ESP-600C

Plasma Power Source

Instruction Manual

0558006583

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

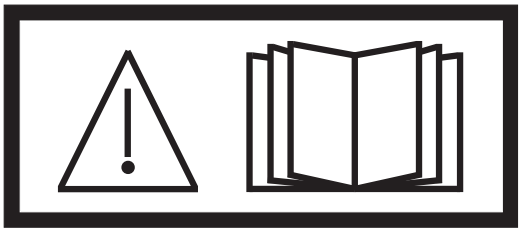
CAUTION

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.



READ AND UNDERSTAND THE INSTRUCTION MANUAL BEFORE INSTALLING OR OPERATING.

PROTECT YOURSELF AND OTHERS!

TABLE OF CONTENTS

Section / Title **Page**

TABLE OF CONTENTS

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.

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PROTECT YOURSELF AND OTHERS!

2.1 Introduction

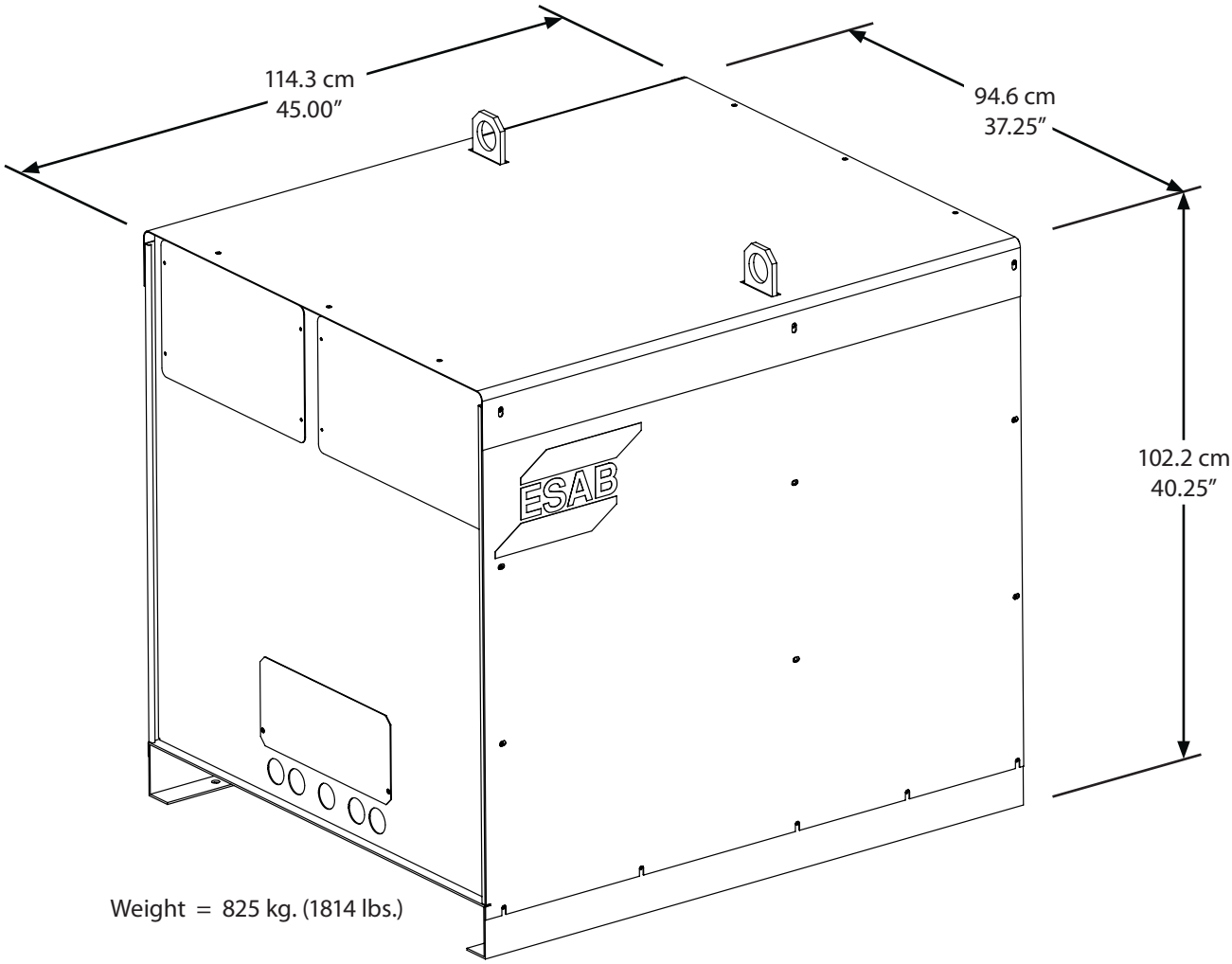
The ESP-600C power source is designed for high speed plasma mechanized cutting applications. It can be used with other ESAB products such as the PT-15, Pt-19XLS, PT-600 and PT-36 torches along with the Smart Flow II, a computerized gas regulation and switching system.

- 50 to 600 amperes cutting current range
- Forced air cooled
- Solid state DC power
- Input voltage protection
- Local or remote front panel control
- Thermal switch protection for main transformer and power semiconductor components
- Top lifting rings or base forklift clearance for transport
- Parallel supplemental power source capabilities to extend current output range.

2.2 General Specifications

		ESP-600C 400V, 50 / 60Hz CE	ESP-600C 460V, 60Hz	ESP-600C 575V, 60Hz
Part Number		0558006467	0558006468	0558006469
Output (100 % duty cycle)	Voltage	200 VDC		
	Current range DC (cutting)	50A to 600A		
	Power	120 KW		
	Open Circuit Voltage (OCV)	423 VDC	427 VDC	427 VDC
Input	Voltage (3-phase)	400 V	460 V	575 V
	Current (3- phase)	206A RMS	179A RMS	143A RMS
	Frequency	50/60 HZ	60 Hz	60 Hz
	KVA	142.7 KVA	142.6 KVA	142.9 KVA
	Power	129.9 KW	129.8 KW	129.6 KW
	Power Factor	91.0 %	91.0%	91.0%
	Input Fuse Rec.	250A	250A	200A

2.3 Dimensions and Weight



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

Using one lifting eye will damage sheet metal and frame.
Use both lifting eyes when transporting with overhead method.

- 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.

3.3 Placement

Note:
Use both lifting eyes when transporting from overhead.

- A minimum of 1 M (3 ft.) clearance on front and back for cooling air flow.
- Plan for top panel and side panels having to be removed for maintenance, cleaning and inspection.
- Locate the ESP-600C 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 flashover.
Equipment damage may occur. Electrical shorting may occur if dust is allowed to build-up inside power source. See maintenance section.

3.4 Input Power Connection

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

ESP-600C 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:

Input at Rated Load		Input and Ground conductor* CU/ mm^2 (AWG)	Time delay Fuse size (amperes)
Volts	Amperes		
400	206	95 (4/0)	250
460	179	95 (3/0)	250**
575	143	50 (1/0)	200

Rated load is output of 600A at 200V

* Sizes per National Electrical Code for a 90° C (194˚ F) rated copper conductors @ 40° C (104˚ F) ambient. Not more than three conductors in raceway or cable. Local codes should be followed if they specify sizes other than those listed above.

** During heavy duty cutting at 600A, input current can momentarily rise above 200A and cause nuisance blowing of 200A fuses. When cutting currents are below 500A, 200A fuses are sufficient.

To estimate the input current for a wide range of output conditions, use the formula below.

$$\text{Input current} = \frac{(\text{V arc}) \times (\text{I arc}) \times 0.688}{(\text{V line})}$$

NOTICE

Dedicated power line may be necessary.
ESP-600C is equipped with line voltage compensation but to avoid impaired performance due to an overloaded circuit, a dedicated power line may be required.

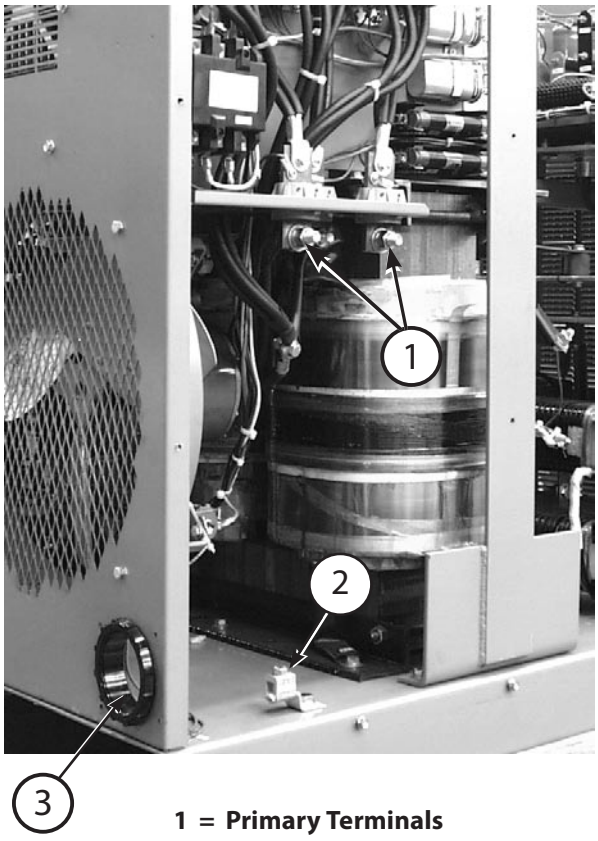
3.4.2 Input Conductors

- Customer supplied
- May consist either of heavy rubber covered copper conductors (three power and one ground) or run in solid or flexible conduit.
- Sized according to the chart.

NOTICE

Input conductors must be terminated with ring terminals.
Input conductors must be terminated with ring terminals sized for 12.7 mm (0.50") hardware before being attached to the ESP-600C.

3.4.3 Input Connection Procedure



1. Remove left side panel of the ESP-600C
2. Thread cables through the access opening in the rear panel.
3. Secure cables with a strain relief or conduit coupling (not supplied) at the access opening.
4. Connect the ground lead to the stud on the chassis base.
5. Connect the power lead ring terminals to the primary terminals with supplied bolts, washers and nuts.
6. Connect the input conductors to the line (wall) disconnect.

1 = Primary Terminals

2 = Chassis Ground

3 = Power Input Cable Access Opening (Rear Panel)

WARNING

ELECTRIC SHOCK CAN KILL!
RING TERMINALS MUST HAVE CLEARANCE BETWEEN SIDE PANEL AND MAIN TRANSFORMER. CLEARANCE MUST BE SUFFICIENT TO PREVENT POSSIBLE ARCING. MAKE SURE CABLES DO NOT INTERFERE WITH COOLING FAN ROTATION.

WARNING

IMPROPER GROUNDING CAN RESULT IN DEATH OR INJURY.
CHASSIS MUST BE CONNECTED TO AN APPROVED ELECTRICAL GROUND. BE SURE GROUND LEAD IS NOT CONNECTED TO ANY PRIMARY TERMINAL.

3.5 Output Connections

WARNING

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

- **DISCONNECT POWER SOURCE AT THE LINE (WALL) DISCONNECT.**
- **HAVE A QUALIFIED PERSON CHECK THE OUTPUT BUS BARS (POSITIVE AND NEGATIVE) WITH A VOLTMETER.**

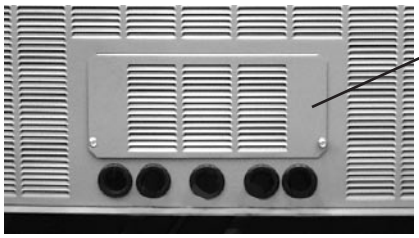
3.5.1 Output Cables (customer supplied)

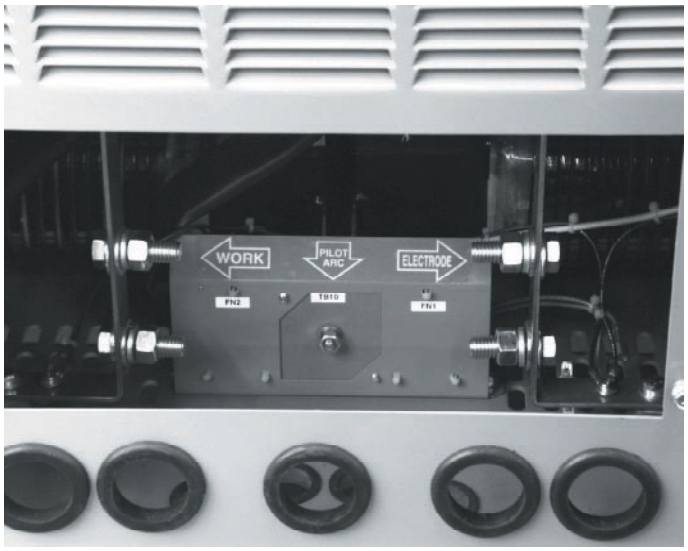
Choose plasma cutting output cables (customer supplied) on the basis of one 4/0 AWG, 600 volt insulated copper cable for each 400 amps of output current.

Note:
Do not use 100 volt insulated welding cable.

3.5.2 Output Connection Procedure

1. Remove access panel on the lower front of the power source.
2. Thread output cables through the openings at the bottom of the front panel or at the bottom of the power source immediately behind the front panel.
3. Connect cables to designated terminals mounted inside the power source using UL listed pressure wire connectors.
4. Replace panel removed during the first step.





3.6 Parallel Installation

Two ESP-600C power sources may be connected together in parallel to extend the output current range.

CAUTION

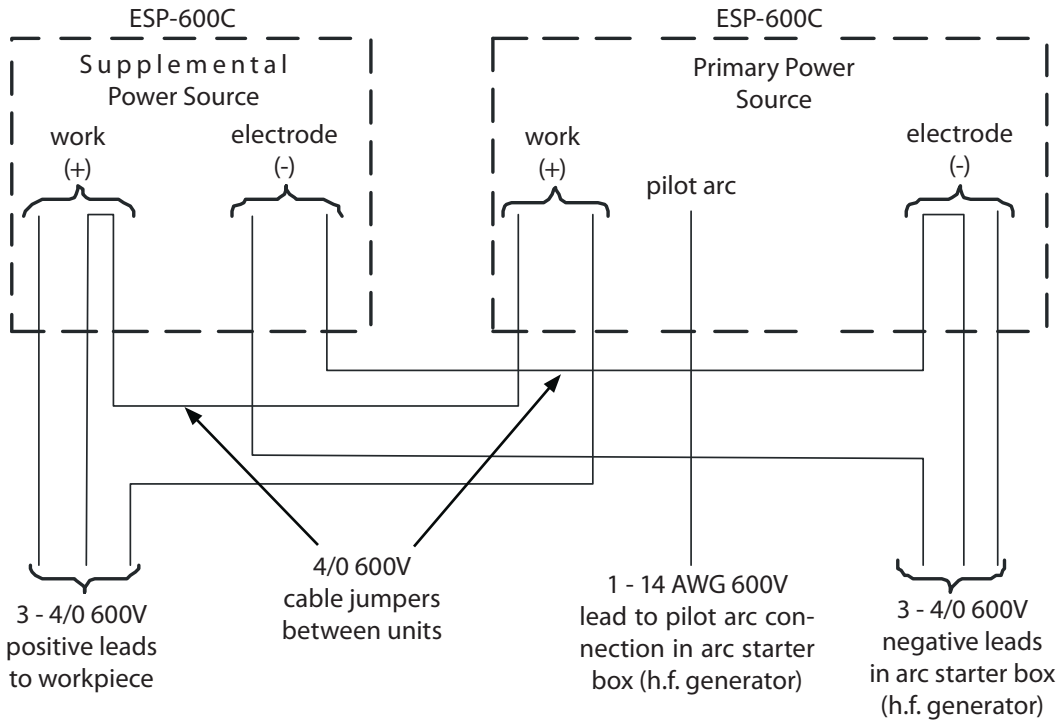
Parallel power source minimum output current exceeds recommended amounts when cutting below 100A.
Use only one power source for cutting below 100A.
We recommend disconnecting the negative lead from the supplemental power source when changing to currents below 100A. This lead should be safely terminated to protect against electric shock.

3.6.1 Connections for Two ESP-600C's in Parallel

Note:
Primary power source has the electrode (-) conductor jumpered. The supplemental power source has the work (+) jumpered.

1. Connect the negative (-) output cables to the arc starter box (high frequency generator).
2. Connect the positive (+) output cables to the workpiece.
3. Connect the positive (+) and negative (-) conductors between the power sources.
4. Connect the pilot arc cable to the pilot arc terminal in the primary power source. The pilot arc connection in the supplemental power source is not used. The pilot arc circuit is not run in parallel.
5. Set the Pilot Arc HIGH / LOW switch on the supplemental power source to "LOW".
6. Set the Pilot Arc HIGH / LOW switch on the primary power source to "HIGH".
7. If a remote 0.00 to +10.00 VDC current reference signal is used to set the output current, feed the same signal into both power sources. Connect J1-B (positive 0.00 to 10.00 VDC) of both power sources together and connect J1-A (negative) of both power sources together. With both power sources operating, the output current can be predicted using the following formula: [output current (amps)] = [reference voltage] x [160]

Connections for parallel installation of two ESP-600C power sources with both power sources in operation.



The ESP-600C does not have an ON/OFF switch. The main power is controlled through the line (wall) disconnect switch.

WARNING

DO NOT OPERATE THE ESP-600C WITH COVERS REMOVED.
HIGH VOLTAGE COMPONENTS ARE EXPOSED INCREASING SHOCK HAZARD.
INTERNAL COMPONENT MAY BE DAMAGED BECAUSE COOLING FANS WILL LOSE EFFICIENCY.

WARNING

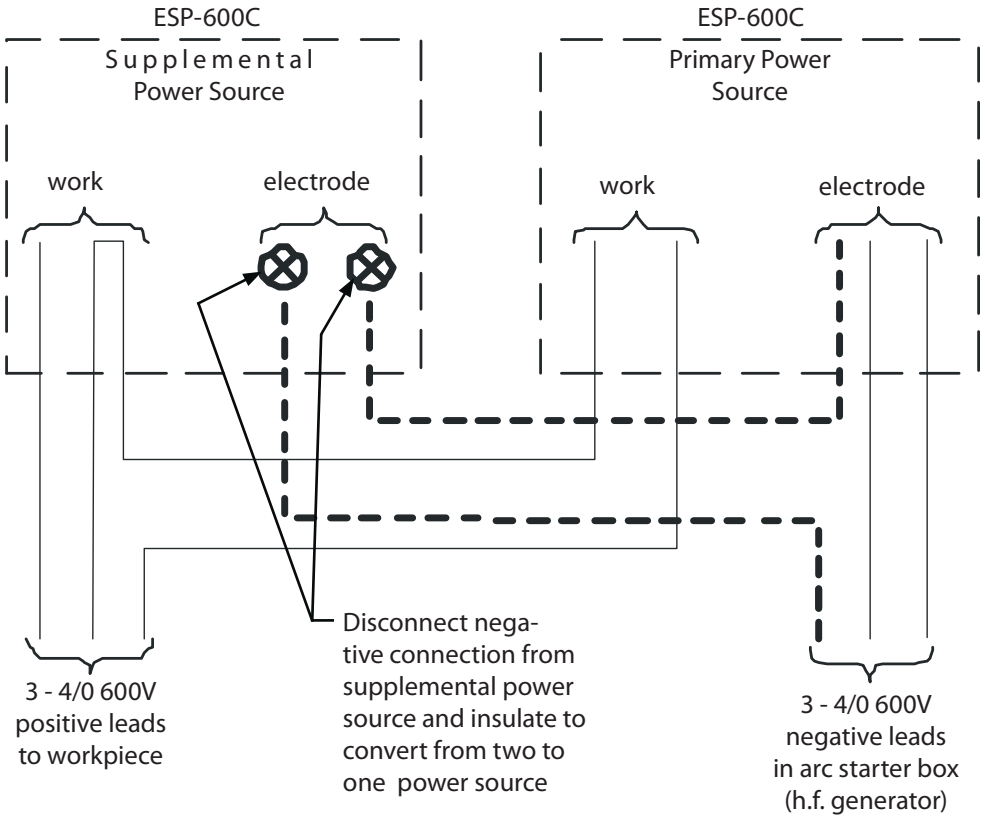
ELECTRIC SHOCK CAN KILL!

EXPOSED ELECTRICAL CONDUCTORS CAN BE HAZARDOUS!

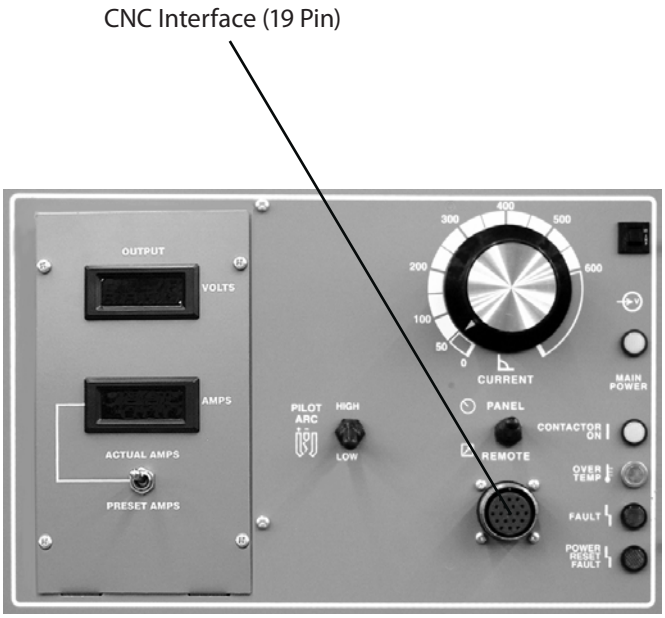
DO NOT LEAVE ELECTRICALLY "HOT" CONDUCTORS EXPOSED. WHEN DISCONNECTING THE SUPPLEMENTAL POWER SOURCE FROM THE PRIMARY, VERIFY THE CORRECT CABLES WERE DISCONNECTED. INSULATE THE DISCONNECTED ENDS.

WHEN USING ONLY ONE POWER SOURCE IN A PARALLEL CONFIGURATION, THE NEGATIVE ELECTRODE CONDUCTOR MUST BE DISCONNECTED FROM THE SUPPLEMENTAL POWER SOURCE AND THE PLUMBING BOX. FAILURE TO DO THIS WILL LEAVE THE SUPPLEMENTAL ELECTRICALLY "HOT".

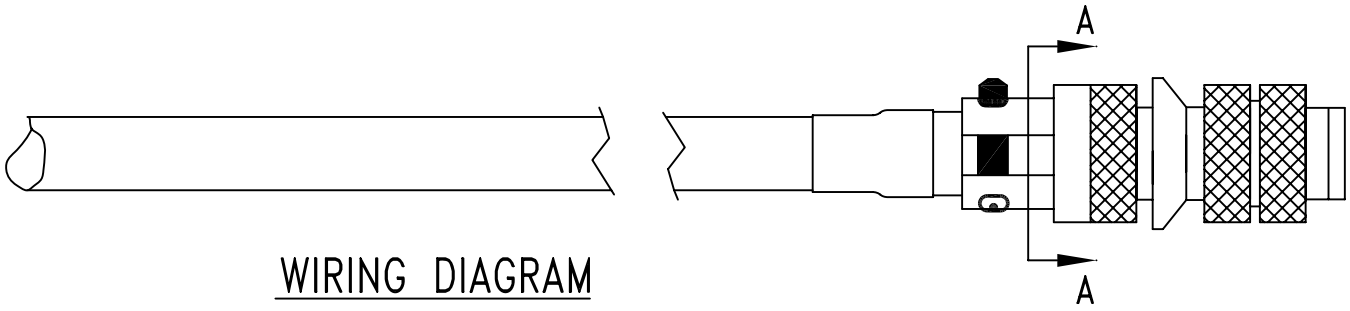
Connections for parallel installation of two ESP-600C power sources with only one power source in operation.



3.7 Interface Cable

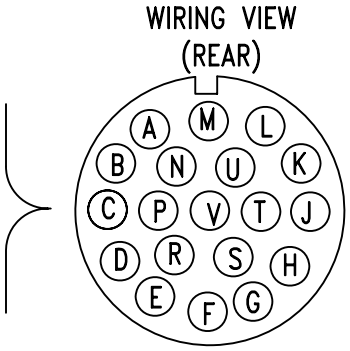


3.7.1 CNC Interface Cable with 19-Pin Mating Power Source Connector



WIRING DIAGRAM

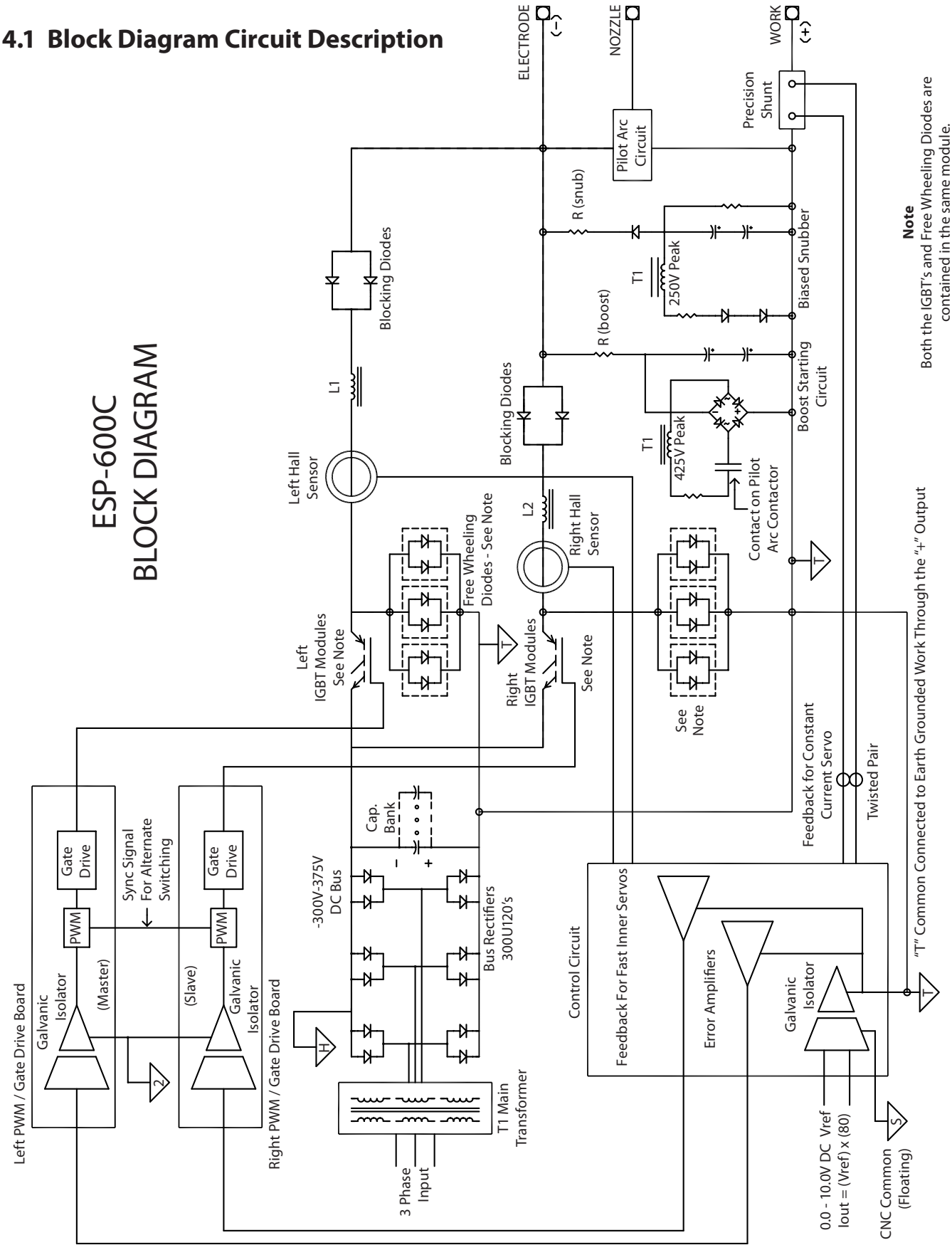
WIRE NUMBER (COLOR)	PIN
1	A
2	B
3	C
4	D
5	E
6	F
7	G
GRN/YEL	H
8	J
9	K
10	L
11	M
12	N
13	P
14	R
15	S
16	T
17	U
N/C	V



VIEW A–A

CABLE LENGTH	
PART NO.	LENGTH
57000419	3 FT.
57000420	50 FT.
57000421	75 FT.
57000422	100 FT.
57000423	125 FT.
57000424	150 FT.
57000425	175 FT.
57000426	200 FT.
0560936234	225 FT.

4.1 Block Diagram Circuit Description



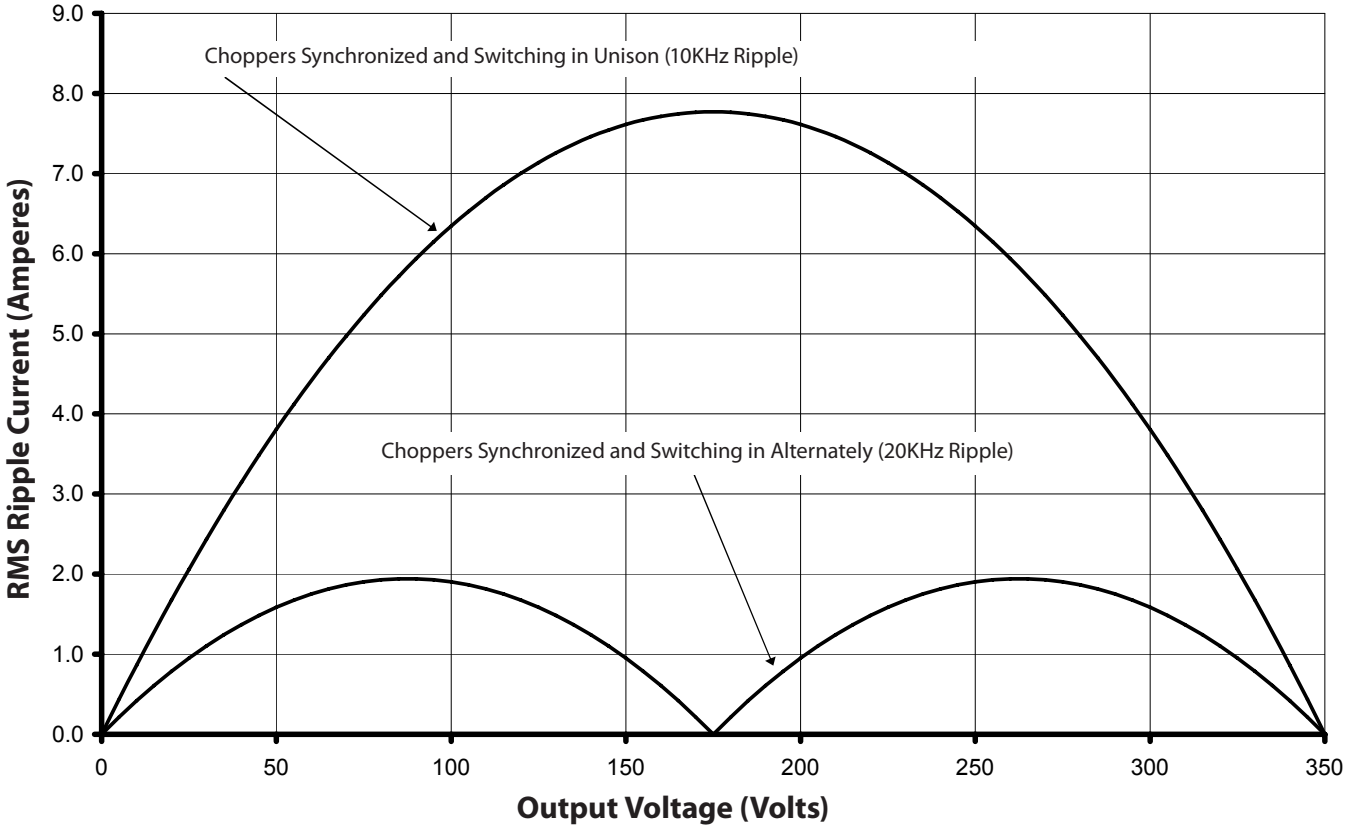
4.1 Block Diagram Circuit Description (con't.)

The power circuit utilized in the ESP-600C is commonly referred to as a Buck Converter or a Chopper. High speed electronic switches turn on and off several thousand times per second providing pulses of power to the output. A filter circuit, consisting primarily of an inductor (sometimes called a choke), converts the pulses to a relatively constant DC (Direct Current) output.

Although the filter inductor removes most of the fluctuations from the "chopped" output of the electronic switches, some small fluctuations of output, called ripple, remain. The ESP-600C utilizes a patented power circuit combining the output of two choppers, each providing approximately half the total output, in a manner that reduces ripple. The choppers are synchronized so that when the ripple from the first chopper is increasing output, the second chopper is decreasing output. The result is the ripple from each chopper partially cancels the ripple from the other. The result is ultra low ripple with a very smooth and stable output. Low ripple is highly desirable because torch consumable life is often improved with low ripple.

The graph below shows the effect of ESAB's patented ripple reduction using two choppers synchronized and switching alternately. Compared to two choppers switching in unison, the alternate switching typically reduces ripple a factor of 4 to 10.

ESP-600C 10/20 KHz Output RMS Ripple Current Versus Output Voltage



4.1 Block Diagram Circuit Description (con't.)

The ESP-600C Block Diagram (after Subsection 6.4.4) shows the main functional elements of the power source. T1, the Main Transformer, provides isolation from the primary power line as well as the proper voltage for the *375V DC Bus. The Bus Rectifiers convert the three phase output of T1 to the *375V bus voltage. A capacitor bank provides filtering and energy storage that supplies power to the high speed electronic switches. The switches are IGBT's (Insulated Gate Bipolar Transistors). The *375V bus provides power for both the Left (Master) Chopper and the Right (Slave) Chopper.

Each chopper contains IGBT's, Free Wheeling Diodes, a Hall Sensor, a Filter Inductor, and Blocking Diodes. The IGBT's are the electronic switches that, in the ESP-600C, turn on and off 10,000 times per second. They provide the pulses of power filtered by the inductor. The Free Wheeling Diodes provide the path for current to flow when the IGBT's are off. The Hall Sensor is a current transducer that monitors the output current and provides the feedback signal for the control circuit.

The Blocking Diodes provide two functions. First, they prevent the 425V DC from the Boost Starting Circuit from feeding back to the IGBT's and the *375V Bus. Second, they provide isolation of the two choppers from one another. This permits independent operation of each chopper without the other chopper functioning.

The Control Circuit contains regulating servos for both choppers. It also contains a third servo that monitors the total output current signal fed back from the Precision Shunt. This third servo adjusts the two chopper servos to maintain an accurately controlled output current commanded by the Vref signal.

The Vref circuitry is galvanically isolated from the rest of the power source. The isolation prevents problems that can arise from "ground" loops.

Each chopper, the Left Master, and the Right Slave, contain their own PWM / Gate Drive PC Boards mounted next to the IGBT's. This circuitry provides the on / off PWM (Pulse Width Modulation) signals to drive the IGBT's. The Left (Master) PWM provides a synchronized clock signal to its own Gate Drive circuitry as well as to the Right (Slave) Gate Drive circuitry. It is through this synchronized signal that the IGBT's from the two sides switch alternately reducing output ripple.

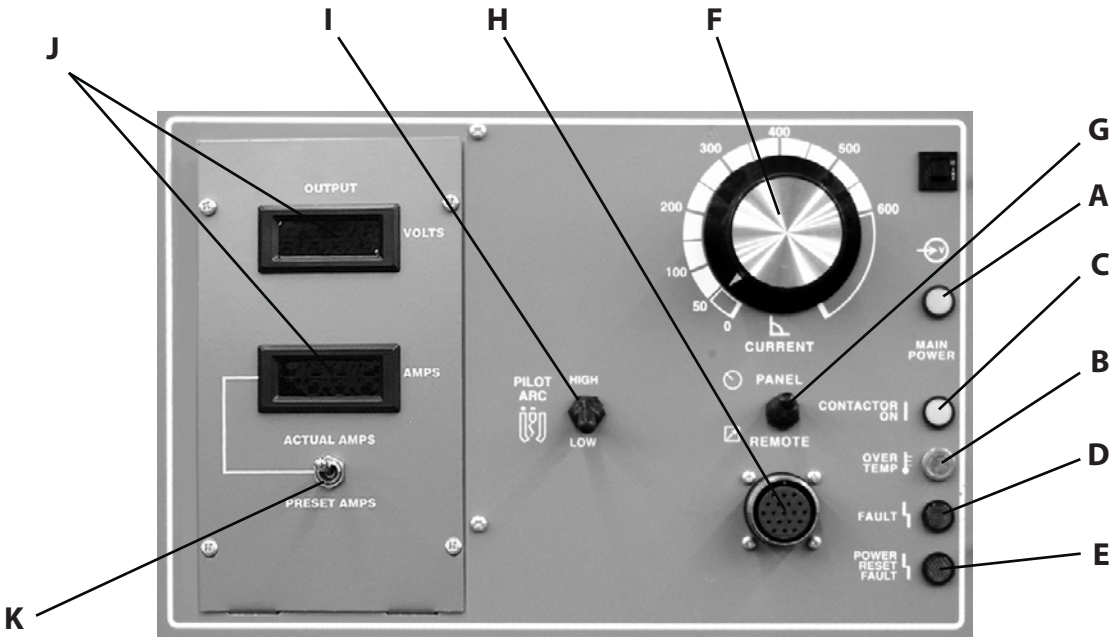
The ESP-600C contains a Boost Supply for providing approximately 425V DC for arc starting. After the cutting arc is established, the Boost Supply is turned off with a contact on the Pilot Arc Contactor (K4).

A Biased Snubber reduces the voltage transients created during cutting arc termination. It also reduces the transient voltages from a parallel power source thus preventing damage to the power source.

The Pilot Arc Circuit consists of the necessary components for establishing a pilot arc. This circuit disengages when the cutting arc is established.

* The Bus voltage for the 400V, 50Hz model is approximately 320V DC.

4.2 Control Panel



A - Main Power

Indicator illuminates when input power is applied to the power source.

B - Contactor On

Indicator illuminates when the main contactor is energized.

C - Over Temp

Indicator illuminates when power source has overheated.

D - Fault

Indicator illuminates when there are abnormalities in the cutting process or when the input line voltage falls outside of the required nominal value by ±10%.

E - Power Reset Fault

Indicator illuminates when a serious fault is detected. Input power must be disconnected for at least 5 seconds and then reapplied.

F - Current Dial (Potentiometer)

ESP-600C dial shown. ESP-600C has a range of 50 to 600 A. Used only in panel mode.

4.2 Control Panel (con't.)

G - Panel Remote Switch

Controls the location of current control.

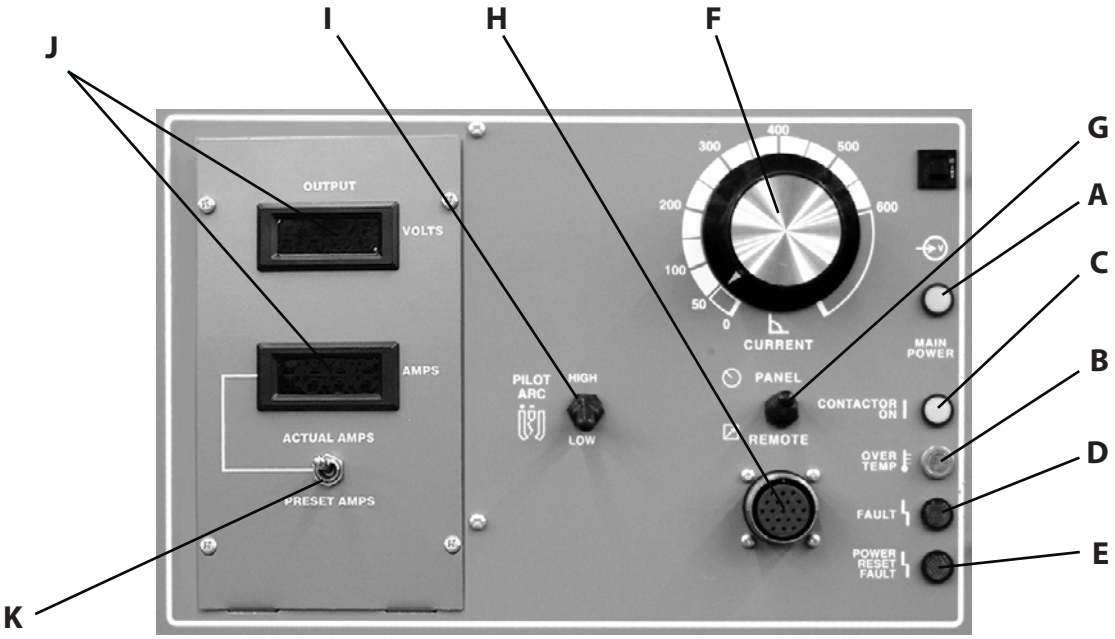
- Place in the PANEL position for control using the current potentiometer.
- Place in REMOTE position for control from an external signal (CNC).

H and L - Remote Connections

H - 19 pin plug for connecting the power source to CNC (remote control)

I - Pilot Arc HIGH / LOW Switch

Used to select amount of pilot arc current desired. As a general rule, for 100 amperes and below, a setting of LOW is used. This can vary depending on gas, material and torch used. High/Low settings are specified in cutting data included in the torch manual.



4.2 Control Panel (con't.)

J - Meters

Displays voltage and amperage when cutting. The ammeter can be activated when not cutting to view an estimation of the cutting current before cutting begins.

K - Actual/Preset Switch

The ACTUAL AMPS / PRESET AMPS spring return toggle switch, S42, defaults to the ACTUAL (UP) position. In the ACTUAL position, the OUTPUT AMMETER displays the output cutting current.

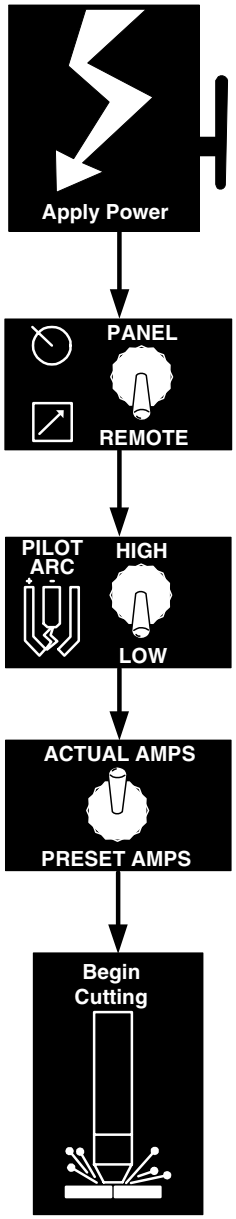
In the PRESET (DOWN) position, the OUTPUT AMMETER displays an estimate of the output cutting current by monitoring the 0.00 to 10.00 VDC cutting current reference signal (Vref). The reference signal comes from the CURRENT POTENTIOMETER with the PANEL/REMOTE switch in the PANEL (UP) position and from a remote reference signal (J1-D / J1-C(+)) with the PANEL/REMOTE switch in the REMOTE (DOWN) position. The value displayed on the OUTPUT AMMETER will be the value of Vref (volts) times 80. For example, a reference signal of 5.00V will result in a preset reading of 400 Amps on the meter.

The switch may be changed to and from the ACTUAL and PRESET positions at any time without affecting the cutting process.

WARNING

DANGEROUS VOLTAGES AND CURRENT!
ELECTRIC SHOCK CAN KILL!
BEFORE OPERATION, ENSURE INSTALLATION AND GROUNDING PROCEDURES HAVE BEEN FOLLOWED. DO NOT OPERATE THIS EQUIPMENT WITH COVERS REMOVED.

4.3 Sequence of Operation



1. Apply power by closing the line (wall) switch. (The ESP-600C does not have an on / off switch). The main power light will illuminate and the fault light will flash and then go out.
2. Select the Panel / Remote setting.
3. Set pilot arc High / Low switch. (Refer to cutting data in the torch manual.)
4. If using panel mode, view preset amps with the ACTUAL / PRESET AMPS switch. Adjust current until the approximate desired value is shown on the ammeter. If using the remote mode, placing the actual Amps / Preset Amps switch in the Preset Amps position provides the initial output current commanded by the remote control.
5. Begin plasma cutting operation. This may include manually setting up other options, depending on the total plasma package.
6. If using panel mode, after cutting has begun, adjust current to desired amount.
7. If cutting fails to initiate, check for fault light. If a fault light illuminates, refer to troubleshooting section.

Note:
The fault light flashes when the contactor is first turned on signifying the DC Bus powered up normally.

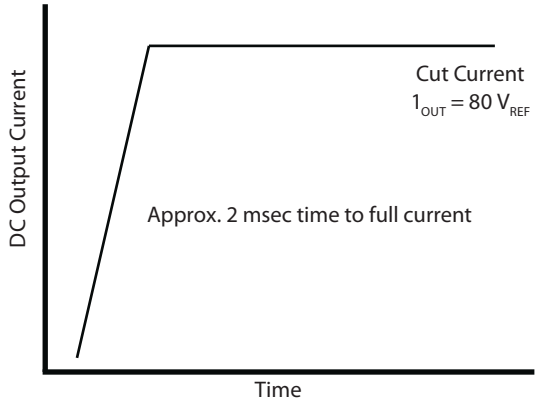
4.4 Arc Initiation Settings

The time to achieve full current can be adjusted for a soft start. This feature uses a reduced current to start and then gradually ramps up to full current. The ESP-600C is factory shipped with soft start enabled. The default settings are:

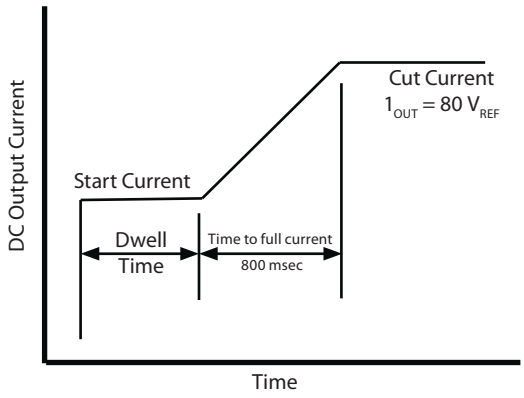
Minimum Start Current 45A
Start Current . . . . . 50% of cut current
Timing to achieve full current . . . . . 800 msec
Dwell Time . . . . . 50 msec

These timing functions can be disabled or adjusted to suit individual system requirements.

Start Current Wave Form With Soft Start OFF



Start Current Wave Form With Soft Start ON

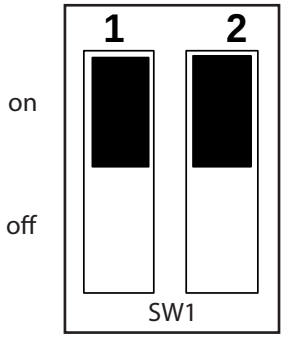


WARNING

ELECTRIC SHOCK CAN KILL!
SHUT OFF POWER AT THE LINE (WALL) DISCONNECT BEFORE REMOVING ANY COVERS OR MAKING ANY ADJUSTMENTS TO THE POWER SOURCE.

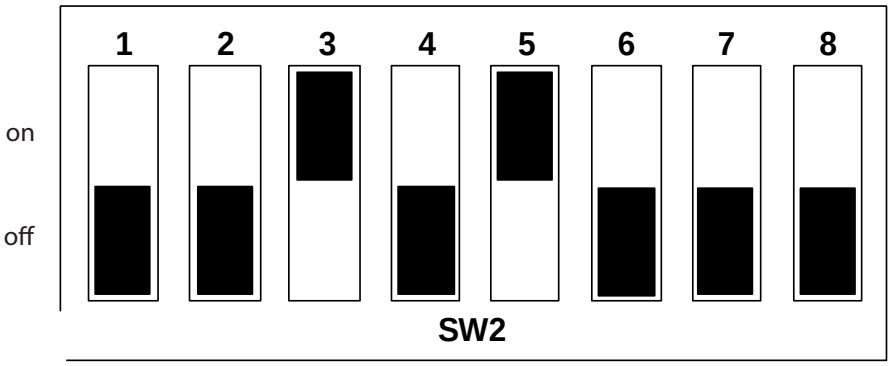
4.4.1 Enable/Disable Arc Initiation Conditions

Factory default setting shown.



1. Remove access panel on the upper-right corner of the front panel. Be sure to replace this panel after adjustments have been made.
2. Locate SW1 and PCB1 and push both rocker switches down to disable. To enable push both switches up. (If one switch is up and the other is down, arc initiation time is considered on.)

Factory default settings shown



4.4.2 Adjusting Arc Initiation Dwell Timer

Dwell Time is controlled by selections of positions 1 through 4 of SW2 on PCB1. When a switch is pushed on, its value is added to the minimum dwell time of 10 msec.

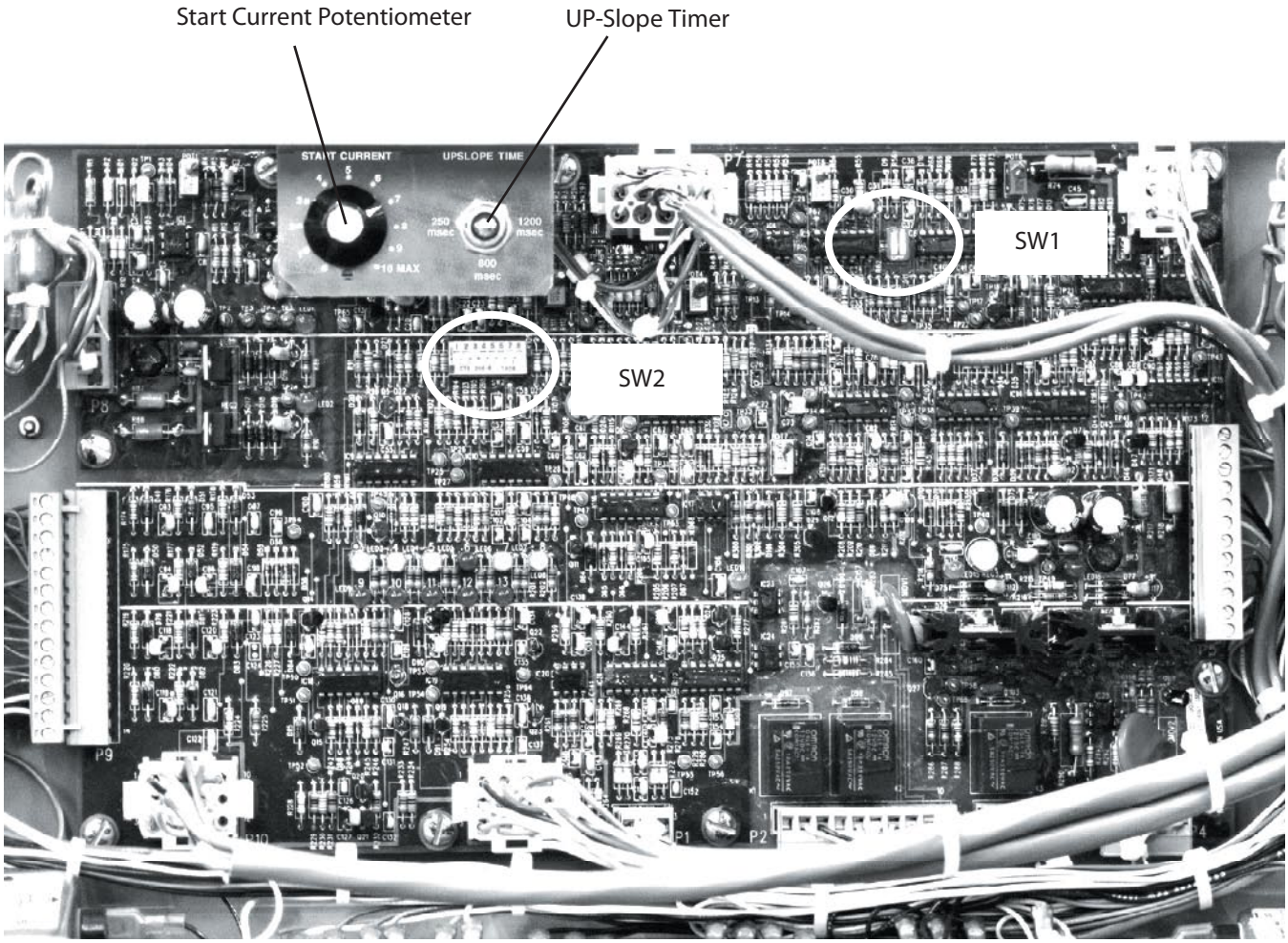
Switch #1 = 10 msec dwell time
Switch #2 = 20 msec dwell time
Switch #3 = 40 msec dwell time
Switch #4 = 80 msec dwell time
The default setting is with switch #3 on. 40 msec + 10 msec (minimum) = 50 msec

4.4.3 Adjusting the Minimum Start Current

Minimum Start Current is controlled by selection of positions 5 through 8 of SW2. When a switch is pushed on, its value is added to the factory set minimum value of 5A.

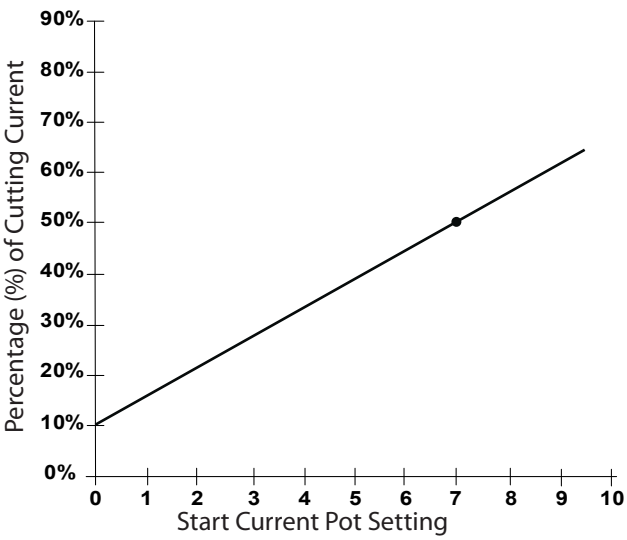
Switch #5 = 40A min. start current
Switch #6 = 20A min. start current
Switch #7 = 10A min. start current
Switch #8 = 5A min. start current
Default setting is with 5 on 40A + 5A = 45A

4.4.4 Arc Initiation Controls



4.4.5 Start Current and Up-Slope Timer

Starting Current (%) and Pot Setting Relationship

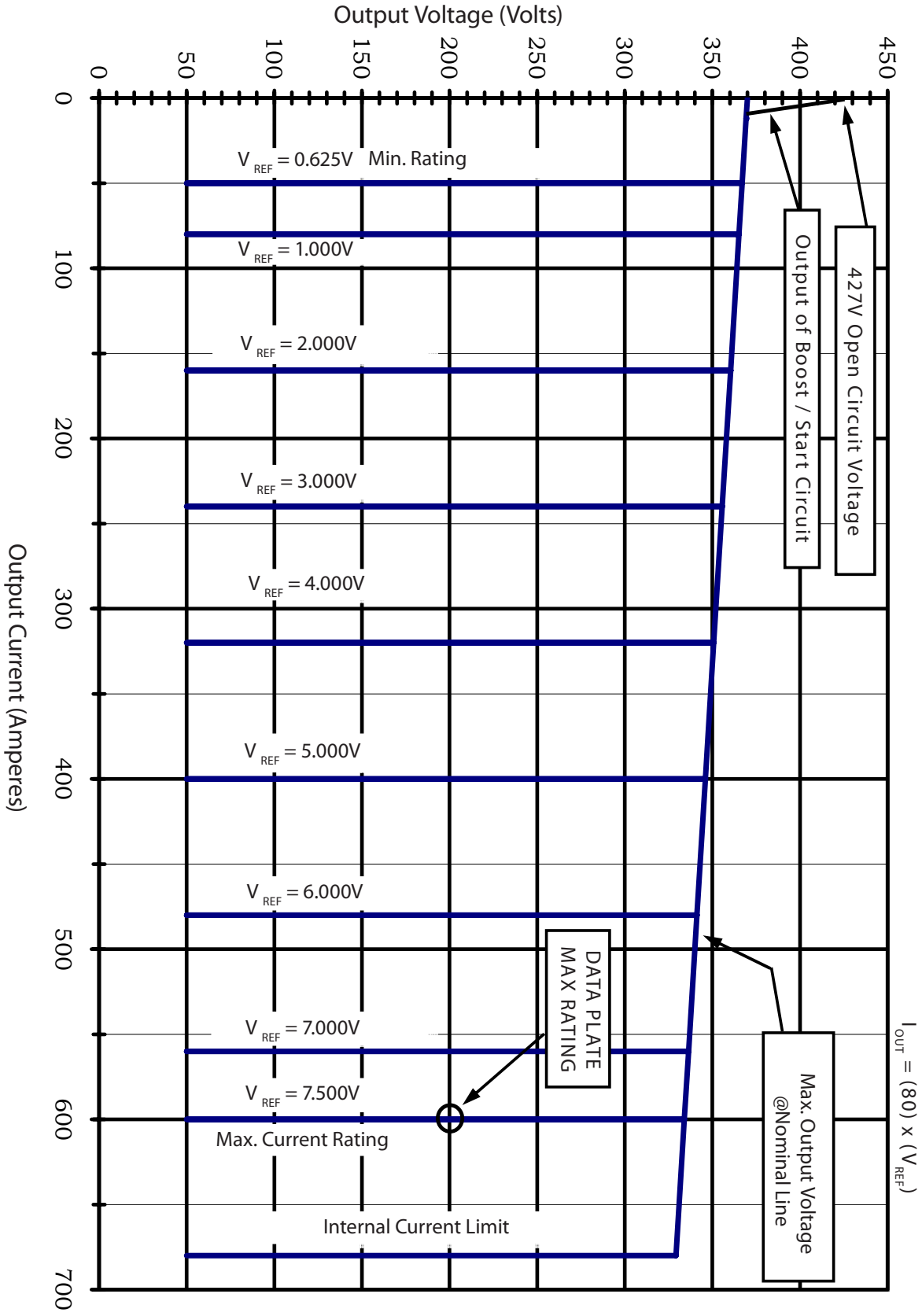


Start Current
Set using potentiometer located above and to the left of center of PCB1. Factory default setting of 7 results in a starting current that is 50% of the cutting current..

Up-Slope Timer
Three position switch located next to the start current potentiometer. Time is from start current (after dwell ends) to full current. Factory default = 800 msec.

Left position = 250 msec
Center position = 800 msec
Right Position = 1200 msec

4.5.1 ESP-600C V-I Curves for 460V and 575V, 60Hz Inputs



4.5.2 ESP-600C V-I Curves for 400V, 50/60Hz Inputs