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

Test Procedure for IOC02, IOC03, & IOC12 Control Cards

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Functional test procedure for IOC02, IOC03, & IOC12 control cards.

1. SCOPE

1.1 This specification provides the Engineering Requirements for testing IOC02, IOC03, & IOC12 control cards. The process applies only to control cards model number 44A719304-102 thru 105.

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**	IOC02, IOC03, IOC12 Schematics

4. ENGINEERING REQUIREMENTS

4.1 Description

4.1.1 The IO Controller (IOC) serves as the interface between system memory and various elements such as Digital IO, Analog IO, Bubble memory, NC Control Station, Remote IO (Machine Control Station), and a local port, Port A. The IOC generally makes data transfers between these devices and main memory in response to commands issued by the CPU. Interrupts are used by the CPU and IOC to signal the initiation and completion of tasks.
The IOC communicates with order boards over both the System Bus and the Local IO Bus. It may make data transfers over the System Bus after becoming the Bus Master via a priority –resolving technique. The IOC is the permanent Bus Master for the local IO Bus; it initiates all data transfer over that bus. There is one and only one IOC of this type is each system.

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 Control	2000 Control with axis cart
1	Factory Service Diagnostics	Resides on Bubble Board MB1:
2	Loop Back Plugs	Used with diagnostic software
1	Spindle Cable	Volt Meter plugs into board through this cable
1	HP	Bench Multimeter (High Resolution)
1	7.59MC Software	Resides on Bubble Board MB3:

6. TESTING PROCESS

6.1 Pre Test Requirement

6.1.1 Insure control is off.
6.1.2 Verify EPROMs are installed correctly on card and DRM03 board is strapped correctly for proper IOC. IOC02 & IOC03 will be running at 5 MHz, whereas IOC12 will run at 8 MHz, DRM03 need to strapped accordingly.
6.1.3 Remove KGB and install IOC card into logic rack. Install loop back plugs in location 1PL & 2PL and install NCS cable into 3PL. Spindle cable goes into 4PL connected to the bottom two pins.
6.1.4 Turn control on by depressing green "Control On" push button on the NCS Station. If the LED on the IOC does not come on, stop the testing and begin your troubleshooting.
6.1.5 "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".
6.1.6 Press any key and Factory Diagnostic Screen will be displayed.
6.1.7 To select a heading on the menu page, use the cursor control up or down arrow key.

6.1.8 Go to manual testing of the IOC by selecting IOC Test and pressing enter or return. You need to go through the following tests. The last four can not be done without a special test card.

6.1.8.1 "1. IOC Local Ram Test
6.1.8.2 "2. IOC Timer Test
6.1.8.3 "3. IOC USART Test
6.1.8.4 "4. IOC Port A External Loop Test
6.1.8.5 "5. IOC Port D External Loop Test
6.1.8.6 "6. IOC D/A Converter
6.1.8.7 "7. IOC D/A Converter (Manual)

6.1.9 This should help determine what area has failed on the IOC card. Only after board has passed all tests should you continue on.
6.1.10 Go to diagnostic page and select "Execute Automatic Test Cycle", Push Enter.
6.1.11 Enter test name "IOC", Push Enter.
6.1.12 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.

6.2 The following headings will appear on the CRT and "Working" will appear under the headings:
6.2.1 "1. IOC TEST LRAM" 9 sec
6.2.2 "2. IOC TEST TIMER" 7 sec
6.2.3 "3. IOC TEST USART" 29 sec
6.2.4 "4. IOC TEST SPINDLE" 7 sec
6.2.5 "5. IOC TEST PORT A" 8 sec
6.2.6 "6. IOC TEST PORT D" 9 sec
6.2.7 If all the tests pass, control will come back to "Factory Test Diagnostics" page. Skip next section and go to section 6.4.

6.3 If test fails, then "Failure in Error Log" will be displayed.
6.3.1 Depress any key to continue to main menu.
6.3.2 Select "Error Log Options", press enter.
6.3.3 Select "Display Error Log", press enter.
6.3.4 Scroll through Error Log with the Down key until "fail" appears in log.
6.3.5 Record test name for all failures present in Error Log.
6.3.6 When all failures are recorded, depress Cancel.
6.3.7 Select "Erase Error Log", and push enter.
6.3.8 Press "Cancel" to return to main menu. Shut down control and troubleshoot card.

6.4 MB3 Test.

6.4.1 Before turning on control be sure proper boards have been inserted into the logic rack and CPU switch is in the middle position.
6.4.2 If everything is ready turn on control, pressing “ON”.
6.4.3 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 except for the DIO02 card.

6.5 Part Program Test

6.5.1 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, then press POSN, one of the white keys. This should take you back to the position page.
6.5.1.1 Turn on axis cart and enable drives.
6.5.1.2 Press Control On again, this will lock in drives from control.
6.5.1.3 Press “Auto” and then “Cycle Start” and drive should begin to move and will continue until they are interrupted by pressing “Cancel or Clear” or removing power. Run Part Program Test for 4 to 6 hours.
6.5.1.4 When complete power down control.

6.6 ***TEST COMPLETE ***

7. REFERENCES

The latest revision EPROMs for this card are 174-008R & 174-009R.