Man - Machine Interface for Power Supply Control for Electron Cyclotron Resonance Ion Source

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Abstract

Man - Machine Interface (MMI) becomes more and more important in supervisory control system as a rapid transformation in system monitoring and control is taking place due to evolution of state of the art tools and techniques. This paper describes the design and implementation of MMI system for control and monitoring of magnet power supply for Electron Cyclotron Resonance Ion Source (ECRIS) at Variable Energy Cyclotron Centre (VECC) , Calcutta.

1 Introduction

A large number of magnets have been installed and commissioned to guide the beam from ECRIS to the Cyclotron central region at VECC, Calcutta. All these magnets need to be powered by highly stabilised direct current to maintain the alignment of the beam. Our objective is to design and develop a powerful MMI to control and monitor the operation of these power supplies.

2 Man -machine interface system

The function of the MMI system is summarised in fig. 1. The MMI subsystem sends requests and obtains inputs and status information through data acquisition subsystem. The main aim of the MMI is to allow the operator fast and convenient access to information. It provides rapid notification of important events through display and alarm generation. It also saves the information on hard disk for offline analysis. In addition to displays, hard copy devices like printers are used to notify the operator of events occurring in the system to provide a permanent record of system activity.

3 System configuration

The system has been developed based on PC AT / 486 - DX2 hardware platform running Windows 3.11 and Visual Basic as the graphic user interface tools. Data from the power supply system is received through the communication port of the PC with RS232C serial interface. The communication parameters of the power supply are set up accordingly by proper switch settings. The link between the computer and the power supply is done through a 25 pin D-connector. All these connections are optically isolated. Visual Basic is chosen due to its simplicity for writing programs for windows applications.

4 System features

The system displays the operator control panel in the main form which can be connected and disconnected from the power supply without affecting the operation of the power supply.The following operations can be controlled from the panel (fig. 2).

- Main power ON / OFF
- Current setting

The coarse button will change the current by 10% for each turn. The first two digits only on the display will change.

By turning the medium button , the current setting will be altered by 0.1% for each turn. Digits 3 & 4 of the display will change.

The fine button will change the current setting by 10 ppm for each turn. The last two digits on the display will change.

- Display of the actual current in both text as well as in ammeter form.
- Ready LED indicates when the actual output current is equal to the set value within +/- 200 ppm.
- Display of the actual current signal and its drift from the set value.

The function of the second form is to monitor the status of the various interlocks like waterflow, etc. It is obtained by sending a request and reading a status word of 24 character length. The failure of any of the interlocks is indicated by the change of color to draw the operator's attention. The third form monitors the internal parameters like +5 V, +/-15 V , passbank drop, etc, which are essential for proper functioning of the internal circuits.

The system has also been designed to offer a powerful and comprehensive set of analysis and visualisation functions. It provides the history of the current output, drift and the statistical parameters like mean, rms, standard deviation and histogram.

A very important aspect of any control system is security. This is provided by incorporating a password feature at the entry level so that unauthorized personnel can not enter into the system.

5 Conclusion

This system has been developed as a subsystem of the Human Computer Interface for the computerised control of the Electron Cyclotron Resonance Ion Source (ECRIS) at Calcutta [6]. The system has been working successfully with one DANFYSIK 8000 Series Magnet power Supply. The system provides better security of the operation of the power supply. It also saves an uncountable amount of manpower. The system is open for upgrade to connect multiple power supplies through RS422 interface which will overcome the limitation of distance with RS232C.

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References

[1] P. K . McBride 'Programming in Visual Basic' BPB Publications.

[2] Magnet Power Supply 853 System 8000 Manual DANFYSIK, JYLLINGE, DENMARK.

[3] Richard Lai , 'Real Time Supervisory control and Data Acquisition Systems', CSI Communications, April 1986.

[4] Microsoft Visual Basic Programmer's Guide, Microsoft Corporation.

[5] Microsoft Visual Basic Language Reference, Microsoft Corporation.

[6] Tapas Samanta , C . D . Datta and D . Sarkar , 'Human Computer Interface for the Computerised Control of Electron Cyclotron Resonance Ion Source (ECRIS) at Calcutta', presented at the ICALEPCS'97 at IHEP, Beijing.

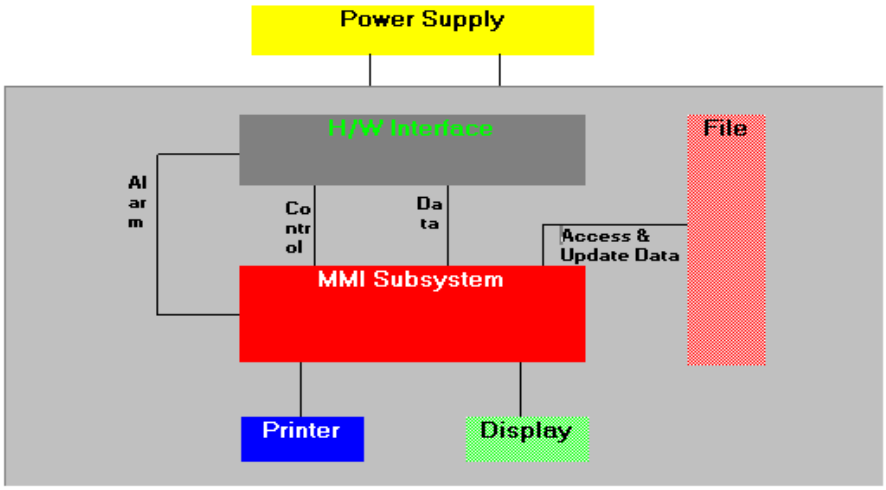

Fig. 1 The function of the MMI system

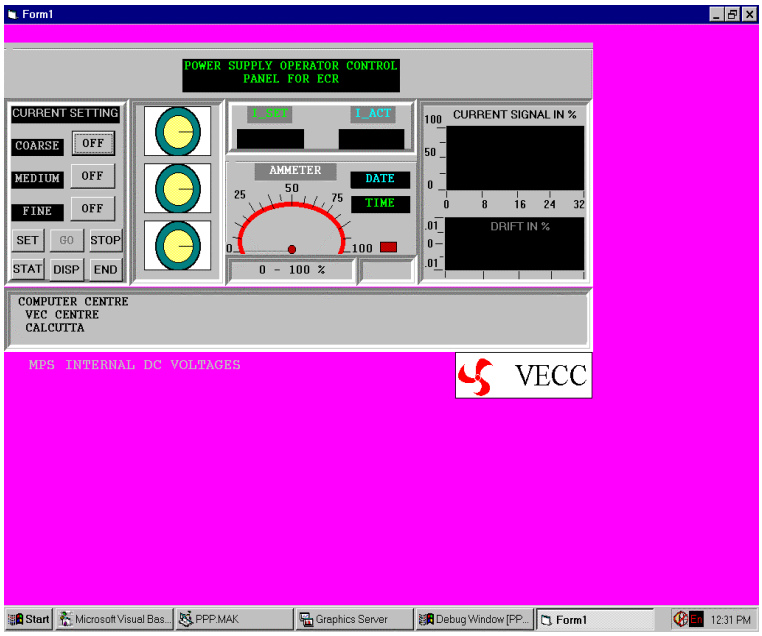

Fig. 2 The control panel