ArcGlide® THC with Serial Communication

Field Service Bulletin

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Hypertherm®

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 work piece*. 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, 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 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.

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RECOGNIZE SAFETY INFORMATION

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



FOLLOW SAFETY INSTRUCTIONS

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

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

DANGER WARNING CAUTION

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.



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.



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.

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.

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
Explosion Hazard
Underwater Cutting with Fuel Gases

- 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.

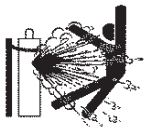


WARNING
Hydrogen Detonation with
Aluminum Cutting

- 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.

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.



TOXIC FUMES CAN CAUSE INJURY OR DEATH

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

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

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

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

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

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

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

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

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

To reduce the risk of exposure to fumes:

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



A PLASMA ARC CAN CAUSE INJURY AND BURNS

Instant-on torches

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

The plasma arc will cut quickly through gloves and skin.

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



ARC RAYS CAN BURN EYES AND SKIN

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

- Use eye protection in accordance with applicable national 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.
- Cuff less 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 EN 169:2002
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.

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/
12. ASTM, D 4185-96(2001) E1, *Practice for Measurement of Metals in Workplace Atmosphere by Flame Atomic Absorption Spectrophotometry*, ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428 http://www.astm.org/
13. AS/NZS 3760:2003, *In-service safety inspection and testing of electrical equipment*. Standards Australia, Level 10, The Exchange Centre, 20 Bridge Street, Sydney, GPO Box 476, Sydney NSW 2001 http://www.standards.org.au
14. NFPA 68, *Standard on Explosion Protection by Deflagration Venting,* National Fire Protection Association (NFPA), 1 Batterymarch Park Quincy, Massachusetts 02169-7471 http://www.nfpa.org
15. CEN publication, EN 169:2002 *Personal eye-protection - Filters for welding and related techniques - Transmittance requirements and recommended use*. The European Committee for Standardization (CEN), CEN-CENELEC Management Centre, Avenue Marnix 17, B-1000 Brussels http://www.cen.eu

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 IEC60974-4. 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

Purpose

This FSB describes the features of an ArcGlide THC that are unique to systems in which ArcGlide communication uses the RS-422 serial protocol. The adapter cable kits that make this type of configuration possible are used in the following two types of systems:

- The ArcGlide THC replaces a Command THC (Kit no. 228846).
- The ArcGlide THC is installed in new system (Kit no. 228851).

Additional information

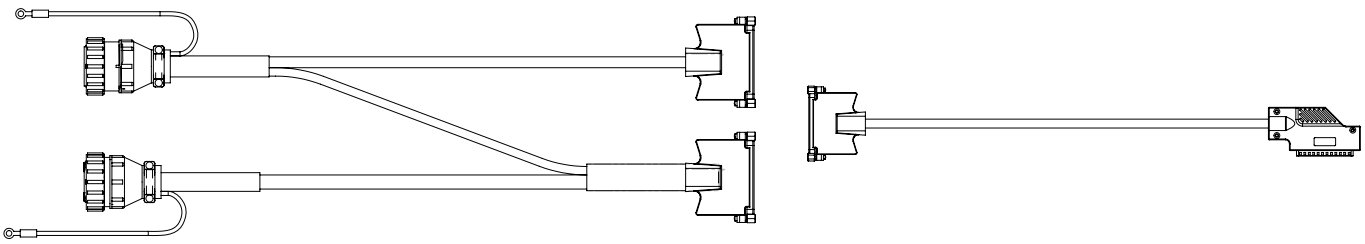
The procedures in this document supplement the information in the *ArcGlide THC Information Manual* (806450) that accompanies the ArcGlide THC. Refer to the instruction manual for complete product specifications, installation and operation instructions, and maintenance and troubleshooting information.

For more information on the ArcGlide serial protocol, see *ArcGlide Serial Communication Protocol* (807470)

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 system.

Kit 228846 (Command THC replacement)

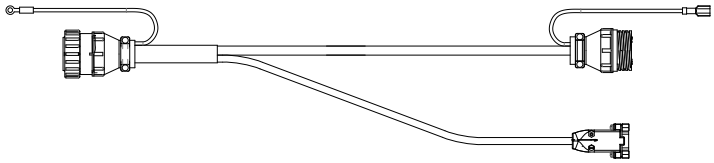
For detailed information on this cable, see the *Cables* section, later in this manual.



Part number	Description	Quantity
223253	Plasma I/O and CNC I/O to THC controller cable with serial split (Z adapter)	1
223260	Plasma interface adapter cable	1
807360	Field Service Bulletin	1

Kit 228851 (New ArcGlide installation)

For detailed information on this cable, see the *Cables* section, later in this manual.



Part number	Description	Quantity
223262	Plasma I/O to THC controller cable with serial split (Y adapter)	1
074067	Quick-disconnect ground terminal	1
807360	Field Service Bulletin	1

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 illustration on the next page and the corresponding descriptions below for a comparison of how the two THCs are configured in a plasma cutting system.

A. The optional HMI of the ArcGlide THC corresponds to the optional pendant for the Command THC. The HMI is used for monitoring operations and allows the operator to perform manual control functions with the lifter.

B. Both models of THC send I/O and serial signals to the CNC. When an ArcGlide THC replaces a Command THC, the Z adapter cable (223253) connects the CNC I/O cable to the control module. The Command THC CNC I/O cable can be reused with the ArcGlide THC.

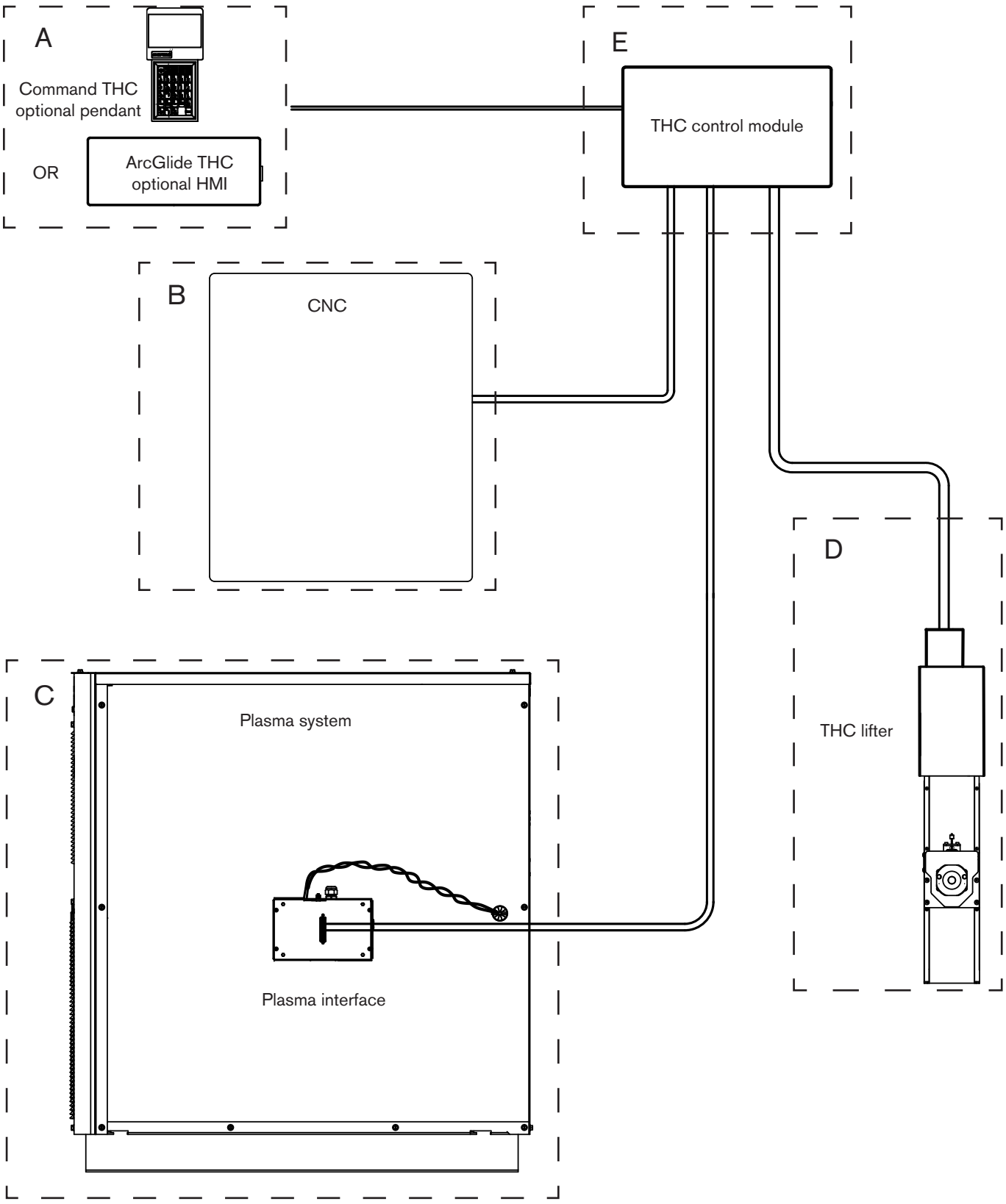
C. Both models of THC send I/O signals to the plasma interface in the plasma system. When an ArcGlide THC replaces a Command THC, the Z adapter cable (223253) connects the plasma I/O cable to the control module. The Command THC plasma I/O cable can be reused with the ArcGlide THC.

   The plasma interface adapter (223260) connects the plasma I/O cable and the ArcGlide plasma interface PCB within the plasma system.

D. The ArcGlide THC uses its own lifter I/O cable, which is shipped with the system.

E. 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 connect to the control module.

For more details about connecting serial, I/O, and adapter cables, refer to *Connecting cables for a Command THC replacement* later in this FSB.



Comparison of Command THC and ArcGlide THC installations

Specifications

An ArcGlide THC that uses RS-422 serial communication supports these 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 auto or manual mode
  - Perform an IHS test.
- The HMI displays status and error messages from the control module but it cannot be used to change values for ArcGlide parameters. Communication between the HMI and the control module is carried over a Hypernet link. This is the only Hypernet link 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 interface 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 links. 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 newer Command THC installations by using the discrete I/O signals in addition to the RS-422 link. True Hole capability varies from installation to installation because proper True Hole operation depends on motion control and the system and CNC software.
- An ArcGlide THC that uses RS-422 communication cannot be configured with an HPR plasma system that uses Hypernet for communication.
- When the system is powered on, only ArcGlide default values are used:
  - Hypertherm standard lifter setup (9.5-inch, 25-pound lifter)
  - Loop gains for speed, position, and voltage
  - Puddle Jump and Transfer Height are not available
  - No automatic settings

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
- Sampled Arc Voltage mode
- HMI language
- Relative kerf detect level

When the extended command set is used, both the CNC and the control module display ArcGlide error messages. Refer to *ArcGlide Serial Communication Protocol* (807470) for the ArcGlide serial protocol command set.

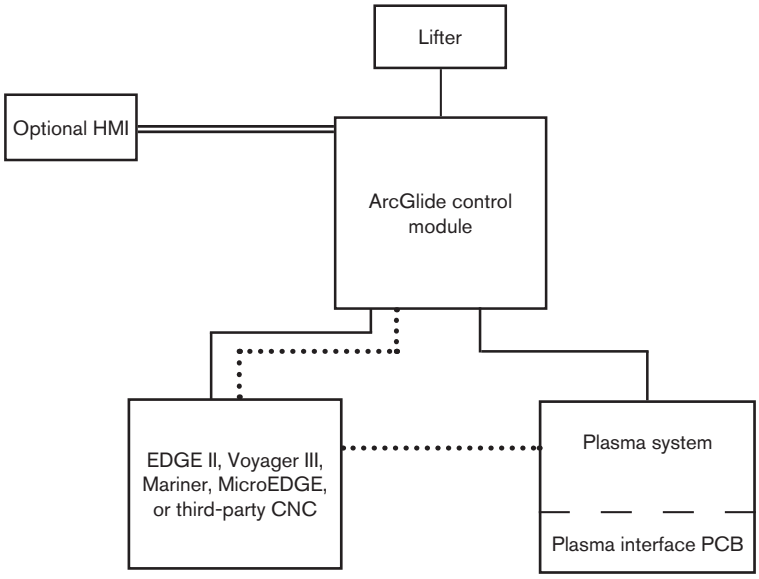
Serial communication configurations

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 supply. Both the plasma I/O and combined CNC I/O and serial cables can be same cables that were used for the Command THC or the table manufacturer can create them. For more information on cables, see the *Installation* section in this document.

In new systems, an adapter cable (223262 in kit number 228851) connects the plasma interface 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 control module using the Hypernet protocol over a shielded Ethernet Cat-5e cable. In a serial configuration, the HMI is optional and performs many of the same functions that the pendant preforms for the Command THC.



Key

Hypernet connection

Discrete connection

Serial connection

Basic configuration with serial connections

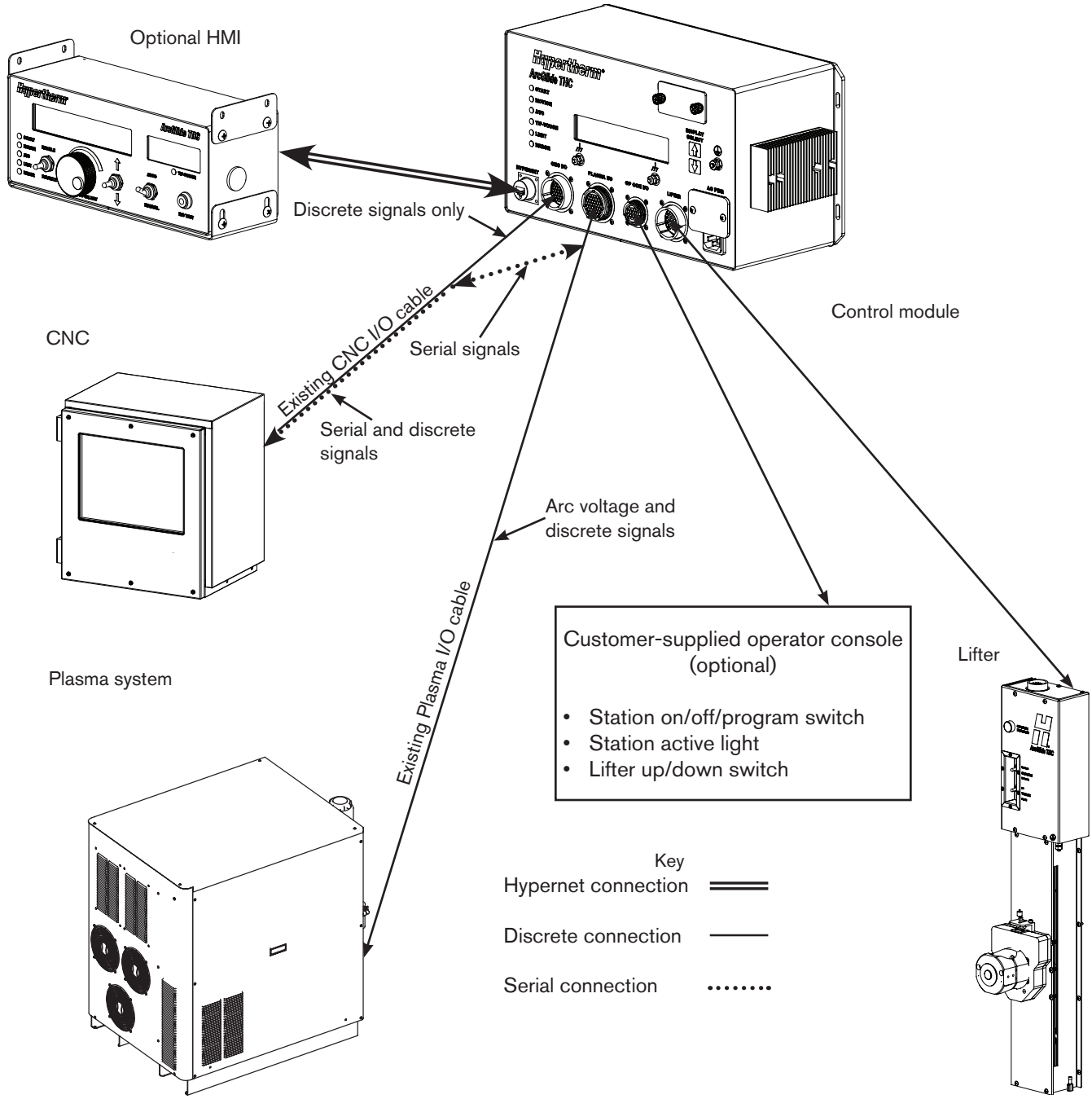
Installation

System description for a serial configuration

ArcGlide THC replacement for Command THC

The following diagram illustrates an ArcGlide THC 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.

For more information, refer to the illustration in *Connecting cables for a Command THC replacement*, later in this FSB.



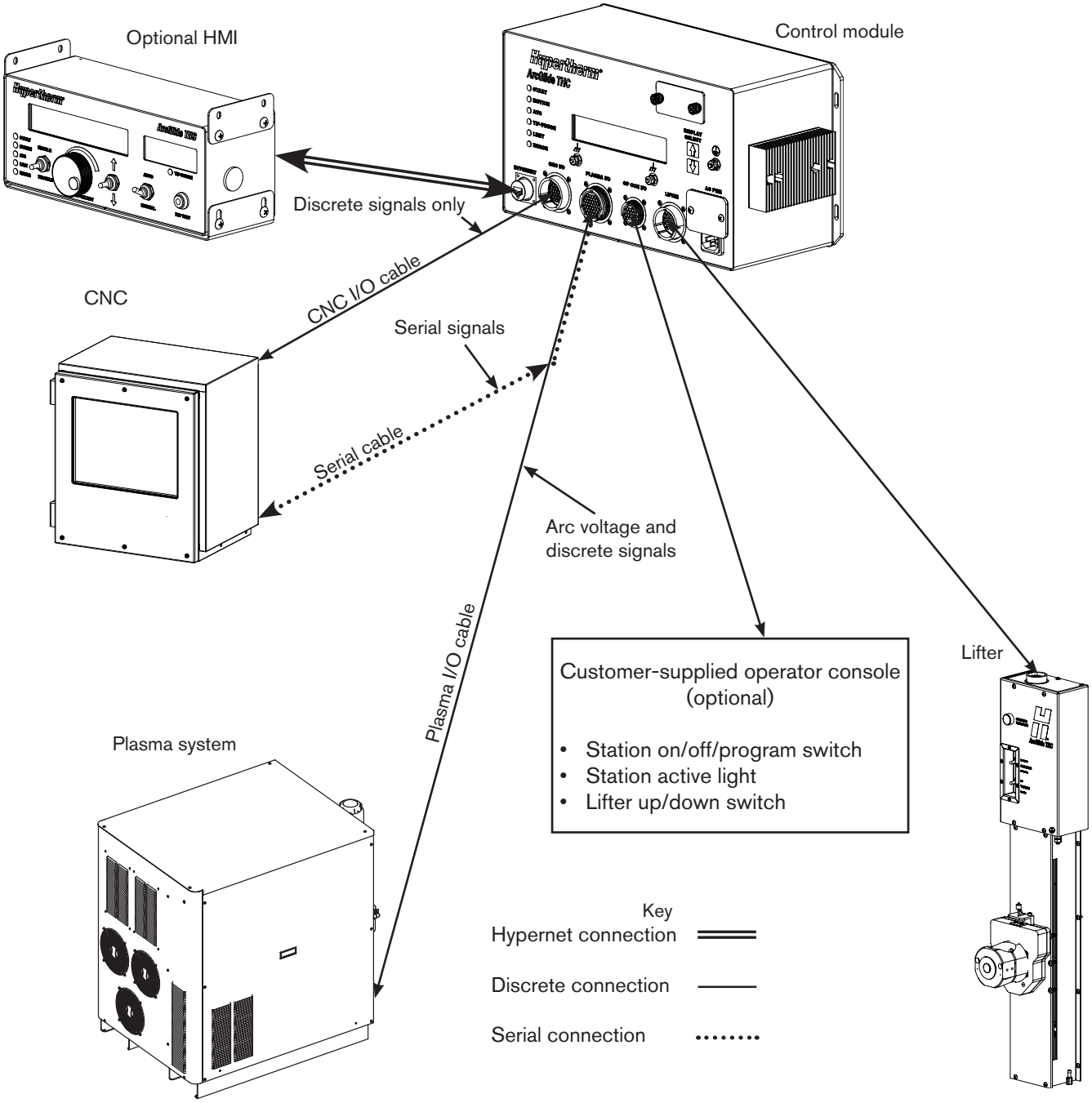
Cabling and signals for a Command THC replacement

ArcGlide THC in a new installation

The following diagram illustrates 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, see the *ArcGlide THC Instruction Manual*.

For more information, refer to the illustration in *Connecting cables in a new system*, later in this manual.



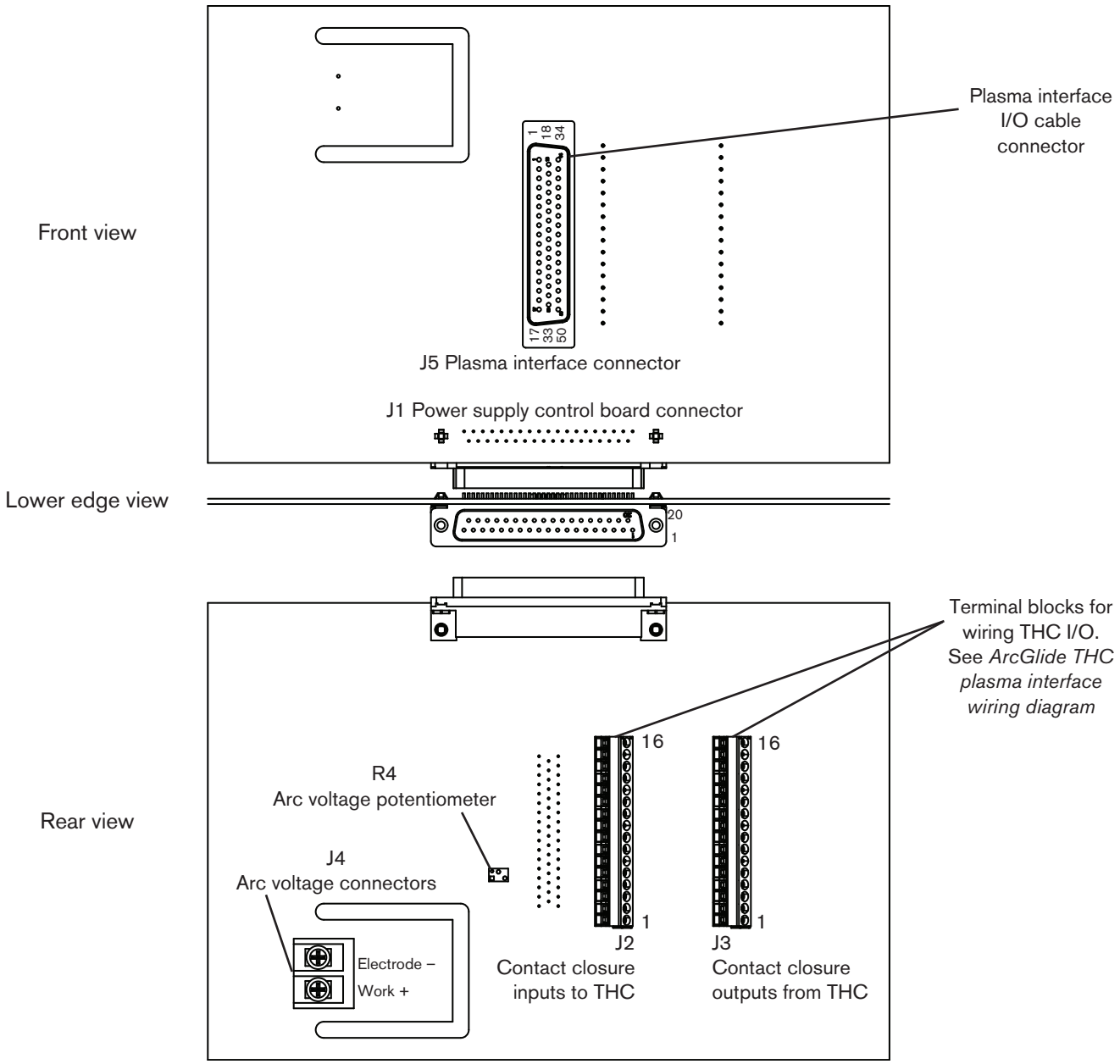
Cabling and signals in a new system

Installing the ArcGlide plasma interface PCB (090052) in a plasma system

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

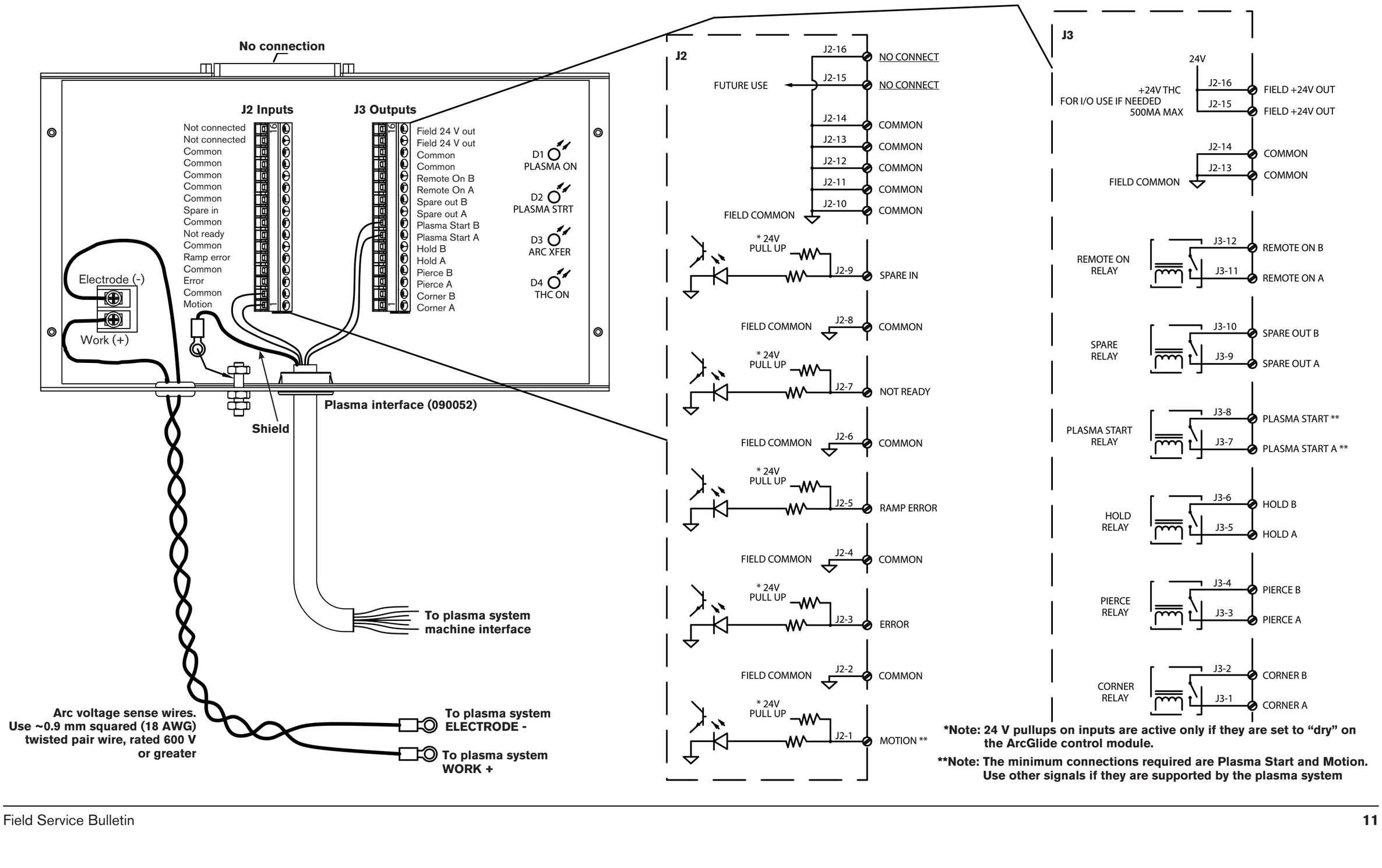
If you are replacing a Command THC with an ArcGlide THC, you must also replace the Command THC plasma interface in your plasma system with the ArcGlide plasma interface.

Refer to the illustration on the following page for wiring information for the ArcGlide plasma interface.



ArcGlide THC plasma interface PCB

ArcGlide THC plasma interface PCB wiring diagram



***Note: 24 V pullups on inputs are active only if they are set to "dry" on the ArcGlide control module.**

****Note: The minimum connections required are Plasma Start and Motion. Use other signals if they are supported by the plasma system**

Connecting system cables

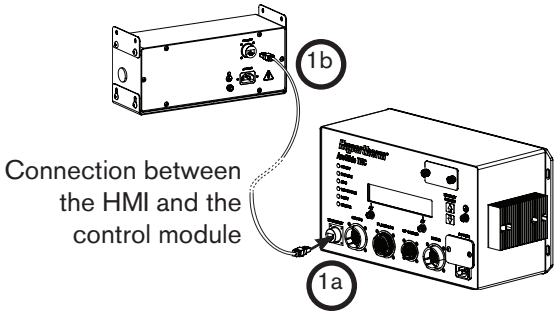
In a serial configuration, an adapter cable (223253 or 223262) diverts serial signals from the plasma interface to the CNC. The control module and HMI communicate over a single span of Hypernet.

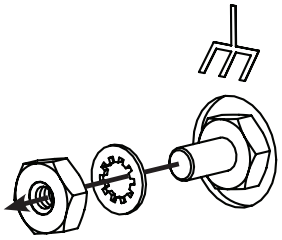
Arc voltage and plasma I/O signals are carried between the plasma interface and the plasma supply by the plasma interface cable. When an ArcGlide THC is replacing a Command THC in an existing system, an adapter cable (223260), connects the plasma I/O cable to the plasma interface PCB.

The adapters convert ArcGlide THC connectors to Command THC connectors so that the existing Command THC cables can be used with the ArcGlide THC.

Note: Each connector on the front of the control module and on the adapter cables are color-coded to match the connector on the cable that connects to it, as shown in the illustrations for each cable later in this section.

1. Connect the optional 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.

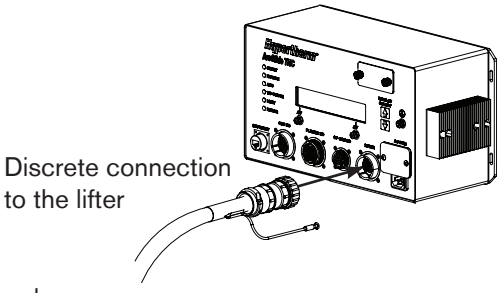




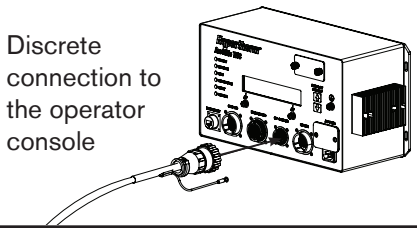
2. Ground all cables with circular connectors:
   a. Remove the top nut and washer of the grounding assembly.
   b. Fit the ground wire terminal on the cable over the grounding post.
   c. Replace the top nut and the washer on the ground post and finger-tighten it so the ground terminal is in contact with the washer and bottom nut.

For more information, see *Recommended grounding and shielding practice* in the *ArcGlide THC Instruction Manual*.

3. Use the instructions in *Install the lifter* in the *ArcGlide THC Instruction Manual* to connect the ArcGlide lifter to the control module.



4. If your configuration includes an 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.



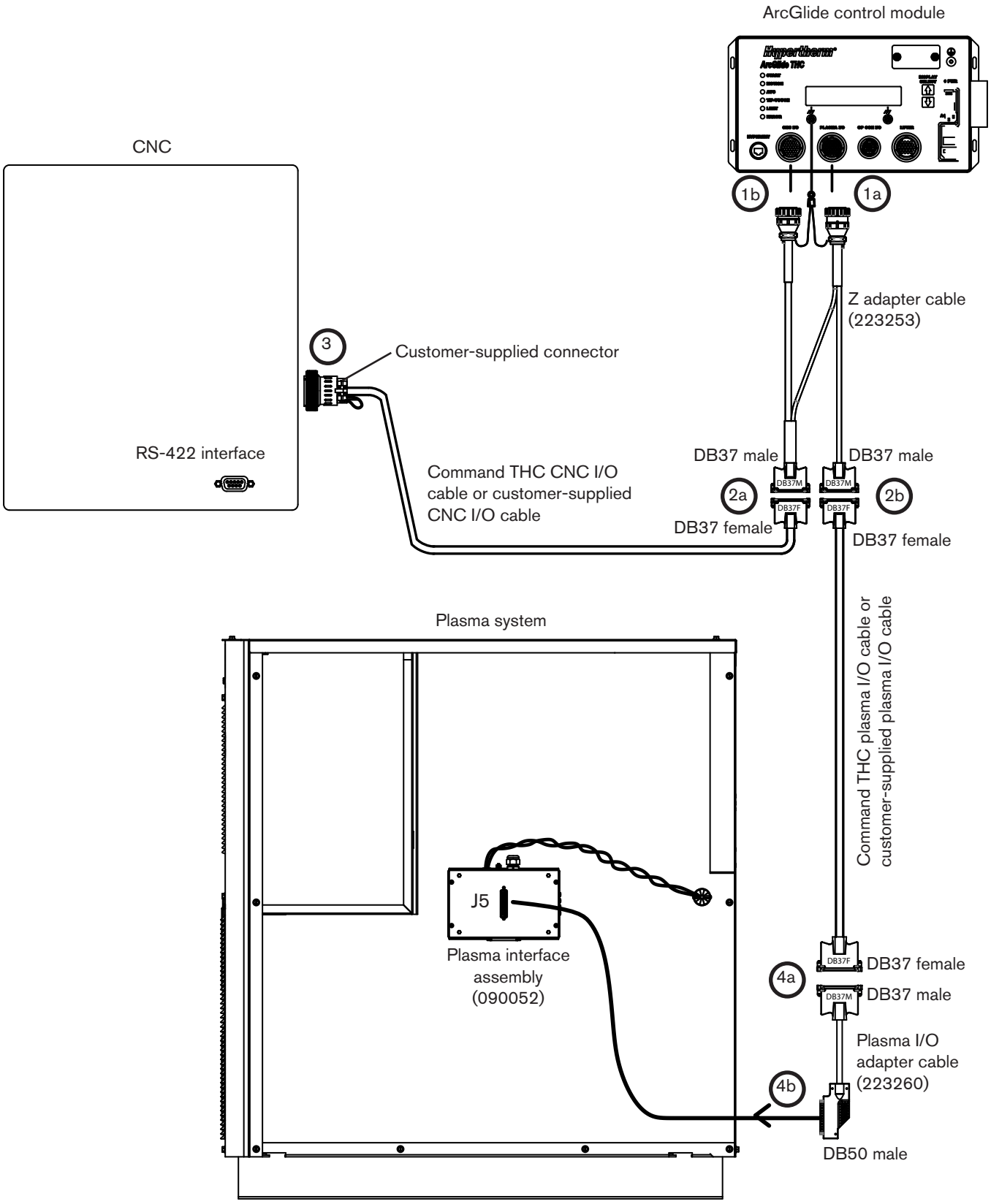
Connecting cables for a Command THC replacement

Before you install your ArcGlide THC, refer to the *ArcGlide THC Instruction Manual* for information about placing ArcGlide THC components and how to connect power.

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 connector on the front of the control module.
   b. Insert the round connector with the yellow band into the CNC I/O connector 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 serial and I/O interface on the CNC.
4. Connect the plasma interface 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 interface adapter cable. Fasten the standoffs to secure the connectors.
   b. Connect the DB50 male connector on the end of the plasma interface adapter cable to the J5 connector on the plasma interface PCB in the plasma system.

For more information, see the description of the Z adapter cable (223253) and the plasma interface adapter (223260) in the *Cables* section of this FSB.



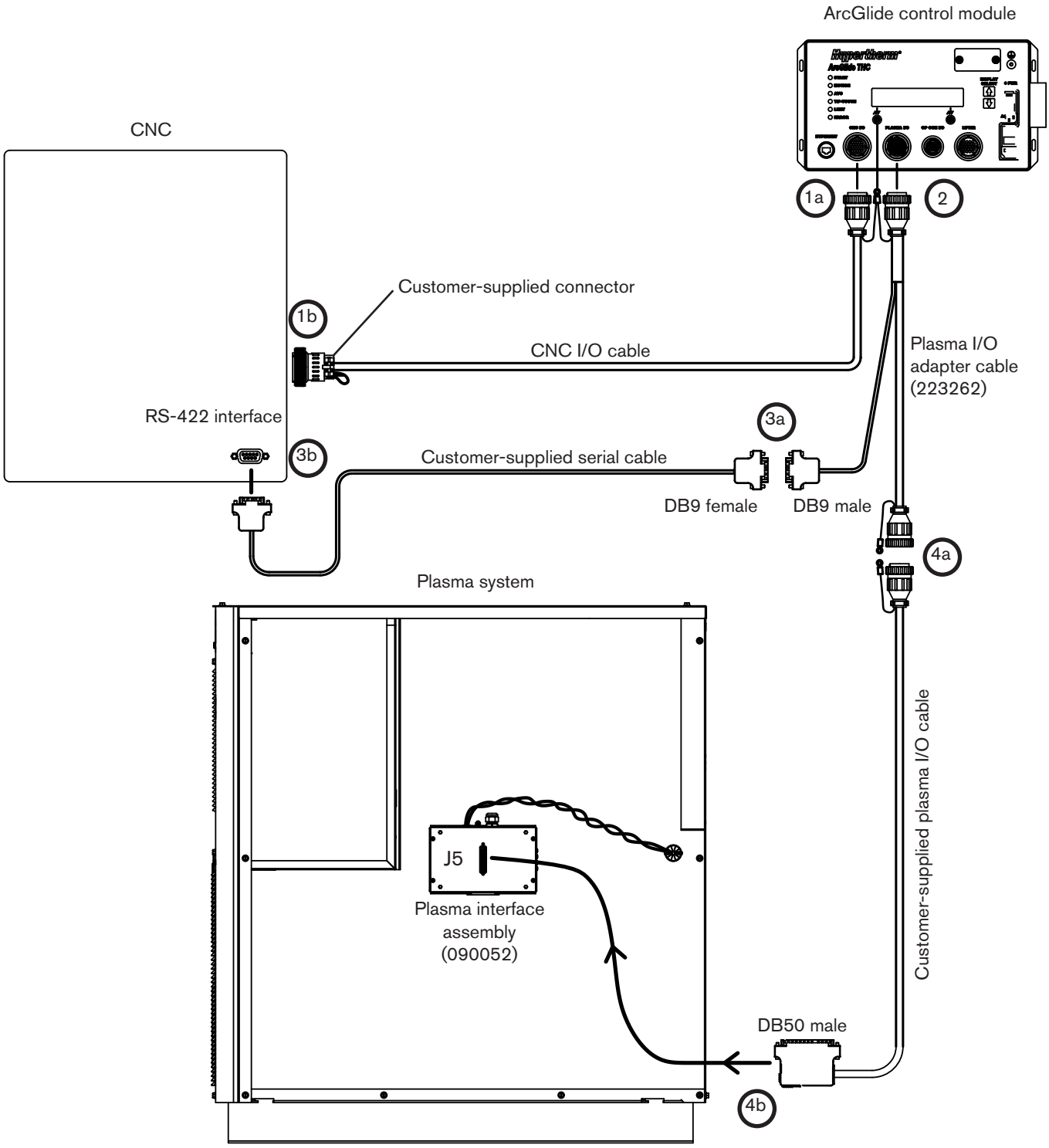
Command THC replacement

Connecting cables in a new system

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 interface 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 interface 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 interface 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 PCB 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.

For more information, see the description of the Y adapter (223262) in the *Cables* section of this FSB.



New system installation

Calibrate arc voltage




DANGER

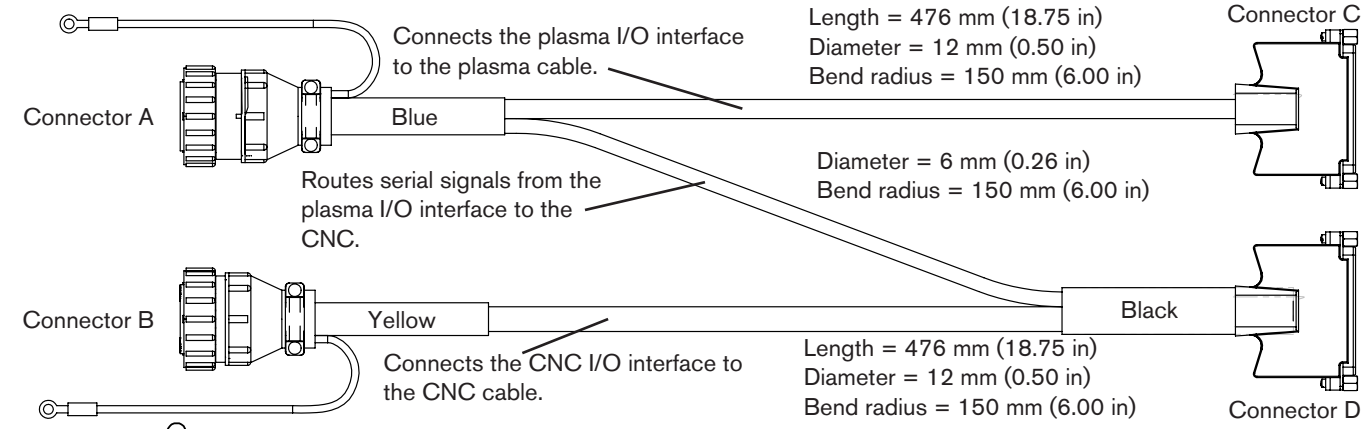
SHOCK HAZARD: Always use caution when servicing a power supply when plugged in and the covers are removed. Dangerous voltages exist within the power supply which could cause injury or death.

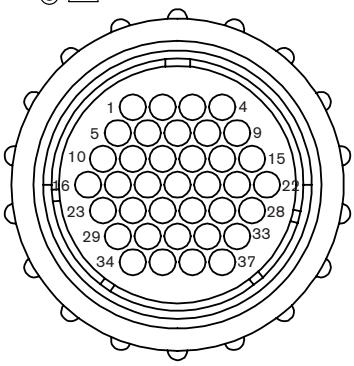
ArcGlide THC arc voltage is calibrated at the factory as part of the manufacturing process. If you need to verify or recalibrate the arc voltage, use the following procedure:

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 selected cut process.
6. Start a 2-foot rip cut, using the recommended cut speed for the process you selected.
7. While the torch is cutting, use a voltmeter to measure the arc voltage between the work and electrode terminals on the plasma interface in the plasma system.
8. Compare the measured voltage with the voltage that is displayed in the red LED display on the HMI or on display screen 1 on the ArcGlide control module.
9. If the two values do not match, adjust the potentiometer (R4) on the plasma interface PCB (090052) by turning the slotted screw.
10. Repeat the calibration and adjustment until the measured arc voltage and the displayed arc voltages are the same.

Cables

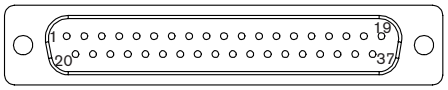
Plasma I/O split cable (Z) (223253)





Connector A

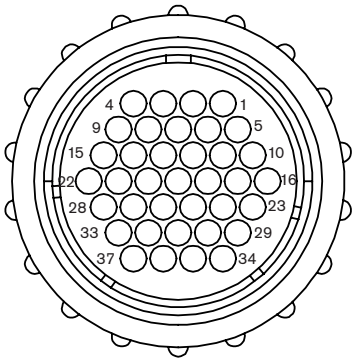
Connector C and D



Connector A Pin No.	Wire color	Signal	Connector C Pin No.
6	White	Motion +	28
7	Black	Input common -	9
18	White	Pierce output A	13
19	Brown	Pierce output B	32
20	White	Hold output A	14
21	Red	Hold output B	33
22	White	Start output A	15
23	Orange	Start output B	34
28	White	Field common	18
31	Yellow	Plasma 24 V field	37
34	White	1/50 Arc Voltage +	35
35	Green	1/50 Arc Voltage -	16

Connector A Pin No.	Wire color	Signal	Connector D Pin No.
1	Red	RS422 RX +	1
2	Black	RS422 RX -	2
3	White	RS422 TX +	3
4	Black	RS422 TX -	4
5	Green	RS422 common	5
not connected	Black		not connected

Plasma I/O split cable (Z) (223253), continued

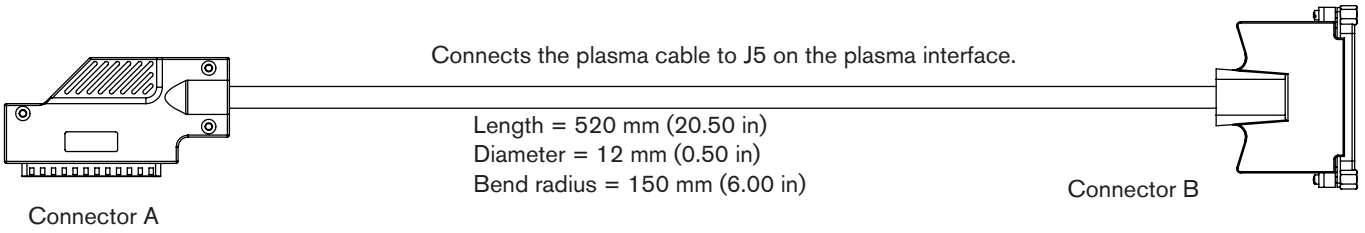


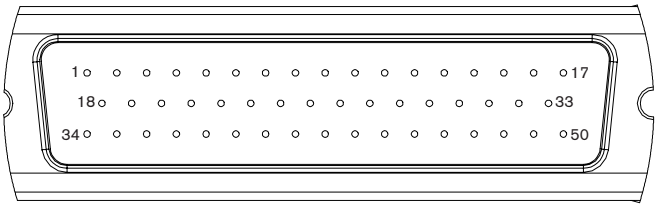
Connector B

Connector B Pin No.	Wire color	Signal	Connector D Pin No.
1	Red	Cycle Start input +	28
2	Black	Input common -	9
5	White	AVC Disable input +	27
6	Black	Input common	8
7	Green	IHS Sync input +	24
8	Black	Input common -	5
9	Blue	Spare input 1 +	26
10	Black	Input common -	7
11	Yellow	Spare input 2 +	25
12	Black	Input common -	6
13	Brown	IHS Complete output A	29
14	Black	IHS Complete output B	10
15	Orange	Retract Complete output A	31
16	Black	Retract Complete output B	12
17	White	Machine Motion output A	34
18	Red	Machine Motion output B	15
19	Green	THC Error output A	33
20	Red	THC Error output B	14
23	Blue	CNC Spare output A	30
24	Red	CNC Spare output B	11
25	Yellow	Interlock input +	35
26	Red	Interlock input -	16
29	Brown	Field common	18
34	Red	Field 23 V	37

63.5 mm (2.5 in Jumper wire)		
Connector A Pin No.	**Signal**	**Connector D pin No.**
14	Spare input +	22
15	Input common -	3

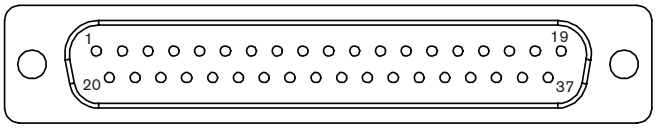
Plasma interface adapter cable (223260)





Connector A

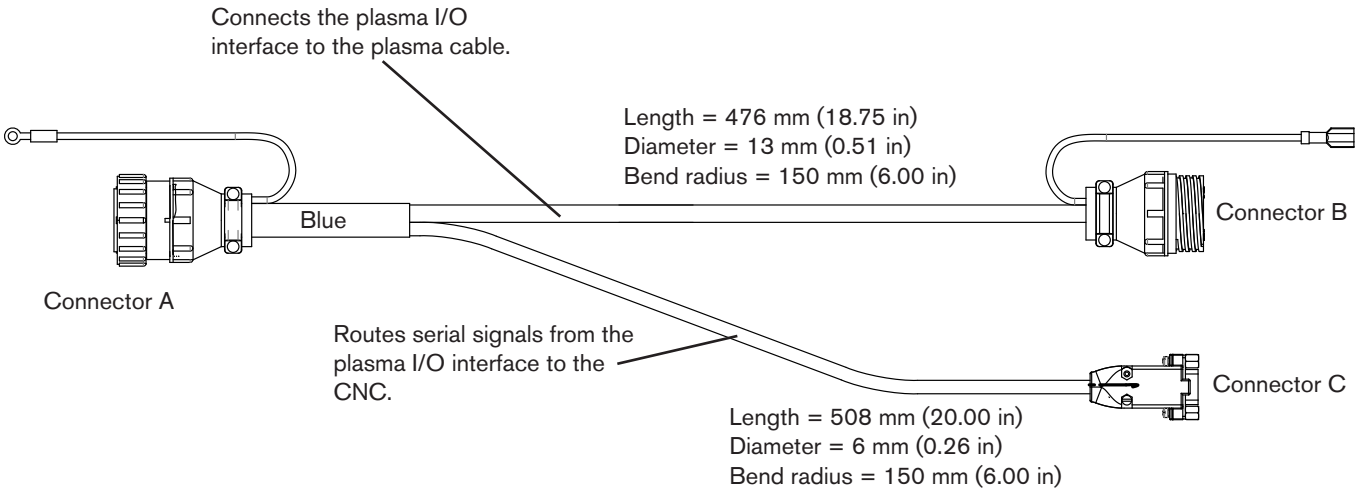
Connector B

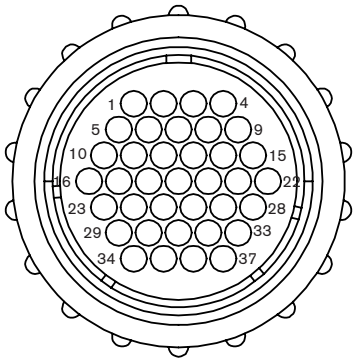


Pin No.*	Wire color	Signal
28	White	Motion +
9	Black	Input common -
13	White	Pierce output A
32	Brown	Pierce output B
14	White	Hold output A
33	Red	Hold output B
15	White	Start output A
34	Orange	Start output B
18	White	Field common
37	Yellow	Plasma 24 V field
35	White	1/50 Arc Voltage +
16	Green	1/50 Arc Voltage -

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

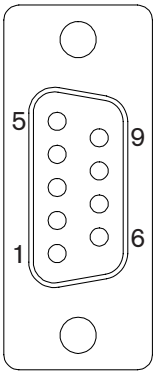
Plasma I/O split cable (Y) (223262)





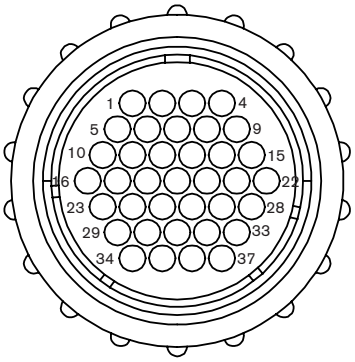
Connector A

Connector C



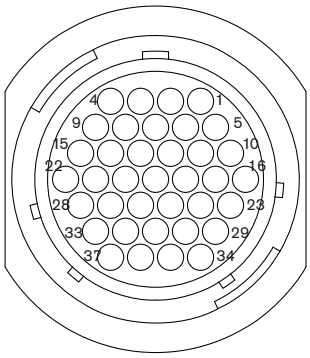
Connector A Pin No.	Wire color	Signal	Connector C Pin No.
1	Red	RS422 RX +	4
2	Black	RS422 RX -	2
3	White	RS422 TX +	7
4	Black	RS422 TX -	3
5	Green	RS422 common	5
not connected	Black		not connected

Plasma I/O split cable (Y) (223262), continued



Connector A

Connector B

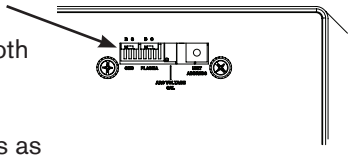


Connector A Pin No.	Wire color	Signal	Connector B Pin No.
1		not connected	
2		not connected	
3		not connected	
4		not connected	
5		not connected	
6	Black	Motion input +	6
7	Blue	Input common -	7
8	Black	Error input +	8
9	Yellow	Input common -	9
10	Black	Rampdown Error input +	10
11	Brown	Input common -	11
12	Black	Not Ready input +	12
13	Orange	Input Common -	13
14	Black	Spare input +	14
15	White	Input common -	15
16	Red	Corner output A	16
17	Green	Corner output B	17
18	Red	Pierce output A	18
19	Blue	Pierce output B	19
20	Red	Hold output A	20
21	Yellow	Hold output B	21
22	Red	Start output A	22
23	Brown	Start output B	23
24	Red	Spare output A	24
25	Orange	Spare output B	25
26	Red	Remote On output A	26
27	White	Remote On output B	27
28	Green	Field common	28
29	Blue	Field common	29
30	Green	Field common	30
31	Yellow	Field 24 V	31
32	Green	Field 24 V	32
33	Brown	Field 24 V	33
34	Green	1/50 Arc Voltage +	34
35	Orange	1/50 Arc Voltage -	35
not connected	Green		not connected

ArcGlide discrete interface signal examples

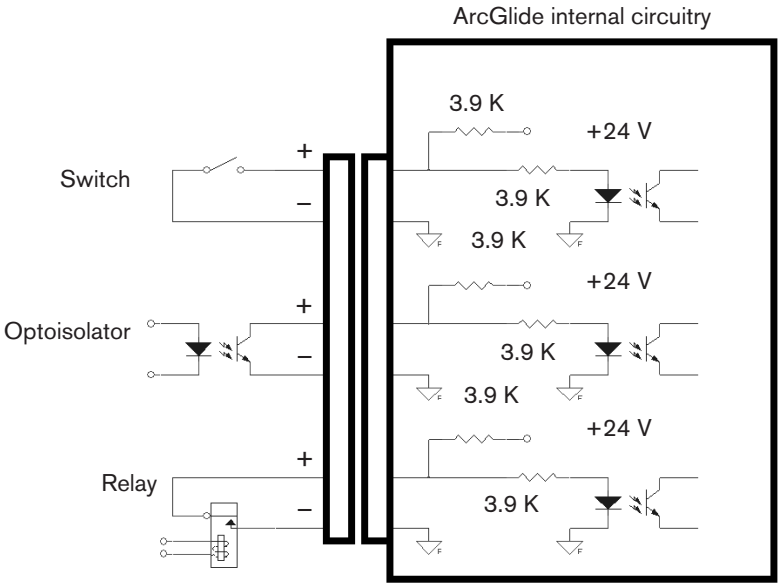
Inputs

The figures below show simplified schematics of the ArcGlide THC inputs. The inputs for both CNC and plasma must be configured for dry contacts (no external voltage). 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.

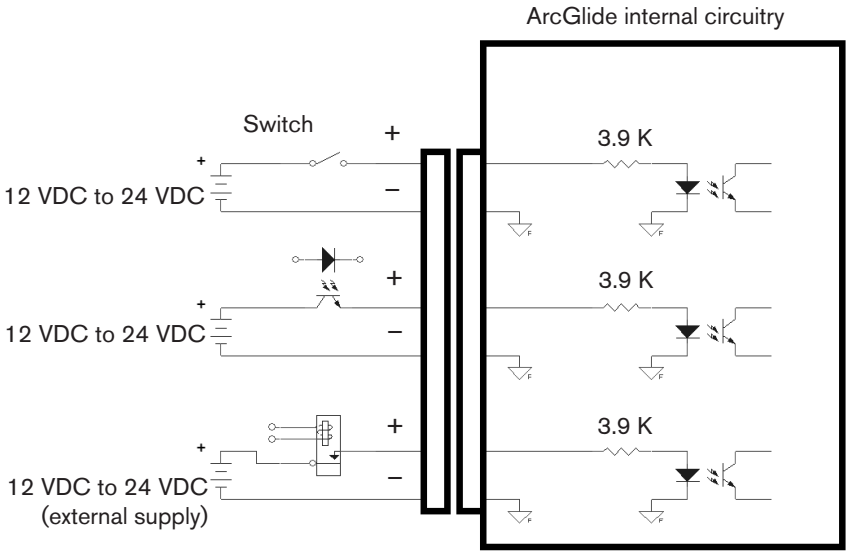


The mode that is selected automatically compensates for the polarity reversal so that in both cases a closed switch input will activate the signal.

All inputs to the lifter interface and operator console interface are set with the dry contacts as the default.



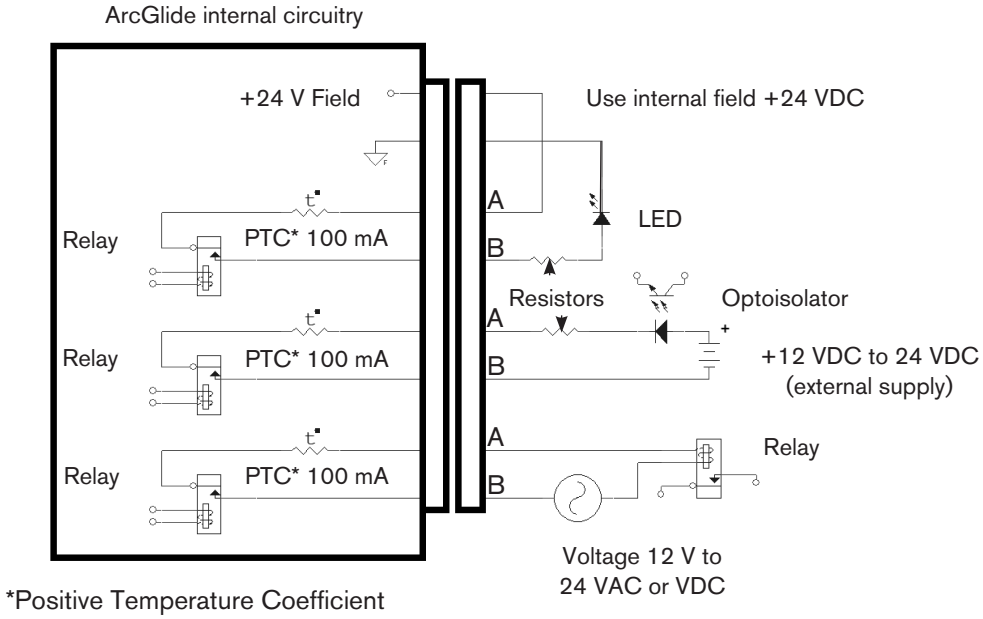
Dry contact inputs



Voltage sourced inputs

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 can be reset automatically and that protect against currents above 100 mA. The 24 V supply is limited to a total of 2 Amps for all outputs. The figure below shows the simplified schematic of the ArcGlide THC outputs.



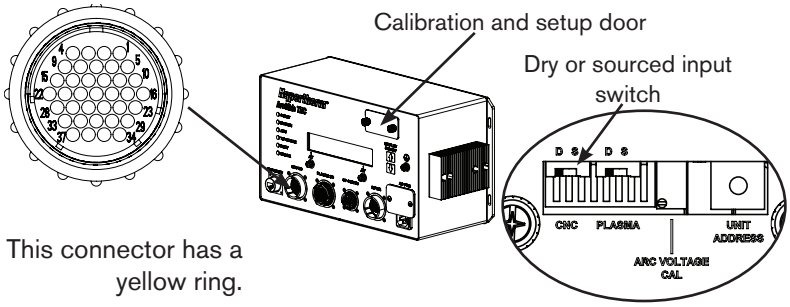
Relay outputs

CNC discrete I/O

All the required discrete interface signals between the control module and the CNC are marked with asterisks (*) in the following table. These signals must be connected. All other signals are optional for improved performance or reduction in cycle times.

Inputs from the CNC have two different modes that are selected using switches behind the calibration and setup door. The THC input mode (dry contact mode [no external voltage] or positive voltage sourced mode) must match the mode of the CNC outputs.

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

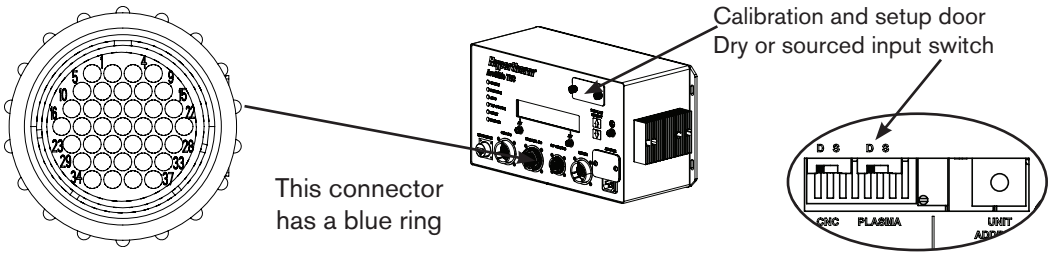


CNC I/O	Description
Cut Control*	This is a required signal. It is an output from the CNC and an input to the ArcGlide. The CNC should activate this signal to begin a plasma cut. This signal begins the entire process of IHS, Plasma Start and Motion, and Automatic Voltage Control (AVC) followed by a retract at the end of the cut when this signal is removed. This signal must be maintained during the plasma cut.
Low Gain Input	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 required signal input to the ArcGlide. When active this signal will temporarily disable the automatic height control and force 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 but is recommended to save cycle time by performing gas preflow during the IHS sequence.

CNC I/O	Description
Spare inputs 1 and 2	These are unused inputs to the ArcGlide that are available for future use.
IHS Complete	This is an optional signal output from the ArcGlide to the CNC. 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. This signal is optional.
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 Time has expired. This signal indicates that the CNC should begin the cutting motion. For more information on Pierce Delay, see the Operation section.
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. For more information on ArcGlide error messages, see the Maintenance section.
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 required input to the ArcGlide. It 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 state of this independent contact closure is the same as the state of the Interlock Input.

Plasma discrete I/O

All the required discrete interface signals between the control module and the plasma system are marked with asterisks (*) in the following table. These signals must be connected. All other signals are optional for improved performance or reduction in cycle times.



Inputs from the plasma system have two different modes that are selected using switches behind the calibration and setup door. The THC input mode (dry contact mode [no external voltage] or positive voltage sourced mode) must match the mode of the plasma system outputs.

Note: If the THC controller interface is configured with dry contacts, LED operation on the discrete plasma interface is reversed and the LEDs will turn OFF when input is active. With sourced inputs, LEDs turn ON when an input is active.

Plasma I/O	Description
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 turn off. This condition indicates that the consumable life may be reduced. The user is encouraged to make any 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 insure proper operation the CNC should check this signal before issuing a Plasma Start.

Plasma I/O	Description
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.
Spare Input	This is an extra input for future use.
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 power supplies only.
Hold Ignition	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 to save cycle time by performing gas preflow during the IHS sequence.
Start*	This output from the THC is starts 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 power up or down capable plasma power supplies. On capable systems, such as the HPR plasma supplies, deactivating this signal will remove the high power input to the plasma system and will turn off the gas and torch cooling pump. For more information, see *Hypernet plasma interface (141161)* in the *Maintenance* section of the *ArcGlide THC Instruction Manual*.
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 volts DC equals an arc voltage of 250 volts DC. 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 K Ohms or less.

Error messages

The ArcGlide supports a broad error message set. When using the ArcGlide as a replacement for the Command THC, ArcGlide error codes are transformed into Command THC error codes, and only the Command THC error codes are returned with the EC command.

When using the ArcGlide 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 controller and HMI displays. Refer to the *ArcGlide Instruction Manual* (806450) for a definition of each error and suggestions for corrective action.

ArcGlide errors and equivalent Command THC errors

ArcGlide		**Command THC**	
Error Code	Description	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
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

ArcGlide errors and equivalent Command THC errors (continued)			
ArcGlide THC		**Command THC**	
Error Code	Description	Error Code	Description
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

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