700-Relay Board Test Procedure
(20-0720-00)

Factory Test Procedure

UPDATE THIS DOCUMENT BEFORE RUNNING TESTS …

MANDATORY REQUIREMENT TO UPDATE: When the **MP-Lab Software version** changes, then **Section-1 Step-1a** must be updated and the **affected page-pair** (odd/even front & back) must be replaced in all the Factory Binder Sets.

Likewise, if any ***other instructions*** must be changed, then the **affected page-pair** (odd/even front & back) must be reprinted (duplexed) and replaced in all binder sets.

There are at least 2 sets of procedures for every Galaxy circuit board.

IMPORTANT: Follow instructions to update and duplex printing on the inside-cover.

Duplex Printing Instructions for updated steps or flash/software version:

These steps describe how to update this document and reprint the affected page-pair for duplex print output

1. Open this document in the full **MS-Word** software. *Do not use Word Pad or other products*.

UPDATING FLASHING SOFTWARE PRODUCT & VERSION

2. Click **File** menu and choose **Properties.**
3. In the **Category field,** update **MP Lab Software v 6.15** with new version.
4. In the **Comment field**, update **Revision 1.6** with new version (based on which type of changes were made - see *Increment Document Revision* at the bottom of this page)
5. Click **OK** to save properties.
6. See the **Appendix** for important instructions about updating or modifying any other content in the procedure such as instructions or images. Make all updates before reprinting any page-pairs**.**

PRINTING THE AFFECTED 'ODD/EVEN PAGE-PAIR' IN DUPLEX MODE

7. With this document open, press **<Ctrl+P>** to open the print properties:
   - » set **Printer** = 'EXCELSIOR\Copier' (or any printer that can print duplex mode (see more)
   - » set **Page Range = "3 – 4" (and/or whichever page-pairs you need to print)**
   - » set **Number of Copies = "2" (or how many binder sets you must update)**
   - » click the **[Properties]** button
   - » set **Orientation** = Portrait
   - » set **Duplex** = "Open to the Left" (or the equivalent setting that allows the document to print on "both sides" or both front & back in upright portrait layout)
   - » set **Color** = "color" (should be color because some)
   - » set **Staple option** = OFF
   - » click **OK** to send to printer (*the flash version field will automatically update before it goes to print*)

LAMINATE AND REPLACE THE AFFECTED PAGES IN ALL BINDERS

8. **Laminate** the individual sheets (page-pairs)
9. **Punch Holes** on the LEFT side (with the odd page facing up) for the 3-ring binder.
10. **Replace** the updated page(s) in all the binders.
    (There are 2 copies of the procedures for every board.)

INCREMENT DOCUMENT REVISION ONLY WHEN INSTRUCTIONS CHANGE: If any instructions are changed, the document revision should be incremented (revision is also in the Document Properties screen).

- **MAJOR REVISION**: If you correct or modify an instruction or test in a major way (i.e., add, modify, or delete an instruction or diagram, etc.); or you correct and incorrect statement or diagram; then increment the number to the left of the decimal point … Remember to u*pdate Document History chart in appendix.* **Example: change 4.0 to 5.0 if you added missing instruction, corrected an error, changed the way a test is done**.
- **MINOR REVISION**: If you are only fixing a typo/spelling mistake **⟨OR⟩** making a minor clarification to existing text or existing diagram; the change is only needed to *clarify* the existing instructions when the instructions are correct and complete, but unclear; then increment the number to the right of the decimal point … **Example: change 4.0 to 4.1 if you added clarification or fixed a typo.** *Update Document History chart in appendix.*
- **EXCEPTION**: Updating the flash code version **does not** increment the document revision – the flash version is expected to change periodically as the programming tool is updated. *See Document History chart.*

SECTION-1: SET UP OF FACTORY TEST ENVIRONMENT

PURPOSE: This section designates the correct flash, prepares the test environment / loads flash to the factory test station.

STEP 1. TEST MATERIALS & REQUIREMENTS

PART	INSTRUCTION

A This test must use current MP-Lab Software v 6.15

〈 MP Lab software is installed on the Test PC 〉

B List of Materials:

TEST BENCH

1. **Test PC:** with **TeraTerm** and **MP-Lab software** installed.
2. **MP-Lab Programming Device**
3. **Factory Test Jig:** with 12 VDC power cables supplied.
4. **Cable Set:**
   - **16-pin I2C Ribbon Cable:** to connect CPU to DSI); (this may be part of the Test Jig).
   - **RS-485 Cable:** 22AWG; 2-piece DSI Connector with *open leads* on Relay Board end.
   - **USB to USB-C Cable:** for the MP-LAB Microchip Programming Device.
   - **6-pin Ribbon Cable:** for flashing the Relay Board.

TEST JIG HARDWARE (for RS-485 Data Bus Validation / Relay Test)

5. Factory-designated **635-CPU board** running current flash
6. Factory-designated **635-DSI board** running current flash
7. Designated **Assembly Drawing** that is approved for visual inspections.

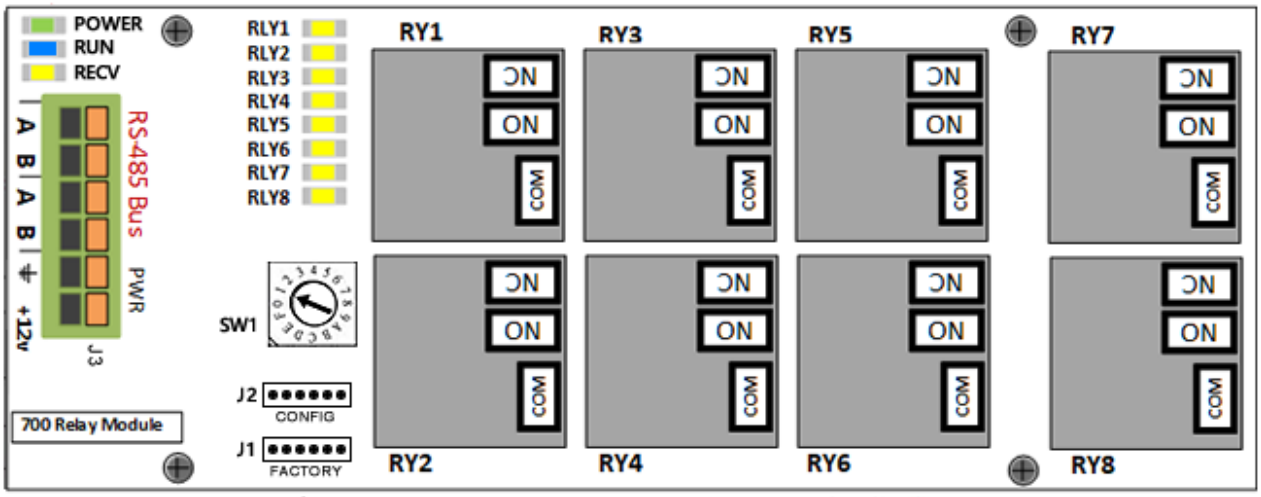
OTHER ITEMS

8. **Serial Number Stickers** (8-digits; affix to back of Relay Board)
9. **QC Stamp**
10. **CE Stickers**
11. **Baseline Relay board** (or drawing)

C 700-ORM - RELAY BOARD COMPONENT LIST:

This is a diagram of the 700 ORM (Output Relay Module) that shows the name and location of the components that are referenced during the inspections and tests in this procedure:

- **J1 = Factory Flash Port** (board flash)
- **J2 = Console Port** (board configuration)
- **J3 = Power & RS-485 Data Connector**
- **SW1 = Rotary Switch** (Board ID address)
- **Relays 1 thru 8 = Output Relays**
- **LEDs for RLY1** thru **RLY8 (Yellow) = ON / SOLID** if corresponding Relay is energized
- **LED Power (Green) = ON / SOLID,** while power is applied
- **LED Run (Blue) = ON / FAST BLINKING,** when powered after programming is done
- **LED Recv (Yellow) = ON / BLINKING,** when RS-485 data is received



SECTION-2: VISUAL INSPECTION OF RELAY BOARD

PURPOSE: This describes the inspections done to a new Relay Board. You must compare the new Relay Board to an approved designated Baseline Relay Board.

STEP 2. VISUAL INSPECTION OF TARGET BOARD

REQUIREMENTS:

- The board must pass the visual inspection before doing factory tests.
- You must use the designated Assembly Drawing to perform comparisons during the visual inspection.

PASS ACTION	• If target board passes ALL checks, then the board can advance to the next Step.
FAIL ACTION	• If target board fails ANY visual check, the board must be repaired as appropriate before it can proceed with Factory Tests. • If the board cannot be repaired, the board must be rejected and cannot advance to factory tests.
WARNING	**Do not apply power to a failed board until all corrections and repairs are completed!**

PART	INSTRUCTION

A. INSPECT THE ORIENTATION OF COMPONENTS:

Perform a visual inspection of the components on the ***target Relay board***.

✓ VERIFY: **all components are correctly oriented on the *Relay board***
including components that are “keyed” or are installed based on polarity.

B. INSPECTION OF BOARD AND SOLDER:

Inspect the front and back of the board for the following things …

✓ VERIFY: **there are no obvious solder bridges or cold solder connections**

✓ VERIFY: **there is no obvious damage to the board**

✓ VERIFY: **that parts are not broken, pulled-up, or improperly installed**

SECTION-3: FACTORY FLASH AND BOARD CONFIGURATION

This section covers loading Factory Flash and configuring an 8-digit Serial Number into Relay Board.

PREREQUISITES & STIPULATIONS

- STEP-1 (Setup) MUST be completed before running Step-3.
- STEP-2 (visual inspection) MUST be completed before running Step-3.
- ALL instructions and tests MUST be done in sequential order.
- DO NOT abbreviate, modify or skip any steps.
- DO NOT interrupt power to the board during testing or flashing.
- a failed board must be retested starting from Step-2 after it has been corrected/repaired.

STEP 3. SET-UP the FACTORY TEST JIG:

PART	INSTRUCTION

A **Connect the Test Jig to the Factory Bench:**

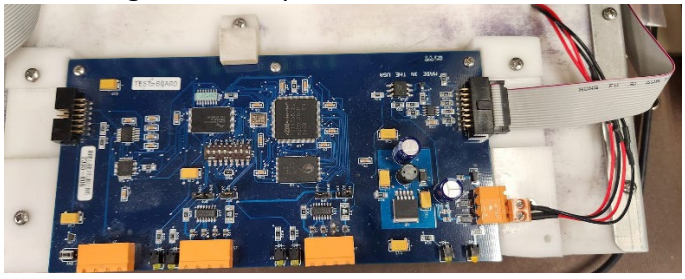
1. **TURN OFF POWER AT THE BENCH (TOGGLE SWITCH)**
2. **Connect power JACKS** to front of bench (observing polarity of the Black & Red Jacks).

B **Install the 'designated CPU' into the LEFT SIDE of the Test Jig:**

1. Seat the **'designated CPU'** on the left side of Jig; connecting +12vdc cable.
2. Connect the **16-pin I2C Ribbon Cable to J8 Data connector** on the CPU Board.
3. Secure the hasp/clip, as appropriate.

C **Install the 'designated DSI' into the RIGHT SIDE of the Test Jig:**

1. Place the rubber spacers on the deck of the Test Jig to prevent the DSI Board from contacting the metal pins, when it is seated on the Test Jig.



2. Plug in the **12vdc power cable** into **DSI Board**.
3. Connect the **16-pin I2C Ribbon Cable** to the **635-DSI Board**
4. Connect **RS-485 Cable** to **Section-1 DSI (J6)**

- **Proceed to the next step.**

STEP 4. TEST 700-RELAY BOARD POWER:

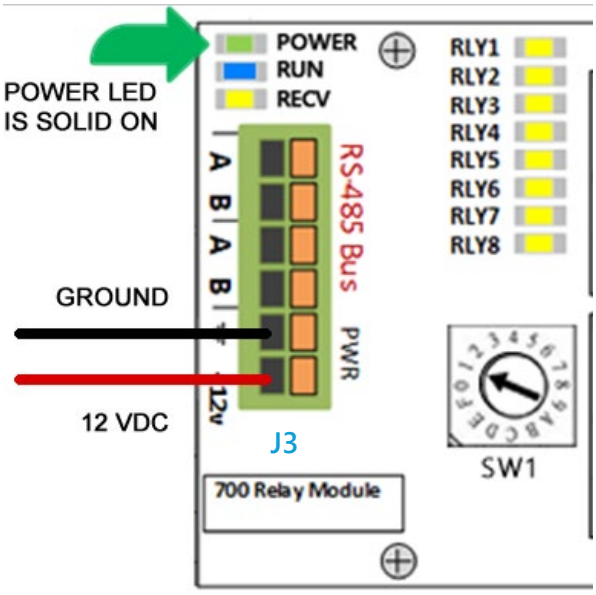
A

1. Make sure the **Power Source is OFF** for the Relay Board.

B

2. Set the Rotary Switch (SW1) set to the “1” position.
3. Connect the **Power Leads** to the **Relay board (J3) –** observing polarity.
4. Turn **ON Power to the Test Bench** at the toggle switch.

✓**VERIFY:** **the Power LED is ON/SOLID (Green LED)**



(image is cropped to enlarge board)

▸ Proceed to the next step.

STEP 5. FLASH THE RELAY BOARD:

A 1. **Connect the USB-C Cable as follows …**

a. Connect one end to the **USB Port** on the **Test PC.**

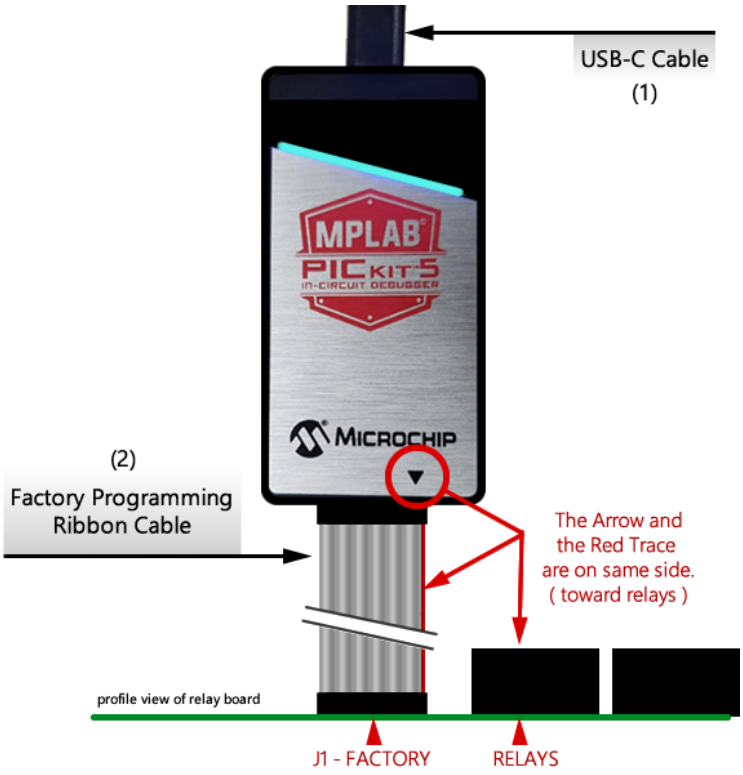
b. Connect the other end *to the* **USB-C port** on the **Microchip Programming Device.**

2. **Connect the 6-Pin Ribbon Cable as follows …**

a. Connect one end *to the* **6-Pin Port** on the **Microchip Programming Device.** (Make sure the Red Trace on the Ribbon cable is on the side with the arrow as shown in the picture below).

b. Connect the other end to the **Factory Port (J1)** on the **Relay Board.**

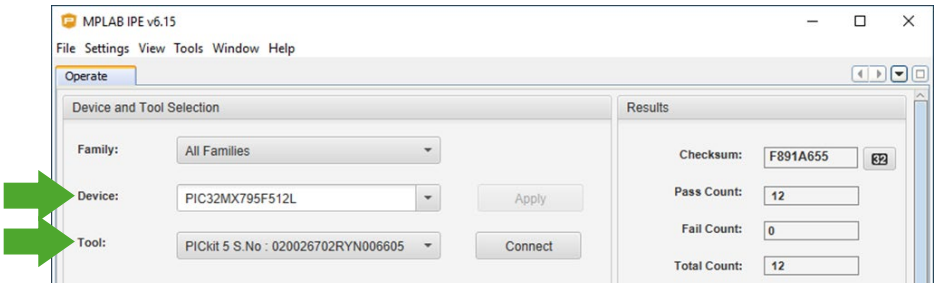
✓ **VERIFY: Be sure the Microchip Arrow and the Red Trace of the ribbon cable are on the same side – toward the relays.**



B Open the **MPLab software** from the PC desktop shortcut**.**

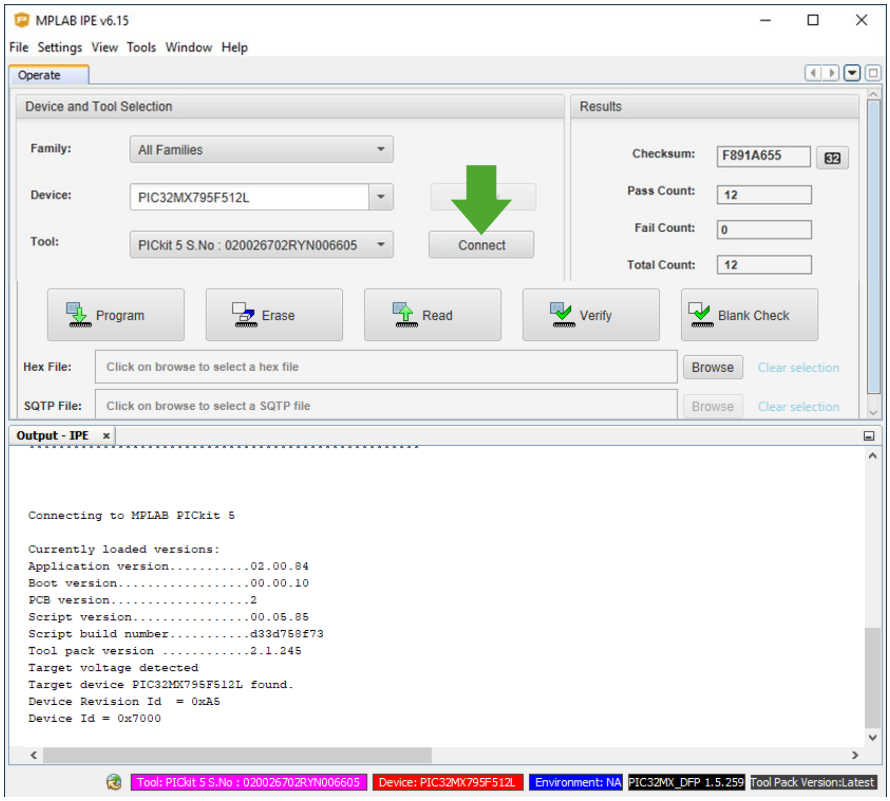
C In the **[Operate]** tab the following settings should be selected …

- Device = PIC32MX95F512L
- Tool = PICkit 5 S.No : 02002670RYN006605

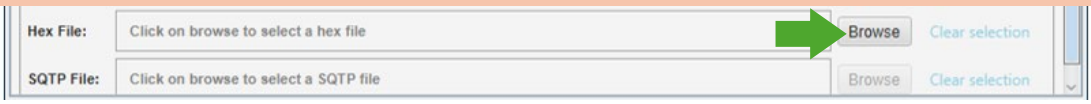


D Click the [**CONNECT**] button on the *Operate tab* of the MPLab software.

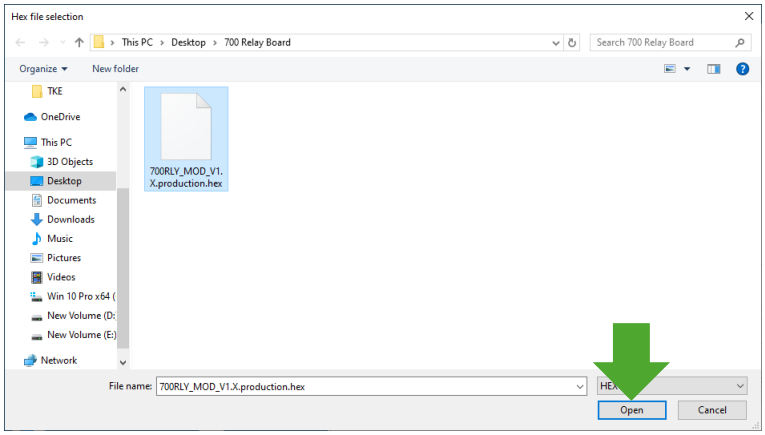
RESULTS: the Output tab should show the results of connecting.



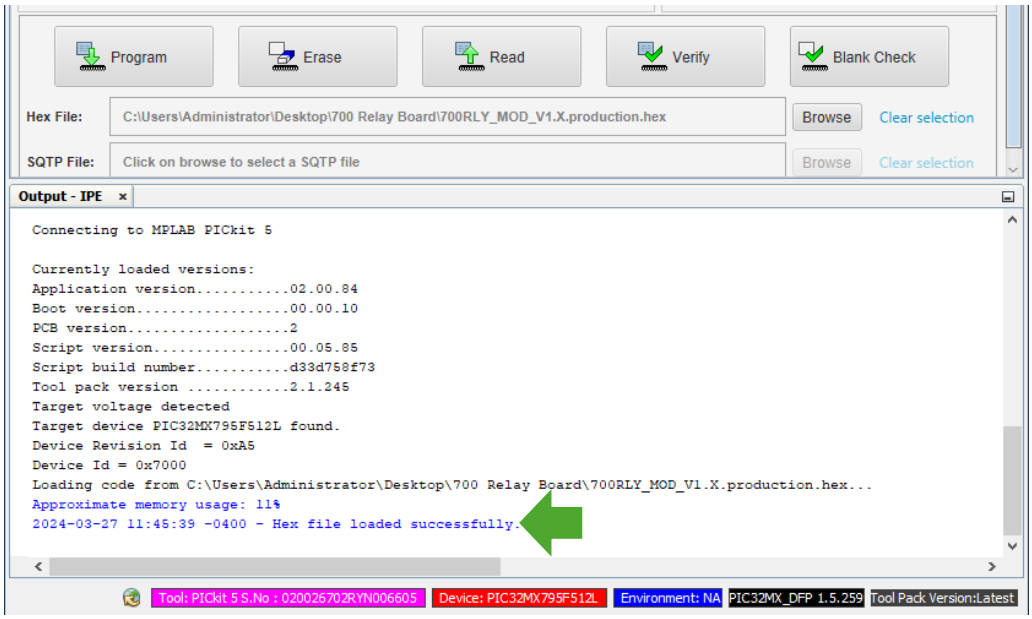
E 1. Click **[BROWSE]** in the Hex File field and select (highlight) the hex file.



2. Click **[OPEN]** to begin loading flash to the Relay board.



✓**VERIFY:** the Output tab displays “Load Success” when completed.

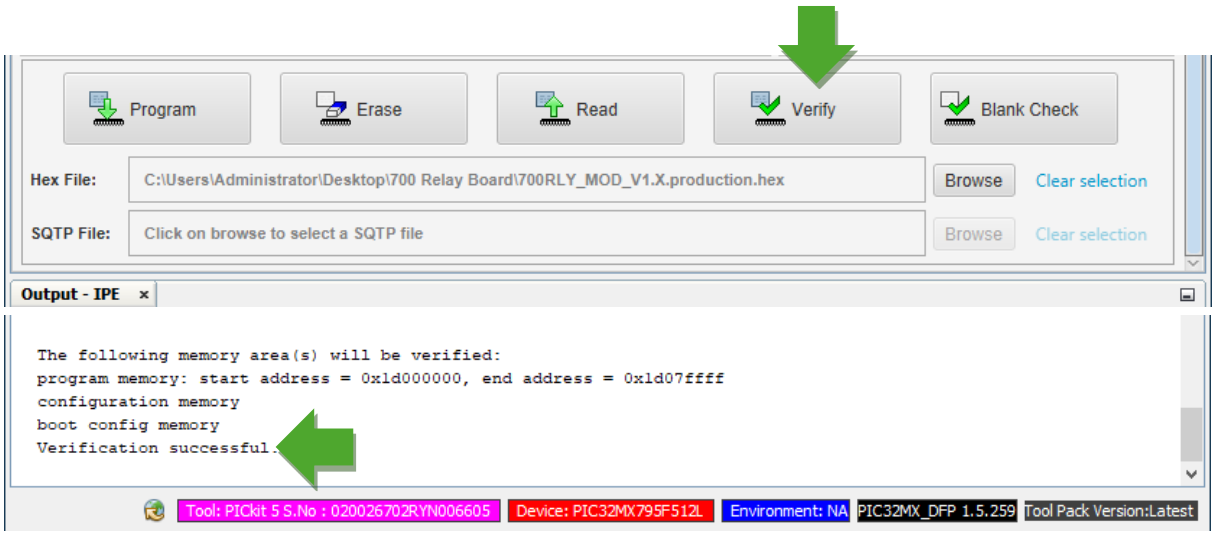


F Click the **[PROGRAM]** button to begin flashing the relay board through the factory port.

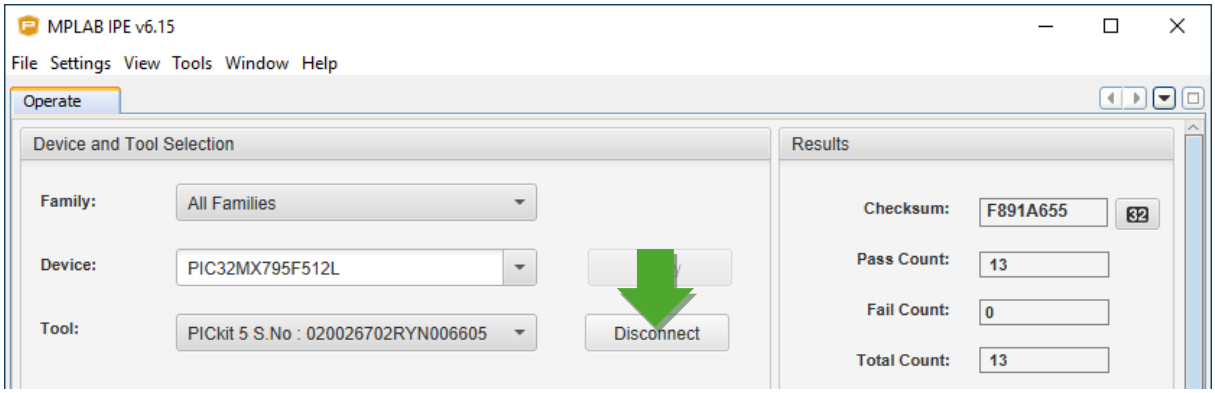
✓**VERIFY:** the Output tab, displays "*Program Complete*" message.

G Click the [**VERIFY]** button to confirm flash allocation.

✓**VERIFY:** the Output tab should display "*Verify Successful*" message.



H Click the [**DISCONNECT]** button in the Operate tab to end the program session.



I Unplug/remove the **6-Pin Ribbon Cable** from Factory Port of Relay Board after the flashing is complete.

J Cycle power **OFF then ON** at the Power Source for the Relay board.

✓VERIFY:

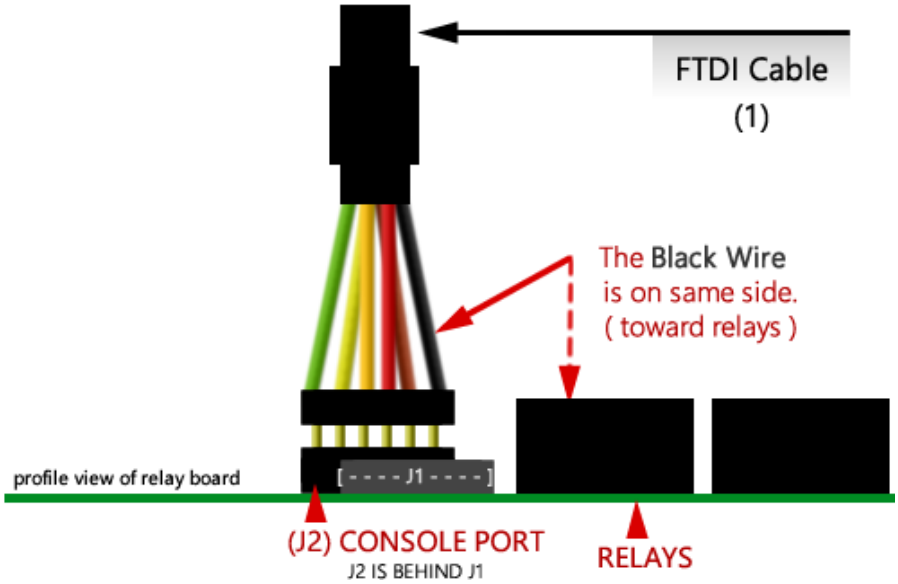
- **Green LED** (Power): = Solid ON (indicates power is ON)
- **Blue LED** (Run): = Rapid Blinking /ON (indicates board flash is running)

▶ **Proceed to the next section to Configure this Relay Board.**

STEP 6. PROGRAM SERIAL NUMBER INTO THE RELAY BOARD:

A **Connect the FTDI Cable to the USB Port on the Test PC.**

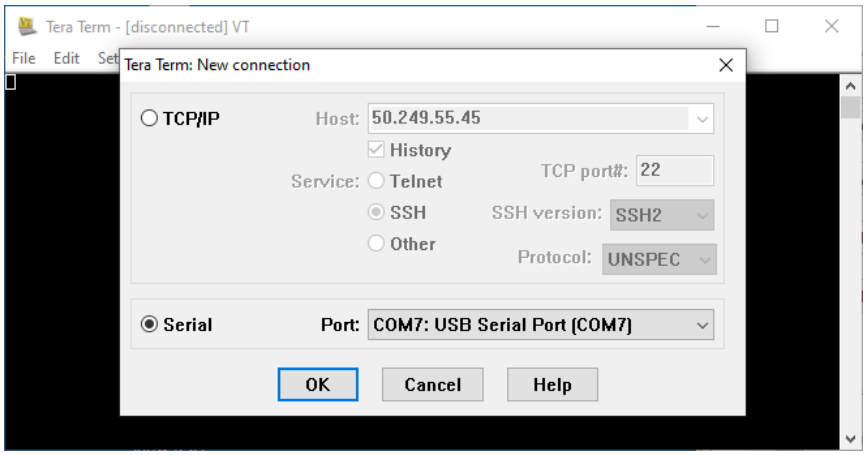
B **Connect FTDI to J2 Console port** with the **Black Wire toward → Relay**.



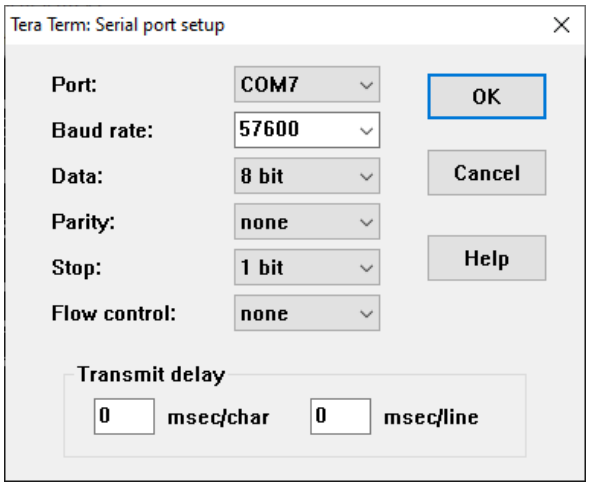
C

1. Launch **TeraTerm** software from the Desktop shortcut on the **Test PC.**

2. Choose **New Connection** if needed.
3. Choose the **Serial radio** button.
4. Choose the **COM Port** and click **OK** button.

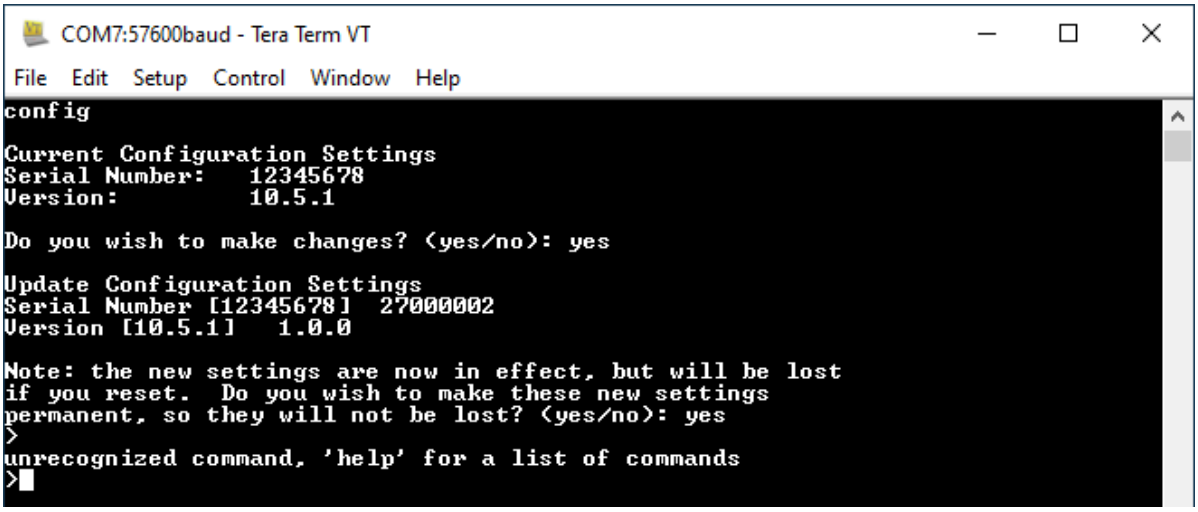


5. From the **Setup menu** select the **Serial Port** option
6. Choose **57600 Baud Rate**
7. Click **OK** button.



E **Type the following commands in lower case …**

1. Press the keyboard **<Enter> key**
2. Type "**config**" and **press <Enter> key**
3. Type "**yes**" and **press <Enter> key**
4. Enter the **8-digit serial number** and **press <Enter> key**
   Example: "27000001" – you must match the SN affixed to the back of the board.
5. Type "**1.0.0**" and **press <Enter> key**
6. Type "**yes**" and **press <Enter> key** (to save the serial number).



Proceed to the next section to test this Relay Board.

SECTION-4: BOARD TESTING

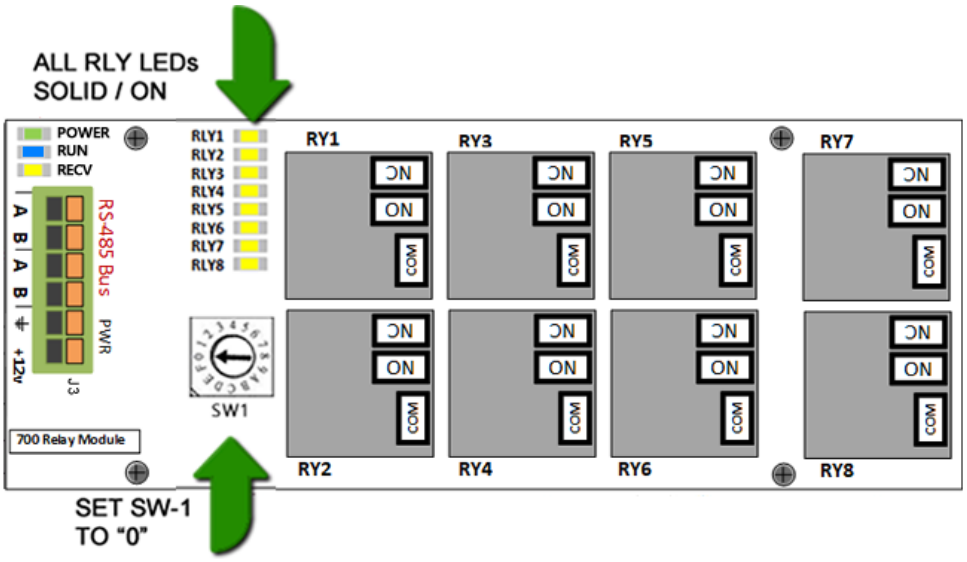
STEP 7. TEST RELAYS: This is a test of the Relays and LEDs using the Rotary Switch.

A Power should already be applied to the Relay board.

Result: the Power LED should be ON/Solid (Green LED).

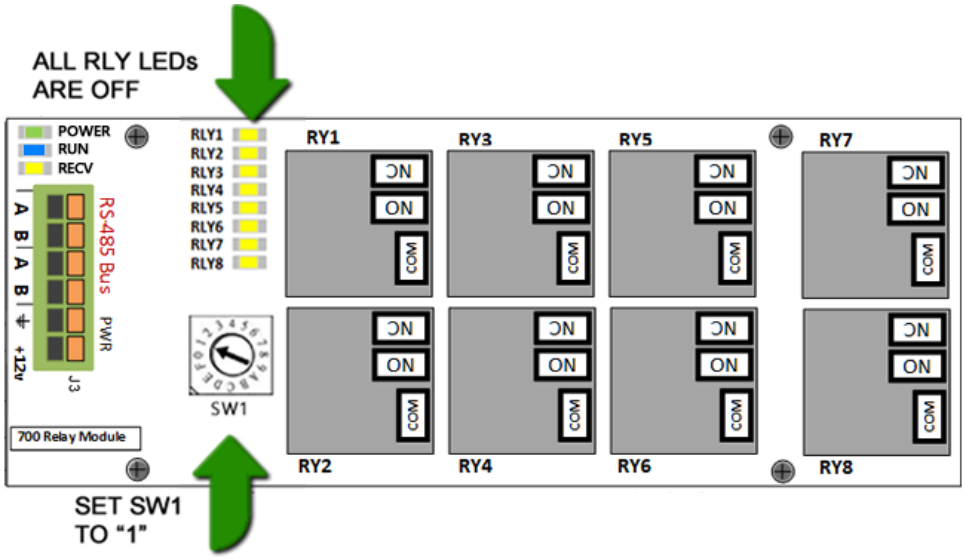
B Using a small screwdriver, set the Rotary Switch ARROW to "0" …

✓**VERIFY:** that **ALL relays are ENERGIZED** and all **LEDs are Solid-ON**



C Set the Rotary Switch (SW1) ARROW to position "1" on the dial.

✓**VERIFY:** that **ALL the relays DE-Energize** and all **LEDs turn OFF**



STEP 7 RELAY TEST CONTINUED:

D

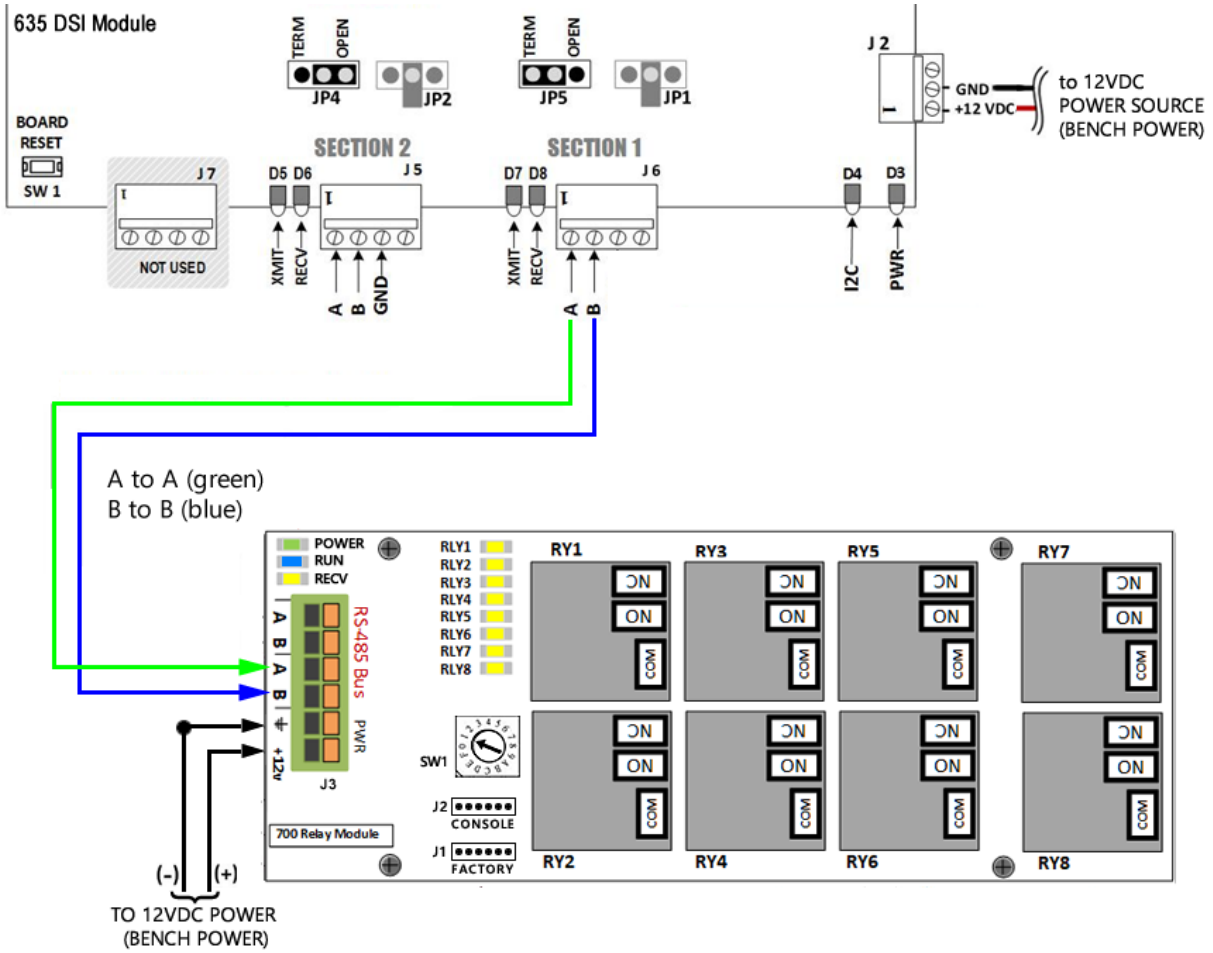
1. **Connect *RS-485 Cable* to the J6 DSI Board …**
   - plug in the *2-piece Orange Connector* into J6 Terminal Block (Section-1)

2. **Connect *RS-485 Cable* to the J3 Relay Board …**
   - push in orange button at *J3 Contact-A* and insert the GREEN WIRE (A to A).
   - push in orange button at *J3 Contact-B* and insert the BLUE WIRE (B to B).

Table of RS-485 Cable Pin-Out

	DSI Board J6	→	Relay Board J3
	(Section-1)		*press orange button*
GREEN WIRE	A	→	A
BLUE WIRE	B	→	B

RS-485 Wiring Diagram from DSI Board to Relay Board



E Using the Browser Desktop Shortcut on the Test PC, do the following …

1. **Open the Web Browser** – *to connect to the CPU on the test jig.*

(type 192.168.0.150 into the web address bar.)

2. **Click the DSI serial number** *link to the board.*

RESULT**:** this will open the BOARD TEST PAGE *(seen in next step).*

---------- Panel Status Page ----------

Model Number:	635
Local Date/Time:	20:30:13 03/22/2024 Set Date/Time
Unit No:	1
Cluster No:	1
Serial Number:	03765783
Software Version:	11.0.10
CPU Number is:	1
Extended Card Mode:	No
Number of Users:	11
Unacknowledged Logs:	37

Event Server Configuration				
No.	**Status**	**Server IP**	**Server Port**	**Local Port**
0	Connected	63.122.126.128	3001	0
1	Not Used			
2	Not Used			
3	Not Used			

Attached Boards						
Serial#	**Board#**	**Status**	**Board Type**	**Version**	**Using CPU**	**Flash Update**
3401556	4	NORMAL	635-DSI	11.0.9	1	n/a
3050354	2	NORMAL	635-DPI	11.0.9	1	n/a
3666677	1	NORMAL	TKE	11.0.10	1	n/a

F **Set up and test the relays as follows …**

1. Set Section to **'One'**
2. Set Function to **'Galaxy Relay Boards'**
3. **Click APPLY** button – *this will reveal the relay table*
4. Enable (CHECK) the **Ripple Relay option**

---------- Board Test Page ----------

Configuration Options	
Local Date/Time:	14:54:30 03/15/2024
Serial Number:	3401556
Software Version:	11.0.9

Selection Testing	
Section	One
Function	Galaxy Relay Boards
	Apply

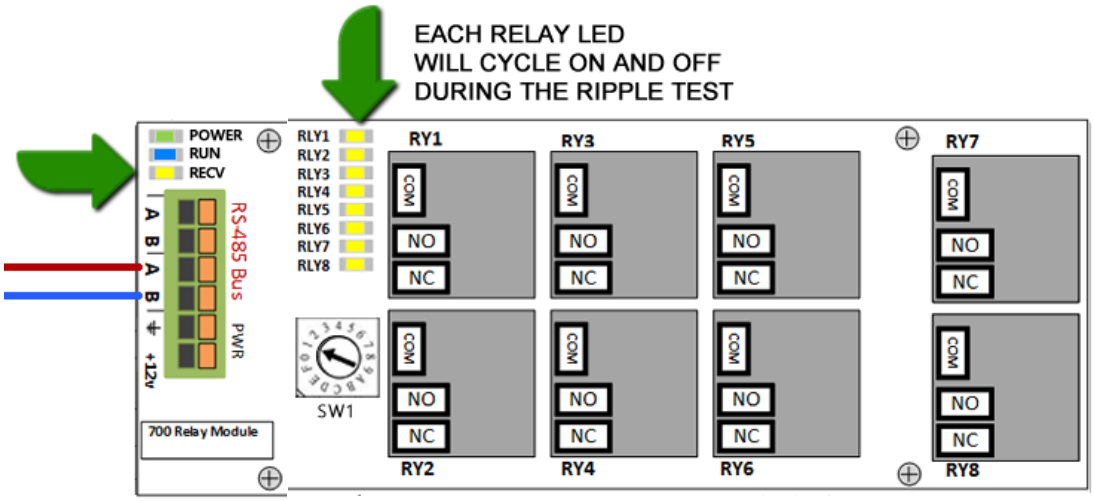
DSI Section 1 set to drive Relay Boards
☑ Automatically Ripple Relays

Pusher Timeout, use REFRESH or APPLY to resume

rBrd #	Found	R1	R2	R3	R4	R5	R6	R7	R8
1	no	☑	☐	☐	☐	☐	☐	☐	☐
2	no	☑	☐	☐	☐	☐	☐	☐	☐
3	no	☑	☐	☐	☐	☐	☐	☐	☐

✓**VERIFY:** **the (yellow) RECV LED blinks as each relay activates.**

✓**VERIFY:** **that each Relay (1 – 8) energizes and each LED turns ON <u>in sequence</u>.**



IMPORTANT: If a LED doesn't blink or a relay doesn't engage, then the board needs to be repaired. Then retest it by rerunning Step-7.

▸ Proceed to the next step.

STEP 8. FINISH BOARD: finish prepping the board for stock.

A **Remove the RELAY BOARD from the Test Jig:**

1. **Turn OFF power to the test Bench**
2. Disconnect **2-PIN power cable** at the RELAY BOARD
3. Disconnect the **RS-485 two-wire Cable** at the RELAY BOARD
4. Leave the Relay Board addressed to “1”

B **Affix the board stickers:**

1. QC Stamp
2. Serial Number sticker should be affixed to back of board.
3. CE sticker
4. Attached Ziploc bag with 16 terminal connectors for the relays.:

▸ **RETURN TO BEGINNING OF PROCEDURE TO CONTINUE TESTING THE NEXT BOARD.**

! NOTICE: When finished testing all boards, store the **RS-485 harness** and other necessary cables (FTDI, USB-C, 6-PIN Ribbon Cable) in the pocket of the primary procedure.