g GE Energy Management	**Functional Testing Specification**
Industrial Repair Services ***Louisville, KY***	**LOU-GEF-IMC-A**

Test Procedure for a IMCxxx

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1. SCOPE

1.1 This is a functional testing procedure for an Independent Motion Control Unit.

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 Check board's electronic folder for more information

4. ENGINEERING REQUIREMENTS

4.1 Equipment Cleaning
4.1.1 Equipment should be clean and free of debris prior to applying power unless performing an initial check. Refer to site specific SRA's for cleaning guidelines.
4.2 Equipment Inspection
4.2.1 Equipment should be visually inspected for any defects prior to applying power. This inspection should include the following as a minimum:
4.2.1.1 Wires - broken, cracked, or loosely connected
4.2.1.2 Terminal strips / connectors - broken or cracked
4.2.1.3 Components - visually damaged
4.2.1.4 Capacitors - bloated or leaking
4.2.1.5 Solder joints - damaged or cold
4.2.1.6 Circuit board - burned or de-laminated
4.2.1.7 Printed wire runs / Traces - 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		Fluke 87 DMM (or Equivalent)
1	H190145	IMC Logic Card Programming Station
1	H190146	IMC Power Supply Test Fixture
1	H190147	IMC Mated Board Calibration Fixture
1	H190149	IMC Burn In Station
1	H190148	IMC Final Test Station

6. Testing Process

6.1 Notes

6.1.1 **IT IS HIGHLY RECCOMMENDED THAT YOU FAMILIARIZE YOURSELF WITH THE TEST IF YOU HAVE NEVER EXECUTED IT BEFORE DUE TO THE FACT THAT THERE ARE SEVERAL NOTES ALONG THE WAY THAT MAY SAVE YOU SOME TIME.**

6.1.2 The IMC product line is tested at several different test benches using multiple fixtures. The purpose is to test the circuit cards individually then calibrate them as a reassembled unit. After successful calibration tests the UUT then is put on a burn in station for no less than 2 hours. After the UUT has passed the burn in tests it is checked one final time to ensure the burn in did not create a problem and/or determine if the unit fails after it has been in operation for a period of time

6.1.3 This procedure is written as a UUT would progress thru the different benches and fixtures to successful final test.

6.1.4 Each Sub Procedure is in **Bold** for reference purposes only. Even if you just need to test one card, and not a complete unit, the entire test needs to be executed . They are as follows: **Program the Logic Card, Power Supply Test, Mated Board Cal Test, Burn In, Final Test, and Completion of UUT**

6.1.5 **Along with the mandatory replacement of electrolytic capacitors these unit require a battery replacement before any testing. The battery is BT1, found in the logic card. Before being installed the new battery is to be tested with a DMM to verify it is at its proper voltage which is 3VDC. Any battery that reads below 3VDC is not to be used.**

6.2 Testing Procedure

6.2.1 Separate the Logic Card from the Power Supply card and replace the battery and electrolytic capacitors.

6.2.2 Place the Logic Card on the Test Power Supply card found in the IMC Logic Card Programming Station, Asset # H190145, and close the lid.

6.2.3 Using the Firmware/Flash Information sheet, found below the monitor on the test bench, identify what files need to be programmed to the Logic Card.

6.2.4 Program the Logic Card

6.2.4.1 On the PC Desktop open the program CCSWIN32

6.2.4.2 Apply power by flipping the Main Power switch on the small box located directly above the programming station to On

6.2.4.3 Type “KLALL” then return. This stops all processor commands so the firmware can be written.

6.2.4.4 Click tools then Send Firmware

6.2.4.5 Click OK on the dialog box that opens

6.2.4.6 Locate and Double Click the file you identified earlier.

6.2.4.7 A dialog box should open that shows the percentage transferred, Once completely loaded the bottom of the CCSWIN32 screen will read “Operation Completed Successfully!”

6.2.4.8 Turn the main power Switch to the Programming Station to the “Off” position and remove the Logic Card.

6.2.4.9 The Firmware should now be loaded which is the end of this sub procedure.

6.2.5 Power Supply Test

6.2.5.1 **NOTE:** All measurements are in reference to the terminal strip on the front of the test fixture.

6.2.5.2 Place the Power Supply in the fixture being sure to properly line up the pins protruding from the left side of the fixture into the black connector on the Power Supply card. Be Very Careful. These pins are prone to break.

6.2.5.3 Do Not Connect the BLUE and BROWN clamp wires

6.2.5.4 Connect the GREEN power connect

6.2.5.5 Set Clamp Switch to Off

6.2.5.6 Set the Model Switch to MODEL-D

6.2.5.7 Verify the Variac on the front of the fixture is fully CCW

6.2.5.8 Apply power to the UUT by pressing the RED Power Button located on the front of the fixture.

6.2.5.9 Verify the RED CLAMP indicator on the fixture illuminates

6.2.5.10 Adjust R19 for a meter reading between +5.00V and +5.05V at pin 2 with reference to pin 1

6.2.5.11 Move the (+) meter lead to pin 3 of the test connector and the meter must read between +11.75V and +12.25V

6.2.5.12 Move the (+) meter lead to pin 4 of the test connector and the meter must read between -11.75V and -12.25V

6.2.5.13 Move the (+) meter lead to pin 5 of the test connector and the meter must read between +11.75V and +12.25V

6.2.5.14 Move the (+) meter lead to pin 6 of the test connector and the meter must read between +4.80V and +5.20V

6.2.5.15 Move the (-) meter lead to pin 8 of the test connector and the (+) meter lead to pin 9 the meter must read between 4.80V and +5.20V

6.2.5.16 Move the (+) meter lead to the cathode of D9 and the meter must read 9V $\pm$ 1V.

6.2.5.17 Remove power from the UUT by pressing the RED Power Button and wait 15 seconds for any voltages to discharge.

6.2.5.18 The Power Supply is now tested which is the end of this sub procedure.

6.2.6 Mated Board Cal Test

6.2.6.1 Reassemble the UUT by connecting the Power Supply card to the Logic card and securing all hardware. Be certain the pins on the Logic card go into the connector on the Power Supply card

6.2.6.2 Install UUT in custom fixture, Asset #H190147, with power supply facing toward you and LED's up.

6.2.6.3 Connect all cables to the corresponding connector on the UUT. There is no connection for the LINK port on the power supply. The RED and BLACK twisted pair that goes to the 2 position black connector is also not used.

6.2.6.4 Connect DMM to the RED and BLACK banana jacks labeled DMM

6.2.6.5 On the PC at the T1009 Bench open the program "MODDCAL.EXE" and follow all prompts except the following, these changes were made for ease of use and safety. These occur at the beginning of the test

When prompted: "Connect meter across resistor on motor connector pin 1"…

Instead Set the "switch box" to position A and set DMM to mV

When prompted: "Connect meter across resistor on motor connector pin 3"…

Instead Set the "switch box" to position B and keep DMM to mV

When prompted: "Connect voltmeter between J1 pins 21 and 22"…

Instead Set the "switch box" to position C and set DMM to VDC

6.2.6.6 Do Not Apply Power Until Prompted. When prompted power is applied by turning on the power strip under the bench.

6.2.6.7 When all the test have passed the monitor will display “Loading Program For Burn-In”

6.2.6.8 After successful loading of burn in program the monitor will display “Write your employee # and todays date on WETS5511 tag. Hit any key to continue.” Just press any key and the program will close.

6.2.6.9 Remove power, all cables, and finally the unit from the custom fixture. This completes the Mated Board Cal Test Sub Procedure.

6.2.7 Burn-In

6.2.7.1 To prepare the unit for Burn-In remove the heat sink assembly from the Burn-In test station and secure it to the heat sink on the UUT using the two screws found on the back of the heat sink assembly. **NOTE:** the heat sink should extend below the GREEN connector on the Power Supply Card. Also, this can be tricky because you want a flush mount between the het sink on the power supply card and the burn in heat sink assembly.

6.2.7.2 Connect the Burn In Heat Sink Assembly, with the UUT attached, to the Burn In Test Station by sliding the glastic over the two screws on the test station.

6.2.7.3 Connect the Burn-In Enable connector to the 24 pos. connector on the UUT. Be certain the switch is in the “0” position

6.2.7.4 Apply power to the fans by turning on the power strip on the rear of the Burn In Station

6.2.7.5 Apply power to the UUT by closing SW1 located at the top left of the fixture on the front.

6.2.7.6 Verify D1 on the UUT is illuminated and RED

6.2.7.7 On the Burn In Enable connector set the switch to “1” and verify the RED LED turns GREEN and LED D3 illuminates then extinguishes and D4 illuminates then extinguishes. These LED’s are forward and reverse LED’s. Only one should be on at a time as the UUT cycles from forward to reverse

6.2.7.8 Allow UUT to run for a minimum of two hours.

6.2.7.9 After time has passed set the switch on the Burn In Enable connector back to “0” and verify D1 turns from GREEN to RED and D3 and D4 extinguish.

6.2.7.10 Turn off the Burn In Test Station by opening SW1 on the front of the station and then turning off the power strip located on the back of the fixture.

6.2.7.11 Remove the UUT from the Burn In Heat Sink Assembly and the Burn In Enable Connector and place them back where they were. This completes the Burn-In Test Sub Procedure.

6.2.8 **NOTE:** There is a nuisance failure with the final test. Every test that calls the Auxiliary Encoder will Fail because the there is no Auxiliary Encoder on the Motor. Just continue the test and it will finish. This is permissible since the encoder and auxiliary encoder were tested earlier on the MODDCAL test.

6.2.9 **NOTE:** If you have to run this test more than once the battery test will fail every time. This is because when you ran the MODDCAL test, on the other test station, the following data string was stored to battery backed memory “123456789”. After the unit has been on burn in for a couple of hours and taken to the Final Test Station the first thing that is checked is, did the battery backed memory hold the data string? If the value in memory matches it is erased and reprogrammed with different data. Since the test isn’t checking for anything more than the data in a register and passing if it matches all subsequent tests, without reprogramming on MODDCAL, will fail because the data in the memory no longer matches what the test is expecting.

6.2.10 Final Test

6.2.10.1 Connect all cables on test bench to corresponding connector of UUT. There is no connector that will not go where it should. Power is applied via a command thru the test when the test is executed, and removed when the test stops.

6.2.10.2 With the heatsink of the unit face down, and sitting on the glastic motor cover, with all connections made type MODDTEST into the DOS prompt on the PC

6.2.10.3 Follow all on screen instructions.

6.2.10.4 Once the test has finished all the LED’s on the UUT will extinguish.

6.2.10.5 Disconnect all cables. This completes the Final Tests sub procedure and is the end of functional testing of the UUT

6.2.11 Completion of UUT

6.2.12 If all tests have passed the unit is now ready for QA.

6.2.13 Before completing the job seal all pots and apply a warranty label to both cards.

6.3 ***TEST COMPLETE ***

7. Notes

7.1 See Procedure

8. Attachments

None at this time