APPENDIX I: TELETYPE OPERATION

A.   Introduction

The Teletype is the input/output (I/O) device normally used for reading in
binary tapes, entering instructions and data. It consists of four separate ele-
ments: (a) the keyboard, (b) the printer, (c) the tape reader and (d) the tape
punch.

During offline (LOCAL) operation, all four of these sections are mechan-
ically linked, so that typing a character produces an impulse to the printer and
punch mechanisms causing that character to be printed and (if the punch is turned
on) punched. Similarly, reading a character into the tape reader causes it to be
echoed by the printer and punch.

During on-line (LINE) operation, the reader and the keyboard are logically
equivalent and the printer and punch are equivalent. A computer command to
read from the teletype causes the keyboard-reader to be queried and a command
to print on the teletype printer will also cause tape to be punched if the punch is
turned on.

However, it must be emphasized that there is no link whatever between the
keyboard-reader and the printer-punch during on-line operation. In fact, the only
way the teletype can be made to influence computer operations is if the computer
has been specifically programmed to read and print on the teletype. Program-
ming the 1080 computer to interact with the teletype is discussed in the 1080
Programming Manual.

B.   Switch Functions

LINE-OFF-LOCAL: This switch is located below and to the right of the
keyboard. It is the main power switch and controls whether the Teletype "talks"
to the computer or only to itself. In the LINE mode, the teletype sends out sig-
nals to the computer which it can recognize depending on how it has been pro-
grammed. In the LOCAL mode the teletype acts just as a typewriter. It is
wholly disassociated from the computer and can be used, for instance, to gen-
erate tapes while the computer is performing some other function.

START-STOP-FREE: This control on the tape reader controls tape motion.
In the FREE position, the sprocket wheel moves freely. The reader should always
be set to FREE during tape loading to prevent possible tearing of the tape. In
the STOP position the sprocket wheel is immobile and in the START position,
the tape will read in.

Tape Punch Switches: If ON is depressed, the printing of any character will cause its duplication on the punch. Depressing REL (release) allows one to pull out old tape before loading in a new roll. B.SP. backspaces the tape one position each time it is firmly depressed. This is useful for correcting tapes prepared off-line.
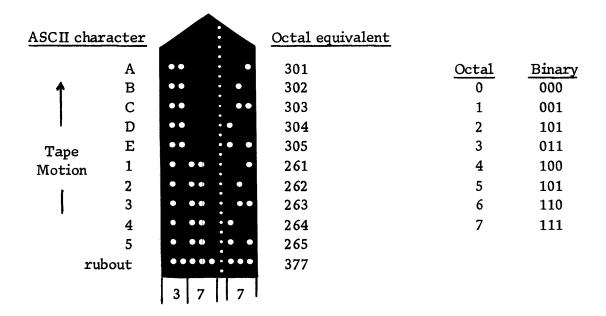
C. Off-Line Preparation of Source Tapes

Programs can be generated using the Assembler-Editor program in Insert mode (see the Programming Manual) but since the 1080 may be in use for data acquisition or analysis while new software is being prepared, it is a good idea to understand how to generate programs off-line as well.

1. Turn the Teletype on in the LOCAL position
2. Depress the tape punch ON switch.
3. Hold down the HERE IS key to generate a few inches of leader
4. Type the source program
5. If you make an error, depress B.SP. once for each character to be deleted and then type Rubout an equal number of times. During the Read-in or Append mode, the Assembler will ignore all rubouts. (This is not true during Insert mode)
6. After completing the program, generate some trailer tape using the HERE IS key.

D. Reading an ASCII Paper Tape

All characters punched by the Teletype* are punched according to the ASCII code (American Standard Code for Information Interchange). Paper tapes punched contain eight rows of holes, representing binary numbers from 0 to 2^7-1, or octal numbers from 0 to 377_8. The binary to octal conversion is performed as usual, by grouping the binary bits into groups of three and converting each group to its octal equivalent. Hold the tape as shown below and use the conversion table at the right. Unlike tapes produced by actual computer programs, this one has had blank lines inserted between the punched ones to improve legibility for this example.

*Teletype is a registered trademark of the Teletype Corporation

ASCII character	Octal equivalent
A	301
B	302
C	303
D	304
E	305
1	261
2	262
3	263
4	264
5	265
rubout	377

Tape Motion

Octal	Binary
0	000
1	001
2	101
3	011
4	100
5	101
6	110
7	111

Examining the first line of the tape, the binary number 11 000 001 is found. Since $11_2 = 3_8$, $000_2 = 0_8$ and $001_2 = 1_8$, the number is 301_8. After consulting the ASCII character table in the Programming Manual one finds that this is the octal code for the letter A. Similarly, the sixth punched line contains the number 10 110 001 or 261_8. This is the ASCII code for the number 1.

Since all ASCII codes range between 200_8 and 377_8, a punched tape can always be recognized as ASCII rather than binary if its leftmost column, the 200 column, is punched.