

Ed Rich

Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

SUBJECT: DISCUSSION OF MAGNETIC DRUM SYSTEMS AT ENGINEERING RESEARCH ASSOCIATES, OCTOBER 20-22, 1952

To: J. W. Forrester

From: E. S. Rich

Date: November 5, 1952

Abstract: On October 20-22 Engineering Research Associates, St. Paul, was visited to inspect testing work on the auxiliary drum system and to discuss design problems on the buffer drum system. The auxiliary drum system is now undergoing initial testing coincident with installation of the plug-in chassis, and shortly will be given systems tests. It appears that work on this system is proceeding according to schedule. In the buffer drum system a serious cross-talk problem and also a problem of finding sufficient chassis space had come up. During our visit a solution to the cross-talk problem was worked out by providing an insertion register for the special data inputs and changing the logic where necessary to provide the same operating characteristics as before. The extra chassis space needed will be obtained by removing the voltage regulator panels from one bay and making plans to have these installed in one of our standard racks instead of in the drum cabinet.

1.0 INTRODUCTION

E. S. Rich, J. A. O'Brien and B. E. Morriss visited Engineering Research Associates, St. Paul, on October 20-22 to discuss problems which have arisen in connection with the design of the buffer drum system and to examine the test work on the auxiliary drum which is now underway. The buffer drum problems occupied the major portion of our attention since it had been recently discovered that cross-talk in some of the circuits they had planned to use will require a substantial change in these circuits. K. E. McVicar arrived at ERA on October 20 for an extended visit during the testing of the auxiliary drum so he was also present at some of the discussions. J. L. Hill, W. W. Butler, R. Eulberg, L. Reid, and W. R. Johnson, all from ERA, entered into these discussions.

2.0 STATUS OF THE AUXILIARY DRUM SYSTEM

2.1 Assembly and Testing

For two weeks prior to our visit, engineers of ERA had been conducting the initial phases of testing on the auxiliary drum. Mainly this involved tracking down a few errors and omissions in the power distribution wiring and in debugging the circuits which form the addressing section of the system. At the time of our visit about one-half of the plug-in chassis were in place and had been given qualitative tests. Work remaining to be done before the system is completely assembled was largely that of setting the heads into the magnetic drum casting and of installing the reading amplifier chassis. It was estimated that by October 27 the assembly would be completed and quantitative system testing could be started. Barring unforeseen difficulties it appears that the testing will be completed on schedule.

2.2 Motor-Generator Set

The motor-generator set to be supplied with the two drum systems has been in operation at ERA for several weeks. Recently it was discovered that some defect in one of the generators was causing some of the commutator segments to turn dark. ERA notified the manufacturer and after examination by a manufacturer's representative it appeared necessary to return this equipment to the factory for overhaul. ERA was awaiting information from the manufacturer as to how long this overhaul would take.

2.3 Plans for Shipment and Installation at MIT

The schematic of the power distribution and control circuits for the auxiliary drum was reviewed and minor changes which have been made since our last visit were discussed. These changes do not affect our plans for tie-in of the drums with the computer power system. Sufficient information in the form of drawings, sketches and wiring tabulations was obtained to enable us to construct the cables needed to connect power to this system. A list of these drawings is given in section 5.0.

To give some idea of how our purchasing department should proceed in arranging for shipment of the auxiliary drum, the following information relative to shipment of similar equipment to the Air Force Cambridge Research Center was obtained. The shipment in this case had a gross weight of 5000 lbs and was made by the Chicago Express Company whose local representative is the Denman Transportation Company, 450 D Street, Boston. This shipment was by a special truck routed point to point with no stopovers. Standard charges for this company are \$4.43 per 100 lbs with a 14,000 lb minimum, making a total cost of \$620.20 for the shipment. It was pointed out that the crated cabinet may be too high to get into a closed van. This was the case for the AFCRC shipment. However, no difficulty was experienced in shipping in an open truck. Delivery required about 3 days. The measured dimensions of the auxiliary drum cabinets are 84" high (including casters), 30 1/4" wide, and 117" long. Crating will add approximately 1 foot to the height dimension and 6 inches to the other dimensions.

3.0 BUFFER DRUM

There were two relatively serious problems in connection with the buffer drum which were considered and for which satisfactory solutions appear to have been worked out. The first of these was the cross-talk between reading and writing circuits which had been found in their flip-flop writer. ERA had worked out an improved circuit involving the addition of an insertion register which would eliminate the cross-talk problem but which required slight changes in system logic to obtain operation equivalent to that previously planned for. The added insertion register will require additional chassis space. Finding additional chassis space was the second problem which had been encountered. It had been determined that the circuits in this system required somewhat more chassis than they had originally estimated so that even before the need for an additional register had been discovered, much of the spare panel space had been used up. As originally planned three bays each holding 32 chassis were planned for the logical circuitry. Ninety to ninety-two of these 96 chassis would be required for the circuits exclusive of the insertion register, leaving insufficient space for the eight chassis required for this register. I suggested that the power supply regulator panels which were to occupy most of an additional bay in the buffer drum cabinet be taken out and plans made to have these mounted in one of our standard racks. This would give space for 32 additional chassis which would accommodate the insertion register, and at the same time it would give spare panel space which is desirable for expansion to be carried out in the future. This proposal was accepted by ERA and therefore will be followed.

So that ERA would have a firm basis on which to proceed with the layout of the buffer drum, the changes in logic required as a result of the decision to use an insertion register for avoiding the cross-talk problem were worked out in detail. Morriss and I prepared a revised set of block diagrams showing all necessary changes and left copies of the drawings at ERA. These changes, in general, seem to involve a negligible change in total equipment but rather consist of rearrangement of certain control circuits and rerouting of some of the control signals. The drawings which were prepared also include block diagrams for equipment which is to be tied in with the buffer drum system after its shipment. These were included primarily to enable ERA to trace complete operations involving the buffer drum. From the original block diagram supplied them (R-50760) it was impossible for them to analyze the operation of certain parts of the system. On the copies of the revised drawings left with ERA, it was indicated what parts of the total system were to be included in the buffer drum cabinet and what parts were to be built later by us. These drawings also enable ERA to visualize what circuits we will later desire to add to the drum system and enable them to more efficiently plan location for spare chassis mountings.

4.0 CIRCUITS AND COMPONENTS

The magnetic heads being installed in the auxiliary drum are part of ERA's first production of 250 ferrite core models. They reported that this first run of the new heads showed up better on their acceptance tests than any other models previously built. No trouble has been encountered to date in using these new heads.

The proper nomenclature for the special junction diodes used in the reading group selection switch was obtained so that we can procure spare units. They are type 4J1A2 germanium diodes recently released by the General Electric Company. There will be no problem of obtaining replacement diodes during the initial tests of the auxiliary drum since our changes in the buffer drum resulted in removal of 64 of these crystals from that system. These crystals have already been procured by ERA so they can be available as replacement units.

Our plans for utilization of group 3 on the buffer drum make it desirable to tie our circuits on to the cathode-follower outputs of the reading amplifiers for this group rather than on to the output gates normally needed with these amplifiers. We were informed that these cathode followers can safely drive an impedance of 120 μ farads and 1000 ohms. If the output gate tube is not used, it is possible to add an additional dual-triode cathode follower in parallel with the existing cathode follower. This would reduce the impedance that can be driven by a factor of 3.

A question was raised as to whether it would be necessary for us at any time to rerecord a timing track on one of the magnetic drums. To do so initially requires special equipment and a cut and try process. To simplify rerecording of a timing track, the drums are shipped with two identical tracks recorded one of which can be reserved as a spare. In case of accidental damage to one track the spare track can be used to regenerate the damaged one. With this provision it should never be necessary to generate a timing track by the cut and try method.

5.0 DRAWINGS

The only drawings obtained were ones relating to the mechanical arrangement of indicator lights and power control wiring. One copy each of the following was supplied.

| <u>Drawing No.</u> | <u>Title</u> |
|--------------------|--|
| XG61189 | Plate Terminal Strip Mounting |
| XG61207 | Auxiliary Power Control Panel (Wiring Schematic) |
| XD61209 | Indicator Light P102 |
| XD61208 | Indicator Light P101 |
| | } Jack Wiring Tabulations |

XD68900

Schematic Auxiliary Power Control (Revised copy - receipt of previous copies reported in M-1614)

SIGNED



E. S. Rich

ESR/cp

cc: S. H. Dodd
R. R. Everett
H. Fahnestock
R. E. Hunt
K. E. McVicar
H. B. Morley
B. E. Morriss
J. H. Newitt
J. A. O'Brien
G. F. Sandy
P. W. Stephan
C. R. Wieser
C. W. Simmonds
H. J. Ziegler
W. W. Butler, ERA (2 copies)