g	GE Energy	**Functional Testing Specification**
	Inspection & Repair Services *Louisville, KY*	**LOU-GEF-MCD1** **MCD1 Board**

Test Procedure for MCD1 Printed Circuit Board for a 1050HL Control

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PREPARED BY Rick Diercks	REVIEWED BY	REVIEWED BY	QUALITY APPROVAL *Charlie Wade*
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Functional test procedure for 1050HL MCD1 Printed Circuit Board

1. SCOPE

1.1 The instructions apply to all MCD1 boards in test.

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-25341**   Operators Manual for 1050HL Controls
3.1.2 **GEK-25340**   Support Manual for 1050HL Controls

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.

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

5. **EQUIPMENT REQUIRED**

    5.1 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 1050HL	Control with axis cart

6. **Purpose :**
    6.1 To describe the procedure for testing the digital and analog circuitry of the MCD1 board using the 1050HL simulator.

7. **General:**
    7.1 Testing of the MCD1 board is done in three steps. The first step involves using the 1050HL diagnostics software to test the board's A/D conversion circuit. The second and third step involves a check of the D/A spindle circuit and a functional check.

8. **TESTING PROCESS**
    8.1 **Diagnostics Tests**
        8.1.1 Remove test MCD1 board from slot 25 and insert the extender and the board to be tested.
        8.1.2 Place Special Mode switch (UP).
        8.1.3 Press "ON".
        8.1.4 "00" should appear in the message display and "?" in the alphanumeric display.
        8.1.5 A "20" in the message display indicates that no machine setup date (MSD) is stored in memory. MSD is not necessary to operate the software diagnostics, but is required to perform the functional testing.
        8.1.6 The procedure for entering the MSD into the control memory is described in Exhibit A.
        8.1.7 Press "P4", "1", and "Enter". This instructs the control to read from the resident diagnostic boards (DPMA and DPMD).
        8.1.8 "T" will appear in the alpha display. Press '6000" and "Enter". This instructs the control to read the block of diagnostics that contains the MCD1 board tests. See exhibit B.
        8.1.9 "C" will appear in the alpha display. The 6000 block consists of twelve subtests. However only subtests 7, 8, 11, & 12 pertain to the MCD1 board.
        8.1.10 Press '7", "Enter", and "FWD".
        8.1.11 "I" will appear in the alpha display. Pres "Enter".
        8.1.12 "S" will appear in the alpha display. Press "Enter".
        8.1.13 Press "FWD" and "G".
        8.1.14 Turn P% fully CCW.
        8.1.15 Turn P1 and observe that the display varies from 0000 to 0254.
        8.1.16 Note: It may be necessary to adjust P5 slightly to count down to 0000.
        8.1.17 Press "DELETE BLOCK" to exit 6007 block.
        8.1.18 Repeat procedure from step 8, entering subtest Number 8 in step 10.
        8.1.19 Turn P3 and observe display count from 0000 to 0254

8.1.20 Press "DELETE BLOCK" then go to Number 11 subtest as previously explained.

8.1.21 Turn spindle speed pot on control. Observe display for a count of 0000 to 0120.

8.1.22 This concludes the first part of the MCD1 board tests. The following tests can only be run on the 1050HL motion simulator.

8.2 Motion Tests for the MCD1 Board

8.2.1 MSD must be stored in memory. See steps 8.1.5 & 8.1.6 in previous section.

8.2.2 Special mode switch should be off (Down).

8.2.3 Press "ON".

8.2.4 "00" should appear in message display. If an error code appears, consult Exhibit C for explanation.

8.2.5 Move display select to program. Press "DELETE PRGRM" to clear program memory.

    8.2.5.1 NOTE: Detailed programming instructions can be found in GEK-71740.

8.2.6 Key in the following program. Increment to next block by pressing "NEXT BLOCK".

Block Number		
0010	S1500	M03
0020	S1125	
0030	S750	
0040	S375	
0050	M04	
0060	S750	
0070	S1125	
0080	S1500	
0090	M05	
0100	M30	

    8.2.6.1 NOTE: Program will remain in memory unless "DELETE PRGRM" is pressed. Therefore it is not necessary to repeat this step for every board.

8.2.7 Press "SINGLE". The instructs the control to only execute one block of instructions at a time.

8.2.8 Move display select to active and press "F". Turn feed rate pot on control to 100%. Adjust P5 on board to make display read 100.

8.2.9 Press "S" and "↑" and verify that turning the spindle pot will vary the display from 500 to 120.

8.2.10 Elect gear range 4 on the left console. Connect VOM to MCD1 jacks on front panel.

8.2.11 Adjust P7 for 0VDC.

8.2.12 Turn spindle pot to 100%. Press "↓" to observe RPM.

8.2.13 Press "CYCLE START", program should start. Adjust P6 to 7.5VDC. Press "CYCLE START" to increment to each program block.

8.2.14 Observe the output voltage at each RPM and compare to the following specs.

8.2.14.1

Program RPM	DC Voltage
1500	7.5
1125	5.80 - 5.45
750	3.86 - 3.63
375	1.93 - 1.81
-375	-1.93 - -1.81
-750	-3.86 - -3.63
-1125	-5.80 - -5.45
-1500	-7.35 - -7.65

*8.3 ***TEST COMPLETE ******

9. NOTES

9.1 Exhibit A

9.1.1 Special Mode switch on (UP).
9.1.2 Press "CONTROL ON".
9.1.3 Press "P3".
9.1.4 Key in "00500054"
9.1.5 Press "ENTER".
9.1.6 Press "↑" to increment to next line. ("↓" maybe used to decrement to previous line.)
9.1.7 Use the above procedure to enter the reminder of the MSD as follows.

9.1.7.1

Line Number	Data
00	00500054
01	02000000
02	20202020
03	20202020
04	06060808
05	99991500
06	00000000
07	00000000
08	15001500
09	15001500

9.1.8 Errors may be corrected by simply writing over the incorrect data line and pressing "ENETER"
9.1.9 To exit MSD Mode press "OFF" then "ON", data will be retained in the battery supported RAM on the PGM2 board.

9.2 Exhibit B

ROM Board Diagnostics for the 1050H Control
Test Descriptions - Axis Controller
Operator-Aided Diagnostics   GEK-71770

AXIS CONTROLLER
OPERATOR-AIDED DIAGNOSTICS

Identification Number: 6000. Composed of 12 sub-
tests, numbered 6001-6012.

Boards Tested: First MIC, Second MIC, Third MIC,
Fourth MIC, SPPC, MCD, MIIO

Commands:

Key in test number of function to be exercised per
the table below. (See example 3, page 6.)

Table 14.
AXIS CONTROLLER OPERATOR-AIDED DIAGNOSTICS

COMMAND NUMBER	FUNCTION
1	Selects and runs spindle RPM check.
2	Selects and runs spindle resolver check.
3	Selects and runs first axis feedback resolver check.
4	Selects and runs second axis feedback resolver check.
5	Selects and runs third axis feedback resolver check.
6	Selects and runs fourth axis feedback resolver check.
7	Selects and runs first axis reversal error count check.
8	Selects and runs second axis reversal error count check.
9	Selects and runs third axis reversal error count check.
10	Selects and runs fourth axis reversal error count check.
11	Selects and runs manual feedrate override check.
12	Selects and runs spindle speed override check.

Displays: Standard displays excluding Error Count/
Pass Count

    G - display dependent upon test being ex-
ercised.

Error Numbers: 94 - Invalid Command

General Comments:

Each sub-test requires that the user verify proper
operation of the feedback devices or functions being
tested. In these operator-aided diagnostics, the
function to be exercised is selected by entering the
command number for the desired test. If the enter-
ed command number is invalid, error code 94 is dis-
played as soon as the test begins to execute.

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9.3   Exhibit C

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SECTION 4
OPERATOR MESSAGES

The following table contains a list of operator mes-
sages generated by the Control, their meanings, and
the time at which the check is performed. A complete
description including probable cause and recovery
procedure is contained in Section 3, page 34.

Table 4.
OPERATOR MESSAGES

MESSAGE	MESSAGE MEANING
00	M00 program stop.
01	M01 option program stop.
02	M02 End of Program.
10**	Data control RAM error.
12**	Data control PROM checksum error.
13**	PCI RAM error.
14**	PCI Edit PROM checksum error. This check will be made only if the PCI option is installed.
15*	Part program RAM error.
16	Part program memory exceeded.
17	RS-232 Port overrun or parity error.
18+	Part program format error loaded from RS-232 port.
19*	Flashing - channel operation error; steady-channel data error.
20*	MSD/TOOL DATA/OFFSET checksum error. If the special mode switch is on, a "?" is displayed in addition to the 20. In addition to displaying an error message, the MSD and all tool data pairs are set to zero when the checksum error is detected.
21*	Part program checksum error. Part program storage is cleared.
30	M30 program stop-rewind.
40*	Supervisor operating error.
47+	Tool number greater than 18 programmed.
48	X axis servo board fault; out-of-sync; loss of clock; loss of feedback.
49	Z axis servo board fault; out-of-sync; loss of clock; loss of feedback.
50+	Canned cycle threading error.
51+	Other canned cycle error.
52+	Worksurface programming error.
53+	Illegal G code in the Execute mode.
54+	G63, G64, G65 programming error.
55*	X axis MIC not present.
56*	Z axis MIC not present.
57*	Spindle board not present (except for resolverless IPR).
58*	D/A Input board (MCD1) not present.
59*	Programming productivity PROM not installed.
60+	Data format error in part program block.
61+	No Constant Surface Speed constraint programmed.
62+	No Constant Surface Speed surface speed programmed.
63+	Illegal combination of data.

  *Checked during power-up. Failure will cause a Stop condition that may be cleared only by turning the Control off and then on again.
 **Checked during power-up and clear.
***Checked during clear only.
  +Error is further defined in universal command display. Refer to Table 2, page 35, for a complete description.

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Table 2.
Continued

MESSAGE	MESSAGE MEANING
64+	Parametric subroutine parameter (#) entry without G24.
65+	Too many blocks in G66, G67, G68, or G69 contour description.
66+	Change in G66, G67, G68, or G69 contour direction.
67+	Parameter error in subroutine or G66-69. G66-69 error.
68+	Subroutine error.
69	End of stored program in memory.
71*	Invalid MSD for feedback gearing.
72*	Axis MSD for error limit, out-of-sync or zone = 0.
73+	Axis error - false acknowledge.
74***	Axis error - lost interrupt.
75	Reference, grid, or set zero required.
76	Offset error.
77**	Axis control 16-bit RAM error.
78**	Axis control 8-bit RAM error.
79**	Axis control PROM checksum error.
80	Spindle overspeed.

*Checked during power-up. Failure will cause a Stop condition that may be cleared only by turning the Control off and then on again.
**Checked during power-up and clear.
***Checked during clear only.
+Error is further defined in universal command display. Refer to Table 2, page 35, for a complete description.

INDUSTRIAL CONTROL DEPARTMENT, GENERAL ELECTRIC COMPANY, CHARLOTTESVILLE, VIRGINIA

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