COMPUTER CONTROL OF 500 MEV BEAM TRANSPORT LINE AT KEK, PART I
(BEAM PROFILE MONITOR DATA ACQUISITION SYSTEM)

Z. Igarashi, K. Uchino, T. Katoh, H. Ishimaru and S. Shibata

National Laboratory for High Energy Physics
Oho-machi, Tsukuba-gun, Ibaraki-ken,

Abstract

In the 500 MeV beam transport line, ten secondary emission profile monitors were installed and have been used for tuning up main ring injection. Recently six profile monitors were connected to computer (MELCOM-70) for automatic display of beam profiles[4] and computer control of the transport line is in progress[3].

Profile Monitor

The grid of profile monitor consists of a row of 32 horizontal and 32 vertical wires (Ni, ϕ = 100 μ) mounted on a glass epoxy frame[1]. The spacing of the wire is 3 mm in the horizontal and 2 mm in the vertical plane. The signal from wires are sent to 32ch. S/H and multiplexer, which contains amplifiers and S/H circuits (one per channel) and an analog multiplexer. The multiplexers are interfaced with one of the satellite computer in the KEK control computer system[2].

Process of Data Acquisition

Block diagram of the system and timing chart are shown in Fig.1 and Fig.2. There are two types of PI/O (Process Input Output interface). One is High-Speed PI/O which is connected to DMA (Direct Memory Access), and the other is Program Control Channel. PMC (Profile Monitor Controller) communicates with Program Control Channel. Analog data from profile monitors are fed to ADC (A/D converter, 8 bit, ±10 V) in the High-Speed PI/O. The operator starts data acquisition program via Key Board of Graphic Terminal. Simultaneously, Central Computer sends START FLAG to PMC via Satellite Computer, then PMC sends INTERRUPT SIGNAL 500 μs before beam extraction from booster. The High-Speed PI/O opens the External Strobe Input and sends READY FLAG to PMC upon receiving INTERRUPT SIGNAL. After that PMC sends STROBE PULSE to High-Speed PI/O. The ADC starts to scan signals from ten multiplexers. The scanning of all data is completed by 32 STROBE PULSE (scanning speed is 4.8 ms), then Satellite Computer closes Strobe Input and sets END FLAG in the flag address. As soon as the central computer finds out END FLAG, all data in Satellite Computer are transfered to Central Computer. These data are processed in Central Computer and results are displayed on Graphic Terminal.

References

1) H. Ishimaru, et al., "Beam Profile Measurements for KEK 12 GeV Proton Synchrotron", IEEE Trans. Nucl. Sci. (June 1977), Vol.NS-24, No.3, pp.1821 1823.
2) T. Katoh, et al., "Control Computer System for KEK Proton Synchrotron", IEEE Trans. Nucl. Sci. (June 1977), Vol.NS-24, No.3, pp.1789-1791.
3) K. Arakita, et al., "Computer Control of 500 MeV Beam Transport Line at KEK, Part II" of this meeting.
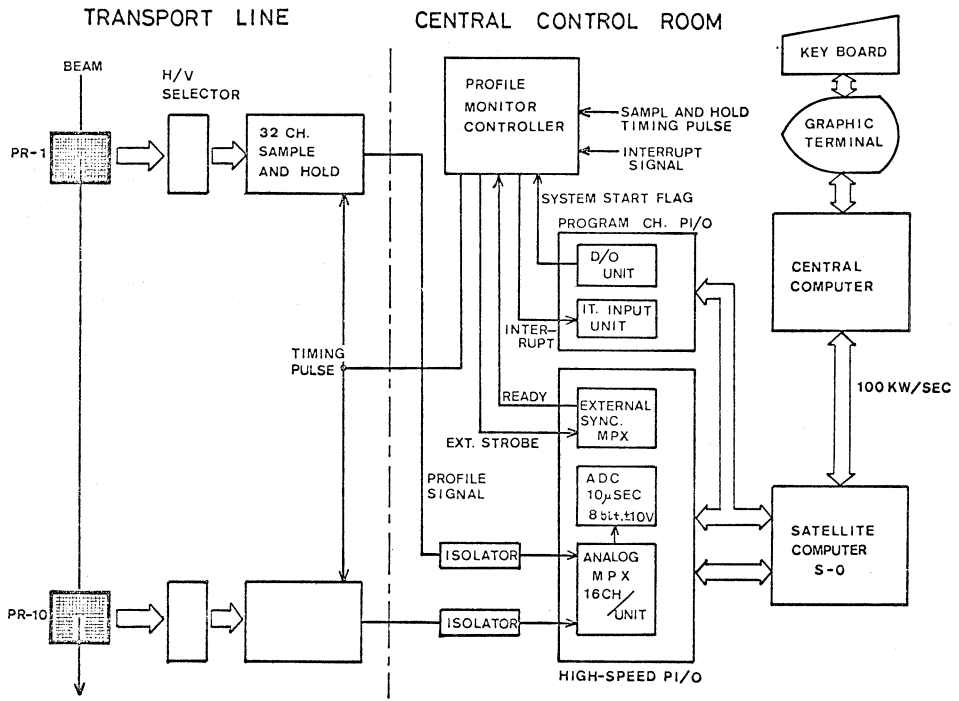4) T. Katoh, et al., "Computer Control of 500 MeV Beam Transport Line at KEK, Part III" of this meeting.
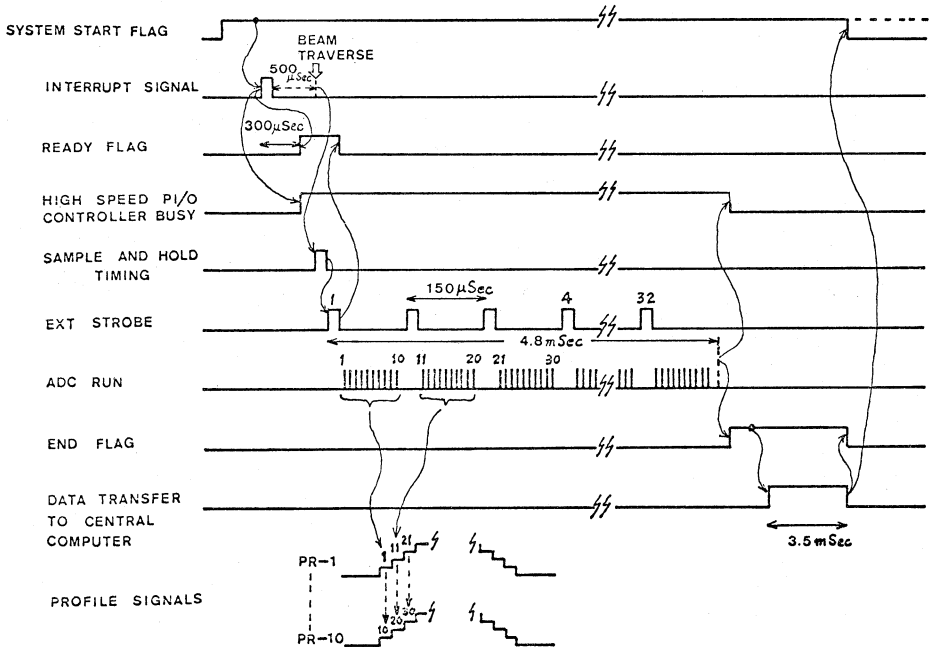
Fig.1 Block Diagram

Fig.2 Timing Chart