CONTROL SYSTEM FOR THE BENGING MPS AT PLS LINAC*

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Abstract

The former control system of the bending MPS (**M**agnet **P**ower **S**upply) was based on Supervisory Control and Data Acquisition (SCADA), RTworks[1]. It is changed based on EPICS as a framework for the full upgrade of the PLS control system. Also we have replaced the former VME 68K CPU boards with OS-9 to new Power CPU boards operated by VxWorks as IOC in the linac klystron gallery. The replaced bending MPS control system consists of a MVME5100 EPICS IOC core in the lower level control. It is implemented with the MEDM tool of EPICS to provide friendly Graphical User Interfaces. This paper describes the VME IOC and OPI and embedded local controller in MPS cabinet used for the bending MPS control in the PLS linac

INTRODUCTION

As of now, the bending MPS(Magnet Power Supply)control system have been well performed the mission to operate 2.5 GeV linac as the beam injector for the PLS storage ring. However, in early 2001, we have decided to convert the current control system into the EPICS based one because of its lack of flexibility and control speed [2]. We have been studied the key technology for EPICS control system during the development of EPICS based test-bed control system completed at the early of 2000.

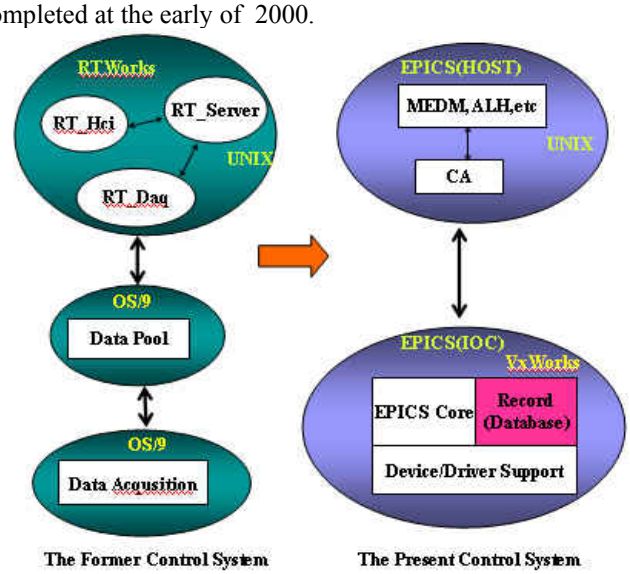

Figure 1: software structure of the former and present bending MPS control system.

Originally, the former bending MPS control system has three layers of hierarchy; the operator interface computer, the supervisory control computer (SCC) for data processing and the device interface computer (DIC) for distributed data acquisition as shown fig. 1. The operator interface is designed configured on the commercial product, RTworks[1]. The VME systems under OS-9 are used for data processing and data acquisition. In order to provide EPICS structure, our bending MPS control system with three-layered architecture is changed.

Table 1 shows the difference between the former and present systems.

Table1: Comparison Table

	The former control system	The present control system
VME CPU	Eltec 16	MVME5110
I/O Board	TSVME500	TPMC866
Network	10base2	100base TX/FX
VME RTOS	OS-9	vxWorks
Core S/W	Homemade S/W	EPICSBase3.13.6
Device Interface	Serial	Serial

BENDING MPS CONTROL SYSTEM

There are 6 power supplies for bending magnet in BTL. These power supplies are placed in the BTL power supply room. A VME system for controlling them is installed in the nearest power supply [3].

As shown in fig. 2, this control system is based on the EPICS standard model. VME Systems as IOCs is used and connected via Ethernet for host and communicate with embedded controller of MPS using RS422 protocol.

This bending MPS control system has currently following features.

- All Current Set, Power/On, Off
- Individual Current Set, Power/On, Off
- Status Monitoring (Remote/Local, Polarity, Over-temperature, Over-current, etc)
- Degaussing for Bending Magnet
- Saving of individual set current value

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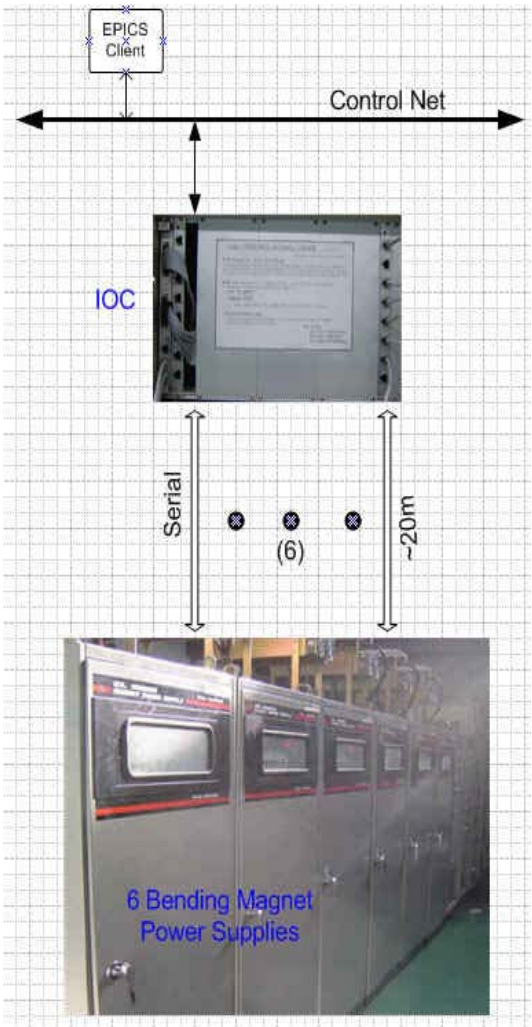

Figure 2: Structure of bending MPS control system.

Operator Interface

Sun Workstation with 2 CPUs and 1GB memory are selected as the console computer. The Motif Editor and Display Manager (MEDM) is chosen as the primary operator interface for MPS control system. Bending MPS operator windows are designed with schematic and user friend design concept as seen in fig. 3&4.

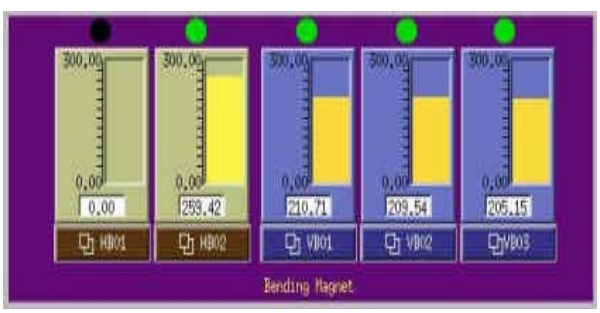

Figure 3: Monitoring panel of bending MPS.

There are two panels for monitoring of power supply parameters and for controlling individual power supply. The operator screen is designed for monitoring power supply data through bar graph object.

Figure 4: Control panel of bending MPS.

VME System as IOC (Input/Output Controller)

EPICS IOCs are implemented in VME bus system with MVME5100 CPU running the vxWorks real-time operating system. We selected the VME system under vxWorks to preserve our investment in hardware and to make much use of the existing EPICS resources for VME I/O boards. To interface the embedded controller of bending MPS with serial interface, serial PMC module (TPMC866) with 8 channels on PowerPC CPU Board is used. Also we can monitor the status of the working VME crate parameter (voltage, temperature, etc) remotely. The application tasks running IOC is developed by a SUN Workstation and vxWorks development environment.

Base Release3.13.6, EPICS Core S/W is configured and successfully installed. The device/record support was obtained from the community of the EPICS collaboration and is slightly modified to satisfy the in-house protocol of the power supply controller. Before constructing database for IOC, PV (Process Variable) list was defined by the rule of PLS naming convention.

For PLS EPICS, the Capfast schematic editor was chosen as the IOC database configuration tool in the initial development stage. But MPS IOC uses generic editor (vi etc) to construct the simple IOC function database as shown fig. 5.

The following functions are implemented using various records like Analog Input/Output, Binary Input, String Input/Output, Scalout, Sequence record etc.

- All Bending MPS Set Current Out, Current Out
- All Bending MPS Set Power On/Off, Power On/Off
- Individual Power O/OFF, Current Set
- Current Response Input
- Status Response Input

The configured IOC database is loaded into MPS IOC at start-up.

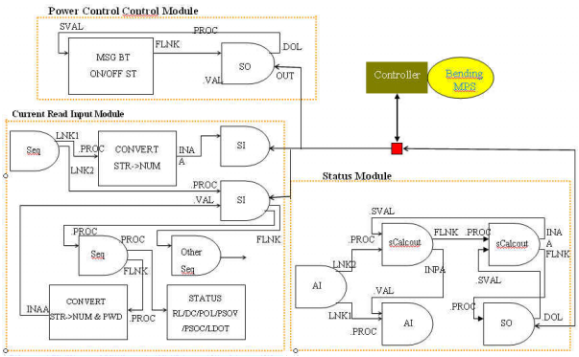

Figure 5: Schematic diagram of EPICS records for bending magnet power supply in IOC.

Embedded Controller in bending MPS

Local controller of bending MPS was developed in house member. The bending MPS has the capacity of handling the individual power supply.

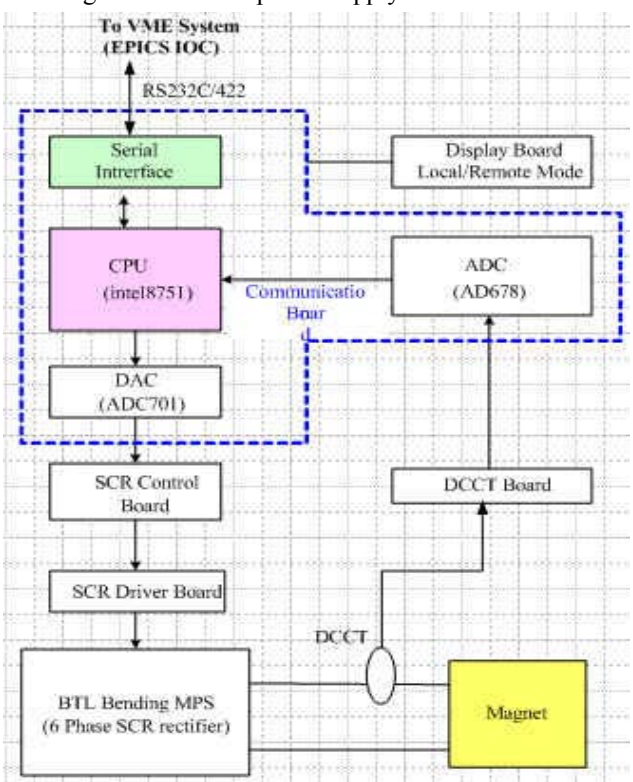

Figure 6: Block diagram of bending magnet power supply.

It is the embedded single board computer with serial interface and Analog to Digital, Digital to Converter in the custom crate. Also, it has self-diagnostic functions and with keypad on the front panel can adjust control and monitor power supply current locally without IOC intervention as shown fig. 6 & 7.

It is programmed in EPROM the execution code to handle the communication between the IOC and this controller via RS422 with in-house protocol.

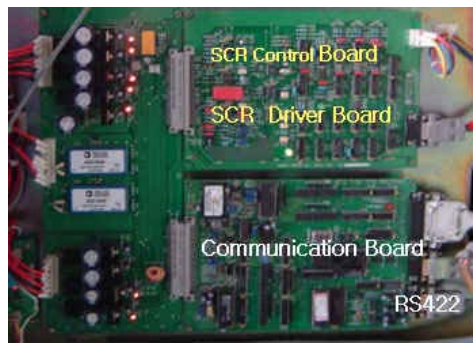

Figure 7: Electronic boards in bending MPS cabinet.

FUTURE PLANS

The EPICS based bending MPS control system has successfully operated since the beginning of installation in the linac field.

We have plan to upgrade bending MPS which have better performance and Ethernet interface connecting to upper level computer. If the local intelligent CPU on MPS is sufficient to load real-time operating system, like RTMES, EPICS IOCcore can run on the local intelligent CPU board and VME processing power can be off-loaded.

ACKNOWLEDGMENTS

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REFERENCES

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