MODERN CONTROL TECHNOLOGY WITH MODEL T COMPUTERS *

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In 1968, it was decided to convert one of the Bevatron control systems to a small computer based digital control system. The External Proton Beam was to be expanded from 15 to 64 magnets which would make the analog system in use very cumbersome. A PDP-8 with a tape transport was available and a system was designed and built to control up to 64 pulsed magnets. A 6 megaword disc was soon added to the system. When the system was operational, a second PDP-8 was added to be utilized as a backup computer.

The next step was to start a system to control the pulsing of the Bevatron main guide field. A third PDP-8 was purchased and the pulsing system was developed and put into operation.

We now had an accelerator with the guide field precision of 1 part in 30000 and an extraction magnet system with the resolution of 1 part in 4000 which made for very stable operation. We also had the only accelerator in the world with a major part of its control systems being controlled by computers.

The last system to be developed was the rf control system. The system used a 12-bit 8 K external memory to store the correction curve to control the beam during acceleration. The system also can close the loop radially on the accelerating beam. A fourth PDP-8 was utilized for this system. Later the external memory was replaced by a 16-bit 32 K memory to store the entire frequency curve required to accelerate beam in the Bevatron.

At this time, a second 6 megaword disc was added to the system and two more PDP-8's were purchased to be used as the human interface to the data stored on the disc by the control computers and for development and experimenter support.

As needed, overlays were added to the control computers and now they have approximately 2 K of overlays each.

With the advent of the new 750 keV ion source, 50 MeV linac, 50 MeV transport line, and Bevalac transfer line, it was decided to procure three more PDP-8's to control and monitor these systems. The development of these system is now in progress and by February 1974 we will have a 9 PDP-8 (4 K each) multiprocessor system with common bulk storage operating the Bevatron and Bevalac systems.

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