700-Input Board Test Procedure
(20-0710-00)

Factory Test Procedure

UPDATE THIS DOCUMENT BEFORE RUNNING TESTS …

MANDATORY REQUIREMENT TO UPDATE CONTENT: When the **MP-Lab Software version** changes, then **Section-1 Step-1a** must be updated in the source file.

MANDATORY REPLACEMENT OF UPDATED PAGES: After the content update is done to the source file, the **affected page-pair** (odd/even front & back) must be printed and replaced in every copy of the Factory Binder Sets.

NECESSARY UPDATES TO INSTRUCTIONS: If any *instructions* must be changed, then the **affected page-pair** (odd/even front & back) must be reprinted (duplexed) and replaced in every copy of the Factory Binder Sets.

There are at least 2 sets of procedures for most Galaxy circuit boards.

IMPORTANT: Follow duplex printing instructions to reprint the back-to-back pages when content is updated. (Duplex printing steps are found on the inside-cover.)

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

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

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

<u>UPDATING FLASH VERSION & SOFTWARE PRODUCT VERSION</u>

2. Click **File** menu and choose **Properties.**
3. In the **Category field,** update <u>MP Lab Software v 6.15</u> with the new version.
4. In the **Comment field**, update document **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. Make any other content updates as needed. <u>Make all updates before reprinting any page-pairs</u>.
7. **Determine which 'back-to-back' page-pairs are affected.**

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

8. With the source 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** = "3" (or however many binder sets you must update)
   - » click the **[Properties]** button (if your printer requires you to)
   - » set **Color** = "color" (should be set to color)
   - » 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 **Staple option** = OFF (if available)
   - » click **OK** to send to printer (*the flash version field will automatically update before it goes to print*)

<u>LAMINATE AND REPLACE THE AFFECTED PAGES IN ALL BINDERS</u>

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

INCREMENT DOCUMENT REVISION NUMBER 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 <u>does not</u> 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   [or current version   ]**
〈 MP Lab software is already 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 Input Board end.
   - **USB to USB-C Cable:** for the MP-LAB Microchip Programming Device.
   - **6-pin Ribbon Cable:** for flashing the Input Board.

TEST JIG HARDWARE (for RS-485 Data Bus Validation / Input 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 Input Board)
9. **QC Stamp**
10. **CE Stickers**
11. **Baseline 700-Input board** (or drawing)

C   700-AMM - INPUT BOARD COMPONENT LIST:

This 700 AMM (Input Module) board diagram shows layout of the main components that are referenced in this procedure:

- **J1 = Factory Flash Port** (board flash)
- **J2 = Console Port** (board test)
- **J3 = RS-485 Data Connector (and Power In VDC)**
- **SW1 = Rotary Switch** (for Board ID addressing 1 thru 16)
- **J4 thru J9 = Input Ports** (Inputs 1 thru 16; board tamper, volts)
- **J10/J11 = Input Supervision Resistor Bank** (4.7 K Ω factory default)
- **LED1 thru LED16 (Green) = ON / BLINKING** if corresponding Input is closed.
- **LED Power (Green) = ON / SOLID,** while power is applied.
- **LED Run (Blue) = ON / BLINKING,** when powered after programming is done.
- **LED Recv (Yellow) = ON / FLICKERING,** when RS-485 data is received.
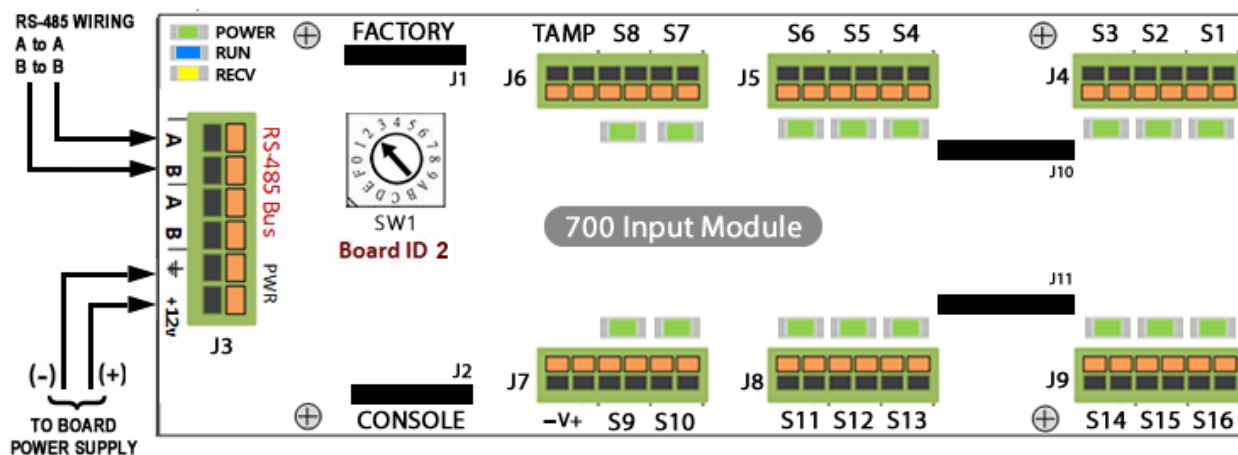
- **Note:** J6 also supports a *Tamper Switch* function for situations where the Input Board is installed in a separate cabinet enclosure with a separate power supply.
- **Note:** J7 also supports *Input Voltage Monitoring* for the separate power supply that powers peripheral Input Sensors. The voltage must be 12VDC. When voltage drops below +12.0 VDC a Low Voltage signal is generated and a "Low Voltage message is transmitted to the System Galaxy software.

SECTION-2: VISUAL INSPECTION OF INPUT BOARD

PURPOSE: This outlines the visual inspections done to a new Input 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 known-good board or appropriate drawing to perform comparisons.

TEST STATUS	STATUS CONDITION
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.
WARNING	Do not apply power to a failed board until all corrections and repairs are completed!

PART	INSTRUCTION

A.   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

B.   INSPECT THE ORIENTATION OF COMPONENTS:

✓ VERIFY: the inductor "key" is positioned in the **top left corner** when viewed as shown below.
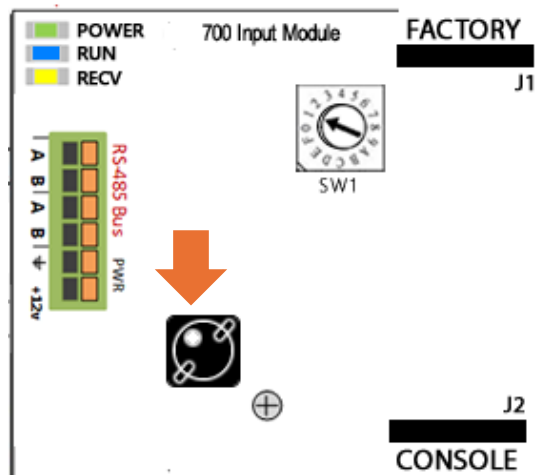
SECTION-3: FACTORY FLASH AND BOARD CONFIGURATION

This section covers loading Factory Flash and configuring an 8-digit Serial Number into Input 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.
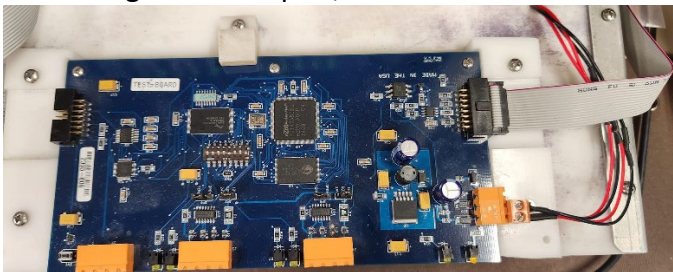
2. Plug in the **12vdc power cable** into **DSI Board**.
3. Connect the **16-pin I2C Ribbon Cable** to the **635-DSI Board**
4. Connect **RS-485 Cable** to **Section-1 DSI (J6)**

▸ **Proceed to the next step.**

STEP 4.   TEST 700-INPUT BOARD POWER:

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

2. Set the Rotary Switch (SW1) set to the "1" position.

3. Connect the **Power Leads** to the **Input 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)**
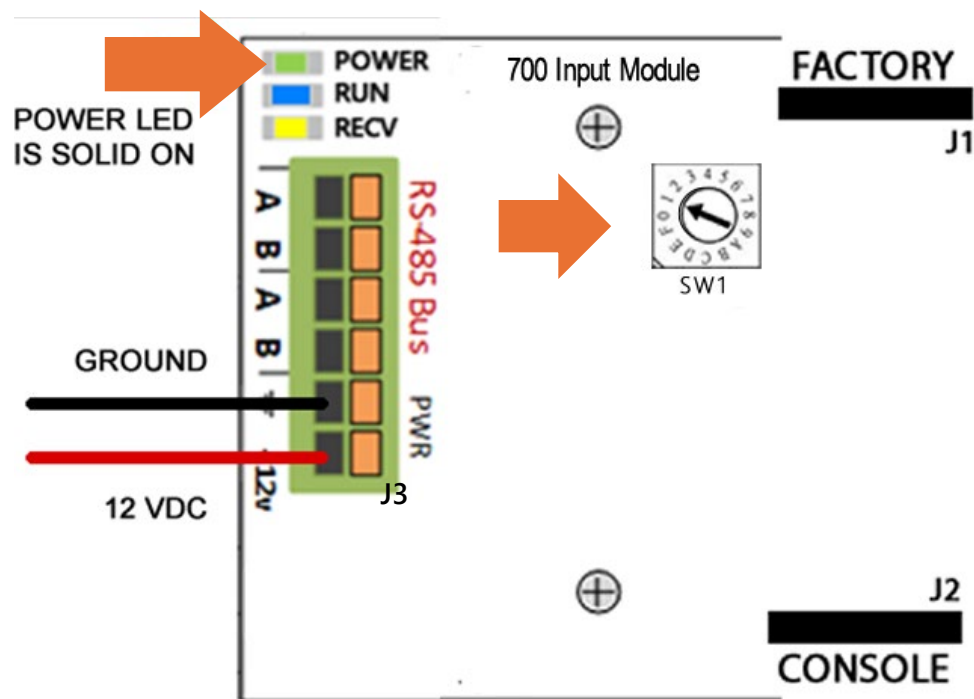
(image is cropped to enlarge board)

▸   **Proceed to the next step.**

STEP 5. FLASH THE INPUT 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 **Input Board.**

   ✓ **VERIFY:** the Microchip Arrow – is toward the power LED
        (The *device label* should be facing toward the outer edge of board.
        Might be facing away from the tester when mounted on test fixture.)
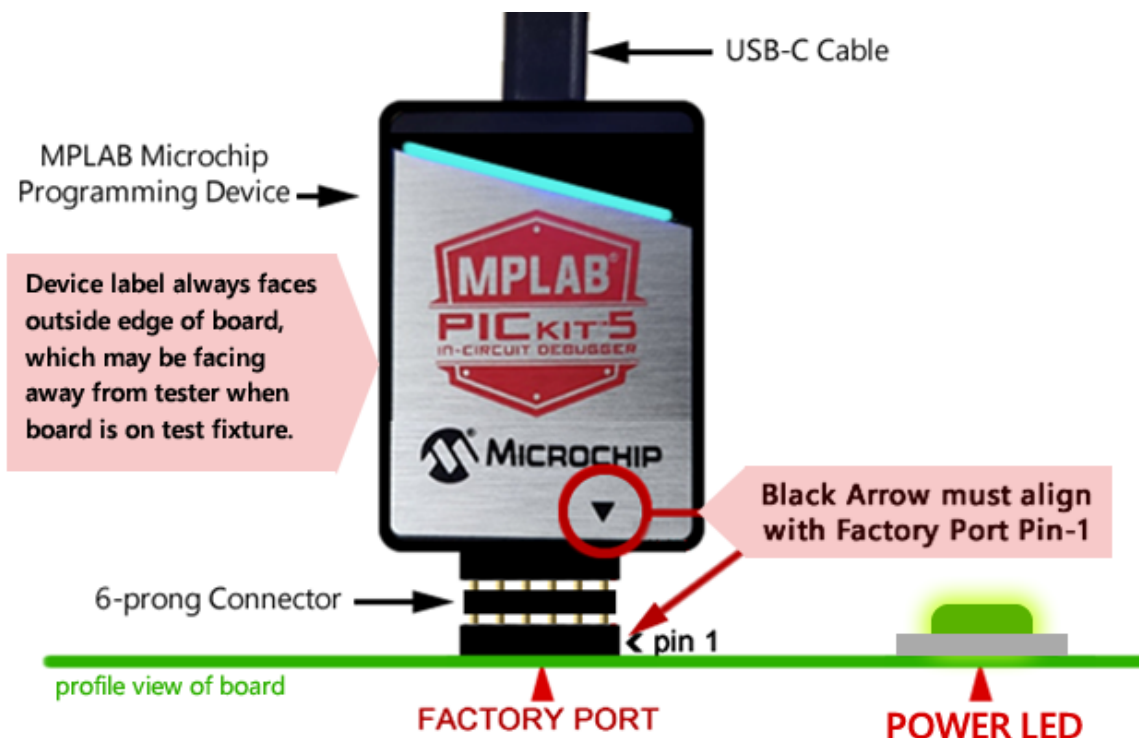
B   Open the **MPLab software** from the PC desktop shortcut**.**

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

- Device = PIC32MX95F512L
- Tool = PICkit 5 S.No : 02002670RYN006605
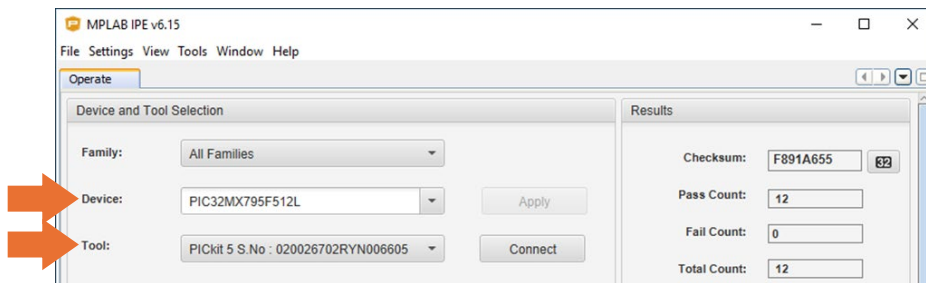
D   Click the [**CONNECT**] button on the *Operate tab* of the MPLab software.

RESULTS: the Output tab should show the results of connecting.
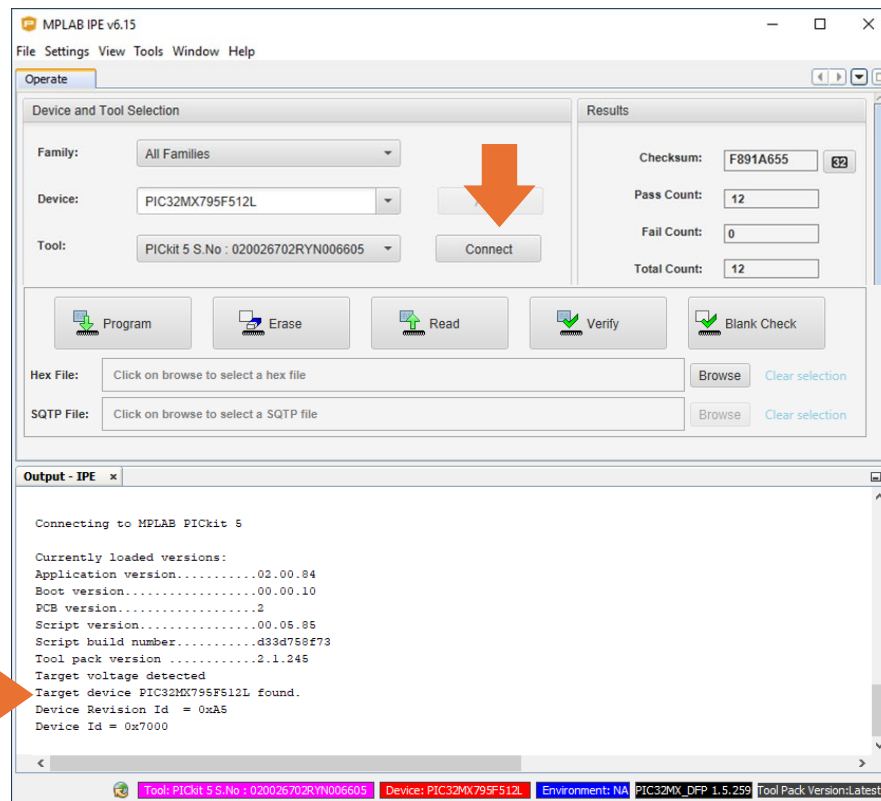
E   Click **[BROWSE]** in the Hex File field and select (highlight) the hex file named "InputModule.X.production.hex".
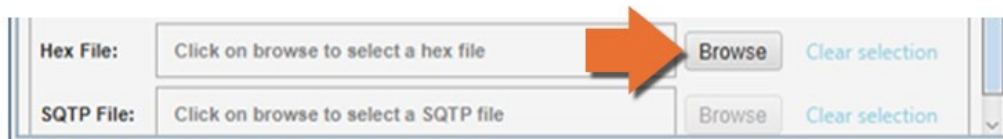
Click **[OPEN]** to begin loading flash to the Input board.
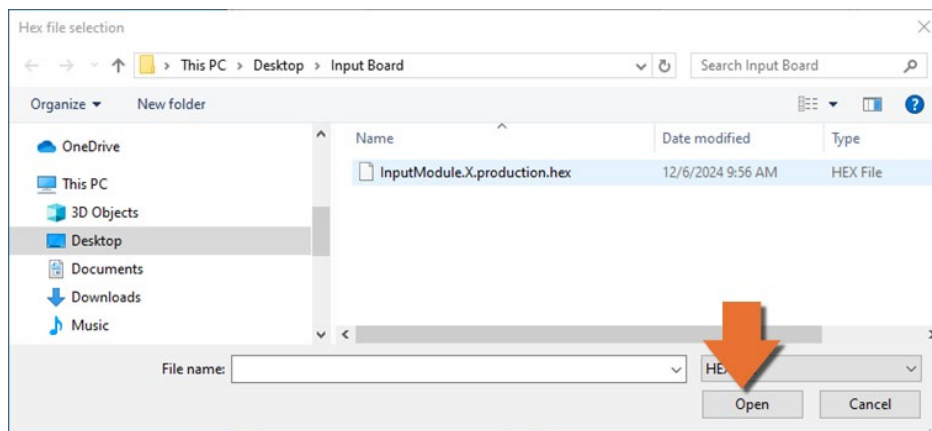
✔ **VERIFY:** the Output tab displays "Load Success" when completed.
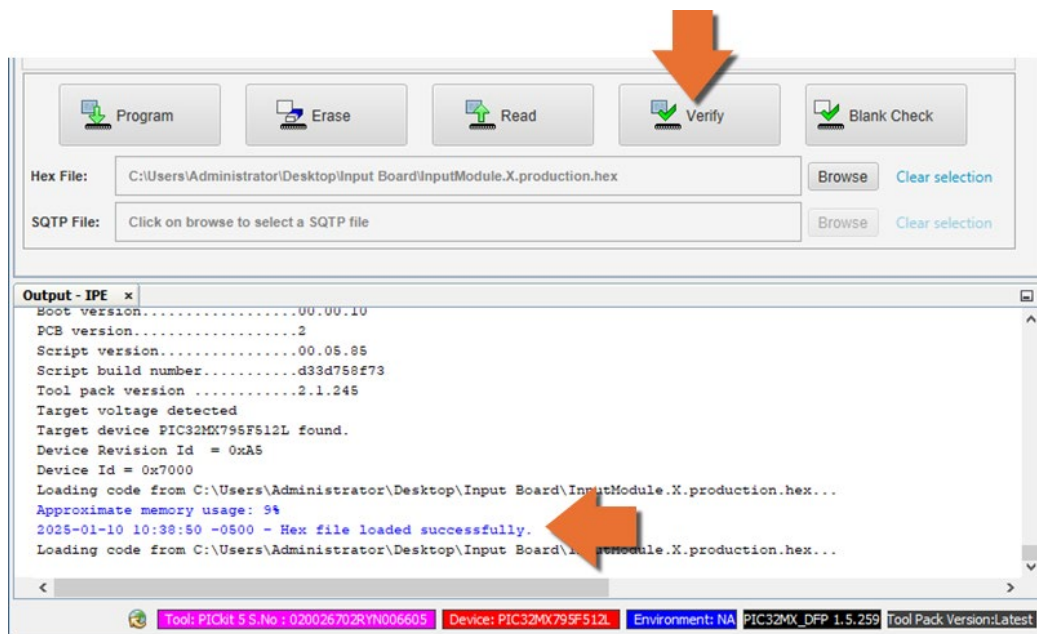
F   Click the **[PROGRAM]** button to begin flashing the Input board through the factory port.

    ✓**VERIFY:** the Output tab, displays "*Program Complete*" message.
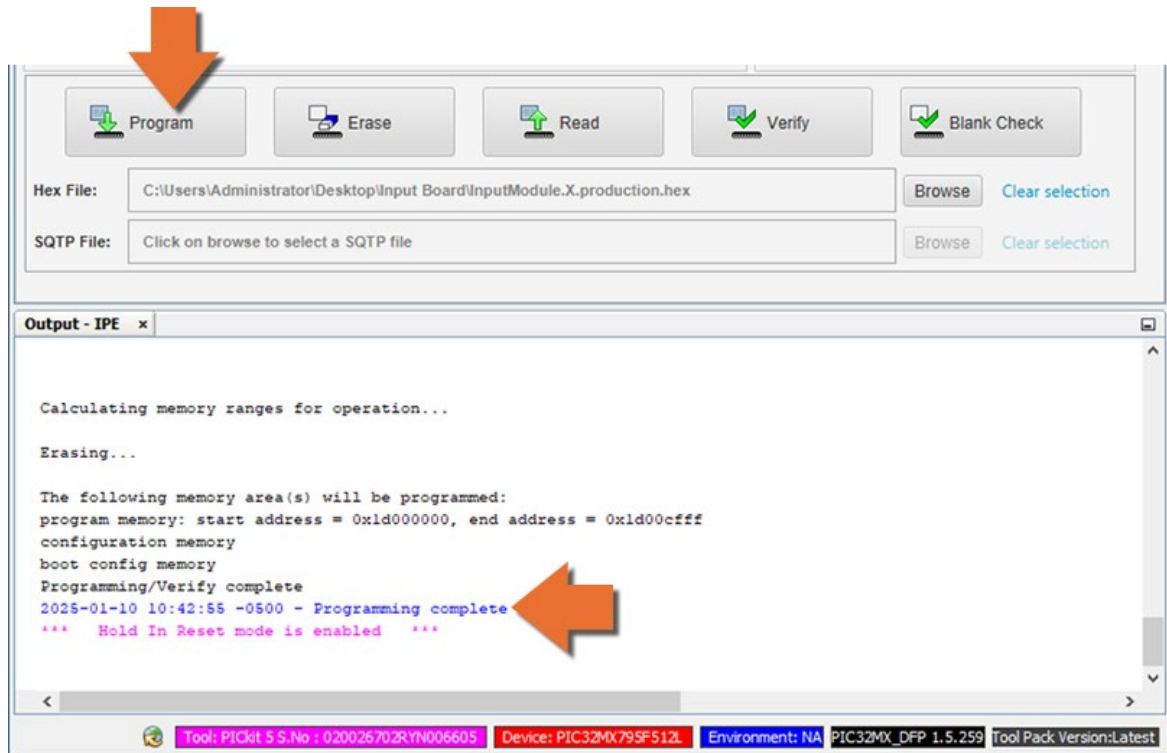
G   Click the [**VERIFY**] button to confirm flash allocation.

    ✓**VERIFY:** the Output tab should display "*Verify Successful*" message.
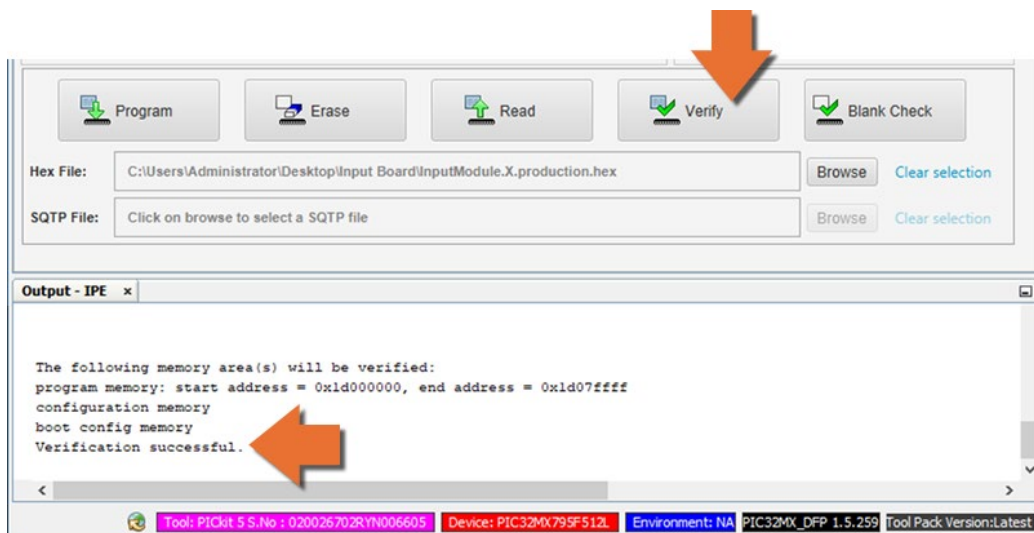
H   Click the [**DISCONNECT**] button in the Operate tab to end the program session.
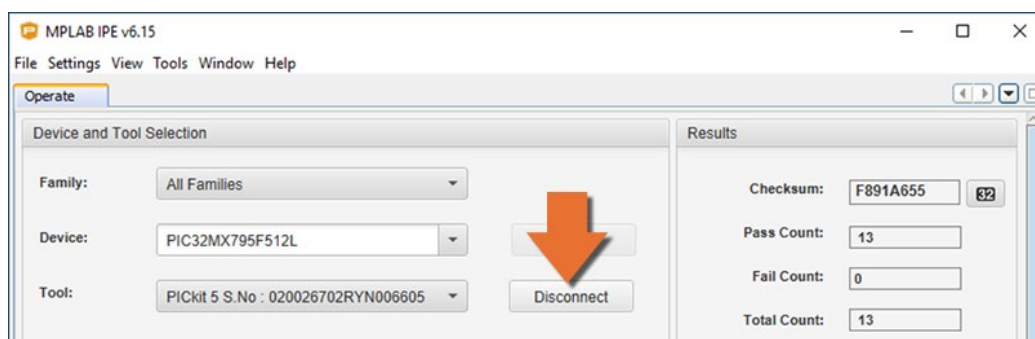
I   Unplug/remove the **6-Pin Ribbon Cable** from Factory Port of Input Board after the flashing is complete.

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

STEP 6. CONNECT TEST CABLE TO THE INPUT BOARD:

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

B   Connect **FTDI Cable** to **Console Port (J2)** with the **Black Wire toward → Input Port (J7)** .

FTDI Cable

The BLACK wire goes toward the Input Connector J7.

profile view of board

CONSOL PORT (J2)

INPUT PORT (J7)
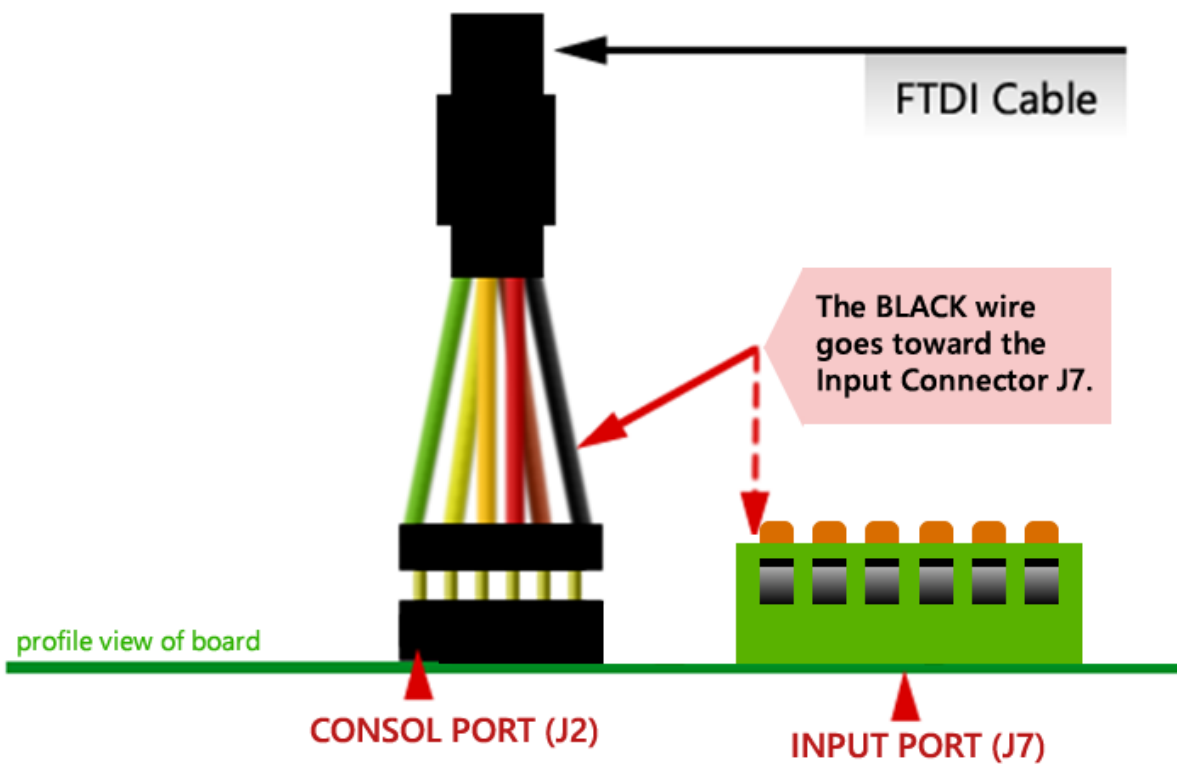
C 1. Launch **TeraTerm** software from the Desktop shortcut on the **Test PC.**

2. Choose **New Connection** if needed.

3. Choose the **Serial radio** button.

4. Choose the **COM Port** and click **OK** button.
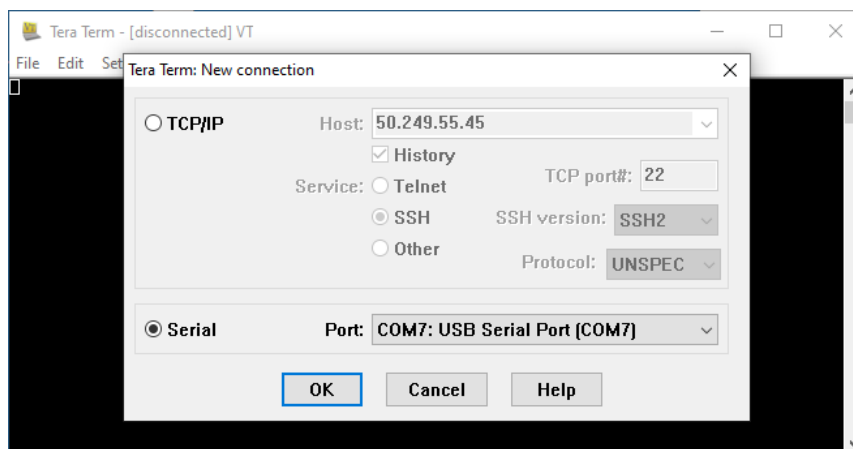
5. From the **Setup menu** select the **Serial Port** option

6. Choose **57600 Baud Rate**

7. Click **OK** button.
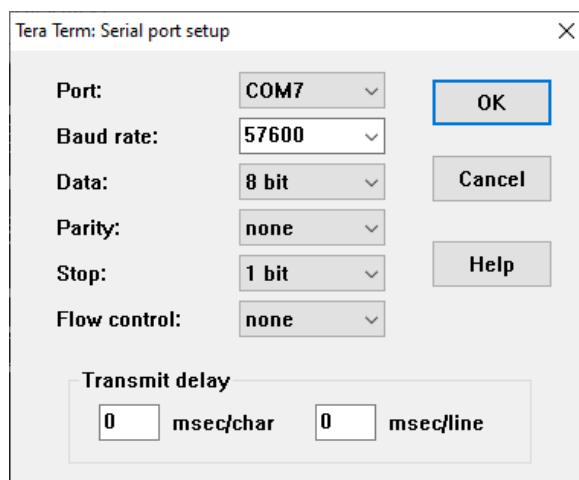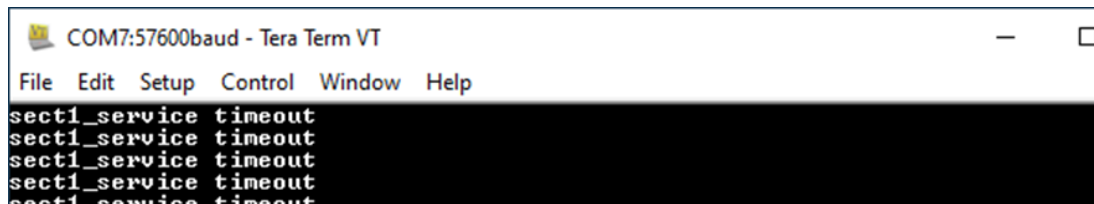
SECTION-4: BOARD TESTING

STEP 7. TEST INPUTS: This is a test of the Input Sensors and LEDs using the Rotary Switch.

E   Enter the following commands in lower case ...
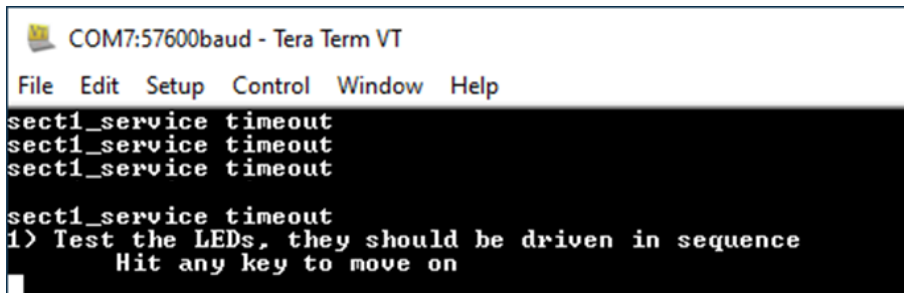
1. **Press <Enter> key:**

2. **Type "test"** (lower case): to start running the Test Program.

   RESULT: As you type, you will not see the word *test*, but the test command is detected. Notice the screen continues scrolling the "**sect# Service timeout**" message.

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3. **Press <Enter> key** to begin **STEP 1 LED TEST**:

   VERIFY: each LED# (1 – 16) automatically turns ON and OFF, one at a time.
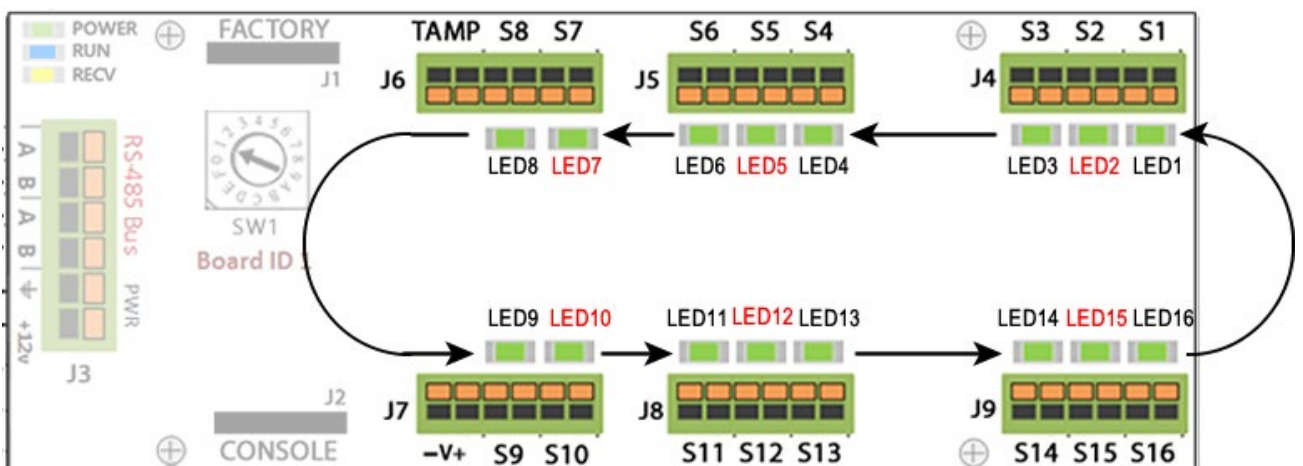
G   1. **Press <Enter> key → STEP 2 Board Address Test begins**:

2. Turn the dial on Rotary Switch (S1) to each number position (1 thru 16)..

   RESULT: screen will display instructions to 'test the Board ID Switch using the LEDs'.
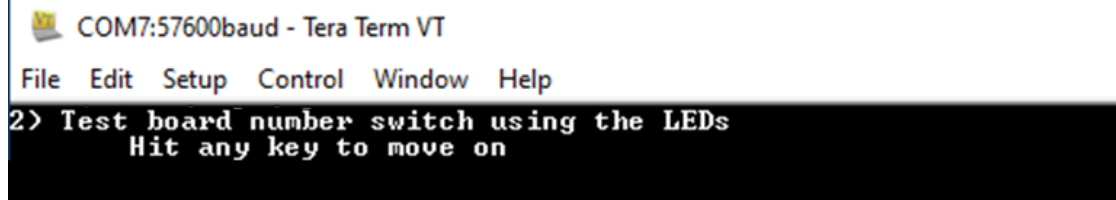
VERIFY: (using table) **Verify each position of the Rotary Switch (SW1)**
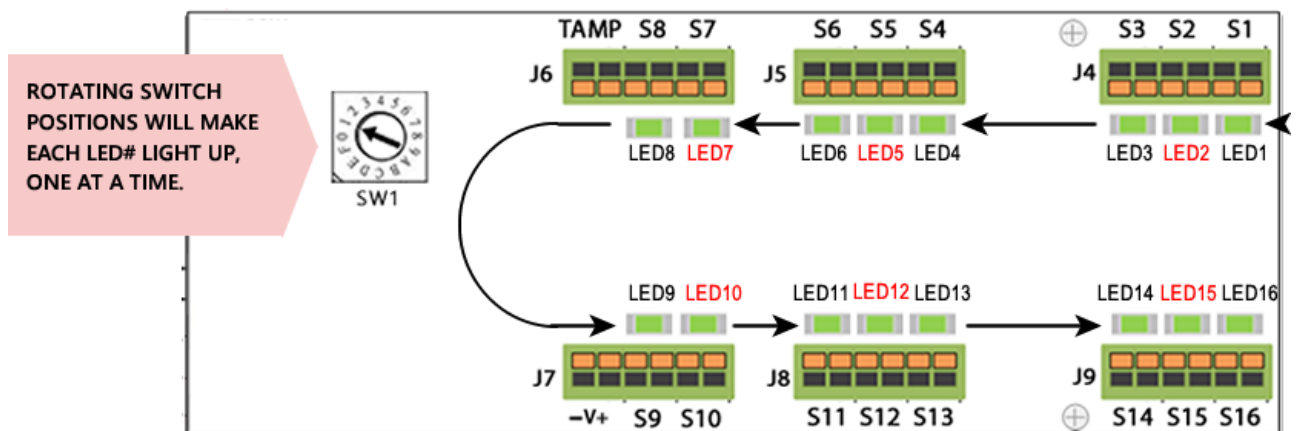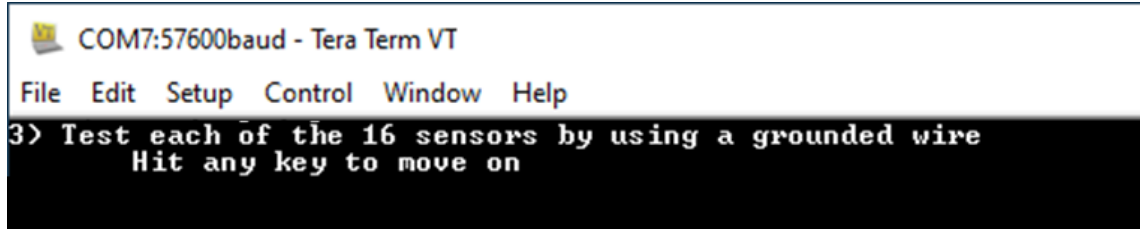   **will cause the corresponding LED# (1 - 16) turn ON.**

Table-2: Rotary Switch Settings for Board ID Numbering			
Position	LED#	Position	LED#
1	LED 1	9	LED 9
2	LED 2	A	LED 10
3	LED 3	B	LED 11
4	LED 4	C	LED 12
5	LED 5	D	LED 13
6	LED 6	E	LED 14
7	LED 7	F	LED 15
8	LED 8	0	LED 16

H   1. **Press <Enter> key** to begin **STEP 3 Input Sensor Test:**

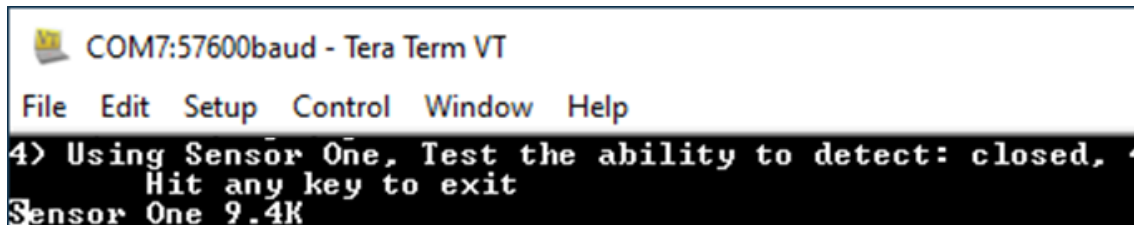2. **Insert Jumper Wire** to close (short) each **sensor position** (1 thru 16), in sequence

VERIFY: that each corresponding LED# turns ON when the jumper wire is installed.
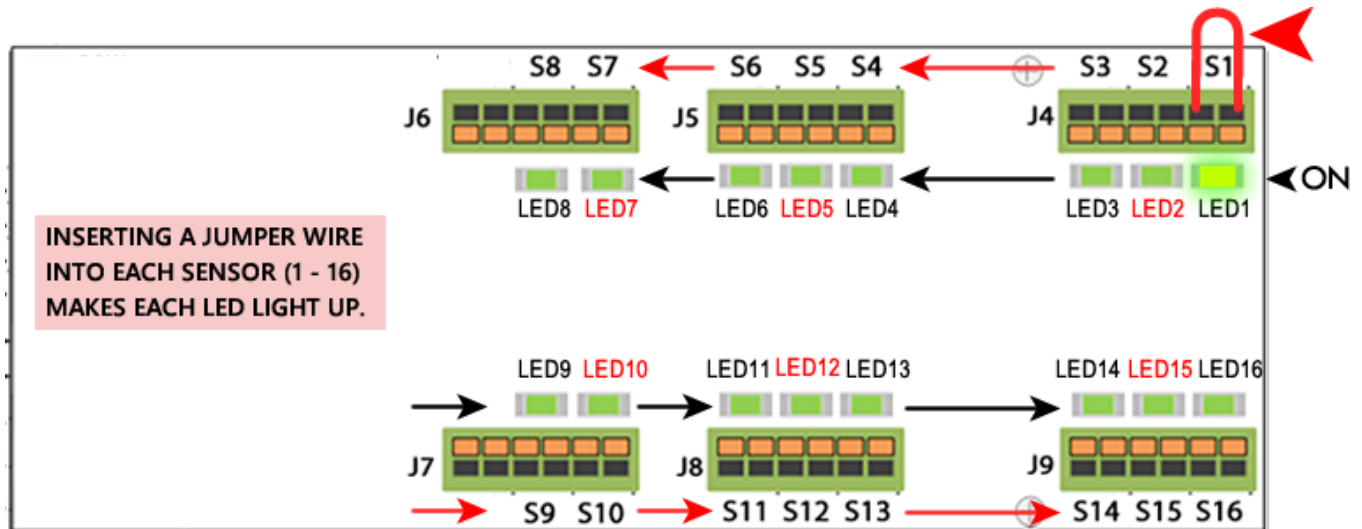
3. **REMOVE the Jumper Wire from the board before proceeding.**

1. **Press <Enter> key** to start **STEP 4 Input Sensor Supervision Test**:

2. **INSTALL the S/P Toggle Switch on Sensor S1** (input 1)

3. **SET the Toggle Switch to position 1** (series/parallel)
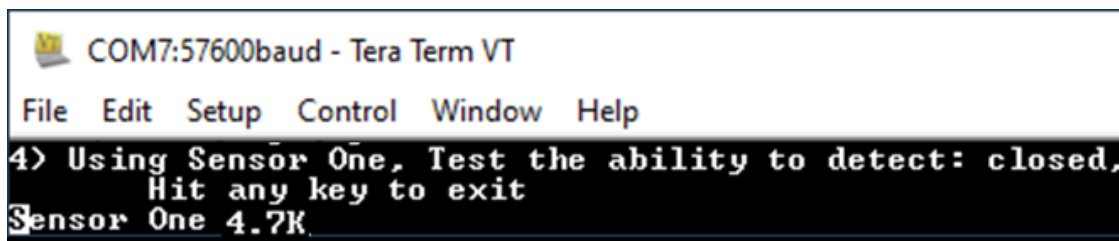
   VERIFY: the screen shows "9.4 K" resistance when the switch is in position-1.

   COM7:57600baud - Tera Term VT

   File   Edit   Setup   Control   Window   Help

   ```
   4) Using Sensor One, Test the ability to detect: closed, 4
           Hit any key to exit
   Sensor One 9.4K
   ```

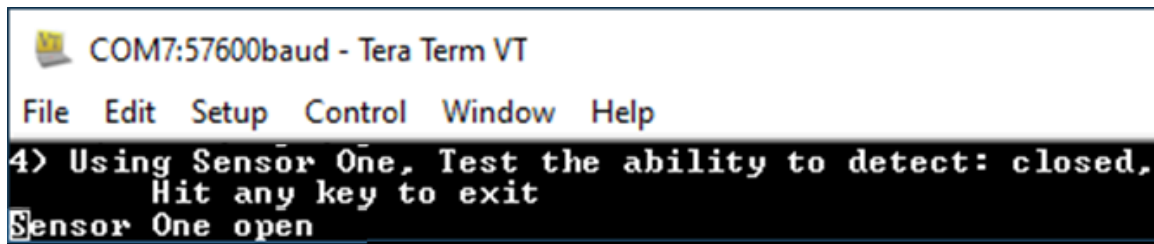4. **CHANGE the Toggle Switch to position 2** (series)

   VERIFY: the screen shows "4.7 K" resistance when the switch is in position-2.

   COM7:57600baud - Tera Term VT

   File   Edit   Setup   Control   Window   Help

   ```
   4) Using Sensor One, Test the ability to detect: closed,
           Hit any key to exit
   Sensor One 4.7K
   ```
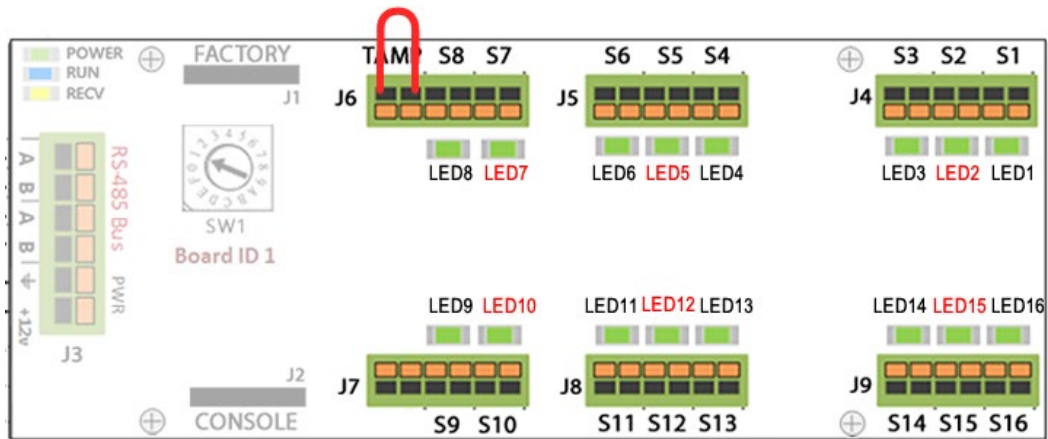
5. **REMOVE the Toggle Switch from the Sensor S1.**

   VERIFY: the screen shows "open" when the switch is removed.

   COM7:57600baud - Tera Term VT

   File   Edit   Setup   Control   Window   Help

   ```
   4) Using Sensor One, Test the ability to detect: closed,
           Hit any key to exit
   Sensor One open
   ```

J   1. **Press <Enter> key** to start **STEP 5 Tamper Test**:

2. **INSTALL Jumper Wire** to CLOSE (short) the Tamper Sensor (J6).
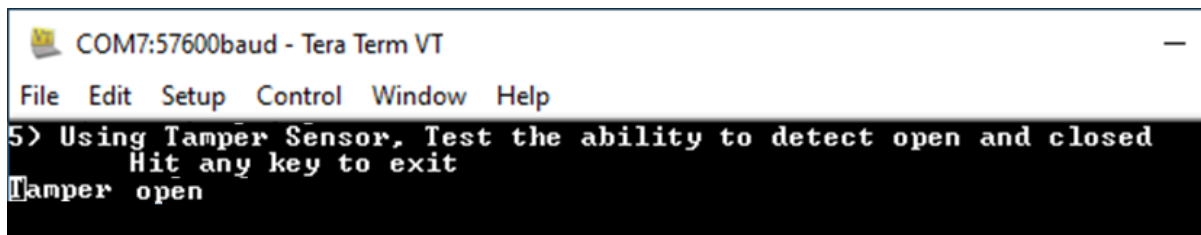

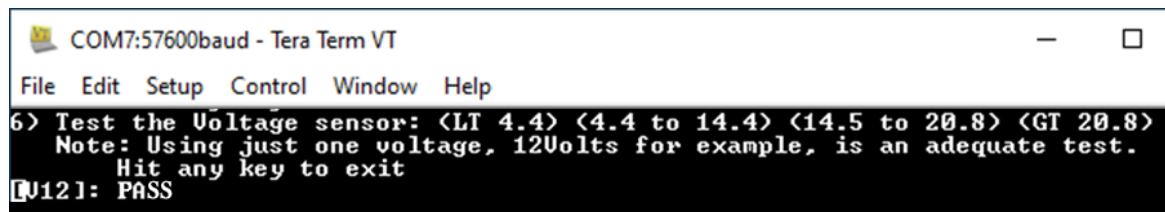VERIFY: screen shows "CLOSED" when the Jumper Wire is IN (installed).
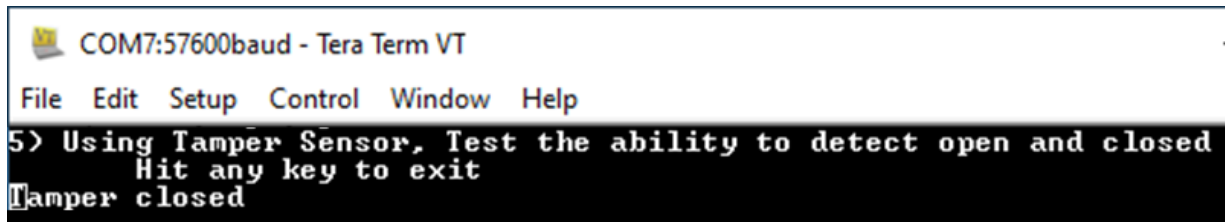
3. **REMOVE Jumper Wire** the jumper wire to OPEN the Tamper Sensor (J6).

VERIFY: screen shows "OPEN" when the Jumper Wire is OUT (removed).

K   1. **Press <Enter> key** to begin **STEP-6 Voltage Sensor Test**:

2. INSTALL the Voltmeter leads on J7: RED → Positive(+) BLACK → Negative (-)
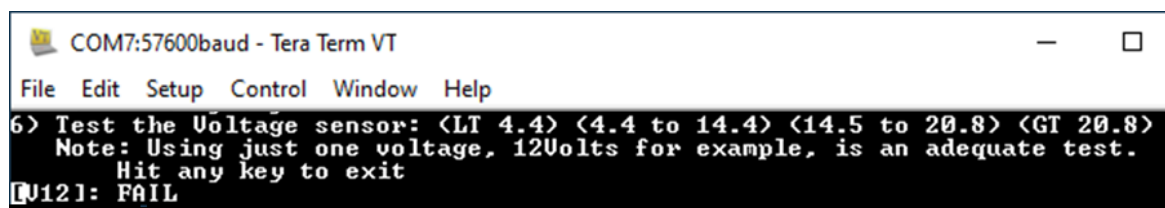
   VERIFY: TeraTerm shows "PASS" when meter dial is set to 12.5 VDC

3. **DROP** the Voltage Meter setting to 10.5 VDC

   VERIFY: screen shows "FAIL" when meter dial is set to 10.5 VDC

4. **RETURN** the Voltage Meter setting to 12.5 VDC

5. **Disconnect Voltmeter leads on J7 (V+/-)**(if using external volt meter).

STEP 7 INPUT TEST CONTINUED:

L   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 Input Board …

- push in orange button at *J3 Contact-A* and insert the RED 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	→	Input Board J3
	(Section-1)		*press orange button*
RED WIRE	A	→	A
BLUE WIRE	B	→	B

RS-485 Wiring Diagram from DSI Board to Input Board
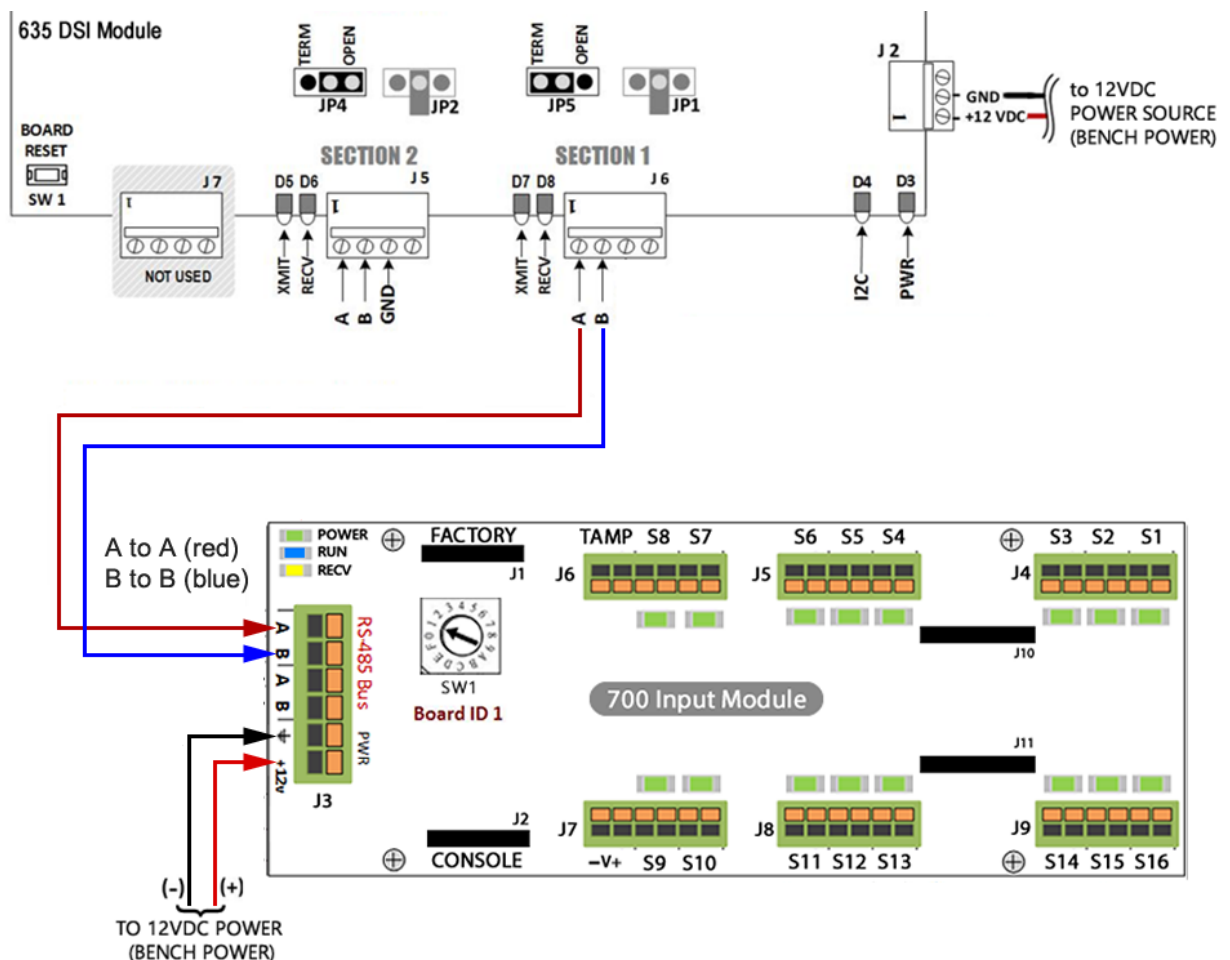
M   Using the Browser Desktop Shortcut on the Test PC, do the following …

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
2401556	4	NORMAL	635-DSI	11.0.9	1	n/a
3050354	2	NORMAL	635-DPI	11.0.9	1	n/a

3. **Set the Board Type to "Galaxy Input Module"**

4. **Click [APPLY] button.**

VERIFY: the webpage shows "yes" on Input-1

VERIFY: all other columns show "RED" in color.

▶ **Proceed to the next section.**

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

A   Remove the INPUT BOARD from the Test Jig:

1. **Turn OFF power to the test Bench**

2. Disconnect **2-PIN power cable** at the INPUT BOARD

3. Disconnect the **RS-485 two-wire Cable** at the INPUT BOARD

4. Leave the Input 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

▸   **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.