g GE Energy	**Functional Testing Specification**
Inspection & Repair Services ***Louisville, KY***	**LOU-GEF-DIO02** MC2000 Digital IO Card

Test Procedure for DIO02 I/O Card

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

REV.	DESCRIPTION	SIGNATURE	REV. DATE
A	Initial release	Rick Diercks	02/01/2008
B			
C			

PREPARED BY	REVIEWED BY	REVIEWED BY	QUALITY APPROVAL
Rick Diercks			Charlie Wade
DATE	**DATE**	**DATE**	**DATE**
02/01/2008			2/4/2008

Functional test procedure for DIO02 Digital Input & Output card.

1. SCOPE

1.1 This specification provides the Engineering Requirements for testing DIO02 cards. The process applies only to control cards model number 44A719305-C02

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-25382**	Maintenance & Troubleshooting
3.1.2	**GEK-25381**	Startup & Adjustments
3.1.3	**GEK-25391**	System Diagrams
3.1.4	**44C719625**	Board Schematics
3.1.5	**GIT-200**	**TAB12** Diagnostic Software

4. ENGINEERING REQUIREMENTS

4.1 Description

4.1.1 The DIO Board (44A719305-G02) is an interface for the MC2000 to digital input and output from the machine tool. Inputs accept contact closures connected to P24V and outputs switch to P24V. The board provides 40 inputs and 24 outputs. Eighteen of the outputs are FET's arranged in three groups of six, each having a common +24V power source. Six output are reed relays with both contacts on the relay brought to the connector.

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 MC2000 Bench Test Control	2000 Bench test Control
1	GE MC2000 PWM Drive Control	2000 Control with axis Motors
1	Factory Service Diagnostics	Resides on Bubble Board MB1:
1	7.59MC Software	Resides on Bubble Board MB3:

5.1 TESTING EQUIPMENT

1 Fluke Multimeter
1 DIO WADI1Test Board
1 DIO Test Box

6. TESTING PROCESS

6.1 Pre Test Requirement

6.1.1 Install board in MC2000 Control Rack
6.1.2 Connect Test Box Cables into DIO's 1PL and 2PL
6.1.3 Connect OHM Meter into Test Box Relay Contact U29 Test Jacks.
6.1.4 Place Test Box Drive Input Switch in up position to High.
6.1.5 Turn control on by depressing green "Control On" push button on the NCS Station. If the LED on the CPU does not come on, stop the testing and begin your troubleshooting.
6.1.6 "Power Up Diagnostics" should be displayed on screen, followed by "System Loading", which will be followed by "Mark Century 2000 Service Diagnostics Initialization" & "Make any Keyboard entry for manual/menu mode".
6.1.7 Press any key and Factory Diagnostic Screen will be displayed.

6.1.8 To select a heading on the menu page, use the cursor control up or down arrow key. Go to manual testing of the DIO by selecting Digital I/O Test and pressing enter or return. You need to go through the following tests.

6.1.9 "1. Manual Control Test Bit MAP DIO #2: Inputs should be all **"1"** Outputs should be **"0" (IF not the board it bad shut down and repair DIO)** using Keyboard enter 1 into all Outputs all test lamps should be on. Tested each relay contact output U29-U37 with OHM Meter (should be closed les than 1 Ohm). Enter 0 into all Output Lamps should go off and relays open.

6.1.9.1 "2. Automatic Test, test 5 times.

6.1.9.2 "3. Flash Diagnostic LED Test, test 5 times.

6.1.9.3 "4. Initiate Output High Test, 1 time. With Ohmmeter, check all 6-relay contacts should be less than 1 ohm.

Place Test Box Drive Input Switch in down to low position

6.1.9.4 "5 Initiate Outputs Low Test, Test 1 all lamps should go off. With Ohmmeter, check all 6-relay contacts should be open.

Place Test Box Drive Input Switch in up to high position

6.1.9.5 "6 Alternating Highs and Low Test, test 5 times. Test Box lamps should alternately flash.

6.1.9.6 "7 Shift Pulse Test, test 25 times and observe test box lamps. A "cascade" effect will be observed with lamps being driven low and high and Relays contacts open and close.

6.1.10 This should help determine what area has failed on the DIO card. Only after board has passed all tests should you continue on.

6.1.11 **END of Test Shut down**

6.1.12 Remove DIO from MC2000 PWM Drive Control

6.1.13 Install WADI1 Test Board into DIO 1PL and 2PL, also connect +24V Install in MC2000 Bench Test Control Logic Rack.

6.1.14 Turn control on by depressing green "Control On" push button on the NCS Station. If the LED on the DIO does not come on, (LED does not light up until program is completely Loaded) stop the testing and begin your troubleshooting.

6.1.15 "Power Up Diagnostics" should be displayed on screen, followed by "System Loading", which will be followed by "Mark Century 2000 Service Diagnostics Initialization" & "Make any Keyboard entry for manual/menu mode".

6.1.16 Press any key and Factory Diagnostic Screen will be displayed.

6.1.17 Go to diagnostic page and select "Execute Automatic Test Cycle", Push Enter.

6.1.18 Enter test name "DIO", Push Enter.

6.1.19 Enter number of test cycles as 1 to 99, Push Enter. Usually we choose 25 to 50 cycles depending on the board problem. Takes a little over a minute to run 1 cycle.

6.1.20 The following headings will appear on the CRT and "Working" will appear under the headings:

6.1.20.1 "DIO PRTO AUTOMATIC"

6.1.20.2 "DIO PRTO SHIFT"

6.1.20.3 "DIO PRTO ALTERNATE"

6.1.21 If all the tests pass, control will come back to "Factory Test Diagnostics" page. Skip next section and go to section 6.3

6.2 If test fails, then "Failure in Error Log" will be displayed.

6.2.1 Depress any key to continue to main menu.

6.2.2 Select "Error Log Options", press enter.

6.2.3 Select "Display Error Log", press enter.

6.2.4 Scroll through Error Log with the Down key until "fail" appears in log.

6.2.5 Record test name for all failures present in Error Log.

6.2.6 When all failures are recorded, depress Cancel.

6.2.7 Select "Erase Error Log", and push enter.

6.2.8 Press "Cancel" to return to main menu. Shut down control and troubleshoot card. MB3 Test

6.3 PART PROGRAM TEST

6.3.1 Remove DIO from MC2000 PWM Test Control

6.3.2 Remove WADI1 Test Board. And Install in MC2000 PWM Drive Control.

6.3.3 Before turning on control: be sure proper boards have been inserted into the logic rack and CPU switch is in the middle position.

6.3.4 If everything is ready turn on control, pressing "ON".

6.3.5 It will take a minute or so for control to boot up. Once done the CRT should display a banner page for 7.59MC control. All LEDs should be lit on all board.

6.3.6 Once control is up and on line with the 7.59MC application, select "INDEX" on the white keys at the top of the keyboard. This should cause the control to display two or three part programs, select "MCLOOP Program" with the gray buttons, and then press POSN, one of the white keys. This should take you back to the position page.

6.3.7 Turn on axis cart and enable drives.

6.3.8 Press Control On again, this will lock in drives from control.

6.3.9 Press "Auto" and then "Cycle Start" and drive should begin to move and will continue until pressing "Cancel or Clear" to halt program.

6.3.10 Run Part Program Test for 4 to 6 hours.

6.3.11 When complete power down control.

6.3.12 Shut down and remove DIO from Rack.

******TEST COMPLETE ******