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14-008

17 Oct, 2014

T500U MIRROR ASSEMBLY REPLACEMENT PROCEDURE

I. PURPOSE:

To provide instructions on field replacement of the mirror assemblies in a T500U.

II. TOOLS:

9/16" Wrench, 7/16" Wrench, Phillips Screwdriver, 2 channel Oscilloscope, Powder Free Gloves, Grounding strap, Clean dust free room (if available).

***NOTICE* MIRROR SURFACES MUST NEVER BE TOUCHED!**

III. PARTS:

081920000 AKIT, MIRROR REPLACEMENT, T500U

IV. PROCEDURE:

1. Power down the T500U and remove the detector cable from the top of the instrument as shown in Figure 1. Be sure to follow proper ESD procedures.

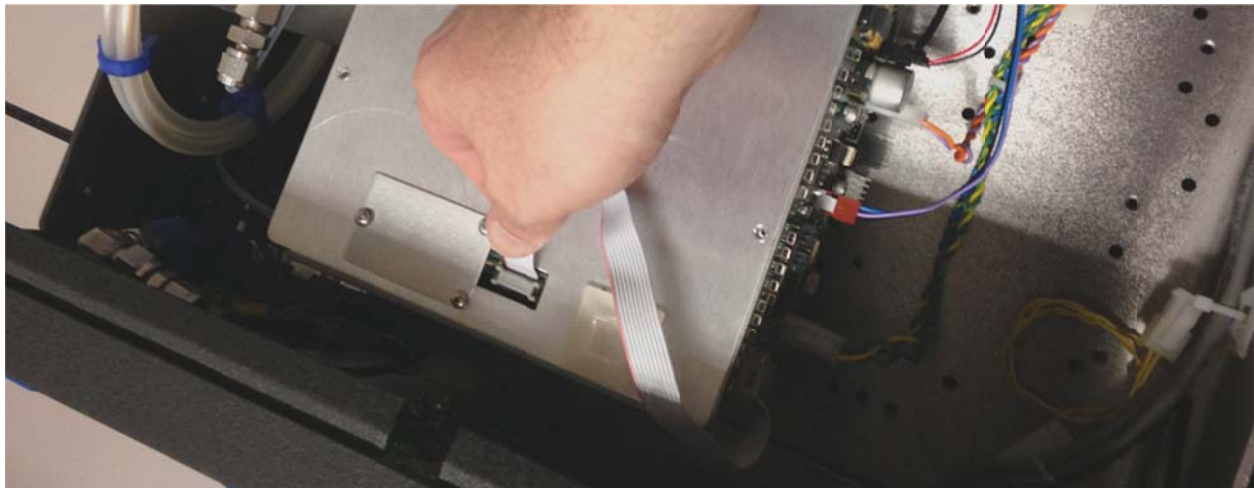


Figure 1

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- Remove the top cover of the oven and open the pneumatic fittings shown in Figure 2.

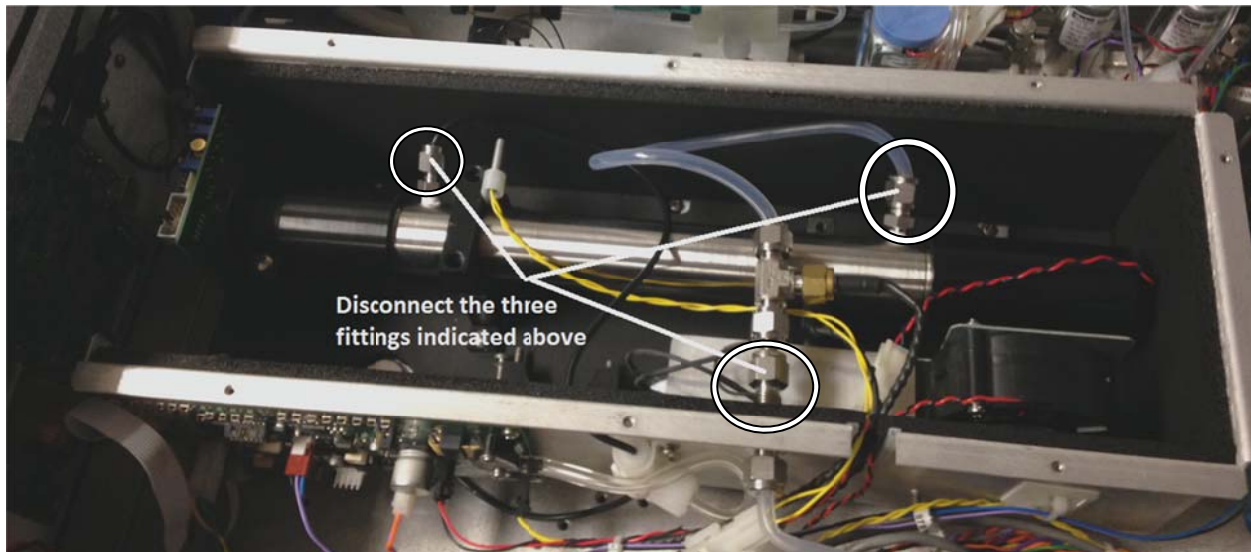


Figure 2

- Disconnect the Thermistor and LED connectors, from the DAQ board, as shown in Figure 3.

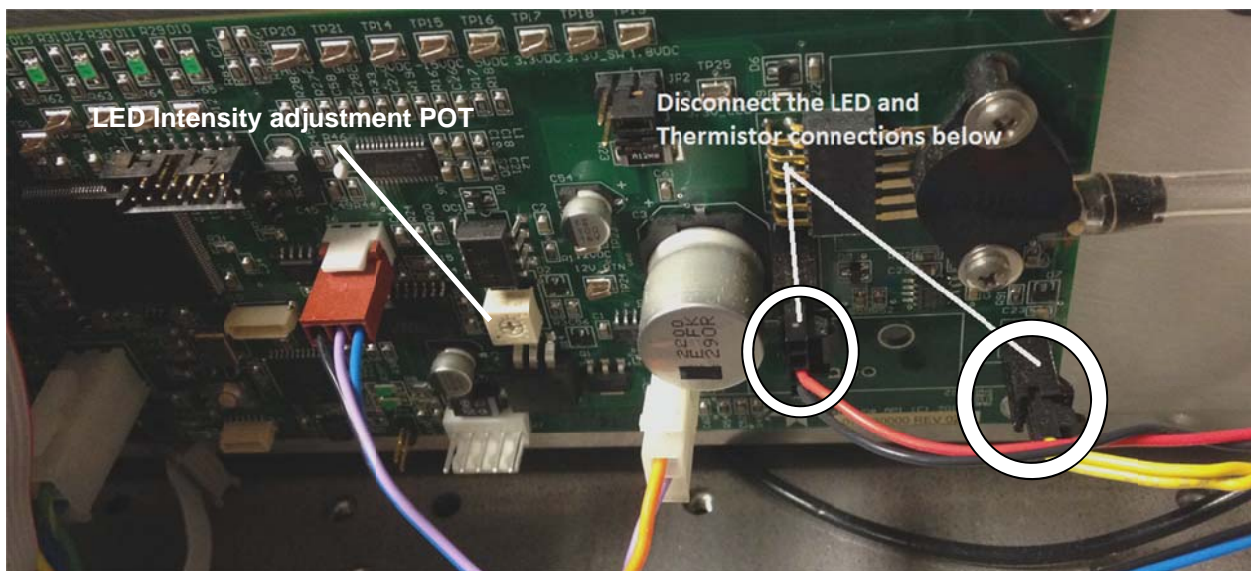


Figure 3

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4. Remove the two mounting brackets holding the sensor assembly to the chassis as shown in Figure 4.

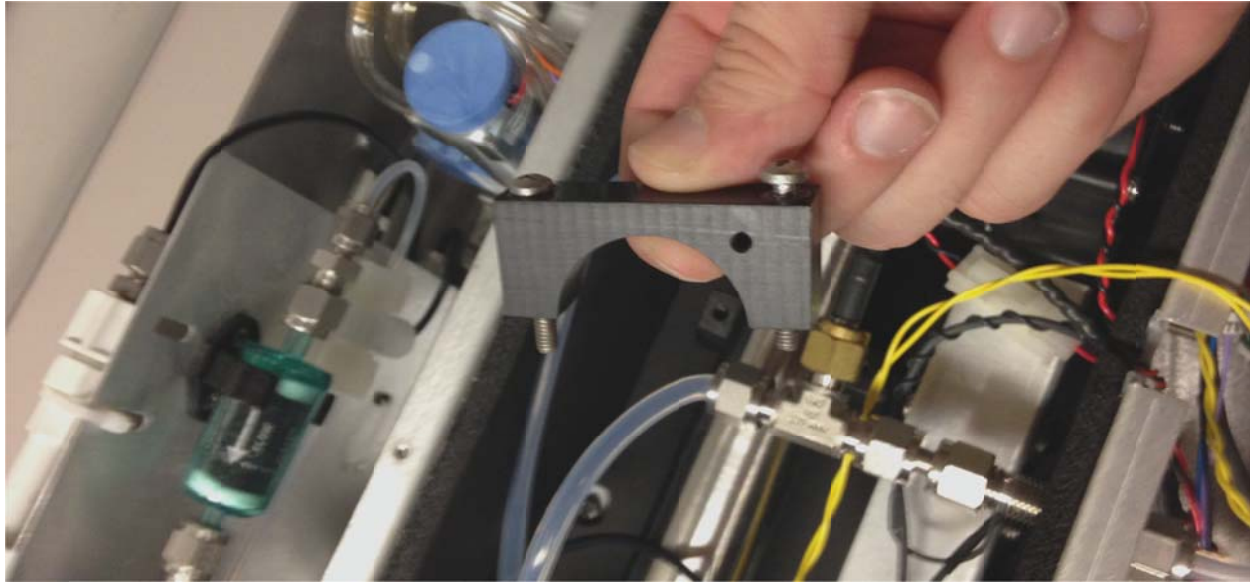


Figure 4

5. Carefully unscrew the black section from the stainless section of one end of the tube as shown in Figure 5. **Caution - There is an O-ring between the mirror and black section inside, be sure not to lose this.**

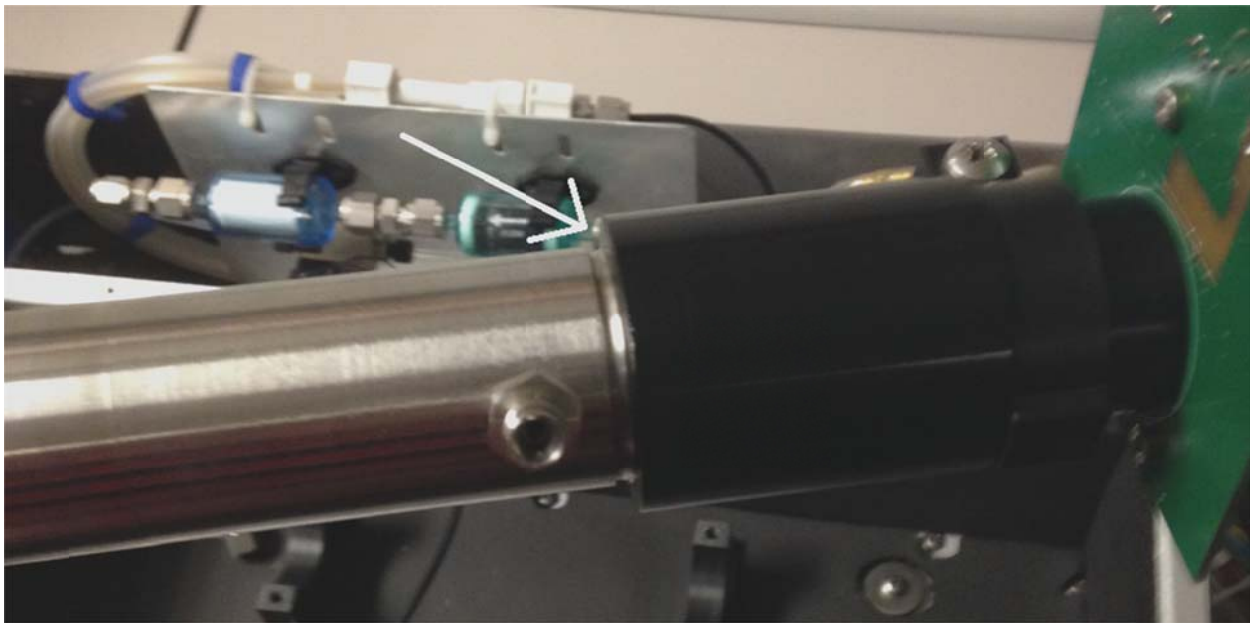


Figure 5

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6. Once the black section is removed, you can now see and access the mirror assembly as shown in Figure 6.

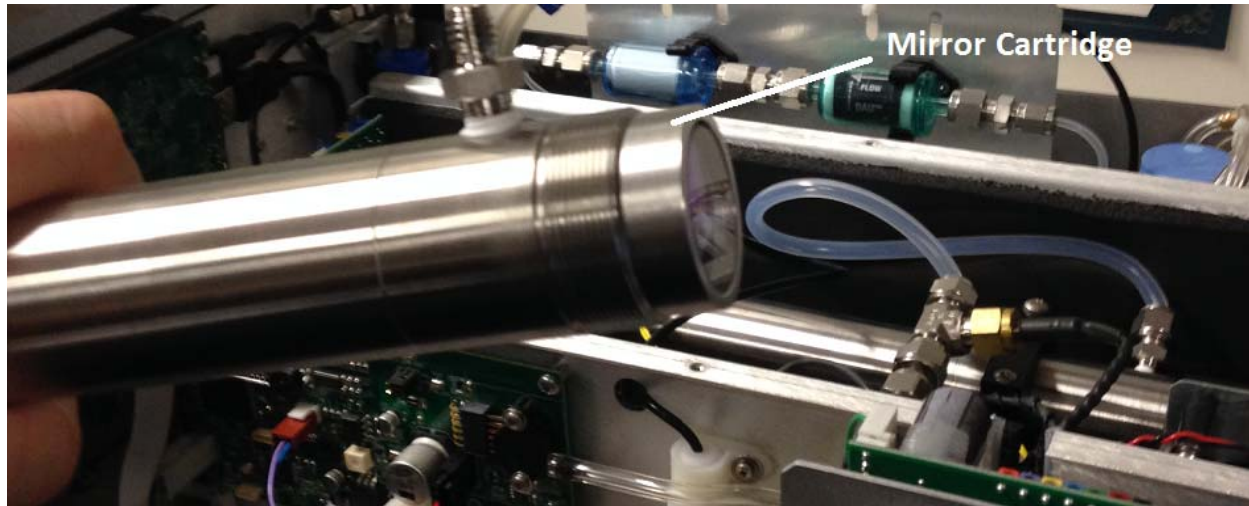


Figure 6

7. To remove the mirror, gently grip the sides of the mirror sleeve, and wiggle the mirror out of the tube. **Caution - Mirror surfaces must not be touched or permanent damage may occur!** In order for the T500U to measure within the specifications of the instrument, the mirrors must maintain 99.99% reflectivity. The surface is shown in figure 7.



Figure 7

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8. Remove the mirror assemblies from both ends of the sensor tube, use compressed air to blow out debris from the sensor tube or endcaps as necessary. **Caution - Do not use compressed air on the replacement mirrors.**
9. Check the O-ring in the two black end cap housings to make sure the O-rings are fully seated as shown in Figure 8.

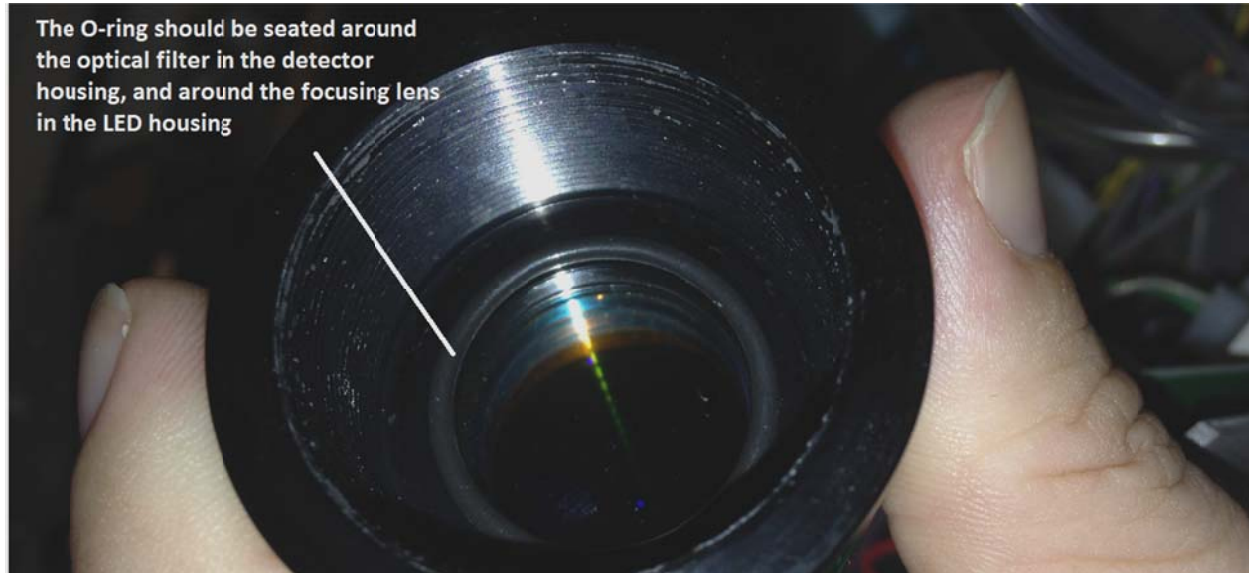


Figure 8

10. Once any debris is clear, use reverse steps to insert one mirror assembly at a time from your KIT making sure not to touch the mirrored surfaces by gently wiggling the replacement mirror into place until it is fully seated.
11. Now that the O-ring should have the mirror secured in place, you should be able to hold the stainless tube, and the black LED and detector housings vertical as shown in figure 9 to ensure that the O-ring between the housing and the tube does not fall out of place, and screw the housing back on to a snug fit. Do not over tighten. In the event that you don't remember which side goes where, remember that the side of the tube with the 1/8" fitting is the detector side, and the side with the 1/4" fitting is the LED side.



Figure 9

12. Once the optical bench is re-assembled, place it back in the oven housing, and reconnect the fittings, the thermistor and LED connections to the DAQ board, and loosely connect the two brackets that hold the bench down in place. The detector will need to be re-aligned with the opening in the top of the oven cover as shown in Figure 1 so that the signal cable can be re-connected.
13. Once the sensor is aligned with the cover, finish tightening down the two brackets holding the sensor down being sure not to over tighten. Plug in the detector signal cable shown in Figure 1, and disconnect the red and black LED power cable shown in Figure 3 then turn the instrument back on while sampling Zero air at the sample port. **Caution - Never operate the instrument with open/loose pneumatic fittings, ambient air will be pulled into the sensor and dirty the mirrors.**

Note: Following the addition of new mirrors it is typical to only have to adjust the amplitude to both the first and second stage signals, by adjusting the “LED Intensity adjustment POT” Figure 3. The goal is to keep the first stage at 8 to 8.5 V and the second stage at 4 to 4.5 V. Steps 15 to 19 should be undertaken only if excessive noise is noted on either signal. This is not common!

14. Connect channel 1 of the oscilloscope to “Amplifier Stage 1 Testpoint” and channel two of the oscilloscope to “Amplifier Stage 2 Testpoint” as shown in Figure 10.

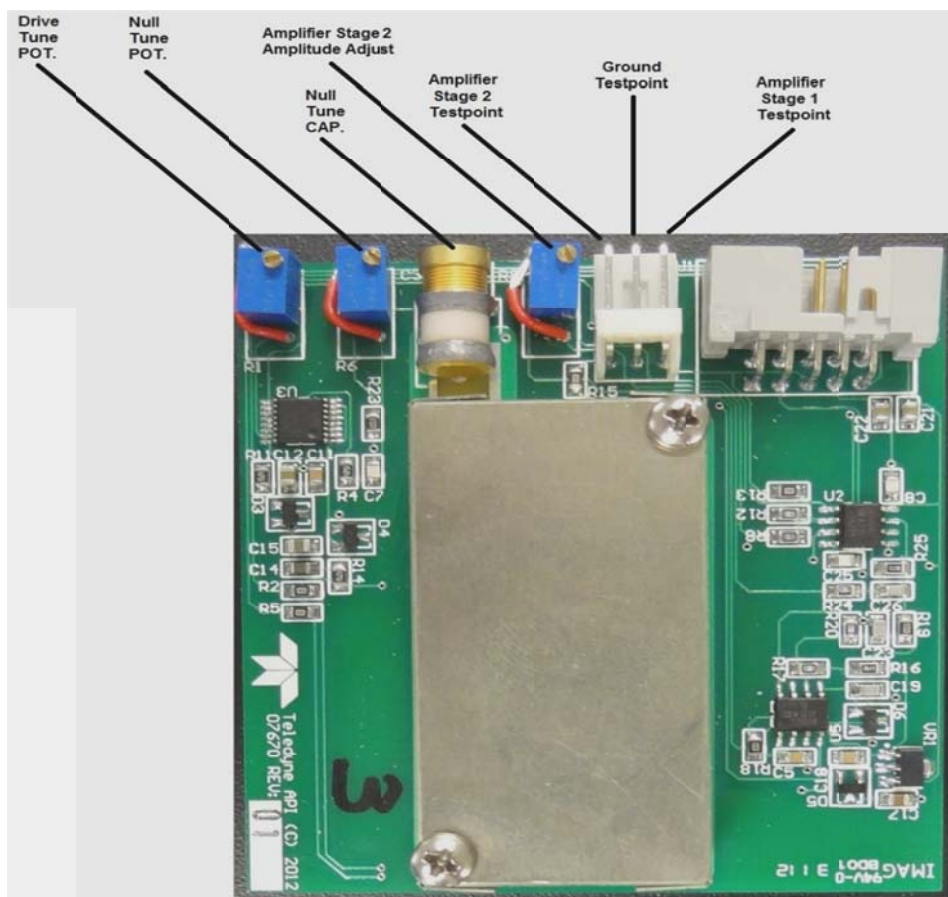


Figure 10

15. Unplug the LED and adjust channel one to 2V/DIV and 10.0uS. You will see a ringing square wave type of wave form as shown in Figure 11.

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Figure 11 Unadjusted Capacitor Waveform with LED Unplugged

- Adjust C3 the variable capacitor “Null Tune CAP”, until the square wave is as minimal as possible without flat lining. Once the square wave is as small as possible, then adjust R6 “Null Tune POT.” until the ringing is minimized as shown in Figure 12.

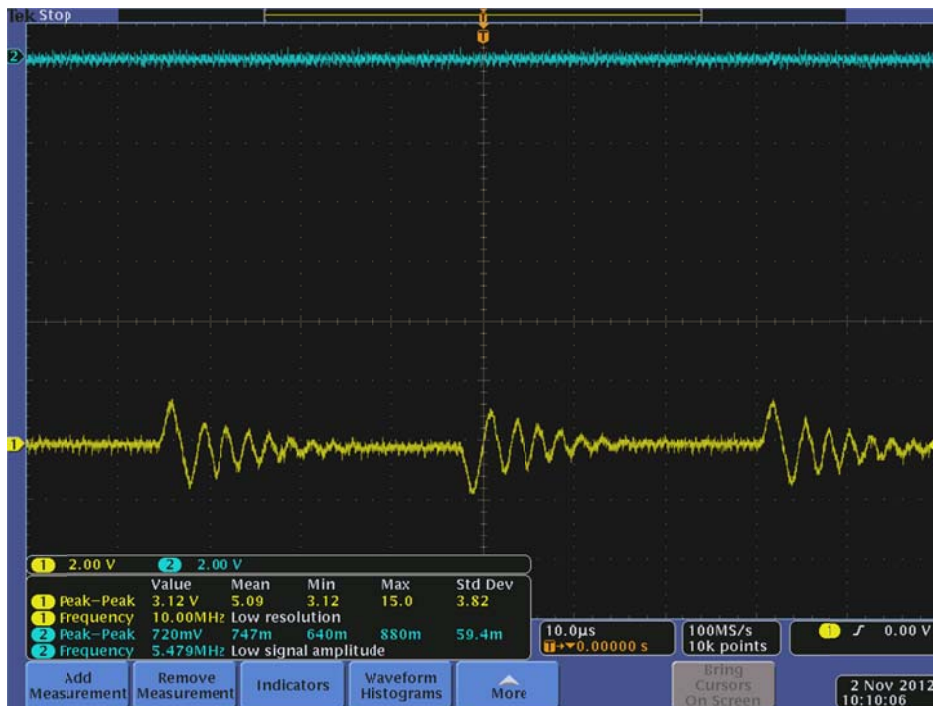


Figure 12 Correctly Adjusted Capacitor Waveform with LED Unplugged

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- Plug in the LED to the Mixer/Preamp board as shown in figure 3, adjust the oscilloscope to a 10mS time scale and turn on channel 2 with 1V/DIV as shown in Figure 13.

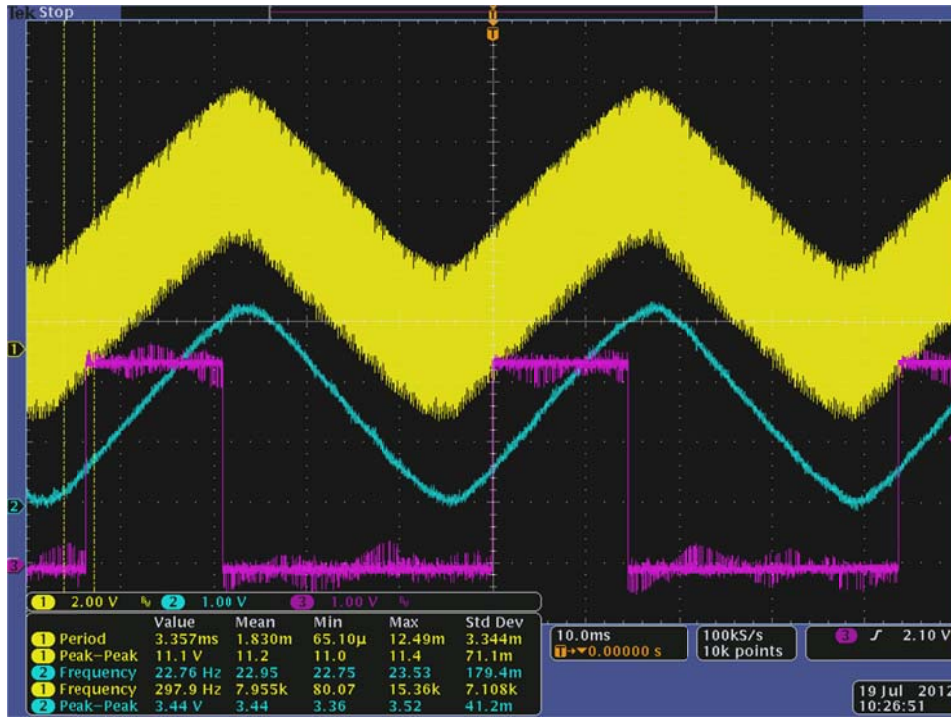


Figure 13 Stage 1 output incorrectly adjusted

18. Adjust R1 "Drive Tune POT." until amplifier stage 1 is as clean and noise free as can be adjusted as shown in Figure 14. Both signals are required to be in phase with each other. Adjust R9 "Amplifier Stage 2 Amplitude Adjust" if signals are out of phase.

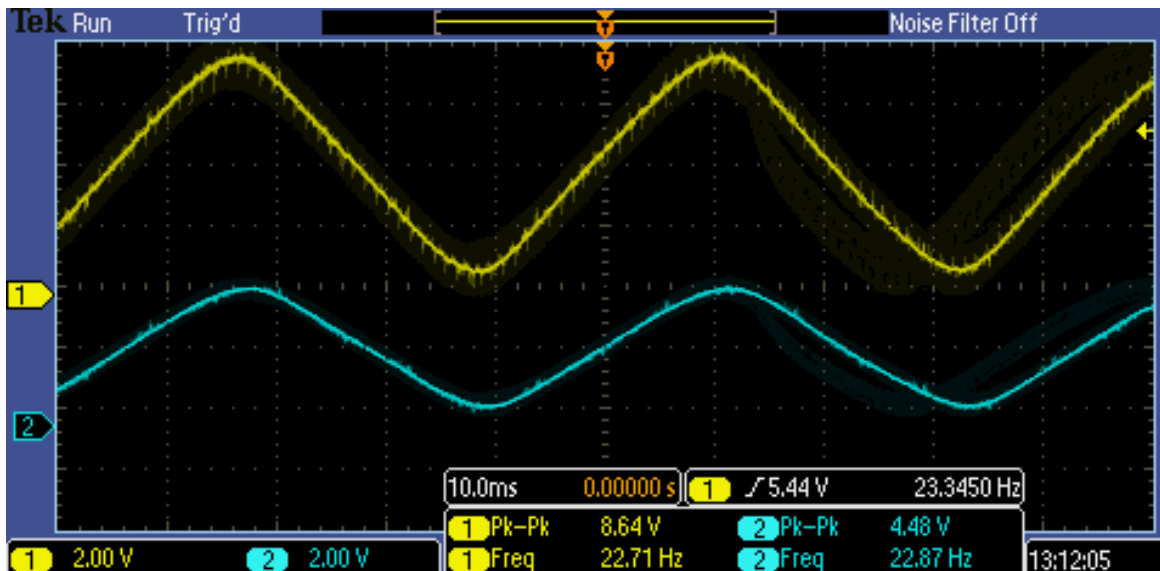


Figure 14 Stage 1 and Stage 2 Waveforms Properly Adjusted.

19. Adjust R9 "Amplifier Stage 2 Amplitude Adjust" until the amplitude is between 4 - 4.5Vdc.

20. Ideally you want amplifier stage 1 to have amplitude of 8 – 8.5Vdc and amplitude stage 2 between 4 – 4.5Vdc. If the waveform(s) are clipping adjust the LED Intensity adjustment POT down until amplifier stage 1 is 8 – 8.5Vdc. See Figure 15 for an example of an incorrect clipping waveform.

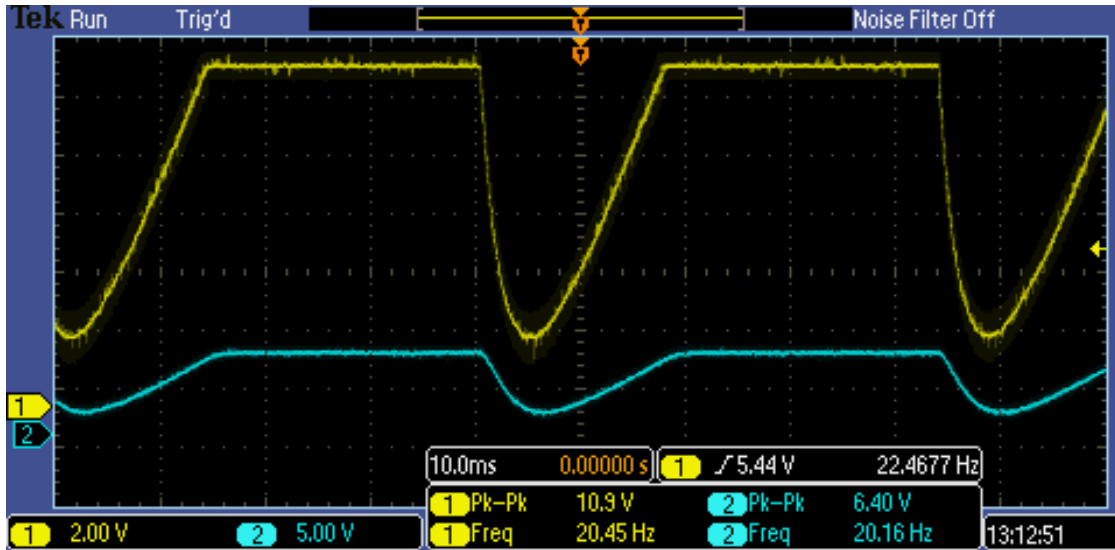


Figure 15 Incorrect Clipping Waveform due to high current to LED

21. Once the two waveforms are set, power off the instrument, disconnect the detector cable, replace the cover on the oven and secure it, re-connect the detector cable, and the instrument should be ready to operate.