



B-Series & C-Series Plasma Cutting System Safety, Operation, and Maintenance Manual With Microstep Gen 2

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Valid for Machines with Microstep Generation 2 as seen below



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Chapter 1: INTRODUCTION

1.1. About Piranha

Piranha is a subsidiary of MegaFab, based in Rockford Illinois. MegaFab is a manufacturer of metal fabrication machinery, including laser cutting machines, plasma cutting machines, ironworkers, press brakes, bending rolls, combination punching and cutting machines, and structural steel punching equipment. Equipment is sold under the Piranha, Whitney, and Bertsch brands.

1.2. Contact Information

Congratulations on the purchase of a genuine Piranha Plasma Machine. If there are questions regarding the machine, or if you need help, please use the following:

For technical support:

Via Phone: 815.490.0473

Via Email: service@megafab.com

For ordering parts and consumables:

Via Phone: 800.338.5471

Via Email: tooling@megafab.com

Please have the serial number or model ready when calling.

Piranha
650 Race St. • P.O. Box 1206
Rockford IL 61105, USA
www.piranhafab.com

Chapter 2: SAFETY

2.1. Introduction

Read this chapter on safety and the sections of vendor components manuals on safety before beginning to operate the Piranha Plasma Cutting Table.

Do not become complacent about safety or completely dependent on safety devices.

2.2. Safety Symbols Used in the Manual

This document uses the following symbols to highlight areas of importance.

Note:

Indicates information easily overlooked, or of special importance.



Caution

Indicates a hazardous situation with low risk that could result in minor injury and/or damage to machine.



Warning

Indicates a hazardous situation with medium risk that could result in moderate injury.



Danger

Indicates a hazardous situation with high risk that could result in injury or death.

Please do not underestimate the importance of other text not designated by any symbols.

2.3. All Users

Read this manual thoroughly before operating the machine.

Read the Torch Height Control Manual before operating the machine.

Read the CNC Control Operator Manual before operating the machine.

2.3.1. Supervisors

It is very important that a safe and appropriate working environment is provided for this Piranha equipment and in compliance with applicable federal and local industry standards.

It is imperative that programmers, machine operators and maintenance personnel be trained adequately in the use and care of the equipment. These employees should receive the proper instruction in order to have a complete understanding of the operation of this machine before beginning to program, operate or service it.

Careful programming and debugging of new programs is essential for successful operation of this machine. Use program Stop Codes to stop machine motion for operator removal of parts or scrap.

Never allow operators to place any part of their body into the machine while the machine is active. Ensure that all personnel understand the function and use of EMERGENCY STOP and CYCLE STOP button.

2.3.2. Maintenance Personnel

Only qualified personnel should make repairs on this equipment. Use caution and follow Piranha procedures when working on the machine. Be sure to observe the following guidelines:

1. Before performing maintenance or repair, turn the power OFF and follow lock out/tag out (zero energy shutdown) procedures. Also, follow any lock out/tag out procedures applicable to your specific plant requirements.
2. Wear safety glasses and other personal protective equipment as required by applicable federal, local industry, and plant safety program standards.
3. Wear proper clothing. Do not wear watches, rings, jewelry, or loose-fitting clothes.
4. Read and review the manual carefully.
5. Be familiar with the operation of the machine.
6. Practice preventative maintenance. Inspect the equipment regularly and repair or replace worn components and tooling. Read the vendor components manuals for any additional preventative maintenance.
7. Always replace safety guards and other safety devices removed for service and make sure that they are fully functional before operating the equipment.
8. Never remove, jumper out or bypass a safety device to permit machine production.
9. Never place yourself in a hazardous situation to observe a problem and ask someone else to operate the machine. This could be a very dangerous and life-threatening situation.

2.3.3. Operator

This equipment has been designed with operator safety in mind (when used under normal operating conditions). The user must always be alert to the possibility of dangerous situations. Always exercise care and caution. Report any minor problems immediately, so that they can be corrected before becoming major difficulties. Only qualified personnel should make repairs on the machine.

1. Be familiar with the machine. Read and review the Piranha and vendor component manuals carefully.
2. Be alert to the significance of the various warning indicators and be conscious of the functions of pushbuttons and other controls. Use the controls properly. Review and understand the operation of the EMERGENCY STOP function and the CYCLE STOP function.
3. Never operate the equipment unless it is in good working order.
4. Wear safety glasses and other personal protective equipment as required by applicable federal, local industry and plant safety program standards.
5. Wear proper clothing. Do not wear watches, rings, jewelry or loose-fitting clothes.
6. Avoid all moving parts of the machine or workpiece when setting up or operating the equipment. Never reach into the machine while it is active. Use the EMERGENCY STOP or CYCLE STOP function to stop machine motion. Never use the machine Dwell time code for parts removal or other operator intervention activities that puts the operator in a hazardous position.
7. Recognize and avoid unsafe operating conditions.
8. Maintain a clean work area. Avoid accidents by keeping work areas clean and neat.
9. Never leave the machine in an unsafe condition.
10. Never leave a machine running unattended.
11. Never remove or bypass safety devices.
12. Report any unsafe conditions, personal injury or machine problems immediately to your appropriate supervisor(s) and safety manager(s). In case of personal injury, notify Piranha Service Department giving a brief description and date reported injury occurred.
13. Never operate the machine with someone within a hazardous area.

2.4. Personal Protection

- Keep the operator's body and clothing dry.
- Do not stand, sit, or lie in/on any wet surfaces when using this equipment.
- Never work in a damp or wet area without proper insulation against electric shock.
- Disconnect main power before servicing the torch, power supply or service connections to the plasma arc system, or any part of the machine bed.
- Wear adequate personal equipment (overalls, gloves, safety boots etc.) when operating the machine.
- Remove or secure articles of clothing, such as ties and loose sleeves, which may catch or be drawn into moving machinery.

2.4.1. Eye Protection



Warning

The plasma arc cutting process produces rays that can burn eyes and skin. Always wear eye protection with appropriate lens shades.



LENS SHADE		
Arc Current	AWS (USA)	ISO 4850
Up to 100A	No. 8	No. 11
100 – 200A	No. 10	No. 11 – 12
200 – 400A	No. 12	No. 13
Above 400A	No. 14	No. 14

Medical treatment facilities and a qualified first aid person should be available for immediate treatment of flash burns to the eyes and skin.

It is recommended that the cutting area be prepared in such a way as to minimize the reflection and transmission of ultraviolet radiation. Walls and other surface areas should be painted in dark colors to reduce reflection. Protective screens or curtains may be installed to avoid unnecessary ultraviolet transmission.

2.4.2. Noise

The noise levels generated during plasma arc cutting may be as high as 105 decibels. This depends on the distance from the machine, arc, plasma torch nozzle design, gas velocity, material type, and plate thickness. Piranha recommends that each user check the sound levels in his own shop under normal operating conditions.

Based on those findings, provide adequate ear protection to all personnel who must work near the machine, in accordance with applicable local, state, and federal industry standards.



Warning

Exposure to noise from the cutting process can damage hearing. Wear appropriate ear protection when operating the machine or when working in the proximity of the machine.



Noise levels that can cause discomfort or damage to hearing will vary greatly from one individual to another. Piranha recommends that ear protection be furnished to any worker who requests it, regardless of applicable industrial standards or tested noise levels.

2.5. Safety Devices

Plasma arc units are provided with certain safety interlocks designed to prevent equipment damage and/or personal injury.

Never short out or in any way attempt to defeat the safety interlock devices.



Warning

Never attempt to operate the plasma unit with any of the power supply covers not in place. This is extremely hazardous to the operator and any other person in the area. It also prevents the equipment from properly cooling critical components and could result in equipment damage.



All exposed electrical connections must be covered with the proper insulation material.

Safety devices must be regularly checked for proper operation and replaced immediately if found to be inoperative.

2.6. Risk of Electric Shock



Danger

Always verify that ALL electrical supplies are isolated before undertaking any service or maintenance work. The machine may have more than one electrical supply.



Plasma cutting equipment uses high open circuit voltages to initiate the plasma arc. Normal load voltages are higher than experienced with other types of welding equipment. Extreme CAUTION must be exercised when operating or servicing this equipment.



Warning

Plasma arc can cause injury and burns. Verify that no person is in the proximity of the plasma torch at any time that the plasma system is switched on. Serious burn and electrical shock hazards exist, even when the plasma cutting system is not active.



2.6.1. Input Connections

1. A wall mounted line isolating switch, fused as required by local electrical codes, must be fitted as close as possible to the plasma arc power supply.
2. Three-phase input conductors must be sized to carry the rated current of the plasma arc power supply.
3. Primary power cable must be provided with a minimum 600v rating.



Warning

Frequently inspect the cable for damage or cracking of the cover. Bare wiring can kill. Replace damaged cable immediately.



2.6.2. Grounding

Input Power

1. Connect the ground lead of the four-conductor / three phase input cable to the electrical system ground in the disconnect box and the ground stud provided in the plasma arc supply.
2. Be sure all ground lugs are of adequate size to carry the rated current load.
3. Make all connections tight to avoid resistance heating.

Output

1. Connect all positive output ground leads to the material grid of the worktable.
2. Connect the material grid of the worktable to a good earth ground.

2.7. Fumes and Air Contamination

2.7.1. Toxic Fumes

Proper precautions must be exercised to prevent the exposure of others in the vicinity to toxic fumes that may be generated while plasma cutting.

Certain chlorinated solvents such as perchloroethylene and trichlorethylene will decompose under ultraviolet radiation to form phosgene and other gasses. Care must be taken to avoid the use of these solvents on materials being cut with plasma arc cutting equipment. Containers of these solvents and other degreasing agents should be removed from the immediate area around the plasma arc.

Metals coated with or containing significant amounts of lead, cadmium, zinc, mercury or beryllium can produce harmful concentrations of toxic fumes when the plasma arc cuts. Adequate local exhaust ventilation must be used, or the operator must be supplied with special equipment to guarantee a supply of fresh air such as a respirator or air supplied helmet.

Metals coated with materials that emit toxic fumes must not be cut unless:

1. The coating is removed prior to cutting.
2. The area is adequately ventilated.
3. The operator is supplied with fresh air breathing equipment.

2.7.2. Air Contamination

The plasma cutting process generates large quantities of hot metal dust and fumes that would be hazardous if uncontrolled.

A blower pulls a vacuum through the fume extraction assembly in the bed of the machine. The blower pulls the dust-laden air through a customer supplied filter before exhausting the air to the environment.

The gases listed below either are produced normally during plasma arc cutting or can form under certain conditions.

2.7.2.1. Ozone

Ozone is produced by the reaction of the plasma arc's ultraviolet radiation with oxygen in the air. Uncontrolled, excessive levels of ozone can constitute a hazard. When there is proper venting to the outside and the machine's internal ventilation system is functioning properly, there is adequate control of ozone during torch cutting.

2.7.2.2. Nitrogen Dioxide

Nitrogen dioxide gas is produced when nitrogen and oxygen in the air pass through the electric arc. A hazard may exist if uncontrolled, excessive levels of nitrogen dioxide are formed. With proper venting to the outside, the machine's internal ventilation system is adequate to control nitrogen dioxide during torch cutting, if the system is functioning normally.

2.7.2.3. Acetyl Chloride

Acetyl chloride gases form in the air surrounding the plasma arc when the airborne vapors of chlorinated solvents or degreasers decompose upon being exposed to the ultraviolet radiation of the arc. A hazard may exist if uncontrolled, excessive levels of acetyl chlorides are formed. A pungent "sweetish" aroma similar to chlorine bleach is the first sign that these gases are being produced. Shut down the plasma arc cutting system immediately if you detect the acetyl chloride odor. Do not resume cutting until you locate and control the source of the vapors.

Various cleaning solvents and vapor degreasers contain chemicals that decompose rapidly when exposed to ultraviolet radiation.

If the solvents, cleaning solutions, or vapor degreasers used in the shop contain any of the following chemicals, *do not use them near the plasma arc cutting system*:

1. trichloroethylene
2. trichloroethane
3. perchloroethylene
4. perchloroethane
5. trifluoro-trichloroethane (fluorocarbon-113)

These chemicals also decompose into small amounts of the toxic gases phosgene and chlorine. You will notice the acetyl chloride odor long before phosgene or chlorine levels become harmful.

The vapors can decompose up to several feet away from the arc, *do not rely on the machine's internal ventilation system to control solvent vapors and their products*. Do not use or store chlorinated solvents, cleaning solutions, and vapor degreasers close to the machine, where the vapors can enter the torch-cutting area.

Note:

It may prove advisable to provide separate ventilation for the solvent/degreaser storage area.

2.7.3. Metal Fumes

Metal fumes are produced when the plasma arc vaporizes the metal. A hazard may exist when uncontrolled, excessive levels of metal fumes are produced some vaporized metals form toxic gases. These metals may be in their pure metallic state, in an alloy, or in a coating such as paint or plating.

Metals that are known to produce toxic fumes include beryllium, cadmium, lead, manganese, mercury, and zinc. Beryllium products require particular care, because their fumes are highly toxic. If there is proper venting to the outside and the machine's internal ventilation system is functioning normally, there should be adequate control of metal fumes during torch cutting.

2.7.4. Metal Dust

Metal dust is formed as metal vaporizes during torch cutting. A hazard may exist when uncontrolled, excessive levels of metal dust are produced. If there is proper venting to the

outside and the machine's internal ventilation system is functioning normally, there should be adequate control of metal dust during torch cutting. For proper ventilation, at least 90% of the worktable should be covered by the workpiece (or other sheet metal covers).

See dust collector vendor installation and operation manual for additional precautions.

2.7.5. Internal Ventilation System

Due to the noxious and toxic nature of many torch cutting by-products, Piranha recommends venting the machine's internal ventilation system (referred to as the "dust collector") to the outside atmosphere. This recommendation is especially important when the shop has one of the following:

1. Low ceilings and/or confined area
2. Large amount of welding and/or torch cutting near the plasma system
3. Poor cross plant ventilation

2.8. Fire, Explosion, and Burn Prevention



Warning

Since plasma arc cutting produces hot metal, sparks, and slag, precautions must be taken to prevent fire or explosions.



All combustible materials must be removed from the immediate cutting area to at least 35 feet away. Appropriate fire extinguishing equipment must be available in the immediate cutting area.

After cutting, be sure to allow the metal to cool sufficiently before handling or before allowing contact with combustible materials.

Never plasma cut empty containers that have held toxic or potentially explosive materials. Those containers must be thoroughly cleaned according to national standards prior to cutting or welding.

Never plasma cut in an atmosphere that contains heavy concentrations of dust, flammable gas, or combustible liquids (such as petrol).

2.8.1. Hot Surfaces



Warning

Components may remain hot for a considerable period of time. Always wear gloves to remove components and scrap from the bed.



Warning

During prolonged periods of cutting, parts of the machine bed may become hot to the touch.



Warning

Moving machinery can be dangerous.



Assure that the bed is free of obstructions and no person or articles of clothing are in the proximity of moving parts when the machine is in operation. This safety precaution also applies when the machine is manually moved and when the plasma system is off.

2.8.2. Heat

Plasma arc cutting creates a Heat-Affected Zone (HAZ) around the cut edge of the workpiece. Until the hot edges cool, the HAZ will burn an unprotected hand severely.

1. When removing produced parts or skeletons from the machine, operators should wear heat-resistant, gauntlet-type gloves.
2. The torch, cutter bars, ducting, and dust collector become hot during torch cutting. Avoid contact with these components unless you are wearing heat-resistant gloves.

2.8.3. Sparks

Sparks form as the plasma arc torch vaporizes metal. These sparks are tiny droplets of extremely hot molten metal and are a possible fire hazard. The volume of sparks formed and the area over which they are scattered depend on several variables. These variables include the type and thickness of the material being cut, the cutting current, and the feed rate. Where practical, keep all combustible material at least 35 ft. (10.7 m) away from the plasma arc work area. Where this is not practical, protect all combustible materials with close fitting, flame proof covers or shields. Protect wooden or other combustible floors by covering them with sand or installing fire-resistant shields. Shield any wall openings, floor openings, cracks, ducts, or conveyors within 35 ft. (10.7 m) of the torch to prevent sparks from passing into adjacent areas.



Warning

Sparks from the cutting process may ignite flammable items in the machine bed which may then be drawn into the extraction unit, possibly causing a fire.



Caution

Be sure to use an approved facemask and approved eye protection when cleaning or servicing the dust collector.



Caution

Plasma arc cutting systems can produce large volumes of fumes. If you exhaust fumes to the outside atmosphere, additional air pollution control devices may be in order to conform to local, state, and federal government ordinances. Air pollution control devices are the responsibility of each individual user.

2.8.4. Burn Prevention

High intensity ultraviolet and infrared radiation is produced by the plasma arc and is of similar intensity to typical high current welding arcs. This radiation is damaging to the eyes and skin. As the operator comes closer to the torch, the level of exposure increases rapidly.



Warning

The operator and any other persons working in the vicinity of the arc must wear proper protective clothing and equipment.



2.8.5. Cutting Aluminum on a Water Table



Warning

Aluminum slag mixed with water can cause an explosion. Always follow these precautions.

- When cutting aluminum with plasma over a water table, hydrogen bubbles form. These bubbles can accumulate and get trapped beneath the workpiece causing an explosion in the presence of an ignition source (such as an arc ignition).
- Do not leave workpieces on the table if it is not being cut at that moment. For example, do not leave a sheet on the table overnight. Cut aluminum, and all materials, in a well-ventilated area.
- Use a fan to increase air circulation beneath the workpiece on the plasma table. Make sure the fan is turned on for several minutes prior to initiating an arc on the plasma table.
- Allow at least one inch (25mm) of clearance between the aluminum plate and the water level.
- Use pointed slats to improve air flow. Do not use sheared, rectangular slats.
- Consider installing an aerator, circulator, or filtration system if cutting consecutive sheets of aluminum, anything that agitates the water to break up the bubbles of hydrogen.
- Clean out fine aluminum particles from the water table after each use.
- See the plasma power supply safety manual for additional information.

2.9. Light and Radiant Energy

When it is necessary to look directly at the arc for diagnostic purposes, do so briefly. Use shade #10 welding glass (for up to 200 amps) or shade #12 (for 200 amps). During operation, use a shade not less than #8.



Warning

Do not look directly at the arc without proper eye protection.



Caution

During plasma arc cutting, clothing worn should conform to the instructions presented in the General Safety Requirements section of this manual.

Ultraviolet rays and other radiant energy reflected off the workpiece can produce sunburn. Therefore, when plasma arc cutting is being performed, anyone working within 25 feet (7.5M) of the arc should wear an approved, protective full-face mask, a long-sleeved shirt, gloves, and long pants.

Operations, such as edge cutting, that can cause the arc to be exposed to view should be avoided, because they can increase exposure to radiant energy.

Shield personnel at nearby workstations from accidental exposure to radiant energy by the use of non-reflective, fireproof enclosures, open at the top and at floor level to allow air to circulate freely.

The pilot arc in the plasma cutting systems is initiated and stabilized by a high-voltage signal. This signal can create electromagnetic interference.

As with any equipment that can create such interference (e.g., microwave ovens and TIG welders), people who have implanted heart pacemakers must exercise caution when working near the equipment. Piranha recommends that a person with a pacemaker who works near where plasma arc cutting is being performed should wear a Holter monitor for one day of work to record the existence of electromagnetic fields. A qualified doctor should review the recorded data with the pacemaker manufacturer to determine whether the worker can safely continue working in the area on which the study is based.

Note:

There is no history of problems caused to pacemakers by the plasma arc cutting equipment that have been reported to Piranha.

2.10. Compressed Gas Equipment

Gas cylinders should be mounted securely to a wall or other stable supporting device.

2.10.1. Cylinders

Compressed gas cylinders must be handled and used in accordance with appropriate national safety standards.

- Never use a cylinder that is physically damaged or leaks.
- Never move or transport a cylinder without the protective valve cover in place.
- Never use a gas cylinder or its contents for any other purpose than that for which it is intended.
- Never lubricate cylinder valves with oil or grease.
- Never allow electrical contact such as welding arcs with cylinders.
- Never expose cylinders to excessive heat, sparks, slag, or open flames, which may cause rupture.
- Never use hammers, wrenches or other tools to open stuck valves. Send these cylinders back to the supplier.

2.10.2. Pressure Regulators

All regulators used to operate plasma equipment must be maintained in proper working condition.

- Faulty equipment can cause equipment damage or operator injury. Faulty equipment must be serviced at the manufacturers designated facility by trained repair technicians.
- Never use a regulator for any other gas than that for which it is intended.
- Never use a regulator that leaks, excessively creeps, or is physically damaged in any way.
- Never attempt to lubricate a regulator with oil or grease.

2.10.3. Hoses

Gas hoses used for plasma arc cutting systems adhere to the following color coding:

Red..... Acetylene
Orange..... LPG
Blue..... Oxygen
Black..... Inert gases and air

- Replace any hose that is damaged by physical abuse or from sparks, heat or open flame.
- Lay hoses out straight to prevent kinks.
- Coil excess hose and place out of the way to prevent loose connections, or other damage.
- Keep hose lengths to a minimum to prevent damage, reduce pressure drop and prevent possible volume flow restriction.
- Please refer to national standards for more information on hoses.

2.11. Additional Safety Information

The general safety information presented in this chapter does not constitute a complete list of safety instructions for any particular configuration of the Piranha Plasma Cutting Table. Warnings and other safety information related to operations described in this manual are presented in the chapters in which those operations are explained. Specific equipment being used by the customer and its particular application in the customer's factory may require supplementary safety information.

Note:

It is the responsibility of the customer's company to make sure safety information covering the equipment being used and its particular application is available to personnel operating and maintaining the equipment and is read by them.

SAFETY STANDARDS PUBLICATIONS

It is recommended that companies using the kind of equipment covered in this manual consult the applicable Safety Standards publications available from the agencies listed below:

OSHA

Superintendent of Documents
U. S. Government Printing Office
Washington, DC 20402-9371, USA
Tel: (202) 512-2457

ANSI

American National Standards Institute
11 West 42nd Street
13th Floor
New York, NY 10036-8002, USA
Tel: (212) 642-4900
Fax: (212) 398-0023

NFPA

National Fire Protection Association
P.O. Box 9101
1 Batterymarch Park
Quincy, MA 02269-9101, USA
Tel: (617) 770-3000
1-800-344-3555
Fax: (617) 770-0700

FINAL SAFETY RECOMMENDATION

Piranha strongly urges that problems encountered in the operation and maintenance of the equipment be reported to our Field Service Department. The department is prepared to give additional information and to answer questions in regard to the equipment. When contacting the Field Service Department, please give the model number, serial number, and purchase date of the equipment.

Piranha/MegaFab.
P.O. Box 1206
Rockford, Illinois 61105, USA
Telephone (815) 490-0472

The preceding safety instructions are advisory, general in scope, and not necessarily complete. Specific safety information for the Piranha plasma cutting machine appears throughout this manual.



Warning

In keeping with standard safety practices, the manufacturer recommends the use of eye protective equipment, with side shields, during the operation of this machine.

Chapter 3: SPECIFICATIONS



Machine	C404	C408	C510
X-axis Travel	49.0"	49.0"	61.0"
Y-axis Travel	49.0"	97.0"	121.0"
Approximate Dimensions (in)	82L x 92W x 60H	138L x 92W x 60H	158L x 102 x 60H
Approximate Weight (lbs)	1,500	2,000	2,500
Maximum Rapid Speed	393 inches/min		
CNC Control	Starfire		
Frame Construction	Welded Tubular Steel		
Bridge Construction	Welded Tubular Steel		
Drive Motors	X-Axis – Two Servo Motors Y-Axis – Servo Motor Torch Height Control – Stepper Motor		
Mechanical Drive System	X-Axis – Rack & Pinion (2) Y-Axis – Rack & Pinion Z-Axis – Ball Screw		
Available Plasma Torches	Hypertherm Powermax 45XP Hypertherm Powermax 65 Hypertherm Powermax 85 Hypertherm Powermax 105* Hypertherm Powermax 125* (*) Requires Drop-in Water Table Option		
Maximum Cutting Amperage	85 amps Air Plasma with downdraft 125 amps with water table option		
Torch Control	Arc Voltage with Initial Height Sensing		
Torch Protection	Pneumatic Breakaway Design		
Exhaust Fan	6500 cfm @ 1.25" H ₂ O		
Available Options	Pipe Cutting Attachment Drop-in Water Table		

3.1. Machine View

C-Series



B-Series Plasma





CNC Controller

Plasma Power Supply: Powermax 85
shown, other models available



Torch Consumables: will vary; see plasma power supply manual



Chapter 4: INSTALLATION

4.1. Introduction and Checklist

Thank you for purchasing a Piranha B- Series or C-Series Plasma Cutting Table. The following information will guide you from unpacking to setting up your table for your first cut. If something needs better explanation, please contact us.

✓	Step Needed- Prior to Installation	Page
	1. Find location with space and floor condition requirements	<u>33</u>
	2. Electrical	<u>35</u>
	a. CNC control: a dedicated 230V / 30A single phase service	<u>35</u>
	b. Plasma system: full requirements in plasma system manual	
	c. Plasma system: electrical box	<u>35</u>
	d. Earth Ground	<u>35</u>
	3. Air	<u>36</u>
	a. Pneumatic connection requirements	<u>50</u>
	b. Supply Requirements	<u>36</u>
	c. Buy dryer and filter if needed	<u>36</u>
	4. Fume/Smoke Extraction Plan (if applicable)	<u>37</u>
	a. Water table only: Purchase additive (optional)	<u>37</u>
	5. Prepare tools and equipment	<u>38</u>

	Step Needed- Machine Arrival	
	6. Inspect for shipping damage	<u>40</u>
	7. Check invoice with shipment	<u>40</u>
	8. Unload the machine	<u>40</u>
	9. Unpack the machine	<u>46</u>
	Step Needed- Installation	
	10. Installing Covers (if applicable)	<u>47</u>
	11. Leveling	<u>48</u>
	12. Machine and CNC Connections	
	a. Air to machine	<u>50</u>
	b. Electrical to CNC control	
	13. Plasma Connection	<u>53</u>
	a. For units with a Hypertherm Powermax plasma system furnished by Piranha	<u>53</u>
	b. To install a Hypertherm Powermax power supply, not purchased with the machine:	<u>55</u>
	14. Fill the table with water and additive if applicable	<u>37</u>
	15. First Time Power On	<u>59</u>

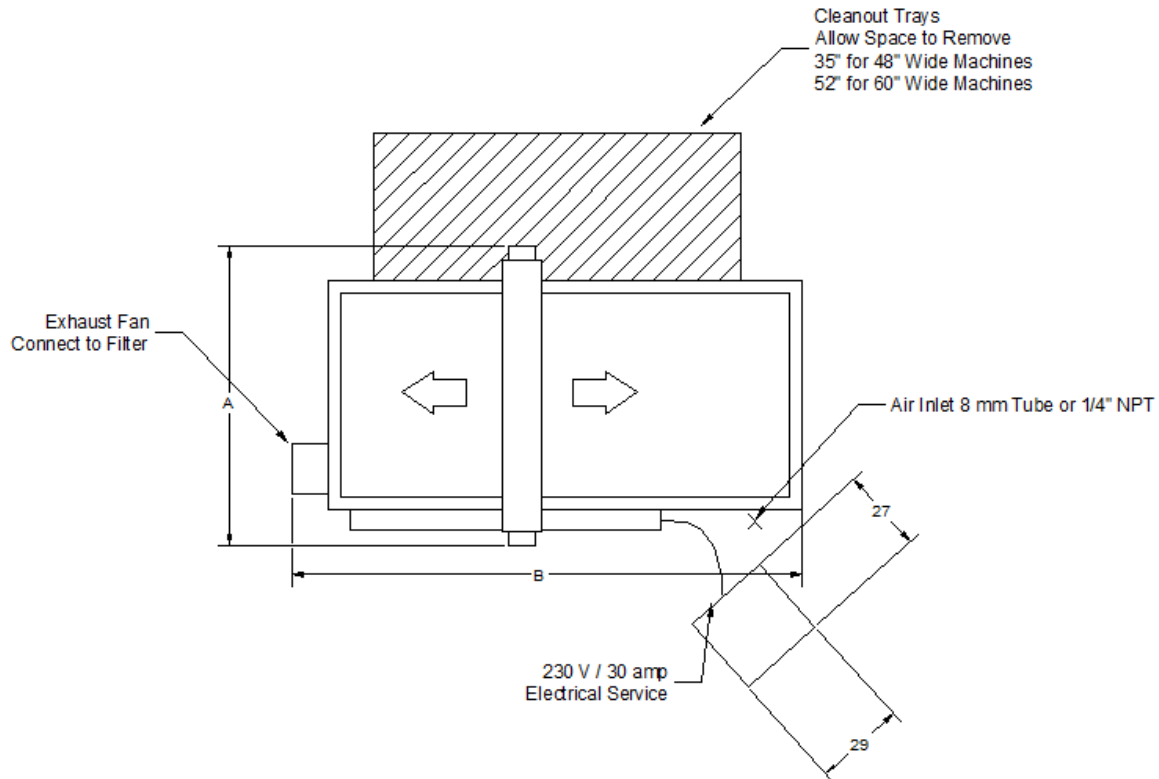
4.2. Prior To Receiving

4.2.1. Floor Condition

Piranha requires a concrete floor, in good condition, level to within $\pm 0.500"$ (12.7mm).

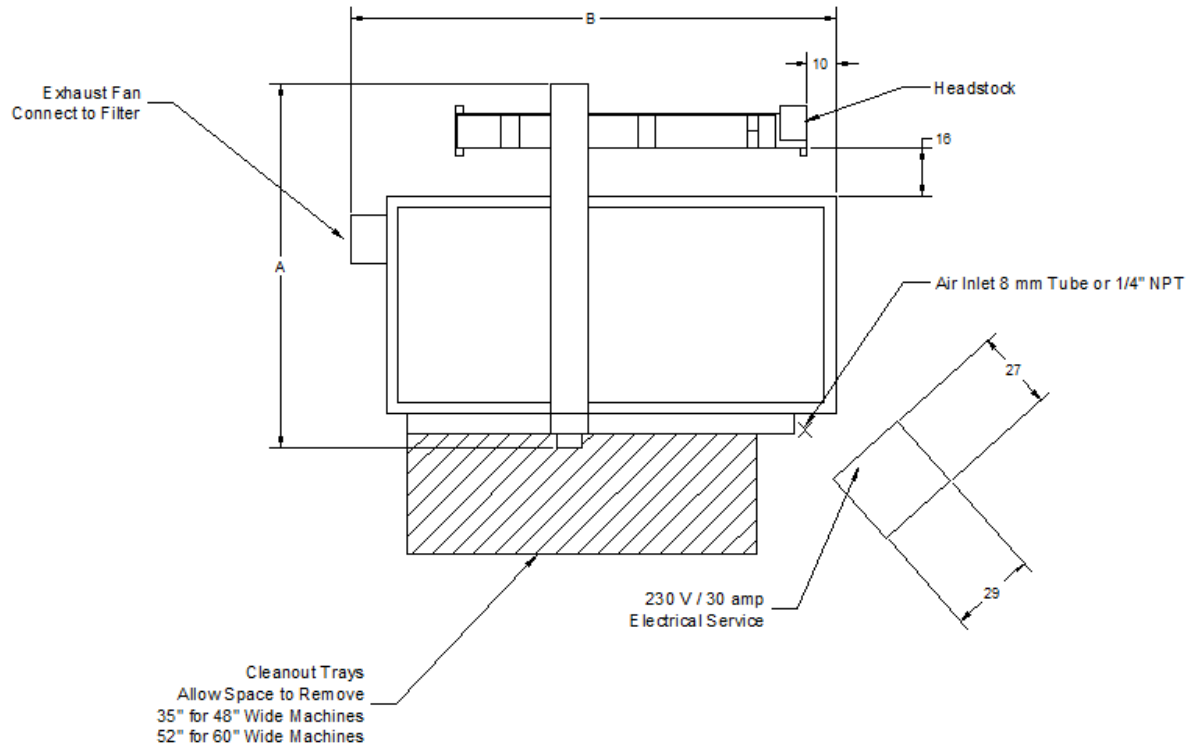
4.2.2. Space/Location/Weights

The following drawing shows the required space for the C-Series Plasma Cutting Table without optional Pipe Cutter.



	"A"	"B"	MACHINE WEIGHT
4'X4'	92"	82"	1,500 lbs
4'X8'	92"	138"	2,000 lbs
5'X10'	102"	158"	2,500 lbs

The following drawing shows the required space for the C-Series Plasma Cutting Table with optional Pipe Cutter.



	"A"	"B"	MACHINE WEIGHT	PIPE CUTTER WEIGHT
4'x4'	88"	116"	1,500 lbs	800 lbs
4'x8'	144"	116"	2,000 lbs	800 lbs
5'x10'	164"	126"	2,500 lbs	800 lbs

C408 and C510 Machines with pipe cutters require shipment as an oversize (over width) load. It is not possible to ship these machines as a standard load.

Note:

Refer to the chapter on the PIPE CUTTER for installation information specific to machines with PIPE CUTTER.

4.3. Electrical Services

The electrical supply to the machine and the plasma arc cutting system must be stable, with no spikes or electrical noise (interference) from other machinery.

4.3.1. CNC Control

A dedicated 230V / 30A single phase service is required for the CNC control. See section [4.12.2 Electrical Connection CNC Control](#) on page 50 for connection information.

4.3.2. Plasma System

- Refer to the specific plasma system manual for available voltages.
- Use a separate, wall mounted, fused, quick disconnect electrical box in a convenient location near the machine for the plasma system.

4.3.3. Earth Ground

The machine foundation area must have an adequate ground rod to reduce electrical noise problems. Excess electrical noise will interfere with automated control functions and plasma arc cutting performance. Proper grounding is essential for reasons of personal safety and machine operation.



Installation must be inspected by a qualified electrician and meet state and local regulations.

Caution

- Use 5/8" (16.0 mm) copper rod, 8 ft. long (2.5 m) minimum or per State requirements.
- Install the primary ground rod next to the main electric enclosure (within 8 feet or 2.5 meters of the plasma table).

4.4. Compressed Air & Gas

Air is required for two reasons on the machine. First, air is needed to maintain the breakaway torch. Air is only consumed if the torch is broken away. Second, it needs air for processing.

The plasma torch requires clean, dry, oil free air, i.e. it must be filtered. Poor quality air will reduce cutting speeds, produce poor cut quality and reduce torch parts life. Ensure that adequate air supply is available for stable operation. Air must be delivered at the pressure and flow rate specified.



Caution

Do not use any quick disconnects in the air supply line to the machine as these have small flow areas that will restrict the air flow rate to the machine.

4.4.1. Air Connection Requirements

See section [4.12 Machine and CNC Connection](#) on page 50.

4.4.2. Gas Supply Requirements

Gas Supply: Clean, dry, oil-free air

Air inlet pressure for machine: 80-110 psi

Gas inlet flow rate/pressure for Hypertherm plasma systems:

Powermax 45	400 scfh; 6.7 scfm @ 85 psi
Powermax 65	400 scfh, 6.7 scfm @ 85 psi
Powermax 85	400 scfh, 6.7 scfm @ 85 psi
Powermax 105	480 scfh, 8.0 scfm @ 85 psi
Powermax 125	550 scfh, 9.2 scfm @ 85 psi

4.4.3. Option A: Air Dryer Unit

(Piranha Part Number 230579 or equivalent)

Piranha recommends using a stand-alone air dryer unit that consists of a water-oil-separator and a post filter for the plasma system to protect your machine. Piranha offers a dryer / filter combination.

4.4.4. Option B: Three-Stage Filter System

(Piranha Part Number 230634 or equivalent)

This option uses a series of three different filters to remove moisture, oil, and particulate. The filtration should be located as close to the machine as possible. An outlet valve should be installed to isolate the air supply.

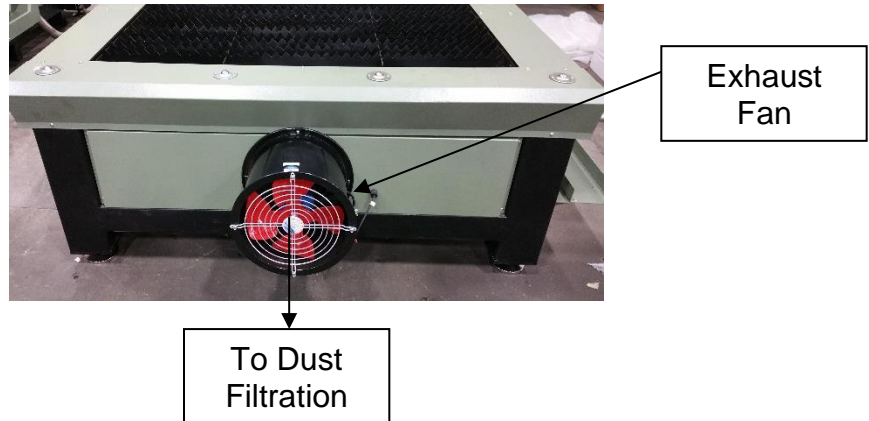
Using this option requires more maintenance than the air dryer option since there are three different filters to monitor and maintain.

4.5. Fumes & Smoke Extraction Plan

The plasma table will come with either an exhaust fan or water table depending on the model and options purchased.

4.5.1. Exhaust Fan

The machine will come pre-installed with a 11,000 m³/h (6,500 ft³/min) exhaust fan. User is responsible for providing further ductwork and filtration to meet federal, state, and local codes. Proper ventilation is required for operator safety and health – refer to the SAFETY section of this manual.



Even with the large exhaust fan, it is normal that there will be some smoke going to atmosphere. For most efficient smoke removal, the work table should be covered 80% in order to concentrate smoke collection at the source of the plasma cut.

Piranha offers a dust collector and filter as an option. Please contact Piranha if interested in this option.

4.5.2. Water Table

Fill the table with water and an additive. The water should be no less than an inch below the material to about a quarter inch below the material. If the water is too low, the water

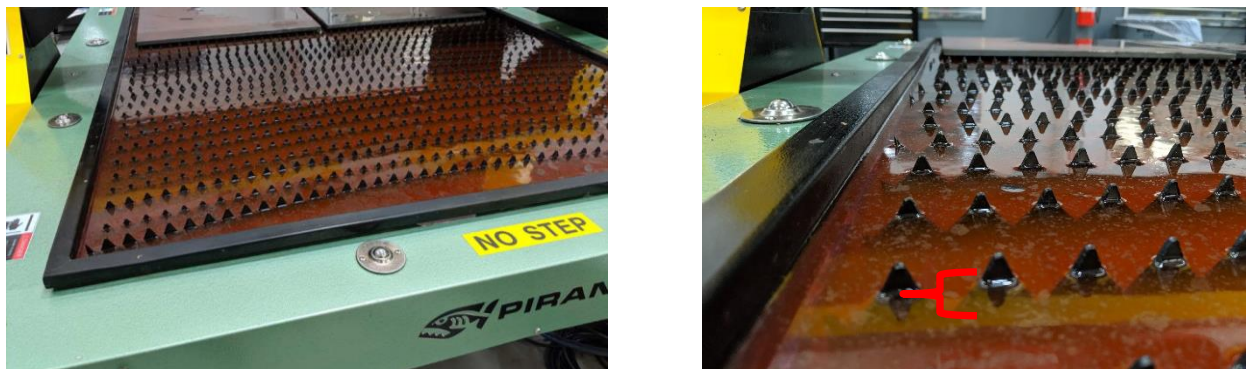


Figure 4-1: Plasma Pink Additive in a Water Table (left) and Water Level Range (right)

will not capture the fumes. If the water is too high, cuts quality will suffer with more dross on the bottom, and the water will splash out more.

Use an additive that works as both a rust inhibitor and biocide. Plasma Green 9010, Piranha part number 230812, comes in a 5-gal (19 L) container. Follow the manufacturer's instructions on safety, dilution, storage, and disposal. Pour the additive in all parts of the table equally for good distribution.

Use the table below to determine the amount of Plasma Green 9010 is needed based on model and table size. Users in areas where biological growth thrives (high heat, high humidity, near sources of natural water) may need more than 5% dilution.

B Series	5x10	4x8	4x4
Water Volume (Gallons) with Typical 4" Water Depth	153	104	61
Plasma Green 9010 Needed at 5% Typical Dilution	7.6	5.2	3.1

C Series	5x10	4x8	4x4
Water Volume (Gallons) with Typical 3.5" Water Depth	134	89	53
Plasma Green 9010 Needed at 5% Typical Dilution	6.7	4.4	2.6

The pH level of the water table should be checked periodically, monthly or if water level changes significantly, in accordance with the plasma cutting fluid used. Plasma Green 9010 should be 9.7 pH or higher at minimum concentration of 3% by volume. Use pH paper, Piranha part number 649511.

Chips and slag should be scooped out of the table frequently to keep from accumulating. If the water in the table is heavily contaminated with slag and metal dust, it can cause hard starting of the plasma torch. It may also cause rust accumulation on the cut pieces. Drain and clean out the table every 6 months to a year. Machines with particularly heavy use may need to be cleaned more often.

Note:

When using the water table, water and slag must be disposed of in accordance with state and local codes.

While it is not advised to place water tables in an area subject to freezing temperatures, users in those areas should consider using antifreeze as an additional additive. KCI Industrial Chemicals sells Plasma Add AF (708-878-7636 or contact Mark Konzen at mkonzen@kcichemicals.com).

4.6. Required Equipment/Tools

The following tools will be required for the installation and handling of the plasma table:

1. Metric Allen wrenches set
2. Two adjustable crescent wrenches for adjusting the leveling pads
3. Minimum of 3 ft. bubble level for leveling the machine on the floor
4. Philips screwdriver
5. Forklift with 8 ft. forks to lift or overhead crane with 20 ft. slings/chains to unload and move the machine as desired to the designated area (you may also need machinery skates)

4.7. After Receiving

Upon the arrival of equipment:

1. Inspect it visually for shipping damage. If damage is found, notify both the trucker's insurance company and Piranha.
2. Compare the actual shipment with the invoice to verify that everything ordered has been received.

4.8. Unloading



Caution

Extreme care must be taken when lifting and moving the machine. Obtain the weight of the machine from section [4.2.2 Space/Location/Weights](#).

Note:

It is the responsibility of the customer to verify that the forklift truck and/or crane is of adequate lifting capacity, and that any maneuver is undertaken safely.

Damage caused to the machine through incorrect or careless maneuvers is not covered under the machine warranty.

Piranha is not responsible for personal injury to any person while this machine is transported, unloaded or installed.

1. It is important that the machine is lifted only at the specified lifting points.
2. Verify that the machine is balanced and stable before and during lifting/moving.
3. Verify that no person is in a position where they may become trapped or injured.

The machine is shipped with the gantry installed and CNC control as one unit. The CNC control and the gantry will be secured off-centered on the cutting table bed.



Caution

Make sure the load is always lifted about the center of gravity to prevent from any tipping and accidents.

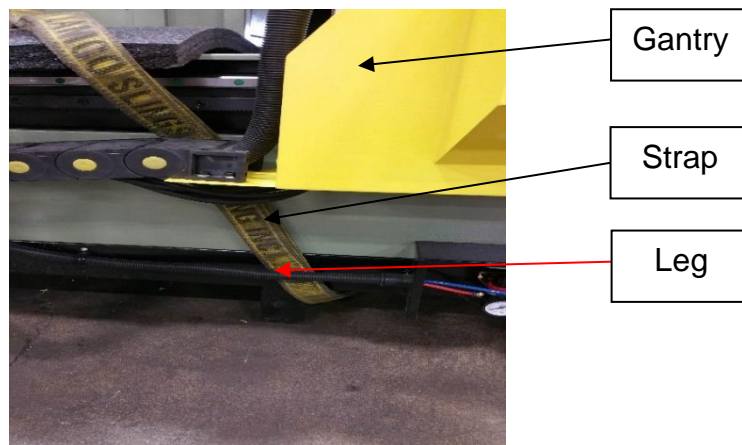
4.8.1. Lifting with Crane (Recommended)

1. Remove securing straps/chains attached to the truck bed.
2. Obtain two straps of 20 feet length that are rated for the weight of the load (dependent on the size of machine).

Note:

Longer lifting straps may be required if the crane does not have hoist chains attached.

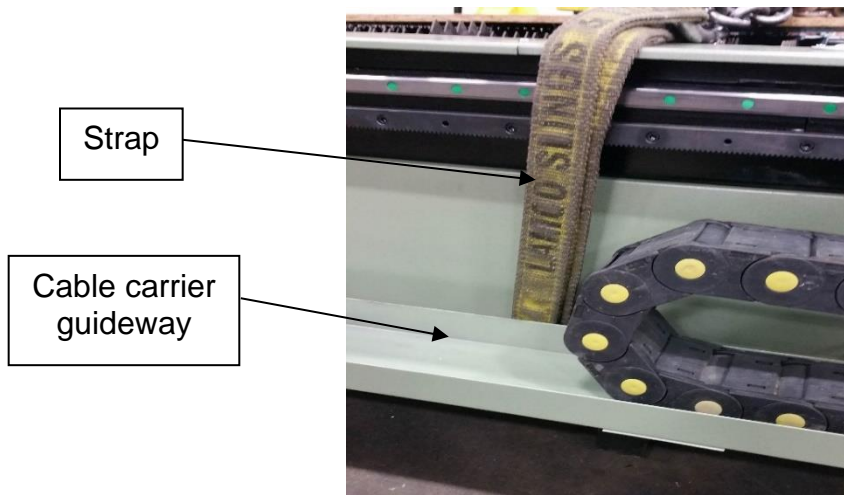
3. Slide one of the lifting straps under the machine base close to the gantry side as shown on the picture below.



4. Slide the other lifting strap under the machine base off-centered of machine length.

Note:

Ensure both straps are between the cable carrier guideway and frame so lifting the machine will not cause damage to the cable carrier.



5. Take each end of the strap and put chain through them and attach the eye hook back to the hoist chains.
6. Before lifting, make sure straps are even on both sides of the machine and tight underneath the machine and up against the table leg.
7. Move crane close to the center of gravity of load.
8. Use protection (i.e. cardboard/heavy blanket) if any scratches or damage could result to machine components while lifting.
9. Begin to lift the machine above the truck bed and confirm that load is not tipping in either direction by doing a complete walkaround.
10. Reposition straps and crane as necessary to keep load stable and balanced.
11. Once the load is balanced and stable, lift the machine clear of the vehicle



Before moving the machine into position, it is essential to plan for the path of travel to ensure that no hazards exist in the path that could result in any damage.

Caution

12. Lower the machine to floor level and place it firmly on the ground at the designated area of operation.

Note:

Ensure machinery skates are placed in all four corners of the machine base, if they are used.

4.8.2. Lifting with a Forklift

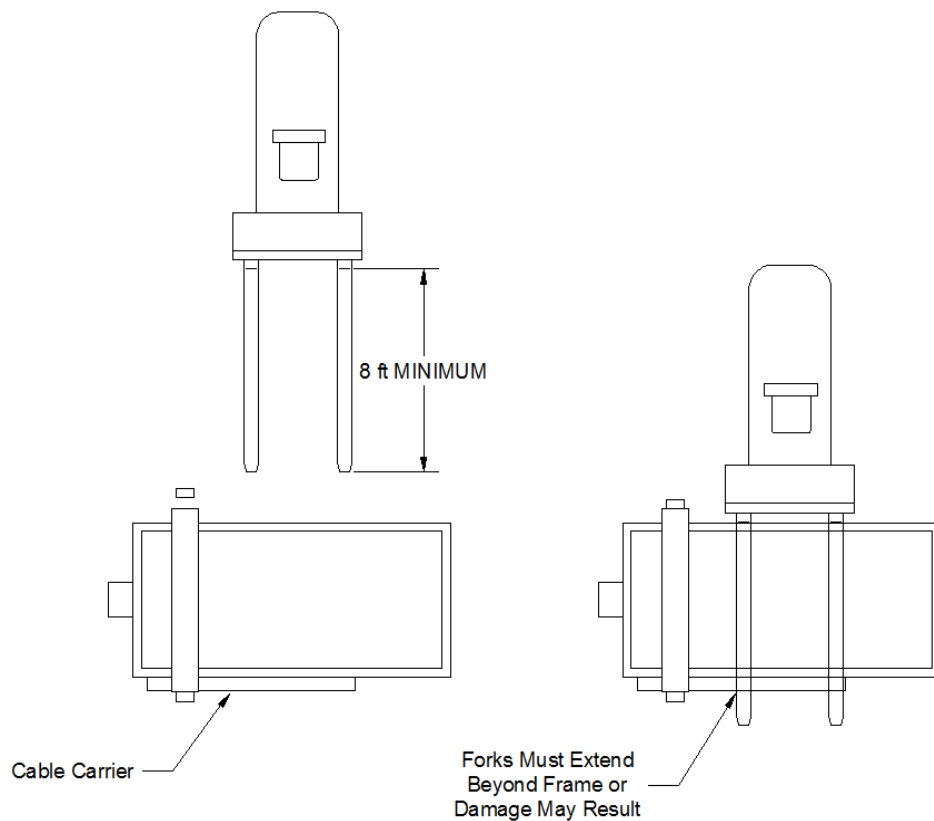


A forklift of adequate fork length (8 ft. minimum) is required to lift the machine otherwise the frame will get damaged.

Caution

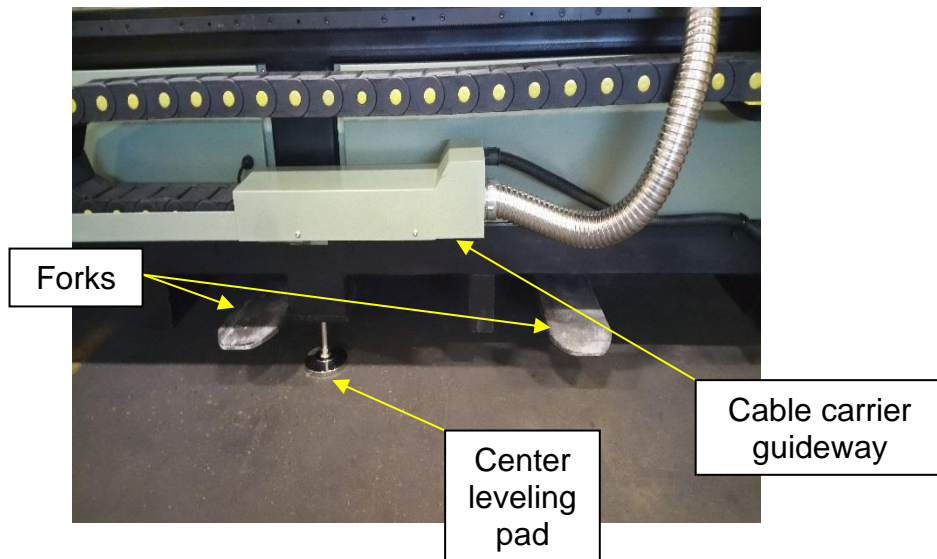
1. Remove securing straps/chains attached to the truck bed.
2. Drive the forklift to the side of the truck at the lifting points shown in the picture below.

NOTE: The forklift must not lift the machine from the cable carrier side, instead lifting must be done from opposite side to prevent damage to the track and guideway.



3. Before lifting, move the forklift close to the frame. You may want to put padding between the forklift and frame to protect the machine from any scratches or damage.

4. Ensure that forks extend all the way through the machine base to the opposite side.



5. Begin to lift the machine above the truck bed and confirm that load is not tipping in either direction.
6. Reposition forks as necessary to keep load stable and balanced, ensure load is picked up as close to the center of gravity as possible.
7. Once the load is balanced and stable, lift the machine clear of the vehicle.



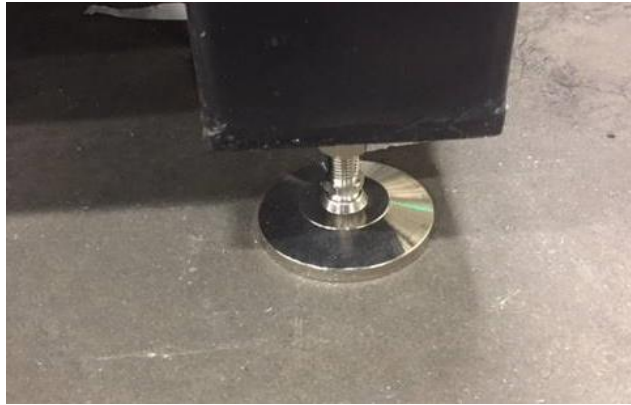
Before moving the machine into position, it is essential to plan for the path of travel to ensure that no hazards exist in the path that could result in any damage.

Caution

8. Travel with forks close to the ground so the machine is not suspended very high in the air. This will reduce damage to the machine if accidentally dropped.



9. Install the supplied leveling pads at each corner of the machine by threading them into the bottom of the machine supports. On C408 and C510 models, two additional leveling pads are located in the center of each side.



10. Lower the machine to floor level and place it firmly on the ground at the designated area of operation.

NOTE: Ensure machinery skates are placed in all four corners of the machine base, if they are used.

4.9. Unpacking

1. Remove any protective packaging from the machine.
2. Remove straps that are used for securing the gantry and CNC control unit.



When unpacking and moving components, be careful the numerous cables don't get damaged or pulled.

Caution

3. Move the Plasma Power Supply (if applicable) from the table bed and place it on the floor.



The Plasma unit may be heavy. For example, some 85A units weigh about 50lbs, but other units go up to 100lbs. Please see Plasma Power Supply operator's manual for exact specifications.

Caution



4. Lift and move the CNC control to the desired floor area.

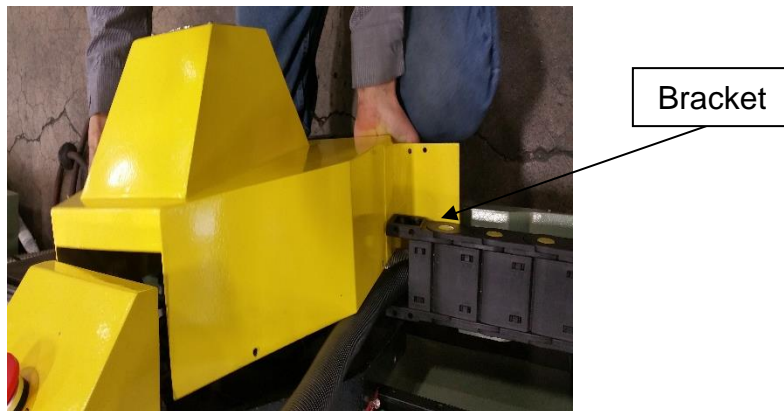
4.10. Installing Covers (5' X 10' Only)

To meet the transportation regulations of load size, the motor covers are not pre-installed to the machine for shipment. The following procedure can be followed to install motor covers:

1. Locate both motor covers, 1 for each side. The picture below shows the cover for the motors. The cover for the cable carrier side has an extra bracket attached to it.



2. Take the cable carrier side cover and place it over the motor. Ensure that cables are routed under the bracket as shown in the picture below.



3. Align the side holes and install M6 button head cap screw on each side of the 2 holes. Then align the holes on the bracket and install the M6 socket head cap screw to attach the cable carrier with the cover bracket.
4. Repeat the above procedure for the other side.

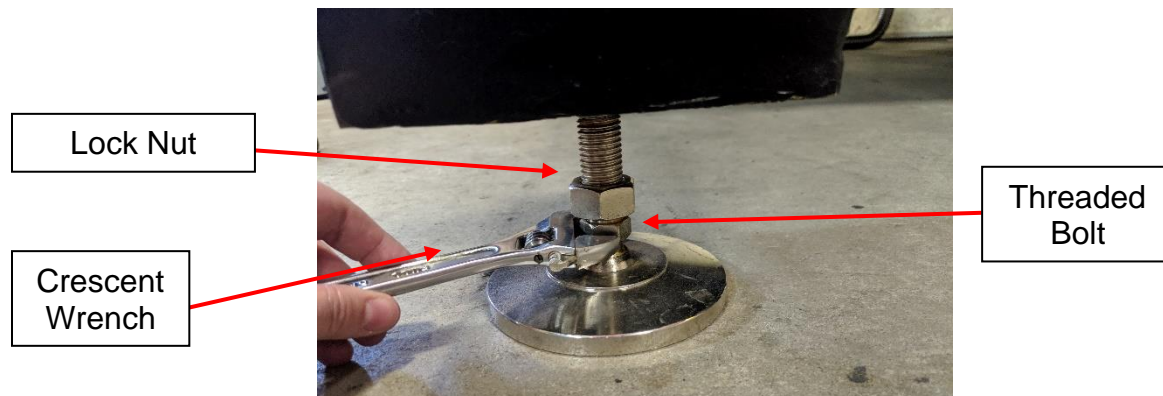
4.11. Leveling

Before starting to level the machine, place the machine firmly on the ground with leveling pads already installed to the designated area where it will be seated permanently for operation.

1. Place level on the y-axis of the machine surface as shown in the picture below.



2. Determine the side that is higher of the two based on the water bubble.
3. Loosen the lock nut on the higher side of leveling pad and drop the height of the pad by rotating the threaded bolt with wrench until the surface is fully balanced. Tighten the lock nut slightly. (Do not fully tighten the lock nut yet)



4. Place level on the x-axis surface adjacent to the leveling pad that was just adjusted in the last step as shown in the picture.



5. Adjust the pad by loosening the lock nut and rotating the threaded bolt with a wrench until the surface is fully balanced. Tighten lock nut in similar manner as before.
6. Place level on the adjacent y-axis surface parallel to the first y-axis and perpendicular to the previous x-axis.
7. Adjust the pad by loosening the lock nut and rotating the threaded bolt with a wrench until the surface is fully balanced and tighten lock nut in a similar manner to the last steps.
8. Move on to the remaining x-axis surface parallel to the first x-axis surface and place a level on it.
9. Adjust the pad by loosening the lock nut and rotating the threaded bolt with a wrench until the surface is fully balanced and tighten lock nut in a similar manner to the last steps.
10. The machine should now be leveled. Lastly, go back and place a level on each surface to verify that the machine is indeed level. Perform any adjustment needed to the corner and center pads. Ensure all leveling pads are firmly placed on the ground.
11. Once machine is fully leveled, go back and tighten all the lock nuts to lock the leveling pads.

4.12. Machine and CNC Connections

4.12.1. Air to Machine

Compressed air is needed to the machine for the break-away function on the machine. This is different than the air that will be connected to the plasma supply for processing.

1. Locate the air supply connection on the machine.
2. Install 8mm tubing into the 90-degree fitting on the end of the regulator. If 8mm tubing is not available, remove the 90-degree fitting and replace it with the supplied adapter for 1/4" NPT.
3. Turn the knob to set the pressure on air regulator to above 4.5 kgf/cm² (.45 MPa). Note: the pressure must be above 4 kgf/cm² always or else CNC control will produce errors and machine will not function. If the air pressure alarm is not clearing, especially after the break-away function has been used on the machine, try increasing this pressure half a kgf/cm² at a time.



Figure 4-2: Air Supply Location, Connection and Close-up of Gauge on Regulator

The break-away function on the torch is pneumatic. When the machine is transported, no air is going to the torch. When the air is connected to the machine, the break-away function is enabled. If the torch is not straight, air will escape. Straighten the torch as needed at this point.

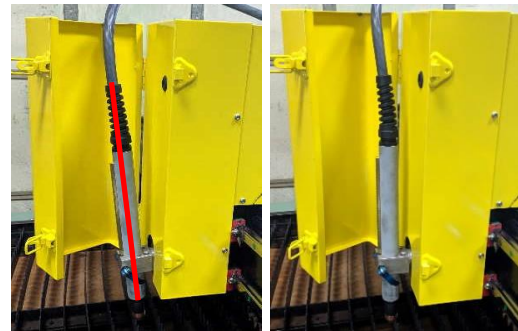


Figure 4-3: Side View Crooked Torch (left) and Straight Torch (right)

4.12.2. Electrical Connection CNC Control



Do not turn on the main circuit breaker until all the wiring is complete and verified by a qualified electrician.

Caution

1. Run 230V 10/3 conductor wire through the knockout of CNC control and into the enclosure. This wire should be protected in flexible or rigid conduit.
 - a. Connect the power and neutral lines to the terminals on the main disconnect.
 - b. Run the ground wire to the ground bar.
2. Run 10-gauge wire (green or green/yellow) from the ground rod to the ground bar. Connect it at both ends.

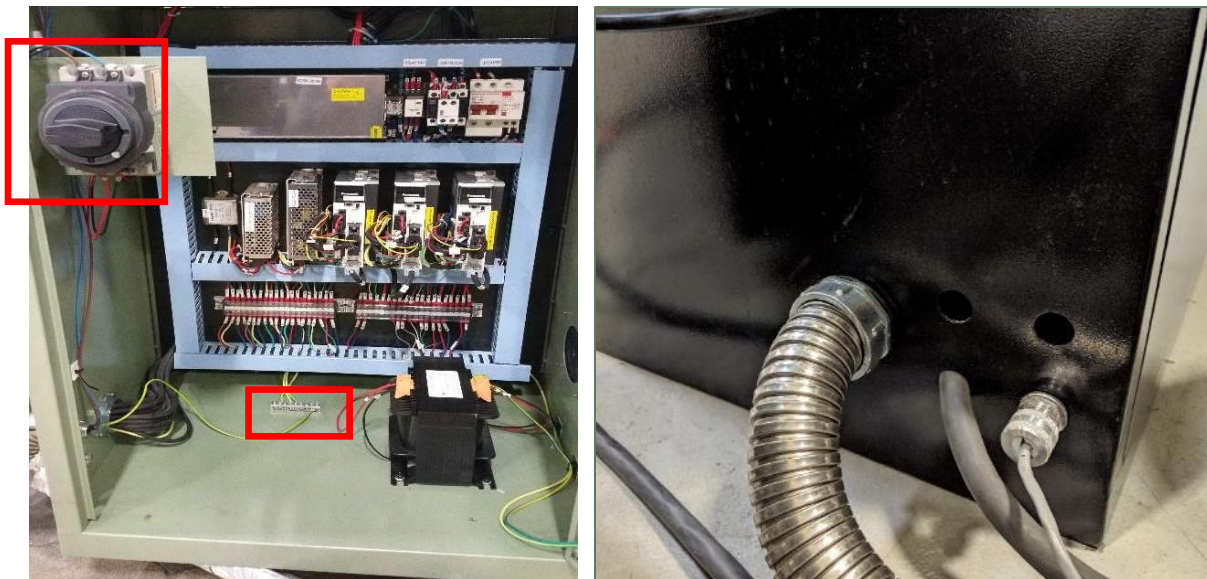


Figure 4-4: CNC Control Disconnect and Ground Bar Outlined (left) and Outside of CNC Control (right)

3. Connect the other end of the power cord to a dedicated 230V/30A supply line for the machine. Refer to the local Electrical Code for correct wiring instructions.
4. The flexible conduit going to the CNC may be loose.
 - a. Insert the conduit into the hole.



- b. Insert the plastic backing connector.
 - c. Tighten the outside nut.
- 5. Shut the control door and close the latch. Turn the disconnect on and the interlock will engage.

4.13. Plasma Power Supply Connections



Caution

Read the instruction manual furnished by the manufacturer of the plasma arc system before proceeding. Use a licensed electrician for making the final power connection.

4.13.1. For Hypertherm Powermax plasma system furnished by Piranha:

1. Insert the torch lead (from the cable carrier) into the front of the Hypertherm Powermax power supply. Slightly pull on the plug to make sure the connection is good.
2. Insert the plug from the grey cable into the connection at the top right on the rear of the Powermax power supply. Rotate the locking nut to secure the connection.
3. Insert a compressed air line into the rear of the Powermax power supply. Notice the maximum air pressure allowed will be written next to this connection.
4. Connect the ground clamp to the front of the Powermax power supply. The other end, with the spring-loaded clamp, should be connected to one of the slats on the worktable or some models may have a separate ground tang for this purpose. See next page.
5. Connect the plasma power supply to the appropriate power connection per the manufacturer's instructions using a licensed electrician.

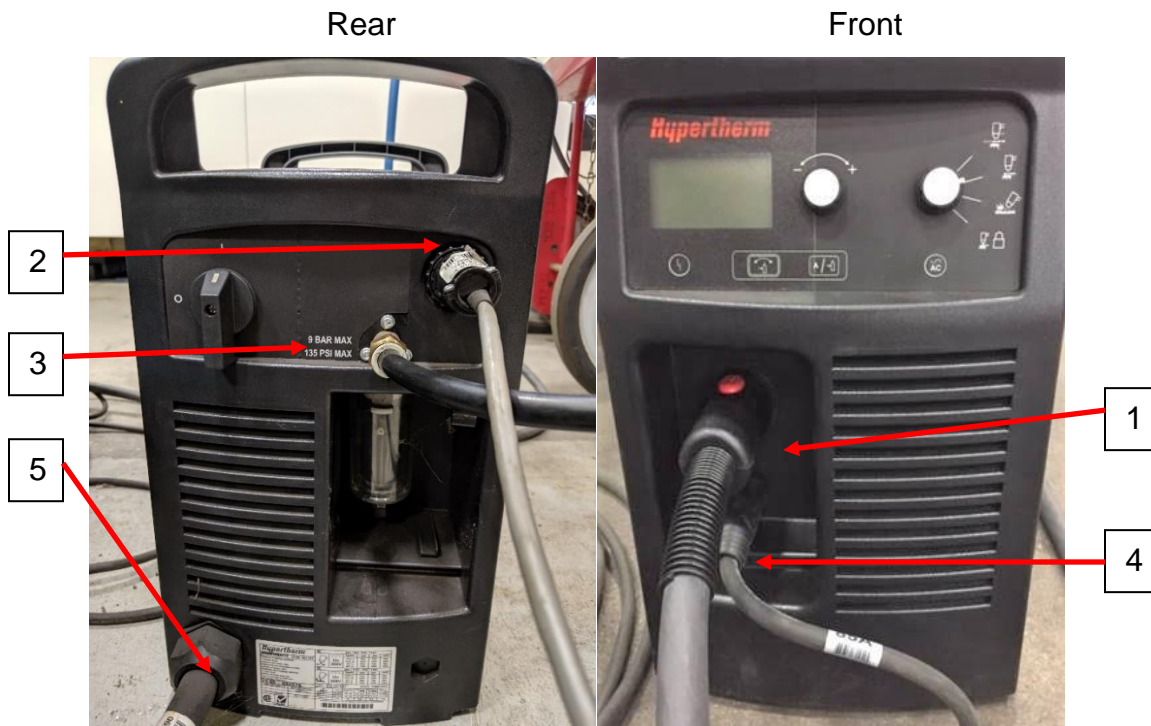




Figure 4-5: Ground Lead Clamped to Table (left) and Ground Tang on C-Series (right)

4.13.2. For Hypertherm Powermax power supply not purchased from Piranha

Requirements:

- Hypertherm Powermax 45XP, 65, or 85 power supply with machine torch and 50 ft torch leads. A Hypertherm Powermax 105 or 125 may be used if the optional drop-in water table is purchased.
 - Hypertherm Interface Cable – 25 ft long (Piranha Part Number 230521 / Hypertherm Part Number 228351)
 - 5/8" Diameter Tube Clamp (Qty 1)
 - 1/2" Cord Grip (Qty 1)
 - Licensed Electrician for power connection
1. Insert the torch in the torch holder on the front of the gantry. Clamp the torch so that the gear rack on the torch fits between the split clamp.



2. Provide a generous loop of the torch lead over the top of the yellow cover so that there is no restriction when the torch lowers all the way to the bottom of stroke. Piranha recommends adding a clamp to keep the torch lead from retracting into the cable carrier at this point. Use one of the screws holding the ventilation cover to mount the clamp.



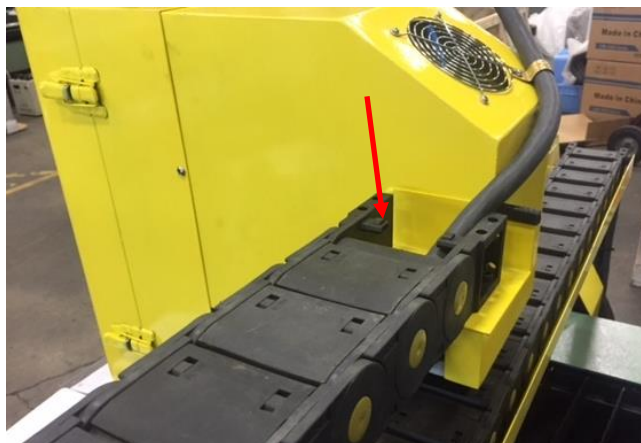
3. Expose the top side of the cable carrier by removing the plastic covers. Use a screwdriver to unsnap the plastic covers by gently prying up in the slots provided.



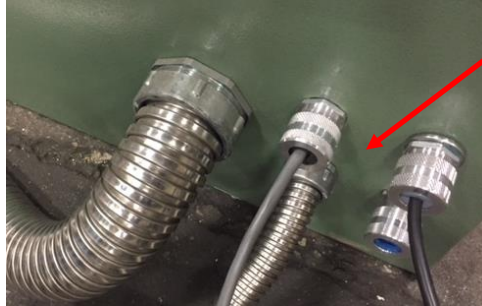
4. After running the torch leads, snap the plastic covers back in place. Take care to make sure that each cover is fully snapped in place.



5. Leave off the last plastic clip as the torch lead exits each cable carrier (this will give the torch lead a more generous radius as it exits the cable carrier).



6. Insert the opposite end of the torch lead (from the cable carrier) into the front of the Hypertherm Powermax power supply
7. Insert the plug end from the Hypertherm interface cable into the connection at the top right on the rear panel of the Powermax power supply.
8. With power to the machine OFF, remove one of the 7/8" knockouts on the side of the electrical cabinet. Run the other end of the grey cable into the electrical cabinet. Use a 1/2" cord grip at the entrance to the cabinet.



9. Inside the electrical cabinet, connect the terminals from the interface cable to the terminal strip in line with wires 33 through 36. There are three pairs of wires in the Hypertherm cable: Green/Black; White/Black; Red/Black



- Green wire to wire 33; Black wire to wire 34
 - Black wire to wire 35; White wire to wire 36
 - Red / Black wires are not used and each connection should be separately taped over with electrician's tape.
10. Insert a compressed air line into the rear of the Powermax power supply.



4.14. First Time Power On

Once all the cables are plugged in, the machine can now be powered on.

1. Close the door on the CNC Control Cabinet.
2. Power on the circuit breaker from the supply line.
3. Ensure all E-stops are out. (Two on the side of the bridge and one on the CNC control)
4. Turn on the CNC control disconnect. Back door of CNC must be closed, or interlock will not allow power to be turned on.

Note:

It is important that all the Emergency Stop buttons are disengaged before switching on the power, otherwise errors will be produced, and machine will not function.

5. Turn on the power switch.
6. Home the machine. (See next section)



Note:

Before running the machine, check the checklist in the next section.

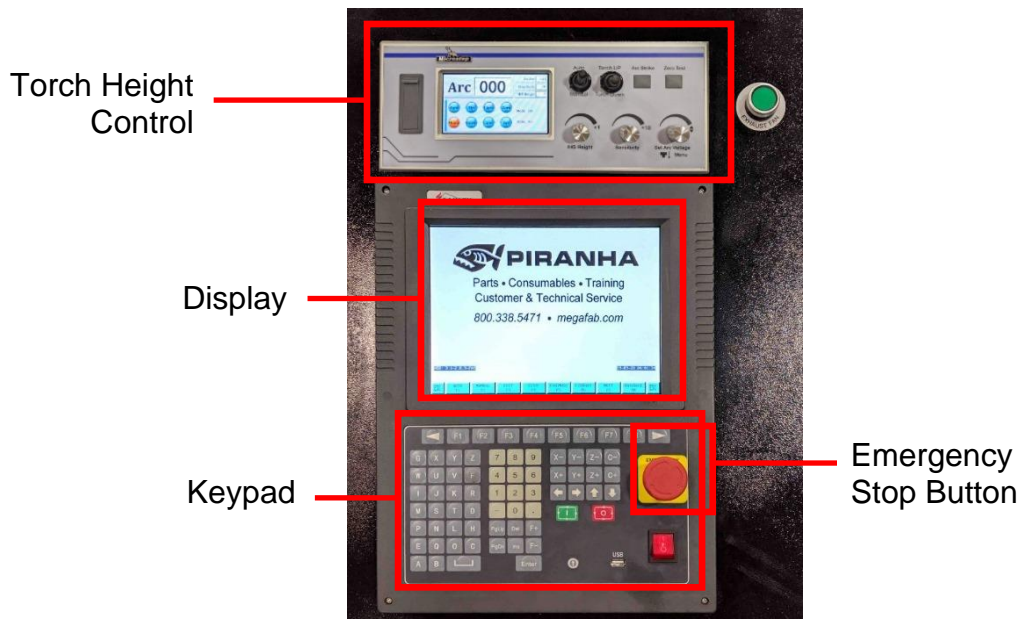
Chapter 5: OPERATIONS

Prior to making the first cut, be sure to read the OPERATION MANUAL from the supplier of the plasma cutting power source and torch. Be familiar with all safety aspects of plasma cutting including eye protection, electrical safety, heat, and respiratory protection.

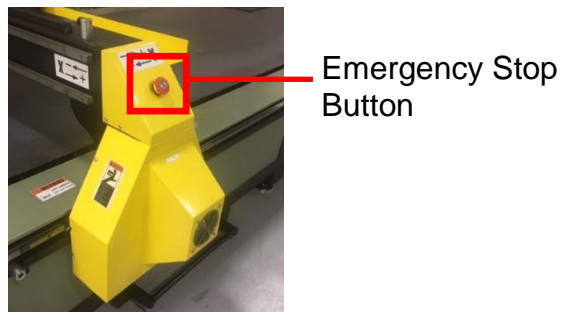
The following chapter will get the operator familiar with navigating the CNC control, and describes how to perform the tasks to start cutting.

5.1. Operator's Panel

The operator's panel is separated into two segments – the keypad and the display. The keypad is there for operator input into the machine control, and the display shows data and information to the operator. The torch height control is above the display.



The red Emergency Stop button is located on the right-hand side of the keypad. When this button is depressed, power is removed from the motion components (motors and drives), and the plasma arc is turned off. There are two additional Emergency Stop buttons, one on either side of the gantry. They all perform the same function.



5.2. CNC Control Navigation

The CNC Control menu is located at the bottom of the screen. The blocks shown correspond to the related FUNCTION keys at the top of the Operator's keypad. In order to select the corresponding block, press the FUNCTION key (example: [F1] for AUTO in the diagram below).

The ESCAPE [ESC] function cancels out the active function and returns to the previous page. ESC may need to be hit more than once to get back to the main menu.

The screen is not a touch screen.



The function keys, above, are the options on the main menu. The description of each is shown below:

[F1] AUTO: For cutting operations using a stored program

[F2] MANUAL: For manual operations such as jogging the machine

[F3] EDIT: Edit/Change/Save Files/Load Files

[F4] SETUP: Set or modify cutting parameters

[F5] DIAGNOSE: See the status of Input/Outputs

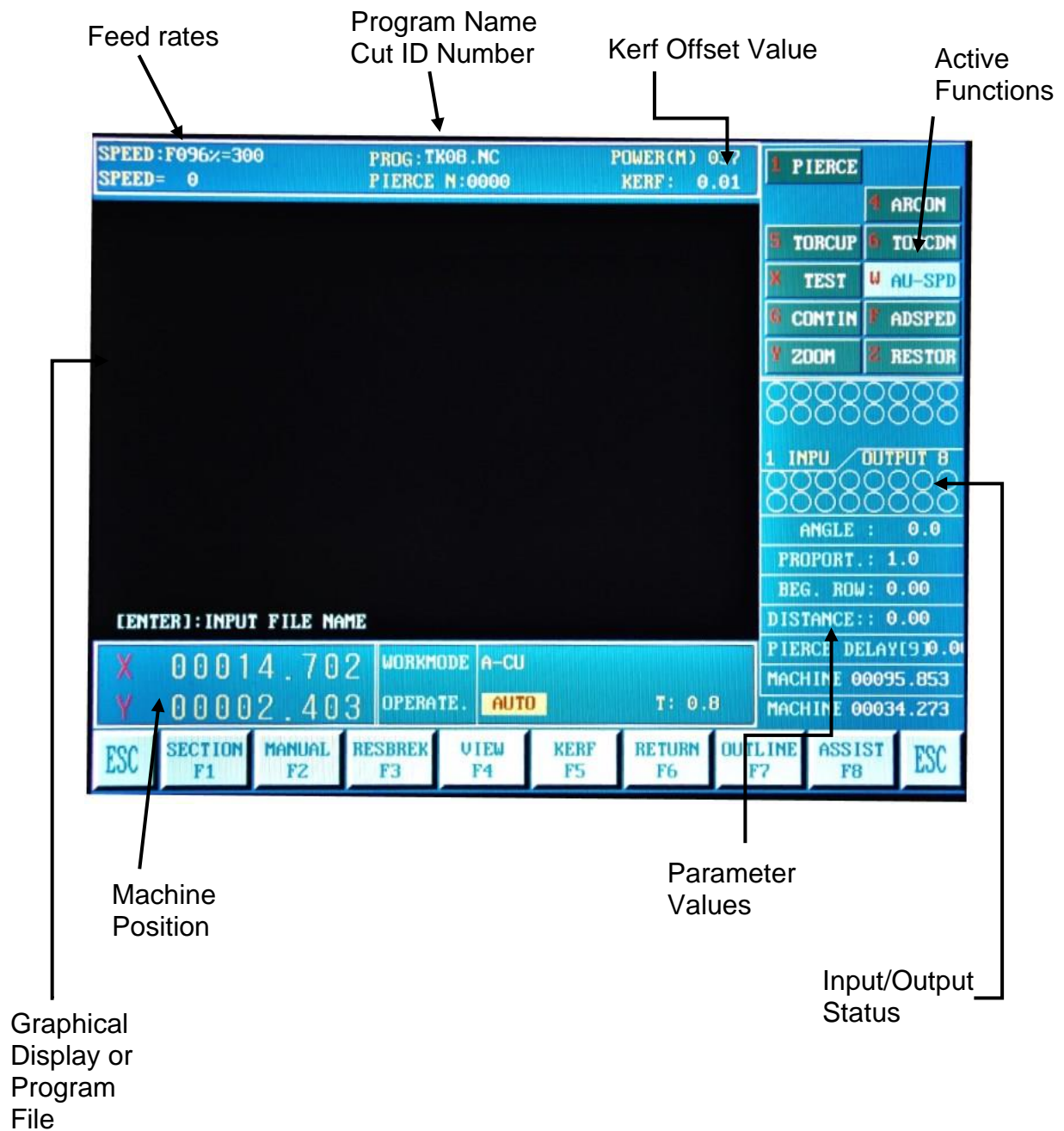
[F6] LIBRARY: Parametric shape library

[F7] NEST: Create or load shapes

[F8] DATABASE: Cut parameter database- future use

Each of the functions keys has at least one additional sub-menu below it. Navigate by pressing the appropriate function key and return by pressing the ESC key.

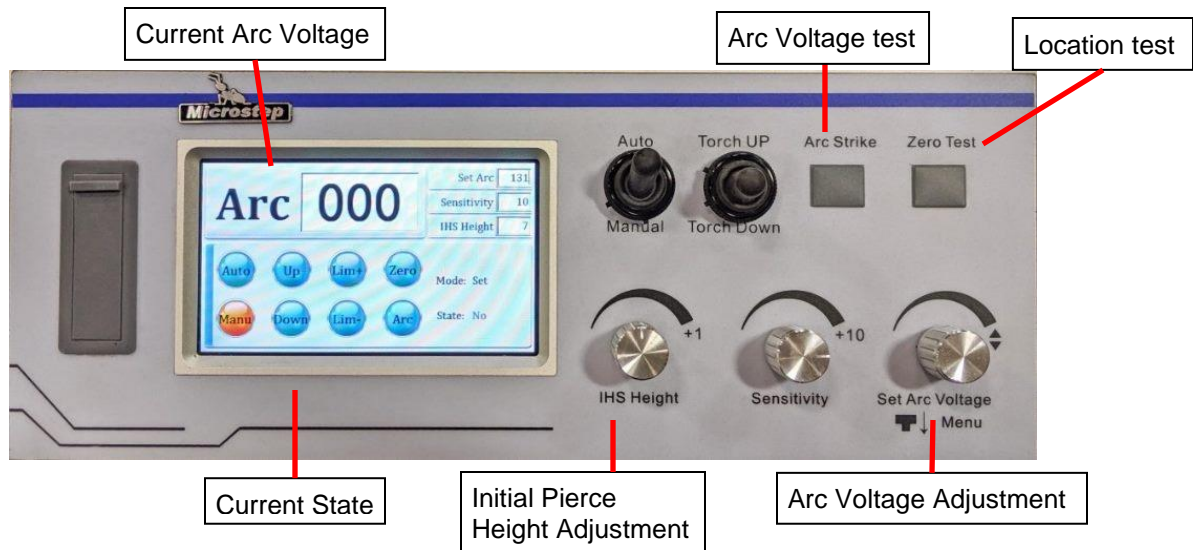
The display provides the following information:



5.3. Using the Torch Height Control

The torch height control serves three functions:

1. Jogs the torch up and down
2. Locates the torch to the correct position prior to initiating the arc
3. Maintains the proper standoff between the torch and the workpiece while cutting



The display of the torch height control (on the left-hand side of the panel) shows the status of the height control. The buttons, switches and dials on the right-hand side are the controls for the operator to adjust and test the system. The “lights” refer to the round digital display buttons located in the “current state” display in the diagram above.

Current State Display

Manu: without an automatic signal from the CNC control, the light is on.

Auto: when receiving automatic signal from the CNC control, the light is on (this only lights up when the torch is cutting).

Up: when manual up, the light is on.

Down: when manual down, the light is on.

Lim+: when torch up, the motor gets to upper limit, the light is on.

Lim-: when torch down, the motor gets to lower limit, the light is on.

Zero test: press Zero Test button, the light is on.

Arc: when arc voltage is detected, the light is on

5.4. Operating Start Guide

The following checklist includes all the steps needed to successful run a program, and the page number to find explanations on how to do those steps.

✓	Step Needed	Page
	1. Turn the plasma power supply and machine on:	66
	a. Home the machine.	67
	b. Move the machine manually and load the material.	68
	2. Adjust the amperage on the plasma power supply to the desired amperage.	69
	3. Insert the correct consumables into the plasma torch.	69
	4. In the Torch Height Controller:	71
	a. Set Height Control to AUTO	
	b. Set the Initial Pierce Height using IHS knob	71
	c. Zero the torch with a tip touch zero test	71
	d. Set the arc voltage using Set Arc Voltage knob	71
	5. Set the Pierce Delay in the CNC	73
	a. Per the OPERATION MANUAL +1.5 seconds	
	6. Set the cutting speed per the OPERATION MANUAL in the CNC	74
	7. Load a program into the CNC control memory:	
	a. From USB	76
	b. Or from control memory	78
	c. Or creating a program in the shape library	80
	8. Verify the Program with View	84
	9. Set program zero.	86
	10. Verify program fits on material with Outline Mode	87
	11. (Optional) Set the correct kerf offset	88
	12. Automatic Operation	89

Note that part quality is determined by selection of proper consumables, as well as correct setup of cutting speed, and height control. Failure to set these correctly will result in poor quality parts, or the inability to cut a part at all. Refer to the Operations Manual of the plasma system for cut charts which supply the correct setting for these parameters. An

example of a cut chart is shown below. Make sure to refer to the cut chart for your plasma system – not the information below.

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings		
					Cut Speed	Voltage	Cut Speed	Voltage	
	in	in	%	seconds	ipm	Volts	ipm	Volts	
10GA	0.06	0.15	250	0.2	275	122	336	120	
3/16 in					200	122	240	121	
1/4 in				0.5	130	122	164	122	
3/8 in					65	126	80	125	
1/2 in		0.18	300	1.0	36	132	48	131	
5/8 in					28	135	30	134	
3/4 in		Edge Start				20	137	24	136
7/8 in						16	140	19	139
1 in						11	143	14	141

5.4.1. Powering the Machine On and Sending to Machine Home

5.4.1.1. Power On

1. Turn the plasma power supply on according to that Operation manual for that plasma unit.
2. Turn power on by rotating the knob on the main disconnect to the I-ON position. The knob located behind the operator's panel on the pedestal control.
3. If air was off to machine, make sure the torch is on straight.
4. Make sure ALL Emergency Stop buttons are fully out. These can be pulled out by rotating the red button counterclockwise.



Note: If Emergency Stop buttons are not fully out on power up, the machine will not perform correctly. You will need to power down, pull the buttons out, and then power up again in order to get out of this condition.

5. Press the top end of the red rocker switch (below the Emergency Stop button) until it latches in place.



6. Power is now on, and the Piranha HOME screen should appear. This also displays the main menu on the bottom.



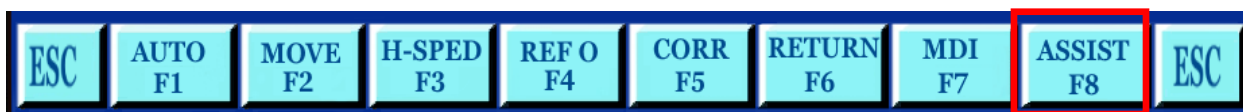
5.4.1.2. Home the Machine

The machine should be sent home on start up. If not done, X+ and Y+ will not know their limits and may cause hard overtravels.

7. Press F2 [MANUAL].



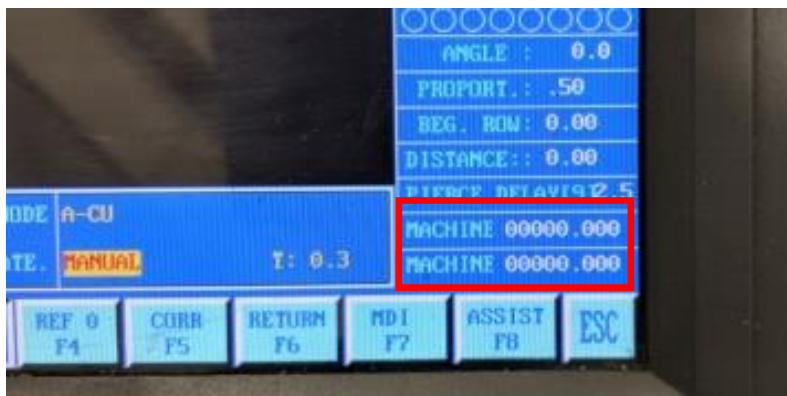
8. Press F8 [ASSIST].



9. Press F5 [MEASURE]. The machine will travel to machine home.*



10. The machine coordinates on the right-hand bottom of the screen should read zero.



11. Press [ESC] until the screen returns to the Home Screen.



*Origin can also be used but may cause an overtravel. This has to do with how some parameters are set up.

5.4.1.3. Moving the Machine in Manual Mode

Manual mode is used to jog the machine without running it from a program. This is commonly used to bring the machine to the operator so that consumables can be changed, or to move the machine out of the way while the operator unloads finished parts and loads new material.

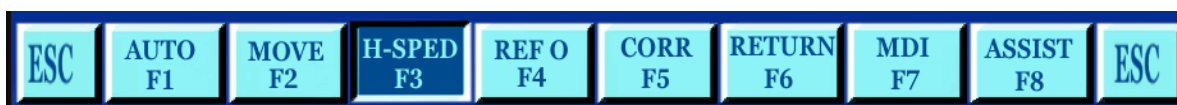
1. From the HOME page, select [F2] MANUAL.



2. In MANUAL mode, you can move the X and Y axes by pressing the arrow buttons on the operator keypad. Make sure that no one is near the machine gantry, and that the torch is all the way up prior to moving the machine.



3. To jog even quicker, select high-speed jog by pressing F3 [H-SPED].



4. If you move too far in one direction, simply move it back.
5. Move the torch so that the material can be safely loaded.
6. Load the material.
7. Press [ESC] to return to the main menu.



5.4.2. Prepare the Plasma Power Supply and Torch

The Operator's Manual for the Plasma Power Supply is needed for this section and contains more information.

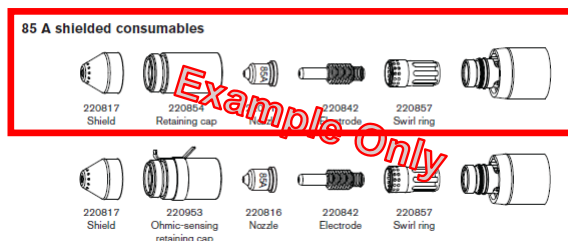
Materials can often be cut at more than one amperage setting. This is referred to as a process. For example, with a Hypertherm Powermax 85, materials may be cut at 85 amps, 65 amps, 45 amps, or less, depending on material type and thickness. Different processes will produce different results and speeds.

Locate the "Estimated kerf-width compensation-English" in the Plasma Power Supply manual. While this chart is primarily for setting kerf, which will be explained later, it is an easy way to see what processes are available for a particular material. The chart below is an example for a Powermax 85 manual. Please refer to **your** manual. Using this example, when cutting 18 gauge mild steel, the 45A or Finecut process is available. If you are cutting 1/4", then 85A, 65A, or 45A processes are available. However, 1/4" with the 45A process is the maximum at 45A, and probably not the best option to choose if 65A or 85A is available. The lowest powered process, including FineCut, will generally yield the best cut quality. The highest powered process, will produce the fastest speed.

Process	Thickness (inches)								
	22GA	18GA	14GA	10GA	3/16	1/4	3/8	1/2	5/8
	Mild Steel								
85A Shielded			0.062	0.065	0.071	0.073	0.078	0.090	0.095
65A Shielded			0.062	0.065	0.068	0.070	0.076	0.088	0.090
45A Shielded	0.035	0.054	0.055	0.061	0.065	0.066			
FineCut	0.024	0.043	0.049	0.051					

1. Select the process for the material being cut using the explanation above.
2. In the that same Operator's manual, locate the consumables needed for that process.

TORCH SETUP

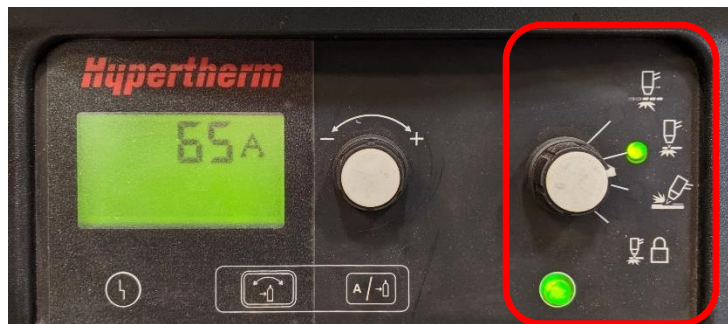


- a. Insert the correct consumables into the plasma torch per the OPERATION MANUAL.
- b. Replace damaged consumables as needed. See note below for more information.
- c. Do not use "Ohmic-sensing" consumables.

3. Reset the Plasma Power Supply after changing consumables. Changing consumables will cause an alarm on the Power Supply, seen below. To reset, turn off, wait 10 seconds, turn back on.



4. Adjust the amperage on the plasma power supply to the desired amperage.
 - a. Check other settings on the Plasma Power Supply, if applicable:
 - i. Operating Mode set to non-continuous pilot arc or appropriate cutting mode.
 - ii. Leave Plasma Power Supply in Automatic mode.



5.4.2.1. Notes on Consumables

Consumables can last 50-400 starts, and last, very roughly, on average of 200 starts. If settings are incorrect, the consumables can be damaged immediately just from 1 pierce. Some consumables may be able to last even 1000 starts. Hypertherm has videos available online on when consumables should be changed out:

<https://www.youtube.com/playlist?list=PLQzzZWV3v0c6JRYoIXryVKvXAPcAeB3H->
Or search Youtube for: When to change out your Powermax consumables

5.4.3. Setting the Torch Height Controller

Prior to cutting, the operator must make sure the torch height controller is set correctly. This includes making sure it is in auto mode, setting the initial pierce height, doing the zero test, and finally setting the arc voltage, which establishes the cutting height.

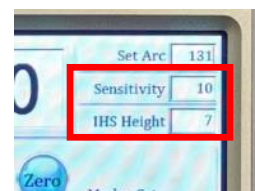
1. Make sure the height controller is set to **Auto**.



2. Initial Pierce Height:
 - a. Find the Initial Pierce Height in the Operation Manual. This value is set in millimeters in the machine, so if your cut chart shows inches, you will need to convert the desired value from inches to millimeters. For example, if the cut chart calls for an initial pierce height of 0.200", adjust the POSITION value to 5mm.
 - b. Round to the nearest millimeter.



- c. Adjust the value using the **IHS Height** dial to the initial pierce height. Actual height may vary slightly, and minor adjustments may need to be made to achieve the desired pierce height.
3. Verify that Sensitivity is set to 10.
4. Make sure there is material below the torch.



5. Press the **ZERO TEST** button again. This initiates the torch tip zero test. The torch will come down to the material. This also gets the torch close to the



material for the start of the cut. If the torch is too high when the process is started, there will be an alarm. If the material is very thin, execute the zero test between two slats so that it is properly supported. If this is done on the edge of the material, the material may bow and flex and the height may not be set correctly.

6. The torch should be above the material the distance set in the IHS Height value above. Eyeball the distance to see if it is about right.
7. Arc Voltage: Rotate the **Set Arc Voltage** dial until the arc voltage on the display reads the same as the desired arc voltage in the cut chart. For machines with water tables, add 5-7 volts to the book value.



- a. The Hypertherm cut charts may include “Best Quality” and Production” values. As a starting point, use an average of the two.

Note: SENSITIVITY should be set nominally to 10. Lower numbers mean that the torch will react less quickly. Higher numbers will make the torch height adjust more quickly (however this may cause vibration or oscillation in the drive).

5.4.4. Setting Pierce Delay Time

The pierce delay can be changed in the AUTO screen.

1. Determine the correct value for Pierce Delay from the plasma OPERATION MANUAL cut charts.
2. ADD **1.5 seconds** to the value in the chart.

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
10GA				0.2	230	122	336	121
3/16 in				0.2	185	123	220	123
1/4 in		0.15	250		130	123	160	126
3/8 in				0.5	70	126	86	127

Example Only

- a. In the example above, the Pierce Delay Time for 10ga is .2 seconds and 1/4" it is .5 second.
 - b. In this example above, the pierce delay to be entered in the machine is 1.7 for 10ga (.2 + 1.5) and for 1/4" it is 2.0 seconds (.5 + 1.5).
3. Go to the AUTO screen.



4. Press the number 9 to edit the value for Pierce Delay.



5. Type in the new value. Tip: Type in zeros or use the Del button to type over old value.
6. Press ENTER.
7. Press ESC to exit.



5.4.5. Adjusting Speeds

Types of speeds:

- CUTTING SPEED – this is the speed at which the machine moves when the plasma torch is cutting
- JOG SPEED – this is the speed at which the machine moves when manually moving the machine with the arrow keys
- RAPID SPEED – this is the speed that the machine uses when traversing between cuts (going from the end of one cut to the beginning of the next)

Note: Only the cutting speed needs to be adjusted to run a program.

5.4.5.1. Adjusting Cutting Speed

1. Determine the correct value for Cut Speed from the plasma OPERATION MANUAL cut charts.

English

Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
					Cut Speed	Voltage	Cut Speed	Voltage
	in	in	%	seconds	ipm	Volts	ipm	Volts
10GA				0.2	250	122	336	121
3/16 in		0.15		0.2	185	123	220	123
1/4 in					130	123	160	126

- a. The Hypertherm cut charts may include “Best Quality” and Production” values. As a starting point, use an average of the two. In the example above, for 3/16”, use a feed of 200ipm.
- b. The machine cannot cut over 300ipm and will cut best with processes that use less than 200ipm. In the example above, 10ga will probably cut better with a lower amperage process.
- c. If hole quality is most important, a slower speed may yield better quality holes, but the outside cut may somewhat deteriorate.

2. From the main menu, select [F1] AUTO.



Note: Cutting speed must be changed in the AUTO mode.

3. Press the letter F on the keypad. The value at the very top of the screen can now be changed.

4. Type in the desired speed.



5. Use a decimal. For example, if the desired speed is 100, type in 100.0.
6. Press ENTER. The feedrate will be displayed at the top. However, the machine uses a percent of total speed. For example, if you type in a feed of 145, the machine will change it to 144.



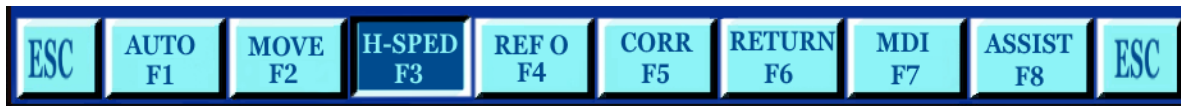
5.4.5.2. Changing Jog or Rapid Speed

Note:

Only the cutting speed needs to be adjusted to run a program. The following are optional adjustments.

The machine can only be moved manually in the MANUAL mode. It has two speeds, regular and high-speed (H-SPED), both of which can be customized. By default, the machine will jog at medium rate.

If H-SPED is selected, the machine will jog at the higher speed.



Press H-SPED again to deselect it and the machine will again move at the regular jog rate.



In either case, the jog speed can be changed in the same manner as described in the section above, using the F button, but in still in the MANUAL mode.

A quicker way is to use the F+ and F- buttons. These can be adjusted as a percentage of the maximum traverse speed.

Changing the H-SPED rate also changes the rapid speed during cutting.



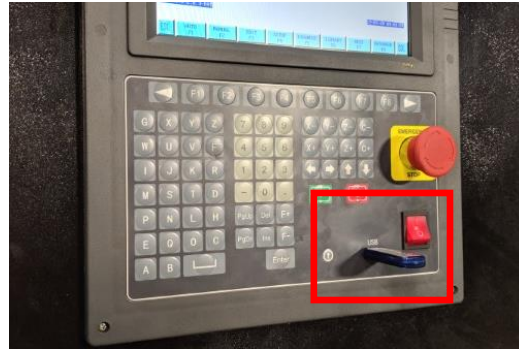
5.4.6. Methods of Loading Programs

There are three methods of loading programs:

1. Loading a pre-programmed part or nest from the USB drive. Instructions below.
2. Selecting a file from CNC Control memory that has already been saved in the control, in section [5.4.6.2 Loading A Program from Control Memory](#), page 78.
3. From the shape library, [Creating and Loading A Program from the Parametric Shape Library](#), page 80.

5.4.6.1. Selecting A Program from USB Drive

Note: Maximum file size is 10,000 lines.



1. Insert a USB Thumb Drive into the slot on the CNC Control.
2. From the MAIN SCREEN, select [F3] EDIT:



3. From the EDIT SCREEN, Select [F6] USB:




4. From the USB SCREEN, Select [F1] INPUT:



5. From the INPUT SCREEN, use the up/down arrows to highlight program to be loaded.
6. Select [F1] COPY.

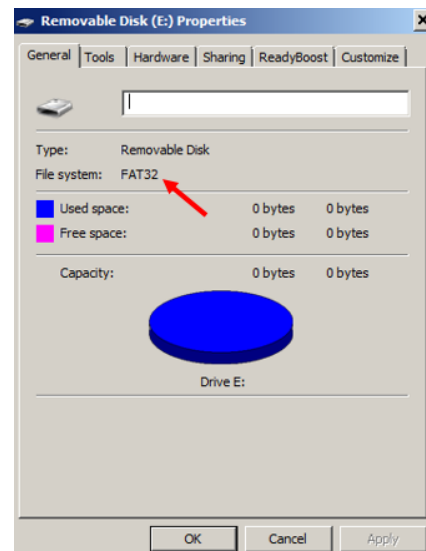
7. Press ENTER to view the Program CODE:



Program Name	Size
0000: 000000.TXT	1.462 K
0001: WHEELRUB-R1.TXT	0.749 K
0002: 2006.TXT	0.039 K
0003: 1234.NC	0.349 K
0004: F132	0.515 K
0005: BDCIRCLE.TXT	0.352 K
0006: FEATHER-352385.TXT	0.723 K
0007: CHASE2	10.524 K
0008: BATMANLOGO7.TXT	1.121 K
0009: THEB.TXT	2.647 K
0010: TRACTOR2.TXT	10.004 K
0011: TRACTOR51.TXT	7.680 K
0012: 4SQNEST	1.094 K
0013: 4SQNEST2	1.094 K
0014: BAT	6.744 K
0015: BOGLIFE2.TXT	30.412 K
0016: BOG12INCH3.TXT	4.690 K
0017: BUTTERFLY4.TXT	22.830 K
0018: PIRANHA002.TXT	5.500 K
0019: PIRANHA003.TXT	3.255 K

8. Press ESC to get back to the main menu.
9. To edit the program, continue to the section 5.4.7 Editing and Saving Files.
10. If more than one program was loaded from the USB thumb drive, you will have to select which to run. In this case, continue to the next page.
11. Otherwise, continue to section [5.4.8 Verify Program with View](#), on page 84.

IMPORTANT: The USB Thumb Drive must be formatted to FAT32 File System or the CNC Control will not read the thumb drive. To check this, insert the thumb drive into a computer's USB port, right click and select "Properties". The following screen should appear.

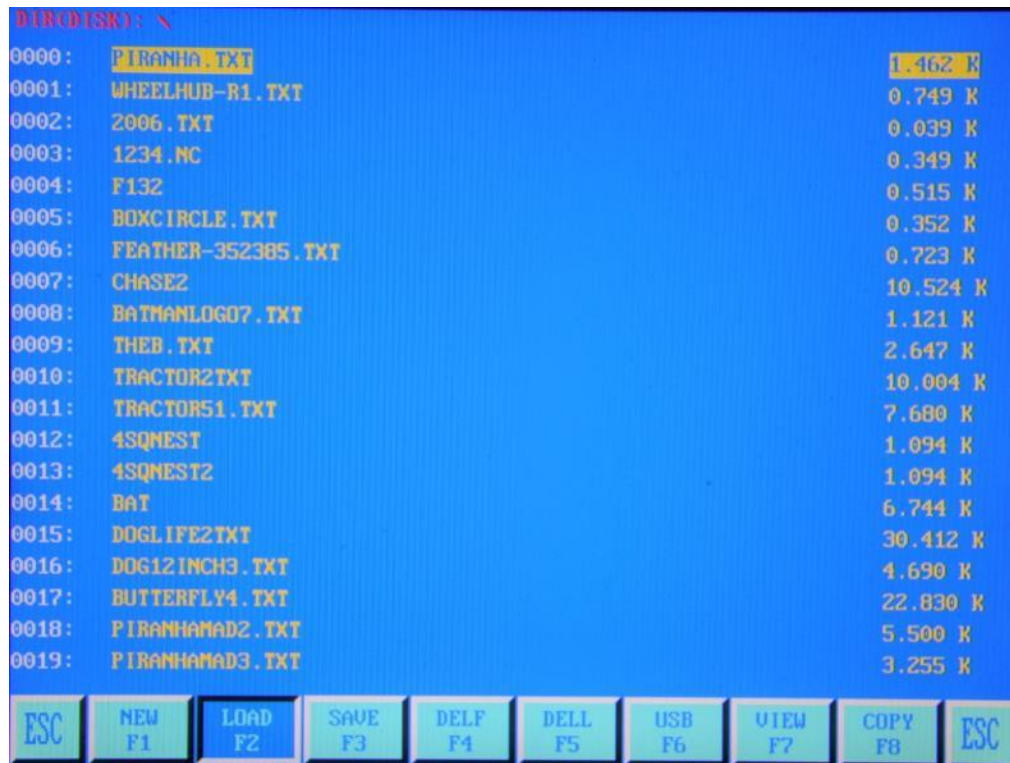


5.4.6.2. Loading A Program from Control Memory

1. From the main screen, select EDIT.
2. Select [F2] LOAD:



3. From the LOAD SCREEN, use arrow up/down to highlight program to be loaded. Use PgUp (Page up) and PgDn (Page down) to move a page at a time.
4. Once on the correct program, press ENTER:



- After pressing ENTER, the selected program will be loaded, and the program **code** will display:

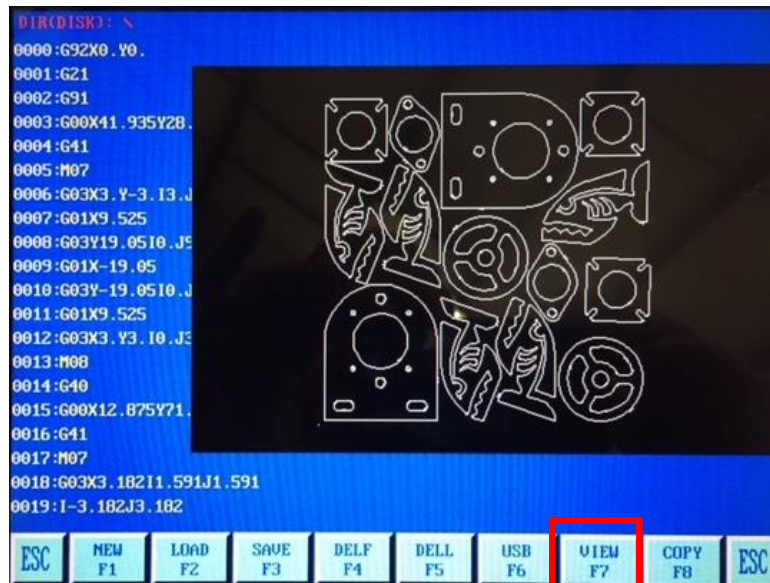
```

DIR(DISK): \
0000:G32 X0 Y0
0001:G91
0002:G00 X6.25 Y17.5
0003:M07 G42
0004:G02 X-1 Y1 I0 J1
0005:G02 X0 Y0 I0.75 J0
0006:G02 X1 Y1 I1 J0
0007:M08 G40
0008:G00 X0 Y8
0009:M07 G42
0010:G02 X-1 Y1 I0 J1
0011:G02 X0 Y0 I0.75 J0
0012:G02 X1 Y1 I1 J0
0013:M08 G40
0014:G00 X-5.25 Y-29.5
0015:M07 G41
0016:G01 X0 Y46
0017: G01 X10 Y0
0018:G01 X0 Y-45
0019: G01 X-11 Y0

```

ESC NEW F1 LOAD F2 SAVE F3 DELF F4 DELL F5 USB F6 VIEW F7 COPY F8 ESC

- Pressing [F7] VIEW will display a temporary graphical representation of the program.



- Once done, press ESC twice to return to the Main screen.

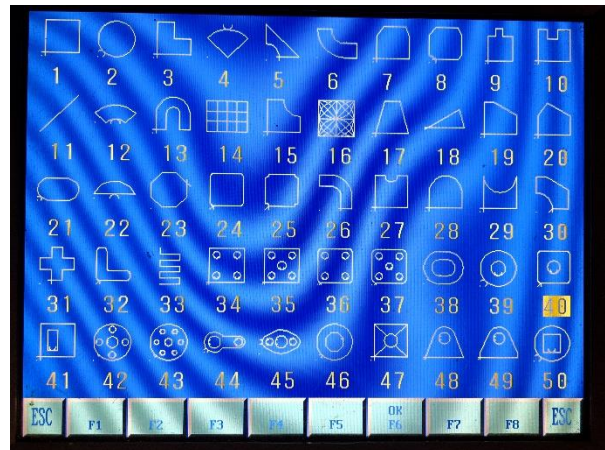
5.4.6.3. Creating and Loading A Program from the Parametric Shape Library

The CNC Control has several common shapes that are used in the Metal Fabrication industry. The size of the features within each shape can be adjusted easily in order to achieve customer requirements.

1. From the main menu, choose [F6] LIBRARY.

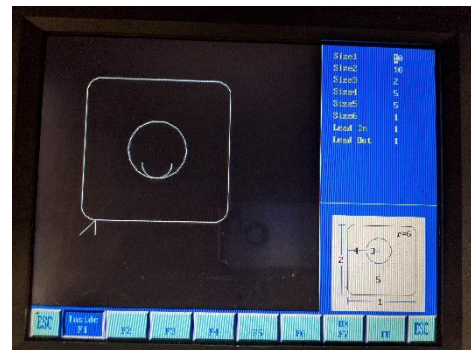


2. The library of available shapes will appear.
3. To select a shape, use the arrow keys to highlight the name of the shape, and press [ENTER].

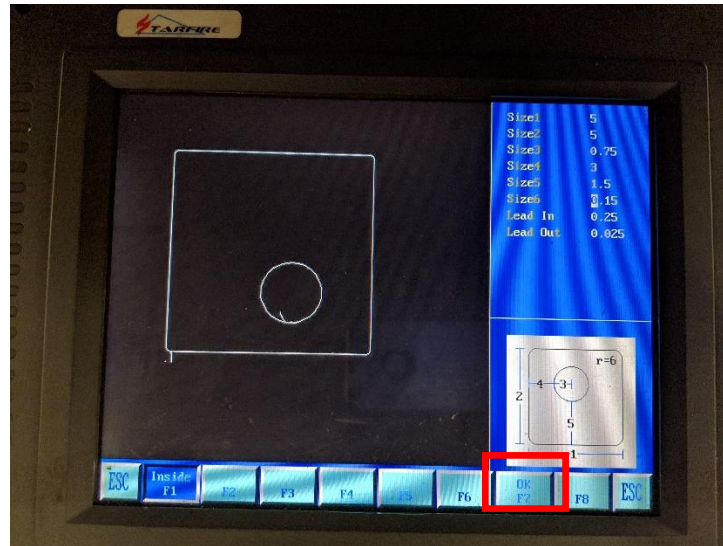


4. This is the shape 40, a square with a hole. Parameters are as follows:

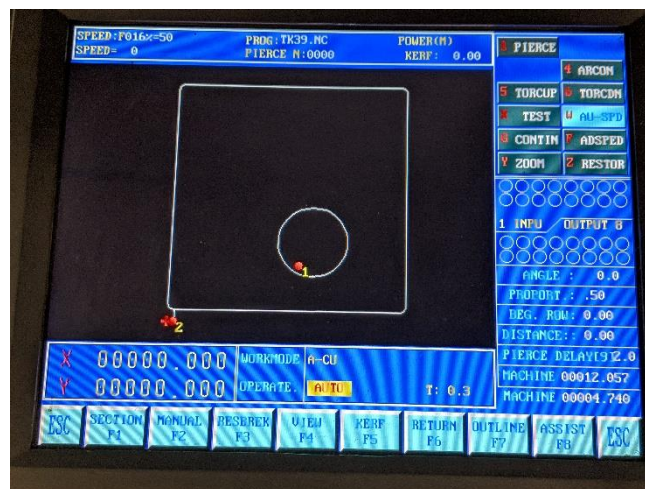
Size1 – Width
 Size2 – Height
 Size3 – Radius of hole
 Size4 – X distance to hole
 Size5 – Y distance to hole
 Size6 – radius of external corners
 Lead-in Distance (initially – try 1/4" to start and adjust from there)
 Lead-out Distance (initially – try 1/4" to start and adjust from there)



5. Select each parameter by using the up and down arrow keys.
6. Enter the values desired. Decimal points are optional.



7. Once you are satisfied with the geometry, press [F7] OK and the HOME screen will appear.
8. At this point, the geometry of the part has NOT been saved. While it can be run on the machine, it cannot be nested, modified, or used later. Continue to the [section 5.4.7 Editing and Saving Files](#) to save the file or to [5.4.8 Verify Program with View](#) to continue.



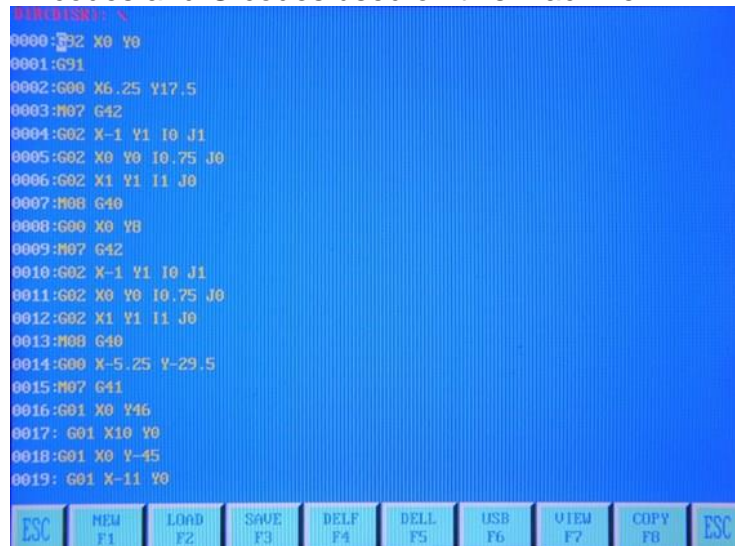
5.4.7. Editing and Saving Files

Once a file has been loaded on the control, or created using the SHAPE LIBRARY, it is important to save the file on the control. That way, the program can be called up again in the future, and it will be still in the control in case the power is cycled off and on. This also allows the operator to use the NESTING function on the control.

1. After a program has been selected from the USB drive, or from the Shape Library, go to the HOME screen and select [F3] EDIT.

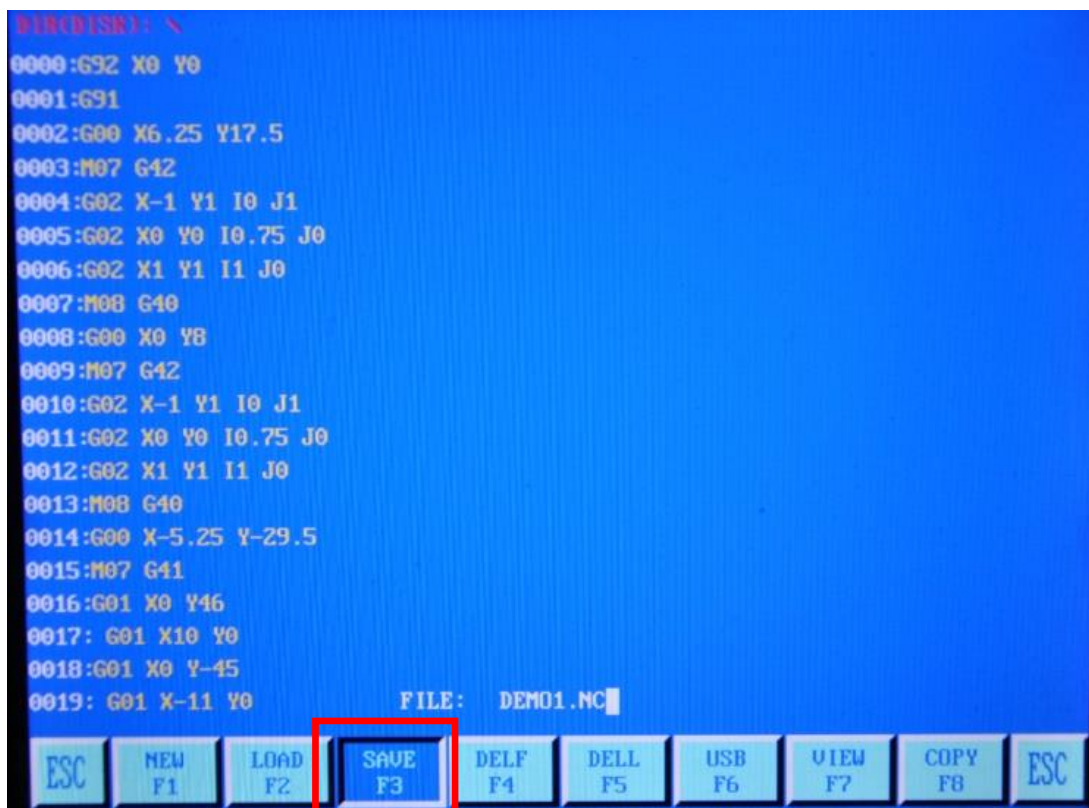


The display should now show the part program. If the operator has familiarity with M code and G code programming, the program can be edited just as a normal text file can be edited on a home computer. Do not try to edit a program if you are not familiar with M code and G code programming. See the PROGRAMMING section of the manual for M codes and G codes used on this machine.



- Entire lines can be deleted by pressing [F5] DELL, which means delete line.
- The entire file can be deleted by pressing [F4] DELF, which means delete file.

2. The program can be saved by pressing the [F3] SAVE button.



3. A text box appears, and the operator can type in the desired file name. Be sure that the program name is not already taken in the directory. If you type in an existing file name, the new program will overwrite the previous program.
4. End the file name with ".NC".
5. Press [ENTER].

5.4.8. Verify Program with View

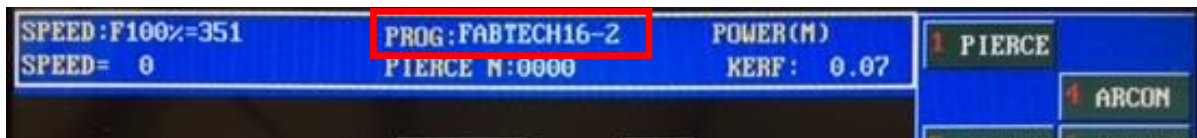
Use View mode to update the graphics screen.

Note: When in View mode, other functions are restricted.

1. From the main menu, or from Manual mode, select [F1] AUTO.



2. Verify the program at the top is the desired program. If not, reload the program using the steps in [5.4.6.2 Loading A Program from Control Memory](#), on page 78.

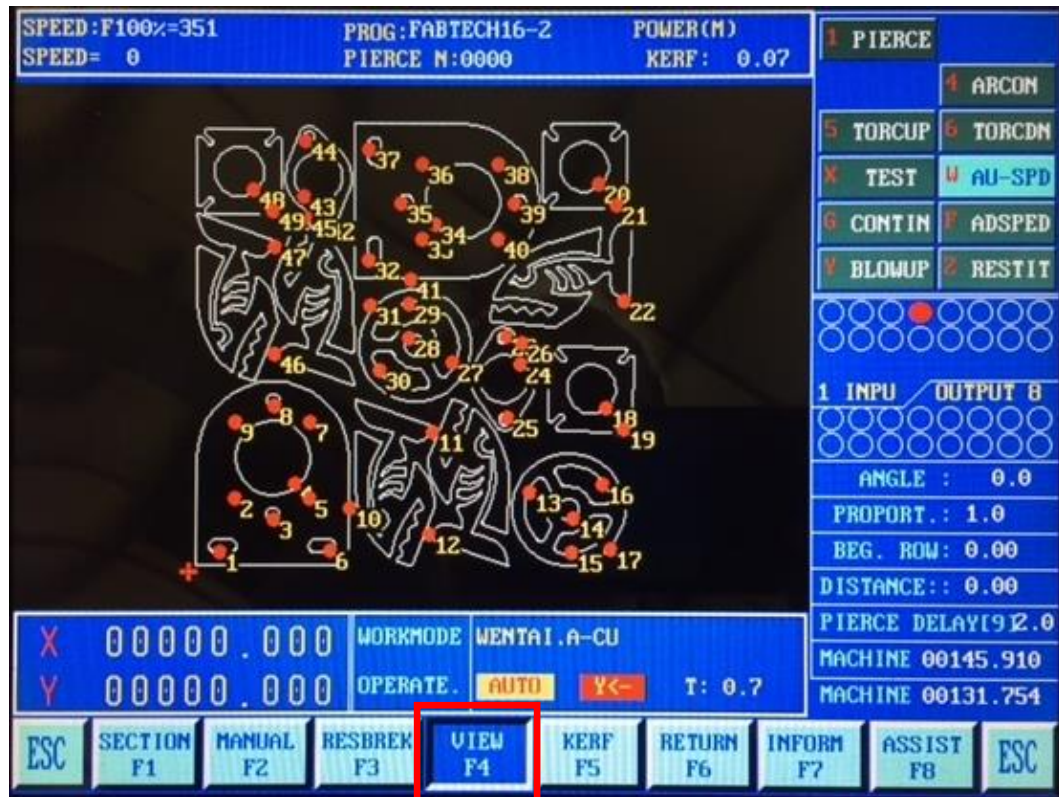


[Continued next page]

3. Press [F4] VIEW. This will display a graphical representation of the loaded program.
 - a. The red dots with numbers show the pierce points and cut order.
 - b. The red crosshairs show the program zero location, the location the operator needs to set PROGRAM ZERO. This will be done in the next section.



- c. Pressing the arrow keys in this mode will move the image around.
- d. Use the letter Y to zoom in and Z to restore the image.
- e. View is highlighted while in View mode. See image below.
- f. Use View anytime to update the graphics.



4. Press [F4] to leave VIEW mode. It should no longer be highlighted.



5.4.9. Set Program Zero

Part programs have a zero-starting point for (X0, Y0), identified by a red crosshair on the screen. This is also known as a program origin or reference point. The operator can see where zero is located relative to the parts cut within the program. This zero location must be set before starting the program*.

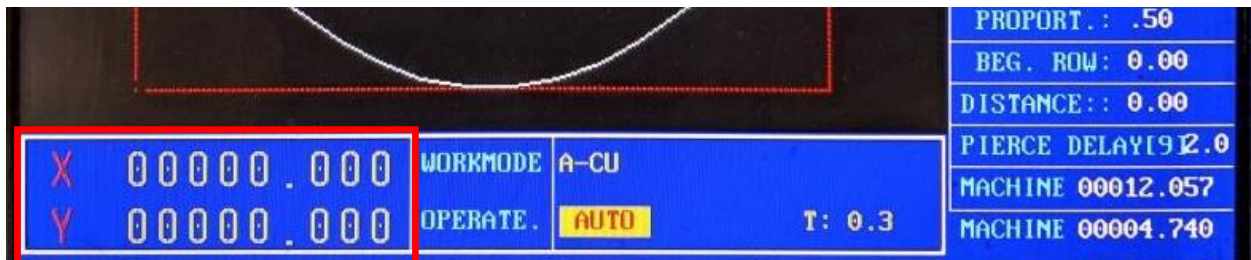
1. Press **MANUAL**, if not already there.



2. Position the torch at the desired program zero. Usually this is the lower, left-hand side of the sheet.
3. From **MANUAL** mode, press the **REF 0** button. The program origin has been set*.



The X and Y values on the bottom right of the screen will both be zero.



4. (Optional) Update the graphics with View, in Auto mode as described in the last section.

Advanced tip: it may be useful to write down the machine coordinates where the program zero is set. If, for example, the program is interrupted and restarted, but program zero is lost, the program zero can be set using these coordinates.



*Programs created in the shape library will set program zero wherever the head is positioned at start. These programs use a G92 X0 Y0 to set program zero.

5.4.10. Verify Program Size on Material with Outline

Depending on software version, this may be called either contour or outline.

When outline is pressed, a red rectangle appears around the outside edge of loaded program in the graphics. The torch head will physically move above the sheet following this rectangle. This will allow the operator to see if the program fit on the sheet of material as it is located on the machine.

While no arc is active, the machine will be moving. Make sure nothing and no one is in the way.

To run OUTLINE:

1. From Main Menu, press [F1] **AUTO**.
2. If the material is bent or bowed, it may be best to lift the head a bit off the material as it will not sense material height changes in outline mode.
3. Press the [F7] **OUTLINE** key. The torch will start moving immediately, tracing the part or parts.
4. Adjust the program zero if necessary. See previous section.

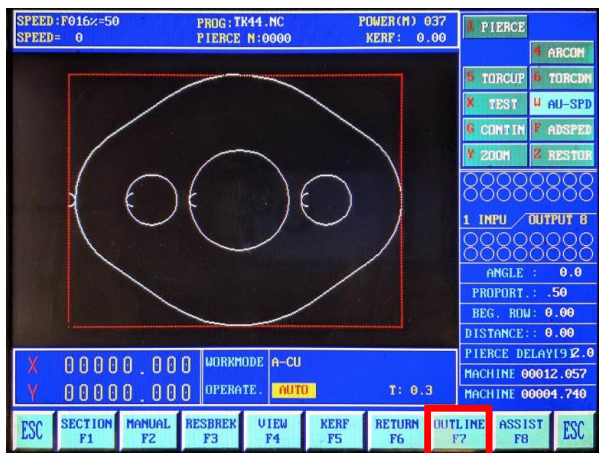


Figure 5-1: Red Outline Shown on Graphics & Outline Button (left) and Outline Path for Torch (right)

If the outline is clearly much larger than the part/s, try pressing [F4] VIEW twice, to update the graphic.

If the torch over-travels in any direction, go into manual mode and move it back manually.

5.4.11. Setting Kerf Offset (Optional)

When plasma cutting, a kerf, or opening, is produced by the plasma arc. Like cutting wood with a saw, the saw takes out material while sawing. External cuts will be too small, and internal cuts will be too large. To get the parts of the correct size, the kerf needs to be compensated.

Making this adjustment is optional; the machine will still cut parts, and the quality will not be affected without it. It will only affect the size of the parts.

The cutting current and speed, as well as the diameter of the orifice in the plasma torch nozzle determine the width of the kerf. Typically, the amount of offset will range from 0.040" (1.0 mm) to 0.080" (2.0 mm) when cutting mild steel. Refer to the plasma cutting system manual for recommended kerf offsets. Set the compensation for the kerf width using the following procedure.

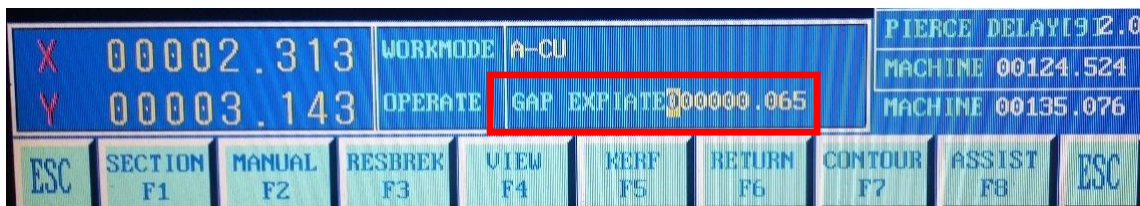
1. Kerf offset can be set from Automatic operation menu.



2. Press the KERF button.



3. Enter the offset for the Kerf in the GAP EXPIATE entry area and press enter when finished.



For example, cut a 2" square. Measure it. Let's say it measures 1.94". Enter a value of 0.06 into the Gap Expiate value. Cut and measure again.

If it is undersized, then the kerf value is too small, and the operator should add to it. If it is oversize, then the kerf value is too large, and the operator should subtract from it. The opposite will be true for holes/internal cuts. Too large of a value may cause a G41/G42 error.

Due to the candle flame shape of the cutting arc, parts will measure differently from top to bottom.

Advanced tips: Due to the angle of plasma cutting, holes will often benefit from zero offset. If the internal features require a different offset than the external features, it is recommended to adjust the size at the programming level, for example by resizing the internal features accordingly.

5.4.12. Automatic Operation

Before starting the machine in automatic operation, double-check all other necessary steps have been completed in the checklist on page [64](#).



Caution

Before starting automatic operation, make sure the operator understands how to stop the machine in case it is necessary.

1. Set the machine to AUTO [F1] mode from the HOME screen.



2. Prior to cutting the part, it may be desired to test run the program without cutting. See the section [5.9](#) TEST MODE (DRY RUN) to test run the program.
3. Pressing the green CYCLE START button at this point will start the program execution.

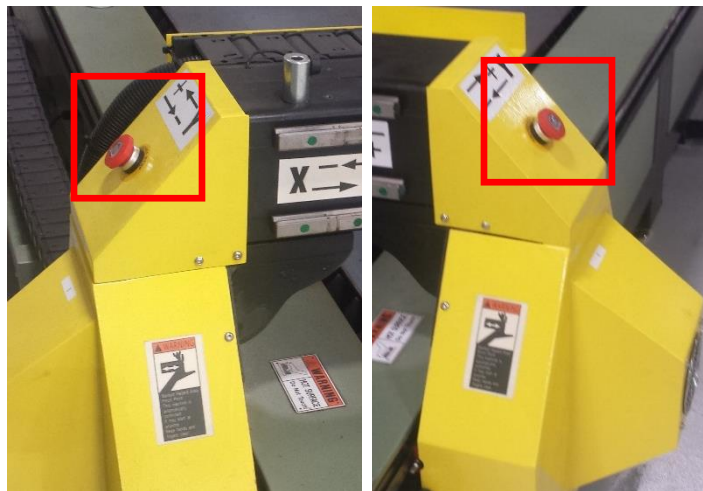


5.4.13. Stopping the Machine

During operation, the machine can be stopped by either pressing the red CYCLE STOP button on the operator panel or by pressing one of the three EMERGENCY STOPS. The EMERGENCY STOP button immediately turns off all power to the drives and plasma torch.

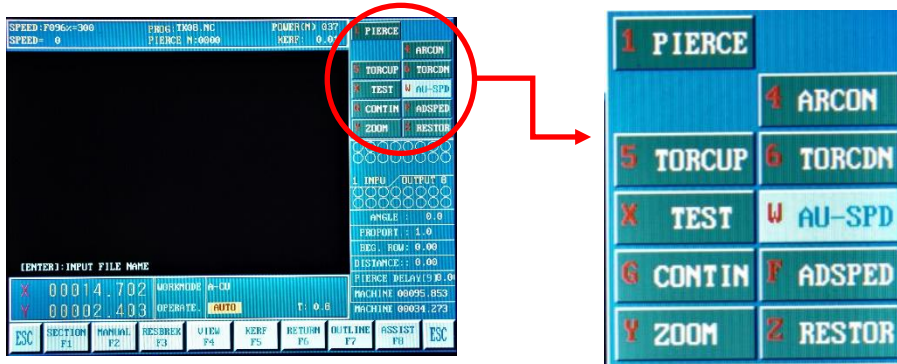
The red CYCLE STOP button pauses the machine and turns off the torch. Use this button for non-emergencies. However, this function will not work during the pierce or torch off commands (M07/M08). Either press CYCLE STOP again just after the pierce or torch off command or use the EMERGENCY STOP button instead.

See section [5.6 Restarting a Cut](#) for restarting programs after stopping.



5.5. Active Functions

There are several active functions that can be used when the machine is in MANUAL mode:



1 – Pressing the '1' key will initiate a torch pierce, and when restarting a program, starts the cut

4 – Pressing the '4' key will toggle the arc on and off

5 – Pressing the '5' key will jog the torch to the up position

6 – Pressing the '6' key will jog the torch down

X – Pressing the 'X' key will toggle the machine between TEST MODE and RUN MODE (see section on TEST MODE (DRY RUN))

W – Auto Speed Mode (highlights when running at a controlled cutting speed)

G –

F – Adjusting Speed Mode (highlights when adjusting speed)

Y – Two functions:

1. When in VIEW mode, this allows the operator to zoom in to certain areas of the nest, see [5.4.8](#) for View mode.
2. When not in VIEW mode, this allows the operator to select parameters from the DATABASE

Z – When in VIEW mode, use the 'Z' key to zoom out (after using 'Y' to zoom in)

5.6. Restarting a Cut

Cutting failures can happen for a variety of reasons. Luckily there are a couple ways to restart a program if needed.

- If CYCLE STOP was pressed, and nothing else, refer to [5.6.2 Cycle Stop](#).
- The user-friendly restart option is Break Point Resume (RESBREK). See [5.6.4 Break Point Resume](#). It may not work in all situations.
- If RESBREK does not work, or you want to start at a specific pierce refer to [5.6.3 Using Section to Restart](#). However, be sure to read about Pierce Numbers below first. Use this method if you are not sure which to use.

Whichever method is used, be sure to read about **Zero Test+1** on the next page.

5.6.1. Background Information on Restarting

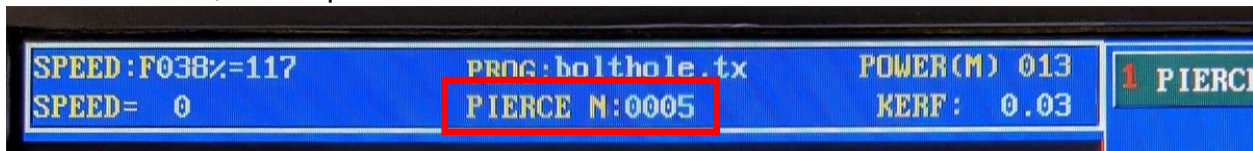
Note:

If a restart is done incorrectly, this may shift the REF 0 and therefore the part program.

5.6.1.1. Pierce Numbers and Line Numbers

Pierce numbers and line numbers may be used in some of the restart options, such as SECTION.

The pierce number is what pierce the machine is cutting. The pierce number can be seen at the top of the screen. In this example, this part was stopped during the 5th cut, after 4 holes were cut, so the pierce number is 5.



The line number is what line of the program the machine is executing. This is shown in the bottom right of the screen when a program is running, or Cycle Stop is pressed. In the example below, the program is on the 39th line of the program.



Both pierce numbers and line numbers can be used to restart a program at a certain point. However, if neither is known when a program restart is needed, the pierce number is easier to figure out. Simply count how many pierces have already been done, or how many parts have been cut.

5.6.1.2. Zero Test +1

In most cases when restarting a program, the height sensor will need to be re-initialized.



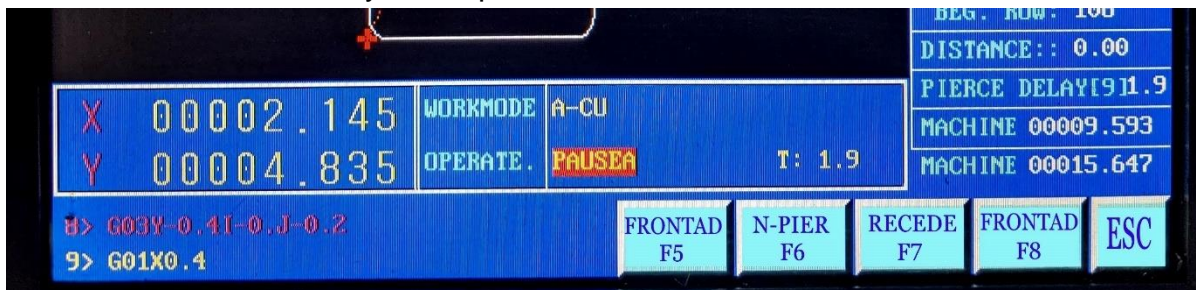
This is done simply by pressing by pressing Zero Test button on the height controller over material, preferably close to the restarting point. When executing most restart functions, use the number 1 to turn the arc back on and start the cutting. The procedures below will tell you when these steps need to be done.

5.6.2. Cycle Stop

If the program is paused using the red Cycle Stop, X or Y were not moved, and you want to just restart:

- If the machine was traveling from part to part (G00 line), then you can press Cycle Start to continue.
- If the machine was in the middle of a cut, then do Zero Test +1 (see section above for details) to restart.

If you want to rewind, advance, or jump to a particular pierce, the following menu will be available while still in the Cycle Stop /Pause mode.



FRONTAD [F5]: No function

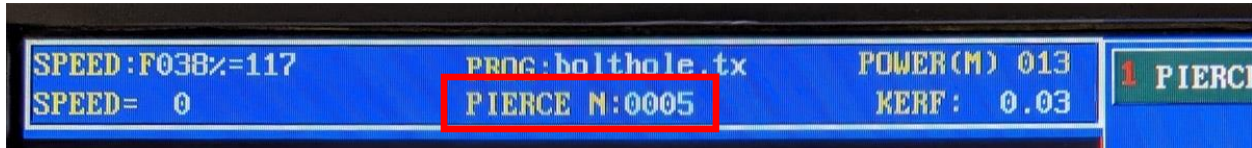
N-PIER [F6]: Number Pierce- Type in number, press enter, and it will jump to that pierce. See the section above [5.6.1.1](#) for using N-Pierce in more detail.

RECEDE [F7]: Pressing this button rewinds one part each time it is hit. Use Zero Test +1 to start cutting or FRONTAD [F8] to skip this part and start cutting on the next.

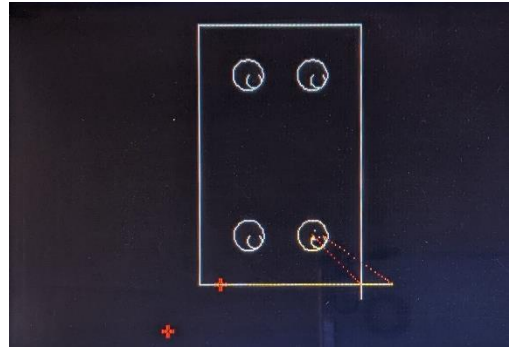
FRONTAD [F8]: Front Advance -Traces the current part and starts cutting on the next one.

5.6.3. Using Section to Restart

Using Section allows the user to start the program on a specific pierce or even line number in the program, if known. To put it differently, the program can be restarted on any hole or cutout in the program.



The pierce number can be seen at the top of the screen. In this example, this part was stopped during the 5th cut, after 4 holes were cut.



1. Go into AUTO mode, if not there already.
2. Press the SECTION[F1] button.



3. The following pop-up will appear. If the program line number is known, that can be selected. Otherwise, arrow down SELE N-PIERCES to select the pierce number.



4. Press ENTER.
5. Type in the number of the pierce to start on. In this example, it is 5.

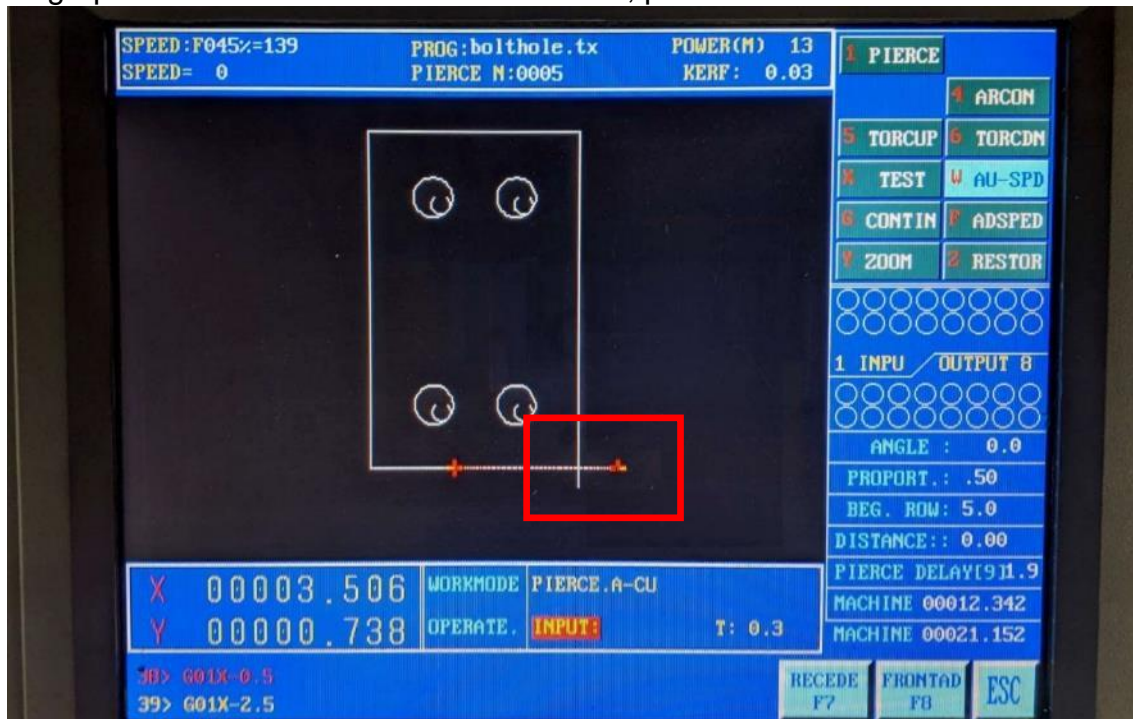


6. Press ENTER.

7. Press Cycle Start.
8. This pop-up will appear. Arrow down to FROM REFERENCE.



9. Press ENTER.
10. The torch will travel to the start of the pierce picked earlier and show on the graphics. If this is not the correct location, press ESC and start over.



11. Press the ZERO TEST on the torch height control to re-establish cutting height.
12. To start cutting from this point, press '1' to pierce and continue the program.
13. Or to minimize the amount of material re-cut do the following:
 - a. Press Cycle Start and the head will start moving but will not start cutting immediately.
 - b. Press Cycle Stop just **before** the head approaches the area the cut was lost.
 - c. Press '1' to pierce and continue the program from that point.

5.6.4. Break Point Resume

After the system is paused from a CYCLE STOP, EMERGENCY STOP, or POWER OFF, the system saves the current torch position as a breakpoint. The breakpoint will remain active even if the system is turned off. If a different program is selected, then the breakpoint will be lost.

Break Point Resume is easy to use but will not work in all cases. For example, if the arc was lost the CNC may not create the breakpoint at the right spot. If you stop the machine due to poor cutting, the breakpoint will be created where you stopped but that might be after the poor cutting has started. In these cases, use Section to Restart, page 94, instead.

1. To use the BREAK POINT RESUME function, the control must be in AUTO mode.



2. Press the RESBREK button.



3. Press CYCLE START button.



4. If the current program matches the last program to run and the torch has not been moved, then it will continue the program from the break point.
 - a. Use Zero Test +1 to start cutting.
5. If the torch has been moved, the following dialog will display.



6. Use the arrow key to select one of these options:
- The first option is **ORI PATH RET** (original path return). With this selection, the system will return the torch to where it stopped cutting. This is usually the selection needed.
 - After selecting the correct option with the arrow key, press ENTER. The torch will travel into position, if necessary.
 - If the program was stopped traveling from part-to-part**, on a G00 line, press CYCLE START.
 - Or if the program was stopped mid-cut:**
 - Press the ZERO TEST on the torch height control to re-establish cutting height.
 - Then press '1' to pierce and continue the program.
 - The second option is **CUT RET**, with this selection the system will pierce at its current location and move in a straight line at cut speed to the breakpoint and then continue with the programmed contour.
 - Press the ZERO TEST on the torch height control to re-establish cutting height.
 - After selecting the correct option with the arrow key, press ENTER. Cutting will start immediately.
 - The third option is **HOLE HERE**, with this selection the system will pierce in its current location and shift the machine coordinates such that the breakpoint is located at the current pierce location and the program will continue the contour from this pierce location.
 - Press the ZERO TEST on the torch height control to re-establish cutting height.
 - After selecting the correct option with the arrow key, press ENTER.
 - Press ENTER again, then press '1' to pierce and continue the program.

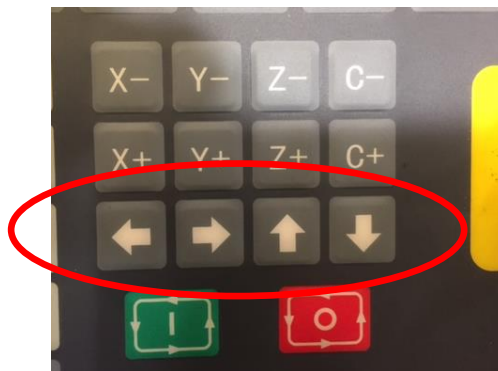
5.7. Trim Cuts

Use the following procedure to manually trim areas of the raw material, for example, trimming the used skeleton in order to save a remnant.

1. Press F2 [MANUAL].



2. Move the torch to the area you wish to begin by using the arrow keys. If you want to start on the edge of the material, move the torch above the material near the location you wish to begin. It is important that the torch is located above clean material.



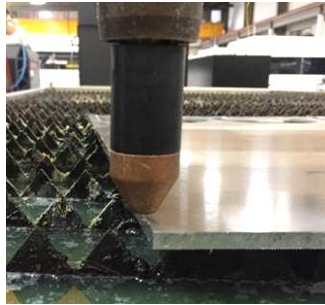
3. On the Torch Height Control, switch the AUTO/MANUAL switch to MANUAL.



4. On the Torch Height Control, press the ZERO TEST button. The torch should contact the material and move to the initial pierce height.



5. If edge starting, move the torch to the edge of the material you wish to pierce by using the arrow keys. Do not move too far away from the location you zeroed the torch.



6. Still in manual mode on the controller, set the cutting speed one of two ways: press F, and type in the value and press enter. Or press the F+ / F- buttons, until the desired cutting speed is shown in the upper left-hand corner of the screen.



7. Press the (1) button to ignite the torch.



8. Move the torch by using the arrow keys. Only one axis (X or Y) can be moved at a time. During this process, you may wish to change the Torch Height Control back to AUTO (this must be done after cutting begins)
9. When reaching the end of the cut, press the (4) button to extinguish the arc.



10. Put torch control back into **Auto**.

5.8. Finding Correct Arc Voltage when Cutting Copper

Please see the following procedure for finding appropriate arc voltage in different materials, such as copper. It involves cutting a straight line while in MANUAL mode to find the correct arc voltage.

1. Use mild steel cut parameters for speed and consumables, but not for arc voltage.

45A Shielded Mild Steel		Air flow rate - slpm/scfh	
		Hot	150 / 310
		Cold	210 / 450

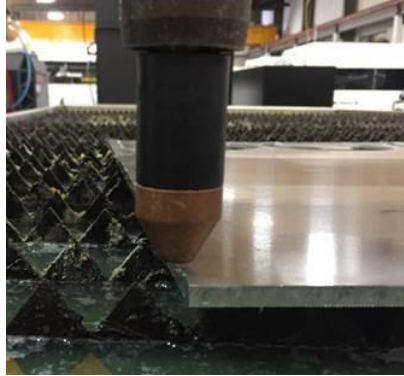
Metric								
Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
		mm	%		Cut Speed	Voltage	Cut Speed	Voltage
mm	mm	mm	%	seconds	(mm/min)	Volts	(mm/min)	Volts
0.5	1.5	3.8	250	0.0	9000	128	12500	126
1					9000	128	10800	128
1.5				0.1	9000	130	10200	129
2				0.3	6600	130	7800	129
3				0.4	3850	133	4900	131
4					2200	134	3560	131
6				0.5	1350	137	2050	132

English								
Material Thickness	Torch-to-Work Distance	Initial Pierce Height		Pierce Delay Time	Best Quality Settings		Production Settings	
		in	%		ipm	Volts	ipm	Volts
	in	in	%	seconds	ipm	Volts	ipm	Volts
26GA	0.06	0.15	250	0.0	350	128	500	128
22GA					350	128	450	128
18GA				0.1	350	129	400	128
16GA					350	130	400	129
14GA				0.2	270	130	320	129
12GA				0.4	190	133	216	131
10GA					100	134	164	131
3/16 in				0.5	70	135	108	132
1/4 in				0.6	48	137	73	132

2. Bring the torch down so that the gap between the nozzle and the workpiece is the same as the torch-to-work distance called for in the Hypertherm manual. This is best done by adjusting the IHS value in the Microstep height control and doing a Zero Test to come up with a gap that is somewhat close to the required distance – typically a value of 1 or 2 will be sufficient.

26GA	0.06	0.15	250	0.0	350	128	500	128
22GA					350	128	450	128
18GA				0.1	350	129	400	128
16GA					350	130	400	129
14GA				0.2	270	130	320	129
12GA				0.4	190	133	216	131
10GA					100	134	164	131
3/16 in				0.5	70	135	108	132
1/4 in				0.6	48	137	73	132

3. Move the torch to the edge of the material so that the center of the nozzle is on the edge of the material.



4. Turn the switch on the Microstep torch height controller to MANUAL.



5. Go to MANUAL mode on the Starfire control. Make sure that HIGH SPEED is NOT selected. Adjust the jogging feed rate to equal the Cut Speed called out in the Hypertherm manual by pressing F, typing in the feed, and pressing enter.
6. On the Starfire control, start the arc by pressing the '4' button, and then immediately pressing the arrow button to jog in the direction of cut (into the material). Only one direction can be used at a time.
7. While the arc is cutting, read the arc voltage on the Microstep display. This should be the starting point for arc voltage. Turn the arc off by pressing the '4' button again.



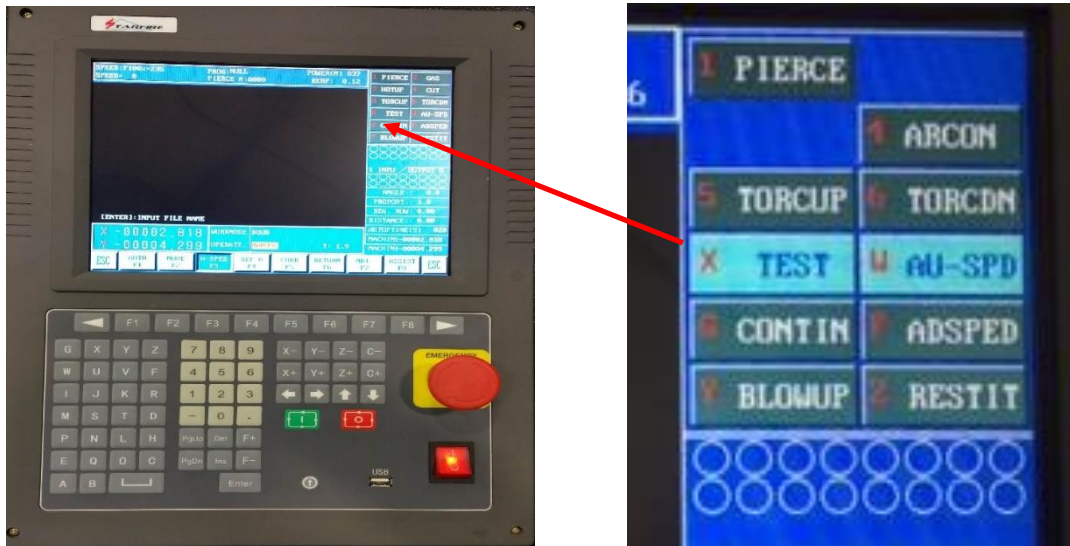
8. Switch back to AUTO on the Microstep controller
9. Turn the IHS Height value back to its appropriate value for pierce height.

Now that you have a starting point for arc voltage, you can set the Microstep controller to this value and adjust it slightly up or down to improve cut quality.

5.9. Test Mode (Dry Run)

The TEST Mode function allows the operator to run the program without starting the torch or cutting.

1. In AUTO mode, press the [X] button and the TEST location on the Display becomes illuminated. The operator can now press the START button and the program will run without cutting.
2. In TEST mode, the program defaults to maximum feedrate, not at the programmed cutting speed.
3. To quit the TEST mode, press the [X] key again, and the TEST location no longer will be illuminated.



5.10. Other Functions

5.10.1. Rotate

Under the Assist submenu, this function rotates the program by the degree entered. For example, if 90.0 is entered, the program will rotate 90° around the reference point. Because the point of rotation is around the reference point, and not the center of the part, the reference point may need to be moved. In other words, the program spun around the torch location, and now the torch will need to be moved over and Ref 0 will need to be redone to cut in the same spot as before the rotation.

The rotate function is incremental/cumulative. Once the program has been rotated 90°, rotating it 90° again will result in 180° rotation total.

Use [F8] RESTO (restore), in that same submenu, to cancel rotate mode.

On the left is the image before 90.0 rotation (The 90.0000 has been typed in but enter



has not been hit). Notice the red plus sign as the reference point.

On the right, the part is rotated. Notice the part in relation to the red plus sign.

5.11. Nesting

The CNC control has a nesting function where parts can be automatically placed on a sheet of material for cutting. This can be used with items within the Shape Library, or with items that are programmed using the ProNest programming system.

A maximum of 100 pieces / parts can be placed in a single nest.

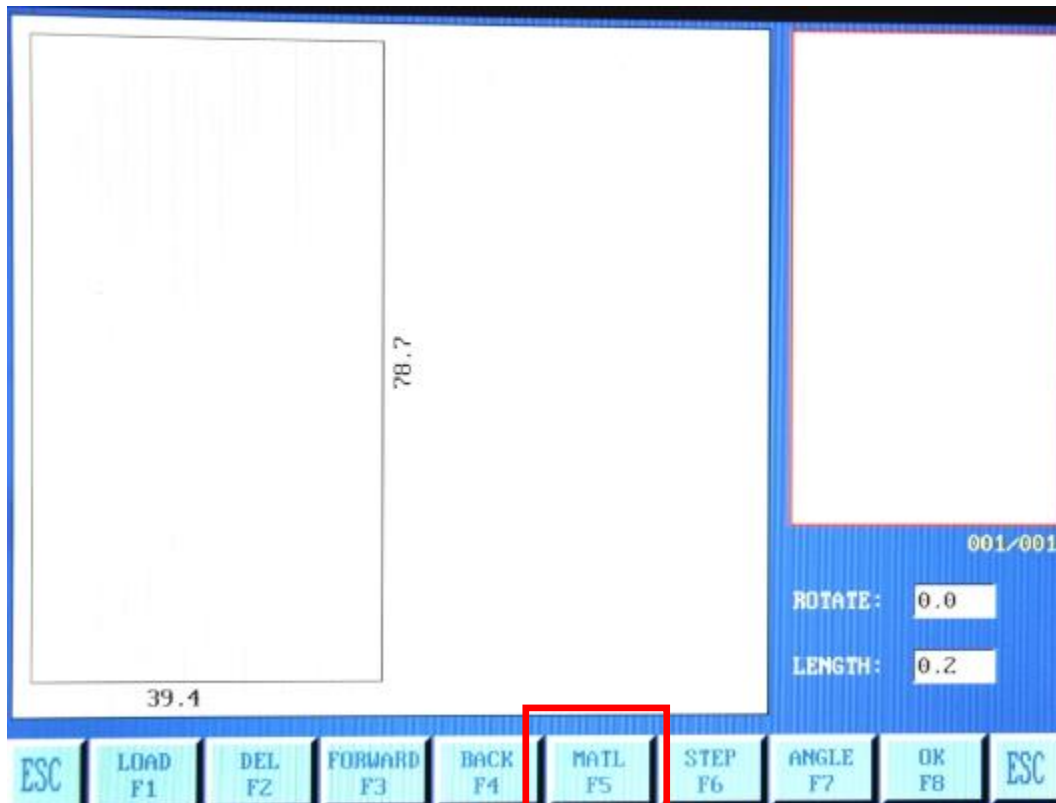
NOTE: It is important that all individual part programs used in the nesting system return to the program zero point at the end of the program. Failure to do this will result in unusable nests.

Use the following sequence to create nests:

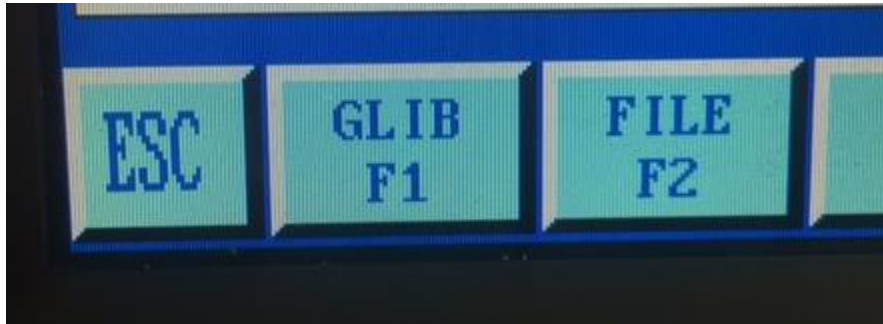
1. From the HOME page, select F7 [NEST]



2. The following screen will appear. Press the F5 [MATL] key to adjust the size of the plate.

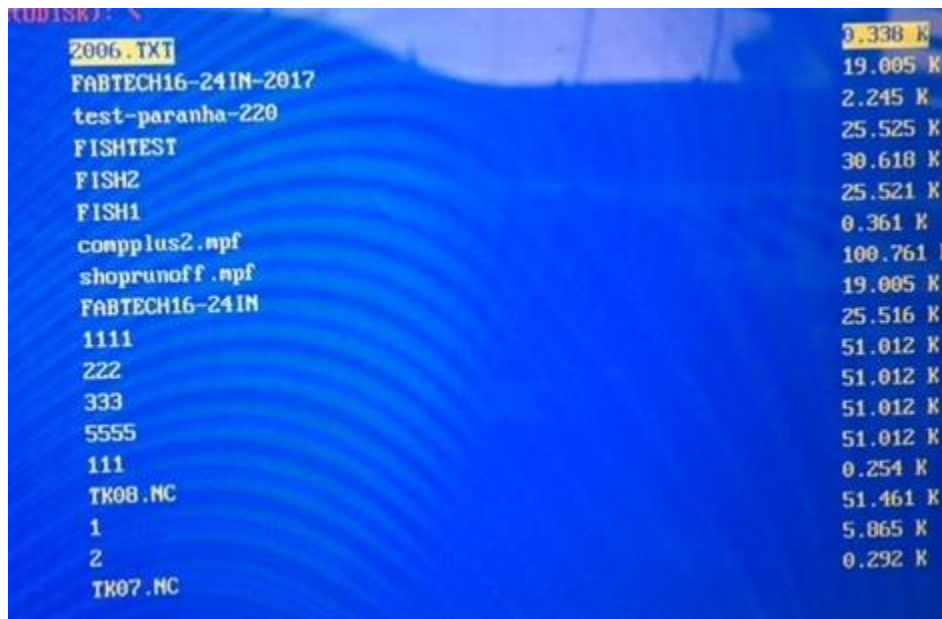


3. Select the part program you wish to nest. This can be from the Shape Library (F1), or from a File (F2).

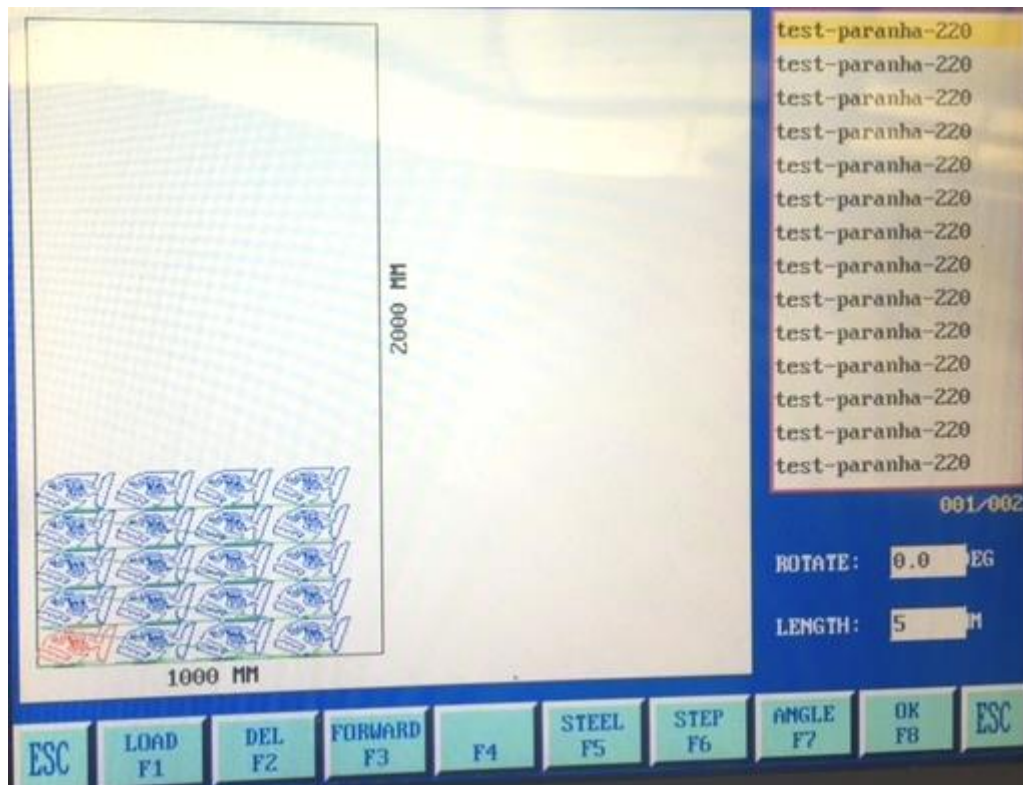


NOTE: Only files from Shape Library #1 can be entered using the F1 key. If shapes are required from Shape Library #2, you must create the shape inside Shape Library #2 and save it to a file first. Then you can nest that part by choosing F2 File (see 4 below).

4. Select the Saved File you wish to nest and press [ENTER]:



5. You will be prompted to input the number of parts. Type in the number of parts you wish to cut and press [ENTER]. The screen will then populate the parts onto the raw material:



6. Individual parts can be modified by selecting the part with the up and down arrow keys to select the part (on the right-hand side of the screen) and edit as follows:
 - F2 [DEL] – Deletes a part
 - F3 [FORWARD] – Moves the part in the cut order
 - F7 [ANGLE] – Rotates the part
7. Additional (different) parts can be added by loading more parts. Use the F1 [LOAD] key to add more parts.
8. Once you are satisfied with the nest, press F8 [OK]. You will be prompted for a file name to save the nest.
9. You can now run the nest in AUTO mode.

5.12. Database

There is a Material Library located in the CNC Control, accessed through the Database button from the Home screen. It is a future feature and in development.

Chapter 6: PROGRAMMING



Hypertherm ProNest® LT programming software for any Windows-based PC programming software is included with each machine. This software allows users to import part geometry, create nests of parts, and output code for the Piranha plasma machine to use. The ProNest software line includes industry leading CAD/CAM nesting solutions designed for advanced mechanized cutting. It provides a single solution for all your profile cutting needs, including plasma, laser, waterjet, and oxyfuel.

A disk with the installation files is shipped with the machine, along with a license dongle which plugs into the USB port of your computer. For an additional cost, an upgrade to the full ProNest is available through Piranha.

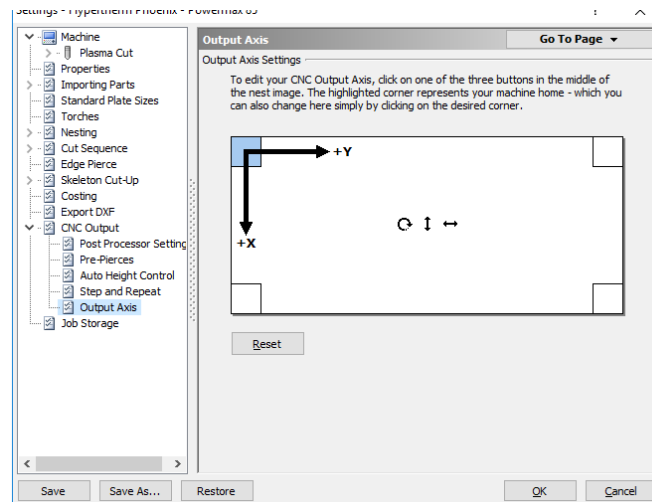
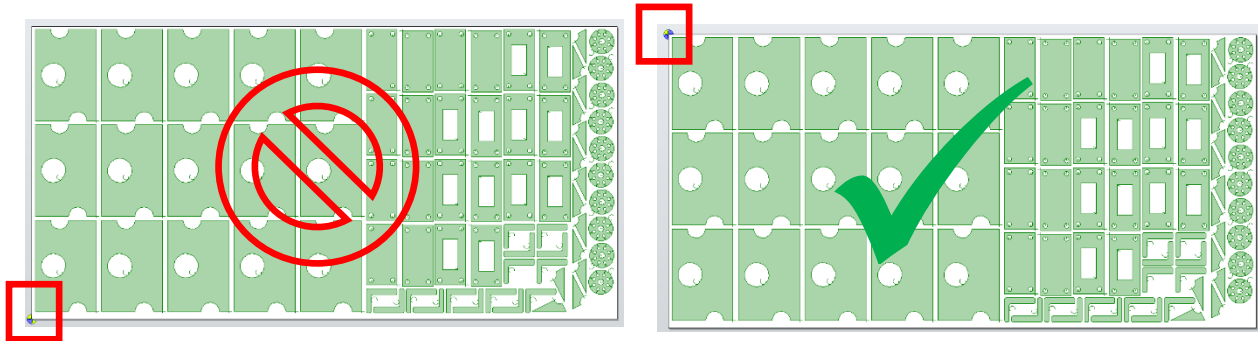
While Piranha technicians can answer some questions, full training and support are available thru the experts at Hypertherm ProNest.

<https://www.hypertherm.com/en-US/hypertherm/pronest/pronest-cadcam-nesting-software/> or call (716) 434-3755 or email CAMUSSupportQueue@Hypertherm.com.

6.1. ProNest Tips

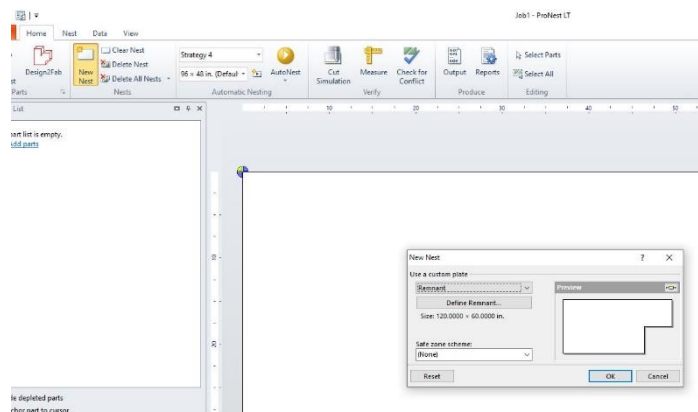
6.1.1. Output Axis

Confirm the output axis setting are correct in ProNest LT to match the machine, otherwise the programs will be rotated on the machine. This is done thru the settings>Output Axis menu.



6.1.2. Remnant Nesting

A less known function of ProNest LT is the ability to create odd-shaped remnant sheets when creating a new nest.



6.2. Programming Codes

6.2.1. G Codes

Code	Argument	Function
G00	X, Y	Fast positioning point to point
G01	X, Y	Linear cutting
G02	X, Y, I, J	Circular cutting clockwise
G03	X, Y, I, J	Circular cutting counter-clockwise (not used)
G04	L	Dwell (stop-delay) in whole seconds
G20		Inch
G21		Metric
G26		Back to reference point axis X
G27		Back to reference point axis Y
G28		Back to reference point axis X and Y
G40		Cancel compensation
G41		Compensation left
G42		Compensation right
G90		Absolute distance mode
G91		Incremental distance mode
G92	X, Y	Reference point set-up, must be first line in program

6.2.2. M Codes

CODE	FUNCTION
M00	Pause program
M02/M30	Program end and return to reference
M07/08	Plasma cutter ON/OFF

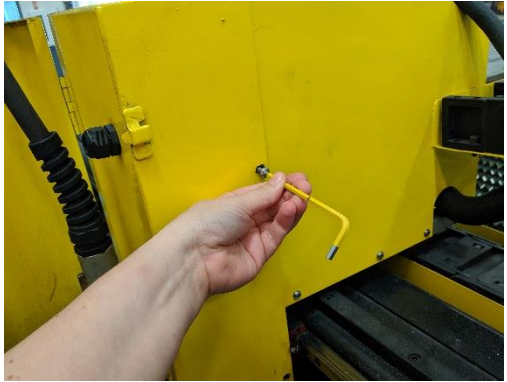

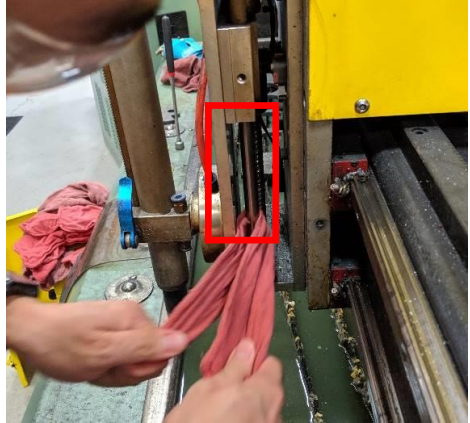
Chapter 7: MAINTENANCE




The following maintenance items should be done on a planned basis:

Maintenance Item	Frequency
Empty slag pan(s) on machines with exhaust fan	Daily or as needed
Clean slag out of water pan on machine with water table	Daily or as needed
Inspect Slats and Replace where necessary	Weekly
Wipe Linear Guides X and Y Axis Wipe with dry, lint-free cloth; Then apply light machine oil e.g. Mobil Vactra #2	Weekly
Lubricate X-Axis (1) and Y-Axis (2) Racks “Moly” Dry Film Spray Lubricant (Found at Grainger or some auto supply stores)	Quarterly
Wipe Torch Height Control Guide Rods Remove Yellow Cover Behind Torch Wipe with dry, lint-free cloth; Then apply light machine oil e.g. Mobil Vactra #2	Quarterly
Lubricate X-Axis (4 total) and Y-Axis (2 Each Side) Bearings Premium Grade lithium base, extreme pressure grease such as Shell Alvania EP-1 or Mobil Mobilux EP-1, or equivalent	Annually

In addition, the operator should take care to clean the machine and surrounding areas regularly, as needed, in order to maintain a safe work environment.

7.1. Torch Height Control Linear Guides & Ball Screw Maintenance

1.	Press Estop on the machine and turn off the plasma supply before doing any maintenance.	
2.	Take off the four bolts, two on either side, that hold the cover on the torch.	
3.	Slip the cover off by bringing it up and under the torch lead. Do this carefully so no wires or cables are damaged.	
4.	Wipe the two linear guides, one on each side, with a dry clean rag.	

5.	<p>Clean the ball screw. This is harder to access. It may be best to clean first with a soft wire brush to loosen debris and then wipe with a rag.</p> <p>The most important section to have clean is bottom of the guides and ball screw.</p>	
6.	<p>Lightly spray the two guides and ball screw with any Moly dry film lubricant spray.</p> <p>Dow Corning Molykote 321 shown but any Moly dry film lubricant spray will work. These are found at industrial supply stores such as Grainger or some auto supply stores.</p>	
7.	<p>Optional: Bring the CNC out of the Estop and lower the torch. Press Estop again before cleaning or inspecting the torch. With the torch lower, it is easier to see and clean the linear guides and ball screw.</p>	
8.	<p>Carefully replace the cover and 4 bolts.</p>	

7.2. Error Code List

Error Code	Description
01H	Overflow/illegal character(s) in program
20H	Division Overflow
21H	Error Starting/ending point of arc
22H	Error radius of arc
24H	Error condition of arc
2AH	Overflow program line. No torch movement of this line
34H	Illegal Operation
40H	Emergency stop pressed
41H	Limit X+
42H	Limit X-
43H	Limit Y+
44H	Limit Y-
45H	Negative limit of software coordinates
46H	Positive limit of software coordinates

7.3. Machine Setup Parameters

For Starfire software version:

- 3.1-2.8.0 or later
- 3.1-2.8.0-FAT or later

The parameters in the SETUP section of the control should be set as follows. Values in red will vary by machine; see notes at the bottom.

INITIAL SETUPS		
FROM MAIN PAGE---> SETUP--->SPEED (F1)		Note
STARTUP	00020	
TIMING (S)	00.30	
CORNER ACCELER (S)	00.25	
HIGH SPD	00314	
LIMIT SPEED (S)	00314	
RET ORIGIN SPEED	00118	
RECEDE/FRONTAD SPEED	00118	
TESTING SPEED	00314	
SPD TRAN ANGLE	030.00	
CORNER RADIUS	000.20	
CURVE SPEED	00020	
CURVE RADIUS	000.00	

FROM MAIN PAGE---> SETUP--->SYSTEM (F2)			Note
NUMERATOR	X:00416	Y:00416	
DENOMINA-	X:00125	Y:00125	
MA-ORIGIN	X:0001.00	Y:0001.00	*1
REFERENCE	X:0000.00	Y:0000.00	
OFFSET	X:0000.00	Y:0000.00	
CLEARANCE	X:0000.00	Y:0000.00	
DIR-ORIGIN	X:-1	Y:-1	Negative
SOFTLIMI+ (4' x 4' MACHINE)	X:000049	Y:00049	*2
SOFTLIMI+ (4' X 8' MACHINE)	X:000049	Y:00097	*2
SOFTLIMI+ (5' X 10' MACHINE)	X:000061	Y:00121	*2
SOFTLIMI-	X:0000.00	Y:0000.00	*3

FROM MAIN PAGE---> SETUP--->PLAS (F4)		Note
TORCH LOCATE TIME	000.50	
TORCHUP TIME (M70)	00.80	
TORCHDN TIME (M71)	0	
ARC-FEEDBACK (0/1)	1	
DETECT DELAY	00.00	
LOCATE CHECK (0/1)	0	
LOCATE CHECK (0/1)	0	
PIERCE TIME	Varies	*4
OFF DELAY	00.00	
DIS. COR. OFF ARCS	0.4	
SPEED OFF AHCS (MM/MIM)	00000	
ANTICIP OFF AHC	0.1	
ANTICIP OFF AUTO-SIG (MM)	00000	
AHCS AUTO-SIG DELAY (S)	01.0	
AHCS AUTO-SIG DIS (MM)	00.0	
SPEED OFF AHCS (MM/MIM)	00100	
ARC ON M ORDER	12	
ARC OFF M ORDER	13	

FROM MAIN PAGE---> SETUP--->CTRL (F5)	
PLASMA(1)/FLAME(0)	1
AUTO ACC SPEED	1000
EXTEND PIERCE (0/1)	0
MA-COORDINATE	00
SELECT CYLINDER UP/DOWN (0/1)	0
CTRL-OUTSIDE (0/1)	0
WIRED-0/RF05-1/RF06-2	0
G41/G42 CHECK EFF (0/1)	1
SOFT LIMIT EFF. 1/INE.0	1
LIMIT POSI EFFECT (0/1)	1
SELECT AUTO-REFERENCE (0/1)	1
CHECK COLLIDE (0/1)	0
COLLIDE LOGIC (0/1)	0
COLLIDE PAUSE (0)/TORCHUP(1)	0
PAUSE UP TORCH (0/1)	1
NUMERATOR	00
NUMERATOR	00
NUMERATOR	01

CUTTING LINE (BREAK.MM)	NOT USED
BRIDGE CUTOFF LINE (MM)	NOT USED
SELECT GIO PLASMA/FLAME	0
DISP NAME (0/1)	0
SELE PLOT KERF LINE (0/1)	1

***1. MA-ORIGIN:** When X:1.0 Y:1.0, will set the machine tool origin 1 inch both in x and y hard machine zero.

***2. SOFTLIMI +=:** Sets X and Y soft limits, or how far the torch can travel in each direction. Notice this varies by machine table size.

***3. SOFTLIMI -=:** How far away the main system will allow torch to go past reference zero point (e.g. X:-0001.00 y:-0002.00 means the torch can go to 1 inch along the X-direction and 2 inches along the Y- direction past the reference zero point

***4. PIERCE TIME:** Pierce delay time changes according to the material thickness and is set in the Auto screen.

7.4. Initial Settings – Microstep Torch Height Control

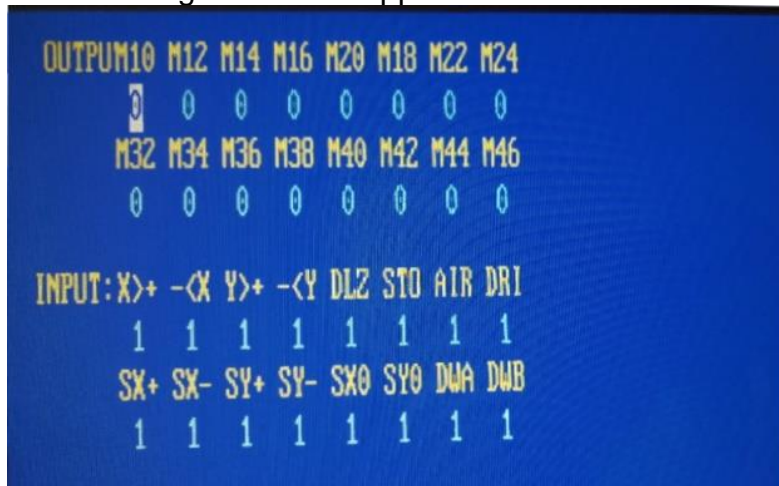
Please contact Piranha for the latest settings.

7.5. Inputs and Outputs

From the main menu, press F5 [DIAGNOSE] to access the inputs and outputs



The following screen will appear



The following is the list of inputs and outputs that are used on the B & C Series Plasma Table:

OUTPUTS:

- M12 – Arc On / Water Solenoid On
- M14 – Torch Up
- M16 – Torch Down
- M38 – Torch Height Control Auto Signal

INPUTS:

- <X – Origin Proximity Switch (X Axis)
- <Y – Origin Proximity Switch (Y-Axis)
- DLZ – Arc Feedback
- STO – Emergency Stop
- AIR – Air Pressure Switch
- DRI – Drive Fault Alert

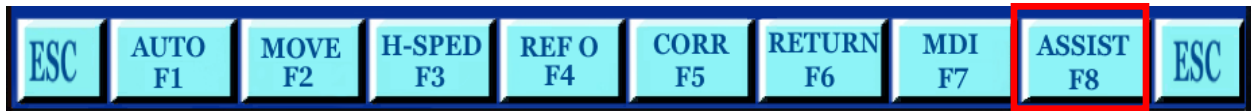
7.6. Procedure - Setting Machine Zero

If the machine has lost its zero-home position, use the following procedure to re-set MACHINE ZERO. MACHINE ZERO is different than PROGRAM ZERO - this procedure should not be used to set PROGRAM ZERO.

1. Press F2 [MANUAL].



2. Press F8 [ASSIST].



3. Press F5 [MEASURE].



NOTE: As an alternative to the first three steps, you can simply jog the machine to the location you wish to set machine zero.

1. Choose F4 [SETUP] from the Home Screen.



2. Choose F2 [SYSTEM].



3. In the parameters, find [DIR-ORIGIN]
4. Set X00 Y00

UNIT:MM, SECOND

NUMERATOR	X:00416	Y:00416
DENOMINA-	X:00125	Y:00125
MA-ORIGIN	X:-0027.84	Y:-0013.81
REFERENCE	X:0000.00	Y:0000.00
OFFSET	X:0000.00	Y:0000.00
CLEARANCE	X:0000.00	Y:0000.00
DIR-ORIGIN	X:00	Y:00
SOFTLIMIT+	X:00061.0	Y:00121.0
SOFTLIMIT-	X:00000.0	Y:00000.0

PARAMETER: -31000.0 < P < 31000.0

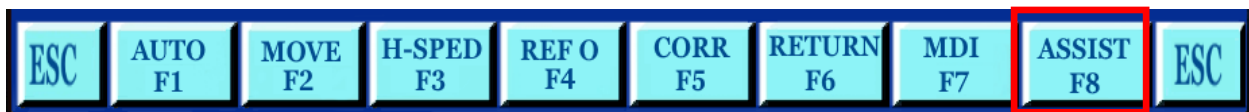
5. Press F8 [SAVE].



6. Press [ESC] until the screen returns to the main screen.
7. Press F2 [MANUAL].



8. Press F8 [ASSIST].



9. Press F6 [ORIGIN].



10. Press [ESC] until the screen returns to the main screen.

11. Choose F4 [SETUP] from the Home Screen.



12. Choose F2 (SYSTEM)



13. In the parameters, find [DIR-ORIGIN] – set X to -1 and Y to -1.

NUMERATOR	X:00416	Y:00416
DENOMINA-	X:00125	Y:00125
MA-ORIGIN	X:-0027.84	Y:-0013.81
REFERENCE	X:0000.00	Y:0000.00
OFFSET	X:0000.00	Y:0000.00
CLEARANCE	X:0000.00	Y:0000.00
DIR-ORIGIN	X:-1	Y:-1
SOFTLIMI+	X:00061.0	Y:00121.0
SOFTLIMI-	X:00000.0	Y:00000.0
PARAMETER: 00001 < P < 65535		

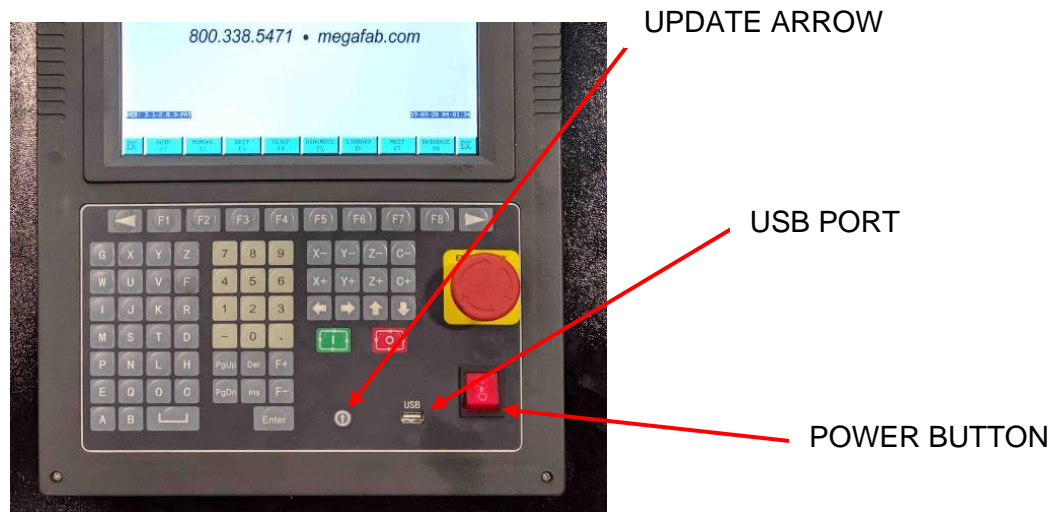
14. Press F8 [SAVE].



7.7. Updating Control Software Procedure

FROM USB DRIVE

1. Before putting in the USB drive, push the update ARROW and turn on the power button.
2. When the screen starts to change, release the button.
3. When the screen stops changing, locate and note the version of STARFIRE control software on the screen.



4. Choose the USB for updating the control from that version.
5. Turn the power supply off, plug in the USB drive.
6. Hold the update ARROW down and turn the power on.
7. Release the button when the screen starts to change.
8. You will see the blue screen with two white squares on bottom left.
9. Push F1.
10. Turn off the power with the red power button when the screen stops changing.
11. Re-start the control with the red power button.

7.8. Squaring the Machine Procedure

The machine may become out of square if the bridge is pushed while power is off. This can also occur during shipping and handling – while moving the machine to its final location.

Since the bridge was squared at the factory, the bridge bolts should still be in their factory set location and should not be loosened. Instead, the machine can easily be squared again by adjusting one side of the bridge relative to the other. This can be done by removing power to one of the drive motors (while the other drive motor maintains its position) and pushing the bridge to its square position.

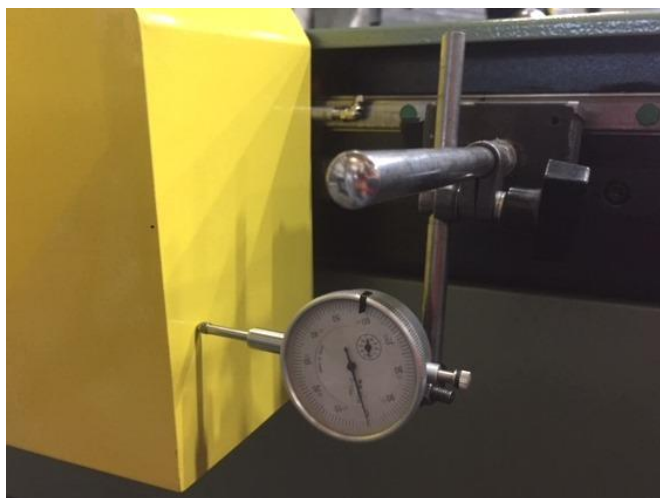
Tools needed: Magnetic base dial indicator; carpenter's square; feeler gauges or calipers

7.8.1. Determine How Much Out of Square the Machine is:

1. Cut a 24" x 24" square plate
2. Determine its squareness by checking it with a carpenter's square and feeler gauges (calipers can be used in lieu of feeler gauges)
3. Multiply the out of square amount by the distance between Y-axis pinions divided by the width of the square (24").
 - a. For 48" wide machines, the distance between pinions is 68"
 - b. For 60" wide machines, the distance between pinions is 80"
4. For example, if the 24" square is out of square by .010", and the distance between pinions on a 60" machine is 72", then the gantry needs to move $.010" \times (80/24) = .033"$

7.8.2. Adjust the Squareness

5. Set a dial indicator up against the gantry cover on the Y2 side of the machine (side opposite the cable carrier side)



6. Set the dial on the indicator to zero



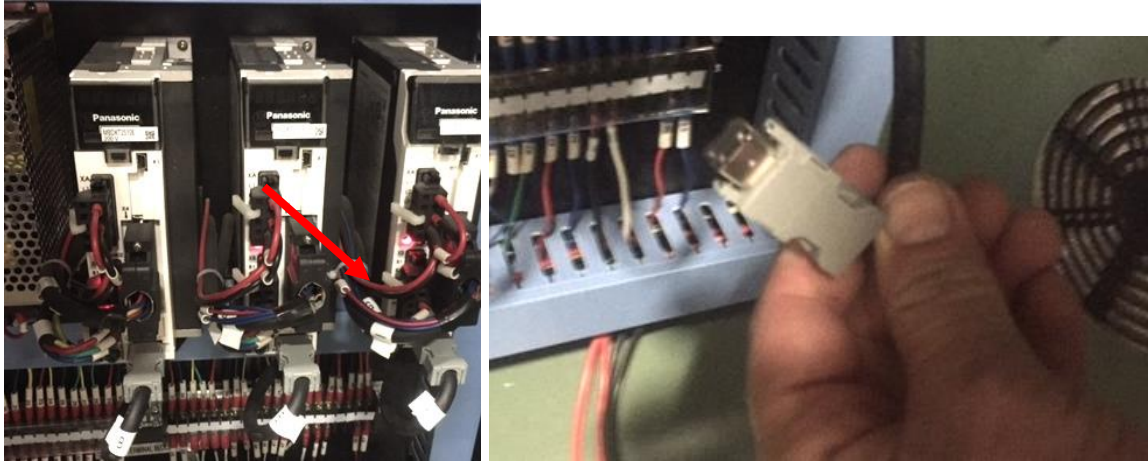
7. Turn the power switch on the CNC control off.



8. Turn power off to machine (Main disconnect)



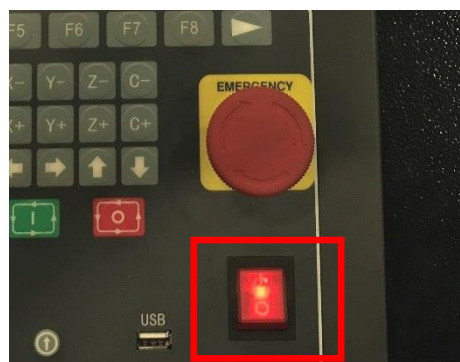
9. Unplug the motor cable from Y2 Drive (the drive on the right hand side inside the electrical enclosure). To unplug the cable, squeeze the two tabs on either side of the plug and remove it from the drive.



10. Turn power back on to machine



11. Turn CNC control on (machine must not be in E-stop condition)



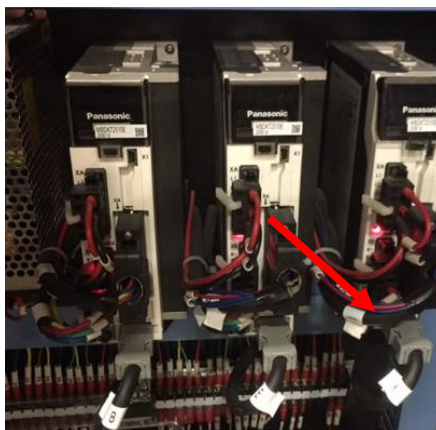
12. Push the Y2 side of the gantry until the dial indicator reads the desired amount (from step 1)
13. Turn CNC control off



14. Turn power off to machine (Main disconnect).



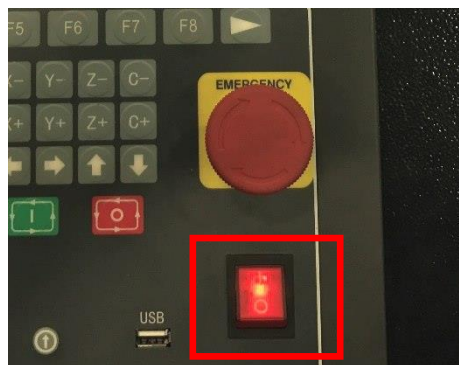
15. Plug the Y2 motor lead back into the Y2 Drive



16. Turn power back on to machine




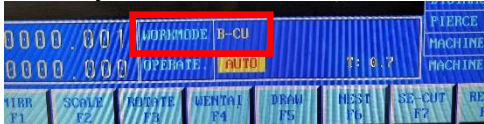
17. Turn CNC control on (machine must not be in E-stop condition)



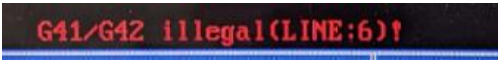
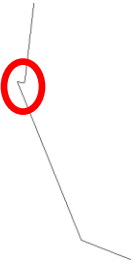
18. Run squareness test again (step 1)
19. Repeat the procedure as necessary until the desired squareness is achieved

7.9. Troubleshooting Guide

The most common issues for a new user are often caused by simply skipping a step. Another common issue is hitting one too many buttons and changing a value that wasn't to be changed.

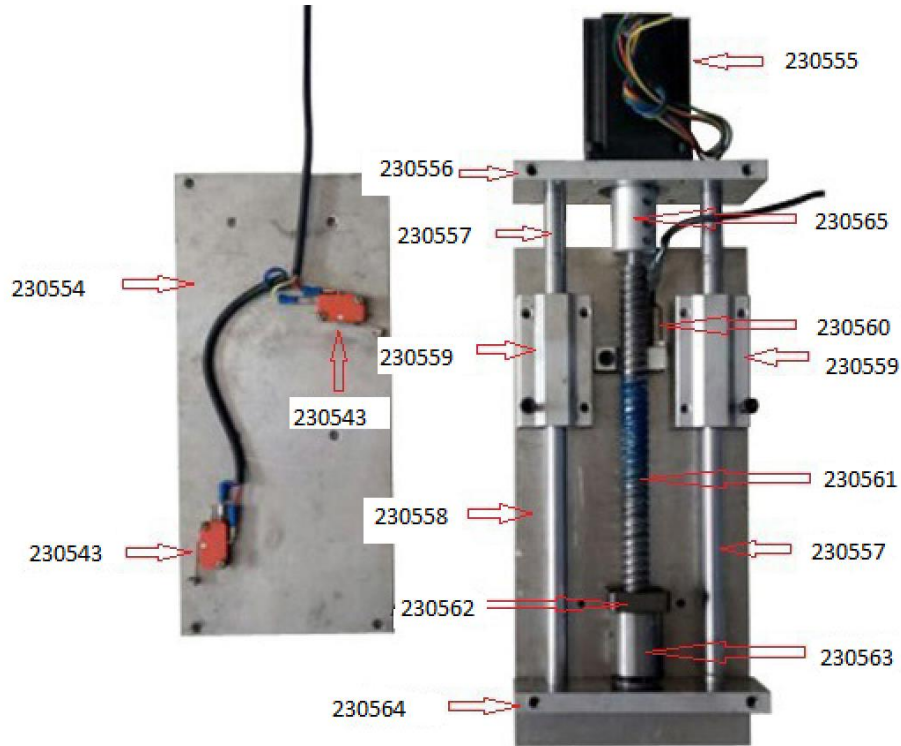
	Issue	Possible Solutions
1.	Cutting speed too fast or too slow Manual jog speed too fast or slow	To change the cutting speed, the machine must be in Auto mode. To change the manual jog speed, the machine must be in Manual. See Adjusting Speeds on page 74.
2.	Cut appears incomplete 	Make sure the pierce delay is set correctly: 1.5 seconds plus the book value for that material type and thickness. See Setting Pierce Delay Time on page 73.
3.	Machine moves before arc initiates	Check or increase PIERCE DELAY setting. Value should be a minimum of 1.500
4.	Workmode is incorrect: It reads B-Cu, Doub, or Wentai. A-Cu, Rotate, or Array.  It should say A-Cu .	If the workmode reads B-Cu or Doub, press Auto , then Assist , then press Se-Cut until the workmode says A-Cu again. If the workmode reads Wentai. A-Cu, press Auto , then Assist , then press Wentai once and the workmode should say A-Cu again. If the workmode reads Rotate, press Auto , then Assist , then press Resto once and the workmode should say A-Cu again. If the workmode reads Array, this is the nesting function. To cancel the nest, press Auto , then Assist , then press Nest once and the workmode should say A-Cu again.
5.	Height sensor is not correctly Value got changed in the Microstep controller on accident	Check the Initial Settings – Microstep Torch Height Control on page 118.

	Issue	Possible Solutions
6.	Arc Voltage always reads zero on Arc Voltage Control	<p>Verify interface cable is wired correctly. Refer to the INSTALLATION section of the manual for correct wiring information.</p> <p>Verify all wires to the Voltage Divider Card are securely terminated. Pull on wires to make sure crimped connections are secure.</p> <p>Replace Voltage Divider Card</p> <p>Replace Torch Height Controller</p>
7.	Waviness in plasma cut edge	<p>Make sure all table slats do not have play. Slat should be curved to make sure that tension keeps them from vibrating.</p> <p>Verify that torch height control settings are set to original factory defaults. Refer to the MAINTENANCE section of the manual for default settings</p>
8.	Machine runs a short time and stops with an Air Fault	Check incoming air pressure at the regulator and make sure the regulator is set to 4.5 bar.
9.	Screen is on, but nothing else works Controller locked up	Check all Emergency Stop buttons. If one is pressed, then release it. If some buttons were pressed too quickly, the controller may lock up. Turn power off to the control, and then turn power on again.
10.	Arc turns off after cutting for a few seconds	Check that the ground clamp is connected properly to the machine. Clamp must be connected to bare metal, not on a painted surface.
11.	Arc tries to start too high off the material	<p>Check value for COMPENSATE on the Arc Voltage Control. Value should be set to 10</p> <p>Change Initial Height setting on Arc Voltage Control. Refer to the Plasma System manual for correct setting. Refer to the MAINTENANCE section of the manual for changing the setting on the Arc Voltage Control. NOTE: Value is in millimeter (MM).</p> <p>Zero Test button not pressed when doing a restart.</p>
12.	When pushing Zero Test on the Arc Voltage Control, the torch does not touch the material before it retracts	Check to make sure that the torch cable has enough play for the torch to reach the material, and that nothing is obstructing it. Try manually lowering the torch over an area with no material to check the torch travel.
13.	No Arc	Check for faults on the plasma supply unit.

	Issue	Possible Solutions
		<p>Arc may be inconsistent in materials coated with non-metallics, for example paint.</p> <p>If the Arc had been on for a little while and then it dropped, the duty-cycle limit may have been reached. See Plasma Supply Operation manual for specifics on your unit and its limits.</p>
14.	Program not found error	Try reloading the program by using Loading A Program from Control Memory on page 78.
15.	Fault on plasma supply	<p>See Plasma Supply Operation manual for specifics on your unit. However, common issues include incorrectly assembled consumables, or consumables left too loose or over-tightened. Hand-tight or “snug” is generally enough.</p> <p>A drop in the air pressure may also cause issues.</p>
16.	<p>G41/G42 error on machine</p> 	<p>The kerf on the machine is incompatible with a movement in the program code. This is most often a result of the kerf value being set larger than movement in the code.</p> <p>Lower the kerf value using the steps Setting Kerf Offset (Optional) on page 88.</p> <p>Alternatively, go back to the programming software and adjust the line or lines causing the issue. For example, a very small lead-in or lead-out could be the issue. Very small lines or radii can be the cause.</p> 

Chapter 8: PARTS MANUAL

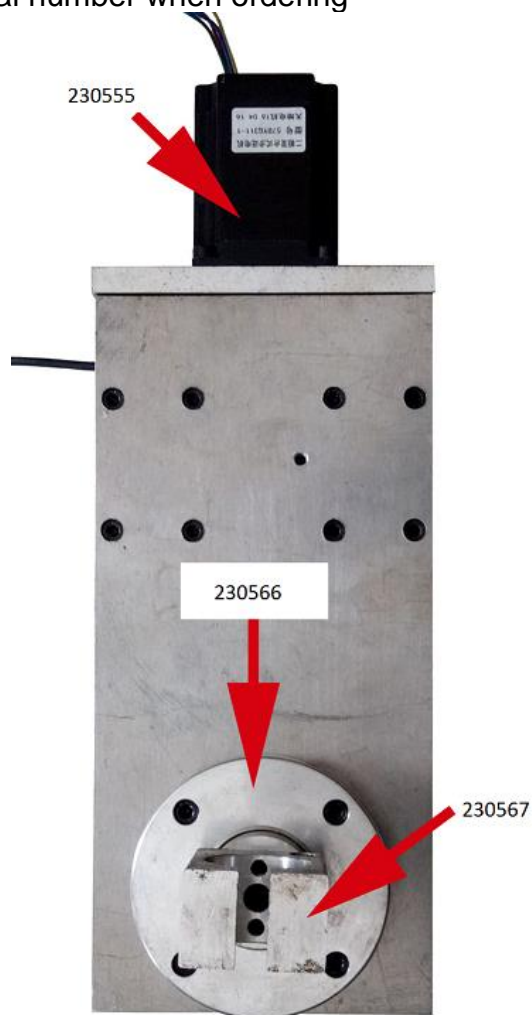
8.1. Automatic Height Control Assembly



Piranha Part #	Description
230554	AHC ASSEMBLY FRONT PLATE
230543	AHC LIMIT SWITCH
230555	STEPPER MOTOR AHC
230556	TOP PLATE
230557	GUIDE ROD
230558	BACK PLATE
230559	GUIDE BLOCK
230560	PROX. SWITCH
230561	GUIDE SCREW
230562	SCREW KEEPER
230563	SCREW NUT
230564	BOTTOM PLATE
230565	MOTOR CONNECTOR

Automatic Height Control Assembly Continued

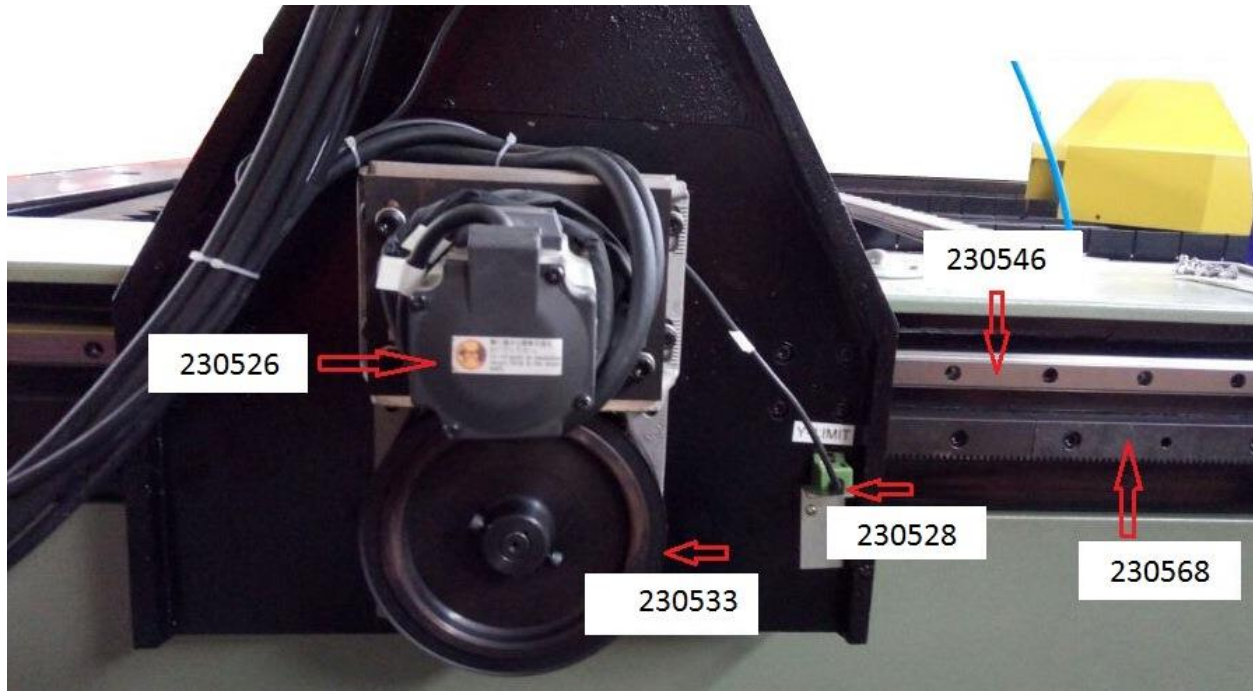
Specify model and serial number when ordering



PIRANHA PART #	DESCRIPTION
230566	ANTI-CRASH ASSEMBLY
230567	TORCH HOLDER
230555	STEPPER MOTOR AHC
230529	ANTI-CRASH SOLENOID (not shown)

8.2. Y-Axis Drive Assembly

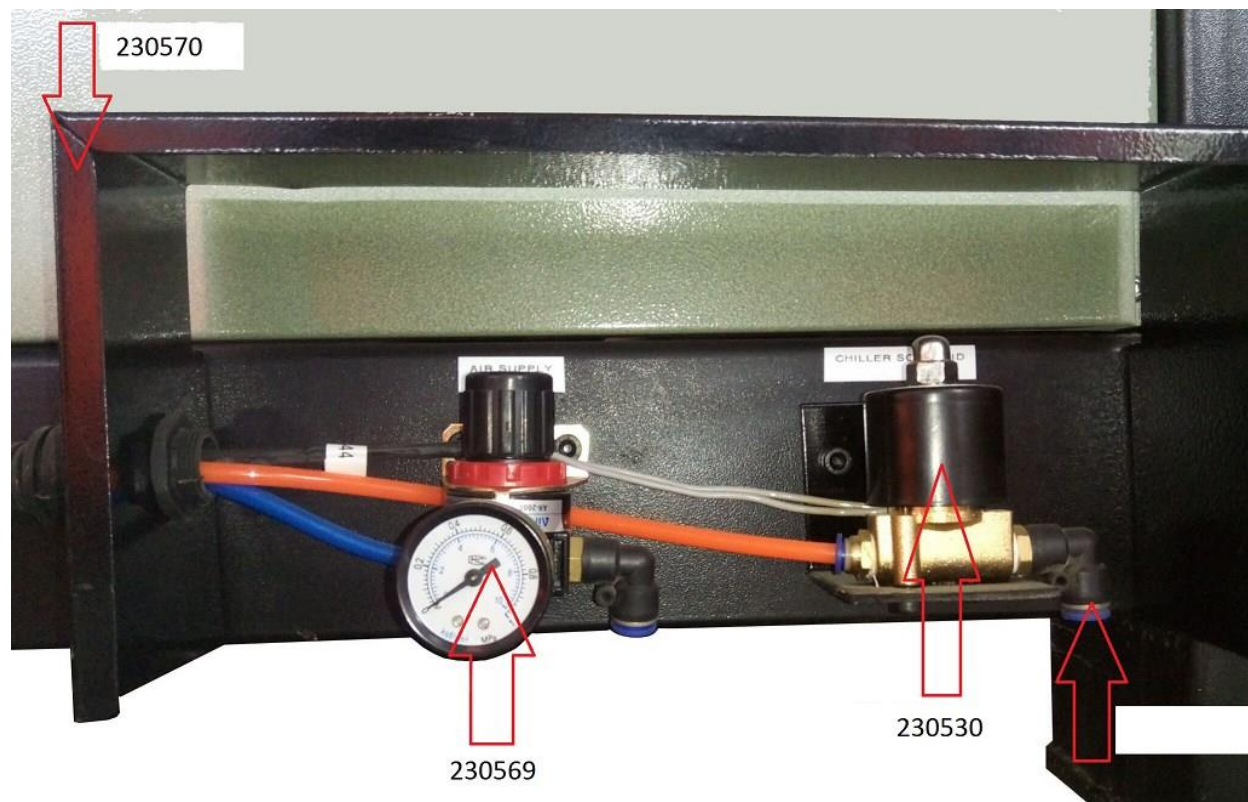
Specify model and serial number when ordering



PIRANHA PART #	DESCRIPTION
230528	PROXIMITY SWITCH
230568	MACHINE RACK
230546	LINEAR GUIDE
230544	BEARING BLOCK (NOT SHOWN)
230533	DRIVE BELT
230526	PANSONIC SERVO MOTOR 400W

8.3. Air and Water Inlet

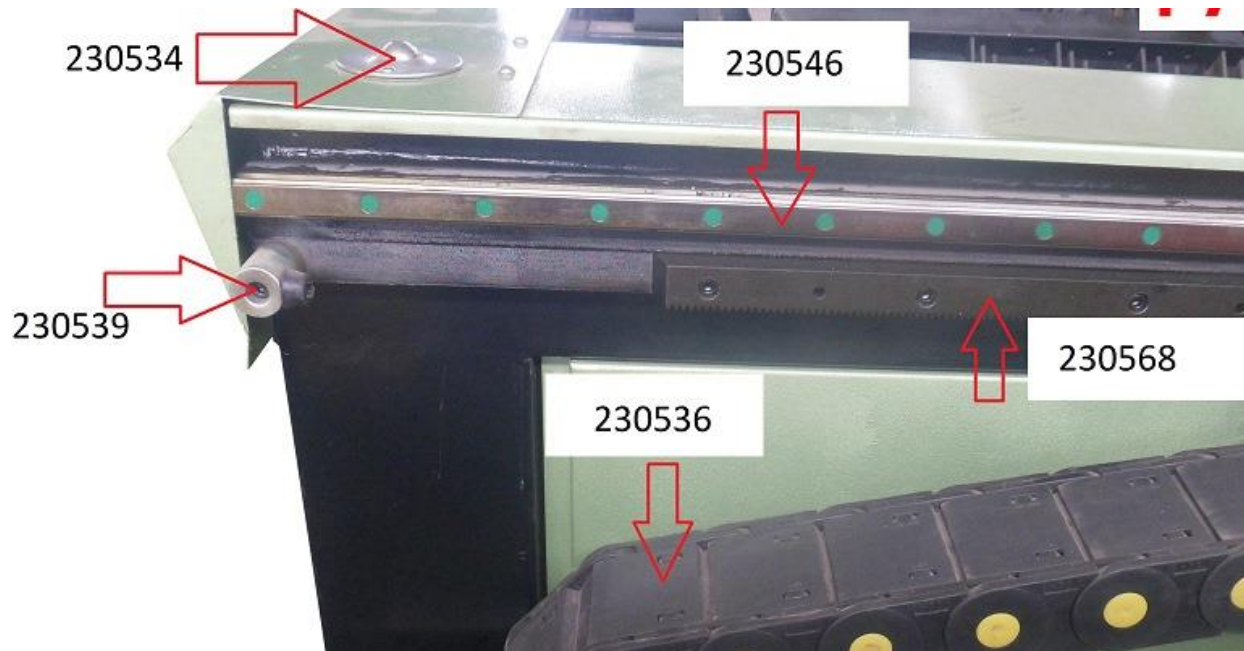
Specify model and serial number when ordering



PIRANHA PART #	DESCRIPTION
230569	AIR REGULATOR
230530	WATER CHILLER SOLENOID
	6MM 90 DEG. TUBING CONNECTOR
230570	AIR VALVE AND SOLENOID COVER
	6 MM TUBING

8.4. X-Axis Drive Assembly

Specify model and serial number when ordering



PIRANHA PART #	DESCRIPTION
230534	MATERIAL BALL ROLLER
230539	HARD LIMIT STOP
230536	CABLE TRACK (PER METER) (COMPLETE CARRIER 3M REQ'D)
230568	MACHINE RACK
230546	LINEAR GUIDE
230544	BEARING BLOCK (NOT SHOWN)
230601	MOTOR PINION ASSEMBLY (NOT SHOWN)
230603	EXTENDED GREASE FITTING (NOT SHOWN)

8.5. Electrical Cabinet

Specify model and serial number when ordering

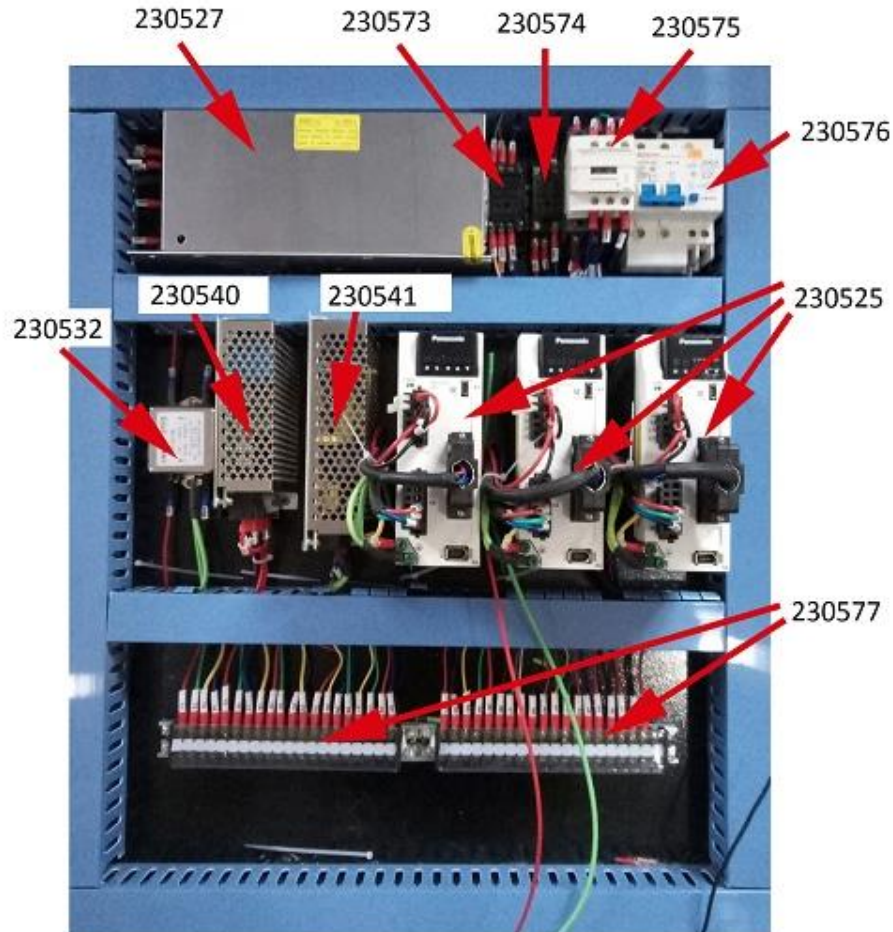


Piranha Part #	Description
	MICROSTEP Generation 2 (Please contact Piranha)
230571	GREEN PUSHBUTTON, LIGHTED
230572	STARFIRE 10.4" CONTROL PANEL

8.6. Electrical Cabinet

Specify model and serial number when ordering

Please contact Piranha for updated part numbers for the electrical cabinet.



Piranha Part #	Description
230527	AC220/DC48V
230573	24V DRIVE FAULT RELAY
230574	24V CONTROL RELAY
230575	MAIN CONTACTOR
230576	MAIN BREAKER
230577	TERMINAL BLOCK
230532	FILTER
230540	VOLTAGE DIVIDER CARD
230541	AC220/DC24V
230525	PANASONIC DRIVE
230609	MAIN DISCONNECT (NOT SHOWN)

8.7. Miscellaneous Parts

Specify model and serial number when ordering

PIRANHA PART #	DESCRIPTION
230602	LEVELING FOOT
230535	FAN GUARD
230604	SLAG DRAWER (C-404 & C-408)
230605	SLAG DRAWER (C-510)
230606	SLAG DRAWER WHEEL

8.8. Consumables

PowerMax Air Plasma 45/65/85/105 A

Shielded

	Shield	Piranha#	Retaining Cap	Piranha#	Nozzle	Piranha#
105	220993	3857R618	220854	3857R464	220990	3857R619
85	220817	3857R538	220854	3857R464	220816	3857R466
65	220817	3857R538	220854	3857R464	220819	3857R444
45	220817	3857R538	220854	3857R464	220941	3857R536

Finecut Shielded 45-105	220948	3857R644	220854	3857R464	220930	3857R534
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↑HT Book says 220953, this is a typo

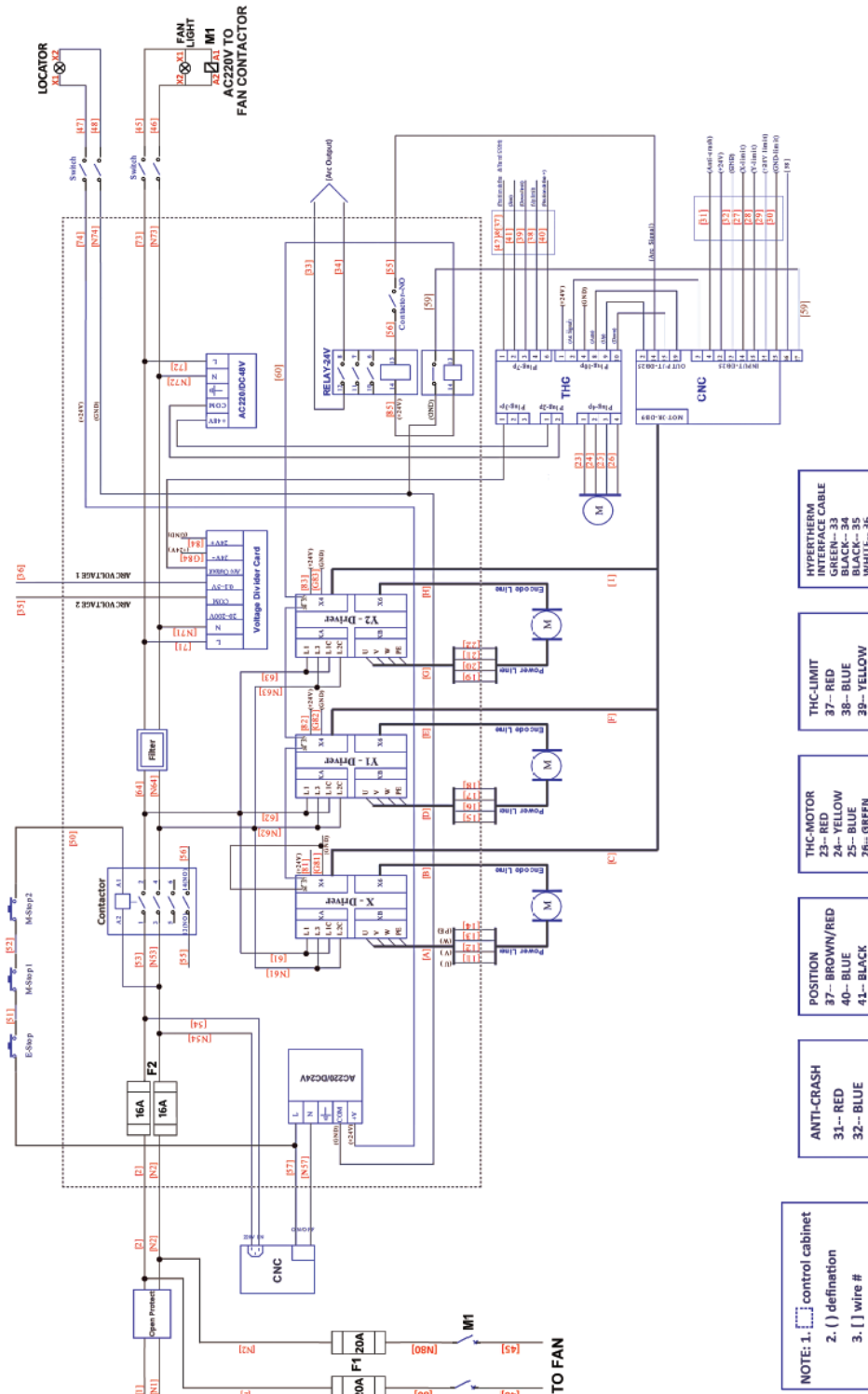
Shielded

	Electrode	Piranha#	Swirl Ring	Piranha#
105	220842	3857R443	220994	TBD
85	220842	3857R443	220857	3857R462
65	220842	3857R443	220857	3857R462
45	220842	3857R443	220857	3857R462

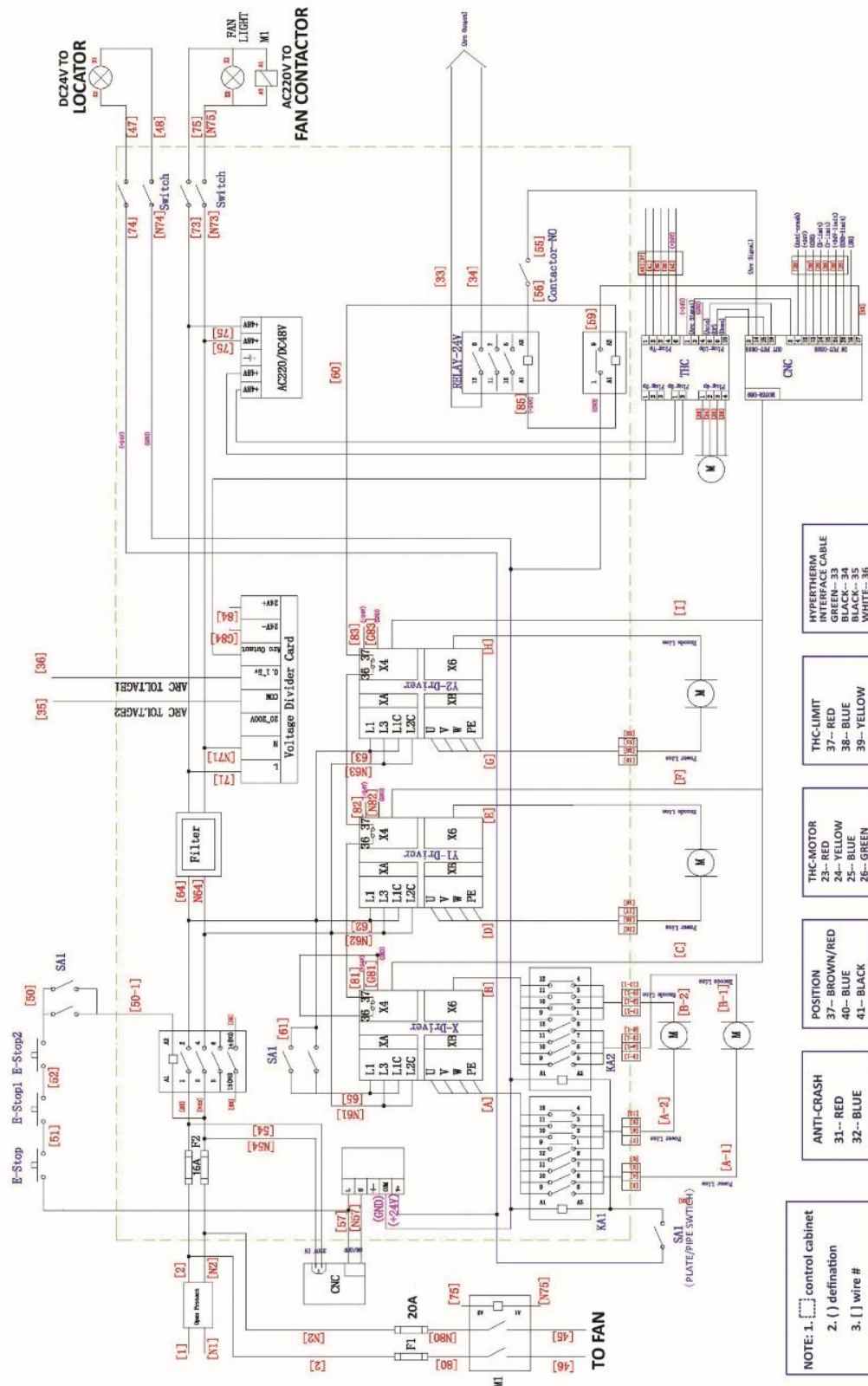
Finecut Shielded 45-105	220842	3857R443	220947	3857R537
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Chapter 9: ELECTRICAL DIAGRAM

9.1. Machines without Pipe Cutter



9.2. Machines with Pipe Cutter

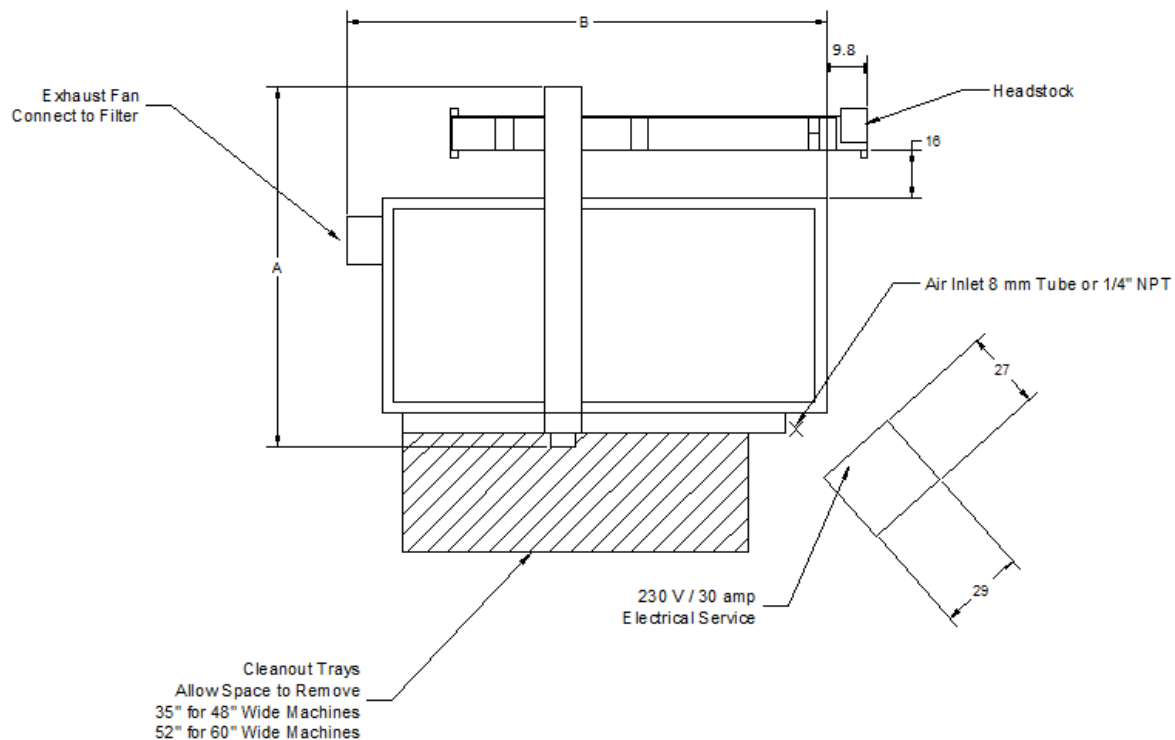


Chapter 10: PIPE CUTTING ATTACHMENT (Optional)

OPTIONAL EQUIPMENT

The Pipe Cutting Attachment is an option on new machines. It must be ordered with the machine – it cannot be retrofit onto an existing product. The pipe cutting attachment can cut round pipe and tube from 2" through 11.5" diameter.

The location of the pipe cutting attachment is shown below – the headstock must be located at the control end of the machine.

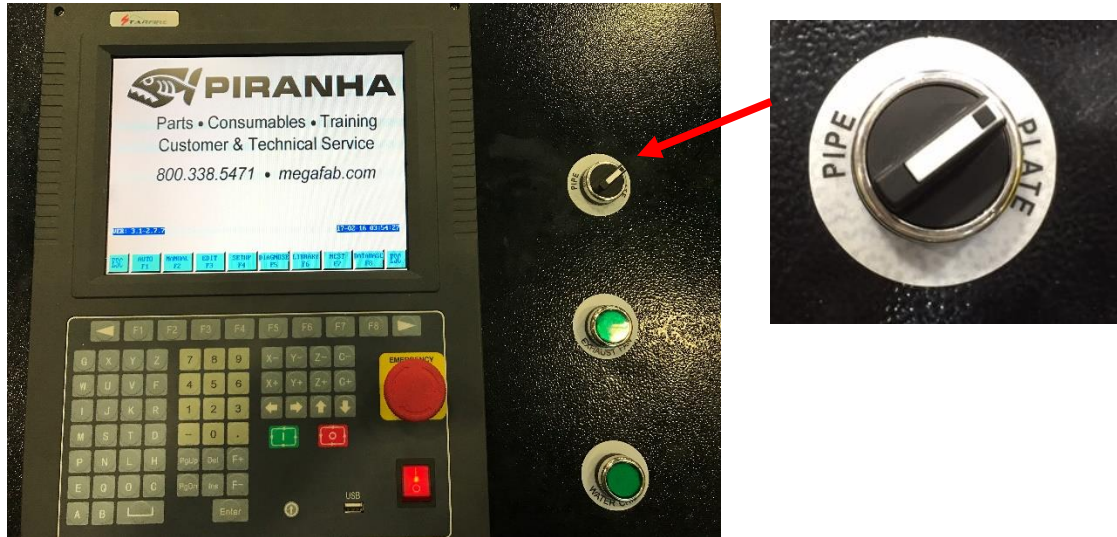


	"A"	"B"	Machine Weight	Pipe Cutter Weight
4'x4'	88"	116"	1,500 lbs.	800 lbs.
4'x8'	144"	116"	2,000 lbs.	800 lbs.
5'x10'	164"	126"	2,500 lbs.	800 lbs.

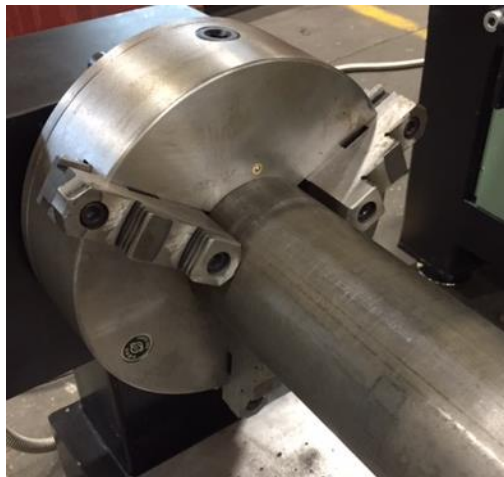
C408 and C510 Machines with pipe cutters require shipment as an oversize (over width) load. It is not possible to ship these machines as a standard load.

10.1. Components:

Pipe/Plate Selector Switch



Headstock



Headstock Wrench



Pipe Supports



Pipe Cutter Base



10.2. After Receiving

Upon the arrival of equipment:

1. Inspect it visually for shipping damage. If damage is found, notify both the trucker's insurance company and Piranha.
2. Compare the actual shipment with the invoice to verify that everything ordered has been received.

10.3. Unloading



Caution

Extreme care must be taken when lifting and moving the machine. Obtain the weight of the machine from of the Section 4.2.2 Space/Location/Weights.

Note:

It is the responsibility of the customer to verify that the forklift truck and/or crane is of adequate lifting capacity, and that any maneuver is undertaken safely.

Damage caused to the machine through incorrect or careless maneuvers is not covered under the machine warranty.

Piranha is not responsible for personal injury to any person while this machine is transported, unloaded or installed.

- It is important that the pipe cutting attachment is lifted only at the specified lifting points.
- Verify that the pipe cutting attachment is balanced and stable before and during lifting/moving.
- Verify that no person is in a position where they may become trapped or injured.



Caution

Make sure the load is always lifted about the center of gravity to prevent from any tipping and accidents.

10.3.1. Lifting with Crane (Recommended)

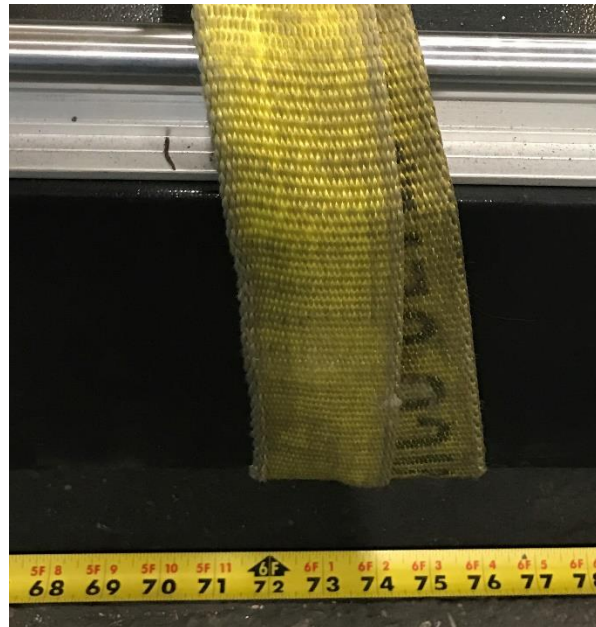
1. Remove securing straps/chains attached to the truck bed.
2. Obtain two straps of not less than 6 feet (1829mm) with the second being 6" (152mm) longer than the first. The below picture shows the strap layout. The load lift is approximately 800 lbs.



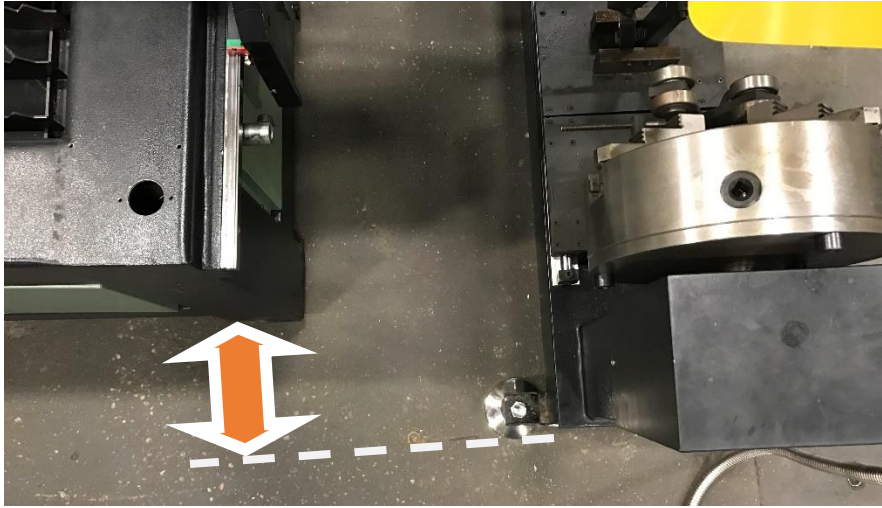
3. The first strap should be located 31" (787mm) from the of the chuck end of the pipe cutter attachment.



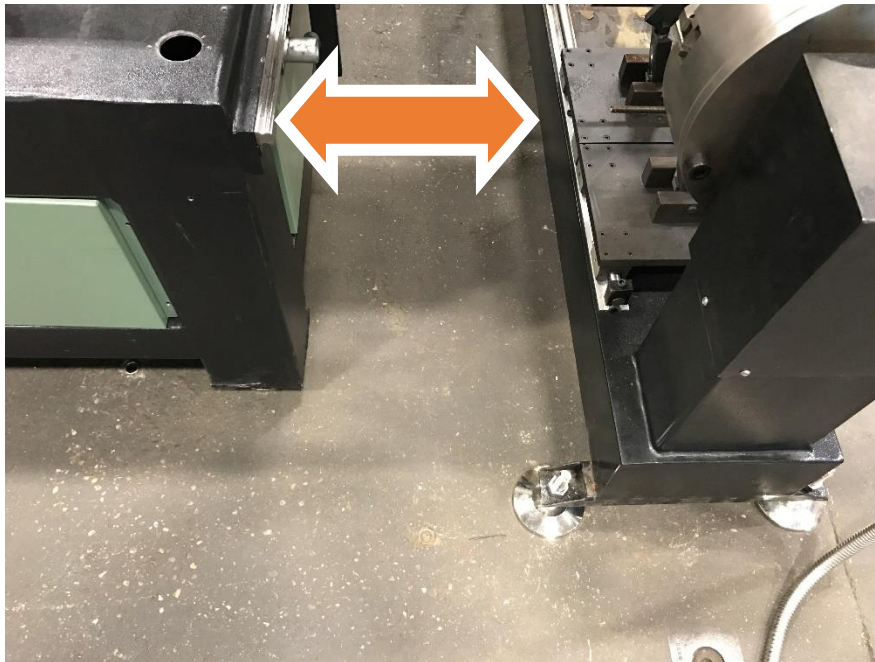
4. The second strap should be located 74" (1880mm) from the of the chuck end of the pipe cutter attachment. The second strap should be approximately 6" longer than the first strap to pick the pipe cutter attachment up level.



5. The end of the pipe cutter attachment is aligned to be 9.8" (250mm) from the end of the plasma table as shown.



6. The pipe cutting attachment is set parallel to the plasma table at a spacing of 16" (406mm) from surface of the plasma table Y axis way to the inside edge of the pipe cutting attachment.

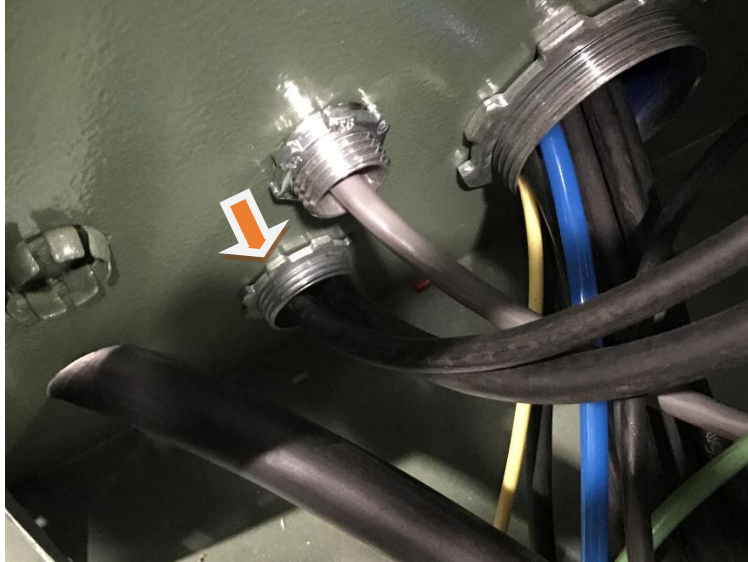


7. The pipe cutting attachment must be leveled (using the four leveling pads) so that the height of the center of the chuck is 1.00" below the slat height of the table. The pipe cutting attachment must be leveled with the four leveling pads.



8. Next, fasten the metal conduit from the pipe cutting attachment to the electrical box.





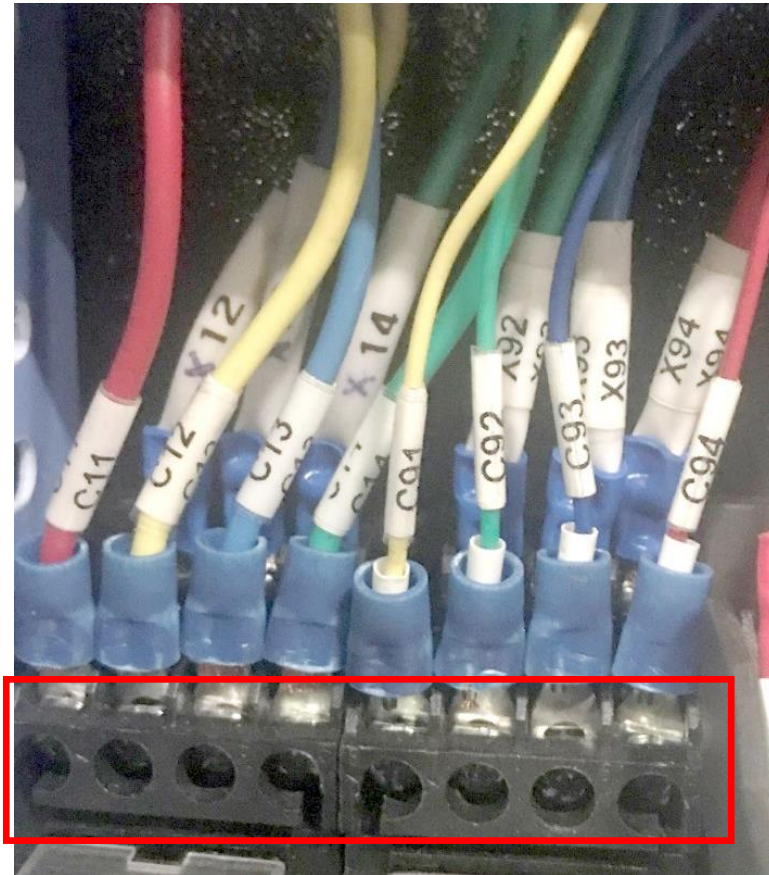
9. Next connect the cables to the relays as shown, there are 8 connections.

Important – Relay's may be in reverse order, so it is important to go by wire numbers on relay.

Wire C11 will connect to terminal without wire behind it
 Wire C12 will connect to terminal in front of wire X12
 Wire C13 will connect to terminal in front of wire X13
 Wire C14 will connect to terminal in front of wire X14

Wire C91 will connect to terminal without wire behind it
 Wire C92 will connect to terminal in front of wire X92
 Wire C93 will connect to terminal in front of wire X93
 Wire C94 will connect to terminal in front of wire X94





10.4. Operation and Programming

10.4.1. Switching from Plate-Cutting to Pipe-Cutting

Change the X-axis limit to allow the torch to move over the center of the pipe:

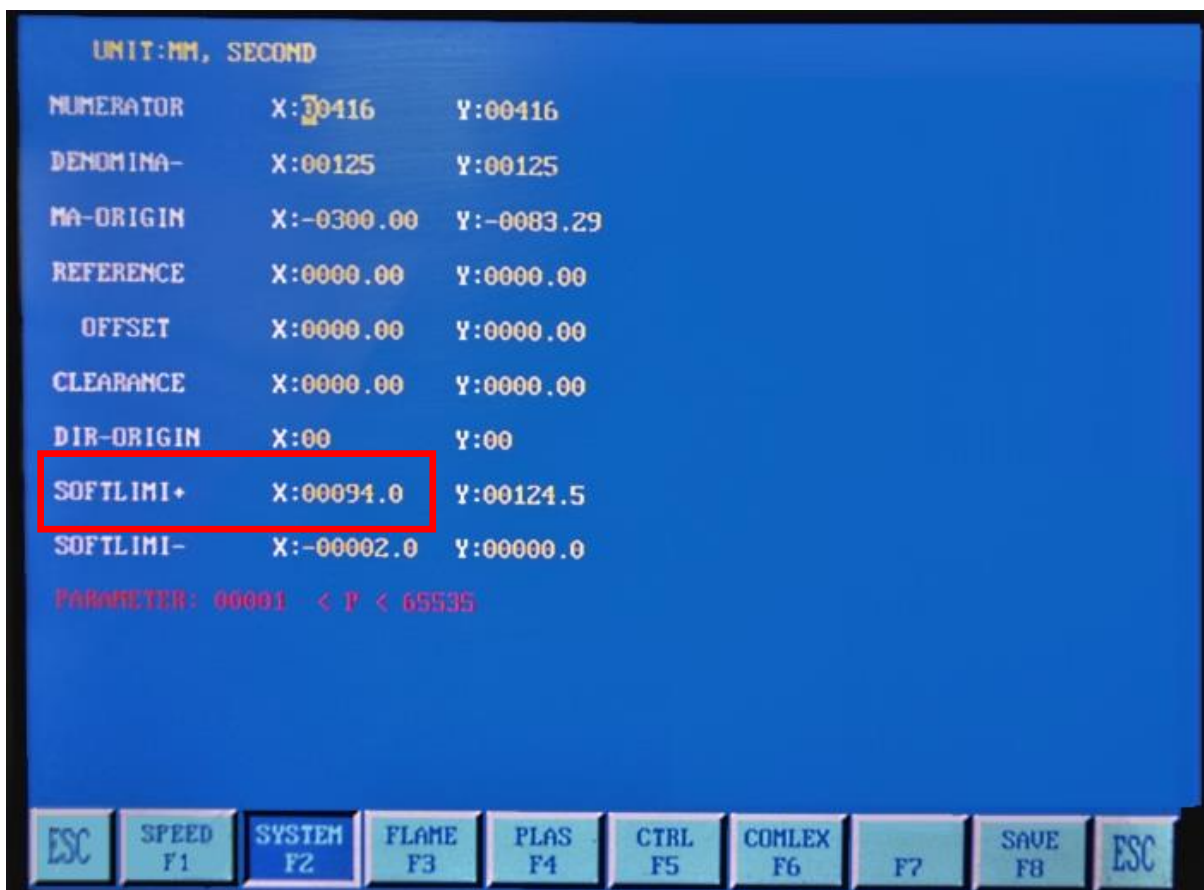
1. From the HOME screen, push F4 [SETUP]



2. Then press F2 [SYSTEM].



3. Change the X-Axis SOFTLIMI+ value to 94.0



4. Then Press the F8 [SAVE] to store the change.



5. Press [ESC] next to go back to home screen.



6. Press F2 [MANUAL] to go to manual move screen.



7. Move the torch in the X-axis until the torch is directly above the center of the pipe.



Tip: Run the torch down the length of the tube to check that it is parallel to the table and torch.

8. Press the [ESC] button to go to home screen.

9. Press F4 [SETUP] button from the home screen.



10. Then press F2 [SYSTEM].



11. Now change NUMERATOR X:00416 using the following formula:

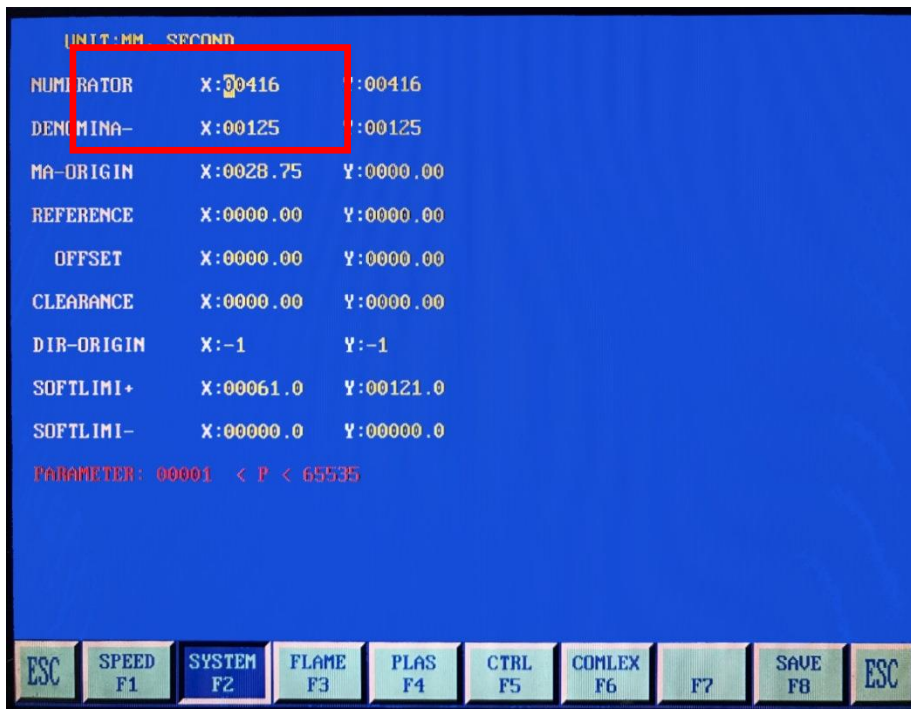
Pipe Diameter * 3.14 * 25.4

Example for 2-inch diameter pipe

$2 * 3.14 * 25.4 = 159.512$ round up to 160

Enter for NUMERATOR X:00160

12. Now change the DENOMINA- X:00125 to X:00256.



13. Press the F8 [SAVE] button.



14. Turn off the power to the CNC Control using the red power button.



15. Move the Pipe/Plate Selector Switch to "PIPE".



16. Turn on power to the CNC Control using the Red Power Button.
17. Connect the plasma cutter ground clamp to the end of the pipe.



18. The pipe cutter attachment is now ready to use.

10.4.2. Programming the Pipe Cutter

When programming the pipe cutter, the programs are generated as if the pipe is unfolded in the flat condition. For example, if the pipe is 4" outside diameter, then the overall circumference of the pipe is $4 \times \pi = 4 \times 3.14 = 12.56$ inches. When programming a 4" O.D. pipe, the programmer should assume a flat sheet with a width of 12.56 inches.

10.4.3. Switching from Pipe-Cutting to Plate-Cutting

Change the X-axis limit to allow the torch to move over the center of the pipe:

1. From the HOME screen, push F4 [SETUP]



2. Then press F2 [SYSTEM].

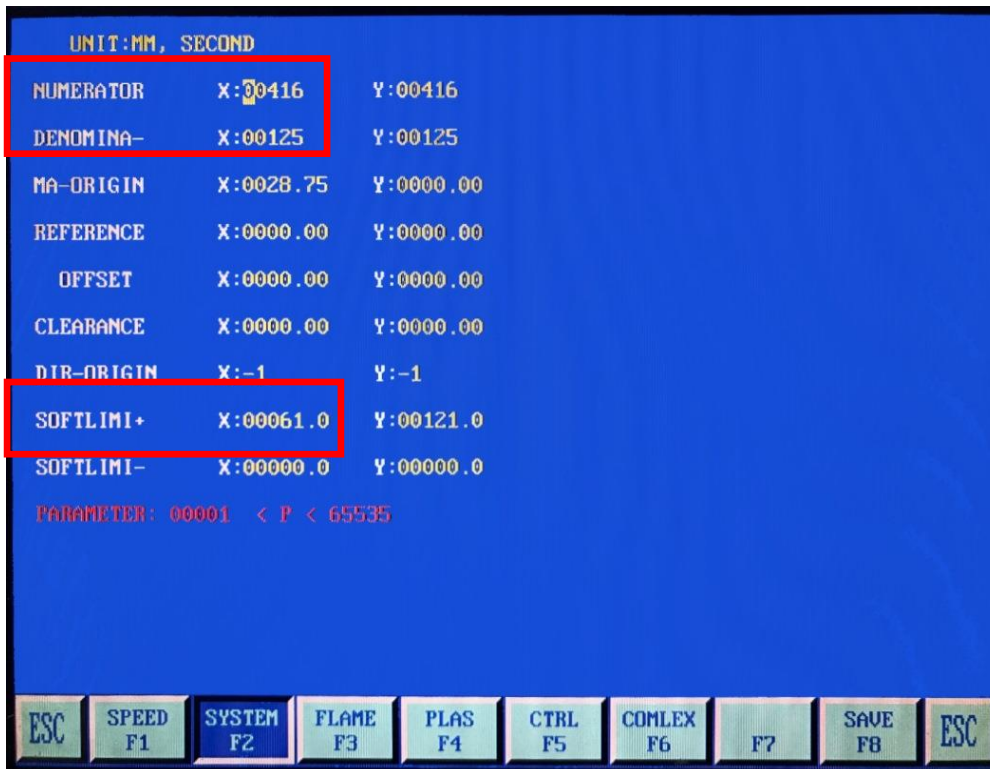


3. Change the following values:

NUMERATOR X:00416

DENOMINA- X:00125

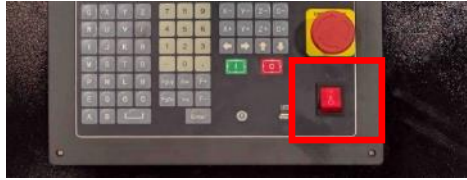
SOFTLIMI+ X:00061.0



4. Then Press the F8 [SAVE] to store the change.



5. Turn off the power to the CNC Control using the Red Power Button.



6. Move the Pipe/Plate Selector Switch to "PLATE".



7. Turn on power to the CNC Control using the red power button.



8. Connect the plasma cutter ground clamp plasma table bed.



9. Move torch back over the cutting bed. The X < + software overtravel alarm will be on the screen but X can move in the minus direction of the table. This alarm will clear once the torch position is less than the normal plate cutting width (61" for C510 machines; 49" for C404 and C408 machines)

The plasma table is now ready to use.

Chapter 11: APPENDIX A - REVISIONS TO THE MANUAL

6/24/2019	2.6.0 Microstep Gen 2, deleted water mist chiller
8/5/2019	2.6.21 NB: Added steps to program zero and “do not use Ohmic” comment
8/5/2019	2.6.3 NB: Troubleshooting section, g-code clarification
9/17/19	2.6.4 NB: 6.4 Add to section 5.4.2 “prepare plasma....”, change speeds photos, added info on breakaway. 4.12 air to machine
9/20/19	Change parameters Ma origin, changed notes for soft limit, ma-origin, pierce time
6/12/20	2.6.6 NB: Added Pronest email address, parameters Torchdown time back to 0, arc feedback back to 1. Sect 8.4. Added note: (COMPLETE CARRIER 3M REQ'D). Sect 8.5. Delete part # for Gen 1 microstep.
10/22/20	2.7.0 NB: Pipe cutter drawing update. Home in startup uses measure instead of origin. Fixed the order of symbols in safety. (2.2) Added ground lead pics. (4.13) Added consumables and power supply to components (3.0)
11/9/20	2.7.1 NB: Water table additive dilution raised to 5%. Fixed reference issue in 4.3 Electrical Services

