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Division 6 - Lincoln Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: Group 62 Section Leaders Meeting - October 26, 1953
AN/FSQ-7 Equipment Design Program

TO: Division 6 Group Leaders, Group 62 Staff Members

FROM: A. P. Kromer

ABSTRACT: The 4 digit arithmetic element will be rebuilt by Project High. Study of drums to permit savings in the number of vacuum tubes is underway. The Charactron display tube will be demonstrated later in the week.

1. Arithmetic Element

The plans to rebuild the 4 digit arithmetic element model at IBM have been crystallized. It is expected that this model will be built and available in approximately three to four weeks, and will be tested and operational in two additional weeks. The A register will be simulated with toggle switches; the B register will be Burroughs test equipment. The adder and accumulator will, however, approximate the physical arrangement and wiring layout using etched wiring and the plug-in unit plan anticipated in the final design. The control will also be Burroughs test equipment.

2. Drums

In the interest of reducing the tube count, a study is underway to determine the advantages, if any, that can be realized through changes in the drum system. This will be a joint IBM--MIT study requiring approximately three weeks time. Initial consideration indicates that the combination of several physical rotating drums, each of the size originally contemplated, into a single rack so as to facilitate switching of write, read and other electronic circuits seems to offer most of the potential savings that might be realized through the use of larger physical drums. This type of combination would avoid the necessity for doing development work on the larger drum units. A separate report is to be issued by Ron Mayer outlining the preliminary estimates of the potential savings in vacuum tubes for several alternative arrangements of combining drums in a single frame and sharing electronic circuitry.

Consideration of switching drum write circuits has been underway for some time. Study of switching by use of crystals is underway by Dick Best. IBM has also added a new man to this work. The possible use of magnetic switching is being carried on as an alternative study by IBM.

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Drums (Continued)

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In order to get additional background on the performance of the magnetic switch being considered, it was suggested that Olsen and Don Thompson visit Schneider Laboratories who have done the basic research work on the switch that is being proposed.

Taylor advised that the IBM engineers at Endicott offered to provide additional information regarding the characteristics and performance of drum heads. He suggested that Olsen and IBM High Street people plan to visit Endicott soon and secure as much information as may be available regarding this subject.

Group 61 programmers have suggested to Ron Mayer that the drum system addressing be made more flexible. He will check into the matter more closely, but he indicated that it appears quite possible to provide increased flexibility as an aid to programming, with a minimum of additional equipment (approximately five flip-flops plus some control). In view of the attention being given to reduced tube count, Mayer will check further with Group 61 to see if this flexibility is of significant help to programming before making a decision to include this feature.

3. Display

An engineer from Consolidated has been here for the past week working with Corderman and his group on the Charactron tube operation. The original difficulty with mis-registration has been traced to non-linearity of the deflection amplifiers. Modification of the amplifiers succeeded in reducing mis-registration to only ten to fifteen per cent of the amount originally encountered. However, this slight amount still exists, and further work in connection with matching the yokes and the deflection amplifiers will be required to reduce the mis-registration further.

Corderman indicated that he will be ready to demonstrate the operation of the Charactron tube on October 30.

It has been decided that separate high voltage supply will be built into each display console. This supply will operate off 60 cycle 120V. Previous considerations to distribute 400 cycle or 1800 cycle power have been discontinued.

4. Magnetic Cores

Dave Brown reported that RCA had produced cores with acceptable characteristics, and it is planned to have them manufacture a sufficiently large quantity to permit a 64 x 64 plane to be assembled from RCA cores. This plane will then be tested in MTC to learn its full operational characteristics. The RCA cores are not exactly the same as General Ceramics cores, but appear to be sufficiently close to be considered a suitable alternative.

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Magnetic Cores (Continued)

Frank Vinal has recently visited IBM and will prepare a report on the status of research and development work on magnetic cores as it presently exists at Poughkeepsie.

IBM is taking emergency steps to make core testing facilities available so that they will be in a position to assume the full load of testing cores for XD-1 by about the middle of November.

5. Memory

Further work on testing the 64 x 64 memory planes now being built for MTC will be necessary to permit final determination of the memory cycle time for XD-1. It is expected that this can be determined approximately December 15. In the meantime, design work should continue on the basis of possible memory cycle time being as fast as 6 μ s, but work on drums should also recognize that the memory cycle might be as slow as 9 μ s.

6. MTC

The program of tapping approximately one-half the tubes in MTC and comparing results with tubes in the other half which are not tapped has not yet reached a point where any trend can be determined. However, three tubes have been replaced in the past week, when shorts developed at the time the tubes were tapped. This is the first instance of having fuses blow due to tube tapping. Statistics are being gathered, and a report will be issued on this matter as soon as sufficient data is available to draw any conclusions regarding a trend.

7. Mechanical Design - Packaging

Review of the plans for packaging and construction of rack modules resulted in some change in previous thinking in order to permit rows of electronic equipment modules to be constructed so as to be rigid, aligned in a straight row and control the air flow as required for proper cooling action. The final choice of exact design arrangement and details is to rest solely with IBM.

A visit to Cambridge by representatives from IBM--Endicott led to a conclusion that IBM will build a mock-up of a display console for study purposes. This work will be done with the interested parties at MIT participating so as to include the desired features.

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8. Schedules

Steve Dodd, in his initial contact with IBM regarding the general status of the development work, indicated that while no central file of schedules for the engineering work exists, and the format in which schedules are prepared by different groups in High Street differ from each other, it seems that he will be able to secure sufficient information from the various engineers and from Crago's central office to determine the information which he desires in connection with the progress of the job.

9. Basic Circuits

Dick Best reported that he plans to build a 16 digit register using "slave" flip-flops in order to study the effect of this circuit on diodes. If the application is not considered harmful to the diodes, it appears that this circuit may have useful applications in the machine.

In order to overcome the trouble due to microphonics which has been encountered with the 5965 tube, the circuit group is now considering using a type 6072 tube in the sense amplifiers for memory.

Shansky has issued M-2466 covering the high powered 5998 type cathode follower circuit. Work is continuing on the investigation regarding the possible use of 7AK7 tube for a medium power cathode follower circuit in the interest of saving on the number of tubes in the machine. Remis will visit IBM during the week and look into this matter further.

Sheets covering the basic circuits listed in the minutes of the meeting of October 5 have been issued by the Circuit Applications Committee. While the data on these sheets represents information that has been concurred on by the circuits and systems offices of both IBM and MIT, the modified sheets have come out marked "Tentative." Final procedure for issuance of information of this type is presently being reviewed, and a procedure written up by Hal Ross of the IBM equipment design office.

10. Outputs

There will be a meeting on Thursday, October 29, to review the work of the group who have been studying outputs for the machine.

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11. Visits to IBM

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Canty and Mitchell will visit Poughkeepsie to discuss memory problems with Wittenberg on Thursday.

Brown and Papian expect to visit IBM during the week to review the core testing situation.

Steve Dodd will go to Poughkeepsie to discuss schedules and the planned program for engineering work in further detail with various engineers.

Signed: 

A. P. Kromer

APK/mmt

CC: J. W. Forrester, R. R. Everett

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