

**TELETYPEWRITER
OPERATING PROCEDURES
NO. 2B ELECTRONIC SWITCHING SYSTEM**

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5. Typical Model 43 TTY Keyboard Layout, Operational Controls, and Status Indicators	8	1.01 This section provides a description of the operation of the teletypewriters (TTYs) that are provided with the No. 2B Electronic Switching System (ESS). The TTYs used in these systems are the Model 35 Automatic Send-Receive TTY Set (ASR), the Model 35 Key Send-Receive TTY (KSR), and the Model 43 Key Send-Receive TTY (KSR) manufactured by the Teletype Corporation, 5555 Touhy Avenue, Skokie, Illinois.	
6. Installing Paper—Model 43 TTY	11	1.02 This section is reissued to include the Model 43 KSR TTY. Since this reissue is a general revision, no revision arrows have been used to denote significant changes.	
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NOTICE
Not for use or disclosure outside the
Bell System except under written agreement

1.03 The TTYs are the primary means of man-machine interface. Operating personnel, by typing input messages per the Input Message Manual (IM-2H200) can command and interrogate the system. The system will respond to the input message and report the result of the action via an output message on the TTY. Output messages are defined in the Output Message Manual (OM-2H200). The TTYs may be operated manually, or they will operate automatically in response to signals from the 3A central control (3A CC) or other TTYs.

1.04 The man-machine interface areas of the TTYs will vary depending on the type of service for which the set is designed. The TTY that is mounted in the Maintenance Center Frame (Fig. 1) is a Model 35 KSR and is equipped only with a keyboard and a page printer; whereas TTYs that are located remotely can be optionally equipped with a keyboard, a page printer, a tape punch, a tape reader, and a mode switching control panel. The control panel configuration will vary depending upon the needs of the office.

1.05 Six TTY channels are used in the No. 2B ESS. (Reference should be made to Section 232-003-101 for TTY descriptive information.) The first channel is the basic communication link between operating personnel and the system; it is designated the maintenance TTY channel. Six other channels are provided for use in a variety of administrative tasks such as traffic control or service order work. Channels 2 through 7 each have one control circuit which serves as a buffer and a conversion unit between the TTY and the system. For procedural purposes, on channels 2 through 7, the words control circuit and channel are synonymous. If a control circuit is removed from service, the channel is removed from service. The maintenance channel, due to operational requirements, uses two control circuits; therefore, if a control circuit is taken out of service, the channel is still operational. One maintenance channel control circuit will communicate with the maintenance TTYs while the other is in a standby state. The status of either one is determined by program control.

1.06 Each channel may be equipped with one or more (the maintenance channel requires two) standard send and receive 4-row TTY machines which operate at a speed of 100 words per minute. Either the 35- or 43-type TTY devices are used in the No. 2B ESS. Certain TTY channels may also be equipped with a paper tape punch or reader. There

are also call store memory areas associated with each channel.

1.07 The following channels may be used in the No. 2B ESS. The maintenance channel is required. Channels 2 through 7 are each optional. If any channel is not equipped, its role is taken over by a designated backup channel.

(a) **Maintenance TTY:** The local maintenance (LM) TTY and the remote maintenance (RM) TTY are part of the maintenance channel and receive messages at the same time. The LM TTY is permanently mounted in the maintenance center frame while the RM TTY is located at some remote attended point. The maintenance channel uses both control circuits 0 and 1.

(b) **Traffic TTY:** This TTY reports the traffic data accumulated by the system as well as certain traffic overflow conditions. Input messages at the traffic TTY interrogate the system for the contents of specified traffic registers. The TTY is normally located at a traffic center. This TTY is located on channel 2.

(c) **Service Order TTY:** The service order TTY provides for input and output information relating to line translation data, line assignments, and verification of line station information. This TTY uses channel 3 and is located in the remote service center. The TTY can be used to produce a punched tape for subsequent transmission into the system.

(d) **Local Test Desk TTY:** The local test desk TTY provides an input and output for the automatic line insulation test program. Permanent signal reports and the numbers in the high and dry list are also printed on this TTY. This TTY is assigned to channel 4.

(e) **Trunk Test TTY:** The trunk test TTY provides input and output information for the trunk and the service circuit diagnostic programs when a second trunk test panel (TTP) is equipped in the office. This TTY is assigned to channel 5, but normally it is not used and the information is routed to the maintenance channel.

(f) **Spare Channels:** Channels 6 and 7 are not presently used. These are spare channels and may be assigned, if required, in the future by the generic program.

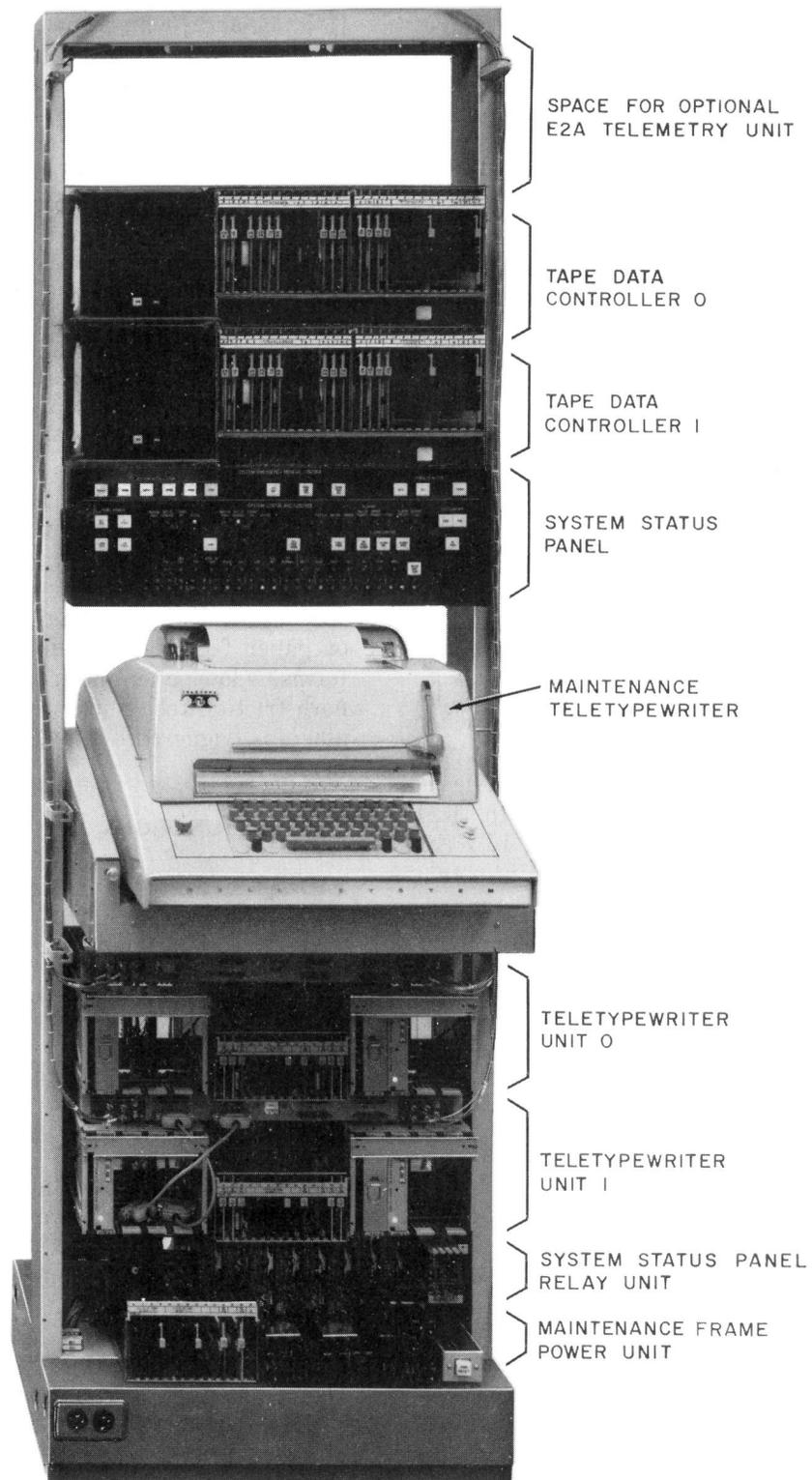


Fig. 1—Maintenance Center Frame With Model 35 LM TTY and TTY Control Logic

1.08 When TTYs are located at points remote from the central office, data sets at the local and at the remote points are used to convert the dc TTY signals to FM frequencies and vice versa for transmission purposes. The TTYs that operate with data sets are considered remote TTYs and those that operate without data sets are considered local TTYs.

1.09 Motor control is performed automatically on the Model 35 TTY by the program if the TTY device on the channel is equipped with an idle line control unit (none required on the Model 43 TTY). This unit responds to the first character received by turning on the TTY motor. The motor takes approximately 1 second to come up to speed. If the built-in detection test fails, a retry is made 1 second later. This delay gives the idle line control unit enough time to bring the motor up to speed. If a second detection fails, the channel is marked out of service.

1.10 Any TTY channel can be placed out of service by typing an input message. No input messages are accepted by the system and no output messages are sent out on an out-of-service TTY. A TTY channel is marked out of service, for example, when the TTY itself is disconnected for maintenance purposes. Messages intended for that channel will be re-routed to a backup channel or lost. Due to their parallel operation, the LM TTY or the RM TTY can be disconnected without marking the maintenance channel out of service. Whenever a maintenance channel control circuit transfer takes place, the idle control circuit is marked inactive. Messages for the maintenance channel will be routed to the active control circuit by program control. A TTY channel is restored to service by typing in a message to restore it from another TTY or by using the BREAK key on the out-of-service TTY.

2. MANUAL OPERATION

2.01 Keyboard—The keyboard has four rows of keys used for typing that are similar to a typewriter. Letters of the alphabet can be printed in either uppercase or lowercase characters on the Model 43 TTY. Only uppercase alpha characters are accepted on the No. 2B ESS. The CAPS LOCK key must be depressed when interfacing the Model 43 TTY with the No. 2B ESS. Letters of the alphabet can only be printed in uppercase characters on the Model 35 TTY. There are no fractional characters on the keyboard; therefore, fractions must be typed with an oblique line, for example, 1/2. The numerals, including 1, are

on the top row of keys. For typing symbols, such as [, %, @, and] which appear on the upper portion of the numeral keytops and certain letter keytops, the SHIFT key is held depressed while the desired key is operated. SHIFT keys are located on each side of the keyboard. They are nonlocking and are larger than other keys. Operation of the keys produces either a data transmission function or a control function.

2.02 The data transmission function is activated by typing characters. Each time a character is typed, an American Standard Code for Information Interchange (ASCII) character is generated. An ASCII character consists of 12 bits. There are eight data bits sandwiched between a start bit (bit 0) and a parity bit and two stop bits, (bits 9, 10, and 11), respectively. The typing unit receives data signals from the keyboard and prints the results of these signals on either fan-folded continuous business forms or continuous roll paper. There are two types of typing units, the friction type of paper feed (Fig. 2), and the sprocket type of paper feed (Fig. 3). The sprocket type of paper feed uses fan-folded continuous business forms. A low paper or paper out alarm is provided on both friction feed and sprocket feed machines. This alarm is triggered by the paper-handling equipment in the TTYs.

CONTROL FUNCTIONS

2.03 The control functions are activated by depressing the CTRL (control) key and, at the same time, a designated letter key. A diagram of the keyboard for the Model 35 TTY is shown in Fig. 4. A diagram of the keyboard for the Model 43 TTY is shown in Fig. 5. The CTRL key and the keys that have nonprinting functions have numbered callouts.

Model 35 TTY

2.04 The explanations of these functions for the Model 35 TTY are as follows:

- (1) ESC (Escape)—When this key is to be used, specific instructions will be given for its use.
- (2) CTRL—Hold this key depressed while you depress one of the keys explained in 3 through 6, 14, 15, 17 through 21, and 23, in order to activate the indicated function.
- (3) X ON—The CTRL Q key. This function, when punched in tape, starts the local transmitter which reads the tape.

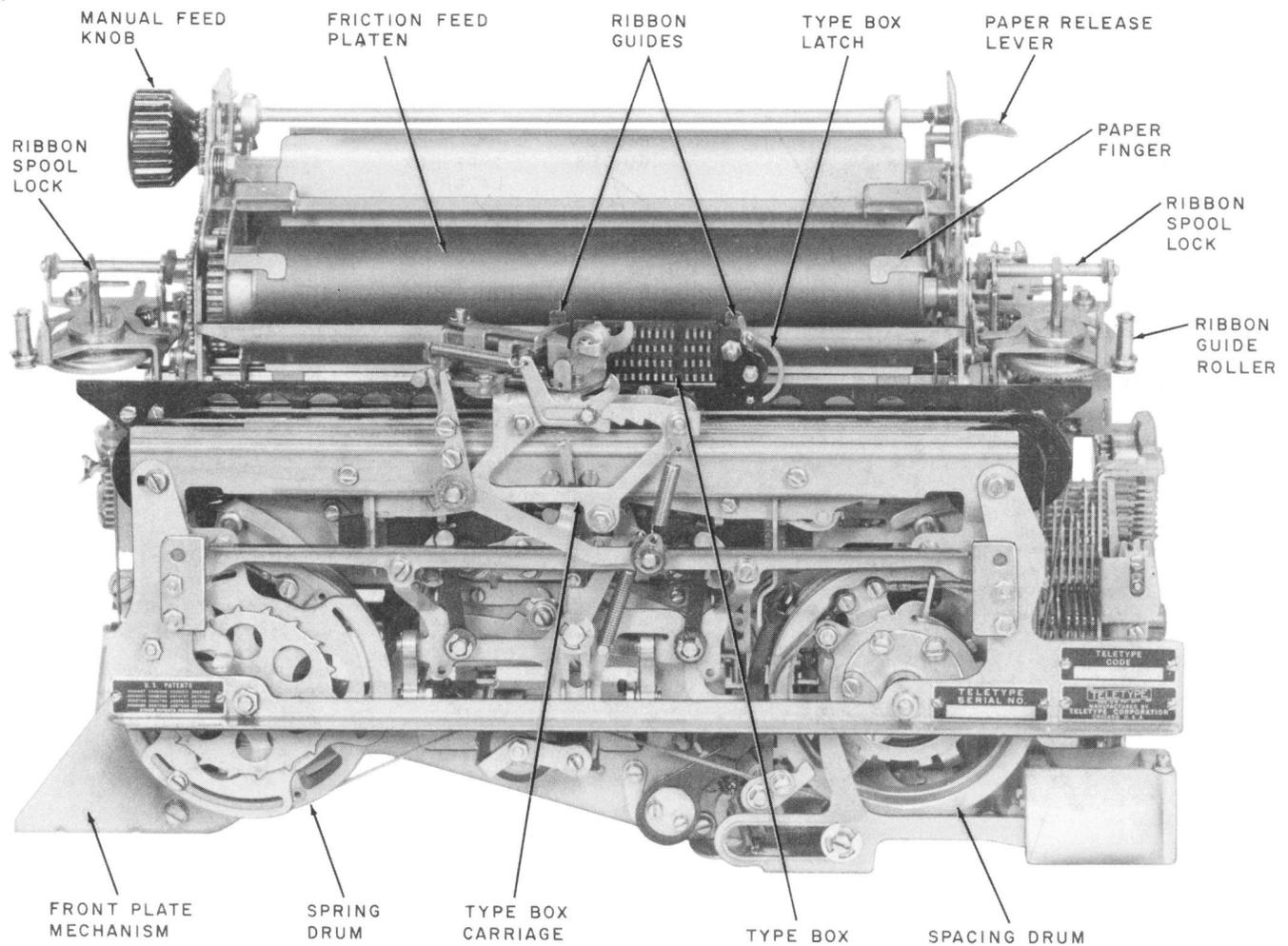


Fig. 2—Model 35 Friction Feed Typing Unit

(4) WRU—The CTRL E key. This function stands for “Who are you.” When this signal is sent and the receiving station is arranged with an automatic identification answer back, it responds by sending its individual answer back code. When the WRU inquiry is punched in tape, it should be preceded and followed by depressing the RUBOUT key. To send this inquiry, depress and hold the CTRL key while depressing the WRU key.

(5) TAPE—The CTRL R key. This function is used to turn on a page reperforator at a distant station. RUBOUT should be depressed once after each operation of this key.

(6) TAPE—The CTRL T key. This function is used

to turn off a tape reperforator at a distant station. RUBOUT is depressed once after each operation of this key.

(7) TAB—The CTRL I key. This function is used for horizontal tabulation when both sending and receiving stations have tab stops at the same settings. RUBOUT is depressed once after each operation of this key.

(8) LINE FEED—Operation of this key causes the paper to move up one or two lines at a time, depending on the line space setting.

(9) RUBOUT—This key is used after operation of certain other characters which take a long

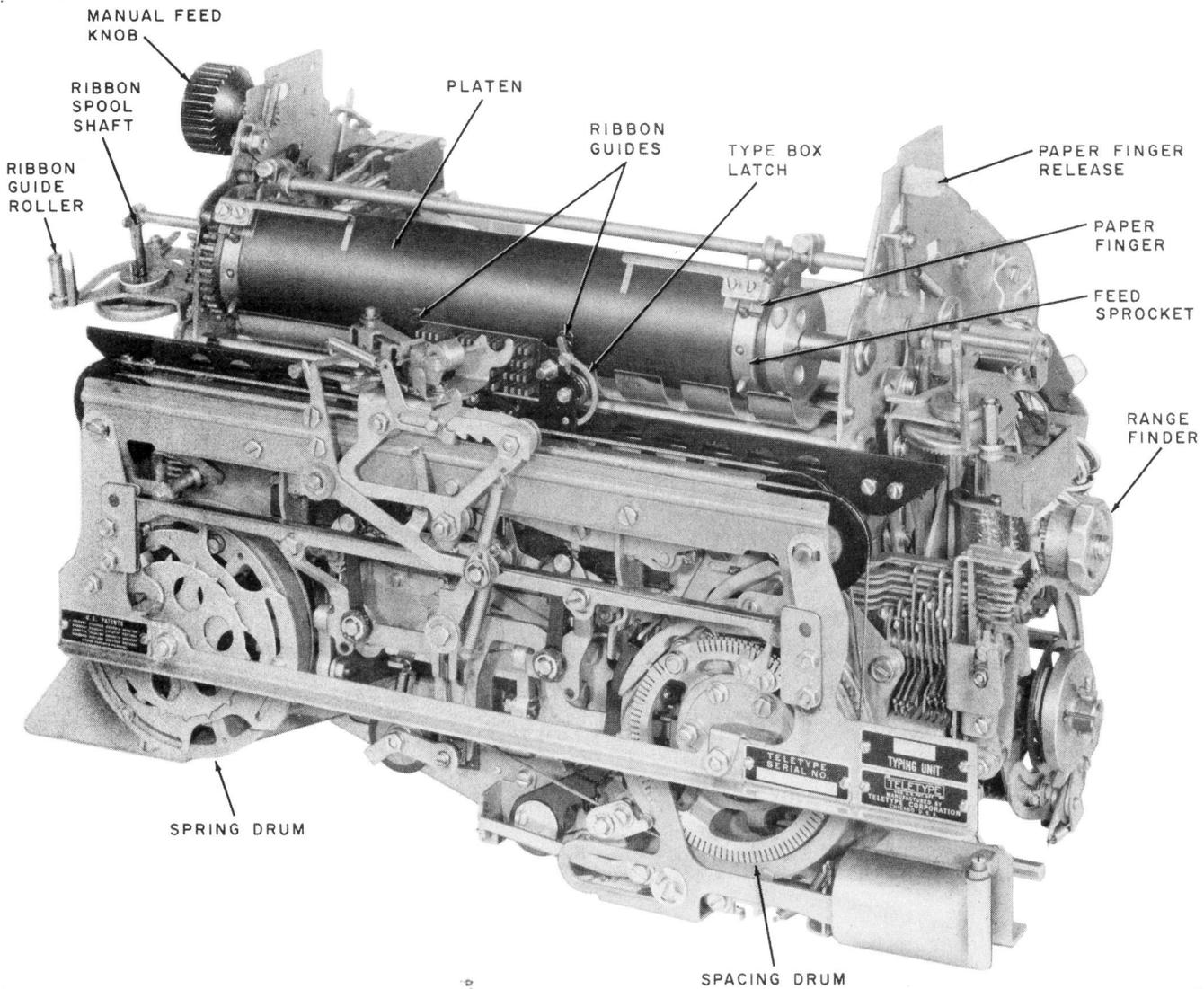


Fig. 3—Model 35 Sprocket Feed Typing Unit

time to respond. This gives enough time for completion. The key is depressed once after each operation of TAPE, TAPE, TAB, VT, and FF keys. Also, when perforating tape, depressing this key causes punches in all levels of the tape. Since this key punches all levels of the tape, it is used when correcting errors in the tape.

- (10) RETURN—Operation of this key causes the type box carriage to return to the left margin.
- (11) REPT (Repeat)—To repeat the same charac-

ter, this key is held depressed while the key for the desired character is operated. The character key is then released while the REPT key is held depressed until the desired number of characters have been typed. If the character selected requires the CTRL or SHIFT key, the CTRL or SHIFT key must be held depressed along with the REPT key.

- (12) LOC BSP (Local Backspace)—This key is used to backspace the tape that is being punched when it is necessary to correct an error.

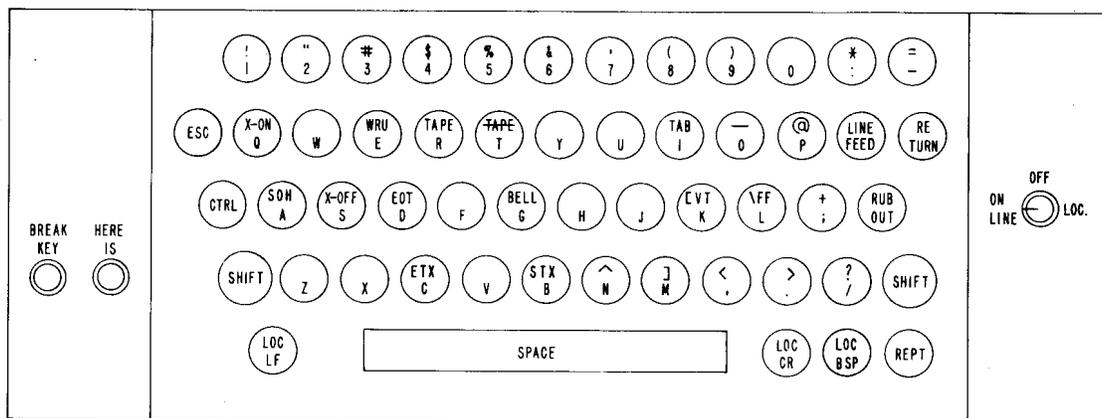


Fig. 4—Typical Model 35 TTY Keyboard and Call Control Panel

This is a local operation and is not transmitted to other teletypewriters.

(13) LOC CR (Local Carriage Return)—Depressing this key causes the typing position to return to the left margin. This is a local function and is not transmitted to other teletypewriters.

(14) FF—The CTRL L key. This function is used to feed out the remaining form to the first typing line of the next form. RUBOUT should be depressed once after each operation of this key.

(15) VT—The CTRL K key. This function is used for vertical tabulation when both sending and receiving stations have tab stops at the same setting. RUBOUT should be depressed once after each operation of this key.

(16) Space Bar—This bar is centered below the four rows of keys and is used for spacing.

(17) STX (Start of Text)—The CTRL B key. When this key is to be used, specific instructions will be given for its use.

(18) BELL—The CTRL G key. This function is used to signal the attendant at a distant station.

(19) ETX (End of Text)—The CTRL C key. This function is used to signal the processor to not turn the paper tape reader back on after processing this message.

(20) EOT (End of Transmission)—The CTRL D key. When this key is to be used, specific instructions will be given for its use.

(21) X OFF—The CTRL S key. This function, when punched in tape, stops the local transmitter which reads the tape.

(22) LOC LF (Local Line Feed)—When this key is depressed, the paper moves rapidly upward. This is a local operation and is not transmitted to other teletypewriters.

(23) SOH (Start of Heading)—The CTRL A key. When this key is to be used, specific instructions will be given for its use.

MODEL 43 TTY

2.05 The explanations of these functions for the Model 43 TTY are as follows:

(1) DC1 (Device Control 1)—Turns on tape reader at distant station.

Note: When any of the device controls (DC1, DC2, DC3, or DC4) are used, DELETE should be depressed once after each operation.

(2) ETB (End of Transmission Block)—Not used by the No. 2B ESS.

(3) ENQ (Enquiry)—Causes the distant station to send its answer-back code.

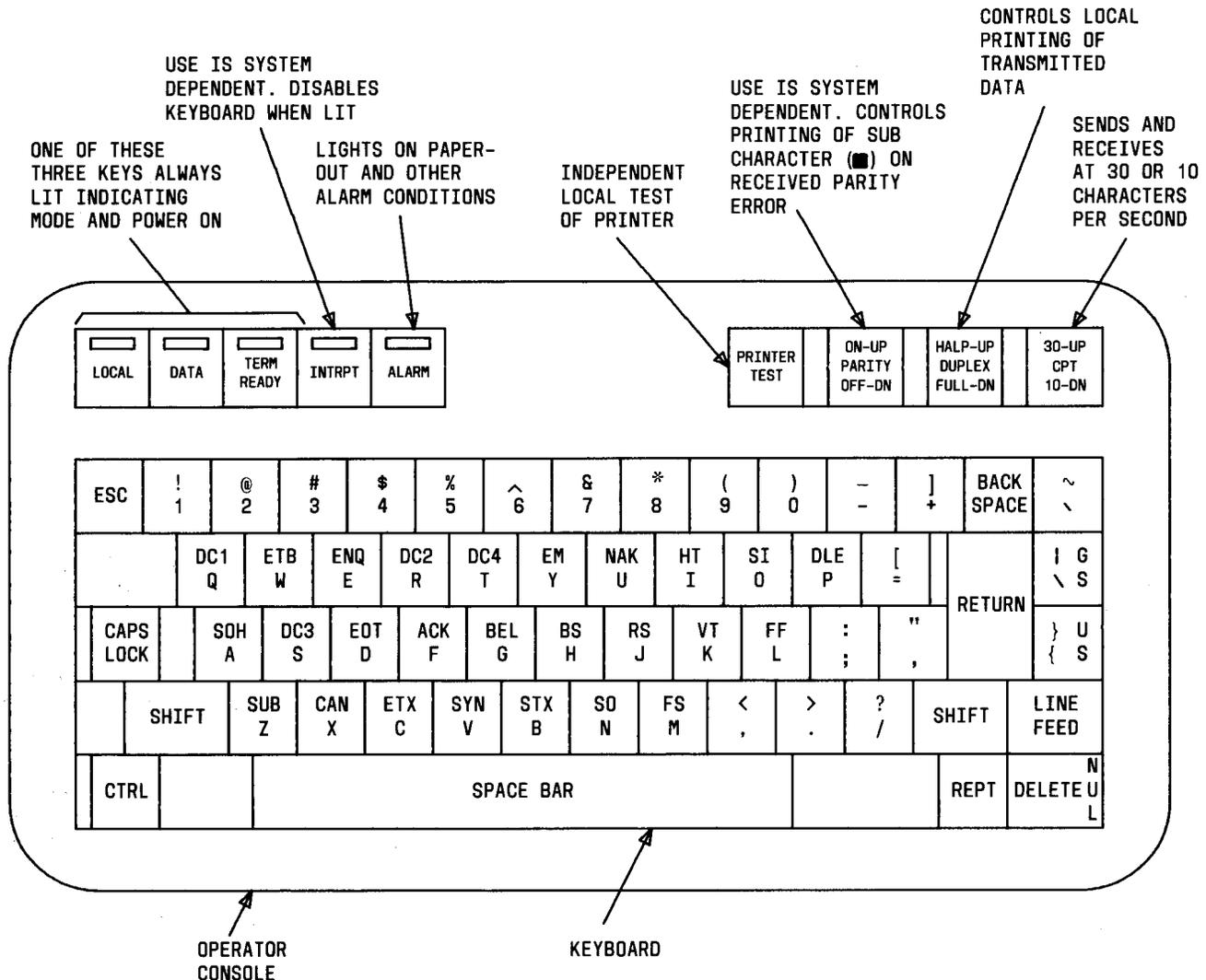


Fig. 5— Typical Model 43 TTY Keyboard Layout, Operational Controls, and Status Indicators

- (4) DC2 (Device Control 2)—Turns on tape punch at distant station (depending on station arrangement, your station and/or the distant station punch[es] turns on).
- (5) DC4 (Device Control 4)—Turns off a tape punch at both your station and the called station.
- (6) EM (End of Medium)—Not used by the No. 2B ESS.
- (7) NAK (Negative Acknowledge)—Not used by

- the No. 2B ESS.
- (8) HT (Horizontal Tabulation)—Not used by the No. 2B ESS.
- (9) SI (Shift In)—Not used by the No. 2B ESS.
- (10) DLE (Data Link Escape).
- (11) GS (Group Separator)—Not used by the No. 2B ESS.
- (12) SOH (Start of Heading)—Used at the begin-

ning of a data message address or routing information (heading). STX is used to indicate the end of heading (see STX explanation).

- (13) DC3 (Device Control 3)—When punched in tape, stops a tape reader from sending.
 - (14) EOT (End of Transmission)—Causes the teletypewriter to turn off. The attendant set must be disconnected separately.
 - (15) ACK (Acknowledge)—Sent out by a receiver as an affirmative response to a sender.
 - (16) BELL—Used to ring signal bell to call for distant attendant's attention.
 - (17) BS (Backspace)—Not used by the No. 2B ESS.
 - (18) RS (Records Separator)—Not used by the No. 2B ESS.
 - (19) VT (Vertical Tabulation)—Not used by the No. 2B ESS.
 - (20) FF (Form Feed)—Moves printing position to first predetermined printing line on next form or page.
 - (21) US (Unit Separator)—Not used by the No. 2B ESS.
 - (22) SUB (Substitute)—Not used by the No. 2B ESS.
 - (23) CAN (Cancel)—Not used by the No. 2B ESS.
 - (24) ETX (End of Text)—Used to terminate a group or sequence of characters started with the STX code.
 - (25) SYN (Synchronous Idle)—Not used by the No. 2B ESS.
 - (26) STX (Start of Text)—Used to indicate the start of a message (text). May be used to end a heading started by SOH (see SOH explanation).
 - (27) SO (Shift Out)—Not used by the No. 2B ESS.
 - (28) FS (File Separator)—Not used by the No. 2B ESS.
 - (29) ESC (Escape)—Not used by the No. 2B ESS.
 - (30) BACK SPACE—Not used by the No. 2B ESS.
 - (31) RETURN—Causes the typing position to return to the left margin.
 - (32) CAPS LOCK—Locks down for uppercase alpha. Releases up for lowercase. Affects alpha characters only.
 - (33) SHIFT—Shifts lowercase alpha to uppercase alpha and symbols on lower half of keytop to symbols on upper half. Does not release CAPS LOCK.
 - (34) LINE FEED—When the key is depressed, the paper moves rapidly upward.
 - (35) SPACE BAR—This bar is used for spacing.
 - (36) REPT (Repeat)—To repeat the same character, this key is held depressed while the key for the desired character is operated. The character key is then released while the REPT key is held down until the desired number of characters has been typed. If the character selected required the SHIFT key, the SHIFT key must be held depressed along with the REPT key.
 - (37) DELETE—Primarily used to "erase" unwanted characters in punched paper tape by punching holes in all levels of the tape. The DELETE character is also used as a time fill to assure that certain functions will have time to continue to their completion.
- Note:** DELETE should be operated after RETURN key at the end of each line of typing. Depress DELETE after each operation of DC1, DC2, DC3, DC4, and FF.

Operational Controls and Status Indicators—Model 43 TTY

- (38) LOCAL TALK—This key lights in the Local Talk mode. The telephone is enabled for normal telephone use and the keyboard printer can be operated locally off-line.
- (39) DATA—This key lights in Data mode and in Analog Loop-Back mode. Data can be sent or received on-line in the Data mode only.
- (40) AUTO ANSW—This key lights in Automatic Answer mode. When power is turned on, the

2.06 The following keys are specially designed not to require use of the CTRL key because they are used so often:

teleprinter will be in this mode. The telephone cannot be used in the normal manner (no dial tone and no dialing or talking, but the ringer can sound) and no printing or data transmission can occur. Telephone calls will be answered automatically after one ring and the AUTO ANSW light will turn off. Following the ring, the teleprinter will automatically transfer to the Data mode only after the remote originating station transfers to the Data mode.

- (41) **INTRPT**—This key lights when transmission has been interrupted by the remote station. The use of this key is system dependent. It may not operate with some remote stations. When operable, its use should be under direction of the system.
- (42) **ALARM**—This key lights or flashes when alarm condition exists.
- (43) **PRINTER TEST**—An independent test of the printer for use by the attendant or field service personnel.
- (44) **ON-UP PARITY OFF-ON**—When the **PARITY** key is on, characters received with incorrect (odd) parity will print as the substitute character symbol ■. When the **PARITY** key is off, the character that is received will be printed or performed if it is a printable character or a valid function.
- (45) **HALF-UP DUPLEX FULL-ON**—In Half Duplex, the printer copies all data sent and received. Only one sender can operate at a time without interference. In Full Duplex, the printer is blinded to on-line transmission from the local keyboard while receiving messages simultaneously from the remote sender.
- (46) **30-UP CPS 10-DN**—This key locks down or releases and sets the on-line operating speed of the station to either 30 (key up) or 10 (key down) characters per second.

Changing Paper or Ribbon on LM and RM TTY

2.07 For the LM TTY, the low paper indication is given by a minor alarm and by the following message being printed out:

* tt REPT TTYC a PORT b ALM FALT

The RM TTY uses the local buzzer indication. The following procedure should be used to replace LM and

RM TTY paper. These procedures are also applicable to ribbon changing except that no buzzer is sounded.

- (1) Momentarily operate the **ALARM RLS** key on the SSP to retire the LM TTY alarm. Proceed to Fig. 6 and 7 for the Model 43 TTY.
- (2) Rotate the **ON-OFF** selector beside the keyboard to the **OFF** position. This will prevent any output message from being printed while changing the paper or ribbon.
- (3) Slide the TTY out into the locking slots.
- (4) Lift the cover and replace the paper or ribbon.
- (5) Restore the cover to its original position and slide the TTY back into its normal operating position.
- (6) Rotate the **ON-OFF** selector to the **ON** position.

Changing Paper or Ribbon on Channels 2 Through 7 (Model 35 TTY)

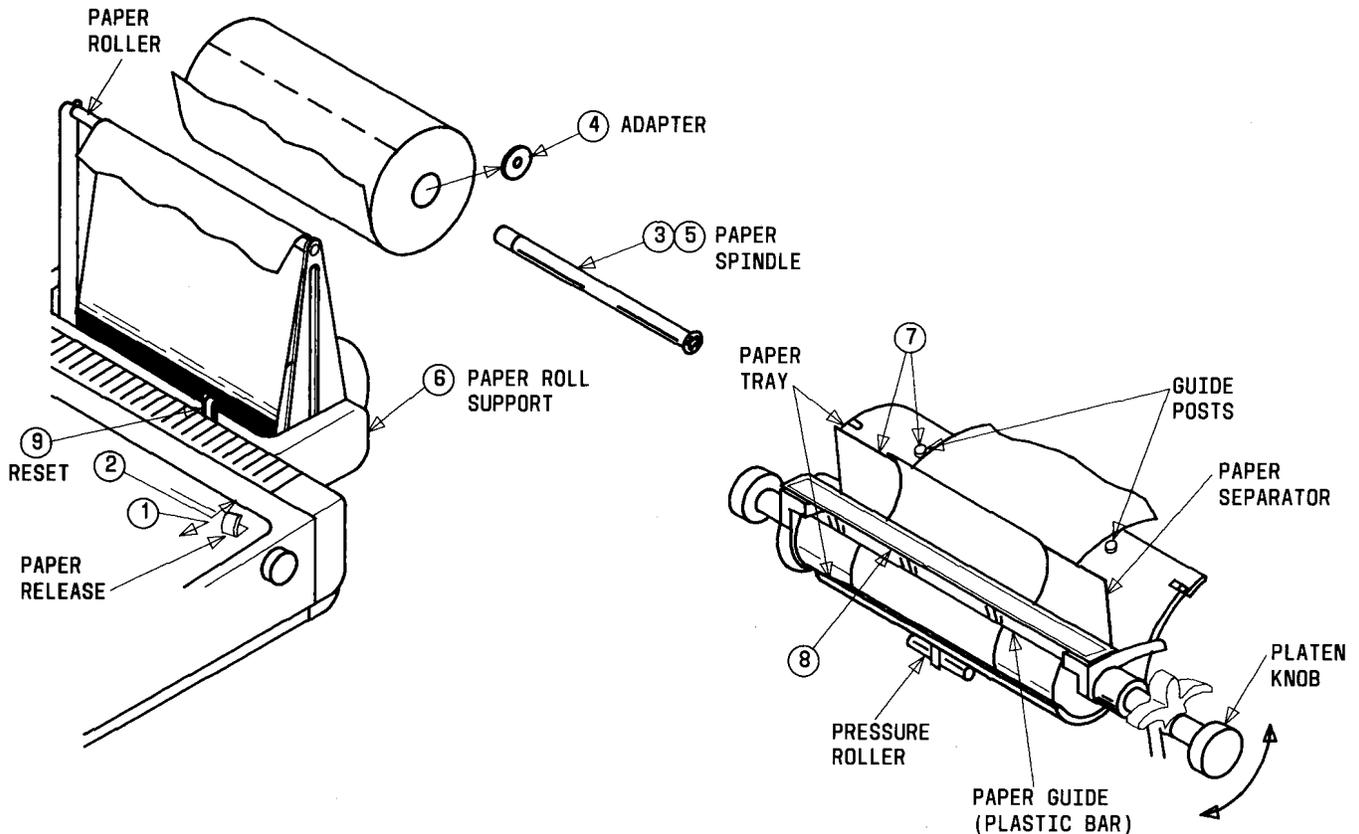
2.08 Servicing the TTY requires no operator action other than to replenish the paper supply or to replace ribbons.

2.09 Before a TTY can be serviced, the channel to which the TTY is connected must be removed from service. This is accomplished by typing **RMV:TTYC a!** The "a" in the input message will be the number of TTY controllers to be removed from service. If this input message is generated by a maintenance TTY, any TTY channel (0 through 7) may be removed from service.

2.10 The following procedure should be used to replace the paper on the Model 35 friction paper feed TTYs.

- (1) Remove the TTY channel from service.
- (2) Operate the **PAPER ALARM** key to deactivate the low paper alarm. Turn the **OFF-ON LINE-LOC** switch to **OFF**.
- (3) Lift the upper cover (Fig. 8).
- (4) Move the **PAPER RELEASE** lever back (Fig. 9), lift the paper finger, and pull the paper from under the platen.

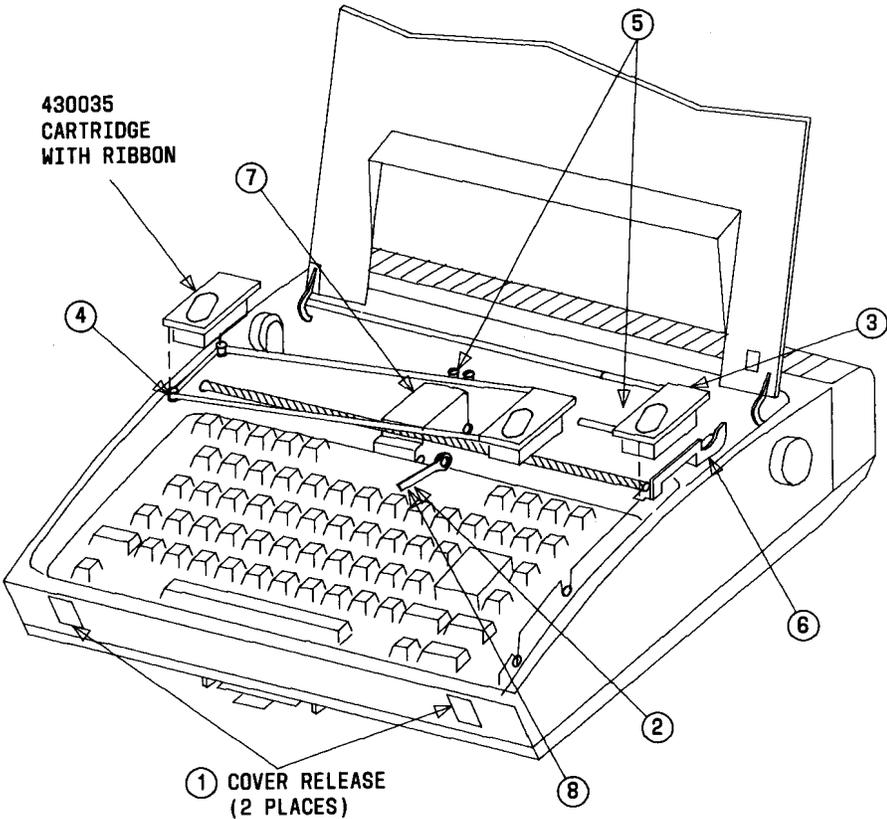
- INSTALL PAPER AS SHOWN AFTER REMOVING THE UNUSED PAPER FROM THE PRINTER. IT IS NOT NECESSARY TO TURN OFF POWER OR OPEN THE COVER WHEN REPLACING THE PAPER BUT TO AVOID LOSS OF DATA, PAPER SHOULD BE REPLACED AFTER THE REMOTE TERMINAL STOPS SENDING.



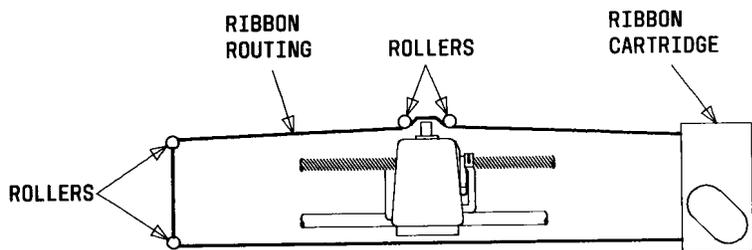
- ① TO REMOVE UNUSED PAPER OR TO STRAIGHTEN PAPER, PULL FORWARD ON THE PAPER RELEASE
- ② PUSH BACK ON THE PAPER RELEASE TO ENABLE PAPER FEEDING
- ③ REMOVE AND RETAIN PAPER SPINDLE FROM TUBE OF THE USED PAPER ROLL
- ④ ADAPTERS (IF PRESENT) ON NEW PAPER ROLLS, SHOULD BE REMOVED. THE ADAPTER CAN BE USED TO CUT AND REMOVE THE OUTER LAYER OF PAPER
- ⑤ INSERT PAPER SPINDLE INTO PAPER ROLL
- ⑥ PLACE PAPER ROLL WITH SPINDLE INTO THE CRADLE OF THE PAPER ROLL SUPPORT. PAPER SHOULD UNWIND FROM THE FRONT OF THE PAPER ROLL AND PASS OVER THE PAPER ROLLER AS SHOWN
- ⑦ LIFT PAPER SEPARATOR AND INSERT PAPER BETWEEN GUIDE POSTS AND DOWN BEHIND THE PLATEN. RELEASE PAPER SEPARATOR
- ⑧ LIFT PAPER GUIDE AND CONTINUE PUSHING PAPER DOWN UNTIL PAPER ENGAGES THE PRESSURE ROLLER. ADVANCE PAPER USING PLATEN KNOB OR LINE FEED FROM KEYBOARD. FEED PAPER UNDER THE PAPER GUIDE THEN LOWER THE PAPER GUIDE
- ⑨ DEPRESS TO RESET IF ALARM LAMP ON THE OPERATOR CONSOLE DOES NOT TURN OFF

Fig. 6—Installing Paper—Model 43 TTY

- ANY DATA RECEIVED WITH THE COVER OPEN WILL NOT BE PRINTED AND THE KEYBOARD AND OPERATIONAL CONTROLS WILL BE DISABLED. POWER MAY REMAIN ON.



- ① CENTER PRINT HEAD AND OPEN COVER. ALARM LAMP LIGHTS
- ② PULL PRINT HEAD LOCKING LEVER BACK (TOWARDS KEYBOARD) AS FAR AS IT WILL GO
- ③ REMOVE AND DISCARD CARTRIDGE WITH USED RIBBON BY GRASPING AND LIFTING THE CARTRIDGE. THIS APPLIES ONLY WHEN CHANGING A RIBBON
- ④ PLACE NEW RIBBON AROUND THE OUTSIDE OF ROLLERS
- ⑤ PULL ON CARTRIDGE TO THE RIGHT AND PASS RIBBON BETWEEN PRINT HEAD AND ROLLERS
- ⑥ PLACE RIBBON CARTRIDGE ON THE RIGHT-HAND BRACKET AND ALLOW MAGNET TO PULL CARTRIDGE DOWN INTO PLACE. MAKE SURE IT IS DOWN
- ⑦ POSITION PRINT HEAD AGAINST RIBBON, WITH THUMB ON TOP OF THE PRINT HEAD PUSH THE PRINT HEAD TOWARD THE PLATEN. THE LOCKING HANDLE WILL MOVE TO THE REAR
- ⑧ USING THUMB, PUSH LOCKING LEVER TOWARD PLATEN UNTIL IT SNAPS INTO PLACE



NOTE: MAKE SURE RIBBON IS FULLY ON ALL FOUR ROLLERS BEFORE CLOSING COVER

Fig. 7—Installing Ribbon—Model 43 TTY

- (5) Lift out the used roll.
- (6) Remove the spindle from the core of the used roll and insert it into the new roll.
- (7) Place the new roll in position with the paper feeding out from the bottom of the roll toward the platen, and with the roll of paper placed on the low paper alarm lever (Fig. 10).
- (8) Feed the paper over the paper straightener shaft, down under the platen, and up between the platen and paper bail.
- (9) Pull the paper up a few inches beyond the top of the platen and align the edges of the paper.
- (10) Lower the paper fingers to rest on the paper.
- (11) Move PAPER RELEASE lever forward.
- (12) Lower the upper cover making sure the end of the paper feeds out through the top of the cover.
- (13) Turn the OFF-ON LINE-LOC switch to ON LINE and operate the BREAK key to restore the TTY channel to service.

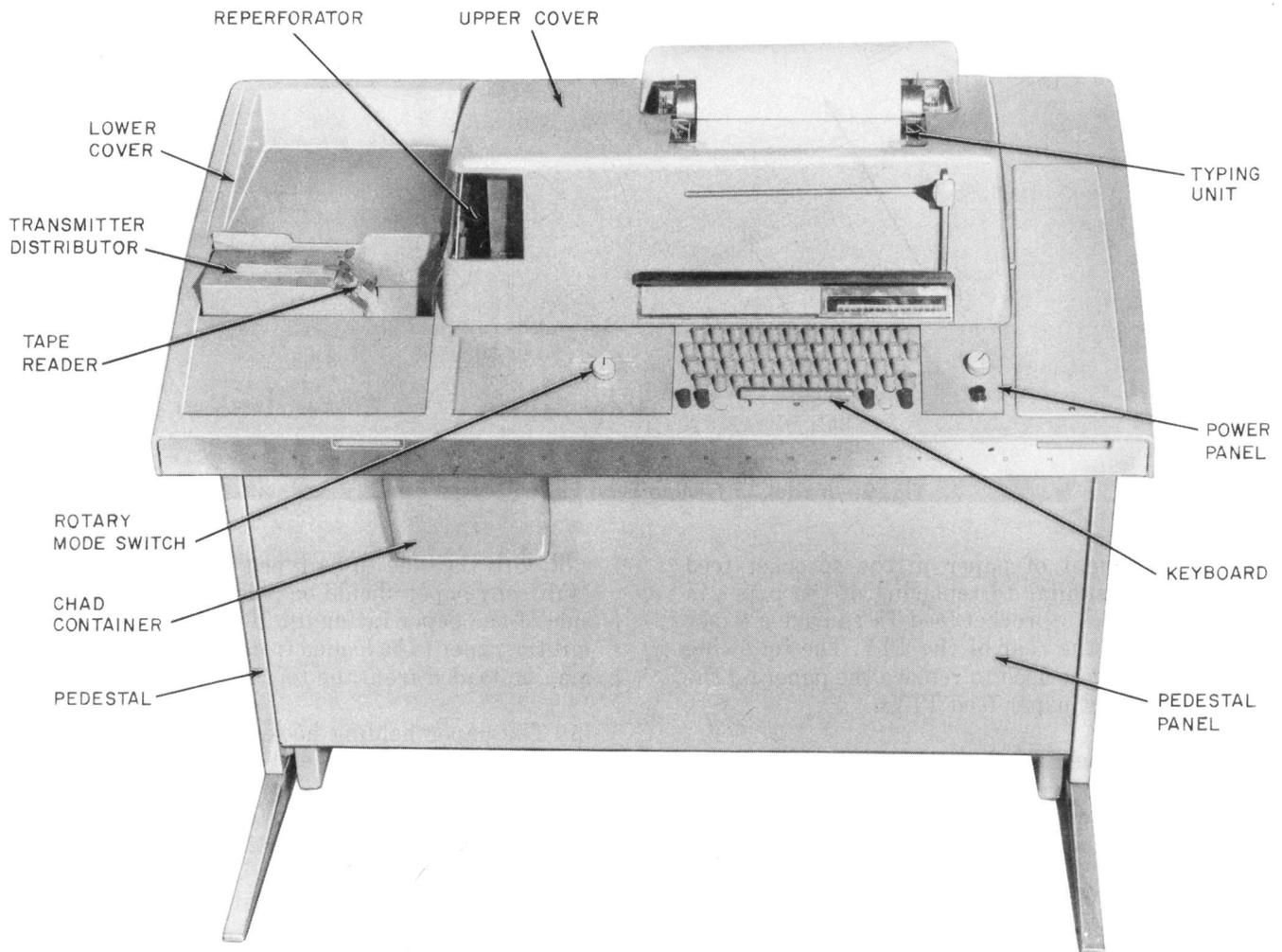


Fig. 8—Model 35 Automatic Send-Receive Set (Private Line Service)

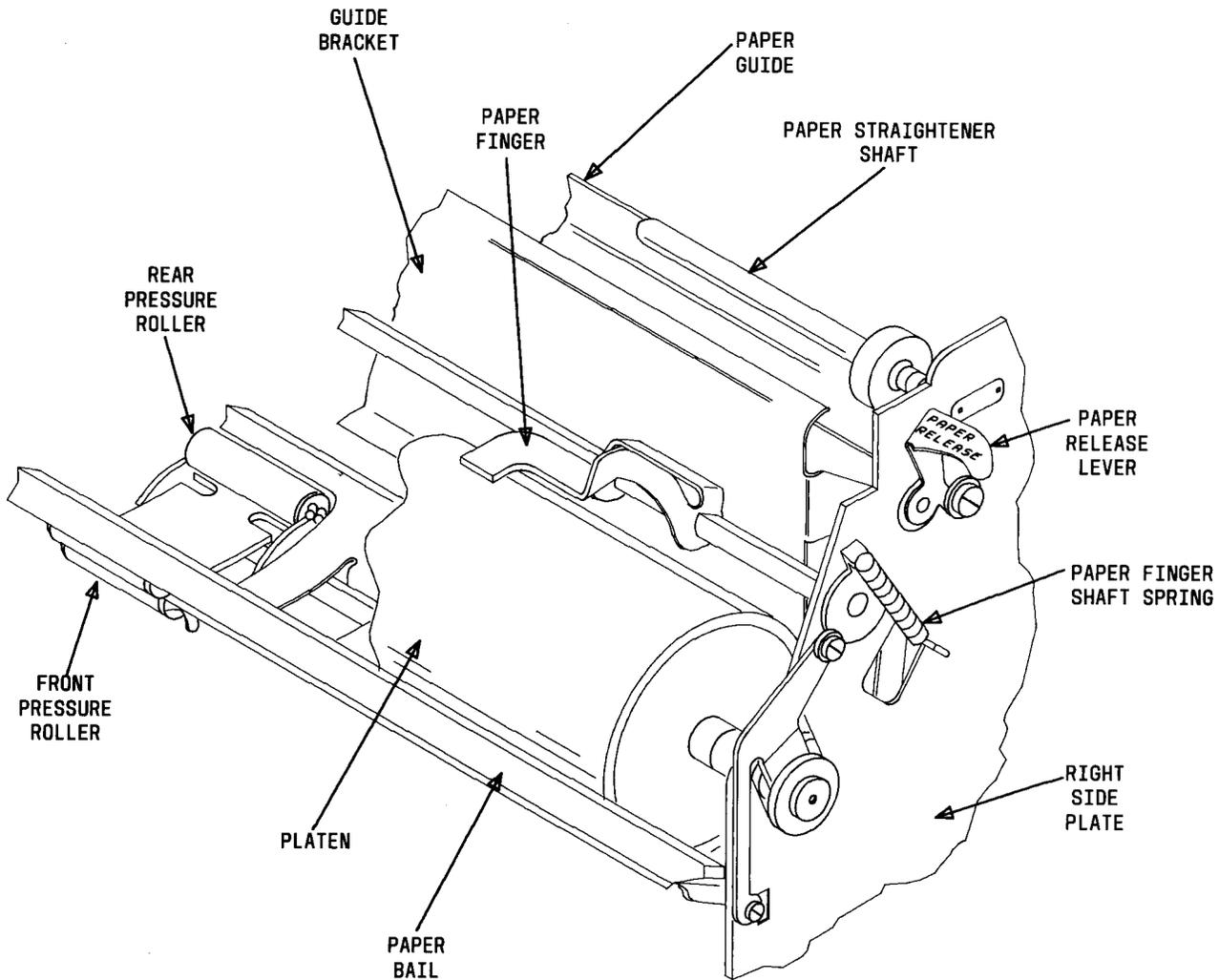


Fig. 9—Model 35 Friction Feed Platen Mechanism

2.11 Replacement of paper in the sprocket feed TTYs is similar to replacing of the paper in friction feed types. Sprocket feed TTYs have a paper box mounted at the rear of the TTY. The following procedure should be used to replace the paper on the Model 35 sprocket paper feed TTYs.

- (1) Remove the TTY channel from service.
- (2) Operate the PAPER ALARM key to deactivate the low paper alarm. Operate the BREAK key and turn the OFF-ON LINE-LOC switch to OFF.
- (3) At the rear of the TTY, open the paper box (Fig. 11) by raising the form accumulator shelf.
- (4) Place the carton of paper in the paper box so that the first page will feed through the paper slot with the side to be typed upon facing down. Multicopy paper should be placed with the carbon side of the paper facing up. If space does not permit the paper to be loaded from the rear, the paper may be loaded from the top.
- (5) The paper holding hook should be placed on the front of the paper box. After feeding the paper through the paper slot, catch a sprocket hole on the paper holding hook to prevent the paper from slipping into the paper box.
- (6) Return the form accumulator shelf to its normal position.
- (7) Lift the upper cover of the TTY.
- (8) Move the lever marked PUSH back to raise the paper guide.

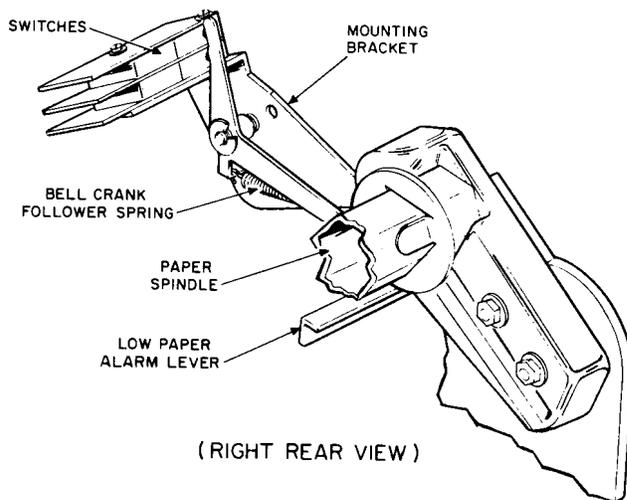


Fig. 10—Low Paper Alarm Lever and Switch

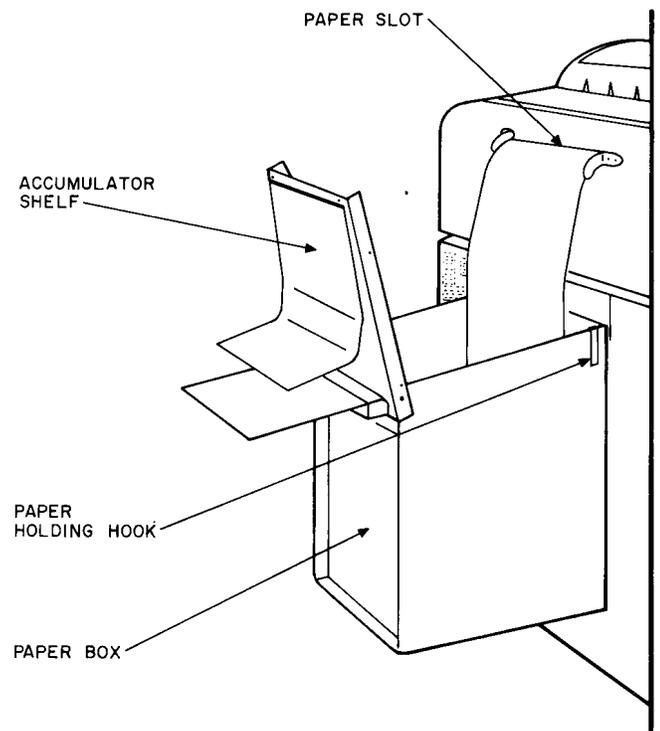


Fig. 11—Paper Box

(9) Make sure the paper has been released from the holding hook in the paper box and feed it under the platen, keeping it against the left side of the loading plate and under the low paper and no paper sensing arms (Fig. 12).

(10) Turn the platen hand wheel to keep the paper under the paper guide and position the paper to the first line on the form or to a reference mark.

(11) Lower the paper guide to rest on the paper.

(12) After the paper is in place, check to see that the ribbon is still properly threaded through the ribbon guides and that the type box latch is locked into position.

(13) Pull out and set the index wheel by turning it until the indicator is beneath the pointer. This registers the location for the first typing line on the page in exact correspondence with any other TTYs on the network.

(14) Lower the TTY cover making sure the end of the paper feeds out through the top of the cover.

(15) Depress the CTRL and FF (or FORM) keys. This operation at a sending station will feed paper automatically to the first typing line on the next page or form of all connected TTYs.

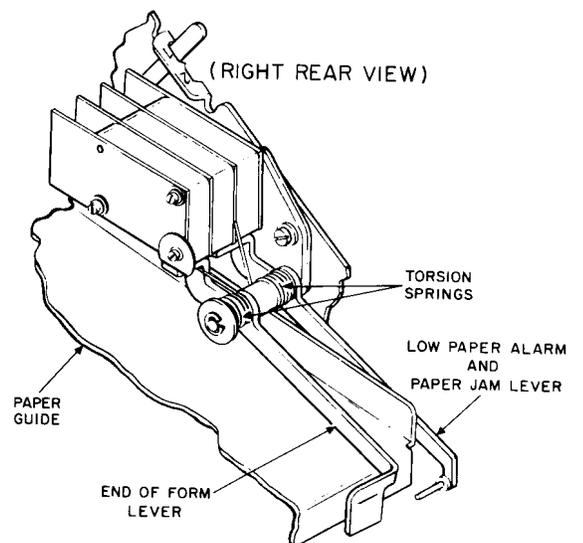


Fig. 12—Low Paper and No Paper Sensing Arms

2.12 The procedure for changing the ribbon on either the friction feed or the sprocket feed for the Model 35 TTY is identical. The following procedure should be used to replace the ribbon.

- (1) Remove the TTY channel from service and turn the OFF-ON LINE-LOC switch to OFF.
- (2) Lift the upper cover of the TTY.
- (3) Lift up the ribbon spool locks (Fig. 13), remove both ribbon spools, and move the ribbon from the ribbon guides.
- (4) Unwind and remove the ribbon from one of the spools.
- (5) Hook the end of the new ribbon to the hub of the empty spool and wind the ribbon until the reversing eyelet in the ribbon is wound onto the spool.
- (6) Replace the spools onto the spool shafts with the ribbon feeding from the outside of the spools.
- (7) Thread the ribbon forward around the ribbon rollers, through the slots in the ribbon reverse levers and ribbon guides.
- (8) Take up any slack in the ribbon by turning the free spool.
- (9) Push the spool locks down against the spools.
- (10) Lower the upper TTY cover with the paper feeding out through the top of the upper cover between the cover and the plastic dome.
- (11) Turn the OFF-ON LINE-LOC. switch to ON LINE, operate the BREAK key, and restore the TTY channel to service.

Punched Paper Tape (Model 35 TTY)

2.13 Reperforator and Tape Reader—A paper tape punch (reperforator) and a paper tape reader are used on the private line service (Fig. 8) and switched network service (Fig. 14) TTYs.

2.14 Reperforator—The typing reperforator is an electromechanical unit which records information both as printed characters and as code perforations on paper tape. The information is received from a signaling line in the form of an electrical signaling code which is translated into mechanical motions which print and perforate. The tape punch fully perforates a 1-inch, 8-level paper tape by using signals from the local keyboard, tape reader, or from a remote location. When a TTY receives a message from a remote location, it is necessary for the receiving attendant to operate the KT (keyboard tape) control on the mode switching control panel. This enables the receiving station to perforate a tape and print a page copy at the same time. Chad (the paper from the punched holes in the tape) falls into a chad box located under the perforator punch. The messages to be entered on paper tape must be perforated by an off-line TTY. The typing reperforator has a maximum operating speed of 100 words per minute. The tape is fully perforated, and on TTYs that are equipped with a typing wheel, characters are printed on the tape between the sprocket feed holes. The printing of characters in addition to the coded perforations is an optional feature. On TTYs that have the typing tape punch feature, the operator will have to change the typing ribbon periodically and replenish the paper tape as necessary. The following procedure should be used to replace the typing ribbon.

(1) Remove the TTY channel from service and turn the OFF-ON LINE-LOC. switch to OFF.

(2) Lift the upper cover of the TTY (Fig. 15).

(3) Pull the spool locks outward (Fig. 15).

(4) Remove the ribbon from the ribbon rollers, the ribbon reverse levers, and the typing wheel.

(5) Remove both spools from shafts (Fig. 15).

(6) Unwind and remove the ribbon from one of the spools.

(7) Hook the end of the new ribbon to the hub of the empty spool and wind the ribbon until the reversing eyelet in the ribbon is on the spool.

(8) Replace the spools on the spool shafts with the ribbons feeding from the outside of the spools.

(9) Thread the ribbon around the ribbon rollers, through the slots in the ribbon reverse levers, and under the ribbon guides and the typing wheel.

(10) Take up any slack in the ribbon by turning the free spool.

- (1) Remove the TTY channel from service and turn the OFF-ON LINE-LOC. switch to OFF.
- (2) Lift the upper cover of the TTY (Fig. 15).
- (3) Pull the spool locks outward (Fig. 15).
- (4) Remove the ribbon from the ribbon rollers, the ribbon reverse levers, and the typing wheel.
- (5) Remove both spools from shafts (Fig. 15).
- (6) Unwind and remove the ribbon from one of the spools.
- (7) Hook the end of the new ribbon to the hub of the empty spool and wind the ribbon until the reversing eyelet in the ribbon is on the spool.
- (8) Replace the spools on the spool shafts with the ribbons feeding from the outside of the spools.
- (9) Thread the ribbon around the ribbon rollers, through the slots in the ribbon reverse levers, and under the ribbon guides and the typing wheel.
- (10) Take up any slack in the ribbon by turning the free spool.

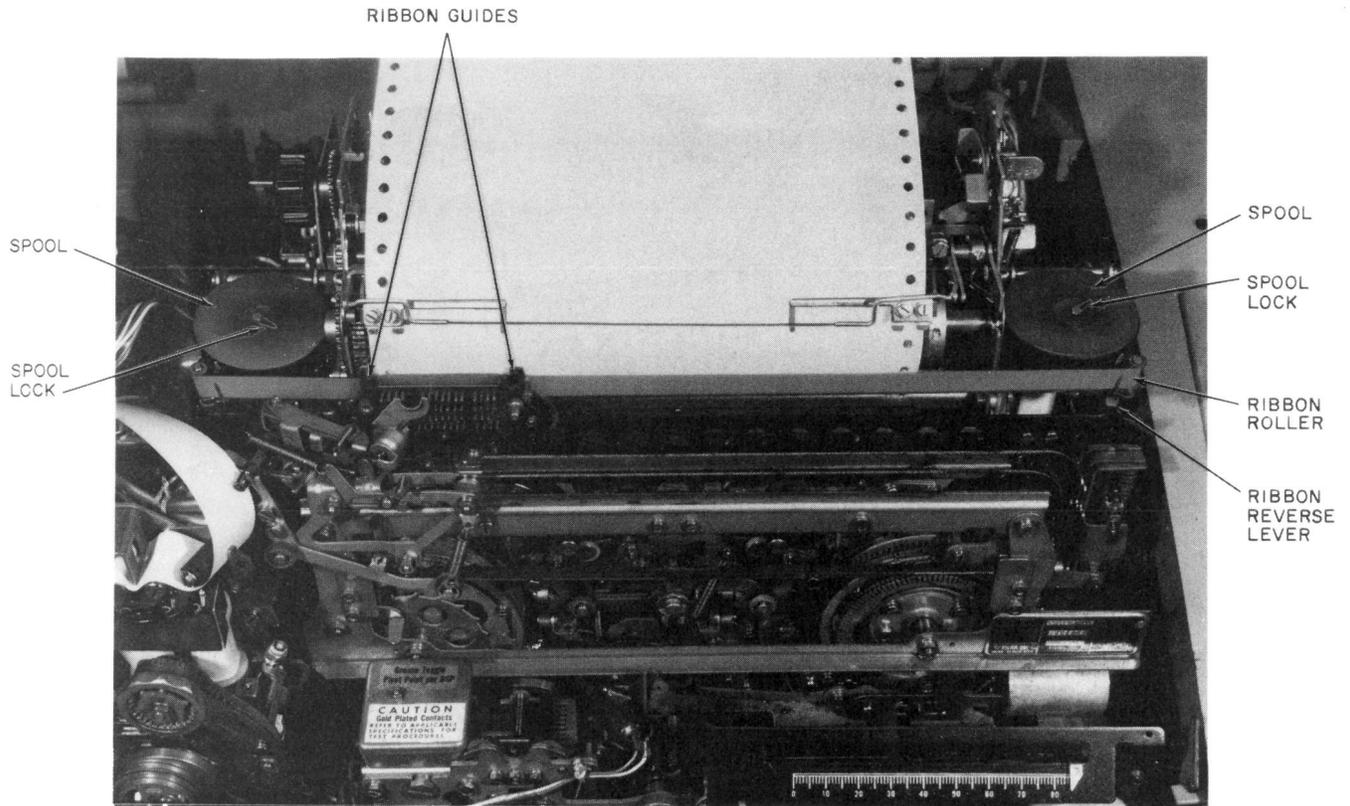


Fig. 13—Model 35 TTY Ribbon Mechanism

- (11) Push the spool locks down against the spools.
- (12) Lower the TTY cover making sure the paper feeds out through the top of the cover, between the cover and the plastic dome.
- (13) Turn the OFF-ON LINE-LOC. switch to ON LINE, operate the BREAK key to restore the TTY channel to service.

2.15 The following procedure should be followed when replenishing the paper tape in both the

typing tape punch reperforator and the nontyping tape punch reperforator.

- (1) Remove the TTY channel from service and turn the OFF-ON LINE-LOC. switch to OFF.
- (2) Lift the upper cover of the TTY.
- (3) Tear or cut the old tape smoothly and evenly near the tape chute (Fig. 15).
- (4) Feed the remaining tape through the

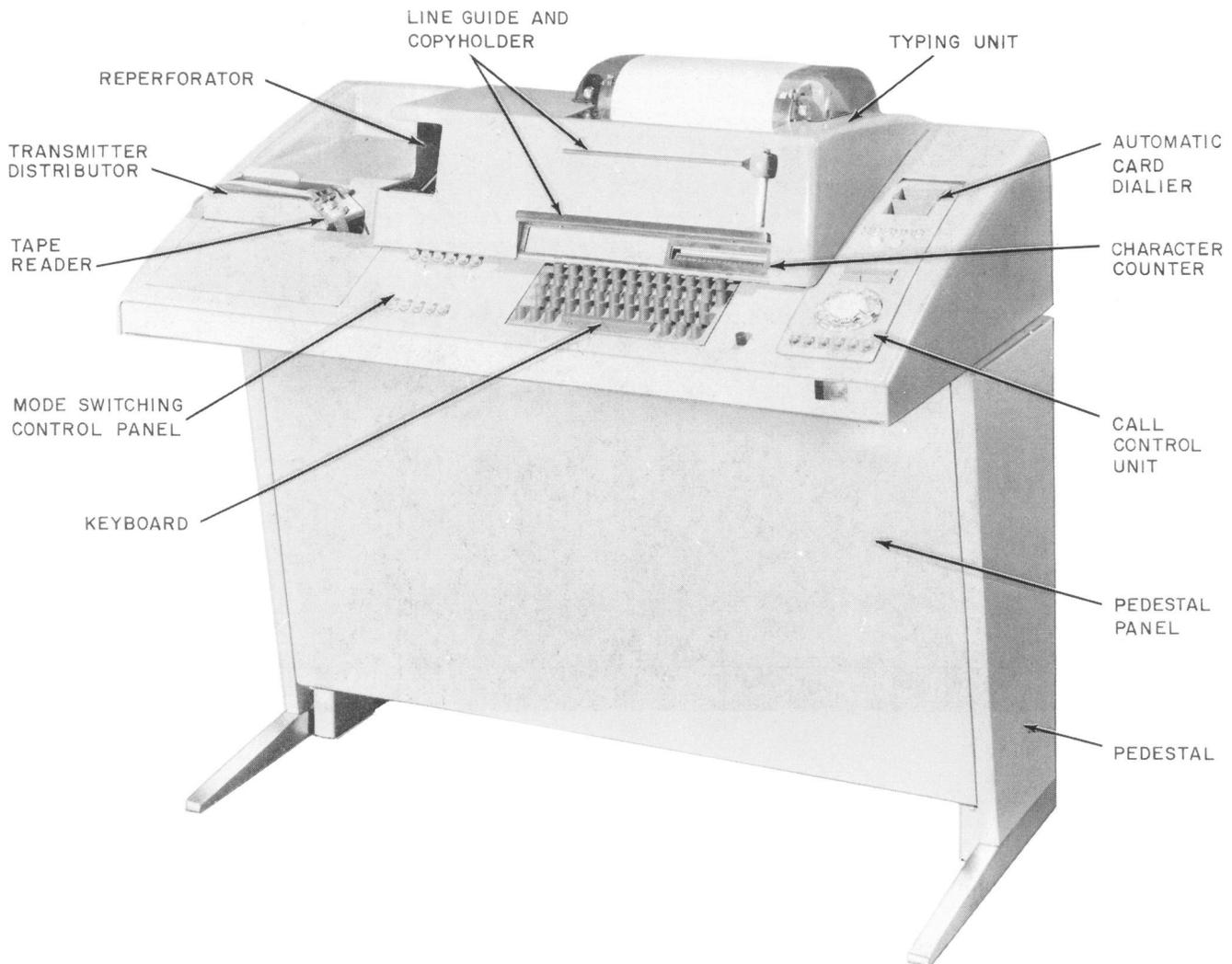


Fig. 14—Model 35 Automatic Send-Receive Set (Switched Network Service)

reperforator by repeated operation of the RUBOUT key.

- (5) Lift the used roll of tape from its holder.
- (6) Remove the tape core from the used roll of tape and insert it into the new roll of tape.
- (7) Place the new roll of tape in the holder with the tape feeding from the top or the bottom, depending on the design of the machine.
- (8) Place the tape around the tape guide spool (Fig. 15) and into the chute.

(9) As the tape is eased through the chute, operate the RUBOUT key on the keyboard until the tape goes through and is visible at the punch head.

(10) If the tape is smoothly and evenly torn, it may be inserted with the tape gate (Fig. 16) closed and the tape read switch held in the FREE position.

(11) When necessary, the tape gate may be released by depressing the release button and inserting the lead end of the tape over the tape feed wheel.

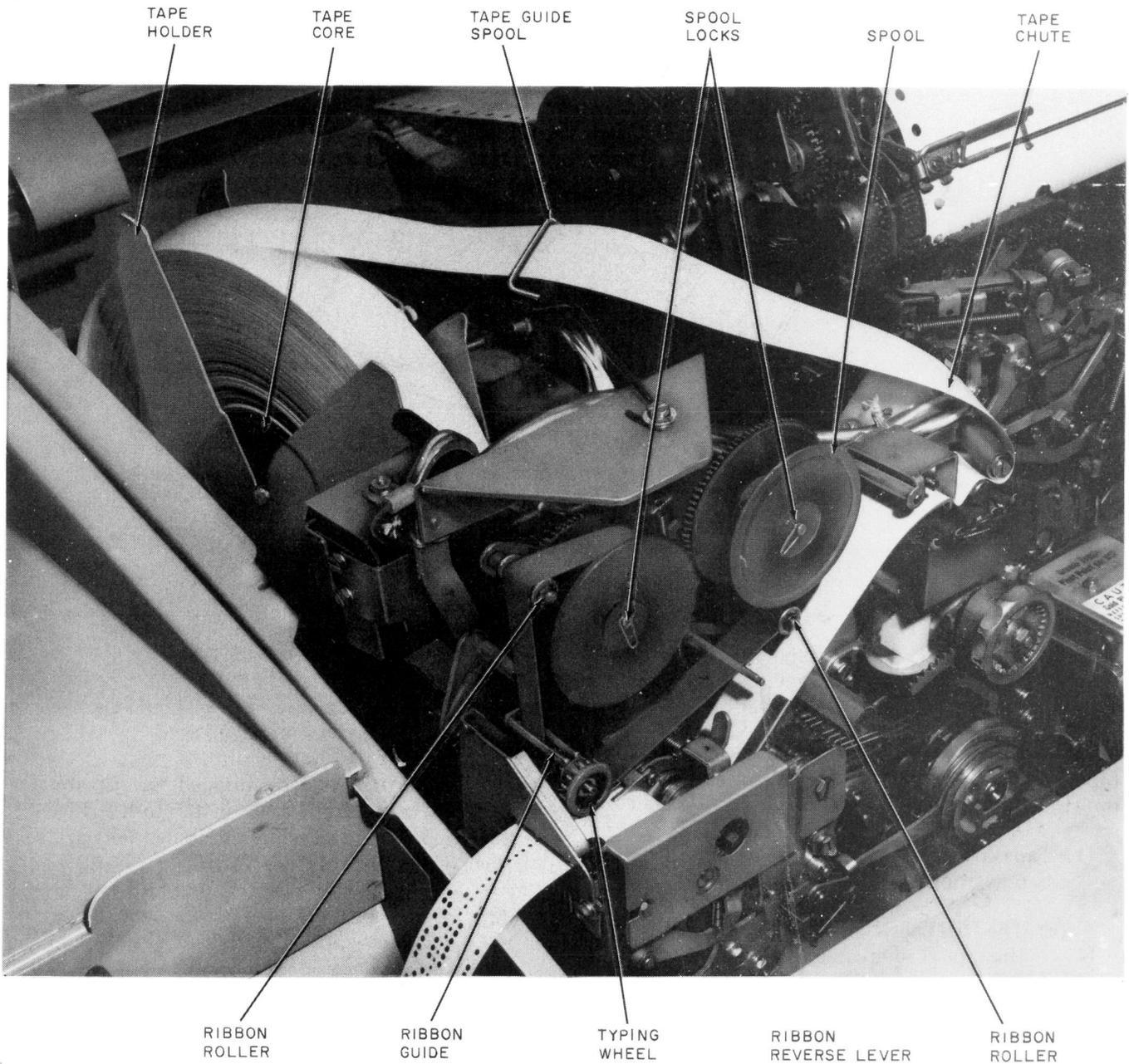


Fig. 15—Typing Reperforator

(12) Place the code holes of the RUBOUT perforations directly over the sensing pins and close the tape gate.

(13) Lower the TTY cover making sure the paper feeds out through the top of the cover, between the cover and the plastic dome.

(14) Turn the OFF-ON LINE-LOC. switch to ON LINE, operate the BREAK key, and restore the TTY channel to service.

2.16 Tape Reader—The tape reader permits the automatic transmission of tape messages. When originating a call, the TTY is automatically

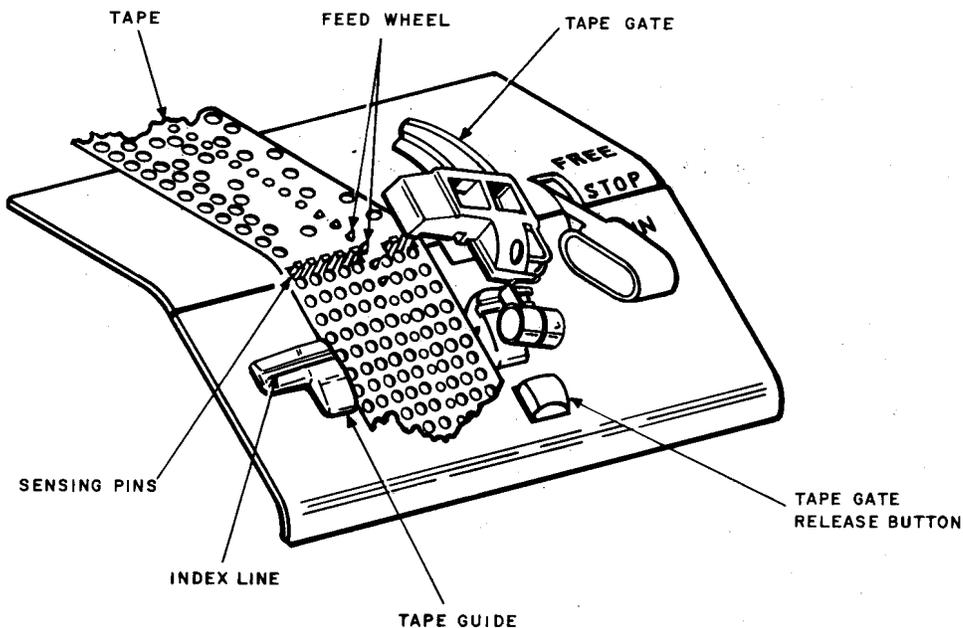


Fig. 16—Tape Reader

switched to the tape mode. If tape has been inserted into the tape reader, the reader will start automatically upon receipt of a multicharacter automatic answer-back signal from the called station. The operator-activated controls of the tape reader are the tape read switch, a tape gate, and a gate release button (Fig. 16).

- (1) **Tape Read Switch**—The tape read switch has two positions: RUN and FREE.
 - (a) The RUN position is a locking position and the tape reader can operate in this position.
 - (b) The FREE position is a nonlocking position. When the tape read switch is held to the free position, the tape feed wheel is free-wheeling. This feature allows the insertion of smooth and evenly torn tape to be inserted without raising the tape gate. When released, the switch returns to the RUN position.
- (2) **Tape Gate**—The tape gate keeps the tape flat and under the proper tension.
- (3) **Gate Release Button**—When depressed, this button opens the tape gate and exposes the feed wheel and sensing pins. This is the normal position for tape insertion.

Punching Paper Tape (Model 35 TTY)

2.17 The following procedures should be used to punch messages on paper tape.

- (1) On TTYs that are equipped for private line service, turn the mode switch to KT (Fig. 17). On TTYs that are used for switched network service, operate the KT pushbutton.
- (2) To turn on the tape punch, hold down the CTRL key and depress the TAPE key on the TTY keyboard.
- (3) Type the message that is to be punched on tape.

2.18 At the end of the message (line), before the execute character, continue character, or abandon character is typed, X-OFF must be punched. The X-OFF character is typed by first depressing and holding the control (CTRL) key, then depressing the X-OFF key. This character must be followed immediately by the execute, continue, or abandon character, followed immediately by the RUBOUT character. There must be no spaces between these three characters. This sequence is punched for each message (line) punched on the tape in order to turn the tape reader

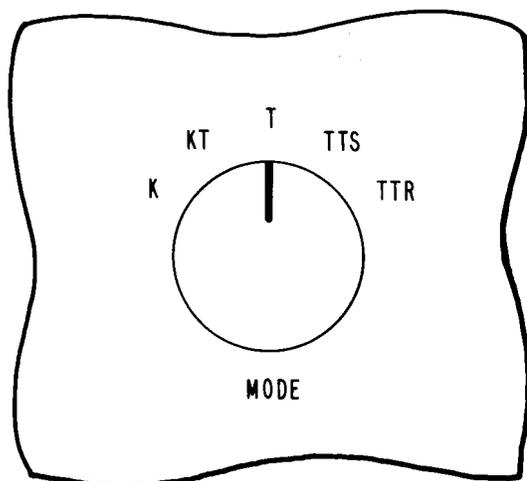


Fig. 17—Mode Control Switch (Private Line Service)

off. In the last message (line) on the paper tape, the ETX character must be typed just prior to X-OFF, which is followed by the above sequence. This tells the system not to turn the tape reader back on.

2.19 When punching has been completed, take the TTY out of the punch mode by depressing and holding the CTRL key and depressing the TAPE key.

2.20 Restore the TTY to service by depressing the BREAK key.

2.21 Mode Control—The mode switch control panel configuration will vary depending on the use for which the TTY is designed. The TTYs that are used for private line service have a rotary mode control switch with five positions. The TTYs that are used for switched network service have pushbuttons for mode control. The maintenance center TTY has no mode control switch.

2.22 The position of the mode control switch determines the mode of operation of the TTY. The mode of the TTYs can be switched when they are either on-line or in local condition. The mode control switch used on private line service TTYs is shown on Fig. 17.

2.23 The mode control switch positions are as follows:

- K—keyboard
- KT—keyboard tape

- T—tape
- TTS—tape—tape send
- TTR—tape—tape receive.

The last two positions, TTS and TTR, may be disabled where not applicable.

2.24 The following discussion of the modes of operation assumes a half duplex signal line.

2.25 K (Keyboard) Operation: The keyboard and typing unit are connected to the external line. Transmission is provided from the keyboard and is monitored by the typing unit. The transmitter distributor is disabled and the reperforator is placed on the auxiliary local circuit. The LOC operation is the same with the keyboard and typing unit connected to the local signal line.

2.26 KT (Keyboard-Tape) Operation: The keyboard, typing unit, transmitter distributor, and reperforator are connected to the external signal line. When the transmitter distributor is transmitting, the message is copied by the typing unit and a duplicate tape punched by the reperforator. The keyboard should not be operated when the transmitter distributor is sending. When the keyboard is transmitting, the message is copied by the typing unit and tape is punched by the reperforator. In this case, the transmitter distributor should not be operated. The LOC operation will be the same except the units are connected to the local signal line.

2.27 T (Tape) Operation: The transmitter distributor and typing unit are connected to the external signal line. The typing unit copies what is being transmitted from the transmitter distributor or received from a distant station. The keyboard and reperforator are on the auxiliary local circuit. Tape can be prepared on the reperforator from the keyboard without interfering with transmission on the external signal line. The LOC operation will be the same except the transmitter distributor and typing unit are connected to the local signal line.

2.28 TTS (Tape-Tape Send) Operation: The transmitter distributor transmits data other than ASCII over the external signal line. The typing unit is blinded to outgoing and incoming traffic. The keyboard and reperforator are connected in the auxiliary local circuit and can be used to prepare subsequent traffic.

2.29 TTR (Tape-Tape Receive) Operation: The reperforator is connected to the external signal line to receive from a distant station data other than ASCII coded data. The transmitter distributor is disabled, the typing unit is blinded, and the keyboard is in the auxiliary local circuit. The TTR and TTS modes in LOC operation provide no functional use.

2.30 The mode control panel used for Switched Network Service TTYs is shown in Fig. 18. The mode controls consist of two rows of six controls each. Two of the controls, TD CALL IN and MOTOR ON, are twist switches. The other controls are pushbuttons, some of which light when operated.

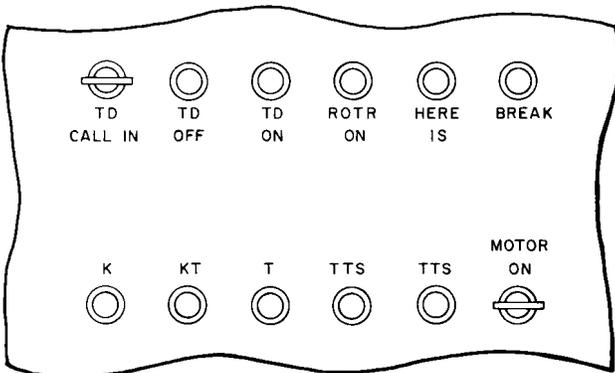


Fig. 18—Mode Control Switch Panel (Switched Network Service TTY)

2.31 The function of controls K, KT, T, TTS, and TTR is identical to that described in paragraphs 2.25 through 2.29, respectively. These controls light when operated.

2.32 TD CALL IN—(Twist Switch)—If turned to the right, the local tape reader will start automatically when a TD CALL IN signal is received from a remote location. On some machines, this switch may be used to prevent the tape reader from starting upon receipt of an answer back.

2.33 TD OFF—This pushbutton has no light. It is used to stop the tape reader.

2.34 TD ON—This pushbutton is used to start the tape reader.

2.35 ROTR ON—This pushbutton has no light. It is used to start the local auxiliary receiving only typing reperforator. (This is an optional feature.)

2.36 HERE IS—This pushbutton has no light. It is used to send its own answer-back code combination to a distant station. This pushbutton should be blocked at RU stations to prevent manual answering of an invalid RU sequence.

2.37 BREAK—Depress twice momentarily to signal the TWX operator on call being placed. Depress once for about 2 seconds to interrupt a sending station when the copy becomes scrambled, overlined, or piled up.

2.38 MOTOR ON—(Twist Switch). This switch is used to prepare tape locally (without page copy) without placing the station in the local mode. This allows the station to function as a normal unattended receiving station and incoming calls are answered automatically during tape preparation. The motor will not turn off at the end of an incoming call.

Note: When operation in TTS-TTR mode is desired, the sending station so informs the receiving station and both attendants operate the TTS and TTR buttons, respectively. When transmitting the tape, there are no machine controls and no page copy is received. At end of transmission, both stations either revert to another mode or disconnect.

2.39 Call Control Panel—TTYs for switched network service are equipped with call control units. The call control unit consists of a dialer, either rotary, TOUCH-TONE®, or card dialer, plus associated pushbuttons, indicators, and switch controls. The controls associated with the call control panel are as follows:

(1) SPKR VOL (Speaker Volume)—This is a rotating knob that regulates the volume of the speaker. The speaker is located to the left of the call control panel (Fig. 4). The volume is adjusted according to room noise. The volume of the speaker should never be adjusted below an audible level.

(2) ORIG (Originate)—This pushbutton is depressed to obtain a dial tone in order to place a call.

(3) CLR (Clear)—This pushbutton is depressed to disconnect at the end of a connection or to re-

turn the set to normal from any other mode. The pushbutton lights during disconnect cycle or when a CLR signal is received from a remote TTY.

(4) ANS (Answer)—The lamp within this pushbutton flashes to indicate an incoming call, and a bell rings if the set is in the local mode. This pushbutton must be depressed to condition the set to answer the call when in the local mode. If the button is not depressed, the calling station receives a “don’t answer” condition.

Note: If the NORMAL switch is operated to the OUT OF SERV (out-of-service) position, the ANS button lamp will flash but the bell will not ring. The calling station encounters a “don’t answer” condition. The ANS button must be depressed to answer call.

(5) TST (Test)—This pushbutton is used for maintenance purposes.

(6) LCL (Local)—This pushbutton is depressed to condition the TTY to do local off-line work, such as practicing or perforating tape. While in the local mode, it is necessary to depress the ANS button to answer an incoming call. If not depressed, the calling station receives “don’t answer.”

(7) BUZ-RLS (Buzzer Release)—When the paper supply is low or exhausted, a buzzer sounds and a lamp lights within this pushbutton. The pushbutton is depressed to deactivate the buzzer. The pushbutton light is extinguished after a new supply of paper is inserted and the CLR button is depressed. While the paper alarm (BUZ-RLS) is lighted, an incoming call is indicated by the flashing of the ANS pushbutton lamp.

2.40 The upper portion of the call control panel and the surrounding area have the following controls and lamps:

(1) BRK-RLS (Break-Release)—This pushbutton is depressed to allow transmission to resume after a break signal has been sent or received.

(2) REST (Restrain)—When lighted, this lamp is an indication that the sending speed is too fast to communicate with a TTY of lower speed. When sending speed is reduced, the lamp will extinguish.

Note: If the faster sending speed is maintained after the REST lamp lights, the commu-

nication will be interrupted and the BREAK lamp will light. When sending tape, the tape will stop momentarily when the REST lamp lights. After a moment, the tape reader will start again.

(3) NORMAL—Operate this switch with the arrow pointing toward the OUT OF SERV lamp while replacing paper or ribbon. The OUT OF SERV lamp lights and stays lighted as long as the station is out of service. On incoming calls during this interval, a calling station will encounter a “don’t answer” condition. The lamp within the ANS pushbutton will flash, but the bell will not ring. To restore the set to service, turn and hold the switch to the RESTORE position until dial tone is present. After dial tone is heard, allow the switch to return to NORMAL. When the switch returns to NORMAL, the OUT OF SERV lamp extinguishes.

Note: The TTY is placed in the out-of-service condition, in case of malfunction or immediately prior to replacing paper, tape, or ribbon, and is restored promptly after this work has been completed. Occasions for taking a TTY out of service should be kept to a minimum so that incoming calls may be answered promptly.

(4) Cover Release—These buttons release the upper TTY cover so it can be raised. The release buttons are located on both sides of the upper cover.

(5) Ringer Control—This is an adjusting lever that is located in a slot underneath the call control panel (in general area of dial). This lever is used to adjust the volume of the bell. The bell should always be audible.

3. OUTPUT MESSAGES

3.01 Detailed explanations of the output messages are provided in the Output Message Manual (OM-2H200). No more than one output message is included on one page. In some cases, one message may require several pages. Some output messages contain data which must be interpreted using the Trouble Locating Manuals (TLMs). In these cases, the TLM is referenced in the OM-2H200 for each such message. Familiarity with the contents of the OM-2H200 should aid personnel in more efficient system operation and maintenance.

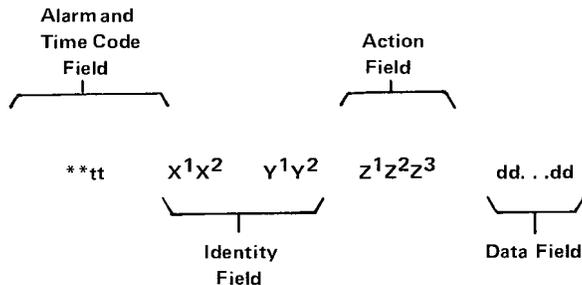
3.02 There are two main types of output messages: responses to input messages and internally generated outputs.

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- (a) Typical output message responses to input messages include diagnostic test results and system status reports.
- (b) Typical internally generated messages include reports of trouble detected by the system and regularly scheduled reports, such as the time of day printouts and traffic data.

3.03 Output Message Format—There are two output message formats used with the No. 2B ESS. Format A messages are used with both No. 2 ESS and No. 2B ESS. Format B messages are used only with the No. 2B ESS. Both formats use four groups of characters (fields) which are separated by a space.

3.04 Format A messages are as follows:



The first two character positions of the Alarm and Time Code Field identify the type of alarm that accompanies the message. The alarms are defined as follows:

- ** = Major alarm
- * = Minor Alarm
- = Spurt alarm or no alarm

The second two characters of the Alarm and Time Code Field (tt) always contain two numbers. The two numbers indicate how many minutes have passed since the last hourly message was printed. To determine the actual time the message was printed, add the minutes printed in the message to the hour printed in the previous hourly printout. Characters X₁ and X₂ of the Identity Field have the following meaning:

- (1) Character X₁ defines the type of message.
 - A—Administration type message

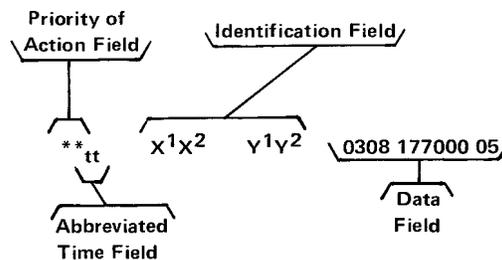
- M—Maintenance type message
 - T—Traffic type message
 - U—Utility type message.
- (2) Character X₂ indicates why this output message was generated.
- A—Action was taken: the system has taken an action automatically and a different configuration is being used.
 - I—Information being outputted due to an automatic trigger.
 - R—Response to a message that was previously typed in and was followed by the PF acknowledgment.

(3) Characters Y₁ and Y₂ of the Identity Field indicate the type of unit to which this message applies.

(4) Characters Z₁, Z₂, and Z₃ of the Action Field define the type of action that has taken place or give the action performed.

(5) The Data Field characters (dd...dd) provide the data words for the output message.

3.05 Format B messages are as follows:



(1) The Priority of Action Field denotes five separate levels of priority for action. The five categories are listed as follows:

- ** Immediate action required—results in major alarm being sounded.
- * Action required—results in minor alarm being sounded.

M Message is result of a manual action on the part of the craftsperson (TTY input, key operation, etc).

A Action was automatically taken by the system resulting in this automatically generated message.

(blank) Automatically generated message by the system to provide information—no action taken.

(2) The Abbreviated Time Field consists of two digits indicating the minutes after the current hour.

(3) The Identification Field of all messages in response to an input message consists of the input action field and that portion of the Identification Field that is not optional.

3.06 Some output messages that are automatically generated can also be manually requested. For actions that cannot be directly requested of the system, two categories of identification have been defined—one specific category and one general category. The keyword RCOVRY is used for the specific category under the following definition:

(a) RCOVRY—to report system actions taken to restore basic processing capabilities.

(b) The keyword REPT has been selected for the general category of automatically generated output messages.

(c) Additional keywords are used for further identification.

3.07 The type of report being given is identified with appropriate keywords following the keyword REPT. The report category has been further subcategorized to cover a comprehensive set of failure types. The name of the subcategory is the keyword which is used in the identification field if that subcategory is chosen. The definitions of these subcategories are as follows:

(1) **Interrupt (INT)**—to report the occurrence of a Maintenance Interrupt, where the definition of Maintenance Interrupt is a function of system design.

(2) **Alarm (ALM)**—to report the sensing of an alarm condition, eg, fuse alarms, building

alarms, low TTY paper, broken tapes, where the definition of alarms is a function of system design.

(3) **Threshold**—to report that some measured quantity falls outside normal limits, eg, peg count overflows, voltage levels, excessive dial tone delay.

(4) **Trouble (TRBL)**—to report a condition, such as a fault or error, that causes a deviation from normal system design.

(5) **Error (ERR)**—to report a malfunction, the symptoms of which cannot be reproduced under program control.

(6) **Fault (FALT)**—to report a malfunction, the symptoms of which can be reproduced under program control.

Note: In regard to the TRBL, ERR, and FALT subcategories, it is the intent that the specific conditions are reported as Faults or Errors when a clear distinction is made by the system as to the nature of the condition. Where a clear distinction is not or cannot be made as to FALT or ERR, then the condition is reported as TRBL.

3.08 The data field portion of the message follows the identification field. The data field of an output message may be null or may consist of only a termination report or a termination report and detailed results, data statements, etc. There are three possible termination reports that can be specified in the data field of an output message. A fourth, the COMPL report, is the default case. The absence of a termination report implies normal completion of the action. The conditions under which any of the reports can be used are as follows:

(a) **COMPLETED (COMPL) (default case)**—The requested action is terminated after completion.

(b) **STOPPED**—The requested action is terminated before a normal completion. A statement follows explaining the reason for noncompletion.

(c) **ABORTED (ABT)**—The requested action is terminated before completion. The termination is immediate. A statement follows explaining the reason for the abort.

(d) **NOT STARTED**—The requested action is not begun. A statement follows explaining the reason for not starting.

3.09 If the assigned output channel for an output message is currently out of service, the message is routed to the assigned backup channel. If the backup channel is out of service, the message is aborted.

3.10 In order to save time, zero data fields that come at the end of the output message are not usually typed on the TTY. When the output message manual indicates more fields than have been typed, it can be assumed that these fields are zero unless stated otherwise in the manual.

3.11 No input message should be typed while an output message is in the process of being printed out. Characters being typed in are ignored by the system, and the printout may be garbled. The operation of the BREAK key, however, can cause an output message to be terminated and puts the TTY channel in an input mode.

3.12 Output Message Priority—Output messages are assigned a priority when they are put into the TTY buffer. This priority is only used to determine which message, if any, to delete from the buffer when the buffer is full and a new message arrives. If any messages in the buffer have a lower priority than the new message, the earliest message with the lowest priority is deleted to make room for the new message. In rare cases, some output messages are lost and not printed out. In any event, all messages for a given TTY are printed in the exact order they are received into the buffer. Priority does not affect the order of printing.

3.13 Hourly Time Messages—Every hour on the hour a complete date and time message is printed on each idle, in-service TTY. The format of an hourly date and time message is shown as follows:

A mm SYS STAT www dd1 dd2 dd3

mo/dd/yy hh:mm:ss xxxxxxxxxxxx

mo = month (01-12)

dd = day of month (01-31)

yy = year (75-99)

hh = hour (00-23)

mm = minute past the hour (00-59)

ss = seconds (00-59)

xx---x = local office code

www = day of week (omitted, SUN, MON, TUES, WED, THURS, FRI, SAT)

dd1 = contents of memory location SYS STAT. (Refer to OM-2H200 for details.)

3.14 The date and time message printed each hour acts as a reference for the following hour; therefore, most individual TTY output messages include only the number of minutes after the previous hour.

3.15 Determining TTY Channel Output Integrity—
At the beginning of each output message, a detection test is conducted to guarantee the ability to communicate with the device. (This test may be permanently disabled on a particular channel by setting a bit in translations for that channel.) This test consists of sending a standard character (WRU) to a TTY which is to receive a TTY message. The WRU character triggers a response (ACK) off the answer back unit (on channels so equipped). In channels 2 through 7, if the correct response is not received, the channel is marked out of service and a complete diagnostic is run on the channel to determine if the trouble lies in the loop or in the control circuit. Meanwhile, the output message is routed to the backup channel.

4. INPUT MESSAGES

TYPING INPUT MESSAGES

4.01 There are three main types of input messages. The functions of these messages are to request output messages, to request system changes, and to provide data for system use.

(a) Typical input requests for output messages include requests for traffic data, requests for line activity states, requests for diagnostic tests to be run and the results printed out, and requests for translation information associated with a particular equipment number.

(b) Typical input requests for system changes include requests for switching active and

standby units and requests for taking a unit out of service.

(c) Typical input messages providing data for system use include recent change information and time-of-day information. Recent change (RC) messages are a particular type of input message and can be entered via the service order channel or the maintenance channels. There are several different types of translation information which can be altered via RC messages. Some of these are:

- (1) Line translation information
- (2) PBX translation information
- (3) Trunk translation information
- (4) Three-digit translation information.

4.02 Detailed explanations of the input messages to be typed are provided in the Input Message Manual (IM-2H200).

4.03 Input messages normally begin at the left-hand margin. The carriage is automatically repositioned by the system to the proper starting place, and no action is taken by the attendant to obtain the correct margin.

A. Verifying Channel Availability

4.04 The maintenance personnel, if away from the channel for some time, should verify that the channel is in working order before typing an input message. A channel may be verified as being operational by typing the abandon character (&) with the response being: line feed—carriage return—line feed (LFCRLF). If this does not occur, diagnostic tests should be requested on that channel. If the TTY responds properly, then any alphabetic character should be typed followed by the execute character (!). If the channel is operational, the ?A acknowledgment (action error) should be printed out. Input messages can then be typed. If the acknowledgment ?O is printed out, the channel is out of service.

B. Allowable Times To Type

4.05 Input messages may be typed at any time the TTY is not busy with an output message. If the TTY buffer is full, a sharp sign (#) is printed out following the first input character. If, after several at-

tempts, an input cannot be entered, the priority of an input message may be raised if the input message is important. This can be done by operating the BREAK key which eliminates a low priority output message in the buffer providing room for the input message. If the buffer is filled with high priority output messages, the BREAK key has no effect.

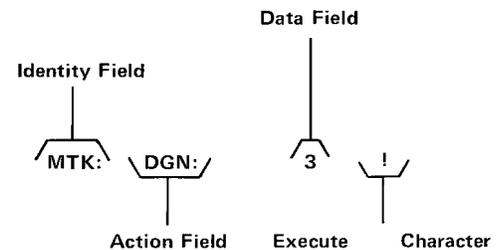
INPUT MESSAGE FORMAT

4.06 There are two input message formats used with the No. 2B ESS;

- Message Format A—Used in both the No. 2 ESS and No. 2B ESS.
- Message Format B—Used in the No. 2B ESS only.

Message Format A

4.07 Input messages consist of from three to eight fields. These fields are grouped into three major fields: identity field, action field, and data field. A typical input message is shown in the following example.



4.08 The identity field consists of two separate fields. The first field, consisting of a maximum of four characters, specifies the program that is to handle the message plus other optional information. The second field, consisting of one or two characters, designates the program or equipment for which the message is intended.

4.09 The action field indicates the action that the system must perform on the unit specified in the identity field. The action field may contain up to three characters.

4.10 The data field may consist of up to five separate fields. These fields specify the data re-

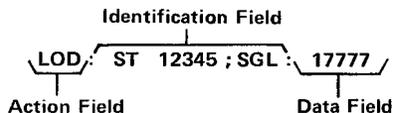
quired by the system to process the message and is followed by an execute character which initiates the processing of the message. Some messages require no data field.

4.11 In some input messages, the amount of data entered in a field may be less than the amount of data that could be entered in a field (for example, 256 in a 5-digit field). When this situation occurs, leading zeros need not be typed unless instructed otherwise by the input message manual (256 typed instead of 00256). However, at least one digit must be typed in a field if any nonzero fields follow. If the last fields of data in a message are completely zero, they do not need to be typed unless stated otherwise by the IM-2H200.

4.12 The message format for some types of recent change messages differs from the normal input message format particularly in the case of recent change service orders. Consult the IM-2H200 for the specific RC format needed for a particular application. Reference should be made to the input message manual before typing any message to ensure that the correct format is used.

Message Format B

4.13 The basic structure for a format B message is divided into three categories; (1) action, (2) identification, and (3) data. A typical example of a format B message is as follows:



4.14 The action field is always required and consists of only a single action verbal keyword indicating the action that the system should perform. Each action verb specifies the meaning of the identification subfields allowed and whether or not a data field is permitted on a message using that verb.

4.15 The identification field consists of up to three subfields depending on the action verb. The first subfield is always required, whereas the other two subfields may be optional. Therefore, optional fields preceding another nonzero field need not always be typed.

4.16 The data field, if allowed, may consist of no data or defaulted data, interchangeable or noninterchangeable keyword units, or positional data, as required by the message. If the last fields of data in a message are completely zero, they do not need to be typed. However, at least one digit must be typed in a field if any nonzero fields follow.

INPUT TIMEOUT

4.17 Since an output message cannot occur on a TTY while an input message is being typed, a time-out feature is provided to ensure that no excessive delays occur during the typing of an input message. Each character in the message must be typed within 45 seconds of the preceding character. If this timing interval is exceeded, a *time-out* occurs and an error acknowledgment (?T) is printed out on the TTY. The system causes the carriage to reposition, and it is necessary to retype the input message from the beginning. A *time-out* may be prevented by typing redundant spaces *between* fields of a message or by typing the rubout (RO) character on the Model 35 TTY (the DELETE character on the Model 43 TTY) at any point in the input stream.

INPUT MESSAGE CONTROL CHARACTERS

4.18 A group of TTY characters have been reserved for use in controlling the handling of input messages as well as controlling the TTY keyboard and carriage. Since these characters have control significance, their indiscriminate use produces chaotic results. The control characters and their significance are described in the following paragraph.

- (a) **Execute (!)**: The exclamation point is the execute character for the end of an input message. It tells the system that the input message has been completed and that the message should be processed. It is typed at the end of a 1-line input message and at the end of the last line of a multiple-line input message. The execute character is followed one space later by an input message acknowledgment, which is returned by the system.
- (b) **Continue (/)**: The virgule is the execute character for all lines of a multiple-line input message except the last line which uses the exclamation point. This character is followed by a carriage return, then a line feed from the system. It must never be used to end a message.
- (c) **Abandon (&)**: The ampersand is used as the abandon message character to cancel an input

message any time before the execute or continue character is entered. It causes the current line being typed to be abandoned. If the current line is a 1-line input message, the entire message is erased and a line feed, carriage return, and line feed is returned. If the current line is one line of a multiple-line input message, only that line is erased, and a carriage return, line feed is returned; all previous lines remain and the current line must be retyped.

(d) **Colon (:):** The colon is used to separate the major fields of an input message from the other fields. Its proper use is indicated in the input message manual.

(e) **Space:** The space is used to separate the smaller fields within the identity and data fields. After the first space or colon, all spaces used repetitively are ignored as a control character by the program except that the successive spaces may be used to prevent a *time-out*. The horizontal tab has the same effect as a space.

(f) **Semicolon (;):** The semicolon is used in format B messages to separate the different ID subfields in the *identification* section of the message.

4.19 The line feed, carriage return, and vertical tab carriage positioning keys should not be used while typing an input message. All carriage positioning is done automatically by the system. If one of these keys is operated while entering an input, the character is ignored. If the carriage fails to position properly, the ampersand key should be used.

INPUT MESSAGE ACKNOWLEDGMENT

4.20 Whenever an input message is completed, the system types out an acknowledgment indicating that the message has been received and what action has been taken. The acknowledgment is typed on the same line as the input message if a single-line message, and on the last line if a multiple-line message. The carriage is then automatically repositioned for the next input message or an output message. Table A gives the possible input message acknowledgments and their general meanings. The IM-2H200 specifies the acknowledgment expected for each message.

5. PROCEDURES

REMOVING A TTY DEVICE FROM SERVICE

A. Maintenance Channel

LM TTY

5.01 After the remove message (RMV:TTYC) has been entered into the system, the motor for the Mode 35 LM TTY can be turned off by operating the power switch on the inside of the TTY to the OFF position. The ON/OFF switch for the Model 43 TTY is located on the rear of the TTY.

Note: The LM TTY can automatically be turned off after a time-out using the idle line control feature, if so equipped (Model 35 TTY only).

RM TTY

5.02 In like manner, the RM TTY should be removed from service via a TTY input message (RMV:TTYC) before the motor is turned off. The motor can then be turned off by rotating the ON-OFF selector beside the keyboard to the OFF position. The ON/OFF switch for the Model 43 TTY is located on the rear of the TTY.

Note: If the RM TTY is equipped with an idle line control unit, it too can be automatically turned off (Model 35 TTY only).

5.03 Both maintenance TTYs should *not* be turned off at the same time. Since there are two control circuits to ensure that the maintenance channel is operative, there should be a TTY device always available for output messages.

B. Channels 2 Through 7 (Model 35 TTY)

Channel With Both Local and Remote TTYs

5.04 If the channel has multiple TTYs and the motor is to be turned off on only one TTY, rotate the ON-OFF selector (located beside the keyboard) to the OFF position. Any messages designated for the channel will still be received on the TTY with power.

Caution: *If a channel has two TTYs and the TTY containing the answer back*

TABLE A
INPUT MESSAGE ACKNOWLEDGMENTS

ACKNOWLEDGMENT	MEANING
?A*	The action field is incorrect.
?C*	The message may be a legal message, but it is not allowed from this channel.
?D*	The data field is incorrect.
?F*	A format error has occurred. Illegal characters in a particular kind of field were typed.
?I*	The ID field is incorrect.
?O*	This channel marked out of service. It must be restored to service before being used.
?T*	A time-out occurred while waiting for more input characters. This time-out is about 45 seconds.
?P*	Somewhere during the input message a parity error was detected. Retype the input message. If ?P persists, run a TTY diagnostic to find the fault.
?X*	The TTY is in the tape reader mode.
??* (format A) NA* (format B) (No Action)	A system initialization of some degree occurred during execution of this message but not necessarily because of it. The system cannot tell if the message was completed. The user must investigate and possibly repeat the message if not completed. <i>Caution: Do not repeat the message without determining the reason for this response.</i>
IP (In progress)	The message was received and is in the process of being acted upon. A message may not follow. The request may still be rejected for validity reasons. If the message came from paper tape, the reader is turned on unless an End of Test (ETX) is received.
NG* (No Good)	The message was not accepted. The action or data fields were not acceptable, or the present system state may not allow this message now, or if the message came from paper tape the reader-off character may not have preceded the execute or abandon character. If message came from tape, the reader is not turned on. Message must be retyped.
OK	The message was received; the appropriate program was initiated; and the work requested has been accomplished. If the message came from paper tape, the tape reader is turned on unless an (ETX) is received.
PF (Printout follows)	A printout will follow sometime later explaining in detail the results of the work initiated by the input message. If the message came from paper tape, the reader is turned on unless an ETX is received.
RL* (Retry later)	The message should be repeated because for some reason the system cannot handle the message. If the message came from tape, the reader is not turned on.

* A paper tape reader is not turned back on for additional transmission following any message-not-accepted (?, NG, RL) acknowledgment.

mechanism is to be turned off, this is equivalent to taking that channel out of service.

If either the local or remote TTY device is equipped with an idle line control unit, the TTY motor will automatically turn off the motor if no data is received within a certain period of time. This time period, up to a maximum of 20 minutes, is adjusted at the idle line control unit as a user option.

Channel With Either a Local or Remote TTY

5.05 If the channel has only one TTY, either local or remote, the channel must be removed from service prior to turning off the TTY motor. This tells the system to route the messages intended for this channel to its backup. To remove the channel from service, type in:

RMV:TTYC a!

a = TTY channel to be removed from service.

This message may be entered only from the maintenance channel. Then the TTY motor can be manually turned off at the keyboard control. It may be allowed to turn off automatically after a time-out interval using the idle line control feature.

RESTORING A TTY TO SERVICE

A. Maintenance Channel

5.06 The maintenance channel is assumed in service under control of either control circuit 0 or 1. Therefore, only the TTY device needs to be turned on.

Turning on the LM TTY

5.07 To turn on the Model 35 LM TTY, operate the power switch on the inside of the TTY to the ON position. To turn on the Model 43 LM TTY, depress the ON/OFF switch located on the rear of the TTY.

Turning on the RM TTY

5.08 To turn on the Model 35 RM TTY, rotate the OFF-ON selector beside the keyboard to the ON position. To turn on the Model 43 RM TTY, depress the ON/OFF switch located on the rear of the TTY.

B. Channels 2 Through 7 (Model 35 TTY)

5.09 The following procedure is applicable for any nonmaintenance TTY.

- (1) If power was removed from the control circuit, restore power at the TTY controller.
- (2) If the TTY is equipped with an idle line control unit, put the unit in the bypass mode.
- (3) Rotate the ON-OFF selector, located beside the keyboard, to the ON position.
- (4) Place the idle line control in the normal mode.
- (5) Operate the BREAK key. This causes a diagnostic of the TTY channel and restores the channel to service. The system responds with a printout indicating the TTY was restored to service properly. If the diagnostic fails, a diagnostic printout appears on the LM and RM TTYs. The channel may also be restored to service from the maintenance channel by typing in RST:TTYC a!

MANUAL MAINTENANCE CHANNEL TRANSFER

5.10 Maintenance channel control circuits are switched by program control when requested by type-in or during a diagnostic test failure. The transfer messages, typed in on either LM or RM TTY, are identical to the normal remove-restore format. These messages are as follows:

RMV:TTYC a!

a = control circuit to be removed

RST:TTYC a!

a = control circuit to be restored.

As viewed from the CP, the maintenance channel control circuits look like two separate channels during a transfer cycle. For example, the maintenance TTYs normally operate from control circuit 0 but can be transferred to 1 by the **remove** message. When it is desired to switch back to control circuit 0, the **restore** message is typed in. In both cases, a channel diagnostic will precede the actual transfer.

RESETTING A MAINTENANCE TTY

5.11 In addition to transferring control circuits, the CP can also remove the LM or RM TTY

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from service. A light emitting diode (LED) on the SSP labeled TTYC will light indicating the operation is performed. These conditions might be due to a temporary malfunction and can be reset by typing in the RST:TTYC a! message. If the condition persists, further maintenance procedures are necessary.

PROCEDURES USING THE BREAK/INTRPT KEY

5.12 The BREAK/INTRPT key provided on all ASR and KSR TTYs has three specialized functions. The function which is performed depends upon the state of the TTY channel at the time the BREAK/INTRPT key is depressed. The functions the BREAK/INTRPT key may perform are as follows.

- (a) If the channel is out of service, the BREAK/INTRPT key initiates a request to restore the channel to service.
- (b) When the TTY buffer is full, the priority of an input message can be raised in an attempt to get space in the TTY buffer by operating the BREAK/INTRPT key.
- (c) If an output message is being typed, the BREAK/INTRPT key terminates that output message, destroys the remaining untyped portion, and leaves the TTY in an input mode.

A. Initiating a Request From an Out-Of-Service Channel to Restore the Channel to Service

Note: These procedures do not apply for a channel that is to be restored to service when the channel was removed from service by a diagnostic program which determined the TTY loop was open. Refer to paragraph 6.07 for this procedure.

- (1) Depress the BREAK/INTRPT key for approximately 1/2 second (holding the BREAK/INTRPT key down longer does not aid the process).
- (2) Wait for the following output message:

```
tt INIT TTYC a STAT PORT cc EQP dd BCP g
```

Note: Do not type a space or any other character immediately after operating the BREAK/INTRPT key in this case. The BREAK/INTRPT key causes diagnostics to be run and a space or

any other character at this time may cause certain checks to fail due to the extra bits interjected into the control circuit.

B. Terminating an Output Message and Putting the Channel Into an Input Mode

- (1) Depress the BREAK/INTRPT key for approximately 1/2 second.
- (2) Begin typing the desired input message within 45 seconds, **or** depress the SPACE key again.

Since the output message currently being typed is eliminated, an input buffer is assumed for the input message.

PARITY OPERATION

5.13 All TTYs to be used with the No. 2B ESS are equipped for even parity operation. These TTYs insert a parity bit, in addition to the seven information bits in their communication with the central processor. The TTY program checks that the proper parity insertion is followed for input messages typed in from the TTYs.

REMOTE MAINTENANCE OPERATION

5.14 The system is always under the jurisdiction of the maintenance TTYs, either local, remote, or both, since they are on the same channel. During periods of remote operation, the LM TTY may be turned off. Maintenance channel messages will continue to be printed on the RM TTY.

5.15 Alarms are normally operated locally as well as being transmitted to the RM TTY. For remote maintenance operation, an alarm transfer condition can be effected from either maintenance TTY using the following messages:

```
M SY:TFR:ALM! (Transfer alarms to remote site)
```

```
M SY:RST:ALM! (Restore alarms to local office).
```

The transfer message will allow alarms to be sounded locally for only 30 seconds.

Note: The alarm transfer function can also be accomplished by operating the ALARM TRFR key on the SSP.

6. TTY TROUBLE DIAGNOSIS AND MAINTENANCE

6.01 Diagnostics may be initiated upon the TTY in the following ways.

- (1) Detection test failure (automatic).
- (2) If during an output message a character cannot be sent to the channel because of a faulty circuit pack, an automatic diagnosis is performed.
- (3) Manual input request.
- (4) Depression of the BREAK/INTRPT key on an out-of-service channel (manual request).
- (5) Twenty-four hour TTY exercise (automatic) on the maintenance channel only.

REQUESTING DIAGNOSTICS OF TTY CHANNELS

6.02 If there are problems in the TTY channel or in the TTY device itself, the problems may be pinpointed by typing in the following message:

DGN:TTYC a!

a = channel (control circuit for maintenance channel) to be diagnosed.

The request to diagnose a channel does not restore the channel to service even if the diagnostic tests pass.

CHECKING A TTY FOR CORRECT PRINTING AND KEYBOARD OPERATION

6.03 The previously mentioned diagnostics can neither guarantee the correct printing on the paper, nor can they check input from the keyboard. There is a manual test which allows the operating personnel to work along with the system to check for problems in the TTY device. The message requesting this manual test is as follows:

OP:TTYC a, ECHO!

a = channel (control circuit for maintenance channel) to be tested.

The program then waits for the craftsman to type in a character. The character, as seen by the system,

is then typed back to be verified by the craftsman. If the channel had previously passed diagnostics, any problem must be in the TTY device itself.

REMOVING A TTY FROM SERVICE FOR MAINTENANCE

6.04 When a TTY channel has been determined to be defective, it must be removed from service before any maintenance is attempted. The nonmaintenance channels (channels associated with control circuits 2 through 7) are then removed from the system by the RMV:TTYC a! message. In the out-of-service state, any tests can be run on the device that do not require system usage. After repair, the device should be restored to service.

6.05 To work on a TTY control circuit, it should first be taken out of service via a type in. For channels associated with control circuits 2 through 5, the entire channel must be removed from service. The maintenance channel control circuits can be taken out of service individually while the channel itself remains operational. Power to the control circuit should be removed whenever replacing a circuit pack. However, before operating the POWER and RESET key for the controller unit, both channels associated with the key must be removed from service.

POWER REMOVAL FOR CIRCUIT PACK REPLACEMENT

6.06 To work on a TTY control circuit, it should be removed from service. For the control circuit(s) to be removed, the procedures are as follows:

- (1) At either of the maintenance TTYs, type the following input message:

RMV:TTYC a!

a = control circuit for which removal is requested.

All control circuits supplied by the bus whose power is to be removed **must** be taken out of service.

- (2) At the TTY devices just taken out of service, turn the motors off by rotating the ON-OFF selector beside the keyboard to the OFF position.
- (3) Remove power from the bus supplying the control circuits by depressing the TTYC POWER and RESET key for the unit containing the controller circuit.

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RESTORING A TTY CHANNEL TO SERVICE AFTER MAINTENANCE

6.07 After repair, a TTY channel may be restored to service by typing the following input message:

RST:TTYC a!

This message causes a diagnostic of the channel (the same as requested by typing DGN:TTYC a!) and restores the channel to service only if all diagnostic tests pass.