

LW405 laser writer troubleshooting manual

Introduction

In this manual, we have discussed the common error messages that we had encountered during the laser writing process. The error messages would indicate the affected modules of the system. On the basis of the specific cause, remedial steps to troubleshoot the error have been listed. We have offered some recommendations to minimize the recurrence of the error messages and thereby reduce the system down time. The reader must bear in mind that at the time of this writing, we had encountered the error messages that will be discussed later. The suggested remedies worked and the error messages were gone. It may be possible that the user may encounter error messages that are not included in this manual. In this case, an additional chapter detailing the causes, remedy and recommendations could be added.

LW1 errors

Errors in LW1 indicate problems in the write control computer of the laser writer. Typically the error messages follow a certain sequence detailed below.

Error messages

The error messages follow a sequence and typically start with “LW1 write timeout” message.

The error messages would occur anytime during the writing process and the writing would not continue further. The error messages are shown below:

- Query timeout
- LW1 write timeout (Dummy data.bin download)
- LW1 write timeout (data.bin download)
- LW1 write timeout (BEAM OFF)
- LW1 write timeout (DAC3)
- LW1 write timeout (DAC2)
- LW1 write timeout (Strip start)
- No command acknowledge (scan stop from LW1)
- LW1 write timeout ()

After this, you will not be able to resume the writing process. You may shut down the system, wait for 10 minutes and then start the system. You will observe that the writing process can be resumed (after setting up the process parameters). But after a few strips (or in some cases many strips depending on strip length), the writing process would stop and the error messages listed above would recur.

Causes

The “LW1 write timeout” message indicates that the affected module is LW1 that regulates the write control unit of the system. The fact that the system works/writes for a short duration after system restart and then starts giving errors may indicate a thermal problem. The LW1 CPU might be getting overheated. The LW1 heat sink could be detached from the LW1 CPU or the LW1 CPU fan could be damaged. In this case, the CPU has an in-built safety mechanism to shut down in order to protect itself from thermal damage. Once the CPU shuts down, the write control unit is disabled and the writing process cannot be resumed.

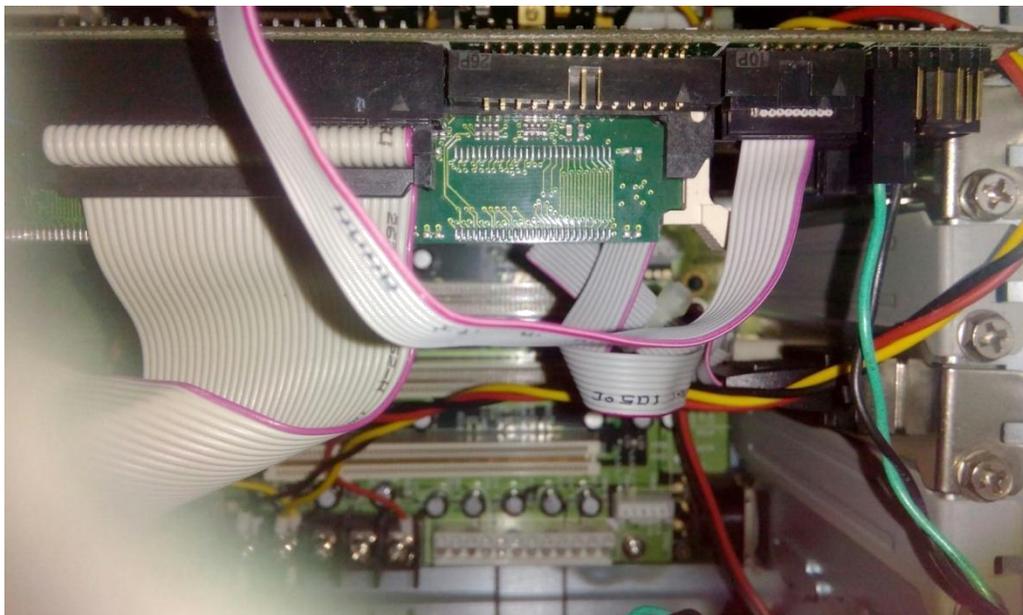
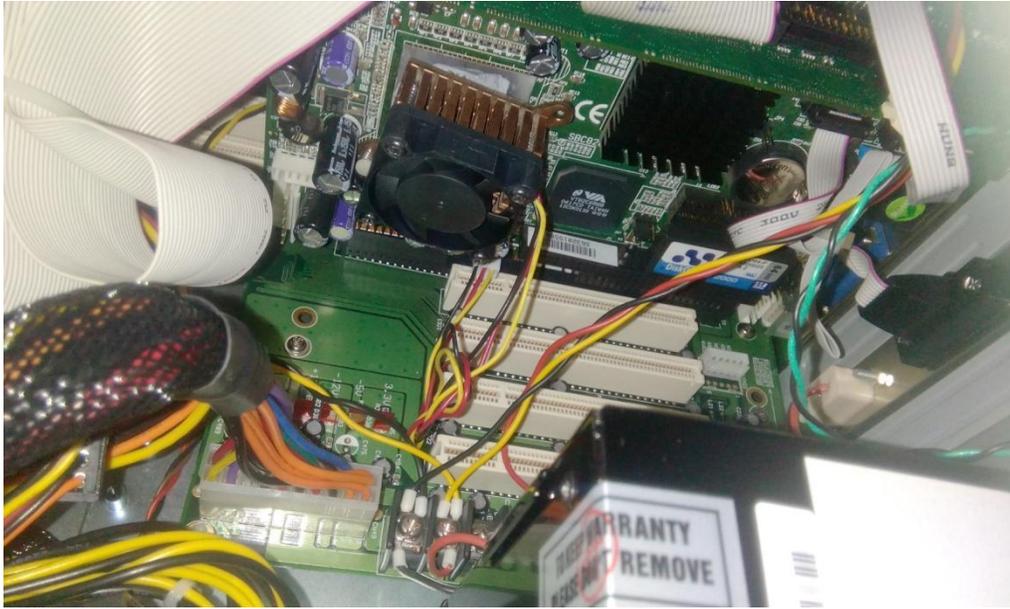
Remedy

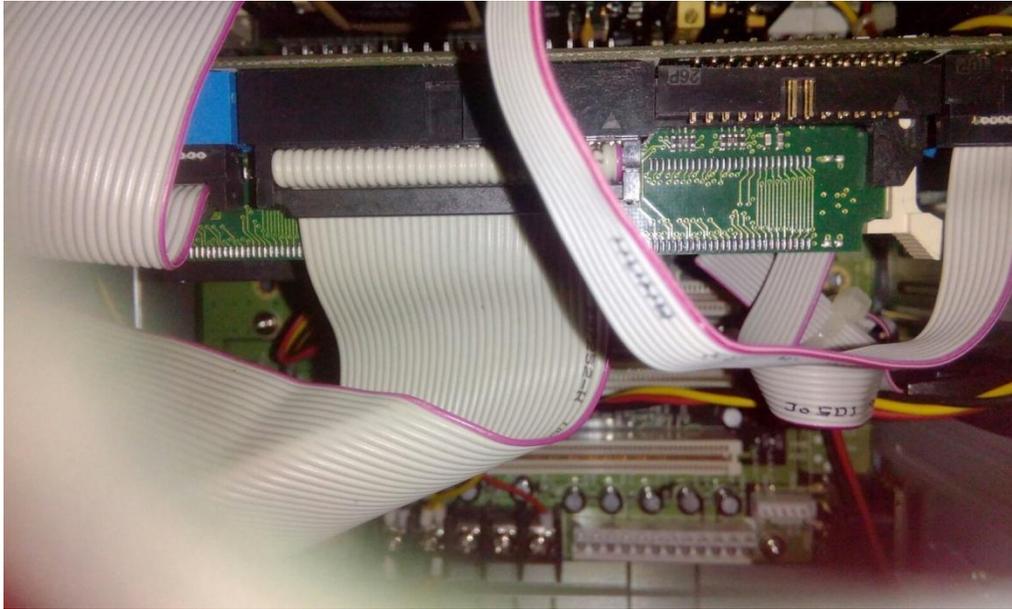
The LW405 computer rack needs to be opened to check the LW1 board. This is kept above the XPS controller unit. Before opening the rack, the back connections need to be removed. The connections are as shown below:



Fig. 1: Laser writer backside connections

The LW1 board connections are as shown in the snapshots below:





Remove the LW1 board from the system. Remove and replace the CPU fan. If the heat sink lock pins are broken and damaged, replace them. Ensure that the broken pieces are first removed from the system. Clean the thermal paste with acetone. Apply fresh thermal paste on the heat sink and CPU and then place the heat sink on the CPU. Put the lock pins on the diagonally opposite ends of the heat sink. The spring on each lock pin ensures that adequate pressure is applied such that the heat sink has good thermal contact with the CPU but not large enough such that the PCB cracks.

Connect the LW1 board to the system. Keep the computer rack open. Complete the back connections and all other remaining connections. Start the system. Ensure that the LW1 fan is running and then close the rack. After loading Windows, wait for a few minutes. Perform a system check to ensure that the LW1 board is running perfectly:

Remove the VGA cable connection from LW0 to LW1 as indicated in fig. You may also consult the manual to verify the back connection labels.

Press the LW1 reset button. This is the red button at the left hand corner of fig. 1.

If the LW1 is working perfectly, you will see the “LW1 ready” message as indicated in the image below:

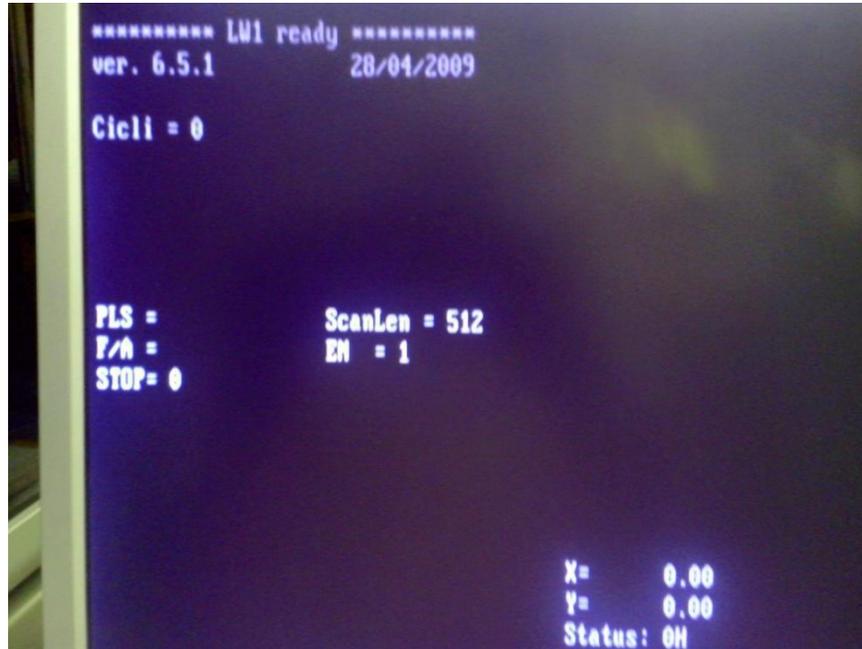


Fig. 5: LW1 system check message

Now connect the VGA cable back to LW0. Wait for a few minutes.

Start the writing process and check for errors.

This system check serves as a diagnostic test to ensure that the LW1 computer is working fine.

Recommendations to limit the recurrence of this error

- Try to ensure that the writing time is limited to 24 hours.
- You may consider switching off the system during weekends or long holidays if no process is planned.

Stage errors

Errors of this type indicate problems in the XYZ stage. Like LW1, the error messages follow a certain sequence.

Error messages

The error messages occur during the writing process. They typically occur between the end of a strip and the beginning of a new strip. The messages are:

- Compare enable error:Error -22 : Not allowed action
- Jog enable error:Error -22 : Not allowed action
- Jog set error:Error -22 : Not allowed action
- LW2 start timeout
- LW1 shutter open timeout

Moreover after clicking on Exit, XY initialization would take place.

Causes

This type of error is often associated with patterns having large vertical length. This is happening because of the optical misalignment. When every strip starts, there will be a trigger signals which release the pixels to scan the vertical area. When the Laser writer scanner failed to produce the trigger signal, this timeout error will occur. The errors indicate co-ordination problems between the writing lens and stage. Another possibility is that in such patterns, the lens that is very close to the stage may hit one of the metal stops thereby disengaging the stage causing it to re-initialize. Another possibility is that high humidity levels (>70%) may influence the stage movement thereby causing those errors.

Remedy

If the lab humidity is high (>70%), inform the lab in-charge immediately. The lab humidity should be less than 60% (ideally <50%). After the humidity stabilizes to an acceptable value (or range), consult with the faculty in-charge of the tool to determine the additional amount of time to wait before starting (or resuming) the writing process.

If the lab temperature and humidity are within acceptable range but you still observe those errors, shut down the system, wait for 10 minutes and then start the system. After loading Windows, wait for a few minutes and then resume the writing process.

If the above 2 steps do not eliminate the errors, then reduce the vertical length of your pattern, center the pattern and then rewrite your pattern.

Recommendations to limit the recurrence of this error

- Ensure that the lab humidity is <60%. The lab temperature should lie between 19°C and 22°C. The 3 dehumidifiers in the Yellow room should always be running (with breaks after every 12 hours). The humidity set point can be kept at 50%.
- Try to include all features of your pattern in the wafer region of your design. After all, you are primarily interested in patterning that region. This will significantly limit the vertical length of the pattern.

Further help

If the suggested remedies and recommendations do not eliminate the error messages or if you encounter error messages not included in this manual, you may contact Prof. Claudio Arnone and send him complete screenshots of the error messages and describe the problem in detail. His contact details are listed below:

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