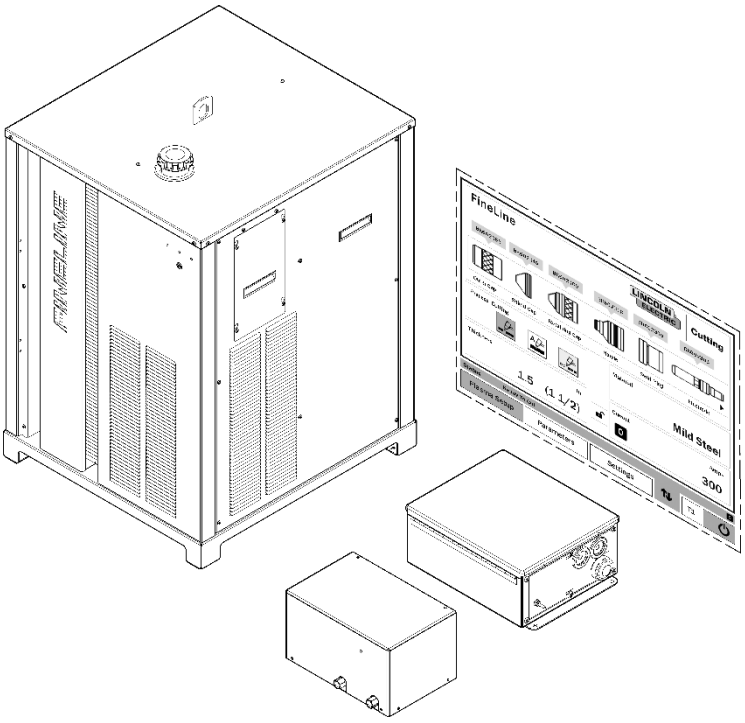
Operator's Manual

FineLine® 170HD Plasma System

Codes: 13050, 13051, 13526, 13608



GENUINE LINCOLN PARTS™

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BK8053-000111 Rev G | Issue Date: 01-OCT-2024

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Revision History

Rev	Date	Description of Change
G	01-OCT-2024	Cooling tube BK1111-200207 replaced by BK1111-200216. Added Maintenance Schedule.

Trademark Notice

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Please examine carton and equipment for damage immediately

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

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Table of Contents

1.0 Safety Warnings

⚠ WARNING

1.1 General Precautions

Whereas plasma cutting has been used safely for years, it does require certain precautions to ensure the safety of the operator and other people around the equipment. The following safety information must be provided to each person who will operate, observe, perform maintenance, or work in close proximity to this piece of equipment. Always wear appropriate personal protective equipment (PPE).

Installation, operation, and repairs made to this System should only be performed by qualified personnel. The System makes use of both A.C. and D.C. circuitry for operation. Fatal shock hazard does exist. Exercise extreme caution while working on the System.

⚠ WARNING: This statement appears where the information must be followed exactly to avoid serious personal injury or loss of life.

⚠ CAUTION: This statement appears where the information must be followed to avoid minor personal injury or damage to this equipment.

1.2 California Proposition 65

This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code § 25249.5 et seq.)

WARNING: Cancer and Reproductive Harm
www.p65warnings.ca.gov

1.3 Ultraviolet Radiation Protection

Plasma cutting produces ultraviolet radiation similar to a welding arc. This ultraviolet radiation can cause skin and eye burns. For this reason, it is essential that proper protection be worn. The eyes are best protected by using safety glasses or a welding helmet with an AWS No. 12 shade or ISO 4850 No. 13 shade, which provides protection up to 400 amperes. All exposed skin areas should be covered with flame-retardant clothing. The cutting area should also be prepared in such a way that ultraviolet light does not reflect. Walls and other surfaces should be painted with dark colors to reduce reflected light. Protective screens or curtains should be installed to protect additional workers in the area from ultraviolet radiation.

1.4 Fire Prevention

When using this System, it is necessary to exercise good judgment. While cutting, the arc produces sparks that could cause a fire if they fall on flammable materials. Make sure that all flammable materials are a suitable distance away from the cutting area. All flammable liquids should be at least 40 feet away from the cutting area, preferably stored in a metal cabinet. Plasma cutting should never be attempted on containers that contain flammable materials. Make sure that fire extinguishers are readily accessible in the cutting area.

Make sure that the cutting area is properly ventilated when using oxygen as a cutting gas.

⚠ WARNING

1.5 Noise Protection

The System generates high noise levels while cutting. Depending on the size of the cutting area, distance from the cutting torch, and arc current cutting level, acceptable noise levels may be exceeded. Proper ear protection should be used as defined by local or national codes. Refer to Section 2.12 for noise emission levels.

1.6 Toxic Fume Prevention

Care should be taken to ensure adequate ventilation in the cutting area. Some materials give off toxic fumes that can be harmful or fatal to people in the vicinity of the cutting area. Also, some solvents decompose and form harmful gases when exposed to ultraviolet radiation. These solvents should be removed from the area prior to cutting.

Galvanized metal can produce harmful gases during the cutting process. Ensure proper ventilation and use breathing equipment when cutting these materials.

Certain metals coated with or containing lead, cadmium, zinc, beryllium, and mercury produce harmful toxins. Do not cut these metals unless all people subjected to the fumes wear proper air breathing equipment.

1.7 Health Support Equipment

The System creates electric and magnetic fields that may interfere with certain types of health support equipment, such as pacemakers. Any person who uses a pacemaker or similar item should consult a doctor before operating, observing, maintaining, or servicing the System. Observe the following guidelines to minimize exposure to these electric and magnetic fields:

- Stay as far away from the Power Supply, torch, torch leads, and arc start console as possible.
- Route the torch leads as close as possible to the work ground cable.
- Never place your body between the torch leads and work ground cable. Keep the work ground cable and the torch leads on the same side of your body.
- Never stand in the center of a coiled up set of torch leads or work ground cable.

⚠ WARNING

1.8 Electric Shock Prevention

The System uses high open circuit voltages that can be fatal. Extreme care should be used when operating or performing maintenance on the System. Only qualified personnel should service the System. Observe the following guidelines to protect against electric shock:

- A wall-mounted disconnect switch should be installed and fused according to local and national electrical codes. The disconnect switch should be located as close as possible to the Power Supply so it can be turned off in case of an emergency.
- The primary power cord should have a 600 volt minimum rating in order to protect the operator. In addition, it should be sized according to local and national electrical codes. Inspect the primary power cord frequently. Never operate the System if the power cord is damaged in any way.
- Make sure the primary power ground wire is connected to the input power ground stud on the Power Supply. Make sure the connection is securely tightened.
- Make sure the positive output (work ground) of the Power Supply is connected to a bare metal area on the cutting table. A driven ground rod should be placed no further than five feet from this connection. Make sure this ground point on the cutting table is used as the star ground point for all other ground connections.
- Inspect the torch leads frequently. Never use the System if the leads are damaged in any way.
- Do not stand in wet, damp areas when operating or performing maintenance on the System.
- Wear insulated gloves and shoes while operating or performing maintenance on the System.
- Make sure the System is switched off at the wall disconnect before servicing the Power Supply or torch.
- Never change torch consumable parts unless the System is switched off at the wall disconnect.
- Do not attempt to remove any parts from beneath the torch when cutting. Remember that the workpiece forms the current path back to the Power Supply.
- Never bypass the safety interlock devices.
- Before removing any of the covers, switch the System off at the wall disconnect. Wait at least five (5) minutes before removing any cover. This will give the capacitors inside the unit time to discharge.
- Never operate the System without all of the covers in place.
- Preventive maintenance should be performed daily to avoid possible safety hazards.

⚠ WARNING

1.9 Explosion Prevention

The System uses compressed gases. Use proper techniques when handling compressed gas cylinders and other compressed gas equipment. Observe the following guidelines to protect against explosion:

- Never operate the System in the presence of explosive gases or other explosive materials.
- Never cut pressurized cylinders or any closed container.
- When using a water table and cutting aluminum under water or with water touching the underside of the aluminum plate, hydrogen gas is produced. This hydrogen gas may collect under the plate and explode during the cutting process. Make sure the water table is properly aerated to help prevent the accumulation of hydrogen gas.
- Handle all gas cylinders in accordance with safety standards published by the U.S. Compressed Gas Association (CGA), American Welding Society (AWS), Canadian Standards Association (CSA), or other local or national codes.
- Compressed gas cylinders should be maintained properly. Never attempt to use a cylinder that is leaking, cracked, or has other signs of physical damage.
- All gas cylinders should be secured to a wall or rack to prevent accidental knock over.
- If a compressed gas cylinder is not being used, replace the protective valve cover.
- Never attempt to repair compressed gas cylinders.
- Keep compressed gas cylinders away from intense heat, sparks, or flames.
- Clear the compressed gas cylinder connection point by opening the valve momentarily prior to installing a regulator.
- Never lubricate compressed gas cylinder valves or pressure regulators with any type of oil or grease.
- Never use a compressed gas cylinder or pressure regulator for any purpose other than which it is intended.
- Never use a pressure regulator for any gas other than which it is intended.
- Never use a pressure regulator that is leaking or has other signs of physical damage.
- Never use oxygen hoses and pressure regulators for any gas other than oxygen.
- Never use any gas hose that is leaking or has other signs of physical damage.

Refer to **www.lincolnelectric.com/safety** for additional safety information.

1.10 Safety Standards Booklet Index

For further information concerning safety practices to be exercised with plasma arc cutting equipment, please refer to the following publications:

- AWS Standard AWN, *Arc Welding and Cutting Noise*, obtainable from the American Welding Society, 550 NW LeJeune Road, Miami, FL 33126.
- AWS Standard C5.2, *Recommended Practices for Plasma Arc Cutting*, obtainable from the American Welding Society, 550 NW LeJeune Road, Miami, FL 33126.
- AWS Standard FSW, *Fire Safety in Welding and Cutting*, obtainable from the American Welding Society, 550 NW LeJeune Road, Miami, FL 33126.
- AWS Standard F4.1, Recommended *Safe Practices for Preparation for Welding and Cutting of Containers and Piping*, obtainable from the American Welding Society, 550 NW LeJeune Road, Miami, FL 33126.
- AWS Standard ULR, *Ultraviolet Reflectance of Paint*, obtainable from the American Welding Society, 550 NW LeJeune Road, Miami, FL 33126.
- AWS / ANSI Standard Z49.1, *Safety in Welding, Cutting, and Allied Processes,* obtainable from the American Welding Society, 550 NW LeJeune Road, Miami, FL 33126.
- ANSI Standard Z41.1, *Standard For Men's Safety-Toe Footwear*, obtainable from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.
- ANSI Standard Z49.2, *Fire Prevention in the Use of Cutting and Welding Processes*, obtainable from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.
- ANSI Standard Z87.1, *Safe Practices For Occupation and Educational Eye and Face Protection,* obtainable from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.
- ANSI Standard Z88.2, *Respiratory Protection*, obtainable from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.
- OSHA Standard 29CFR 1910.252, *Safety and Health Standards,* obtainable from the U.S. Government Printing Office, Washington, D.C. 20402.
- NFPA Standard 51, *Oxygen - Fuel Gas Systems for Welding, Cutting, and Allied Processes*, obtainable from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269.
- NFPA Standard 51B, *Cutting and Welding Processes*, obtainable from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269.
- NFPA Standard 70, *National Electrical Code*, obtainable from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269.
- CGA booklet P-1, *Safe Handling of Compressed Gases in Containers*, obtainable from the Compressed Gas Association, 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202.

- CGA booklet P-14, *Accident Prevention in Oxygen-Rich and Oxygen-Deficient Atmospheres*, obtainable from the Compressed Gas Association, 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202.
- CGA booklet TB-3, *Hose Line Flashback Arrestors*, obtainable from the Compressed Gas Association, 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202.
- CSA Standard W117.2, *Safety in Welding, Cutting, and Allied Processes*, obtainable from Canadian Standards Association, 178 Rexdale Boulevard, Toronto, Ontario M9W lR3, Canada.
- Canadian Electrical Code Part 1, *Safety Standard for Electrical Installations,* obtainable from the Canadian Standards Association, 178 Rexdale Boulevard, Toronto, Ontario M9W 1R3, Canada.

2.0 Specifications

2.1 System Description

The FineLine® 170HD Plasma System is designed for mechanized plasma cutting applications. The FineLine Plasma System ("the System") includes the FineLine 170HD Power Supply, FineLine Gas Controller, FineLine Arc Start Console, FineLine User Interface, and Magnum® PRO LC300M Plasma Torch.

The FineLine 170HD Power Supply is a digitally controlled, inverter-based plasma power supply that is capable of producing 170A output current at a 100% duty cycle. It is capable of piercing mild steel up to 1.25 in. (30mm) and severance cutting up to 2 in. (50mm). It is also capable of plasma marking, which creates a noticeable mark in the metal surface without cutting through the metal.

2.2 System Components

2.2.1 Standard Components

- FineLine 170HD Power Supply ..... K4910-1 (CSA, CCC)
  ..... or K4910-2 (CE, RCM)
- FineLine Gas Controller (GC) BK300350
- FineLine Arc Start Console (ASC) K4901-1
- FineLine User Interface (UI)
- CutLinc® Server
- Magnum PRO Standard Plasma Torch BK602622
- Magnum PRO Quick-Disconnect Plasma Torch Head BK602625
- Magnum PRO Quick-Disconnect Plasma Torch Base BK602623
- Torch Handle BK602621
- Torch Clamp BK700223
- Torch Leads BK602604-XX
- Torch Coolant BK500695
- Gas Hose Package BK602617-XX
- Power Supply Electrode Lead K4903-XX
- Power Supply Nozzle Lead K4904-XX
- Work Ground Lead K4902-XX
- Coolant Supply Hose BK200308-XX
- Coolant Return Hose BK200307-XX
- Power Supply (PS) Interconnect Cable K4905-XX
- ASC Control Cable K4906-XX
- Ethernet Cable w/ Bayonet, Qty 2 ..... K4907-XX

NOTE: *-XX defines length in feet. Refer to Section 8.2 for available lengths.*

2.2.2 Supplied Optionally

- Oxygen Supply Gas Hose..... BK200362-XX
- H17 Supply Gas Hose BK200363-XX
- Air Supply Gas Hose BK200364-XX
- Nitrogen or Argon Supply Gas Hose..... BK200365-XX
- Supply Gas Hose Fittings Kit BK300421
- CNC Interface Cable..... BK602610-XX
- Inova® Torch Height Control System ..... See Appendix B
- PS Interconnect Cable Extender..... See Appendix C
- Human Machine Interface (Burny® CNC Controller or VMD Software)

2.2.3 Supplied by OEM or End User

- Human Machine Interface (CNC Controller or Industrial Computer)
- Ethernet Router/Switch
- Standard Ethernet Cable (Cat5e Shielded Twisted Pair)
- Gas Controller Ground Cable
- ASC Ground Cable

2.3 Compliance

Power Supply K4910-1:

AGENCY APPROVALS		
MARKET	**CONFORMITY MARK**	**STANDARD**
US and Canada	cCSAus	CAN/CSA-E60974-1 ANSI/IEC 60974-1

Arc Start Console K4901-1:

AGENCY APPROVALS		
MARKET	**CONFORMITY MARK**	**STANDARD**
US and Canada	cCSAus	CAN/CSA-E60974-3 ANSI/IEC 60974-3

Magnum PRO Torches BK602622 and BK602625:

AGENCY APPROVALS		
MARKET	**CONFORMITY MARK**	**STANDARD**
US and Canada	cCSAus	CAN/CSA-E60974-7 ANSI/IEC 60974-7

2.4 FineLine 170HD Power Supply

Input Voltage and Current:

- Duty Cycle 100%
- K4910-1, Input Voltage ±10% .....380-415 / 460 / 575
- K4910-1, Input Amperes .....69 / 58 / 53
- K4910-2, Input Voltage ±10% 380-415
- K4910-2, Input Amperes 69

Rated Output at 40°C:

- Duty Cycle 100%
- Current .....170 A
- Voltage .....210 V

Output:

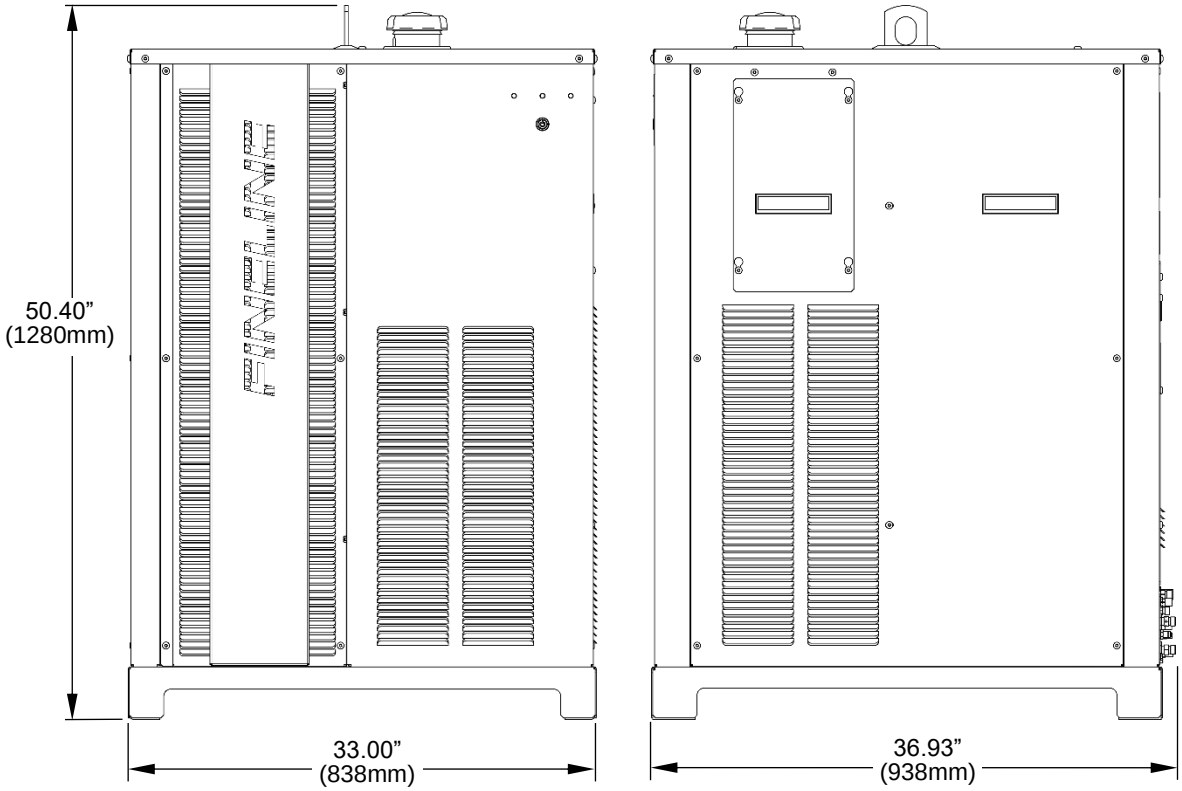
- Current Range .....20-170 Amps
- Open Circuit Voltage ..... 300 VDC
- Pilot Current .....30 Amps

Temperature and Environment:

- Operating Temperature ..... 14°F to 104°F (-10°C to 40°C)
- Storage Temperature ..... 14°F to 185°F (-10°C to 85°C)
- Insulation Class ..... Class F (155°C)

Weight ..... 700 lbs (318 kg)

Physical Dimensions:



2.5 Cooling System and Torch Coolant

Cooling System (located inside the Power Supply):

- Discharge pressure.....175 psi (12.07 bar)
- Flow rate..... 1.5 gal/min (5.7 liters/min)
- Coolant fluid..... Propylene glycol solution
- Reservoir capacity..... 5.0 gal (18.9 liters)
- Maximum coolant temperature .....149°F (65°C)

The torch coolant solution consists of 25% industrial grade propylene glycol and provides freeze protection down to 9º F (-13º C). Torch coolant can be ordered in 1.0 gallon (3.8 liter) containers, part number BK500695.

DO NOT USE automotive or other commercial anti-freeze that contains rust inhibitors or leak stoppers. These coolants will damage the pump and block the small internal passageways in the heat exchanger, affecting cooling performance.

To avoid freeze damage and fluid leakage during shipment, the Power Supply is delivered with very little coolant in the reservoir. **DO NOT OPERATE** the System until it has been filled with coolant.

After the initial filling and after coolant flushes, additional coolant will be required because the coolant hoses and torch leads will also fill with coolant. Longer runs require more coolant than shorter runs.

Refer to the Safety Data Sheet (SDS) supplied with the torch coolant for complete information regarding first aid, handling, storage, transportation and proper disposal.

2.6 Gas Supply

Plasma gas types:
- Mild Steel ..... Oxygen
- Stainless Steel ..... Air, Nitrogen, or H17
- Aluminum ..... Air

Shield gas types:
- Mild Steel ..... Oxygen or Air
- Stainless Steel ..... Air or Nitrogen
- Aluminum ..... Air or Nitrogen

Preflow gas type ..... Nitrogen

Marking gas type ..... Nitrogen or Argon

Plasma gas flow rate (maximum):
- Oxygen ..... 92 SCFH (2605 SLPH)
- Air ..... 80 SCFH (2265 SLPH)
- H17 or Nitrogen ..... 125 SCFH (3540 SLPH)

Shield gas flow rate (maximum):
- Air ..... 250 SCFH (7079 SLPH)
- Nitrogen ..... 300 SCFH (8495 SLPH)

Pre / Post flow gas flow rate (maximum) ..... 125 SCFH (3540 SLPH)

Marking gas flow rate (maximum) ..... 45 SCFH (1274 SLPH)

Rated Inlet gas pressure ..... 115 psi (7.93 bar)

Minimum Inlet gas pressure ..... 105 psi (7.24 bar)

Maximum Inlet gas pressure ..... 145 psi (10.00 bar)

Oxygen and nitrogen should be supplied with a purity of at least 99.5%. H17 purity should be at least 99.995%. Argon purity should be at least 99.99%. All should be clean, dry and oil-free.

A potential fire hazard exists when cutting with oxygen. It is recommended that an exhaust ventilation system be used when cutting with oxygen. Flashback arrestors must be supplied (unless they are not available for the chosen gases and pressures) to prevent a possible fire from propagating back to the gas supplies.

Ensure that oxygen lines remain free from contaminants such as oil and grease. The mixture of such contaminants with oxygen presents an additional fire hazard.

Compressed air must be clean, dry, and oil-free and may be supplied from compressed cylinders or from an air compressor. Be aware that shop air systems are prone to oil and moisture contamination. If shop air is used, it must be cleaned to ISO 8573.1: Class 1.4.1. Specify dry air when using compressed cylinders. Breathing quality air contains moisture and must not be used.

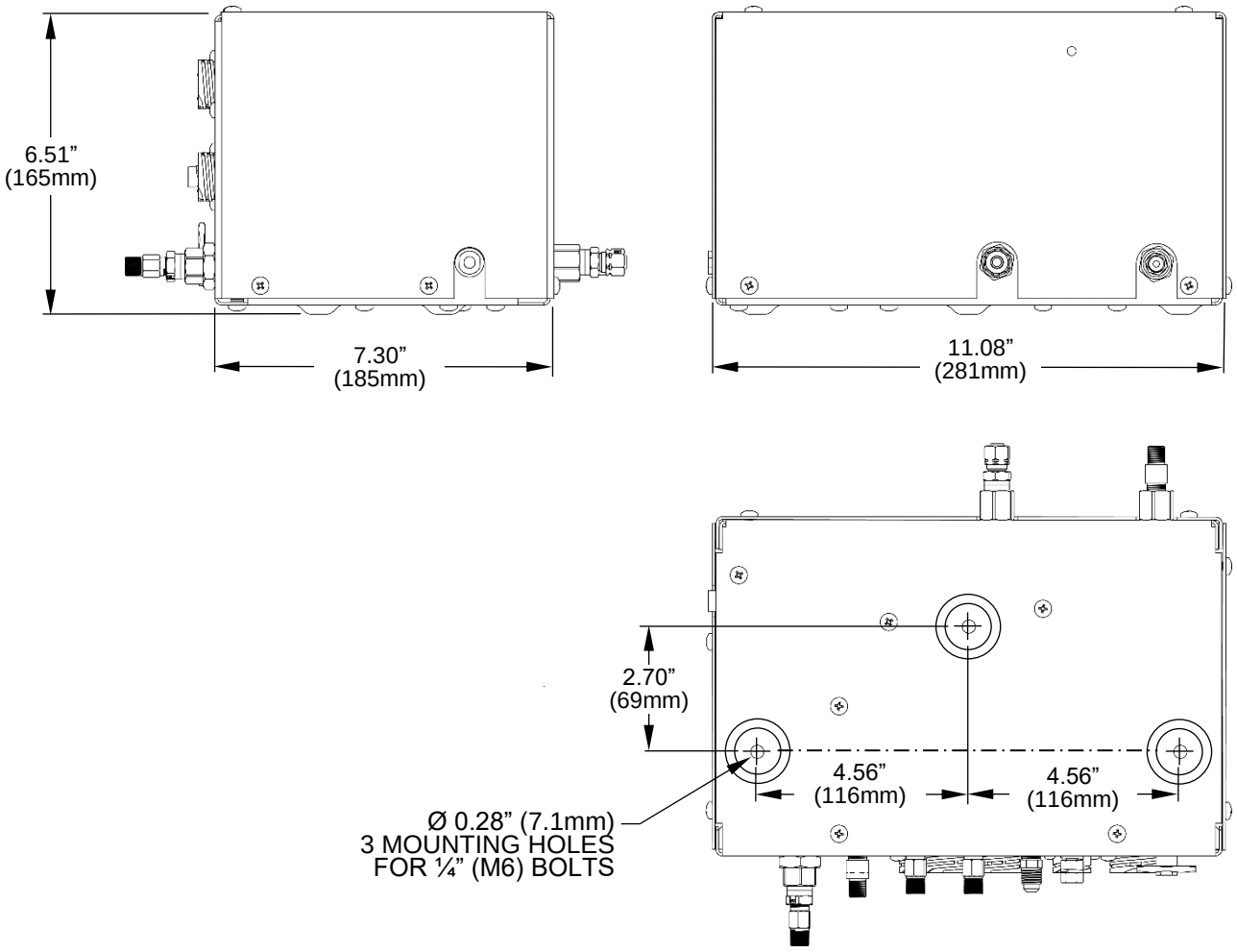
3/8” (inside diameter) hoses are required for all inlet gas connections. Mating connectors are available as an option. Quick-connect fittings must not be used.

2.7 FineLine Gas Controller (GC)

Part Number BK300350

Weight ..... 15.7 lbs (7.12 kg)

Physical Dimensions and Mounting:

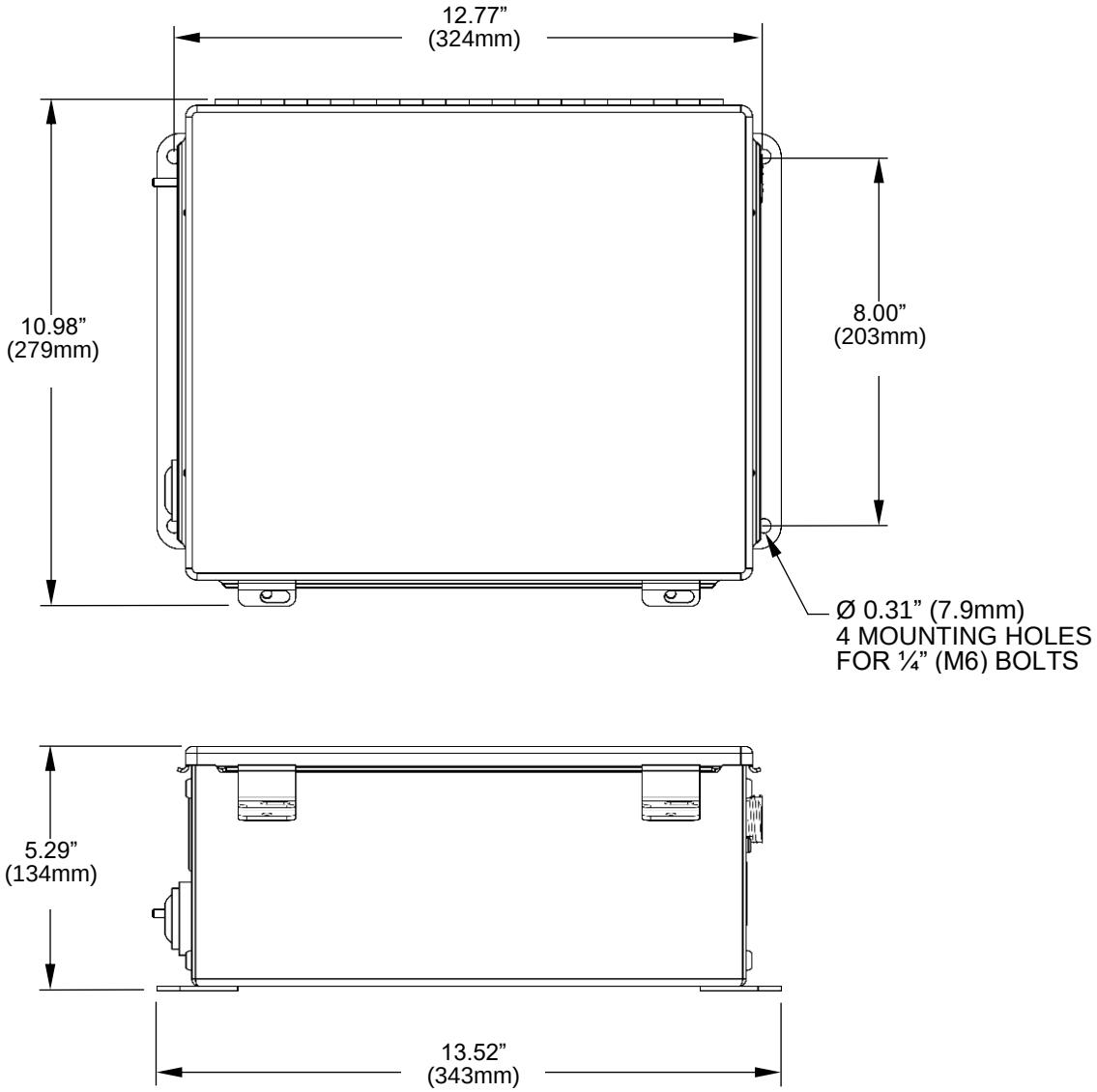


2.8 FineLine Arc Start Console (ASC)

Part Number K4901-1

Weight ..... 18.9 lbs (8.57 kg)

Physical Dimensions and Mounting:



2.9 Magnum PRO LC300M Plasma Torch & Accessories

Standard Torch Part Number..... BK602622
Standard Torch Weight (with consumables)..... 2.10 lbs (0.95 kg)

Quick-Disconnect Torch Head Part Number..... BK602625
Quick-Disconnect Torch Head Weight (with consumables)... 1.40 lbs (0.62 kg)

Quick-Disconnect Torch Base Part Number..... BK602623
Quick-Disconnect Torch Base Weight..... 0.75 lbs (0.34 kg)

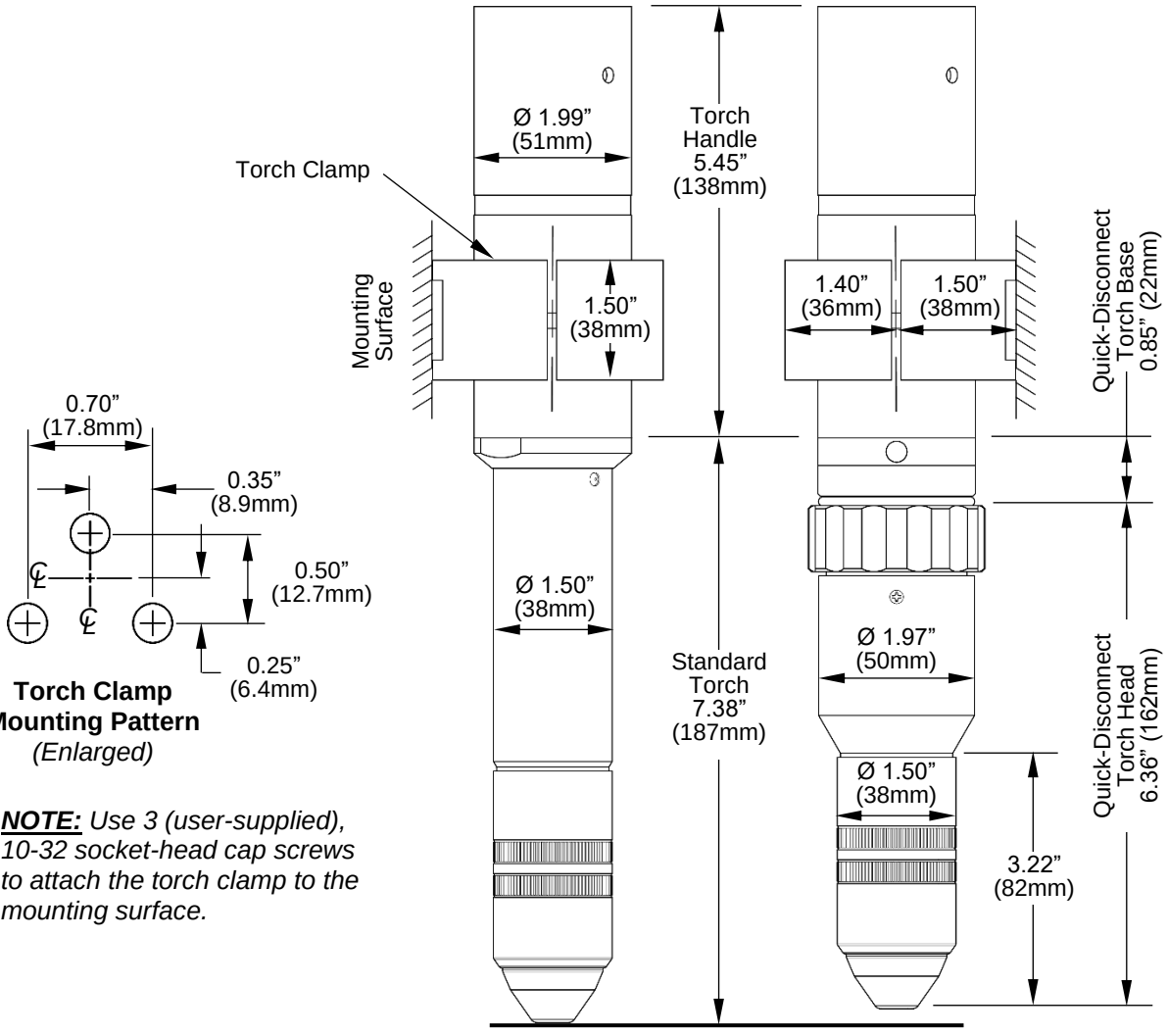
Torch Handle Part Number..... BK602621
Torch Handle Weight..... 0.95 lbs (0.43 kg)

Torch Clamp Part Number..... BK700223
Torch Clamp Weight..... 0.75 lbs (0.34 kg)

Minimum Gas Pressure at Torch.....5 psi (0.34 bar)
Maximum Gas Pressure at Torch.....95 psi (6.55 bar)

Torch Arc Strike Voltage Rating 7.5kV

Physical Dimensions and Mounting:



Torch Clamp Mounting Pattern *(Enlarged)*

NOTE: *Use 3 (user-supplied), 10-32 socket-head cap screws to attach the torch clamp to the mounting surface.*

2.10 FineLine User Interface & CutLinc Server

A Human Machine Interface (HMI) is required to run the FineLine Plasma System. The HMI can be a CNC Controller or Industrial Computer running the FineLine User Interface (UI) and CutLinc Server.

The FineLine UI is the user interface for the FineLine Plasma System. CutLinc Server is the communication hub for the FineLine Plasma System. They are already integrated into certain Lincoln Electric HMIs. Other HMIs require both to be integrated by the OEM or end-user.

Specifications for the HMI:

- Windows 10 operating system
- One (1) Ethernet port

Specifications for the FineLine UI and CutLinc Server:

- Controls up to four FineLine 170HD Systems

2.11 Ethernet Router/Switch

A user-supplied Ethernet router/switch is required with the following specifications:

- Four (4) Channel (minimum)
- 10/100 Mbps (minimum)
- IEEE 802.3(x) Compliant
- Auto MDI / MDIX

2.12 Airborne Noise Emissions

The System generates high noise levels while cutting. Depending on the size of the cutting area, distance from the cutting torch, and arc current cutting level, acceptable noise levels may be exceeded. Proper ear protection should be used as defined by local or national codes.

The following chart gives the noise levels generated by the System when operating at 170 amps, 180 arc volts. The measurements were made with a sound level meter.

Distance From Torch	A-Weighted Sound Pressure Level	C-Weighted Sound Pressure Level
1 meter horizontal, 1.6 meters above the floor	111 dB	108 dB
8 cm horizontal, level with plate	130 dB	127 dB

2.13 Electromagnetic Compatibility (EMC)

CE marked FineLine 170HD Systems are manufactured to comply with the European standard EN 60974-10 (Electromagnetic compatibility (EMC) – Product standard for arc welding equipment). Information about the EMC standard EN 60974-10 can be found in Appendix A.

2.14 ECO Design Information

The equipment has been designed in order to be compliant with the Directive 2009/125/EC and the Regulation 2019/1784/EU.

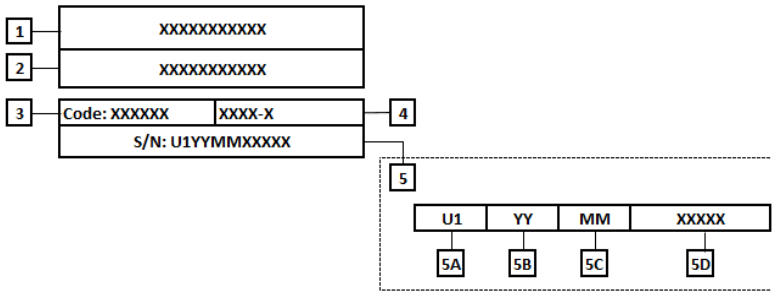
Efficiency and idle power consumption:

Name	Efficiency when max power consumption / Idle power consumption	Equivalent model
Fineline 170HD CE	90% / 45W	No equivalent model

For idle state, see section 4.2.1 step 3 first bullet point in this manual.

The value of efficiency and consumption in idle state have been measured by method and conditions defined in the product standard EN 60974-1

Manufacturer's name, product name, code number, product number, serial number and date of production can be read from rating plate and serial number label.



Where:

1- Manufacturer name and adress
2- Product name
3- Code number
4- Product number
5- Serial number
5A- country of production
5B- year of production
5C- month of production
5D- progressive number different for each machine

Typical gas usage for the Fineline equipment:

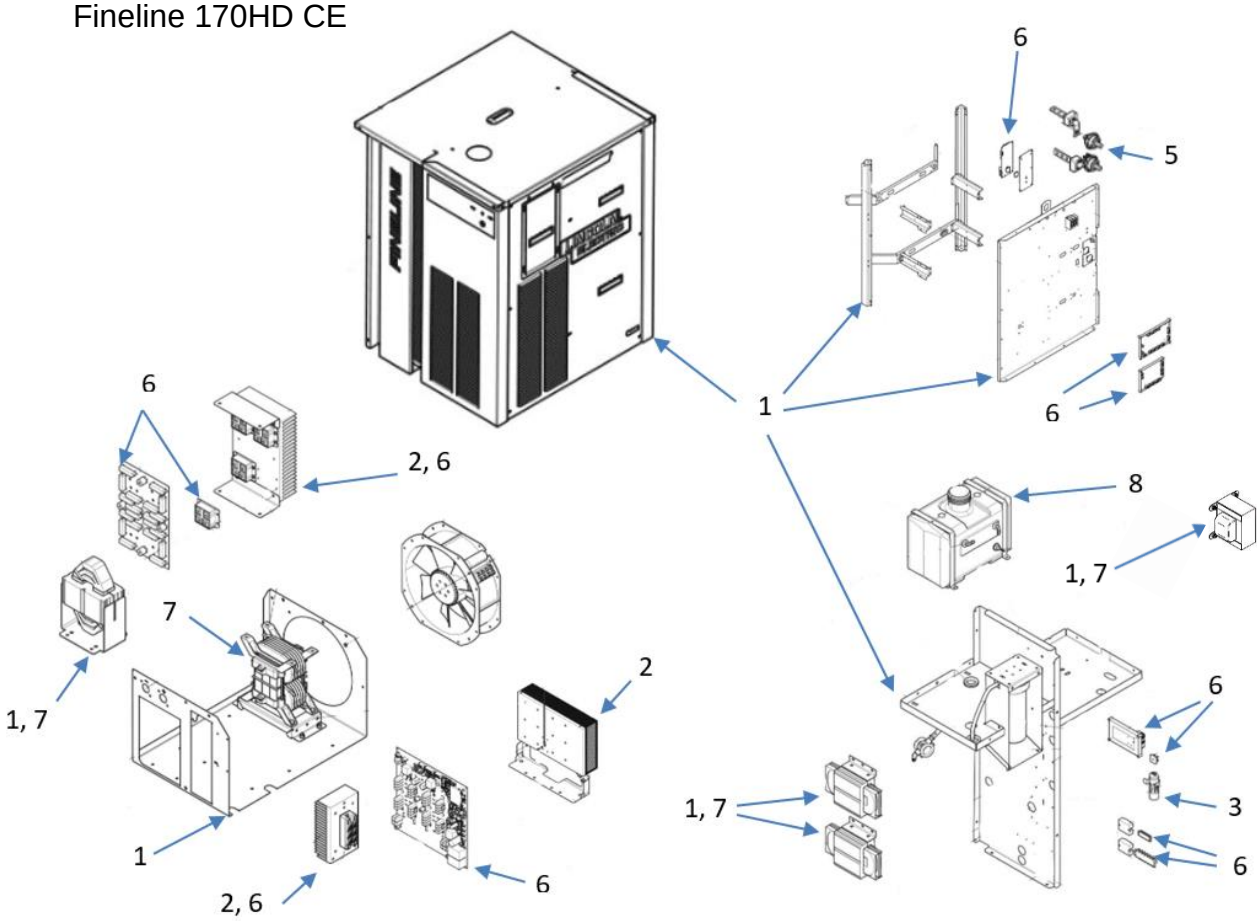
Material Type	Plasma Gas / Shield Gas Type	Cutting Amperage (amp)	Material Thickness (mm)*	Plasma / Shield Gas (l/min)
Carbon, low alloy Steel	O2 / Air	170	12 - 20	15.8 / 64.4
		140	20	14.2 / 49.3
		80	4 - 12	9.7 / 17.2
Austenitic Stainless Steel	Air / N2	170	6 - 25	17.7 / 63.5
		140	6 - 12	16.8 / 46.7
		80	3 - 8	9.7 / 15.8
Aluminum	Air / N2	170	6 - 38	17.5 / 57.8
		140	6 - 25	18.2 / 43.2
		80	2 - 6	9.7 / 21.0

** Material thickness not all-inclusive – reference cut charts for complete range.*

End of life

At end of life of product, it has to be disposal for recycling in accordance with Directive 2012/19/EU (WEEE), information about the dismantling of product and Critical Raw Material (CRM) present in the product, can be found at: www.lincolnelectriceurope.com

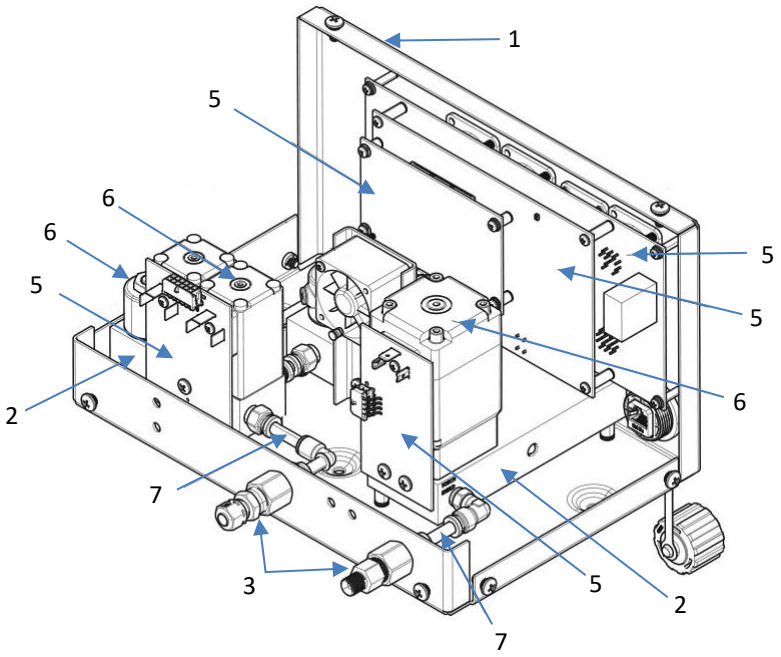
Fineline 170HD CE



Item	Component	Material for recovery	CRM	Selective treatment
1	Enclosure and lamination	Steel	-	-
2	Heat sink	Aluminum	Si, 40 g Mg, 67 g	-
3	Capacitor	-	-	Required
4	External cables (not shown)	Copper	-	Required
5	Output terminal, 2 total	Brass and copper	-	-
6	PC board, 14 total	-	-	Required
7	Choke Transformers Internal cables Bus bars	Copper	-	-
8	Reservoir	HDPE (High Density Polyethylene)	-	-

Reference: P-1601, codes 13051, 13526

Gas Controller



Item	Component	Material for recovery	CRM	Selective treatment
1	Enclosure	Steel	-	-
2	Manifolds, 2 total	Aluminum	Si, 7 g Mg, 12 g	-
3	Output fittings, 7 total	Brass, Stainless Steel	-	
4	External and internal cables (not shown)	Copper	-	Required
5	PC board, 5 total	-	-	Required
6	Proportional Valves, 3 total Solenoid Valves, 5 total	Copper, Brass, Steel	-	-
7	Tubing	Nylon	-	-

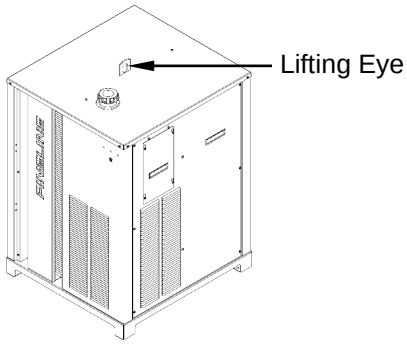
3.0 Installation

3.1 Component Placement

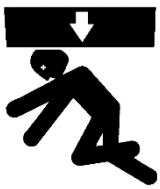
3.1.1 Power Supply

The Power Supply should be lifted by a forklift, pallet jack or crane. In order to prevent damaging the Power Supply when lifting with a forklift or pallet jack, the forks should be of adequate length to protrude on the far side of the Power Supply. If lifting by lifting eye, ensure the following:

- Material handling equipment must comply with local and national laws and regulations. The personnel involved in the move must be properly trained and qualified to use such equipment.
- All Power Supply covers must be securely installed.
- Lift slowly -not more than 8 in. (203.2mm) high- to ensure even weight distribution.
- Move slowly to prevent uncontrollable acceleration/deceleration.



⚠ WARNING



Falling equipment can cause injury.

Lift only with equipment of adequate lifting capacity.

Be sure Power Supply is stable when lifting.

The proper location of the Power Supply will provide dependable service and reduce periodic maintenance time. Choose a location that will provide unrestricted air movement into and out of the Power Supply. Maintain at least 24 in. (609.6mm) of space on all sides of the unit.

The Power Supply is IP23 rated for use in an outdoor environment. The Power Supply is not suitable for use in rain or snow. It should not be subjected to falling water during use nor should any parts of it be submerged in water or snow. Doing so may cause improper operation as well as pose a safety hazard. The best practice is to keep it in a dry, sheltered area.

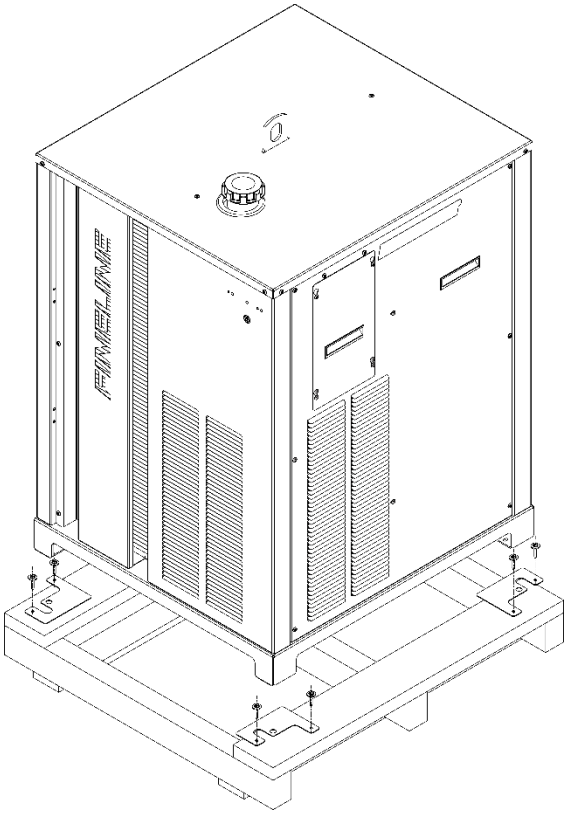
Do not mount the Power Supply over a combustible surface. Where there is a combustible surface directly under stationary or fixed electrical equipment, that surface shall be covered with a steel plate at least .060” (1.6mm) thick, which shall extend not less than 5.90” (150mm) beyond the equipment on all sides.

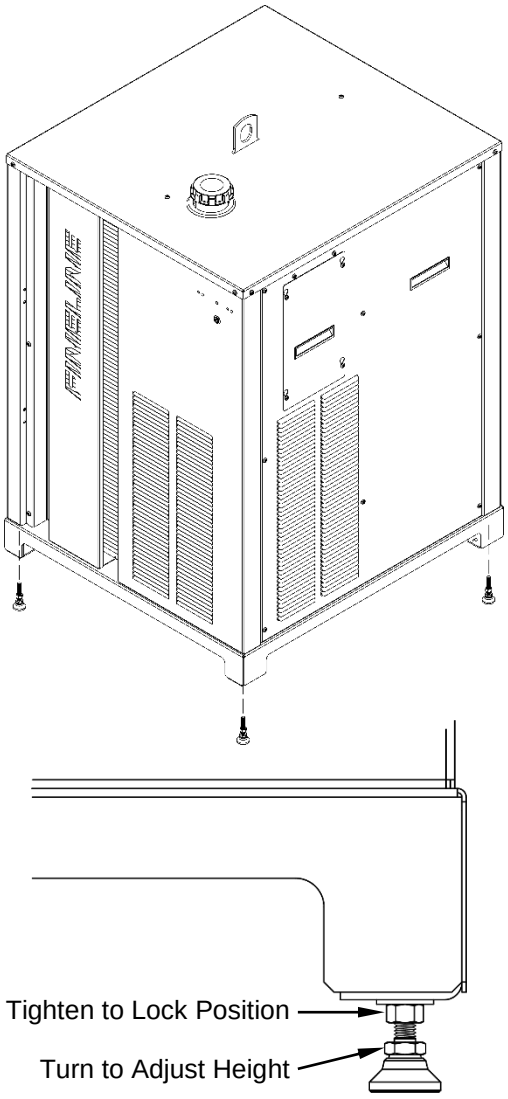
The surface on which the Power Supply is located should have a grade of no greater than 10° to eliminate the risk of toppling over.

For a standard installation, the maximum distance between the Power Supply and Gas Controller is 75 ft. (22.8m). Refer to Appendix C for longer lengths.

Unboxing and Leveling

1) Place the Power Supply on a flat and level surface.
2) Remove the wooden crate and plastic bag surrounding the Power Supply.
3) Remove the rear input cover to find the operator's manual and accessories.
4) Remove the eight screws and washers and four mounting plates between Power Supply and skid.
5) Lift the machine off of the skid.
6) With the machine properly lifted and secured, carefully thread each leveling foot in place while keeping the jam nut between the foot and the base. Be careful not to cross thread the feet and be sure the threads are fully engaged with the base. Roughly adjust all four feet to the same desired height.
7) Set the machine on the floor, adjust the feet to level the machine, and then tighten the jam nut against the base to lock their position.





3.1.2 Gas Controller (GC)

The Gas Controller (GC) must be mounted within 8 ft. (2.44m) of the torch/base. Secure the GC to the mounting surface using three ¼" or M6 bolts. Refer to the mounting pattern shown in Section 2.7. Ensure the port on the side of the GC marked "VENT" is not blocked. The GC is IP23 rated.

The plasma and shield hoses connecting the torch to the GC run inside the torch leads for 6 ft. (1.83m) before breaking out to connect to the GC. As such, the GC has to be mounted within 2 ft. (0.61m) of the torch lead routing.

To minimize high frequency interference from the arc starting circuit, it is recommended that the GC be mounted as far as possible - 2 ft. (0.61m) - from the torch leads with the control cables routed away from the torch leads.

All control/communication cables must be routed with a minimum separation of 2 ft. (0.61m) from the torch leads and a minimum separation of 6 in. (152mm) from the power leads.

Refer to Figure 1.

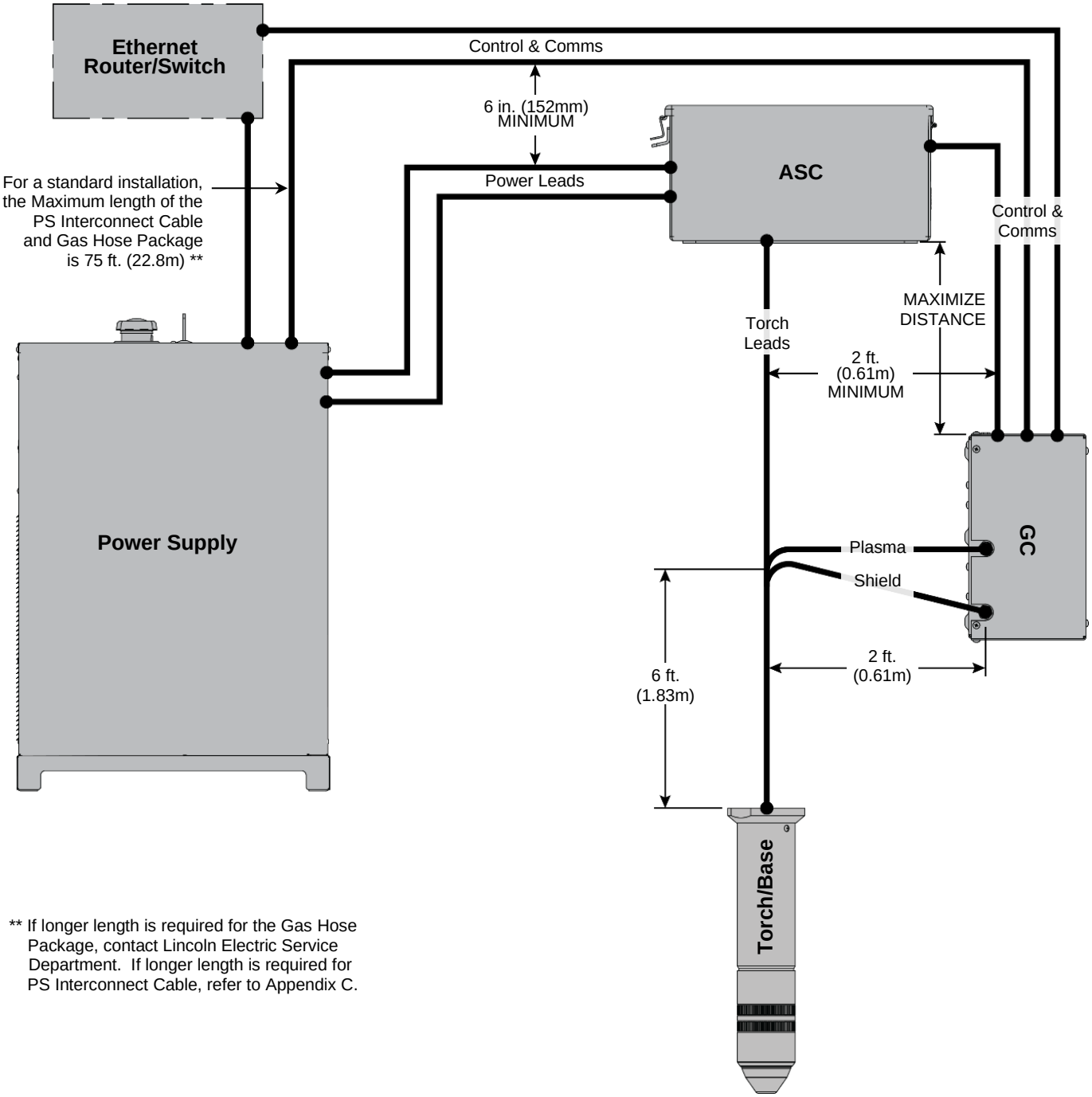


Figure 1: Gas Controller (GC) Placement

3.1.3 Arc Start Console (ASC)

The Arc Start Console (ASC) should be mounted in a convenient location that is away from other electronic control devices. The high voltage pulse generated inside the unit may interfere with the operation of sensitive control electronics. The ASC is usually mounted on the gantry of the cutting machine or on the cutting table. The ASC is IP23 rated.

Secure the ASC to the mounting surface using four ¼" or M6 bolts. Refer to the mounting pattern shown in Section 2.8.

3.1.4 Torch

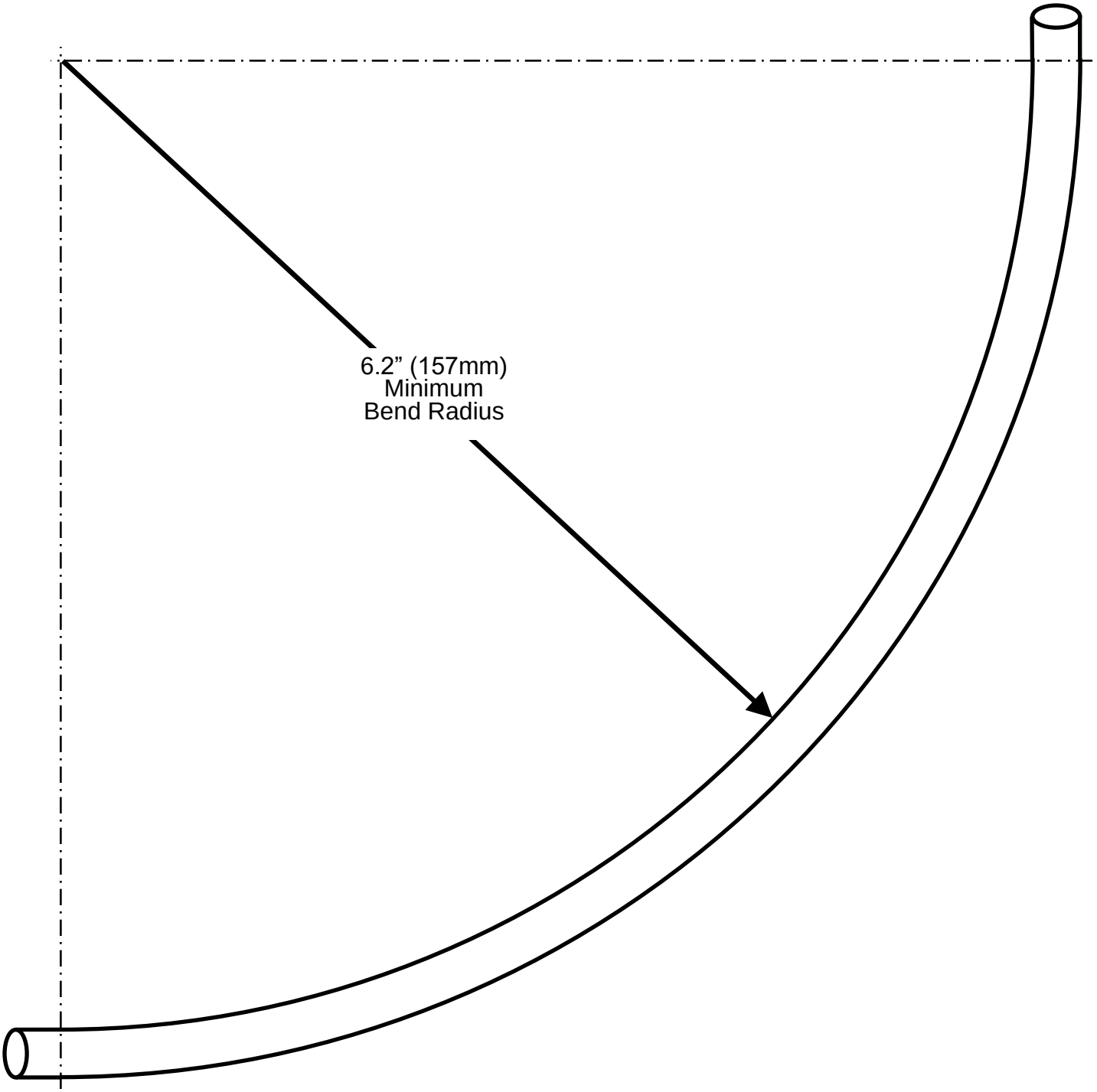
The torch should be installed on the positioner of a height control system capable of maintaining a cutting arc voltage within a maximum of 1 arc volt. The arc voltage should be adjustable within a maximum of 1 arc volt increments. The positioner must be rigid to ensure cut quality and a torch collision sensor is highly recommended.

Refer to the mounting pattern for the Torch Clamp shown in Section 2.9.

Ensure that the Quick-Disconnect Torch Head is kept free from dirt and debris when not installed into a Quick-Disconnect Torch Base.

3.2 Bend Radius for Cables, Hoses and Torch Leads

The minimum bend radius for all cables, hoses, and torch leads is 6.2” (157mm). As a visual guide, the figure below is actual size when the page is printed to fit on US letter sheet, which is 8.5”x11” (215.9mm x 279.4mm).



3.3 Connection Diagram

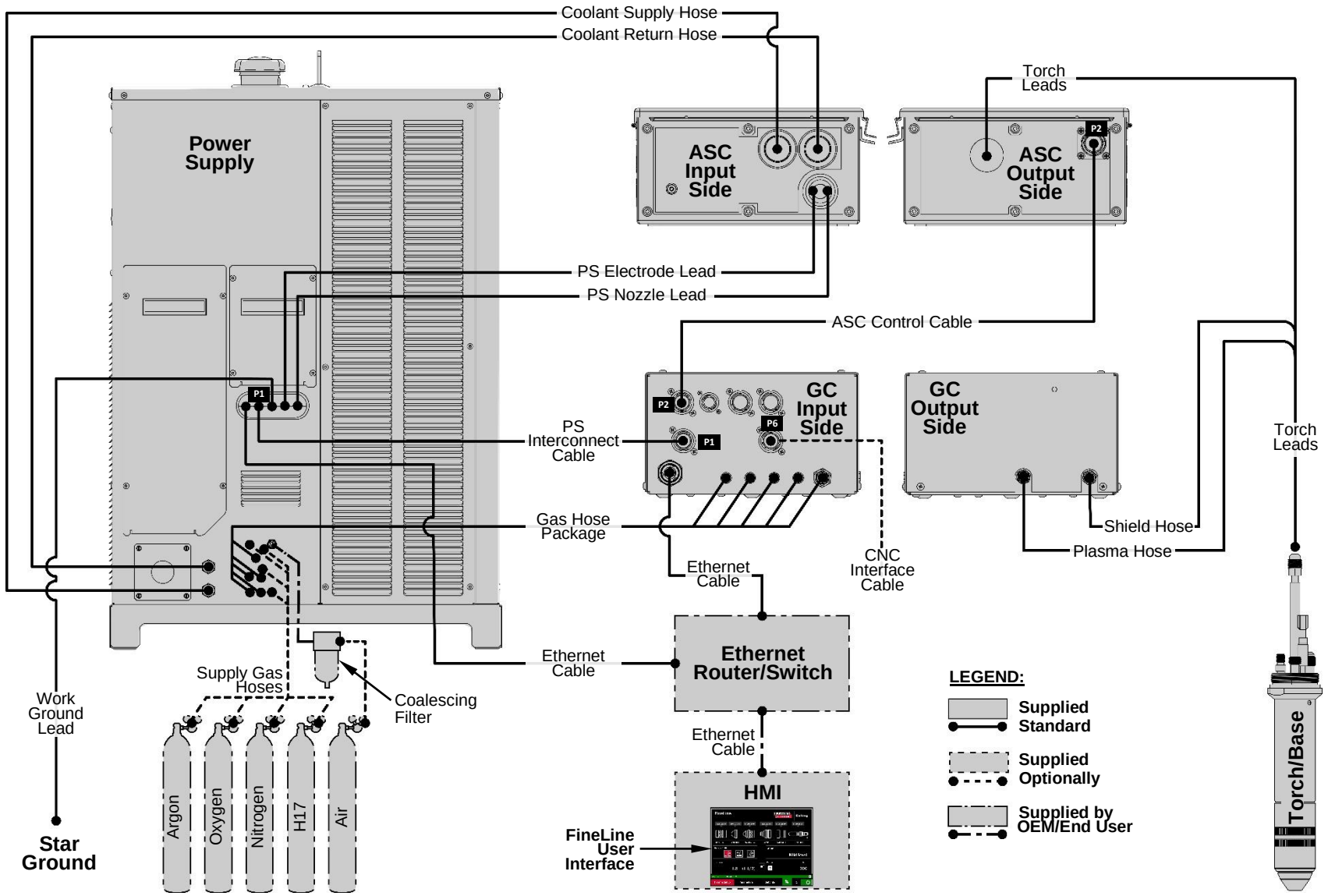


Figure 2: Connection Diagram

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3.4 Radio Frequency (RF) and Electromagnetic Interference (EMI)

3.4.1 Overview

This section describes the proper grounding of the System components to minimize Radio Frequency (RF) and Electromagnetic Interference (EMI).

The Arc Start Console (ASC), by nature of its function in the plasma system, is a source of RF/EMI along with other system components such as drive amplifiers. If proper grounding techniques are not employed during system installation, RF/EMI can couple into other components causing system malfunction and/or component failure. While this section outlines best practices for grounding, this does not guarantee system immunity. These guidelines should be the basis for initial installation and modifications made as necessary to achieve complete immunity.

3.4.2 Types of Grounds

There are three different types of grounds in a plasma system.

1) Service or Protective Earth (PE) ground. This is the ground associated with the mains power supplied to the System. The purpose is to prevent a shock hazard with respect to the plasma equipment and work table. It represents the Service ground connected to the plasma and all other system components such as drive amplifiers and CNC. The PE or Service ground must be connected to each piece of equipment per local and national codes.
2) DC power ground. This is the work lead of the Power Supply and is connected to the cutting table to complete the electrical path for the cutting current.
3) RF/EMI ground. This is the ground for limiting RF/EMI noise in the System. This is the ground that this section addresses.

3.4.3 RF/EMI Grounding Rules

The cutting table is used as the common star grounding point. All RF/EMI grounds should terminate at this point. The star ground connection to the table should have welded studs to the table with a copper bus bar mounted to them. All hardware used for ground connections should be copper or brass with exception of the studs welded to the table.

A ground rod that meets all applicable local and national electrical codes must be installed within 20 ft. (6.10m) of the star ground point. The ground rod should be connected to the star ground with a minimum 8 AWG green/yellow cable.

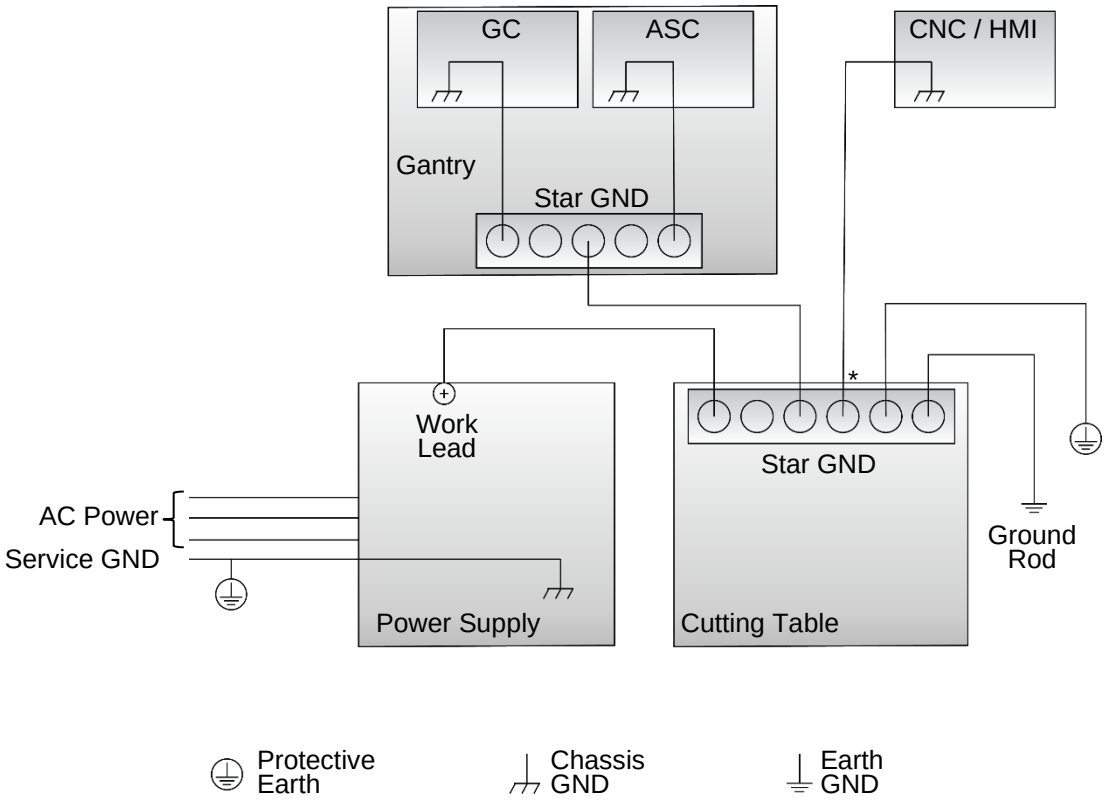
The work, electrode and pilot arc leads from the Power Supply should be bundled together for as long a distance as possible and segregated from control leads. Ideally the power and control leads should run in separate cable tracks – if not, a minimum separation of 6 in. (152.4mm) is recommended.

The braided shield on the torch leads must be electrically connected to the ASC and to the torch handle. The length of the braid must be insulated from any metal contact or contact with the floor. The braid can be insulated with a plastic or leather sheath or run in a plastic track.

Each plasma system component as well as any other related equipment (CNC, motor drives, etc.) must have a separate ground connection to the star ground point even if bolted to the gantry or Power Supply. Grounds are not to be daisy-chained.

For components mounted to the cutting table gantry, it is acceptable to create a star ground at the gantry with a single ground cable connecting the gantry star ground with the cutting table star ground.

Refer to Appendix A for additional information.



* If the CNC / HMI is mounted to the Gantry, the CNC / HMI chassis ground should be connected to the Gantry Star GND.

3.5 Power Supply Input Connections - Primary Power

**** Before connecting primary power, check the data plate on the Power Supply to verify the voltage required ****

Refer to chart below for recommended fuse, wire sizes, and type of copper wires. Fuse the input circuit with the recommended current rated fuses or breakers. Choose input and grounding wire size according to local or national electric codes. Using input wire sizes, fuses, or circuit breakers smaller than recommended may result in “nuisance” shut-offs even if the machine is not being used at high currents.

Power Supply Model	Voltage	Input Amperes	Fuse or Breaker Size	Type 75C Copper Wire in Conduit AWG (IEC) Sizes 40°C (104°F) Ambient	Type 75C Copper Ground Wire in Conduit AWG (IEC) Sizes
K4910-1	380-415V / 3 / 50/60	69	80	4 (25)	8 (10)
K4910-1	460V / 3 / 50/60	58	70	4 (25)	8 (10)
K4910-1	575V / 3 / 50/60	53	60	6 (16)	10 (6)
K4910-2	380-415V / 3 / 50/60	69	80	4 (25)	8 (10)

[1] Wire and Fuse Sizes based upon the U.S. National Electric Code and maximum output.

Connection to the supply circuit can be by means of flexible supply cables or supply cables through conduit to a permanent installation. The supply cables should have a 600 volt minimum rating and should be sized according to local and national codes.

Remove the access panel as shown in Figure 3 or Figure 4; replace when installation is complete.

Select Voltage

1) For Power Supply model K4910-1, set the voltage selection jumper to match the actual supply voltage; refer to Figure 3. Model K4910-2 only has one available voltage selection and the jumper is set at the factory; refer to Figure 4.

Make Connections

2) Supply cables and terminations are provided by the OEM or end user. Route flexible supply cables through the strain relief on the back of the Power Supply and connect as shown in Figure 3 or Figure 4. For supply cables through conduit, install the conduit in place of the strain relief and connect supply cables as described above. Under no circumstances are the supply cables to be routed through the opening in the Power Supply cabinet without conduit or an appropriate strain relief as per local and national codes.

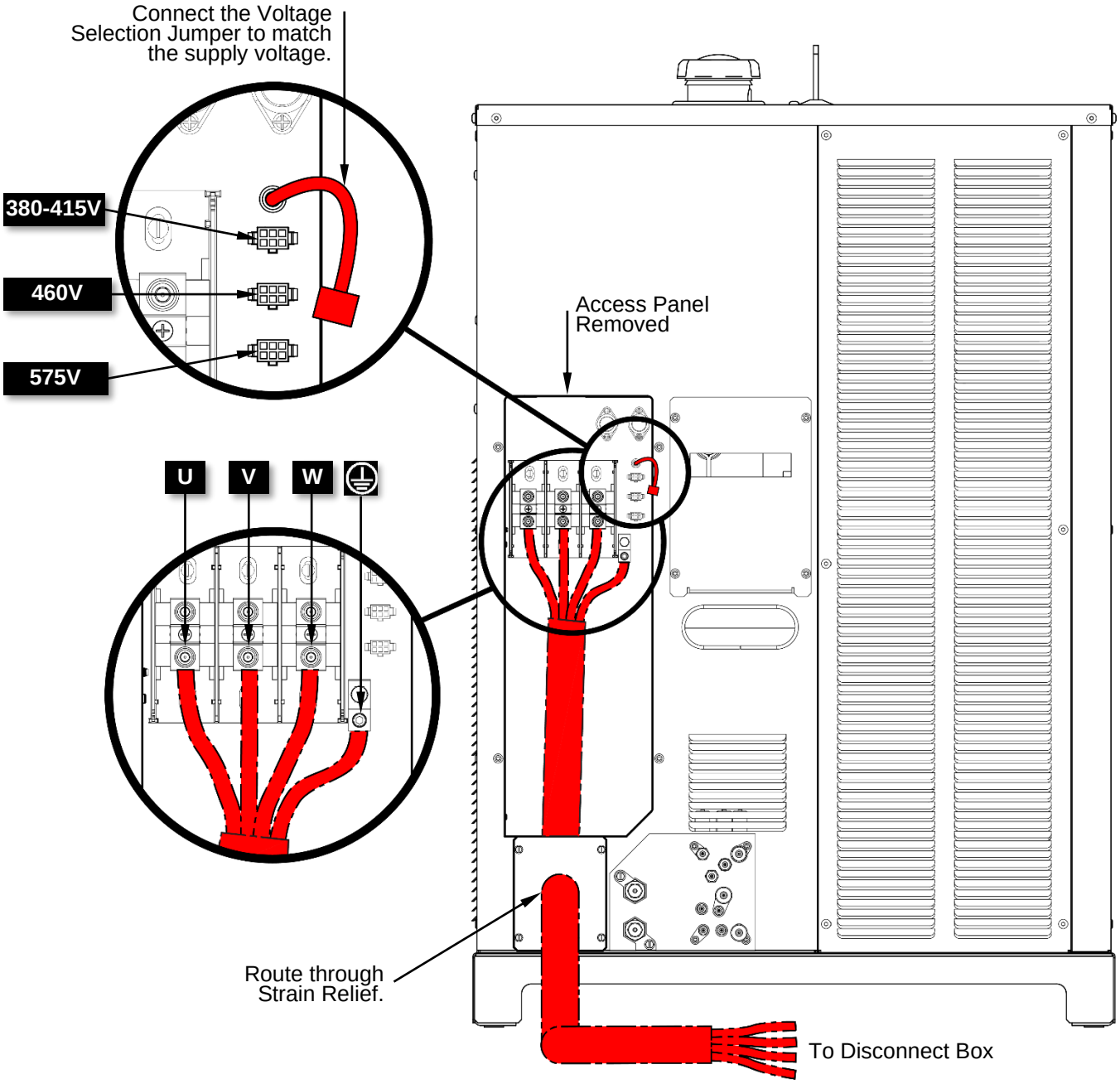


Figure 3: K4910-1 Primary Power Connections

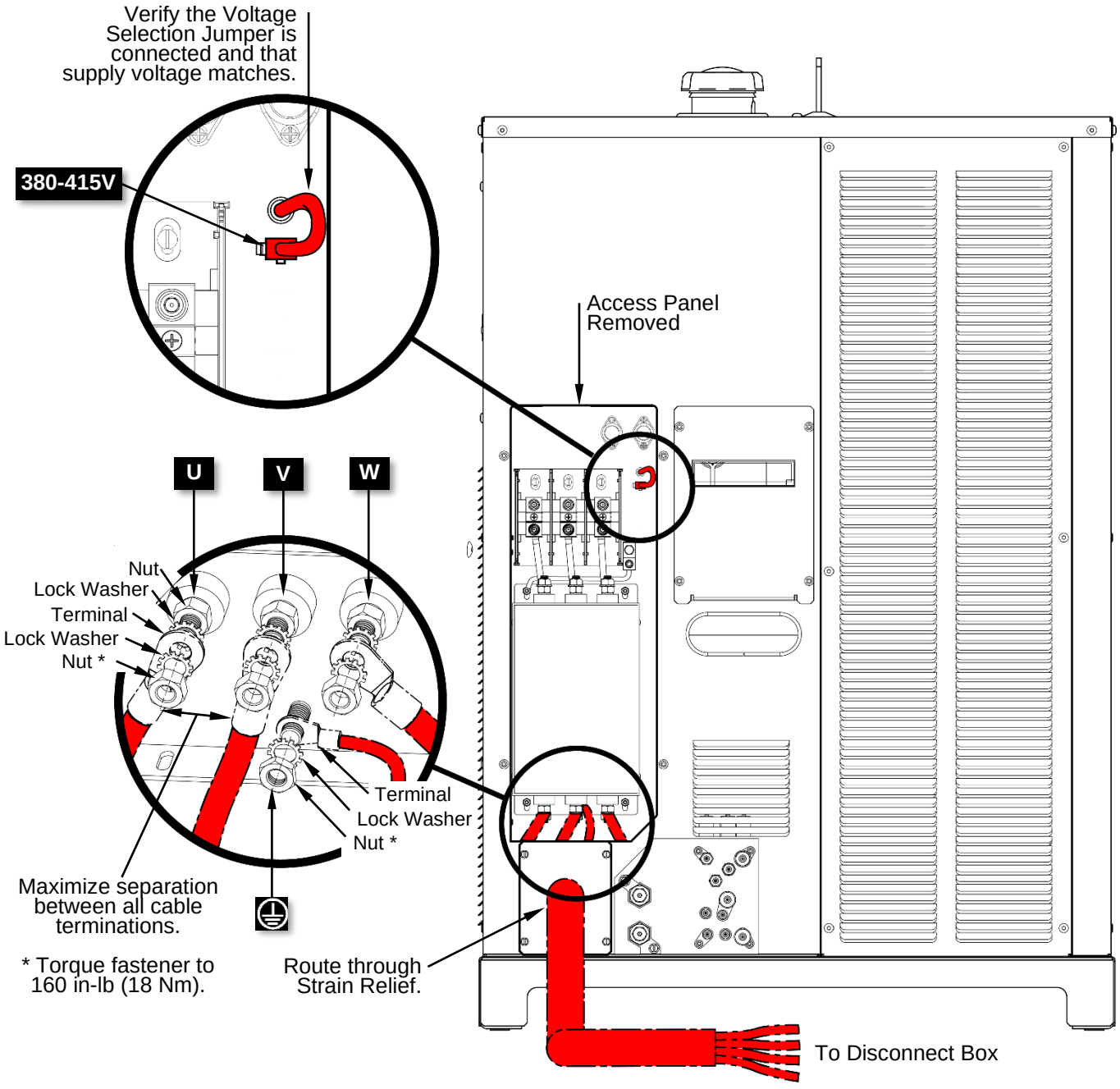


Figure 4: K4910-2 Primary Power Connections

3.6 Power Supply Input Connections - Gas Supply

Connectors are sized for 3/8" inside diameter hose. Do not change the inlet gas supply fittings to quick-connect fittings. Using quick-connect fittings to connect and disconnect pressurized hoses may cause damage to the System. Gas supply hoses can be supplied as an option. Refer to Figure 5 for the physical location of all connections. **Make connections in the order shown below.** When making brass fitting connections, use two opposing wrenches and only tighten enough to make gas seals. The fittings are subject to damage if over tightened.

Argon Inlet

1) Argon is optional and provides improved marking capabilities. If not used, this inlet should be capped.

Nitrogen Inlet

2) Nitrogen must be supplied at all times.

H17 Inlet

3) H17 gas must be supplied to the unit when stainless steel is to be cut with H17 as the plasma gas. If not used, this inlet should be capped.

Air Inlet

4) Air must be supplied at all times, except when cutting stainless steel with H17. Refer to Section 2.6 for air quality requirements. If using shop air, the OEM/End User must install an inline coalescing filter that meets or exceeds the following:

D.O.P Coalescing Efficiency 0.3 to 0.6 Micron Particles	Maximum Oil Carryover[1] PPM w/w	Pressure Drop (PSID)[2] @ Rated Flow		Particulate Micron Rating
		Media Dry	Media Wet with 10-20 wt. oil	
95%	0.85	0.5	0.5	0.7

[1] Tested per BCAS 860900 at 40 ppm inlet. [2] Add dry + wet for total pressure drop. D.O.P. = Dioctylphthalate

Oxygen Inlet

5) Oxygen must be supplied to the unit at all times for cutting mild steel; not required for cutting stainless steel or aluminum.

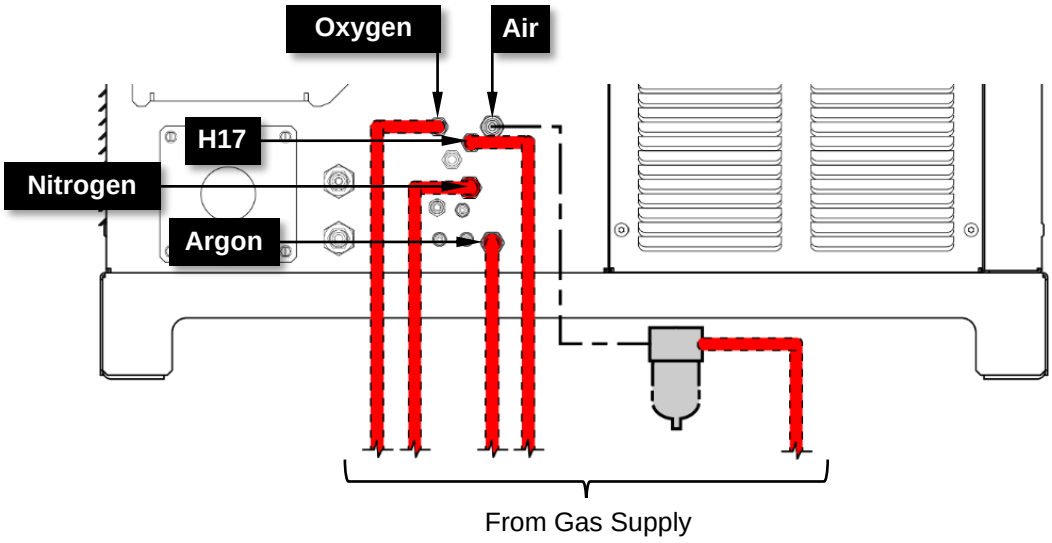


Figure 5: Gas Supply Connections

3.7 Power Supply Output Connections

Refer to Figure 6 and Figure 7 for the physical location of all connections. Remove the access panel as shown in Figure 6 to begin; replace when installation is complete. When making brass fitting connections, use two opposing wrenches and only tighten enough to make water or gas seals. The fittings are subject to damage if over tightened.

Power Supply Electrode Lead

1) Route the 1/2” lug of the Power Supply electrode lead through the opening in the rear of the Power Supply and connect it using the supplied hardware to the terminal labelled with the symbol shown. The lug must be installed flat against the terminal as shown.
2) Route the 5/16” lug of the Power Supply electrode lead through the strain relief on the ASC. Remove the bolt, lock washer, and ring terminal from the cathode manifold and install the lug flat against the brass cathode manifold. Replace the ring terminal, lock washer, and bolt.

Work Ground Lead

3) Route one end of the work ground lead through the opening in the rear of the Power Supply and connect it with the provided hardware to the terminal labelled with the symbol shown.
4) Connect the other end of the work ground lead to the star ground point for the cutting system. Make sure that good metal-to-metal contact is made.

Power Supply Nozzle Lead

5) Route the 1/2” lug of the Power Supply nozzle lead through the opening in the rear of the Power Supply and connect it using the supplied hardware to the terminal labelled with the symbol shown.
6) Route the 1/4” lug end of the Power Supply nozzle lead through the strain relief on the ASC. Connect it to the terminal on the PCB as shown using the supplied hardware.

Coolant Supply Hose

7) Connect one end of the coolant supply hose to the fitting on the Power Supply labelled with the symbol shown. The fitting has right hand threads.

8) Connect the other end of the coolant supply hose to the fitting the ASC labelled with the symbol shown. The fitting has right hand threads.

Coolant Return Hose

9) Connect one end of the coolant return hose to the fitting on the Power Supply labelled with the symbol shown. The fitting has left hand threads.

10) Connect the other end of the coolant return hose to fitting on the ASC labelled with the symbol shown. The fitting has left hand threads.

PS Interconnect Cable

11) Connect the PS interconnect cable to the connector labelled P1 on the Power Supply and to the corresponding connector labelled P1 on the GC.
The Power Supply provides 24VDC to power the GC through this cable. The 24VDC is protected by a 3.5A circuit breaker.

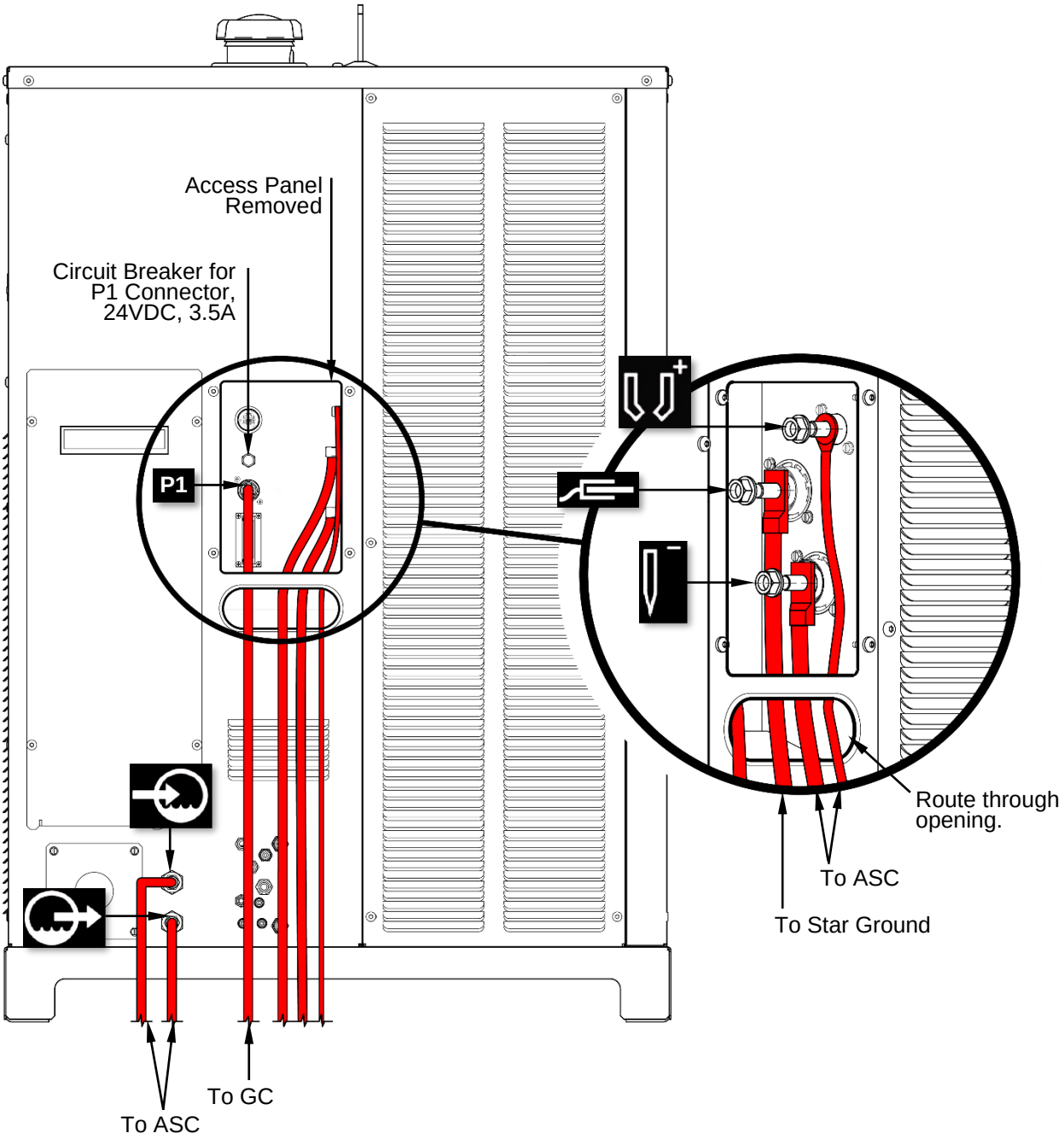


Figure 6: Power Supply Output Connections

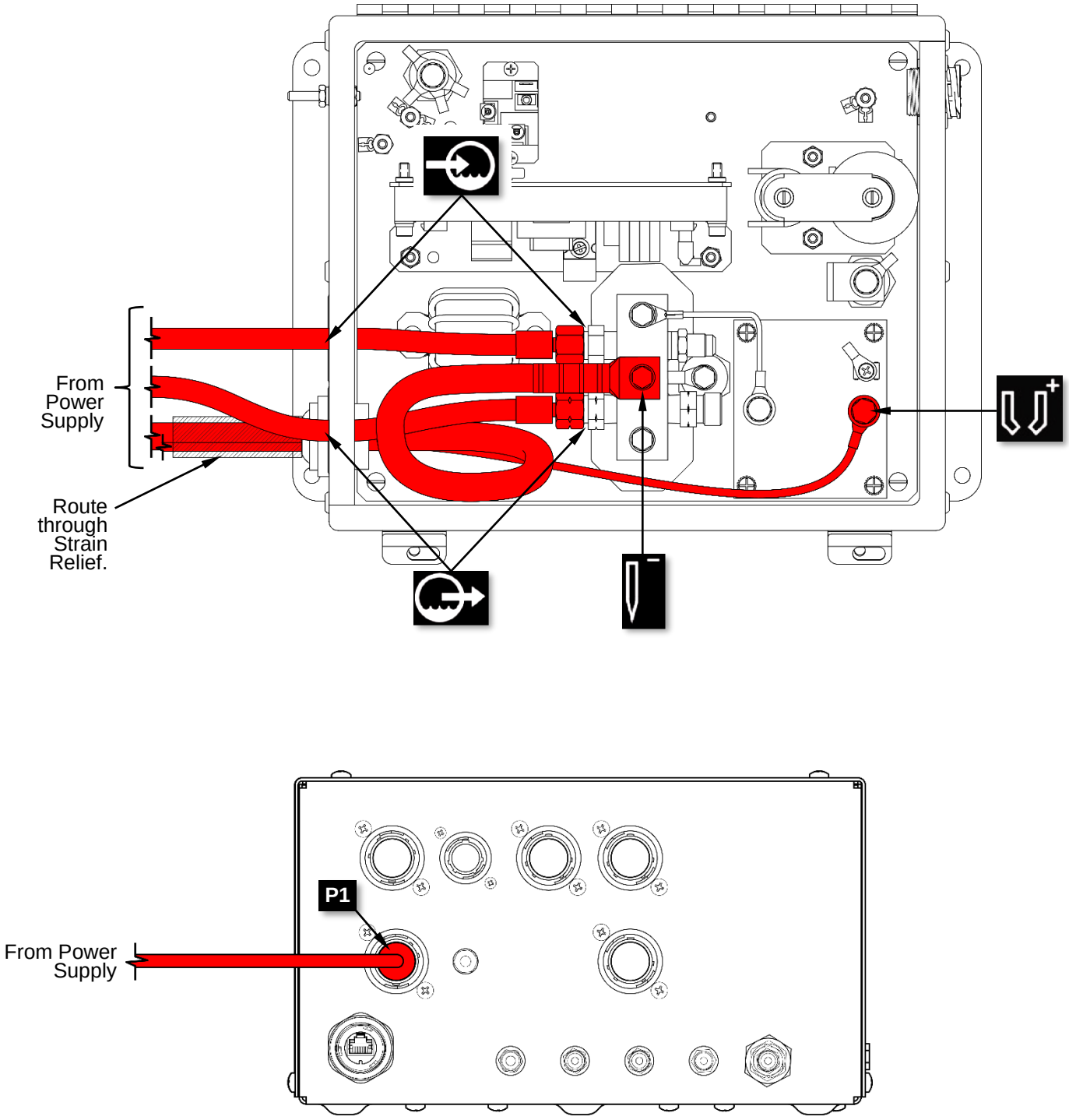


Figure 7: Power Supply Output Connections

3.8 Arc Start Console Output Connections

Refer to Figure 8 for the physical location of all connections. Secure the cover on the ASC when installation is complete. When making brass fitting connections, use two opposing wrenches and only tighten enough to make water or gas seals. The fittings are subject to damage if over tightened.

Torch Leads

1) Remove the threaded ring from the brass shield connector on the end of the torch leads. Route the torch leads through the opening in the ASC. Push the brass shield connector through the hole until it is seated against the ASC enclosure.
2) Slide the threaded ring over the torch leads, thread it onto the brass shield connector, and then tighten firmly. The shield connector will ground the braided shield to the ASC enclosure in order to help reduce high frequency noise emission. Using an ohmmeter, measure for zero Ohms between the braided shield and the ground stud located on the outside of the ASC enclosure.
3) Connect the torch CTP (Clear The Plate, a.k.a. Ohmic Sense) sensor lead to the red hexagonal standoff.
4) Connect the torch electrode/coolant supply lead to the brass cathode manifold. The torch electrode/coolant supply lead has right hand threads.
5) Connect the torch coolant return lead to the brass cathode manifold. The torch coolant return lead has left hand threads.
6) Connect the torch nozzle lead to the angled (“L”) bracket on the red hexagonal standoff as shown using the supplied hardware. The torch nozzle lead has right hand threads.

ASC Control Cable

7) Connect the ASC control cable to the connector labelled P2 on the ASC and to the connector labelled P2 on the GC.

   The GC supplies 24VDC to the ASC through this cable. The 24VDC is protected by a PTC overcurrent protection device, which automatically resets.

ASC Ground Cable

8) Connect the ASC ground cable (user-supplied) to the ground stud on the ASC labelled with the symbol shown and to the star ground point for the cutting system. Make sure that good metal-to-metal contact is made. 6AWG cable is recommended.

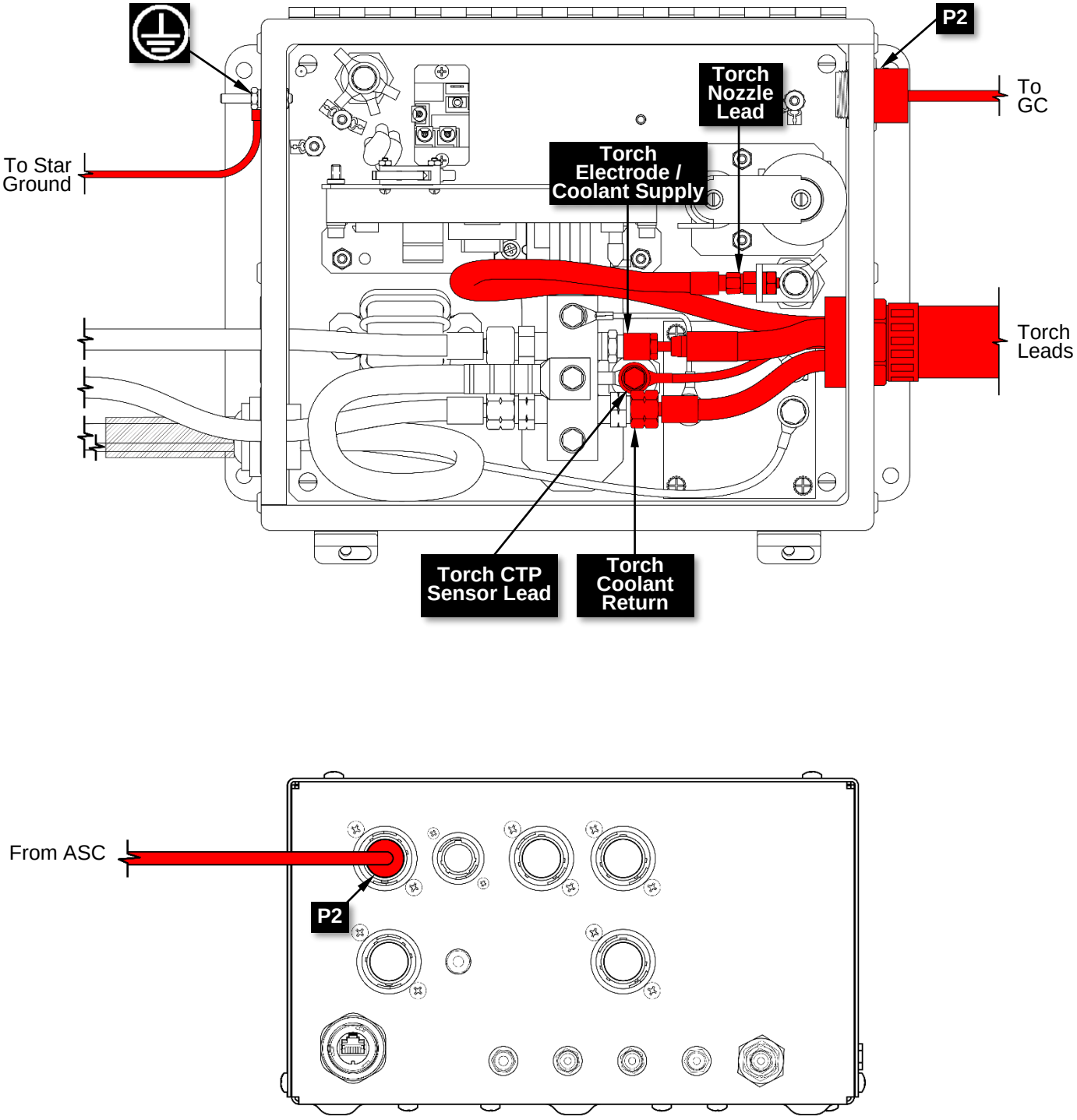


Figure 8: ASC Output Connections

3.9 Gas Controller Input Connections

Refer to Figure 9 for the physical location of all connections. **Make connections in the order shown below.** When making brass fitting connections, use two opposing wrenches and only tighten enough to make gas seals. The fittings are subject to damage if over tightened.

Plasma Pre / Post Gas Hose

1) Connect the plasma pre / post hose to the fitting on the input side of the GC labelled with the symbol shown and to the corresponding fitting on the Power Supply.

Plasma Marking Gas Hose

2) Connect the plasma marking hose to the fitting on the input side of the GC labelled with the symbol shown and to the corresponding fitting on the Power Supply.

Shield Marking Gas Hose

3) Connect the shield marking hose to the fitting on the input side of the GC labelled with the symbol shown and to the corresponding fitting on the Power Supply.

Shield Cutting Gas Hose

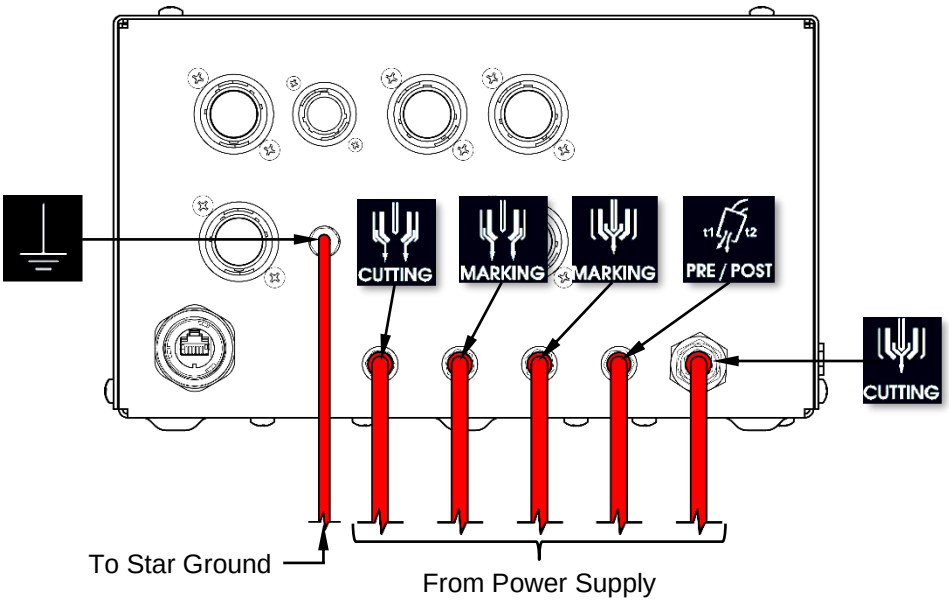
4) Connect the shield cutting hose to the fitting on the input side of the GC labelled with the symbol shown and to the corresponding fitting on the Power Supply.

Plasma Cutting Gas Hose

5) Connect the plasma cutting gas hose to the fitting on the input side of the GC supply labelled with the symbol shown and to the corresponding fitting on the Power Supply.

Gas Controller Ground Cable

6) Connect the GC ground cable (user-supplied) to the ground stud on the GC labelled with the symbol shown and to the star ground point for the cutting system. Make sure that good metal-to-metal contact is made. 6AWG cable is recommended.



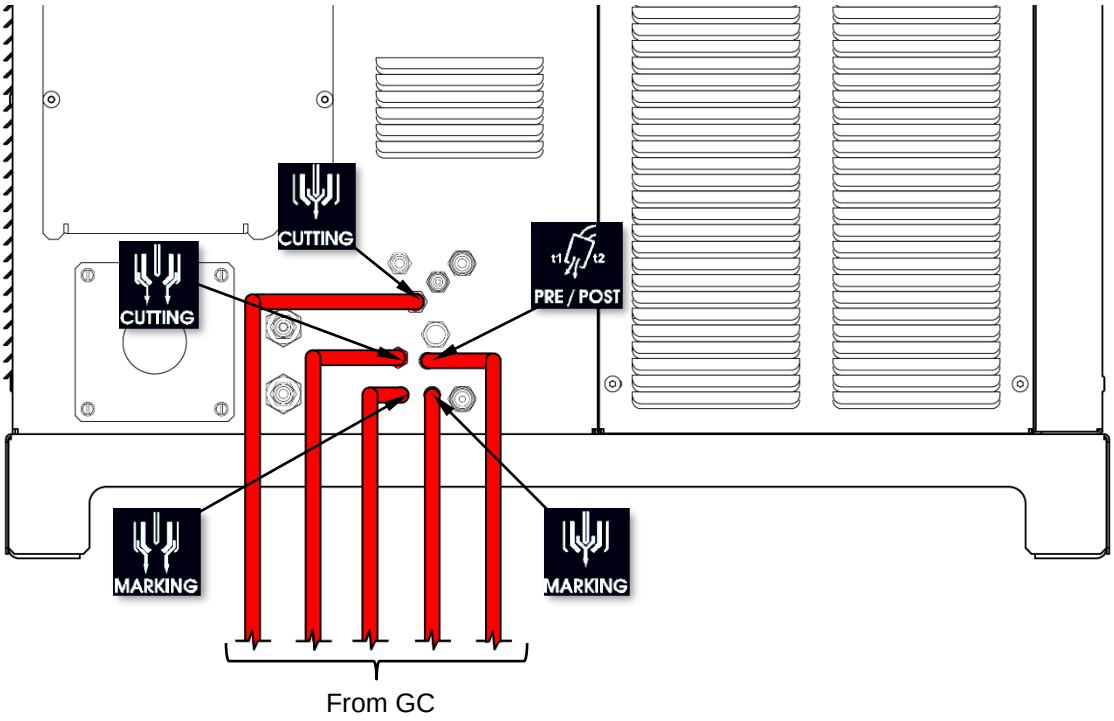


Figure 9: GC Input Connections

3.10 Gas Controller Output Connections

Refer to Figure 10 for the physical location of all connections.

Plasma Hose

1) Connect the plasma hose, which exits from the torch leads about 6 ft. (1.83m) from the torch end, to the fitting on the output side of the GC labelled with the symbol shown.

Shield Hose

2) Connect the shield hose, which exits from the torch leads about 6 ft. (1.83m) from the torch end, to the fitting on the output side of the GC labelled with the symbol shown.

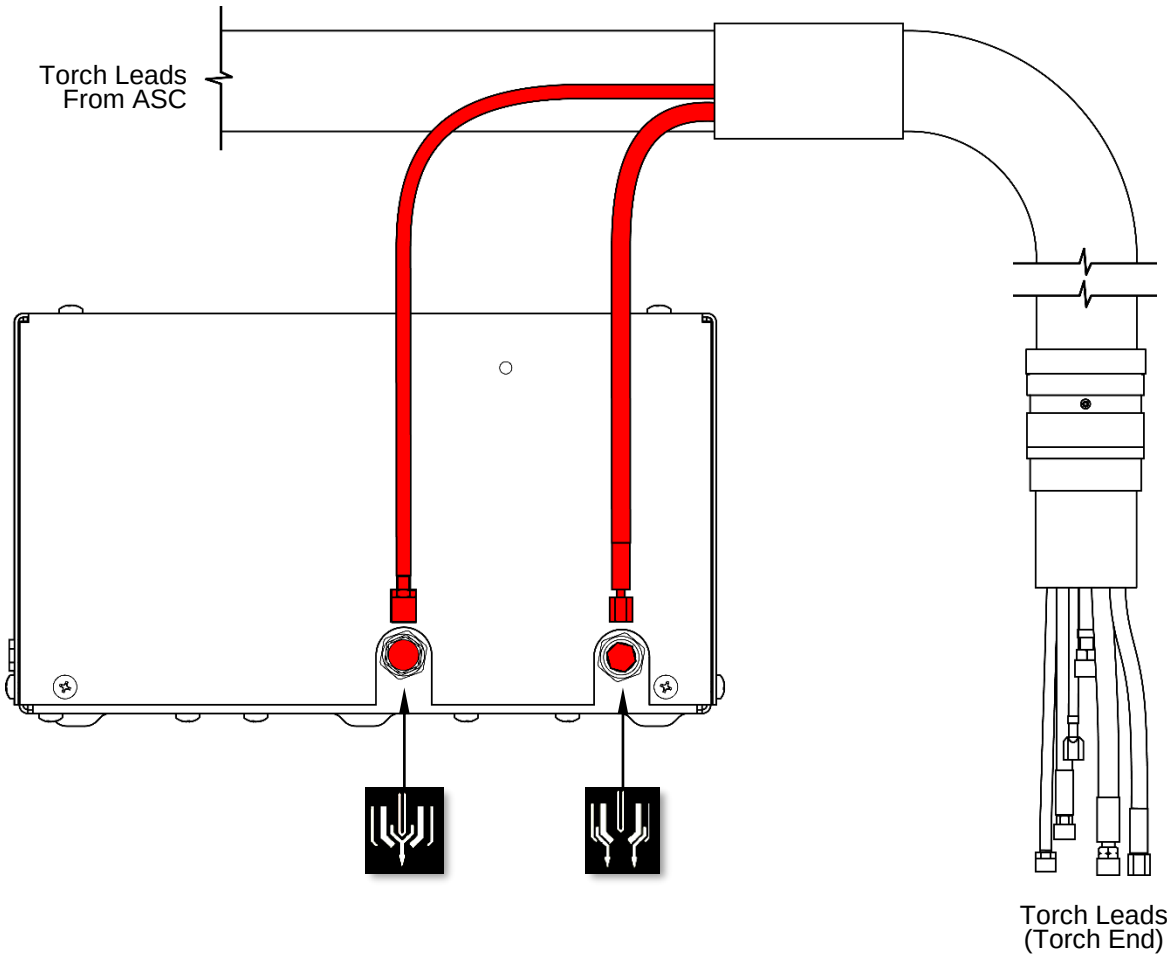


Figure 10: GC Outputs

3.11 Torch Connections

Refer to Figure 11 for the physical location of all connections. When making brass fitting connections, use two opposing wrenches and only tighten enough to make water or gas seals. The fittings are subject to damage if over tightened.

Torch Leads and Torch Handle

1) Slide the torch lead isolator (and braided shield) away from the torch end of the torch leads by at least the length of the torch handle. Slide the torch leads through the non-threaded end of the torch handle (the end with two set-screw holes). Make sure that all torch lead fittings are visible so that connections can be made.

Electrode/Coolant Supply Lead

2) Connect the electrode/coolant supply lead to the corresponding fitting on the torch or torch base.

Plasma Gas Hose

3) Connect the plasma gas hose to the corresponding fitting on the torch or torch base.

Nozzle Lead

4) Connect the nozzle lead to the corresponding fitting on the torch or torch base.

Shield Gas Hose

5) Connect the shield gas hose to the corresponding fitting on the torch or torch base.

Coolant Return Lead

6) Connect the coolant return lead to the corresponding fitting on the torch or torch base. The torch coolant return lead fitting has left hand threads.

Torch CTP Sensor Lead

7) Connect the torch CTP sensor lead to the corresponding connector on the torch or torch base.

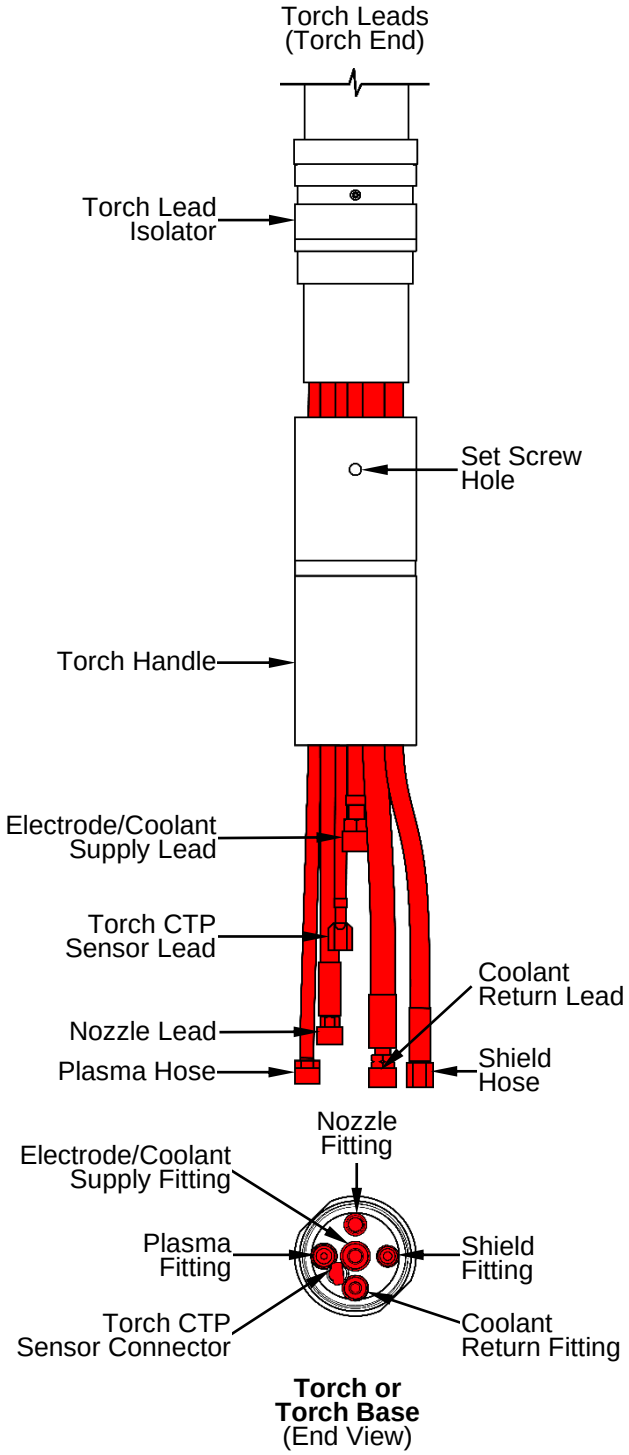


Figure 11: Torch Connections

3.12 Mount the Torch

Mount the Quick-Disconnect Torch

Refer to Figure 12 for Quick-Disconnect Torch mounting requirements.

⚠ CAUTION: Missing or damaged o-rings can damage the System. Inspect all o-rings on the Quick-Disconnect Torch Head before mating it to the Quick-Disconnect Torch Base. Never use the System with missing or damaged o-rings.

Torch Handle

1) Hold the torch or torch base stationary and thread on the torch handle until hand-tight. Do not twist the torch leads while tightening or damage may occur.

   Tighten the torch base to the handle using a pin style adjustable spanner wrench (fits 2" diameter with ¼" diameter pin).

Torch Leads

2) Slide the torch lead isolator into the end of the torch handle until it is fully seated. Align the small indentations (dimples) in the torch lead isolator with the set screw holes in the torch handle. Secure with the two provided set screws using a 3/32" (2.5mm) hex key.

Torch Clamp and Torch

3) Separate the two halves of the torch clamp by removing the two socket-head cap screws (8-32 x 1 ¾") using a 9/64" (3.5mm) hex key.

   Refer to Section 2.9 for the mounting pattern, which requires three user-supplied 10-32 socket-head cap screws.

4) Mount the torch clamp base to the mounting surface so the torch is positioned 90 degrees relative to the workpiece. Use a machinist's square or other alignment tool on multiple sides of the torch to ensure that it is perpendicular to the workpiece.

5) Place the torch handle into the torch clamp base. Ensure the alignment indicator on the torch base is visible. Attach the other half of the torch clamp with the two screws removed earlier. Ensure the entire torch assembly is rigid.

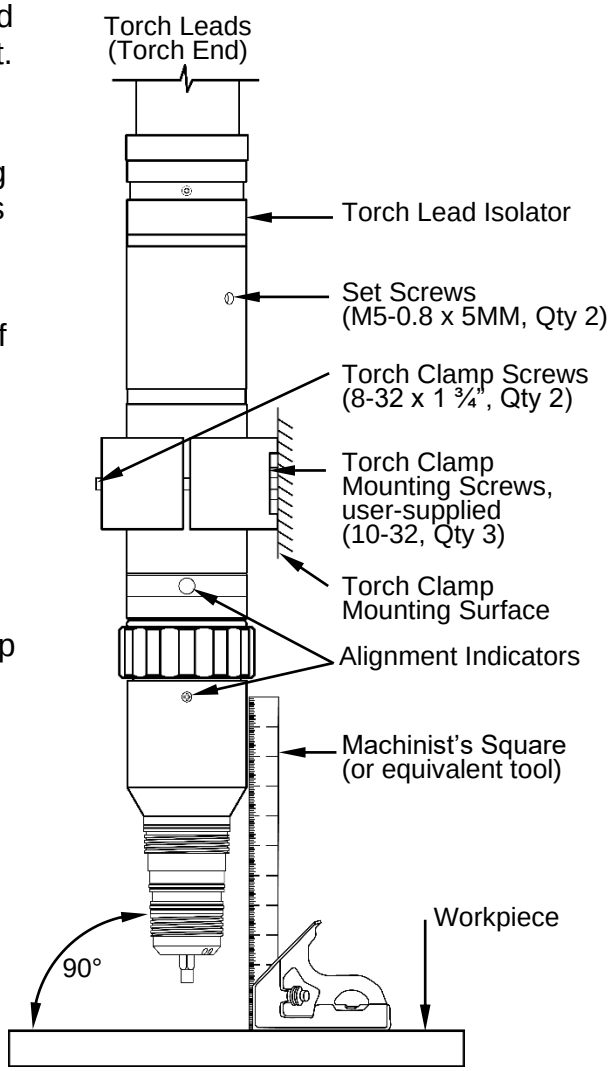


Figure 12: Mount the Quick-Disconnect Torch

Mount the Standard Torch

Refer to Figure 13 for Standard Torch mounting requirements.

NOTE: *Inspect all o-rings. Never use the System with missing or damaged o-rings.*

Torch Handle

1) Hold the torch stationary and thread on the torch handle until hand-tight. Do not twist the torch leads while tightening or damage may occur.

Torch Leads

2) Slide the torch lead isolator into the end of the torch handle until it is fully seated. Align the small indentations (dimples) in the torch lead isolator with the set screw holes in the torch handle. Secure with the two provided set screws using a 3/32" (2.5mm) hex key.

Torch Clamp and Torch

3) Separate the two halves of the torch clamp by removing the two socket-head cap screws (8-32 x 1 ¾") using a 9/64" (3.5mm) hex key.

   Refer to Section 2.9 for the mounting pattern, which requires three user-supplied 10-32 socket-head cap screws.

4) Mount the torch clamp base to the mounting surface so the torch is positioned 90 degrees relative to the workpiece. Use a machinist's square or other alignment tool on multiple sides of the torch to ensure that it is perpendicular to the workpiece.

5) Place the torch handle into the torch clamp base. Attach the other half of the torch clamp with the two screws removed earlier. Ensure the entire torch assembly is rigid.

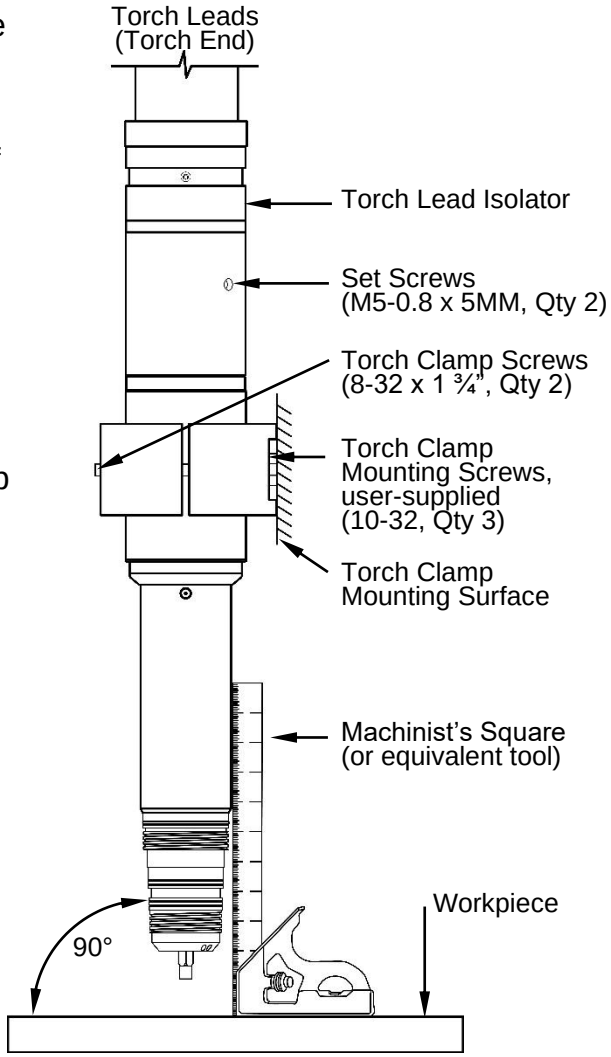


Figure 13: Mount the Standard Torch

3.13 Install Consumables

⚠ WARNING

Electric Shock Can Kill.
Disconnect input power before servicing.
Do not touch electrically live parts or electrode with skin or wet clothing. Always wear dry insulating gloves.

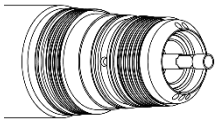
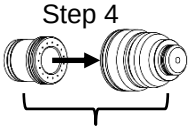
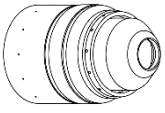
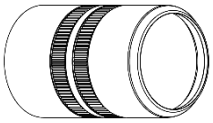
⚠ WARNING

Hot Parts Can Burn Skin.
Do not touch hot parts bare-handed.
Always use gloves when handling the torch as it can be hot after cutting, especially with high amperages and long cut times.
Allow cooling period before working on the torch.

NOTE: *Do not use an excessive amount of o-ring lubricant. Ensure lubricant is only placed on o-rings. Excess lubricant can interfere with gas flow, which can cause starting problems, poor cut quality, and short consumable life.*

NOTE: *Inspect all o-rings. Never use the System with missing or damaged o-rings.*

1) Remove primary power to the Power Supply. For multi-torch setups, ensure this is the Power Supply physically connected to the serviced torch.
2) If applicable, remove the Quick-Disconnect Torch Head and place on a clean work surface.
3) Apply lubricant BK716012 (or BK716012-2) to the o-ring on the electrode. Push the electrode over the cooling tube and thread the electrode into the torch by hand. Tighten the electrode using a 10mm, 6-point deep socket (BK602396) and ¼" driver (BK277086).
4) Apply lubricant to the o-rings on the swirl ring. Press the larger end of the swirl ring into the bottom of the nozzle until it is fully seated.
5) Apply lubricant to the o-rings on the nozzle. Push the nozzle/swirl ring onto the electrode. The larger nozzle o-ring will fit completely inside the torch.
6) Apply lubricant to all o-rings on the torch. Thread the retaining cap onto the torch until it is fully seated.
7) Apply lubricant to the o-ring on the shield cap. Push the shield cap onto the retaining cap until it is fully seated.
8) Thread the outer retaining cap onto the torch until it is fully seated.
9) If applicable, install the Quick-Disconnect Torch Head.

Torch	Electrode	Swirl Ring	Nozzle	Retaining Cap	Shield Cap	Outer Cap
 ← Step 3		 Step 4 ← Step 5		 ← Step 6	 ← Step 7	 ← Step 8

3.14 Ethernet Connections

Refer to Figure 14 for the physical location of all connections. Replace the access panel on the Power Supply when installation is complete.

Power Supply to Ethernet Router/Switch

1) Route the bayonet connector end of an Ethernet cable through the opening in the rear of the Power Supply. Plug it into the connector labelled with the symbol shown. Connect the other end to the Ethernet router/switch.

GC to Ethernet Router/Switch

2) Connect the bayonet connector end of an Ethernet cable to the connector on the GC labelled with the symbol shown. Connect the other end to the Ethernet router/switch.

Ethernet Router/Switch to HMI

3) Connect a standard Ethernet cable (user-supplied) between the Ethernet router/switch and the HMI.

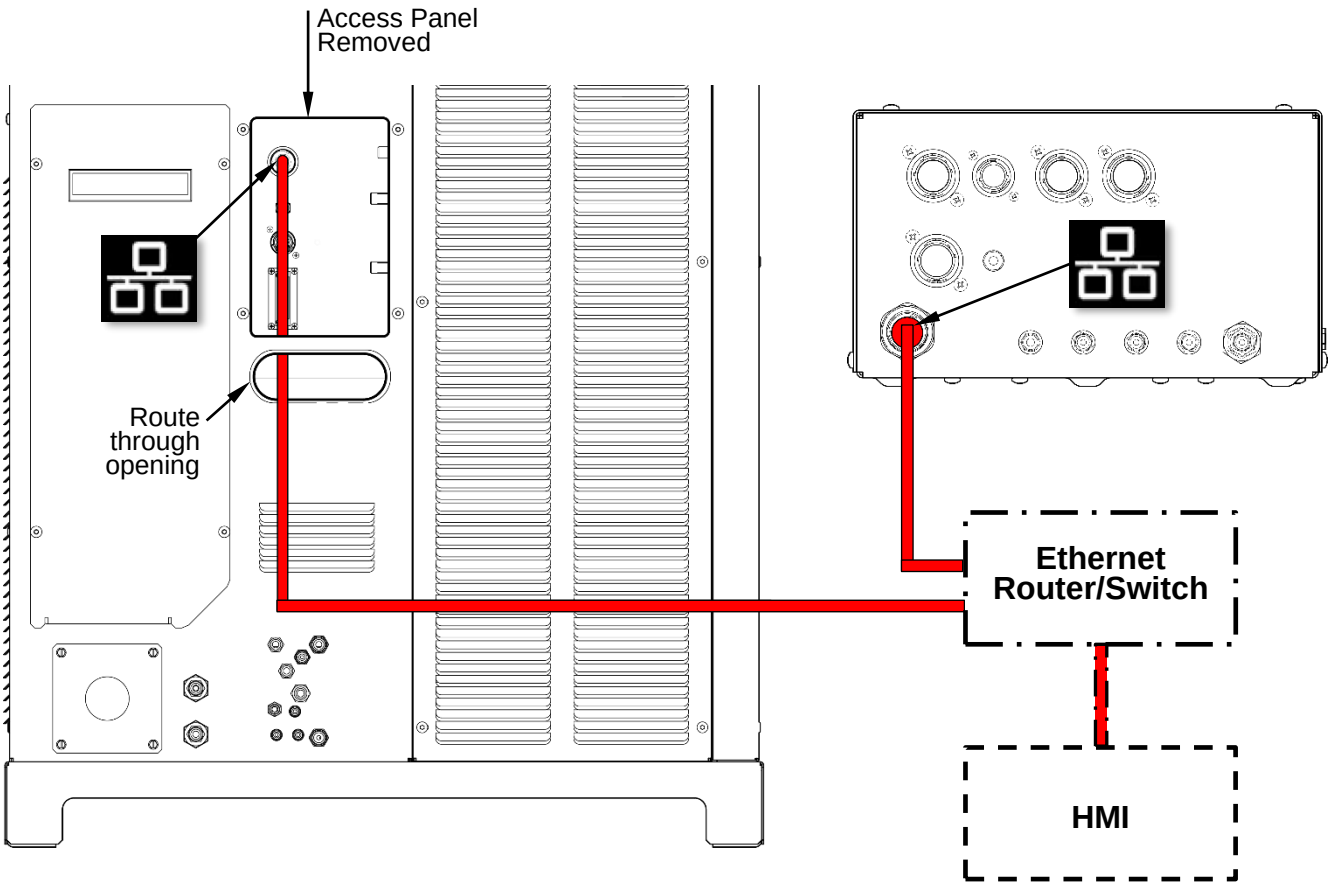


Figure 14: Ethernet Connections

3.15 Emergency Stop (EStop) Circuit

The FineLine 170HD System incorporates an EStop circuit meeting Performance Level (d) Category 3 requirements as per ISO 13849-1 and IEC 62061 standards. The EStop circuit employs a Safety Relay which controls both the Power Supply and Gas Controller outputs, disabling both when the EStop is engaged.

The OEM or end user must supply the EStop enable/disable switches and wiring. The Safety Relay employs dual monitored EStop input circuits. Both are required and must be isolated from each other for proper operation. Switch contacts must be rated for 35 VDC, 100mA.

Refer to Figure 15 for the physical location of all connections. Replace the access panel on the Power Supply when installation is complete.

Power Supply to EStop Connections

1) On the rear of the Power Supply, remove the two jumper wires from the terminal block labelled with the symbol shown.
2) Connect the EStop wiring to the terminal block as shown. Route wiring through the opening on the rear of the Power Supply.

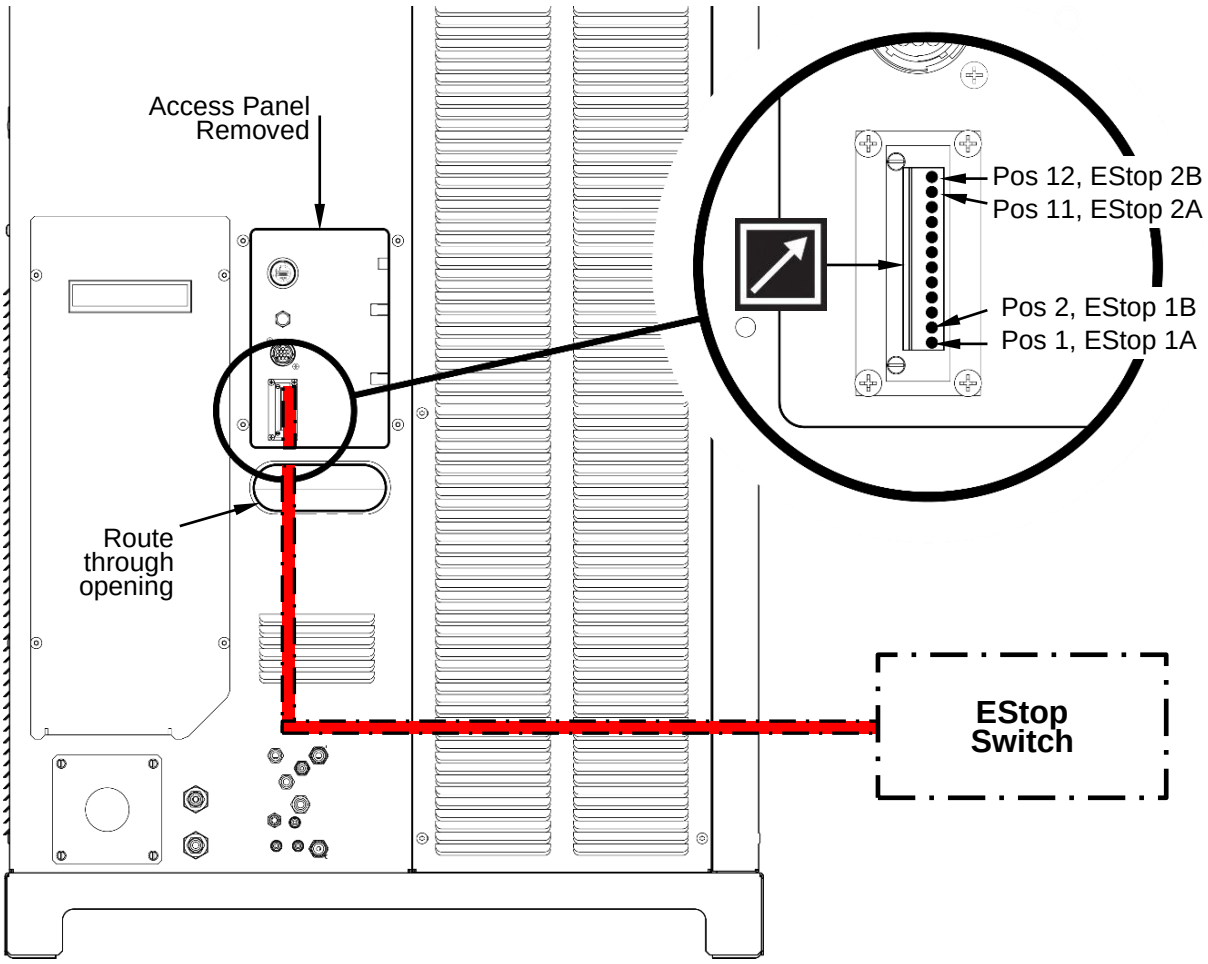
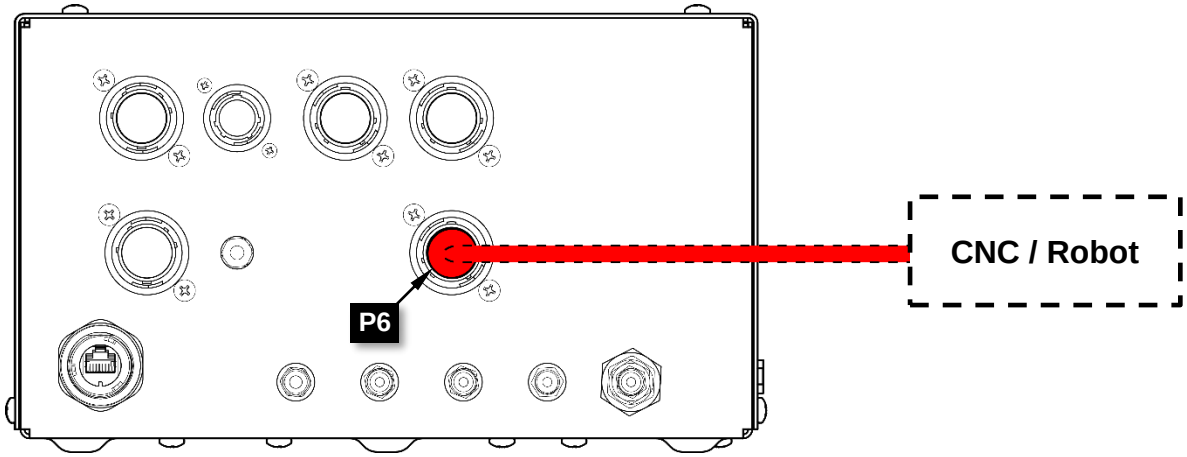


Figure 15: EStop Circuit

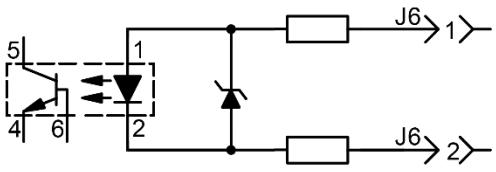
3.16 CNC Interface

The Gas Controller provides an optional CNC interface (P6) for legacy products and robotic applications. Refer to Appendix B to interface with an Inova System. The following I/O is provided:

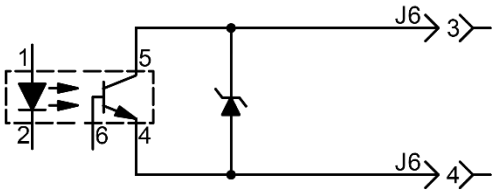
- Start Input (24Vdc, 20ma)
  - Pin 1 (+), Pin 2 (-)
- Transferred Arc Output (24Vdc, 20mA)
  - Pin 3 (+), Pin 4 (-)
  - Turns on upon transferred arc by default
  - Logic can be inverted
- Plate Sense Output (24Vdc, 20mA)
  - Pin 5 (+), Pin 6 (-)
  - Turns on upon sensing plate by default
  - Logic can be inverted
- Arc Voltage Output
  - Pin 7 (+), Pin 8 (-)
  - Arc voltage is represented as a current output 0 – 20mA.
    400V => 20mA output
  - Output Voltage ratio is a function of load resistance.
    - R_{load} = 500 Ohms; $400V_{arc}$ = 20mA x 500 Ohms = $10V_{out}$
      Ratio = 400V/10V or 40:1
    - R_{load} = 250 Ohms; $400V_{arc}$ = 20mA x 250 Ohms = $5V_{out}$
      Ratio = 400V/5V or 80:1
  - Max Resistance = 1000 Ohms (20:1 Ratio)



3.16.1 CNC Interface Circuit Diagrams



Start Input



Transferred Arc Output

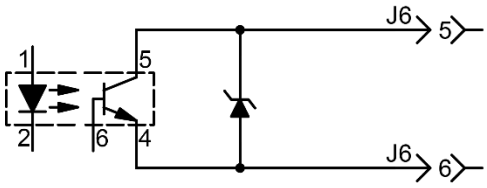
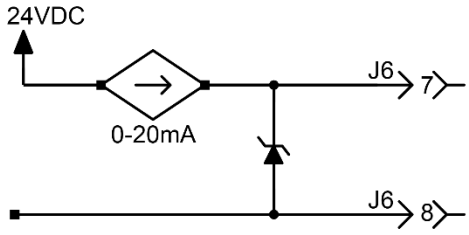


Plate Sense Output



Arc Voltage Output

3.17 Software Installation

3.17.1 CutLinc Server

Installation

If the System uses a non-Lincoln Electric HMI (CNC Controller or Industrial Computer), the CutLinc Server must be installed. This is not required when using a Lincoln Electric provided HMI.

Contact Lincoln Electric service department for FineLine Service Installer.

Manual Start

CutLinc Server should automatically start each time the HMI is rebooted; however, to manually start CutLinc Server, run file:

C: > Program Files > Lincoln Electric > CLFServer > CLFSserver.exe

Alternate IP Addresses

When not using DHCP, the following alternate IP addresses will be assigned by default after the timeout period shown:

Timeout	IP Address	Component
180 seconds	192.168.90.11	Power Supply
10 seconds	192.168.90.12	Gas Controller
~60 seconds	192.168.90.13*	HMI
10 seconds	192.168.90.14	Advanced Process Controller (optional equipment)

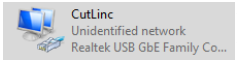
** Must be assigned manually. See instructions below.*

The subnet mask is 255.255.255.0.

To manually assign the alternate IP Address for the HMI:

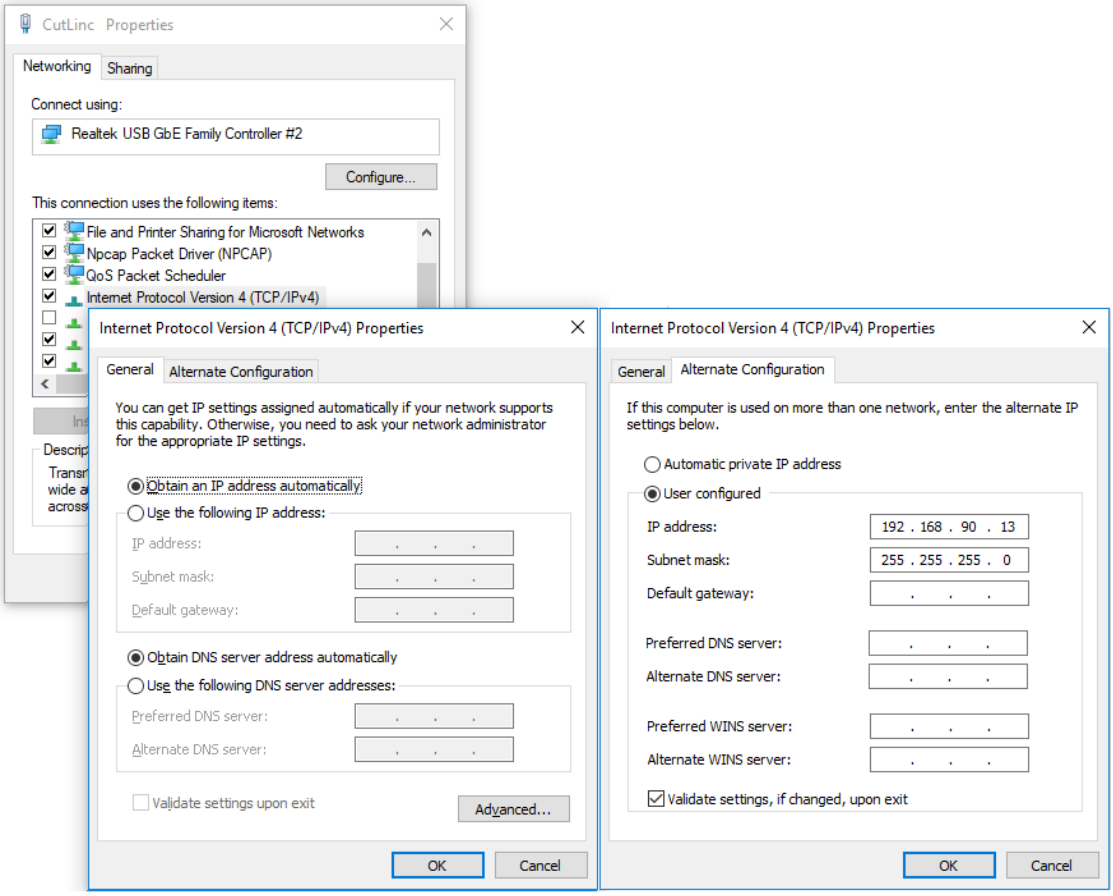
1) On the HMI, navigate to the following:

2) Right-click on the Ethernet adapter and rename it to “CutLinc”.

3) Right-click on the CutLinc adapter (

) and then choose Properties.

4) Select Internet Protocol Version 4 (TCP/Ipv4) and then the Alternate Configuration tab. In the User configured section, enter the IP address and Subnet mask shown below.



Firewall Exclusions

If CutLinc Server is not connecting, inbound and outbound exclusion may need to be added to the network firewall to allow data to pass through.

MultiCast IP:	224.0.180.90
Multicast Port:	17272
TCP Address:	Any
TCP Server Port:	48548

3.17.2 FineLine User Interface (UI)

Installation

If the System uses a non-Lincoln Electric HMI (CNC Controller or Industrial Computer), the FineLine UI must be installed. Installation of the FineLine UI is not required when using a Lincoln Electric provided HMI.

Contact Lincoln Electric service department for FineLine Service Installer.

3.18 Commission the System

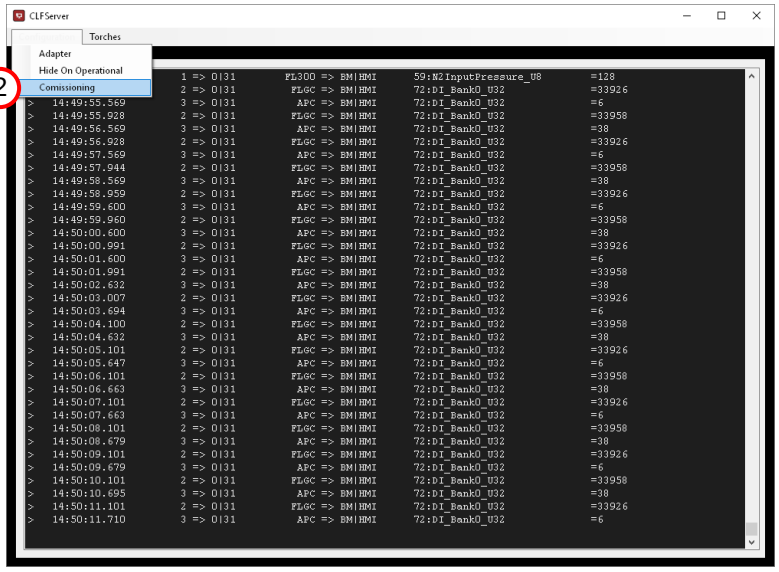
With the System installed and all connections made:

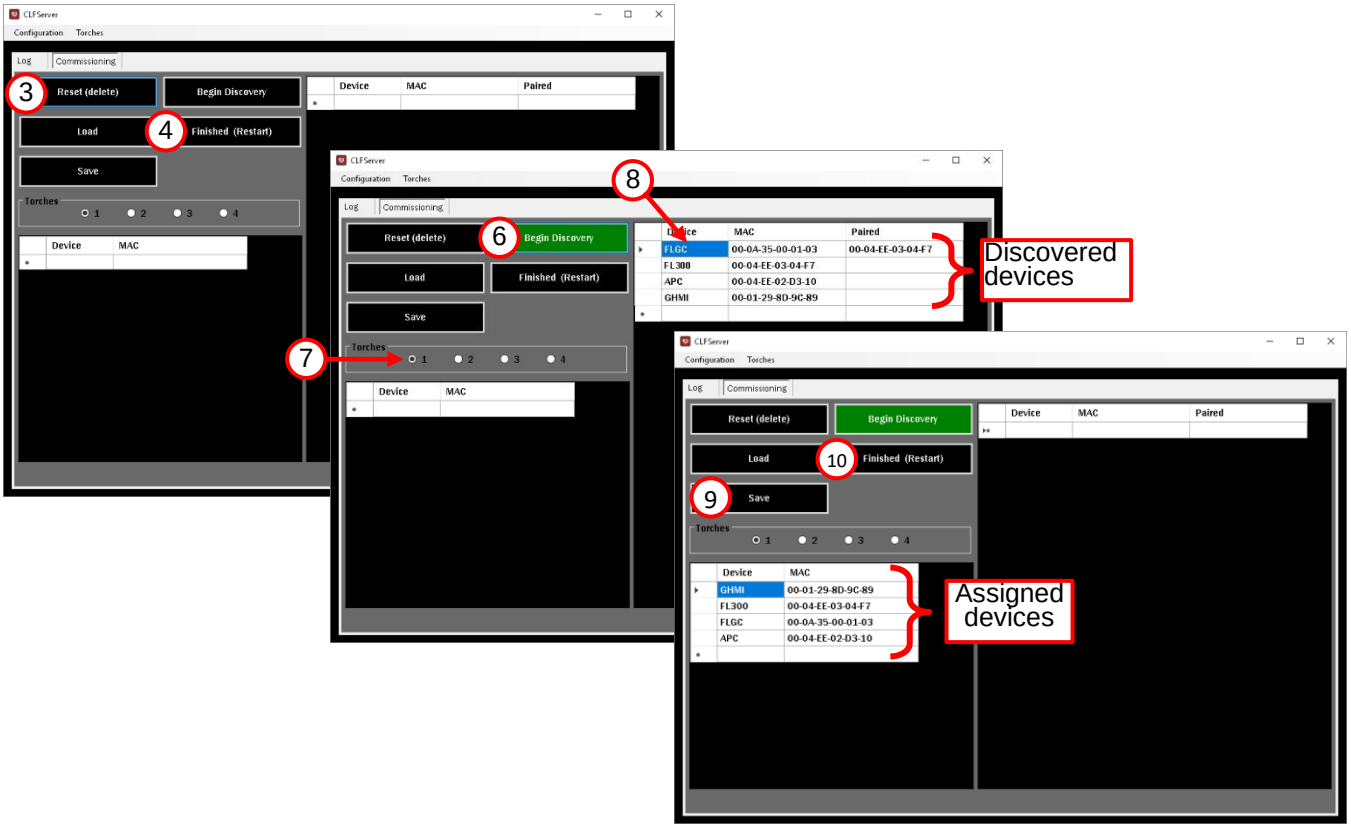
1) Apply power to the Ethernet router/switch and HMI (starts CutLinc Server and FineLine UI).
2) Open CutLinc Server, select **Configuration**, and then select **Commissioning**.
3) Select **Reset (Delete)** and then confirm.
4) Select **Finished (Restart)** and then confirm.
5) Apply primary power to the Power Supply and then wait at least 3 minutes (180 seconds) before proceeding.
   For multi-torch setups, all connected FineLine Systems must be powered.
6) Select **Begin Discovery**. The list of discovered devices populates with the MAC address for each connected device:
   - FLGC = FineLine Gas Controller
   - FL170, FL300, etc. = FineLine Power Supply
   - GHMI = HMI running the FineLine UI
   - APC = Advanced Process Controller (optional)

   The list of discovered devices should include at least one Power Supply, one Gas Controller, and one HMI. The Gas Controller will show paired with the Power Supply it is physically connected to.

   *For multi-torch setups**:*** Determine which discovered devices are physically associated with a given torch by selecting the empty cell to the left of a device's name. The selected device can be identified by observing its status LED. A selected Gas Controller or APC status LED will illuminate solid green for several seconds versus flashing at a constant rate. A selected Power Supply status LED will flash rapidly versus solid illumination.
7) Ensure **Torch 1** is selected.
8) Select one each of the following devices to move them to the list of assigned devices for Torch 1: HMI, Gas Controller (paired Power Supply moves also), and optional APC, if installed.
   NOTE: *The HMI must be assigned to Torch 1.*

   For multi-torch setups: Select **Torch 2** and assign associated Gas Controller (paired Power Supply moves also) and optional APC, if installed. Repeat for all remaining torches.
9) Select **Save** and then confirm.
10) Select **Finished (Restart)** and then confirm to complete the commissioning procedure.





3.19 Fill the Cooling System

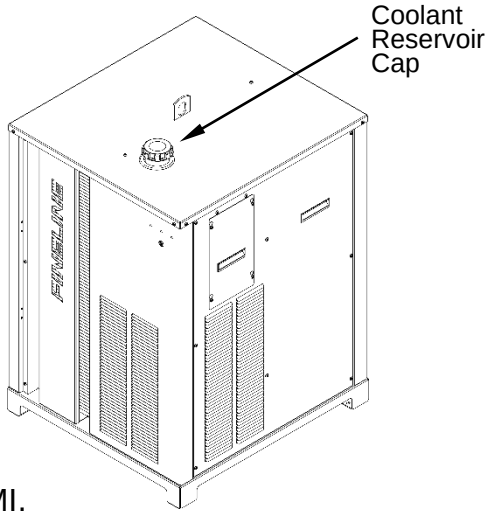
To avoid freeze damage and coolant leakage during shipment, the Power Supply is delivered with very little coolant. **DO NOT OPERATE the System until it has been filled with coolant.**

⚠ CAUTION: Never turn on the System when the coolant reservoir is empty or if the reservoir cap is not installed.

⚠ CAUTION: When handling coolant, wear nitrile gloves and safety glasses.

⚠ CAUTION: Only use approved coolant. Commercially available antifreeze contains corrosion inhibitors that will damage the cooling system.

1) Remove primary power to the Power Supply.
2) Ensure all System components are installed and that all System hose and cable connections have been made.
3) Unscrew the coolant reservoir cap from the top of the Power Supply.
4) Pour 4-5 gallons (15-18 liters) of approved torch coolant through a funnel and into the coolant reservoir. The full level is the bottom of the reservoir neck. Wipe up any spilled coolant.
5) Replace the reservoir cap.
6) Ensure the torch and consumables are properly installed.
7) Apply primary power to the Power Supply. Power on the Ethernet router/switch and HMI.



8) Clear the EStop, if installed.
9) Press the Coolant On button on the FineLine UI > Status Screen > Diagnostics Screen. Coolant will begin circulating through the cooling system to fill hoses and torch leads.
10) Check for leaks in hoses and fittings on the Power Supply, Torch, and ASC.
11) Allow the coolant to circulate until the flow value stabilizes between 1.2 and 1.5 GPM as displayed on the FineLine UI > Status Screen. If the System displays a low coolant error, return to step 1 to add enough coolant so that it is level with the bottom of the reservoir neck.
12) Press the Coolant Off button to stop coolant flow (FineLine UI > Status Screen > Diagnostics).
13) Remove the reservoir cap. Add coolant until the level is at the bottom of the reservoir neck. The amount necessary is dependent upon the length of the coolant hoses and torch leads. Longer runs require more coolant, shorter runs require less coolant. Wipe up any spilled coolant.

3.20 Installation Checklist

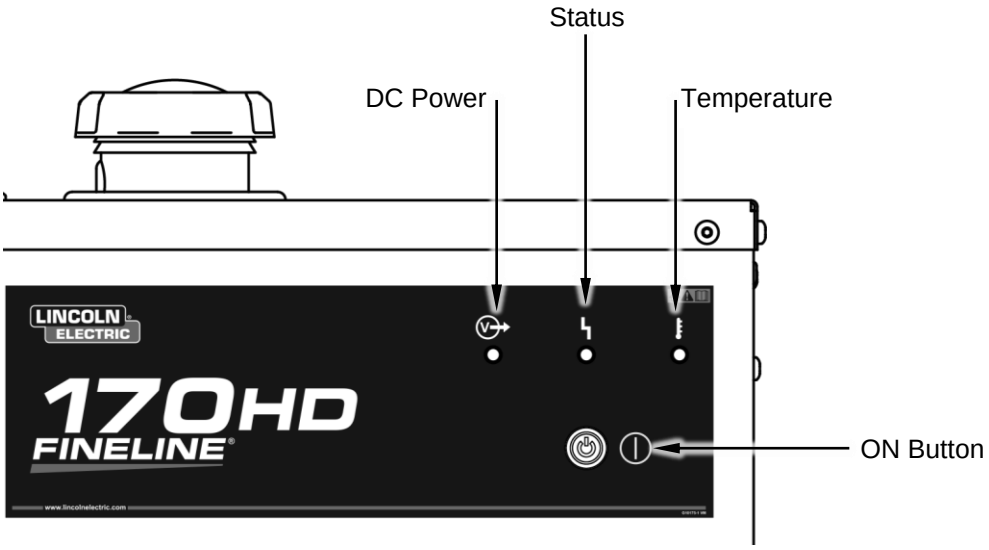
Complete the following checklist before operating the System.

- ☐ System is located within the specified operating environment and the components have been placed as specified. Refer to Sections 2.0 and 3.1.
- ☐ System is properly grounded according to local and national codes.
- ☐ Emergency Stop (EStop) circuit has been integrated. Refer to Section 3.15.
- ☐ Primary power is connected to the Power Supply according to local and national codes.
- ☐ The voltage selection jumper matches the supplied voltage. Refer to Section 3.5.
- ☐ Gasses are connected properly. Fittings have been checked for leaks.
- ☐ All System components are connected properly. Refer to Section 3.3.
- ☐ Torch assembly is securely mounted and consumables are installed in the torch. Refer to Sections 3.12 and 3.13.
- ☐ All required software is installed. Refer to Section 3.17.
- ☐ The System is commissioned. Refer to Section 3.18.
- ☐ Cooling system is filled with torch coolant. Reservoir cap is installed. Fittings have been checked for leaks. Refer to Section 3.19.
- ☐ All access panels and doors are closed and secured.

4.0 Operation

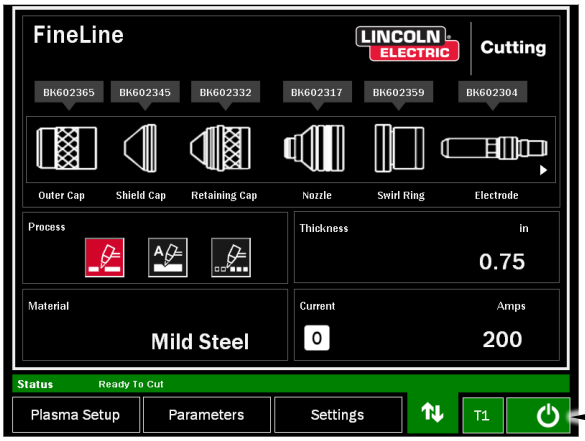
4.1 Status Lights and Buttons

4.1.1 Power Supply



Icon	Name	LED Color	Description
	Status	Blinking Green	Performing initial power up sequence.
		Steady Green	No errors/faults.
		Blinking Red	Error. Record error code and refer to Section 7.0 for troubleshooting.
		Off (not lit)	Off. Primary power removed.
	Temperature	Steady Red	Thermal fault. Refer to Section 7.0 for troubleshooting.
		Off (not lit)	Internal temperature is OK.
	DC Power	Steady Red	Output voltage/current currently being supplied.
		Off (not lit)	No output of voltage/current being supplied.
	ON Button	Pulsing White	Not Ready. Output voltage, current, and gas are disabled.
		Fast Blinking White	Changing states. Enabling the Power Supply's output.
		Steady White	Power Supply ready. Waiting for start signal. System output enabled.
		Off (not lit)	Off. Primary power removed.

4.1.2 FineLine User Interface (UI)



Icon	Name	Color	Description
	System Off	Black	System is off. System outputs are disabled. Press to turn on System.
	System On	Black	System initializing. Press to turn off System.
		Green	Ready. Waiting for start signal. System outputs are enabled.

4.1.3 Gas Controller (GC)

Icon	Name	LED Color	Description
	Status	Blinking Green (~1 per second)	Normal. Gas Controller has power, Ethernet connected, and system status is OK.
		Off (not lit)	Off (no power to Gas Controller) or System Error.
		Steady Green	System Error.
		Fast Blinking Green	Firmware update in progress. Do not remove power.

4.2 Operational Sequence

4.2.1 Power Up (Turn On) the System

1) Apply power to the Ethernet router/switch and HMI. CutLinc Server and the FineLine User Interface (UI) start automatically. The FineLine UI Status Bar is red and indicates “CutLinc Initializing.”
2) Apply primary power to the Power Supply.
3) The status light on the Power Supply initially blinks green, and then:
    - If there are no errors, the status light changes to steady green and the ON Button (Power Supply) pulses white. The System’s outputs are disabled.
    - If there is an error, the status light blinks red in a pattern that defines the error code. Once the error condition is corrected, the status light changes to steady green and the ON Button (Power Supply) pulses white. Some errors, even though corrected, require the System’s power to be cycled.
4) The status light on the Gas Controller begins blinking green to indicate normal operation.
5) The Status Bar changes to green and indicates “System Idle. Press [On] to Activate,” provided there are no errors. The System On button (FineLine UI) is black. If System errors exist, the Status Bar remains red and indicates the error.

4.2.2 Make a Cut

6) Use the FineLine UI to select the Active Torch (only for multi-torch setup), Process, Material Type, Thickness, and Current (Refer to Section 4.3.1).
7) Use the FineLine UI > Plasma Setup screen to identify which consumables are required for the selected configuration. Power will be removed during the next step so the FineLine UI will not be available for reference.
8) Install the required consumables into the torch (Refer to Section 5.2).
9) Use the displayed cut parameters on the FineLine UI > Parameters screen to configure the CNC and Torch Height Control.
10) Clear the EStop, if installed.
11) Press the ON Button (Power Supply) or System On button (FineLine UI), and then:
    - The Status Bar indicates “System is Initializing” and includes a progress bar.
    - The Power Supply’s main contactor closes (audible click).
    - The cooling system briefly circulates coolant (cooling fans start/stop).
    - The ON Button (Power Supply) changes to steady white and the System On button (FineLine UI) turns green.

- The Status Screen expands automatically, the Status Bar turns red and indicates “Purging…”, then the System automatically completes one of the following gas purge sequences (where s = seconds):
  - Purge 1 – 10s.
  - Purge 2 – 30s, then 30s.
  - Purge 3 – 10s, then 30s, then 30s.
  - Purge 4 – 12s.
- The Status Screen automatically collapses (returns to the previous screen), the Status Bar turns green and indicates “Ready to Cut.”

12) Initiate a start signal (refer to Section 4.2.4 for important details) via the CNC, which triggers the following sequence:
    a. Cooling system starts circulating coolant (cooling fans start).
    b. Gas preflow is initiated.
    c. Power supply output is energized; the DC Power light is steady red.
    d. ASC circuit is energized.
    e. Pilot arc is initiated and the ASC circuit is de-energized.
    f. Transferred arc is established and the pilot arc is turned off.
    g. Motion signal is sent from the System to the CNC.
    h. Power supply initiates current upslope to the selected current level.
13) Initiate a stop signal via the CNC, which triggers the following sequence:
    a. Power supply initiates current downslope.
    b. Transferred arc is extinguished; the DC Power light is extinguished.
    c. Gases are turned off.
    d. Coolant pump and cooling fans continue to run for 5 minutes.

4.2.3 Power Down (Turn Off) the System

14) Press the ON Button (Power Supply) or the System Off button (FineLine UI) to disable the System’s outputs, and then:
    - The ON Button (Power Supply) changes to pulsing white.
    - The Status Bar indicates “System Idle. Press [On] to Activate” and the System On button changes to black.
15) Remove primary power to the Power Supply.
16) Remove power from the HMI and Ethernet router/switch.

4.2.4 Start Signal Sequence

Double Edge Start (DES), which requires two CNC start signal pulses (Figure 16), is required if using the Arc Hold feature or with optional APC commissioned; otherwise, the System will default to Single Edge Start (SES) as shown in Figure 17. If optional APC is commissioned and the CNC (Height Control) cannot generate (operate with) a DES, contact Lincoln Electric service department. The Arc Hold feature can only be used with DES.

- Receipt of initial edge of CNC Start Signal; Initiates IHS sequence.
- IHS sequence complete.
- Receipt of second edge of CNC Start Signal. Pilot Arc initiated (normal start sequence).
- Transferred Arc Sensed.
- Motion/Pierce Delay (time) initiated, Current Upslope initiated.
- Motion/Pierce Delay complete. Motion initiated.

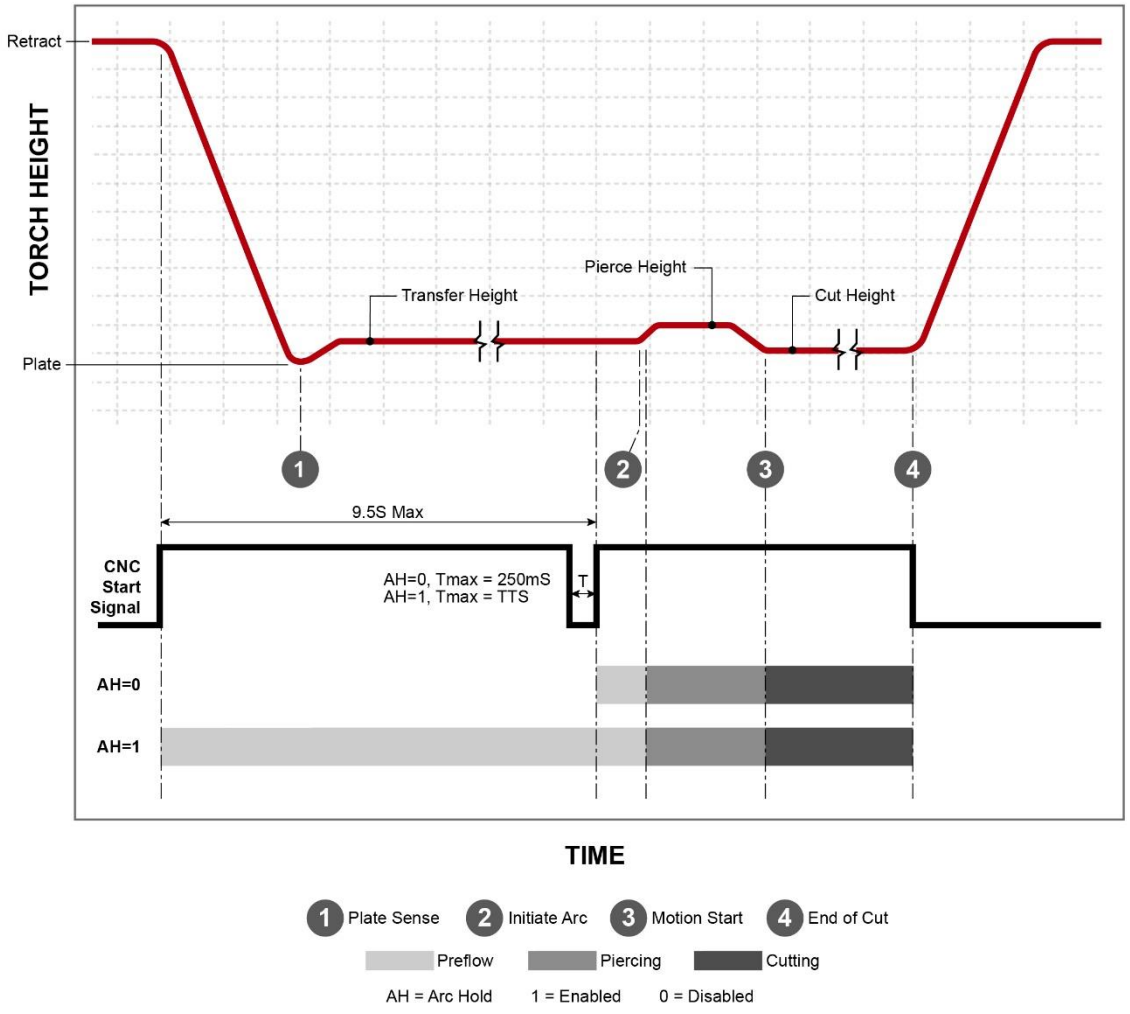


Figure 16: DES Timing Diagram

Figure 16 NOTES:

- After receipt of the initial edge of CNC Start Signal, the second edge of CNC Start Signal must be received within 9.5 seconds or the system will return to the ready state. The IHS sequence must be completed within the first CNC Start Signal pulse.
- If Arc Hold is not being used, the rising edge of the second CNC Start Signal pulse must be received within 250mS of the falling edge of the first CNC Start Signal pulse. If Arc Hold is being used, then rising edge of the second CNC Start Signal pulse must be received within programmed TTS. In either case, if not received within specified time the system will return to the ready state.

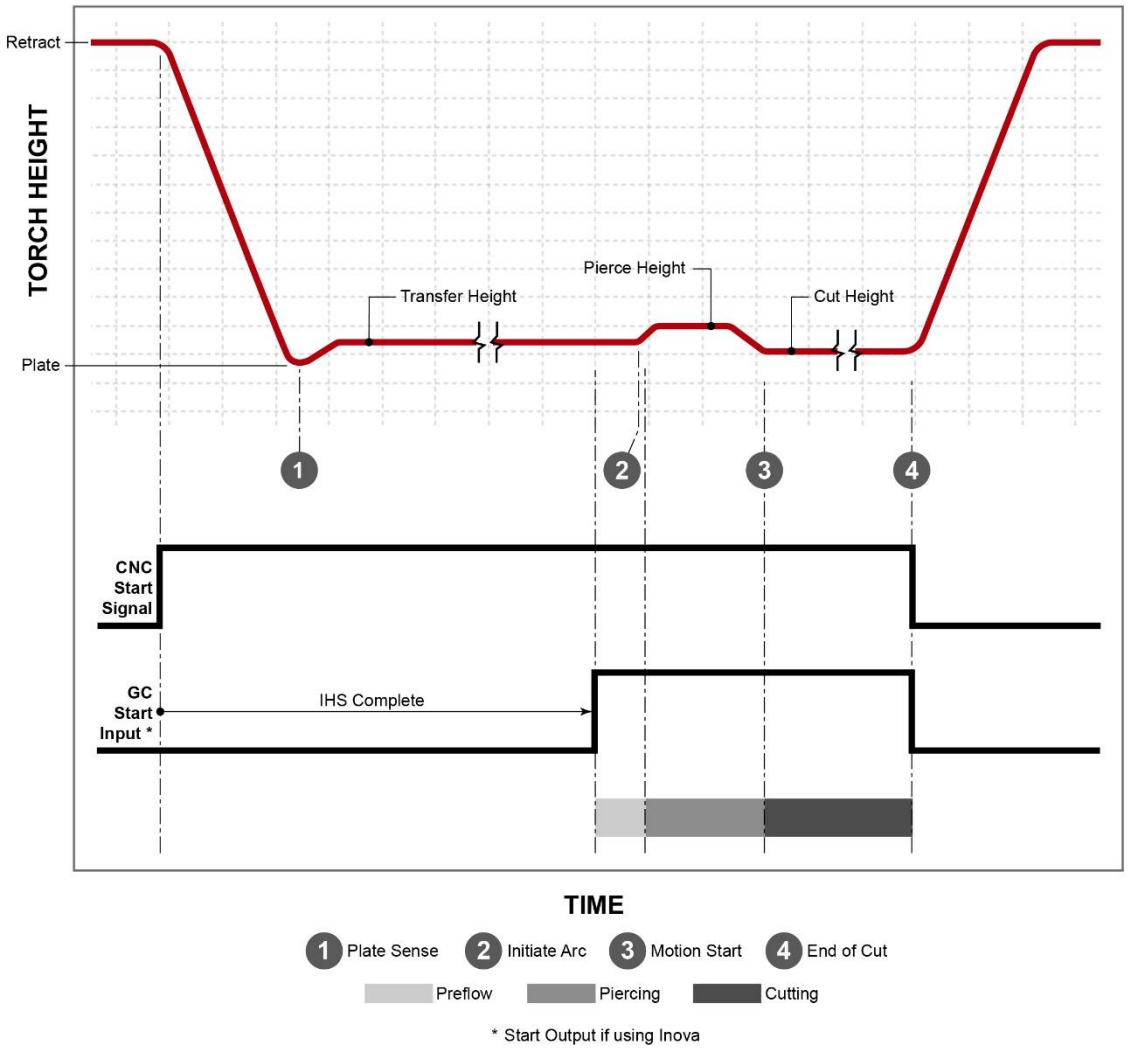


Figure 17: SES Timing Diagram

4.3 FineLine User Interface – Operation

4.3.1 Overview

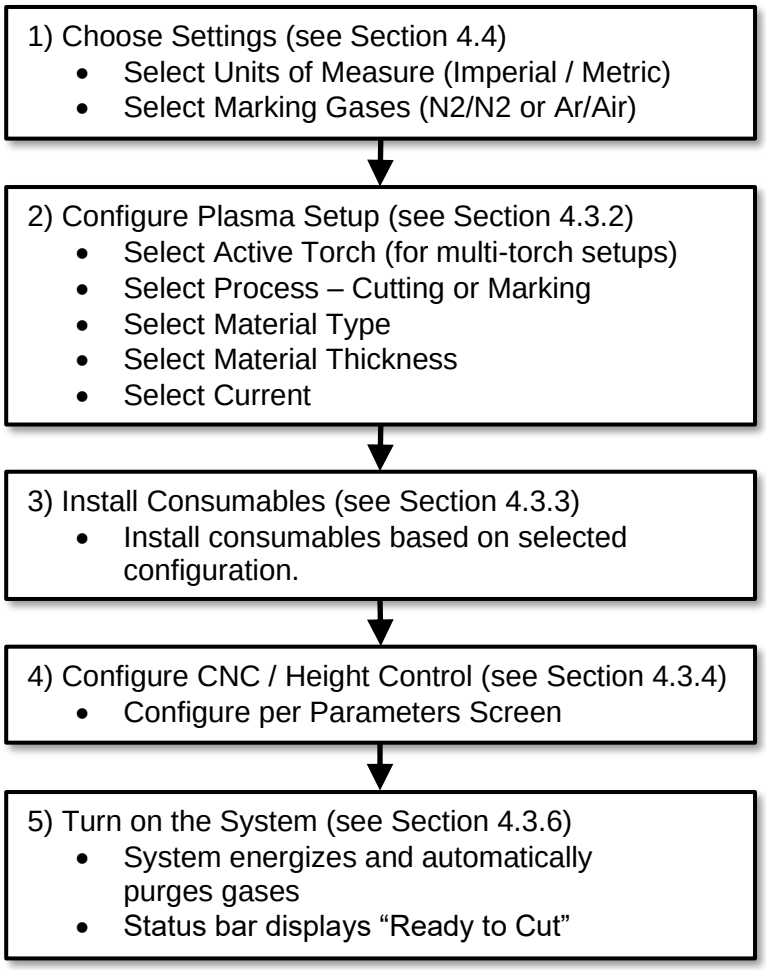
The FineLine User Interface (UI) runs on an HMI, which can be a CNC Controller or Industrial Computer. Since the HMI may include a touch screen interface, “press” and “click” are used interchangeably to describe interacting with the FineLine UI.

The System is capable of several different plasma processes; however, “cutting” will be used generically to describe the user interface:

- Cutting completely severs solid material, like plate and structural steel.
- Marking creates a noticeable mark in the material surface without cutting all the way through the metal.
- [Reserved for future use] Grid cuts through a non-continuous workpiece, like expanded metal.

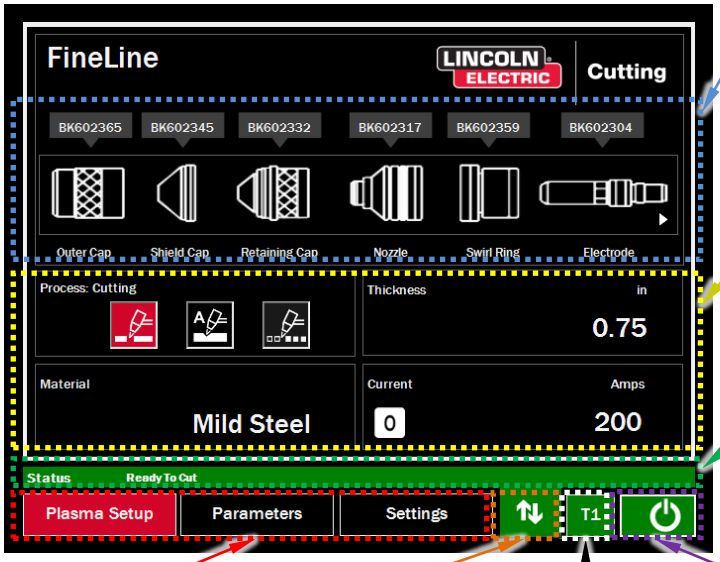
Block Diagram

The following high-level sequence shows the steps required to prepare the System to cut using the FineLine UI. Each step is described in detail later in this section.



Layout and Navigation

The FineLine UI's main screen – Plasma Setup – is described below. It contains all selections required to configure the System to cut as well as the corresponding consumable stack that must be installed into the torch prior to cutting.



Torch Consumable Stack
Part numbers for the selected configuration (see below) are automatically updated as the configuration is changed.

Selected Configuration
Select the Plasma Process, Material, Thickness, Current Lock/Unlock, and Current.

Status Bar
Colors, words, and icons display important information about the System.

Navigation Tabs – Press to access the desired screen.

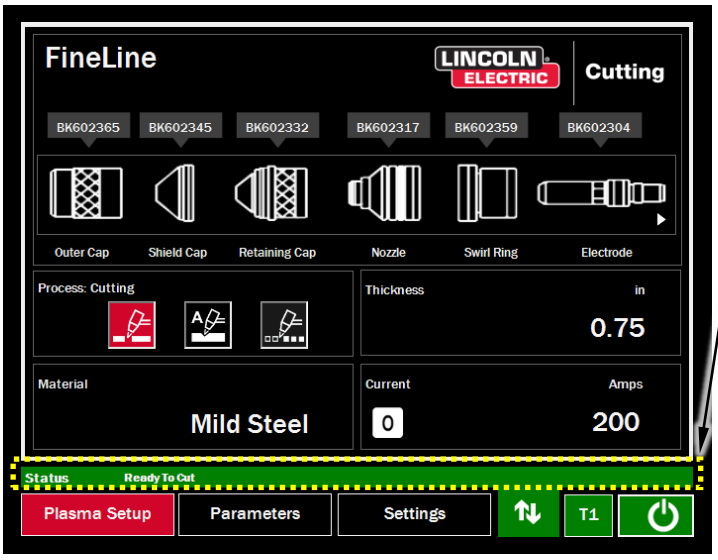
Status Button Expand or collapse the Status Screen.

Select Torch Button – Press to choose the Active Torch. Refer to Section 4.4.4.

System On/Off Button – Press to turn on/off the System. Refer to Section 4.2 for the full operational sequence.

Status Bar and Icons

The Status Bar displays important information about the System. Press the Status Bar or Status button (⇅) to expand the Status Screen.

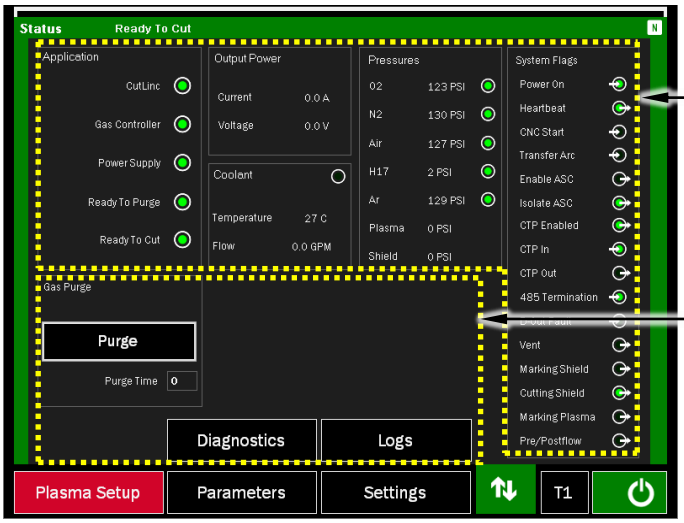


Status Bar icons and messages include:

- Green color means ready.
- Red color means needs attention.
- Words describing the System's condition or an error message.
- ⚡ = Outputting DC voltage/current.

Status Screen

Press the Status button (⇅) to expand the Status Screen shown below. Colored LEDs indicate status of the corresponding item; green means good or active, red means error, and not illuminated means not active. Press the Status Bar or Status button (⇅) to collapse the Status Screen and return to the previous screen.



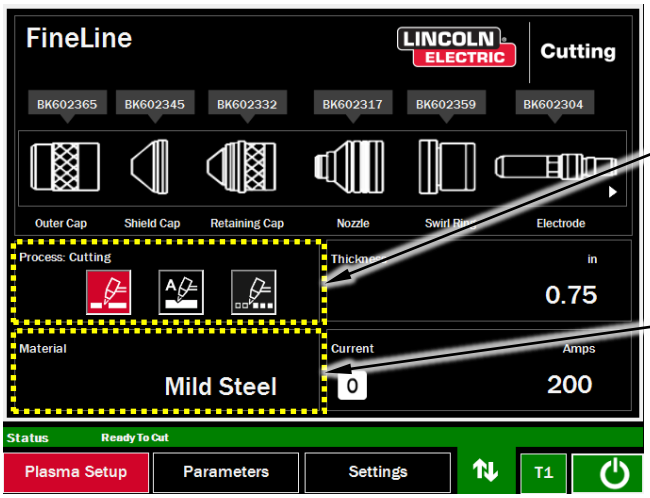
Refer to the descriptions below.

Refer to Sections 4.3.6, 4.4.6, and 4.4.7.

Group	*Item*	*Description*
Application – each LED illuminates green as described.	**CutLinc:**	All devices are powered and connected to the server.
	Gas Controller:	Gas Controller outputs are enabled.
	Power Supply:	Power Supply outputs are enabled.
	Ready to Purge:	System is on; awaiting gas purge / purge completed.
	Ready to Cut:	System is on, gas purge completed and no System faults. All necessary System requirements have been met and the System is ready to cut.
Output Power	**Current:**	Actual Power Supply output current.
	Voltage:	Actual Power Supply output voltage.
Coolant – Green LED illuminates when coolant system is on and there are no coolant errors.	**Temperature:**	Actual coolant temperature. Coolant LED illuminates Red when temperature is too high.
	Flow:	Actual coolant flow. Coolant LED illuminates Red when flow is too low.

Group	*Item*	*Description*
Pressures – Plasma and Shield are actual output values (no LEDs); all others are actual input values (with LEDs).	**LED:**	Illuminates Green when gas pressure input is within the min/max range. Illuminates Red when gas pressure input is not within the min/max range.
System Flags – each LED illuminates green when condition met as described.	**Power On:**	The power section of the Power Supply is energized.
	Heartbeat:	Control link operational between Gas Controller and HMI. Blinks once per second.
	CNC Start:	CNC start input received.
	Transfer Arc:	Arc has transferred to the plate.
	Enable ASC:	Arc Start Console output is turned on.
	Isolate ASC:	CTP isolation relay in ASC is turned on.
	CTP Enabled:	CTP detection circuit in Gas Controller is on.
	CTP In:	(Input to Gas Controller) Turns on when **Isolate ASC** is on, **CTP Enabled** and Torch touches plate.
	CTP Out:	(Output from Gas Controller) Turns on when **CTP In** is on – normal logic. Turns off when **CTP In** is on – logic inverted. Refer to Appendix B.4.
	485 Termination:	Gas Controller's RS-485 is terminated with 120 Ohms.
	D-Out Fault:	Fault condition with the Gas Controller's digital outputs.
	Vent:	Gas Controller Vent solenoid valve is energized.
	Marking Shield:	Gas Controller Marking shield solenoid valve is energized.
	Cutting Shield:	Gas Controller Cutting shield solenoid valve is energized.
	Marking Plasma:	Gas Controller Marking plasma solenoid valve is energized.
	Pre/Postflow:	Gas Controller Pre/Postflow solenoid valve is energized.

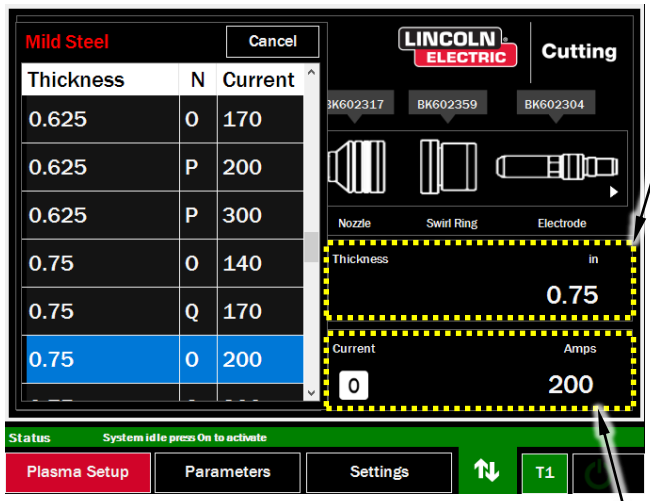
4.3.2 Configure Plasma Setup



Select the Active Torch, then press the **Plasma Setup** tab.

Select the Plasma Process
Press the desired process button: Cutting ( ) or Marking ( ). Selected process is red.

Select the Material Type
Press the Material button and then select from the list: Mild Steel, Stainless Steel, Aluminum, or H17 Stainless Steel (requires H17 gas).



Select the Material Thickness
Press the Thickness button and then select from the list.

Each thickness also includes a letter (P, Q, O, or S) corresponding to the expected Cut Quality as described in the table below.

Press the Cut Quality column header (initially “N”) to cycle through and filter thicknesses by Cut Quality. “N” = no filter applied, so all thickness are displayed.

NOTE: *The list of available thicknesses is determined by the selected material and Cut Quality filter, if applied.*

Verify Current and Cut Quality
Or press to change current or thickness.

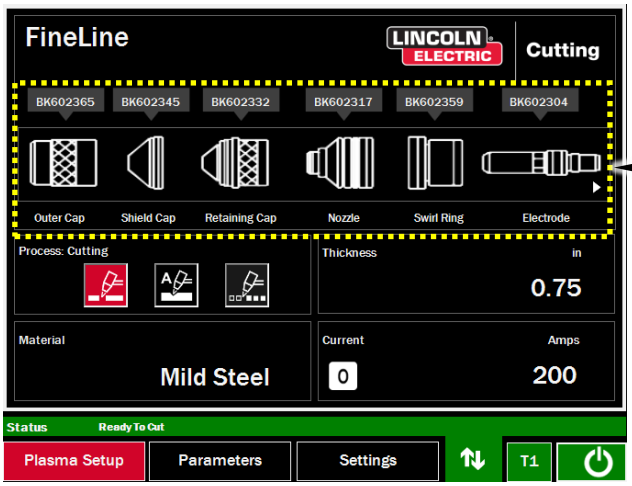
Cut Quality *	Travel Speed	Bevel Angle	Dross Amount
S = Severance	Low	Minimal to Medium	Medium to High
P = Production	High	High	Minimal to Medium
Q = Quality	Medium	Medium	Minimal
O = Optimal	Medium	Minimal	None to Minimal

* ***NOTE:*** *Cut Quality selections are intended to guide the operator to the best starting point. Test first. A different selection may achieve a better cut for the application.*

4.3.3 Install Consumables

The consumable stack for the selected configuration is displayed on the **Plasma Setup** screen. The part number for each consumable is shown for quick reference.

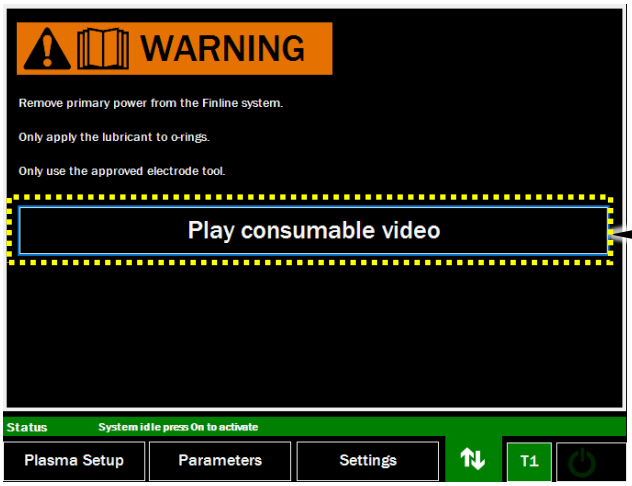
Use this information to install consumables in the torch. Refer to Section 5.2 for the full consumable installation procedure.



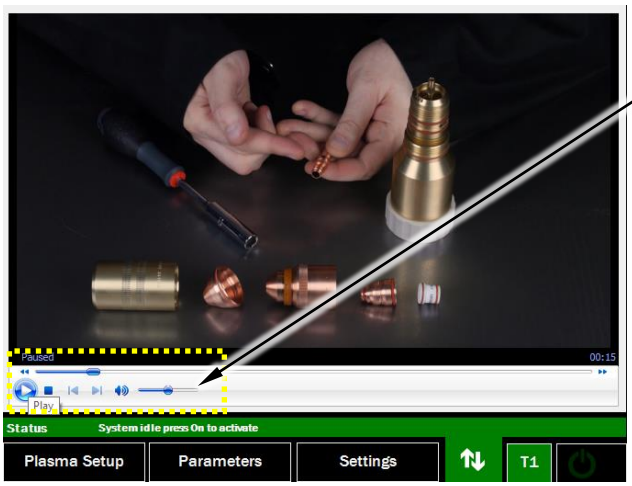
Select the Active Torch, then press the **Plasma Setup** tab.

The consumable stack for the selected configuration includes the required part numbers.

Press anywhere on the consumable stack to watch an installation video.



Press to play the video.



The video contains no sound. Use the controls to pause or skip around. When finished, press any of the navigation tabs to close the video.

Although the Quick-Disconnect Torch is shown in the video, the same procedure applies to the Standard Torch.

4.3.4 Configure CNC and Height Control

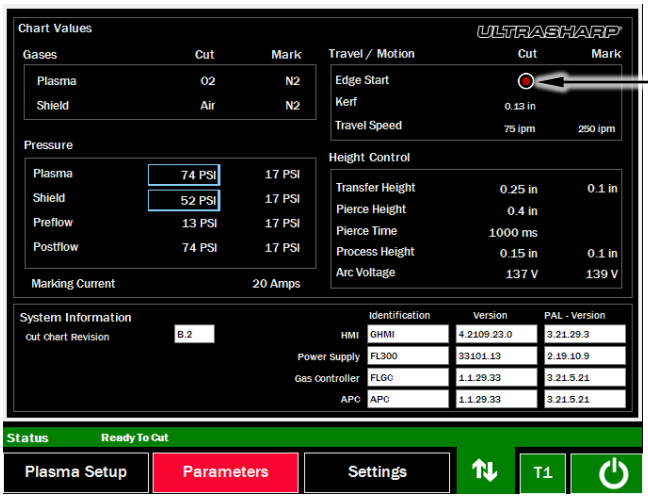
Press the **Parameters** tab to see the cut parameters, based on the selected configuration on the **Plasma Setup** tab.

Prior to making a cut or mark, confirm that the CNC and Torch Height Control are configured using the displayed cut parameters.

For reference purposes, cut charts are published in a standalone document, BK8053-000108 (Cut Charts for LC300M Plasma Torch).

Confirm the desired marking gases are selected. Refer to Section 4.4.3.

When an edge start is recommended in the cut chart, the Edge Start LED will illuminate green. The torch should be positioned at the edge of the material prior to starting the arc. When the Edge Start LED is red, the cut can begin with a pierce.



Edge Start LED illuminates Green for edge start or Red for pierce.

4.3.5 Override Standard Pressures (Optional)

Although not necessary, Plasma and Shield cutting pressures can be changed from standard cut chart values to accommodate special circumstances or to fine-tune a cut. This optional override should only be made by experienced operators because serious damage to equipment may occur.

Press either the Plasma or Shield cutting pressure values. Press delete (◁) or clear (C) on the keypad, enter a new value, and then press Apply.

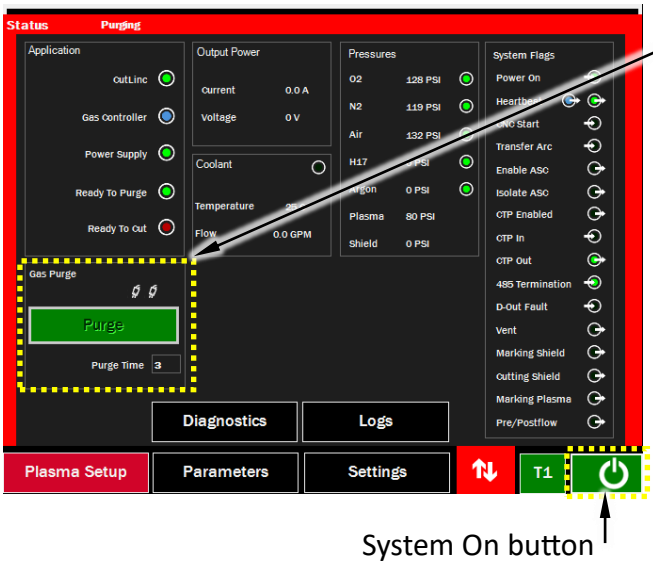
⚠ CAUTION: Do not change Plasma cutting pressure more than ±5 PSI from the standard cut chart value or permanent damage to consumables and/or torch may occur.

Shield cutting pressure can be changed to any value.

Press the red “chart” icon (📈) to reset both the Plasma and Shield cutting pressures to standard cut chart values.

4.3.6 Turn On the System

Press the System On button. The Status Screen automatically expands and the System begins to initialize.



Purge progress is indicated by a purge icon ( ) and countdown clock. The number of icons indicates the number of purge cycles to be completed. The countdown clock indicates the time remaining for each purge cycle.

If prompted by a message on the Status Bar, press the **Purge** button to start a manual purge, which will be 10 seconds, 30 seconds, 30 seconds.

When the gas purge sequence completes successfully, the Status Bar color changes to green and indicates “Ready to Cut.”

Refer to Section 4.2 for the System’s full operational sequence.

When necessary, press the System Off button to turn off the System.

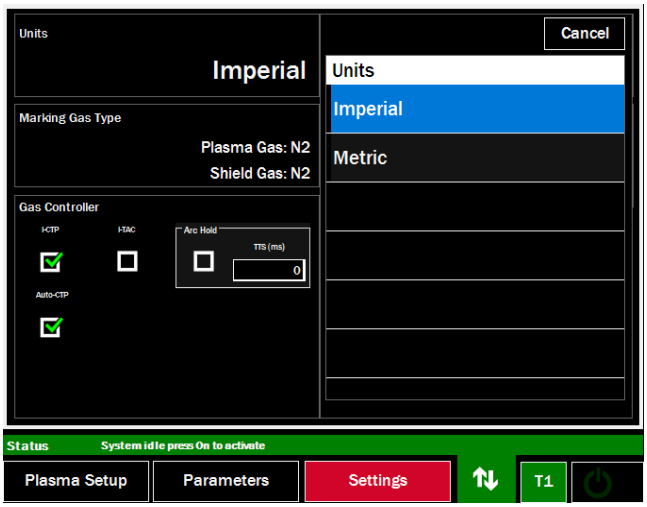
Gas Purging Notes:

1) When switching between oxidizing gas or oxygen containing gas to combustible gas, and vice versa, a manual purge is required. The Status Bar will indicate “Purge Required.”
2) Gases purge automatically after initial System power up.
3) The System regulates to 80 psi during a purge.

4.4 FineLine User Interface – Settings & Diagnostics

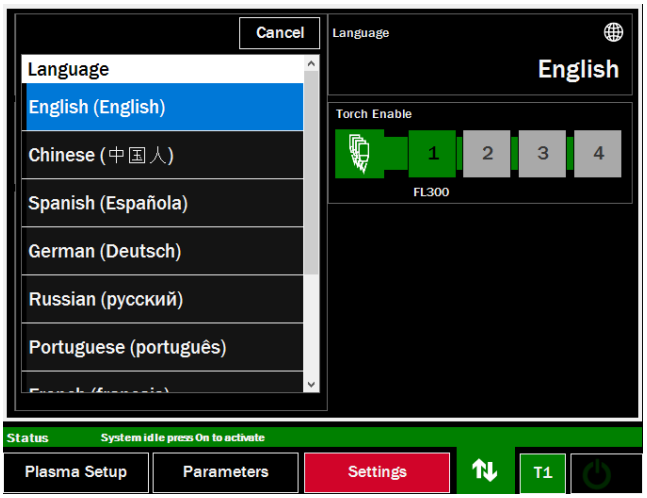
4.4.1 Settings > Units

Choose between Imperial and Metric units.



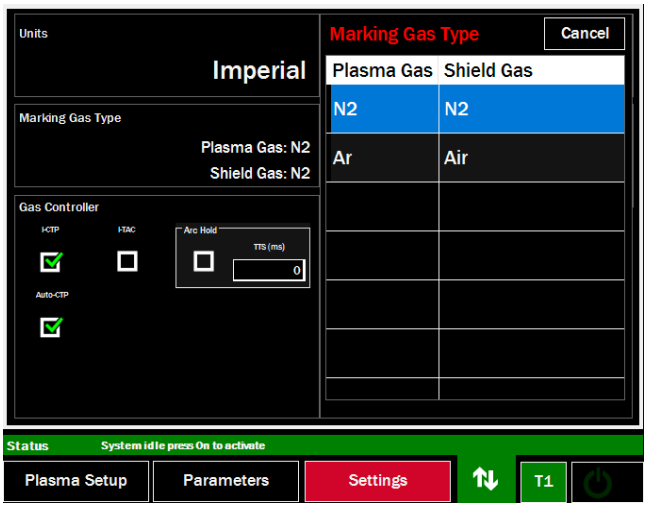
4.4.2 Settings > Language

Choose to use any of the available languages.



4.4.3 Settings > Marking Gas Type

Choose between Nitrogen (N2) Plasma Gas with Nitrogen (N2) Shield Gas, or Argon (Ar) Plasma Gas with Air (Air) Shield Gas.



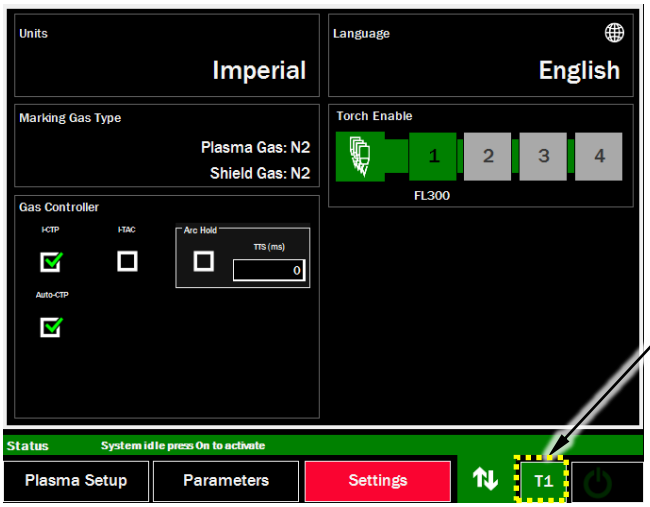
4.4.4 Settings > Torch Enable

If the System has been commissioned with more than one torch (multi-torch setup), select the corresponding torch numbers to enable them in the FineLine UI. **When more than one torch is enabled, all setting are applied to all torches.**

Torch 1 is enabled by default.

Enabled torch numbers are green. Red torch numbers have been commissioned but are not enabled. Grey torch numbers have not been commissioned.

If more than one torch is enabled, press the **Select Torch Button** to choose the Active Torch (Torch 1 = T1, Torch 2 = T2, etc.).



For multi-torch setups, press the **Select Torch Button** to choose the Active Torch.

4.4.5 Settings > Gas Controller

I-CTP: When enabled (☑), the CNC Plate Sense (a.k.a., Clear-the-Plate or Ohmic sensing) output logic is inverted – output turns off upon sensing the plate (refer to Section 3.16).

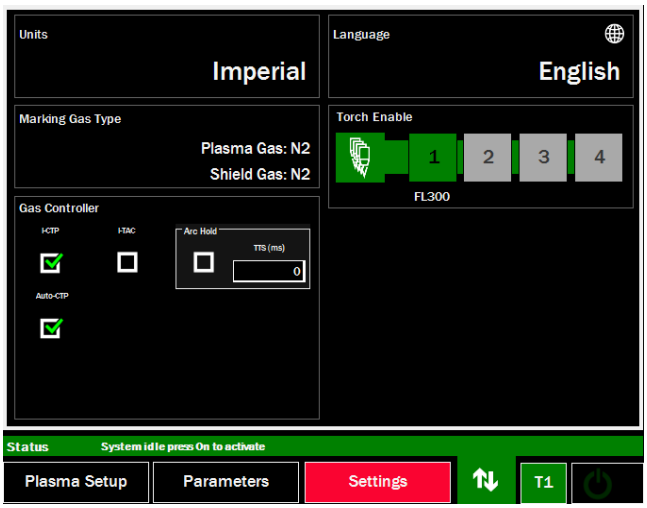
I-TAC: When enabled (☑), the CNC Transferred Arc Circuit (TAC) output logic is inverted – output is off when arc is on (refer to Section 3.16).

Arc Hold: When enabled (☑), upon initial receipt of Start Command, preflow and CTP functions are initiated as normal, but an arc is not initiated. Arc Hold is released by removing the Start Command and reasserting – the Start Command must be removed for a minimum of 10ms before reasserting. Upon reasserting the Start Command, the arc will be initiated.

The Arc Hold feature can only be used with DES (refer to Section 4.2.4).

Time To Start (TTS) is the length of time in milliseconds (ms), upon removal of the Start Command, after which the System will revert to the ready state if the Start Command has not been reasserted. The Start Command must be reasserted within 9.5 seconds of initial receipt otherwise the System will revert to the ready state. Removal of the Start Command after reasserting (releasing arc hold) will terminate the arc and return System to ready state.

Auto-CTP: When enabled (☑), automatically enables CTP when idle (not cutting) and disables when Start Signal received (cutting). This avoids the need for the Motion Controller to post CTP enable/disable commands through CutLinc to the Gas Controller.

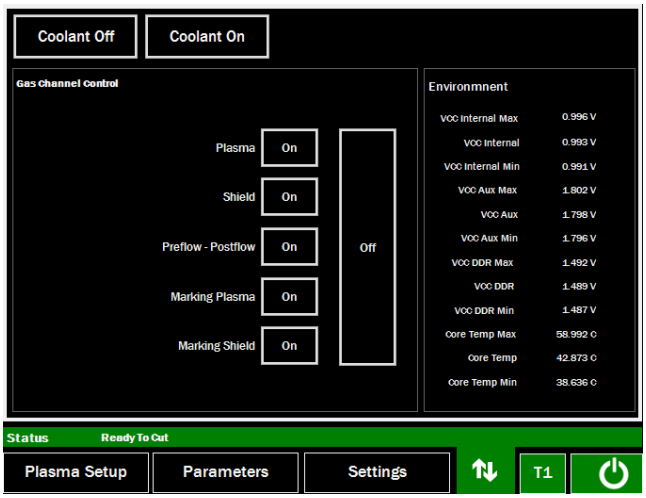


4.4.6 Status Screen > Diagnostics

Press **Coolant On** to circulate coolant through the cooling system during the initial filling or during maintenance. Press **Coolant Off** to stop circulating coolant.

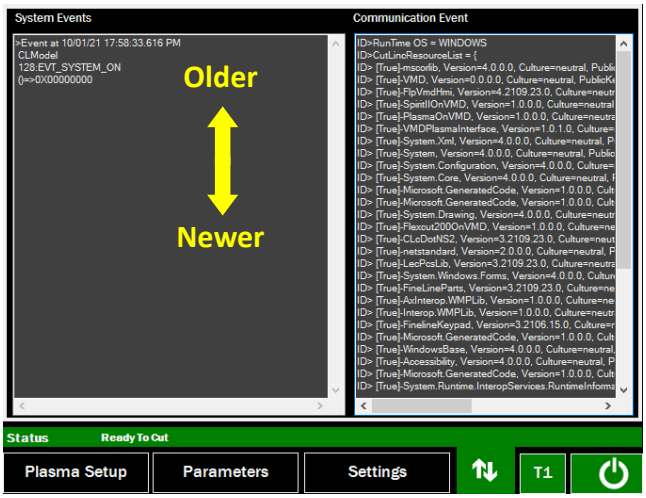
For troubleshooting purposes, individual gas channels can be turned on.

Environment values are for the microprocessor core inside the Gas Controller.



4.4.7 Status Screen > Logs

This screen records System events and errors and assigns a time stamp to each. Older items are at the top of the list and newer items are at the bottom. Use the scroll bars when necessary. Refer to Section 7.2 for more information about error codes.



BLANK

5.0 LC300M Plasma Torch & Consumables

5.1 Installing / Removing the Quick-Disconnect Torch Head

⚠ WARNING

Electric Shock Can Kill.

Disconnect input power before servicing.

Do not touch electrically live parts or electrode with skin or wet clothing. Always wear dry insulating gloves.

⚠ WARNING

Hot Parts Can Burn Skin.

Do not touch hot parts with bare hands.

Always use gloves when handling the torch as it can be hot after cutting, especially with high amperages and long cut times.

Allow cooling period before working on the torch.

⚠ CAUTION

Missing or damaged o-rings can damage the System.

Inspect all o-rings on the Quick-Disconnect Torch Head before mating it to the Quick-Disconnect Torch Base.

Never use the System with missing or damaged o-rings.

5.1.1 Installing

1) Remove primary power to the Power Supply. For multi-torch setups, ensure this is the Power Supply physically connected to the torch being installed.
2) Each time the Quick-Disconnect Torch Head is installed, use a cotton swab to apply a small amount of o-ring lubricant to each of the o-rings on top of the Torch Head.

   NOTE: *Do not use an excessive amount of o-ring lubricant, which can build up over time; especially if Torch Heads are frequently installed.*
3) Align the indicator on the Torch Head (small circle) with the one on the Torch Base (large circle).
4) Apply enough upward force to engage the threads while tightening the attachment ring. Turn the attachment ring to the RIGHT to tighten.
5) Keep tightening the attachment ring until it stops. There should be no gap between the attachment ring and the o-ring on the Torch Base. O-ring lubricant should not be applied to this o-ring because it is not a seal; it only indicates proper installation. See Figure 18.

   During this process, a small amount of coolant will collect in the Torch Head. It is normal for this coolant to discharge between the o-ring on the Torch Base and the attachment ring while the cooling system is being pressurized. If coolant continues to discharge after the cooling system is pressurized, remove primary power to the Power Supply, remove the Torch Head and inspect the o-rings for damage.

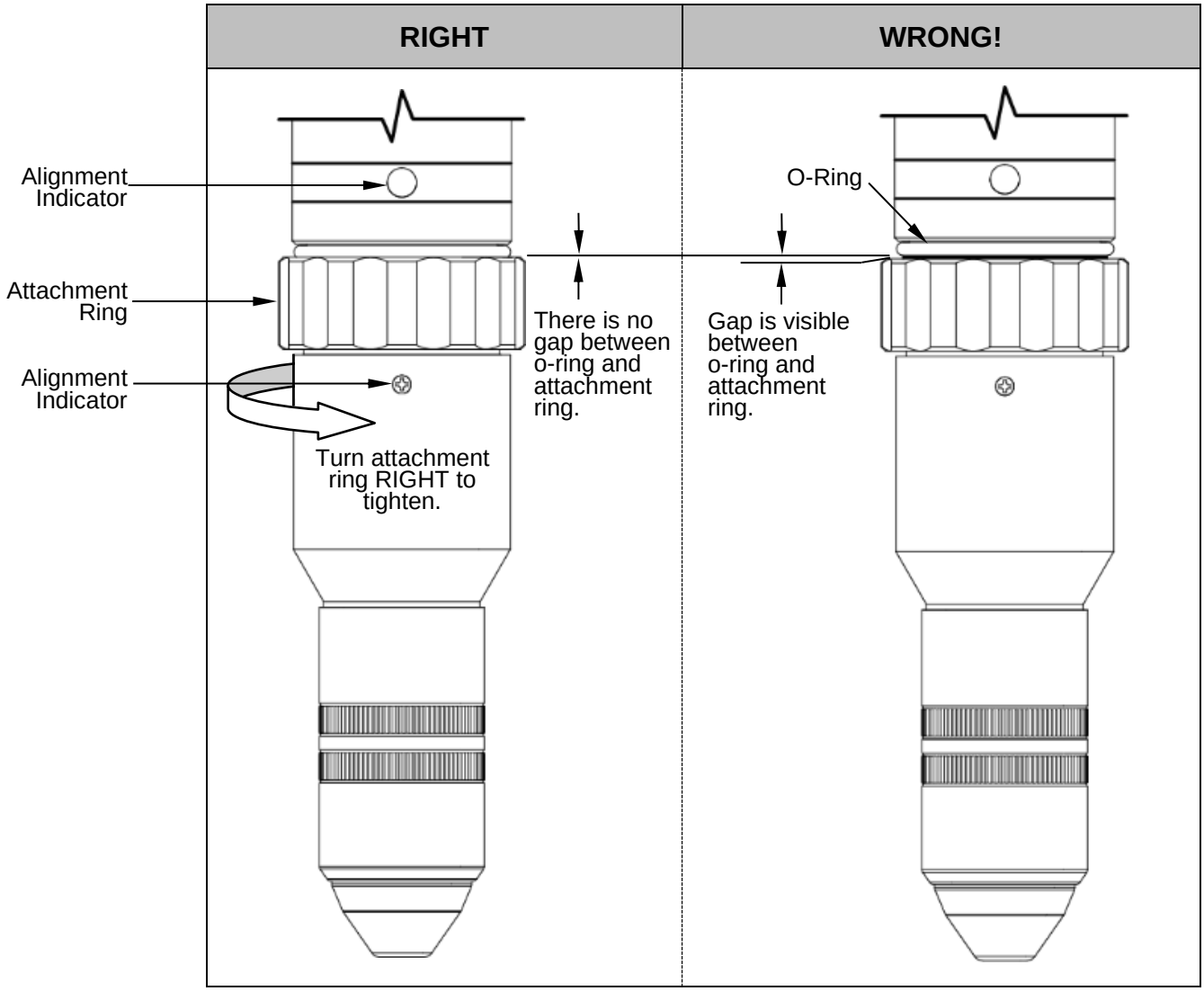


Figure 18: Quick-Disconnect Torch Installation

5.1.2 Removing

1) Remove primary power to the Power Supply. For multi-torch setups, ensure this is the Power Supply physically connected to the torch being removed.
2) Turn the attachment ring to the LEFT and then pull down on the Quick-Disconnect Torch Head to separate it from the Torch Base.

⚠ CAUTION

Protect Connections From Contamination.

Dust and debris can contaminate exposed connections/o-rings on the Quick-Disconnect Torch Head. Protect these areas from contamination while the Torch Head is disconnected from the Torch Base.

5.2 Replacing Consumables

⚠ WARNING

Electric Shock Can Kill.

Disconnect input power before servicing.

Do not touch electrically live parts or electrode with skin or wet clothing. Always wear dry insulating gloves.

⚠ WARNING

Hot Parts Can Burn Skin.

Do not touch hot parts with bare hands.

Always use gloves when handling the torch as it can be hot after cutting, especially with high amperages and long cut times.

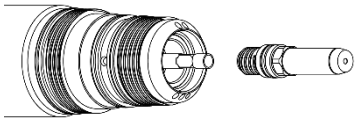
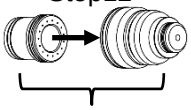
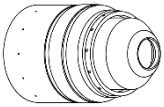
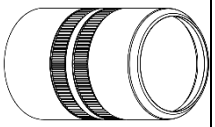
Allow cooling period before working on the torch.

NOTE: *Do not use an excessive amount of o-ring lubricant. Ensure lubricant is only placed on o-rings. Excess lubricant can interfere with gas flow, which can cause starting problems, poor cut quality, and short consumable life.*

NOTE: *Inspect all o-rings. Never use the System with missing or damaged o-rings.*

1) Remove primary power to the Power Supply. For multi-torch setups, ensure this is the Power Supply physically connected to the torch being serviced.
2) If applicable, remove the Quick-Disconnect Torch Head and place on a clean work surface.
3) Unscrew the outer cap from the torch.
4) Pull the shield cap off of the retaining cap or remove it from the outer cap.
5) Unscrew the retaining cap from the torch.
6) Pull the nozzle straight out of the torch. The swirl ring will come out with the nozzle. Do not use tools.
7) Separate the swirl ring and nozzle by pulling them apart. Do not use tools.
8) Unscrew the electrode from the torch using a 10mm, 6-point deep socket (BK602396) and ¼" driver (BK277086).
9) Inspect the cooling tube in the torch for damage. If damaged, replace by unscrewing the cooling tube using an adjustable wrench across the flats.
10) Inspect all consumables and o-rings for damage and excess wear. Refer to Section 6.4. Replace with new consumables as necessary.
11) Apply lubricant BK716012 (or BK716012-2) to the o-ring on the electrode. Push the electrode over the cooling tube and thread the electrode into the torch by hand. Tighten the electrode using a 10mm, 6-point deep socket (BK602396) and ¼" driver (BK277086).
12) Apply lubricant to the o-rings on the swirl ring. Press the larger end of the swirl ring into the bottom of the nozzle until it is fully seated.

13) Apply lubricant to the o-rings on the nozzle. Push the nozzle/swirl ring onto the electrode until it is fully seated. The larger nozzle o-ring will fit completely inside the torch.
14) Apply lubricant to all o-rings on torch. Thread the retaining cap onto the torch until it is fully seated.
15) Apply lubricant to the o-ring on the shield cap. Push the shield cap onto the retaining cap until it is fully seated.
16) Thread the outer retaining cap onto the torch until it is fully seated.
17) If applicable, install the Quick-Disconnect Torch Head.
18) Apply primary power to the Power Supply.

Torch	Electrode	Swirl Ring	Nozzle	Retaining Cap	Shield Cap	Outer Cap
		 Step12				
← Step 11		← Step 13		← Step 14	← Step 15	← Step 16

5.3 Maximizing Consumable Life

Use the following guidelines to maximize consumable parts life:

1) The System utilizes the latest advancement in technology for extending the life of the torch consumable parts. To maximize the life of the consumable parts, it is imperative that the shutdown procedure of the arc is carried out properly. The arc must be extinguished while it is still attached to the workpiece. A popping noise may be heard if the arc extinguishes abnormally. Note that holes are usually programmed without lead-outs to prevent loss of the arc during shutdown. There is a time delay between the reception of a stop signal and when the arc is extinguished. During this time, the gases and cutting current are changed to optimum values for extinguishing the arc. Ideally, the CNC controller should provide a plasma stop signal prior to the end of the cut path so the gases and current reach the shut off values at the same time that the part has been completely cut. The shutdown times are different for each current and are given in the table below.

Arc Shutdown Times

Current (A)	Time (ms)
30	548
80	315
140	340
170	260

2) Consumable life and cut quality will be adversely affected if the motion/height control doesn't begin retracting the torch from transfer height to pierce height within 15mS after arc transfers to the plate.
3) Use the recommended pierce height given in the cutting charts. A pierce height that is too low will allow molten metal that is ejected during the piercing process to damage the shield cap and nozzle. A pierce height that is too high will cause the pilot arc time to be excessively long and will cause nozzle damage. Refer to Section 5.5.
4) Never fire the torch in the air. Nozzle damage will occur.
5) Make sure the torch does not touch the plate while cutting. Shield cap and nozzle damage will result.
6) Use a chain cut when possible. Starting and stopping the torch is more detrimental to the consumables than making a continuous cut.
7) Always check the FineLine UI > Status Screen > Logs to keep track of cut errors.

5.4 Cut Quality

Before the optimum cutting condition can be achieved on a particular material type and thickness, the machine operator must have a thorough understanding of the cutting characteristics of the System. When the cut quality is not satisfactory, the cutting speed, torch height, or gas pressures may need to be adjusted in small increments until the proper cutting condition is obtained. The following guidelines should be useful in determining which cutting parameter to adjust.

NOTE: *Before making any parameter changes, verify that the torch is square to the workpiece. Also, it is essential to have the correct torch parts in place and to ensure that they are in good condition. Check the electrode for excessive wear and the nozzle and shield cap orifices for roundness. Also, check the parts for any dents or distortions. Irregularities in the torch parts can cause cut quality problems.*

1) A positive cut angle (top dimension of piece smaller than the bottom dimension) usually occurs when the torch standoff distance is too high, when cutting too fast, or when excessive power is used to cut a given plate thickness.
2) A negative cut angle (top dimension of piece larger than the bottom dimension) usually occurs when the torch standoff distance is too low or when the cutting speed is too slow.
3) Top dross usually occurs when the torch standoff distance is too high.
4) Bottom dross usually occurs when the cutting speed is either too slow (slow-speed dross) or too fast (high-speed dross). Low-speed dross is easily removed, while high-speed dross usually requires grinding or chipping off. When using oxygen as the shielding gas, bottom dross can sometimes be removed by increasing the shield gas pressure. However, increasing the shield pressure too much can cause cut face irregularities (see below). Bottom dross also occurs more frequently as the metal heats up. As more pieces are cut out of a particular plate, the more likely they are to form dross.
5) When using oxygen as a shielding gas, cut face irregularities usually indicate that the shield gas pressure is too high or the torch standoff distance is too low.
6) A concave cut face usually indicates that the torch standoff distance is too low or the shield gas pressure is too high. A convex cut face usually indicates that the torch standoff distance is too high or the shield gas pressure is too low.
7) Note that different material compositions have an effect on dross formation.
8) If the material is not being completely severed, the likely causes are that the cutting current is too low, the travel speed is too high, the gas pressures are incorrect, the incorrect gas types are selected, the incorrect consumables are installed in the torch, or the consumables are worn.

5.5 Piercing Thick Materials

Care must be taken when piercing thick materials in order to prevent damage to the shield cap and nozzle. As with all thicknesses, the pierce height must be set high enough so the metal ejected while piercing does not come into contact with the shield cap. Also, some of the material ejected during the pierce may adhere to the top side of the plate and form a ring of solidified material around the pierce point.

Action must be taken so the torch does not move from the pierce height down to the cutting height and come into contact with this solidified metal. The torch should not move from the pierce height down to the cutting height until the CNC controller has moved the torch away from the pierce point.

One way to accomplish this may be to program the pierce time on the torch height control system to a value that is longer than the CNC controller motion delay time.

5.6 Edge Starts

On very thick materials, an edge start may be required to prevent damage to the torch consumables.

When the edge start recommended LED illuminates green on the FineLine UI > Status Screen, the torch should be positioned at the edge of the material prior to starting the arc. Refer to Section 4.3.4.

5.7 Cut Charts

Cut chart values have been selected to provide the best cut quality with the least amount of dross; however, material variations and application differences may require changes to these initial values.

Cut charts values can be viewed through the FineLine User Interface or in a separate document, BK8053-000108 (Cut Charts for LC300M Plasma Torch).

The latest version of all documentation and cut charts can be downloaded from www.lincolnelectric.com.

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6.0 Maintenance

⚠WARNING

Electric Shock Can Kill.

Do not touch electrically live parts or electrode with skin or wet clothing. Insulate yourself from work and ground. Always wear dry insulating gloves.

Disconnect input power to the Power Supply and disconnect power to the HMI and Ethernet router/switch before servicing.

Do not operate with covers, panels, or guards removed.

Only qualified personnel should install, use, or service this equipment.

⚠WARNING

Fan Blades Are Sharp.

Keep hands, hair, clothing, and tools away from the fans inside the cooling system.

⚠WARNING

Capacitor failure can injure and/or cause property damage.

Large electrolytic capacitors store large amounts of energy even after power has been removed from the System. Wait at least five minutes after turning off power, and then use a voltmeter to verify that the capacitors are fully discharged before performing System maintenance.

Failure of a capacitor can result in a sudden release of stored energy causing rupture of the capacitor case.

⚠ CAUTION

Missing or damaged o-rings can damage the System.

If equipped, inspect all o-rings on the Quick-Disconnect Torch Head before mating it to the Quick-Disconnect Torch Base.

Never use the System with missing or damaged o-rings.

⚠ CAUTION

Electrostatic Discharge Can Damage Electronic Components.

Protection against electrostatic discharge (ESD) is critical when performing any service or repair to any internal component.

Always use a grounded wrist strap, grounded antistatic mat, or similar device.

Always keep electronic components in anti-static bags when storing or shipping.

6.1 Routine Maintenance

These tasks should be performed on a monthly basis unless otherwise noted. In excessively dirty environments or in heavy usage situations, these tasks should be performed more frequently.

6.1.1 Power Supply

1) Examine the sheet metal case for dents or other damage and repair as required. Keep case in good condition to ensure that high voltage parts are protected and correct internal spacing is maintained. All external sheet metal screws must be in place to ensure case strength and electrical ground continuity.
2) Remove the covers on the Power Supply.
3) Using clean, dry, compressed air (30 psi maximum), blow out all accumulated dust, including dust on PC boards and fans.
4) Verify the ground and primary three phase A.C. voltage connections are tight.
5) Verify all PC board connectors are installed securely.
6) Verify all rear cable connectors are installed securely.
7) Verify the electrode lead and work ground lead are secure and free from corrosion.
8) Verify that all gas hose connectors are tight and that there are no leaks. Only tighten the fittings enough to make water or gas seals. The fittings are subject to damage if over tightened.
9) Check the torch coolant filter cartridge and replace if dirty. Refer to Section 6.2.
10) Flush the cooling system every six months or after 1,040 hours of operation (5 days/week X 8 hours/day X 26 weeks = 1,040 hours), whichever comes first. Replace all coolant and coolant filter cartridge. Refer to Section 6.3.

6.1.2 Gas Controller (GC)

1) Verify that all exterior gas hose connectors are tight and that there are no leaks. Only tighten the gas fittings enough to make a gas seal. The fittings are subject to damage if over tightened.
2) Inspect all exterior gas hoses to ensure no damage exists. Immediately replace any damaged gas hoses.
3) Remove the cover of the GC. Using clean, dry, compressed air (30 psi maximum), blow out all accumulated dust inside the unit.
4) Verify that all PC board connectors are installed securely, and then replace the GC cover.
5) Every two years, install FineLine GC Maintenance Kit part number BK602615.

6.1.3 Arc Start Console (ASC)

1) Open the cover of the ASC and verify that all leads and hoses are tightened securely. Only tighten the fittings enough to make a coolant or gas seal. The fittings are subject to damage if over tightened.
2) Using clean, dry, compressed air (30 psi maximum), blow out all accumulated dust inside the unit.

6.1.4 Torch, Torch Leads, and Gas Hoses

1) Verify that all torch lead and gas hose connections are tight and that there are no gas or coolant leaks. Only tighten the fittings enough to make a coolant or gas seal. The fittings are subject to damage if over tightened.
2) Verify that the braided shield of the torch leads is fastened securely to the brass shield adapter that connects to the arc start console. Also, make sure the shield adapter is secured tightly to the arc start console enclosure.
3) Inspect the braided shield for nicks or cuts and replace if necessary.
4) Remove the torch handle and verify that the connections at the torch are tightened securely. Only tighten the fittings enough to make a coolant or gas seal. The fittings are subject to damage if over tightened. Coolant leaking from the drain hole in the torch handle indicates damaged or loose torch leads.
5) Make sure the torch lead insulating sleeves are positioned to properly cover the brass torch fittings at the torch.
6) Inspect the outer sleeve on the torch's electrode/coolant supply lead. If nicks, cuts or holes are found, replace the torch.
7) Remove the torch consumables and inspect all o-rings. If equipped, inspect all o-rings on the Standard Torch. If equipped, remove the Quick-Disconnect Torch Head from the Torch Base and inspect all o-rings. Replace any o-rings with cuts, nicks, abrasions, or any other signs of wear. Never use the System will missing or damaged o-rings.
8) With the electrode removed, inspect the cooling tube in the torch for damage. If replacement is required, use an adjustable wrench on the flats to loosen and then replace the cooling tube.
9) Ensure that the Quick-Disconnect Torch Head is kept free from dirt and debris when not installed into a Quick-Disconnect Torch Base.
10) Wipe any excess o-ring lubricant off of the torch.

6.1.5 Work Ground

1) Verify that the work ground lead is securely fastened to the star ground on the cutting table, and that the connection point is free from corrosion. Use a wire brush to clean the connection point if necessary.

6.2 Coolant Filter Replacement (without Coolant Flush)

⚠ CAUTION: When handling coolant, wear nitrile gloves and safety glasses.

1) Remove primary power to the Power Supply.
2) Use a Torx T30 screwdriver to loosen the four screws on the right side of the Power Supply that secure the coolant filter access panel. Remove the coolant filter access panel.
3) Unscrew the filter housing (turn to the left) and then carefully remove it from the Power Supply. Minimize spilled coolant. Wipe up any spilled coolant.
4) Remove the dirty coolant filter cartridge from the housing and replace with new coolant filter cartridge part number KP4730-1.
5) Re-install the filter housing into the Power Supply and tighten by hand (turn to the right). Wipe up any spilled coolant.
6) Replace the coolant filter access panel and then tighten the four screws.
7) Apply primary power to the Power Supply.
8) Press the Coolant On button on the FineLine UI > Status Screen > Diagnostics. Coolant will begin circulating through the system.
9) Allow the coolant to circulate until the flow value stabilizes between 1.2 and 1.5 GPM as displayed on the FineLine UI > Status Screen.
10) Press the Coolant Off button to stop coolant flow (FineLine UI > Status Screen > Diagnostics).
11) End of procedure.

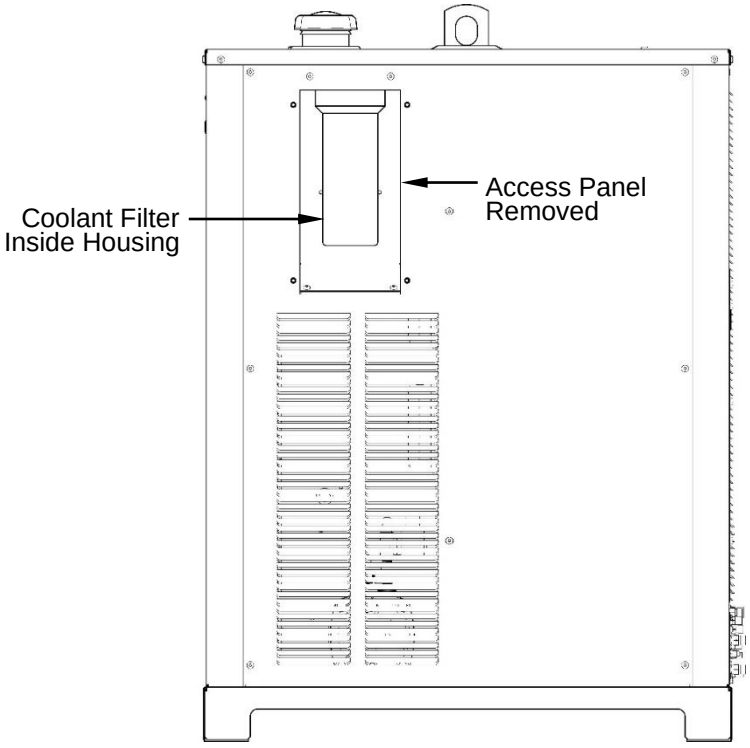


Figure 19: Coolant Filter Replacement

6.3 Coolant Flush and Filter Replacement

⚠ CAUTION: Never turn on the System when the coolant reservoir is empty.

⚠ CAUTION: When handling coolant, wear nitrile gloves and safety glasses

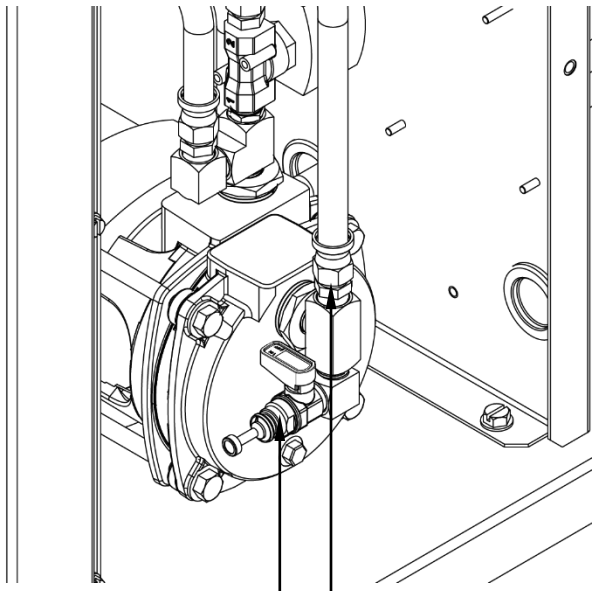
⚠ CAUTION: Only use approved coolant. Commercially available antifreeze contains corrosion inhibitors that will damage the cooling system.

⚠ CAUTION: When making brass fitting connections, use two opposing wrenches and only tighten enough to make liquid seals. The fittings are subject to damage if over tightened.

The torch coolant should be flushed out of the system every six months and replaced with new coolant. Replace the coolant filter at the same time.

1) Remove primary power to the Power Supply.
2) Ensure the torch base and torch head (with consumables) are properly installed.
3) Ensure the coolant supply (in and out) hoses are properly installed.
4) Remove the coolant reservoir cap.
5) Remove the right case side from the Power Supply.
6) Make sure the drain valve is in the closed position and push back on the release ring to remove the plug. Install 3/8” OD tubing into the valve and place the opposite end into an appropriately sized vessel (minimum 5 gallons) to collect the system coolant. Turn the valve to the open position to allow the coolant to drain.

   NOTE: *Some older Systems may not have a drain valve. For these Systems, disconnect the pump inlet hose from the top/front of the pump. Be prepared for coolant to escape and have a bucket or other vessel ready to catch escaping coolant. Leave the hose inside the bucket when moving to the next step.*



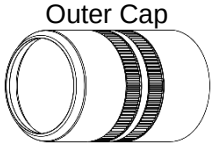
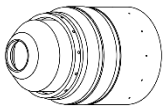
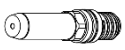
7) Remove the coolant supply hose (coolant out) from the rear of the Power Supply. Note that the coolant supply hose has right hand threads. Be prepared for coolant to escape from the hose/fitting when breaking this connection.
8) Blow compressed air (100 psi maximum) into the coolant supply hose. This will force the remaining coolant from the torch, torch leads, and supply hose into the reservoir and out the drain valve or supply hose.

9) Remove the drain hose, reinsert the valve plug, close the valve, and clean up any leaked coolant. ***NOTE:*** *On older Systems, reconnect the pump inlet hose and clean up any leaked coolant.*
10) Unscrew the coolant filter housing and remove the coolant filter. Install a new coolant filter and replace the coolant filter housing. Clean up any leaked coolant.
11) Reconnect the coolant supply hose on the rear of the Power Supply and clean up any leaked coolant.
12) Discard old coolant and filter housing according to national and local codes.
13) Follow all of the steps in Section 3.19 “Fill the Cooling System” to complete this procedure.

6.4 Consumable Inspection

When the cut quality is not satisfactory, use the following guidelines for determining which consumable parts need to be changed. Inspect all parts for dirt, debris, and excess o-ring lubricant. Clean as necessary.

NOTE: *Inspect all o-rings. Never use the System with missing or damaged o-rings.*

Part	Inspect For	Corrective Action
Outer Cap 	Dents, cracks	Replace outer cap.
Shield Cap 	Center hole out of round	Replace shield cap.
	Dents, Scratches	Replace shield cap.
	Dry o-ring	Apply a thin film of o-ring lubricant.
	Damaged o-ring	Replace shield cap.
Retaining Cap 	Center hole out of round	Replace retaining cap.
	Dents, cracks	Replace retaining cap.
Nozzle 	Center hole out of round	Replace nozzle.
	Erosion or arcing	Replace nozzle.
	Dry o-rings	Apply a thin film of o-ring lubricant.
	Damaged o-rings	Replace nozzle.
Swirl Ring  or 	Damage	Replace swirl ring.
	Clogged holes	Blow out with compressed air. Replace swirl ring if clogs can't be removed.
	Dry o-rings	Apply a thin film of o-ring lubricant.
	Damaged o-rings	Replace swirl ring.
Electrode 	Pit depth	Replace electrode if center pit depth is greater than: 0.040" (1mm) for 30A, 80A 0.060" (1.5mm) for 140A, 170A.
	Erosion or arcing	Replace electrode.
	Dry o-rings	Apply a thin film of o-ring lubricant.
	Damaged o-rings	Replace electrode.

6.5 Software/Firmware Updates

Contact Lincoln Electric service department to obtain the FineLine Service Installer (FLSI), which includes the latest updates for the FineLine System.

Follow the installation instructions provided with the FLSI.

6.5.1 Power Supply Update Troubleshooting

In the event the power supply network connection cannot be established, the following procedure sets the FineLine power supply address to static.

1) Verify System wall power is **ON**. Verify **CutLinc** and **FLUI** applications are closed.
2) Run the FineLine Service Installer and select the **Installation Type**.
3) Select the applicable **Power Supply Update**.
4) Select "**Connect through Ethernet**," then "**I do not know the IP address of the welder**." Select the power supply in the list and then "**Configure**."
5) Select "**Use the following IP Address**," then enter **192.168.90.11** in the IP Address field. Enter **255.255.255.0** in Subnet Mask field. Select **OK**.
6) Select **Yes**, then **OK**.
7) Power **OFF** System wall power, wait 3 minutes, and then power **ON** System wall power.
8) Run the FineLine Service Installer and select the **Installation Type**.
9) Select the applicable **Power Supply Update**.
10) In the System Update Utility, verify "**Connect through Ethernet**" and "**I do not know the IP address of the welder**" is selected. Select Refresh List, then select the power supply with **192.168.90.11** IP address. Select **Connect**.
11) Machine connection is now established. Select **Begin Update**. Wait until the update completes.
12) Select the applicable **Power Supply Update** again.
13) Select "**Connect through Ethernet**," then "**I do not know the IP address of the welder**." Select the power supply in the list and then "**Configure**."
14) Select "**Obtain an IP Address automatically**." Select **Yes**, then **OK**.

6.6 Maintenance Schedule

Operating hours are estimates. Time duration estimated as 2,000 working hours per year for one shift at 30% arc on time. Use time duration or arc hours, whichever comes first.

Part Number	*Description*	*Qty*	*Arc Hours / Months*							
			300 6	600 12	900 18	1200 24	1500 30	1800 36	2100 42	2400 48
BK602605	**Maintenance Kit, 6 Month 300 Hour (QD Torch)**	1	X	X	X	X	X	X	X	X
KP4730-1	Coolant filter	1	X	X	X	X	X	X	X	X
BK602613	O-Rings for QD Torch, Fluid Adapter End	1	X	X	X	X	X	X	X	X
BK602614	O-Rings for Std & QD Torch, Consumable End	1	X	X	X	X	X	X	X	X
BK1111-200216	Cooling Tube	1	X	X	X	X	X	X	X	X
BK716012	O-Ring Lubricant, 5 gram tube	1	As Needed							
BK602606	**Maintenance Kit, 6 Month 300 Hour (STD Torch)**	1	X	X	X	X	X	X	X	X
KP4730-1	Coolant filter	1	X	X	X	X	X	X	X	X
BK602614	O-Rings for Std & QD Torch, Consumable End	1	X	X	X	X	X	X	X	X
BK1111-200216	Cooling Tube	1	X	X	X	X	X	X	X	X
BK716012	O-Ring Lubricant, 5 gram tube	1	As Needed							
BK602607	**Maintenance Kit, 2 Year 1200 Hour (QD Torch)**	1				X				X
BK602615	FineLine GC & APC Maintenance Kit	1				X				X
BK602623	LC300M, QD Plasma Torch Base	1				X				X
BK602621	LC300M, Plasma Torch Handle	1				X				X
BK602608	**Maintenance Kit, Electrical**	1								X
9SM12161-102	Contactor	2								X
9SS33485	Check Valve (Coolant-Fineline)	1								X
BK500695	Coolant, 1 Gallon, 9°F (-13°C), 25%	5 (N1)	X	X	X	X	X	X	X	X
BK602604-XX (N2)	Torch Leads (N3)	1								X

(N1): Coolant capacity varies with hose length. Check with Original Equipment Manufacturer (OEM) for system capacity.
(N2): Torch lead lengths vary; refer to Section 8.2.1 Verify torch lead length for your system.
(N3): Torch lead life varies and can be considerably shorter on 3D cutting and profiling systems.

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7.0 Troubleshooting

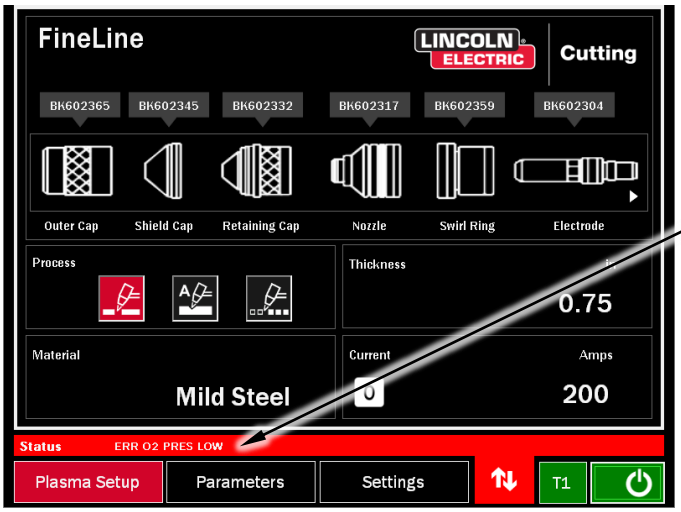
WARNING

Service and Repair should only be performed by Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

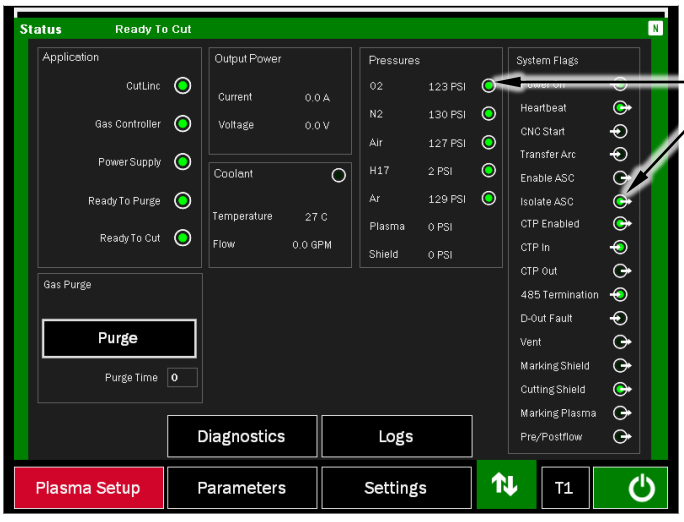
7.1 Error Identification

On the FineLine User Interface

The FineLine UI indicates errors in several ways: a red Status Bar, Status Bar Error Message, LEDs on the Status Screen, and specific error codes in the Event Log.



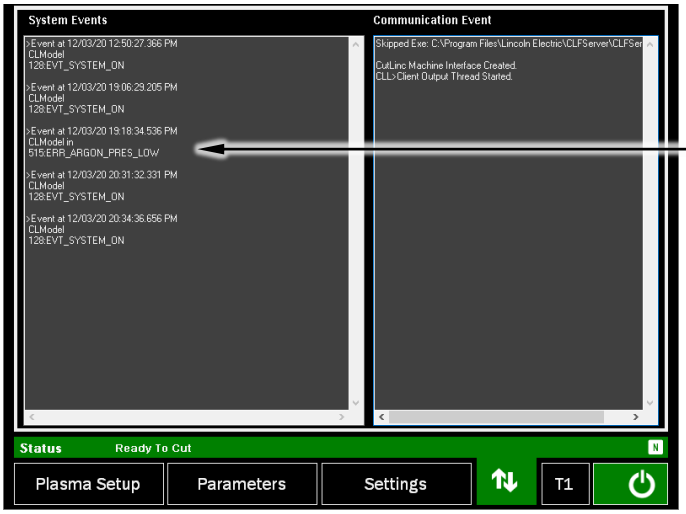
Red Status Bar and Error Message



Colored LEDs

The Status Screen contains colored LEDs that indicate:

- Green = active or okay
- Red = requires attention
- Not illuminated = inactive.

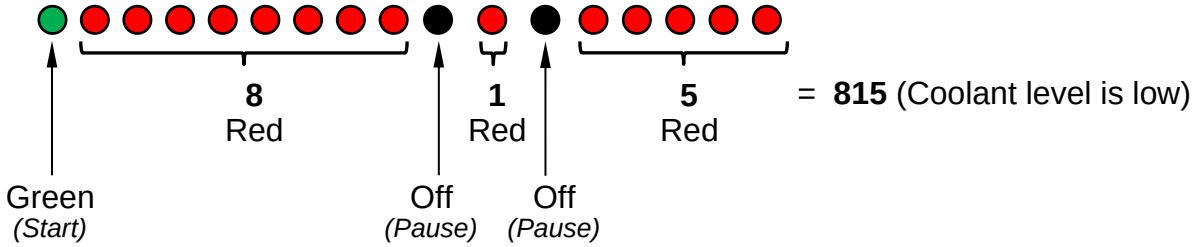


System Events Log
The most recent events appear at the bottom of the list on Status Screen > Logs. Events are also indicated by a time stamp. Use the scroll bar to move up and down the list. Refer to Section 7.2.2 to lookup specific event codes.

On the Power Supply

The Power Supply status light will display Power Supply-specific error codes only. Error codes are displayed starting with one green blink followed by a series of red blinks. Pauses indicate the start of another digit. Count the number of red blinks to identify each digit in the error code and then refer to the table below to identify the error. Errors will be displayed at least three times or until the error is cleared. Refer to Section 7.2.2 to lookup specific error codes.

Example:



7.2 Error Codes and Event Log

Errors are captured in the event log (Status Screen > Logs) and displayed on the status bar.

Multiple events/errors may occur at the same time, which may prevent the System from operating; only the first event is reported as a message on the status bar.

It is important to check the event log for any additional events/errors logged after the initial event/error displayed on the status bar. Also, check the Status Screen and verify status LEDs.

Event Log Entry Format:

Line 1: Event Timestamp
Line 2: Event Source and Cut Group
Line 3: Event Code: Event Description

Example:

Event Source Codes:

FLGC	FineLine Gas Controller
FL3HD	FineLine Power Supply
CLMI	CutLinc
CLModel	CutLinc
HMI	FineLine User Interface

Event Cut Groups:

The FineLine UI can communicate with up to four Cut Groups (0 through 3). Each Cut Group consists of a single torch, a single Power Supply and a single Gas Controller.

Event Codes and Descriptions:

Event codes are referenced in tables below based on event source codes. The same event code may be used by different sources, therefore it is important to note the event source listed in the event log.

Contact Lincoln Electric service department for resolution of errors not described in this section.

7.2.1 Event Log File

Each time the FineLine UI starts, it creates a log file in the following location:

C:\Users\Public\Documents\CutLinc\temp

Filename format is:

GHMI-Month-Day-Year-Hour-Min-Second.txt

Example: GHMI-09-09-2020-10-45-44.txt

Events are written chronologically into this file as they are generated.

7.2.2 Event Codes

Source	HMI	
Event Code	**Description**	**Possible Resolution**
1	SYSTEM NOT READY	
11	CUTLINC CONNECT FAILED	Check Ethernet connection. Check router.
12	CUTLINC CONNECTION LOST	Check Ethernet connection. Check router.

Source	CLMI	
Event Code	**Description**	**Possible Resolution**
11	CUTLINC CONNECT FAILED	Check Ethernet connection. Check router.
12	CUTLINC CONNECTION LOST	Check Ethernet connection. Check router.

Source	CLModel	
Event Code	**Description**	**Possible Resolution**
512	N2 PRES LOW	Check input gas pressure – pressure should be within 105 – 140 psi
513	O2 PRES LOW	Check input gas pressure – pressure should be within 105 – 140 psi
514	AIR PRES LOW	Check input gas pressure – pressure should be within 105 – 140 psi
515	AR PRES LOW	Check input gas pressure – pressure should be within 105 – 140 psi
516	H17 PRES LOW	Check input gas pressure – pressure should be within 105 – 140 psi

Source	FL3HD		
Event Code	**Status Light**	**Description**	**Possible Resolution**
1	311	Switchboard A Primary Over Current	Report issue to Lincoln Electric service department.
8	741	Switchboard A Fault	Report issue to Lincoln Electric service department.
64	54	Secondary Over Current	Report issue to Lincoln Electric service department.
128	71	Secondary Over Power	Report issue to Lincoln Electric service department.
256	36	Thermal Fault	1) Check for blockage of the vents in the sheet metal enclosure. 2) Check operation of internal fans. 3) Ensure within operating limits. 4) Using clean, dry, compressed air (30 psi maximum), blow out all accumulated dust inside the unit.
512	76	Pilot Board Fault	Check wiring to pilot PCB.
1024	761	Switchboard A Softstart Precharge Error	Report issue to Lincoln Electric service department.
8192	32	Switchboard A Cap Over Voltage	Report issue to Lincoln Electric service department.
16384	34	Switchboard A Cap Under Voltage	Report issue to Lincoln Electric service department.
524288	733	Switchboard Missing	Report issue to Lincoln Electric service department.
1048576	43	High Cap Voltage Differential	Report issue to Lincoln Electric service department.
2097152	817	Coolant Temperature Too High	***NOTE:*** *The coolant pump will run until the coolant temperature returns to normal.* 1) Check for blockage of the vents in the sheet metal enclosure. 2) Check operation of internal fans. 3) Ensure within operating limits. 4) Check the routing of hoses and leads are not near an external heat source.

Source	FL3HD		
Event Code	**Status Light**	**Description**	**Possible Resolution**
4194304	814	Cooler Flow Fault	1) Check that the machine is supplied 3 phase input. 2) Check for blockage of coolant supply hose and coolant return hose. 3) Check for blockage of torch leads. 4) Check coolant pump operation. 5) Check the coolant filter cartridge and replace if dirty.
8388608	815	Cooler Level Fault	1) Check for coolant leaking from supply and return hoses, ASC, torch leads, and torch connections. 2) Add coolant to the reservoir until it reaches the bottom neck of the reservoir.
33554432	825	Switchboard Thermistor Not Connected	Check that the thermistor is plugged into each switchboard.
67108864	751	Switchboard A Thermal Error	1) Check for blockage of the inlet and outlet vents to the power sections. 2) Check that power section fans are operating properly.
536870912	64	Safety Circuit Not Ready	EStop activated.
1073741824	299	N2 Over Pressure	Adjust gas regulator until pressure is within specifications. Refer to Section 2.6.
2147483648	299	O2 Over Pressure	
4294967296	299	H17 Over Pressure	
8589934592	299	Air Over Pressure	
17179869184	299	Argon Over Pressure	
137438953472	492	Gas MUX Missing	Check wiring between control board and gas mux PCB.
274877906944	491	CAN Fault	Check the Power Supply interconnect cable.
549755813888	45	Secondary Over Voltage	Report issue to Lincoln Electric service department.
1099511627776	826	High Coolant Flow	Verify all consumables are installed.
2199023255552	827	Flow without Active Pump	
9223372036854770000	Other	Power Source Fault	Read the error conde blinking on the front of the Power Supply and report the fault to Lincoln Electric service department for assistance.

Source		FLGC	
Event Code	**Hex**	**Description**	**Possible Resolution**
256	0x100	TCA SET DIRECTION FAILED	Report issue to Lincoln Electric service department.
257	0x101	TCA SET POLARITY FAILED	
258	0x102	TCA READ ERROR	
259	0x103	TCA DATA ERROR	
260	0x104	TCA SETUP REGISTER READ FAILED	
261	0x105	TCA REGISTER READ FAILED	
262	0x106	TCA SET OUTPUTS FAILED	
263	0x107	TCA INPUT READ ERROR	
264	0x108	TCA INAVLID DEVICE ID	
265	0x109	TCA CANNOT ALLOCATE MEMORY	
512	0x200	DIO GPIO IN FABRIC	Report issue to Lincoln Electric service department.
513	0x201	DIO GPIO OUT FABRIC	
514	0x202	DIO INVALID PHY DI REQ	
515	0x203	DIO GPIO FAILED	
768	0x300	REG INVALID READ DI REQ	Report issue to Lincoln Electric service department.
769	0x301	REG INVALID READ DO REQ	
770	0x302	REG INVALID READ AI REQ	
771	0x303	REG INVALID READ AO REQ	
772	0x304	REG INVALID DI WRITE	
773	0x305	REG INVALID DO WRITE	
774	0x306	REG INVALID AI WRITE	
775	0x307	REG INVALID AO WRITE	
776	0x308	REG INVALID READ CMD	
777	0x309	REG INVALID WRITE CMD	
778	0x30A	REG HEAP ERROR	
779	0x30B	REG CRC	
1024	0x400	TMR INIT ERROR	Report issue to Lincoln Electric service department.
1025	0x401	TMR CONNECTING INT	
1026	0x402	TMR TICK TABLE FULL	
1027	0x403	TMR SYSTEM TICK FAILED	
1028	0x404	TMR FRT FAILED	
1536	0x600	MCP SET DAC FAILED	Report issue to Lincoln Electric service department.
1537	0x601	MCP REGISTER READ FAILED	
1538	0x602	MCP SETUP REGISTER READ FAILED	
1539	0x603	MCP INVALID DAC PROFILE	
1540	0x604	MCP SELECT VREF FAILED	
1541	0x605	MCP SELECT GAIN FAILED	
1542	0x606	MCP MEMORY ALLOCATION	
1792	0x700	ADC WRITE CONFIG	Report issue to Lincoln Electric service department.
1793	0x701	ADC REGISTER READ FAILED	
1794	0x702	ADC SETUP REGISTER READ FAILED	
1795	0x703	ADC READ ERROR	

Source		FLGC	
Event Code	**Hex**	**Description**	**Possible Resolution**
2560	0xA00	MA INSUFFICIENT POINTS	Report issue to Lincoln Electric service department.
2561	0xA01	MA POLYNOMIAL ORDER TOO LARGE	
2562	0xA02	MA SINGULAR MATRICES INVALID	
2563	0xA03	MA FPC COEFFICIENT ERROR	
3083	0xC0B	CAN TX BUSY ERROR	Report issue to Lincoln Electric service department.
3844	0xF04	GC CANNOT CREATE GAS OBJECT	Report issue to Lincoln Electric service department.
4099	0x1003	EX INVALID WAYPOINTS	Report issue to Lincoln Electric service department.
4100	0x1004	EX INVALID PLASMA GAS PRESSURE	Compare pressure displayed on Parameters screen to cut chart values in manual
4101	0x1005	EX INVALID SHIELD GAS PRESSURE	Compare pressure displayed on Parameters screen to cut chart values in manual
4102	0x1006	EX INVALID PREFLOW GAS PRESSURE	Compare pressure displayed on Parameters screen to cut chart values in manual
4103	0x1007	EX INVALID POSTFLOW GAS PRESSURE	Compare pressure displayed on Parameters screen to cut chart values in manual
4104	0x1008	EX UNDEF PREFLOW PRESSURE	
4105	0x1009	EX UNDEF SHIELD PRESSURE	
4108	0x100C	EX LOST Y VALUE	
4110	0x100E	EX REMOTE POWER OFF	Power Supply has been turned off via Off Button on HMI, Power Button on Power Supply, EStop has been asserted or Power Supply Fault.
4111	0x100F	EX PURGING	Wait for purge to finish.
4113	0x1011	EX PURGING PLASMA PRESSURE TOO LOW	Output pressure at Gas Controller is lower than 80psi during purge. Check for restrictions or leaks in supply lines to Gas Controller. Check for gas leak at output connections, torch leads or at torch connections.
4114	0x1012	EX PURGING SHIELD PRESSURE TOO LOW	
4115	0x1013	EX PURGING MARKING PRESSURE TOO LOW	
4116	0x1014	EX PURGE GASES BEFORE FIRST CUT	Initiate a manual gas purge.

Source		FLGC	
Event Code	**Hex**	**Description**	**Possible Resolution**
4117	0x1015	EX OCV TIMEOUT	Power Supply was commanded on but no open circuit voltage (OCV) was reported. Check Power Supply indicator LED for faults. Check error log for events prior to the OCV timeout event.
4118	0x1016	EX PLASMA TRACKING	Output pressure does not track to commanded output pressure. Verify correct consumables are installed. Check for restriction or blockage in gas supply hose and torch leads. Check for leaks at gas controller output connections and torch connections.
4119	0x1017	EX POSTFLOW TRACKING	
4120	0x1018	EX PREFLOW TRACKING	
4121	0x1019	EX SHIELD TRACKING	
4122	0x101A	EX CNC START DEASSERTED	Start signal has been removed.
4123	0x101B	EX BOOST ABORT	High current boost for piercing has timed out.
4124	0x101C	EX START PROHIBITED	Check ESTOPs are clear, RT communication with power supply is operational, gases have been purged and if APC fitted shield water has been purged. If all conditions are clear then cycle power (ON Button to off and back to on). Wait 5s between off and turning back on.
4126	0x101E	EX ARC HOLD TIMEOUT	Second CNC start signal pulse (rising edge) not received within arc hold timeout (TTS). Extend TTS or generate the second CNC start signal pulse closer to the first.
4127	0x101F	EX APC PLASMA START TIMEOUT	APC dispense operation did not complete in time. Cycle power to APC and GC as an unrecoverable communication error has occurred.
4128	0x1020	EX APC WATER COMMAND TIMEOUT	APC water shield on/off operation did not complete in time. Cycle power to APC and GC as an unrecoverable communication error has occurred.

Source		FLGC	
Event Code	**Hex**	**Description**	**Possible Resolution**
4129	0x1021	EX INVALID WATER PRESSURE	APC and GC given water shield pressure outside of operating limits. Verify cut chart data and if correct report issue to Lincoln Electric service department.
4130	0x1022	EX APC PURGING WATER PRESSURE TOO LOW	Check: water inlet to APC for leaks, kinks in water hose, correct hose diameter, and water mains pressure. If water mains pressure too low, must be corrected by external means.
4352	0x1100	IIR TOO MANY COEFFICIENTS	Report issue to Lincoln Electric service department.
4353	0x1101	IIR INVALID FILTER OBJECT	
4354	0x1102	IIR INVALID IIR ORDER	
4355	0x1103	IIR TOO FEW COEFFICIENTS	
4356	0x1104	IIR INVALID IIR DCGAIN	
4357	0x1105	IIR INVALID IIR COEEFICIENT	
4864	0x1300	SV INITIALISATION FAILED	Report issue to Lincoln Electric service department.
4865	0x1301	SV CONFIGURATION FAILED	
5120	0x1400	FRAM WRITE FAILED	Report issue to Lincoln Electric service department.
5121	0x1401	FRAM WRITE BLOCK TOO BIG	
5122	0x1402	FRAM INVALID DATA BLOCK	
5123	0x1403	FRAM INVALID WRITE ADDRESS	
5124	0x1404	FRAM INVALID READ ADDRESS	
5125	0x1405	FRAM READ FAILED	
5126	0x1406	FRAM HEAP ERROR	
5127	0x1407	FRAM RD WRITE FAILED	
5128	0x1408	FRAM READ BLOCK TOO BIG	

7.3 Replacing System Components

⚠ WARNING

Electric Shock Can Kill.

Do not touch electrically live parts or electrode with skin or wet clothing. Insulate yourself from work and ground. Always wear dry insulating gloves.

Disconnect input power before servicing.

Do not operate with covers, panels, or guards removed.

Only qualified personnel should install, use, or service this equipment.

If it becomes necessary to replace any System component containing a MAC address – Power Supply, Gas Controller, HMI, or optional APC – after the System has been commissioned, follow these steps to re-commission the System:

1) Remove primary power to the Power Supply. For multi-torch setups, ensure this is the Power Supply physically connected to the serviced torch. Disconnect power to the HMI and Ethernet router/switch.
2) Replace the System component and remake all necessary connections.
3) Follow the steps in Section 3.18 to Commission the System.

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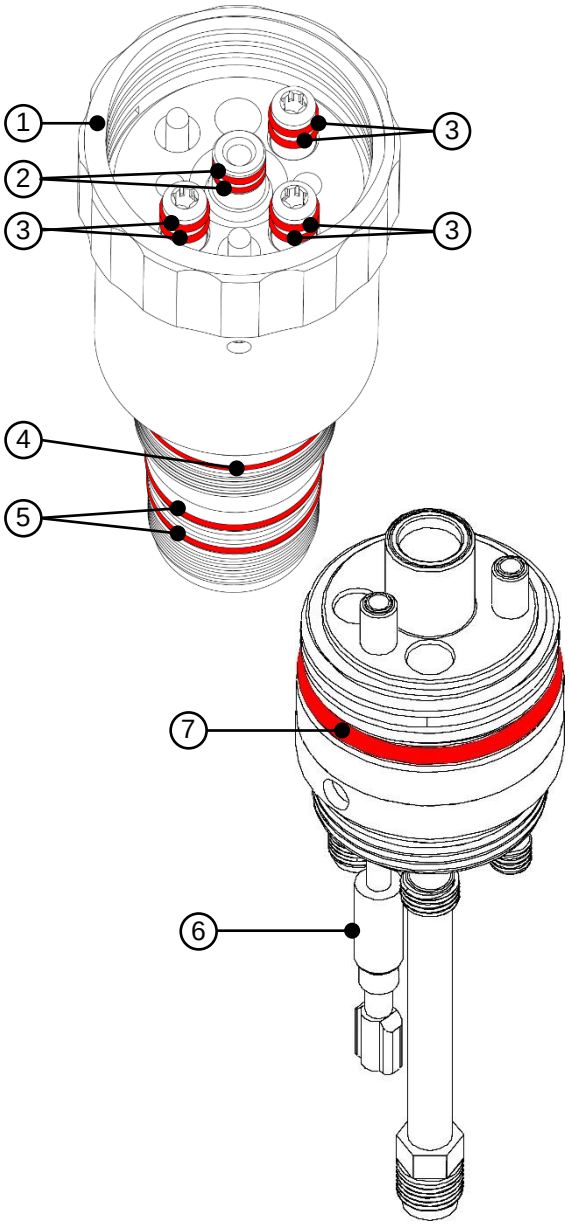
8.0 Parts List

For the most up-to-date parts list, refer to Lincoln Electric's Service Navigator (parts.lincolnelectric.com) or contact Lincoln Electric service department for the following components:

- FineLine 170HD Power Supply (K4910-1)
- FineLine 170HD Power Supply (K4910-2)
- FineLine Gas Controller (BK300350)
- FineLine Arc Start Console (K4901-1)

8.1 Torch and Related Parts



Item	Part Number	Description
	BK602621	Torch Handle
	BK602622	Magnum PRO LC300M Standard Plasma Torch
1	BK602625	Magnum PRO LC300M Quick-Disconnect Plasma Torch Head
2	BK279112	O-Ring, Quantity required = 2
3	BK279113	O-Ring, Quantity required = 6
4	BK1111-200231	O-Ring, Quantity required = 1 (also used on Standard Torch)
5	BK820148	O-Ring, Quantity required = 2 (also used on Standard Torch)
6	BK602623	Magnum PRO LC300M Quick-Disconnect Plasma Torch Base
7	BK279013	O-Ring, Quantity required = 1
	BK700223	Torch Clamp
	BK1111-200207	Electrode Cooling Tube. Compatible with torch serial numbers where last four digits are lower than 0824.
	BK1111-200216	Electrode Cooling Tube. Compatible with all torch serial numbers.
	BK716012	O-Ring Lubricant, 5 gram tube (smaller quantity)
	BK716012-2	O-Ring Lubricant, 2 ounce tube (larger quantity)
	BK602396	Electrode Removal Socket (10mm, 6-point deep socket, ¼" square drive)
	BK277086	Electrode Removal Driver (¼" square driver)

8.2 Hoses, Leads, and Cables

8.2.1 Torch Leads

Part Number	Length
BK602604-XX	Where -XX is the length in feet. -10, -12, -15, -20, -25, -30**, -35** ft. lengths available. ** Contact Lincoln Electric service department if leads longer than 25ft. are required.

8.2.2 Gas Hose Package

Part Number	Length
BK602617-XX	Where -XX is the length in feet. -35, -50, -75, -100**, -125** ft. lengths available. ** Maximum length for standard installation is 75 ft. (22.8m). Contact Lincoln Electric service department if longer length is required.

8.2.3 Coolant Supply Hose

Part Number	Length
BK200308-XX	Where -XX is the length in feet. -25, -35, -50, -75, -100 ft. lengths available.

8.2.4 Coolant Return Hose

Part Number	Length
BK200307-XX	Where -XX is the length in feet. -25, -35, -50, -75, -100 ft. lengths available.

8.2.5 Work Ground Lead

Part Number	Length
K4902-XX	Where -XX is the length in feet. -25, -50, -75, -100 ft. lengths available.

8.2.6 Power Supply Electrode Lead

Part Number	Length
K4903-XX	Where -XX is the length in feet. -25, -35, -50, -75, -100 ft. lengths available.

8.2.7 Power Supply Nozzle Lead

Part Number	Length
K4904-XX	Where -XX is the length in feet. -25, -35, -50, -75, -100 ft. lengths available.

8.2.8 PS Interconnect Cable

Part Number	Length
K4905-XX	Where -XX is the length in feet. -35, -50, -75, -100**, -125** ft. lengths available. ** Maximum length for standard installation is 75 ft. (22.8m). Refer to Appendix C if longer length is required.

8.2.9 ASC Control Cable

Part Number	Length
K4906-XX	Where -XX is the length in feet. -5, -10, -15, -20, -25 ft. lengths available.

8.2.10 Ethernet Cable w/ Bayonet

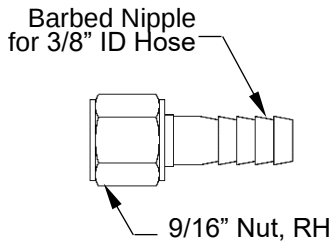
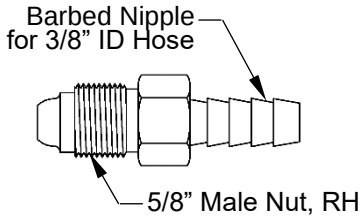
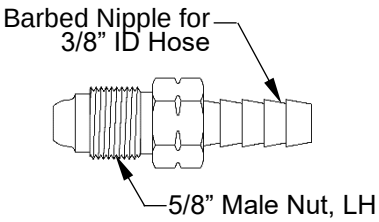
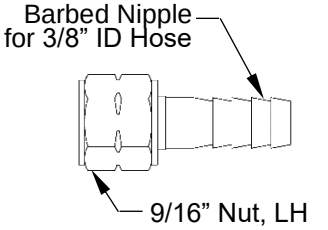
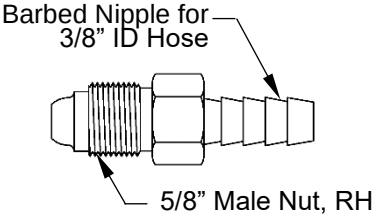
Part Number	Length
K4907-XX	Where -XX is the length in feet. -25, -50, -75, -100, -125 ft. lengths available.

8.2.11 CNC Interface Cable

Part Number	Length
BK602610-XX	Where -XX is the length in feet. -25, -50, -75, -100, -125 ft. lengths available.

8.3 Supply Gas Hose Fittings Kit, BK300421 (Optional)

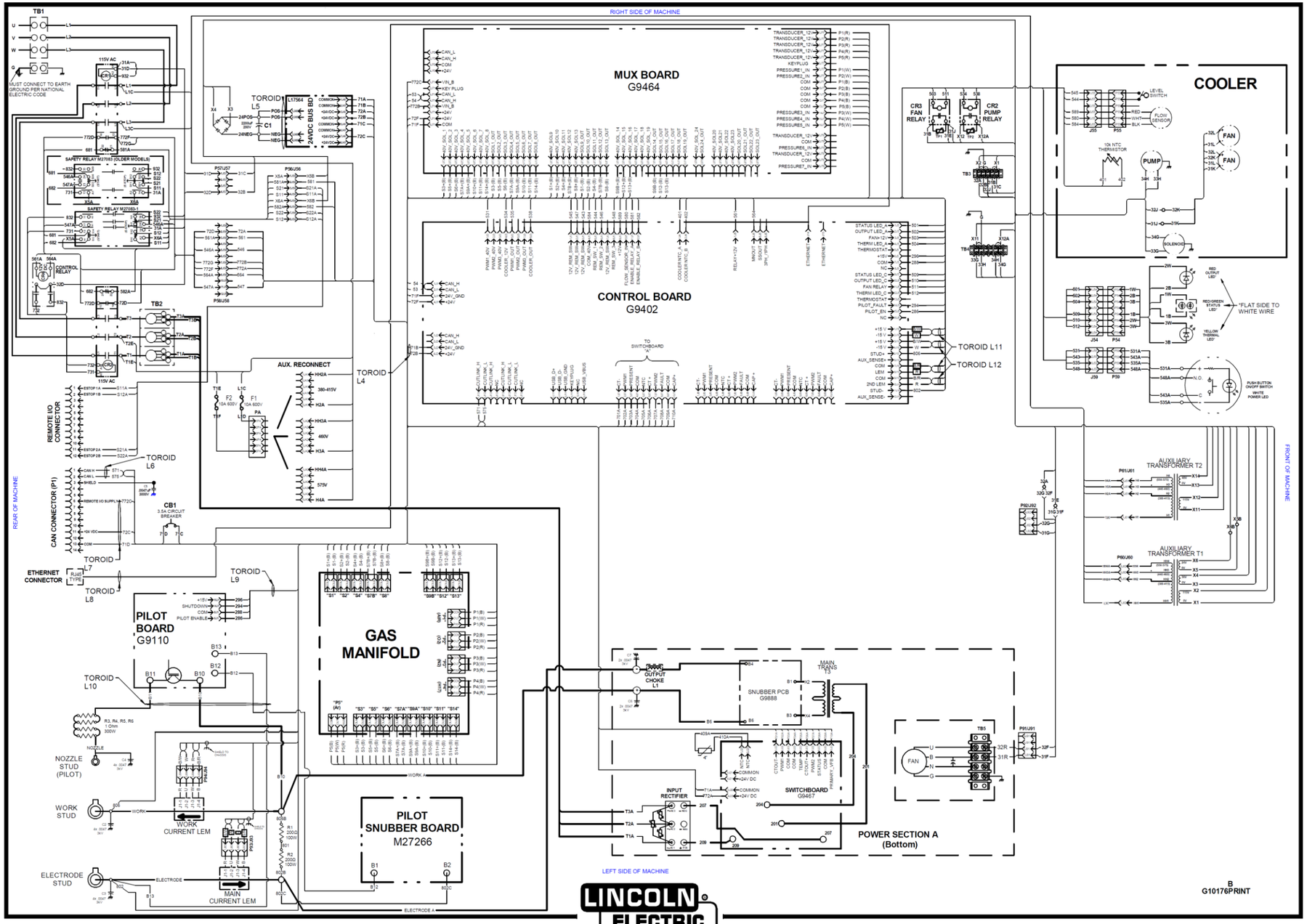
This kit contains the components shown below. Hose and ferrule/clamp are not supplied.

Supply Gas Hose	Assembled Fittings
Oxygen	
Nitrogen	
Air (1 for standard System, 1 for optional APC)	
H17	
Argon	

9.0 Wiring & Flow Diagrams

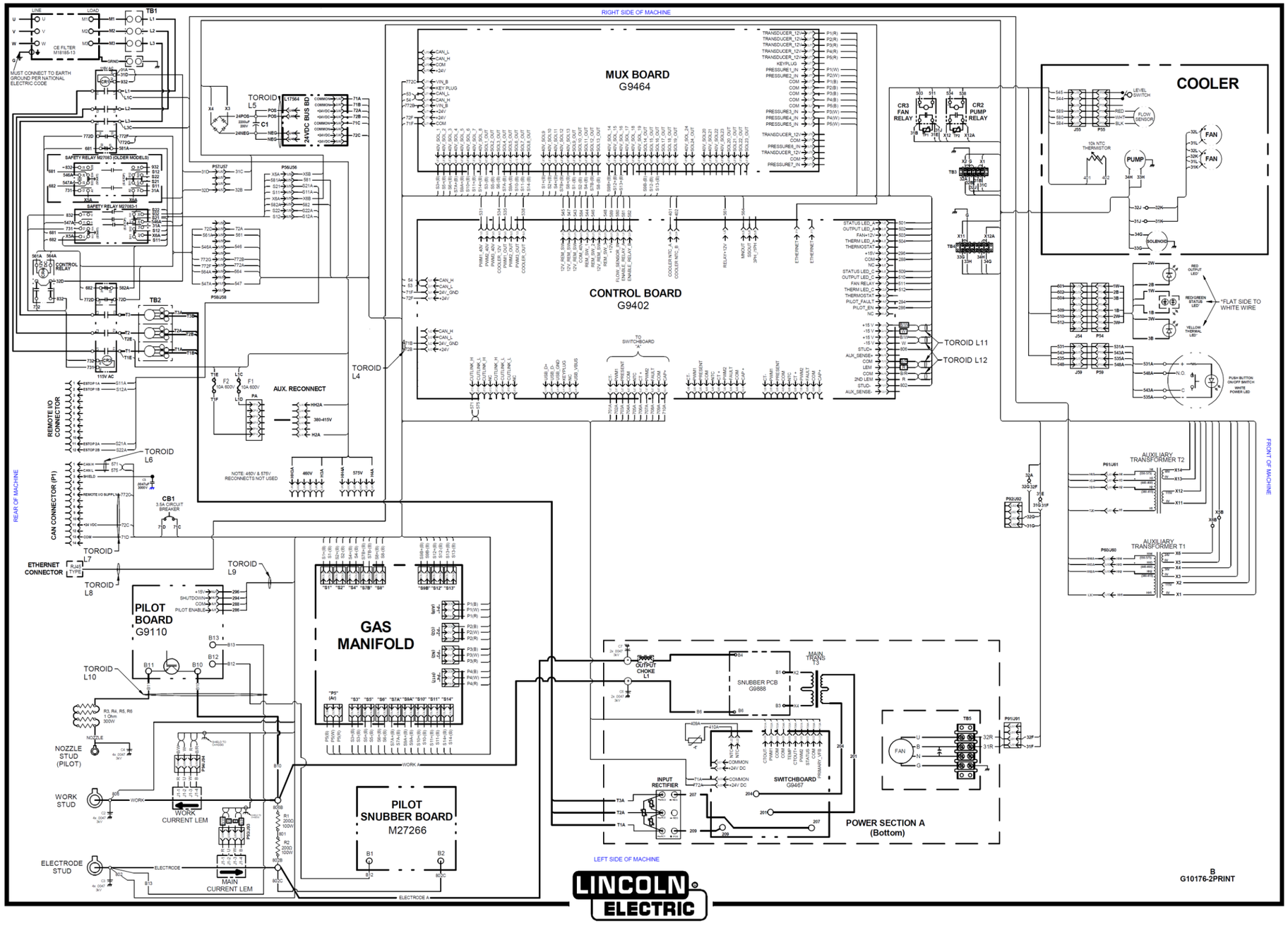
9.1 Power Supply K4910-1 Wiring Diagram (click to open PDF)

For Code 13050 / 13608

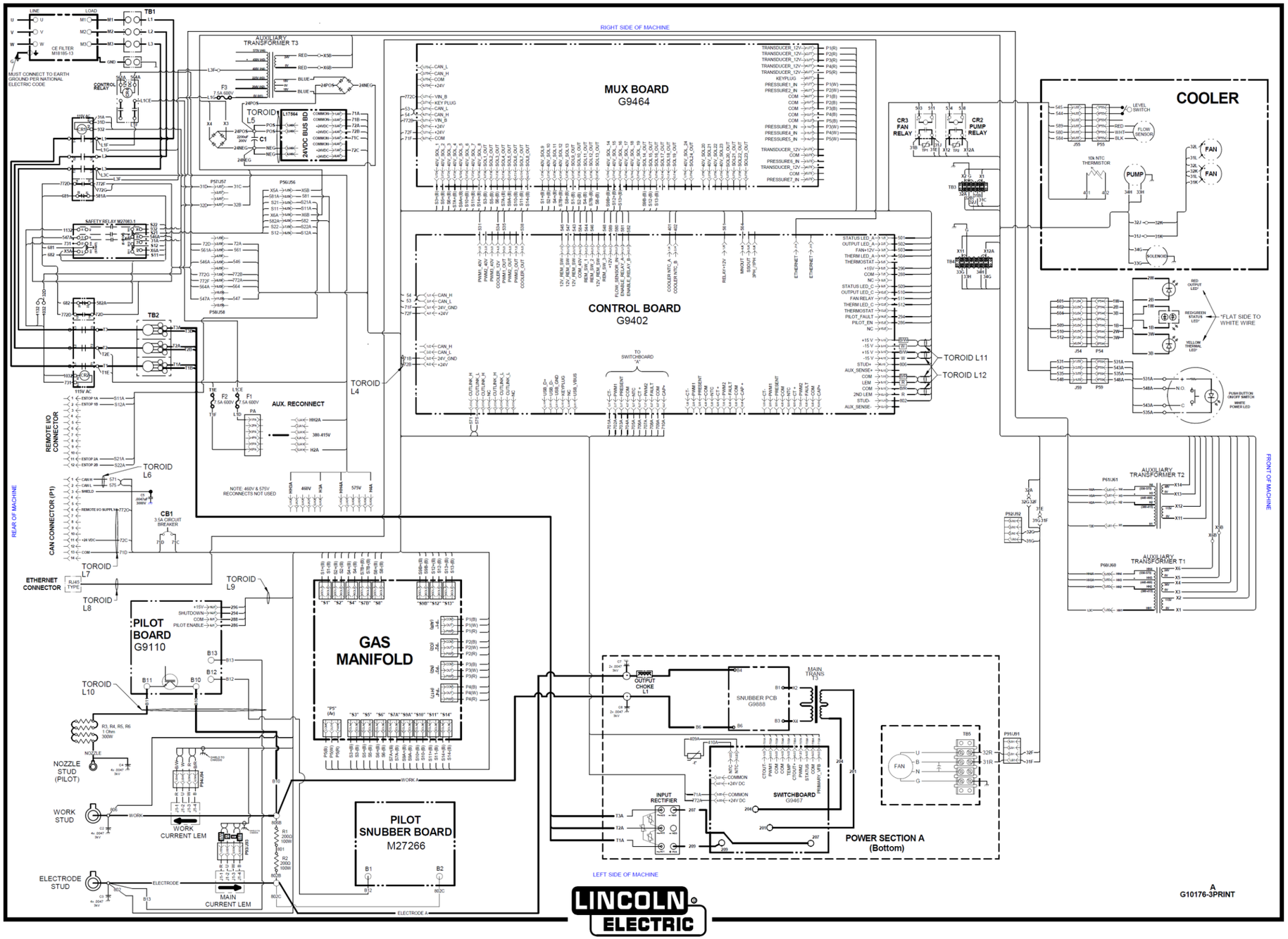


9.2 Power Supply K4910-2 Wiring Diagram (click to open PDF)

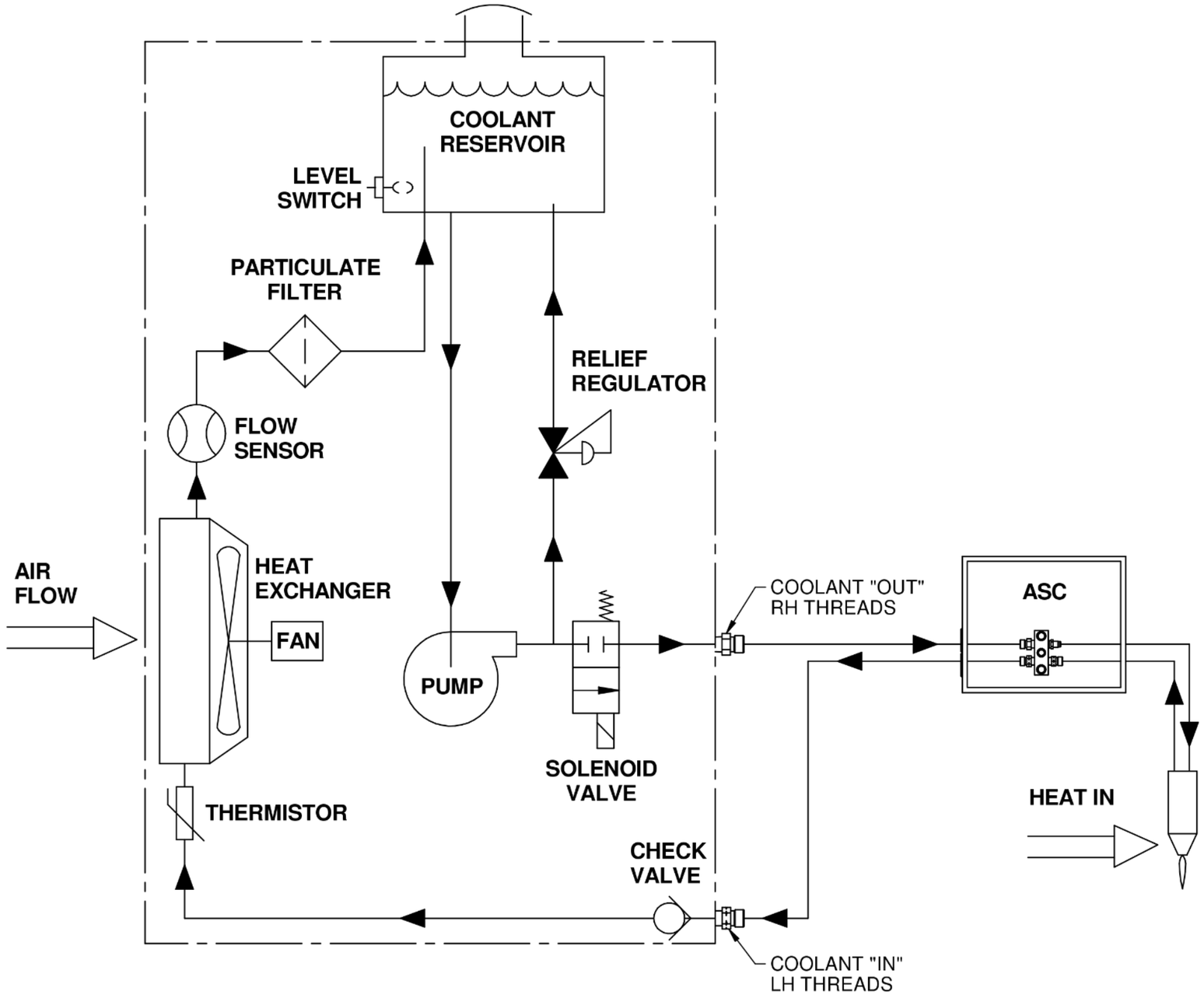
For Code 13051



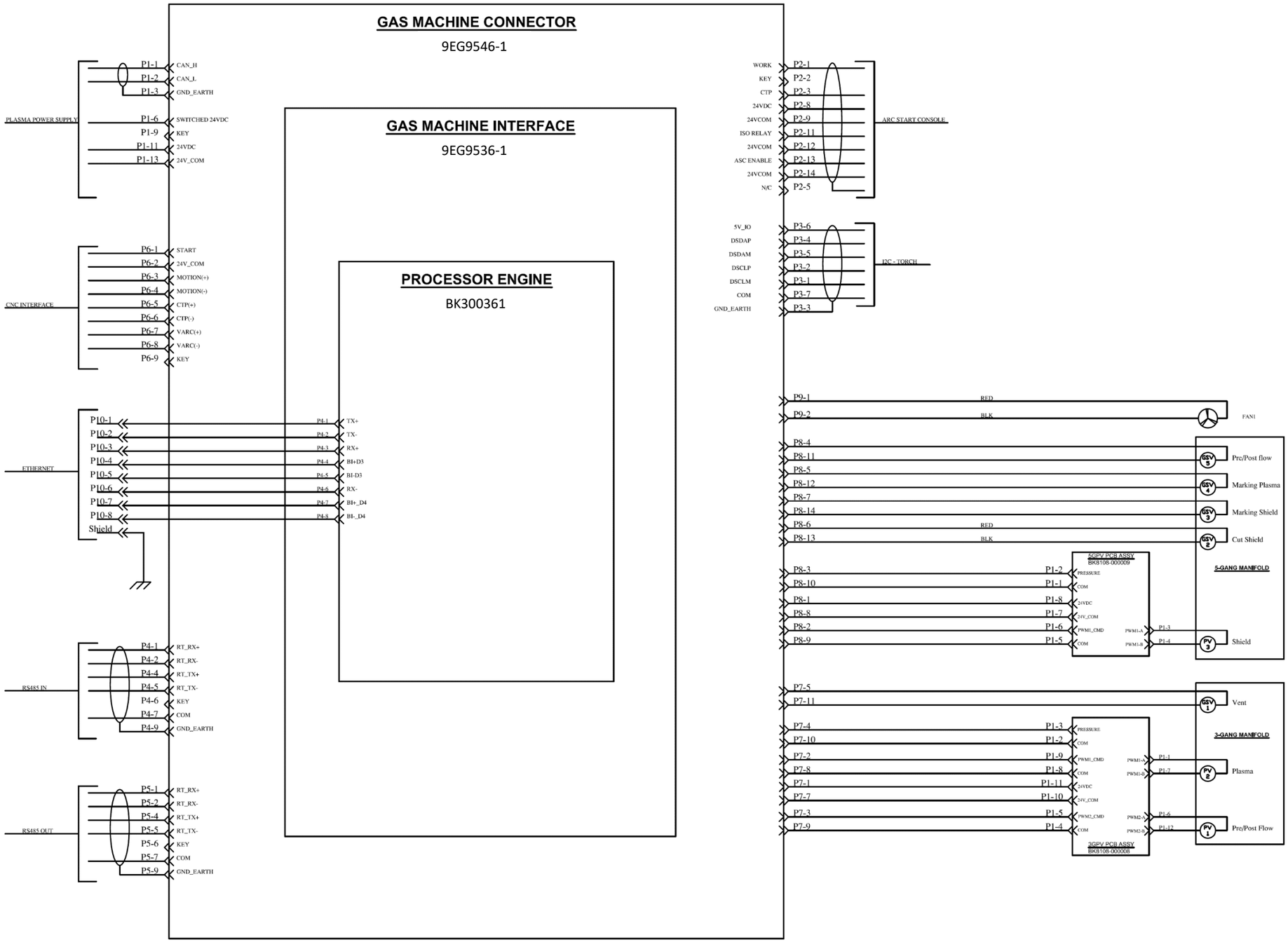
For Code 13526



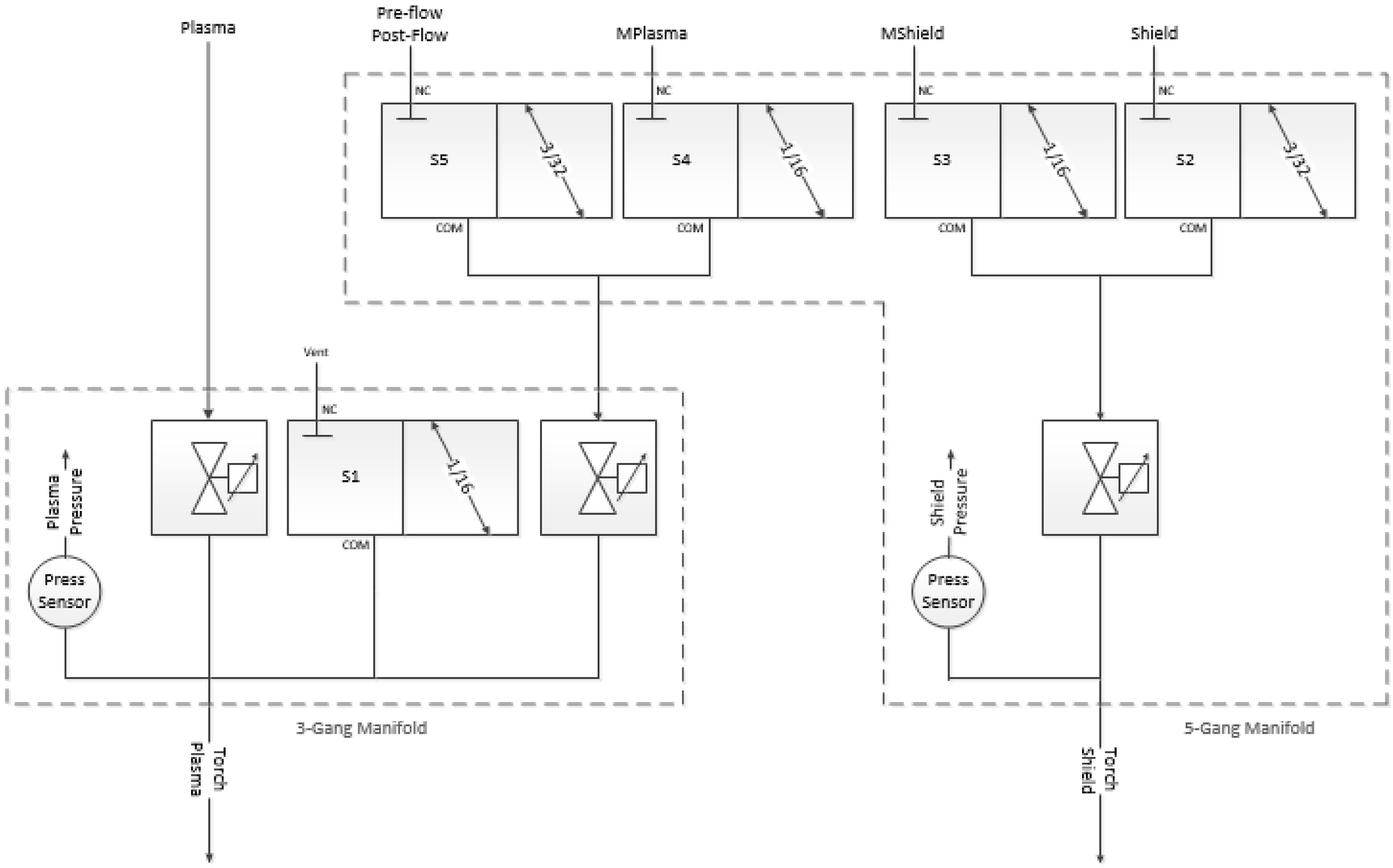
9.3 Cooling System (Inside Power Supply) Flow Diagram



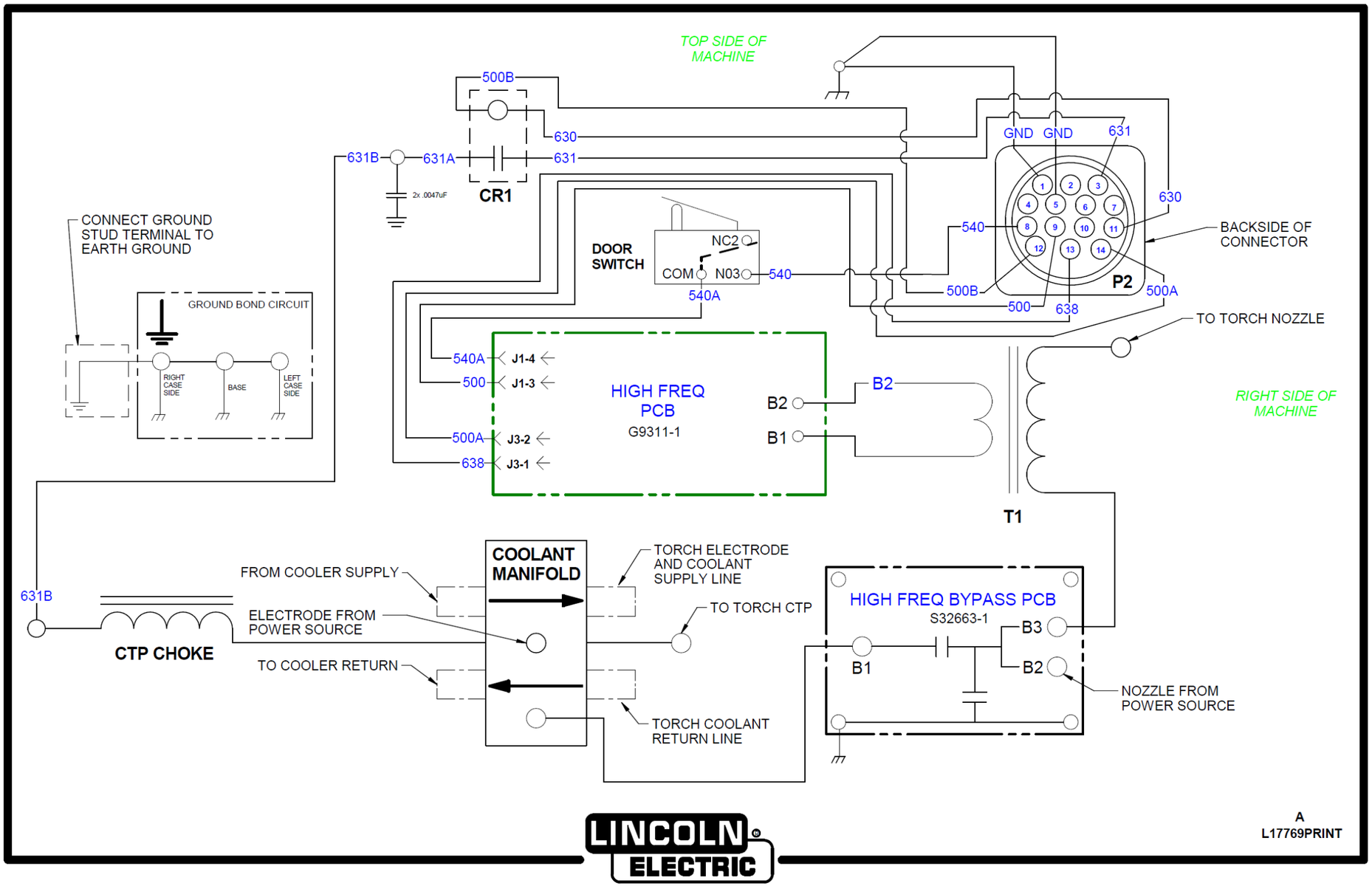
9.4 Gas Controller (GC) Wiring Diagram



9.5 Gas Controller (GC) Flow Diagram



9.6 Arc Start Console (ASC) Wiring Diagram



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Appendix A Electromagnetic Compatibility (EMC)

A.1 Background

CE marked Systems are manufactured to comply with the European standard EN 60974-10 (Electromagnetic compatibility (EMC) – Product standard for arc welding equipment). These have been tested in accordance with CISPR 11, EMC classification – Group 2 ISM (Class A). The limits used in this standard are based on practical experience. However, the ability of plasma cutting equipment to work in a compatible manner with other radio and electronic systems is greatly influenced by the manner in which it is installed and used. For this reason, it is important that the plasma cutting equipment be installed and used in accordance with the information below if electromagnetic compatibility is to be achieved.

Plasma cutting equipment is primarily intended for use in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments.

A.2 Installation and Use

The user is responsible for installing and using the plasma cutting equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the plasma cutting equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the plasma cutting circuit (refer to the Note below). In other cases it could involve constructing an electromagnetic screen enclosing the plasma power source and the work, complete with associated input filters. In all cases, electromagnetic disturbances shall be reduced to the point where they are no longer troublesome.

NOTE: *The plasma 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, e.g. by allowing parallel plasma cutting current return paths which may damage the earth circuits of other equipment. Further guidance is given in IEC 974-13 Arc welding equipment – Installation and use.*

A.3 Assessment of Area

Before installing plasma cutting equipment, the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

- other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the plasma cutting equipment;
- radio and television transmitters and receivers;
- computer and other control equipment;
- safety critical equipment, e.g. guarding of industrial equipment;
- the health of the people around, e.g. the use of pacemakers and hearing aids;
- equipment used for calibration or measurement;
- the immunity of other equipment in the environment; the user shall ensure that other equipment being used in the environment is compatible; this may require additional protection measures;
- the time of day that plasma 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.

A.4 Methods of Reducing Emissions

A.4.1 Mains Supply

Plasma cutting equipment should 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 plasma cutting equipment in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the plasma power source so that good electrical contact is maintained between the conduit and the plasma power source enclosure.

A.4.2 Maintenance of the Plasma Cutting Equipment

The plasma cutting equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the plasma cutting equipment is in operation. The plasma cutting equipment should not be modified in any way except for those changes and adjustments covered in the manufacturer's instructions.

A.4.3 Plasma Cutting Cables

The plasma cutting cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

A.4.4 Equipotential Bonding

Bonding of all metallic components in the plasma cutting installation and adjacent to it should be considered. However, metallic components bonded to the workpiece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

A.4.5 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, e.g. ship's hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

A.4.6 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 welding installation may be considered for special applications.

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Appendix B Inova System Integration

B.1 Inova System Components

The Inova torch height control system requires the following components to be added to the FineLine 170HD System:

Description	Part Number	Quantity
Inova Positioner	BK110036	1
Inova Control Console, 115V *or* Inova Control Console, 230V	BK110025 *or* BK110027	1
Optional - Inova Remote, Imperial Units *or* Inova Remote, Metric Units	BK110020 *or* BK110120	1
“A” Cable	BK711705-XX*	1
“B” Cable	BK711710-XX*	1
“F” Cable	BK711730-XX*	1
“G” Cable (for use with Burny CNCs)	BK711735-XX*	1
CNC Interface Cable	BK602610-XX*	1

** where –XX is the cable length in feet*

Unlike other Inova configurations, a separate Voltage Divider Card is not required when using the FineLine 170HD System.

When the CNC is a Burny controller, the optional G Cable allows the following parameters to be set through the FineLine User Interface (on the CNC); otherwise, they must be set through the Inova Remote:

- Cut / Mark Pierce Time
- Cutting / Marking Height
- Pierce / Initial Height
- Arc Voltage

Refer to the Inova System manual for installation and operation instructions that are not covered in this section.

Inova will not function with DES. If the optional APC is installed as part of the System, contact Lincoln Electric service department.

B.2 Connection Diagram

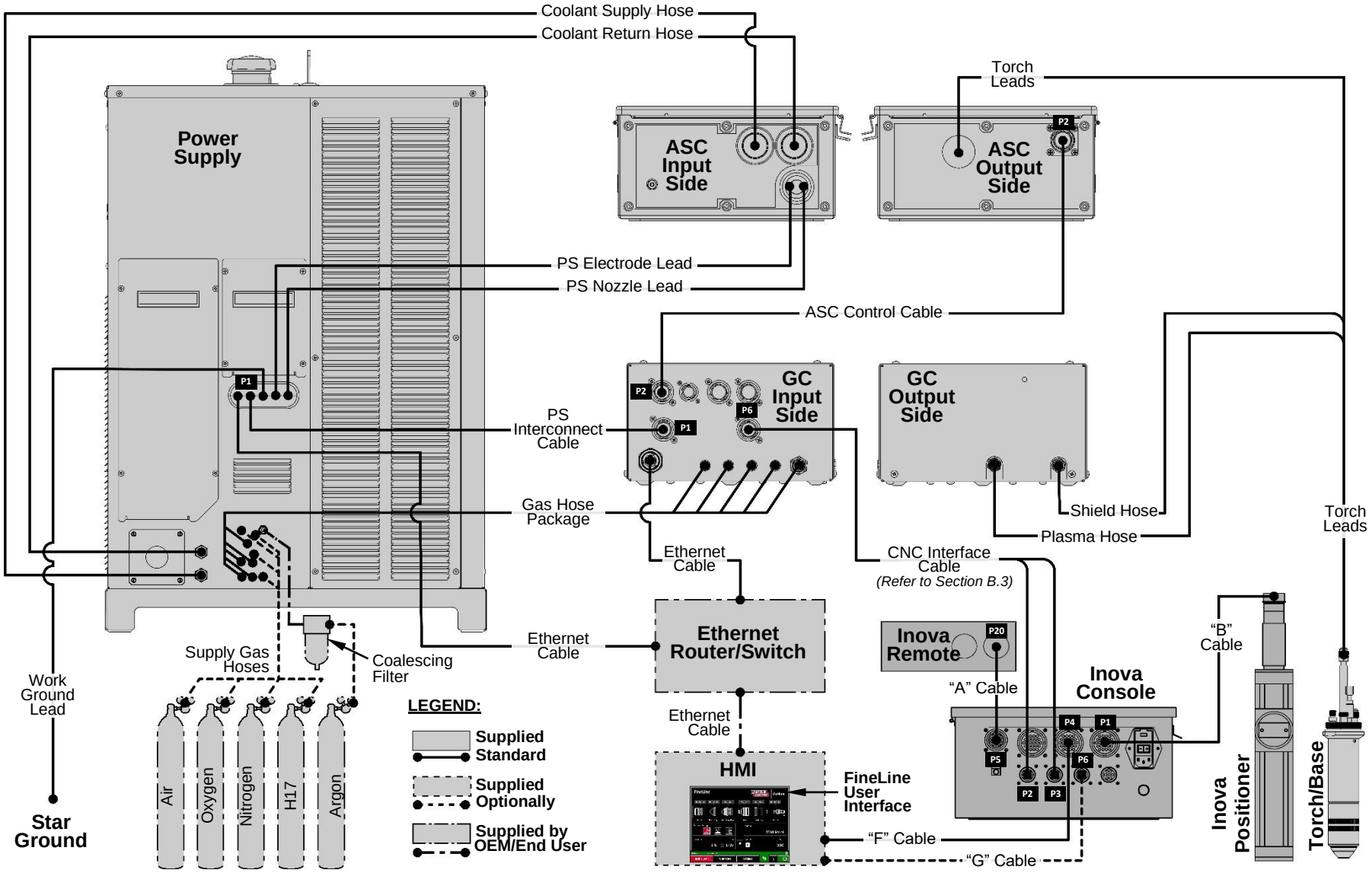
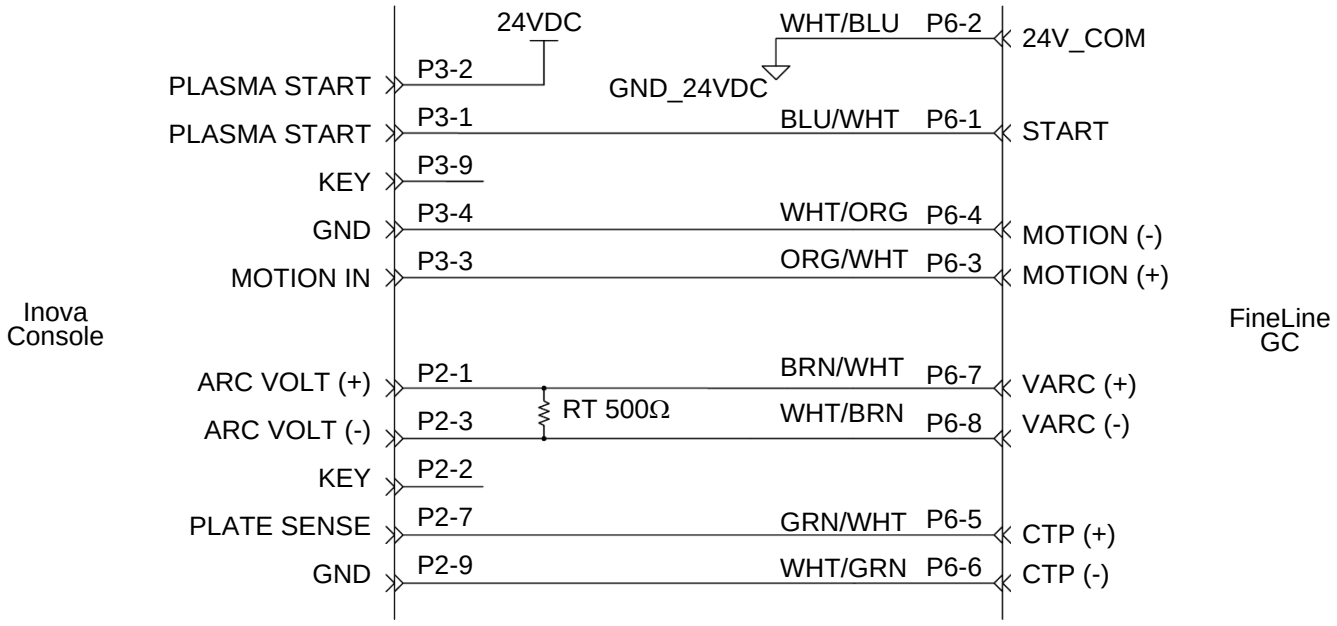


Figure 20: Inova Connection Diagram

B.3 CNC Interface Cable

The OEM / End User is responsible for terminating the CNC interface cable (BK602610-XX) into the Inova Console.



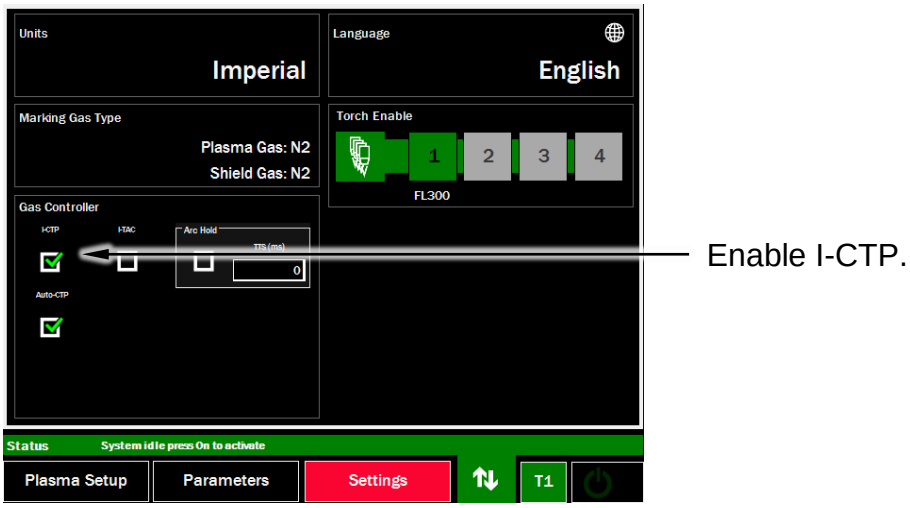
B.3.1 Schematic

B.3.2 Termination Components

LECO P/N	TE Connectivity P/N	Description	Quantity
BK709016	206708-1	CPC Plug, 9 position, shell size 13	2
BK709015	206966-7	Cable Clamp	2
BK709018	66105-4	Standard Circular Contact Socket	8
BK709019	200821-1	Keying Plug	2
n/a	n/a	24VDC Supply, 100ma	1
n/a	n/a	Resistor, 500Ω, 0.1%, 1/4W	1

B.4 Gas Controller Configuration

For operation with an Inova System, the Gas Controller's CTP output logic needs to be inverted. Navigate to: Settings > Gas Controller and then enable I-CTP (☑).



Appendix C PS Interconnect Cable Extender

For standard installations, the maximum length of the Power Supply (PS) Interface Cable is 75 ft. (22.8m) due to CAN communication limits. For installations requiring longer lengths, a PS Interconnect Cable Extender (BK300364) consisting of a CAN Bridge can be used to extend the length. The Extender allows two standard PS Interconnect Cables to be joined together, extending the distance between the Power Supply and Gas Controller up to a maximum of 150 ft. (45.7m). Two standard PS Interconnect Cables of any length can be used, but the maximum length per cable is 75 ft. for a maximum combined length of 150 ft.

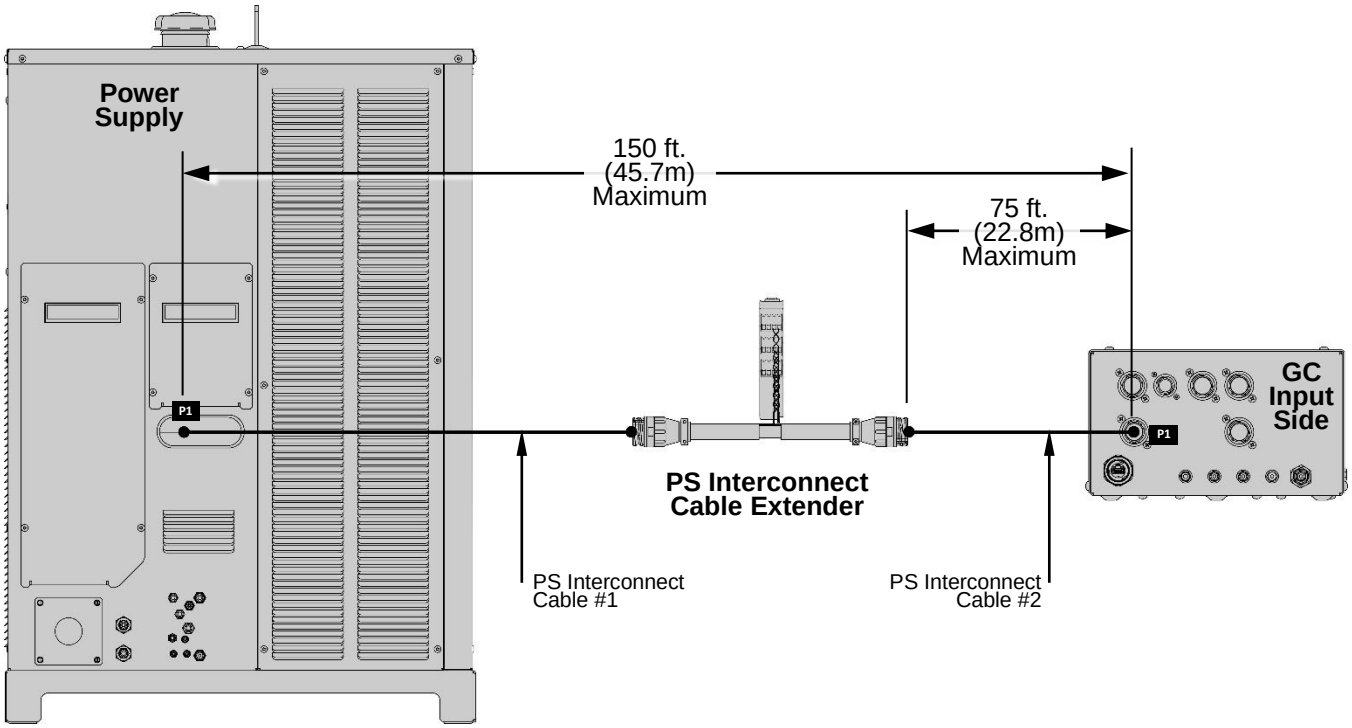
One PS Interconnect Cable is supplied standard with the System. One additional PS Interconnect Cable is required to use the PS Interconnect Cable Extender.

PS Interconnect Cable #1

1) Connect one end of PS Interconnect Cable #1 to the connector labelled P1 on the Power Supply. Connect the other end to either of the connectors on the PS Interconnect Cable Extender.

PS Interconnect Cable #2

2) Connect one end of PS Interconnect Cable #2 to the open connector on the PS Interconnect Cable Extender. Connect the other end to the connector labelled P1 on the Gas Controller.



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