

Hercules User Interface/Bezel Assembly Functional Test Procedure  
PCA 1261318  
Revision 15

REV INFO	INITIALS	DATE	NOTES
Rev 9	CAH	21 July 2020	<ol style="list-style-type: none"> <li>1. Setup: changed 100 ohms to 1200 ohms</li> <li>2. Digital Output Check: Steps 4-12 has changes - "shall be less than +0.5V" to "shall be less than +1.0V" due to the diode current is 20mA (ESD1 diodes at 20mA has a Vf ~ 0.63V)</li> <li>3. Digital Output Check step 12 doubled. Fixed increment to be 13.</li> <li>4. Digital Input Check step 11 changed from GND to unconnected. This type of input gives VBATT connection for a high level... when input is left floating the input to micro gives a low.</li> <li>5. Accelerometer, Cell modem and Wifi checks added <b><u>(Not Applicable to 1244465)</u></b> so that we can eliminate these tests from 1244465 builds.</li> <li>6. Added Trusted Platform Module Check.</li> <li>7. Removed Secure Element Check</li> </ol>
Rev 10	SHB	2 February 2021	<ol style="list-style-type: none"> <li>1. Board Revision Check: Call out specific Application Version</li> </ol>
Rev 11	SHB	21 June 2021	<ol style="list-style-type: none"> <li>1. Removed FCT mode USB test</li> <li>2. Add USB check to beginning of test sequence</li> </ol>
Rev 12	SHB	7 October 2021	<ol style="list-style-type: none"> <li>1. Update Machine App version to 1.2.0.227</li> </ol>
Rev 13	SHB	9 December 2021	<ol style="list-style-type: none"> <li>1. Remove references to specific Machine App version</li> <li>2. Remove tests that are Not Applicable to 1244465, these are now in a separate document</li> </ol>
Rev 14	SHB	12 April 2022	<ol style="list-style-type: none"> <li>1. Update Part number to 1261318</li> <li>2. Remove manual USB check</li> <li>3. Restore FCT mode USB test</li> <li>4. Add LEDs 27 – 32 to LED test</li> </ol>
REV 15	BAP	2023-08-31	<ol style="list-style-type: none"> <li>1. Update LED test to include resistor value</li> <li>2. Add Backlight test section</li> <li>3. Update CAN section</li> <li>4. Update setup paragraph</li> </ol>

**Setup:**

A fixture has connections with the Pascal user interface for the LCD using the 40 pin ZIF connector, and with pogo pins for all other necessary points. All other Test commands are sent to the board using the UART debug port. The board executes the commands and returns status over the same interface. The UART terminal should be configured for 115200 baud, no stop bits and 8 data bits. Operator input is required to verify LCD and touch panel function. A VW scrub board is also included in the fixture and is connected to the Pascal board via the CAN interface. The test fixture has the following 1200 Ohm, 1 Watt loads: from J10-6 to J7-10; from J10-7 to J7-10; from J10-8 to J7-10; from J7-5 to J7-10; from J7-6 to J7-10; from J7-7 to J7-10.

### **Test Sequence:**

1. Install user interface assembly in machine.
2. Turn power on. Power supply is set to 24.0V and should be capable of driving a 2A load. Power is applied as indicated: COM goes to J7-8. +24V goes to J7-10.

### **Initialize FCT Mode:**

1. Login to the UART debug port. Username is "root" and password is "am3". Note: the password characters will not echo back to the terminal for security reasons.
2. Initialize FCT mode by typing "fct" and pressing return.
3. A menu should appear similar to the one shown below (some menu items may be different than what is shown, but the general structure will be the same). The board is now in FCT mode. All tests following will be done in this mode.

```
Main Menu
-----
1) Turn on GPIO
2) Turn off GPIO
3) Read GPIO
4) Read ADC
5) Turn on membrane LED
6) Turn off membrane LED
7) Read Accelerometer
8) Read Membrane Key
9) Set Clock (RTC)
10) Read Clock (RTC)
11) Test LCD
12) Calibrate Touchscreen
13) Test Touchscreen
14) Test Cellular Modem
15) Test Wifi Modem
16) Test CAN Bus
17) Read Revision Numbers
18) RS-232 Check
19) Potentiometer Test
20) Quit

Select option: [ ]
```

### **Digital Output Check:**

1. From the Main Menu, select by typing the menu number should appear as follows:

```
Turn on GPIO
-----
1) Turn on LSD_ENBL
2) Turn on LSD_5_DRV
3) Turn on LSD_4_DRV
4) Turn on LSD_3_DRV
5) Turn on LSD_2_DRV
6) Turn on LSD_1_DRV
7) Turn on LSD_0_DRV
8) Go back to Main Menu

Select option: [ ]
```

the "Turn on GPIO" menu item and pressing return. The menu

2. Select the "Turn on LSD\_ENBL" menu item. Then select the "Go back to Turn on GPIO" menu item.

```
Turn on LSD_ENBL
-----
1) Go back to Turn on GPIO
Select option: ☐
```

3. The voltage at J10-8, J10-7, J10-6, J7-7, J7-6, and J7-5 shall all be greater than +23V.

4. Select the "Turn on LSD\_5\_DRV" menu item. The voltage at Pin J10-8 shall be less than +1.0V . Select the "Go back to Turn on GPIO" menu item.

5. Select the "Turn on LSD\_4\_DRV" menu item. The voltage at Pin J10-7 shall be less than +1.0V . Select the "Go back to Turn on GPIO" menu item.

6. Select the "Turn on LSD\_3\_DRV" menu item. The voltage at Pin J10-6 shall be less than +1.0V . Select the "Go back to Turn on GPIO" menu item.

7. Select the "Turn on LSD\_2\_DRV" menu item. The voltage at Pin J7-7 shall be less than +1.0V . Select the "Go back to Turn on GPIO" menu item.

8. Select the "Turn on LSD\_1\_DRV" menu item. The voltage at Pin J7-6 shall be less than +1.0V . Select the "Go back to Turn on GPIO" menu item.

9. Select the "Turn on LSD\_0\_DRV" menu item. The voltage at Pin J7-5 shall be less than +1.0V . Select the "Go back to Turn on GPIO" menu item.

10. Select the "Go back to Main Menu" menu item. Then select the "Turn off GPIO" menu item.

11. Select the "Turn off LSD\_ENBL" menu item. The voltage at Pin J10-8 shall be greater than +23V. Select the "Go back to Turn off GPIO" menu item.

12. Select the "Go back to Main Menu" menu item, then select the "Turn on GPIO" menu item, then select the "Turn on LSD\_ENBL" menu item. The voltage at Pin J10-8 shall be less than +1.0V. Select the "Go back to Turn on GPIO" menu item, then select the "Go back to Main Menu" item, then select the "Turn off GPIO" menu item.
13. Select the "Turn off LSD\_5\_DRV" menu item. The voltage at Pin J10-8 shall be greater than +23V. Select the "Go back to Turn off GPIO" menu item.
14. Select the "Turn off LSD\_4\_DRV" menu item. The voltage at Pin J10-7 shall be greater than +23V. Select the "Go back to Turn off GPIO" menu item.
15. Select the "Turn off LSD\_3\_DRV" menu item. The voltage at Pin J10-6 shall be greater than +23V. Select the "Go back to Turn off GPIO" menu item.
16. Select the "Turn off LSD\_2\_DRV" menu item. The voltage at Pin J7-7 shall be greater than +23V. Select the "Go back to Turn off GPIO" menu item.
17. Select the "Turn off LSD\_1\_DRV" menu item. The voltage at Pin J7-6 shall be greater than +23V. Select the "Go back to Turn off GPIO" menu item.
18. Select the "Turn off LSD\_0\_DRV" menu item. The voltage at Pin J7-5 shall be greater than +23V. Select the "Go back to Turn off GPIO" menu item.
19. Digital Output Check test is complete. Select the "Go back to Main Menu" menu item.

**Digital Input Check:**

1. From the Main Menu, select the "Read GPIO" menu item by typing the menu number and pressing return. The menu should appear as follows:

```

Read GPIO
-----
1) Read CHARGER_PWR_UP
2) Read KEYSWITCH_PWR_UP
3) Read SW1_uC
4) Read SW2_uC
5) Read SW3_uC
6) Read SW4_uC
7) Read SW5_uC
8) Read SW6_uC
9) Read SW7_uC
10) Read SW8_uC
11) Read BAIL_SWITCH
12) Read LSD_nFAULT_0_1
13) Read LSD_nFAULT_2
14) Read LSD_nFAULT_3
15) Read LSD_nFAULT_4
16) Go back to Main Menu

Select option: 

```

2. Connect J7-9 to +24V. Then select the “Read CHARGER\_PWR\_UP” menu item. The menu should say “Input is HIGH” (see image below for example output). Select the “Go back to Read GPIO” menu item.

```

Read CHARGER_PWR_UP
Input is HIGH
-----
1) Go back to Read GPIO

Select option: 

```

3. Lower J7-9 to +10V. Then select the “Read CHARGER\_PWR\_UP” menu item. The menu should say “Input is LOW”. Select the “Go back to Read GPIO” menu item.

4. Connect J7-10 to +24V. Then select the “Read KEYSWITCH\_PWR\_UP” menu item. The menu should say “Input is HIGH”. Select the “Go back to Read GPIO” menu item.

5. Lower J7-10 to +10V. Then select the “Read KEYSWITCH\_PWR\_UP” menu item. The menu should say “Input is LOW”. Select the “Go back to Read GPIO” menu item.

6. Leave J7-3 to unconnected. Then select the “Read SW1\_uC” menu item. The menu should say “Input is HIGH”. Select the “Go back to Read GPIO” menu item.

7. Lower J7-3 to GND. Then select the "Read SW1\_uC" menu item. The menu should say "Input is LOW". Select the "Go back to Read GPIO" menu item.

8. Leave J10-3 to unconnected. Then select the "Read SW2\_uC" menu item. The menu should say "Input is HIGH". Select the "Go back to Read GPIO" menu item.

9. Lower J10-3 to GND. Then select the "Read SW2\_uC" menu item. The menu should say "Input is LOW". Select the "Go back to Read GPIO" menu item.

10. Connect J7-1 to +24V. Then select the "Read SW3\_uC" menu item. The menu should say "Input is HIGH". Select the "Go back to Read GPIO" menu item.

11. Lower J7-1 to unconnected. Then select the "Read SW3\_uC" menu item. The menu should say "Input is LOW". Select the "Go back to Read GPIO" menu item.

12. Leave J10-1 to unconnected. Then select the "Read SW4\_uC" menu item. The menu should say "Input is HIGH". Select the "Go back to Read GPIO" menu item.

13. Lower J10-1 to GND. Then select the "Read SW4\_uC" menu item. The menu should say "Input is LOW". Select the "Go back to Read GPIO" menu item.

14. Leave J7-2 to unconnected. Then select the "Read SW5\_uC" menu item. The menu should say "Input is HIGH". Select the "Go back to Read GPIO" menu item.

15. Lower J7-2 to GND. Then select the "Read SW5\_uC" menu item. The menu should say "Input is LOW". Select the "Go back to Read GPIO" menu item.

16. Leave J7-4 to unconnected. Then select the "Read SW6\_uC" menu item. The menu should say "Input is HIGH". Select the "Go back to Read GPIO" menu item.

17. Lower J7-4 to GND. Then select the "Read SW6\_uC" menu item. The menu should say "Input is LOW". Select the "Go back to Read GPIO" menu item.

18. Leave J10-2 to unconnected. Then select the "Read SW7\_uC" menu item. The menu should say "Input is HIGH". Select the "Go back to Read GPIO" menu item.

19. Lower J10-2 to GND. Then select the "Read SW7\_uC" menu item. The menu should say "Input is LOW". Select the "Go back to Read GPIO" menu item.

20. Leave J10-4 to unconnected. Then select the "Read SW8\_uC" menu item. The menu should say "Input is HIGH". Select the "Go back to Read GPIO" menu item.

21. Lower J10-4 to GND. Then select the “Read SW8\_uC” menu item. The menu should say “Input is LOW”. Select the “Go back to Read GPIO” menu item.

22. Connect J4-4 to J4-1. Then select the “Read BAIL\_SWITCH” menu item. The menu should say “Input is HIGH”. Select the “Go back to Read GPIO” menu item.

23. Disconnect J4-4 and leave floating. Then select the “Read BAIL\_SWITCH” menu item. The menu should say “Input is LOW”. Select the “Go back to Read GPIO” menu item.

24. Digital Input Check test is complete. Select the “Go back to Main Menu” menu item.

### **Analog Input Check:**

1. From the Main Menu, select the “Read ADC” menu item by typing the menu number and pressing return. The menu should appear as follows:

```
Read ADC
-----
1) Read KEYSWITCH_PWR_MONITOR
2) Read CHARGER_PWR_MONITOR
3) Read CURRENT_MEAS_OUT
4) Read SHUNT_REF_SENSE
5) Go back to Main Menu

Select option: 
```

2. Connect J7-10 to +24V. Select the “Read KEYSWITCH\_PWR\_MONITOR” menu item. The menu should say “24000.0mV”, within 1%. (see image below for example output). Select the “Go back to Read ADC” menu item.

```
Read KEYSWITCH_PWR_MONITOR
23565.7mV
-----
1) Go back to Read ADC

Select option: 
```

3. Connect J7-9 to +24V. Select the “Read CHARGER\_PWR\_MONITOR” menu item. The menu should say “24000.0mV”, within 1%. Select the “Go back to Read ADC” menu item.

4. Analog Input Test is complete. Select the “Go back to Main Menu” menu item.

### **Membrane LED Check:**

1. The test setup should have a 1.5k ohm load resistor from each LED output LED1 through LED32 to 3.3V.

2. From the main menu, select the “Turn on membrane LED” menu item by typing the menu number and pressing return. The menu should appear as follows:

```
Turn on membrane LED
-----
1) Turn on LED1_uC_MEMBRANE
2) Turn on LED2_uC_MEMBRANE
3) Turn on LED3_uC_MEMBRANE
4) Turn on LED4_uC_MEMBRANE
5) Turn on LED5_uC_MEMBRANE
6) Turn on LED6_uC_MEMBRANE
7) Turn on LED7_uC_MEMBRANE
8) Turn on LED8_uC_MEMBRANE
9) Turn on LED9_uC_MEMBRANE
10) Turn on LED10_uC_MEMBRANE
11) Turn on LED11_uC_MEMBRANE
12) Turn on LED12_uC_MEMBRANE
13) Turn on LED13_uC_MEMBRANE
14) Turn on LED14_uC_MEMBRANE
15) Turn on LED15_uC_MEMBRANE
16) Turn on LED16_uC_MEMBRANE
17) Turn on LED17_uC_MEMBRANE
18) Turn on LED18_uC_MEMBRANE
19) Turn on LED19_uC_MEMBRANE
20) Turn on LED20_uC_MEMBRANE
21) Turn on LED21_uC_MEMBRANE
22) Turn on LED22_uC_MEMBRANE
23) Turn on LED23_uC_MEMBRANE
24) Turn on LED24_uC_MEMBRANE
25) Turn on LED25_uC_MEMBRANE
26) Turn on LED26_uC_MEMBRANE
27) Go back to Main Menu

Select option: 
```

2. LEDs LED1\_uC\_MEMBRANE through LED32\_uC\_MEMBRANE shall not be lit.
3. Select the “Turn on LED1\_uC\_MEMBRANE” menu item. LED LED1\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.
4. Select the “Turn on LED2\_uC\_MEMBRANE” menu item. LED LED2\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.
5. Select the “Turn on LED3\_uC\_MEMBRANE” menu item. LED LED3\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.
6. Select the “Turn on LED4\_uC\_MEMBRANE” menu item. LED LED4\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.



7. Select the “Turn on LED5\_uC\_MEMBRANE” menu item. LED LED5\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.

8. Select the “Turn on LED6\_uC\_MEMBRANE” menu item. LED LED6\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.

9. Select the “Turn on LED7\_uC\_MEMBRANE” menu item. LED LED7\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.

10. Select the “Turn on LED8\_uC\_MEMBRANE” menu item. LED LED8\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.

11. Select the “Turn on LED9\_uC\_MEMBRANE” menu item. LED LED9\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.

12. Select the “Turn on LED10\_uC\_MEMBRANE” menu item. LED LED10\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.

13. Select the “Turn on LED11\_uC\_MEMBRANE” menu item. LED LED11\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.

14. Select the “Turn on LED12\_uC\_MEMBRANE” menu item. LED LED12\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.

15. Select the “Turn on LED13\_uC\_MEMBRANE” menu item. LED LED13\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.

16. Select the “Turn on LED14\_uC\_MEMBRANE” menu item. LED LED14\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.

17. Select the “Turn on LED15\_uC\_MEMBRANE” menu item. LED LED15\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.

18. Select the “Turn on LED16\_uC\_MEMBRANE” menu item. LED LED16\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.

19. Select the “Turn on LED17\_uC\_MEMBRANE” menu item. LED LED17\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.

20. Select the “Turn on LED18\_uC\_MEMBRANE” menu item. LED LED18\_uC\_MEMBRANE shall be lit. Select the “Go back to Turn on membrane LED” menu item.

21. Select the “Turn on LED19\_uC\_MEMBRANE” menu item. LED LED19\_uC\_MEMBRANE shall be lit.  
Select the “Go back to Turn on membrane LED” menu item.

22. Select the “Turn on LED20\_uC\_MEMBRANE” menu item. LED LED20\_uC\_MEMBRANE shall be lit.  
Select the “Go back to Turn on membrane LED” menu item.

23. Select the “Turn on LED21\_uC\_MEMBRANE” menu item. LED LED21\_uC\_MEMBRANE shall be lit.  
Select the “Go back to Turn on membrane LED” menu item.

24. Select the “Turn on LED22\_uC\_MEMBRANE” menu item. LED LED22\_uC\_MEMBRANE shall be lit.  
Select the “Go back to Turn on membrane LED” menu item.

25. Select the “Turn on LED23\_uC\_MEMBRANE” menu item. LED LED23\_uC\_MEMBRANE shall be lit.  
Select the “Go back to Turn on membrane LED” menu item.

26. Select the “Turn on LED24\_uC\_MEMBRANE” menu item. LED LED24\_uC\_MEMBRANE shall be lit.  
Select the “Go back to Turn on membrane LED” menu item.

27. Select the “Turn on LED25\_uC\_MEMBRANE” menu item. LED LED25\_uC\_MEMBRANE shall be lit.  
Select the “Go back to Turn on membrane LED” menu item.

28. Select the “Turn on LED26\_uC\_MEMBRANE” menu item. LED LED26\_uC\_MEMBRANE shall be lit.  
Select the “Go back to Turn on membrane LED” menu item.

29. Select the “Turn on LED27\_uC\_MEMBRANE” menu item. LED LED27\_uC\_MEMBRANE shall be lit.  
Select the “Go back to Turn on membrane LED” menu item.

30. Select the “Turn on LED28\_uC\_MEMBRANE” menu item. LED LED28\_uC\_MEMBRANE shall be lit.  
Select the “Go back to Turn on membrane LED” menu item.

31. Select the “Turn on LED29\_uC\_MEMBRANE” menu item. LED LED29\_uC\_MEMBRANE shall be lit.  
Select the “Go back to Turn on membrane LED” menu item.

32. Select the “Turn on LED30\_uC\_MEMBRANE” menu item. LED LED30\_uC\_MEMBRANE shall be lit.  
Select the “Go back to Turn on membrane LED” menu item.

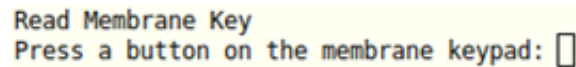
33. Select the “Turn on LED31\_uC\_MEMBRANE” menu item. LED LED31\_uC\_MEMBRANE shall be lit.  
Select the “Go back to Turn on membrane LED” menu item.

34. Select the “Turn on LED32\_uC\_MEMBRANE” menu item. LED LED32\_uC\_MEMBRANE shall be lit.  
Select the “Go back to Turn on membrane LED” menu item.

35. Membrane LED Test is complete. Select the “Go back to Main Menu” menu item.

### **Membrane Key Check:**

1. From the main menu, select the "Read Membrane Key" menu item by typing the menu number and pressing return. The menu should appear as follows:

A screenshot of a terminal window showing the 'Read Membrane Key' menu. The text is displayed in a monospaced font. The first line is 'Read Membrane Key' and the second line is 'Press a button on the membrane keypad: ' followed by a small square cursor.

```
Read Membrane Key
Press a button on the membrane keypad: □
```

2. Connect pins ROW1\_MEMBRANE and COL1\_MEMBRANE together. Menu should read "1,1". Disconnect pins. Select the "Go back to Main Menu" menu item.

3. Select the "Read Membrane Key" menu item. Connect pins ROW1\_MEMBRANE and COL2\_MEMBRANE together. Disconnect pins. Menu should read "1,2". Select the "Go back to Main Menu" menu item.

4. Select the "Read Membrane Key" menu item. Connect pins ROW1\_MEMBRANE and COL3\_MEMBRANE together. Disconnect pins. Menu should read "1,3". Select the "Go back to Main Menu" menu item.

5. Select the "Read Membrane Key" menu item. Connect pins ROW1\_MEMBRANE and COL4\_MEMBRANE together. Disconnect pins. Menu should read "1,4". Select the "Go back to Main Menu" menu item.

6. Select the "Read Membrane Key" menu item. Connect pins ROW2\_MEMBRANE and COL1\_MEMBRANE together. Disconnect pins. Menu should read "2,1". Select the "Go back to Main Menu" menu item.

7. Select the "Read Membrane Key" menu item. Connect pins ROW2\_MEMBRANE and COL2\_MEMBRANE together. Disconnect pins. Menu should read "2,2". Select the "Go back to Main Menu" menu item.

8. Select the "Read Membrane Key" menu item. Connect pins ROW2\_MEMBRANE and COL3\_MEMBRANE together. Disconnect pins. Menu should read "2,3". Select the "Go back to Main Menu" menu item.

9. Select the "Read Membrane Key" menu item. Connect pins ROW2\_MEMBRANE and COL4\_MEMBRANE together. Disconnect pins. Menu should read "2,4". Select the "Go back to Main Menu" menu item.

10. Select the "Read Membrane Key" menu item. Connect pins ROW3\_MEMBRANE and COL1\_MEMBRANE together. Disconnect pins. Menu should read "3,1". Select the "Go back to Main Menu" menu item.

11. Select the "Read Membrane Key" menu item. Connect pins ROW3\_MEMBRANE and COL2\_MEMBRANE together. Disconnect pins. Menu should read "3,2". Select the "Go back to Main Menu" menu item.

12. Select the "Read Membrane Key" menu item. Connect pins ROW3\_MEMBRANE and COL3\_MEMBRANE together. Disconnect pins. Menu should read "3,3". Select the "Go back to Main Menu" menu item.

13. Select the "Read Membrane Key" menu item. Connect pins ROW3\_MEMBRANE and COL4\_MEMBRANE together. Disconnect pins. Menu should read "3,4". Select the "Go back to Main Menu" menu item.

14. Select the "Read Membrane Key" menu item. Connect pins ROW4\_MEMBRANE and COL1\_MEMBRANE together. Disconnect pins. Menu should read "4,1". Select the "Go back to Main Menu" menu item.

15. Select the "Read Membrane Key" menu item. Connect pins ROW4\_MEMBRANE and COL2\_MEMBRANE together. Disconnect pins. Menu should read "4,2". Select the "Go back to Main Menu" menu item.

16. Select the "Read Membrane Key" menu item. Connect pins ROW4\_MEMBRANE and COL3\_MEMBRANE together. Disconnect pins. Menu should read "4,3". Select the "Go back to Main Menu" menu item.

17. Select the "Read Membrane Key" menu item. Connect pins ROW4\_MEMBRANE and COL4\_MEMBRANE together. Disconnect pins. Menu should read "4,4".

18. Membrane Key Check complete. Select the "Go back to Main Menu" menu item.

### **RTC Check:**

1. From the main menu, select the “Set Clock (RTC)” menu item by typing the menu number and pressing return. The menu should appear as follows:

```
Set Clock (RTC)
Minute (0-59): 
```

2. Type the number of minutes after the hour, in the range 0 to 59, and press return.

3. Type the number of hours after midnight, in the range of 0 to 23, and press return.

4. Type the day of the month, in the range of 1 to 31, and press return.

5. Type the number of the month, the number 1 corresponding to January and ranging from 1 to 12, and press return.

6. Type the year, in the range of 2000 to 2069, and press return.

7. The menu should say “Set time to “ followed by the time set. Below is an example of the time set to 1:05PM, January 20, 2020.

```
Set Clock (RTC)
Minute (0-59): 05
Hour (0-23): 13
Day (1-31): 20
Month (1-12): 1
Year (2000-2069): 2020
Set time to 2020-01-20T13:05:01Z
-----
1) Go back to Main Menu
Select option:
```

8. Turn off power for 10 seconds. Then turn on power. Wait for the board to boot, then enter FCT mode as described in the **Initialize FCT Mode** section.

9. From the main menu, select the “Read Clock (RTC)” menu item by typing the menu number and pressing return.

10. The date should be correct. The clock must have incremented by approximately the time since Step 7 was completed. Below is an example output.

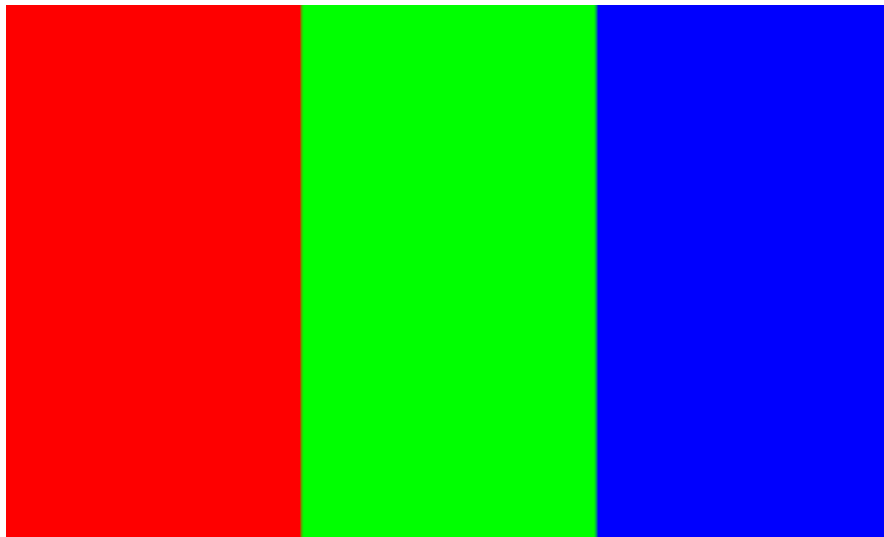
```
Read Clock (RTC)
2020-01-20T13:15:52Z
-----
1) Go back to Main Menu
Select option: 
```

11. RTC Check complete. Select the “Go back to Main Menu” menu item.

**LCD Color Check:**

1. From the main menu, select the “Test LCD” menu item by typing the menu number and pressing return.

2. Confirm that the following pattern appears on the LCD:

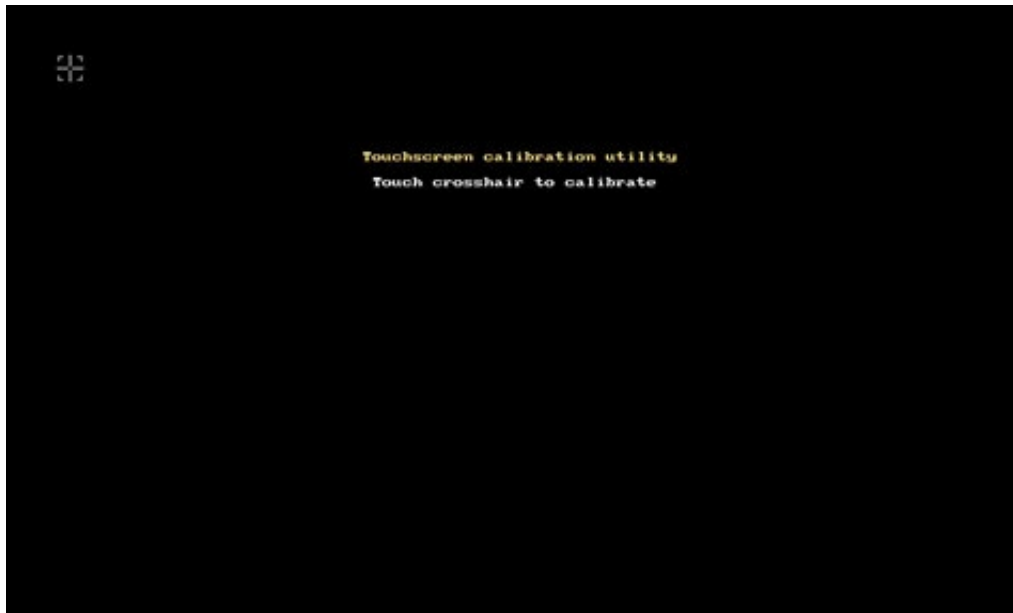


3. LCD Color Check complete. Select the “Go back to Main Menu” menu item.

**Touchscreen Check:**

1. From the main menu, select the “Calibrate Touchscreen” menu item.

2. Follow the prompt on the LCD to calibrate the touchscreen:



3. Select the "Go back to Main Menu" menu item.
4. Select the "Test Touchscreen" menu item.
5. Follow the prompt on the LCD to test the touchscreen. Touch the touchscreen in several places and ensure that the cursor moves to that location. Touch "Quit" on the LCD to exit.



6. Touchscreen Check complete. Select the "Go back to Main Menu" menu item.

### **Backlight Driver Check:**

If no LCD is included in the fixture, the previous two sections can be ignored. If it is included, this section can be skipped.

1. Connect a 100Ω 1.5W resistor between nets LCD\_BL\_P and LCD\_BL\_N
2. From the main menu, select the “Test LCD” menu item by typing the menu number and pressing return.
3. The voltage at LCD\_BL\_P with respect to GND shall be 4.4V +/- 10%

### **CAN Bus Check:**

If no scrub board is in the fixture, it is necessary to simulate the scrub board CAN commands via a computer.

1. Test the UI transmit capability. Read CAN message ID 0x701 via a computer. This is the UI heartbeat message and shows the operational state, the data field shall have a non-zero value.
2. Send the CAN message 0x182 with a data field of 0x 00 10 60 00 00 00 00 00 via a computer. Message interval is every 1 second. This sends the scrub motor current to the UI board.
3. From the main menu, select the “Test CAN Bus” menu item.
4. The menu should read, “Read CAN bus: OK”. Below is sample output.
5. CAN Bus Check complete. Select the “Go back to Main Menu” menu item.

```
Test CAN Bus
Read CAN bus: OK
-----
1) Go back to Main Menu
Select option: 
```

### **Board Revision Check:**

1. From the main menu, select the “Read Revision Numbers” menu item.
2. The menu should read TELEM\_REV\_BIT0 through TELEM\_REV\_BIT3, BOARD REVISION BIT 0 through BOARD REVISION BIT 3, machine app version and bootloader version. The UI board revision shall match the revision number listed in the released drawing of 1261318.



```
Read Revision Numbers
Telemetry board revision: 0001
UI board revision:       0010
Machine app revision:    1.2.0.227
Bootloader revision:     U-Boot 2018.11-rc3 (Feb 27 2020 - 22:14:15 +0000)
-----
1) Go back to Main Menu
```

Telemetry, UI board, and Machine App revisions may differ.

3. Board Revision Check complete. Select the “Go back to Main Menu” menu item.

#### **RS-232 Check:**

1. Connect J5-3 to J5-4.
2. From the main menu, select the “RS-232 Check” menu item.
3. The menu should read “Loopback test: OK”. Below is sample output:

```
RS-232 Check
Loopback test: OK
-----
1) Go back to Main Menu
Select option: 
```

4. RS-232 Check complete. Select the “Go back to Main Menu” menu item.

#### **Potentiometer Check:**

1. Connect J4-1 to J4-4.
2. From the main menu, select the “Potentiometer Test” menu item.
3. The voltage at J5-2 shall be +2.3V volts, within 10%.
4. Potentiometer Check complete. Select the “Go back to Main Menu” menu item.

#### **USB Check:**

1. Connect J6 to a PC using an A-Male to Mini-B USB cable.
2. From the main menu, select the “USB Test” menu item.
3. The menu should read “USB test: OK”. Below is sample output:

```
USB Test
USB test: OK
-----
1) Go back to Main Menu
Select option: 
```

4. USB Check complete. Select the “Go back to Main Menu” menu item.

**Flash Check:**

1. From the main menu, select the “Flash Test” menu item.
2. The menu should read “Flash test: OK”. Below is sample output:

```
Flash Test
Flash test: OK
-----
1) Go back to Main Menu
Select option: 
```

3. Flash Check complete. Select the “Go back to Main Menu” menu item.

**Trusted Platform Module (TPM) Check:**

1. From the main menu, select the “TPM Test” menu item.
2. The menu should read “TPM test: OK”. Below is sample output:

```
TPM Test
TPM test: OK
-----
1) Go back to Main Menu
Select option: 
```

3. TPM Check complete. Select the “Go back to Main Menu” menu item.

END OF TEST.