



UDC 3500 Application Note

Controller Failure Symptoms

Introduction

In addition to the error message prompts, there are failure symptoms that can be identified by noting how the controller displays and indicators are reacting.

Symptoms

Compare your symptoms with those shown in Table-1.

Table-1 Controller Failure Symptoms

Upper Display	Lower Display	Indicators	Controller Output	Probable Cause	Trouble-shooting Procedure
Blank	Blank	Off	None	Power Failure	0
OK	Displayed Output disagrees with Controller Output	OK	Controller Output disagrees with Displayed Output	Current Proportional Output	0
OK		OK		Position Proportional or TPSC Output	0
OK		OK		Time Proportional Output	0
OK		OK		Current/Time Proportional Output	0
OK	OK	OK	External Alarm function does not operate properly	Malfunction in alarm output	0
OK	Displayed Output disagrees with First Current Output	OK	Controller Current Output #1 disagrees with Displayed First Current Output	First Current Output	0
OK	Displayed Output disagrees with Second Current Output	OK	Controller Current Output #2 disagrees with Displayed Second Current Output	Second Current Output	0
OK	Displayed Output disagrees with Third Current Output	OK	Controller Output disagrees with Displayed Third Current Output	Third Current Output	0



UDC 3500 Application Note

Upper Display	Lower Display	Indicators	Controller Output	Probable Cause	Trouble-shooting Procedure
Display does not change when a key is pressed				Keyboard Malfunction	0
Controller fails to go into "Slave" operation during communications				Communications Failure	RS-485: 0 Ethernet: 0
Bad PV Reading	Bad InX Reading	OK	OK	Analog Input Failure	0

Other symptoms

If a set of symptoms or prompts other than the one you started with appears while troubleshooting, re-evaluate the symptoms. This may lead to a different troubleshooting procedure.

If the symptom still persists, refer to the installation section in this manual to ensure proper installation and proper use of the controller in your system.

Troubleshooting Procedures

Introduction

The troubleshooting procedures are listed as they appear in Table-1. Each procedure describes what to do if you have that particular failure and how to do it or where to find the data needed to accomplish the task.



WARNING—SHOCK HAZARD

TROUBLESHOOTING MAY REQUIRE ACCESS TO HAZARDOUS LIVE CIRCUITS AND SHOULD ONLY BE PERFORMED BY QUALIFIED SERVICE PERSONNEL. MORE THAN ONE SWITCH MAY BE REQUIRED TO DE-ENERGIZE UNIT BEFORE SERVICING.

Equipment needed

You will need the following equipment in order to troubleshoot the symptoms listed:

- Multimeter – Capable of measuring millivolts, volts, milliamps and resistance.
- Calibration sources – T/C, mV, Volt, etc.



UDC 3500 Application Note

Procedure #1 – Power

Table 2 explains how to troubleshoot power failure symptoms.

Table 2 Troubleshooting Power Failure Symptoms

Step	What to do	How to do it
1	Check the AC or DC line voltage.	Use a voltmeter to measure the AC or DC voltage across terminals L1 and L2 on the rear terminal panel of the controller. Check the earth ground connection.
2	Make sure the chassis plugs into the rear of the case properly.	Withdraw the chassis and visually inspect the controller board and the inside of the case. Reseat the boards into the Chassis if necessary.
3	Check the system for Brown-outs, heavy load switching, etc., and conformance to installation instructions.	Refer to <i>Installation Section</i> .
4	Change Power board.	Installation instructions supplied with new board.

Procedure #2 – Current Outputs

Table 3 explains how to troubleshoot Current Output failure symptoms.

Table 3 Troubleshooting Current Output Failure

Step	What to do	How to do it
1	Make sure that the controller is configured correctly and that the proper range (4 to 20 or 0 to 20) is configured.	Refer to <i>Configuration Section</i> . Configuration incorrect: Fix configuration Configuration correct: Go to Step 2.
2	Check the field wiring.	Output impedance must be less than or equal to 1000 ohms.
3a	First Current Output: Test for operation.	Change Output Set Up group function prompt OUT ALG = CUR. Make the Output Set up group function prompt CO RANGE = 4–20 Go to Step 4
3b	Second Current Output: Test for operation.	Change Options Set Up group function prompt CUR2 OUT = OUTPUT Make the Current #2 Options Set up group function prompt CO RANGE = 4–20 Go to Step 4



UDC 3500 Application Note

Step	What to do	How to do it
3c	Third Current Output: Test for operation.	<p>Change Options Set Up group function prompt CUR3 OUT = OUTPUT</p> <p>Make the Current #3 Options Set up group function prompt CO RANGE = 4–20</p> <p>Go to Step 4</p>
4	Check the output.	<p>Put the controller into Manual mode and change the output via the front keyboard from 0 % to 100 %. Use a DC milliammeter at the rear terminals for the output being diagnosed to verify the output.</p> <p>Output works correctly: Return the controller to its original configuration and check output again.</p> <p>Output does not work correctly: Go to Step 5.</p>
5	Restore Factory Calibration	<p>For the output being diagnosed, change the CO RANGE prompt from its present setting to its other setting. Exit the setup group and then return and change CO RANGE back to its previous setting.</p> <p>Output works correctly: Finished</p> <p>Output does not work correctly: Go to Step 6.</p>
6	Field Calibrate the output.	<p>Refer to <i>Output Calibration Section</i> for details.</p> <p>Output works correctly: Finished</p> <p>Output does not work correctly: Go to Step 7.</p>
7	Change Current Output board.	<p>Installation instructions provided with new board.</p>



UDC 3500 Application Note

Procedure #3 – Position Proportional

Table 4 explains how to troubleshoot Position Proportional Output failure symptoms.

Table 4 Troubleshooting Position Proportional Output Failure

Step	What to do	How to do it
1	Make certain that the controller is configured properly for Position Proportional output.	<p>Make Output Algorithm Set Up group function prompt OUT ALG = POSPROP.</p> <p>Make Input 3 Set Up group function prompt IN3 TYPE = SLIDEW</p> <p>Refer to <i>Configuration Section</i>.</p> <p>If the “CAL MTR” diagnostic prompt is flashing on the lower display, then this means that the instrument was never calibrated for your application. See the Position Proportional field calibration procedure in <i>Output Calibration Section</i> for motor slidewire calibration procedure.</p>
2	Check the field wiring.	Refer to <i>Installation Section</i> for details.
3	Check whether the motor drives in both directions.	<p>Put the controller into Manual mode. Vary the output above and below the present value. Observe “OUT” indicators and the output value (“OUT”) on the lower display. When the “OUT 1” indicator is on and the “OUT 2” indicator is off, then the motor should be opening and the output value shown on the lower display should be increasing. When the “OUT 1” indicator is off and the “OUT 2” indicator is on, then the motor should be closing and the output value on the lower display should be decreasing. Listen for a click from a relay when the OUT1 and OUT 2 indicators change state.</p> <p>a) Motor moves in both directions but the displayed Output value does not change or does not have a decimal point – Go to Step 4</p> <p>b) Motor does not move in one or both directions – Go to Step 5</p> <p>c) Motor moves in both directions but the displayed Output value moves in the wrong direction: This means that the motor or the slidewire or both are incorrectly wired. Check the motor manufacturer’s wiring diagram and then refer to <i>Installation Section</i> to rewire the controller.</p>



UDC 3500 Application Note

Step	What to do	How to do it
4	Motor moves in both directions but the displayed Output value does not change or does not have a decimal point	Slidewire input is malfunctioning. See the Position Proportional field calibration procedure in <i>Output Calibration Section</i> for motor slidewire calibration procedure. Follow that procedure to Field Calibrate the instrument. If after a Field Calibration the problem is still not fixed, then go to Step 6.
5	Motor does not move in one or both directions	Wiring Problem. Check the motor manufacturer's wiring diagram and then refer to <i>Installation Section</i> –to rewire the controller. If wiring is correct, then go to Step 7.
6	Determine if Motor Slidewire or Input 3 is at fault.	Disconnect and tag the field wiring for the slidewire. Refer to <i>Installation Section</i> . Measure the voltage between the R (28) and the – (30) terminals. Voltage is $+1.2Vdc \pm 0.2Vdc$: Bad motor slidewire. Refer to the motor manufacturer's instructions. Voltage not $+1.2Vdc \pm 0.2Vdc$: Check the Jumper on the Input 3 Board . Jumper should be in W1 position. If not, then move it to W1 position and recalibrate the instrument per <i>Output Calibration Section</i> . If the Jumper is in the W1 position, then replace the Input 3 board. Installation instructions supplied with the new board.



UDC 3500 Application Note

Step	What to do	How to do it
7	Check the Relays.	<p>Turn off power to the motor and to the instrument. Disconnect and tag the field wiring to the relays. Relay 1 (MOTOR – OPEN) is on terminals 8 and 9. Relay 2 (MOTOR – CLOSE) is on terminals 7 and 8.</p> <p>Turn on power to the instrument. Put the controller into Manual mode. Connect your multimeter to terminals 8 and 9 and set the multimeter to measure resistance. Now, vary the output above and below the present value and observe the “OUT” indicators and your multimeter. When the “OUT 1” indicator is on, then Relay 1 should be closed and there should be only a few ohms between terminals 8 and 9. When the “OUT 1” indicator is off, then Relay 1 should be open and there should be infinite resistance between terminals 8 and 9. Listen for a click from the relay when the OUT1 indicator changes state.</p> <p>Repeat this test for Relay 2 by connecting your multimeter to terminals 7 and 8. When the “OUT 2” indicator is on, the relay should be closed and there should be only a few ohms between terminals 7 and 8. When the “OUT 2” indicator is off, the relay should be open and there should be infinite resistance between terminals 7 and 8. Listen for a click from the relay when the “OUT 2” indicator changes state.</p> <p><i>Relays measure correctly:</i> Check motor. Refer to manufacturer’s instructions.</p> <p><i>Relays do not measure correctly:</i> Go to Step 8.</p>
8	Replace the Dual Relay Board.	Installation instructions supplied with the new board.



UDC 3500 Application Note

Procedure #4 – Time Proportional

Table -5 explains how to troubleshoot Time Proportional Output failure.

Table -5 Troubleshooting Time Proportional Output Failure

Step	What to do	How to do it
1	Make sure the controller is configured for Time Proportional output.	Make Output Algorithm Set Up group function prompt OUT ALG (Loop 1) or OUT2 ALG (Loop 2) = RLY or RLYD. Refer to Configuration Section.
2	Check the field wiring.	Make sure the NO or NC contact wiring is correct. Refer to <i>Installation Section</i> - for details.
3	Check the output.	Put the controller into Manual mode. Vary the output above and below the present value. Observe OUT1 indicator (Loop 1) or OUT3 indicator (Loop 2) on the operator interface. Contact should change state. 0 % open, 100 % closed. Listen for a click from the relay when the OUT1 or OUT3 indicator changes state.
4	Check relay.	Change relay.
5	Change relay board.	Installation instructions supplied with the new board.



UDC 3500 Application Note

Procedure #5 – Current/Time or Time Current/Proportional

Table -6 explains how to troubleshoot Current/Time or Time/Current Proportional Output failure.

Table -6 Troubleshooting Current/Time or Time/Current Proportional Output Failure

Step	What to do	How to do it
1	Make sure the controller is configured for Time/Current or Current/Time Proportional output.	Make Output Algorithm Set Up group function prompt OUT ALG = TCUR or CURT. Refer to <i>Configuration Section</i>
2	Check the field wiring.	Make sure the NO or NC contact wiring selection is correct. Refer to <i>Installation Section</i> for details.
3	Check the relay output.	Put the controller into Manual mode. Vary the output above and below the present value. Observe OUT1 indicator (Loop 1) or OUT3 indicator (Loop 2) on the operator interface. Contact should change state. 0 % open, 100 % closed. Listen for a click from the relay when the OUT1 or OUT3 indicator changes state.
4	Check the Current Proportional Output.	Put the controller into Manual mode and change the output from 0 % to 100 % (4-20 mA). Use a DC milliammeter at the rear terminals to verify the output.
5	Recalibrate the controller.	Refer to <i>Output Calibration Section</i> for details.
6	Change Current Output or Relay board.	Installation instructions supplied with new board.



UDC 3500 Application Note

Procedure #6 – Alarm Relays

ATTENTION

Control Outputs take precedence over Alarms which in turn take precedence over Logic Gate Outputs. For example, if you select the Loop 2 Output Algorithm as Time Simplex, then the instrument will use Relay #3 to perform the Time Simplex output. Therefore, Relay #3 would not be available for Alarm 3 or Logic Gate functions.

The prompts for the Alarm Outputs appear whether or not the alarm relays are physically present or used for some other function. This allows the Alarm status to be shown on the display and/or sent via communications to a host computer.

Table 7 explains how to troubleshoot Alarm Relay Output failure.

Table 7 Troubleshooting Alarm Relay Output Failure

Step	What to do	How to do it
1	Check the alarm configuration data. If it is correct, check the field wiring.	Reconfigure if necessary. Refer to <i>Configuration Section</i> for details.
2	Check that the applicable alarm relay actuates properly depending on what you have set at prompt AxSxTYPE. If it does, check the field wiring.	If the alarm type is set for PV, place the controller in manual mode. Vary the input to raise and lower the PV around the setpoint. Listen for a click from the relay as the PV moves in either direction and note that the proper ALM1 or ALM2 is lit. EXAMPLE: If the alarm is set for MAN, put the controller into manual mode. The alarm light is ON. Put the controller into automatic mode and the alarm light is OFF.
3	Check the contacts.	Make sure the NO or NC contact wiring is correct. Refer to <i>Installation Section</i> for relay contact information.
4	Change the relay and/or the relay output board.	Installation instructions supplied with the new relay or board.





UDC 3500 Application Note

Procedure #7 – Keyboard

Table -8 explains how to troubleshoot a Keyboard failure.

Table -8 Troubleshooting a Keyboard Failure

Step	What to do	How to do it
1	Make sure the keyboard is connected properly to the MCU/output and power/input boards.	Withdraw the chassis from the case and visually inspect the connection.
2	Controller Keyboard or specific keys may be LOCKED OUT via the security code.	Use your four-digit security code number to change the lockout level. Refer to Section 3 – Configuration.
3	Run the keyboard test.	<p>Simultaneously press both the</p>  <p>key and the</p>  <p>key.</p> <p>The controller will now run a display test which lights every element in the display. Following that test, you will then see:</p> <div style="text-align: center;"> <p>Upper Display</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;">KEYS</div> <p>Lower Display</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;">TRY ALL</div> </div> <p>Press each key. If instrument reads the key, then the key's name will appear in the lower display. After fifteen seconds, the unit returns to normal operation.</p>
4	Replace the Display/Keyboard Assembly if any keys do not function.	Refer to “Parts Replacement Procedures” in this section.



UDC 3500 Application Note

Procedure #8 – RS-485

Table -8 explains how to troubleshoot a RS 485 Communications failure.

Table 9 Troubleshooting a RS-485 Communications Failure

Step	What to do	How to do it
1	Check the Address Number, ComState and Baud Rate settings.	See Configuration Section.
2	Check if the controller is wired correctly to the Network.	See Section Installation for wiring diagrams.



UDC 3500 Application Note

Step	What to do	How to do it
------	------------	--------------

3 Determine if the Communications board is faulty by running a LOCAL LOOPBACK TEST.

If the test fails, replace the board. If the test passes, the problem is most likely elsewhere in the communications network.

Disconnect the communications cable from the rear terminals. Run the Local Loopback Test.

Press  key until you see:

Upper Display
SET UP

Lower Display
COM

Press  key until you see:

Upper Display
DISABLE

Lower Display
LOOPBACK

Press  or  and you will see:

Upper Display
ENABLE

Lower Display
LOOPBACK

Press  key and you will see:

Upper Display
START

Lower Display
LOOPBACK

Then you will see either PASS or FAIL in the Upper Display. The test will run until the operator disables it or until the unit is power-cycled.

If you see FAIL, go to Step 4. If you see PASS, then the problem is most likely not in the instrument, but somewhere else in the network. Go to Step 7.

4 Make sure that the Communications Printed Wiring Board is installed properly in the controller.

Withdraw the chassis from the case and inspect the board. See the exploded view for location of the board. Return the chassis to the case and go back to Step 3.



UDC 3500 Application Note

Step	What to do	How to do it
5	Change RS-485 Communications board.	Installation instructions provided with new board.
6	Change Controller	
7	Follow these next two steps if you saw PASS in Step 3. Check the field wiring and termination resistor.	Turn off the power to all instruments on the Network. Using an ohm meter, check the resistance across the communications rear terminals. See Installation Section for wiring diagrams. There should be a reading equivalent to the value of the termination resistor.
8	Check the rest of the Network.	



UDC 3500 Application Note

Procedure #9 – Ethernet

Table 10 explains how to troubleshoot an Ethernet Communications failure.

Table 10 Troubleshooting an Ethernet Communications Failure

Step	What to do	How to do it
1	Check the IP address, Subnet Mask address and Gateway address settings.	See the PIE Tool Manual. As shipped from the factory, all units are configured for an IP address of 10.0.0.2. The MAC address is printed on the product label located on the instrument's case.
2	Check if the Ethernet Connection is active.	If the lower display is showing the diagnostic message "EUNPLGED" (Ethernet Unplugged), then this means that either the Ethernet link itself is bad or that the unit is improperly connected to the Ethernet. See Section Installation for wiring diagrams.
3	Change Ethernet Communications board.	Installation instructions provided with new board. ATTENTION The replacement Ethernet Communications board will have a label showing its MAC address. To avoid confusion, it is strongly recommended that you change the MAC address shown on the label on your instrument's case to be the same as the MAC address shown on your new board.
4	Change Controller	



UDC 3500 Application Note

Procedure #10 – Analog Input

Table 11 explains how to troubleshoot an Analog Input failure.

Table 11 Troubleshooting an Analog Input Failure

Step	What to do	How to do it
1	Check Input Configuration.	Check if the input configurations are correctly set for the kind of sensor attached to the input terminals. See Section (Input 1) through Section (Input 5).
2	Check input wiring and external resistor assemblies.	See the Input Wiring Diagrams and confirm that the instrument is properly connected to the sensor. Thermocouple, Milliamp, 0 to 10 Volt and –1 to 1 Volt input types all require that external resistor assemblies be connected to the input terminals. These are provided with your instrument based upon the Model Number ordered. See the Input Wiring Diagrams for installation information.
3	Check interconnection wiring	If the actual sensor does not come directly to the UDC but is instead connected via one or more intermediate junction panels which in turn are connected to the UDC, then check the continuity of the sensor to the UDC. Check the tightness of the screws or connectors at the junction panels.
4	Check Input Signals.	Using a multimeter, measure the actual signal present at the terminals to ensure that it is within the allowed input range as shown in Installation Section.
5	Change the Input Type in order to restore Factory Calibration.	See Configuration Section
6	Replace Input Board.	Installation instructions provided with new board.
7	Replace Controller.	