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## **C3Or1B-05: FRIB Cryogenic Control System**

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The cryogenic system for the Facility for Rare Isotope Beams (FRIB) produces refrigeration required to support 2K, 4K and 35-60K shield loads for the linear accelerator consisting of forty six cryomodules, four superconducting dipoles and fourteen superconducting magnets for the experimental system. The controls system for cryogenics was designed, installed, and commissioned with the goal of high availability, ease of maintenance, and ease of operation. The system was designed using Allen Bradley Programmable Logic Controllers (PLCs) with local Human Machine Interfaces (HMIs) along with Experimental Physics and Industrial Controls System (EPICS) for everyday operations and data acquisition. Two separate networks are utilized in the cryogenic facility. One network includes a network cluster designed with high redundancy which is completely separate from the network for the rest of the particle accelerator. Another network was implemented to only include the Allen Bradley PLCs and HMIs which allows for faster data transfer between PLCs, increases flexibility for changing operating conditions, and allows for complete system operations in the case of a network failure. This paper reports on the design choices made and experiences in integrating and commissioning the cryogenic system.

Keywords: helium, refrigeration, control system, EPICS, PLC

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