

## CHAPTER 5

### TELETYPEWRITERS

Teletypewriters are motor-driven electromechanical devices that interchange typewritten messages between two or more points. The characters appear at both sending and receiving stations. An operator transmitting from New York to Boston will have his message repeated in Boston, letter by letter, virtually as soon as it is formed in New York. The same thing will happen at all receiving stations that tie into the network.

#### MODEL 28 TELETYPEWRITER FAMILY

Most of the teletypewriter sets used by the Navy belong to the Model 28 family of teletypewriter equipments. The Model 28 equipments feature light weight, small size, quietness, and high speed operation. They present relatively few maintenance problems and are particularly suitable for shipboard use under severe conditions of roll, vibration, and shock.

Another feature of the teletypewriters of the Model 28 family is their ability to operate at speeds between 65 and 106 words per minute. Conversion from one speed to another is accomplished by changing the driving gears that are located within the equipment (a maintenance personnel function). Most of the Navy's teletypewriters are presently operated at 100 words per minute.

#### AUTOMATIC SEND-RECEIVE (ASR) TELETYPEWRITER SET AN/UGC-49

One of the more commonly used teletypewriters of the Model 28 family is the model AN/UGC-49 teletypewriter, shown in

figure 5-1. It is used for both sending and receiving page-size copy and/or printed reperforated tape messages. With pageprint monitoring, the teletypewriter electrically transmits messages that are originated either by reperforated tape or keyboard operation. The AN/UGC-49 can also be used to prepare reperforated tape for separate transmission at a later time.

The keyboard, typing reperforator, typing unit, and transmitter distributor are operated by the motor mounted on the keyboard. Selection of these components for either individual or simultaneous operation is by the selector switch located at the front cabinet, to the left of the keyboard. All of these components are connected in series in the signal line, but the selector switch has provisions for shunting various components from the line. The typing reperforator is operated by a separate motor and power distribution system. It is connected to a separate external signal line.

#### Major Components

The major components of the AN/UGC-49 teletypewriter are described in the following paragraphs and illustrations:

**KEYBOARD UNIT.**—The keyboard unit (figure 5-2) provides a foundation for the a.c. motor, keyboard, and typing reperforator. This component incorporates the necessary electrical and mechanical elements for message transmission and for controlling the mechanical printing and perforating of the tape. It also contains a three-position selector switch for

ADVANCE/RETARD switch on the LEFT drawer a sufficient number of times to cause element No. 1 of the signal to appear in lamp 1 of the upper row of the Data Display panel. Operating the switch to the ADVANCE position will cause the displayed signal to move to the right, while operation of the RETARD position will cause the displayed signal to move to the left. Set the PRINTERS switch on the RIGHT drawer to the ON position for print-out.

**PHASING (SEVEN-UNIT CODE SIGNALS).**—While observing ERROR lamps on the front panel of the RIGHT drawer, operate the PHASING ADVANCE/RETARD switch on the LEFT drawer a sufficient number of times to cause all error lamps to extinguish. Also observe sync or idle patterns on the Data Display panel.

When sub-channel operation is employed on a particular channel, every fourth cycle of that channel will normally be inverted. To compensate for this, set INV/NORM CYCLE 1 switch for the affected channel to INV and operate the PHASE switch for that channel until the ERROR lamp is extinguished.

In sub-channel operation, one or more of the four subcycles may be used to give sub-channel operating speeds of normally 15, 30, and 45 words per minute. To compensate for this, the equipment provides four printer output lines for each of the first four main channels, together with switches to select which of the four subcycles is to be routed out on any given line. To determine what combination of sub-channeling is being employed, set the PRINTERS switch to ON. During traffic in the subdividing channel, observe the printer for that channel as follows:

(1) If valid traffic is being printed at a speed slower than 60 words per minute, switch the PRINTER SELECT CYCLE 1, 2, 3, and 4

switches for that channel to position 2 until, by the process of elimination, it is known which of the subcycles is being employed.

(2) Garbled traffic indicates that more than one sub-channel is active. In this case, switch PRINTER SELECT CYCLE 1, 2, 3, and 4 switches to position 2 until, by the process of elimination, it is known which of the subcycles is being used for each stream of traffic.

(3) Adjust PRINTER SELECT CYCLE 1, 2, 3, and 4 switches so that each stream of traffic is routed out on a different line. For example, if it is found that a 30 word-per-minute subchannel is employing cycles 1 and 3, the CYCLE 1 and 3 switches would be set to position 1. Cycles 2 and 4 switches would be set to positions other than 1. If four, 15 wpm sub-channels were employed, each PRINTER SELECT CYCLE switch would be set to positions 1, 2, 3, and 4.

**APPLIQUE SYNCHRONIZER OPERATION.**—The operation of the Applique Synchronizer is identical to the operation of the AN/TCA-4 Synchronizer, except that the POWER switch on the front panel is used for applying power to the Applique synchronizer.

**APPLIQUE CONVERTER OPERATION.**—Set the CYCLE LENGTH switches on the front panel of the Applique Converter to the cycle length to be employed. Phase the input signal with the AN/TCA-4 equipment. Observe the ERROR indicator lamps on the Applique Converter and operate the PHASING ADVANCE/RETARD switch until all the ERROR lamps are extinguished.

**EQUIPMENT SHUTDOWN.**—To shut down the equipment, it is necessary to only momentarily depress the POWER OFF switch on the LEFT drawer and place the POWER switch on the Applique Synchronizer to the OFF position.

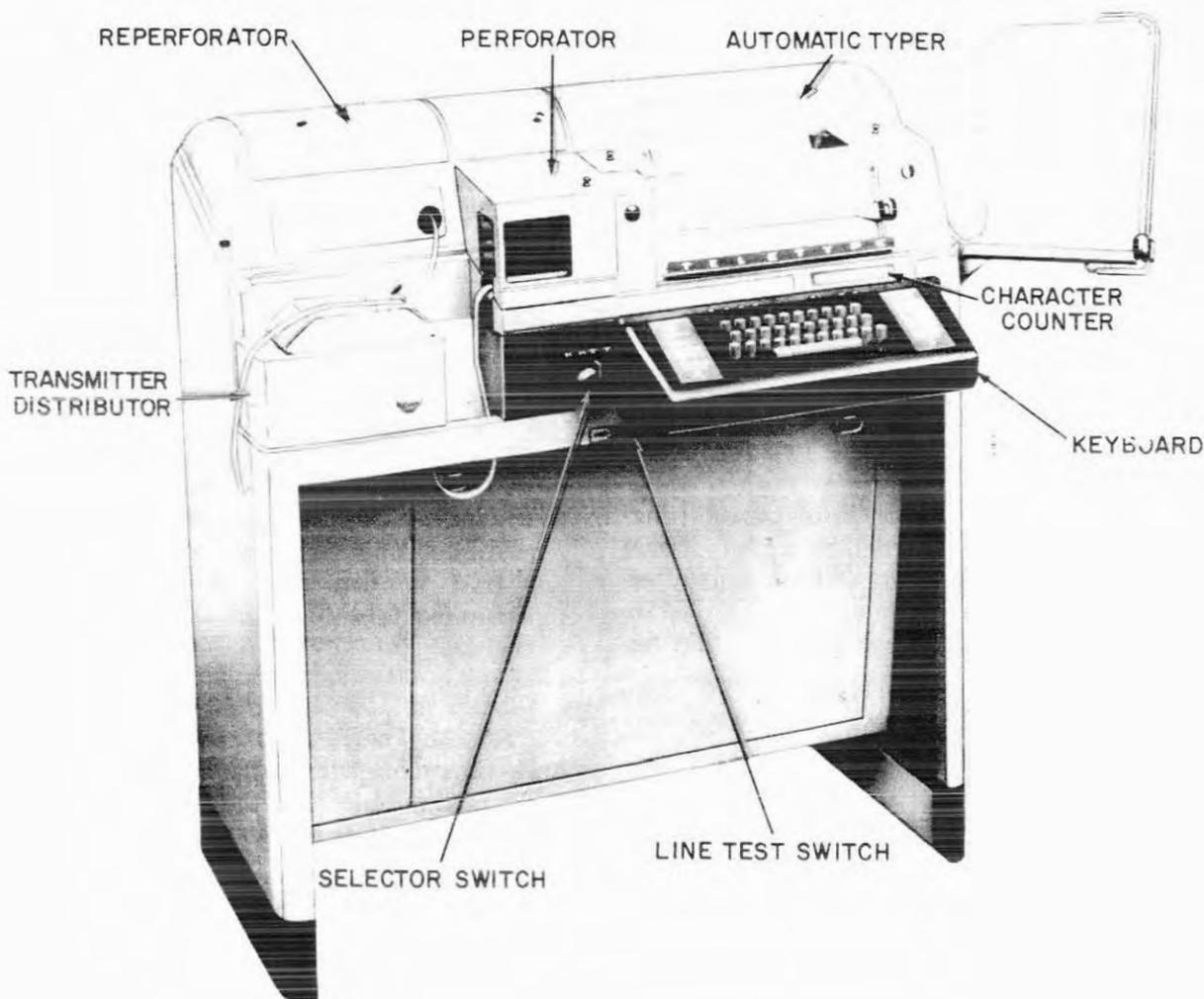


Figure 5-1.—Model AN/UGC-49 Teletypewriter.

1.217.13A

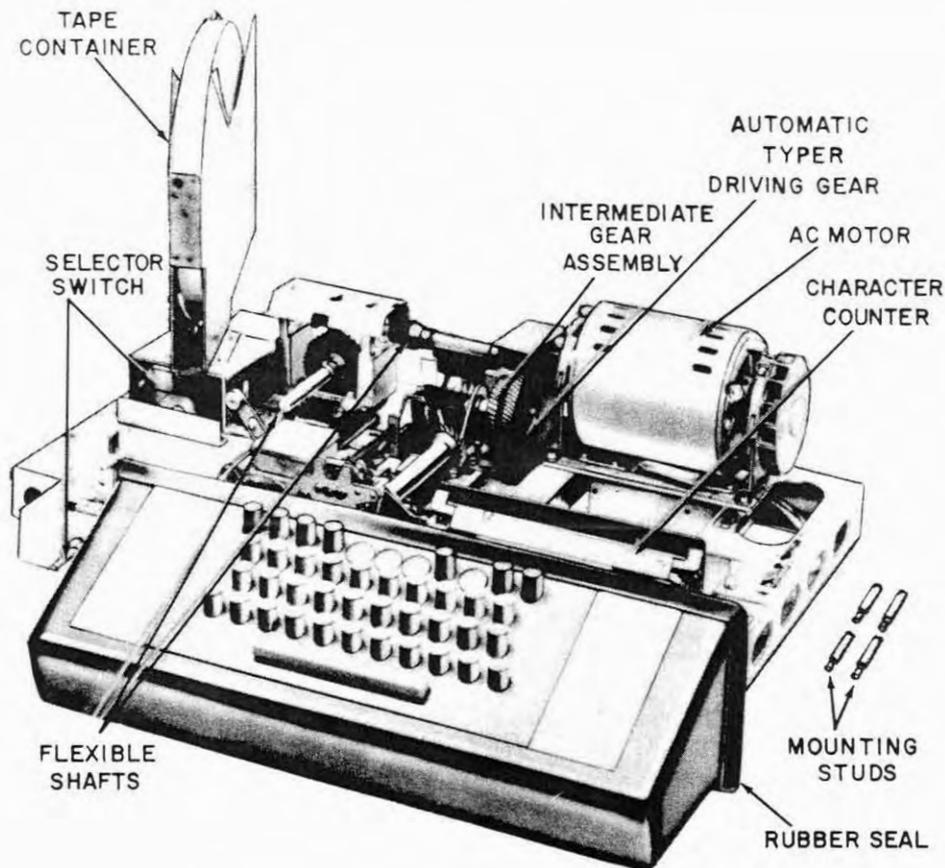
choosing the mode of operation of the equipment.

The AN/UGC-49 and other Model 28 printers are equipped with either of two types of keyboards: Communication or Weather. The communication keyboard contains letters and punctuation marks common to the standard typewriter; the weather keyboard provides symbols necessary for the transmission of weather data. Similarities and differences in the two keyboards are illustrated in figure 5-3. Observe that the lower case characters are the same, and that the letters of the alphabet appear in the same positions in each. The difference lies

in the upper case of the bottom two rows. A trained operator can use either the communication or weather keyboard without loss of speed or efficiency. Figure 5-4 is an illustration of the communication keyboard with emphasis placed on the function keys. The action performed by the function keys is described as follows:

**SPACE BAR.**—The space bar located at the front of the keyboard, is used to send spaces (as between words).

**CAR RET (Carriage Return).**—The carriage return key is used to return both the type box



50.92

Figure 5-2.—AN/UGC-49 keyboard unit.

and the printing carriage to the left to start a new line of typing.

**LINE FEED.**—When depressed, this key causes the paper to feed upward one or two spaces depending upon the position of the single-double line feed lever located on the typing unit.

**FIGS (Figures).**—The figures key is pressed to condition the machine for printing figures and other upper case characters.

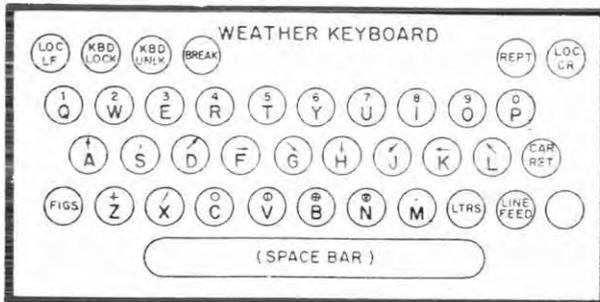
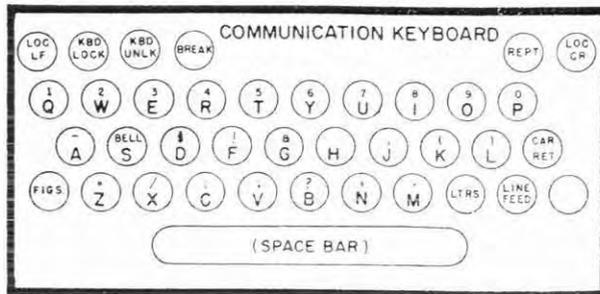
**LTRS (Letters).**—The letters key is used to condition the machine for printing the lettered (lower case) characters.

**Blank (Unlabeled key in bottom row).**—Depressing the blank key twice (effective

in either upper case or lower case) locks all keyboards in the circuit and renders them inoperative by setting up the receive condition. Restoration to the send condition is accomplished, under individual circumstances, through operation of the SEND key by the operator desiring to send from his keyboard. SEND and REC keys, when installed, will be located in spaces available in the center of the function key row.

**REPT (Repeat).**—To repeat a character, depress the character key and the REPT key. The character will be repeated automatically as long as both keys are held down.

**NOTE:** The next three keys to be described perform their functions only on the machine on



31.23

Figure 5-3.—Two types of teletypewriter keyboards.

which the key is operated (referred to as “local machine”), without affecting any other machine on the line.

**LOC LF (Local Line Feed).**—To feed the paper into the local machine, depress the LOC LF key, which feeds the paper automatically and rapidly so long as it is held down. This key is used to locally feed paper upwards to permit tearing off a message not fed up far enough by the transmitting station’s line feed keying. It also is used when inserting a new supply of paper into the machine.

**LOC CR (Local Carriage Return).**—Depressing this key returns the type box to the left margin on the local machine.

**Back Space.**—A back-space mechanism is available through the installation of a modification kit. It allows the operator to back-space while preparing a tape on the typing reperforator and to letter-out any errors.

**TYPING UNIT.**—The typing unit used in the AN/UGC-49 teletypewriter is pictured in figure

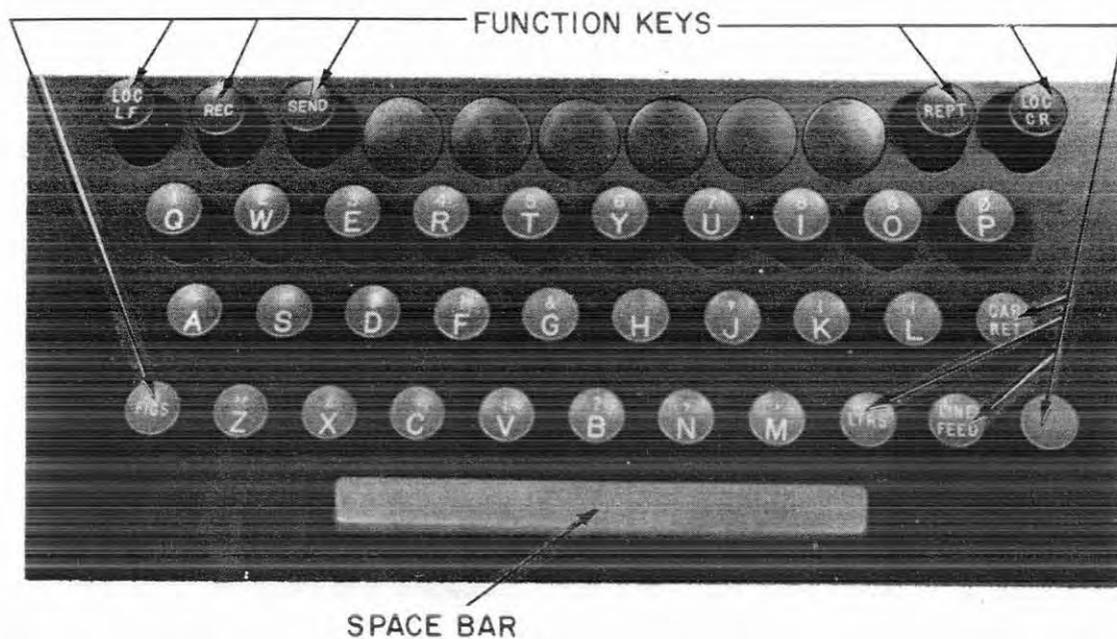


Figure 5-4.—AN/UGC-49 keyboard.

1.217.13B

5-5. This unit incorporates the necessary electrical and mechanical elements to translate the signaling code combinations into mechanical actions that print the messages and perform functions incidental thereto.

Paper (single or multi-copy) feeds from a five-inch (maximum) diameter roll mounted at the rear of the typing unit. The paper feeds around a platen which rotates, but which does not move horizontally.

Type pallets are arranged in a small type box (figure 5-6), which is easily detached for cleaning or replacement. In operation, the type

box moves across the paper and presents the proper type pallets to the printing hammer. The printing hammer drives the pallets and inked ribbon against the paper to print the characters.

As each character is printed, the inked ribbon feeds from one spool to the other, reversing automatically when the ribbon reverse level is tripped by the small rivets at each end of the ribbon. The ribbon mechanism is shown in figure 5-7.

Printing is produced by the type box, which contains the characters and symbols shown on

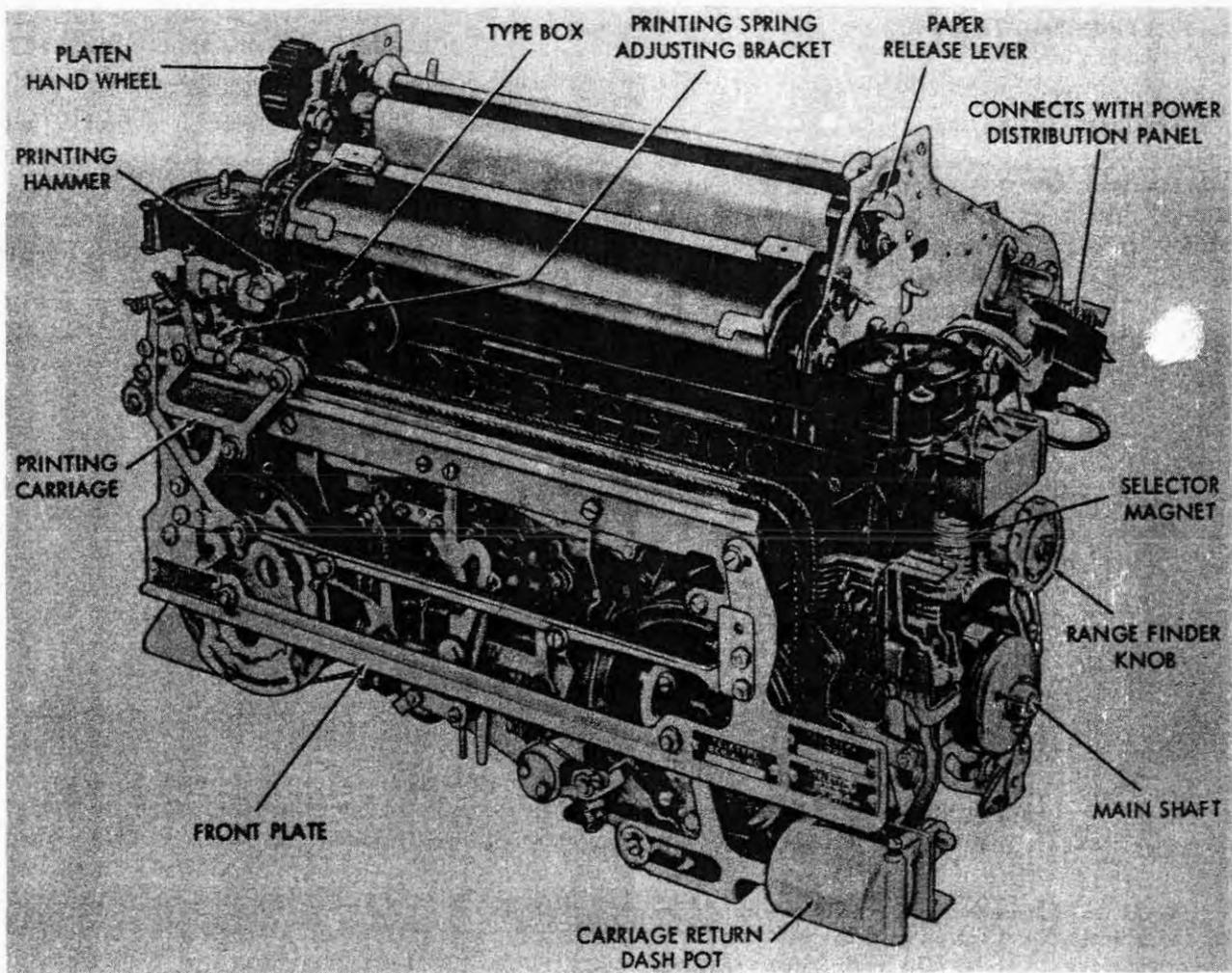
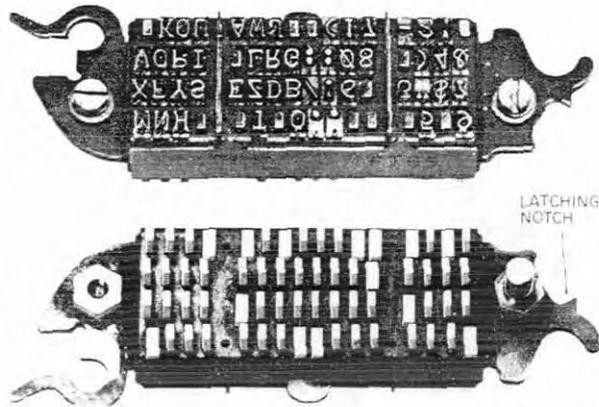


Figure 5-5.—Typing unit.



31.28

Figure 5-6.—Type box, front and back.

the keyboard. Operation of the keys and space bar moves the type box across the platen from left to right. On each key stroke, the type box is moved into position for the printing hammer to strike the proper type pallet, printing the

character on the paper. Operation of the CARRET key returns the type box to the left margin, and the operation of the LINE FEED key moves the paper up to the next line.

**TYPING REPERFORATOR.**—Tape preparation, by operation of the keyboard, is accomplished by the typing reperforator (figure 5-8). The reperforator is a transmittable, five-level, chadless, perforated tape with printed characters corresponding to the perforated code.

The typing reperforator, mounted on the left front corner of the keyboard, is powered through flexible connections and a jack shaft by the a.c. motor mounted on the keyboard. Its tape is supplied from a container mounted at the left rear corner of the keyboard.

With the keyboard selector switch (figure 5-9) in the K (keyboard) position, the typing reperforator is inoperative. In K-T (keyboard tape) position, the selector switch connects the selector magnet on the keyboard typing

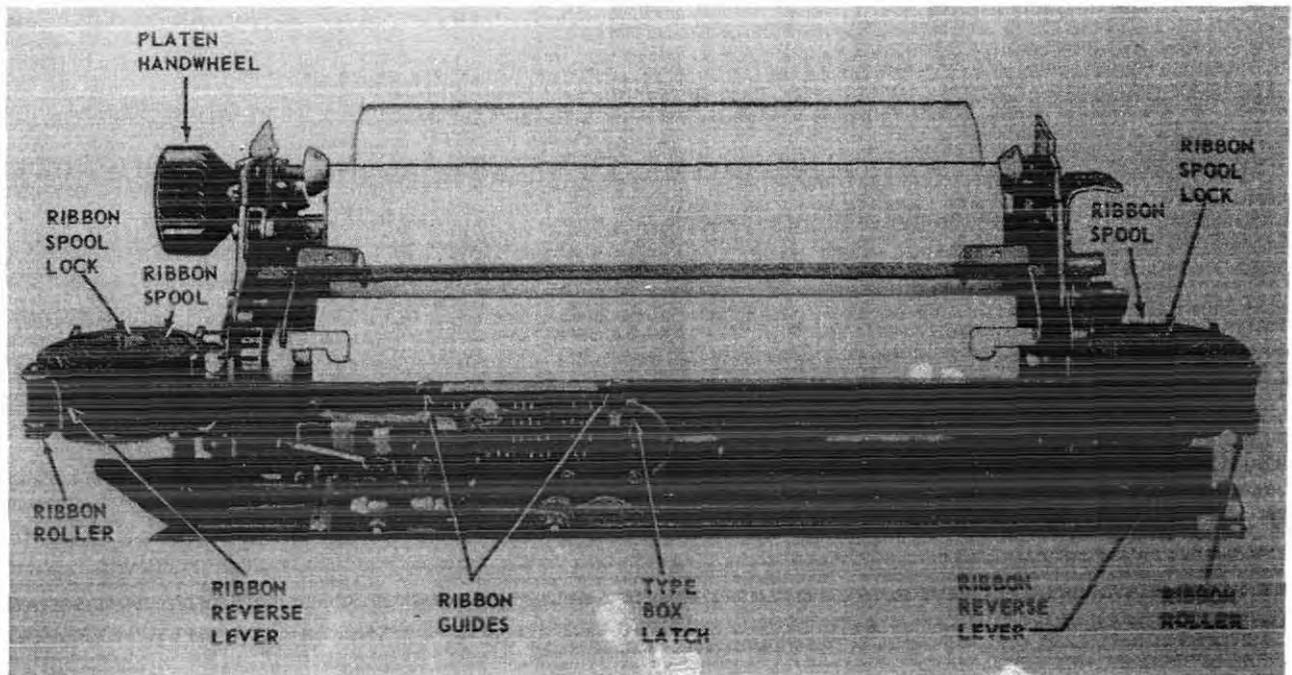
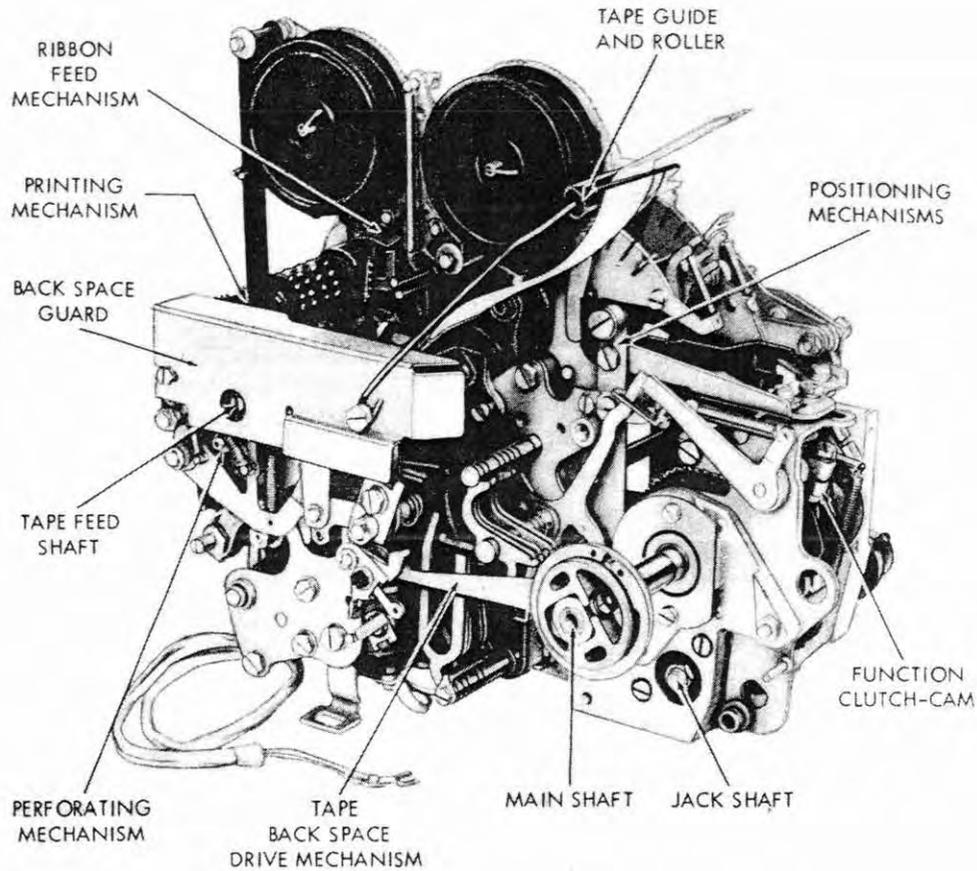


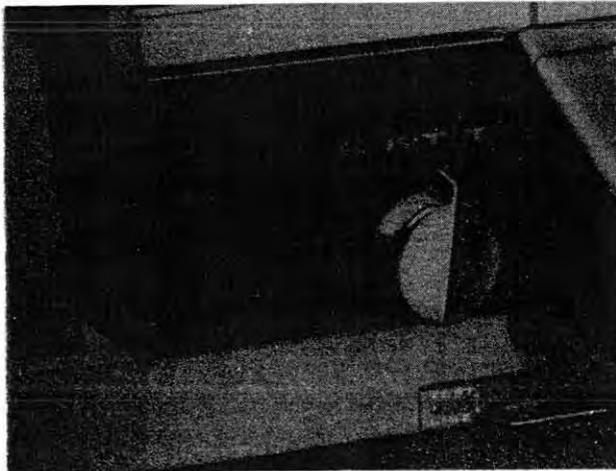
Figure 5-7.—Ribbon inserted.

1.222



50.98

Figure 5-8.—Typing reperforator (front view).



76.34

Figure 5-9.—Selector switch.

reperforator into the signal line circuit of the keyboard signal generator, at the cabinet terminal board. This permits preparation of perforated and typed tape simultaneously with signal line transmission. In the T (tape) position, the selector switch electrically connects the keyboard and the keyboard typing reperforator, resulting in manual typing reperforator operation independent of the signal line.

**AUXILIARY TYPING REPERFORATOR.**—The auxiliary typing reperforator is similar in appearance, design, and operation to the typing reperforator already described above. Because the reperforator is not controlled by keyboard, but instead, receives messages from an incoming signal line, it has a selector unit. The reperforator is located in the

cabinet, at the top left, above and behind the transmitter distributor.

Additional features of the auxiliary reperfocator are the signal bell and switch, low tape alarm and switch, the mechanical variable speed drive mechanism, a non-interfering letters tape feed-out mechanism, which provides a suitable length of "letters" at the end of each message (by operation of the Tape Feed-Out Switch on the dome of the cabinet), and a tape threading handwheel.

Both reperfocators are provided with a chad chute which discharges the chad from the perforated tape (by way of chad chute extensions), into a common chad container located under the dome compartment of the

cabinet. It is important that the container is emptied frequently to prevent chad from backing up and jamming the perforating mechanism.

**TRANSMITTER DISTRIBUTOR.**—The transmitter distributor (figure 5-10) is mounted on its own base in front of the cabinet and to the left. It is simply a mechanical tape reader used to convert messages on standard five-level chad or chadless tapes to signaling code combinations for transmission over a telegraph channel.

The unit includes a start-stop switch, incorporating tight-tape, shut-off, and free-wheeling tape feed features. A second

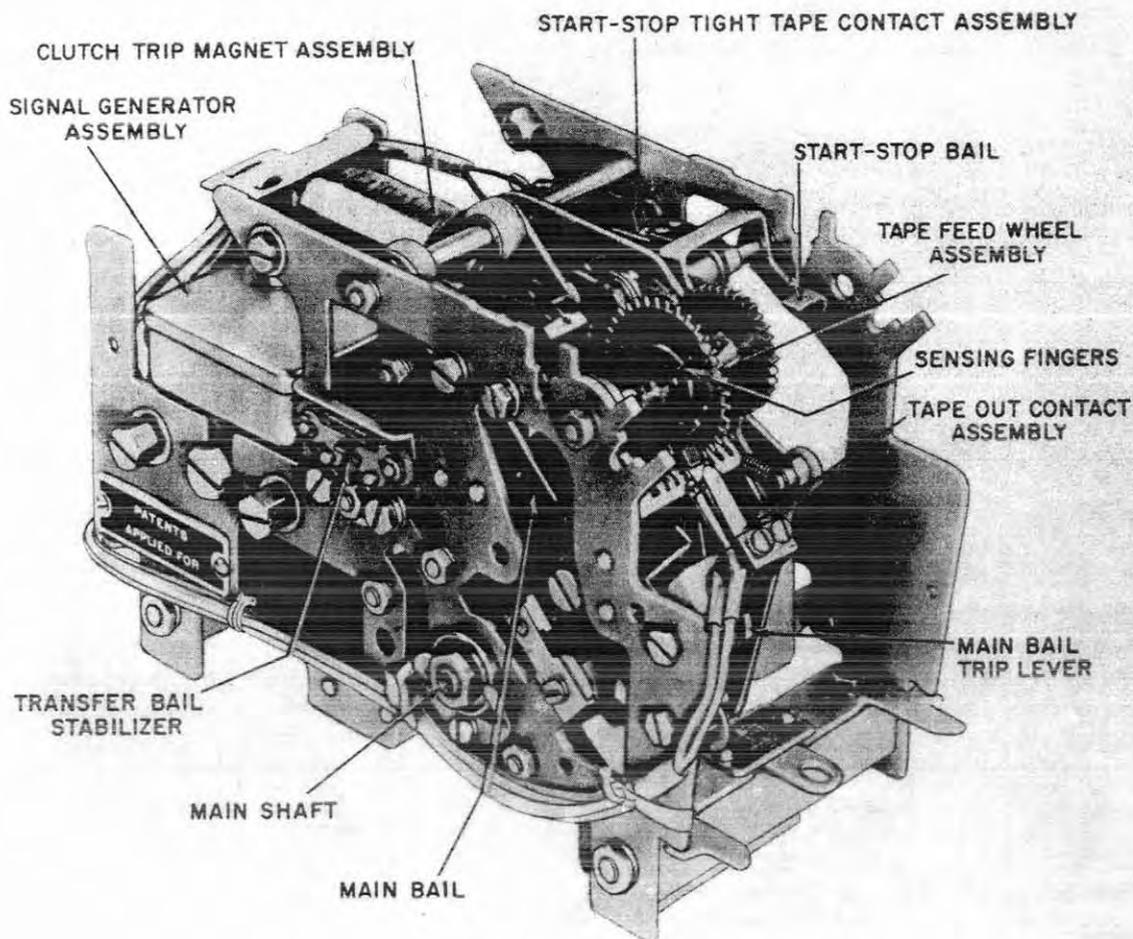


Figure 5-10.—Transmitter distributor.

50.104

switch shuts off the transmitter distributor automatically when the tape reaches its end.

### Changing Paper

To avoid losing messages because of running out of paper, the operator should check the supply of paper in the teletypewriter frequently. The approach of the end of a roll is indicated by a colored streak along the edge of the paper. Prior to changing paper in actual circuit operation, the distant station must be notified. After opening the front and rear covers of the cabinet, the following steps should be taken: (Refer to figure 5-11)

1. Shut off the power.
2. Turn the platen handwheel to roll back the paper from under the platen.
3. Push back the paper release.
4. Remove the used roll from the spindle grooves.

5. Remove the spindle from the roll and insert a new roll on the spindle.
6. Place the spindle in the spindle grooves with the paper feeding from underneath the front of the roll.
7. Feed the paper over the straightening rod and under the platen, bringing it up between the platen handwheel. **DO NOT DISTURB THE RIBBON.**
8. Straighten the paper and pull the paper release lever forward.
9. Turn on the power.
10. Close the rear cover and roll the paper up over it, using the LOC LF key.

NOTE: After the paper is in place, check to see that the ribbon is still properly threaded through the ribbon guides. Also check to make certain that the type box latch has not been disengaged. It should be in a position holding the type box firmly in place.

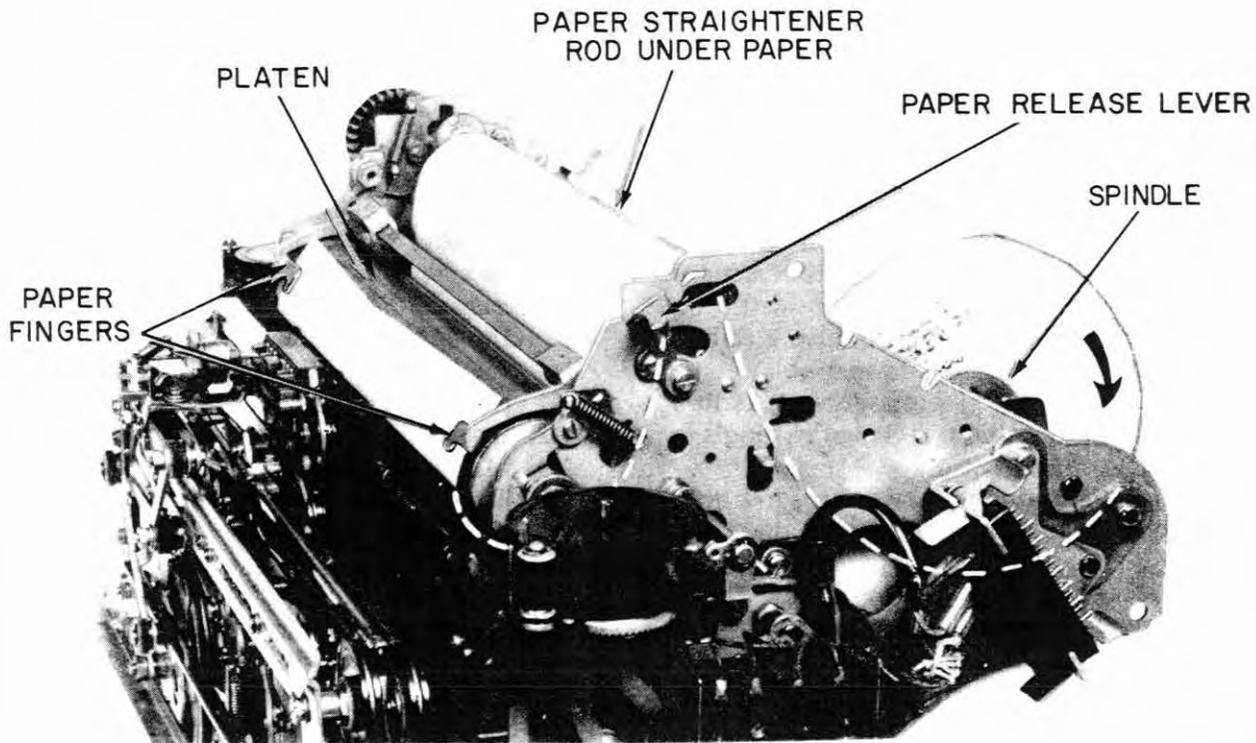


Figure 5-11.—Paper roll inserted.

1.220

11. Close the front cover and resume operations.

### Changing Ribbons

To avoid producing poor pageprint copies, the condition of the ribbon should be checked frequently and replaced when it becomes worn. When changing the ribbon the following steps should be taken: (Refer to figure 5-7)

1. Open the front cover of the cabinet.
2. Disengage the old ribbon from the ribbon guides, roller guides, and ribbon-reverse levers.
3. Unlock the ribbon spool locks and lift both spools from the spool shafts.
4. Remove the old ribbon from the spools and discard the ribbon and one spool. Retain the other spool for use with the new ribbon.

NOTE: Ribbons should always be disposed of with security in mind. Ribbons must be unwound and placed in burn bags, and the spools placed in trash cans.

5. Engage the hook of a new ribbon onto the hub of the empty spool. (If the ribbon has no hook at the end, the spool will have a barb that should be used to pierce the ribbon near its end.)
6. Replace the spools on the ribbon spool shafts, making sure that they settle on the spool shaft pins and that the ribbon feeds from the front of the spools.
7. Turn down the ribbon spool locks to a horizontal position, locking the spools in place.
8. Thread the ribbon forward around both ribbon rollers and through the slots in the ribbon levers and ribbon guides.
9. Take up the slack by turning the free spool. (After the slack has been taken up, check to make certain that the ribbon is still properly threaded through the ribbon guides, and that the reversing eyelet is between the spool and the reverse lever.)

10. Check to see that the type box latch has not been disengaged. It should be in position, holding the type box firmly in place.
11. Close the cabinet cover and resume operations.

NOTE: If the ribbon is feeding and the printing is faint, it is an indication that a new ribbon is needed or that the ribbon is not reversing itself correctly. If the ribbon is not feeding, make sure that it has been placed in the machine properly. If the ribbon-reversing mechanism is not operating correctly, notify maintenance.

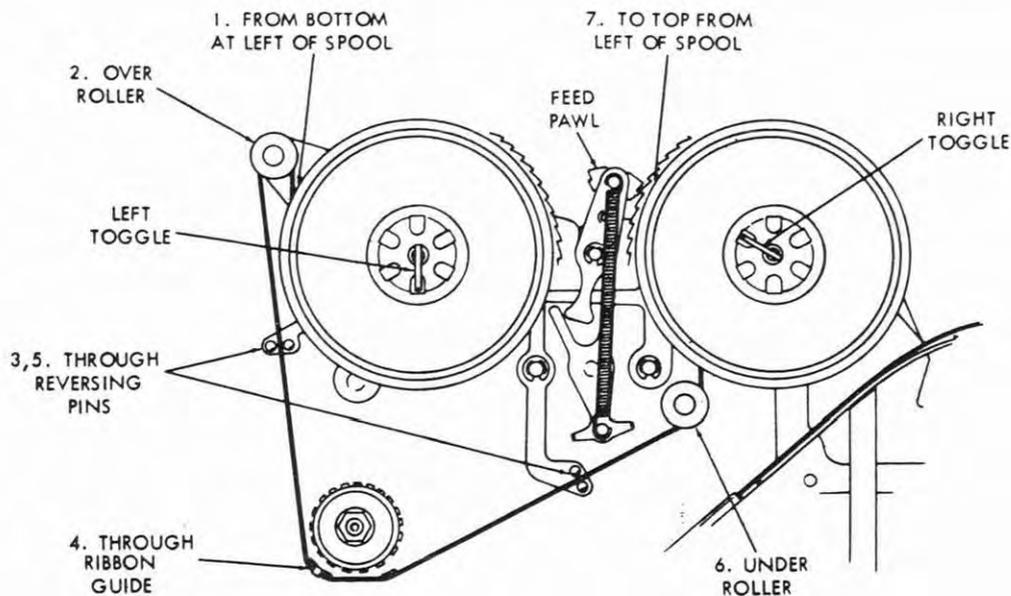
### Changing The Type Reperforator Ribbon

The procedure for replacing the ribbon in either of the type reperforators, basically the same as in the automatic typing unit, is as follows: (The path of the ribbon is illustrated in figure 5-12.)

1. Open the cabinet dome lid for access to the ribbon.
2. Open the ribbon spool toggles and remove the old spools.
3. Disengage the old ribbon from the reversing pins, the ribbon guide, and the rollers.
4. Remove the old ribbon from one of the spools.
5. Engage the hook of the new ribbon on the hub of the empty spool, and wind the ribbon on the spool past the reversing eyelet.
6. Insert the spools on the shafts and close the spool locks.
7. Thread the ribbon through the path as shown in figure 5-12.

NOTE: Ensure that the ribbon remains in the guide slots and that both reversing eyelets are between the ribbon spools and the reverse levers. Roll up any slack in the ribbon onto the spool on which the ribbon is wound.

8. Close the cabinet and resume operation.



1.215(76)C

Figure 5-12.—Path of ribbon in typing reperforator.

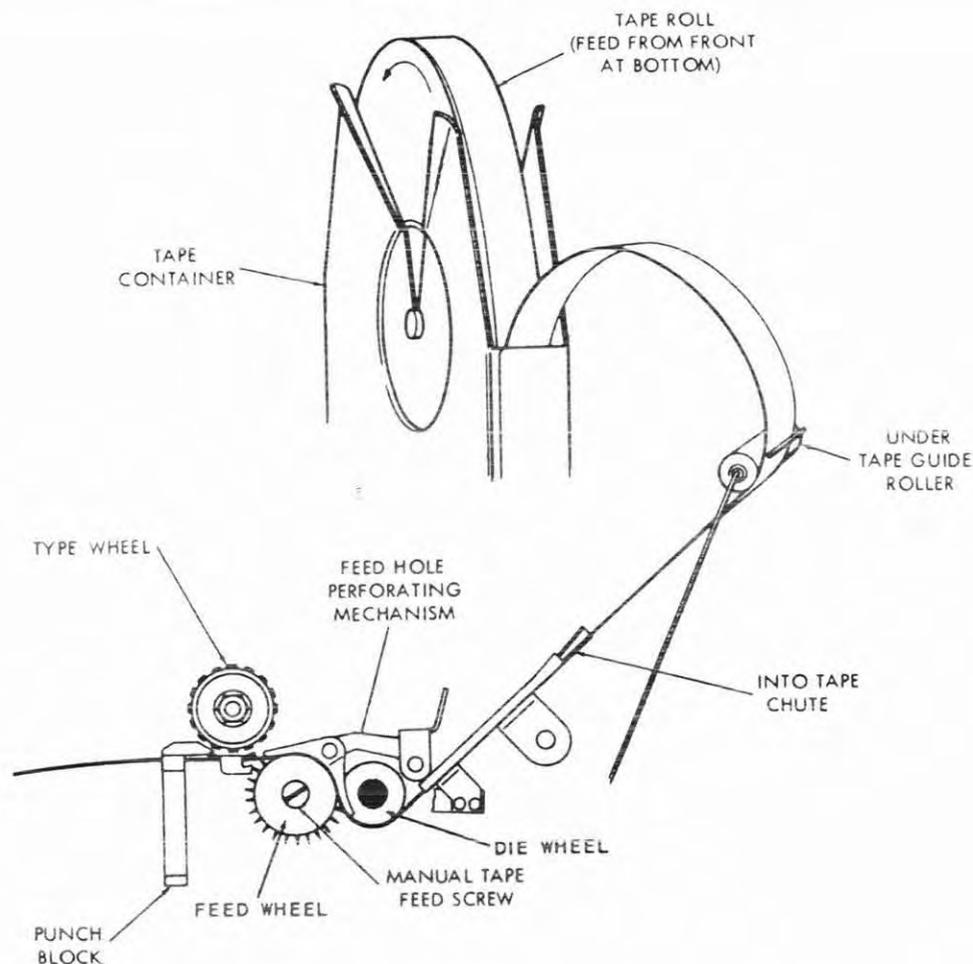
### Changing Reperforator Tape

A visual indication of low tape supply is incorporated into each roll of reperforator tape. When the color of the tape changes, i.e., red to purple, it is a warning that the roll is nearly exhausted and requires replacement. Additionally, the warning device in the auxiliary typing reperforator's tape container is activated when the tape supply for that unit is low. Heed this warning! **DON'T MISS A MESSAGE BY TRYING TO USE UP THE LAST BIT OF TAPE ON A ROLL.**

The procedure for changing the reperforator tape is as follows: (Refer to figure 5-13.)

1. Set the keyboard selector switch to the T mode of operation.
2. Raise the left front cabinet door and open the center dome door of the cabinet.
3. Tear the old tape at the point where it enters the tape chute.
4. Depress the REPT key and any character on the keyboard until the old tape is fed out of the punch block.
5. Lift the tape reel from its container and remove the remainder of the old tape on the reel.
6. Place the reel back into its container so that the tape feeds from the front of the container and off the bottom of the reel.
7. Thread the tape over the tape guide roller and into the chute of the punch mechanism.
8. Depress the REPT key and any character on the keyboard for automatic feeding. Simultaneously, push the tape downward until it is engaged by the feed and die wheels. Continue feeding the tape until the tape appears at the left side of the punch block.
9. Close the lid in the cabinet and lower the cover over the reperforator.

**CAUTION:** Never try to feed the leader end of a new roll of tape into a reperforator until the old roll is completely removed. Trying to run two thicknesses of tape through the reperforator usually causes the tape to hang up and frequently causes damage to the punching block.



1.215(76)A

Figure 5-13.—Path of tape in typing reperforator.

### Changing Auxiliary Reperforator Tape

The procedure for changing tape in the auxiliary typing reperforator is almost identical to that for changing tape in the keyboard typing reperforator. The path of the tape through the two units is identical (refer to figure 5-14). The procedure for changing the auxiliary typing reperforator is as follows:

1. Open the left rear dome door on the cabinet for access to the auxiliary typing reperforator and its tape supply.
2. Tear the tape at the tape chute and clear it out of the punch block by manually rotating the tape-feed wheel thumbscrew counterclockwise. If the auxiliary typing reperforator is equipped with the automatic tape-feed button, press the button to feed the tape out.
3. Lift the tape reel from its container, remove the old tape, and insert a fresh roll of tape on the reel.
4. Position the reel in its container in such a manner that the tape feeds from the rear of the container and off the bottom of the reel. (Make certain that the lever on the tape-out switch assembly is toward the rear of the cabinet and under the roll of tape.)

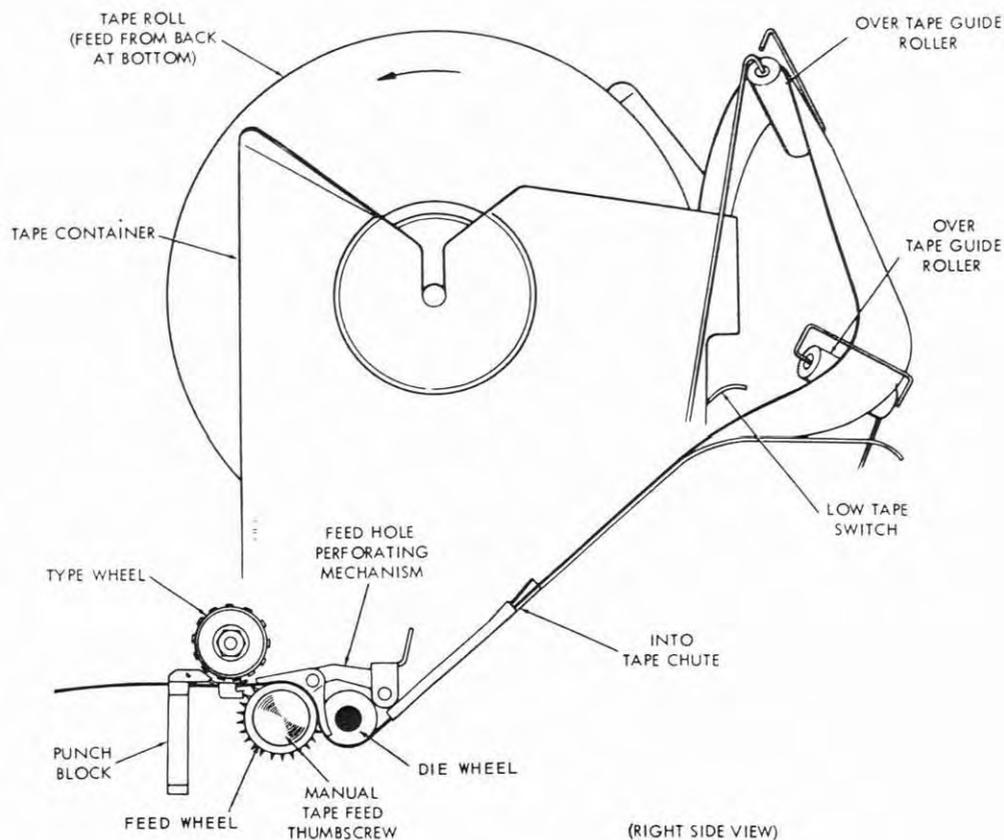


Figure 5-14.—Path of tape in auxiliary typing reperforator.

1.215(76)B

5. Lead the tape over the tape roller at the rear of the tape container, to the right and over the roller mounted on the auxiliary typing reperforator, and to the tape chute.
6. Slide the tape into the chute and rotate the tape-feed wheel thumbscrew counterclockwise until the tape emerges from the punch chute at the left of the reperforator.
7. Close the lid, making sure that the tape feeds through the hole in the front of the lid.

#### Cleaning Type Box

The following procedures should be followed when cleaning the type box:

1. Open the cover and unlock the type-box latch by moving it to the right.

2. Grasp the handle on the right side of the type box, and raise that side up and to the left until the type-box unhooks on the left side and can be freed from the type-box carriage.
3. Turn the type box over to the side with type (see figure 5-6) and clean with a dry, hard bristle brush. **DO NOT USE ANY TYPE OF CLEANING SOLUTION.**
4. To replace the type-box, hold it with the type toward the platen and the large hook on the left.
5. Slip this hook under the stud in front of the left type-box roller, and push the smaller hook on the right side down into place on the stud in front of the right type-box roller.
6. Hold the type-box latch in a horizontal position and move to the left over the latching notch as far as it will go.

7. Raise the latch to the vertical position, and press to the left until it locks into the latching notch.
8. Check to see that the ribbon is still properly threaded.

#### OPERATING THE AN/UGC-49

Power to the AN/UGC-49 is applied by a switch located on the front of the cabinet, slightly below and to the right of the keyboard. Turning the switch to its upper position, "ON", fully conditions the teletypewriter for on-line service in one of the three modes of operation determined by the selector switch at the left of the keyboard. If the auxiliary typing reperforator is not required, the auxiliary power switch can be turned to the "OFF" position.

**KEYBOARD MODE OF OPERATION.**—To transmit a message directly to the line as it is typed, rotate the SELECTOR switch to the K position. The usual procedure in transmitting is to depress the SEND key to unlock the local keyboard. Transmit five spaces, two carriage returns and a line feed (in that order) to align the sending machine, and start typing the message. The typing unit monitors the transmission, providing a printed copy of the message.

In the keyboard mode of operation, the typing reperforator is mechanically isolated from the keyboard, and the character-counter mechanism does not function. The transmitter distributor circuits are also inoperable.

**KEYBOARD-TAPE MODE OF OPERATION.**—Keyboard operation in the keyboard-tape (K-T) mode is the same as when in the keyboard mode, except that typed, reperforated tape is *simultaneously prepared*. The character counter is not operative in the K-T mode, but the operator can use the monitored pageprinted copy as a position indicator under those circumstances. The transmitter distributor can also be operated in this mode.

**TAPE MODE OF OPERATION.**—When the selector switch is in the T position, the keyboard and reperforator are isolated from the other units. This mode of operation permits the

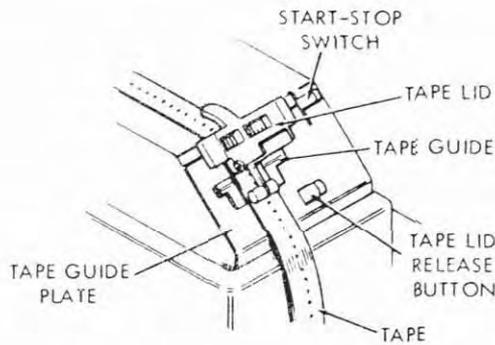
operator to prepare tape for transmission while transmitting messages via the transmitter distributor or while receiving messages on the printer. No page copy is typed in this mode.

When preparing chadless tape, the printed character occurs six units after the point at which the five-level code for the character is punched into the tape by the reperforator. No page copy is typed in the tape mode, so the character counter automatically illuminates the end-of-line indicator lamp to regulate the length of the line. The character counter registers each spacing character. Non-printing functions, such as FIGS, LTRS, LF, and CAR RET are not registered.

**USING THE TRANSMITTER DISTRIBUTOR.**—The transmitter distributor (commonly called the TD) is operable only in the K-T and T modes of operation, and then only when the SEND key is depressed. The TD is operated as follows: (Assume that the SELECTOR switch is in either the K-T or T position and that the SEND key is depressed.)

1. Move the start-stop lever to the center (OFF) position.
2. Release the tape lid by pressing the tape lid release button.
3. Place the tape guide in such a manner that its feed holes engage the feed wheel with the portion of the tape having two perforations toward the rear of the TD.
4. Insert the printed tape so that the printed, chad side is up. If non-typed chadless tape is used, position the tape so that the open side of the hinged chads is on the top. Reversing the tape results in a garbled transmission.
5. While holding the tape firmly in place on the feed wheel, press down on the tape retaining lid until its latch is caught.
6. Move the start-stop lever to the left (FREEWHEELING) position and manually adjust the tape so that the first character to be transmitted is located over the sensing pins. Figure 5-15 shows the path of the tape through the TD.

Another feature of the TD is the end-of-tape switch. The switch is controlled by a pin protruding through the tape guide plate. As long as this is depressed by tape feeding through the



1.210

Figure 5-15.—Path of tape in transmitter distributor.

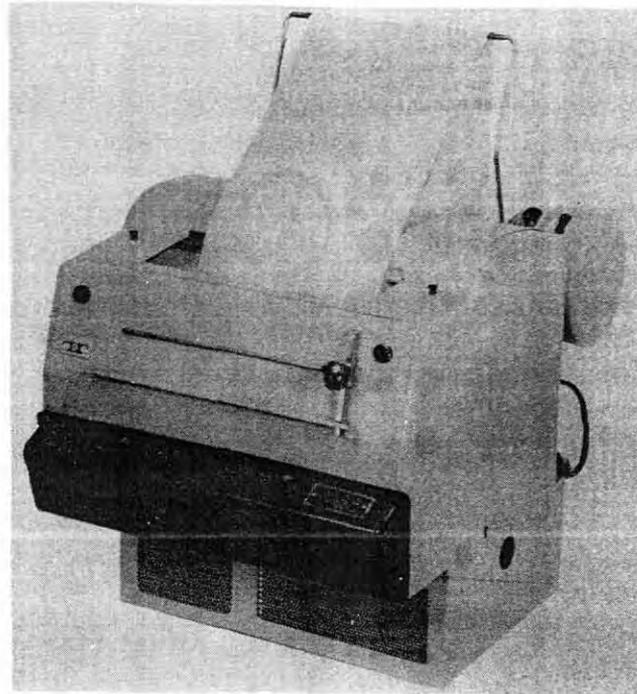
guide, the TD is operable. When the end of the tape passes over the pin, the pin rises and the TD stops transmission automatically. Should the tape be torn on the bottom edge, the tape-out pin also raises, and stops the transmission. For this reason tapes should be handled carefully.

#### RECEIVE-ONLY (RO) TELETYPEWRITER SET AN/UGC-50

The AN/UGC-50 (figure 5-16) is housed in a cabinet for rack mounting. It is similar to the keyboard send-receive (KSR) teletypewriter set, except that parts required for transmitting messages are not provided. Therefore, only typewritten pageprint messages can be received. In contrast to the number of functions that can be performed by a sending and receiving teletypewriter, only two off-line functions can be performed by the AN/UGC-50. These non-typing functions (Carriage Return and Line Feed) are provided so that they can be operated locally when required.

#### KEYBOARD SEND-RECEIVE (KSR) TELETYPEWRITER SET AN/UGC-51

The KSR teletypewriter set will receive messages electrically from the telegraph channel and print them on page-size copy paper. It will electrically transmit on the channel messages which are originated by keyboard operation and monitor the message on page-size copy paper.



31.140

Figure 5-16.—Receive Only (RO) teletypewriter set AN/UGC-50.

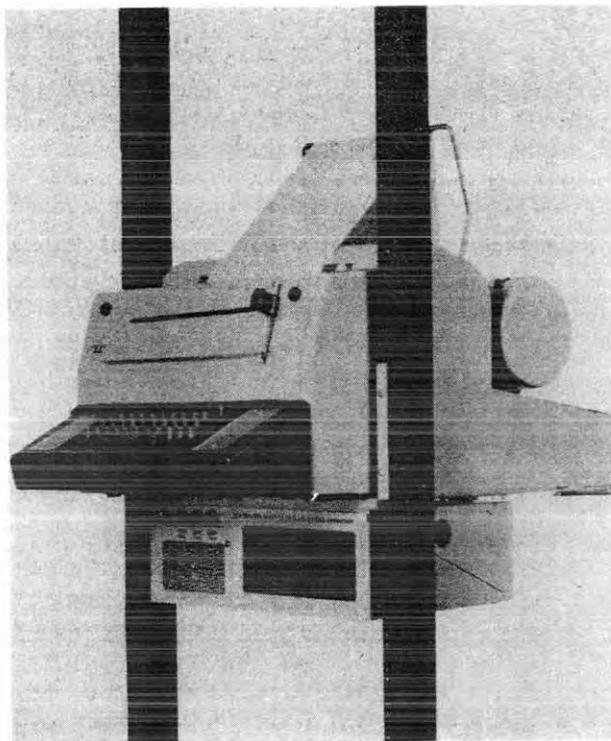
The KSR contained in a cabinet for rack mounting as illustrated in figure 5-17 is nomenclatured AN/UGC-51. When the KSR is contained in a floor-type console (figure 5-18), it is designated TT-471/UG.

#### TT-470/UG TELETYPEWRITER

The TT-470/UG is a modified Model 28 Receive-Only teletypewriter designed for use with the AN/GSQ-76 DATA ACQUISITION SYSTEM (TEBO) (U). The controls, functions and operating procedures for the TT-470/UG will be discussed in the AN/GSQ-76 DATA ACQUISITION SYSTEM (U) training publication.

#### TT-471/UG TELETYPEWRITER

As previously stated, the TT-471/UG is a floor mounted KSR teletypewriter. It too, is designed for use with the AN/GSQ-76 DATA



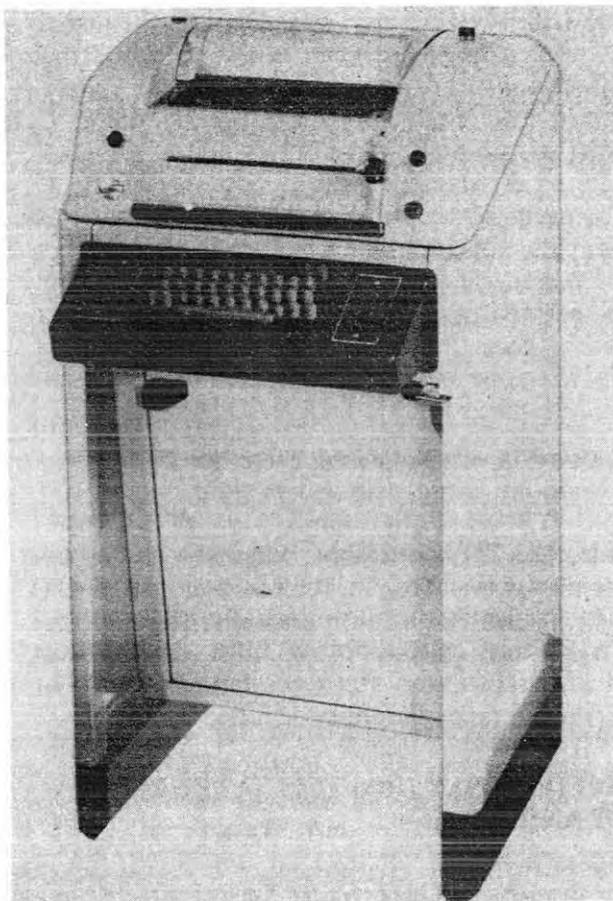
31.139

Figure 5-17.—Keyboard Send-Receive (KSR) teletypewriter set AN/UGC-51.

ACQUISITION SYSTEM (U) and will be discussed in the AN/GSQ-76 DATA ACQUISITION SYSTEM (U) training publication.

#### MODEL 40 TELETYPEWRITER EQUIPMENT

The Model 40 line of data terminals provide advanced facilities for entering, storing, displaying, editing, printing, sending, and receiving data in communications systems. Significant features of Model 40 terminals are: high speed, easy data preparation and editing, modular design, modern and versatile styling, quiet operation, and low maintenance. The Model 40 is intended to replace most of the Model 28 telecommunication equipments described earlier in this chapter.



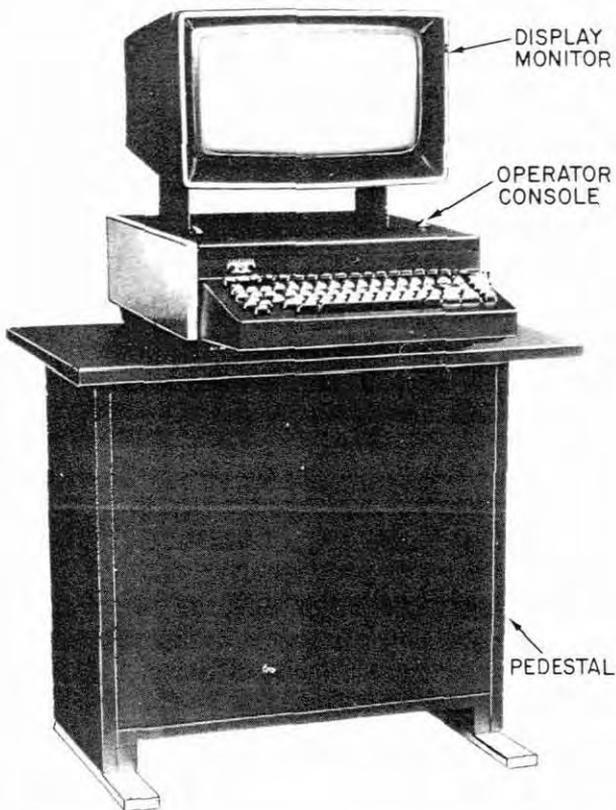
1.217.48

Figure 5-18.—Teletypewriter TT-471/UG.

#### KEYBOARD DISPLAY AND KEYBOARD DISPLAY PRINTER

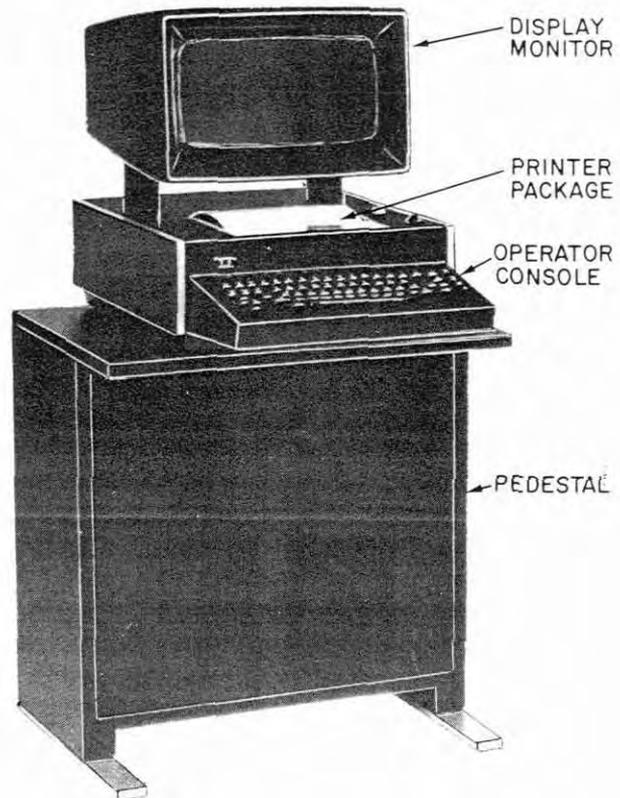
The Model 40 Keyboard Display (KD) displays messages on a monitor that has a screen similar to a television set (see figure 5-19). When a message is typed locally on the keyboard, it is displayed on the screen. The message can be corrected locally by using the editing controls (discussed later) prior to transmission. Received messages are also displayed.

The Model 40 Keyboard Display Printer (KDP) is similar to the KD with the addition of a page printer. The KDP consists of the keyboard, display unit, and page printer. The KDP pedestal configuration is shown in figure 5-20 with the printer located under the display



31.152

Figure 5-19.—Model 40 Keyboard Display (KD).



31.153

Figure 5-20.—Model 40 Keyboard Display Printer (KDP) pedestal mounted.

monitor. As you can see from the accompanying illustration (figure 5-21), the KDP is also configured as a table-top model with the printer adjacent to the keyboard and display monitor. With the KDP table-top model, the printer may be located up to 50 feet from the unit.

The Model 40 KD and KDP contain a storage unit that "remembers" all characters and control functions indicated on the screen. Any errors shown on the screen can be corrected locally so that when the corrected message is displayed it can be transmitted error free.

The Model 40 Receive Only (figure 5-22) receives messages on a hard copy page printer and has its own set of operational controls.

#### Local Operation (KD & KDP)

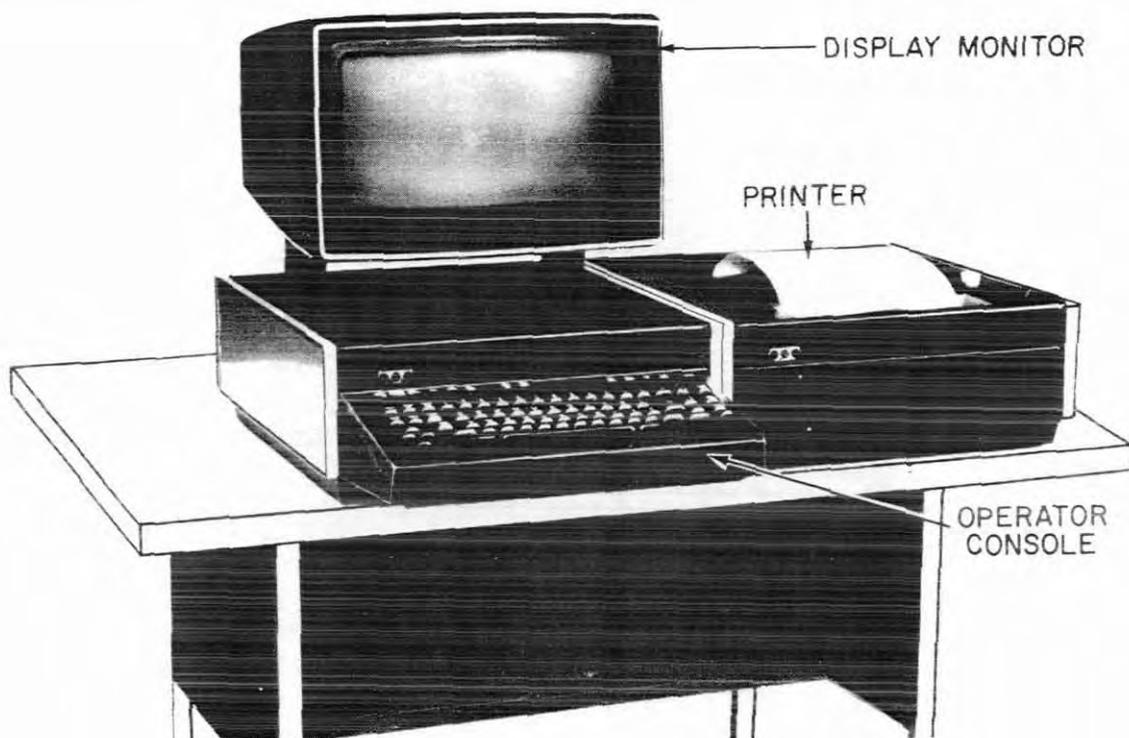
Power to the Model KD and KDP is applied by switches located on the printer or electronic

package cabinet, the pedestal, and the display monitor as illustrated in figure 5-23. Power to the display monitor may be turned off (KDP only) when the set is in the RECEIVE condition or if the PRINT ON LINE is selected to receive page copy. The keyboard is inoperative when the power to the display monitor is turned off.

The brightness control increases and decreases intensity of the displayed characters. Each character is formed on a 7 x 9 dot matrix (figure 5-24), and is displayed on a flicker-free anti-glare screen. The unique tube-tilt control allows the operator to adjust the display viewing angle for maximum clarity.

#### CURSOR

The cursor is a light, rectangular area on the screen that indicates where the next character



31.154

Figure 5-21.—Keyboard Display Printer (KDP) table mounted.

will be displayed or where the next function will appear. The cursor is always on the screen when the monitor is ON. If the display monitor power is turned on, (and after a slight delay) the cursor and No. 1 segment marker should appear as shown in figure 5-25.)

When main power to the set and logic printer is first turned on, the cursor may not be in the home position or random characters may be displayed on the screen. This is caused by power variations when the power to the entire set is turned on. Depressing the HOME and CLEAR keys will clear the display screen and home the cursor.

#### OPERATOR CONSOLE

In addition to the standard keyboard arrangement, there are several control keys unique to the Model 40. Figure 5-26 is an illustration of the Model 40 operator console. Data entry keys, data editing keys, and data

communication keys are clearly separate from one another for ease and efficiency of operator use. The discussion that follows explains and illustrates the various features of the operator console by Operational Mode controls, editing controls, and the keyboard.

#### Operational Mode Controls

The Operational Mode Controls, (top row of keys), normally light when depressed and indicate the operational mode of the terminal. The keyboard and editing controls will not operate on the SEND or RECEIVE mode. The function control keys are as follows:

- a. SEND—Puts terminal in the send mode and sends all data in display memory to the line.
- b. REC—Puts terminal in the receive mode and permits it to receive data from the line.
- c. LOCAL—Puts terminal in the local mode and permits data to be entered.

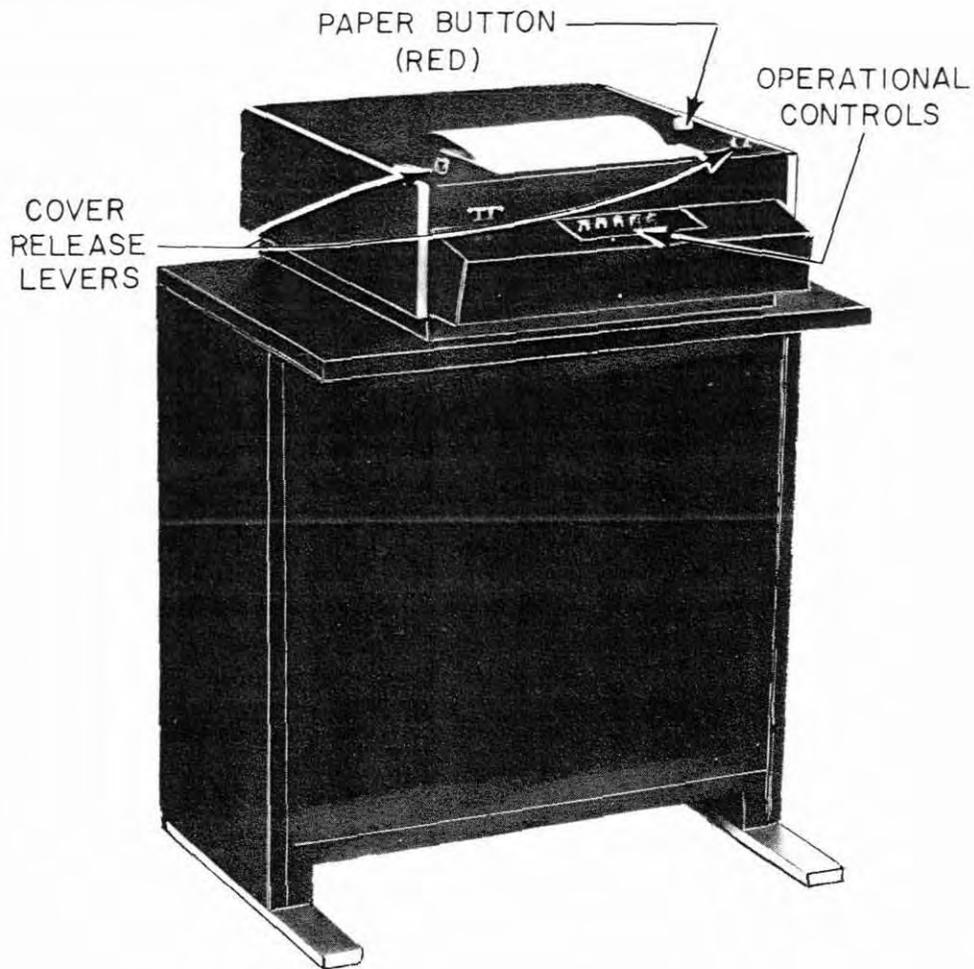


Figure 5-22.—Model 40 Receive Only (RO) printer.

31.155

d. S/R (Send/Receive)—Puts terminal in the conversational mode and permits conversational communication to take place.

e. INTRPT—Stops transmission from remote device by sending interrupt signal.

f. FORM SEND—Overrides the send options associated with the SEND key and causes all data to be sent as displayed when the SEND key is depressed.

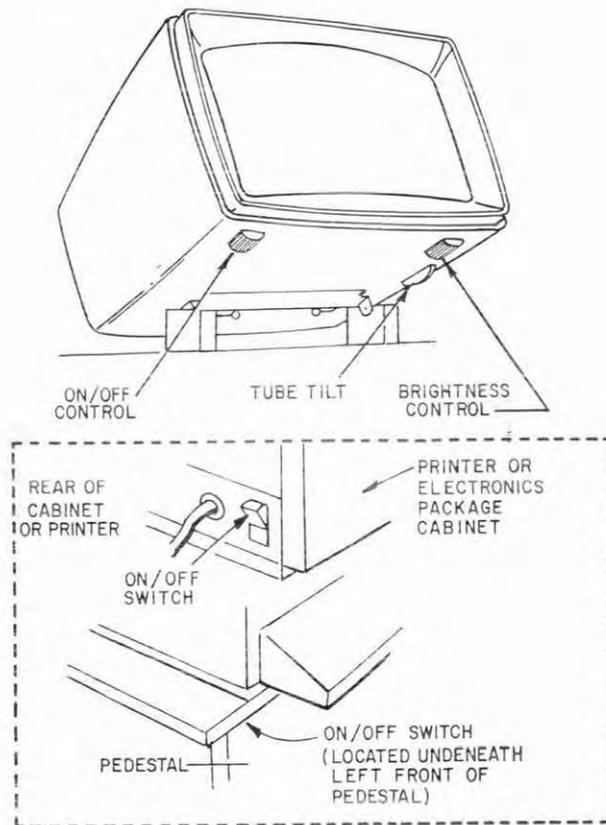
g. PRINT ON-LINE—Puts terminal in receive mode, unless SEND key was depressed, and permits terminal to receive data on the printer and display module, unless the display module is turned OFF. Data is displayed from the cursor location to the end of display

memory if display is ON. If SEND was depressed, PRINT ON-LINE causes sent data to be printed as sent, according to send option.

h. PRINT LOCAL—Causes printer to print all data in display memory, regardless of send option.

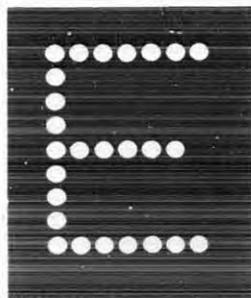
i. HIGHLIGHT—Causes characters that follow to be displayed as flashing characters.

j. FORM ENTER—Puts terminal in projected data mode during which all data entered will be displayed as protected data. Operation of the CLEAR key will clear protected and unprotected data from memory, and operation of the editing keys will effect both protected and unprotected data.



31.156

Figure 5-23.—Model 40 power and control switch.

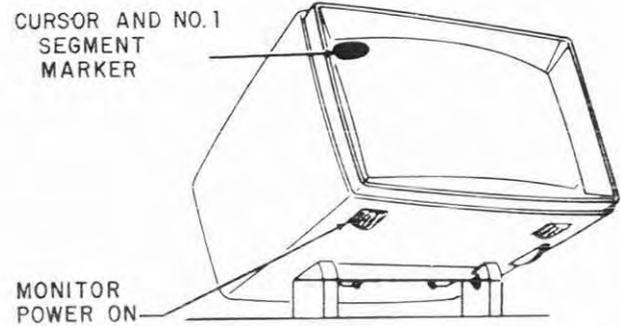


31.157

Figure 5-24.—Character formed on a 7 X 9 dot matrix.

k. TAB SET—Sets tab stops at cursor location, on that line and all lines below, to end of display memory.

l. TAB CLEAR—Clears all tab stops from the cursor location to the end of the line, on



31.158

Figure 5-25.—Cursor on display monitor.

that line and all lines below, to the end of display memory.

m. CLEAR—Clears all unprotected data from the cursor location to the end of the display memory. To clear all data from the cursor location to the end of the display memory, whether protected or unprotected, depress the FORM ENTER and then the CLEAR keys.

Use of the above keys in message preparation and operation will be discussed later in this chapter.

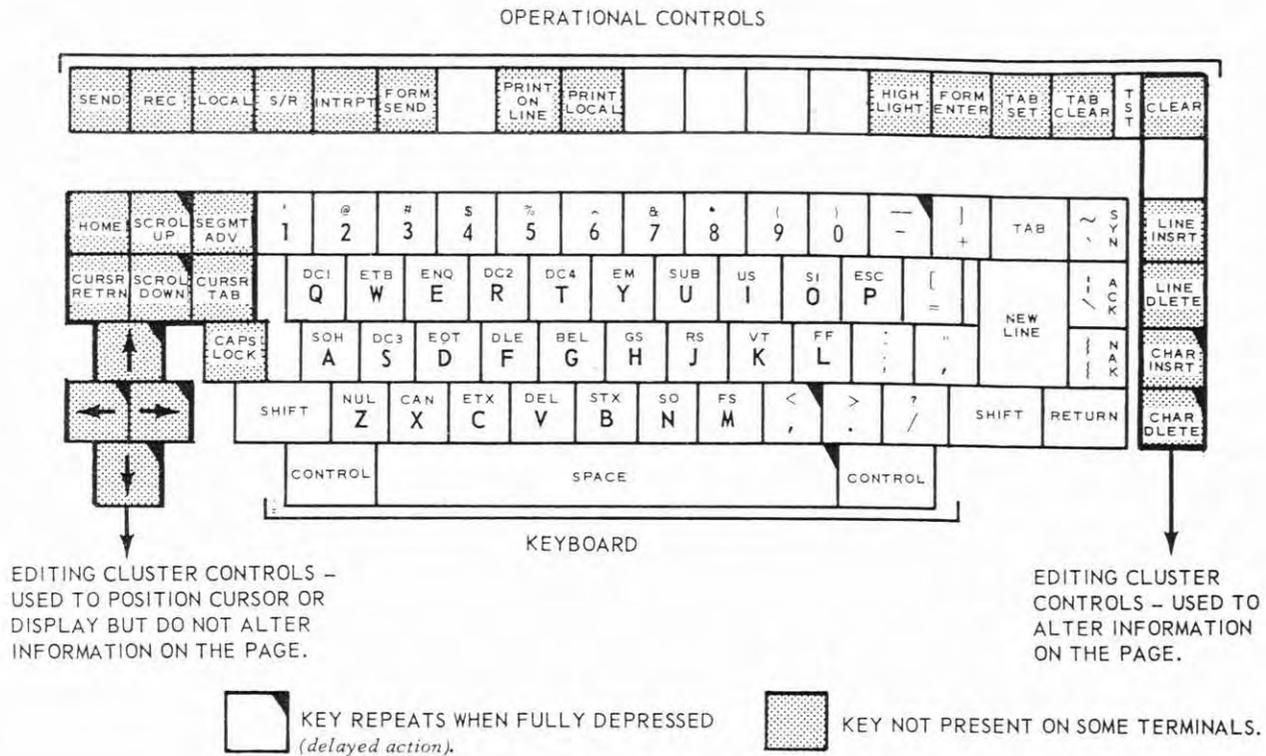
### Left-Hand Editing Controls

These keys position cursor or displayed data, but do not alter information on the page. Additionally, the left-hand editing controls operate only in the local mode. Figure 5-27 illustrates the various positions of the cursor and scroll as a result of depressing one of the left-hand editing controls. The left-hand editing controls are defined below: (Refer to figure 5-27 to identify the action performed by each key.)

a. HOME—Causes first segment to be displayed and moves cursor to start of first line.

b. CURSR RETRN—Moves cursor to start of line.

c. Up arrow, left arrow, right arrow, and down arrow (Repeatable)—Moves cursor up, left, right, and down, respectively.



31.159

Figure 5-26.—Model 40 operator console.

d. SCROL UP AND SCROL DOWN (Repeatable)—Moves displayed data up and down, respectively.

e. SEGMT ADV—Removes the 24 lines being displayed, and displays the next whole 24-line segment. A page may consist of 1, 2, or 3 segments of 24 lines each. The three segments contain a total of 72 lines; each line contains a maximum of 80 characters.

f. CURSR TAB—Moves cursor to the first tab stop on the right, to the start of the next line, or to the first unprotected character following protected data, whichever comes first.

#### Right-Hand Editing Controls

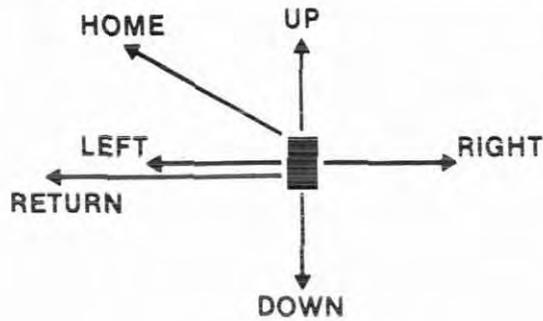
Operation of these keys can be affected when protected data or tab marks are present. These keys alter information on the page and

operate only in the local mode. The right-hand editing controls are defined as follows:

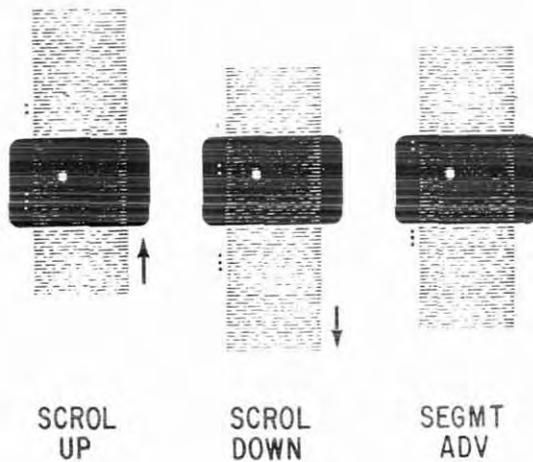
a. LINE INSRT—Moves unprotected data down one line so that there is a line of space on the line the cursor is on. This does not occur if there are no lines of space at the end of the display memory or if there are no lines of space above the first line below having protected data in it.

b. LINE DLETE—Clears unprotected data from the line when the cursor is on, and moves all unprotected data displayed below up one line.

c. CHAR INSRT (Repeatable)—Moves unprotected data one character to the right so that there is a character of space at the cursor location. This does not occur if there are no character spaces ahead of the first protected character or the first tab stop displayed on the right.



CURSOR POSITIONS



SCROLL POSITIONS

31.160

Figure 5-27.—Left-hand editing controls.

d. CHAR DLETE (Repeatable)—Clears unprotected character at the cursor location and moves all unprotected data displayed on the right one character position to the left.

**Keyboard**

Figure 5-28 shows the remainder of the operator console which resembles a standard keyboard arrangement. Depressing a key by itself generates the character marked on the lower half, or the control marked in the center. Depressing a key with the SHIFT key generates the uppercase equivalent of the character

marked on the lower half, or the character marked on the top half of the key. Depressing a key with the CONTROL key generates the control marked on the key. (The uppercase-control characters are not normally used by collection operators; therefore, they will not be explained in this publication.)

**PRINTER OPERATION**

The page printer, figure 5-29, provides a hard copy of messages originated locally or messages that are transmitted or received on-line. Two of the Operational Mode Control keys located just above the keyboard, control the operation of the page printer. They are the PRINT LOCAL and PRINT ON-LINE keys.

Depressing the PRINT LOCAL (lamp lights; SEND lamp will also light) will provide a printed copy of data on the display from the cursor position. The cursor will move through the display to the message ending character.

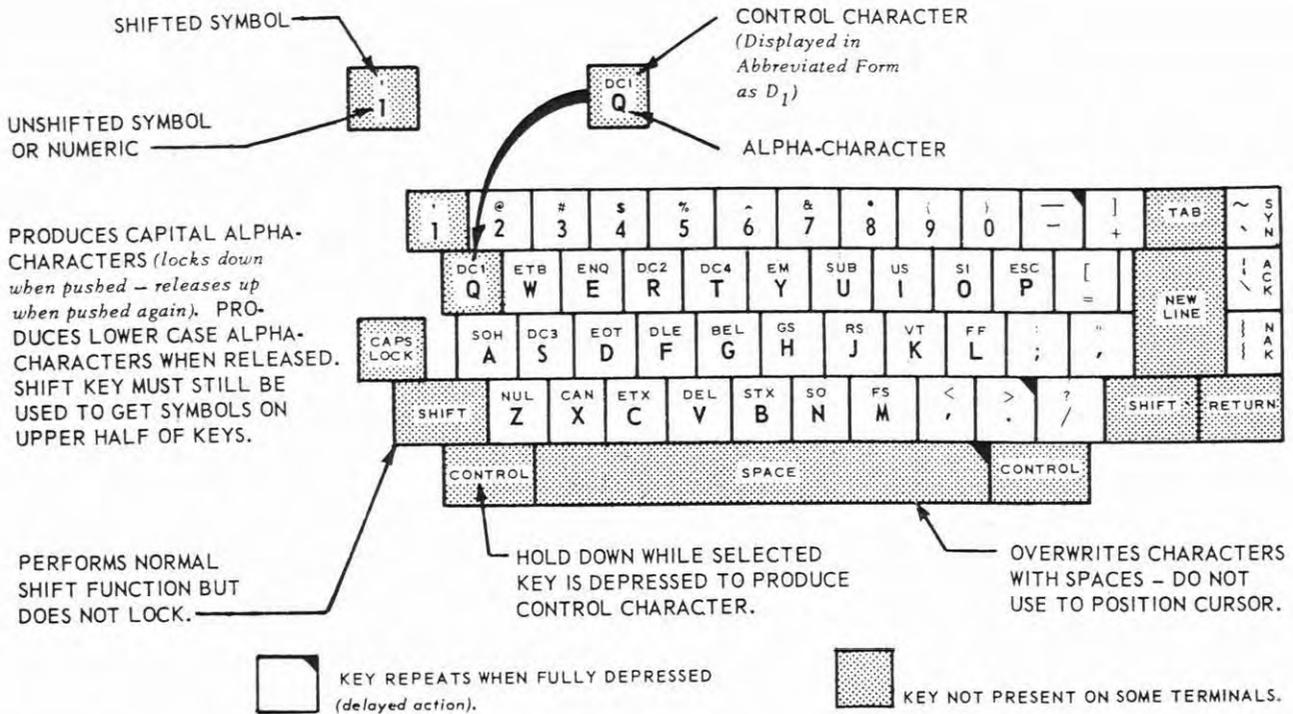
The PRINT ON-LINE, when depressed (lights), will provide a printed copy of any data transmitted or received on-line. It will light until depressed again.

The button located on top of the printer is the PAPER button and is red in color. When depressed, paper in the page printer advances. Paper feed-out will be continuous until the button is released. The PAPER button lights when an out-of-paper condition exists and extinguishes whenever the paper supply is replenished.

The 40 printer module prints characters by means of individual type pallets in an endless revolving carrier belt (see figure 5-30). With this method, high speed operation is gained without losing the character clarity and changeability advantages of an impact typebox printer.

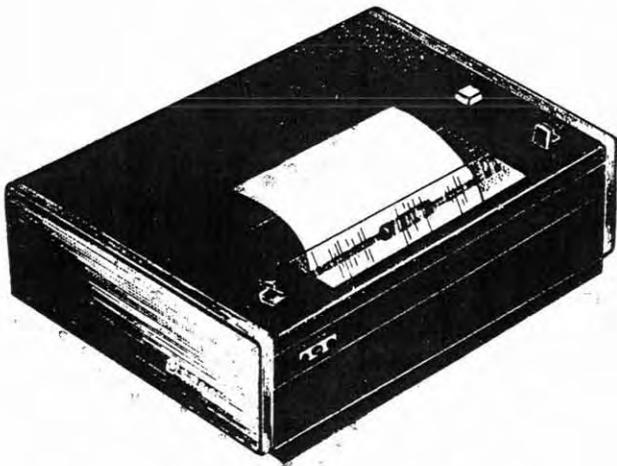
**RECEIVE ONLY PAGE PRINTER OPERATION**

The Receive Only Page Printer, figure 5-31, provides a hardcopy of messages received on-line. The Receive Only printer has its own set



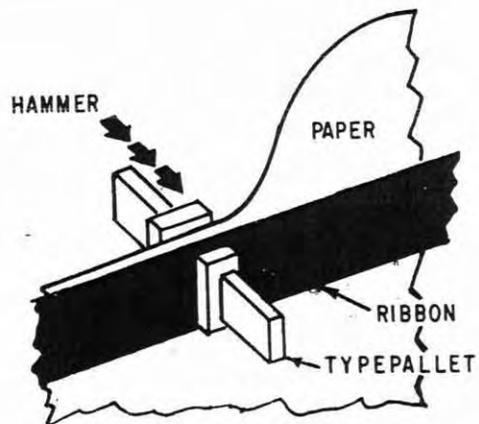
31.161

Figure 5-28.—Model 40 keyboard.



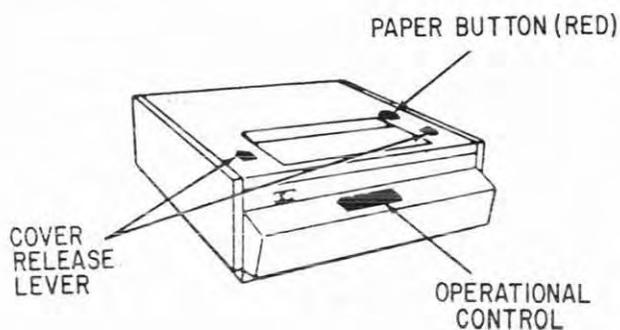
31.162

Figure 5-29.—Model 40 page printer.



31.163

Figure 5-30.—Individual typepallet and hammer.



31.164

Figure 5-31.—Model 40 receive only page printer.

of operational controls and are defined as follows:

- a. INTRPT—Sends reverse channel signal to halt remote sender, should reception become garbled or unwanted.
- b. TRANS START—Sends a discrete calling code to remote device when the terminal is on-line. When the terminal is off-line, test data is generated.
- c. IN SERVICE—Terminal is ready to receive, i.e., power is on, no low paper supply, etc.

The Receive Only printer terminal has a test data generator. With this feature, the operator can push a button and generate a sequence of characters which will test the terminal for proper operation.

The printer normally prints six lines to the inch but can be selected to print three lines to the inch by moving the single/double line feed lever (located under the printer cover) from 1 to 2.

#### PREPARING DATA

Depress the LOCAL pushbutton. Its illumination tells you that you are in the off-line or local mode, and are ready to enter data from the console and display it on the screen.

Operate the tilt control to remove any glare from nearby lighting, and the brightness control to make the cursor clearly visible and easy on the eyes.

If the cursor is not already at the start of the first line of the first display segment, depress the HOME key. There will be a dot to the left of the first line, telling you that segment number one is being displayed. Were you to depress the SEGMENT ADV key, the display would shift from the first segment, to the second, to the third, and back to the first—and cause the number of dots to go from one, to two, to three, and back to one. These dots permit you to rapidly recognize which segment of the display memory is being displayed.

Now enter characters from the keyboard, located in the center of the console, operating it as you would a normal typewriter. Operate the SHIFT key to generate capital letters and shift-position characters. Operate the CONTROL key to generate the controls that appear on the keys that are marked with a character. Note that frequently used controls are on keys by themselves, and don't require use of the CONTROL key.

If you will not be generating lower case letters, depress and lock down the CAPS LOCK key. This permits you to generate capital letters without having to operate the SHIFT key, and also without having to unlock the CAPS LOCK key in order to generate numbers and other unshifted characters. This is a feature that is advantageous over standard typewriter operation.

As you enter each line of data from the keyboard, you should hear the audible tone which sounds once as you near the end of the line, and again at the end of the line each time you attempt to put more than 80 characters on a line. It serves as a reminder to go to a new line, by depressing the NEW LINE (NL) key.

**THE QUICK BROWN FOX ≡**

Should you remove the ≡ (NEW LINE symbol) in the course of editing the displayed data, and forget to replace it, this does not mean that you will fail to send the required new line code at the end of the line. When the display memory is read-out on-line, spaces will be automatically sent following the last displayed character until 80 characters have been sent, at which point the control NL will be automatically generated.

This also means that you can enter and display up to 80 characters on each line not counting new line ( $\equiv$ ), since the new line code will be automatically generated following the 80th character.

If, as you enter and display data, you happen to enter a wrong character, simply position the cursor over the character by operating the four arrow keys, which moves the cursor in the directions indicated by the arrows. Then enter the correct character. It will replace the incorrect one.

before: THE QU $\square$ ACK BR $\square$ WN

after: THE QU $\square$ ICK BR $\square$ WN

If you notice a character missing from the data you entered, again operate the arrow keys, except this time position the cursor over the character following the missing character. Then depress the CHAR INSERT key. The character the cursor is on and all characters to the right will move one character to the right, to make room at the cursor location for the missing character. Then enter the missing character.

before: THE QU $\square$ CK BR $\square$ WN

during: THE QU $\square$ ICK BR $\square$ WN

after: THE QU $\square$ ICK BR $\square$ WN

If several characters are missing, you can cause the CHAR INSRT key to repeat, by pressing down on it a little harder than normal. Don't worry about pushing characters off the screen. When the character furthest to the right reaches the 80th position it prevents further character inserts from occurring.

THE QU $\square$ CK BR $\square$ WN

THE QU $\square$ ICK BR $\square$ WN

THE QU $\square$  CK BR $\square$ WN

THE QUI CK BR $\square$ WN

If you discover that you have an unwanted character in the data you have entered, position the cursor over the unwanted character and depress the CHAR DELETE key. The unwanted character will be deleted and all characters following it will move one character to the left. If several characters in a row are unwanted, you can repeat the CHAR DELETE key by pressing down harder than normal.

before: THE QU $\square$ ICK BR $\square$ WN

after: THE QU $\square$ ICK BR $\square$ WN

Should you discover a missing line of data, this too can be easily remedied. Operate the arrow keys until the cursor is anywhere on the missing line and depress the LINE INSRT key. The line of data the cursor is on and all lines below will move down one line to make room for the missing line. Also, the cursor will move to the start of the line, ready for you to enter the line of missing data.

before: THE QUICK BROWN  
THE  $\square$ LAZY DOG'S

during: THE QUICK BROWN  
 $\square$   
THE LAZY DOG'S

after: THE QUICK BROWN  
FOX JUMPED OVER  $\square$   
THE LAZY DOG'S

If several lines are missing, operate the LINE INSRT once for each line missing. Don't worry about pushing data below the bottom of the memory. When the last displayed line reaches the last line of display memory it prevents further line inserts from occurring.

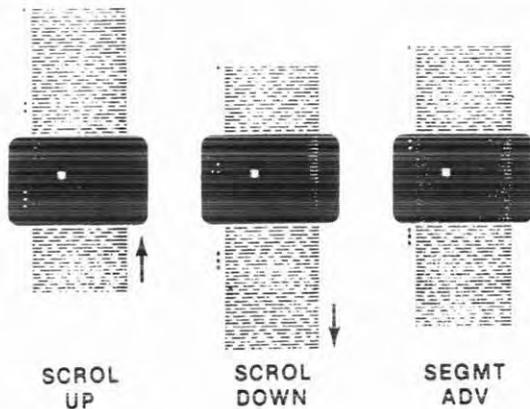
If you have an unwanted line of data, position the cursor anywhere on the line and depress the LINE DELETE key. That line will be deleted, and all lines of data below it will move up one line.

As you enter additional lines of data, you will eventually reach the bottom of the screen.

Notice that as you conclude the bottom line on the screen by operating the NEW LINE key, the top line on the screen disappears and all lines on the screen move up one line, to permit another line to be added at the bottom of the screen.

This does not mean that the line of data that was on the top line of the screen is lost. It, along with all displayed data, is saved in display memory. You may depress the SCROL UP and SCROL DOWN keys at any time and view any 24 consecutive lines of data stored in memory. SCROL DOWN brings down lines which disappear from the top of the screen, and SCROL UP brings up lines which disappear from the bottom of the screen. Both are repeatable keys, for rapid positioning of the displayed data.

Also, the SEGMENT ADV key can be used for rapid positioning of data. Depression of that key causes the next whole segment to be displayed, no matter which portion of the memory was being displayed.

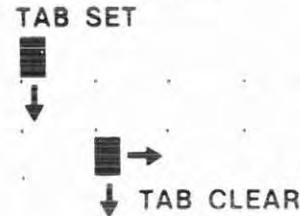


As you enter data, you may wish to highlight certain portions, for ready reference. To do this, merely depress the HIGHLIGHT key prior to entering those characters you wish highlighted, and repress the key to cease highlighting. Characters already highlighting will continue to flash on the screen from full to half intensity, but characters entered after that will be displayed normally.

#### PREPARING TABULAR DATA

The 40 is also suited to the entry of data having tabular format. Tab stops can be set and

cleared by use of the TAB SET and TAB CLEAR keys. Simply move the cursor to the desired tab stop location and depress the TAB SET key. You will set a tab stop at that point on that line and on all lines below to the end of memory, as evidenced by the display of a small dot at all tab set locations.



To clear tab stop, position the cursor and depress the TAB CLEAR key. The tab stop at the cursor location and all tab stops to the right and below will be cleared. Tab stops to the left of the cursor location, and below, will remain, as will all tab stops above the line the cursor is on. By a combination of setting and clearing, tab stops can be set at different locations on each succeeding line.

Once all tab settings have been made, each depression of the CURSOR TAB keys moves the cursor to the next tab setting on the right. If there is no tab setting on the right, it moves the cursor to the start of the next line. In this manner, the tabular data can be quickly and easily entered, using only the CURSOR TAB key and the keyboard.

#### PROTECTED DATA

Protected data is just that. It cannot be replaced or edited without first depressing the FORM ENTER key. Therefore, as you enter or edit unprotected data with protected data already displayed, there will be times when the editing controls will not obey their functions. For example, when you attempt to insert another unprotected character between protected characters, the CHAR INSRT key will not obey its function if there are no more unprotected spaces left between the protected characters.

A similar insertion situation occurs when inserting an unprotected line between lines having protected data in them. The LINE

INSERT key will not obey its function if there are no more lines with only unprotected data in them left in between the lines having protected data in them.

Protected data also affects results obtained by use of either the CURSR TAB or by generation of the control HT (Horizontal Tab). The cursor moves to the first tab stop on the right (after displaying the symbol → in the case of HT), or to the first unprotected character (space is a character) following protected data, whichever comes first.

With regard to protected and unprotected spaces, they look alike on the screen until covered by the cursor, which will display at half intensity when covering a protected space, or

until the brightness control is turned up high enough to show a contrast between protected and unprotected spaces.

#### AUDIBLE TONE

An audible tone sounds to alert the operator to any of the following conditions:

- a. Nearing the end of a line.
- b. At the end of a line.
- c. Attempting to replace protected data with unprotected data.
- d. Attempting to follow new line with data.
- e. Attempting to insert characters or lines where there is no room.