

AccelNET Control System

APPLICATION

The NEC AccelNET computer-based control system is designed to automate the setup and control of the accelerator system. All accelerator parameters needed for normal operation are interfaced to a computer in the console. Sample sequence control, data logging, and safety interlocks permit unattended operation. If allowed access via the Internet, NEC can also log in remotely for additional support.

DESIGN

Parameters are displayed in two (2) formats: text formatted pages of parameter lists and graphic displays of the system layout. Controls can be adjusted by menu-driven restoration of stored values, increment/decrement buttons, keyboard input of the desired parameter value, or assigning the parameter to a knob for analog mode adjustments. Numerical values of readouts are displayed on the monitor and can be assigned to either a meter for analog display or the on-screen strip chart recorder. Most parameters needed for beam transport can be controlled from one window; multiple windows allow convenient setup, fine tuning, data display, and other procedures.

Operators may save and restore preferred system configurations, knob and meter arrangements, and setup preferences. Typically, beam setup from cold start can be done by menu commands, with little or no fine tuning.

Most of the controls and readouts are interfaced via an in-house design known as the NEC ACT System (a replacement for the obsolete CAMAC

standard). Components that have a serial port as their standard computer interface may be connected to a terminal server (a device with serial ports and an ethernet interface). The buyer may also choose to interface with the accelerator control computer via this network.

Control Console and Computer

The control console consists of a desk with an equipment rack. It contains the computer, four (4) assignable knobs, four (4) assignable meters, and an oscilloscope for displaying signals.



Control desk with equipment rack

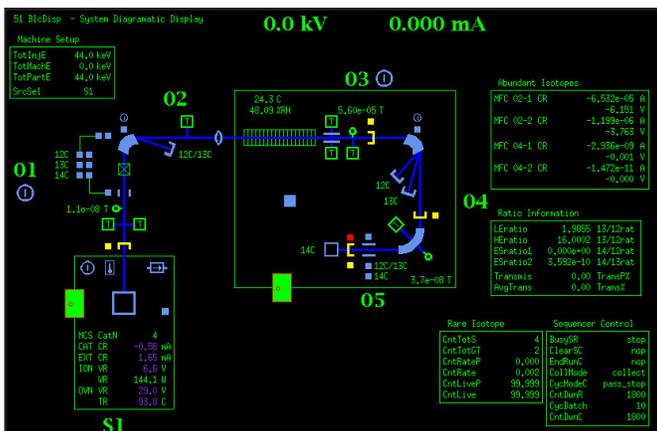
The computer is an up to date PC with RAID2 disk setup for data redundancy. The assignable knobs and meters, an ACT interface, and two Ethernet network boards are all connected to the computer.

The NEC control system software manages the display and control functions through a database management system operating in a Linux-based environment. Displays use X Windows software to allow multiple tasks to be controlled or monitored from one display. The program includes some accelerator parameter diagnostics to alert the operator to potential errors.

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The assignable knobs provide selectable sensitivities. The display range for the assignable meters may be fixed or autoranging, allowing high sensitivity during fine adjustments.

Control signals are transmitted continuously while the control is being adjusted and otherwise about six (6) times per minute. Readout displays are updated approximately once per second; those assigned to a meter are updated about ten (10) times per second.



Example of the diagrammatic display of the accelerator system displayed on the control computer

Control resolution is 15 bits in general, using bipolar 16 bit ADCs. All readouts have 15 bit resolution (using bipolar 16 bit ADCs). Other items such as bending magnet power supplies have higher resolution as needed.

NEC programs are written in C. In addition, NEC will advise the buyer of upgrades and other applicable software modifications for at least five (5) years after system acceptance.

Vacuum, Interlock, and BPM Controls

In general, the vacuum system and the interlocks for protecting personnel or equipment operate independently of the computer. A “watchdog” timer in the ACT crate will cause the interlock to

open if the module stops receiving updates from the computer. Vacuum readings and interlock status are displayed at the console. Ion gauge filaments can be turned on and off through the computer. AC power to vacuum components is switched on and off locally.

Other software interlocks protect the samples and the system. For example, under conditions of poor vacuum, the computer will shut off high voltage components. Another set of interlock conditions will stop the data collection and shut down ion source voltages. These interlocks are set up in the database and configuration files. Contacts are provided for the customer to interlock laboratory doors, radiation monitors, etc., for personnel safety.

Beam profile monitor signals do not pass through the computer, but BPMs are selected via ACT for display on the 2-channel oscilloscope with Z axis marker provided in the console. With this system, BPMs are interfaced to a nearby ACT crate instead of being wired individually to a selector panel in the console. Other signals of interest can also be selected for display on the oscilloscope, including Pelletron stability via the CPO signals and the injection magnet chamber voltage pulsing control signals (for AMS systems). Additional signals can be added by request.



[AccelNET v1]

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