Hypertherm®

ArcGlide® THC

Torch Height Control

Instruction Manual

806450 | Revision 5 | English

Register your new Hypertherm system

Register your product online at **www.hypertherm.com/registration** for easier technical and warranty support. You can also receive updates on new Hypertherm products and a free gift as a token of our appreciation.

For your records

Serial number:_____

Purchase date: _____

Distributor: _____

_____

_____

Maintenance notes:

_____

_____

_____

_____

_____

_____

ArcGlide

Instruction Manual

806450
Revision 5

English

March 2015

Hypertherm Inc.
Hanover, NH 03755 USA

Hypertherm Inc.
Etna Road, P.O. Box 5010
Hanover, NH 03755 USA
603-643-3441 Tel (Main Office)
603-643-5352 Fax (All Departments)
info@hypertherm.com (Main Office Email)
800-643-9878 Tel (Technical Service)
technical.service@hypertherm.com (Technical Service Email)
800-737-2978 Tel (Customer Service)
customer.service@hypertherm.com (Customer Service Email)
866-643-7711 Tel (Return Materials Authorization)
877-371-2876 Fax (Return Materials Authorization)
return.materials@hypertherm.com (RMA email)

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

Hypertherm (S) Pte Ltd.
82 Genting Lane
Media Centre
Annexe Block #A01-01
Singapore 349567, Republic of Singapore
65 6841 2489 Tel
65 6841 2490 Fax
65 6841 2489 (Technical Service)

Hypertherm (Shanghai) Trading Co., Ltd.
Unit 301, South Building
495 ShangZhong Road
Shanghai, 200231
PR China
86-21-60740003 Tel
86-21-60740393 Fax

Hypertherm Europe B.V.
Vaartveld 9
4704 SE
Roosendaal, Nederland
31 165 596907 Tel
31 165 596901 Fax
31 165 596908 Tel (Marketing)
31 165 596900 Tel (Technical Service)
00 800 4973 7843 Tel (Technical Service)

Hypertherm Japan Ltd.
Level 9, Edobori Center Building
2-1-1 Edobori, Nishi-ku
Osaka 550-0002 Japan
81 6 6225 1183 Tel
81 6 6225 1184 Fax

Hypertherm Brasil Ltda.
Rua Bras Cubas, 231 – Jardim Maia
Guarulhos, SP - Brasil
CEP 07115-030
55 11 2409 2636 Tel
55 11 2408 0462 Fax

Hypertherm México, S.A. de C.V.
Avenida Toluca No. 444, Anexo 1,
Colonia Olivar de los Padres
Delegación Álvaro Obregón
México, D.F. C.P. 01780
52 55 5681 8109 Tel
52 55 5683 2127 Fax

Hypertherm Korea Branch
#3904 Centum Leaders Mark B/D,
1514 Woo-dong, Haeundae-gu, Busan
Korea, 612-889
82 51 747 0358 Tel
82 51 701 0358 Fax

Contents

RECOGNIZE SAFETY INFORMATION

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

FOLLOW SAFETY INSTRUCTIONS

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

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

DANGER WARNING CAUTION

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.

ELECTRICAL HAZARDS

- Only trained and authorized personnel may open this equipment.
- If the equipment is permanently connected, turn it off, and lock out/tag out power before the enclosure is opened.
- If power is supplied to the equipment with a cord, unplug the unit before the enclosure is opened.
- Lockable disconnects or lockable plug covers must be provided by others.
- Wait 5 minutes after removal of power before entering the enclosure to allow stored energy to discharge.
- If the equipment must have power when the enclosure is open for servicing, arc flash explosion hazards may exist. Follow ALL local requirements (NFPA 70E in the USA) for safe work practices and for Personal Protective Equipment when servicing energized equipment.
- The enclosure shall be closed and the proper earth ground continuity to the enclosure verified prior to operating the equipment after moving, opening, or servicing.
- Always follow these instructions for disconnecting power before inspecting or changing torch consumable parts.

ELECTRIC SHOCK CAN KILL

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

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

Electric shock prevention

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

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

CUTTING CAN 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

- Do not cut aluminum underwater or with water touching the underside of the aluminum.
- Cutting aluminum underwater or with the water touching the underside of the aluminum can result in an explosive condition that can detonate during plasma cutting operations.

WARNING
Explosion Hazard
Underwater Cutting with Fuel Gases

- Do not cut under water with fuel gases containing hydrogen.
- Cutting under water with fuel gases containing hydrogen can result in an explosive condition that can detonate during plasma cutting operations.

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.

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 and 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.

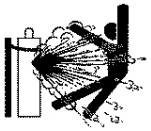
STATIC ELECTRICITY CAN DAMAGE CIRCUIT BOARDS

Use proper precautions when handling printed circuit boards:

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

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 and 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 and 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.

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 and 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	N/A

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.

NOISE CAN DAMAGE HEARING

Cutting with a plasma arc can exceed acceptable noise levels as defined by local codes in many applications. Prolonged exposure to excessive noise can damage hearing. Always wear proper ear protection when cutting or gouging, unless sound pressure level measurements taken at the installed site have verified personal hearing protection is not necessary per relevant international, regional, and local codes.

Significant noise reduction can be obtained by adding simple engineering controls to cutting tables such as barriers or curtains positioned between the plasma arc and the workstation; and/or locating the workstation away from the plasma arc. Implement administrative controls in the workplace to restrict access, limit operator exposure time, screen off noisy working areas and/or take measures to reduce reverberation in working areas by putting up noise absorbers.

Use ear protectors if the noise is disruptive or if there is a risk of hearing damage after all other engineering and administrative controls have been implemented. If hearing protection is required, wear only approved personal protective devices such as ear muffs or ear plugs with a noise reduction rating appropriate for the situation. Warn others in the area of possible noise hazards. In addition, ear protection can prevent hot splatter from entering the ear.

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.

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.

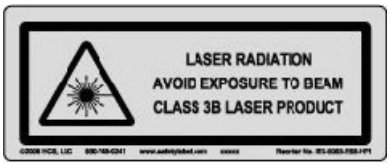
Note 1 – Hypertherm's interpretation of these new requirements is that unless a site-specific evaluation has been completed to determine that all dust generated is not combustible, the 2007 edition of NFPA 68 requires the use of explosion vents designed to the worst-case Kst value (see annex F) that 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.

LASER RADIATION

Exposure to the laser output can result in serious eye injury. Avoid direct eye exposure.

For your convenience and safety, on Hypertherm products that use a laser, one of the following laser radiation labels has been applied on the product near where the laser beam exits the enclosure. The maximum output (mV), wavelength emitted (nM) and, if appropriate, the pulse duration is also provided.



Additional laser safety instructions:

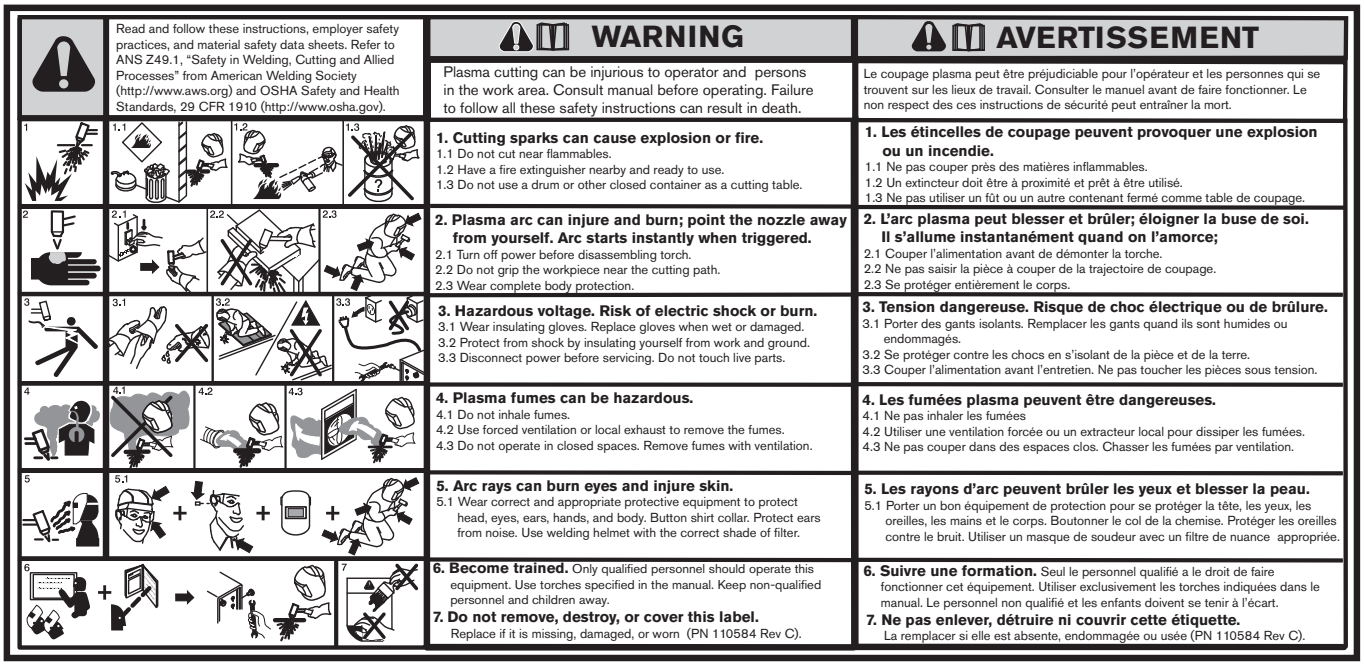
- Consult with an expert on local laser regulations. Laser safety training may be required.
- Do not allow untrained persons to operate the laser. Lasers can be dangerous in the hands of untrained users.
- Do not look into the laser aperture or beam at any time.
- Position the laser as instructed to avoid unintentional eye contact.
- Do not use the laser on reflective workpieces.
- Do not use optical tools to view or reflect the laser beam.
- Do not disassemble or remove the laser or aperture cover.
- Modifying the laser or product in any way can increase the risk of laser radiation.
- Use of adjustments or performance of procedures other than those specified in this manual may result in hazardous laser radiation exposure.
- Do not operate in explosive atmospheres, such as in the presence of flammable liquids, gases, or dust.
- Use only laser parts and accessories that are recommended or provided by the manufacturer for your model.
- Repairs and servicing MUST be performed by qualified personnel.
- Do not remove or deface the laser safety label.

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/

WARNING LABELS

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 labels

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.

Symbols and marks

Your 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

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

CSA mark

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 UL or TÜV.

CE mark

The CE marking signifies the manufacturer's declaration of conformity to applicable European directives and standards. Only those versions of 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.

Eurasian Customs Union (CU) mark

CE versions of products that include an EAC mark of conformity meet the product safety and EMC requirements for export to Russia, Belarus, and Kazakhstan.

GOST-TR mark

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

C-Tick mark

CE versions of 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.

UkrSEPRO mark

The CE versions of products that include a UkrSEPRO mark of conformity meet the product safety and EMC requirements for export to the Ukraine.

Serbian AAA mark

CE versions of products that include a AAA Serbian mark meet the product safety and EMC requirements for export to Serbia.

Introduction

Hypertherm maintains a global Regulatory Management System to ensure that products comply with regulatory and environmental requirements.

National and local safety regulations

National and Local safety regulations shall take precedence over any instructions provided with the product. The product shall be imported, installed, operated and disposed of in accordance with national and local regulations applicable to the installed site.

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 and determined 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 modified in a manner that creates a hazard or non-conformance with the applicable standards.
- 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, or otherwise.

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.

Certificates of compliance for Hypertherm products are available from the Downloads Library on the Hypertherm web site at https://www.hypertherm.com.

Differences in national standards

Nations may apply different performance, safety or other standards. National differences in standards include, but are not limited to:

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

These differences in national or other 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 therefore 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, but are not limited to:

- 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.

Safe installation and use of shape cutting equipment

IEC 60974-9, titled Arc Welding Equipment – Installation and use, provides guidance in the safe installation and use of shape cutting equipment and the safe performance of cutting operations. The requirements of national and local regulations shall be taken into consideration during installation, including, but not limited to, grounding or protective earth connections, fuses, supply disconnecting device, and type of supply circuit. Read these instructions before installing the equipment. The first and most important step is the safety assessment of the installation.

The safety assessment must be performed by an expert, and determines what steps are necessary to create a safe environment, and what precautions should be adopted during the actual installation and operation.

Procedures for periodic inspection and testing

Where required by local national regulations, IEC 60974-4 specifies test procedures for periodic inspection and after repair or maintenance, to ensure electrical safety for plasma cutting power sources built in conformity with IEC 60974-1. Hypertherm performs the continuity of the protective circuit and insulation resistance tests in the factory as non-operating tests. The tests are performed with the power and ground connections removed.

Hypertherm also removes some protective devices that would cause false test results. Where required by local national regulations, a label shall be attached to the equipment to indicate that it has passed the tests prescribed by IEC 60974-4. The repair report shall indicate the results of all tests unless an indication is made that a particular test has not been performed.

Qualification of test personnel

Electrical safety tests for shape cutting equipment can be hazardous and shall be carried out by an expert in the field of electrical repair, preferably someone also familiar with welding, cutting, and allied processes. The safety risks to personnel and equipment, when unqualified personnel are performing these tests, may be much greater than the benefit of periodic inspection and testing.

Hypertherm recommends that only visual inspection be performed unless the electrical safety tests are specifically required by local national regulations in the country where the equipment is installed.

Residual current devices (RCDs)

In Australia and some other countries, local codes may require the use of a Residual Current Devices (RCD) when portable electrical equipment is used in the workplace or at construction sites to protect operators from electrical faults in the equipment. RCDs are designed to safely disconnect the mains electrical supply when an imbalance is detected between the supply and return current (there is a leakage current to earth). RCDs are available with both fixed and adjustable trip currents between 6 to 40 milliamperes and a range of trip times up to 300 milliseconds selected for the equipment installation, application and intended use. Where RCDs are used, the trip current and trip time on RCDs should be selected or adjusted high enough to avoid nuisance tripping during normal operation of the plasma cutting equipment and low enough in the extremely unlikely event of an electrical fault in the equipment to disconnect the supply before the leakage current under a fault condition can pose a life threatening electrical hazard to operators.

To verify that the RCDs continue to function properly over time, both the trip current and the trip time should be tested periodically. Portable electrical equipment and RCDs used in commercial and industrial areas in Australia and New Zealand are tested to the Australian standard AS/NZS 3760. When you test the insulation of plasma cutting equipment to AS/NZS 3760, measure the insulation resistance according to Appendix B of the standard, at 250 VDC with the power switch in the ON position to verify proper testing and to avoid the false failure of the leakage current test. False failures are possible because the metal oxide varistors (MOVs) and electromagnetic compatibility (EMC) filters, used to reduce emissions and protect the equipment from power surges, may conduct up to 10 milliamperes leakage current to earth under normal conditions.

If you have any questions regarding the application or interpretation of any IEC standards described here, you are required to consult with an appropriate legal or other advisor familiar with the International Electrotechnical standards, and shall not rely on Hypertherm in any respect regarding the interpretation or application of such standards.

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 you are 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, water, or other 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.

Introduction

The Hypertherm Environmental Specification requires RoHS, WEEE and REACH substance information to be provided by Hypertherm's suppliers.

Product environmental compliance does not address the indoor air quality or environmental release of fumes by the end user. Any materials that are cut by the end user are not provided by Hypertherm with the product. The end user is responsible for the materials being cut as well as for safety and air quality in the workplace. The end user must be aware of the potential health risks of the fumes released from the materials being cut and comply with all local regulations.

National and local environmental regulations

National and local environmental regulations shall take precedence over any instructions contained in this manual.

The product shall be imported, installed, operated and disposed of in accordance with all national and local environmental regulations applicable to the installed site.

The European Environmental regulations are discussed later in *The WEEE Directive*.

The RoHS directive

Hypertherm is committed to complying with all applicable laws and regulations, including the European Union Restriction of Hazardous Substances (RoHS) Directive that restricts the use of hazardous materials in electronics products. Hypertherm exceeds RoHS Directive compliance obligations on a global basis.

Hypertherm continues to work toward the reduction of RoHS materials in our products, which are subject to the RoHS Directive, except where it is widely recognized that there is no feasible alternative.

Declarations of RoHS Conformity have been prepared for the current CE versions of Powermax plasma cutting systems manufactured by Hypertherm. There is also a "RoHS mark" on the Powermax CE versions below the "CE Marking" on the data plate of CE versions of Powermax series units shipped since 2006. Parts used in CSA versions of Powermax and other products manufactured by Hypertherm that are either out of scope or exempt from RoHS are continuously being converted to RoHS compliance in anticipation of future requirements.

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.
- Consult with legal or other compliance experts when appropriate.

The WEEE Directive

On January 27, 2003, the European Parliament and the Council of the European Union authorized Directive 2002/96/EC or WEEE (Waste Electrical and Electronic Equipment).

As required by the legislation, any Hypertherm product covered by the directive and sold in the EU after August 13, 2005 is marked with the WEEE symbol. This directive encourages and sets specific criteria for the collection, handling, and recycling of EEE waste. Consumer and business-to-business wastes are treated differently (all Hypertherm products are considered business-to-business). Disposal instructions for the CE versions of Powermax plasma systems can be found at www.hypertherm.com/weee.

The URL is printed on the symbol-only warning label for each of these CE version Powermax series units shipped since 2006. The CSA versions of Powermax and other products manufactured by Hypertherm are either out of scope or exempt from WEEE.

The REACH regulation

The REACH regulation (1907/2006), in force since June 1, 2007, has an impact on chemicals available to the European market. The REACH regulation requirements for component manufacturers states that the component shall not contain more than 0.1% by weight of the Substances of Very High Concern (SVHC).

Component manufacturers and other downstream users, such as Hypertherm, are obligated to obtain assurances from its suppliers that all chemicals used in or on Hypertherm products will have a European Chemical Agency (ECHA) registration number. To provide chemical information as required by the REACH regulation, Hypertherm requires suppliers to provide REACH declarations and identify any known use of REACH SVHC. Any use of SVHC in amounts exceeding 0.1% w/w of the parts has been eliminated. The MSDS contains a full disclosure of all substances in the chemical and can be used to verify REACH SVHC compliance.

The lubricants, sealants, coolants, adhesives, solvents, coatings and other preparations or mixtures used by Hypertherm in, on, for, or with its shape cutting equipment are used in very small quantities (except the coolant) and are commercially available with multiple sources that can and will be replaced in the event of a supplier problem associated with REACH Registration or REACH Authorization (SVHCs).

Proper handling and safe use of chemicals

Chemical Regulations in the USA, Europe, and other locations require that Material Safety Data Sheets (MSDS) be made available for all chemicals. The list of chemicals is provided by Hypertherm. The MSDS are for chemicals provided with the product and other chemicals used in or on the product. MSDS can be downloaded from the Downloads Library on the Hypertherm web site at https://www.hypertherm.com. On the Search screen, insert MSDS in the document title and click on Search.

In the USA, OSHA does not require Material Safety Data Sheets for articles such as electrodes, swirl rings, retaining caps, nozzles, shields, deflectors and other solid parts of the torch.

Hypertherm does not manufacture or provide the materials that are cut and has no knowledge whether the fumes released from materials that are cut will pose a physical hazard or health risk. Please consult with your supplier or other technical advisor if you need guidance concerning the properties of the material you will cut using a Hypertherm product.

Fumes emission and air quality

Note: The following information on air quality is intended for general information only and should not be used as a substitute for reviewing and implementing applicable government regulations or legal standards in the country where the cutting equipment will be installed and operated.

In the USA, the National Institute for Occupational Safety and Health (NIOSH) Manual of Analytical Methods (NMAM) is a collection of methods for sampling and analyzing contaminants in workplace air. Methods published by others, such as OSHA, MSHA, EPA, ASTM, ISO or commercial suppliers of sampling and analytical equipment, may have advantages over NIOSH methods.

For example, ASTM Practice D 4185 is a standard practice for the collection, dissolution, and determination of trace metals in workplace atmospheres. The sensitivity, detection limit, and optimum working concentrations for 23 metals are listed in ASTM D 4185. An industrial hygienist should be used to determine the optimum sampling protocol, considering analytical accuracy, cost, and optimum sample number. Hypertherm uses a third party industrial hygienist to perform and interpret air quality testing results taken by air sampling equipment positioned at operator stations in Hypertherm buildings where plasma cutting tables are installed and operated.

Where applicable, Hypertherm also uses a third party industrial hygienist to obtain air and water permits.

If you are not fully aware and up to date on all applicable government regulations and legal standards for the installation site, you should consult a local expert prior to purchasing, installing, and operating the equipment.

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 the 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, signaling 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 as set forth in and in accordance with the manufacturer's written instructions. For example, 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 the 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 steel work, 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 in crease 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 provided in IEC 60974-9, Arc Welding Equipment, Part 9: 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 or injury caused by the use of other than genuine Hypertherm parts may not be covered by the Hypertherm warranty, and will constitute misuse of the Hypertherm Product.

You are solely 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 for the specific periods of time set forth herein and as follows: if Hypertherm is notified of a defect (i) with respect to the plasma 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, with the exception of the HPRXD short torch with integrated lead, which shall be within a period of six (6) months from the 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 Automation products one (1) year from its date of delivery to you, with the exception of the EDGE Pro CNC, EDGE Pro Ti CNC, MicroEDGE Pro CNC, and ArcGlide THC, which shall be within a period of two (2) years from the date of delivery to you, and (iii) with respect to HyIntensity fiber laser components within a period of two (2) years from the date of its delivery to you, with the exception of laser heads and beam delivery cables, which shall be 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 provides repair, replacement or adjustment of the Product as the sole and exclusive remedy, if and only if the warranty set forth herein properly is invoked and applies. 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 pre paid by the customer. Hypertherm shall not be liable for any repairs, replacement, or adjustments of Products covered by this warranty, except those made pursuant to this paragraph and with Hypertherm's prior written consent.

The warranty set forth above is exclusive and is in lieu of all other warranties, express, implied, statutory, or otherwise with respect to the Products or as to the results which may be obtained therefrom, and all implied warranties or conditions of quality or of merchantability or fitness for a particular purpose or against infringement. The foregoing shall constitute the sole and exclusive remedy for any breach by Hypertherm of its warranty.

Distributors/OEMs may offer different or additional warranties, but Distributors/OEMs are not authorized to give any additional warranty protection to you or make any representation to you purporting to be binding upon Hypertherm.

Patent indemnity

Except only in cases of products not manufactured by Hypertherm or manufactured by a person other than Hypertherm not in strict conformity with Hypertherm's specifications and in cases of designs, processes, formulae, or combinations not developed or purported to be developed by Hypertherm, Hypertherm will have the right to 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 in any event no longer than fourteen (14) days after learning of any action or threat of action), and Hypertherm's obligation to defend 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 direct, indirect, punitive or exemplary damages (including but not limited to lost profits) regardless of whether such liability is based on breach of contract, tort, strict liability, breach of warranty, failure of essential purpose, or otherwise, and even if advised of the possibility of such damages.

National and local codes

National and local codes governing plumbing and electrical installation shall take precedence 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.

Liability cap

In no event shall Hypertherm's liability, if any, 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 (whether in court, arbitration, regulatory proceeding or otherwise) 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.

Transfer of rights

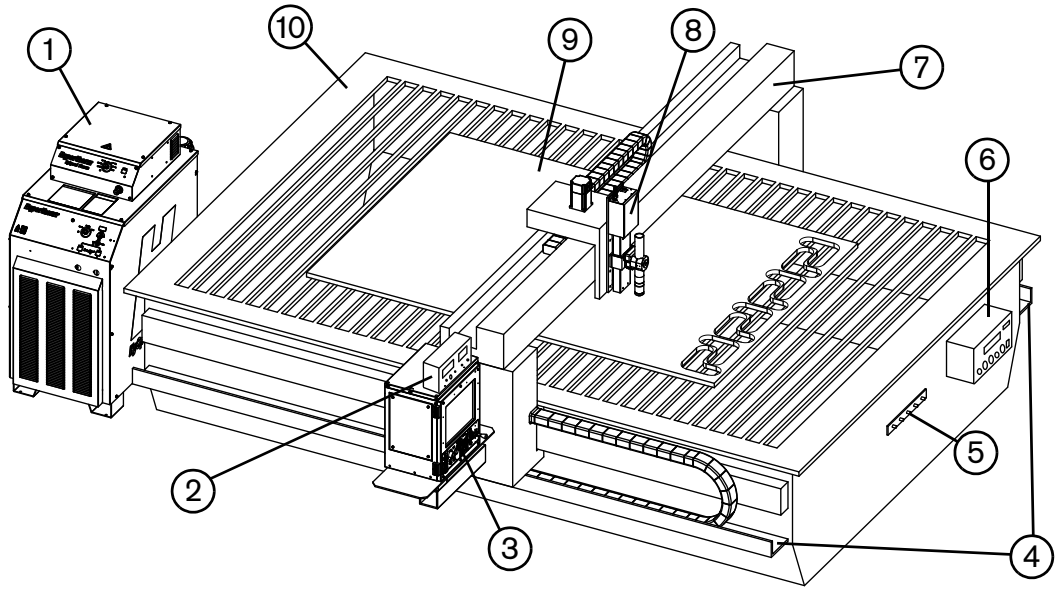
You may transfer any remaining rights you may have hereunder only in connection with the sale of all or substantially all of your assets or capital stock to a successor in interest who agrees to be bound by all of the terms and conditions of this Warranty. Within thirty (30) days before any such transfer occurs, you agree to notify in writing Hypertherm, which reserves the right of approval. Should you fail timely to notify Hypertherm and seek its approval as set forth herein, the Warranty set forth herein shall be null and void and you will have no further recourse against Hypertherm under the Warranty or otherwise.

Section 1
Specifications

Introduction

The Hypertherm ArcGlide THC is a voltage sensing, torch height control (THC) system that is designed for plasma cutting applications on an X-Y cutting machine. The system uses the plasma arc voltage to control the physical distance between the torch and the workpiece during cutting. Up to 4 ArcGlide systems can be installed on a cutting machine. The system includes the components shown in *Figure 1*.

Figure 1



1 Plasma system
2 ArcGlide HMI (optional)
3 CNC
4 Rails
5 Star ground
6 ArcGlide control module
7 Gantry
8 ArcGlide lifter
9 Workpiece
10 Cutting machine

The ArcGlide control module and Ethernet switch should be located in an electrical cabinet that is electrically grounded and environmentally clean.

ArcGlide control module

The ArcGlide control module houses a micro-controller, I/O board, and a motor drive. This component provides arc voltage control and interfaces with the torch lifter, the CNC, and the plasma system through standard discrete I/O interfaces or through the Hypernet® plasma interface board.

Lifter assembly

The torch lifter station, under control of the ArcGlide control module, positions a torch head vertically above the workpiece.

The lifter has the following features:

- Ability to detect the workpiece using ohmic contact sense circuitry or stall force
- Lifter station ENABLE/DISABLE switch with an indicator lamp
- Manual UP/DOWN switch
- Laser pointer for workpiece alignment
- Signal interface cable
- Optional magnetic or pneumatic torch breakaway with circuitry to indicate a collision
- Optional torch mounting block

Human machine interface (HMI)

The HMI includes a liquid crystal display (LCD), operating switches, and a selector knob for THC setup and control. The HMI is an optional operator interface for adjusting or reading settings.

The main functions of the HMI are:

- THC system and operation setup
- Entry for operating parameters
- Manual and automatic operation
- Initial height sense (IHS) test
- THC status and arc voltage display
- THC error display
- Multiple language support (English, German, Portuguese, and Spanish)
- English or metric unit support
- Station ENABLE/DISABLE switch

Plasma interface board

The plasma interface board has 2 main functions:

1. Precise, scaled feedback of the plasma arc voltage to the ArcGlide THC control module.
2. A convenient, control signal interface to the ArcGlide THC.

Hypertherm offers 2 types of plasma interface boards. See *Discrete plasma interface board (141094)* on page 44 or *Hypernet plasma interface board (141162)* on page 45.

Industrial Ethernet switch

An industrial grade Ethernet switch with multiple ports is required in configurations that have more than one cable connection for Hypernet. See *Ethernet switch* on page 46 for more information.

Specifications

ArcGlide system

Input power	115 VAC, 50/60 Hz, 1-phase 230 VAC, 50/60 Hz, 1-phase*
Operating temperature	-10°C to 40°C (14°F to 104°F)
Operating humidity	95% relative humidity
Warranty	2 years for electronics and lifter

* Factory default setting

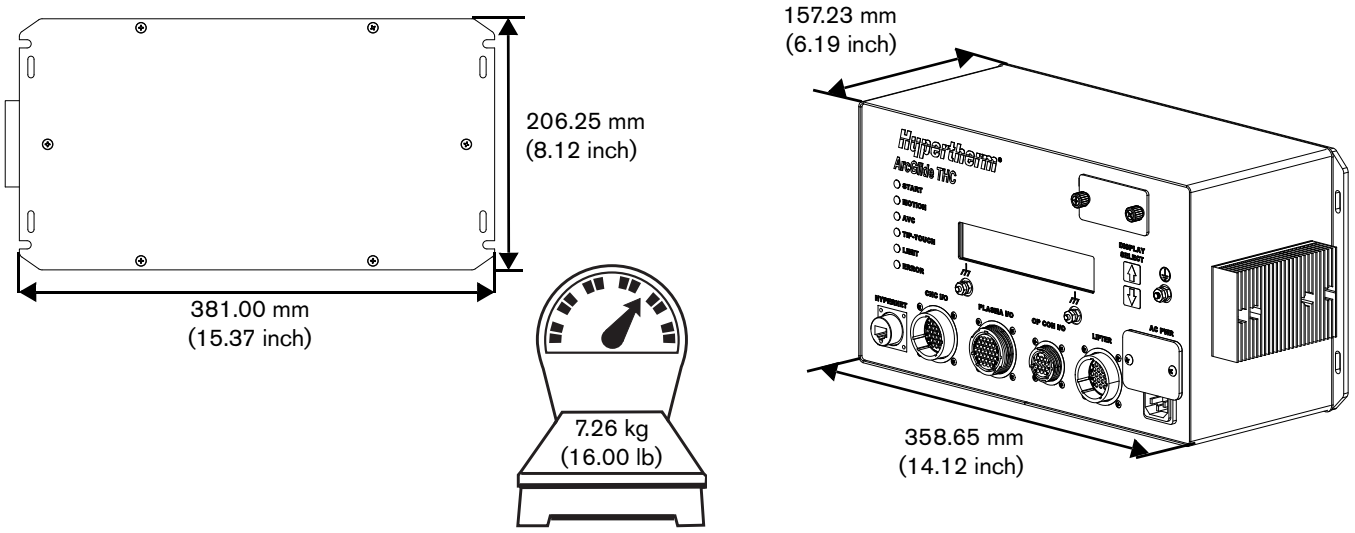
ArcGlide control module (090054)

Regulatory approvals	CE, CSA, C-Tick, GOST-TR, UkrSEPRO
Current rating (selectable)*	2.6 A at 100 VAC – 120 VAC, 50/60 Hz, 1-phase 1.5 A at 200 VAC – 230 VAC, 50/60 Hz, 1-phase**
Slow blow fuse	250 VAC, 5 A, 0.25 inch X 1.25 inch
Parallel digital input range	+12 VDC to +24 VDC
Serial digital I/O	+5 VDC (Plasma interface serial)
Maximum motor drive output	70 VDC, 6 A
Hypernet communication	Shielded RJ-45 Cat5e or Cat6

* To prevent damage to equipment, select the input voltage using the input fuse module on the front of the ArcGlide control module above the power connector (115 V or 230 V).

** Factory default setting

Figure 2



Lifter assembly (090053)

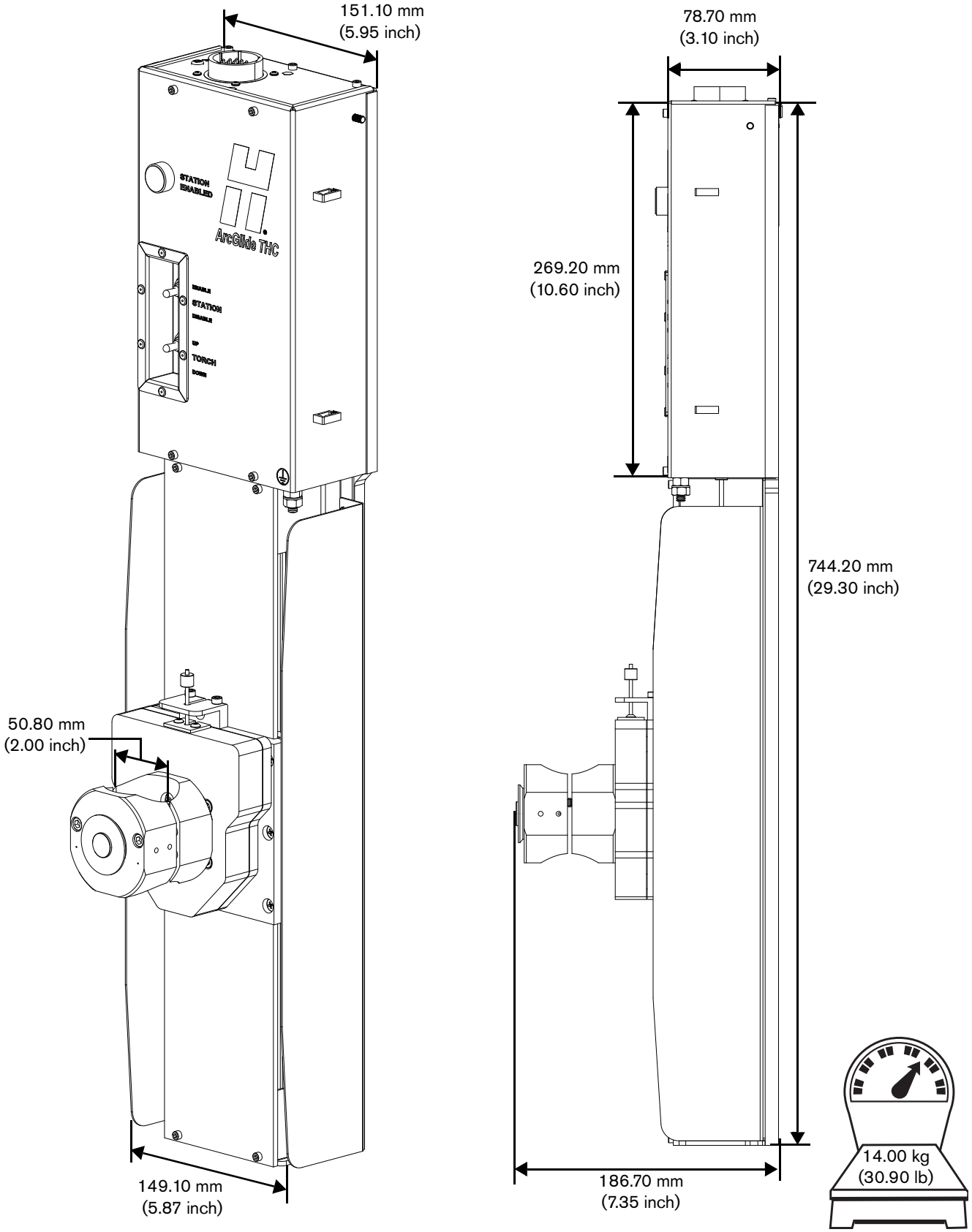
The following table lists specifications that are common for all lifter assemblies. *Table 1* lists specifications that differ from the model listed below.

Regulatory approvals	CE, CSA, C-Tick, GOST-TR, UkrSEPRO
Motor	70 VDC, 3 A continuous, 6 A maximum
Limit switches	+24 VDC
Motor	Permanent magnet
Motor drive	Pulse width modulation (PWM) servo amplifier
Lifter feedback	Incremental encoder
Lifter limit switches	Home switch and lower limit switch
Lifter control switches	Manual UP/DOWN and station ENABLE/DISABLE switches
Maximum Z-axis speed	15,200 mm/min (600 in/min)
Maximum Z-axis stroke	239 mm (9.40 inch)
Breakaway switch	+24 VDC
Motor brake	+24 VDC
Laser pointer (Class 3B)	+5 VDC Maximum power: 500 mW Wavelength: 400 – 695 nm
Lifter capacity	11.3 kg (25.0 lb)

Table 1

Part No.	Torch mounting block	Breakaway options
090082	51 mm (2 inch)	11 kg (25 lb) magnetic
090083	51 mm (2 inch)	Pneumatic
090084	44 mm (1.75 inch)	Pneumatic
090085	35 mm (1.375 inch)	Pneumatic
090086	44 mm (1.75 inch)	11 kg (25 lb) magnetic
090087	35 mm (1.375 inch)	11 kg (25 lb) magnetic
090088	51 mm (2.0 inch)	4.5 kg (10 lb) magnetic
090089	44 mm (1.75 inch)	4.5 kg (10 lb) magnetic
090090	35 mm (1.375 inch)	4.5 kg (10 lb) magnetic
090091	Not included	Pneumatic
090092	Not included	4.5 kg (10 lb) magnetic
090093	Not included	11 kg (25 lb) magnetic

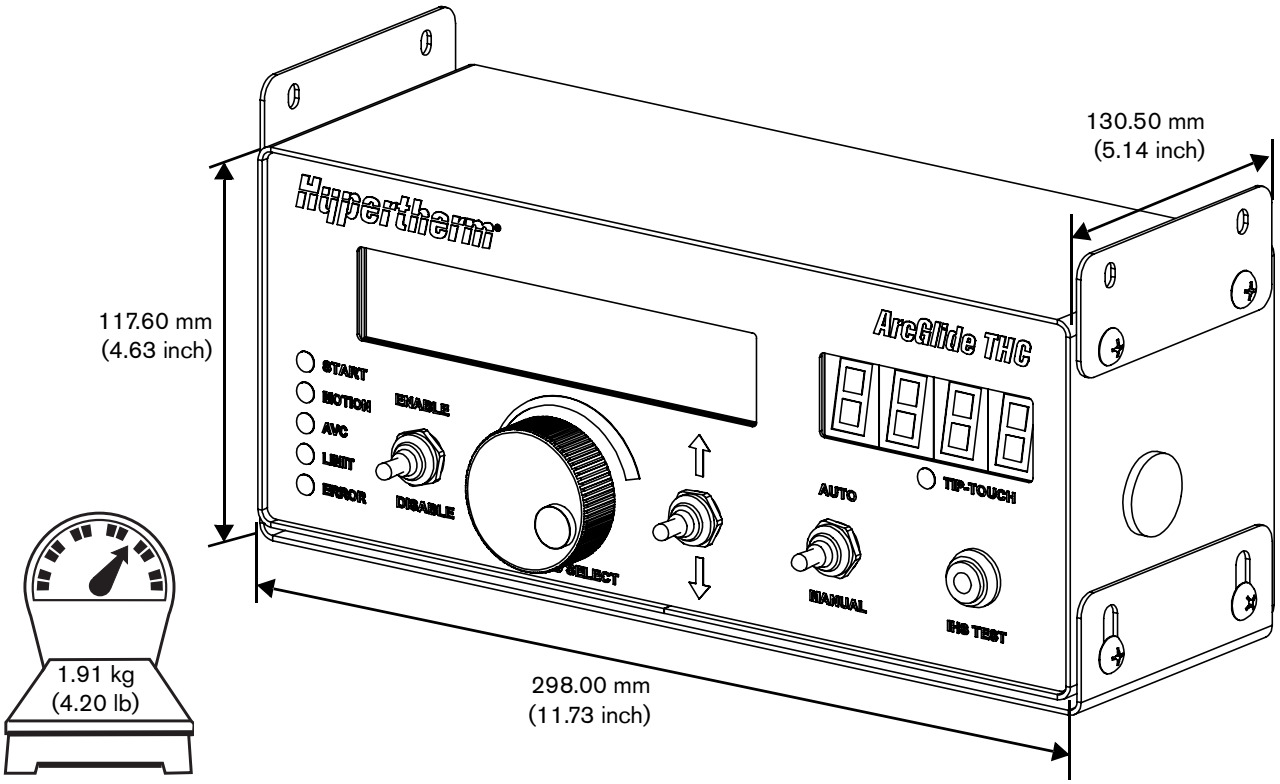
Figure 3


151.10 mm
(5.95 inch)
78.70 mm
(3.10 inch)
269.20 mm
(10.60 inch)
744.20 mm
(29.30 inch)
50.80 mm
(2.00 inch)
149.10 mm
(5.87 inch)
186.70 mm
(7.35 inch)
14.00 kg
(30.90 lb)
STATION ENABLED
ArcGlide THC
ENABLE
STATION
ENABLE
UP
TORCH
DOWN

Optional HMI (090055)

Regulatory approvals	CE, CSA, C-Tick, GOST-TR, UkrSEPRO
Input power	100 VAC, 40 mA, 50/60 Hz, 1-phase 240 VAC, 20 mA, 50/60 Hz, 1-phase
Hypernet communication	Shielded RJ-45 Cat5e or Cat6
Operating temperature	-10°C to 40°C (14°F to 104°F)
Operating humidity	95% relative humidity

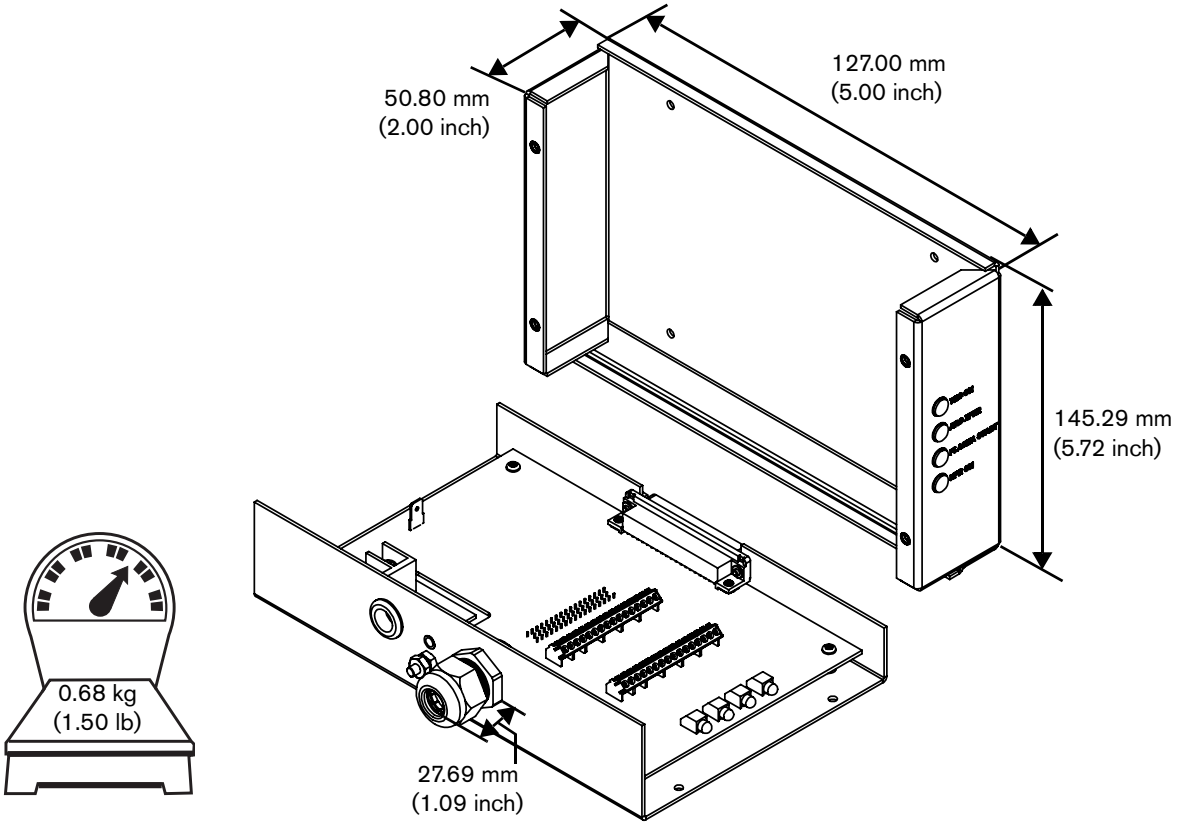
Figure 4



Discrete plasma interface board (141094)

This plasma interface board is required for configurations that use discrete communication.

Figure 5

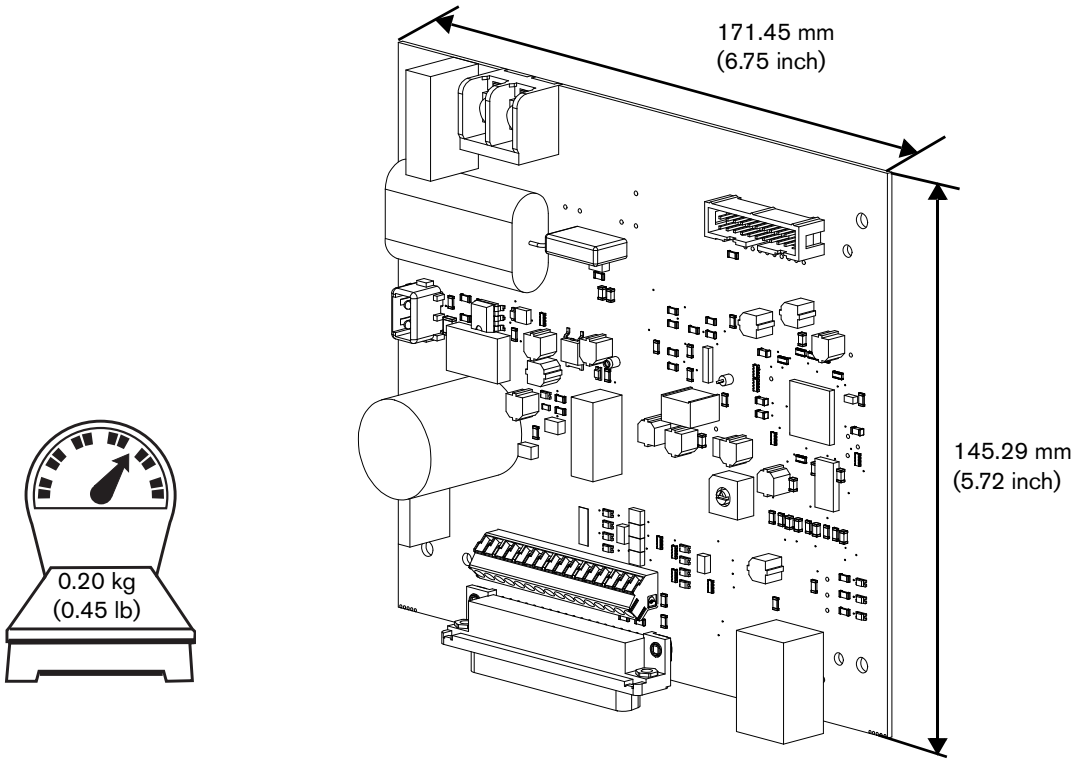


Input power	24 V (AC or DC)
Parallel digital I/O	+12 VDC to +24 VDC
Serial digital I/O	5 VDC
Voltage divider ratio	50:1 Arc voltage

Hypernet plasma interface board (141162)

This plasma interface board is required for configurations that use Hypernet communication.

Figure 6



Input power	24 V (AC or DC)
Parallel digital I/O	+12 VDC to +24 VDC
Serial digital I/O	5 VDC
Voltage divider ratio	50:1 Arc voltage

Ethernet switch

If the ArcGlide THC has more than one connection to Hypernet that communicates with either the CNC or the plasma system, you must include an industrial grade Ethernet switch with multiple ports for communication between these components.

This switch must be an industrial grade switch that supports shielded Cat5e or Cat6 Ethernet cable. The Ethernet switch should be located in an electrical cabinet that is electrically grounded and environmentally clean.

A plasma arc cutting machine can be configured with the following units:

- 1 CNC with Hypernet support
- Up to 4 plasma systems
- 4 ArcGlide THC control modules
- 4 ArcGlide THC lifters
- 4 ArcGlide TNC HMIs

The total number of Ethernet ports the system requires depends on the number of plasma systems and ArcGlide THCs installed. Use *Table 2* to help determine the number of Ethernet ports the system needs.

Table 2

For each of these components:	You need this many Ethernet ports:
CNC	1
Plasma system (1 to 4) + lifter (1 to 4)	2 to 8
Plasma system (1 to 4) + lifter (1 to 4) + HMI (1 to 4)	3 to 12

For example, a cutting machine with 2 plasma systems + 2 THCs + 2 HMIs + 1 CNC = 7 ports.

Hypernet connections and Ethernet connections to a LAN cannot be made through the same switch. If your cutting machine is connected to a LAN over Ethernet, you must use a separate Ethernet switch for these connections.

Hypertherm recommends 3 different models of Advantech™ industrial Ethernet switches. These switches are available from Hypertherm. *Table 3* provides details about each model. Choose the switch that fits your needs.

Table 3 – Recommended Advantech Ethernet switches

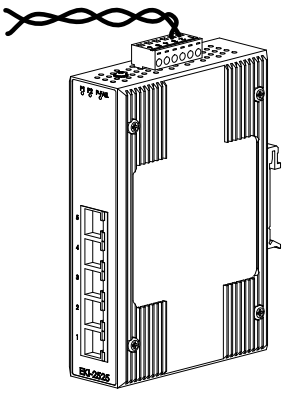
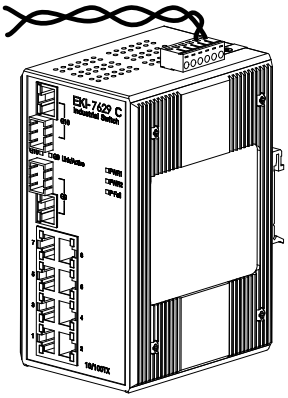
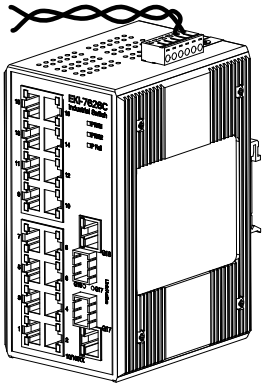
	5 Ports	8 Ports	16 Ports
Hypertherm part number	005657	005655	005656
Advantech part number	EKI-2525I-AE	EKI-7629C-AE	EKI-7626C-AE
Width × height × depth	37 mm X 140 mm X 95 mm (1.46 inch X 5.51 inch X 3.74 inch)	79 mm X 152 mm X 105 mm (3.11 inch X 5.98 inch X 4.13 inch)	79 mm X 152 mm X 105 mm (3.11 inch X 5.98 inch X 4.13 inch)
Maximum power consumption	5 W	6.5 W	6.5 W
Power input (not included)	12 – 48 VDC redundant dual inputs with twisted pair cable.		
			

Table 4 lists the operating specifications for the recommended Ethernet switches. See the respective Advantech user manuals for information about installing and operating these switches.

If your cutting machine does not include one of these Advantech Ethernet switches, use the specifications in *Table 4* to select an industrial-grade Ethernet switch that will support your plasma cutting machine.

Table 4 – Advantech Ethernet switch specifications

Ethernet connections	Shielded RJ-45 ports
Electrical protection	4000 VDC Ethernet ESD protection, 3000 VDC surge (EFT) protection for the power line
I/O transmission distance	Up to 100 m (109 yard) (4-wire Cat5e or Cat6)
I/O transmission speed	10/100 Mbps auto-negotiation
Operating temperature	-10°C to 60°C (14°F to 140°F)

ArcGlide communication

Figure 7 through *Figure 10* show discrete and Hypernet communication that the ArcGlide THC uses to exchange signals with the CNC and the plasma system. Use the following table to distinguish between discrete and Hypernet communication.

Communication style	Data architecture	Cabling configuration
Discrete	Discrete I/O and serial data	A dedicated cable to each component from the ArcGlide control module; within each cable, there is a dedicated wire for each signal.
Hypernet	Ethernet data packets	A standard, Cat5e or Cat6, shielded, Ethernet cable from the Ethernet switch to each component of the cutting machine.

Both communication styles transmit the same signals. The difference is in the way the signals are “packaged” for transmission over the two cabling configurations.

Do not use redundant (both discrete and Hypernet) communication between the same two components in the same ArcGlide configuration.

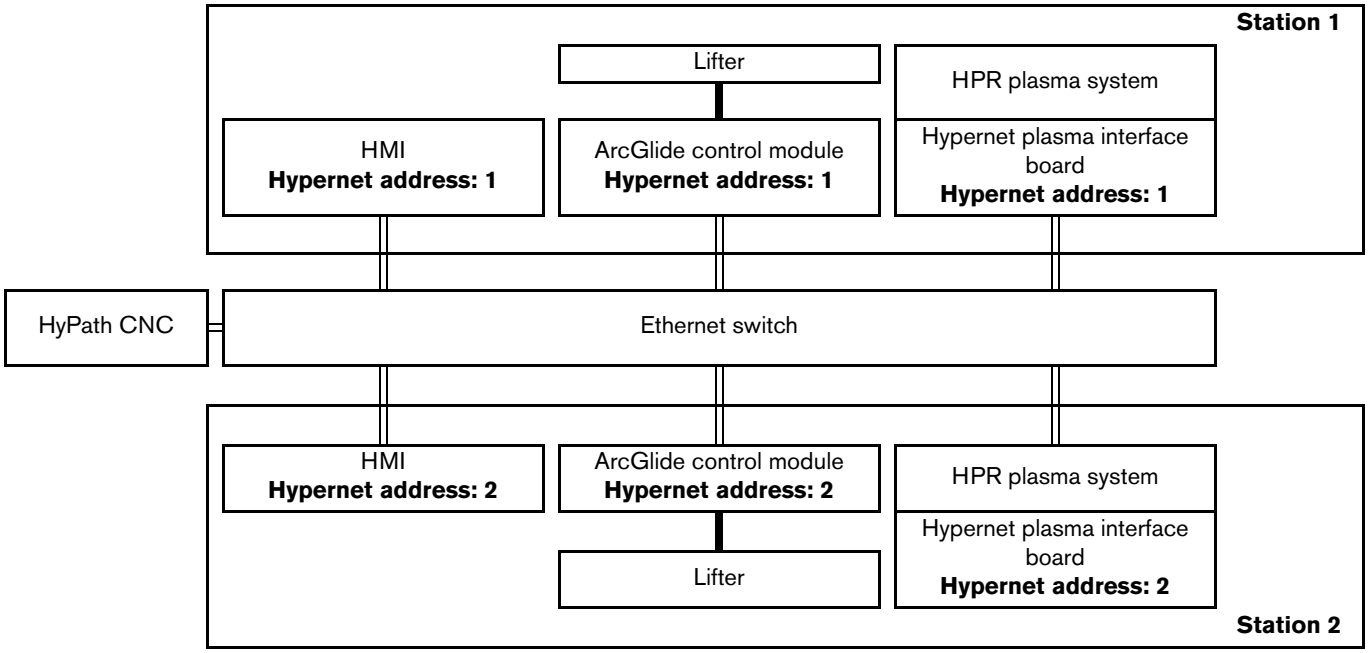
Hypernet communication

ArcGlide THCs in Hypernet configurations connect to the CNC and plasma system using the Hypernet protocol over shielded, Ethernet Cat5e or Cat6 cables. Both the CNC and plasma systems in this configuration must have a dedicated, Hypernet-configured, Ethernet port for these connections.

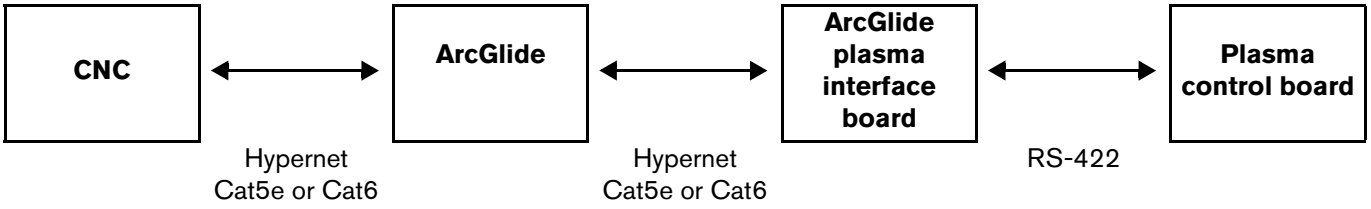
In addition, a Hypernet configuration must include an industrial-grade Ethernet switch to route communication from the CNC to the other components in the system.

Each ArcGlide THC component (HMI, control module, and plasma interface board) that is connected to the Hypernet must have the same Hypernet component address. This address must correspond to the station number for the THC that is selected in Phoenix, on the Station Configuration screen. See *Assign an ArcGlide THC to a station* on page 125 for more information.

Figure 7



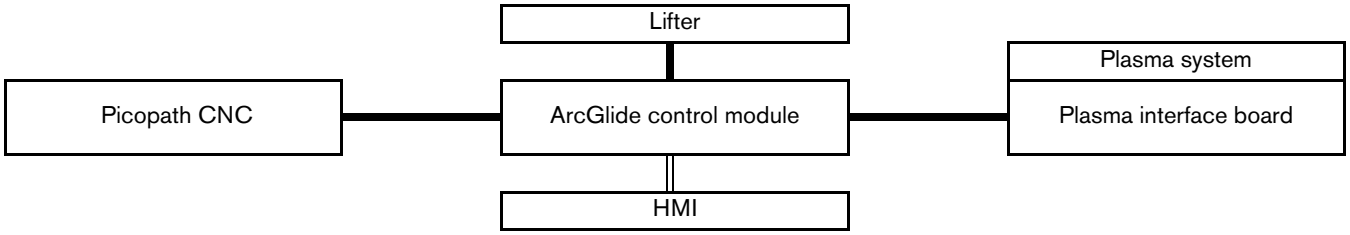
In a Hypernet configuration, serial communication is carried on the Hypernet cable between the CNC and the ArcGlide THC and the ArcGlide plasma interface board in the plasma system. Within the plasma system, serial communication is carried between the ArcGlide plasma interface board and the plasma control board by a serial cable (123760).



Discrete communication

In a discrete configuration, signals are routed through the ArcGlide control module. Each component in the configuration, except the HMI, is connected to the ArcGlide control module with discrete cables. The HMI communicates with the control module using the Hypernet protocol over a shielded, Ethernet Cat5e or Cat6 cable.

Figure 8



Key:

Hypernet connection

Discrete connection

Mixed communication

In a mixed configuration, Hypernet communication is used between the ArcGlide control module and CNC or plasma system and discrete communication is used for the alternate connection from the ArcGlide control module. When the HMI is included, it must be connected to the ArcGlide control module with a Hypernet connection. See *Figure 9* and *Figure 10* for details.

Figure 9

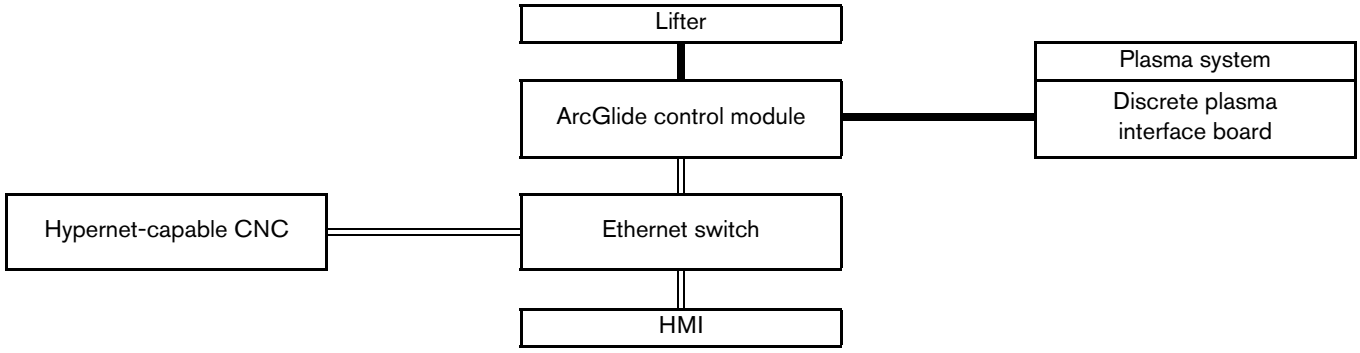
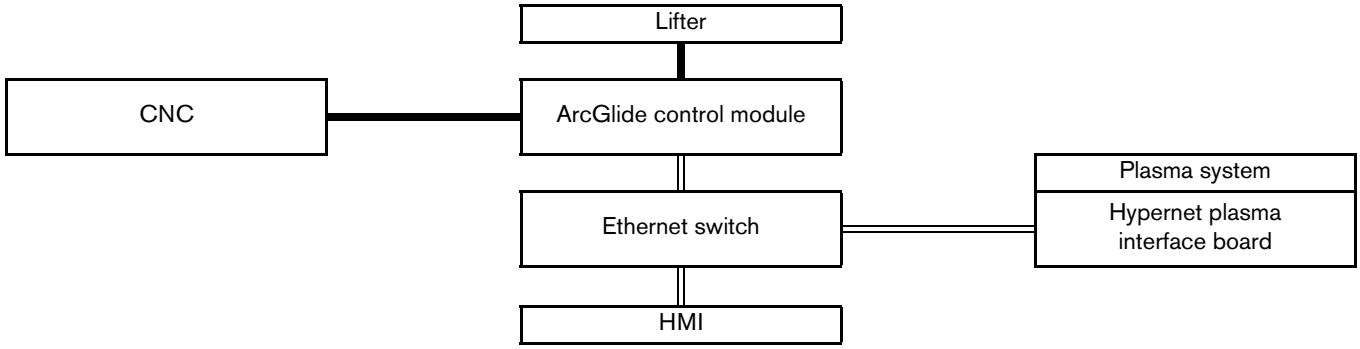


Figure 10



Key:

Hypernet connection

Discrete connection

Serial communication

The ArcGlide THC supports an optional serial interface to a non-Hypernet CNC. See *ArcGlide THC Serial Communication Installation* on page 269 for more information on serial communication.

Section 2
Installation

Hardware setup

After you receive your new equipment:

- Make sure that all items on your order have been received in good condition. Contact your table manufacturer if any parts are damaged or missing.
- Inspect the system components for damage that may have occurred during shipping. See *Claims* if there is evidence of damage. All communications regarding this equipment must include the model number and the serial number located on the back of the unit.
- Before you set up and operate this Hypertherm system, read *Safety* on page 13 for important safety information.

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 the nearest Hypertherm office listed in the front of this manual.
- **Claims for defective or missing merchandise** – If any of the components are missing or defective, contact your table manufacturer. If you need additional assistance, call the nearest Hypertherm office listed in the front of this manual.

Installation requirements

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

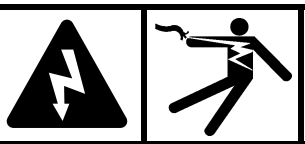
Direct any technical questions to the nearest Hypertherm Technical Service office listed in the front of this manual, or to your table manufacturer.

Placement of system components

Place all system components in position prior to making electrical and interface connections.

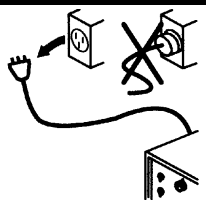
Ground all system components to earth. See *Recommended grounding and shielding practices* on page 55 for more information.

Recommended grounding and shielding practices



WARNING!

ELECTRIC SHOCK CAN KILL



Disconnect electrical power before performing any maintenance.

All work requiring the removal of the plasma system cover must be performed by a qualified technician.

See the *Safety* section of your manual for more safety precautions.

Introduction

This section describes practices for grounding and shielding to protect a plasma cutting system against radio frequency interference (RFI) and electromagnetic interference (EMI) (also called *noise*). It also describes the DC power ground and the service ground. The diagram at the end of this section shows these types of grounds in a plasma cutting system.

The grounding practices in this section have been used on many installations with excellent results, and Hypertherm recommends that these practices be a routine part of the installation process. The actual methods used to implement these practices may vary from system to system, but should remain as consistent as possible. However, due to the variation in equipment and installations, these grounding practices may not succeed in every case to eliminate RFI/EMI noise issues.

Types of grounding

Service ground (also called safety ground or potential earth (PE) ground) is the grounding system that applies to the incoming line voltage. It prevents a shock hazard to any personnel from any of the equipment or the cutting table. It includes the service ground coming into the plasma system and other systems such as the CNC and the motor drives, as well as the supplemental ground rod connected to the cutting table. In the plasma circuits, the ground is carried from the plasma system chassis to the chassis of each separate console through the interconnecting cables.

DC power ground (also called cutting current ground) is the grounding system that completes the path of the cutting current from the torch back to the plasma system. It requires that the positive lead from the plasma system be firmly connected to the cutting table ground bus with a properly sized cable. It also requires that the slats, on which the workpiece rests, make firm contact with the table and the workpiece.

RFI and EMI grounding and shielding is the grounding system that limits the amount of electrical noise emitted by the plasma and motor drive systems. It also limits the amount of noise that is received by the CNC and other control and measurement circuits. The grounding practices described in this section mainly target RFI and EMI grounding and shielding.

Grounding practices

1. Unless noted, use only 16 mm^2 (6 AWG) welding cables (047040) for the EMI ground cables shown on the diagram at the end of this section.

2. The cutting table is used for the common, or star, EMI ground point and should have threaded studs welded to the table with a copper bus bar mounted on them. A separate bus bar should be mounted on the gantry as close to

each motor as possible. If there are motors at each end of the gantry, run a separate EMI ground cable from the far motor to the gantry bus bar. The gantry bus bar should have a separate, heavy EMI ground cable 21.2 mm^2 (4 AWG; 047031) to the table bus bar. The EMI ground cables for the torch lifter and the RHF console must each run separately to the table ground bus.

3. A ground rod that meets all applicable local and national electrical codes must be installed within 6 m (20 ft) of the cutting table. This is a PE ground and should be connected to the cutting table ground bus bar using 16 mm^2 (6 AWG) green and yellow grounding cable (047121) or equivalent.

4. For the most effective shielding, use the Hypertherm CNC interface cables for I/O signals, serial communication signals, between plasma systems in multi-drop connections, and for interconnections between all parts of the Hypertherm system.

5. All hardware used in the ground system must be brass or copper. While you can use steel studs welded to the cutting table for mounting the ground bus, no other aluminum or steel hardware can be used in the ground system.

6. AC power, PE, and service grounds must be connected to all equipment according to local and national codes.

7. For a system with a remote high frequency console (RHF), the positive, negative, and pilot arc leads should be bundled together for as long a distance as possible. The torch lead, work lead, and the pilot arc (nozzle) leads may be run parallel to other wires or cables only if they are separated by at least 150 mm (6 inches). If possible, run power and signal cables in separate cable tracks.

8. For a system with an RHF console, the ignition console should be mounted as closely as possible to the torch, and must have a separate ground cable that connects directly to the cutting table ground bus bar.

9. Each Hypertherm component, as well as any other CNC or motor drive cabinet or enclosure, must have a separate ground cable to the common (star) ground on the table. This includes the ignition console, whether it is bolted to the plasma system or to the cutting table.

10. The metal braided shield on the torch lead must be connected firmly to the ignition console and to the torch. It must be electrically insulated from any metal and from any contact with the floor or building. The torch lead can be run in a plastic cable tray or track, or covered with a plastic or leather sheath.

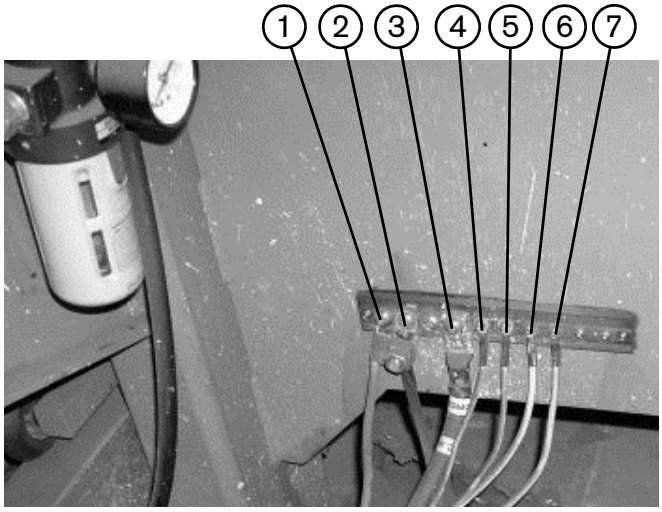
11. The torch holder and the torch breakaway mechanism – the part mounted to the lifter, not the part mounted to the torch – must be connected to the stationary part of the lifter with copper braid at least 12.7 mm (0.5 inches) wide. A separate cable must run from the lifter to the gantry ground bus bar. The valve assembly should also have a separate ground connection to the gantry ground bus bar.

12. If the gantry runs on rails that are not welded to the table, then each rail must be connected with a ground cable from the end of the rail to the table. The rail ground cables connect directly to the table and do not need to connect to the table ground bus bar.

13. If you are installing a voltage divider board, mount it as closely as possible to where the arc voltage is sampled. One recommended location is inside the plasma system enclosure. If a Hypertherm voltage divider board is used, the output signal is isolated from all other circuits. The processed signal should be run in twisted shielded cable (Belden 1800F or equivalent). Use a cable with a braided shield, not a foil shield. Connect the shield to the chassis of the plasma system and leave it unconnected at the other end.

14. All other signals (analog, digital, serial, and encoder) should run in twisted pairs inside a shielded cable. Connectors on these cables should have a metal housing. The shield, not the drain, should be connected to the metal housing of the connector at each end of the cable. Never run the shield or the drain through the connector on any of the pins.

The following picture shows an example of a cutting table ground bus. The components shown here may differ from your system.



1 Gantry ground bus

2 Ground rod

3 Plasma system lead (+)

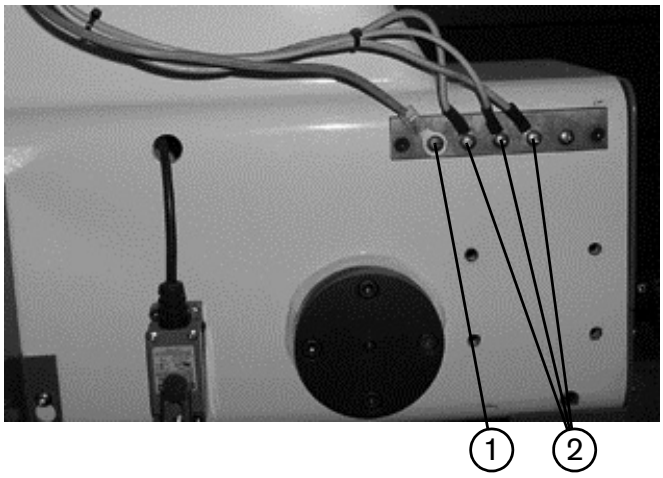
4 Remote high frequency (RHF) console

5 CNC enclosure

6 Torch holder

7 Plasma system chassis

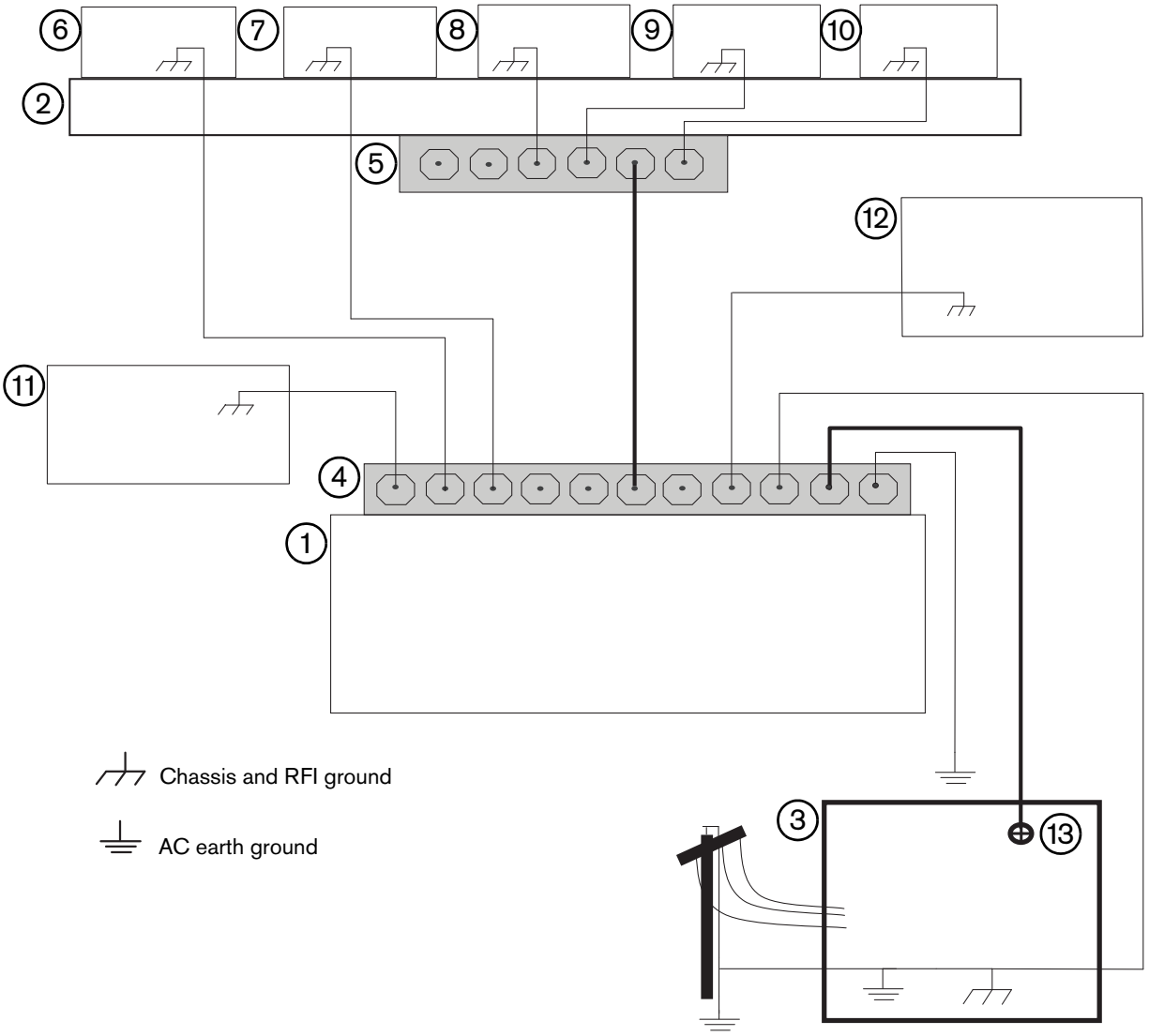
The following picture shows an example of a gantry ground bus. It is bolted to the gantry, close to the motor. All of the individual ground cables from the components mounted on the gantry connect to the bus. A single heavy cable then connects the gantry ground bus to the table ground bus.



1 Cable to the cutting table ground bus

2 Ground cables from components on the gantry

The following diagram shows an example of grounding the components in a plasma cutting system.



1 Cutting table

2 Gantry

3 Plasma system

4 Table ground bus bar

5 Gantry ground bus bar

6 Torch height control lifter (ArcGlide, Sensor THC, Sensor PHC, or other)

7 RHF console (not on all systems). Connect to table ground bus bar.

8, 9 System-specific component such as metering console, gas console, or selection console

10 CNC chassis

11 Torch height control module (ArcGlide, Command THC)

12 System-specific component such as a cooler or chiller

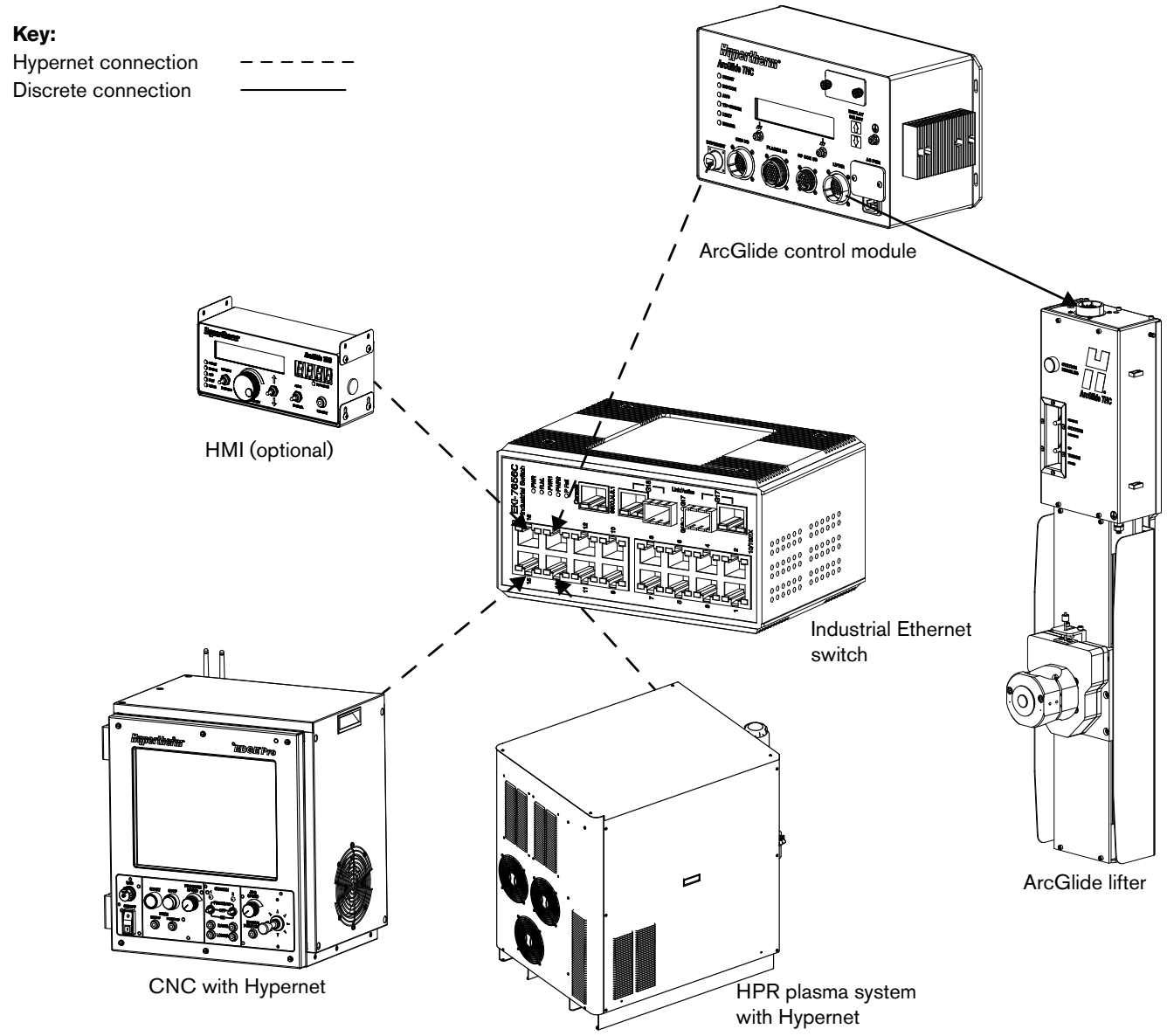
13 DC power ground

System description for a Hypernet configuration

Figure 11 shows the cable and signal connections in a Hypernet communication configuration.

Hypernet cables transmit serial communication.

Figure 11



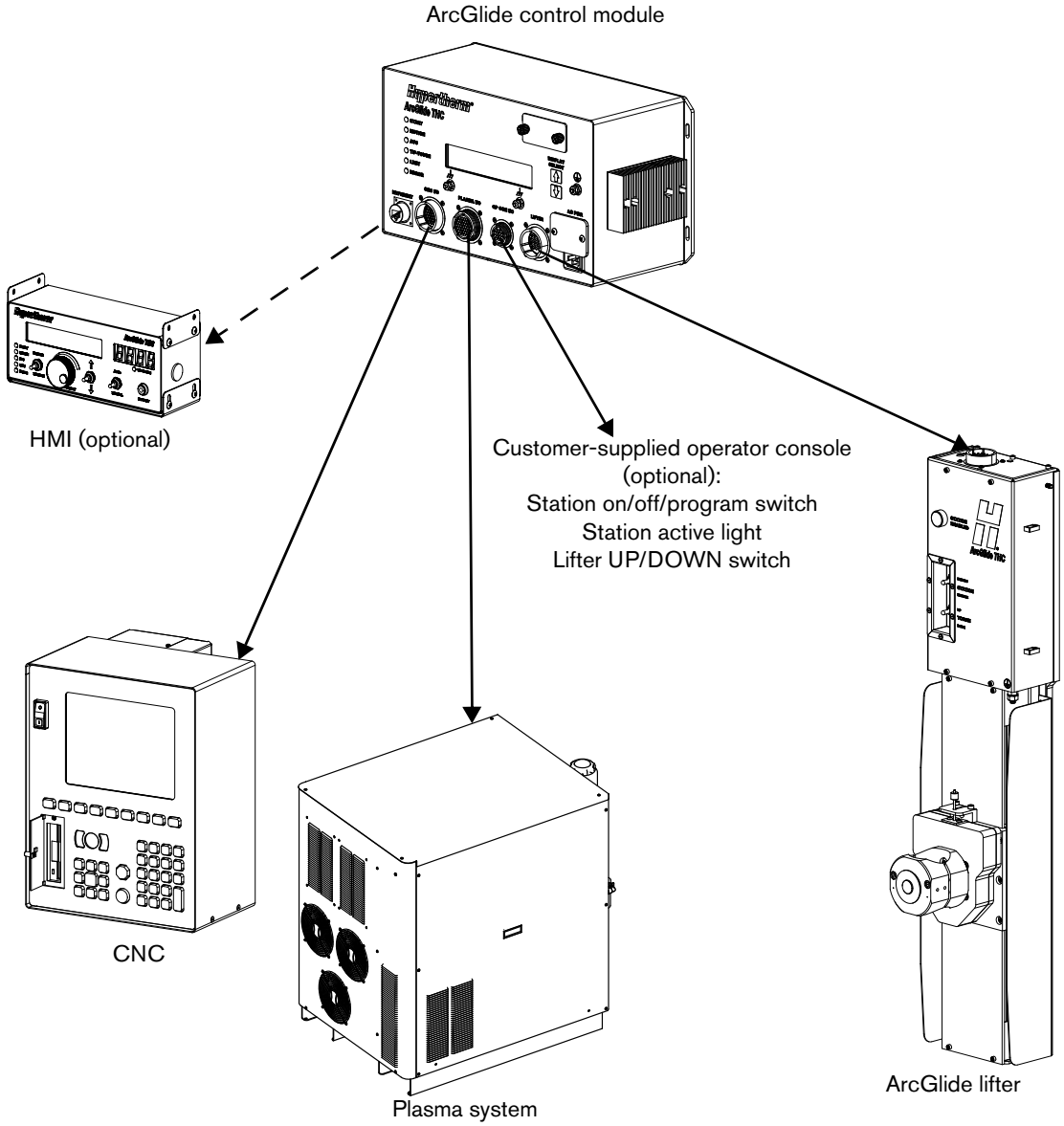
System description for a discrete configuration

Figure 12 shows the cable and signal connections in a discrete communication configuration.

For information on multi-drop configurations, refer to the instruction manual for your plasma system.

Figure 12

Key:
Hypernet connection – – – – – –
Discrete connection ————————



ArcGlide communication configuration examples

Table 5 lists the ArcGlide configurations on the following pages. If you are viewing this manual online, click the page number in the left column to view that configuration.

Table 5

Drawing number and page	Connection to plasma	Connection to CNC
1 page 63	Hypernet to multiple HPR or HPRXD plasma systems, each with plasma interface board 141162. Requires an Ethernet switch.	Hypernet to Hypernet-capable CNCs.
2 page 64	Discrete to HPR or HPRXD plasma system with plasma interface board 141094.	Hypernet to Hypernet-capable CNCs.
3 page 65	Discrete to HPR or HPRXD plasma system with plasma interface board 141094.	Discrete to a CNC with a Picopath interface. Serial cable from CNC to plasma system, supplied by the table manufacturer.
4 page 66	Discrete to HPR or HPRXD plasma system with plasma interface board 141094.	Discrete to third party CNC. Serial cable from CNC to plasma system, supplied by the table manufacturer.
5 page 67	Discrete to HPR400XD or HPR800XD plasma system with plasma interface board 141094.	Discrete to third party CNC. Serial cable from CNC to plasma system, supplied by the table manufacturer.
6 page 68	Discrete to HPR or HPRXD plasma system with plasma interface board141094, showing circuits, signals, and connections to terminal blocks.	
7 page 69	Discrete to HSD130 plasma system with the plasma interface board 141094, machine interface cable (123209) from the plasma interface board to the control board in the plasma system.	Discrete to a CNC with a Picopath interface.
8 page 70	Discrete to MAX 200, HT2000 or HT2000 LHF plasma system with plasma interface board 141094. 1 X 6 interface cable between the plasma interface board and plasma system.	Discrete to a CNC with a Picopath interface.
9 page 71	Discrete to MAX 200, HT2000 or HT2000 LHF plasma system with plasma interface board 141094, showing circuits, signals, and connections to terminal blocks.	
10 page 72	Discrete to Powermax plasma systems with plasma interface board 141094 and Powermax interface cable 023206 between the plasma interface board and the Powermax plasma system.	Discrete to a CNC with a Picopath interface.

Drawing number and page	Connection to plasma	Connection to CNC
11 page 73	ArcGlide to Picopath CNC.	Discrete to a CNC with a Picopath interface. Provides suggested cable termination at CNC port.
12 page 74	Discrete communication to any plasma system with plasma interface board 141094, showing circuits, signals, and connections to terminal blocks.	
13 page 75	Hypernet communication to MAXPRO200 plasma system with plasma interface board 141162 installed. Requires an Ethernet switch.	Hypernet to Hypernet-capable CNCs.
14 page 76	Discrete communication to MAXPRO200 plasma system.	Discrete communication to a CNC with a Picopath interface.

WARNING!

SHOCK HAZARD, ENERGY HAZARD, AND FIRE HAZARD

Connecting directly to the plasma circuit for access to raw arc voltage increases the risk of shock hazard, energy hazard, and fire hazard in the event of a single fault. The output voltage and the output current of the circuit are specified on the data plate.

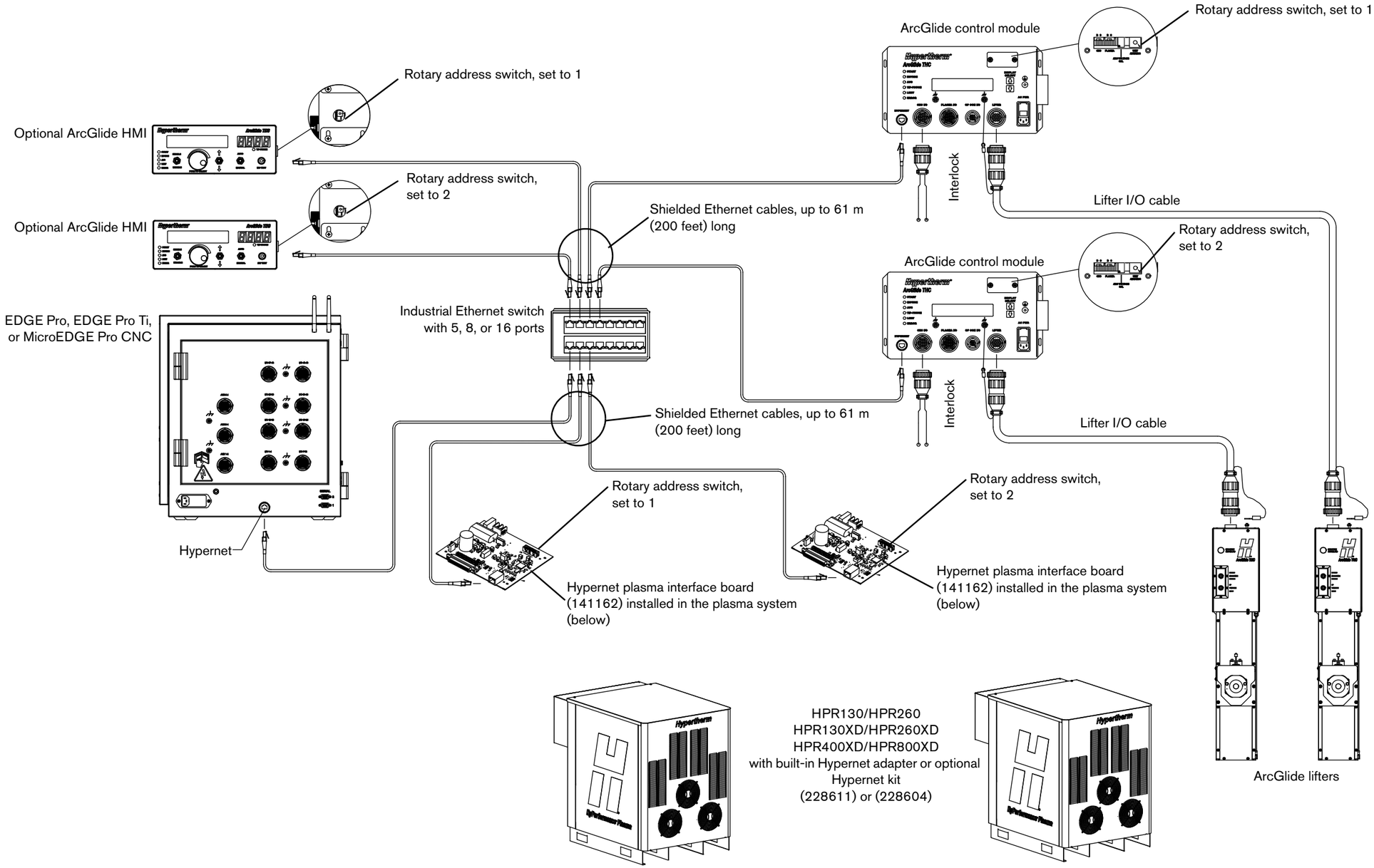
The output of the internal voltage divider board is designed to prevent shock, energy and fire hazards, and is intended to satisfy most codes and standards for external wiring outside the electrical enclosure.

All external wiring practices for an unprotected raw arc voltage should be reviewed and approved by the local inspection authorities at the time of installation prior to operation and use. Raw arc voltage wiring terminals and connections should not be exposed to accidental contact under normal and single fault conditions. External wiring from an unprotected (that is, no voltage divider used in the power source) raw arc voltage routed inside conduit between electrical enclosures will normally satisfy all electrical codes and standards worldwide. Failure to address the hazards associated with live contact, accessibility and single fault failures to this unprotected output can result in death or fire.

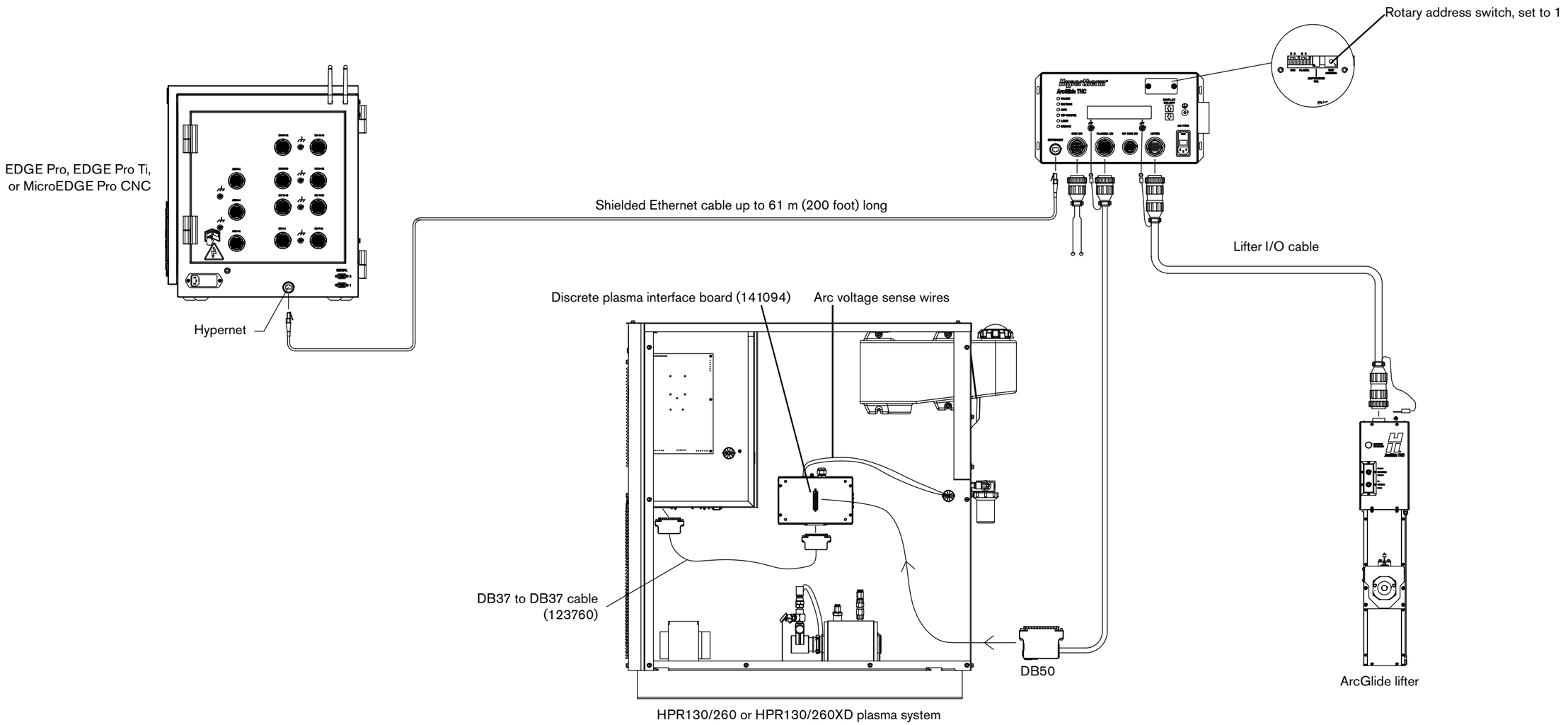
A voltage divider board inside the CNC protects only the CNC and does NOT protect the external interconnecting wiring between the power source and the CNC. Overcurrent protection may be required to protect the user or machine in fault conditions.

External wiring outside the electrical enclosure should be suitable for the installation and meet national and local regulations (for example, NFPA 70 NEC, NFPA 79, Canadian Electrical Code, CSA/CAN E60974-1, IEC 60204-1, BS 7671) or other codes or standards applicable to the installed site where the equipment will be operated.

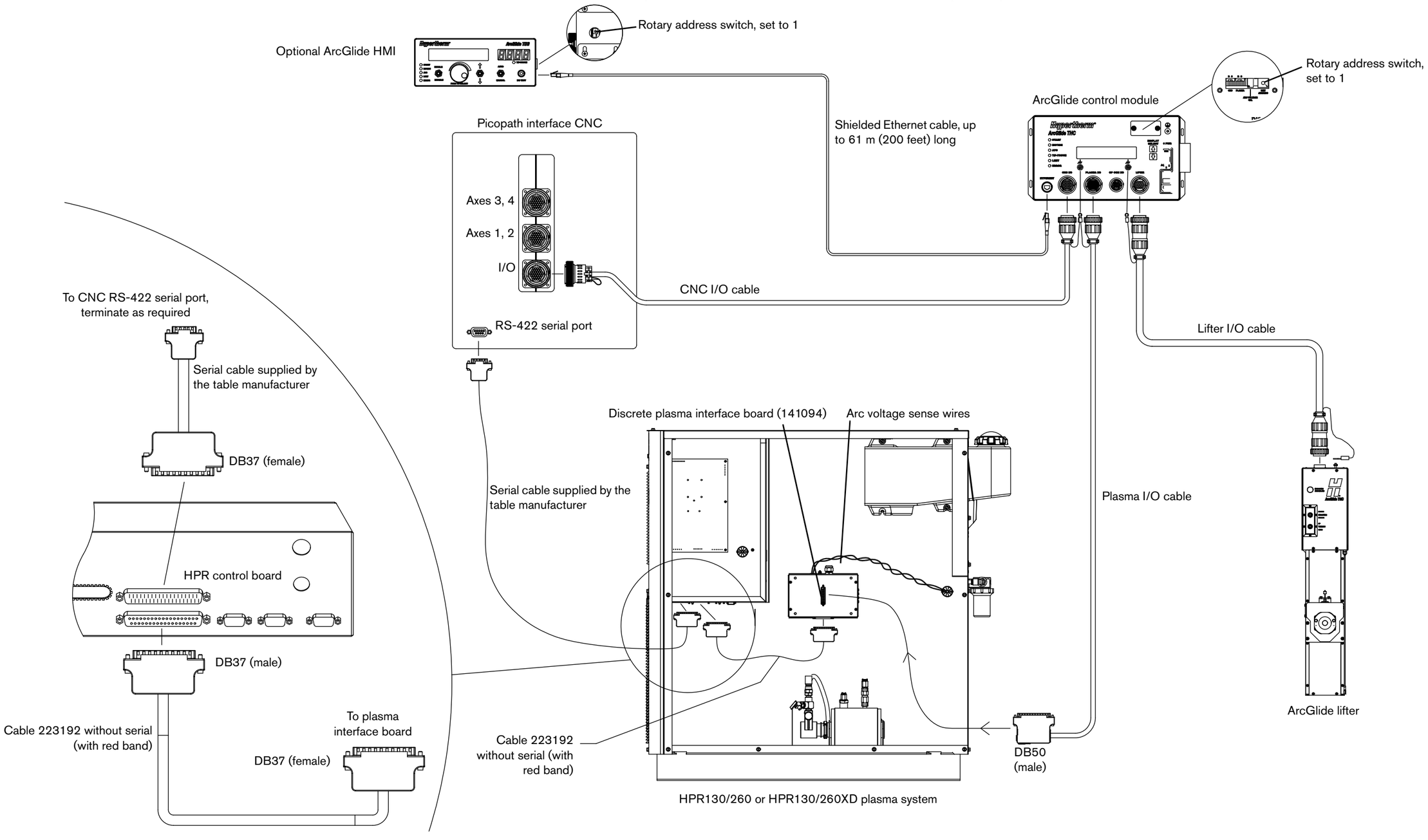
1 – Multiple ArcGlide THCs with Hypernet connection to a Hypernet-enabled CNC and HPR or HPRXD plasma system



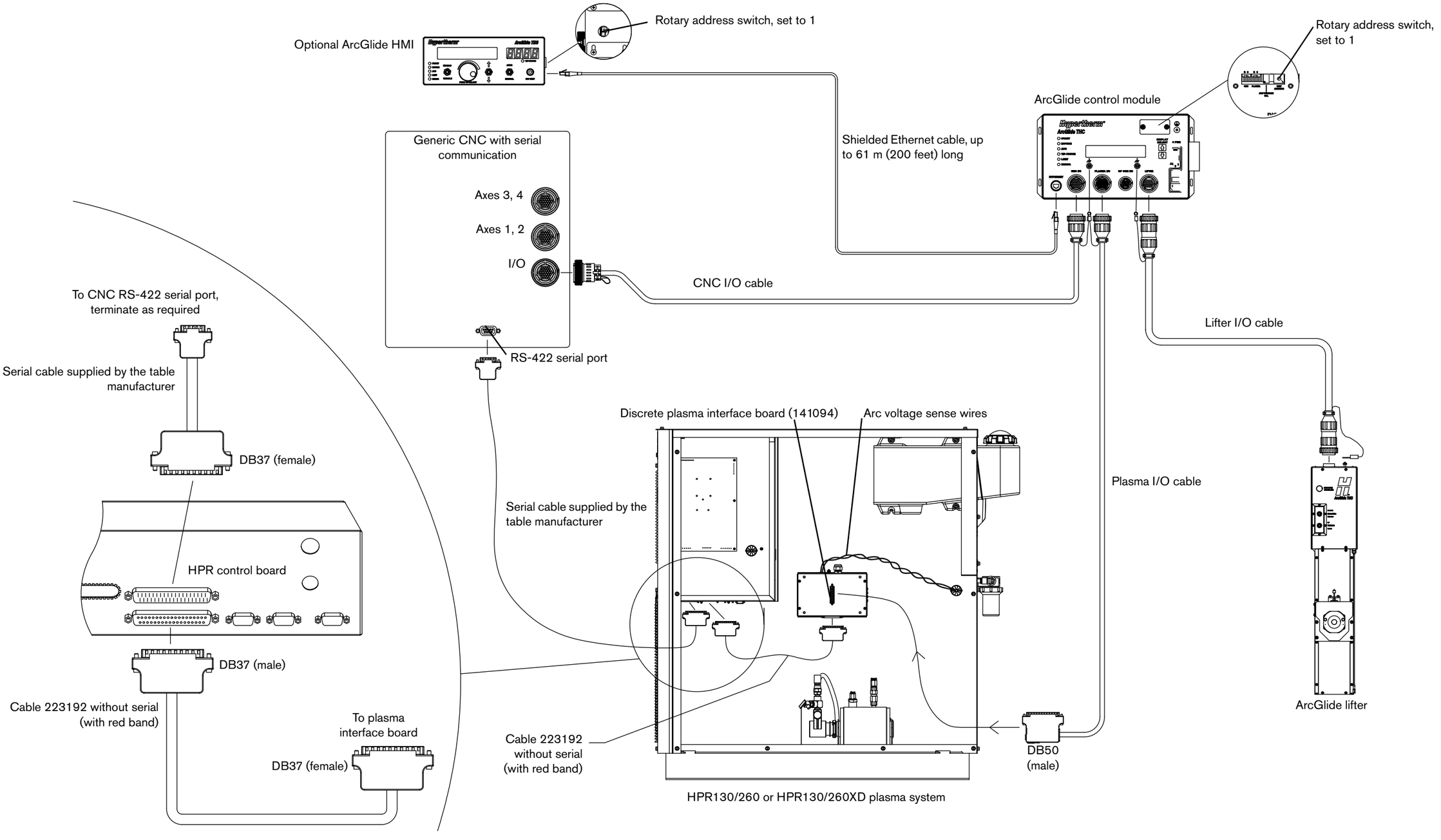
2 – ArcGlide THC with Hypernet connection to a Hypernet-enabled CNC and discrete connection to an HPR130/260 or HPR130/260XD plasma system



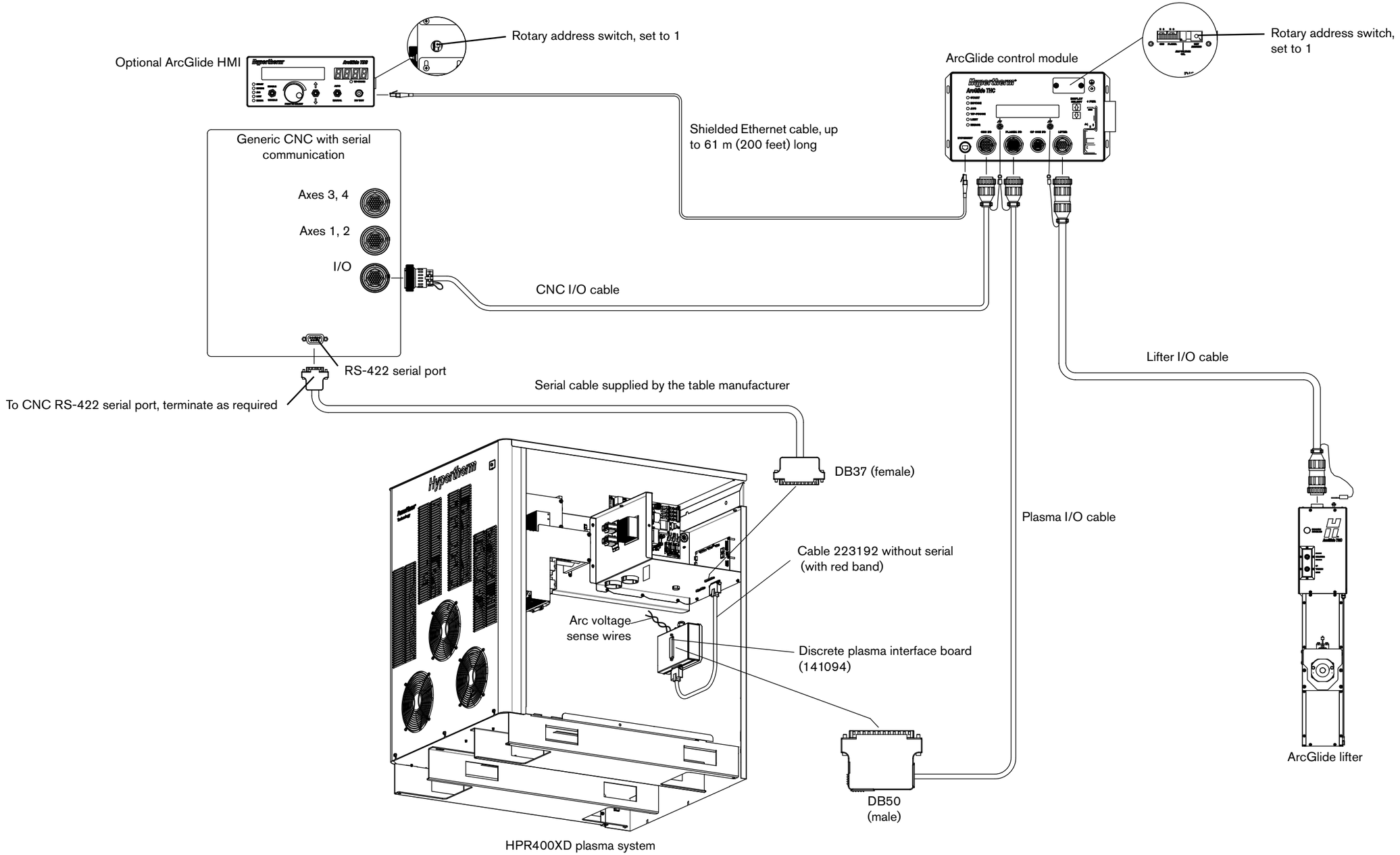
3 – ArcGlide THC with discrete connection to a Picopath interface CNC and HPR130/260 or HPR130/260XD plasma system



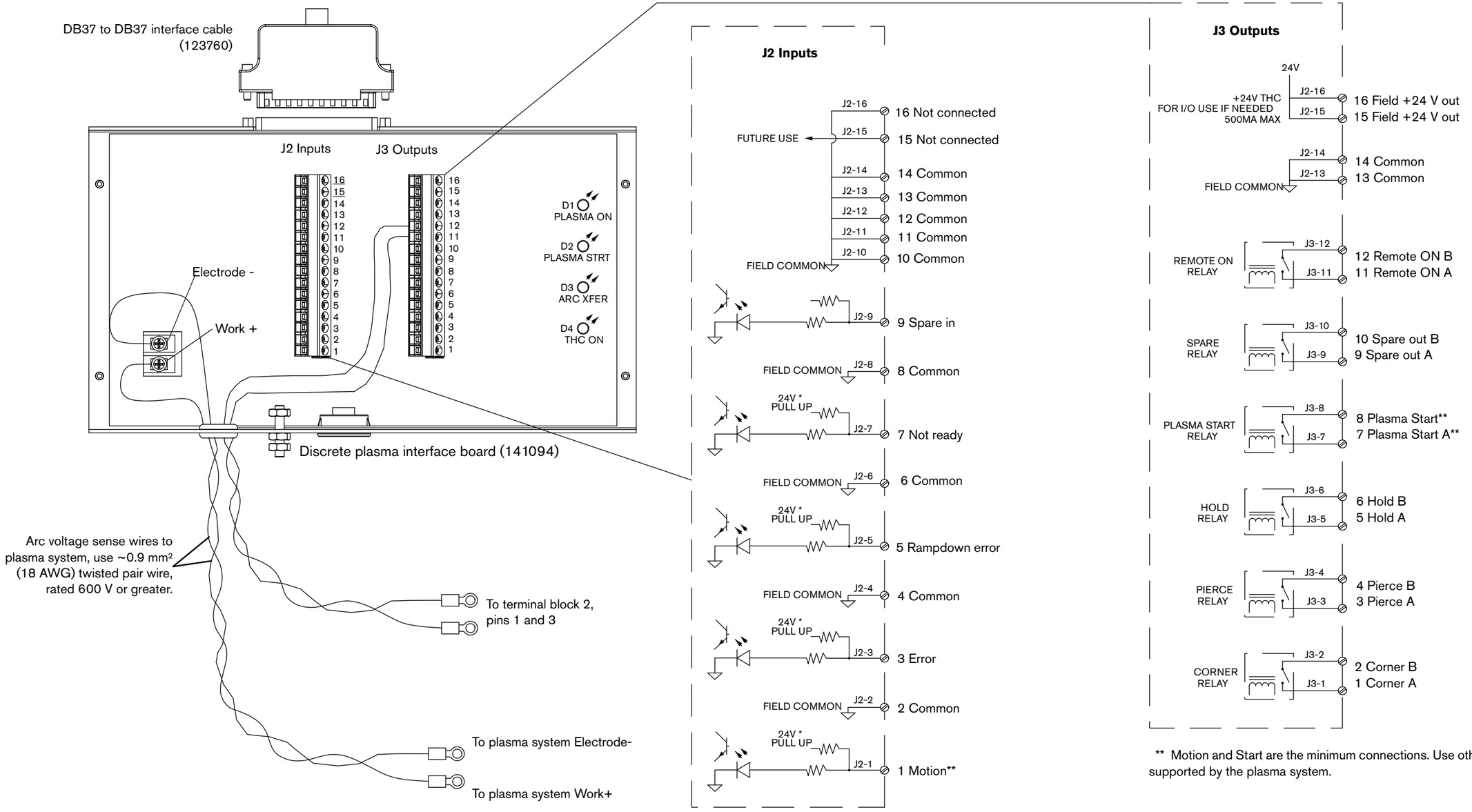
4 – ArcGlide THC with discrete connection to a generic CNC and HPR130/260 or HPR130/260XD plasma system



5 – ArcGlide THC with discrete connection to a generic CNC and HPR400/800XD plasma system



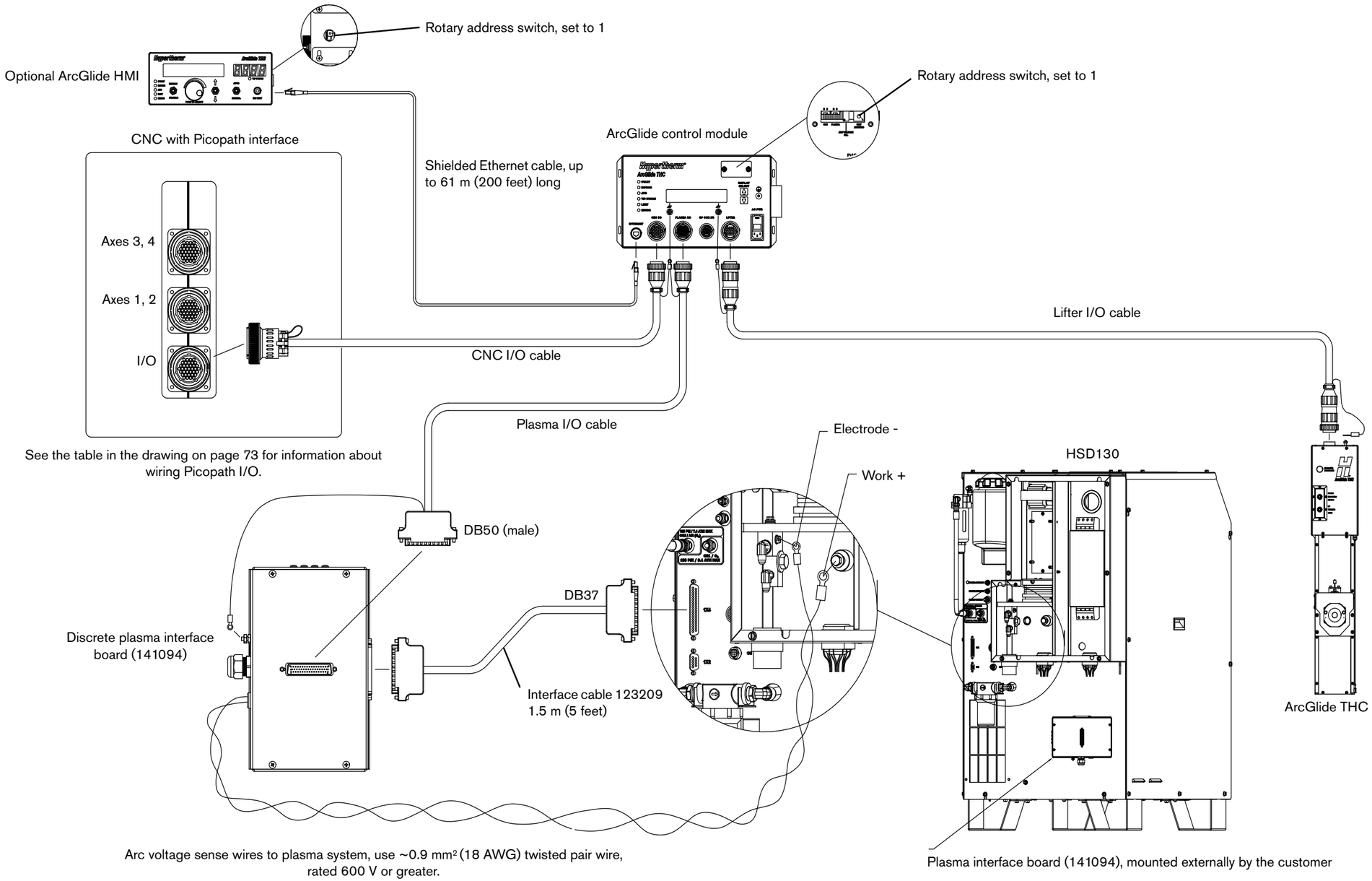
6 – Discrete plasma interface board with connection to an HPR or HPRXD plasma system



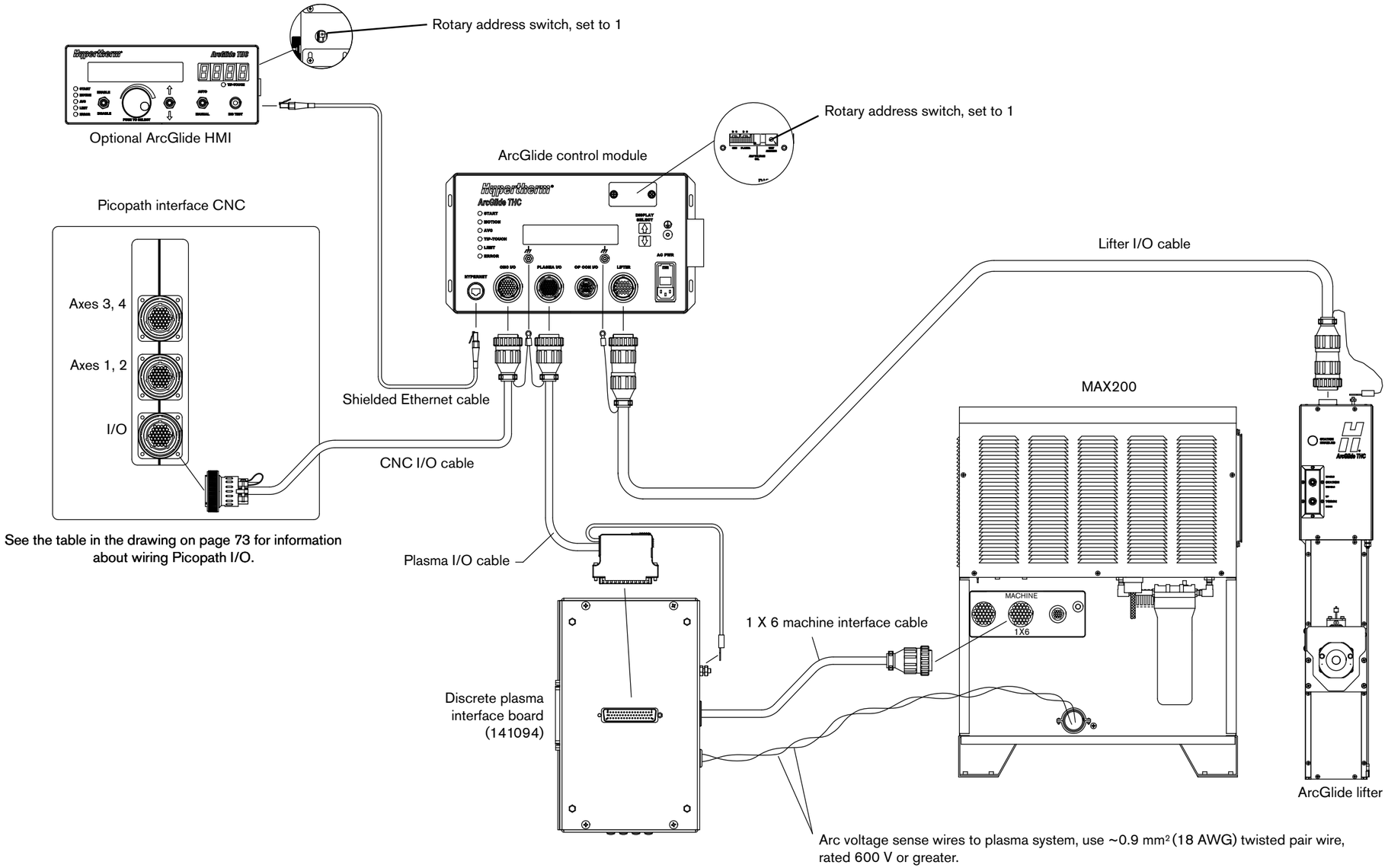
** Motion and Start are the minimum connections. Use other signals if they are supported by the plasma system.

* 24 V pull-up resistors on inputs are active only if they are set to dry (D) on the ArcGlide control module

7 – ArcGlide THC with discrete communication to a Picopath interface CNC and HSD130 plasma system

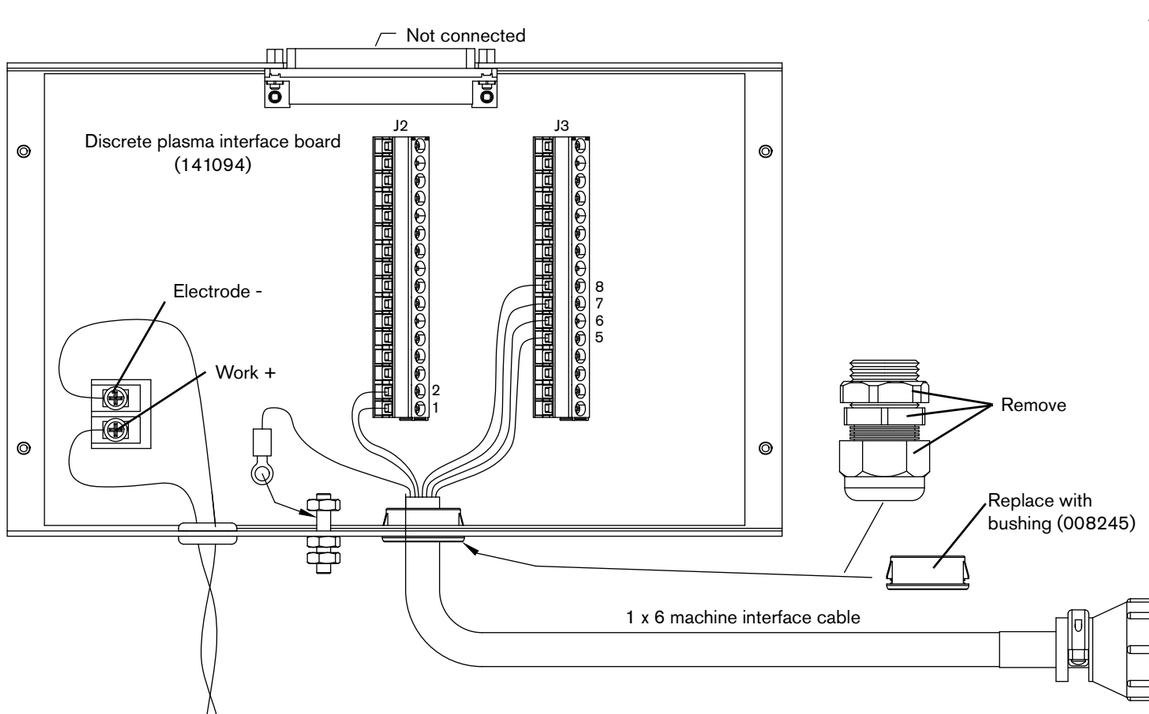


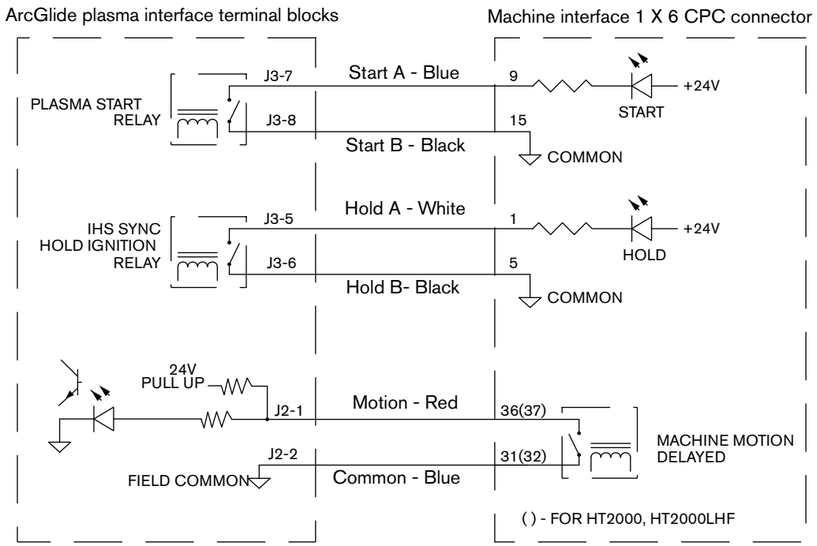
8 – ArcGlide THC with discrete connections to a Picopath interface CNC and MAX200, HT2000, or HT2000 LHF plasma system



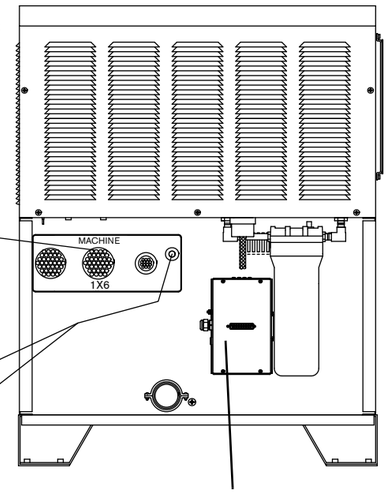
See the table in the drawing on page 73 for information about wiring Picopath I/O.

9 – Discrete plasma interface board with connection to MAX200, HT2000, or HT2000 LHF plasma system





Refer to the *HT2000 Instruction Manual* (802070) or the *HT2000LHF Instruction Manual* (803020) for information about the 1 X 6 connection



Plasma interface termination			
Signal	**Wire color**	**Pin**	**Cable label**
Plasma Start A	Blue	9	82
Plasma Start B	Black	15	83
Hold A	White	1	87
Hold B	Black	5	86
Motion	Red	36 (37*)	84
Common	Blue	31 (32*)	85
Ring terminal to ground stud	Shield wire	No connection	
Set plasma inputs to dry (D) using the input switch on the control module.		(*) For HT2000, HT2000LHF	

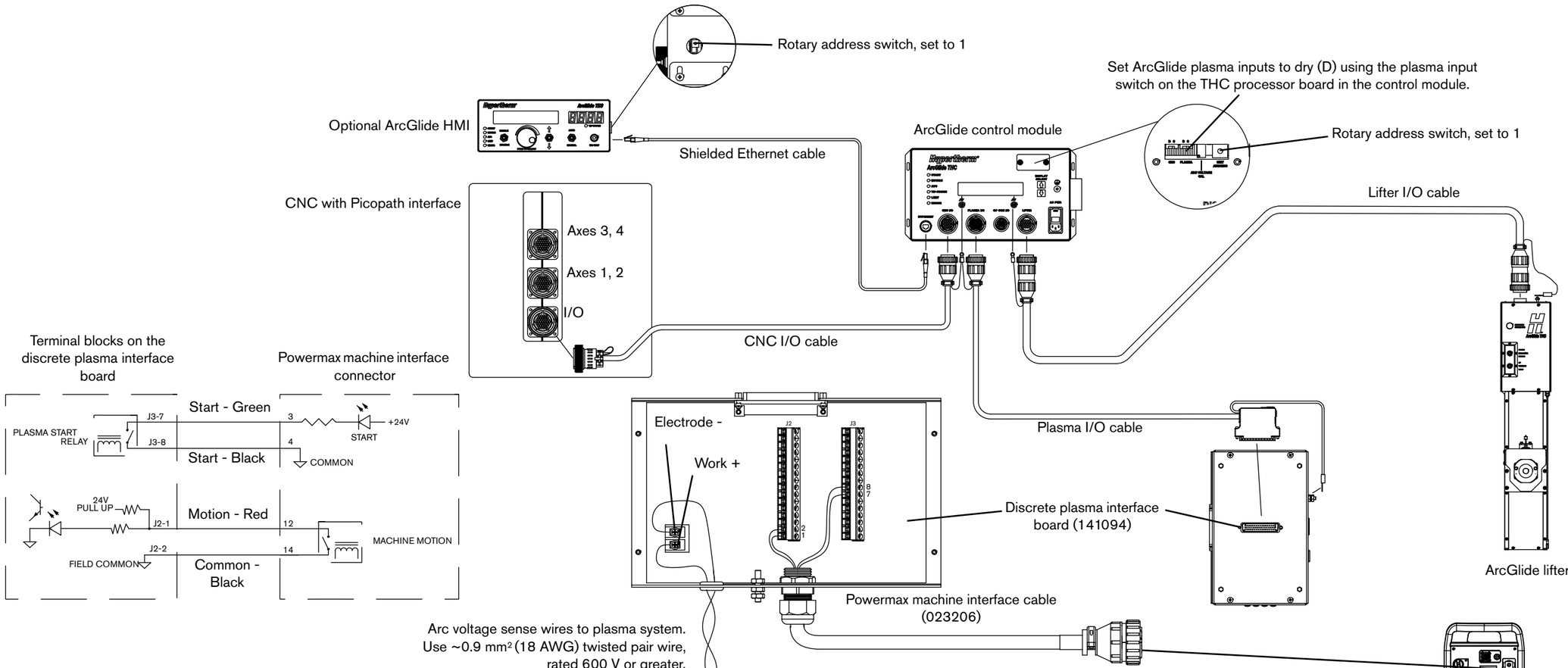
To plasma system
Electrode -

To plasma system
Work +

Plasma interface board (141094), mounted externally by the customer

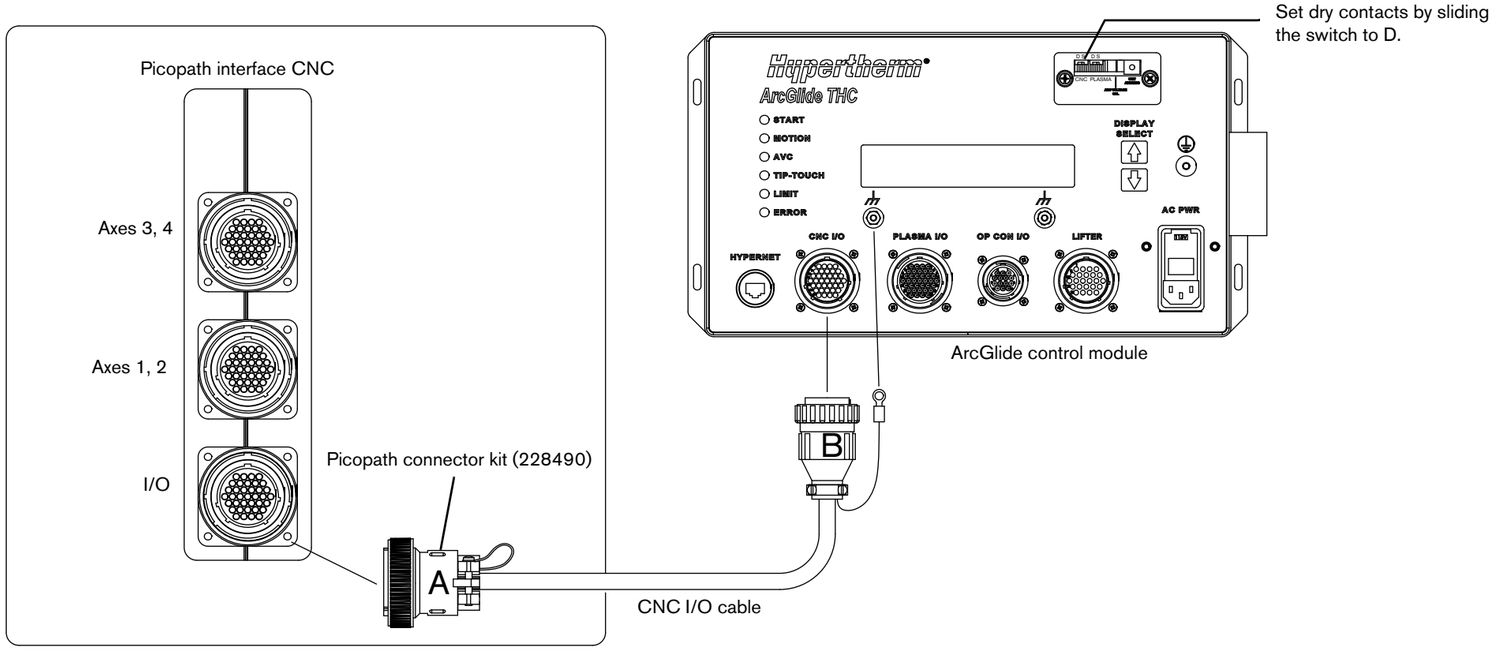
Arc voltage sense wires to plasma system, use ~0.9 mm² (18 AWG) twisted pair wire, rated 600 V or greater.

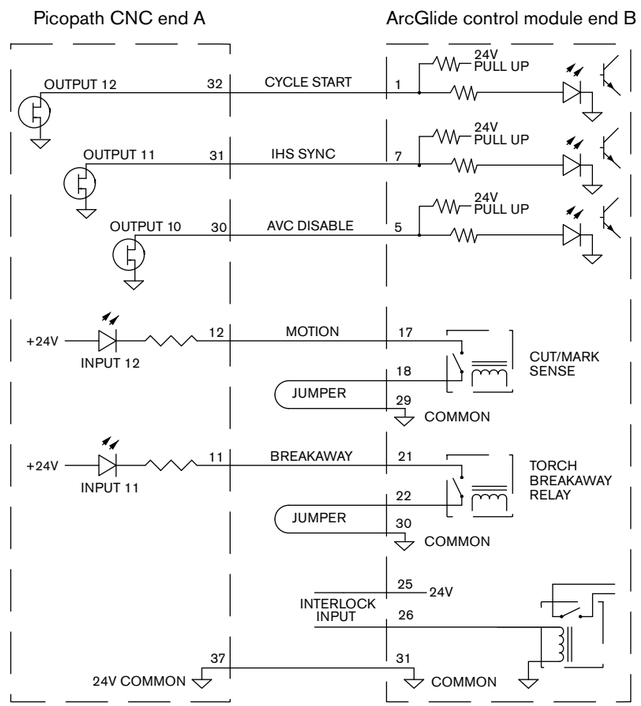
10 – Discrete plasma interface board with connection to Powermax plasma systems



	Plasma Interface Termination		
	Signal	**Wire color**	**Powermax pins**
	Plasma Start A	Green	3
	Plasma Start B	Black	4
	Motion A	Red	12
	Common	Black	14
		Arc voltage	
1000/1230/1650	Electrode-	0.9 mm² (18 AWG)	J16
	Work+	0.9 mm² (18 AWG)	J15
65/85 CSA	Electrode-	0.9 mm² (18 AWG) See Field Service Bulletin *Machine Interface for Raw Arc Voltage (807060)*	J28
	Work+		J26
65/85 CE	Electrode-		J29
	Work+		J27
105/125 CSA or CE	Electrode-		J28
	Work+		J27

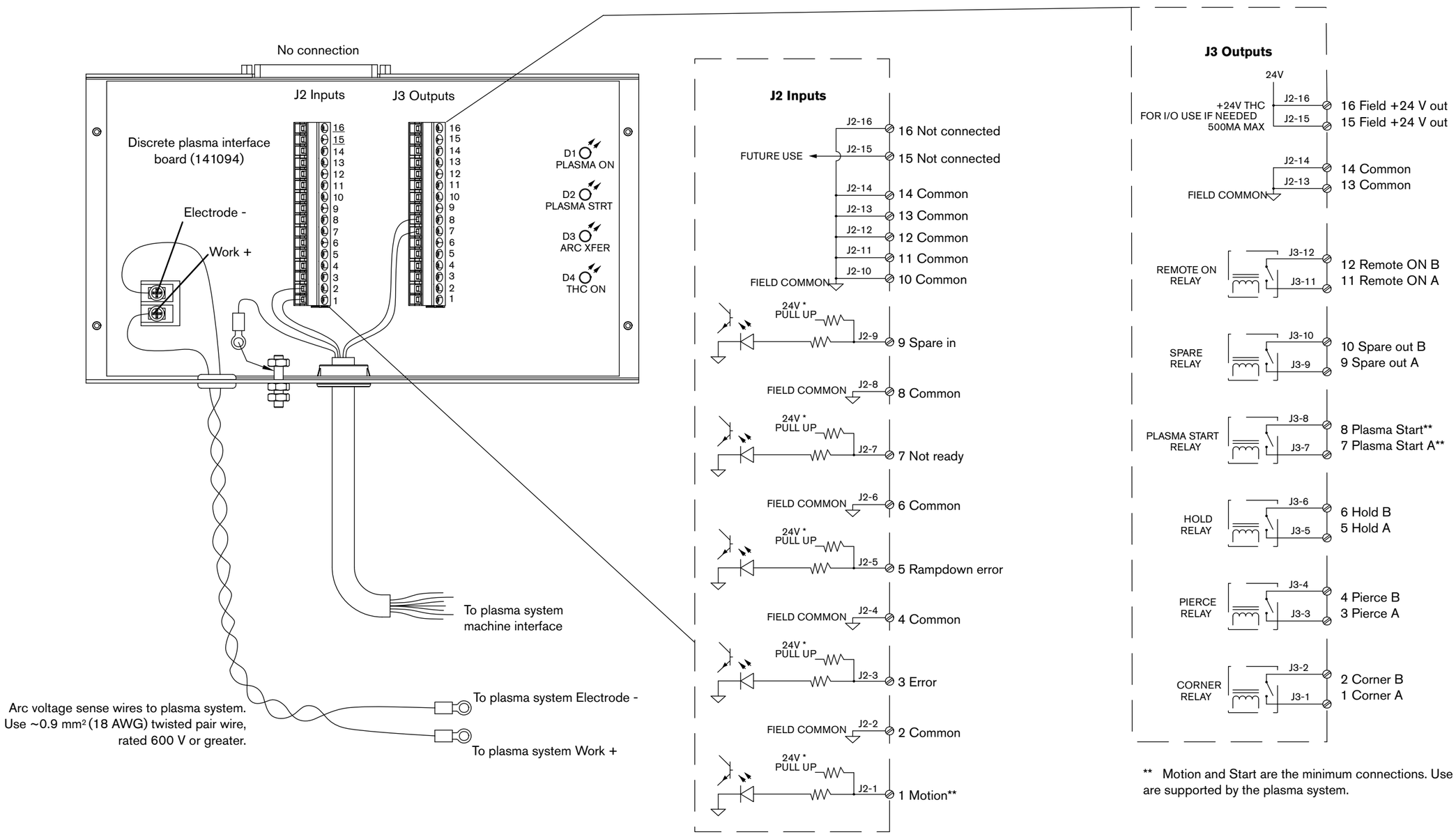
11 – ArcGlide with discrete connection to a Picopath interface CNC





End A of the Hypertherm ArcGlide CNC I/O cable is terminated during installation and will work only if the I/O setup in Phoenix software corresponds to the setup described in this half of this table.				**End B of the Hypertherm ArcGlide CNC I/O cable** is terminated at the factory as described in this half of the table.	
Pin No.	**Function***	**Phoenix mapping name**	**Wire color***	**Pin No.**	**Signal**
32	Output 12	Cut Control	Red	1	Cycle start input +
31	Output 11	Hold Ignition	Blue	7	IHS sync input +
30	Output 10	Torch Height Disable	Green	5	AVC disable input +
12	Input 12**	Cut/Mark Sense	Green	17	Machine motion output A
	Jumper blue and red, pins 18 and 29.		Red	18	Machine motion output B
			Blue	29	Common
11	Input 11**	Torch Collision	Yellow	21	Torch breakaway output A
	Jumper red and green, pins 22 and 30.		Red	22	Torch breakaway output B
			Green	30	Common
	External switch	Satisfy with switch or jumper.	Orange	25	Interlock input + **
			Red	26	Interlock input - **
37	24 V common		Yellow	31	Common
Backshell	Chassis ground		Drain wire	Ring terminal	Chassis ground
* This example uses CNC outputs 10, 11, 12, and inputs 11 and 12. Assign the I/O points in the Phoenix software.			* Multiple wires are the same color. Verify pin-to-pin connections before plugging cables into equipment.		
** Set ArcGlide plasma inputs to dry (D) using the plasma input switch on the THC processor board in the control module.			** ArcGlide interlock must be closed to enable ArcGlide motion.		

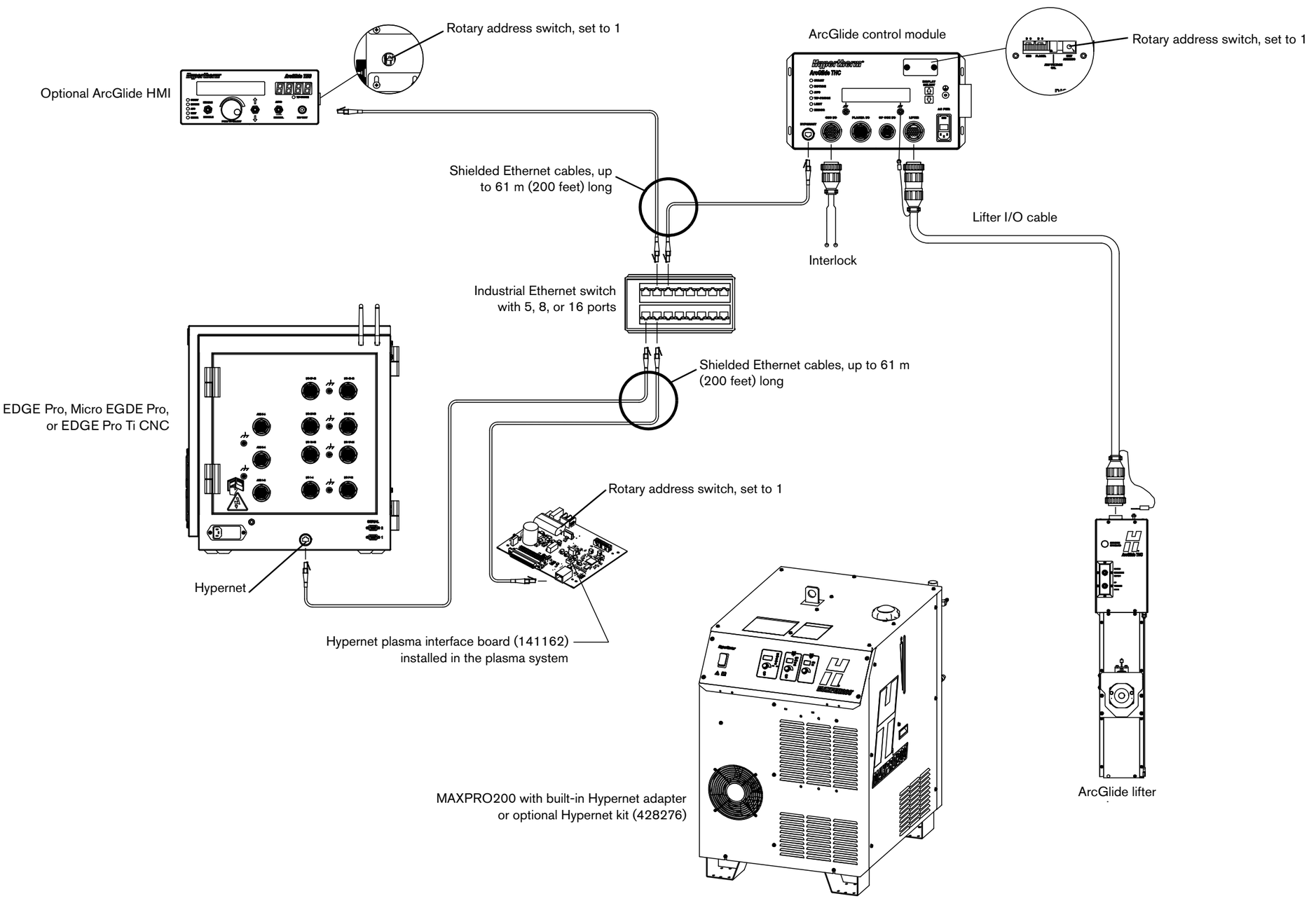
12 – Discrete plasma interface board with connection to any plasma system



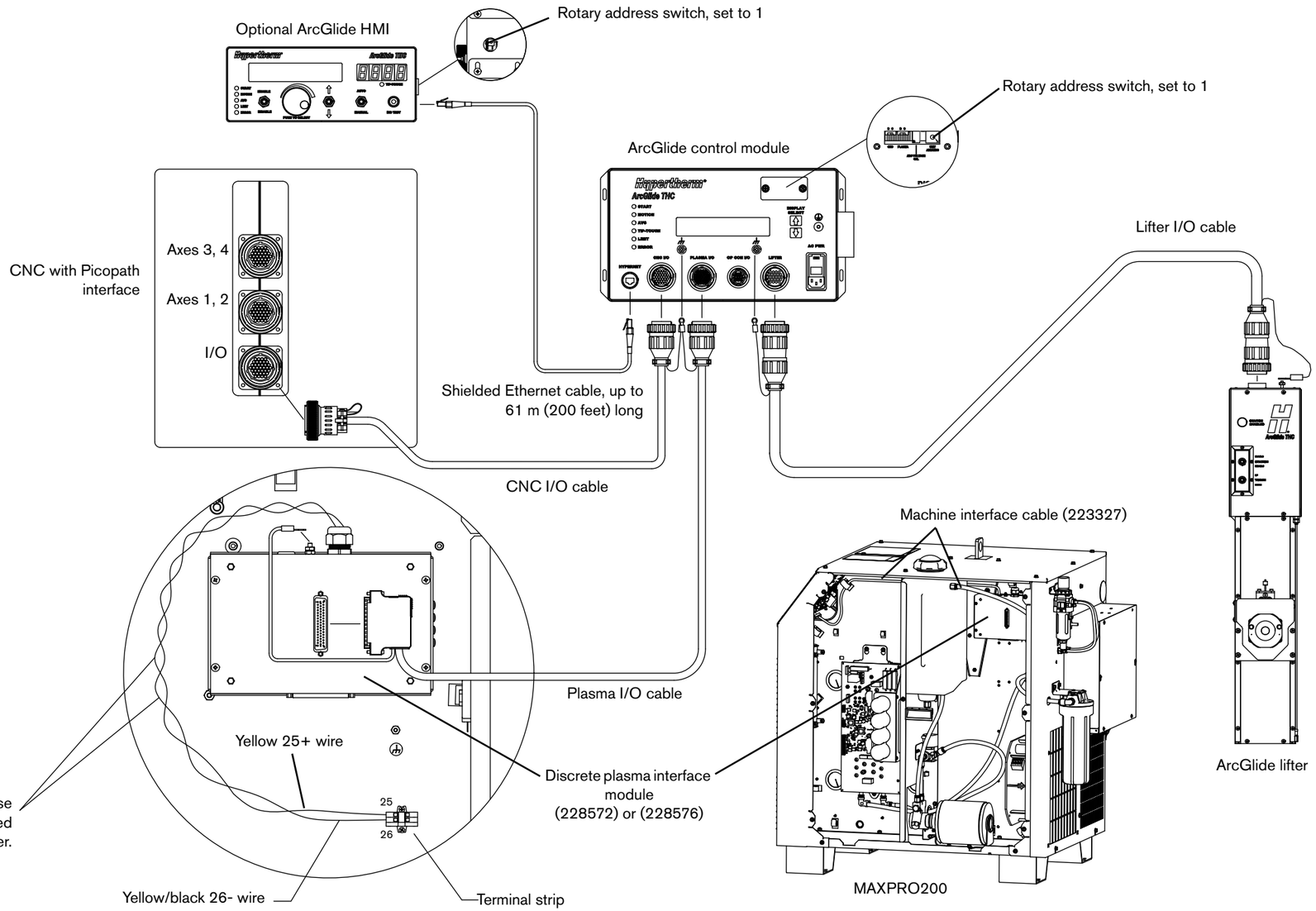
** Motion and Start are the minimum connections. Use other signals if they are supported by the plasma system.

* 24 V pull-up resistors on inputs are active only if they are set to dry (D) on the THC processor board in the control module.

13 – ArcGlide THC with Hypernet connection to an EDGE Pro CNC and MAXPRO200 plasma system

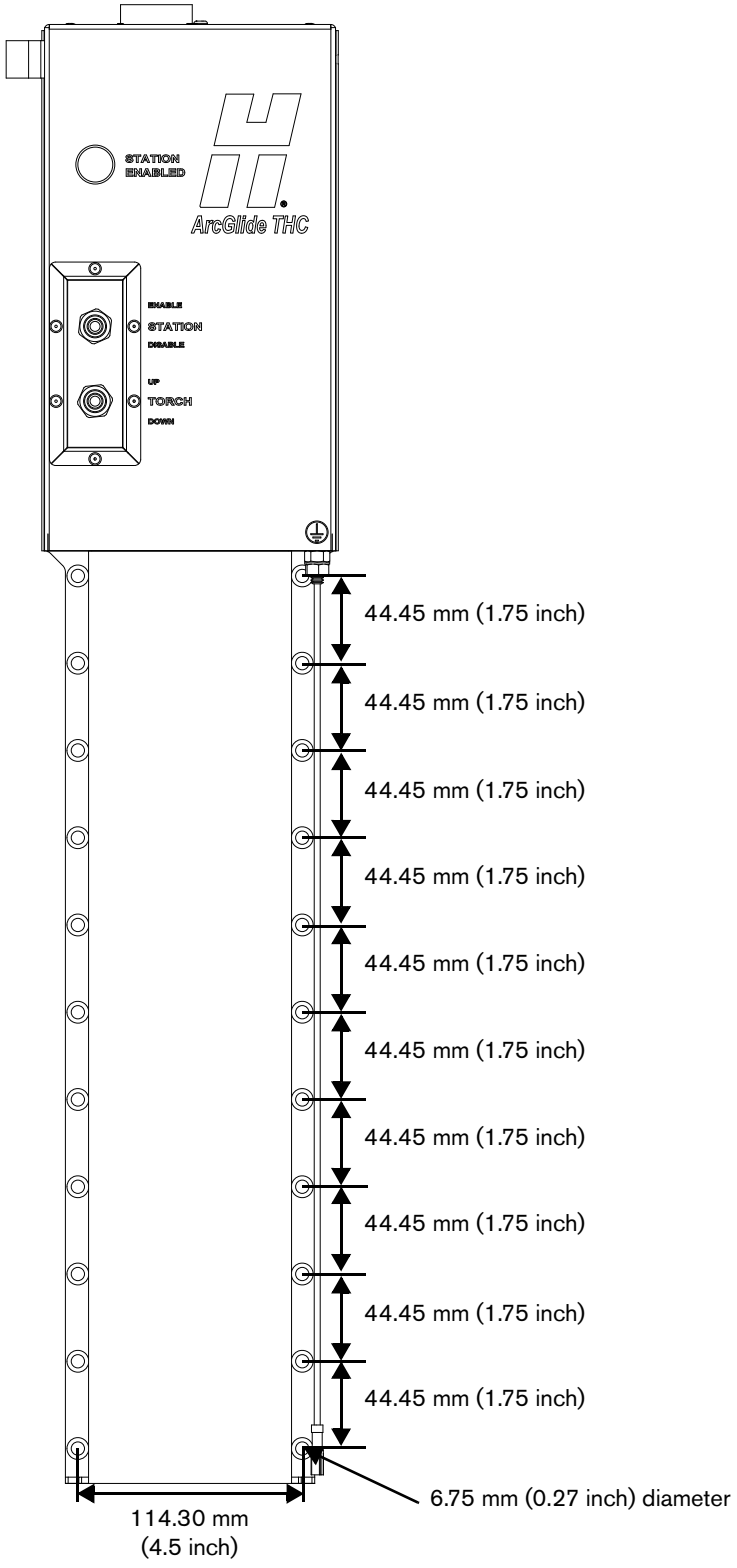


14 – ArcGlide THC with discrete connection to a Picopath interface CNC and MAXPRO200 plasma system



Install the lifter

Figure 13

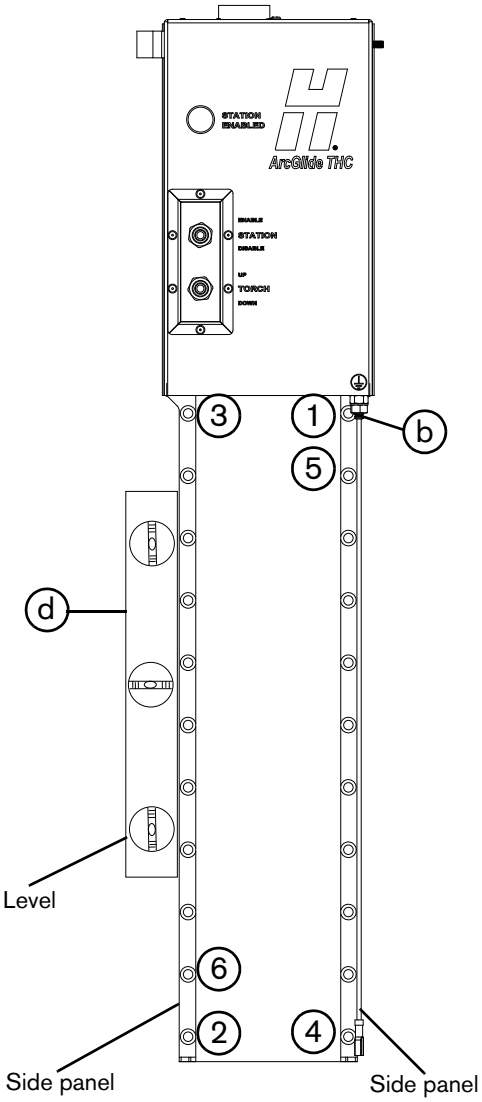


1. Position the lifter on the gantry:

- ❑ Low enough that the torch can reach the workpiece.
- ❑ High enough that the torch does not touch the table.
- ❑ The bottom of the lifter must be within 20 mm (8 inches) of the thinnest workpiece.
- ❑ Mounting holes have the same spacing as the Sensor THC and Command THC lifters.

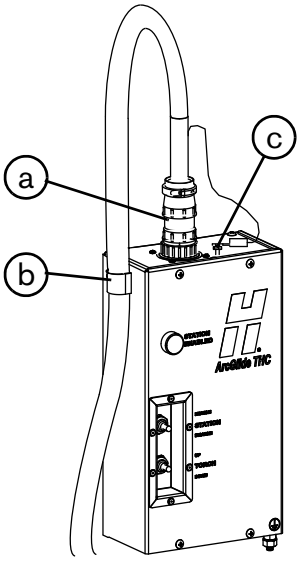
2. Mount the lifter on the gantry:

- **a.** Remove the shield panels and side panels to expose the mounting screw holes.
- **b.** Loosely fasten the screws in a diagonal pattern, top to bottom and right to left (see the numbers in the illustration on the right).
- **c.** Use a minimum of 4 screws to mount the lifter.
- **d.** Place a level vertically along the side of the lifter to verify that it is mounted vertically.
- **e.** Tighten the screws using a maximum torque of 9.1 kg·cm (8.0 in·lb).
- **f.** When they are tightened, the tops of the screws must be below the surface of the back panel of the lifter so the side panels can be replaced.
- **g.** Reinstall the side panels and shield panels.



3. Connect the lifter interface cable and secure it.

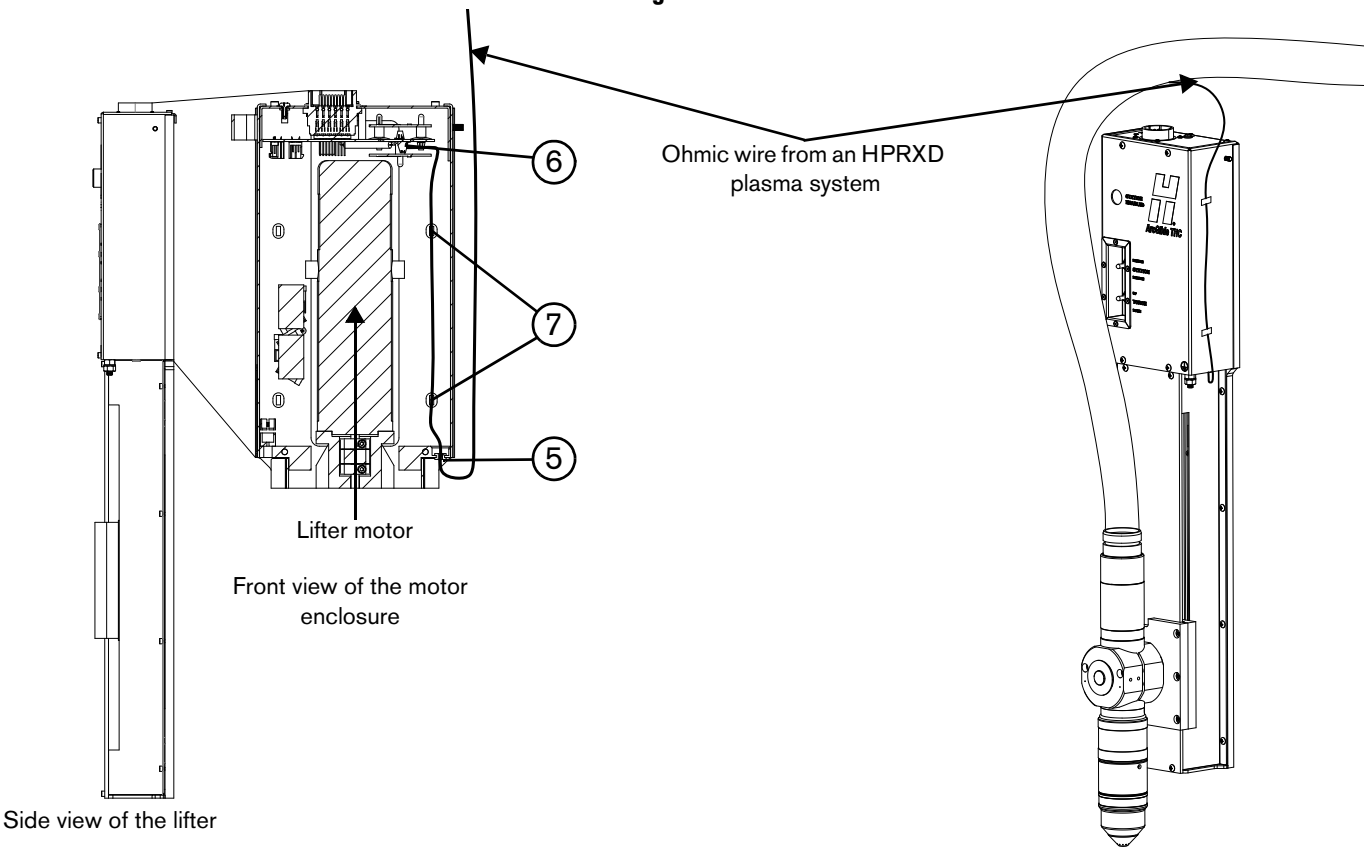
- **a.** The cable connector is not rated for hard use or constant flexing. Support the cable and add enough slack to prevent strain on the cable and prevent damage to the cable assembly, lifter connector, or both.
- **b.** Use the cable clamp that is included with the lifter to secure the cable to either side of the lifter with a generous service loop.
- **c.** Connect the cable ground to the ground connector on the top of the lifter.



Connect the ohmic wire from HPRXD plasma systems

Do not splice ohmic wires.

Figure 14



To connect the ohmic wire from an HPRXD torch to the ArcGlide lifter:

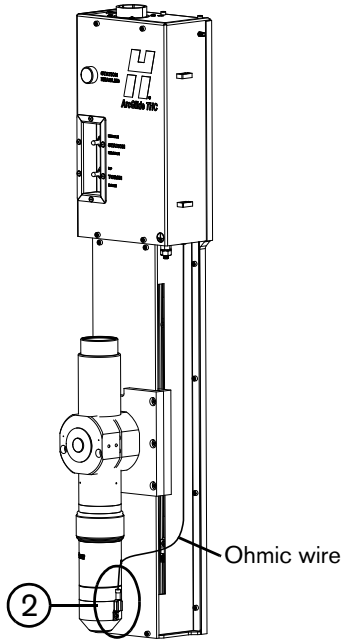
1. Remove the top cover of the motor compartment on the lifter.
2. Disconnect the existing ohmic wire from the J5 connector on the underside of the lifter interface board.
3. Remove the ohmic wire from the motor compartment of the lifter.
4. Cut the terminal end off the ohmic wire from the HPRXD torch and strip 5 mm (0.2 inch) of the covering.
5. Insert the end of the ohmic wire from the HPRXD system through the grommet in the bottom of the motor compartment of the lifter.
6. Insert the stripped HPRXD ohmic wire into the J5 connector on the underside of the lifter interface board.
7. Use cable ties to fasten the wire to the mounts on the inside back wall of the lifter compartment.
8. Replace the top cover of the motor compartment.

Connect the ohmic wire to other plasma systems

Do not splice ohmic wires.

If your plasma system is not an HPRXD system, connect the ArcGlide ohmic wire to the torch:

1. Unfasten the cable tie around the coiled ohmic wire and straighten the ohmic wire.
2. Install the free end of the ohmic wire on the IHS tab on the torch retaining cap.

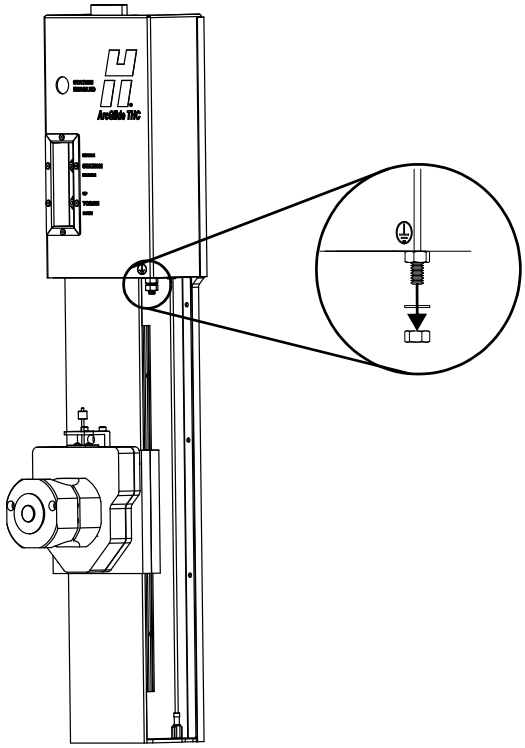


Ground the lifter

The lifter must be grounded correctly to make sure the lifter performs accurate initial height sense (IHS).

To ground the lifter:

1. Remove the bottom nut and washer of the grounding assembly on the lifter.
2. Fit the terminal on the ground wire over the grounding post.
3. Replace the bottom nut and washer on the ground post and finger-tighten it so the terminal is in contact with the washer and bottom nut.
4. Connect the other end of the ground wire to a terminal on the table ground bus bar on the cutting machine.
5. Verify that the wire is not in the path of the lifter mechanics



See *Recommended grounding and shielding practices* on page 55 for more information.

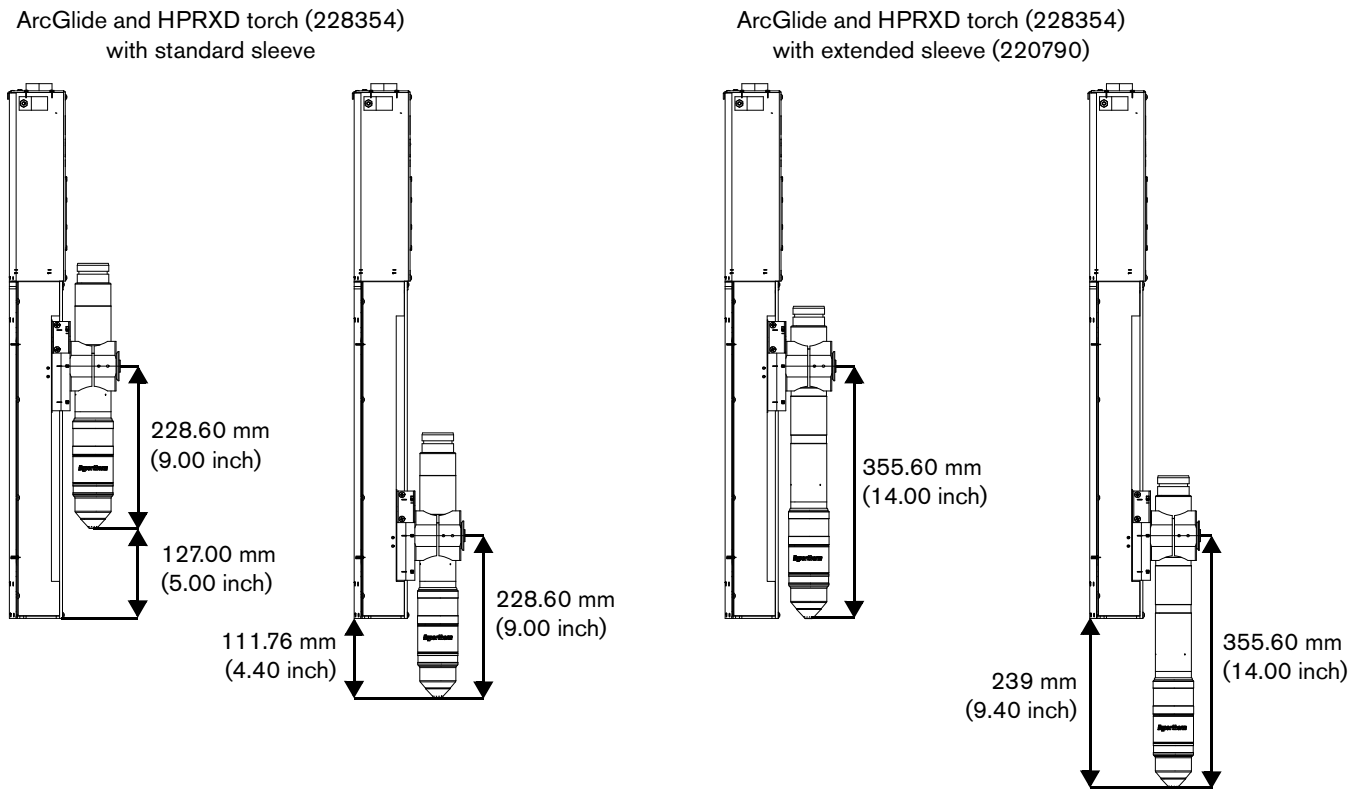
Extended torch sleeve option

An extended torch sleeve (220790) is available for torches used with HPR130XD, HPR260XD, HPR400XD, and HPR800XD plasma systems. This torch sleeve extends the reach of the torch tip 127.00 mm (5.00 inches) and increases the mounting flexibility of your cutting machine setup.

For additional stability, clamp the torch body as close to the torch tip as possible.

Extended torch sleeve options for the MAXPRO200 plasma system are 220942 and 220943.

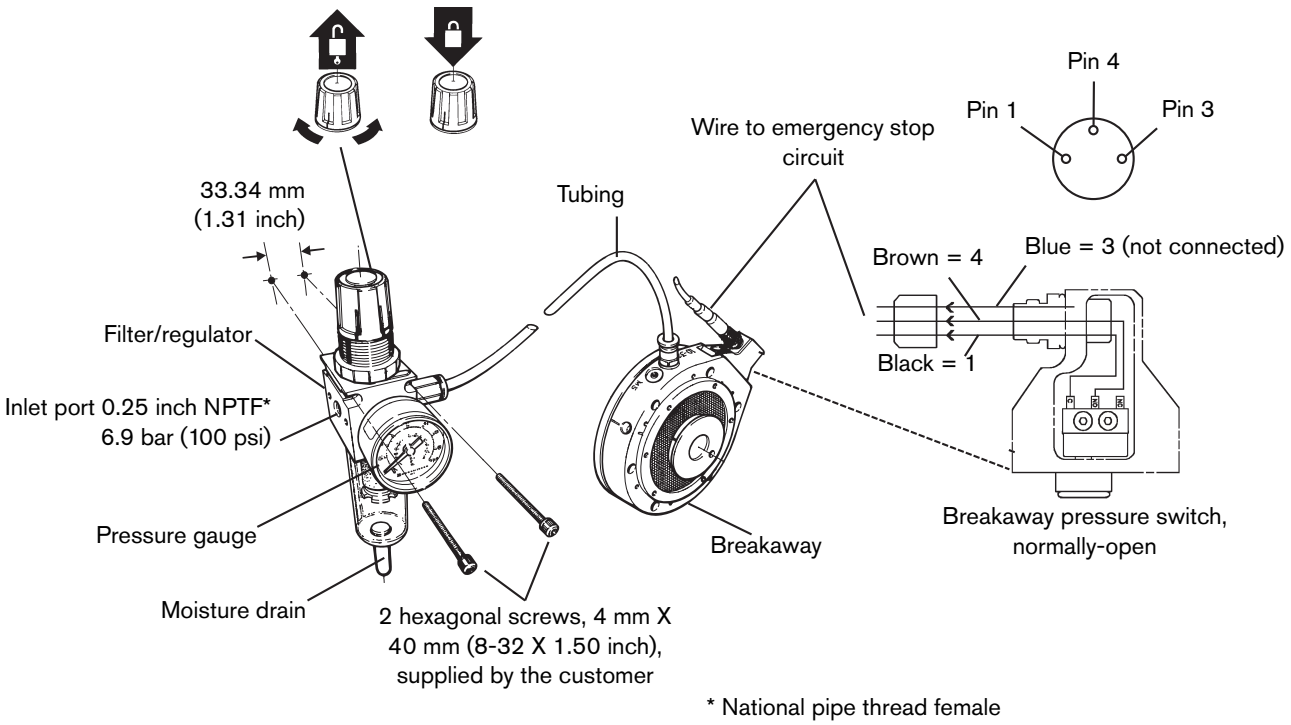
Figure 15



Install the optional pneumatic breakaway

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

Figure 16



To install the pneumatic breakaway:

1. Mount the fiberglass bracket to the lifter using the 4 hexagonal screws.
2. Mount the breakaway to the 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 torch collision input of the CNC.
5. Mount the filter/regulator.
6. Connect the tubing between the filter/regulator and the breakaway.

7. Install the air supply to the filter/regulator inlet port at 6.9 bar (100 psi), the recommended pressure.

8. Adjust the filter/regulator to indicate 2 bar (30 psi), the recommended starting pressure, on the gauge. Typical operating pressure is 2.75 bar to 4 bar (40 psi to 60 psi)

9. Simulate a crash by forcing the breakaway to separate by hand.

10. Manually reposition the breakaway in the locked position.

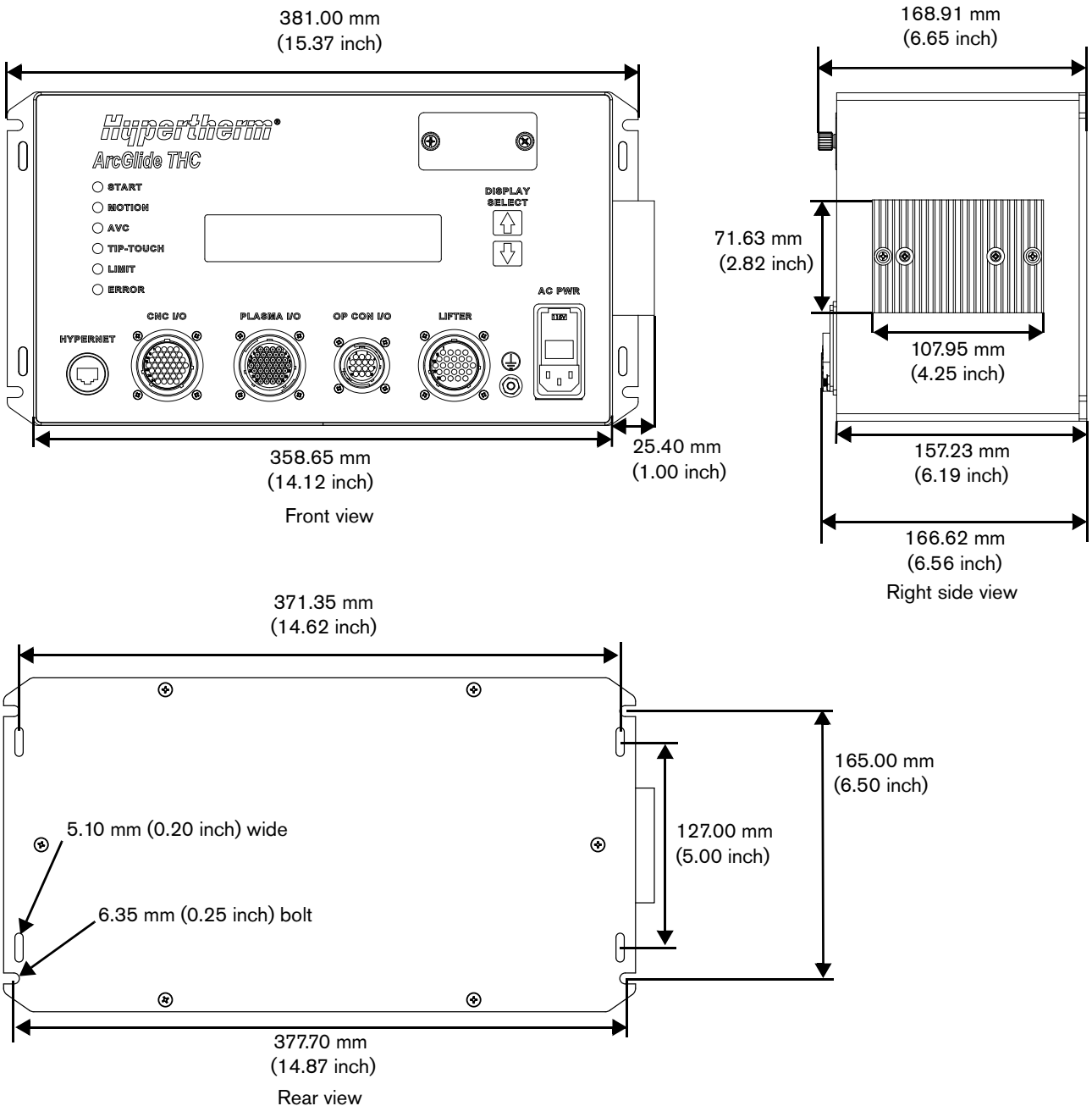
11. Adjust the air pressure until the desired trip force is achieved.

12. Enable the emergency stop circuit at the CNC after the breakaway is installed.

Install the control module

Install the control module where it will be easy to read the display and to reach the controls during installation and troubleshooting. A dry, dust-free wiring cabinet is ideal. Leave a clearance space of 200 mm (8 inches) from the front of the control module and 6.00 mm (0.25 inch) from the heatsink.

Figure 17



1. Mount the control module with 4 screws.

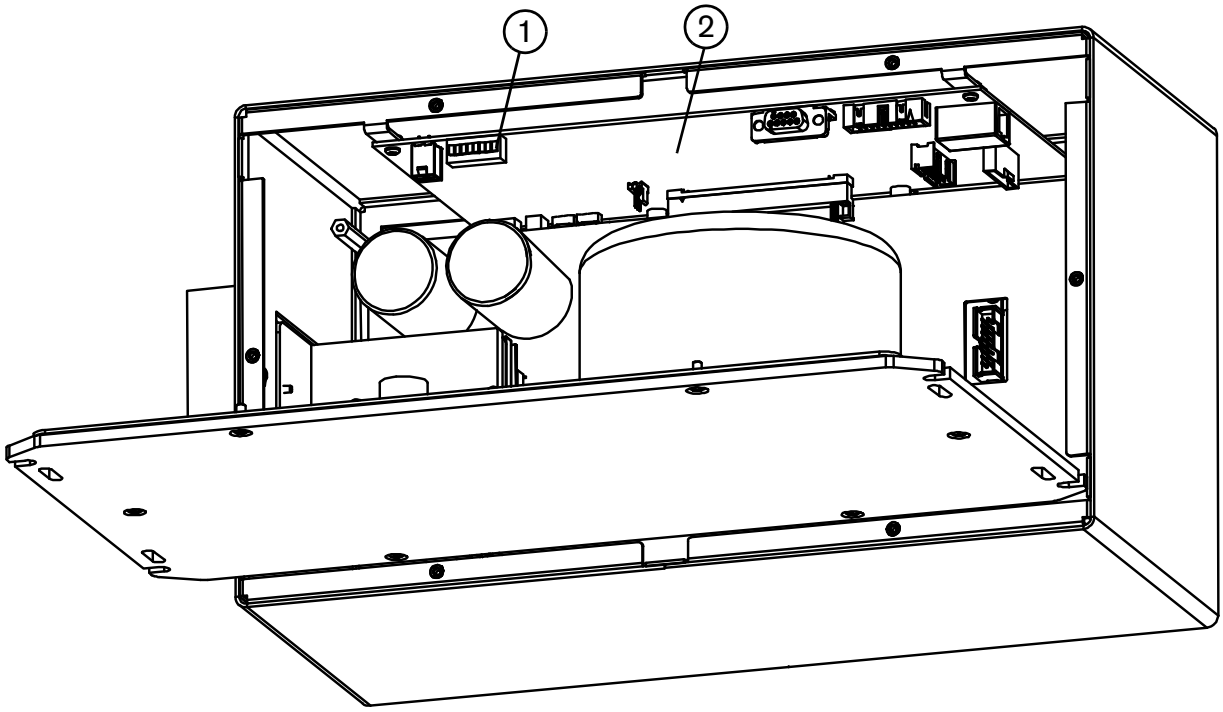
2. Connect the end of the lifter interface cable with the red band to the connector marked Lifter (with the red circle). See *Connect Hypernet cables* on page 92 or *Connect discrete cables* on page 95 for more information.

3. Attach one end of the power cord to the AC power connector on the front of the control module. Prepare the other end for the 100 VAC – 120 VAC or 200 VAC – 230 VAC power outlet.

Modify Retract Delay Time for an HT2000 plasma system

If you are installing an ArcGlide THC with an HT2000 plasma system, set switch 1 on the auxiliary DIP switch options (①) to ON on the THC processor board (228578) in the control module. This setting modifies Retract Delay Time for correct operation.

Figure 18



1 Switch 1 set to ON

2 THC processor board (228578)

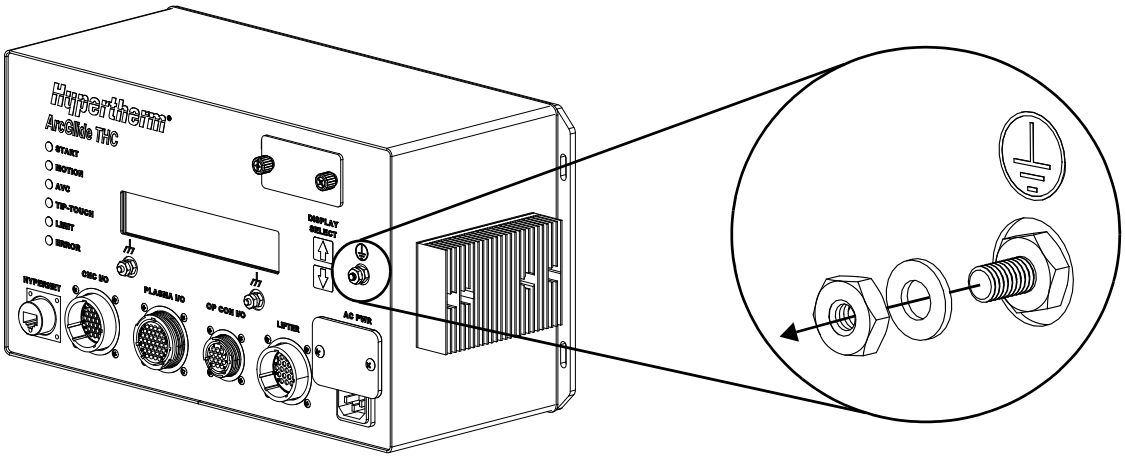
Ground the control module

To ground the control module:

1. Remove the top nut and washer of the grounding assembly on the front of the control module.
2. Fit the ground wire terminal over the grounding post.
3. Replace the top nut and washer on the ground post and finger-tighten it so the terminal is in contact with the washer and the bottom nut.
4. Connect the other end of the ground wire to a terminal on the table ground bus bar on the cutting machine.

See *Recommended grounding and shielding practices* on page 55 for more information.

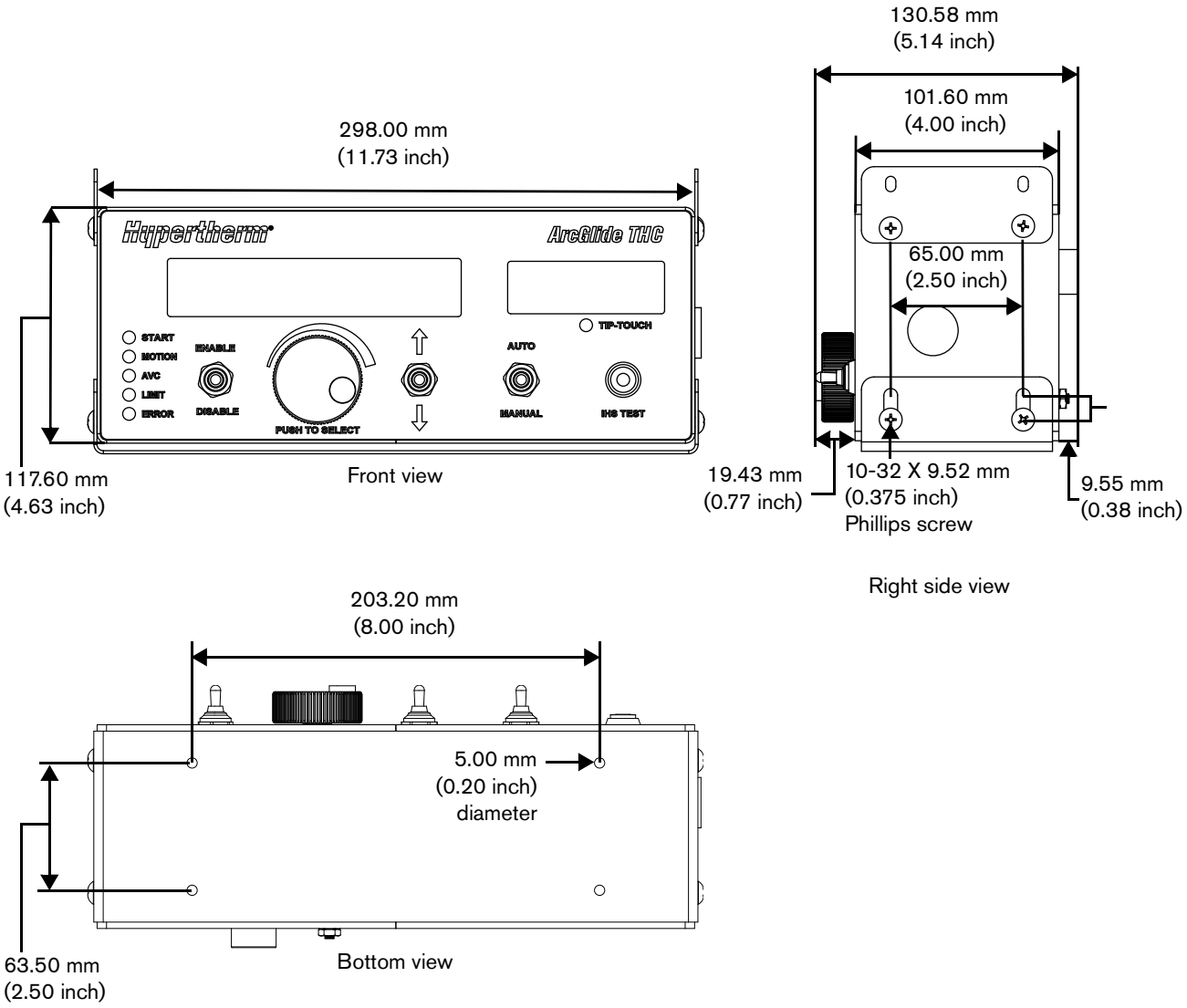
Figure 19



See *Operating the control module* on page 135 for more information.

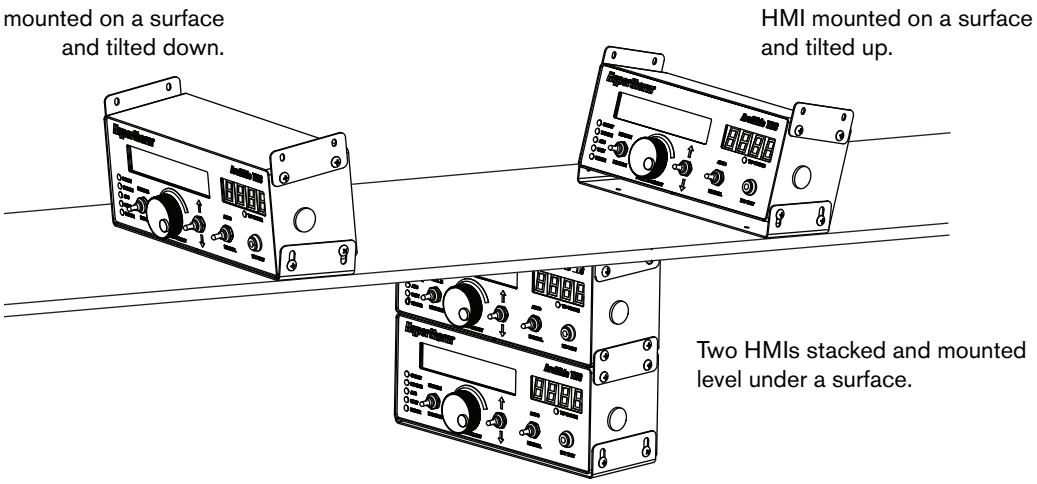
Install the optional HMI

Figure 20



The mounting brackets on the top and bottom of the HMI allow you to install it singly or stacked, under or on another piece of equipment, and level or tilted. See *Figure 21*.

Figure 21

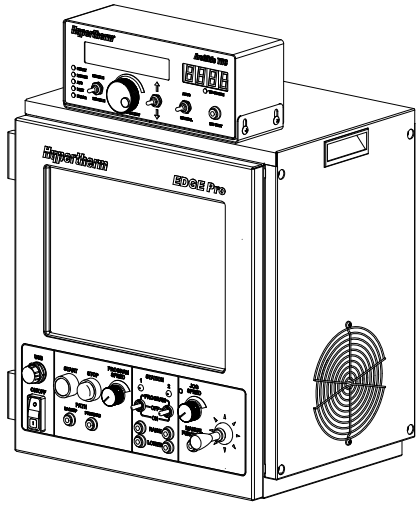


To install the HMI:

1. Remove the mounting bracket from the HMI.
2. Place the mounting bracket on the surface where you will mount the HMI and attach the bracket with screws through the holes in the bottom of the bracket.
3. Remount the HMI in the mounting bracket by loosely fastening the screws through the sides of the bracket into the top or bottom holes in the sides of the HMI.
4. Adjust the HMI to the angle you want it and tighten the screws.
5. Attach one end of the power cord to the AC power connector on the back of the HMI. Prepare the other end for the 100 VAC – 120 VAC or 200 – 230 VAC power outlet.

You can also mount the HMI on top of the EDGE Pro CNC. The EDGE Pro enclosure has 4 mounting holes for the HMI bracket.

Use 4 10-32 x 1/2 inch screws to fasten the HMI to the EDGE Pro CNC enclosure.



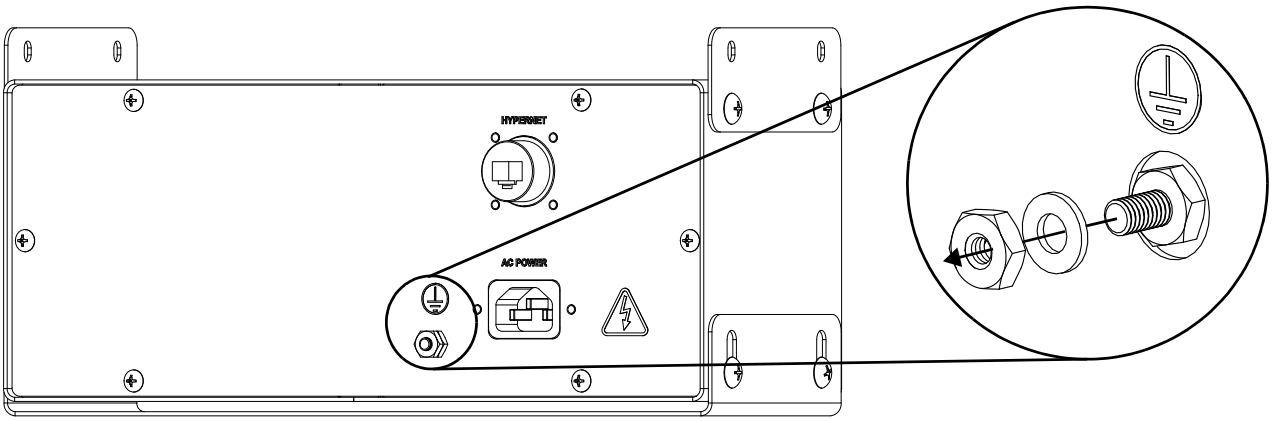
Ground the HMI

To ground the HMI:

1. Remove the top nut and washer of the grounding assembly on the back of the HMI.
2. Fit the ground wire terminal over the grounding post.
3. Replace the top nut and the washer on the ground post and finger-tighten it so the terminal is in contact with the washer and bottom nut.
4. Connect the other end of the ground wire to a terminal on the gantry ground bus bar of the cutting machine.

See *Recommended grounding and shielding practices* on page 55 for more information.

Figure 22



See *Operating the HMI* on page 143 for more information.

Install the plasma interface board in a plasma system

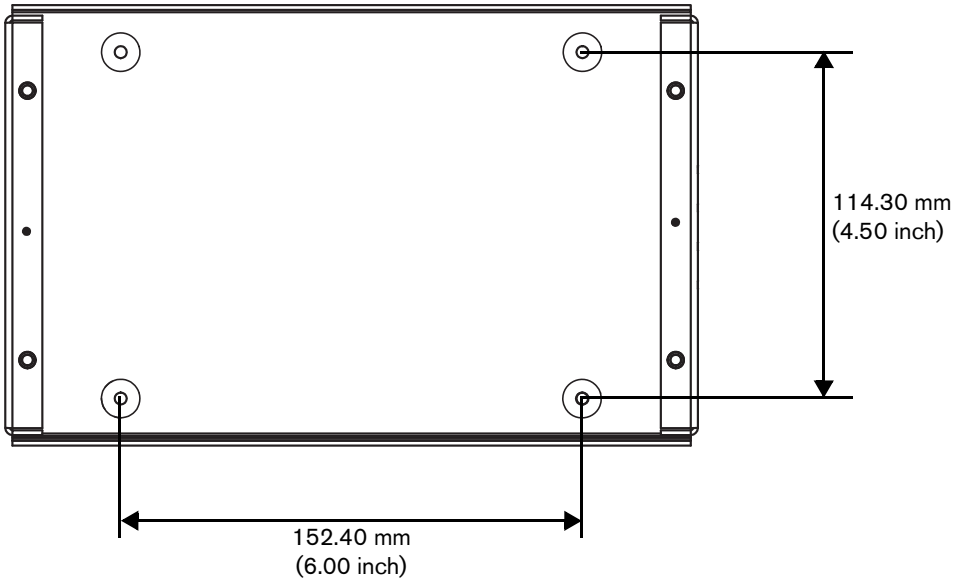
The plasma interface board includes the voltage divider and allows the ArcGlide THC to communicate with the plasma system.

If you are replacing a Command THC with an ArcGlide THC, you must replace the Command THC plasma interface board in your plasma system with an ArcGlide plasma interface board.

Discrete plasma interface board (141094)

The discrete plasma interface board is mounted in an enclosure that is installed in your plasma system, either internally or externally. For specific instructions and safety-related information about mounting the enclosure, refer to the manual that came with your plasma system.

Figure 23

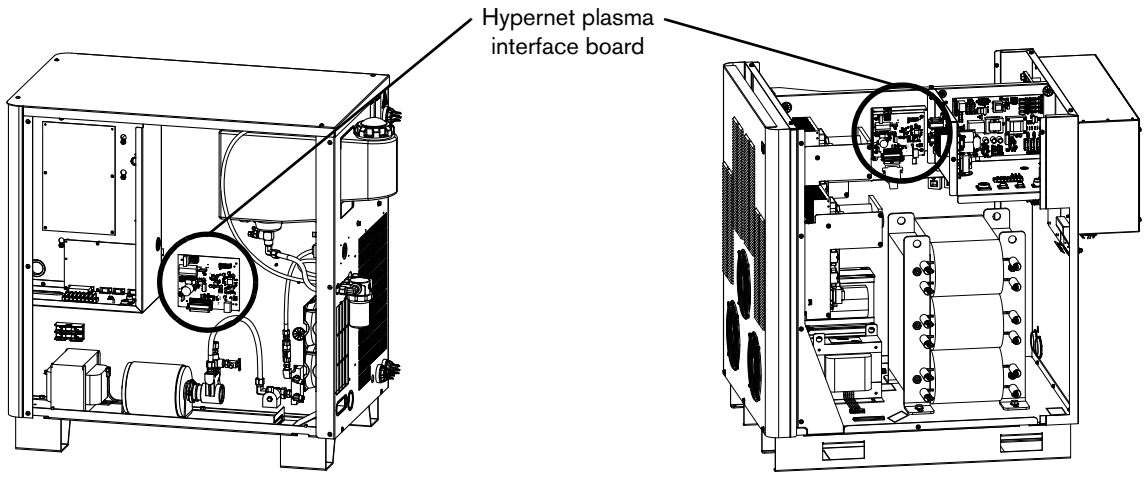


See *Discrete plasma interface board (141094)* on page 224 for information about electrical installation.

Hypernet plasma interface board (141162)

The Hypernet plasma interface board is mounted inside an HPRXD plasma system on standoffs built into the plasma system, as shown in *Figure 24*.

Figure 24



HPR130XD and HPR260XD

HPR400XD

See *Hypernet plasma interface board (141162)* on page 228 for information about electrical installation.

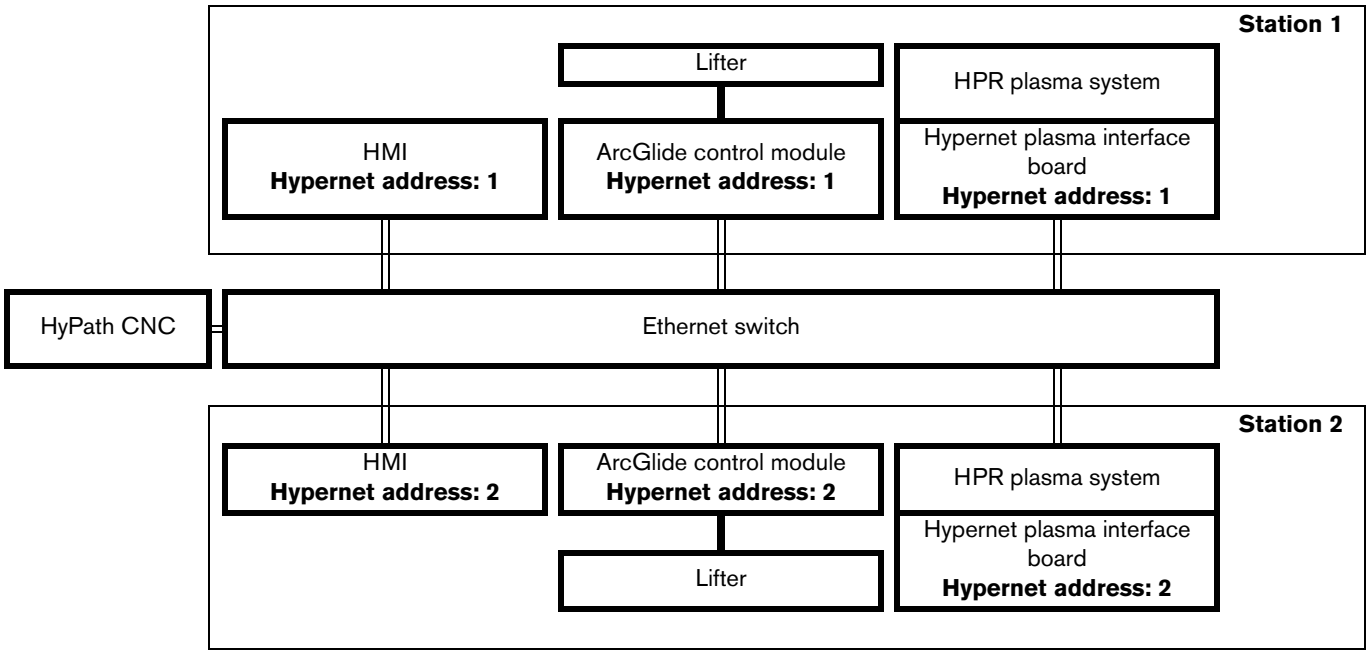
Connect Hypernet cables

A system configuration in which there is more than one Hypernet connection requires an industrial-grade Ethernet switch. See *Ethernet switch* on page 46 for more information.

In this type of configuration, Hypernet connections are made from the ArcGlide control module directly to the Ethernet switch and from there to the CNC or plasma system. See *Figure 11* on page 59 for an example.

Each unit assigned to a station must have the same Hypernet address. This common address between units allows the Ethernet switch to direct communications to the appropriate station. See *Figure 25* for an example.

Figure 25



Key:

Hypernet connection

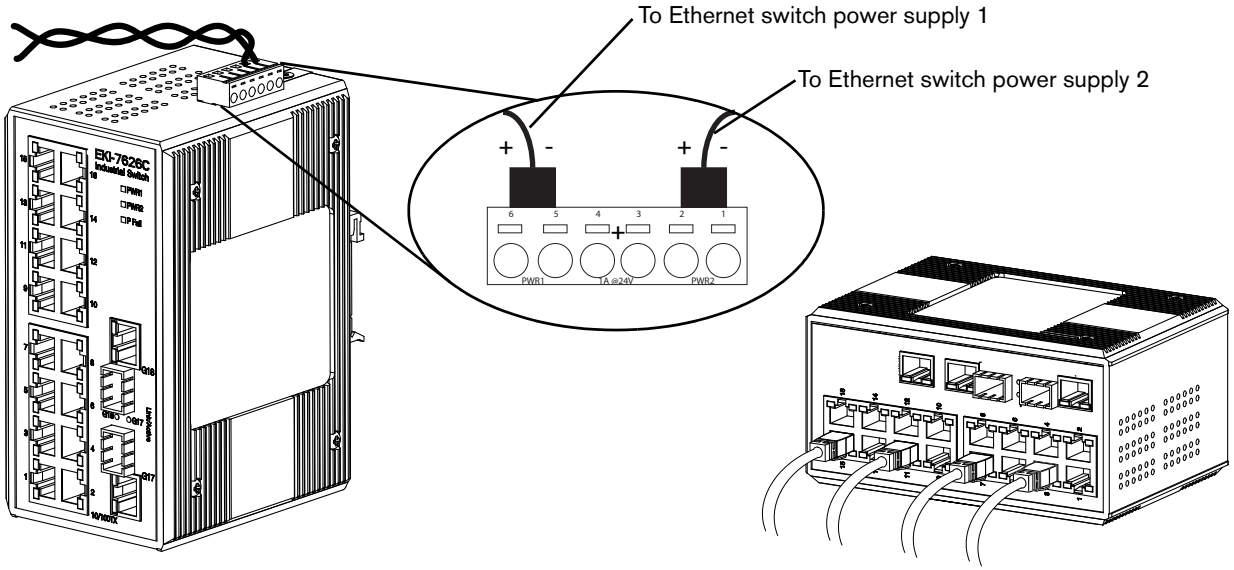
Discrete connection

See the following pages for details:

- See *Assign an ArcGlide THC to a station* on page 125 for information about linking unit addresses to a station in Phoenix software on a Hypertherm CNC.
- See the following sections for the location of the unit address switches:
  - *HMI processor board (228581)* on page 211
  - *THC processor board (228578)* on page 220
  - *Hypernet plasma interface board (141162)* on page 228

Hypernet connections and Ethernet connection to a LAN cannot be made through the same switch. If your cutting machine is connected to a LAN over Ethernet, you must use a separate Ethernet switch for these connections.

Figure 26



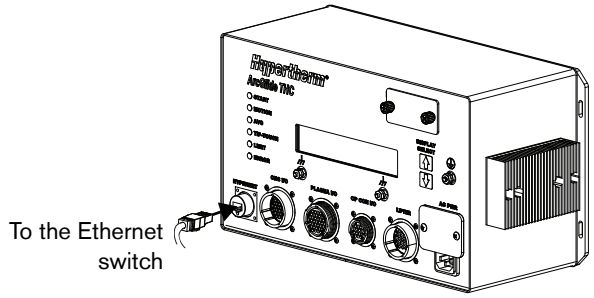
Power connections to the Ethernet switch

Hypernet connections to the Ethernet switch

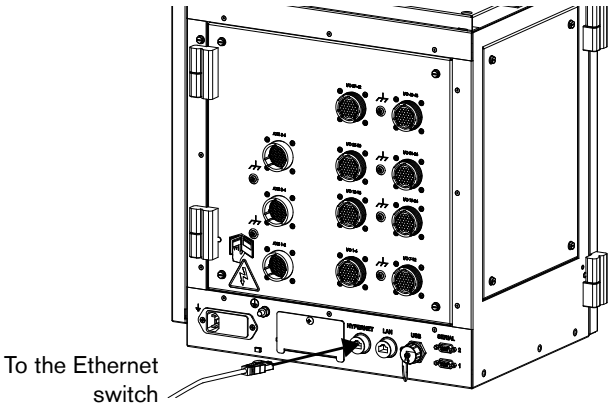
It is also possible to have a mixed Hypernet and discrete configuration in which the ArcGlide THC communicates with only the CNC or plasma system over Hypernet and uses discrete communication for the alternate connection. See *Mixed communication* on page 51.

Use the portions of the following instructions that apply to your configuration.

1. Use a Hypernet cable to connect the control module to the Ethernet switch:
   - **a.** Insert one end of the Hypernet cable into the Hypernet port on the front of the control module.
   - **b.** Insert the other end of the cable into one of the ports of the Ethernet switch.



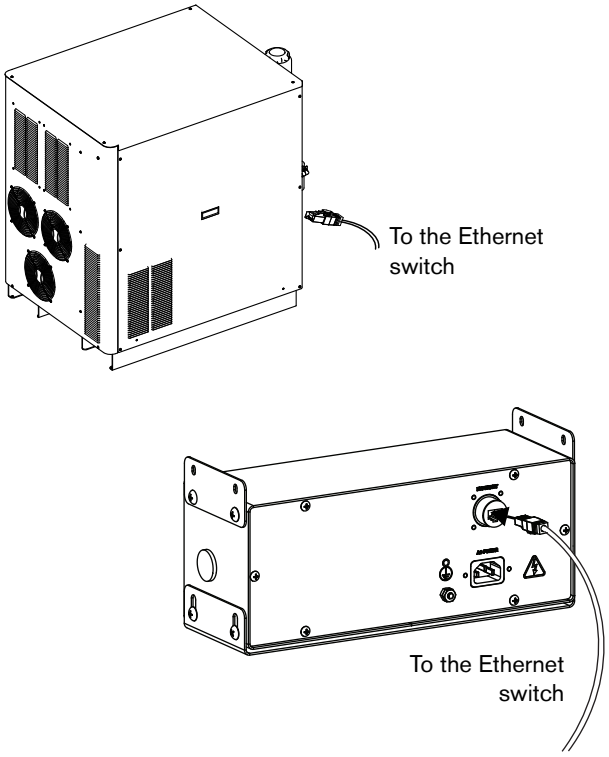
2. Use a Hypernet cable to connect the CNC to the Ethernet switch.
   - **a.** Insert one end of the Hypernet cable into the Hypernet port on the back of a Hypertherm CNC or to a dedicated, Hypernet port on any other CNC.
   - **b.** Insert the other end of the cable into one of the ports of the Ethernet switch.



3. Use a Hypernet cable to connect the plasma system to the Ethernet switch:
   a. Insert one end of the Hypernet cable into the Hypernet port on the plasma interface board in the plasma system.
   b. Insert the other end of the cable into one of the ports of the Ethernet switch.

Refer to the manual for your plasma system for detailed instructions about these connections.

4. If your configuration includes the optional HMI, use a Hypernet cable to connect it to the Ethernet switch:
   a. Insert one end of the Hypernet cable into the Hypernet port on the HMI.
   b. Insert the other end of the cable into one of the ports of the Ethernet switch.



Connect discrete cables

In a discrete configuration, the communication connections are made from the control module to the HMI, CNC, plasma system, and optional operator console. In this type of configuration, the control module and HMI communicate over a single Hypernet connection. Therefore, this is the only configuration that does not require an Ethernet switch. See *Figure 12* on page 60.

It is also possible to have a mixed Hypernet and discrete configuration in which the ArcGlide THC communicates with the CNC or the plasma system over a discrete connection and uses Hypernet communication for the remaining connection. In configurations where there is more than one connection of Hypernet, an industrial-grade Ethernet switch is required for the Hypernet connections.

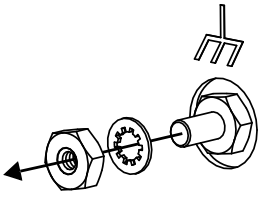
Use the portions of the following instructions that apply to your configuration.

Each port on the front of the control module is color-coded to match the connector on the interface cable that connects to it, as shown in the illustrations for each cable later in this section.

To extract pins and sockets from the Amp style connectors used to create and troubleshoot discrete I/O cables, use the AMP pin extractor tool (008197).

Ground all cables with circular connectors

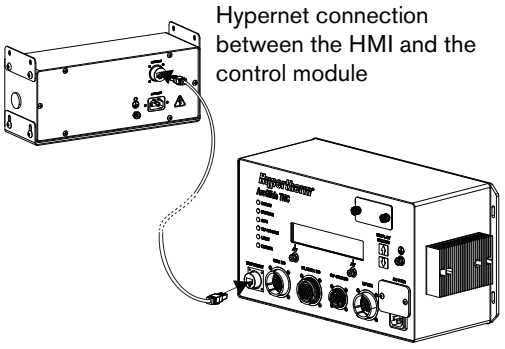
See *Recommended grounding and shielding practices* on page 55 for more information on system grounding.



1. Remove the top nut and washer of the grounding assembly.
2. Fit the ground wire terminal on the cable over the grounding post.
3. Replace the top nut and the washer on the ground post and finger-tighten it so the terminal is in contact with the washer and bottom nut.

Control module cable connections

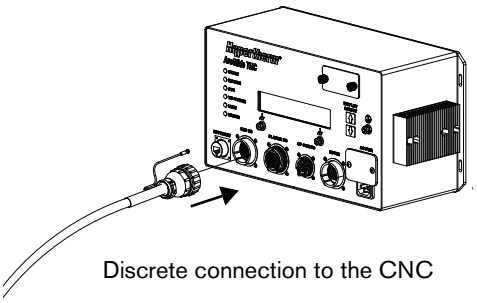
1. Connect the HMI to the control module:
   a. Insert one end of the HMI cable into the Hypernet connector on the front of the control module.
   b. Insert the other end of the cable into the Hypernet port on the back of the HMI.



Hypernet connection between the HMI and the control module

2. Connect the CNC to the control module:
   a. Insert the end of the CNC I/O cable with the yellow band into the CNC I/O connector on the front of the control module.
   b. Connect the wires on the other end of the cable to the I/O signals on the CNC.

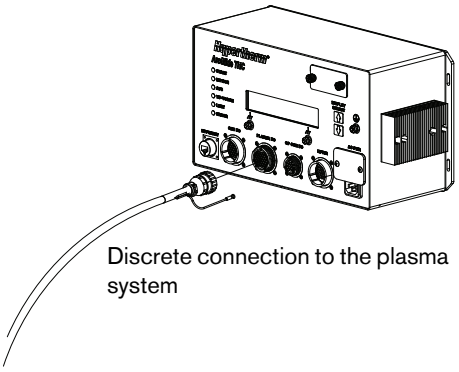
See *CNC I/O cable* on page 105 for more information.



Discrete connection to the CNC

3. Connect the plasma system to the control module:
   a. Insert the end of the plasma interface I/O cable with the blue band into the Plasma I/O connector on the front of the control module.
   b. Connect the other end of the cable into the plasma I/O connector (J5) on the plasma interface board in the plasma system.

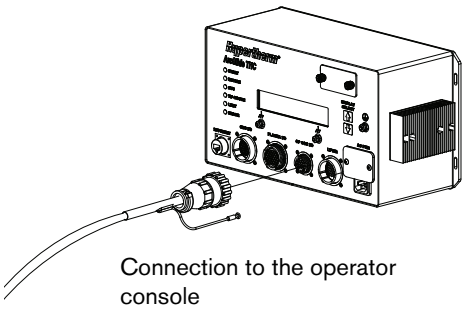
See *Plasma interface I/O cable* on page 110 for more information.



Discrete connection to the plasma system

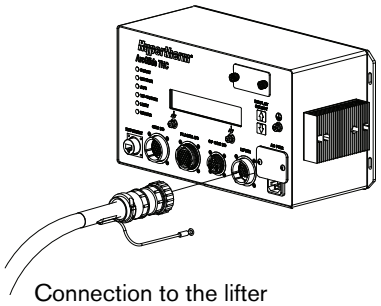
4. If your configuration includes a, optional, customized operator console, connect it to the control module:
   a. Connect the end of the operator console I/O cable with the green band into the operator console I/O connector on the front of the control module.
   b. Connect the other end of the cable into the appropriate connectors on the custom operator console.

See *Optional operator console I/O cable* on page 101 for more information.



Connection to the operator console

5. See *Install the lifter* on page 77 for more information on connecting the ArcGlide lifter to the control module.



Connection to the lifter

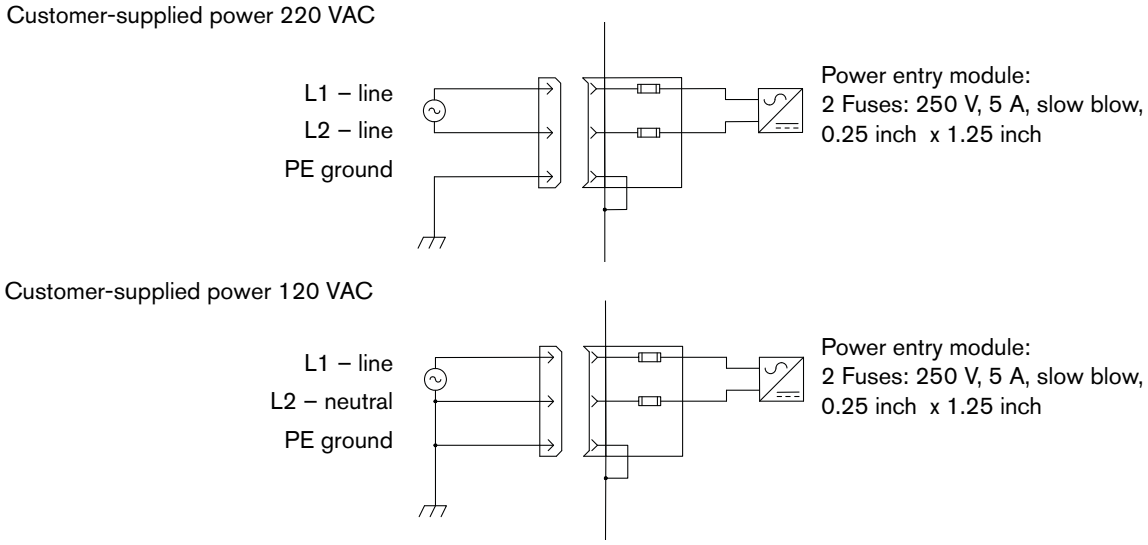
Cables

Power cable

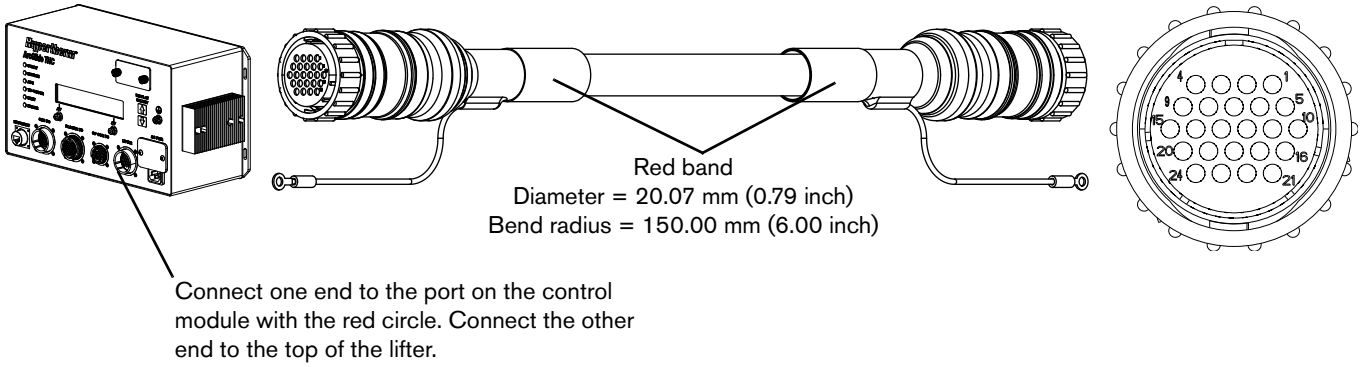
An AC power cable is standard equipment for North America, and is shipped with the ArcGlide THC. For other regions, use a power cable that has an IEC-60320-C13 end which meets the requirements of local code and power connections.

To make a power cable, use the power connector (108842) that ships with the ArcGlide THC and connect a 3-wire cable for line, neutral, and ground signals according to local electrical codes. Figure 27 shows examples of how power cables can be made.

Figure 27



Lifter interface cable



Part number	Length
223219	3.0 m (10 feet)
223220	6.0 m (20 feet)
223120	7.5 m (25 feet)
223221	10.5 m (35 feet)
223007	15.0 m (50 feet)

Part number	Length
223115	23.0 m (75 feet)
223116	30.5 m (100 feet)
223117	45.5 m (150 feet)
223118	61.0 m (200 feet)

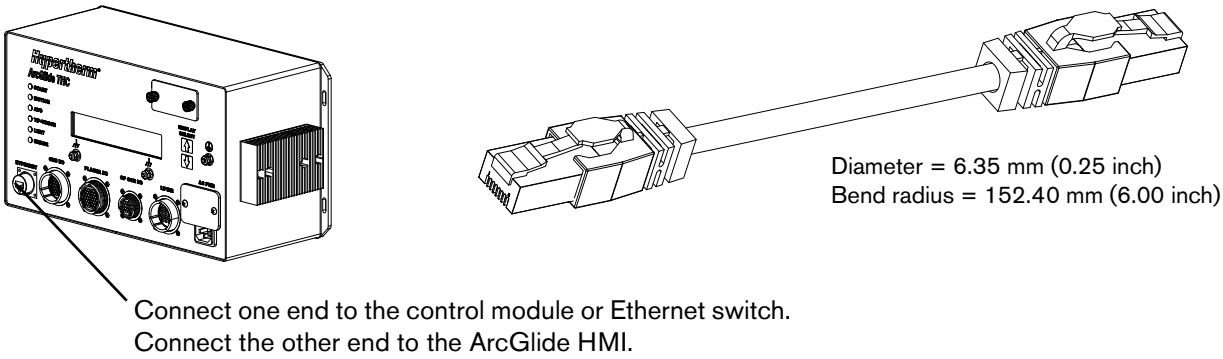
Pin No.*	Color and size	Signal name
1	Red 1.31 mm² (16 AWG)	Motor +
2	Black 1.31 mm² (16 AWG)	Motor -
3	Black 0.82 mm² (18 AWG)	Brake -
4	Brown 0.33 mm² (22 AWG)	Common -
5	Brown 0.82 mm² (18 AWG)	Power +24 VDC
6	Gray 0.33 mm² (22 AWG)	Ohmic contact sense common
7	White 0.33 mm² (22 AWG)	Ohmic contact sense
8	Violet 0.33 mm² (22 AWG)	Ohmic contact sense bias +12 VDC
9	Black 0.33 mm² (22 AWG)	Encoder common
10	Red 0.33 mm² (22 AWG)	Lifter station active
11	White/Blue 0.33 mm² (22 AWG)	Encoder input B -
12	Blue 0.33 mm² (22 AWG)	Encoder input B +
13	White/Yellow 0.33 mm² (22 AWG)	Encoder input A -

* Pin numbers are the same on both ends of the cable.

Pin No.*	Color and size	Signal name
14	Yellow 0.33 mm² (22 AWG)	Encoder input A +
15	White/Black 0.33 mm² (22 AWG)	Common -
16	White/Red 0.33 mm² (22 AWG)	Change consumables switch +
17	Green 0.33 mm² (22 AWG)	Lifter down switch +
18	Orange 0.33 mm² (22 AWG)	Lifter up switch +
19	White/Violet 0.33 mm² (22 AWG)	Breakaway switch +
20	White/Orange 0.33 mm² (22 AWG)	Upper limit switch +
21	White/Green 0.33 mm² (22 AWG)	Lower limit switch +
22	White/Gray 0.33 mm² (22 AWG)	Not connected
23	White/Brown 0.33 mm² (22 AWG)	Common -
24		Not connected

* Pin numbers are the same on both ends of the cable.

Hypernet and HMI interface cable



In a Hypernet or mixed configuration where there is more than one Hypernet connection, use these cables to connect the components of the system to the Ethernet switch.

Part number	Length
223212	3.0 m (10 feet)
223222	6.0 m (20 feet)
223119	7.5 m (25 feet)
223223	10.5 m (35 feet)
223008	15.0 m (50 feet)

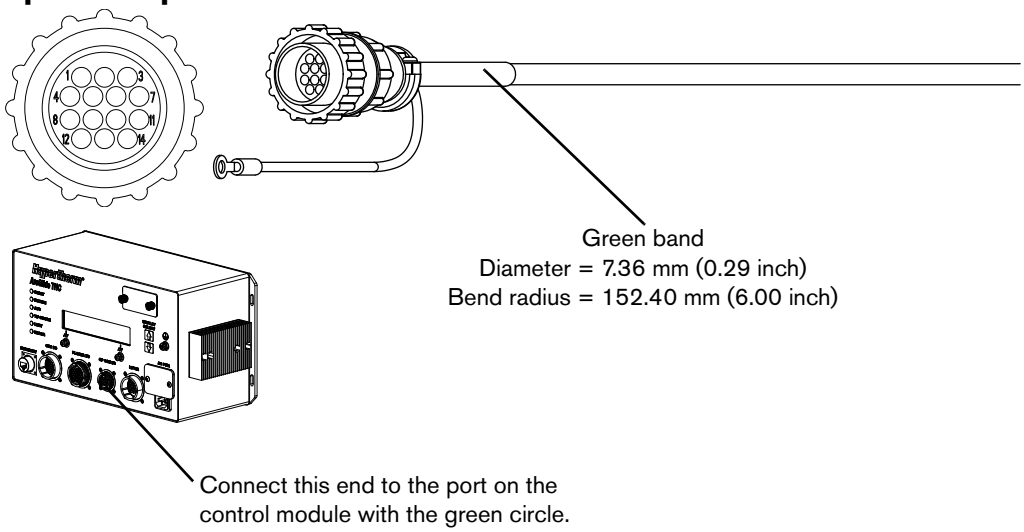
Part number	Length
223099	23.0 m (75 feet)
223100	30.5 m (100 feet)
223101	45.5 m (150 feet)
223102	61.0 m (200 feet)

If you use Ethernet cable from another supplier, make sure that the cable is a standard, shielded RJ-45 Cat5e or Cat6 cable.

Pin No.*	Signal name
1	Tx + (transmit data +)
2	Tx - (transmit data -)
3	Rx + (receive data +)
4	Not connected
5	Not connected
6	Rx - (receive data -)
7	Not connected
8	Not connected

* Pin numbers are the same on both ends of the cable.

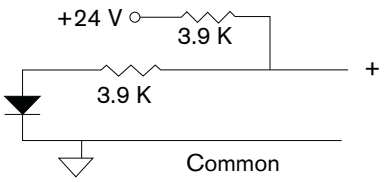
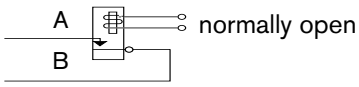
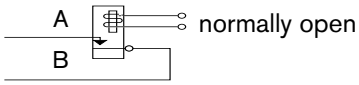
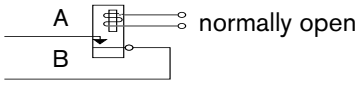
Optional operator console I/O cable



Part number	Length
223216	3.0 m (10 feet)
223217	6.0 m (20 feet)
223121	7.5 m (25 feet)
223218	10.5 m (35 feet)
223006	15.0 m (50 feet)

Part number	Length
223111	23.0 m (75 feet)
223112	30.5 m (100 feet)
223113	45.5 m (150 feet)
223114	61.0 m (200 feet)

See *Optional operator console I/O signals* on page 103 for more information about discrete operator console I/O signals.

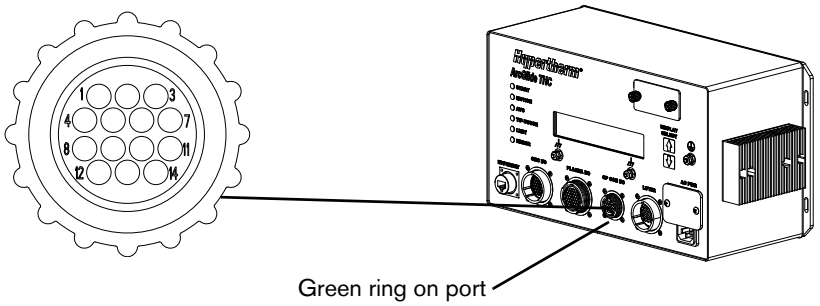
Pin No.*	Color	Signal name**	Dry contact circuit
1	Black	Not connected	
2	White	Manual disable switch input +	
3	Red	Manual select switch input +	
4	Green	Torch up switch input +	
5	Orange	Torch down switch input +	
6	Blue	Spare switch input +	
7	White/black	Common	
8	Red/black	Torch Enabled output A	
9	Green/black	Torch Enabled output B	
10	Orange/black	Error output A	
11	Blue/black	Error output B	
12	Black/white	Spare output A	
13	Red/white	Spare output B	
14	Green/white	Power +24 VDC output	

* Pin numbers are the same on both ends of the cable.

** Input signals (pins 2 – 6) use 24 VDC; Output signals (pins 8 – 14) use dry contact closures at 24 VDC.

Optional operator console I/O signals

The following discrete signals are used between the control module and the optional, customized operator console:



Manual Disable Switch: When this switch is active, its contact input signal indicates that the cutting station connected to this THC is disabled and will not operate when an active Cut Control command is issued from the CNC. If the plasma system is capable of turning OFF remotely, then it will be turned OFF whenever this disable switch is active. When neither the Manual Disable nor Manual Select inputs are active, the CNC can select the individual stations under program control.

Manual Select Switch: This switch's contact input signal indicates that the connected station will be manually forced into the active state and will operate when an active Cut Control command is issued from the CNC. When the Manual Disable or Manual Select inputs are inactive, the CNC can select the individual stations under part program control.

Torch UP Switch: This is a switch contact input signal that raises the torch. This input raises the torch manually if the torch is not cutting. The manual motion starts as a 0.01-inch jog; after a 1/2 second, the motion remains at the slow speed. After an additional second, the motion accelerates to the intermediate programmed speed. If the torch is in the process of cutting, this input increases the voltage setpoint at a rate of 0.2 V every 1/4 second.

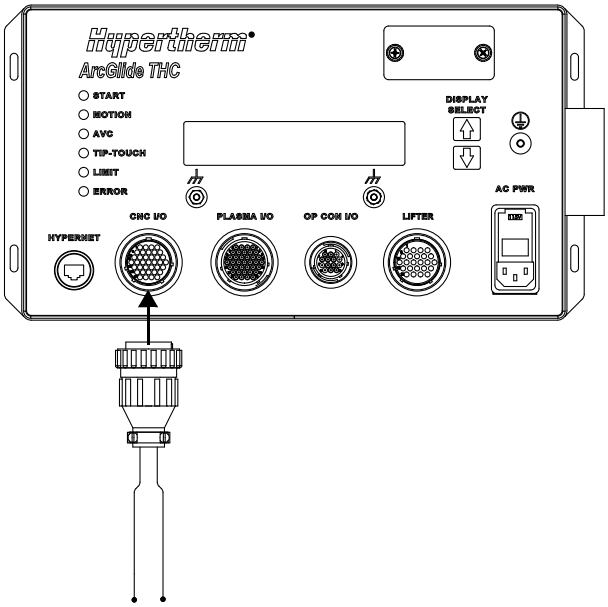
Torch DOWN Switch: This is a switch contact input signal that can be used to lower the connected torch. This input will cause the torch to lower manually. The manual motion starts as a 0.01-inch jog; after 1/2 second, the motion remains at the slow IHS speed. After an additional second, the motion accelerates to the intermediate programmed speed. If the torch is in the process of cutting, this input decreases the voltage setpoint at a rate of 0.2 V every 1/4 second.

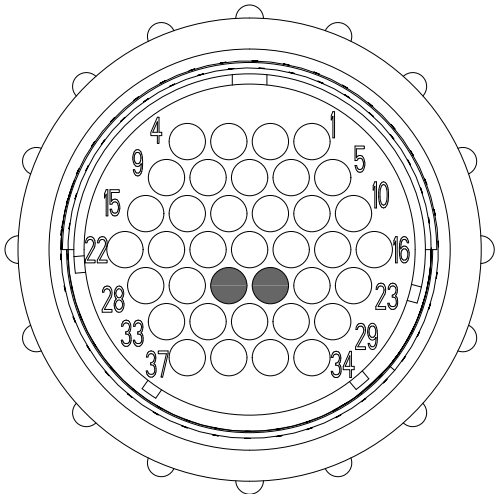
ArcGlide control module CNC interlock kit (228594)

As part of a motion control system, the ArcGlide has an interlock to enable and disable Z-axis motion. This interlock must be wired correctly and according to the appropriate national and local codes to allow the quick stop of motion.

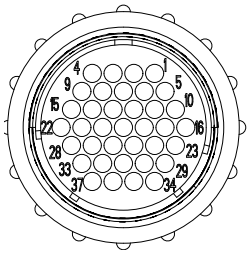
A closed circuit between pins 25 and 26 is required to satisfy the interlock circuit and enable the Z-axis motion of the ArcGlide.

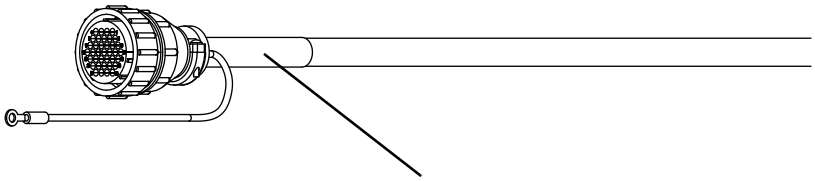
The interlock kit includes the connector, backshell, and pins that are necessary to build the interlock.





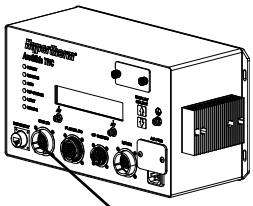
CNC I/O cable





Connect this end to the CNC by adding the appropriate connector for your CNC.

Yellow band
Diameter = 13.72 mm (0.54 inch)
Bend radius = 152.40 mm (6 inch)



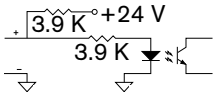
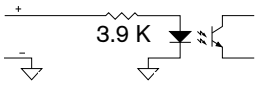
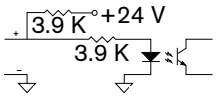
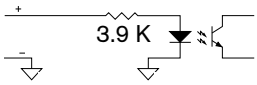
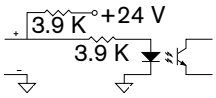
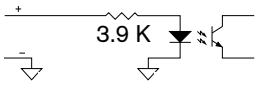
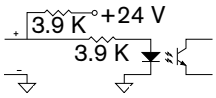
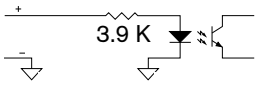
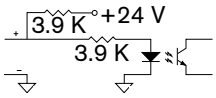
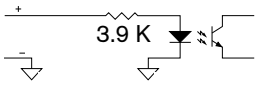
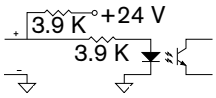
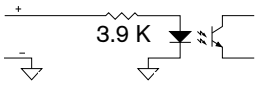
Connect this end to the port on the control module with the yellow ring.

Part number	Length
223213	3.0 m (10 feet)
223214	6.0 m (20 feet)
223122	7.5 m (25 feet)
223215	10.5 m (35 feet)
223005	15.0 m (50 feet)

Part number	Length
223107	23.0 m (75 feet)
223108	30.5 m (100 feet)
223109	45.5 m (150 feet)
223110	61.0 m (200 feet)

See *CNC discrete I/O* on page 108 for more information about discrete CNC I/O signals.

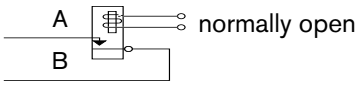
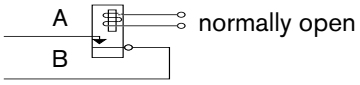
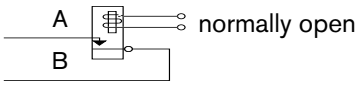
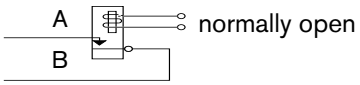
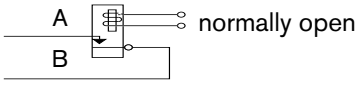
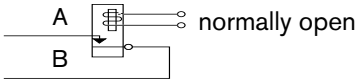
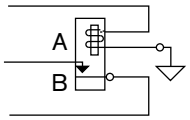
All ArcGlide CNC inputs can be configured for dry contact closures or 12 – 24 V sourced inputs.

Pin No.*	Color	Signal name	Dry contact circuit (D) 	Sourced circuit (S) 
1	Red	Cycle Start input +		
2	Black	Cycle Start input -		
3	White	Low Gain input +		
4	Black	Low Gain input -		
5	Green	AVC** Disable input +		
6	Black	AVC** Disable input -		
7	Blue	IHS Sync input +		
8	Black	IHS Sync input -		
9	Yellow	Spare input 1 +		
10	Black	Spare input 1 -		
11	Brown	Spare input 2 +		
12	Black	Spare input 2 -		

* Pin numbers are the same on both ends of the cable.

** AVC = Arc voltage control

All ArcGlide CNC inputs can be configured for dry contact closures or 12 V – 24 V sourced inputs.

Pin No.*	Color	Signal name	Dry contact or sourced circuit
13	Orange	IHS Complete output A	
14	Black	IHS Complete output B	
15	White	Retract Complete output A	
16	Red	Retract Complete output B	
17	Green	Machine Motion output A	
18	Red	Machine Motion output B	
19	Blue	THC Error output A	
20	Red	THC Error output B	
21	Yellow	Torch Breakaway output A	
22	Red	Torch Breakaway output B	
23	Brown	CNC Spare output A	
24	Red	CNC Spare output B	
25	Orange	Motion Interlock input +**	
26	Red	Motion Interlock input -**	
27	White	Interlock output A	
28	Green	Interlock output B	
29	Blue	Common	
30	Green	Common	
31	Yellow	Common	
32	Green	Common	
33	Brown	+24 VDC output	
34	Green	+24 VDC output	
35	Orange	+24 VDC output	
36		Not connected	
37		Not connected	

* Pin numbers are the same on both ends of the cable.

** The circuit is closed if a jumper is used.

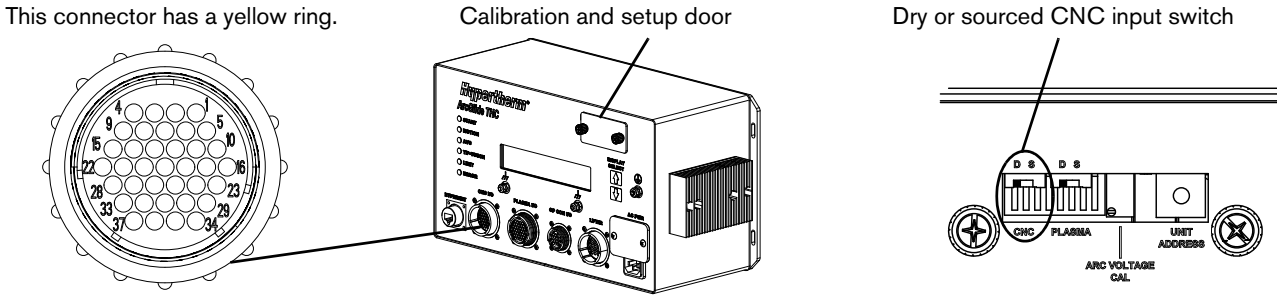
CNC discrete I/O

CNC inputs have two different modes that are selected using switches behind the calibration and setup door. The inputs can be configured for dry contacts (no external voltage), or for positive voltage sourced inputs.

If the THC control module interface is configured with dry contacts, the operation of LEDs on the discrete plasma interface board is reversed and the LEDs turn OFF when input is active. With sourced inputs, LEDs turn ON when an input is active.

If the Hypernet interface to the CNC is used, only the interlock input signal must be wired on this connector. If discrete signals are used, the required discrete signals on this connector must be connected.

Figure 28



All the required discrete interface signals are described below. All other signals are optional for multiple torch operation, improved performance, or reduction in cycle times.

Cut Control: This is a required output from the CNC and an input to the ArcGlide. The CNC should activate this signal to begin a plasma cut. This signal begins the entire process of IHS, Plasma Start and Motion, and Automatic Voltage Control (AVC) followed by a retract at the end of the cut when this signal is removed. This signal must be maintained during the plasma cut.

Low Gain: This input automatically reduces the AVC gain for marking. This improves the stability of the height control during marking.

Torch Height Disable: This is an optional signal input to the ArcGlide. When it is active, this signal temporarily disables the automatic height control and forces the torch to hold its height position. It is primarily used to disable the height control in corners or whenever the machine speed is not at the optimal cutting speed. This signal improves cutting performance by disabling the height control when the machine slows down for corners. This improves the corner cut quality and prevents the torch from diving into the workpiece.

Hold Ignition: This is an optional input to the ArcGlide to allow multiple torches to start synchronized. For a single torch installation, this signal is optional but recommended. The CNC should activate this signal to delay plasma torch ignition until all active torches in a multiple torch configuration have completed their IHS sequence and are in position and ready to fire. At this point all active torches will return an active IHS Complete signal to the CNC and the CNC should remove all Hold Ignition input signals and allow all active plasma torches to ignite simultaneously.

Spare inputs 1 and 2: These inputs to the ArcGlide are reserved and should not be connected.

IHS Complete: This is an optional signal output from the ArcGlide to the CNC that is used only when the CNC has to synchronize IHS for multiple ArcGlide systems. This signal is used to indicate that the initial height sensing (IHS) is complete and that the torch is in position and ready to fire. For multiple torch installations, the CNC should wait for all active torches to return an IHS Complete signal before simultaneously removing the Hold Ignition signal and allowing all torches to ignite at the same time. For single torch installations this signal is not used.

Retract Complete: This signal is an output from the ArcGlide that is active when a cut is completed and the torch has been raised to the selected Retract Height. The CNC uses this signal to delay the move to the next cut and to clear any tip-ups.

Cut Sense: This is a required output from the ArcGlide to the CNC. This signal is issued after plasma torch ignition and the Pierce Delay (Pierce Time in Phoenix software) time has expired. This signal indicates that the CNC should begin the cutting motion.

See *Operation* on page 127 for more information on Pierce Delay.

THC Error: This is an output from the ArcGlide to the CNC that indicates that the THC has encountered an error condition. The HMI displays the actual error condition.

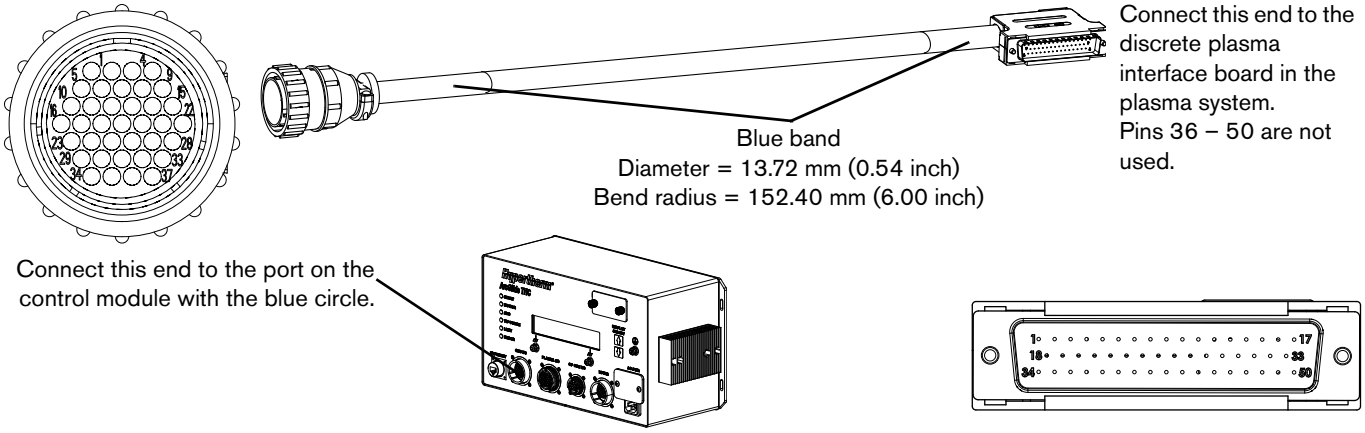
See *ArcGlide errors* on page 191 for more information about ArcGlide error messages.

Breakaway Error: This output from the ArcGlide indicates that the torch breakaway has separated. This output is reset by replacing the torch breakaway.

Interlock input: This is a normally-closed contact closure that allows ArcGlide motion. If this contact is opened, the ArcGlide lifter motor drive will lose power. This circuit must be wired according to national and local regulations.

Interlock output: The Interlock output is an independent contact closure that is also normally-closed. The Interlock output must have the same state as the Interlock input.

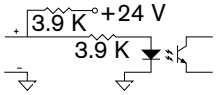
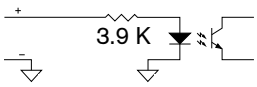
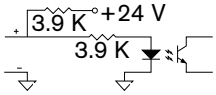
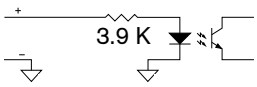
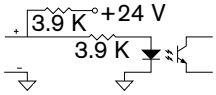
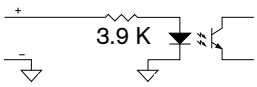
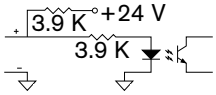
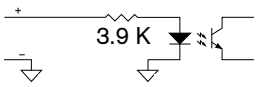
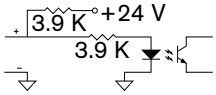
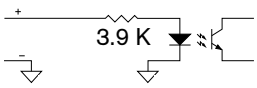
Plasma interface I/O cable



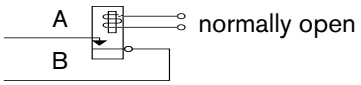
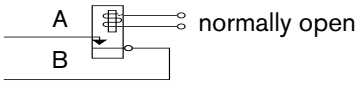
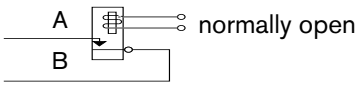
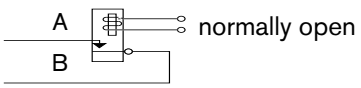
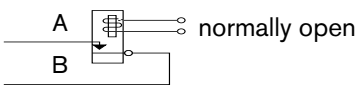
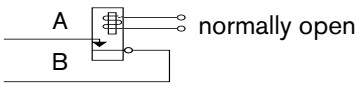
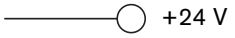
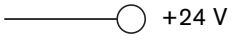
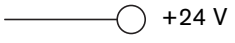
Part number	Length
223227	3.0 m (10 feet)
223228	6.0 m (20 feet)
223123	7.5 m (25 feet)
223229	10.5 m (35 feet)
223004	15.0 m (50 feet)

Part number	Length
223103	23.0 m (75 feet)
223104	30.5 m (100 feet)
223105	45.5 m (150 feet)
223106	61.0 m (200 feet)

See *Plasma discrete I/O* on page 113 for more information about discrete plasma I/O signals.

Pin No*	Color	Signal name	Dry contact circuit (D) 	Sourced circuit (S) 
1	Red	RS-422 Rx +		
2	Black	RS-422 Rx -		
3	White	RS-422 Tx +		
4	Black	RS-422 Tx -		
5	Green	RS-422 common		
6	Black	Motion input +		
7	Blue	Motion input -		
8	Black	Error input +		
9	Yellow	Error input -		
10	Black	Rampdown Error input +		
11	Brown	Rampdown Error input -		
12	Black	Not ready input +		
13	Orange	Not ready input -		
14	Black	Spare input +		
15	White	Spare input -		

* Pin numbers are the same on both ends of the cable.

Pin No.*	Color	Signal name	Dry contact or sourced circuit
16	Red	Corner output A	
17	Green	Corner output B	
18	Red	Pierce output A	
19	Blue	Pierce output B	
20	Red	Hold output A	
21	Yellow	Hold output B	
22	Red	Start output A	
23	Brown	Start output B	
24	Red	Spare output A	
25	Orange	Spare output B	
26	Red	Remote ON output A	
27	White	Remote ON output B	
28	Green	Common	
29	Blue	Common	
30	Green	Common	
31	Yellow	+24 VDC output	
32	Green	+24 VDC output	
33	Brown	+24 VDC output	
34	Green	1/50 Arc voltage +	
35	Orange	1/50 Arc voltage -	
36 to 50		Not connected	

* Pin numbers are the same on both ends of the cable.

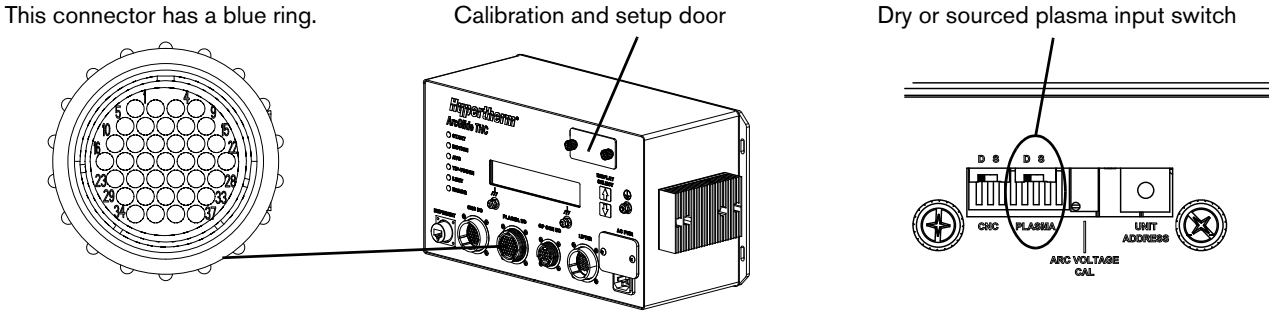
Plasma discrete I/O

Plasma inputs have two different modes that are selected using switches behind the calibration and setup door. The inputs can be configured for dry contacts (no external voltage), or for positive-voltage sourced inputs.

If the THC control board is configured with dry contacts, LED operation on the discrete plasma interface board, installed in the plasma system, is reversed and the LEDs will turn OFF when the input is active.

If the plasma system uses Hypernet communication with the ArcGlide, these discrete signals are not used. If discrete signals are used, the required signals of this connector must be connected to the discrete plasma interface board.

Figure 29



The following discrete signals are used to connect the ArcGlide THC to the plasma system. All the required discrete interface signals between the control module and the plasma system are described below. All other signals are optional for multiple torch operation, improved performance, or reduction in cycle times.

Arc Transfer: This is a required input to the ArcGlide. This signal is input to the ArcGlide from the plasma system to indicate that arc transfer has occurred.

Plasma Error: This is an optional signal that is output from the plasma system to indicate that an error has occurred.

Rampdown Error: This is an optional output from the plasma system that indicates the plasma torch lost arc transfer before the controlled arc turns off. This condition indicates that the consumable life may be reduced. You should make changes to the part programming to reduce or eliminate these types of errors to achieve optimal consumable life.

Not Ready: This is an optional output from the plasma system that indicates that the plasma system is not ready to receive a Plasma Start. The plasma system may be busy changing or purging gas flows or be involved in some other time-consuming operation. To verify proper operation, the CNC should check this signal before issuing a Plasma Start.

Corner: This is an optional output from the THC to the plasma system. This signal indicates that the plasma system should reduce its output current to a pre-programmed level to improve the cutting performance in corners. The default value is 50% of the normal cutting current. This signal is not available with Hypernet.

Serial Enable: This is an optional input that enables serial communication between the ArcGlide and the plasma system.

Pierce: This is an optional output from the THC and input to HPR supplies. This signal informs the plasma system that the unit is piercing and the plasma system should maintain the high shield gas preflow during the pierce. This signal is used to improve the piercing capability of HPR plasma systems only.

Hold: This is an optional output from the THC and input to the plasma system. For a single torch installation, this signal is optional but recommended. The CNC should activate this signal to delay plasma torch ignition until all active torches in a multiple torch configuration have completed their IHS sequence and are in position and ready to fire. At this point, all active torches will return an active IHS Complete signal to the CNC and the CNC should remove all Hold Ignition input signals and allow all active plasma torches to ignite simultaneously. This signal can also be used to save cycle time by performing gas preflow during the IHS sequence.

Start: This output from the THC is used to start the plasma system. This signal is a maintained signal. The plasma system will continue to power the plasma cutting torch until this signal is removed. When the Start signal is removed the plasma system begins to ramp down and turn off the torch power.

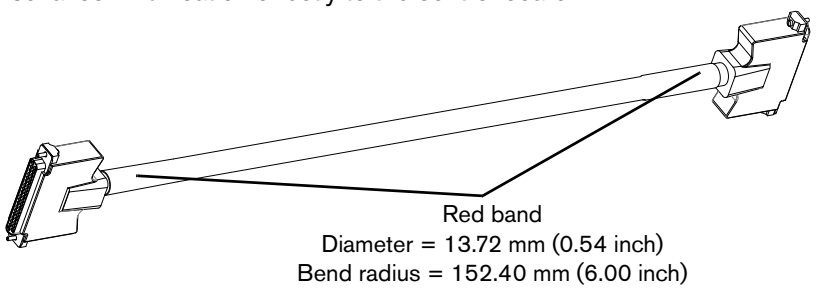
Spare output: This is an extra output for future use.

Remote On: This is an optional output signal from the ArcGlide THC that can be used to turn ON or OFF capable plasma systems. On capable systems, such as the HPR plasma systems, deactivating this signal will remove the high power input to the plasma system and will turn off the gas and torch cooling pump. See *Hypernet plasma interface board (141162)* on page 228 for more information.

1/50th Arc Voltage: This analog input to the THC provides the arc voltage feedback used for automatic height control. The signal is scaled so that 5 VDC equals an arc voltage of 250 VDC. The positive side of this voltage should be connected to chassis ground. To provide high accuracy, this voltage should have an effective output resistance of 2 KΩ or less.

Non-serial plasma interface cable

This cable connects the ArcGlide plasma interface board and control board inside the plasma system. Use this cable only when the CNC provides serial communication directly to the control board.



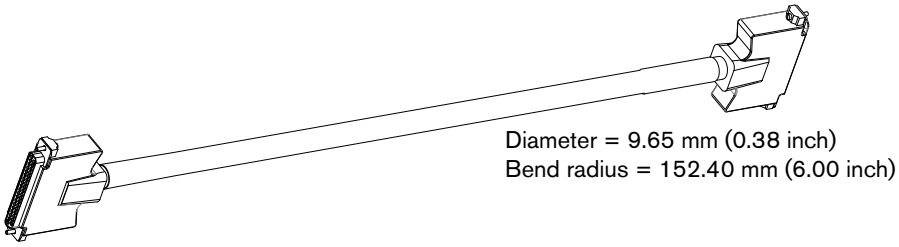
Part number	Length	Used in
223192	0.61 m (2 feet)	HPR130XD, HPR260XD
223193	2.3 m (7.5 feet)	HPR400XD

Pin No.	Color	Signal
1		Not connected
2		Not connected
3	Black	RS-422 communication
4	Black	Motion -
5	Black	Error -
6	Black	Rampdown error -
7	Red	HPR not ready -
8	Red	Not connected
9	Red	Not connected
10	Red	Not connected
11	Red	Not connected
12	Red	Corner A
13	Green	Pierce A
14	Green	Hold A
15	Green	Plasma Start relay A
16	Green	Remote ON A
17	Green	Not connected
18	White	Ground
19	Blue	Not connected

Pin No.	Color	Signal
20		Not connected
21		Not connected
22	Blue	HPR turned ON
23	Yellow	Motion +
24	Brown	Error +
25	Orange	Rampdown error +
26	White	HPR not ready +
27	Green	Not connected
28	Blue	Not connected
29	Yellow	Not connected
30	Brown	Not connected
31	Orange	Corner B
32	White	Pierce B
33	Blue	Hold B
34	Yellow	Plasma Start relay B
35	Brown	Remote ON B
36	Orange	Ground
37	Black	+24 VDC HPR plasma
38		Ground

Serial plasma interface cable

This cable connects the ArcGlide plasma interface board and control board inside the plasma system. Use this cable when the ArcGlide THC supplies serial communication to the plasma system.



Part number	Length
123760	0.61 m (2 feet)
123209	1.5 m (5 feet)

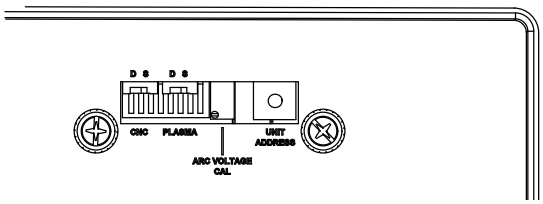
Pin No.	Color	Signal
1	Black	HPR Rx -
2	Black	HPR Tx -
3	Black	RS-422 communication
4	Black	Motion -
5	Black	Error -
6	Black	Rampdown error -
7	Red	HPR not ready -
8	Red	Not connected
9	Red	Not connected
10	Red	Not connected
11	Red	Not connected
12	Red	Corner A
13	Green	Pierce A
14	Green	Hold A
15	Green	Plasma Start relay A
16	Green	Not used
17	Green	Not connected
18	White	Ground
19		Not connected

Pin No.	Color	Signal
20	Red	HPR Rx +
21	Green	HPR Tx +
22	Blue	HPR turned ON
23	Yellow	Motion +
24	Brown	Error +
25	Orange	Rampdown error +
26	White	HPR not ready +
27	Green	Not connected
28	Blue	Not connected
29	Yellow	Not connected
30	Brown	Not connected
31	Orange	Corner B
32	White	Pierce B
33	Blue	Hold B
34	Yellow	Plasma Start relay B
35	Brown	Not used
36	Orange	Ground
37	Black	+24 VDC HPR plasma
38		Ground

ArcGlide discrete interface signal examples

Inputs

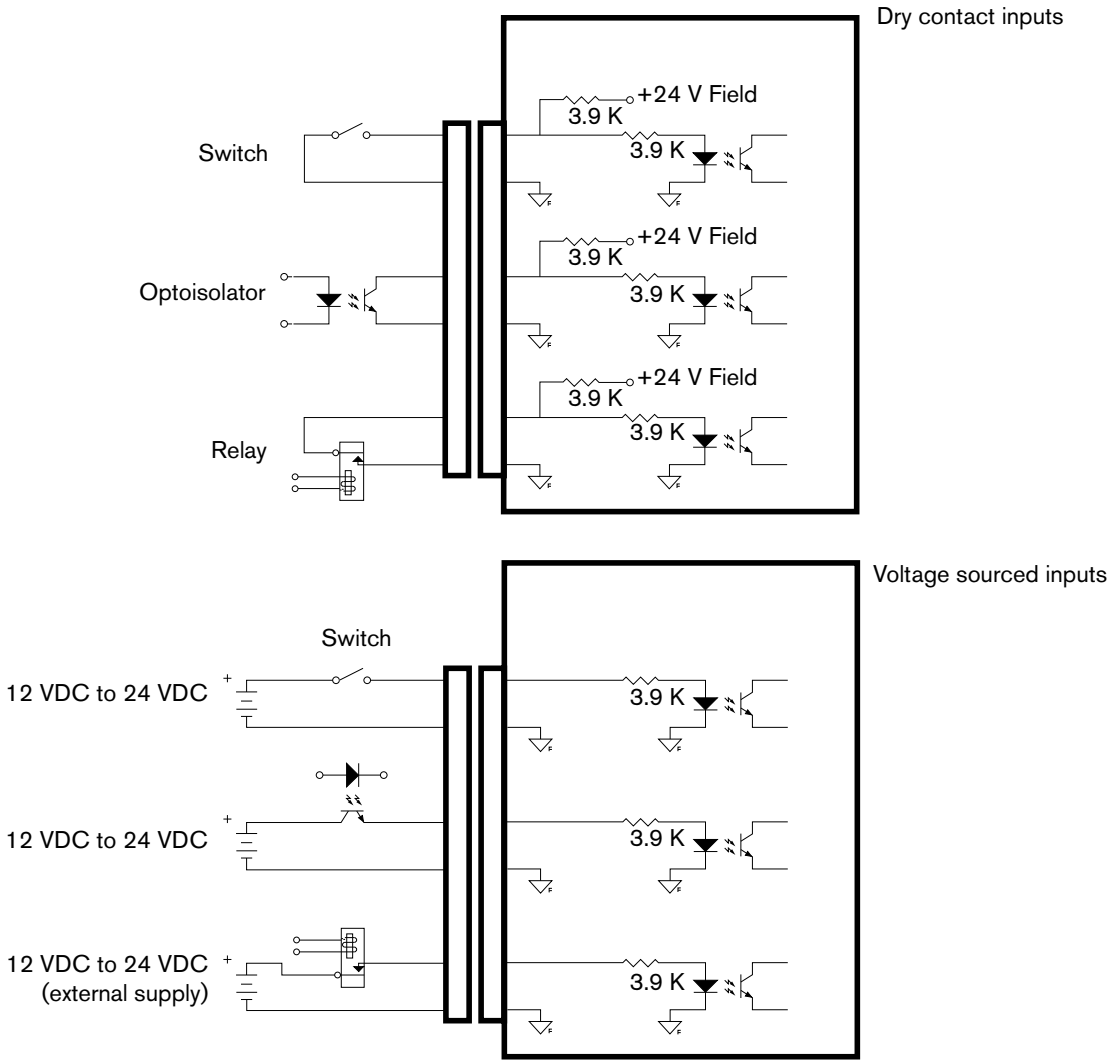
Figure 30 shows a simplified schematic of the ArcGlide THC inputs. The inputs for both CNC and plasma can be configured for dry contacts (no external voltage) or for positive voltage sourced inputs. The default is dry contacts. The inputs have two different modes that are selected using switches behind the calibration and setup door on the top right front of the control module.



The mode that is selected automatically compensates for the polarity reversal so that in both cases, a closed switch input will activate the signal.

All inputs to the lifter interface and operator console interface are fixed in the dry contact mode.

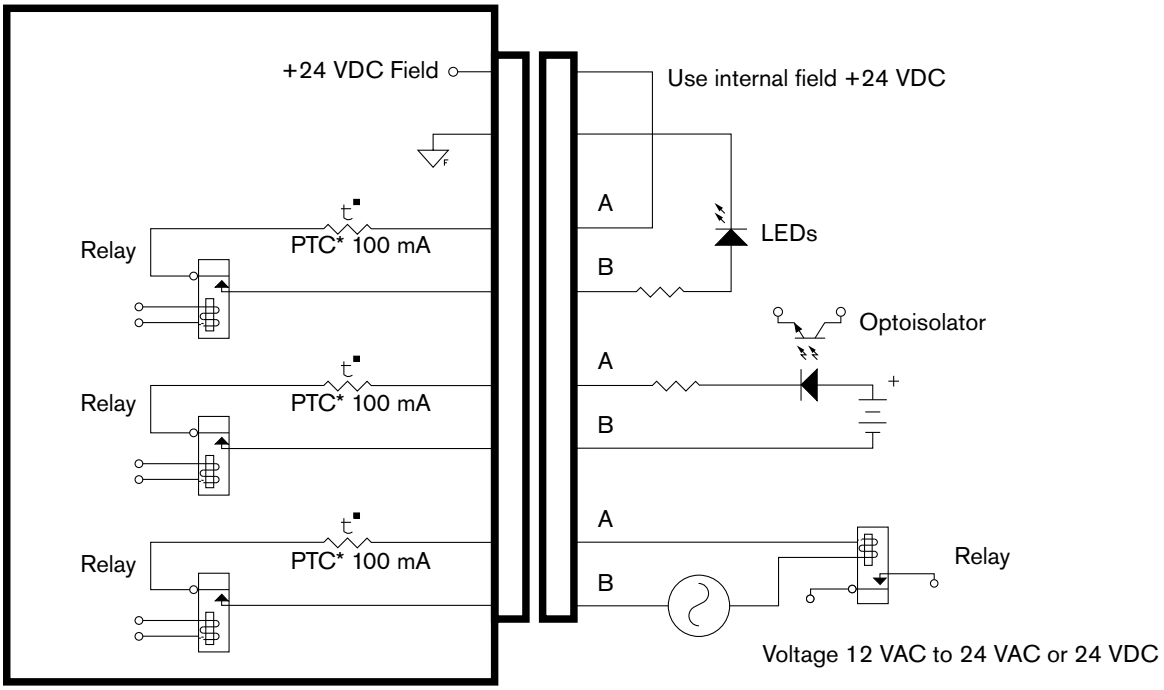
Figure 30



Relay outputs

Most of the ArcGlide THC outputs are relay contacts and can be used for either AC or DC loads. All relay outputs are protected with thermal fuses that automatically reset and protect against currents above 100 mA. The 24 V supply is limited to a total of 2 A for all outputs. *Figure 31* shows a simplified schematic of the ArcGlide THC outputs.

Figure 31



*Positive temperature coefficient

ArcGlide setup in Phoenix™ software

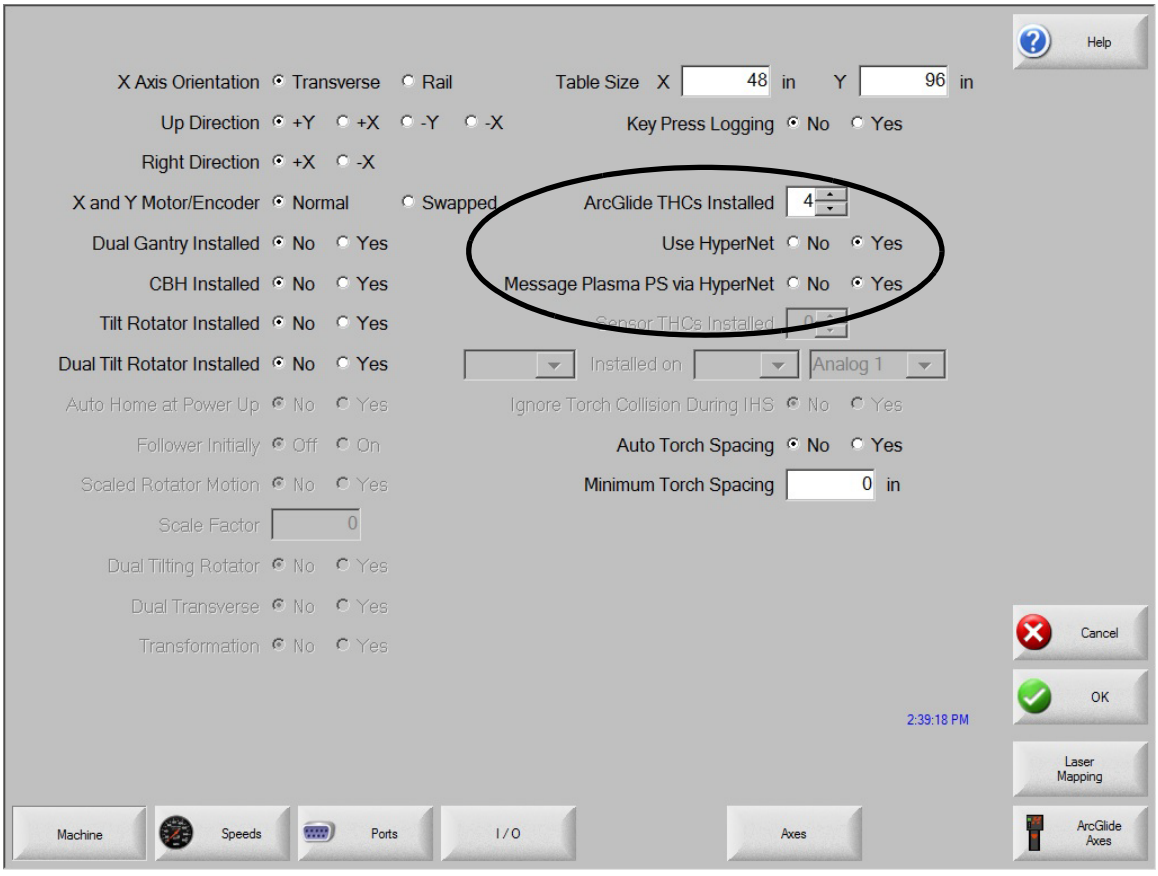
If you are installing the ArcGlide THC hardware with a Hypertherm CNC and Phoenix software (version 9.5 or later) and the Hypernet interface, refer to the *Phoenix Software V9 Series Installation and Setup Manual* (806410) for complete information.

Set up ArcGlide and Hypernet

To set up the ArcGlide THC and Hypernet:

1. Choose Setups > Password and enter the Machine password.
2. On the Machine setup screen, shown in *Figure 32*, use the scroll box next to ArcGlide THCs Installed to specify the number of ArcGlide THCs installed.
3. Choose Yes next to Use Hypernet to enable Hypernet communication. Choose No to configure the system for discrete communication.
4. Choose Yes next to Message Plasma PS via Hypernet to enable command-based messaging with the plasma system.

Figure 32



ArcGlide axis setup

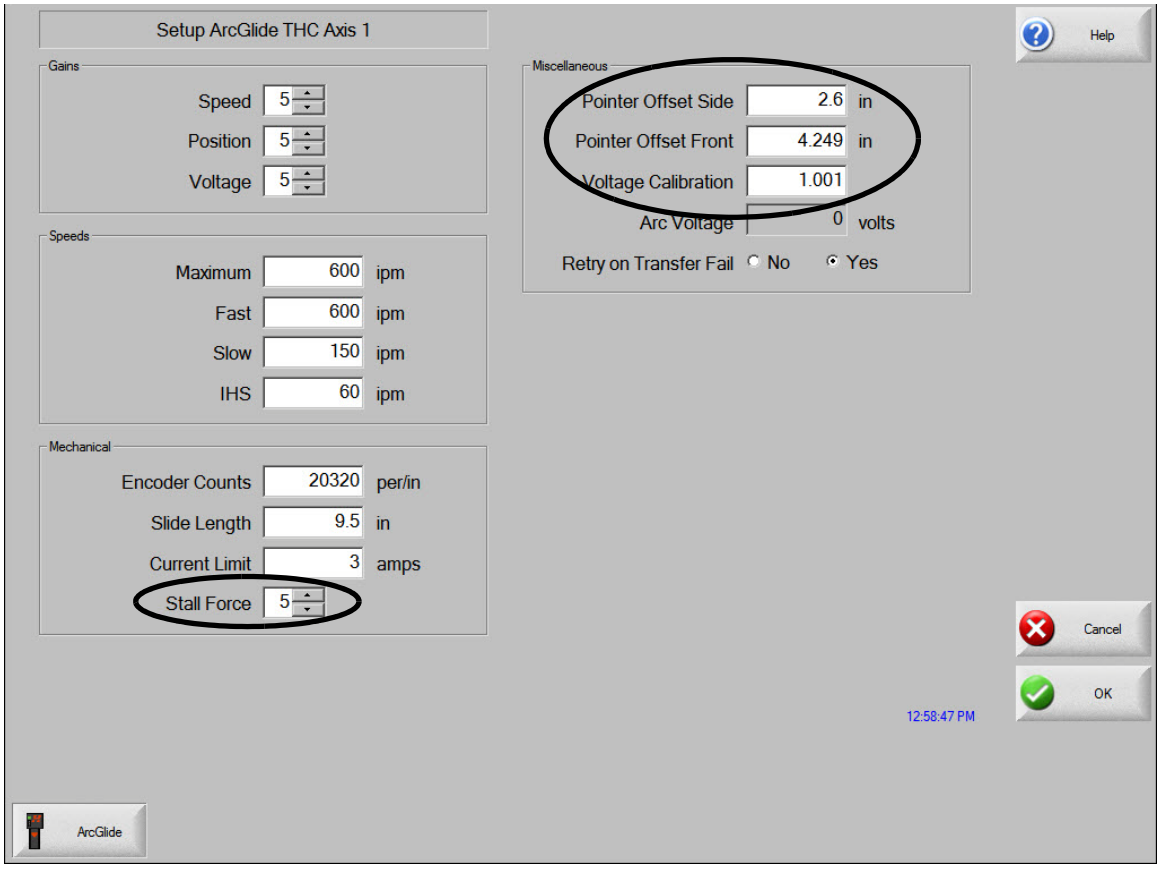
Use the setup parameters on the ArcGlide axes screens to verify that the THC operates successfully for your application.

1. Choose Setups > Password > Machine Setups > ArcGlide Axis. If you have installed more than one ArcGlide axis, the screen displays a numbered soft key for each axis.
2. On the ArcGlide Axis screen, shown in *Figure 33*, choose the soft key for the ArcGlide axis you want to set up. Set values for the parameters on the ArcGlide axes screens.
3. Choose OK when you have finished setting up each axis.

The default values for each parameter on the ArcGlide axes screens are optimized for the majority of applications. However, you may need to adjust the following parameter values:

- Stall Force
- Pointer Offset Side
- Pointer Offset Front
- Voltage Calibration

Figure 33



ArcGlide axis setup parameters

Gains

Gains enable controlled speed and motion from a closed-loop servo system and reduce the effect of position errors in these systems. Gains can correct following error that occurs as a result of mechanical delays, friction and load, or uncontrolled speed.

Each gain value is a multiplier that modifies the output from the encoder and brings this output closer to the set point. Motion tuning involves adjusting gains to reduce error as much as possible and to make sure cutting performance is reliable.

Gains are often interrelated and the value for one gain parameter can have an influence on the performance of other gains. Therefore, motion tuning is experimental and requires multiple tests to reach a set of appropriate values for your system and application.

Most gains affect the raising and lowering of the torch, and improve the accuracy of the initial height sense motion. Voltage gain is the only gain that affects cutting.

The following definitions provide the default or recommended value for each parameter. These values are appropriate for the majority of applications.

Speed: This gain value regulates the speed of the lifter. Set Speed Gain after you enter the value for Maximum Speed.

Set the Maximum Speed *before* optimizing Speed Gain.

Optimize the Speed Gain value before attempting to change either the Position or Voltage gains. Manual motion and approaching the workpiece during automatic IHS require regulated speeds. If this value is too high, the lifter speed regulation will become unstable and prone to oscillation. If this value is too low, the speed regulation can become slow and inaccurate. Test this value by repeatedly raising and lowering the lifter in Manual mode. To optimize this gain, raise this value until there is a very slight oscillation during manual operation and then reduce the setting by 1.

Range: 1 to 10; **Setting:** 5

Position: This gain is a multiplier for closed-loop positioning. Adjust Position Gain after you find the appropriate value for Speed Gain.

The THC uses position-based moves to move the torch to the IHS height and to the retract height at the end of a cut.

If this value is too high, the lifter positioning will become unstable and prone to oscillation. If this value is too low, the positioning can become slow and inaccurate.

Test this gain by repeatedly executing IHS TEST and checking that the lifter quickly and accurately reaches the IHS and Retract Heights.

To optimize this gain, raise the value until there is a very slight oscillation when the torch settles into the IHS or Retract positions and then reduce the setting by 1.

Range: 1 to 10; **Setting:** 5

Voltage: This gain is used when the THC operates with a closed-loop arc voltage control. Adjust this value after you find the appropriate value for Speed Gain.

If this value is set too high, the lifter position during closed-loop arc voltage control will become unstable and prone to oscillation. If this value is too low, the arc voltage control can become slow and inaccurate. Test voltage gain by repeatedly performing a test cut under closed-loop arc voltage control and verify that the THC quickly and accurately reaches the set arc voltage.

To optimize this gain, raise this value until there is a very slight oscillation during a cut and then reduce the setting by 1 or 2.

Range: 1 to 10; **Setting:** 5

Speeds

Maximum: Sets the maximum linear speed that the THC can achieve. This value depends on the lifter motor speed at 45 VDC, the screw pitch, the weight of the lifter load, and the desired speed of operation.

This value is used as the 100% speed value when scaling the control equations. It is important that this value is set correctly because it affects the scaling of all the other control loops.

Set this parameter during installation, before optimizing Speed Gain.

Set this value to a speed that can be achieved easily. Use a conservative setting and assume a low, incoming AC line voltage. If this speed is set too high, the maximum available motor drive voltage will be insufficient to drive the motor to the desired maximum speed. This will make the top of the linear control range unavailable and result in sub-optimal operation.

If the Maximum Speed is set too high, it may be difficult for the THC to operate precisely at slow speeds when trying to control the arc voltage or to move to an accurate IHS distance. If this speed is set too low, the linear control range will only cover the low portion of the available mechanics range and the result may not be optimal.

For the Hypertherm 239 mm (9.40 inch) lifter, this value is 15240 mm/min (600 in/min). At the low input line voltage limit, the motor drive is capable of supplying about 45 VDC. The motor used in the Hypertherm 239 mm (9.40 inch) lifter will produce full-rated torque at about 3,300 r/min at this voltage. The Hypertherm 239 mm (9.40 inch) lifter has a 5-mm pitch ball-screw which requires 25.4 in/mm / 5 mm = 5.08 revolutions to travel one linear inch. This results in a value of 3,300 r/min / 5.08 revolutions/inch = 650 linear in/min of travel speed. This value was rounded down to the nearest even hundreds to guarantee a 100% value under all conditions.

Setting: 15,240 mm/min (600 in/min)

Fast: This speed governs all automatic rapid moves such as the End-of-Cut-Retract or the Initial Approach to the workpiece.

Set this parameter to the value of Maximum Speed. However, you can set it lower if there is a heavy load on the lifter. With the Hypertherm 239 mm (9.40-inch) lifter, this value is set to 15,240 mm/min (600 in/min).

Setting: 15,240 mm/min (600 in/min)

Slow: This speed is the Homing Speed and is the fastest speed for manual moves. It is also the maximum speed limit during arc voltage control.

Setting: 3,810 mm/min (150 in/min)

IHS: This parameter sets the slow speed for the final approach to the workpiece during an IHS operation. It is also the slow speed for manual moves. To avoid poor regulation of speed, do not set this value below 10% of Maximum Speed.

Setting: 1,524 mm/min (60 in/min)

Mechanical

Encoder Counts: This value scales the position feedback from the encoder.

The value is based on the ball-screw pitch and the encoder resolution. It is equal to the number of encoder counts per revolution, multiplied by the number of revolutions required to travel one inch. The encoder is operated in 4X mode, so the number of counts per revolution is equal to the number of pulses per revolution multiplied by four.

The Hypertherm 239 mm (9.40-inch) lifter has an encoder with 1,000 pulses per revolution which produces 4,000 counts per revolution in 4X mode. The lifter has a 5 mm pitch ball-screw which requires 25.4 (in/mm) / 5 (mm) = 5.08 revolutions to travel one linear inch. This results in a value of 5.08 (revolutions) x 4,000 (counts/revolution) = 20,320 counts per linear inch of travel.

Setting: 800 counts/mm (20,320 counts/inch)

Slide Length: This value is the length of the lifter's usable travel. The ArcGlide lifter has 239 mm (9.40 inches) of usable travel.

Current Limit: This is the maximum continuous motor current for which the lifter motor is rated.

This value is the normal, continuous operating current limit but motor current can periodically exceed this value for a few seconds during extreme acceleration. The ArcGlide lifter uses a motor with a 3 A continuous current limit.

The motor can be damaged if the value for this parameter is set above the continuous current operating limit for the installed motor.

Range: 1 A to 6 A; **Setting:** 3 A

Stall Force: This value determines the amount of force for the Stall Force backup to the ohmic contact sensing. The values are relative values and start at 1 for the minimum force and 10 for the maximum force. This value should be set high enough to avoid false stall detection but not so high that the excess force causes a deflection of the workpiece and inaccurate IHS operation.

With the Hypertherm 239 mm (9.40-inch) lifter, the value of 5 is appropriate. It may be necessary to reduce this value if the THC is used with a thin workpiece. Use the Test IHS function to optimize this value.

Test this feature by disabling the ohmic contact by using the process menu or by removing the ohmic contact wire. The Stall Force value is optimum when there are no false workpiece detections and the IHS operation is accurate.

Range: 1 to 10; **Setting:** 5

Miscellaneous

Pointer Offset Side: This value is the offset distance between the torch center and the laser pointer when looking from the side of the cutting machine. Use the precise distance between the laser spot and the center of the torch to fine-tune this value.

Setting: 66.04 mm (2.60 inches)

Pointer Offset Front: This value is the offset distance between the torch center and the laser pointer when looking from the front of the cutting machine.

Use the precise distance between the laser spot and the center of the torch to fine-tune this value. To verify the laser offset, pierce a hole in the workpiece. Perform a manual offset using the laser pointer offset in Manual Options. If the offset is set correctly, the laser should be inside the pierce hole.

Setting: 107.93 mm (4.25 inches) (this value can vary slightly)

Voltage Calibration: This value is used to finely calibrate the measured arc voltage accuracy.

While this parameter is not normally required, it can be used when fine tuning multiple ArcGlide THCs on a cutting machine.

The measured input value is multiplied by this constant before being used for either voltage control or display.

This calibration affects all of the ArcGlide hardware connected to this station including the HMI display and the HPR Hypernet interface. When an ArcGlide is shipped from the factory, the voltage has been calibrated in hardware and this value is set to 1.000. This parameter is normally only used to adjust for the same arc voltage displays on multiple ArcGlide installations.

Range: 0.900 to 1.100; **Setting:** 1.000

Arc Voltage: This Arc Voltage value is for display only and cannot be edited. It is provided to check the results after changing the Arc Voltage Calibration above.

Range: 0 to 400

Retry on Transfer Fail: When IHS completes, the torch attempts ignition, the CNC starts a 10 second timer, waits for the Cut/Mark Sense input (or Cut Sense # input) to turn on, and displays the status message Waiting For Arc On, If the input does not activate within 10 seconds, the ignition process stops, the torch retracts, and the IHS starts again with another attempt to ignite the torch. The CNC repeats this sequence twice.

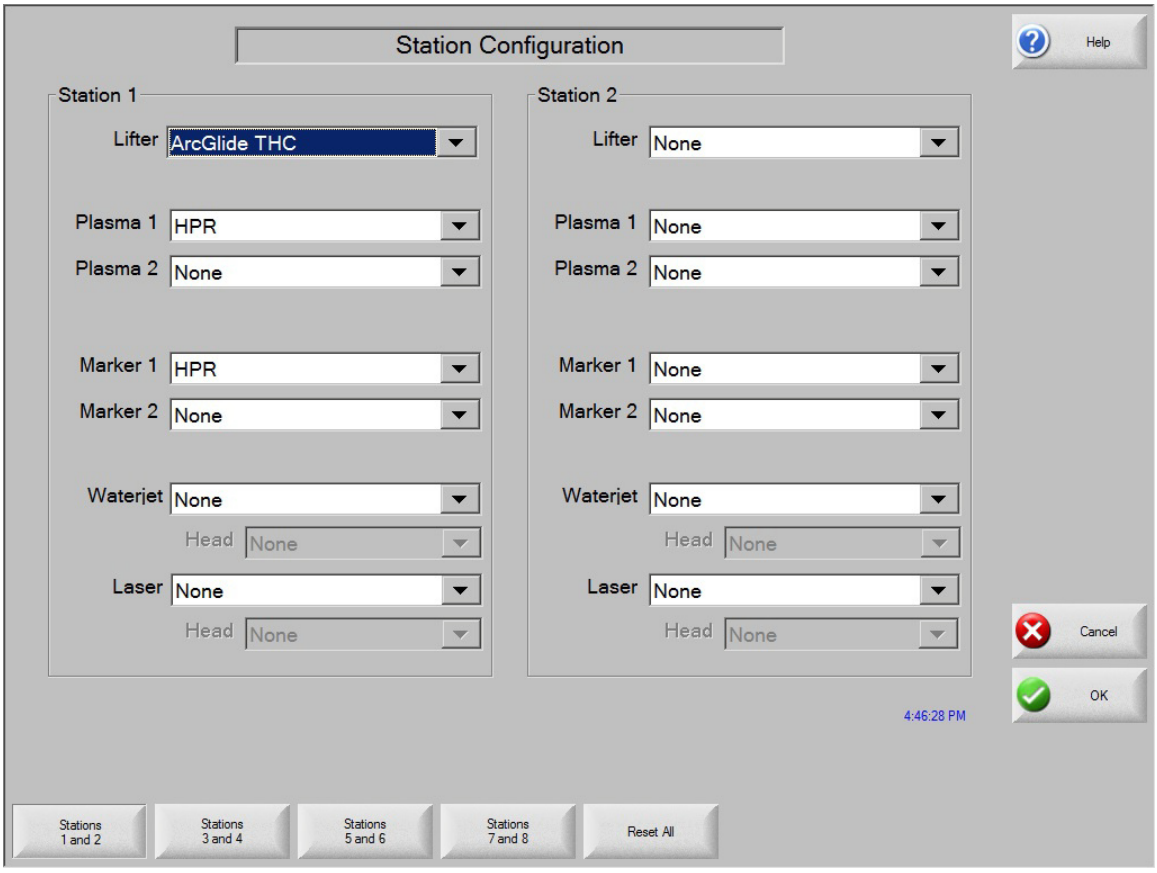
Options: Yes, No

Assign an ArcGlide THC to a station

The station number that you select in the Phoenix Station Configuration screen must match the address set in the ArcGlide control module, HMI, and the address set on the Hypernet plasma interface board. Assigning the ArcGlide to a station in Phoenix software also enables the ArcGlide Process screen (see page 156) and the ArcGlide manual on the Help screen.

1. Verify that the ArcGlide setup fields are correct in the Machine Setup screen. See *Set up ArcGlide and Hypernet* on page 119 for more information.
2. Choose Setups > Password > Station Configuration.
3. Choose Reset if ArcGlide THC does not appear in the Lifter dropdown list.
4. On the Station Configuration screen, shown in *Figure 34*, select ArcGlide THC for each station where an ArcGlide is installed.
5. Choose OK when you have finished assigning ArcGlide lifters to the stations on the cutting machine.

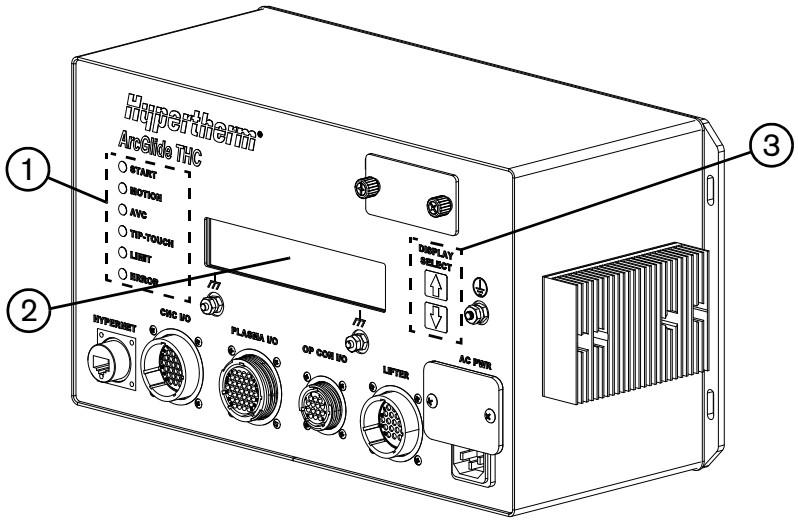
Figure 34



Section 3
Operation

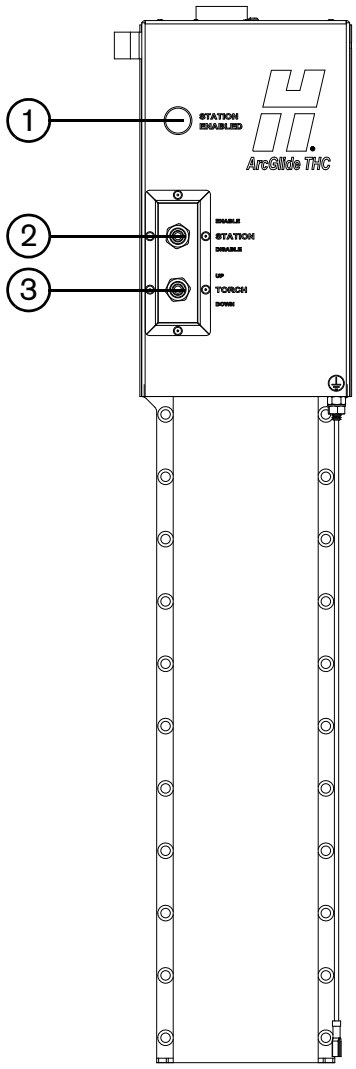
Operator controls

Control module



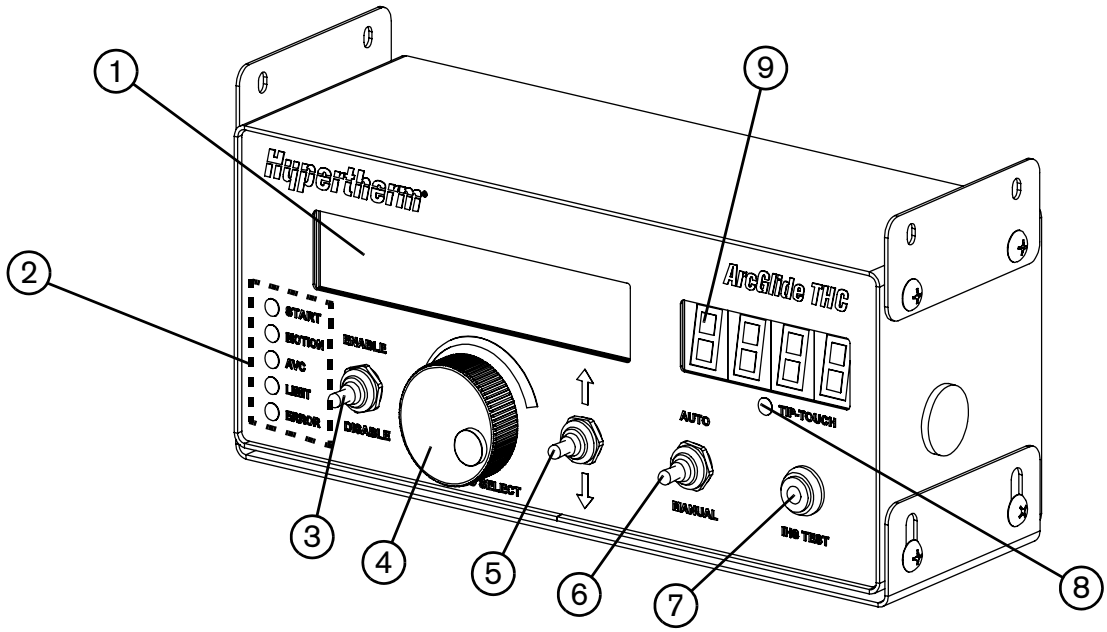
	Control	Description
1	LEDs	These LEDs show the status of system operations.
2	Display window	This window displays status, error, and diagnostic messages.
3	Display select	Push the UP or DOWN arrow to scroll up or down through the screens in the display window.

Lifter



	Control	Description
1	Station status lamp	This lamp is illuminated if the lifter is enabled. The lamp flashes slowly when there is an error. It flashes rapidly in Align mode. When the lamp is not illuminated, the brake is locked and the lifter is disabled.
2	Station ENABLE/DISABLE switch	Push this switch up to enable the lifter for operation. Push the switch down to disable the lifter for maintenance, to replace consumables, or to turn OFF the lifter. If the plasma system allows the THC to turn it on and off and is wired appropriately, this switch can turn ON and OFF the plasma system.
3	Lifter UP/DOWN switch	Push this switch up or down to raise or lower the torch.

HMI



	Control	Description
1	Parameter window	Displays setup and operating parameters, error and status messages. If the system does not have a CNC connected to Hypernet, the operator can also make changes to parameter values.
2	LEDs	These LEDs show the status of system operations.
3	Station ENABLE/DISABLE switch	Push this switch up to enable the lifter for operation. Push the switch down to disable the lifter for maintenance, to replace consumables, or to turn OFF the lifter. In HPR and HPRXD systems in which Remote On is installed on the plasma interface, this switch can be used to turn ON or OFF the plasma system.
4	Scroll and selection knob	Allows the user to select, set, and view values for parameters in the parameter window. Turn the knob to scroll; push it to make a selection.
5	Lifter UP/DOWN switch	Push this switch up or down to raise or lower the torch.
6	Auto or Manual mode selection switch	Push this switch up or down to select Automatic or Manual mode.
7	IHS test button	Push this button to test the IHS function of the lifter. With each successive push, the torch alternates between transfer and retract positions.
8	Tip-touch LED	This LED illuminates when the torch makes ohmic contact with the workpiece. If this LED does not illuminate during ohmic contact, see the description and solution for Error 21 in *ArcGlide errors* on page 191.
9	Arc voltage window	This window displays the actual arc voltage or OFF if the lifter is disabled.

Daily operations

Startup procedure

Turn ON the ArcGlide by connecting the power cord of the control module to the power source.

To turn ON an entire cutting machine, turn ON power to the units in the following order:

1. CNC
2. Plasma system and ArcGlide THC

Automatic diagnostic tests

When the ArcGlide THC is turned ON, the control module automatically performs 3 tests to make sure that the system is ready to operate. During these tests, the control module:

1. Verifies that the necessary Hypernet connections are operational. The minimum Hypernet requirement is the connection between the HMI or CNC and the control module. In a Hypernet configuration, if the Hypernet connection between the ArcGlide and the plasma system is not active, the plasma system will not turn ON.
2. Returns the lifter to the Home position.
3. Calibrates the baseline stall force and returns the torch to the home position.

If the system does not perform as expected in these tests, an error message displays on the HMI or the CNC. See *Error message troubleshooting* on page 191 for more information.

Verify workpiece sensing

Before you begin operations, verify that workpiece sensing is set up correctly for the type of cutting you intend to do.

When the lifter performs an IHS test, it senses the workpiece through one of two functions; *ohmic IHS* or *stall force*. The system uses the ohmic wire to sense the workpiece if nozzle contact is selected for IHS. If the system does not sense the workpiece through the ohmic wire, the system uses stall force as a backup method and reports Error 21, “OHMIC TIP SENSE FAIL.” See *Error message troubleshooting* on page 191 for more information.

If you want to use stall force, verify that the value for stall force is set correctly. If this value is too high, the torch will bend the workpiece during sensing.

If you are cutting or sensing the workpiece under water, you must use stall force.

Shutdown procedure

Turn OFF the ArcGlide by disconnecting the power cord of the control module from the power source.

If you disable the ArcGlide with the ENABLE/DISABLE switch on the lifter unit, the plasma system will also turn off.

If you are using the HPR Remote On or Off feature with the ArcGlide THC, do not disconnect the power cord on the ArcGlide control module to turn OFF the ArcGlide THC.

ArcGlide THC operating modes

The ArcGlide operates in Manual or Automatic mode. Select the operating mode on the Plasma Process screen. See *ArcGlide operating parameters* on page 156 for more information.

WARNING!

THE THC LIFTER CAN INJURE YOUR HAND

The down-force pressure of the lifter can cause injury. Verify that the system is in a safe condition before accessing the lifter area.

Manual mode

The ArcGlide THC can be operated in Manual mode for special circumstances. In Manual mode, there is no THC motion unless it is initiated by the manual UP/DOWN switch on the HMI or CNC. This mode is rarely used because the torch will fire in the air if it is not close enough to the workpiece to transfer the arc.

- Momentarily hold the switch in one direction for less than 0.5 second to move the torch 0.254 mm (0.01 inch).
- Hold the switch in one direction for more than 0.5 second to move the torch continuously at the programmed IHS Speed.
- Hold the switch in one direction for more than 1 second to accelerate the torch to the programmed Slow Speed.

Manual mode is used to:

- Mark or cut a flat workpiece when cut quality is not a primary concern. The torch cuts at the same height regardless of consumable wear.
- Make rip cuts.
- Check arc voltage calibration.
- Accommodate special conditions that do not operate well in automatic modes.

Automatic modes

The ArcGlide THC can operate in one of three automatic modes:

- Voltage Control Off
- Set Arc Voltage
- Sample Voltage

Automatic modes are most commonly used in production cutting applications. These modes use the settings from the cut chart, software, and part programs in the CNC to govern the height, speed, timing, position, and movement of the torch.

Voltage Control Off mode

In Voltage Control Off (also called automatic voltage control disabled or AVC disabled mode), the ArcGlide automatically performs IHS and then moves to the transfer height. When the torch reaches transfer height, it fires but delays X and Y cutting motion until it has moved to the pierce height and the pierce is complete.

After the pierce is complete, the torch begins cutting and transitions to the cut height above the workpiece. The cutting is performed at a fixed position with no adjustment for arc voltage feedback. At the end of the cut, the torch automatically retracts to the programmed Retract Height.

This mode is commonly used for rip cuts, cutting remnants, or for cutting single, simple parts.

Set Arc Voltage mode

In this mode, the THC performs IHS and moves to the transfer height. After the torch fires, it immediately moves to the pierce height. After the pierce, cutting motion begins and, after a programmed delay (AVC Delay and Torch Height Disable), AVC begins. During cutting with AVC, the THC moves the torch up or down to maintain the arc voltage at the programmed value for Set Arc Voltage in the cut chart or Process screen in the Phoenix software.

The Set Arc Voltage mode is used for special cutting or marking conditions in which obtaining an accurate arc voltage sample is difficult. Some examples include:

- Marking at low standoff torch heights
- Cutting thin material at low torch heights
- Cutting complex shapes where lead-ins are short
- Cutting or marking under conditions where an accurate IHS is not possible. Some of these conditions include:
  - A dirty, rusty, oiled, or painted workpiece
  - Stall sensing with thin flexible material
  - Cutting with a bevel head

Sample Voltage mode

Sample Voltage mode is the most automatic mode of operation. It optimizes consumable life because it compensates for the change in arc voltage as consumables wear down.

In Sample Voltage mode, the THC performs the same IHS, piercing, cutting, and retract sequences as the Set Arc Voltage mode. However, after piercing, the THC samples the arc voltage under steady state operating conditions. The THC uses sample voltage as the set arc voltage for the remainder of the cut.

This mode requires an accurate IHS and voltage sample. In addition, when Sample Voltage mode is on, the CNC does not use the Set Arc Voltage from the cut chart.

To enable Sample Voltage mode for the ArcGlide, choose Automatic and set Sample Voltage to ON.

Sample voltage is used for:

- Any cutting or marking conditions in which accurate IHS and arc voltage sample is possible
- Clean, flat, relatively level workpieces
- Parts with medium or long lead-ins

Figure 35 on page 134 shows the sequence of cut control operations that the parameters in the Phoenix software control. If your CNC does not use Phoenix software, the operations can have different names but the actions of the torch are likely to be the same.

Initial height sense

The ArcGlide THC uses a sequence called *initial height sense*, or IHS, to detect the workpiece. You perform a first initial height sense after powering up the cutting machine and before each cutting job. A first IHS detects the height of the workpiece so that the CNC can calculate the torch-to-work distance. The CNC uses the torch-to-work distance for all subsequent IHSs which it can perform using much faster speeds since the height of the workpiece is known.

The IHS begins at the Start IHS Height set in the Process screen in Phoenix, or in the ArcGlide HMI. When the torch reaches this distance, the CNC monitors the Nozzle Contact Sense input. This input activates when the torch touches the workpiece, so the CNC knows the height of the workpiece. The CNC also monitors the axis following error which the CNC compares to the stall force. When the following error exceeds the stall force, the CNC knows the height of workpiece.

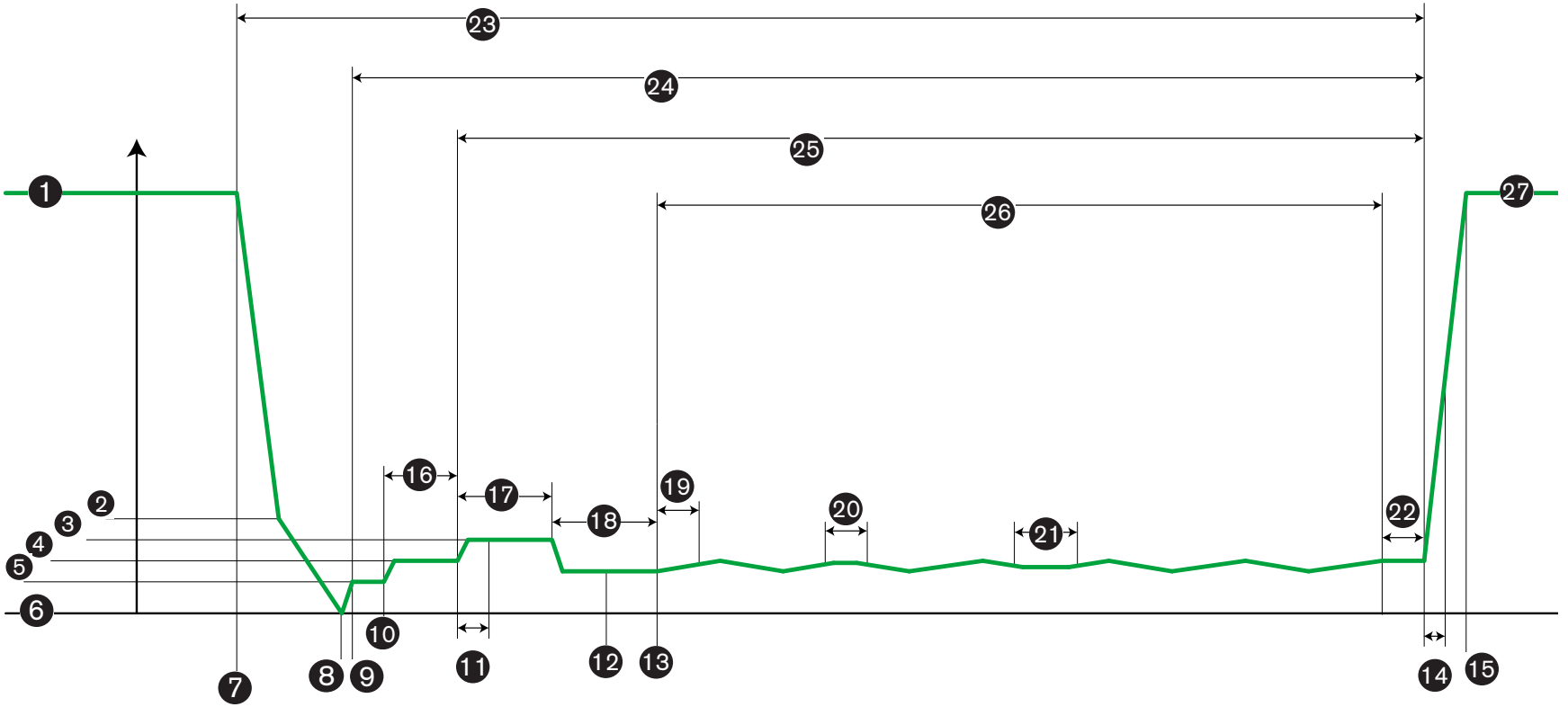
Performing a first IHS on the ArcGlide

Press the IHS test on the ArcGlide HMI to perform a first IHS. To perform a first IHS on a Hypertherm CNC, choose the Test Lifter soft key.

The ArcGlide moves to the workpiece at the Slow IHS speed. On subsequent IHSs, the ArcGlide uses the Fast Speed until it reaches the Start IHS height. Then it switches to Slow speed. After the torch contacts the workpiece, the ArcGlide raises the torch to the Transfer Height.

A THC error, a manual move, an idle timeout of 30 seconds, or a power cycle all result in the next IHS occurring at the Slow Speed to find the workpiece height again.

Figure 35



1 Torch path
2 IHS start height
3 Puddle jump height
4 Pierce height
5 Transfer height
6 Workpiece
7 CNC cycle start (Cut Control)
8 Tip touch
9 Plasma start
10 Arc transfer
11 Creep time
12 Cut height
13 AVC begins
14 Stop time
15 Retract complete
16 Pierce delay
17 Cut height delay
18 AVC delay
19 AVC sampling
20 Auto kerf detect
21 Torch height disable
22 Cut Off time
23 CNC cut control active
24 Plasma torch active
25 Cutting X/Y motion
26 AVC active
27 Retract height

Operating the control module

The ArcGlide control module houses a micro-controller, I/O interface, and a motor drive. This component provides arc voltage control and interfaces with the torch lifter, the CNC, and the plasma system through standard discrete I/O interfaces or through the Hypernet interface. The main function of the control module for the operator of the ArcGlide THC is for viewing system status and reading error messages and other system feedback that can help with system troubleshooting.

You cannot set parameters through the control module using Hypernet or discrete communication. However, if your system includes a CNC that is not a Hypertherm CNC, you can set parameters on the control module with RS-422 communication and commands. See *ArcGlide THC Serial Communication Protocol* on page 249 for more information.

On the front of the ArcGlide control module, there is a set of LEDs and a display window. See *Control module* on page 127 for more information.

The LEDs illuminate to indicate the status of the ArcGlide control module. The meaning of each LED is described in *Table 6*.

Table 6

Control module LED	Meaning
START	An active cycle START signal has been received.
MOTION	Transfer and Pierce Delay (Pierce Time in Phoenix software) have completed and motion can begin for cutting.
AVC	Arc Voltage Control is enabled and is within normal operating limits.
TIP-TOUCH	The torch is touching the workpiece.
LIMIT	The torch has reached its limit switch.
ERROR	There is an error.

In addition to the LEDs, there is also a display window where 13 screens display, screens 0 – 12. These displays can be used to view the parameters that have been set through the HMI or CNC and can be used to check the state of the control module I/O. Push the UP or DOWN arrow to scroll up or down through the screens in the display window.

In the description of each entry on each screen, the default values are in **bold**.

Screen 0 – Idle Park

0			IDLE PARK			
	Errors		No Errors			
	CNC HypNet	0	Off	AC Power		80%
	HMI HypNet	0	On	PAC HypNet	1	Off

Errors: Displays “No Errors” or the latest currently active error number and message. See *Screen 11 – Last errors* on page 142 for more information.

CNC HypNet or CNC RS-422: Indicates whether the Hypernet connection to the CNC is active (On) or inactive (Off). T On/**Off**

HMI HypNet: Indicates whether the Hypernet connection to the HMI is active (On) or inactive (Off). On/**Off**

AC Power: Displays the input voltage level of the control module.

PAC HypNet: Indicates whether the Hypernet connection to the plasma system is active (On) or inactive (Off). On/**Off**

0 - 10: The number of lost network packets sent by the control module to the CNC, HMI, and PAC. When it first powers up and initializes the Hypernet network, the control module sends a packet to each component in the network. A small number such as 1 may appear next to the component, but the number will disappear after communication is established with the component. If the control modules counts 10 lost packets it displays an error at the top of the screen.

The lost packet number will count upward within 100 ms so you may not see the actual numbers increment on the display.

Screen 1 – ArcGlide control state

This screen displays the current ArcGlide control state. The heading of this screen changes during operation of the ArcGlide to one of the following states:

Idle Park	Idle	Go Home	Lifter Calibration
Lower Limit	Upper Limit	IHS Fast Approach	IHS Slow Approach
Workpiece Contact	Go To Transfer Ht	IHS Complete	Start Plasma, Wait Xfer
Go To Pierce Start	Piercing	Go To Puddle Jump Ht	Cut Ht Accel State
V Sample State	Cutting	Ramp Down	Manual Up
Manual Down	End Of Cut Retract		

See *Control States* on page 150 for more information.

1				
	IDLE PARK			
	Mode	Auto	Unit address	1
	Set Volts	120 V	Motor Curr	0.0 A
	Arc Volts	119.3 V	Position	0.001 in

Mode: Displays the operating mode of the ArcGlide THC (Auto or Manual) that was selected at the HMI or CNC.

Set Volts: Displays the voltage setting from the CNC or HMI if sample voltage mode is not enabled.

Arc Volts: Displays the measured arc voltage feedback.

Unit address: Displays the unit address of the control module. This must be the same as the unit address of the plasma system and HMI at the same station.

Motor Curr: Displays the current draw of the lifter motor during motion.

Position: Displays the lifter position relative to the home position.

Screen 2 – Options

2						
	OPTIONS				INPUTS	
	Retr Dly		Dip Sw 4	Off	Lift Fric	Off
	Dip Sw 2	Off	Dip Sw 5	Off	Defaults	Off
	Dip Sw 3	Off	Lift Cycl	Off		

Retr Dly: Reflects an extension of Retract Delay for plasma systems that require it.

Dip Sw 2, 3, 4, 5: Reserved

Lift Cycl: Press the down arrow on the control module and turn ON power to perform mechanical tests of the lifter. On/**Off**

Lift Fric: Press the up arrow on the control module and turn ON power to determine if there is binding or friction during lifter operation. On/**Off**

Defaults: This option resets the stored operating parameters to their default values.

Screen 3 – Inputs from the CNC

3	CNC		DRY INPUTS	
	Cycle Start	Off	IHS Sync	Off
	Low Gain	Off	Spare #1	
	Corner hold	Off	Spare #2	

CNC Inputs: Shows the selected input type based on the settings of the input switches on the THC processor board (141091). **DRY**/SOURCED

Cycle Start: Displays whether the CNC has initiated a plasma cut. On/**Off**

Low Gain: Reduced gain in voltage control loop. The value is On for stable height control during Marking. On/**Off**

Corner hold: Displays whether corner processing (Corner Current Percent) has been set at the CNC or HMI. On/**Off**

IHS Sync: Indicates whether the CNC is synchronizing IHS for more than one THC. On/**Off**

Spare #1 and #2: Reserved

Screen 4 – Outputs to the CNC

4	CNC		OUTPUTS	
	IHS Complete	Off	THC Error	Off
	Retract Cmplt	Off	Torch Breakaway	Off
	Mach Motion	Off	Spare	Off

IHS Complete: The lifter has completed IHS. On/**Off**

Retract Cmplt: The torch has finished retracting. On/**Off**

Mach Motion: The THC is ready for the table to move and to begin cutting. On/**Off**

THC Error: Indicates that there is an error at the THC. See *Screen 11 – Last errors* on page 142 for more information. On/**Off**

Torch Breakaway: The breakaway sensor has detected a torch collision. On/**Off**

Spare: Reserved

Screen 5 – Inputs from the lifter control board

5	LIFTER		INPUTS	
	Lower Limit	Off	Lifter Up	Off
	Upper Limit	Off	Lifter Dwn	Off
	Breakaway	Off	Lifter Enable	On

Lower Limit: The lower limit of motion on the lifter has been reached. On/**Off**

Upper Limit: The upper limit of motion on the lifter has been reached. On/**Off**

Breakaway: The breakaway sensor has detected a torch collision. **On**/Off

Lifter Up: Indicates that the lifter is moving up. On/**Off**

Lifter Dwn: Indicates that the lifter is moving down. On/**Off**

Lifter Enable: Indicates that the lifter is enabled at the lifter. On/**Off**

Screen 6 – Outputs from the lifter control board

6	LIFTER		OUTPUTS	
	Encoder Error	No	Tip Sense	Off
	Encoder Dir	Dwn	Brake	Off
	Enc Count	456262	Motor	On

Encoder Error: Indicates that there is an error from the lifter motor. See *Screen 11 – Last errors* on page 142 for more information. Yes/**No**

Encoder Dir: Displays the direction in which the lifter is moving. Up/**Dwn**.

Enc Count: Displays the distance from home that the lifter has traveled, in encoder counts.

Tip Sense: Indicates that the torch has touched the workpiece. This is active only for tip touch plate detection and the value corresponds with the illumination of the TIP-TOUCH LED on the front of the control module. On/**Off**

Brake: Indicates that the lifter brake is activated. On/**Off**

Motor: Indicates that the lifter motor is operating. **On**/Off

Screen 7 – Inputs from the operator console

7	OPCON		INPUTS	
	Sta Disable	Off	Torch Dwn	Off
	Sta Select	On	Spare	Off
	Torch Up	Off		

Sta Disable: Indicates whether the station is enabled at the operator console. The displayed value should be the opposite of the value for Sta Select. On/**Off**

Sta Select: Indicates that the station is selected at the optional HMI or at the operator console if the operator console is designed to select a station. The displayed value should be the opposite of the value for Sta Disable. **On**/Off

Torch Up: Indicates that the torch is being commanded to move up at the operator console. On/**Off**

Torch Dwn: Indicates that the torch is being commanded to move down at the operator console. On/**Off**

Spare: Reserved

Screen 8 – Outputs to the operator console

8	OPCON		OUTPUTS
	Torch enable	On	
	Error	Off	
	Spare	Off	

Torch Enable: Indicates that the torch is enabled at the lifter. **On**/Off

Error: Indicates that there is an ArcGlide error. See *Screen 11 – Last errors* on page 142 for more information. On/**Off**

Spare: Reserved

Screen 9 – Inputs from the plasma system

9	PLASMA		DRY INPUTS	
	Motion	Off	Not Ready	Off
	Error	Off	CNC-RS422	Off
	Rampdown Err	Off	RS422 R OFF T OFF	

Plasma Inputs: Shows the selected input type based on the settings of the input switches on the THC processor board (141091). **DRY**/SOURCED

Motion: Indicates that the torch has transferred to the workpiece and that cutting motion can begin. On/**Off**

Error: Indicates that there is a plasma system error. Look for plasma errors on the CNC or plasma system. On/**Off**

Rampdown Err: Indicates that there is an error during the plasma system rampdown. On/**Off**

Not Ready: Indicates that the plasma system is ready to fire the torch. This turns ON during a change in process while the torch is purging and not ready to fire. On/**Off**

CNC-RS422: Indicates whether RS-422 communication is enabled. On/**Off**

RS422 R and T: If CNC-RS422 is On, this value indicates whether the plasma system is receiving (R On/**Off**) or transmitting (T On/**Off**) serial communication with the CNC.

Screen 10 – Outputs to the plasma system

10	PLASMA		OUTPUTS	
	Corner	Off	Start	Off
	Pierce	Off	Remote On	On
	Hold	Off		

Corner: Indicates whether corner processing (Corner Current Percent) has been set at the CNC or HMI. This value should be the same as the value for the CNC input Corner hold (*Screen 3 – Inputs from the CNC* on page 138). This function does not work over Hypernet. On/**Off**

Pierce: Indicates that the plasma system is using the Pierce Control output. On/**Off**

Hold: Indicates that the Hold output is preventing the plasma system from firing the torch. On/**Off**

Start: Indicates that a Start signal is being sent to the plasma system. On/**Off**

Remote On: Shows that the Remote ON output is active. **On**/Off

Screen 11 – Last errors

11	DIAGNOSTIC	LAST ERRORS
1st No error		
2nd No error		
Last No error		

Lists the most recent 3 changes in ArcGlide error conditions, including “No error.”

Screen 12 – Total lifter operating time

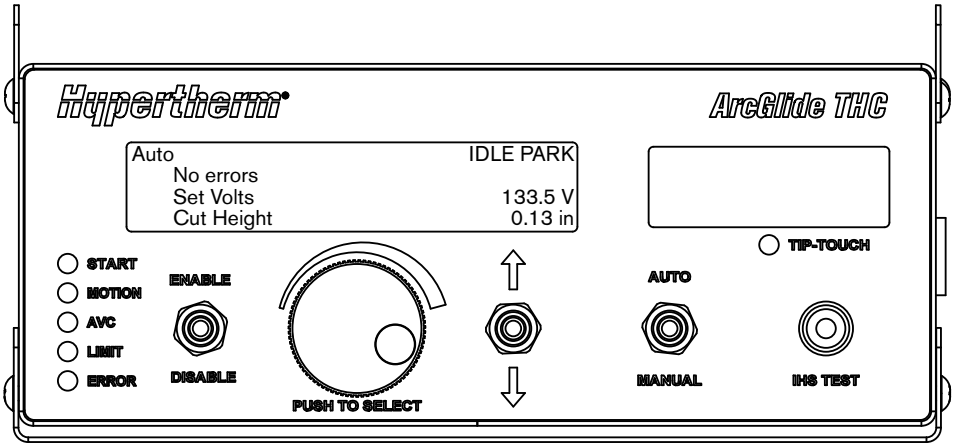
12	Total Lifter Operating Time
	50 Hours
	Service lifter every 500 hours

Operating the HMI

If your cutting machine does not include a CNC connected with Hypernet, the HMI is required so an operator can control the ArcGlide THC. On the HMI, the operator can set parameters, read error and diagnostic messages, and manually control the position of the torch.

If your system includes a CNC connected to Hypernet, most control and diagnostic activities will take place on the CNC. In this case, the HMI is optional and can be used to display messages and status.

Figure 36



There are four sets of information that display in the HMI parameter window:

- The Main screen provides actual information about the ArcGlide.
- The Setup screen provides information about the process setup of the ArcGlide.
- The Diagnostics screen shows the latest error message and control state of the system.
- The Installation Data screen provides access to lifter hardware specifications and the values of parameters that are used by the control module.

The screen displays 4 lines at a time. The selection knob below the parameter window allows you to scroll up and down through each display.

To change the value of a parameter:

1. Turn the selection knob to scroll to the parameter and highlight it.
2. Push the knob to select the parameter.
3. Turn the knob to scroll through the value options.
4. Push the knob when you have selected the appropriate option.

If you do not select a new value in 5 seconds, the value reverts to the original entry.

All the information on the screens is described in the following sections.

For more information about the LEDs, switches, and other controls, see *Specifications* on page 35.

HMI screen hierarchy

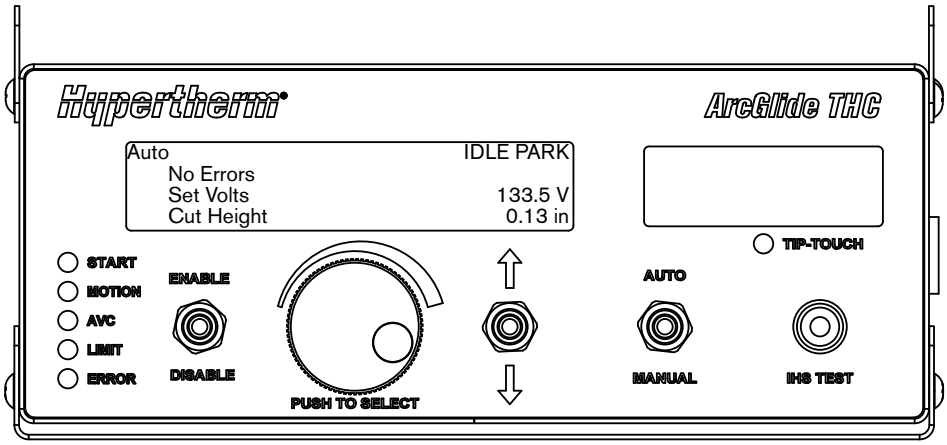
Main screen			
Auto mode	Error Message Set Volts Cut Height Pierce Height Pierce Delay AVC Enabled <Setup parameters>		
	Setup parameters	Sample Voltage Mode Thick Plate Cycle IHS Start Height Retract Height Preflow during IHS Stall Force Ohmic Plate Sense Kerf Detect Kerf Level <Diagnostics> <Installation data>	
		Diagnostics	Error Message Control State Hypernet Status Switch Diagnostics
		Installation Data	Slide Length Max Servo Current Encoder Counts/in Max Speed/min Fast Speed Slow Speed IHS Speed Relative Speed Gain Relative Position Gain Relative Arc Volts Gain Arc Voltage Calibration Display Units Languages

Manual mode	Error Message Pierce Delay <Setup parameters>		
	Setup parameters	Sample Voltage Mode Thick Plate Cycle IHS Start Height Retract Height Preflow during IHS Stall Force Ohmic Plate Sense Kerf Detect Kerf Level <Diagnostics> <Installation data>	
		Diagnostics	Error Message Control State Hypernet Status Switch Diagnostics
		Installation Data	Slide Length Max Servo Current Encoder Counts/in Max Speed/min Fast Speed Slow Speed IHS Speed Relative Speed Gain Relative Position Gain Relative Arc Volts Gain Arc Voltage Calibration Display Units Languages
Disabled mode	Arc Starts Arc Minutes		

Main screen

The Main screen is the primary display that the operator sees during normal operation.

Figure 37



Operation mode and the current THC state: Use the AUTO/MANUAL switch to select automatic or manual operation:

Auto: Automatic mode (Set Arc Voltage or Sample Voltage). *See Control States* on page 150 for more information.

Manual: Torch height changes with manual UP/DOWN commands only.

Disabled: The torch retracts to Home position and parks. Use the ENABLE/DISABLE switch to enable or disable the torch. In addition, if the THC is able to turn the plasma system ON and OFF, the plasma system turns OFF.

Errors: The latest, and currently active error condition, sent from the control module.

Set Volts: 50 V – 300 V with 0.1 V resolution. This line displays only if Sample Voltage mode is not enabled. Default = 140.0 V.

Cut Height: Inch or equivalent mm – 0.254 – 25.40 mm (0.01 – 1.0 inch) with 0.254 mm (0.01 inch) resolution. Default = 0.15 inch.

Pierce Height: Inch or equivalent mm – 0.254 – 25.40 mm (0.01 – 1.0 inch) with 0.254 mm (0.01 inch) resolution. Default = 0.25 inch.

Pierce Delay: 0 – 10 seconds with 0.01 second resolution. Pierce Delay is Pierce Time in Phoenix software. Default = 0.20 second.

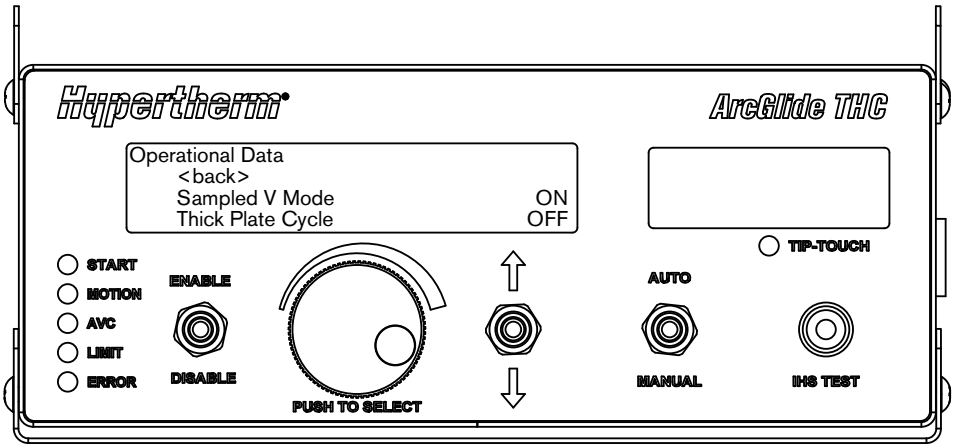
AVC Enabled: When AVC is enabled (ON), Automatic Height Control is active in Auto mode. When AVC is disabled (OFF), the torch height sequences in Auto mode (IHS, Cut Height, Retract) but the torch height does not change based on arc voltage and remains constant during the cut. Default = ON.

<Setup Parameters> Select this line to display the Setup Parameters menu.

Setup screen

The Setup screen provides data for setup and maintenance.

Figure 38



<back> Select this line to return to the Main screen.

Sampled V Mode: When Sample Voltage mode is ON, the arc voltage is sampled at the beginning of the cut and this value is averaged with previous samples to provide the setpoint for the AVC during the remainder of the cut. When this mode is OFF, the Set Volts mode is used for AVC. Default = OFF.

Thick Plate Cycle: (For installations without Hypernet-enabled CNC) When this option is ON, the ArcGlide estimates torch height set parameters to avoid contacting the pierce puddle that forms when cutting thicker workpieces. In addition, Transfer Height will depend on Cut Height, Pierce Height, and Pierce Time settings. Default = ON.

IHS Start Height: This is the height above the workpiece at which the torch speed slows to the IHS speed before contacting the workpiece. 2.54 – 50.8 mm (0.1 – 2.0 inch) with 0.254 mm (0.01 inch) resolution. Default = 0.75 inch.

Retract Height: This is the height above the workpiece to which the torch will retract at the end of the cut. Default = 2.00 inch.

Preflow during IHS: When Preflow during IHS is ON, this saves cut-to-cut cycle time by allowing the plasma preflow time to occur during the IHS process. The Plasma Start and Plasma Hold signals are applied early. Default = YES.

Stall Force: This parameter sets a force threshold of 1 (low force limit) – 10 (high force limit). Default = 5.

Ohmic Plate Sense: When this parameter is ON, the ohmic contact sense is used. Default = ON.

Kerf Detect: When this parameter is ON, automatic kerf detection is active. When a kerf crossing is detected, AVC is disabled and the torch position is fixed for a short period to avoid diving into the workpiece. Default = ON.

Kerf Level: This parameter sets a sensitivity threshold to detect kerf. The range is 1 (more sensitive) – 10 (less sensitive). Default = 5.

<Diagnostics> Select this line to view the Diagnostics screen.

<Installation Data> Select this line to display the Installation Data screen.

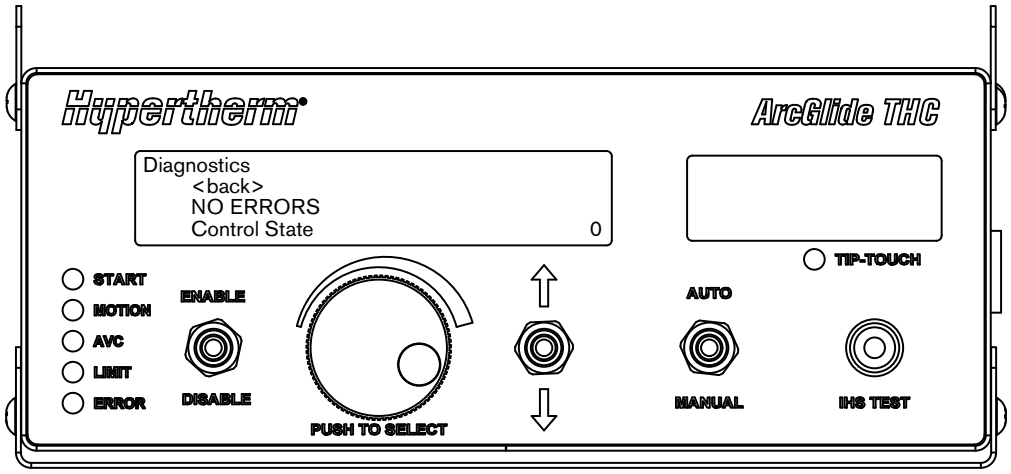
<back> Select this line to return to the Main screen.

Diagnostics screen

The Diagnostics display on the HMI provides information about errors that the HMI receives from the control module, the control state of the cutting machine, as well as whether Hypernet is enabled and diagnostics for the switches on the front panel of the HMI. The following table provides details for the parameters that can appear on the Diagnostics display.

See *Error message troubleshooting* on page 191 for more information.

Figure 39



<back> Select this line to return to the Main screen.

Errors: The latest and currently active error condition. Normal errors are cleared on the next start. Critical errors must be corrected before the next start. See *Error message troubleshooting* on page 191 for more information.

Normal Errors

NO ERRORS – Ready to start.

ERR 1 FLASH SETUPS – Checksum failed on stored setups in flash memory – the THC is using default values.

ERR 2 MAX SPEED EXCEEDED – A speed regulation problem occurred – the value for Maximum Speed was exceeded.

ERR 3 LIFTER HOME TIMEOUT – Lifter did not return to home position within 20 seconds.

ERR 4 PLATE CONTACT AT HOME – Ohmic contact with the workpiece at home position – an invalid condition.

ERR 5 HOME LIM DURING OPR – The lifter reached the home (upper) limit during auto operation.

ERR 6 LOWER LIM DURING OPR – The lifter reached the lower limit during operation.

ERR 7 FAILED MOVE TO IHS START – The lifter failed to reach IHS Start Height.

ERR 8 FAILED TO CONTACT PLATE – The torch failed to contact the workpiece within 60 seconds.

ERR 9 FAILED TO CLEAR PLATE – The torch failed to retract and break ohmic contact within 10 seconds.

ERR 10 FAILED TO MOVE TO XFER HT – The torch failed to retract to Transfer Height within 10 seconds.

ERR 11 IHS SYNC TIMEOUT – The torch reached the IHS position but IHS SYNC was not released within 60 seconds.

ERR 12 TRANSFER TIMEOUT – The Transfer signal was not received from the plasma system within 60 seconds.

ERR 13 LOST TRANSFER – The plasma arc was lost during the cut.

ERR 14 FAILED MOVE TO PIERCE – The lifter failed to reach Pierce Start Height within 10 seconds.

ERR 15 FAILED MOVE CUTHEIGHT – The lifter failed to reach Cut Height during Accel Delay.

ERR 16 RAMPDOWN TIMEOUT – The Motion signal was not removed within 10 seconds.

ERR 17 RETRACT TIMEOUT – The lifter failed to retract within 20 seconds at the end of the cut.

ERR 18 ERR SAMPLED ARC VOLTS – During the sample arc voltage operation, there was an excessive change in sample voltage.

ERR 19 EXCESS PLATE CONTACT – During the cut, the torch made excessive contact with the workpiece.

ERR 20 PLASMA SUPPLY – Plasma system error.

ERR 21 OHMIC TIP SENSE – Nozzle Contact Sense was enabled but not sensed.

Critical Errors

ERR 23 INPUT VOLTAGE LOW – The incoming AC line voltage is more than 20% low.

ERR 24 INPUT VOLTAGE HIGH – The incoming AC line voltage is more than 15% high.

ERR 25 OVER-TEMPERATURE – The temperature of the processor has exceeded the maximum value.

ERR 26 MOTOR DRIVE – The temperature for the motor drive has exceeded the maximum value.

ERR 27 INTERLOCK TRIPPED – The safety interlock was removed.

ERR 28 BREAKAWAY TRIPPED – The torch breakaway was removed.

ERR 29 FIELD SUPPLY FAILED – The +5 V, +12 V, or -12 V supply has failed.

ERR 30 STALL CALIBRATION – Stall Calibration down motion failed after power was turned ON.

ERR 31 NO HYPERNET CONNECTION – There is no Hypernet connection to either the HMI or CNC.

ERR 32 LOST CNC HYPERNET – The CNC Hypernet connection was lost after it was established.

ERR 33 LOST HMI HYPERNET – The HMI Hypernet connection was lost after it was established.

ERR 34 ENCODER OVERFLOW – Height position error.

ERR 35 ENCODER UNDERFLOW – Height position error.

ERR 36 HYPERNET ADDRESSING – Hypernet communication error. Check unit addressing.

ERR 37 SOFTWARE ERROR – Contact your table manufacturer.

ERR 38 SOFTWARE LOOP TIME – The Ethernet cable is loose or damaged or there is electrical interference if ArcGlide and drives are sharing power.

ERR 39 SOFTWARE UNDEF DISPLAY – The control board in the control module is not operating correctly.

ERR 40 SOFTWARE ANALOG INPUT – Pins on a cable connector are not transmitting the expected signal, examine all cable connections on the control module.

ERR 41 PROTOCOL MISMATCH – Verify that compatible software and firmware is installed on all the units of the system that are connected to Hypernet. See *Update ArcGlide firmware* on page 180 for more information.

ERR 42 LOST PAC HYPERNET – Examine all Hypernet connections between the control module, the Ethernet switch, and the plasma system.

Control States

IDLE PARK – In this state, the plasma system is OFF, the servo motor has no power, and the lifter brake is ON. This is the low power standby state. The lifter waits for the Cycle Start input signal and enters the IHS Slow Approach state.

IDLE – In this state, the plasma system is OFF, the servo motor has power and is holding position, and the lifter brake is OFF. The lifter waits for the Cycle Start input signal and enters either the IHS Fast Approach state or the IHS Slow Approach state, depending on whether the workpiece position is known. If there is no Cycle Start signal after a 30-second timeout, the lifter enters the Idle Park state.

GO HOME – The lifter moves the torch up at the programmed Slow Speed until the upper limit switch or a stall is detected. Then the lifter enters the Upper Limit state.

LIFTER CALIBRATION – The control module calibrates the lifter immediately after it turns on.

LOWER LIMIT – The THC enters this state after it senses the lower limit switch or when the actual position is the programmed Slide Length. The motor is stopped and the torch maintains its position. Only up motion is allowed during this state. An error message displays if the THC enters this state during automatic operation.

UPPER LIMIT – The THC enters this state when it senses the upper limit switch. The servo motor is stopped and the torch maintains its position and the THC resets its actual position to 0 (Home). Only down motion is allowed during this state. An error message displays if the THC enters this state during automatic operation.

IHS FAST APPROACH – The torch moves down at the programmed Fast Speed to the Start IHS Height then enters the IHS Slow Approach state.

IHS SLOW APPROACH – The lifter continues to move down at IHS Speed, using Stall Limit, until the lifter receives the Tip Sense input signal or stalls. When the THC receives the Tip Sense input signal or detects a stall, it enters the Workpiece Contact state.

WORKPIECE CONTACT – The torch lifter begins to move up slowly until ohmic sense contact is broken. The lifter then sends the workpiece position to the control module and enters the IHS Retract state.

IHS RETRACT – The lifter moves up at the programmed Fast Speed to the Transfer Height and then enters the IHS Complete state.

IHS COMPLETE – The lifter holds the IHS Transfer position and sends the IHS Complete output signal to the CNC. If necessary, the THC waits for the IHS Sync input signal from the CNC to synchronize multiple torches. Then the THC enters the Start Plasma state.

START PLASMA – The lifter holds the torch at the IHS Transfer position, waits for the Motion input signal from the plasma system, and then enters the programmed Pierce Start state.

PIERCE START – The lifter moves the torch to Pierce Height. When the torch is in position, the lifter enters the Piercing state.

PIERCING – The lifter holds the torch at the Pierce Height for the Pierce Delay (Pierce Time in Phoenix software) interval. When Pierce Delay is complete, the lifter enters the Puddle Jump state.

PUDDLE JUMP – The lifter moves the torch to the Puddle Jump Height. It waits for Cut Height Delay, and then enters the Cut Height Accel state.

CUT HT ACCEL – The lifter moves the torch to the Cut Height and sends the Machine Motion output signal to the CNC to begin X/Y cutting motion. The THC waits for the AVC Delay and then enters either the V Sample state or the Cutting state, depending on the operating mode.

SAMPLE – The lifter receives a new Arc Voltage sample for this cut. It modifies the operating Arc Voltage Control setpoint and enters the Cutting state.

CUTTING – If Auto Mode is active and the Corner Hold input signal from the CNC is not active, the lifter controls the torch height using arc voltage feedback. If ohmic contact sense is selected, the torch retracts if it makes ohmic contact. When the cut is complete and the Cycle Start input signal from the CNC is deactivated, the THC enters the Ramp Down state.

RAMP DOWN – The lifter holds the torch position and deactivates the Plasma Start output signal to shut down the plasma system. The lifter waits for the plasma system to ramp down (when it loses the Motion input signal from the plasma system). When the rampdown is complete, the lifter enters the End Cut Retract state.

MANUAL UP – The lifter initially jogs up 0.254 mm (0.01 inch). After 0.5 second, it begins continuous upward motion at the IHS Speed. After 2 seconds, the lifter increases the speed to the programmed Slow Speed. Outputs do not change; if the torch is already cutting, it continues to cut.

MANUAL DOWN – The lifter initially jogs down 0.254 mm (0.01 inch). After 0.5 second, it begins continuous downward motion at the IHS Speed. After 2 seconds, the lifter increases the speed to the programmed Slow Speed. The lifter does not change the output signals; if the torch is already cutting, it continues to cut.

END CUT RETRACT – The lifter moves the torch up at Full Speed to the Retract Height. When the torch is in position at the Retract Height, the lifter activates the Retract Complete output signal to the CNC and enters the Idle state.

Hypernet Status: ON, OFF, or PM (protocol mismatch). See Error 41 in *Critical Errors* on page 149 for more information.

Switch Diagnostics: Allows the operator to test the status of the switches on the front panel of the HMI. ON or OFF displays as each switch is pushed or moved.

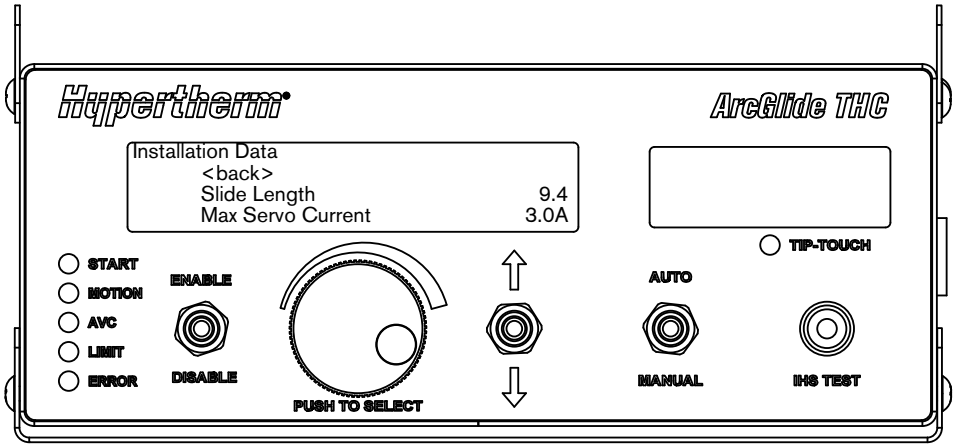
<back> Select this line to return to the Main screen.

Installation Data screen

The Installation Data screen provides information on ArcGlide hardware and firmware settings that are used by the control module.

The default for Display Units is *inch*. To view metric measurements, select *mm*.

Figure 40



Slide Length: This value is the length of the lifter's usable travel. Default = 9.50 inch.

Max Servo Current: This is the maximum continuous motor current for which the lifter motor is rated. Default = 3.0 A.

Encoder Counts per inch: This value scales the position feedback. Default = 20320 per inch.

Maximum Speed (per minute): This parameter sets the maximum linear speed that the THC can achieve. Default = 600 inch.

Fast Speed (per minute): This speed is used for all automatic rapid moves such as the End-of-Cut-Retract or the Initial Approach to the workpiece. Default = 600 inch.

Slow Speed (per minute): This speed is the Homing Speed and is the fastest speed used for manual moves. It is also the maximum speed limit used during arc voltage control. Default = 150 inch.

IHS Speed (per minute): This parameter sets the lowest speed for the final approach to the workpiece during an IHS operation. It is also used as the low speed for manual moves. Default = 17 inch.

Relative Speed Gain: This gain value regulates the speed of the lifter. Default = 5.

Relative Position Gain: This gain is used for closed loop positioning. Default = 5

Relative ARC Volts Gain: This gain is used when the THC is operating closed-loop arc voltage control. Default = 5.

Arc Voltage Calibration: This value is used to finely calibrate the measured arc voltage accuracy. Default = 1.000.

Display Units: The unit of measurement, inch or millimeter, that are used in the display. Default = inch.

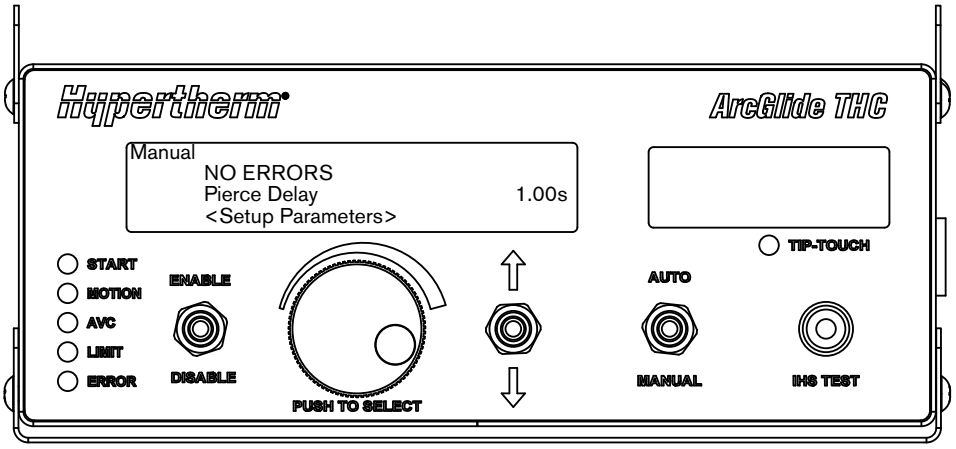
Language: The language selected for the display. Options are English, German, Portuguese, Spanish. Default = English.

<back> Select this line to return to the Main screen.

Manual mode

In Manual mode, only errors and Pierce Delay information is displayed.

Figure 41



Error: The most recent error condition.

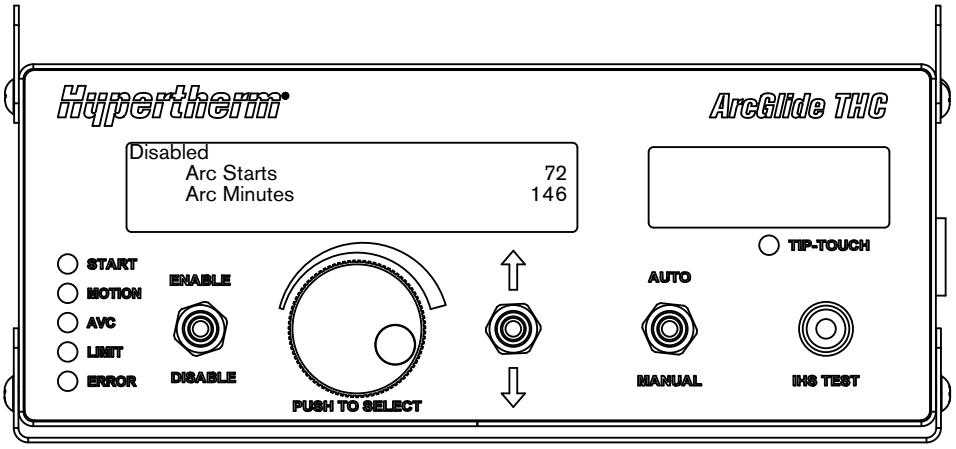
Pierce Delay: 0 – 10 seconds with 0.01 second resolution (Pierce Delay is Pierce Time in Phoenix software).

<Setup Parameters> Return to the Setup parameters display.

Lifter Disabled mode

When the lifter is disabled, there are only two parameters that display.

Figure 42



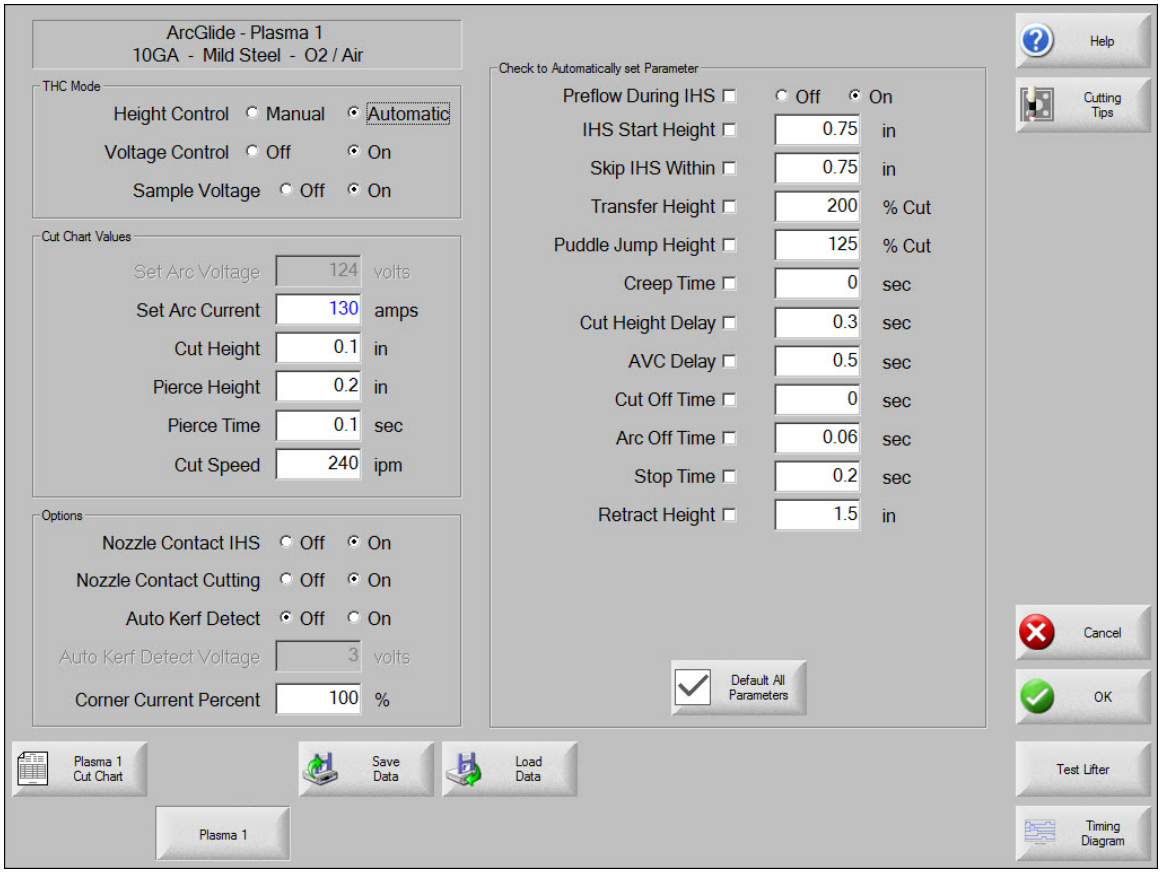
Arc Starts: The number of times the arc has started since the last time consumables were changed and the counter was restarted.

Arc Minutes: The number of minutes of active cutting since the last time consumables were changed and the counter was restarted.

ArcGlide operating parameters

The ArcGlide Process screen in Phoenix software contains a combination of plasma process and THC parameters that control the THC operations. In this screen you can customize the operation for the duration of a single cutting operation. After a part or nest program is complete, if the cut chart is accessed, the selections on this screen return to the values of the selected cut chart. ArcGlide operating parameters can also be viewed in the HMI display.

Figure 43



See the *Phoenix Software Operator Manual* (806400) for more information on these parameters in Phoenix.

There are 4 sets of parameters on the Process screen:

- THC mode
- Cut chart values
- Options
- Automatically-set parameters

THC mode

Height Control: In Manual mode, the torch only moves in response to manual UP/DOWN commands from the Raise and Lower soft keys in Phoenix software, an operator console, the HMI, or the lifter. No other torch height motion occurs. In Automatic mode, the torch moves through its programmed sequence, based on values set on the Process screen.

Setting: Manual/Automatic

Voltage Control: The THC must be in Automatic mode. If Voltage Control is ON, the torch height is controlled by the measured arc voltage. If Voltage Control is OFF, the torch maintains a constant position during the cut that is independent of the arc voltage.

Setting: Off/On

Sample Voltage: The THC must be in Automatic mode and Voltage Control must be ON. When Sample Voltage is ON, the THC measures the voltage at the end of the AVC Delay and uses it as a setpoint for the remainder of the cut. When Sample Voltage is OFF, Set Arc Voltage is used as the setpoint for torch height control.

Setting: Off/On

Cut chart values

These fields display the values in the cut chart that is active for the process. These values can be changed here, for this job, and the values for the automatically-set parameters will be recalculated and displayed. However, these changes are not saved in the cut chart.

Set Arc Voltage: The ArcGlide THC must be in Automatic mode, Voltage Control must be ON, and Sample Voltage must be OFF.

When Sample Voltage is OFF, Set Arc Voltage is used as the setpoint for torch height control.

Setting: 50 VDC to 300 VDC

Set Arc Current: This is the value for the plasma arc current. Enter the amperage needed to cut the material. This parameter can be used only with plasma systems that communicate with the CNC.

Setting: 5 A to 1000 A

Cut Height: Determines the height at which the torch cuts the workpiece.

Setting: 0.25 mm to 25.4 mm (0.01 inch to 1.00 inch)

Pierce Height: Determines the height at which the torch pierces the workpiece. The torch moves to this height after Transfer Height.

Setting: 0.25 mm to 25.40 mm (0.01 inch to 1.00 inch)

Pierce Time: This is the value for the Pierce Delay. During this time, the X/Y cutting motion is delayed to allow the plasma to fully pierce the workpiece.

Setting: 0 seconds to 10 seconds

Cut Speed: This value specifies the cutting speed.

Setting: 50 mm/min (2 in/min) to Maximum Machine Speed

Options

Nozzle Contact IHS: To set this parameter, the Height Control must be in Automatic mode. When Nozzle Contact IHS is ON, the THC uses electrical ohmic contact to sense the workpiece. When this parameter is OFF, the THC uses stall force to sense the workpiece. This setting is normally disabled on water tables or painted workpieces due to the unreliability of the electrical contact.

Setting: Off/On

Nozzle Contact Cutting: Hypernet does not support this feature.

Auto Kerf Detect: To set this parameter, the THC must be in Automatic mode. When Auto Kerf Detect is active, the THC looks for a rapid rise in the measured arc voltage that indicates that the torch is cutting across a previously-cut kerf. This parameter temporarily disables the AVC and prevents the torch from diving into the workpiece.

Setting: Off/On

Auto Kerf Detect Voltage: This parameter is active if Auto Kerf Detect is turned ON. The lower the voltage, the higher the detection sensitivity. This value should be set high enough to detect normal kerf crossings but low enough to prevent false kerf detection.

Setting: 1 V to 10 V

Corner Current Percent: Hypernet does not support this feature.

Automatically-set parameters

The CNC can automatically estimate these values for the current plasma process. On the Process screen in Phoenix software, choose the Default All Parameters soft key to load the estimated values. Under most conditions, these estimated values yield good results. However, you can override any of these values for special conditions. To override an estimated value, clear the check box for that parameter and enter a new value. The CNC displays your entered value in blue.

If a part program reloads the cut chart, the Transfer Height, Creep Time, and Cut Height Delay values will replaced with the cut chart values for these parameters.

Preflow During IHS: This parameter is used for Rapid Part cutting. When this parameter is active (On), the CNC issues the Start and Hold Ignition signals to the plasma system early to allow the gas preflow to occur while the THC is performing an IHS operation. This reduces the time required to move to the next part and start cutting.

Setting: Off/On

IHS Start Height: This is the height above the workpiece where the THC starts the initial height sense process. When the torch reaches this distance above the workpiece, the following actions occur on Hypertherm CNCs:

- Speed slows from Maximum THC Speed to Fast IHS Speed.
- THC Torque Limit and Nozzle Contact Enable outputs turn ON.
- The CNC monitors the Nozzle Contact Sense input. This input activates when the torch touches the workpiece, so the CNC knows the height of the workpiece.
- The CNC monitors the axis following error which the CNC compares to the stall force. When the following error exceeds the stall force, the CNC knows the height of workpiece.

Setting: 2.54 mm to 50.80 mm (0.10 inch to 2.00 inch)

Skip IHS Within: This parameter optimizes production by reducing the time between cuts. If the next starting point is within this distance of the end of the previous cut, the THC skips the IHS. When this happens, the torch goes directly to the Transfer Height and skips contact with the workpiece. This setting can improve the overall machine production rate. Set this parameter to 0 to disable this feature. Skip IHS will be ignored if:

- The ArcGlide is not connected to a CNC with Hypernet
- An M07 HS command is in the part program for that pierce (see the *Phoenix Software Version 9 Series Programmer's Reference* (806420) for more information)
- Sample Voltage mode is active and an IHS is needed for arc voltage sampling (six arc voltage samples are required before IHS can be skipped)
- The THC is locked out by the M50 (Height Sensor Disable) command
- The THC is not in Automatic mode

Setting: 0 to table size (mm or inch)

Transfer Height: When the arc transfers to the workpiece, it can be "stretched" to the pierce height. The transfer height is lower than the pierce height because initiating arc transfer at a high pierce height may result in the arc not transferring to the workpiece at all. Enter the Transfer Height as a percentage of the cut height or as an actual transfer height distance.

Setting: 50% to 400% of Cut Height, commonly 150%

Puddle Jump Height: This value determines the height above the workpiece where the torch is raised after pierce and before lowering to Cut Height so that the torch clears the dross puddle that can form during the pierce. Enter a percentage of the Cut Height. The torch remains at this height until the Cut Height Delay has elapsed. If you are not using Puddle Jump Height, set this parameter to 100%.

Setting: 50% to 500% of Cut Height

Creep Time: Specifies the amount of time after piercing the workpiece that the torch travels at Creep Speed. (See Setups > Machine Setups > Speeds for the Creep Speed.) The torch accelerates to cut speed after the Creep Time elapses. Creep Speed can help stabilize the arc during the transition to Cut Speed.

Setting: 0 seconds to 10 seconds

Cut Height Delay: This value sets the number of seconds to hold the torch at the Puddle Jump Height before transitioning to the Cut Height so that the torch clears the dross puddle that can form during a pierce. If you are not using Puddle Jump Height, set this parameter to 0.

Setting: 0 seconds to 10 seconds

AVC Delay: This value sets a number of seconds to allow the plasma system to achieve steady-state operation at the cut height before AVC begins. After this delay, the AVC is enabled for the remainder of the cut. If the THC is in Sample Voltage mode, the arc voltage sample is taken after this delay.

Setting: 0 seconds to 10 seconds

Cut Off Time: This value turns off the plasma arc before or after the end of the programmed cut to improve edge quality. If the value is negative, the torch turns off before the end of the cutting machine motion. With positive values, the plasma arc turns off after motion stops. This parameter minimizes notches in part edges that can occur when motion stops with the arc on.

Setting: -1 seconds to 2 seconds

Arc Off Time: This value defines the number of seconds to wait before sending a lost arc signal. This setting allows arc loss during the remainder of the part to be ignored so the CNC can move to the next pierce point.

Setting: 0 seconds to 2 seconds

Stop Time: This parameter allows a pause at the end of a cut and delays X/Y motion to the next pierce point. This delay can be used to retract the torch to avoid tip-ups.

Setting: 0 seconds to 10 seconds

Retract Height: This parameter specifies the height above the workpiece to which the torch retracts at the end of a cut.

Setting: 2.54 mm (0.10 inch) to the maximum lifter length

Plasma cutting tips

The following reference guide offers several solutions to help improve cut quality.

Consider the following factors when evaluating plasma cut quality:

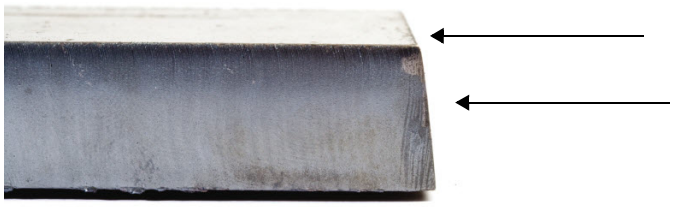
- Type of machine (example: XY table, punch press)
- Plasma cutting system (example: plasma system, torch, consumables)
- Motion control device (example: CNC, torch height control)
- Process variables (example: cutting speed, gas pressures, flow rates)
- External variables (example: material variability, gas purity, operator experience)

All of these factors can affect the appearance of a cut.

Cut quality issues

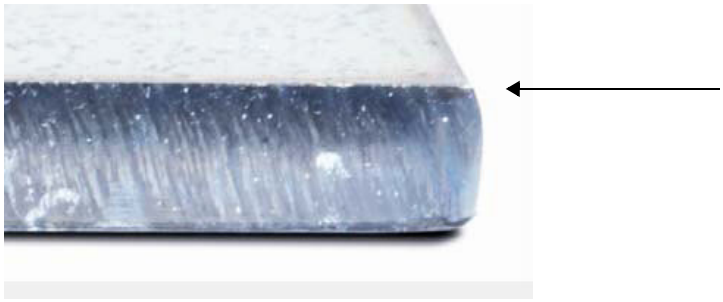
Angularity

Positive cut angle: More material is removed from the top of the cut surface than from the bottom.



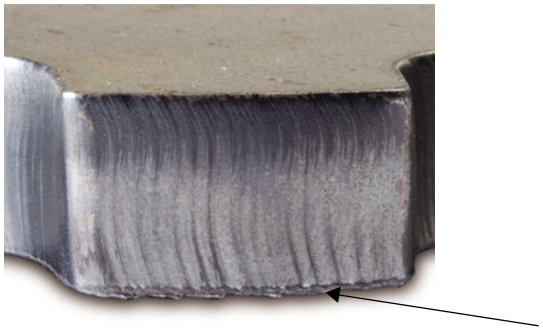
Negative cut angle: More material is removed from the bottom of the cut surface than from the top.

Top edge rounding: There is a slight rounding along the top edge of the cut surface.



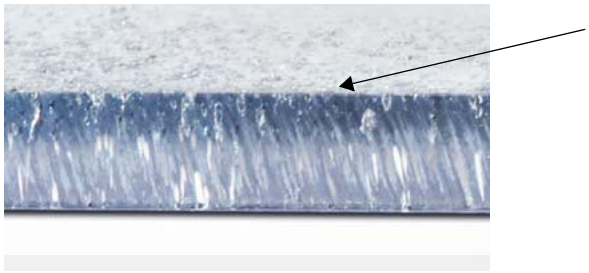
Dross

High-speed dross: A small, linear bead of molten material attaches and hardens along the bottom edge of the cut. In addition, S-shaped lag lines are present; dross is difficult to remove and requires grinding.



Low-speed dross: A bubbly or globular accumulation of molten material attaches and hardens along the bottom edge of the cut. In addition, vertical lag lines may be present; dross is easy to remove and flakes off in large chunks.

Top spatter: A light spatter of molten material collects on the top edges of the cut. Usually, this spatter is inconsequential and is most common with air plasma.



Surface finish

Roughness: Depending on the type of metal being cut, some roughness should be expected; “roughness” describes the texture of the cut face (the cut is not smooth).

Aluminum

Top: Air/Air

- Best for thin material under 3 mm (1/8 inch)

Bottom: H35/N_2

- Excellent edge quality
- Weldable edge

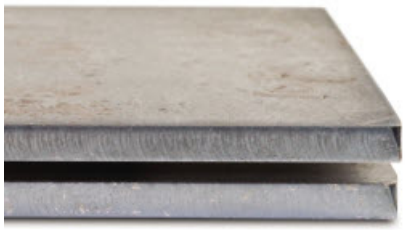
Mild steel

Top: Air/Air

- Clean cut
- Nitrided edge
- Increased surface hardness

Bottom: O_2

- Exceptional edge quality
- Weldable edge



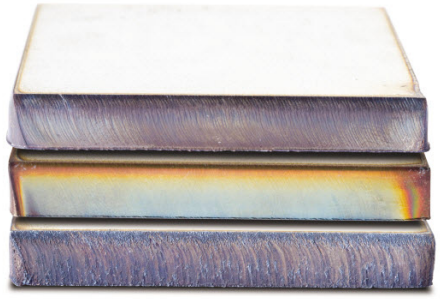
Color

Color results from a chemical reaction between a metal and the plasma gas that is used to cut it. Color changes are to be expected and vary most dramatically with stainless steel.

Top: N_2/N_2

Middle: $H35/N_2$

Bottom: Air/Air



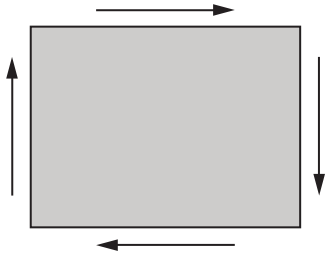
Basic steps to improve cut quality

Step 1: Is the plasma arc cutting in the appropriate direction?

- The squarest cut angles are always on the right side in relation to the forward motion of the torch.
- Verify the direction of the cut.
- Adjust the cutting direction, if necessary. The plasma arc typically spins clockwise with standard consumables.

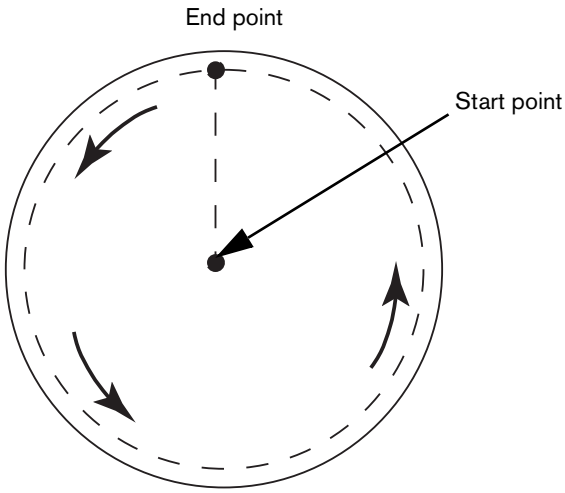
Contour

- The torch travels clockwise.
- The good side of the cut is to the right side of the torch, as it travels forward.



Internal feature (hole)

- Torch travels counterclockwise.
- Good side of the cut is to the right side of the torch as it travels forward.



Step 2: Was the correct process selected for the material and thickness being cut?

Refer to the cut charts in the Operation section of the Hypertherm Instruction Manual. On the CNC, choose the Cut Chart soft key on the Main Screen to view the cut chart for the selected torch type, material and thickness.

Follow the specifications in the cut charts:

- Select the appropriate process for:
  - Material type
  - Material thickness
  - Desired cut quality
  - Productivity goals
- Select the correct plasma and shield gas.
- Select correct parameters for:
  - Gas pressures (or flow rates)
  - Cut height and arc voltage
  - Cutting speed
- Confirm that the correct consumables are being used and verify the part numbers.

Generally, lower amperage processes offer better angularity and surface finish. However, cutting speeds are slower and dross levels are higher.

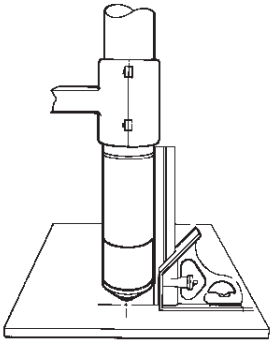
Step 3: Are the consumables worn?

- Inspect consumables for wear.
- Replace worn consumables.
- Always replace the nozzle and electrode at the same time.
- Avoid over-lubricating o-rings.

Use genuine Hypertherm consumables to ensure maximum cutting performance.

Step 4: Is the torch perpendicular to the workpiece?

- Level the workpiece.
- Make the torch perpendicular to the workpiece, both from the front and side of the torch.



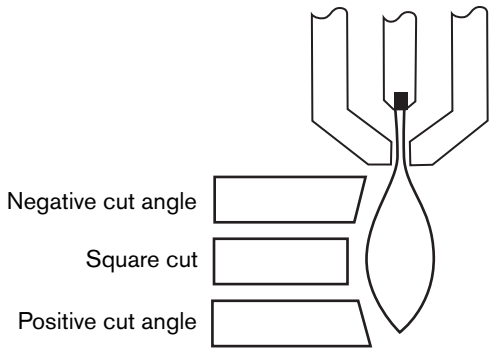
Inspect the material to see if it is bent or warped. In extreme cases this limitation cannot be corrected.

Step 5: Is the cut height set at the proper height?

- Adjust the cut height to the correct setting.
- If you are using arc voltage control, adjust the voltage.

As consumable parts wear, arc voltage settings need continual adjustment to maintain cut height.

- Cut height can impact angularity.



- Negative cut angle: torch too low; increase cut height.

- Positive cut angle: torch too high; decrease cut height.

A slight variation in cut angles may be normal if the variation is within tolerance.

Step 6: Is the cutting speed set too fast or too slow?

- Adjust cutting speed as needed.

Cutting speed may also impact your dross levels.

- High-speed dross: The cutting speed is too fast and the arc lags behind. Reduce the cutting speed.
- Low-speed dross: The cutting speed is too slow and the arc shoots ahead. Increase the cutting speed.
- Top spatter: The cutting speed is too fast, reduce the cutting speed.

In addition to speed, both material chemistry and surface finish can impact dross levels. When the workpiece heats up, more dross may form on subsequent cuts.

Step 7: Are there problems with the gas delivery system?

- Identify and repair any leaks or restrictions.
- Use properly sized regulators and gas lines.
- Use pure, high-quality gas.
- If manual purge is required, such as with the MAX200, confirm that the purging cycle was completed.
- Consult the gas distributor.

Step 8: Is there torch vibration?

- Verify that the torch is securely attached to the table gantry.
- Consult the table manufacturer, your table may require maintenance.

Step 9: Does the table need to be tuned?

- Check and ensure that the table is cutting at the specified speed.
- Consult the table manufacturer; the table speed may need tuning.

Section 4
Maintenance

Introduction

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

In addition to being technically qualified, maintenance personnel must perform all testing with safety in mind. See *Safety* on page 13 for more safety precautions.

Lifter routine maintenance

The control module and HMI do not require routine maintenance.

On the lifter, the bearings of the ball screw have permanent lubrication and do not require in-service lubrication under normal operating conditions.

Carriage

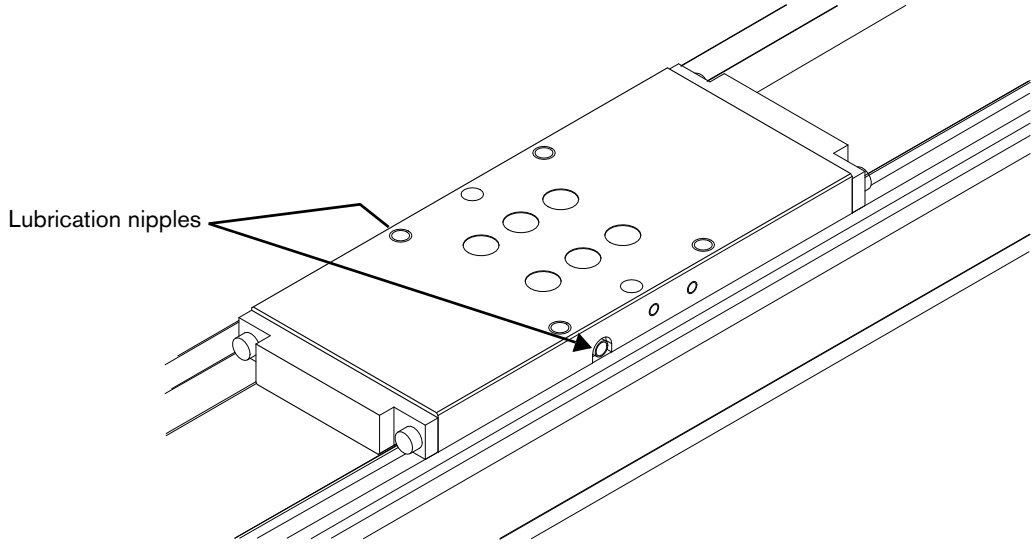
The carriage on the slide within the ArcGlide lifter requires lubrication at regular intervals that are based on the number of hours of operation or the distance that the slide travels.

Under normal operating conditions, the slide should be lubricated every 500 hours of operation. You can find the Total Lifter Operation Hours parameter on Screen 12 on the ArcGlide control module.

To lubricate the carriage:

1. Remove the side shields and side panels to access the carriage.
2. Locate the funnel-type lubrication nipples (DIN 3405-D3) on either side of the carriage, as shown in *Figure 44*.

Figure 44



3. Load a small grease gun with a needle-type adapter with lithium base grease. (Castrol Longtime® PD2 or equivalent is recommended.) To lubricate with a hand press, weigh out the quantity of grease in each stroke.

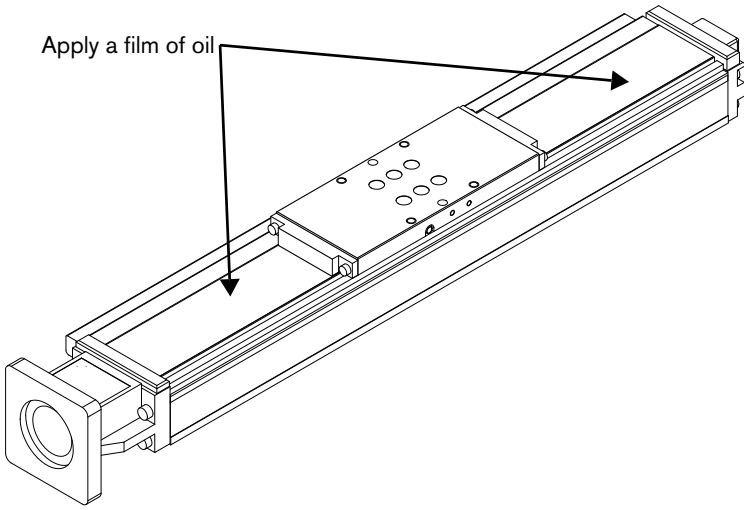
4. Inject 0.7 g (0.025 oz) of grease into one of the lubrication nipples. If you are using the Hypertherm grease gun (428259), one pump of the gun is equivalent to 0.7 g (0.025 oz). You do not need to lubricate the carriage on both sides.

Sealing strip

Apply oil to the sealing strip behind the carriage at every lubrication interval.

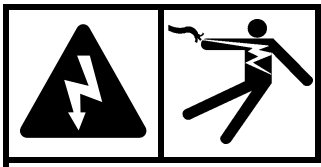
1. Remove the front panel to access the carriage and sealing strip.
2. Apply a few drops of ISO Grade 100 heavy hydraulic fluid (Shell Tellus™ 100 heavy hydraulic fluid is recommended) to the sealing strip.
3. Install the front panel.
4. Use the UP/DOWN switch to move the carriage along length of the sealing strip and distribute the oil.

Figure 45



Cable connections

Examine all cables regularly for chafing or unusual wear. If the outside insulation has been cut or otherwise damaged, replace the cable. In particular, examine the ohmic contact wire.



WARNING!

ELECTRIC SHOCK CAN KILL

Do not disconnect cables when the system power is turned ON.

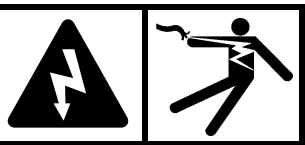
System grounding

Verify that all components of the system are individually grounded to a driven earth ground. See *Recommended grounding and shielding practices* on page 55. Examine the work lead (+) connection, particularly where the work lead (+) connects to the cutting machine. This must be a good, clean connection because a poor connection can interfere with arc transfer.

Calibrate arc voltage

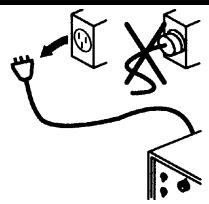
ArcGlide THC arc voltage is calibrated at the factory as part of the manufacturing process. If you need to verify or recalibrate the arc voltage for multiple ArcGlide installations or for long torch leads, begin by adjusting the value of the Voltage Calibration parameter on the ArcGlide Axes screen. The measured raw arc voltage input value is multiplied by the value of this parameter before being used for either voltage control or display in the red LED display on the HMI or on Screen 1 on the ArcGlide control module.

This calibration affects all of the ArcGlide hardware connected to this station, including the HMI display and the HPR Hypernet plasma interface board.



WARNING!

ELECTRIC SHOCK CAN KILL

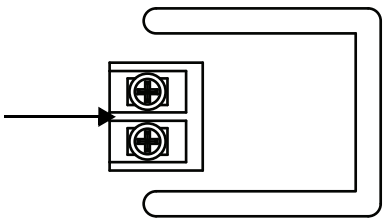


Disconnect electrical power before performing any maintenance.

All work requiring removal of the plasma system cover must be performed by a qualified technician.

See *Safety* on page 13 for more safety precautions.

1. Mount a test workpiece that can be used for arc voltage calibration.
2. Verify that the test workpiece is level.
3. Switch the THC to Manual Mode.
4. Load the cut process that is recommended for the test workpiece.
5. Position the torch to the cut height that is specified for the selected cut process.
6. Start a 2-foot (0.6 m) rip cut, using the recommended cut speed for the process.
7. After the pierce completes and the torch is cutting, use a voltmeter to measure the raw arc voltage between the work and electrode terminals on the plasma interface board (141094 or 141162) in the plasma system.



8. Compare the measured voltage with the voltage that displays in the red LED display on the HMI or on Screen 1 on the ArcGlide control module.

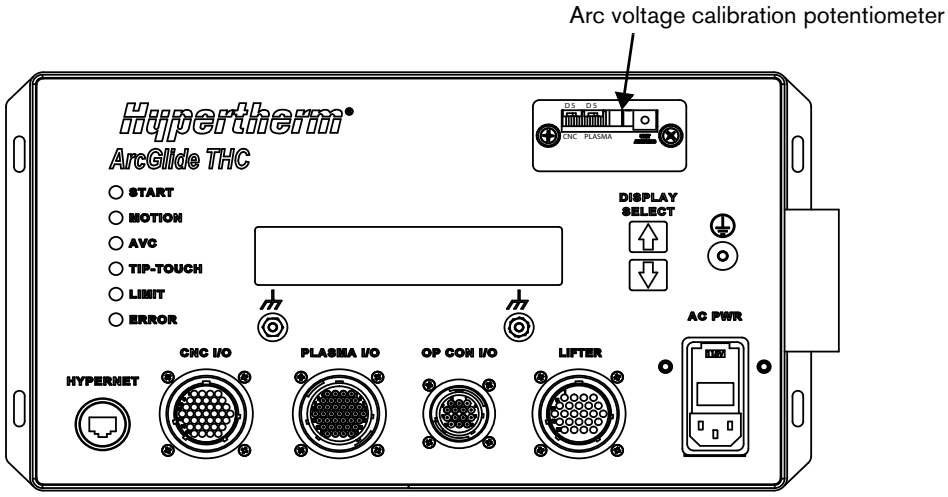
9. If the 2 values do not match, divide the raw arc voltage by the value in the display and enter the result as the value for the Voltage Calibration parameter.

For example, if the raw arc voltage is 120 and the value in the display is 125, divide 120 by 125. The result, 0.96 is the value for the Voltage Calibration parameter. The range of values for the Voltage Calibration parameter is 0.900 to 1.100.

10. If you cannot bring the arc voltage in the display within the range of 0.900 to 1.100, adjust the arc voltage calibration potentiometer on the THC processor board (141091):

a. Remove the calibration and setup door on the top right front of the control module.

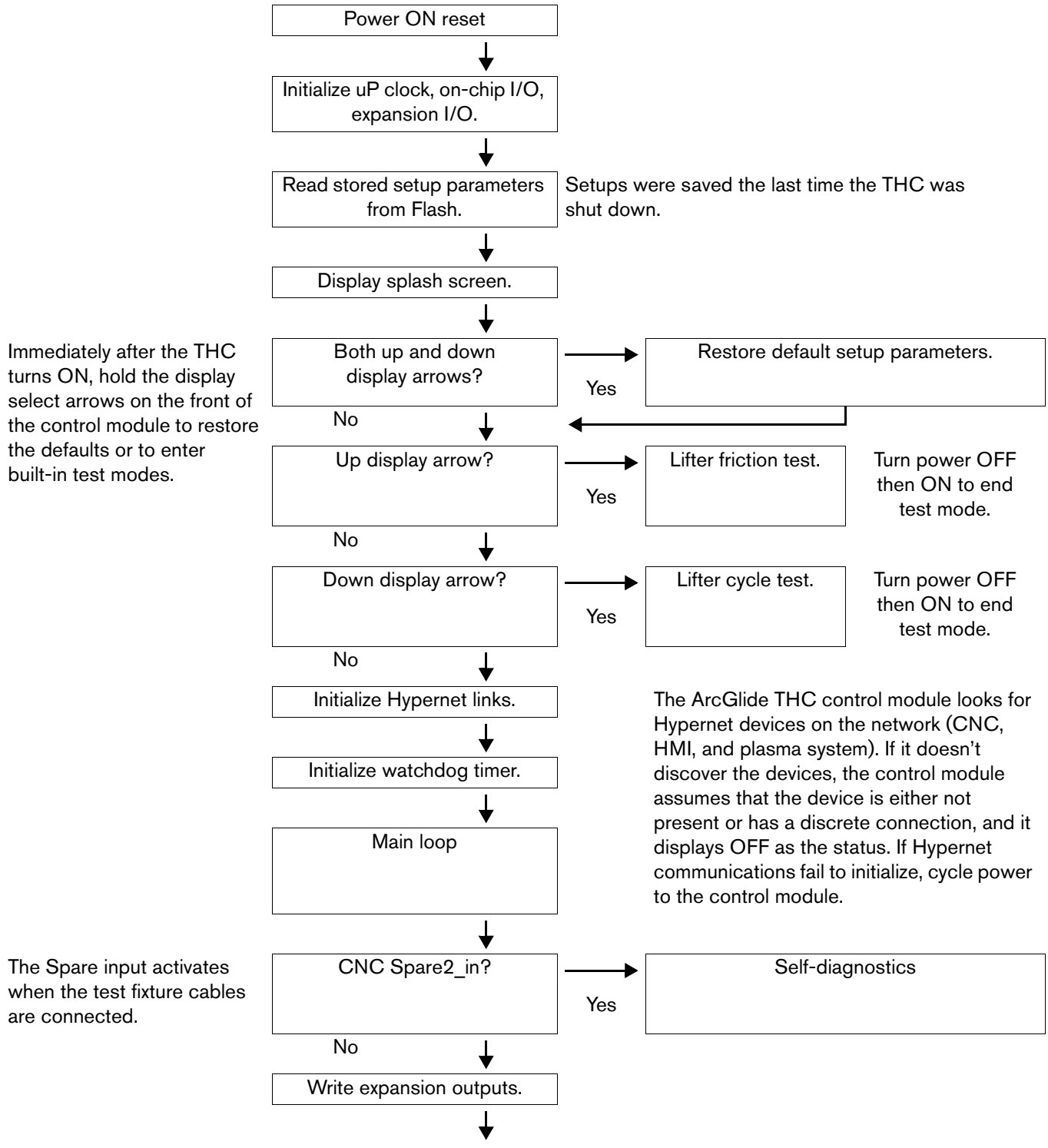
b. Use a small straight screwdriver to turn the slotted screw on the arc voltage potentiometer clockwise, to increase the voltage, or counterclockwise, to decrease the voltage.

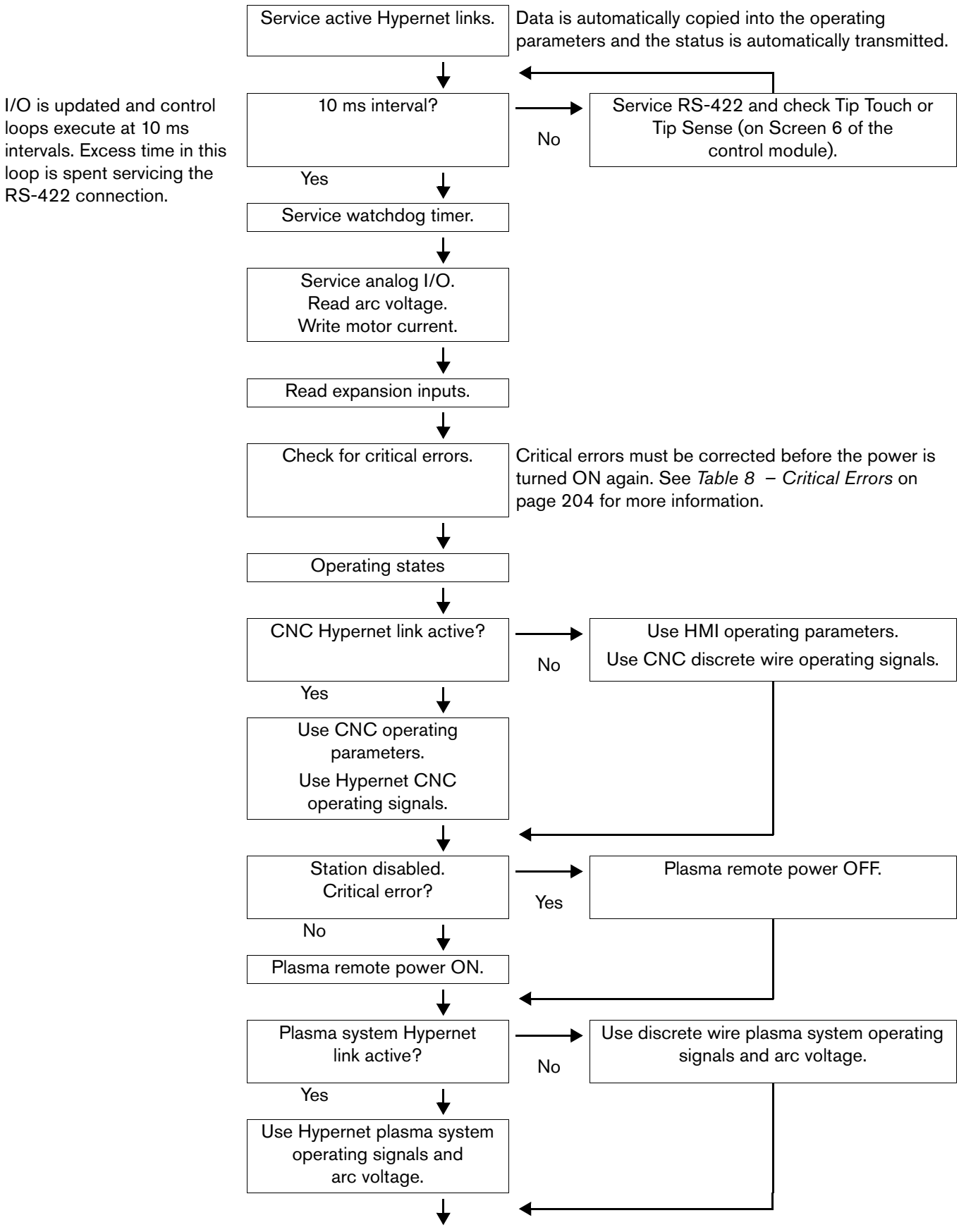


11. Repeat the parameter and potentiometer calibration until the measured arc voltage and the displayed arc voltage are the same.

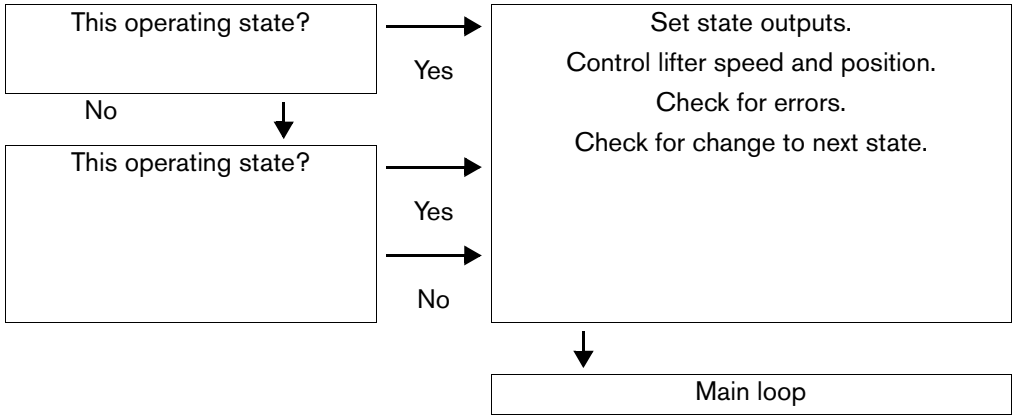
Flow of ArcGlide operations

The flowchart on the following pages illustrates the sequence of states in the operation of an ArcGlide THC.



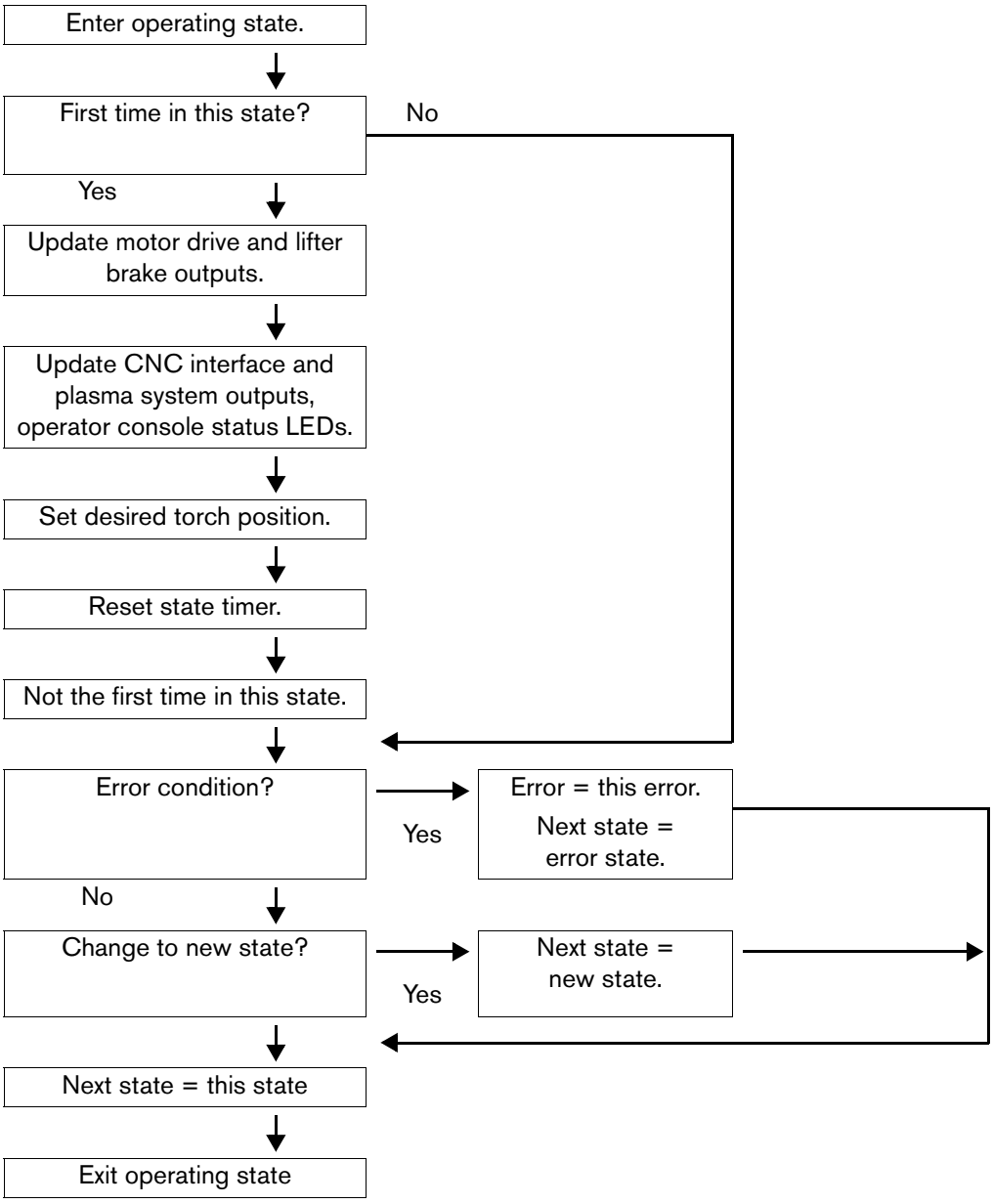

Service active Hypernet links.
Data is automatically copied into the operating parameters and the status is automatically transmitted.
I/O is updated and control loops execute at 10 ms intervals. Excess time in this loop is spent servicing the RS-422 connection.
10 ms interval?
No
Service RS-422 and check Tip Touch or Tip Sense (on Screen 6 of the control module).
Yes
Service watchdog timer.
Service analog I/O.
Read arc voltage.
Write motor current.
Read expansion inputs.
Check for critical errors.
Critical errors must be corrected before the power is turned ON again. See Table 8 – Critical Errors on page 204 for more information.
Operating states
CNC Hypernet link active?
No
Use HMI operating parameters.
Use CNC discrete wire operating signals.
Yes
Use CNC operating parameters.
Use Hypernet CNC operating signals.
Station disabled.
Critical error?
Yes
Plasma remote power OFF.
No
Plasma remote power ON.
Plasma system Hypernet link active?
No
Use discrete wire plasma system operating signals and arc voltage.
Yes
Use Hypernet plasma system operating signals and arc voltage.

Switch to Active state.



See *Diagnostics screen* on page 148 for a complete list of states.

Basic flow for all ArcGlide operating states



Common machine-cutting faults

This section lists faults an operator can encounter and the possible causes for each fault.

The arc fails to transfer.

- The work lead is not making good contact with the cutting machine, or the cutting machine is not making good contact with the workpiece.
- The transfer or cut height is too large.
- The surface of the workpiece is rusty, oiled, or painted.

The workpiece is not completely pierced, and there is excessive sparking on top of the workpiece.

- The metal being cut is too thick for the selected amperage.
- The Pierce Delay (Pierce Time in Phoenix software) is set too low.
- The workpiece surface is not clean of rust or paint.
- The consumables are worn and need to be replaced.
- The work lead is not making good contact with the cutting machine, or the cutting machine is not making good contact with the workpiece.
- The current (amperage) is set too low. (Review the cut chart information.)
- The cut speed is too high. (Review the cut chart information.)

Excessive dross forms on the bottom of the cut.

- The consumables are worn and need to be replaced.
- The cutting speed is too slow. (Review the cut chart information.)
- A plasma system gas setting is not correct. (Review the cut chart information.)

The cut angle is not square.

- The torch is not perpendicular to the workpiece.
- The consumables are worn and need to be replaced.
- The direction of the torch travel is incorrect. The high-quality cut is always on the right with respect to the forward motion of the torch.
- The cut height is too large or too small. (Review the cut chart information.)
- The cutting speed is not correct. (Review the cut chart information.)
- The current (amperage) is not correct. (Review the cut chart information.)
- The torch is damaged.

The consumable life is shortened.

- The arc current, arc voltage, travel speed, motion delay, gas flow rates, or cut height are not set as recommended in the cut charts.
- Attempting to cut highly magnetic metal workpiece, such as one with a high nickel content. Long consumable life is difficult to achieve when cutting a workpiece that is magnetized or becomes magnetized easily.
- Firing the torch in the air (beginning or ending the cut off of the workpiece surface). Starting at the edge is acceptable as long as the arc makes contact with the workpiece when started.

- Starting a pierce with an incorrect torch height. Refer to the cut charts for the specific initial pierce height.
- The pierce time is incorrect.
- The swirl ring or retaining cap is worn and needs to be replaced.

Torch does not fire.

- The torch is not enabled. For HPR and HPRXD plasma systems, verify that Remote On is wired correctly on the plasma interface board. See *Hypernet plasma interface board (141162)* on page 228 for more information.
- If your cutting machine does not include a Hypertherm plasma system, refer to the instruction manual for your plasma system.

Update ArcGlide firmware

Download through Phoenix software

To download firmware updates for the ArcGlide system using Phoenix software, the ArcGlide must be turned ON and connected to a Hypertherm CNC by Hypernet.

To avoid a protocol mismatch error, make sure each ArcGlide unit and Hypernet-enabled plasma system is turned ON before updating the firmware.

To update directly from the CNC:

1. Download the most current version of Phoenix software from www.hypertherm.com. Follow the instructions on the web page or in *Updating Phoenix Software* in the *Phoenix Software Operator Manual* (806400).
2. Copy the Update.exe file onto a USB memory stick.
3. Insert the USB memory stick into the USB port in the CNC.
4. From the Main screen in Phoenix software, choose Setups > Password and enter the UPDATESOFTWARE password.

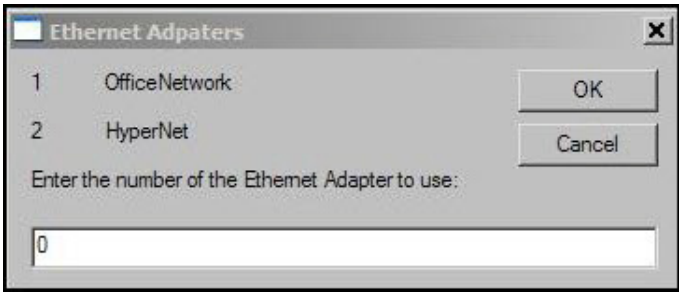
The CNC updates the Phoenix software and sends ArcGlide firmware updates to each ArcGlide unit and Hypernet-enabled plasma system.

Download from a laptop

If your configuration does not include a Hypertherm CNC, you can download the ArcGlide THC Firmware Update.zip file from the Hypertherm Downloads Library. This file contains the program and script files necessary to update the ArcGlide components.

If your cutting machine does not have a Hypertherm CNC, before you upgrade your ArcGlide firmware, contact your table manufacturer to ask if you should update your CNC at the same time.

1. After you download the ArcGlide THC Firmware Update.zip file, unpack it in a directory on the laptop hard drive or on a USB memory stick. One of the files included is EthernetSetup.vbs. There are also some program image .bin files and Update.exe files to load the images.
2. Plug the laptop into the device that you want to update or the Ethernet switch if you want to update multiple units.
3. Navigate to the directory where you downloaded the files.
4. Double click-on the EthernetSetup.vbs file. A dialog box displays that lists the Ethernet ports that are installed on the computer.



5. Enter the number of the adapter that you want to use to update the ArcGlide unit.

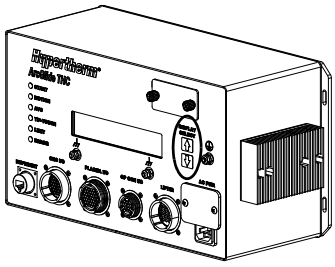
6. After a short delay, a dialog box displays with a list of the devices you can update.

7. Enter the number of the device that you want to update from the list on the dialog box. Enter 4 to update the HMI, control module, and Hypernet-enabled plasma system. Enter 0 to exit without updating.

8. When the update process is complete, the program returns the network settings to their original settings and exits.

Operator tests

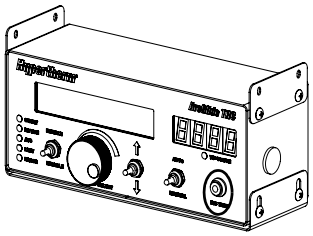
The operator can perform several diagnostic tests on the lifter mechanics and initial height sense (IHS). To test lifter mechanics:



- To test the lifter friction, push the UP arrow button on the front of the control module when the system turns ON.
- To test the up and down cycling of the lifter, push the DOWN arrow button on the front of the control module when the system turns ON.

The IHS test makes sure that the IHS process is operating correctly. Perform this test when lifter parameter values need to be adjusted or verified.

To test IHS:



- On the front of the HMI, push the IHS Test button. Each successive push of the button moves the torch between the transfer and retract heights.
- On a Hypertherm CNC, the IHS Test soft key on the Process screen performs the same function.

Problems and solutions

Unable to establish communication with the CNC or plasma system.

- Examine Hypernet cables from the ArcGlide.
- Verify that the Ethernet switch is turned ON.
- Verify that the plasma control board is not receiving dual serial signals. If the CNC communicates directly with the plasma system over a serial (RS-422) cable, verify that you are using the correct cable (123760) to connect the control board and the ArcGlide plasma interface board.

No response to CYCLE-START-IN at THC.

- Verify that the control module is receiving power.
- Examine the line input fuses in the power module of the control module.
- Watch the Cycle Start state on the CNC input screen (Screen 3) on the THC control module display. Cycle Start should alternate between ON and OFF as the Cycle Start input becomes active or inactive. Test the machine interface inputs on the THC control board.
- Examine the condition of the external interlock on the THC control board. See *THC control interface board (228577)* on page 215 for more information.
- Verify that the corresponding station is enabled and that the green Enable lamp on the lifter is illuminated.

Arc ignites before IHS is complete.

- Verify that the Hold signal is reaching the plasma system.
- If plasma system has a Hold signal, examine it for correct wiring.
- Verify that the Stall Force is set correctly. Adjust it if necessary.
- Verify that the plasma system coolant meets the manufacturer's specifications.
- Look for false ohmic contact sense.
- Verify that the corresponding station is enabled on the lifter, HMI, or CNC.

The green Enable lamp on the lifter is not illuminated.

See *Install the lifter* on page 77 for more information.

The torch does not approach the workpiece at programmed IHS speed and Stall Force.

- Verify that the THC is in Automatic Mode. If not, change the mode to Automatic.
- Verify that Stall Force is not set too low.
- Verify that IHS Speed is not set too high.
- Look for cable and hose obstructions that may stop movement.

Inaccurate IHS with Nozzle Ohmic Contact.

- Verify that the THC is in Automatic Mode. If not, select Automatic Mode.
- Verify that Nozzle Ohmic Contact is ON (enabled).
- Verify that the nozzle ohmic contact wire is connected at both ends.
- Verify that the torch retaining cap is tight.
- Examine the workpiece for water. If there is water, use Stall Force sensing and disable the ohmic contact.
- If you are cutting under water, use only Stall Force.
- Examine the workpiece for any type of coating, such as oil or plastic. If there is a coating, use Stall Force sensing.
- Examine the nozzle and shield and, if necessary, clean or replace them.
- Examine the work lead connection.

Inaccurate IHS with Stall Force sensing.

- Verify that Nozzle Ohmic Contact is OFF (disabled).
- Make sure the value for Transfer Height is correct.
- Verify that Stall Force is not set too high.
- Verify that the workpiece is not deflecting excessively. Examine the table supports under the workpiece. Offset workpiece deflection by adjusting Set Cut Height and Transfer Height to achieve the improved results.

Torch fails to ignite.

- Verify that the plasma system is operational.
- Verify that the Start signal is transmitted.
- Verify that the IHS piercing height is correct for the torch.
- Verify that IHS SYNC is OFF on the control module CNC interface inputs. See *Screen 3 – Inputs from the CNC* on page 138 for more information.
- Examine the torch consumables and replace them if necessary.
- Verify that the corresponding station is enabled.

Torch arc fails to transfer to workpiece.

- Verify that Transfer Height is not set too high. It is typically a percentage of Cut Height.
- Examine the work lead connection.
- Examine the torch consumables, and replace them if necessary.
- Look at the Motion input in the display window on the control module to see if it turns ON. This input confirms arc transfer. (See *Screen 9 – Inputs from the plasma system* on page 141 for more information.)

Arc extinguishes immediately after transfer or creates an excessively large pierce hole.

- Verify that Pierce Time is set correctly. The delay is set too long so that the torch dwells in the piercing position too long before machine motion.
- Verify that Machine Motion Out is active after Pierce Delay ends.

The laser pointer is not illuminated.

The station is not enabled or the laser is damaged and needs to be replaced.

Torch moves before workpiece is pierced all the way through.

Increase the value of Pierce Delay or Pierce Time.

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.
- Increase Machine Accel Delay.

Torch dives toward workpiece immediately after AVC begins.

- Increase Set Arc Volts.
- Increase Machine Accel Delay.
- Decrease Set Cut Height.
- Examine the torch consumables, and replace them if necessary.

Torch retracts from workpiece immediately after AVC begins.

- Decrease Set Arc Volts.
- Increase Set Cut Height.
- Examine plasma interface arc voltage wiring.
- Examine the torch consumables, and replace them if necessary.

Retract begins before arc has extinguished.

Increase Retract Delay.

Failure to retract.

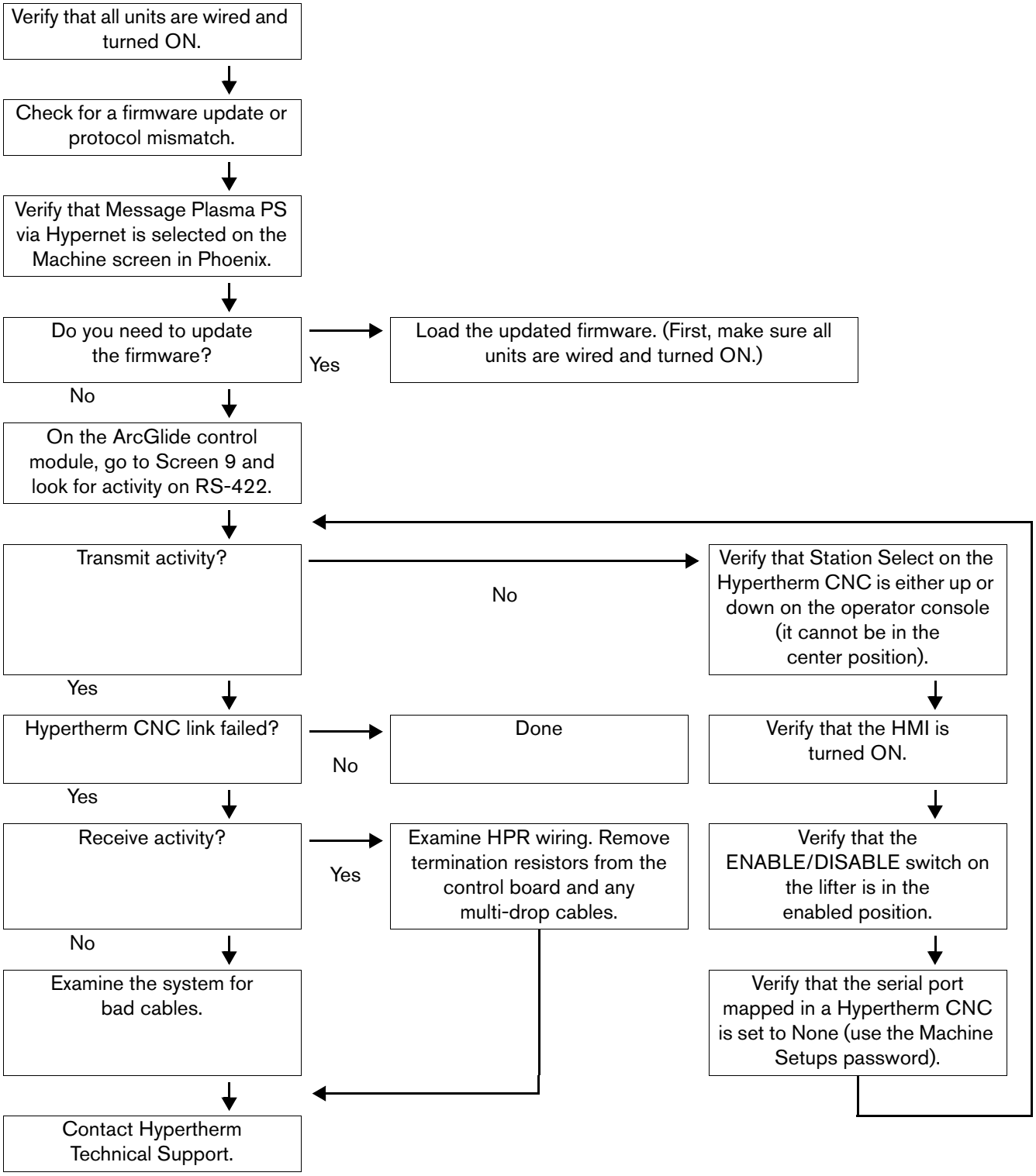
- Decrease the THC Homing Speed.
- Look for obstructions in the torch path and torch lead set.

For True Hole applications, verify that these HPRXD features are installed:

- ❑ HPRXD control board and code
- ❑ HPRXD torch
- ❑ New torch leads
- ❑ Ohmic contact wire with correct routing.

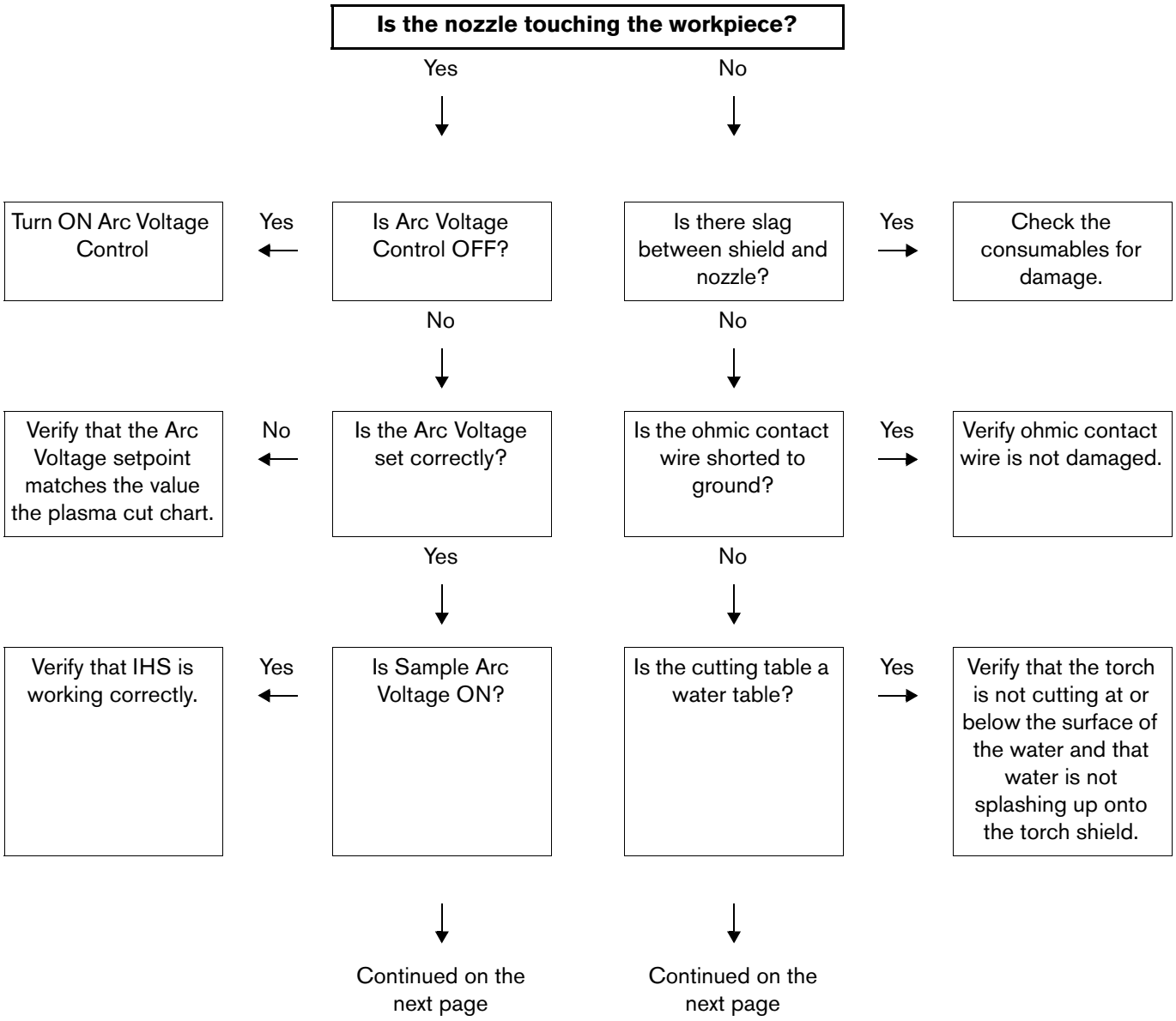
Troubleshooting routines

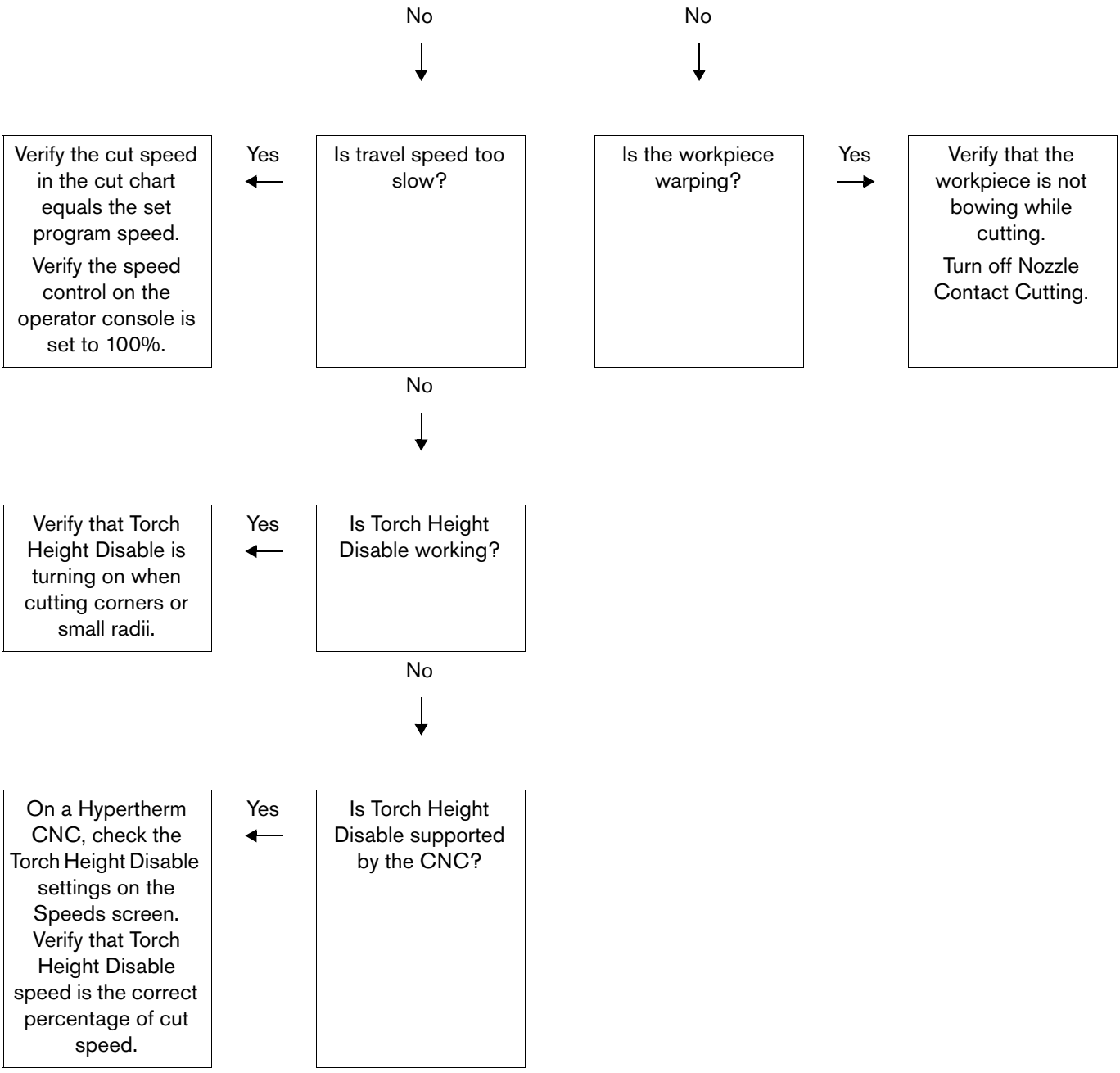
Hypertherm CNC will not communicate with HPR plasma system



Error 19 – Excess plate contact

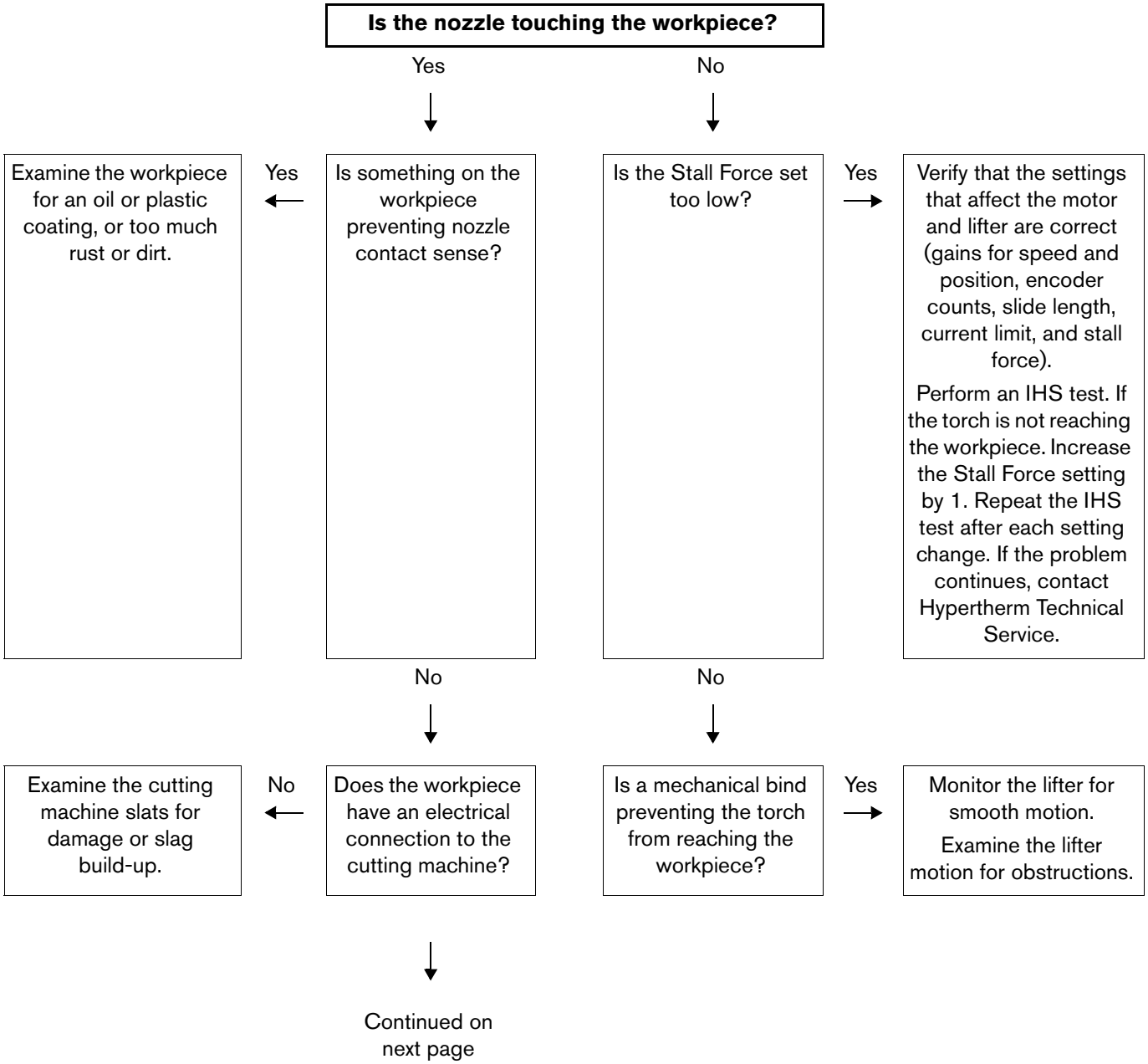
The Nozzle Contact Sense input, while cutting, was turning ON and OFF numerous times in succession or was ON continuously for a period of time.

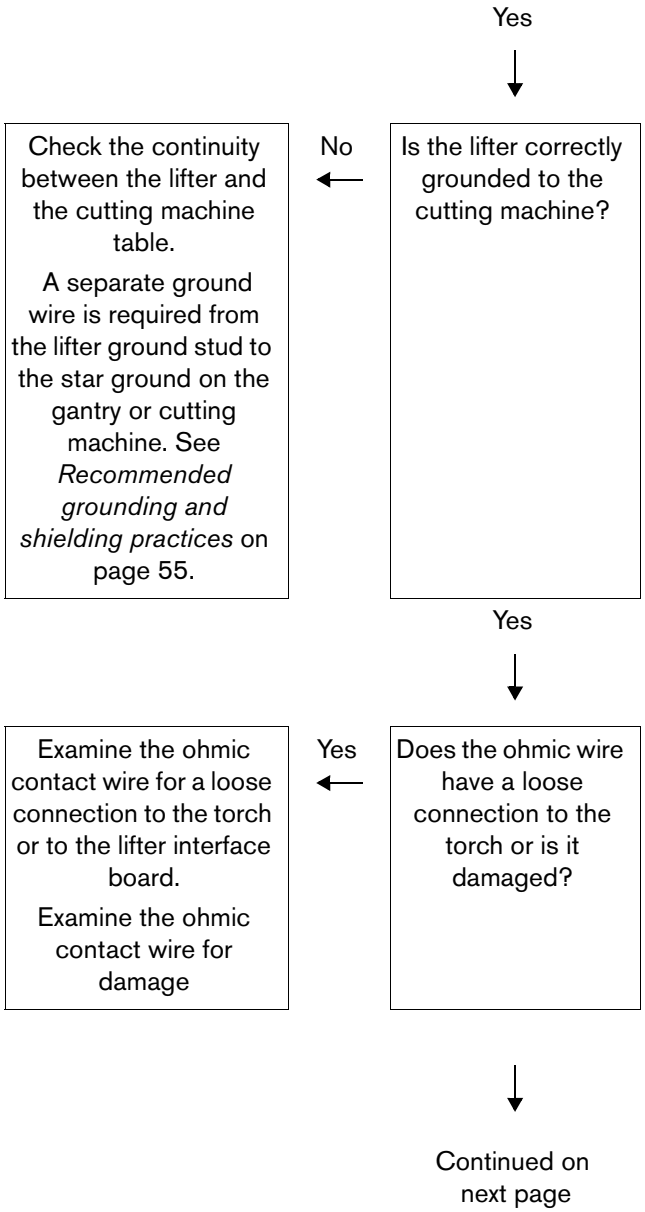


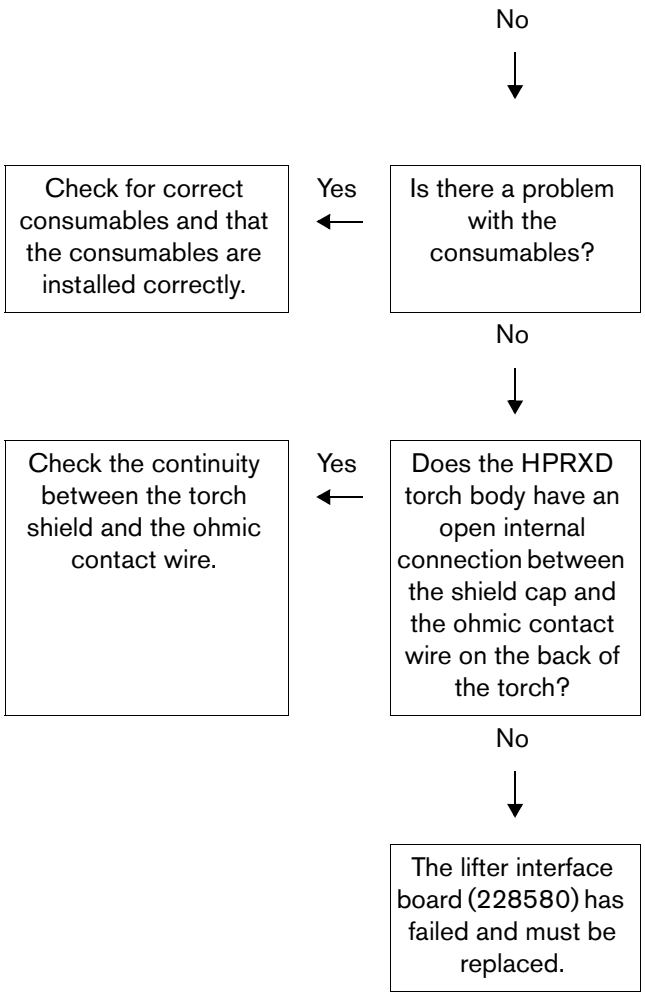

No
No
Verify the cut speed in the cut chart equals the set program speed.
Verify the speed control on the operator console is set to 100%.
Yes
Is travel speed too slow?
Is the workpiece warping?
Yes
Verify that the workpiece is not bowing while cutting.
Turn off Nozzle Contact Cutting.
No
Verify that Torch Height Disable is turning on when cutting corners or small radii.
Yes
Is Torch Height Disable working?
No
On a Hypertherm CNC, check the Torch Height Disable settings on the Speeds screen. Verify that Torch Height Disable speed is the correct percentage of cut speed.
Yes
Is Torch Height Disable supported by the CNC?

Error 21 – Ohmic tip sense

Nozzle Contact Sense input does not turn ON during initial height sense. The ArcGlide uses stall force to sense the workpiece.




Yes
Is the lifter correctly grounded to the cutting machine?
No
Check the continuity between the lifter and the cutting machine table.
A separate ground wire is required from the lifter ground stud to the star ground on the gantry or cutting machine. See *Recommended grounding and shielding practices* on page 55.
Yes
Does the ohmic wire have a loose connection to the torch or is it damaged?
Yes
Examine the ohmic contact wire for a loose connection to the torch or to the lifter interface board.
Examine the ohmic contact wire for damage
Continued on next page


No
Check for correct consumables and that the consumables are installed correctly.
Yes
Is there a problem with the consumables?
No
Check the continuity between the torch shield and the ohmic contact wire.
Yes
Does the HPRXD torch body have an open internal connection between the shield cap and the ohmic contact wire on the back of the torch?
No
The lifter interface board (228580) has failed and must be replaced.

Error message troubleshooting

Error message displays

On the ArcGlide THC, error messages are displayed on both the HMI and the control module. In addition, on Hypertherm CNCs, a system error message window can be set up in the Watch Window. This window displays the last 5 system error messages. See *Watch Window Setup* in the *Phoenix Software Operator Manual (806400)*.

In addition, there is an error log feature in the Phoenix software that captures error messages. See *Diagnostics and Troubleshooting* in the *Phoenix Software Operator Manual (806400)* for more information.

ArcGlide errors

The following tables provide the text that appears in both the HMI and control module displays when an error occurs. The tables also describe the reason for the message and the steps that you can take to correct it. See *Troubleshooting routines* on page 185 for more information.

Normal errors (See *Table 7* on page 192) are cleared with the next Cycle Start signal. Critical errors (See *Table 8* on page 204) must be corrected before you can continue operation.

Table 7 – Normal Errors

Error	Description	Causes	Solutions
0	NO ERRORS	▪ The system is ready to start.	
1	FLASH SETUPS When power is turned OFF, all THC setup parameters are stored in non-volatile flash memory. When power is turned ON, the parameters are verified with a checksum and all values are restored from memory.	▪ When power is turned ON, the parameter checksum does not match the saved parameter checksum. Default parameters will be used only for those parameters that have changed.	▪ Review all setup parameters and restore your setup parameter values if necessary.
		▪ This message is normal after a firmware update for new features or changes to a feature.	▪ If the message occurred after a firmware update, no action is required. ▪ If this error persists with another power cycle, replace the THC processor board (228578) in the control module.
2	MAX SPEED EXCEEDED The THC controls the lifter speed between 5% and 100% of the maximum speed value stored in the ArcGlide Axis setup screen. In a discrete system, if a speed greater than 120% of the maximum value is detected during operation, motion stops and an error displays.	▪ Excess speed was detected during operation.	▪ If this is a newly installed system, verify that these setup parameters are correct: Max Speed, Speed Gain, Encoder Counts per mm (inch). ▪ Turn power OFF then ON to the control module and monitor operation again. ▪ Manually jog the lifter down while watching the display window on the HMI or control module and verify that the position being displayed increases as the torch moves downward. ▪ If the problem continues, contact Hypertherm Technical Service. There could be a faulty motor encoder or a problem with the motor amplifier.
		▪ Speed Gain could be set too high or incorrect values are being used for the Encoder Counts per mm (inch) parameter.	▪ If this is a newly installed system, verify that these setup parameters are correct: Max Speed, Speed Gain, Encoder Counts per mm (inch).
		▪ There could be a problem with the motor's encoder, faulty wiring in the lifter cable, or a faulty motor drive in the control module.	▪ If this is an existing system that was previously working, examine the cable connections to the motor encoder. Verify that the set screws for the mechanical coupling between the motor and lifter slide are tightened correctly. ▪ If the lifter is not a Hypertherm lifter and the installation is new, change the encoder wiring to the control module.

Error	Description	Causes	Solutions
3	LIFTER HOME TIMEOUT While the lifter is moving toward home position, the control module is reading negative motion from the lifter motor but the HOME switch input or stall force was not sensed after a reasonable length of time.	▪ The slide mechanics are malfunctioning.	▪ Verify that the lifter moves when the motor is operating. ▪ Examine the coupling between the motor and the ball screw. Verify that the set screws are tightened correctly. ▪ Examine the lifter cables for damage.
4	PLATE CONTACT AT HOME The Nozzle Contact Sense input turns ON while the lifter is in the home position.	▪ The Nozzle Contact input is active while the upper limit switch is active.	▪ Examine the torch tip for an electrical short between the shield and nozzle. ▪ Turn off Nozzle Contact IHS if the lifter is being used with a water table or water injection torch. ▪ If the torch is an HPRXD torch, ensure the coolant is not conductive.
		▪ The upper limit switch is faulty.	▪ Go to the diagnostic screen in the Hypertherm CNC, HMI, or control module (See *Screen 11 – Last errors* on page 142). Verify that the upper limit switch is operating correctly.
		▪ The nozzle contact wire is damaged.	▪ Examine the ohmic contact wire for damage, and replace it if necessary.
		▪ There is a floating ground.	▪ Verify that the lifter and control module are grounded correctly. The lifter and control module should have separate ground wires between the ground stud on the lifter, control module, and star ground on the gantry or table.

Error	Description	Causes	Solutions
5	HOME LIM DURING OPR The upper limit switch was activated while cutting.	▪ The upper limit switch is faulty.	▪ Verify that the lifter has sufficient range of motion while cutting. Raise the torch in the mounting clamp if needed. ▪ Use the diagnostic screen on the Hypertherm CNC, HMI, or control module to monitor the I/O of the upper limit switch and make sure it is turning ON and OFF.

		▪ Arc voltage feedback was lost while cutting.	▪ Monitor the actual arc voltage while doing a manual cut at a fixed height. If the voltage is displayed as 0.00:
			  ▪ Verify that the arc voltage input to the plasma interface board is set correctly.
			  ▪ Perform the test again. Monitor the arc voltage output from the plasma interface board.
			▪ Examine the power connections to the plasma interface board and the cables to and from the board. If you have a Hypernet plasma interface board, monitor the Hypernet communications to the board from the control module display. If Arc Voltage is read at the Hypertherm CNC, HMI, or control module, but the value is low, refer to the instruction manual for the plasma system for possible gas problems.

6	LOWER LIM DURING OPR During automatic operation or an IHS test, the lower limit switch was activated.	▪ The torch is not positioned correctly in the torch holder. ▪ No torch is installed and an IHS was attempted. ▪ There is no workpiece under the torch and the IHS failed.	▪ Verify that the torch will contact the workpiece while doing an IHS before the lower limit switch is activated. If not, lower the torch in the mounting clamp. ▪ Verify that the torch is over the workpiece while doing an IHS.
		▪ The lower limit switch is faulty.	▪ Go to the diagnostic screen on the Hypertherm CNC, HMI, or control module (See *Screen 11 – Last errors* on page 142). Monitor the operation of the lower limit switch.

Error	Description	Causes	Solutions
7	FAILED MOVE TO IHS START During automatic operation or an IHS test, the lifter failed to reach the IHS Start Height.	▪ The IHS Start Height is set too low.	▪ Verify that the value of IHS Start Height is 19.1 mm (0.75 inch) or more. Lower values will work but at high speeds, the torch may not have enough travel distance to slow down before making workpiece contact. ▪ Disable then enable the torch station, and perform an IHS test. The ArcGlide calculates the travel distance. ▪ Perform the test again. The ArcGlide uses the programmed IHS Start Height.
		▪ Something on the cutting surface is preventing the torch from reaching the IHS Start Height.	▪ Examine for part tip-ups or debris on the surface of the workpiece that can limit the torch travel distance to the workpiece.
8	FAILED TO CONTACT PLATE The torch failed to make workpiece contact (either by Stall Force or by Nozzle Contact) within a reasonable period of time. The timer starts after the lifter has reached the IHS Start Height.	▪ The IHS Start Height has a high programmed value combined with a very slow IHS speed. ▪ The torch needs to be repositioned in the torch mounting clamp.	▪ Decrease the IHS Start Height. ▪ Increase the IHS Speed. ▪ Verify that the torch is tight in the mounting clamp. ▪ Reposition the torch in the mounting clamp. ▪ Manually lower the torch to verify that the torch tip can touch the workpiece.
9	FAILED TO CLEAR PLATE The Nozzle Contact input remains active after making workpiece contact and while the torch is retracting after an IHS.	▪ The ohmic contact wire is damaged.	▪ Examine the ohmic contact wire for damage, and replace it if necessary. ▪ Monitor the Nozzle Contact input in the diagnostic screen of Hypertherm CNC, HMI, or control module. If the input is always ON, disconnect the ohmic contact wire from the lifter interface board and verify that the input is OFF. If the input stays ON, examine the lifter cable for damage. The lifter cable could be faulty or there could be a faulty input to the control module. Call Hypertherm Technical Service for further assistance.
		▪ The nozzle and shield are shorted together or the wrong consumable combination is installed in the torch.	▪ Examine the torch tip for an electrical short between the shield and nozzle. ▪ Examine the consumables for damage, and make sure you are using the correct combination.
		▪ There is a problem with the lifter mechanics.	▪ Verify that the lifter is not binding mechanically and that it can retract.
		▪ Water from a water table is causing a short between the shield and the nozzle.	▪ If you are using a water table or water injection plasma, disable Nozzle Contact IHS and Nozzle Contact Cutting in the Plasma Process screen.

Error	Description	Causes	Solutions
		▪ The coolant conductivity in a HPRXD plasma system is too high.	▪ Flush the coolant system and replace the coolant filter on the HPRXD plasma system.
		▪ The workpiece is bowing during an IHS and following the torch up while the torch is retracting.	▪ Move the IHS to an area of the workpiece that is well supported by the table slats.
10	FAILED TO MOVE TO XFER HT The lifter failed to retract to the programmed Transfer Height after a reasonable period of time.	▪ The lifter cable is damaged.	▪ Examine the lifter cable for damage. ▪ Make sure the Transfer Height setting in the Plasma Process screen is correct.
		▪ The Gain settings for the lifter are causing unstable motion.	▪ If this is a new installation, make sure the Gain settings for the lifter are correct in the Hypertherm CNC or in the HMI on the Installation Data screen. See *ArcGlide axis setup parameters* on page 121.
		▪ There is a mechanical problem with the lifter.	▪ Examine the lifter for binding.
		▪ There is a problem with the encoder.	▪ Jog the motor up and down. Verify that the position is changing and values are incrementing correctly (torch moving down = positive direction).
11	IHS SYNC TIMEOUT The IHS_Sync input to the control module was not released within a reasonable time and after the IHS was complete. This error can occur when the ArcGlide and CNC communicate over Hypernet or a discrete connection.	▪ The CNC is not using the correct logic to operate this input. ▪ There is a faulty input (IHS Complete) or output (IHS_Sync) at the CNC or control module.	▪ If a CNC is using the IHS Sync signal, the IHS Complete output must be used. ▪ Make sure the Hold settings within the CNC are correct. ▪ Monitor the IHS Sync output from the CNC to the THC. Force the output at the CNC to be ON, and monitor the IHS Sync input at the control module. ▪ Jump out the IHS Complete output and verify that the IHS Complete input at the CNC turns ON.
		▪ The CNC I/O cable is damaged.	▪ Examine the CNC I/O cable for damage.
12	TRANSFER TIMEOUT The ArcGlide did not receive the Transfer signal from the plasma system before the transfer time elapsed	▪ The torch did not produce an arc.	▪ Determine if the plasma system has an error. ▪ Verify that the torch is firing over the workpiece. ▪ Examine the plasma interface cable for damage.

Error	Description	Causes	Solutions
		▪ There is a faulty Transfer (or Motion) output from the plasma system.	▪ Monitor the Plasma Start input to the plasma system. If the torch fires: ▪ Examine the Plasma Start wiring at the plasma interface board. ▪ Verify that the torch consumables and cutting process are correct. ▪ Examine the plasma interface cable for damage. ▪ Verify that the Motion and Transfer outputs from the plasma system are working correctly.
		▪ In a discrete system, there is a faulty input (Transfer) to the control module.	▪ In a discrete system: ▪ Monitor the Plasma Start input to the control module. ▪ Monitor the Transfer (or motion) output from the plasma system. ▪ Monitor the Transfer input to the control module.
13	LOST TRANSFER The Transfer signal was lost before the Arc Glide removed the Plasma Start signal from the plasma system.	▪ When cutting scrap, the torch moves off the edge of the workpiece.	▪ Examine the consumables for damage. If you are cutting scrap, this error is normal but will reduce the consumable life. ▪ Determine if the plasma system has an error. ▪ Perform an IHS test and verify that the torch is retracting to the pierce height listed in the plasma system cut chart. ▪ Verify that the Hypertherm CNC Arc Off Time is correct. A small time should be used, usually no longer than 0.1 seconds. An Arc Off Time that is too high can prevent the error from occurring but could result in poor consumable life. ▪ Verify that the arc is shutting off over metal.
		▪ The lead-outs are too long, especially when cutting holes and the arc is stretching out as the slag falls into the table.	▪ Verify that the lead-out length is correct, especially if you are cutting holes.
		▪ There is a faulty connection between the workpiece, the cutting surface, and the work lead of the plasma system.	▪ Verify that the workpiece, table surface, and work lead are electrically connected. Heavy slag build-up on the workpiece can result in a poor connection between the plasma arc and the work lead.
		▪ The Transfer Height or Pierce Height is set too high.	▪ Verify that the Transfer Height (or Pierce Height) setting in the Plasma Process screen or in the Plasma menu in the control module is correct.

Error	Description	Causes	Solutions
		▪ There is a damaged or loose work lead connection on the plasma system.	▪ Examine the plasma system's work lead for damage or loose connections.
		▪ There is a loose connection or damaged plasma interface cable.	▪ Examine the plasma interface cable for damage or loose connections.
14	FAILED MOVE TO PIERCE The torch failed to retract to the Pierce Height after the arc transfer and after a reasonable amount of time. The torch retracts to a Transfer Height after IHS, which may be equal to the Pierce Height. After ignition and the arc transfer input activates, the torch then retracts to Pierce Height if the value is not equal to Transfer Height.	▪ Pierce Height is set too high.	▪ Verify that Pierce Height is set correctly in the CNC or in the HMI.
		▪ The Gain settings in the control module are set incorrectly.	▪ Verify the Gain settings in the Hypertherm CNC or in the HMI, on the Installation Data screen. See *ArcGlide axis setup parameters* on page 121.
		▪ A mechanical bind is preventing the torch from retracting after arc transfer.	▪ Examine the lifter for mechanical binding or slipping of the drive mechanism.
		▪ A mechanical loose connection in the lifter is preventing the torch from retracting to the pierce height after arc transfer.	▪ Examine the lifter for other mechanical binds that are preventing the lifter from moving.
15	FAILED MOVE CUT HEIGHT The torch failed to reach the Cut Height after motion started and after AVC delay time expired. After Pierce Delay (Pierce Time in Phoenix software), the torch goes to puddle jump and motion starts. The torch drops to cut height after the cut height delay. At this point the AVC delay time begins. If the position of the lifter is not equal to the cut height after the AVC delay, motion stops and the error displays.	▪ The Cut Height is set too low or too high.	▪ Verify that the Cut Height is set correctly in the CNC or in the HMI.
		▪ The Gain settings shown in the control module are set incorrectly.	▪ Verify the Gain settings in the Hypertherm CNC or in the HMI, on the Installation Data screen. See *ArcGlide axis setup parameters* on page 121.
		▪ A mechanical bind is preventing the torch from moving to the cut height position. ▪ A mechanical loose connection in the lifter is preventing the torch from moving to the cut height position.	▪ Examine the lifter for mechanical binding or slipping of the drive mechanism. ▪ Examine the lifter for other mechanical binds that are preventing the lifter from moving.

Error	Description	Causes	Solutions
16	RAMPDOWN TIMEOUT The Transfer signal from the plasma system remained active at the end of the cut and remained on longer than a reasonable amount of time.	▪ There is a faulty or loose connection to the plasma system transfer (or motion output). ▪ A plasma interface cable has been damaged. ▪ In discrete systems, there is a faulty Transfer input to the control module. ▪ There is a faulty Plasma Start output on the plasma interface board or control module.	▪ Examine the cables between the control module, the plasma interface board, and the control board of the plasma system. ▪ Repair loose or damaged cables. ▪ In a discrete system, make sure the Plasma Start output from the control module is ON. ▪ Make sure the Plasma Start output from the plasma interface board to the plasma system control module is active. ▪ Monitor the Transfer output on the plasma system control board. If the plasma arc actually extinguishes, verify that the transfer current sensor in the plasma system is active.
17	RETRACT TIMEOUT The lifter failed to retract to the Retract Height at the end of the cut and within a reasonable amount of time.	▪ Retract Height is set too low or too high. ▪ A mechanical bind is preventing the torch from moving to the retract height position. ▪ A mechanical loose connection in the lifter is preventing the torch from moving to the Retract Height.	▪ Verify that the Retract Height is set correctly in the CNC or HMI, on the Setup screen. ▪ Examine the lifter for mechanical binding or slipping of the drive mechanism.
		▪ The Gain settings in the control module are set incorrectly.	▪ Verify that the Gain settings in the Hypertherm CNC or in the HMI, on the Installation Data screen, are correct. See *ArcGlide axis setup parameters* on page 121.

Error	Description	Causes	Solutions
18	ERR SAMPLE ARC VOLTAGE With Sample Voltage ON, the arc voltage samples from cut to cut were out of the sample range. This error can occur if the arc voltage sample on the next cut is not within a given range from the voltage sample of the previous cut. For example, if the sample voltage of the previous cut was 120 VDC and the sample voltage of the next cut is 170 VDC, cutting stops and the error displays. The IHS at the next pierce point could not be performed accurately.	▪ The lifter is stalling before reaching the workpiece.	▪ Perform an IHS test and verify that the torch is retracting to the transfer height accurately. ▪ The Stall Force is set too high. (Nozzle Contact is OFF.) ▪ If the problem continues and cut quality is affected, disable Sample Voltage mode and see if the cut quality improves.
		▪ There is slag build-up on the bottom of the shield.	▪ Examine the shield for slag build-up.
		▪ The workpiece is not lying flat on the table.	▪ Verify that the workpiece is lying flat and not warping while cutting. If so, set Nozzle Contact Cutting to OFF in the Plasma Process screen.
		▪ The consumables were changed and the consumable counter in the ArcGlide was not reset. ▪ The consumables are damaged. ▪ The wrong consumables are in the torch or the plasma system is using the wrong cutting process.	▪ Verify that the consumable life counter on the ArcGlide was reset after changing the consumables. ▪ Examine the consumables for damage, and verify that the cutting process is correct.
		▪ There is a problem with plasma system.	▪ Verify that the plasma system does not have any gas leaks or restrictions.

Error	Description	Causes	Solutions
19	EXCESS PLATE CONTACT The Nozzle Contact input, while cutting, was turning ON and OFF numerous times in succession or was ON continuously for a period of time. This error can occur whether or not the nozzle is contacting the workpiece. For a flow chart, see *Error 19 – Excess plate contact* on page 186.		
	The nozzle is contacting the workpiece	▪ Arc Voltage Control is off.	▪ Enable Arc Voltage Control.
		▪ The Arc Voltage setpoint is set too low.	▪ Verify that the Arc Voltage setpoint matches the value in the plasma cut chart.
		▪ Sample Voltage is ON and the IHS is inaccurate.	▪ If Sample Voltage is ON, verify that the torch height is correct by performing an IHS test.
		▪ The travel speed is too slow.	▪ Verify that the cut speed equals the cut speed in the cut chart. If the value is red, the speed control on the operator console is overriding the travel speed.
		▪ The Torch Height Disable is not turning ON when approaching or exiting corners, holes, cutting a small radius, or when crossing a kerf. Torch Height Disable should be OFF when the cutting machine is moving at program speed. Torch Height Disable should turn ON when cutting corners, a small radius, or other situations when the cut speed is slower than program speed. Torch Height Disable should be ON when piercing.	▪ In a discrete connection to the ArcGlide control module, check the output wiring at the CNC and the input wiring at the ArcGlide. ▪ Verify the Torch Height Disable settings in the Speeds screen of the Phoenix software are set correctly. Torch Height Disable speed defines the percentage of the Cut Speed at which to disable the torch height control.
		▪ The workpiece is not lying flat on the table or is warping due to heat from the arc.	▪ Verify that the workpiece is lying flat and not warping while cutting. If so, set Nozzle Contact Cutting to OFF in the Plasma Process screen.
		▪ Error occurs only when marking.	▪ If the problem occurs while marking, verify that these parameters are set according to the marker cut chart: ▪ Marking Speed ▪ Marking Height ▪ Set Arc Voltage
	The nozzle is not contacting the workpiece.	▪ There is slag build-up between the shield and the nozzle.	▪ Examine the consumables for damage or slag build-up between the shield and nozzle.
		▪ The ohmic contact wire shorted to ground after the cut started.	▪ Examine the ohmic contact wire for damage to the insulation around the wire.
		▪ The torch is operating in a water table and the water is above the surface of the workpiece.	▪ If you are cutting in a water table, set Nozzle Contact Cutting to OFF in the Plasma Process screen.

Error	Description	Causes	Solutions
20	PLASMA SUPPLY The plasma system has reported an error condition.	▪ The plasma system is producing an error. ▪ In a discrete system, there is a loose or damaged connection to the Error input at the control module or plasma interface board.	▪ Determine if the plasma system has an error. ▪ Examine the Error input wiring to the plasma interface board. ▪ In a discrete system, examine the plasma I/O cable for damage. ▪ Verify that the Error output is not continuously ON at the plasma system. ▪ Verify that the Error input is functioning on the plasma interface board and control module.
21	OHMIC TIP SENSE Nozzle Contact Sense input does not turn on during initial height sense. The ArcGlide uses stall force to sense the workpiece. This error can occur whether or not the nozzle is contacting the workpiece. For a flow chart, see *Error 21 – Ohmic tip sense* on page 188.		
	The nozzle is contacting the workpiece	▪ Something on the workpiece is preventing ohmic contact.	▪ Verify that the workpiece is conductive. An oil or plastic coating, or too much dirt or rust can prevent ohmic contact.
		▪ The workpiece does not have a good electrical connection to the cutting machine.	▪ Examine the cutting machine slats for damage or slag build-up.
		▪ The lifter is not correctly grounded to the cutting machine.	▪ Check the continuity between the lifter and the cutting machine table. ▪ A separate ground wire is required from the lifter ground stud to the star ground on the gantry or cutting machine.
		▪ The ohmic contact wire has a loose or open connection to the torch or it is damaged.	▪ Examine the ohmic contact wire for a loose connection to the torch or to the lifter interface board. ▪ Examine the ohmic contact wire for damage.
		▪ There is a problem with the torch consumables.	▪ Check for correct consumables and that the consumables are installed correctly.

Error	Description	Causes	Solutions
		▪ The HPRXD torch body has an internal open connection between the shield cap and ohmic contact wire on the back of the torch.	▪ Check the continuity between the torch shield (nozzle) and the ohmic contact wire.
		▪ The lifter interface board (228580) has failed and must be replaced.	▪ Contact Hypertherm Technical Service.
	The nozzle is not contacting the workpiece.	▪ Stall Force is set too low.	▪ Verify that the settings that affect the motor and lifter are correct (gains for speed and position, encoder counts, slide length, current limit, and stall force). ▪ Perform an IHS test. If the torch is not reaching the workpiece, increase the Stall Force setting by 1. Repeat the IHS test after each setting change. If the problem continues, contact Hypertherm Technical Service.
		▪ A mechanical bind is preventing the torch from reaching the workpiece.	▪ Monitor the lifter for smooth motion. ▪ Examine the lifter motion for obstructions.

Table 8 – Critical Errors

Error	Description	Causes	Solutions
23	INPUT VOLTAGE LOW The AC Input Voltage to the control module exceeds the low tolerance limit.	▪ The control module is configured for 220 VAC and 120 VAC is being applied. ▪ There is a problem with the incoming voltage to the control module.	▪ Verify that the control module is configured for the line voltage being applied. ▪ Verify that the incoming voltage to the control module is correct.
24	INPUT VOLTAGE HIGH The AC Input Voltage to the control module exceeds the high tolerance limit.	▪ The control module is configured for 120 VAC and 220 VAC is being applied.	▪ Verify that the control module is configured for the line voltage being applied. ▪ Verify that the incoming voltage to the control module is correct.
25	OVER TEMPERATURE The temperature of the processor in the control module is too high. Allow the control module to cool down to within the normal operating temperature before continuing operation of the ArcGlide.	▪ The ambient temperature is too high for the control module. ▪ There is an internal failure with the control module.	▪ Verify that the ambient temperature does not exceed the recommended operating temperature of -10°C to 40°C (14°F to 104°F). ▪ If fans or coolers are present, verify that they are functioning correctly. ▪ If this error occurs repeatedly, contact Hypertherm Technical Service.
		▪ The control module is located inside a cabinet where the air is not circulating or the fans inside the cabinet are not functioning.	▪ If the control module is mounted inside a cabinet, measure the ambient temperature inside the cabinet. Verify that air is continuously circulating inside the cabinet.
		▪ The control module is mounted too close to other heat dissipating devices or components.	▪ Verify that other heat dissipating components are not mounted too close to the control module.
26	MOTOR DRIVE The the temperature of the motor drive in the control module is too high. Allow the control module to cool down to within the normal operating temperature before continuing to operate the ArcGlide.	▪ The ambient temperature is too high for the motor drive. ▪ There is an internal failure with the control module.	▪ Verify that the ambient temperature does not exceed the manufacturer's recommended operating temperature. ▪ If fans or coolers are present, verify that they are functioning correctly. ▪ If this error occurs repeatedly, contact Hypertherm Technical Service.
		▪ The control module is located inside a cabinet and the air is not circulating or the fans inside the cabinet are not functioning.	▪ If the control module is mounted inside a cabinet, measure the ambient temperate within the cabinet. Verify that air is continuously circulating inside the cabinet.

Error	Description	Causes	Solutions
		▪ The control module is mounted too close to other heat dissipating devices or components.	▪ Verify that other heat dissipating components are not mounted too close to the control module.
		▪ The lifter has a mechanical bind.	▪ Examine the lifter and torch leads for mechanical binding.
		▪ A non-Hypertherm lifter is drawing to much current.	▪ Contact the lifter manufacturer.
27	INTERLOCK TRIPPED The interlock input is activated.	▪ An E-stop is depressed on the cutting machine. There is a damaged or open wire in the cutting machine's E-stop circuit.	▪ Verify that all E-stops on the cutting machine are disengaged. ▪ Examine the E-stop circuit for damage or a loose connection. Contact your table manufacturer.
		▪ The interlock input was not wired as part of the CNC interface to the control module. ▪ There is a loose connection to the interlock input.	▪ Wire the interlock input to the E-stop circuit for the cutting machine. ▪ If this is a new installation, verify that the interlock input is being used and is part of the CNC I/O interface to the control module.
28	BREAKAWAY TRIPPED The magnetic torch breakaway has separated.	▪ The torch made excessive workpiece contact or made contact with the cutting machine.	▪ Re-install the magnetic torch breakaway. ▪ Verify that the torch is not diving into the workpiece or hitting an obstruction while cutting.
		▪ There is debris between the 2 halves of the magnetic torch breakaway.	▪ Clean the surface of magnetic breakaway.
		▪ There is a faulty proximity switch in the torch breakaway.	▪ Verify that the proximity switch LED illuminates when placing a metallic object over the switch.
		▪ The lifter I/O cable is damaged.	▪ Examine the lifter I/O cable for damage.
29	FIELD SUPPLY FAILED The +5 V, +/-12 V, or +24 V supplies are not within their normal operating range.	▪ 120 VAC is applied to the control module and control module is configured for 220 VAC.	▪ Verify that the control module is configured for the correct line voltage.
		▪ A damaged cable is loading down one of the control module's internal voltages.	▪ Examine all cables that are plugged into the control module and plasma interface board for damage.
		▪ The electrical load that is being applied to the 24 VDC source of the control module is too high.	▪ Look for excess external loading on the +24 V supply.
		▪ A faulty component external to the control module is loading down one of the voltages.	▪ Verify that all external components (relays, proximity switches, etc.) operate correctly.
		▪ The unit is overheating due to high ambient temperatures.	▪ If the unit is operating at a high temperature, allow it to cool.

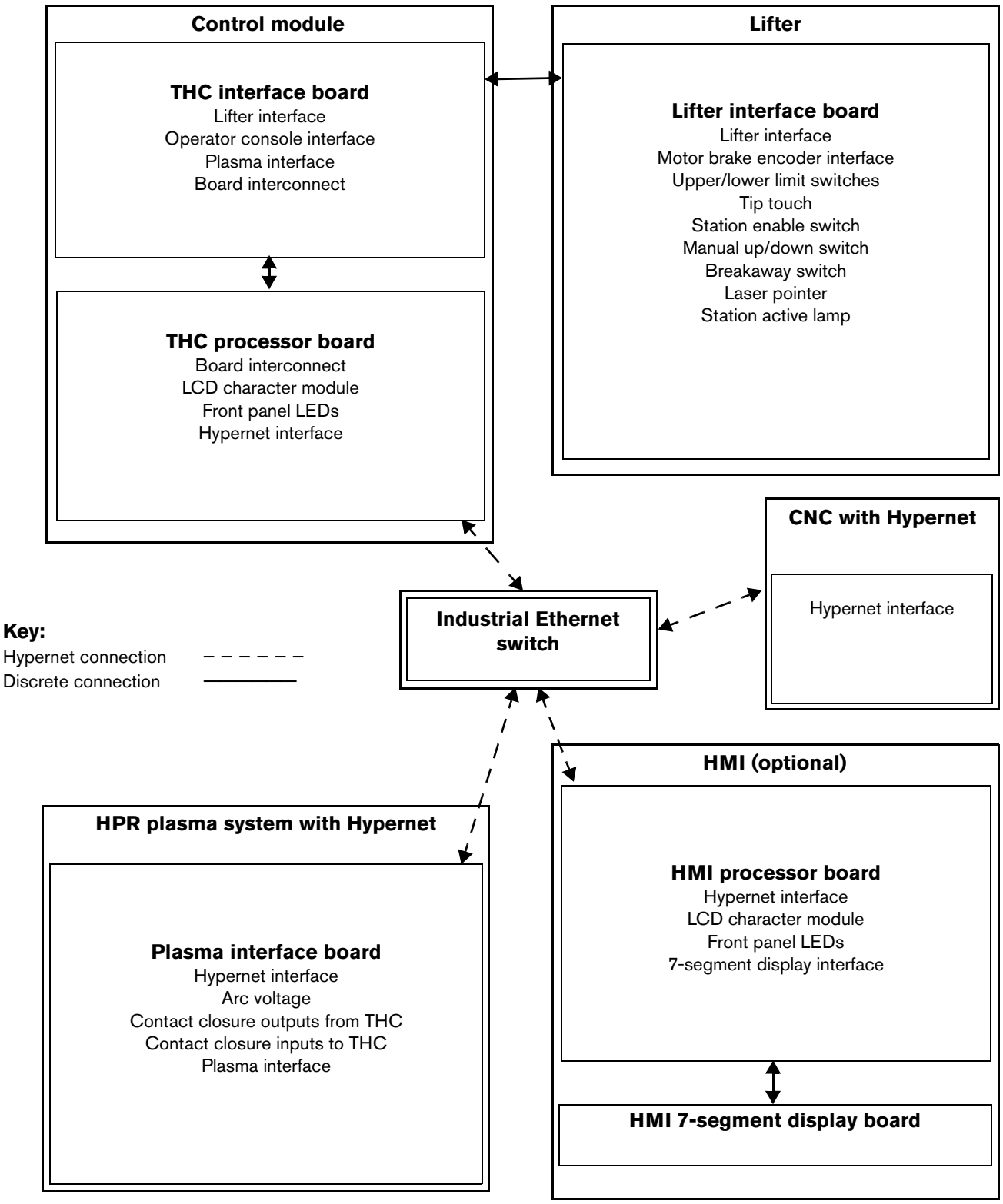
Error	Description	Causes	Solutions
30	LIFTER CALIBRATION The lifter calibration process failed after the lifter was homed.	▪ The lifter failed to home correctly.	▪ Verify that the upper limit switch is functioning correctly. ▪ Home the lifter and verify that the lifter is homing correctly.
		▪ The Gain settings are not factory settings.	▪ Verify that the Speed Gain and Current Limit are correct. See *ArcGlide axis setup parameters* on page 121.
		▪ The lifter has a mechanical bind or loose drive coupling.	▪ Examine the lifter and torch leads for mechanical binding.
		▪ The current limit is set too low.	▪ Examine the motor drive and position encoder for correct operation.
31	NO HYPERNET CONNECTION The control module is unable to communicate with either the CNC or the HMI. If an HMI is part of the ArcGlide system, a Hypernet connection is required to the control module.	▪ The Hypernet setting in the CNC is set to NO.	▪ Verify that the Hypernet setting in the CNC is set to ON and that all ArcGlide setup screens are correctly configured.
		▪ The Ethernet cable is not plugged into the Hypernet port of the CNC or the HMI.	▪ Examine the Ethernet cables connecting to HMI, the CNC, and the Hypernet plasma interface board. ▪ Examine all cables for damage.
		▪ The Ethernet switch is not receiving power or not receiving it correctly.	▪ Verify that the Ethernet switch is correctly turned ON.
		▪ The control module, the Hypernet plasma interface board, and the HMI are not addressed correctly.	▪ Verify that all related units are turned ON and addressed to the same unit number.
32	LOST CNC HYPERNET The CNC lost the Hypernet connection after it was established.	▪ The CNC is not turned ON and the control module is turned ON.	▪ Verify that the CNC has correctly turned ON.
		▪ The Hypernet setting in the CNC is set to NO.	▪ Verify that the Hypernet setting in the CNC is set to ON and that all ArcGlide setup screens are correctly configured.
		▪ An Ethernet cable is unplugged or damaged.	▪ Examine the Ethernet cables connected to the HMI or CNC. ▪ Examine the Ethernet cables for damage.
		▪ The Ethernet switch is not receiving power or not receiving it correctly.	▪ Verify that the Ethernet switch is correctly turned ON. ▪ Verify that all related units are turned ON and addressed to the unit number.

Error	Description	Causes	Solutions
33	LOST HMI HYPERNET The HMI lost the Hypernet connection after it was established.	▪ The HMI is not turned ON.	▪ Verify that the HMI is turned ON.
		▪ An Ethernet cable is unplugged or damaged.	▪ Examine the Ethernet cables connecting to HMI to the control module, and to the Ethernet switch. ▪ Examine the Ethernet cables for damage.
		▪ The Ethernet switch is not turned ON correctly.	▪ Verify that the Ethernet switch is correctly turned ON. ▪ Verify that all related units are turned ON and addressed to the unit number.
34	ENCODER OVERFLOW The internal position counter has counted beyond its maximum value.	▪ There is electrical noise on the lifter cable or the cable is not correctly shielded or grounded. ▪ The motor drive board in the control module is faulty.	▪ Verify that the lifter cable is correctly shielded and grounded to the control module and to the lifter assembly. ▪ Verify that the system is correctly grounded.
		▪ There is an incorrect encoder setting in either the control module or in the CNC. ▪ The encoder on the motor is faulty.	▪ Look at the encoder counts in the control module or CNC. Verify that the settings are the default settings. See *ArcGlide axis setup parameters* on page 121. ▪ Monitor the operation of the motor and encoder from the diagnostic screen of the CNC or at control module (See *Screen 6 – Outputs from the lifter control board* on page 139).
		▪ The lifter interface cable is damaged.	▪ Examine the lifter interface cable for damage.
35	ENCODER UNDERFLOW The internal position counter has counted below its minimum value.	▪ There is electrical noise on the lifter cable or the cable is not correctly shielded or grounded. ▪ The encoder on the motor is faulty. ▪ The motor drive board in the control module is faulty.	▪ Verify that the lifter cable is correctly shielded and grounded to the control module and to the lifter assembly. ▪ Verify that the system is correctly grounded.
		▪ There is an incorrect encoder setting in either the control module or in the CNC.	▪ Look at the encoder counts in the control module or CNC. Verify that the settings are the default settings. See *ArcGlide axis setup parameters* on page 121. ▪ Monitor the operation of the motor and encoder from the diagnostic screen of the CNC or at control module (See *Screen 6 – Outputs from the lifter control board* on page 139).

Error	Description	Causes	Solutions
		▪ The lifter interface cable is damaged.	▪ Examine the lifter interface cable for damage.
36	HYPERNET ADDRESSING The number of Hypernet packets that dropped out exceeded the maximum number.	▪ The Hypernet components are not addressed correctly. ▪ The Ethernet cable is loose or damaged.	▪ Verify that the unit addresses on all the Hypernet devices on each station have the same unit address. ▪ Examine all Ethernet cable connections. ▪ Examine all Ethernet cables for damage.
37	SOFTWARE FAILURE	▪ The microprocessor cannot be programmed.	▪ Restart the ArcGlide control module. ▪ Contact your table manufacturer to replace the THC processor board (228578) in the control module.
38	SOFTWARE LOOP TIME The 10 ms control loop time was exceeded.	▪ The Ethernet cable is loose or damaged.	▪ Examine all Ethernet cables and cable connections to verify that they are not damaged or loose.
		▪ Spare input 2 on the CNC is being used.	▪ Spare input 2 is reserved for factory use only. Do not use Spare input 2.
		▪ Electrical interference can occur when the ArcGlide and drives are sharing power.	▪ Isolate electrical noise between ArcGlide and drive power. ▪ Check for low line voltage.
39	SOFTWARE UNDEF DISPLAY There's an invalid value on the Diagnostics screen.	▪ The THC processor board in the control module is not operating correctly.	▪ Contact your local Hypertherm Technical Service representative to replace the THC processor board or update the ArcGlide firmware.
40	SOFTWARE ANALOG INPUT An invalid input channel was selected.	▪ Pins on a cable connector are not transmitting the expected signal.	▪ Examine all of the cable connections on the control module.
41	PROTOCOL MISMATCH	▪ Software versions are not the same in all of the units that are connected to Hypernet.	▪ Turn ON power to the CNC, plasma system, ArcGlide HMI, and control module then update the ArcGlide firmware. See *Update ArcGlide firmware* on page 180 for instructions.
42	LOST PAC HYPERNET The ArcGlide control module lost the Hypernet connection to the plasma system.	▪ The Hypernet cable is disconnected between the control module, the Ethernet switch, and the plasma system.	▪ Verify that the plasma system is turned ON ▪ Examine all Hypernet connections.

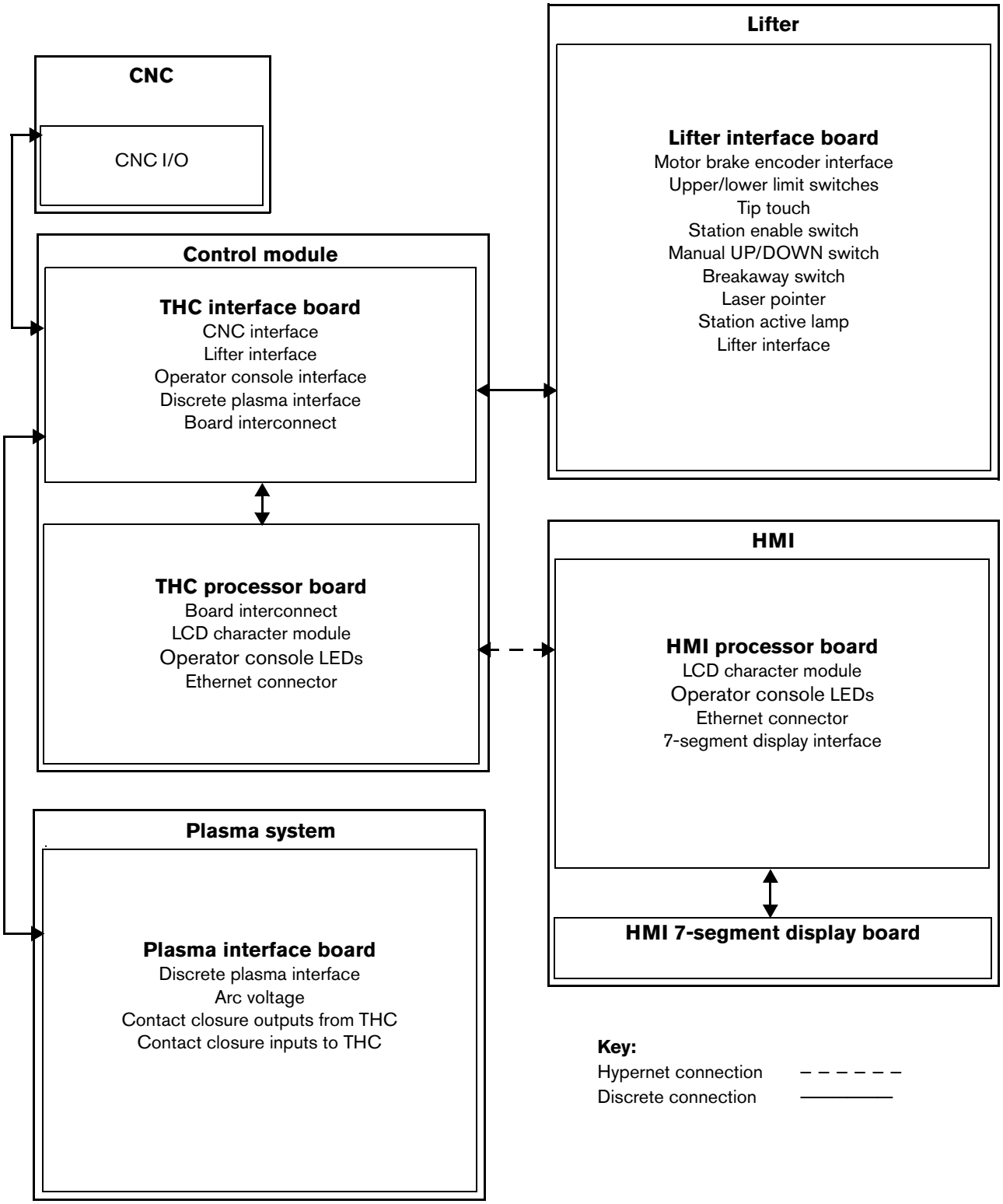
Printed circuit board (PCB) block diagram for a Hypernet configuration

Figure 46



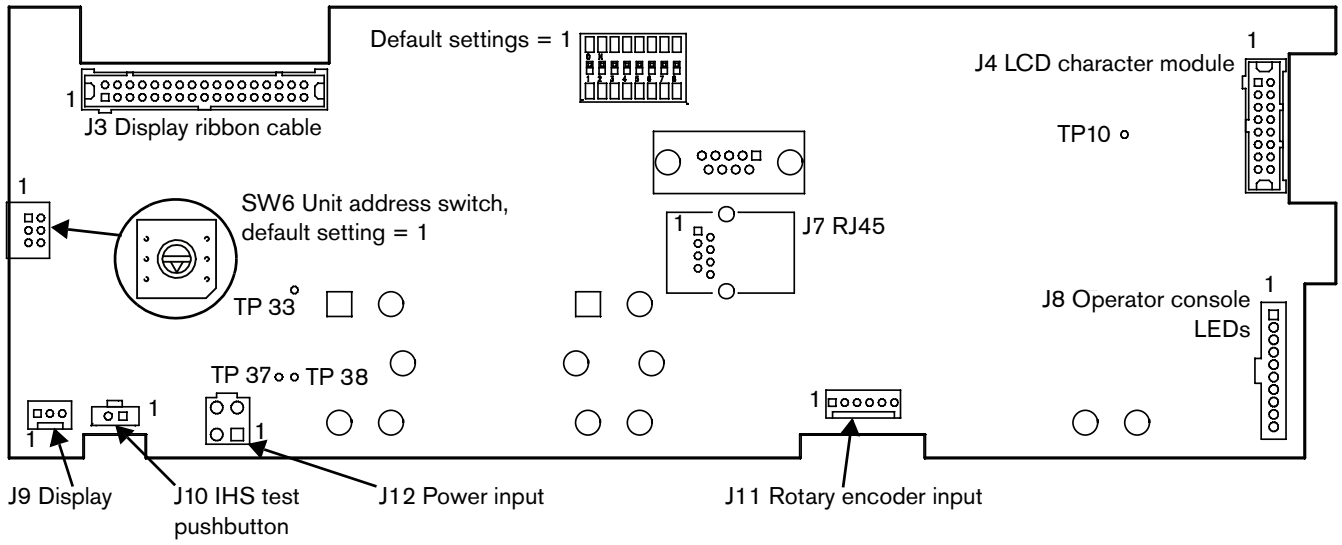
Printed circuit board (PCB) block diagram for a discrete configuration

Figure 47



ArcGlide PCBs

HMI processor board (228581)



In a Hypernet configuration, the Unit address switch (SW6) on the HMI processor board must have the same address as the Unit address switch on the THC processor and the Hypernet plasma interface boards. The default setting is 1.

Test points	
Test point No.	**Signal**
TP10	+2.5 VDC
TP33	+3.3 VDC
TP37	+5 VDC
TP38	Ground

J4 LCD character module			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	DB6	**2**	DB7
3	DB4	**4**	DB5
5	DB2	**6**	DB3
7	DB0	**8**	DB1
9	WR\	**10**	E1 (lines 1 and 2)
11	Vee	**12**	RS
13	VOC	**14**	Vss
15	Not connected	**16**	E2 (lines 3 and 4)

J7 RJ45			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	Tx + (transmit data +)	**2**	Tx - (transmit data -)
3	Rx + (receive data +)	**4**	Not connected
5	Not connected	**6**	Rx - (receive data -)
7	Not connected	**8**	Not connected

J8 Front panel LEDs			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	+LED V	**2**	+LED V
3	Start LED	**4**	Motion LED
5	Limit LED	**6**	AVC LED
7	Error LED	**8**	Contact LED
9	Spare1 LED	**10**	Spare1 LED

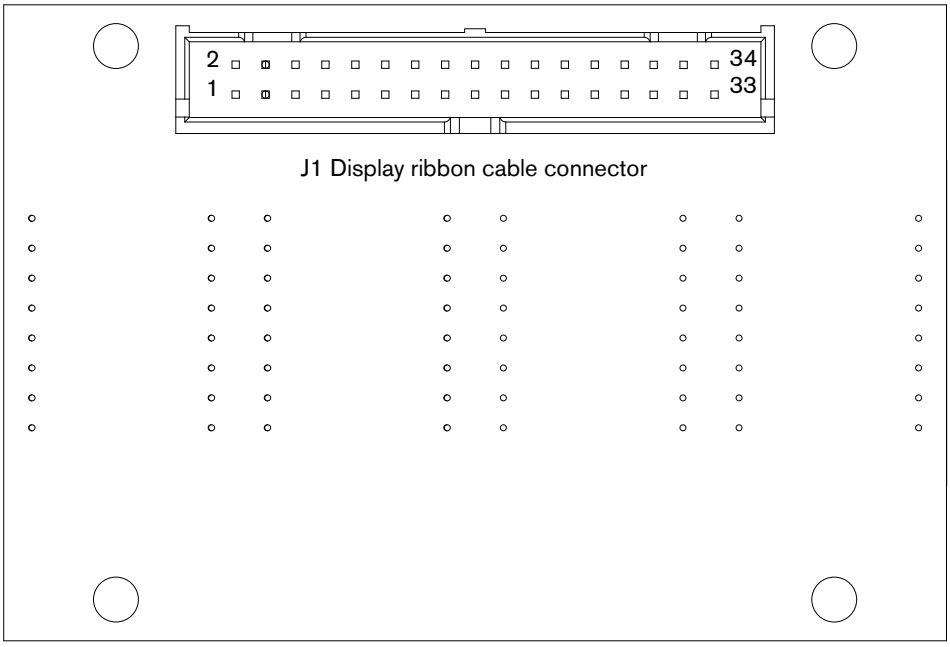
J9 Display	
Pin No.	**Signal**
1	+5 V
2	Ground
3	Not connected

J10 IHS test push button	
Pin No.	**Signal**
1	Ground
2	IHS test

J11 Front panel rotary encoder input	
Pin No.	**Signal**
1	Ground
2	Ground
3	Pushbutton-A
4	Output B
5	Output A
6	+5 V

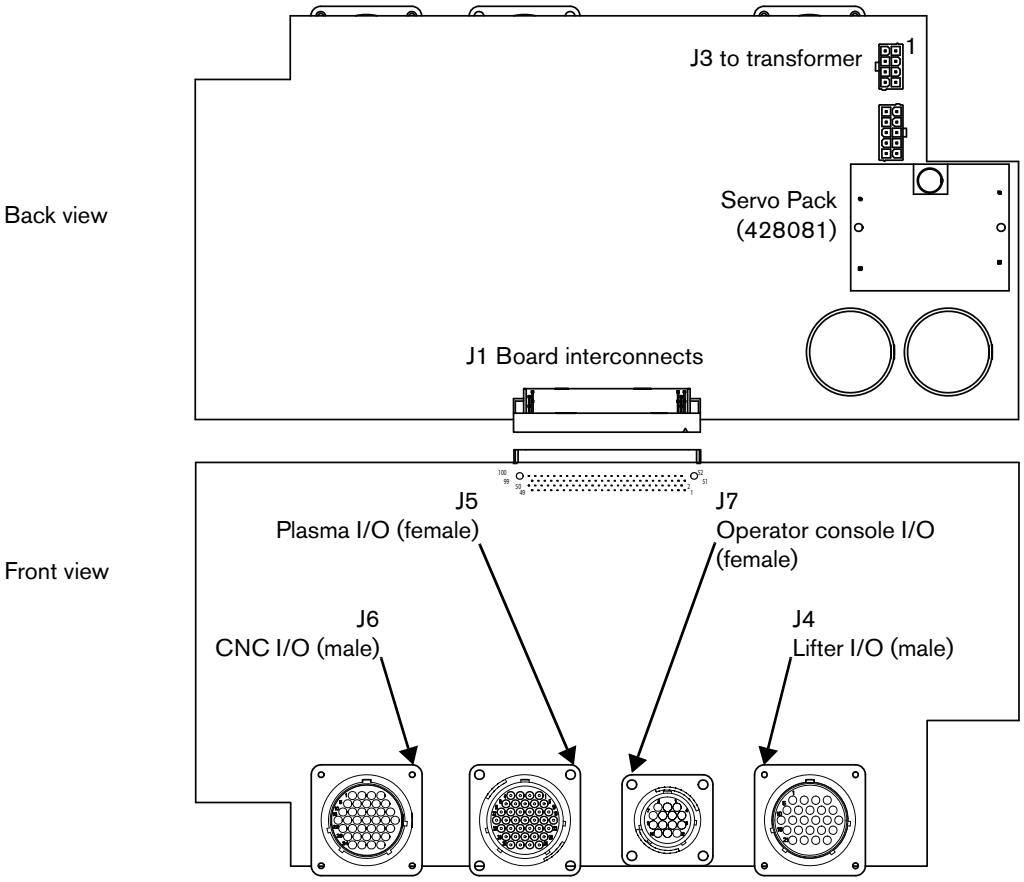
J12 Power connector	
Pin No.	**Signal**
1	+5 V
2	Ground
3	Common
4	Not connected

HMI 7-segment display interface board (228582)



J3 Display ribbon cable			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	+LED V	**2**	+LED V
3	Ones decimal point	**4**	Ones G
5	Ones F	**6**	Ones E
7	Ones D	**8**	Ones C
9	Ones B	**10**	Ones A
11	Tens decimal point	**12**	Tens G
13	Tens F	**14**	Tens E
15	Tens D	**16**	Tens C
17	Tens B	**18**	Tens A
19	Hundreds decimal point	**20**	Hundreds G
21	Hundreds F	**22**	Hundreds E
23	Hundreds D	**24**	Hundreds C
25	Hundreds B	**26**	Hundreds A
27	Thousands decimal point	**28**	Thousands G
29	Thousands F	**30**	Thousands E
31	Thousands D	**32**	Thousands C
33	Thousands B	**34**	Thousands A

THC control interface board (228577)



J3 To transformer	
Pin No.	**Signal**
1	115 V input 1
2	115 V input 2
3	115 V input 3
4	115 V input 4
5	45 V output line 1
6	45 V output line 2
7	22 V output line 1
8	22 V output line2

J1 Board interconnects			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	CNC Cycle Start input	**2**	CNC IHS Complete output
3	CNC IHS Disable input	**4**	CNC Retract Complete output
5	CNC AVC Disable input	**6**	CNC Machine Motion output
7	CNC IHS Sync input	**8**	CNC Error output
9	+5 VDC	**10**	Ground
11	CNC spare 1 input (Do not use)	**12**	CNC Breakaway output
13	CNC spare 2 input (Do not use)	**14**	CNC spare output
15	Interlock	**16**	CNC Dry Inputs 24 V
17	Not connected	**18**	Not connected
19	+5 VDC	**20**	Ground
21	Plasma Motion input	**22**	Plasma Corner output
23	Plasma Error input	**24**	Plasma Pierce output
25	Plasma Ramp Error input	**26**	Plasma Hold output
27	Plasma Not Ready input	**28**	Plasma Start output
29	+5 VDC	**30**	Ground
31	Plasma spare input	**32**	Plasma spare output
33	Plasma RS-422 RX	**34**	Plasma RS-422 Tx
35	Not connected	**36**	Plasma Dry Inputs 24 V
37	Lifter Station Enable	**38**	Plasma Remote On output
39	+5 VDC	**40**	Ground
41	Lifter Lower Limit input	**42**	Lifter Brake output
43	Lifter Upper Limit input	**44**	Not connected
45	Lifter Breakaway input	**46**	Not connected
47	Lifter Manual Up input	**48**	Not connected
49	+5 VDC	**50**	Ground
51	Lifter Manual Down input	**52**	Operator console Enabled output
53	Lifter Change Consumable	**54**	Operator console Error output
55	Encoder A	**56**	Operator console spare output
57	Encoder B	**58**	Not connected
59	+5 VDC	**60**	Ground
61	Operator console Disable input	**62**	1/50 Arc V -
63	Operator console Select input	**64**	1/50 Arc V +
65	Operator console Torch Up input	**66**	Ohmic contact sense -
67	Operator console Torch Down input	**68**	Ohmic contact sense common
69	+5 VDC	**70**	Ground
71	Operator console spare input	**72**	Power good low active
73	Not connected	**74**	Line Volts
75	Not connected	**76**	Actual current
77	Not connected	**78**	Not connected
79	+5 VDC	**80**	Ground

J1 Board interconnects (Continued)			
Pin No.	**Signal**	**Pin No.**	**Signal**
81	Torque DAC	**82**	+24 V
83	Drive Enable output	**84**	+12 V
85	Not connected	**86**	+5 V
87	Not connected	**88**	-12 V
89	+5 VDC	**90**	Ground
91	Drive Fail input	**92**	Not connected
93	Not connected	**94**	Reserved low active
95	Ground	**96**	Ground
97	Ground	**98**	Ground
99	+5 VDC	**100**	Ground

J4 Lifter interface			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	Motor +	**2**	Motor -
3	Brake -	**4**	Common -
5	Power +24 VDC	**6**	Ohmic contact sense common
7	Ohmic contact sense	**8**	Ohmic contact sense bias +12 VDC
9	Encoder common	**10**	Lifter station active
11	Encoder input B -	**12**	Encoder input B +
13	Encoder input A -	**14**	Encoder input A +
15	Common -	**16**	Change consumables switch +
17	Lifter down switch +	**18**	Lifter up switch +
19	Breakaway switch +	**20**	Upper limit switch +
21	Lower limit switch +	**22**	Not connected
23	Common -	**24**	Not connected

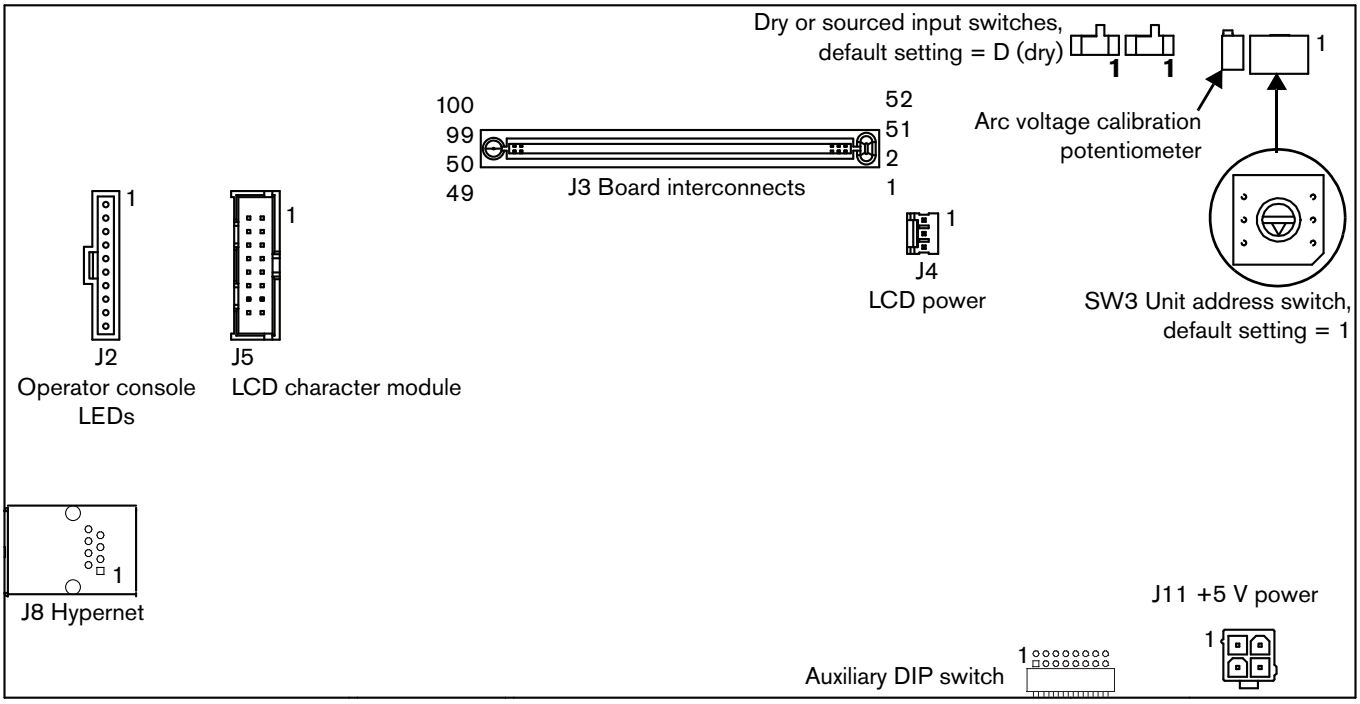
J5 Plasma interface			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	RS-422 Rx +	**2**	RS-422 Rx -
3	RS-422 Tx +	**4**	RS-422 Tx -
5	RS-422 common	**6**	Motion input +
7	Motion input -	**8**	Error input +
9	Error input -	**10**	Rampdown error input +
11	Rampdown error input -	**12**	Not ready input +
13	Not ready input -	**14**	Spare input +
15	Spare input -	**16**	Corner output A
17	Corner output B	**18**	Pierce output A
19	Pierce output B	**20**	Hold output A

J5 Plasma interface (Continued)			
Pin No.	**Signal**	**Pin No.**	**Signal**
21	Hold output B	**22**	Start output A
23	Start output B	**24**	Spare output A
25	Spare output B	**26**	Remote on output A
27	Remote on output B	**28**	Common
29	Common	**30**	Common
31	+24 VDC output	**32**	+24 VDC output
33	+24 VDC output	**34**	1/50 Arc voltage +
35	1/50 Arc voltage -	**36**	Not connected
37	Not connected		

J6 CNC interface			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	Cycle Start input +	**2**	Cycle Start input -
3	Low gain input +	**4**	Low gain input -
5	AVC Disable input +	**6**	AVC Disable input -
7	IHS Sync input +	**8**	IHS Sync input -
9	Spare input 1 + (Do not use)	**10**	Spare input 1 - (Do not use)
11	Spare input 2 + (Do not use)	**12**	Spare input 2 - (Do not use)
13	IHS Complete output A	**14**	IHS Complete output B
15	Retract complete output A	**16**	Retract complete output B
17	Machine Motion output A	**18**	Machine Motion output B
19	THC Error output A	**20**	THC Error output B
21	Torch Breakaway output A	**22**	Torch Breakaway output B
23	CNC spare output A	**24**	CNC spare output B
25	Interlock input +	**26**	Interlock input -
27	Interlock output A	**28**	Interlock output B
29	Common	**30**	Common
31	Common	**32**	Common
33	+24 VDC output	**34**	+24 VDC output
35	+24 VDC output	**36**	Not connected
37	Not connected		

J7 Operator console interface			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	Not connected	**2**	Manual disable switch input +
3	Manual select switch input +	**4**	Torch up switch input +
5	Torch down switch input +	**6**	Spare switch input +
7	Common	**8**	Torch enabled output A
9	Torch enabled output B	**10**	Error output A
11	Error output B	**12**	Spare output A
13	Spare output B	**14**	Power +24 VDC output

THC processor board (228578)



In a Hypernet configuration, the Unit address switch (SW3) on the THC processor board must have the same address as the Unit address switch on the HMI processor and the Hypernet plasma interface boards. The default setting is 1.

J2 Front panel LEDs			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	+5 VDC	**2**	+5 VDC
3	Start LED	**4**	Motion LED
5	Limit LED	**6**	AVC LED
7	Error LED	**8**	Contact LED
9	Display backup	**10**	Display advance

J3 Board interconnects			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	CNC Cycle Start input	**2**	CNC IHS Complete output
3	CNC IHS Disable input	**4**	CNC Retract Complete output
5	CNC AVC Disable input	**6**	CNC Machine Motion output
7	CNC IHS Sync input	**8**	CNC Error output
9	+5 VDC	**10**	Ground
11	CNC spare 1 input	**12**	CNC Breakaway output
13	CNC spare 2 input	**14**	CNC spare output
15	Interlock	**16**	CNC Dry Inputs 24 V
17	Not connected	**18**	Not connected
19	+5 VDC	**20**	Ground
21	Plasma Motion input	**22**	Plasma Corner output
23	Plasma Error input	**24**	Plasma Pierce output
25	Plasma Ramp Error input	**26**	Plasma Hold output
27	Plasma Not Ready input	**28**	Plasma Start output
29	+5 VDC	**30**	Ground
31	Plasma spare input	**32**	Plasma spare output
33	Plasma RS-422 RX	**34**	Plasma RS-422 Tx
35	Not connected	**36**	Plasma Dry Inputs 24 V
37	Lifter Station Enable	**38**	Plasma Remote On output
39	+5 VDC	**40**	Ground
41	Lifter Lower Limit input	**42**	Lifter Brake output
43	Lifter Upper Limit input	**44**	Not connected
45	Lifter Breakaway input	**46**	Not connected
47	Lifter Manual Up input	**48**	Not connected
49	+5 VDC	**50**	Ground
51	Lifter Manual Down input	**52**	Operator console enabled output
53	Lifter Change Consumable	**54**	Operator console error output
55	Encoder A	**56**	Operator console spare output
57	Encoder B	**58**	Not connected
59	+5 VDC	**60**	Ground
61	Operator console Disable input	**62**	1/50 Arc V -
63	Operator console Select input	**64**	1/50 Arc V +
65	Operator console Torch Up input	**66**	Ohmic contact sense -
67	Operator console Torch Down input	**68**	Ohmic contact sense common
69	+5 VDC	**70**	Ground
71	Operator console spare input	**72**	Power good low active
73	Not connected	**74**	Line volts
75	Not connected	**76**	Actual current
77	Not connected	**78**	Not connected
79	+5 VDC	**80**	Ground

J3 Board interconnects (Continued)			
Pin No.	**Signal**	**Pin No.**	**Signal**
81	Torque DAC	**82**	+24 V Field
83	Drive Enable output	**84**	+12 V Field
85	Not connected	**86**	+5 V Field
87	Not connected	**88**	-12 V Field
89	+5 VDC	**90**	Ground
91	Drive Fail input	**92**	Not connected
93	Not connected	**94**	Reserved low active
95	Ground	**96**	Ground
97	Ground	**98**	Ground
99	+5 VDC	**100**	Ground

J4 LCD power	
Pin No.	**Signal**
1	+5 V
2	Ground
3	Not connected

J5 LCD character module			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	DB6	**2**	DB7
3	DB4	**4**	DB5
5	DB2	**6**	DB3
7	DB0	**8**	DB1
9	WR\	**10**	E1 (lines 1 and 2)
11	Vee	**12**	RS
13	VOC	**14**	Vss
15	Not connected	**16**	E2 (lines 3 and 4)

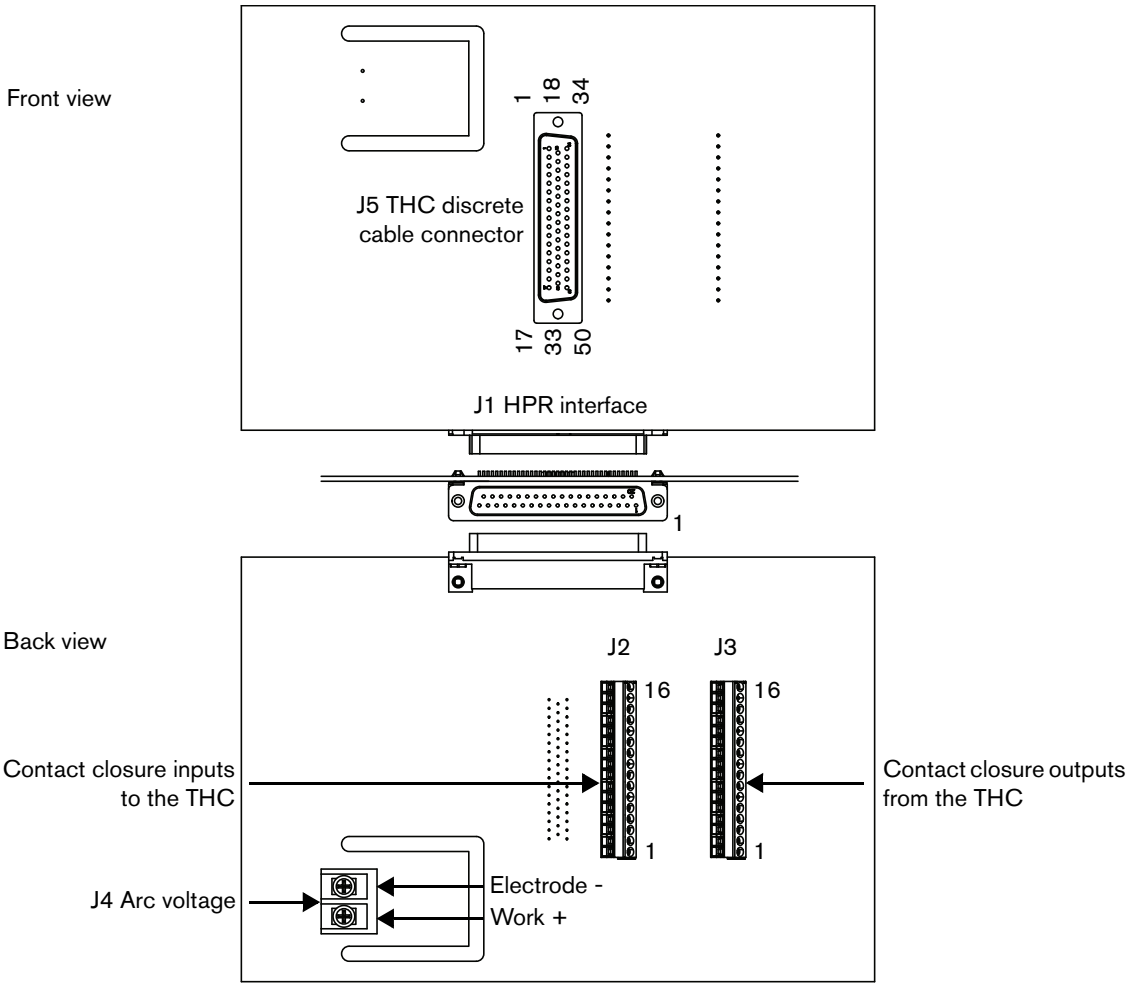
J8 Hypernet	
Pin No.	**Signal**
1	Tx + (transmit data +)
2	Tx - (transmit data -)
3	Rx + (receive data +)
4	Not connected
5	Not connected
6	Rx - (receive data -)
7	Not connected
8	Not connected

J11 +5 V power	
Pin No.	**Signal**
1	+5 VDC
2	Ground
3	Common
4	Not connected

Discrete plasma interface board (141094)

You can order the discrete plasma board in 2 different kits:

Kit number	Description
228576	Plasma interface board subassembly
228572	Plasma interface board subassembly and enclosure



LEDs*		
LED No.	**Color**	**Signal**
D1	Green	Plasma on
D2	Green	Plasma start
D3	Green	Arc transfer
D4	Green	THC on

* If the THC control board is configured with dry contacts, LED operation on the discrete plasma interface board is reversed and the LEDs will turn OFF when input is active. See *THC processor board (228578)* on page 220 for the location of this switch.

J1 Plasma interface			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	HPR Rx -	**2**	HPR Tx -
3	RS-422 communication	**4**	Ground
5	Ground	**6**	Ground
7	Ground	**8**	Not connected
9	Not connected	**10**	Not connected
11	Not connected	**12**	Corner A
13	Pierce A	**14**	Hold A
15	Plasma start relay A	**16**	Rem on A
17	Not connected	**18**	Ground
19	Optional 24 V from HPR	**20**	HPR Rx +
21	HPR Tx +	**22**	HPR turned ON
23	Motion	**24**	Error
25	Ramp-down error	**26**	HPR NR
27	Not connected	**28**	Not connected
29	Not connected	**30**	Not connected
31	Corner B	**32**	Pierce B
33	Hold B	**34**	Plasma start relay B
35	Rem on B	**36**	Ground
37	Optional 24 V from HPR	**38**	Ground

J2 (+24 V or contact closure inputs to the THC from a generic plasma system)			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	Motion	**2**	Common
3	Error	**4**	Common
5	Ramp error	**6**	Common
7	Not ready	**8**	Common
9	Spare input	**10**	Common
11	Common	**12**	Common
13	Common	**14**	Common
15	Plasma system 24 VAC line*	**16**	Plasma system 24 VAC neutral**

* Pin 15 can be changed to +24 VDC.

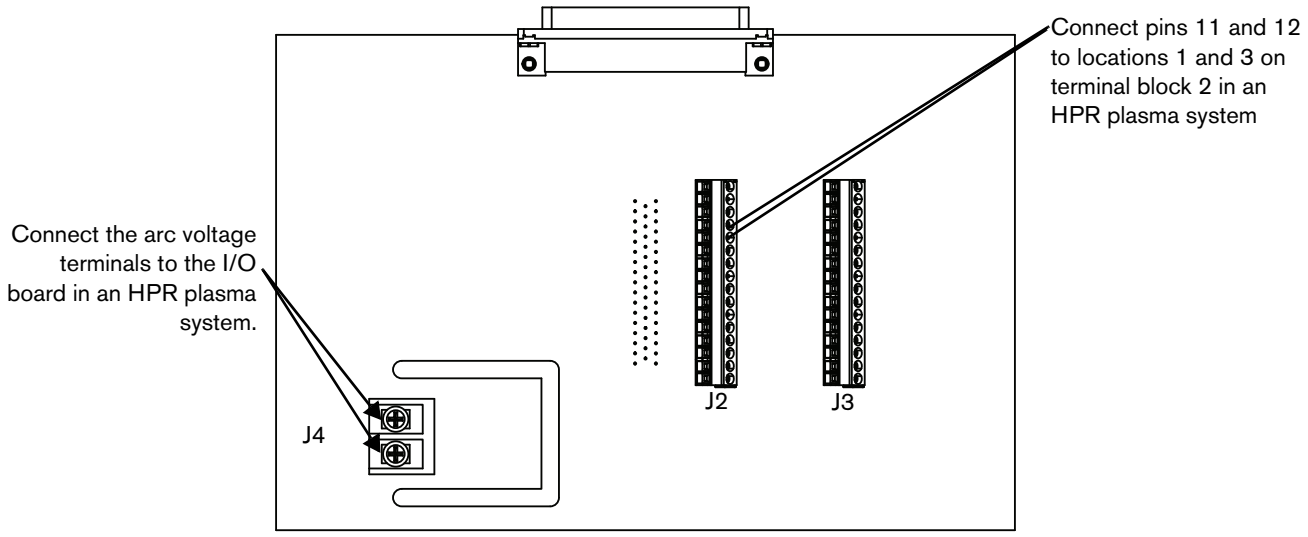
** Pin 16 can be changed to -24 VDC.

J3 (Relay contact outputs from the THC to a generic plasma system)			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	Corner A	**2**	Corner B
3	Pierce A	**4**	Pierce B
5	Hold A	**6**	Hold B
7	Plasma start A	**8**	Plasma start B
9	Spare THC out A	**10**	Spare THC out B
11	Remote ON A	**12**	Remote ON B
13	Common	**14**	Common
15	+24 V output	**16**	+24 V output

Pins 11 and 12 on connector J3 must be connected to locations 1 and 3 on terminal block 2 in an HPR plasma system.

J4 Arc voltage	
Pin No.	**Signal**
1	Electrode -
2	Work +

The arc voltage terminals on connector J4 must be connected to the I/O board in an HPR plasma system.



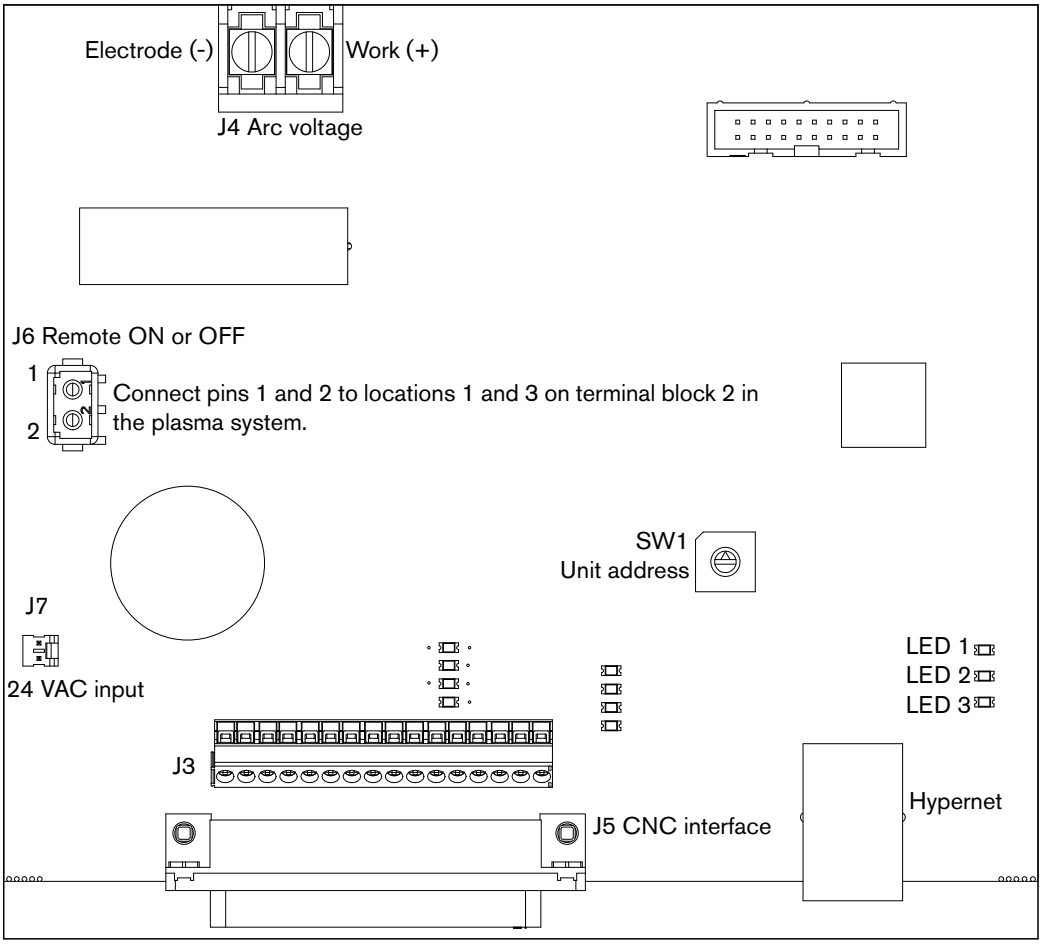
J5 Plasma I/O cable (blue)			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	RS-422 Rx -	**2**	RS-422 Rx +
3	RS-422 Tx -	**4**	RS-422 Tx +
5	RS-422 common	**6**	Motion input +
7	Input common -	**8**	Error input +
9	Input common -	**10**	Rampdown error input +
11	Input common -	**12**	Not ready input +
13	Input common -	**14**	Spare input +
15	Input common -	**16**	Corner output A
17	Corner output B	**18**	Pierce output A
19	Pierce output B	**20**	Hold output A
21	Hold output B	**22**	Start output A
23	Start output B	**24**	Spare output A
25	Spare output B	**26**	Remote on output A
27	Remote on output B	**28**	Common
29	Common	**30**	Common
31	+24 VDC	**32**	+24 VDC
33	+24 VDC	**34**	1/50 Arc voltage +
35	1/50 Arc voltage -	**36**	Not connected
37 – 50	Not connected		

Hypernet plasma interface board (141162)

There are multiple kits for the Hypernet plasma interface board. Order the kit that corresponds to your plasma system:

Kit number	Description
228604	Hypernet upgrade kit for HPR400XD and HPR800XD
228611	Hypernet upgrade kit for HPR130XD and HPR260XD
428276	Hypernet upgrade kit for MAXPRO200

Connect the arc voltage terminals to the I/O board in the HPR plasma system.



In a Hypernet configuration, the Unit address switch (SW1) on the Hypernet interface board must have the same address as the Unit address switch on the HMI processor and the THC processor boards. The default setting is 1.

LEDs		
LED No.	**Color**	**Signal**
1	Red	Plasma system error
2	Slow blinking red	HPR Hypernet is ready
3	Rapid blinking red	Serial transmission

J3 Discrete interface			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	Start +	**2**	Start -
3	Hold +	**4**	Hold -
5	Pierce +	**6**	Pierce -
7	Corner +	**8**	Corner -
9	Not ready C	**10**	Not ready E
11	Ramp down error C	**12**	Ramp down error E
13	HPR error C	**14**	HPR error E
15	Transfer (Motion) C	**16**	Transfer (Motion) C

J4 Arc voltage*	
Pin No.	**Signal**
1	Work +
2	Electrode -

* The arc voltage terminals on connector J4 must be connected to the I/O board in the plasma system.

J5 CNC interface			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	HPR Rx -	**2**	HPR Tx -
3	RS-422 Common	**4**	Motion
5	Error	**6**	Rampdown error
7	HPR not ready	**8**	Not connected
9	Not connected	**10**	Not connected
11	Not connected	**12**	Spare
13	Pierce A	**14**	Hold A
15	Start A	**16**	Not connected
17	Not connected	**18**	Ground
19	Not connected	**20**	HPR Rx +
21	HPR Tx +	**22**	Not connected
23	Motion	**24**	Error
25	Rampdown error	**26**	HPR not ready

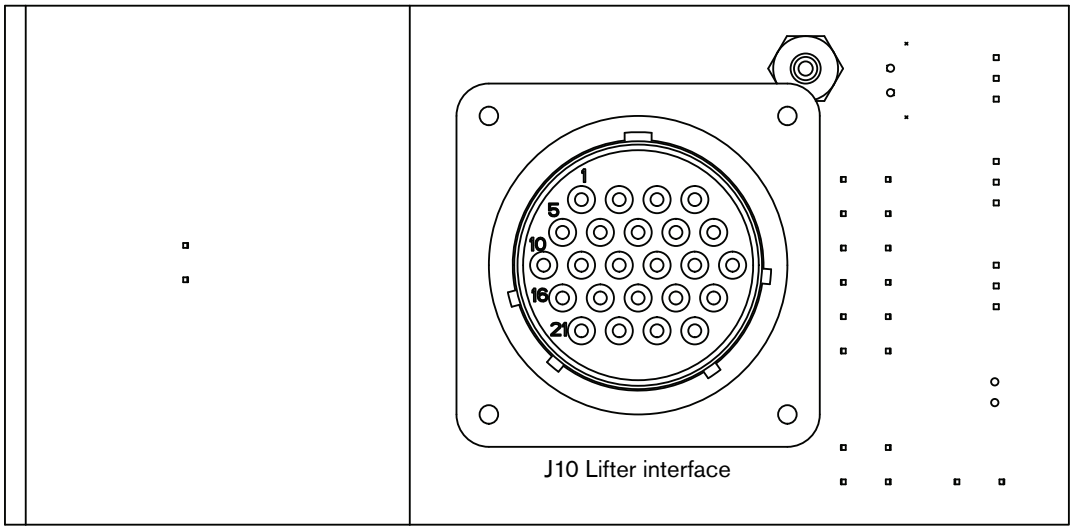
J5 CNC interface (Continued)			
Pin No.	**Signal**	**Pin No.**	**Signal**
27	Not connected	**28**	Not connected
29	Not connected	**30**	Not connected
31	Spare	**32**	Pierce B
33	Hold B	**34**	Start B
35	Not connected	**36**	Ground
37	Not connected		

J6 Remote ON/OFF	
Pin No.	**Signal**
1	ON/OFF out +
2	ON/OFF out -

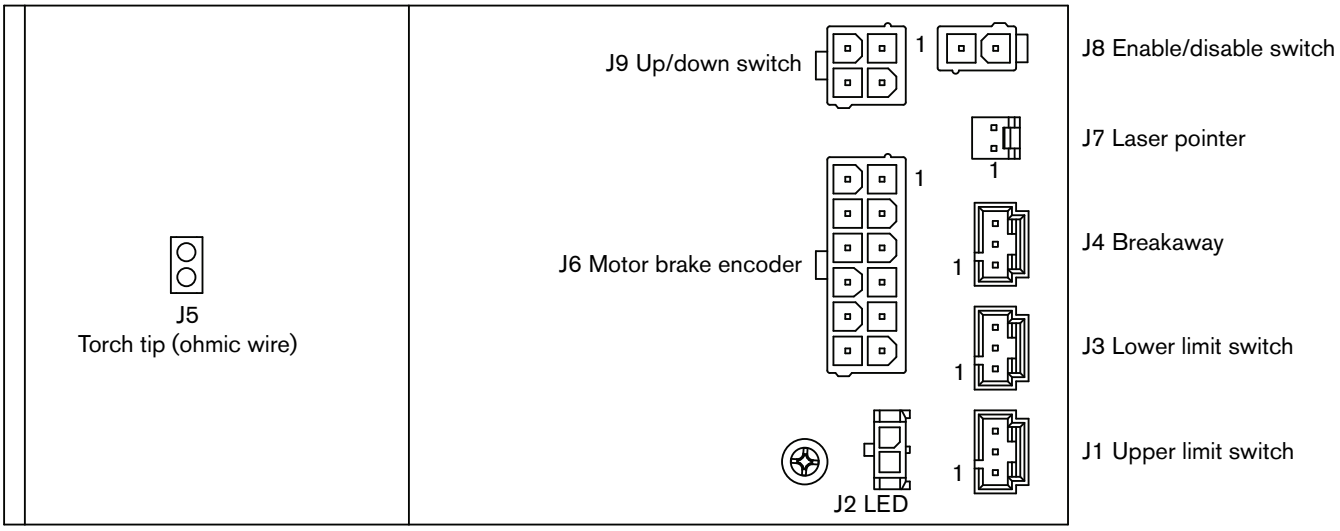
J7 24 VAC	
Pin No.	**Signal**
1	Ground
2	24 VAC

Lifter interface board (228580)

Top view



Bottom view



J1 Upper limit switch	
Pin No.	**Signal**
1	+12 VDC
2	Upper limit switch
3	Common

J2 Station active LED	
Pin No.	**Signal**
1	+5 VDC
2	Common

J3 Lower limit switch	
Pin No.	**Signal**
1	+12 VDC
2	Lower limit switch
3	Common

J4 Breakaway switch	
Pin No.	**Signal**
1	+12 VDC
2	Breakaway switch
3	Common

J6 Motor brake encoder	
Pin No.	**Signal**
1	Motor +
2	Motor -
3	Not connected
4	Not connected
5	Brake +24 VDC
6	Brake switch return
7	+5 VDC
8	Phase A +
9	Phase A -
10	Phase B +
11	Phase B -
12	Common

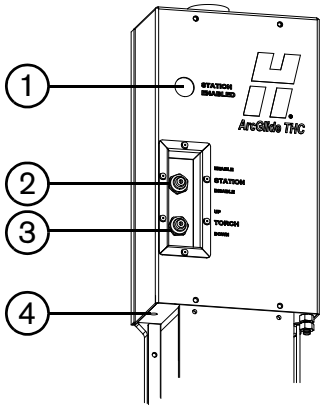
J7 Laser pointer	
Pin No.	**Signal**
1	+5 VDC
2	Common

J8 ENABLE/DISABLE switch	
Pin No.	**Signal**
1	Station enable
2	Common

J9 UP/DOWN switch	
Pin No.	**Signal**
1	Up switch
2	Common
3	Down switch
4	Not connected

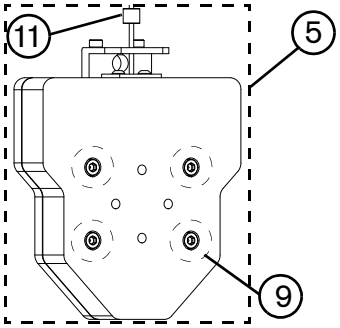
J10 Lifter I/O cable (red)			
Pin No.	**Signal**	**Pin No.**	**Signal**
1	Motor +	**2**	Motor -
3	Brake -	**4**	Common -
5	Power +24 VDC	**6**	Ohmic contact sense common
7	Ohmic contact sense	**8**	Ohmic contact sense bias -12 VDC
9	Encoder common	**10**	+5 V Station active
11	Encoder input B -	**12**	Encoder input B +
13	Encoder input A -	**14**	Encoder input A +
15	Field common	**16**	Change consumable switch +
17	Lifter down switch +	**18**	Lifter up switch +
19	Breakaway switch +	**20**	Upper limit switch +
21	Lower limit switch +	**22**	Not connected
23	Common	**24**	Not connected

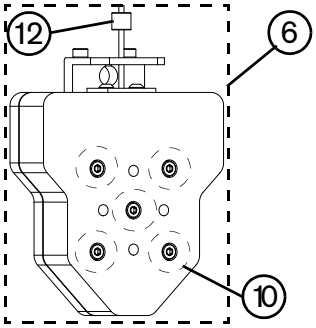
Lifter parts

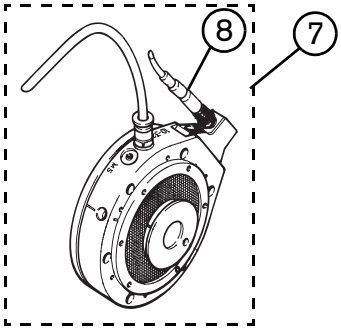


Item	Kit number	Description	Quantity
1	228588	Station Enable 5 V LED	1
2	228585	ENABLE/DISABLE switch	1
3	228584	Torch lifter UP/DOWN switch	1
4	228592	Laser pointer diode	1

Breakaway parts

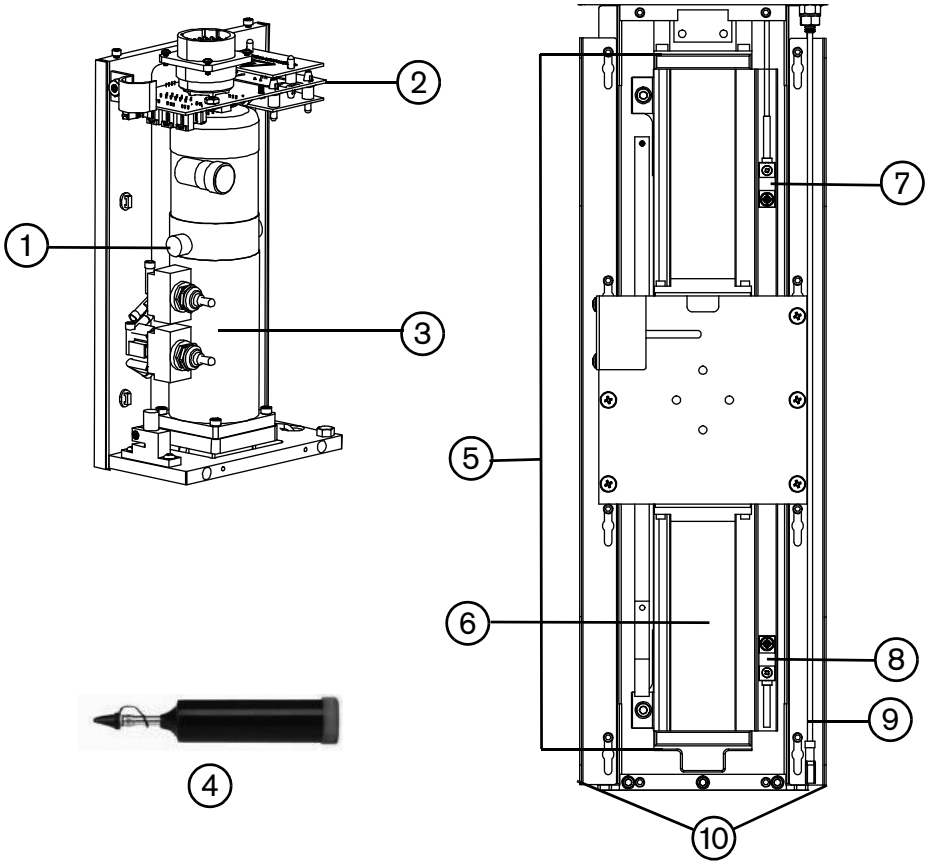






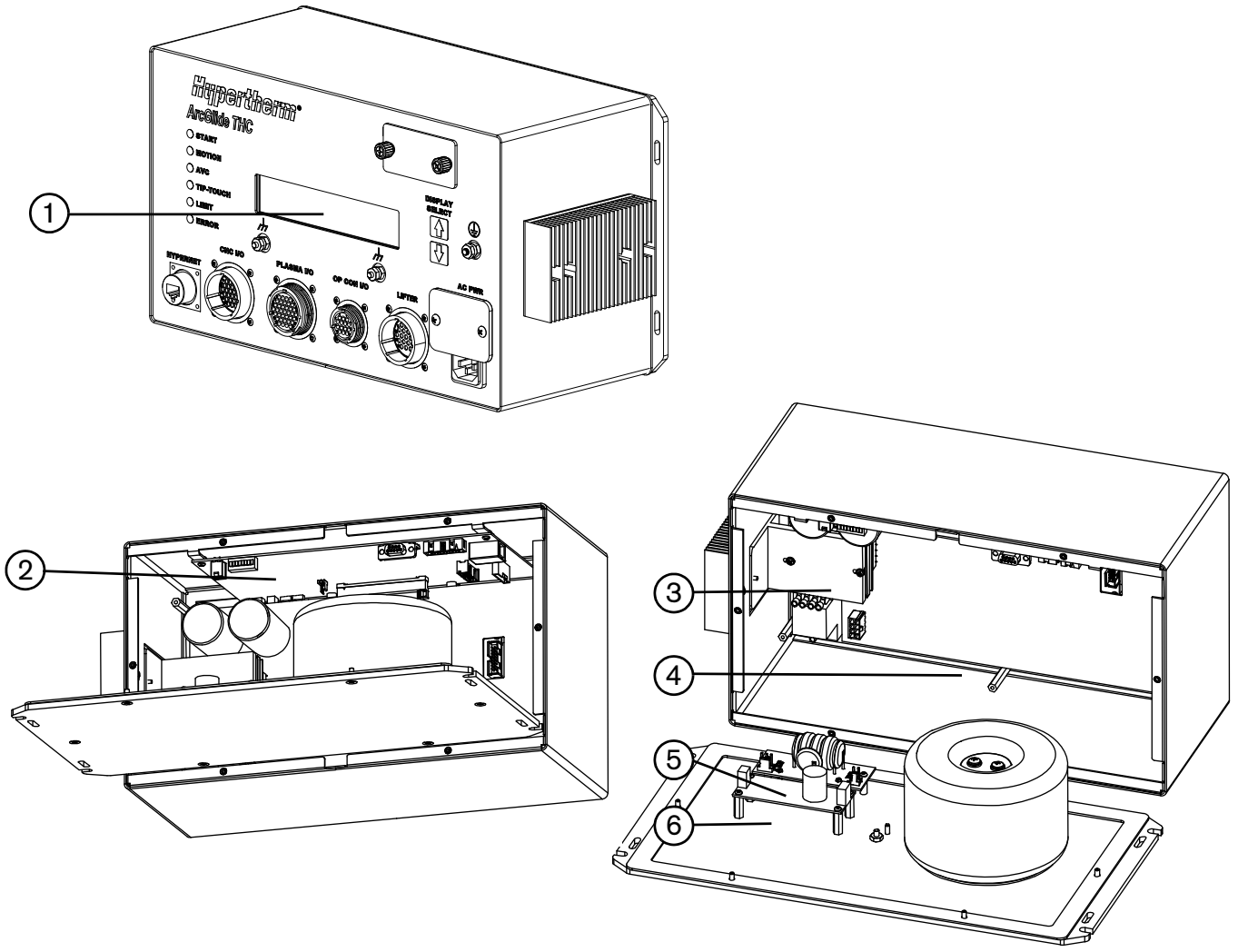
Item	Kit number	Description	Quantity
5	228593	11.34 kg (25 lb) magnetic breakaway	1
6	228607	4.54 kg (10 lb) magnetic breakaway	1
7	228597	Pneumatic breakaway	1
8	123596	Pneumatic breakaway cable	1
9	228939	35.7 kgf (78.7 lbf) replacement magnets for 11.34 kg (25 lb) magnetic breakaway	4
	104473	35.7 kgf (78.7 lbf) replacement magnet for 11.34 kg (25 lb) magnetic breakaway	1
10	228938	20 kgf (45 lbf) replacement magnets for 4.54 kg (10 lb) magnetic breakaway	5
	104513	20 kgf (45 lbf) replacement magnet for 4.54 kg (10 lb) magnetic breakaway	1
11	228940	Magnetic breakaway retaining tether	1
	128277	35 mm (1-3/8 inch) torch mounting block	1
	120596	44.5 mm (1-3/4 inch) torch mounting block	1
	120597	50 mm (2 inch) torch mounting block	1
	228608	Breakaway cable and sensor	1

Lifter motor and slide parts



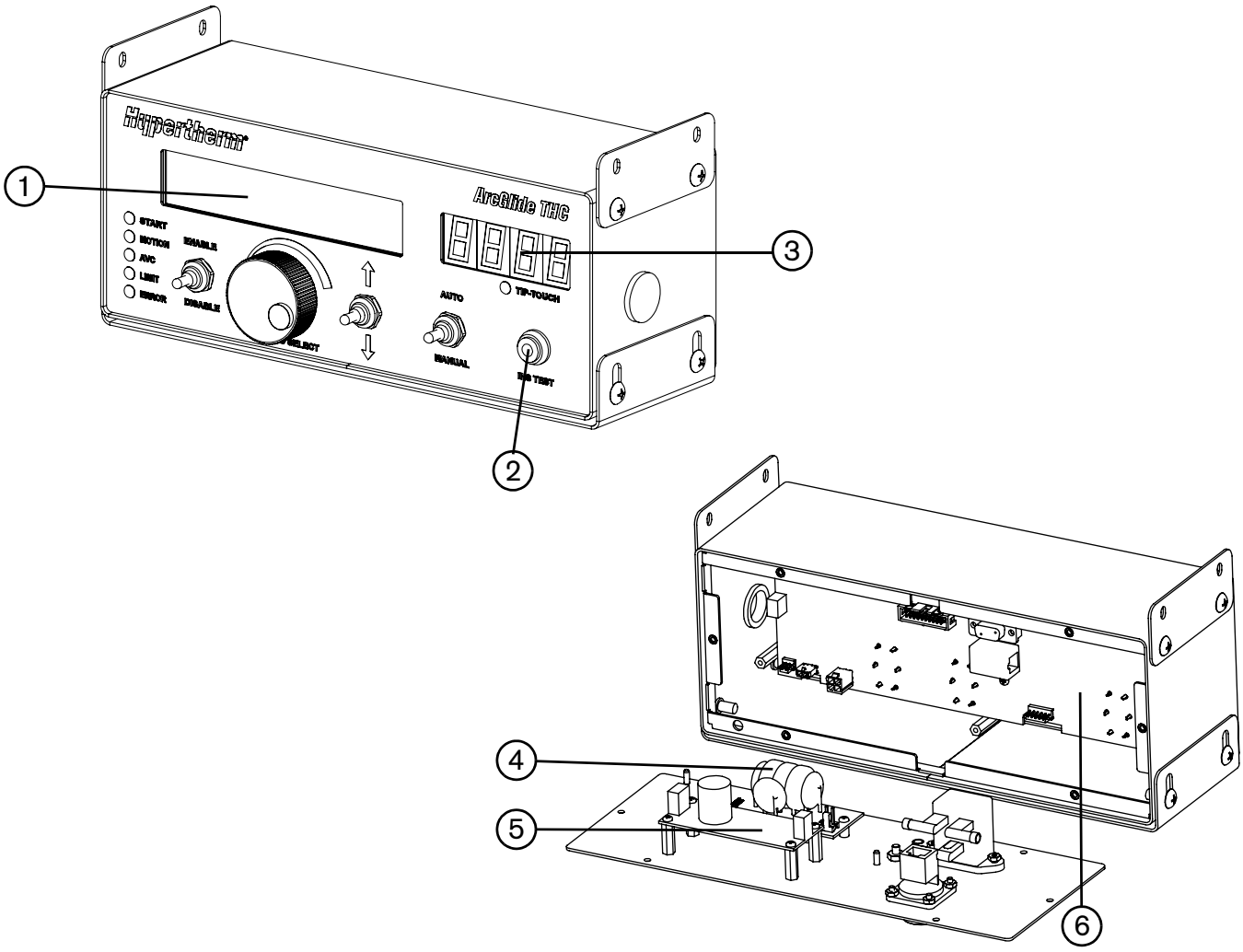
Item	Kit number	Description	Quantity
1	228595	Lifter motor brushes	2
2	228580	Lifter interface board	1
3	428302	Lifter motor	1
4	428259	Grease gun	1
5	228591	Lifter slide	1
6	428245	Sealing band	1
7	228587	Lifter upper limit proximity switch	1
8	228586	Lifter lower limit proximity switch	1
9	428242	Ohmic contact wire	1
10	428241	Lifter side shields	2

Control module parts



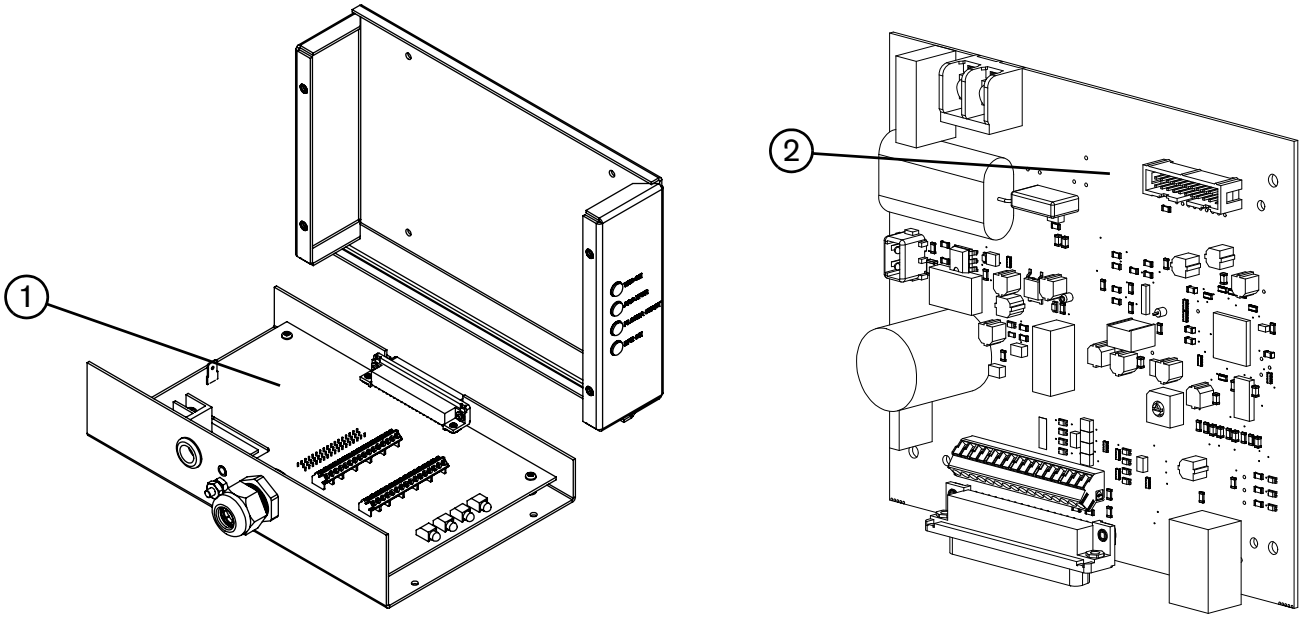
Item	Kit number	Description	Quantity
1	228589	LCD display	1
2	228578	THC processor board	1
3	428081	Servo amplifier module	1
4	228577	THC control interface board	1
5	228579	230 V surge board	1
6	228590	120 VAC, 5 V, 5 A, 25 W power source	1
	008756	5 A, 250 V, 1/4 inch X 1-1/4 inch slow blow fuse	1
	108842	Power cable connector	1
	008197	AMP Pin extractor tool	1

HMI parts



Item	Kit number	Description	Quantity
1	228589	LCD display	1
2	228583	Momentary pushbutton switch	1
3	228582	HMI 7-segment display board	1
4	228579	230 V surge board	1
5	228590	120 VAC, 5 V, 5 A, 25 W power source	1
6	228581	HMI processor board	1

Plasma interface boards

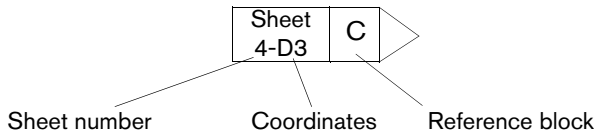


Item	Kit number	Description	Quantity
1	228576	Discrete plasma interface board subassembly	1
	228572	Discrete plasma interface board subassembly and metal enclosure	1
2	228604	Hypernet upgrade kit for HPR400XD and HPR800XD	1
	228611	Hypernet upgrade kit for HPR130XD and HPR260XD	1
	428276	Hypernet upgrade kit for MAXPRO200	1

Section 6
Wiring Diagrams

This section contains the wiring diagrams for the system. When you trace a signal path, or reference the *Parts List* or *Troubleshooting* sections, the following conventions will help you understand the organization of the wiring diagrams:

- Sheet numbers are located in the lower, right-hand corner of each page.
- References to other pages use the following connection symbol:



Use the sheet number to find the reference sheet. Line up the coordinates A–D on the Y axis and numbers 1–4 on the X axis of each sheet to find the reference blocks (similar to a road map).

Wiring diagram symbols


Battery


Cap, polarized


Cap, not polarized


Cap, feed-through


Circuit breaker


Coax shield


Current sensor


Current sensor


DC supply


Diode


Door interlock


Fan


Feed-through LC

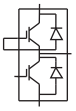

Filter, AC


Fuse


Ground clamp


Ground, chassis


Ground, earth


IGBT


Inductor


LED


Lamp


MOV


Pin


Socket


Plug


PNP transistor


Potentiometer


Push button, normally closed


Push button, normally open


Receptacle


Relay, coil


Relay, normally closed


Relay, normally open


Relay, solid state, AC


Relay, solid state, DC


Relay, solid state


Resistor


SCR

Shield

Shunt

Spark gap

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, 2 throw, center off


Switch, temperature, normally closed


Switch, temperature, normally open

Terminal block

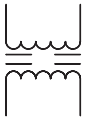

Time delay closed, NC/off


Time delay open, NO/off


Time delay open, NC/on


Time delay closed, NO/off


Transformer


Transformer, air core


Transformer, coil


Triac


VAC source

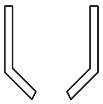

Valve, solenoid

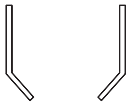

Voltage source

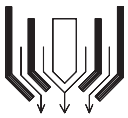

Zener diode

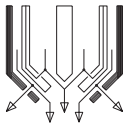
Torch symbols


Electrode

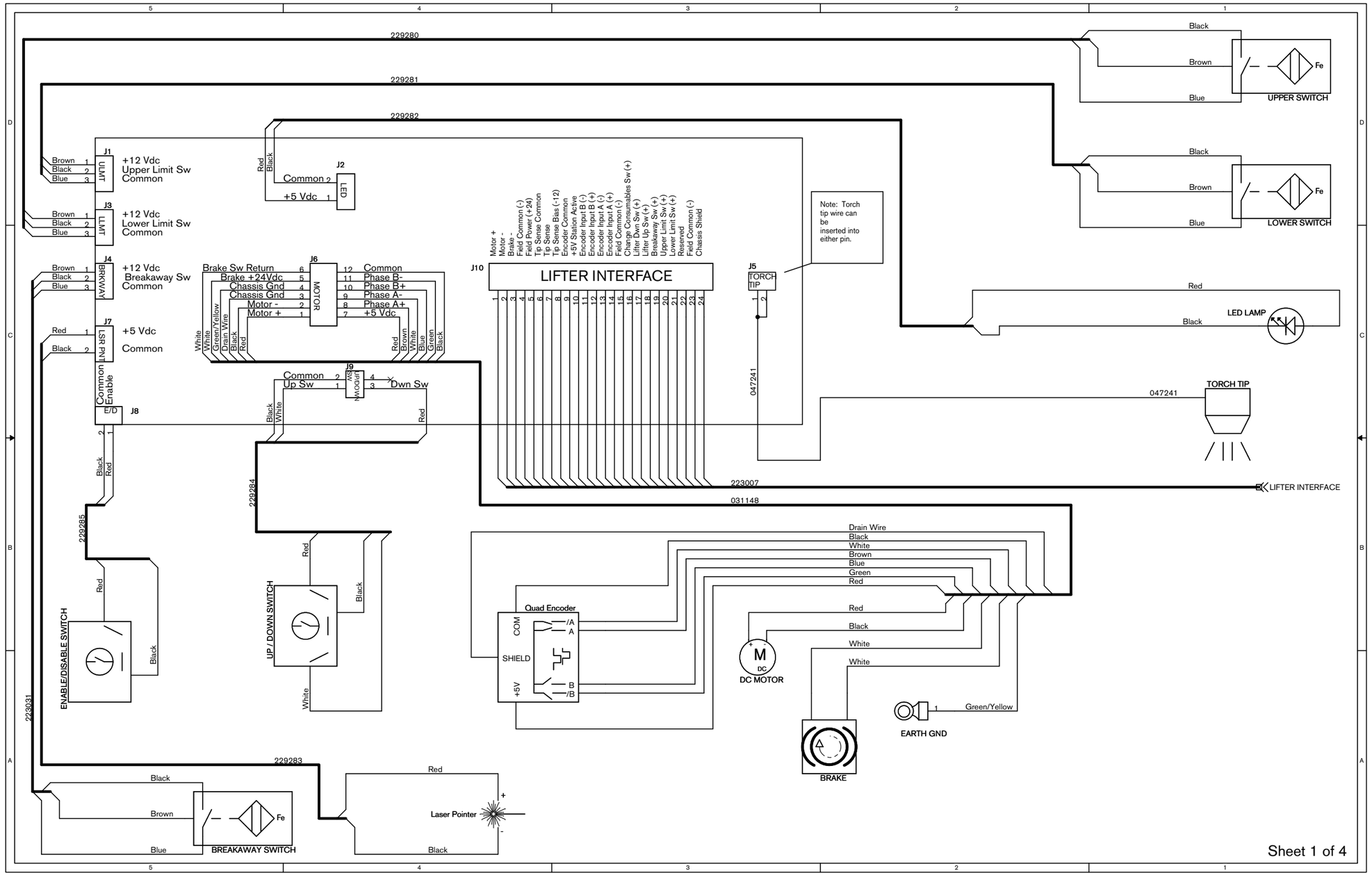

Nozzle


Shield

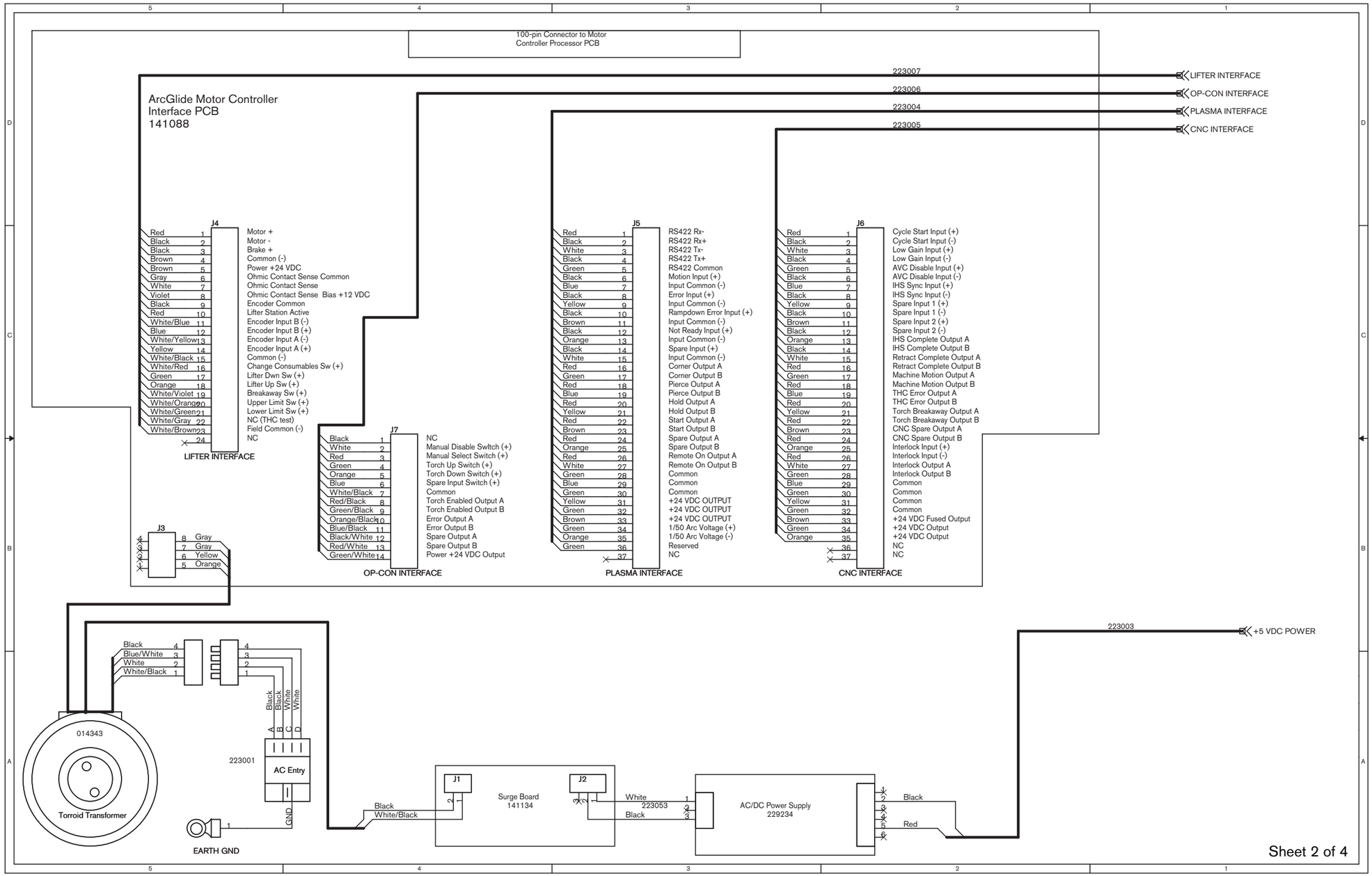

Torch


Torch, HyDefinition™

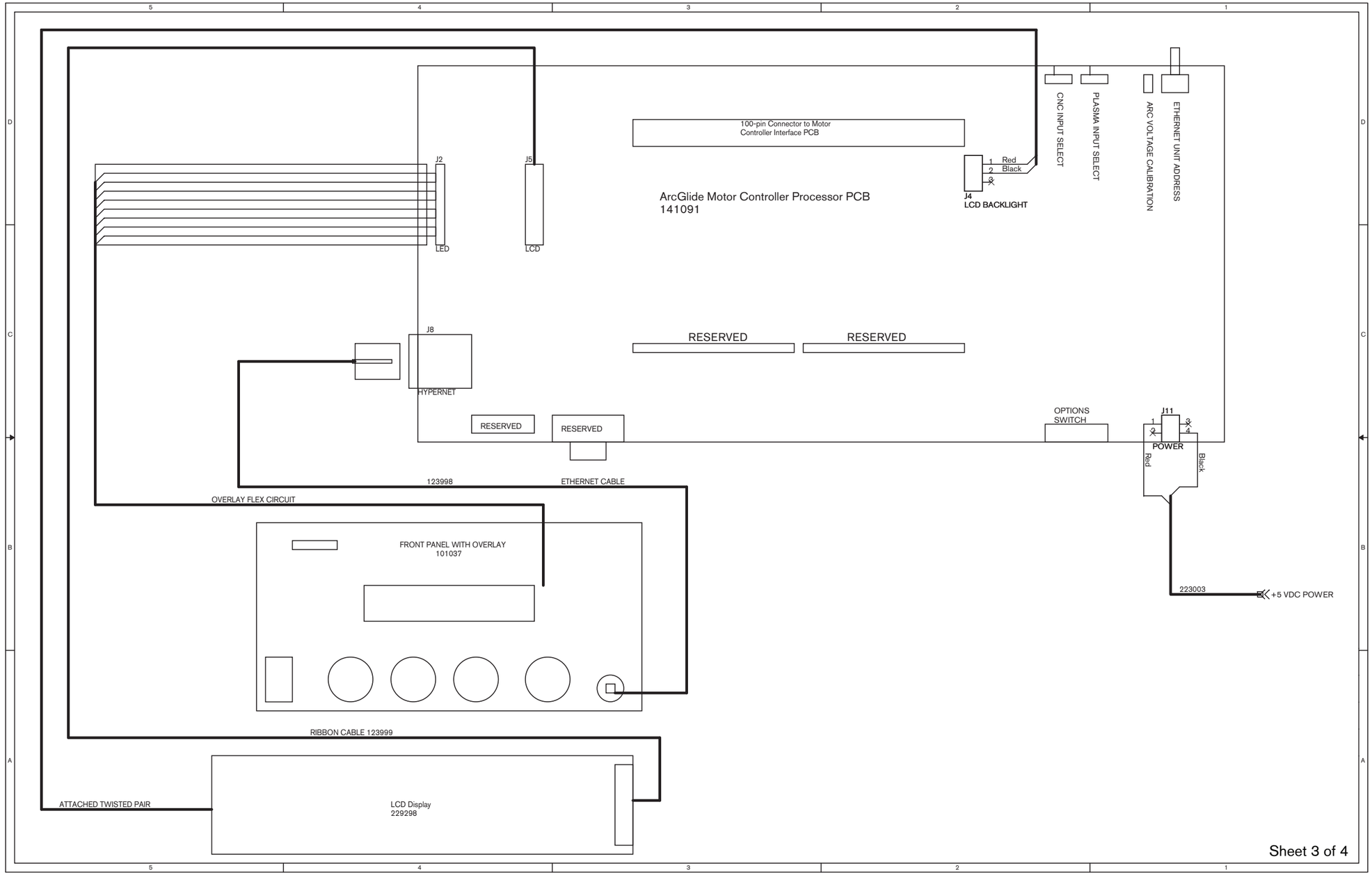
1 – Lifter interface board (141097)



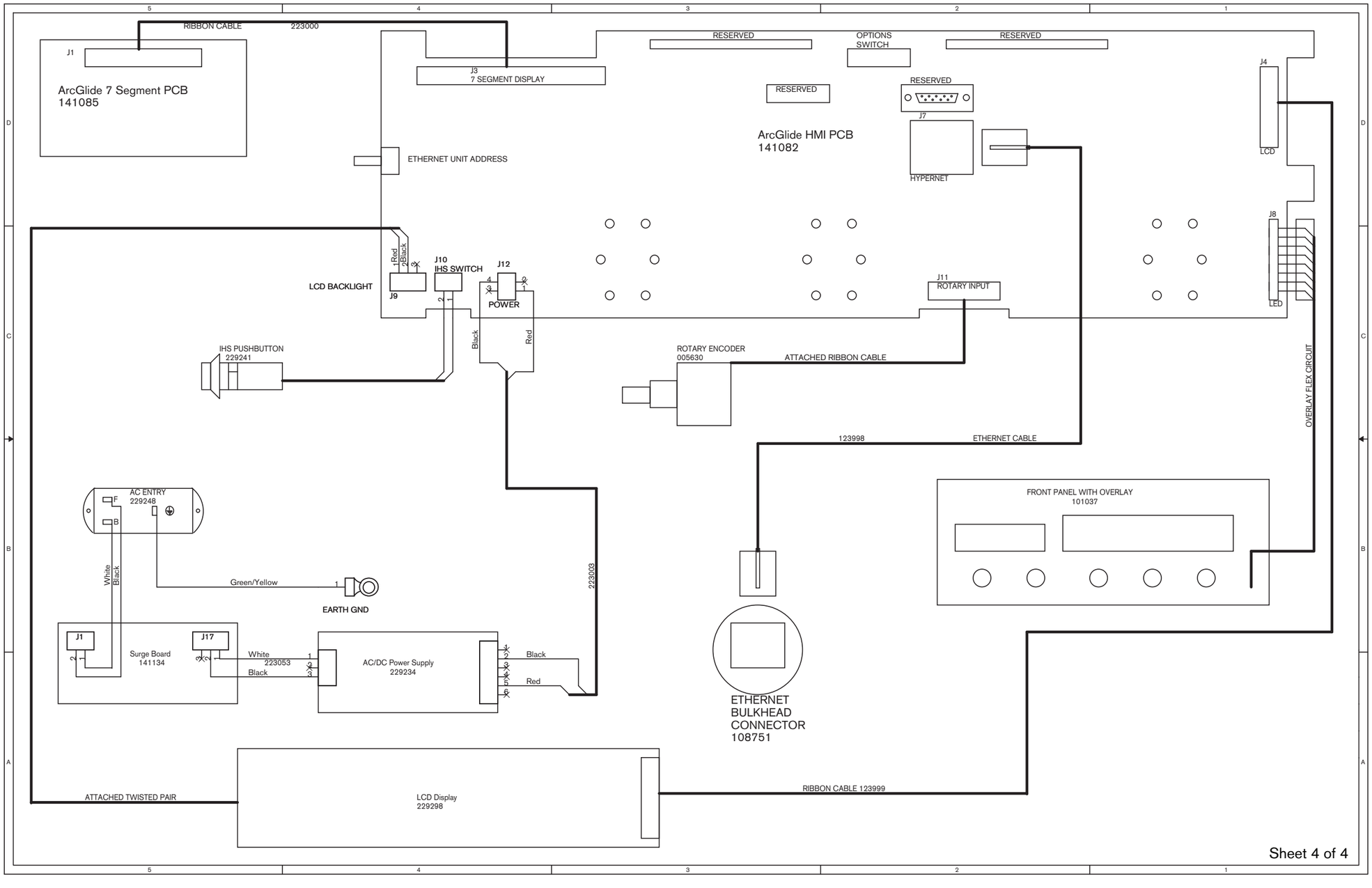
2 – THC control interface board (141088)



3 – THC Processor board (141091)



4 – HMI processor board (141082)



Appendix A

ArcGlide THC Serial Communication Protocol

Overview

The Hypertherm ArcGlide THC can communicate with a CNC using RS-422 serial communications. It uses a serial protocol which contains commands for setting parameters within the ArcGlide THC and for setting and switching operating modes. This section provides the command IDs, data format, and example messages and responses.

This Appendix is intended for the development of RS-422 serial protocol for ArcGlide THC communications. If you are replacing a Command® THC with the ArcGlide THC, no additional coding should be required, and neither the hardware installer or machine operator needs the information contained in this section.

ArcGlide THC Operation

Because Hypernet communications take advantage of real-time signals between the ArcGlide THC and a CNC, Hypertherm recommends Hypernet communications. See *Hypernet plasma interface board (141162)* on page 91 for Hypernet installation. RS-422 communications are for configurations where Hypernet communications are not possible.

Serial Protocol

The ArcGlide THC supports RS-422 serial communications with the CNC. If you are familiar with the Command THC, the ArcGlide supports the same protocol, format, and commands as the Command THC. The ArcGlide also supports an extended message set to be used to access the additional functionality that the ArcGlide provides.

The serial frame runs at the following settings:

19200 baud	1 stop bit
8 data bits	no parity

The protocol uses ASCII characters. Each message is formatted as shown below.

In the table below, and in other examples in this section, 0x is the designation for hexadecimal. Any value preceded by 0x designates the next values as hexadecimal values.

Start	Command ID	Data	Checksum	End
1 character	2 characters, capitalized	variable length	2 characters	1 character
> (0x3E)				< (0x3C)

The CNC sends this command to put the ArcGlide into Remote mode which enables serial communications:

```
>RM1D0<
```

The components of this command are defined below:

> = Start character

RM = Command ID (Remote mode)

1 = Data (1 = ON)

D0 = Checksum (The checksum equals the 8-bit unsigned sum of the 8 bit ASCII character equivalents of the message contents, excluding the two framing characters “>” and “<”.)

< = End character

ArcGlide THC Responses

The ArcGlide THC response to an accepted command is ^ (0x5E). The response to an invalid command is # (0x23). For all accepted commands, the ArcGlide THC response echoes the command ID.

The CNC can also query the ArcGlide by sending a question mark (?). For example, to query the actual arc voltage, the CNC sends the message >AV?D6<. The ArcGlide would send the response >AV100058< which represents an actual arc voltage of 100.0 V with a checksum of 0x58.

Calculating the Checksum

The checksum for the example message >AV100058< is calculated as follows:

Character	Hex value
A	41
V	56
1	31

Character	Hex value
0	30
0	30
0	30
Sum	158

Truncate the hex value of the sum 158 to an unsigned 8-bit limit, 58. Append the ASCII 5 and 8 to the end of the message followed by the end framing character <. The checksum is always the last two digits of the message before the end framing character.

ArcGlide Commands and Examples

ArcGlide commands fall into three categories:

- Setup commands are programmed once and rarely need to change.
- Operating commands control the operational mode of the ArcGlide. Some operational commands can be sent to the ArcGlide during cutting.
- ArcGlide extended commands provide precise control of the ArcGlide mechanics.

The tables on the following pages show sample command strings that could be sent from the CNC and include the default values for each setting. The ArcGlide is ready to accept commands when it finishes its reset after turning ON.

Important! For best results, use the default values for the ArcGlide commands. The defaults provide a starting point and testing will indicate if you need to adjust the command values from the defaults.

Setup Commands

Use the commands in the following tables to enter setup parameters for the ArcGlide. These settings rarely need to be changed.

Pierce Height		
Command ID	**Data**	**Examples**
PH	50 – 400 (50% – 400%)	>PH1502E< Pierce Height set to 150% of cut height. >PH?D7< Query from the CNC.
Sets the height above the workpiece for piercing as a percentage of the cut height. Default: Previous setting		

Preflow during IHS		
Command ID	**Data**	**Examples**
PF	0 = OFF 1 = ON	>PF1C7< Turn on Preflow During IHS. >PF0C6< Turn off Preflow During IHS. >PF?D5< Query from the CNC.
Preflow during Initial Height Sense (IHS) saves cut-to-cut cycle time by allowing the plasma preflow time to occur during the IHS process. The Plasma Start signal is applied early. The Plasma Hold signal must be connected for this feature to operate properly. Default: Previous setting		

IHS Stall Force		
Command ID	**Data**	**Examples**
SC	1 – 10 (1 = least force)	>SC5CB< Stall force set to 5. >SC?D5< Query from the CNC.
This value determines the amount of force used for the stall force plate sensing which is secondary to the ohmic plate sensing. This parameter sets a force threshold of 1 (low force limit) to 10 (high force limit). Default: 5		

IHS Speed		
Command ID	**Data**	**Examples**
IV	1 – 10 (approximately 5% – 25% of maximum speed)	>IV5D4< Sets IHS speed to a relative value of 5 out of 10. 5 represents approximately 15% of the maximum speed or about 90 in/min with the standard Hypertherm lifter. >IV?DE< Query from the CNC.
IHS Speed sets the speed for the final approach to the workpiece during an IHS operation as a relative value between 1 (slow) and 10 (fast). These values represent 5 to 25% of the maximum speed of the lifter (15,240 mm/min or 600 in/min). Default: 2 IHS Speed command IV sets the speed on a scale of 1 – 10 to maintain compatibility with the Command THC. To set IHS Speed in mm/min or in/min, use the IHS Speed command IS described later in this document.		

Homing Speed		
Command ID	**Data**	**Examples**
HS	1 – 10 (40% – 80% of maximum speed)	>HS2CD< Set home speed to a relative value of 2 out of 10. 2 represents approximately 45% of the maximum speed of 6,858 mm/min or 270 in/min. >HS?DA< Query from the CNC
Homing speed is the maximum speed for manual moves. It also sets the maximum speed used by the ArcGlide for Arc Voltage Control. As the ArcGlide moves up and down when maintaining the set arc voltage, it does not exceed the homing speed. Default: 5 (5 is 60% of maximum speed) Homing Speed command HS sets the speed on a scale of 1 – 10 to maintain compatibility with the Command THC. To set Homing Speed in mm/min or in/min, use the Slow Speed command SS described later in this document.		

Nozzle Contact		
Command ID	**Data**	**Examples**
NC	0 = OFF 1 = ON	>NC1C2< Enable ohmic contact. >NC0C1< Disable ohmic contact. >NC?D0< Query from the CNC.
When Nozzle Contact is on, the ArcGlide uses ohmic contact to sense the plate. Disable Nozzle Contact to use stall force sensing (for example, with a water table or painted workpieces where electrical contact is unreliable). Default: Previous setting		

Machine Acceleration Delay		
Command ID	**Data**	**Examples**
MA	0 – 9,000 (0 – 9.000 seconds)	>MA150054< Sets machine acceleration delay to 1.5 seconds. >MA?CD< Query from the CNC.
Delays the activation of the Automatic Voltage Control so the cutting machine can reach a steady cutting speed. The time delay begins at arc transfer. It allows the machine enough time to get up to steady state speed when motion first initiates within a cut. Default: Previous setting		

Auto Kerf Detect		
Command ID	**Data**	**Examples**
AK	0 = OFF 1 = ON	>AK1BD< Turns on Auto Kerf Detect. >AK0BC< Turns off Auto Kerf Detect. >AK?CB< Query from the CNC.
When Auto Kerf Detect is active, the THC looks for a rapid rise in the measured arc voltage that indicates that the torch is cutting across a previously cut kerf. This parameter temporarily disables the Automatic Voltage Control and prevents the torch from diving into the workpiece. This feature has limited ability when cutting thick metal with a large kerf crossing. Default: Previous setting		

Display Units		
Command ID	**Data**	**Examples**
UN	0 = English 1 = metric	>UN0D3< Sets ArcGlide to English units. >UN1D4< Sets ArcGlide to metric units. >UN?E2< Query from the CNC.
Sets the units displayed on the ArcGlide control module and HMI to English or metric units. Default: Previous setting		

Operating Commands

The ArcGlide provides both Manual and Automatic modes of operation. For Manual mode operation, the ArcGlide HMI or an operator console on the CNC is required.

Manual mode: The ArcGlide HMI or an operator console on the CNC controls the ArcGlide motion. To enter manual mode, use the Remote Mode command (RM) set to 0 and the Height Control command (AA) set to 0.

Automatic Voltage Control (AVC): In AVC, also called Auto mode, the CNC controls the ArcGlide motion. To enable Automatic Voltage Control, use the Remote Mode command (RM) set to 1 and Height Control command (AA) set to 1. The Set Arc Voltage command (VS) provides the voltage setpoint for Automatic Voltage Control.

Sample Voltage: When Set Arc Voltage is set to 0, sample arc voltage control is enabled. After piercing, the ArcGlide reads the arc voltage and uses the reading as the arc voltage setting. By sampling the arc voltage, the ArcGlide can automatically compensate for consumable wear or torch lead length.

Voltage control off (AVC disabled): A discrete signal that is part of Auto mode, AVC disabled causes the ArcGlide to position at the cut height and remain at that height regardless of the arc voltage.

See *Operation* on page 127 for more information.

Use the commands in the following tables to change ArcGlide settings for operational mode, cut settings, and error recovery.

Height Control		
Command ID	**Data**	**Examples**
AA	0 = Manual 1 = Automatic Voltage Control	>AA1B3< Automatic Voltage Control. >AA0B2< Manual mode. >AA?C1< Query from the CNC.
Selects operating mode for the ArcGlide: Automatic or Manual. You will also need to use the Set Arc Voltage command (VS) to set the voltage for Automatic Voltage Control, or to select Sample Voltage (VS = 0 for sampled arc voltage). Default: Previous setting		

Remote Mode		
Command ID	**Data**	**Examples**
RM	0 = OFF 1 = ON	>RM1D0< Turns on Remote mode, serial communication only. The ArcGlide HMI is display-only. >RM0CF< Turns off Remote mode. Parameter entry is through the ArcGlide HMI only. >RM?DE< Query from the CNC.
Set to On to allow serial communication with the ArcGlide. Set to Off to allow parameter entry from the ArcGlide HMI. Default: OFF		

Maintenance Mode		
Command ID	**Data**	**Examples**
MT	No data. Toggle on and off.	>MTA1< Disables the station and homes the torch. >MTA1< Enables the station.
Maintenance mode homes the torch and disables the station. This command prevents THC motion or cutting and is used to change consumables. Default: None		

IHS Test		
Command ID	**Data**	**Examples**
IH	0 = Run 1 = Test	>IH0C1< Run mode. >IH1C2< Test IHS.
Set to 1 to perform a Test IHS (Initial Height Sensing). Set to 0 to exit the test and place the ArcGlide THC in Run mode. Default: None		

Retract		
Command ID	**Data**	**Examples**
RE	0 = Full 1 = Partial	>RE1C8< Partial retract to Retract Height. >RE0C7< Full retract to Home position. >RE?D6< Query from the CNC.
Selects a full or partial retract of the torch at the end of every cut. In the Full retract mode, the torch retracts to the Home position. In the Partial retract mode, the torch retracts to the set retract distance. Default: Previous setting		

Retract Height		
Command ID	**Data**	**Examples**
RH	0 – 8000 (0 – 8.000 inch) 0 – 20,320 (0 – 203.20 mm)	>RH250061< Sets Retract Height to 2.500 inch. >RH1500090< Sets Retract Height to 150.00 mm.
Specifies height above the workpiece to which the torch retracts at the end of a cut. Default: Previous setting		

Cut Height		
Command ID	**Data**	**Examples**
CH	0 – 1,000 (0 – 1.000 inch) 0 – 2,540 (0 – 25.40 mm)	>CH2201F< Sets cut height to 0.220 inch. >CH60021< Sets cut height to 6.00 mm. >CH?CA< Query from the CNC.
Sets the initial cut height before Automatic Voltage Control is activated. The torch moves to the set cut height after the Pierce Delay (Pierce Time in Phoenix software) has elapsed. Default: Previous setting		

Set Arc Voltage		
Command ID	**Data**	**Examples**
VS	500 – 3,000 (50.0 – 300.0 V)	>VS165075< Sets voltage to 165.0 V. >VS000069< Sets arc voltage to 0 and enables sampled arc voltage mode. >VS?E8< Query from the CNC.
Sets the voltage for Automatic Voltage Control. The ArcGlide adjusts its height along a cut to maintain the set arc voltage. Use the Set Arc Voltage command (VS) to set the voltage for Automatic Voltage Control, or to select sampled arc voltage (VS = 0 for sampled arc voltage). Default: Previous setting		

Actual Arc Voltage		
Command ID	**Data**	**Examples**
AV	Query only	>AV?D6< Queries the arc voltage in the ArcGlide. >AV14125F< ArcGlide response: 141.2 V.
Reads the actual arc voltage from the ArcGlide THC. Default: None		

Pierce Delay		
Command ID	**Data**	**Examples**
PD	0 – 9,000 (0 – 9.000 seconds)	>PD45005D< Set Pierce Delay to 4.5 seconds. >PD?D3< Query from the CNC.
Pierce Delay inserts a time delay before motion output to allow extra time for piercing the workpiece. Use a longer Pierce Delay for thicker workpieces. Pierce Delay is the same as Pierce Time in Phoenix software. Default: Previous setting		

Flush Buffers		
Command ID	**Data**	**Examples**
FL	No data	>FL92< Clears buffers.
Resets the serial transmit and receive buffers. Use this command immediately after the system turns ON or resets. You can also use it when recovering from communications errors such as when the message is rejected because the checksum does not match.		

Error Code		
Command ID	**Data**	**Examples**
EC	Query only	>EC?C7< Query. >EC3BB< Response: Tip touch error. >EC16EF< Response: No error.
Returns a Command THC error code. See *Table 9 – ArcGlide errors and equivalent Command THC errors* on page 266.		

Clear Error		
Command ID	**Data**	**Examples**
CL	No data	>CL8F<
Clears non-critical errors from the ArcGlide control module.		

IO Rev and RT Rev		
Command ID	**Data**	**Examples**
RI	Query only	>RR?E3< Query. >RR1.731< Response: ArcGlide firmware revision 1.7.
RR	Query only	
The RI and RR commands are unique to the Command THC and are used to return the firmware revision levels. The Command THC has two internal microprocessors the “I/O” processor and the Real-Time processor. These commands originally returned the I/O processor revision level (RI) and the Real-Time Processor revision level (RR). When the ArcGlide THC replaces the Command THC, these will both return a string representing the current ArcGlide firmware revision level. For example the ArcGlide would return the string “1.7” to represent firmware revision 1.7.		

Step Up		
Command ID	**Data**	**Example**
S+	No data	>S+7E< Move up 0.254 mm (0.01 inch).
In Manual mode, this command moves the torch up 0.254 mm (0.01 inch). In Auto mode, each command increases the arc voltage setpoint by 0.5 V. When using sampled arc voltage, each command increases both the voltage and the IHS start height. Default: None		

Step Down		
Command ID	**Data**	**Example**
S-	No data	>S-80< Move down 0.254 mm (0.01 inch).
In Manual mode, moves the torch down 0.254 mm (0.01 inch). In Auto mode, each command decreases the arc voltage setpoint by 0.5 V. When using sampled arc voltage, each command decreases both the voltage and the IHS start height. Default: None		

Jog Up		
Command ID	**Data**	**Example**
J+	No data	>J+75< (Repeat within 50 ms.)
In Manual Mode, moves the torch up continuously. In Auto mode, each command increases the arc voltage setpoint by 0.5 V. When using sampled arc voltage, each command increases both the voltage and the IHS start height. This command must be repeated within the 50 ms motion time out. Default: None		

Jog Down		
Command ID	**Data**	**Example**
J-	No data	>J-77< (Repeat within 50 ms.)
In Manual mode, moves the torch down continuously. In Auto mode, each command decreases the arc voltage setpoint by 0.5 volts. When using sampled arc voltage, each command decreases both the voltage and the IHS start height. The command must be repeated within the 50 ms motion time out. Default: None		

ArcGlide THC Extended Commands

The tables below show the additional commands that are not supported by the Command THC. Use these commands to implement the ArcGlide setup parameters.

Important! For best results, use the default values for the ArcGlide extended commands.

Slide Length		
Command ID	**Data**	**Examples**
SL	10 – 480 (1.00 – 48.00 inch) 25.00 – 1,219.00 mm	>SL950D< Sets Slide Length to 9.0 inch. >SL24136< Sets Slide Length to 241.30 mm. >SL?DE< Query from the CNC.
Sets the travel length of the lifter. Default: 95 (9.5 inch)		

Maximum Continuous Motor Current		
Command ID	**Data**	**Examples**
MC	10 – 60 (1.0 – 6.0 A)	>MC30F3< Sets maximum motor current to 3.0 A. >MC?CF< Query from the CNC.
This is the maximum continuous motor current for which the lifter motor is rated, to the tenth of an amp. You can exceed the maximum motor current to provide rapid acceleration, but only for 0.5 seconds. Default: 30 (3.0 A) Use the default when using the Hypertherm lifter with the ArcGlide.		

Encoder Counts		
Command ID	**Data**	**Examples**
CI	10,000 – 50,000 counts/inch 394 – 1,969 counts/mm	>CI2032083< Sets the encoder counts to 20,320 per inch. >CI80024< Sets encoder counts to 800 per mm. >CI?CB< Inch or metric query from the CNC.
Sets encoder 4X counts-per-inch linear motion. This value scales the position feedback. Default: 20,320 counts/inch or 800 counts/mm Use the default when using the Hypertherm lifter with the ArcGlide.		

Maximum Speed		
Command ID	**Data**	**Examples**
MD	50 – 1,000 in/min 1,270 – 25,400 mm/min	>MS60036< Sets the maximum speed to 600 in/min. >MS152409C< Sets maximum speed to 15,240 mm/min. >MS?DF< Inch or metric query from the CNC.
Sets the maximum linear speed that the ArcGlide THC can achieve. It is also the 100% scale for servo loop calculations. Default: 600 inches/min or 15,240 mm/min Use the default when using the Hypertherm lifter with the ArcGlide.		

Fast Speed		
Command ID	**Data**	**Examples**
FS	50 – 1,000 in/min 1,270 – 25,400 mm/min	>FS6002F< Fast speed set to 600 in/min. >FS1524095< Fast speed to set 15,240 mm/min. >FS?D8< English or metric query from the CNC.
Sets the speed used for all automatic rapid moves such as the end-of-cut-retract or the initial approach to the workpiece. Default: 600 in/min or 15,240 mm/min Use the default when using the Hypertherm lifter with the ArcGlide.		

Slow Speed		
Command ID	**Data**	**Examples**
SS	30 – 500 in/min 762 – 12,700 mm/min	>SS1503C< Slow Speed set to 150 in/min. >SS381072< Slow speed set to 3,810 mm/min. >SS?E5< Inch or metric query from the CNC.
Sets the homing speed and the fastest speed used for manual moves. It is also the maximum speed limit used during arc voltage control. Default: 150 in/min or 3,810 mm/min Use the default when using the Hypertherm lifter with the ArcGlide.		

IHS Speed		
Command ID	**Data**	**Examples**
IS	10 – 150 in/min 254 – 3,810 mm/min	>IS6002< IHS Speed set to 60 in/min. >IS152468< IHS Speed set to 1,524 mm/min. >IS?DB< Inch or metric query from the CNC.
Sets the slow speed for the final approach to the workpiece during an IHS operation and the slow speed for manual moves. Default: 1,524 mm/min or 60 in/min Use the default when using the Hypertherm lifter with the ArcGlide.		

Speed Gain		
Command ID	**Data**	**Examples**
SG	1 – 10 (1 = lowest gain)	>SG5CF< Speed Gain set to 5. >SG?D9< Query from the CNC.
This gain value regulates the speed gain of the lifter. Default: 5 Use the default when using the Hypertherm lifter with the ArcGlide.		

Position Gain		
Command ID	**Data**	**Examples**
PG	1 – 10 (1 = lowest gain)	>PG5CC< >PG05FC< Either command sets Position Gain to 5. >PG?D6< Query from the CNC.
This gain is used for closed loop positioning. Default: 5 Use the default when using the Hypertherm lifter with the ArcGlide.		

Voltage Gain		
Command ID	**Data**	**Examples**
VG	1 – 10 (1 = lowest gain)	>VG5D2< Voltage Gain set to 5. >VG?DC< Query from the CNC.
This gain is used for closed-loop arc voltage control. Default: 5 Use the default when using the Hypertherm lifter with the ArcGlide.		

Voltage Calibration		
Command ID	**Data**	**Example**
VC	900 – 1,100 (0.900 – 1.100)	>VC10005A< Sets arc voltage calibration to a value of 1.
This value calibrates the arc voltage measurement accuracy. It is the software equivalent of adjusting the voltage divider board to correct for small unit-to-unit tolerances. The measured arc voltage is multiplied by this correction value before it is displayed or used for voltage control. Default: 1.000		

Language		
Command ID	**Data**	**Example**
LG	0 – 6 0 = English, 1 = German, 2 = Spanish, 3 = Italian, 4 = French, 5 = Portuguese, 6 = Dutch	>LG0C3< Sets language to English. >LG?D2< Query from the CNC.
Sets the language displayed on the ArcGlide HMI. The ArcGlide control module always displays messages in English. Default: 0 (English)		

Sample Voltage		
Command ID	**Data**	**Examples**
SV	0 = OFF 1 = ON	>SV1DA< Sample Voltage turned on. >SV?E8< Query.
Samples voltage at cut height. Height control must be in Automatic mode and the Voltage Control must be on. When Sample Voltage is on, the ArcGlide THC measures the voltage at the end of the Accel Delay and uses it as a setpoint for the remainder of the cut. When Sample Voltage is off, the Set Arc Voltage is used as the setpoint for the torch height control. Default: Off		

IHS Start Height		
Command ID	**Data**	**Examples**
SH	0 – 2,000 (0 – 2.000 inch) 0 – 5,080 (0 – 50/80 mm)	>SH10005C< IHS Start Height set to 1.00 inch. >SH254066< IHS Start Height set to 15.40 mm. >SH?DA< Inch or metric query.
This is the height above the last known workpiece position where the ArcGlide switches from fast speed to the slower IHS speed. This height should be set high enough to avoid contacting the workpiece. Default: 1000 (1 inch above plate)		

Auto Kerf Detect Level		
Command ID	**Data**	**Examples**
KL	1 – 10 (1 = lowest peak voltage)	>KL5CC< Auto Kerf Detect Level set to 5. >KL?D6< Query.
This parameter sets a sensitivity threshold to detect kerf. The range is 1 (more sensitive) to 10 (less sensitive). Default: 5		

Thick Plate Mode		
Command ID	**Data**	**Examples**
TP	0 = OFF 1 = ON	>TP0D4< Thick Plate mode set to OFF. >TP?E3< Query.
When Thick Plate mode is On, the ArcGlide estimates torch heights for piercing thick plate. Default: Off		

ArcGlide Error Code		
Command ID	**Data**	**Examples**
AE	No data, query only	>AE?C5< Query. >AE27EF< Response: ERR 27 Interlock tripped.
Returns the ArcGlide Error code. Error codes appear on the HMI and the Control Module and can be displayed on the CNC. See *ArcGlide errors* on page 191. Default: None		

ArcGlide THC to Command THC error conversions

The ArcGlide THC supports a broad error message set. When you are using the ArcGlide THC as a replacement for the Command THC, ArcGlide error codes are converted into Command THC error codes, and only the Command THC error codes are returned with the EC command.

When you are using the ArcGlide THC in a new installation and using the ArcGlide extended command set:

- ArcGlide errors can be returned using the AE command.
- The actual ArcGlide errors will always be displayed on the ArcGlide control module and HMI displays.
- These errors are for reference. See *ArcGlide errors* on page 191 for a definition of each error and suggestions for corrective action.

Table 9 – ArcGlide errors and equivalent Command THC errors

ArcGlide		Command THC	
Error Code	**Error Message**	**Error Code**	**Description**
0	NO ERRORS	16	ERR-NO ERROR
1	ERR 1 FLASH SETUPS	2	ERR-EEPROM checksum Error
2	ERR 2 MAX SPEED EXCEEDED	4	ERR-Motion FAIL
3	ERR 3 LIFTER HOME TIMEOUT	4	ERR-Motion FAIL
4	ERR 4 PLATE CONTACT AT HOME	7	ERR-Nozzle Contact at Home
5	ERR 5 HOME LIM DURING OPR	1	ERR-Torch is in HOME LIMIT
6	ERR 6 LOWER LIM DURING OPR	0	ERR-Torch is in LOWER LIMIT
7	ERR 7 FAILED MOVE TO CROSSOVER	4	ERR-Motion FAIL
8	ERR 8 FAILED TO CONTACT PLATE	4	ERR-Motion FAIL
9	ERR 9 FAILED TO CLEAR PLATE	4	ERR-Motion FAIL
10	ERR 10 FAILED MOVE TO XFER HT	4	ERR-Motion FAIL
11	ERR 11 IHS SYNC TIMEOUT	5	ERR-Watchdog timeout FAIL
12	ERR 12 TRANSFER TIMEOUT	5	ERR-Watchdog timeout FAIL
13	ERR 13 LOST TRANSFER	11	ERR-Plasma Cable Missing
14	ERR 14 FAILED MOVE TO PIERCE	4	ERR-Motion FAIL
15	ERR 15 FAILED MOVE CUTHEIGHT	4	ERR-Motion FAIL
16	ERR 16 RAMPDOWN TIMEOUT	5	ERR-Watchdog timeout FAIL

ArcGlide		Command THC	
Error Code	**Error Message**	**Error Code**	**Description**
17	ERR 17 RETRACT TIMEOUT	4	ERR-Motion FAIL
18	ERR 18 SAMPLED ARC VOLTS	10	ERR-Machine Cable Missing
19	ERR 19 EXCESS PLATE CONTACT	3	ERR-Lifter not installed
20	ERR 20 PLASMA SUPPLY	11	ERR-Plasma Cable Missing
21	ERR 21 OHMIC TIP SENSE	3	ERR-Lifter not installed
22	ERR 36 CRITICAL ERROR	10	ERR-Machine Cable Missing
23	ERR 23 INPUT VOLTAGE LOW	9	ERR-Motor Current Fault
24	ERR 24 INPUT VOLTAGE HIGH	9	ERR-Motor Current Fault
25	ERR 25 OVER-TEMPERATURE	9	ERR-Motor Current Fault
26	ERR 26 MOTOR DRIVE	9	ERR-Motor Current Fault
27	ERR 27 INTERLOCK TRIPPED	10	ERR-Machine Cable Missing
28	ERR 28 BREAKAWAY TRIPPED	3	ERR-Lifter not installed
29	ERR 29 FIELD SUPPLY FAILED	9	ERR-Motor Current Fault
30	ERR 30 STALL CALIBRATION	8	ERR-Cycle Start ON at Init
31	ERR 31 NO HYPERNET CONNECTION	6	ERR-InterProcessor Comm Fail
32	ERR 32 LOST CNC HYPERNET	6	ERR-InterProcessor Comm Fail
33	ERR 33 LOST HMI HYPERNET	6	ERR-InterProcessor Comm Fail
34	ERR 34 ENCODER OVERFLOW	4	ERR-Motion FAIL
35	ERR 35 ENCODER UNDERFLOW	4	ERR-Motion FAIL
36	ERR 36 HYPERNET ADDRESSING	6	ERR-InterProcessor Comm Fail
37	ERR 37 SOFTWARE ERROR	5	ERR-Watchdog timeout FAIL
38	ERR 38 SOFTWARE LOOP TIME	5	ERR-Watchdog timeout FAIL
39	ERR 39 SOFTWARE UNDEF DISPLAY	5	ERR-Watchdog timeout FAIL
40	ERR 40 SOFTWARE ANALOG INPUT	5	ERR-Watchdog timeout FAIL
41	ERR 41 PROTOCOL MISMATCH	6	ERR-InterProcessor Comm Fail
42	ERR 42 LOST PAC HYPERNET	6	ERR-InterProcessor Comm Fail

Appendix B

ArcGlide THC Serial Communication Installation

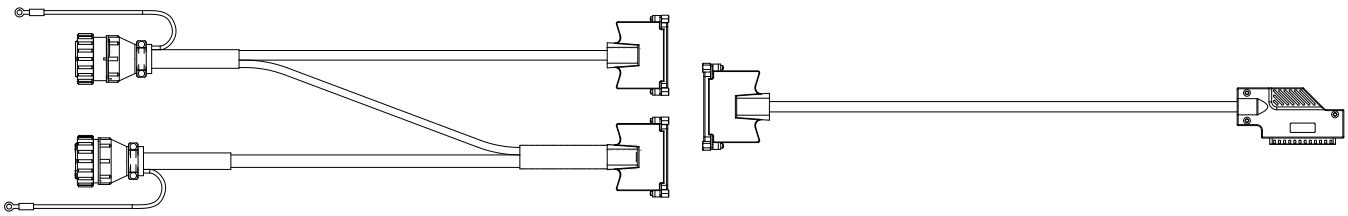
Introduction

This appendix describes the features of an ArcGlide THC that are unique to systems in which ArcGlide communication uses the RS-422 serial protocol and in which the ArcGlide:

- Replaces a Command THC
- Is installed in new system using Command THC serial communication

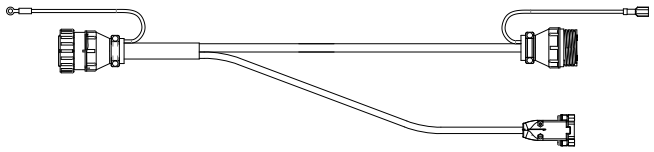
For more information on the ArcGlide serial protocol, see *ArcGlide THC Serial Communication Protocol* on page 249. Refer to the manufacturers' instruction manuals for specific information about making serial, I/O, and power connections to the CNC and plasma system in your plasma cutting machine.

Kit 228846 (Command THC replacement)



Part number	Description	Quantity
223253	Plasma I/O and CNC I/O to THC control module cable with serial split (Z adapter)	1
223260	Plasma board adapter cable	1

Kit 228851 (New ArcGlide installation)



Part number	Description	Quantity
223262	Plasma I/O to THC control module cable with serial split (Y adapter)	1
074067	Quick-disconnect ground terminal	1

Specifications

An ArcGlide THC that uses RS-422 serial communication supports the following features:

- Built-in jumpers on the adapter cables that connect to the ArcGlide control module enable serial communication and allow the rest of the system to interact with the ArcGlide THC as if it were a Command THC
- Only single-torch configurations are allowed
- The HMI is optional. However, the switches on the HMI are active and allow it to be used as an operator console to perform the following functions:
  - Enable or disable the lifter
  - Raise or lower the torch
  - Select Automatic or Manual mode
  - Perform an IHS test
- The HMI only displays status and error messages from the control module. To allow the HMI to modify parameters in a system that uses serial communication, you must remove the jumper between pins 14 and 15 in Connector A on the Plasma I/O split cable (Z) (223253). For more information, see *ArcGlide discrete interface signal examples* on page 117. Communication between the HMI and the ArcGlide control module is carried over a Hypernet connection. This is the only Hypernet connection in the RS-422 serial configuration.
- Plasma I/O is carried on a discrete cable. The RS-422 signals that are sent from the plasma board on the control module are diverted to the CNC.

Limitations

An ArcGlide THC that uses RS-422 serial communication has the following configuration limitations:

- Real-time signals are not supported over serial RS-422 connections. Therefore, True Hole™ technology and other interactive cutting commands and signals are not always supported. However, it is possible to implement True Hole technology in some Command THC installations by using the discrete I/O signals in addition to the RS-422 connection.
- It cannot be configured with an HPR plasma system that uses Hypernet for communication.
- When the system is turned ON, only ArcGlide default values are used:
  - ArcGlide THC standard lifter setup (9.40-inch, 25-pound breakaway)
  - Loop gains for speed, position, and voltage
  - Puddle Jump and Transfer Height features are not available
  - There are no Automatic mode settings
- The HMI can only be used for monitoring and manual control functions unless you have removed the jumper between pins 14 and 15 in Connector A on the Plasma I/O split cable (Z) (223253). For more information, see *Adjusting ArcGlide parameters with the HMI* on page 283.

RS-422 serial protocol

The serial protocol supports the 19,200 baud, 8 data, 1 stop, no parity format. It does not support the older Command THC 9600 baud format. This basic protocol supports all Command THC instructions with the exception of the following:

- Real Time revision (RR) returns the ArcGlide firmware revision number.
- I/O revision (RI) returns the ArcGlide firmware revision number.
- Error code (EC) returns the nearest equivalent Command THC error code.
- Lifter test (LT) is not supported.

When the ArcGlide THC replaces a Command THC, the CNC receives error and status messages as Command THC messages.

If the ArcGlide THC is installed in a new system, extensions to the serial protocol are available to allow programmers to edit the parameter settings for the following:

- Lifter setup: length, motor current, encoder counts
- Speed setup: maximum, fast, slow, IHS
- Loop gains: speed, position, voltage
- Height settings: Crossover, Transfer, Cut, Pierce, Puddle Jump
- Sample Voltage mode
- HMI language
- Relative kerf detect level

When the extended command set is used, both the CNC and the ArcGlide control module display ArcGlide error messages. See *ArcGlide THC Serial Communication Protocol* on page 249 for the ArcGlide serial protocol command set.

Serial communication configurations

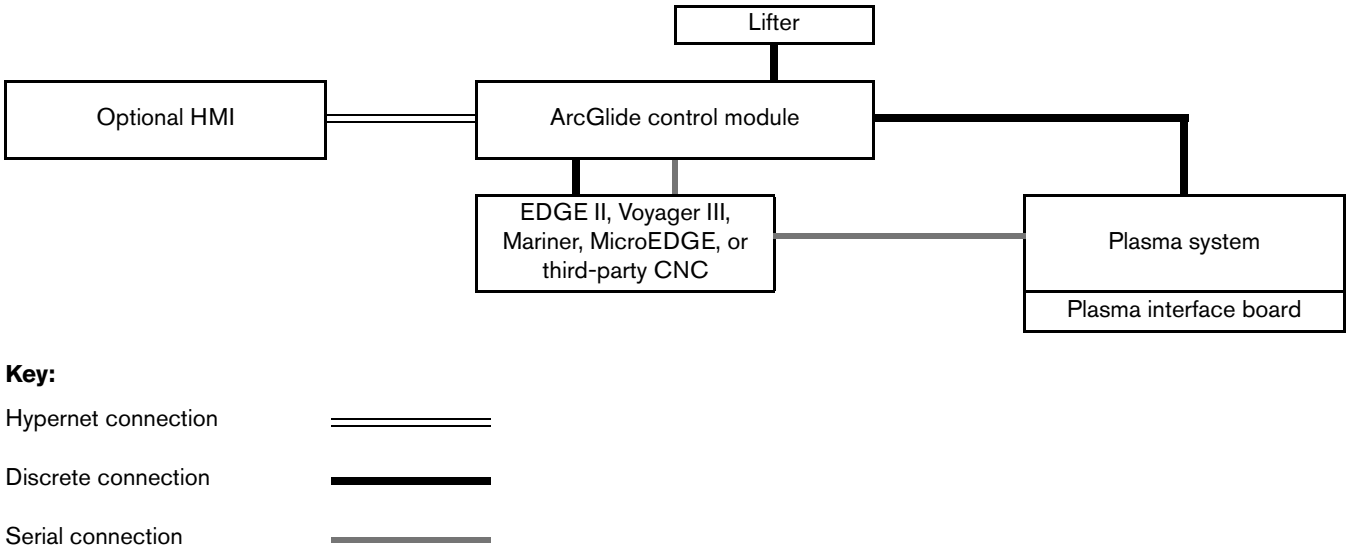
In a serial configuration, adapter cables are provided to accommodate the routing of serial signals to the ArcGlide THC.

When the ArcGlide THC replaces a Command THC in a system with a Hypertherm CNC, adapter cables (223253 and 223260 in kit number 228846) connect the CNC I/O and plasma I/O cables to the ArcGlide control module and the plasma system. Both the plasma I/O and combined CNC I/O and serial cables can be the same cables that were used for the Command THC or the table manufacturer can create them. For more information, see *Cables* on page 97.

In new systems, an adapter cable (223262 in kit number 228851) connects the plasma board on the ArcGlide control module to the plasma I/O cable. This adapter cable separates the serial transmit and receive signals and sends them to the CNC over a serial cable that is supplied by the table manufacturer.

The HMI communicates with the ArcGlide control module using the Hypernet protocol over a shielded, Ethernet Cat5e or Cat6 cable. In a serial configuration, the HMI is optional and performs many of the same functions that the pendant performs for the Command THC.

Figure 48



Replacing a Command THC

The Command THC and ArcGlide THC have many of the same types of components. Therefore, replacing the Command THC hardware with ArcGlide THC hardware is relatively straightforward. Use the corresponding descriptions that follow for a comparison of how the 2 THCs are configured in a plasma cutting machine.

1. The optional HMI of the ArcGlide THC corresponds to the optional pendant for the Command THC with a few differences, depending on the style of system communication:
   a. Hypernet configurations – the HMI only allows the operator to monitor operations of the THC and to perform manual control functions with the lifter.
   b. Discrete configurations – the HMI communicates directly with the ArcGlide control module and can perform diagnostic functions in addition to monitoring and manual functions.

   c. Serial configurations – the HMI performs monitoring and manual control functions only. Serial communication is enabled by a jumper inside connector A of the Plasma I/O split cable (Z) (223253). You can disable serial communication by removing this jumper and allowing full use of the HMI for diagnostic purposes. For more information, see *ArcGlide discrete interface signal examples* on page 117.

2. Both models of THC send discrete I/O and serial signals to the CNC. When an ArcGlide THC replaces a Command THC, the Z adapter cable (223253) connects the existing Command THC CNC I/O cable to the control module.

3. Both models of THC send discrete I/O signals to the plasma interface board in the plasma system. When an ArcGlide THC replaces a Command THC, the Z adapter cable (223253) connects the existing Command THC plasma I/O cable to the control module.

4. The plasma interface board adapter (223260) connects the plasma I/O cable and the ArcGlide plasma interface board within the plasma system.

5. The ArcGlide THC uses its own lifter I/O cable between the control module and the lifter and comes with the system.

6. Both models of THC have a control module that provides arc voltage control and a motor drive. Cables to the optional pendant or HMI, CNC, plasma system, and lifter all connect to the control module.

For more details about connecting serial, I/O, and adapter cables, see *Connecting cables for a Command THC replacement* on page 276.

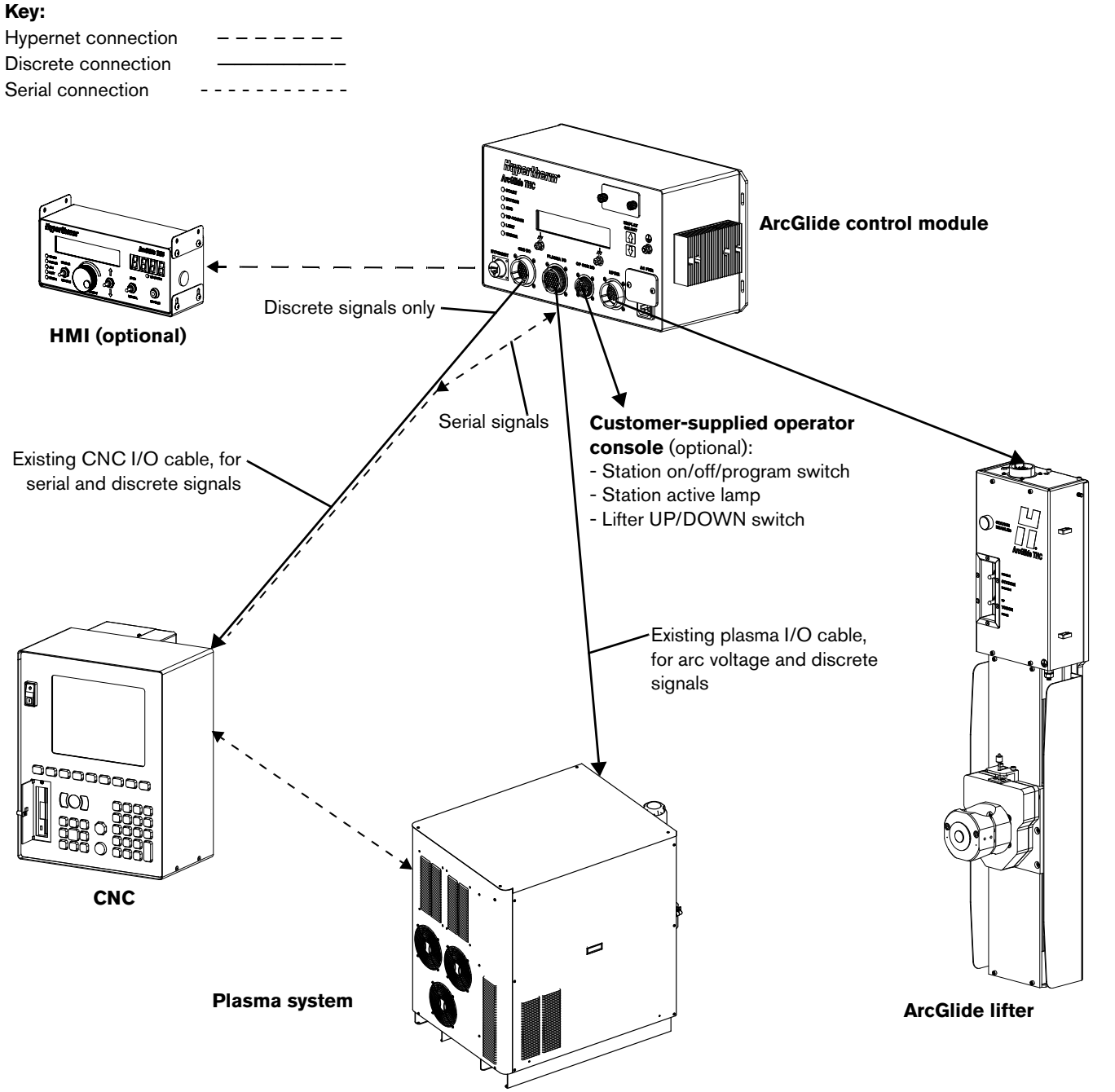
To allow the ArcGlide HMI to make adjustments to parameters in a system that uses serial communication, you must remove the jumper between pins 14 and 15 in Connector A on the Plasma I/O split cable (Z) (223253). For more information, see *ArcGlide discrete interface signal examples* on page 117.

System description for a serial configuration

ArcGlide THC replacement for Command THC

Figure 49 shows an ArcGlide THC that has replaced a Command THC. In this configuration, the ArcGlide operates and communicates with the rest of the system using the serial protocol, as if it were a Command THC, as described in *ArcGlide THC Serial Communication Installation* on page 269. For more information, refer to the illustration in *Connecting cables for a Command THC replacement* on page 276.

Figure 49

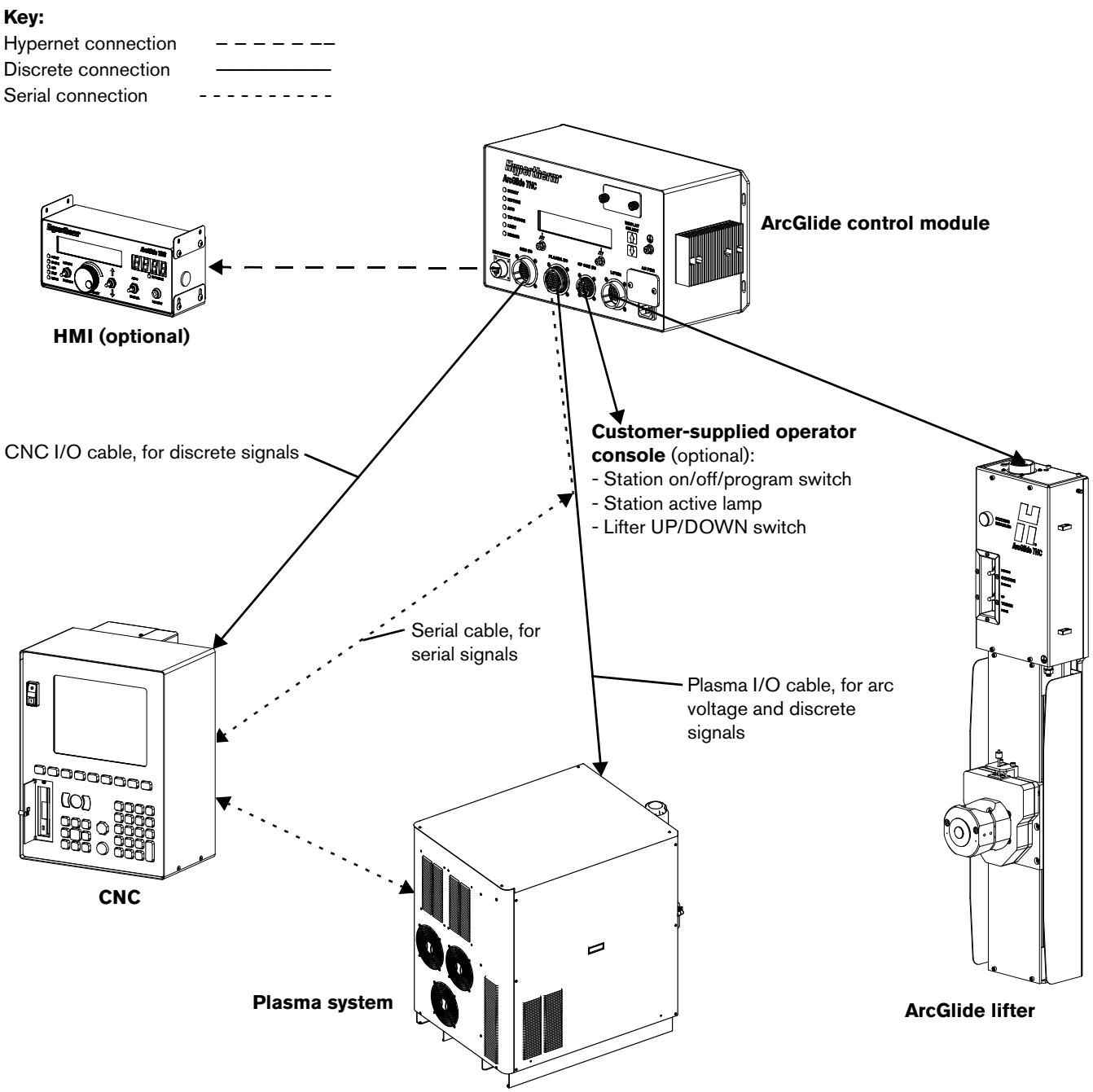


ArcGlide THC in a new installation

Figure 50 shows an ArcGlide THC in a new installation with a third-party CNC. In this configuration, the extended set of ArcGlide THC features are available to third-party CNCs with the ArcGlide extensions to the basic Command THC serial protocol.

New configurations with a Hypertherm CNC must use Hypernet for communication. For more information, refer to the illustration in *Connecting cables in a new serial system* on page 278.

Figure 50



Connect serial cables

Connecting serial cables to an ArcGlide THC depend on whether you are replacing a Command THC or installing the ArcGlide in a new system.

Connecting cables for a Command THC replacement

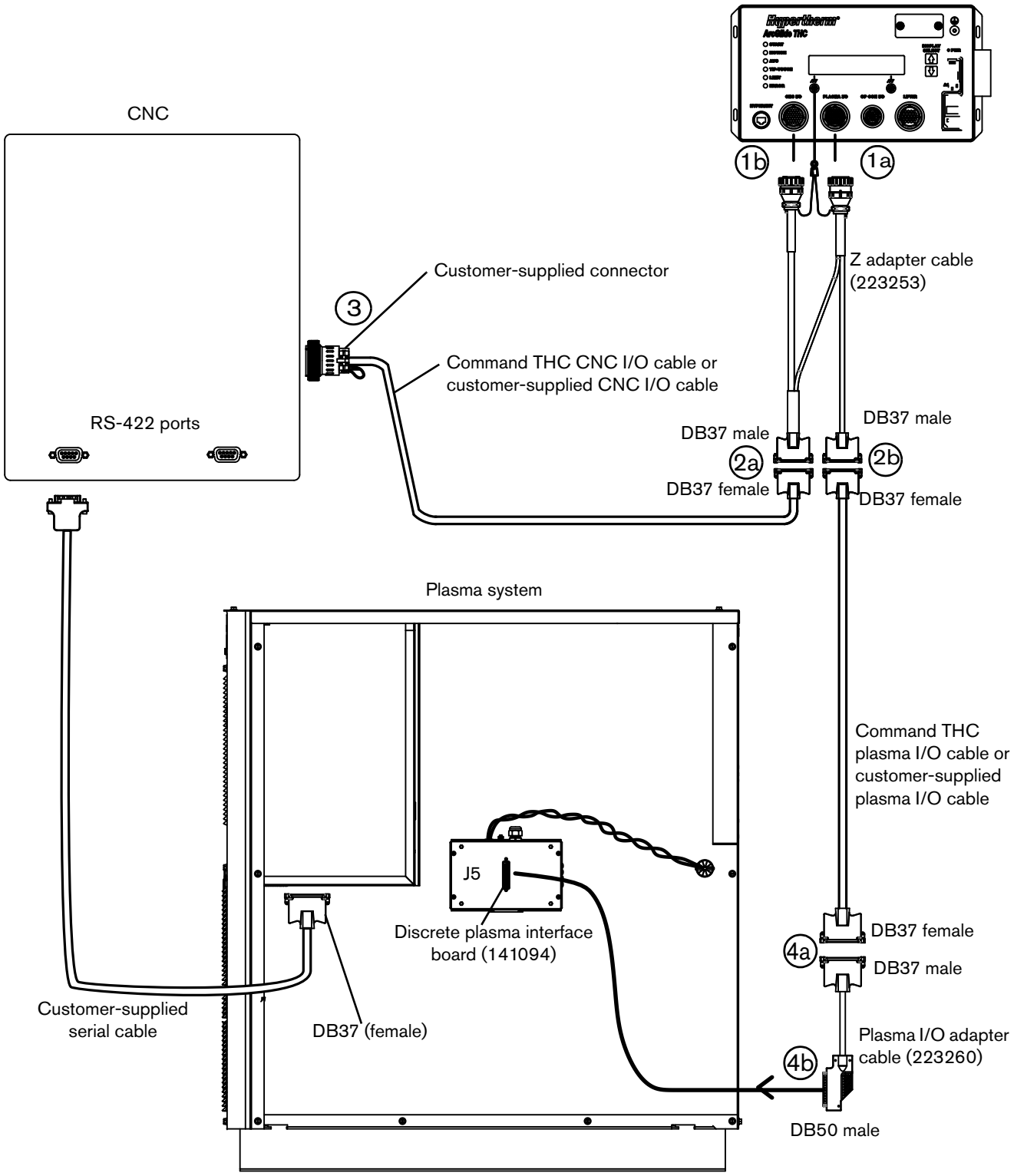
Before you install your ArcGlide THC, see *Placement of system components* on page 54 for information about placing ArcGlide THC components and how to connect power. See also *Figure 51* on page 277.

To replace a Command THC with an ArcGlide THC:

1. Connect the Z adapter cable (223253) to the control module:
   a. Insert the round connector with the blue band into the plasma I/O port on the front of the control module.
   b. Insert the round connector with the yellow band into the CNC I/O port on the front of the control module.
2. Connect the CNC and plasma I/O cables to the Z adapter:
   a. Connect the DB37 female connector on the end of the CNC I/O cable to the DB37 male connector with the yellow band on the Z adapter cable. Fasten the standoffs to secure the connectors.
   b. Connect the DB37 female connector on the end of the plasma I/O cable to the DB37 male connector with the blue band on the Z adapter cable. Fasten the standoffs to secure the connectors.
3. Connect the CNC I/O cable to the I/O port on the CNC.
4. Connect the plasma board adapter cable (223260):
   a. Connect the DB37 female connector on the end of the plasma I/O cable to the DB37 male connector on the plasma board adapter cable. Fasten the standoffs to secure the connectors.
   b. Connect the DB50 male connector on the end of the plasma board adapter cable to the J5 connector on the plasma interface board in the plasma system.

For more information, see *Plasma I/O split cable (Z) (223253)* on page 280.

Figure 51


CNC
RS-422 ports
Customer-supplied connector
3
Command THC CNC I/O cable or
customer-supplied CNC I/O cable
1b
1a
Z adapter cable
(223253)
DB37 male
DB37 male
2a
2b
DB37 female
DB37 female
Plasma system
Command THC
plasma I/O cable or
customer-supplied
plasma I/O cable
J5
Discrete plasma interface
board (141094)
DB37 female
4a
DB37 male
Customer-supplied
serial cable
DB37 (female)
Plasma I/O adapter
cable (223260)
4b
DB50 male

Connecting cables in a new serial system

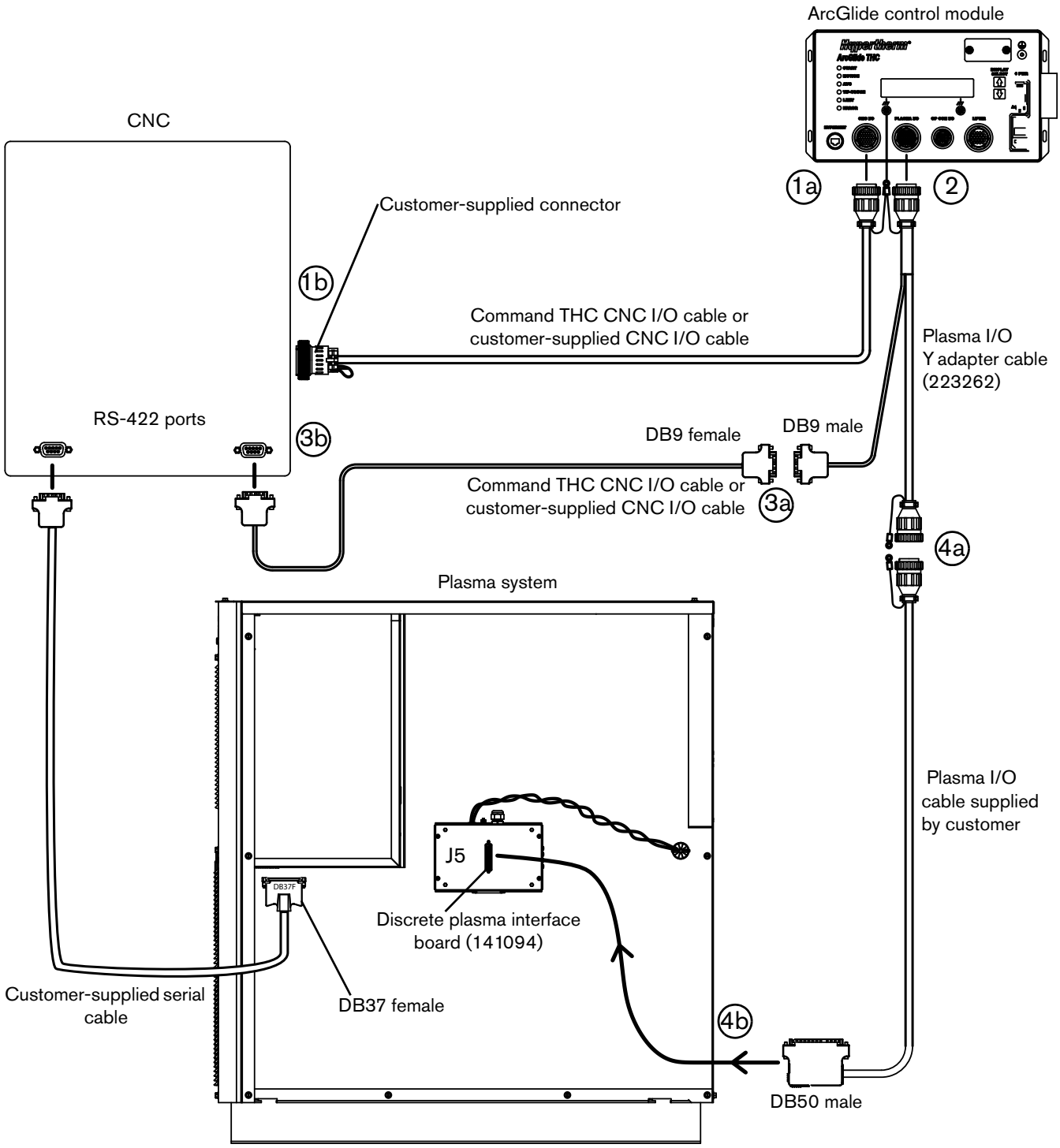
See *Figure 52* on page 279 for an illustration of this configuration.

To add an ArcGlide THC to a new system:

1. Connect the CNC to the control module:
   a. Insert the end of the CNC I/O cable with the yellow band into the CNC I/O port on the front of the control module.
   b. Connect the wires on the other end of the cable to the I/O signals on the CNC. Refer to the description of the CNC I/O cable later in this section for details.
2. Connect the Y adapter (223262) to the control module by inserting the round connector with the blue band into the plasma I/O port on the front of the control module.
3. Connect the serial cable:
   a. Connect the DB9 female connector on the serial cable to the DB9 male connector on the Y adapter.
   b. Connect the other end of the serial cable to the serial port on the CNC.
4. Connect the plasma I/O cable to the Y adapter:
   a. Connect the round connector on the end of the plasma I/O cable to the round connector on the Y adapter.
   b. Connect the DB50 male connector on the other end of the plasma I/O cable to the J5 connector on the plasma interface board in the plasma system.
5. Secure the ground wires between the plasma I/O cable and the Y adapter:
   a. Cut the ring terminal from the ground wire on the plasma I/O cable.
   b. Strip the insulation from the cut end.
   c. Crimp the male quick-disconnect terminal (074016) onto the stripped end of the ground wire.
   d. Wind the ground wires in opposite directions around the joined connectors of the plasma I/O cable and the Y adapter cable.
   e. Connect the quick-disconnect terminals on the ground wires.

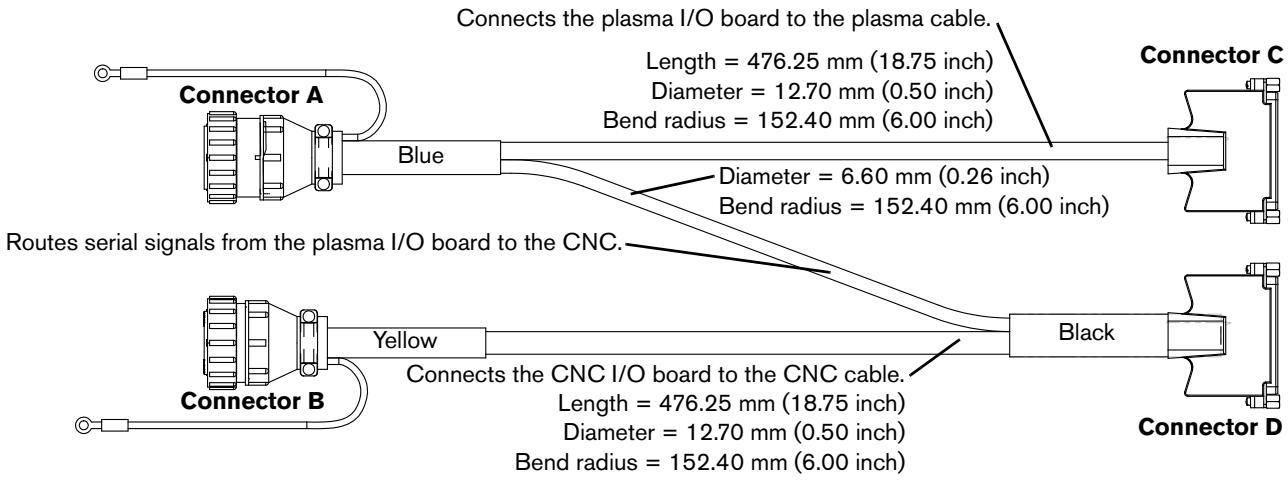
See *Plasma I/O split cable (Y) (223262)* on page 285 for more information.

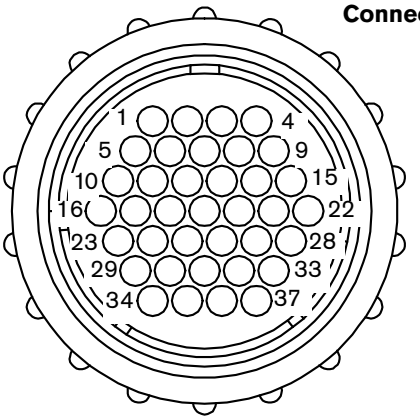
Figure 52

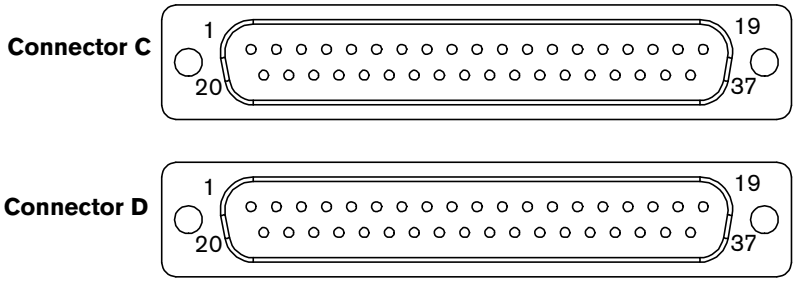

ArcGlide control module
CNC
Customer-supplied connector
1a
2
1b
Command THC CNC I/O cable or
customer-supplied CNC I/O cable
Plasma I/O
Y adapter cable
(223262)
RS-422 ports
3b
DB9 female
DB9 male
Command THC CNC I/O cable or
customer-supplied CNC I/O cable
3a
4a
Plasma system
Plasma I/O
cable supplied
by customer
J5
DB37F
Discrete plasma interface
board (141094)
Customer-supplied serial
cable
DB37 female
4b
DB50 male

Cables

Plasma I/O split cable (Z) (223253)



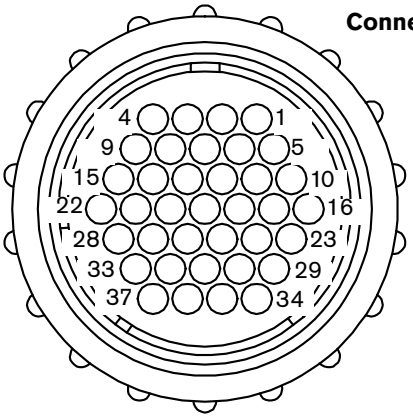


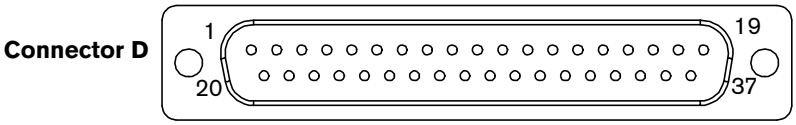


Connector A Pin No.	Wire color	Signal	Connector C Pin No.
6	White	Motion input +	**28**
7	Black	Motion input -	**9**
18	White	Pierce output A	**13**
19	Brown	Pierce output B	**32**

Connector A Pin No.	Wire color	Signal	Connector C Pin No.
20 **21**	White Red	Hold output A Hold output B	**14** **33**
22 **23**	White Orange	Start output A Start output B	**15** **34**
28 **31**	White Yellow	Field common Plasma 24 V field	**18** **37**
34 **35**	White Green	1/50 Arc Voltage + 1/50 Arc Voltage -	**35** **16**

Connector A Pin No.	Wire color	Signal	Connector D Pin No.
1 **2**	Red Black	RS-422 RX + RS-422 RX -	**20** **1**
3 **4**	White Black	RS-422 TX + RS-422 TX -	**21** **2**
5 **Not connected**	Green Black	RS-422 common	**36** **Not connected**





Connector B Pin No.	Wire color	Signal	Connector D Pin No.
1 **2**	Red Black	Cycle Start input + Input common -	**28** **9**
5 **6**	White Black	AVC Disable input + Input common	**27** **8**
7 **8**	Green Black	IHS Sync input + Input common -	**24** **5**
9 **10**	Blue Black	Spare input 1 + Input common -	**26** **7**
11 **12**	Yellow Black	Spare input 2 + Input common -	**25** **6**
13 **14**	Brown Black	IHS Complete output A IHS Complete output B	**29** **10**
15 **16**	Orange Black	Retract Complete output A Retract Complete output B	**31** **12**
17 **18**	White Red	Machine Motion output A Machine Motion output B	**34** **15**

Connector B Pin No.	Wire color	Signal	Connector D Pin No.
19 **20**	Green Red	THC Error output A THC Error output B	**33** **14**
23 **24**	Blue Red	CNC Spare output A CNC Spare output B	**30** **11**
25 **26**	Yellow Red	Interlock input + Interlock input -	**35** **16**
29 **34**	Brown Red	Field common Field 23 V	**18** **37**

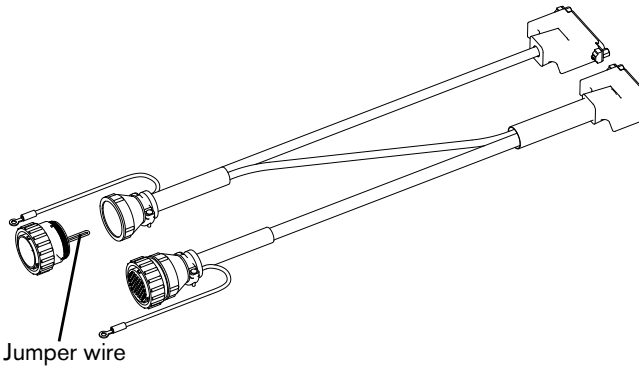
Adjusting ArcGlide parameters with the HMI

The jumper on pins 14 and 15 in Connector A limit the HMI to monitoring ArcGlide functions. To enable the HMI to adjust ArcGlide parameters, you must remove pins 14 and 15 and the jumper wire from Connector A, using a contact extraction tool (008197).

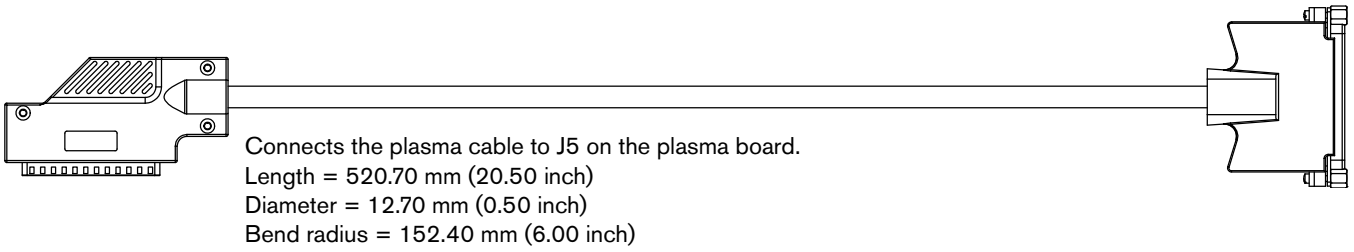
Jumper wire in Connector A:	
Pin No.	**Signal**
14 **15**	Serial enable + Input common -

To remove the jumper in Connector A:

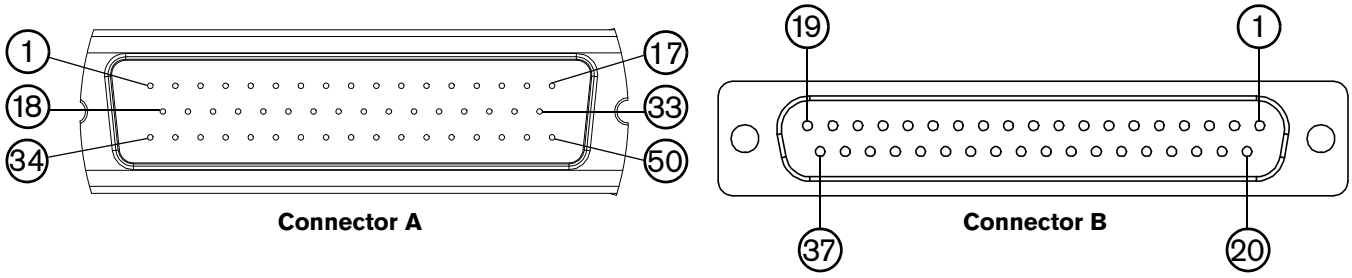
1. Remove the 2 screws from the cable clamp around the connector.
2. Unscrew the backshell from the connector.
3. Insert the contact extraction tool into pin position 14 and push the end of the tool to remove the pin.
4. Repeat Step 3 for pin position 15.
5. Pull the jumper wire from the back of the connector.
6. Screw the backshell onto the connector.
7. Replace the cable clamp around the connector and fasten the 2 screws.



Plasma board adapter cable (223260)

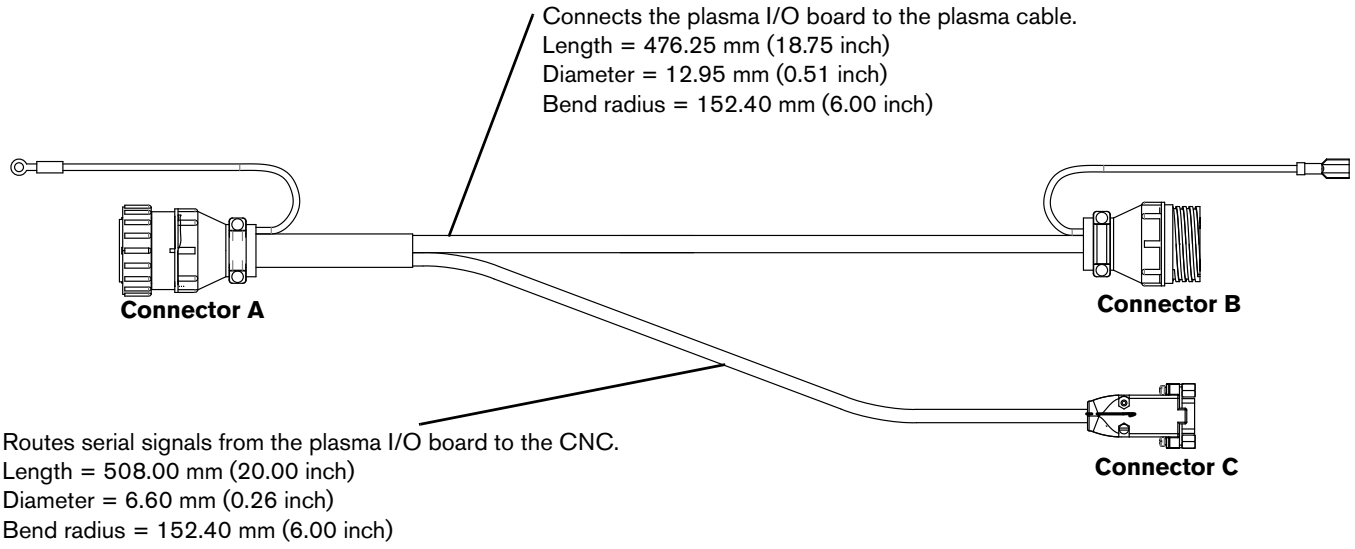


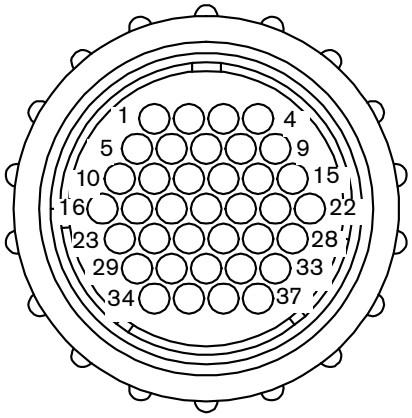
Connects the plasma cable to J5 on the plasma board.
Length = 520.70 mm (20.50 inch)
Diameter = 12.70 mm (0.50 inch)
Bend radius = 152.40 mm (6.00 inch)

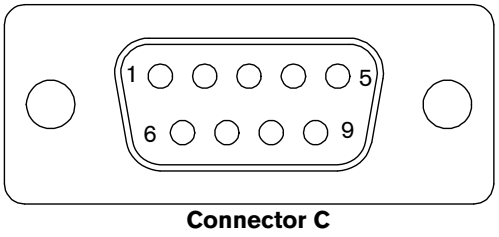


Connector A Pin No.	Wire color	Signal	Connector B Pin No.
6 **7**	White Black	Motion + Input common -	**28** **9**
18 **19**	White Brown	Pierce output A Pierce output B	**13** **32**
20 **21**	White Red	Hold output A Hold output B	**14** **33**
22 **23**	White Orange	Start output A Start output B	**15** **34**
28 **31**	White Yellow	Field common Plasma 24 V field	**18** **37**
34 **35**	White Green	1/50 Arc Voltage + 1/50 Arc Voltage -	**35** **16**

Plasma I/O split cable (Y) (223262)

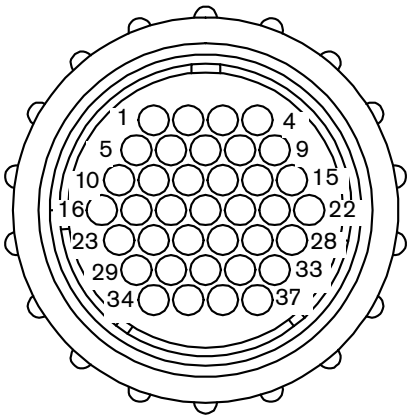




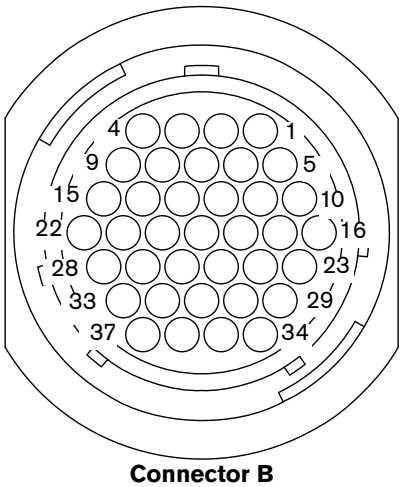


Connector A Pin No.	Wire color	Signal	Connector C Pin No.
1 **2**	Red Black	RS-422 TX + RS-422 TX -	**4** **2**
3 **4**	White Black	RS-422 RX + RS-422 RX -	**7** **3**
5 **Not connected**	Green Black	RS-422 common	**5** **Not connected**

Plasma I/O split cable (Y) (223262), continued



Connector A



Connector B

Connector A Pin No.	Wire color	Signal	Connector B Pin No.
1		Not connected	**1**
2		Not connected	**2**
3		Not connected	**3**
4		Not connected	**4**
5		Not connected	**5**
6	Black	Motion input +	**6**
7 **8**	Blue Black	Input common - Error input +	**7** **8**
9 **10**	Yellow Black	Input common - Rampdown Error input +	**9** **10**
11 **12**	Brown Black	Input common - Not Ready input +	**11** **12**
13 **14**	Orange Black	Input Common - Serial enable +	**13** **14**
15 **16**	White Red	Input common - Corner output A	**15** **16**

Connector A Pin No.	Wire color	Signal	Connector B Pin No.
17 **18**	Green Red	Corner output B Pierce output A	**17** **18**
19 **20**	Blue Red	Pierce output B Hold output A	**19** **20**
21 **22**	Yellow Red	Hold output B Start output A	**21** **22**
23 **24**	Brown Red	Start output B Spare output A	**23** **24**
25 **26**	Orange Red	Spare output B Remote On output A	**25** **26**
27 **28**	White Green	Remote On output B Field common	**27** **28**
29 **30**	Blue Green	Field common Field common	**29** **30**
31 **32**	Yellow Green	Field 24 V Field 24 V	**31** **32**
33 **34**	Brown Green	Field 24 V 1/50 Arc Voltage +	**33** **34**
35 **Not connected**	Orange Green	1/50 Arc Voltage -	**35** **Not connected**