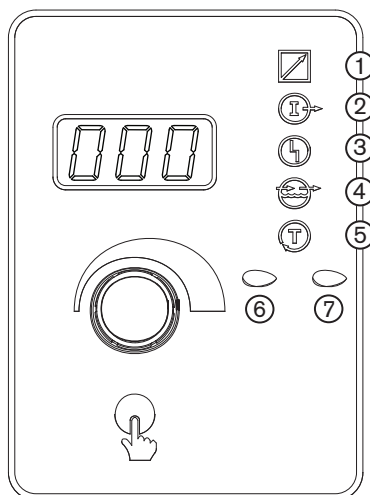


Error codes

When the fault indicator is illuminated the error code number can be seen in the three digit display.

There are three general types of error codes:

- Self clearing – An over temperature error, for example, will clear when the power supply cools off.
- Low priority – The user must select the fault icon and press the current selection knob to see the error code. This type of error can be cleared with the start signal.
- High priority – The system will automatically select the fault icon and show the error code. This type of error requires the power to the system to be turned off and then on again, after the cause of the error has been corrected.



3-digit display icons	
Name	Description
1 Remote	The remote icon illuminates when there is serial communication with the power supply. You can still cycle through the functions. But cut parameters can only be changed through the CNC.
2 Amps	Increase or decrease the amperage by selecting the amperage (A) icon and turning the knob. The current increases or decreases in 1 A increments when you turn the knob slowly. You can jump from one process amperage to another when you turn the knob quickly.
3 Fault	The fault icon illuminates when an error occurs. If the error code number is 60 or less, press the current selection knob to navigate to the illuminated fault icon. When the fault icon is selected the error code appears in the 3-digit display. If the error code is 60 or more the system automatically selects the fault icon and the error code number flashes in the 3-digit display. Press and hold the current selection knob to see the power supply status number for both types of error code.
4 Coolant flow	When the coolant flow icon is selected the display shows the coolant flow in gallons per minute. When you turn ON the power to the system and select the coolant flow icon before the power supply finishes the purge count, the flow switch is overridden and coolant will continue to flow for 30 seconds.
5 Test	When test icon is selected the system is in test mode. A number of functions can be accessed by turning the current selection knob. See the Maintenance section for detailed information.
6 Plasma start	The plasma start LED illuminates white when the plasma start signal is given and stays illuminated until the start signal is removed.
7 Arc transfer	The arc transfer LED illuminates green when the arc transfers to the workpiece.

Diagnostic functions

Press and release the current selection knob until the Test icon in the 3-digit display is selected. Turn the current selection knob to access the functions shown in the table below. The function activates when the function number appears in the 3-digit display.

Function	Description
000	No function. Gases will stop flowing if the system was in another test mode.
001	Flow gas at set pressure. Plasma and shield gases flow at the set value.
002	Display software revision. Shows the current software revision of the power supply.
003	Plasma gas leak check. The plasma channel is pressurized and the pressure trapped. The 3-digit display shows the actual pressure. The system remains in this state until you select another function or return to cutting. The pressure in the plasma channel should remain stable (+/- 2 psi) for 5 minutes. The shield gas channel should drop to near zero psi (less than 5 psi).
004	Flow gas at full pressure. The plasma and shield gases flow at full pressure. It is typical to see low pressure errors during this function because the system is attempting to achieve the maximum flow possible. Function 4 is used when setting the supply gas regulators.
005	Display torch ID. The torch ID indicates the lead length that is connected to the system.
006	In-line valve check. The plasma channel is pressurize, the system closes the Burkert valve and opens the in-line torch valve. The plasma pressure is expected to drop to near zero psi (less than 5 psi) in less than 30 seconds.

Troubleshooting table

Number	Name	Description	Corrective action
000	No Error	System is ready to run	None
005	Low line voltage	Line voltage is close to or less than the lower limit of 102 VAC (120 VAC -15%). The normal lower limit for operation is 108 VAC (120 VAC -10%).	<p>Verify the line voltage at the control transformer and the fuses on the control board. The chopper bus voltage should be 360 VDC nominal.</p> <ol style="list-style-type: none"> 1. If the voltage is good, use a multimeter to measure across TP102 (gnd) and TP 111 (isolated bus voltage) on the chopper. 2. If the voltage is 2.1 VDC nominal, replace the control board. 3. If the voltage is 0 VDC or 5 VDC, replace the chopper.
006	High line voltage	Line voltage is close to or greater than the upper limit of 138 VAC (120 VAC +15%). The normal upper limit for operation is 132 VAC (120 VAC +10%).	<p>Verify the line voltage at the control transformer and the fuses on the control board. The chopper bus voltage should be 360 VDC nominal.</p> <ol style="list-style-type: none"> 1. If the voltage is good, use a multimeter to measure across TP102 (gnd) and TP 111 (isolated bus voltage) on the chopper. 2. If the voltage is 2.1 VDC nominal, replace the control board. 3. If the voltage is 0 VDC or 5 VDC, replace the chopper.
020	No pilot arc	No current detected from chopper at ignition and before 1-sec timeout	<ol style="list-style-type: none"> 1. Verify that the correct consumable parts are installed and in good condition. 2. Perform the gas checks (See <i>Control board</i> on page 164). 3. Verify that there is spark across spark gap. 4. Inspect CON1 for excessive wear. 5. Perform the torch lead test (See <i>Torch lead test</i> on page 175). 6. Perform the start circuit test (See <i>Start circuit troubleshooting</i> on page 169).
021	No arc transfer	For a machine torch, no current detected on work lead 500-msec after pilot arc current was established. For a hand torch, no current detected on work lead 5-sec after pilot arc current was established.	<ol style="list-style-type: none"> 1. Verify proper transfer/pierce height. 2. Verify proper cutflow settings. 3. Inspect the work lead for damage or loose connections. 4. Perform the torch lead test (See <i>Torch lead test</i> on page 175).
024	Lost current on chopper	Lost current from chopper after transfer	<ol style="list-style-type: none"> 1. Verify that the correct consumable parts are installed and in good condition. 2. Verify proper cutflow gas settings. 3. Verify the pierce height setting. 4. Verify the pierce delay time. 5. Verify that the arc did not lose contact with the workpiece while cutting (hole cutting, scrap cutting, etc.).

Number	Name	Description	Corrective action
026	Lost transfer	Lost the transfer signal after transfer completed.	<ol style="list-style-type: none"> 1. Verify that the correct consumable parts are installed and in good condition. 2. Verify proper cutflow gas settings. 3. Verify the pierce height setting. 4. Verify pierce delay time. 5. Verify that the arc did not lose contact with the workpiece while cutting (hole cutting, scrap cutting, etc.). 6. Inspect the work lead for damage or loose connections. 7. Try connecting the work lead directly to the workpiece.
027	Lost phase	Phase imbalance to chopper after contactor engaged or while cutting	<ol style="list-style-type: none"> 1. Verify phase-to-phase voltage to power supply. 2. Disconnect power to power supply, remove cover on contactor and inspect contacts for excessive wear. 3. Inspect power cord, contactor, and input to chopper for loose connections. 4. Perform phase loss test. See <i>Phase loss detection</i> on page 174.
032	Hold timeout	Hold signal was active for longer than 60 seconds	<ol style="list-style-type: none"> 1. Check the interface cable for damage. The hold wires may be short-circuiting inside. 2. The CNC is maintaining this input, it could be waiting for an IHS complete input from another torch. 3. If the CNC interface cable is good and it is a 1-torch system, change the control board.
044	Low plasma gas pressure	Plasma gas pressure is less than 25% of the set (desired) value	<ol style="list-style-type: none"> 1. Inspect gas supply pressure and volume of gas remaining in supply tanks. 2. Verify the gas settings on the front panel with the parameters in the cut charts. 3. See <i>Setting the supply gas regulators</i> on page 74. 4. Perform the Flow gas at set pressure test (001), and verify the gas settings on the front panel with the parameters in the cut charts. See <i>Control board</i> on page 164.
045	High plasma gas pressure	Plasma gas pressure is greater than 25% of the set (desired) value	<ol style="list-style-type: none"> 1. Verify gas supply pressure settings. 2. Perform the Flow gas at set pressure test (001), and verify the gas settings on the front panel with the parameters in the cut charts. See <i>Control board</i> on page 164. 3. See <i>Setting the supply gas regulators</i> on page 74. 4. The In-line valve may not be opening. Perform the Plasma leak check (003) and the in-line valve check (006). See <i>Control board</i> on page 164.

Number	Name	Description	Corrective action
050	Start lost/Start at Initialization	Start signal was received and then lost before an arc was established/ Start signal was applied when power was applied to the system	<ol style="list-style-type: none"> 1. If a mechanical relay is being used to provide the system with a start signal, this relay is either bouncing when activated or the contacts are faulty. Replace the relay. 2. Inspect the interface cable for damage; faulty crimps, or poor electrical connections. 3. If the interface cable is good and a relay is not driving the start input, the CNC is dropping the start signal before a steady state arc has been established. 4. Remove the start signal from the CNC or THC and turn the system on again. <p>NOTE: It is normal to see an 050 error when cutting with the hand torch if the start signal is removed before the pilot arc time (5 seconds) has expired.</p>
051	Pilot Arc Over-temp	Maximum pilot arc duration exceeded	<ol style="list-style-type: none"> 1. Allow the power supply to idle with the fans running for 10 seconds. 2. Verify that the pierce height is correct. 3. Minimize pilot arcing off the workpiece.
053	Low shield gas pressure	Shield gas pressure is less than 25% of the set (desired) value	<ol style="list-style-type: none"> 1. Verify gas supply pressure and that sufficient gas remains in your supply. 2. Perform the Flow gas at set pressure test (001), and verify the gas settings on the front panel with the parameters in the cut charts. See <i>Control board</i> on page 164. 3. See <i>Setting the supply gas regulators</i> on page 74.
054	High shield gas pressure	Shield gas pressure is 25% greater than the set (desired) value	<ol style="list-style-type: none"> 1. Check for a restriction or dross on the shield cap 2. Perform the Flow gas at set pressure test (001), and verify the gas settings on the front panel with the parameters in the cut charts. See <i>Control board</i> on page 164. 3. Verify that the pressure transducers are providing the system with the proper pressures.
060	Low coolant flow	Coolant flow is less than the required 2.3 lpm (0.6 gpm)	<ol style="list-style-type: none"> 1. Verify that the correct consumables are properly installed. 2. Perform the coolant flow test procedure. See <i>Coolant flow test</i> on page 160.
063	Inlet Pressure Fault	Inlet pressure measured was greater than 135 or less than 40 psi	Verify that the input pressures at the regulators are in range.
065	Chopper over-temp at power-up	Chopper is indicating an over-temp at power-up	<ol style="list-style-type: none"> 1. Verify that the heat exchanger fan is spinning. 2. Blow dust out the heat exchanger with compressed air to clean off the fins. 3. Verify that the level of coolant is at the proper height. 4. Verify that the coolant mixture is correct (% propylene glycol). A mixture with a high percentage of propylene glycol will have a lower cooling capacity. 5. Change the consumables. Older consumables emit more heat into the cooling loop. 6. Verify the pump flow rate. If it is less than 2.3 lpm (0.6 GPM) troubleshoot the low flow rate issue.

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Number	Name	Description	Corrective action
067	Magnetics over temp	Main transformer has over heated	<ol style="list-style-type: none"> 1. Verify that the magnetics fan is operating properly. Spinning fan blades should be difficult to see. 2. Blow dust out of the system especially from fans and the main transformer. 3. If voltage is low or near 0 VDC, inspect wiring between the transformer's temperature sensor and J1.12, pins 1 and 2 on the control board. Look for shorts between wires or to ground. 4. If wiring is good, the transformer has overheated. Allow the power supply to idle with the fans running for a minimum of 30 minutes to cool the main transformer.
068	Inductor A over temp	Inductor has over heated	<ol style="list-style-type: none"> 1. Verify that the magnetics fan is operating properly. Spinning fan blades should be difficult to see. 2. Blow dust out of the system especially from fans and inductors. 3. If voltage is low or near 0 VDC, inspect wiring between inductor A's temperature sensor and J1.12, pins 4 and 5 on the control board. Look for shorts between wires or to ground. 4. If wiring is good, the inductor has overheated. Allow the power supply to idle with the fans running for a minimum of 30 minutes to cool the inductors.
069	Inductor B over temp	Inductor has over heated	<ol style="list-style-type: none"> 1. Verify that the magnetics fan is operating properly. Spinning fan blades should be difficult to see. 2. Blow dust out of the system especially from fans and inductors. 3. If voltage is low or near 0 VDC, inspect wiring between inductor B's temperature sensor and J1.12, pins 7 and 8 on the control board. Look for shorts between wires or to ground. 4. If wiring is good, the inductor has overheated. Allow the power supply to idle with the fans running for a minimum of 30 minutes to cool the inductors.
071	Coolant over temp	Torch coolant has overheated	<ol style="list-style-type: none"> 1. Verify that the heat exchanger fan is spinning. 2. Blow dust out the heat exchanger with compressed air to clean off the fins. 3. Verify that the level of coolant is at the proper height. 4. Verify that the coolant mixture is correct (% propylene glycol). A mixture with a high percentage of propylene glycol will have a lower cooling capacity. 5. Change the consumables. Older consumables emit more heat into the cooling loop. 6. Verify the pump Flow rate. If it is less than 0.5 gpm troubleshoot the low flow rate issue. 7. Replace the coolant temperature sensor if it is open or shorted. Replacement part number is 229474.

Number	Name	Description	Corrective action
093	No coolant flow	Coolant flow was below 1.9 lpm (0.5 gpm) while the system was running or the coolant flow was below 1.7 lpm (0.45 gpm) while cutting.	<ol style="list-style-type: none"> 1. Verify that the level of coolant is at the proper level. 2. Verify that the coolant filter is in good condition. replace if necessary. 3. The pump motor may have reached its internal thermal trip point. Make sure the side panel is installed, for proper airflow, and that the heat exchanger fan is working properly. 4. Perform the coolant flow test. See <i>Coolant flow test</i> on page 160. 5. See the corrective actions for the low coolant flow error (60).
097	No Torch Found	Torch or torch ID jumper missing or installed incorrectly	<ol style="list-style-type: none"> 1. Verify that the torch connection by the I/O panel (CPC plug) is good. 2. Verify the pin out on the torch lead connection.
102	Current Sensor A Fault	A fault was detected on channel A of the chopper	<ol style="list-style-type: none"> 1. Turn OFF the line power to the system. Check the wiring between the control board and the chopper for damaged wires and proper connections and then turn ON the line power again so the automatic diagnostic checks will run. 2. If the error changes to a 409 error replace the chopper assembly.
108	Transfer at power-up	The system has detected current on the work lead during power-up	<ol style="list-style-type: none"> 1. Verify that the chopper PCB is functioning properly by checking the LEDs on the board against the LED list in the Maintenance section. See <i>Start circuit troubleshooting</i> on page 169. 2. Replace the chopper PCB if connections are correct and not damaged. 3. Verify that the main contactor (CON1) is not welded closed, or closing at power-up.
109	Coolant Flow At power-up	Coolant flow measured during power-up and before pump motor has been turned on.	<ol style="list-style-type: none"> 1. Verify that the shield cap is properly installed. A loose shield cap can allow shield gas to get into the coolant, and cause a coolant flow error. 2. Verify that the torch lead connections are good. 3. Turn off the power to the system, wait 30 seconds, and turn the power back on. Sometimes if you turn the power off and then on too quickly it may cause a 109 error. 4.
134	Chopper A over current	Chopper A current exceeded maximum	<ol style="list-style-type: none"> 1. Verify that the chopper PCB is functioning properly by checking the LEDs on the board against the LED list in the Maintenance section. 2. Turn off the power to the system and then turn it on again to verify that the system passes the initial power up test. 3. Verify the current output on J2.1 white to black (4 VDC=100 A). 4. If the wiring is good, the IGBT may have failed. Replace the chopper assembly.

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Number	Name	Description	Corrective action
138	Chopper B over current	Chopper B current has exceeded maximum	<ol style="list-style-type: none"> 1. Verify that the chopper PCB is functioning properly by checking the LEDs on the board against the LED list in the Maintenance section. See <i>Start circuit troubleshooting</i> on page 169. 2. Turn off the power to the system and then turn it on again to verify that the system passes the initial power up test. 3. Verify the current output on J2.6 white to black (4 VDC=100 A). 4. If the wiring is good, the IGBT may have failed. Replace the chopper assembly.
161	High coolant flow rate	Coolant flow rate has exceeded maximum	<ol style="list-style-type: none"> 1. Check to make sure the shield cap is properly installed. A loose shield cap can allow shield gas to get into the coolant, and cause this error. 2. Check to make sure the consumables are installed properly and are not damaged.
190	Current Sensor B Fault	A fault was detected on channel B of the chopper	<ol style="list-style-type: none"> 1. Turn OFF the power to the system. Check the wiring between the control board and the chopper for damaged wires and proper connections and then turn ON the power again so the automatic diagnostic checks will run. 2. If the error changes to a 410 error replace the chopper assembly.
300	Temp sensor unplugged Chopper	The temperature reading was unexpectedly low, possibly indicating the sensor is unplugged	<ol style="list-style-type: none"> 1. Verify that the red and black wires on chopper J2.8 are plugged into the control board at J1.22. 2. Verify the cold workpiece temperature sensor wires are plugged into the chopper at J2.9 (10K ohm nominal).
301	Temp sensor unplugged Transformer	The temperature reading was unexpectedly low, possibly indicating the sensor is unplugged	Verify the electrical connection back to the control board at J1.12 pins 1-2 (10K ohm nominal).
302	Temp sensor unplugged Inductor 1	The temperature reading was unexpectedly low, possibly indicating the sensor is unplugged	Verify the electrical connection back to the control board at J1.12 pins 4-5 (10K ohm nominal).
303	Temp sensor unplugged Inductor 2	The temperature reading was unexpectedly low, possibly indicating the sensor is unplugged	Verify the electrical connection back to the control board at J1.12 pins 7-8 (10K ohm nominal).
304	Temp sensor unplugged Coolant	The temperature reading was unexpectedly low, possibly indicating the sensor is unplugged	Verify the electrical connection back to the control board at J1.18 pins 6-7 (10K ohm nominal).
400	Current sensor A and Current sensor B current with contactor off	During the chopper test, current was detected on channel A and on channel B when no current was expected	<ol style="list-style-type: none"> 1. Verify that the contactor is not welded shut or always ON. 2. Verify that there is no DC output on the I/O board from the Torch to Work connections. If DC output is found, replace the chopper. 3. Verify that the LED for PWM is not active.
401	Current sensor A current with contactor off	During the chopper test, current was detected on channel A when no current was expected	<ol style="list-style-type: none"> 1. Verify that the contactor is not welded shut or always ON. 2. Verify that there is no DC output on the I/O board from the Torch to Work connections. If DC output is found, replace the chopper. 3. Verify that the LED for PWM is not active.

Number	Name	Description	Corrective action
402	Current sensor B current with contactor off	During the chopper test, current was detected on channel B when no current was expected	<ol style="list-style-type: none"> 1. Verify that the contactor is not welded shut or always ON. 2. Verify that there is no DC output on the I/O board from the Torch to Work connections. If DC output is found, replace the chopper. 3. Verify that the LED for PWM is not active.
405	Current sensor A and Current sensor B current with contactor on and PWM off	During the chopper test, current was detected on channel A and on channel B when no current was expected	<ol style="list-style-type: none"> 1. Verify that the LED for PWM is not active. 2. Verify that there is no DC output on the I/O board from the Torch to Work connections. If DC output is found, replace the chopper.
406	Current sensor A current with contactor on and PWM off	During the chopper test, current was detected on channel A when no current was expected	<ol style="list-style-type: none"> 1. Verify that the LED for PWM is not active. 2. Verify that there is no DC output on the I/O board from the Torch to Work connections. If DC output is found, replace the chopper.
407	Current sensor B current with contactor on and PWM off	During the chopper test, current was detected on channel B when no current was expected	<ol style="list-style-type: none"> 1. Verify that the LED for PWM is not active. 2. Verify that there is no DC output on the I/O board from the Torch to Work connections. If DC output is found, replace the chopper.
408	With choppers active, no current on Current sensor A and Current sensor B during chopper test	No current detected on channel A and channel B when current was expected	<ol style="list-style-type: none"> 1. Verify the output voltage from the contactor. 2. Verify the DC voltage on both bridges of the Chopper. 3. Verify the DC output on the I/O board for each chopper test. 4. Verify that the 10 Ohm resistor on the I/O board is not damaged. 5. Disconnect any exterior equipment from the I/O Board (Example: Arc Voltage connection). 6. Replace the chopper.
409	With choppers active, no current on Current sensor A during chopper test	No current was detected on channel A when current was expected	<ol style="list-style-type: none"> 1. Verify the output voltage from the contactor. 2. Verify the DC voltage on Chopper. 3. Verify the DC output on the I/O board for each chopper test. 4. Verify that the 10 Ohm resistor on the I/O board is not damaged. 5. Disconnect any exterior equipment from the I/O Board (Example: Arc Voltage connection). 6. Replace the chopper.
410	With choppers active, no current on Current sensor B during chopper test	No current was detected on channel B when current was expected	<ol style="list-style-type: none"> 1. Verify the output voltage from the contactor. 2. Verify the DC voltage on Chopper. 3. Verify the DC output on the I/O board for each chopper test. 4. Verify that the 10 Ohm resistor on the I/O board is not damaged. 5. Disconnect any exterior equipment from the I/O Board (Example: Arc Voltage connection). 6. Replace the chopper.
411	Current detected for longer than expected on Current sensor A and Current sensor B	Current on channel A and channel B did not return to 0 as expected	Verify that the surge circuit on the I/O board is functioning properly.
412	Current detected for longer than expected on Current sensor A	Current on channel A did not return to 0 as expected	Verify that the surge circuit on the I/O board is functioning properly.

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Number	Name	Description	Corrective action
413	Current detected for longer than expected on Current sensor B	Current on channel B did not return to 0 as expected	Verify that the surge circuit on the I/O board is functioning properly.
414	Current sensor A and Current sensor B signals crossed	Current from output A was detected on channel B and output from channel B was detected on channel A	Verify that the current sensor wiring is not crossed.
415	Current detected on Current sensor B when expected on Current sensor A	Current from output A was detected on channel B	Verify that the current sensor wiring is not crossed.
416	Current detected on Current sensor A when expected on Current sensor B	Current from output B was detected on channel A	Verify that the current sensor wiring is not crossed.
417	Current too high on Current sensor A	Current exceeded the maximum expected value on channel A	<ol style="list-style-type: none"> 1. Verify that the 10 Ohm resistor on the I/O board is not damaged. 2. Disconnect any exterior equipment from the I/O Board (Example: Arc Voltage connection).
418	Current too high on Current sensor B	Current exceeded the maximum expected value on channel B	<ol style="list-style-type: none"> 1. Verify that the 10 Ohm resistor on the I/O board is not damaged. 2. Disconnect any exterior equipment from the I/O Board (Example: Arc Voltage connection).
419	Current too high on Current sensor A and Current sensor B	Current exceeded the maximum expected value on channel A and channel B	<ol style="list-style-type: none"> 1. Verify that the 10 Ohm resistor on the I/O board is not damaged. 2. Disconnect any exterior equipment from the I/O Board (Example: Arc Voltage connection).