

Setup instructions for Controller for Tectivity.

Things needed to setup Controller Board.

- 1: Get a USB to serial converter.
- 2: Get hyper terminal or any other terminal program. This is how a lot of setup will be done to the Controller.
- 3: Set terminal program to 115200 8 1 and none. 115200 Baud, 8 Data Bits, 1 Stop Bit, and no handshaking.
- 4: A special serial cable will need to be made to connect the PC serial port to the Controller. See Drawing.
- 5: To program the Controller a cable will need to be made and use the same connector as the serial port on the controller.
- 6: To program the Controller you will need to download Microchips MPLAB IDE development software. It is free from Microchip.
- 7: You will need a Microchip Pic Kit3 programmer. This you will need to buy. This is how to program the controller.
- 8: I made a test board to run and test the Controller board.

How to run the controller in Mode 0 (Power Up On).

- 1: Make sure controller is off.
- 2: Connect LED board.
- 3: Set SW1 to 0.
- 4: Apply power and the LEDs will turn on and stay on based on SW1 switch setting.
- 5: To get the LEDs to turn on again the power will need to be removed and then turned back on.
- 6: The LED temp and the CPU temp will be outputted to the serial port continually.
- 7: If the LED or CPU is over temp the LEDs will not come on.
The over temp signal will change and the over temp LED will come on and the temp LED will go off.

How to run the controller in Mode 1(Fixed Time).

- 1: Make sure controller is off.
- 2: Connect LED board.
- 3: For testing connect the test board I made. The pin that does not have a wire on it goes toward the power connector.
You don't need the test board if you are going to connect it to your system.
- 4: Set SW1 to 1.
- 5: Make sure trigger pot VR6 has been set to 10 turns counter clock wise unless you have ran trigger setup test.
- 6: Apply power.
- 7: In this mode to turn on the LEDs use the trigger input on the 6 pin connector J2 pin 6.
You can set the trigger level low or high from the serial port setup routines.
When the trigger level is sensed the LED strings will come on for the time set by switch 1.
The LED power level comes from the CPUs EEPROM.
The LED strings will be kept off for a rest time that is set by the serial setup routines.
If there is a trigger during rest time it will be ignored.
- 8: The LED temp and the CPU temp will be outputted to the serial port continually.
- 9: If the LED or CPU is over temp the LEDs will not come on. The over temp signal will change and the over temp LED will come on and the temp LED will go off.

How to run the controller in Mode 2 (Variable Time).

- 1: Make sure controller is off.
- 2: Connect LED board.

- 3: For testing connect the test board I made. The pin that does not have a wire on it goes toward the power connector. You don't need the test board if you are going to connect it to your system.
- 4: Set SW1 to 2.
- 5: Make sure trigger pot VR6 has been set to 10 turns counter clock wise unless you have ran trigger setup test.
- 6: Apply power.
- 7: In this mode to turn on the LEDs use the trigger input on the 6 pin connector J2 pin 6.
You can set the trigger level low or high from the serial port setup routines.
When the trigger level is sensed the LED strings will come on for the time set by switch 1.
The LED power level comes from DIM A, B, and C.
If these inputs are left unconnected the LEDs will come on at full power.
Make sure these inputs are connected. 0 volts is max on and 10 volts is off.
The LED strings will be kept off for a rest time that is set by the serial setup routines.
If there is a trigger during rest time it will be ignored.
- 8: The LED temp and the CPU temp will be outputted to the serial port continually.
- 9: If the LED or CPU is over temp the LEDs will not come on.
The over temp signal will change and the over temp LED will come on and the temp LED will go off.

How to run the controller in Mode 3 (Fixed Time, Variable Intensity).

- 1: Make sure controller is off.
- 2: Connect LED board.
- 3: For testing connect the test board I made. The pin that does not have a wire on it goes toward the power connector. You don't need the test board if you are going to connect it to your system.
- 4: Set SW1 to 3.
- 5: Make sure trigger pot VR6 has been set to 10 turns counter clock wise unless you have ran trigger setup test.
- 6: Apply power.
- 7: In this mode to turn on the LEDs use the trigger input on the 6 pin connector J2 pin 6.
You can set the trigger level low or high from the serial port setup routines.
When the trigger level is sensed the LED strings will come on for the time of the trigger pulse width.
The LED power level comes from the CPUs EEPROM.
The LED strings will be kept off for a rest time that is set by the trigger pulse width and the rest time multiplier that is set by the serial setup routines. If there is a trigger during rest time it will be ignored.
- 8: The LED temp and the CPU temp will be outputted to the serial port continually.
- 9: If the LED or CPU is over temp the LEDs will not come on.
The over temp signal will change and the over temp LED will come on and the temp LED will go off.

How to run the controller in Mode 4 (Variable Time, Variable Intensity).

- 1: Make sure controller is off.
- 2: Connect LED board.
- 3: For testing connect the test board I made. The pin that does not have a wire on it goes toward the power connector. You don't need the test board if you are going to connect it to your system.
- 4: Set SW1 to 4.
- 5: Make sure trigger pot VR6 has been set to 10 turns counter clock wise unless you have ran trigger setup test.
- 6: Apply power.
- 7: In this mode to turn on the LEDs use the trigger input on the 6 pin connector J2 pin 6.
You can set the trigger level low or high from the serial port setup routines.
When the trigger level is sensed the LED strings will come on for the time of the trigger pulse width.
The LED power level comes from DIM A, B, and C.

If these inputs are left unconnected the LEDs will come on at full power.

Make sure these inputs are connected. 0 volts is max on and 10 volts is off.

The LED strings will be kept off for a rest time that is set by the trigger pulse width and the rest time multiplier that is set by the serial setup routines. If there is a trigger during rest time it will be ignored.

8: The LED temp and the CPU temp will be outputted to the serial port continually.

9: If the LED or CPU is over temp the LEDs will not come on. The over temp signal will change and the over temp LED will come on and the temp LED will go off.

How to run the controller in Mode 5 (Variable Time, Fixed Intensity).

1: Make sure controller is off.

2: Connect LED board.

3: For testing connect the test board I made. The pin that does not have a wire on it goes toward the power connector. You don't need the test board if you are going to connect it to your system.

4: Set SW1 to 5.

5: Make sure trigger pot VR6 has been set to 10 turns counter clock wise unless you have ran trigger setup test.

6: Apply power.

7: In this mode to turn on the LEDs use the trigger input on the 6 pin connector J2 pin 6.

You can set the trigger level low or high from the serial port setup routines.

When the trigger level is sensed the LED strings will come on for the time of the trigger pulse is active.

The LED power level comes from the CPUs EEPROM.

8: The LED temp and the CPU temp will be outputted to the serial port continually.

9: If the LED or CPU is over temp the LEDs will not come on. The over temp signal will change and the over temp LED will come on and the temp LED will go off.

How setup controller in Mode F (DC Calibration Mode). The DC mode is mostly used for LED string setup.

1: Make sure controller is off.

2: Connect LED board.

3: For testing connect the test board I made. The pin that does not have a wire on it goes toward the power connector. You don't need the test board if you are going to connect it to your system.

4: Turn all pots counter clockwise.

5: Set SW1 to F.

6: PotVR1 controls LED string 1.

7: Pot VR2 controls LED string 2.

8: Pot VR3 controls LED string 3.

9: VR4 is the master pot controls LED strings 1, 2, 3.

10: Apply power.

11: The LED temp and the CPU temp will be outputted to the serial port continually.

12: You can control all 3 LED strings by adjusting the Master pot.

If you want 1 or 2 LED strings to be brighter adjust that LED's string pot.

13: You can adjust each LED string individually by adjusting the pot for that LED string.

14: To set the values in the CPUs EEPROM is done by changing SW2 to another position.

15: If the LED or CPU is over temp the LEDs will not come on.

The over temp signal will change and the over temp LED will come on and the temp LED will go off.

How to setup Controller by using the serial port.

Select test to run

Version B 2/1/2016.

- | | |
|---|---|
| a Runs LED test. | b Runs Switch test. |
| c Runs Pot A test. | d Runs Pot B test. |
| e Runs Pot C test. | f Runs Master Pot test. |
| g Runs Dim A input test. | h Runs Dim B input test. |
| i Runs Dim C input test. | j Runs External Temp sensor test. |
| k Runs External Temp sensor trip point test. | l Runs Internal CPU Temp sensor test. |
| m Runs Trigger input test. | n Runs Over Temp output test. |
| o Runs LED String A current set test. | p Runs LED String B current set test. |
| q Runs LED String C current set test. | r Set LED Temp trip point. |
| s Set trigger level to low or high. | |
| t Set LED rest time. This number 1 -9. This number times LED on time. | |
| u Set CPU Temp trip point. | v Set LED String A Value From 000 to 255. |
| w Set LED String B Value From 000 to 255. | y Set LED String C Value From 000 to 255. |
| z Set Master LED Value From 000 to 255. | A Display Current Settings. |
| B Turn on all analog outputs to max for testing. | C Set CPU Temp offset. Enter -+xxx xxx = 000-255. |
| D Test Watchdog Timmer. | E Set Watchdog Timer Timeout period. |
| F Reset Defaults. | |
| x Exit Test Routine. | |

- 1: Make sure trigger pot VR6 has been set to 10 turns counter clock wise unless you have ran trigger setup test.
- 2: Make sure USB to Serial adapter is connected to Computer.
- 3: Connect cables from Controller to USB to Serial adapter.
- 4: Start HyperTerminal.
- 5: For testing connect the test board I made. The pin that does not have a wire on it goes toward the power connector.
- 6: To put the Controller in to debug mode type \$ and then the Controller will send and display menu that show the options to choose from.
- 7: Debug mode is for testing functionality and setup.
- 8: Hit the x key and it will back out of the test routine and at the menu it will exit debug mode and start running the dip switch routine you have selected.
- 9: The first time the Controller with the firmware is run it will default to these values.
POT A = 0, POT B = 0, POT C, = 0, Master POT = 0, LED temp sensor trip point = 90 C, Trigger level = high,
LED rest time multiplier = 8, CPU temp sensor trip point = 65 C.
- 10: "a" - LED Indicator Light (LIL) test.
The LIL will alternate green/red blinking. Hit "x" key to escape this test (ends with LIL Off). Note:
Hit the x key again, to escape debug mode and reactivate LIL.
- 11: "b" - Hex Switch test.
This tests that the hex switches work right and increment correctly. Terminal window outputs 2 digits showing setting of switches 1 (Mode) and 2 (Time).
Hit " x" key to escape this test.
- 12: "c" - POT A test.
This routine will display the A to D value of POT A. Turn the adjustment screw on VR1 and make sure it goes from 0 to 1023. When done set to 0. Hit " x" key to escape this test.
- 13: "d" - POT B test.
This routine will display the A to D value of POT A.
Turn the adjustment screw on VR2 and make sure it goes from 0 to 1023.

When done set to 0. Hit “ x” key to escape this test.

14: “e”- POT C test.

This routine will display the A to D value of POT A. Turn the adjustment screw on VR3 and make sure it goes from 0 to 1023: When done set to 0. Hit “ x” key to escape this test.

15. “f” - Master POT test.

This routine will display the A to D value of the Master POT. Turn the adjustment screw on VR4 and make sure it goes from 0 to 1023. When done set to 0. Hit “ x” key to escape this test.

16: “g” - DIM A test.

This routine will display the A to D value of DIM A input from the test board or the CPU. Turn the adjustment screw on DIM A pot on the test board and make sure it goes from 0 to 1023.

When done set to 0. Hit “ x” key to escape this test.

17: “h” - DIM B test.

This routine will display the A to D value of DIM B input from the test board or the CPU. Turn the adjustment screw on DIM B pot on the test board and make sure it goes from 0 to 1023. When done set to 0.

Hit “ x” key to escape this test.

18: “I” - DIM C test

This routine will display the A to D value of DIM C input from the board or the CPU. Turn the adjustment screw on DIM B pot on the test board and make sure it goes from 0 to 1023. When done set to 0.

Hit “ x” key to escape this test.

19: “j” - LED temp will be displayed continuously.

Hit “ x” key to escape this test.

20: “I”- CPU temp will be displayed continuously.

Hit “ x” key to escape this test.

21: “m”- Display the current trigger input level.

This routine will continuously update input level until the x key is hit and then the test will end. This test can be used to setup trigger level. Make sure VR6 is at least 10 turns counter clockwise before starting. Set a high level either by the test board or CPU. Turn pot VR6 clock wise slowly till you get a high. Then turn the pot VR6 another 1/2 turn clock wise. If you know the trigger voltage level then you can remove VR6 and use these resistor values for R6. For 5 volt trigger level use 470 ohm resistor for R6. Use a 1K resistor for R6 for 12 volt trigger voltage.

22: “n” - Test over temp output to CPU.

This routine will change over temp from high to low.

Hit “ x” key to escape this test.

23: “o” - Run LED String A test.

This test needs a scope to check for stuck bits. How this test works is by outputting a saw tooth waveform from the D to A converter on channel A. The next part of this test is you can use the < and > keys to increase or decrease the LED current on channel A. Hit “ x” key to escape this test.

24: “p” - run LED String B test.

This test needs a scope to check for stuck bits. How this test works is by outputting a saw tooth waveform from the D to A converter on channel B. The next part of this test is you can use the < and > keys to increase or decrease the LED current on channel B. Hit “ x” key to escape this test.

25: “q” - Run LED String C test. This test needs a scope to check for stuck bits. How this test works is by outputting a saw tooth waveform from the D to A converter on channel C. The next part of this test is you can use the < and > keys to increase or decrease the LED current on channel C. Hit “ x” key to escape this test.

- 26: “r” - Set LED temp trip point in Celsius.
You must enter a 3 digit value. Example 090.
- 27: “s” - Set Trigger level.
0 = trigger on a low level. 1 = trigger on a high level.
- 28: “t” - Set LED rest time multiplier.
Enter a number between 1 and 9. The rest time is on time times the rest value.
- 29: “u” - Set CPU temp trip point in Celsius.
You must enter a 3 digit value. Example 065.
- 30: “v” - Manually set LED String A value.
Must enter 3 digits between 000 and 255. Example 043. 0 = 0 Amps,
128 = 1.15 Amps, 255 = 2.3 amps roughly.
- 31: “w” - Manually set LED String B value.
Must enter 3 digits between 000 and 255. Example 043. 0 = 0 Amps,
128 = 1.15 Amps, 255 = 2.3 amps roughly.
- 32: “y” - Manually set LED String C value.
Must enter 3 digits between 000 and 255. Example 043. 0 = 0 Amps,
128 = 1.15 Amps, 255 = 2.3 amps roughly.
- 33: “z” - Manually set Master LED value.
Must enter 3 digits between 000 and 255. Example 043. 0 = 0 Amps,
128 = 1.15 Amps, 255 = 2.3 amps roughly.
- 34: “A” - Display current EEPROM settings.
- 35: “B” - Turn on all analog outputs to max for testing. Not sure what this is for.
- 36: “C” - Set CPU Temp offset. Enter -+xxx where xxx = 000-255.
- 37: “D” - Test the watchdog timer. The controller will restart.
- 38: “E” - Set Watchdog Timer Timeout period. Settings below.
- a = 1ms
 - b = 2ms
 - c = 4ms
 - d = 8ms
 - e = 16ms
 - f = 32ms
 - g = 64ms
 - h = 128ms
 - i = 256ms
 - j = 512ms
 - k = 1s
 - l = 2s
 - m = 4s
 - n = 8s
 - o = 16s
 - p = 32s

q = 64s
r = 128s
s = 256s

39: “F” – Reset EEPROM to Defaults.

SW 1 is Mode Control

0 **Power Up Test and Variable Time** (triggered, w/o rest)

The power on starts this mode. LED Strings will be turned on for the time set by SW2. The LED string value needs to be preset before running this routine. If triggered, LED Strings come on and stays on until trigger goes low. No rest time. If the temp of the LED temp sensor or CPU temp sensor is over the preset then the temp needs to drop by 10 C before it will start working again.

1 **Fixed Time** (triggered, w/ rest)

When trigger level matches the preset trigger level the LED Strings will be turned on for the time set by SW2. The LED string value needs to be preset before running this routine. The rest time is set by the preset value between 1x and 9x. After the rest time then Controller will wait for next trigger. If the temp of the LED temp sensor or CPU temp sensor is over the preset then the temp needs to drop by 10 C before it will start working again.

2 **Variable Time** (triggered, w/ rest)

When trigger level matches the preset trigger level the LED Strings will be turned on based on the trigger level duration. The trigger level time is saved and used to calculate the rest time. The LED string value needs to be preset before running this routine. The rest time is set by the preset value between 1x and 9x. After the rest time then Controller will wait for next trigger. If the temp of the LED temp sensor or CPU temp sensor is over the preset then the temp needs to drop by 10 C before it will start working again.

3 **Fixed Time** (triggered, w/ rest) and **Variable Intensity** (w/ analog control)

When trigger level matches the preset trigger level the LED Strings will be turned on for the time set by SW2. The LED string values are set by DIM A, DIM B, DIM C inputs from the CPU. The rest time is set by the preset value between 1x and 9x. After the rest time then Controller will wait for next trigger. If the temp of the LED temp sensor or CPU temp sensor is over the preset then the temp needs to drop by 10 C before it will start working again.

4 **Variable Time** (triggered, w/ rest) and **Variable Intensity** (w/ analog control)

When trigger level matches the preset trigger level the LED Strings will be turned on based on the trigger level duration. The trigger level time is saved and used to calculate the rest time. The LED string values are set by DIM A, DIM B, DIM C inputs from the CPU. The rest time is set by the preset value between 1x and 9x. After the rest time then Controller will wait for next trigger. If the temp of the LED temp sensor or CPU temp sensor is over the preset then the temp needs to drop by 10 C before it will start working again.

5 **Variable Time** (triggered, w/o rest)

Like Mode 2, but w/o any rest time. When triggered, LED Strings come on and stays on until trigger goes low. No rest time. If the temp of the LED temp sensor or CPU temp sensor is over the preset then the temp needs to drop by 10 C before it will start working again. The LED string value needs to be preset before running this routine.

6,7,8,9,A,B,C,D – Not Used

E Continuous Fixed Time (triggered, w/ rest, no calibration)

F DC Calibration Mode (no trigger needed)

The DC mode is used to set LED string settings by using the POTs.

Before entering this mode adjust POTs VR1 – 4 full counter clock wise to make sure they are at 0.

Enter DC mode.

Adjust Master pot first and increase it till the LED string that needs the least amount of current to get to their full brightness.

Then adjust the other strings to their needed brightness.

SW2 is LED on time

Hex switch setting. 0 = 1ms, 1 = 2ms, 2 = 3ms, 3 = 5ms, 4 = 10ms, 5 = 20ms, 6 = 30ms, 7 = 60ms,
8 = 100ms, 9 = 200ms, A = 300ms, B = 500ms, C = 1000ms.

Serial and Debug connector wiring for Pic Kit3.

10 Pin Connector on Controller Pin #	Description	6 Pin Male Conn to Pic Kit3	DB-9-F Serial port Pin #
1-----White/Blue	GND	3	
2-----Brown	GND		5
3-----Orange	VCC	2	
4			
5-----Blue	VPD	4	
6-----Green	TX		2
7-----White/Brown	VPP	1	
8-----White/Green	RX		3
9-----White/Orange	VPC	5	
10			

Serial and Debug connector wiring for MPLAB ICD 2.

10 Pin Connector on Controller Pin #	Description	6 Pin RJ-12 Conn to MPLAB ICD 2	DB-9-F Serial port Pin #
1-----White/Blue	GND	4	
2-----Brown	GND		5
3-----Orange	VCC	5	
4			
5-----Blue	VPD	3	
6-----Green	TX		2
7-----White/Brown	VPP	6	
8-----White/Green	RX		3
9-----White/Orange	VPC	2	
10			

