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GE Energy

**Functional Testing Specification**

*Inspection & Repair Services  
Louisville, KY*

**LOU-GEF-AXIS2x  
Standard 1050 Axis Card**

**Test Procedure for AXIS2G Printed Circuit Board**

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## Functional test procedure for AXIS2G Printed Circuit Board

### 1. SCOPE

- 1.1 This specification provides the Engineering Requirements for testing the AXIS2G printed circuit board. The process applies only to AXIS2G boards model number 44A399739-G01.

### 2. STANDARDS OF QUALITY

- 2.1 Refer to the current revision of the IPC-A-610 standard for workmanship standards.

### 3. APPLICABLE DOCUMENTS

- 3.1 The following document(s) shall form part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue shall apply.
- |       |                  |   |
|-------|------------------|---|
| 3.1.1 | <b>GEK-36093</b> | Diagnostic Software for 1050T Controls  |
| 3.1.2 | <b>GEK-71632</b> | Diagnostic Software for 1050MC Controls |
| 3.1.3 | <b>GEK-45668</b> | Computer Access Panel                   |
| 3.1.4 | <b>44C283973</b> | Schematics                              |

### 4. ENGINEERING REQUIREMENTS

#### 4.1 Description

- 4.1.1 The 1050 Control is a solid-state, integrated circuit controller/processor system using LSI circuits for data processing and control. The static logic circuits are arranged on modular, plug in, printed circuit boards, clearly identified by type. The circuit boards are mounted with functional grouping. In addition, a board identification number marks each rack slot. The backplane consists of printed conductors arranged in a busing structure so that each slot is universal and can accept any board type. The 1050 control uses the AXIS2 board for controlling two or more axis drives.

#### 4.2 Equipment Cleaning

- 4.2.1 Equipment should be clean and free of debris prior to applying power unless performing an initial check. Refer to the local documented procedures for cleaning guidelines.

#### 4.3 Equipment Inspection

- 4.3.1 Equipment should be visually inspected for any defects prior to applying power. This inspection should include the following as a minimum:
- 4.3.1.1 Wires broken or cracked
  - 4.3.1.2 Terminal strips / connectors broken or cracked
  - 4.3.1.3 Loose wires
  - 4.3.1.4 Components visually damaged
  - 4.3.1.5 Capacitors leaking
  - 4.3.1.6 Solder joints damaged or cold
  - 4.3.1.7 Circuit board burned or de-laminated
  - 4.3.1.8 Printed wire runs burned or damaged

## **EQUIPMENT REQUIRED**

- 4.4** The following equipment is required to perform the process requirements. Equipment may be substituted provided that all accuracy's and test ratios are equivalent or better.

Qty	Reference #	Description
1	GE 1050T/MC	CPU3 Model
1	GE Computer Access Panel	External Interface
1	Diagnostic Tape Specific to Control	Diagnostic Tape
1	Executive Tape Specific to Control	Executive Tape
1	Part Program Specific to Control	Part Program Tape
1	Axis Cart	Motion Cart for Control
1	HP 3478A or Similar	Precision Volt Meter

## **5. TESTING PROCESS**

### **5.1 Diagnostic Test**

- 5.1.1** Ensure that board is strapped for proper control (1050T) and axis (board #1). See attachment 1, strapping for 1050 AIXS2 boards.
- 5.1.2** Remove existing board from control and insert board to be tested.
- 5.1.3** Load third section of diagnostic tape into 1050 Control. When tape has finished loading the display should read, "**TURN CONTROL OFF, THEN CONTROL ON**". Turn off control.
- 5.1.4** Turn on control and toggle "RUN" switch on the CAP panel to start control.
- 5.1.5** Depress "OPTION STOP" to enter diagnostics, "**READY ENTER DATA**" should appear on display.
- 5.1.6** Push "CYCLE START" to run diagnostics, takes about fifteen seconds to go though entire test if no error occur. The resultant display will be; **AXIS\* 1 Test Complete, THC\*1 Test Complete, Axis\*1 interaction Complete.**
- 5.1.7** If errors occur, press option stop to display error. Once recorded, shut down control and repair board. Go back to **5.1.4** if repair of board was necessary. If no error occurred, continue on to next section.

### **5.2 Diagnostic test with axis motions**

- 5.2.1** Press "OPTION STOP" until "**READY-ENTER DATA**" appears on display.
- 5.2.2** Turn selector switch on CAP Panel to MEM ADDRESS and load 00F3 on CAP panel; press the "LOAD DATA" toggle switch.
- 5.2.3** Turn selector switch on CAP Panel to MEM DATA and load 00F3 into control by toggling the "LOAD DATA" switch.
- 5.2.4** Press the "NEXT" push button on control, then enter 2 from keyboard and press "CYCLE START".
- 5.2.5** Press "CYCLE START" again until the "OPTION STOP push button stops flashing, test should now be running.

### 5.3 Test 80

- 5.3.1 Press “NEXT”, resolver feedback will appear on display for X-axis and Z-axis.
- 5.3.2 Go to motion cart and hand crank both servos and check for up count and down count on display. This is a visual test and failures will not halt test, operator is responsible for sighting errors.
- 5.3.3 Press “OPTION STOP” to continue to test 81.

### 5.4 Test 81

- 5.4.1 Display should read “**E-STOP JUMPER OUT**”. Place E-STOP switch on control station down to jumper out the E-stop circuitry, press “NEXT”.
- 5.4.2 Push “CONTROL ON” button to bring control out of an E-Stop condition, E-Stop light should go out.
- 5.4.3 Be sure that the spindle, X-axis, Z-axis are disabled on the motion cart.
- 5.4.4 Press “NEXT” to continue test.
- 5.4.5 Plug multimeter’s positive lead into axis-1 plug on front panel, common lead to common plug on front panel.
- 5.4.6 Press 0 on keyboard and adjust P2 on the upper axis to register zero volts on multimeter, (voltage range is only +0.02 to –0.02 volts), be careful.
- 5.4.7 Press 6 on keyboard and check for 4 volts on multimeter, if voltage is off adjust the X gain POT on the AGA1 board (located at back of control) until 4.00 is registered on meter.
- 5.4.8 Readings should be appear as follows when the appropriate keyboard button is pushed. If not, go back and ensure the two previous steps were done correctly.

<u>P.B</u>	<u>LAG Counts</u>	<u>Pin U03 (Volts)</u>	<u>Tol.</u>	<u>Lag Counts</u>	<u>Pin U03 (Volts)</u>	<u>Tol.</u>
0	0	+0		-0	-0	
1	+50	+.22	+-.1V	-50	-.22	+-.1V
2	+100	+.45	+-.1V	-100	-.45	+-.1V
3	+200	+.9	+-.2V	-200	-.9	+-.2V
4	+400	+1.8	+-.3V	-400	-1.8	+-.3V
5	+800	+3.4	+-.3V	-800	-3.4	+-.3V
6	+1000	+4.0	+-.1V	-1000	-4.0	+-.1V
7	+2000	+5.5	+-.3V	-2000	-5.5	+-.3V
8	+3000	+6.5	+-.3V	-3000	-6.5	+-.3V
9	+4000	+7.5	+-.3V	-4000	-7.5	+-.3V

## Test 81 Continued

- 5.4.9 Press “-“ on the keyboard to get negative readings. Reverse the order of readings while checking to make sure they are the same, only negative.
- 5.4.10 Press “NEXT” to get Axis-2 (Z-axis) readings.
- 5.4.11 Plug multimeter’s positive lead into axis-2 plug on front panel, common lead to common plug on front panel.
- 5.4.12 Press 0 on keyboard and adjust P2 on the lower axis to register zero volts on multimeter, (voltage range is only +0.02 to –0.02 volts), be careful.
- 5.4.13 Press 6 on keyboard and check for 4 volts on multimeter, if off adjust the Z gain POT on the AGA1 board (located at back of control) until 4.00 is registered on meter.
- 5.4.14 Should see the same readings on axis-2 (Z-axis) as in the table above in section 5.4.8, (positive and negative) as were on axis-1 (X-axis).
- 5.4.15 Press “OPTION STOP” to continue on to Test 82.

## 5.5 Test 82

- 5.5.1 Be sure to leave the E-Stop switch down, “**ENABLE SERVOS**” should now be displayed on control.
- 5.5.2 Enable X and Z servos on motion cart.
- 5.5.3 Display should read “PRESS NEXT”, press the “NEXT” push button.
- 5.5.4 Press, “1” on the keyboard to get X servo to run, press “2” on the keyboard to get Z servo to run, servo X and Z have to be running to do Test 82.
- 5.5.5 Press “OPTION STOP” to continue on to Test 83.

## 5.6 Test 83

- 5.6.1 Keyboard buttons 1 and 2 are for axis selection. Whereas keyboard buttons 3 through 6 are for inches per minute selection. Pressing “CYCLE START” push button will initiate speed or directional command and pressing the “CLEAR” push button will stop axis. You must stop the axis before changing axis, speed, or direction.
- 5.6.2 The follow reading should appear when the corresponding keyboard (P.B.) entry is made.

<u>P.B.</u>	<u>IPM</u>	<u>Pin U03 (+Volts)</u>	<u>Tolerance</u>	<u>IPM</u>	<u>Pin U03 (-Volts)</u>	<u>Tolerance</u>
3	+40	+2.1	+- .5 volts	-40	-2.1	+- .5 volts
4	+60	+3.2	+- .5 volts	-60	-3.2	+- .5 volts
5	+100	+5.3	+- .5 volts	-100	-5.3	+- .5 volts
6	+200	+8.5	+- .5 volts	-200	-8.5	+- .5 volts

- 5.6.3 Go through all the above readings, both positive and negative with both axis 1 and axis 2.
- 5.6.4 Press “OPTION STOP” to end test. Turn off (flip to up position) E-Stop switch. Then press “NEXT”:
- 5.6.5 Display should read “**AXIS TEST COMPLETE**”, step through the last few tests by using “OPTION STOP” and the “NEXT” push buttons. At “**READY-ENTER DATA**”, turn off control.

## 5.7 Running a Part Program

- 5.7.1 Load executive software into control, be sure servos are disabled on motion cart.
- 5.7.2 After tape finishes loading and rewinding, turn off "SOFTWARE LOAD SWITCH".
- 5.7.3 Press "CONTROL ON" push button to bring control out of an E-Stop condition. Control should display "**ZERO MACHINE**".
- 5.7.4 Load short part program tape into tape reader and enable servos on motion cart.
- 5.7.5 Press "CYCLE START" and tape reader should begin to read tape and axis's should start turning. When tape is completed it should rewind.
- 5.7.6 Disable servos, shut down motion cart, and turn off control.

## 5.8 \*\*\*TEST COMPLETE\*\*\*

## 6. NOTES

- 6.1 Cheap sockets have been known to cause intermittent problems and will keep the control from initializing, FFFE on the computer access panel.

## 7. REFERENCES

- 7.1 Proms used on an AXIS2G board.

Location	Checksum	GE #	Chip type	Chip type
A9	0DEF	662-001A	74S287	14S10/AM27S21/82S123
B9	0C75	662-002A	74S287	14S10/AM27S21/82S123
H9	0E3C	662-003A	74S287	14S10/AM27S21/82S123
C9	0E03	662-004A	74S287	14S10/AM27S21/82S123
G9	0BD8	662-005A	74S287	14S10/AM27S21/82S123
F9	0B54	662-006A	74S287	14S10/AM27S21/82S123
D9	0D09	662-007A	74S287	14S10/AM27S21/82S123
E9	0CEC	662-008A	74S287	14S10/AM27S21/82S123
J11	0ECE	662-018A	74S287	14S10/AM27S21/82S123
H11	012C	601-009A	74S288	18SA030/82S129/82S123
G11	013B	601-010A	74S288	18SA030/82S129/82S123
B11	0C50	601-011A	74S288	18SA030/82S129/82S123