E2-A Strobe Testing Protocol

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Description

Prior to commissioning an E2A microsecond LED flash, quality checks must be performed to ensure no issues or faulty components are present which may reduce the unit's lifespan. Relying on experience with the destructive testing of dozens of LED's, the tests are designed to identify defects and early failures while not reducing the lifespan.

Tools & Instruments Required

- Oscilloscope
- Digital Multimeter
- Active Light Probe
- Camera with Video Record Function
- Lab PSU (2.5V – 6.0V, 2A output)
- FTDI RS-232 adapter

EMCB1 (Main Control Board)

1. Board can be programmed (FTDI adapter). **Check:**
2. Board can be powered by 2.5 - 6 v (Lab PSU). **Check:**
3. Board IO functional (encoder, display, audio). **Check:**
4. Connect high-voltage converter, set to 120V, calibrate firmware. **Check:**
5. Confirm 130V output into board, 120V @ Zener (multimeter). **Check:**
6. Confirm capacitors charge 0V – 120V in 2 seconds or less. **Check:**
7. Confirm capacitors discharge 120V – 36V in 2 seconds or less. **Check:**
8. Test high-pass filter (CH1 -> Gate, CH2 -> microcontroller output, 1us/div, 0us offset). **Save trace:**

ECC0 (Capacitor Charger)

9. Using oscilloscope, measure the voltage at the flyback converter's switch pad. Confirm switch overshoot does not exceed 30V @ MIC3172. **Save traces with input voltages of 3.0V and 6.0V:**

10. Set capacitor anode voltage to 120V, TC4452 input voltage to 12.8V. **Record full unit current draw @ 3.0V, 4V.0, 6.0V.:**

11. Install charged batteries. Leave unit on and capacitors charged for 2 hours. Confirm voltages have not deviated. **Record pre-test and post-test battery voltage, TC4452 input voltage, and Capacitor Anode voltage:**

	Time	Input Voltage	TC4452 Voltage	Capacitor Anode Voltage
Start				
End				

Strobe Testing

Mount the unit on the integrating sphere. Install a 2-stop ND filter. Oscilloscope CH2 connects to the active light probe.

1. Measure the light output @ 0.5us, 1us, 2us, 4us. **Save traces.**

2. Oscilloscope CH1 – trigger input, test delay Active-Low (push to trigger). **Save trace:**

3. Oscilloscope CH1 – trigger input, test delay Active-High (release to trigger). **Save trace:**

4. Set the strobe to 500ns strobe duration and 6x consecutive strobes. Test the following matrix. After each test, measure the time between strobes using the oscilloscope's Measure Frequency function and a measurement gate. **Save Traces:**

Delay between strobes	Total strobe time | Timebase	Tolerance	All Strobes Within Tolerance?
250 us	1,250 us | 100us	+/- 6 us	
500 us	2,500 us | 200us	+/- 12 us	
750 us	3,750 us | 500us	+/- 19 us	
1,000 us	5,000 us | 500us	+/- 25 us	
1,250 us	6,250 us | 500us	+/- 0.03 ms	
1,500 us	7,500 us | 1ms	+/- 0.04 ms	

1,750 us	8,750 us | 1ms	+/- 0.04 ms	
2,000 us	10,000 us | 1ms	+/- 0.05 ms	

5. Test the following matrix. Total strobes: 7,400x. Total testing time: 900 seconds (15 minutes). Total illumination time: 14.25 milliseconds. **Video record the oscilloscope @ 30fps and note whether LED's appeared damaged or have completely failed.**

Duration | Count | Rate	Reps | Rate	Timebase	(P)ass / (D)amage / (F)ailure
0.5us, 1x	1,000x | 8Hz	200ns, -1us	
1us, 1x	1,000x | 8Hz	200ns, -1us	
2us, 1x	1,000x | 8Hz	200ns, -1us	
4us, 1x	1,000x | 8Hz	500ns, -3us	
0.5us, 6x, 250us	250 | 2Hz	100us, -600us	
1us, 4x, 250us	250 | 2Hz	100us, -600us	
2us, 4x, 1,000us	250 | 2Hz	500us, -3ms	
4us, 3x, 1,000us	250 | 2Hz	200us, -1.2ms	

6. Oscilloscope CH1 – ATMEGA328P pin 7, CH2 – ATMEGA328P pin 20 (vcc pins), test 0.5us, 1us, 2us, 4us strboe. **Save traces.**

7. Measure the light output @ 0.5us, 1us, 2us, 4us. Light levels must meet the pre-testing levels measured during step 1. **Save traces.**

Information & Signature

Name   *Date*

Unit S/N   *EMCB1 S/N*

ECC0 S/N   *Faceplate S/N*

Signature