December 20, 1958

MEMO TO: Mr. S. W. Dunwell

SUBJECT: Attachment of 729 Tapes to Project 7000 Systems

Our investigation on the use of the "Universal Channel Adapter" for attaching 729 tape systems to the Project 7000 Basic Exchange has lead to the following conclusions.

1. The philosophy and specifications for this device rest on the desirability of the following assumptions.

    (a) Byte conversion can be eliminated for 729 tape systems.
    (b) Limitations on the number of 729 tape drives connected to an adapter.
    (c) ECC mode of operation is unnecessary for 729 tape systems.

2. Since most of the reasoning associated with this approach to 729 tape usage has been stimulated by considerations of SWIFT tape systems, a few points may be indicated in connection with them.

    (a) It has been assumed that SWIFT tapes will be available for attachment to the AEC and subsequent Project 7000 Systems.
    (b) Discussions with personnel of the SWIFT project have indicated that such prospects are questionable.
    (c) The contract for the AEC system, states that we will furnish 4 tape drives similar to the 727 tape drives, but with a higher level of reliability. This condition will certainly be satisfied if we provide 729-II tapes although we might find it expedient to deliver 729-IV drives..
    (d) Attachment of SWIFT tapes to the AEC system should become the subject of further negotiation in a subsequent contract if they desire these tapes.
    (e) Use of the Channel Adapter with the absence of byte conversion and elimination of the ECC mode would not, under the contract commitments, provide an effective tape system.
    (f) It has been indicated that if SWIFT systems are rushed for Project 7000 usage many functional limitations would be imposed on them.

3. The assumptions of paragraph 1 appear to rest on the premise that 729 tapes are basically undesirable for Project 7000 Systems. Thus, the impression is created, that 729 tapes will only be used in a minimal sense. Thus, we assume that 729 tapes are useful only for communication with Data Processing Systems other than Project 7000 Systems, such as the 700 Series or 7070 and peripheral units associated with EAM type installations. Further it implies a requirement that the information contained on these tapes will be rewritten on higher speed tapes or disks before processing.

4. Such a premise ignores the desirability and potential of lower cost (rental) Project 7000 Systems for which a 729 Tape System will be sufficient. Such configurations of Project 7000 System elements can be described with emphasis on their orientation toward commercial applications. Note that 729 tape drives are required in order to realize the benefit of capital investment in the current standard tape footage and reels of existing large commercial files. Such a system would consist of 1 or 2 memory units, a CPU and Basic Exchange. Attached to the Basic Exchange will be the following:

> 1 - 1000 cpm card reader
> 1 - 250 cpm card punch
> 2 - 600 lpm printers
> 1 - Console - Inquiry Station
> A tape system of 12 tape drives

We may consider two basic alternatives for connecting a 12-tape drive basic tape system of 8 - 729-IV's and 4 - 729-II's.

(a) Using Channel Adapter - TAU tape control units.
(b) STRETCH Tape Control Unit.

With (a) we require 6-Control Units and an additional 8 Exchange Channels. In order to expand this tape system we can add a maximum of 5-Control Units and 10-tape drives before additional Exchange Channels are required. With (b) we may assume 3-Control Units each initially having 4 tape drives. Note that only 8 Exchange Channels are required. Assigning drives so that we use 2 of the 3 units for 729-IV's and one for 729-II's we can add 8 - 729-IV's and 4 - 729-II's before requiring our second group of Exchange Channels.

5. Thus, it is not clear that the "Universal Channel Adapter" approach will really result in any savings to the user, and may even be more expensive, when rentals are considered.

6. A part from cost considerations with respect to rentals, higher job costs based on functional usage are indicated. The limitation of two tape drives per channel is based on arguments of the ability to use many tapes simultaneously. While some operations can use this technique, many others cannot. The use of the Channel Adapter imposes increases of 1/3 more storage for memory areas associated with tape input and output and additional processing time for bit spreading and/or compression. For the commercial system mentioned earlier, this might prove to be a serious drawback in that the cost of a memory unit represents a large fraction of the systems cost. Clearly these factors represent serious restrictions when one considers the multiple program processing.

7. The STRETCH Tape Control Unit has the functional capacity required for using on-line multiprogramming of the "peripheral" functions. One Exchange Channel controling 4 - 729-II tape drives will enable continuous operation of the card reader (1000 cpm), card punch (250 cpm) and two chain printers (48 character - 600 lpm) at full speed.

8. The assumption of a limited number of 729 tape drives associated with the Project 7000 Systems implies excessive operator handling of tape reels associated with their use. Even though only one tape per Exchange Channel can be used at one time for reading or writing, all present and prospective systems will require the convenience of reserving tape drives for system usage and retention of the ability to leave tape reels mounted for random system use. Note that the 729 tape system, as offered by IBM with all other Data Processing Systems, permits up to 10 tapes to be attached to the tape control unit. The ultimate choice of equipment and mode of installation operation must be left to the discretion of the customer.

9. Objections to the potential Channel Adapter - TAU tape control unit for connecting 729 Tape Drives may be summarized as:

   (a) Limited numbers of tape drives permitted per channel. This imposes economic and programming penalties on the user through necessity for renting additional Tape Control Units, additional Exchange Channels, larger memory space required for data handling and program handling of bit spreading and bit compression.

(b) This limitation is imposed on a standard tape system widely advertised and sold with up to 10 tape drives per control unit on all our other present and prospective Data Processing System.

(c) Lack of byte conversion destroys the continuity of tape processed data, thus, making it virtually impossible to use 729's as effective intermediate storage. Furthermore, it puts extreme restrictions on the ability of the system to be used for initial program loading from tape.

(d) Lack of an ECC mode of operation removes another source of checking for potential lower rental systems considered for commercial usage.

(e) Use of this tape control permits the AEC and subsequent systems only a partially effective tape system since it is not clear that the full SWIFT System will be available.

10. It is our recommendation that the presently developed STRETCH Tape Control Unit having full Locate facilities, ECC mode of operation, byte converter and possibility of mixing 729-II and 729-IV tapes on the same channel be made available as a standard attachment to the Basic Exchange.

E. W. Coffin

E. W. Coffin
Product Planning Representative
Project 7000

EWC:jcj

cc: Mr. D. W. Pendery
    Mr. H. K. Wild
    Mr. D. W. Holmes
    Mr. C. B. Poland
    Project 7000 Engineering Planning
    Project 7000 Product Planning