Laser Replacement Procedure
Thermo Avatar FTIR

last udpated 8/5/2024

Summary

In order, the top three consumables of an FTIR are the desiccant, IR source, and HeNe laser.

The HeNe laser is a critical component of the Interferometer and is used to calibrate the instrument as well as control the moving mirror.

Replacement of the HeNe laser is often needed due to:

• High laser gains after alignment (pegged at maximum of 240).

• Scan issues resulting to no scanning, intermittent bad scans, or noisy data.

• No visible laser light in sample compartment or from the laser head (dead laser).

• Old lasers (from the manufacturing date shown on the head) of more than 7 years will often show one or more of these top three symptoms.

Removing the old laser

1. Turn off FTIR and remove the main cover (four threaded knobs on the bottom).
2. Unplug the laser and remove the entire mount (holding the laser).
3. Remove the small brick held by two screws.

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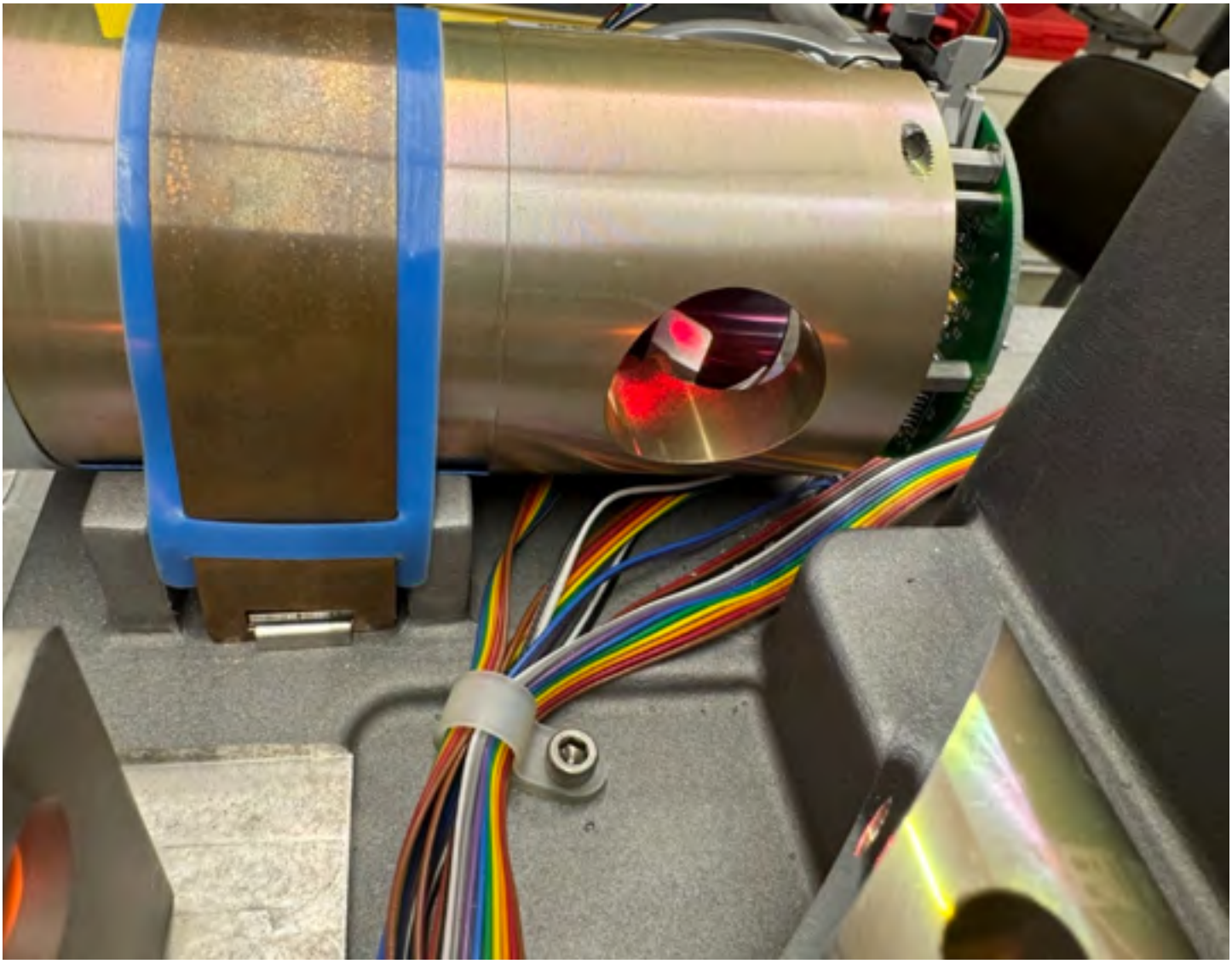
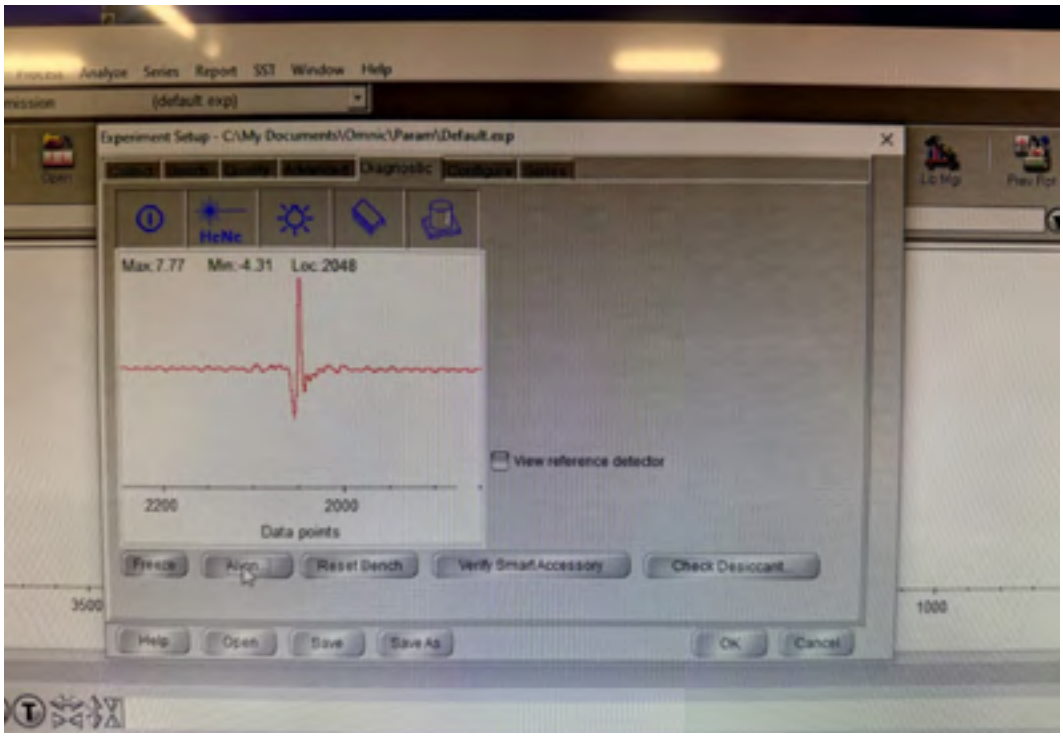
Installing the new laser

1. Re-install the new brick.
2. Slide in the new laser, note the dowel pin fits into the hole located on the front of the laser. The laser can only go in one way.
3. Lock in the spring clamps.
4. Plug in connector.
5. Power the FTIR up.
6. When the laser turns on check that the beam is hitting the clear (square) aperture as shown in the photo.

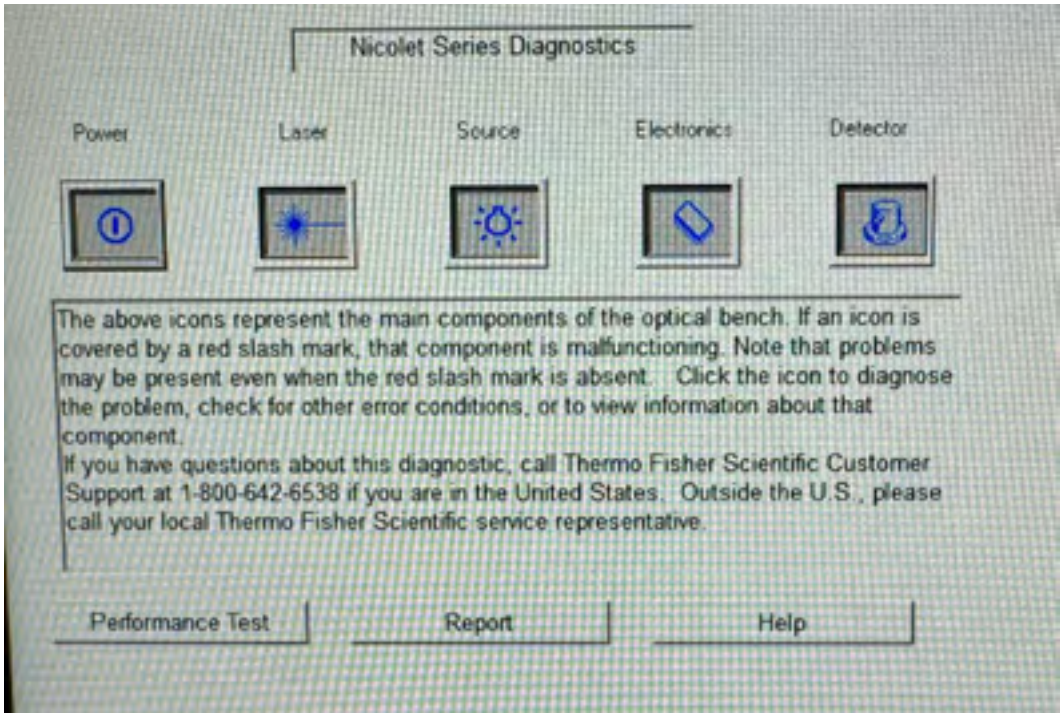


Installing the new laser (continued)

7. Go into Experiment Setup, then the Diagnostics tab.
8. Hit Align and verify the alignment has completed.
9. When the alignment is complete you should see an interferogram of some amplitude as shown to the right.

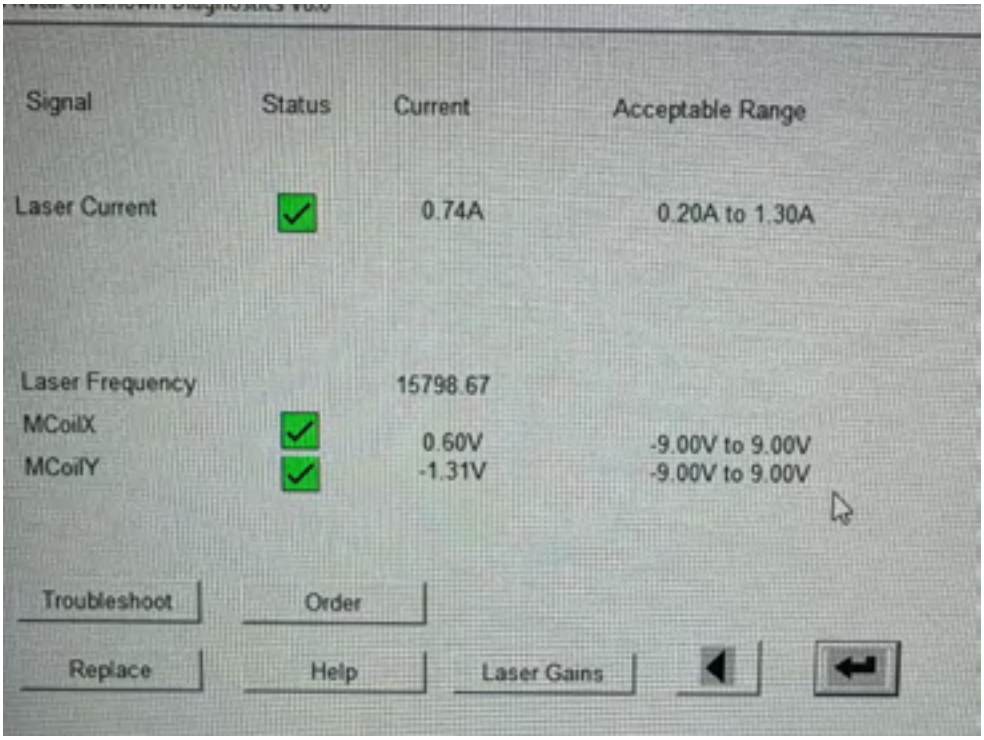


10. Close out of Omnic and go into the C-drive->programs->Omnic Folder. Pin the application called ADiag to the taskbar (so you do not have to hunt for it next time.
11. Open ADiag (note the panels may not look exactly the same as right based on the version of the Omnic software, but the content should the same

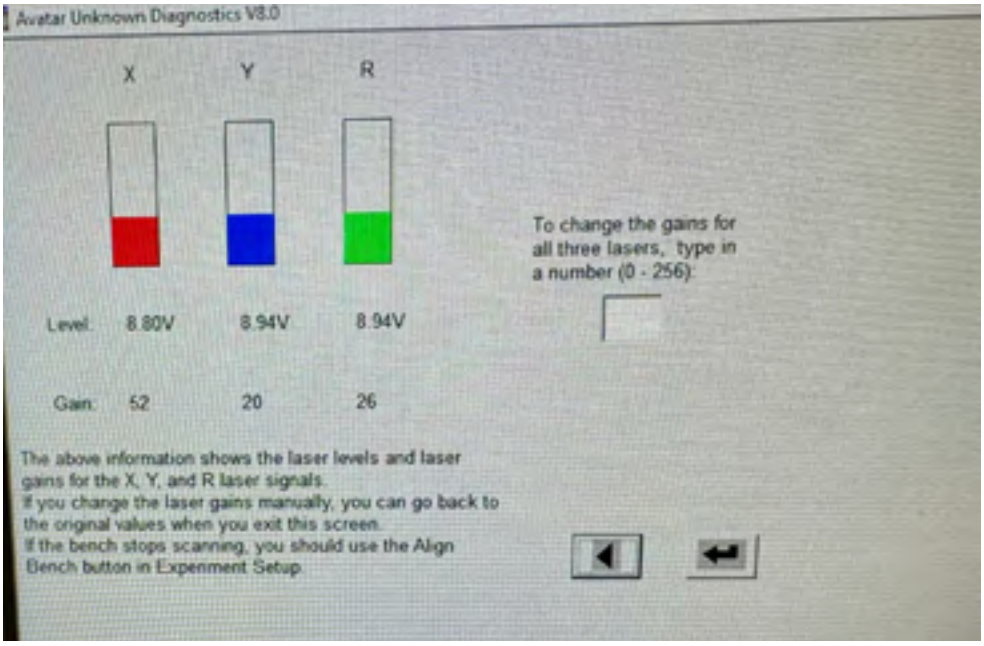


Installing the new laser (continued)

12. Then hit the Laser icon you will see:



13. Take a screen shot and record the MCoilX and MCoilY (for future reference).
14. Hit Laser Gains icon:



Installing the new laser (continued)

Note all of the gain values should ideally be less than 100 with a new laser. Take a screen shot of this and record the date of this laser change if all three are less than 100. If all values are above 100 this would indicate the KBR beamsplitter is partially fogged from exposure to high humidity.

Final Comments

Based on the instrument, this process may not result in the instrument successfully scanning if the instrument was not used for an extended period or time or came out of storage. Since nearly all FTIRs use KBR optics (salt optics), they can easily be damaged by humidity. When this happens there will be a significant amount of scattering in HeNe laser form the KBR beam splitter in the interferometer. Secondly, if the beam splitter is partially “fogged”, this will result in high laser gains (all three, X, Y, and R) after the auto alignment. In general, when all three laser gain parameters are high it is usually a result of a weak laser or a fogged beam splitter. When one or two of the laser gain values are low (normal, and well less than 100), with the other(s) high at 240 it becomes an alignment issue with the laser beam either not being uniform or off the laser detector.

The laser gains window shown above (ADiag) is only accessible when Omnic application is closed. This means you need to close out Omnic, then open ADiag for access to this window. This window is convenient since it provides a real output of the voltages seen by the Laser Detector. The other method of observing these voltages is by connecting a scope to the three test points on the preamp board as described in the Thermo Service Manual. We have found the ADiag “shortcut” with the auto-align iteration, is easier to use.

Executing Align in the Diagnostics window has a two-step process. First it establishes the proper gain values read from the HeNe laser. During this process it is monitoring the laser detector board just outside the interferometer. Once the gain levels are established the instrument will start scanning and you will then see an interferogram to appear. During next step called the “Fine Alignment”, the galvo mirror will optimize the IR beam on the IR detector (on the left of the sample compartment). You will see the amplitude of the interferogram go up and down, until the maximum is found. Once found the galvo mirrors are parked at the voltages shown for McoilX and McoilY in the window shown in step 12.

Note the final amplitude of the interferogram will be related to the signal to noise after the Align process. If the amplitude is lower than 3 at Gain=1, most likely the IR source is getting close to end of life. If there is no amplitude, and the system is scanning the IR source is either dead or switched off.