

HT4001[®]

Start Circuit Upgrade

***Field Service Bulletin
802580 - Rev. 1***

Hypertherm
*The world leader in
plasma cutting technology*

HT4001

Start Circuit Upgrade

**Field Service Bulletin
IM-258
(P/N 802580)**

Revision 1 March, 1998

**HYPERTHERM, Inc.
P.O. Box 5010
Hanover, New Hampshire 03755-5010
Tel.: (603) 643-3441
Fax: (603) 643-5352**

**© Copyright 1998 Hypertherm, Inc.
All Rights Reserved**

**HYPERTHERM, HT, MAX and LongLife are trademarks of Hypertherm, Inc. and may be
registered in the United States and/or other countries**

Hypertherm Offices Worldwide:

Hypertherm, Inc.

Etna Road, P.O. Box 5010
Hanover, NH 03755 USA
Tel.: (603) 643-3441 (Main Office)
Fax: (603) 643-5352 (All Departments)
Tel.: (800) 643-9878 (Technical Service – toll-free in USA and Canada)
Tel.: (800) 737-2978 (Customer Service – toll-free in USA and Canada)
email: info@hypertherm.com (General Information)
email: service@hypertherm.com (Technical/Customer Services)

Hypertherm Plasmatechnik GmbH

Technologiepark Hanau
Rodenbacher Chaussee 6
D-63457 Hanau-Wolfgang, Germany
Tel.: 49 6181 58 2100
Fax: 49 6181 58 2134

Hypertherm (S) Pte Ltd

No. 19 Kaki Bukit Road 2
K.B. Warehouse Complex
Singapore 417847
Tel.: 65 841 2489
Fax: 65 841 2490

Hypertherm UK Ltd

9 Berkeley Court, Manor Park
Runcorn, Cheshire, England WA7 1TQ
Tel.: 44 1928 579 074
Fax: 44 1928 579 604

France

15 Impasse des Rosiers
95610 Eragny, France
Tel.: 33 1 30 37 15 28
Fax: 33 1 30 37 15 79

Hypertherm S.r.L.

Via Torino 2
20123 Milan, Italy
Tel.: 39 02 725 46 312 (Customer Service)
Tel.: 39 02 725 46 314 (Technical Service)
Fax: 39 02 725 46 400 (All Departments)

Hypertherm B.V.

Burg, Haverkampstraat 13
7091 CN Dinxperlo, The Netherlands
Tel.: 31 315 655 866 (Customer Service)
Fax: 31 315 655 886

European Technical Support Organization (ETSO)

Edisonstraat 12
3281 NC Numansdorp, The Netherlands
Tel.: 00 800 4973 7843 (00 800 Hypertherm) – (toll-free Technical Service)
Tel.: 31 186 659494
Fax: 31 186 659495

Japan

Shinjuku Park Tower
30th Floor
3-7-1 Nishi-Shinjuku
Shinjuku-ku, Tokyo
163-1030, Japan
Tel.: 81 03 5326 3142
Fax: 81 03 5326 3001

HT4001 Start Circuit Upgrade

In this bulletin:

Introduction	2
Purpose	2
General	2
Customer Required Tools	3
HT4001 Start Circuit Upgrade Kit	3
Installation	3
I. Installing High Frequency Panel into RHF Console	4
Removing Old High Frequency Panel	4
Installing New High Frequency Panel	5
II. Installing Start Circuit Subassembly in HT4001 Power Supply	6
III. Removing Old Pilot Arc Lead from I/O Panel and Connecting to Pilot Arc Relay	8
IV. Attaching Loose Wires from Start Circuit Subassembly to HT4001 Power Supply	9
V. Replacing 46" Off-Valve Hose Assembly with a 60" Off-Valve Hose Assembly	11
VI. Replacing Analog PCB and Control PCB	12
Operational Check	14

HT4001 Start Circuit Upgrade

INTRODUCTION



WARNING



**INSTALLATION MUST BE PERFORMED ONLY BY QUALIFIED
HYPERTHERM ELECTRONICS TECHNICIANS FAMILIAR WITH
ELECTRO-MECHANICAL ASSEMBLY AND TECHNIQUES!**

Purpose

This field service bulletin will enable a qualified technician to upgrade the HT4001 high frequency start circuit. With the new start circuit in place, you will experience improved torch starting performance in all conditions including cutting painted plate and underwater cutting.

General

The old start circuit design limited the amount of energy to the nozzle. Because of this limited energy, burning through painted surfaces caused starting problems with some systems.

The new start circuit parallels a passive surge injection circuit and an active pilot arc control circuit. Under optimal conditions, only the passive surge injection circuit activates. If the arc does not transfer after the initial surge injection, the pilot arc control circuit is then activated.

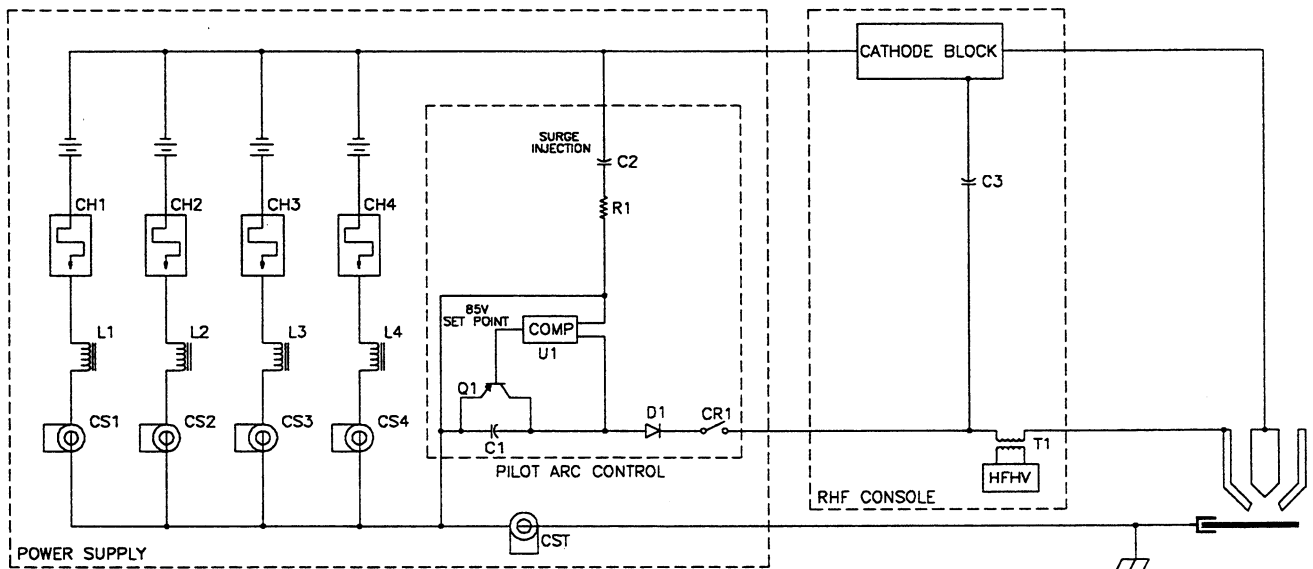


Figure 1 HT4001 Block Diagram of New High Frequency Start Circuit

HT4001 Start Circuit Upgrade

Customer Required Tools

Phillips head screwdriver
flat head screwdriver
7/16" open-end wrenches
nut driver kit
#43 and #29 drill bits
8-32 tap and handle
center punch
wire strippers
drop cloth

HT4001 Start Circuit Upgrade Kit (128066):

Part No.	Description	Qty.
128066	HT4001 Start Circuit Upgrade Kit	
129088	HT4001 Start Circuit Assembly Retrofit	1
129041	HF Panel SA:4001 Start Circuit	1
024317	Hose Assy: 60"	1
041282	PCB Assy:4001 4-Channel Analog	1
041368	PCB Assy:4001 μ p with 081019 Rev.L (or later)	1
802690	Drill Template, HT4001 Start Circuit Chassis	1
075073	M/S: 8-32 x 1/2 PH Rnd	8
008197	Pin extraction tool	1
074134	Terminal:16-14 Female Tee (Splice)	4
802580	FSB: HT4001 Start Circuit Upgrade	1
075161	Kepnut: 1/4-20	4

INSTALLATION

Installation involves 6 steps:

- I. Installing the high frequency panel into the RHF console.
- II. Installing the start circuit subassembly in the HT4001 power supply.
- III. Removing the old pilot arc lead from the I/O panel and connecting to the pilot arc relay.
- IV. Attaching loose wires from start circuit subassembly to the HT4001 power supply.
- V. Replacing the 46" off-valve hose assembly with a 60" off-valve hose assembly.
- VI. Replacing the analog PCB and control PCB.



WARNING



SHOCK HAZARD: Always turn off all power to HT4001 power supply before removing or opening any covers. Set line voltage disconnect box to OFF. Lock out and tag out switch.

HT4001 Start Circuit Upgrade

I. INSTALLING HIGH FREQUENCY PANEL (129041) INTO RHF CONSOLE.

Removing Old High Frequency Panel - Fig. 2

1. Disconnect the 2X1 cable from the 2X1 connector.
2. Open the door to the RHF console to expose the high frequency components. See Fig. 2.
Note: The old high frequency panel may or may not look exactly like the one depicted in Fig. 2.
3. Remove plastic cover for easy access to all electrical connections.
4. Remove the red wires that are attached to the high frequency panel:
 - a. Disconnect wires #12 and #15 from the line filter.
 - b. Disconnect wires #9 and #11 from the pilot arc relay.
 - c. Disconnect wires #6 and #3 from the cap relay (if your high frequency panel does not have a cap relay, skip this step).
5. Disconnect wire #45 from upper capacitor.
6. Disconnect torch pilot arc cable at high frequency coil point #33.
7. Disconnect all PE wires.
8. Disconnect old power supply pilot arc cable from terminal strip.
9. Remove 4 nuts securing high frequency panel to enclosure. Save the nuts.
10. Remove old high frequency panel.

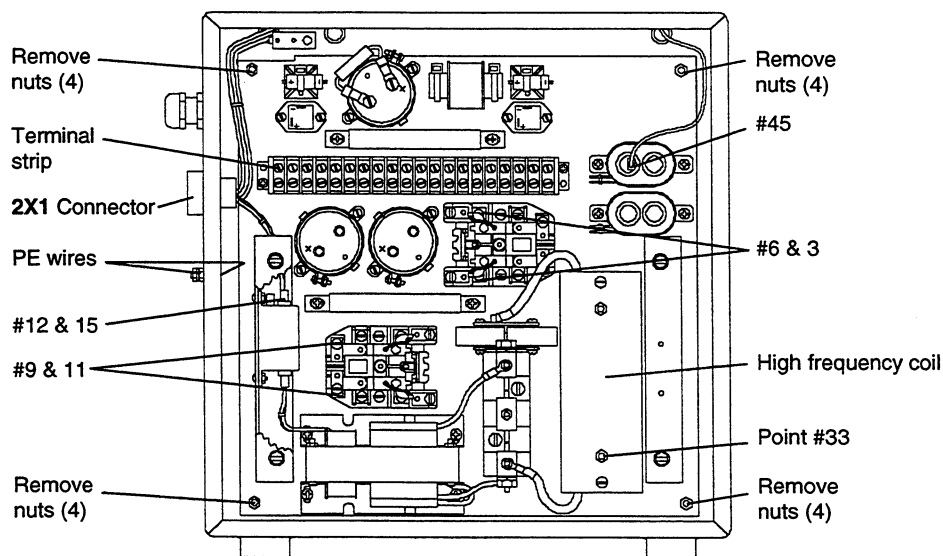


Figure 2 Old High Frequency Panel (typical)

HT4001 Start Circuit Upgrade

Installing New High Frequency Panel - Fig. 3

1. Using the pin extractor, completely remove wires #9, 11, 6 and 3 from the 2X1 connector. Do not remove wires #12 and #15.
2. Install the new high frequency panel 129041 and secure with the 4 nuts that were removed in step 9, page 4.
3. Connect all the green and yellow PE wires to the stud on the console.
4. Connect wires #12 and #15 to the line filter.
5. Connect wire #45 to the upper capacitor.
6. Remove the plastic cover and connect the old pilot arc lead from the power supply to the high frequency coil at point 32.
Note: This lead is now referred to as the "Nozzle Lead" in all documentation.
7. Connect the pilot arc lead from the torch to the high frequency coil at point 33.
8. Replace the plastic cover.
9. Reconnect the 2X1 cable to the 2X1 connector.

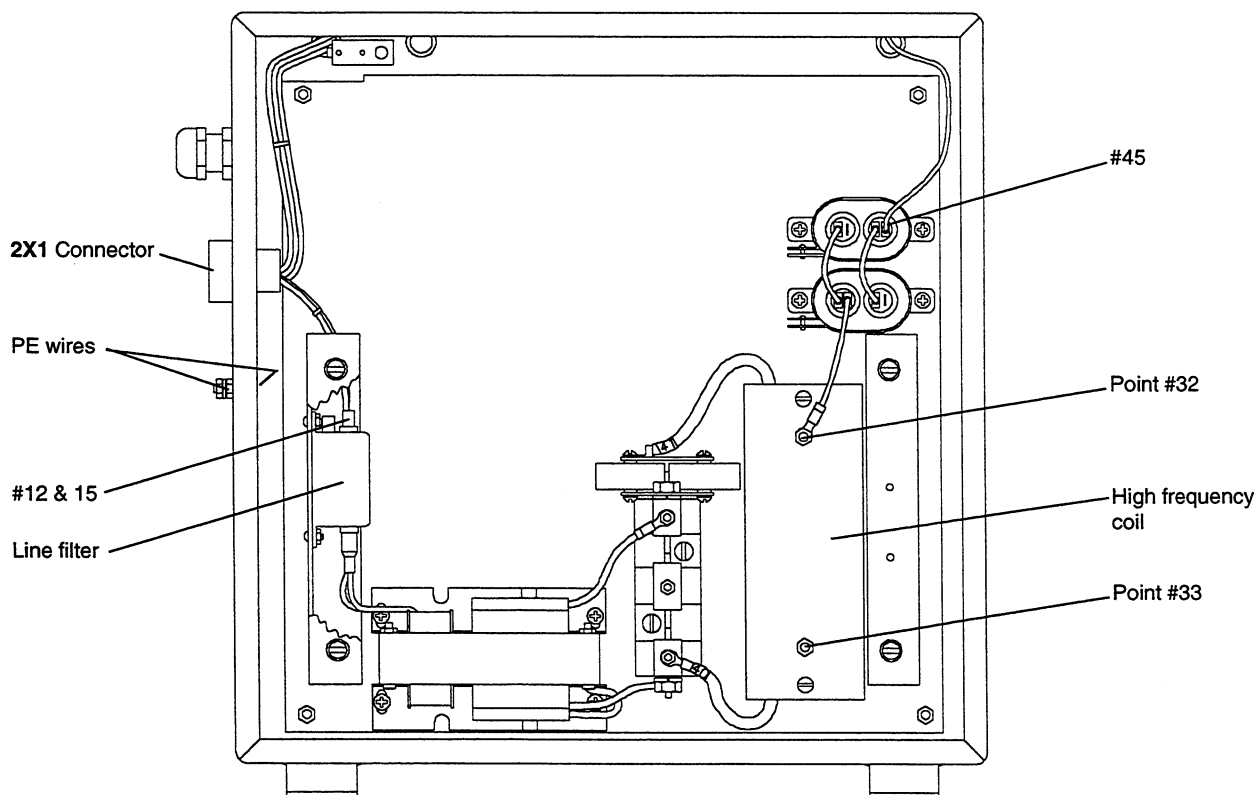


Figure 3 New High Frequency Panel (129041)

HT4001 Start Circuit Upgrade

II. INSTALLING START CIRCUIT SUBASSEMBLY IN HT4001 POWER SUPPLY.

1. Remove the side covers and front cover to the power supply.
2. Place a drop cloth over any exposed components on the floor of the power supply.
3. Find the drill template (802690) on the D-sized paper and follow the instructions on the print. The template holes will line up approximately as indicated by the dotted lines in Fig. 4 below.
Note: Alignment of the template is critical to the success of the installation of the start circuit subassembly. Take extra care when punching the centers of the 4 holes.
4. Punch the centers of the 4 holes with the center punch.

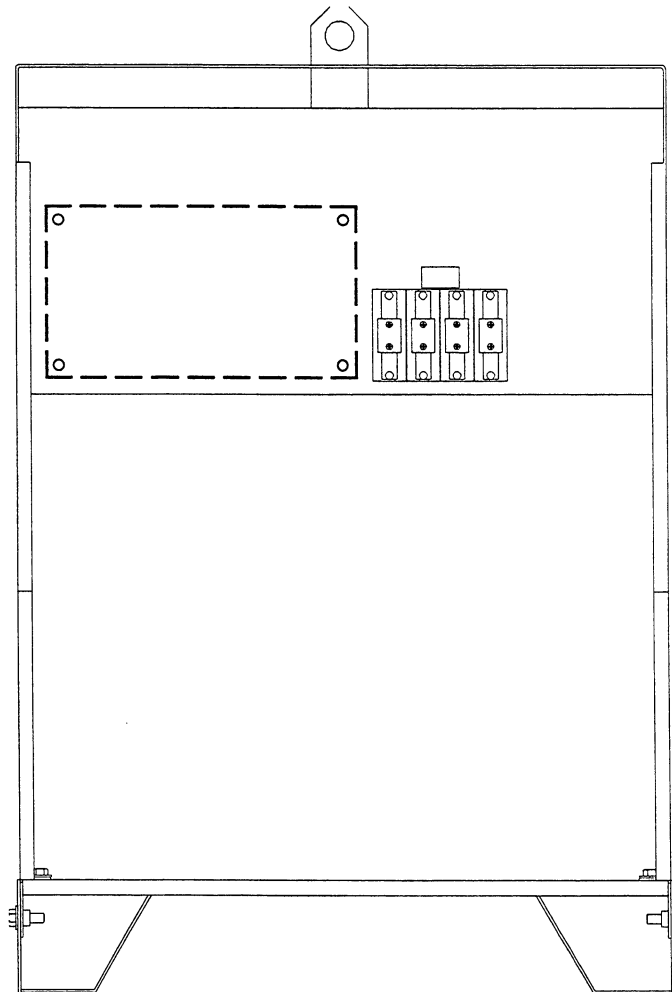


Figure 4 HT4001 Mounting Location of Start Circuit Subassembly

HT4001 Start Circuit Upgrade

5. Drill holes in four locations first using a #43 (.089"/2.25 mm) drill bit and then with a #29 (.136"/3.45 mm) drill bit.
6. Tap each hole with the 8-32 tap.
7. Mount the HT4001 Start Circuit Assembly 129029 and secure with four 8-32 screws. See Fig. 5.
8. Remove the drop cloth taking care to contain all metal debris that may have fallen onto cloth from drilling step.
9. Sweep out the floor of the power supply to remove any excess metal debris. Do not blow out the floor of the power supply with compressed air.

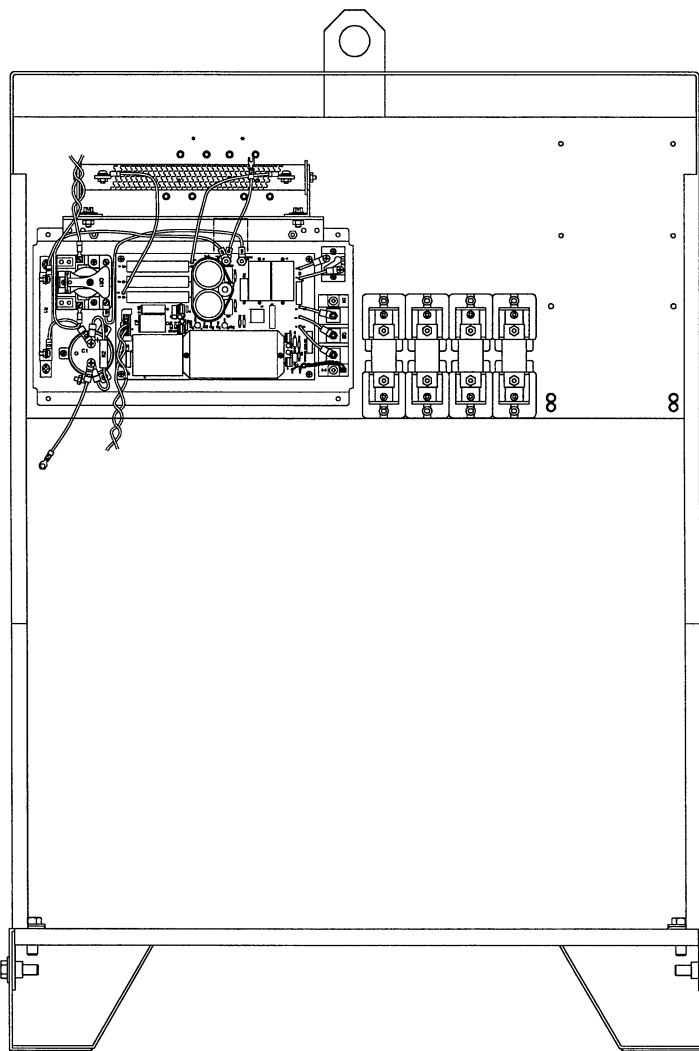


Figure 5 HT4001 with Start Circuit II Subassembly Mounted

HT4001 Start Circuit Upgrade

III REMOVING OLD PILOT ARC LEAD FROM I/O PANEL AND CONNECTING TO PILOT ARC RELAY

1. Remove the old pilot arc lead from TB1 on the I/O panel, and disconnect the coaxial shield from the chassis.
 2. Cut off the coaxial shield and protect any exposed wires of the shield.
 3. Connect the pilot arc lead to the pilot arc relay (CR1) on the start circuit subassembly as shown in Fig. 6.
- Note: This lead is now referred to as the "Nozzle Lead" in all documentation.

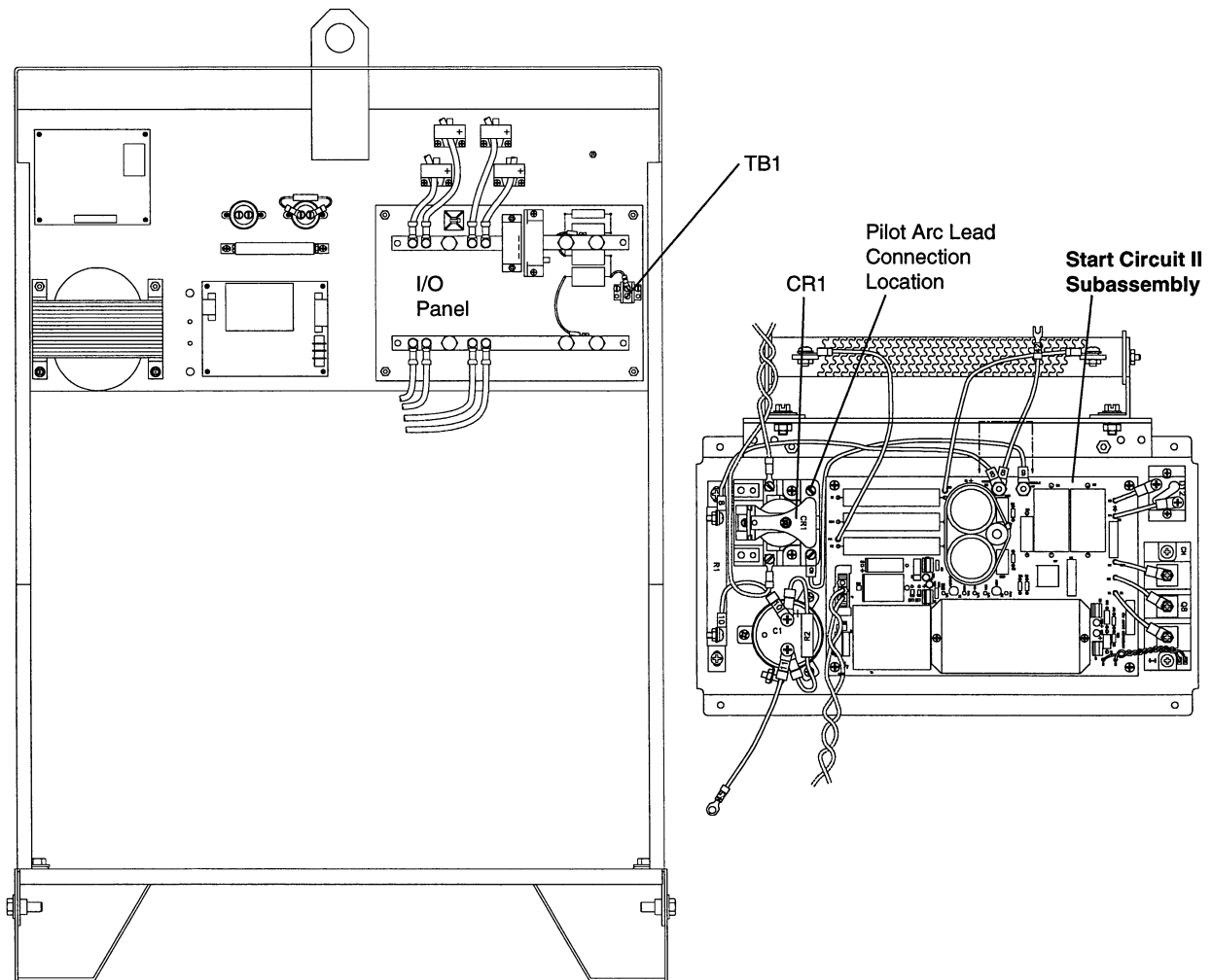


Figure 6 Moving Pilot Arc Lead from I/O Panel to Start Circuit PCB

HT4001 Start Circuit Upgrade

IV. ATTACHING LOOSE WIRES FROM START CIRCUIT SUBASSEMBLY TO HT4001 POWER SUPPLY.

1. Attach wire from location H8 on the start circuit subassembly to TB1 on the I/O panel subassembly.
2. Attach wire from the large capacitor on the start circuit subassembly to the **NEGATIVE** bus bar on the I/O panel.

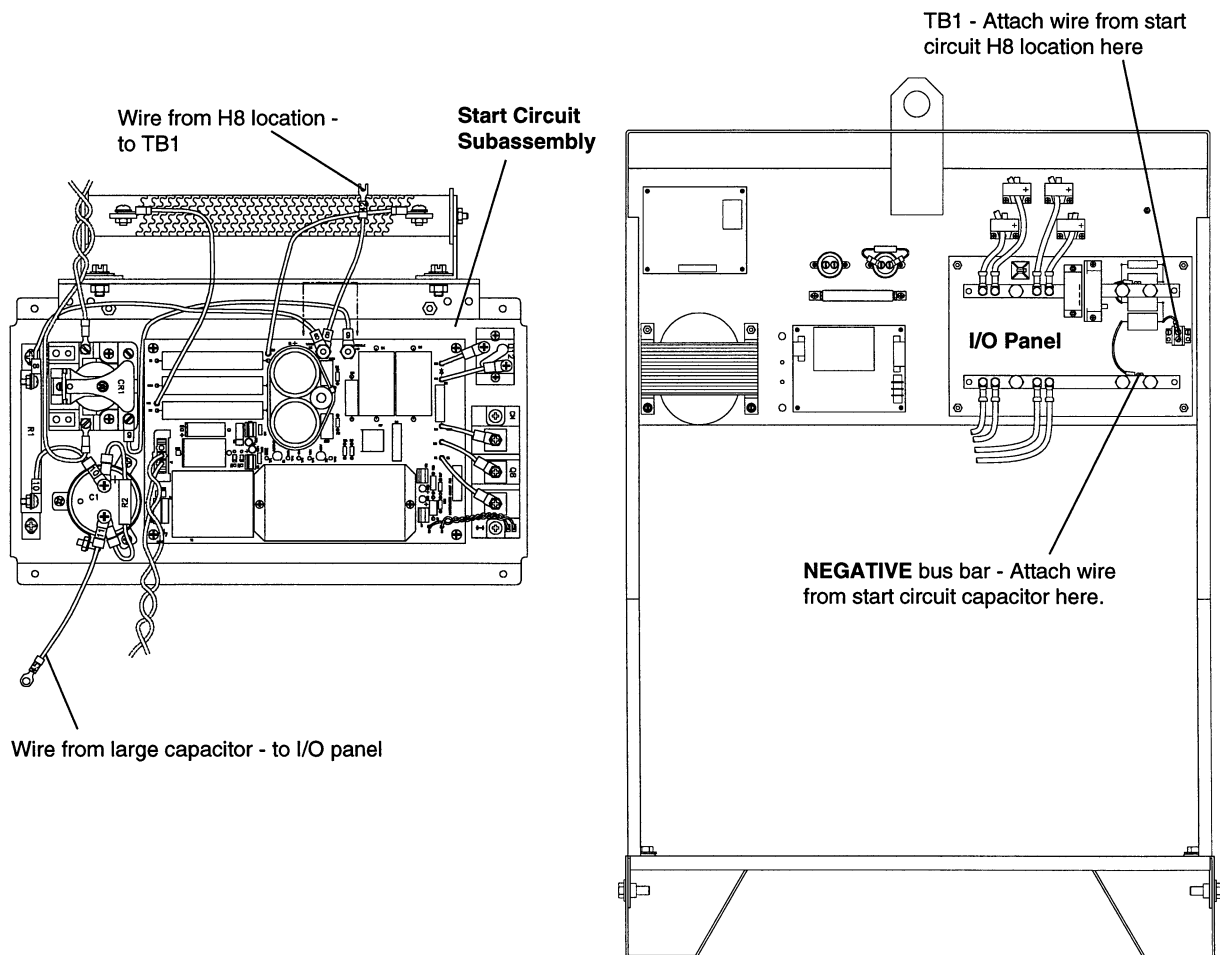


Figure 7 Attaching Loose Wires from Start Circuit Subassembly to HT4001 Power Supply 1 of 2

HT4001 Start Circuit Upgrade

3. Connect the twisted pair of wires coming off of the start circuit PCB to the power distribution PCB by following these steps:
 - 3.1. Find wires going to pins 21 and 22 in PL1.2 of power distribution PCB. PL1.2 is plugged into REC2 on the power distribution PCB - see Fig. 8.
 - 3.2. Find splices 074134 and attach one splice to wire 21 and one splice to wire 22. Squeeze tightly with pliers to ensure a secure connection.
 - 3.3. Route twisted wire pair from the start circuit PCB and attach terminals to splices - red wire to pin 21 wire and red with black wire to pin 22 wire.
4. Connect the twisted pair of wires coming off of CR1 on the start circuit subassembly to the relay PCB by following these steps:
 - 4.1. Find PL4.4 on the relay PCB and extract pins 11 and 12 using the extraction tool.
 - 4.2. Cut wires that went to pins 11 and 12 and protect any exposed wire after cutting.
 - 4.3. Insert twisted pair from CR1 into sockets 11 and 12 of PL4.4 - the red wire into socket 11 and the red with black wire into socket 12.

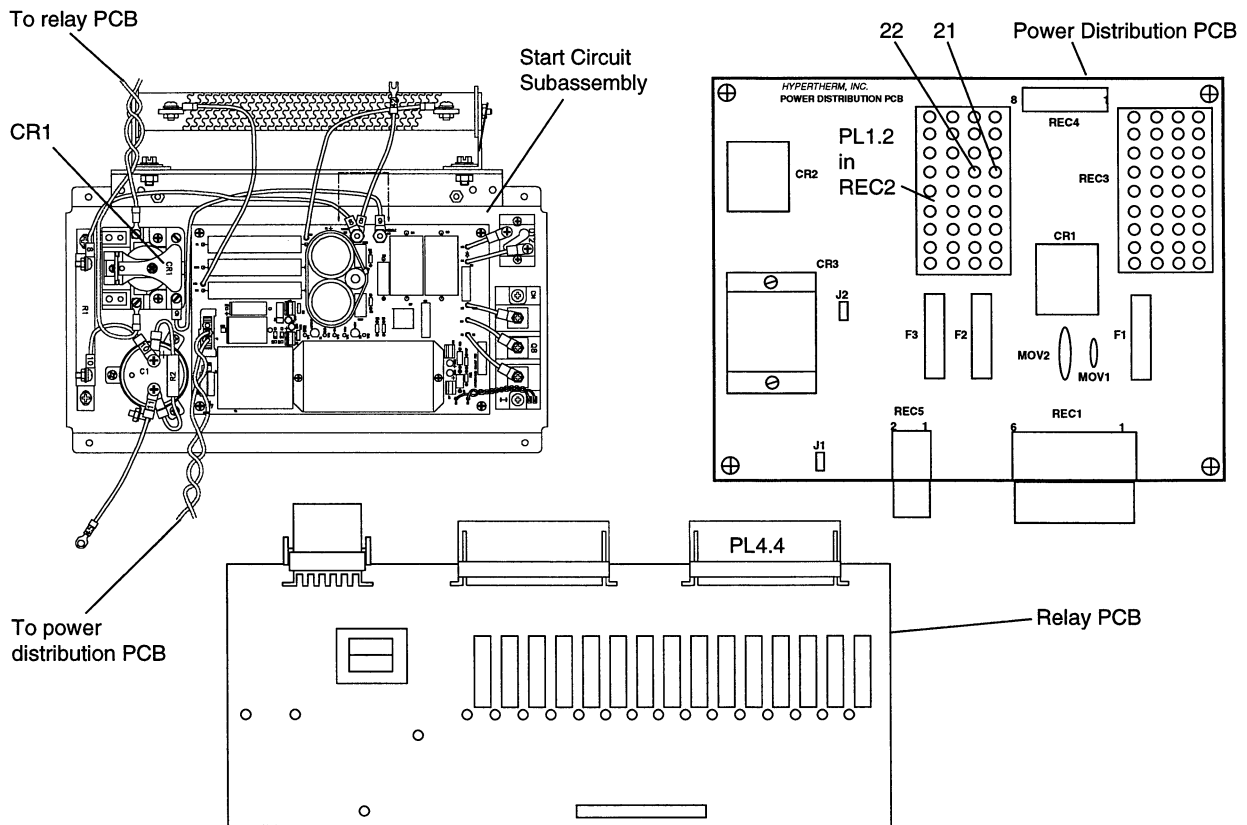


Figure 8 Attaching Loose Wires from Start Circuit Subassembly to HT4001 Power Supply 2 of 2

HT4001 Start Circuit Upgrade

V. REPLACING THE 46" OFF-VALVE HOSE ASSEMBLY WITH A 60" OFF-VALVE HOSE ASSEMBLY.

Note: If you already have Motor Valve Console to Torch Lead Assembly 029940 with 024317 60" off valve hose assembly, skip this step.

1. Using 7/16" wrenches, remove the 46" off valve hose assembly from the off valve.
2. Unscrew the torch insulating sleeve from the torch and slide it back on the torch leads to expose the torch connections.
3. Remove the 46" off valve hose assembly from the torch.
4. Using 7/16" wrenches, attach the new 60" off valve hose assembly 024317 at the torch end.
5. Slide the torch sleeve back onto the torch and screw together.
6. Attach the other end of the 60" off valve hose assembly to the off valve.

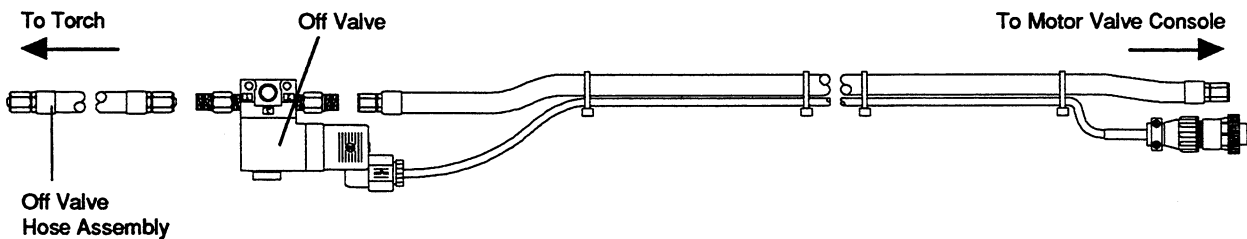


Figure 9 Motor Valve Console to Torch Lead Assembly 029940

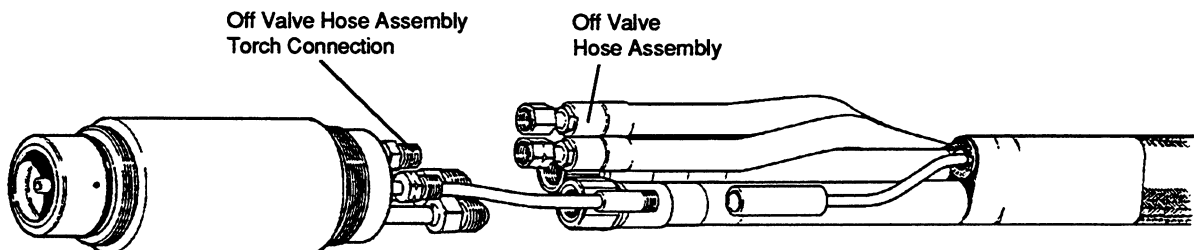


Figure 10 Off Valve Hose Assembly to Torch Connection

HT4001 Start Circuit Upgrade

VI REPLACING THE ANALOG PCB AND CONTROL PCB



WARNING



SHOCK HAZARD: Always turn off all power to HT4001 power supply before removing front covers. Set line voltage disconnect box to OFF. Lock out and tag out switch.

1. Disconnect power from HT4001 system - see warning above.
2. Remove front panel of power supply.
3. Find Analog PCB (PCB3) and Control PCB (PCB2). See Figure 11.

Caution: Before replacing old Control and Analog PCBs with new Control and Analog PCBs, ground yourself to the power supply chassis to reduce the chance of electrical static discharge.

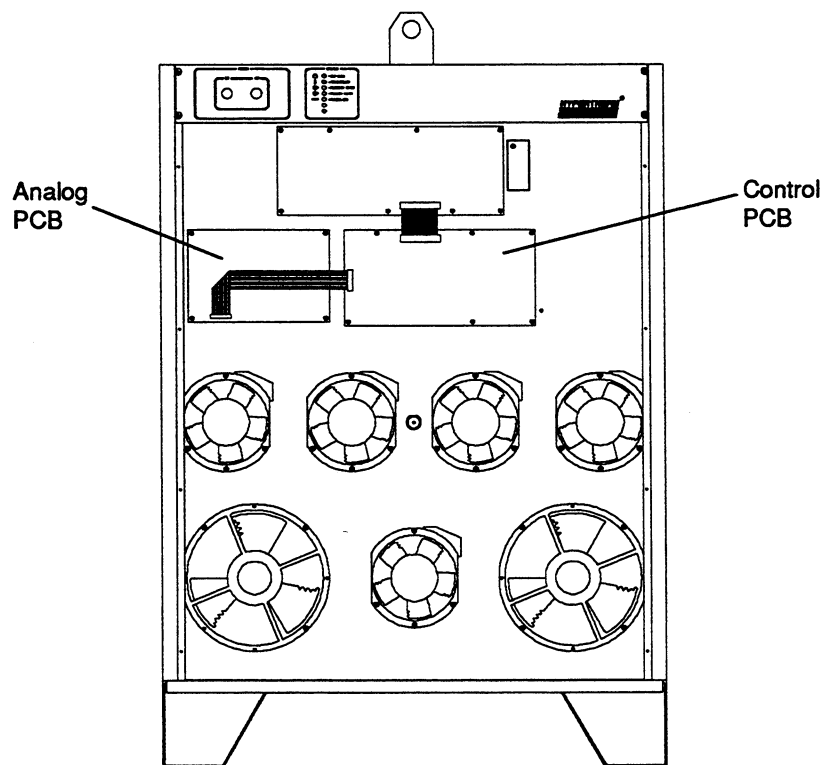


Figure 11 Analog PCB and Control PCB Locations

HT4001 Start Circuit Upgrade

4. Remove all plugs from receptacles on Analog PCB (plug designations are shown in Fig. 12 for reference)
5. Remove 4 screws securing Analog PCB to chassis.
6. Replace old Analog PCB with new Analog PCB. Note: The new Analog PCB - PCB only (041281) - is Rev. B.
7. Reconnect all plugs. Check that pin 1 on the cable between the analog and control PCBs is oriented correctly.

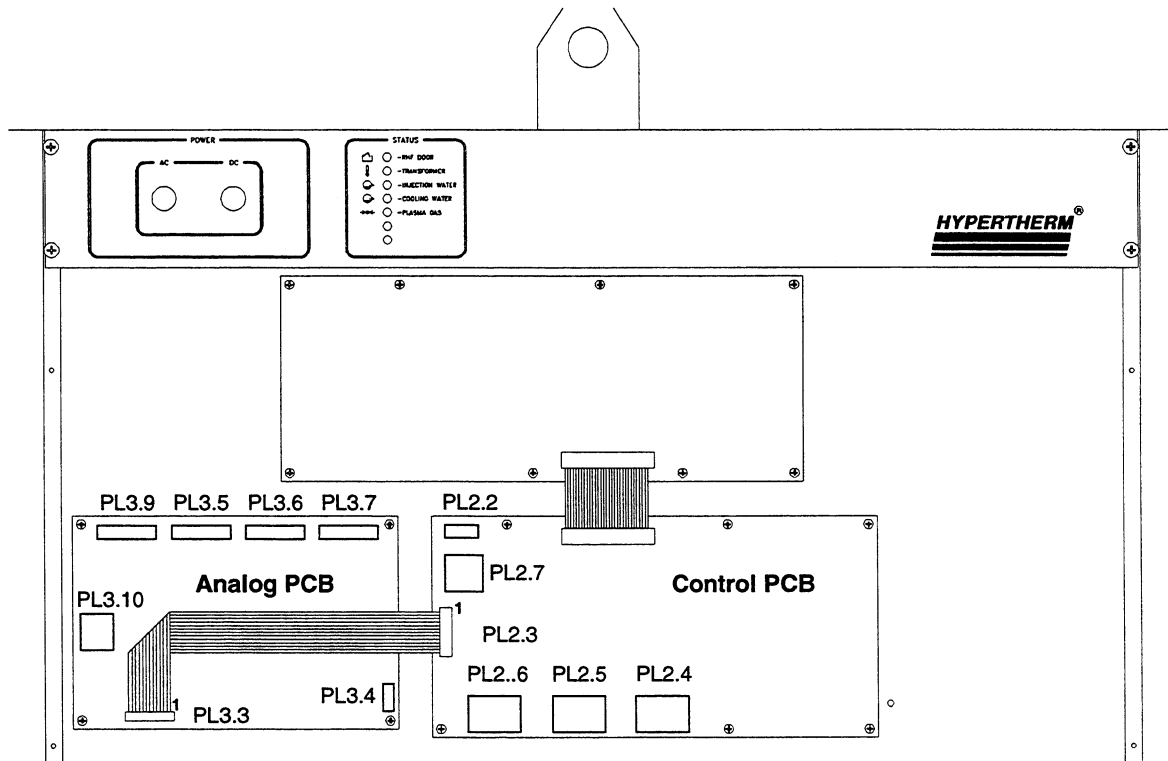


Figure 12 Analog PCB and Control PCB Removal and Replacement

7. Remove all plugs from receptacles on Control PCB (plug designations are shown in Fig. 12 for reference)
8. Remove 6 screws securing Control PCB to chassis.
9. Replace old Control PCB with new Control PCB. Note: The new Control PCB - PCB only (041279) - is Rev. C and contains new firmware chip (081019) Rev. J.
10. Reconnect all plugs. Note: If PL2.4 has blue and white wires in locations 15 and 16, move wire in location 15 to location 17 and move wire in location 16 to location 18.

HT4001 Start Circuit Upgrade

OPERATIONAL CHECK

Equipment Needed

Dual Digital Storage Oscilloscope (50 MHZ minimum)
800A rated current transducer
100A rated current transducer

Setup

Monitor pilot arc lead with 100A current transducer and plug into Channel 1 on the scope.
Monitor work lead with 800A current transducer and plug into Channel 2 on the scope.

Oscilloscope Settings

10 milliseconds per division
20A per division Channel 1
50A per division Channel 2
Trigger Channel 1 off of pilot arc lead

Procedure

1. Insert oxygen consumable parts in the torch. See instruction manual 802000 if necessary to change consumables or to operate the HT4001 system.
2. Raise torch above plate so that transfer will not occur.
3. Turn main disconnect switch to the HT4001 power supply on.
4. Move power supply circuit breaker up to ON (I) position.
5. Press START command from controller.

The torch should give a single burst of energy from the surge injection and pilot arc circuits. The waveforms for Channel 1 should compare to Fig. 13. There should be no waveform on Channel 2. Repeat this procedure using nitrogen consumables and compare waveform to Fig. 14.

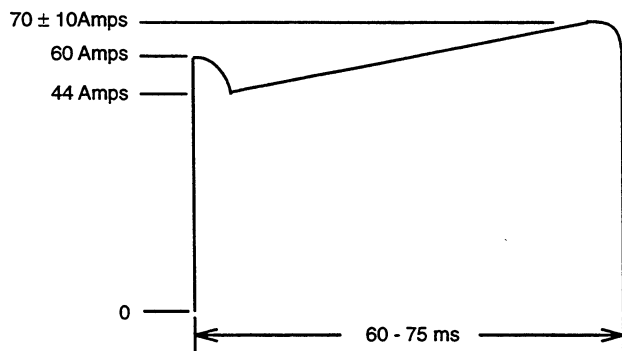


Figure 13 O₂ Waveform from Pilot Arc Lead, Channel 1 - No Transfer

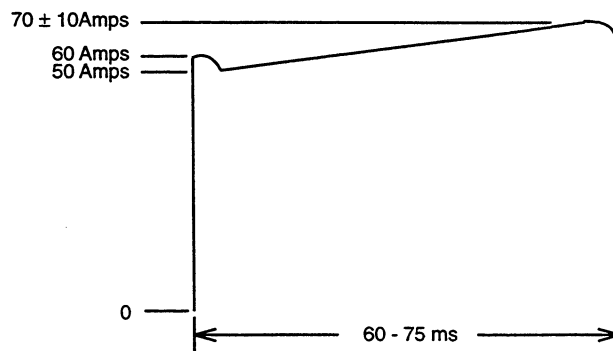


Figure 14 N₂ Waveform from Pilot Arc Lead, Channel 1 - No Transfer

HT4001 Start Circuit Upgrade

5. Move power supply circuit breaker to OFF (O) position.
6. Lower torch close to plate so that transfer will occur.
7. Move power supply circuit breaker to ON (1) position.
8. Press START command from controller.

Channel 1 should look similar to Figure 13 or 14. Channel 2 should look approximately like the Electrode to Work waveforms depicted in Fig. 15 below.

OXYGEN OPERATION
CURRENT, PRESSURE,
AND VOLTAGE WAVEFORMS

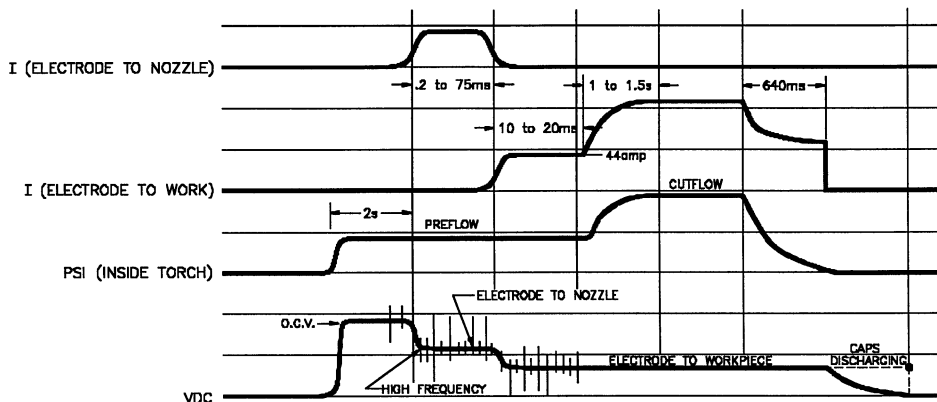


Figure 15 Oxygen Operation Current, Pressure, and Voltage Waveforms