g GE Energy	**Functional Testing Specification**
Inspection & Repair Services ***Louisville, KY***	**LOU–GEF** **PCI2A**

Test Procedure for PCI2A Printed Circuit Board

DOCUMENT REVISION STATUS: Determined by the last entry in the "REV" and "DATE" column

REV.	DESCRIPTION	SIGNATURE	REV. DATE
A	Initial release	C. Wade	06/06/2005
B			
C			

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DATE	**DATE**	**DATE**	**DATE**
06/06/2005			6/6/2005

Functional test procedure for PCI2A Printed Circuit Board

1. SCOPE

1.1 This specification provides the Engineering Requirements for testing the PCI2A printed circuit board. The process applies only to PCI2A boards model number 44A399785-G02.

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	**GEK-36093**	Diagnostic Software for 1050T Controls
3.1.2	**GEK-45668**	Computer Access Panel
3.1.3	**44C285480**	Schematics
3.1.4	**GEK-3607**	Programmable Control Interface (PCI)

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	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	PCI Ladder Tape	PCI Tape
1	Special MSD Tape	Machine Setup Data Tape
1	Axis Cart	Motion Cart for Control

5. TESTING PROCESS

5.1 Diagnostic Test

5.1.1 Ensure that board is strapped for 256 relays. See attachment 1, PCI board strapping

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. Turn ON Logitrol 550 Programming Panel.

5.1.4 Turn on control and toggle the "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 two minutes 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, PCI Test in Progress, PCI Test Complete, Total Errors 00.**

5.1.7 If errors occur, press option stop to display error. Once recorded, shut down control and repair board. Go back to **5.1.3** if repair of board was necessary. If no error occurred, continue on by pressing "CYCLE START".

5.1.8 At the "**READY-ENTER DATA**", press 9, then "NEXT", then 2, then "CYCLE START".

5.1.9 The display test should start with different characters rolling across the screen. Press "CYCLE START", until display stops moving.

5.1.10 The "OPTION STOP" push button should be flashing, press "CYCLE START" until the "OPTION STOP" button stops flashing and wait until display reads "**AXIS2*1 Test 80, Depress Next**".

5.1.11 Press "NEXT" and resolver feedback should be displayed on screen

5.1.12 Press "OPTION STOP" to end test. The display should now read "**THC*1 Test 22, Depress Next".**

5.1.13 Press “NEXT” and Feedrate Pot and Dip Switch setting should be displayed on screen.

5.1.14 Press “OPTION STOP” to end test. The display will now read “**THC*1 Test 23, Depress Next**”.

5.1.15 Press “Next” and the Spindle Angle will be displayed on screen.

5.2 PCI Testing

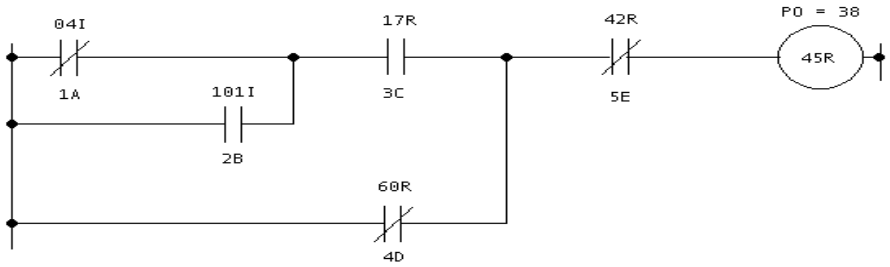
5.2.1 Press “OPTION STOP” to end test. The display will now **read “THC1*1 Test Complete**”, followed soon by “**THC-Axis*1 Interaction Complete**”, followed soon by “**PCI Test in Progress**”. After a minute or so the display should register how many rungs the PCI board is strapped for. Display should read “**Test 62, 256 Programmable Relays**”.

5.2.2 Press “CYCLE START” to move to next test. Display will read “**PCI Serial I/O Tests, Press Next**”.

5.2.3 Press “NEXT”. Display will read “**Press 2 for Programming Panel, 1 Other**”.

5.2.4 Press “2”. Display now reads “**PCI I/O Test 76 (Programming Panel)”.**

5.2.5 On Programming Panel Press “1”, then “0”, then “1”, then search buttons, you should see the following relay combination at Rung 45R



5.2.6 Press “CYCLE START” if correct.

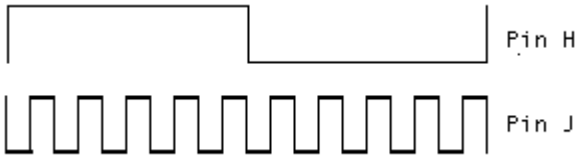
5.2.7 Test 77 is announced by the display in the same manner as Test 76. Test 77 checks data write by the programmer’s panel. (The operator may enter any relay configuration by using the programmer’s panel, and then verify that the programmer’s panel shows the described change). Move cursor to an input and push jumper on Program Panel, then hit enter; you should see the reflected input on the screen. Exit Test 77 by depressing “CYCLE START” if successful or “OPTION STOP” for failure.

5.2.8 If no error proceed to next section

5.3 Running a PCI Ladder Program

5.3.1 Be sure I/O panel on the front of the 1050T is hooked up to IFI32#3 and ODI32# boards. Wires are labeled appropriately.

5.3.2 Hook up scope channel one to D11 pin H, and channel two to D11 pin J. Scope should be set to .1ms, .5 volts/div, X10 probes, Chop. Turn on control and adjust pots to correspond to the following waveforms on your scope. P1 will affect Pin H's waveform, and P2 will affect Pin J waveform.



5.3.3 It made be very hard to see the exact waveform, so look for something that is close. The pots that control these waveforms are adjustable, so depending where they are set will dictate the length of the waveform. C12 and C14 capacitors play an active role in these waveforms, putting the wrong size in will change the length of the waveforms.

5.3.4 Once this is done load tape. Load executive software into control, be sure servos are disabled on motion cart.

5.3.5 After tape finishes loading and rewinding, load MSD and PCI ladder tape into tape reader without turning off the "SOFTWARE LOAD" switch.

5.3.6 Press "CYCLE START" push button to begin loading MSD tape.

5.3.7 The MSD tape takes just a few seconds to load, then press "CYCLE START" again to load the PCI ladder onto the PCI board. Tape will rewind when finished.

5.3.8 Turn off "SOFTWARE LOAD" switch. Control should display "**Servo Fault", "Motion Inhibited**".

5.3.9 Go to switch panel and flip all switches, it's corresponding light should light up as each switch is engaged. (You can verify the activation of the switch either through the I/O page of the control or through the programmer panel).

5.3.10 Turn off control.

5.1 ***TEST COMPLETE ***

6. NOTES

6.1 Have had some trouble getting the Logitrol 550 programming panel working, may have to reset cards.

7. REFERENCES

Some information about the PROMs used on this card.

Location	Checksum	GE #	Chip type	Chip type
F13	1726	35-001A	74S474	
C13	0679	35-002A	74S474	
F14	A80F	35-003A	74S474	
H13	DCD3	35-004A	74S474	
E13	05AB	35-005A	74S474	
H14	AA1C	35-006A	74S474	
J13	60CA	35-007A	74S474	
E14	8670	35-008A	74S474	
J14	5239	35-009A	74S474	
K15	111E	34-001A	74S288	18S030/82S123
K14	029F	34-002A	74S288	18S030/82S123
K13	16FC	34-003A	74S288	18S030/82S123
K12	0D11	34-004A	74S288	18S030/82S123
K11	15FC	34-005A	74S288	18S030/82S123
J11	0C86	34-006A	74S288	18S030/82S123