

LCD display information of closed converter racks

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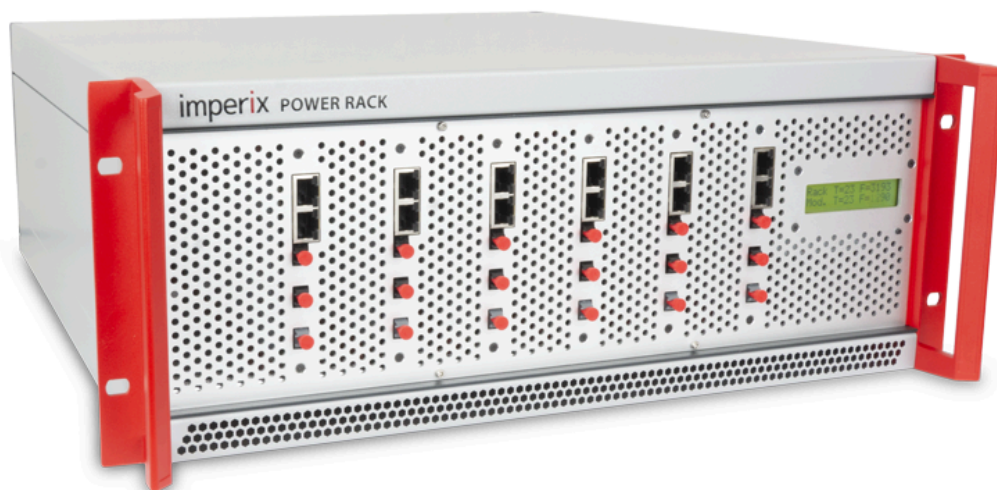


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This note presents the various messages displayed on the LCD screen of imperix closed converter racks. These racks contain several [power modules](#), forming a reconfigurable power electronics converter.



Closed converter rack with LCD display

The rack contains six power modules as well as a small controller (called the Sideboard) located behind the LCD screen. The Sideboard controls the fans located at the rear of the closed rack, measures the temperature inside the rack and displays messages on the LCD screen.

Multiple signals are shared between the modules and the Sideboard through the flat ribbon cables:

- A “global fault” signal, that any module or the Sideboard can pull down (active low) in case of a local fault. All the modules stop switching until the fault is cleared.

- A “clear fault” signal that the Sideboard can pull up to clear the faults on every module.
- Communication signals, to transmit information such as temperature or fan speed.

More information about the fault signal sharing is available in the datasheet of the power modules.

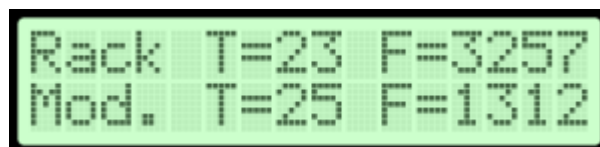
Booting and normal operation

When the closed rack is turned on, the LCD displays a booting message for 1 second:



After the boot, the screen displays the following information:

- The temperature inside the rack [°C]
- The highest fan speed of the three fans at the rear of the rack [rpm]
- The highest temperature among all the power modules [°C]
- The highest fan speed of all the power modules [rpm]

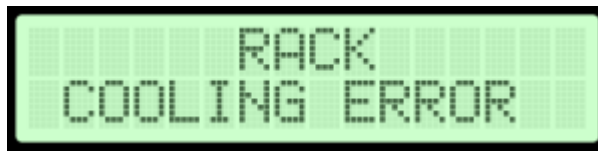


As long as there are no faults, the screen is refreshed every second.

Behavior under fault

In case of fault on ones of the power modules, the shared error signal is pulled down (active low), all the modules stop switching, and the rack enters in fault mode. Several messages will repeat in a continuous loop on the screen until the fault is cleared:

- A first message indicating the source of the fault. The possible sources are:
 - “POWER MODULE FAULT” if the fault comes from one of the modules,
 - “RACK COOLING ERROR” if the Sideboard triggered a fault due to troubles with the fans located at the rear of the rack or with the rack temperature.



- Then, six messages (one per module) are displayed one after the other, indicating if the corresponding power module has a local fault. In this case, the type of fault is displayed. If the module is okay, its temperature and fan speed are displayed.

The modules are numbered from M0 to M5, starting from the left of the rack (when looking at the front). The Sideboard detects how many modules are connected. For custom racks with a different number of modules, the messages go from M0 to M(X-1), where X is the total number of power modules.

The different types of faults are:

- "I." an overcurrent fault;
 - "V." an overvoltage fault;
 - "T.F." a temperature or fan fault;
 - "P." a power supply fault;
 - "D." a desaturation or a 1-1 fault.
- If the source of the fault is "POWER MODULE FAULT" and that all the power modules have the status "OK", the fault is either an EMI issue or a desaturation on an old power module (the desaturation fault was not communicated to the Sideboard).

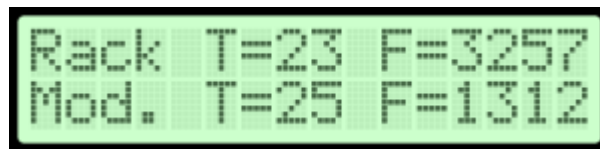


Example of current fault on the module 2



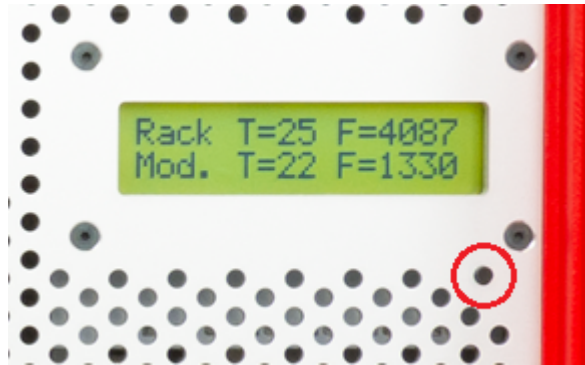
Example of module without fault

- The last message displays the highest temperatures and fan speeds, as in normal operation:



Fault clearing

The user can clear the fault by pressing the small button located under the screen:



Fault clearing button

If the source of the fault is still present, the rack will stay in fault mode. Otherwise, the fault is cleared and the rack goes in normal operation.