POUGHKEEPSIE
Dept. 539, Bldng. 965
January 27, 1958

MEMO TO: Mr. R. P. Fletcher
                  Mr. J. D. Calvert

SUBJECT: Exchange

This is a summary of recent discussions on cleaning up various details.

1.   The I/O operations are encoded as follows:

0000	Read
0001	Write
0010	Control
0011	Locate
0100	Read EOS
0101	Write EOS
0110	Control EOS
0111	Locate EOS
1000	Copy Control Word
1001	Release

(Ref: Memo to E. D. Foss by Blaauw and Brooks, of January 23.)

Note that one bit represents EOS.

2.   We should retain the Skip function. The saving in memory time and space will be significant in such things as searching "Swift" tapes on the 24-bit channels.

3.   When in the ECC mode and during a skip, the Unit Check indication should be suppressed. This will be helpful, for example, when grouping records on tape where individual records are logically distinct but part of a block. When not skipping, a Unit Check should freeze the control word as soon as the error is detectable, and the operation should stop.

4.   When not in the ECC mode, we will not expect the Exchange to look at Unit Check signals from the unit until the end of the block so that Skip will not suppress the Unit Check. We will accept this operation on the basis of hardware cost and the preference for operating in the ECC mode whenever possible.

5. The LOCATE instruction will not be subject to a Not Ready Reject. This permits switching from a unit, which happens to be Not Ready, to another unit on the same adapter.

6. If the power fails on an adapter, it is possible for the corresponding Exchange channel to hang up in the middle of an operation or while attempting to execute LOCATE (see 5). We should at least attempt to find a simple but fail-safe way to generate a Cancel signal in the Exchange if the Exchange attempts to operate an adapter whose power is off. This protection is not mandatory, however.

7. The Exchange does not interrogate the Ready status <u>during</u> an operation. Thus it becomes possible for the operator to stop a unit between blocks of a multiple read or write operation, without generating interrupts, and to keep the Exchange waiting until the READY button is pushed. If the stop occurs after the last block of the operation, the operation ends normally, and, as for single read or write, the next instruction is subject to a Not Ready Reject.

8. On the high-speed units, only LOCATE EOS and CONTROL EOS can be used. Their execution will have been completed when the computer proceeds to the next instruction and no End of Operation interrupt is needed. On disks, a Unit Signal will be given when the arms have reached the desired track. Ordinary LOCATE and CONTROL will give rise to a Cancel indication.

9. The Initial Program Load function is to be assigned to a separate button and need not be combined with Power On. The Initial Program Load button performs these functions:

   a. It forces the instruction sequencing operations to come to a stop, disables all interrupts, and sets the Instruction Counter to zero. This can be accomplished by executing the instruction "Branch and Disable to Address Zero".

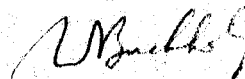   b. It sets up a different interpretation of Unit Signal in the Exchange.

   The next Unit Signal from any unit performs these functions:

   a. The Exchange stores a Control Word with address 64 and a count of 8 in the control word location for this unit. All other bits are zero.

b. The Exchange initiates a Read operation for this unit.

c. If the operation is not successful, the Exchange comes to a stop. Another Unit Signal will repeat steps a and b.

d. When the operation is completed successfully, the Exchange sends a special signal to the computer which sets the Instruction Counter to 64 and starts normal instruction sequencing. The Initial Program Load status is removed.

The above procedure keeps extraneous interrupts, such as from the Elapsed Time Clock, from interfering with initial loading. The initial loading program must take care of resetting the Indicator Register before enabling interrupts.

10. The Power On function should also execute a "Branch and Disable to Address Zero" to keep the computer from running away and unnecessarily interfering with existing memory contents.

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WB/pkb

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