

## NOTES ON THE CENTRAL CONTROL COMPUTER FACILITY

Lowell A. Klaisner

October 29, 1968

This note describes some of the implications of a central control computer facility to the research and development work in the Booster Section. Two systems are described; one without the central facility, and one with it. These are compared functionally and economically. The specific configuration for the central facility is the result of discussions between personnel from the Scientific Data Systems Company, the Engineering Services Office, the Linac Section, RF Section, and Booster Section.

### The System Without the Central Facility

The Booster Section has need of a prototype control computer to test concepts related to the instrumentation and control of the Booster Synchrotron. This facility would also provide simulation signals to other research and development activities within the Booster Section. These signals could be provided from a local system of the size of a Sigma 2 with 16 K of memory, card reader, disk, line printer, paper tape

I/O, and teletype. The components of such a system are listed in Table I. This system has an external memory rather than an internal memory to allow direct access which is required by the booster prototype timing system.

This system would be purchased over a two year period since the scale of the Booster Section's program during this Fiscal Year does not justify the cost of the advanced peripherals (Items 17 through 20).

#### The System With The Central Facility

It has been proposed that a central facility be provided in the immediate future to provide the opportunity for sharing computational peripherals. Table II lists the components that would be required at the Booster Research and Development Facility to implement the Booster research and development activities. This differs from the above system in that it has 8 K of memory rather than the 16 K and does not have the complete set of computational peripherals. This central facility would consist of the present Linac computer with the addition of the computational peripherals and disk storage. All program development would be carried out at the central facility and the central facility would provide for file transfer between the Booster Facility and the central peripherals.

This arrangement allows a more satisfactory usage of the peripherals in that they are time-shared by a number of groups. The proposed system would initially service the Linac Section, the RF Section, and the Booster Section. It is easily expanded to service other sections with the addition of local facilities. The components that will be added to the Linac computer are listed in Table III. This will expand that system to have 16 K of memory and a three megabyte disk storage. There will be a direct data link from the central facility to each of the section facilities that will operate in a word parallel mode.

#### Comparison

The three tables show the cost of each of these systems. If the cost of the Linac expansion is divided evenly over the participating sections, the combined system costs \$124,000 as opposed to \$161,000 for a similar stand alone capability. The short term advantages of the central system to the Booster research and development effort are:

1. A Complete Set of Computational Peripherals

This allows program development to proceed more efficiently.

2. File Handling

This allows a range of development projects that

could not be carried out with a limited memory size of the other system. This also allows more efficient use of control program as they can be rapidly called from disk.

3. Information Transmission

The direct data link will provide experience at transmitting data at high data rates for extended distances at an early stage of development. This type of data link will be required in the final installation for communications between the different areas of the facility.

4. Standardization

A high level of cooperation can be achieved in software development when the sections are using common equipment. This can result in a higher level of sophistication in more systems by eliminating redundant effort.

Conclusion

From the point of view of the Booster Section, the central facility would provide a much more useful and powerful tool for the research and development work within the section.

CONFIGURATION WITHOUT CENTRAL SYSTEM

<u>Item</u>	<u>Qty.</u>	<u>Model</u>	<u>Description</u>	<u>Price</u>
1	1	8001	Sigma 2 CPU	12,000
2	1	8011	Two Real-Time Clocks	2,000
3	1	8012	Memory Parity Interrupt	500
4	1	8013	Power Fail Safe	1,000
5	1	8014	Protection Feature	2,000
6	1	8020	Multiply/Divide	6,000
7	1	8021	Interrupt Control Chassis	2,200
8	3	8022	Priority Interrupt, 2 Levels	1,050
9	1	8072	Watchdog Timer	3,500
10	1	8051	Memory: 4096 Words	12,000
11	3	8053	Memory Increment: 4096 Words	30,000
12	1	8070	External Interface	1,500
13	1	8091	Keyboard/Printer, KSR-35	5,000
14	1	7060	Paper Tape Reader, Punch, Spooler, with Controller, and Rack	12,000
15	1	8054	External Memory Adapter	5,000
16	1	8055	2-Way Access	3,000
17	1	7122	Card Reader	16,000
18	1	7201	RAD Controller	8,000
19	1	7202	Random Access Disk, .75 MB	18,000
20	1	7440	Line Printer 600/pm	35,000
TOTAL:				175,750
EXPECTED DISCOUNT:				14,675
NET TOTAL:				161,075

CONFIGURATION WITH CENTRAL SYSTEM

<u>Item</u>	<u>Qty.</u>	<u>Model</u>	<u>Description</u>	<u>Price</u>
1	1	8001	Sigma 2 CPU	12,000
2	1	8011	Two Real-Time Clocks	2,000
3	1	8012	Memory Parity Interrupt	500
4	1	8013	Power Fail Safe	1,000
5	1	8014	Protection Feature	2,000
6	1	8020	Multiply/Divide	6,000
7	1	8021	Interrupt Control Chassis	2,200
8	3	8022	Priority Interrupt, 2 Levels	1,050
9	1	8072	Watchdog Timer	3,500
10	1	8051	Memory: 4096 Words	12,000
11	1	8053	Memory Increment: 4096 Words	10,000
12	1	8070	External Interface	1,500
13	1	8091	Keyboard/Printer, KSR-35	5,000
14	1	7060	Paper Tape Reader, Punch, Spooler, with Controller, and Rack	12,000
15	1	7929	IOP to DIO Adapter	5,500
16	1	8054	External Memory Adapter	5,000
17	1	8055	2-Way Access	3,000
TOTAL:				84,250
EXPECTED DISCOUNT:				5,524
NET TOTAL:				78,736

PRICE CONFIGURATION - LINAC DIVISION  
SIGMA 2 EXPANSION REQUIREMENTS

<u>Item</u>	<u>Qty.</u>	<u>Model</u>	<u>Description</u>	<u>Purchase Price</u>	<u>Field Exp.</u>
1	1	8021	Interrupt Control Chassis	2,200	100
2	8	8022	Priority Interrupts, 2 Levels	2,800	80
3	1	8053	Memory Increment, 4096 Words	10,000	200
4	2	8071	Additional I/O Channels	4,000	50
5	1	7122	Card Reader, 400 cpm	16,000	200
6	1	7201	RAD Controller	8,000	200
7	1	7204	RAD Storage 3.0 mb	35,000	100
8	1	7361	20 KC Mag Tape C+1	6,000	200
9	1	7362	20 KC Mag Tape Unit	19,000	50
10	1	7365	BCD Option	2,000	50
11	2	7929	IOP to DIO Adapter	11,000	400
12	1	7440	Line Printer	35,000	200
TOTAL:				151,000	1,830
PURCHASE:				\$151,000	
EXPECTED DISCOUNT:				<u>15,100</u>	
SUBTOTAL:				135,900	
FIELD EXPANSION:				<u>1,830</u>	
TOTAL:				\$137,730	