

MEMORANDUM ON VISIT TO WATSON LABORATORY ANNEX OF THE I.B.M. COMPANY
(March 21, 1952)

On March 21, 1952, Messrs. Charl Gillie, L. E. Record, W. Tietzworth, and the writer visited the Watson Laboratory Annex of the I.B.M. Company in New York City. We were met there by Mr. J. A. Goetz of the Poughkeepsie I.B.M. Plant and were introduced to Mr. B. L. Havens who was in charge of the computer project using the Williams Storage Tube. He introduced us to Mr. W. Deerhake, the engineer on the Williams Storage phase of the computer, and Mr. G. F. Eland, another engineer on the project.

They are using four 3" cathode ray tubes very similar to the 3KP1 in each computer. Tubes differ from the 3KP1, in that they use a modified electron gun with an anode cylinder equal in length to the 2BP1 plus the 3KP1. The electron beam is apertured to a diameter of 0.040" before it passes through the focusing electrode. The deflection plates have been modified such that their shape approximates a hyperbolic curve near the end. This gives very little deflection defocusing. The spot size obtained on this tube is on the order of 0.010" for a beam current to the screen of 3 to 4 microamperes.

Each tube is required to store information at 500 addresses, with 900 read-outs before rewriting is necessary. If 1,000 cites are stored the read-out must be reduced to 200 or 300 times as spill over destroys the signal. In this computer project they need to store information at 2,000 different addresses and because of a spill over limitation are forced to use four tubes and a rather complicated circuit to store the information in blocks of 5 x 10 dots. Visually a pattern of 20 x 25 dots appears on the face of each cathode ray tube. The information is applied to the face of the tube by dots of 1 microsecond duration or dashes of 4 microsecond duration. The beam is moved at such a fast rate between addresses that no trace is visible until it pauses to write a dot or dash. Access time is 3 microseconds for any place on the face of the tube and read-out and rewrite takes no longer than 5 microseconds.

Read-out of the stored information is accomplished by using the focus--de-focus or de-focus--focus method. The spot is de-focused by modulating the focus electrode with a pulse of minus 50 volts. This gives a poor focus spot but a higher output signal than a plus 50 volt modulation signal that results in a round spot.

I was impressed with the complexity of their deflection and modulating circuits used with these tubes. Approximately two six-foot double relay racks were filled with power supplies, deflection amplifiers, and binary counter circuits. The deflection amplifiers must respond in less than 1 microsecond and recover in less than 2 microseconds. The location of the addresses (term for position of stored information) is such as to require very accurate registry of the spot at all times. With an oscilloscope connected to the output signal amplifier it is possible to see a spot shift of .001". However, a slow movement of addresses with time is not harmful as a complete read-out and rewrite takes place in about 1/60th second. The storage pattern occupies a rectangle about 1.5" x 1.6".

They were using tubes of their own manufacture as well as samples produced by R.C.A. at Lancaster. Mr. Deerhake said that the R.C.A. samples were of I.B.M. design and that they were amazingly uniform in signal output with variations of 25% or less. A type number 3VP5 is expected to be assigned to this tube and released to the industry within the next month or so.

General Electric
Cathode Ray Tube Dept.
Syracuse, N.Y.

They are quite anxious to obtain another source of supply and graciously offered to provide us with complete manufacturing specifications, test specifications, circuit diagrams and other assistance. The tube which they will require will only be used with the 500 spots of the face in either dots or dashes. Spill-over must not reduce the storage signal more than 50% after 900 consecutive read-outs, the screen must be blemish free and the tube must not "mudhole". "Mudholing" is the effect produced after a spot has been bombarded continuously for 900 or more times and then the storage signal read-out (after a time interval of 16 milliseconds or more has elapsed) with a reversed polarity on the first read-out, returning to the correct polarity on the second read-out. Mr. Goetz who is in charge of the Tube Laboratories was quite insistent that the big problem to be solved in building a good Williams Type Storage tube was the screen. They are desirous of having a storage material which has good light output as well as good signal output.

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Engineering
CATHODE RAY TUBES
4-7-52

VCC/mb

cc: RV Bontecou, Bldg. #267, Schen.
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