ESP-200

Plasmarc Cutting System

Instruction Manual

F15-462-C **02 / 2008**

BE SURE THIS INFORMATION REACHES THE OPERATOR.
YOU CAN GET EXTRA COPIES THROUGH YOUR SUPPLIER.

CAUTION

These INSTRUCTIONS are for experienced operators. If you are not fully familiar with the principles of operation and safe practices for arc welding and cutting equipment, we urge you to read our booklet, "Precautions and Safe Practices for Arc Welding, Cutting, and Gouging," Form 52-529. Do NOT permit untrained persons to install, operate, or maintain this equipment. Do NOT attempt to install or operate this equipment until you have read and fully understand these instructions. If you do not fully understand these instructions, contact your supplier for further information. Be sure to read the Safety Precautions before installing or operating this equipment.

USER RESPONSIBILITY

This equipment will perform in conformity with the description thereof contained in this manual and accompanying labels and/or inserts when installed, operated, maintained and repaired in accordance with the instructions provided. This equipment must be checked periodically. Malfunctioning or poorly maintained equipment should not be used. Parts that are broken, missing, worn, distorted or contaminated should be replaced immediately. Should such repair or replacement become necessary, the manufacturer recommends that a telephone or written request for service advice be made to the Authorized Distributor from whom it was purchased.

This equipment or any of its parts should not be altered without the prior written approval of the manufacturer. The user of this equipment shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, damage, improper repair or alteration by anyone other than the manufacturer or a service facility designated by the manufacturer.

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DECLARATION OF CONFORMITY

According to

The Low Voltage Directive 2006/95/EC of 12 December 2006, entering into force 16 January 2007
The EMC Directive 2004/108/EC

FÖRSÄKRAN OM ÖVERENSSTÄMMELSE

Lågspänningsdirektivet 2006/95/EG från 12 december 2006, ikraftsat 16 januari 2007
EMC-Direktivet 2004/108/EG

Type of equipment Materialslag
Plasma Cutting Console

Brand name or trade mark Fabrikatnamn eller varumärke
ESAB

Type designation etc. Typbeteckning etc.
ESP-200 Console - 36974

Manufacturer or his authorised representative established within the EEA
Name, address, telephone No, telefax No: Tillverkarens namn, adress, telefon, telefax:

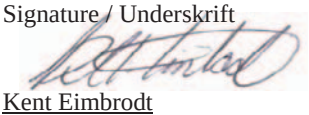
ESAB AB
Esabvägen, SE-695 81 Laxå, Sweden
Phone: +46 586 81000, Fax: +46 584 411 924

The following harmonised standard in force within the EEA has been used in the design:
Följande harmoniserande standarder har använts i konstruktionen:

EN 60974-1, Arc welding equipment – Part 1: Welding power sources
EN 60974-10, Arc welding equipment – Part 10: Electromagnetic compatibility (EMC) requirements

Additional information: / Tilläggsinformation: Restrictive use, Class A equipment, intended for use in locations other than residential

By signing this document, the undersigned declares as manufacturer, or the manufacturer's authorised representative established within the EEA, that the equipment in question complies with the safety requirements stated above.
Genom att underteckna detta dokument försäkrar undertecknad såsom tillverkare, eller tillverkarens representant inom EES, att angiven materiel uppfyller säkerhetskraven angivna ovan.

Date / Datum	Signature / Underskrift	Position / Befattning
Laxå 2009-02-18		Global Director Equipment and Automation
	Kent Eimbrodt Clarification	

1.0 Safety Precautions

Users of ESAB welding and plasma cutting equipment have the ultimate responsibility for ensuring that anyone who works on or near the equipment observes all the relevant safety precautions. Safety precautions must meet the requirements that apply to this type of welding or plasma cutting equipment. The following recommendations should be observed in addition to the standard regulations that apply to the workplace.

All work must be carried out by trained personnel well acquainted with the operation of the welding or plasma cutting equipment. Incorrect operation of the equipment may lead to hazardous situations which can result in injury to the operator and damage to the equipment.

1. Anyone who uses welding or plasma cutting equipment must be familiar with:
   - its operation
   - location of emergency stops
   - its function
   - relevant safety precautions
   - welding and / or plasma cutting

2. The operator must ensure that:
   - no unauthorized person stationed within the working area of the equipment when it is started up.
   - no one is unprotected when the arc is struck.

3. The workplace must:
   - be suitable for the purpose
   - be free from drafts

4. Personal safety equipment:
   - Always wear recommended personal safety equipment, such as safety glasses, flame proof clothing, safety gloves.
   - Do not wear loose fitting items, such as scarves, bracelets, rings, etc., which could become trapped or cause burns.

5. General precautions:
   - Make sure the return cable is connected securely.
   - Work on high voltage equipment **may only be carried out by a qualified electrician**.
   - Appropriate fire extinquishing equipment must be clearly marked and close at hand.
   - Lubrication and maintenance **must not** be carried out on the equipment during operation.

WARNING

WELDING AND PLASMA CUTTING CAN BE INJURIOUS TO YOURSELF AND OTHERS. TAKE PRECAUTIONS WHEN WELDING OR CUTTING. ASK FOR YOUR EMPLOYER'S SAFETY PRACTICES WHICH SHOULD BE BASED ON MANUFACTURERS' HAZARD DATA.

ELECTRIC SHOCK - Can kill.
- Install and earth (ground) the welding or plasma cutting unit in accordance with applicable standards.
- Do not touch live electrical parts or electrodes with bare skin, wet gloves or wet clothing.
- Insulate yourself from earth and the workpiece.
- Ensure your working stance is safe.

FUMES AND GASES - Can be dangerous to health.
- Keep your head out of the fumes.
- Use ventilation, extraction at the arc, or both, to take fumes and gases away from your breathing zone and the general area.

ARC RAYS - Can injure eyes and burn skin.
- Protect your eyes and body. Use the correct welding / plasma cutting screen and filter lens and wear protective clothing.
- Protect bystanders with suitable screens or curtains.

FIRE HAZARD
- Sparks (spatter) can cause fire. Make sure therefore that there are no inflammable materials nearby.

NOISE - Excessive noise can damage hearing.
- Protect your ears. Use earmuffs or other hearing protection.
- Warn bystanders of the risk.

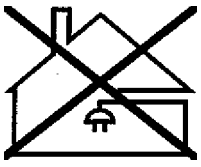
MALFUNCTION - Call for expert assistance in the event of malfunction.

READ AND UNDERSTAND THE INSTRUCTION MANUAL BEFORE INSTALLING OR OPERATING.

PROTECT YOURSELF AND OTHERS!

CAUTION

Class A (380/415V CE) equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There may be potential difficulties in ensuring electromagnetic compatibility of Class A equipment in those locations due to conducted as well as radiated disturbances.



2.1 Introduction

The ESP 200 Power Console is designed for plasma mechanized or hand cutting applications. It can be used with other ESAB products such as the PT-26 and PT-600 torches, an optional plumbing box and a remote set-up pendant.

- 50 to 200 Amperes cutting current range
- Forced air cooled
- Solid state DC power
- Integral water cooler
- Input voltage protection
- Local or remote front panel control
- Thermal switch protection for main transformer and power semiconductor components
- LED status troubleshooting

2.2 General Specifications

ESP 200 Power Console, p/n 36974		
OUTPUT (100 % duty cycle)	Voltage	160VDC
	Current range DC	50A to 200A
	Power	8000 W to 32000 W
	Open Circuit Voltage (OCV)	325VDC
INPUT	Voltage (3-phase)	200/230/380/415/460/575 Volts
	Current (3- phase)	115/100/60/55/50/40 Amperes
	Frequency	50/60Hz
	KVA	39.8 kW
	Power	37.8 kW
	Power Factor	95%
	Input Fuse Rec.	See Section 3, Installation, page 3-3

380/415V CE Mains Supply ..... $S_{sc\,min}$ 6.8MVA
..... Z_{max} 0.025Ω

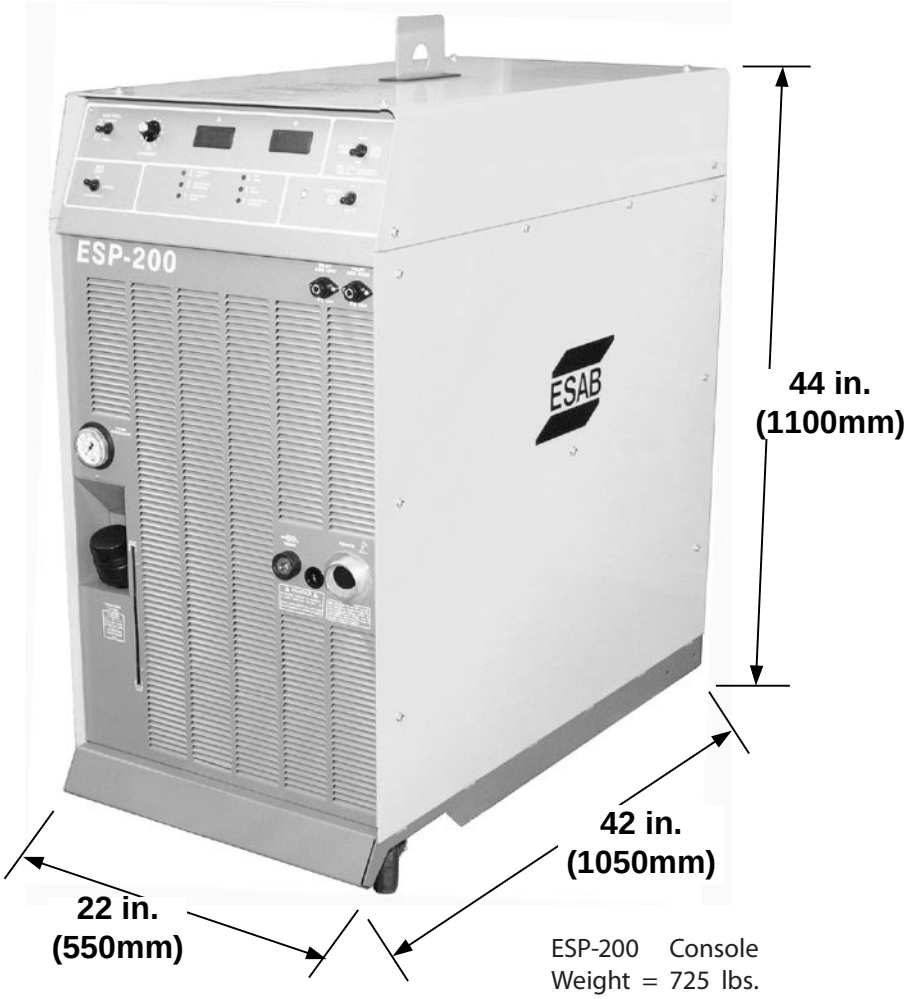
380/415V CE Mains Supply, $S_{sc\,min}$
Minimum short circuit power on the network in accordance with IEC61000-3-12.

380/415V CE Mains Supply, Z_{max}
Maximum permissible line on the network impedance in accordance with IEC61000-3-11.

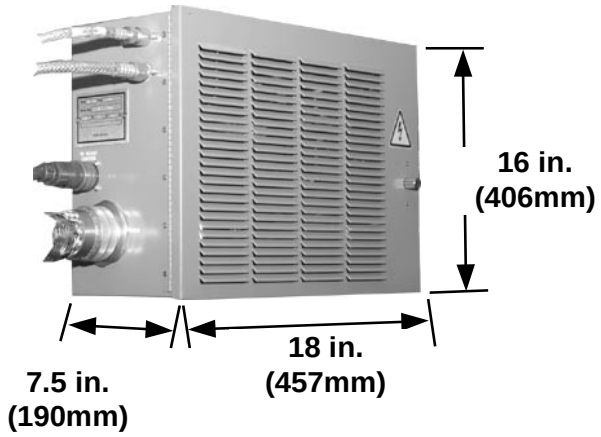
WARNING

ELECTRIC SHOCK CAN KILL!
USE OF TORCHES NOT DESIGNED FOR THIS CONSOLE COULD RESULT IN A HAZARDOUS ELECTRIC SHOCK. USE ONLY TORCHES DESIGNED FOR THE ESP-200 CONSOLE.

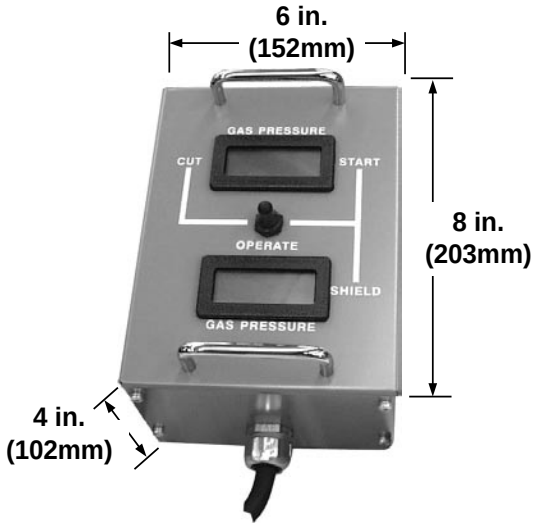
2.3 Dimensions and Weight



ESP-200 Console
Weight = 725 lbs.
(330kg)



ESP Plumbing Box Weight = 38 lbs
(17kg)



Remote Setup Pendant Weight
1lb (0.9kg)

2.4 ESP-200 Options and Accessories

ESP-200 Plumbing Box .....P/N 22000
Remote Setup Pendant .....P/N 37145

Water Hoses and Cables for options

	25 ft. (7.6m)	50 ft. (15.2m)	75 ft. (22.8m)	100 ft. (30.4m)	150 ft. (45.7m)
Cooling Water Hoses, console to plumbing box (2 required)	33132	33133	33134	33135	33136
Control Cable, plumbing box to console	22264	22265	22266	22267	22268
Pilot Arc Lead, plumbing box to console	33303	33304	33305	33306	33307
Power Lead, console to plumbing box	22001	22002	22003	22004	22005
Pendant Control Cable	37293	37294	37295	37296	37297

Torch Coolant – 1gallon (3.8 L) (4 required)..... 156F05

2.5 Gas Hoses

Gas Type	25 ft. (7.6m)	50 ft. (15.2m)	75 ft. (22.8m)	100 ft. (30.4m)	150 ft. (45.7m)
Nitrogen	33122	33123	33124	33125	33126
Oxygen (blue)	0558002973	0558002974	0558002975	0558002976	0558002977
Argon/Hydrogen (H-35)	33122 (note 1)	33123 (note 1)	33124 (note 1)	33125 (note 1)	33126 (note 1)
Air (black)	0558002978 (note 2)	0558002979 (note 2)	0558002980 (note 2)	0558002981 (note 2)	0558002982 (note 2)

Note 1: Requires adapter P/N 19X54 (order separately)
Note 2: Requires adapter P/N 74S76 (order separately)

2.6 Gas Regulators

	Station Regulator	Cylinder Regulator
Nitrogen	19155	998343
Oxygen	998961	998336
Argon/Hydrogen (H-35)	----------	998341
Air	30338	N/A

NOTICE

A SEPARATE START GAS REGULATOR IS ALWAYS REQUIRED:

- For air plasma use air start gas.
- For oxygen or nitrogen use nitrogen start gas.
- For H-35 (argon/hydrogen) use H-35 or nitrogen start gas.

A TOTAL OF 3 REGULATORS WILL BE REQUIRED (PLASMA, START AND SECONDARY).

NOTICE

WHEN USING A PLUMBING BOX:

- Gas hoses from supply cylinders go directly to the plumbing box.
- Console gas manifold is not used.

2.7 Basic Packages

The ESP-200 system is available as a pre-engineered package or can be ordered as individual parts as listed. Basic Packages include:

- ESP-200 Console
- Plasma Torch
- Appropriate regulators for the gases indicated
- Gas hoses from regulators to console
- Torch coolant

Torch Coolant – 1 gallon (3.8 L) .....P/N 156F05

3.1 General

WARNING

FAILURE TO FOLLOW INSTRUCTIONS COULD LEAD TO DEATH, INJURY OR DAMAGED PROPERTY. FOLLOW THESE INSTRUCTIONS TO PREVENT INJURY OR PROPERTY DAMAGE. YOU MUST COMPLY WITH LOCAL, STATE AND NATIONAL ELECTRICAL AND SAFETY CODES.

3.2 Unpacking

CAUTION

Use Lifting Eye When Hoisting From Overhead.
Use safe practices when transporting with overhead method.
Unit weighs over 700 lbs. Use approved straps or cables in good condition.

- Inspect for transit damage immediately upon receipt.
- Remove all components from shipping container and check for loose parts in container.
- Inspect louvers for air obstructions.

CAUTION

Do Not Restrict Air Flow

Restricting intake air with any type of filter on or around the Plasma console will result in overheating and may void the warranty.

3.3 Placement

- A minimum of 2 ft. clearance for cooling air flow.
- Plan for top panel and side panels having to be removed for maintenance, cleaning and inspection.
- Locate the ESP-200 relatively close to a properly fused electrical power supply.
- Keep area beneath power source clear for cooling air flow.
- Environment should be relatively free of dust, fumes and excessive heat. These factors will affect cooling efficiency.

CAUTION

Conductive Dust And Dirt Inside Power Source May Cause Arc Flash-Over.
Equipment damage may occur. Electrical shorting may occur if dust is allowed to build-up inside power source. See maintenance section.

3.4 Input Connections to Console

WARNING

ELECTRIC SHOCK CAN KILL!
PROVIDE MAXIMUM PROTECTION AGAINST ELECTRICAL SHOCK. BEFORE ANY CONNECTIONS ARE MADE INSIDE THE MACHINE, OPEN THE LINE WALL DISCONNECT SWITCH TO TURN POWER OFF.

3.4.1 Primary Power Specifications

ESP-200 is a 3-phase unit. Input power must be provided from a line (wall) disconnect switch that contains fuses or circuit breakers in accordance to local or state regulations.

Recommended input conductor and line fuse sizes:

Rated Load		Input and Ground conductor* CU/AWG	Time delay Fuse size (amperes)
Volts	Amperes		
200/208	140	2/0	200
230	121	1/0	150
380	74	No.2	100
415	66	No.4	100
460	62	No.4	100
575	48	No.6	70

*Sizes per National Electrical Code for a 75 °C rated copper conductors @ 40 °C ambient. Not more than four conductors in raceway or cable. Local codes should be followed if they specify sizes other than those listed above. Input current values given in this table are at maximum output power (40kW) 200 amps at 200VDC.

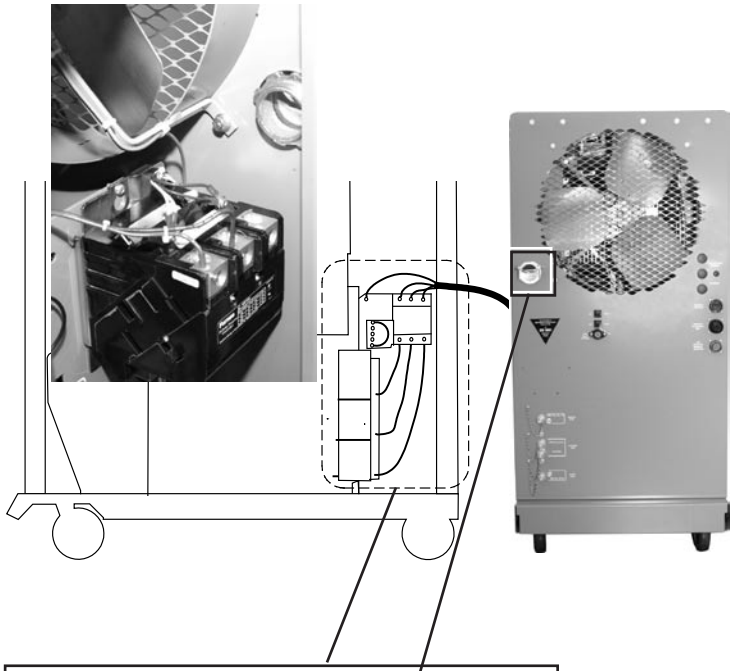
NOTICE

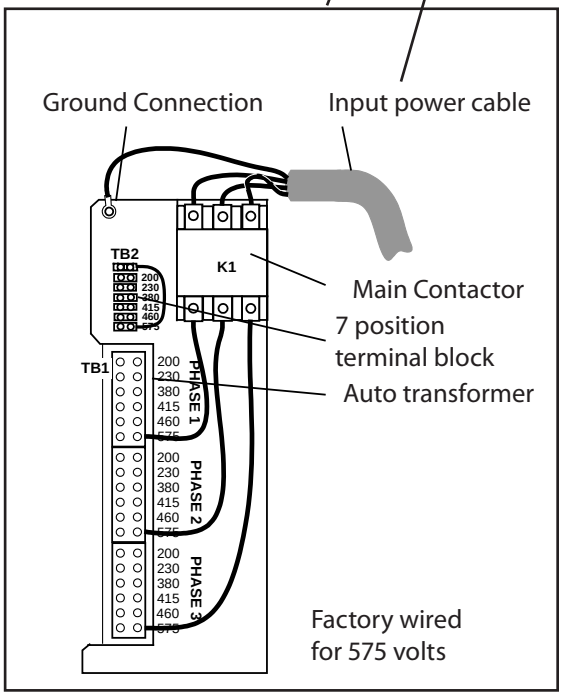
Dedicated power line may be necessary.
ESP-200 is equipped with line voltage compensation but to avoid impaired performance due to an overloaded circuit, a dedicated power line may be required.

NOTE !!!

380/415V CE Mains Supply Requirements:
High power equipment may, due to the primary current drawn from the mains supply, influence the power quality of the grid. Therefore connection restrictions or requirements regarding the maximum permissible mains impedance or the required minimum supply capacity at the interface point to the public grid may apply for some types of equipment (see technical data). In this case it is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment may be connected.

3.4.2 Primary Power Hookup Procedure





The following procedure explains the proper installation steps for connecting primary electrical power to the plasma console.

NOTE: Safety codes specify the power ground wire be the last connection to break should the cable be pulled out of the unit. When preparing the cable for connection, make the ground wire 6 inches (152mm) longer than the three primary wires.

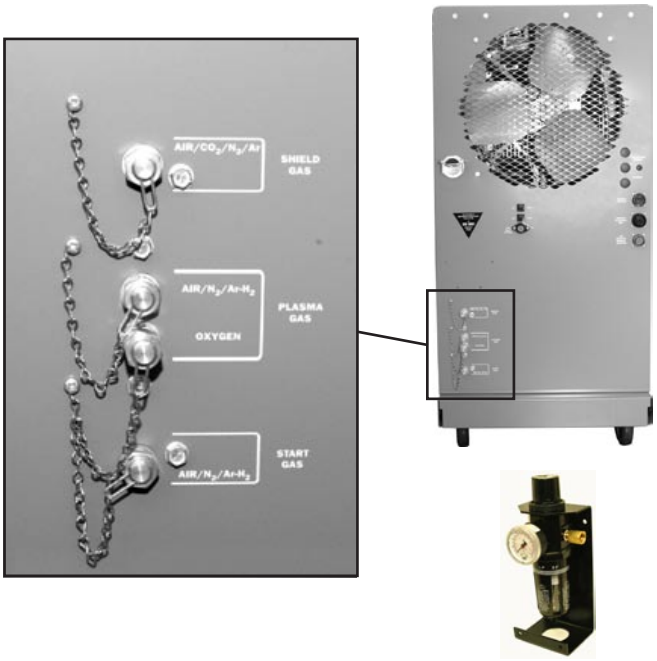
1. Ensure input power cable is disconnected from all electrical sources.
2. Remove right side panel (as viewed from front of console).
3. Route input power cable through the strain relief located at the rear panel.
4. Pull input power cable through the strain relief to allow cable wires sufficient length to connect to main contactor. Tighten strain relief to ensure input power cable is secured.
5. Connect input power cable ground wire to the ground lug provided above TB2 (7 position terminal block).
6. Connect three power leads of input power cable to terminals located atop the main contactor. Secure the leads by tightening each screw.
7. Connect jumper power cables from bottom of the main contactor to proper input voltage marked on auto transformer. Unit is factory set for 575V as shown at the left.
8. Connect jumper on TB2 to proper input voltage. This 7 position terminal block jumper is factory set to 575V.
9. Connect input conductors to line (wall) disconnect.
10. Replace side panel (Replace only if all connections have made --output connections require this panel to be removed).

CAUTION

Input Power Jumper Connection.
Ensure each input power jumper cable is connected to correct input voltage on autotransformer and on TB2. Factory wired for 575 Volts.

3.4.3 Gas Input Connections

Rear view of console



PT-26 Input Connections

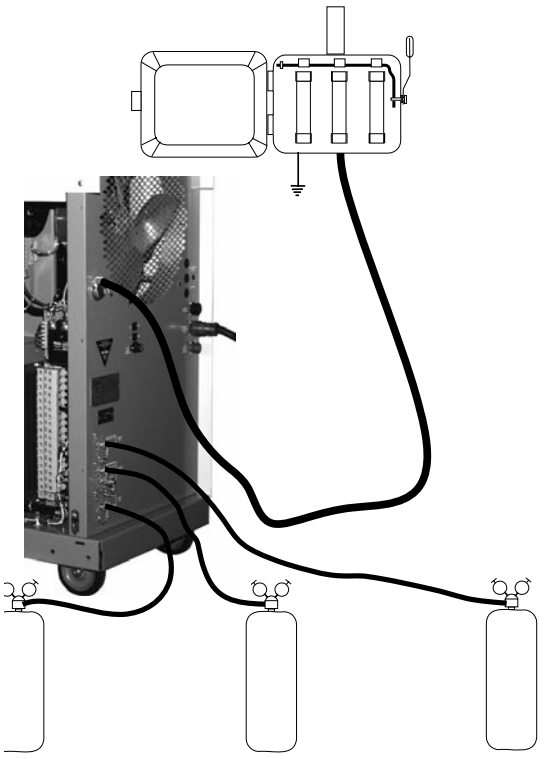
Connect primary current conductors and ground as described previously.

Unscrew gas fitting cap plugs and connect gas supply hoses. Gas supply hoses are customer supplied. See Description Section 2 or Replacement Part Section 7 for part numbers.

Note: Leave Oxygen Plasma Gas cap plug attached. DO NOT USE OXYGEN WITH PT-26 TORCH.

Install filter regulators if using shop air for any of three process gases. (Start, Shield, Cut Gas)
Filter: 5 micron
Regulator: 5 to 125 PSI (0.35 to 8.63 bar)
ESAB P/N 30338

View as shipped



Start Gas
N2, CO2 or Air

Cut Gas
N2, H-35, N2-H2 or Air

Shield Gas
N2, H-35, N2-H2, or Air

Note: Refer to your torch manual for proper pressure/flow settings.

WARNING

IMPROPER GROUNDING CAN RESULT IN DEATH OR INJURY.
CHASSIS MUST BE CONNECTED TO AN APPROVED ELECTRICAL GROUND. ENSURE SYSTEM HAS A GOOD EARTH GROUND. SEE GROUNDING YOUR MANUAL.
BE SURE GROUND LEAD IS NOT CONNECTED TO ANY PRIMARY TERMINAL.

3.5 Connecting PT-26 Plasma Hand Torch

WARNING

ELECTRIC SHOCK CAN KILL! DANGEROUS VOLTAGE AND CURRENT! ANY TIME WORKING AROUND A PLASMA POWER SOURCE WITH COVERS REMOVED:

- Disconnect power source at line (wall) disconnect.
- Have a qualified person check the output bus bars (positive and negative) with a voltmeter.

3.5.1 PT-26 and ESP-200 Output Cables, Hoses and Adapters (customer supplied)

Hose and cable lengths vary depending on system.

- Coolant Return (pilot arc cable inside)
- Coolant Supply (plasma current cable inside)
- Switch Lead
- Shield Gas
- Plasma Gas
- Work Cable

SEE Description, Section 2 for part numbers.

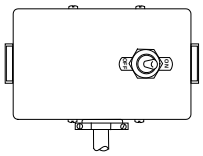
NOTE:

Do not use the PT-26M (mechanized) on a CNC application. A plumbing box is not available (required for CNC gas control). Torch can be mounted on a mechanized tractor. An auxiliary pilot arc ON switch is required when using a PT-26M. See connection procedure for details.

ESP-200 Console

PT-26 Hand Torch

PT-26M Mechanized Torch



Hand Remote Arc ON Switch

3.5.2 PT-26 Torch Output Connection Procedure

WARNING

ELECTRIC SHOCK CAN KILL!
TURN OFF PRIMARY INPUT POWER AT THE WALL DISCONNECT BOX BEFORE MAKING ANY CONNECTIONS TO THE ESP-200.

Thread service lines through bushing.

PT-26 Plasmarc Torches

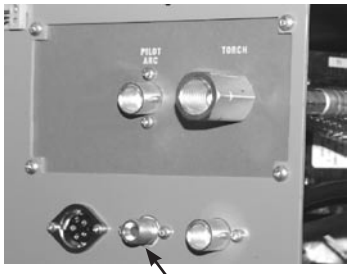
Both hand and mechanized torches connect the same. The mechanized torch requires an auxiliary arc ON switch that connects the same as the arc ON switch of the hand held torch.

Note: Tighten all gas and water fittings during assembly.

1. Thread 4 torch service lines through the bushing at middle right side of front panel and proceed as follows:

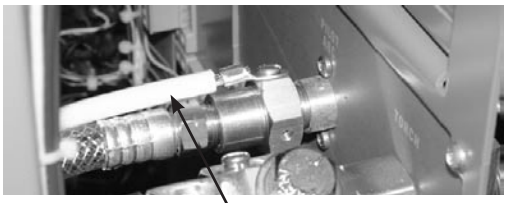
   a. Insert pilot arc adapter into left hand threaded pilot arc fitting.

   b. Connect coolant return hose (male left-hand thread) to the adapter.



Pilot arc fitting

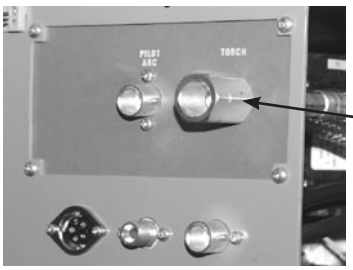
Pilot arc adapter (P/N 999278)



Pilot Arc Cable

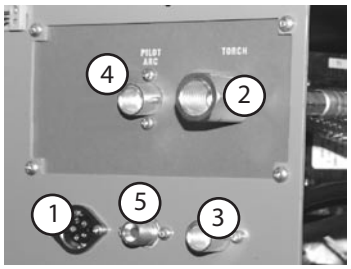
   c. Connect pilot arc cable to one of 3 threaded holes on the outside of adapter with supplied screw.

   d. Connect coolant supply/power cable to fitting labeled "TORCH".

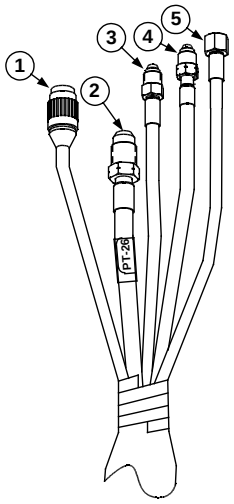


Coolant Supply/electrode cable connection

Coolant Supply/electrode cable Fitting



e. Connect shield gas hose (if used) to the shield gas fitting ('B' size left-hand threaded male fitting). Hose has left-hand female fitting.



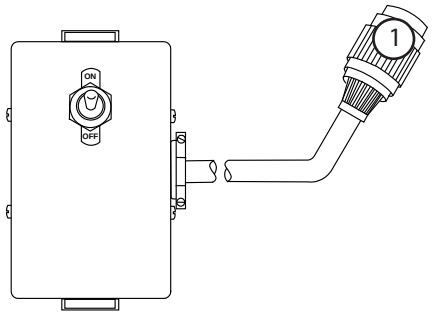
PT-26 Torch Bundle Leads

f. Connect plasma cut gas ('B' size right-hand threaded female fitting). Hose has right-hand male fitting.

g. Connect the switch lead.

Note:
The PT-26M requires an auxiliary pilot ON switch box. Item number 1 at the left is not included in the PT-26M torch bundle. See next page for details.

1	Switch Lead
2	Electrode Cable/Coolant Supply Hose
3	Plasma Cut Gas Hose
4	Coolant Return Hose
5	Shield Gas Hose

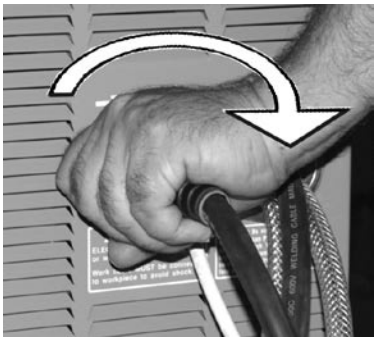


Pilot ON Switch Box.
Used with a PT-26 mechanized plasma torch.

Connect cable (1) , same as Step (g) from the immediately above, to adapt the mechanized version of the PT-26 plasma torch.

2. Re-install side panel.

3. Connect work cable to work connection on front panel.
   Insert and rotate clockwise until tight. Approximately ½ turn.



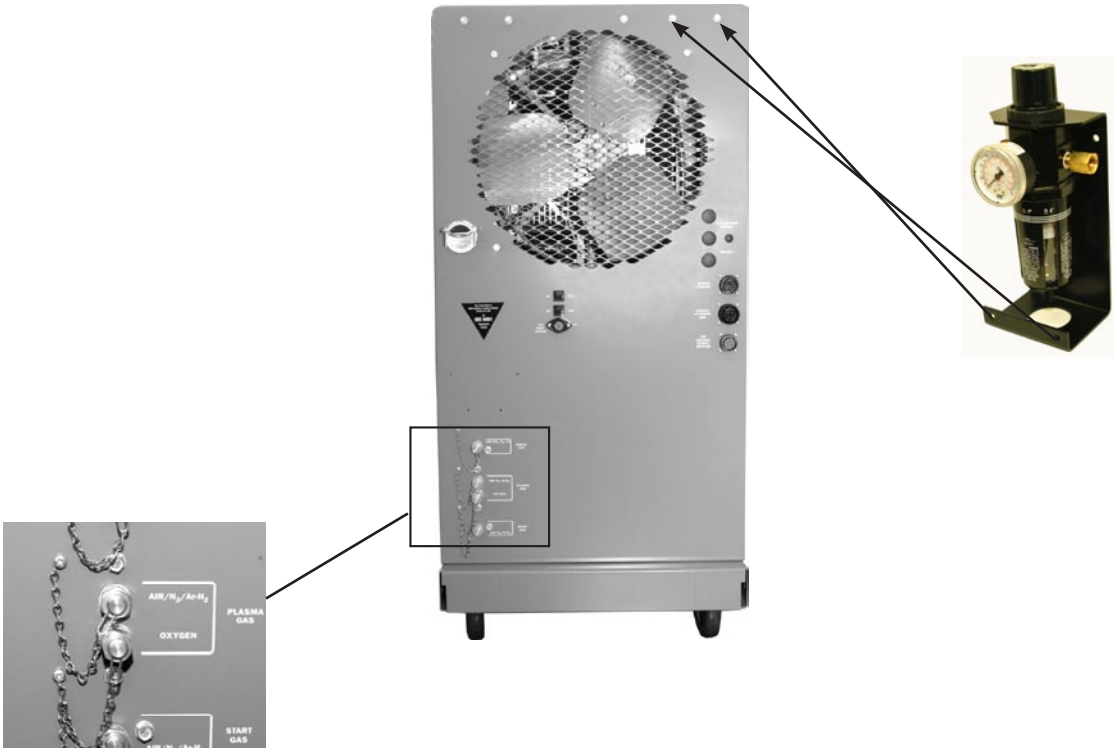
4. Assemble filter regulator and mounting bracket (P/N 30338) to the upper right corner on rear panel (as viewed from the rear).

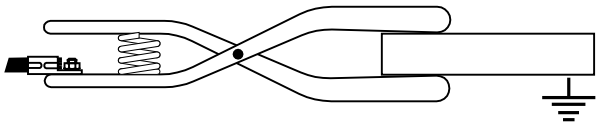
Note:
A second filter/regulator can be mounted on the left.

5. Connect air hose assembly (P/N 678152) to filter regulator outlet fitting and to the N2/Air plasma gas fitting on the rear panel.

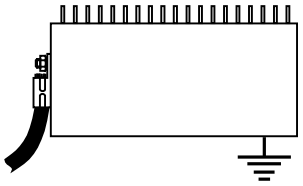
Note:
The air hose assembly has a left-hand threaded nut fitting on one end and a right-hand threaded nut on the other.

6. Connect your air supply to the inlet port on filter regulator. (1/4 inch NPT female – customer supplied)





Work ground to work piece



Work ground to cutting table

7. Connect the other end of work cable to workpiece or cutting table. Connection must be made to a clean, exposed metal surface, free of paint, rust, mill scale, etc.

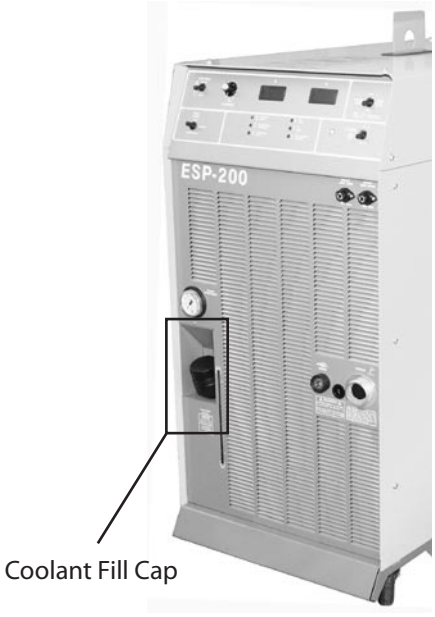
WARNING

ELECTRIC CURRENT IS HAZARDOUS.
IT IS IMPORTANT TO HAVE A GOOD EARTH GROUND CONNECTED TO THE WORKPIECE OR CUTTING TABLE.

CAUTION

Commercial Antifreeze Will Cause Torch To Malfunction.

Use special torch coolant. P/N 156F05
Due to high electrical conductivity, DO NOT use tap water or commercial automotive type antifreeze for torch cooling. A specially formulated torch coolant is REQUIRED. This coolant also protects from freezing to –34 degrees C. Operating the unit without coolant will cause permanent damage to the coolant pump. Check coolant level frequently.

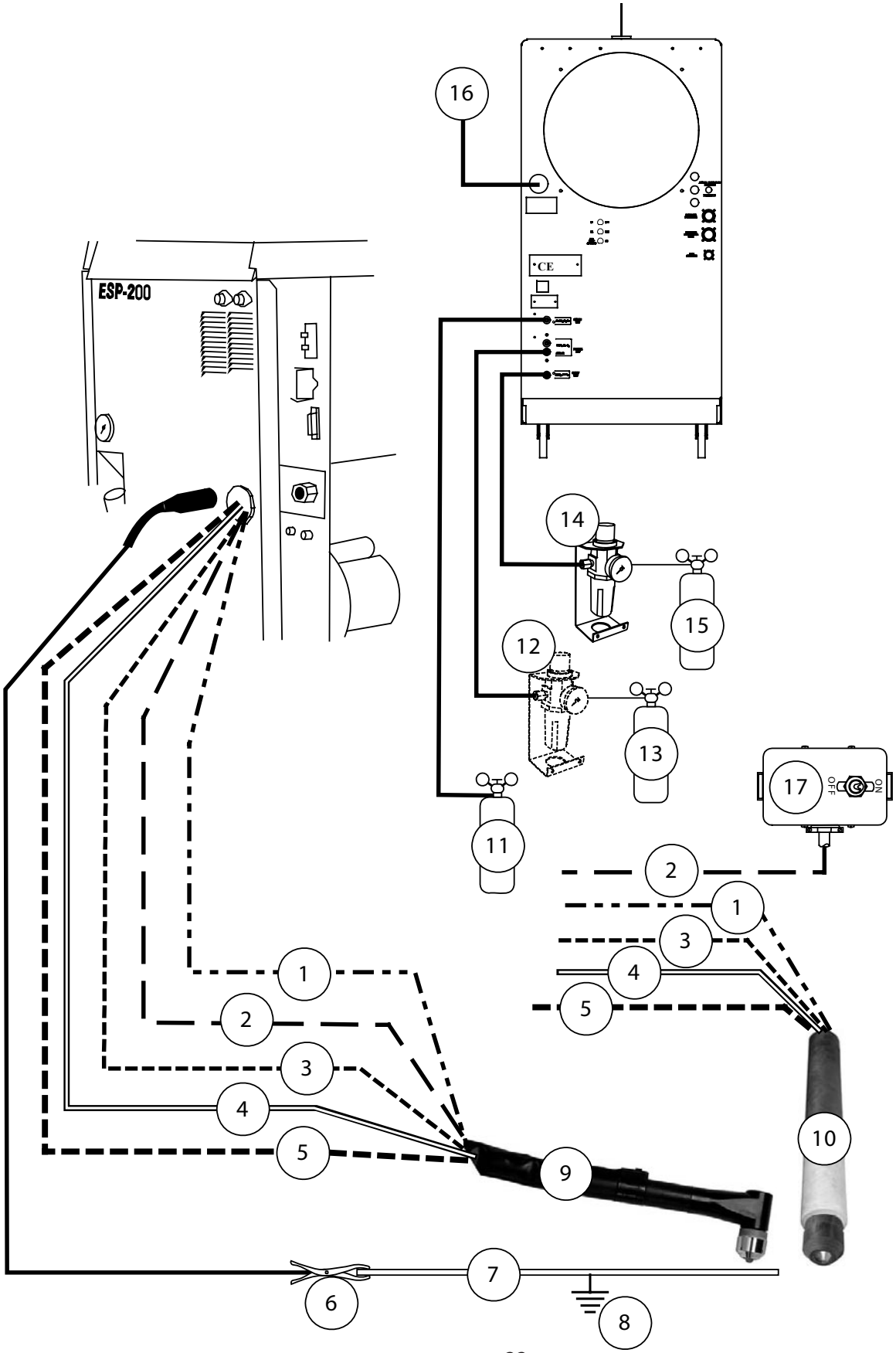


Coolant Fill Cap

8. Remove coolant fill cap at front console and fill coolant tank with 4 gallons (15 liters) of plasma torch coolant, P/N 156F05 (one gallon).

   - Do not fill above indicated maximum level.
   - Reinstall cap.

3.5.3 PT-26 Hand and Mechanized Torch Interconnection Diagram



PT-26 Interconnecting Diagram Legend

1	Shield Gas
2	Switch Lead (the switch lead connects to a auxiliary arc ON switch box when using the PT-26M torch)
3	Coolant Supply/Electrode Current
4	Pilot Arc/Coolant Return
5	Plasma Gas
6	Work Lead
7	Work Piece
8	Earth Ground
9	PT-26 Hand Torch
10	PT-26 Mechanized Torch
11	Shield Gas Supply
12	Plasma Gas Air Filter/Regulator (if air is used for plasma gas)
13	Plasma Gas Supply
14	Air Filter Regulator for Shield Gas
15	Shield Gas Supply
16	Input Power (from wall disconnect – not shown)
17	Auxiliary Switch Box (required for PT-26 mechanized torch only)

3.6 Connecting PT-19XLS or PT-600 Plasma Torches to ESP-200 Console and Options

3.6.1 PT-19XLS or PT600 and ESP-200 Output Cables, Hoses and Adapters (customer supplied)

ESP-200 Console

PT-19XLS and PT-600 with ESP-200 Plumbing Box/ESP-200
Lengths vary depending on system.

- Coolant Return
- Coolant Supply
- Pilot Arc Cable
- Pilot Arc Cable Adapter (P/N 999278)
- Electrode Cable
- Electrode Cable Adapter (P/N 36743)
- Shield Gas (directly to the Plumbing Box)
- Start Gas (directly to the Plumbing Box)
- Cut Gas (directly to the Plumbing Box)
- Work Cable
- Pendant Cable (if Pendant option is ordered)

Note:
Separate electrode and pilot arc cables are required when using the ESP-200 Plumbing Box.

SEE Description, Section 2 for part numbers.

PT-600 Plasmarc Torch

A remote SETUP Panel option (P/N 22000) is available on Avenger 1 and larger ESAB cutting machines. This panel operates the same as the pendant. Refer to your machine manual for replacement parts.

Plumbing Box

Remote Setup Pendant

3.6.2 PT-19XLS and PT-600 with ESP-200 Plumbing BoxTorch Output Connection Procedure

WARNING

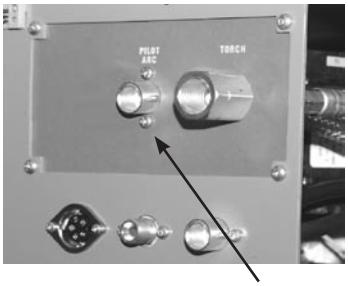
Electric Shock Can Kill!

Turn off primary input power at the wall disconnect box before making any connections to the ESP-200.

1. Thread 3 torch service lines (electrode cable, coolant supply, and coolant return) through large bushing at the middle right side of front panel. Insert power arc cable through black grommet between the large bushing and work cable plug. Proceed as follows:

Pilot arc cable here.

Thread service lines through bushing.



Pilot arc fitting

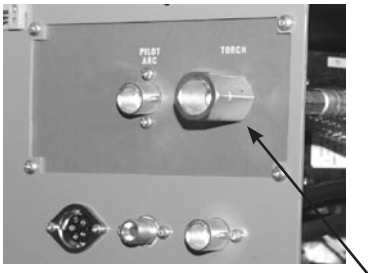
Pilot arc adapter (P/N 999278)

a. Insert pilot arc adapter into left hand threaded Pilot Arc fitting and tighten with a wrench.

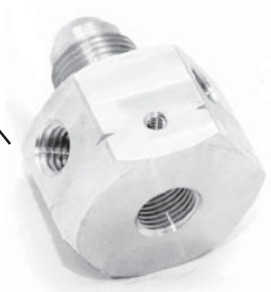
b. Thread cable adapter (P/N 36743) into coolant supply/electrode cable connection.

Note:

Use of the ESP-200 plumbing box requires separation of coolant supply and electrode cable. The electrode cable is inside the coolant supply hose for the PT-26 torch interface. (The PT-26 does not use a plumbing box.)



Coolant Supply/ Electrode Cable connection

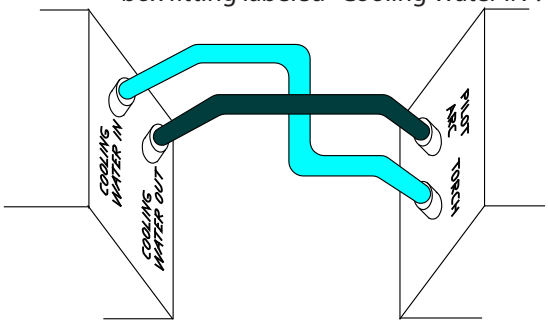


Coolant Supply Hose/Electrode Cable Adapter

c. Attach coolant hoses (see Description, Section 2 for part numbers) to console and plumbing box.

Note:

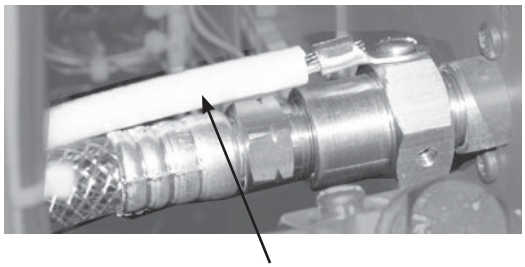
The supply and return coolant hoses between the ESP console and plumbing box have identical fittings. It is possible to cross connect these hoses. Be very careful to connect console connection labeled "Pilot Arc" with the P-box labeled "Cooling Water Out" and console connection labeled "Torch" with plumbing box fitting labeled "Cooling Water IN".



Plumbing Box Cooling Water Connections

Console Cooling Water Connections

d. Connect pilot arc cable to one of 3 threaded holes on the outside of the adapter with supplied screw.

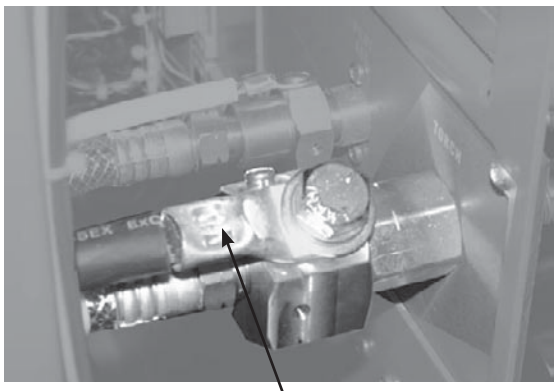


Pilot Arc Cable

e. Attach electrode cable to one of 3 large threaded holes. As shown above.

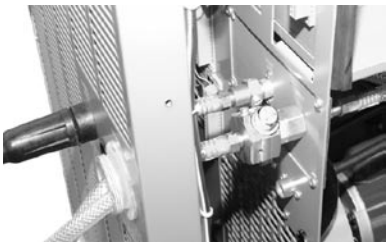
Note:

A large connection is necessary to safely carry the current in this circuit.

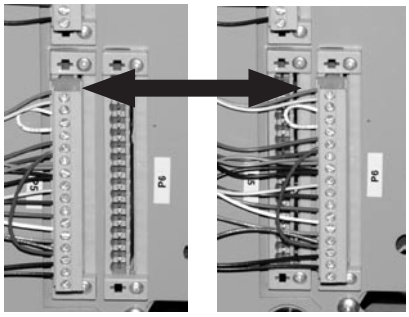


Electrode Cable

f. Move the P5 plug from J5 position to J6 position. This is to setup the plasma console for a remote plumbing box.



P5/P6 location

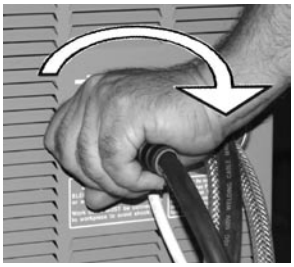


Move connector

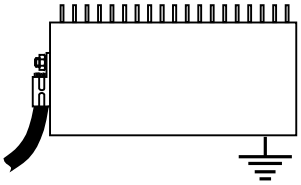
2. Re-install side panel of the ESP-200 Console.

3. Connect work cable to work connection on the front panel of console.

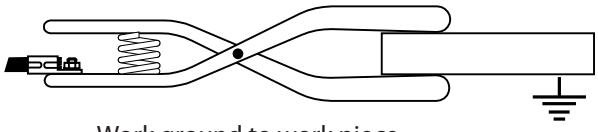
Insert and rotate clockwise until tight. Approximately ½ turn.



4. Connect the other end of the work cable to workpiece or cutting table. Connection must be made to a clean, exposed metal surface, free of paint, rust, mill scale, etc.



Work ground to cutting table

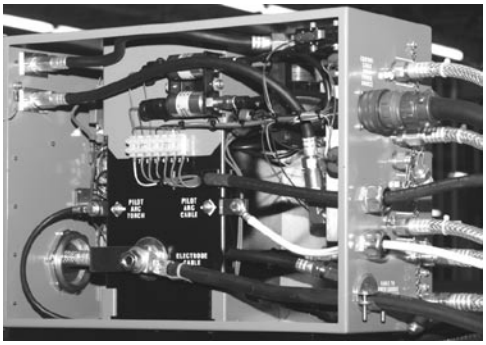


Work ground to work piece

3.6.3 Input connections to ESP-200 Plumbing Box

WARNING

ELECTRIC SHOCK CAN KILL!
TURN OFF PRIMARY INPUT POWER AT THE WALL DISCONNECT BOX BEFORE MAKING ANY CONNECTIONS TO THE ESP-200.



1. Connect cooling water supply (from Console connection labeled "TORCH") hose to "COOLING WATER IN".

2. Connect cooling water return (from Console connection labeled "PILOT ARC") hose to "COOLING WATER OUT".

3. Insert Pilot arc cable into pilot arc cable strain relief and connect to pilot arc cable terminal. Tighten strain relief.

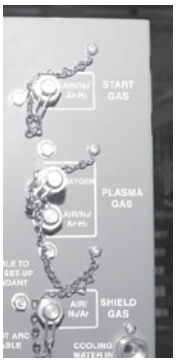
4. Insert electrode cable from the plasma console cooling water supply adapter into the strain relief labeled "Cable to Power Source Torch Adapter". Connect to the terminal labeled "Electrode Cable". Tighten strain relief.

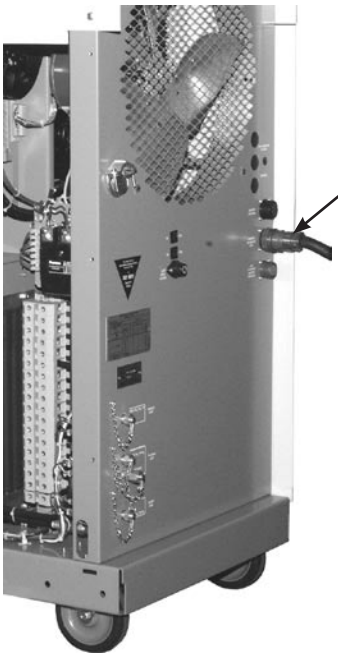
5. Insert Remote Pendant cable (if this option was selected in your package) into strain relief labeled "Cable to Remote Setup Pendant". (See remote pendant installation and operation Sections for more details).

6. Connect start gas, shield gas and cut gas hoses from gas supply to the appropriate labeled connection points on the back of the plumbing box. (When using a remote plumbing box, gases by-pass the power console and go directly to the plumbing box.)

Note:

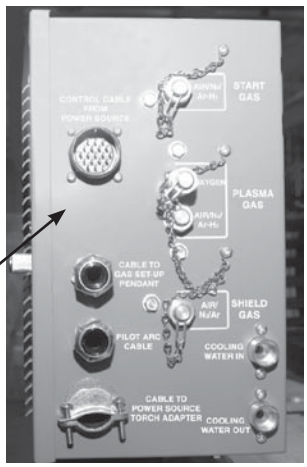
Gas supplies (including air) should be filtered prior to entering the plumbing box. 5 micron is the recommended filter size. See Replacement Part, Section 7 for part numbers.





Plasma console to plumbing box

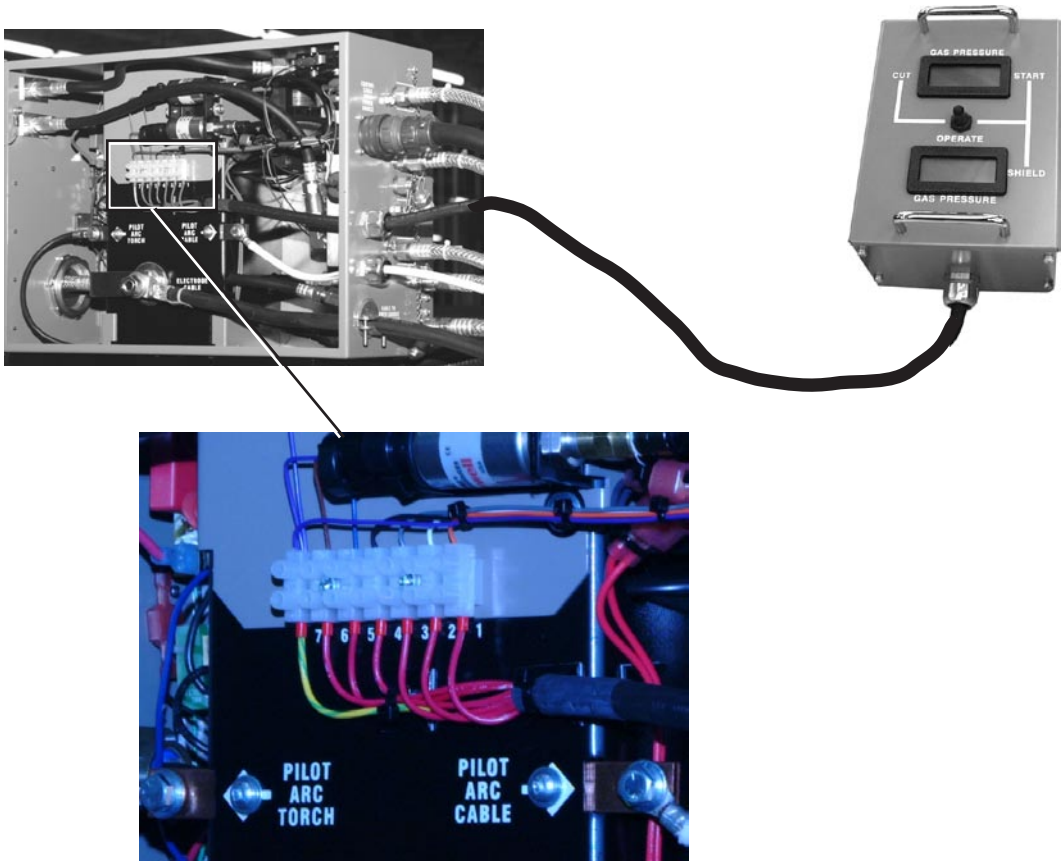
5. Connect remote plumbing box cable to the back of the power console to the receptacle on the back of the plumbing box.



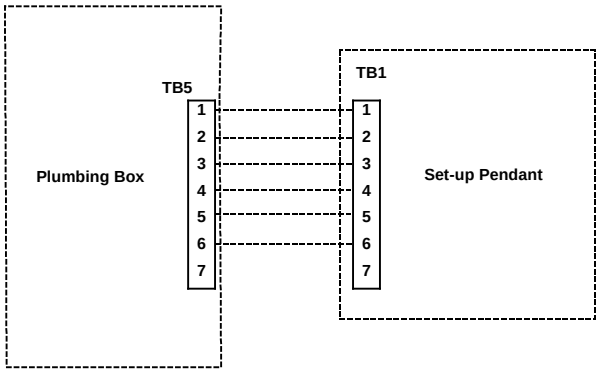
Plumbing box to Plasma console

3.6.4 Remote Setup Pendant Installation

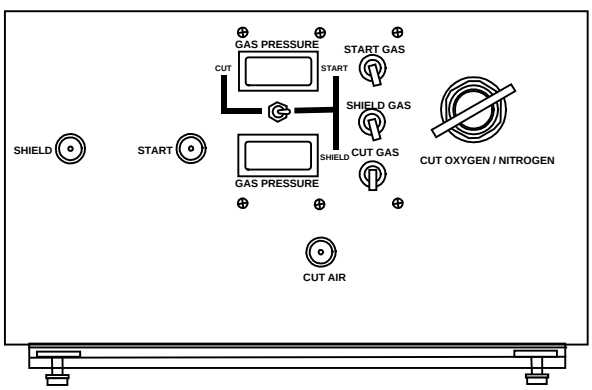
Remote Setup Pendant



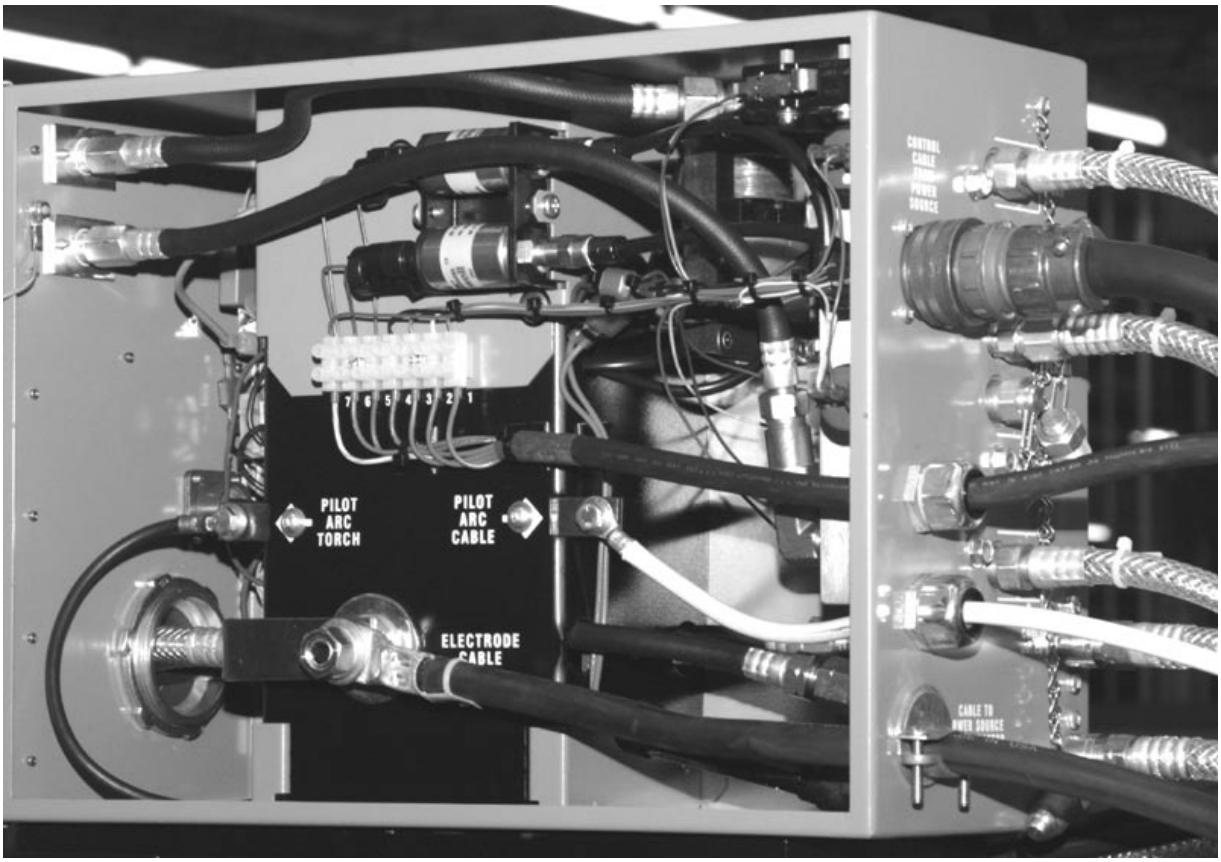
TB5 in the plumbing box



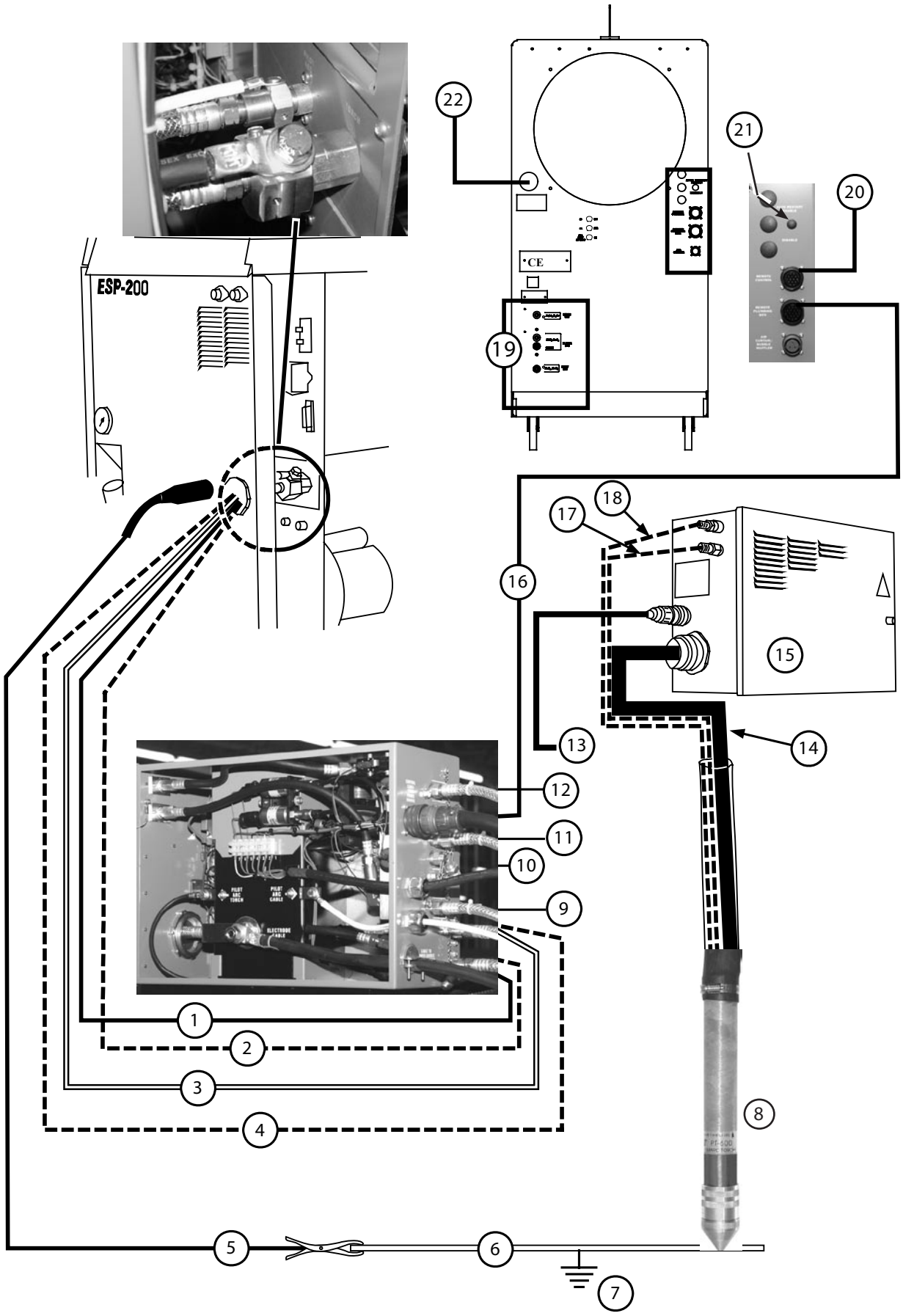
The Set-up Pendant/Panel cable is a 6 conductor cable.
Connect:
TB5-1 to TB1-1
TB5-2 to TB1-2
TB5-3 to TB1-3
TB5-4 to TB1-4
TB5-5 to TB1-5
TB5-6 to TB1-6



Remote Setup Panel w/Regulator Option For Cutting Machines. See Machine manual for details



Plumbing box fully connected (including setup pendant)


ESP-200
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PT-600 (and 19XLS) Interconnecting Diagram Legend

1	Electrode Cable
2	Coolant Return Hose
3	Pilot arc Cable
4	Coolant Supply Hose
5	Work Cable
6	Work Piece
7	Earth Ground
8	Plasma Torch (PT-600 shown)
9	Shield Gas In (from gas supply)
10	Setup Pendant (Remote)
11	Cut gas In (from gas supply)
12	Start Gas (from gas supply)
13	Height Control
14	Torch Bundle (Cooling Water: Supply and Return, Current: Pilot Arc and Electrode)
15	Flow Control (Front)
16	Remote Plumbing Box Cable
17	Shield Gas (to Torch)
18	Plasam Gas (to Torch)
19	Gas Connections on Console (not used in this application)
20	CNC Cable
21	Restart Switch (used on CE version only)
22	Current Input (from wall disconnect – not shown)

3.7 Coolant Installation

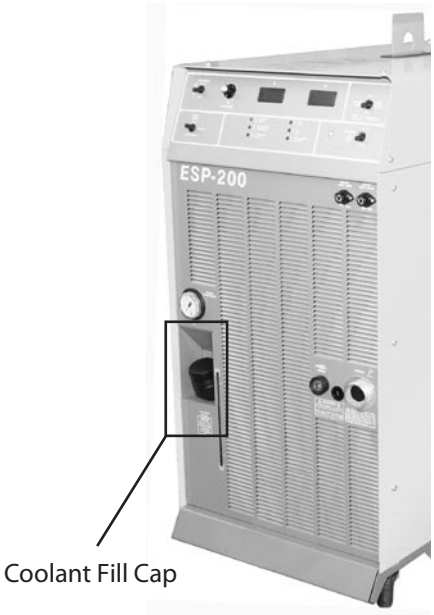
WARNING

ELECTRIC CURRENT IS HAZARDOUS.
IT IS IMPORTANT TO HAVE A GOOD EARTH GROUND CONNECTED TO THE WORKPIECE OR CUTTING TABLE.

CAUTION

Commercial Antifreeze Will Cause Torch To Malfunction.

Use special torch coolant. P/N 156F05
Due to high electrical conductivity, DO NOT use tap water or commercial automotive type antifreeze for torch cooling. A specially formulated torch coolant is REQUIRED. This coolant also protects from freezing to –34 degrees C. Operating the unit without coolant will cause permanent damage to the coolant pump. Check coolant level frequently.



Remove coolant fill cap at front console and fill coolant tank with 4 gallons (15 liters) of plasma torch coolant, P/N 156F05 (one gallon).

- Do not fill above indicated maximum level.
- Reinstall cap.

4.1 Introduction – Operational Safety

DANGER

ELECTRIC SHOCK CAN KILL!

DISCONNECT CURRENT SUPPLY AT WALL DISCONNECT BEFORE SERVICING CONSOLE, TORCH OR PLUMBING BOX.

- Do not operate console or plumbing box with any covers removed/ open.
- Do not touch any torch front-end parts with power on.
- Do not attempt to service any portion of this plasma system unless power has been disconnected at the wall disconnect.

WARNING

THIS EQUIPMENT CAN BE HAZARDOUS IF NOT PROPERLY OPERATED AND MAINTAINED.

READ AND UNDERSTAND ALL EQUIPMENT LITERATURE AND WARNING LABELS BEFORE OPERATING THIS EQUIPMENT.

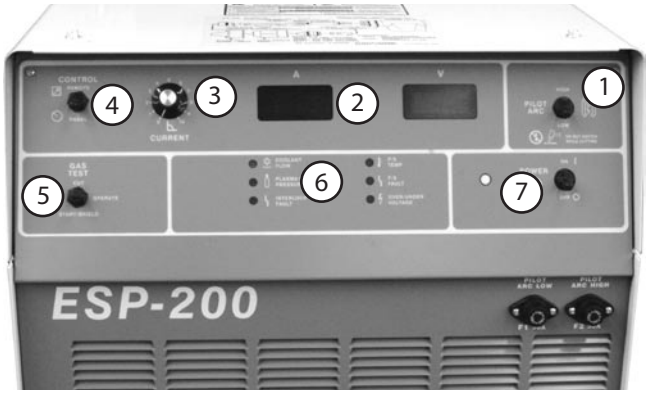
WARNING

PLASMA ARC CUTTING CAN BE HAZARDOUS TO EYES AND EARS.

- Wear hearing protection.
- Wear eye protection specifically designed for arc welding and cutting. Lenses should be at least a No. 6 or No. 7 lens shade.
- Wear protective clothing to avoid skin burns.

4.2 Operating the ESP-200 Console

4.2.1 Console Controls



1	Pilot Arc High/Low Switch
2	Cutting Voltage and Cutting Current Meters
3	Output Current Control
4	Remote/Panel Selection Switch
5	Gas Test Switch
6	Fault Lights
7	Main Power Switch

Pilot Arc Switch

Used to select pilot arc current range. HIGH position is used for most cutting applications. Electrode life is adversely affected when used in high position when low is suitable. Starting may be difficult if set on low when high is required. Related to the initial torch standoff height.

Cutting Voltage and Current Meters

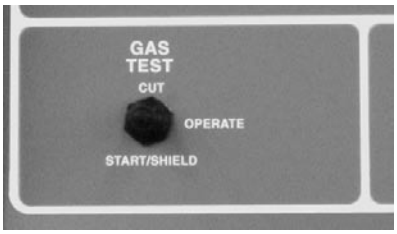
"A" meter indicates actual cutting current, 0-200 amperes
"V" meter indicates actual output voltage, 0-160 VDC

Output Current Control

Sets the cutting current when current settings are made from the power console front panel. (The Remote/Panel switch must be in the Panel position.)

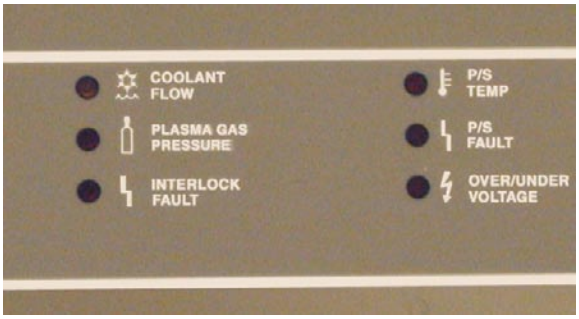
Remote/Panel Switch

Panel position – Output current is set by the output current control on the console front panel as described above.
Remote position – Output current is set by the CNC with an analog dc signal.



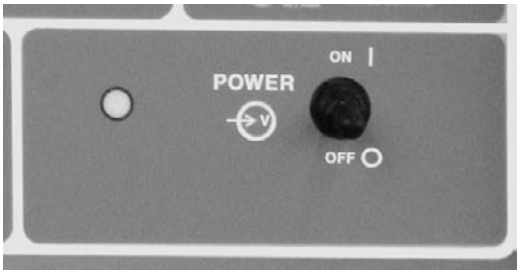
Gas Test Switch

Cut – Allows for setup of cut gas pressure and flow.
Start/Shield – Setup of gas pressures and flows.
Operate – Default position – Must be in this position for cutting.



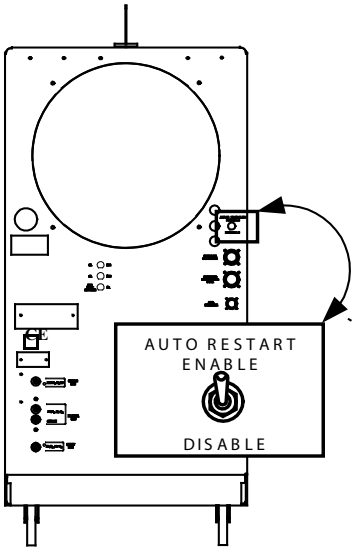
Fault Indicator Lights

- Coolant Flow – Will show low coolant flow. Light will briefly show a fault when console is turned on and then go out.
- Plasma Gas Pressure -- fault indicator – low plasma gas pressure. Torch will not fire when illuminated.
- Interlock Fault – Indicates Remote Plumbing box door is not properly closed.
- P/S Temp – fault indicator – over temperature condition in the inverter power source.
- P/S Fault – fault indicator – Not used.
- Over/Under Voltage – fault indicator – input voltage is above or below tolerances of the power source console. Will stay shut down console until main power switch is recycled and fault is corrected.



Main Power Switch

Controls the input power to the fan, water cooler, inverter and interface circuitry. Light illuminates to indicate power is on.



Auto Restart Selector Switch

Located on the back upper right side of console. Used on mechanized cutting only (CE version console).

- Enable – Arc will restart after arc ON signal is lost if a START signal is supplied.
- Disable – START signal will be disabled if arc ON signal is lost and arc will not restart until START signal is removed and re-supplied.

4.2.2 Remote Setup Pendant

Remote setup pendant switch is identical in function to the Gas Test Switch on the console.

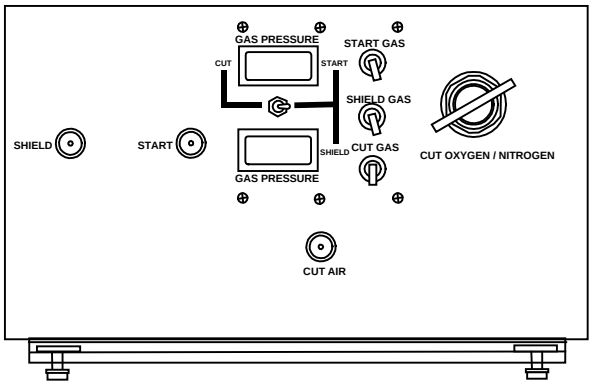
Pendant has a three position switch:

Position CUT – Temporarily allows cut gas to flow to preset pressure before operation. Cut gas pressure is displayed on the top digital meter.

Position START/SHIELD – Temporarily allows start and shield gases to flow before operation. Start gas pressure is displayed on the top digital meter. Shield gas is displayed on the bottom digital meter.

Position OPERATE – This is default position (Spring tension returns toggle to this position). Switch will return to this position without assistance when released. This middle switch position allows console to be in cutting mode (not setup).

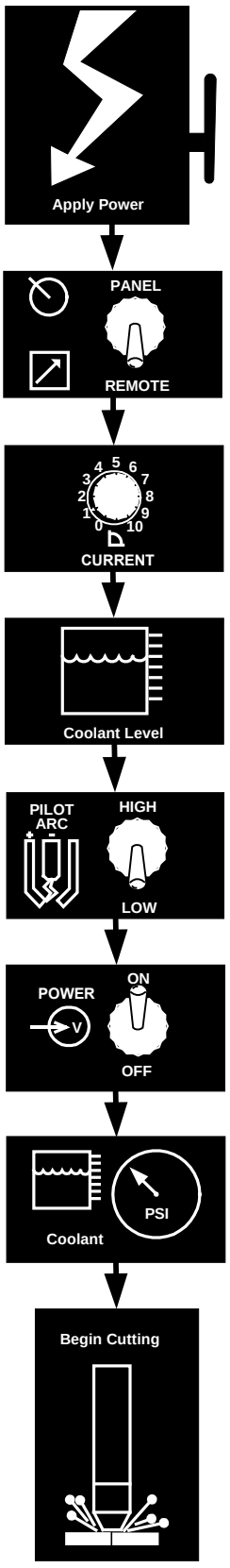
4.2.3 Remote Setup Panel



The Remote Setup Panel is an option for Avenger 1 CNC cutting machines and larger. It is substituted for the pendant and operates the same with addition of a regulator for cut oxygen and nitrogen.

Refer to your cutting machine manual for details.

4.3 Sequence of Operation



1. Apply power by closing the line (wall) switch. Main power light will not illuminate until console power switch is turned ON. Fault light should flash and go out.

2. Select the Panel/Remote setting. If current is controlled from cutting machine CNC, place switch to Remote position. Consult cutting machine instructions for current setting. If current is not controlled by the CNC, select Panel and set current on output current dial.

3. Check coolant level. Level must be checked with console main power in OFF position. Coolant level must fall in the safe operating level.

4. Set pilot arc High/Low switch. (Refer to cutting process data of the torch manual.)

5. Turn on console power by placing power switch in ON position. White light to left of the switch will illuminate.

6. Check coolant pressure. The pressure is factory set between 80 to 90 PSI (5.5 –6.2 bars).

7. Begin plasma cutting operation. This may include manually setting other options, depending on total plasma package.

If using panel mode, after cutting has begun, adjust current to desired amount.

Check for a fault light. If a fault light illuminates, SHUT OFF POWER IMMEDIATELY and refer to troubleshooting section.

NOTICE

Refer to your torch manual for recommended consumables for cutting at different amperes.

NOTICE

For the purposes of process data, the PT-19XLS and The PT-600 are the same torch. The PT-600 is an improved version of the PT-19XLS plasma torch. Higher manufacturing tolerances in the PT-600 result in improved torch concentricity resulting in greater part accuracy potential.

4.4 Process Data for PT19XLS/PT-26 and the ESP-200

4.4.1 Introduction to Cut Characteristics

The quality of a cut is judged by three primary characteristics;

1. Bottom Dross and Top Spatter
2. Bevel Angle
3. Surface Roughness

These characteristics vary by many factors including the type and condition of plate material of which there is little control such as;

- plate chemistry
- coatings
- scale

The Condition Selection Charts express the cut quality obtained in laboratory tests with a variety of materials. The information in the charts is based on the following terminology.

4.4.1.1 Dross:

- Excellent - Essentially dross free with no top spatter.
- Good - Very light removable dross, or dross free with top spatter.
- Fair - Medium to heavy removable dross.
- Poor - Tenacious dross

4.4.1.2 Bevel angle:

A slight bevel is characteristic of plasma cutting. The objective in the selection chart is to establish conditions that cause the least angle. Bevel angle ratings in the chart are identified as; 1 for the least angle, 2 for second best and 3 for third rate, etc. When more than one set conditions produce the same bevel angle they are given the same rating. It is possible to have four conditions with a "1" rating, one with a "2", and two with a "3".

Bevel angle ratings are relative for particular material and thickness, they are not absolute; a "3" on 1 inch (25.4mm) material may have less bevel than a "1" on 1/4 inch (6.4mm) material.

4.4.1.3 Surface roughness:

- Excellent - Bright and smooth
- Good - Discolored, fairly smooth
- Fair - Moderate roughness
- Poor - Very rough

4.4.2 CONDITION SELECTION Charts for PT-19XLS with ESP-200

4.4.2.1 Carbon Steel

Current		50-65A	100A	100A	150A	150A	200A	200A
Plasma gas		AIR	AIR	O_2	AIR	O_2	AIR	O_2
Shield gas		AIR	AIR	AIR	AIR	AIR	AIR	AIR
		Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface
Material Thickness	1,6mm (1/16 in.)	G 1 G						
	3,2mm (1/8 in.)	G 1 G						
	6,4mm (1/4 in.)	G 2 F	E 2 G	E 1 E	E 1 G	E 2 E	E 3 G	E 3 E
	9,6mm (3/8 in.)		E 2 G	E 1 E	G 2 G	E 2 E	E 3 G	G 3 E
	12,7mm (1/2 in.)		F 1 G	E 1 E	G 1 G	E 1 E	G 3 G	E 2 E
	19,1mm (3/4 in.)		F 1 G	F 1 E	F 2 G	F 1 E	G 2 G	E 1 E
	25,4mm (1 in.)						F 1 G	G 1 E
	31,8mm (1-1/4 in.)						F 1 G	F 1 E
	38,1mm (1-1/2 in.)						F 1 G	F 1 E
	44,5mm (1-3/4 in.)						F 1 G	F 1 G
	50,8mm (2 in.)						F 1 G	F 2 G

4.4.2.2 Stainless Steel

Current		50-65A	50-65A	100A	100A	100A	150A	150A	150A	200A	200A	200A
Plasma gas		AIR	N_2	AIR	N_2	N_2	AIR	N_2	H-35	AIR	N_2	H-35
Shield gas		AIR	N_2	AIR	N_2	AIR	AIR	AIR	N_2	AIR	AIR	AIR
		Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface
Material Thickness	1,6mm (1/16 in.)	E 1 P	G 1 G									
	3,2mm (1/8 in.)	E 1 P	P 1 G									
	6,4mm (1/4 in.)	E 5 P	P 5 F	E 1 F	G 2 G	G 2 G	G 3 F	E 4 G		G 2 G	E 4 G	
	9,6mm (3/8 in.)			E 1 F	E 1 G	E 1 F	G 2 F	E 2 G		G 2 G	E 2 G	
	12,7mm (1/2 in.)			G 2 F	E 2 F	E 1 F	E 2 F	E 1 F	E 3 E	E 2 F	E 1 G	E 3 E
	19,1mm (3/4 in.)			P 2 P	P 1 P	P 1 F	G 2 P	G 1 P	P 1 E	E 1 F	E 1 F	E 1 E
	25,4mm (1 in.)						G 1 P	P 2 P	P 1 G	G 2 F	P 2 F	P 1 E
	31,8mm (1-1/4 in.)											P 1 G
	38,1mm (1-1/2 in.)											P 1 G

4.4.2.3 Aluminum

Current		50-65A	50-65A	100A	150A	150A	200A	200A	200A
Plasma Gas		N_2	AIR	AIR	AIR	H-35	N_2	AIR	H-35
Shield Gas		N_2	AIR	AIR	AIR	N_2	AIR	AIR	N_2
		Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface	Dross Angle Surface
	1,6mm (1/16 in.)	E 1 G	E 2 F						
	3,2mm (1/8 in.)		E 1 G	E 2 F					
	6,4mm (1/4 in.)		E 1 G	E 2 F	E 1 G	E 2 G	E 2 E	G 4 G	E 3 G
	9,6mm (3/8 in.)				E 1 G	E 1 G	E 2 E	G 3 G	E 2 G
	12,7mm (1/2 in.)				E 3 G	E 1 G	E 2 E	G 3 F	E 1 G
	19,1mm (3/4 in.)				G 3 P	G 1 F	E 3 E	G 2 F	G 1 F
	25,4mm (1 in.)					G 1 F	E 1 E	G 1 P	G 1 F

4.4.3 Process Data for PT19XLS (or PT-600) and ESP-200

4.4.3.1 Introduction

The cutting speeds and conditions in the following tables were selected to give the best quality with a particular gas combination at a specific current. They are unique to the ESP-200/PT19XLS combination because of restrictive gas ports built into the power supply

- Consumables - Refer to recommended parts for these conditions. Use of parts in combinations and applications other than as described herein can result in damage to the torch or poor performance.
- Gas and Current Selection- Refer to the following tables to chose the most appropriate conditions for your application.
- Maximum Economy- Refer to Paragraph D for high speed cutting conditions where cost is a principle concern.

4.4.3.2 Process Data at 50 to 65 Amps (PT-19XLS and PT-600)

Refer to your torch manual for recommended consumables for cutting at this current.

Material Type-Thickness in.(mm)	Current (Amps)	Travel Speed ipm(M/m)	Pierce Height in. (mm)	Cutting Height in.(mm)	Arc Voltage (Volts)	Start Gas Type/Pressure psi (bar)	Plasma Gas Type/Pressure psi (bar)	Shield Gas Type/Pressure psi (bar)
CS - 1/16 (1.6)	50	220 (5.6)	1/4 (6.4)	5/32 (4)	115	Air - 40 (2.76)	Air - 60 (4.14)	Air - 30 (2.07)
CS - 1/8 (3.2)		120 (3)			112			
CS - 1/8 (3.2)	65	120 (3)		1/8 (3.2)	110			
CS - 3/16 (4.8)		95 (2.4)		5/32 (4)	118			
CS - 1/4 (6.4)		80 (2)			120			Air - 65 (4.48)
CS - 3/8 (9.6)		40 (2)	5/16 (8)		122			
SS - 1/16 (1.6)	50	180 (4.6)	1/4 (6.4)	5/32 (4)	111	Air - 40 (2.76)	Air - 60 (4.14)	Air - 30 (2.07)
SS - 1/8 (3.2)	65	80 (2)			119			
SS - 1/4 (6.4)		60 (1.5)			118			Air - 65 (4.48)
AL - 1/16 (1.6)	50	180 (4.6)	1/4 (6.4)	1/8 (3.2)	116	Air - 40 (2.76)	Air - 60 (4.14)	Air - 45 (3.1)
AL - 1/8 (3.2)		110 (2.8)			115			
AL - 1/4 (6.4)	65	65 (1.6)		5/32 (4)	128			Air - 65 (4.48)
AL - 1/16 (1.6)	50	180 (4.6)	1/4 (6.4)	1/8 (3.2)	118	N_2 - 40 (2.76)	N_2 - 60 (4.14)	N_2 - 30 (2.07)
AL - 1//8 (3.2)		120 (3)			117			
AL - 1/4 (6.4)	65	70 (1.8)			125			N_2 - 65 (4.48)
SS - 1/16 (1.6)	50	180 (4.6)	1/4 (6.4)	5/32 (4)	119	N_2 - 40 (2.76)	N_2 - 60 (4.14)	N_2 - 30 (2.07)
SS - 1/8 (3.2)	65	80 (2)			125			N_2 - 45 (3.1)
SS - 1/4 (6.4)		55 (1.4)			127			N_2 - 65 (4.48)

NOTES:
CS - Carbon Steel, SS - Stainless Steel, AL - Aluminum
Air Plasma/Air Shield, 50 - 65 Amp cuts on Stainless Steel and Aluminum have rough surfaces.
N_2 Plasma/N2 Shield, 50 - 65 Amp cuts of Stainless Steel and Aluminum have fair to good surfaces.
Pilot Arc -- Low

4.4.3.3 Process Data at 100 Amps (PT-19XLS and PT-600)

Material Type-Thickness in.(mm)	Current (Amps)	Travel Speed ipm(M/m)	Pierce Height in.(mm)	Cutting Height in.(mm)	Arc Voltage (Volts)	Start Gas Type/Pressure psi((bar)	Plasma Gas Type/Pressure psi (bar)	Shield Gas Type/Pressure psi(bar)
CS - 3/16 (4.8)	100	150 (3.8)	3/8 (9.6)	1/8 (3.2)	148	Air - 30 (2.07)	Air - 50 (3.45)	Air - 110 (7.6)
CS - 1/4 (6.4)		120 (3)		5/32 (4)	154			Air - 85 (5.86)
CS - 3/8 (9.6)		65 (1.65)		3/16 (4.8)	159			
CS - 1/2 (12.7)		50 (1.27)			162			Air - 65 (4.48)
CS - 5/8 (15.8)		35 (.89)	1/2 (12.7)	9/32 (7.1)	175			
CS - 3/4 (19)		20 (.50)		5/16 (8)	184			
SS - 1/4 (6.4)	100	55 (1.4)	3/8 (9.6)	1/8 (3.2)	154	Air - 30 (2.07)	Air - 45 (3.1)	Air - 85 (5.86)
SS - 3/8 (9.6)		35 (.89)		3/16 (4.8)	165			
SS - 1/2 (12.7)		25 (.6)		5/16 (8)	180			Air - 65 (4.48)
SS - 3/4 (19)		10 (.25)	1/2 (12.7)		189			
AL - 1/4 (6.4)	100	100 (2.5)	3/8 (9.6)	3/16 (4.8)	154	Air - 30 (2.07)	Air - 50 (3.45)	Air - 65 (4.48)
AL - 3/8 (9.6)		70 (1.78)		1/4 (6.4)	174			Air - 85 (5.86)
AL - 1/2 (12.7)		50 (1.27)		5/16 (8)	183			
AL - 3/4 (19)		30 (.76)	1/2 (12.7)		189			Air - 65 (4.48)
CS - 3/16 (4.8)	100	150 (3.8)	3/8 (9.6)	5/32 (4)	135	N_2 - 30 (2.07)	O_2 - 50 (3.45)	Air - 85 (5.86)
CS - 1/4 (6.4)		120 (3)			133			
CS - 3/8 (9.6)		80 (2)		1/4 (6.4)	149			
CS - 1/2 (12.7)		60 (1.5)		3/16 (4.8)	141			Air - 65 (4.48)
CS - 5/8 (15.8)		37 (.94)	1/2 (12.7)	5/16 (8)	159			
CS - 3/4 (19)		20 (.50)			162			
SS - 1/4 (6.4)	100	55 (1.4)	3/8 (9.6)	1/8 (3.2)	153	N_2 - 30 (2.07)	N_2 - 35 (2.4)	N_2 - 85 (5.86)
SS - 3/8 (9.6)		45 (1.1)		3/16 (4.8)	157			
SS - 1/2 (12.7)		35 (.89)			162			
SS - 3/4 (19)		13 (.33)	1/2 (12.7)	5/16 (8)	185			N_2 - 65 (4.48)
SS - 1/4 (6.4)	100	55 (1.4)	3/8 (9.6)	1/8 (3.2)	153	N_2 - 30 (2.07)	N_2 - 35 (2.4)	Air - 85 (5.86)
SS - 3/8 (9.6)		45 (1.1)		3/16 (4.8)	157			
SS - 1/2 (12.7)		35 (.89)			162			
SS - 3/4 (19)		13 (.33)	1/2 (12.7)	5/16 (8)	185			Air - 65 (4.48)

NOTES: When using a 50 ft torch, a dwell of approx. 3 sec. is required to allow the N_2 start gas to be purged out by the O_2 cut gas.
CS - Carbon Steel, SS - Stainless Steel, AL - Aluminum
All Air Plasma/Air Shield, 100 Amp cuts on Aluminum have good surfaces except 3/4" (19mm) AL that has poor surface.
All Air Plasma/Air Shield, 100 Amp cuts on Stainless Steel have fair surface except 3/4" (19mm) SS that is very rough.
All N_2 Plasma/N2 Shield, 100 Amp cuts on Stainless Steel have fairly good surfaces except 3/4" (19mm) SS that is fair.

Pilot Arc -- HIGH

4.4.3.4 Process Data at 150 Amps (PT-19XLS and PT-600)

Material Type-Thickness in. (mm)	Current (Amps)	Travel Speed ipm(M/m)	Pierce Height in.(mm)	Cutting Height in.(mm)	Arc Voltage (Volts)	Start Gas Type/Pressure psi(bar)	Plasma Gas Type/Pressure psi(bar)	Shield Gas Type/Pressure psi(bar)
CS - 3/16 (4.8)	150	160 (4.1)	3/8 (9.6)	1/8 (3.2)	143	Air - 25 (1.7)	Air - 50 (3.45)	Air - 85 (5.86)
CS - 1/4 (6.4)		140 (3.6)			145			Air - 55 (3.8)
CS - 3/8 (9.6)		90 (2.3)		3/16 (4.8)	156			
CS - 1/2 (12.7)		75 (1.9)		1/4 (6.4)	160			Air - 65 (4.48)
CS - 5/8 (15.8)		50 (1.3)	1/2 (12.7)		164			
CS - 3/4 (19)		45 1.1)		3/8 (9.6)	179			
CS - 1 (25.4)		25 (.64)			184			
SS - 3/16 (4.8)	150	200	3/8 (9.6)	1/8 (3.2)	138	Air - 25 (1.7)	Air - 50 (3.45)	Air - 85 (5.86)
SS - 1/4 (6.4)		165		3/16 (4.8)	146			Air - 65 (4.48)
SS - 3/8 (9.6)		95		1/4 (6.4)	155			
SS - 1/2 (12.7)		60		5/16 (8)	163			
SS - 3/4 (19)		25	1/2 (12.7)	3/8 (9.6)	175			
SS - 1 (25.4)		15			185			
AL - 3/16 (4.8)	150	200 (5.1)	3/8 (9.6)	3/16 (4.8)	148	Air - 25 (1.7)	Air - 45 (3.1)	Air - 85 (5.86)
AL - 1/4 (6.4)		140 (3.6)			149			
AL - 3/8 (9.6)		105 (2.7)		1/4 (6.4)	159			Air - 65 (4.48)
AL - 1/2 (12.7)		80 (2)		5/16 (8)	174			Air - 85 (5.86)
AL - 3/4 (19)		45 (1.1)	1/2 (12.7)		180			Air - 65 (4.48)
AL - 1 (25.4)		30 (.76)			184			
CS - 3/16 (4.8)	150	160 (4.1)	3/8 (9.6)	1/8 (3.2)	127	N_2 - 25 (1.7)	O_2 - 45 (3.1)	Air - 85 (5.86)
CS - 1/4 (6.4)		150 (3.8)		3/16 (4.8)	130			Air - 45 (3.1)
CS - 3/8 (9.6)		90 (2.3)			134			Air - 65 (4.48)
CS - 1/2 (12.7)		75 (1.9)		1/4 (6.4)	142			
CS - 5/8 (15.8)		55 (1.4)	1/2 (12.7)	5/16 (8)	151			Air - 85 (5.86)
CS - 3/4 (19)		45 (1.1)		3/8 (9.6)	157			Air - 65 (4.48)
CS - 1 (25.4)		25 (.64)		5/16 (8)	160			

NOTES: When using a 50 ft torch, a dwell of approx. 3 sec. is required to allow the N_2 start gas to be purged out by the O_2 cut gas.
CS - Carbon Steel, SS - Stainless Steel, AL - Aluminum
All Air Plasma/Air Shield, 100 Amp cuts on Aluminum have good surfaces except 3/4" (19mm) AL that has poor surface.
All Air Plasma/Air Shield, 100 Amp cuts on Stainless Steel have fair surface except 3/4" (19mm) SS that is very rough.
All N_2 Plasma/N_2 Shield, 100 Amp cuts on Stainless Steel have fairly good surfaces except 3/4" (19mm) SS that is fair.

Pilot Arc -- HIGH

150 Amp Data (PT-19XLS and PT-600) Continued

Material Type-Thickness in. (mm)	Current (Amps)	Travel Speed ipm(M/m)	Pierce Height in.(mm)	Cutting Height in.(mm)	Arc Voltage (Volts)	Start Gas Type/Pressure psi(bar)	Plasma Gas Type/Pressure psi(bar)	Shield Gas Type/Pressure psi(bar)
SS - 3/16 (4.8)	150	200 (5.1)	3/8 (9.6)	1/8 (3.2)	132	N_2 - 25 (1.7)	N_2 - 45 (3.1)	Air - 85 (5.86)
SS - 1/4 (6.4)		130 (3.3)		3/16 (4.8)	140			
SS - 3/8 (9.6)		85 (2.16)			143			
SS - 1/2 (12.7)		60 (1.5)		1/4 (6.4)	154			
SS - 3/4 (19)		18 (.45)	1/2 (12.7)		164			Air - 65 (4.48)
SS - 1 (25.4)		10 (.25)		5/16 (8)	179			
SS - 1/2 (12.7)	150	40 (1.0)	3/8 (9.6)	5/16 (8)	160	N_2 - 25 (1.7)	H-35 - 55 (3.8)	N_2 - 65 (4.48)
SS - 3/4 (19)		25 (.64)	1/2 (12.7)	3/8 (9.6)	175			N_2 - 45 (3.1)
SS - 1 (25.4)		12 (.30)	NR		180			N_2 - 20 (1.37)
AL - 3/16 (4.8)	150	200 (5.1)	3/8 (9.6)	3/16 (9.6)	136	N_2 - 25 (1.7)	H-35 - 55 (3.8)	N_2 - 65 (4.48)
AL - 1/4 (6.4)		150 (3.8)		1/4 (6.4)	141			
AL - 3/8 (9.6)		110 (2.8)			145			
AL - 1/2 (12.7)		90 (2.3)		5/16 (8)	155			
Al - 3/4 (19)		50 (1.3)	1/2 (12.7)	3/8 (9.6)	166			
AL - 1 (25.4)		30 (.76)			171			

NOTES: When using a 50 ft torch, a dwell of approx. 3 sec. is required to allow the N_2 start gas to be purged out by the O_2 cut gas.
CS - Carbon Steel, SS - Stainless Steel, AL - Aluminum
All Air Plasma/Air Shield, 100 Amp cuts on Aluminum have good surfaces except 3/4" (19mm) AL that has poor surface.
All Air Plasma/Air Shield, 100 Amp cuts on Stainless Steel have fair surface except 3/4" (19mm) SS that is very rough.
All N2 Plasma/N_2 Shield, 100 Amp cuts on Stainless Steel have fairly good surfaces except 3/4" (19mm) SS that is fair.

Pilot Arc -- HIGH

4.4.3.5 Process Data at 200 Amps (PT-19XLS and PT-600)

Material Type-Thickness in.(mm)	Current (Amps)	Travel Speed ipm(M/m)	Pierce Height in.(mm)	Cutting Height in.(mm)	Arc Voltage (Volts)	Start Gas Type/Pressure psi(bar)	Plasma Gas Type/Pressure psi(bar)	Shield Gas Type/Pressure psi(bar)
CS - 1/4 (6.4)	200	150 (3.8)	3/8 (9.6)	1/8 (3.2)	143	Air - 30 (2.07)	Air - 45 (3.1)	Air - 65 (4.48)
CS - 3/8 (9.6)		100 (2.54)			146			
CS - 1/2 (12.7)		95 (2.4)		7/32 (5.5)	158			
CS - 5/8 (15.8)		75 (1.9)	1/2 (12.7)		160			Air - 55 (3.8)
CS - 3/4 (19)		65 (1.65)		1/4 (6.4)	165			
CS - 1 (25.4)		35 (.89)		3/8 (9.6)	180			Air - 65 (4.48)
CS - 1/4 (6.4)	200	170 (4.3)	3/8 99.6)	1/8 (3.2)	129	N_2 - 30 (2.07)	O_2 - 45 (3.1)	Air - 65 (4.48)
CS - 3/8 (9.6)		110 (2.8)		3/16 (4.8)	133			
CS - 1/2 (12.7)		95 (2.4)		7/32 (5.5)	136			
CS - 5/8 (15.8)		75 (1.9)	1/2 (12.7)		139			Air - 55 (3.8)
CS - 3/4 (19)		55 (1.4)		1/4 (6.4)	142			
CS - 1 (25.4)		40 (1.0)		3/8 (9.6)	155			Air - 65 (4.48)
SS - 1/4 (6.4)	200	140 (3.6)	3/8 (9.6)	1/8 (3.2)	142	Air - 30 (2.07)	Air - 52 (3.6)	Air - 85 (5.86)
SS - 3/8 (9.6)		125 (3.2)		3/16 (4.8)	150			
SS - 1/2 (12.7)		85 (2.2)			154			
SS - 3/4 (19)		55 (1.4)	1/2 (12.7)	3/8 (9.6)	174			
SS - 1 (25.4)		20 (.50)			180			
AL - 1/4 (6.4)	200	125 (3.2)	3/8 (9.6)	3/16 (4.8)	155	Air - 30 (2.07)	Air - 52 (3.6)	Air - 85 (5.86)
AL - 3/8 (9.6)		110 (2.8)		1/4 (6.4)	165			
AL - 1/2 (12.7)		85 (2.2) □			167			
Al - 3/4 (19)		60 (1.5)	1/2 (12.7)	3/8 (9.6)	182			
AL -1 (25.4)		40 (1.02)			189			

NOTES: CS - Carbon Steel, SS - Stainless Steel, AL - Aluminum
All N_2 Plasma/Air Shield, 200 Amp cuts on Aluminum and Stainless Steel have fair surfaces except 1" (25.4mm) AL that is poor.
Pilot Arc -- HIGH

200 Amp Data (PT-19XLS and PT-600) continued

Material Type-Thickness in.(mm)	Current (Amps)	Travel Speed ipm(M/m	Pierce Height in.(mm)	Cutting Height in.(mm)	Arc Voltage (Volts)	Start Gas Type/Pressure psi(bar)	Plasma Gas Type/Pressure psi(bar)	Shield Gas Type/Pressure psi(bar)
AL - 1/4 (6.4)	200	180 (4.6)	3/8 (9.6)	3/16 (4.8)	151	N_2 - 30 (2.07)	N_2 - 35 (2.4)	Air - 65 (4.48)
AL - 3/8 (9.6)		110 (2.8)			155			
AL - 1/2 (12.7)		70 (1.8)			159			
AL - 3/4 (19)		55 (1.4)	1/2 (12.7)	1/4 (6.4)	170			
AL - 1 (25.4)		30 (.76)			177			
SS - 1/4 (6.4)	200	165 (4.2)	3/8 (9.6)	1/4 (6.4)	148	N_2 - 30 (2.07)	N_2 - 35 (2.4)	Air - 85 (5.86)
SS - 3/8 (9.6)		105 (2.7)		3/16 (4.8)	149			
SS - 1/2 (12.7)		90 (2.3)			150			Air - 65 (4.48)
SS - 3/4 (19)		45 (1.1)	1/2 (12.7)	1/4 (6.4)	159			Air - 45 (3.1)
SS - 1 (25.4)		20 (.50)			169			Air - 65 (4.48)
SS - 1/2 (12.7)	200	50 (1.27)	1/2 (12.7)	3/8 (9.6)	163	N_2 - 30 (2.07)	H-35 - 52 (3.6)	N_2 - 85 (5.86)
SS - 5/8 (15.8)		47 (1.2)		5/16 (8)	162			
SS - 3/4 (19)		32 (.8)		3/8 (9.6)	169			
SS - 1 (25.4)		17 (.43)			175			
AL - 1/4 (6.4)	200	155 (3.9)	3/8 (9.6)	5/16 (8)	146	N_2 - 30 (2.07)	H-35 - 52 (3.6)	N_2 - 65 (4.48)
AL - 3/8 (9.6)		120 (3)		1/4 (6.4)	148			N_2 - 45 (3.1)
AL - 1/2 (12.7)		110 (2.8)		5/16 (8)	155			
AL - 3/4 (19)		60 (1.5)	1/2 (12.7)	3/8 (9.6)	166			N_2 - 85 (5.86)
AL - 1 (25.4)		40 (1.01)			169			

NOTES: SS - Stainless Steel, AL - Aluminum
Stainless Steel 3/8" (9.6mm) and thinner is NOT recommended for H-35 plasma gas - heavy dross
Pilot Arc -- HIGH

4.4.4 PT-26 Plasma Torch and ESP-200 Process Data

4.4.4.1 Carbon Steel

Material Type-Thickness in.(mm)	Current (Amps)	Travel Speed ipm(M/m	Height in.(mm)	Start Gas Type/Pressure psi(bar)	Plasma Gas Type/Pressure psi(bar)	Shield Gas Type/Pressure psi(bar)
CS- 3,2 (1/8)	50	4,95 (195)	7,9 (5/16)	Air – 2,76 (40)	Air - 4,14 (60)	Air - 3,45 (50)
CS- 4,7 (3/16)		3,8 (150)				
CS- 6,35 (1/4)		2,58 (100)				
CS- 7,9 (5/16)		1,9 (75)				
CS- 9,5 (3/8)		1,27 (50)				
CS- 12,7 (1/2)		0,63 (25)				
CS- 1,6 (1/16)	150	4,45 (175)	7,9 (5/16)	Air - 2,76 (40)	Air - 4,14 (60)	Air - 3,45 (50)
CS- 3,2 (1/8)		3,94 (155)				
CS- 6,3 (1/4)		3,48 (137)				
CS- 7,9 (5/16)		3,17 (125)				
CS- 9,5 (3/8)		2,2 (87)				
CS- 12,7 (1/2)		1,93 (76)				
CS- 15,9 (5/8)		1,57 (62)				
CS- 19,1 (3/4)		1,27 (50)				
CS- 25,4 (1.0)		0,76 (30)				
CS- 28,6 (1-1/8)		0,63 (25)				
CS- 31,7 (1-1/4)		0,5 (20)				
CS- 34,9 (1-3/8)		0,38 (15)				
CS- 38,1 (1-1/2)		0,33 (13)				
CS- 44,5 (1-3/4)		0,15 (6)				
CS- 50,8 (2.0)		0,10 (4)				
CS- 4,7 (3/16)	200	4,57 (180)	7,9 (5/16)	Air - 2,76 (40)	Air - 4,14 (60)	Air - 3,45 (50)
CS- 6,35 (1/4)		4,32 (170)				
CS- 7,9 (5/16)		3,8 (150)				
CS- 9,5 (3/8)		3,43 (135)				
CS- 12,7 (1/2)		2,67 (105)				
CS- 15,9 (5/8)		2,1 (82)				
CS- 19,1 (3/4)		1,73 (68)				
CS- 25,4 (1.0)	200	0,96 (38)	7,9 (5/16)	Air - 2,76 (40)	Air – 4,14 (60)	Air - 3,45 (50)
CS- 28,6 (1-1/8)		0,76 (30)				
CS- 31,7 (1-1/4)		0,63 (25)				
CS- 34,9 (1-3/8)		0,5 (20)				
CS- 38,1 (1-1/2)		0,3 (12)				
CS- 44,5 (1-3/4)		0,2 (8)				
CS- 50,8 (2.0)		0,13 (5)				

4.4.4.2 Aluminum Cutting Data (PT-26)

Material Type-Thickness in.(mm)	Current (Amps)	Travel Speed ipm(M/m	Height in.(mm)	Start Gas Type/Pressure psi(bar)	Plasma Gas Type/Pressure psi(bar)	Shield Gas Type/Pressure psi(bar)
AL- 6,35 (1/4)	200	3,56 (140)	7,9 (5/16)	Air - 2,1 (30)	Air - 3,45 (50)	Air - 3,45 (50)
AL- 7,9 (5/16)		3,17 (125)				
AL- 9,5 (3/8)		2,9 (115)				
AL- 12,7 (1/2)		2,4 (95)				
AL- 15,9 (5/8)		2,16 (85)				
AL- 19,1 (3/4)		1,78 (70)				
AL- 25,4 (1,0)		1,27 (50)				
AL- 28,9 (1-1/8)		1,02 (40)				
AL- 31,7 (1-1/4)		0,89 (35)				
AL- 34,9 (1-3/8)		0,76 (30)				
AL- 38 (1-1/2)		0,63 (25)				
AL- 44,5 (1-3/4)		0,5 (20)				
AL- 50,8 (2.0)		0,43 (17)				
AL- 6,35 (1/4)	150	2,84 (112)	7,9 (5/16)	H-35 or N_2 2,06 (30)	H-35- 3,45 (50)	Air- 3,45 (50)
AL- 7,9 (5/16)		2,54 (100)				
AL- 9,6 (3/8)		2,36 (93)				
AL- 12,7 (1/2)		1,98 (78)				
AL- 15,9 (5/8)		1,6 (63)				
AL- 19,1 (3/4)		1,32 (52)				
AL- 25,4 (1,0)		0,94 (37)				
AL- 28,9 (1-1/8)	150	0,76 (30)	7,9 (5/16)	H-35 or N_2 2,06 (30)	H-35 - 3,45 (50)	Air- 3,45 (50)
AL- 31,7 (1-1/4)		0,63 (25)				
AL- 34,9 (1-3/8)		0,5 (20)				
AL- 38,1 (1-1/2)		0,46 (18)				
AL- 44,5 (1-3/4)		0,3 (12)				
AL- 50,8 (2.0)		0,25 (10)				
AL- 6,35 (1/4)	200	4,11 (162)	7,9 (5/16)	H-35 or N_2 2,06 (30)	H-35 - 3,45 (50)	Air - 3,45 (50)
AL- 7,9 (5/16)		3,8 (150)				
AL- 9,5 (3/8)		3,35 (132)				
AL- 12,7 (1/2)		2,67 (105)				
AL- 15,9 (5/8)		2,2 (87)				
AL- 19,1 (3/4)		1,78 (70)				
AL- 25,4 (1.0)		1,17 (46)				
AL- 28,9 (1-1/8)		0,94 (37)				
AL- 31,7 (1-1/4)		0,76 (30)				
AL- 34,9 (1-3/8)		0,63 (25)				
AL- 38 (1-1/2)		0,5 (20)				
AL- 44,5 (1-3/4)		0,3 (12)				
AL- 50,8 (2.0)		0,25 (10)				

4.4.4.3 Stainless Steel Cutting Data (PT-26)

Material Type-Thickness in.(mm)	Current (Amps)	Travel Speed ipm(M/m	Height in.(mm)	Start Gas Type/Pressure psi(bar)	Plasma Gas Type/Pressure psi(bar)	Shield Gas Type/Pressure psi(bar)
SS- 6,35 (1/4)	200	3,8 (150)	7,9 (5/16)	Air - 2,76 (40)	Air - 4,14 (60)	Air - 3,45 (50)
SS- 9,5 (3/8)		2,87 (113)				
SS- 12,7 (1/2)		2,16 (85)				
SS- 15,9 (5/8)		1,6 (63)				
SS- 19,1 (3/4)		1,27 (50)				
SS- 25,4 (1.0)		0,68 (27)				
SS- 31,7 (1-1/4)		0,33 (13)				
SS- 38,1 (1-1/2)		0,25 (10)				
SS- 44,5 (1-3/4)		0,13 (5)				
SS- 50,8 (2.0)		0,08 (3)				
SS- 9,5 (3/8)	200	1,19 (47)	7,9 (5/16)	H-35 or N_2 2,06 (30)	H-35 - 4,83 (70)	Air - 3,45 (50)
SS- 12,7 (1/2)		0,96 (38)				
SS- 15,9 (5/8)		0,89 (35)				
SS- 19,1 (3/4)		0,81 (32)				
SS- 25,4 (1.0)		0,5 (20)				
SS- 31,7 (1-1/4)		0,33 (13)				
SS- 38,1 (1-1/2)		0,3 (12)				
SS- 44,5 (1-3/4)		0,2 (8)				
SS- 50,8 (2.0)		0,15 (6)				

4.4.5 Recommended Gas and Current

The following provide the recommended gas and current selection for common metals to obtain the best cutting results.

4.4.5.1 Carbon Steel

1/8" (3.2mm) and Thinner
- 50 / 65 Amps, Air Plasma/Air Shield.

3/16 – 1/2 (4.8-12.7mm)
- 100 Amps, O2 Plasma/Air Shield.
- 100 Amps, Air Plasma/Air Shield is also good but there will be bottom dross on 1/2" (12.7mm) material.

NOTE: If using a 50 foot torch system, about 2-1/2 seconds will be required before the O2 reaches the cut.

5/8" (15.8mm) and Thicker
- 200 Amps, N2 Plasma/ Air Shield is best. Dross free cuts cannot be made on material thicker than 3/4" but dross is removable.
- 200 Amp Air Plasma/Air shield is an economical second choice - a little more dross and a little rougher surface will result.

4.4.5.2 Stainless Steel

1/8" (3.2mm) and Thinner
- 50 - 65 Amps, N2 Plasma/N2 Shield produces best surface but light dross on 1/8" material.
- 50 - 65 Amps, Air Plasma/Air Shield can produce dross free cuts but the surface is rough.

1/4 - 3/8" (3.2-9.6mm)
- 100 Amps, N2 Plasma/N2 Shield can produce little or no dross and good surface quality through 1/2" (12.7mm) material.

1/2" (12.7mm) and Thicker
- 200 Amps, H-35 Plasma/Air Shield can produce nearly dross free cuts with excellent surface through 3/4" (19mm) and more drossy but good surface through 1-1/2" (38mm).
- 200 Amps, N2 Plasma/Air Shield can produce dross free cuts up to 3/4" (19mm) with fair surface quality through 1" (25.4mm) plate.
- 200 Amps, Air Plasma/Air Shield produces a slightly rougher cut surface but less dross on 1" (25.4mm) plate.

4.4.5.3 Aluminum

1/4" (6.4mm) and Thinner

- 50/65 Amps, N2 Plasma/N2 Shield usually produces fairly smooth, dross free cuts.
- 50/65 Amps, Air Plasma/Air Shield produces much rougher cut surfaces.

1/4" (6.4mm) and Thicker

- 200 Amps, H-35 Plasma/N2 Shield produces best results with little or no dross under 1"(25.4mm) thickness and excellent surface quality on 1/4 to 1/2" (6.4 - 12.7mm) material. Surface is good on thicker materials.
- 200 Amps, Air Plasma/Air Shield produces fair surfaces on 3/4"(19mm) and thinner material with very light dross to dross free conditions on 1/2" (12.7mm) and thinner.
- 200 Amps, N2 Plasma/Air Shield produces more dross than other 200 amp conditions but slightly smoother surface on 3/8" (9.6mm) and thinner compared to air plasma/air shield.

4.4.6 Maximum Economy Conditions

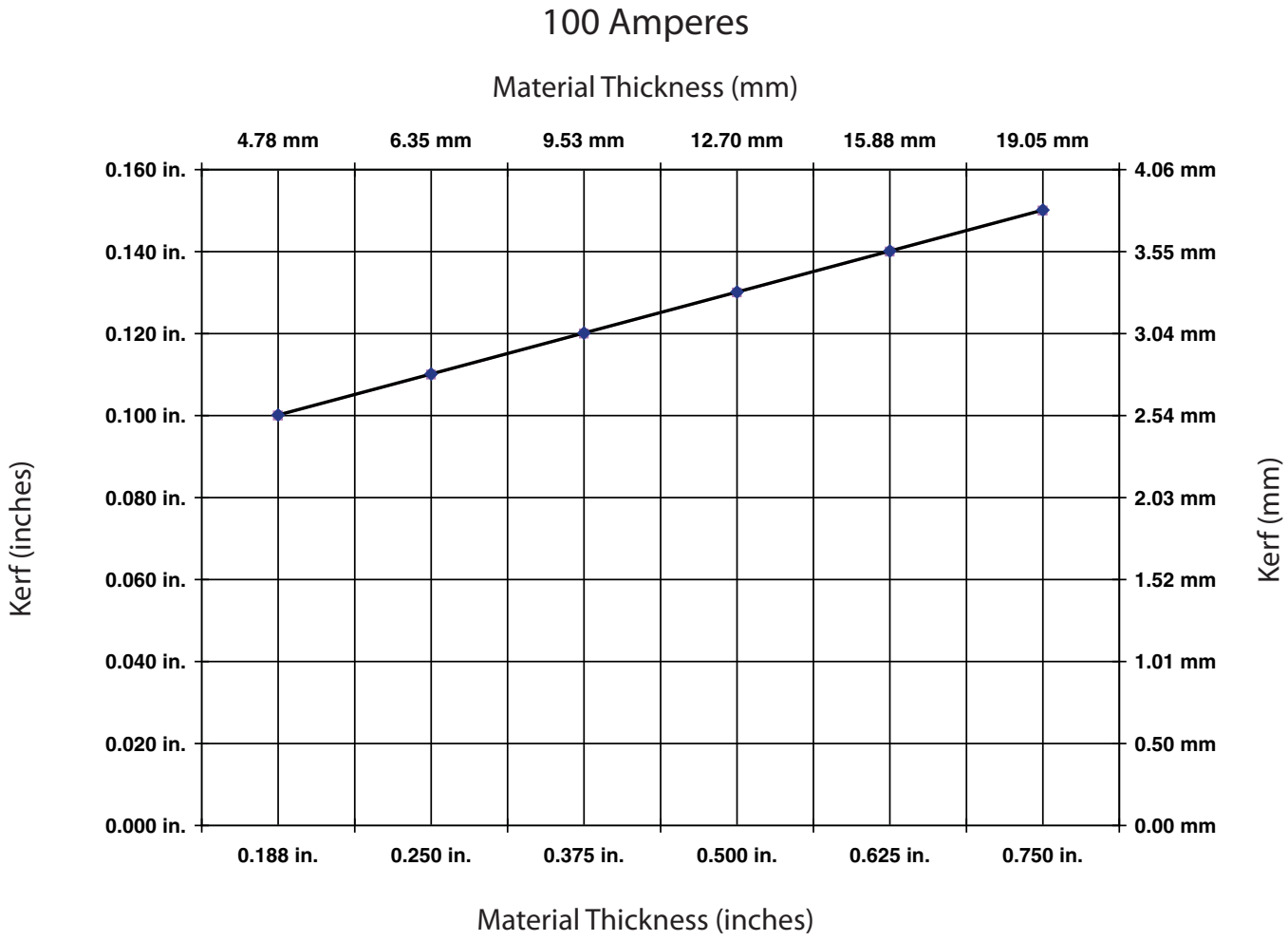
The conditions outlined in the following tables will minimize the operating cost for common metals:

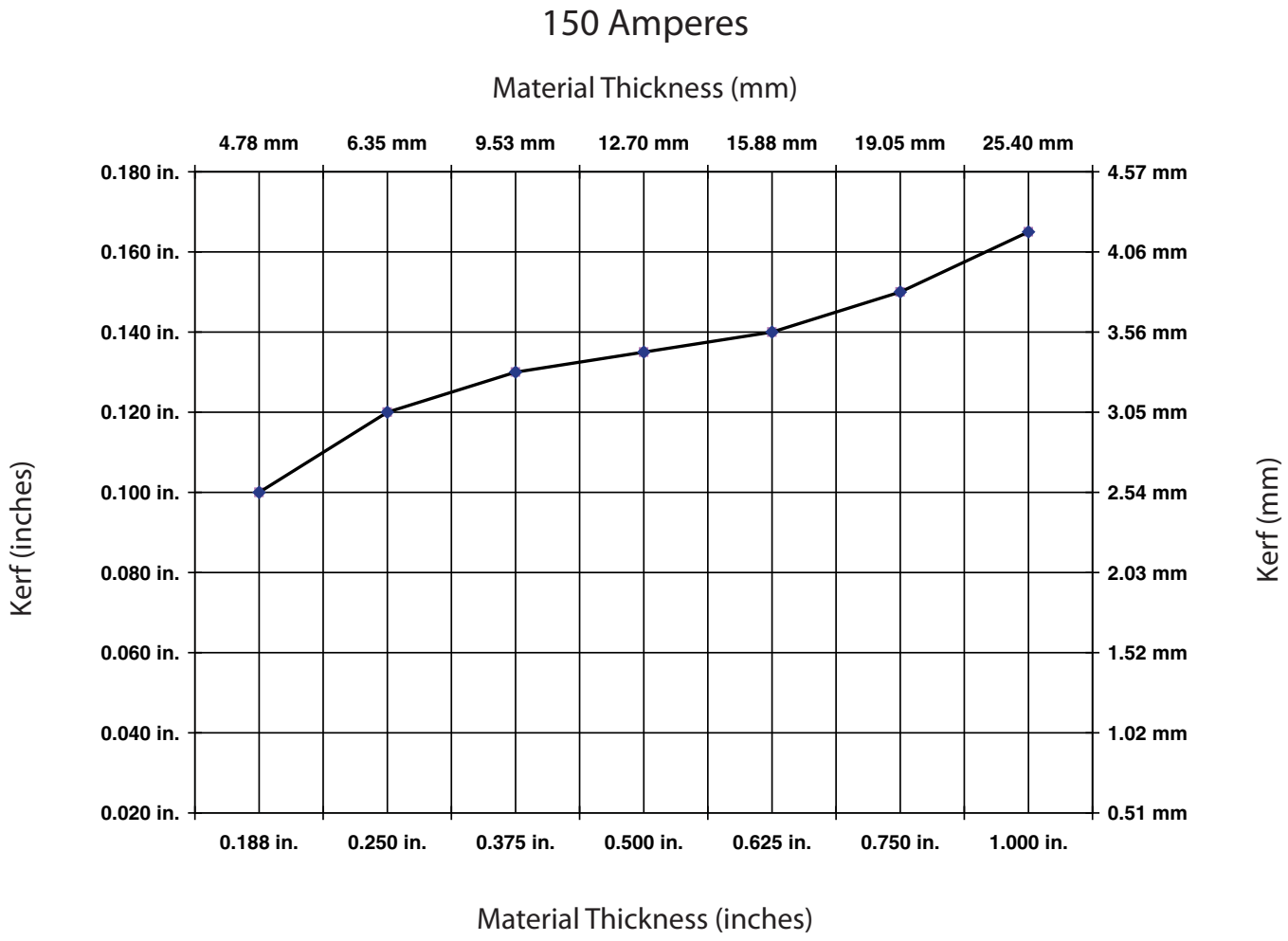
- Use AIR as PLASMA and SHIELD GAS.
- Achieve maximum cutting speed without regard to cut quality.

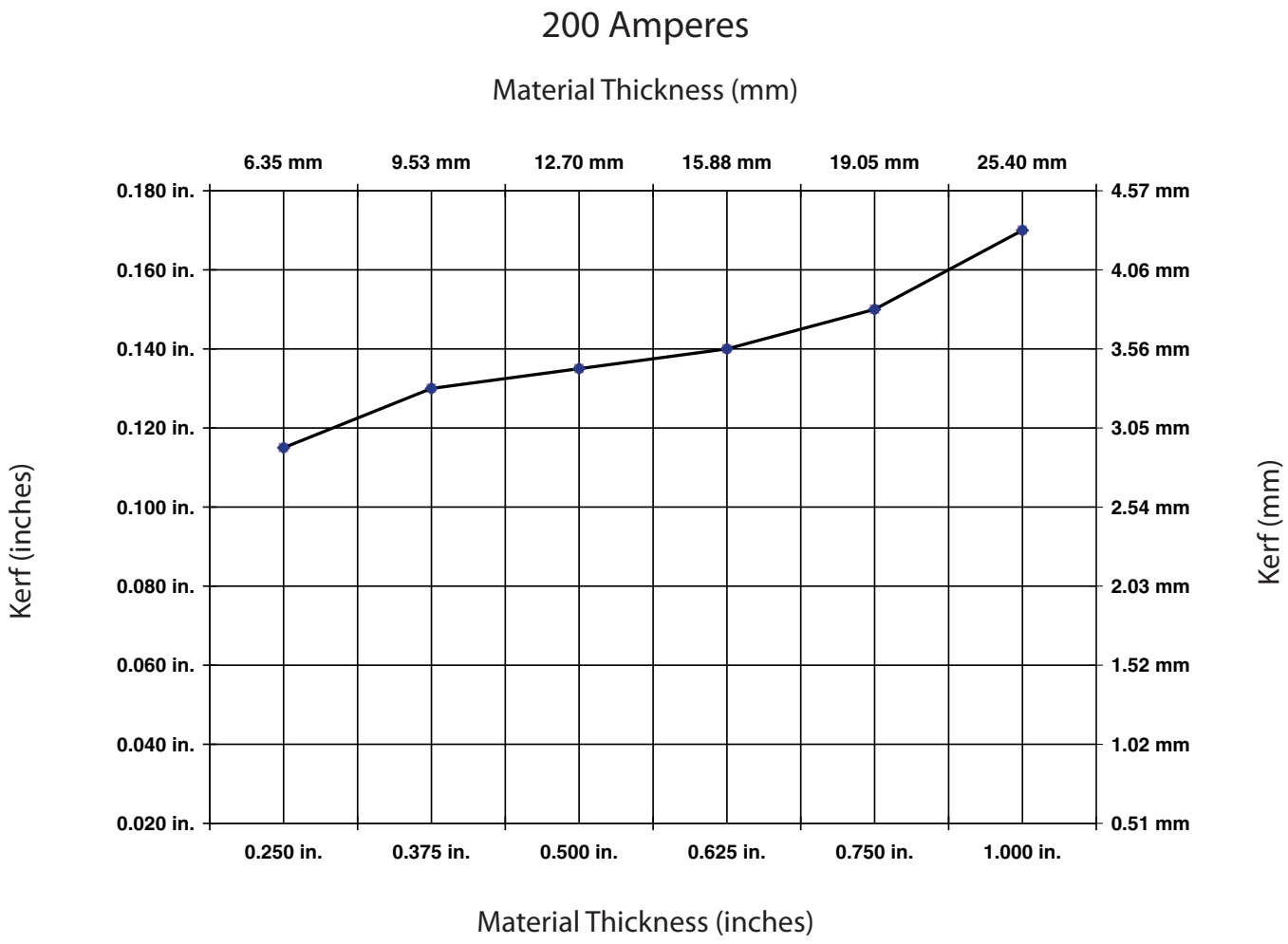
Pilot Arc - HIGH
Current - 200 Amps
Start Gas - AIR @ 25 psig
Plasma Gas - Air @ 45 psig (3.1 bar) for CS, 50 psig (3.5 bar) for SS & Al
Shield Gas - AIR (See Table)
See Torch manual for appropriate consumable part numbers.

Material Type-Thickness in.(mm)	Speed ipm(M/m	Standoff		Arc Voltage	Shield Air psi(bar)
		Piercing in.(mm)	Cutting in.(mm)		
CS - 6,4 (1/4)	5,1 (200)	9,6 (3/8)	9,6 (3/8)	153	4,48 (65)
CS - 9,6 (3/8)	3,17 (125)	9,6 (3/8)	9,6 (3/8)	161	4,48 (65)
CS - 12,7 (1/2)	3,4 (95)	9,6 (3/8)	9,6 (3/8)	163	4,48 (65)
CS – 19,1 (3/4)	1,65 (65)	12,7 (1/2)	6,4 (1/4)	165	4,48 (65)
CS - 25,4 (1.0)	0,89 (35)	12,7 (1/2)	9,6 (3/8)	180	4,48 (65)
CS - 31,7 (1-1/4)	0,64 (25)	NR	9,6 (3/8)	182	2,07 (30)
CS – 38,1 (1-1/2)	0,38 (15)	NR	9,6 (3/8)	189	2,07 (30)
CS - 50,8 (2.0)	0,15 (6)	NR	9,6 (3/8)	211	2,07 (30)
SS - 6,4 (1/4)	5,33 (210)	9,6 (3/8)	9,6 (3/8)	164	4,48 (65)
SS - 9,6 (3/8)	3,94 (155)	9,6 (3/8)	9,6 (3/8)	166	4,48 (65)
SS - 12,7 (1/2)	2,8 (110)	9,6 (3/8)	9,6 (3/8)	170	4,48 (65)
SS – 19,1 (3/4)	1,4 (55)	12,7 (1/2)	9,6 (3/8)	174	4,48 (65)
SS - 25,4 (1.0)	0,64 (25)	12,7 (1/2)	9,6 (3/8)	181	4,48 (65)
SS - 31,7 (1-1/4)	0,38 (15)	NR	9,6 (3/8)	187	2,07 (30)
SS – 38,1 (1-1/2)	0,25 (10)	NR	9,6 (3/8)	194	2,07 (30)
AL - 6,4 (1/4)	5,33 (210)	9,6 (3/8)	9,6 (3/8)	171	5,86 (85)
AL - 9,6 (3/8)	3,94 (155)	9,6 (3/8)	9,6 (3/8)	179	4,48 (65)
AL - 12,7 (1/2)	2,8 (110)	9,6 (3/8)	9,6 (3/8)	182	4,48 (65)
AL – 19,1 (3/4)	1,65 (65)	9,6 (3/8)	9,6 (3/8)	187	4,48 (65)
AL - 25,4 (1.0)	1,0 (40)	9,6 (3/8)	9,6 (3/8)	189	5,86 (85)
AL - 31,7 (1-1/4)	0,50 (20)	NR	9,6 (3/8)	193	2,07 (30)
AL – 38,1 (1-1/2)	0,35 (14)	NR	9,6 (3/8)	197	2,07 (30)

4.4.7 PT-19XLS and PT-600 Kerf Values




150 Amperes
Material Thickness (mm)
4.78 mm
6.35 mm
9.53 mm
12.70 mm
15.88 mm
19.05 mm
25.40 mm
0.180 in.
0.160 in.
0.140 in.
0.120 in.
0.100 in.
0.080 in.
0.060 in.
0.040 in.
0.020 in.
4.57 mm
4.06 mm
3.56 mm
3.05 mm
2.54 mm
2.03 mm
1.52 mm
1.02 mm
0.51 mm
Kerf (inches)
Kerf (mm)
0.188 in.
0.250 in.
0.375 in.
0.500 in.
0.625 in.
0.750 in.
1.000 in.
Material Thickness (inches)


200 Amperes
Material Thickness (mm)
6.35 mm
9.53 mm
12.70 mm
15.88 mm
19.05 mm
25.40 mm
0.180 in.
0.160 in.
0.140 in.
0.120 in.
0.100 in.
0.080 in.
0.060 in.
0.040 in.
0.020 in.
4.57 mm
4.06 mm
3.56 mm
3.05 mm
2.54 mm
2.03 mm
1.52 mm
1.02 mm
0.51 mm
Kerf (inches)
Kerf (mm)
0.250 in.
0.375 in.
0.500 in.
0.625 in.
0.750 in.
1.000 in.
Material Thickness (inches)

5.1 General

WARNING

ELECTRIC SHOCK CAN KILL!
OPEN WALL DISCONNECT SWITCH BEFORE ATTEMPTING ANY MAINTENANCE ON:

- plasma console
- plumbing box
- plasma torch
- interconnecting cables

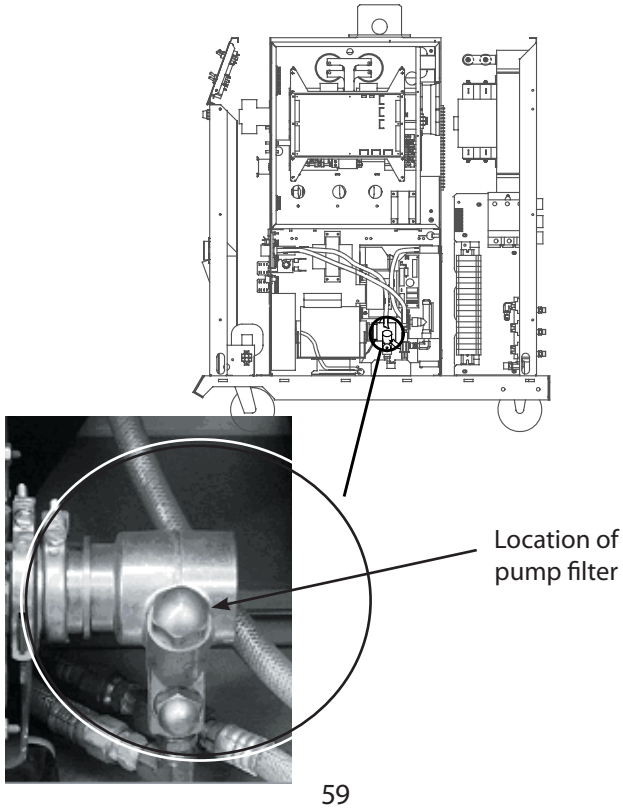
CAUTION

Only trained personnel should perform maintenance or repairs on this equipment.

5.2 Inspection and Cleaning

Frequent inspection and cleaning of the ESP-200 and related equipment are recommended for safety and proper operation. Consider the following during inspection and cleaning:

- Check work cable to workpiece connection.
- Check safety earth ground at workpiece and at power source chassis.
- Check heat shield on torch. Replace if damaged.
- Check torch electrode and cutting nozzle for wear daily.
- Ensure cable and hoses are not damaged or kinked.
- Ensure all plugs, fittings, and ground connections are tight.
- Check screen filter in coolant pump (located inside console) periodically and flush as required.



WARNING

FLYING DEBRIS HAZARD.

FLYING DEBRIS CAN SERIOUSLY INJURE EYES.
WEAR PROTECTIVE EYEWEAR WHEN CLEANING WITH COMPRESSED AIR. USE LOW PRESSURE AIR ONLY.

CAUTION

Avoid Potential Equipment Damage

Water and/or oil can accumulate in compressed air lines. Be sure to direct the first air blast away from equipment to avoid damaging the junction box or flow control box.

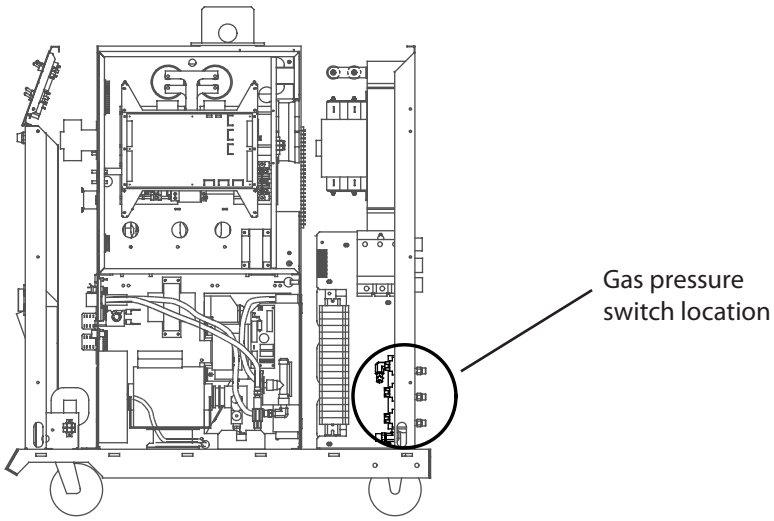
- With all input power disconnected and with proper eye and face protection, blow out the inside of the power source, flow control, and junction box using low-pressure, clean dry compressed air.
- Periodically bleed all water from the air filter/regulator trap.

5.3 Gas Manifold Pressure Switches

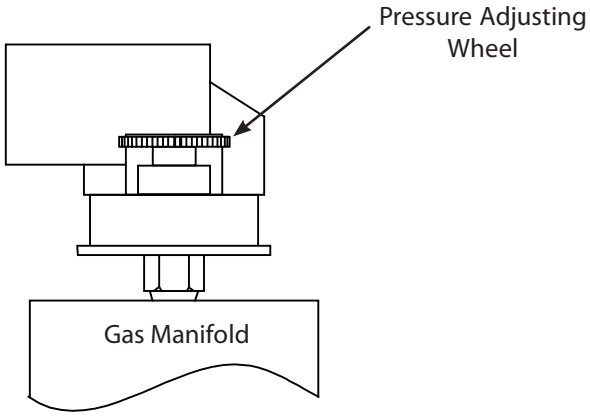
Newer ESP-200 consoles are equipped with nonadjustable preset gas manifold pressure switches. Older ESP-200 consoles have adjustable pressure switches.

Both type switches are preset for:

- 17 psig (1.2 bar), shield and start gas switches
- 22 psig (1.5 bar), cut gas switch



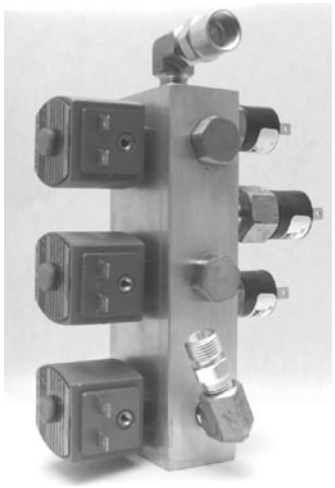
5.3.1 Pressure Switch Adjustment Procedure



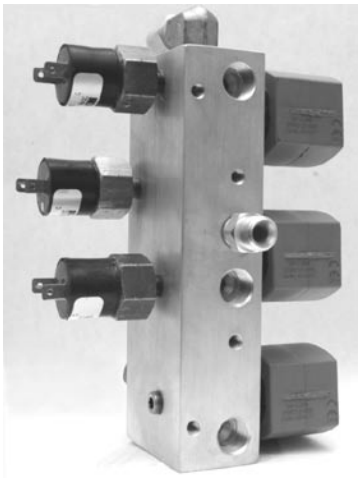
1. Turn main power switch OFF.
2. Remove right side panel
3. Turn wheel:
   - Counterclockwise to increase pressure
   - Clockwise to decrease pressure
4. Replace panel.
5. Resume operation.

5.3.2 Gas Manifold with Non-adjustable Pressure Switches (reference)

Solenoids

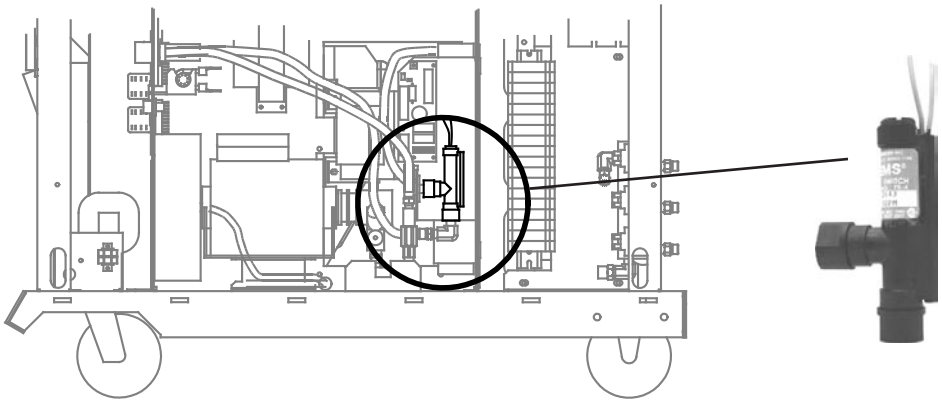


Nonadjustable Pressure Switches



5.4 Cooling Water Flow Switch

Water Flow Switch cleaning may be indicated if excessive coolant contamination is noticed or Coolant Fault light illuminates.



NOTICE

It is not necessary to remove the flow switch from the console for cleaning.

WARNING

ELECTRIC SHOCK CAN KILL!

DO NOT ATTEMPT MAINTENANCE ON CONSOLE WITH MAIN POWER SWITCH ON. COOLANT PUMP IS RUNNING WHEN MAIN POWER SWITCH IS ON.

Cleaning procedure:

1. Shut console OFF.
2. Remove right side panel (as viewed from the front).
3. Check coolant pressure gauge for a reading of zero.

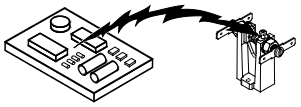
Note:
There is a cooling system line blockage if the gauge does not return to zero when console is turned off. Correct this problem before continuing.

4. Remove piston plug.
5. Carefully remove spring. Do not distort. Replace with original replacement part if damaged during handling. Failure to replace with correct spring will change calibration of switch and may damage torch or other components.
6. Remove piston.
7. Clean all parts with mild soap solution and rinse thoroughly with clean water.
8. Reassemble in reverse order.

Note:
Use only ESAB replacement parts.

5.5 Spark Gap

CAUTION



High Frequency Interference Can Damage Machine Electronic Components

Potentially damaging high frequency interference may result from increasing the spark gap beyond recommendation. This electrical interference may find its way to pc boards in the electronics cabinet or Vision control. The result can be failure of some portion of machine function.
It is not recommended setting the spark gap beyond a distance of 0.040" (1,0 mm)

Spark gap controls the amount of starting current (high frequency) sent to the torch. There is a direct relationship between spark gap and starting reliability/electrode life.

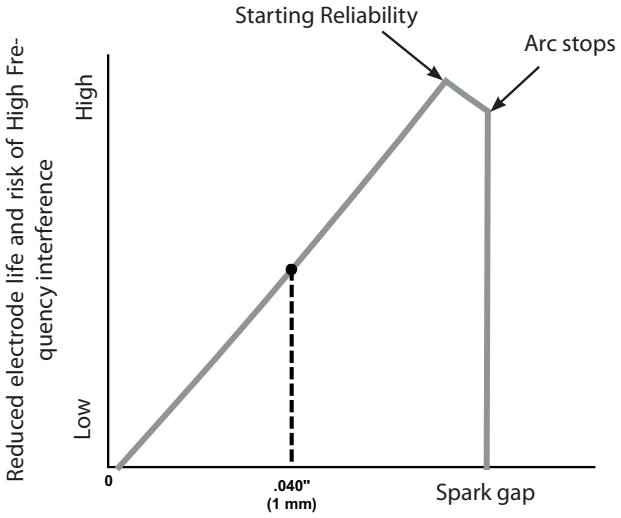
Spark gap should be set at 0.040 inches (1 mm).

Characteristics of spark gap below 0.040 inches (1 mm);

- Negative Effect - Starting reliability is decrease.
- Positive Effect – Reduced risk of high frequency interference and improved electrode life.

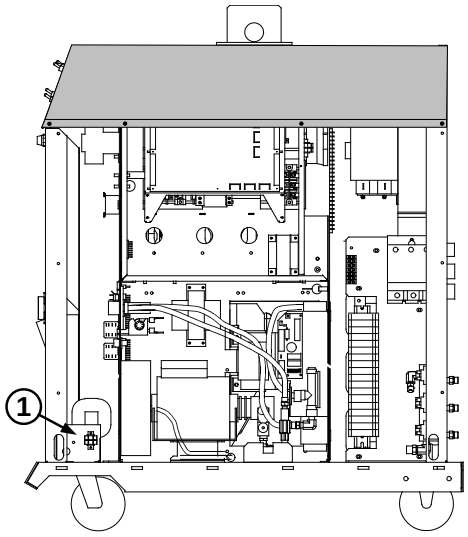
Characteristics of spark gap above 0.040 inches (1 mm);

- Negative Effect – increased risk of high frequency damage and reduced electrode life.
- Positive Effect – Starting reliability is increased (until approximately 0.056 inch (1,4 mm) when the gap becomes too wide, resulting in no spark).



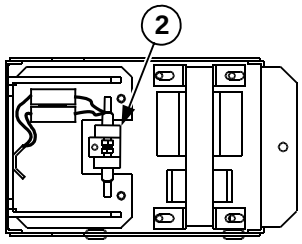
WARNING

ELECTRICITY CAN KILL
DISCONNECT MAIN POWER BEFORE MAKING ANY ADJUSTMENTS.

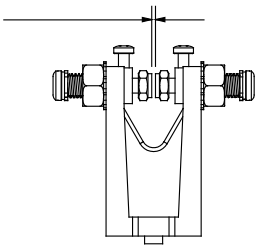


The high frequency start box is accessed by removing the right side panel.

Note:
Do not making any adjustments to this box if using the ESP plumbing box. The plasma starting arc originates from the plumbing box.



Top view of console starter box

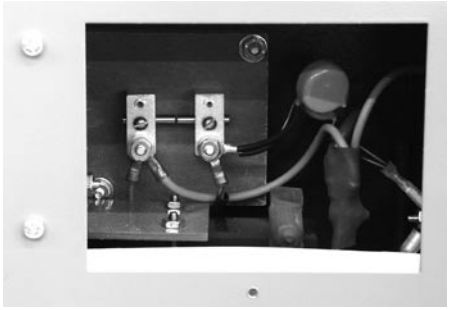


Spark gap assembly
Set gap to 0.040" (1 mm)

Note:
If a plumbing box is included in your system, the start box in the console is not used. The starting arc comes from the plumbing box.

The spark gap access is on the left side, opposite the door.

Remove single screw and remove cover.



Set spark gap to 0.040 inches (1 mm).

NOTE:
Schematics and Wiring Diagrams on 11″ x 17″
paper are included
inside the back cover of this manual.

6.1 Introduction

WARNING

ELECTRIC SHOCK CAN KILL!

ENSURE ALL PRIMARY POWER TO MACHINE HAS BEEN EXTERNALLY DISCONNECTED. OPEN LINE (WALL) SWITCH BEFORE ATTEMPTING INSPECTION OR PERFORMING WORK INSIDE THE PLASMA CONSOLE OR PLUMBING BOX.

WARNING

CAPACITORS CAN STORE HIGH VOLTAGES.

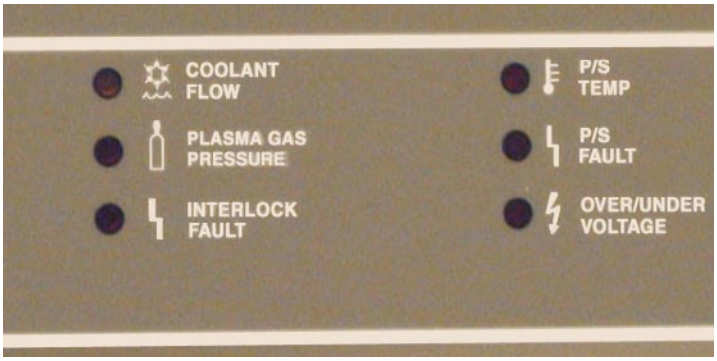
DISCONNECTING PLASMA CONSOLE DOES NOT ENSURE CAPACITORS ARE DE-ENERGIZED. ENSURE CONSOLE CAPACITORS ARE GROUNDED AFTER REMOVING POWER AND PRIOR TO PERFORMING MAINTENANCE.

6.2 Procedure

1. Shut main power switch on the console to OFF position.
2. Disconnect main power line (wall) switch.
3. Check for obvious external settings, switches and external connections.
4. If a problem is found, correct and proceed with normal operations.
5. If not, remove side panels. (Reminder: Power must be disconnected before removing any covers.)
6. Perform a visual inspection of internal components. Check for:
    - Loose or burned wiring and components
    - Secure terminal connections
    - Bulged or leaking capacitors
    - Other signs of discoloration

Refer to the troubleshooting guide for identification of many problems, possible causes and remedies.
Reference wiring diagrams and schematics are found in the last part of this section.

6.3 Front Panel Fault Lights



Fault Indicator Lights

- Coolant Flow – Will show low coolant flow. The light will briefly show a fault when console is turned on and then go out.
- Plasma Gas Pressure -- fault indicator – low plasma gas pressure. Torch will not fire when indicated.
- Interlock Fault – Indicates Remote Plumbing box door is not properly closed.
- P/S Temp – fault indicator – over temperature condition in the inverter power source.
- P/S Fault – Not used.
- Over/Under Voltage – fault indicator – input voltage is above or below the tolerances of the power source console. Will stay shut down console until main power switch is recycled.

6.4 Troubleshooting Guide

HIGH VOLTAGES CAN CAUSE SERIOUS INJURY OR DEATH!

WARNING

VOLTAGES IN PLASMA CUTTING EQUIPMENT ARE HIGH ENOUGH TO CAUSE SERIOUS INJURY OR DEATH. ONLY TRAINED TECHNICIANS SHOULD ATTEMPT DIAGNOSIS AND REPAIR OF THIS MACHINERY.

CAUTION

Avoid damaging your voltmeter.

Disconnect the power from the high frequency generator before checking voltages in the high frequency circuit.

Problem	Possible Cause	Corrective Action
Power Switch is ON. Power LED is OFF. Fan is OFF. Pump is OFF.	1) Bad Power Switch S1. 2) Open Fuse F4. 3) Open Jumper at TB2.	1) Check continuity of Power Switch. 2) Check Fuse F4 and related wiring. 3) Check Jumper and wiring of TB2.
Power Switch is ON. Power LED is ON. Pump is OFF. Fan is ON.	1) Bad or open CB2. 2) Pump motor failed.	1) Reset CB2. Check wiring and check free rotation of Pump fan. 2) Replace Pump motor.
Power LED is OFF. Pump is ON. Fan is ON. LEDs in power modules are OFF.	1) Bad or open CB1.	1a) Reset CB1. 1b) If CB1 fails to reset, check wiring, bad T1 or PCB1.
Plasma gas fault indicator is ON.	1) Plasma gas pressure to console is below 40 psi. 2) Bad Pressure Switch. 3) Open wire between Pressure Switch and PCB1.	1) Adjust gas pressure to proper level for torch and application. 2) Adjust (if adjustable type) or replace Pressure Switch. 3) Check wiring between PS1, PS2 and PCB1 also P1-9 and P1-10.

Problem	Possible Cause	Corrective Action
Power Source Temperature Fault indicator is ON.	1) Poor ventilation at rear of console. 2) Open thermal switch. 3) Open wire between temperature switch and PCB1.	1) Make sure that there is 2 feet of clearance on each side of console. 2) With power OFF, check each thermal switch. Normal operation is switch closed below 194°F. 3) Check wiring between temperature switches and PCB1, P1-15 and P1-16.
Over / Under Voltage Fault indicator is ON.	1) Input voltage is 15% above or below the selected console operating voltage. 2) Bad PCB1. 3) Bad PCB1 in MOD1. 4) Bad T1 in MOD1.	1) Provided input voltage must be equal to the selected console operating voltage. Change if necessary. 2) Replace PCB1. 3) Replace PCB1 in MOD1. 4) Replace T1 in MOD1.
Meters M1 or M2 - no display.	1) Bad meter. 2) Bad PCB1.	1) Replace Meter M1 and/or M2. 2) Replace one meter to verify above step did not happen twice. If still not working replace PCB1.
Press torch switch or send start signal. (No pilot arc or main arc transfer.)	1) Gas Test Switch is in START / SHIELD or CUT position. 2) Plasma gas pressure is too LOW. 3) Improper current command signal. 4) LEDX on MOD1 PCB1 is not ON when torch switch is depressed or start signal sent. 5) LEDX is ON but main contactor does not close. 6) LEDX is ON. Main contactor is closed. No OCV or arc transfer.	1) Place Gas Test Switch in OPERATE position. 2) Set plasma gas pressure per torch or application requirements (above 40 psi). 3) If in manual mode, Panel Switch must be in PANEL and P5 must be in J5 connector. If in mechanized mode, Panel Switch must be in REMOTE and a current signal above 0 volts must be present. P5 must be in J6 connector. 4) Test TBD. 5) Test TBD. 6) Test TBD.

Problem	Possible Cause	Corrective Action
LEDX on MOD1 not ON.		
LEDX on MOD2 not ON.		
LEDX on MOD2 not ON when torch switch is depressed or start signal is sent.		
Arc does not transfer to work. (Open circuit voltage is between 315 and 355. Pilot arc IS present.)	1) Open connection between the console WORK connector and the workpiece.	1a) Check continuity of WORK cable and clamp. 1b) Attach clamp to workpiece. 1c) Ground work table to earth ground.
Arc does not transfer to work. (Open circuit voltage is between 315 and 355. Pilot arc is NOT present.)	1) Pilot arc Fuses F1 and/or F2 are open. 2) Bad pilot arc contactor. 3) Bad K3. 4) Bad PCB1 in MOD2. 5) Nozzle to electrode short in torch. 6) Bad control PCB. 7) No preflow signal from CNC. 8) Current setting too low. 9) Contaminated or worn electrode.	1) Replace F1 and/or F2. 2) Replace pilot arc contactor. 3) Replace K3. 4) Replace PCB1 in MOD2. 5) Disconnect torch from console. Check for open between pilot arc and torch leads. Repair if shorted. 6) Replace control PCB. 7) Bad PCB1. Bad MOD1 PCB1. 8) Readjust current setting. Torch too high above workpiece. 9) Replace electrode.

Torch and Cut Quality

Note:
This is offered as a general guide. Refer to your torch manual for specifics on your equipment

Problem	Possible Cause	Corrective Action
Reduced Electrode Life	1) Skeleton cutting	1) Cutting skeletons to facilitate their Removal from the table can adversely affect electrode life by: a) Causing the torch to run off the work. b) Continuous pilot arc edge starts. c) Greatly increasing the frequency of starts. This is mainly a problem for O2 cutting and can be alleviated by choosing a path with a minimum number of starts. d) Increased likelihood that the plate will spring up against the nozzle causing double arc. Careful attention by the operator, increasing standoff and reducing cutting speeds will help mitigate these conditions. If the machine is equipped with a gas torch, it may be more practical to use it for skeleton cutting.
	2) Height control problems. 3) Piercing standoff too low. 4) Starting on edges with continuous pilot arc. 5) Gas pressures too high or low. 6) Coolant flow below 3/4 GPM (0.5 l/sec). 7) Gas or water leaks in torch	2) See crashing/diving in item 6. 3) Increase piercing standoff 4) Position torch more carefully or use waste plate to start on. 5) Make appropriate adjustment 6) Check coolant level and flow 7) See torch manual

Problem	Possible Cause	Corrective Action
Reduced Electrode Life	1) Diving	1). Diving is usually caused by a change in arc voltage when an automatic height control is in use. Diving can result in damage to the nozzle. Usually, the voltage change is the result of a change of direction or speed to negotiate a corner, failure to disable the height control during piercing, or of plate falling away from the arc. These problems can be dealt with by disabling the height control in such situations and by extinguishing the arc earlier when finishing the cut on falling plate. Diving may also be caused by a problem with the height control or signals fed to it.
	2) Work flipping	2). The nozzle may sometimes be damaged if the torch hits a flipped up part. This is difficult to avoid entirely but careful part programming can minimize the problem.
	3) Catching on piece	3). This refers to crashes or nozzle damage caused by the front end of the torch catching on top spatter after a pierce. Hold the torch at a higher standoff for a longer lead-in to avoid this problem.
	4) Excessive speed	4). Reduce speed to prevent rooster tailing during cut. Reduce speed on corners if rooster tailing occurs only when coming out of corners.
	5) Excessive pilot arc on time	5). Check the following: a). When the torch is properly positioned, it should start on the first pop. b). The pilot arc contactor should open as soon as the arc transfers. c). Pilot Arc switch in wrong position. d). Gas or water leak in torch.
	6) Process factors	6). Same as for electrode.
	7) Inadequate initial delay. Pierce not complete before starting	7). Increase delay time.

Problem	Possible Cause	Corrective Action
Poor Cut Quality Refer to your torch manual for more details.	1. Gas selection	1. Refer to gas selection section.
	2. Torch alignment to work	2. Verify and correct torch alignment (vertically).
	3. Incorrect current	3. Verify current value. Refer to parameter tables.
	4. Cutting over slats	4. Cutting over slats will cause some bottom dross. If the cut runs along the slat, it can produce other cut quality problems. The only solution is to try to avoid running along the slats.
	5. Cutting machine or torch vibrates	5. Make sure bracket and height control is rigid and properly adjusted.
	6. Bevel angle	6. Standoff and speed have considerable effect on bevel angle.
	7. Wrong travel direction (good angle on scrap side).	7. With standard swirl the squarest side is on the right side of the direction of travel.
	8. Plate shifting while being cut.	8. Small, thin, or lightweight plates can shift while cutting. Clamp them down.
	9. Slag buildup on cutting table.	9. Clean slag from cutting table.
	10. Wrong gas settings.	10. Check gas chart and adjust for proper settings.
	11. Gas or water leak in torch.	11. Check torch manual.
No PreFlow	1. No start signal.	1. Check input. Verify a start command has been given.
	2. Emergency stop signal open	2. Check for continuity between TB3-18 and TB3-19.
	3. Shorted, closed, or jumpered out CWFS.	3. Check coolant LED on front panel. Should be lit.
	4. No Coolant flow.	4 Check reservoir. Add coolant until full.
	5. N2 pressure switch not activated.	5. Check switch for flow. Pressure too low.

Problem	Possible Cause	Corrective Action
Torch Fails to Fire	1. Start gas too high. 2. Coolant flow switch not satisfied. 3. Torch parts worn out. 4. Start signal not present 5. Pressure switches for gas not satisfied. 6. Power supply problem.	1. Lower start gas flow. 2. a). Pump pressure too low, should be 90 - 100 psig. b).Faulty coolant flow switch. c). Obstruction in torch limiting coolant flow. 3. Service torch as outlined in the torch manual. 4. Trouble shoot signal path. 5. Check for proper pressure and flow. 6. Run through all setup procedures.
Positive Cut Angle	1. Arc voltage too high. 2. Cutting speed too fast. 3. Cutting current too high.	1. Lower arc voltage in small (5 Volt) increments. 2. If cutting speed is too fast, decrease speed. 3. a). Wrong nozzle being used. b). Lowercurrentintocorrect operating range.
Negative Cut Angle	1. Arc voltage too low. 2. Cutting speed too slow. 3. Cutting current too low	1. Raise the arc voltage in small increments (5 Volts). 2. Simply increase speed. 3. Change to a higher current nozzle.

NOTE:
Schematics and Wiring Diagrams on 11″ x 17″
paper are included
inside the back cover of this manual.

7.0 Replacement Parts

7.1 General

Always provide the serial number of the unit on which the parts will be used. The serial number is stamped on the unit nameplate.

7.2 Ordering

To ensure proper operation, it is recommended that only genuine ESAB parts and products be used with this equipment. The use of non-ESAB parts may void your warranty.

Replacement parts may be ordered from your ESAB Distributor.

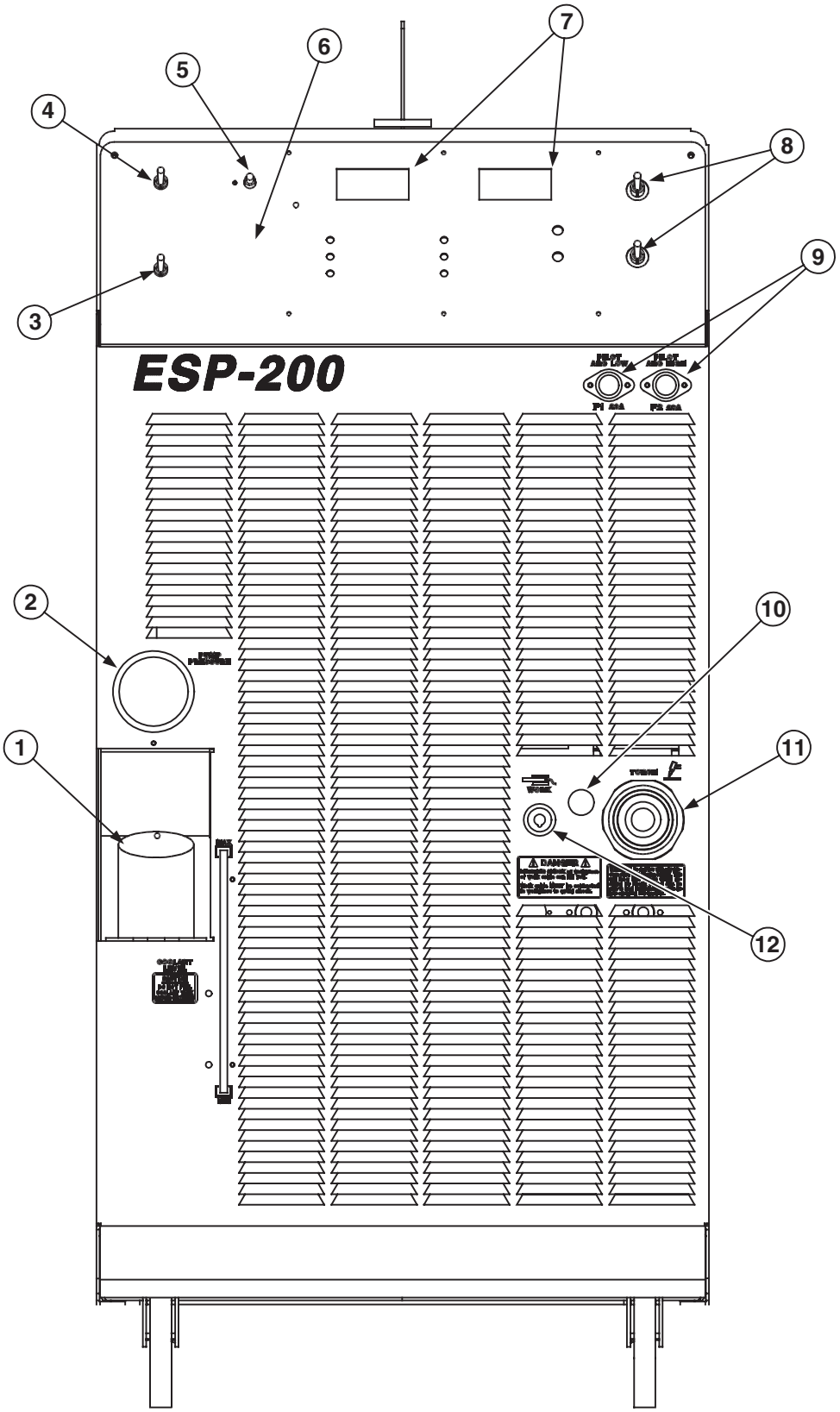
Be sure to indicate any special shipping instructions when ordering replacement parts.

Refer to the Communications Guide located on the back page of this manual for a list of customer service phone numbers.

Note

Bill of material items that have blank part numbers are provided for customer information only.
Hardware items should be available through local sources.

7.3 ESP-200 P/N 36324 -- Outside View – Front



Item No	Qty	Part Number	Description	Circuit Symbol
1	1	952182	Spout –Remote Filler	
2	1	See Below	Gauge –200PSI	
3	1	636702	Switch – Toggle DPDT 3pos 15A 125V	S4
4	1	634518	Switch – Toggle DPDT 2pos 15A	S2
5	1	2062018	POT 10K 2W	R1
6	1	954619	Overlay 200I	
7	2	951061	Meter – LED 5VDC	AM1, VM1
8	2	672508	Switch – Toggle 2PST 2pos 15A	S1, S3
9	2	952556	Fuse – 30A 600V	F1, F2
10	1	639533	Bushing –Snap .88ID X 1.09 MH X .45L	
11	1	33053	Strain Relief	
	1	951188	Locknut – Conduit 2 in. NPT	
12	1	13733935	Panel Recpt 2-1/0	WORK

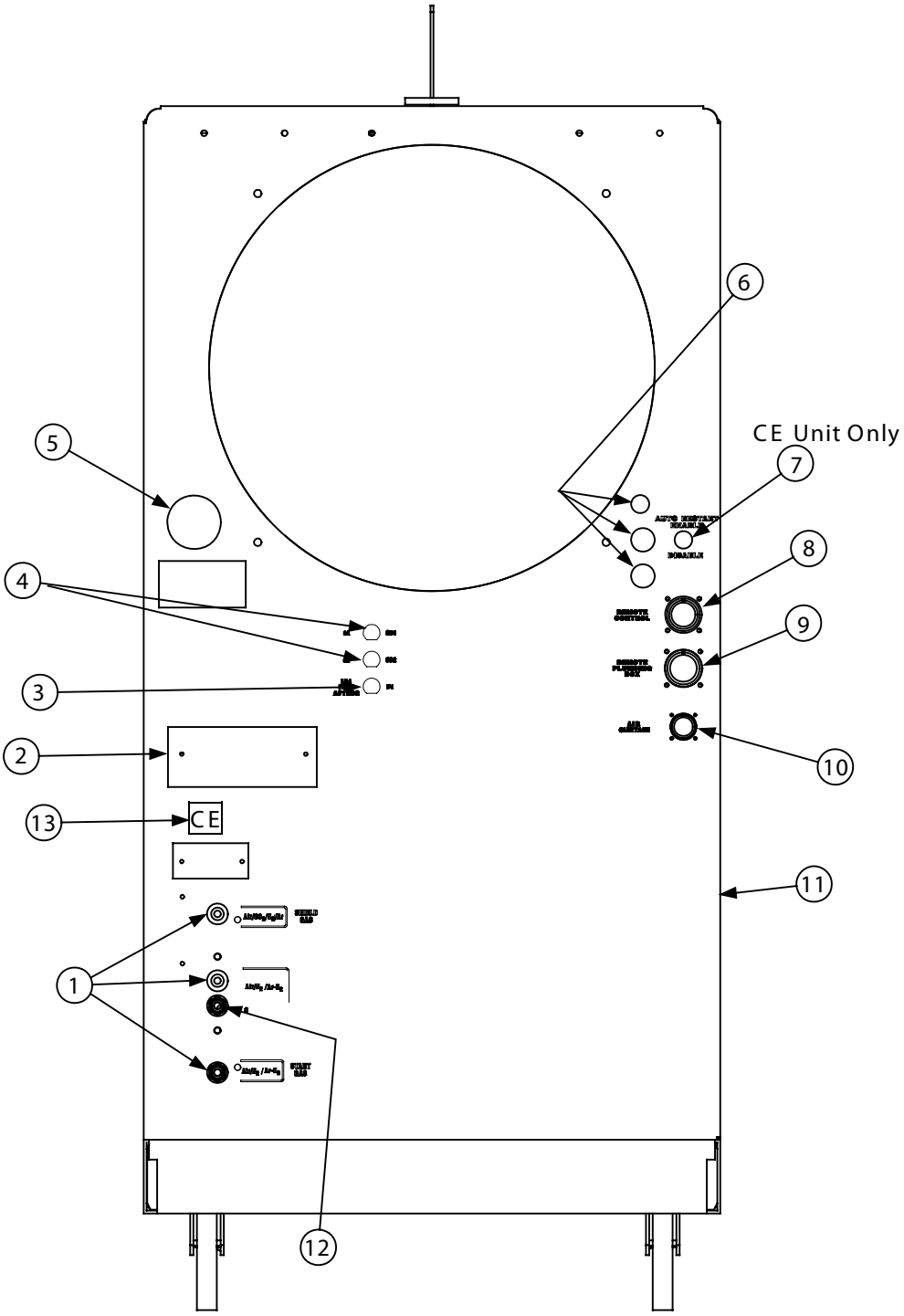
Refer to Console Serial Number to determine which gauge to order. Gauges require different hole sizes in front panel and are not interchangeable.

- Console with serial number in PxxJ348xx format require gauge P/N 0558004488
- All others use P/N 598481

P/N 598481

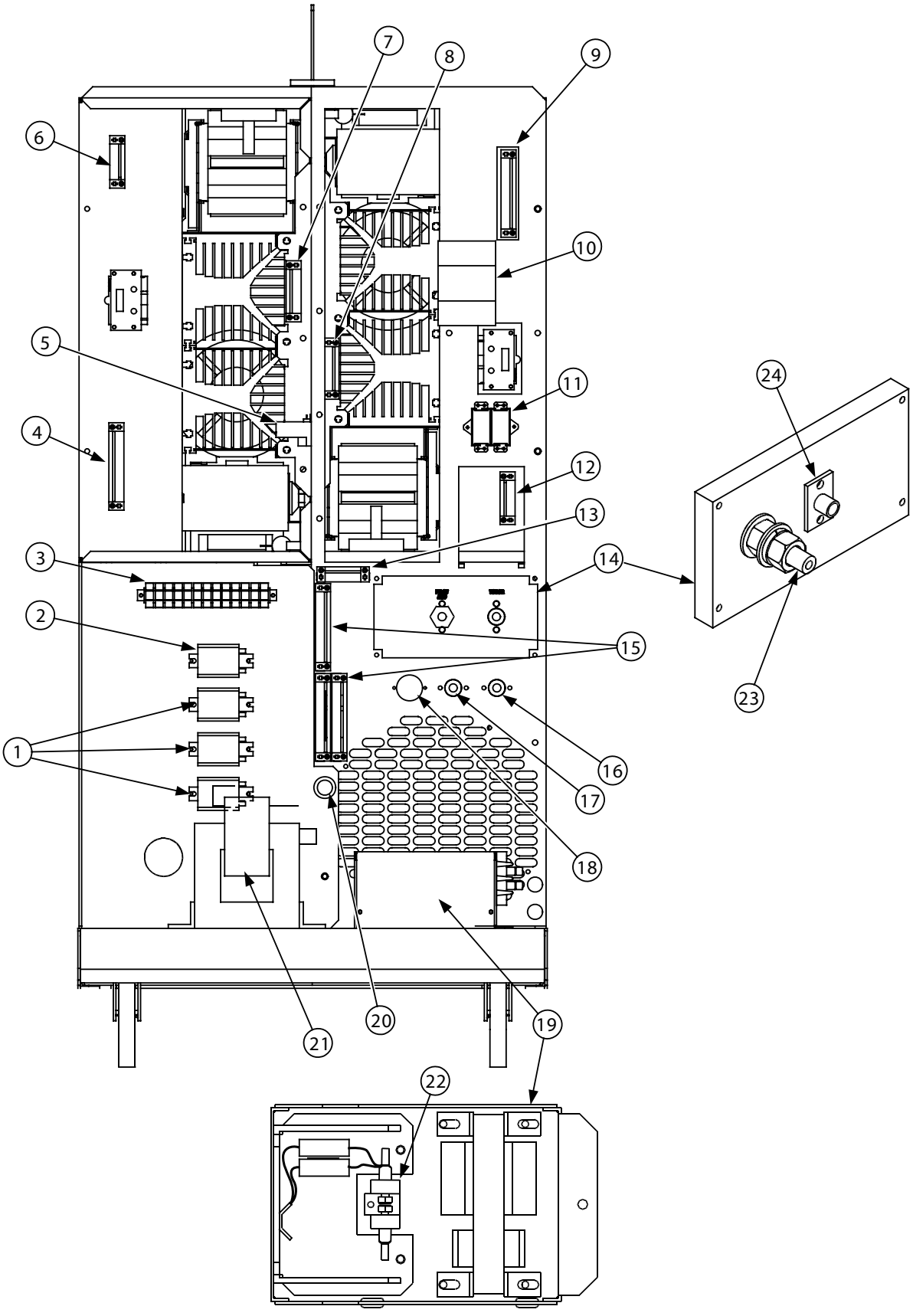
P/N 0558004488

7.4 Outside View- Back



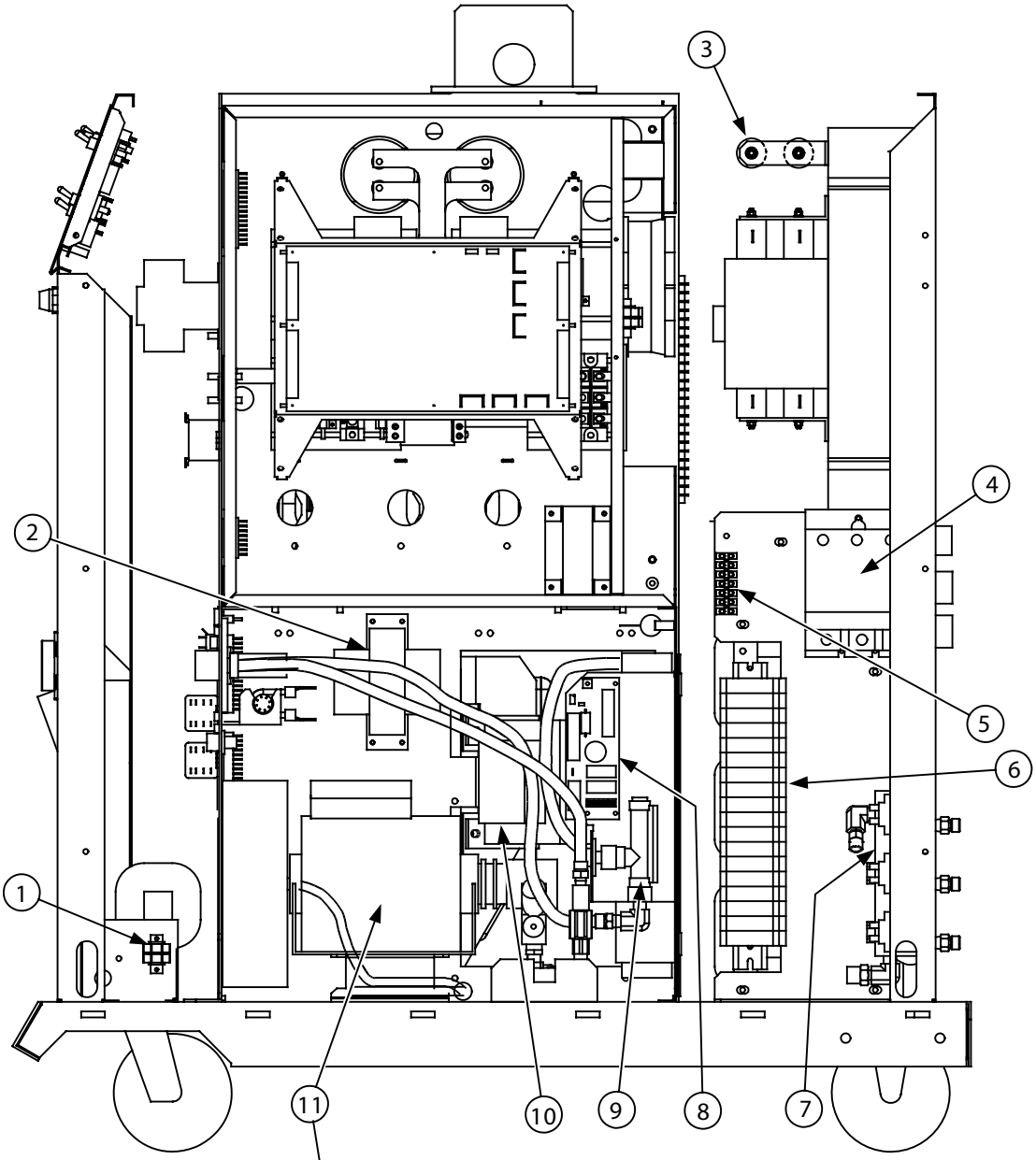
Item No	Qty	Part Number	Description	Circuit Symbol
1	3	639582	Plug and Chain B/I—G M RH BRS	
2	1	13730763	Plate -- Serial	
3	1	952137	Fuse – 600V 15A Fast acting	F4
4	2	950829	Circuit Breaker 3 AMP	CB1,2
5	1	952595	Strain Relief	
6	3	23610197	Hole Plugs	
7	1	2133514	Hole Plug (restart switch on CE units)	
8	1	952210	Conn – Box Recept 14 FS SH	J2
9	1	952209	Conn – Box Recpt 19 FS SH	J7
10	1	182W62	Conn – Box Recpt 3 FS 18S	J8
11	1	32233GY	Rear Panel	
12	1	88W40	Plug and Chain B/OXY F RH BRS	

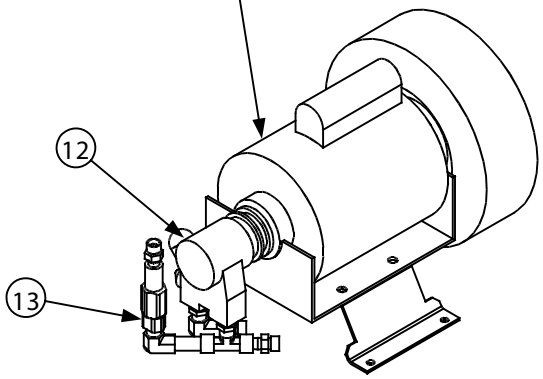
7.5 Front View with Front Panel Removed

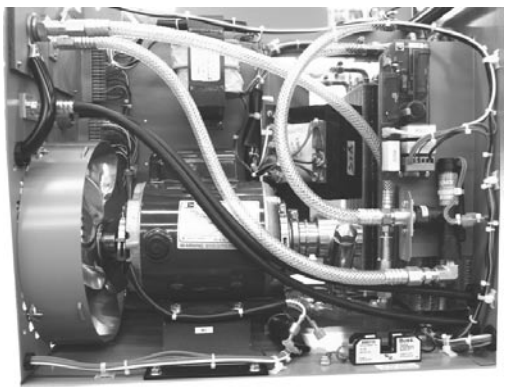


Item No	Qty	Part Number	Description	Circuit Symbol
1	3	950760	Relay Enclose DPDT 24 VAC 10A	K4,5,6
2	1	2080196	Relay Enclose 3PDT 120VAC	K3
3	1	673168	Terminal Block 13pos 20A	TB4
4	5	2234521	Plug – 16pos	P4,5,6, Mod1 P1, Mod2 P1
5	1	952252	Sensor --Current	TD1
6	3	2234520	Plug – 8pos	P3, Mod1 P2,
Mod2 P2				
7	2	2234891	Plug – 10pos	Mod1 P3,4,
8	2	2234891	Plug – 10pos	Mod2 P3,4
9	5	2234521	Plug – 16pos	P4,5,6, Mod1 P1, Mod2 P1
10	1	673458	Contactor – Pilot Arc 3 pole 40A	K2
11	2	951161	Capacitor – Metpoly 20uf 120VDC	C1,C2
12	3	2234520	Plug – 8pos	P3, Mod1 P2,
Mod2 P2				
13	3	2234518	Recpt 16pos	J3
	3	2234520	Plug – 8pos	P3, Mod1 P2,
Mod2 P2				
14	1	36351	Board – Terminal Output	
15	3	2234519	Recpt 16pos	J4,5,6
	3	2234521	Plug – 16pos	P4,5,6, Mod1 P1, Mod2 P1
16	1	58V58	Adapter B/I—G F ¼ NPTM BKHD	
17	1	33033	Adapter B/A-W M ¼ NPTM BKHD	
18	1	997830	Recpt 5 Pole	J1
19	1	36909GY	Box – High Frequency	
20	1	950823	Snap Bushing	
21	1	837302	Reactor Assembly H.F.	T3
22	1	836431	Spark gap Assembly	SG
23	1	58v75	Adapter, B/A-W ¼ NPTM BKHD	
24	1	634090	Adapter, C/A-W F ¼ NPTM Cable	

7.6 Right Inside View

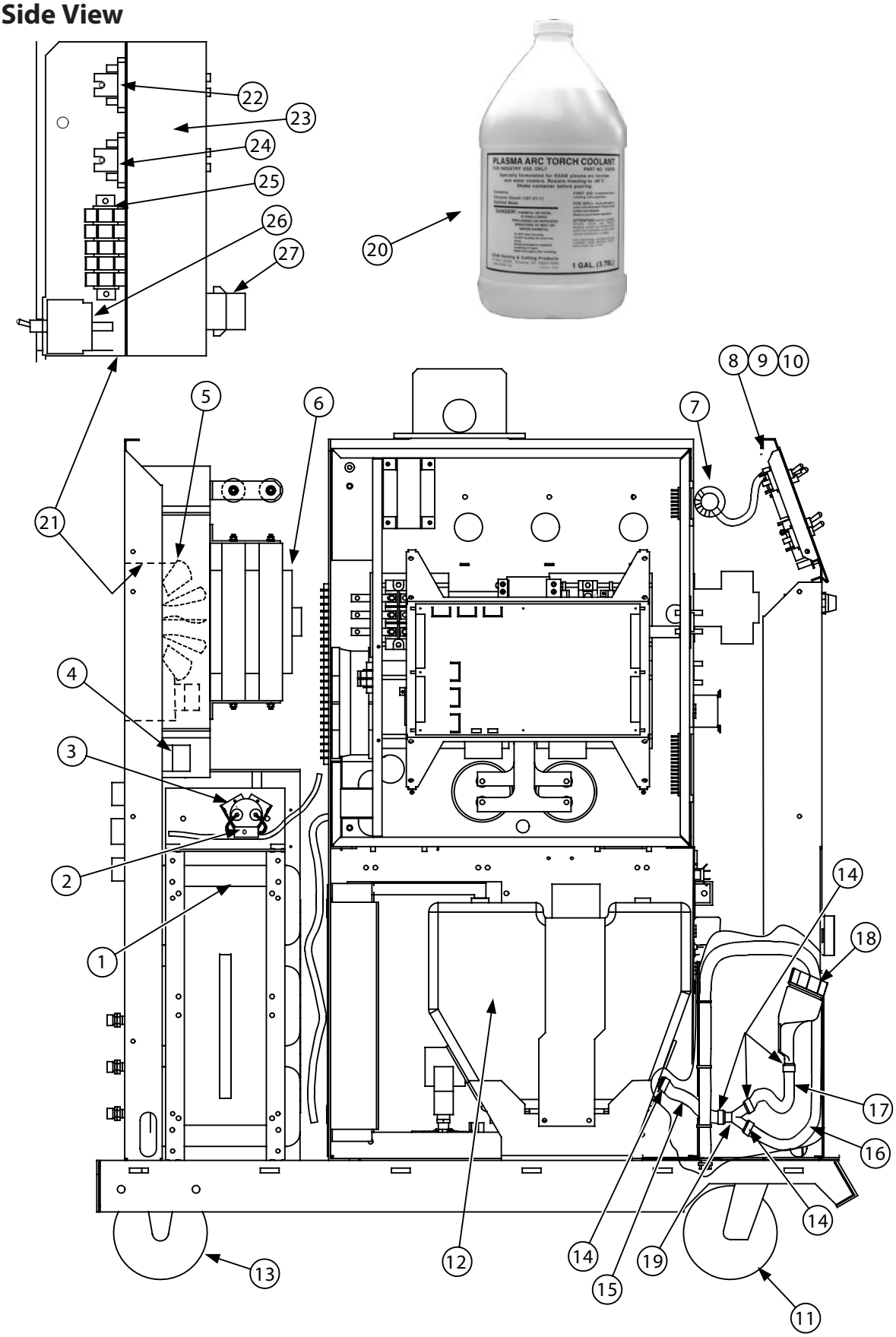






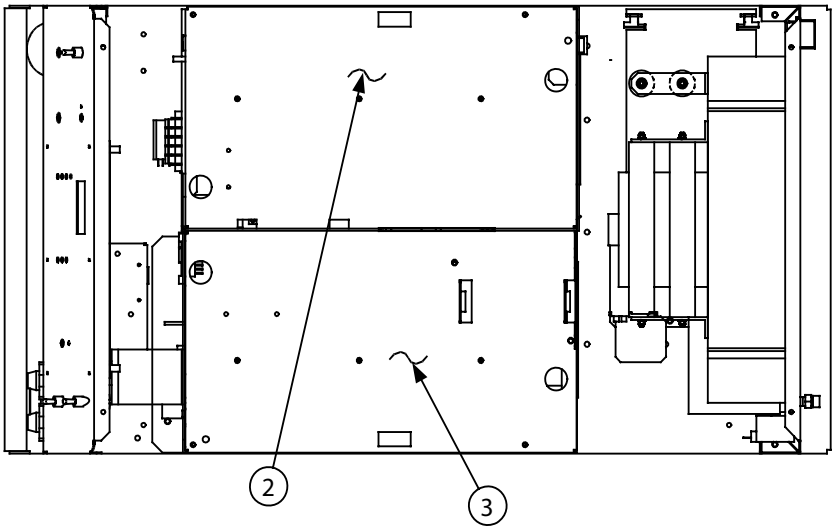
Item No	Qty	Part Number	Description	Circuit Symbol
1	1	950487	Term Blk 2pos	TB5
2	1	0558005165	Control Xfrmr 35759 w/ Terminals	
3	4	17300008	Resistor 8ohm 300W	R7,8,9,10
4	1	952251	Contactor 3 pole 150A	K1
5	1	952026	Term Blk 7pos 25A 12-18 AWG	TB2
6	1	952198	Term Block 145 A	TB1
7	1	36910	Gas Manifold	
8	1	38131	Board –PC/Startup	PCB2
9	1	952230	Flow Switch .50 GPM SPST	FS1
10	1	37805	Auto XFMR	T5
11	1	951215	Motor Carb 1/3 HP	M2
12	1	951347	Pump Carb W/Strainer	
13	2	68100126	Reducer 3/8 NPT to ¼ NPT	
	1	67100080	NPL Pipe ¼ NPT X 1.5" long	
	4	182W82	Elbow 90 deg. ¼ NPT	
	1	21124	Valve – Check Assembly	
	1	950179	Tee Pipe Branch ¼ BRS	
	4	810Z30	Adapter B/A—W M ¼ NPTM	
14	1	951346	Fan Blade for pump motor	
15	1	673676	Fan Blade	

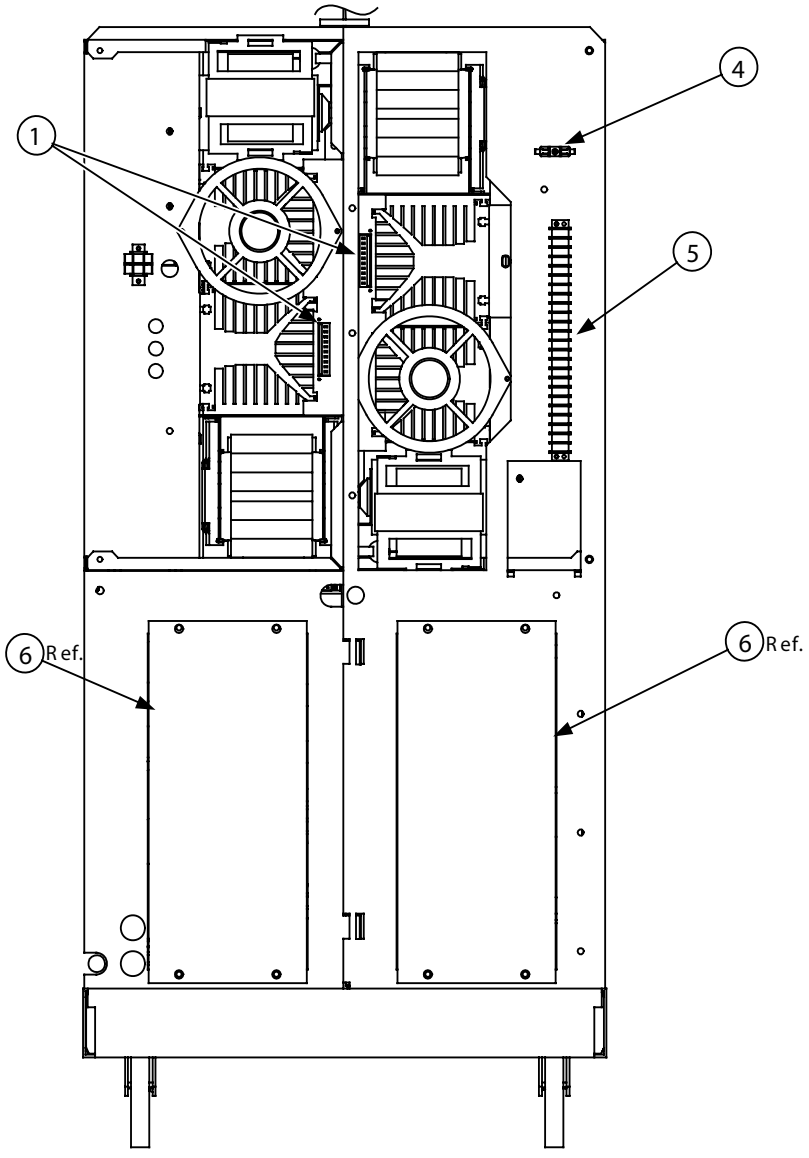
7.7 Left Side View



Item No	Qty	Part Number	Description	Circuit Symbol
1	1	36349	Auto XFMR	T2
2	1	17315247	Resistor 4.7K OHM 12W	R6
3	1	950627	Capacitor 4200uf 350VAC	C3
4	2	951109	Housing Contact 12pos	J9,10
	2	2062367	Recpt Housing 12pos nylon	P9,10
5	1	673676	Fan Blade	
6	1	2062334	Motor --Fan	M1
7	1	952002	Core -- Saturable	L1
8	1	38094	PCB Isolation Amp	PCB1
9	2	950101	Housing –Contact Crimp 4 pin	PCB1 P9,5
	1	952034	Plug 5pos	PCB1 P10
	3	952030	Plug 18pos	PCB1 P1,3,4
10	1	952032	Plug 16pos	PCB1 P2
	1	950096	Housing, Contact Crimp 3 pin	PCB1 P7
11	2	952013	Caster --Swivel	
12	1	952179	Water Tank	
13	2	952012	Caster -- Fixed	
14	5	994471	Clamp – Hose W/D .5OD X 1.06 D SS	
15	1.25ft	90858007	Tubing Braided 5/8 ID	
16	3.67ft	90858625	Tubing, Vinyl Clear 5/8 ID	
17	1.25ft	90858007	Tubing Braided 5/8 ID	
18	1	952182	Spout Remote Filler	
19	1	952181	“Y” plastic pipe	
20	3	156F05	Plasma torch coolant 1 gallon (3.8 L)	
21		Reference	Restart Switch Assembly –Ref. CE units only	
22	1	674553	Relay Enclosed, TD10 DPDT 120 VAC	K8
23	1	37671	BRKT Restart Sel Mod	
24	1	13735310	Relay enclosed, DPDT 24VDC	K7
25	1	950826	Term Block 5 POS 20A	TB6
	1	2062197	Marker Strip 5 POS	
26	1	673213	SW, SPST, TGGL	S7
27	1	2062367	Recpt. Housing 12 POS nylon	P10
	1	951109	Housing Contact, 12 POS	J10

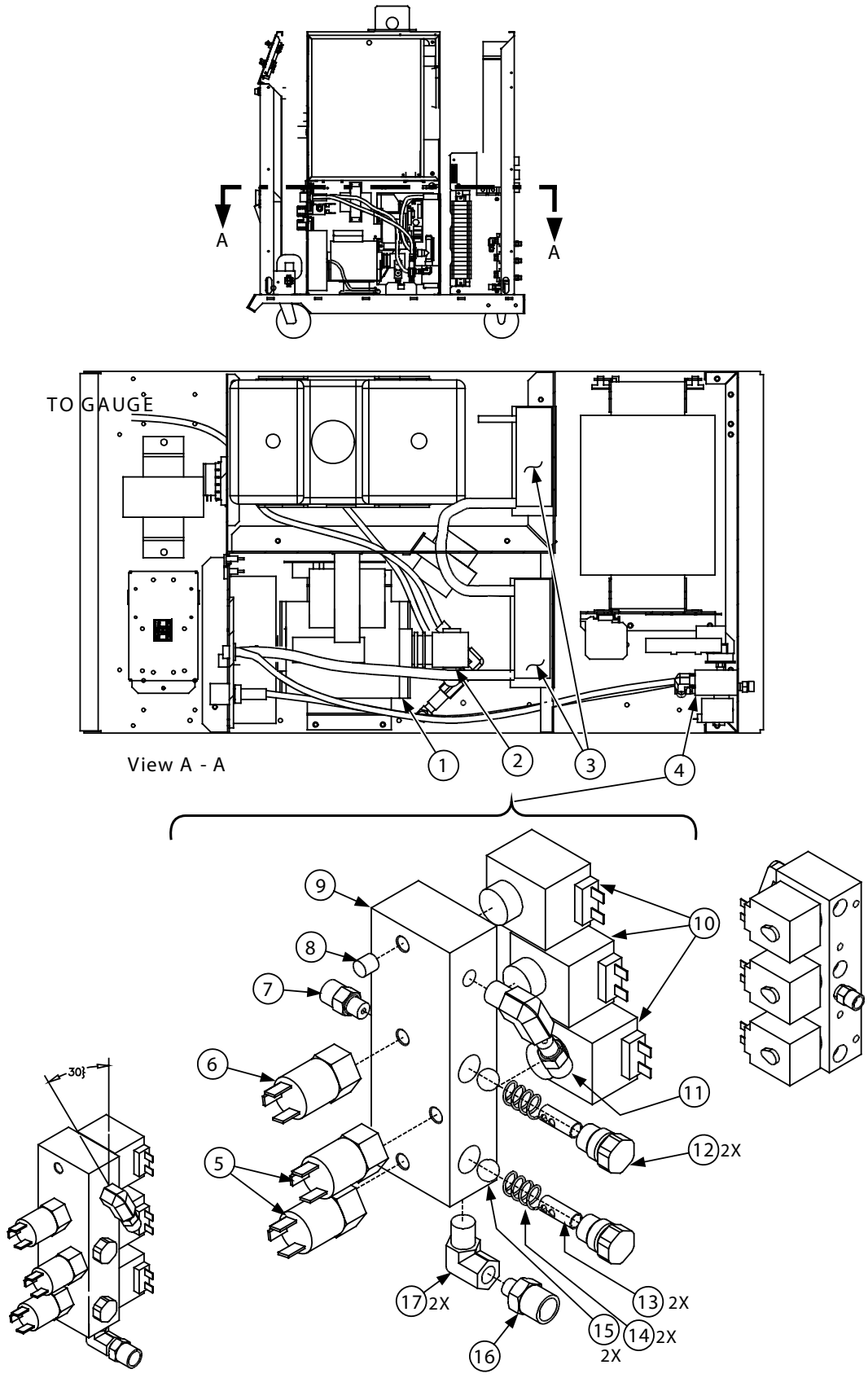
7.8 Back and Top Inside View





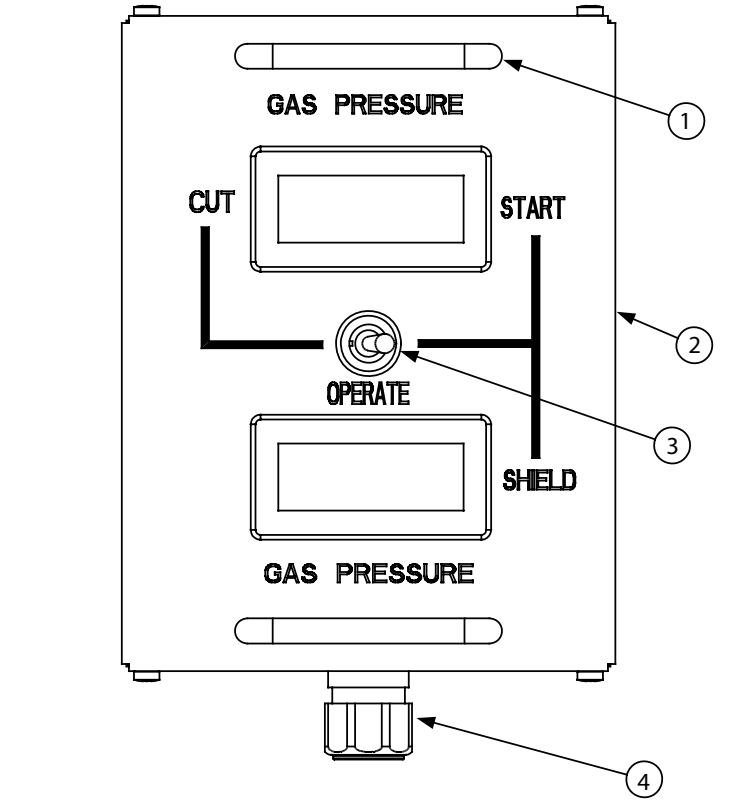
Item No	Qty	Part Number	Description	Circuit Symbol
1	4	2234891	Plug 10pos	Mod1 P3,4 Mod2 P3,4
2	1	37243	Module –Power CE	Mod2
3	1	37100	Module – Power CE	Mod1
4	1	2017483	Fuse N-T Delay 1.00A 250V	F3
5	1	995103	Terminal Block 24pos 15A	TB3
6	1	13735961	Heat Exchanger	

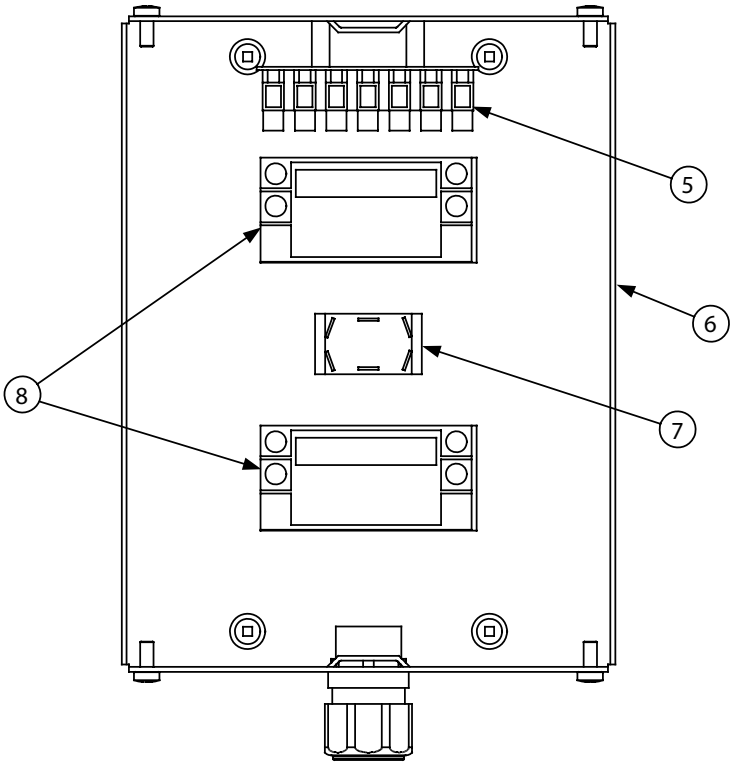
7.9 Cross Section and Gas Manifold



Item No	Qty	Part Number	Description	Circuit Symbol
1	1	951215	Motor carb 1/3 HP	M2
2	1	951347	Pump Carb w/Strainer	
3	2	13735961	Heat Exchanger	
4	1	36910	Manifold, Gas Control Assembly	
5	2	0558002345	Pressure Switch 17 PSI	PS1,2
6	1	0558002346	Pressure Switch 22 PSI	PS3
7	2	3389	Adapter B/OXY m ¼ NPTM	
8	1	60101025	Plug Pipe Socket HD 1/8 BRS	
9	1	0558006864	Manifold – Gas control	
10	3	952061	Valve -- Solenoid	SOL1,2,3
11	1	10Z30	Adaptor B/A—W M ¼ NPTM	
12	2	36358	Plug -- Manifold	
13	2	639678	Tube	
14	2	639669	Spring	
15	2	950654	Ball, Neoprene 70DUR	
16	1	74S76	Adapter B/I—G F ¼ NPTM	
17	2	182W82	Elbow 90 deg. ¼ NPTM	

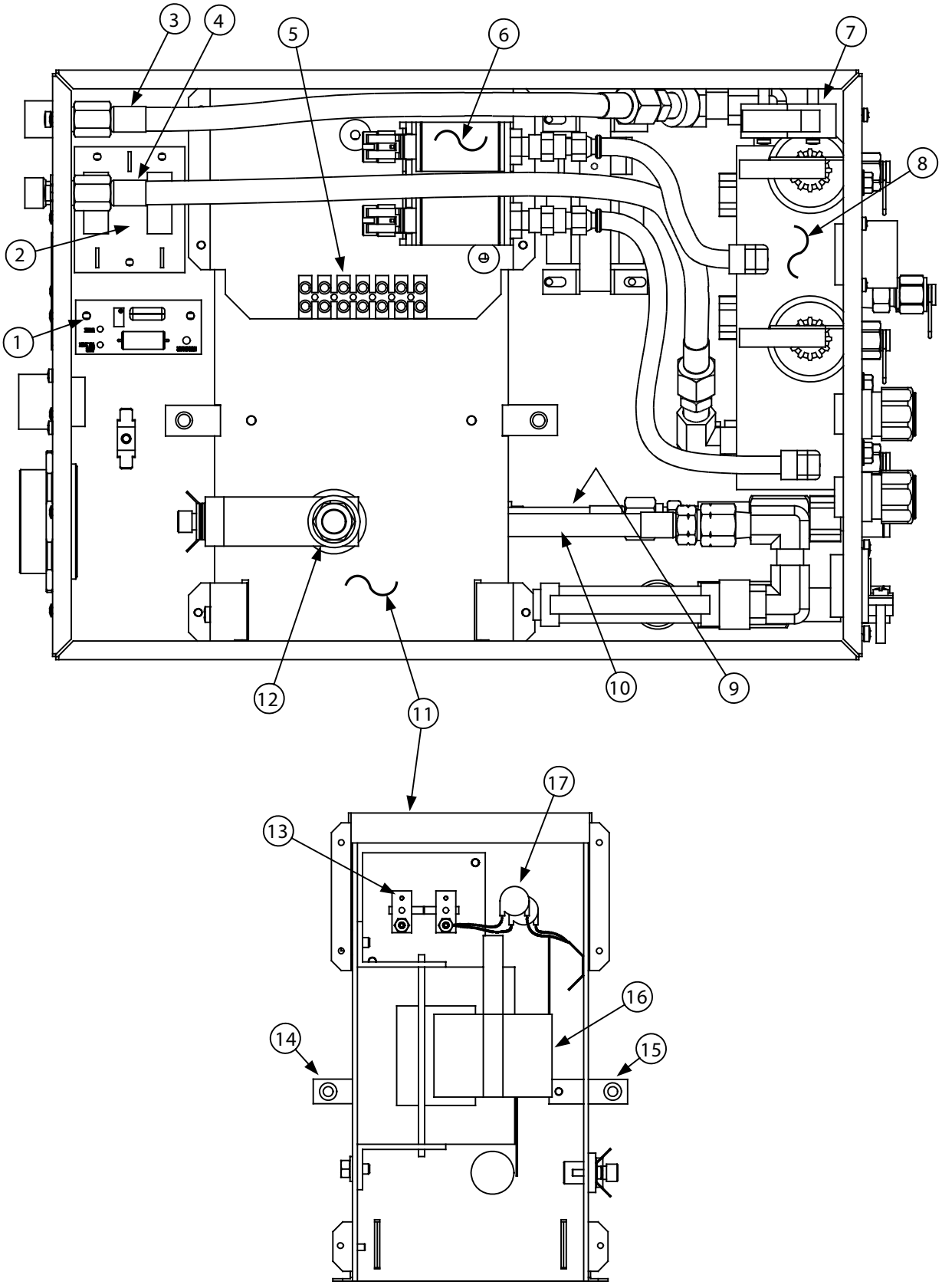
7.10 Remote Setup Pendant P/N 37145





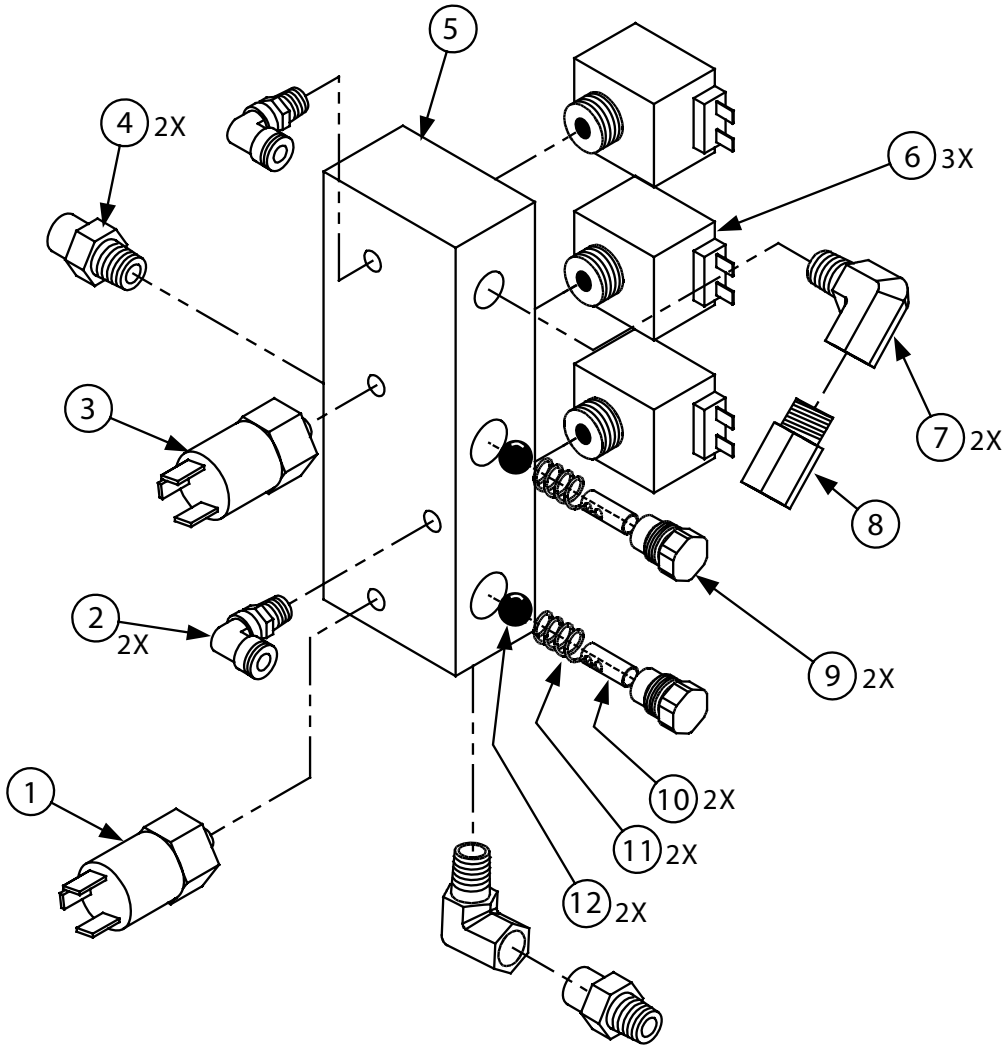
Item No	Qty	Part Number	Description
1	2	951086	Handle
2	1	32282GY	Cover
3	1	951474	Switch Boot
4	1	527376	Strain Relief
	1	2062151	Locknut
5	1	952026	Term Blk 7pos 25A 12—18AWG
6	1	37239GY	Base
7	1	636702	Switch – Toggle DPDT 3pos 15A 125V
8	2	952625	Display – LCD 4—20mA

7.11 ESP-200 Plumbing Box P/N 22000 -- Inside and H.F. Box



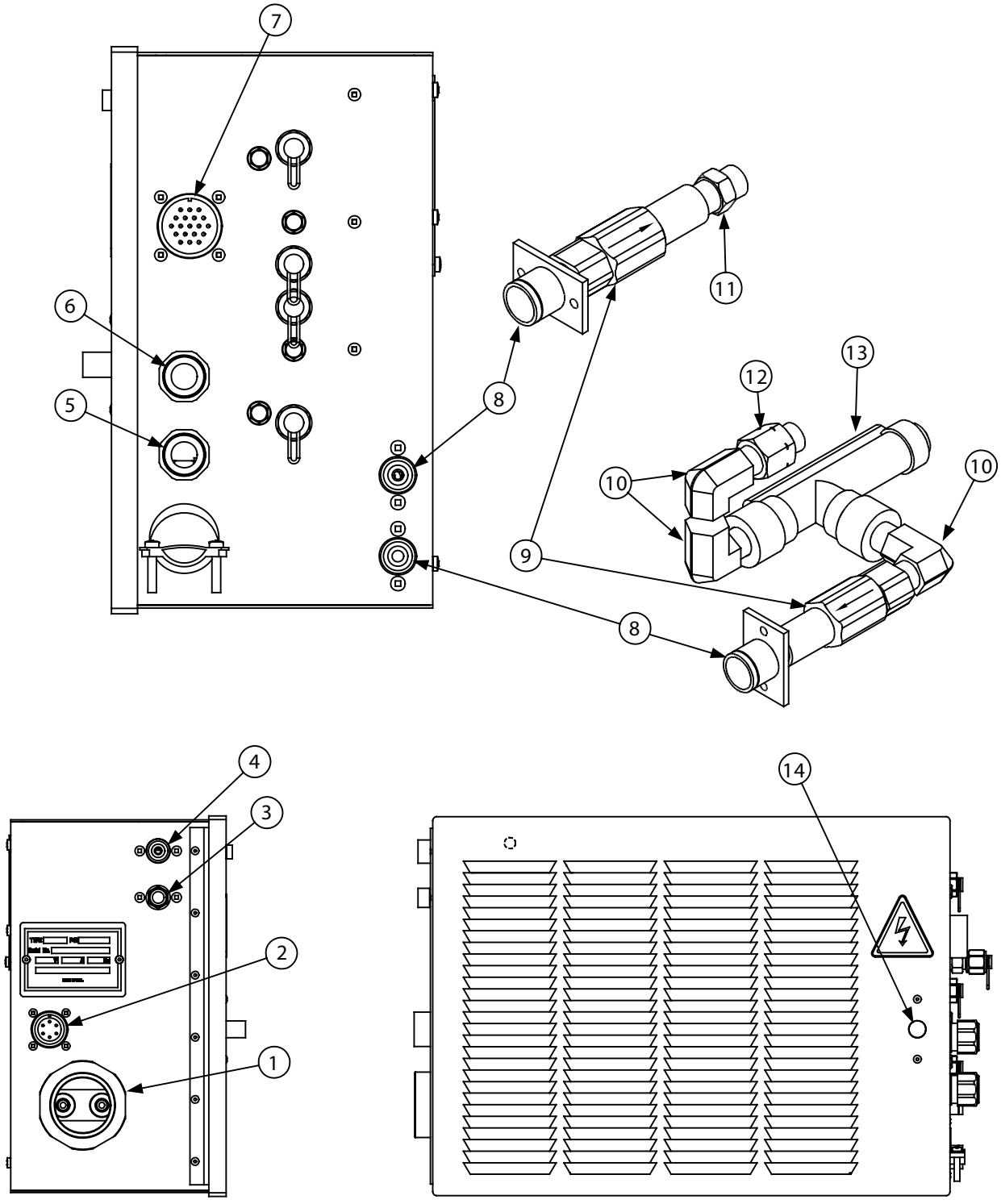
Item No	Qty	Part Number	Description	Circuit Symbol
1	1	56997963	Board, PC Arc Voltage	PCB1
2	1	674969	Filter Board	PCB2
3	1	37232	Hose Assembly – Plasma Gas	
4	1	37233	Hose Assembly – Shield Gas	
5	1	952026	Term Block 7pos 25A 12—18AWG	TB5
6	2	952624	Transducer Pressure 4—20mA	TD1,2
7	1	673085	Switch Micro SPDT 25A 250V SCR	ISW
8	1	0558001952	Manifold Assembly	
9	1	37234	Hose Assembly – Water Supply	
10	1	37235	Hose Assembly – Water Return	
11	1	32281	Enclosure	
12	1	37230	Busbar Torch Connection	TB3
13	1	0558001297	Spark Gap Assembly	
14	1	Ref.	Busbar – Pilot Arc	TB1,2
15	1	Ref.	Busbar – Pilot Arc	TB1,2
16	1	37250	Rector Assembly – High Frequency	T2
17	1	36682	Wire Kit – Plumbing Box	

7.12 Gas Manifold – Plumbing Box P/N 0558001952



Item No	Qty	Part Number	Description	Circuit Symbol
1	1	0558002345	Pressure Switch – 17 PSI	PS1
2	2	952087	Elbow – Male Swivel 90 deg 1/8 NPT	
3	1	0558002346	Pressure Switch – 22 PSI	PS2
4	2	3389	Adapter CPLR B/OXY M ¼ NPTM	
5	1	36357	Manifold	
6	3	0558006864	Valve Solenoid	SOL1,2,3
7	2	182W82	Elbow 90deg ¼ NPT	
8	1	74S76	Adapter B/1—G F ¼ NPTM	
9	2	36358	Plug Manifold	
10	2	639678	Tube	
11	2	639669	Spring	
12	2	950654	Ball – Neoprene 70 DUR	

7.13 ESP-200 Plumbing Box – Outside and Cooling Water Connections



Item No	Qty	Part Number	Description	Circuit Symbol
1	1	33053	Strain Relief	
	1	951188	Locknut	
2	1	993952	Conn Box Recpt ^FS Shell 18	J2
3	1	33033	Adapt B/A-W M ¼ NPTM BKHD	
4	1	58V58	Adapt B/I-G F ¼ NPTM BKHD	
5	1	526652	Strain Relief	
	1	2062151	Locknut	
6	1	527376	Strain Relief	
	1	2062151	Locknut	
7	1	950762	Conn Box Recpt 19MP Shell 22	J1
8	2	58V75	Adapt B/A-W ¼ NPTM BKHD	
9	2	21124	Check Valve Assembly (note flow direction)	
10	2	182W82	Elbow ST90 ¼ BRS	
11	1	REF	Nut .138--32	
12	1	11N16	Adapt B/A—W F ¼ NPTM	
13	1	952230	Flow Switch .50 GPM SPST	FS1
14	2	182W82	Elbow ST90 ¼ BRS	
15	1	13730623	Door Latch	

NOTES

REVISION HISTORY

1. Revision of 09/2004 - changed p/n 36911, wire kit to: p/n 0558005165, contrl xfrmr 35679 w/terminals in the replacement parts section 7.

2. Revision of 02/2005 - updated schematic 37105 (ESP-200 CE) per change notice #043269.

3. Revision of 08/2005 - converted manual to Indesign format, updated schematics per CN-053071.

4. Revision of 03/2007 - Chgd replacement parts BOM (2 places), item 952230 description from: Flow Switch .25 GPM SPST to: Flow Switch .50 GPM SPST.

5. Revision of 02/2008 - Added 380/415V harmonics information.

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