g GE Energy	**Functional Testing Specification**
Inspection & Repair Services ***Louisville, KY***	**LOU–GEF** **CMC-4230-1-B**

Test Procedure for a CMC-4230-1-B Slave Amplifier

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Test Procedure for a CMC-4230-1-B Amplifier

1. SCOPE

1.1 This is a functional testing procedure for CMC-0000-1-B & CMC-4230-1-B Amplifier.

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 Pub 14

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 the local documented procedures 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 or cracked
4.2.1.2 Terminal strips / connectors broken or cracked
4.2.1.3 Loose wires
4.2.1.4 Components visually damaged
4.2.1.5 Capacitors leaking
4.2.1.6 Solder joints damaged or cold
4.2.1.7 Circuit board burned or de-laminated
4.2.1.8 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	CMC-4230-1-B	Dual Axis Slave Drive
1	CMC-0000-1-B	Master Drive
1	15vdc PS	Power Supply
1	Cable Set	Master/Slave cable set
1	Motor	Motor with encoder
1	Variac	110vac variac

6. TESTING PROCESS

6.1 Connection Setup

6.1.1 Before hooking up controller/amplifier ohm check the dipswitches.

6.2. Testing Procedure

6.2.1. CMC-0000 Setup

6.2.2. Set all dipswitches (SW1 & SW2) on controller to left except for (SW2) 5,7, & 8 they go to the right. This sets up the address to "0" and sets up communications.

6.2.3. Hookup the CMC communication cable to P3. Cable is not reversible, be sure to connect proper end to amp and to the PC. If communication has been established you should see an echo from the drive every time you hit enter on the PC.

6.2.4. This unit is 110VAC model, be sure to hook up power cable through the autoformer. Hook up power and encoder cable to controller's P2 connector; leave P1 off at this time. Plug encoder into encoder cable. The XMIT LED will blink every time screen updates/transmits.

6.2.5. CMC-4230 Setup for Encoder Feedback

6.2.6. SW1 Settings 5 & 7 switched right, all others switched left

6.2.7. SW2 Settings 3, 4, & 5 switched right, all others switched left.

6.2.8. Hook up 15 pin connecting cable and place all switches on switch box in the up (open) state. Hook up two switches one to axis 1 and the other to axis 2. This will allow you to enable each axis separately. Connect a stepper motor to each end of the 15 pin connector cable, should be two, not important at this time if the motor has an encoder or not because we are not looking for feedback at this time.

6.2.9. Power up computer and go into CCS for DOS.

6.2.10. Access CCS and go to the Terminal Mode. Enter the address of the amplifier. Controller communication LED will blink when the enter key is pressed, if you are communicating.

6.2.11. Download the following program CMC-4230 into master CMC controller. Once done go into the On-line communication mode and setup Master unit's address to zero and talk to master controller. Flip switches Forward, Reverse, and enable on slave unit, motor should be engaged but not moving. Enter 0GT1 or 0GT2 or 0GT3 (If profiles are active, flip switch Profile 3 to manually enter 0GT3 program) into computer and slave should begin to turn and continue until a command is given to stop the unit.

6.2.12. Flip individual axis switch to enable axis, fault light should go when active.

X Axis	Y Axis
ER26214	ER26214
ACX25000	ACY25000
VX1000	VY1000
IMX5000	IMY5000
RIX	RIY
IMX-5000	IMY-5000
RIX	RIY

6.2.13. Switch 10 is for the positive over travel limit. When you remove this voltage, drive will stop (Be sure to Check). Switch 11 will not affect the drive. Busy light will go out when switch is flipped. Motor should be turning clockwise direction with the forward command. Green LED should steadily be ON, with Yellow LED blinking. Switch Box busy Lamp will be ON (Lamp Three).

6.2.13.A. 0ST (Stop) Stops Motor

6.2.14. Run motor for a minute or so and then stop unit and run in the opposite direction.

6.2.14.A. 0SRN (Slew Reverse) Reverse Direction

6.2.15. Switch 11 is for the negative over travel limit. When you remove this voltage drive will stop (Be sure to Check). Switch 10 will not affect the drive. Busy light will go out when switch is flipped.

6.2.16. Motor should be turning counterclockwise direction with the forward command. Yellow LED should steadily be ON, with Green LED blinking. Switch Box busy Lamp will be ON (Lamp Three)

6.2.16.A. 0ST (Stop) Stops Motor

6.2.17. This is the initial test to see if the controller runs motor smoothly in both directions. If so continue with test.

6.3. Stepper Motor Test with encoder

6.3.1. Power down controller and reset switches SW1 and SW2 the following way;

6.3.1.A. SW1 1,3,4, 5, & 7 flipped in right direction.

6.3.1.B. SW1 2, 5, & 7 flipped in the left direction

6.3.1.C. SW2 3, 4, & 5 right, all others switched left, no change from previous step.

6.3.2. Disconnect both I/O plugs with switches.

6.3.3. Connect I/O cable and feedback cable to axis 2.

6.3.4. Be sure stepper motor has an encoder connected to it.

6.3.5. Flip all test box switches up again.

6.3.6. Power up +12V and 110VAC power supplies. If you physically turn stepper motor shaft you will see feedback LED light up depending on direction turned. This will let you know if you have the correct motor/encoder/axis configuration.

6.3.7. Controller address should still be set for (0). Go to on-line communications and change 0ER and 1ER from 4096 to 26214, this let the drive know you have encoder feedback and will act accordingly. You can poll the memory within each axis by entering specific information, for example (0ER?) will give me what ER information is in Axis 2 and (1ER?) will give what ER information is in Axis 1

6.3.8. Now Flip SW10, SW11, & SW12 switches down, should see LED 5 go off.

6.3.9. Flip switch 1 and stepper should begin to move. Once stepper stops flip switch 2, motor will move again, SW3, SW4, SW5, SW6, and SW7. When switch 8 is flipped the motor will reverse direction and go back to where the program began.

6.3.10. Switch 10 and 11 are for the positive and negative over travel limit. When you remove this voltage drive will stop (Be sure to check). In one direction one of the switches will not affect the drive whereas the other will.

6.3.11. Motor should be turning clockwise direction with the forward command. Green LED should steadily be ON, with Yellow LED blinking. Switch Box busy Lamp will be ON (Lamp Three). Motor should be turning counterclockwise direction with the forward command. Yellow LED should steadily be ON, with Green LED blinking. Motor should run smoothly in both directions, continue with test. When axis has stop inhibit drive and press ESC. This will bring you back to the header page.

6.3.11.A. 0ST (Stop) This command will stop axis 2.

6.3.11.B. 1st (Stop) This command will stop axis 1.

6.3.12. Press 6 for the Application Screen. Press F5 to download a file and press "Y" to clear memory. Download CMC-4230 program to both axis controllers, address (0) and (1).

6.4. Checking switches 9 thru 12

6.4.1. During On-Line Communication Mode, Enter the address 0 or 1, then press F7, enter, then set the time, usually I enter 55 to 200.

6.4.2. On the switch box by flipping SW9, SW10, SW11, and SW12 down, you should see a change in the number sequence registered on the screen. I am looking for a consistent change when activating the switch.

6.5. Checking Profiles

6.5.1. Press ESC until you are back at main screen. Press 2 for on-line communication, and then enter 0DG1. When you toggle SW1 through SW6 from the center position to the down position you should see the screen reflect the change. Switch number will also be displayed.

6.5.2. Be sure to check axis 1 also (1DG1).

6.6. If you have downloaded the program IMC4230 into both axis, then all you should have to do to access it is type (0EX9) for axis two and (1EX9) for axis one. Both motors should be spinning, type 0ST or 1ST command to stop each axis.

6.7. End of Test

6.8. ******TEST COMPLETE ******

6.8.1. CMC-0001 Setup

6.8.2. Be sure cable is wired correctly for each profile, no tachometer needed at this time. Be sure connector is wired correctly. Connector P1-1 should be +12V and inputs are P1-2 through P1-13, ground connections are P1-14 & P1-19.

6.8.3. Testing the Inputs

6.8.4. Enter RDI in query mode so that screen shows switch settings. Once connector is hooked up correctly and voltage applied to inputs; as you flip SW1 through SW12 on the switch box you should see the response on the PC screen.

SW12 ***SW1***

i. 1000 ***0***000 0000 000***0***

ii.

6.8.5. With encoder plugged in P2 connector, as you turn encoder clockwise the Green LEDs will light. Counterclockwise the Amber LEDs will light. They should all toggle together.

6.8.6. Testing Analog Inputs

6.8.7. Use HP6826 Power Supply. Drive will need to be enabled and you should go to terminal mode and query the inputs (F7). Enter RA1 thru RA4 to display all four inputs at once.

6.8.8. The following values were taken from the first unit tested. Use as a comparison for further units. The more exact you are to the actual voltage, the closer you should get to the actual numerical value.

Voltage Input	**Number Value**	**Voltage Input**	**Number Value**
0V	0-10	0V	0-10
1V	205	-1V	205
2V	411	-2V	410
3V	615	-3V	615
4V	821	-4V	825
5V	1029	-5V	1030
6V	1239	-6V	1235
7V	1440	-7V	1440

Seven volts should be high enough to verify or register any problems. The unit is supposed to take up to ten volts, but I would rather not go that high at this point. Done with the CMC-0001-2-B

6.9. ******TEST COMPLETE ******

7. NOTES

8. REFERENCES

CMC-0000 Master Motor Controller

Switch 1

1	L	
2	L	Channel One Pulse Multiplier
3	L	
4	L	
5	L	Channel Two Pulse Multiplier
6	L	
7	L	
8	L	Channel Three Pulse Multiplier
9	L	
10	Unused	

Switch 2

			Y	Z	W other Axis' Addresses
1	**L**		L	L	L
2	**L**	**X Axis Address**	L	R	R
3	**L**		R	R	L

4	Unused			
5	R	Echo	L	Non-Echo
6	**L**	**9600 Baud Rate**		
7	**R**			
8	L	RS-232 Communications		

L=Closed R=Open

Configuration and test procedures for CMC-OXOX-X-B

The power bd. is calibrated the same way for all cmc-0 and cam-0 using Wets procedure #WETS5400.
There is no separate configuration for 110VAC or 220VAC. This power bd. can withstand either.
To test a CMC-0000 or CMC-0001, be sure to burn in the correct e-proms respectively. For CMC-0000, use EPROMs 31450066 and 31450067. For CMC-0001, use EPROMs 31450068 and 31450069. Be sure to put the correct e-prom in u6 and u7. For sinking, JP1 jumper closest to J1 connector to rt. And one behind to the left. For sourcing, move the jumpers over. Run through WETS5418 test and forward to assembly.
To test a CMC-0100 or CMC-0101, be sure to burn in the correct EPROMs and put in the corresponding socket. For CMC-0100, use EPROMs 31450056and 31450055. For CMC-0101, use EPROMs 31450061 and 31450062. Again, set the jumpers the same way. Run through WETS5417 test and forward to assembly.

31450067	61FA
31450066	C05C
31450068	C12F
31450069	5D47

Repairs and what to look for on CMC-0 units

Most of the time there is a no problem found condition. The customer usually has a problem with their programmed IC's at U33 and U34 on the logic board.
If the unit has been in the field a couple of years, it is a good idea to change the battery and upgrade the EPROMs (U6&U7) to the latest revision.
Be sure U15 on logic bd. has a 70004482 bd. with the green lead going to pin 20 of U5. If not, install one.
Install a 70004446 bd. at U22 to U28 if not present.
On the power bd. upgrade R2, R3, R4, and R13 with the metal oxide type. Be sure the capacitors at C12-17 are the new style. If not, replace with new. Finally, be sure there are no 1N4935 diodes anywhere. If so, replace with 1N4937 (D1 & D2).
If there is still trouble after all of this and you already pulled out the schematic, it is probably time to replace a board or the unit.

R2	47K 2 Watt
R4, R1	56K 2 Watt
C7-C11	330uf 35vdc
C5, C6	180uf 250vdc

Configuration and Test procedures for XMC-4-B

1. Use test WETS5406 to calibrate XMC-4 power bd. Must have logic boards connected to test power bd.
2. To change power bd. for 220VAC operation, make a cut across foil between holes at JP1 after burn in and before final test.
3. To convert unit from sink to source, change EPROM (U19), set JP1 to A & B and E & F, then remove R1 and put it in R2 spot.
4. E-proms are as follows:

IMC-4230	31450011 (SINK)
IMC-4231	31450012 (SOURCE)
CMC-4230	31450028 (SINK)
CMC-4231	31450045 (SOURCE)

5. To convert from IMC to CMC, use applicable EPROM, remove 12 and jumper pins 9&11, then remove U11 and replace with 31320090.
6. Now mate the power and logic boards together with a shield board between them.
   a. **POWER LED PCB- CABLE TO J1**
   b. SERIAL PORT PCB- CABLE TO J3
   c. SHIELD BOARD
   d. POWER BOARD PCB
7. Run WETS5428 test procedure at Jeff's old bench.
8. After successful completion of testing, forward to assembly.

Repairs and what to look for on XMC-4 units

1. If the unit is returned for repair, be sure the board is not burned. If it looks repairable, more than likely have to replace R2 & R3, C5, C6, C36, C38, and C46-48. C5 & C6 has to be replaced only if R2 or R3 is open.
2. Be sure the driver boards. 70004140 are the latest revision. If not, they need to be replaced.
3. Check the logic supply. If R60&61 are open, logic supply is blown and needs many parts including the following: R60 & R61, 58, U8, D9, Q7, Q8, Q9, Q1, and C28. May have to replace U1&2 also. Piggyback R13 with same value and be sure R5 is 7.5K and R10 is 20K.
4. These power boards can be difficult to troubleshoot at times. Disable motor bridge by lifting R30&40 at times to help in troubleshooting procedures.
5. **Be sure to leave logic boards connected to power board when applying power for troubleshooting or other problems <u>will</u> arise!**
6. To upgrade logic boards, replace U30 with 70004444 bd., replace D6 with zero ohm resistor, upgrade EPROM to latest revision. Run jumper wire from U19 pin 28 to U20 pin 28. Run more jumper wire fromU30 pin 7 to U15 pin 14 and U30 pin 14 to U15 pin 7.
7. If you turn on the power to the unit and the bottom 3 lights are on, the clock is probably not working. Check for a clock signal to the EPROM and look for the INT pulse at pin 16 of the CPU. If not there, suspect bad CPU. Have been getting a few of them lately.
8. Communication problems can be on the logic bd. U31,32, or 34. Have to troubleshoot with computer in terminal mode hooked up to the unit using techniques with the scope. Hopefully this narrows it down some. If having real difficulty, sometimes can be as simple as SW2 not functioning. Test SW2 with ohmmeter.
9. If a lot of weird things are going on as well as intermittent, you may want to replace J1 ribbon connector.
10. If the over-current lights are illuminated on the logic bd. turn the power off and check to see if the + or – 12V lines are shorted to ground. If so, pull off the logic bd. and see if the short is still there. If so, could be a .1ufd capacitor that is bad. Many times you can see a little burn spot on one of them that is the culprit.