

UPGRADING THE CONTROL SYSTEM AT KCSR

Yu. Krylov, KCSR RSC Kurchatov Institute, Moscow; V. Korchuganov, KCSR RSC Kurchatov Institute, Moscow and Budker INP SB RAS, Novosibirsk; L. Moseiko, N. Moseiko, V. Novikov, A.Valentinov, Yu. Yupinov, KCSR RSC Kurchatov Institute, Moscow, Russia

Abstract

Kurchatov Centre of Synchrotron Radiation facility control system is based on a CAMAC-oriented computers network. In this paper the project of upgrading and results of prototyping of the new equipment is submitted. Upgrading includes two levels. First, it is possible to create the modern CAMAC crate-controller, connected with standard network. More advanced variant will consist in replacement of CAMAC modules with the embedded controllers of equipment. Second level is a creation of a local managing network of personal computers, as consoles of the control system. Examples of realisation of the software are presented.

INTRODUCTION

Kurchatov Centre of Synchrotron Radiation - the electron accelerators facility, including the linear accelerator, the storage ring - booster at energy 450 MeV and the main storage ring at 2.5 GeV, is a dedicated synchrotron radiation source [1][2]. The CAMAC-embedded minicomputers are used in the KCSR as the lower level of control system [3]. The PC connected to central machine crate, is used as a file server of control system, it is connected to a local network, that allows to start the network applications from anyone PC of a local network [4].

THE PROJECT OF CONTROL SYSTEM UPGRADING

The control system solves the following tasks:

- control in a mode real time of accelerator equipment during storage and rumping processes in booster and main ring;
- saving of an operating conditions of technological systems, testing of magnets power supplies and RF-systems;
- measurement of electron beam current and orbit parameters in storage rings,
- monitoring of vacuum and temperature;
- support of facility archive and providing of access on a local PC network;
- creation of statistical reports and support of resources of processing of the archive data convenient for the external users.

Block diagram of control system is submitted on Fig. 1. It is supposed to organise the top level of control through local the computer network as the allocated segment of KCSR local area network (LAN). The LAN includes workplaces of operators in the control room, the file server providing access to a database.

Table 1: Channels of control and monitoring

Accelerators equipment	Number of channel
Magnet systems of booster and main ring	600
Linac, RF systems, synchronisation	300
Vacuum monitoring	150
Temperature monitoring	450
Radiation safety monitoring and interlock system	50
Beam diagnostic	200
Total	1750

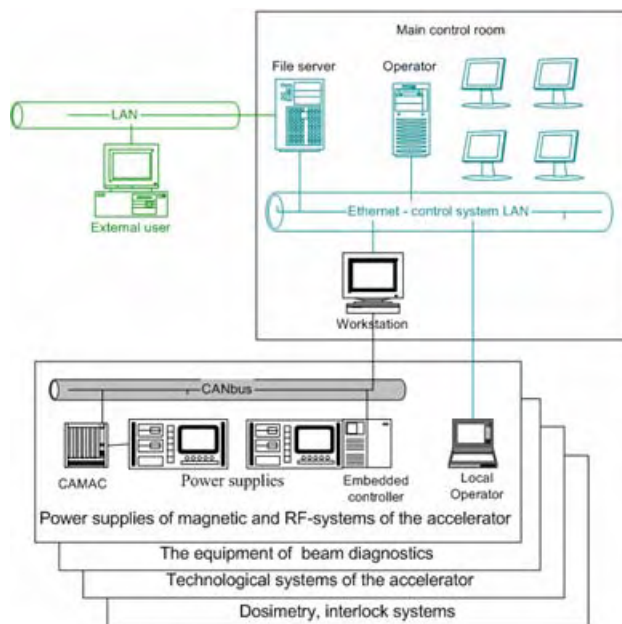


Figure 1: The control system block diagram.

At the second stage installation of a communication facility of the LAN and CAMAC blocks is supposed. CAMAC equipment (mini computer, RAM, adapters of terminals and monitors) will be replaced on new crate controller connected by CANbus to PCs a workstation connected to the LAN.

Further it is supposed to replace executive devices of the accelerating equipment (power supplies of magnetic and RF-systems, beam diagnostics, vacuum and temperature monitoring etc.) on new one, controlled by the embedded controllers connected by CANbus.



Figure 2: CAMAC crate-controller, developed and made in KCSR.

RESULTS OF PROTOTYPING

CAMAC Crate Controller

The prototype of a new CAMAC crate-controller is developed and made (see Fig. 2). Crate controller K167 [5] based on the miniMODUL-167 single-board computers and the FastFlash XC 95288XL. SBC miniMODUL167CS based on populated Infinion 167CS, which have powerful microcontroller, advanced periphery (ADC, Pulse Width Modulation Module, counters etc.) and effective programming system including RTX166 operating system.

The XC95288XL is a high-performance CPLD providing advanced in-system programming and test capabilities for general logic integration. It is comprised of 288 macrocells, providing 6,400 usable gates with propagation delays of 15 ns. Device supports in-system programming (ISP) and the full IEEE 1149.1 (JTAG) boundary-scan.

K167 crate-controller, working together with computers Pentium IY will control the accelerating equipment, using all control and measuring modules. Standard CAN-network will be used for connection between controllers and workstation.

The program is developed, allowing to work on a CAN-network under the control of OS real time RTX166 for miniMODUL167 which allows to process up to 256 tasks and contains drivers for work on a CAN-network.

The Model of LAN and Users Applications

For debugging the software of the top level the control LAN including 4 PCs, placed in main control room, and a workstation for support of an information exchange with CAMAC and the PC, managing receivers of radiation was simulated and started in work. The general circuit is given on fig. 3. Control network was executed as a segment of working LAN of KCSR, communication with external users, including experimental stations on channels of a synchrotron radiation was tested.

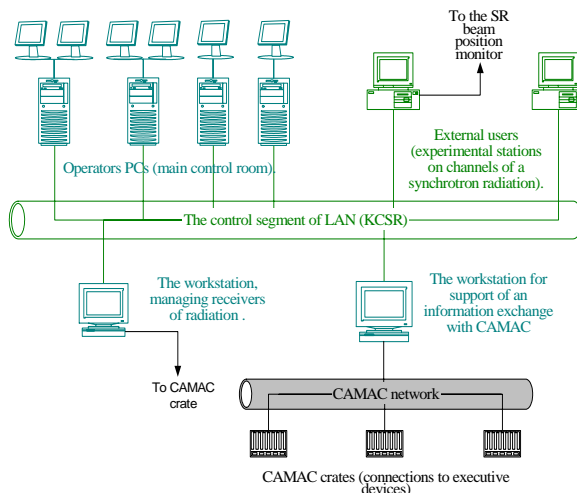


Figure 3: The model of control LAN.

The console and the workstation are a PCs of class Intel Pentium 1.7GHz, 128Mb SDRAM, 40Gb HDD, working under the control of OS Windows98/2000/XP.

We have developed on VisualC++ application software to fit the KCSR control framework. Using this framework, it is possible to control the following measurement system remotely:

- status of a complex (current mode and basic parameters of a beam),
- vacuum monitoring (on a current of pumps),
- temperature monitoring,
- test of magnet power supplies and RF-system.

The application which with the period 2 minutes updates htm-file used by KCSR web-server for the current information on the status of a complex (see web-site KCSR) is started.

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