A.12: Control system development and integration for Horizontal Test Stand

Horizontal Test Stand (HTS) is being commissioned at RRCAT. It is used for high power testing of dressed multi-cell superconducting RF cavities. There are numerous sensors, instruments and devices which have been integrated to provide their data and control at a centralized control room for operator to monitor and control the HTS. A control system has been developed and installed for this purpose. There are four major parts to this control system:

i. VME based Data Acquisition (DAQ) system
ii. LabVIEW based Graphical User Interface (GUI)
iii. Search and Scram system
iv. PLC based Machine Protection System (MPS)

Some of the sensors and instruments that have been integrated with control system are as follows:

- Temperature readout units (Cernox & PT100)
- Liquid He (LHe) level meters
- Mass flow meters
- Area radiation monitors
- Radiation rate meter
- Oxygen monitor
- Electro-pneumatic valve actuators
- Pressure sensors
- Vacuum gauges
- Heater and its power supply
- RF Amplifier

VME based DAQ System: All system parameter signals to be monitored, analog as well as digital are handled by this system (Figure A.12.1). Various signals interfaced are of type 4-20 mA, 0-10 V and digital signals like potential-free contacts, open collector etc. Presently, system can cater to about 180 signals. Isolation has been provided for all the signals. About 20 parameters come from instruments/ systems which give their data directly over data communication links.

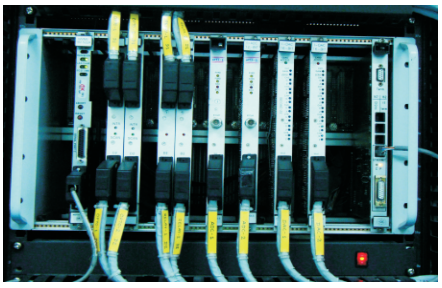

Fig. A.12.1: VME based DAQ system.

LabVIEW based GUI: The GUI (Figure A.12.2) presents a comprehensive view of all the readback parameters and setting of all the controlled parameters. It also provides facility of logging the data at user selectable rate. Software communicates with VME station over TCP/IP and with certain instruments over RS-232 and RS-485 (Modbus).

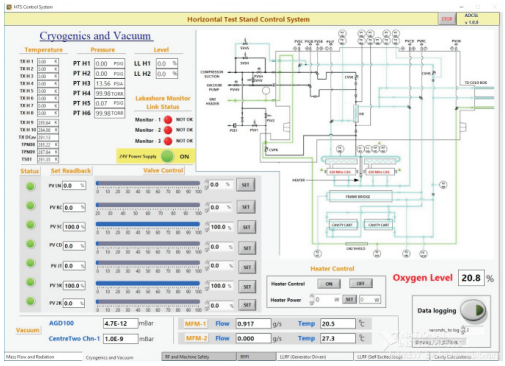

Fig. A.12.2: LabVIEW based GUI for HTS control.

Search and Scram System: A search and scram system (Figure A.12.3) has been developed and installed for personnel safety. This is used to ensure that no person is present in the vault before powering the cavity. The system includes hooter, flashing lamps and display board.

Fig. A.12.3: Search and Scram system.

PLC based Machine Protection System: This system (Figure A.12.4) takes a number of signals critical for general machine safety from the system (like oxygen and radiation levels, He vessel pressure, LHe level etc.) and generates safety permit signal that goes to other sub-systems. The machine operation is allowed only if the parameters are in safe state.

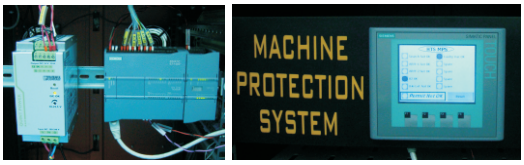

Fig. A.12.4: PLC based Machine Protection System.

For the deployment of the system, operation and interfacing of instruments was tested. Hundreds of meters of cables were prepared and laid in the field to connect the devices to control system. Using this control system, cooldown trials of HTS cryostat have been performed successfully, while monitoring and controlling the parameters from the control room.

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