A.14: New distributed control system for Indus-1 RF using ECMs and EPICS

In Indus-1, the RF system comprises of three sub systems viz Booster ring, Storage ring and RF Knock out & Ion Clearing system. The Booster RF system is common subsystem for Indus-1 and Indus-2 rings. The old control system for Indus-1 RF was based on VME and LabVIEW. The system commissioned in late nineties evolved through several iteration of signals, hardware and software changes. With recent evolution of RF system with solid state amplifiers, it was decided to build a new control system. The new Indus-1 RF control system uses distributed modular approach (Fig. A.14.1). The core of the system is an FPGA (Xilinx Spartan 3 series) based modular hardware box called Equipment Control Module (ECM). The multiple ECMs are used to cater to the signal requirements of distributed RF subsystems.
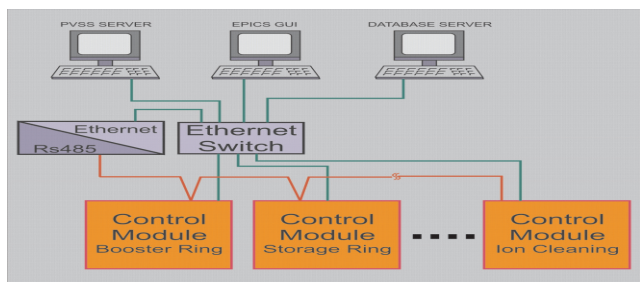

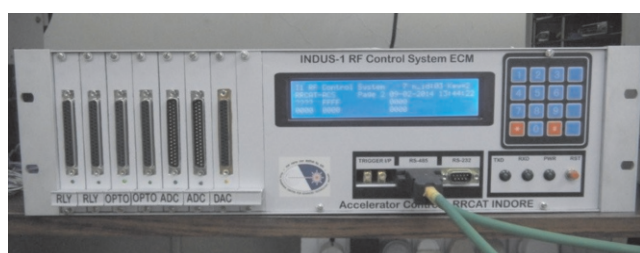Fig. A.14.1: Architecture of control system for Indus-1 RF subsystem

Fig. A.14.2: ECM of Indus-1 RF control system

The ECM (Fig. A.14.2) provides local LCD display, LED indicators, 4x4 key pad, communication ports and trigger inputs. It has 32 control signals, 32 status signals, 32 analog inputs and 4 analog outputs to interface with the subsystem. Figure A.14.3 shows different boards used in ECM.

Main features:
- Data acquisition update rate of ~ 10 Hz.
- Local operation from ECM front panel.
- Local data monitoring on LCD display.
- Ramp generation feature with fine setting of gap voltage at injection & final energy level.
- Smooth switching from DC to Ramp and vice versa.

- Programmable slope for smooth analog signal settings.
- System last state restore feature on power up.
- 16 bit ADC & 5KSPS for all 16 channels.
- Ext. trigger input for event based sampling.
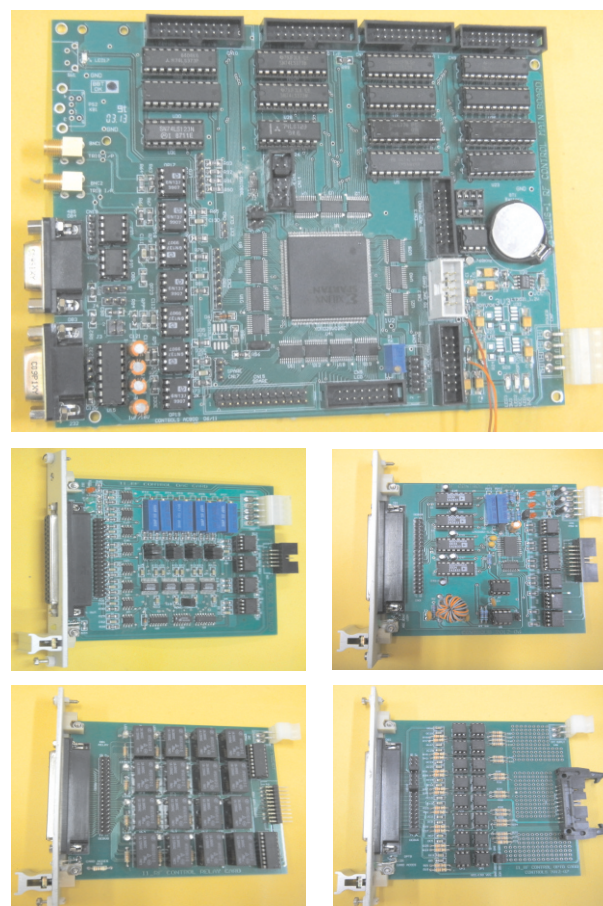- Time stamping using Real Time Clock (RTC).

Fig. A.14.3: Boards developed for ECM of Indus-1 RF control system

Open source software tool Experimental Physics and Industrial Control System (EPICS) is used as the Supervisory Control And Data Acquisition (SCADA) system and Control System Studio (CSS) is used as Graphical User Interface (GUI) development tool. Application software, two step database logging, alarm handling in central Process Visualization and Supervisory System (PVSS), web based data retrieving system for data analysis by different users are provided. Extra efforts have been done for seamless integration of the EPICS developments within the overall PVSS environment. The system is developed, tested and is in operation for controlling the Indus-1 RF system.

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