



(2) All local stations microcomputer links to Host computer by CAMAC serial loop line. Two communication mechanism are available:

(1) A memory "mailbox" CAMAC module accessible from both host and remote processors. (2) A CAMAC Dataway Communications module or "DMA port" between the remote processor memory and the Dataway.

## 2.1 Computer

HIRFL is controlled by means of 2 kinds of processors: mini-computers as host computer and microcomputer as local stations. They are linked with CAMAC serial loop line.

The host computer is two VAX-8350 that are connected by cluster configuration. They share 4x520MB disks, 2x300MB movable disks and tapes. Each computer equipped with 12MB memory. One of them is used as a host computer for HIRFL control system. The other is used as a reserved computer when the former one is in fault. In addition, it is also used calculation and data processing for the experiments carried out in the experimental areas.

Microcomputers for the local stations are LSI-11/23 and IBM-PC. They are used to control subsystem for Vacuum, R.F, Beam diagnosis system and so on. These microcomputers are a completed system with memory, disk, terminal.

VAX-8350 control the SSC Cyclotron through the CAMAC bit serial loop. This loop was driven by serial highway driver. Serial rate is 2.5MB. There are about 20 CAMAC crates, corresponding CAMAC module are used for the interface of devices.

## 2.2 Device control

In order to bring into being link and matching between CAMAC modules and devices, 5V digitalized I/O-signals, 24V switch signals, and 5V analog voltage signals was planned. A variety of condition circuits, such as switch board, status

board, DAC adjusting board with accuracy of 16bit-18bit and ADC data acquisition board with accuracy of 12-16bit, had been designed and made. They are used for on/off power supply, status monitor, current adjusting and data acquisition.

A step motor control is used for units requiring accurate position setting, such as electrostatic deflectors, magnetic channels. The controller of step motor is designed to provide with local control function. They are slow acceleration when movable units is started and slow deceleration when movable units is derived to the front of end. So movable units not only can keep running smoothly, but also can obtain higher operating speed.

In order to save funds, a number of digital and analogue multiplexer is used for devices of some slower action. Otherwise, the pressure operated control is mainly used for the units of two movable position such as Faraday cup, vacuum valve, secondary emission multi-wire profile monitor etc.

## 3. Console

Our console is designed after a careful analysis of which have been done in GANAL<sup>(4)</sup> and RIKEN<sup>(5)</sup>.

The console, mechanically built with 10 benches is divided in 3 operating console units L, C, R. The central console unit C is devoted to equipments not linked to the computer, such as worksite monitor, RF waveform and beam signal observation. The console units L and R are identical.

Controlling the HIRFL process with the console system can be exercised at the elementary level or a higher level. At the elementary level the control system behaves as a large multiplexer. Equipments designed by their device name are handled one by one.

The operator uses the touch panel and the turn pages of the device name to choose one corresponding equipment he wants to control. Then, operator moves a cursor to a selected device name

on TV screen with a defined touch key and reads the various informations such as the controlled value the actual value of the parameter and a status word on the TV screen area designed.

Among the numerous signals collected along the accelerator, most of them concerning parameters values or status are digitalized and enter the data flow transmitted by the CAMAC system for processing. A little analog form is remain which are to be used in their analog form. This is the case of some beam diagnosis signals and R.F signals with time. These waveform signal observation is necessary.

These signals can be displayed on autoranging picoammeters or on oscilloscopes.

#### 4. The present situation

The HIRFL operating software called HIRFLCSF which is written in Fortran 77. Presently, center console programs are developing for the man-machine interface with Touch Panel.

With time goes on, HIRFL operating level will improve.

#### Refernce

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