MAGNET CORRECTOR POWER SUPPLY CONTROLLER FOR LCLS-I

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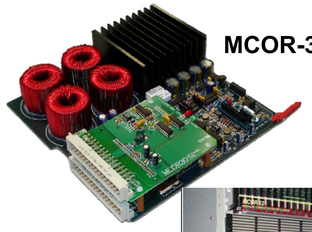
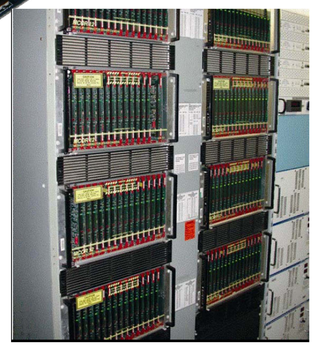
Introduction

The MCOR is a 16-channel modular architecture, precision magnet driver, capable of providing bipolar output currents in the range from –12A to +12A or 8 channels of -30A to +30A. A single, unregulated bulk power supply provides the main DC power for the entire crate. The MCOR controller card upgrades, existing LCLS-I and future LCLS-II needed, controls for Magnet Corrector Power Supplies.

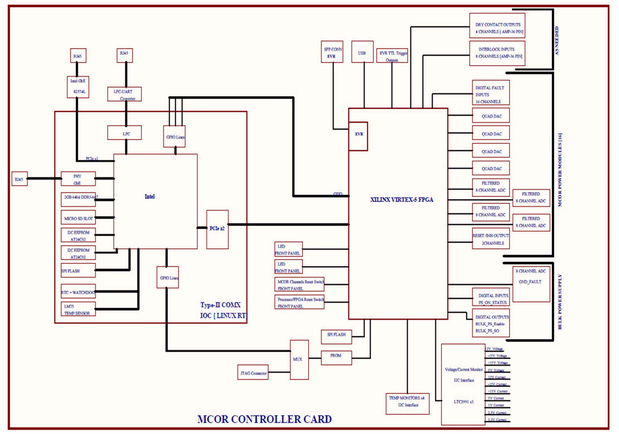


MCOR-30 Power Card

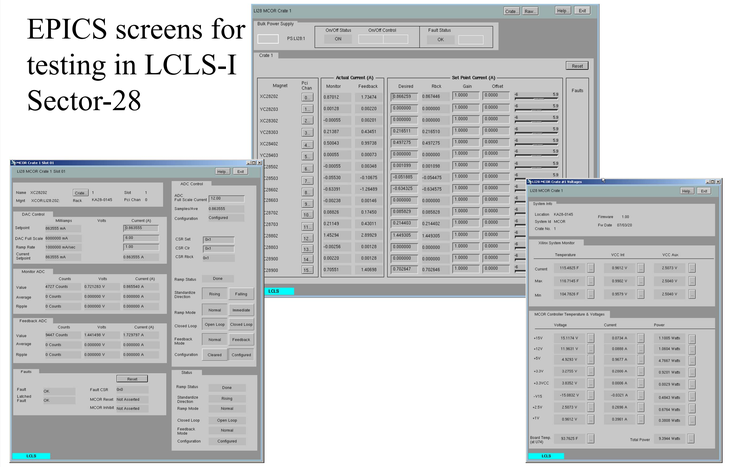


MCOR Typical Installation

MCOR Controller Block Diagram



EPICS screens for testing in LCLS-I Sector-28

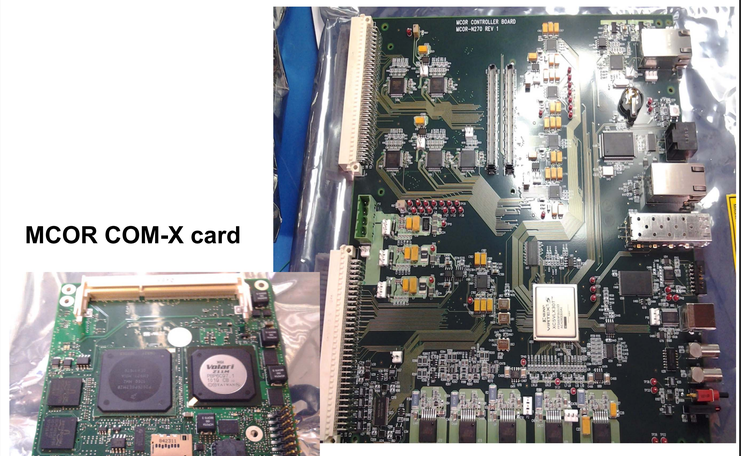


MCOR Controller Features

- ❖ The MCOR Controller card features a Xilinx Virtex-5 FPGA and an Intel Atom N270 Processor @1.6 GHz[COM-X form factor]
- ❖ The DAC accuracy for a desired set point is 0.1% [1000 ppm] of full scale output voltage. The MCOR Controller card has a long term temperature stability of 0.01 % of maximum current for each MCOR channel. (100 ppm).
- ❖ The controller has 18 bits, 100KSps ADCs and 16 bit DAC with settling time of less than 10uS. Full scale temperature drift for both the DAC and ADCs is less than +/-10ppm/degC
- ❖ Reads both the “Monitor” and “Feedback” analog outputs along with the digital “Fault” status from each MCOR module. It also four general purpose inputs and four dry-contact outputs.
- ❖ The card provides features like Linear Ramping and Ripple measurement for each MCOR Channel. Other features like DAC calibrate and Digital regulation can be implemented.
- ❖ MCOR Controller card has Gigabit Ethernet links to both Fast Feedback network and Channel Access to reduce latency. Other peripherals include a USB port for diagnostic purposes, a Serial RJ-45 connector for communicating with the IOC and a JTAG connection on the Front Panel for firmware upgrade to the FPGA
- ❖ MCOR Controller card incorporates an FPGA based EVR to provide timing information. The EVR supports Multi Mode/Single Mode and daisy chaining.
- ❖ The MCOR controller card monitors the card voltages [+/-15V, 5V, 3.3V, 1V], power consumption on card voltages along with card temperature for diagnostic purposes

MCOR Controller components

MCOR COM-X card with Intel Atom N270 Processor [1.6 GHz] running Linux-RT interfaces to the Xilinx Virtex-5 FPGA using PCIe 2.0



MCOR COM-X card

MCOR Controller card

Conclusion

The MCOR Controller card has been installed in Sector-28 in the LCLS-I Gallery and is undergoing extensive beam line testing. Plans are to roll out the MCOR Controller card for all LCLS-I installations.