g GE Energy	**Functional Testing Specification**
Parts & Repair Services ***Louisville, KY***	**LOU-GED-MARKV**

Test Procedure for operating a Mark V Turbine System

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

REV.	DESCRIPTION	SIGNATURE	REV. DATE
A	Initial release	12/16/2013	J. Barton & C. Wade
B	Corrected some typos, TCEA vs TCPS and added testing for the SDCC/SLCC cards	1/14/2014	C. Wade
C			

PREPARED BY	REVIEWED BY	REVIEWED BY	QUALITY APPROVAL
J. Barton			Charlie Wade
DATE	**DATE**	**DATE**	**DATE**
12/16/2013			12/16/2013

1. SCOPE

1.1 This is a functional testing procedure for a Mark V Turbine Control System.

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	H190115	HMI Computer for Mark V Turbine
1	H190117	Mark V Turbine System

6. Table of Contents & Burn-in requirements

6.8 Burn-in time for Mark V cards normal repair

- **6.8.1** DS200TCEA 1 Hour in Mark V rack
- **6.8.2** DS200TCPS 1 Hour in Mark V rack
- **6.8.3** DS200TCDA 1 Hour in Mark V rack
- **6.8.4** DS200SDCCG4A/G5A 1 Hour in Mark V rack
- **6.8.5** DS200SLCCG3A 1 Hour in Mark V rack

6.9 Burn-in time for Mark V cards revitalization program

- **6.9.1** DS200TCEA 3 Hours in Mark V rack
- **6.9.2** DS200TCPS 3 Hours in Mark V rack
- **6.9.3** DS200TCDA 3 Hours in Mark V rack
- **6.9.4** DS200SDCCG4A/G5A 3 Hours in Mark V rack
- **6.9.5** DS200SLCCG3A 3 Hours in Mark V rack

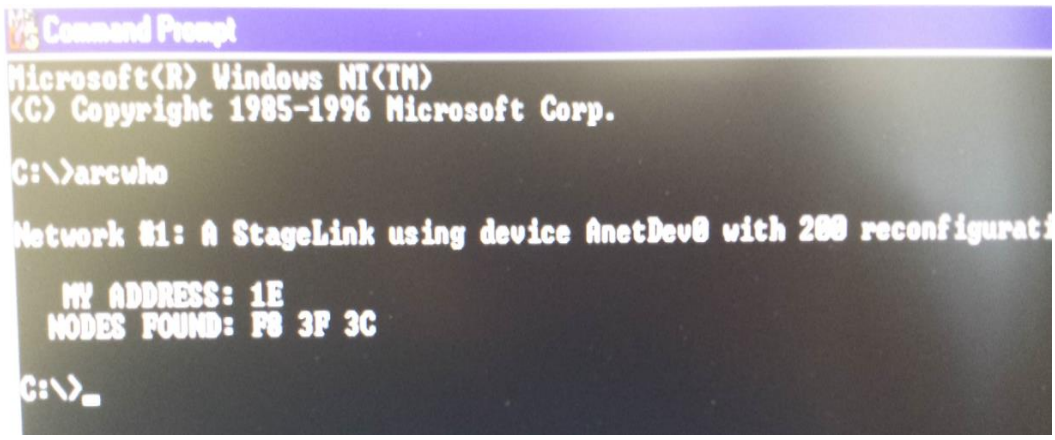
7. Communicating to Mark V System

7.1.1 Power up HMI and Mark V; once units has booted open a DOS prompt window on the HMI.

7.1.1.1 Type “arcwho”

7.1.2 Should see this HMI with address FF (or the address you set it for)

7.1.3 And other nodes on the network, below, verify the LEDS also blink RX/TX



7.1.4 The above screenshot is showing: 1E (GAS HMI) ARCNET address.

7.1.5 Your HMI “FF” will be at the reading “MY ADDRESS: FF”

7.1.6 Also it should read: “NODES FOUND: 1E_F8_3F_3C”

7.1.6.1 Where: 1E = GAS HMI

7.1.6.2 F8 = STEAM HMI

7.1.6.3 3F = C CORE

7.1.6.4 3C = D CORE

7.1.7 Verify the Mark V D core is power up and at A4 or greater.

7.1.8 Type “eeprom down t2 d format”.

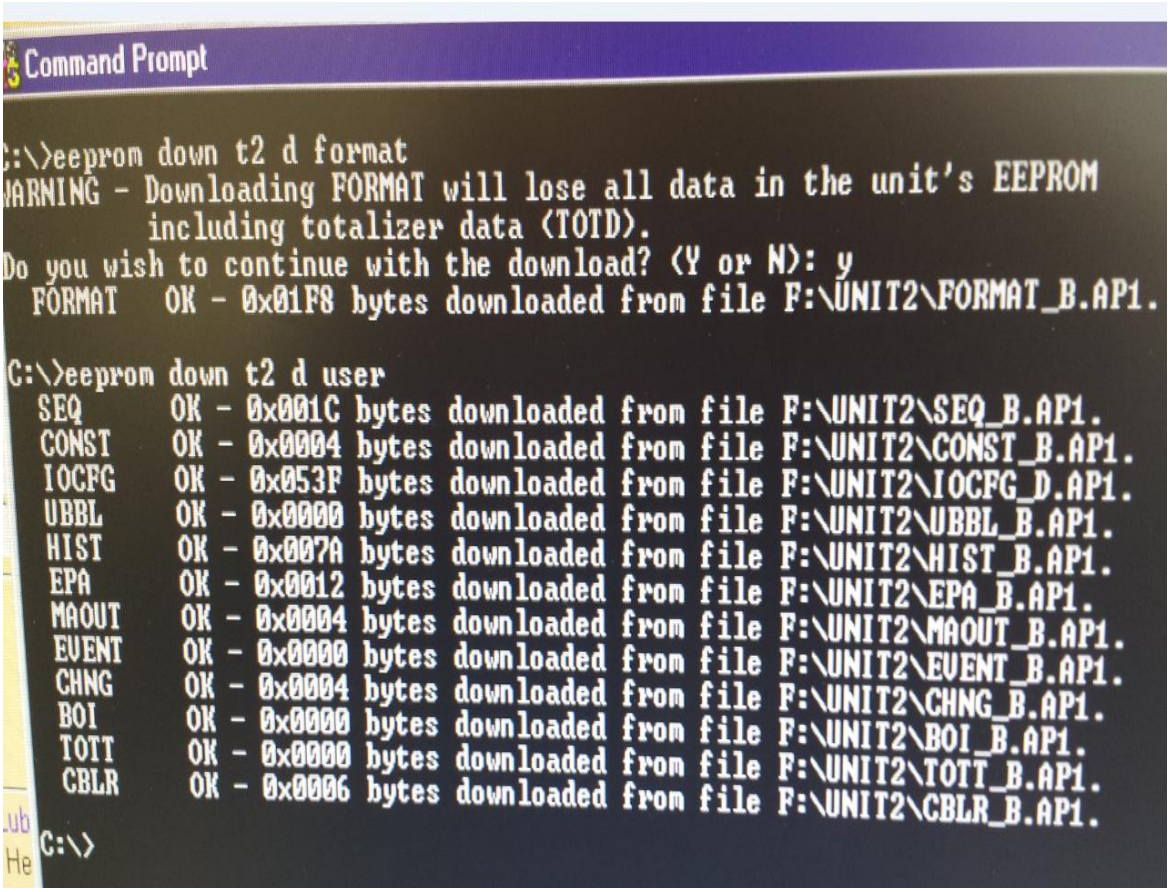
7.1.9 Press enter.

7.1.10 Type “Y” for yes.

7.1.11 Verify format was completed by comparing screenshot below.

7.1.12 Type “eeprom down t2 d user” and press enter.

7.1.13 Verify D core accepted the files by comparing screenshot below



7.1.14 Reboot/Reset D core and verify it comes up to A7 via SLCC screen readout.

7.1.15 You have now established and verified communication link.

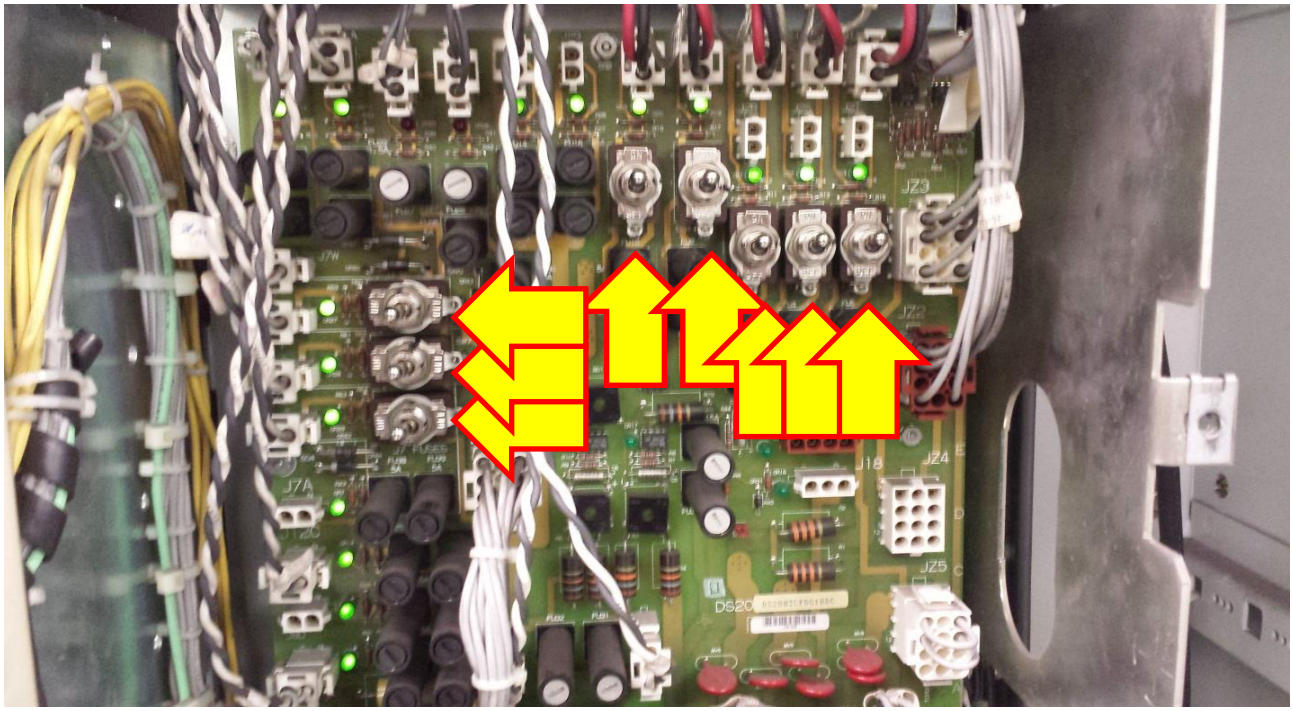
7.1.16 Power down HMI and Mark V if this is all you require. Otherwise continue to the board section of interest.

8. DS200TCEA

8.1 Removal of existing TCEA card.

8.1.1 Installing the replacement DS200TCEA into Mark V Turbine System

8.1.2 Remove Power to Respective Core:



8.1.3 Before attempting to remove the TCEA verify that the power has been removed from the related core in the panel via the TCPD. (If it is a dead PS this may have been overlooked and power to core MAY STILL BE PRESENT!)

8.1.4 Locate the P Core power switch on the TCPD and turn off power to the P core

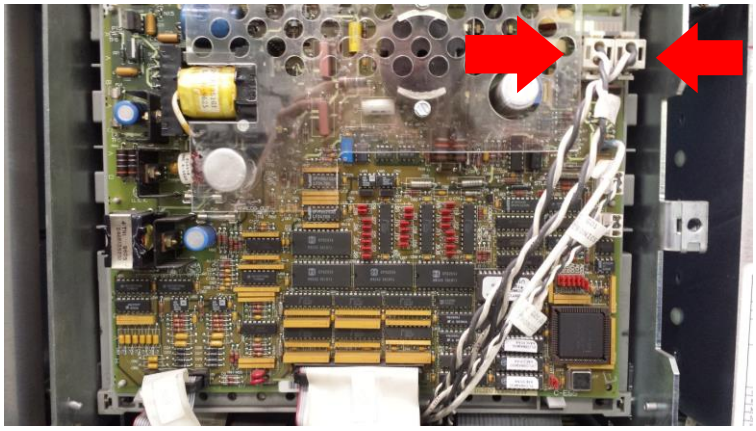
8.1.5 Open the P Core front door and pull the two tabs at lower right and left to unlock the plastic frames holding the boards within.

8.1.6 For each of the front board slots (Locations 1, 3, 5) perform the following steps to replace the original X, Y, and Z DS200TCEA protection boards.

8.1.7 After verifying the POWER has been removed via the TCPD.

8.1.8 Remove the POWER INPUT Connectors to the TCEA FIRST! Top right hand corner

(Indicated by the RED ARROW's above)



8.1.9 Disconnect remaining: Connectors, Chassis Ground and Ribbon Cables.

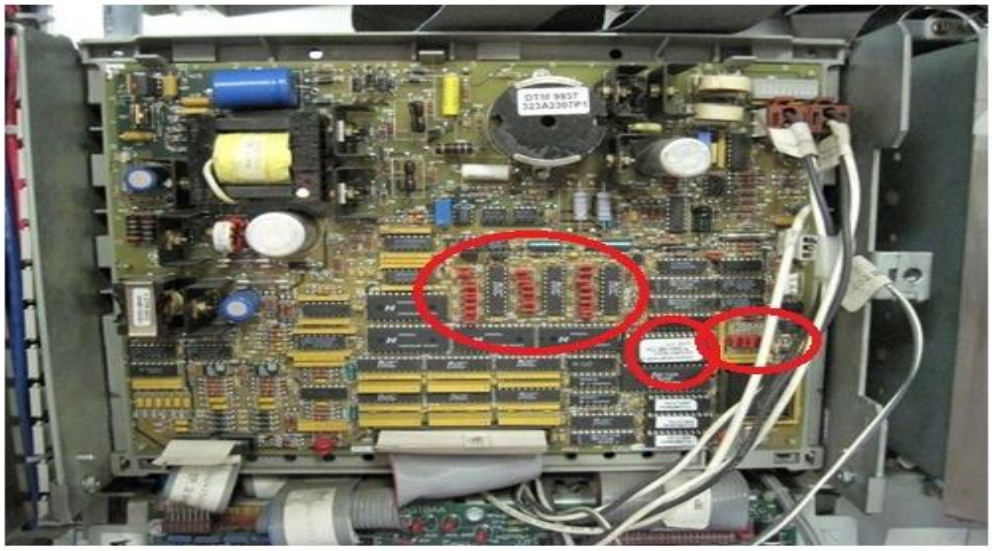
8.1.10 Remove the TCEA by releasing the retaining clips on the card tray, 6 total, 3 located on the physical top of the card and 3 on the bottom.

8.1.11 Disconnect and remove all the ribbon cables, power cables, etc.

8.1.12 Remove the TCEA board from the plastic frame, releasing the plastic tabs along the top and bottom of the board frame.

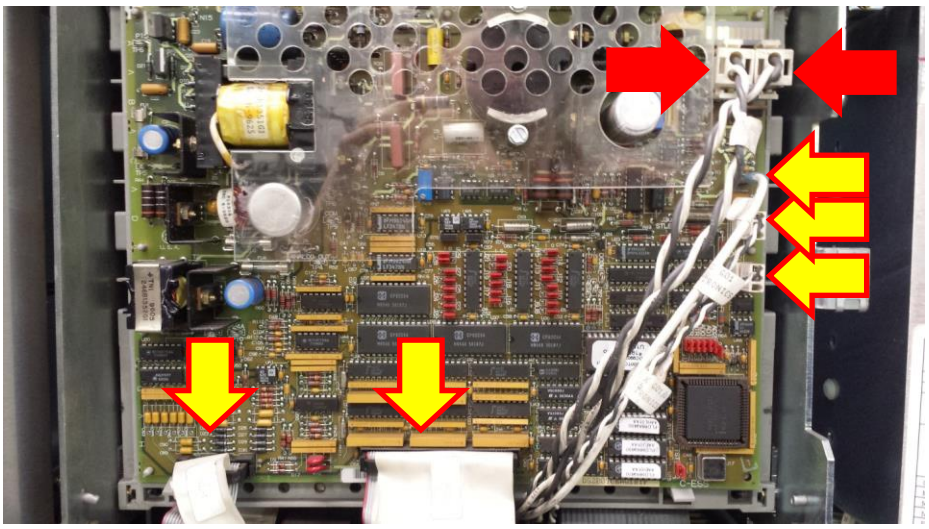
8.1.13 Remove the EEPROM on original TCEA board and install it on the revitalized board.

8.1.14 Set ALL jumpers to match the ORIGINAL… DO NOT CHANGE THE ORIGINAL BOARDS JUMPERS



8.2 Installation of replacement TCEA card.

8.2.1 Re-install the board in panel



8.2.2 Install the TCEA by securing it with the retaining clips on the card tray, 6 total, 3 located on the physical top of the card and 3 on the physical bottom.

8.2.3 Make sure that the CHASSIS GROUND WIRE is NOT behind the TCEA! (between the TCEA and the card tray)

8.2.4 Connect the POWER INPUT Connector to the TCEA LAST! (Indicated by the RED ARROW above)

8.2.5 Connect remaining: Connectors, Chassis Ground and Ribbon Cable.

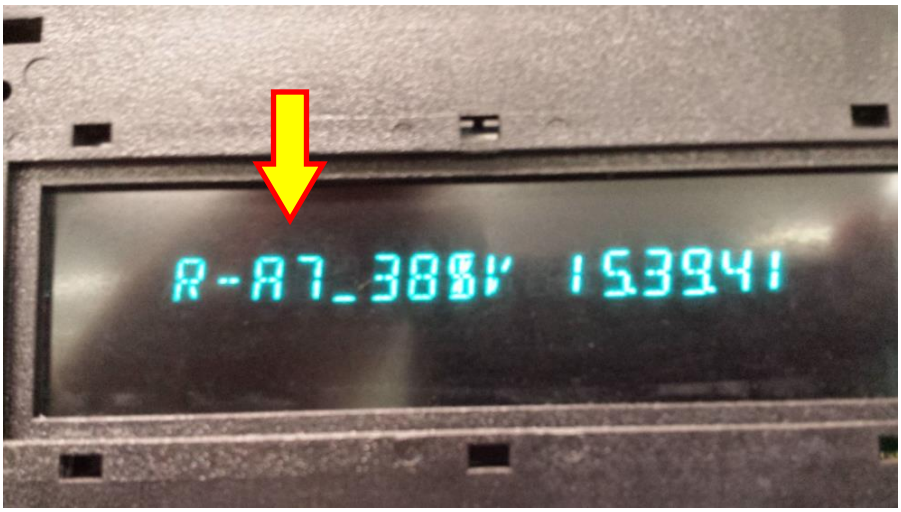
8.2.6 Keep in mind of the total connectors disconnected, some cores may have different amount of connectors. (ex. D Core)

8.2.7 Connect the POWER INPUT Connector to the TCEA.

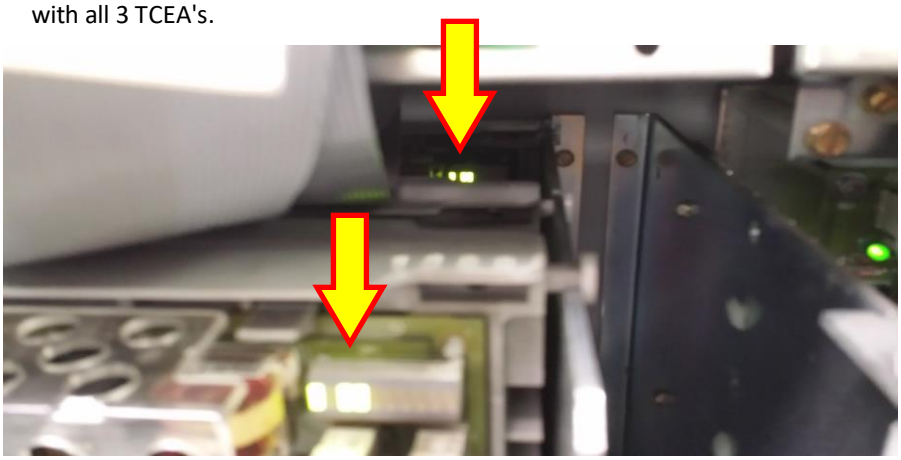
8.2.8 Recheck ALL connectors to verify none are misaligned (off one pin), partially connected or orientated 180 degrees of what it should be.

8.2.9 Restore power to core via the TCPD

8.2.10 Verify that the core boots and condition is A7 is present via the SLCC display.



8.2.11 Verify TCEA board is still synched with the others in the panel by the BAR GRAPH LEDS match with all 3 TCEA's.



8.2.12 If board has gone through its revitalization power soaking, this unit needs only one more hour to be burn-in/synchronization to complete testing.

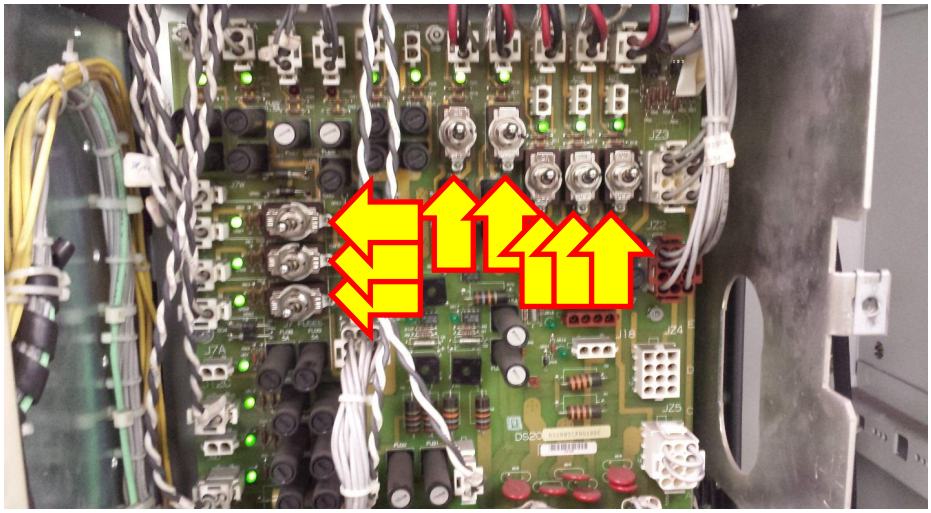
8.3 ***TEST COMPLETE for DS200TCEA card***

9. DS200TCPS

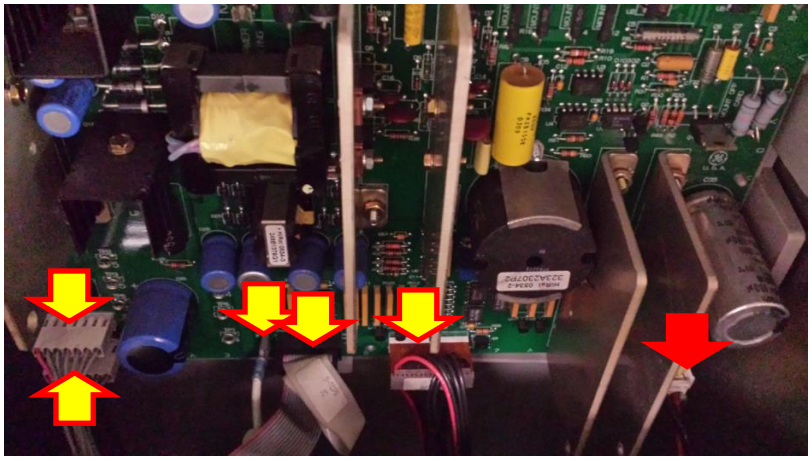
9.1 Removal of existing TCPS card.

9.1.1 Installing the replacement DS200TCPS into Mark V Turbine System

9.1.2 Remove Power to Respective Core:



9.1.3 After verifying the POWER has been removed, disconnect the POWER INPUT Connector to the TCPS FIRST! This is indicated by the RED ARROW in the picture below.



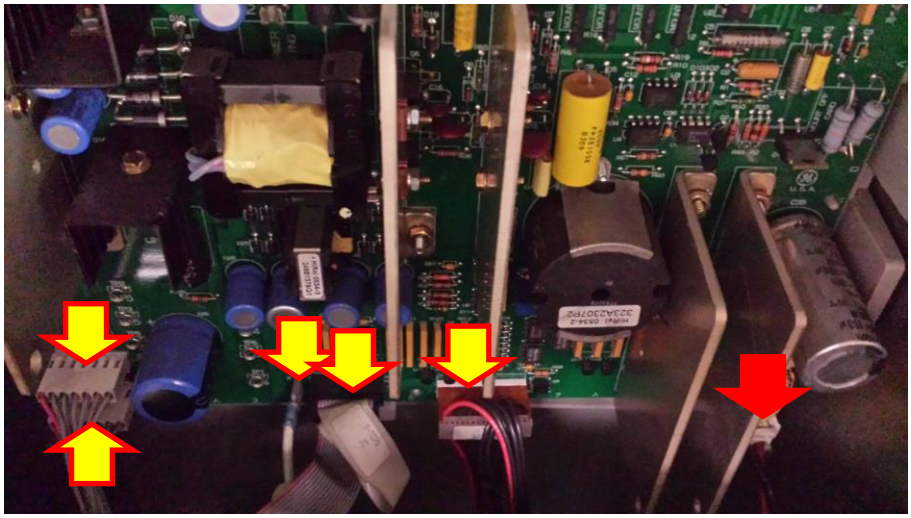
9.1.4 Disconnect remaining: Connectors, Chassis Ground and Ribbon Cable.

9.1.5 Keep in mind of the total connectors disconnected, some cores may have different amount of connectors. (ex. D Core)

9.1.6 Remove the TCPS by releasing the retaining clips on the card tray, 6 total, 3 located on the physical top of the card and 3 on the bottom.

9.2 Installation of replacement DS200TCPS card.

9.2.1 Re-install the board in panel



9.2.2 Install the TCPS by securing it with the retaining clips on the card tray, 6 total, 3 located on the physical top of the card and 3 on the physical bottom.

9.2.3 Connect the POWER INPUT Connector to the TCPS LAST! (Indicated by the RED ARROW above)

9.2.4 Connect remaining: Connectors, Chassis Ground and Ribbon Cable.

9.2.5 Keep in mind of the total connectors disconnected, some cores may have different amount of connectors. (ex. D Core)

9.2.6 Connect the POWER INPUT Connector to the TCPS.

9.2.7 Recheck ALL connectors to **verify none are misaligned** (off one pin), partially connected or orientated 180 degrees of what it should be.

9.2.8 Restore power to core via the TCPD

9.2.9 Verify that the core boots and condition is A7 is present via the SLCC display.

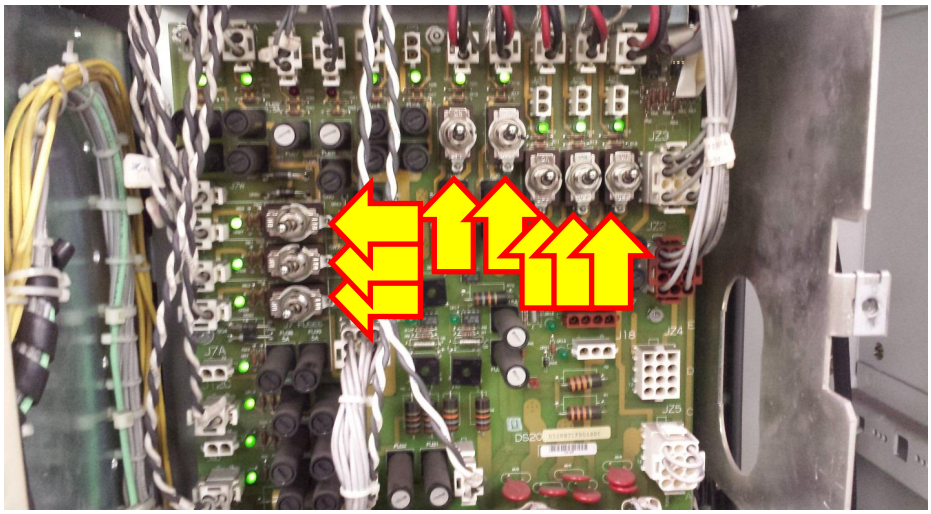
9.3 ***TEST COMPLETE for DS200TCPS card***

10. DS200TCDA

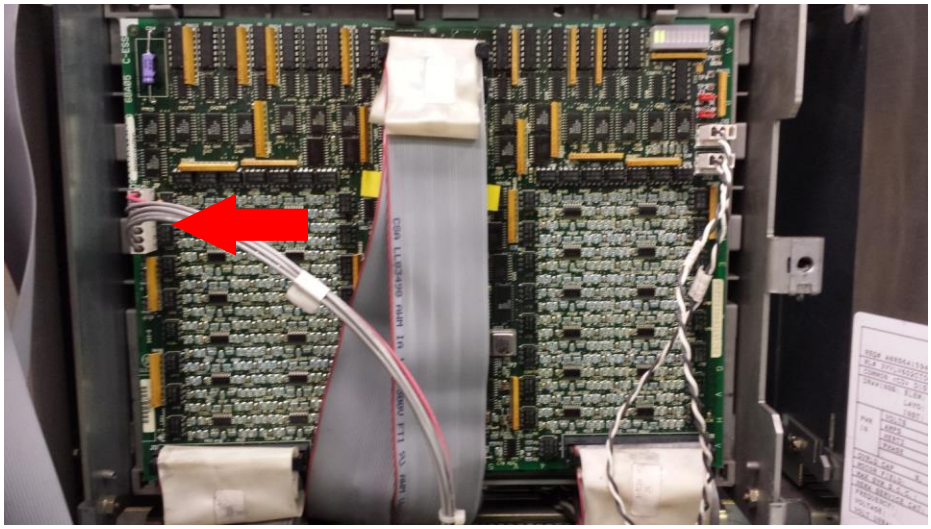
10.1 Removal of existing TCDA card.

10.1.1 Installing the replacement DS200TCDA into Mark V Turbine System

10.1.2 Remove Power to Respective Core:



10.1.3 After verifying the POWER has been removed, remove the POWER INPUT Connector to the TCDA FIRST! (Indicated by the RED ARROW above).



10.1.4 Disconnect remaining: Connectors, Chassis Ground and Ribbon Cable.

10.1.5 Remove the TCDA by releasing the retaining clips on the card tray, 6 total, 3 located on the physical top of the card and 3 on the bottom.

10.2 Installation of replacement DS200TCDA card.

10.2.1 Remove the EEPROM on original TCDA board and install it on the replacement board.

10.2.2 Set ALL jumpers to match the ORIGINAL… DO NOT CHANGE THE ORIGINAL BOARDS JUMPERS

10.2.3 Install the TCDA by securing it with the retaining clips on the card tray, 6 total, 3 located on the physical top of the card and 3 on the physical bottom.

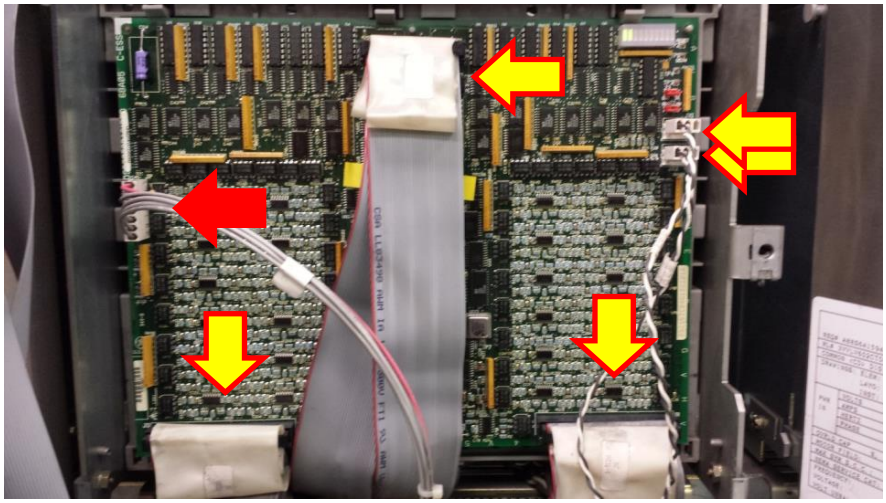
10.2.4 Connect the POWER INPUT Connector to the TCDA LAST! (Indicated by the RED ARROW above)

10.2.5 Connect remaining: Connectors, Chassis Ground and Ribbon Cable.

10.2.6 Keep in mind of the total connectors disconnected, some cores may have different amount of connectors. (ex. D Core)

10.2.7 Connect the POWER INPUT Connector to the TCDA.

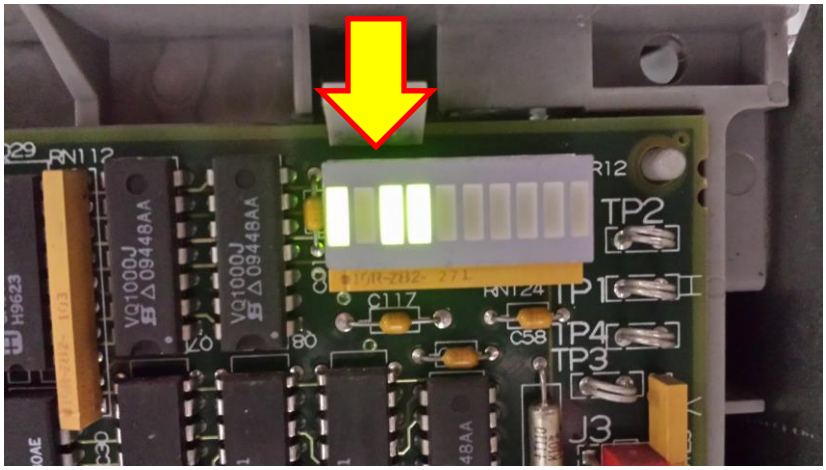
10.2.8 Recheck ALL connectors to verify none are misaligned (off one pin), partially connected or orientated 180 degrees of what it should be.



10.2.9 Restore power to core via the TCPD

10.2.10 Verify that the core boots and condition is A7 via the SLCC display

10.2.11 Verify TCDA synchs with the other cores (if applicable) by watching the BAR GRAPH LEDs blink in unison.



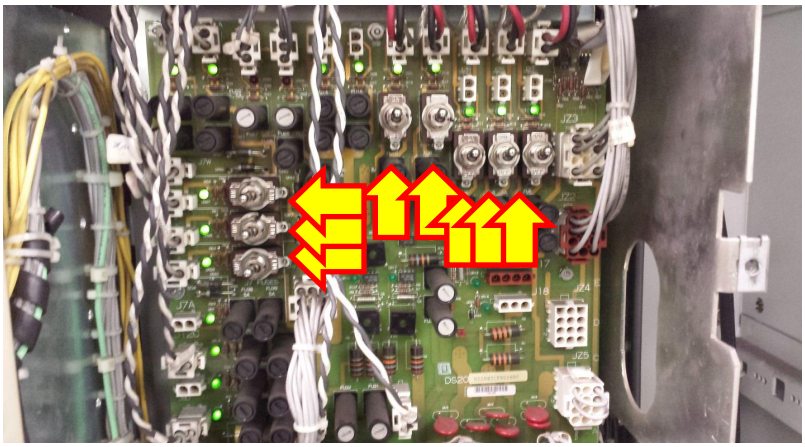
10.3 ***TEST COMPLETE for DS200TCDA card***

11. DS200SDDCC/SLCC

11.1 Removal of existing SDCC/SLCC card.

11.1.1 Installing the replacement DS200SDCC/SLCC into Mark V Turbine System

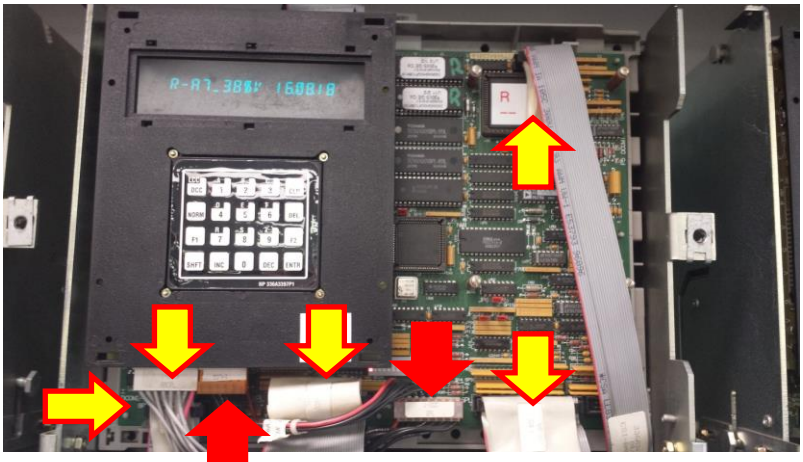
11.1.2 Remove Power to Respective Core:



11.1.3 Before attempting to remove the SDCC/SLCC verify that the power has been removed from the related core in the panel via the TCPD. (If it is a dead PS this may have been overlooked and power to core MAY STILL BE PRESENT!)

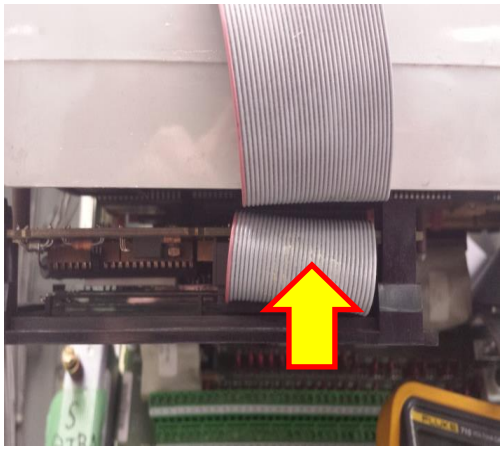
11.1.4 Locate the respective Core power switch on the TCPD and turn off power to the P core

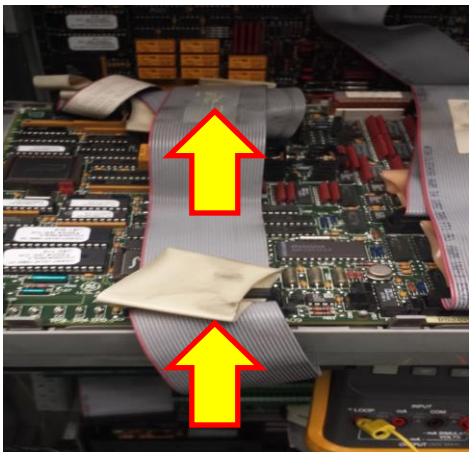
11.1.5 After verifying the POWER has been removed via the TCPD. Remove the KEYPAD from the SLCC by releasing the 2 retaining clips at the top of the KEYPAD and the 2 at the bottom.



11.1.6 Remove the POWER INPUT Connectors to the SDCC/SLCC FIRST! (Indicated by the RED ARROW's above)

11.1.7 Disconnect remaining: Connectors, and Ribbon Cables. There is one ribbon cable that is connected to both the SDCC and the SLCC that is ALSO connected to other card's located behind the SLCC/SDCC card tray. It is necessary to disconnect the ribbon cable from the OTHER cards indicated by YELLOW arrows. (see below)



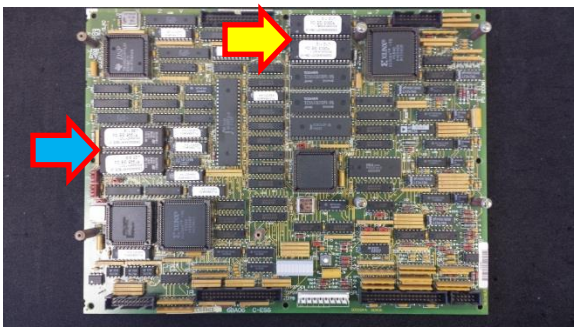


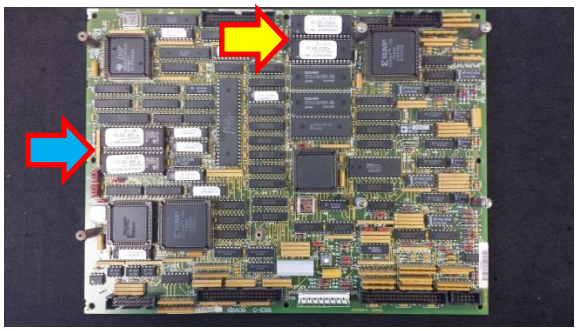
11.1.8 Remove the SDCC/SLCC and the single ribbon cable attached to the SLCC/SDCC by releasing the 6 retaining clips on the card tray, 3 located on the physical top of the card and 3 on the bottom.

11.1.9 Disassemble the SDCC/SLCC assembly by removing the 4 screws at each corner of the SLCC.

11.2 Setup of new SDCC card.

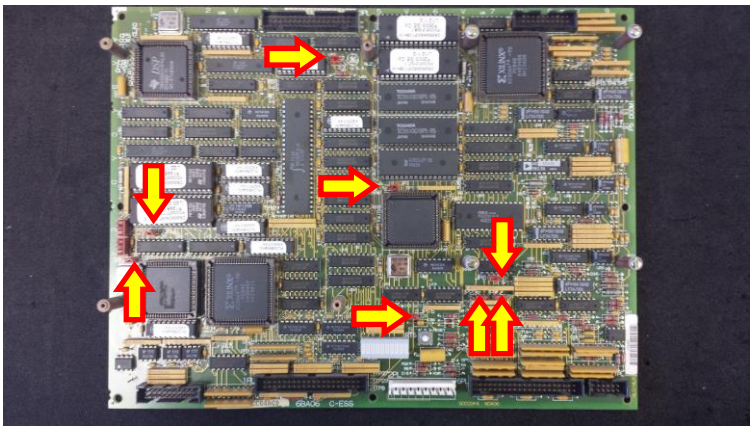
11.2.1 Place OLD and NEW SDCC side by side. Locate EPROM Puller sent with Revitalization Kit labeled TOOL KIT. Remove the 4 EPROM's, one at a time from the OLD SDCC and carefully reinsert them into the NEW SDCC.





11.2.2 Verify the EPROM PIN 1 is correctly orientated with in PIN 1 of the socket. Easily identified by EPROM's orientation notch. (Indicated by YELLOW arrow).

11.2.3 Verify all EPROMS on SLCC-(2) and SDCC-4; be sure EPROM pins are not bent under the EPROM or over the socket.



11.2.4 Set jumpers to match the OLD SDCC. (Indicated by YELLOW arrow above).

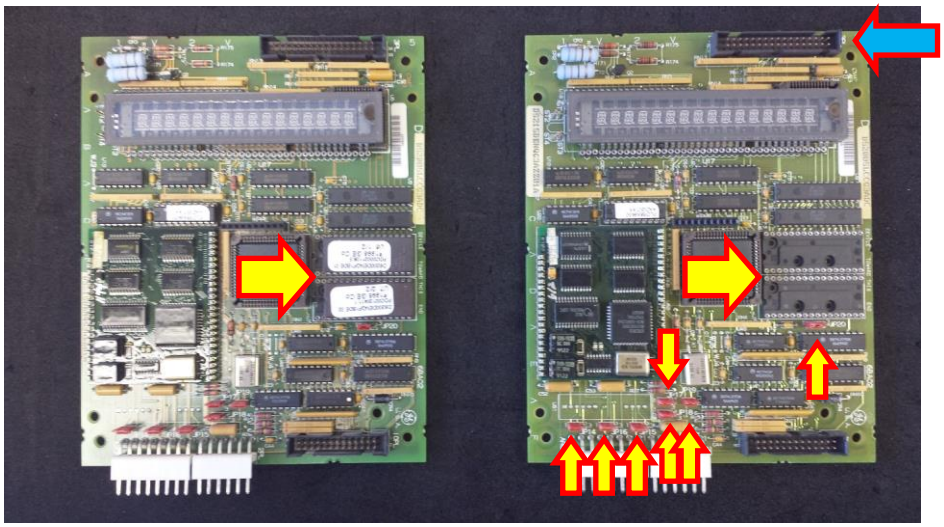
11.3 Setup of new SLCC card.

11.3.1 Place OLD and NEW SLCC are side by side. Remove the 2 EPROM's, one at a time from the OLD SDCC and carefully reinsert them into the NEW SLCC.

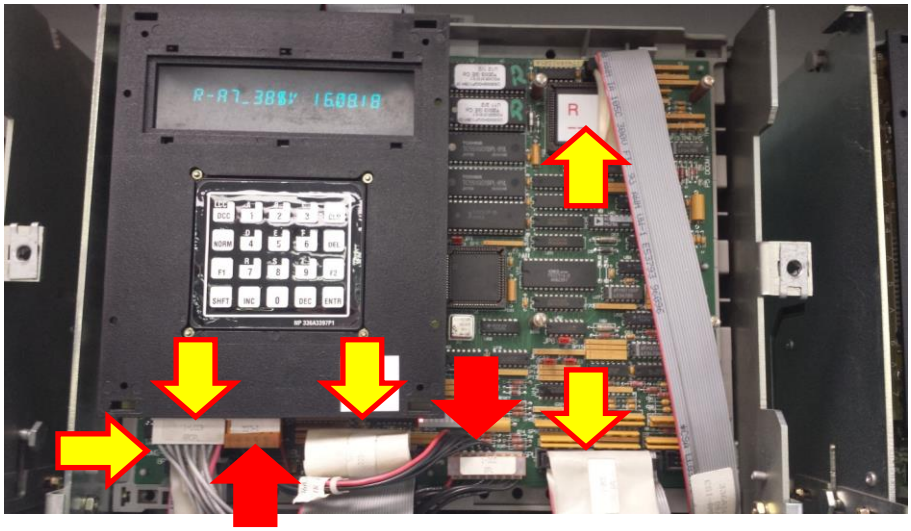
11.3.2 Compare ALL jumpers from the OLD SLCC to the NEW SLCC.

11.3.3 Reassemble BOTH the SDCC and SLCC with the removed screws.

11.3.4 Note: Install the ribbon cable removed with the SDCC/SLCC on to the SDCC first and then attach the SLCC to the SDCC, see blue arrow for location.

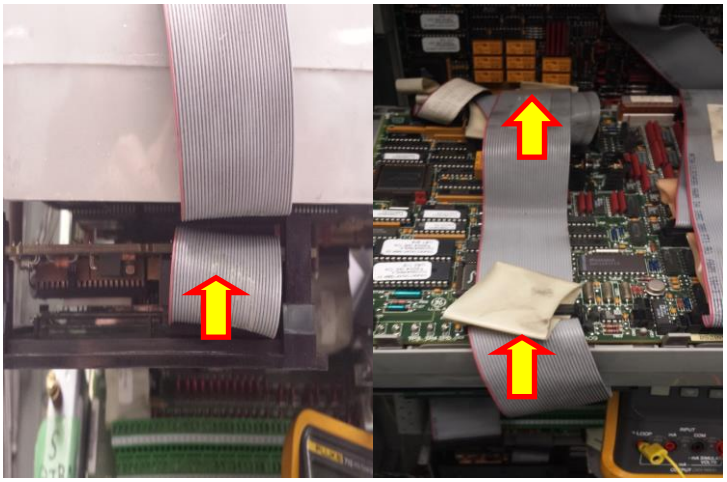


11.4 Installation of the new SDCC/SLCC assembly



11.4.1 Install the SDCC/SLCC by securing it with the 6 retaining clips on the card tray, 3 located on the physical top of the card and 3 on the physical bottom.

11.4.2 Connect remaining cables; Chassis Ground and Ribbon Cables including the one that disconnected from the boards in trays behind the SDCC/SLCC. (see below)

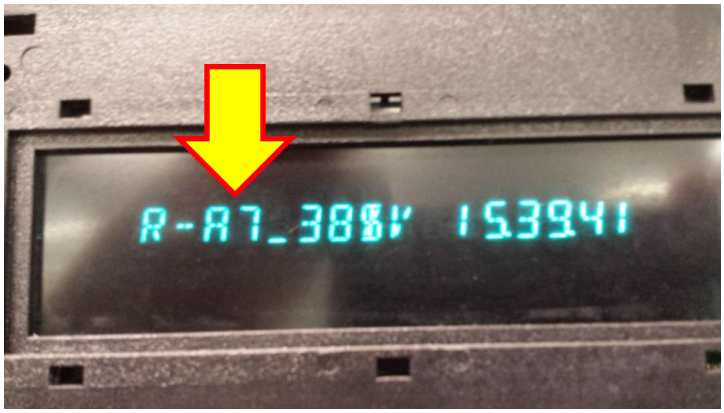


11.4.3 Install KEYPAD

11.4.4 Recheck ALL connectors to verify none are misaligned (off one pin), partially connected or orientated 180 degrees of what it should be. Close card tray.

11.4.5 Restore power to core via the TCPD

11.4.6 Verify that the core boots and condition is at least A4 via the SLCC display.



11.4.7 Set up SDCC/SLCC to which core it will be configured. (i.e. R, S or T) by using KEYPAD.

11.4.8 Press LCC/DCC

11.4.8.1 ---- 186 MONITOR ---- should display on SLCC

11.4.8.2 Press INC

11.4.8.3 Press ENTER

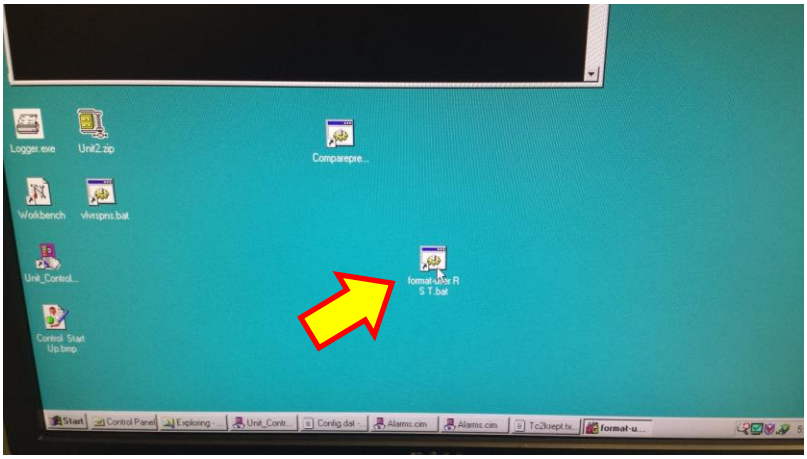
11.4.9 HOLD the SHIFT key down as you select which core the SDCC/SLCC will be assigned; R, S or T by pressing the associated key on the KEYPAD, (Above is example of “D” core).

11.4.9.1 Press ENTER

11.4.9.2 ---- OK FINE---- should display on the SLCC display for a short period.

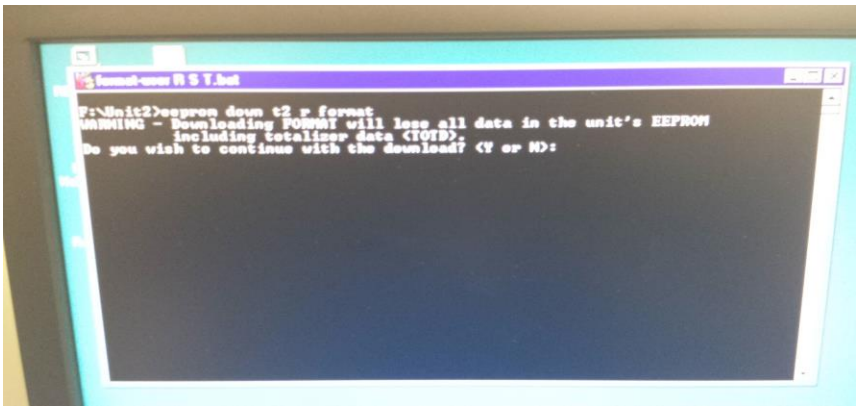
11.4.9.3 Reboot/Reset this core, by pressing the manual reset button above the 2PLconnector.

11.4.10 On the Desktop of the GAS HMI computer.

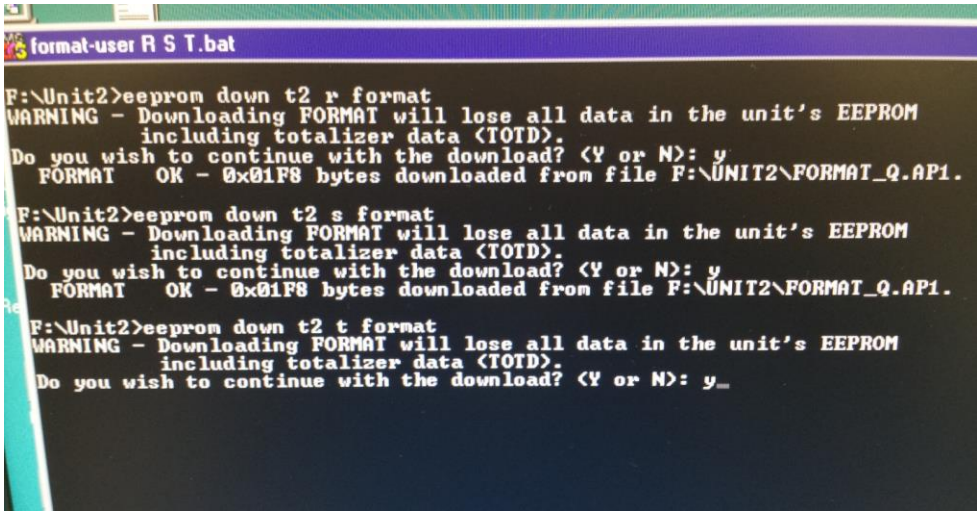


11.4.11 Double click in the icon shortcut “format-user R S T.bat”.

11.4.12 It will open a Command Prompt window, see next page.



11.4.13 Type "Y" and press enter to format the "R" core.

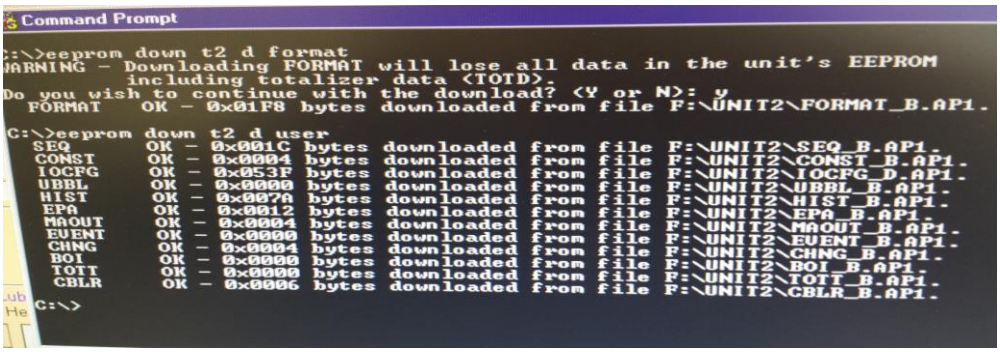


11.4.14 Type "Y" and press enter to format the "S" core.

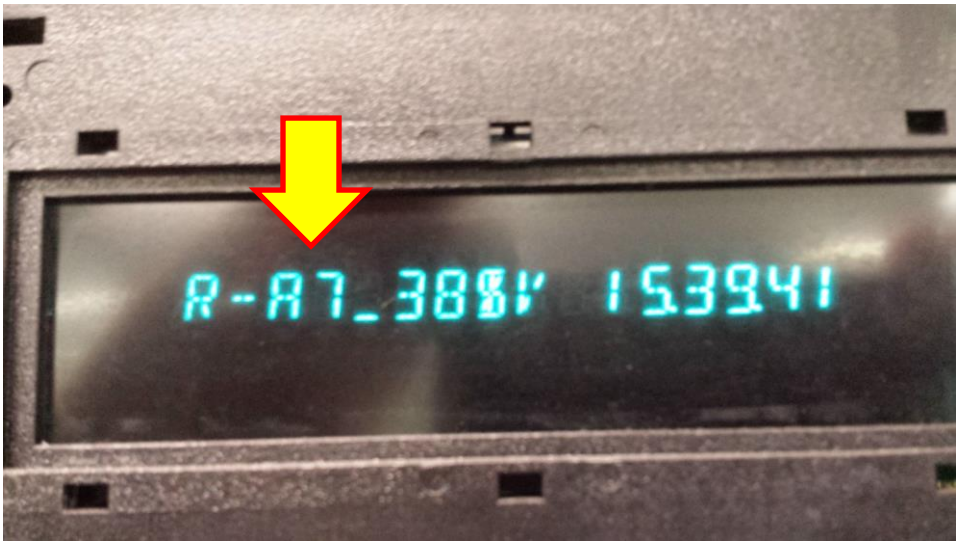
11.4.15 Type "Y" and press enter to format the "T" core.

11.4.16 The program will continue on its own and install ALL the "USER" files needed for the R/S/T cores and close by itself if successful.

11.4.16.1 Example below of the USER files downloaded to cores.



11.4.17 Reboot ALL R/S/T cores (by pressing manual reset button just above 2PL on all SDCCs) and verify they ALL come up to A7 status.



11.4.18 Need data on the MW readings that are adjustable on the SDCC cards.

12. Notes

12.1 None at this time.

13. Attachments

13.1 None at this time.