CONTROL SYSTEM OF RIKEN LINAC

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Abstract

The control and data processing of the Riken variable fre-
quency heavy ion linac (RILAC) is aided by a minicomputer system
(HP-1000). The outline and present status of the system are
reported below.

1. Introduction

The parameters of many devices of the linac should be set
to different combination of values corresponding to each ion,
energy and frequency combination. In order to help operators
handle these parameters, we use a HP-1000 model 40 computer system
with 96k 16bit word memory. The functions of the computer are as
follows: 1) a digital signal communication center connecting the
control room and the devices distributed in the linac vault, 2)
a display and control apparatus in direct contact with the opera-
tors and 3) an auxiliary data handler and keeper with which oper-
ators can interact.

2. Hardware

The interlock and sequence logic of the vacuum and cooling
systems are hard-wired and self-contained locally. Informations
of them are transmitted to the control room individually and
displayed on monitoring panels. The display circuits are inde-
pendent to the computer system.

Those devices such as magnet power supplies and RF devices
are interfaced to the computer. Protection, sequence and feedback
systems of each individual device are hard-wired locally. Every
device sends its information (on/off, interlock, analog measure-
ment) to the computer and when the device is not in local control
mode it receives commands (on/off operation, analog setpoint) from
it.

As the interface between the computer system and the devices,
four data stations are installed in the linac vault and one in the
computer room. Those in the linac vault are connected to the
computer by a serial data link with HP3070A communication inter-
faces and the GP-IB, while that in the computer room is connected
only by the GPIB. The data station provides the following func-
tions: 1) analog input by voltage signal, 2) analog output by
voltage signal with resolution of 10 or 14 bit, 3) digital input
by floating contact or open collector and 4) digital output by
relay contact or open collector. Each data station has an intelli-
gent interface HP2240A/2241A and signal conditioner modules. The
intelligent interface has a microprocessor and several standardized
I/O function boards. The signal conditioner modules are installed
between the I/O function boards and the linac devices for electric
isolation, amplification and D/A conversion.

A control console is installed in the control room. The data
(status and numerals) gathered by the computer are displayed on
each of two CRT's (HP2645A and HP2648A). Operators can set the
status and analog setpoints, and also can command calculation and
print-out of the data, using a cursor and keyboard of the CRT.

In a few months a new control panel with shaft encoders and plazma displays, interfaced to the computer via a microprocessor, will be set in the console, where we can control fine tuning of analog parameters more easily.

Block diagram of the control system is shown in Fig.1.

3. Present Status

Most of the hardware components have been completed and installed. On line test of the components is now in progress. All the magnet currents (about 40) can be set to calculated preset values in almost 10 minutes. In a few months the RF system will be interfaced to the computer.
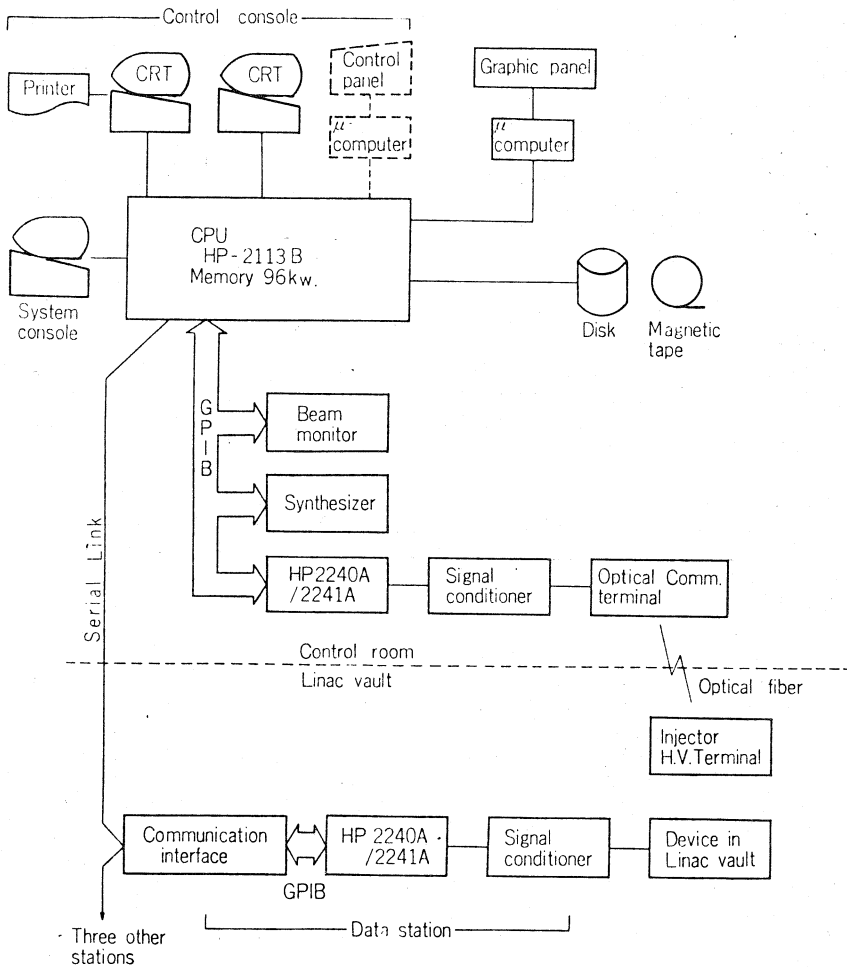
Fig.1. Block diagram of the computer control system.