PC/MULTIBUS Based Control System

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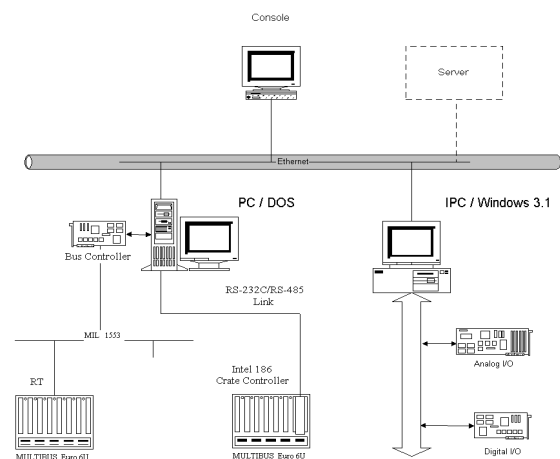IHEP, PROTVINO, RUSSIA, 142284, MOSCOW REG.

Abstact

The system is designed for controls of different power supply equipment of accelerators, electrical power stations and for electrical power production/consumption controls.

It includes Industrial PC, connected by ETHERNET, and MULTIBUS/EUROCARD crates, connected to PC by Field Bus (MIL 1553, RS-485, CAN).

Multibus EUROcrate houses modules: Intel 80186 based Crate Controller, MIL 1553 Remote Terminal, Input/Output Registers, ADC, RS-232 Multiplexer.

Implementation of low consumption components permits to exclude fan cooling.

Alarm PC performs the filling in circular buffer with data for retrospective analysis in case of controlled equipment failure.

Overview

The system is designed for controls of different power supply equipment of accelerators, power stations, the electrical power consumption controls, short term archiving and post-mortem failure analysis.

The network diagramm is shown above. The system includes PC's: Communication (DOS) housing a Field Bus Controllers, Consoles (DOS/Windows NT), Alarm (Windows 3.1), connected by ETHERNET. The Multibus-1 Eurocard crates, connected to the Communication PC by Fieldbus MIL 1553 or RS-485/RS 232 included too.

MULTIBUS-1 EUROcrate houses modules:

1.Power Supply with its Controller.

2.INTEL 80186 based Crate Controller including:
 - three programable 16 bit counters,
 - two interrupt controllers,
 - 128K ROM,
 - 1M RAM,
 - real time clock,
 - Watch Dog timer,
 - XACK control time out,
 - two RS-485/RS 232 interface.

The internal bus for data exchange between the processor devices placed on the board is implemented. Internal clock frequency up to 20 MHz. In case of +5V Power Supply default the RAM is switched to stand-by regime with data preservation.

3.Remote Terminal of the MIL 1553 Field Bus, based on the ALTERA PLD.

4.Input Register Module, based on 80C31/51 chip.
The module monitors up to 64 input channels, fills internal RAM archive, generates an interrupt if necessary.

5.Output Register Module includes 32 relay.

6.RS-232 Interface Module for communications with remote Electrical Power consumption counters and other devices. 16 In/Out ports for 20 mA channels, 8 interrupt levels, opto insulation, 50 Baud-56 KBaud.

7.Unstable Process Register Module for equipment routine work and failure monitoring, 8 channel, 12 bit ADC, providing 3 work modes:
a)   routine monitoring of the input signals, storing 100 data per 50 Hz period, gap control;
b)   storing 4000 data in failure (exceding of the preset gap) case. Low consumption components are used, what excludes necessity of the fan cooling.

System SW of the Communication PC includes:
-Field Bus Driver;
-Multitask Kernel to MS DOS;

Alarm Industrial PC (MS Windows 3.1) runs Lab View application program. It monitors up to 300 digital signals with 100 Hz rate and up to 50 analog signals with 10 KHz sample rate filling circular buffers.In case of alarm signal generation the content of the buffers is available for the post mortem analysis.

Server computer together with client-server approach planned to be implemented later, during including described system into global Control System of the 70 GeV Proton Synchrotron.

Now it's been used for controls, including electrical power consumption, of an electrical power station, and for control the 70 GeV Proton Synchrotron Ramp Power Supply.