When a program tape is prepared from a coding sheet (see Figure 3.1) only the information in the "Program Input Codes" and "Instruction" columns and the appropriate stop codes are punched. The information in the "Location, " "Contents of Address, " and "Notes" columns is not punched as part of a program tape.

TAPE PREPARATION

The procedure for punching a program tape is as follows:

1. Turn the typewriter POWER switch ON.

2. Depress the POWER switch on the computer console.

3. Position the Mode switch to MANUAL INPUT to protect the memory from accidental recording.

4. Depress PUNCH ON.

5. Hold the TAPE FEED lever down long enough to produce a few inches of tape with sprocket holes (a leader).

6. The first punch on every tape should be a Carriage Return code, so that, when the tape is read, information will not start printing in the middle of a line.

7. Program information is entered in this sequence:

    a. Type the entries in the "Program Input Codes" column. There are normally two, each followed by a Conditional Stop Code ('), before the first instruction is encountered. A carriage return is indicated on the coding sheet following the second input code. If there is a further entry in this column, preceding the first "Instruction" on the same line, it is punched next and again followed by a stop code. A stop code is not punched if there is no "Program Input Codes" entry on this line.

    b. Punch the first entry in the "Instruction" column, and follow it with a stop code.

    c. Continue punching information from the "Program Input Codes" and 'Instruction" columns as encountered in left-to-right order. If a line is left blank in this sequence, only a stop code is punched.

There are a number of general rules for punching the above information which, briefly, are as follows:

(1) Leading zeros need not be punched. For example, the hexadecimal word 00013W8J' can be punched without the leading zeros as 13W8J'. (However, the instruction T0016 is punched as T0016, since no leading zeros precede the "T".)

(2) Brackets are considered as containing zeros unless otherwise indicated. That is, for B[. . . .]' = B[0000]' we must punch B0000'. In the exceptional case where an entire word is bracketed which consists entirely of zeros, that is [. . . . .]' = [00000000]', only the stop code need be punched. In all other cases, zeros must be punched to assure that data appears in the proper positions.

(3) All characters may be punched in lower case. (In this manual capital letters are used to indicate operations. This is merely for ease of identification.) In printout, B0627' will appear as b0627'.

(4) Carriage returns, color shifts, back spaces, upper case, lower case, and sections of blank tape (tape feeds) may be punched as desired and will not affect the input operation. On the coding sheet, a carriage return is indicated after every fourth word.

(5) A heading may precede a punched program to identify the tape. It may contain any characters except stop codes. As the tape is read during input through the typewriter, the heading will print but will not affect the input operation.

8. After the last instruction in the program has been punched, depress the TAPE FEED lever and allow a few inches of tape to pass through the punch to produce a trailer. Tear off the tape.

9. Each tape should be verified in the following manner, after it is punched:

a. Place the tape in the reader.

b. Raise the PUNCH ON lever.

c. Depress the CONDITIONAL STOP lever.

d. Depress START READ.

As the tape passes through the reader, a typed copy is produced. The reader will not stop at stop codes, but these codes will appear as apostrophes in the hard copy. This copy may then be checked against the coding sheets. If errors are found, they should be corrected before the program is stored in memory.

CORRECTION OF ERRORS Errors on punched tape may be corrected in various ways, depending upon the type of error and when it is noticed. Three correction techniques are explained here.

The easiest correction is for an error which is detected immediately after the wrong key has been depressed. In this case, one need only

1. Turn the FEED KNOB on the left side of the punch back one notch.

2. Depress the CODE DELETE lever once.

3. Continue punching by depressing the proper key on the keyboard.

If a wrong key is depressed whose tape code is a portion of the desired combination, the operator need only back the tape until the incorrect character is under the punch head, and overpunch it with the proper key. This method is particularly useful when the error is detected after characters have been punched beyond the error. However, it can only be used when the erroneous and correct tape codes are related in the proper way. For example, a "6" can be overpunched on a "0", "2", or "4", but not on "5" since the tape code for 5 has a punch in channel 4 while that for "6" does not.

A more time-consuming correction method is to reproduce the tape up to the error, punch the correct word, and then continue duplicating. The procedure is as follows:

1. Place the original tape in the reader.

2. Depress the PUNCH ON lever.

3. Depress the TAPE FEED lever and produce a tape leader.

4. Depress the CONDITIONAL STOP lever.

5. Depress the START READ lever. The tape will be read and a duplicate made. When the tape in the reader nears the error, raise CONDITION-AL STOP. The reader will halt when it encounters a stop code. Depress START READ each time another word is to be read.

6. When the last word prior to the error has been read and copied, raise PUNCH ON.

7. Depress START READ once to read past the error.

8. Depress PUNCH ON. Type the correct word.

9. Depress CONDITIONAL STOP and START READ to continue duplicating the original tape.

Appendix B contains a description of the basic input/output unit, including an explanation of the function of each lever.