EDGE® Pro Ti

Shape Cutting Control

Instruction Manual

807660 – Revision 3

Hypertherm®

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For your records

Serial number:_____

Purchase date: _____

Distributor: _____

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_____

Maintenance notes:

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EDGE Pro Ti CNC

Instruction Manual

807660 – Revision 3

English

September 2018

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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

Carefully read 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

American National Standards Institute (ANSI) guidelines are used for safety signal words and symbols. The 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.

INSPECT EQUIPMENT BEFORE USING

All cutting equipment must be inspected as required to make sure it is in safe operating condition. When found to be incapable of reliable and safe operation, the equipment must be repaired by qualified personnel prior to its next use or withdrawn from service.

RESPONSIBILITY FOR SAFETY

The person or entity responsible for the safety of the workplace must:

- Make sure that operators and their supervisors are trained in the safe use of their equipment, the safe use of the process, and emergency procedures.
- Make sure that all hazards and safety precautions identified herein are communicated to and understood by workers before the start of work.
- Designate approved cutting areas and establish procedures for safe cutting.
- Be responsible for authorizing cutting operations in areas not specifically designed or approved for such processes.
- Make sure that only approved equipment, such as torches and personal protective equipment, are used.
- Select contractors who provide trained and qualified personnel, and who have awareness of the risks involved, to do cutting.
- Tell contractors about flammable materials or hazardous conditions that are specific to the site, or hazardous conditions that they may not be aware of.
- Make sure that the quality and quantity of air for ventilation is such that personnel exposures to hazardous contaminants are below the allowable limits.
- Make sure that ventilation in confined spaces is sufficient to allow adequate oxygen for life support, to prevent accumulation of asphixiants or flammable explosive mixtures, to prevent oxygen-enriched atmospheres, and to keep airborne contaminants in breathing atmospheres below allowable limits.

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 PRINTED CIRCUIT BOARDS

Use proper precautions when handling printed circuit boards:

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

GROUNDING SAFETY

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

Cutting table Connect the cutting table to an earth ground, in accordance with appropriate national and local electrical regulations.

Input power

- Make 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, make 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. Tighten the retaining nut.
- 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.
- Prior to operating the equipment after moving, opening, or servicing, make sure to close the enclosure and make sure that there is proper earth ground continuity to the enclosure.
- 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.
- In machine torch applications, never touch the torch body, workpiece, or water in a water table when the plasma system is operating.

Electric shock prevention

All 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 the work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground. If you must cut 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, make sure that it is correctly connected to an earth ground.
- Install and ground this equipment according to the instruction manual and in accordance with national and local regulations.
- 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 lead 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 a proper grounding conductor first.
- Each plasma system is designed to be used only with specific torches. Do not substitute other torches, which could overheat and present a safety hazard.

CUTTING CAN CAUSE FIRE OR EXPLOSION

Fire prevention

- Make sure the cutting 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 containers.
- 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
Containing Hydrogen

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

WARNING
Explosion Hazard
Hydrogen Detonation with Aluminum Cutting

When you use a plasma torch to cut aluminum alloys under water or on a water table, a chemical reaction between the water and the workpiece, parts, fine particles, or molten aluminum droplets generates significantly more hydrogen gas than occurs with other metals. This hydrogen gas may get trapped under the workpiece. If exposed to oxygen or air, the plasma arc or a spark from any source can ignite this trapped hydrogen gas, causing an explosion that may result in death, personal injury, loss of property, or equipment damage.

Consult with the table manufacturer and other experts prior to cutting aluminum to implement a risk assessment and mitigation plan that eliminates the risk of detonation by preventing hydrogen accumulation.

Also, make sure that the water table, fume extraction (ventilation), and other parts of the cutting system have been designed with aluminum cutting in mind.

Do not cut aluminum alloys underwater or on a water table unless you can prevent the accumulation of hydrogen gas.

Note: With proper mitigation, most aluminum alloys can be plasma cut on a water table. An exception is aluminum-lithium alloys. **Never cut aluminum-lithium alloys in the presence of water.** Contact your aluminum supplier for additional safety information regarding hazards associated with aluminum-lithium alloys.

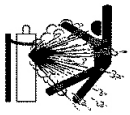
MACHINE MOTION CAN CAUSE INJURY

When an original equipment manufacturer (OEM) makes a cutting system by combining Hypertherm equipment with other equipment, the end-use customer and the OEM are responsible for providing protection against the hazardous moving parts of this cutting system. However, we advise the following to prevent operator injury and equipment damage:

- Read and follow the instruction manual provided by the OEM.
- Maintain a restricted-access area larger than the maximum movement range of the cutting system's moving parts.
- Where there is a risk of collision, do not allow personnel or equipment near the cutting system's moving parts.
- Avoid accidental contact with the CNC touchscreen or joystick. Accidental contact can activate commands and result in unintended motion.
- Do not service or clean the machinery during operation.
- If servicing is required, enable the safety interlock or disconnect and lock out/tag out power to disable the motors and prevent motion.
- Allow only qualified personnel to operate, maintain, and service the machinery.

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 regulations.



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 regulations.
- Never use a cylinder that is not upright and secured in place.
- Keep the protective cap in place over the 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.

The 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.

The 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 on 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 cutting area and to make sure 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 workplace.
- Personal protective equipment.
- Number of welding and cutting systems in operation.
- Other workplace 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 workplace 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.
- Make sure 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 make sure air quality is safe.

A PLASMA ARC CAN CAUSE INJURY AND BURNS

Instant-on torches

A plasma arc ignites 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 regulations.
- 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.

- Wear gauntlet gloves, safety shoes, and hat.
- Wear flame-retardant clothing to cover all exposed areas.
- Wear cuffless trousers to prevent entry of sparks and slag.

Also, 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	Minimum protective shade number (ANSI Z49.1:2012)	Suggested shade number for comfort (ANSI Z49.1:2012)	OSHA 29CFR 1910.133(a)(5)	Europe EN168:2002
Less than 40 A	5	5	8	9
41 A to 60 A	6	6	8	9
61 A to 80 A	8	8	8	9
81 A to 125 A	8	9	8	9
126 A to 150 A	8	9	8	10
151 A to 175 A	8	9	8	11
176 A to 250 A	8	9	8	12
251 A to 300 A	8	9	8	13
301 A to 400 A	9	12	9	13
401 A 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 lead and the torch lead to one side, away from your body.
- Route the torch leads as close as possible to the work lead.
- Do not wrap or drape the torch lead or work lead 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 regulations 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 site have verified personal hearing protection is not necessary per relevant international, regional, and local regulations.

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 and limit operator exposure time, and screen off noisy areas and/or take measures to reduce reverberation in cutting 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 equipment such as ear muffs or ear plugs with a noise reduction rating appropriate for the situation. Warn others near the cutting area of possible noise hazards. In addition, ear protection can prevent hot splatter from entering the ear.

DRY DUST COLLECTION INFORMATION

In some workplaces, dry dust can represent a potential explosion hazard.

The U.S. National Fire Protection Association's 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 standard 68 has been "adopted by reference" in your local building codes.

Refer to NFPA standard 68 for definitions and explanations of regulatory terms such as deflagration, AHJ, adopted by reference, the Kst value, deflagration index, and other terms.

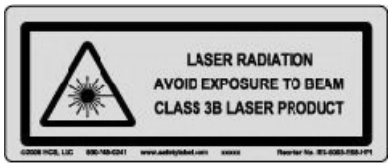
Note 1 – Unless a site-specific evaluation has been completed that determines that none of the dust generated is combustible, then NFPA standard 68 requires the use of explosion vents. Design the explosion vent size and type to conform to the worst-case Kst value as described in Annex F of NFPA standard 68. NFPA standard 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 should consult and comply with all applicable national, state, and local regulations. Publications do not 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 beam from a laser pointer can result in serious eye injury. Avoid direct eye exposure.

On products that use a laser pointer for alignment, 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, pulse duration are 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, 1 Batterymarch Park, Quincy, MA 02169-7471
9. NFPA Standard 70, National Electrical Code, National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471
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/

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 Documents Library on the Hypertherm web site at www.hypertherm.com/docs.

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 Hypertherm products that fall within the scope of the RoHS Directive. These RoHS-compliant products also have a "RoHS mark" near the "CE Marking" on the data plate. Parts 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, and there is no "RoHS mark" on their data plates.

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.
- In other countries, check national and local laws.
- Consult with legal or other compliance experts when appropriate.

A variety of options for sustainable disposal of Hypertherm products are available on our website at www.hypertherm.com/recycle.

The WEEE Directive

The European Parliament and the Council of the European Union authorized Directive 2012/19/EU or WEEE (Waste Electrical and Electronic Equipment) Recast.

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 options for Hypertherm systems can be found at www.hypertherm.com/recycle.

The URL is printed on the symbol-only warning label for each CE version Hypertherm plasma system since 2006. The CSA versions of products manufactured by Hypertherm are either out of scope or exempt from WEEE.

The REACH regulation

The REACH regulation, 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 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) or Safety Data Sheets (SDS) 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 Documents Library on the Hypertherm web site at www.hypertherm.com/docs. In the Documents Library, select “Material Safety Data Sheets” in the Category drop-down menu.

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 increase the risk of injury, for example, by allowing parallel cutting current return paths which may damage the earth circuits of other equipment. Further guidance is 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 Connect CNC, EDGE Connect T CNC, EDGE Connect TC CNC, 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.

All third-party engines, engine accessories, alternators, and alternator accessories are covered by the respective manufacturers' warranties and not covered by this warranty.

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. Hypertherm shall not be liable for any losses to Distributor based on down time, lost production or lost profits. It is the intention of the Distributor and Hypertherm that this provision be construed by a court as being the broadest limitation of liability consistent with applicable law.

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.

Waterjet product warranty coverage

Product	Parts coverage
HyPrecision pumps	27 months from the ship date, or 24 months from the date of proven installation, or 4,000 hours, whichever occurs first
PowerDredge abrasive removal system	15 months from the ship date or 12 months from the date of proven installation, whichever occurs first
EcoSift abrasive recycling system	15 months from the ship date or 12 months from the date of proven installation, whichever occurs first
Abrasive metering devices	15 months from the ship date or 12 months from the date of proven installation, whichever occurs first
On/off valve air actuators	15 months from the ship date or 12 months from the date of proven installation, whichever occurs first
Diamond orifices	600 hours of use with the use of a thimble filter and compliance with Hypertherm's water quality requirements

Consumable parts are not covered by this warranty. Consumable parts include, but are not limited to, high-pressure water seals, check valves, cylinders, bleed-down valves, low-pressure seals, high-pressure tubing, low- and high-pressure water filters and abrasive collection bags. All third-party pumps, pump accessories, hoppers, hopper accessories, dryer boxes, dryer box accessories and plumbing accessories are covered by the respective manufacturers' warranties and not covered by this warranty.

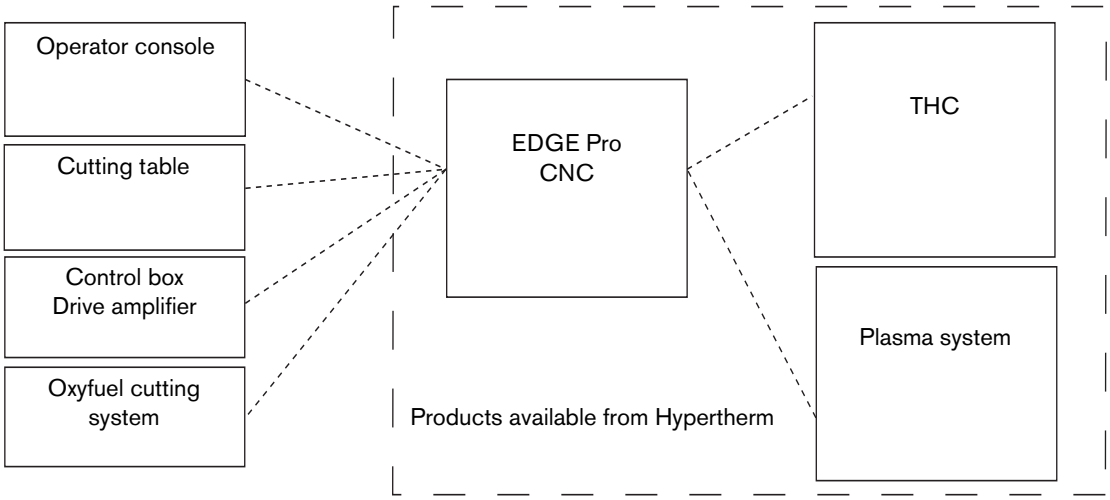
Section 1

Specifications

Main features of an automated cutting system

The diagram in Figure 1 illustrates the relationship between the components of an automated cutting system. The following sections describe these components and their relationships more fully.

Figure 1 Components of an automated cutting system



The diagram in Figure 2 illustrates an automated cutting system that includes an EDGE Pro Ti CNC with the drive amplifier located within the CNC and not on the cutting table.

Figure 2 Automated cutting system with an EDGE Pro Ti CNC

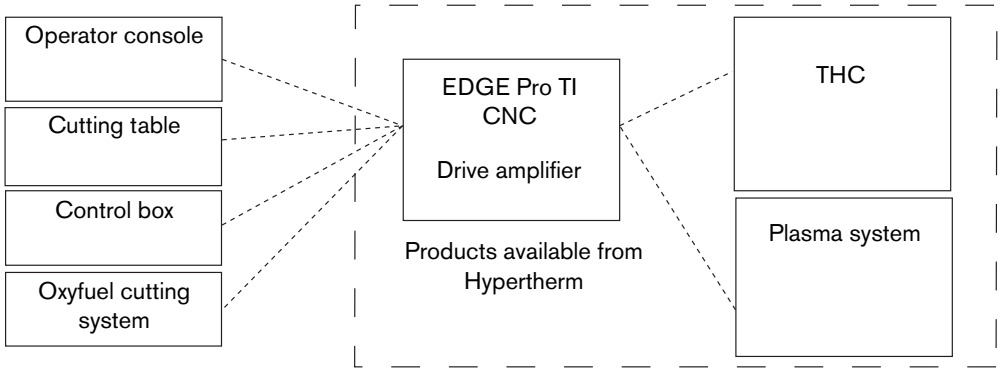
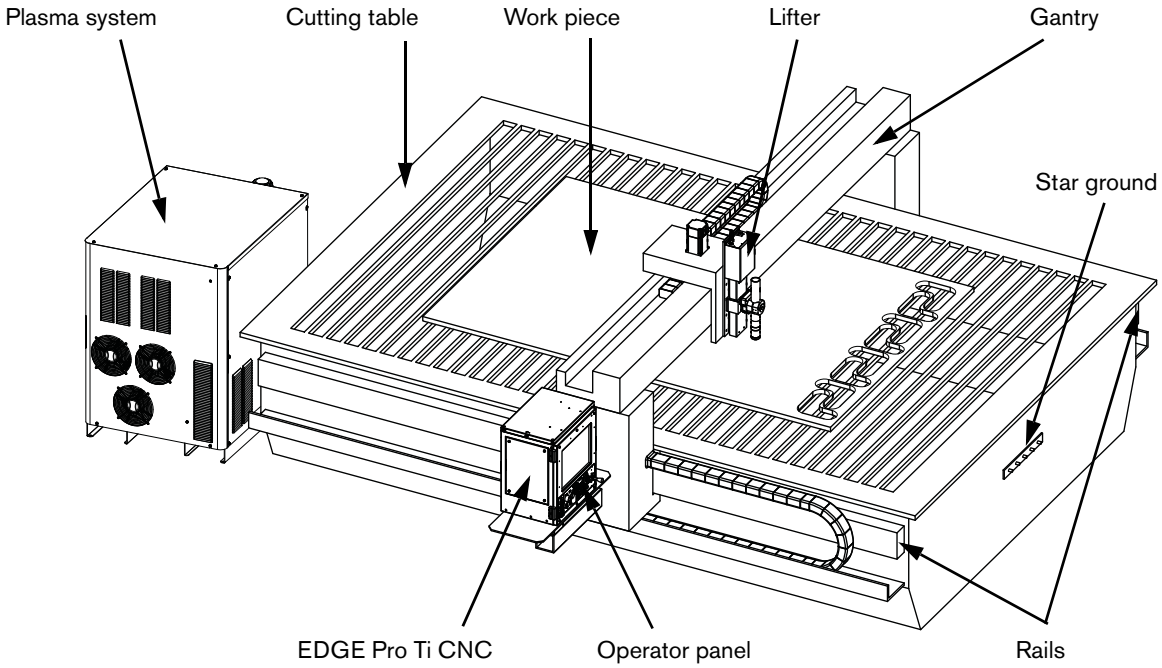


Figure 3 illustrates a typical cutting table with an EDGE Pro Ti CNC and other components that are described in the following sections.

Figure 3 Illustration of a cutting table



CNC

The computerized numerical control (CNC) reads part programs and communicates with the other components of the shape cutting system. It controls which parts (shapes) are cut from the metal that is being cut. In addition, the EDGE Pro Ti includes 4 drive amplifiers that control the motors for the X and Y axes.

Refer to the sections in this manual for more detailed information about the hardware features of the EDGE Pro Ti CNC. Refer to the following Phoenix® software manuals for detailed information on the software that operates on the EDGE Pro Ti CNC:

- Installation and Setup Manual (806410)
- Operator's Manual (806400)
- Programmer's Reference (806420)

Cutting table

The cutting table is the frame that supports the plate of material from which parts are cut. A typical cutting table has two rails that run the length of the table on either side and form the track for the gantry. The gantry rides along these rails and spans the width of the table. A torch height controller (THC) is attached to the gantry and provides the vertical movement of the cutting torch. The horizontal motion of the gantry and torch station, and the vertical motion of the torch on the THC provide the three axes that are necessary for controlling the torch's position on the plate.

Hypertherm does not manufacture cutting tables. For more information on the cutting table in your system, refer to the manual that the table manufacturer supplied.

Plasma system

The cutting tool is the heart of any cutting system and may be a plasma, oxyfuel, laser, or waterjet system. The cutting system controls key parameters, such as the plasma gas and assist gases, and controls how they are mixed. It also provides process parameters, such as standoff and speed for optimal cut quality.

Your cutting system may include a Hypertherm plasma system. Refer to the appropriate manual for additional information. Electronic (PDF) versions of Hypertherm manuals are available at https://www.hypertherm.com or on the CNC. If your plasma supply or cutting system is manufactured by another company, refer to the appropriate manual.

Control box

The control box (supplied by the table manufacturer) contains terminal blocks that route power and control signals to the subsystems of the cutting system.

Drive system

The speed, smoothness, and accuracy of the cuts are determined by the combination of the CNC, encoders, servo drive amplifiers, THC, gears, rails, servo motors, and how well they are integrated (tuned) by the table manufacturer. The table manufacturer must select and install the motors that will be used with the EDGE Pro Ti CNC. For more information on the drive system for your cutting system, refer to the manual supplied by the table manufacturer.

Torch height control (THC)

The THC controls the distance between the torch and the workpiece (plate), also known as the standoff. This standoff is usually defined by height or voltage.

If your system includes an ArcGlide® THC, refer to the user manual (806450) for more information about installing and using it. If your THC is manufactured by another company, refer to the manual provided by the table manufacturer.

Operator console

The EDGE Pro Ti operator control panel can control two cutting stations. Additional control panels, not manufactured by Hypertherm, may be installed by the table manufacturer to control oxyfuel, markers, ventilation systems, and other devices. For more information about an optional control panel, refer to the manual provided by the table manufacturer.

Oxyfuel torch

Automated cutting systems can also be configured with oxyfuel torches with or without an oxygen height control (OHC).

If the Hypertherm Sensor™ OHC is configured in your system, refer to the Sensor OHC manual (MANU–0044) for information about installation and operation.

For more information about any other oxyfuel torch, refer to the manual supplied by the table manufacturer.

Marker

A marker can be any device or process that marks a plate rather than piercing or cutting it. If the Hypertherm ArcWriter® is configured in your system, refer to the ArcWriter manual (802520) for information about installation and operation. Any HPR plasma system can also be used for marking. For more information, see the appropriate HPR manual.

For other devices or processes, refer to the appropriate manual.

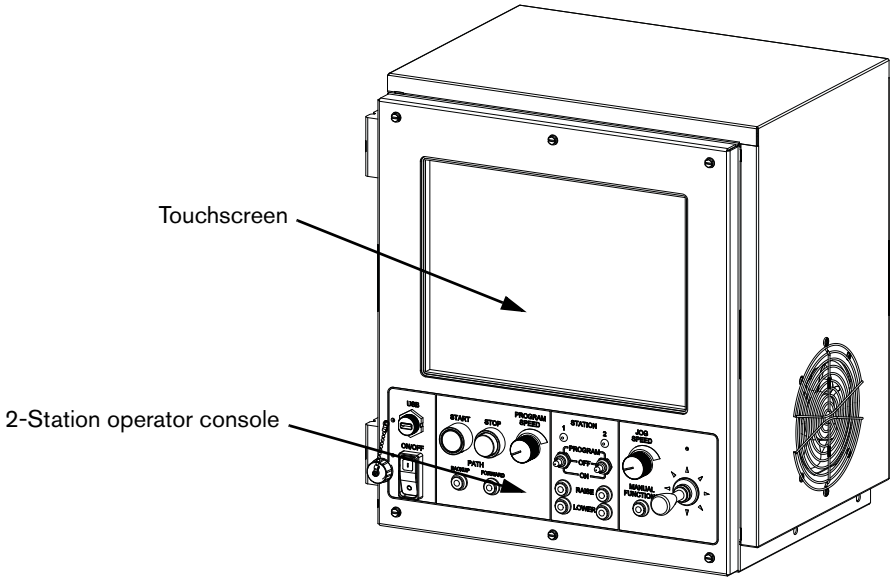
Overview

The EDGE Pro Ti is a PC-based CNC and uses Hypertherm's Phoenix software to control one or more cutting or marking stations.

The EDGE Pro Ti CNC has up to 4 integrated servo drive amplifiers, a two-station operator console, a 15-inch touchscreen, wireless communication, and the Phoenix application software.

EDGE Pro Ti features can be expanded with the addition of networking to download part programs or remote diagnostic utilities.

Figure 4 Front view of the EDGE Pro Ti CNC



Features of the EDGE Pro Ti CNC

Touchscreen

The touchscreen is a 15-inch LCD monitor combined with software that allows direct user input from the screen. A user makes selections on the screen using check boxes, radio buttons, drop-down menus, and data input. Data input boxes automatically display a numeric or alphanumeric keypad for entries in the fields.

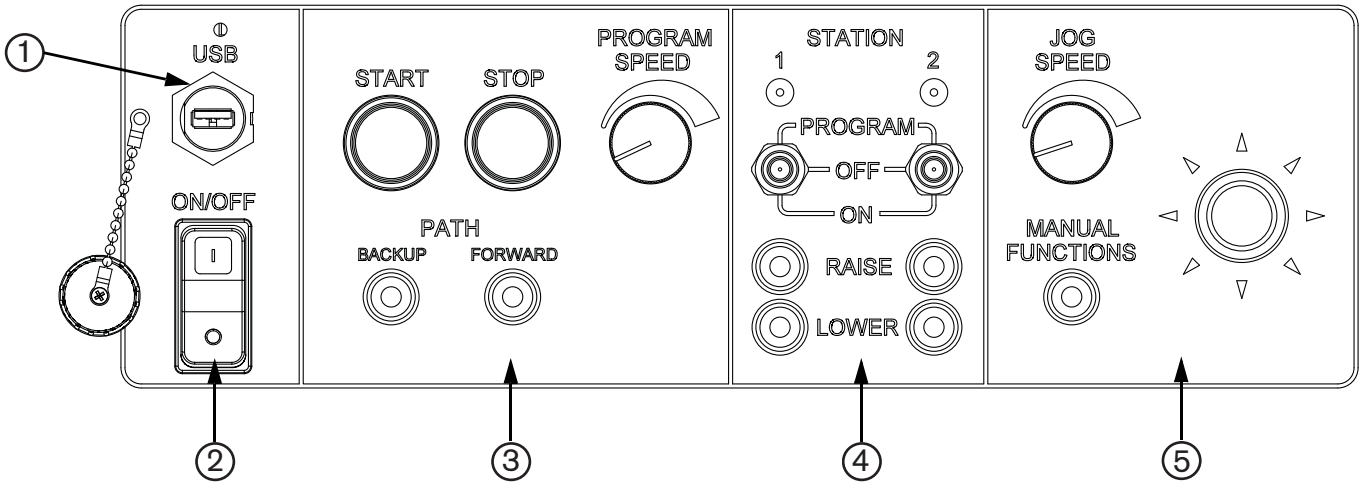
The touchscreen has a resolution of 1024 x 768, or higher.

See “Care and handling of the touchscreen” on page 99 for more information about how to care for the touchscreen.

Operator console

The operator console provides the physical controls that allow you to regulate part program execution, as well as station and manual motion.

Figure 5 EDGE Pro Ti operator console



1 Data transfer

2 Power switch

3 Program execution controls

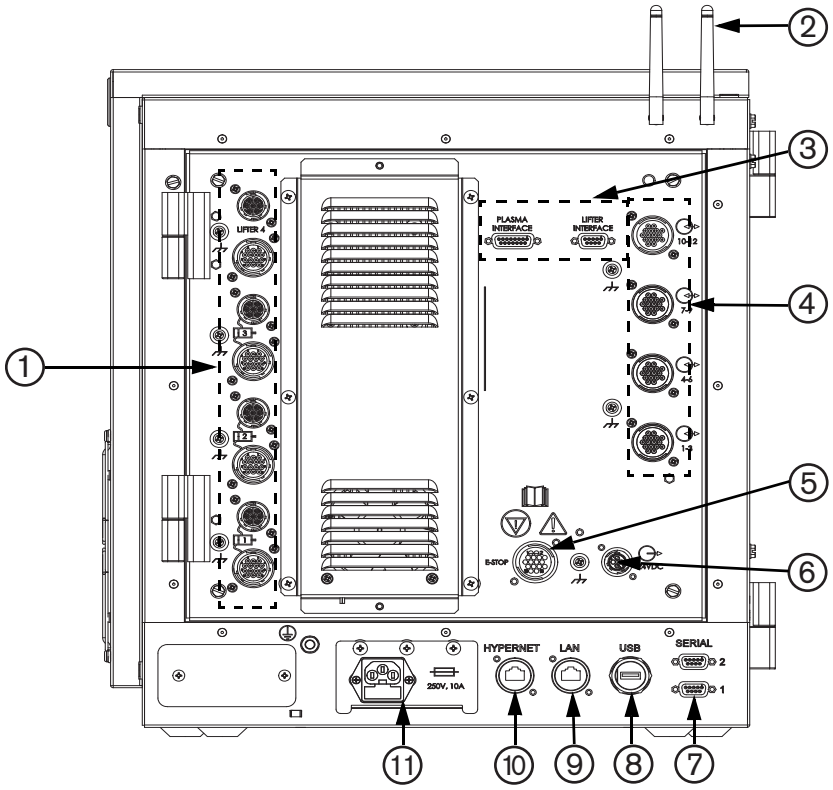
4 Station controls

5 Manual motion controls

Rear panel

The rear panel of the EDGE Pro Ti CNC has cable connectors for power, motion control, I/O, and communication ports. These connectors are clearly labeled with their function.

Figure 6 Rear panel of the EDGE Pro Ti CNC



1	Drive/encoder connectors
2	Wireless antennas
3	Plasma and lifter (Sensor Ti) connectors
4	I/O connectors
5	E-stop connector
6	24 V auxiliary power output
7	Serial ports
8	USB port
9	LAN port
10	Hypernet port
11	AC power input

For more information about the electrical installation of the EDGE Pro Ti CNC, See Installation on page 37..

System specifications

The following table contains technical specifications for the EDGE Pro Ti CNC.

Table 1 System specifications for the EDGE Pro Ti CNC

System features	
Processor	Intel® Processor
Operating system	Windows XPe
RAM	≥1GB
Ethernet port	1 RJ-45 Ethernet port
Hypernet port	1 Hypernet port for use with the ArcGlide THC
USB ports	2 USB 2.0 ports
Serial ports	2 RS-422/RS-232 configurable ports with D-sub 9-pin connectors
Wireless communication	Complies with 802.11G and 802.11N standards.
Onboard monitoring devices	Hardware monitoring, CPU fan, CPU temperature, voltages, POST display
Hard drive	SATA drive
Operator console	2-station standard (expandable by table manufacturer)
Display	381 mm (15 in.) touchscreen, surface acoustic wave glass
Regulatory compliance	CE, CSA, GOST-R
Configuration	
Number of I/O	12/12
I/O Type	Positive logic input or dry contact and relay output
Axes available	2 – 4
Power	
AC input	Voltage: 100 VAC to 240 VAC Current: single-phase, 10.0 A at 100 VAC/4.1 A at 240 VAC Frequency: 50/60 Hz
DC output	Encoder power: 5 VDC E-stop power: 24 VDC Axis 4 brake power: 24 VDC at 500 mA Total field power available: Encoders = 5 V/0.5A, I/O = 1.5 A, E-stop = 500 mA, lifter brake = 0.5 A
Slow blow fuse (2)	250 V, 10A, 5 mm x 20 mm
DC available for I/O	24 V at 1.5 A
Servo output	700 watts continuous at 120 VAC input 700 continuous watts and 1,000 intermittent watts at 70% duty at 240 VAC input DC brush or brushless motors with Hall sensor feedback

System features	
Environmental	
Temperature	-10° C to 40° C (14° F to 104° F)
Humidity	95% maximum relative humidity
Ingress Protection	IP2X Protect the equipment from exposure to excessive moisture.
Altitude	Operational up to 2000 m (6561 ft)
Environment	Pollution degree Level II
Mechanical	
Height	490.9 mm (19.33 in.)
Width	435 mm (17.13 in.)
Depth	377.2 mm (14.85 in.)
Weight	28.83 kg (63.55 lb)

EDGE Pro Ti axis and I/O configuration

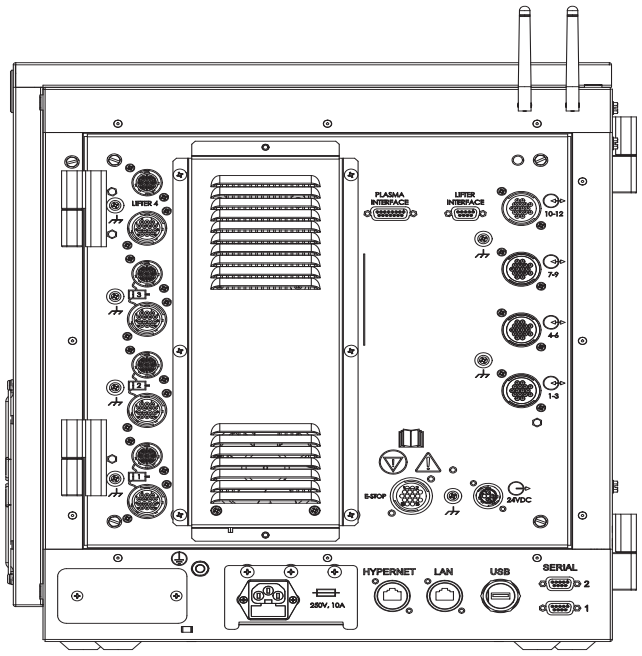
The EDGE Pro Ti interface offers 2 to 4 axes of motion control using internal motor drives with 12 inputs and 12 outputs. This interface can be used to retrofit an existing system with the Edge Pro Ti interface.

The EDGE Pro Ti interface can be configured to supply encoder power at 5 VDC. For more information, See Ti I/O circuits on page 75.

Table 2 EDGE Pro Ti part numbers

Part Number	Number of Axes	Number of I/O
090136	2	12/12
090137	3	12/12
090138	4	12/12

Figure 7 Rear panel of the EDGE Pro Ti CNC



Specifications for the Sensor Ti lifter

Compatible motors	DC brush, 60 VDC, 1 A
Maximum power output	60 W
Standard lifter range	Linear 152 mm (6 in.)
Accuracy	0.25 mm (0.01in.) or 0.5 V *
Measuring technology	Arc voltage feedback and Ohmic contact sensing
Standard lifter dimensions	152 mm (6 in.) W x 80 mm (3.15 in.) D x 546 mm (21.5 in.) H*
Standard lifter weight	8.7 k (19 lb) *
Operating environment	0 to 50 C; 95% maximum relative humidity (non-condensing)

* With standard, supplied lifter mechanics

Figure 8 Sensor Ti lifter

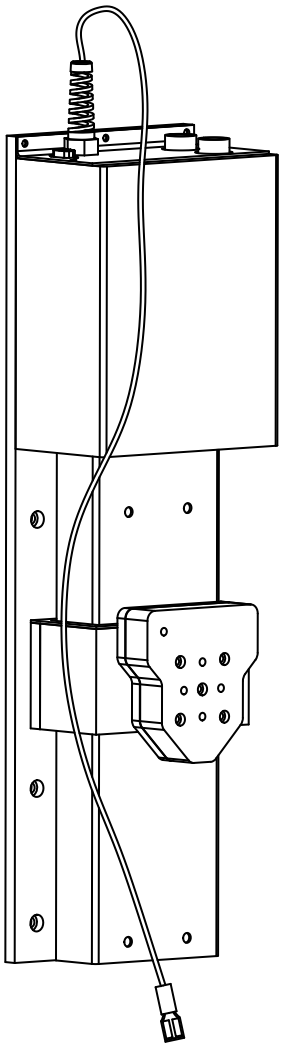


Table 3 Sensor Ti lifter part numbers

Part number	Description
228119	Sensor Ti lifter, motor, encoder, 4.53 k (10 lb) magnetic breakaway
128277	35 mm (1-3/8 in.) torch mounting block
128278	44 mm (1-3/4 in.) torch mounting block
128279	50 mm (2 in.) torch mounting block

Section 2

Installation

Upon receipt

- Verify that all the system components on your order have been received. Contact your supplier if any items are missing.
  - EDGE Pro Ti CNC
  - Power cable (North America)
  - EDGE Pro Ti CNC instruction manual
  - Phoenix software instruction manuals
  - Any other optional components that appear on your order form
- Inspect the system components for any physical damage that may have occurred during shipping. If there is evidence of damage, refer to the following section, *Claims*. All communications regarding claims must include the model number and serial number located on the back of the CNC.

Claims

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

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

Installation requirements

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

Gantry sizing for EDGE Pro Ti motors

There are many features of a cutting table that impact the performance of the complete system including:

- Size of the pinion gear
- Ratio of the gears
- Choice of direct-drive gearboxes or pulley sizing
- Gantry weight

- Table size
- Design

The following information is intended to assist with determining the weight of a gantry on a table that is accelerated by the EDGE Pro Ti motors (031143).

A theoretical table configuration using a single-side drive with rack and pinion mechanics is the basis for the calculations. The pinion gear diameter is 50 mm (1.9 in.). Table 4 provides the suggested values for the weight of the gantry and multiple gearbox ratios based on this hypothetical table.

Different table designs have different weight values. These values have been calculated with the torque equation, which compares the maximum continuous torque of the motor to the theoretically calculated inertia of the cutting machine.

In the following table, the figure for maximum linear speed is based on the pinion diameter and gearbox ratio for a single side drive using a 50 mm (1.9 in.) pinion gear. This figure does not include the limitations of table mechanics which can significantly reduce this value. To determine the gantry weight for a dual gantry setup, increase the weight of the single-side drive by 40%.

Table 4 Gantry sizing

Gear box ratio	Maximum linear speed millimeter per minute/inch per minute	Gantry weight (kg/lb)
10:1	54966/2164	131/288
15:1	36652/1443	197/433
20:1	27483/1082	263/579
25:1	21996/866	329/724

Properly sizing the machine to performance specifications requires mechanical engineering and motion engineering expertise. Table manufacturers are responsible for the optimal sizing and performance characteristics of the complete machine. The EDGE Pro Ti can be used in many different configurations but the final performance characteristics of the machine depend on the total solution provided by the table manufacturer.

Placement of system components

- Place all system components in position prior to making electrical, gas and interface connections. See *Mounting the CNC* on page 39 for details.
- Ground all system components to earth. See *Recommended grounding and shielding* on page 43 for grounding details.

WARNING!

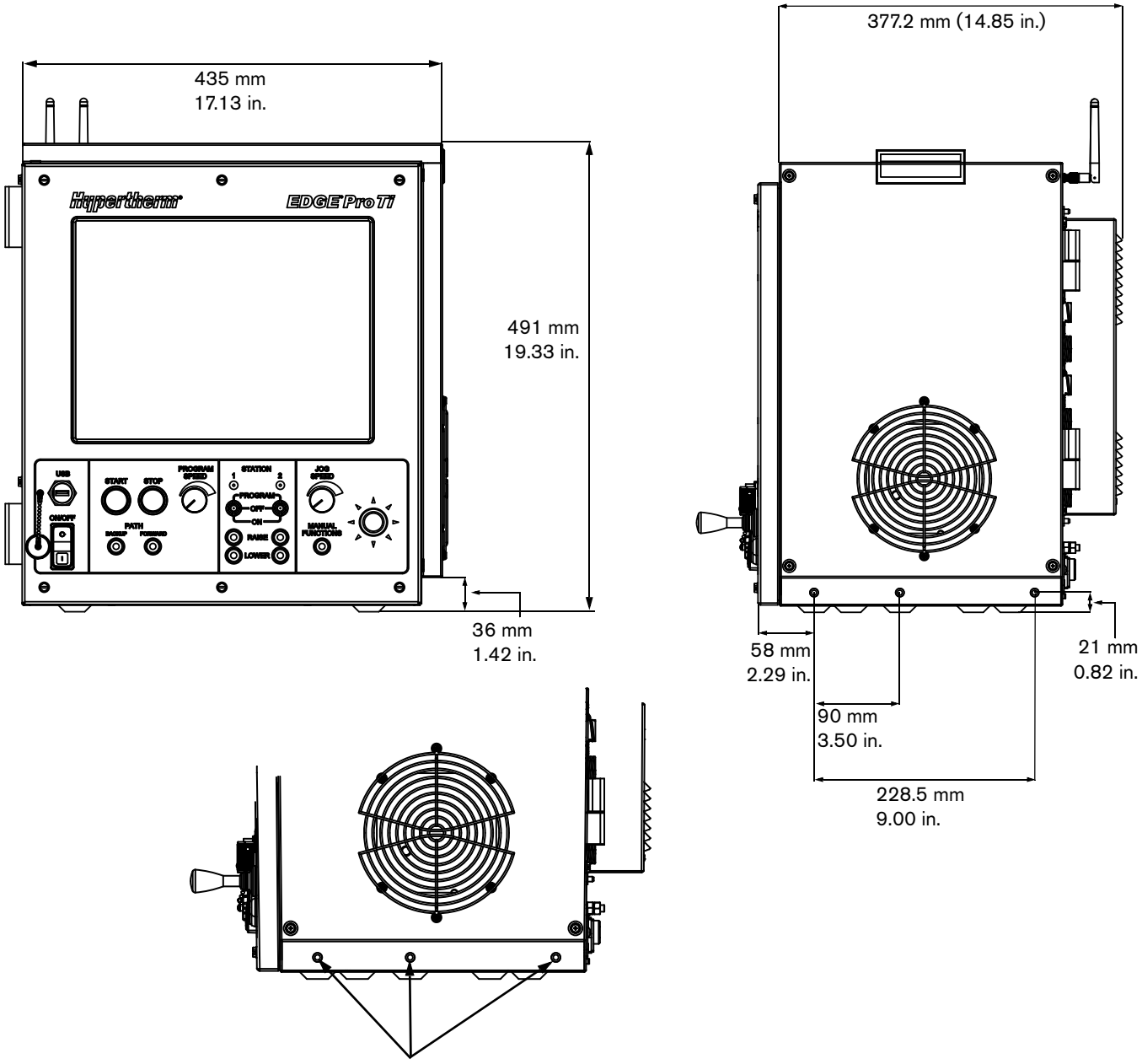
Use a 2-man lift to position the EDGE Pro Ti CNC and avoid bodily injury.

Mounting the CNC

Before you connect the EDGE Pro Ti CNC to other system components, mount all the components using the appropriate instructions.

Do not allow the system components to lie unsecured on top of cabinets or on the floor.

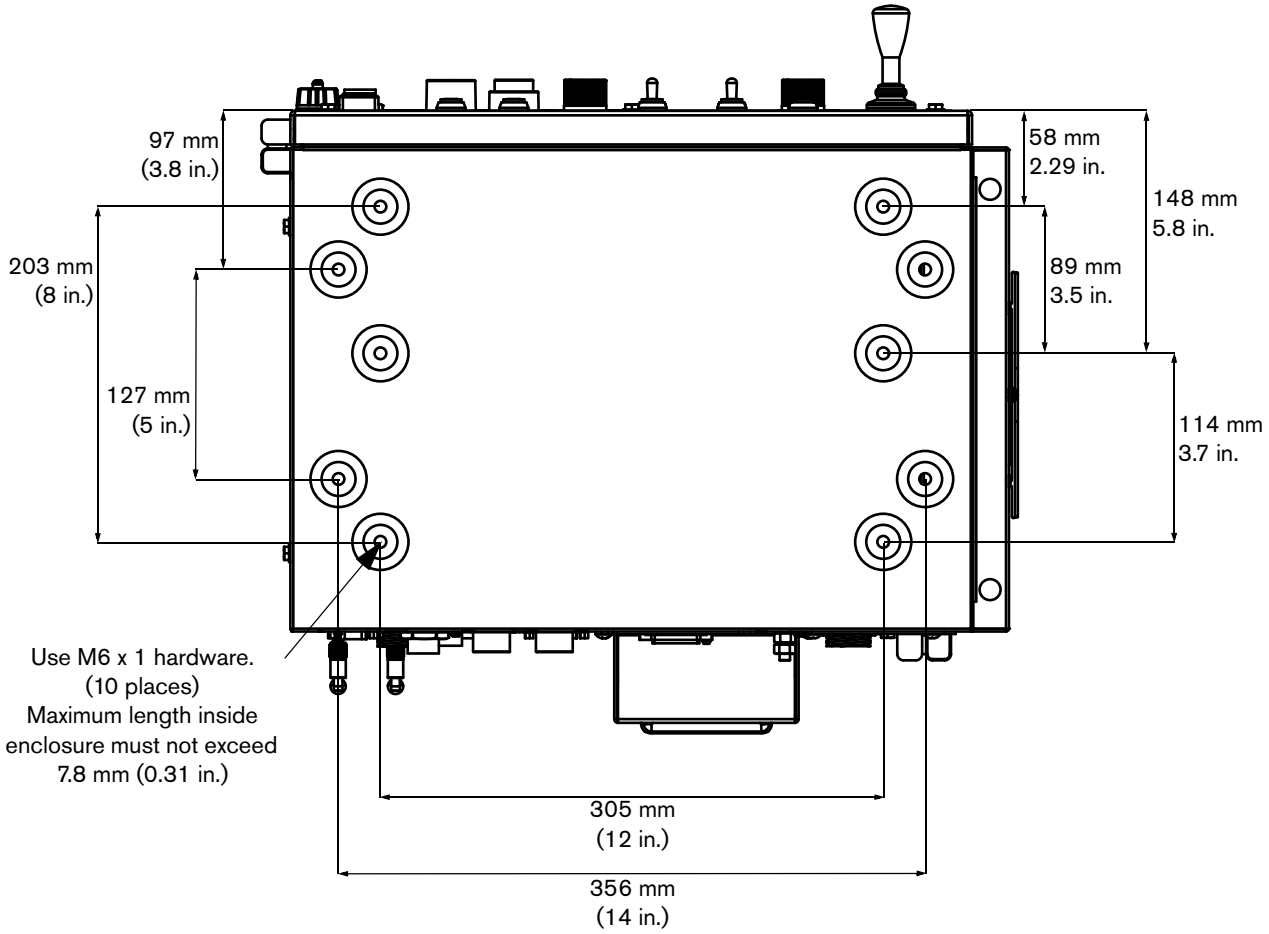
Figure 9 Front and side views of the EDGE Pro Ti CNC



Mounting hole patterns on the bottom of the CNC

The EDGE Pro Ti CNC has 10 mounting holes on the bottom of the enclosure for mounting the CNC to the cutting table. Fasten the mounting screws through the holes that will provide the most stability for your CNC during the operation of your table.

Figure 10 EDGE Pro Ti mounting hole pattern

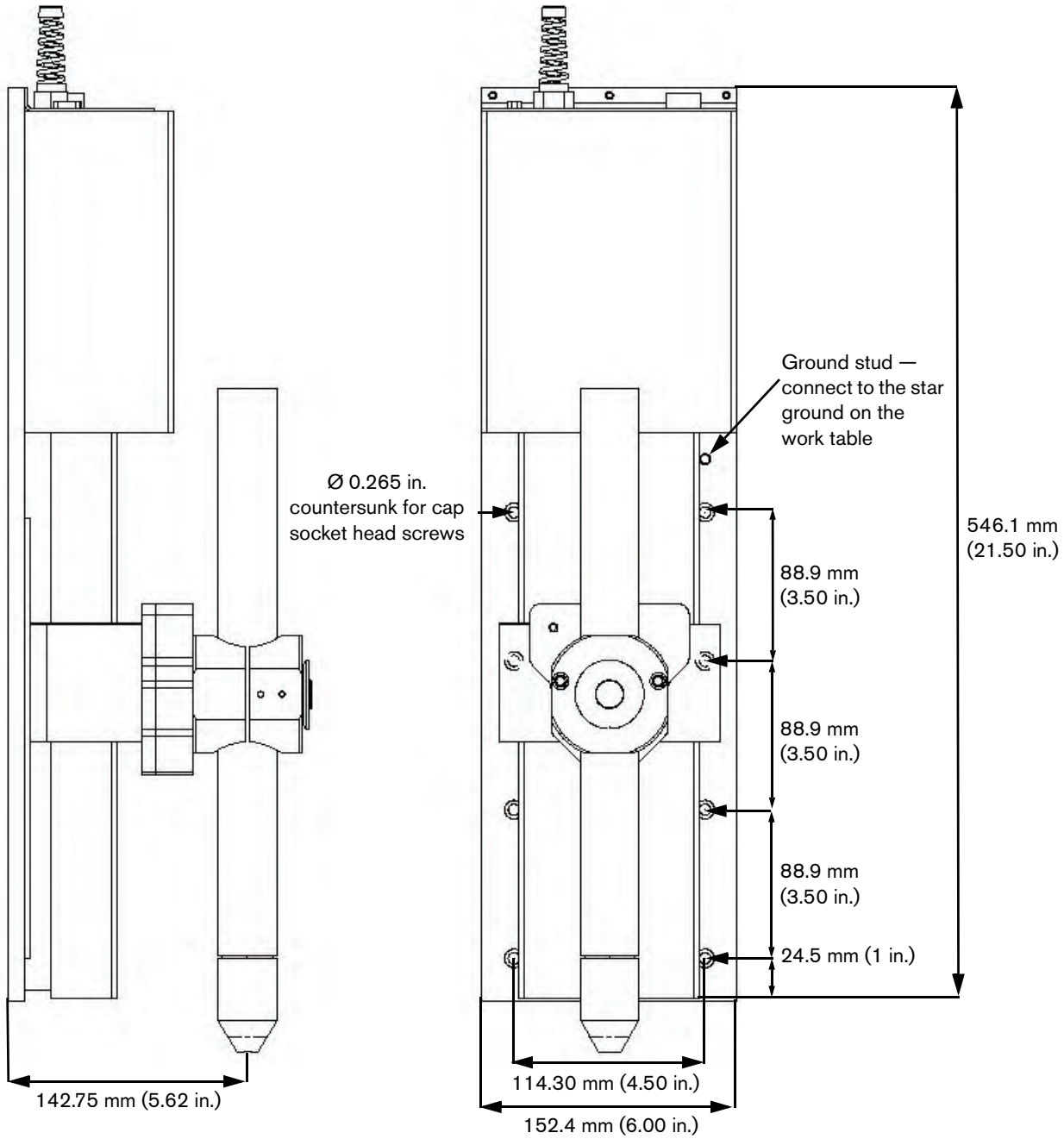


Mounting the THC

Sensor™ Ti THC

The EDGE Pro Ti CNC supports one Sensor Ti THC. Mount the Sensor Ti lifter assembly (228119) on the cutting table to take maximum advantage of the vertical travel range. Typically the bottom of the lifter should be between 15.24 and 20.32 cm (6 and 8 in.) above the cutting table.

Figure 11 Front and side views of the Sensor Ti



ArcGlide THC

The EDGE Pro Ti CNC supports a maximum of 4 ArcGlide THCs. Refer to the *ArcGlide THC Instruction Manual* (806450) for complete information about installing this THC.

Recommended grounding and shielding

Introduction

This section describes practices for grounding and shielding a plasma cutting system to minimize its susceptibility to electromagnetic interference (EMI) (also known as **noise**). It also describes the service ground, protective earth (PE) ground, and DC power ground. The diagram at the end of this section shows these types of grounds in a plasma cutting system.

> **Note:** 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 EMI problems. Hypertherm recommends that you consult your local and national electrical codes to make sure that the grounding and shielding practices that you use satisfy the requirements for your location.

Types of grounding

Service ground (also known as safety 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.

Protective earth (PE) ground is the grounding system inside the electrical equipment. The PE ground, which connects to the service ground, provides electrical continuity between the equipment and the AC service.

DC power ground (also known as cutting current ground or work) 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.

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

Grounding practices

1. Unless noted, use cables with a minimum gauge of 13.3 mm² (6 AWG) (047040) for the EMI ground cables shown in the "Example grounding diagram" on page 47.

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 mm² (4 AWG; 047031) to the table bus bar. The EMI ground cables for the torch lifter and the RHF or combined ignition/gas connect console must each run separately to the table ground bus.

3. Inadequate grounding not only exposes operators to dangerous voltages, but inadequate grounding also increases the risk of equipment failure and unnecessary downtime. Ideally a ground should be zero ohms resistance, but field experience indicates under 1 ohm resistance is satisfactory for most applications. Hypertherm recommends that you consult your local and national electrical codes to make sure that the grounding and shielding practices that you use satisfy the requirements for your location.

4. A ground rod (a PE ground) that meets all applicable local and national electric codes must be installed within 6 m (20 ft) of the cutting table. The PE ground must be connected to the cutting table ground bus bar using a minimum 13.3 mm² (6 AWG) green and yellow grounding cable (047121).

5. 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.

6. 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.

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

8. For a system with a remote high frequency (RHF) console or combined ignition/gas connect console, 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.

9. For a system with a RHF console or combined ignition/gas connect console, Hypertherm recommends that you mount this console as close as possible to the torch. This console also must have a separate ground cable that connects directly to the cutting table ground bus bar.

10. 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/gas connect console, whether it is bolted to the plasma system or to the cutting table.

11. The metal braided shield on the torch lead must be connected firmly to the ignition/gas connect console and to the torch. It is recommended to 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.

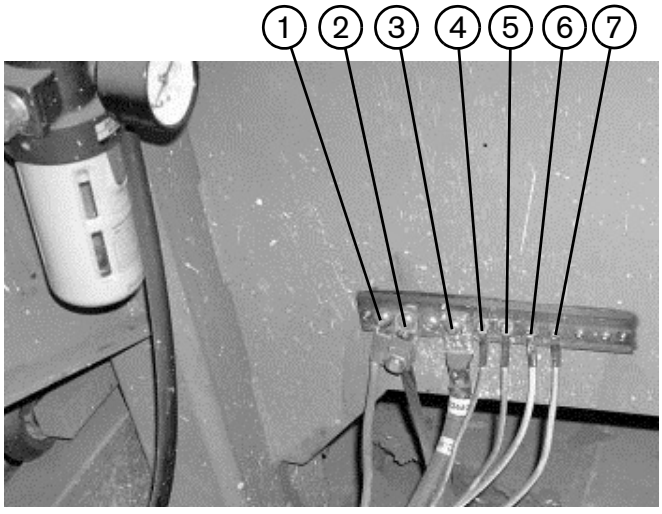
12. The torch holder and the torch breakaway mechanism – the part mounted to the lifter, not the part mounted to the torch – must be connected to the stationary part of the lifter with copper braid at least 12.7 mm (0.5 inches) wide. A separate cable must run from the lifter to the gantry ground bus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

13. 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.

14. 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.

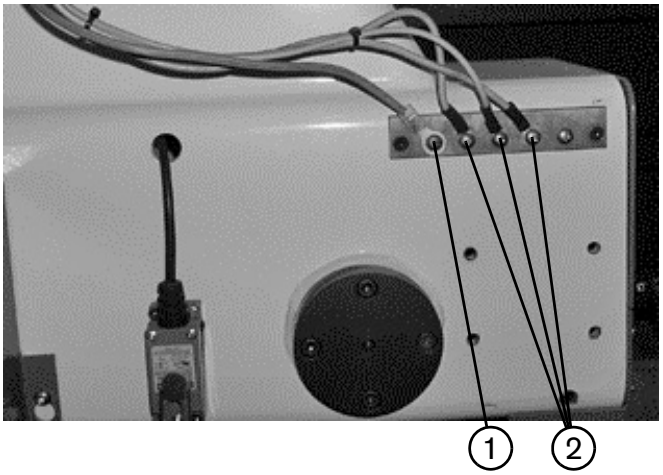
15. All other signals (analog, digital, serial, and encoder) should run in twisted pairs inside a shielded cable. Connectors on these cables should have a metal housing. The shield, not the drain, should be connected to the metal housing of the connector at each end of the cable. Never run the shield 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 RHF console (if applicable, not on all systems)
5 CNC enclosure
6 Torch holder
7 Plasma system chassis

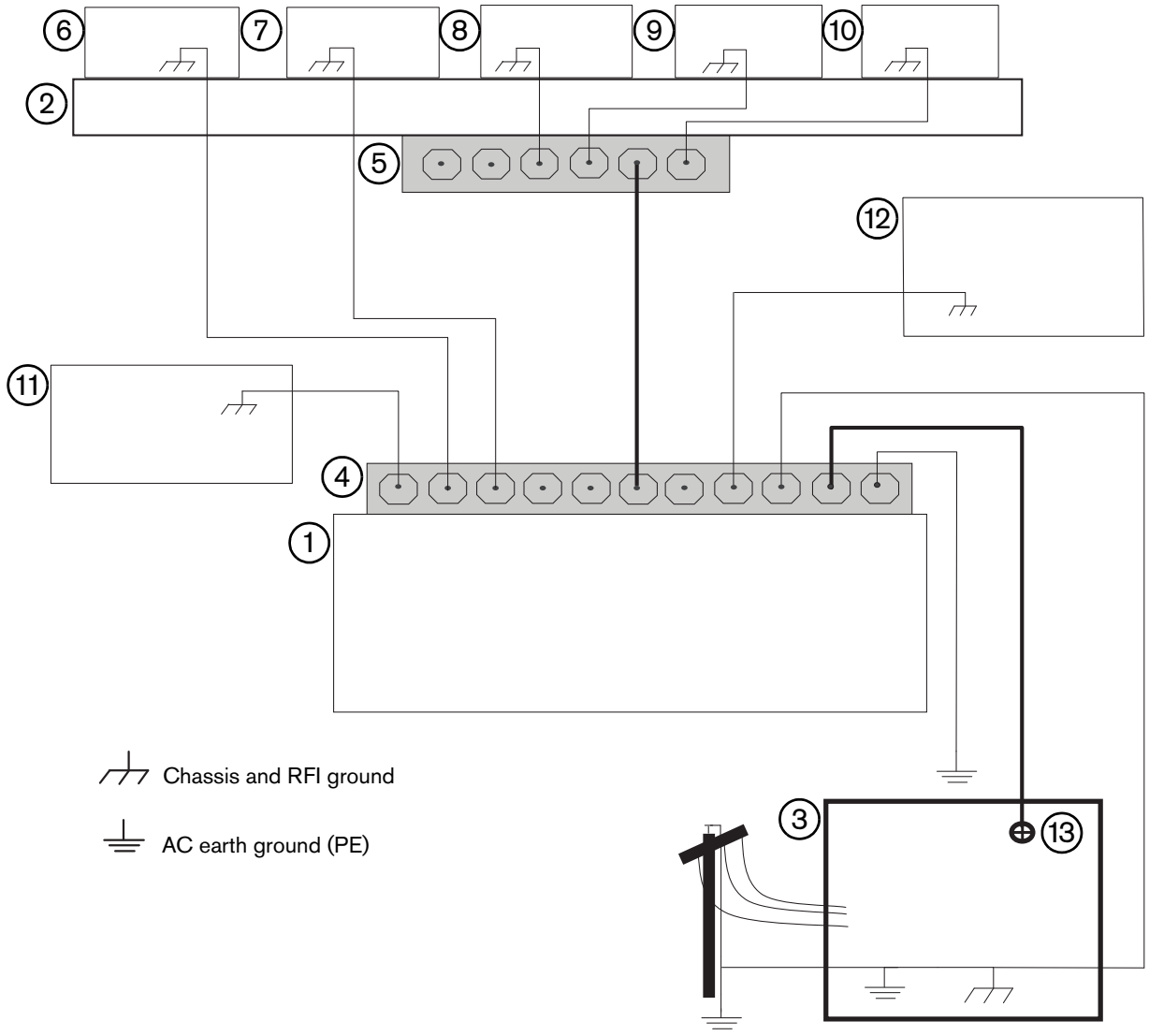
The following picture shows an example of a gantry ground bus. It is bolted to the gantry, close to the motor. All of the individual ground cables from the components mounted on the gantry connect to the bus. A single heavy cable then connects the gantry ground bus to the table ground bus.



1 Cable to the cutting table ground bus

2 Ground cables from components on the gantry

Example grounding diagram



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

Note: This example is based on practices in North America. Other regions can have different local or national electrical codes. Hypertherm recommends that you consult your local and national electrical codes to make sure that the grounding and shielding practices that you use satisfy the requirements for your location.

Configuration diagrams

Figure 12 Example of a configuration with an EDGE PRO Ti CNC and an integrated Sensor Ti lifter

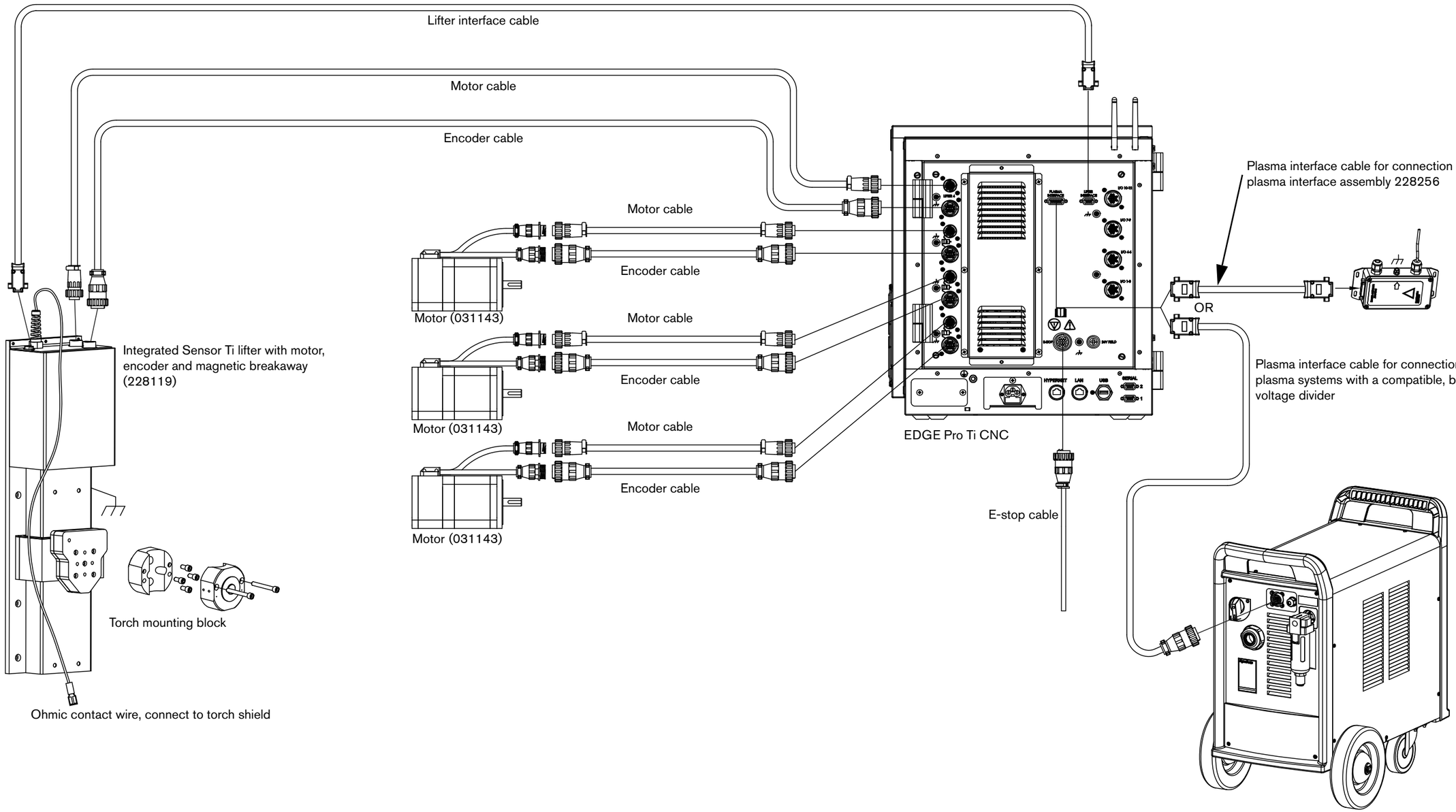
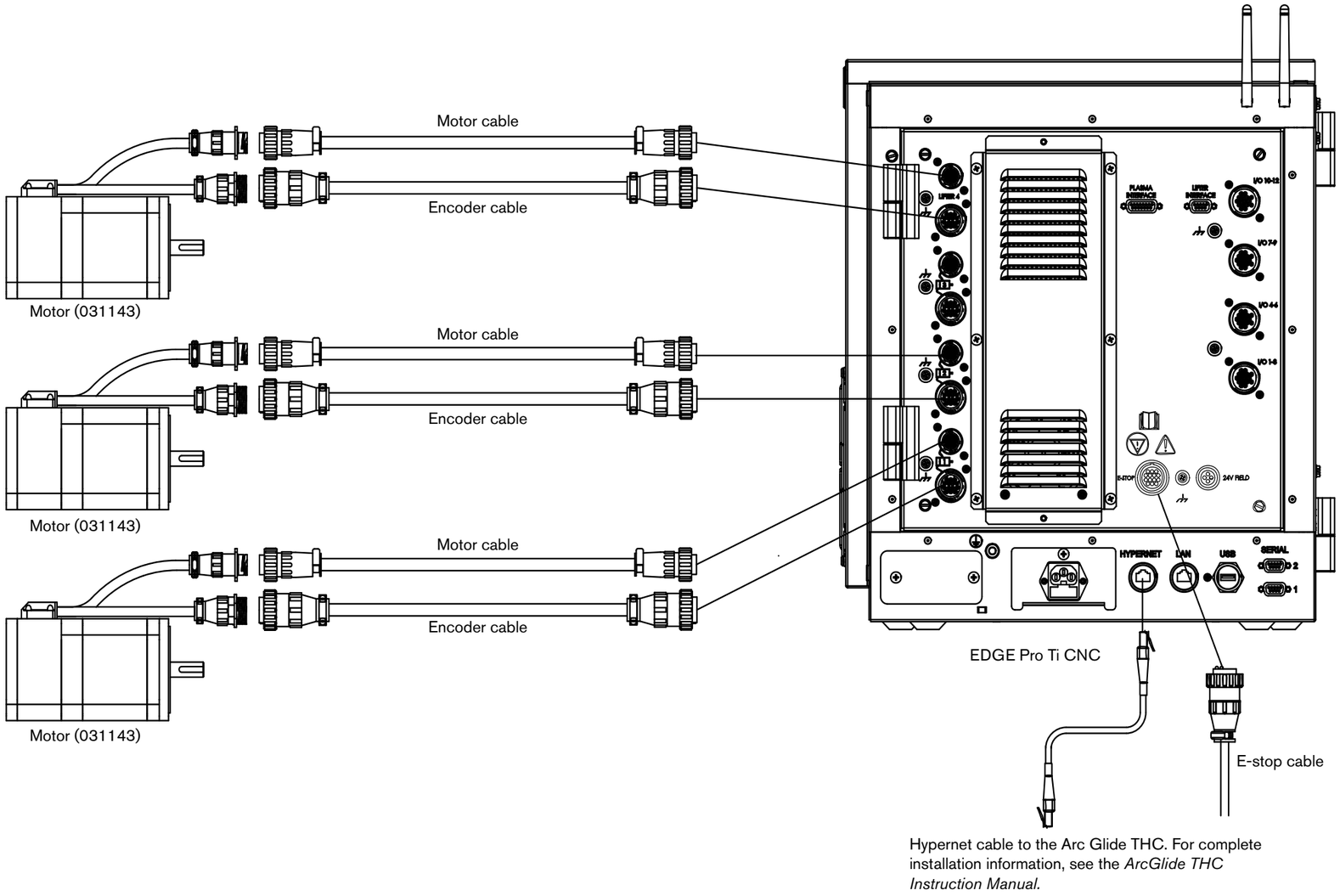


Figure 12 EDGE Pro Ti with an ArcGlide lifter

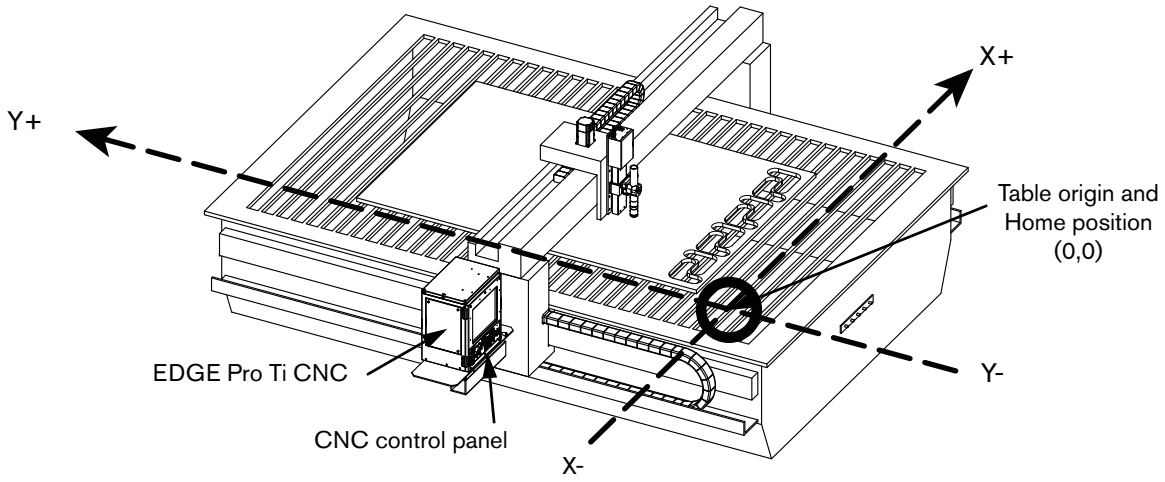


X and Y axis configuration

To configure the X and Y axes, first decide which axis on the table will be the X axis and where the home position will be.

Next, define the X/Y orientation and home position in Phoenix software (Setups > Password > Machine Setups) to match the configuration you want on the table. The definition of the axes orientation and home position in software and on the table must agree so the system can execute the part programs as expected.

Figure 13 Example of a shape cutting system configured with an EDGE Pro Ti CNC



The operator console

The EDGE Pro Ti comes with a 2-station operator console that allows you to operate two cutting torches or stations.

The operator console allows you to:

- Start and stop the cutting program.
- Switch to manual mode
- Manually jog the torch with the joystick
- Jog forward or backward on path
- Adjust the jog and cutting feed rates
- Activate or deactivate the 2 cutting stations

The device I/O for the operator console are assigned to Input and Output 129 and higher, as listed in Table 5.

Front panel I/O

The I/O for the devices on the front panel of the CNC are all pre-assigned as factory defaults. These I/O assignments begin at 129.

Table 5 Front panel I/O assignments

Function	Input No.	Output No.
Front Panel Start	129	
Front Panel Stop	130	
Front Panel Manual	131	
Front Panel Forward On Path	132	
Front Panel Backward On Path	133	
Jog Up	134	
Jog Down	135	
Jog Left	136	
Jog Right	137	
Auto Select 1	138	
Manual Select 1	139	
Raise Torch 1	140	
Lower Torch 1	141	
Auto Select 2	142	
Manual Select 2	143	
Raise Torch 2	144	
Lower Torch 2	145	
Station Enable LED 1		129
Station Enable LED 2		130
Speed Pot 1 (Program Speed)	Analog Input 1	
Speed Pot 2 (Jog Speed)	Analog Input 2	
Divided and filtered arc voltage	Analog Input 3	
Scaled interior temperature	Analog Input 4	

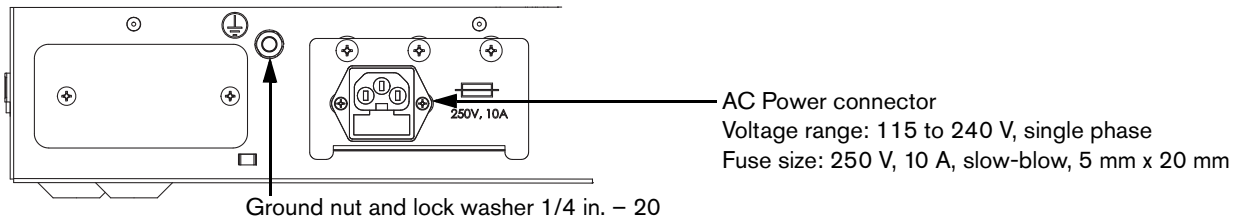
Note: Loading a setup file from a different Hypertherm CNC will not affect these I/O assignments.

AC power

Power input

Figure 14 illustrates the power input connector on the rear of the EDGE Pro Ti CNC.

Figure 14 AC power input connector



Note: The AC power cable must be plugged into an AC branch circuit with a 20-A limit.

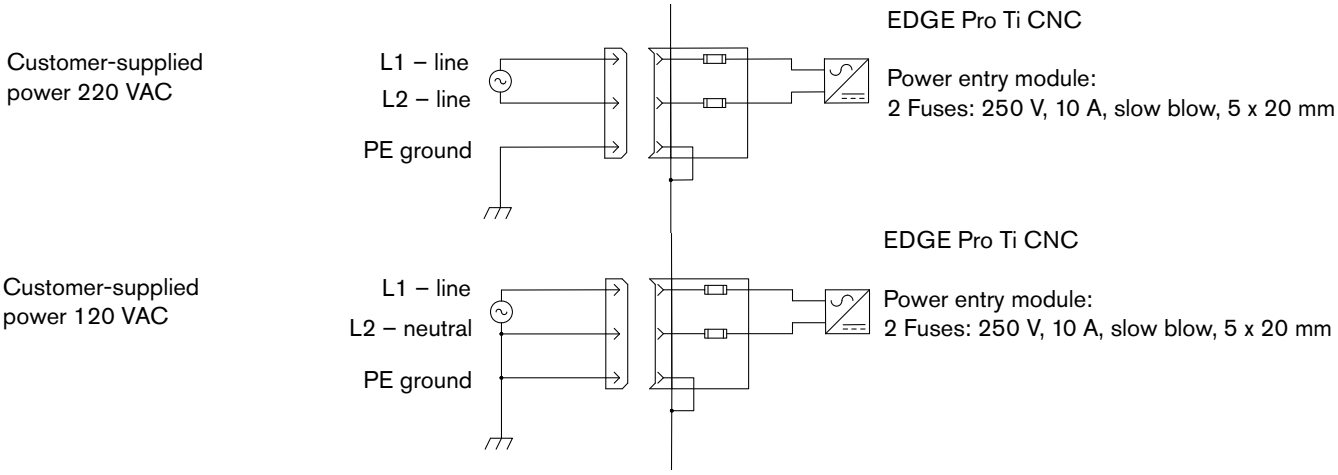
Power cable

An AC power cable is standard equipment for North America, and is shipped with the EDGE Pro Ti CNC. For other regions, use a power cord that has an IEC–60320–C13 end which meets the requirements of local code and power connections.

For more electrical specifications, see “System specifications” on page 33. Figure 15 shows examples of how power cables can be created.

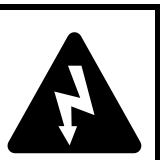
Note: The fuse block holds two 250 V, 10 A, slow-blow, 5 mm x 20 mm fuses.

Figure 15 Input VAC wiring examples



Chassis grounding

The CNC must be properly grounded according to national and local electrical codes for safe operation. Use a number 6 AWG (16 mm^2) wire between the ground stud on the rear of the CNC and the star ground on the cutting table, as shown in Figure 16.

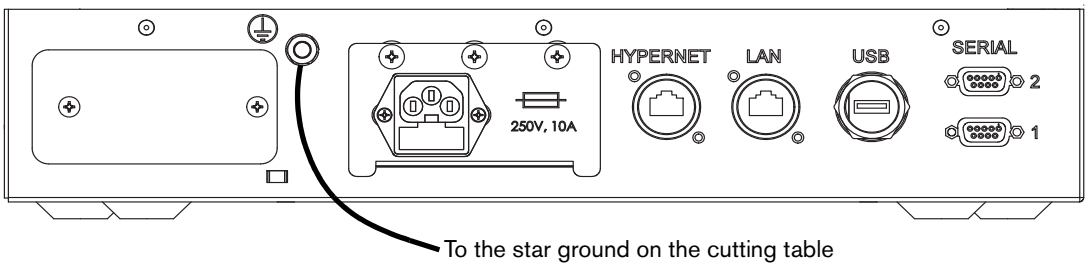


WARNING!

ELECTRIC SHOCK CAN KILL

This ground connection must be wired for safe and reliable operation.

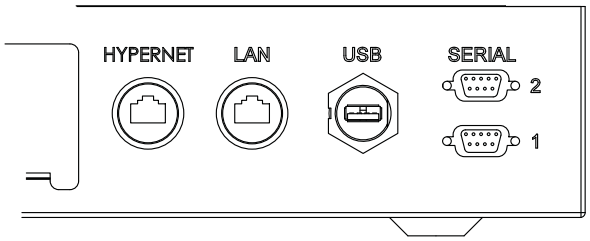
Figure 16 Ground cable on the CNC



Interface ports

Figure 17 illustrates the interface ports and their location on the rear of the EDGE Pro Ti CNC.

Figure 17 Interface ports



Hypernet® interface

The Hypernet interface allows the EDGE Pro Ti to connect to an ArcGlide THC and plasma system using the Hypernet protocol over shielded, Ethernet Cat-5e cables. This configuration must include an industrial-grade Ethernet switch to route communication from the EDGE Pro Ti to the other units in the system. Note that the EDGE Pro Ti does not support both an ArcGlide and a Sensor Ti lifter in the same system. See *EDGE Pro Ti Parts List* for Hypernet cable lengths and part numbers.

LAN interface

The RJ-45 LAN interface allows the EDGE Pro Ti to connect to a local area network (LAN) for downloading parts and using Remote Help. See *EDGE Pro Ti Parts List* for LAN cable lengths and part numbers.

For more information on LAN setup, see the *Phoenix Software Installation and Setup Manual*.

USB interface

The USB 2.0 port on the back of the CNC, like the one on the front panel, can be used to load programs or to connect a USB keyboard or mouse.

Serial ports

The two serial RS-232/RS-422 ports on the back of the CNC are configurable ports and accept D-sub 9-pin connectors. Transmission rate is up to 115K Baud. Both ports are preset for RS-422 as the default. For more information, see “Utility and serial isolation board (141307)” on page 126.

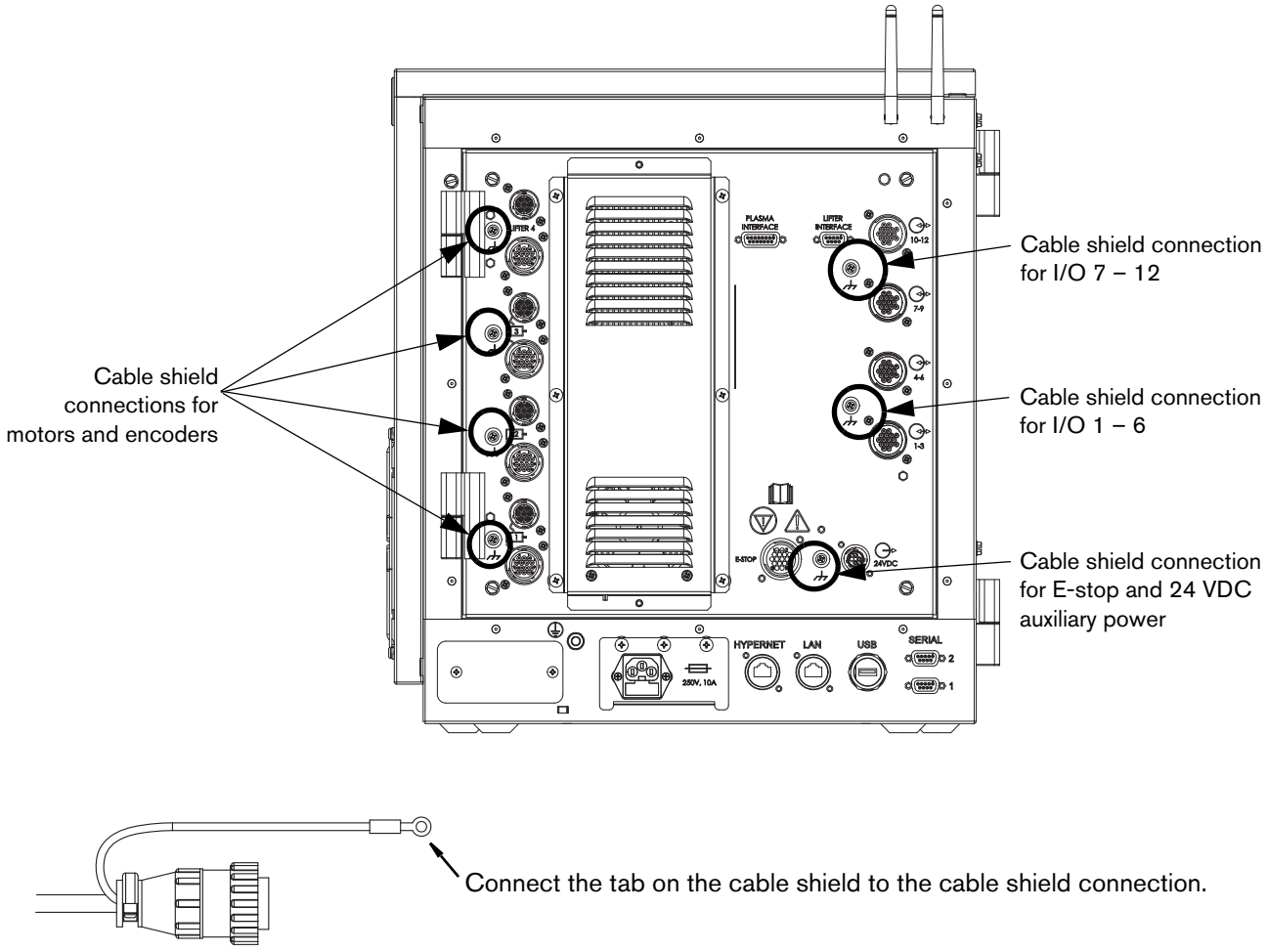
System connections

Cable shield grounds

To minimize electromagnetic and radio frequency interference (EMI/RFI), connect all interface cable shields to the chassis using the following methods, as appropriate:

- The ground screw on the EDGE Pro Ti enclosure
- The dedicated ground pin on each plastic cable connector (CPC)
- The metal shell on the plasma and lifter cable D-sub connectors should be connected to the cable shield

Figure 18 EDGE Pro Ti cable shield ground connections



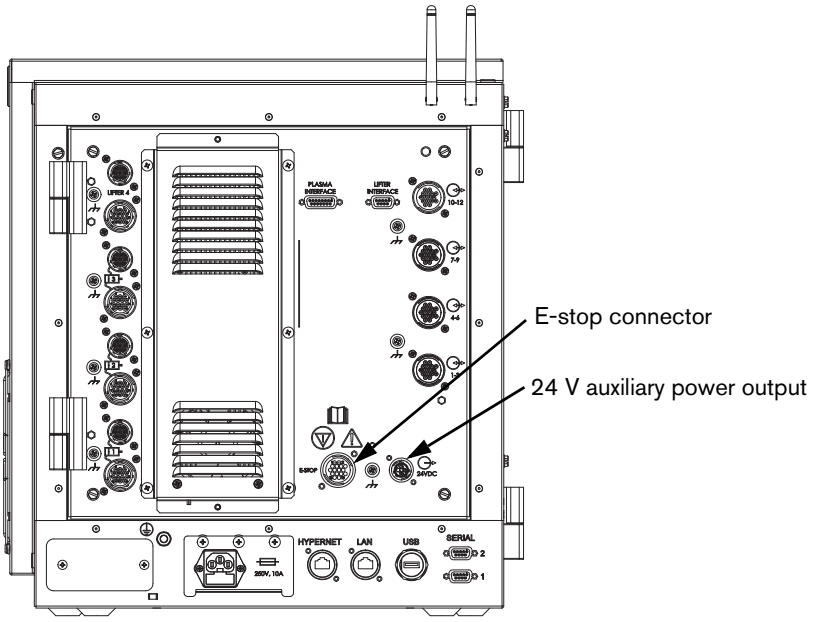
Emergency stop (E-stop) connection

The E-stop connector provides the interface for an E-stop button with a separate reset switch to meet local safety regulations.

Safety audit

A safety audit must be conducted before the system is installed. All requirements for redundancy, monitoring, and scheduled testing for safety circuits that result from the audit must be implemented.

Figure 19 Location of the EDGE Pro Ti E-stop connector



The table manufacturer must supply and install the E-stop logic functions, E-stop switch and reset switch to insure that they are in complete compliance with national and local safety regulations and the configuration of the system.

Installation of the circuitry and switches can be done using safety relays or PLCs, as necessary. A safety PLC may be preferred if advanced functionality or advanced machine and factory integration is required. The E-stop interface on the rear of the EDGE Pro Ti enclosure has been tested with the following commercially available components:

- Safety relay (003239)
- Normally closed, dual pole, single throw E-stop switch (428025)
- Normally open, momentary reset switch (428026)

The E-stop interface must be satisfied to engage the motors. If the E-stop is not satisfied, the motors will not spin. Figure 20 on page 58 shows a possible design for an E-stop circuit, including the circuitry that exists within the EDGE Pro Ti CNC and circuitry using an Allen Bradley safety relay.

Note:

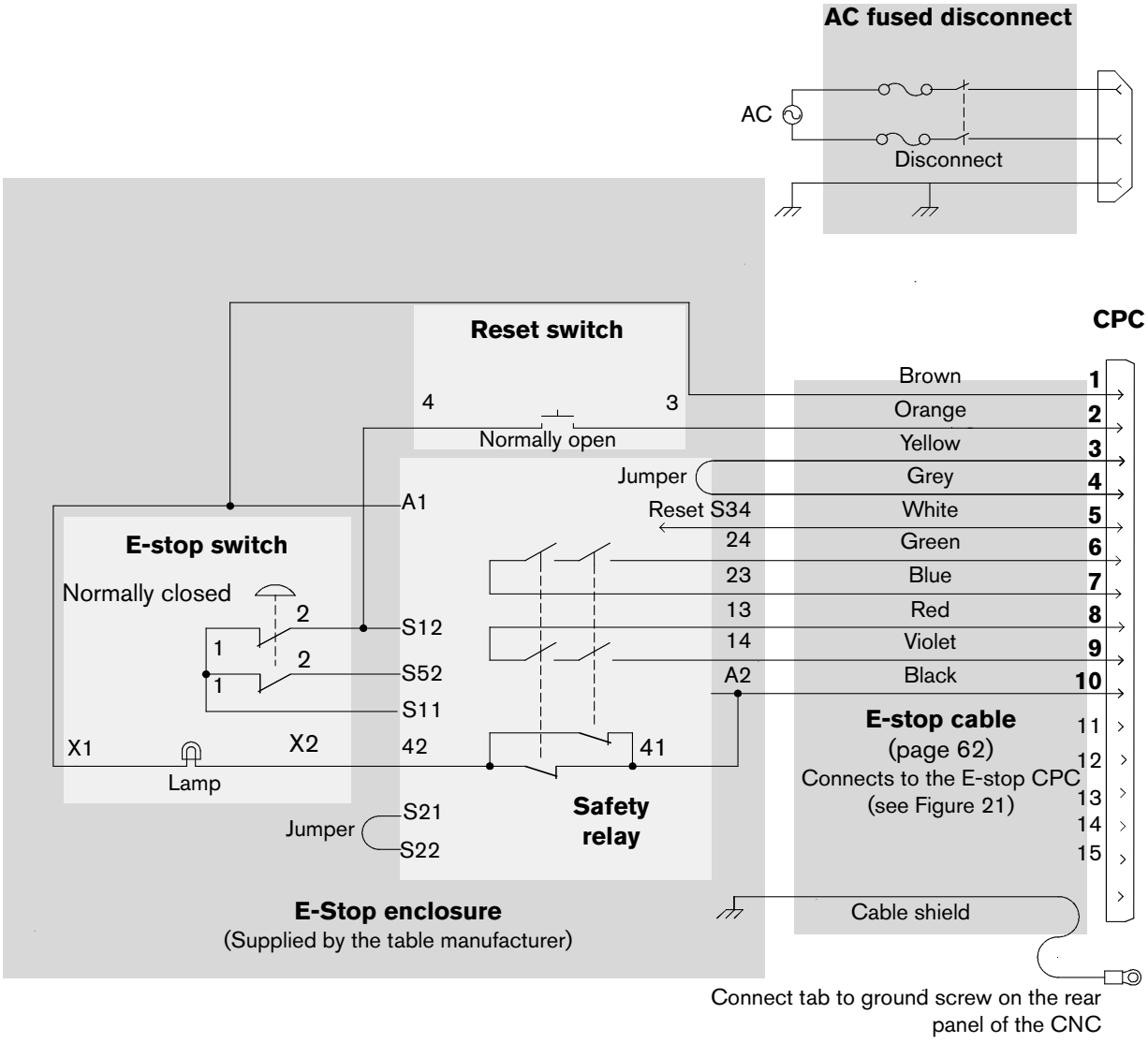
- The safety relay is powered by 24 VDC from pins 1 and 10 of the E-stop connector on the CNC.
- The sensor circuit is wired for 2-channel E-stop monitoring with LS1 and LS2 monitor contacts in series.
- The start circuit is wired for manual, monitored activation.
- When the LED is illuminated, it indicates that the machine is disabled.

Sample E-stop circuit

Figure 20 illustrates an example of an E-stop that a table manufacturer might implement. The CPC for this circuit connects to the E-stop connector on the rear enclosure of the CNC and to the built-in safety circuit within the EDGE Pro Ti CNC, shown in Figure 21.

The E-stop in Figure 20 uses Hypertherm components; an E-stop switch (428025), safety relay (003239), and reset switch (428026) and uses the EDGE Pro Ti E-stop cable to connect to the safety circuit within the CNC. Other components require a different design.

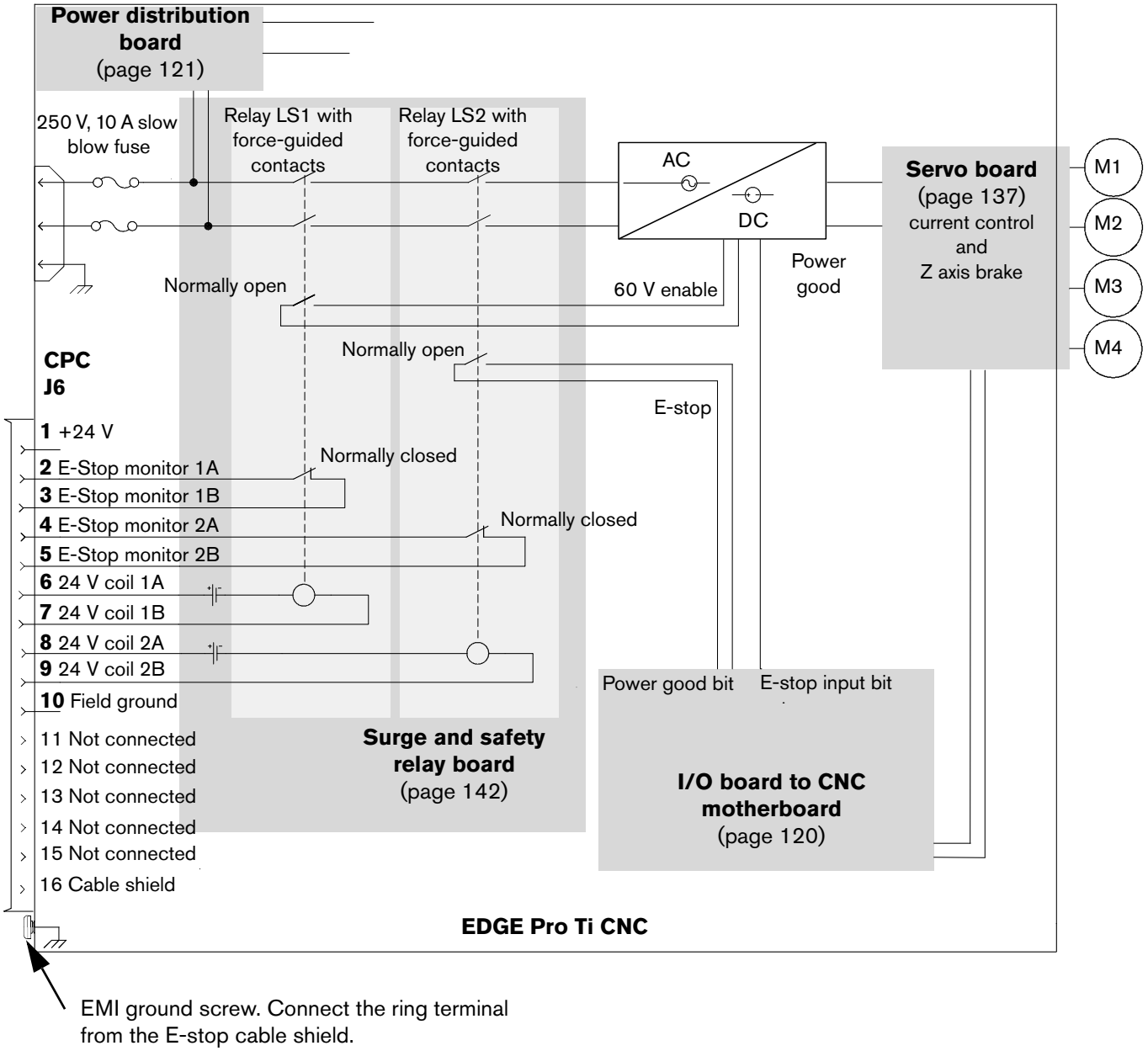
Figure 20 Example of an E-stop circuit



EDGE Pro Ti safety circuit

The EDGE Pro Ti CNC has a safety circuit that allows table manufacturers to implement E-stop or other safety measures according the needs of their customers and their local and national safety regulations. Figure 21 illustrates this circuit. Figure 20, illustrates an example of an E-stop design that might connect to the safety circuit within the EDGE Pro Ti CNC through the E-stop connector on the rear panel of the CNC.

Figure 21 EDGE Pro Ti safety circuit



E-stop test circuit

WARNING!

This test circuit is designed for testing only and does not replace an approved E-stop implementation.

Use this test circuit with two jumpers to provide E-stop inputs that engage the motor drives.

Machinery is activated as soon as the jumpers are applied and can present a danger.

Figure 22 E-stop test circuit

This E-stop test circuit connects to the E-stop circuit within the EDGE Pro Ti. The CPC for this test circuit connects to the E-stop connector on the rear enclosure of the CNC.

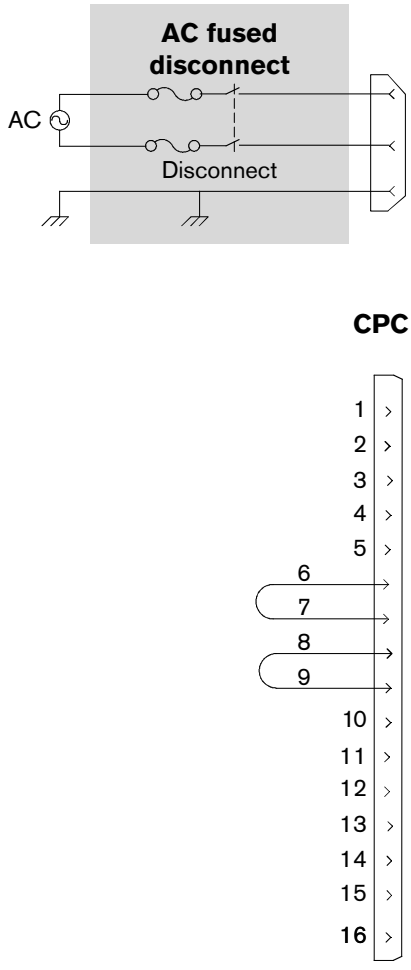
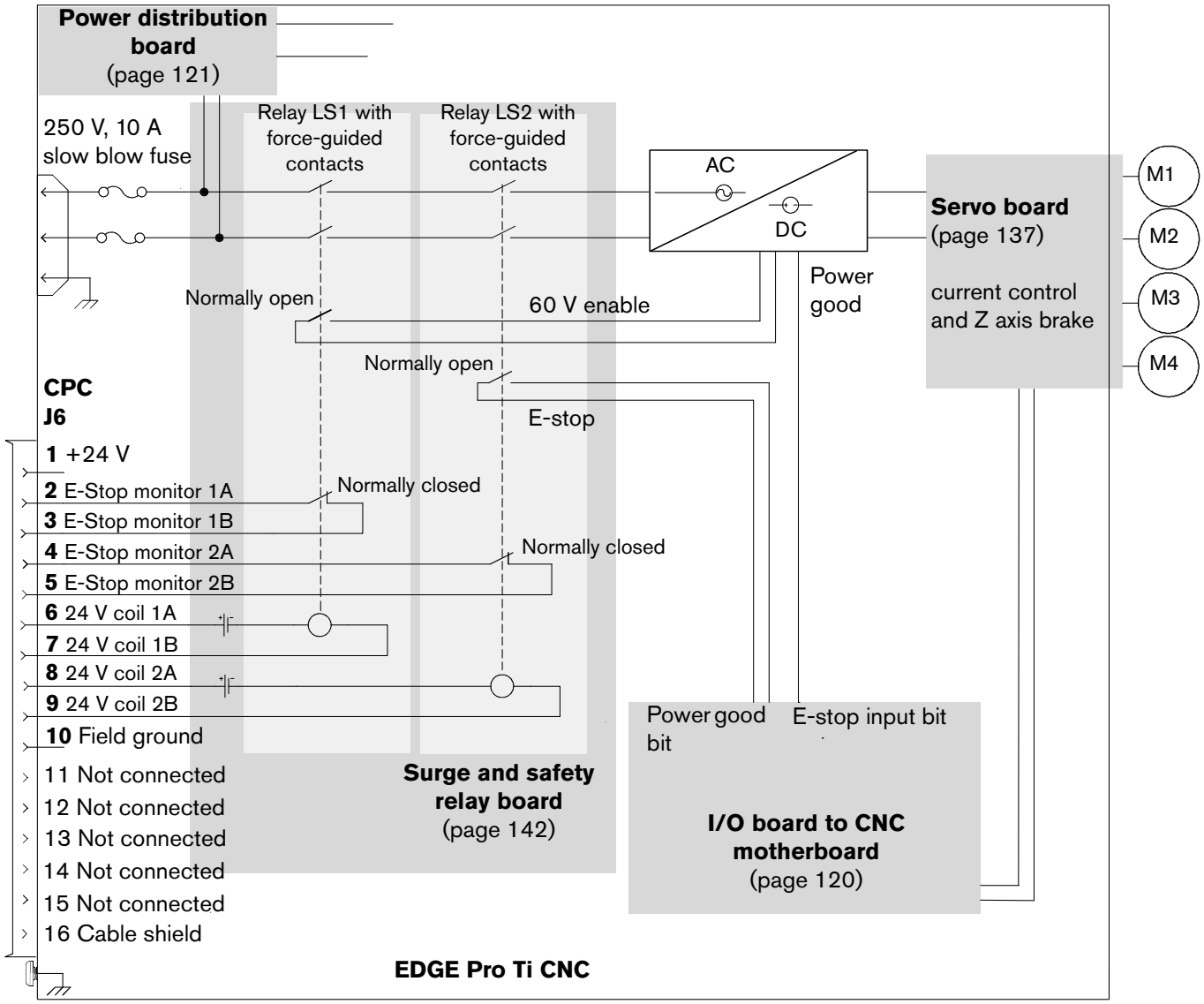


Figure 23 EDGE Pro Ti safety circuit



E-stop cable

Figure 24 E-stop cable

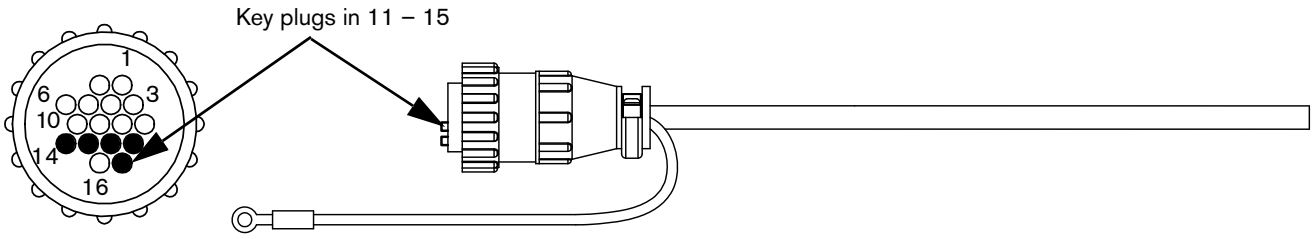


Table 6 E-stop cable pinouts

Pin no.	Wire color	Signal
1	Brown	+24 V field
2	Orange	E-stop monitor 1A
3	Blue	E-stop monitor 1B
4	Violet	E-stop monitor 2A
5	Grey	E-stop monitor 2B
6	White	24 V coil 1A
7	Green	24 V coil 1B
8	Yellow	24 V coil 2A
9	Red	24 V coil 1B
10	Black	Field ground
11–16		Not connected

Use the following information to order E-stop cables.

Part Number	Length
223365	3.05 m (10 ft)
223366	6.08 m (20 ft)
223367	7.62 m (25 ft)
223368	10.66 m (35 ft)
223369	15.25 m (50 ft)

To create a custom cable, order the connector kit (428046).

Motor connection

Install the motor cables between the Axis 4 motor connector and the motor connector on the Sensor Ti and between the Axis 3, Axis 2, and Axis 1 motor connectors on the rear of the EDGE Pro Ti and the motor connector on the remaining axis motors (031143). For more information about the motor cable, see *Motor cable* on page 66.

Figure 25 Ti motor interfaces

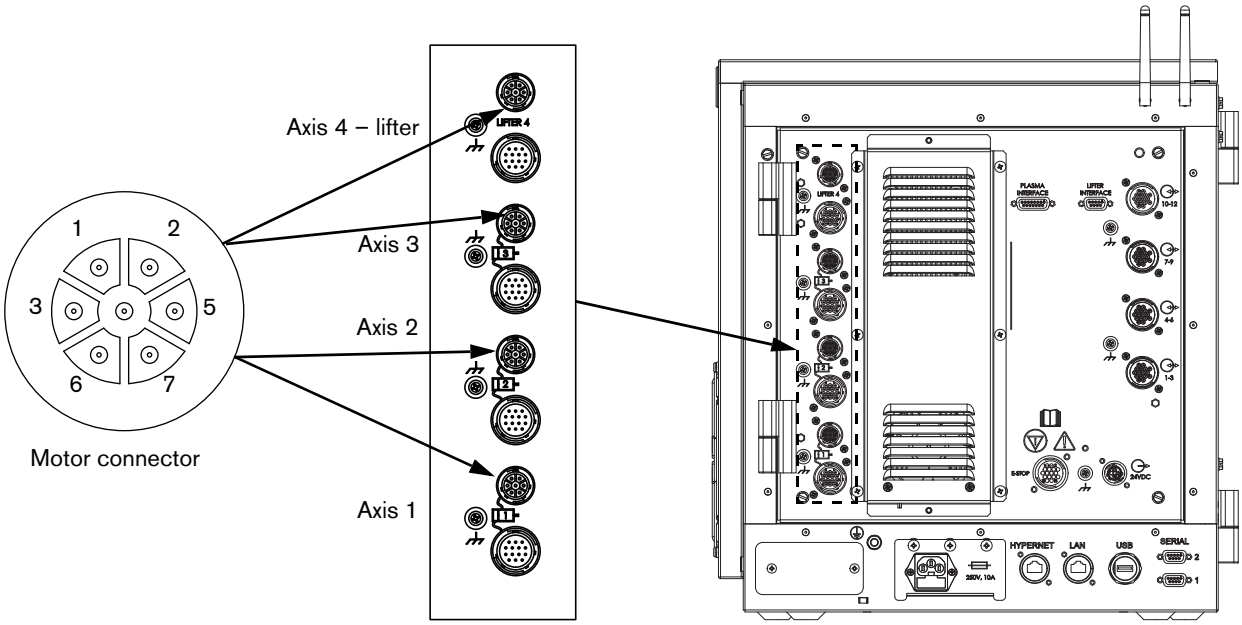


Table 7 Pinouts for motor interfaces

Pin no.	Axis 4 – Lifter	Axis 3 (Dual gantry)	Axis 2 (Y or X)	Axis 1 (X or Y)
Motor connectors	**J16**	**J15**	**J14**	**J13**
1	Motor/brake A	Motor/brake A	Motor/brake A	Motor/brake A
2	Motor/brake B	Motor/brake B	Motor/brake B	Motor/brake B
3	Motor/brake C	Motor/brake C	Motor/brake C	Motor/brake C
4	Brake+ (24 VDC)	Brake+ (dry contact)	Brake+ (dry contact)	Brake+ (dry contact)
5	Brake- (common)	Brake- (dry contact)	Brake- (dry contact)	Brake- (dry contact)
6	Shield	Shield	Shield	Shield
7	Shield	Shield	Shield	Shield

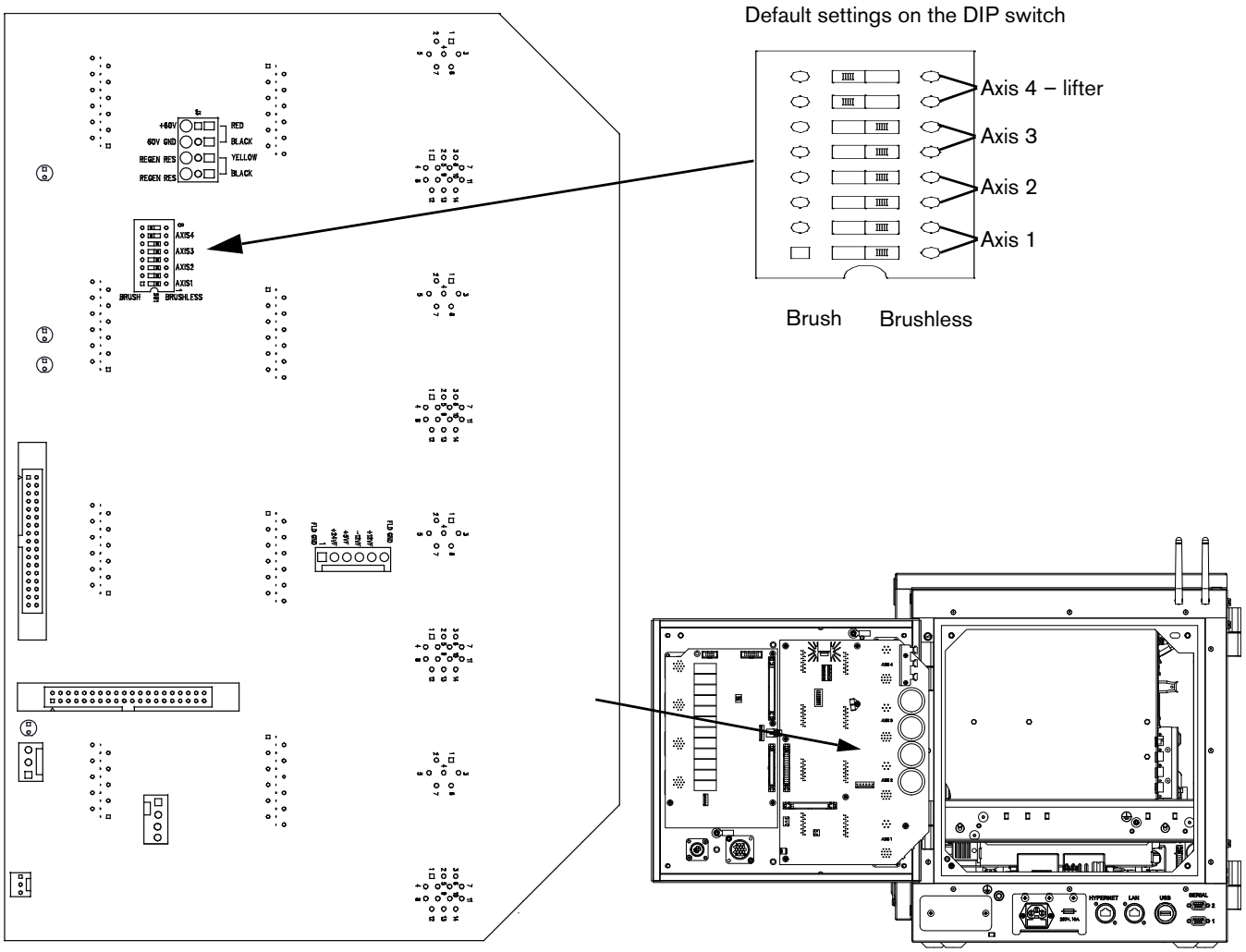
Note:

- Select brushed or brushless mode for the motor on each axis using the DIP switch on the Ti servo board (141281) inside the back door of the CNC. A single EDGE Pro Ti can have both brush and brushless motors if switches are set properly. For more information, see *Axis configuration* on page 64.
- Axis 4 is the only axis that supports a lifter. It is the only axis that supplies the 24 VDC that is required to disable a lifter's electromechanical power-off brake.
- For optimum noise immunity, cable shields should be tied externally to the CNC enclosure.

Axis configuration

The EDGE Pro Ti supports DC brush and brushless motors. Use the DIP switch on the Ti servo board (141281) to select the type of motor for each axis. Verify that the axis number and type on the rear of the enclosure matches the number of the axis on the DIP switch.

Figure 26 Axis configuration switch



In Phoenix software, the Drive Type parameter on the Axes Setup screen must be set to Current mode. For more information, see the *Phoenix Software Installation and Setup Guide (806410)*.

Table 8 Default axis assignments

Axes	Axes Assignment	Default motor type
1	Transverse or rail	Brushless
2	Transverse or rail	Brushless
3	Dual gantry	Brushless
4	THC	Brush

Motor (031143)

The Ti motor is a brushless motor (NEMA 34) with the following specifications:

Figure 27 Motor

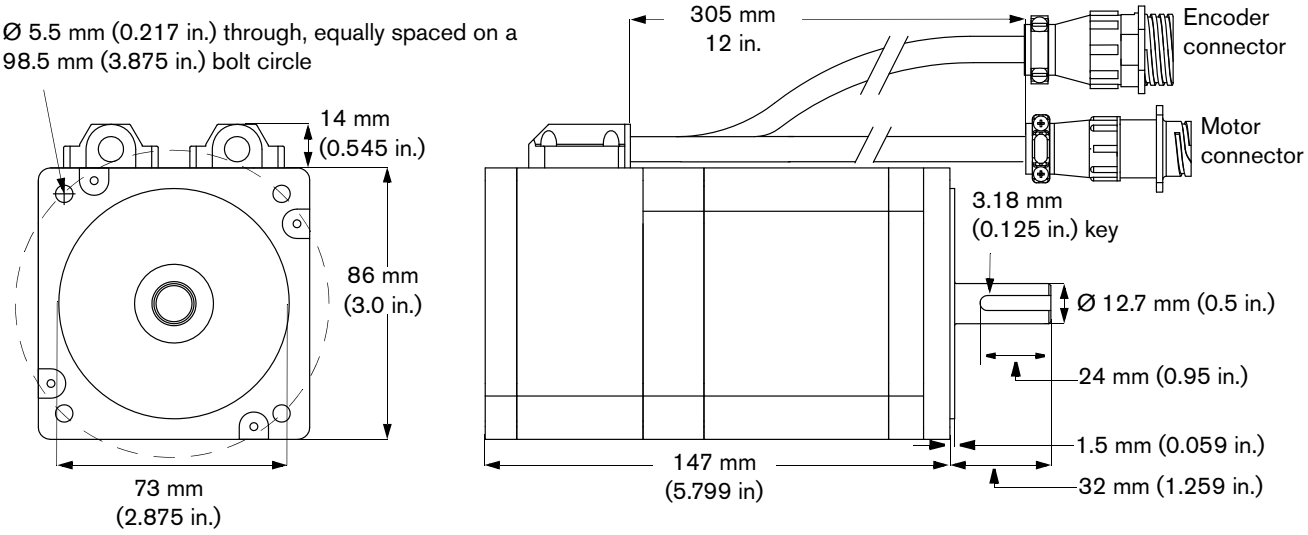


Table 9 Motor specifications

Encoder pulses/revolution	1x = 2000 pulses/revolution, 4x = 8000 pulses /revolution
Differential encoders	5 VDC
Voltage constant	16 V/krpm
Torque constant	0.18 N-m/A, (1.56 in.-lb/A)
CNC axis constant current	6 A
CNC axis peak current (2 seconds)	12 A
Effective CNC and motor torque constant	1.08 N-m (9.36 in.-lb)
Effective CNC and motor torque peak (2 seconds)	2.16 N-m (18.72 in.-lb)
CNC motor power bus	60 VDC
Approximate maximum speed	3500 RPM
Hall Effect sensors	120 degrees
Rotor inertia (J)	1.60 kg-cm^2 (0.00142 lb-in.-sec^2)
Weight	2.90 kg (6.39 lb)

Table 10 Motor power

Pin no.	Description
1	Brushless motor A or Brush+
2	Brushless motor B or Brush-
3	Brushless motor C
4	Brake+ (24 VDC, 250 mA)
5	Brake-
6	Cable shield
7	Cable shield

Regeneration circuit

When rapid deceleration of a motor brake creates additional, excessive voltage on the 60 VDC bus, the regeneration circuit turns on a 10 Ohm resistor to divert the excess braking energy and lower the voltage. When the bus voltage decreases, the resistor turns off.

When the resistor circuit turns on or off, the circuit sends an input signal to Phoenix software to report the change in status. This signal is fixed as Input 14 in Phoenix software.

Users can monitor the regeneration circuit in the Watch Window on the Main screen in Phoenix software by turning on the Regen Active status in the Watch Window setup. The oscilloscope function also allows users to monitor the operation of the regeneration circuit. For more information on setting up the Watch Window or using the oscilloscope function, refer to the *Phoenix Software Operator's Manual (806400)*.

The regeneration circuit should not be active for more than 25% of a single cut. See "Troubleshooting" on page 112 for more information.

Motor cable

Figure 28 Motor cable from the CNC to the axes

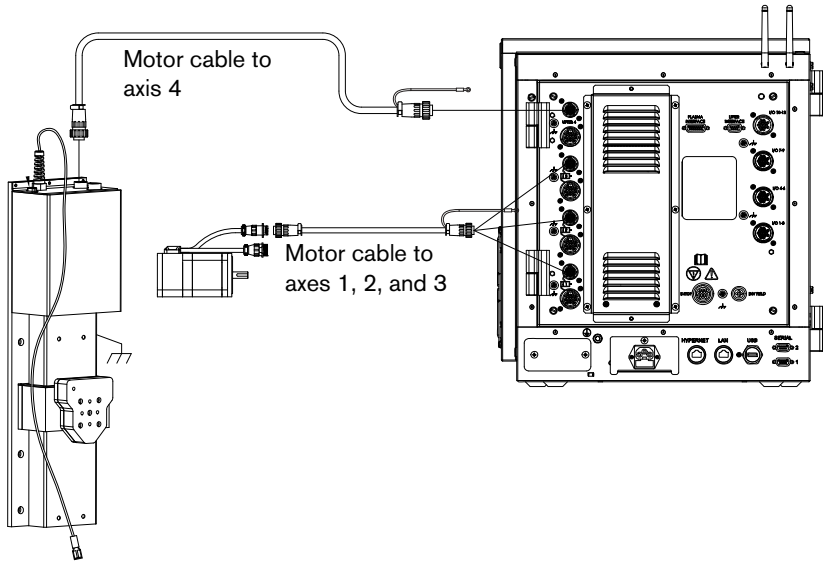


Figure 29 Motor cable

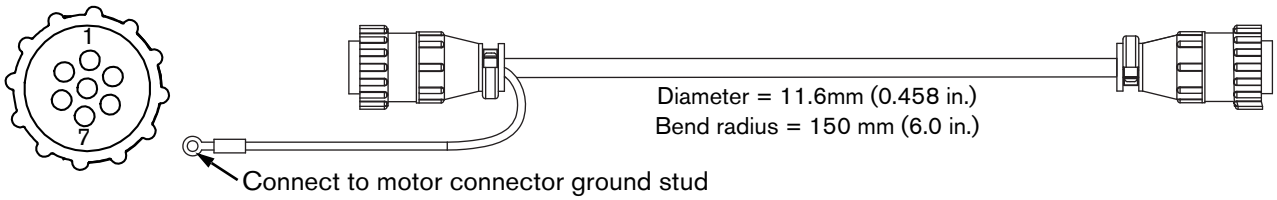


Table 11 Pinouts for the motor cable

Pin no.	Wire color	Signal
1	Red	Phase A
2	Black	Phase B
3	Red	Phase C
4	Red	Brake+
5	Black	Brake-
6	Red	Not connected
7	Black	Chassis
8	Drain wire	Shield

Use the following information to order motor cables.

Part Number	Length
223052	1.52 m (5 ft)
223051	3.05 m (10 ft)
223347	6.08 m (20 ft)
123972	7.62 m (25 ft)
123973	10.06 m (33 ft)
223348	10.66 m (35 ft)
123974	10.97 m (36 ft)
123902	15.25 m (50 ft)

To create a custom cable, order the connector kit (428045).

Encoder connection

Install the encoder cables between the Axis 4 encoder connector and the encoder connector on the Sensor Ti and between the Axis 3, Axis 2, and Axis 1 motor connectors on the rear of the EDGE Pro Ti and the motor connector on the remaining axis motors (031143). For more information about the encoder cable, see *Encoder cable* on page 69.

Figure 30 EDGE Pro Ti encoder interfaces

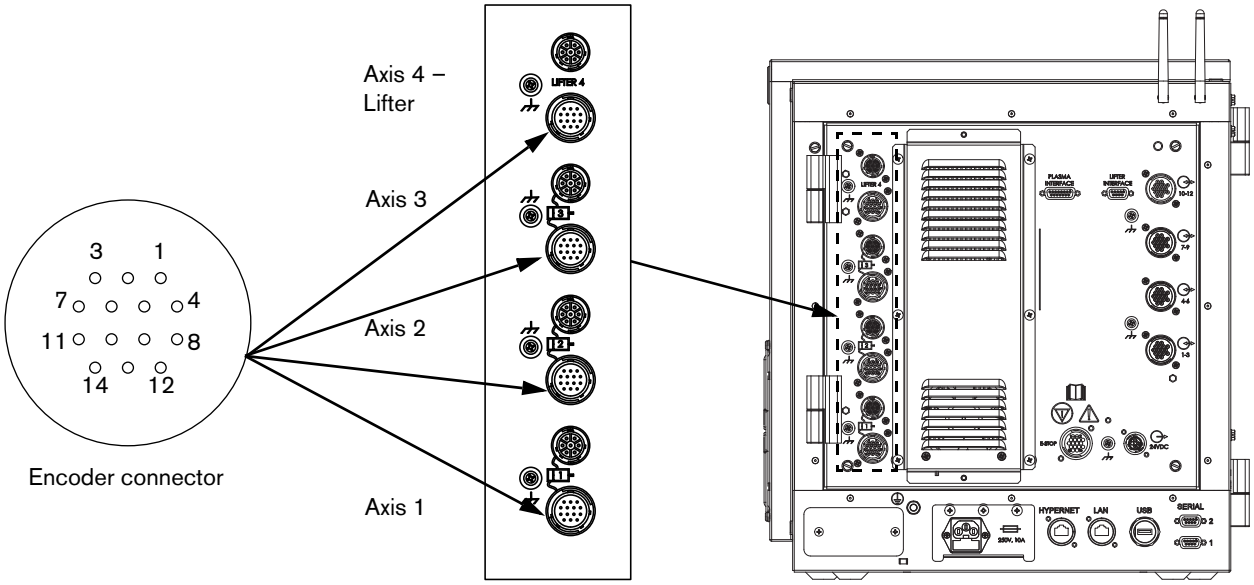


Table 12 Pinouts for encoder interfaces

Pin no.	Axis 4 – Lifter	Axis 3 (Dual gantry)	Axis 2 (Y or X)	Axis 1 (X or Y)
	J12	**J11**	**J10**	**J9**
1 (Red)	+5 V	+5 V	+5 V	+5 V
2 (Black)	Ground	Ground	Ground	Ground
3 (White)	Axis 4A	Axis 3A	Axis 2A	Axis 1A
4 (Black)	Axis 4A\	Axis 3A\	Axis 2A\	Axis 1A\
5 (Green)	Axis 4B	Axis 3B	Axis 2B	Axis 1B
6 (Black)	Axis 4B\	Axis 3B\	Axis 2B\	Axis 1B\
7 (Blue)	Axis 4Z	Axis 3Z	Axis 2Z	Axis 1Z
8 (Black)	Axis 4Z\	Axis 3Z\	Axis 2Z\	Axis 1Z\
9 (Yellow)	+V Encoder/Hall out (Maximum 6 V at 30 mA)	+V Encoder/Hall out (Maximum 6 V at 30 mA)	+V Encoder/Hall out (Maximum 6 V at 30 mA)	+V Encoder/Hall out (Maximum 6 V at 30 mA)
10 (Black)	Ground	Ground	Ground	Ground
11 (Brown)	Encoder/Hall A	Encoder/Hall A	Encoder/Hall A	Encoder/Hall A
12 (Orange)	Encoder/Hall B	Encoder/Hall B	Encoder/Hall B	Encoder/Hall B
13 (White)	Encoder/Hall C	Encoder/Hall C	Encoder/Hall C	Encoder/Hall C
14 (Red)	Shield	Shield	Shield	Shield

Note:

- Only 5 V encoders are supported.
- Hall sensors are used with brushless motors only.
- For optimum noise immunity, cable shields should be connected externally to the CNC enclosure.

Encoder cable

Figure 31 Encoder cable to axes

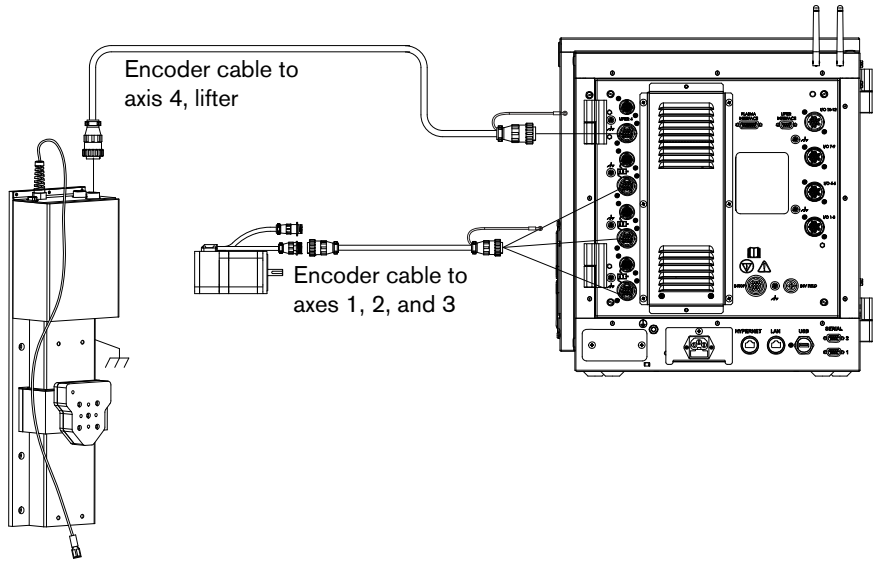


Figure 32 Encoder cable

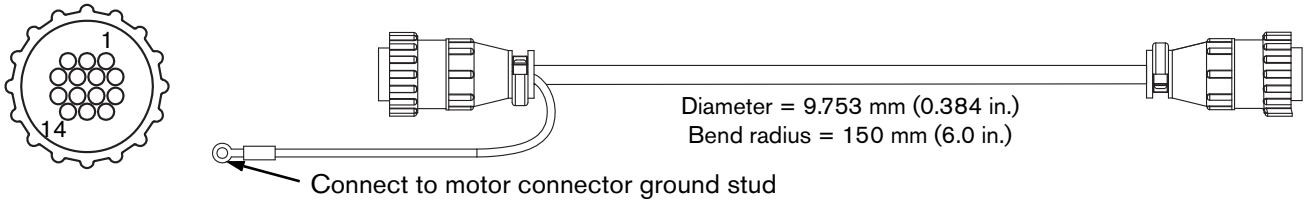


Table 13 Pinouts for encoder cable

Pin no.	Twisted pair colors	Signal
1 2	Red Black	Encoder +5 VDC Encoder ground
3 4	White Black	Channel A Channel A-
5 6	Green Black	Channel B Channel B-
7 8	Blue Black	Index Index-
9 10	Yellow Black	6 V Hall Hall ground
11 12	Brown Orange	Hall U Hall V
13 14	White Drain wire	Hall W Shield

Use the following information to order the encoder cable.

Part Number	Length	Part Number	Length
223050	1.6 m (5 ft)	123970	10.06 m (33 ft)
223049	3.2 m (10 ft)	223342	10.66 m (35 ft)
223341	6.08 m (20 ft)	123971	10.97 m (36 ft)
123969	7.62 m (25 ft)	123899	15.25 m (50 ft)

To create a custom cable, order the connector kit (428045).

I/O connection

Install the I/O cables in the I/O connectors on the rear of the CNC.

Figure 33 EDGE Pro Ti I/O interface

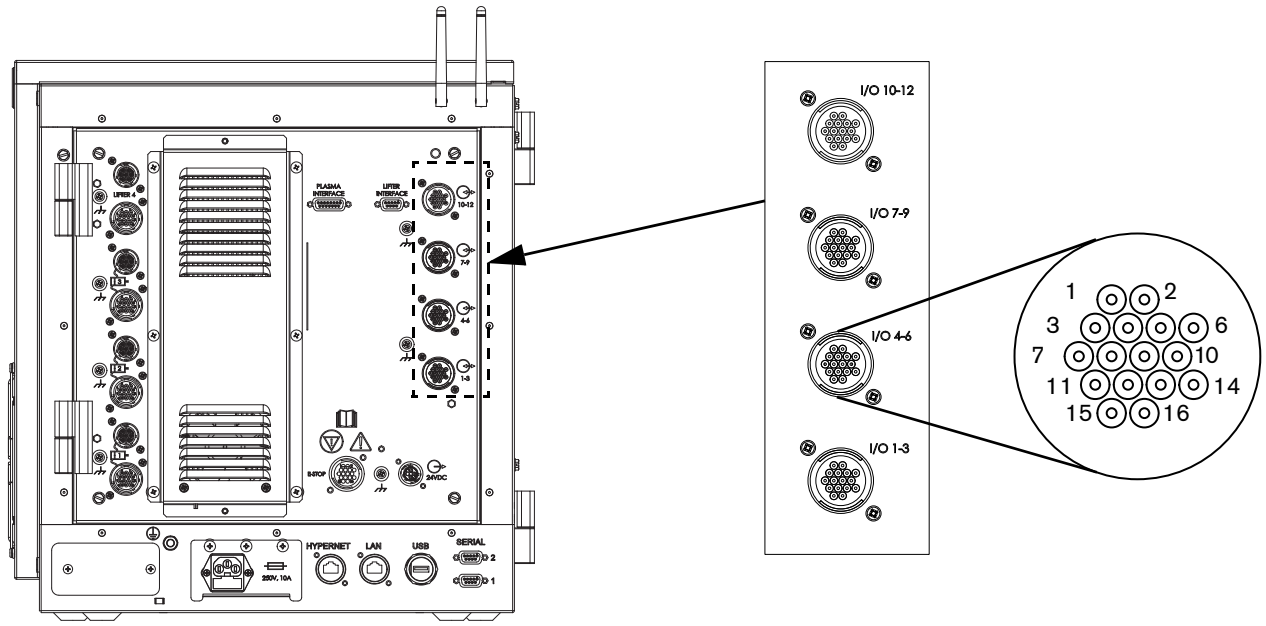


Table 14 Pinouts for I/O interface

Pin no.	Connector J9 I/O 1 – 3	Connector J10 I/O 4 – 6	Connector J11 I/O 7 – 9	Connector J12 I/O 10 – 12
1	Output 1 common	Output 4 common	Output 7 common	Output 10 common
2	Output 1 normally closed	Output 4 normally closed	Output 7 normally closed	Output 10 normally closed
3	Output 1 normally open	Output 4 normally open	Output 7 normally open	Output 10 normally open
4	Output 2 common	Output 5 common	Output 8 common	Output 11 common
5	Output 2 normally closed	Output 5 normally closed	Output 8 normally closed	Output 11 normally closed
6	Output 2 normally open	Output 5 normally open	Output 8 normally open	Output 11 normally open
7	Output 3 common	Output 6 common	Output 9 common	Output 12 common
8	Output 3 normally closed	Output 6 normally closed	Output 9 normally closed	Output 12 normally closed
9	Output 3 normally open	Output 6 normally open	Output 9 normally open	Output 12 normally open
10	Input 1	Input 4	Input 7	Input 10
11	Input 1 common	Input 4 common	Input 7 common	Input 10 common
12	Input 2	Input 5	Input 8	Input 11 (shared with lifter Upper Limit input)
13	Input 2 common	Input 5 common	Input 8 common	Input 11 common
14	Input 3	Input 6	Input 9	Input 12 (shared with lifter Lower Limit input)
15	Input 3 common	Input 6 common	Input 9 common	Input 12 common
16	Shield	Shield	Shield	Shield

I/O cable

Figure 34 I/O cable

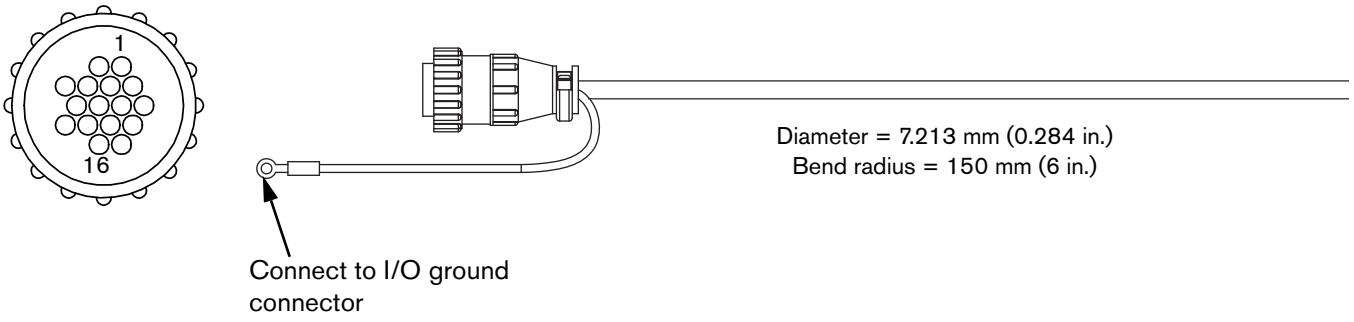


Table 15 Pinouts for I/O cable

Pin no.	Wire color	Signal
1	Black	Output 1 common
2	White	Output 1 normally closed
3	Red	Output 1 normally open
4	Green	Output 2 common
5	Orange	Output 2 normally closed
6	Blue	Output 2 normally open
7	White/Black	Output 3 common
8	Red/Back	Output 3 normally closed
9	Green/Black	Output 3 normally open
10	Orange/Black	Input 1
11	Blue/Black	Input 1 common
12	Black/White	Input 2
13	Red/White	Input 2 common
14	Green/White	Input 3
15	Blue/White	Input 3 common
16		Not connected

Use the following information to order I/O cables.

Part Number	Length
223349	3.05 m (10 ft)
223350	6.08 m (20 ft)
223351	10.66 m (35 ft)
223352	7.62 m (25 ft)
223353	15.25 m (50 ft)

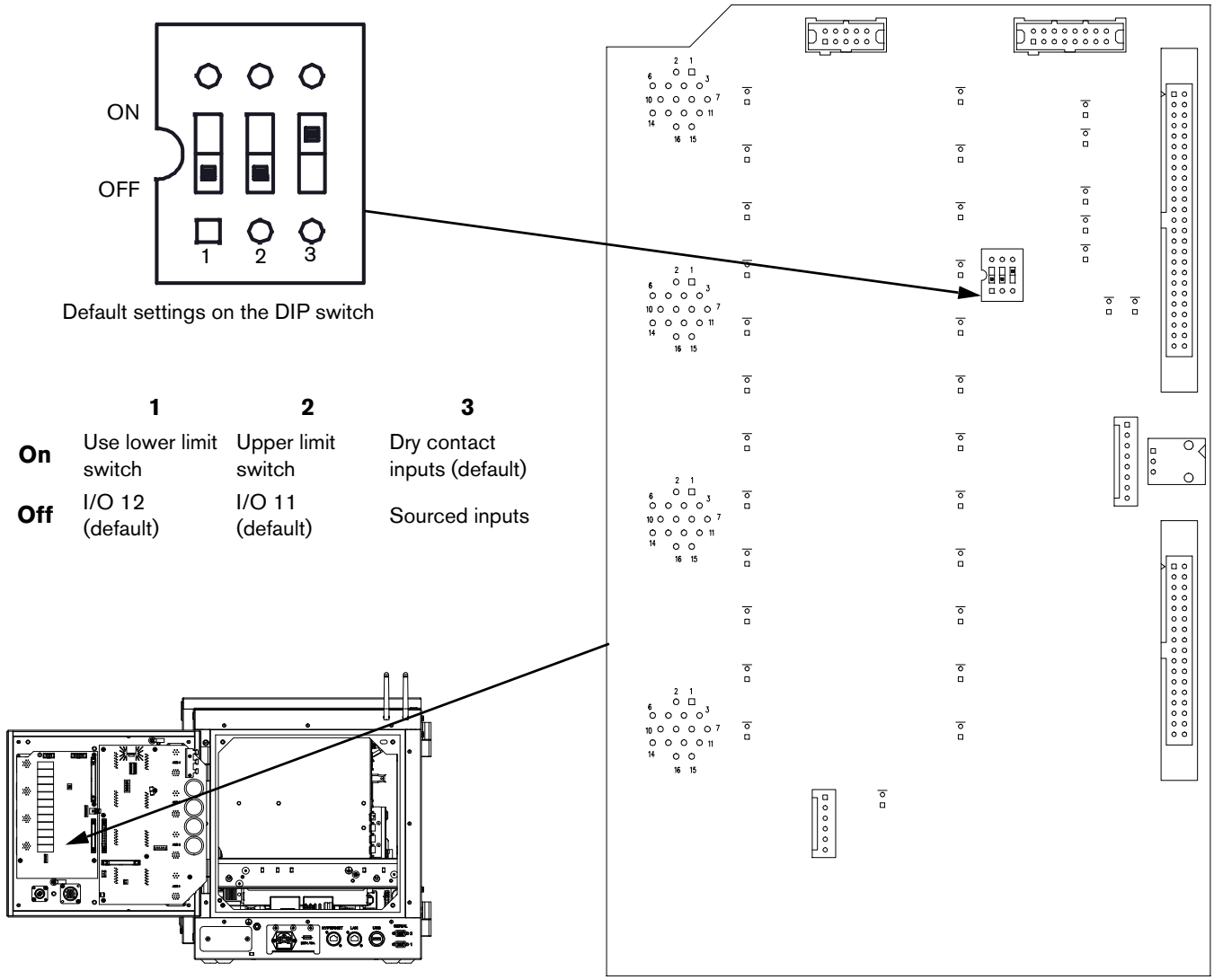
To create a custom cable, order the connector kit (228126).

Configuring I/O

The EDGE Pro Ti I/O circuitry provides inputs through optoisolators and outputs through relays. Contacts for both normally open and normally closed outputs are available.

Use the DIP switch on the Relay I/O board (141278) to configure I/O.

Figure 35 I/O configuration DIP switch



Default settings on the DIP switch

	1	2	3
On	Use lower limit switch	Upper limit switch	Dry contact inputs (default)
Off	I/O 12 (default)	I/O 11 (default)	Sourced inputs

Shared inputs

General inputs 11 and 12 are shared with the limit switch inputs. However, the Sensor Ti lifter does not use limit switches so position 1 and 2 must remain in the OFF (default) position. In this case, inputs 11 and 12 are available on the I/O interface CPC connector as general purpose inputs.

If you are using a custom lifter with upper and lower limit switches, change position 1 and 2 to the ON position and select sourced input mode (position 3 in the OFF position); this changes all general purpose I/O to sourced inputs. Wire the limit switches to the lifter interface DB-9 connector.

Regardless of the type of lifter you install, do not wire to both the CPC inputs 11 and 12 and to the DB-9 lifter interface connector inputs 11 and 12 simultaneously.

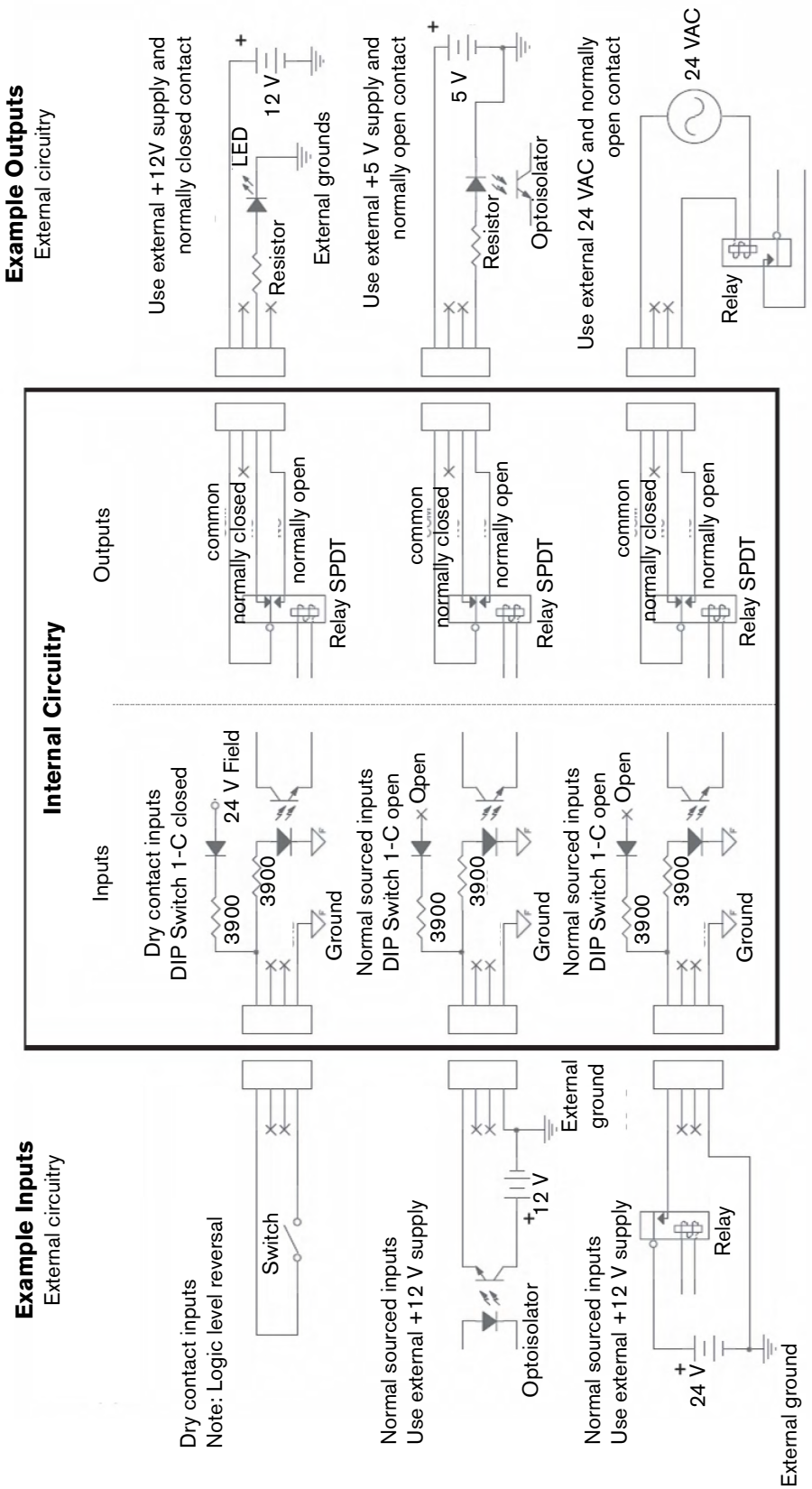
Input modes

Inputs have two different modes that are selected using the DIP switch on the Relay I/O board (141278). When DIP switch position 3 is ON (the default position), inputs are in dry contact mode and normally open. In this situation, inputs require an external switch (or relay contact) to ground to activate the inputs. The logic states are reversed between the two input modes. When position 3 of this switch is OFF, the inputs are in the sourced input mode and an external voltage source of between 12 V and 24 V is required to activate each input.

I/O circuits

Figure 36 shows the details of connecting the I/O to common circuitry. All outputs are relay contacts rated at a maximum of 1 A, 250 VAC.

Figure 36 Ti I/O circuits



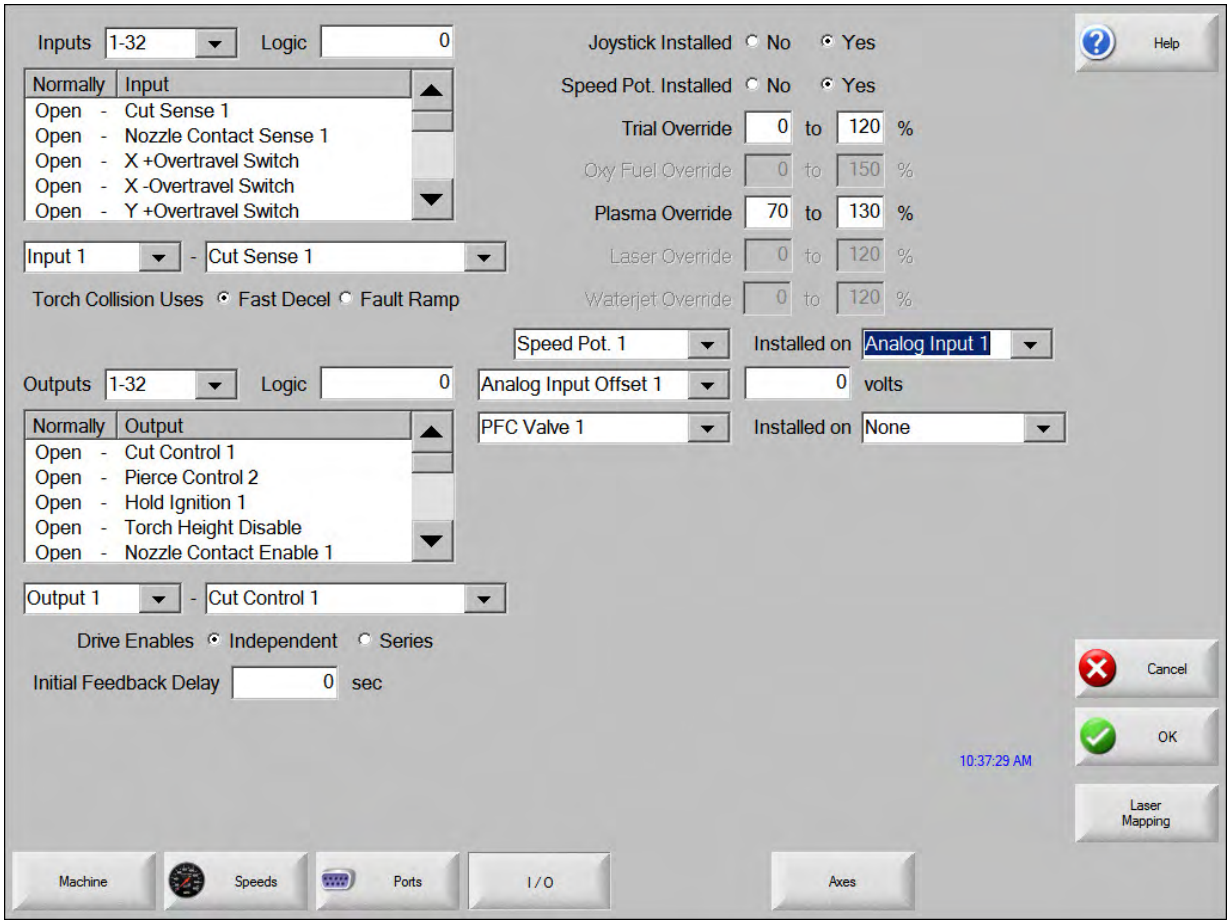
Note:

- To prevent damage, do not apply more than 24 VDC to any optoisolator input and verify the correct signal polarity.
- Do not exceed the following voltage and amperage ratings through any relay output:
  - For outputs 1-12 and Plasma Start: 30 VAC or VDC/1 A. The rating is the same for both AC or DC.
  - For the brakes 1-4: 30 VDC/1 A or 30 VAC/0.5 A.
  - For Hold Ignition: 30 VDC/10 mA, polarity is important.

I/O Setup screen

The I/O setup screen in Phoenix software defines inputs, outputs, and their logic state.

Figure 37 I/O setup screen in Phoenix software

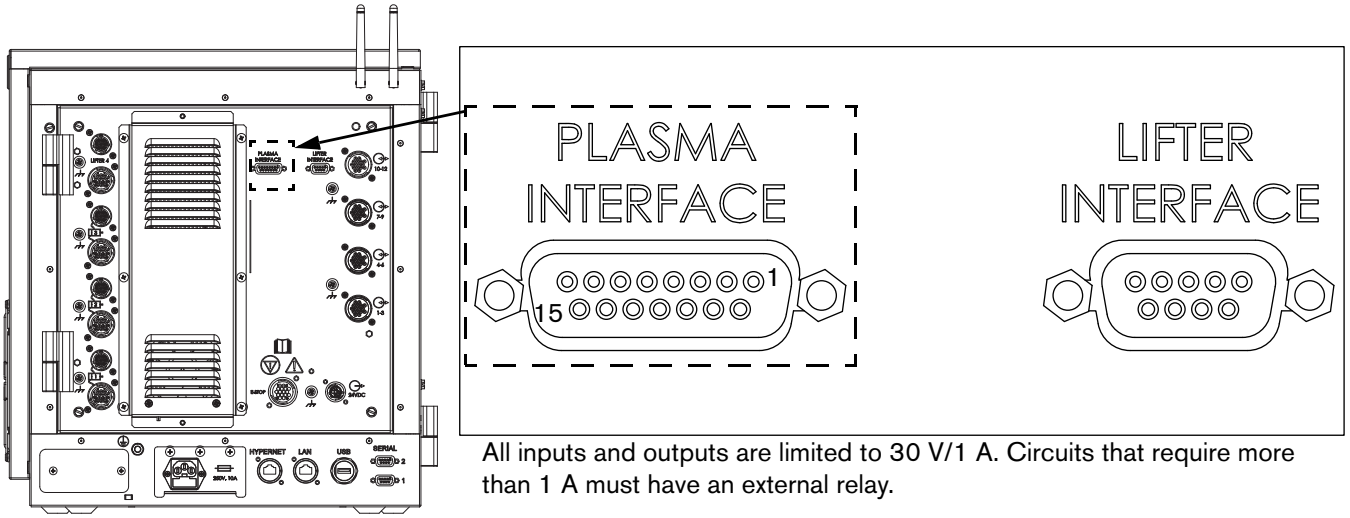


Plasma connection

The plasma interface on the rear of the CNC is a 15-pin D-sub connector for the cable that connects the EDGE Pro Ti to the plasma interface board in the plasma system. The Plasma interface is designed for use with the Sensor Ti lifter only. This interface requires:

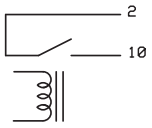
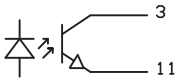
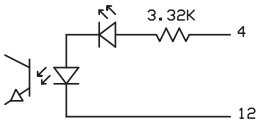
- Arc Voltage, Start, Transfer, and Hold signals. See Table 16 for information on signal wiring.
- A voltage divider

Figure 38 Plasma interface



All inputs and outputs are limited to 30 V/1 A. Circuits that require more than 1 A must have an external relay.

Table 16 Pinouts for the plasma interface

Pin number	Signal	Dry contact circuit
1	+12 VDC	
2	Plasma Start Output (Cut Control)	 Normally open
10	Plasma Start Output (Cut Control; Output 13 in Phoenix)	
3	Hold Ignition Output +	
11	Hold Ignition Output (Output 14 in Phoenix)	
4	Transfer Input + (Cut Sense)	
12	Transfer Input - (Cut Sense; Input 13 in Phoenix)	
5	Common	
6	Common	
7	Common	
8	Arc Voltage + (Work)	
9	+12 VDC	
13	Common	
14	Common	
15	Arc Voltage - (Electrode)	

Plasma connection for Powermax plasma systems

Install plasma interface cable between the plasma interface on the rear of the EDGE Pro Ti and the connector on the rear of a Powermax plasma system with a built-in voltage divider.

Figure 39 Plasma interface cable to a Powermax system

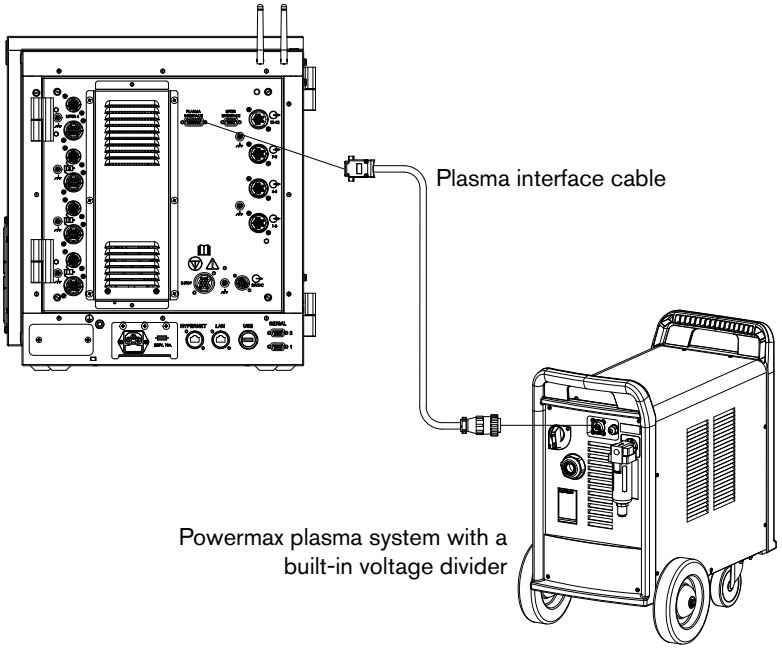


Figure 40 Plasma interface cable for Powermax systems

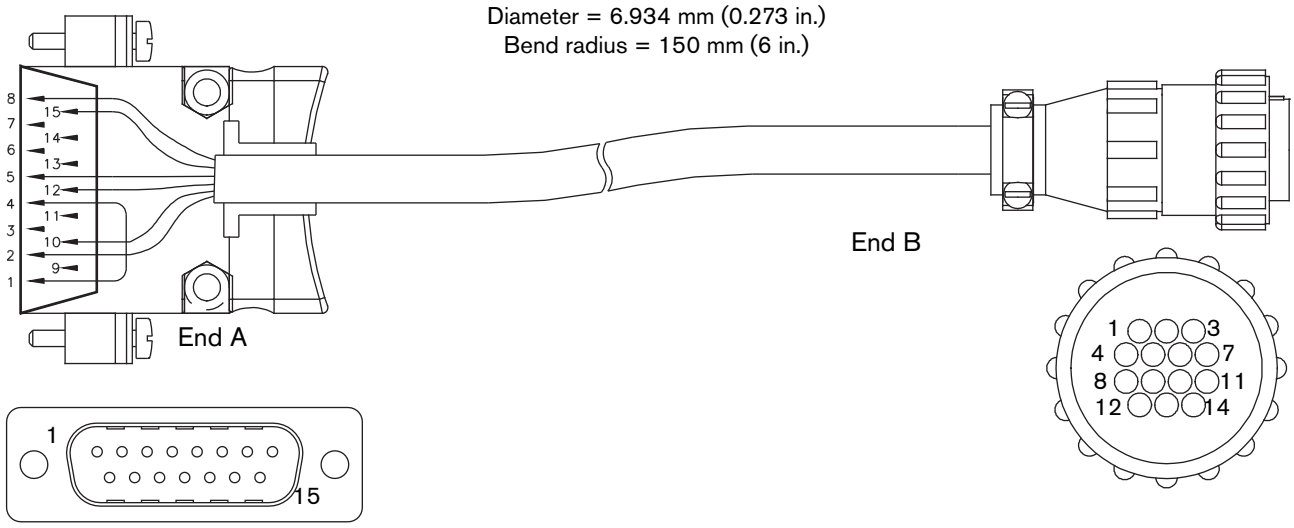


Table 17 Pinouts for plasma interface cable

End A signal	Pin no.	Wire color	Pin no.	End B signal
+12 V to Transfer +	1 to 4	Jumper, black		
Start	2	Black	4	Start
Start	10	Red	3	Start
Transfer	12	Black	12	Transfer-
Transfer	5	White	14	Ground
V-Div-	15	Black	5	V-Div-
V-Div+	8	Green	6	V-Div+
Ground	Shell	Drain wire	13	Shield

Use the following information to order this plasma interface cable.

Part Number	Length
223354	3.05 m (10 ft)
223355	6.08 m (20 ft)
223048	7.62 m (25 ft)
223356	10.66 m (35 ft)
123896	15.25 m (50 ft)

Plasma connection for generic plasma systems

To connect the plasma interface on the EDGE Pro Ti CNC to any plasma system that does not have a compatible voltage divider, install the generic plasma interface cable between the plasma interface on the EDGE Pro Ti and the 15-pin D-sub connector (P1) on the plasma interface assembly (228256) in the plasma system. Refer to *Plasma interface assembly (228256)* on page 82 for information about the plasma interface assembly and how to install and wire it.

Figure 41 Generic plasma interface cable to the plasma interface assembly (228256)

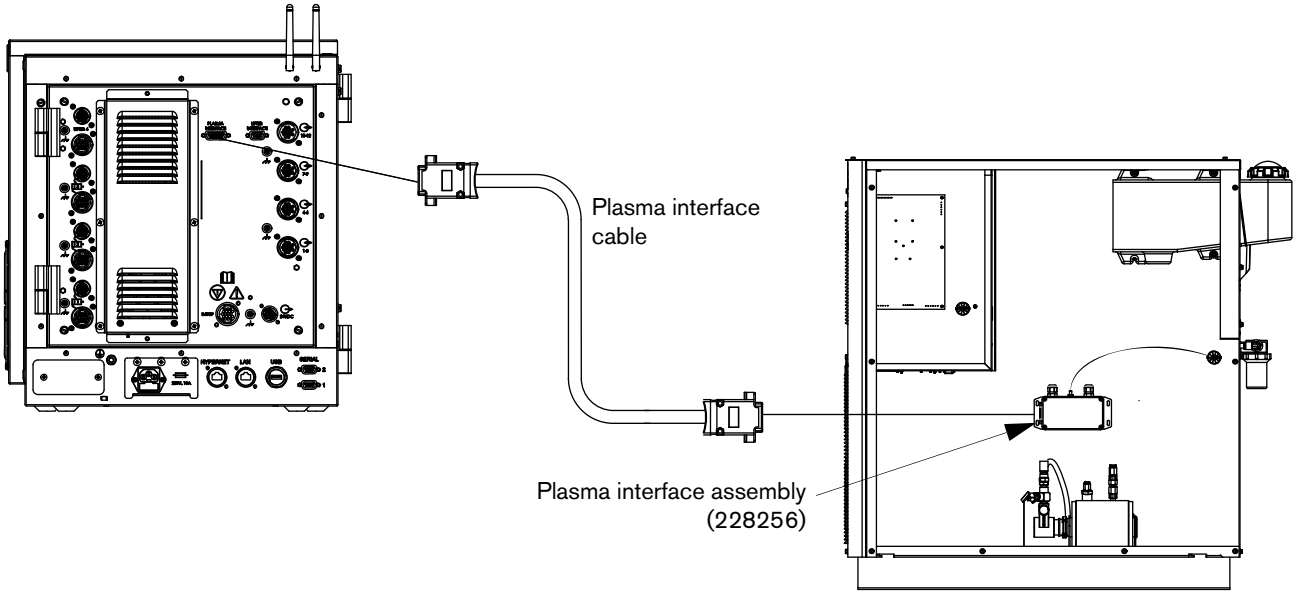


Figure 42 Generic plasma interface cable

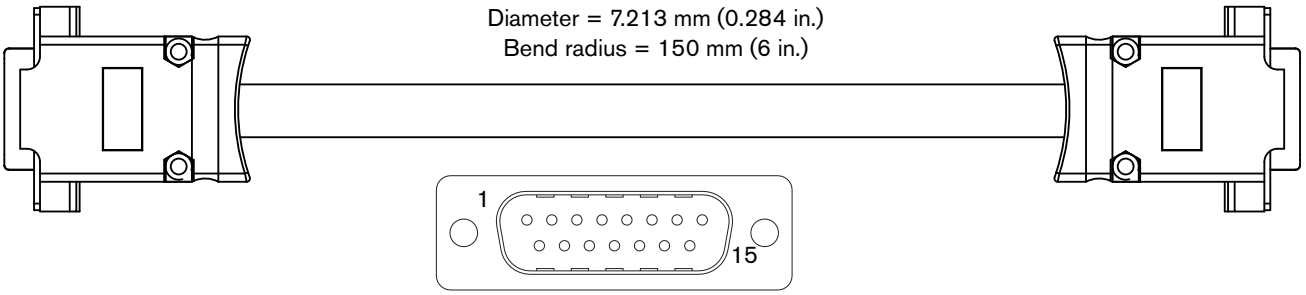
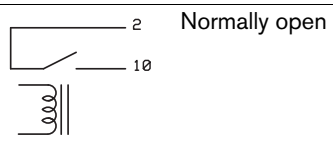
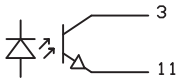
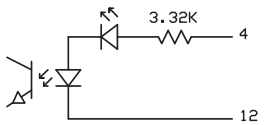


Table 18 Pinouts for the generic plasma interface cable

Pin number	Signal	Dry contact circuit
1	+12 VDC	
2	Plasma Start Output (Cut Control)	
10	Plasma Start Output (Cut Control; Output 13 in Phoenix)	
3	Hold Ignition Output +	
11	Hold Ignition Output - (Output 14 in Phoenix)	
4	Transfer Input + (Cut Sense)	
12	Transfer Input - (Cut Sense; Input 13 in Phoenix)	
5	Common	
6	Common	
7	Common	
8	Arc Voltage + (Work)	
9	+12 VDC	
13	Common	
14	Common	
15	Arc Voltage - (Electrode)	

Use the following information to order this plasma interface cable.

Part Number	Length
223358	3.05 m (10 ft)
223359	6.08 m (20 ft)
223360	7.62 m (25 ft)
223361	10.66 m (35 ft)
223362	15.25 m (50 ft)
223363	22.86 m (75 ft)

Plasma interface assembly (228256)

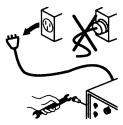
The plasma interface assembly (228256) is installed in between the CNC and any plasma system that does not have a built-in voltage divider.

The plasma interface board (141267) is part of the plasma interface assembly (228256). I/O and arc voltage signals are transmitted through this interface board between the CNC and plasma system. Connect the wires that exit the assembly to the appropriate connectors within the plasma system.

If your plasma system has instructions for mounting the plasma interface assembly, use those instructions. If you have no instructions for mounting the assembly, install it as far as possible from the control board, preferably with sheet metal between them.

WARNING!

HAZARDOUS VOLTAGE AND ENERGY



The plasma interface signals from plasma cutting equipment without an internal voltage divider are directly connected to the plasma cutting circuit output. To prevent electrical shock and energy hazards, wiring from the plasma cutting circuit of the plasma system to the plasma interface (228256) must be enclosed or protected.

The wiring from the plasma cutting circuit to the plasma interface (228256) must be enclosed or protected for safe operation. The plasma cutting circuit output ratings are printed on the data plate and vary by manufacturer and model up to 500 VDC and 400 ADC. Contact with metal live parts of this connection under normal operating and fault conditions can result in death or burns.

To make connections between the plasma cutting circuit and the plasma interface assembly:

- Use qualified service personnel only.
- Turn OFF and disconnect all power.
- Mount the plasma interface assembly (228256) as close as possible to the entry point to the plasma system. Permanent connection is recommended.
- Use jacketed cables and wire that are appropriate for your installation and your local and national safety regulations.

Follow these steps:

1. Verify that the outer jacket of each interconnecting cable is protected from damage at the entry point to the plasma system. A strain relief is recommended.
2. Verify that the outer diameter of the interconnecting cable fits the strain relief that is provided with the plasma interface assembly:
   - Plasma start, transfer grip: 2.895 mm – 6.350 mm (0.114 in. – 0.250 in.) diameter
   - Plasma interface grip: 1.625 mm – 5.334 mm (0.064 in. – 0.210 in.) diameter
3. Strip back the outer jacket and individual conductor insulation as needed.
4. Insert the outer jacket cable through the strain relief and make connections.
5. Verify that the outer jacket is a min. of 2.54 cm (1 in.) inside the 228256 and tighten the strain relief(s).
6. Before operating the equipment, verify that the connections are correct and that all live parts are enclosed and that all jacket/conductor insulation is protected against damage.

Figure 43 Mounting dimensions for the plasma interface assembly (228256)

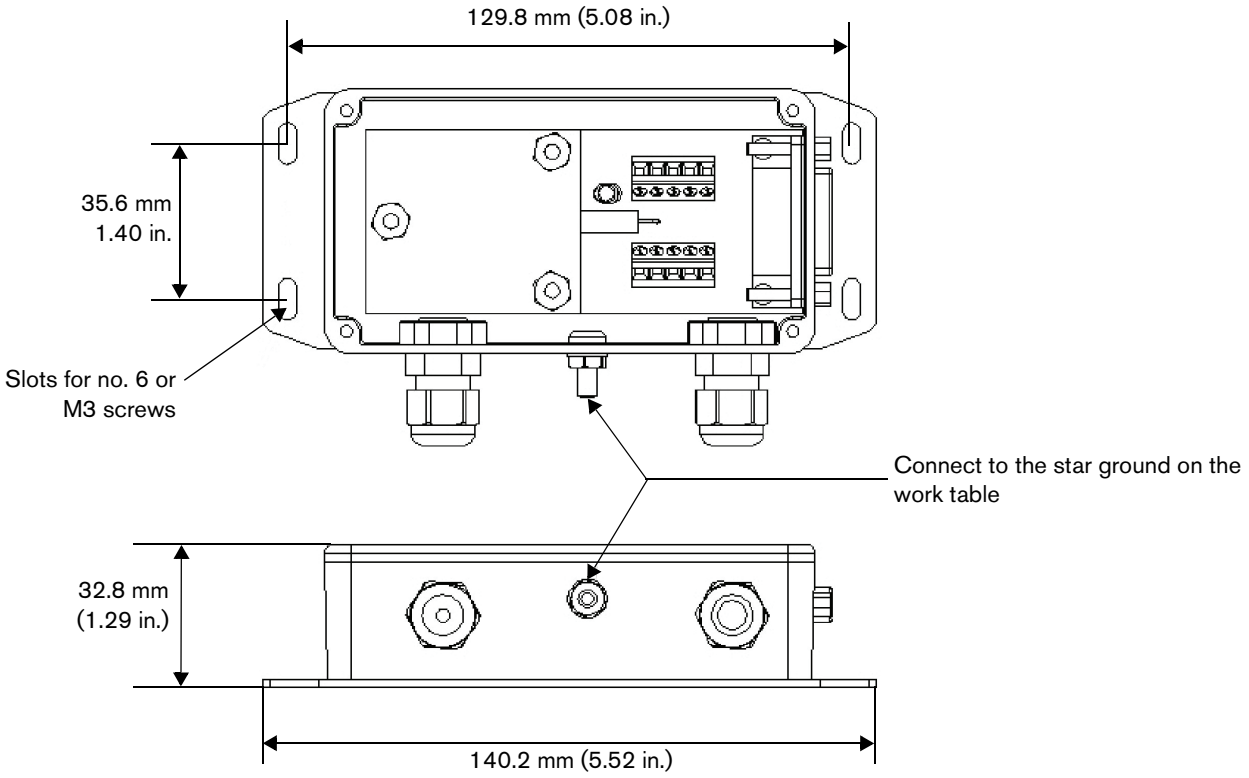


Figure 44 Plasma interface assembly (228256)

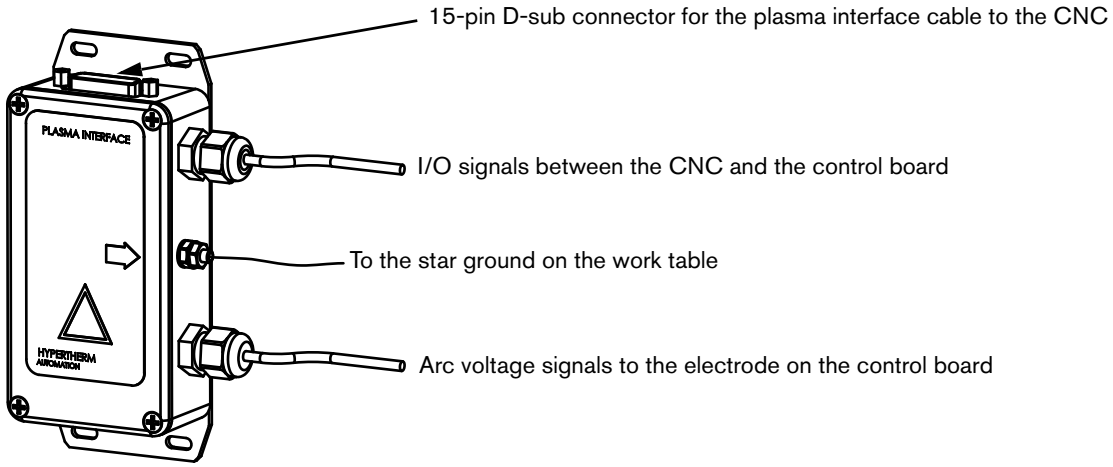
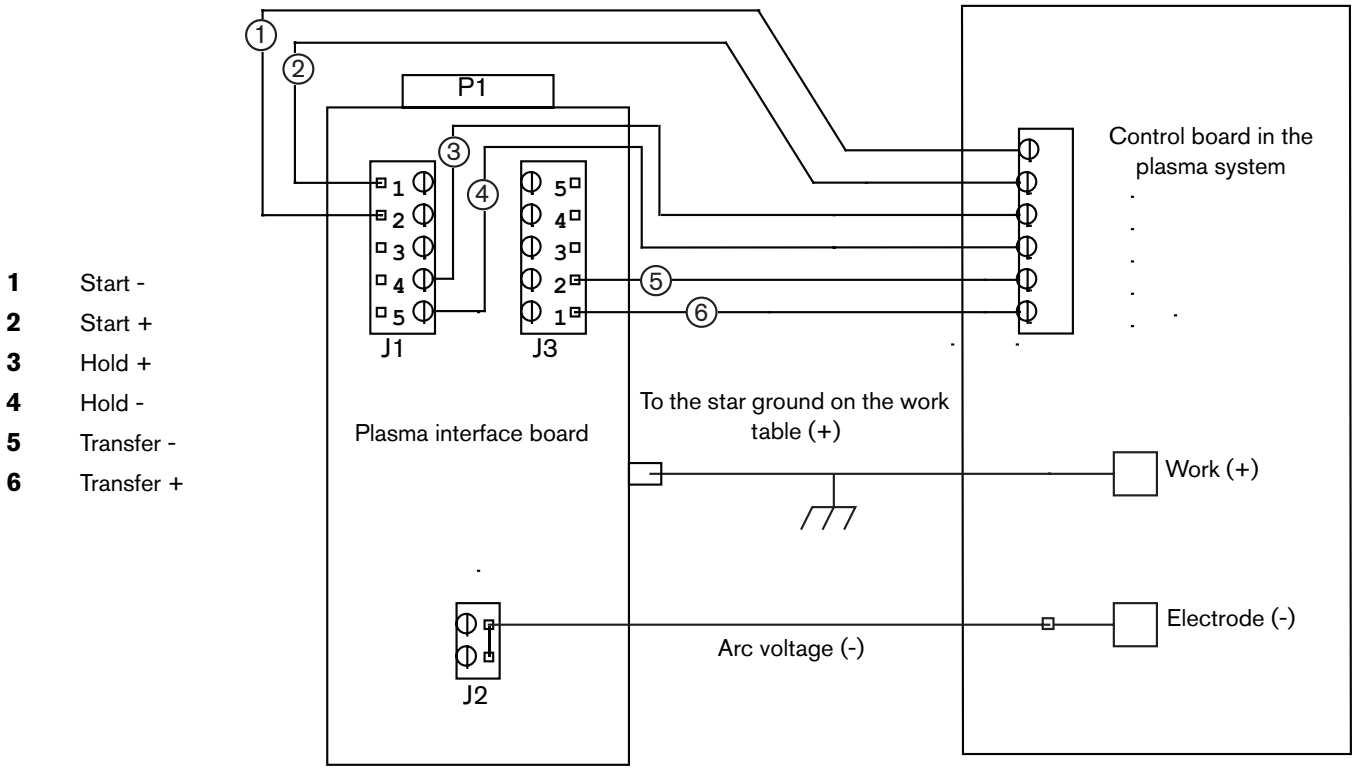


Figure 45 provides a conceptual representation of how the plasma interface is wired to the control board in the plasma system. Refer to Table 16 on page 77 for detailed information about signal types and ratings.

To make the electrical connections for these signals within your plasma system, refer to the manual for your plasma system for more detailed information.

Figure 45 Wiring between the plasma interface and control boards



For more information about the board within this assembly, see “Plasma interface board (141267)” on page 128.

Plasma connection to HSD130 plasma systems

The plasma interface cable and plasma interface assembly for HSD130 plasma systems are packaged together as a kit. The *Field Service Bulletin* (805690) for the kit provides instructions for installing the plasma interface assembly and connecting the plasma interface cable.

Figure 46 Plasma interface cable to an HSD130 plasma system

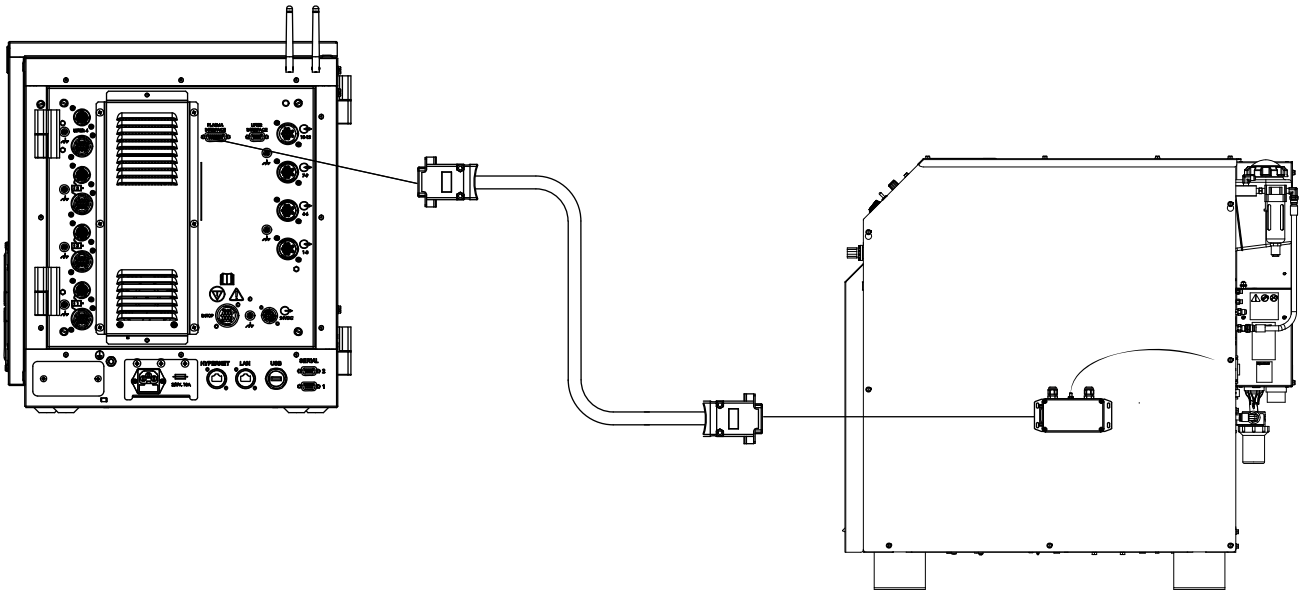


Figure 47 HSD130 plasma interface cable

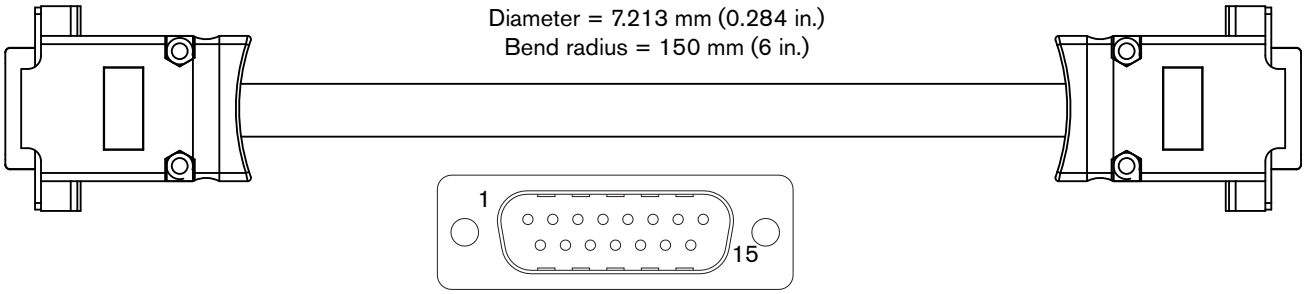
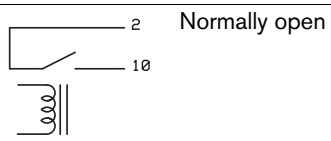
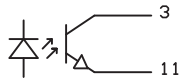
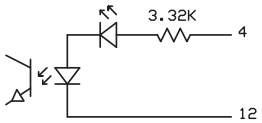


Table 19 Pinouts for the HSD130 plasma interface cable

Pin number	Signal	Dry contact circuit
1	+12 VDC	
2	Plasma Start Output (Cut Control)	
10	Plasma Start Output (Cut Control; Output 13 in Phoenix)	
3	Hold Ignition Output +	
11	Hold Ignition Output - (Output 14 in Phoenix)	
4	Transfer Input + (Cut Sense)	
12	Transfer Input - (Cut Sense; Input 13 in Phoenix)	
5	Common	
6	Common	
7	Common	
8	Arc Voltage + (Work)	
9	+12 VDC	
13	Common	
14	Common	
15	Arc Voltage - (Electrode)	

Use the following information to order the HSD130 plasma interface cable.

Part Number	Length
428019	3.05 m (10 ft)
428020	6.08 m (20 ft)
228247	7.62 m (25 ft)
428021	10.66 m (35 ft)
228248	15.25 m (50 ft)
228306	22.86 m (75 ft)

Lifter interface

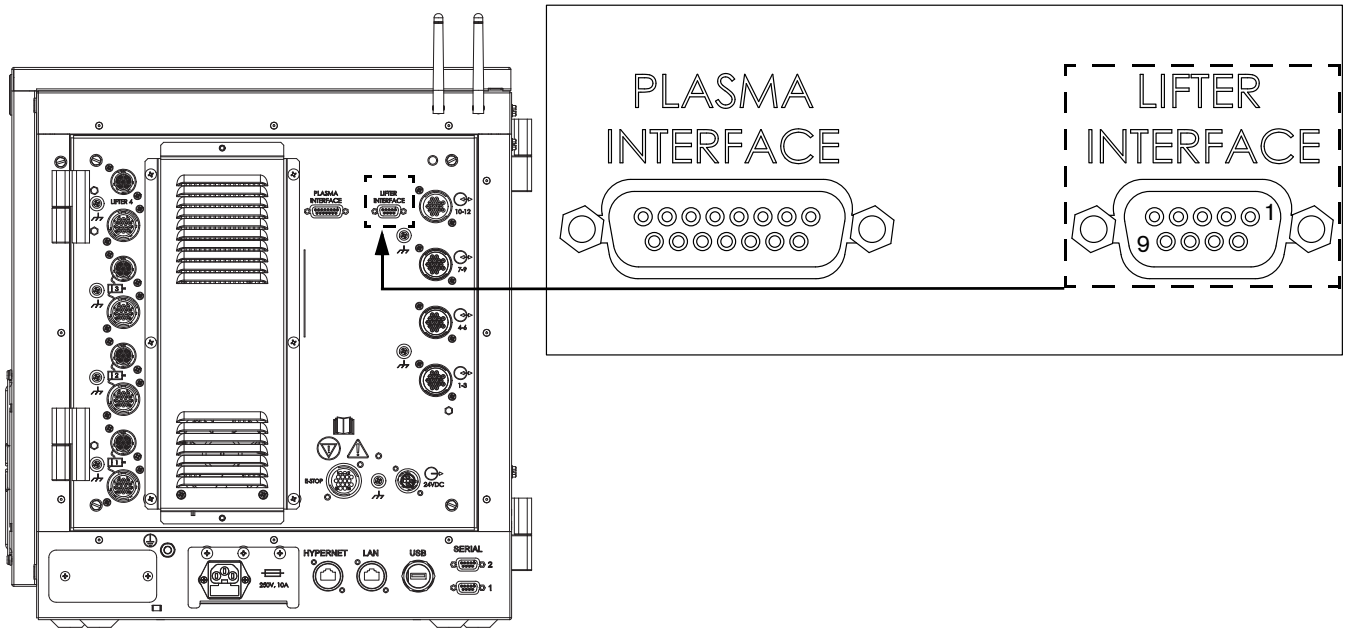
The lifter interface on the rear door of the EDGE Pro Ti is a 9-pin D-sub connector for the lifter interface cable that connects the EDGE Pro Ti to the optional, integrated Sensor Ti. The lifter interface is designed for use with the Sensor Ti lifter only and provides the proper height during cutting. This interface requires:

- Arc Voltage, Start, Transfer, and Hold signals. See Figure 45and Table 16for information on signal wiring.
- A voltage divider

The connection between the EDGE Pro Ti CNC and the ArcGlide lifter uses a Hypernet cable, as shown in Figure 12 on page 50 and as described in the *ArcGlide THC Instruction Manual*.

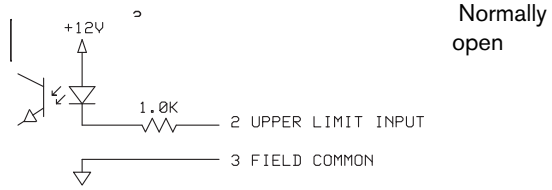
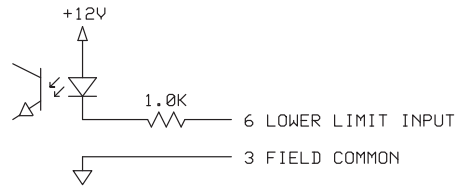
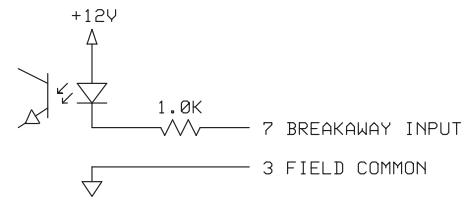
Install the lifter cable between the lifter interface on the EDGE Pro Ti and the Sensor Ti.

Figure 48 Lifter interface for the Sensor Ti



Note: Lower Limit, Upper Limit, and Breakaway switch inputs are sinking inputs to field common.
For THCs that are not manufactured by Hypertherm, the Upper Limit and Lower Limit switch inputs are shared with general inputs 11 and 12. For more information, see *Shared inputs* on page 73.

Table 20 Pinouts for the lifter interface

Pin number	Signal	Wire color	Dry contact circuit
1	+12 VDC	Black	
2	Upper Limit switch (shared with input 11)	White	
3	Field Common	Red	
6	Lower Limit switch (shared with input 12)	Blue	
3	Field Common	Red	
7	Breakaway switch	Orange	
3	Field Common	Red	
8	Field Common	Yellow	
4	Nozzle contact -12 V	Green	
9	Nozzle contact sense	Violet	
5	Nozzle contact common	Brown	

Lifter interface cable

The lifter interface cable is a 9-pin D-sub cable that connects the lifter interface on the CNC to the Sensor Ti.

Figure 49 Lifter interface cable to the Sensor Ti

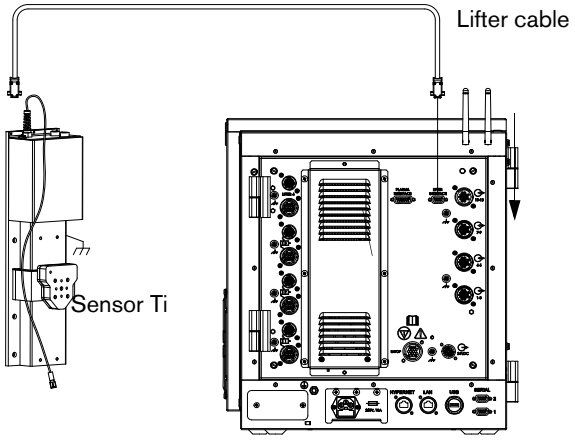


Figure 50 Lifter interface cable

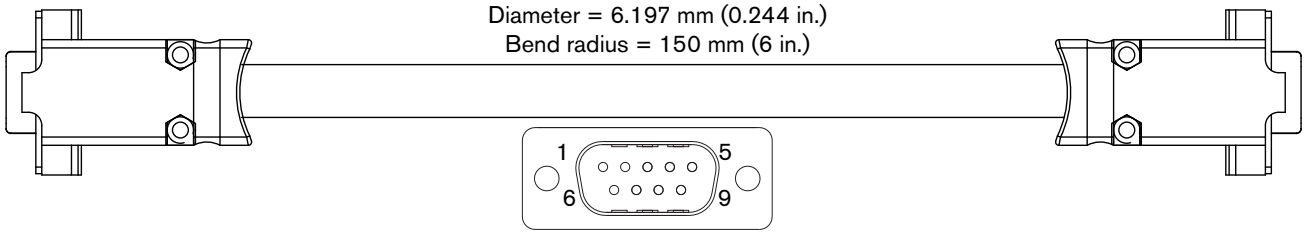
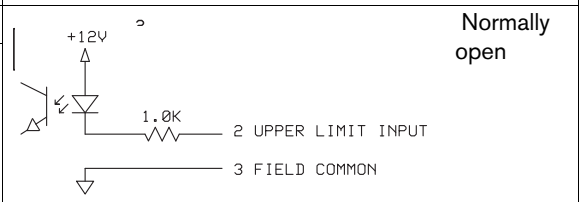
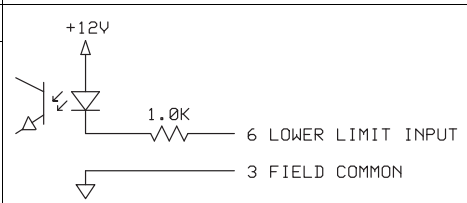
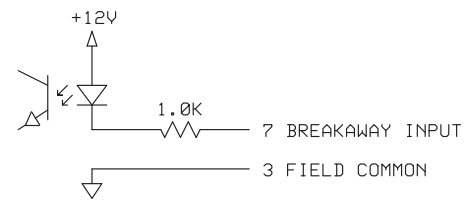


Table 21 Pinouts for lifter interface cable

Pin number	Signal	Wire color	Dry contact circuit
1	+12 VDC	Black	
2	Upper Limit switch (shared with input 11)	White	
3	Field Common	Red	
6	Lower Limit switch (shared with input 12)	Blue	
3	Field Common	Red	
7	Breakaway switch	Orange	
3	Field Common	Red	
8	Field Common	Yellow	
4	Nozzle contact -12 V	Green	
9	Nozzle contact sense	Violet	
5	Nozzle contact common	Brown	

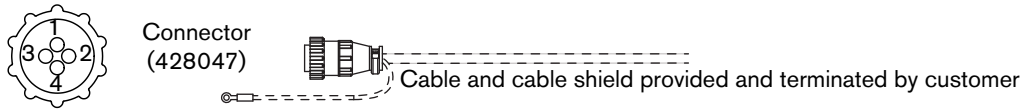
Use the following information to order the lifter interface cable.

Part Number	Length
223343	3.05 m (10 ft)
223344	6.08 m (20 ft)
223345	7.62 m (25 ft)
223346	10.66 m (35 ft)
123968	10.97 m (36 ft)
123897	15.25 m (50 ft)

24 VDC auxiliary power connector

The cable for the 24 V auxiliary power cable must be assembled to suit the needs of the system. Use the following information to order the connector for this cable then add the cable and cable shield.

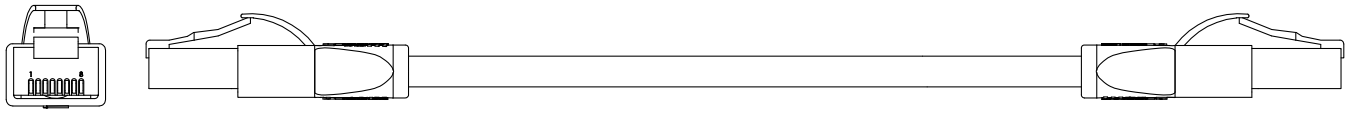
Figure 51 24 VDC auxiliary power connector and cable



Part Number	Description
428047	24 VDC auxiliary power cable connector

Hypernet and LAN cable

Figure 52 Hypernet and LAN cable



Use the following information to order the Hypernet or LAN cable.

Part Number	Length	Part Number	Length
223381	0.3 m (1 ft)	223223	10.66 m (35 ft)
223382	0.6 m (2 ft)	223008	15.25 m (50 ft)
223380	1.5 m (5 ft)	223099	22.86 m (75 ft)
223212	3.2 m (10 ft)	223100	30.48 m (100 ft)
223222	6.08 m (20 ft)	223101	45.72 m (150 ft)
223119	7.62 m (25 ft)	223102	60.96 m (200 ft)

Note: In some cases, EMI noise can interfere with LAN communication. If this happens, install an EMI ferrite filter on the LAN cable to suppress both differential and common-mode EMI. Use one of the following filters:

- Hypertherm 209195
- Fair-Rite 0431164181

Figure 53 Ferrite filter installed on a Hypernet or LAN cable

Operating the CNC

Phoenix software runs on the Hypertherm computer numerical controls (CNCs) and supports either a touch screen or LCD display with a USB-connected keyboard and mouse for entering information and navigating the software. For more information, see the *Phoenix Software Operator's Manual*.

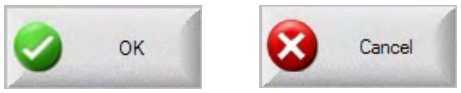
For more information about the components of your cutting system that are supplied by your table manufacturer, refer to the manuals supplied by the manufacturer.

Touch screen LCD

The Phoenix software is designed for touch screens with 1024 x 768 resolution and a 4:3 aspect ratio. When your CNC is equipped with a touch screen, you can enter data into the software by touching the window controls and fields. Any field that requires data input automatically displays an onscreen keypad when you touch it.

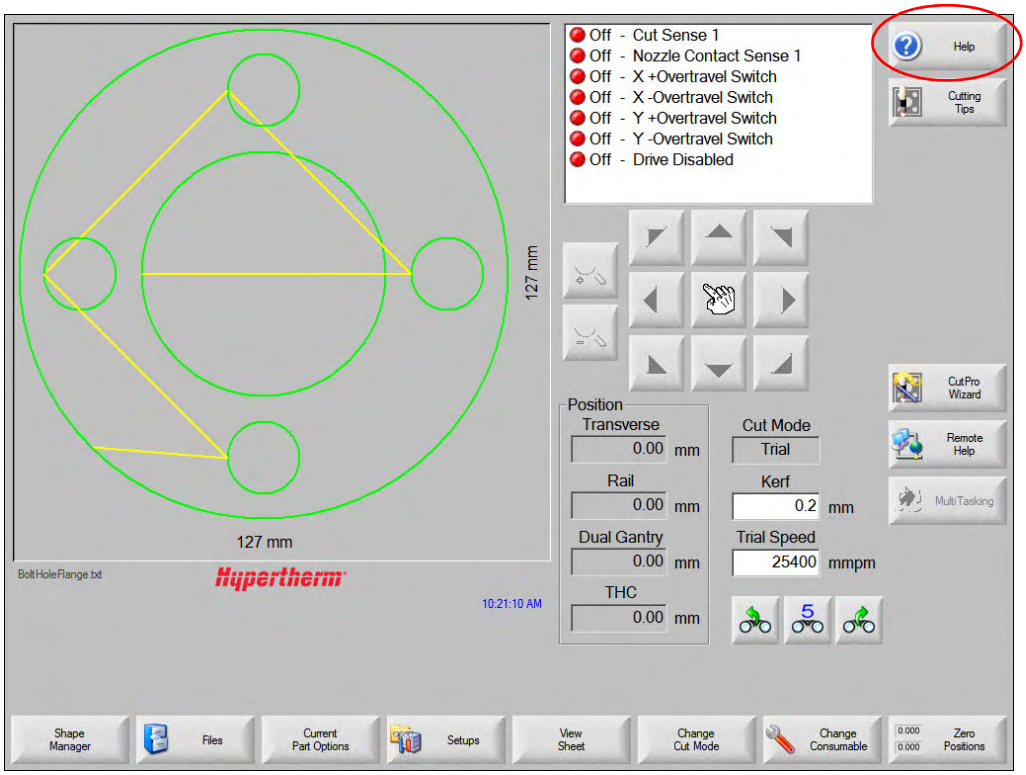
Screen navigation

The keys located at the bottom of the screen in the software are called soft keys. The soft keys correspond to function keys on a PC keyboard. OK and Cancel soft keys let you save or cancel changes that you make in a screen.



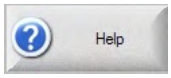
For more information, refer to the *Phoenix Software Operator's Manual (806400)*.

Note: The features shown on each screen vary depending on the user level (Beginner, Intermediate, or Advanced) and the features enabled on the Special Setups and Station Configuration screens. This manual assumes the CNC is in Advanced Mode and shows all features with an example machine configuration.

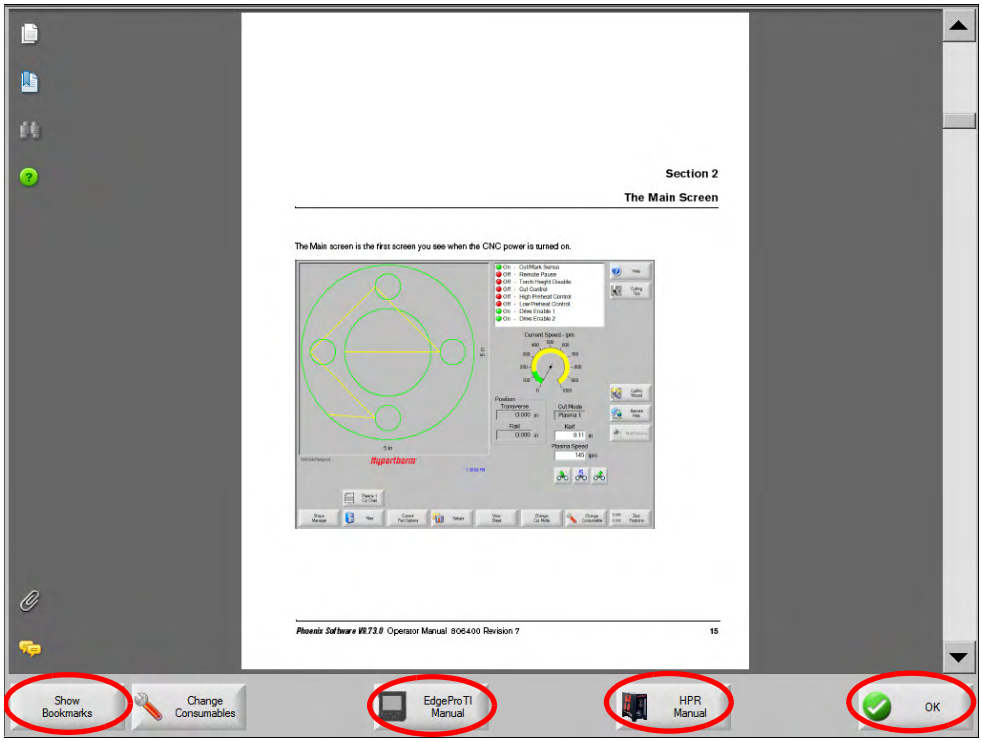


Help

Choose the Help soft key to display information about each screen



Choose the OK soft key to exit the Help screen and return to the control screen.



The Show Bookmarks soft key opens the navigation pane.

View additional manuals

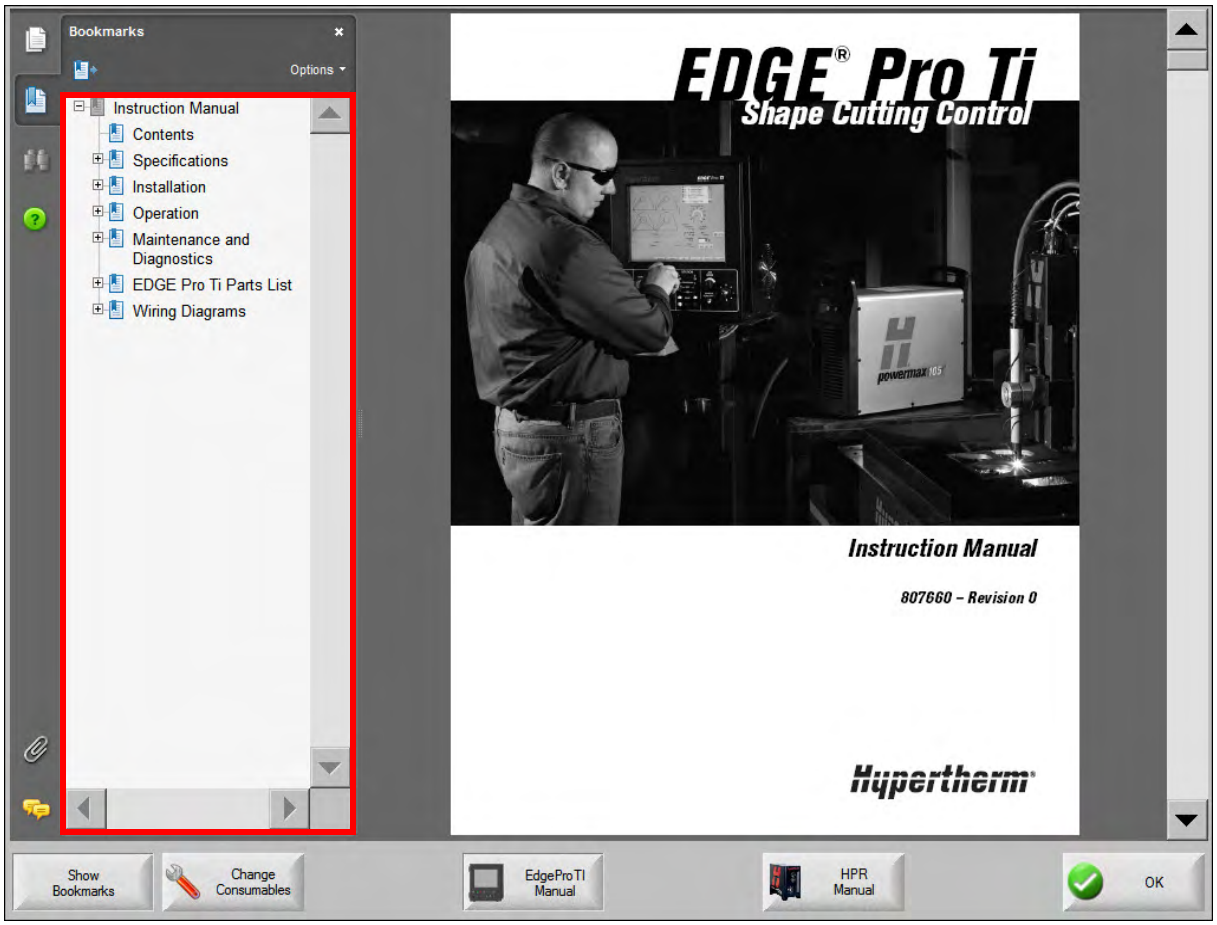
The Help screen may also display buttons for other types of information, for example:

- Manuals for the Hypertherm equipment installed with your CNC, such as plasma systems or torch height controls.
- Manuals for equipment provided by your table manufacturer.

Choose any of these buttons to view this additional information.

Show bookmarks

Choose the Show Bookmarks soft key on the Help screen to view the list of Help topics. Click on a topic in the list to view it.



Automated operations

The Phoenix software includes two wizards that automate plate alignment and part cutting operations.

Align Wizard

The Align Wizard automates several tasks including aligning a nest on a plate, adjusting for a skewed plate, and positioning the torch at the program start location.

To start the Align Wizard, choose Shape Library on the Main screen, then choose Shape Wizard, Shape Options, Align. The Align Wizard may launch automatically. If not, choose the Align Wizard soft key.

For more information, see Align Wizard in the Arranging Parts chapter of the *Phoenix Software Operator's Manual*.

CutPro Wizard

The CutPro Wizard automates common cutting tasks including loading a part or nest, selecting the cutting process, aligning the part or nest on the plate, and starting the program.

The CutPro Wizard may launch automatically when you start the CNC. If not, choose the CutPro Wizard soft key on the Main screen to start the wizard. For more information on the CutPro Wizard see the Cutting Parts chapter.

Updating Phoenix software

Hypertherm provides regular updates to the Phoenix software. You can download the most current software from the website www.hypertherm.com. Choose Products > Automated cutting > Controls > Phoenix software updates to open the Phoenix Software Update downloads page. On this page you can download:

- Phoenix software update (update.exe)
- Phoenix Help file (Help.exe)
- Cut charts (CutChart.exe)

Follow the instructions on the web page to download the updates in your language.

Before you update the Phoenix software, follow these guidelines:

- Back up your system files: On the Main screen, choose Files > Save to Disk > Save System Files to Disk. See Saving System Files in Diagnostics and Troubleshooting in the *Phoenix Software Operator's Manual* for more information.
- Copy the files that you download from Hypertherm.com to the root folder of a USB memory stick.
- Be prepared to restart the CNC after you have updated the software.

Updating the software

1. At the CNC, plug the memory stick that contains the file update.exe into a USB port.
   Note: Verify that update.exe resides in the root folder of the memory stick.
2. On the Main screen, choose Setups > Password. Double-tap the screen to display an onscreen keyboard.
3. Enter updatesoftware (all lower case, one word) and choose Enter. The Phoenix software automatically reads the memory stick and installs the new software.

Updating the Help

1. At the CNC, plug the memory stick that contains the file Help.exe into a USB port.
   Note: Verify that Help.exe resides in the root folder of the memory stick.
2. On the Main screen, choose Setups >Password. Double-tap the screen to display an onscreen keyboard.
3. Enter updatehelp (all lower case, one word) and choose Enter. The Phoenix software automatically reads the memory stick and installs the new help file.

Updating the cut charts

Hypertherm provides cut charts in two different file types: .fac and .usr. The .fac files are the factory-default cut charts. These cut charts cannot be changed. The .usr cut charts contain any changes you have made to a cut chart and saved with the Save Process soft key. The cut chart update file (CutChart.exe) contains both .fac and .usr cut chart files. The update automatically overwrites all of .usr cut charts. Before installing the update, back up your modified cut charts.

Hypertherm recommends saving modified cut charts as custom cut charts. When you create a custom cut chart, Phoenix creates a .usr file with a unique name. This prevents the custom cut charts from being overwritten by the .usr files in CutChart.exe. See the Phoenix Software Operator's Manual for instructions.

To back up modified cut charts:

1. At the CNC, plug a memory stick into a USB port.
2. On the Main screen, choose one of the cut chart soft keys, such as Plasma 1 Cut Chart.
3. Choose the Save Cut Charts soft key. Phoenix copies all the cut charts associated with the Plasma 1 Torch Type onto the memory stick.

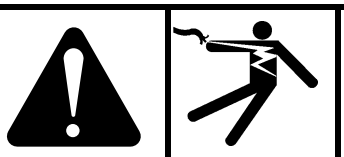
To update the cut charts:

1. At the CNC, plug the memory stick that contains the file CutChart.exe into a USB port.

   Note: Verify that CutChart.exe resides in the root folder of the memory stick.
2. On the Main screen, choose Process, and choose one of the cut chart soft keys such as Plasma 1 Cut Chart.
3. Choose the Load Cut Charts soft key, then choose Yes when prompted to load cut charts from the memory stick. Phoenix extracts the cut charts and copies them to the hard drive.
4. If you have modified cut charts to copy back onto the hard drive, you will need to exit Phoenix and use Windows® Explorer to copy your .usr files back onto the hard drive. The cut chart folder is c:\Phoenix\CutCharts.

Section 4

Maintenance and Diagnostics



WARNING!

ELECTRIC SHOCK CAN KILL

Disconnect electrical power before performing any maintenance.

Only qualified personnel can work inside the CNC cabinet with AC power connected.

See the *Safety* section in this manual for more safety precautions.

Introduction

Hypertherm assumes that the service personnel who perform 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. For more information, refer to the Safety section for operating precautions and warning formats.

Care and handling of the touchscreen

The following tips will help keep the touchscreen functioning at the optimal level:

- To clean the touchscreen, use window or glass cleaner. Put the cleaner on a soft clean rag and wipe the touchscreen. Never apply the cleaner directly to the touchscreen.
- Avoid getting liquids inside your touchscreen. If liquid does get inside, have a qualified service technician check it before you power it on again.
- Do not wipe the screen with a cloth or sponge that could scratch the surface.
- Do not use alcohol (methyl, ethyl or isopropyl) or any strong solvent. Do not use thinner or benzene, abrasive cleaners or compressed air.

Touchscreens, drops of water, and unintended motion

Drops of water can be a safety concern if the CNC is installed on an X-Y water table and the watch window is configured with jog keys. If water splashes from the table onto the touchscreen, the drops can activate a jog key and create unintended motion on the table. Unintended motion can result in danger to the operator and other people, damage to machinery, or faults in cutting.

To prevent motion caused by drops of water on the touchscreen:

- Install the CNC so that the touchscreen is shielded from water splashes.
- If water could accidently hit the touchscreen, do not include the jog keys in the watch windows.

For additional information, contact your local Hypertherm Technical Service team.

THC Slide Maintenance

The ball screw in the lifter should be cleaned and lubricated every 6 months.

Cleaning

The ball screw should be cleaned carefully by wiping away all used grease, dust and dirt with a clean, dry cloth. If possible, move the nut several times over the complete travel distance of the slide so that as much old grease as possible comes out of the nut.

Note:

- Do not use any detergents or other cleaning fluids, such as trichloroethylene, alcohol, or acetone.
- Do not remove or disassemble the ball screw or ball screw nut.

Lubrication

To lubricate the lifter screw, apply a thin layer of fresh grease over the entire surface of the screw.

After lubrication, the assembly should be operated through its stroke several times at low speeds and low loads to ensure that all the contact surfaces of the nut, balls, and screw are covered with a film of grease.

Diagnostic tests

Note: A test kit (428057) is required to perform the following diagnostic tests.

Machine interface tests

If you are using an EDGE Pro Ti CNC, you can perform diagnostic tests with the following connectors and Phoenix software to test the interface ports on the CNC:

- LAN and Hypernet
- Serial interface, for RS-422 only
- USB
- E-stop (Blue, for dry mode contacts; yellow, for sourced mode contacts)
- I/O (Green and red for dry mode contacts; orange and white for sourced mode contacts)
- Lifter and plasma interfaces

To begin an interface test:

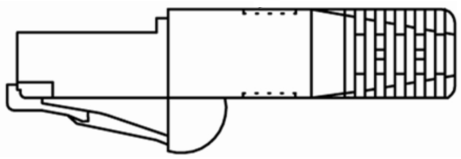
1. From the Main screen, select Setups > Diagnostics > Machine Interface.
2. Enter the Machine password.
3. On the Machine Interface screen, choose the connector you want to test on the image of the CNC.
4. Follow the instructions in the sections below and on the individual test screens.

Figure 54 Machine interface test screen

LAN and Hypernet tests

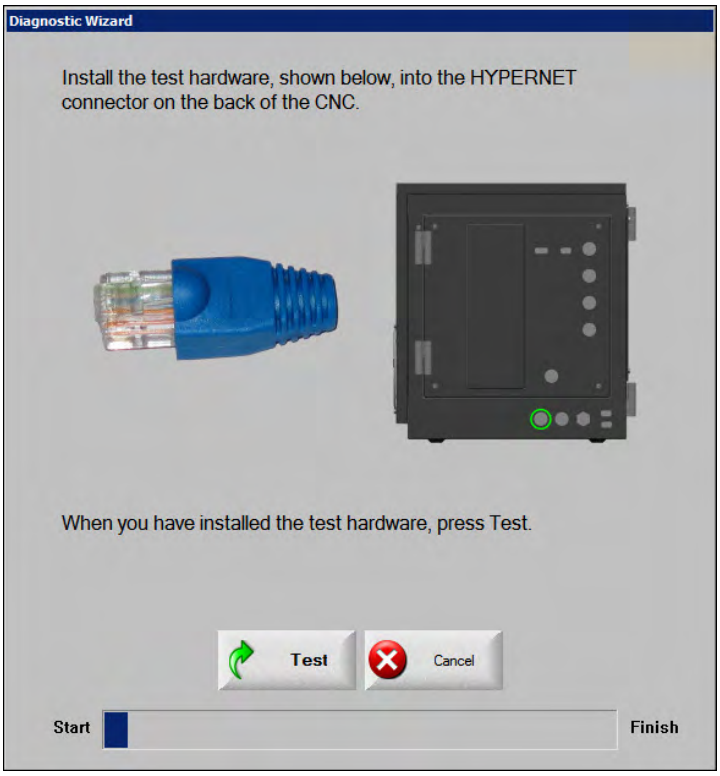
The LAN and Hypernet tests both use the same tester, shown in Figure 55.

Figure 55 LAN and Hypernet tester



Conduct this test if:

- The CNC is not communicating with the ArcGlide or plasma system.
- The CNC is not communicating with the local area network.



To test a LAN or Hypernet port:

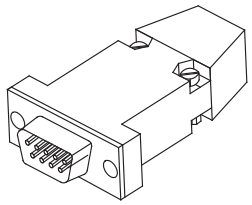
1. On the Machine Interface screen, choose the LAN or Hypernet port.
2. Follow the instructions on the screen to plug in the tester.
3. Choose Test on the Hypernet or LAN test screen. A message informs you if the test is successful.

If either test fails, contact your table manufacturer to replace the motherboard (141110).

Serial test

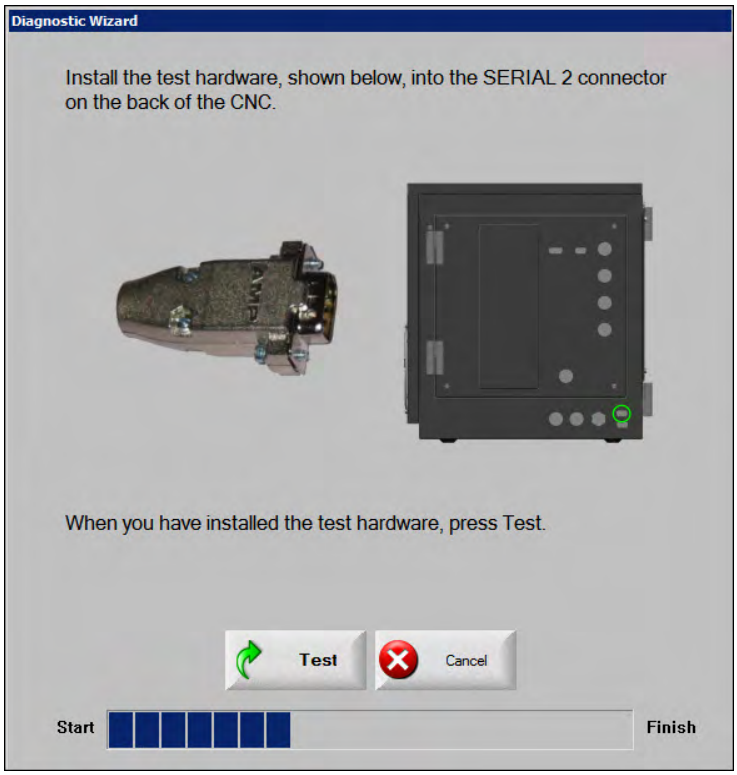
The EDGE Pro is equipped with two serial ports. Serial 1 and 2 support RS-422 or RS-232 communications, depending on the jumper configuration. For more information, see *Utility and serial isolation board (141307)* on page 126.

Figure 56 Serial tester



Conduct this test if:

- Processes or information communicated through the serial port are not operating properly.
- The CNC is unable to download files through the serial port.
- The serial link to the plasma supply fails.



To test serial communications:

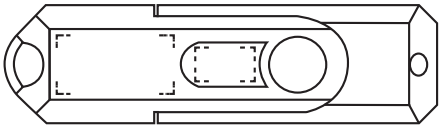
1. On the Machine Interface screen, choose the serial port you want to test.
2. On the CNC, plug the serial test hardware into the port you selected.
3. Choose Test on the serial test screen. A message informs you if the test is successful.

If the test fails, contact your table manufacturer to replace the utility and serial isolation board (141307).

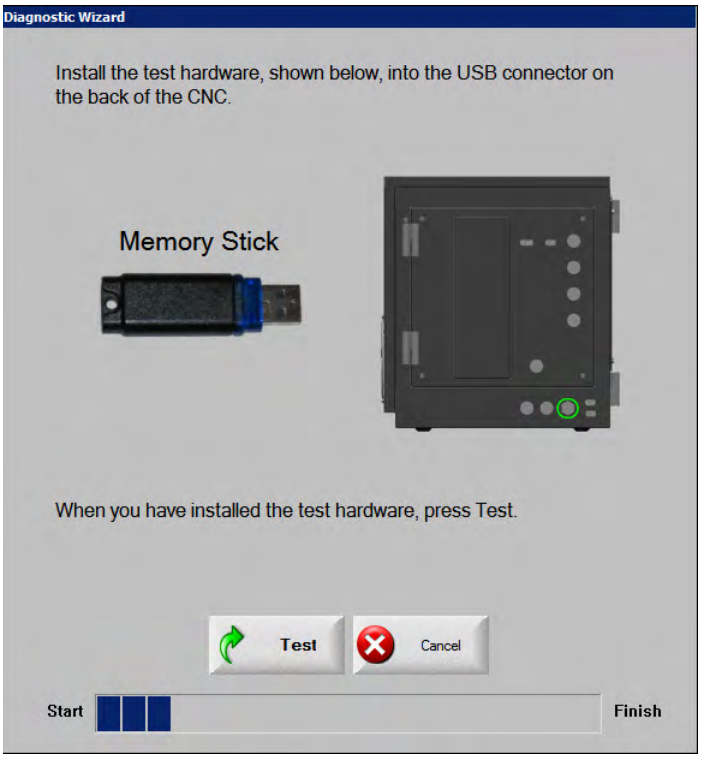
USB test

Use this test to check the USB ports on the front and back of the CNC. The diagnostic software will test the first USB memory stick that it finds so it is important to remove all USB memory devices before conducting this test.

Figure 57 USB tester



Conduct this test if the memory stick is not shown as an option when you try to load part programs or update cut charts, software, or Help.



To test the USB port on the back of the CNC:

1. Verify that no USB memory device is installed.
2. On the Machine Interface screen, choose the USB port on the back of the CNC.
3. Follow the instructions on the screen to insert the memory stick in the USB port on the back of the CNC.
4. Press Test. A message informs you if the test is successful.

To repeat this test for the USB port on the front of the CNC:

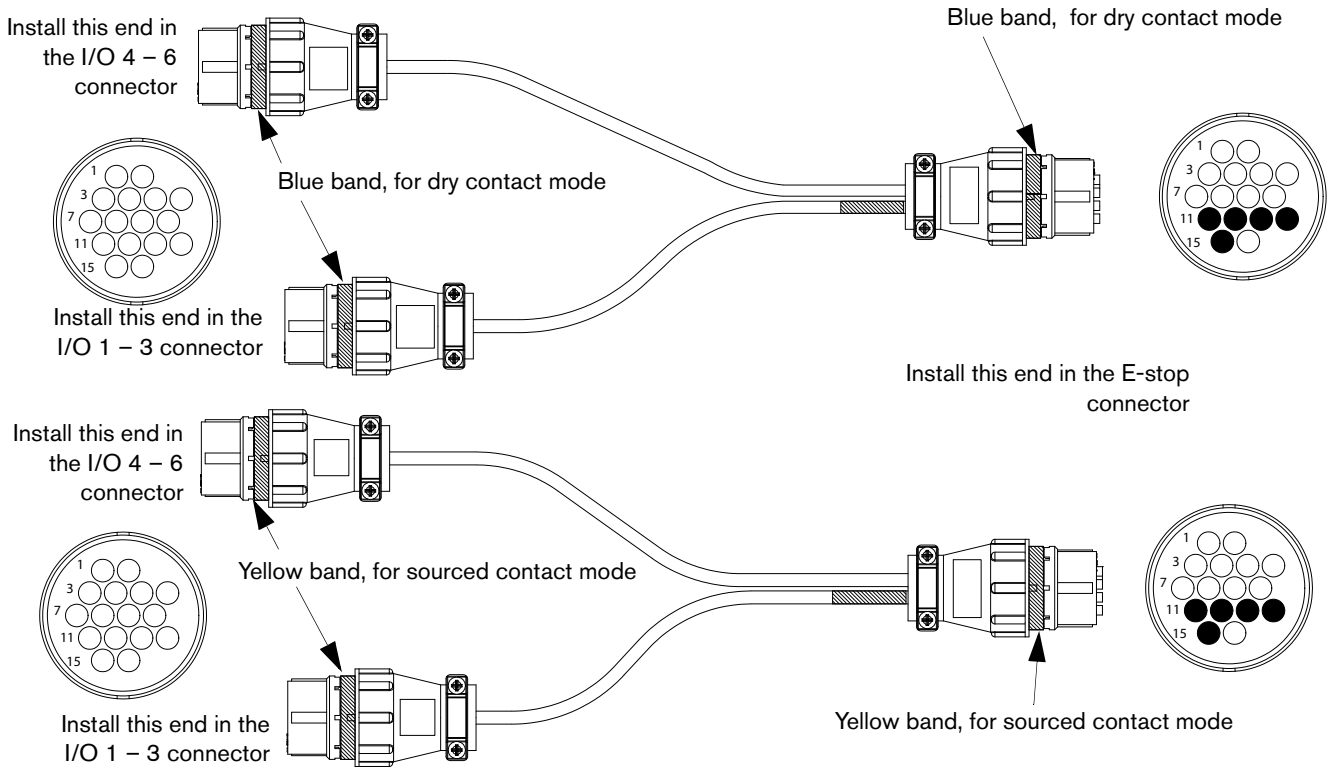
1. Verify that no USB memory device is installed.
2. On the Machine Interface screen, choose the USB port on the back of the CNC.
3. Follow the instructions on the screen to insert the memory stick in the USB port on the front of the CNC.
4. Press Test. A message informs you if the test is successful.

If the test fails on both USB ports, contact your table manufacturer to replace the motherboard (141110).

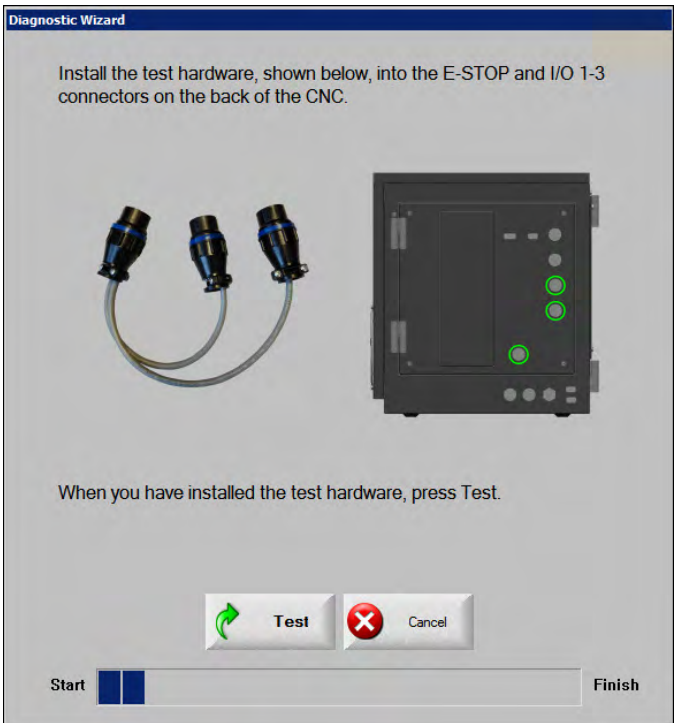
E-stop test

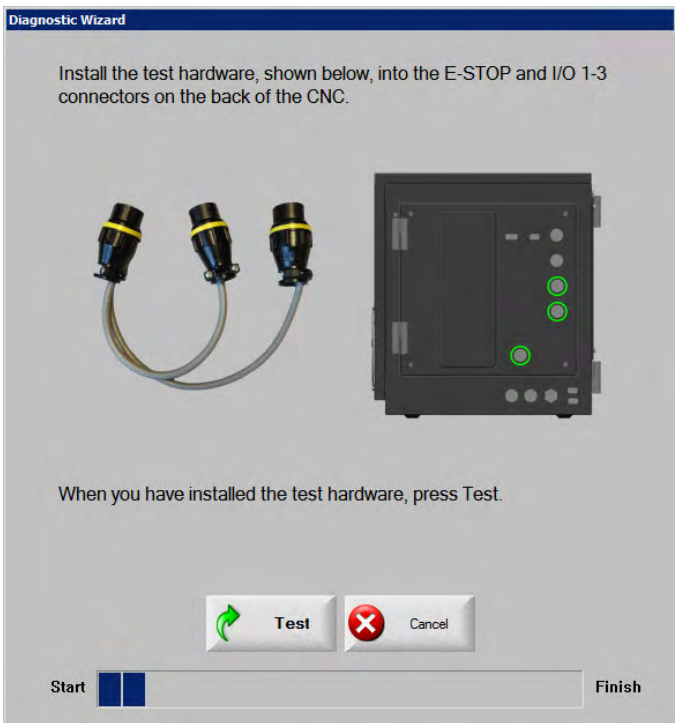
There are two E-stop testers. The tester for dry contact mode has blue rings around the connectors. The tester for sourced contact mode has yellow rings around the connectors. Each tester has a plug for the E-stop connector and two plugs for the connectors for I/O 1 – 3 and I/O 4 – 6.

Figure 58 E-stop testers



Conduct this test to verify that the E-stop circuit is functioning correctly.





To test the E-stop port on the back of the CNC:

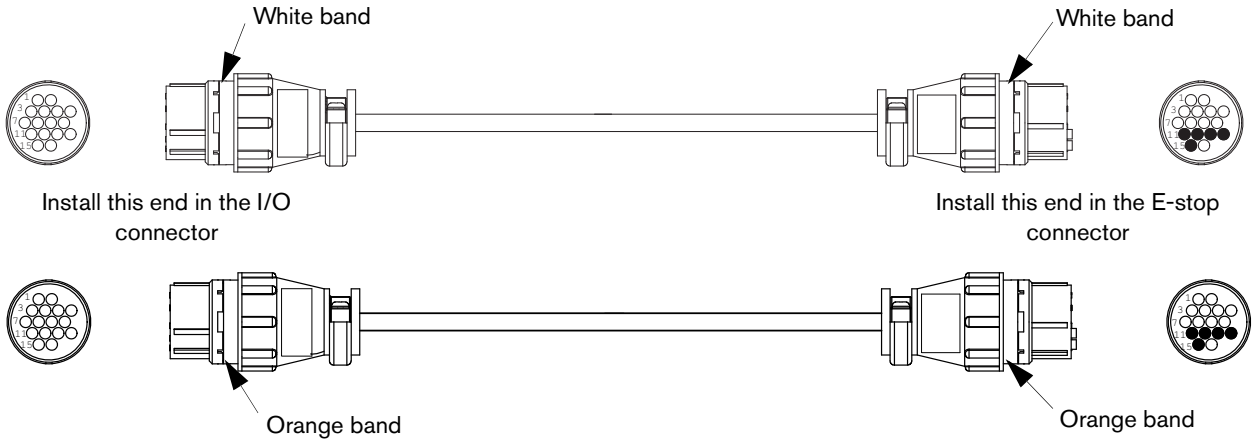
1. On the Machine Interface screen, choose the E-stop port on the back of the CNC.
2. Follow the instructions on the screen to insert the dry or sourced tester in the E-stop and I/O ports 1 – 3 and 4 – 6 on the back of the CNC.
3. Press Test. A message informs you whether the test is successful.
4. If the test fails, conduct the I/O test (see page 107) to verify that the I/O is functioning correctly.
5. If the I/O test is successful, replace the surge and safety board (141287).
6. If the I/O test fails, replace the I/O relay board (141278)

I/O test

The I/O test requires the green and red testers for input contacts in dry mode or white and orange testers for input contacts in sourced mode.

Figure 59 I/O testers for input contacts in dry mode

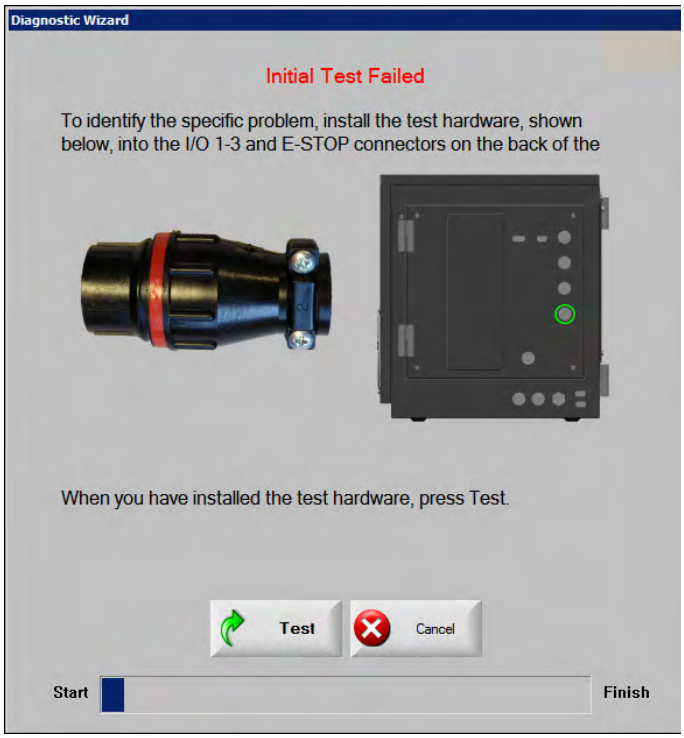
Figure 60 I/O testers for input contacts in sourced mode



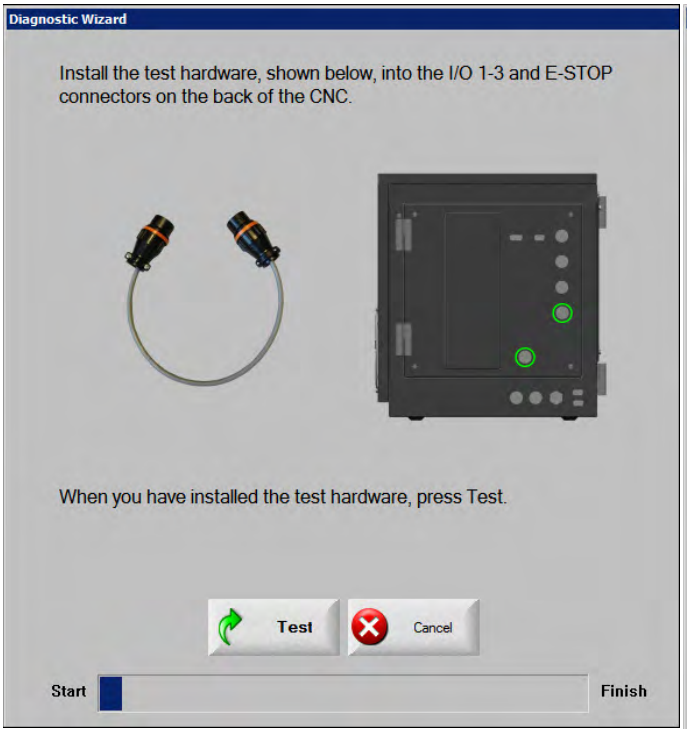
Conduct this test if:

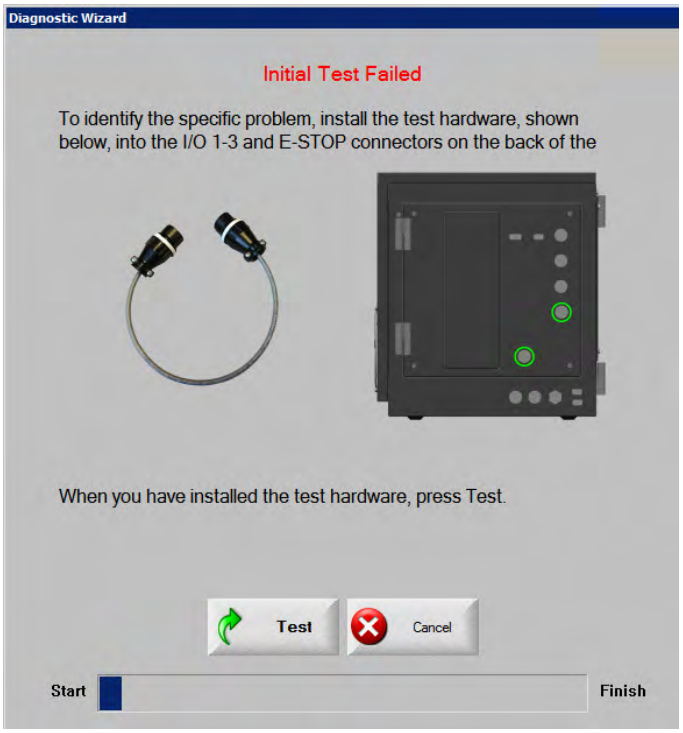
- An I/O point is malfunctioning.
- You need to eliminate CNC I/O operation as a problem in the system.
- A continuous fault is occurring, such as a limit switch that is not turning on or clearing.

These screens test I/O contacts in dry mode.



These screens test I/O contacts in sourced mode.





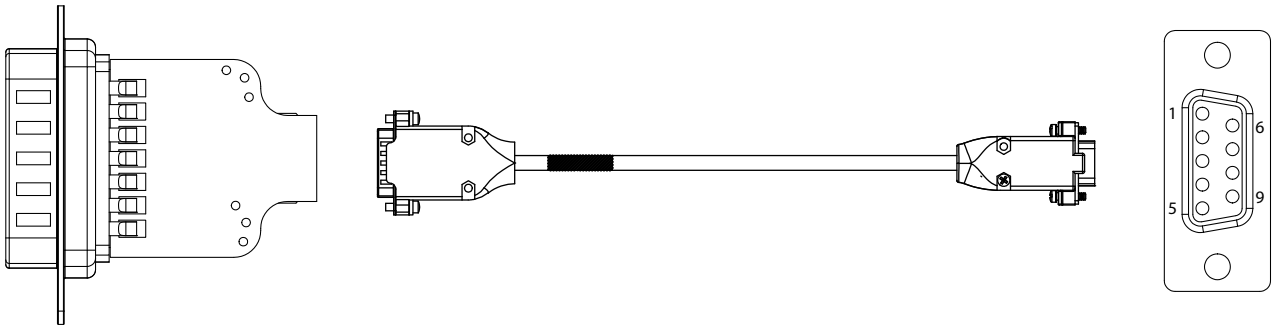
To test I/O contacts:

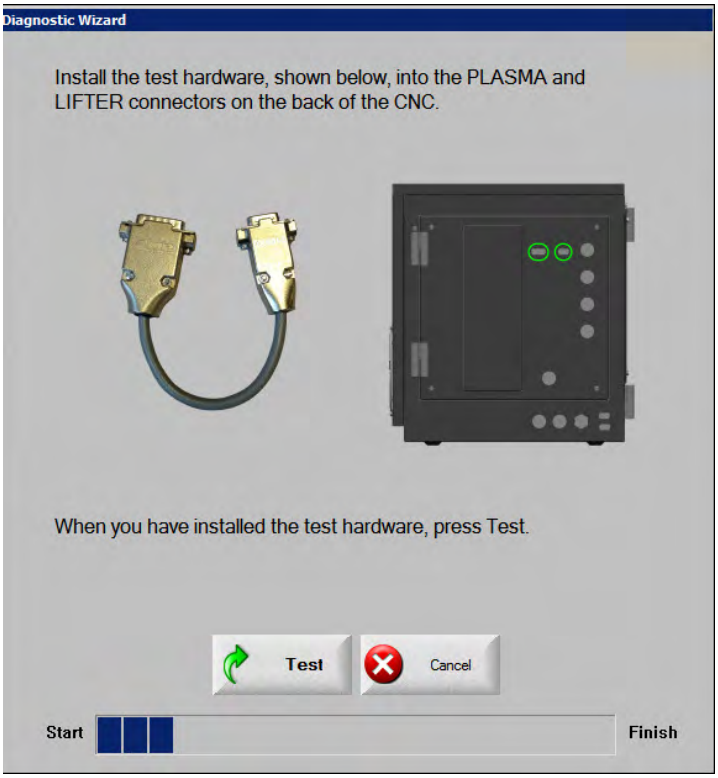
1. On the Machine Interface screen, choose the I/O port you want to test.
2. Follow the instructions on the screen to connect the test plug into the I/O port you selected on the back of the CNC.
3. Press Test. A message informs you if the test is successful.
4. If the first test fails, follow the instructions on the screen to conduct the second test and isolate the I/O points that are causing the problem.
5. If the second test fails, the screen reports the number of the failed input or output. Contact your table manufacturer to replace the I/O board (141278).

Plasma and lifter tests

The plasma and lifter tests use the same tester. Conduct this test to verify that the plasma and lifter interfaces are performing as expected.

Figure 61 Plasma and lifter interface tester





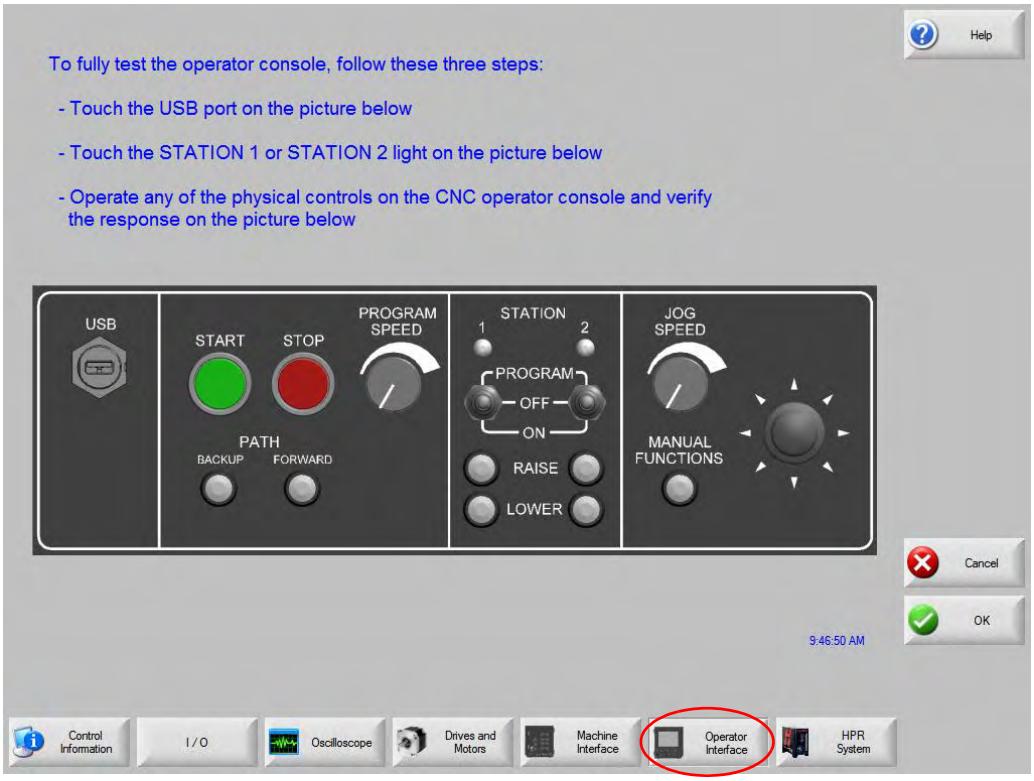
To test the plasma or lifter interface:

1. On the Machine Interface screen, choose the plasma or lifter interface on the back of the CNC.
2. Follow the instructions on the screen to install the tester on the back of the CNC.
3. Press Test. A message informs you if the test is successful.
4. If the test fails, replace the I/O relay board (141278) or the utility and serial isolation board (141307).

Operator panel test

Perform these tests if any function on the integrated operator console is not working as expected.

Note: None of the components on the screen allow motion or any action to take place on the CNC or cutting table.



To test the controls on the operator panel:

1. On the Machine Interface screen, press the Operator Interface soft key.
2. On the Operator Interface screen, follow the instructions on the screen and in the following steps.
3. To test the USB port, touch it on the picture on the Operator Interface screen then follow the instructions on the screen.
4. To test the indicator lamps for Station 1 or 2, touch the corresponding light on the picture on the Operator Interface screen.
5. You can also operate any component on the front panel of the CNC and watch the corresponding component on the screen. Verify that the operation of the component on the screen matches what you do on the panel.
6. If the test for a single component fails, replace that component.

If multiple components fail, contact your table manufacturer to replace one or all of the following parts:

- Ribbon cable to the operator control panel board (223013)
- Operator control panel board (141058)
- Utility and serial isolation board (141307)

Troubleshooting

Introduction

Hypertherm assumes that the service personnel performing the troubleshooting 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 tests with safety in mind. Refer to the *Safety* section for operating precautions and warning formats.


WARNING!

ELECTRIC SHOCK CAN KILL

Disconnect electrical power before performing any maintenance.

Only qualified personnel can work inside the CNC cabinet with AC power connected.

See the *Safety* section in this manual for more safety precautions.


WARNING!

MOVING PARTS CAN CAUSE DAMAGE AND INJURY

To avoid unexpected machine motion and personal injury, disconnect the motor drive mechanics responsible for table and component movement before using the Drive Diagnostics screen.

To avoid damage to the THC and motors, use extreme caution when you select the TEST THC button or the TEST ALL button on the Drive Diagnostics screen.

CAUTION!

Turn OFF the CNC whenever you remove or reconnect a cable.

Common situations

The following list provides information about problems that an operator might encounter during operation.

Power up

The CNC does not power up when the ON/OFF button is pressed.

1. Verify that the power cord is plugged into the back of the CNC.
2. Verify that the wall circuit breaker is active.
3. Verify that the fuse in the power entry module is functional. Replace if necessary (208142).
4. Open the CNC enclosure and verify that the D6 AC lamp is illuminated on the power distribution board. See page 121.
5. If the lamp is not illuminated, replace the surge board or the power entry harness (223310). See *Surge board (141287)* on page 142 or *Power distribution board (141153)* on page 121.
6. Verify the connections for the ON / OFF button on the front panel.
7. Verify the green LED light on the motherboard is illuminated. This LED indicates power is reaching the motherboard. See page 120. If it is not illuminated, replace the ATX power supply (228473), or contact your table manufacturer for additional troubleshooting.
8. Verify that the green and white wires from the utility and serial isolation board (141307) are connected to the motherboard.
9. Contact your table manufacturer.

Display

The power switch is on and illuminated, but the screen remains black.

1. Verify that the AC power connections are plugged into the display.
2. Look at the motherboard to see if there is a BIOS fault.
3. Verify that the ambient temperature is within the operating range of the CNC. See *System specifications* on page 33.

LED

A button, function, or LED on the front panel is not responding when the corresponding switch is activated by the operator.

1. Go to Setups > Diagnostics > Operator Interface screen.
2. Move or press any of the components on the physical front panel to verify the proper operation on the CNC screen. If any of these tests fail, replace the individual component on the front panel (see *EDGE Pro Ti Parts List* for the appropriate part number).

The “Field power failure” error message is posted on the CNC.

1. Verify that the cable between the utility and serial isolation board (141307) and the power distribution board (141153) is connected at both ends.
2. Verify that all other cables are properly connected.
3. Verify that the ATX power supply is operating.
4. Verify that the LEDs on the power distribution board are illuminated. See page 121.
5. If the LEDs on the power distribution board are not illuminated, replace the board.

Input failure

- An input point is in an unexpected state or fails to change state.
- The table is not performing as set up when reaching limit switches.
- A continuous fault is occurring and won't clear.

For Ti interfaces with the test kit, see *Diagnostic tests* on page 101.

For Ti interfaces without the test kit:

1. Go to the Setups > Diagnostics > I/O > Enter the Machine password.
2. Exercise the input device on the table and verify that the state of the input reacts on the CNC screen. If the screen reflects that the input state is not changing, replace the I/O board (141278).
3. Verify that input logic changes with a multimeter.
4. If the state of the input is still not changing, move and reconfigure the I/O on the CNC.

Output failure

- An output point is in an unexpected state or fails to change state.
- A continuous fault is occurring and won't clear.

For Ti interfaces with the test kit, see *Diagnostic tests* on page 101.

For Ti interfaces without the test kit:

1. Go to the Setups > Diagnostics > I/O > Enter Machine password.
2. Exercise the output through the CNC to see if the output reacts as expected. If an output point fails, replace and retest in this order:
   a. I/O board (141278)
   b. MCC board (141191)
   c. I/O ribbon cable (223016)
3. If the output point still fails, contact your table manufacturer for additional troubleshooting.

Hypernet

Communications with components connected to the Hypernet are not working properly.

See *Diagnostic tests* on page 101.

LAN connection

- Downloading part programs over the LAN is not working properly.
- Previously mapped network drives are not shown when trying to load a part program.

See *Diagnostic tests* on page 101.

The regeneration circuit remains on for more than 25% of a single cut

1. The acceleration rate may be too high. Experiment with this setting to change the need for braking.
2. The gear ratio may be inadequate.
3. Axis motors are inadequate.
4. Hardware somewhere is defective.

Motion issues

- Motion is erratic.
- An axis “runs away”.
- No motion is observed.
- There is a high number of position errors.
- Parts may not be to tolerance.

Serial communication issues

- Processes and information communicated through the serial ports are not operating properly.
- P-S link fail messages are occurring.
- Unable to download files over a configured serial port.
- HPR-link fail messages are occurring when using serial communications to the HPR.

Using the serial port tester:

Note: This test only works with RS-422 configured ports. Refer to *Utility and serial isolation board (141307)* on page 126 for information on how to determine whether the port is set up for RS-422.

1. In Phoenix, choose Setups > Diagnostics > Machine Interface > Enter the Machine password.
2. Test each of the serial port connectors on the back of the CNC by pressing one of the serial port connectors on the touch screen and following the on-screen instructions.
3. If the test passes, verify that the ports are set up for RS-422 or RS-232, as needed by the external components connected to the serial port.
4. If the test fails, replace the following items, one at a time and re-run the tests after each replacement:
   a. Utility and serial isolation board (141307)
   b. Ribbon cable (229245, 229459, or 229250)

The CNC is not recognizing a device in a USB port

1. In Phoenix, choose Setups > Diagnostics > Machine Interface > Enter Machine password or Setups > Diagnostics > Operator Interface screens.
2. Press the USB port on the front panel or rear panel on the touch screen and follow the on-screen instructions.
3. If the test fails, re-run the test with a different USB memory stick.
4. If the test fails again, re-run the test using the other USB port (front or back).
5. If the test fails again, contact Technical Service. The problem is with the motherboard, the USB ports on the CNC or the connection cables.

Cut quality or plasma performance issues

Press the “Cutting Tips” button on the Main screen and follow the on-screen instructions to improve cut quality.

The CNC feels excessively warm

1. Verify that the external fan is running. If it is running slowly, clean the fan.
2. If the fan is not running and ambient temperature is above 70° F (20° C):
   a. Verify that the internal harness is connected from the fan to the Utility board.
   b. Remove the fan shroud and verify that the connections to the fan are in place.
   c. Replace the external fan (428007).
3. If the external fan is running and the CNC is still excessively warm, open the front door of the CNC and verify that the internal fan is running. If the fan is not running, replace the internal fan (228474).

Loading files

The CNC is loading files slower than when it was first installed or is taking a long time to perform operations that used to happen faster.

1. In Phoenix, choose Setups > Password > Enter Special Password > System.
2. If all five numbers on the screen are blue, the CNC is performing as designed.
3. If any of the five numbers on the screen are red, the CNC is operating more slowly than is needed for peak performance.
   a. Restart the CNC. After 5 minutes, re-enter the Setups > Password > Enter Special Password > System screen and recheck the numbers. If the five numbers are blue, the CNC is operating as expected.
   b. If any of the five numbers are red, there may be other programs that are running on the CNC besides Phoenix that are negatively affecting performance. Close these other programs. Call Technical Service for additional troubleshooting.
4. If the CNC is having difficulty connecting to the network, files will load slowly. Verify network connections.

Wireless troubleshooting

Refer to the *Phoenix Software V9 Series Installation and Setup Manual (806410)* for information about how to set up your wireless network.

Follow these guidelines if you are experiencing problems using the wireless network on your CNC:

- The wireless network board (141223) requires a bus mastering slot on the motherboard. On the motherboard (141110), PCI slot 1 is not a bus mastering slot. Verify that the wireless board is installed in PCI slot 2.
- The wireless network board conforms to 802.11N and 802.11G standards and connects to either a wireless G or N local area network (LAN). It provides wireless G or better performance for part program downloads, remote help, or other network tasks.
  - An 802.11G wireless network can operate at reasonable speeds up to 38 m (125 ft) from the wireless router or access point, even if the path between the CNC and the access point is obstructed with a wall or door.
  - An 802.11N wireless network can operate at reasonable speeds up to 70 m (230 ft) from the wireless router or access point. However, 802.11N requires a clear line of sight between antennas.
  - When in doubt, use the 802.11G wireless network connection.

  Note: The network must be set to broadcast its SSID for it to be visible as a connection.
- Make sure the wireless network board appears in the Windows Device Manager under the “Network Adapters” heading, and does not have a yellow ! or ? next to it.
- Use the Windows Network Connections Manager to locate your router or wireless network access point. Choose Start > Settings > Network Connections.
- If the network connection wizard does not list any company wireless networks, check the network availability using a Windows XP laptop or other wi-fi device to verify the router or access point connection is available at that physical location.
- Signal strength diminishes with distance. A wireless network connection does not require 100% signal strength to be effective (shown as four solid bars on the screen). If the Network Connections Manager shows two or three signal strength bars, the network connection is reasonable.
- If the connection speed frequently dips below 24 Mbs or signal strength dips below two bars, move the wireless router or access point closer to the CNC, or add another access point closer to the CNC.
- For best network performance, minimize the number of clients on the wireless network.
- Avoid connecting slower wireless devices to the network (for example, 802.11B devices) as the entire network may degrade to that level of performance.

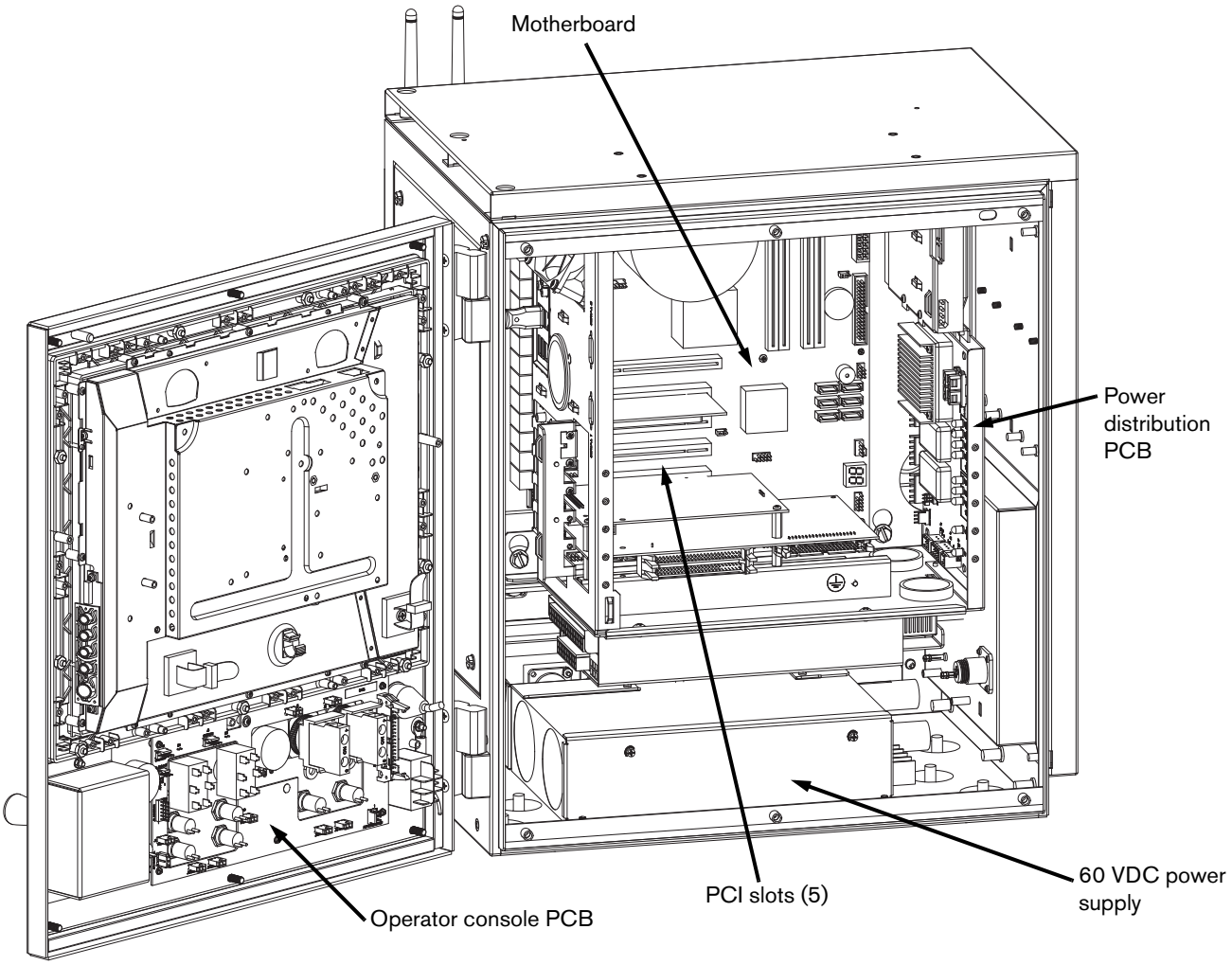
Component locations and information

The following pages provide details about the major components of the EDGE Pro Ti. Refer to*EDGE Pro Ti Parts List* for the corresponding replacement kits and part numbers.

Note: Use the instructions in *Replacement Parts for EDGE Pro CNC Field Service Bulletin* (806440) to replace parts in the EDGE Pro CNC. In addition:

- Use common safety precautions when replacing parts in the CNC:
- Turn off electrical power to the CNC before opening panels on the enclosure.
- Use common safety precautions when handling printed circuit boards.
- Store PC boards in anti-static containers.
- Wear a grounded wrist strap when handling PC boards.

Figure 62 Front internal view of the EDGE Pro Ti CNC



Operator control panel board (141058)

Figure 63 Operator control panel board

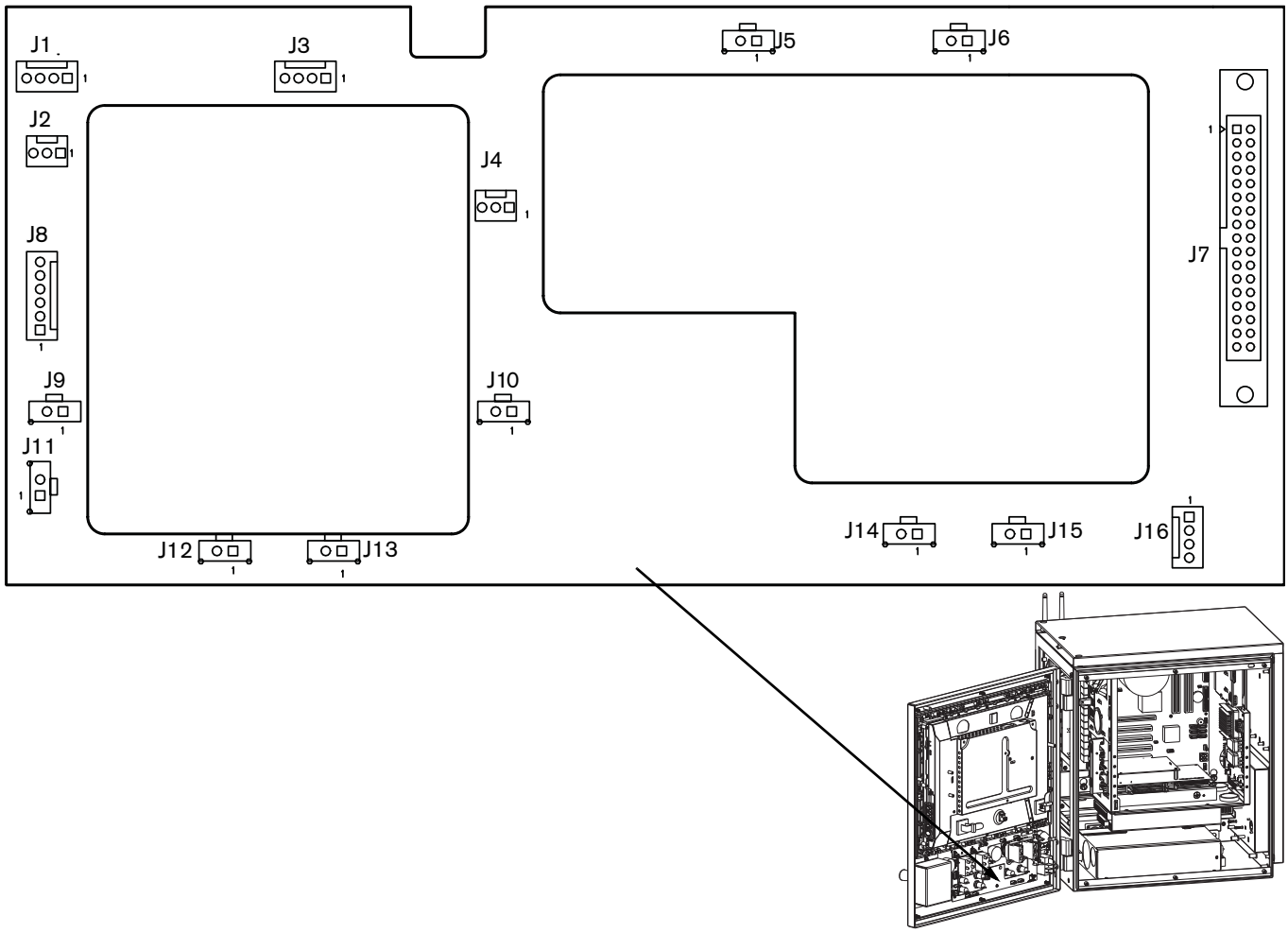
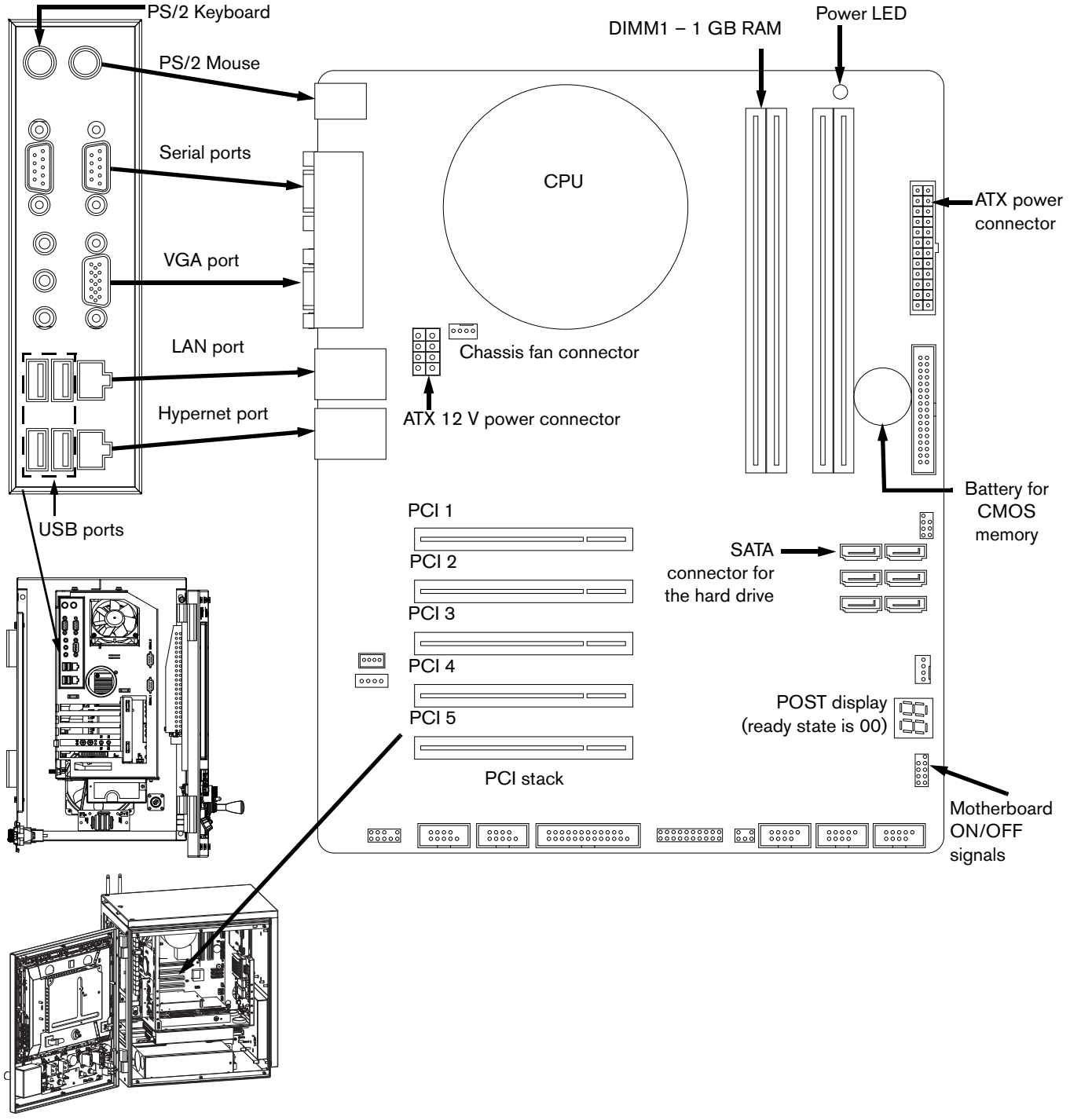


Table 22 Pinouts for J1 to J16

Pin no.	Signal	Pin no.	Signal	Pin no.	Signal
J1 Station 2		**J7 To utility PCB**		33	Logic +5 V
1	Auto select 2	1	Start	34	Logic +12 V
2	Logic ground	2	Stop	**J9 Raise 2**	
3	Manual select 2	3	Manual	1	Logic ground
4	Not used	4	Forward on path	2	Raise torch 2
J2 Jog potentiometer		5	Backward on path	**J10 Raise 1**	
1	Logic ground	6	Joystick +Y	1	Logic ground
2	Analog (jog speed)	7	Joystick -Y	2	Raise torch 1
3	4.096 V Reference	8	Joystick -X	**J11 Manual**	
J3 Station 1		9	Joystick +X	1	Logic ground
1	Auto select 1	10	Logic ground	2	Manual switch
2	Logic ground	11	Logic ground	**J12 Lower 2**	
3	Manual select 1	12	Not connected Front panel ID 1	1	Logic ground
4	Not used	13	Ground Front panel ID 0	2	Lower torch 2
J4 Cut potentiometer		14	Not connected Front panel ID 1	**J13 Lower 1**	
1	Logic ground	15	Logic ground	1	Logic ground
2	Analog (cut speed)	16	Logic ground	2	Lower torch 1
3	4.096 V Reference	17	Not connected Front panel ID 2	**J14 Forward**	
J5 Stop		18	Auto select 1	1	Logic ground
1	Logic ground	19	Manual select 1	2	Forward on path
2	Stop switch	20	Raise torch 1	**J15 Back**	
J6 Start		21	Lower torch 1	1	Logic ground
1	Logic ground	22	Auto select 2	2	Backward on path
2	Start switch	23	Manual select 2	**J16 Power switch**	
J8 Joy stick		24	Raise torch 2	1	Logic +12 V
1	Up	25	Lower torch 2	2	MB On/Off 1
2	Down	26	Station enable LED1	3	MB On/Off 2
3	Left	27	Station enable LED2	4	Logic ground
4	Right	28	Motherboard On/Off 1		
5	Logic ground	29	Motherboard On/Off 2		
6	Logic ground	30	Cut speed		
		31	Jog sped		
		32	4.096 V Reference		

Motherboard (141110)

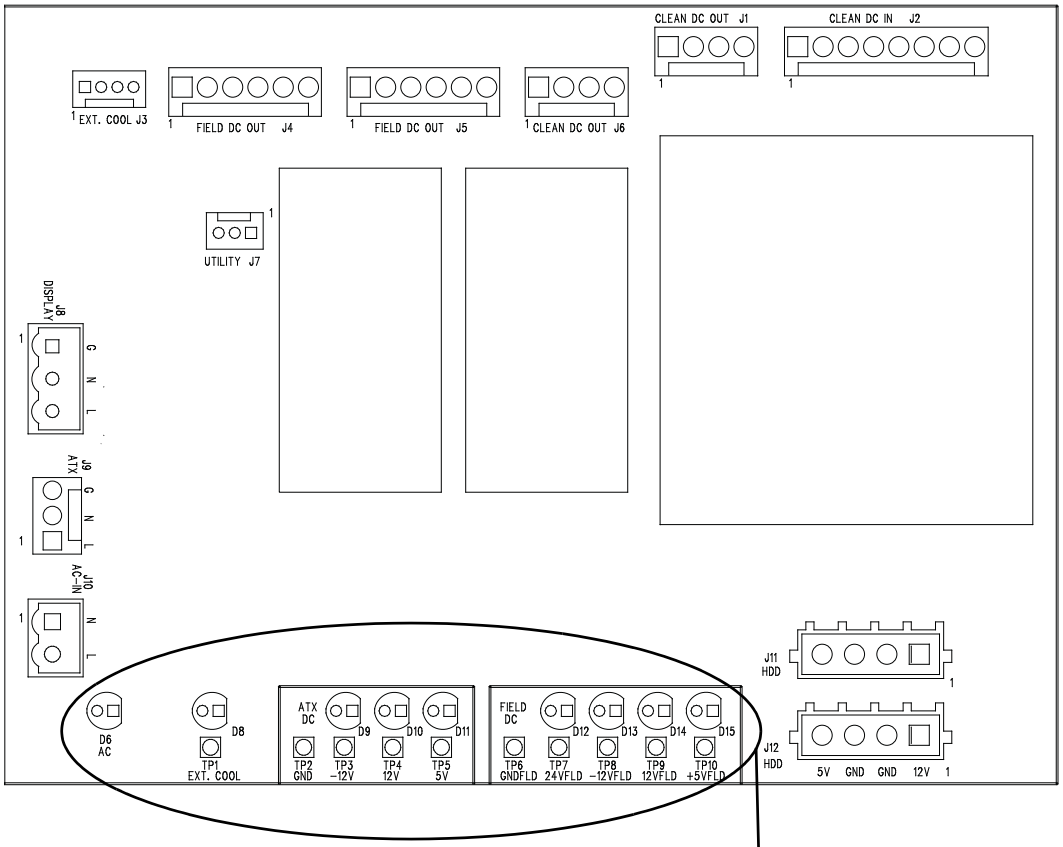
Figure 64 Motherboard

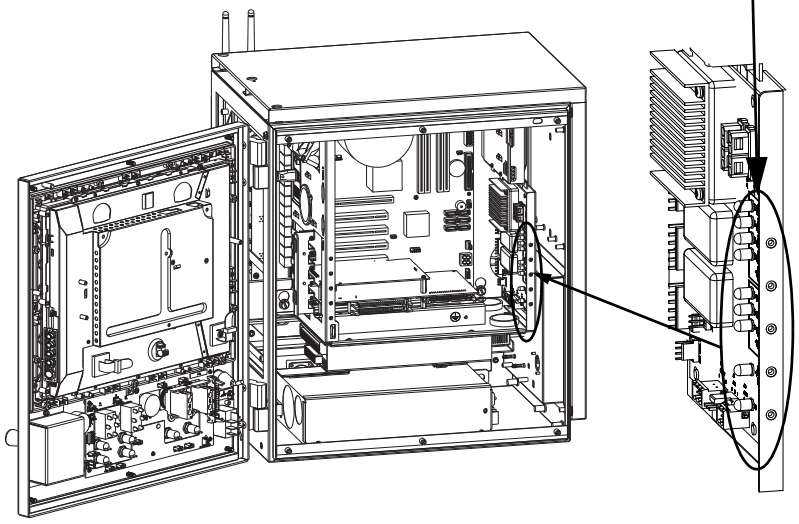


	PCI slot 2	PCI slot 3	PCI slot 4	PCI slot 5
EDGE Pro Ti PCI boards	Wireless	None	Utility/serial isolation	MCC

Power distribution board (141153)

Figure 65 Power distribution board





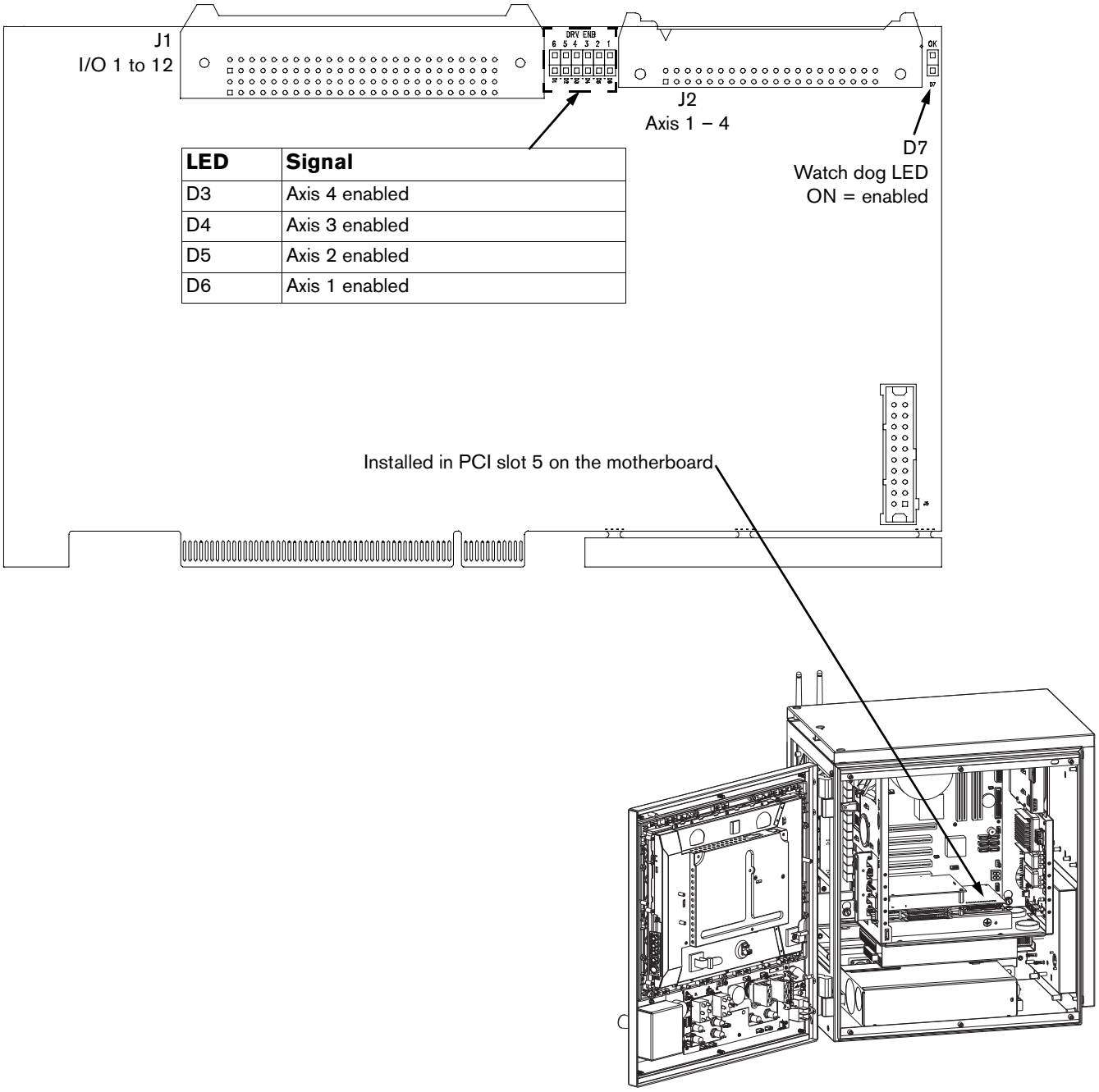
LED	Signal	Color
D15	+5 V Field DC	Green
D14	12 V Field DC	Green
D13	-12 V Field DC	Green
D12	24 V Field DC	Green
D11	5 V ATX DC	Green
D10	12 V ATX DC	Green
D9	-12 V ATX DC	Green
D8	External fan	Green
D6	AC power	Green

Table 23 Pinouts for J1 to J12

Pin no.	Signal	Pin no.	Signal
J1 Clean DC out		**J6 Clean DC out**	
1	Logic +5 V fused	1	Logic +5 V fused
2	Logic -12 V fused	2	Logic -12 V fused
3	Logic +12 V fused	3	Logic +12 V fused
4	Logic ground	4	Logic ground
J2 Clean DC in		**J7 Utility**	
1	Logic +5 V	1	Fan disable
2	Logic +12 V	2	Field power good
3	Logic +12 V	3	Logic ground
4	Logic +12 V	**J8 Display**	
5	Logic -12 V	1	Earth ground
6	Logic ground	2	Line 2
7	Logic ground	3	Line 1
8	Logic ground	**J9 ATX power supply**	
J3 External cooling		1	Line 1
1	Fan +24 V	2	Line 2
2	Fan Interlock 2	3	Earth ground
3	Fan Interlock 1	**J10 AC in (from surge board J2)**	
4	Field ground	1	Line 2
J4 Field DC out		2	Line 1 switched
1	Field ground	**J11 and J12 HDD**	
2	+24 V	1	Logic +12 V
3	+5 V	2	Logic ground
4	-12 V	3	Logic ground
5	+12 V	4	Logic +5 V
6	Field ground		
J5 Field DC out			
1	Field ground		
2	+24 V		
3	+5 V		
4	-12 V		
5	+12 V		
6	Field ground		

4-axis MCC board (141191)

Figure 66 4-axis MCC board



LED	Signal
D3	Axis 4 enabled
D4	Axis 3 enabled
D5	Axis 2 enabled
D6	Axis 1 enabled

Table 24 Pinouts for J1 I/O 1 to 12

Pin no.	Signal	Pin no.	Signal
1	Input 1	26	Not connected
2	Output 1	27	Not connected
3	Input 2	28	Not connected
4	Output 2	29	Not connected
5	Input 3	30	Not connected
6	Output 3	31	Not connected
7	Input 4	32	Not connected
8	Output 4	33	Not connected
9	Input 5	34	Not connected
10	Output 5	35	Not connected
11	Input 6	36	Not connected
12	Output 6	37	Not connected
13	Input 7	38	Not connected
14	Output 7	39	Not connected
15	Input 8	40	Not connected
16	Output 8	41	Not connected
17	Input 9	42	Not connected
18	Output 9	43	Not connected
19	Input 10	44	Not connected
20	Output 10	45	Not connected
21	Input 11	46	Not connected
22	Output 11	47	Picopath ID (0=True) Hypath ID (NC=1=False)
23	Input 12	48	Not connected
24	Output 12	49	Not connected
25	Not connected	50	Ground

Table 25 J2 Axis 1 to 4

Pin no.	Signal	Pin no.	Signal
1	/Axis 1 enable	21	Not connected
2	/Axis 2 enable	22	Not connected
3	/Axis 3 enable	23	Not connected
4	/Axis 4 enable	24	Not connected
5	Not connected	25	Not connected
6	Not connected	26	Ground
7	/Watchdog enable	27	Ground
8	Axis 1A	28	Analog common
9	Axis 1B	29	Axis 1 analog
10	Axis 1Z	30	Axis 2 analog
11	Axis 2A	31	Axis 3 analog
12	Axis 2B	32	Axis 4 analog
13	Axis 2Z	33	Not connected
14	Axis 3A	34	Not connected

15	Axis 3B	35	Ground
16	Axis 3Z	36	+5 V
17	Axis 4A	37	+5 V
18	Axis 4B	38	+12 V
19	Axis 4Z	39	-12 V
20	Not connected	40	Ground

Utility and serial isolation board (141307)

Figure 67 Utility and serial isolation board

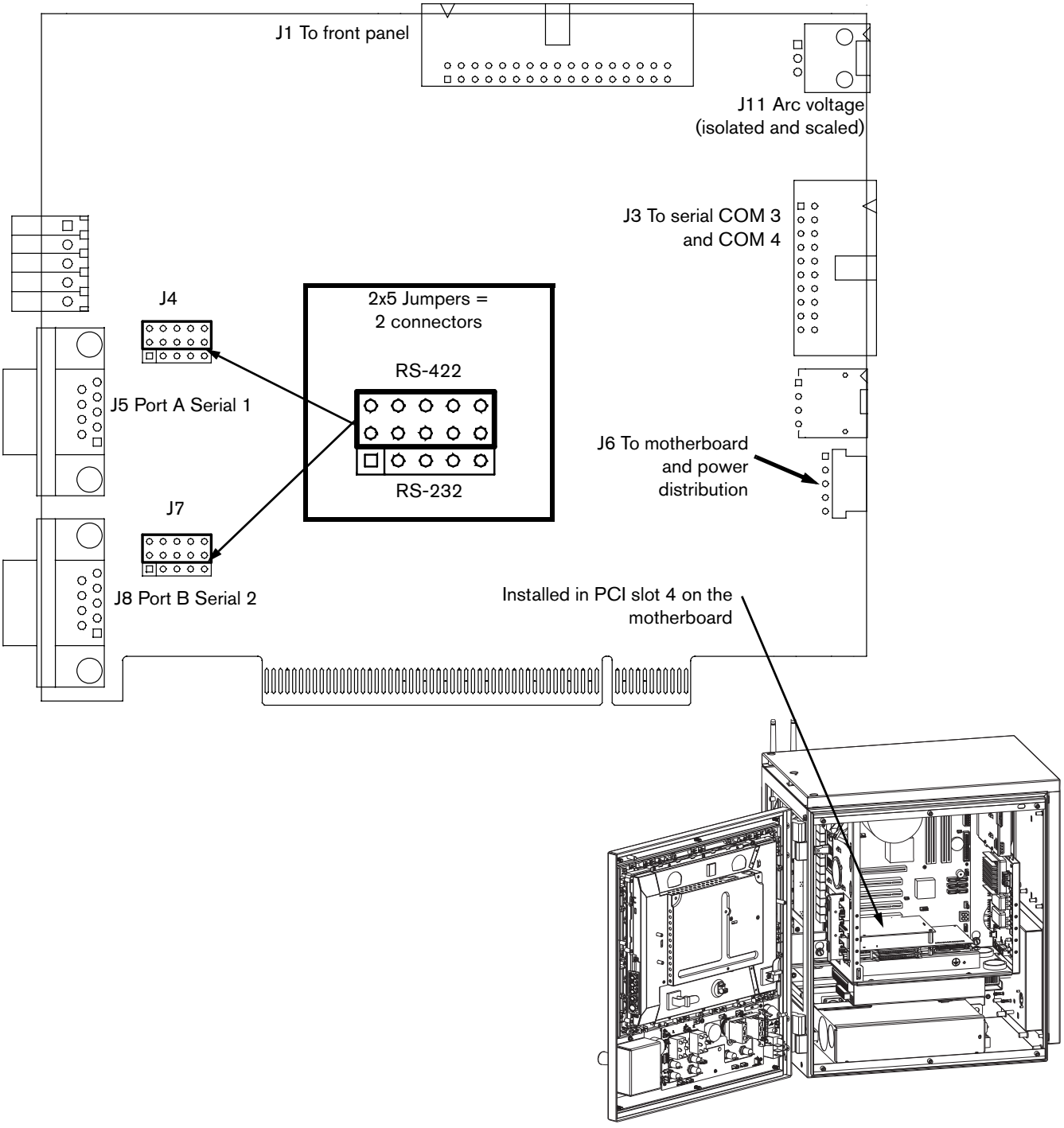


Table 26 Pinouts for J1 to J8

Pin no.	Signal	Pin no.	Signal
J1 To and from the front panel		**J2 Remote on/off**	
1	Start	1	Motherboard ON/OFF 1
2	Stop	2	Ground
3	Manual	3	Ground
4	Forward on path	4	12 V
5	Backward on path	5	Ground
6	Joystick +Y	**J5 Serial port A, Serial 1**	
7	Joystick -Y	1	Not connected
8	Joystick -X	2	Transmit A-
9	Joystick +X	3	Receive A-
10	Ground	4	Transmit A+
11	Ground	5	Signal ground 1
12	Front panel ID1	6	Not connected
13	Front panel ID0	7	Receive A+
14	Front panel ID1	8	Not connected
15	Ground	9	Not connected
16	Ground	**J6 To motherboard on/off and power distribution**	
17	Front panel ID2	1	Field power
18	Auto select 1	2	Chiller
19	Manual select 1	3	Logic ground
20	Raise torch 1	4	Motherboard ON/OFF 1
21	Lower torch 1	5	Motherboard ON/OFF 2
22	Auto select 2	**J8 Serial port B, Serial 2**	
23	Manual select2	1	Not connected
24	Raise torch 2	2	Transmit B-
25	Lower torch 2	3	Receive B-
26	Station enable LED 1	4	Transmit B+
27	Station enable LED 2	5	Signal ground 2
28	Motherboard ON/OFF 1	6	Not connected
29	Motherboard ON/OFF 2	7	Receive B+
30	Cut speed	8	Not connected
31	Jog speed	9	Not connected
32	4.096 V	**J11**	
33	5 V	1	Ground
34	12 V	2	Arc voltage
		3	Not connected

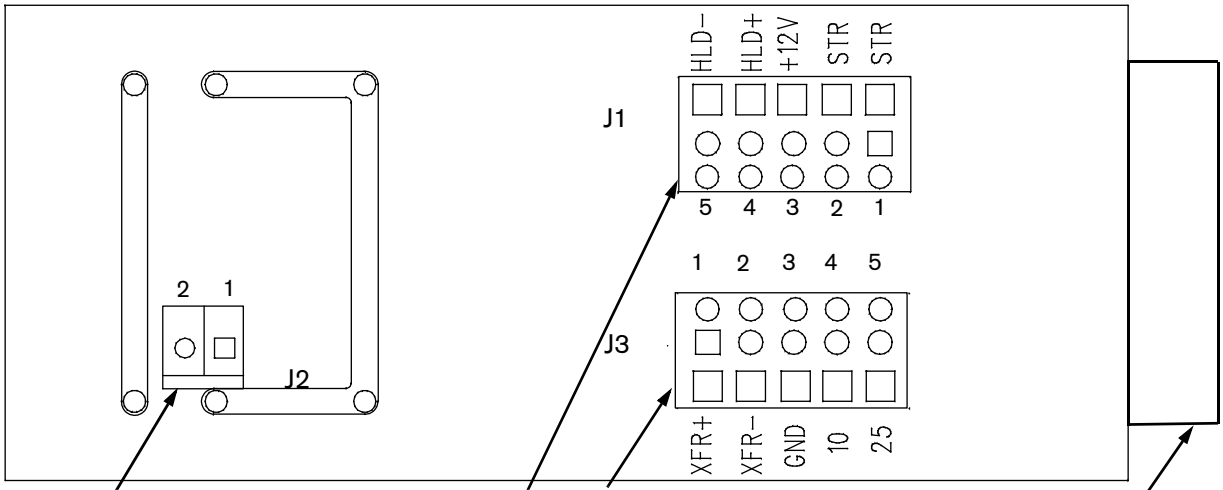
Table 27 Pinouts for J3

J3 To Serial COM3 and COM4	
1	Ground
2	DR_A
3	/RXD_INA
4	TS_A
5	TXD_OUTA
6	TS_A
7	DR_A
8	Ground
9	Ground
10	Not connected
11	Ground
12	DR_B
13	/RXD_INB
14	TS_B
15	TXD_OUTB
16	TS_B
17	DR_B
18	Ground
19	Ground
20	Not connected

Plasma interface board (141267)

The plasma interface board is a component of the plasma interface assembly (228256) described on page 143.

Figure 68 Plasma interface board



These pins are connected and receive arc voltage signals (-) from the control board in the plasma system

J1 and J3 carry I/O signals between the CNC and the control board in the plasma system

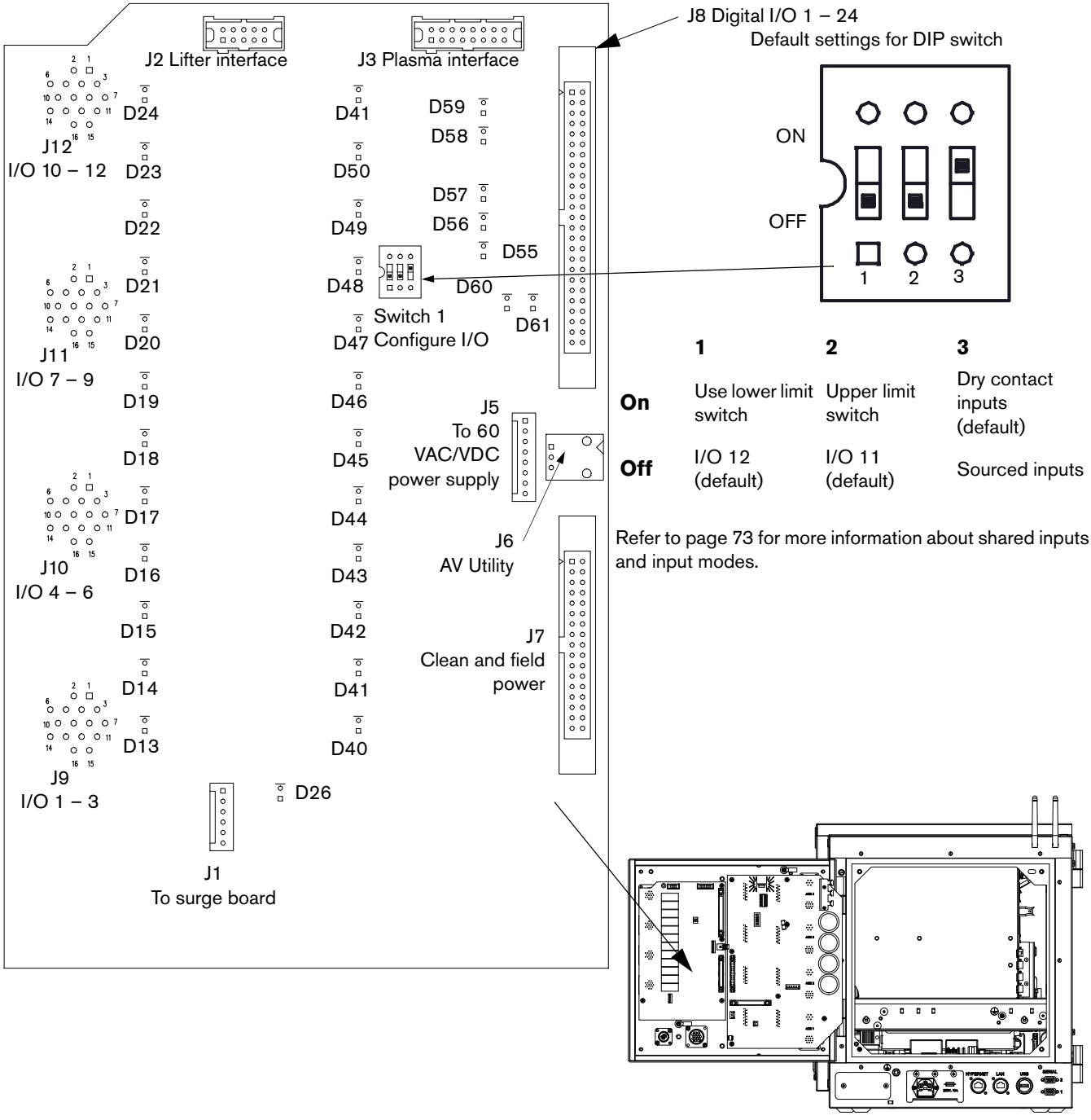
15-pin D-sub connector (P1) for the plasma interface cable to the CNC

Table 28 Pinouts for J1 to J3

Pin no.	Signal
J1 I/O terminal block	
1	Start output+ (contact closure)
2	Start output- (contact closure)
3	+12 V output (maximum 50 mA)
4	Hold output+
5	Hold output-
J2 Negative electrode	
1	Arc voltage-
2	Arc voltage-
J3 I/O terminal block	
1	Transfer input+
2	Transfer input-
3	Ground
4	Not used
5	Not used

Relay I/O board (141278)

Figure 69 Relay I/O board



	1	2	3
On	Use lower limit switch	Upper limit switch	Dry contact inputs (default)
Off	I/O 12 (default)	I/O 11 (default)	Sourced inputs

Refer to page 73 for more information about shared inputs and input modes.

Table 29 Status LED for E-stop

LED	Color and condition
D26	Green when Input 21, E-stop, is satisfied (LS2 on the Surge board has been activated by the external E-stop circuit)

Table 30 Input LEDs

LED			Color and condition
D13	Input 1	J9	These LEDs correspond to the 4 I/O connectors: In dry contact mode, input 1 – 12 LEDs are normally illuminated (green) by internal pull ups, and turn off when an input is applied. This is the default mode. In sourced input mode, input 1 – 12 LEDs are normally OFF, and illuminated (green) when an external 12 – 24 VDC is applied at each input.
D14	Input 2		
D15	Input 3		
D16	Input 4	J10	
D17	Input 5		
D18	Input 6		
D19	Input 7	J11	
D20	Input 8		
D21	Input 9		
D22	Input 10	J12	
D23	Input 11		
D24	Input 12		

Table 31 Output LEDs

LED			Color and condition
D40	Output 1	J9	Green when the relay for the corresponding I/O is activated.
D41	Output 2		
D42	Output 3		
D43	Output 4	J10	
D44	Output 5		
D45	Output 6		
D46	Output 7	J11	
D47	Output 8		
D48	Output 9		
D49	Output 10	J12	
D50	Output 11		
D51	Output 12		

Table 32 Status LEDs for signals on the DB-15 plasma interface connector

LED	Color and condition
D55	Green when Input 13, Transfer (also Machine Motion), is activated by the plasma system
D60	Green when Output 14, Hold Ignition, is activated by Phoenix
D61	Green when Output 13, Plasma Start (also Cut Control), is activated by Phoenix

Table 33 Status LEDs for signals on the DB-9 lifter interface connector

LED	Color and condition
D26	Green when Input 21, E-stop, is satisfied (LS2 on the Surge board has been activated by the external E-stop circuit)
D56	Green when Input 12, Lower Limit, is applied to the Lifter Interface DB-9 connector
D57	Green when Input 11, Upper Limit, is applied to the Lifter Interface DB-9 connector
D58	Green when Input 16, Torch Collision, is in run condition (the torch is in place). This LED turns off during a torch collision.
D59	Green when Input 15, Nozzle Sense 1 (also Ohmic Contact or Plate Contact) is activated, when the torch makes contact with the work piece.

Table 34 Pinout for J1 to J6

Pin no.	Signal	Pin no.	Signal
J1 To surge board		**J5 To 60 V AC/DC power supply**	
1	E-Stop active A	1	60 V inhibit B
2	E-Stop active B	2	60 V inhibit A
3	60 V inhibit A	3	Ground
4	60 V inhibit AB	4	AC/DC power good
5	Spare Out A	5	60 V inhibit A
6	Spare Out B	6	60 V inhibit B
J2 Lifter interface		7	XP 5 V standby
1	+12 V	8	Not connected
2	Lower limit switch	**J6 Arc voltage utility**	
3	Upper limit switch	1	Ground
4	Breakaway switch	2	Arc voltage
5	Field ground	3	Not connected
6	Field ground		
7	Plate contact -12 V		
8	Plate contact sense		
9	Plate contact common		
10	Not connected		
J3 plasma interface			
1	+12 V		
2	+12 V		
3	Plasma start output		
4	Plasma start output		
5	Hold ignition output +		
6	Hold ignition output		
7	Transfer input+		
8	Transfer input-		
9	Field ground		
10	Field ground		
11	Field ground		
12	Field ground		
13	Field ground		
14	Electrode arc voltage-		
15	Electrode arc voltage+		
16	Not connected		

Table 35 Pinouts for J7 clean and field power

Pin no.	Signal	Pin no.	Signal
1	+12 V	18	Field ground
2	Field ground	19	Regen active D
3	-12 V	20	Not connected
4	Field ground	21	Not connected
5	+5 V	22	Not connected
6	Field ground	23	Not connected
7	+24 V	24	Not connected
8	Field ground	25	Not connected
9	+24 V	26	Not connected
10	Field ground	27	Logic +5 V
11	Servo 1 fault	28	Logic ground
12	Field ground	29	Logic +12 V
13	Servo 2 fault	30	Logic ground
14	Field ground	31	Logic -12 V
15	Servo 3 fault	32	Logic ground
16	Field ground	33	Logic +5 V
17	Servo 4 fault	34	Logic ground

Table 36 Pinouts for J8 digital I/O 1 to 24

Pin no.	Signal	Pin no.	Signal
1	Input 1	26	Output 13
2	Output 1	27	Regen active
3	Input 2	28	Output 14
4	Output 2	29	Input 15
5	Input 3	30	Not connected
6	Output 3	31	Input 16
7	Input 4	32	Not connected
8	Output 4	33	Axis 1 fault
9	Input 5	34	60 V inhibit
10	Output 5	35	Axis 2 fault
11	Input 6	36	Spare output
12	Output 6	37	Axis 3 fault
13	Input 7	38	Not connected
14	Output 7	39	Axis 4 fault
15	Input 8	40	Not connected
16	Output 8	41	E-stop active
17	Input 9	42	Not connected
18	Output 9	43	AC/DC power good
19	Input 10	44	Not connected
20	Output 10	45	Logic ground
21	Input 11, Upper limit	46	Not connected

Pin no.	Signal	Pin no.	Signal
22	Output 11	47	Not connected
23	Input 12, Lower limit	48	Not connected
24	Output 12	49	Not connected
25	Input 13	50	Logic ground

Table 37 Pinouts for I/O interfaces

	Connector J9 I/O 1 – 3	**Connector J10 I/O 4 – 6**	**Connector J11 I/O 7 – 9**	**Connector J12 I/O 10 – 12**
Pin no.	**Signal**	**Signal**	**Signal**	**Signal**
1	Output 1 common	Output 4 common	Output 7 common	Output 10 common
2	Output 1 normally closed	Output 4 normally closed	Output 7 normally closed	Output 10 normally closed
3	Output 1 normally open	Output 4 normally open	Output 7 normally open	Output 10 normally open
4	Output 2 common	Output 5 common	Output 8 common	Output 11 common
5	Output 2 normally closed	Output 5 normally closed	Output 8 normally closed	Output 11 normally closed
6	Output 2 normally open	Output 5 normally open	Output 8 normally open	Output 11 normally open
7	Output 3 common	Output 6 common	Output 9 common	Output 12 common
8	Output 3 normally closed	Output 6 normally closed	Output 9 normally closed	Output 12 normally closed
9	Output 3 normally open	Output 6 normally open	Output 9 normally open	Output 12 normally open
10	Input 1	Input 4	Input 7	Input 10
11	Input 1 common	Input 4 common	Input 7 common	Input 10 common
12	Input 2	Input 5	Input 8	Input 11 (shared with lifter Lower Limit)
13	Input 2 common	Input 5 common	Input 8 common	Input 11 common
14	Input 3	Input 6	Input 9	Input 12 (shared with lifter Upper Limit)
15	Input 3 common	Input 6 common	Input 9 common	Input 12 common
16	Shield	Shield	Shield	Shield

4-axis DC servo board (141281)

Figure 70 4-axis DC servo board

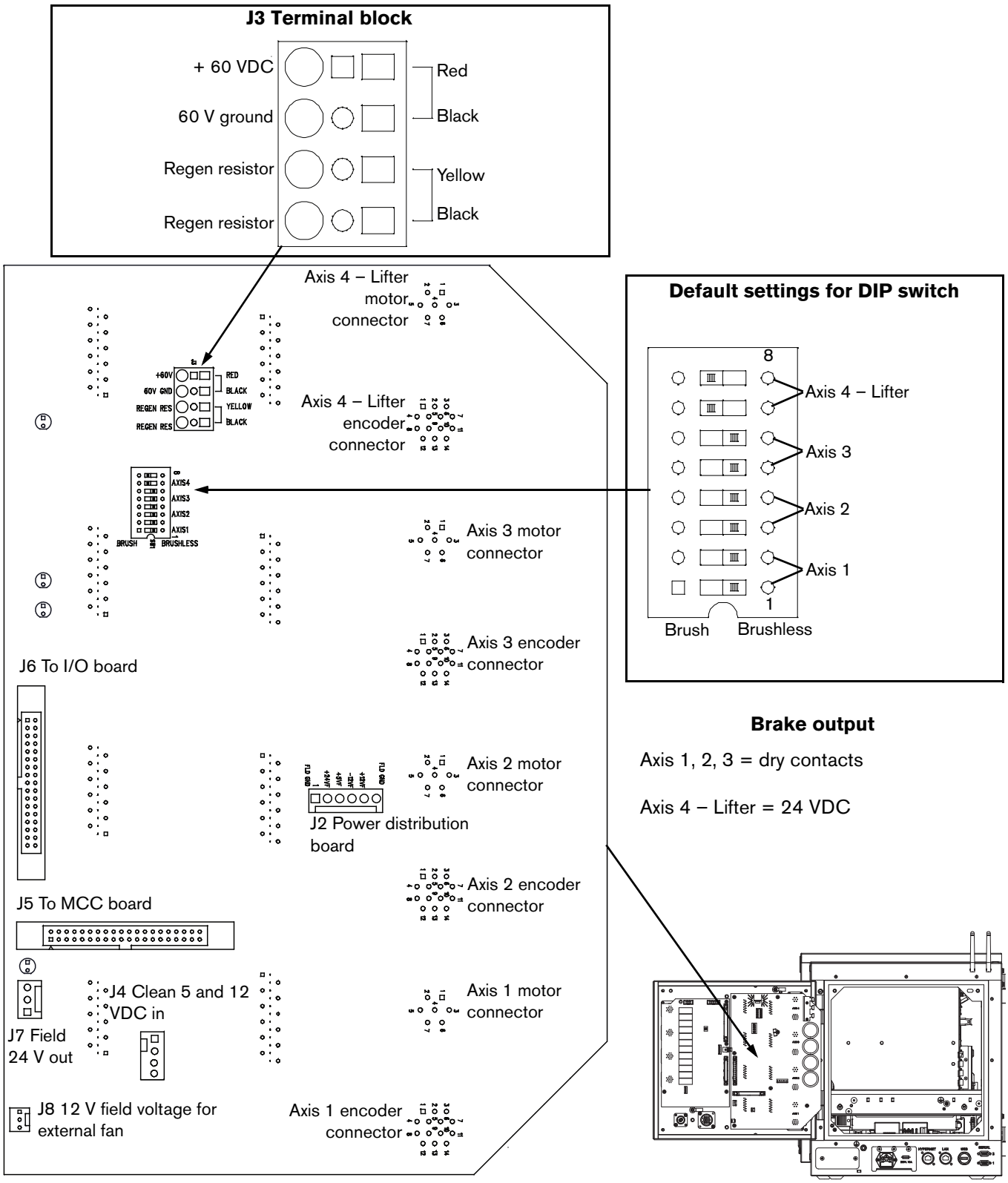


Table 38 Axis fault LEDs

LED	Color and condition
D13	Red, axis 4 fault
D16	Red, axis 3 fault
D17	Red, axis 2 fault
D21	Red, axis 1 fault

When illuminated, these LEDs indicate that the servo amplifier for the corresponding axis has shut down and that a fault is present, such as:

- Motor or cable short circuit or open circuit
- Excessive DC input voltage to the amplifier
- Amplifier is overheated
- Power up reset

Table 39 Pinouts for J2 to J4

Pin no.	Signal	Pin no.	Signal
J2 Power distribution board		**J3 Terminal block**	
1	Field ground	1	+60 VDC
2	+24 V	2	60 V power ground
3	+5 V	3	Regen resistor
4	-12 V	4	Regen resistor
5	+12 V	**J4 Clean 5 V and 12 V in**	
6	Field ground	1	+5 VDC
		2	Not connected
		3	+12 VDC
		4	Ground

Table 40 Pinouts for J5 to MCC board

Pin no.	Signal	Pin no.	Signal
1	Axis 1 enable	21	Not connected
2	Axis 2 enable	22	Not connected
3	Axis 3 enable	23	Not connected
4	Axis4enable	24	Not connected
5	Not connected	25	Not connected
6	Not connected	26	Logic ground
7	Watchdog enable	27	Logic ground
8	Axis 1A	28	Analog common
9	Axis 1B	29	Axis 1 analog
10	Axis 1Z	30	Axis 2 analog
11	Axis 2A	31	Axis 3 analog
12	Axis 2B	32	Axis 4 analog
13	Axis 2Z	33	Not connected
14	Axis 3A	34	Not connected
15	Axis 3B	35	Logic ground
16	Axis 3Z	36	Logic +5 V
17	Axis 4A	37	Logic +5 V
18	Axis 4B	38	Logic +12 V
19	Axis 4Z	39	Logic -12 V
20	Not connected	40	Logic ground

Table 41 Pinouts for J6 to I/O board (clean and field power)

Pin	Signal	Pin	Signal
1	+12 V	18	Field ground
2	Field ground	19	Not connected
3	-12 V	20	Field ground
4	Field ground	21	Not connected
5	+5 V	22	Not connected
6	Field ground	23	Not connected
7	+24 V	24	Not connected
8	Field ground	25	Not connected
9	+24 V	26	Not connected
10	Field ground	27	+5 V
11	Axis 1 fault	28	Logic ground
12	Field ground	29	Logic +12 V
13	Axis 2 fault	30	Logic ground
14	Field ground	31	Logic -12 V
15	Axis 3 fault	32	Logic ground
16	Field ground	33	Logic +5 V
17	Axis 4 fault	34	Logic ground

Table 42 Pinouts for J7 and J8

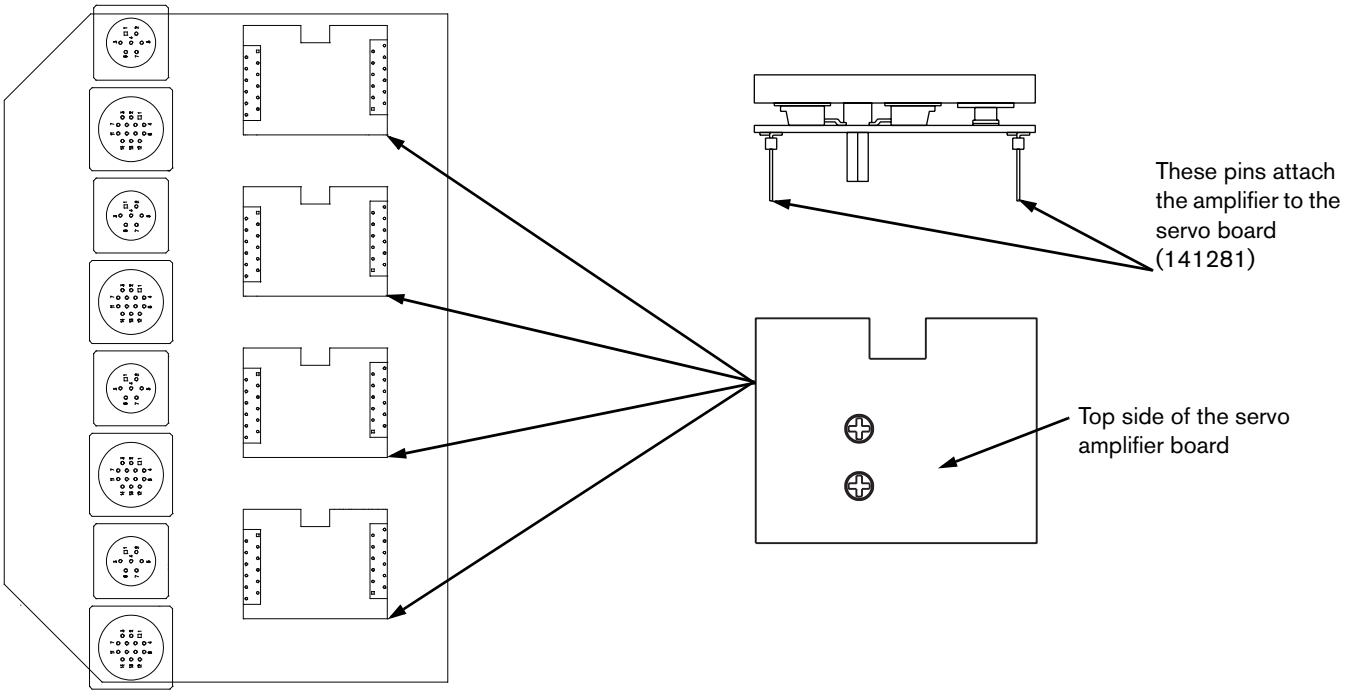
Pin no.	Signal
J7 Field 24 V output	
1	+24 V
2	Field ground
3	Not connected
J8 Exterior fan	
1	Field ground
2	+12 V
3	Field ground

Table 43 Pinouts for motor and encoder interfaces

Pin no.	Axis 4 – Lifter	Axis 3 (Dual gantry)	Axis 2 (Y or X)	Axis 1 (X or Y)
	J16 (motor)	**J15 (motor)**	**J14 (motor)**	**J13 (motor)**
1	Motor/brake A	Motor/brake A	Motor/brake A	Motor/brake A
2	Motor/brake B	Motor/brake B	Motor/brake B	Motor/brake B
3	Motor/brake C	Motor/brake C	Motor/brake C	Motor/brake C
4	Brake+ (24 VDC)	Brake+ (dry contact)	Brake+ (dry contact)	Brake+ (dry contact)
5	Brake- (common)	Brake- (dry contact)	Brake- (dry contact)	Brake- (dry contact)
6	Shield	Shield	Shield	Shield
7	Shield	Shield	Shield	Shield
	J12 (encoder)	**J11 (encoder)**	**J10 (encoder)**	**J9 (encoder)**
1	Encoder +5 V	Encoder +5 V	Encoder +5 V	Encoder +5 V
2	Field ground	Field ground	Field ground	Field ground
3	Axis 4A	Axis 3A	Axis 2A	Axis 1A
4	Axis 4A\Ch	Axis 3A\Ch	Axis 2A\Ch	Axis 1A\Ch
5	Axis 4B	Axis 3B	Axis 2B	Axis 1B
6	Axis 4B\	Axis 3B\	Axis 2B\	Axis 1B\
7	Axis 4Z	Axis 3Z	Axis 2Z	Axis 1Z
8	Axis 4Z\	Axis 3Z\	Axis 2Z\	Axis 1Z\
9	+V Encoder/Hall out	+V Encoder/Hall out	+V Encoder/Hall out	+V Encoder/Hall out
10	Field ground	Field ground	Field ground	Field ground
11	Encoder/Hall A	Encoder/Hall A	Encoder/Hall A	Encoder/Hall A
12	Encoder/Hall B	Encoder/Hall B	Encoder/Hall B	Encoder/Hall B
13	Encoder/Hall C	Encoder/Hall C	Encoder/Hall C	Encoder/Hall C
14	Shield	Shield	Shield	Shield

Servo amplifier (228360)

Figure 71 Servo amplifier board



Surge board (141287)

Figure 72 Surge board

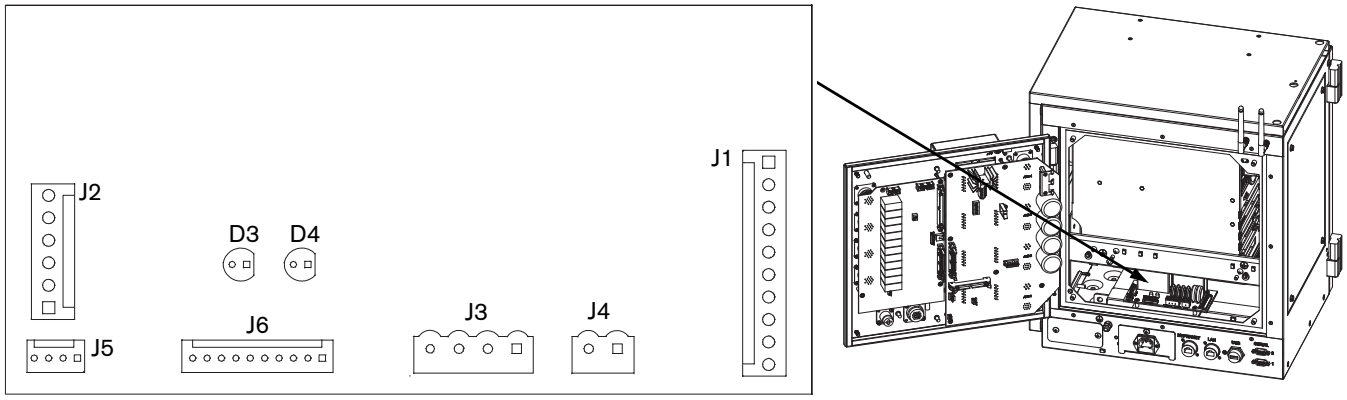


Table 44 Pinouts for J1 to J3

Pin no.	Signal	Pin no.	Signal
J1		**J4**	
1	Line 1	1	Line 2, neutral
2	Line 1 ATX	2	Line 1
3	Not connected	**J5**	
4	Not connected	1	E-Stop sense A
5	Not connected	2	E-Stop sense B
6	Not connected	3	60 V Enable A
7	Line 2 MOV	4	60 V Enable B
8	Earth ground	**J6**	
9	Line 1 MOV	1	+24 V
10	Earth ground	2	E-Stop monitor 1A
J2		3	E-Stop monitor 1B
1	Field ground	4	E-Stop monitor 2A
2	+24 V	5	E-Stop monitor 2B
3	Not connected	6	24 V coil 1A
4	Not connected	7	24 V coil 1B
5	Not connected	8	24 V coil 2A
6	Not connected	9	24 V coil 2B
J3		10	Field ground
1	Line 1 ATX	**LEDs**	**Color and condition**
2	Line 2	Both D3 and D4 must be illuminated to indicate that the Edge Pro Ti E-stop is satisfied and to enable servo drives and motor activity.	
3	Line 1 60 VDC power supply	D3	Green. Illuminated when E-stop CPC pins 8 to 9 are closed and relay LS2 has power.
4	Line 2 60 VDC power supply	D4	Green. Illuminated when E-stop CPC pins 6 to 7 are closed and relay LS1 has power.

Plasma interface assembly (228256)

Figure 73 Plasma interface board (141267)

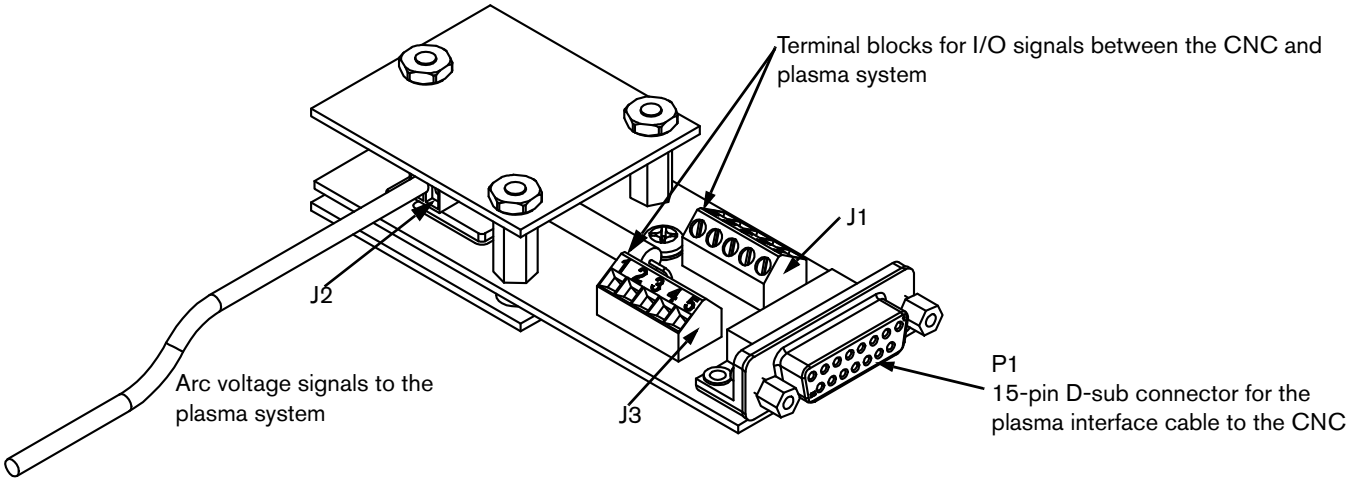


Table 45 Pinouts on the plasma interface board

P1 Plasma interface cable connector			
Pin no.	**Signal**	**Pin no.**	**Signal**
1	+12 V	9	+12 V
2	Plasma start+	10	Plasma start-
3	Hold ignition+	11	Hold ignition-
4	Transfer+	12	Transfer-
5	Field common	13	Field common
6	Field common	14	Field common
7	Field common	15	Arc voltage
8	Ground		
J1 Terminal block for power supply I/O		**J3 Terminal block for power supply I/O**	
1	Plasma Start+	1	Transfer+
2	Plasma Start-	2	Transfer-
3	+12 VDC	3	Field ground
4	Hold Ignition+	4	Not connected
5	Hold Ignition-	5	Not connected
J2 Terminal block for arc voltage			
1	Arc voltage 250 V		
2	Arc voltage 250 V		

Section 5

EDGE Pro Ti Parts List

EDGE Pro Ti CNC parts

Part	Kit number	Description
Motor	031143	Brushless motor (NEMA 34) for X and Y axes

Sensor Ti THC parts

Replacement Sensor Ti lifter	228209	Includes motor, encoder, (10 lb) magnetic breakaway
Replacement lifter motor with encoder	228189	70 V, with encoder, brake, and harness
Motor to ballscrew coupling	228207	
Ohmic contact wire	228191	
Magnetic breakaway assembly	228193	10 lb
Torch mounting block	128277	35 mm (1-3/8 in.)
	128278	44 mm (1-3/4 in.)
	128279	50 mm (2 in.)
Breakaway sensor and cable	228194	Terminated, includes fastener
Sensor Ti upper sheet metal cover	228195	Includes fasteners
Sensor Ti lower sheet metal cover	228196	Includes fasteners
Sensor Ti lifter silicone end stop	228197	Includes fastener
Ball screw	228198	4 mm pitch, with ball nut, top and bottom bearing blocks and fasteners

Interface assembly kits

Part	Kit number	Description
Plasma interface assembly	228256	Installed in plasma systems with no compatible, built-in voltage divider
Plasma interface assembly for HSD130 plasma systems		See *Cables* for HSD plasma interface and cable kits

Safety circuit kits

Part	Kit number	Description
Safety relay	003239	Manages E-stop and reset logic
E-stop mushroom switch	428025	DPST normally closed, red/yellow, red LED
Reset push button switch	428026	Momentary, SPST normally open, green

Diagnostic kits

Part	Kit number	Description
Comprehensive set of testers	428057	Includes all testers in this table
Communication testers		Ethernet and Hypernet
		Serial interface RS-232 or RS-422 on the utility and serial isolation board
		USB
I/O testers		Green, for dry contact input mode
		Red, for dry contact input mode
		Orange, for sourced contact input mode
		White, for sourced contact input mode
E-stop tester		Blue, for dry contact input mode
		Yellow, for sourced contact input mode
Lifter and plasma interface tester		For lifter and plasma interface connections

Cables

Part	Kit number	Description
E-stop cable, terminated at the CNC end only	223365	3.05 m (10 ft)
	223366	6.08 m (20 ft)
	223367	7.50 m (25 ft)
	223368	10.66 m (35 ft)
	223369	15.25 m (50 ft)
Plasma interface cable for connection to plasma systems with a compatible, built-in voltage divider	223354	3.05 m (10 ft) for Powermax plasma systems
	223355	6.08 m (20 ft) for Powermax plasma systems
	223048	7.50 m (25 ft) for Powermax plasma systems
	223356	10.66 m (35 ft) for Powermax plasma systems
	123896	15.25 m (50 ft) for Powermax plasma systems
Plasma interface and cable for connection to HSD130 plasma systems	428019	3.05 m (10 ft) for HSD 130 plasma systems
	428020	6.08 m (20 ft) for HSD 130 plasma systems
	228247	7.62 m (25 ft) for HSD 130 plasma systems
	428021	10.66 m (35 ft) for HSD 130 plasma systems
	228248	15.25 m (50 ft) for HSD 130 plasma systems
	228306	22.86 m (75 ft) for HSD 130 plasma systems
Plasma interface cable for connection to plasma interface assembly 228256	223358	3.05 m (10 ft)
	223359	6.08 m (20 ft)
	223360	7.62 m (25 ft)
	223361	10.66 m (35 ft)
	228249	15.25 m (50 ft)
	223363	22.86 m (75 ft)

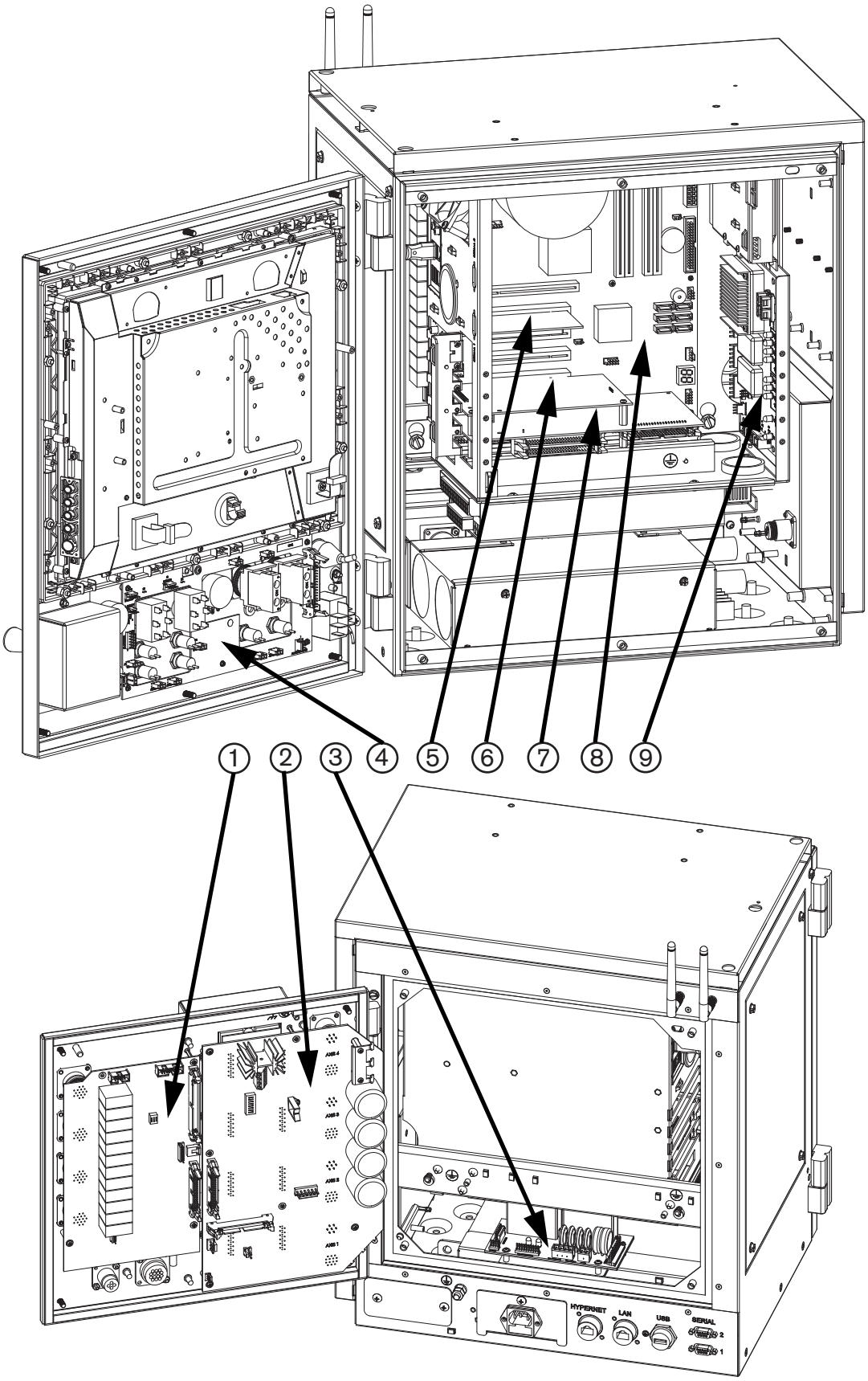
Part	Kit number	Description
Lifter interface cable	223343	3.05 m (10 ft)
	223344	6.08 m (20 ft)
	223345	7.62 m (25 ft)
	223346	10.66 m (35 ft)
	123968	10.97 m (36 ft)
	123897	15.25 m (50 ft)
I/O cable	223349	3.05 m (10 ft)
	223350	6.08 m (20 ft)
	223351	7.62 m (25 ft)
	223352	10.66 m (35 ft)
	223353	15.25 m (50 ft)
Motor cable	223052	1.6m (5 ft)
	223051	3.2 m (10 ft)
	223347	6.08 m (20 ft)
	123972	7.62 m (25 ft)
	123973	10.06 m (33 ft)
	223348	10.66 m (35 ft)
	123974	10.97 m (36 ft)
	123902	15.25 m (50 ft)
Encoder cable	223050	1.6 m (5 ft)
	223049	3.2 m (10 ft)
	223341	6.08 m (20 ft)
	123969	7.62 m (25 ft)
	123970	10.06 m (33 ft)
	223342	10.66 m (35 ft)
	123971	10.97 m (36 ft)
	123899	15.25 m (50 ft)
Hypernet and LAN cable	209195	Ferrite filter
	223212	3.2 m (10 ft)
	223222	6.08 m (20 ft)
	223119	7.62 m (25 ft)
	223223	10.66 m (35 ft)
	223008	15.25 m (50 ft)
	223099	22.86 m (75 ft)
	223100	30.48 m (100 ft)
	223101	45.72 m (150 ft)
	223102	60.96 m (200 ft)

Cable connector kits

Part	Kit number	Description
Cable connector kits (include housings, backshells, pins, sockets)	228126	I/O cable connector (includes connectors for all 4 I/O connections)
	428045	Motor and encoder cable connectors. 1 kit is required for each axis.
	428046	E-stop cable connector
	428047	24 VDC auxiliary power cable connector
	228493	Serial connector, DB 9, male. solder cup, with backshell
	428059	Metal shell, panel mount USB connector with molded cable, metal dust cover, and washer

PCB kits

Part	Location	Kit number	Description
PCB kits	**1**	428002	I/O board (141278)
	2	428003	4-axis servo board (141281)
	3	428005	Surge and safety board (141287)
	4	228450	Operator control panel board (141058)
	5	428063	Wireless board (141223), includes 2 cables and antennas
	6	428001	Utility and serial isolation board (141307)
	7	428004	4-axis MCC board (141191)
	8	228454	Motherboard (141110), with CPU, heatsink/fan, and RAM
	9	228448	Power distribution board (141153)


1
2
3
4
5
6
7
8
9
HYPERNET
LAN
USB
SERIAL 2
SERIAL 1

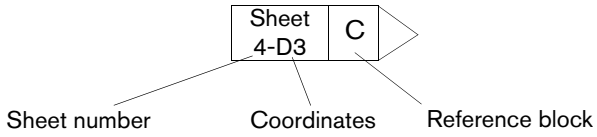
Additional kits

Part	Kit number	Description
Servo bus power supply	428006	60 VDC, 1000 W
ATX power supply	228473	1 U, 300 W, with harness and bracket
Servo amplifier fan	428060	Installed under the shroud on the rear of the CNC
Side cooling fan	428007	Installed under right side and top shroud
Subchassis cooling fan	228474	Internal
CPU fan	428012	Internal
DC servo amplifier	428008	Installed on 4-axis servo board (see *PCB kits*)
Battery for motherboard	428011	3 V lithium, coin cell, CR2032-type
Fuse	208142	240 V, 10 A, slow-blow, 5 mm x 20 mm
Power entry module	428058	Includes internal harness and 2 fuses
Ribbon cable for utility and serial board	229245	
Hasp hardware key	228446	
Hard drive, SATA	228447	Includes Windows XPe operating system
15" LCD touchscreen	228462	
Joy stick	228471	
Speed potentiometer	228470	
Stop switch assembly, red	228468	
Start switch assembly, green	228467	
Power switch	228465	
Station select toggle switch	228469	
White pushbutton switch assembly	228463	
Hypernet/LAN RJ-45 connector	228445	

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

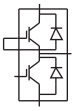

Filter, AC


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

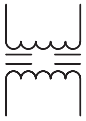

Time delay closed, NC/off


Time delay open, NO/off


Time delay open, NC/on


Time delay closed, NO/off


Transformer


Transformer, air core


Transformer, coil


Triac


VAC source

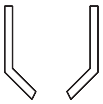

Valve, solenoid

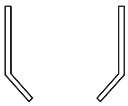

Voltage source

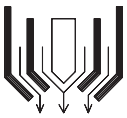

Zener diode

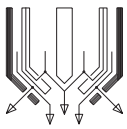
Torch symbols


Electrode

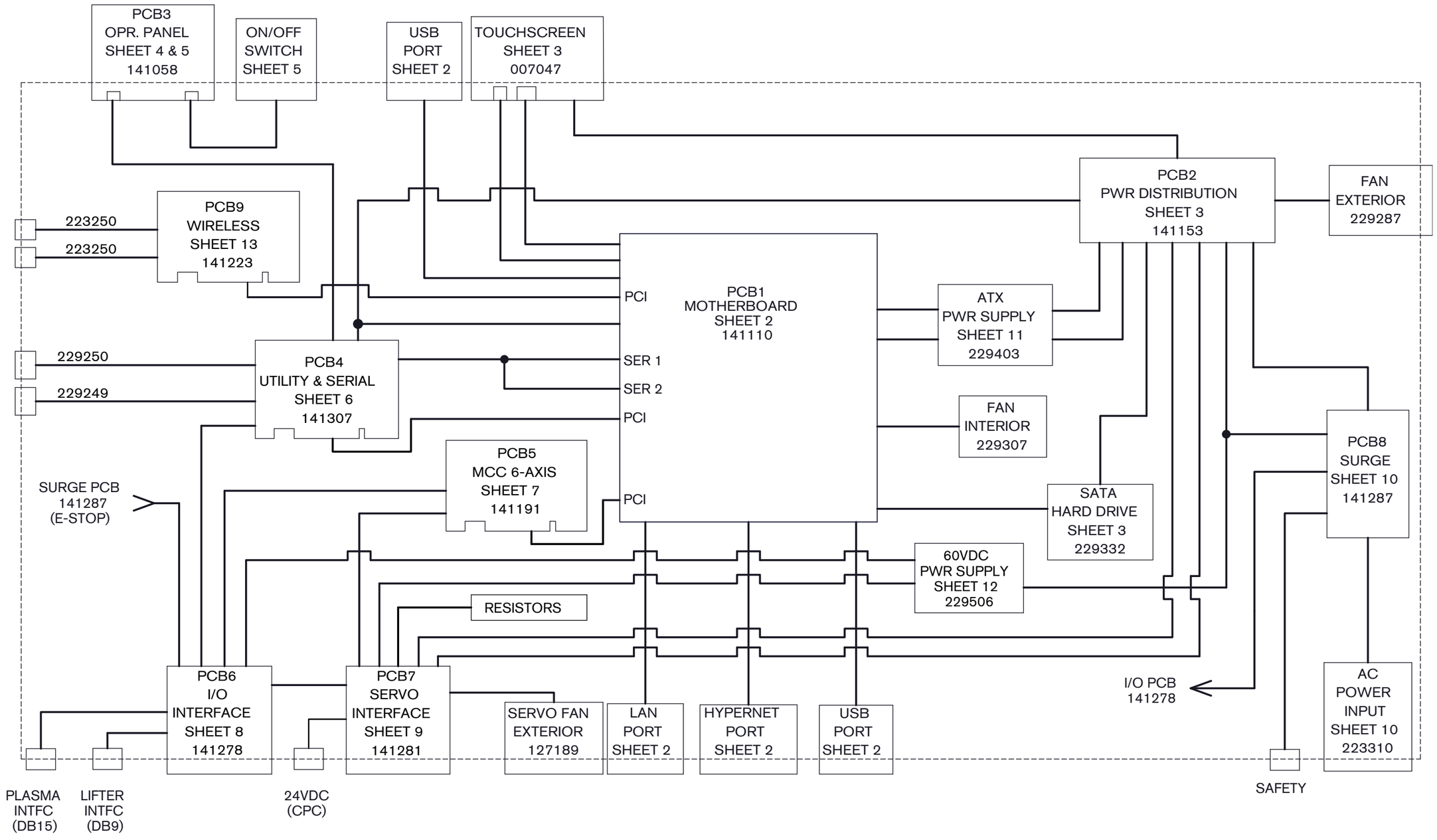

Nozzle


Shield

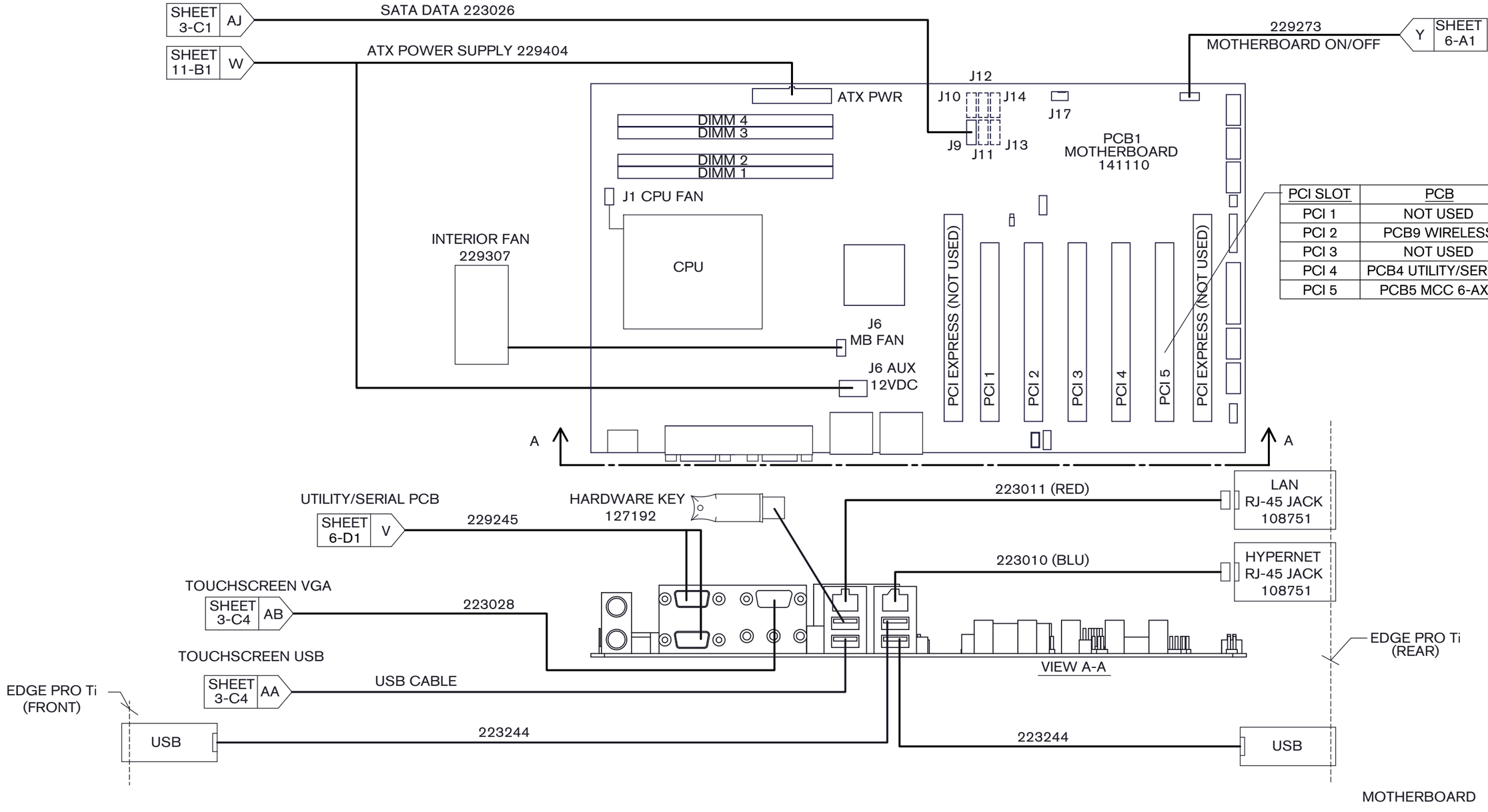

Torch


Torch, HyDefinition™

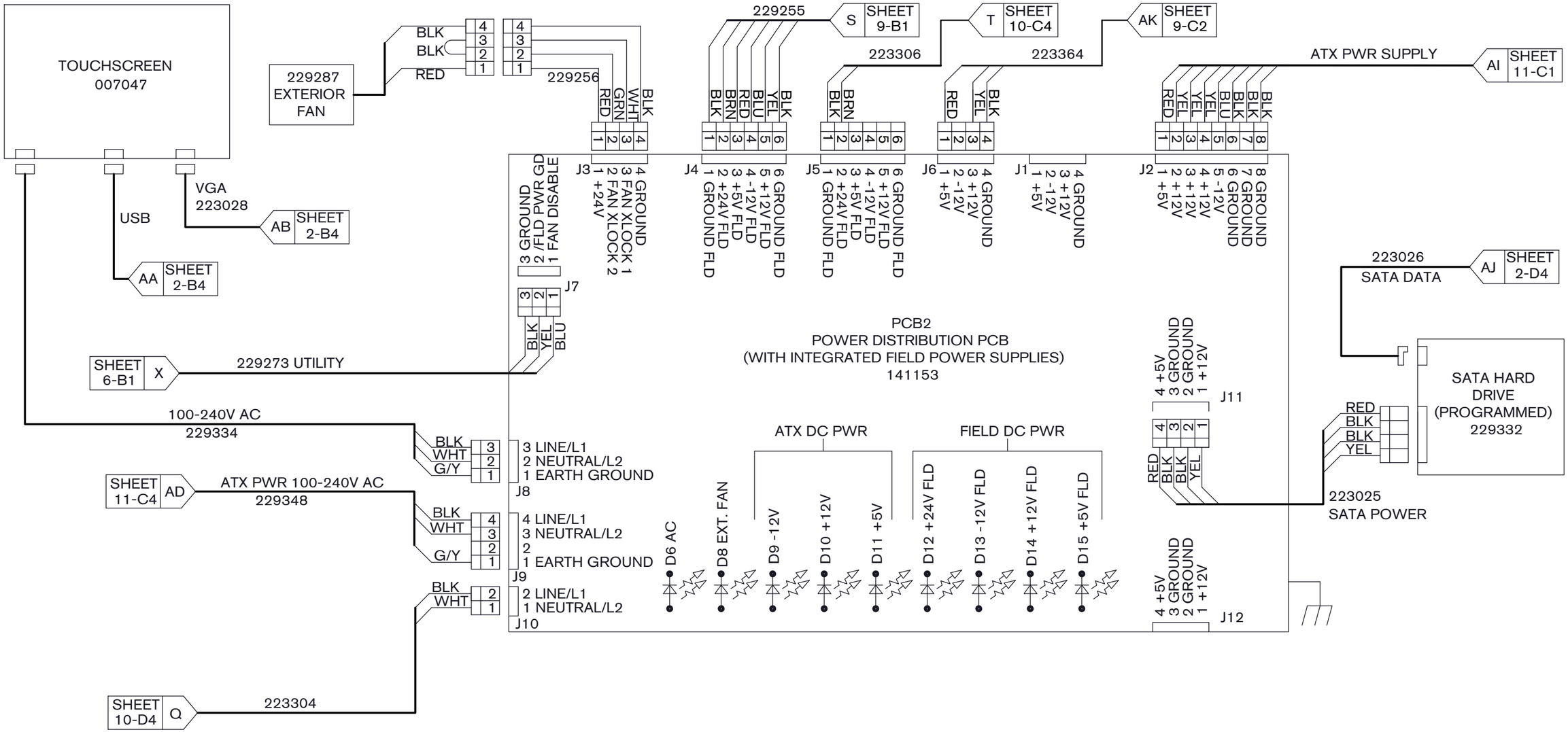
Section



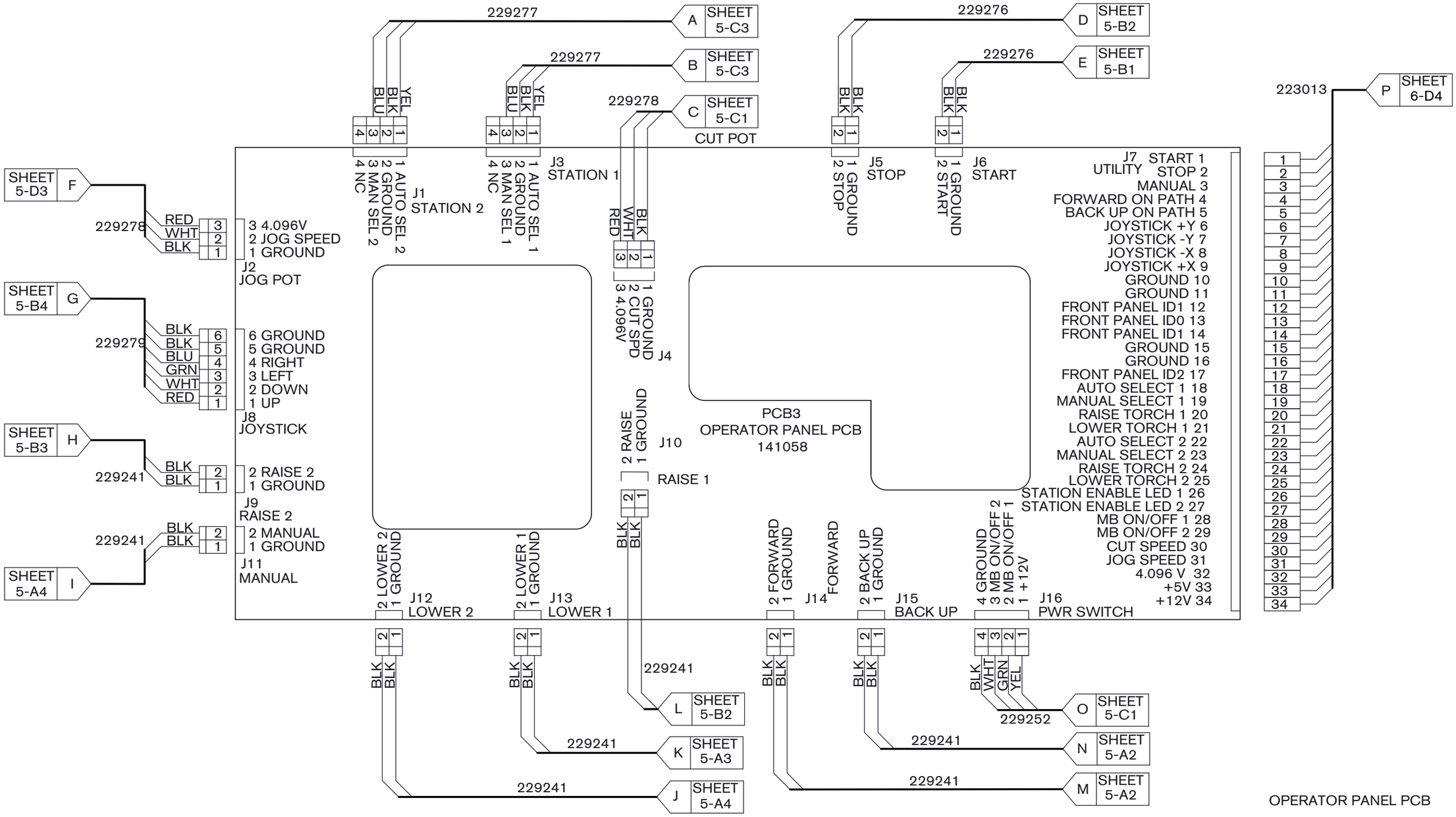
EDGE Pro Ti system wiring



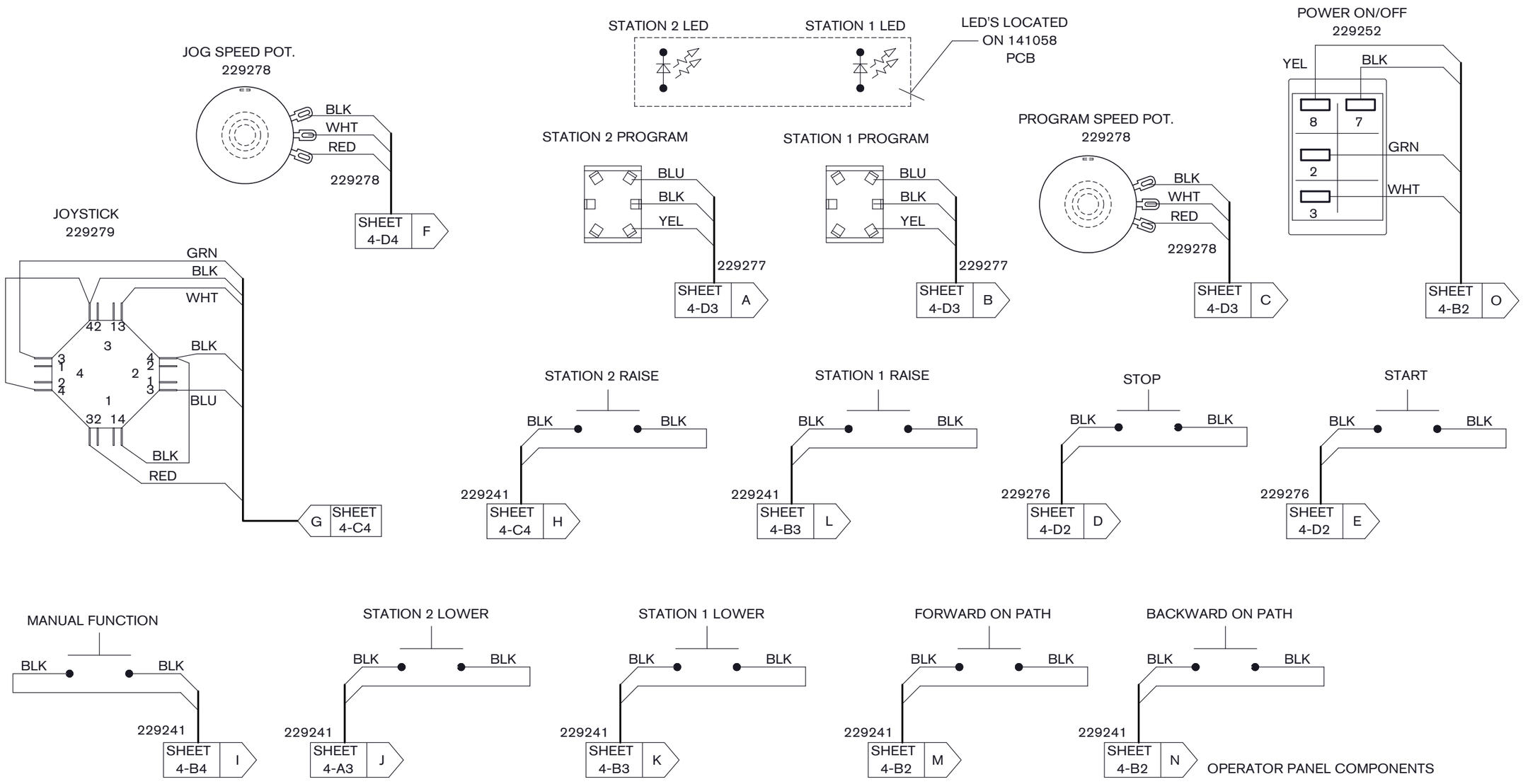
Motherboard



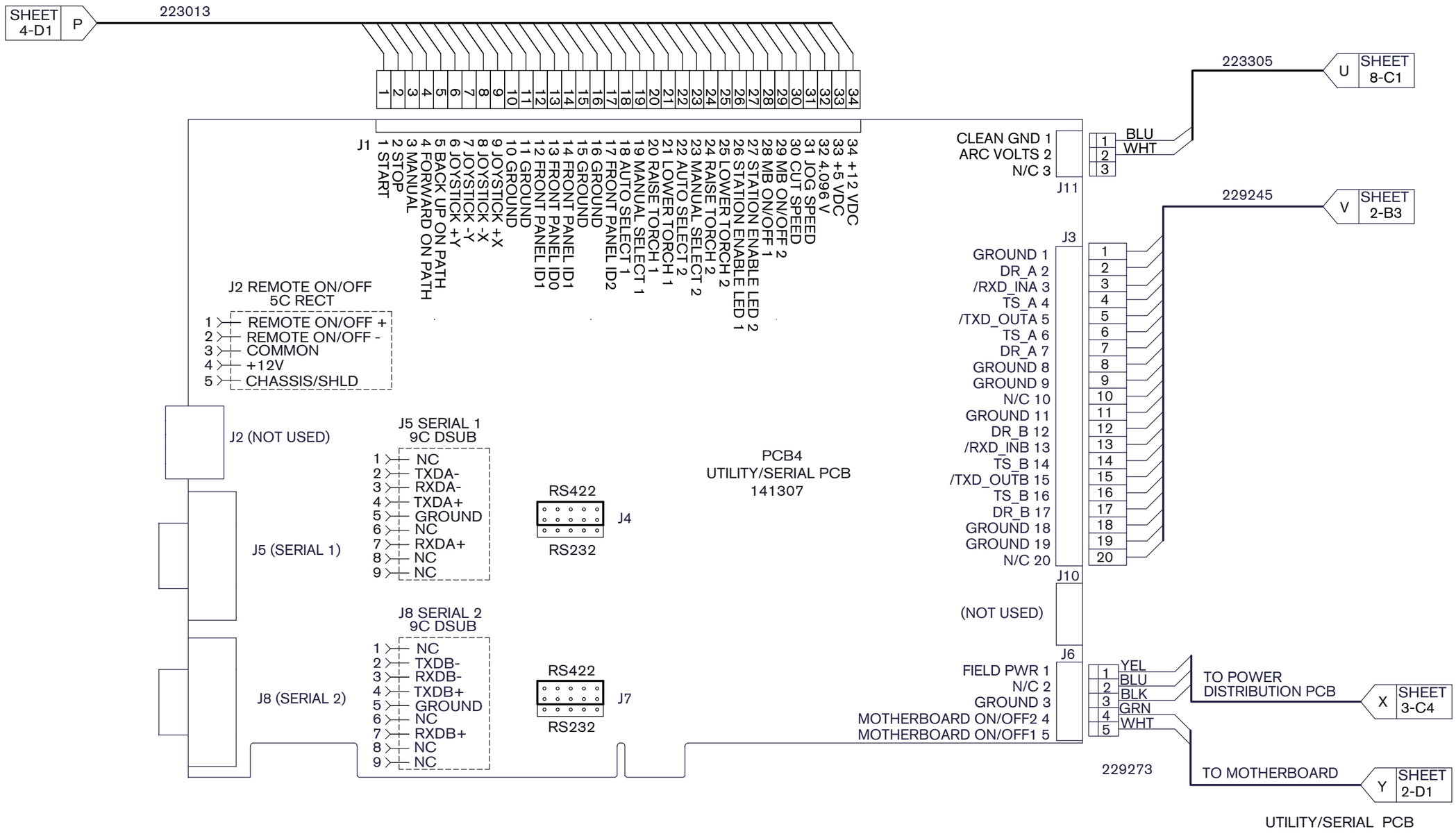
Power distribution board



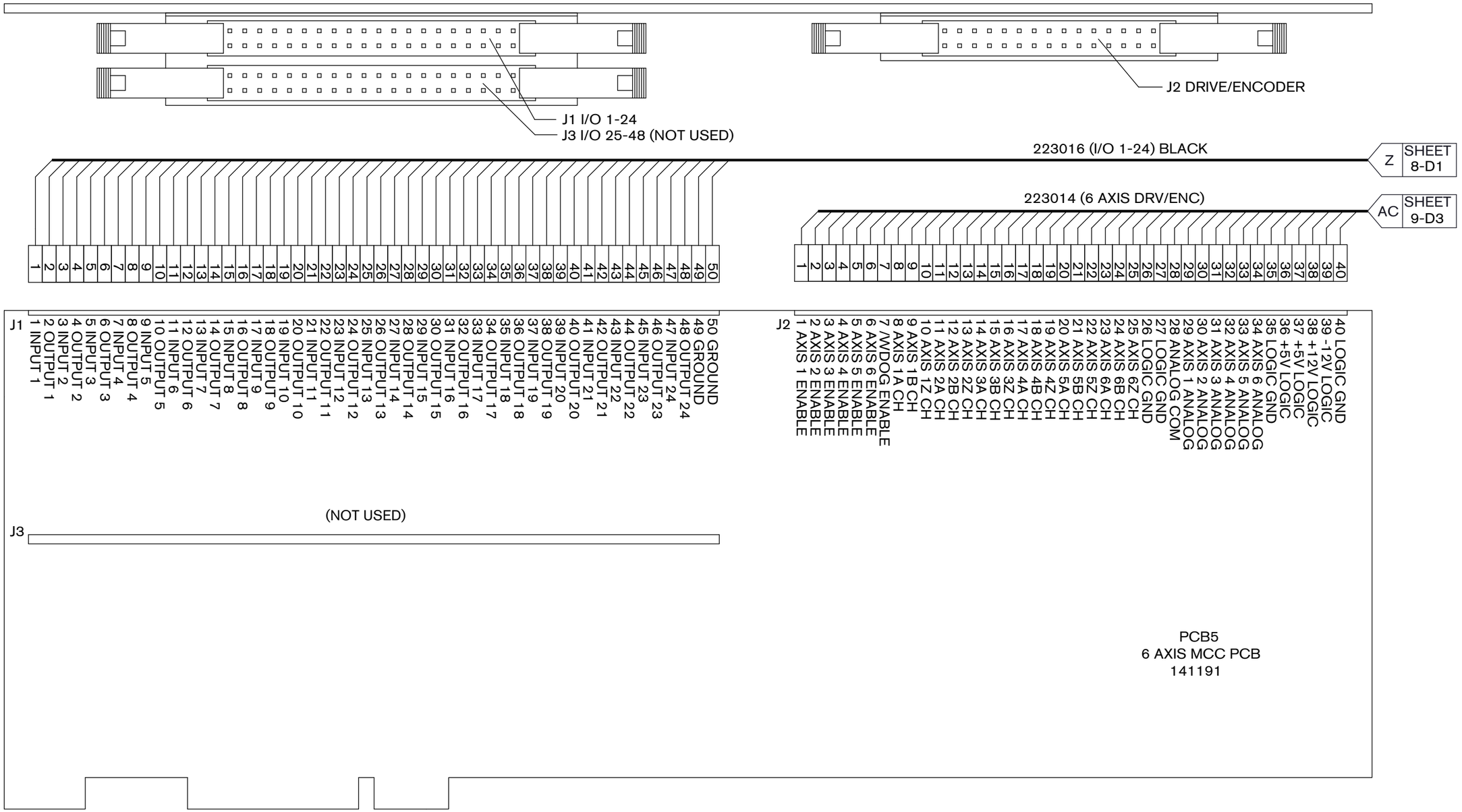
Operator panel board



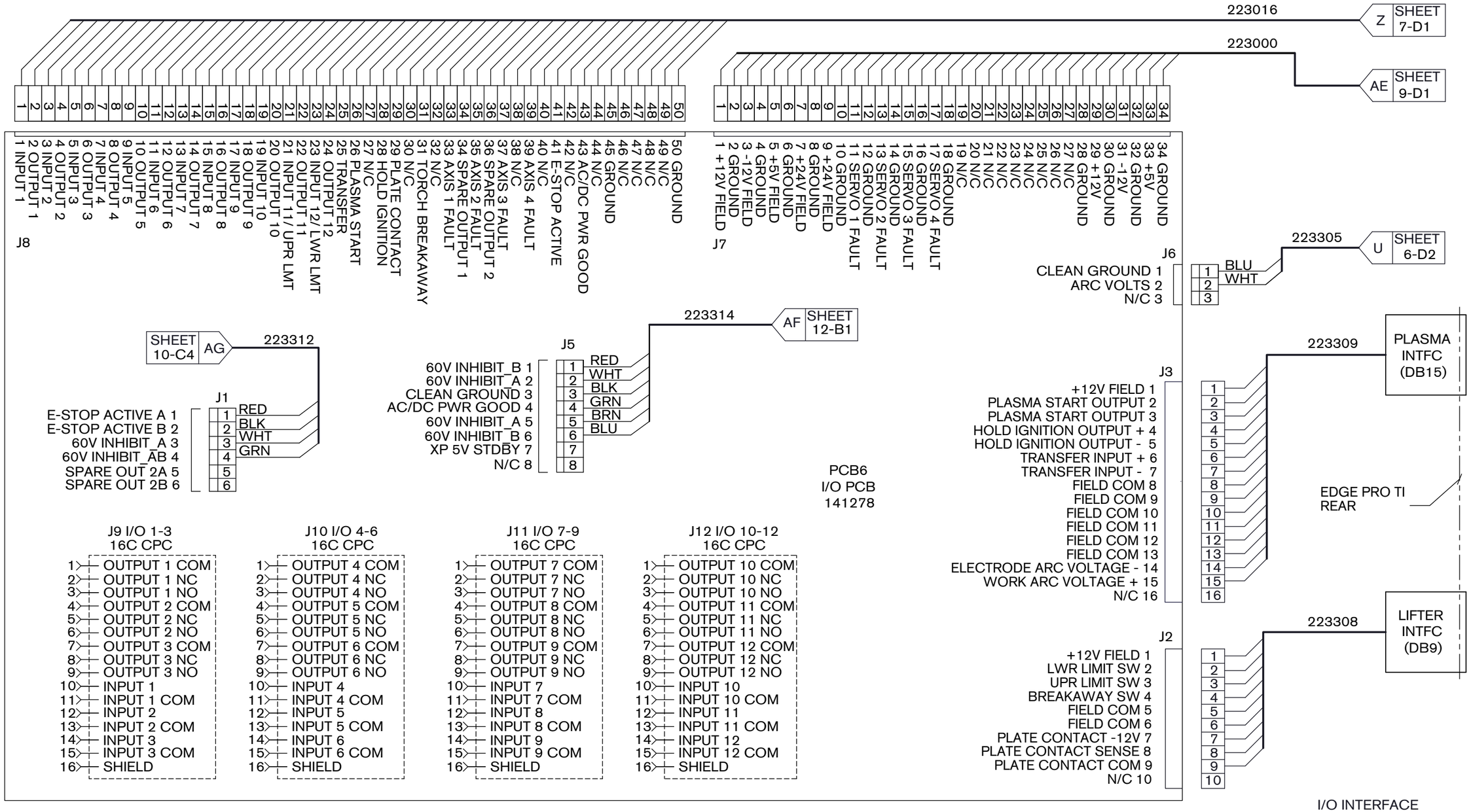
Operator panel components



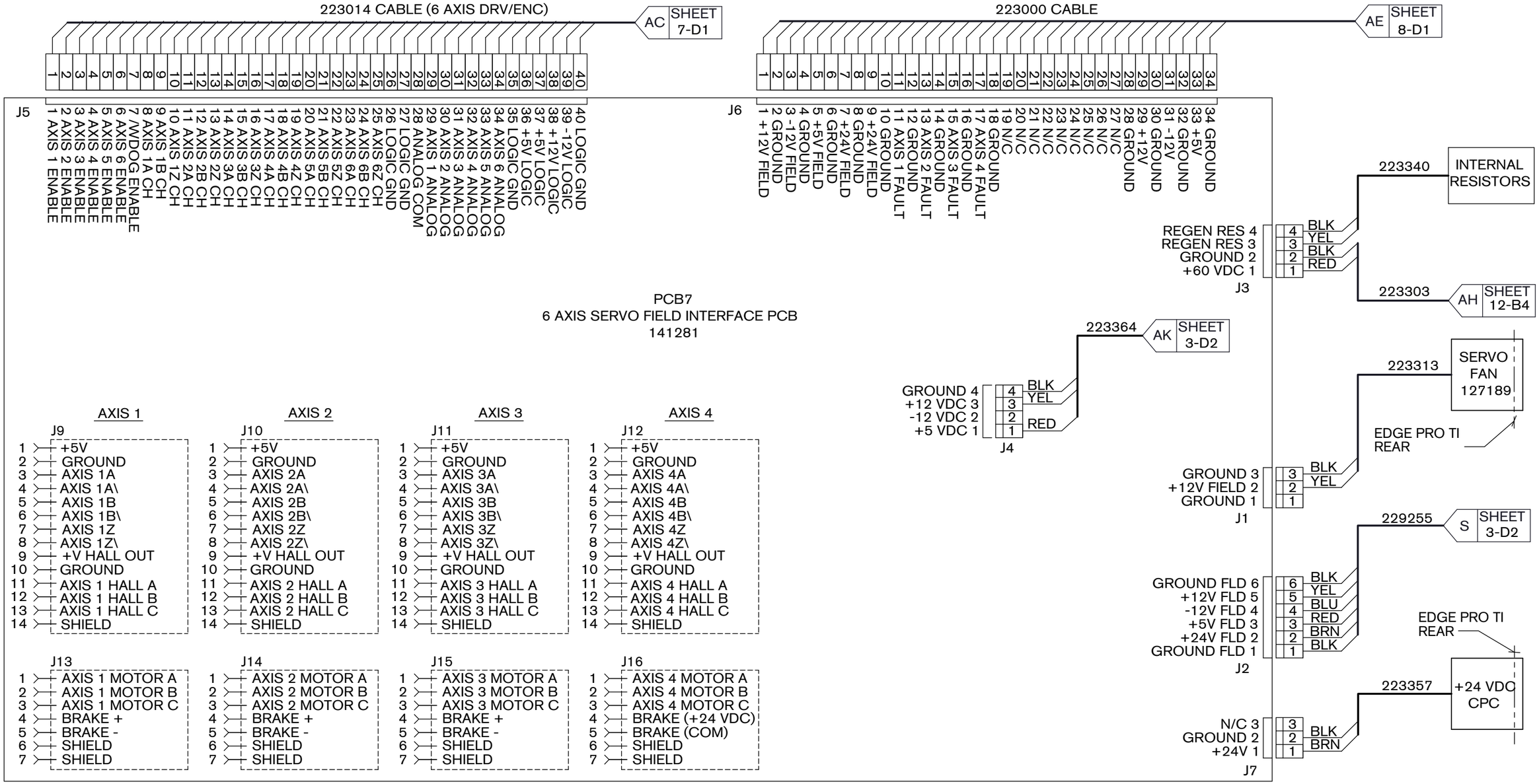
Utility and serial board


J1 I/O 1-24
J3 I/O 25-48 (NOT USED)
J2 DRIVE/ENCODER
223016 (I/O 1-24) BLACK
Z SHEET 8-D1
223014 (6 AXIS DRV/ENC)
AC SHEET 9-D3
J1
1 INPUT 1
2 OUTPUT 1
3 INPUT 2
4 OUTPUT 2
5 INPUT 3
6 OUTPUT 3
7 INPUT 4
8 OUTPUT 4
9 INPUT 5
10 OUTPUT 5
11 INPUT 6
12 OUTPUT 6
13 INPUT 7
14 OUTPUT 7
15 INPUT 8
16 OUTPUT 8
17 INPUT 9
18 OUTPUT 9
19 INPUT 10
20 OUTPUT 10
21 INPUT 11
22 OUTPUT 11
23 INPUT 12
24 OUTPUT 12
25 INPUT 13
26 OUTPUT 13
27 INPUT 14
28 OUTPUT 14
29 INPUT 15
30 OUTPUT 15
31 INPUT 16
32 OUTPUT 16
33 INPUT 17
34 OUTPUT 17
35 INPUT 18
36 OUTPUT 18
37 INPUT 19
38 OUTPUT 19
39 INPUT 20
40 OUTPUT 20
41 INPUT 21
42 OUTPUT 21
43 INPUT 22
44 OUTPUT 22
45 INPUT 23
46 OUTPUT 23
47 INPUT 24
48 OUTPUT 24
49 GROUND
50 GROUND
J2
1 AXIS 1 ENABLE
2 AXIS 2 ENABLE
3 AXIS 3 ENABLE
4 AXIS 4 ENABLE
5 AXIS 5 ENABLE
6 AXIS 6 ENABLE
7 /WDOG ENABLE
8 AXIS 1A CH
9 AXIS 1B CH
10 AXIS 1Z CH
11 AXIS 2A CH
12 AXIS 2B CH
13 AXIS 2Z CH
14 AXIS 3A CH
15 AXIS 3B CH
16 AXIS 3Z CH
17 AXIS 4A CH
18 AXIS 4B CH
19 AXIS 4Z CH
20 AXIS 5A CH
21 AXIS 5B CH
22 AXIS 5Z CH
23 AXIS 6A CH
24 AXIS 6B CH
25 AXIS 6Z CH
26 LOGIC GND
27 LOGIC GND
28 ANALOG COM
29 AXIS 1 ANALOG
30 AXIS 2 ANALOG
31 AXIS 3 ANALOG
32 AXIS 4 ANALOG
33 AXIS 5 ANALOG
34 AXIS 6 ANALOG
35 LOGIC GND
36 +5V LOGIC
37 +5V LOGIC
38 +12V LOGIC
39 -12V LOGIC
40 LOGIC GND
(NOT USED)
J3
PCB5
6 AXIS MCC PCB
141191

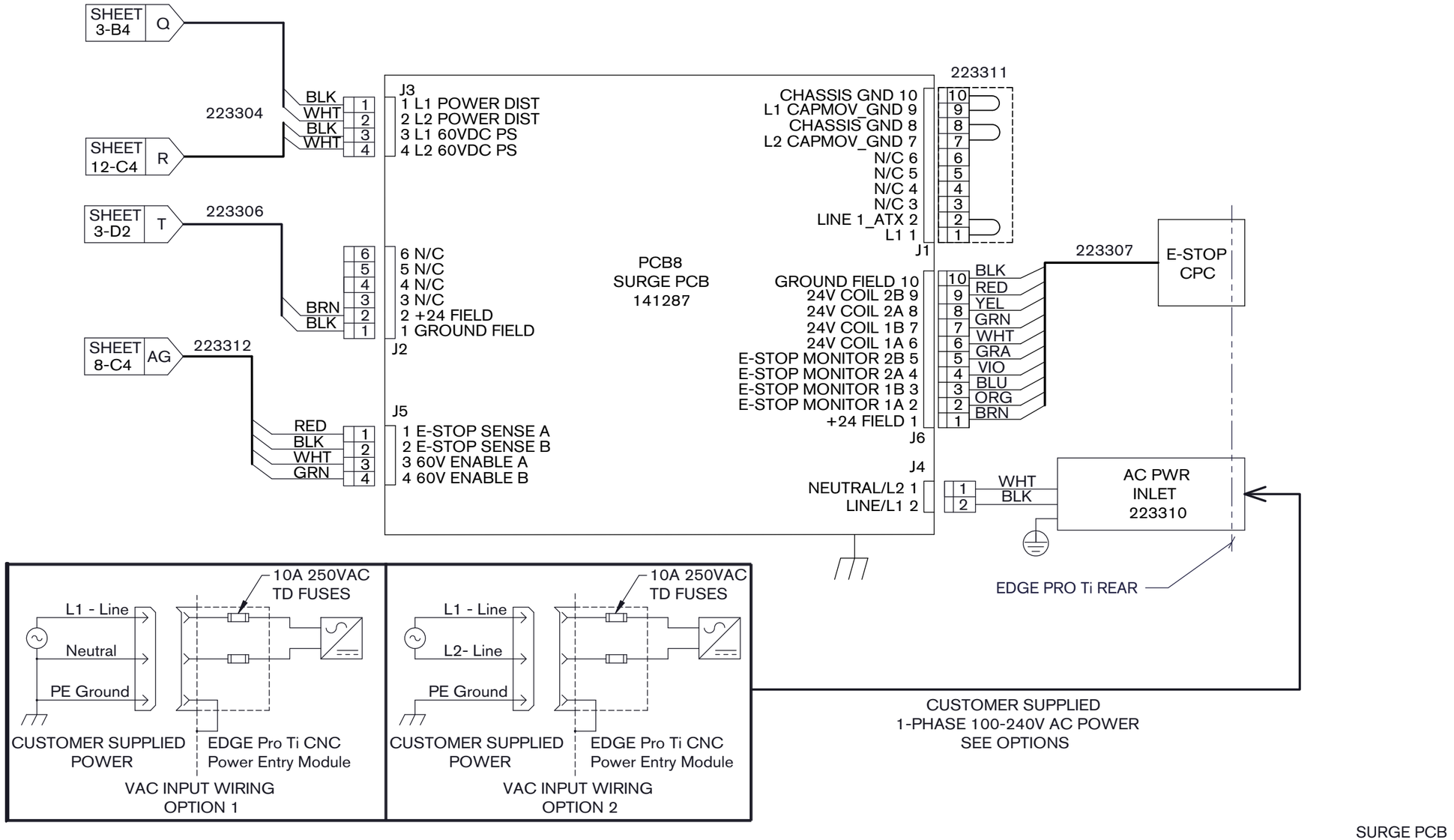
MCC board


223016
Z SHEET 7-D1
223000
AE SHEET 9-D1
J8
1 INPUT 1
2 OUTPUT 1
3 INPUT 2
4 OUTPUT 2
5 INPUT 3
6 OUTPUT 3
7 INPUT 4
8 OUTPUT 4
9 INPUT 5
10 OUTPUT 5
11 INPUT 6
12 OUTPUT 6
13 INPUT 7
14 OUTPUT 7
15 INPUT 8
16 OUTPUT 8
17 INPUT 9
18 OUTPUT 9
19 INPUT 10
20 OUTPUT 10
21 INPUT 11/ UPR LMT
22 OUTPUT 11
23 INPUT 12/ LWR LMT
24 OUTPUT 12
25 TRANSFER
26 PLASMA START
27 N/C
28 HOLD IGNITION
29 PLATE CONTACT
30 N/C
31 TORCH BREAKAWAY
32 N/C
33 AXIS 1 FAULT
34 SPARE OUTPUT 1
35 AXIS 2 FAULT
36 SPARE OUTPUT 2
37 AXIS 3 FAULT
38 N/C
39 AXIS 4 FAULT
40 N/C
41 E-STOP ACTIVE
42 N/C
43 AC/DC PWR GOOD
44 N/C
45 GROUND
46 N/C
47 N/C
48 N/C
49 N/C
50 GROUND
J7
1 +12V FIELD
2 GROUND
3 -12V FIELD
4 GROUND
5 +5V FIELD
6 GROUND
7 +24V FIELD
8 GROUND
9 +24V FIELD
10 GROUND
11 SERVO 1 FAULT
12 GROUND
13 SERVO 2 FAULT
14 GROUND
15 SERVO 3 FAULT
16 GROUND
17 SERVO 4 FAULT
18 GROUND
19 N/C
20 N/C
21 N/C
22 N/C
23 N/C
24 N/C
25 N/C
26 N/C
27 N/C
28 GROUND
29 +12V
30 GROUND
31 -12V
32 GROUND
33 +5V
34 GROUND
J6
CLEAN GROUND 1
ARC VOLTS 2
N/C 3
1 BLU
2 WHT
3
223305
U SHEET 6-D2
223314
AF SHEET 12-B1
J5
60V INHIBIT_B 1
60V INHIBIT_A 2
CLEAN GROUND 3
AC/DC PWR GOOD 4
60V INHIBIT_A 5
60V INHIBIT_B 6
XP 5V STDBY 7
N/C 8
1 RED
2 WHT
3 BLK
4 GRN
5 BRN
6 BLU
7
8
SHEET 10-C4 AG
223312
J1
E-STOP ACTIVE A 1
E-STOP ACTIVE B 2
60V INHIBIT_A 3
60V INHIBIT_AB 4
SPARE OUT 2A 5
SPARE OUT 2B 6
1 RED
2 BLK
3 WHT
4 GRN
5
6
PCB6
I/O PCB
141278
J3
+12V FIELD 1
PLASMA START OUTPUT 2
PLASMA START OUTPUT 3
HOLD IGNITION OUTPUT + 4
HOLD IGNITION OUTPUT - 5
TRANSFER INPUT + 6
TRANSFER INPUT - 7
FIELD COM 8
FIELD COM 9
FIELD COM 10
FIELD COM 11
FIELD COM 12
FIELD COM 13
ELECTRODE ARC VOLTAGE - 14
WORK ARC VOLTAGE + 15
N/C 16
223309
PLASMA INTFC (DB15)
EDGE PRO TI REAR
J2
+12V FIELD 1
LWR LIMIT SW 2
UPR LIMIT SW 3
BREAKAWAY SW 4
FIELD COM 5
FIELD COM 6
PLATE CONTACT -12V 7
PLATE CONTACT SENSE 8
PLATE CONTACT COM 9
N/C 10
223308
LIFTER INTFC (DB9)
I/O INTERFACE
J9 I/O 1-3
16C CPC
1 OUTPUT 1 COM
2 OUTPUT 1 NC
3 OUTPUT 1 NO
4 OUTPUT 2 COM
5 OUTPUT 2 NC
6 OUTPUT 2 NO
7 OUTPUT 3 COM
8 OUTPUT 3 NC
9 OUTPUT 3 NO
10 INPUT 1
11 INPUT 1 COM
12 INPUT 2
13 INPUT 2 COM
14 INPUT 3
15 INPUT 3 COM
16 SHIELD
J10 I/O 4-6
16C CPC
1 OUTPUT 4 COM
2 OUTPUT 4 NC
3 OUTPUT 4 NO
4 OUTPUT 5 COM
5 OUTPUT 5 NC
6 OUTPUT 5 NO
7 OUTPUT 6 COM
8 OUTPUT 6 NC
9 OUTPUT 6 NO
10 INPUT 4
11 INPUT 4 COM
12 INPUT 5
13 INPUT 5 COM
14 INPUT 6
15 INPUT 6 COM
16 SHIELD
J11 I/O 7-9
16C CPC
1 OUTPUT 7 COM
2 OUTPUT 7 NC
3 OUTPUT 7 NO
4 OUTPUT 8 COM
5 OUTPUT 8 NC
6 OUTPUT 8 NO
7 OUTPUT 9 COM
8 OUTPUT 9 NC
9 OUTPUT 9 NO
10 INPUT 7
11 INPUT 7 COM
12 INPUT 8
13 INPUT 8 COM
14 INPUT 9
15 INPUT 9 COM
16 SHIELD
J12 I/O 10-12
16C CPC
1 OUTPUT 10 COM
2 OUTPUT 10 NC
3 OUTPUT 10 NO
4 OUTPUT 11 COM
5 OUTPUT 11 NC
6 OUTPUT 11 NO
7 OUTPUT 12 COM
8 OUTPUT 12 NC
9 OUTPUT 12 NO
10 INPUT 10
11 INPUT 10 COM
12 INPUT 11
13 INPUT 11 COM
14 INPUT 12
15 INPUT 12 COM
16 SHIELD

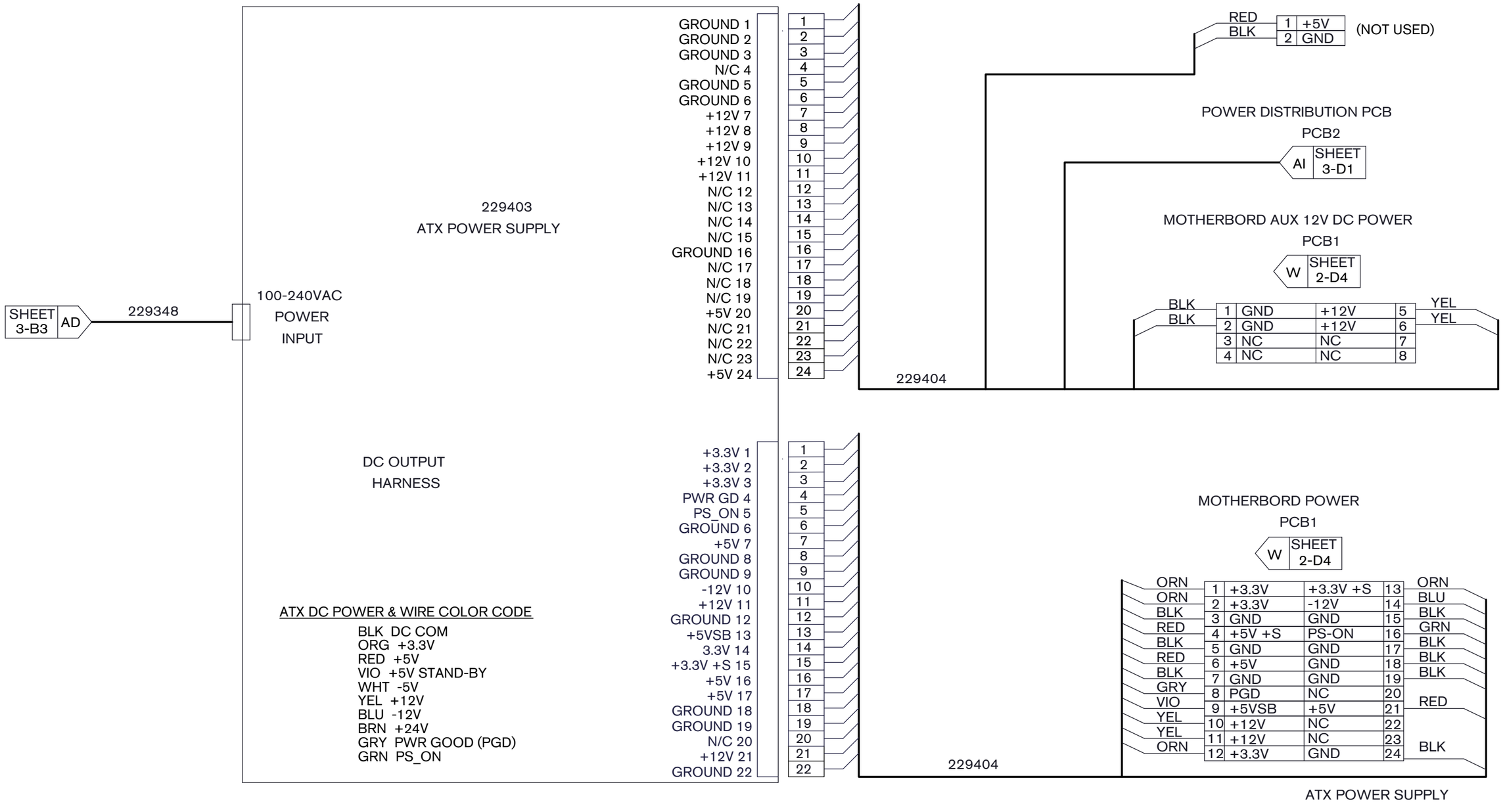
I/O board



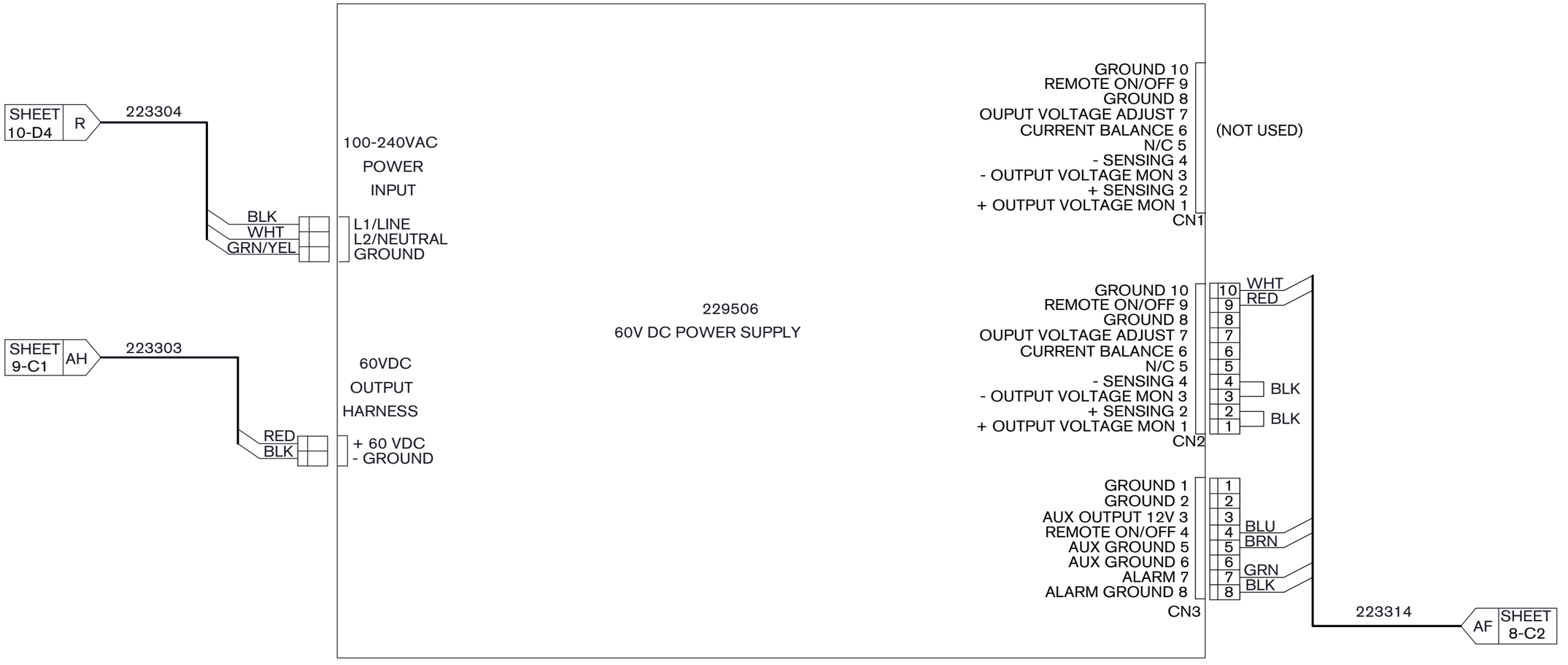
6-Axis servo board


SHEET 3-B4
Q
223304
BLK
WHT
BLK
WHT
SHEET 12-C4
R
J3
1 L1 POWER DIST
2 L2 POWER DIST
3 L1 60VDC PS
4 L2 60VDC PS
223306
SHEET 3-D2
T
6 N/C
5 N/C
4 N/C
3 N/C
2 +24 FIELD
1 GROUND FIELD
BRN
BLK
J2
SHEET 8-C4
AG
223312
RED
BLK
WHT
GRN
J5
1 E-STOP SENSE A
2 E-STOP SENSE B
3 60V ENABLE A
4 60V ENABLE B
PCB8
SURGE PCB
141287
223311
CHASSIS GND 10
L1 CAPMOV_GND 9
CHASSIS GND 8
L2 CAPMOV_GND 7
N/C 6
N/C 5
N/C 4
N/C 3
LINE 1_ATX 2
L1 1
J1
GROUND FIELD 10
24V COIL 2B 9
24V COIL 2A 8
24V COIL 1B 7
24V COIL 1A 6
E-STOP MONITOR 2B 5
E-STOP MONITOR 2A 4
E-STOP MONITOR 1B 3
E-STOP MONITOR 1A 2
+24 FIELD 1
J6
BLK
RED
YEL
GRN
WHT
GRA
VIO
BLU
ORG
BRN
223307
E-STOP CPC
J4
NEUTRAL/L2 1
LINE/L1 2
WHT
BLK
AC PWR INLET
223310
EDGE PRO Ti REAR
10A 250VAC TD FUSES
L1 - Line
Neutral
PE Ground
CUSTOMER SUPPLIED POWER
EDGE Pro Ti CNC Power Entry Module
VAC INPUT WIRING OPTION 1
10A 250VAC TD FUSES
L1 - Line
L2- Line
PE Ground
CUSTOMER SUPPLIED POWER
EDGE Pro Ti CNC Power Entry Module
VAC INPUT WIRING OPTION 2
CUSTOMER SUPPLIED
1-PHASE 100-240V AC POWER
SEE OPTIONS
SURGE PCB

Surge board



ATX power supply



60 VDC power supply