Pilot to Operate Current
t7 = Optional Pierce Complete

SV1	Solenoid Valve, H35 Plasma Gas Select
SV2	Solenoid Valve, O2 Gas Select
SV3	Solenoid Valve, Air Gas Select
SV4	Solenoid Valve, N2 Plasma Gas Select
SV5	Solenoid Valve, CH4 Shield Gas Select
SV6	Solenoid Valve, N2 Shield Gas Select
SV7,SV8	Solenoid Valve, Plasma Gas Operate
SV9,SV10	Solenoid Valve, Shield Gas Operate
SV11,SV12	Solenoid Valve, Preflow Gas Operate
SV14	Solenoid Valve, Shield Gas Vent
SV15	Solenoid Valve, Palsma Preflow/Operate
SV16	Solenoid Valve, Shield Preflow/Operate

MATERIAL

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DRAWN BY	JLF	DATE 2-4-98
CHECKED BY		DATE
APP. BY	JLF	DATE 4-10-98

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
2 PL DECIMALS ±.015
3 PL DECIMALS ±.005
FRACTIONS ±1/64
BREAK SHARP CORNERS WITH CHAMFER OR RADIUS .015 MAX.

HYPERTHERM, INC.
Hypertherm, Incorporated
Box-5010 Hanover, NH 03755-5010 603/643-3441

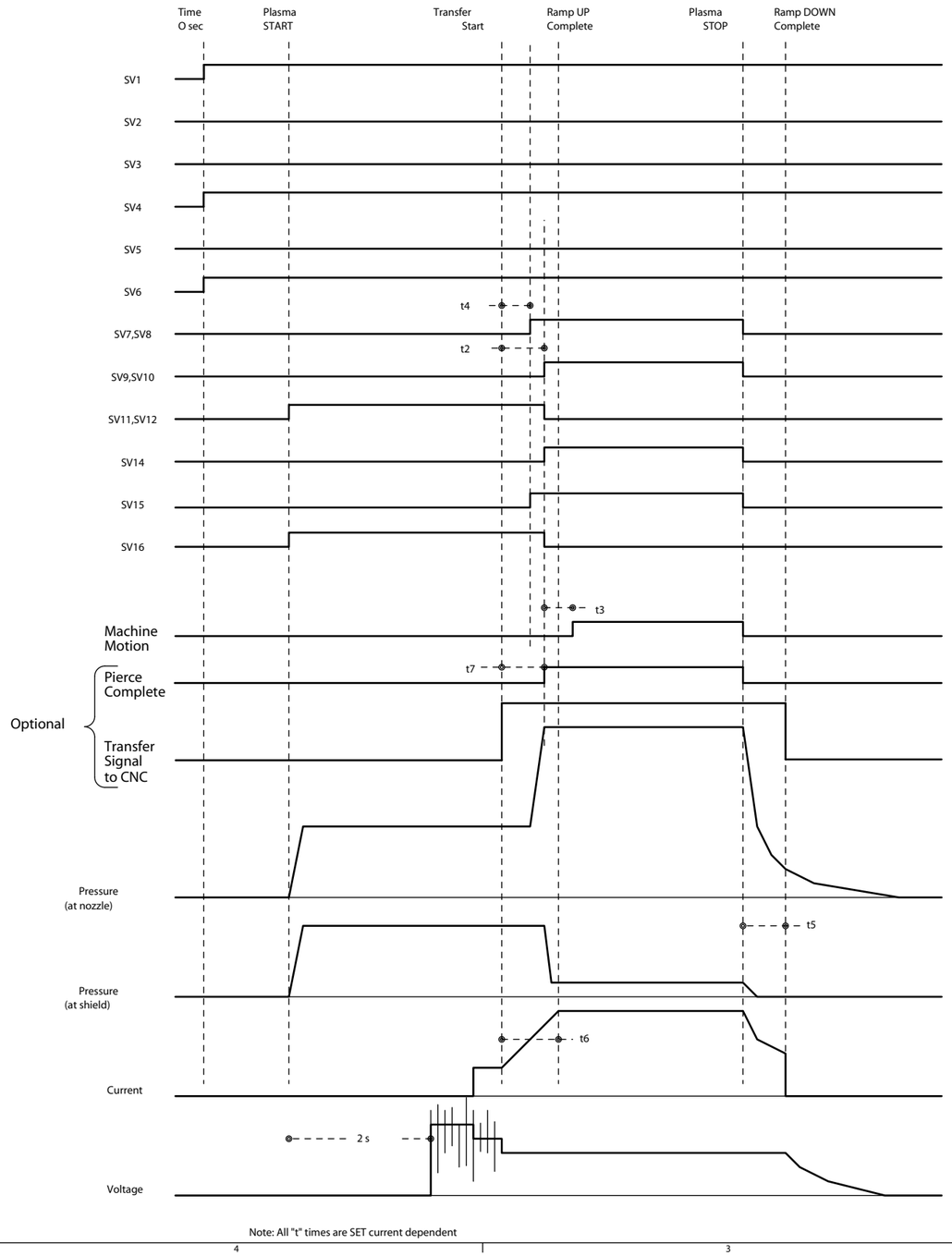
DESCRIPTION: ELEC SCHEM:HD3070 GAS CSL AUTO (C)

STOCK NO.	DRAWING NO.	FILE NAME
013325	013-2-325	013325B3

SCALE	MODEL	SHEET
N/A		3 OF 4

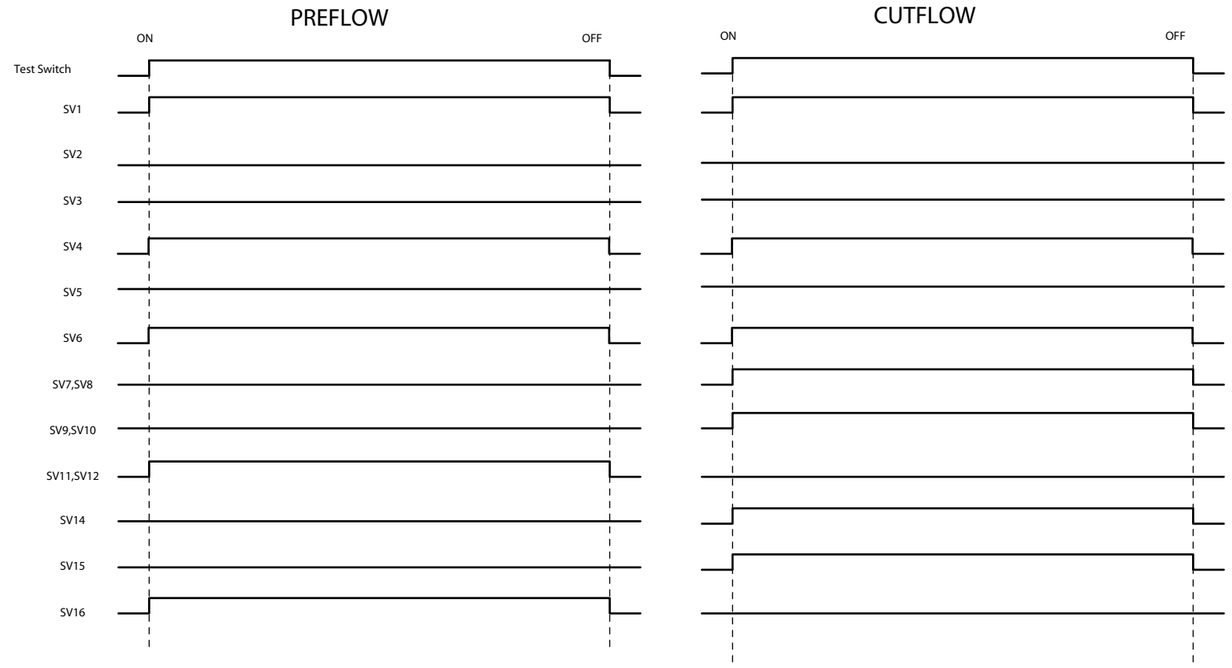
TIMING DIAGRAM
(FOR H35 & N2 PLASMA GAS ONLY)

RUN



Note: All "t" times are SET current dependent

TEST



t2 = Transfer to Shield Gas
t3 = Transfer to Machine Motion
t4 = Transfer to Plasma Gas
t5 = Torch Ramp-Down (Gas & Current)
t6 = Ramp-up of Current From Pilot to Operate Current
t7 = Optional Pierce Complete

SV1	Solenoid Valve, H35 Plasma Gas Select
SV2	Solenoid Valve, O2 Gas Select
SV3	Solenoid Valve, Air Gas Select
SV4	Solenoid Valve, N2 Plasma Gas Select
SV5	Solenoid Valve, CH4 Shield Gas Select
SV6	Solenoid Valve, N2 Shield Gas Select
SV7,SV8	Solenoid Valve, Plasma Gas Operate
SV9,SV10	Solenoid Valve, Shield Gas Operate
SV11,SV12	Solenoid Valve, Preflow Gas Operate
SV14	Solenoid Valve, Shield Gas Vent
SV15	Solenoid Valve, Palsma Preflow/Operate
SV16	Solenoid Valve, Shield Preflow/Operate

MATERIAL

DRAWN BY	JLF	DATE 2-4-98
CHECKED BY		DATE
APP. BY	JLF	DATE 4-10-98

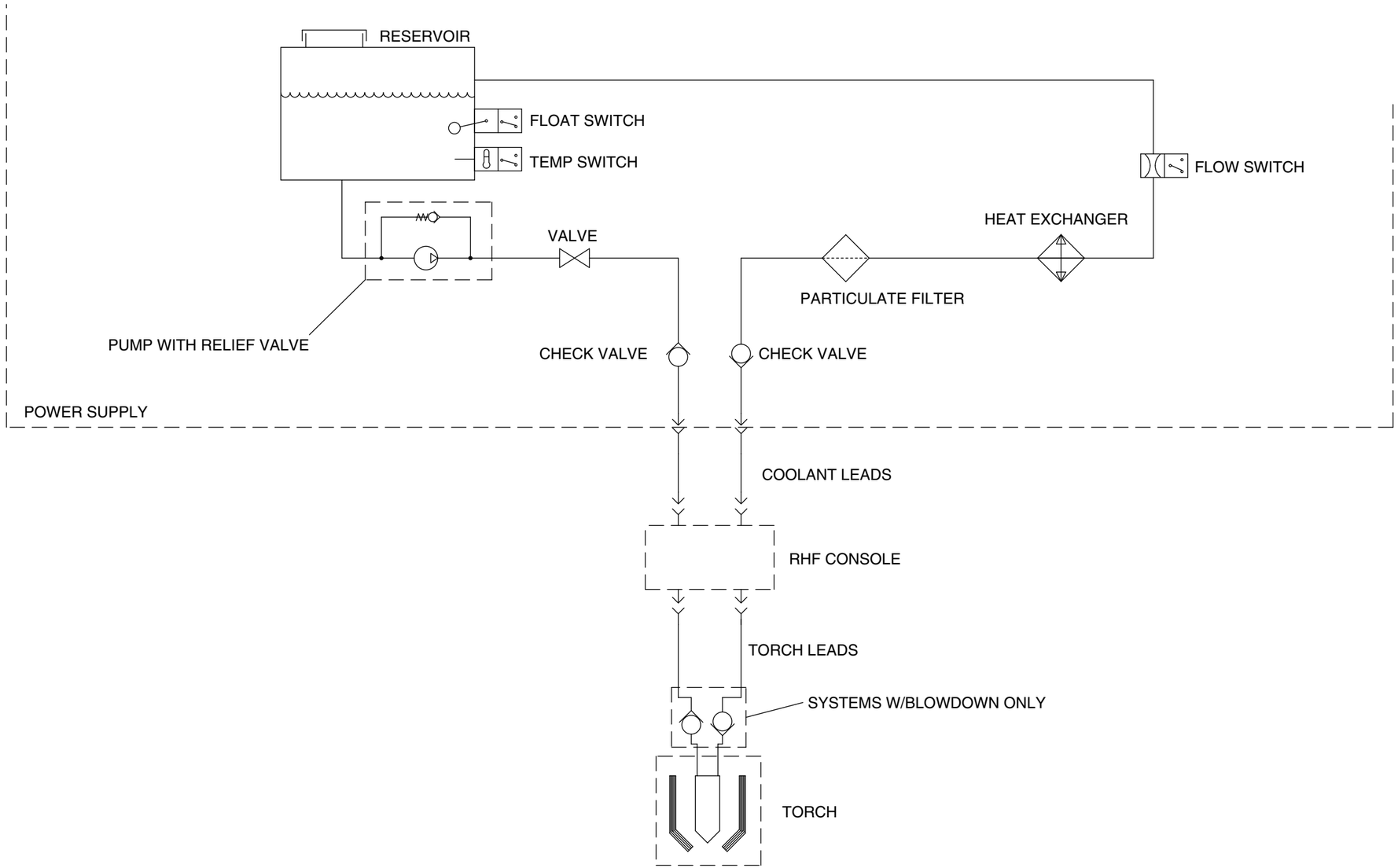
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
2 PL DECIMALS ±.015
3 PL DECIMALS ±.005
FRACTIONS ±1/64
BREAK SHARP CORNERS WITH CHAMFER OR RADIUS .015 MAX.

HYPERTHERM, INC.
Hypertherm, Incorporated
Box-5010 Hanover, NH 03755-5010 603/643-3441

DESCRIPTION: ELEC SCHEM:HD3070 GAS CSL AUTO (C)

STOCK NO.	DRAWING NO.	FILE NAME
013325	013-2-325	013325B4

SCALE	MODEL	SHEET
N/A		4 OF 4



MATERIAL	DRAWN BY: BC	DATE: 6-23-97	Hypertherm Box-5010 Hanover, NH 03755-5010 603/643-3441
	CHECKED BY:	DATE:	
	APP. BY: EBH	DATE: 7-2-97	
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.		DESCRIPTION: COOLANT SA:HD3070 B ITEM NO.: 129255 DRAWING NO.: 129-2-255 FILE NAME: 129255B SCALE: N/A MODEL: SHEET: 1 OF 1

200 VAC
3 PHASE
50 OR 60 HERTZ

PE

CUSTOMER
SUPPLIED
DISCONNECT

078072
200/50-60

T2
(014069)

TB1
L3
L2
L1
PE

WHT
AUX1
WHT

CON1

A4
B4
C4

F1
20A
F2
20A

AUX2
YEL
YEL/BLK

0 VAC
200 VAC

200 VAC

A
B
C

041564
PCB6
PHASE LOSS
DETECTION
P1

PL29
BLU
WHT

AA
SHEET
4-B2

CH130 CHOPPER SA
129118

JP6
PL28
RED/BLK
RED
NC

JP9
PL12
NC
SHLD
RED
BLK
NC
NC

B
SHEET
4-C4

C
SHEET
3-A1

F4
125A

39
48

L1
4mH

70
C1
100 uF
350 V
69
R2A
15
50W
68
R2B
15
50W
65

R1
10K
10W

67
CR4
66
41

R3
126

1XPCB1
I/O PCB
(029623)
MODIFIED

SHEET
4-D4
A

PL14

R3
R4
R5
P1
C1
PA
C2
C3
R1
R2
CS1
REC13
PL13
BLU
BLK
RED

140
126

F
SHEET
4-B1

SHEET
2-B4
G

START CIRCUIT
129264
H9
H8
124
CR1
100
F5
101
126

REC31
PL31
RED
RED/BLK

E
SHEET
3-B1

D
SHEET
4-D4

SEE SHEET
5 FOR ADDITIONAL
TRANSFORMER
CONFIGURATIONS.

T1
(029671)

WHT
0V
BRN
200V

ORG
ORG
RED
RED
YEL
YEL

REC1-6
REC1-4
REC1-5
REC1-3
REC1-2
REC1-1

H
SHEET
3-D3

120 VAC AUXILIARY
AUTO-OFF
24 VAC
AUX CONTACT
(WATER PUMP)
PLASMA ON
12 VDC
(CONTACT CLOSURE)

1 2 3 4 5 6 7 8 9 10 11 12

TB2
TERMINAL BLOCK

YEL
YEL/BLK
RED/BLK
RED
RED
WHT
RED
WHT

I
SHEET
2-B4

K
SHEET
3-D1

J
SHEET
3-B1

DC ON
LT2
R
WHT
RED

L
SHEET
4-A2

M
SHEET
3-C1

MATERIAL

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DRAWN BY	JLF	DATE 2-4-98
CHECKED BY		DATE
APP. BY	JLF	DATE 4-10-98

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
2 PL DECIMALS ±.015
3 PL DECIMALS ±.005
FRACTIONS ±1/64
BREAK SHARP CORNERS WITH
CHAMFER OR RADIUS .015 MAX.

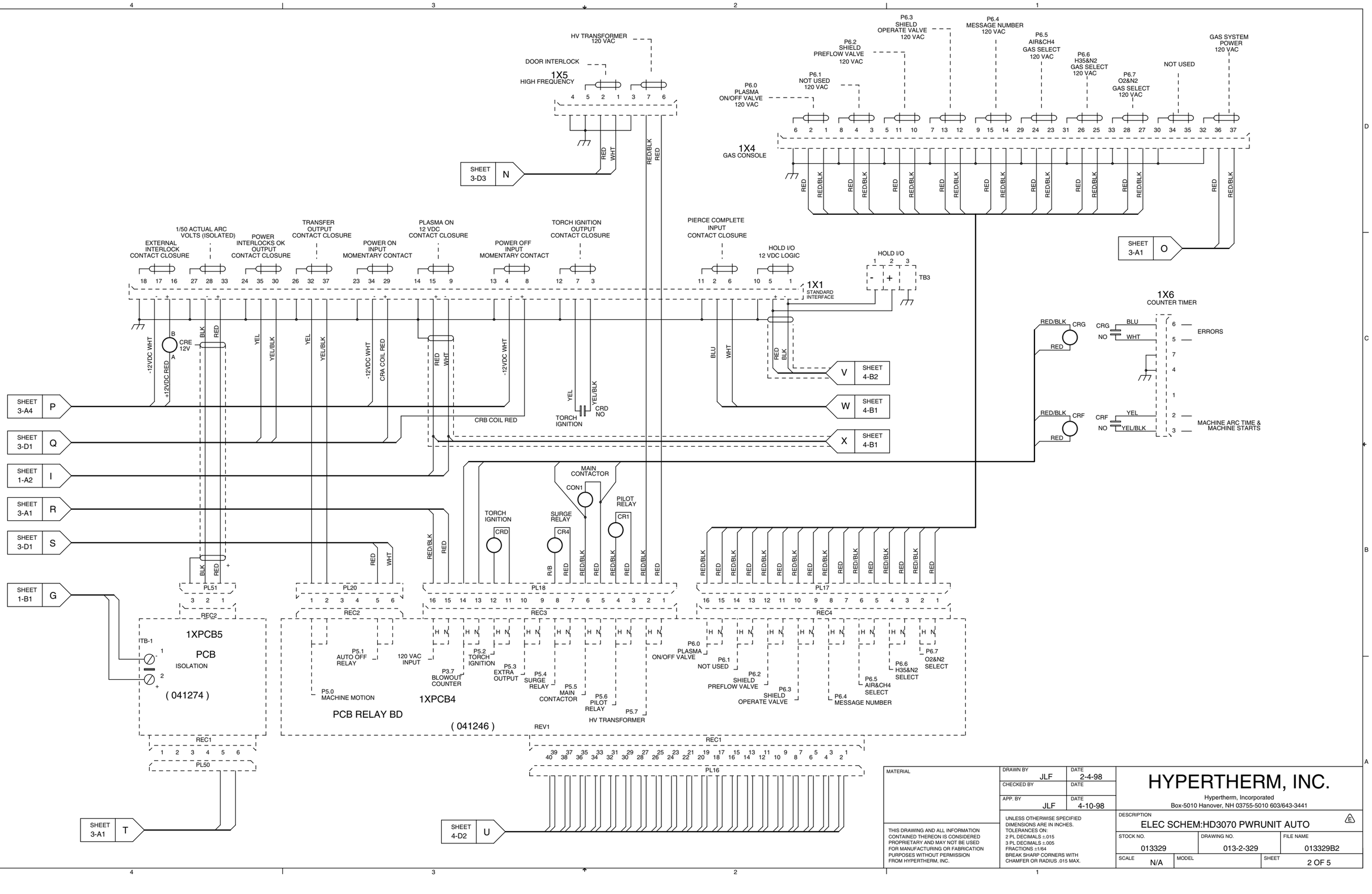
HYPERTHERM, INC.

Hypertherm, Incorporated
Box-5010 Hanover, NH 03755-5010 603/643-3441

DESCRIPTION
ELEC SCHEM:HD3070 PWRUNIT AUTO
E

STOCK NO.	DRAWING NO.	FILE NAME
013329	013-2-329	013329B1

SCALE	MODEL	SHEET
N/A		1 OF 5



MATERIAL	DRAWN BY JLF	DATE 2-4-98	HYPERTHERM, INC.
	CHECKED BY	DATE	Hypertherm, Incorporated Box-5010 Hanover, NH 03755-5010 603/643-3441
	APP. BY JLF	DATE 4-10-98	DESCRIPTION: ELEC SCHEM:HD3070 PWRUNIT AUTO (E)
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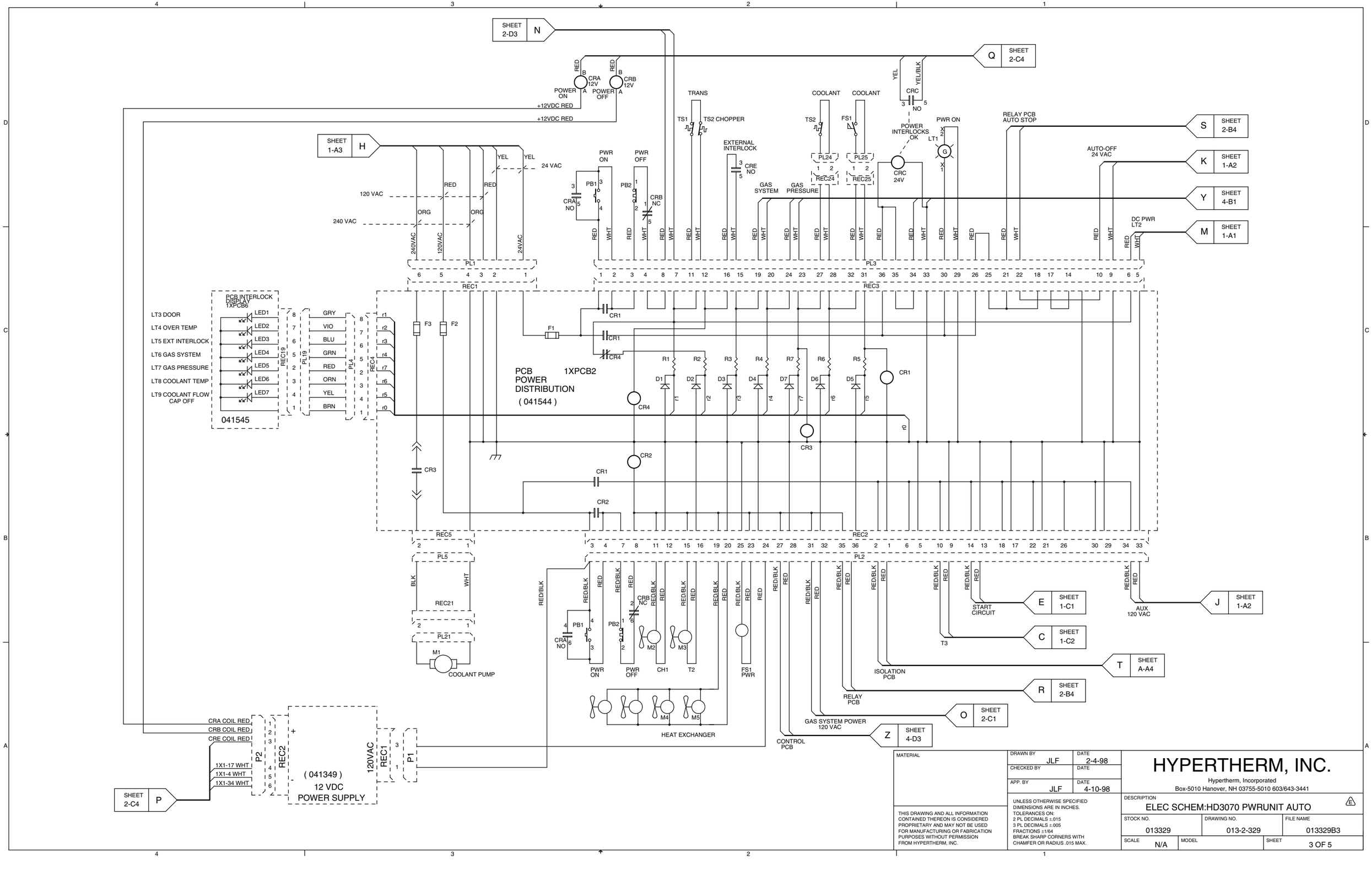

MATERIAL	DRAWN BY JLF	DATE 2-4-98	HYPERTHERM, INC.
	CHECKED BY	DATE	Hypertherm, Incorporated
	APP. BY JLF	DATE 4-10-98	Box-5010 Hanover, NH 03755-5010 603/643-3441

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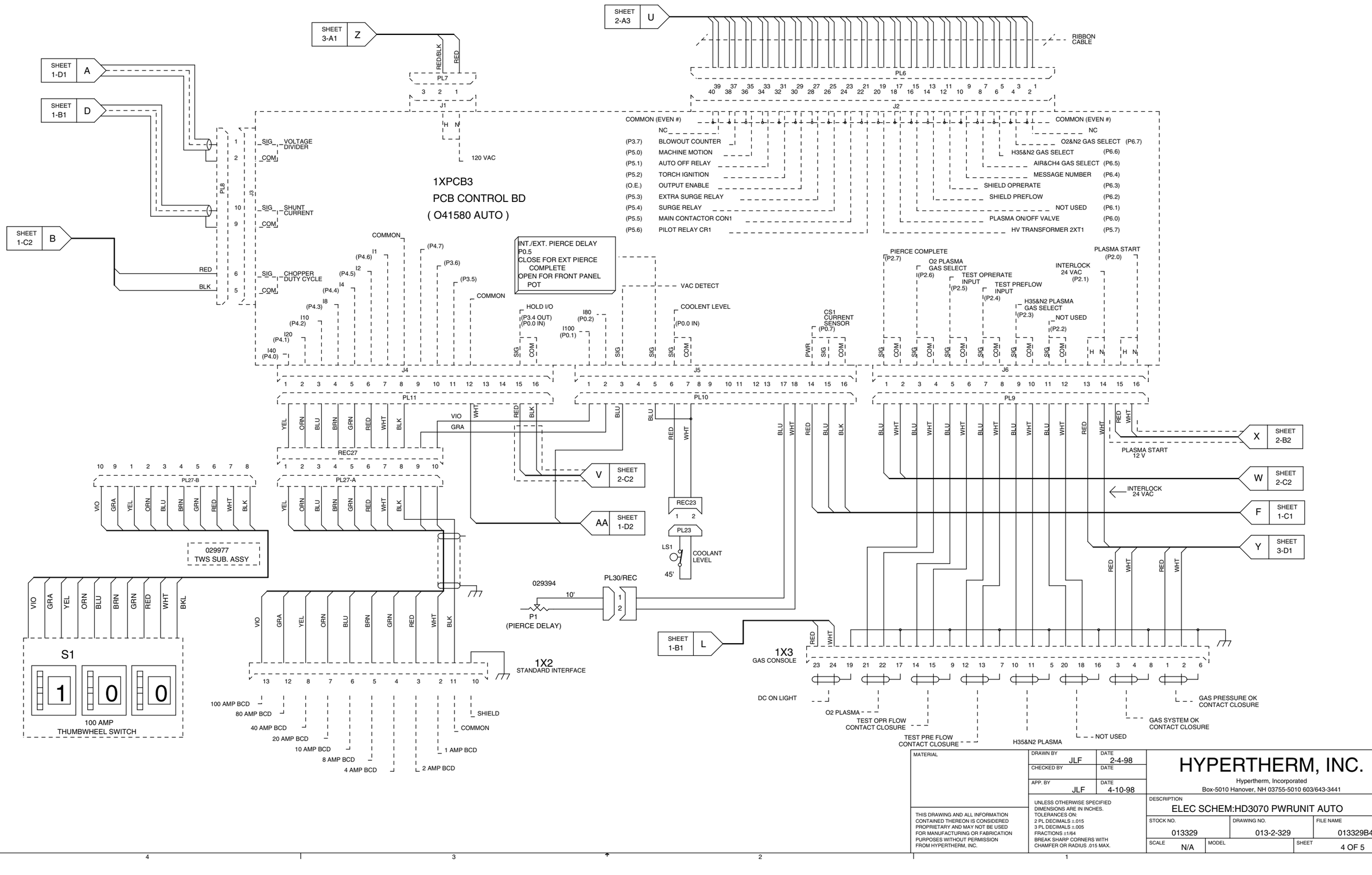
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
2 PL DECIMALS ±.015
3 PL DECIMALS ±.005
FRACTIONS ±1/64
BREAK SHARP CORNERS WITH CHAMFER OR RADIUS .015 MAX.

DESCRIPTION: ELEC SCHEM:HD3070 PWRUNIT AUTO

STOCK NO.	DRAWING NO.	FILE NAME
013329	013-2-329	013329B3

SCALE	MODEL	SHEET
N/A		3 OF 5



MATERIAL	DRAWN BY JLF	DATE 2-4-98	HYPERTHERM, INC.
	CHECKED BY	DATE	Hypertherm, Incorporated Box-5010 Hanover, NH 03755-5010 603/643-3441
	APP. BY JLF	DATE 4-10-98	DESCRIPTION: ELEC SCHEM:HD3070 PWRUNIT AUTO (E)
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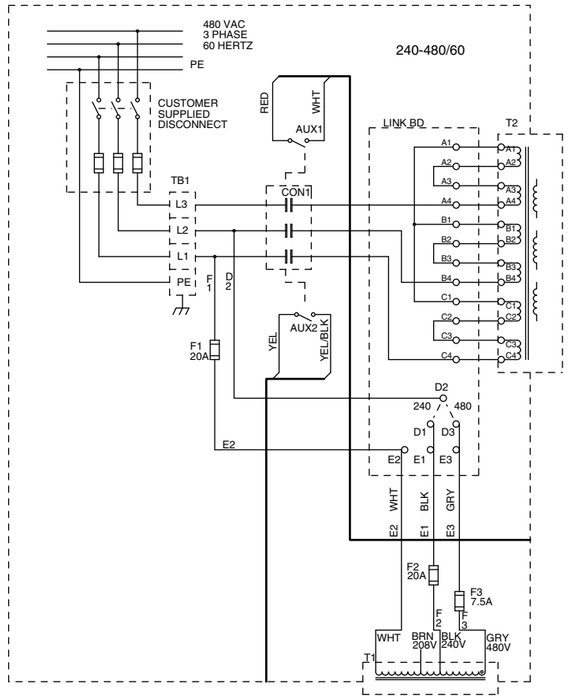
078075



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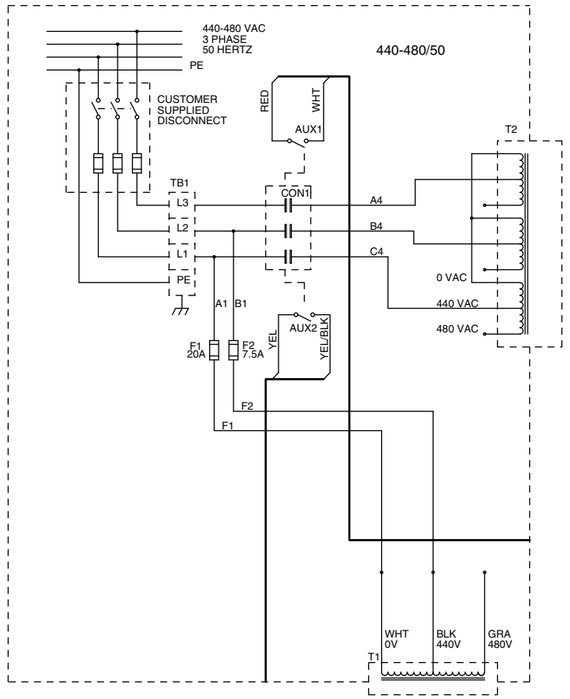

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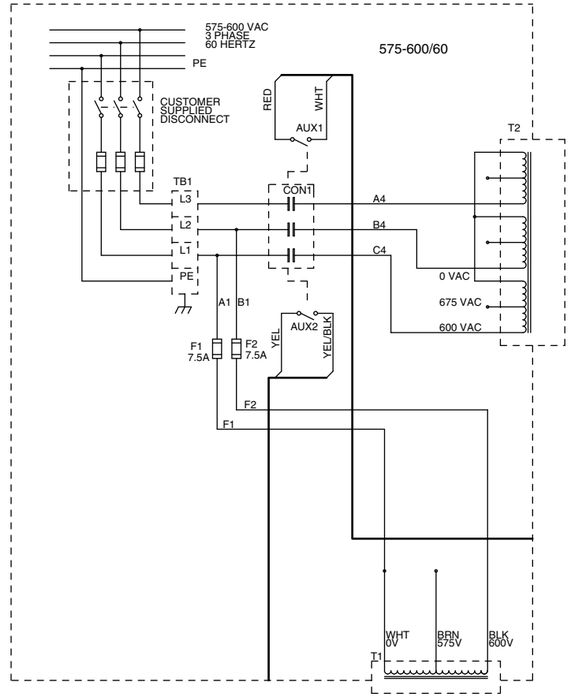

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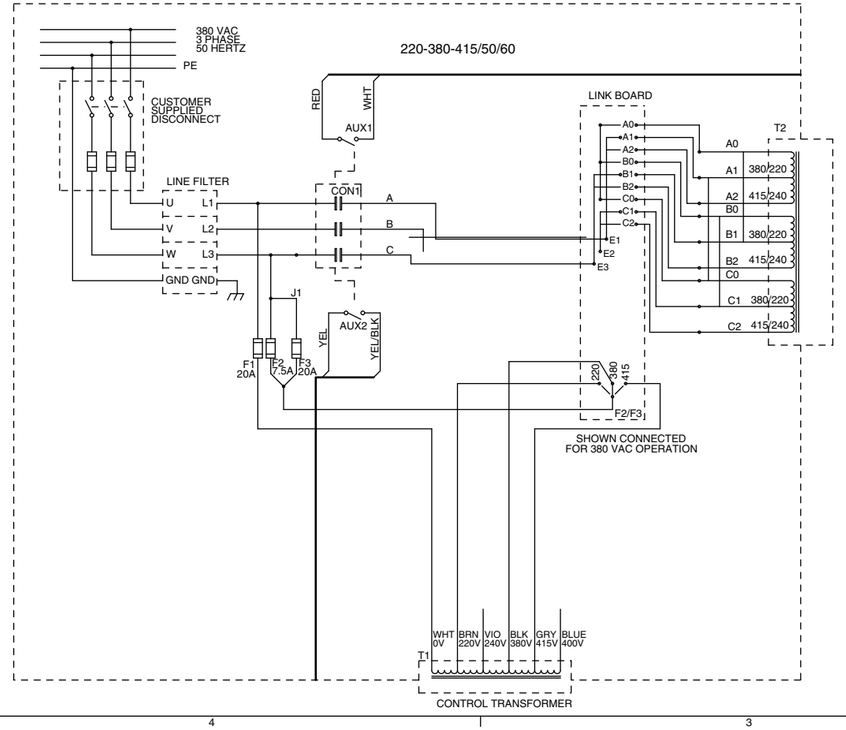

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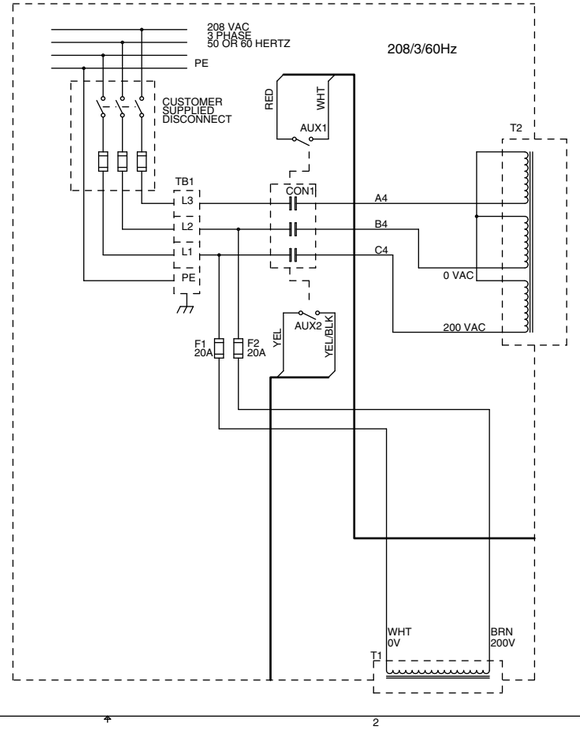

MATERIAL	DRAWN BY JLF	DATE 2-4-98	HYPERTHERM, INC.
	CHECKED BY	DATE	Hypertherm, Incorporated Box-5010 Hanover, NH 03755-5010 603/643-3441
	APP. BY JLF	DATE 4-10-98	DESCRIPTION: ELEC SCHEM:HD3070 PWRUNIT AUTO (E)
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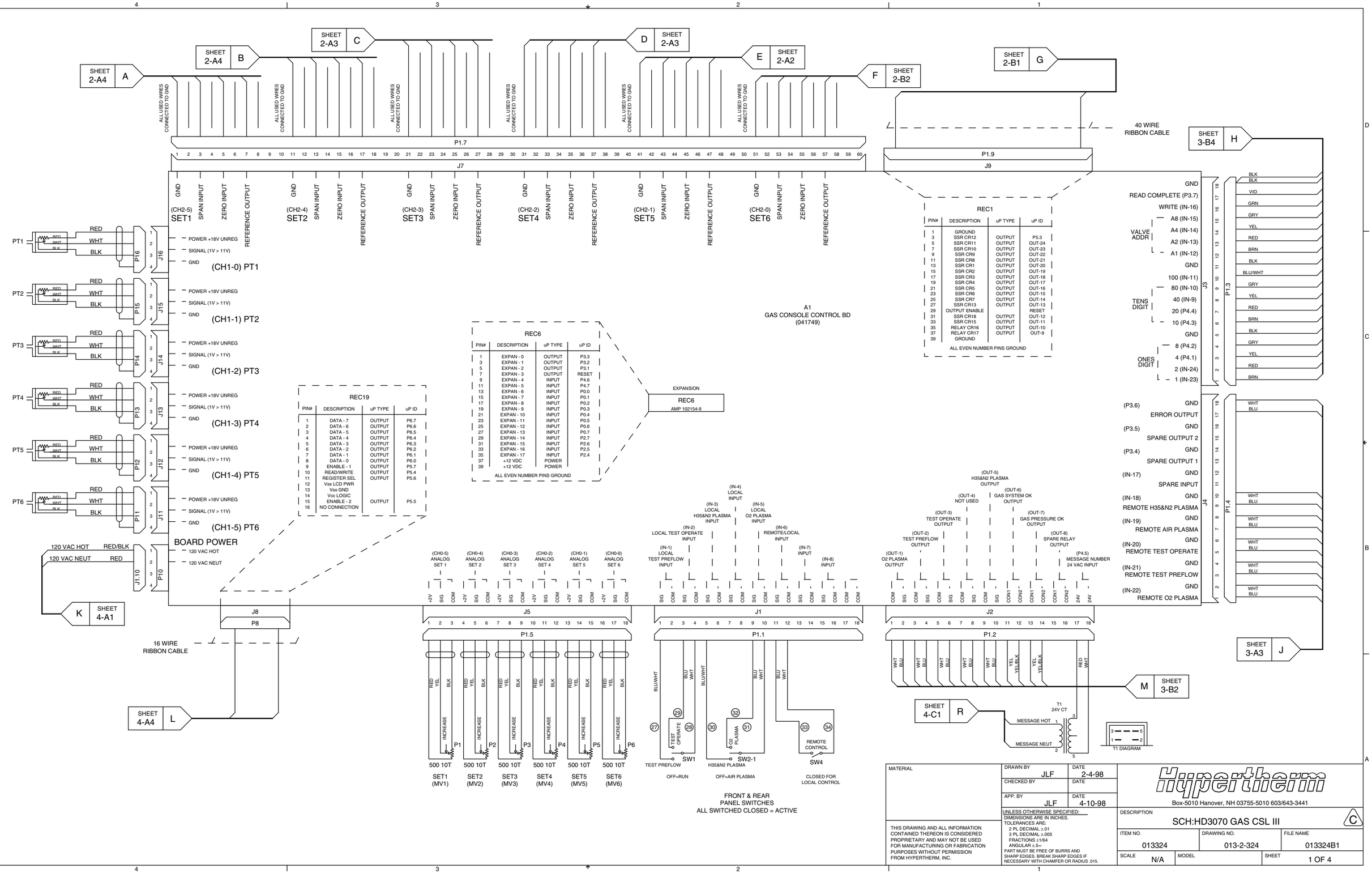
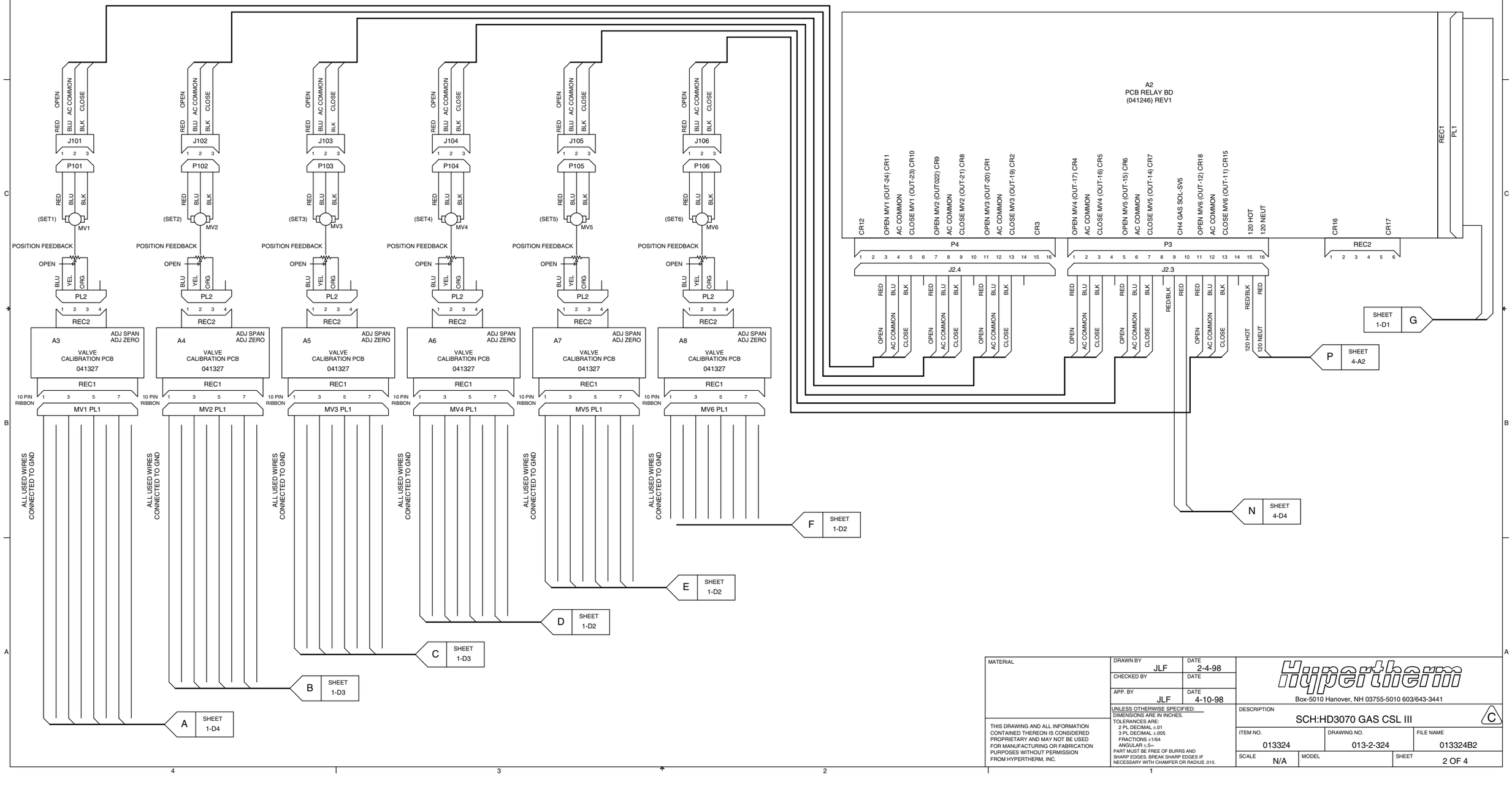
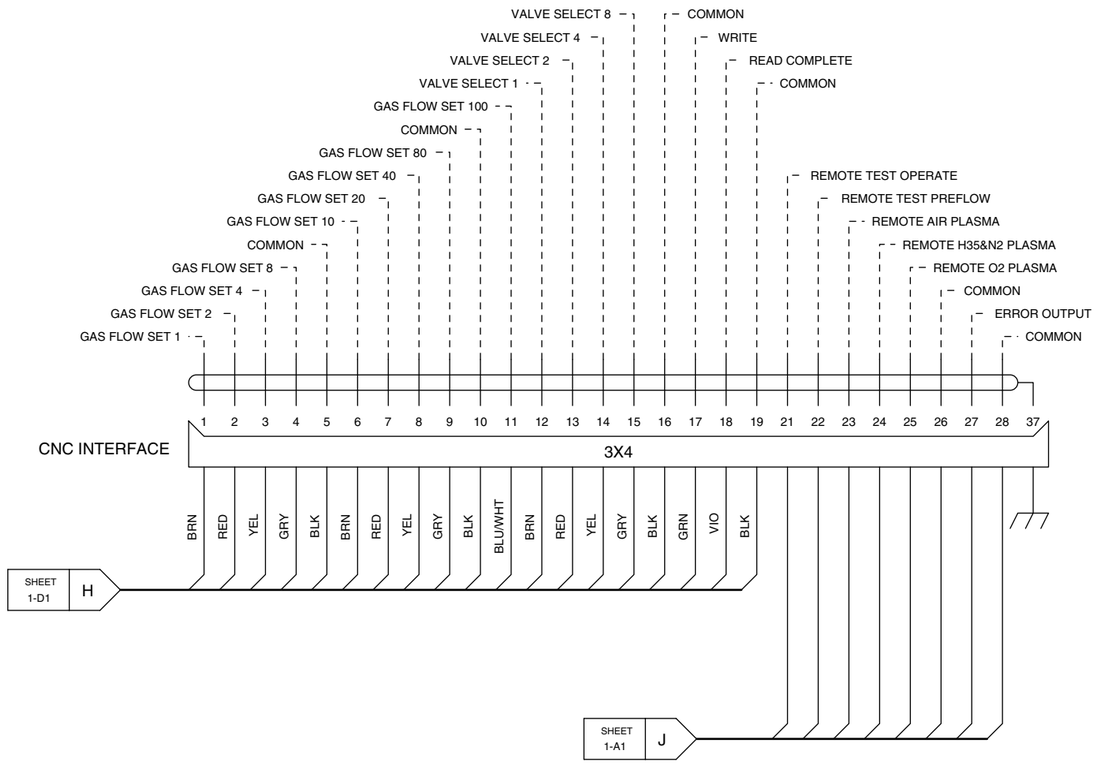


MATERIAL	DRAWN BY JLF	DATE 2-4-98	Hypertherm
	CHECKED BY	DATE	Box-5010 Hanover, NH 03755-5010 603/643-3441
	APP. BY JLF	DATE 4-10-98	DESCRIPTION: SCH:HD3070 GAS CSL III (C)
THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS CONSIDERED PROPRIETARY AND MAY NOT BE USED FOR MANUFACTURING OR FABRICATION 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.		ITEM NO. 013324 | DRAWING NO. 013-2-324 | FILE NAME 013324B1 | SCALE N/A | MODEL | SHEET 1 OF 4

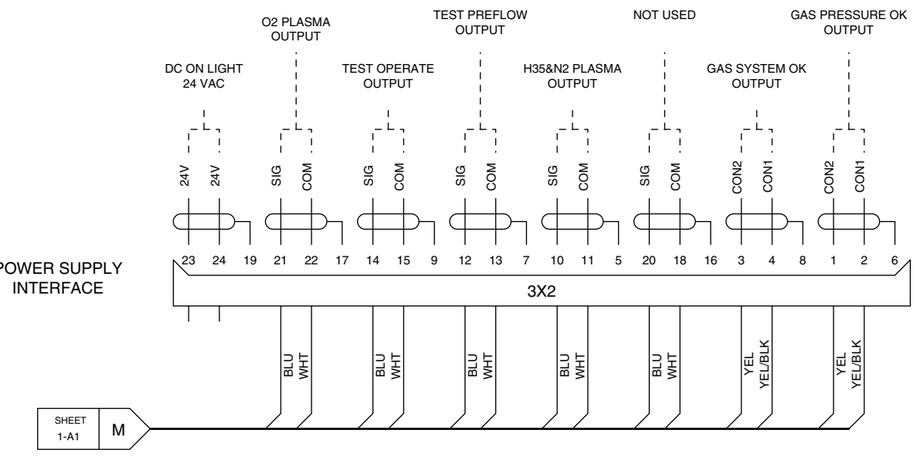


MATERIAL	DRAWN BY JLF	DATE 2-4-98	Hypertherm Box-5010 Hanover, NH 03755-5010 603/643-3441
	CHECKED BY	DATE	
	APP. BY JLF	DATE 4-10-98	DESCRIPTION: SCH:HD3070 GAS CSL III (C)
THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS CONSIDERED PROPRIETARY AND MAY NOT BE USED FOR MANUFACTURING OR FABRICATION 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.		ITEM NO. 013324 · DRAWING NO. 013-2-324 · FILE NAME 013324B2 SCALE N/A · MODEL · SHEET 2 OF 4

ALL INPUTS LOW OR CLOSED = ACTIVE



ALL OUTPUTS LOW OR CLOSED = ACTIVE



MATERIAL	DRAWN BY: JLF	DATE: 2-4-98	Hypertherm
	CHECKED BY	DATE	Box-5010 Hanover, NH 03755-5010 603/643-3441
	APP. BY: JLF	DATE: 4-10-98	DESCRIPTION: SCH:HD3070 GAS CSL III (C)
	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.		ITEM NO.: 013324 / DRAWING NO.: 013-2-324 / FILE NAME: 013324B3
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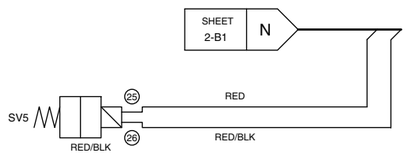
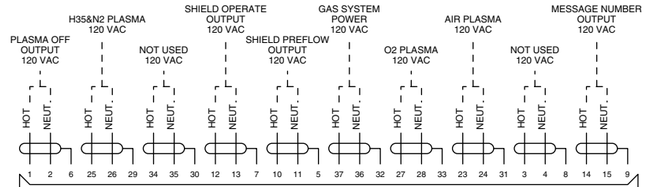
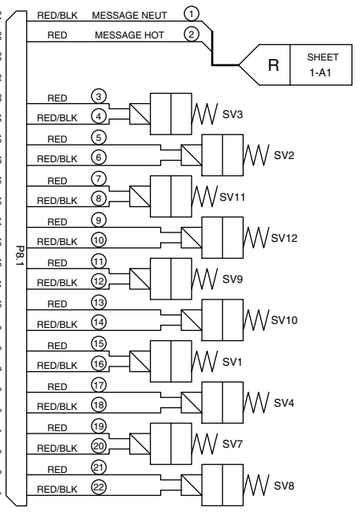
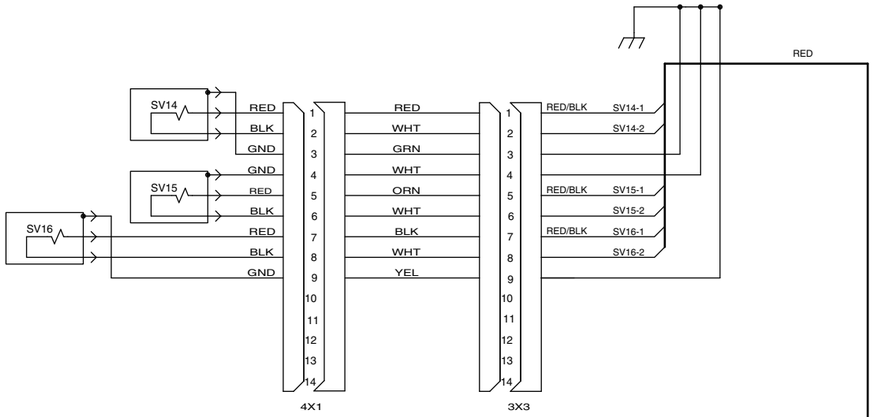
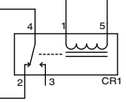


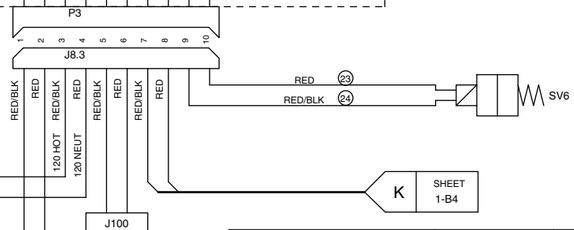


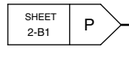
A8
VALVE DISTRIBUTION
(041559)

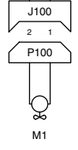




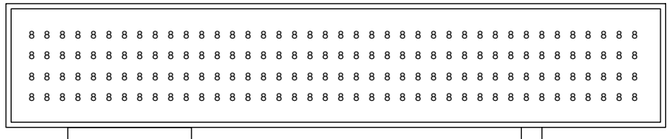


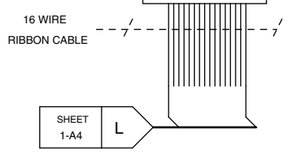


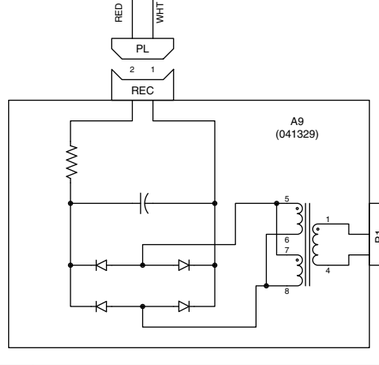




A10
LCD DISPLAY
OPTREX DMC40457-NY-LY







MATERIAL	DRAWN BY JLF	DATE 2-4-98	Hypertherm Box-5010 Hanover, NH 03755-5010 603/643-3441
	CHECKED BY	DATE	DESCRIPTION SCH:HD3070 GAS CSL III C
	APP. BY JLF	DATE 4-10-98	ITEM NO. 013324 / DRAWING NO. 013-2-324 / FILE NAME 013324B4
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Hypertherm

Appendix A

HD3070 CNC INTERFACE SIGNAL LIST

In this section:

Power Supply CNC Interface Signals

Power Supply Connector 1X1 Standard Interface

SIGNAL	PIN #	POL	DESCRIPTION
EXTERNAL INTERLOCK INPUT	16 17 18	+ - SHLD	CNC MUST PROVIDE A CLOSED CKT TO ALLOW POWER SUPPLY OPERATION. 12VDC, 80MA SINK REQUIRED.
1/50 ARC VOLTAGE OUTPUT	33 28 27	+ - SHLD	SIGNAL PROPORTIONAL TO ARC VOLTS 4VDC OUTPUT WITH 200Vdc ARC. OUTPUT IS ISOLATED AND FLOATING.
INTERLOCKS OK OUTPUT	35 30 24	DRY DRY SHLD	DRY CONTACT CLOSURE THAT IS CLOSED WHEN ALL POWER SUPPLY INTERLOCKS ARE SATISFIED.
TRANSFER OUTPUT	32 37 26	DRY DRY SHLD	DRY CONTACT CLOSURE THAT IS CLOSED WHEN TRANSFER OCCURS. USED TO START PIERCE COMPLETE AND MACHINE MOTION TIMING.
POWER ON INPUT	29 34 23	+ - SHLD	CNC MUST PROVIDE A CLOSED CKT TO POWER UP THE POWER SUPPLY. CNC SHOULD MAINTAIN UNTIL INTERLOCKS OK OUTPUT BECOMES ACTIVE AND THEN OK OUTPUT BECOMES ACTIVE AND REMOVE. IF INTERLOCKS OK OUTPUT IS NOT RECEIVED IN A REASONABLE TIME (20 SEC) THEN CHECK INDIVIDUAL INTERLOCKS. 12V dc, 80mA SINK REQUIRED.
PLASMA ON INPUT	15 9 14	DRY DRY SHLD	CNC MUST INITIATE DRY CONTACT CLOSURE TO START AND OPERATE PLASMA.
POWER OFF INPUT	8 4 13	+ - SHLD	CNC SHOULD PROVIDE A MOMENTARY CLOSED CIRCUIT TO POWER DOWN THE POWER SUPPLY. INPUT IS 12V dc AND REQUIRES SINKING 80mA.

Power Supply Connector 1X1 Standard Interface (continued)

SIGNAL	PIN #	POL	DESCRIPTION
TORCH IGNITION OUTPUT	7 3 12	DRY DRY SHLD	CONTACT WILL CLOSE WHEN PLASMA TORCH IGNITES. CAN BE USED TO LOCATE WORK BY STARTING MOTION UNTIL TRANSFER OUTPUT IS ACTIVE.
PIERCE COMPLETE INPUT	2 6 11	+ - SHLD	THIS INPUT CHANGES THE SHIELD GAS FLOW FROM THE PIERCE LEVEL TO THE CUT LEVEL. THE CNC SHOULD PROVIDE A CONTACT CLOSURE ON THIS INPUT A TIME DELAY AFTER THE TRANSFER OUTPUT BECOMES ACTIVE. 12Vdc, 3 mA.
HOLD I/O INPUT/ OUTPUT	5 1 10	+ - SHLD	THE CNC CAN EXTEND THE PREFLOW TIME AND DELAY TORCH IGNITION BY PROVIDING A CONTACT CLOSURE ON THIS INPUT. THIS INPUT CAN BE USED TO SYNCHRONIZE MULTIPLE TORCHES OR PROVIDE AN ADVANCED START TO ALLOW PREFLOW DURING MACHINE MOTION BETWEEN CUTS. 12Vdc 3mA

Power Supply Connector 1X2 Standard Interface

SIGNAL	PIN #	POL	DESCRIPTION
100 AMP BCD	13	+	
80 AMP BCD	12	+	
40 AMP BCD	8	+	
20 AMP BCD	7	+	THESE INPUTS ARE FOR THE CNC CONTROLLER TO SET THE POWER SUPLY CURRENT LEVEL. THE BCD DIGITS ARE MADE ACTIVE BY CONNECTING THEM TO THE SIGNAL COMMON. 12Vdc, 3mA
10 AMP BCD	6	+	
8 AMP BCD	5	+	
4 AMP BCD	4	+	THE POWER SUPPLY OUT WILL FOLLOW THESE SET POINTS DURING A CUT TO ALLOW THE CNC TO COMPENSATE FOR CHANGES IN MACHINE MOTION.
2 AMP BCD	3	+	
1 AMP BCD	2	+	
COMMON	11	-	
SHIELD	10	SHLD	

Power Supply Connector 1X6 Timer/Counter

SIGNAL	PIN #	POL	DESCRIPTION
ARC TIME & # STARTS OUTPUT	2 3	DRY DRY	THIS CONTACT WILL CLOSE EACH TIME THE TORCH IS STARTED. THE CONTACT WILL REMAIN CLOSED UNTIL THE TORCH IS EXTINGUISHED. THIS OUTPUT IS USED TO KEEP TRACK OF OR PREDICT CONSUMABLE LIFE. # STARTS & ARC TIME
ERRORS OUTPUT	6 6	DRY DRY	THIS CONTACT WILL PULSE CLOSED (100 mS) EVERY TIME THE TORCH IS IMPROPERLY EXTINGUISHED. THE TORCH MUST REMAIN TRANSFERED DURING TURN OFF TO MAXIMIZE CONSUMABLE LIFE. THIS OUTPUT IS USED TO KEEP TRACK OF OR PREDICT CONSUMABLE LIFE.

Gas Console CNC Interface Signals

Gas Console Connector 3X4 CNC Interface

SIGNAL	PIN #	POL	DESCRIPTION
GAS FLOW SET 1	1	+	THESE INPUTS ARE USED BY THE CNC MACHINE TO SET THE PERCENT FLOW RATES FOR THE 6 GAS METERING VALVES. THE BCD INPUTS ARE MADE ACTIVE BY CONNECTING THEM TO THE SIGNAL COMMON. THE DATA ON THESE LINES MUST BE SETUP AND STABLE BEFORE THE CNC ISSUES A WRITE PULSE TO LOCK IN THE SET POINT. FLOW SETPOINTS MUST BE IN THE RANGE 0 TO 100%. 12Vdc, 3mA
SET 2	2	+	
SET 4	3	+	
SET 8	4	+	
COMMON	5	+	
SET 10	6	+	
SET 20	7	+	
SET 40	8	+	
SET 80	9	+	
COMMON	10	+	
SET 100	11	+	
VALVE SELECT SELECT 1	12	+	THESE INPUTS ARE USED BY THE CNC TO DETERMINE WHICH GAS FLOW METERING VALVE IS TO BE CHANGED. THE VALVES ARE NUMBERED FROM 1 TO 6 CORRESPONDING TO THE NUMBERS IN THE CUT CHARTS. AN INPUT IS MADE ACTIVE BY CONNECTING IT TO THE SIGNAL COMMON. 12Vdc, 3mA
SELECT 2	13	+	
SELECT 4	14	+	
SELECT 8	15	+	
COMMON	16	+	THE DATA ON THESE LINES MUST BE SETUP AND STABLE BEFORE THE CNC ISSUES A WRITE PULSE.
WRITE INPUT	17	+	THESE 2 SIGNALS ARE USED TO COORDINATE THE DATA TRANSFER BETWEEN THE CNC AND THE GAS CONSOLE. THE CNC SHOULD PLACE VALID DATA ON THE GAS FLOW SET AND VALVE SELECT LINES. THE CNC SHOULD THEN ASSERT THE WRITE SIGNAL UNTIL A READ COMPLETE SIGNAL IS RETURNED. 12Vdc, 3mA
READ COMLETE OUTPUT	18	OPEN COLL-ECTOR	
COMMON	19	-	

Gas Console Connector 3X4 CNC Interface (continued)

SIGNAL	PIN #	POL	DESCRIPTION
TEST OPERATE INPUT	21	+	THE CNC CAN ACTIVATE THIS INPUT TO FLOW CUTFLOW GAS IN A TEST INPUT MODE. 12Vdc, 3mA
TEST PREFLOW INPUT	22	+	THE CNC CAN ACTIVATE THIS INPUT TO FLOW PREFLOW GAS IN A TEST INPUT MODE. 12Vdc, 3mA
REMOTE AIR PLASMA	**23**	**+**	THE CNC CAN ACTIVATE THIS INPUT PLASMA GAS. 12Vdc, 3mA
REMOTE H35 & N_2 PLASMA	24	+	THE CNC CAN ACTIVATE THIS INPUT PLASMA GAS. 12Vdc, 3mA
REMOTE O_2 PLASMA	**25**	**+**	THE CNC CAN ACTIVATE THIS INPUT PLASMA GAS. 12Vdc, 3mA
COMMON	26	-	SIGNAL COMMON.
ERROR INPUT	27	OPEN COLL-ECTOR	THIS OUTPUT WILL BE ACTIVATED WHENEVER THERE IS AN ERROR DISPLAYED ON THE LCD DISPLAY.
COMMON	28	-	SIGNAL COMMON.

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Appendix B

GAS CONTROL BOARD DIP SWITCH FUNCTIONS

In this section:

Gas Control Board DIP Switch Functions

DIP SWITCH	POSITION	FUNCTION
1	OFF ON	PRESSURE DISPLAY IN (PSI) PRESSURE DISPLAY IN (BAR)
2		NOT USED
3	OFF ON	NORMAL OPERATION ALL VALVES MOVE TO ZERO POSITION
4	OFF ON	NORMAL OPERATION ALL VALVES MOVE TO FULL SCALE POSITION

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Appendix C

PROPYLENE GLYCOL SAFETY DATA
BENZOTRIAZOLE SAFETY DATA

In this section:

MATERIAL SAFETY DATA SHEET

SECTION 1 -- CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME	HYPERTHERM TORCH COOLANT

PRODUCT CODE	

ISSUE DATE	11-22-96

EMERGENCY TELEPHONE NUMBERS

MANUFACTURER	**HYPERTHERM**	**Transportation: (703) 527-3887 ***
STREET ADDRESS	**Etna Rd.**	*** For spill, leak, fire or transport accident emergencies.**
CITY, STATE, ZIP	**Hanover, NH 03755**	**Product Information: (603) 643-5638**

SECTION 2 -- COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENT	CAS No.	% by wt.	EXPOSURE LIMITS OSHA PEL	ACGIH TLV	NIOSH REL
Propylene glycol	0057-55-6	< 50	None Established	None Established	None Established

SECTION 3 -- HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW	Can cause eye and skin irritation. Harmful if swallowed..

POTENTIAL HEALTH EFFECTS	
INGESTION	Can cause irritation, nausea, stomach distress, vomiting and diarrhea.
INHALATION	May cause mild irritation of nose, throat, and respiratory tract.
EYE CONTACT	Causes eye irritation.
SKIN CONTACT	Prolonged or repeated contact may cause skin irritation.

SECTION 4 -- FIRST AID MEASURES

INGESTION	DO NOT induce vomiting, but give one or two glasses of water to drink and get medical attention.
INHALATION	No specific treatment is necessary, since this material is not likely to be hazardous by inhalation.
EYE CONTACT	Immediately flush eye with cool running water for 15 minutes. If irritation persists, get medical attention.
SKIN CONTACT	Wash with soap and water. If irritation develops or persists, get medical attention.
NOTE TO PHYSICIAN	Treatment based on judgment of the physician in response to reactions of the patient.

SECTION 5 -- FIRE FIGHTING MEASURES

FLASH POINT / METHOD	None / N.A.	FLAMMABLE LIMITS	Not flammable or combustible
EXTINGUISHING MEDIA	If involved in a fire, use foam, carbon dioxide or dry chemical extinguisher. Water may cause frothing.		
SPECIAL FIRE FIGHTING PROCEDURES	None		
FIRE AND EXPLOSION HAZARDS	None		

SECTION 6 -- ACCIDENTAL RELEASE MEASURES

RESPONSE TO SPILLS	Small spills: Flush into a sanitary sewer. Mop up residue and rinse area thoroughly with water. Large spills: Dike or dam the spill. Pump into containers or soak up on inert absorbent.

SECTION 7 -- HANDLING AND STORAGE

HANDLING PRECAUTIONS	Keep container in upright position.
STORAGE PRECAUTIONS	Store in a cool dry place. Keep from freezing.

SECTION 8 -- EXPOSURE CONTROLS / PERSONAL PROTECTION

HYGIENIC PRACTICES	Normal procedures for good hygiene.
ENGINEERING CONTROLS	Good general ventilation should be sufficient to control airborne levels. Facilities using this product should be equipped with an eyewash station.

PERSONAL PROTECTIVE EQUIPMENT

X	**RESPIRATOR**	Recommended for prolonged use in confined areas with poor ventilation
X	**GOGGLES / FACE SHIELD**	Recommended; goggles should protect against chemical splash
	APRON	Not necessary
X	**GLOVES**	Recommended; PVC, Neoprene or Nitrile acceptable
	BOOTS	Not necessary

SECTION 9 -- PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE	Clear liquid	BOILING POINT	160 deg F
ODOR	Not Appreciable	FREEZING POINT	Not established
pH	4.6-5.0(100% concentrate)	VAPOR PRESSURE	Not applicable
SPECIFIC GRAVITY	1.0	VAPOR DENSITY	Not applicable
SOLUBILITY IN WATER	Complete	EVAPORATION RATE	Not determined

SECTION 10 -- STABILITY AND REACTIVITY

CHEMICAL STABILITY		**STABLE**	X		**UNSTABLE**	
CONDITIONS TO AVOID	No special precautions beyond standard safe industrial practices.					
INCOMPATIBILITY	Avoid contact with strong mineral acids and strong oxidizers, including chlorine bleach.					
HAZARDOUS PRODUCTS OF DECOMPOSITION	Carbon monoxide may be formed during combustion.					
POLYMERIZATION		**WILL NOT OCCUR**	X		**MAY OCCUR**	
CONDITIONS TO AVOID	Not applicable					

SECTION 11 -- TOXICOLOGICAL INFORMATION

CARCINOGENICITY

	THIS PRODUCT CONTAINS A KNOWN OR SUSPECTED CARCINOGEN
X	**THIS PRODUCT DOES NOT CONTAIN ANY KNOWN OR ANTICIPATED CARCINOGENS ACCORDING TO THE CRITERIA OF THE NTP ANNUAL REPORT ON CARCINOGENS AND OSHA 29 CFR 1910, Z**

OTHER EFFECTS

ACUTE	Not determined
CHRONIC	Not determined

SECTION 12 -- ECOLOGICAL INFORMATION

BIODEGRADABILITY		CONSIDERED BIODEGRADABLE	X		NOT BIODEGRADABLE	
BOD / COD VALUE	Not established					
ECOTOXICITY	No data available					

SECTION 13 -- DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD	Product that cannot be used according to the label must be disposed of as a hazardous waste at an approved hazardous waste management facility. Empty containers may be triple rinsed, then offered for recycling or reconditioning; or puncture and dispose of in a sanitary landfill.								
RCRA CLASSIFICATION	NO								
RECYCLE CONTAINER		YES	X		CODE	2 - HDPE		NO	

SECTION 14 -- TRANSPORT INFORMATION

DOT CLASSIFICATION		HAZARDOUS			NOT HAZARDOUS	X
DESCRIPTION	Not applicable					

SECTION 15 -- REGULATORY INFORMATION

USA REGULATORY STATUS

	EPA REGISTERED (UNDER FIFRA)	
	FDA REGULATED	
	KOSHER	
	SARA TITLE III MATERIAL	
	USDA AUTHORIZED	

SECTION 16 -- OTHER INFORMATION

NFPA CLASSIFICATION

1	BLUE	HEALTH HAZARD
1	RED	FLAMMABILITY
0	YELLOW	REACTIVITY
--	WHITE	SPECIAL HAZARD

Information contained in this MSDS refers only to the specific material designated and does not relate to any process or use involving other materials. This information is based on data believed to be reliable, and the Product is intended to be used in a manner that is customary and reasonably foreseeable. Since actual use and handling are beyond our control, no warranty, express or implied, is made and no liability is assumed by Hypertherm in connection with the use of this information.

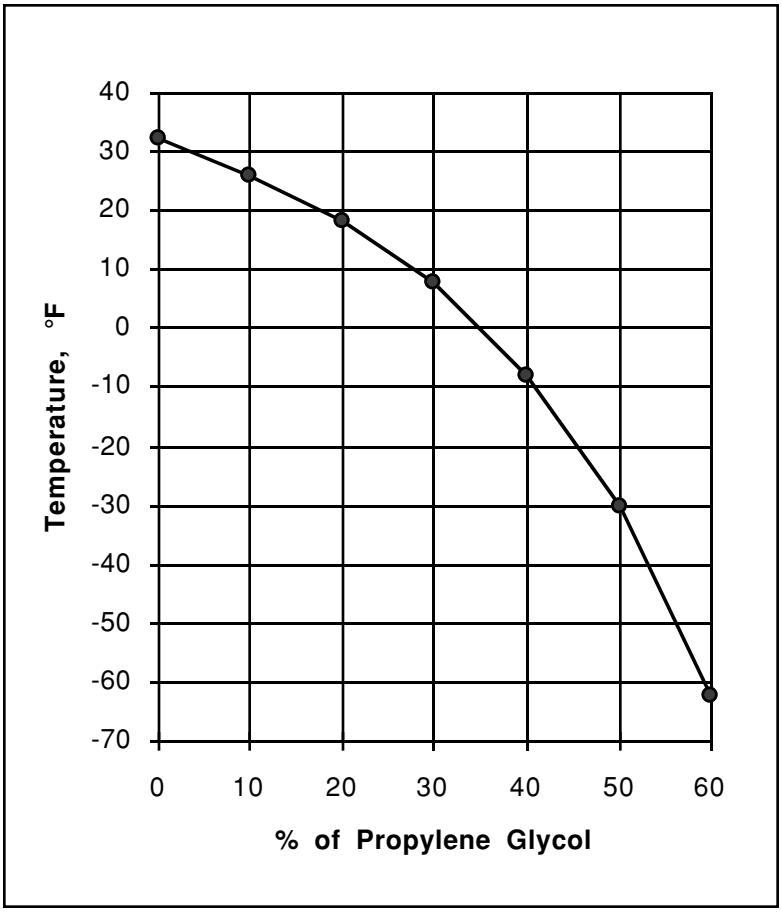

Figure c-1 Freezing Point of Propylene Glycol Solution

SECTION I

MANUFACTURER:	PMC SPECIALTIES GROUP, INC.
ADDRESS:	501 Murray Road Cincinnati, OH 45217
EMERGENCY TELEPHONE:	(513) 242-3300
FOR TRANSPORTATION EMERGENCY:	(800) 424-9300
CHEMICAL NAME AND SYNONYMS:	1-H Benzotriazole, Benzotriazole
TRADE NAMES AND SYNONYMS:	COBRATEC® 99 Powder
CHEMICAL FAMILY:	Triazole
FORMULA:	$C_6H_5N_3$
DOT SHIPPING DESCRIPTION:	Not Regulated (Benzotriazole)
PRODUCT NUMBER:	X18BT5585

NFPA BASED RATINGS: Health: 1, Flammability: 1, Reactivity: 0
HMIS RATINGS: Health: 2, Flammability: 0, Reactivity: 0, PPE: E
WHMIS CLASSIFICATION: D-2-(B)

SECTION II INGREDIENTS

Material	CAS No.	Wt. %	Exposure Limits
Benzotriazole	95-14-7	>99	None Established

SECTION III PHYSICAL DATA

BOILING POINT:	>350° C
FREEZING POINT:	94-99° C
SPECIFIC GRAVITY:	1.36 (solid)
VAPOR PRESSURE AT 20° C:	0.04 mm Hg
VAPOR DENSITY (air=1):	4.1 (calculated)
SOLUBILITY IN WATER % BY WT at 20° C:	2.0
% VOLATILES BY VOLUME:	None
EVAPORATION RATE (Butyl Acetate = 1):	Non-volatile
APPEARANCE AND ODOR:	Off white powder. Slight characteristic odor.

08/28/95

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT:	340° F. (CC)
AUTOIGNITION TEMPERATURE:	Not Available
FLAMMABLE LIMITS IN AIR:	LOWER: Dust MEC. 0.03 oz/(cu. ft.) UPPER: Not Available

EXTINGUISHING MEDIA: Carbon Dioxide, Dry Chemical, Foam

SPECIAL FIRE FIGHTING PROCEDURES: Full protective equipment including self-contained breathing apparatus should be used. Water spray may be ineffective. If water is used, fog nozzles are preferable. Water may be used to cool closed containers to prevent pressure build-up and possible autoignition or explosion when exposed to extreme heat. During emergency conditions, overexposure to decomposition products may cause a health hazard. Symptoms may not be immediately apparent. Get medical attention.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Airborne dust is rated a severe explosion hazard at a minimum concentration of 0.03 ounce per cubic feet (30 grams per cubic meter).

SECTION V HEALTH HAZARD DATA

OSHA AIR CONTAMINANTS: Due to its dusting nature during handling, exposure to dust must comply with OSHA's particulate not otherwise regulated limits for total and respirable dust.

EFFECTS OF OVEREXPOSURE: Contact with the eyes is likely to cause severe irritation. Detailed information about the effects of overexposure in the human being is unavailable. Experience thus far has not provided any example of obvious overexposure with resultant symptoms. Animal studies have indicated an effect on the central nervous system. An NCI bioassay showed no convincing evidence of carcinogenicity (NCI-CG-TR-88). Bacterial mutagenicity data exists. Experts consider the data inconclusive. (Environmental Mutagenesis, Vol. 7, Suppl. 5: 1-248 (1985) and references in RTECS #DM1225000).

EMERGENCY AND FIRST AID PROCEDURES: IF INHALED: If affected, remove from exposure. Restore breathing. Keep warm and quiet. IF ON SKIN: Wash affected area thoroughly with soap and water. IF IN EYES: Flush eyes with large amounts of water for 15 minutes. Get medical attention. IF SWALLOWED: Never give anything by mouth to an unconscious person. Give several glasses of water. If vomiting is not spontaneous, induce vomiting. Keep airway clear. Get medical attention.

TOXICITY DATA:

Oral LD_{50} (rat)	560 mg/Kg
Primary skin Irritation (rabbit)	Not a primary skin irritant
Dermal LD_{50}	>2000 mg/Kg
Eye irritation (rabbit)	caused severe eye irritation
Bluegill Sunfish (96 hr. Tlm)	28 mg/l
Minnow (96 hr. Tlm)	28 mg/l
Trout (96 hr. LC_{50})	39 mg/l
Algae (96 hr. EC_{50})	15.4 mg/l
Daphnia magna (48 hr. LC_{50})	141.6 mg/l

SECTION VI REACTIVITY DATA

STABILITY: Stable
INCOMPATIBILITY: Oxidizing Agents
HAZARDOUS DECOMPOSITION PRODUCTS: BY FIRE: Carbon Dioxide, Carbon Monoxide Nitrogen oxides, HCN in reducing atmospheres
HAZARDOUS POLYMERIZATION: Will Not occur

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE THE MATERIAL IS SPILLED OR RELEASED: If local high concentration of airborne dust occurs, dampen spill with water and ventilate to disperse dust laden air. Sweep up spill and reclaim or place in a covered waste disposal container.
WASTE DISPOSAL METHOD: Sanitary landfill or incinerate in approved facilities in accordance with local, state, and federal regulations. Do not heat or incinerate in closed containers.

SECTION VIII SPECIAL PROTECTIVE INFORMATION

RESPIRATORY PROTECTION: If personal exposure cannot be controlled below applicable exposure limits by ventilation, wear respiratory devices approved by NIOSH/MSHA for protection against organic vapors, dusts, and mists.

VENTILATION: Local exhaust recommended for dust control.
PROTECTIVE GLOVES: Recommended to avoid skin contact, Rubber, Vinyl
EYE PROTECTION: Use safety goggles where airborne dust is a problem.
OTHER PROTECTIVE EQUIPMENT: Safety shower, eye wash

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Store in a cool, dry area. Keep containers tightly closed when not in use. Avoid creating airborne dust concentrations which could constitute a potential dust explosion hazard. Avoid contact with skin, eyes, and clothing. Avoid inhalation of dust and vapor. DO NOT TAKE INTERNALLY. Clean up spills immediately.

SECTION X REGULATORY STATUS

Benzotriazole (CAS No. 95-14-7) is contained on the following chemical lists:

1. TSCA Section 8(a)/40CFR 712 Preliminary Assessment Information Rule
2. TSCA Section 8(d) Health and Safety Data Rule
3. NTP Testing Program
4. Massachusetts Substance List
5. Canadian Domestic Substance List
6. WHMIS Ingredient Disclosure List
7. TSCA Inventory List

PREPARED: August 28, 1995
SUPERSEDES: May 25, 1994

The information contained herein is based on the data available to us and is believed to be correct as of the date prepared; however, PMC SPECIALTIES GROUP, INC. makes no warranty, expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof.

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Appendix D

TIMER-COUNTER

In this section:

Introduction

This appendix will enable a technician to install the optional timer-counter to the HD3070 plasma cutting system. The timer-counter consists of the timer-counter and control cable.

	**WARNING** **High Voltage!**
Power supply <u>must</u> be disconnected before installation.	

Installation

1. Mount the timer-counter for easy access, refer to Figure d-1 for dimensions. For fixed mounting of the timer-counter, four mounting holes are located on the bottom.

2. Interface the timer-counter to the power supply with the current setpoint cable by referring to Section 3, *Installation*, page 3-23 and Figure 3-19 and the current setpoint cable lengths and wire run list on Figure 3-20.

Operation

Controls and Indicators (Figure d-2)

Each LCD unit is self-powered by a three-volt lithium battery. When the battery weakens (three to five years) the unit will operate erratically. Replace the faulty LCD unit.

- **STARTS** LCD Counter (w/Reset)
  Indicates the number of arc starts.

- **ARC TIME** LCD Elasped Time Meter
  Indicates the cumlative time that the arc is on hours.

- **ERRORS** LCD Counter (w/Reset)
  Indicates the number of arc errors that have occured. Any of the following four error codes will cause the error counter to increment. Refer to Section 5, *Maintenance* for more information on the error codes.

  Lost Transferred Current During Ramp Up
  Arc was extinguished after the current transferred to the workpiece, but before steady-state operation.

  Lost Set Transferred Current
  Arc was lost during steady-state operation.

  Over Voltage During Steady-State Operation
  During steady-state operation the measured arc voltage exceeded the programmed maximum allowable arc voltage for the set current.

  Lost Current During Ramp Down
  Arc was lost during current ramp down, but before the programmed ramp down time had elapsed.

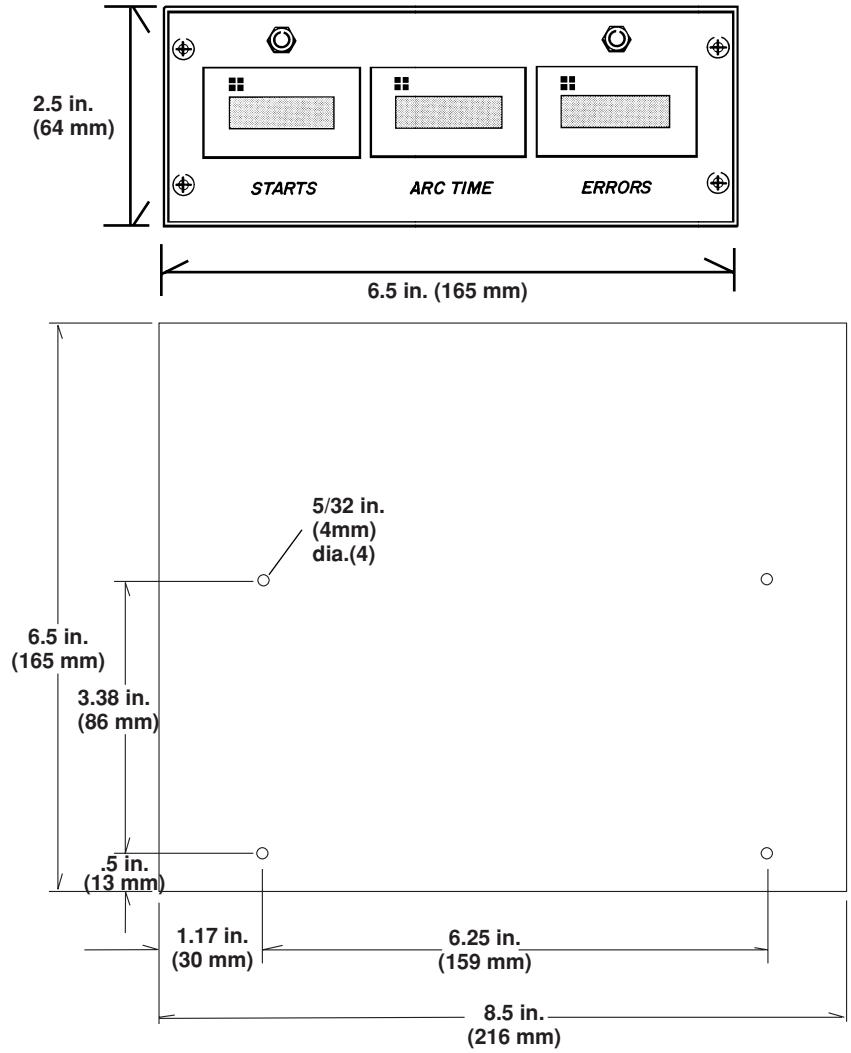

Figure d-1 Timer-Counter Dimensions and Mounting Holes

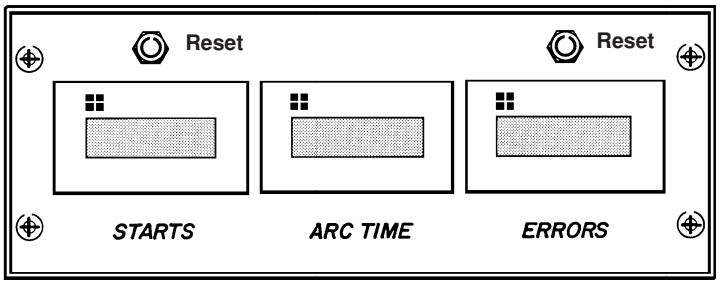

Figure d-2 Timer-Counter Controls and Indicators

Timer-Counter Internal Wiring

Refer to Figure d-3 for the timer-counter wiring between receptacle 5X1 and the ERROR counter, ARC TIME elasped time meter and STARTS counter.

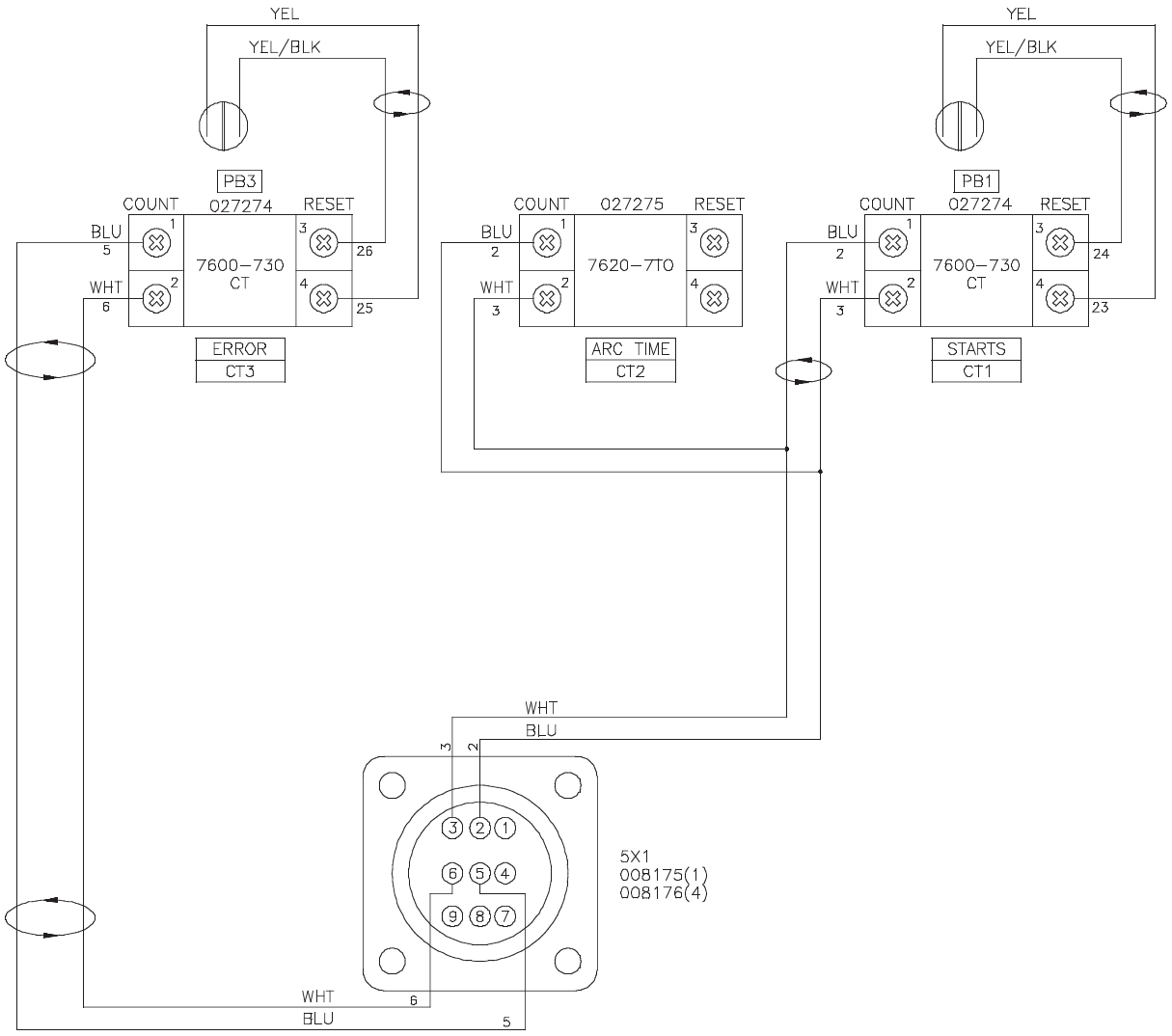

Figure d-3 Timer-Counter Internal Wiring

Parts List

Item	Part Number	Description	Designator	Qty.
	078049	**Assembly, timer-counter**		**1**
1	001391	Panel, front		1
2	027274	Counter, self powered LCD	CT3	1
3	027275	Meter, elapsed time, self powered LCD	CT2	1
4	027274	Counter, self powered LCD	CT1	1
5	005161	Switch, pushbutton, SPDT	PB3	1
6	005161	Switch, pushbutton, SPDT	PB1	1
7	001513	Panel, rear		1
8	008175	Receptacle, CPC 13-9 standard sex	5X1	1
8	008176	Pin, 24-20 AWG TYPE III + CRP		4
	001068	Enclosure, timer-counter (not shown)		1

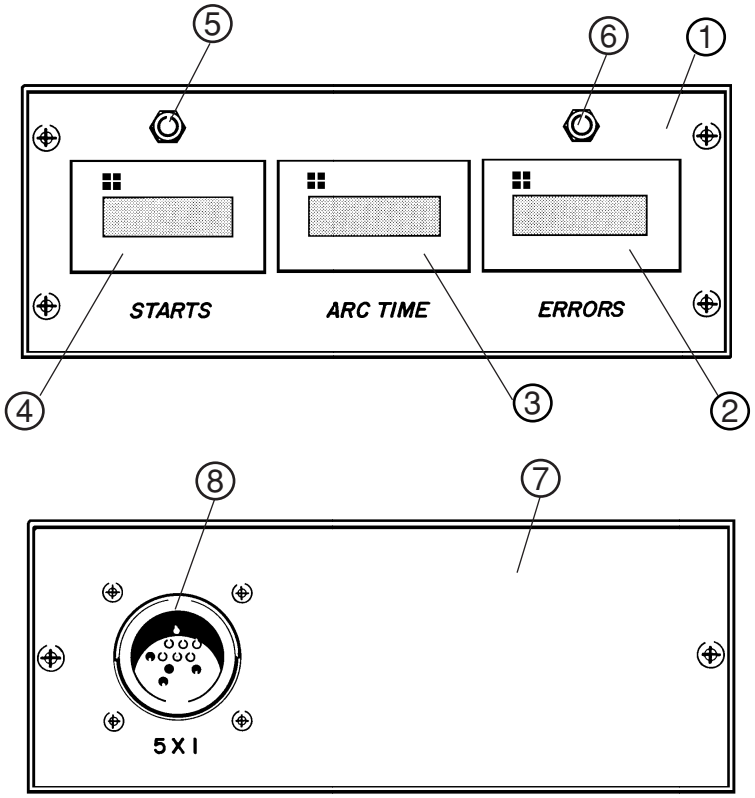

Figure d-4 Timer-Counter Component Locations

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Appendix E

REMOTE CURRENT CONTROL (RCC)

In this section:

Introduction

This appendix will enable a technician to install the optional remote current control (RCC) to the HD3070 plasma cutting system. The RCC has two basic components: the remote current control box (078050) and the current setpoint cable. The RCC is interfaced with the power supply with the current setpoint cable.

WARNING

High Voltage!

Power supply must be disconnected before installation.

Installation

1. Mount the RCC for easy access. For fixed mounting of the RCC, refer to Figure e-1.

2. Interface the RCC to the power supply with the current setpoint cable by referring to Section 3, *Installation,* page 3-23 and Figure 3-19 and the current setpoint cable lengths and wire run list in Figure 3-22.

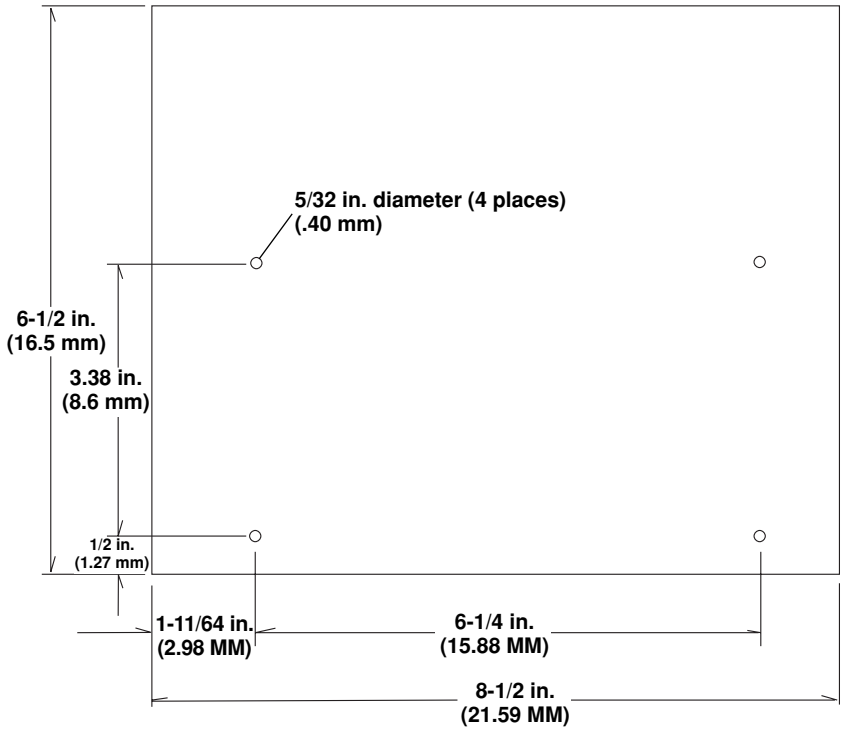

Figure e-1 RCC Mounting Dimensions

RCC 1X2 to Thumbwheel Switch Wiring Interface

Refer to Figure e-2 for wiring interface data between receptacle 1X2 and the thumbwheel switch.

From RCC 1X2 Pin	Color	Thumbwheel
8	Yellow	#1-4
7	Orange	#1-2
6	Blue	#1-1
5	Brown	#2-8
4	Green	#2-4
3	Red	#2-2
2	White	#2-1
11	Black	#2-Common
12	Gray	#2-8
13	Violet	#3-1

Figure e-2 RCC 1X2 to Thumbwheel Switch Wiring Interface

Operation

Set the desired current using the thumbwheel switch on the RCC. Refer to Section 4, *Operation*, for the Cut Chart data for current settings on the type and thickness of materials to be cut.

Parts List

Item	Part Number	Description	Designator	Qty.
	078050	**Remote Current Control, HD3070**		**1**
1	001514	Panel, RCC Front		1
2	005182	Switch, thumbwheel, 3-position BCD		1
3	001515	Panel, RCC Rear		1
4	008186	Socket, 24-20 AWG Type III + CRP		9
4	008208	Recptacle shell, CPC 23-37 reverse sex		1
	001068	Enclosure, RCC (not shown)		1

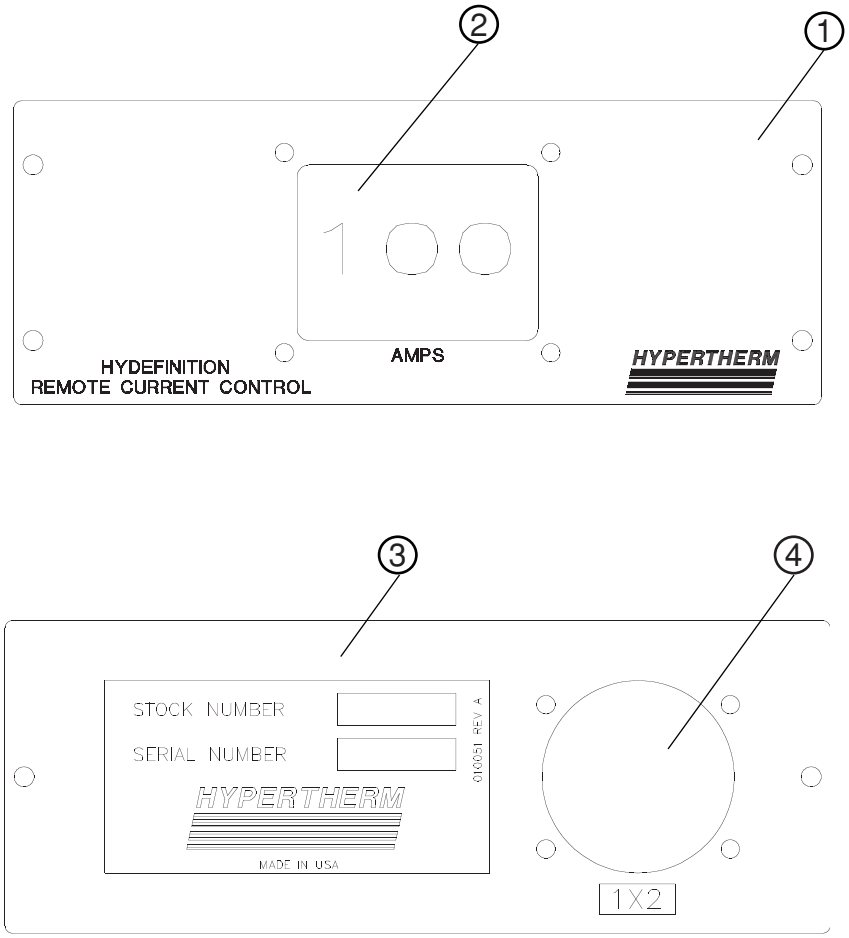

Figure e-3 RCC Component Locations

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Appendix F

ELECTROMAGNETIC COMPATIBILITY (EMC)

In this section:

EMC INTRODUCTION

This plasma cutting equipment has been built in compliance with standard EN50199. To ensure that the equipment works in a compatible manner with other radio and electronic systems, the equipment should be installed and used in accordance with the information below to achieve electromagnetic compatibility.

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

This plasma equipment should be used only in an industrial environment. It may be difficult to ensure electromagnetic compatability in a domestic environment.

INSTALLATION AND USE

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

ASSESSMENT OF AREA

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

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

Maintenance of Cutting Equipment

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

Cutting Cables

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

Equipotential Bonding

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

Earthing of Workpiece

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

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

Screening and Shielding

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

General

This appendix will enable a qualified electrician to install the power cable to the EMI filter on all CE 220/380/415 volt power supplies (078024).

Power Cable

The power cable is **customer supplied.** Refer to *Power Cables* on page 3-4 for cable information. Final specification and installation of the power cable should be made by a licensed electrician and according to national and local codes. Also, refer to *Mains Supply* on page f-2 for further power cable shielding recommendations.

Install Ring Terminals on to Power Cable Leads

1. Obtain four ring terminals that can be crimped on to the power cable leads. Terminal specifications are as follows:

   - Ring inner diameter 7.143 mm
   - Current rating of 60 amps or higher.

2. Crimp ring terminals on to leads.

	**WARNING** **High Voltage!**
Ensure ring terminals are securely crimped on to leads to reduce chance of arcing and shorting.	

Connect Power Cable

Connect the power cable to the EMI filter first and then connect it to the line disconnect switch.

Power Supply

1. Locate the EMI filter at the lower right rear of the power supply (see Figure f-1).

2. Remove two screws to remove cover to access input voltage stud connections.

3. Remove nuts and and top washers from studs.

4. Insert the power cable through the strain relief.

5. Connect the leads to the **U**, **V**, and **W** studs and secure using nuts and washers. Ensure that all electrical connections are tight to avoid excessive heating.

6. Connect the **ground lead** to the stud directly in front of ground symbol**.**

Line Disconnect Switch

Connecting the power cable to the disconnect switch must conform to national and local electrical codes. This work should be performed only by qualified, licensed personnel.

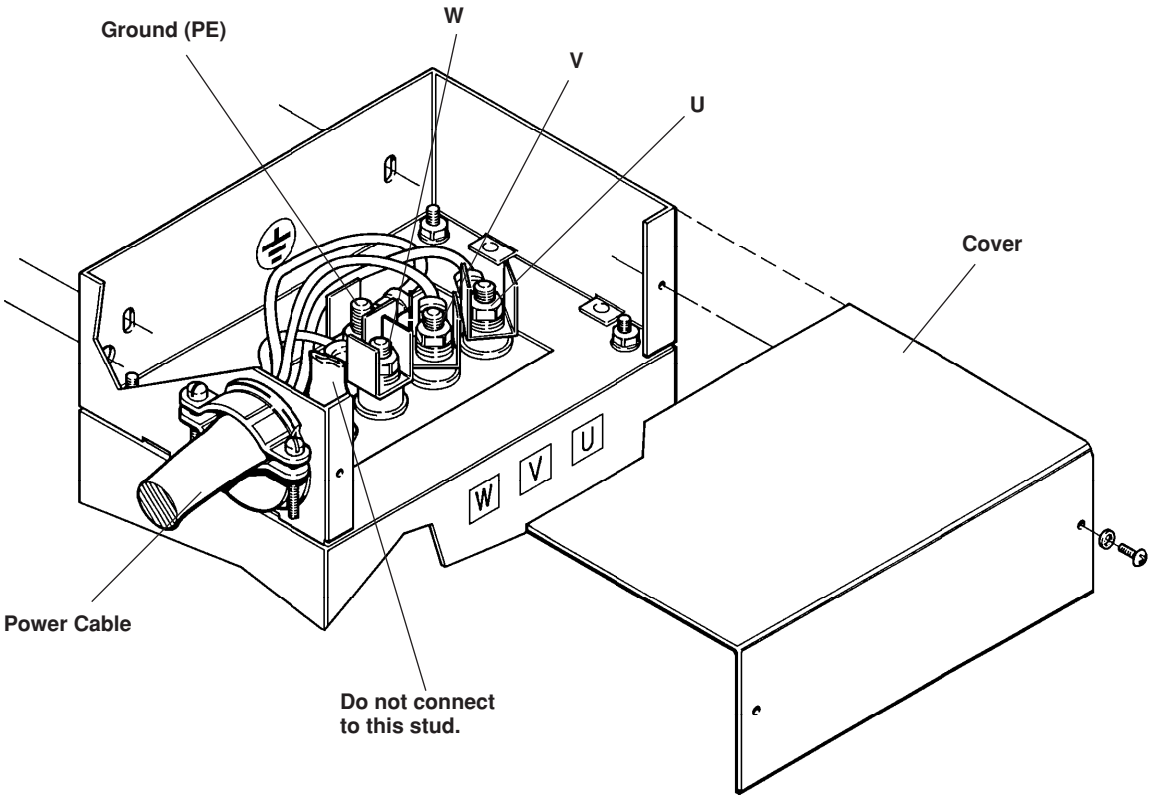

Figure f-1 Power Cable Connections to EMI Filter

EMI Filter Parts List

Item	Part Number	Description	Designator	Qty.
1	109036	Filter, 60A 2-stage AYT6C Elek		1
2	001526	Cap, end		2
3	001554	Cover, end cap		2
4	008318	Relief, strain		1

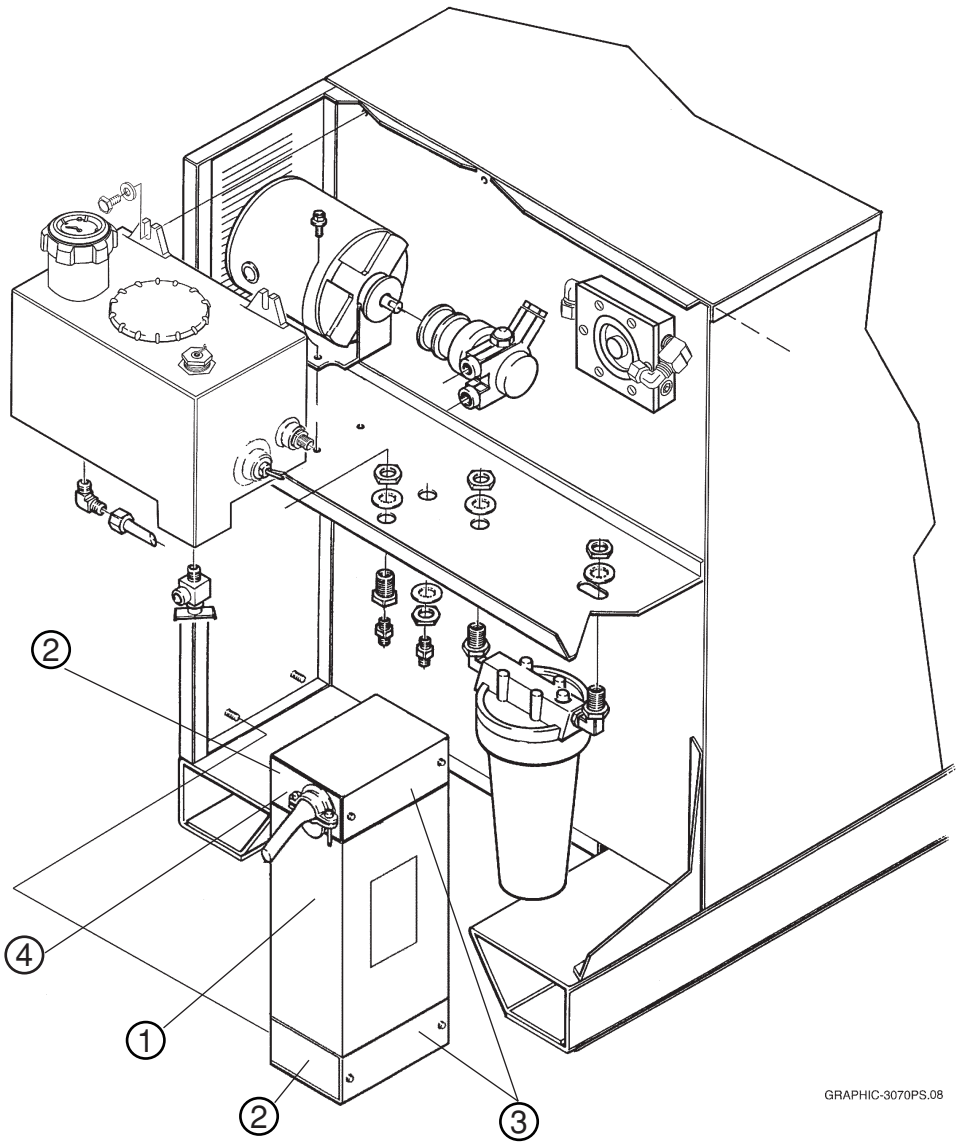

Figure f-2 EMI Filter Location

Appendix G

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 g-1 and g-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 g-1).

All modules may also be installed near the work table, and grounded directly to it (Figure g-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 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.

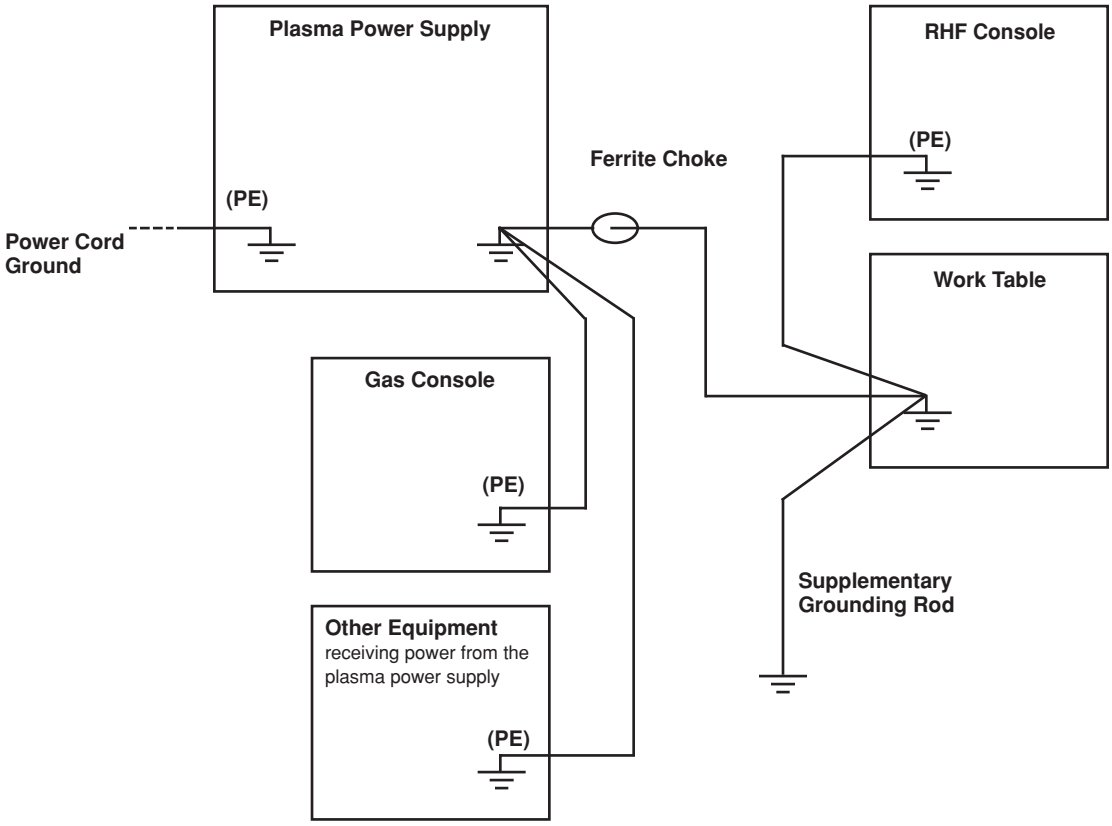

Figure g-1 Recommended Ground Connection Configuration

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

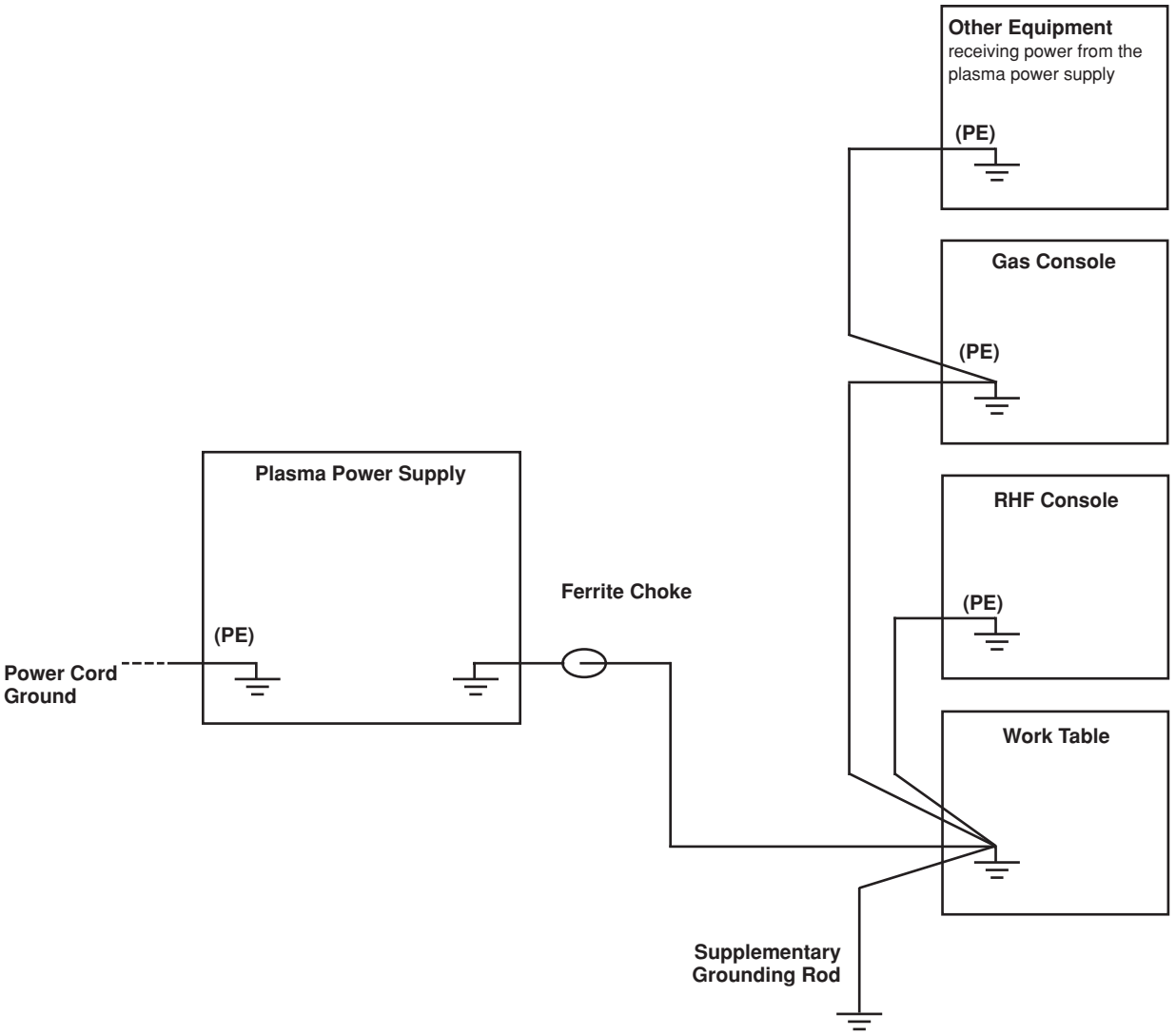

Figure g-2 Alternate Ground Connection Configuration

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 RHF console. The RHF console should NOT be daisy-chained through the other components to the work table.