

Digital Computer Laboratory
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SUBJECT: Testing of Buffer Drum System; Progress Report # 1
TO: S. H. Dodd; J. L. Hill, E.R.A.; J. A. O'Brien; E. S. Rich
FROM: R. J. Eulberg and K. E. McVicar
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ABSTRACT: The buffer drum system has been received from E.R.A. and installed in Room 156. The chassis have been inspected and installed in the drum bays. All of the drum surface has been checked on both the single and dual-head tracks.

The buffer drum system consists of four bays of electronics and one bay containing power control and the drum itself. These units are joined together to form one cabinet. The entire system is too large to permit moving it into place at M.I.T. so the system was shipped from E.R.A. in two sections. Upon receipt of the drum system at the Digital Computer Lab., it was installed in Room 156. A technician from E.R.A. spliced together the wires which had to be cut to permit shipment.

The individual chassis were sent to the Computer Lab Inspection Department for inspection of solder joints and detection of defects which could be located by a visual check. B. Paine had a man come to the Barta Building to check the diffused junction diodes which were mounted in the drum bays for the crystal read gates. This inspection resulted in the location of eighteen defective crystals out of about 250. Of this number: nine were found to have low back resistance, eight were found to drift excessively, and one was found to be completely shorted.

The buffer drum itself was shock mounted in a box and this entire unit shock mounted in a larger crate by E.R.A. The larger crate was then moored in place on the truck on which it was shipped by building a rail around the bottom of the crate of double two-by-four thickness. During the trip from St. Paul, the

truck was evidently subjected to a hard jolt which caused the drum crate to hop out of the enclosure and sit on the two-by-fours. It was feared that this jolt might have damaged the drum so initial attention was directed towards checking this possibility.

The buffer drum was mounted in the drum bay and the power connections made. When the drum was first started it was very noisy. This was especially true as it was accelerating and decelerating, but even when running at a steady speed, the noise level was high. The "rundown" time (the time required for the drum to come to a complete stop after power to the motor is turned off) was seven minutes when the drum left E.R.A. The first "rundown" time measured at M.I.T. was $3\frac{1}{2}$ minutes which indicates that something was dragging.

The buffer drum was allowed to run overnight. By the next day it was running more quietly, but it is still much noisier than the auxiliary drum. The rundown time had increased to over six minutes by the following morning. This is approximately the present rundown time.

An attempt was made at this time to get someone from the mechanical engineering department at M.I.T. to analyze the noise made by the drum and determine, if possible, whether it is serious now or whether there is some defect which might adversely affect the life of the drum bearings. The professor who does this type of analysis is presently on vacation and will not return until Monday, June 29.

It was feared that the drum surface might have been damaged by flexing of the drum shaft under impact, thus driving the heads onto the surface. We next made a surface check. Extension head cables were constructed and the buffer drum was connected to run as group ten of the auxiliary system. This permitted checking of sixteen tracks at one time by the computer.

The computer recorded and read back both ones and zeros from every slot on every information track on the buffer drum. The read-back signal was checked against the information recorded with a forty-volt negative margin on the reading amplifiers. Not one of the drum tracks was found to be impaired in its operation.

After the information tracks had been checked, attention turned to the dual heads. These heads had been removed during shipment and they were reinstalled by E.R.A.'s technician. The readout signal and timing was then checked and the heads adjusted where necessary.

During the check of the dual-head tracks, it was noticed that there was a nick on the oxide surface on one track. This nick causes a spurious read-out signal which cannot be erased. The effect of this signal is to cause the dual-track to simulate the "have recorded" condition. That is, no new information can be recorded in the corresponding information slot by the computer because the slot appears to be full. When a read operation is ordered, the contents of the information register will read out even though nothing was recorded in that slot.

The effect of the nick seems to be confined to a single slot in one track. This track is one which is now designated as OA, but it can be exchanged for any of the other dual-head tracks. Attempts to eliminate the nick by rubbing the oxide surface with a plastic rod were unsuccessful.

After the dual heads were all given their final adjustment, one more check of their operation was made. Then a "track check" was made of all the information tracks. This consists of measurement of the read-out-signal amplitude for both ones and zeros, a check on the ability of the head to alter, and observation of the signal envelope to locate writing between slots, blemishes on the track, or other signal peculiarities. The heads which gave too small a read-back signal, were turned in and those which read-back too large a signal were turned out. The amplitude of the minimum track signal, on the information tracks, is now not less than two-thirds the amplitudes of the maximum.

During the check of the information tracks, it was noticed that there was some distortion in the signal on group two. This was traced to the timing pulses and evidently is caused by the lack of "silencers" as used in groups 0 and 1. With no signal from the head, the crosstalk in this group is about seven volts at the output from the first cathode-follower on the reading amplifier.

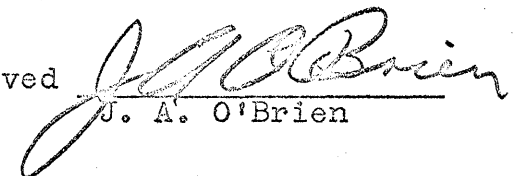
Group three was not checked during the track check because of the lack of associated electronics. It was felt that the check with the computer indicated that there were no serious blemishes on the tracks in that group and the electronic components can easily be checked by more simple methods.

The majority of the time spent on the buffer drum system to date has been concentrated on the drum tracks, both single and dual head. Inevitably, this has involved the circuitry of the drum system, and to this extent the circuitry has also been checked. No effort has been expended on checking of the circuits except where it was necessary for the track checks. There is some evidence that

there is crosstalk in the system, both steady-state and transient and this phase of the system will be studied next. It was felt that E.R.A.'s representatives had accomplished the most important purposes of their visit and that little would be gained by having them stay for the more routine electronic checks. One man from E. R. A. has already left and the other will leave at the end of this week. When we are ready to connect the drum system to the computer, another visit by E.R.A.'s representative will be arranged.

Signed 
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