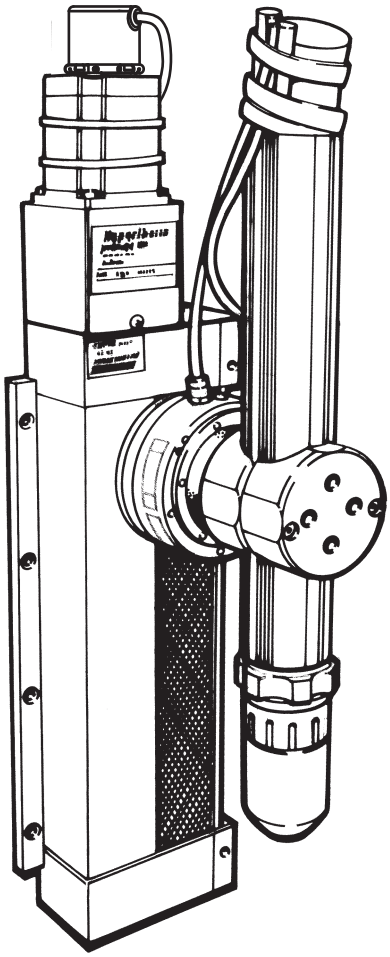
Command® THC

X-Y Table
Torch Height Control
(THC) System

Instruction Manual
802780 – Revision 11



CE
EN50199
EN60974-1

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The world leader in plasma cutting technology

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For your records

Serial number: _____

Purchase date: _____

Distributor: _____

_____

_____

Maintenance notes:

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Command® THC

X-Y Table
Torch Height Control
(THC) System

Instruction Manual
(P/N 802780)

Revision 11 – February 2009

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EMC Introduction

Hypertherm's CE-marked equipment is built in compliance with standard EN60974-10. The equipment should be installed and used in accordance with the information below to achieve electromagnetic compatibility.

The limits required by EN60974-10 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 cutting 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 (nozzle for laser heads) 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/TS 62081 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.

Attention

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

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

General

Hypertherm, Inc. warrants that its Products shall be free from defects in materials and workmanship, if Hypertherm is notified of a defect (i) with respect to the power supply within a period of two (2) years from the date of its delivery to you, with the exception of Powermax brand 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, and with respect to torch lifter assemblies within a period of one (1) year from its date of delivery to you, and with respect to laser heads within a period of one (1) year from its date of delivery to you. This warranty shall not apply to any Powermax brand power supplies that have been used with phase converters. In addition, Hypertherm does not warranty systems that have been damaged as a result of poor power quality, whether from phase converters or incoming line power. 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.

Certification test marks

Certified products are identified by one or more certification test marks from accredited testing laboratories. The certification test marks are located on or near the data plate. Each certification test mark means that the product and its safety-critical components conform to the relevant national safety standards as reviewed by that testing laboratory. Hypertherm places a certification test mark on its products only after that product is manufactured with safety-critical components that have been authorized by the accredited testing laboratory.

Once the product has left the Hypertherm factory, the certification test marks are invalidated if any of the following occurs:

- The product is significantly modified in a manner that creates a hazard or non-conformance.
- Safety-critical components are replaced with unauthorized spare parts.
- Any unauthorized assembly or accessory that uses or generates a hazardous voltage is added.
- There is any tampering with a safety circuit or other feature that is designed into the product as part of the certification.

CE marking constitutes a manufacturer's declaration of conformity to applicable European directives and standards. Only those versions of Hypertherm products with a CE Marking located on or near the data plate have been tested for compliance with the European Low Voltage Directive and the European EMC Directive. EMC filters needed to comply with the European EMC Directive are incorporated within versions of the power supply with a CE Marking.

Differences in national standards

Differences in standards include, but are not limited to:

- Voltages
- Plug and cord ratings
- Language requirements
- Electromagnetic compatibility requirements

These differences in national standards may make it impossible or impractical for all certification test marks to be placed on the same version of a product. For example, the CSA versions of Hypertherm's products do not comply with European EMC requirements and they do not have a CE marking on the data plate.

Countries that require CE marking or have compulsory EMC regulations must use CE versions of Hypertherm products with the CE marking on the data plate. These include:

- Australia
- New Zealand
- Countries in the European Union
- Russia

It is important that the product and its certification test mark be suitable for the end-use installation site. When Hypertherm products are shipped to one country for export to another country, the product must be configured and certified properly for the end-use site.

Higher-level systems

When a system integrator adds additional equipment; such as cutting tables, motor drives, motion controllers or robots; to a Hypertherm plasma cutting system, the combined system may be considered a higher-level system. A higher-level system with hazardous moving parts may constitute industrial machinery or robotic equipment, in which case the OEM or end-use customer may be subject to additional regulations and standards than those relevant to the plasma cutting system as manufactured by Hypertherm.

It is the responsibility of the end-use customer and the OEM to perform a risk assessment for the higher-level system and to provide protection against hazardous moving parts. Unless the higher-level system is certified when the OEM incorporates Hypertherm products into it, the installation also may be subject to approval by local authorities. Seek advice from legal counsel and local regulatory experts if uncertain about compliance.

External interconnecting cables between component parts of the higher level system must be suitable for contaminants and movement as required by the final end-use installation site. When the external interconnecting cables are subject to oil, dust, or water contaminants, hard usage ratings may be required.

When external interconnecting cables are subject to continuous movement, constant flexing ratings may be required. It is the responsibility of the end-use customer or the OEM to ensure the cables are suitable for the application. Since there are differences in the ratings and costs that can be required by local regulations for higher-level systems, it is necessary to verify that any external interconnecting cables are suitable for the end-use installation site.

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.

Proper disposal of Hypertherm products

Hypertherm plasma cutting systems, like all electronic products, may contain materials or components, such as printed circuit boards, that cannot be discarded with ordinary waste. It is your responsibility to dispose of any Hypertherm product or component part in an environmentally acceptable manner according to national and local codes.

- In the United States, check all federal, state, and local laws.
- In the European Union, check the EU directives, national, and local laws. For more information, visit www.hypertherm.com/weee.
- In other countries, check national and local laws.

ELECTROMAGNETIC COMPATIBILITY (EMC) ..... **i**
WARRANTY ..... **ii**

Section 1 SAFETY **1-1**
Recognize safety information 1-2
Follow safety instructions 1-2
Cutting can cause fire or explosion 1-2
Electric shock can kill 1-3
Static electricity can damage circuit boards 1-3
Toxic fumes can cause injury or death 1-4
A plasma arc can cause injury and burns 1-5
Arc rays can burn eyes and skin 1-5
Grounding safety 1-6
Compressed gas equipment safety 1-6
Gas cylinders can explode if damaged 1-6
Noise can damage hearing 1-7
Pacemaker and hearing aid operation 1-7
A plasma arc can damage frozen pipes 1-7
Additional safety information 1-8
Symbols and markings 1-8
Warning labels 1-9
Dry dust collection information 1-11

Section 1a SÉCURITÉ **1a-1**
dentifier les consignes de sécurité 1a-2
Suivre les instructions de sécurité 1a-2
Le coupage peut provoquer un incendie ou une explosion 1a-2
Les chocs électriques peuvent être fatals 1a-3
L'électricité statique peut endommager les cartes de circuits imprimés 1a-3
Les vapeurs toxiques peuvent provoquer des blessures ou la mort 1a-4
L'arc plasma peut provoquer des blessures ou des brûlures 1a-5
Les rayons de l'arc peuvent brûler les yeux et la peau 1a-5
Mise à la masse et à la terre 1a-6
Sécurité des bouteilles de gaz comprimé 1a-6
Les bouteilles de gaz comprimé peuvent exploser en cas de dommages 1a-6
Le bruit peut provoquer des problèmes auditifs 1a-7
Pacemakers et prothèses auditives 1a-7
Un arc plasma peut endommager les tuyaux gelés 1a-7
Symboles et marquage 1a-8
Étiquettes de sécurité 1a-9
Information sur le dépoussiérage 1a-11

Section 1b SEGURIDAD **1b-1**
Reconocimiento de información de seguridad 1b-2
Siga las instrucciones de seguridad 1b-2
Los cortes pueden provocar incendios o explosiones 1b-2
El choque eléctrico puede provocar la muerte 1b-3

Electricidad estática puede dañar tablillas de circuito....1b-3
Humos tóxicos pueden causar lesiones o muerte....1b-4
El arco de plasma puede causar lesiones y quemaduras....1b-5
Los rayos del arco pueden producir quemaduras en los ojos y en la piel....1b-5
Seguridad de toma a tierra....1b-6
Seguridad de los equipos de gas comprimido....1b-6
Los cilindros de gas pueden explotar si están dañados....1b-6
El ruido puede deteriorar la audición....1b-7
Operación de marcapasos y de audífonos....1b-7
Un arco plasma puede dañar tubos congelados....1b-7
Símbolos y marcas....1b-8
Etiquetas de advertencia....1b-9
Información sobre la colección de polvo seco....1b-11

Section 2 DESCRIPTION & SPECIFICATIONS

General....2-3
Specifications....2-4
- THC control module....2-4
- Plasma interface assembly....2-5
- X-Y lifter assembly....2-6
- Operator pendant....2-7

X-Y lifter breakaway option....2-8

Section 3 SETUP

Upon receipt....3-2
- Standard components....3-2
- Optional components....3-2

Claims....3-2
Power requirements....3-2
System unit mounting....3-3
- THC control module....3-3
- Plasma interface assembly....3-4
- X-Y lifter assembly....3-5
- Torch mounting block kit....3-6
- Torch breakaway kit (optional)....3-8
- Install the torch (without torch breakaway option)....3-10
- Install the torch (with torch breakaway option)....3-11

System interconnections....3-12
- THC system cables....3-12
- Machine interface cable....3-14

THC selectable responses....3-16
- DIP switch positions....3-17

CommandTHC serial protocol....3-18
Grounding requirements....3-20
- Power cord grounding....3-20
- Protective earth ground....3-20

Lifter I/O Cable....3-21

Plasma interface cable....3-22
CNC interface cable....3-23
Pendant extension cable....3-25
Motor drive cable....3-26
HD3070 system interconnections....3a-1
HT2000 system interconnections....3b-1
HT2000LHF system interconnections....3c-1
HT4001 system interconnections....3d-1
MAX100 System interconnections....3e-1
MAX200 System interconnections....3f-1
POWERMAX system interconnections....3g-1
HT4400 system interconnections....3h-1
HPR system interconnections....3i-1
HSD system interconnections....3j-1
HD4070 system interconnections....See IM 803760

Section 4 OPERATION

Operating controls....4-2
- THC control module....4-2
- Operator pendant....4-2
- Pendant display screens....4-4
- Pendant programmable fields....4-6
  - Automatic operation screen....4-6
  - Manual operation screen....4-8
  - Setup screen A....4-9

Determining pierce height factor....4-11
- Typical pierce height factor....4-11
- Pierce height factor for thicker materials....4-12

THC operating cycle time-lines....4-14
- Automatic mode time-line....4-15
- Problems and solutions....4-16
- Manual mode time-line....4-18

THC selectable responses (DIP switch)....See section 3 *Setup*

Section 5 MAINTENANCE

Routine maintenance....5-2
X-Y lifter sealing band removal and replacement....5-2
Troubleshooting....5-6
- Diagnostic screen B....5-6
- Error messages....5-6
- AC power distribution....5-10
- Motor drive board status lights during normal power-up....5-11
- DC power distribution....5-12
- Control board status lights during normal power-up....5-14
- Interface board status lights during normal power-up....5-16

Section 6 PARTS LIST
THC control module 6-2
Plasma interface assembly 6-4
2 Rail X-Y lifter assembly 6-5
X-Y lifter torch mounting block kits 6-6
X-Y lifter torch breakaway kit – optional 6-7
Operator pendant 6-8
Power cords 6-8
Ohmic contact wire 6-9
Recommended spare parts 6-10
Interface cables ..... See Section 3a through 3j

Section 7 WIRING DIAGRAMS 7-1
Introduction 7-1
Wiring diagrams 7-5

Appendix A PARTS LIST FOR OLDER SYSTEMS a-1
1 Rail Lifter a-2
Plasma interface assembly a-3
THC control module a-4

Appendix B PENDANT CONTRAST ADJUSTMENT PROCEDURE b-1

Section 1

SAFETY

In this section:

Recognize safety information....1-2
Follow safety instructions....1-2
Cutting can cause fire or explosion....1-2
Electric shock can kill....1-3
Static electricity can damage circuit boards....1-3
Toxic fumes can cause injury or death....1-4
A plasma arc can cause injury and burns....1-5
Arc rays can burn eyes and skin....1-5
Grounding safety....1-6
Compressed gas equipment safety....1-6
Gas cylinders can explode if damaged....1-6
Noise can damage hearing....1-7
Pacemaker and hearing aid operation....1-7
A plasma arc can damage frozen pipes....1-7
Additional safety information....1-8
Symbols and markings....1-8
Warning labels....1-9
Dry dust collection information....1-11

RECOGNIZE SAFETY INFORMATION

DANGER **WARNING** **CAUTION**

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.

Hypertherm uses American National Standards Institute guidelines for safety signal words and symbols. 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.
- DANGER safety messages precede related instructions in the manual that will result in serious injury or death if not followed correctly.
- 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 minor injury or damage to equipment if not followed correctly.

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.

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.

STATIC ELECTRICITY CAN DAMAGE CIRCUIT BOARDS

Use proper precautions when handling printed circuit boards.

- Store PC boards in anti-static containers.
- Wear a grounded wrist strap when handling PC boards.

TOXIC FUMES CAN CAUSE INJURY OR DEATH

The plasma arc by itself is the heat source used for cutting. Accordingly, although the plasma arc has not been identified as a source of toxic fumes, the material being cut can be a source of toxic fumes or gases that deplete oxygen.

Fumes produced vary depending on the metal that is cut. Metals that may release toxic fumes include, but are not limited to, stainless steel, carbon steel, zinc (galvanized), and copper.

In some cases, the metal may be coated with a substance that could release toxic fumes. Toxic coatings include, but are not limited to, lead (in some paints), cadmium (in some paints and fillers), and beryllium.

Gases produced by plasma cutting vary based on the material to be cut and the method of cutting, but may include ozone, oxides of nitrogen, hexavalent chromium, hydrogen, and other substances if such are contained in or released by the material being cut.

Caution should be taken to minimize exposure to fumes produced by any industrial process. Depending upon the chemical composition and concentration of the fumes (as well as other factors, such as ventilation), there may be a risk of physical illness, such as birth defects or cancer.

It is the responsibility of the equipment and site owner to test the air quality in the area where the equipment is used and to ensure that the air quality in the workplace meets all local and national standards and regulations.

The air quality level in any relevant workplace depends on site-specific variables such as:

- Table design (wet, dry, underwater).
- Material composition, surface finish, and composition of coatings.
- Volume of material removed.
- Duration of cutting or gouging.
- Size, air volume, ventilation and filtration of the work area.
- Personal protective equipment.
- Number of welding and cutting systems in operation.
- Other site processes that may produce fumes.

If the workplace must conform to national or local regulations, only monitoring or testing done at the site can determine whether the site is above or below allowable levels.

To reduce the risk of exposure to fumes:

- Remove all coatings and solvents from the metal before cutting.
- Use local exhaust ventilation to remove fumes from the air.
- Do not inhale fumes. Wear an air-supplied respirator when cutting any metal coated with, containing, or suspected to contain toxic elements.
- Assure that those using welding or cutting equipment, as well as air-supplied respiration devices, are qualified and trained in the proper use of such equipment.
- Never cut containers with potentially toxic materials inside. Empty and properly clean the container first.
- Monitor or test the air quality at the site as needed.
- Consult with a local expert to implement a site plan to ensure safe air quality.

A PLASMA ARC CAN CAUSE INJURY AND BURNS

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

The plasma arc will cut quickly through gloves and skin.

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

ARC RAYS CAN BURN EYES AND SKIN

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

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

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

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

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.

Arc current (amps)	Minimum protective shade number (ANSI Z49.1:2005)	Suggested shade number for comfort (ANSI Z49.1:2005)	OSHA 29CFR 1910.133(a)(5)	Europe EN168:2002
Less than 40 A	5	5	8	9
41 to 60 A	6	6	8	9
61 to 80 A	8	8	8	9
81 to 125 A	8	9	8	9
126 to 150 A	8	9	8	10
151 to 175 A	8	9	8	11
176 to 250 A	8	9	8	12
251 to 300 A	8	9	8	13
301 to 400 A	9	12	9	13
401 to 800 A	10	14	10	

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.

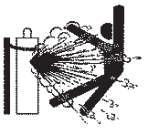
Work table Connect the work table to an earth ground, in accordance with appropriate national or local electrical codes.

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

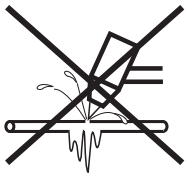
Gas cylinders contain gas under high pressure. If damaged, a cylinder can explode.

- 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
11. AWS Safety and Health Fact Sheets, American Welding Society 550 LeJeune Road, P.O. Box 351040, Miami, FL 33135 www.aws.org/technical/facts/

SYMBOLS AND MARKS

Your Hypertherm product may have one or more of the following markings on or near the data plate. Due to differences and conflicts in national regulations, not all marks are applied to every version of a product.

S mark symbol

The S mark symbol indicates that the power supply and torch are suitable for operations carried out in environments with increased hazard of electrical shock per IEC 60974-1.

CSA mark

Hypertherm products with a CSA mark meet the United States and Canadian regulations for product safety. The products were evaluated, tested, and certified by CSA-International. Alternatively the product may have a mark by one of the other Nationally Recognized Testing Laboratories (NRTL) accredited in both the United States and Canada, such as Underwriters Laboratories, Incorporated (UL) or TÜV.

CE marking

The CE marking signifies the manufacturer's declaration of conformity to applicable European directives and standards. Only those versions of Hypertherm products with a CE marking located on or near the data plate have been tested for compliance with the European Low Voltage Directive and the European Electromagnetic Compatibility (EMC) Directive. EMC filters needed to comply with the European EMC Directive are incorporated within versions of the product with a CE marking.

GOST-R mark

CE versions of Hypertherm products that include a GOST-R mark of conformity meet the product safety and EMC requirements for export to the Russian Federation.

c-Tick mark

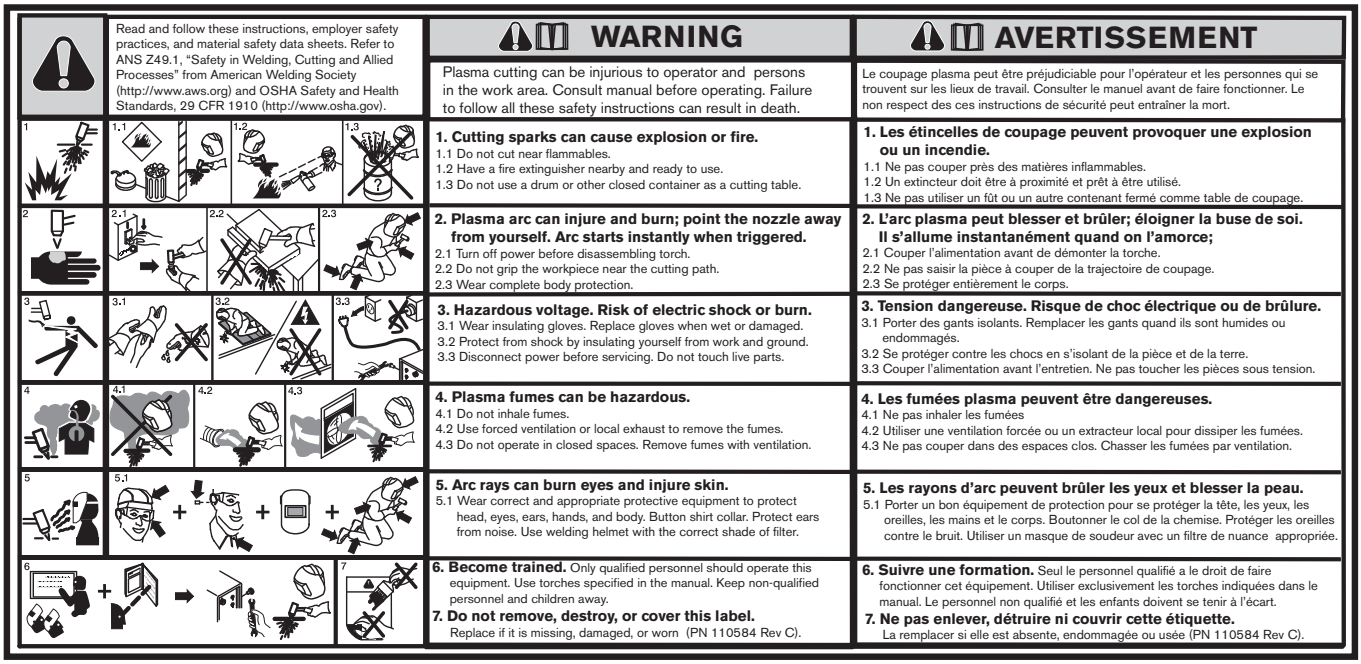
CE versions of Hypertherm products with a c-Tick mark comply with the EMC regulations required for sale in Australia and New Zealand.

CCC mark

The China Compulsory Certification (CCC) mark indicates that the product has been tested and found compliant with product safety regulations required for sale in China.

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.



Read and follow these instructions, employer safety practices, and material safety data sheets. Refer to ANS Z49.1, "Safety in Welding, Cutting and Allied Processes" from American Welding Society (http://www.aws.org) and OSHA Safety and Health Standards, 29 CFR 1910 (http://www.osha.gov).

WARNING

Plasma cutting can be injurious to operator and persons in the work area. Consult manual before operating. Failure to follow all these safety instructions can result in death.

1. Cutting sparks can cause explosion or fire.
1.1 Do not cut near flammables.
1.2 Have a fire extinguisher nearby and ready to use.
1.3 Do not use a drum or other closed container as a cutting table.

2. Plasma arc can injure and burn; point the nozzle away from yourself. Arc starts instantly when triggered.
2.1 Turn off power before disassembling torch.
2.2 Do not grip the workpiece near the cutting path.
2.3 Wear complete body protection.

3. Hazardous voltage. Risk of electric shock or burn.
3.1 Wear insulating gloves. Replace gloves when wet or damaged.
3.2 Protect from shock by insulating yourself from work and ground.
3.3 Disconnect power before servicing. Do not touch live parts.

4. Plasma fumes can be hazardous.
4.1 Do not inhale fumes.
4.2 Use forced ventilation or local exhaust to remove the fumes.
4.3 Do not operate in closed spaces. Remove fumes with ventilation.

5. Arc rays can burn eyes and injure skin.
5.1 Wear correct and appropriate protective equipment to protect head, eyes, ears, hands, and body. Button shirt collar. Protect ears from noise. Use welding helmet with the correct shade of filter.

6. Become trained. Only qualified personnel should operate this equipment. Use torches specified in the manual. Keep non-qualified personnel and children away.

7. Do not remove, destroy, or cover this label.
Replace if it is missing, damaged, or worn (PN 110584 Rev C).

AVERTISSEMENT

Le coupage plasma peut être préjudiciable pour l'opérateur et les personnes qui se trouvent sur les lieux de travail. Consulter le manuel avant de faire fonctionner. Le non respect des ces instructions de sécurité peut entraîner la mort.

1. Les étincelles de coupage peuvent provoquer une explosion ou un incendie.
1.1 Ne pas couper près des matières inflammables.
1.2 Un extincteur doit être à proximité et prêt à être utilisé.
1.3 Ne pas utiliser un fût ou un autre contenant fermé comme table de coupage.

2. L'arc plasma peut blesser et brûler; éloigner la buse de soi. Il s'allume instantanément quand on l'amorce;
2.1 Couper l'alimentation avant de démonter la torche.
2.2 Ne pas saisir la pièce à couper de la trajectoire de coupage.
2.3 Se protéger entièrement le corps.

3. Tension dangereuse. Risque de choc électrique ou de brûlure.
3.1 Porter des gants isolants. Remplacer les gants quand ils sont humides ou endommagés.
3.2 Se protéger contre les chocs en s'isolant de la pièce et de la terre.
3.3 Couper l'alimentation avant l'entretien. Ne pas toucher les pièces sous tension.

4. Les fumées plasma peuvent être dangereuses.
4.1 Ne pas inhaler les fumées
4.2 Utiliser une ventilation forcée ou un extracteur local pour dissiper les fumées.
4.3 Ne pas couper dans des espaces clos. Chasser les fumées par ventilation.

5. Les rayons d'arc peuvent brûler les yeux et blesser la peau.
5.1 Porter un bon équipement de protection pour se protéger la tête, les yeux, les oreilles, les mains et le corps. Boutonner le col de la chemise. Protéger les oreilles contre le bruit. Utiliser un masque de soudeur avec un filtre de nuance appropriée.

6. Suivre une formation. Seul le personnel qualifié a le droit de faire fonctionner cet équipement. Utiliser exclusivement les torches indiquées dans le manual. Le personnel non qualifié et les enfants doivent se tenir à l'écart.

7. Ne pas enlever, détruire ni couvrir cette étiquette.
La remplacer si elle est absente, endommagée ou usée (PN 110584 Rev C).

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 Do not cut near flammables.

1.2 Have a fire extinguisher nearby and ready to use.

1.3 Do not use a drum or other closed container as a cutting table.

2. Plasma arc can injure and burn; point the nozzle away from yourself. Arc starts instantly when triggered.

2.1 Turn off power before disassembling torch.

2.2 Do not grip the workpiece near the cutting path.

2.3 Wear complete body protection.

3. Hazardous voltage. Risk of electric shock or burn.

3.1 Wear insulating gloves. Replace gloves when wet or damaged.

3.2 Protect from shock by insulating yourself from work and ground.

3.3 Disconnect power before servicing. Do not touch live parts.

4. Plasma fumes can be hazardous.

4.1 Do not inhale fumes.

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

4.3 Do not operate in closed spaces. Remove fumes with ventilation.

5. Arc rays can burn eyes and injure skin.

5.1 Wear correct and appropriate protective equipment to protect head, eyes, ears, hands, and body. Button shirt collar. Protect ears from noise. Use welding helmet with the correct shade of filter.

6. Become trained. Only qualified personnel should operate this equipment. Use torches specified in the manual. Keep non-qualified personnel and children away.

7. Do not remove, destroy, or cover this label. Replace if it is missing, damaged, or worn.

Dry dust collection information

At some sites, dry dust can represent a potential explosion hazard.

The U.S. National Fire Protection Association's 2007 edition of NFPA standard 68, "Explosion Protection by Deflagration Venting," provides requirements for the design, location, installation, maintenance, and use of devices and systems to vent combustion gases and pressures after any deflagration event. Consult with the manufacturer or installer of any dry dust collection system for applicable requirements before you install a new dry dust collection system or make significant changes in the process or materials used with an existing dry dust collection system.

Consult your local "Authority Having Jurisdiction" (AHJ) to determine whether any edition of NFPA 68 has been "adopted by reference" in your local building codes.

Refer to NFPA68 for definitions and explanations of regulatory terms such as deflagration, AHJ, adopted by reference, the Kst value, deflagration index, and other terms.

Note 1 – Hypertherm's interpretation of these new requirements is that unless a site-specific evaluation has been completed to determine that all dust generated is not combustible, the 2007 edition of NFPA 68 requires the use of explosion vents designed to the worst-case Kst value (see annex F) that could be generated from dust so that the explosion vent size and type can be designed. NFPA 68 does not specifically identify plasma cutting or other thermal cutting processes as requiring deflagration venting systems, but it does apply these new requirements to all dry dust collection systems.

Note 2 – Users of Hypertherm manuals should consult and comply with all applicable federal, state, and local laws and regulations. Hypertherm does not, by the publication of any Hypertherm manual, intend to urge action that is not in compliance with all applicable regulations and standards, and this manual may never be construed as doing so.

Section 1a

SÉCURITÉ

Dans cette section :

Identifier les consignes de sécurité 1a-2
Suivre les instructions de sécurité 1a-2
Le coupage peut provoquer un incendie ou une explosion 1a-2
Les chocs électriques peuvent être fatals 1a-3
L'électricité statique peut endommager les cartes de circuits imprimés 1a-3
Les vapeurs toxiques peuvent provoquer des blessures ou la mort 1a-4
L'arc plasma peut provoquer des blessures ou des brûlures 1a-5
Les rayons de l'arc peuvent brûler les yeux et la peau 1a-5
Mise à la masse et à la terre 1a-6
Sécurité des bouteilles de gaz comprimé 1a-6
Les bouteilles de gaz comprimé peuvent exploser en cas de dommages 1a-6
Le bruit peut provoquer des problèmes auditifs 1a-7
Pacemakers et prothèses auditives 1a-7
Un arc plasma peut endommager les tuyaux gelés 1a-7
Symboles et marquage 1a-8
Étiquettes de sécurité 1a-9
Information sur le dépoussiérage 1a-11

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 ATTENTION

Hypertherm adopte les lignes directrices de l'American National Standards Institute relativement aux termes, aux symboles et à la signalisation de sécurité. 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 de sécurité DANGER précèdent les directives associées dans le manuel qui, si elles ne sont pas suivies scrupuleusement, entraînent des blessures graves voire mortelles.
- 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 sécurité ATTENTION précèdent les directives associées dans le manuel qui, si elles ne sont pas suivies scrupuleusement, peuvent entraîner des blessures secondaires ou endommager l'équipement.

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.

L'ÉLECTRICITÉ STATIQUE PEUT ENDOMMAGER LES CARTES DE CIRCUITS IMPRIMÉS

On doit prendre les précautions qui s'imposent quand on manipule les circuits imprimés.

- On doit ranger les cartes de circuits imprimés dans des contenants antistatiques.
- On doit porter un bracelet antistatique quand on manipule les cartes de circuits imprimés.

LES VAPEURS TOXIQUES PEUVENT PROVOQUER DES BLESSURES OU LA MORT

L'arc plasma est lui-même la source de chaleur utilisée pour le coupage. Par conséquent, bien que l'arc plasma n'ait pas été reconnu comme une source de vapeurs toxiques, le matériau coupé peut être une source de vapeurs ou de gaz toxiques qui épuisent l'oxygène.

Les vapeurs produites varient selon le métal coupé. Les métaux qui peuvent dégager des vapeurs toxiques comprennent, entre autres, l'acier inoxydable, l'acier au carbone, le zinc (galvanisé) et le cuivre.

Dans certains cas, le métal peut être revêtu d'une substance susceptible de dégager des vapeurs toxiques. Les revêtements toxiques comprennent entre autres, le plomb (dans certaines peintures), le cadmium (dans certaines peintures et enduits) et le béryllium.

Les gaz produits par le coupage plasma varient selon le matériau à couper et la méthode de coupage, mais ils peuvent comprendre l'ozone, les oxydes d'azote, le chrome hexavalent, l'hydrogène et autres substances présentes dans le matériau coupé ou en émanent.

On doit prendre les précautions qui s'imposent pour réduire au minimum l'exposition aux vapeurs produites par tout processus industriel. Selon la composition chimique et la concentration des vapeurs (ainsi que d'autres facteurs comme la ventilation), il peut y avoir un risque de maladie physique, comme des malformations ou le cancer.

Il incombe au propriétaire du matériel et du site de vérifier la qualité de l'air dans le secteur où l'on utilise le matériel et de s'assurer que la qualité de l'air sur les lieux de travail répond aux normes et réglementation locales et nationales.

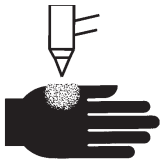
Le niveau de qualité de l'air dans tout lieu de travail dépend des variables propres au site comme :

- Type de table (humide, sèche, sous l'eau).
- Composition du matériau, fini de la surface et composition des revêtements.
- Volume de matériau enlevé.
- Durée du coupage ou du gougeage.
- Dimensions, volume d'air, ventilation et filtration de la zone de travail.
- Équipement de protection individuelle.
- Nombre de systèmes de soudage et de coupage en fonctionnement.
- Autres procédés du site qui peuvent produire des vapeurs.

Si les lieux de travail doivent être conformes aux règlements nationaux ou locaux, seuls les contrôles ou les essais effectués au site peuvent déterminer si celui-ci se situe au-dessus ou au-dessous des niveaux admissibles.

Pour réduire le risque d'exposition aux vapeurs :

- Éliminer tout revêtement et solvant du métal avant le coupage.
- Utiliser la ventilation d'extraction locale pour éliminer les vapeurs de l'air.
- Ne pas inhaler les vapeurs. Porter un respirateur à adduction d'air quand on coupe des métaux revêtus d'éléments toxiques ou qui en contiennent ou sont susceptibles d'en contenir.
- S'assurer que les personnes qui utilisent un matériel de soudage ou de coupage ainsi que les dispositifs de respiration par adduction d'air sont qualifiés et ont reçu la formation sur la bonne utilisation d'un tel matériel.
- Ne jamais couper les contenants dans lesquels il peut y avoir des matériaux toxiques. En premier lieu, vider et nettoyer correctement le contenant.
- Contrôler ou éprouver la qualité de l'air au site selon les besoins.
- Consulter un expert local pour mettre en œuvre un plan du site afin d'assurer une qualité de l'air sûre.



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.

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.

Courant de l'arc (A)	Indice de protection minimum (ANSI Z49.1:2005)	Indice de protection suggéré pour assurer le confort (ANSI Z49.1:2005)	OSHA 29CFR 1910.133(a)(5)	Europe EN168:2002
Moins de 40 A	5	5	8	9
41 à 60 A	6	6	8	9
61 à 80 A	8	8	8	9
81 à 125 A	8	9	8	9
126 à 150 A	8	9	8	10
151 à 175 A	8	9	8	11
176 à 250 A	8	9	8	12
251 à 300 A	8	9	8	13
301 à 400 A	9	12	9	13
401 à 800 A	10	14	10	

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.

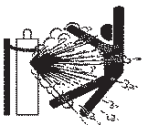
Table de travail Raccorder la table de travail à la terre, conformément aux codes de sécurité locaux ou nationaux appropriés.

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

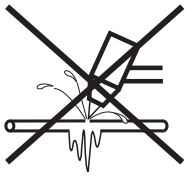
Les bouteilles de gaz contiennent du gaz à haute pression. Si une bouteille est endommagée, elle peut exploser.

- 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.

SYMBOLES ET MARQUAGE

Votre produit Hypertherm peut comporter une ou plusieurs des marques suivantes sur sa plaque signalétique ou à proximité. En raison des différends et des conflits relatifs aux règlements nationaux, toutes les marques ne sont pas appliquées à chaque version d'un produit.

Symbole marque S

Le symbole de marque S indique que la source de courant et la torche conviennent pour les travaux effectués dans les milieux à risque accru de choc électrique selon l'IEC 60974-1.

Marque CSA

Les produits Hypertherm comportant la marque CSA répondent aux règlements des États-Unis et du Canada relatifs à la sécurité du produit. Les produits sont évalués, mis à l'essai et certifiés par la CSA-International. En outre, le produit peut porter une marque d'un des laboratoires d'essai reconnus sur le plan national (NRTL) accrédité aux États-Unis et au Canada comme les Underwriters Laboratories, Incorporated (UL) ou TÜV.

Marque CE

La marque CE signifie la déclaration de conformité du fabricant aux directives et normes européennes applicables. Seules les versions des produits Hypertherm portant la marque CE placée sur la plaque signalétique ou à proximité ont été mises à l'essai de conformité à la directive européenne sur la basse tension et la compatibilité électromagnétique européenne (CEM). Les filtres CEM qui doivent se conformer à la directive CEM européenne sont intégrés aux versions du produit portant la marque CE.

Marque GOST-R

Les versions CE des produits Hypertherm qui portent la marque de conformité GOST-R répondent aux exigences de sécurité du produit et de CEM en vue de l'exportation à la Fédération russe.

Marque c-Tick

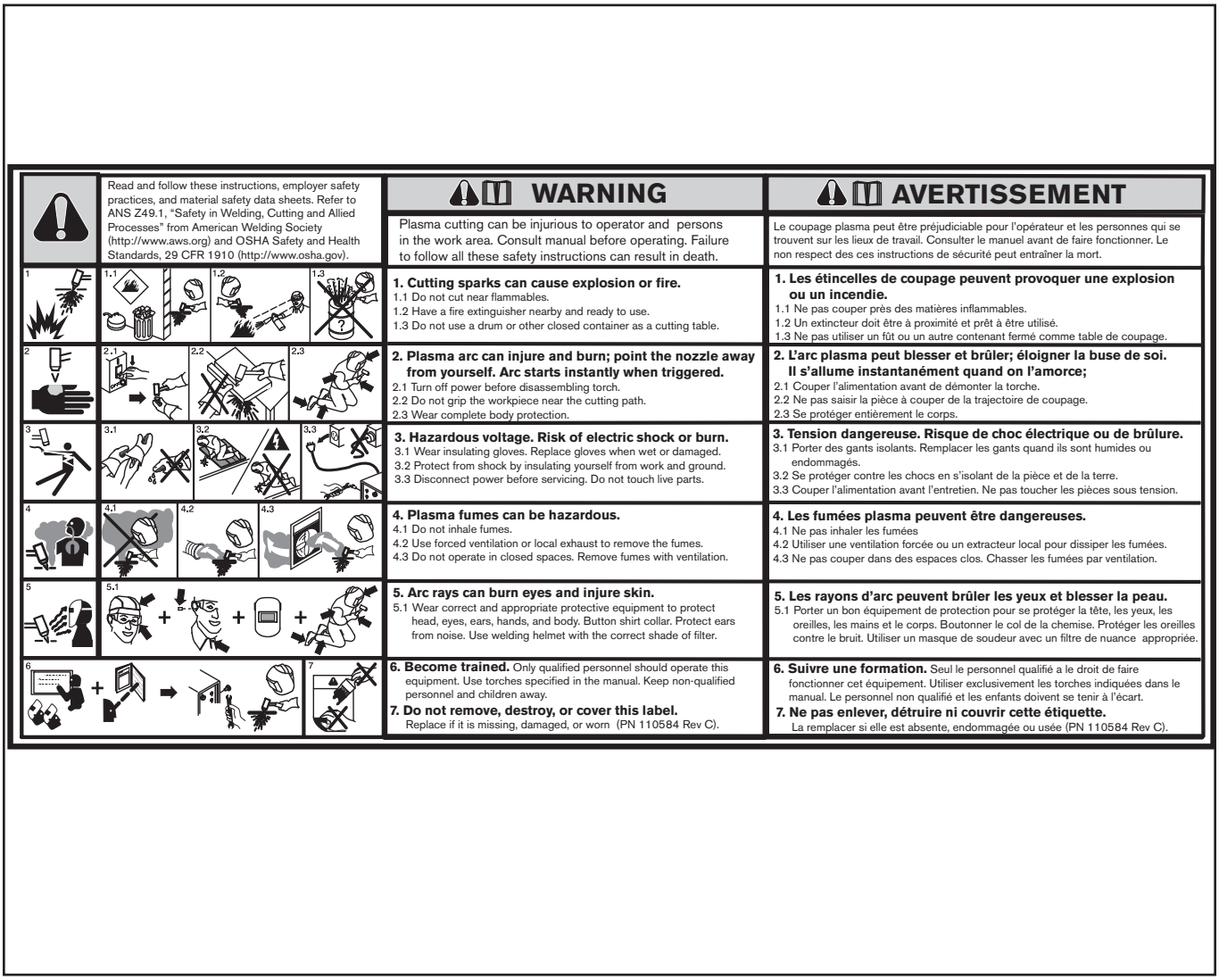
Les versions CE des produits Hypertherm portant la marque c-Tick sont conformes aux règlements CEM prescrits pour la vente en Australie et en Nouvelle-Zélande.

Marque CCC

La marque de certification obligatoire en Chine (CCC) indique que le produit a été mis à l'essai et déclaré conforme aux règlements de sécurité du produit prescrits pour la vente en Chine.

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.



Read and follow these instructions, employer safety practices, and material safety data sheets. Refer to ANS Z49.1, "Safety in Welding, Cutting and Allied Processes" from American Welding Society (http://www.aws.org) and OSHA Safety and Health Standards, 29 CFR 1910 (http://www.osha.gov).

WARNING

Plasma cutting can be injurious to operator and persons in the work area. Consult manual before operating. Failure to follow all these safety instructions can result in death.

1. Cutting sparks can cause explosion or fire.
1.1 Do not cut near flammables.
1.2 Have a fire extinguisher nearby and ready to use.
1.3 Do not use a drum or other closed container as a cutting table.

2. Plasma arc can injure and burn; point the nozzle away from yourself. Arc starts instantly when triggered.
2.1 Turn off power before disassembling torch.
2.2 Do not grip the workpiece near the cutting path.
2.3 Wear complete body protection.

3. Hazardous voltage. Risk of electric shock or burn.
3.1 Wear insulating gloves. Replace gloves when wet or damaged.
3.2 Protect from shock by insulating yourself from work and ground.
3.3 Disconnect power before servicing. Do not touch live parts.

4. Plasma fumes can be hazardous.
4.1 Do not inhale fumes.
4.2 Use forced ventilation or local exhaust to remove the fumes.
4.3 Do not operate in closed spaces. Remove fumes with ventilation.

5. Arc rays can burn eyes and injure skin.
5.1 Wear correct and appropriate protective equipment to protect head, eyes, ears, hands, and body. Button shirt collar. Protect ears from noise. Use welding helmet with the correct shade of filter.

6. Become trained. Only qualified personnel should operate this equipment. Use torches specified in the manual. Keep non-qualified personnel and children away.

7. Do not remove, destroy, or cover this label.
Replace if it is missing, damaged, or worn (PN 110584 Rev C).

AVERTISSEMENT

Le coupage plasma peut être préjudiciable pour l'opérateur et les personnes qui se trouvent sur les lieux de travail. Consulter le manuel avant de faire fonctionner. Le non respect des ces instructions de sécurité peut entraîner la mort.

1. Les étincelles de coupage peuvent provoquer une explosion ou un incendie.
1.1 Ne pas couper près des matières inflammables.
1.2 Un extincteur doit être à proximité et prêt à être utilisé.
1.3 Ne pas utiliser un fût ou un autre contenant fermé comme table de coupage.

2. L'arc plasma peut blesser et brûler; éloigner la buse de soi. Il s'allume instantanément quand on l'amorce;
2.1 Couper l'alimentation avant de démonter la torche.
2.2 Ne pas saisir la pièce à couper de la trajectoire de coupage.
2.3 Se protéger entièrement le corps.

3. Tension dangereuse. Risque de choc électrique ou de brûlure.
3.1 Porter des gants isolants. Remplacer les gants quand ils sont humides ou endommagés.
3.2 Se protéger contre les chocs en s'isolant de la pièce et de la terre.
3.3 Couper l'alimentation avant l'entretien. Ne pas toucher les pièces sous tension.

4. Les fumées plasma peuvent être dangereuses.
4.1 Ne pas inhaler les fumées
4.2 Utiliser une ventilation forcée ou un extracteur local pour dissiper les fumées.
4.3 Ne pas couper dans des espaces clos. Chasser les fumées par ventilation.

5. Les rayons d'arc peuvent brûler les yeux et blesser la peau.
5.1 Porter un bon équipement de protection pour se protéger la tête, les yeux, les oreilles, les mains et le corps. Boutonner le col de la chemise. Protéger les oreilles contre le bruit. Utiliser un masque de soudeur avec un filtre de nuance appropriée.

6. Suivre une formation. Seul le personnel qualifié a le droit de faire fonctionner cet équipement. Utiliser exclusivement les torches indiquées dans le manual. Le personnel non qualifié et les enfants doivent se tenir à l'écart.

7. Ne pas enlever, détruire ni couvrir cette étiquette.
La remplacer si elle est absente, endommagée ou usée (PN 110584 Rev C).

ÉTIQUETTE DE SÉCURITÉ

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Information sur le dépoussiérage

À certains endroits, la poussière peut représenter un risque d'explosion potentiel.À certains endroits, la poussière peut représenter un risque d'explosion potentiel.

La norme NFPA 68 de la National Fire Protection Association des É.-U. (édition 2007) « Explosion Protection by Deflagration Venting » établit les exigences relatives à la conception, à l'emplacement, à l'installation, à l'entretien et à l'utilisation de dispositifs et de systèmes pour évacuer à l'air libre les gaz de combustion et les pressions après une éventuelle déflagration. Communiquer avec le fabricant ou avec l'installateur pour tout système de dépoussiérage afin de connaître les exigences applicables avant d'installer un tel système neuf ou d'apporter des modifications importantes aux procédés ou aux matériaux utilisés à un système de dépoussiérage existant.

Consultez l'autorité compétente locale pour déterminer si une édition de la NFPA 68 a été adoptée par référence dans vos codes du bâtiment locaux.

Voir le document NFPA68 pour obtenir des définitions et des explications des termes réglementaires tels que « déflagration, autorité compétente, adopté par référence, valeur du pire cas, indice de déflagration » et autres termes.

Note 1 – L'interprétation d'Hypertherm de ces nouvelles exigences est que, sauf évaluation particulière du site, pour déterminer que toute la poussière produite n'est pas combustible, l'édition 2007 de la NFPA 68 exige l'utilisation d'évents d'explosion conçus pour la valeur du pire des cas (voir annexe F) qui pourrait provenir de la poussière de sorte que l'on puisse concevoir la dimension et le type d'évent d'explosion. La NFPA 68 ne stipule pas particulièrement le procédé de coupage plasma particulier ou autres procédés de coupage thermique comme le prescrivent ces nouveaux règlements à tous les systèmes de dépoussiérage.

Note 2 – Les utilisateurs des manuels d'Hypertherm doivent consulter tous les règlements et lois fédéraux et locaux applicables et s'y conformer. Hypertherm n'a pas l'intention, en publiant un manuel d'Hypertherm, de demander des mesures qui ne sont pas conformes aux règlements et normes applicables et ce manuel ne peut jamais être interprété dans ce sens.

Seccíon 1b

SEGURIDAD

En esta sección:

Reconocimiento de información de seguridad 1b-2
Siga las instrucciones de seguridad 1b-2
Los cortes pueden provocar incendios o explosiones 1b-2
El choque eléctrico puede provocar la muerte 1b-3
Electricidad estática puede dañar tablillas de circuito 1b-3
Humos tóxicos pueden causar lesiones o muerte 1b-4
El arco de plasma puede causar lesiones y quemaduras 1b-5
Los rayos del arco pueden producir quemaduras en los ojos y en la piel 1b-5
Seguridad de toma a tierra 1b-6
Seguridad de los equipos de gas comprimido 1b-6
Los cilindros de gas pueden explotar si están dañados 1b-6
El ruido puede deteriorar la audición 1b-7
Operación de marcapasos y de audífonos 1b-7
Un arco plasma puede dañar tubos congelados 1b-7
Símbolos y marcas 1b-8
Etiquetas de advertencia 1b-9
Información sobre la colección de polvo seco 1b-11

RECONOCIMIENTO DE INFORMACIÓN DE SEGURIDAD

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

SIGA LAS INSTRUCCIONES DE SEGURIDAD

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

- Mantenga las etiquetas de seguridad de su máquina en buen estado. Reemplace las etiquetas que se pierdan o se dañen inmediatamente.
- Aprenda a utilizar la máquina y a utilizar los controles de la manera correcta. No permita que sea utilizada por alguien que no conozca su funcionamiento.
- Mantenga su máquina en buenas condiciones de funcionamiento. La realización de modificaciones no autorizadas a la máquina puede comprometer la seguridad y la vida útil de la máquina.

PELIGRO ADVERTENCIA PRECAUCIÓN

Hypertherm usa las directivas del Instituto Americano de Normas Nacionales (American National Standards Institute) para las palabras y símbolos que señalan seguridad. Las palabras PELIGRO y ADVERTENCIA se utilizan conjuntamente con un símbolo de seguridad. La palabra PELIGRO se utiliza para identificar los mayores peligros.

- Encontrará etiquetas de seguridad con las inscripciones PELIGRO y ADVERTENCIA en su máquina, junto a peligros específicos.
- Los mensajes de seguridad de PELIGRO preceden instrucciones relacionadas en el manual que resultarán en lesión grave o muerte si no se las sigue correctamente.
- En este manual, la palabra ADVERTENCIA va seguida de instrucciones que, si no se siguen correctamente, pueden provocar lesiones e inclusive la muerte.
- Los mensajes de seguridad de CUIDADO o PRECAUCIÓN preceden mensajes relacionados con instrucciones en el manual que puede resultar en lesiones menores, o daño a equipo, si no se siguen correctamente.

LOS CORTES PUEDEN PROVOCAR INCENDIOS O EXPLOSIONES

Prevención ante el fuego

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

Prevención ante explosiones

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

ADVERTENCIA

Peligro de explosión
Argón-Hidrógeno y metano

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

ADVERTENCIA

Detonación de hidrógeno con el corte de aluminio

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


EL CHOQUE ELÉCTRICO PUEDE PROVOCAR LA MUERTE

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

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

Prevención ante el electrochoque

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

- Use guantes y botas aislantes y mantenga el cuerpo y la ropa secos.
- No se siente, se pare o se ponga sobre cualquier superficie húmeda cuando esté trabajando con el equipo.
- Aíslese eléctricamente de la pieza a cortar y de la tierra utilizando alfombrillas o cubiertas de aislamiento secas lo suficientemente grandes como para impedir todo contacto físico con la pieza a cortar o con la tierra. Si su única opción es trabajar en una área húmeda o cerca de ella, sea muy cauteloso.
- Instale un interruptor de corriente adecuado en cuanto a fusibles, en una pared cercana a la fuente de energía. Este interruptor permitirá al operador desconectar rápidamente la fuente de energía en caso de emergencia.
- Al utilizar una mesa de agua, asegúrese de que ésta se encuentre correctamente conectada a la toma a tierra.
- Instale este equipo y conéctelo a tierra según el manual de instrucciones y de conformidad con los códigos locales y nacionales.
- Inspeccione el cordón de alimentación primaria con frecuencia para asegurarse de que no esté dañado ni agrietado. Si el cordón de alimentación primaria está dañado, reemplácelo inmediatamente. **Un cable pelado puede provocar la muerte**.
- Inspeccione las mangueras de la antorcha y reemplácelas cuando se encuentren dañadas.
- No toque la pieza ni los recortes cuando se está cortando. Deje la pieza en su lugar o sobre la mesa de trabajo con el cable de trabajo conectado en todo momento.
- Antes de inspeccionar, limpiar o cambiar las piezas de la antorcha, desconecte la potencia primaria o desenchufe la fuente de energía.
- Nunca evite o descuide los bloqueos de seguridad.
- Antes de retirar la cubierta de una fuente de energía o del gabinete de un sistema, desconecte la potencia primaria de entrada. Espere 5 minutos después de desconectar la potencia primaria para permitir la descarga de los condensadores.
- Nunca opere el sistema de plasma sin que las tapas de la fuente de energía estén en su lugar. Las conexiones expuestas de la fuente de energía presentan un serio riesgo eléctrico.
- Al hacer conexiones de entrada, conecte el conductor de conexión a tierra en primer lugar.
- Cada sistema de plasma Hypertherm está diseñado para ser utilizado sólo con antorchas Hypertherm específicas. No utilice antorchas diferentes, que podrían recalentarse y ser peligrosas.

ELECTRICIDAD ESTÁTICA PUEDE DAÑAR TABLILLAS DE CIRCUITO

Use precauciones adecuadas cuando maneje tablillas impresas de circuito

- Almacene las tablillas PC en recipientes antiestáticos.
- Use la defensa de muñeca conectada a tierra cuando maneje tablillas PC.

HUMOS TÓXICOS PUEDEN CAUSAR LESIONES O MUERTE

El arco plasma es por si solo la fuente de calor que se usa para cortar. Según esto, aunque el arco de plasma no ha sido identificado como la fuente de humo tóxico, el material que se corta puede ser la fuente de humo o gases tóxicos que vacían el oxígeno.

El humo producido varía según el metal que está cortándose. Metales que pueden liberar humo tóxico incluyen, pero no están limitados a, acero inoxidable, acero al carbón, cinc (galvanizado), y cobre.

En algunos casos, el metal puede estar recubierto con una sustancia que podría liberar humos tóxicos. Los recubrimientos tóxicos incluyen, pero no están limitados a, plomo (en algunas pinturas), cadmio (en algunas pinturas y rellenos), y berilio.

Los gases producidos por el corte por plasma varían basándose en el material a cortarse y el método de cortar, pero pueden incluir ozono, óxidos de nitrógeno, cromo hexavalente, hidrógeno, y otras substancias, si están contenidas dentro o liberadas por el material que se corta.

Se debe tener cuidado de minimizar la exposición del humo producido por cualquier proceso industrial. Según la composición química y la concentración del humo (al igual que otros factores, tales como ventilación), puede haber el riesgo de enfermedad física, tal como defectos de natividad o cáncer.

Es la responsabilidad del dueño del equipo y instalación el comprobar la calidad de aire en el lugar donde se está usando el equipo para garantizar que la calidad del aire en el lugar de trabajo cumpla con todas las normas y reglamentos locales y nacionales.

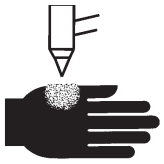
El nivel de la calidad del aire en cualquier lugar de trabajo relevante depende en variables específicas al sitio tales como:

- Diseño de mesa (mojada, seca, bajo agua).
- La composición del material, el acabado de la superficie, y la composición de los recubrimientos.
- Volumen que se quita del material.
- La duración del corte o ranura.
- Tamaño, volumen del aire, ventilación y filtración del lugar de trabajo.
- Equipo de protección personal.
- Número de sistemas de soldar y cortar en la operación.
- Otros procesos del lugar que pueden producir humo.

Si el lugar de trabajo debe cumplir reglamentos nacionales o locales, solamente el monitoreo o las pruebas que se hacen en el lugar pueden determinar si el sitio está encima o debajo de los niveles permitidos.

Para reducir el riesgo de exposición a humo:

- Quite todos los recubrimientos y solventes del metal antes de cortar.
- Use ventilación extractora local para quitar humo del aire.
- No inhale el humo. Use un respirador con fuente propia de aire cuando corte cualquier metal recubierto con, o sospechado de contener, elementos tóxicos.
- Garantice que aquéllos usando equipo de soldar o cortar, al igual que aparatos de respiración con aire propio de aire, estén capacitados y entrenados en el uso apropiado de tal equipo.
- Nunca corte recipientes con materiales potencialmente tóxicos adentro. Primero, vacíe y limpie el recipiente adecuadamente.
- Monitoree o compruebe la calidad del aire en el sitio como fuera necesario.
- Consulte con un experto local para realizar un plan al sitio para garantizar la calidad de aire seguro.



EL ARCO DE PLASMA PUEDE CAUSAR LESIONES Y QUEMADURAS

Antorchas de encendido instantáneo

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

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

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

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

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

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

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

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

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

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

Corriente de arco (amps.)	El número de matiz protector mínimo (ANSI Z49.1:2005)	El número de matiz sugerido para comodidad (ANSI Z49.1:2005)	OSHA 29CFR 1910.133(a)(5)	Europa EN168:2002
Menos de 40 A	5	5	8	9
41 a 60 A	6	6	8	9
61 a 80 A	8	8	8	9
81 a 125 A	8	9	8	9
126 a 150 A	8	9	8	10
151 a 175 A	8	9	8	11
176 a 250 A	8	9	8	12
251 a 300 A	8	9	8	13
301 a 400 A	9	12	9	13
401 a 800 A	10	14	10	

SEGURIDAD DE TOMA A TIERRA

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

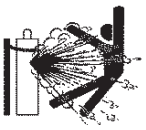
Mesa de trabajo Conecte la mesa de trabajo a una buena toma de tierra, de conformidad con los códigos eléctricos nacionales o locales apropiados.

Potencia primaria de entrada

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

SEGURIDAD DE LOS EQUIPOS DE GAS COMPRIMIDO

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



LOS CILINDROS DE GAS PUEDEN EXPLOTAR SI ESTÁN DAÑADOS

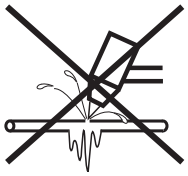
Los cilindros de gas contienen gas bajo alta presión. Un cilindro dañado puede explotar.

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

EL RUIDO PUEDE DETERIORAR LA AUDICIÓN

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

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



UN ARCO PLASMA PUEDE DAÑAR TUBOS CONGELADOS

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

OPERACIÓN DE MARCAPASOS Y DE AUDÍFONOS

Los campos magnéticos producidos por las elevadas corrientes pueden afectar la operación de marcapasos y de audífonos.

Las personas que lleven marcapasos y audífonos deberán consultar a un médico antes de acercarse a sitios donde se realizan operaciones de corte y ranurado por plasma.

Para reducir los peligros de los campos magnéticos:

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

SÍMBOLOS Y MARCAS

Su producto de Hypertherm puede tener una o más de las marcas que siguen en, o cerca de la placa de datos. Debido a diferencias y conflictos en reglamentos nacionales, no todas las marcas se aplican a toda versión del producto.

Símbolo de marca S

El símbolo de marca S indica que la fuente de energía y antorcha son aptas para operaciones que se llevan a cabo en entornos con peligro aumentado de choque o descarga eléctrica según IEC 60974-1.

Marca CSA

Los productos de Hypertherm con la marca CSA cumplen con los reglamentos de Estados Unidos y Canadá para la seguridad del producto. Estos productos fueron evaluados, comprobados, y certificados por CSA-Internacional. Alternativamente, el producto puede tener la marca según uno de los otros Laboratorios de Prueba Reconocidos nacionalmente (NRTL siglas en inglés) acreditados en ambos Estados Unidos y Canadá, tales como Underwriters Laboratories, Incorporated (UL) ó TÜV.

Marcas CE

Las marcas CE significan una declaración del fabricante de conformidad a las directivas y estándares aplicables Europeos. Sólo aquellas versiones del producto Hypertherm con la marca CE ubicada en o cerca de la placa de datos han sido comprobadas para cumplir con la Directiva Europea de Voltaje Bajo, la Compatibilidad Electromagnético Europea (EMC). Los filtros EMC que necesitan cumplir con la Directiva Europea EMC están incorporados dentro de las versiones del producto con la marca CE.

Marca GOST-R

Las versiones de los productos Hypertherm CE que incluye la marca de conformidad GOST-R cumplen con la seguridad del productos y los requisitos EMC para exportarse a la Federación Rusa.

Marca c-Tick

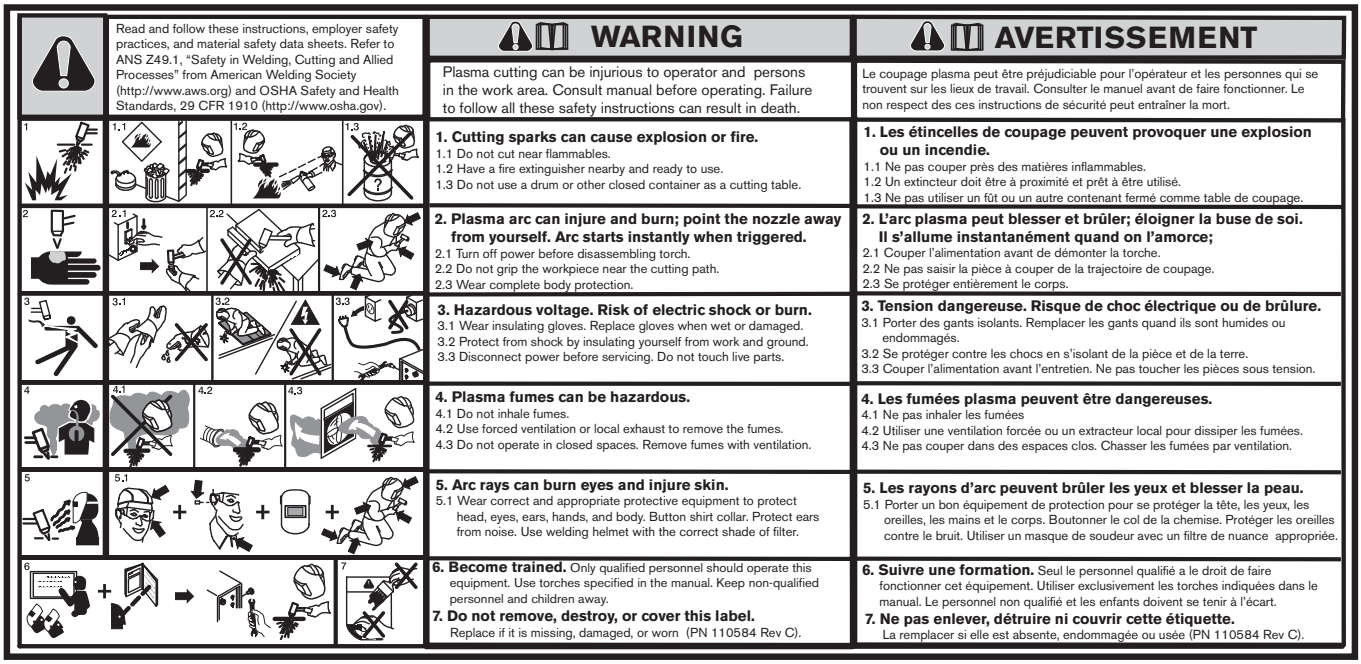
Las versiones CE de los productos Hypertherm con la marca c-Tick cumple con los reglamentos EMC requeridos para venta en Australia y Nueva Zelandia.

Marca CCC

La marca de Certificación Obligatoria China (CCC en inglés) indica que el producto ha sido comprobado y se lo ha encontrado que cumple con los reglamentos de seguridad del producto requeridos para venta en China.

ETIQUETA DE ADVERTENCIA

Esta etiqueta de advertencia se encuentra adherida a la fuente de energía. Es importante que el operador y el técnico de mantenimiento comprendan el sentido de estos símbolos de advertencia según se describen.



Read and follow these instructions, employer safety practices, and material safety data sheets. Refer to ANS Z49.1, "Safety in Welding, Cutting and Allied Processes" from American Welding Society (http://www.aws.org) and OSHA Safety and Health Standards, 29 CFR 1910 (http://www.osha.gov).

WARNING

Plasma cutting can be injurious to operator and persons in the work area. Consult manual before operating. Failure to follow all these safety instructions can result in death.

1. Cutting sparks can cause explosion or fire.
1.1 Do not cut near flammables.
1.2 Have a fire extinguisher nearby and ready to use.
1.3 Do not use a drum or other closed container as a cutting table.

2. Plasma arc can injure and burn; point the nozzle away from yourself. Arc starts instantly when triggered.
2.1 Turn off power before disassembling torch.
2.2 Do not grip the workpiece near the cutting path.
2.3 Wear complete body protection.

3. Hazardous voltage. Risk of electric shock or burn.
3.1 Wear insulating gloves. Replace gloves when wet or damaged.
3.2 Protect from shock by insulating yourself from work and ground.
3.3 Disconnect power before servicing. Do not touch live parts.

4. Plasma fumes can be hazardous.
4.1 Do not inhale fumes.
4.2 Use forced ventilation or local exhaust to remove the fumes.
4.3 Do not operate in closed spaces. Remove fumes with ventilation.

5. Arc rays can burn eyes and injure skin.
5.1 Wear correct and appropriate protective equipment to protect head, eyes, ears, hands, and body. Button shirt collar. Protect ears from noise. Use welding helmet with the correct shade of filter.

6. Become trained. Only qualified personnel should operate this equipment. Use torches specified in the manual. Keep non-qualified personnel and children away.

7. Do not remove, destroy, or cover this label.
Replace if it is missing, damaged, or worn (PN 110584 Rev C).

AVERTISSEMENT

Le coupage plasma peut être préjudiciable pour l'opérateur et les personnes qui se trouvent sur les lieux de travail. Consulter le manuel avant de faire fonctionner. Le non respect des ces instructions de sécurité peut entraîner la mort.

1. Les étincelles de coupage peuvent provoquer une explosion ou un incendie.
1.1 Ne pas couper près des matières inflammables.
1.2 Un extincteur doit être à proximité et prêt à être utilisé.
1.3 Ne pas utiliser un fût ou un autre contenant fermé comme table de coupage.

2. L'arc plasma peut blesser et brûler; éloigner la buse de soi. Il s'allume instantanément quand on l'amorce;
2.1 Couper l'alimentation avant de démonter la torche.
2.2 Ne pas saisir la pièce à couper de la trajectoire de coupage.
2.3 Se protéger entièrement le corps.

3. Tension dangereuse. Risque de choc électrique ou de brûlure.
3.1 Porter des gants isolants. Remplacer les gants quand ils sont humides ou endommagés.
3.2 Se protéger contre les chocs en s'isolant de la pièce et de la terre.
3.3 Couper l'alimentation avant l'entretien. Ne pas toucher les pièces sous tension.

4. Les fumées plasma peuvent être dangereuses.
4.1 Ne pas inhaler les fumées
4.2 Utiliser une ventilation forcée ou un extracteur local pour dissiper les fumées.
4.3 Ne pas couper dans des espaces clos. Chasser les fumées par ventilation.

5. Les rayons d'arc peuvent brûler les yeux et blesser la peau.
5.1 Porter un bon équipement de protection pour se protéger la tête, les yeux, les oreilles, les mains et le corps. Boutonner le col de la chemise. Protéger les oreilles contre le bruit. Utiliser un masque de soudeur avec un filtre de nuance appropriée.

6. Suivre une formation. Seul le personnel qualifié a le droit de faire fonctionner cet équipement. Utiliser exclusivement les torches indiquées dans le manual. Le personnel non qualifié et les enfants doivent se tenir à l'écart.

7. Ne pas enlever, détruire ni couvrir cette étiquette.
La remplacer si elle est absente, endommagée ou usée (PN 110584 Rev C).

ETIQUETA DE ADVERTENCIA

Esta etiqueta de advertencia se encuentra adherida a la fuente de energía. Es importante que el operador y el técnico de mantenimiento comprendan el sentido de estos símbolos de advertencia según se describen. El texto numerado corresponde a los cuadros numerados de la etiqueta.

1. Las chispas producidas por el corte pueden causar explosiones o incendios.

1.1 Mantenga los materiales inflamables lejos del lugar de corte.

1.2 Tenga a mano un extinguidor de incendios y asegúrese de que alguien esté preparado para utilizarlo.

1.3 No corte depósitos cerrados.

2. El arco de plasma puede causar quemaduras y lesiones.

2.1 Apague la fuente de energía antes de desarmar la antorcha.

2.2 No sostenga el material junto al trayecto de corte.

2.3 Proteja su cuerpo completamente.

3. Los electrochoques provocados por la antorcha o el cableado pueden ser fatales. Protéjase del electrochoque.

3.1 Colóquese guantes aislantes. No utilice guantes dañados o mojados.

3.2 Aíslese de la pieza de trabajo y de la tierra.

3.3 Antes de trabajar en una máquina, desconecte el enchufe de entrada o la potencia primaria.

4. La inhalación de los humos provenientes del área de corte puede ser nociva para la salud.

4.1 Mantenga la cabeza fuera de los gases tóxicos.

4.2 Utilice ventilación forzada o un sistema local de escape para eliminar los humos.

4.3 Utilice un ventilador para eliminar los humos.

5. Los rayos del arco pueden producir quemaduras en los ojos y en la piel.

5.1 Utilice un sombrero y gafas de seguridad. Utilice protección para los oídos y abróchese el botón del cuello de la camisa. Utilice un casco de soldar con el filtro de sombreado adecuado. Proteja su cuerpo completamente.

6. Antes de trabajar en la máquina o de proceder a cortar, capacítese y lea las instrucciones completamente.

7. No retire las etiquetas de advertencia ni las cubra con pintura.

Información sobre la colección de polvo seco

En algunos sitios, el polvo seco puede representar un peligro potencial de explosión.

La edición del 2007 de “U.S. National Fire Protection Association” iniciales en inglés NFPA (La Asociación Americana Nacional de Protección Contra Incendios) del estándar 68 “Protección de Explosión por medio de Respiradero de Deflagración” proporciona requisitos para el diseño, ubicación, instalación, mantenimiento, y uso de aparatos y sistemas para dar salida a gases de combustión y presiones después de todo evento de deflagración. Consulte con el fabricante o instalador de cualquier sistema de colección de polvo seco para los requisitos aplicables antes de que instale un sistema nuevo de colección de polvo seco, o haga cambios significativos en el proceso o materiales que se usen con un sistema existente de colección de polvo seco.

Consulte su “Autoridad que Tenga Jurisdicción” (iniciales en inglés AHJ) local para determinar si cualquier edición de la NFPA 68 ha sido “adoptada por referencia” en los códigos de construcción locales.

Remítase a la NFPA 68 para definiciones y explicaciones de los términos reguladores como “deflagración, AHJ, adoptada por referencia, el valor Kst, índice de deflagración” y otros términos.

Nota 1 – La interpretación de Hypertherm de estos nuevos requisitos es que, a no ser que se haya completado una evaluación específica del sitio para determinar que todo polvo generado no es combustible, la edición del 2007 de la NFPA 68 requiere el uso de respiraderos de explosión diseñados para el peor caso del valor Kst (vea anexo F) que pudiera ser generado por el polvo, de manera que el tamaño y tipo del respiradero de explosión pueda diseñarse. La NFPA 68 no identifica específicamente corte por plasma u otros procesos de cortes termales como si requirieran sistemas de respiraderos de deflagración, pero en realidad aplica estos nuevos requisitos a todos los sistemas de colección de polvos secos.

Nota 2 – Los usuarios de los manuales de Hypertherm deberían consultar y cumplir con todas las leyes y reglamentos federales, estatales y locales aplicables. Hypertherm, al publicar todo manual de Hypertherm, no intenta urgir acción que no esté en cumplimiento con todos los reglamentos y normas, y este manual nunca debe interpretarse como si lo hiciera así.

Section 2

SPECIFICATIONS

In this section:

General 2-3
Specifications 2-4
- THC control module 2-4
- Plasma interface assembly 2-5
- X-Y lifter assembly 2-6
- Operator pendant 2-7
- X-Y lifter breakaway option 2-8

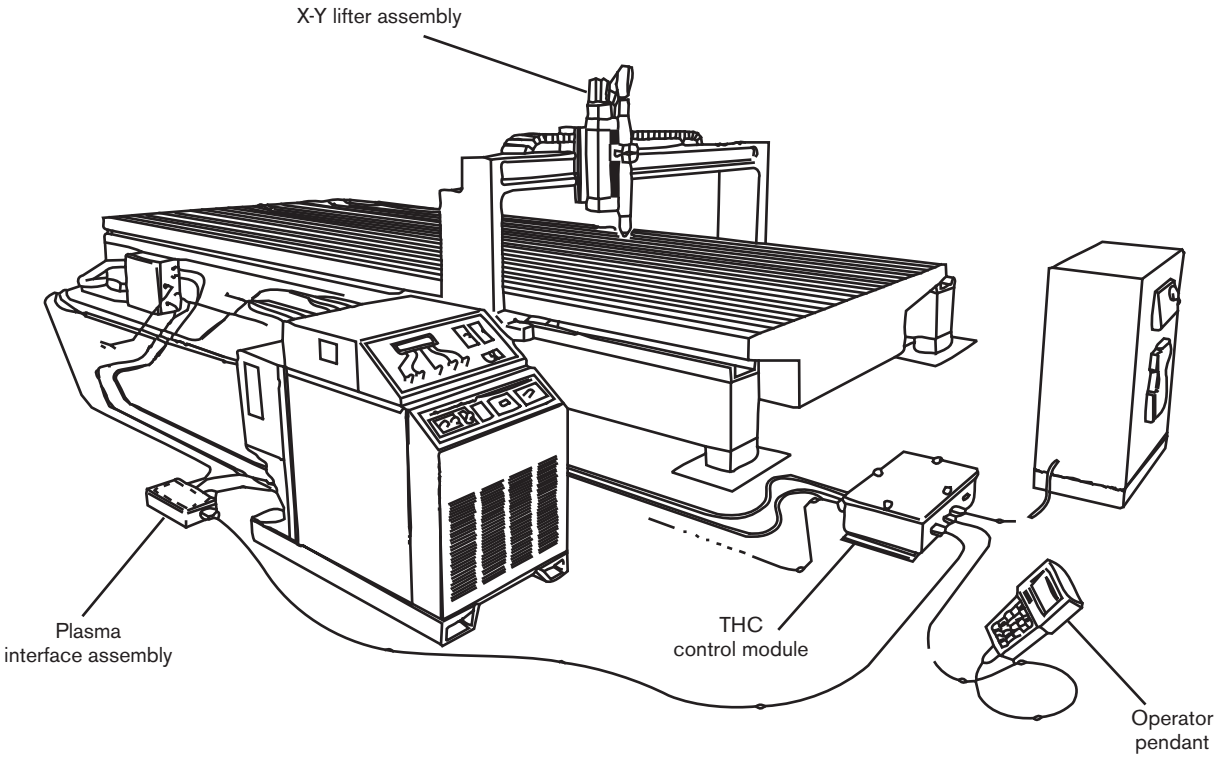


Figure 2-1 X-Y CommandTHC system interfaced with plasma cutting system and CNC

General

Hypertherm's X-Y CommandTHC is a torch height control/initial height sensing (THC/IHS) system designed for plasma cutting applications on a X-Y cutting table (Figure 2-1). The system uses the plasma arc voltage to control the physical stand-off (distance) between the torch and workpiece during plasma arc cutting. IHS is accomplished by ohmic contact sensing or by a limited force stall detection method. The system includes the following:

- **THC control module** (Figure 2-2) The THC control module houses 2 microcontrollers, a realtime controller and an interface controller. This unit provides initial height sensing, arc voltage control and interfaces with the torch lifter, the CNC machine, operator pendant and the plasma power supply through standard discrete I/O interfaces and optional extended RS-422 serial interfaces.

- **Plasma interface assembly with voltage divider** (Figure 2-3) The plasma interface houses an interface PCB which provides a communications link between the THC control module and the plasma power supply. The voltage divider provides a 41 : 1 signal which is derived from the cutting arc voltage. For example, if the arc voltage is 150 volts, the resultant 3.66-volt output signal is used to control the stand-off distance between the torch and workpiece during plasma cutting.

  Note: HyPerformance (HPR) plasma systems do not have an interface assembly. HPR systems have an interface board that mounts in the power supply.

- **X-Y lifter assembly** (Figure 2-4) The torch lifter station, under control of the THC control module, positions a torch head vertically above the workpiece. Its maximum stroke is 8 inches (200 mm) between the home and lower limit switches. It is driven by a stepper motor attached to a leadscrew. An encoder is provided for stall IHS sensing, and to detect gross errors during normal operation. A lower limit switch detects maximum travel in the downward direction. A home switch is provided to detect when the lifter is in the uppermost position. A power-off brake is energized after power up, and allows controlled motion of the torch. It is powered off during "Maintenance Mode" to prevent the torch from being accidentally moved. An optional torch breakaway kit is also available.

- **Operator pendant (optional)** (Figure 2-5) The operator pendant is a remote control which includes an LCD display and keypad used for THC setup and control (parameter entry and menu selection).

- **Torch breakaway kit (optional)** (Figure 2-6) The torch breakaway (collision sensor) provides a level of protection for the torch, lifter and X-Y table. Air pressure locks the torch to the THC lifter assembly. The air pressure can be adjusted to change the force required to trip the breakaway. Upon side impact, the breakaway releases from the lock position and allows the torch to float. See Figure 2-4 for torch mounting dimensions with and with out the breakaway.

Specifications

THC control module

Electrical

Input power (automatic selecting dual range) .....115 VAC or 230 VAC, 1 phase, 50/60 Hz
Parallel digital I/O.....+ 12 VDC
Serial digital I/O (RS-422) .....+ 5 VDC (operator pendant), CNC

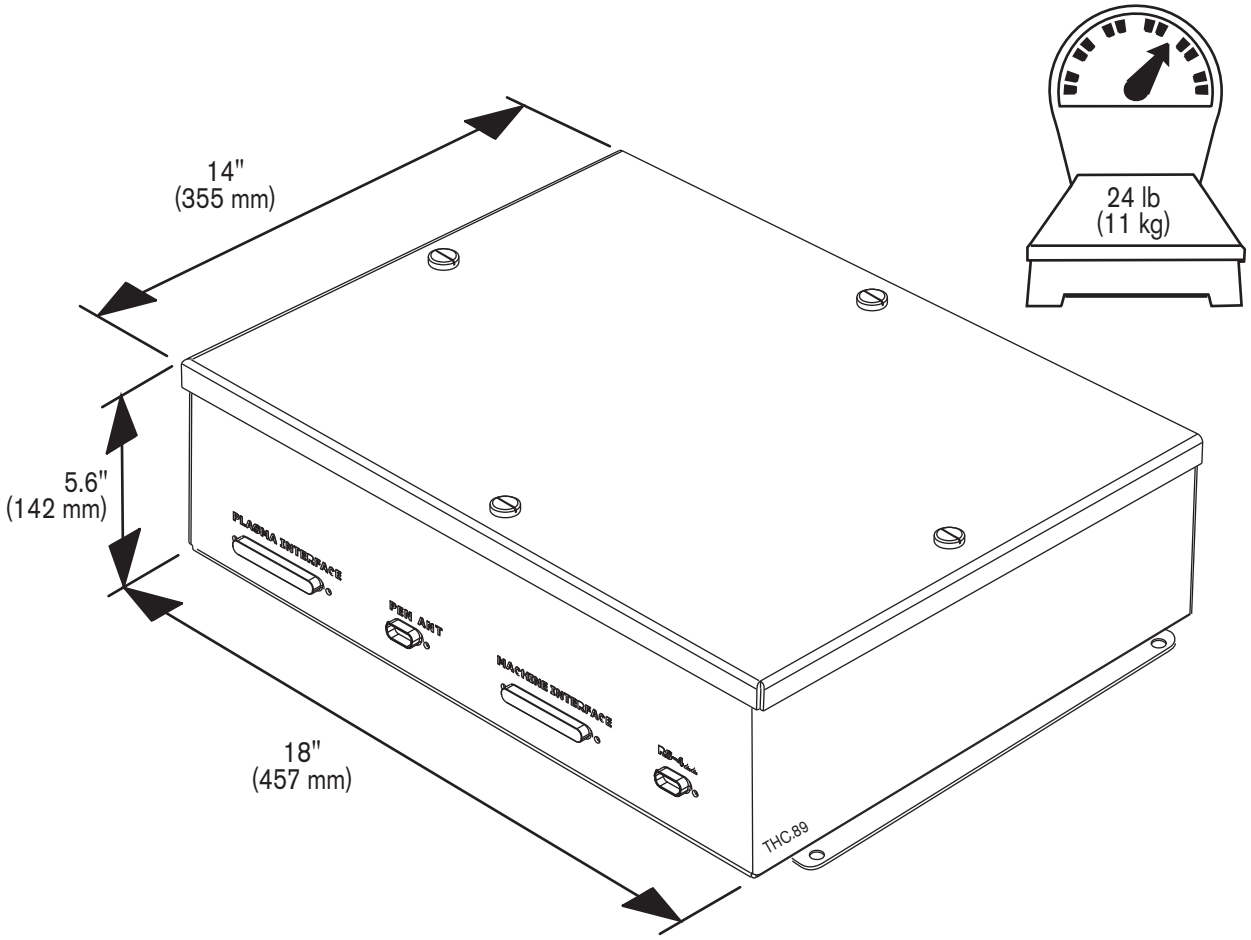


Figure 2-2 THC control module

Plasma interface assembly

Electrical

Input power .....+ 24 VDC
Parallel digital I/O.....+ 12 VDC
Serial digital I/O (RS-422).....+ 5 VDC

Voltage divider function.....41 :1 Arc voltage (isolated)

HT4400 and HPR installation

Note: Instructions to install the plasma interface PCB into the HT4400 power supply are included in section 3h.

Instructions to install the plasma interface PCB into the HPR power supply are included in section 3i.

The plasma interface enclosure is not used for the HT4400.

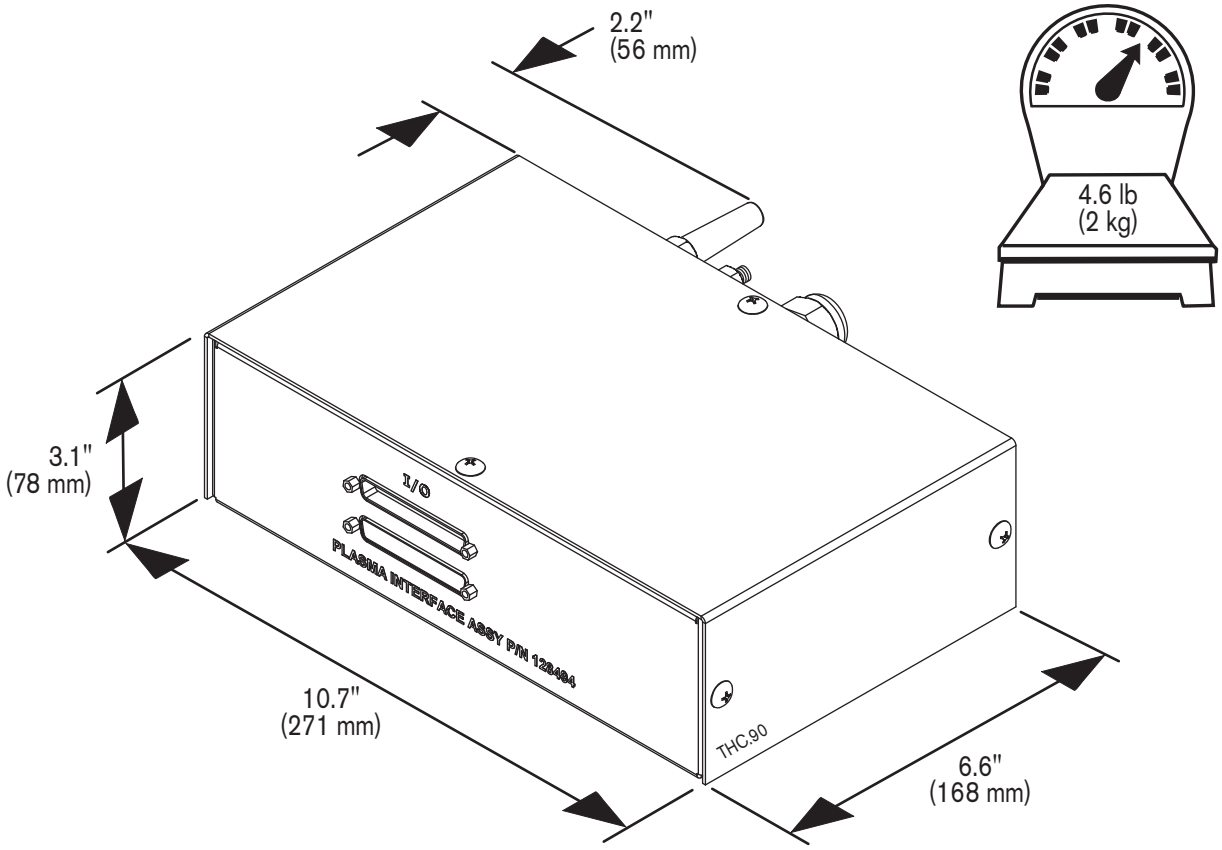


Figure 2-3 Plasma interface assembly

X-Y lifter assembly

Electrical

Motor .....+ 2.48 VDC, 2 phase (3.3 amp per phase)
Limit switches.....+ 24 VDC

Lifter control function

Motor .....Stepper
Motor drive.....Stepper, chopped constant current
Lifter feedback .....Encoder
Lifter limit switches.....Home switch and lower limit switch
Maximum Z axis speed .....200 inches (508 cm) per minute
Maximum Z axis stroke .....8- inches (203 mm)

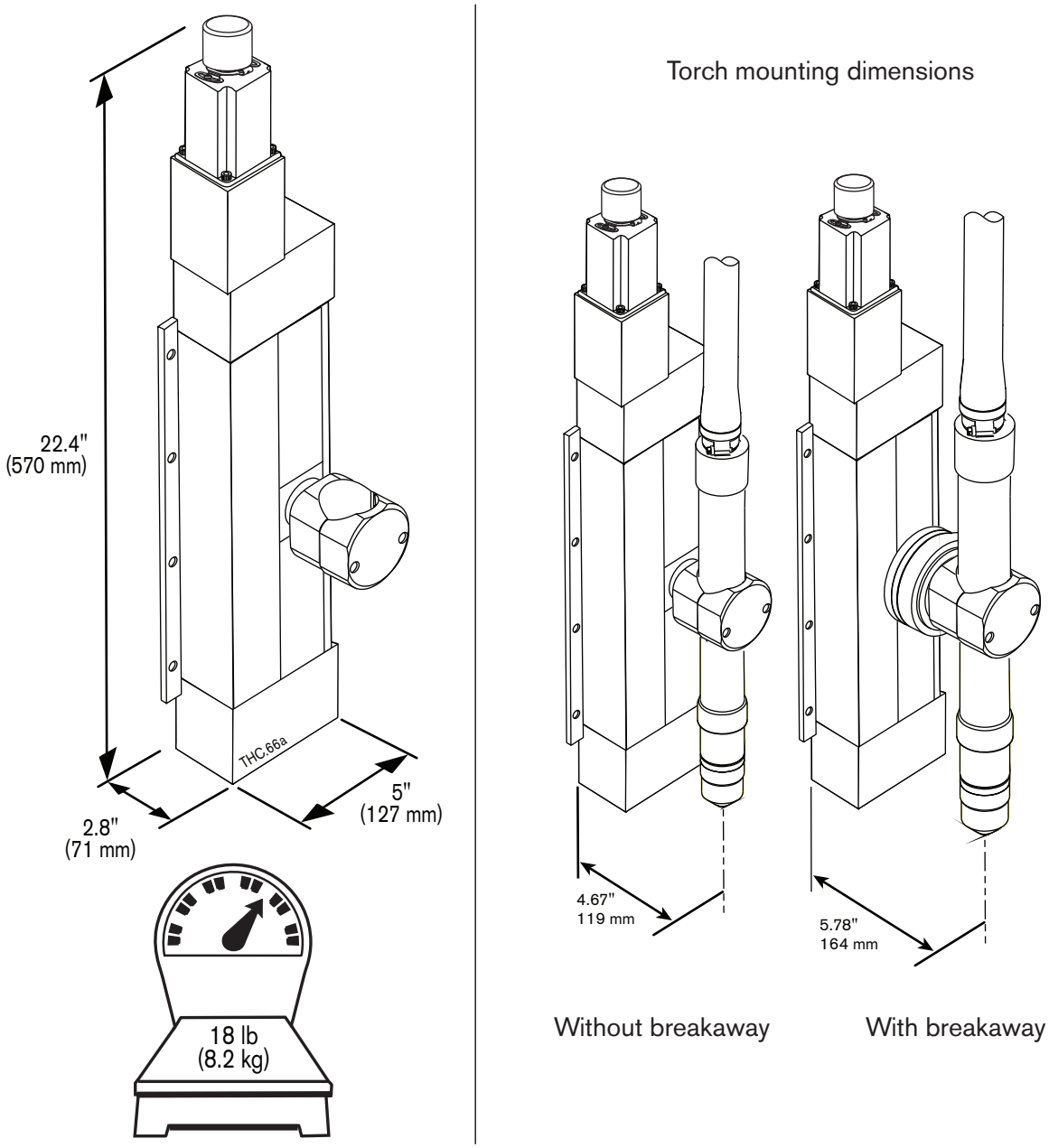


Figure 2-4 X-Y lifter assembly

Operator pendant

Electrical

Input power .....+ 12 VDC
Serial digital I/O (RS-422) .....+ 5 VDC

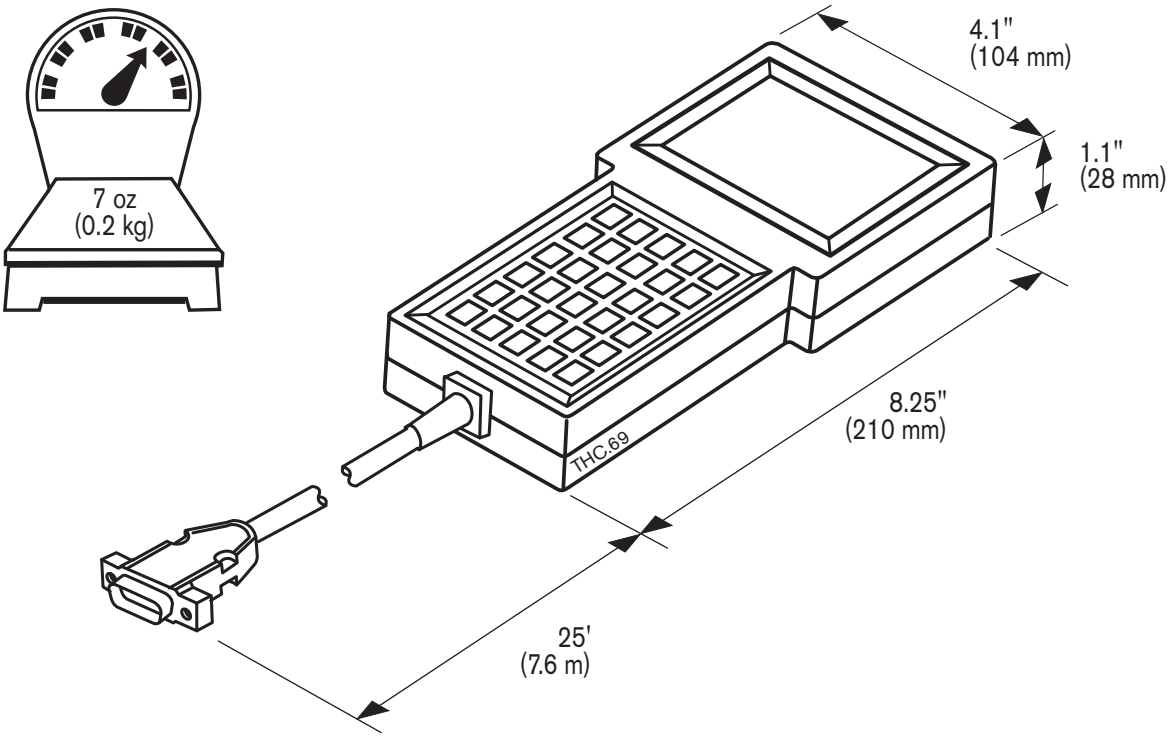


Figure 2-5 Operator pendant

X-Y lifter breakaway option

Electrical
Pressure switch .....CNC emergency stop circuit voltage

Breakaway control function
Shop air pressure.....100 psi (6.9 bar) maximum

Size
Breakaway width .....3.8 inches (97 mm)
Breakaway height (thickness).....2.25 inches (57 mm)
Air filter/regulator height .....7.06 inches (179 mm)
Air filter/regulator width .....1.56 inches (40 mm)
Air filter/regulator depth (from gauge to back).....3.125 inches (79 mm)

Weight
Breakaway.....1.9 pounds (0.86 kg)
Air filter/regulator.....1.0 pounds (0.45 kg)

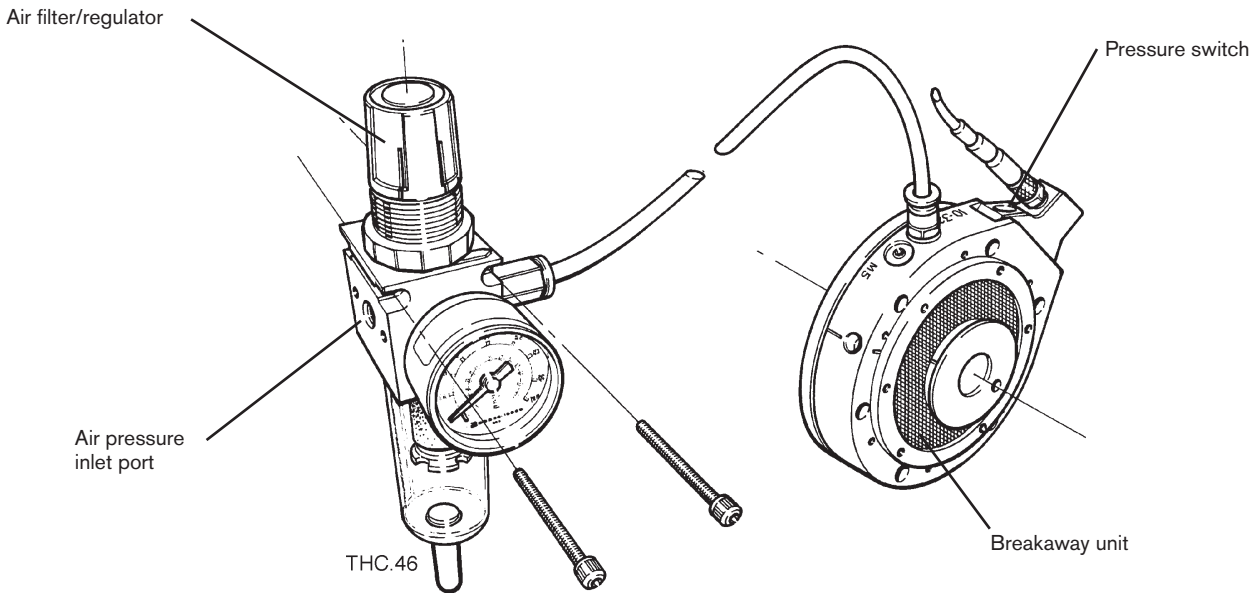


Figure 2-6 X-Y lifter breakaway option

Section 3

SETUP

In this section:

Upon receipt 3-2
- Standard components 3-2
- Optional components 3-2

Claims 3-2
Power requirements 3-2
System unit mounting 3-3
- THC control module 3-3
- Plasma interface assembly 3-4
- X-Y lifter assembly 3-5
- Torch mounting block kit 3-6
- Torch breakaway kit (optional) 3-8
- Install the torch (without torch breakaway option) 3-10
- Install the torch (with torch breakaway option) 3-11

System interconnections 3-12
- THC system cables 3-12
- Machine interface cable 3-14

THC selectable responses 3-16
- DIP switch positions 3-17

CommandTHC serial protocol 3-18
Grounding requirements 3-20
- Power cord grounding 3-20
- Protective earth ground 3-20

Lifter I/O Cable 3-21
Plasma interface cable 3-22
CNC interface cable 3-23
Pendant extension cable 3-25
Motor drive cable 3-26
HD3070 system interconnections 3a-1
HT2000 system interconnections 3b-1
HT2000LHF system interconnections 3c-1
HT4001 system interconnections 3d-1
MAX100 System interconnections 3e-1
MAX200 System interconnections 3f-1
POWERMAX system interconnections 3g-1
HT4400 system interconnections 3h-1
HPR system interconnections 3i-1
HSD system interconnections 3j-1
HD4070 system interconnections ..... See IM 803760

Upon receipt

The THC system is shipped in two containers: one container holds the units; the other holds the cables. The containers should include the following standard and optional components, if ordered:

Standard components

- THC control module
- 2 Power cords, 6.5 ft./2 m
- Plasma interface assembly
- X-Y lifter assembly
- Interface cables
  - Lifter motor drive cable (9 pin)
  - 3 Interface cables (37 pin)
  - Ohmic contact wire
  - Power supply interface cable (for Hypertherm power supplies only)
- Command X-Y THC system instruction manual

Optional components

- Operator pendant with 25 ft. (7.5 m) cable
- Pendant extension cable (9 pin)
- Torch mounting block kit
- Torch breakaway kit

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.

Power requirements

See THC control module in Section 2.

System unit mounting

Before interconnecting the THC system, mount the units as required, using customer-supplied hardware. Do not allow the units to lie unsecured on top of cabinets or on the floor. Refer to Section 2, *Specifications,* for unit dimensions.

THC control module

- Mount the THC control module close to the CNC controller for easy access to the THC system power and to provide easy access for routing and connecting cables. The unit can be mounted in any position except with the power module (AC receptacle and switch) facing up. Four mounting holes, requiring 1/4-inch (6 mm) fasteners, are provided. See Figure 3-1.

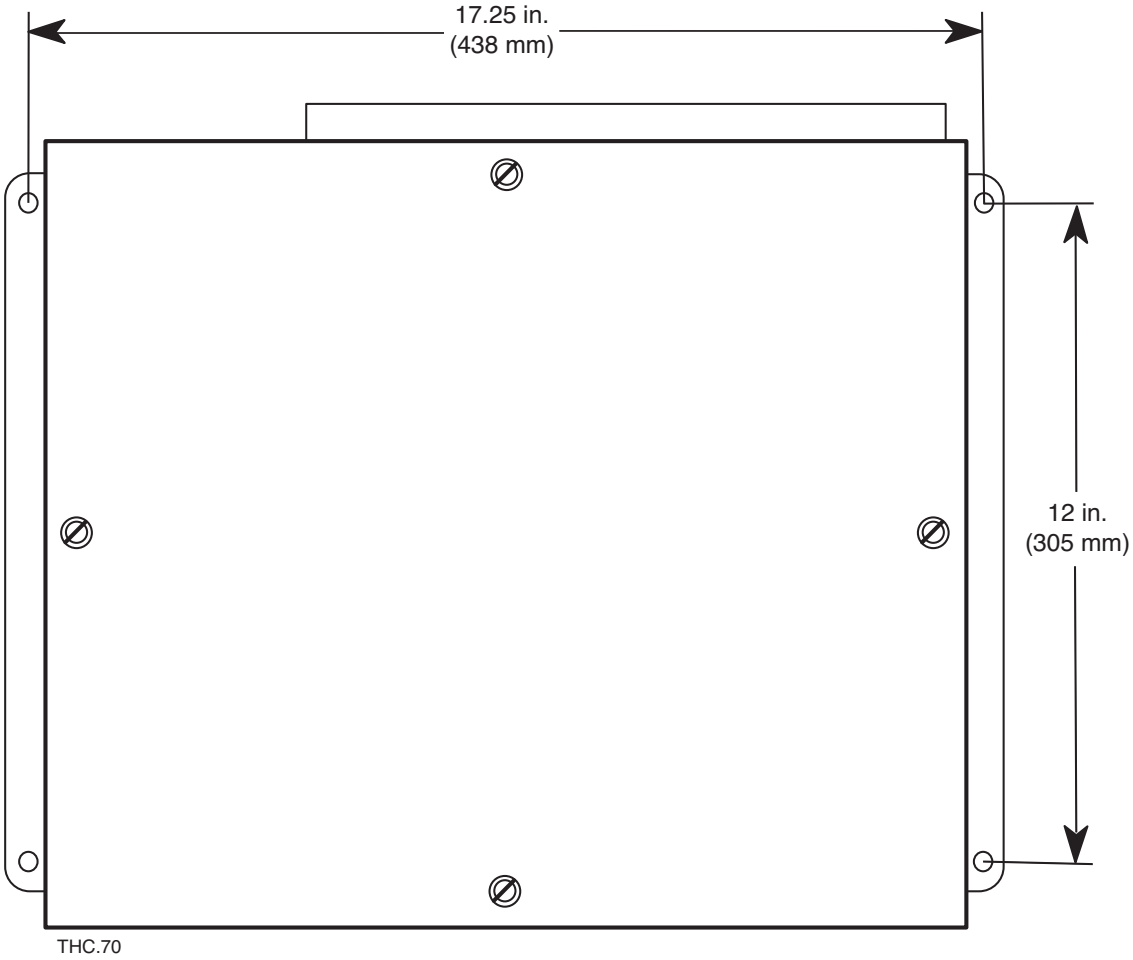


Figure 3-1 THC control module mounting

Plasma interface assembly

HT4400 and HPR installation

Note: Instructions to install the plasma interface PCB into the HT4400 power supply are included in section 3h.

Instructions to install the plasma interface PCB into the HPR power supply are included in section 3i.

The plasma interface enclosure is not used for the HT4400.

- Mount the plasma interface assembly close to the plasma power supply for easy connection of control and process signal wires between the units. The unit can be mounted in any position. The mounting holes require #8 (4 mm) fasteners. See Figure 3-2.

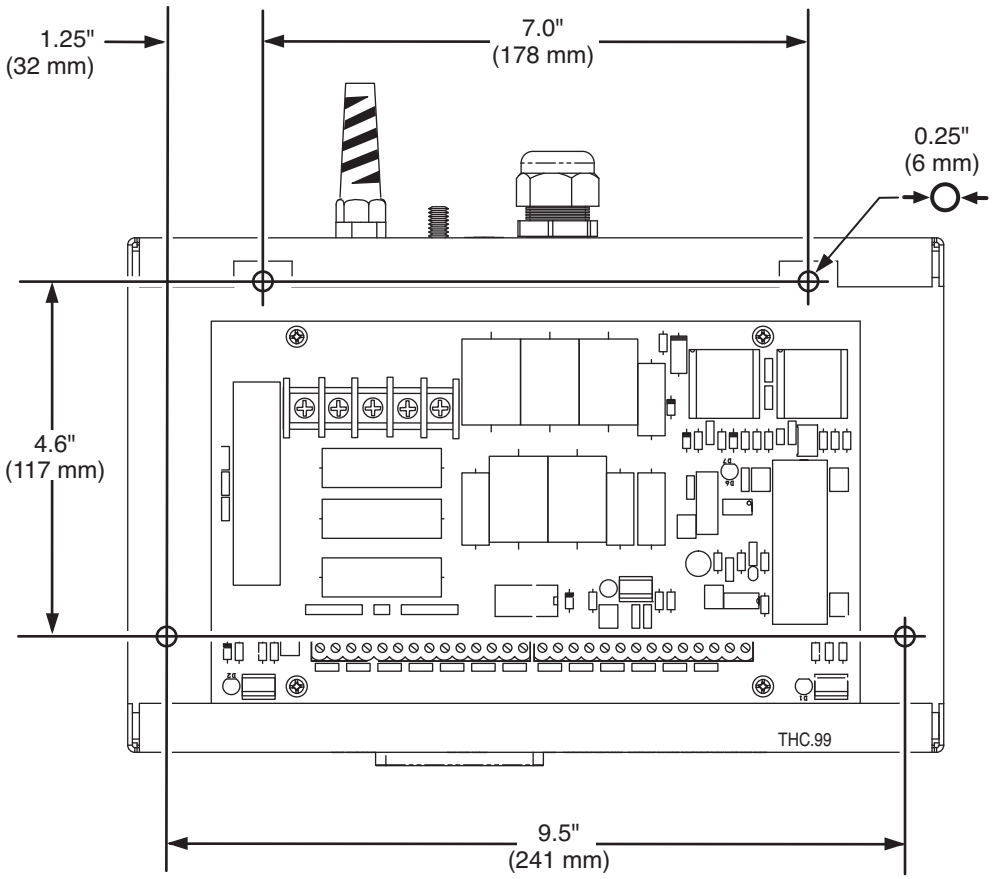


Figure 3-2 Plasma interface assembly mounting

X-Y lifter assembly

- Mount the X-Y lifter assembly on the cutting table. See Figure 3-3.

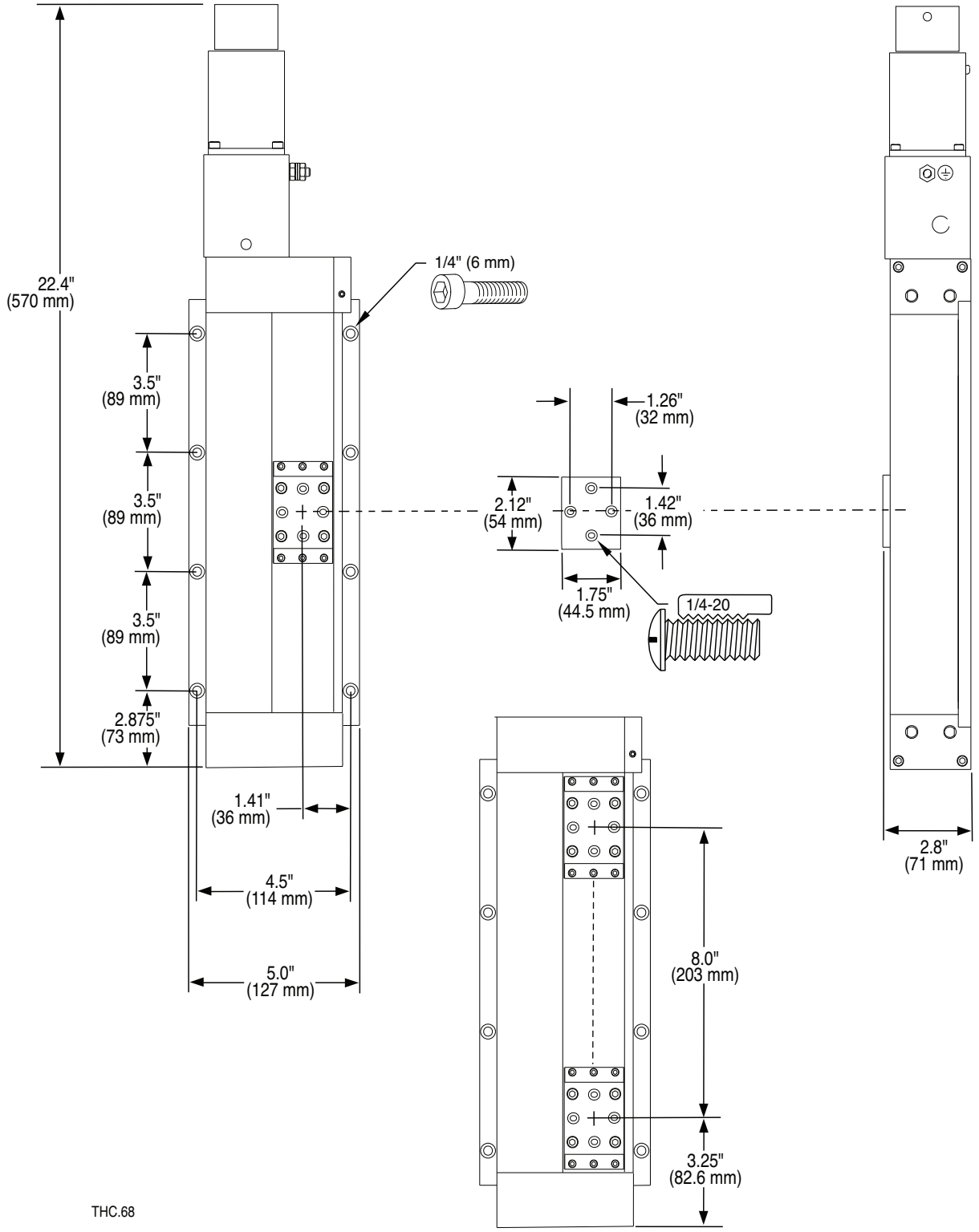


Figure 3-3 X-Y lifter assembly mounting

Torch mounting block kit

- Mount the torch mounting block kit to the X-Y lifter assembly. See Figure 3-4. Refer to Section 6, *Parts List* for a complete list of available kits and kit parts breakdowns.

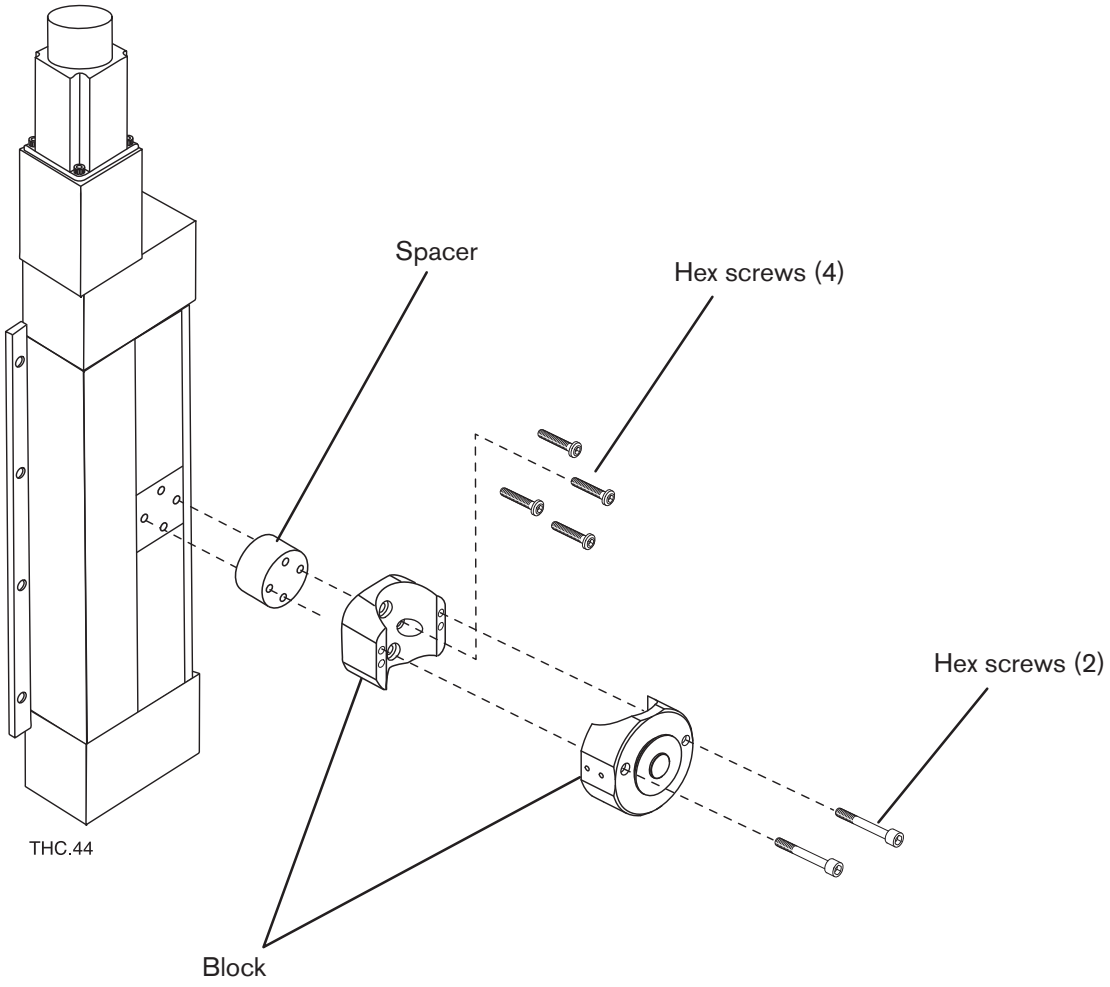


Figure 3-4 X-Y lifter assembly torch mounting block

Blank

Torch breakaway kit (optional)

Install the torch breakaway kit as follows. Refer to Figure 3-5.

1. Mount the fiberglass bracket to the X-Y lifter using the 4 hex screws.
2. Mount the breakaway to fiberglass bracket using the 6 screws.
3. Attach the torch mounting block to the breakaway with the collar and 2 screws.
4. Wire the electrical output of the breakaway to the emergency stop circuit at CNC.
5. Mount the filter/regulator.
6. Connect tubing between regulator and breakaway.
7. Install air supply to the regulator inlet port at 100 psi (6.9 bar) (recommended maximum pressure).
8. Adjust the regulator to indicate 30 psi (2 bar) (recommended starting pressure) on the gauge.
9. By hand, force the breakaway to trip to simulate a crash.
   Manually reposition breakaway to the lock position.
10. Adjust air pressure until the desired trip force is achieved.
11. Enable the emergency stop circuit at CNC after the breakaway is installed.

Notes:

- Installing the torch breakaway kit to the X-Y lifter assembly also requires using parts of the torch mounting block kit of the proper diameter. Refer to Section 6, Part List for details.
- The maximum pressure regulator inlet pressure is 150 psi (10.2 bar). Typically, the maximum inlet pressure should be set at 100 psi (6.9 bar).
- The routing of the leads, stall force, IHS speed, and acceleration/deceleration movements can affect the pressure setting required to achieve reliable operation.
- If air pressure is removed (for example, overnight), the breakaway will have to be manually repositioned when air is applied. The breakaway will not rest in its position when air pressure is lost.

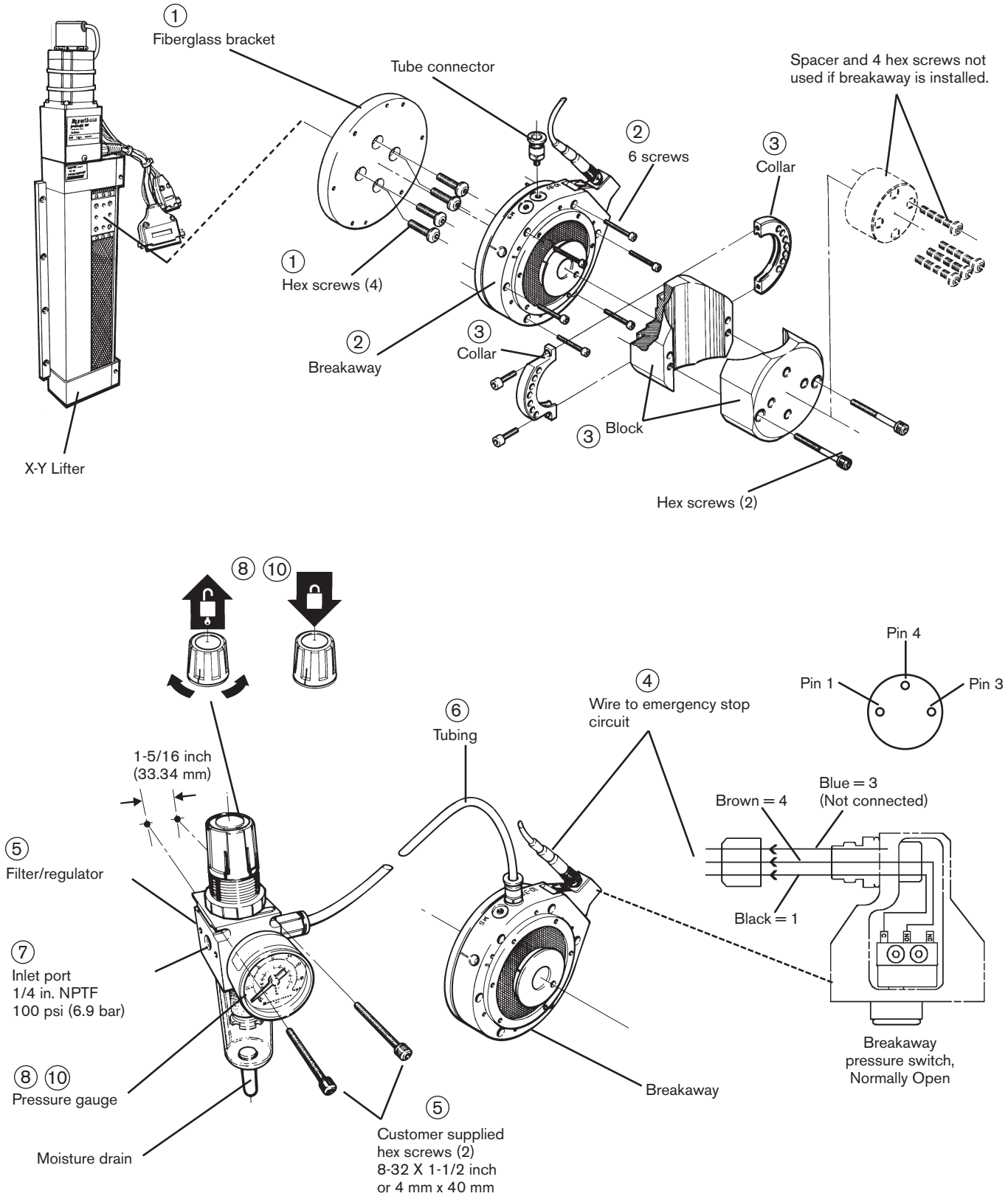


Figure 3-5 X-Y lifter assembly optional torch breakaway kit mounting details

Install the torch (without torch breakaway option)

① Mount the torch to the lifter with the mounting block and 2 screws. See Figure 3-6.

② Install the shield to the mounting block with 4 screws.

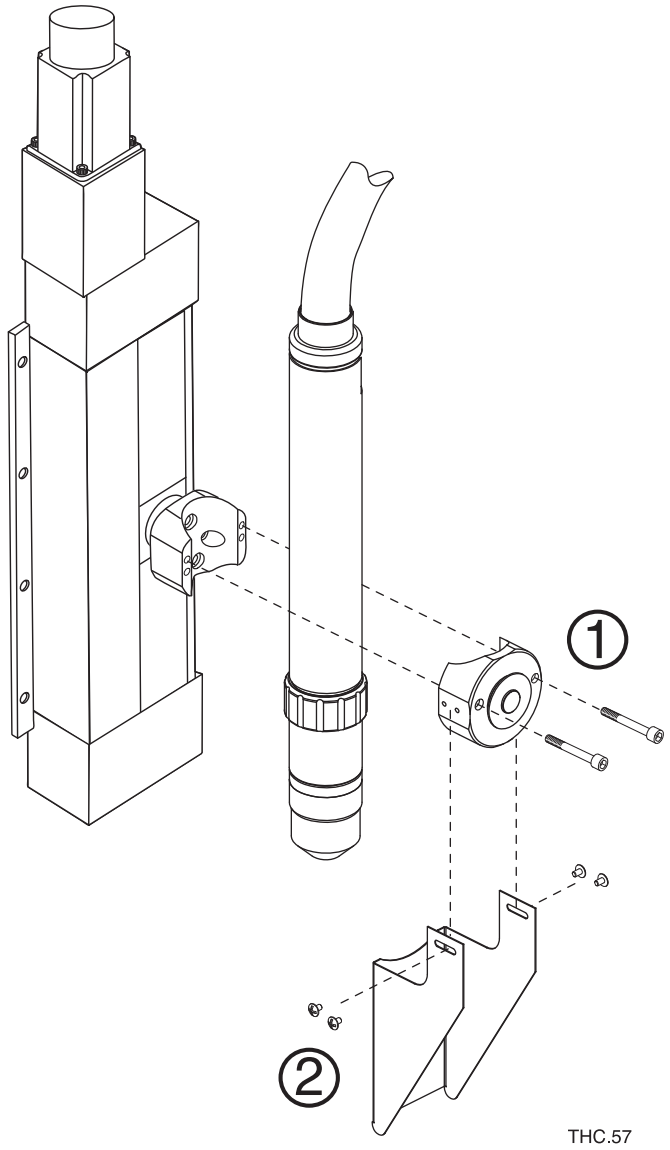


Figure 3-6 Torch installed without torch breakaway option

Install the torch (with torch breakaway option)

① Install the shield to the mounting block with 4 screws. See Figure 3-7.

② Mount the torch to the lifter with the mounting block and 2 screws.

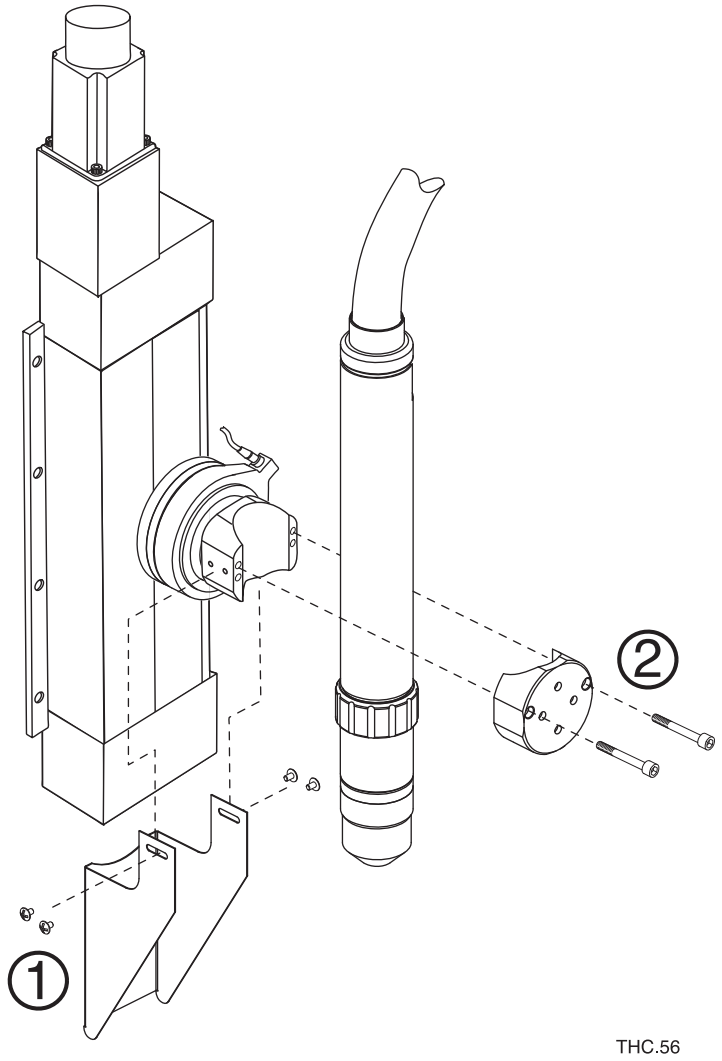


Figure 3-7 Torch installed with torch breakaway option

System interconnections

Cable part numbers and signal lists are provided in figures 3-14 through 3-18.

THC system cables

Caution: **Do not run the pendant cable in parallel and near to the torch lead. There is a possibility that electrical noise will cause erratic operation of the operator pendant or damage it.**

Install system cables as shown in Figure 3-8.

HT4400 and HPR installation

Note: Instructions to install the plasma interface PCB into the HT4400 power supply are included in section 3h.

Instructions to install the plasma interface PCB into the HPR power supply are included in section 3i.

The plasma interface enclosure is not used for the HT4400.

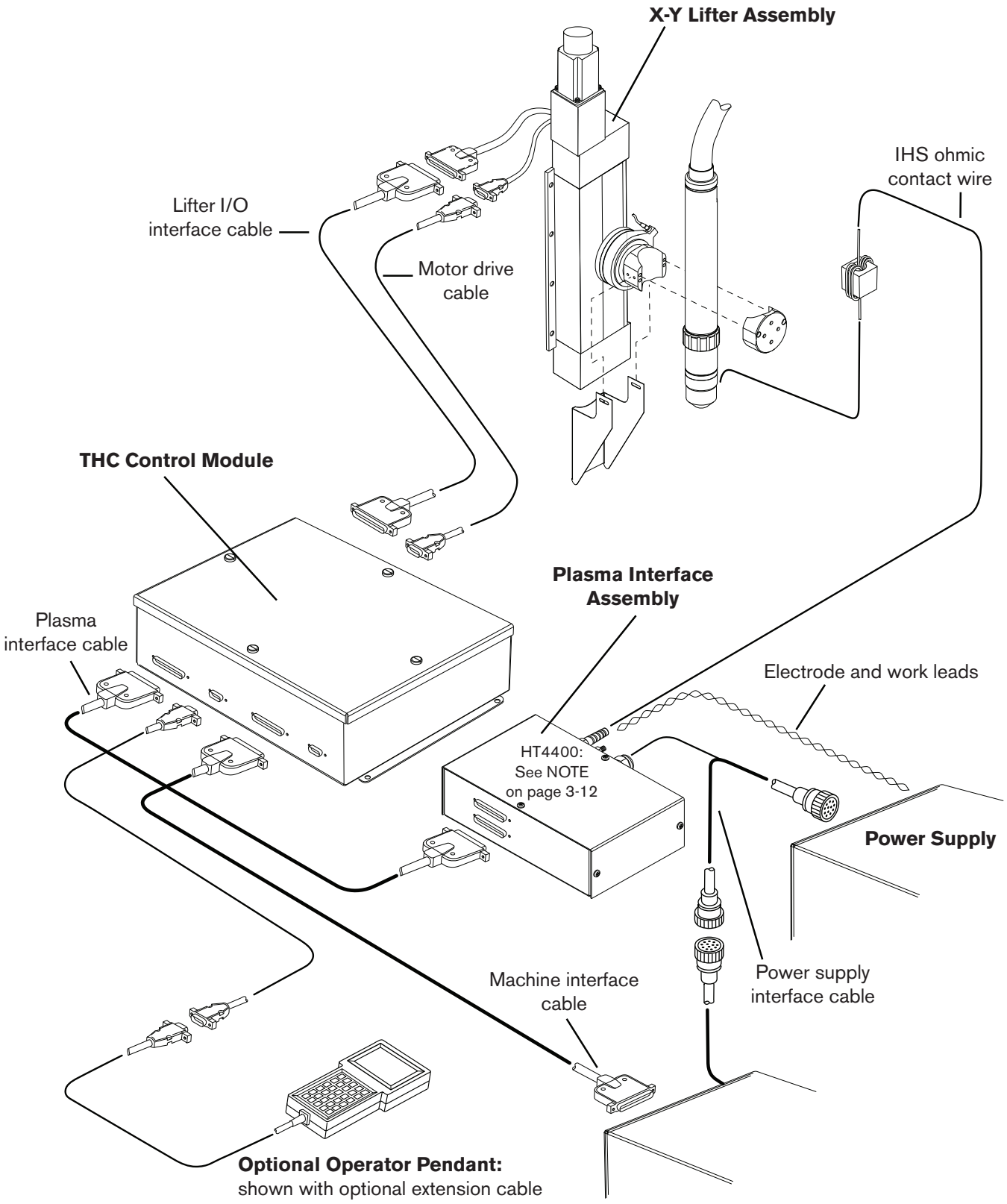


Figure 3-8 X-Y THC system diagram

Machine interface cable

1. Cable-installed signal – See Figure 3-9.

   The machine interface cable provides a signal to verify that the cable is installed properly. Continuity must be provided through pins 3 and 22 so that the signal is not interrupted.

   Install a jumper wire in the CNC to provide continuity between pins 3 and 22 when the machine interface cable is installed to the CNC receptacle.

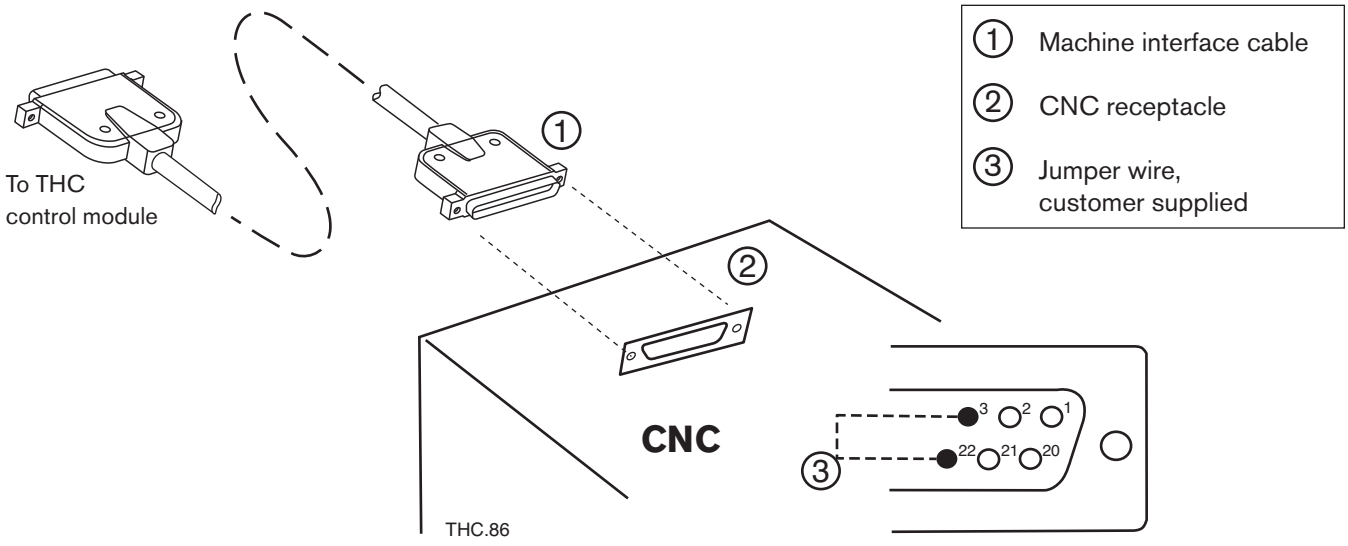


Figure 3-9 CNC cable-installed signal

2. Emergency stop signal – See Figure 3-10.

   The machine interface cable provides a signal for emergency stop. Continuity must be provided through pins 16 and 35 so that the signal is not interrupted.

   Install a normally closed switch in the CNC to provide continuity between pins 16 and 35 when the machine interface cable is installed to the CNC receptacle.

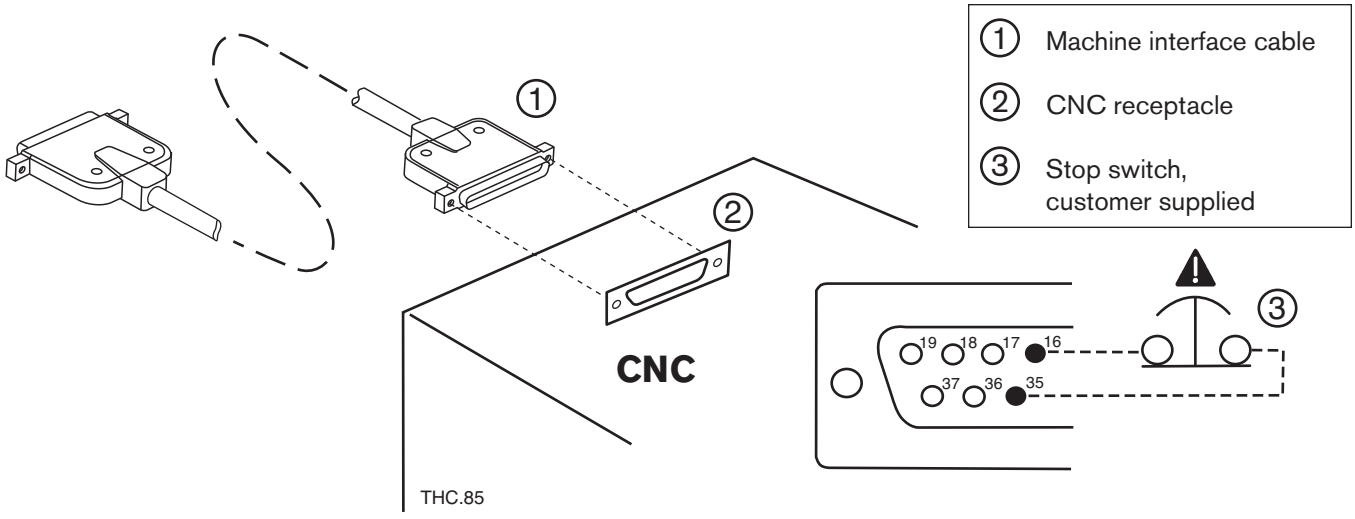


Figure 3-10 CNC emergency stop signal

3. Install the machine interface cable as shown in Figure 3-11.

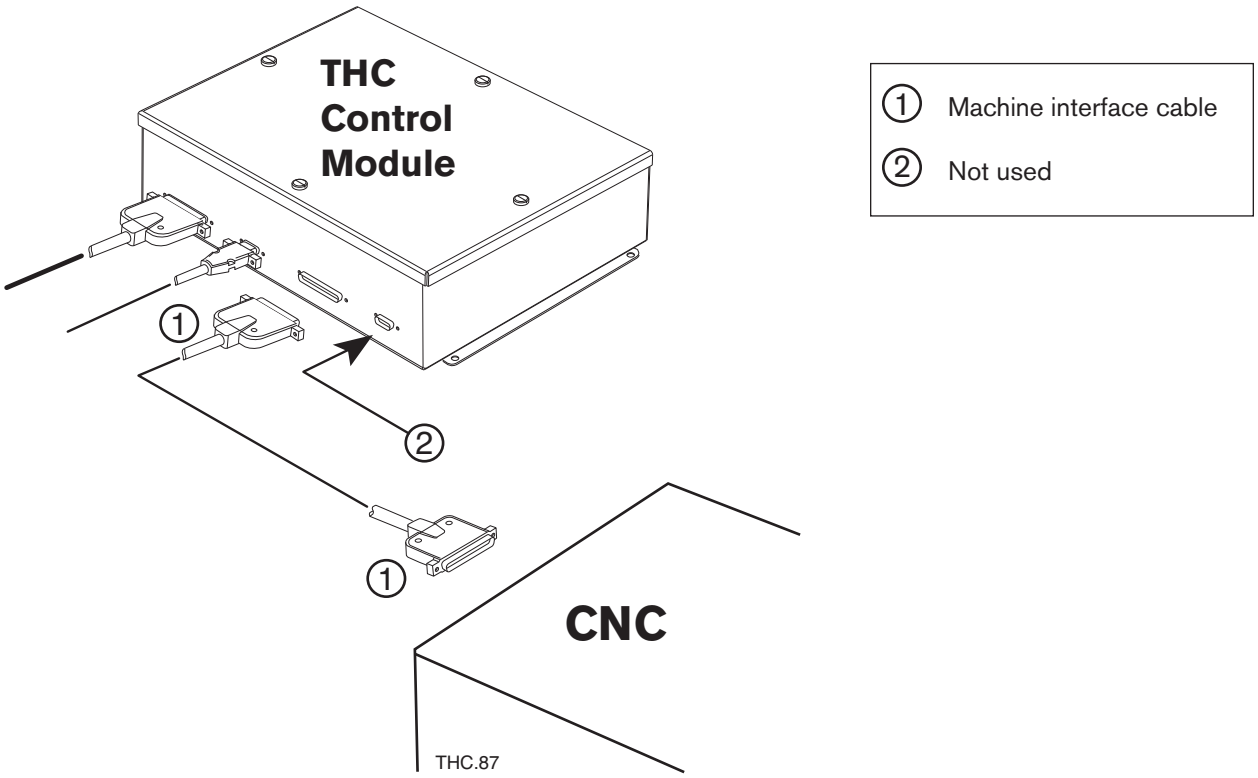


Figure 3-11 Machine interface cable

4. If installation requires removal of a cable connector, all wires must be properly terminated, including shield, or system problems may occur. See Figure 3-12.

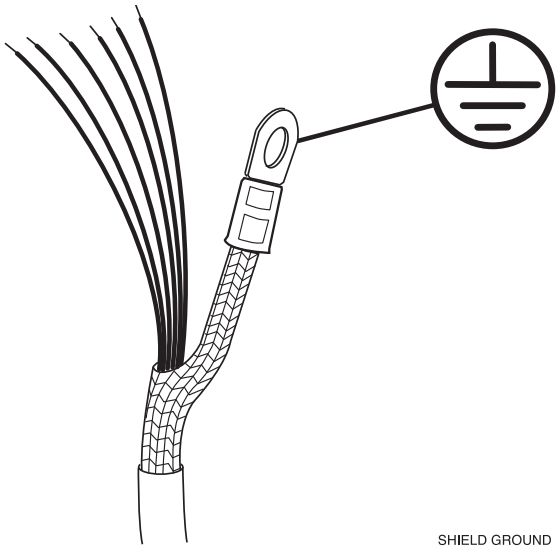


Figure 3-12 Machine interface cable grounding

THC selectable responses

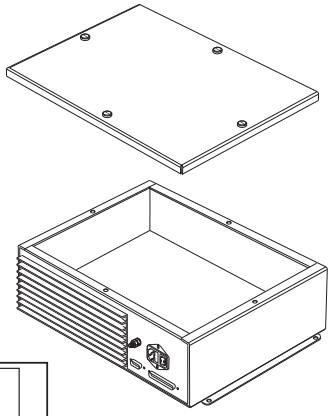
The DIP switch, on the motor drive board, provides adjustable arc voltage control response.

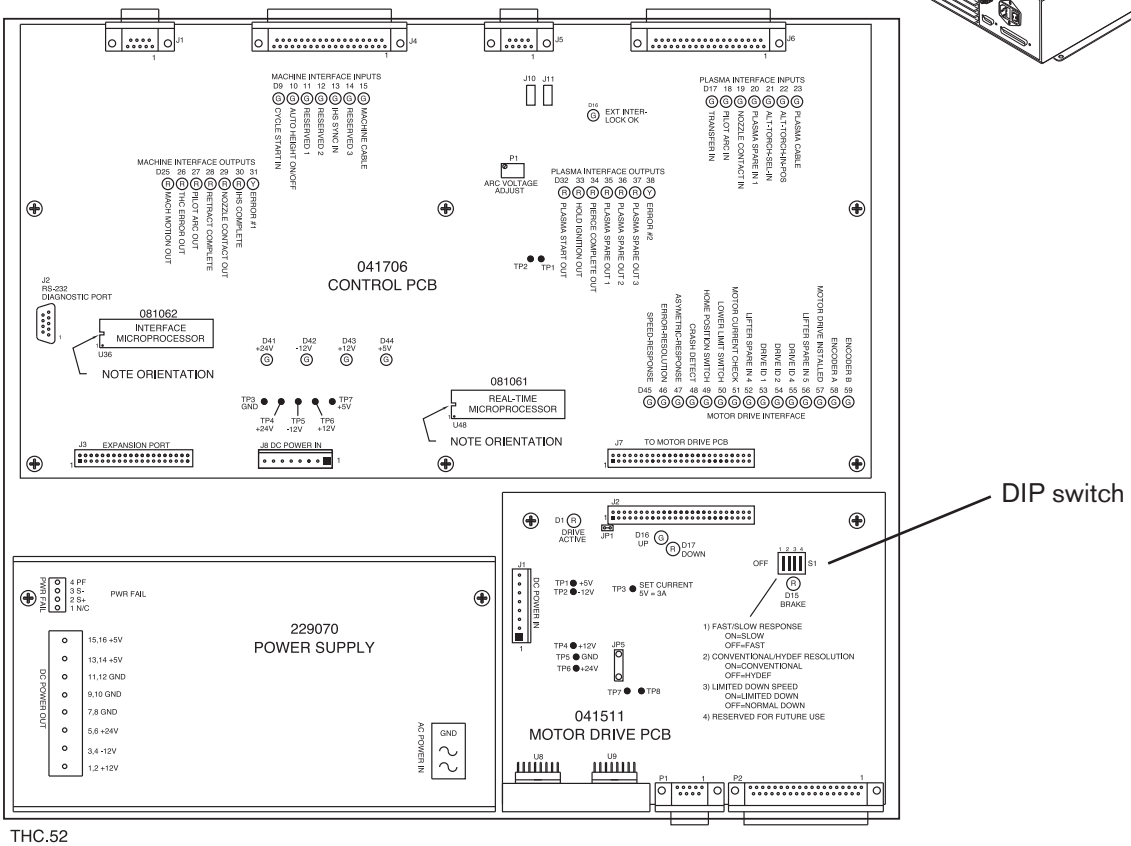
DANGER

ELECTRIC SHOCK CAN KILL

Turn off all electrical power before removing the power supply cover. Press the power supply OFF (0) pushbutton switch and set the line disconnect switch to OFF. In the U.S., use a "lock-out and tag-out" procedure until the service or maintenance is complete. In other countries, follow appropriate local or national safety procedures.

Remove the THC control module cover to access the DIP switch on the motor drive board.





THC.52

Note: The DIP switch positions are set to ON (default settings) at Hypertherm.

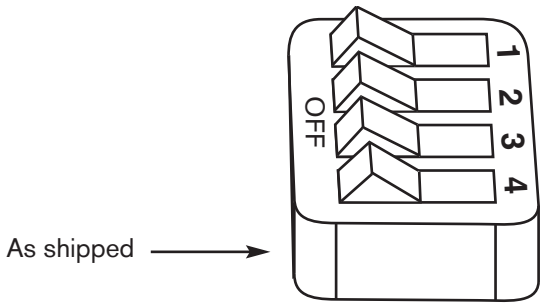
DIP switch positions

1 Fast/Slow response
- **ON** slows response speed of lifter by approximately one half in both up and down directions.
- **OFF** enables "normal" or fast response.

2 Conventional/HyDefinition resolution
- **ON** enables the THC to respond to larger voltage error changes.
- **OFF** enables the THC to respond to smaller error voltage changes.

3 Limited down speed
- **ON** enables lifter to move up at the normal speed, but down at slower speed. This is designed to help where corner diving is a problem.
- **OFF** enables the lifter to move up and down at the "normal" speed.

4 HPR pierce complete



DIP switch ON/OFF positions

Plasma Systems	*DIP Switch Settings			
	1 Fast/Slow Response	2 Conv/HyDef Resolution	3 Limited Down Speed	4 HPR pierce complete
HD3070	OFF	OFF	OFF	OFF
HT2000	OFF	ON	ON	OFF
HT2000LHF	OFF	ON	ON	OFF
MAX100	ON	ON	ON	OFF
MAX200	OFF	ON	ON	OFF
HT4001	ON	ON	ON	OFF
HT4400	ON	ON	ON	OFF
HD4070	ON	OFF	OFF	OFF
Powermax	ON	ON	ON	OFF
HPR/HSD	ON	ON	ON	ON

*** These are recommended switch settings. Since cutting machine installations vary, these switches can be adjusted in any combination to achieve desired results.**

CommandTHC serial protocol

Commands can be sent over a serial link to control the function of the torch height control. The interface is 4 wire RS422 on the MACHINE INTERFACE CABLE (pins (1) RX–, (20) RX+, (2) TX–, (21) TX+).

The serial frame runs at:

Old protocol (041507 control PCB) – 9600 baud, 8 data bits, 2 stop bits, and even parity

New protocol (041706 control PCB) – 19200 baud, 8 data bits, 1 stop bit, and no parity

All bytes in a serial message are ASCII characters. A message consists of a start of message character (>, 0x3E), 2 byte message ID (all message ID's should be capitalized), variable length data, 2 byte checksum, and end of message character (<, 0x3C). For example to put the THC into remote mode >RM1D0<. 'RM' is the message ID, '1' is the data field, and 0xD0 is the checksum (2 hex digits sent as 2 ASCII characters). The response to an accepted command is (^, 0x5E) and the response to an invalid command is (#, 0x23).

Some of the commands can be queried by using (?, 0x3F) as the data. For example to query the actual arc voltage >AV?D6<. The response to this query would be >AV100058<, which represents an actual arc voltage of 100.0 volts with a checksum of 0x58.

Errors can be retrieved over the serial link. There is a discrete output on the machine interface cable (THC Error pins 14,33) which indicates an error has occurred. Using the command >CL8F< errors can be cleared and retrieved. A typical response might be >ERR-Motor Current Fault46< or if there is no error (^, 0x5E) is returned.

Command listing:

Command	ID	Data	Query	Notes
Pierce Delay	PD	0 – 9000 (0 to 9.000 seconds)	yes	Delay before motion output
Pierce Height Factor	PH	50 – 300 (50% to 300%)	yes	Used to set pierce height
Preflow During IHS	PF	0,1 (0 = off, 1 = on)	yes	Improves cycle time
IHS Stall Current	SC	1 – 10 (1 = least force)	yes	Used to set stall force
IHS Speed	IV	1 – 10 (1= slowest)	yes	Used to set IHS speed
IHS Test	IH	0,1 (0 = run, 1 = test)	no	Perform IHS test
Nozzle Contact Active	NC	0,1 (0 = off, 1 = on)	yes	Enable nozzle contact IHS
Machine Acceleration	MA	0 – 9000 (0 to 9.000 seconds)	yes	Delay voltage control
Maintenance Mode	MT	No data	no	Maintenance mode
Auto Kerf	AK	0,1 (0 = off, 1 = on)	yes	Disable voltage control in kerf
Actual Arc Voltage	AV	? (query only)	yes	Returned value is 1/10 volts
Automatic Voltage Control	AA	0,1 (0 = manual, 1 = auto)	yes	Voltage control or manual
Retract	RE	0,1 (0 = full, 1 = partial)	yes	Full or partial retract
Retract Distance	RH	0 – 8000 (0 to 8.000 inches)	yes	Must be in partial retract
Remote Mode	RM	0,1 (0 = off, 1 = on)	yes	Must be ON to use serial link
IO Rev	RI	? (query only)	yes	IO revision
RT Rev	RR	? (query only)	yes	Real Time revision
Homing Speed	HS	1 – 10 (1 = slowest)	yes	Home speed
Unit Conversion	UN	0,1 (0 = inches, 1 = metric)	yes	Units
Lifter Test	LT	No data	no	Perform lifter test
Cut Height	CH	0 – 1000 (0 to 1.000 inches)	yes	Used to set cut height
Arc Voltage Setpoint	VS	500 – 3000 (50.0 to 300.0 volts)	yes	Used to set voltage control
Step Up	S+	No data	no	Move up fixed increment
Step Down	S–	No data	no	Move down fixed increment
Jog Up	J+	No data	no	Continuous movement up
Jog Down	J–	No data	no	Continuous movement down
Clear Error	CL	No data	no	Clear error, send error string
Flush Buffers	FL	No data	no	Reset RX and TX buffers
Error code	EC	? (query only)	yes	Send error code number

Application notes:

1. To do manual movements Jog up, down and Step up, down the THC must be in manual mode (Automatic Voltage Control = 0).
2. When the THC receives a Jog up or down command, it will move the torch up/down for 50 milliseconds. If a new command is not received after this time the motion will stop. To achieve continuous movement the Jog command must be repeatedly sent faster than once every 50 milliseconds.
3. The Error code command will ONLY retrieve an error code, it will not clear an error. To clear an error the CL (Clear error command must be sent).
4. The revision commands (RR and RI) return the decimal representations of the revisions that are stored (as ASCII characters) in the firmware.
5. Setting the Retract distance (RH) only applies when the THC is in partial retract (Retract = 1).
6. To force the lifter station to go home send the following series of commands : RE1, RE0 (partial retract, then full retract this will force a homing sequence).

Error codes:

Code	Error string
0	"ERR-Torch is in LOWER LIMIT"
1	"ERR-Torch is in HOME LIMIT"
2	"ERR-EEPROM checksum Error"
3	"ERR-Lifter NOT Installed"
4	"ERR-Motion FAIL"
5	"ERR-Watch Dog Timeout FAIL"
6	"ERR-InterProcessor Comm Fail"
7	"ERR-Nozzle Contact at Home"
8	"ERR-Cycle Start ON at INIT"
9	"ERR-Motor Current Fault"
10	"ERR-Machine Cable Missing"
11	"ERR-Plasma Cable Missing"
12	"ERR-Robotic Limit FAIL"
13	"ERR-DIAG FAIL REPOWER THC"
14	"ERR-IOP CHECKSUM FAIL"
15	"ERR-RTP CHECKSUM FAIL"
16	"ERR-NO ERROR"

Grounding requirements

To ensure personal safety and proper operation, and to reduce electromagnetic interference (EMI), the THC system must be properly grounded.

Power cord grounding

The THC control module must be properly grounded through the power cord according to national or local electrical codes.

Protective earth ground

- Install protective earth (PE) grounding cables to the 3 THC components as shown in Figure 3-13. Grounding must comply with national or local electrical requirements.
- The PE cables must be supplied by the customer.

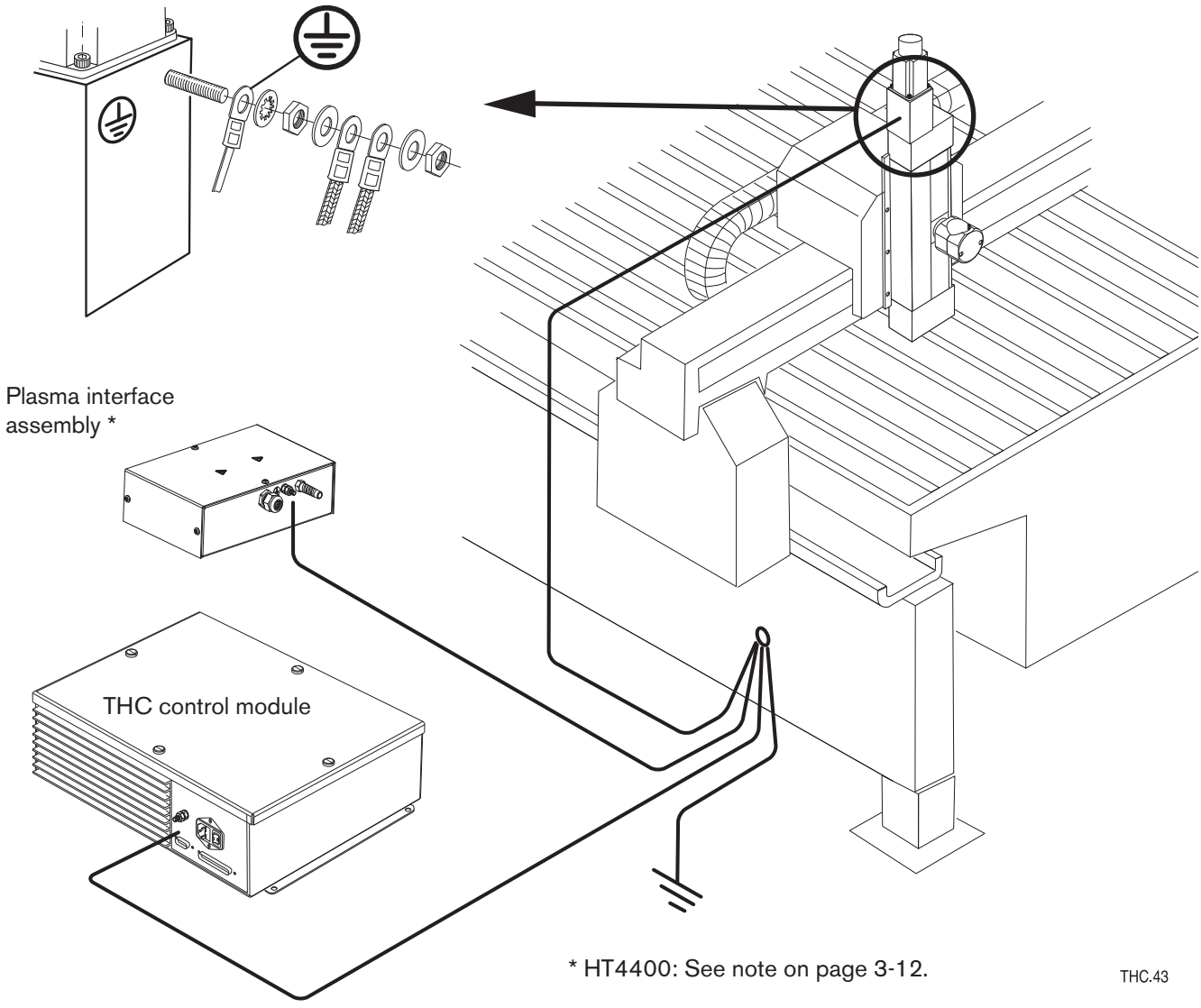
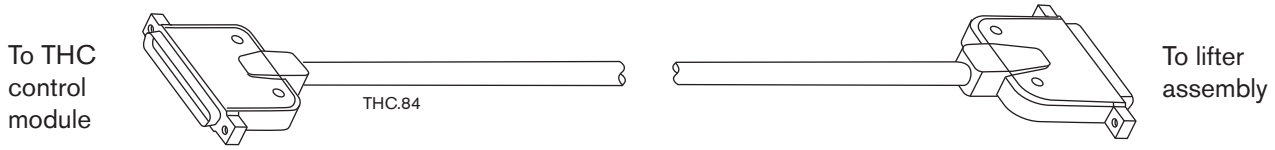


Figure 3-13 THC component PE grounding

Lifter I/O cable

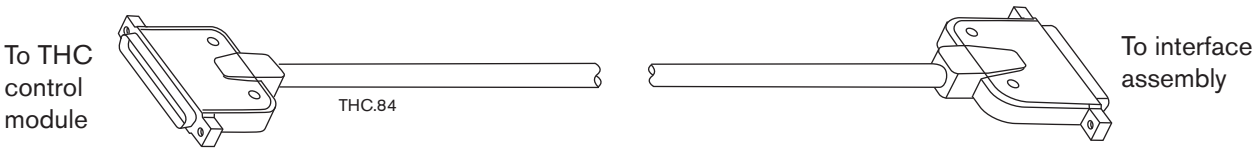


Part number	Length	Part number	Length
123209	5 ft./1.5 m	123215	40 ft./12.2 m
123210	10 ft./3 m	123216	45 ft./13.7 m
123211	15 ft./4.6 m	123023	50 ft./15.2 m
123212	20 ft./6.1 m	123217	75 ft./23 m
123022	25 ft./7.6 m	123218	100 ft./30.5 m
123213	30 ft./9.1 m	123219	125 ft./38 m
123214	35 ft./10.6 m	123220	150 ft./45.6 m

Pin number	Color	Signal name	Function		Pin number
1 Input	Black	Encoder Power –	Encoder power		1 Output
20	Red	Encoder Power (5V)+			20
2 Input	Black	Encoder B –	A quad B position signal.		2 Output
21	Green	Encoder B +			21
3 Input	Black	Encoder A –	A quad B position signal.		3 Output
22	Blue	Encoder A +			22
5 Input	Black	Drive ID2 –	Lifter ID Most Significant Bit (Binary 3)		5 Output
24	Brown	Drive ID2 +			24
6 Input	Black	Drive ID1 –	Lifter ID (Binary 2)		6 Output
25	Orange	Drive ID1 +			25
7 Input	Red	Drive ID0 –	Lifter ID Least Significant Bit (Binary 1)	– Lifter jumper connection ID Code	7 Output
26	White	Drive ID0 +			26
8 Output	Red	Lifter Up –	Active when lifter is moving up.		8 Input
27	Green	Lifter Up +			27
9 Input	Red	Lower Limit Switch Com.	Limit switch common.		9 Output
28 Input	Blue	Lower Limit Switch Signal	Logic low between signal and common.		
10 Output	Red	Lower Limit Switch +24V	Limit switch power.		10 Input
11 Output	Red	Home Switch Signal	Logic low between signal and common.		
29 Output	Yellow	Home Switch Common	Home switch common.		29 Input
30 Output	Brown	Home Switch +24V	Home switch power.		30 Input
16 Output	Green	Lifter Down –	Active when lifter is moving down.		16 Input
35	Brown	Lifter Down +			35
17 Output	Green	Lifter Brake Out –	Powers electro-mechanical brake on lifter.		17 Input
36	Orange	Lifter Brake Out +			36
4 Input	Black	Lifter Spare In 5 –	Spare		4 Output
23	Yellow	Lifter Spare In 5 +			23
12 Output	Red	Crash Detect –	Spare		12 Input
31	Orange	Crash Detect +			31
13 Output	Green	Lifter Spare 3 –	Spare		13 Input
32	White	Lifter Spare 3 +			32
14 Output	Green	Reserved	Spare		14 Input
33	Blue	Reserved			33
15 Output	Green	Lifter Spare 1 –	Spare		15 Input
34	Yellow	Lifter Spare 1 +			34
18	White	24 VDC Common	Available 24 VDC, 500 mA maximum.		18 Input
37	Black	24 VDC +			37
19		Reserved	Not connected		19

Figure 3-14 Lifter I/O cable – part numbers and signal list

Plasma interface cable

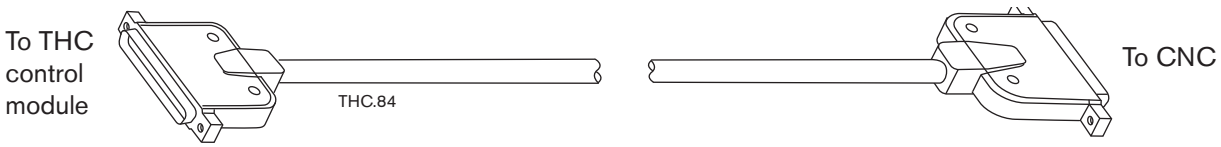


Part number	Length	Part number	Length
123209	5 ft./1.5 m	123215	40 ft./12.2 m
123210	10 ft./3 m	123216	45 ft./13.7 m
123211	15 ft./4.6 m	123023	50 ft./15.2 m
123212	20 ft./6.1 m	123217	75 ft./23 m
123022	25 ft./7.6 m	123218	100 ft./30.5 m
123213	30 ft./9.1 m	123219	125 ft./38 m
123214	35 ft./10.6 m	123220	150 ft./45.6 m

Pin number	Color	Signal name	Function	Signal name	Pin number
1 Input	Black	RX–	RS-422 serial inverting receiver.	TX–	1 Output
20	Red	RX+	RS-422 serial non-inverting receiver.	TX+	20
2 Output	Black	TX–	RS-422 serial inverting transmitter.	RX–	2 Input
21	Green	TX+	RS-422 serial non-inverting transmitter.	RX+	21
3 Input	Black	Plasma Cable –	Plasma cable recognition used for automatic detection of		3 Output
17	Green	Plasma Cable +	plasma interface board.		17
7 Input	Red	Nozzle Contact –	Nozzle Contact is active when nozzle or shield is in ohmic		7 Output
26	White	Nozzle Contact +	contact with the plate.		26
8 Input	Red	Pilot Arc In –	Pilot Arc input verifies that a successful pilot arc has been		8 Output
27	Green	Pilot Arc In +	established.		27
9 Input	Red	Transfer In –	Transfer In input verifies that a transfer has occurred.		9 Output
28	Blue	Transfer In +			28
10 Output	Red	Nozzle H.V. Relay –	Relay active during arc initiation to isolate the THC interface PCB from		
10 Input					
29	Yellow	Nozzle H.V. Relay +	high voltage.		29
13 Input	Green	Pierce Complete –	Pierce Complete output verifies that the THC internal pierce		13 Output
32	White	Pierce Complete +	complete timer has timed out.		32
14 Output	Green	Hold Ignition –	Hold Ignition holds the torch from firing, but allows preflow		14 Input
33	Blue	Hold Ignition +	gas to flow.		33
15 Output	Green	Plasma Start –	Plasma Start signal is used to initiate the arc.		15 Input
34	Yellow	Plasma Start +			34
16 Input	Green	Arc Volts –	Arc Volts is the measured arc voltage between the		16 Output
35	Brown	Arc Volts +	electrode and work, divided by 41.		35
18 Output	White	24 VDC Common	Available 24 VDC, 500 mA maximum		18 Input
37	Black	24 VDC +			37
36 Output	Orange	24 VDC Common	Available 24 VDC, 500 mA maximum		36 Input
4 Input	Black	Torch 2 Select –	Spare		4 Output
23	Yellow	Torch 2 Select +			23
5 Input	Black	Torch 1 Select –	Spare		5 Output
24	Brown	Torch 1 Select +			24
6 Input	Black	Spare 1 –	Spare		6 Output
25	Orange	Spare 1 +			25
11 Output	Red	Plasma Spare 2 –	Spare		11 Input
30	Brown	Plasma Spare 2 +			30
12 Output	Red	Plasma Spare 1 –	Spare		12 Input
31	Orange	Plasma Spare 1 +			31
19			Not connected		19
22	Blue		Not used		22

Figure 3-15 Plasma interface cable – part numbers and signal list

CNC interface cable



Part number	Length	Part number	Length
123209	5 ft./1.5 m	123215	40 ft./12.2 m
123210	10 ft./3 m	123216	45 ft./13.7 m
123211	15 ft./4.6 m	123023	50 ft./15.2 m
123212	20 ft./6.1 m	123217	75 ft./23 m
123022	25 ft./7.6 m	123218	100 ft./30.5 m
123213	30 ft./9.1 m	123219	125 ft./38 m
123214	35 ft./10.6 m	123220	150 ft./45.6 m

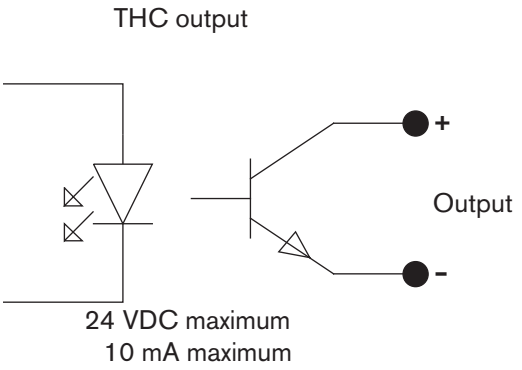
	Pin number	Color	Signal name	Function	Signal name	Pin number	Notes, page 3-24
	1 Input	Black	RX–	RS-422 serial inverting receiver.	TX–	1 Output	
	20	Red	RX+	RS-422 serial non-inverting receiver.	TX+	20	
	2 Output	Black	TX–	RS-422 serial inverting transmitter.	RX–	2 Input	
	21	Green	TX+	RS-422 serial non-inverting transmitter.	RX+	21	
*	3 Input	Black	Machine Cable –	Machine cable recognition used for verifying installation of		3 Output	3
	22	Blue	Machine Cable +	Machine interface cable to CNC.		22	
	5 Input	Black	IHS Sync –	IHS Sync holds torch firing, but allows preflow gas to flow.		5 Output	2
	24	Brown	IHS Sync +			24	
*	8 Input	Red	Auto Height On/Off –	Auto Height On/Off enables or disables Auto Height.		8 Output	2
	27	Green	Auto Height On/Off +	Auto Height is Off when input is active.		27	
*	9 Input	Red	Cycle Start –	Cycle Start (plasma start) initiates start of programmed cycle.		9 Output	2
	28	Blue	Cycle Start +	CNC must provide a contact closure to activate this input.		28	
	10 Output	Red	IHS Complete –	IHS Complete output to CNC to synchronize multiple torch		10 Input	1
	29	Yellow	IHS Complete +	installations. When all connected torches are in position, IHS Sync In signal is deactivated to proceed with torch ignition.		29	
	12 Output	Red	Retract Complete –	Retract Complete output verifies to CNC that the torch has		12 Input	1
	31	Orange	Retract Complete +	retracted and it is safe to move to next start position.		31	
	13 Output	Green	Pilot Arc –	Pilot Arc output verifies to CNC that a pilot arc has been		13 Input	1
	32	White	Pilot Arc +	established.		32	
	14 Output	Green	THC Error –	THC Error output alerts CNC that an error has occurred.		14 Input	1
	33	Blue	THC Error +			33	
*	15 Output	Green	Machine Motion –	Machine Motion output verifies to CNC that a pierce delay		15 Input	1
	34	Yellow	Machine Motion +	has been completed and notifies CNC to start movement of the cutting machine.		34	
*	16 Input	Green	Ext. Emergency Interlock–	Allows installation of an emergency stop switch (normally		16 Output	4
	35	Brown	Ext. Emergency Interlock+	closed).		35	
	18 Output	White	24 VDC Common	Available 24 VDC, 500 mA maximum		18 Input	1
	37	Black	24 VDC +			37	
	36 Output	Orange	24 VDC Common	Available 24 VDC, 500 mA maximum		36 Input	1
	4 Input	Black	Spare 3 –	Spare		4 Output	
	23	Yellow	Spare 3 +			23	
	6 Input	Black	Spare 2 –	Spare		6 Output	
	25	Orange	Spare 2 +			25	
	7 Input	Red	Spare 1 –	Spare		7 Output	
	26	White	Spare 1 +			26	
	11 Output	Red	Spare 1 –	Spare		11 Input	
	30	Brown	Spare 1 +			30	
	17	Green		Not used		17	
	19			Not connected		19	

* **Minimum connections needed for proper operation of CommandTHC**

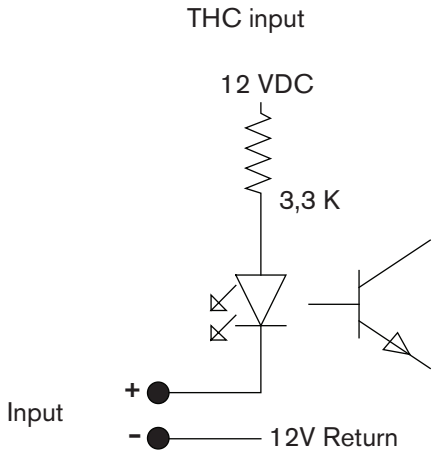
Figure 3-16 CNC interface cable – part numbers and signal list

Notes to Figure 3-16

Note 1. All THC outputs are optically coupled transistors with maximum ratings of 24 VDC and 10 mA.



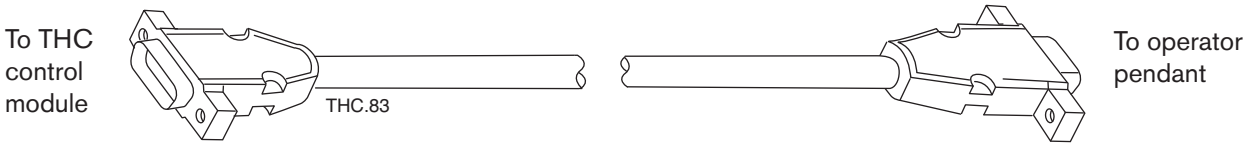
Note 2. All THC inputs are optically isolated 12 VDC signals. Signals are made active by sinking 3 mA per input.



Note 3. Jumper required in CNC. See instructions on page 3-14.

Note 4. Stop switch required in CNC. See instructions on page 3-14.

Pendant extension cable

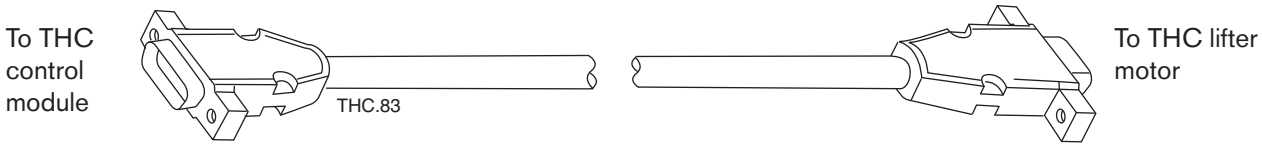


Part number	Length
123018	25 ft./7.6 m
123019	50 ft./15.2 m

Pin number	Color	Signal name	Function	Signal name	Pin number
1 Input	Black	RX–	RS-422 serial inverting receiver.	TX–	1 Output
2	Green	RX+	RS-422 serial non-inverting receiver.	TX+	2
6 Output	Black	TX–	RS-422 serial inverting transmitter output.	RX–	6 Input
3	White	TX+	RS-422 serial non-inverting transmitter output.	RX+	3
5 Output	Black	12 VDC common	12 VDC, 500 mA maximum		5 Input
9	Red	12 VDC +			9
4,7,8			Not connected		4,7,8

Figure 3-17 Pendant extension cable – part numbers and signal list

Motor drive cable



Part number	Length	Part number	Length
123197	5 ft./1.5 m	123203	40 ft./12.2 m
123198	10 ft./3 m	123204	45 ft./13.7 m
123199	15 ft./4.6 m	123021	50 ft./15.2 m
123200	20 ft./6.1 m	123205	75 ft./23 m
123020	25 ft./7.6 m	123206	100 ft./30.5 m
123201	30 ft./9.1 m	123207	125 ft./38 m
123202	35 ft./10.6 m	123208	150 ft./45.6 m

Pin number	Color	Signal name	Function	Pin number
5 Output	Red	Motor Phase A +	Powers lifter motor, phase A+.	5 Input
4	Black	Motor Phase A –		4
9 Output	Red	Motor Phase A +	Powers lifter motor, phase A–.	9 Input
8	Black	Motor Phase A –		8
3			Not connected	3
7 Output	Red	Motor Phase B +	Powers lifter motor, phase B+.	7 Input
6	Black	Motor Phase B –		6
2 Output	Red	Motor Phase B +	Powers lifter motor, phase B–.	2 Input
1	Black	Motor Phase B –		1

Figure 3-18 Motor drive cable – part numbers and signal list

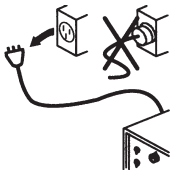
Section 3a

HD3070 SYSTEM INTERCONNECTIONS

Electrode and work lead arc voltage wires

DANGER

ELECTRIC SHOCK CAN KILL



Turn off all electrical power before removing the power supply cover. Press the power supply OFF (0) pushbutton switch and set the line disconnect switch to OFF. In the U.S., use a "lock-out and tag-out" procedure until the service or maintenance is complete. In other countries, follow appropriate local or national safety procedures.

See Figure 3a-1.

1. Remove access covers from the power supply, as required.
2. Locate the 1XPCB1 PC board inside the power supply.
3. Install the arc voltage wires:

   Fabricate the wires as follows:

   - Use 18AWG (≈0.9 mm^2), single pair, unshielded wire, rated for 600V or greater.
   - Wire length: As required, from the power supply to the plasma interface assembly.
   - After installing the wires from the power supply to the plasma interface assembly, install appropriate size fork or ring terminals on the wire ends.

   Connect one of the wires to the 1XPCB1 PC board where wire No. 126 is connected. Label this wire positive (+).

   Connect the other wire to the 1XPCB1 PC board where wire No. 140 is connected. Label this wire negative (–).

   At the plasma interface assembly, connect the negative (–) wire to the J5-2 terminal labeled ELECTRODE. Connect the positive (+) wire to the J5-3 terminal labeled WORK.

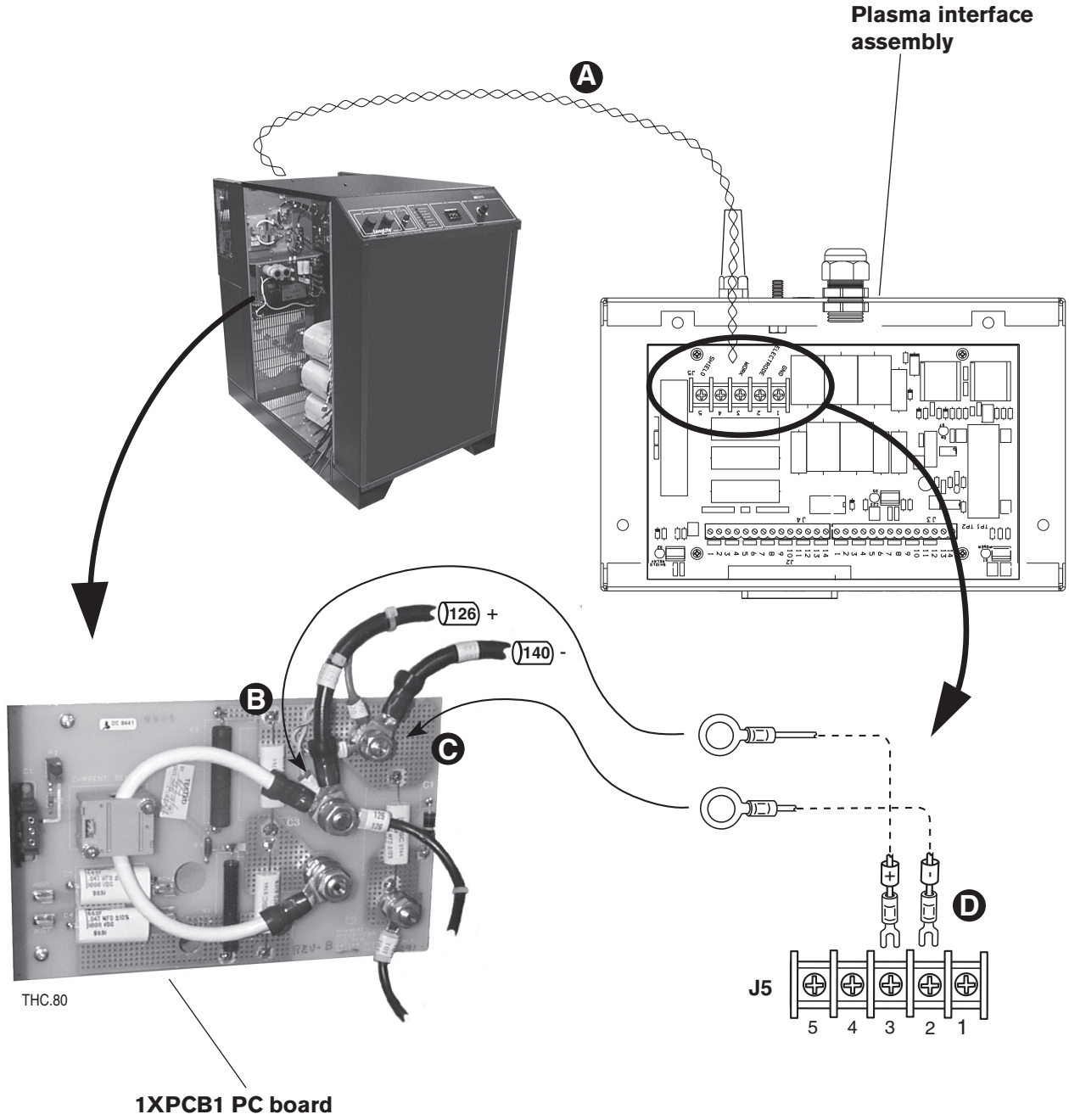
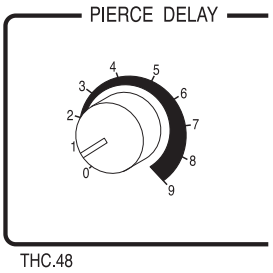


Figure 3a-1 HD3070 electrode and work lead arc voltage wires connection

Power supply interface cable

The HD3070 power supply is equipped with a potentiometer for adjusting the pierce delay time. Disable the pierce delay potentiometer in the power supply per Section 3 of the HD3070 instruction manual.



THC.48

See Figure 3a-2.

Connect the interface cable plug to the 1X1 receptacle on the back of the power supply.

Connect the other plug of the interface cable to the CNC.

Install the 5 pairs of wires of the interface cable to the plasma interface assembly as shown in Figure 3a-2.

Install the wire with the fork terminal to the plasma interface assembly as shown in Figure 3a-2.

See Figure 3a-3 for the interface cable part numbers and signal list.

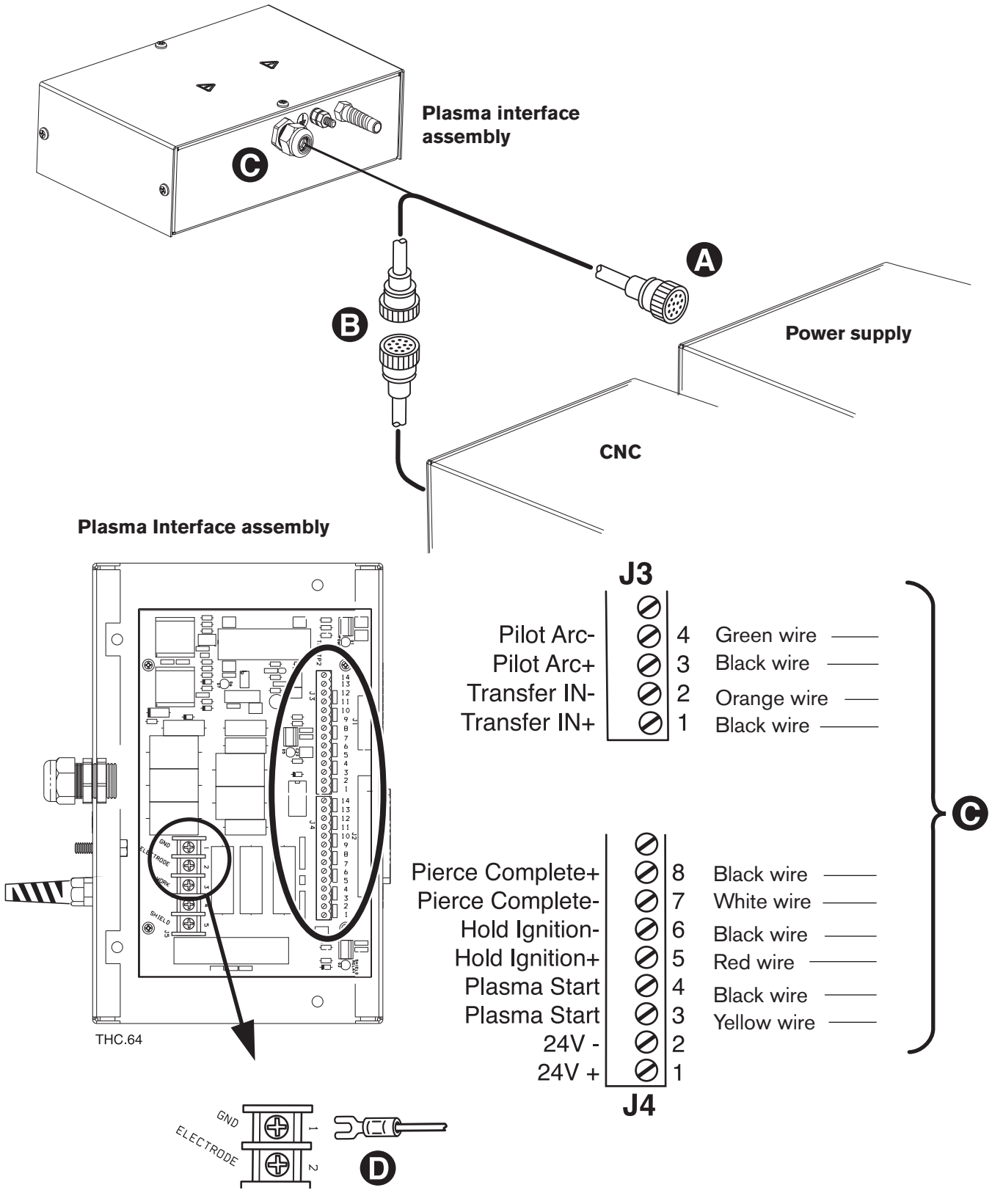
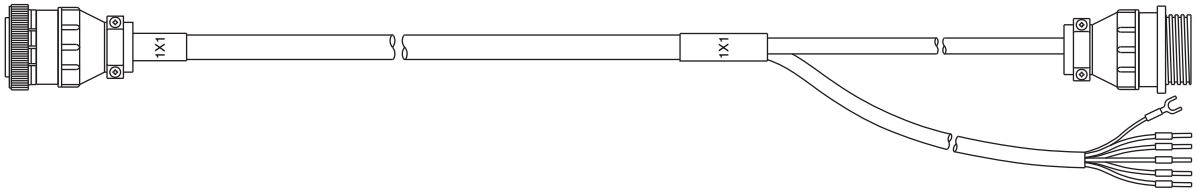


Figure 3a-2 HD3070 Power supply interface cable connections

Part number	Description	Length
123270	HD3070 Power Supply Interface Cable	6 ft./1.8 m



Signal Name	Color	Power Supply End (1X1)	CNC End	Plasma Interface End	Function
Hold I/O – Hold I/O + Drain	Black Red Drain	1 5 10	Not Connected	J4-6 J4-5	**(Optional)** Hold Ignition (I/O) signal used for preflow during IHS. Also used by power unit to synchronize operation of multiple torch installations.
Pierce Complete + Pierce Complete – Drain	Black White Drain	2 6 11	Not Connected	J4-8 J4-7	**(Optional)** Pierce Complete signal used by power unit to time transition from pierce gas flow to cut gas flow. User enters this time delay into THC.
Pilot Arc Out + Pilot Arc Out – Drain	Black Green Drain	3 7 12	Not Connected	J3-4 J3-3	**(Optional)** Pilot Arc Out signal. Maintained during torch ignition. Contact closes after torch ignition. Dry contact closure.
Plasma Start – Plasma Start + Drain	Black Yellow Drain	9 15 14	Not Connected	J4-4 J4-3	Plasma On signal maintained during plasma cut. If signal is lost, system must be restarted.
Transfer Out + Transfer Out – Drain	Black Orange Drain	37 32 26	Not Connected	J3-2 J3-1	Arc Transfer signal. Contact closes after arc transfer and pierce delay (set on power supply front panel). Dry contact closure.
Power Off Power Off Drain	Black Blue Drain	4 8 13	4 8 13	Not Connected	These signals connect to the CNC. Refer to HD3070 Instruction manual for signal information.
External Interlock External Interlock Drain	Red Blue Drain	16 17 18	16 17 18	Not Connected	
Power On Input Power On Input Drain	Black Brown Drain	29 34 23	29 34 23	Not Connected	
Power Interlocks Power Interlocks Drain	Red White Drain	35 30 24	35 30 24	Not Connected	
1/50 AC Volts 1/50 AC Volt Drain	Red Green Drain	33 28 37	33 28 37	Not Connected	

Shaded area indicates plasma interface assembly connections.

Plasma interface assembly other J3 and J4 connection points:

- J3-5 (+) and J3-6 (–) – Alternate Nozzle Contact. An optically isolated signal that indicates nozzle is in ohmic contact with work. Ohmic contact is represented by a logic 1.
- J3-7 through J3-12 – Reserved for future use.
- J3-13 and J3-14 – Protective earth ground.
- J4-1 (+) and J4-2 (–) – Available 24 VDC, 500 mA maximum
- J4-9 through J4-12 – Reserved for future use.

Figure 3a-3 HD3070 interface cable – part number and signal list

Ohmic contact wire

Install the ohmic contact wire through the strain relief of the plasma interface assembly.

Install appropriate size fork terminal on the wire end and attach the wire to the J5-5 terminal labeled SHIELD.

Install the other end of the ohmic contact wire to the IHS tab on the torch retaining cap.

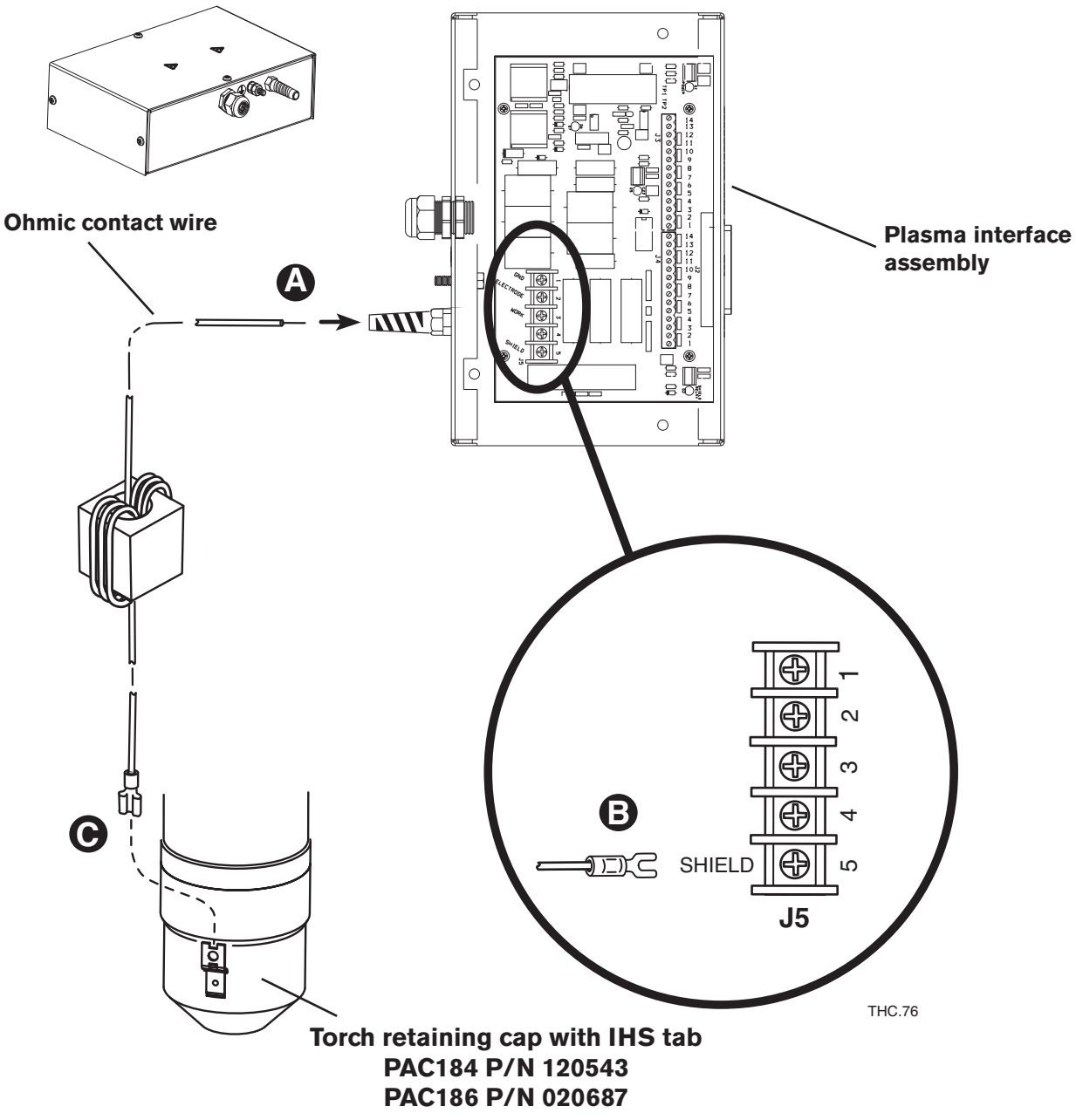


Figure 3a-4 HD3070 ohmic contact wire connection

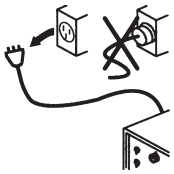
Section 3b

HT2000 SYSTEM INTERCONNECTIONS

Electrode and work lead arc voltage wires

DANGER

ELECTRIC SHOCK CAN KILL



Turn off all electrical power before removing the power supply cover. Press the power supply OFF (0) pushbutton switch and set the line disconnect switch to OFF. In the U.S., use a "lock-out and tag-out" procedure until the service or maintenance is complete. In other countries, follow appropriate local or national safety procedures.

See Figure 3b-1.

1. Remove access covers from the power supply, as required.

2. Locate the input/output panel on the back of the power supply.

3. Install the arc voltage wires:

   Fabricate the wires as follows:

   - Use 18AWG (≈0.9 mm^2), single pair, unshielded wire, rated for 600V or greater.
   - Wire length: As required, from the power supply to the plasma interface assembly.
   - After installing the wires from the power supply to the plasma interface assembly, install appropriate size fork or ring terminals on the wire ends.

   Connect one of the wires to the WORK LEAD (+) connection of the input/output panel. Label this wire positive (+).

   Connect the other wire to the NEGATIVE LEAD (–) connection of the input/output panel. Label this wire negative (–).

   At the plasma interface assembly, connect the negative (–) wire to the J5-2 terminal labeled ELECTRODE. Connect the positive (+) wire to the J5-3 terminal labeled WORK.

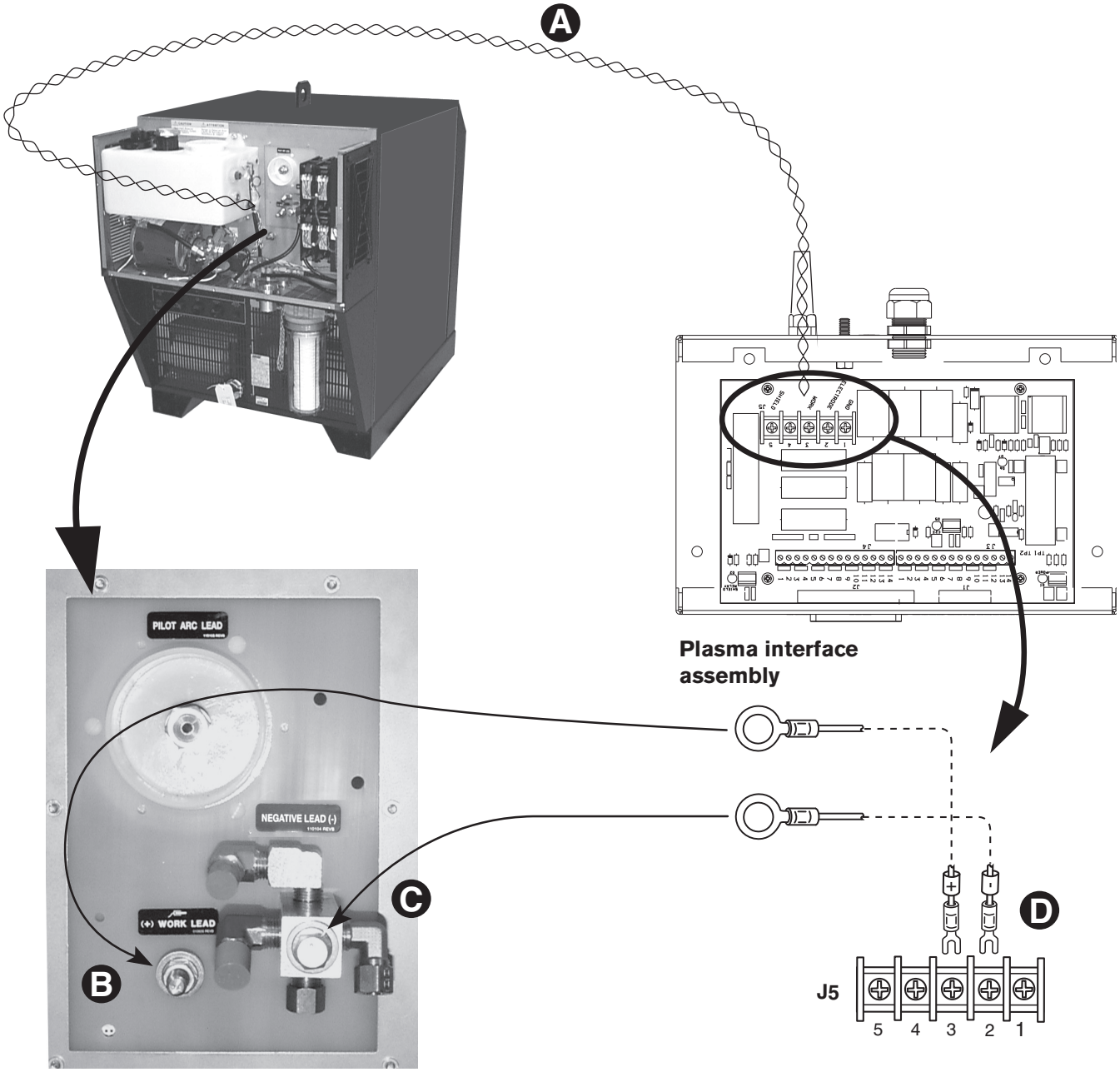


Figure 3b-1 HT2000 electrode and work Lead arc voltage wires connection

Power supply interface cable

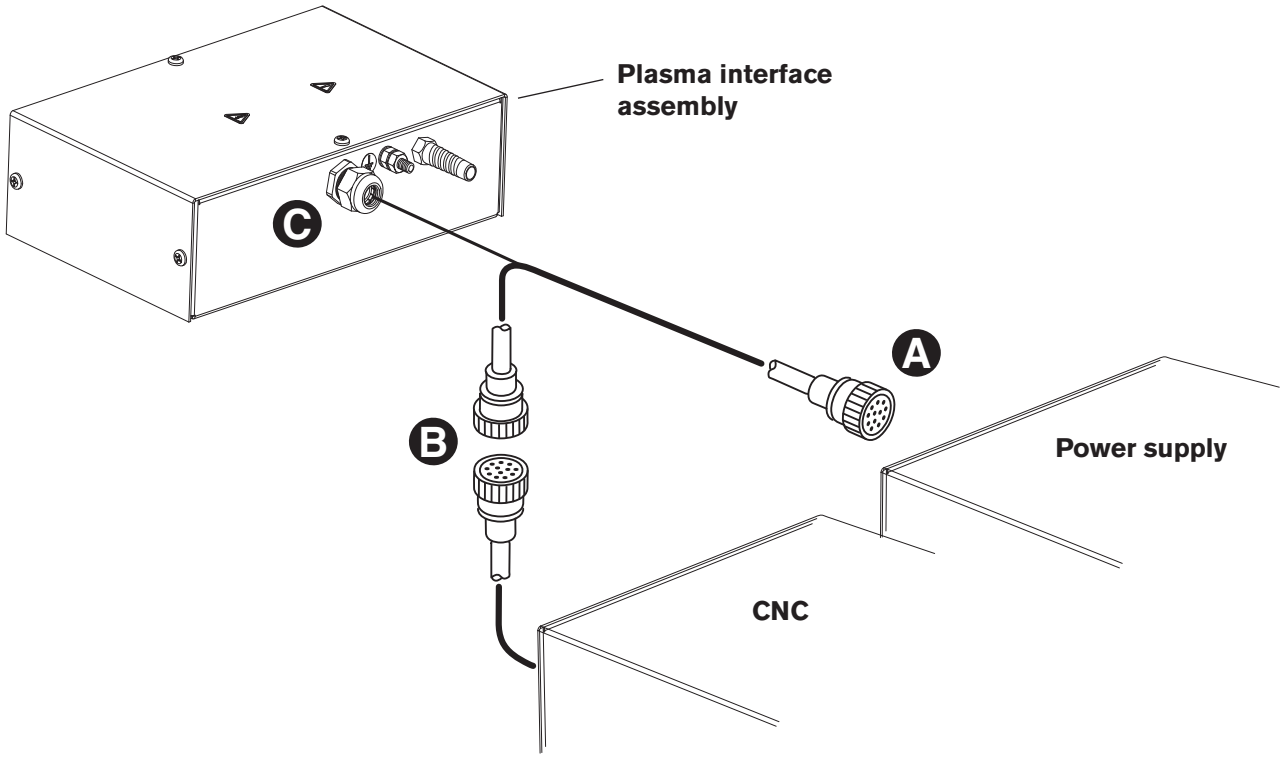
See Figure 3b-2.

Connect the interface cable plug to the 1X6 receptacle on the back of the power supply.

Connect the other plug of the interface cable to the CNC.

Install the 3 pairs of wires of the interface cable to the plasma interface assembly as shown in Figure 3b-2.

See Figure 3b-3 for the interface cable part numbers and signal list.



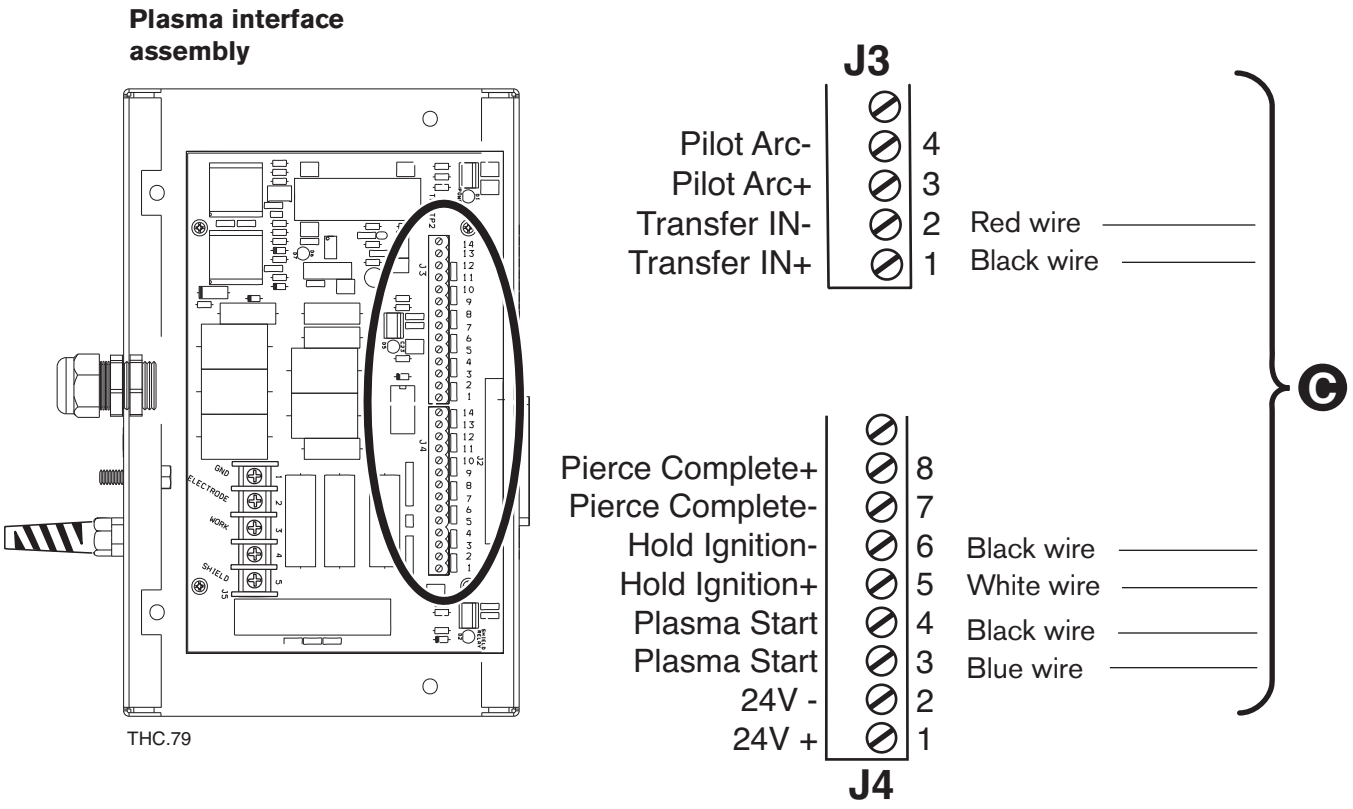
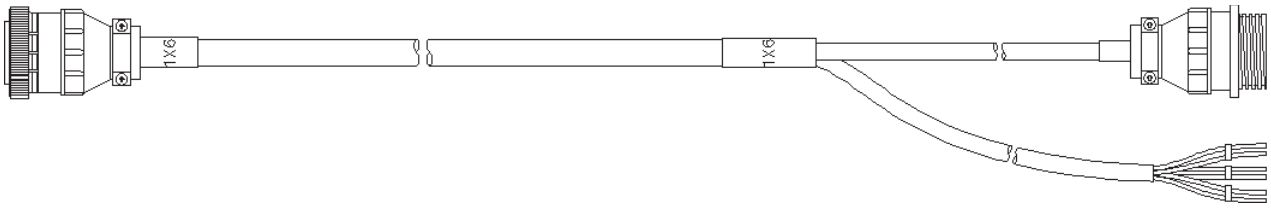


Figure 3b-2 HT2000 power supply interface cable connections

Part number	Description	Length
123329	HT2000 Power Supply Interface Cable	6 ft./1.8 m



Signal Name	Color	Power Supply End (1X6)	CNC End	Plasma Interface End	Function
Hold – during Hold + Drain	Black White Drain	5 1 10	Not Connected	J4-6 J4-5	**(Optional)** Hold Ignition (I/O) signal used for preflow IHS. Also used by power unit to synchronize operation of multiple torch installations. Output signal.
Plasma Start – Plasma Start + Drain	Black Blue Drain	9 15 14	Not Connected	J4-4 J4-3	Plasma Start signal maintained during plasma cut. If signal is lost, system must be restarted. Output signal.
Arc Transfer – Arc Transfer + Drain	Black Red Drain	32 37 26	Not Connected	J3-2 J3-1	Arc Transfer signal. Contact closes after arc transfer and pierce delay (set on power supply front panel). Dry contact closure. Input signal.
Arc Voltage Arc Voltage Drain	Black Yellow Drain	28 33 27	28 33 27	Not Connected	These signals connect to the CNC. Refer to HT2000 Instruction manual for signal information.
Not Used Not Used Drain	Black Brown Drain	7 3 12	7 3 12	Not Connected	
Not Used Not Used Drain	Black Green Drain	16 17 18	16 17 18	Not Connected	

Shaded area indicates plasma interface assembly connections.

Plasma interface assembly other J3 and J4 connection points:

- J3-5 (+) and J3-6 (–) – Alternate Nozzle Contact. An optically isolated signal that indicates nozzle is in ohmic contact with work. Ohmic contact is represented by a logic 1.
- J3-7 through J3-12 – Reserved for future use.
- J3-13 and J3-14 – Protective earth ground.
- J4-1 (+) and J4-2 (–) – Available 24 VDC, 500 mA maximum
- J4-7 and J4-8 – Pierce Complete signal used by power supply to time transition from pierce gas flow to cut gas flow. User enters this time delay into THC. Output signal.
- J4-9 through J4-12 – Reserved for future use.

Figure 3b-3 HT2000 interface cable – part number and signal list

Ohmic contact wire

See Figure 3b-4.

Install the ohmic contact wire through the strain relief of the plasma interface assembly.

Install appropriate size fork terminal on the wire end and attach the wire to the J5-5 terminal labeled SHIELD.

Install the other end of the ohmic contact wire to the IHS tab on the torch retaining cap.

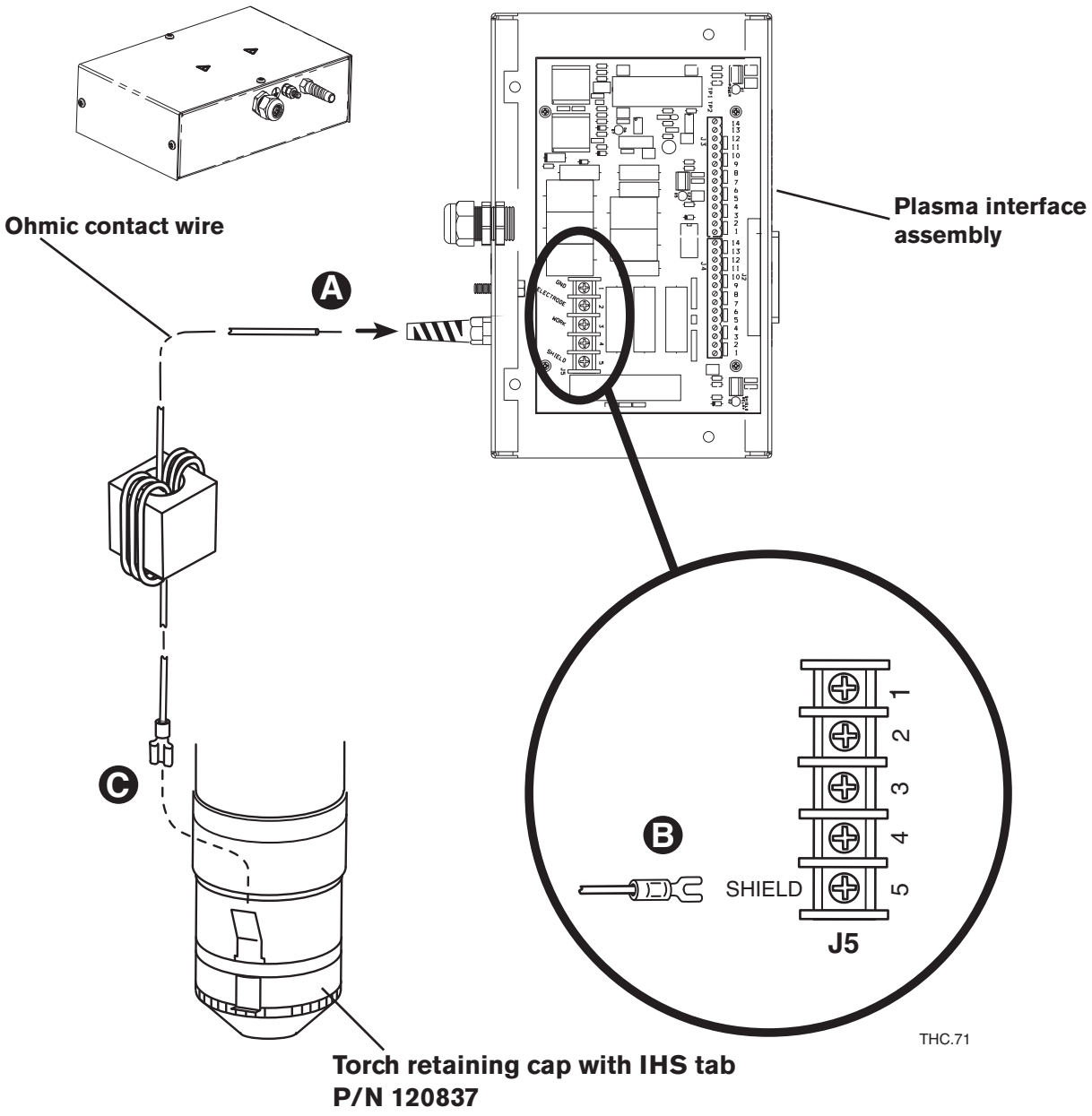


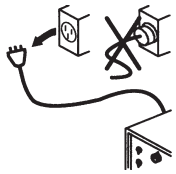
Figure 3b-4 HT2000 ohmic contact wire connection

Section 3c

HT2000LHF SYSTEM INTERCONNECTIONS

Electrode and work lead arc voltage wires

DANGER
ELECTRIC SHOCK CAN KILL



Turn off all electrical power before removing the power supply cover. Press the power supply OFF (0) pushbutton switch and set the line disconnect switch to OFF. In the U.S., use a "lock-out and tag-out" procedure until the service or maintenance is complete. In other countries, follow appropriate local or national safety procedures.

See Figure 3c-1.

1. Remove access covers from the power supply, as required.
2. Locate the input/output panel on the back of the power supply.
3. Install the arc voltage wires:

   Fabricate the sensing wires as follows:

   - Use 18AWG (≈0.9 mm^2), single pair, unshielded wire, rated for 600V or greater.
   - Wire length: As required, from the power supply to the plasma interface assembly.
   - After installing the wires from the power supply to the plasma interface assembly, install appropriate size fork or ring terminals on the wire ends.

   Connect one of the wires to the WORK LEAD (+) connection of the input/output panel. Label this wire positive (+).

   Connect the other wire to the NEGATIVE LEAD (–) connection of the input/output panel. Label this wire negative (–).

   At the plasma interface assembly, connect the negative (–) wire to the J5-2 terminal labeled ELECTRODE. Connect the positive (+) wire to the J5-3 terminal labeled WORK.

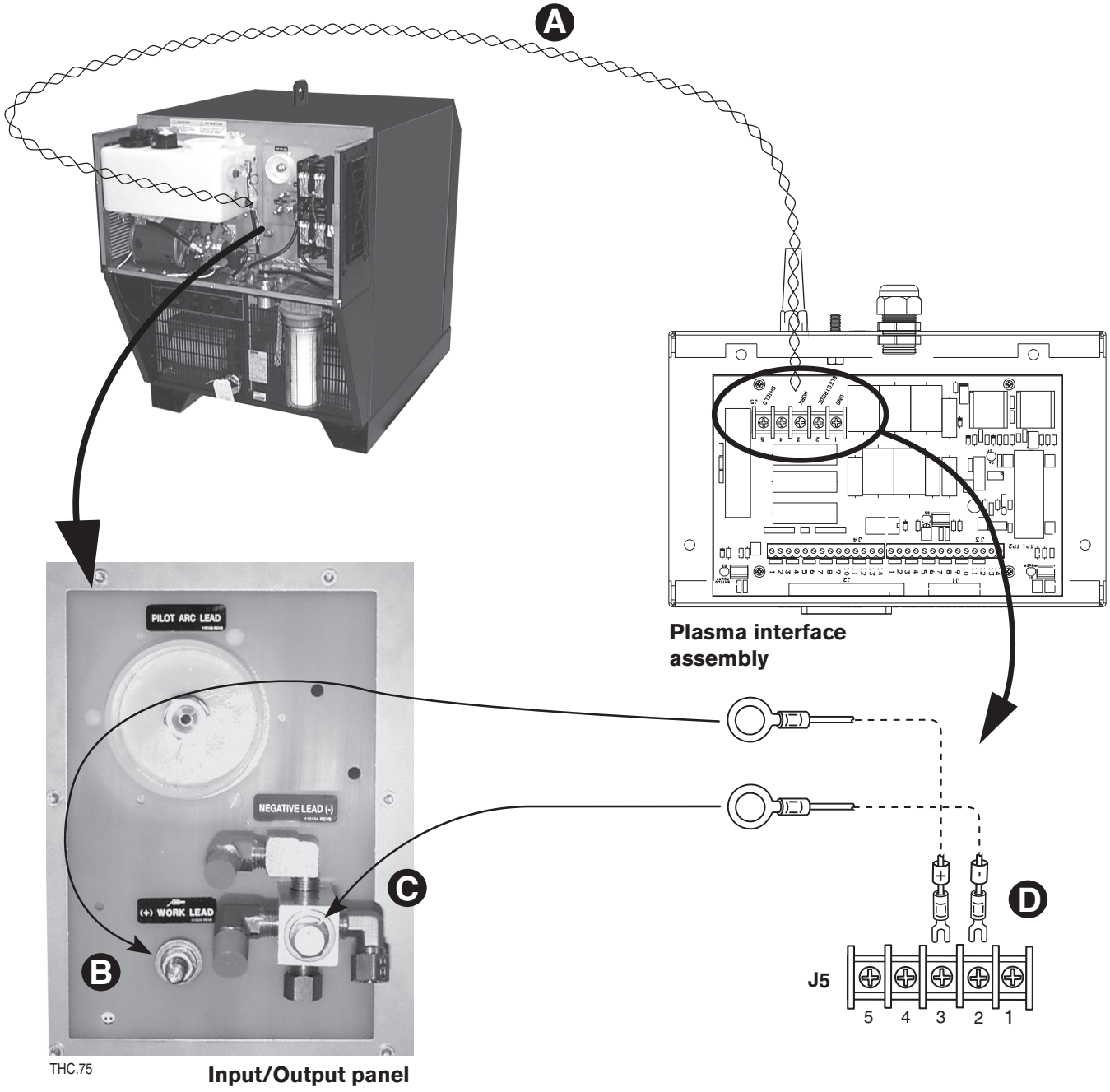


Figure 3c-1 HT2000LHF electrode and work lead arc voltage wires connection

Power supply interface cable

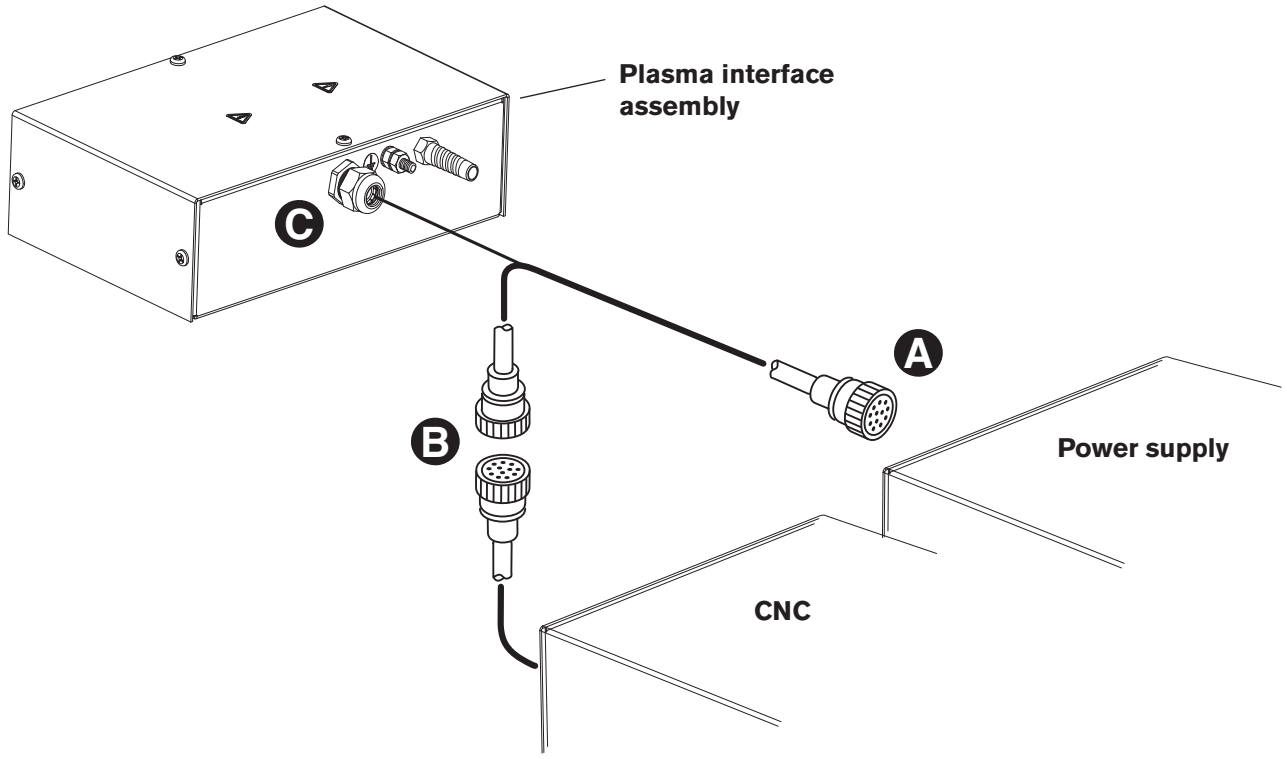
See Figure 3c-2.

Connect the interface cable plug to the 1X6 receptacle on the back of the power supply.

Connect the other plug of the interface cable to the CNC.

Install the 3 pairs of wires of the interface cable to the plasma interface assembly as shown in Figure 3c-2.

See Figure 3c-3 for the interface cable part numbers and signal list.



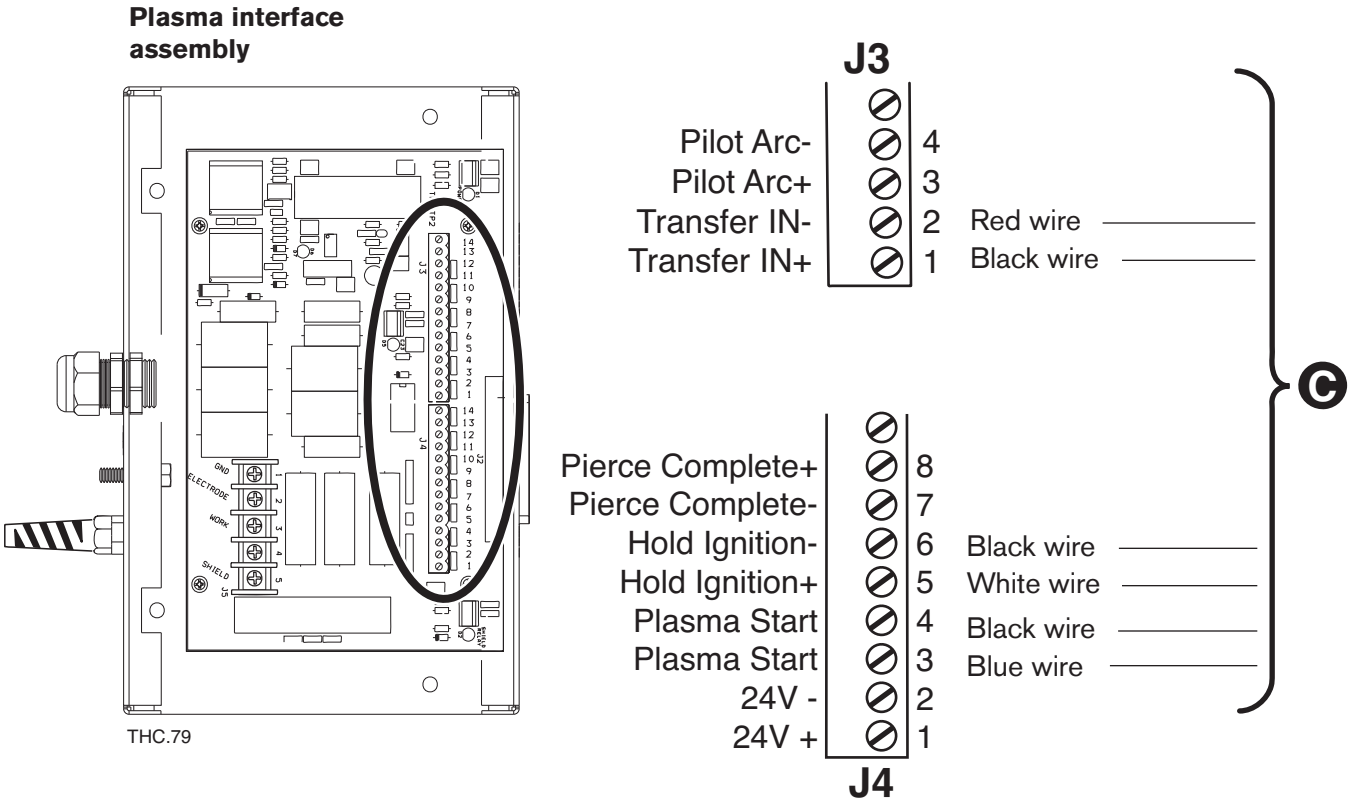
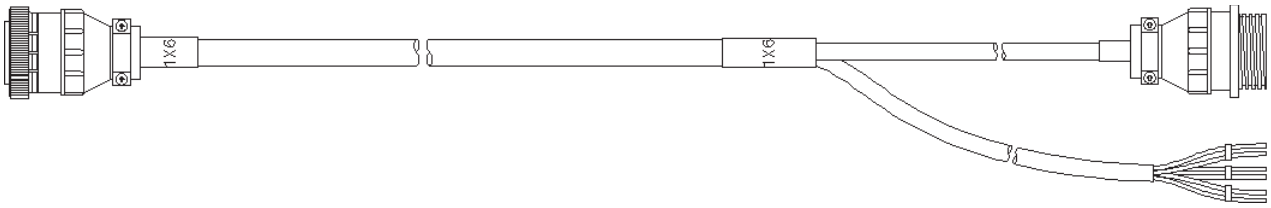


Figure 3c-2 HT2000LHF power supply interface cable connections

Part number	Description	Length
123329	HT2000LHF Power Supply Interface Cable	6 ft./1.8 m



Signal Name	Color	Power Supply End (1X6)	CNC End	Plasma Interface End	Function
Hold – Hold + Drain	Black White Drain	5 1 10	Not Connected	J4-6 J4-5	**(Optional)** Hold Ignition (I/O) signal used for preflow during IHS. Also used by power unit to synchronize operation of multiple torch installations. Output signal.
Plasma Start – Plasma Start + Drain	Black Blue Drain	9 15 14	Not Connected	J4-4 J4-3	Plasma Start signal maintained during plasma cut. If signal is lost, system must be restarted. Output signal.
Arc Transfer – Arc Transfer + Drain	Black Red Drain	32 37 26	Not Connected	J3-2 J3-1	Arc Transfer signal. Contact closes after arc transfer and pierce delay (set on power supply front panel). Dry contact closure. Input signal.
Ramp Down Error Ramp Down Error Drain	Black Yellow Drain	28 33 27	28 33 27	Not Connected	These signals connect to the CNC. Refer to HT2000 LHF Instruction manual for signal information.
Not Used Not Used Drain	Black Brown Drain	7 3 12	7 3 12	Not Connected	
Not Used Not Used Drain	Black Green Drain	16 17 18	16 17 18	Not Connected	

Shaded area indicates plasma interface assembly connections.

Plasma interface assembly other J3 and J4 connection points:

- J3-5 (+) and J3-6 (–) – Alternate Nozzle Contact. An optically isolated signal that indicates nozzle is in ohmic contact with work. Ohmic contact is represented by a logic 1.
- J3-7 through J3-12 – Reserved for future use.
- J3-13 and J3-14 – Protective earth ground.
- J4-1 (+) and J4-2 (–) – Available 24 VDC, 500 mA maximum
- J4-7 and J4-8 – Pierce Complete signal used by power supply to time transition from pierce gas flow to cut gas flow. User enters this time delay into THC. Output signal.
- J4-9 through J4-14 – Reserved for future use.

Figure 3c-3 HT2000LHF interface cable – part number and signal list

Ohmic contact wire

See Figure 3c-4.

Install the ohmic contact wire through the strain relief of the plasma interface assembly.

Install appropriate size fork terminal on the wire end and attach the wire to the J5-5 terminal labeled SHIELD.

Install the other end of the ohmic contact wire to the IHS tab on the torch retaining cap.

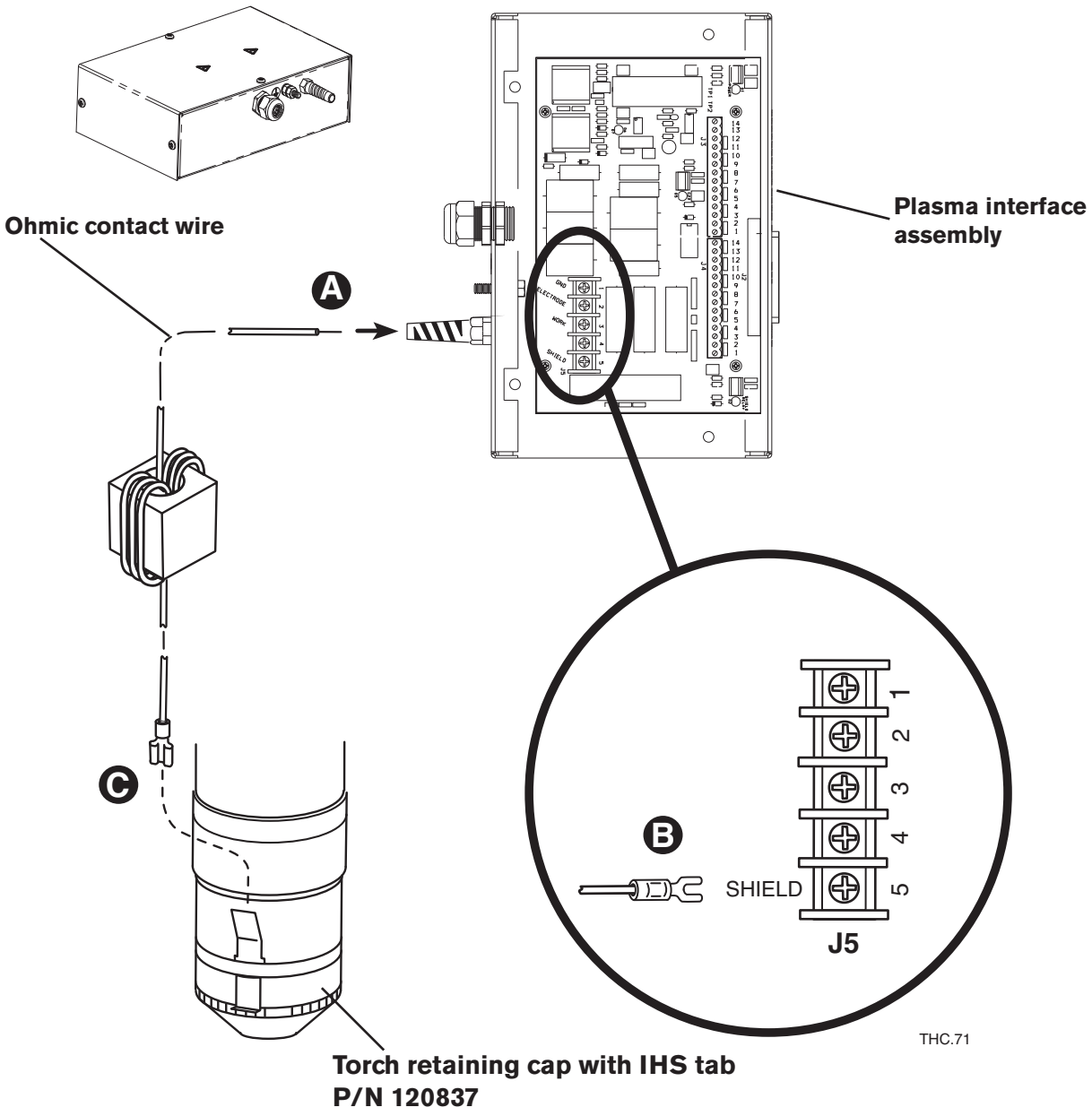
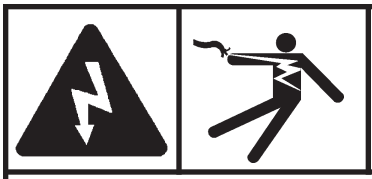


Figure 3c-4 HT2000LHF ohmic contact wire connection

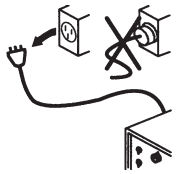
Section 3d

HT4001 SYSTEM INTERCONNECTIONS

Electrode and work lead arc voltage wires



DANGER
ELECTRIC SHOCK CAN KILL



Turn off all electrical power before removing the power supply cover. Press the power supply OFF (0) pushbutton switch and set the line disconnect switch to OFF. In the U.S., use a "lock-out and tag-out" procedure until the service or maintenance is complete. In other countries, follow appropriate local or national safety procedures.

See Figure 3d-1.

1. Remove access covers from the power supply, as required.
2. Locate the input/output bus bars inside the power supply.
3. Install the arc voltage wires:

   A Fabricate the wires as follows:

   - Use 18AWG (≈0.9 mm^2), single pair, unshielded wire, rated for 600V or greater.
   - Wire length: As required, from the power supply to the plasma interface assembly.
   - After installing the wires from the power supply to the plasma interface assembly, install appropriate size fork or ring terminals on the wire ends.

   B Connect one of the wires to the top bus bar (+) where wire No. 42 is connected. Label this wire positive (+).

   C Connect the other wire to the bottom bus bar (–) where wire No. 45 is connected. Label this wire negative (–).

   D At the plasma interface assembly, connect the negative (–) wire to the J5-2 terminal labeled ELECTRODE. Connect the positive (+) wire to the J5-3 terminal labeled WORK.

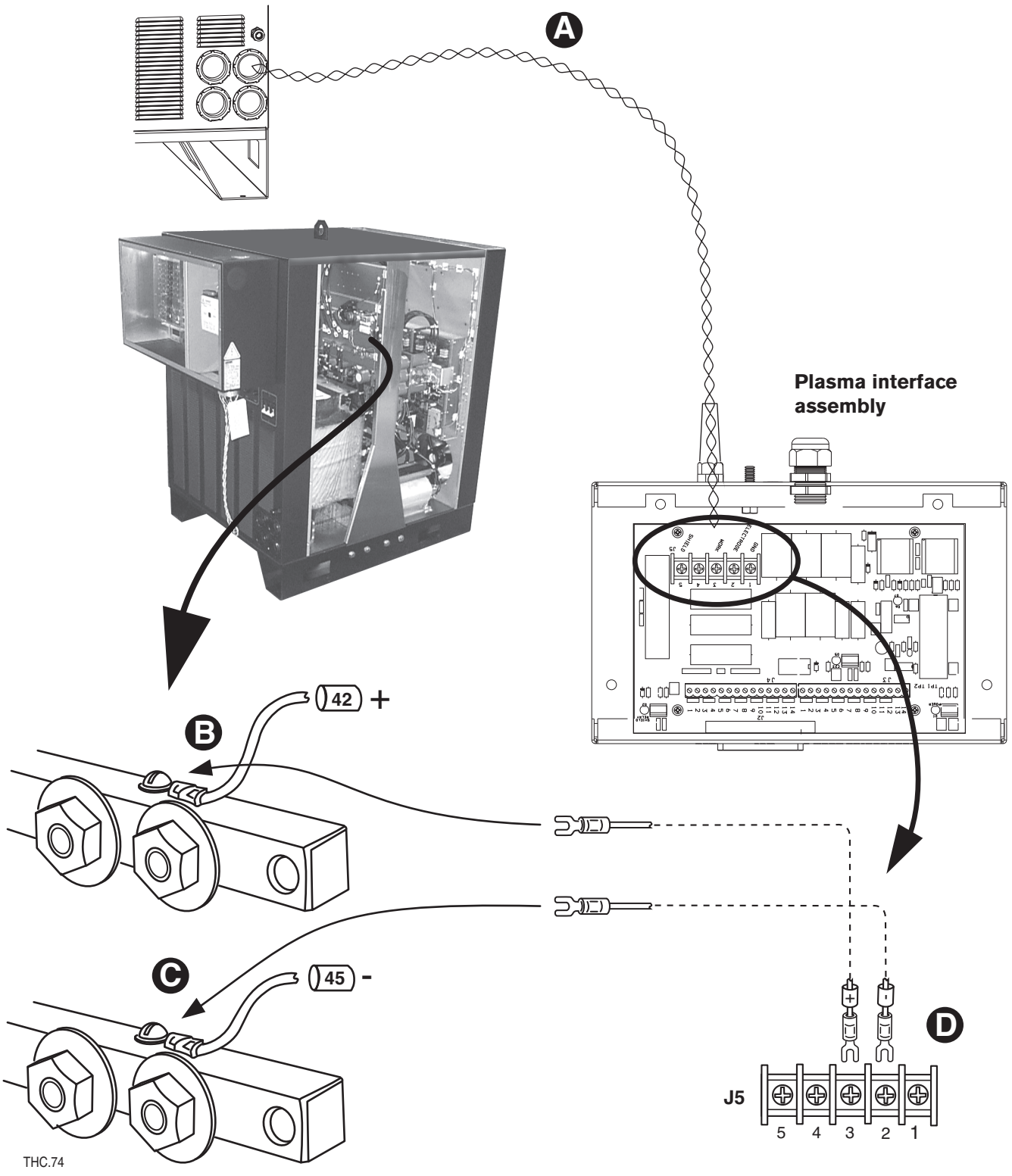


Figure 3d-1 HT4001 electrode and work lead arc voltage wires connection

Power supply interface cable

See Figure 3d-2.

Connect the interface cable plug to the 1X6 receptacle on the back of the power supply.

Connect the other plug of the interface cable to the CNC.

Install the 3 pairs of wires of the interface cable to the plasma interface assembly as shown in Figure 3d-2.

See Figure 3d-3 for the interface cable part numbers and signal list.

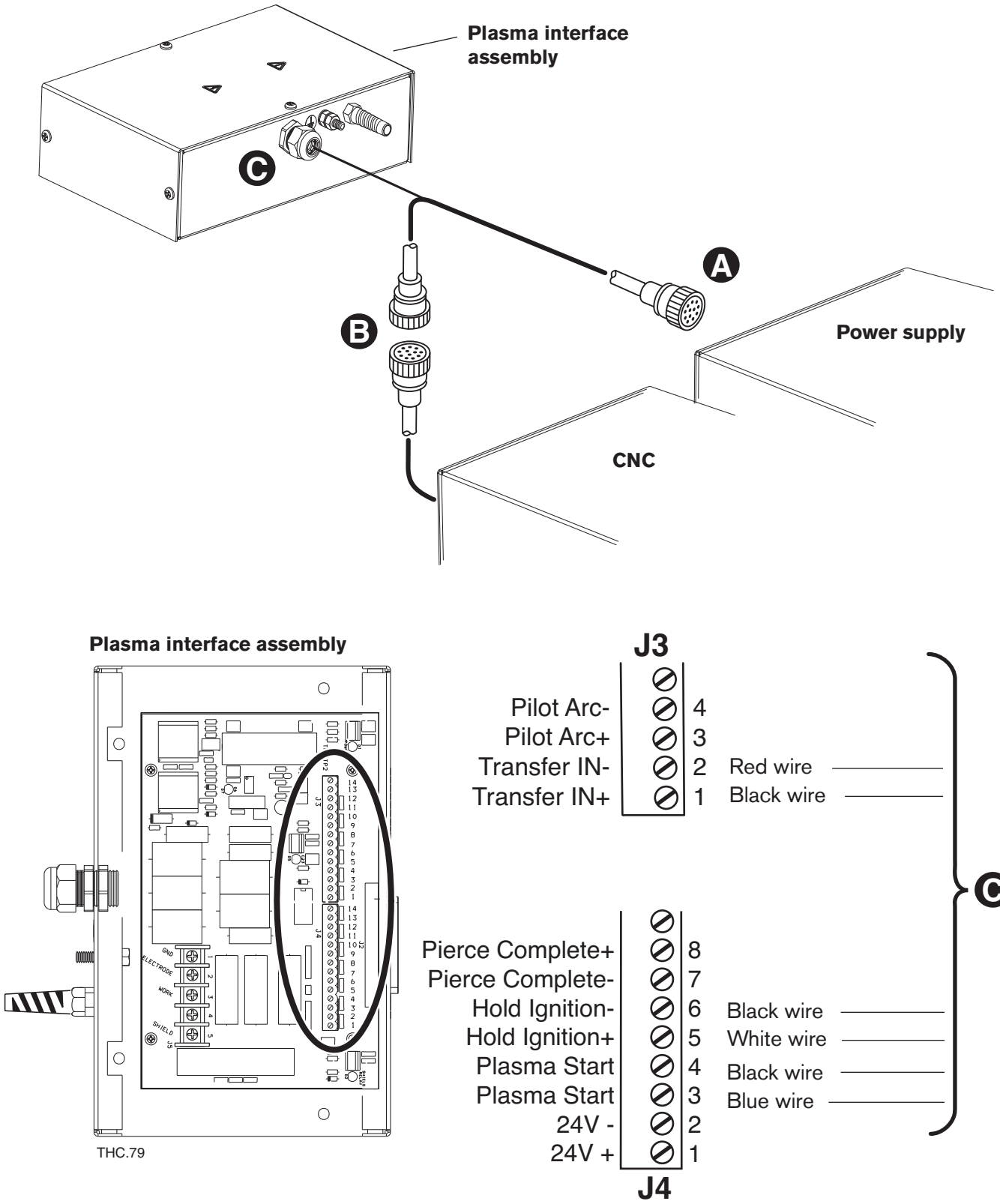
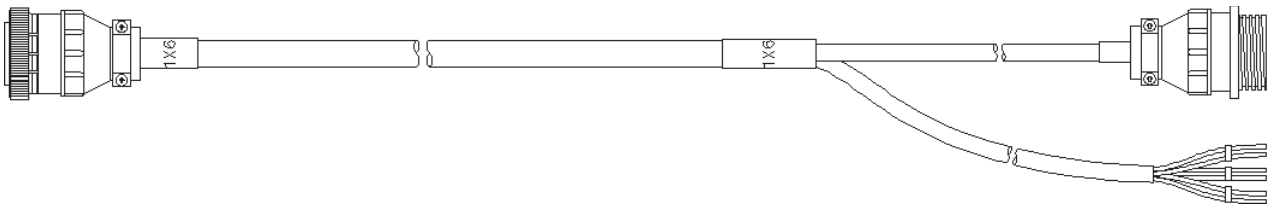


Figure 3d-2 HT4001 power supply interface cable connections

Part number	Description	Length
123330	HT4001 Power Supply Interface Cable	6 ft./1.8 m



Signal Name	Color	Power Supply End (1X6)	CNC End	Plasma Interface End	Function
Hold – Hold + Drain	Black White Drain	5 1 10	Not Connected	J4-6 J4-5	**(Optional)** Hold Ignition (I/O) signal used for preflow during IHS. Also used by power unit to synchronize operation of multiple torch installations. Output signal
Plasma Start – Plasma Start + Drain	Black Blue Drain	9 15 14	Not Connected	J4-4 J4-3	Plasma Start signal maintained during plasma cut. If signal is lost, system must be restarted. Output signal.
Arc Transfer – Arc Transfer + Drain	Black Red Drain	31 36 25	Not Connected	J3-2 J3-1	Arc Transfer signal. Contact closes after arc transfer and pierce delay (set on power supply front panel). Dry contact closure. Input signal.
Emergency Stop Emergency Stop Drain	Black Green Drain	28 33 27	28 33 27	Not Connected	These signals connect to the CNC. Refer to HT4001 Instruction manual for signal information.
Arc Voltage Arc Voltage Drain	Black Yellow Drain	32 37 26	32 37 26	Not Connected	
Spare Spare Drain	Black Green Drain	16 17 18	16 17 18	Not Connected	

Shaded area indicates plasma interface assembly connections.

Plasma interface assembly other J3 and J4 connection points:

- J3-5 (+) and J3-6 (–) – Alternate Nozzle Contact. An optically isolated signal that indicates nozzle is in ohmic contact with work. Ohmic contact is represented by a logic 1.
- J3-7 through J3-12 – Reserved for future use.
- J3-13 and J3-14 – Protective earth ground.
- J4-1 (+) and J4-2 (–) – Available 24 VDC, 500 mA maximum
- J4-7 and J4-8 – Pierce Complete signal used by power unit to time transition from pierce gas flow to cut gas flow. User enters this time delay into THC. Output signal.
- J4-9 through J4-14 – Reserved for future use.

Figure 3d-3 HT4001 interface cable – part number and signal list

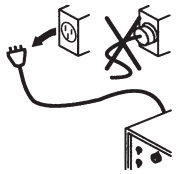
Section 3e

MAX100 SYSTEM INTERCONNECTIONS

Electrode and work lead arc voltage wires

DANGER

ELECTRIC SHOCK CAN KILL



Turn off all electrical power before removing the power supply cover. Press the power supply OFF (0) pushbutton switch and set the line disconnect switch to OFF. In the U.S., use a "lock-out and tag-out" procedure until the service or maintenance is complete. In other countries, follow appropriate local or national safety procedures.

See Figure 3e-1.

1. Remove access covers from the power supply, as required.
2. Locate the 1XPCB1 PC board inside the power supply.
3. Install the arc voltage wires:

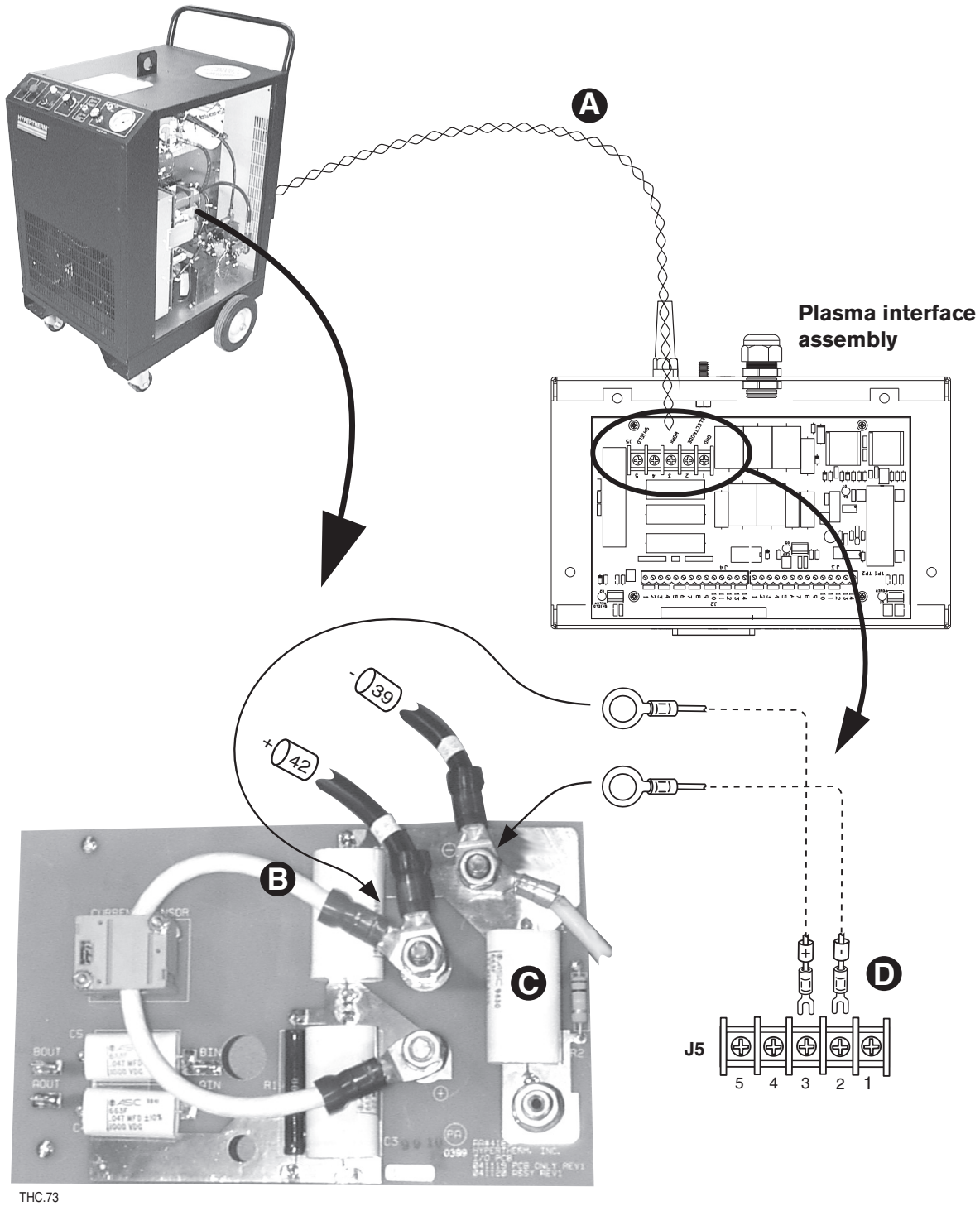
   Fabricate the wires as follows:

   - Use 18AWG (0.9 mm^2), single pair, unshielded wire, rated for 600V or greater.
   - Wire length: As required, from the power supply to the plasma interface assembly.
   - After installing the wires from the power supply to the plasma interface assembly, install appropriate size fork or ring terminals on the wire ends.

   Connect one of the wires to the 1XPCB1 PC board where wire No. 42 is connected. Label this wire positive (+).

   Connect the other wire to the 1XPCB1 PC board where wire No. 39 is connected. Label this wire negative (–).

   At the plasma interface assembly, connect the negative (–) wire to the J5-2 terminal labeled ELECTRODE. Connect the positive (+) wire to the J5-3 terminal labeled WORK.



1XPCB1 PC board

Figure 3e-1 MAX100 electrode and work lead arc voltage wires connection

Power supply interface cable

See Figure 3e-2.

1. Remove access covers from the power supply, as required.

2. Locate TB1 inside the power supply.

3. Install the interface cable:

   Fabricate sensing wires as follows:

   - Use 18AWG (≈0.9 mm^2), double pair, shielded wire, rated for 600V or greater.
   - Wire length: As required, from the power supply to the plasma interface assembly.
   - After installing the wires into the power supply, install appropriate size fork terminals on the 4 wire ends.

   Connect the 4 wires to TB1 where wire No. 33, 34, 35, and 36 are connected. Label these wires No. 33, 34, 35, and 36.

   Connect the other end of the 4 wires to the J3 and J4 terminal of the plasma interface assembly as shown in Figure 3e-2.

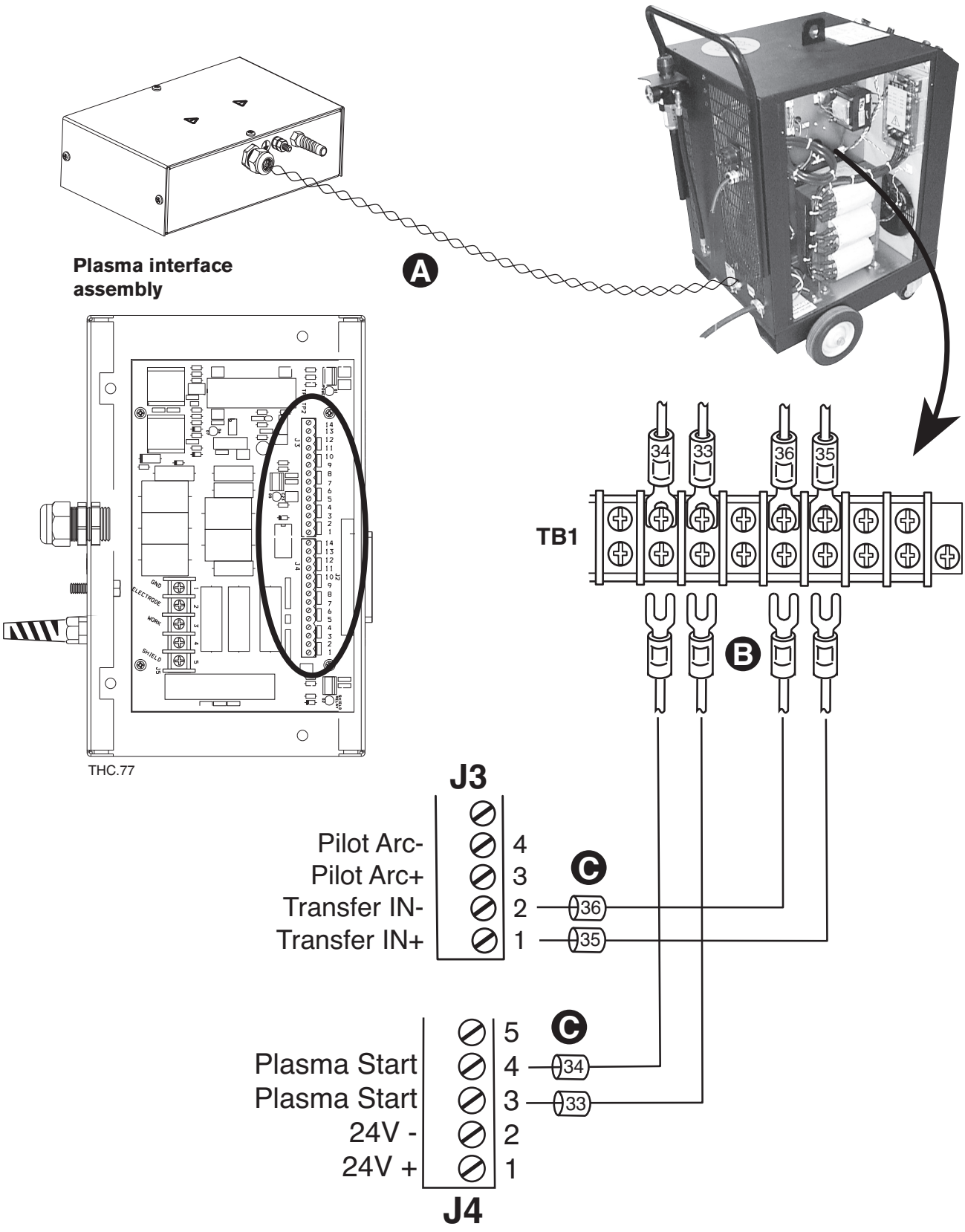


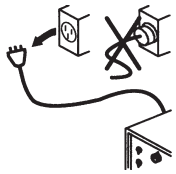
Figure 3e-2 MAX100 power supply interface cable connections

Section 3f

MAX200 SYSTEM INTERCONNECTIONS

Electrode and work lead arc voltage wires

DANGER
ELECTRIC SHOCK CAN KILL



Turn off all electrical power before removing the power supply cover. Press the power supply OFF (0) pushbutton switch and set the line disconnect switch to OFF. In the U.S., use a "lock-out and tag-out" procedure until the service or maintenance is complete. In other countries, follow appropriate local or national safety procedures.

See Figure 3f-1.

1. Remove access covers from the power supply, as required.
2. Locate the input/output panel on the back of the power supply.
3. Install the arc voltage wires:

   Fabricate the wires as follows:

   - Use 18AWG (0.9 mm^2), single pair, unshielded wire, rated for 600V or greater.
   - Wire length: As required, from the power supply to the plasma interface assembly.
   - After installing the wires from the power supply to the plasma interface assembly, install appropriate size fork or ring terminals on the wire ends.

   Connect one of the wires to the WORK LEAD (+) connection of the input/output panel. Label this wire positive (+).

   Connect the other wire to the NEGATIVE LEAD (–) connection of the input/output panel. Label this wire negative (–).

   At the plasma interface assembly, connect the negative (–) wire to the J5-2 terminal labeled ELECTRODE. Connect the positive (+) wire to the J5-3 terminal labeled WORK.

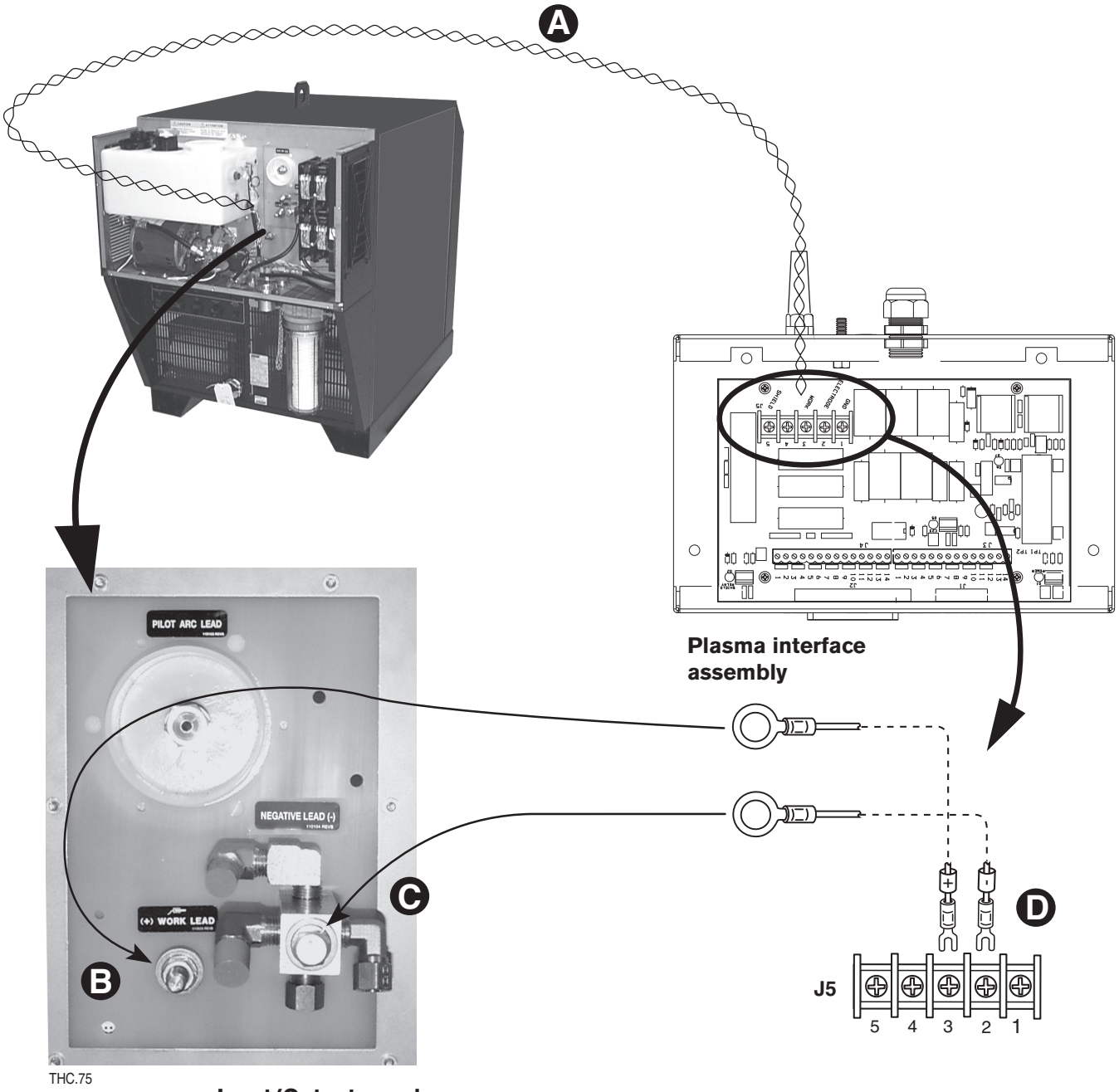


Figure 3f-1 MAX200 electrode and work lead arc voltage wire connections

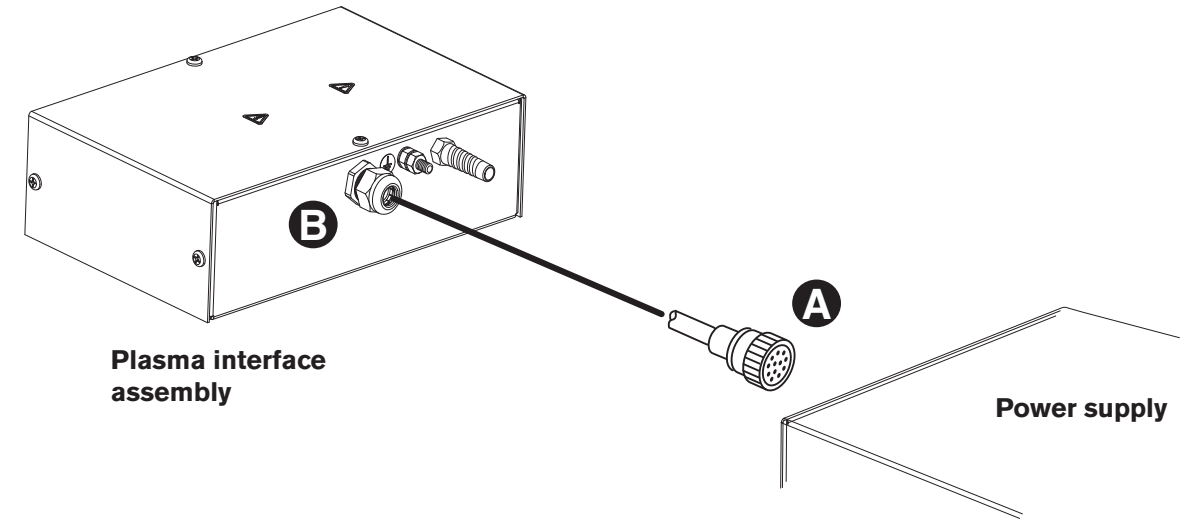
Power supply interface cable

See Figure 3f-2.

Connect the interface cable plug to the receptacle on the back of the power supply.

Install the 3 pairs of wires of the interface cable to the plasma interface assembly as shown in Figure 3f-2

See Figure 3f-3 for the interface cable part numbers and signal list.



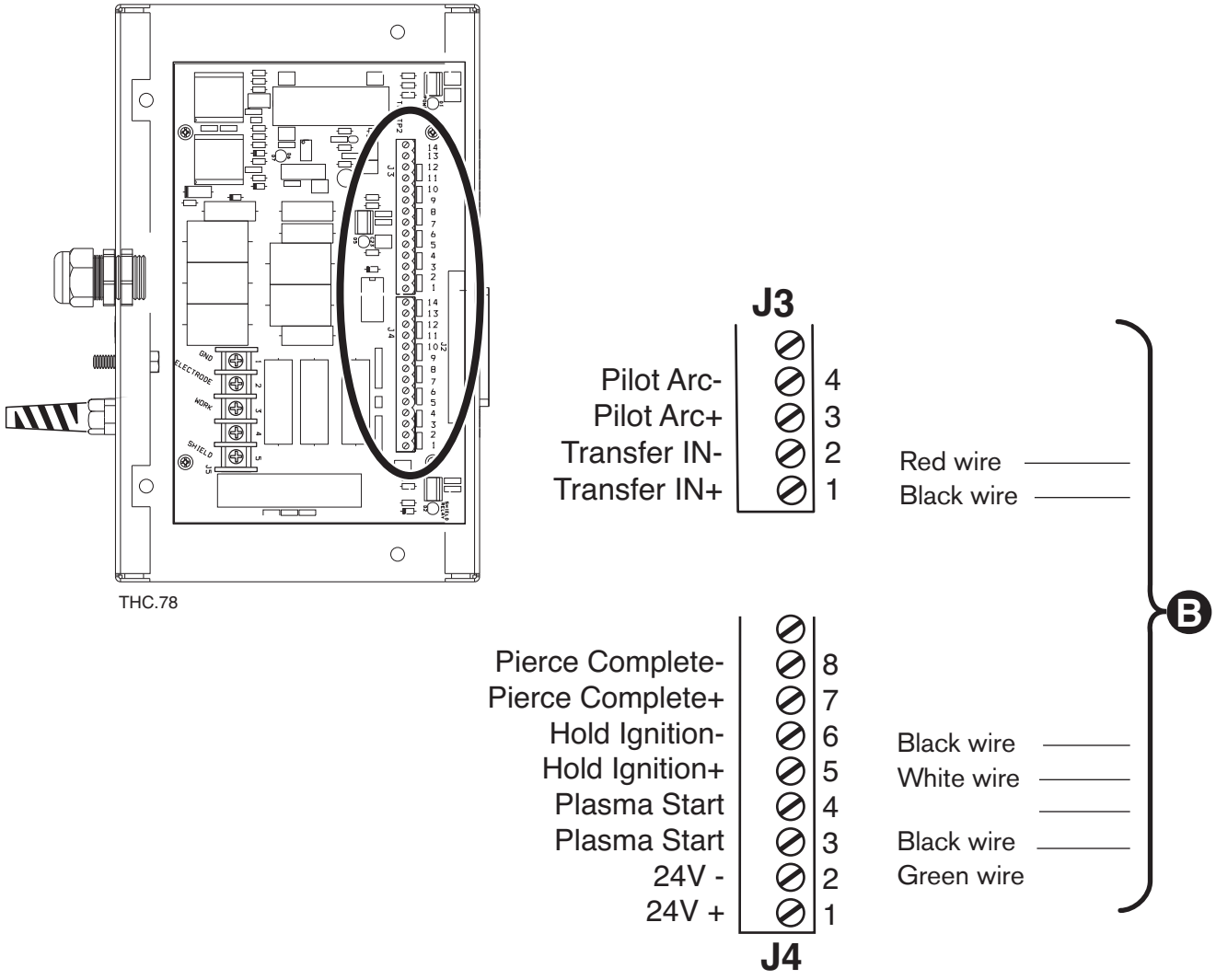
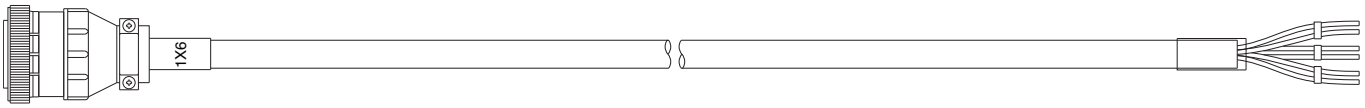


Figure 3f-2 MAX200 power supply interface cable connections

Part number	Description	Length
123358	MAX200 Power Supply Interface Cable	6 ft./1.8 m



Signal Name	Color	Power Supply End (1X6)	Plasma Interface End	Function
Hold I/O – Hold I/O + Drain	Black White Drain	5 1 10	J4-6 J4-5	**(Optional)** Hold Ignition (I/O) signal used for preflow during IHS. Also used by power unit to synchronize operation of multiple torch installations. Output signal.
Plasma Start – Plasma Start + Drain	Black Green Drain	9 15 14	Relay Relay	Plasma Start signal maintained during plasma cut. If signal is lost, system must be restarted. Output signal.
Arc Transfer (Delayed) – Arc Transfer (Delayed) + Drain	Black Red	31 36 25	J3-2 J3-1	Arc Transfer signal. Contact closes after arc transfer and pierce delay (set on power supply front panel). Dry closure. Input signal.contact

Plasma interface assembly other J3 and J4 connection points:

- J3-5 (+) and J3-6 (–) – Alternate Nozzle Contact. An optically isolated signal that indicates nozzle is in ohmic contact with work. Ohmic contact is represented by a logic 1.
- J3-7 through J3-12 – Reserved for future use.
- J3-13 and J3-14 – Protective earth ground.
- J4-7 and J4-8 – Pierce Complete signal used by power unit to time transition from pierce gas flow to cut gas flow. User enters this time delay into THC. Output signal.
- J4-9 through J4-14 – Reserved for future use.

Figure 3f-3 MAX200 interface cable – part number and signal list

Ohmic contact wire

See Figure 3f-4.

Install the ohmic contact wire through the strain relief of the plasma interface assembly.

Install appropriate size fork terminal on the wire end and attach the wire to the J5-5 terminal labeled SHIELD.

Install the other end of the ohmic contact wire to the IHS tab on the torch retaining cap.

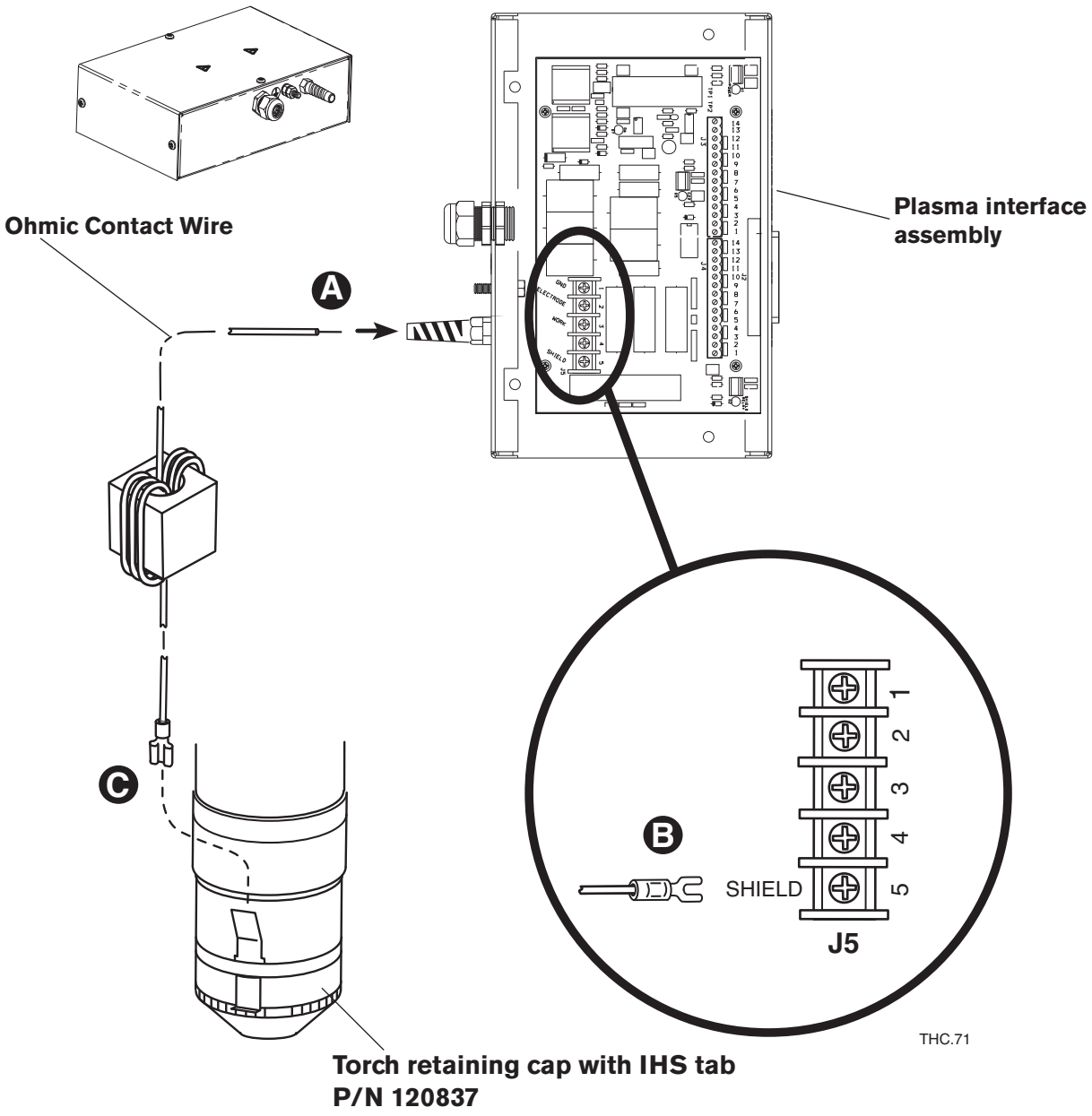


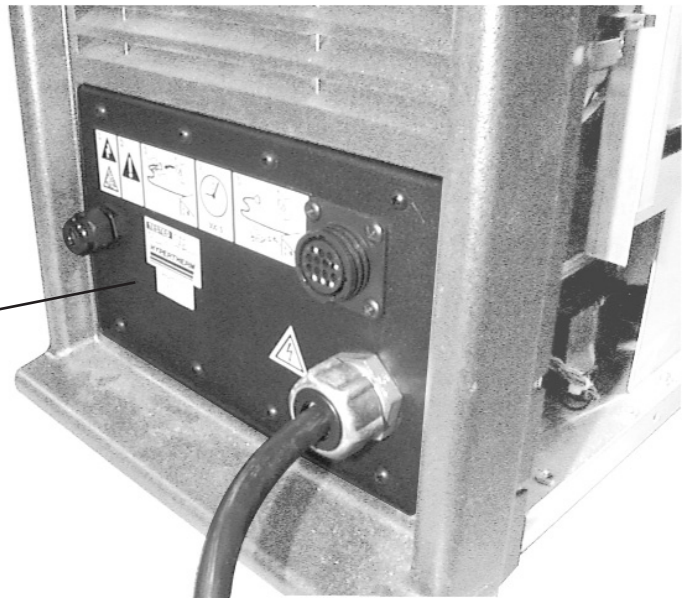
Figure 3f-4 MAX200 ohmic contact wire connection

Section 3g

POWERMAX SYSTEM INTERCONNECTIONS

Verify power supply machine interface (Powermax800, Powermax900 and Powermax 1100)

Look at the back of the power supply and verify that it is equipped with the machine interface option.

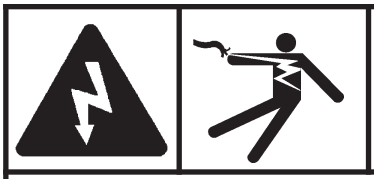


Power supply machine interface kits

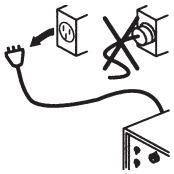
If your power supply is not equipped with the machine interface option, install one of the following kits:

Power Supply	Voltage	Machine Interface Kit
Powermax800	208/240/480 200/230/400 400 CE	028905 128035 128036
Powermax900	208/240/480 200/230/400 230/400 CE	128241 128242 128286
Powermax1100	208/240/480 200/230/400 400 CE	128144 128168 128169

Electrode and work lead arc voltage wires



DANGER
ELECTRIC SHOCK CAN KILL



Turn off all electrical power before removing the power supply cover. Press the power supply OFF (0) pushbutton switch and set the line disconnect switch to OFF. In the U.S., use a "lock-out and tag-out" procedure until the service or maintenance is complete. In other countries, follow appropriate local or national safety procedures.

See Figure 3g-1 and 3g-2.

1. Remove access cover from the power supply.
2. Locate the machine interface board inside the power supply.
3. Install the arc voltage wires:

   Fabricate the wires as follows:

   - Use 18AWG (0.9 mm^2), single pair, unshielded wire, rated for 600V or greater.
   - Wire length: As required, from the power supply to the plasma interface assembly.
   - After installing the wires from the power supply to the plasma interface assembly, install appropriate size fork or ring terminals on the wire ends.

   Connect one of the arc voltage wires to the J1-6 terminal of the machine interface board for the powermax 800, 900, and 1100. Connect one of the sensing wires to the J15 terminal of the machine interface board for the powermax 1000, 1250, and 1650. Label the wire positive (+).

   Connect the other arc voltage wire to the J1-8 terminal of the machine interface board for the powermax 800, 900, and 1100. Connect one of the sensing wires to the J16 terminal of the machine interface board for the powermax 1000, 1250, and 1650. Label the wire negative (–).

   At the plasma interface assembly, connect the negative (–) wire to the J5-2 terminal labeled ELECTRODE. Connect the positive (+) wire to the J5-3 terminal labeled WORK.

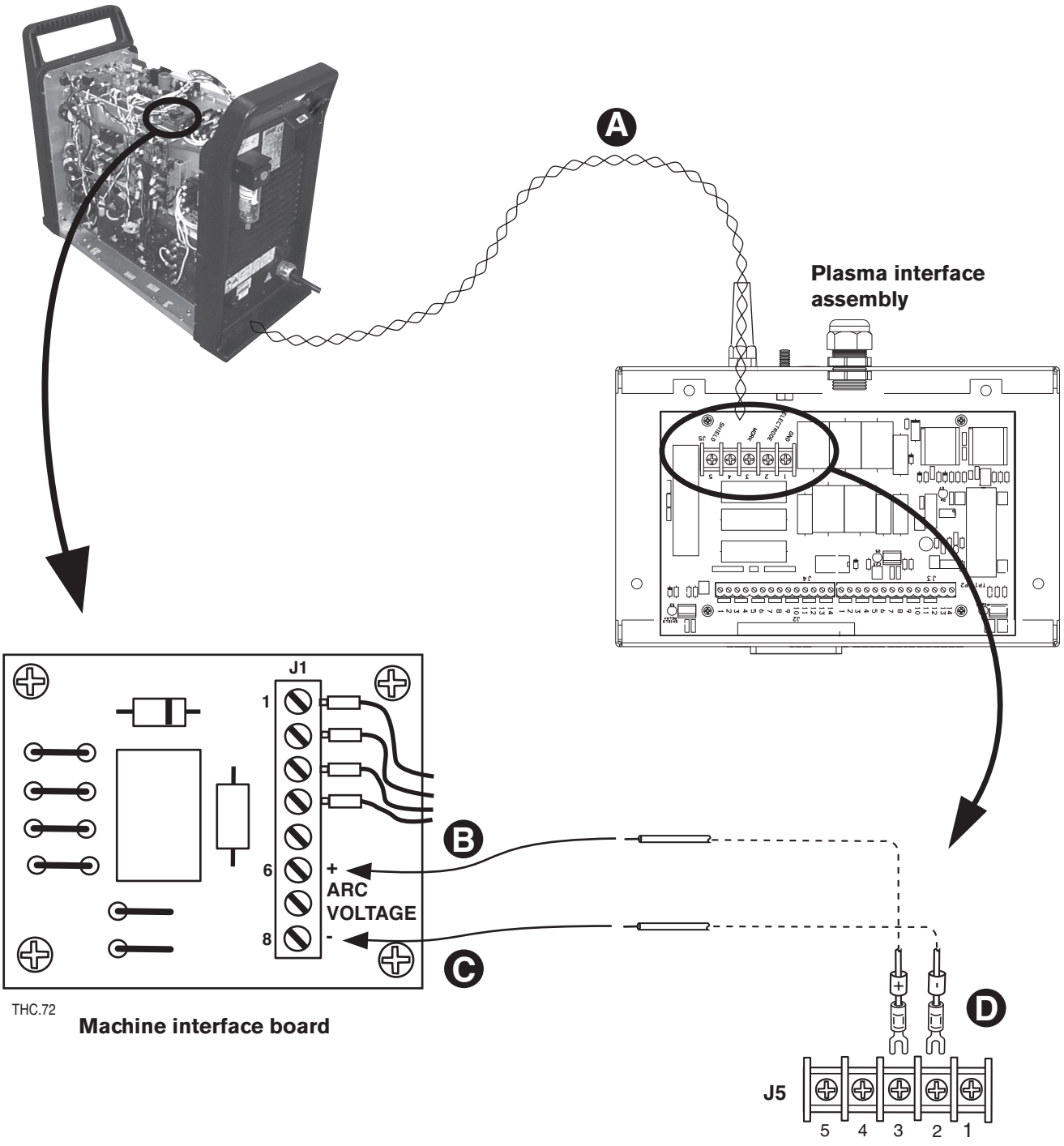


Figure 3g-1 Powermax800, Powermax900 and Powermax 1100 electrode and work lead arc voltage wire connections

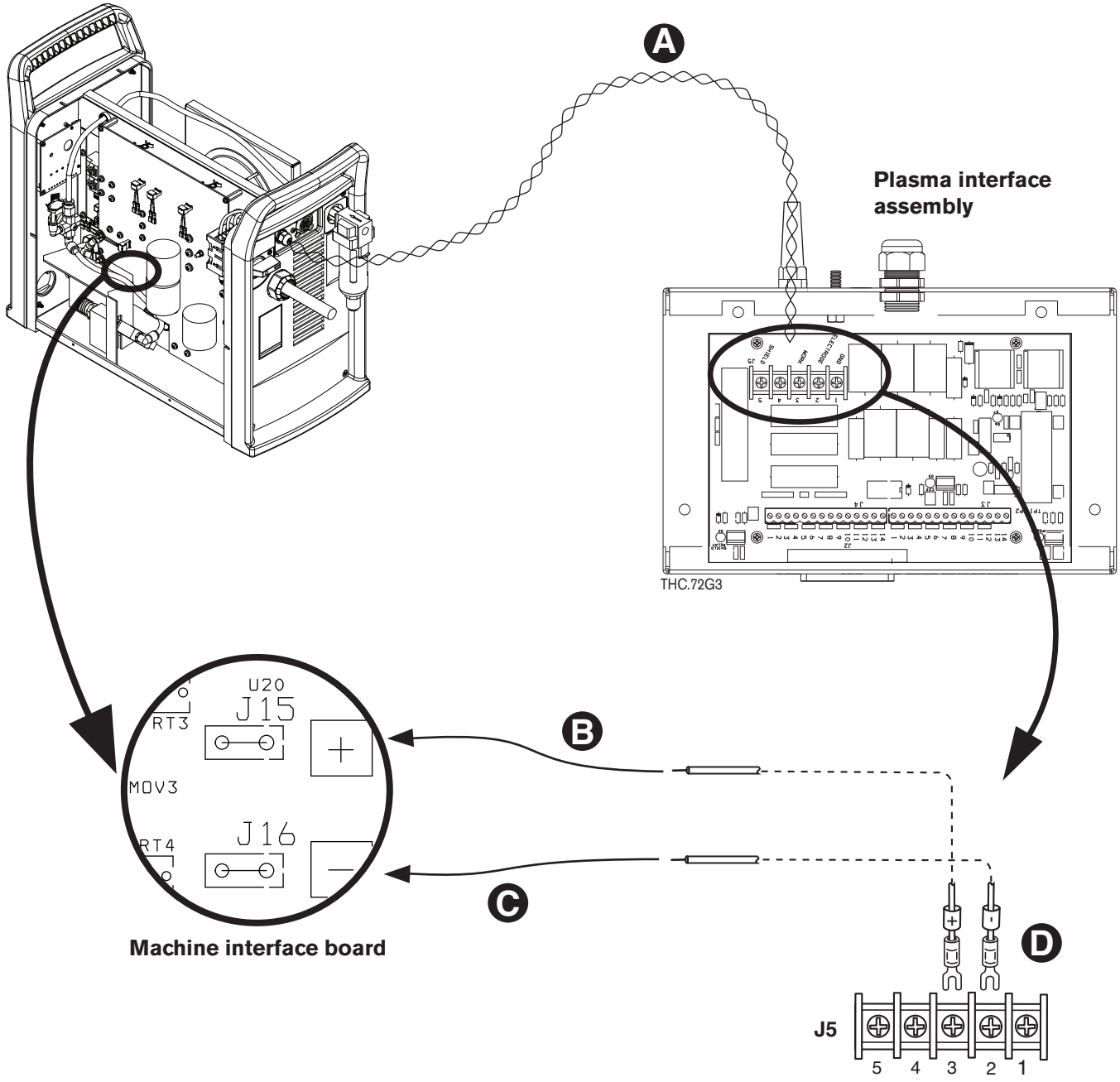


Figure 3g-2 Powermax1000, Powermax1250 and Powermax 1650 electrode and work lead arc voltage wire connections

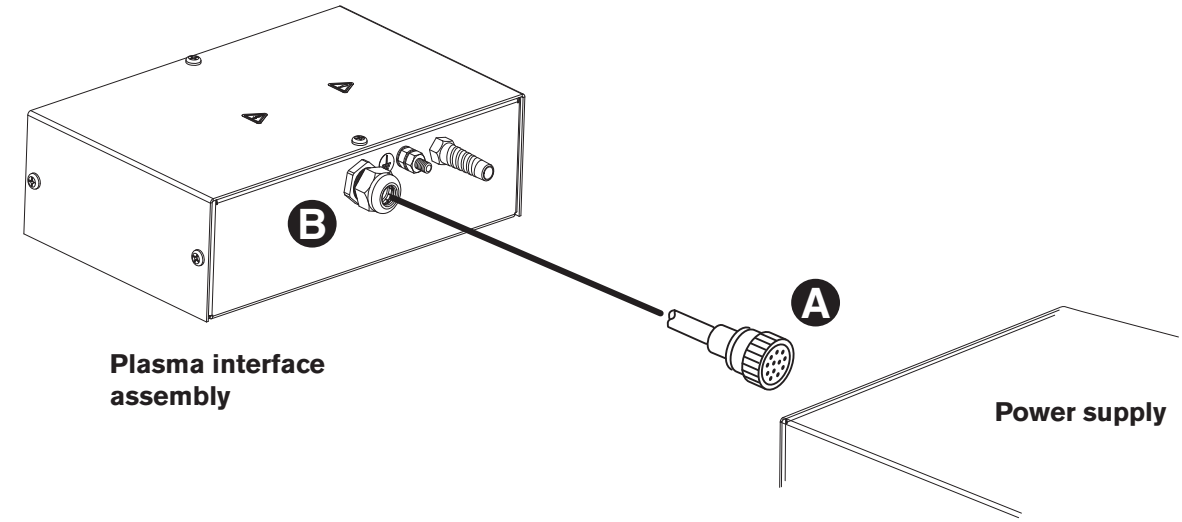
Power supply interface cable

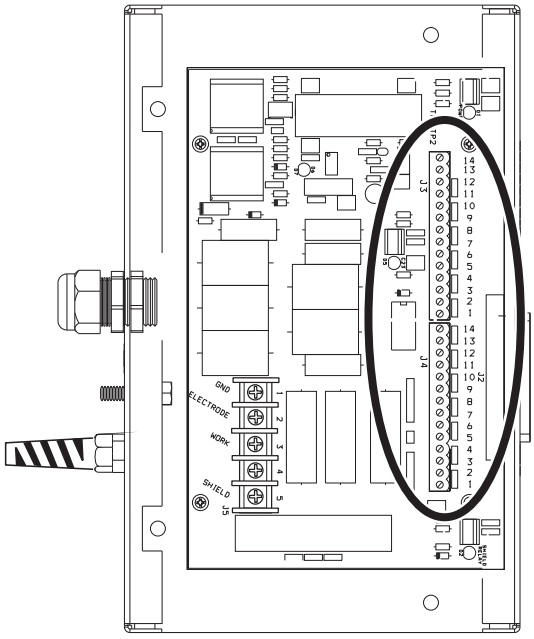
See Figure 3g-3.

Connect the interface cable to the receptacle on the back of the power supply.

Install the 2 pairs of wires of the interface cable to the plasma interface assembly as shown in Figure 3g-3.

See applicable Powermax service manual for the interface cable part numbers and signal list.





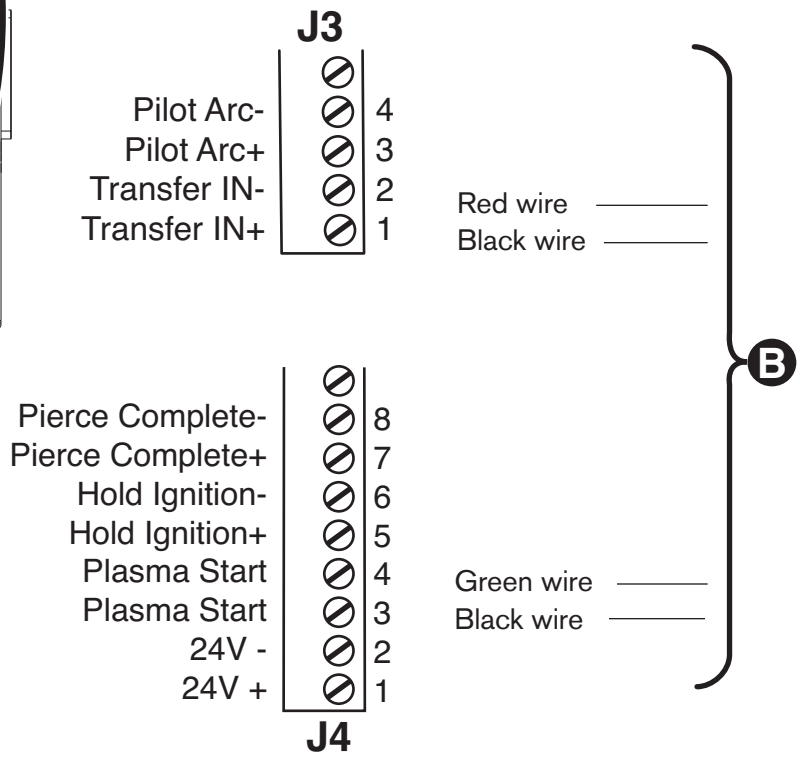


Figure 3g-3 Powermax power supply interface cable connections

Section 3h

HT4400 SYSTEM INTERCONNECTIONS

Plasma interface PC board preparation

See Figure 3h-1.

Remove and discard the access cover from the plasma interface assembly.

Remove and discard the 2 connectors from the plasma interface PC board.

Remove the plasma interface PC board from the interface enclosure. Save the PC board, the 4 standoffs and the 4 mounting screws.

Discard the interface enclosure.

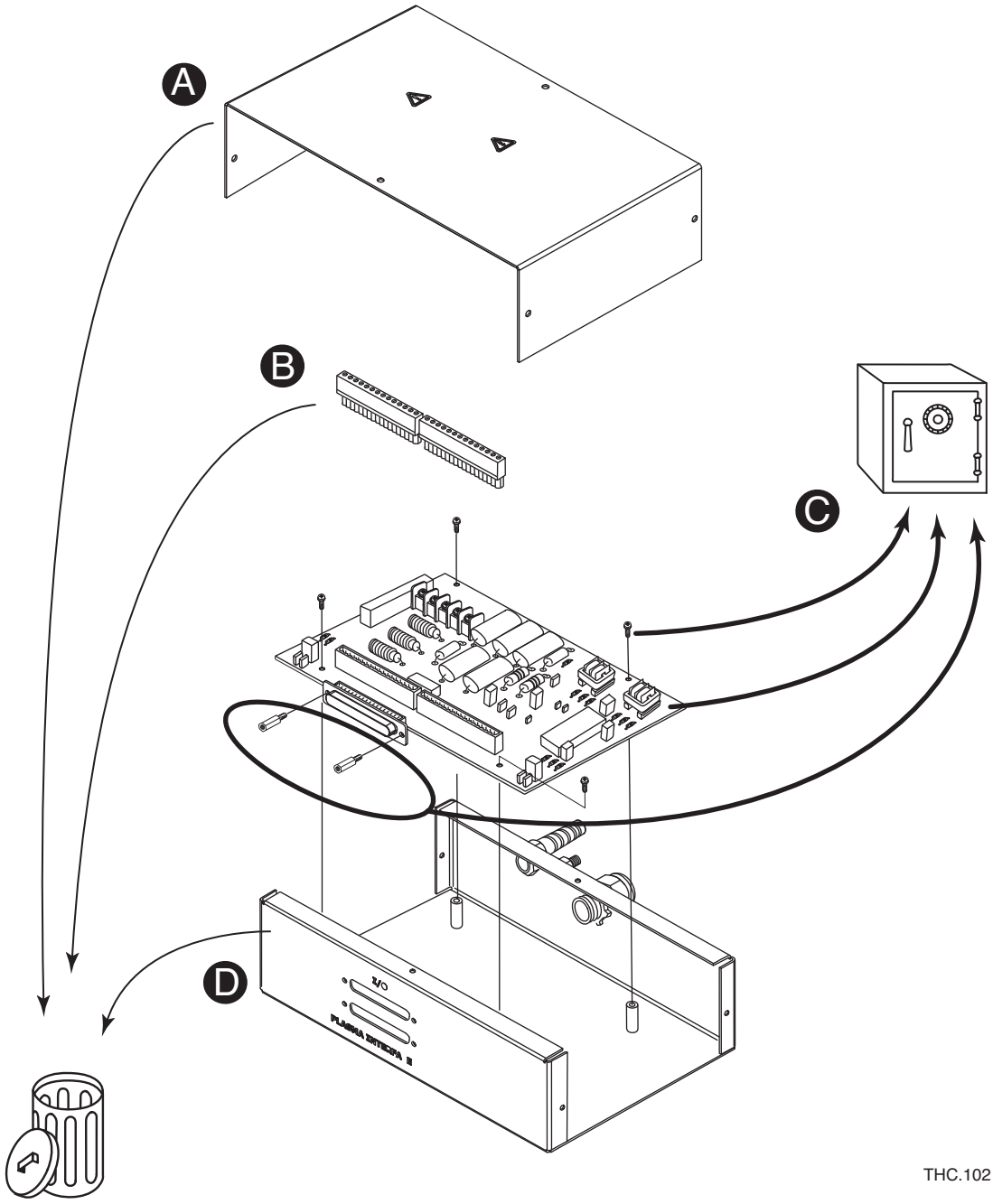
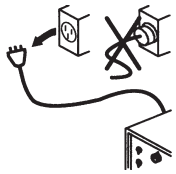


Figure 3h-1 Plasma interface PC board preparation

Install the plasma interface PC board into the HT4400 power supply

DANGER

ELECTRIC SHOCK CAN KILL



Turn off all electrical power before removing the power supply cover. Press the power supply OFF (0) pushbutton switch and set the line disconnect switch to OFF. In the U.S., use a "lock-out and tag-out" procedure until the service or maintenance is complete. In other countries, follow appropriate local or national safety procedures.

See Figure 3h-2.

Remove access covers from the power supply, as required.

Install the 4 standoffs on the plasma interface PC board.

Install the plasma interface PC board into the power supply as show in figure 3h-2. Use the 4 screws that were removed from the plasma interface assembly.

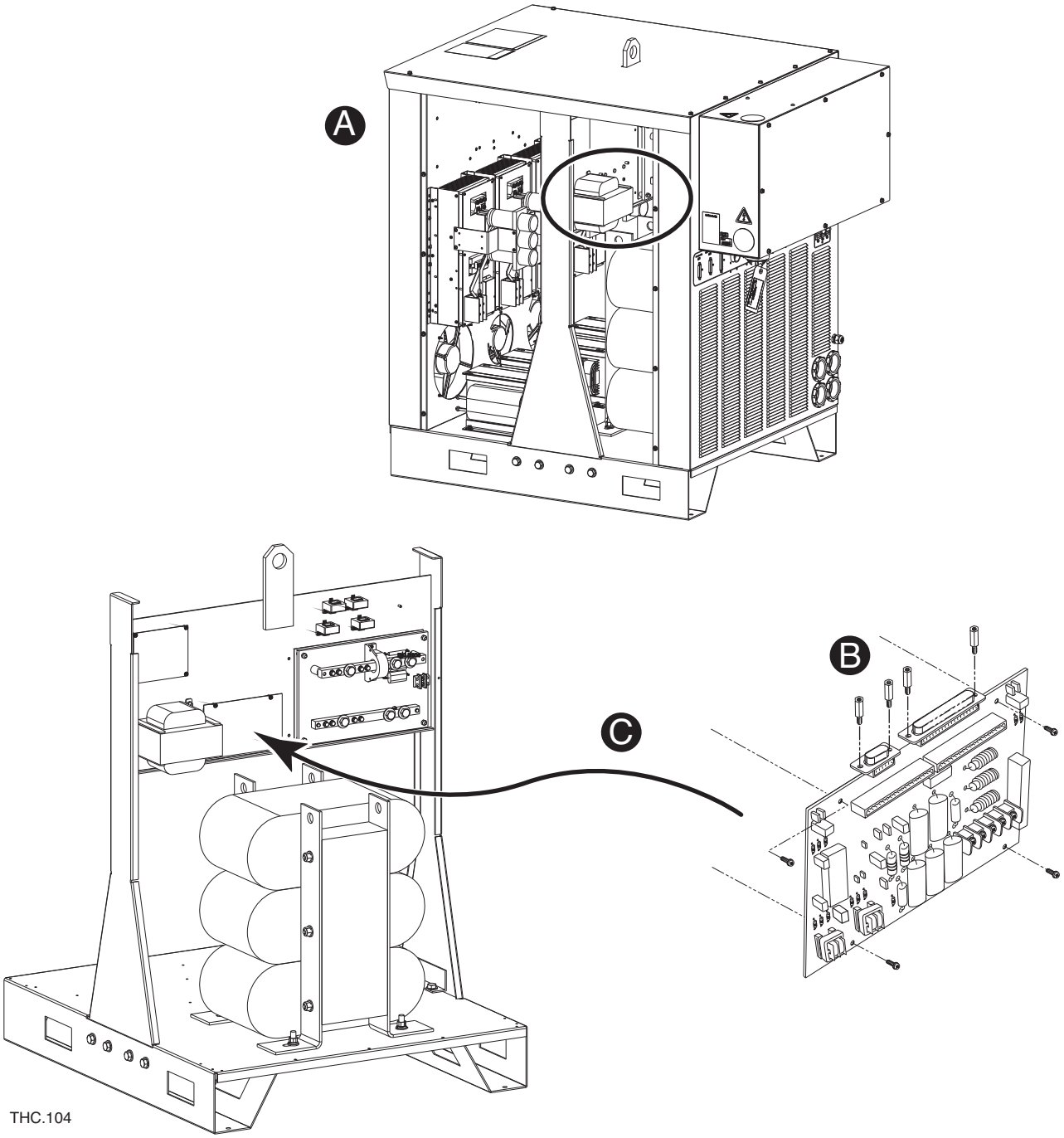


Figure 3h-2 Install the plasma interface PC board

Plasma interface PC board connection

See Figure 3h-3.

Install the 37-pin connector to the plasma interface PC board.

Install the J2 and J3 connectors to the plasma interface PC board.

NOTE: Wire No. 42 and 45 are secured to the 37-pin connector cable inside the power supply. Remove the wires and install as follows.

Connect wire No. 42 to the plasma interface board J5-2 terminal labeled ELECTRODE.
Connect wire No. 45 to the plasma interface board J5-3 terminal labeled WORK.

Connect the other end of wire No. 42 to the top bus bar.
Connect the other end of wire No. 45 to the bottom bus bar.

Secure all wires and cables as required.

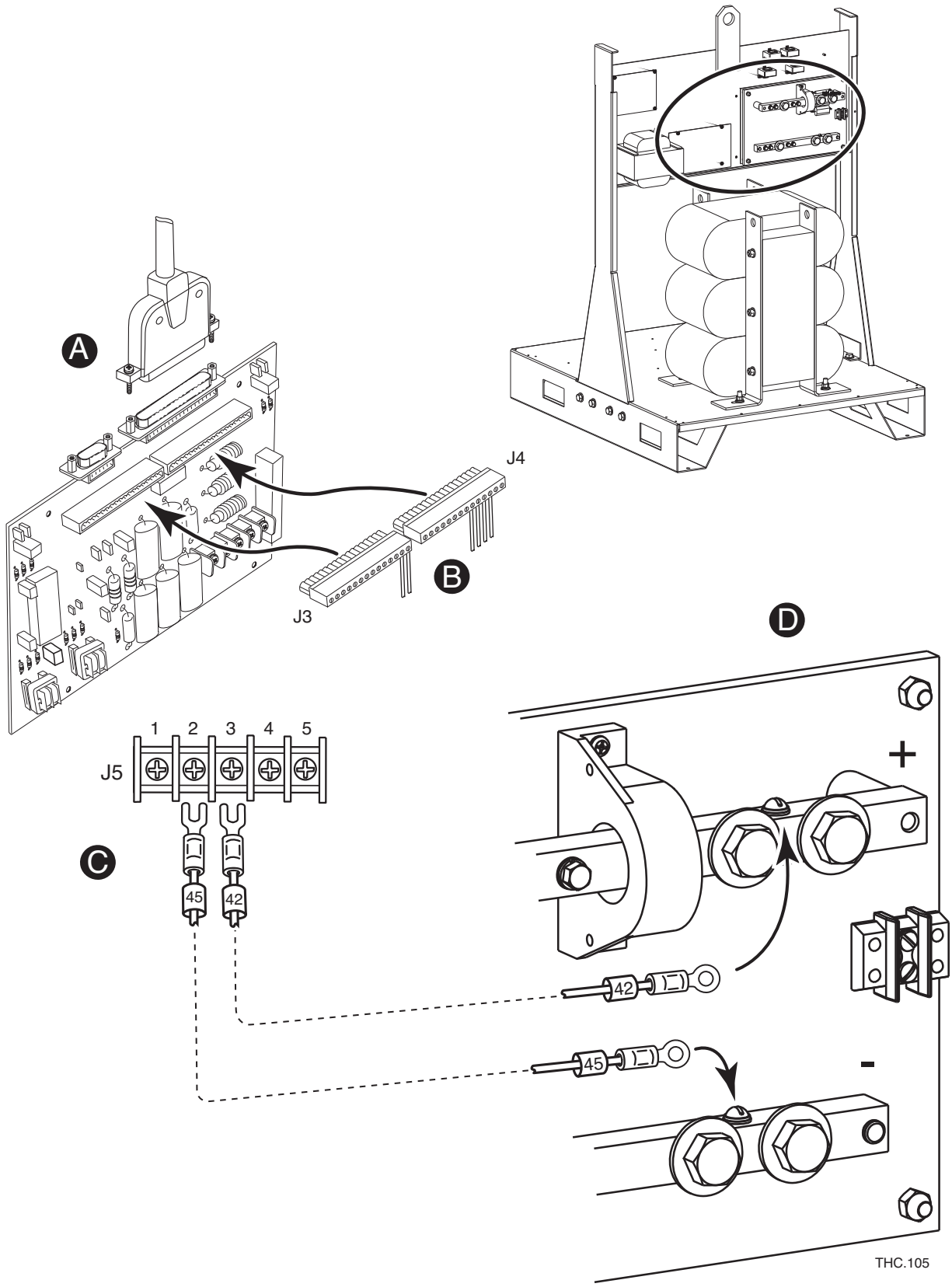


Figure 3h-3 Plasma interface PC board connection

Ohmic contact wire

See Figure 3h-4.

Install the ohmic contact wire through the strain relief of the power supply.

Install appropriate size fork terminal on the wire end and attach the wire to the J5-5 terminal labeled SHIELD of the plasma interface PC board.

Install the other end of the ohmic contact wire to the IHS tab on the torch retaining cap.

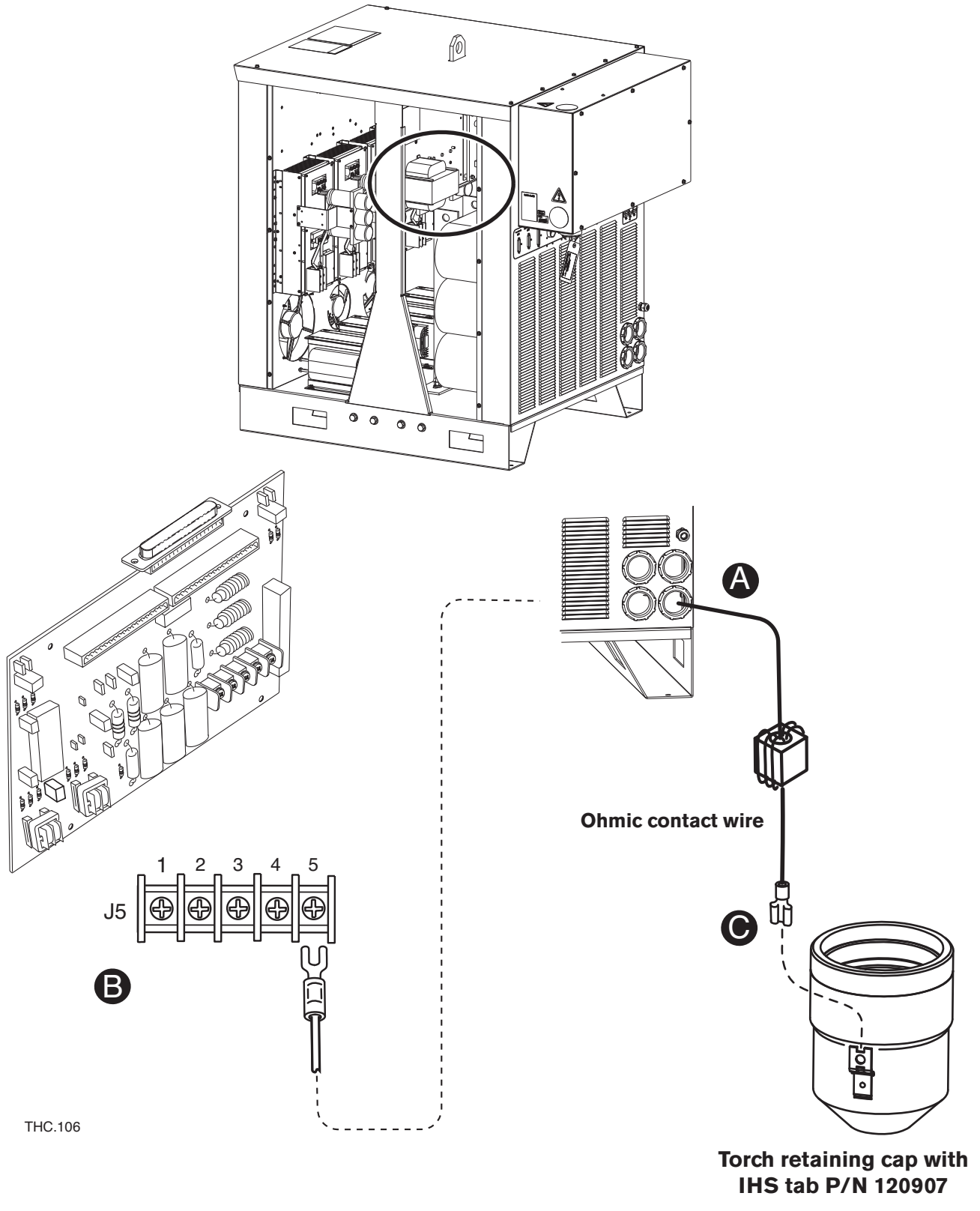
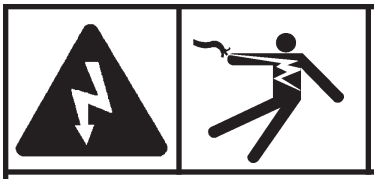


Figure 3h-4 HT4400 ohmic contact wire connection

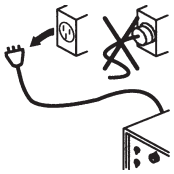
Section 3i

HPR SYSTEM INTERCONNECTIONS

HPR130 and HPR260 power supplies



DANGER
ELECTRIC SHOCK CAN KILL



Turn off all electrical power before removing the power supply cover. Press the power supply OFF (0) pushbutton switch and set the line disconnect switch to OFF. In the U.S., use a "lock-out and tag-out" procedure until the service or maintenance is complete. In other countries, follow appropriate local and national safety procedures.

Install the plasma interface PC board

See Figures 3i-1, 3i-2 and 3i-3

A Remove left and right side panels from the power supply.

B Install the plasma interface PC board (229145) on the 4 standoffs in the power supply.

C Install the machine interface cable (123760) from the control board to the plasma interface board.

Note: Only the HPR130 power supply is shown, but the location for installing the plasma interface board and the location of bundled wires (page 3i-4) are the same in the HPR260 power supply.

A

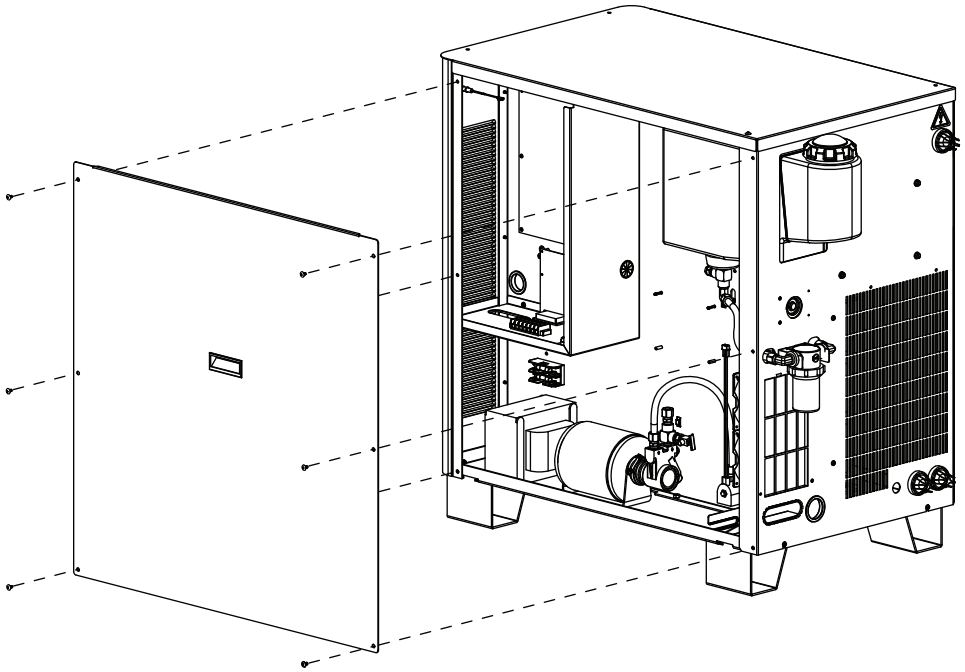


Figure 3i-1 Right side panel removal

B

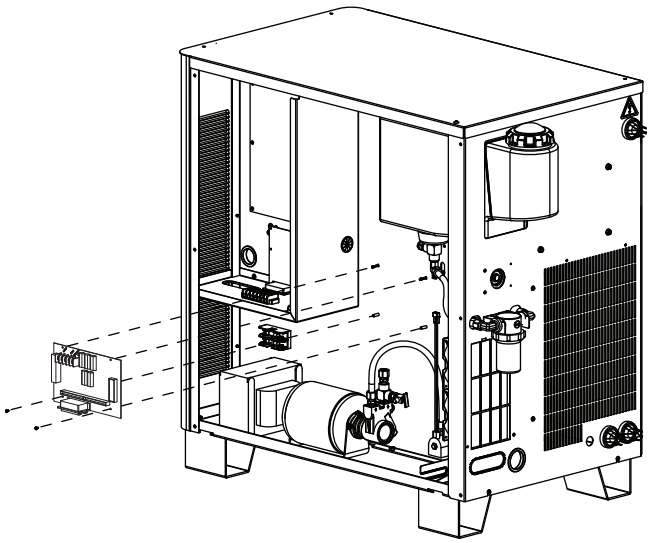


Figure 3i-2 Install the plasma interface PC board

C

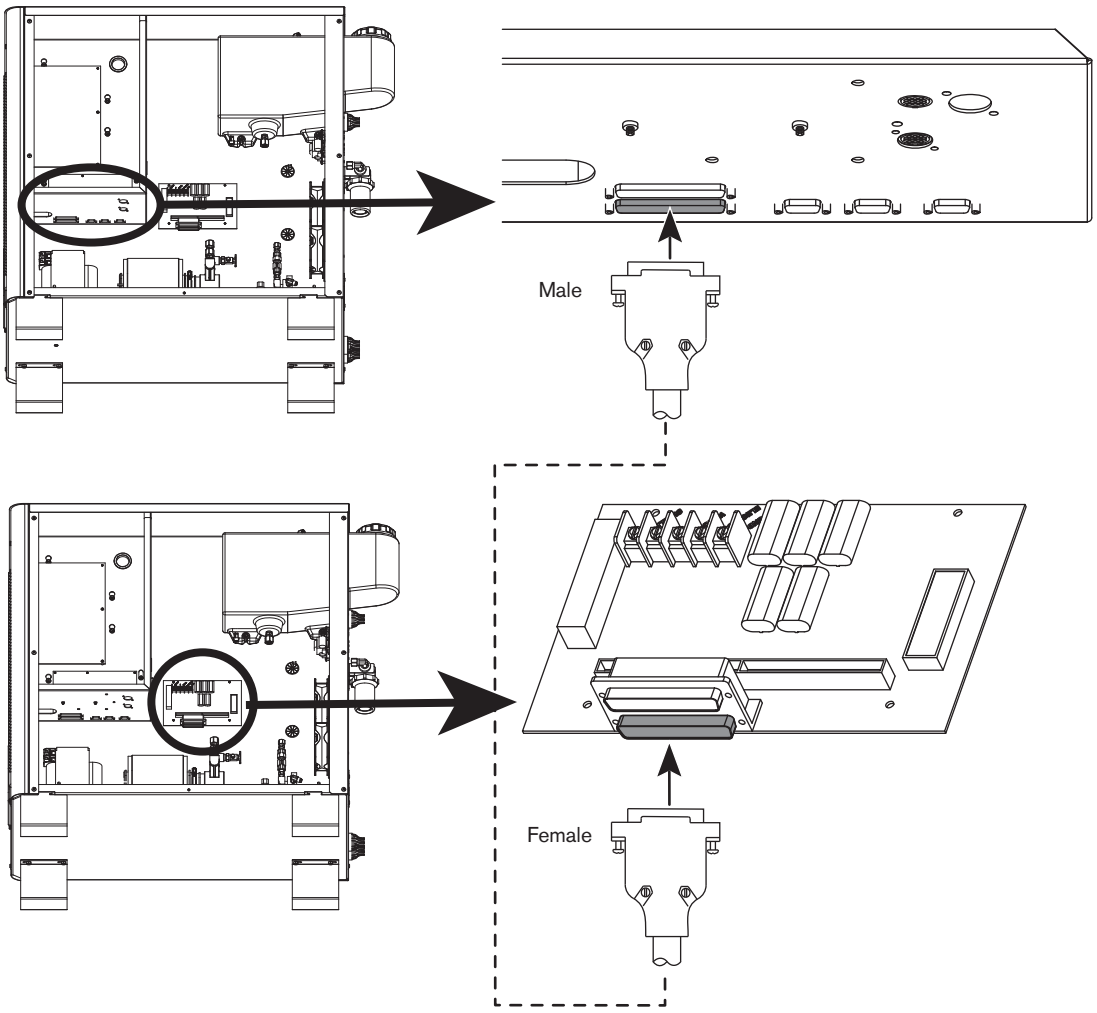
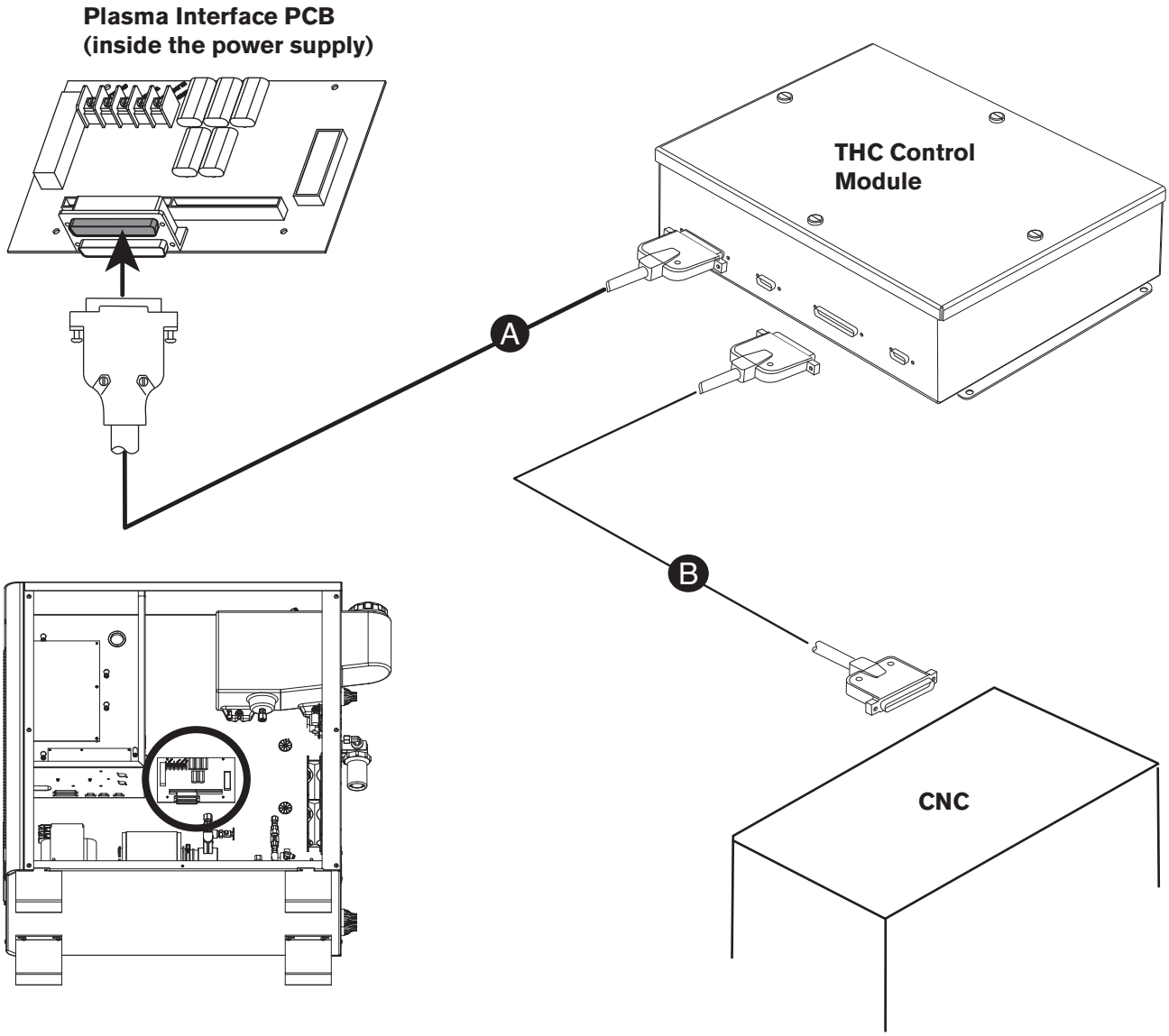


Figure 3i-3 Plasma interface and control PC board connections inside the power supply

Connect the plasma interface assembly to the THC control module

A Install the plasma interface cable (see page 3-22 for part numbers) from the plasma interface PCB in the power supply to the THC control module.

B Install the machine interface cable (see page 3-23 for part numbers) from the THC control module to the CNC.



Plasma interface and I/O board connections

See Figures 3i-4, .3i-5, 3i-6, and 3i-7

A Cut the cable tie on the wires bundled below the plasma interface board (numbered 25 and 26).

B Attach wire number 25 to stud marked WORK, and wire number 26 to stud marked ELECTRODE.

C Cut the cable tie on the wires bundled near the I/O board (numbered 25 and 26).

D Connect wire Number 25 to the bus bar marked WORK (+).
Connect wire Number 26 to the bus bar marked TORCH (–).

Secure all wires and cables as required.

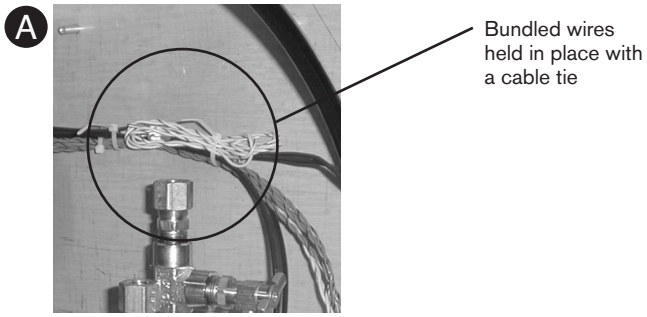


Figure 3i-4 Plasma interface wire location

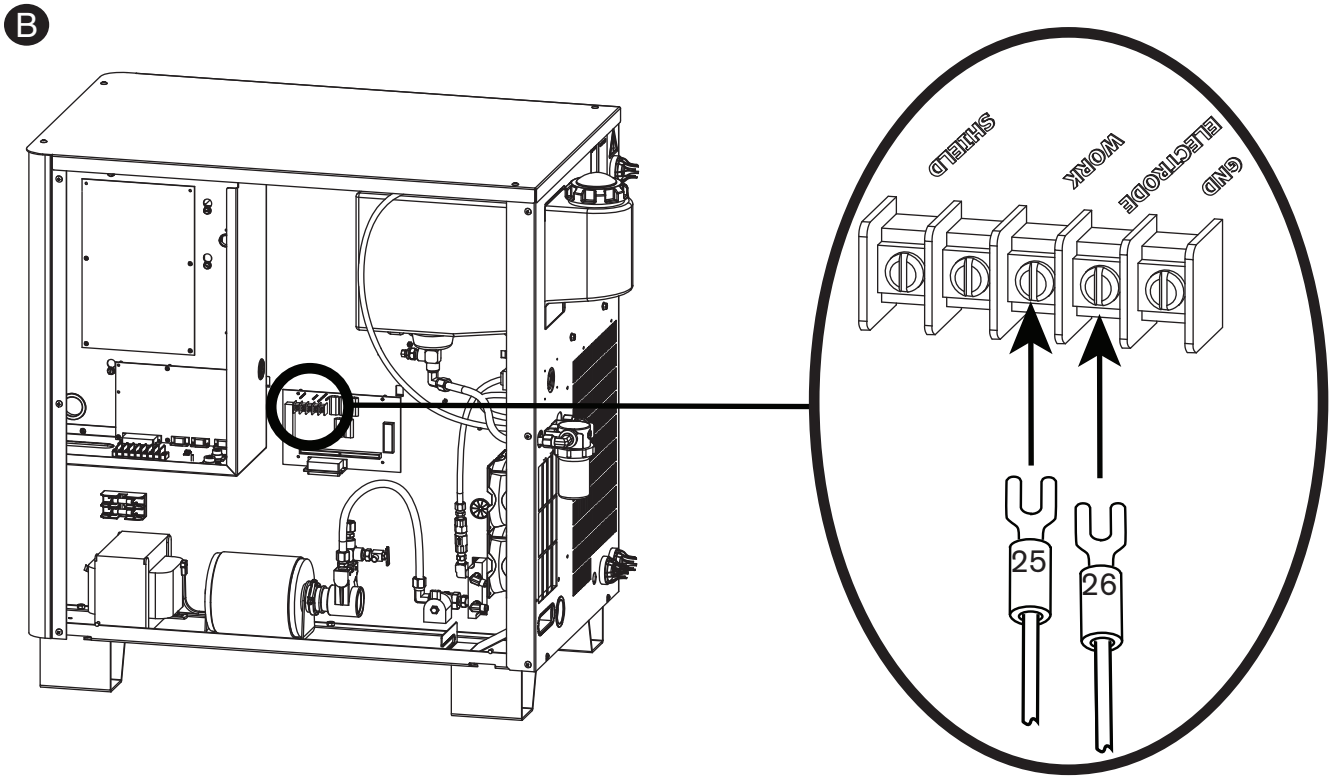


Figure 3i-5 Plasma interface PC board connection

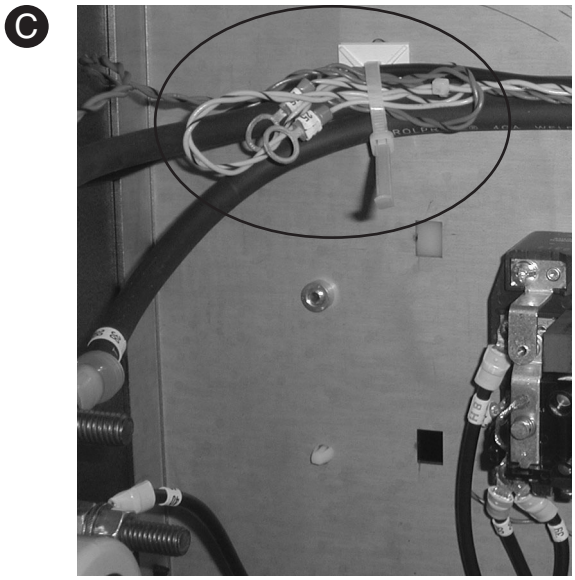


Figure 3i-6 I/O wire location

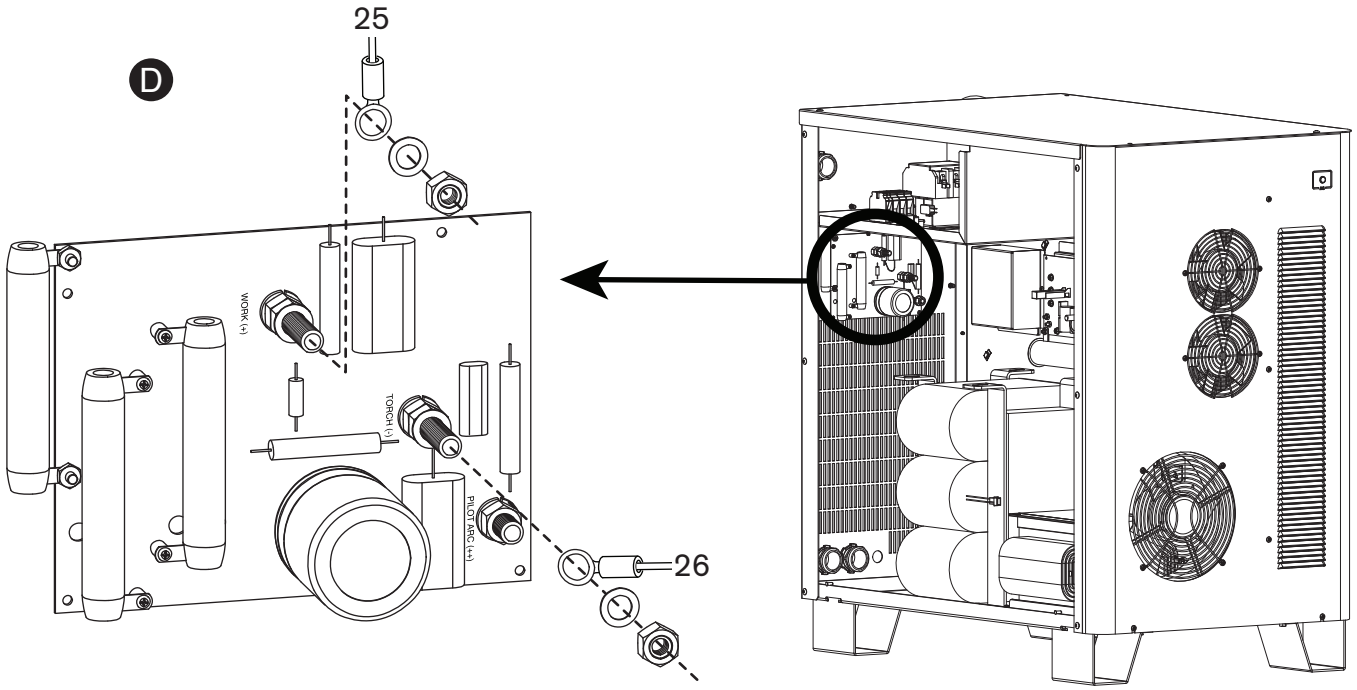


Figure 3i-7 I/O board connections

Ohmic contact wire

See Figure 3i-8.

A Install the ohmic contact wire through the strain relief of the power supply.

B Install appropriate size fork terminal on the wire end and attach the wire to the terminal labeled SHIELD on the plasma interface PC board.

C Install the other end of the ohmic contact wire to the IHS tab on the torch retaining cap.

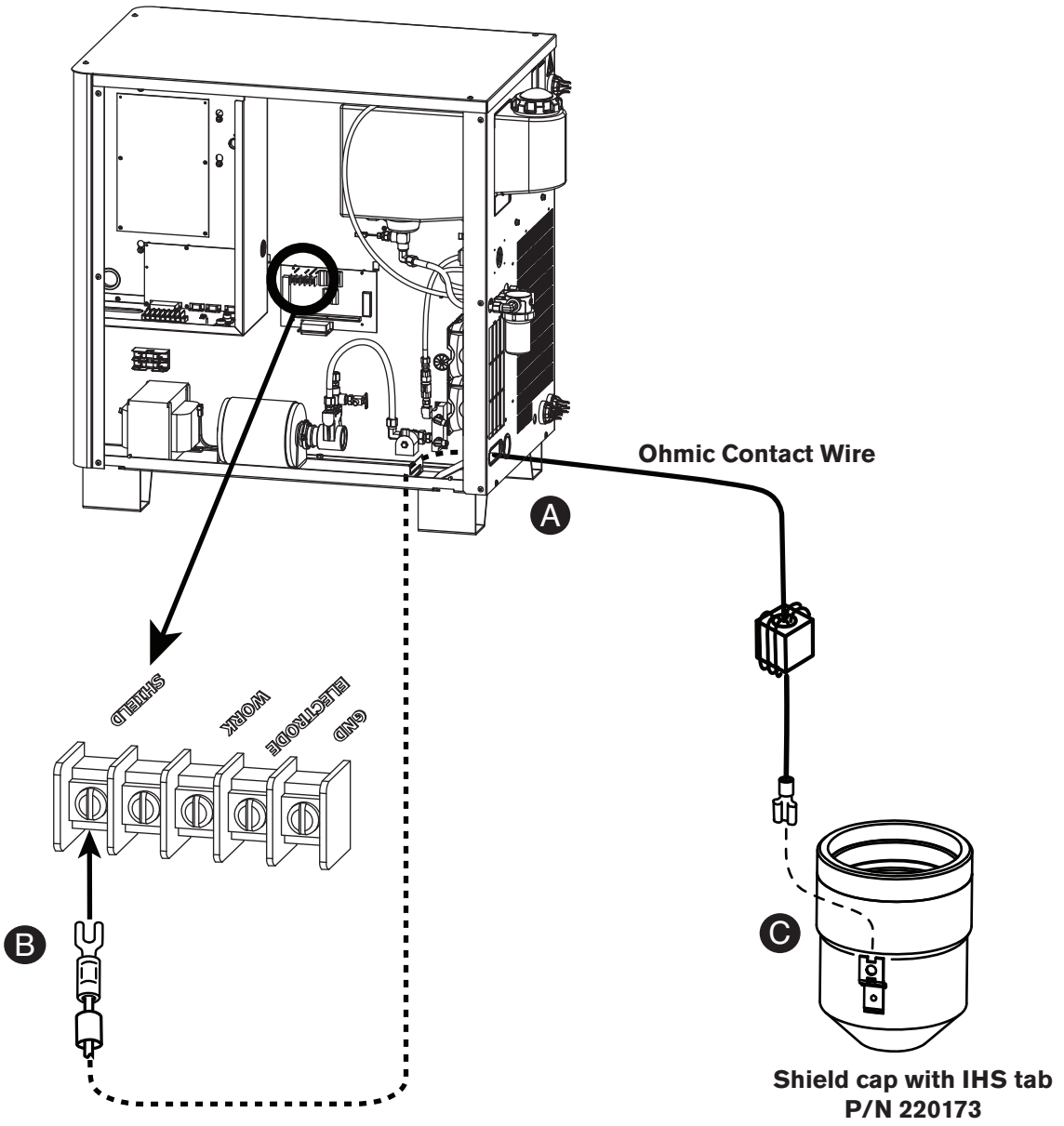


Figure 3i-8 Ohmic contact wire connection

HPR400XD power supply

Install the plasma interface PC board

See Figures 3i-9 and 3i-10

A Remove left and right side panels from the power supply (not shown).

B Install the plasma interface PC board (229145) on the 4 standoffs in the power supply.

C Install the machine interface cable (123760) from the control board to the plasma interface board.

B

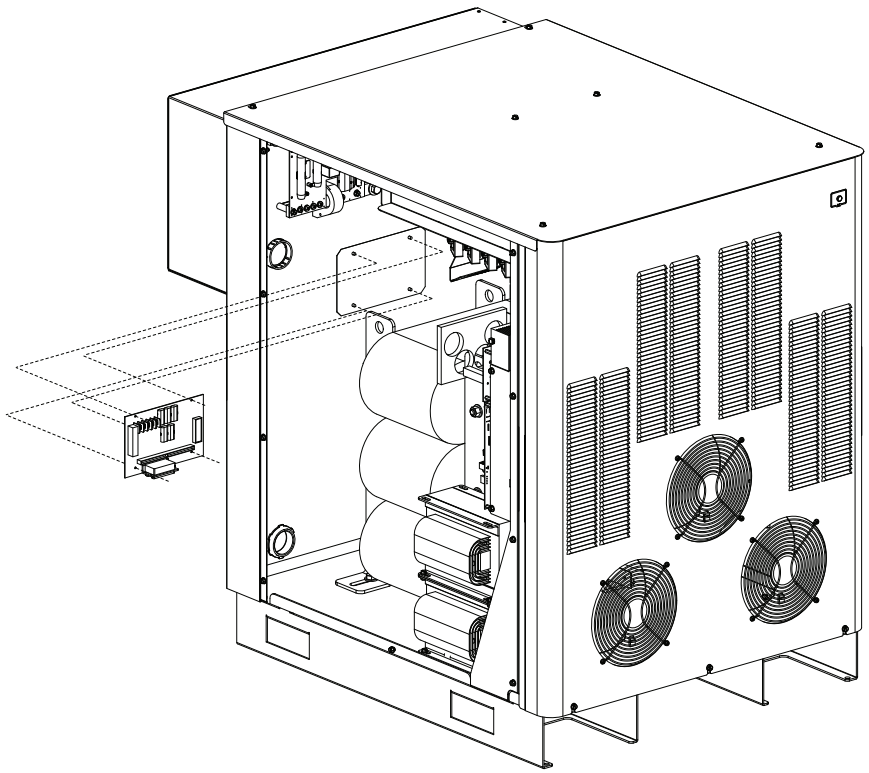


Figure 3i-9 Left side panel removal

Ⓒ

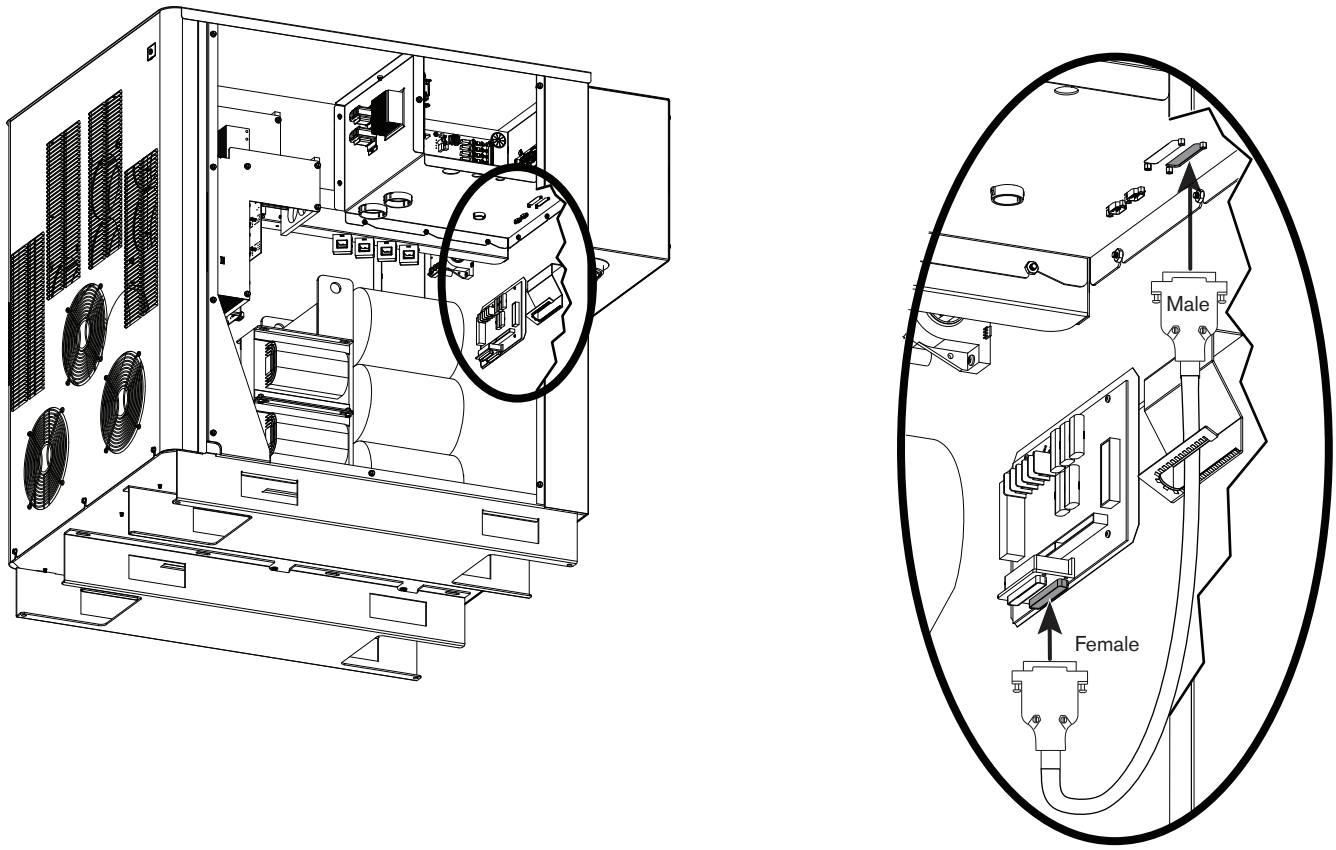
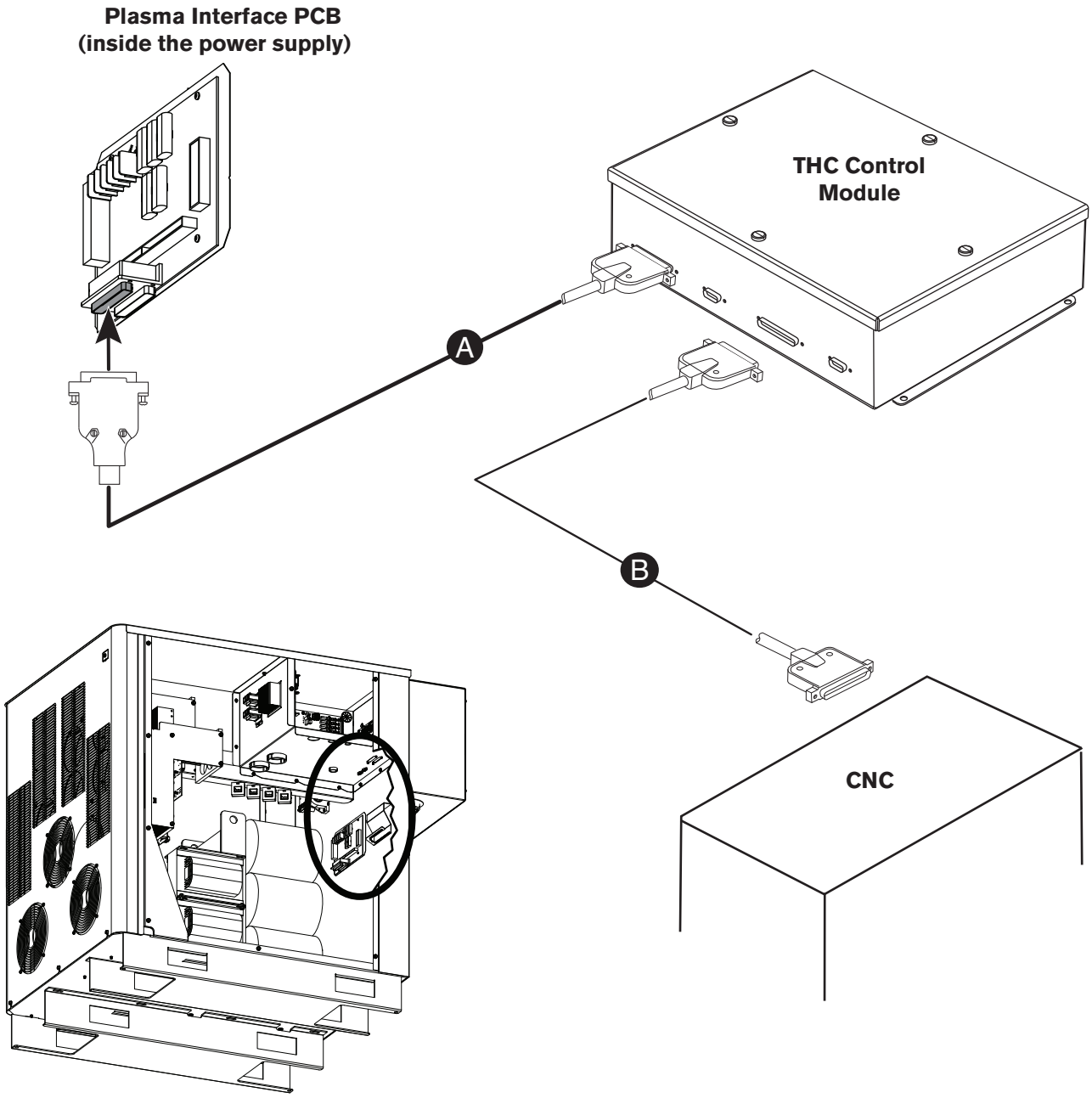


Figure 3i-10 Plasma interface and control PC board connections

Connect the plasma interface assembly to the THC control module

A Install the plasma interface cable (see page 3-22 for part numbers) from the plasma interface PCB in the power supply to the THC control module.

B Install the machine interface cable (see page 3-23 for part numbers) from the THC control module to the CNC.



Plasma interface and I/O board connections

See Figures 3i-4, .3i-5, 3i-6, and 3i-7

A Cut the cable tie on the wires bundled below the I/O board (numbered 25 and 26).

B Make the connections to the plasma interface board using the wire ends with fork terminals. Attach wire number 25 to the terminal marked WORK and wire number 26 to the terminal marked ELECTRODE.

C Make the connections to the I/O board using the wire ends with ring terminals. Connect wire Number 25 to the bottom bus bar as shown. Connect wire No. 26 to the top bus bar marked as shown.

Secure all wires and cables as required.

A

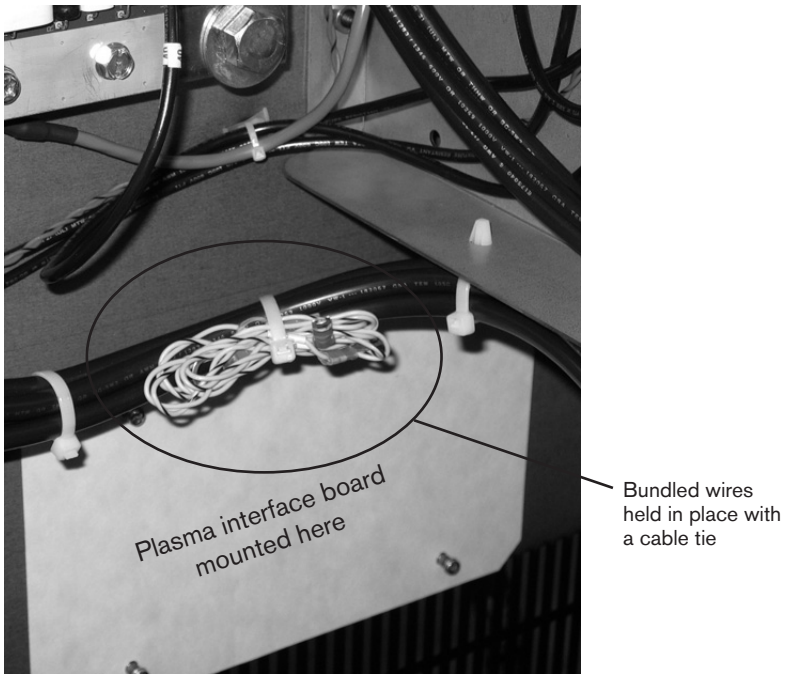


Figure 3i-11 Plasma interface wire location

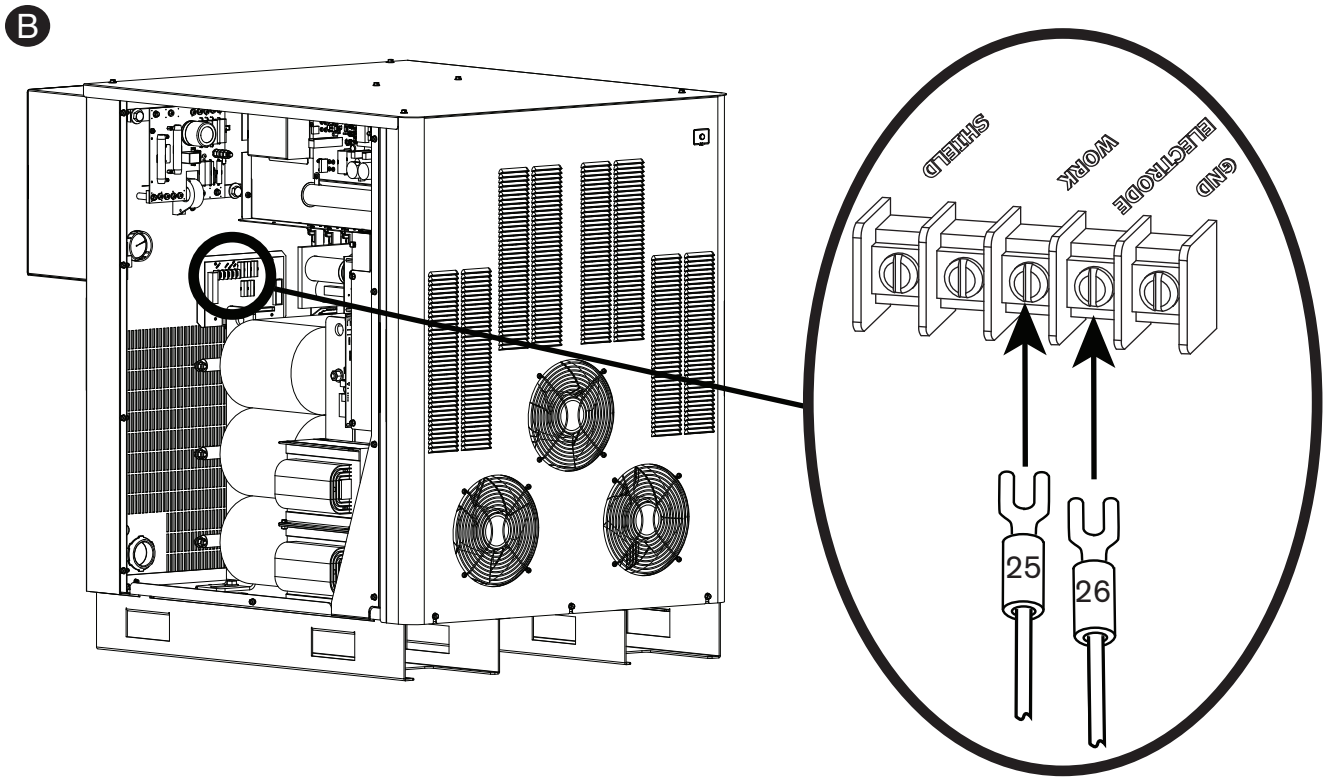


Figure 3i-12 Plasma interface PC board connection

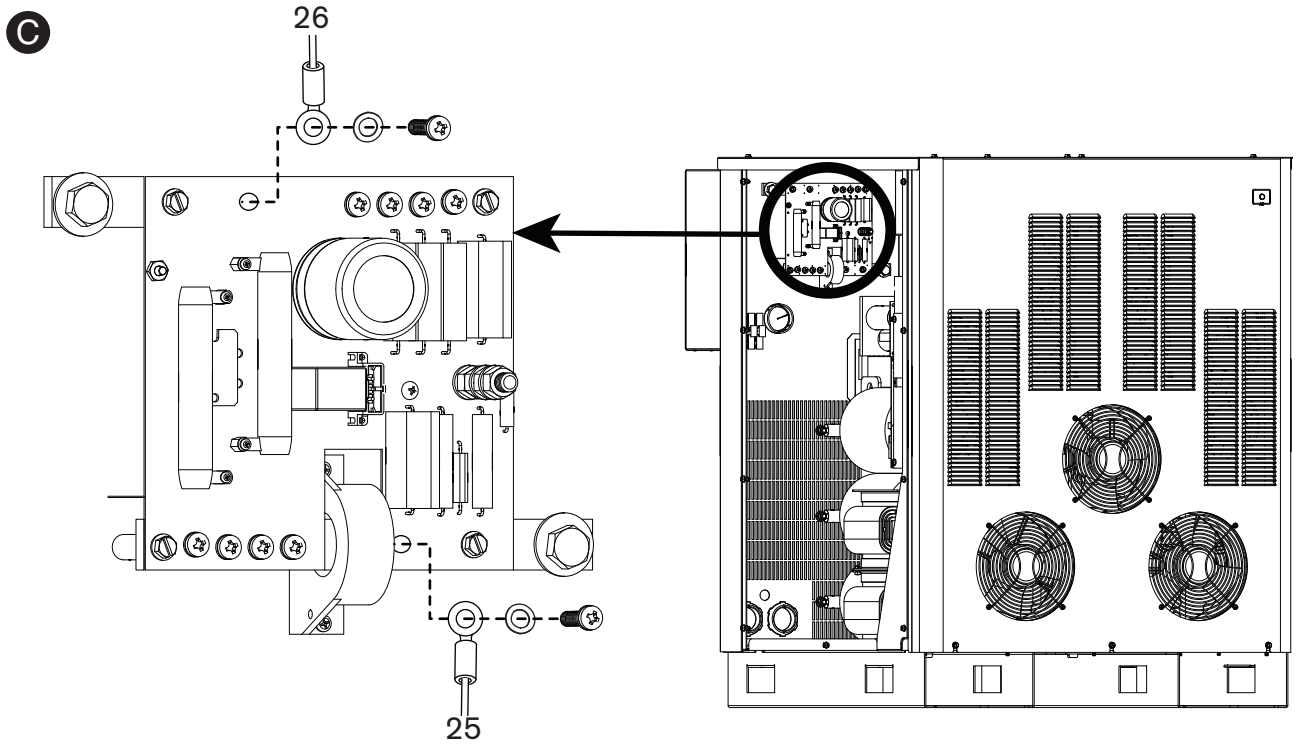


Figure 3i-13 I/O board connections

Ohmic contact wire

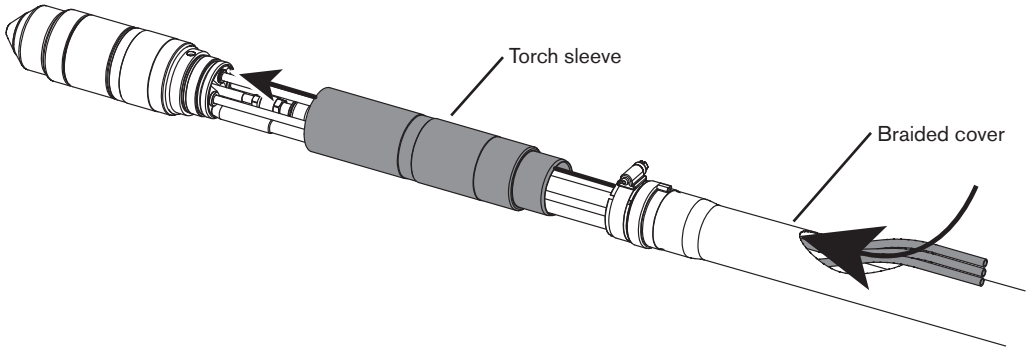
See Figure 3i-8.

Ⓐ Route the ohmic contact wire through the braided cover and torch sleeve and attach the connector to the torch. See figures below.

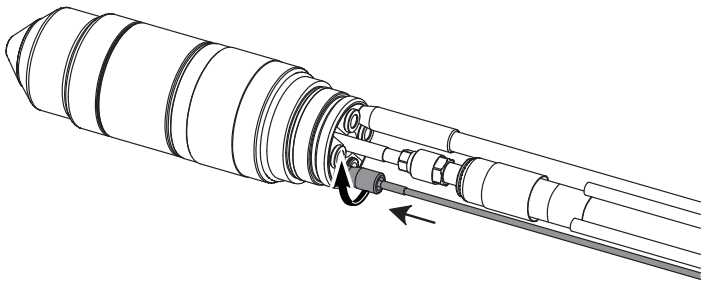
Ⓑ Insert the wire through the rear of the power supply, install the appropriate size fork terminal on the wire end, and attach the wire to the terminal labeled SHIELD on the plasma interface PC board. See figure 3i-14

Ⓐ

1. Slide the end of the ohmic contact wire, with the connector attached, through the opening in the braided cover and the torch sleeve.



2. Insert the connector into the torch receptacle and turn it by hand until it is tight.



HPR400XD Ohmic contact wire part numbers

Part no.	Length
123983	3 m (10 ft)
123984	6 m (20 ft)
123985	7.5 m (25 ft)
123986	9 m (30 ft)
123987	12 m (40 ft)
123988	15 m (50 ft)
123989	23 m (75 ft)
123990	30 m (100 ft)
123991	45 m (150 ft)

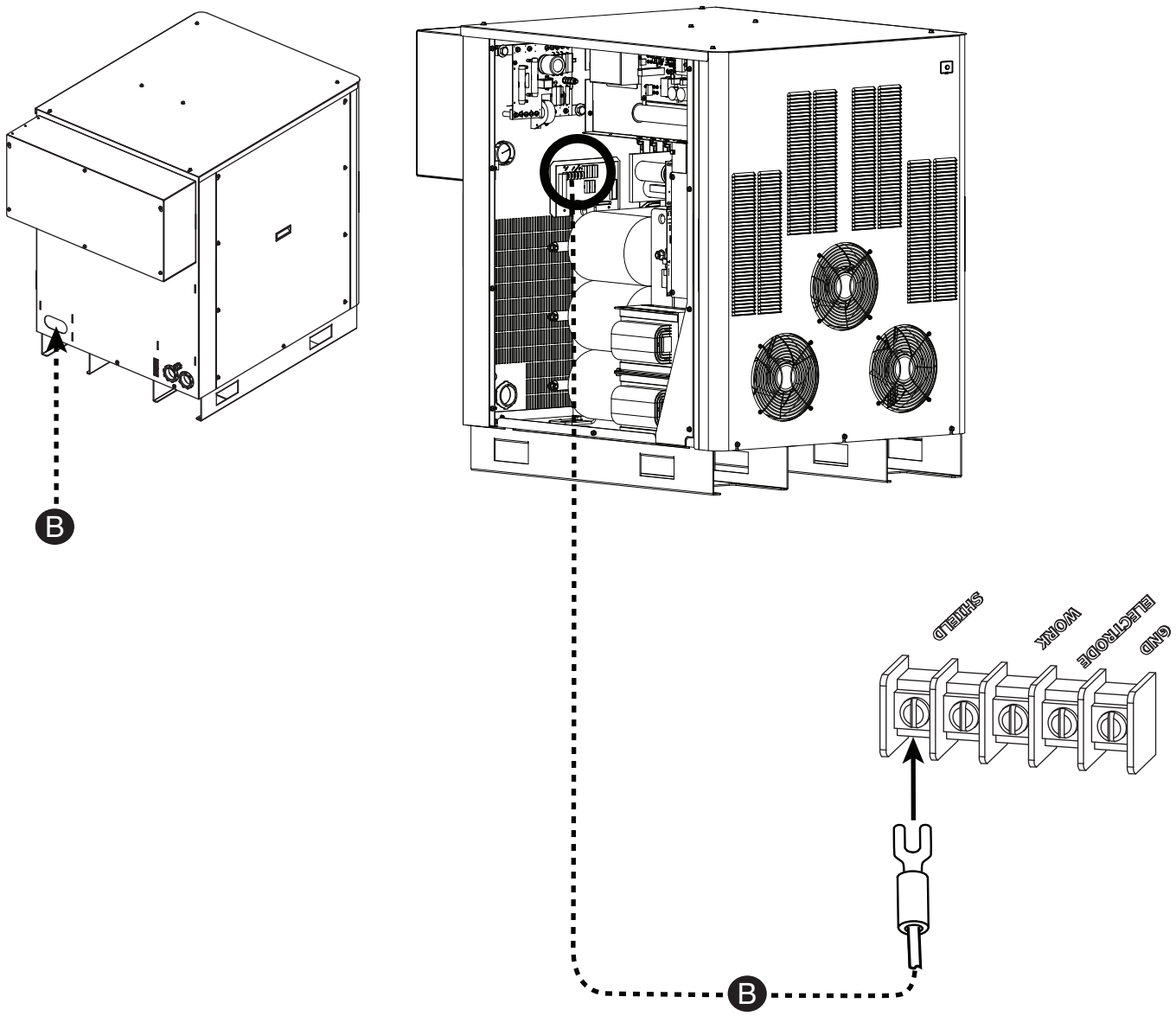


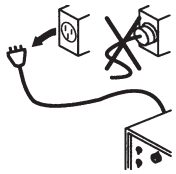
Figure 3i-14 Ohmic contact wire connection

Section 3j

HSD SYSTEM INTERCONNECTIONS

Remove the cover and the rear panel


DANGER
ELECTRIC SHOCK CAN KILL



Turn off all electrical power before removing the power supply cover. Press the power supply OFF (0) pushbutton switch and set the line disconnect switch to OFF. In the U.S., use a "lock-out and tag-out" procedure until the service or maintenance is complete. In other countries, follow appropriate local or national safety procedures.

See Figure 3j-1 and 3j-2.

A Remove the cover from the plasma interface assembly.

B Remove the rear panel from the powe supply

A Remove the cover from the plasma interface assembly.

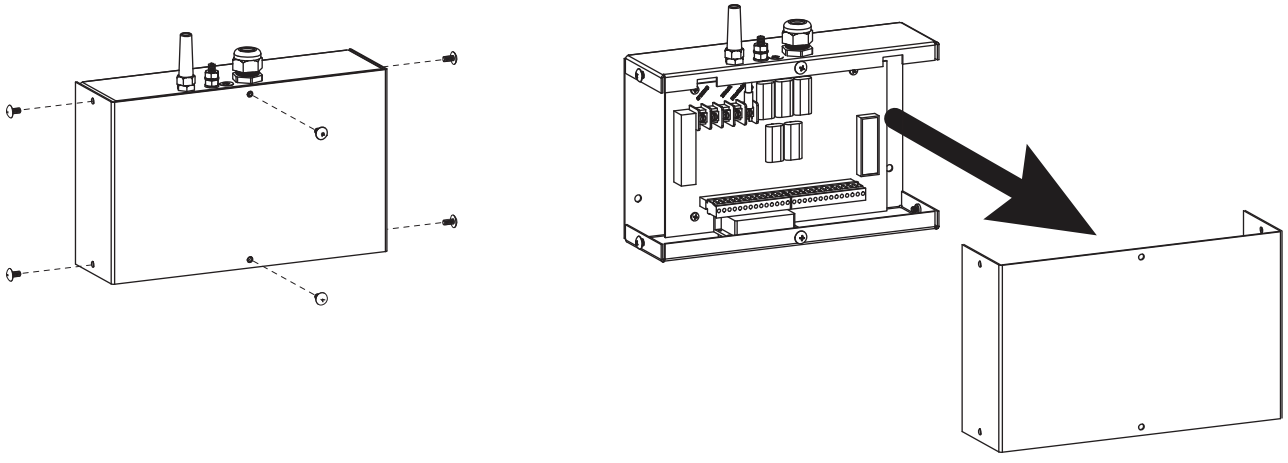
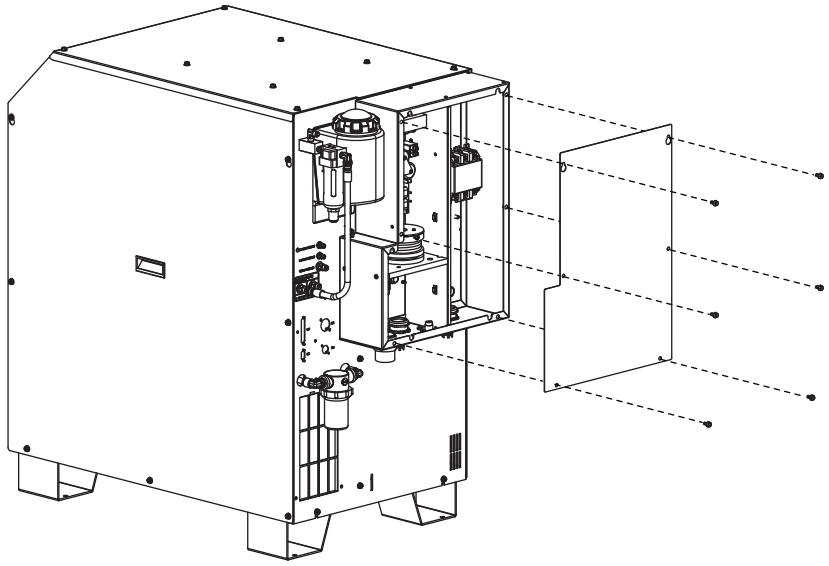


Figure 3j-1 Plasma interface assembly

Ⓑ Remove the rear panel from the HSD power supply.



Arc voltage wires

Fabricate the wires as follows:

- Use 18AWG (0.9 mm^2), single pair, unshielded wire, rated for 600V or greater.
- Wire length: As required, from the power supply to the plasma interface assembly.
- After determining the correct wire length from the power supply to the plasma interface assembly, install appropriate size fork or ring terminals on the wire ends.

Figure 3j-2 Power supply

Install the arc voltage wires

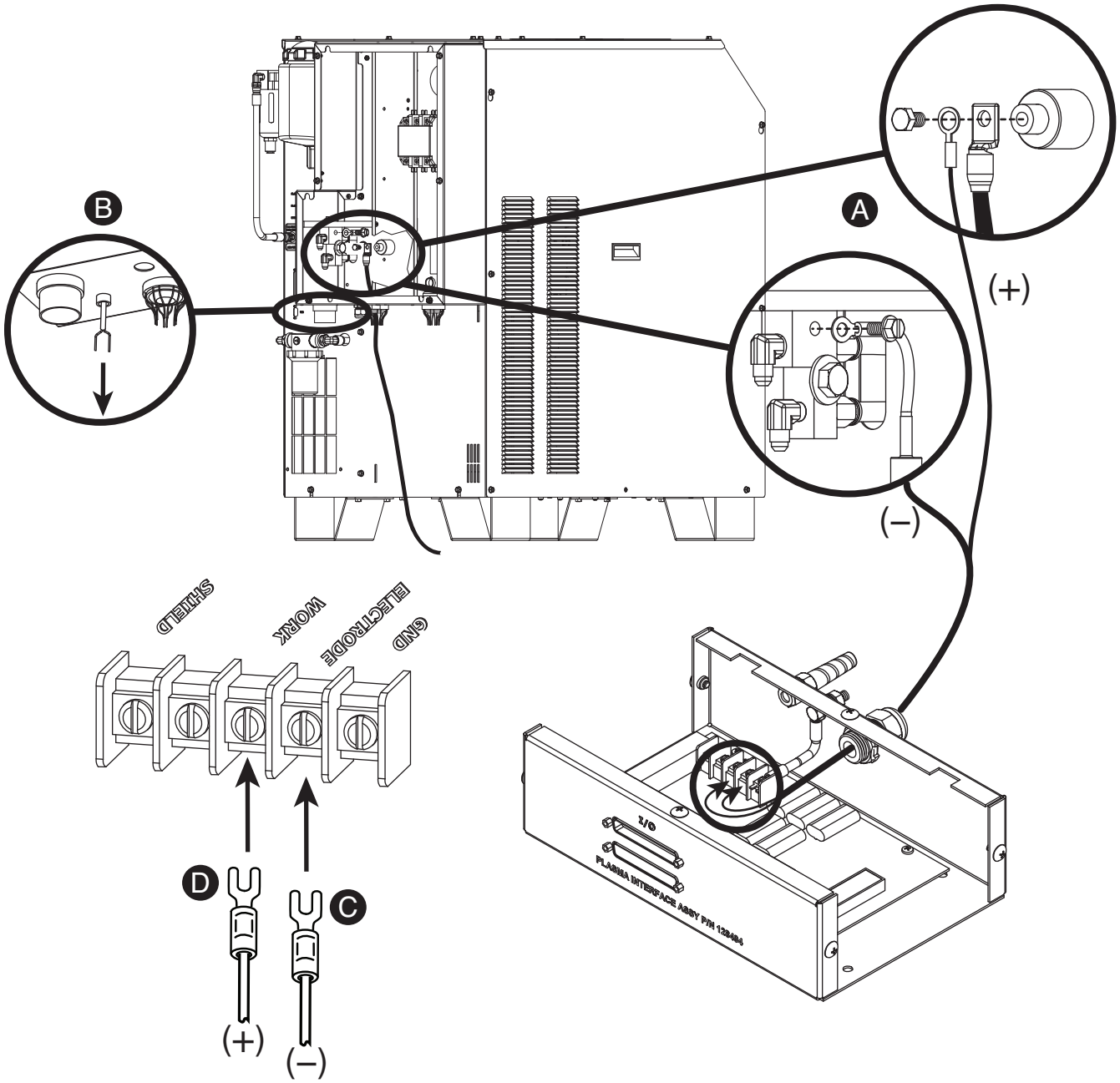
A Make the connections to the HSD power supply as shown below.

B Put the wire ends through the strain relief, where shown, in the power supply.

C Install the appropriate size fork terminal on the end of the negative (–) wire, and attach the wire to the terminal strip, in the plasma interface assembly, labeled ELECTRODE.

D Install the appropriate size fork terminal on the end of the positive (+) wire, and attach the wire to the terminal strip, in the plasma interface assembly, labeled WORK.

D Reinstall the panel on the power supply.



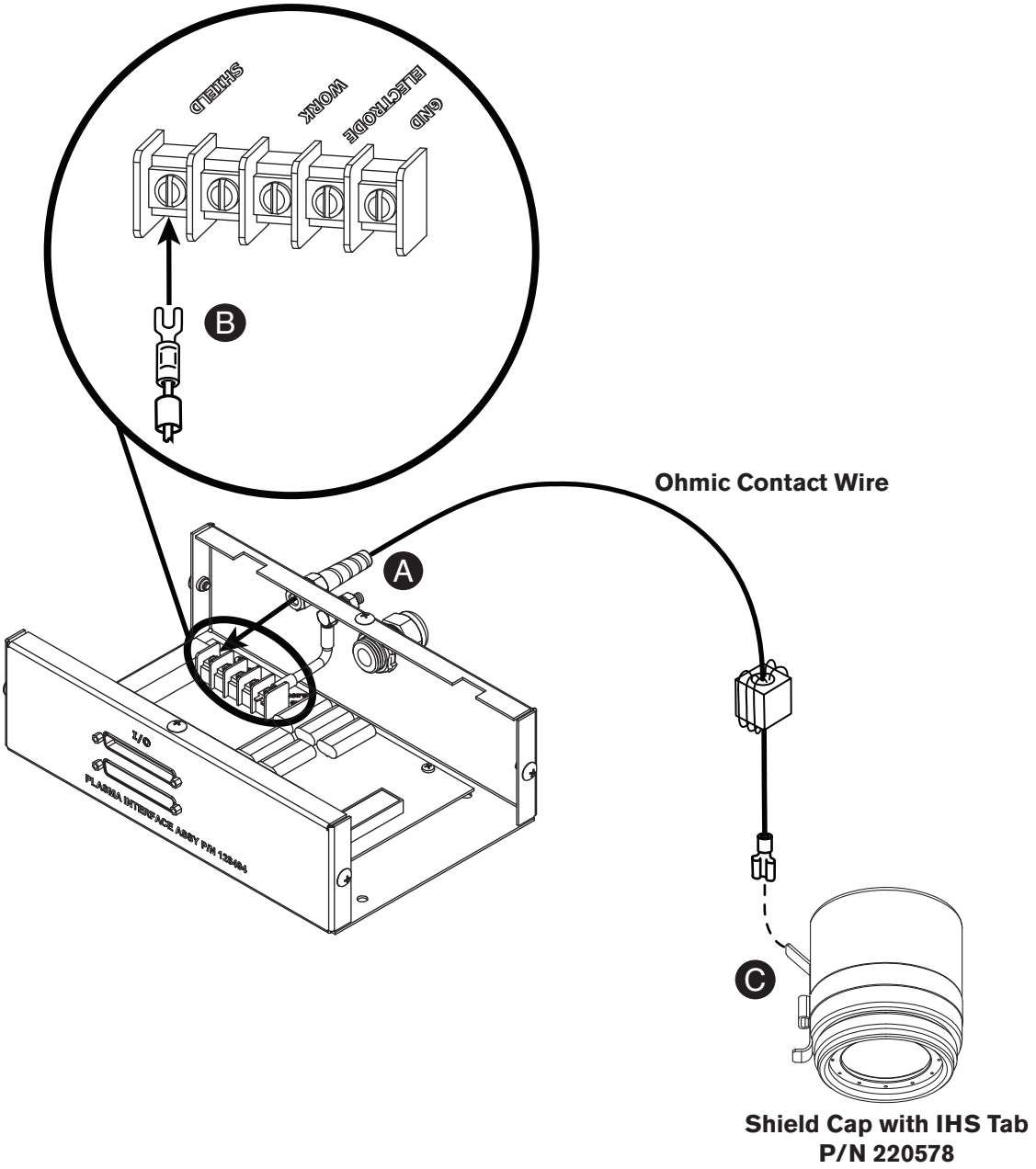
Ohmic contact wire

A Install the ohmic contact wire through the strain relief of the plasma interface assembly.

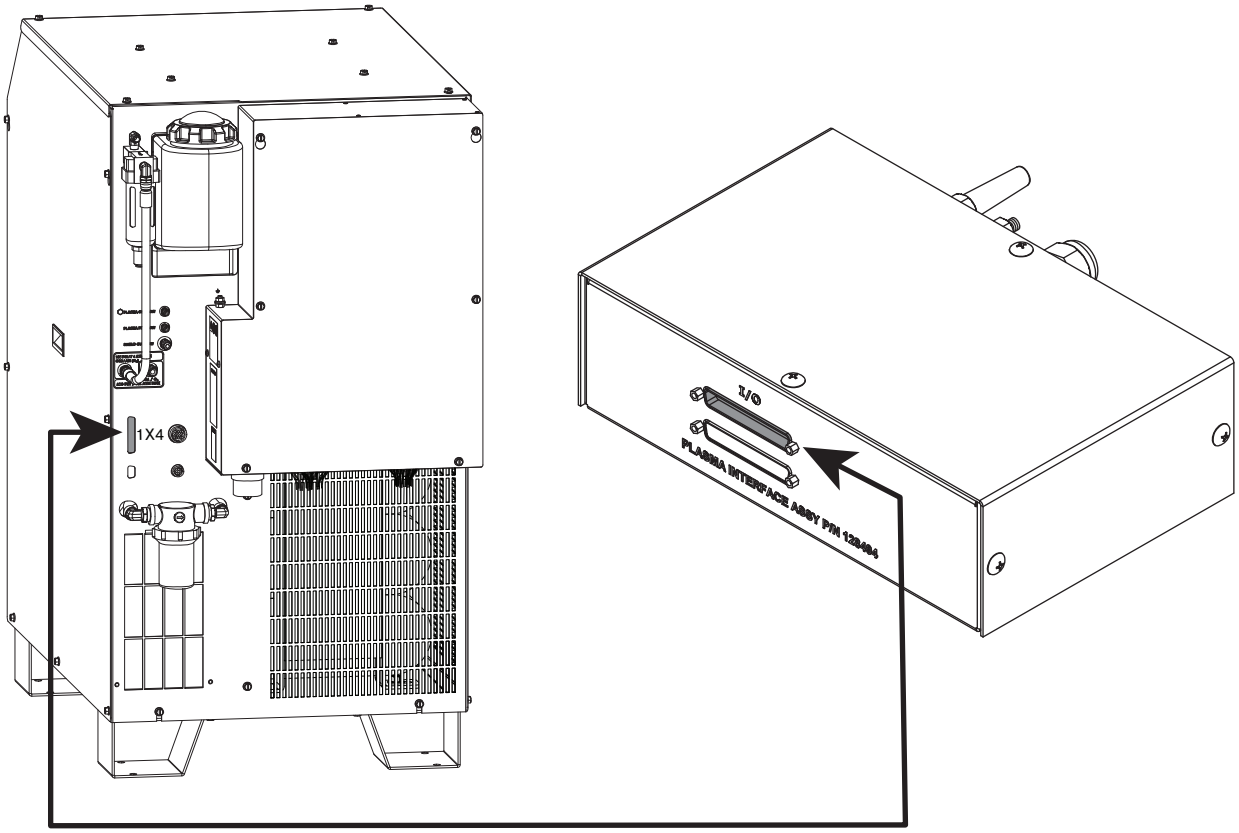
B Install the appropriate size fork terminal on the wire end and attach the wire to the terminal labeled SHIELD on the plasma interface PC board.

C Install the other end of the ohmic contact wire to the IHS tab on the torch retaining cap.

D Reinstall the cover onto the plasma interface assembly.



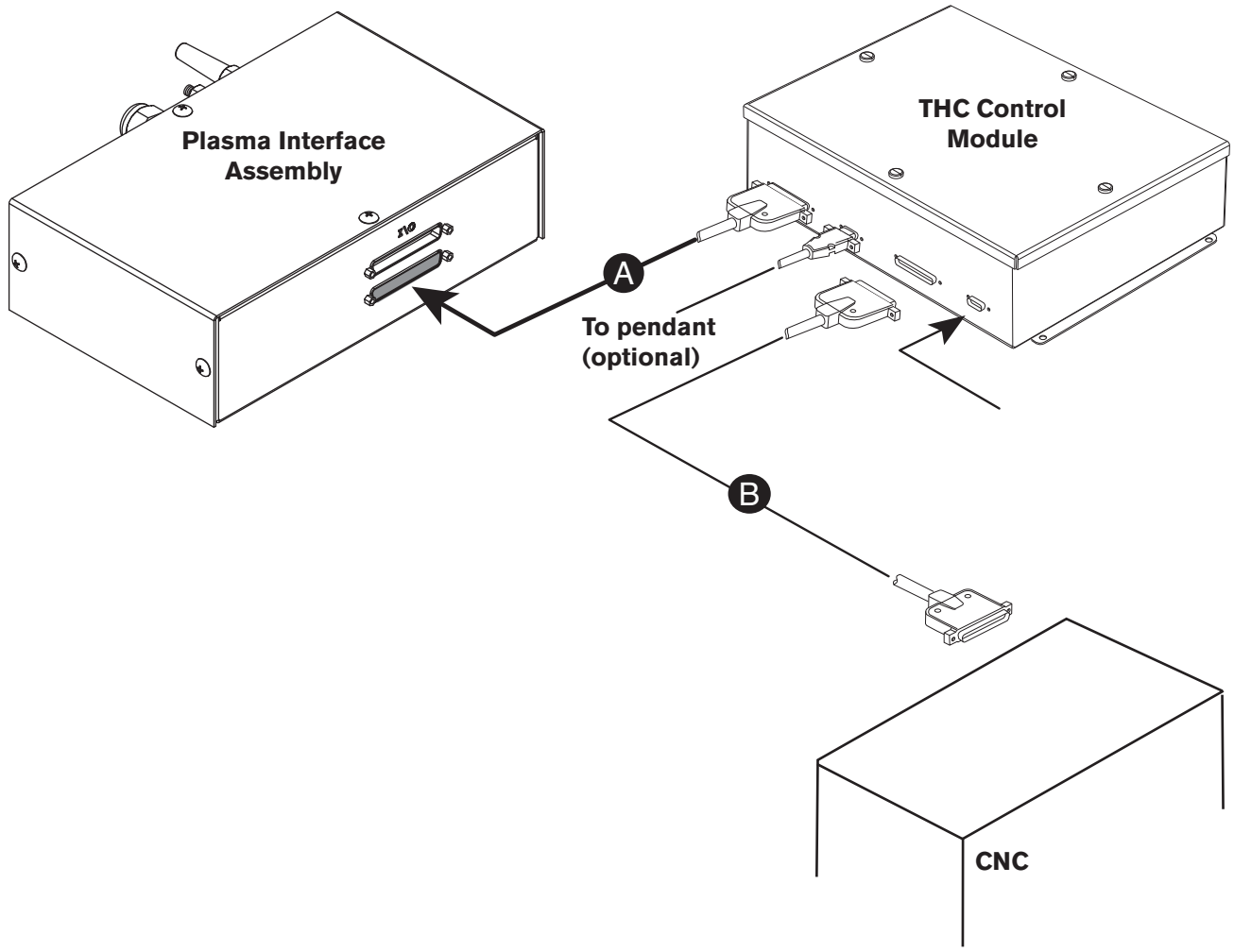
B Install the machine interface cable (see page 3-22 for part numbers) from the power supply to the plasma interface assembly.



Connect the plasma interface assembly to the THC control module

A Install the plasma interface cable (see page 3-22 for part numbers) from the plasma interface assembly to the THC control module.

B Install the machine interface cable (see page 3-23 for part numbers) from the plasma interface assembly to the CNC.



Section 4

OPERATION

In this section:

Operating controls 4-2
- THC control module 4-2
- Operator pendant 4-2
- Pendant display screens 4-4
- Pendant programmable fields 4-6
  - Automatic operation screen 4-6
  - Manual operation screen 4-8
  - Setup screen A 4-9

Determining pierce height factor 4-11
- Typical pierce height factor 4-11
- Pierce height factor for thicker materials 4-12

THC operating cycle time-lines 4-14
- Automatic mode time-line 4-15
- Problems and solutions 4-16
- Manual mode time-line 4-18

THC selectable responses (DIP switch) ..... See section 3 *Setup*

Operating controls

THC control module

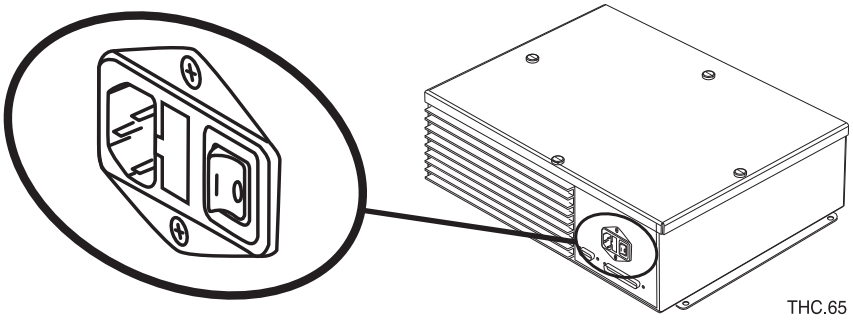


Figure 4-1 Power switch

Operator pendant

The operator pendant consists of the LCD display, the keypad, and the connecting cable. See Figure 4-2 and the following table for pendant keypad use.

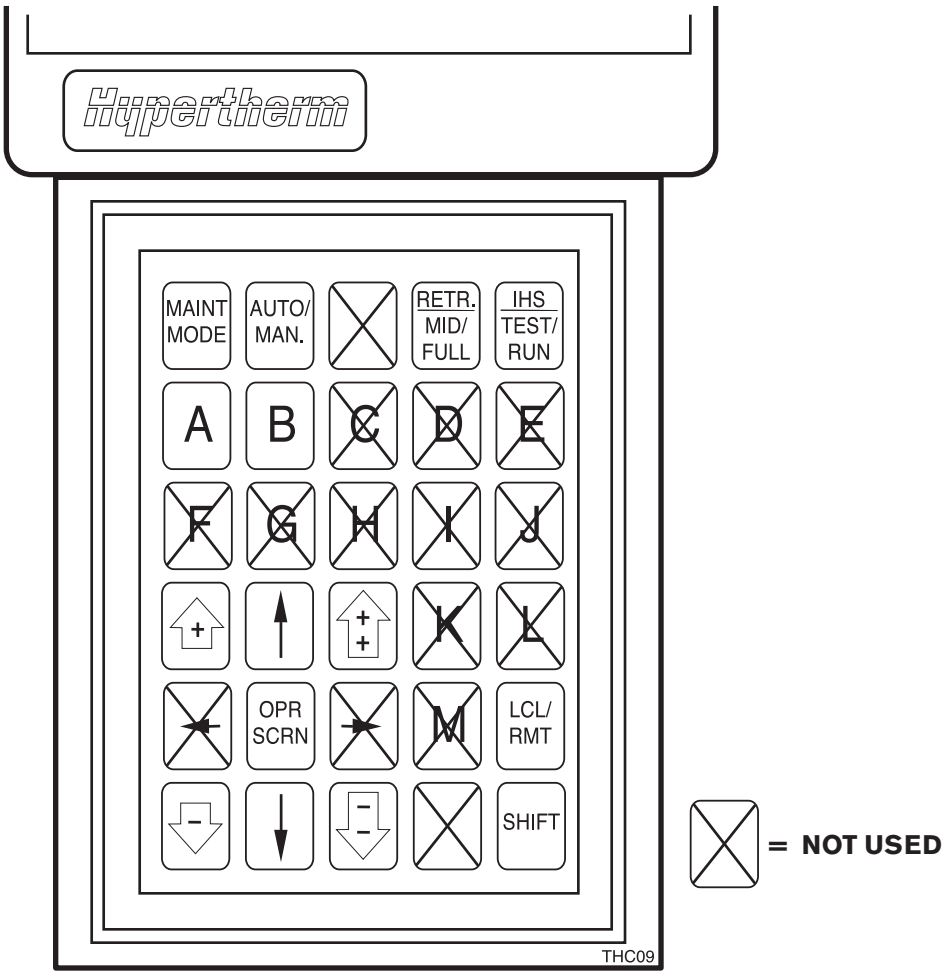


Figure 4-2 Operator pendant key pad

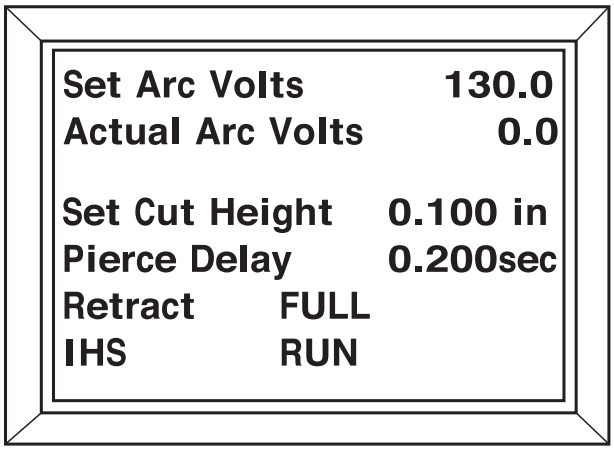
KEY	FUNCTION/USE
MAINT MODE	Lifter moves to home position (full up), the brake locks to prevent the torch from diving, and system ignores the Cycle Start signal.
AUTO/ MAN.	Selects main operating screen for either automatic or manual control mode.
RETR. MID/ FULL	Selects the height the torch retracts after completing a cut. FULL = full retract MID = programmable dimension
IHS TEST/ RUN	Initiates IHS test; Torch moves to plate and then retracts to cutting height. Press again to return to RUN mode.
 	Selects data field for changing operating parameters.
   	Changes the value of selected field. Changes torch height while in manual mode.  small increase  large increase small decrease large decrease
OPR SCRN	Returns to main operating screen (automatic or manual).
LCL/ RMT	Selects operator pendant (local) or CNC (remote) as control. Press SHIFT key to enable this key.
SHIFT	Enables LCL/RMT key. Enables B key when viewing the Diagnostic Screen.
A	Selects Setup Screen A.
B	Selects Diagnostic Screen B. Press *SHIFT B* to begin diagnostic.

Pendant display screens

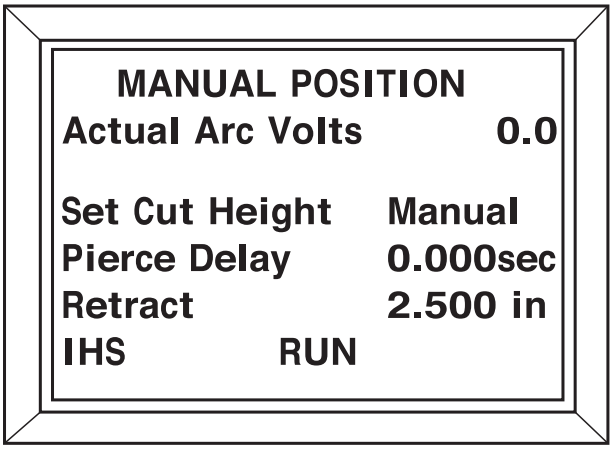
Pendant display screens are shown in Figure 4-3.

SCREEN	*TO GET TO THIS SCREEN*	FUNCTION
AUTOMATIC OPERATION	Press AUTO/ MAN.	Can view and adjust basic operating parameters. Can perform initial height sensing (IHS). Automatic voltage control (AVC) is active. Torch height is automatically adjusted during a cut to maintain the displayed Set Arc Volts.
MANUAL OPERATION	Press AUTO/ MAN.	Torch height can be changed (stationary or during a cut) by pressing the yellow increment (arrow up) or decrement (arrow down) keys. No IHS, AVC, or Rapid Pull-back.
SETUP A	Press A	Can view and adjust detailed operating parameters. ***Press*** OPR SCRN ***to return to main operation screen.***
DIAGNOSTIC B	Press B	Can perform limited on-site testing of the THC controls, cabling and lifter. Proper testing requires that the lifter have an unobstructed path through full length of stroke. Also displays Firmware revision and type of lifter installed. ***Press*** OPR SCRN ***to return to main operation screen.***
REMOTE MODE	Press SHIFT and LCL/ RMT or from CNC	Turns system control over to the CNC. No parameters can be changed from the pendant. ***Press same keys to return to main operation screen.***
MAINTENANCE MODE	Press MAINT MODE	Informs operator that the system is in the maintenance mode. The lifter brake is locked and the system will not respond to the Cycle Start signal. ***Press*** MAINT MODE ***to return to main operation screen.***

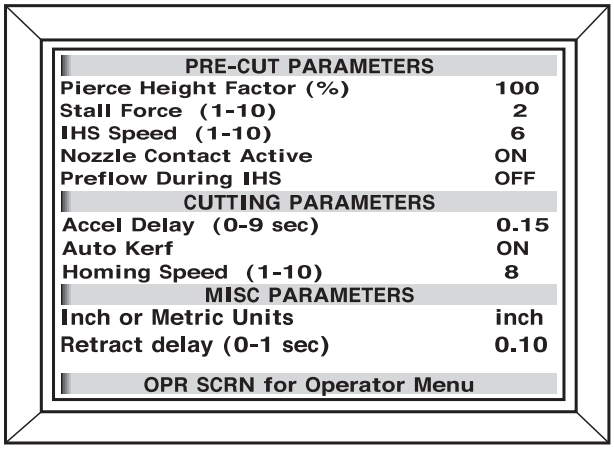
Automatic Operation Screen



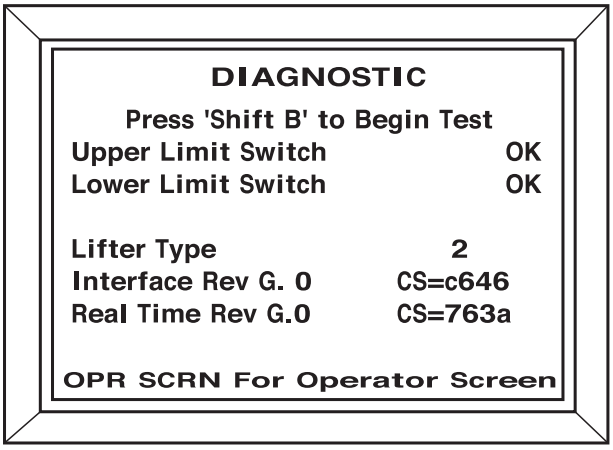
Manual Operation Screen



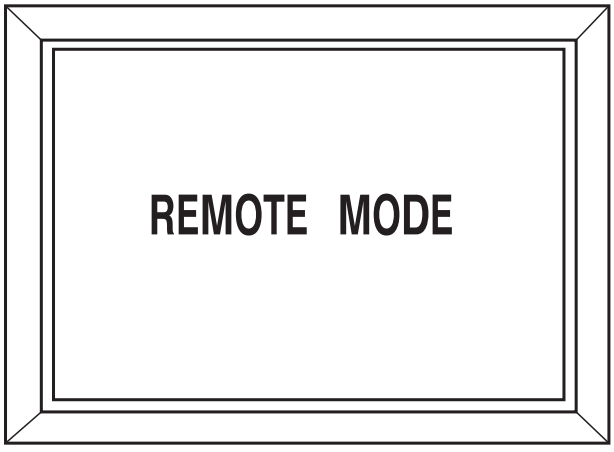
Setup Screen A



Diagnostic Screen B



Remote Mode Screen



Maintenance Mode Screen

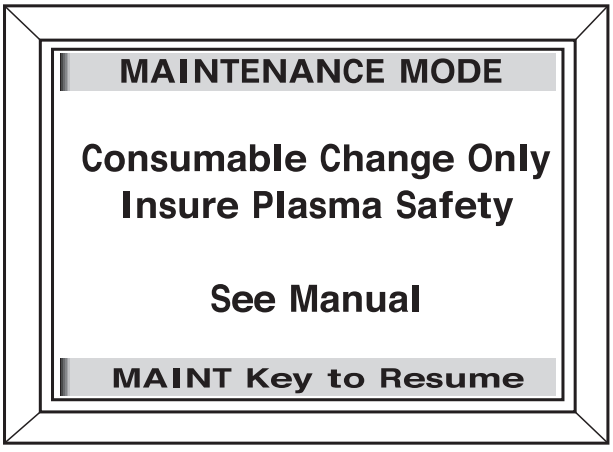
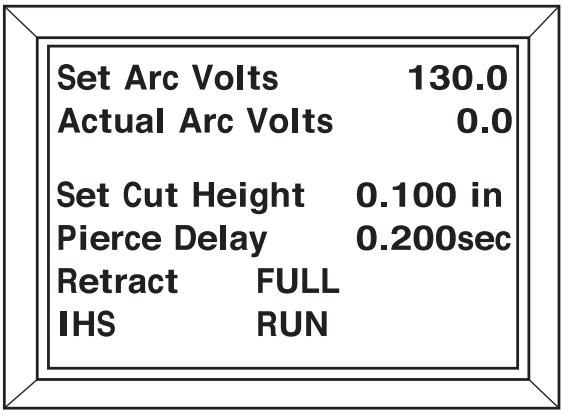


Figure 4-3 Pendant display screens

Pendant programmable fields

The following fields can be changed to adjust system operating parameters.

Automatic Operation Screen



Set Arc Volts

Sets the automatic voltage control (AVC) setpoint. Set Arc Volts can be changed any time (stationary or during a cut). When the AUTO mode is selected and after the Pierce Delay and Machine Accel Delay times have elapsed, the arc voltage is controlled by the THC (torch height). The THC adjusts the torch height during a cut, to maintain the Set Arc Volts.

Small change: +/– 0.5 V

Large change: +/– 5 V

Setpoint range: 50–300 V

Set Cut Height

Sets the initial cutting height before AVC is activated. Also sets the pierce height. See *Determining Pierce Height Factor* later in this section.

During a normal cut cycle, the torch will move down and sense the workpiece, and then retract to the Pierce Height. At this point the THC will issue a “Start” signal to the plasma system and wait for a “Transfer” signal. **The torch will move to the Set Cut Height after the Pierce Delay time has elapsed.**

Small change: +/– 0.010 inch/0.2 mm

Large change: +/– 0.100 inch/2 mm

Setpoint range: 0.010–1 inch (0.25–25.4 mm)

Pierce Delay

Sets Pierce Delay (motion dwell time). After receiving the “Transfer” signal from the plasma system, the THC will delay both the “Machine Motion” and the “Pierce Complete” signals during the pierce delay time. After the “Pierce Delay” time, the “Machine Motion” output will become active and the cutting machine will begin to move. At the same time, the torch height will rapidly adjust to **the Set Cut Height setting and the Machine Accel Delay will begin.**

Note: For best performance, use the THC pierce delay, not the CNC pierce delay. The Pierce Complete signal only applies to HyDefinition plasma systems.

 Small change: +/– 0.010 second

 Large change: +/– 0.100 second

Setpoint range: 0–9 seconds

Retract

Selects Retract to FULL or to a programmed value set by the operator. In the FULL mode, the torch will retract to the home position (full up).

A retract distance that is too low will increase the risk of a torch collision when moving to a new cutting position.

 Small change: +/– 0.050 inch/1.27 mm

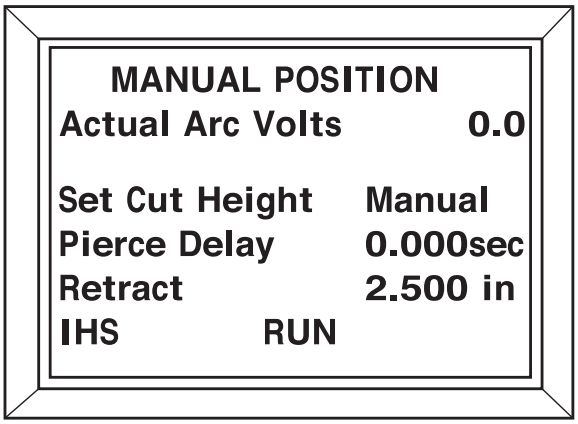
 Large change: +/– 0.50 inch/12.7 mm

Setpoint range: 0–8 inches (0.0–203 mm)

IHS

Selects IHS TEST (no plasma arc) or RUN mode. This control is used to test the IHS without firing the torch. When IHS TEST is selected, the torch will sense the workpiece (with ohmic contact sensing or limited force stall sensing) and then retract to the piercing height. Then when IHS RUN is selected, the torch will retract to the set retract height. After testing, return to the RUN mode for proper cutting operation.

Manual Operation Screen



Torch Position

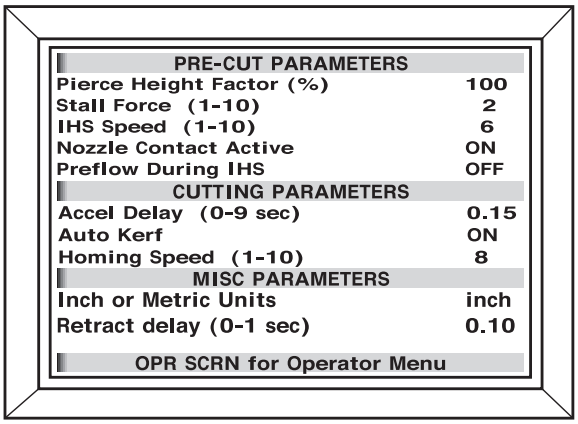
Torch height can be changed when the torch is stationary or during a cut.

Small change: +/– 0.002 inch/0.05 mm

Large change: starts/stops continuous motion

Note: IHS and AVC are disabled when viewing the Manual Operation Screen.

Setup Screen A



Range
50%–300% 1 – 10 1 – 10 ON – OFF ON – OFF
0 – 9 sec ON – OFF 1 – 10
inch or mm 0 – 1 sec

Pierce Height Factor

A percent value used to calculate the pierce height.
During a normal cut cycle, the torch will move down and sense the workpiece, then retract to the Pierce Height (Set Cut Height X Pierce Height Factor). At this point the THC will issue a “Start” signal to the plasma system and wait for a “Transfer” signal.

See *Determining Pierce Height Factor* later in this section.

Stall Force

Sets the lifter downward force during the IHS cycle. This value is a compromise between IHS speed, accuracy and lifter load capacity. Normally this value is set to the lowest force that will reliably move the lifter at the set IHS Speed. This setting will result in the least plate deflection and the greatest IHS accuracy.

This limited-force-stall sensing is the backup mode to the ohmic contact plate sensing. System will default to limited-force-stall sensing if the Nozzle Ohmic Contact is set to OFF.

The use of Stall Force sensing is not as accurate as ohmic contact sensing. To compensate for plate deflection, the user may need to increase the values for Set Cut Height and/or Pierce Height Factor.

Setpoint range: Relative value between 1 (minimum) and 10 (maximum)

IHS Speed

Sets the lifter downward speed during the IHS cycle. This value is a compromise between lifter speed and IHS accuracy.

Note: At lower speeds the IHS accuracy will be improved. At excessive speeds the torch tip may be damaged and decrease IHS accuracy.

Setpoint range: Relative value between 1 (minimum) and 10 (maximum)

Nozzle Contact Active

HD3070, MAX200, HT2000 and HT2000LHF only. Sets ohmic contact sensing to ON or OFF. When sensing is ON, the torch will advance to the workpiece during IHS. The nozzle completes an electrical circuit when it contacts the plate, providing ohmic sensing by the THC.

This parameter should remain ON for most applications. May be disabled (OFF) to get a more reliable IHS when cutting underwater or when cutting extremely dirty or rusty metal. Limited-stall-force sensing is always active and provides secondary sensing to the nozzle ohmic contact sensing.

Preflow During IHS

Sets Preflow During IHS to ON or OFF. When this parameter is ON, the "Plasma Start" and "Hold Ignition" signals will be activated at the start of an IHS cycle.

The "Hold Ignition" signal makes it possible to increase the overall machine throughput. This is done by allowing the two normally sequential processes of IHS and preflow to occur simultaneously. When the IHS cycle is complete and the torch is positioned at the piercing height, the "Hold Ignition" signal is deactivated, allowing the power supply to ignite the torch.

Note that the gas preflow time is determined by the plasma system and will not be reduced by activating this parameter. This function occurs with no interaction with the CNC and is totally under THC control. Some Hypertherm power supplies may not include a "Hold Ignition" signal.

Machine Accel Delay

Sets a delay to allow the cutting machine to reach a steady cutting speed before activating the automatic voltage control (AVC). If AVC is active before the cutting machine reaches a steady cutting speed, the torch may dive toward the plate. During the Machine Accel Delay time, the torch will maintain the Set Cut Height.

This delay is based on the cutting machine acceleration time to reach steady state speed. **Set this delay as low as possible without allowing the torch to dive excessively at the beginning of the cut.**

Auto Kerf Detect

Sets Auto Kerf Detect to ON or OFF. Reduces the probability of the torch diving toward the plate when the arc is crossing a kerf. When this parameter is ON, the THC will constantly monitor the arc voltage for sudden changes. If a sudden change is detected, the THC will assume the torch is crossing a kerf and will maintain the torch height until the arc voltage becomes steady, when AVC is resumed.

If the part being cut does not require crossing a kerf, this parameter should be set to OFF (inactive).

Homing Speed

Sets the lifter retract (homing) speed. This value is a compromise between machine speed and the amount of weight on the lifter. At lower speeds, the lifter is capable of lifting heavier loads.

Setpoint range: Relative value between 1 (minimum) and 10 (maximum)

Inch or Metric Units

Units can be set for inches or millimeters.

Retract Delay

Sets a retract delay to allow time for the arc to ramp down and extinguish. This time delay will start when the CNC removes the "Cycle Start" signal and the plasma system is commanded to shutdown. After this programmed delay, the torch will retract. **Set this delay as short as possible, so that the torch does not retract when the plasma arc is still active.**

Retract Delay should be used on Hypertherm LongLife plasma systems.

Determining pierce height factor

Typical pierce height factor

See Figure 4-4 for sequence of events.

The Pierce Height Factor is a percentage of the cut height. The factor is entered into the THC pendant and the system calculates the required pierce height. The Cut Height will be maintained until the Machine Acceleration Delay time has elapsed, then Automatic Voltage Control will control torch height.

The default pierce height factor is 150%. Typically, this value is left at 150%.

EXAMPLE:	Cut Height	=	0.100 inch
	Pierce Height Factor	=	150%
	0.100 inch X 150%	=	0.150 inch*
	Pierce Height	=	0.150 inch

*THC system performs this calculation.

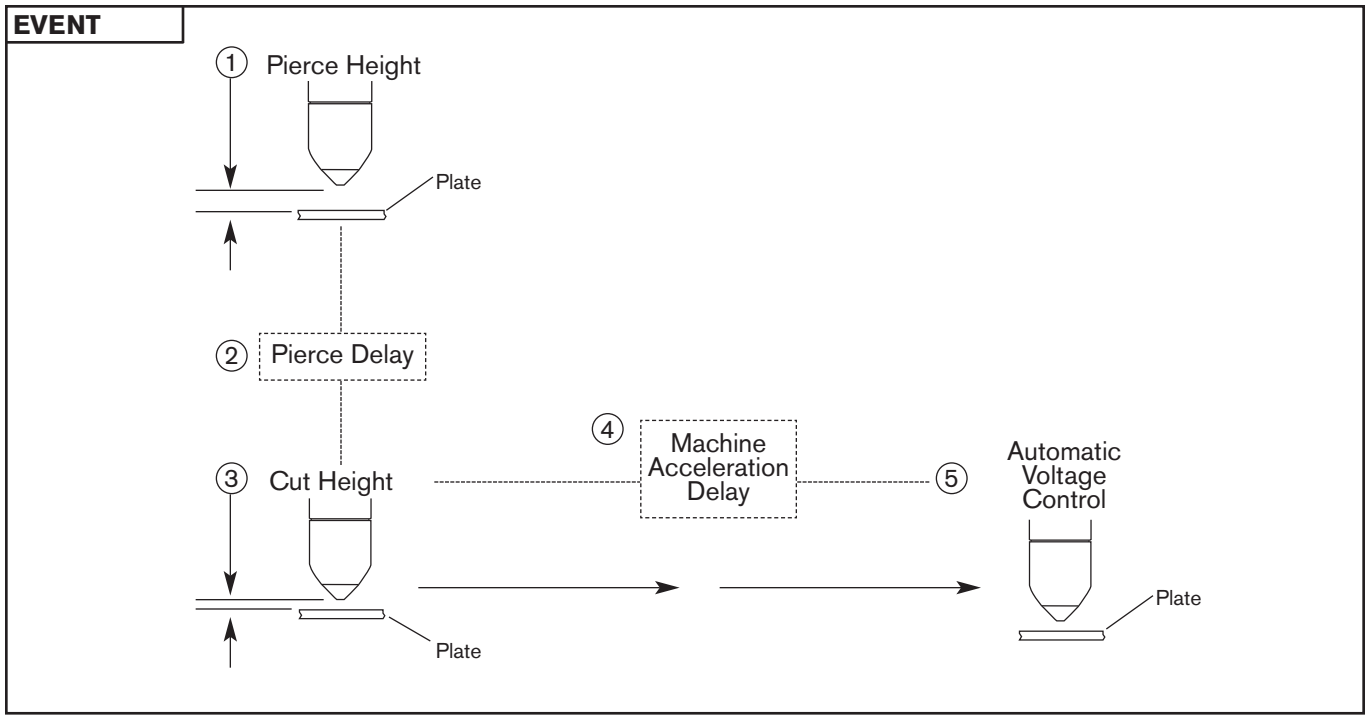


Figure 4-4 Typical pierce height factor – sequence of events

Pierce height factor for thicker materials

General: When cutting materials 3/4 inch (19 mm) or thicker, the torch may contact the molten metal accumulated on top of the plate during piercing. See Figure 4-5. To avoid this, the cut height and pierce height factor can be set so that the torch will jump over the molten metal after piercing is completed.

When to apply: If the torch dives into the molten metal accumulated on top of the plate during piercing. Do not apply if this problem is not encountered during piercing.

Application: Set the cut height to 2X the desired pierce height and enter a pierce height factor of 50%. (These are initial settings which may be adjusted to obtain cut improvements.) After the pierce delay, the torch will retract to the cut height for Machine Acceleration Delay (clearing the molten metal) and then Automatic Voltage Control (AVC) will take over. See Figure 4-6 for sequence of events.

EXAMPLE:	Desired Pierce Height	=	0.25 inch
	Cut Height	=	0.500 inch
	Pierce Height Factor	=	50%
			0.500 inch X 50% = 0.250 inch*
	Pierce Height	=	0.250 inch
			*THC system performs this calculation.

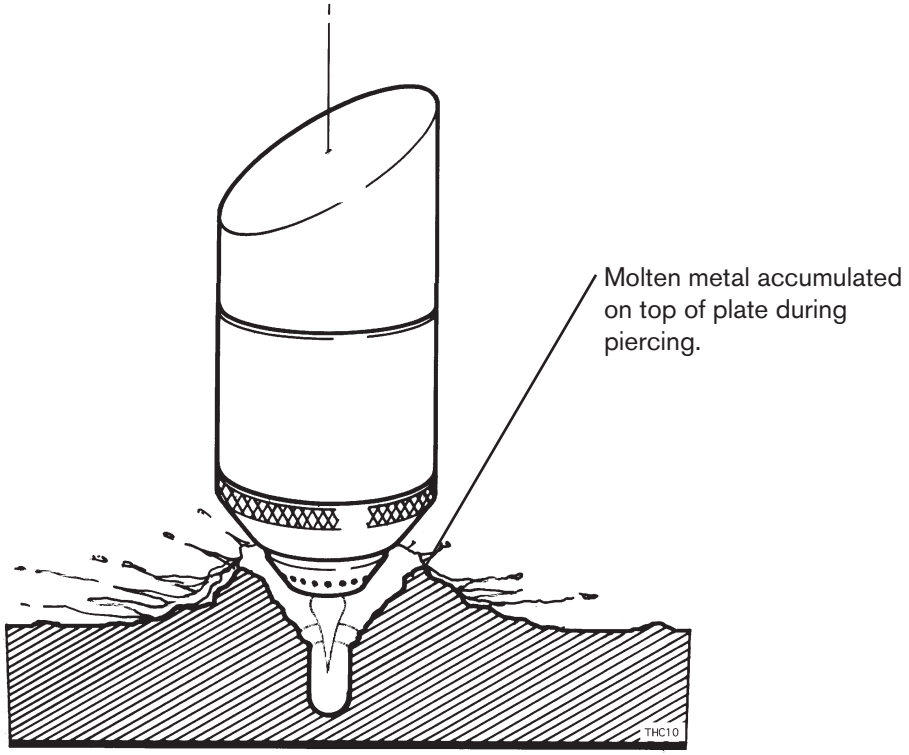


Figure 4-5 Arc piercing thicker materials

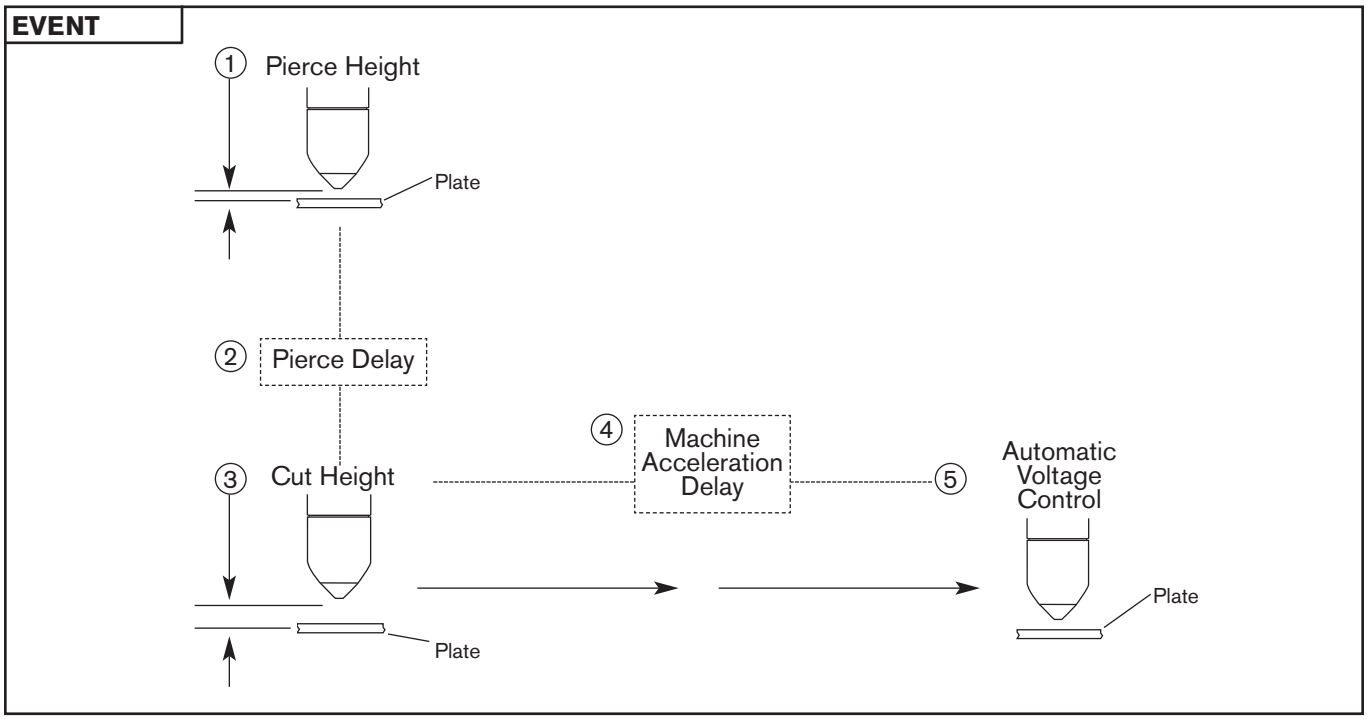


Figure 4-6 Pierce height factor for thicker materials – sequence of events

THC Operating cycle time-lines

The following pages describe the normal operating cycle time-lines for the THC in the automatic and manual modes. Table 4-1 lists the problems that can occur during a typical operating cycle in the automatic mode, as well as solutions that can be done by the operator. The numbers shown in an operating cycle correspond to the numbers in the list of problems and solutions.

WARNING
THE THC LIFTER CAN INJURE YOUR HAND

The down force pressure of the X-Y THC Lifter has potential to cause injury. Be sure that the system is in a safe condition before accessing the lifter area.

Automatic mode time-line

Start

1. CNC traverses to next piercing position.
2. For multiple torch /THC installations only: CNC issues INS-SYNC-IN signal to each THC. This signal holds arc firing until all THCs are at IHS position.
3. CNC issues a CYCLE-START-IN to THC.
4. If Preflow During IHS is enabled, THC issues a PLASMA-START-OUT and a HOLD-IGNITION-OUT signal to plasma power supply.

5a. If Nozzle Contact (ohmic contact) is enabled, torch approaches plate at programmed speed and stall force until nozzle makes ohmic contact with plate; then retracts slowly until nozzle ohmic contact is lost and then retracts to pierce height.

or

5b. If Nozzle Contact (ohmic contact) is disabled, torch dives at programmed speed and stall force, until a motor stall is detected and then retracts to pierce height

6. For multiple torch /THC installations only: THC issues IHS-COMPLETE-OUT signal to CNC. When all IHS-COMPLETE-OUT signals have been satisfied, CNC releases IHS-SYNC-IN signal.
7. If Preflow During IHS is not enabled, THC issues a PLASMA-START-OUT signal to plasma power supply.
8. If Preflow During IHS is enabled, THC releases arc HOLD-IGNITION-OUT signal.
9. Preflow completes, if it has not already completed.
10. Torch ignites.
11. Arc transfers to workpiece. Plasma power supply issues ARC-TRANSFER-IN to THC.
12. Programmed pierce delay signal elapses.
13. Torch quickly dives from pierce height to programmed cut height; programmed MACHINE ACCEL DELAY begins; THC issues PIERCE-COMPLETE-OUT signal to plasma power supply; and THC issues MACHINE-MOTION-OUT signal to CNC to begin profiling part.
14. After MACHINE ACCEL DELAY elapses, arc voltage control (AVC) begins. During AVC, an AUTO-HEIGHT-ON/OFF from CNC freezes torch position (traditional CORNER HOLD). During AVC, CNC should issue an AUTO-HEIGHT-OFF when CNC not moving at programmed velocity. During AVC, if AUTO KERF DETECT is enabled, torch position is frozen when crossing kerfs.
15. At end of cut, CNC releases CYCLE-START-IN signal to THC. Programmed retract delay begins.
16. Programmed retract delay time elapses and the THC raises torch until home limit switch is reached or partial retract height is checked.
17. THC issues RETRACT-COMPLETE-OUT signal to CNC allowing traverse to next cut position.

Cycle completed, return to Start for next cycle.

Table 4-1 THC operating cycle (automatic mode) process problems and solutions

(Refer to operating cycle time-line on previous page)

Problem	Solution
No response to CYCLE-START-IN at THC.	• Check power to THC. On THC control PCB, **D41** – **D44** should be illuminated. Check line input fuses in THC power module. • Check for bad **Cycle Start** connection. Check on THC control PCB, Machine Interface Inputs, that **D9** is illuminated. • Check on control PCB, Machine Interface Inputs, that **D15** is illuminated. • Check on control PCB, External Interlock OK, that **D16** is illuminated. • Check that **Maintenance Mode** is not selected on pendant or do query on RS-422.
Arc ignites before IHS is complete.	• Check that **Preflow During IHS** is **OFF** (disabled) on Setup Screen A. • If plasma power supply has a **Hold** signal, check that it is wired properly.
Torch does not approach workpiece at programmed IHS speed and stall force.	• Check that THC is in **Automatic Mode**. If not, press <AUTO/MAN> key on keypad. • Check that **Stall Force** is not set too low on Setup Screen A. • Check that **IHS Speed** is not set too high on Setup Screen A. • Check for cable and hose obstructions that may stop movement.
Inaccurate IHS with nozzle ohmic contact.	• Check that THC is in **Automatic Mode**. If not, press <AUTO/MAN> key on keypad to select Automatic Mode. • Check that **Nozzle Ohmic Contact** is **ON** (enabled) on Setup Screen A. • Check that nozzle ohmic contact wire is not disconnected. Ensure wire is connected at both ends. • Check **Pierce Height Factor** on Setup Screen A. • Check that torch retaining cap is tight. • Check for water on the workpiece. If present, use Stall Force sensing. Refer to 5b on previous page. • Check for coating (oil, plastic, etc.) on the workpiece. If present, use Stall Force sensing. Refer to 5b on previous page. • Check nozzle/shield, clean or replace. • Check work lead connection.
Inaccurate IHS with Stall Force sensing	• Check that **Nozzle Ohmic Contact** is **OFF** (disabled) on Setup Screen A. • Check **Pierce Height Factor** on Setup Screen A. • Check that **Stall Force** is not set too high on Setup Screen A. • Check that workpiece is not deflecting excessively. Check the work table supports under the workpiece. • Offset workpiece deflection by adjusting **Set Cut Height** on Automatic Operating Screen and **Pierce Height Factor** on Setup Screen A to achieve desired results.
Torch fails to ignite.	• Ensure plasma system is operational. • Check for proper IHS piercing height. Check torch. • Check that **IHS SYNC** is off. Check on THC control PCB, Plasma Interface Inputs, that **D13** is extinguished. • Check torch consumables.

Problem	Solution
Torch arc fails to transfer to workpiece.	• Check that Pierce Height is not too high by checking **Set Cut Height** on Main Operating Screen and **Pierce Height Factor** on Setup Screen A. • Check work lead connection. • Check torch consumables. • Check for **Transfer** signal on control PCB, Machine Interface Inputs, that **D17** is illuminated.
Arc extinguishes immediately after transfer/excessively large pierce hole.	• Check **Pierce Delay** on Automatic Operating Screen; the delay is set too long. (The torch dwells in the piercing position too long before machine motion.) • Check that **Machine Motion Out** is active after Pierce Delay ends. Check on control PCB, Machine Interface Outputs, that **D25** is illuminated.
Torch moves before workpiece is pierced all the way through.	• Check **Pierce Delay** on Automatic Operating Screen, the delay is set too short.
Torch dives below cutting height immediately after pierce delay and before AVC begins.	• Increase **Set Cut Height** on Automatic Operating Screen and decrease **Pierce Height Factor** on Setup Screen A. • Increase **Machine Accel Delay** on Setup Screen A.
Torch dives toward workpiece immediately after AVC begins.	• Increase **Set Arc Volts** on Automatic Operating Screen. • Increase **Machine Accel Delay** on Setup Screen A. • Decrease **Set Cut Height** on Automatic Operating Screen.
Torch retracts from workpiece immediately after AVC begins.	• Decrease **Set Arc Volts** on Automatic Operating Screen. • Increase **Set Cut Height** on Automatic Operating Screen. • Check plasma interface arc voltage wiring.
Erratic voltage control.	• Check for faulty grounds (work lead connection.) • Check for water leaks.
Retract begins before arc has extinguished.	• Increase **Retract Delay** on Setup Screen A.
Failure to retract.	• Decrease **Homing Speed** on Setup Screen A. • Check for obstructions in the torch path and torch lead set.

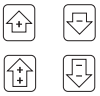
Manual mode time-line

Start

1. CNC traverses to next piercing position.
2. CNC issues a CYCLE-START-IN to THC.
3. THC issues a PLASMA-START-OUT to plasma power supply.
4. Preflow completes.
5. Torch fires and arc transfers to workpiece.
6. Plasma power supply issues TRANSFER-OUT signal to THC.
7. Programmed pierce delay signal elapses. THC issues PIERCE-COMPLETE-OUT signal to plasma power supply; and THC issues MACHINE-MOTION-OUT signal to CNC to begin profiling part.
8. At end of part profile, CNC releases CYCLE-START-IN signal to THC. Torch position freezes until arc has extinguished (until plasma power supply transfer signal is released to THC.)

Cycle completed, return to Start for next cycle.

Note: At any time, the operator can manually jog the torch position up or down using the increment/arrow up or decrement/arrow down keys.



Section 5

MAINTENANCE

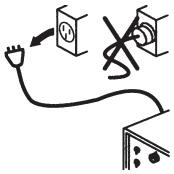
In this section:

Routine maintenance 5-2
X-Y lifter sealing band removal and replacement 5-2
Troubleshooting 5-6
- Diagnostic screen B 5-6
- Error messages 5-6
- AC power distribution 5-10
- Motor drive board status lights during normal power-up 5-11
- DC power distribution 5-12
- Control board status lights during normal power-up 5-14
- Interface board status lights during normal power-up 5-16

Routine maintenance

Every 3 months complete the following:


DANGER
ELECTRIC SHOCK CAN KILL



Turn off all electrical power before removing the power supply cover. Press the power supply OFF (0) pushbutton switch and set the line disconnect switch to OFF. In the U.S., use a "lock-out and tag-out" procedure until the service or maintenance is complete. In other countries, follow appropriate local or national safety procedures.

1. Check the THC control module, plasma interface assembly, lifter assembly and associated cables for wear and damage.
2. Check the inside of the THC control module and plasma interface assembly for dirt. Use compressed air to clean the units. If the work environment is extremely dirty, clean the units more often.
3. Check the lifter assembly sealing band for tears and fraying
4. Replace or repair damaged parts.

Note: Do not grease or lubricate any part of the X-Y lifter assembly.

X-Y lifter sealing band removal and replacement

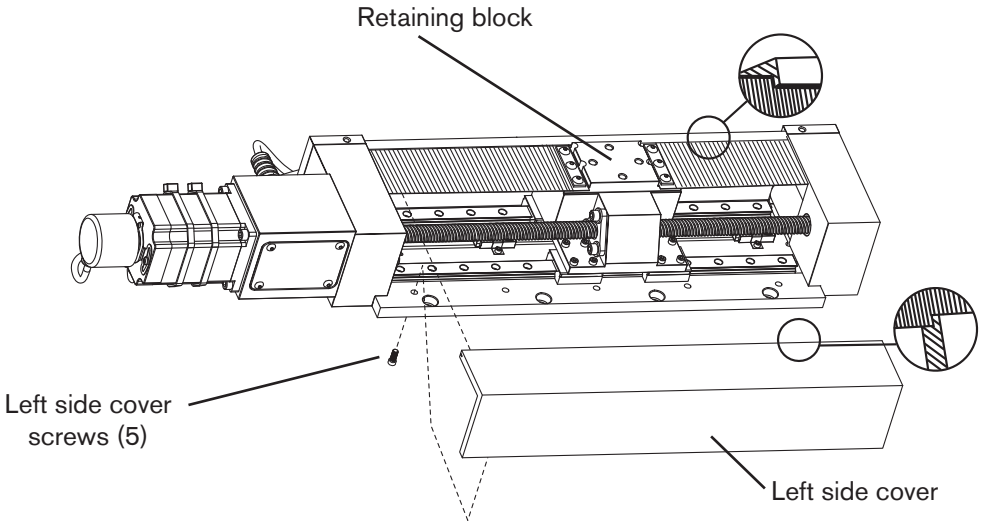
The sealing band keeps foreign matter out of the lifter assembly. Replace the band if it is torn or worn by installing a Band Seal Kit. The kit contains a new band, screws and retainers.

Caution: **Turn off all power to the plasma system and THC before working on the THC lifter.**
The THC system can be damaged if disconnected with power applied.

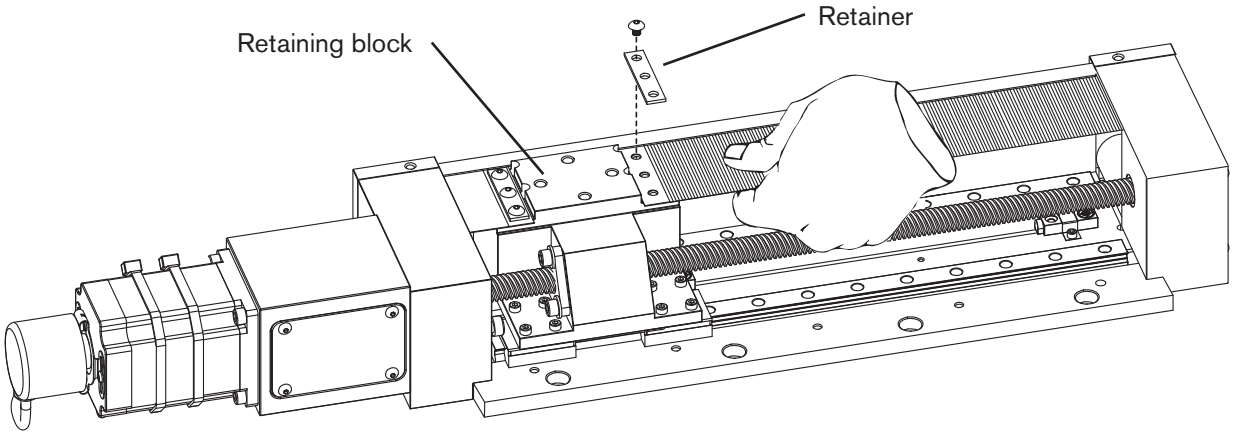
Sealing band – remove (Figure 5-1)

1. Turn off all power to the plasma system and THC.
2. Remove the lifter from the cutting machine.
3. Remove the torch mounting block or breakaway mounting bracket from the lifter retaining block (View 1).
4. Remove the left side cover (View 1).
5. Remove the 2 retainers that secure the band to the retaining block (View 2).
6. Remove the band from the rear of the lifter (View 3).

VIEW 1



VIEW 2



VIEW 3

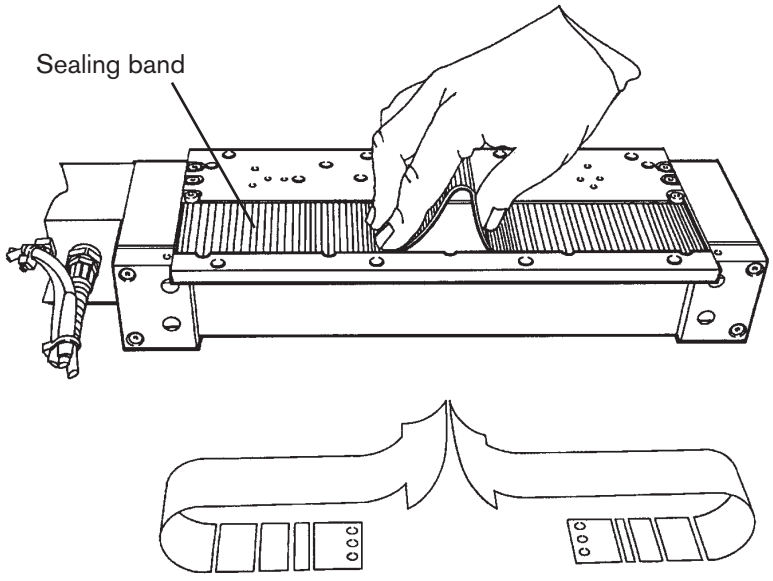


Figure 5-1 Sealing band – Remove

Sealing band – install (Figure 5-2)

1. Install the new band from the back of the lifter (View 1).
2. Route the band through the top and bottom slots. Make sure the band sits in the channel (View 1).
3. Secure the ends of the band to the retaining block with retainers and hex screws. Make sure the band is in the groove (Views 2 and 3).
4. Install the lifter left side cover. Make sure the band is in the groove (View 3).
5. Install the torch mounting block or breakaway bracket as described in Section 3, *Setup*.

VIEW 1

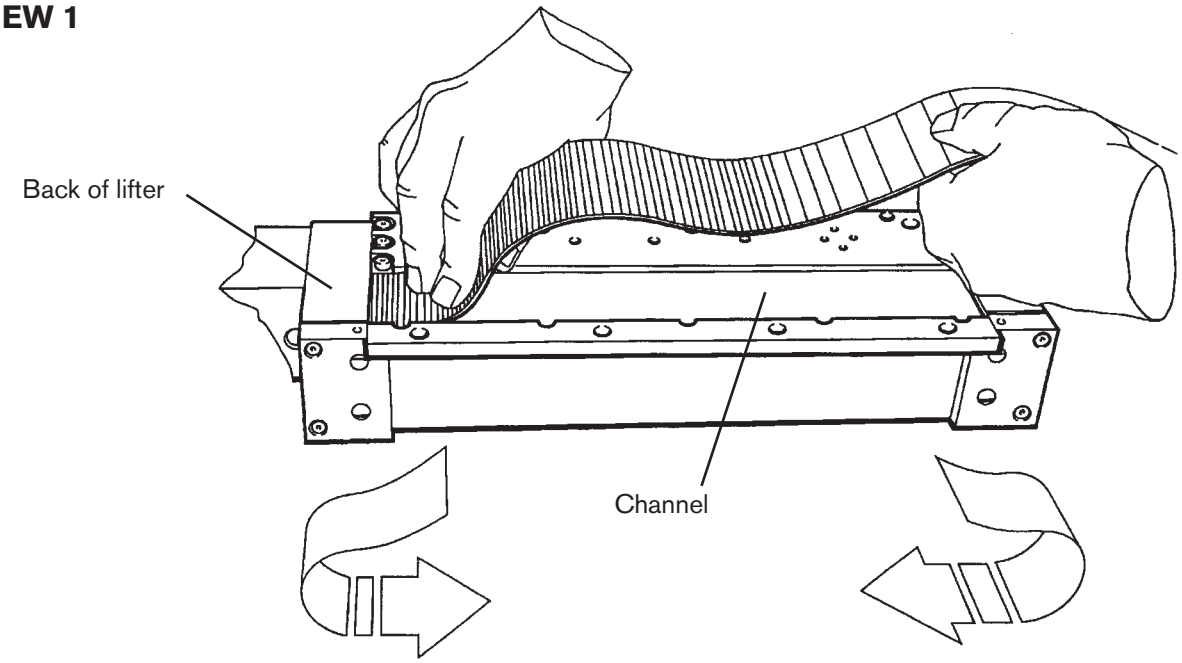
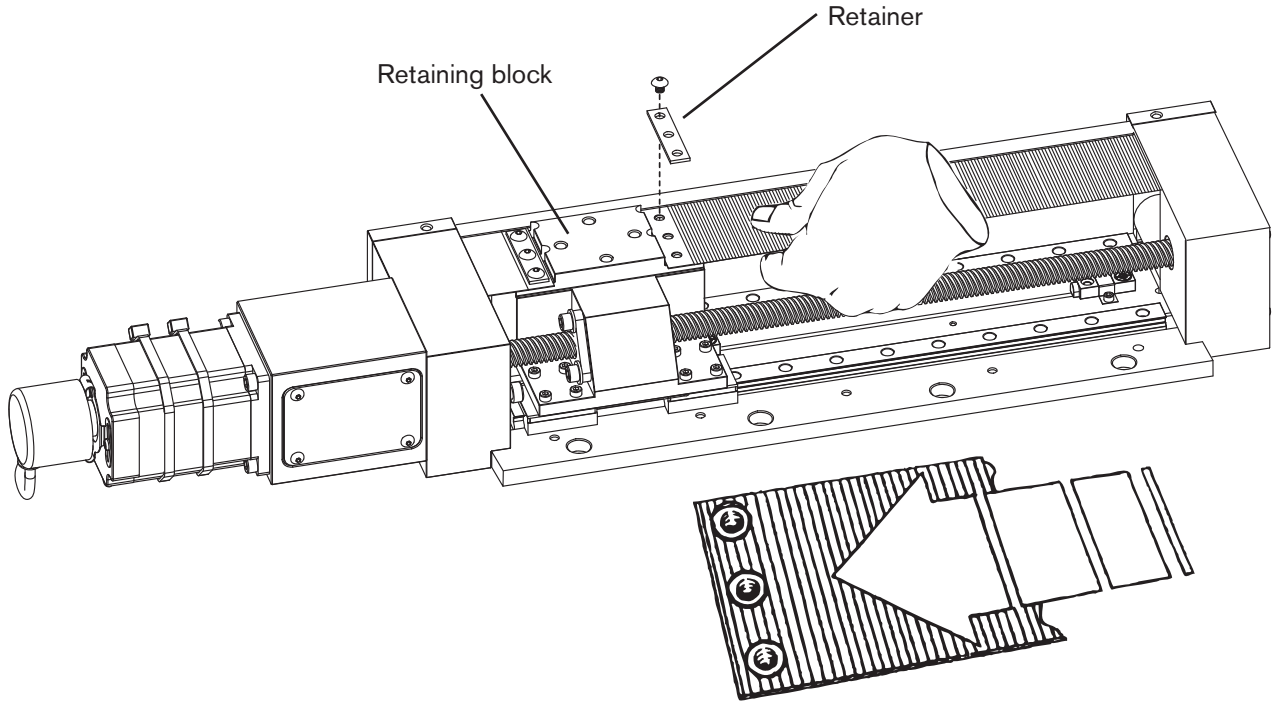


Figure 5-2 Sealing band – install (1 of 2)

VIEW 2



VIEW 3

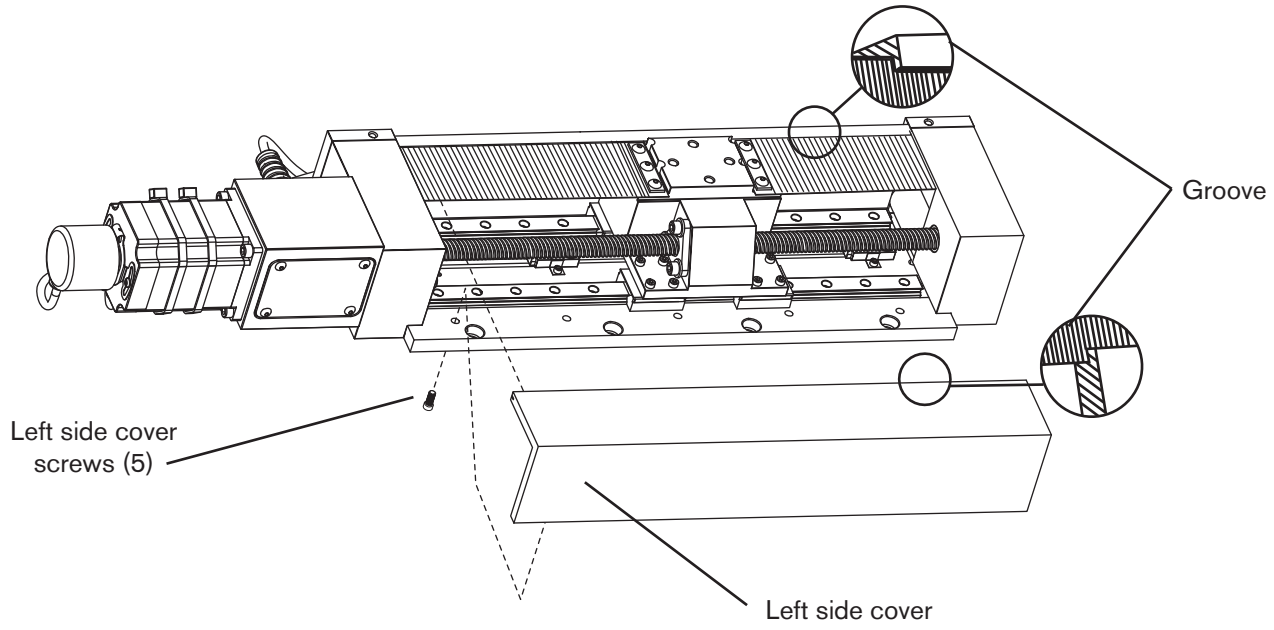
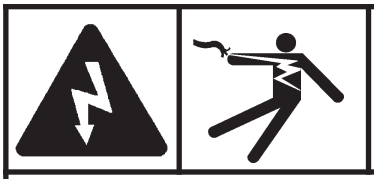


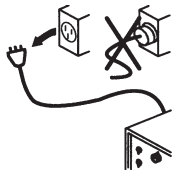
Figure 5-2 Sealing band – install (2 of 2)

Troubleshooting



DANGER

ELECTRIC SHOCK CAN KILL



Turn off all electrical power before removing the power supply cover. Press the power supply OFF (0) pushbutton switch and set the line disconnect switch to OFF. In the U.S., use a "lock-out and tag-out" procedure until the service or maintenance is complete. In other countries, follow appropriate local or national safety procedures.

Note: See Section 4, *Operation,* for THC operating cycle process problems and solutions.

Diagnostic screen B

Diagnostic screen B, Figure 5-3, is used to allow limited on-site testing of the THC controls, cables and lifter. The lifter must have an unobstructed path through its full length of travel to complete testing. Press <SHIFT-B> to begin the test.

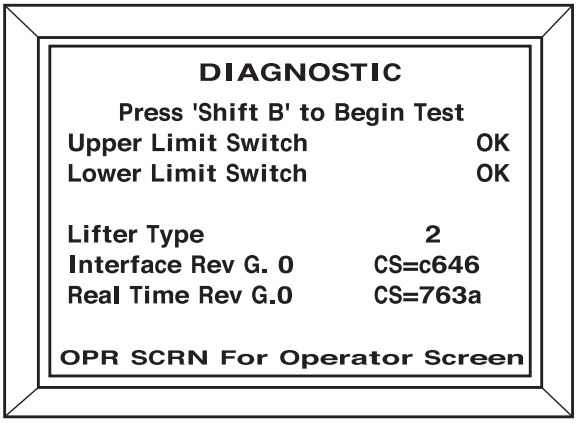


Figure 5-3 Diagnostic screen B

Error messages

The error messages in Table 5-1 are displayed on the pendant or on the CNC via the RS-422 serial interface. The error messages for the RS-422 serial interface are the same as for the Pendant except they are preceded by ERR -.

Table 5-1 X-Y THC error messages

Error Message*	Clear Error	Description of Error	Corrective Action
Torch is in LOWER LIMIT	Press OPR SCRN Key	During IHS the torch did not reach the workpiece. During cutting the torch hits the Lower Limit.	• Reposition lifter, torch or workpiece. • Select Diagnostic Screen B by pressing <B> on keypad. Then press <SHIFT-B> to start tests. Check for the following: – "Lower Limit Switch" indicates "Ok" – "Lifter Type" indicates 2 (X-Y lifter) • On THC control PCB, Motor Drive Interface, D54 should be illuminated. D53 and D55 should be extinguished. • Place THC in Manual Position Mode. – Jog torch to Lower Limit position to activate switch. On THC control PCB, Motor Drive Interface, D50 should illuminate. – Jog torch up to deactivate switch, D50 should extinguish. • Check Lower Limit switch and cable, replace if required.
Torch is in HOME LIMIT	Press OPR SCRN Key	During IHS the torch retracted to the Home Limit.	• Reposition lifter, torch or workpiece. • Stall Force and IHS speed in combination or separately are improperly set. – Try a lower speed or a higher stall force. • Select Diagnostic Screen B by pressing <B> on keypad. Then press <SHIFT-B> to start tests. Check for the following: – "Upper Limit Switch" indicates "Ok" – "Lifter Type" indicates 2 (X-Y lifter) • Place THC in Manual Position Mode. – Jog torch to Home position to activate switch. On THC control PCB, Motor Drive Interface, D49 should illuminate. – Jog torch down to deactivate switch, D49 should extinguish. • Check Home Limit switch and cable, replace if required.
EEPROM Checksum Error	Press OPR SCRN Key	Changed the processors. This error will occur one time after upgrading software.	• Clear error by pressing <OPR SCRN> key and then reenter parameters.
Lifter NOT Installed	Repower	Power up with no lifter cable installed.	• Check that lifter I/O cable is connected at both ends.
Motion FAIL	Press OPR SCRN Key	Torch did not reach Home position during full retract.	• Verify torch is not blocked from moving. • Check for an encoder problem. • Place THC in Manual Position Mode. – Jog torch to Home position to activate switch. On THC control PCB, Motor Drive Interface, D49 should illuminate. – Jog torch down to deactivate switch, D49 should extinguish. • Check Home Limit switch and cable, replace if required.

* Error Messages for the RS-422 serial interface are the same as for the Pendant except they are preceded by ERR -.
Error Messages for the RS-422 serial interface are cleared by using the CL command.

Table 5-1 X-Y THC error messages (continued)

Error Message*	Clear Error	Description of Error	Corrective Action
Motion FAIL	Press OPR SCRN Key	Encoder failed during a cut.	• Verify torch is not blocked from moving. • Check for an encoder problem. • Place THC in Manual Position Mode. - Jog torch up. On THC control PCB, Motor Drive Interface, D58 and D59 should blink alternately. • Check Lower Limit switch and cable, replace if required. • Check Home Limit switch and cable, replace if required.
Watch Dog Timeout FAIL	Repower	A processor on THC control PCB has failed.	• Call Hypertherm Technical Service.
InterProcessor Comm Fail	Repower	Changed real-time processor to a higher revision level.	• Check firmware revisions in both processors for compatibility. • Call Hypertherm Technical Service.
Nozzle Contact at Home	Press OPR SCRN Key	Nozzle contact is being sensed with lifter at Home position.	• Check ohmic contact wire connections at shield and inside plasma interface assembly. • Check ohmic contact wire for a short to ground.
Cycle Start ON at INIT	Press OPR SCRN Key	Cycle start is active during THC power up or while exiting Maintenance Mode.	• Verify CNC start up signal is inactive.
Motor Current Fault	Press OPR SCRN Key	Cable not installed or external interlock not satisfied.	• Install cable. On THC control PCB, Motor Drive Interface, D51 should illuminate. • On THC control PCB, Ext Interlock Ok, D16 should be illuminated. If not, jumper machine interface cable at CNC at pins 16 and 35 on plug J6. See Section 3, External Emergency Interlock for details.
Machine Cable Missing	Repower	Cable not installed or external interlock not satisfied.	• Install cable. On THC control PCB, Machine Interface Inputs, D15 should illuminate. • On THC control PCB, Ext Interlock Ok, D16 should be illuminated. If not, jumper machine interface cable at CNC at pins 3 and 22 on plug J6.
Plasma Cable Missing	Repower	Cable not installed.	• Check cable connections at both ends. On THC control PCB, Plasma Interface Inputs, D23 should illuminate.

* Error Messages for the RS-422 serial interface are the same as for the Pendant except they are preceded by ERR -.
Error Messages for the RS-422 serial interface are cleared by using the CL command.

Table 5-1 X-Y THC error messages

Error Message*	Clear Error	Description of Error	Corrective Action
Diag FAIL	Repower	Torch inhibited from reaching Home Limit position during diagnostic test.	• Place THC in Manual Position Mode and jog torch to Home position to activate switch. • On THC control PCB, Motor Drive Interface, D49 should illuminate.
Diag FAIL	Repower	Torch inhibited from reaching Lower Limit position during diagnostic test.	• Place THC in Manual Position Mode and jog torch to Home position to activate switch. • On THC control PCB, Motor Drive Interface, D50 should illuminate.
Diag FAIL	Repower	Encoder failed during diagnostic test.	• Repower THC. • Check encoder. • Verify torch is not blocked from moving.
IOP CHECKSUM FAIL	Press <SHIFT-H>	Changed firmware. This error will occur one time after upgrading firmware.	• Clear error by pressing <SHIFT-H> on pendant.
RTP CHECKSUM FAIL	Press <SHIFT-H>	Changed firmware. This error will occur one time after upgrading firmware.	• Clear error by pressing <SHIFT-H> on pendant.

* Error Messages for the RS-422 serial interface are the same as for the Pendant except they are preceded by ERR -.
Error Messages for the RS-422 serial interface are cleared by using the CL command.

AC power distribution

Check fuses. Remove fuses by gently prying out the fuse holder. See Figure 5-4 and Table 5-2.

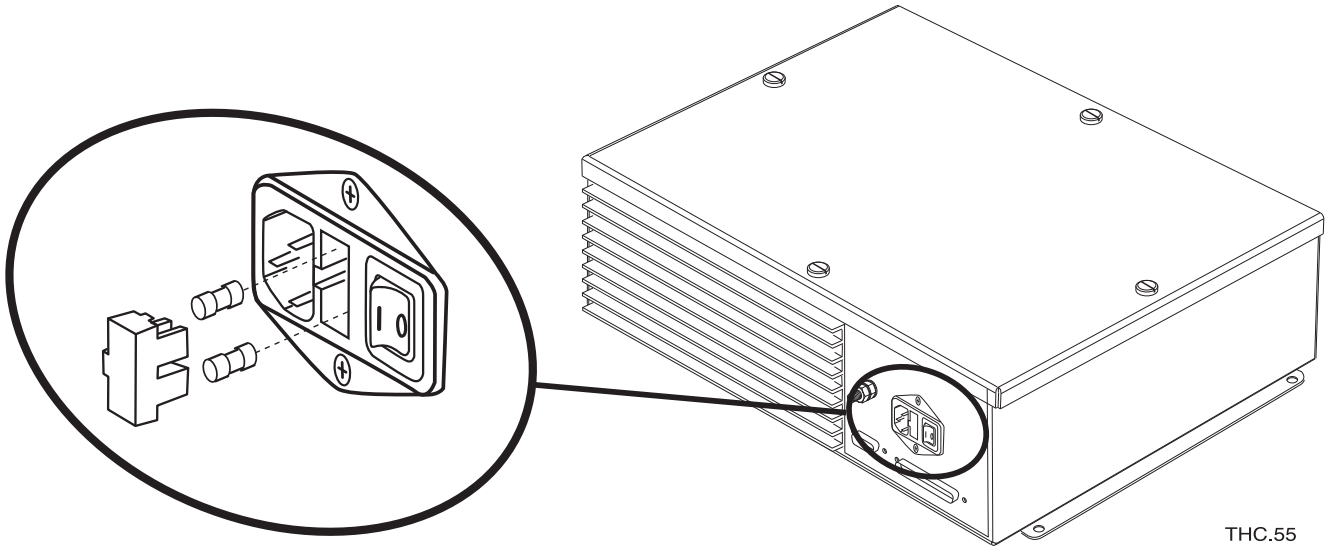


Figure 5-4 AC power and fuses

Table 5-2 AC power and fuses

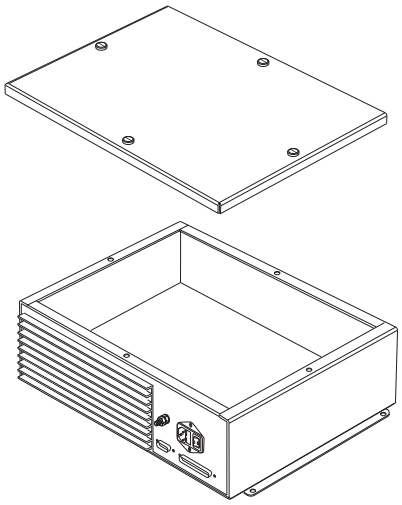
AC Power	Input Filter Fuses	Power Supply AC Power In
Ground (chassis)	–	TB1-1
115 VAC (N)	3.15A, 250V	TB1-2
115 VAC (L)	3.15A, 250V	TB1-3
Ground (chassis)	–	TB1-1
230 VAC (N)	3.15A, 250V	TB1-2
230 VAC (L)	3.15A, 250V	TB1-3

Motor drive board status lights during normal power-up

The following LEDs are located on the motor drive PCB inside the control module. See Figure 5-5.

LED	Signal function	Status
D1	**Drive active**	**On**
D15	**Brake released**	**On***
D16	Up	Off
D17	Down	Off

* On = brake is unlocked
  Off = brake is on



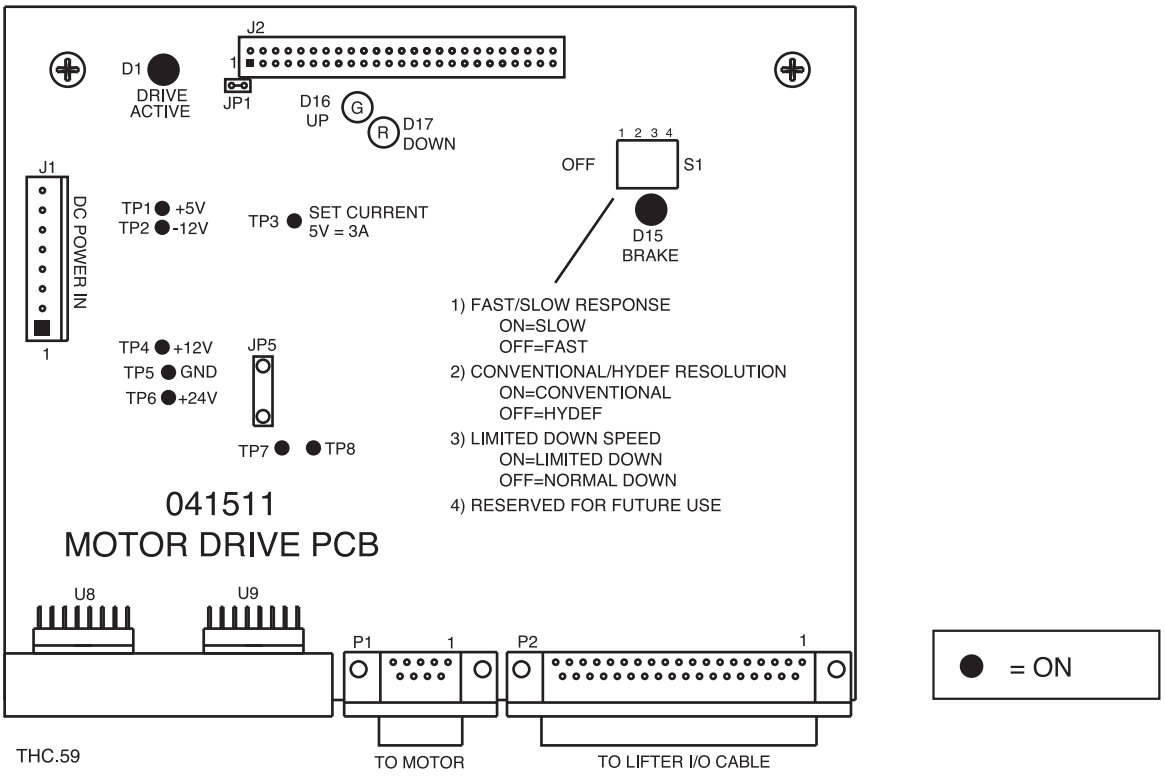


Figure 5-5 Motor drive board

DC power distribution

The following connections are located on the power supply board inside the control module. See Figure 5-6 and Table 5-3.

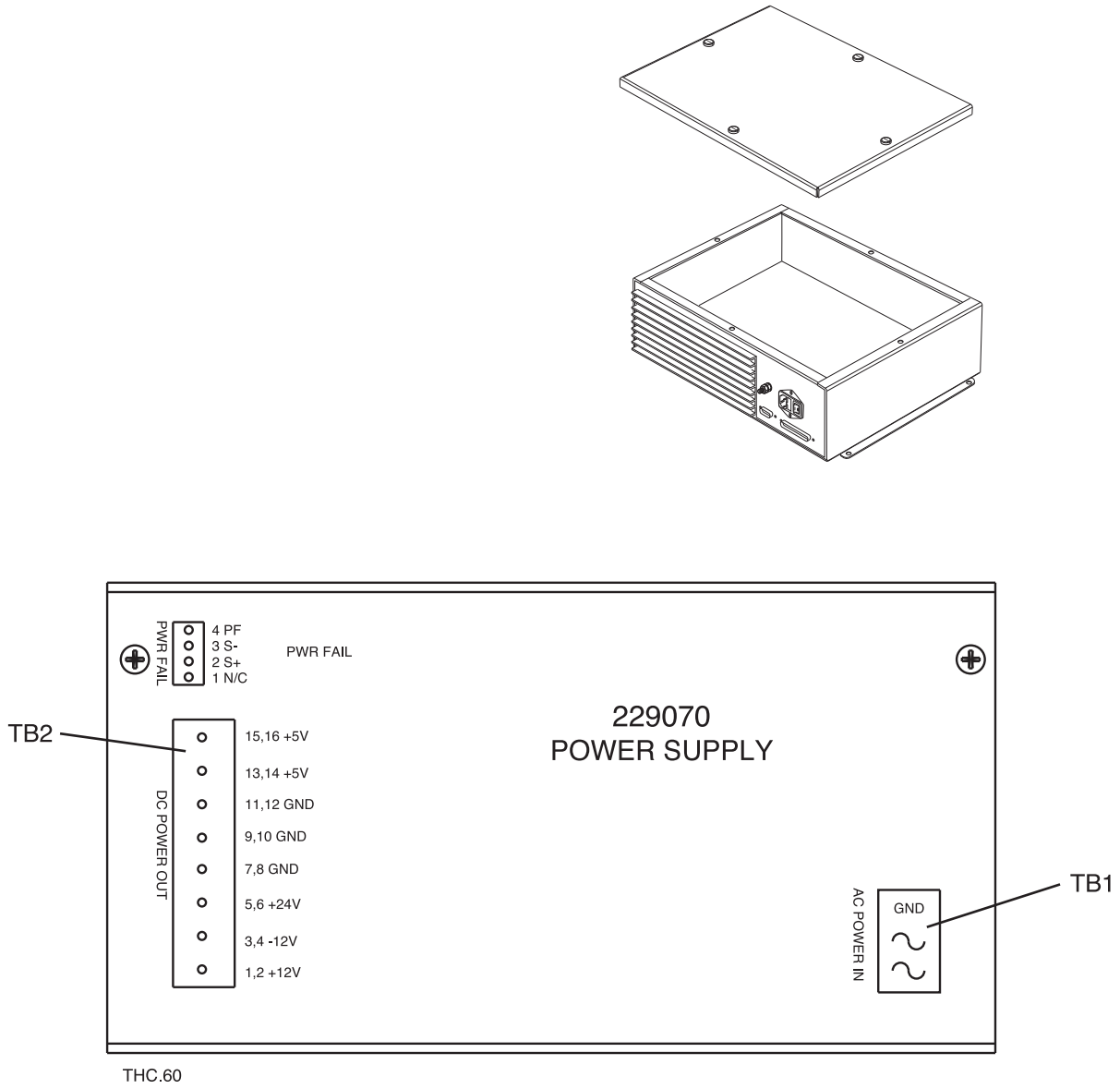


Figure 5-6 Power supply board

Table 5-3 DC power, LEDs and test points

DC Power	Wire Color	Wire Connection Points/LEDs and Test Points Power Supply PCB DC Power Out	Motor Drive PCB DC Power In	Control PCB DC Power In
+ 12 VDC	Blue	TB2-1		J8-3/D43 & TP6
Common	White	TB2-3		J8-4/D42 & TP5
+ 12 VDC	Blue	TB2-2	J1-3/TP4	
Common	White	TB2-4	J1-4/TP2	
+ 24 VDC	Blue	TB2-5		J8-5/D41 & TP4
Ground	White	TB2-7		J8-6/TP3 Ground
+ 24 VDC	Blue	TB2-6		J8-7
+ 24 VDC	Blue		J1-5/TP6	J8-8
Ground	White	TB2-8	J1-6/TP5 Ground	
Ground	White	TB2-11		J8-2 Ground
+ 5 VDC	Blue	TB2-15		J8-1/D44 & TP7
Ground	White	TB2-12	J1-2 Ground	
+ 5 VDC	Blue	TB2-16	J1-1/TP1	
+ 5 VDC	Blue	TB2-13	Resistor 1 mounted	
Ground	White	TB2-10	on heatsink	

Control board status lights during normal power-up

The following LEDs are located on the control board inside the control module. See Figure 5-7.

LED	Signal function	Status
D9	cycle start input	Off
D10	auto height on/off	Off
D11	spare input	Off
D12	spare input	Off
D13	IHS sync input	Off
D14	spare input	Off
D15	**machine cable**	**On**
D17	transfer input	Off
D18	pilot arc input	Off
D19	nozzle contact	Off
D20	spare input	Off
D21	torch 1 select	Off
D22	torch 2 select	Off
D23	**plasma cable**	**On**
D25	machine motion output	Off
D26	THC error out	Off (On if there is error)
D27	pilot arc output	Off
D28	**retract complete**	**On**
D29	spare out	Off
D30	IHS complete	Off
D31	**error #1 (Not functional)**	**On**
D32	plasma start output	Off
D33	hold ignition output	Off
D34	pierce complete out	Off
D35	spare out	Off
D36	spare out	Off
D37	high voltage relay active	Off
D38	**error #2 (Not functional)**	**On**

LED	Signal function	Status
D41	**+24v**	**On**
D42	**–12v**	**On**
D43	**+12v**	**On**
D44	**+5v**	**On**
D45	response switch 1 (user-definable response)	Off
D46	response switch 2 (user-definable response)	Off
D47	response switch 3 (user-definable response)	Off
D48	crash detect (Future use)	Off
D49	home position	On momentarily, then Off
D50	lower limit switch	Off
D51	**motor current check**	**On**
D52	response sw4	Off
D53	drive ID 1	Off
D54	**drive ID 2**	**On**
D55	drive ID 4	Off
D56	spare input	Off
D57	**motor drive installed**	**On**
D58	encoder A	On or Off
D59	encoder B	On or Off

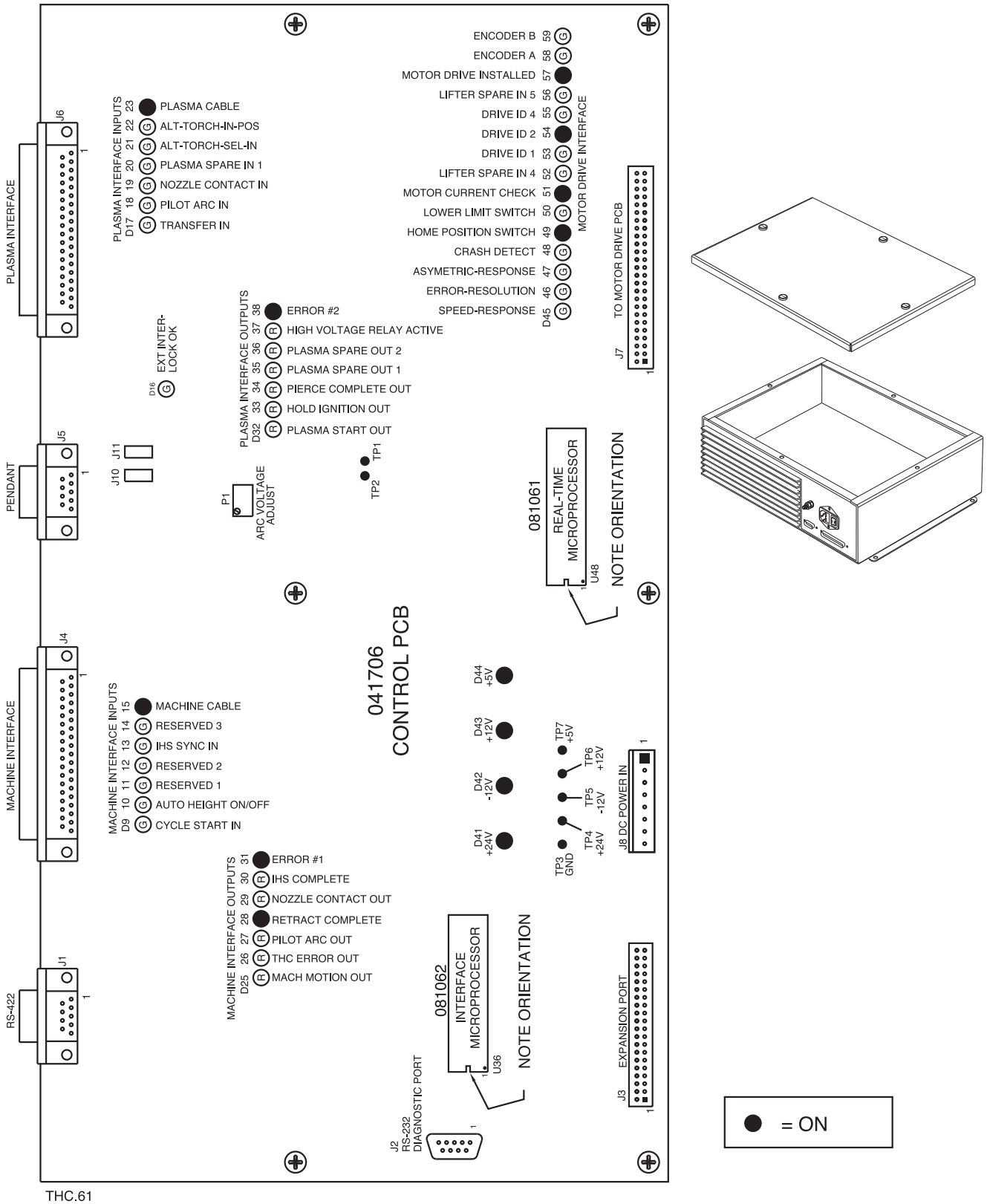


Figure 5-7 Control board

Interface board status lights during normal power-up

The following LEDs and test points are located on the interface board. See Figure 5-8.

LED	Signal function	Status
D1	Power	On
D2	Shield Relay	Normally On – Off when arc initiates.
D5	Plasma Start	On when plasma start signal to the power supply is active.
D6	Ohmic Contact	Normally Off – On when torch is in contact with the plate.

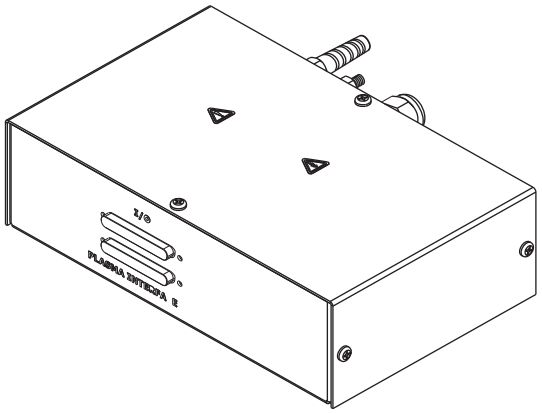
Test Points TP1 (ground) and TP2 (+) allow the measurement of the isolated electrode-to-work voltage divided by 82.

HT4400 and HPR installation

Note: Instructions to install the plasma interface PCB into the HT4400 power supply are included in section 3h.

Instructions to install the plasma interface PCB into the HPR power supply are included in section 3i.

The plasma interface enclosure is not used for the HT4400.



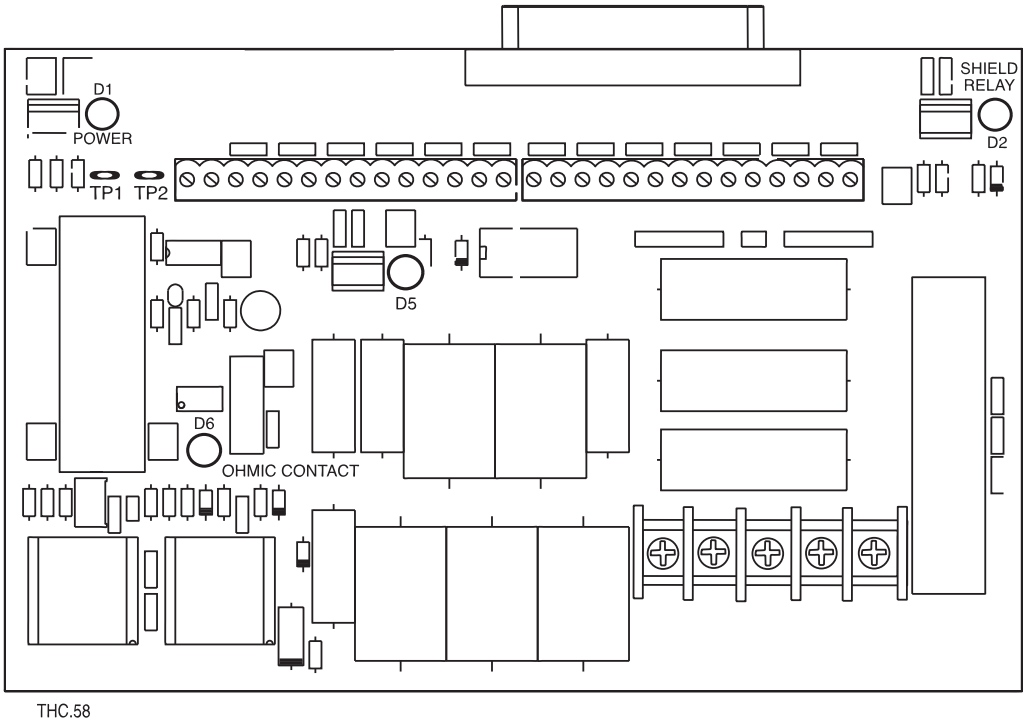


Figure 5-8 Interface board

Section 6

PARTS LIST

In this section:

THC control module 6-2
Plasma interface assembly 6-4
2 rail X-Y lifter assembly 6-5
X-Y lifter torch mounting block kits 6-6
X-Y lifter breakaway kit – optional 6-7
Operator pendant 6-8
Power cords 6-8
Ohmic contact wire 6-9
Recommended spare parts 6-10
Interface cables ..... See Section 3a through 3j

THC control module

Index no.	Part no.	Description	Quantity
	053018	**THC control module**	**1**
1	002261	Enclosure, THC control module	1
	129067	Heatsink SA, THC control module	1
2	004705	Heatsink, THC	
3	005186	Module, power entry, fused filter	1
4	008971	Fuse, T,3.15 Amp H 250V 5 mm x 20 mm	2
5	229070	Power source, 130W (see Figure 6-2)	1
6	041511	PCB assembly, motor driver (see Figure 6-2)	1
7	128407	PCB assembly, control (see Fig. 6-2)	1
	081061	Firmware, real-time microprocessor	1
	081062	Firmware, interface microprocessor	1
8	123254	Cable, THC 50/C ribbon (not shown)	1
9	129066	Harness wiring THC (not shown)	1

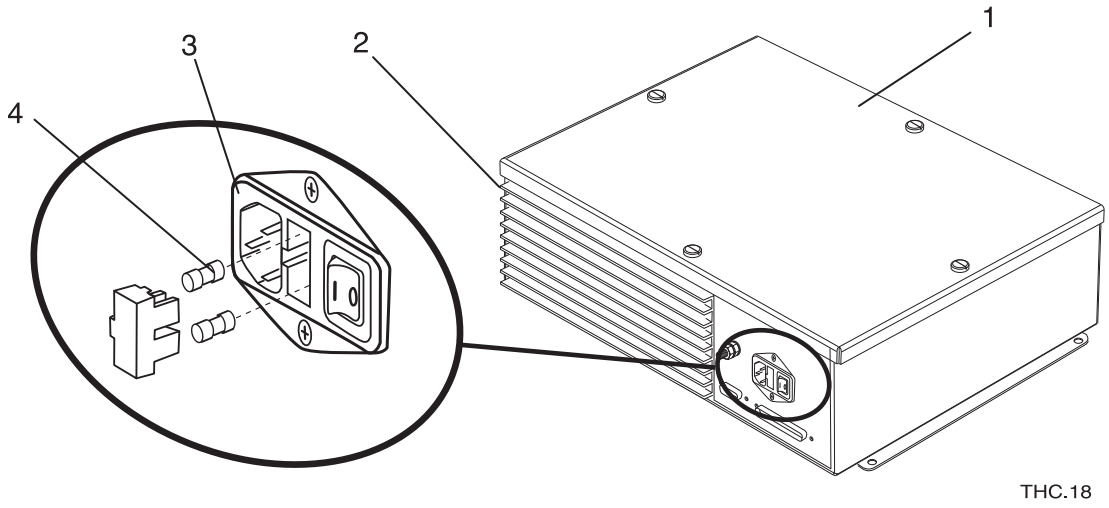


Figure 6-1 THC control module exterior

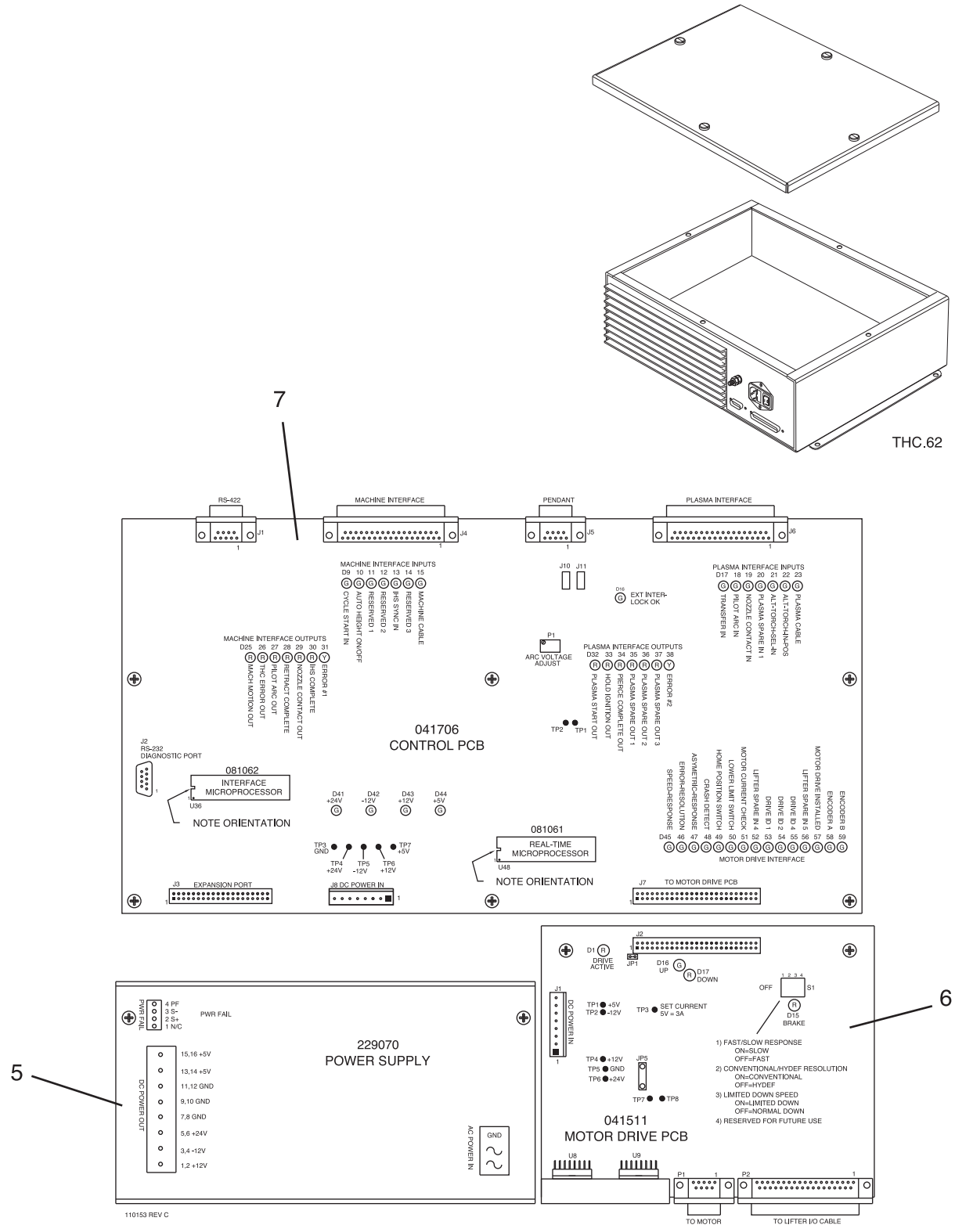


Figure 6-2 THC control module interior

Plasma interface assembly

Index no.	Part no.	Description	Quantity
1	**128494**	**Plasma interface assembly**	**1**
2	128408	PC Board Assembly, plasma interface	1
3	041842	HPR PC Board Assembly, plasma interface	1

HT4400 and HPR installation

Note: Instructions to install the plasma interface PCB into the HT4400 power supply are included in section 3h.

Instructions to install the plasma interface PCB into the HPR power supply are included in section 3i.

The plasma interface enclosure is not used for the HT4400.

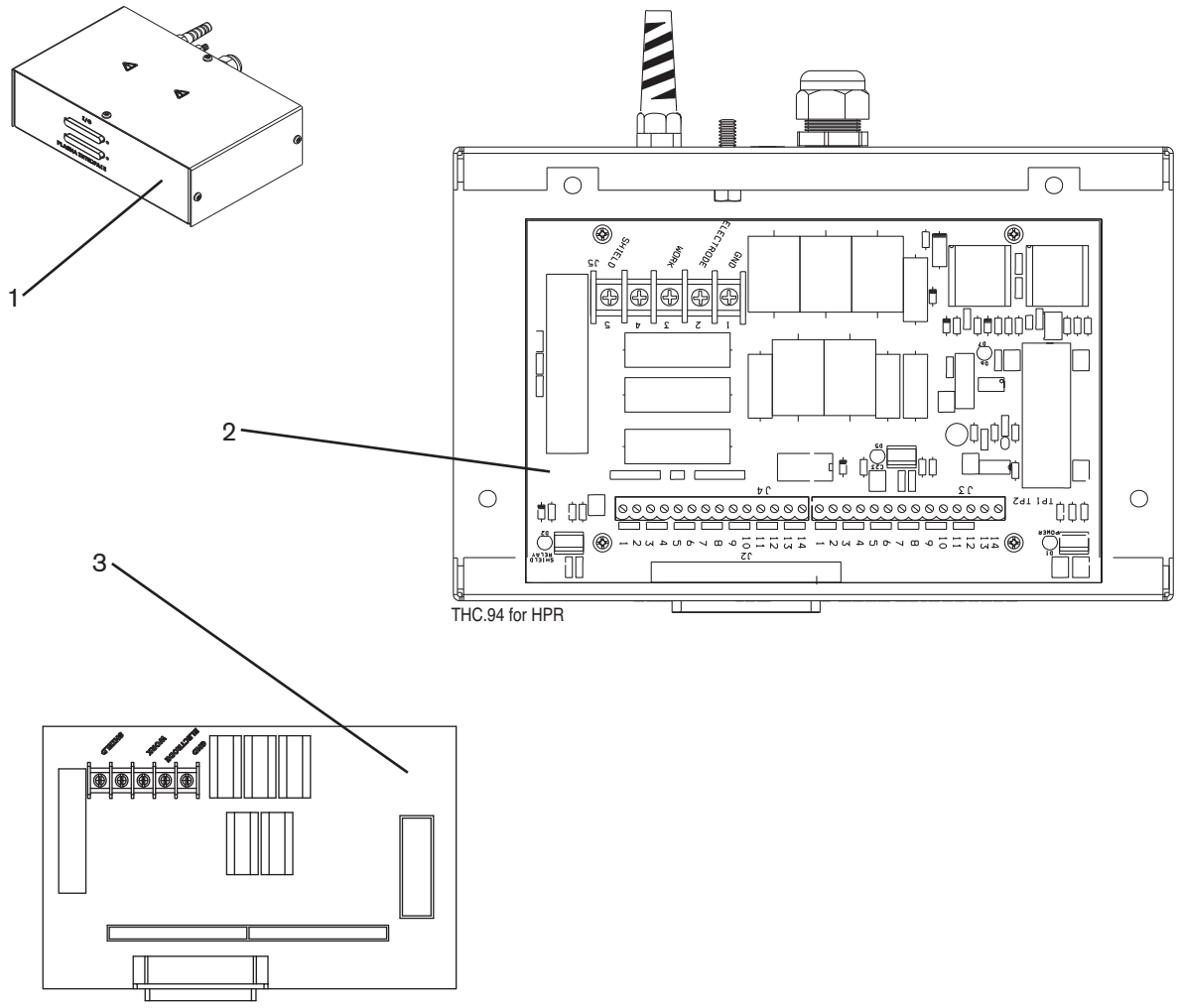


Figure 6-3 Plasma interface assembly

2 rail X-Y lifter assembly

Index no.	Part no.	Description	Quantity
	128606	**X-Y lifter assembly**	**1**
1	128726	Encoder replacement kit	1
2	128727	Motor/Encoder replacement kit	1
3	027550	Brake, power off	1
4	129699	Assembly: leadscrew standard	1
	127154	Drive nut	1
5	128607	Band seal kit (length 32.3125")	1
6	027903	Block, driving	1
7	128190	Band roller kit	4 per lifter
8	027904	Rail and block, bearing	2
9	005195	Limit switch	2

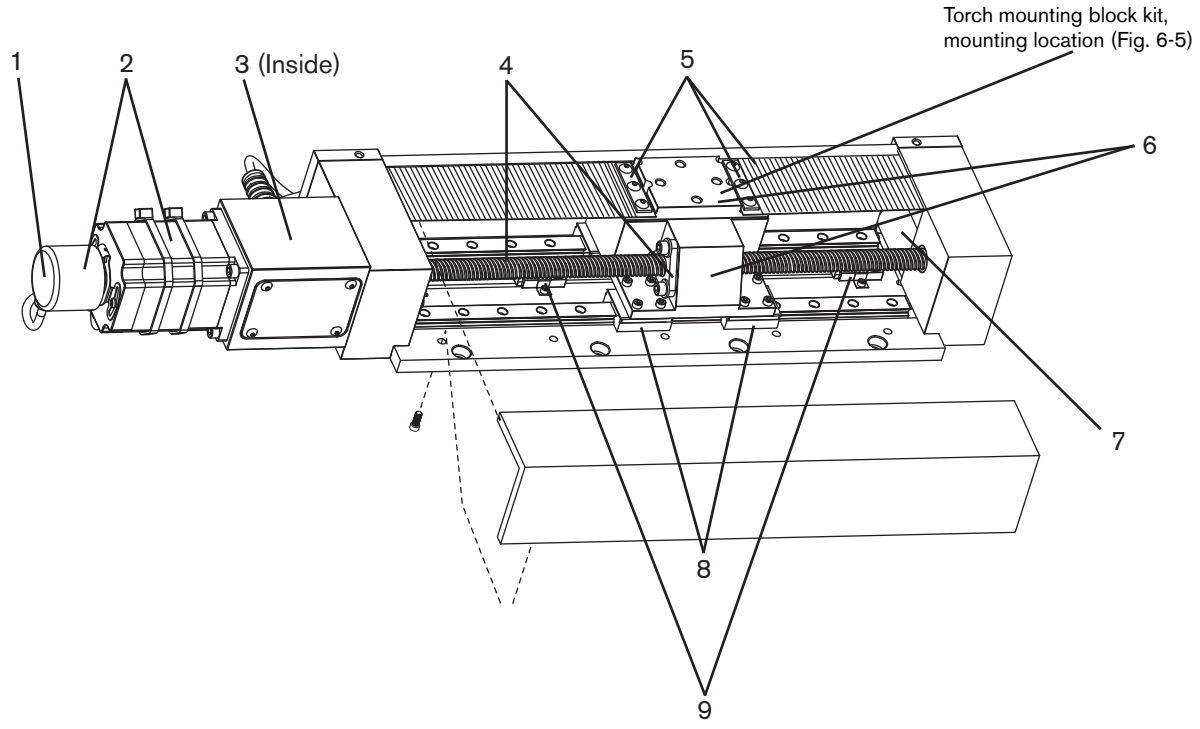


Figure 6-4 X-Y lifter assembly

X-Y lifter torch mounting block kits

Index no.	Part no.	Description	Quantity
	128277	**Kit, torch mounting block, 1-3/8 inch diameter torch**	**1**
	128278	**Kit, torch mounting block, 1-3/4 Inch diameter torch**	**1**
	128279	**Kit, torch mounting block, 2 inch diameter torch**	**1**
1	004775	Spacer, Command THC mounting block	1
2	075127	Socket cap, 1/4-20 X 1-1/2 inch hex BTN S/Z	4
3	075583	Socket cap, 1/4-20 X 1-3/4 inch hex SST	2
4	120595	Block, 1-3/8 inch torch mounting (kit 128277)	1
4	120596	Block, 1-3/4 inch torch mounting (kit 128278)	1
4	120597	Block, 2 inch torch mounting (kit 128279)	1
5	002303	Shield	1
6	075071	Screw, 8-32 X 1/4 inch	4

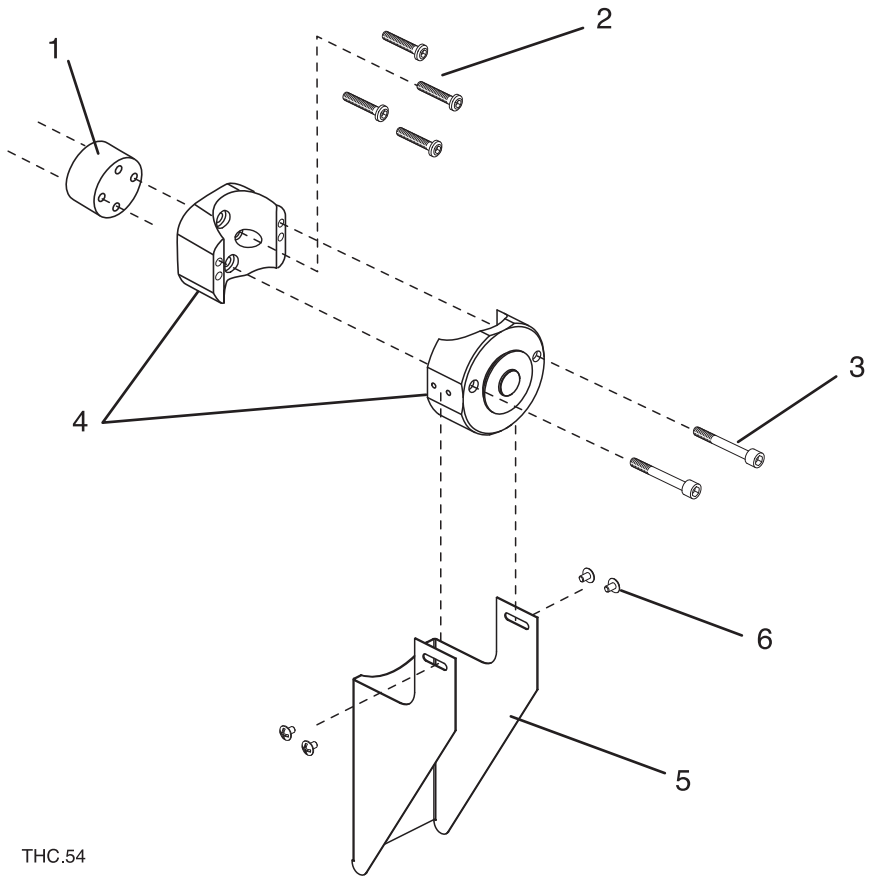


Figure 6-5 X-Y lifter torch mounting block kit

X-Y lifter breakaway kit – optional

Index no.	Part no.	Description	Quantity
	128281	**Kit, X-Y lifter torch breakaway**	**1**
1	004774	Bracket, breakaway X-Y fiberglass	1
		Screw	6
2	075509	Socket cap, 1/4-20 X 1/2 inch hex BTN S/Z	4
3	027574	Breakaway, Command THC	1
3a	123596	Cable: CMD THC lifter torch breakaway	1
3b	127155	Proximity switch	1
3c	127156	Collar	1
4	015317	Connector, male 10-32 X 1/4 inch, push In tube	1
5	046078	Tubing, 1/4 inch O.D. Synflex	10 ft. (3m)
	129361	Regulator/Filter assembly	1
6	011039	Filter/Regulator	1
7	011038	Gauge, pressure 150 PSI (10.2 Bar) maximum	1
8	015285	Adapter, 1/8 inch NPT X 1/4 inch push-in tube	1

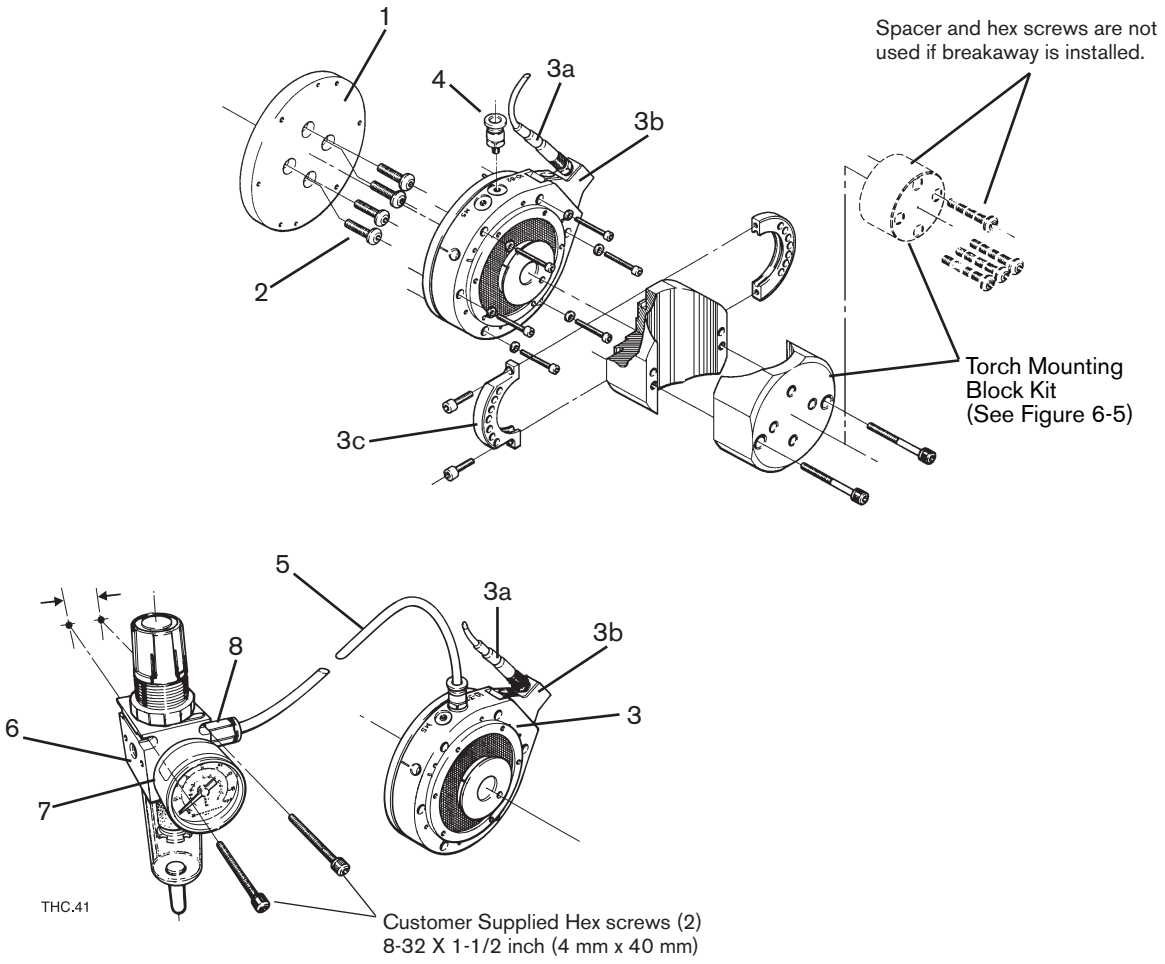


Figure 6-6 X-Y lifter breakaway kit

Operator pendant

Index no.	Part no.	Description	Quantity
1	053019	Operator pendant, with 25 ft. cable	1
	027665	Protective cover (not shown)	1
	228057	Kit: cable replacement	1

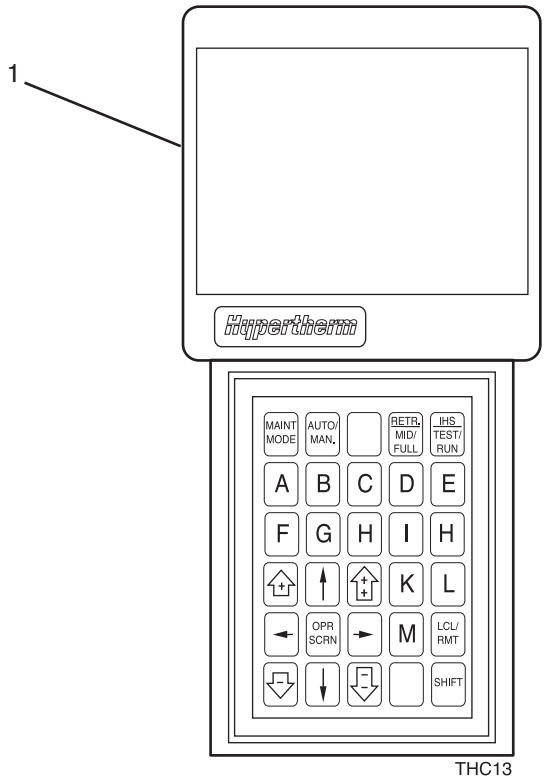


Figure 6-7 Operator pendant

Power cords

Index no.	Part no.	Description	Quantity
1	008960	Domestic power cord, 115 VAC	1
2	008961	International power cord, 230 VAC (not shown)	1

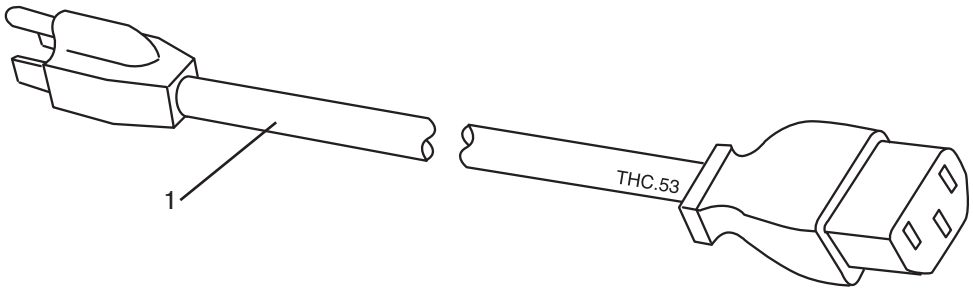


Figure 6-9 Power cord

Ohmic contact wire

Index no.	Part no.	Description	Length	Quantity
1	123464	Ohmic contact wire	10 ft./3 m	1
	123465		20 ft./6.1 m	
	123221		25 ft./7.6 m	
	123222		30 ft./9.1 m	
	123223		40 ft./12.2 m	
	123039		50 ft./15.2 m	
	123224		75 ft./23 m	
	123225		100 ft./30.5 m	
	123226		125 ft./38 m	
	123227		150 ft./45.6 m	
2	123983	HPR400XD ohmic contact wire	10 ft./3 m	1
	123984		20 ft./6.1 m	
	123985		25 ft./7.6 m	
	123986		30 ft./9.1 m	
	123987		40 ft./12.2 m	
	123988		50 ft./15.2 m	
	123989		75 ft./23 m	
	123990		100 ft./30.5 m	
	123991		150 ft./45.6 m	

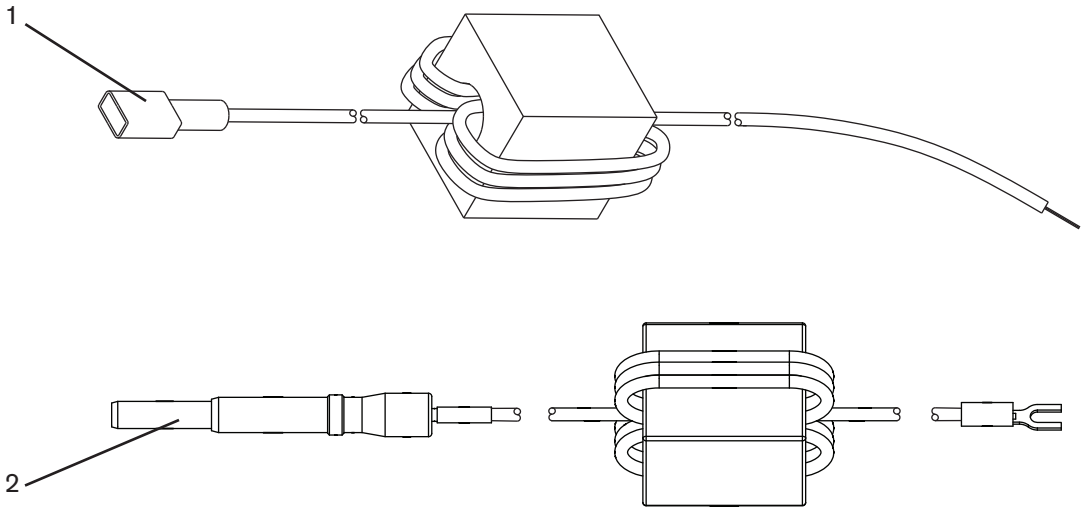


Figure 6-8 Ohmic contact wires

Recommended spare parts

X-Y lifter assembly - 2 rail (128606)

Part No.	Description	Quantity
128607	Kit: torch lifter band-seal replacement	1
128190	Kit: lifter band replacement rollers	1

X-Y lifter assembly - 1 rail (128050 - old style)

Part No.	Description	Quantity
128189	Kit: torch lifter band seal replacement	1
128190	Kit: lifter band replacement rollers	1

X-Y lifter breakaway kit

Part No.	Description	Quantity
027574	Breakaway	1
123596	Cable: lifter breakaway	1
015317	Connector: male 10-32	1

Operator pendant

Part No.	Description	Quantity
053019	Pendant	1
228057	Kit: cable replacement	1

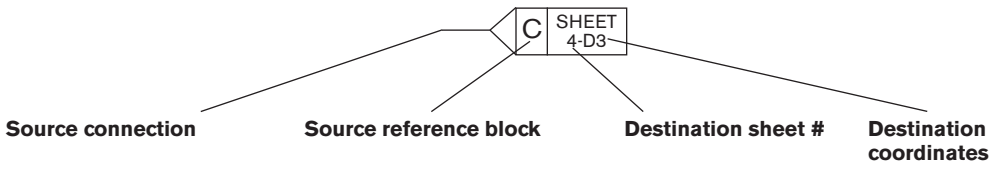
Section 7

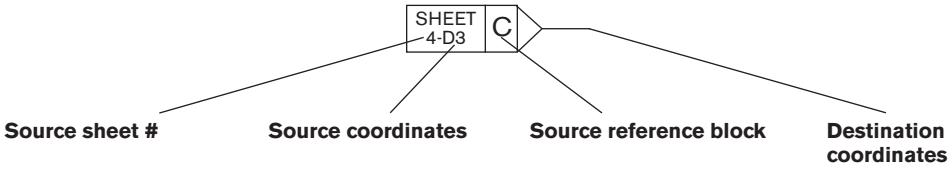
WIRING DIAGRAMS

Introduction

This section contains the wiring diagrams for the system. When tracing a signal path or referencing with the *Parts List* or **Troubleshooting** sections, please be aware of the following format to assist you in understanding the wiring diagrams' organization:

- Sheet numbers are located in the lower right-hand corner.
- Page-to-page referencing is done in the following manner:

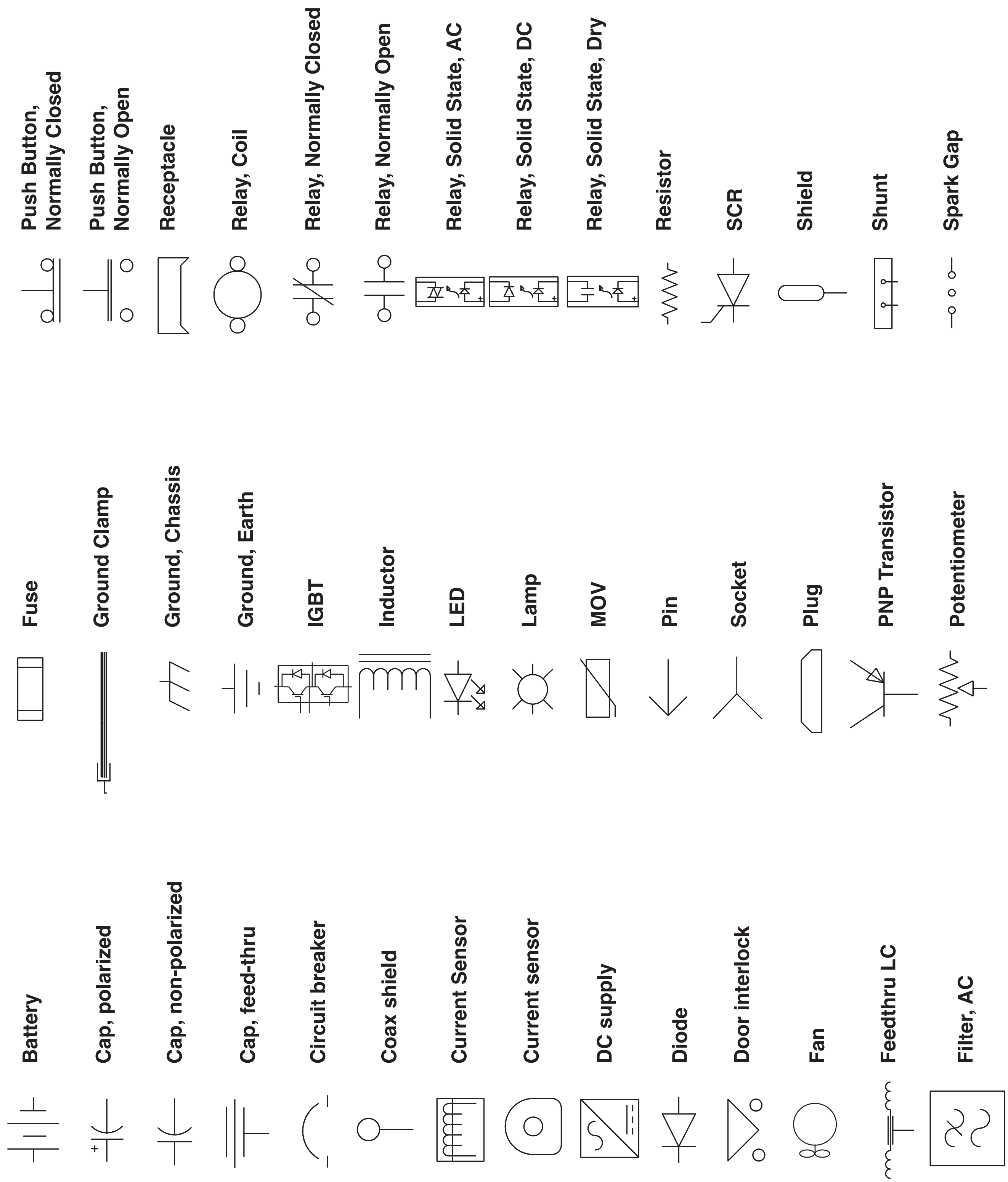


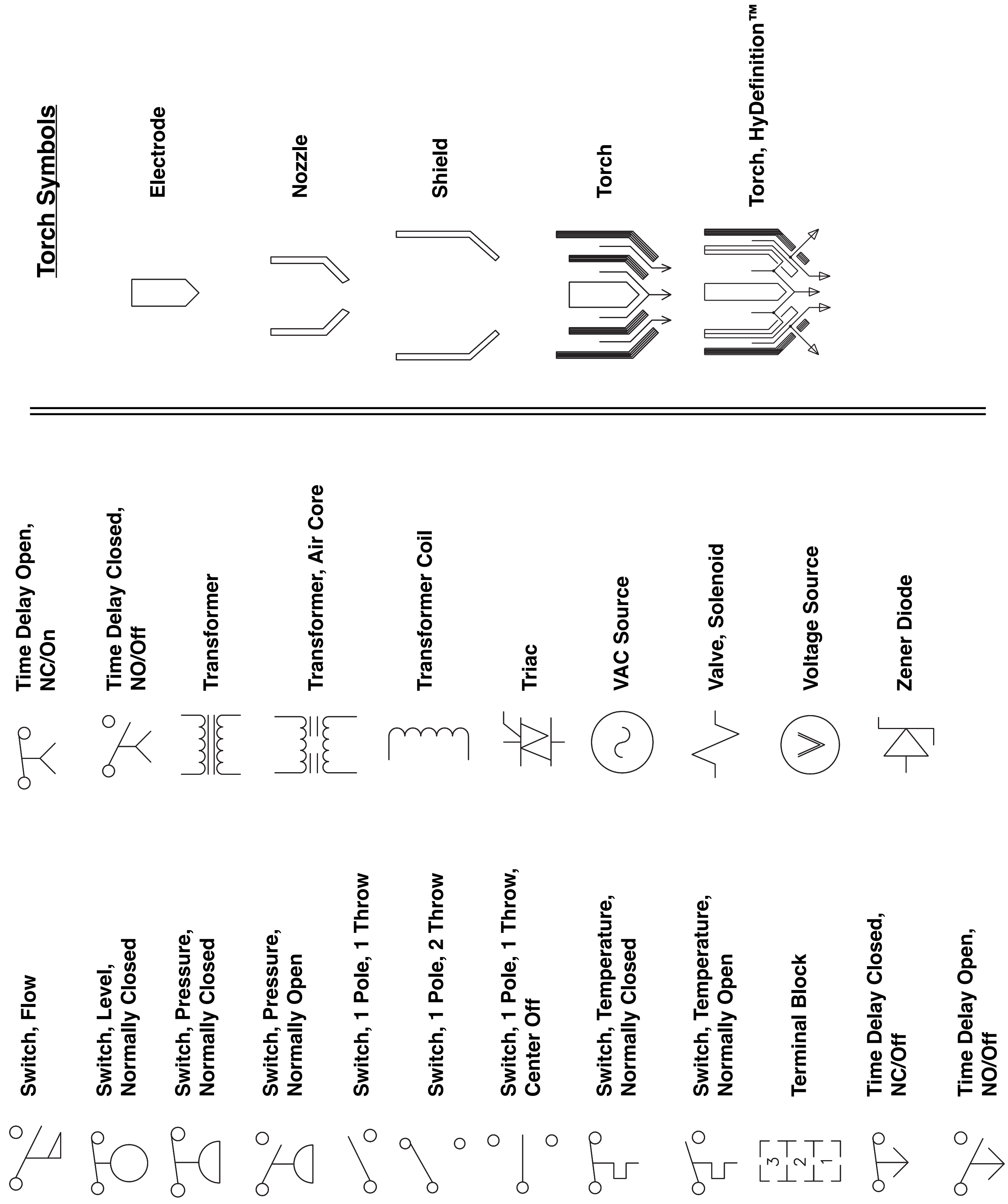


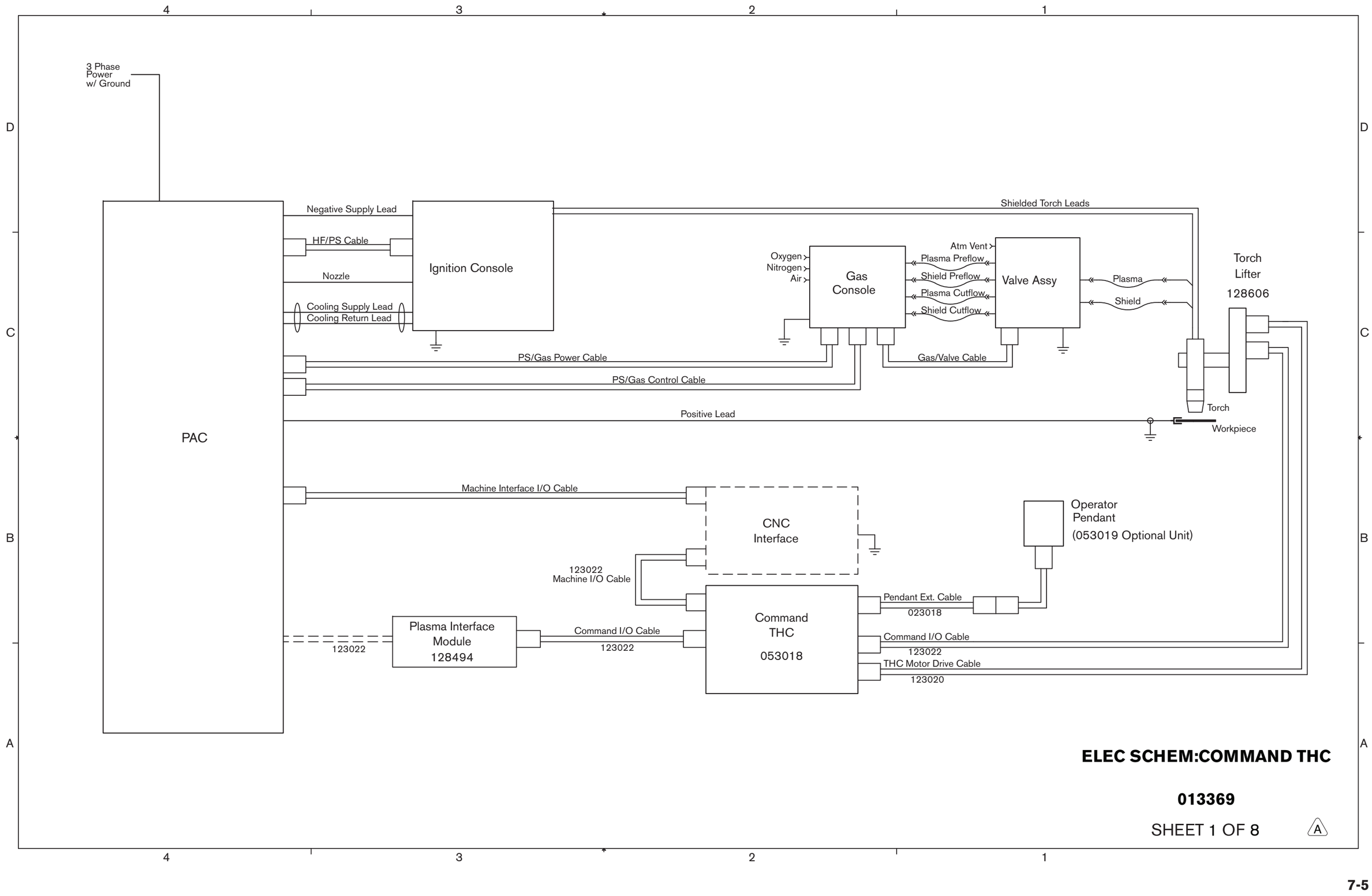
Destination and **Source coordinates** refer to letters A-D on the Y-axis of each sheet and numbers 1-4 on the X-axis of each sheet. Lining up the coordinates will bring you to the source or destination blocks (similar to a road map).

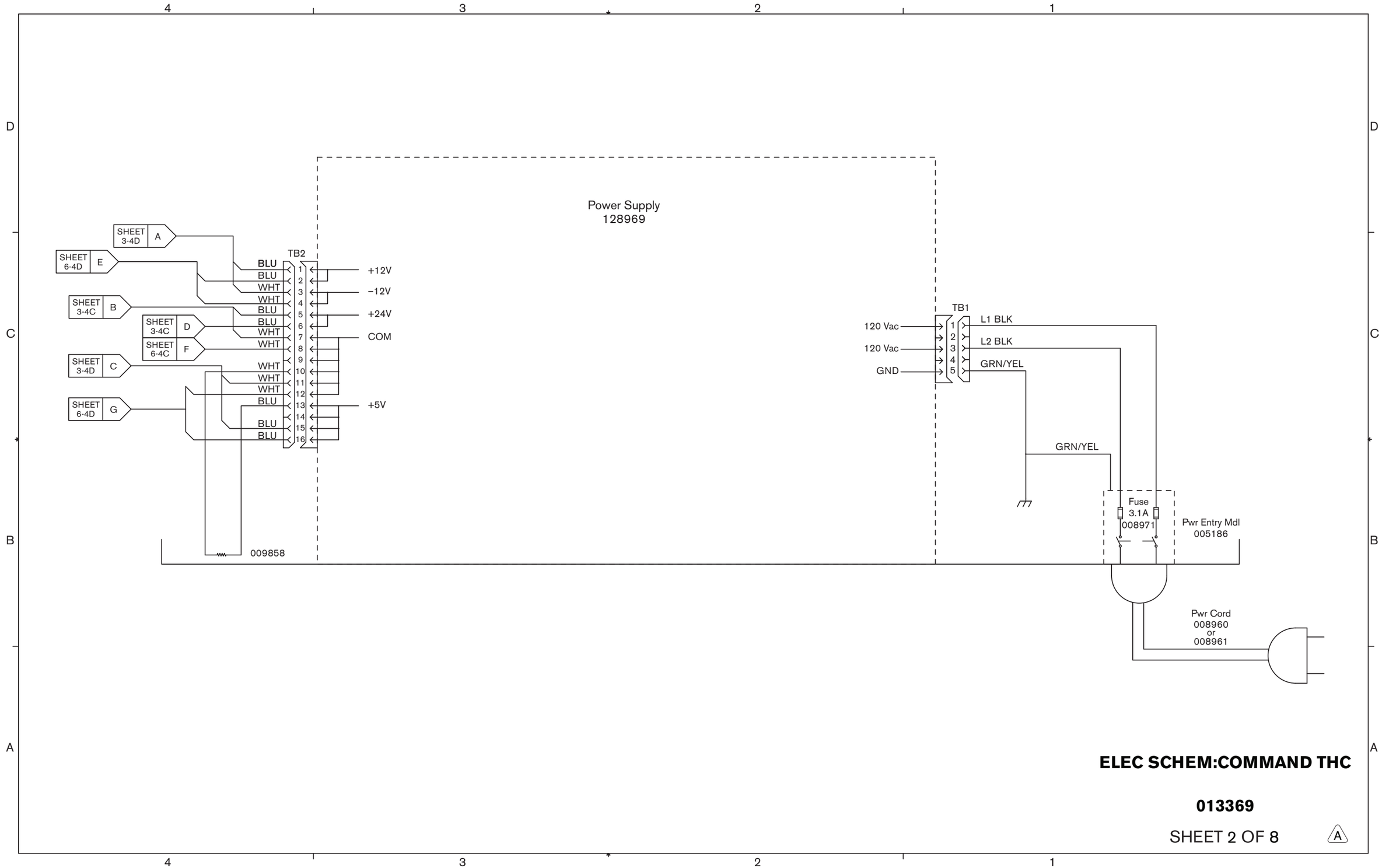
Wiring diagram symbols

Wiring diagram symbols and their identification precede the system wiring diagrams in this section.


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
Fuse
Ground Clamp
Ground, Chassis
Ground, Earth
IGBT
Inductor
LED
Lamp
MOV
Pin
Socket
Plug
PNP Transistor
Potentiometer
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


Switch, Flow
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
3
2
1
Time Delay Closed, NC/Off
Time Delay Open, NO/Off
Time Delay Open, NC/On
Time Delay Closed, NO/Off
Transformer
Transformer, Air Core
Transformer Coil
Triac
VAC Source
Valve, Solenoid
Voltage Source
Zener Diode
Torch Symbols
Electrode
Nozzle
Shield
Torch
Torch, HyDefinition™


3 Phase
Power
w/ Ground
PAC
Negative Supply Lead
HF/PS Cable
Nozzle
Cooling Supply Lead
Cooling Return Lead
Ignition Console
Shielded Torch Leads
Oxygen
Nitrogen
Air
Gas
Console
Atm Vent
Plasma Preflow
Shield Preflow
Plasma Cutflow
Shield Cutflow
Valve Assy
Plasma
Shield
Torch
Lifter
128606
Torch
Workpiece
PS/Gas Power Cable
PS/Gas Control Cable
Gas/Valve Cable
Positive Lead
Machine Interface I/O Cable
CNC
Interface
123022
Machine I/O Cable
Operator
Pendant
(053019 Optional Unit)
Pendant Ext. Cable
023018
Command
THC
053018
Command I/O Cable
123022
THC Motor Drive Cable
123020
123022
Plasma Interface
Module
128494
Command I/O Cable
123022
ELEC SCHEM:COMMAND THC
013369
SHEET 1 OF 8
A



ELEC SCHEM:COMMAND THC

013369

SHEET 2 OF 8 (A)

THC CONTROL
041706

J8

SHEET 2-4C C — BLU 1 — +5V TP7 D44
WHT 2
SHEET 2-4D A — BLU 3 — +12V TP6 D43
WHT 4 — −12V TP5 D42
SHEET 2-4C B — BLU 5 — +24V TP4 D41
WHT 6
SHEET 2-4C D — BLU 7 — MOTOR DRIVE PWR 1
SHEET 6-4D I — BLU 8 — MOTOR DRIVE PWR 2

CNC RS-422
RX–
RX+
TX–
TX+
MACHINE CABLE IN –
D15 MACHINE CABLE IN +
IHS TEST IN –
D14 IHS TEST IN +
IHS SYNC IN –
D13 IHS SYNC IN +
FULL/PART RETRACT IN –
D12 FULL/PART RETRACT IN +
SPARE INPUT 1 IN –
D11 SPARE INPUT 1 IN +
AUTO HEIGHT ON/OFF IN –
D10 AUTO HEIGHT ON/OFF IN +
CYCLE START IN –
D9 CYCLE START IN +
IHS COMPLETE OUT –
D30 IHS COMPLETE OUT +
MACHINE SPARE 1 OUT –
D29 MACHINE SPARE 1 OUT +
RETRACT COMPLETE OUT –
D28 RETRACT COMPLETE OUT +
PILOT ARC OUT –
D27 PILOT ARC OUT +
THC ERROR OUT –
D26 THC ERROR OUT +
MACHINE MOTION OUT –
D25 MACHINE MOTION OUT +
D16 EXT INTERLOCK
+24V

MACHINE INTERFACE
1 20 2 21 3 22 4 23 5 24 6 25 7 26 8 27 9 28 10 29 11 30 12 31 13 32 14 33 15 34 16 35 17 36 18 37 19

TO CNC 123022

PLASMA CABLE IN –
D24 PLASMA CABLE IN +
ARC VOLTS –
D23 PLASMA START OUT +
ARC VOLTS +
D32 PLASMA START OUT –
PLASMA SPARE 1 OUT –
D35 PLASMA SPARE 1 OUT +
PLASMA SPARE 2 OUT –
D36 PLASMA SPARE 2 OUT +
24VDC TO HV RELAY OUT –
D37 24VDC TO HV RELAY OUT +
TRANSFER IN –
D17 TRANSFER IN +
PILOT ARC IN –
D18 PILOT ARC IN +
NOZZLE CONTACT IN –
D19 NOZZLE CONTACT IN +
SPARE 1 IN –
D20 SPARE 1 IN +
ALT TORCH SELECT IN –
D21 ALT TORCH SELECT IN +
ALT TORCH POS IN –
D22 ALT TORCH POS IN +
PIERCE COMPLETE OUT –
D34 PIERCE COMPLETE OUT +
HOLD IGNITION OUT –
D33 HOLD IGNITION OUT +
TX+
TX–
RX+
RX–
+24V

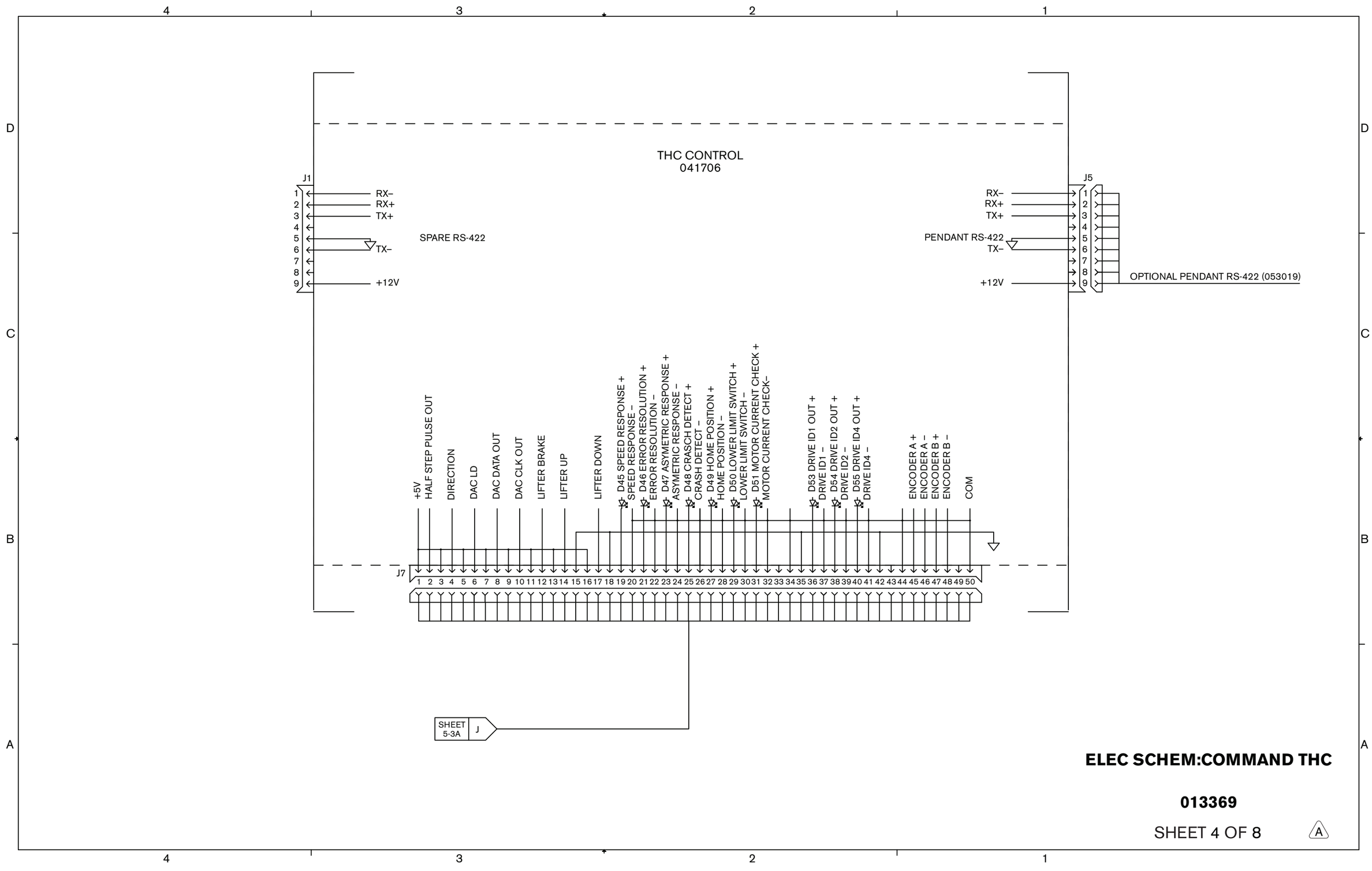
PLASMA INTERFACE
1 20 2 21 3 22 4 23 5 24 6 25 7 26 8 27 9 28 10 29 11 30 12 31 13 32 14 33 15 34 16 35 17 36 18 37 19

SHEET 7-4A I — TO PLASMA INTERFACE 123022

ELEC SCHEM:COMMAND THC

013369

SHEET 3 OF 8 (A)


THC CONTROL
041706
J1
1 RX–
2 RX+
3 TX+
4
5
6 TX–
7
8
9 +12V
SPARE RS-422
J5
RX–
RX+
TX+
PENDANT RS-422
TX–
+12V
1
2
3
4
5
6
7
8
9
OPTIONAL PENDANT RS-422 (053019)
+5V
HALF STEP PULSE OUT
DIRECTION
DAC LD
DAC DATA OUT
DAC CLK OUT
LIFTER BRAKE
LIFTER UP
LIFTER DOWN
D45 SPEED RESPONSE +
SPEED RESPONSE –
D46 ERROR RESOLUTION +
ERROR RESOLUTION –
D47 ASYMETRIC RESPONSE +
ASYMETRIC RESPONSE –
D48 CRASCH DETECT +
CRASH DETECT –
D49 HOME POSITION +
HOME POSITION –
D50 LOWER LIMIT SWITCH +
LOWER LIMIT SWITCH –
D51 MOTOR CURRENT CHECK +
MOTOR CURRENT CHECK–
D53 DRIVE ID1 OUT +
DRIVE ID1 –
D54 DRIVE ID2 OUT +
DRIVE ID2 –
D55 DRIVE ID4 OUT +
DRIVE ID4 –
ENCODER A +
ENCODER A –
ENCODER B +
ENCODER B –
COM
J7
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
SHEET 5-3A J
ELEC SCHEM:COMMAND THC
013369
SHEET 4 OF 8
A

THC MOTOR DRIVE
041511

D1 DRIVE ACTIVE

S1

4 3 2 1

SW1 - ON = LOW SPEED
SW2 - ON - STD PLASMA RESOLUTION
SW3 - ON - LIMIT DOWN
SW4 - HPR PEIRCE COMPLETE

J5

PHASE A–
PHASE A+
MOTOR POWER
PHASE A–
PHASE A+

1 2 3 4 5 6 7 8 9

TO LIFTER 123020

J7

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

+5V
HALF STEP PULSE
DIRECTION
DAC LD
DAC DATA
DAC CLK
LIFTER BRAKE
LIFTER UP D16
LIFTER DOWN D17
SPEED RESPONSE +
SPEED RESPONSE –
ERROR RESOLUTION +
ERROR RESOLUTION –
LIMIT DOWN +
LIMIT DOWN –
CRASH DETECT +
CRASH DETECT –
D13 HOME POSITION +
HOME POSITION –
D14 LOWER LIMIT SWITCH +
LOWER LIMIT SWITCH –
MOTOR CURRENT CHECK +
MOTOR CURRENT CHECK–
DRIVE ID1 +
DRIVE ID1 –
DRIVE ID2 +
DRIVE ID2 –
DRIVE ID4 +
DRIVE ID4 –
ENCODER A +
ENCODER A –
ENCODER B +
ENCODER B –
COM

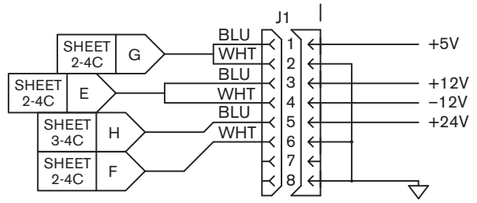
SHEET 4-3A J

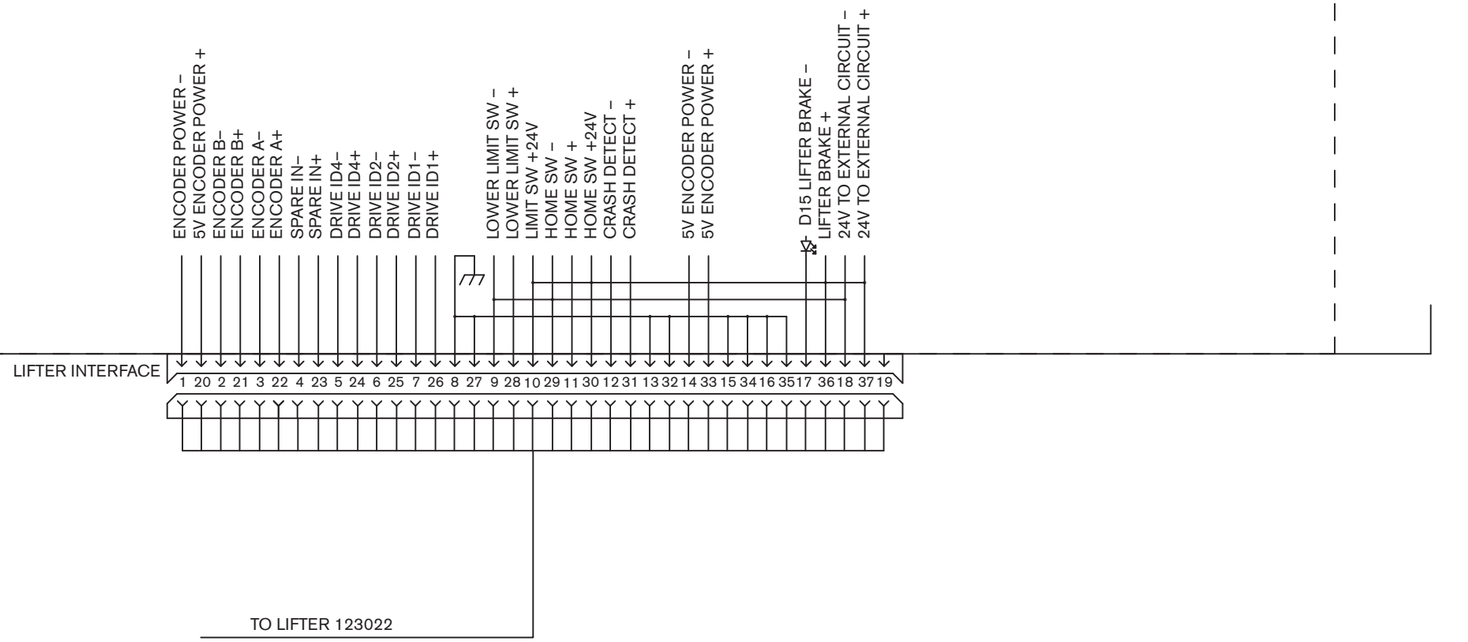
ELEC SCHEM:COMMAND THC

013369

SHEET 5 OF 8 (A)

THC MOTOR DRIVE
041511

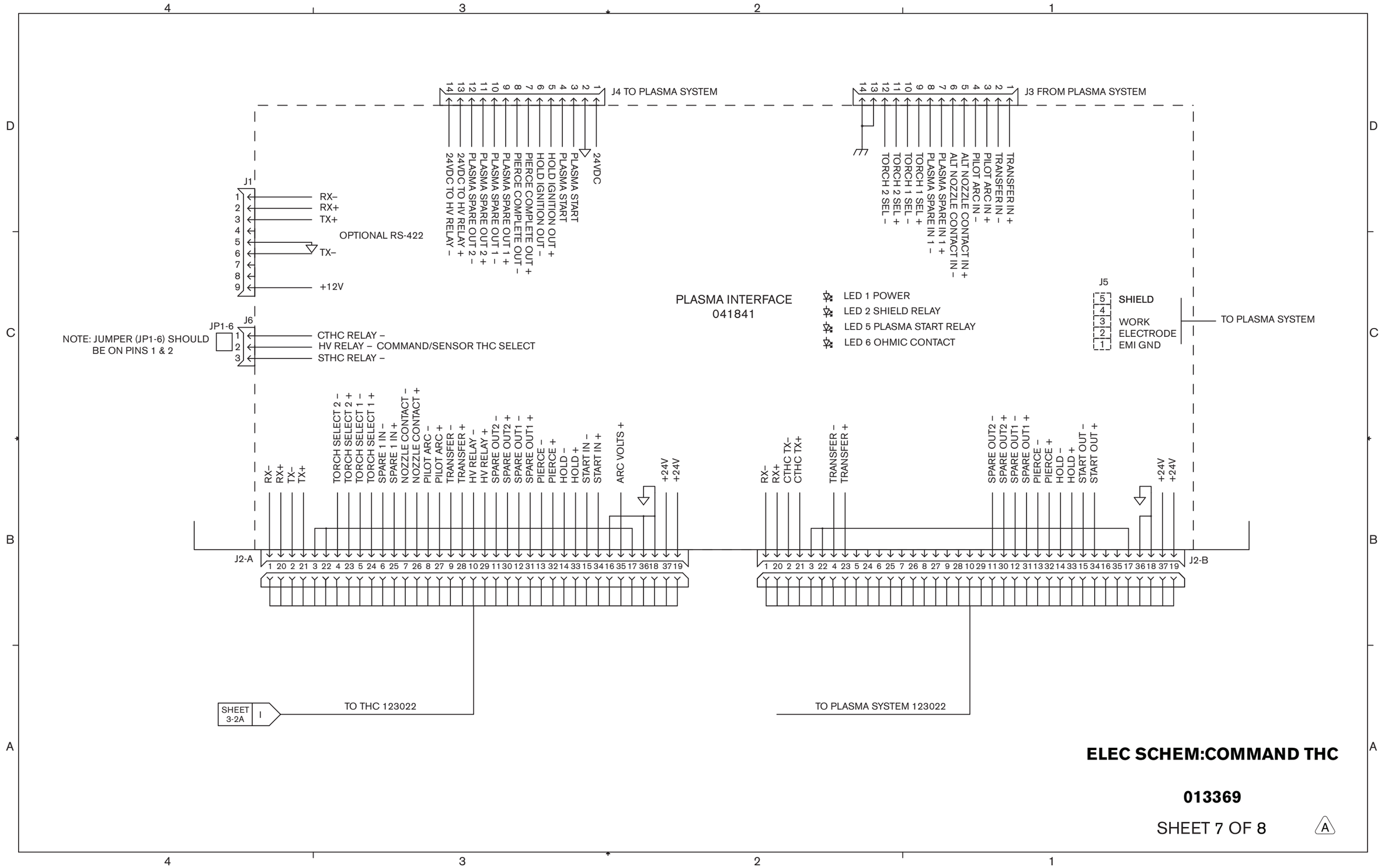




ELEC SCHEM:COMMAND THC

013369

SHEET 6 OF 8 (A)

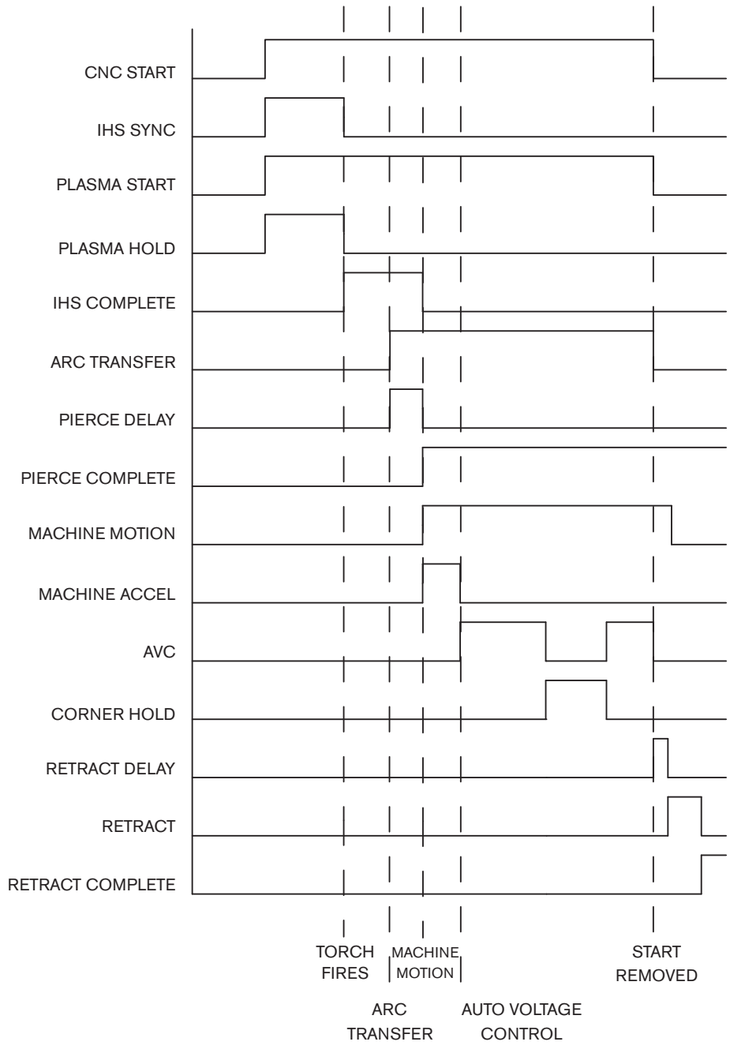


ELEC SCHEM:COMMAND THC

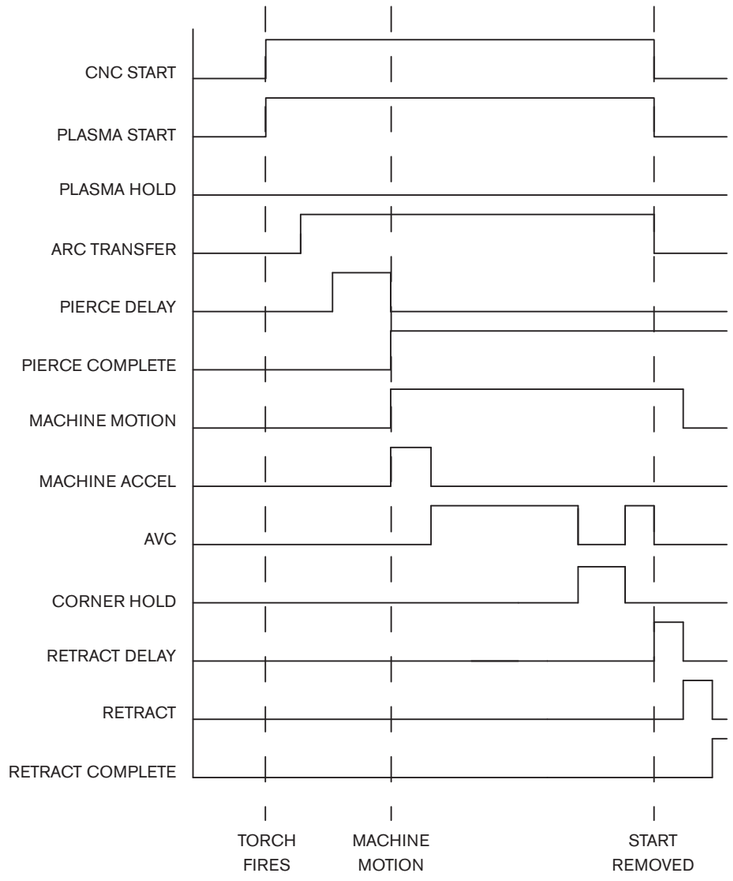
013369

SHEET 7 OF 8 (A)

AUTOMATIC MODE W/ PREFLOW DURING IHS



MANUAL MODE



ELEC SCHEM:COMMAND THC

013369

SHEET 8 OF 8 (A)

Appendix A

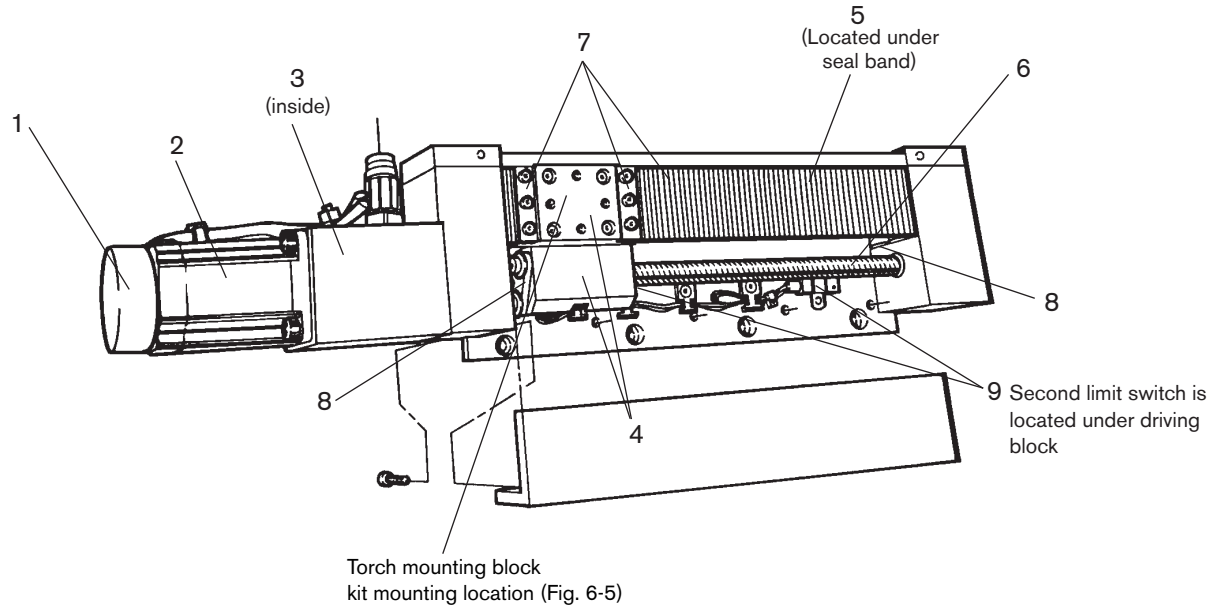
PARTS LIST FOR OLDER SYSTEMS

In this section

1 Rail Lifter a-2
Plasma interface assembly a-3
THC control module a-4

1 rail lifter

Index no.	Part no.	Description	Quantity
	128050	**X-Y lifter assembly**	**1**
1	128726	Encoder replacement Kit	1
2	128727	Motor/Encoder replacement Kit	1
3	027550	Brake, power off	1
4	027552	Driving block	1
5	027551	Rail and block, bearing	1
6	129266	Assembly, leadscrew standard	1
7	128189	Band seal kit (29")	1
8	128190	Band roller kit	4 per lifter
9	005195	Limit switch	2

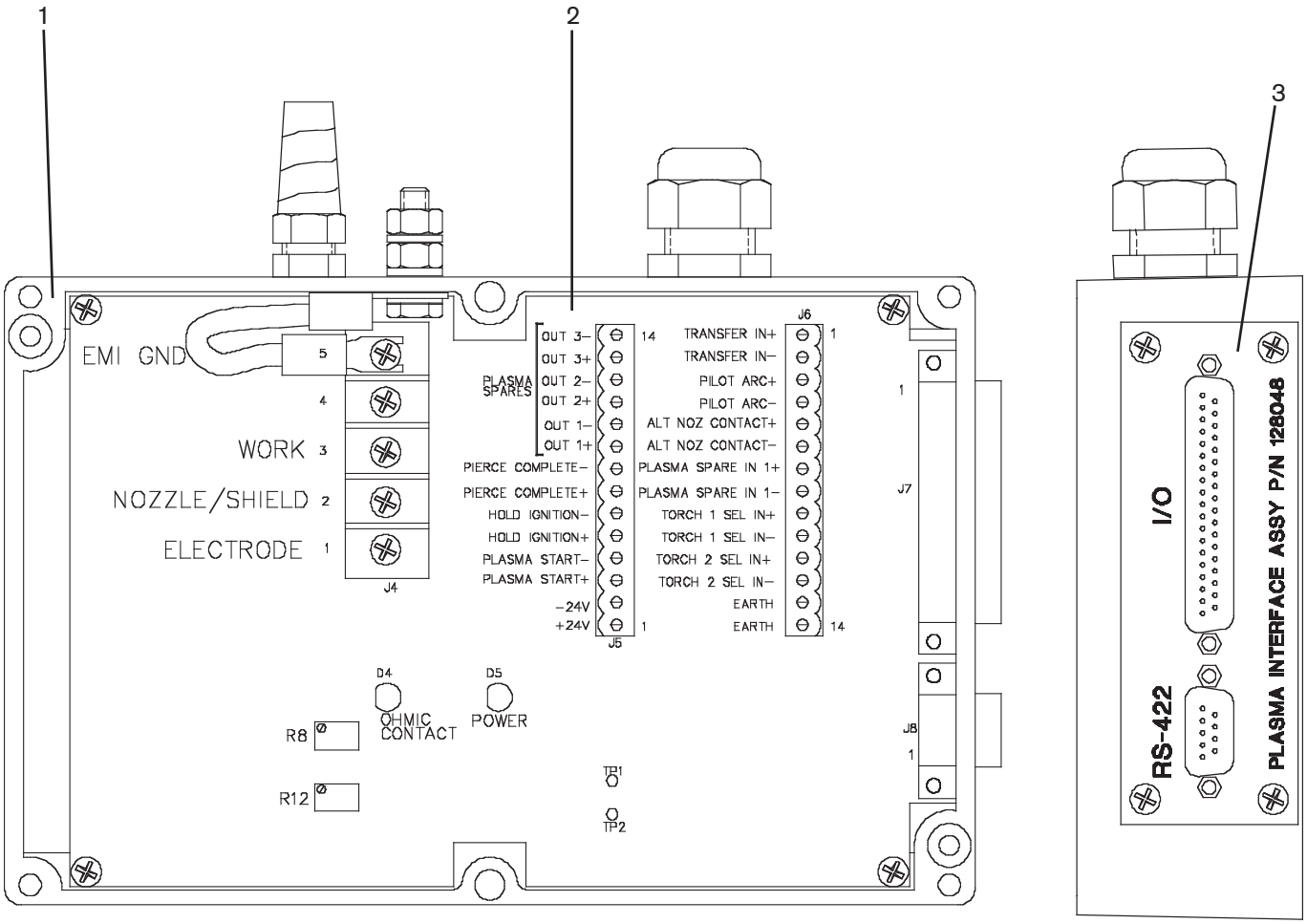


1 rail X-Y lifter assembly

Plasma interface assembly

Note: 128048 can only be used if the control module (see next page) has the older control PCB and software. If the control module is updated the plasma interface upgrade kit (128503) must be installed.

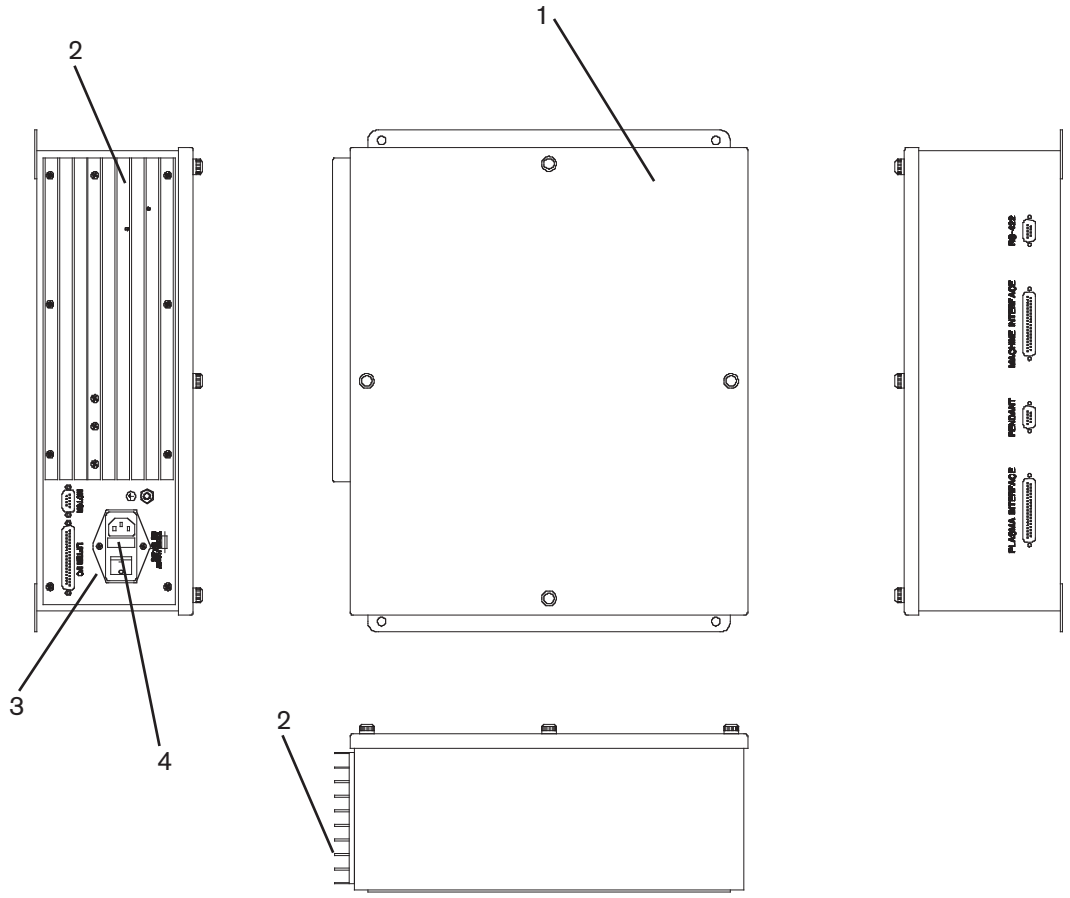
Index no.	Part no.	Description	Quantity
	128048	**Plasma interface assembly**	**1**
	128503	Kit: plasma interface upgrade	1
1	002266	Enclosure: plasma interface	1
2	041521	PCB assembly: plasma interface	1
3	001603	Panel: plasma interface	1



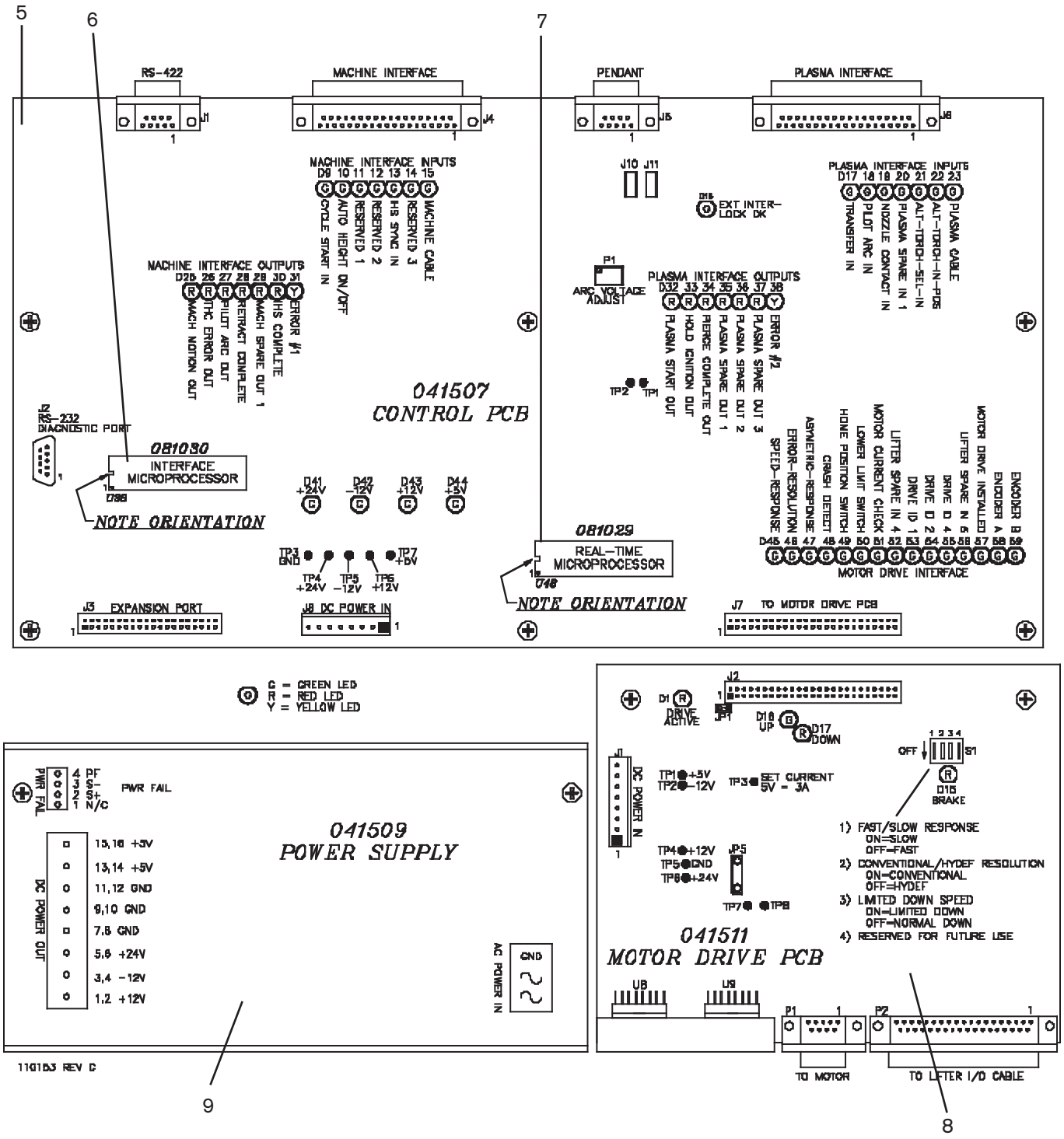
THC control module

Index no.	Part no.	Description	Quantity
1	**053018**	**Control module**	**1**
1	002261	Enclosure: control module	1
2	129067	Heatsink assembly	1
2	004705	Heatsink	1
3	005186	Power entry module: fused filter	1
4	008971	Fuse: T, 3.15 Amp, H 250 V, 5 mm x 20 mm	2
5	*041507	PCB: control (see figure on next page)	1
6	*081029	Firmware: real-time microprocessor	1
7	*081030	Firmware: interface microprocessor	1
8	041511	PCB: motor drive (see figure on next page)	1
9	229070	Power source: 130W (see figure on next page)	1
10	123254	Cable: 50C ribbon (not shown)	1
11	129066	Wiring harness (not shown)	1

* These items can only be used with the older plasma interface assembly (128048). See previous page.



Control module exterior



Control module interior

Appendix B

PENDANT CONTRAST ADJUSTMENT PROCEDURE

Under certain lighting conditions, or in cold temperatures, it may be necessary to adjust the contrast of the pendant display for better visibility. The menu for this parameter also contains other parameters that are critical for the proper operation of the THC. **The only parameter that should be adjusted is the VIEWING ANGLE.** The default settings are listed in case it becomes necessary to reset other parameters.

The following keys on the keypad represent the function keys (F1 – F5)

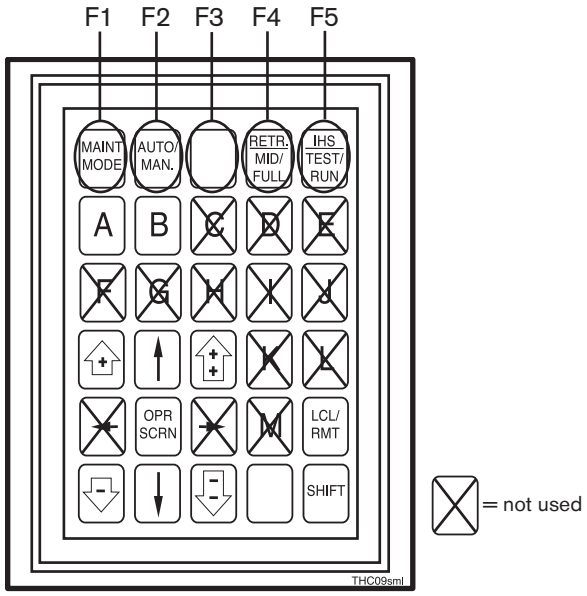
F1 = MAINT/MODE

F2 = AUTO/MAN.

F3 = Blank key to the right of AUTO/MAN.

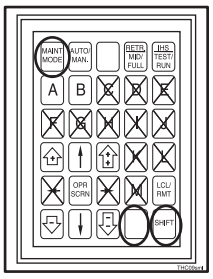
F4 = RETR. MID/FULL

F5 = IHS TEST/RUN



Procedure

1. Press the SHIFT key + the MAINT/MODE key + the blank key next to the shift key at the same time. The following options will APPEAR on the change settings menu:



   F1 – CHANGE THE SETTINGS
   F2 – NEXT OPTION
   F3 – PREVIOUS OPTIONS
   F4 – QUIT WITHOUT SAVING
   F5 – SAVE & EXIT

2. Press F2 (AUTO/MAN button) until you get to the VIEWING ANGLE parameter.

3. Press F1 (MAINT/MODE button) to change the contrast setting until the display is easy to see.

4. Press F5 (IHS TEST/RUN button) to save the changes, and then press F1 (MAINT/MODE button) to acknowledge that the change has been saved. The screen may “freeze” at this time, but will return to normal after about 15 seconds, or after a function key has been pressed.

Default pendant values

BAUD = 9600	DISABLE ECHO
DATA BITS = 8	ESCAPE MODE = ANSI
PARITY = EVEN	CR/LF MODE = NORMAL
ENABLE DISPLAY PE	ENABLE TEST
REPEAT = SLOW	DISABLE SHIFT LOCK
ENABLE KEY CLICK	SCROLL ON LAST CHR
DISABLE KNP FUNCTION	VIEWING ANGLE = 5
DISABLE CURSOR	DISABLE BREAK CMND
DISABLE XON/XOFF	SCREEN SIZE = 24 X 8
DISABLE HANDSHAKE	MENU MODE = DESTRUCTIVE

Page of Change	Description of Change **Rev 10 to 11** 2/2009
Global	Updated formats to current style for TOCs and converted font from Helvetica to Akzidenz.
i and ii	Updated the EMC and Warranty sections to new format
1c	Added section 1c (Spanish safety section) and updated 1a and 1b.
Global	Updated graphics of the plasma interface assembly to show the addition of a second I/O, DB connector.
2.6 and 3.5	Corrected over all length dimension. It was 21.8" (554 mm), changed to 22.4" (570 mm).
3.17	Added HD4070 information to the DIP switch settings, table. This appeared in Revision 10.
3.18	Added old run rates (baud, data bits, stop bit, and parity). to serial protocol.
3.23	Correction. The notes reference on the right side of the table was changed from saying page 3-22 to 3-24.
Global	Changed **sensing** wires to **arc voltage** wires everywhere it appeared.
3g	Updated section to include the G3 series.
3i	Added the 260 and 400XD to the HPR setup section.
Added section 3j	Added installation section for HySpeed HSD system.
6.4	Index No. 1 is now the entire assembly. The assemblies enclosure has been removed.
6.5	Added the drive nut, part number 127154. Added length (32.3125") to the description of the band seal kit. Changed the quantity of the Rail and block bearing from 4 to 2.
6.7	Added items 3b (127155/proximity switch) and 3c (127156/collar).
6.8	Added 027665 (protective cover) and 2280557 (cable replacement kit).
6.9	Added the part numbers for the HPR400XD ohmic contact wires.
Section 7	Added wiring diagrams, 013369 (8 sheets).
Appendix A	Added older revision part numbers for the plasma interface assembly and the THC control module and re-named the appendix to "parts list for older systems". It still includes the 1 rail lifter.
Added Appendix B	Added pendant contrast adjustment procedure.

Page of Change	Description of Change	Rev 9 to 10	1/31/05
Cover & Title page	Rev changed from 9 to 10. Art on cover updated to show new encoder.		
2.3	Added note to Plasma interface assembly with voltage divider, bullet.		
3.16, 5.12 and 6.3	Changed part number in 130 W power supply art from 041509 to 229070		
6.2	Changed part number for item number 5 (power source, 130W) from 041509 to 229070		

Page of Change	Description of Change	Rev 8 to 9	3/20/04
Cover & Title page	Rev changed from 8 to 9.		
3.1	Updated Main TOC and section 3 TOC.		
all relevant pages	RS-422 port removed from plasma interface assembly. Art updated to reflect change.		
3.4, 3.12 and 6.4	HPR130 added to installation note.		
3.9	Diagram added to show pin #'s (1, 3 and 4) on the breakaway pressure switch cable. Pin numbers added to wire colors on breakaway pressure switch diagram.		
3.17	Changed the diagram of the dip switch's ON/OFF positions to show switches 1-3 in the ON position.		
3a-6	Polarities shown for "pierce complete", "torch ignition out" and "transfer out" changed.		
Section 3i added	Added installation section for HPR130.		
Ap A and section 3	Appendix A removed and information added to section 3 pgs 3-16 & 3-17.		

Page of Change	Description of Change	Rev 7 to 8	11/21/02
Cover & Title page	Rev changed from 7 to 8. Rev change only. No changes in the manual.		

Page of Change	Description of Change	Rev 6 to 7	4/9/02
Cover & Title page	Rev changed from 6 to 7. Art on cover updated to show new encoder.		
3a.6, 3b.6, 3c.6, 3d.6, 3f.6	J5 & J6 changed to J4 & J3 respectively.		
3d.6	4th box down under signal name changed from Arc voltage to Emergency stop. Wire color changed from Yellow to Green.		
3g-1	Part numbers for Powermax900 were in Powermax1100 box and vice versa.		
2.6, 3.5, 3.6, 3.9-11, 3.13, 5.3, 5.5	Lifter figures updated to show new encoder.		
6.5	Figure updated to show new encoder. Kit #s 128726 & 128727 added for encoder and motor/encoder replacement. Individual part #s removed.		