

Errors Encountered:

1. “Can’t Reach Pressure”

- The vial (buffer or sample) may have a small crack; replace and retry.
- Sometimes, there are random vial positions in the CE that just don’t work well. I have noticed this error when trying to sample from SI:F1 – I now just start from SI:F2.
- There may be something wrong with the syringe pump. To test, pressurize a vial, and monitor the pressure over time. If it reaches pressure, but then drifts downward consistently, this is probably the case.

2. “Pressure Failure”

- Most commonly, the cap has fallen off, has been depressed into the vial, or is otherwise just gone bad. Replace cap and retry.
- The vial is cracked or broken. Replace vial and retry.
- You are trying to pressurize a cell that does not contain a vial. Check the sequence and ensure that all vials are placed in the correct locations.
- There is a problem with the capillary. Check both ends to make sure that they are not broken, then check the window. Often, there will be signs of leakage at the window if it is indeed cracked there. Replace capillary and retry.
- There is a problem with the electrodes. Check both ends to make sure they are not bent/broken. Repair/replace if necessary, and retry.

3. “Current Leakage”

- Check capillary – the most common problem associated with this error is a capillary broken at the window. Replace and retry.
- Check and clean electrodes (MeOH and Kimwipe)
- Check and clean apertures (especially in LIF)
- Ensure that no salt has spilled in any area that the electrodes come in contact with

4. “Coolant Low”

- Fill coolant to slightly above black line and retry.

- The coolant is 3M FC-77 electronic liquid coolant. Currently, the cheapest source is from Fisher, part # NC9021501

5. “XYZ Home Error”

- Sometimes, the machine just has trouble getting to a certain set of vials. If this error pops up, shut the machine off, move the rails to a middle position, and restart. Fixes it nearly every time.

6. “XYZ Move Error”

- Press load (if possible), then shut off machine. Check to see if rails are free moving in all three directions. If not, check paths for caps, vials, anything that could impede its movement. If rails feel stuck, try to regrease them with a light oil (I use the lyophilizer pump oil). Bring rails to front and restart machine.
- Try this a few times, each time leaving the rails in a different position.
- If error keeps happening (every time machine is initialized), this is a more serious problem, either a bad sensor board (more likely) or driver board (less likely).
- When it is initializing, pay attention to which rail can't move. This rail will lurch forward incrementally, and then the error will appear. This probably means that this rail's sensor board is bad. See below on how to replace – you can also take a board from another machine's rail, as they are all identical (no distinction b/w “left” and “right” boards).
- If both fail to move, or both do the same lurching motion, then it is probably the driver board. I have never fixed this.

7. “Error reading from device -- Hardware Status Fatal”

- The error may be caused by a corrupted method/sequence file. Write both from scratch (don't just save the existing method with a different name), and re-run.
- It also may be caused by low disk drive space -- Check that the C: drive contains at least 500mb of free space; this error can occur when resources become low. Remove all unnecessary programs

- If those don't work, this error is probably caused by current leakage, resulting in high voltage reaching the detector module. It will usually shut down before damage is done.
- Check the capillary, and replace if broken/chipped
- Check that both the interconnect and detector modules are properly installed.
- Thoroughly clean the laser clip and the aperture with water and ethanol. Blow dry with N₂.
- Thoroughly clean the front plate (white plastic) of the detector module with water and ethanol, including the detection window. Also, remove the lens box (black box, held w/ screw on side of module) and clean the detection window. Blow everything dry with N₂.
- If the error continues, try several runs with continually lower voltage (20, 15, 10, 5, etc). If it is a voltage leakage problem, then at some voltage, it will start working again. Clean everything at this point.
- If all these fail, you may have a bad board. See below on how to replace the LIF PMT board assembly.

8. "Hardware Status Fail"

Other errors/problems:

- Method/sequence continues to freeze after first run iteration, and still says "Waiting for run to end" – either method or sequence file is corrupted, rewrite from scratch and restart

Testing laser life

Materials needed

Multimeter

(2) small metal wires

Diagnostic information can be obtained from the 25-pin connector located on the back of the LIF unit. A new laser will read an output between 0.4-0.45; the yellow current limit light will illuminate upon reach a value of 0.7; the current will max out at 0.85, at which time the laser will continue to lose intensity until completely burning out. It should be replaced when this value is reached.

Protocol

- Locate the 25 pin connector on the back of the LIF unit
- Counting from the top right (1) and moving left, locate pins 9, 10, 11
- Place 1 small metal wire on 9, the other in 11
- Read the voltage between these two pins
- Repeat for pins 10 and 11

Sensor Board Assembly Replacement

Materials needed

Long, slender Phillips screwdriver
Short, stubby screwdriver
New sensor board assy (part # 144168)

When an XYZ move error is reported, it is likely the sensor board. This is an easy fix, but be mindful to carefully follow the instructions, as the x-sensor strip can easily be ruined otherwise.

Protocol

Rail Removal

- Determine which rail is not responding correctly (this rail will inch along when trying to hone, then stop, and the error will be reported)
 - Turn MDQ off
 - Remove trays, electrodes, capillary cartridge, and detector module
 - Slide tray holder to the front, uncovering four screw holes located in the middle and back of the tray (see Fig. 1)
 - Prop the entire rail up with a stubby screwdriver (or something else that is small and won't be crushed) by lifting the rail and placing the part under the rail, on top of the silver platform
- ** This is extremely important – it lifts the rail away from the x-sensor strip, preventing possible damage ****
- Unhook the ribbon cable from the sensor board. Depress the release tab on the connector, and pull hard.
 - With rail propped up, loosen each of the four screws. They are permanently mounted in the rail and will not come out.
 - When totally loosened, lift the rail straight up, then out of the MDQ

Board Replacement

- Flip the rail over and set down on table
- Disconnect the stepper motor from the board
- Remove the (4) screws holding the board to the rail
- Carefully lift the board from the rail, noting its orientation
- Carefully set the new board down, lining up the silver peg with its receptacle
- Fasten with the (4) screws and reconnect the stepper motor
- Optional: Using a light oil (pump oil from lyophilizer works well), lubricate the silver cylinder. This will help its movement within the machine

Rail Installation

- Ensure that the stubby screwdriver is still in place between the platform and the rail seating
- *Carefully* place rail back into seating, sliding the alignment pegs into the grooves. At this point, the rail should be seated, and you shouldn't be able to jostle it too much

- Tighten screws in same manner as you would a car tire (opposite corners, tighten all moderately, then finish tightening)
- Reattach ribbon cable to sensor board
- Holding rail with hand, remove stubby screwdriver, and *slowly* lower rail into original position
- Clear area of any tools/debris that were used/generated during install
- Reinstall electrodes, detector, cartridge, close machine, turn on, and hope!

LIF PMT Board Assembly Replacement

Materials needed

5 mm allen wrench

New LIF PMT board assy (part # 144168)

This fix had to be done after the “Hardware Status Fatal” error kept reappearing with the LIF. This error is not necessarily associated with this bad part!

Protocol

Board Removal

- Remove the detector module from MDQ
- Remove the hex screws fastening the face/handle to the detector body
- Slowly pull body away from face plate. Things are packed tightly, so be careful.
- Locate PMT board assy, disconnect ribbon cables, noting where each plugs in
- Locate board mounting begs. Using something flat and hard (like flathead screwdriver), depress pegs so that board can be lifted from detector body
- Install new board in same orientation
- Connect ribbon cables
- Reassamble module, ensuring that the body sits flush with the face (not as easy as it sounds)
- Install into MDQ, and test

** If the detector now works, be sure to calibrate both lasers using the LIF calibration wizard **