

“DATASPEED®” TAPE-TO-TAPE SYSTEM  
TYPE 1 AND TYPE 2 TAPE SENDERS AND RECEIVERS  
DESCRIPTION AND OPERATION

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C. Interim Unattended Answer (Private Line) . . . . .	17	1.01 This section is concerned with the 1A, 2A and 2A Special Tape Senders (Figure 1) and 1B, 2B and 2B Special Tape Receivers (Figure 2) used in the DATASPEED Tape-to-Tape System. This section presents description and operating information for the senders and receivers; also included are optional features and auxiliary equipment.	
D. Discrete Calling Recognizer Unit . . . . .	17	1.02 This section is reissued to incorporate information on the 6-level tape-to-tape system (special advanced feed-hole). Some text has been rearranged and new figures are added. It also adds information on the new application of existing kits. Since this is a general revision, marginal arrows ordinarily used to indicate changes and additions are omitted.	
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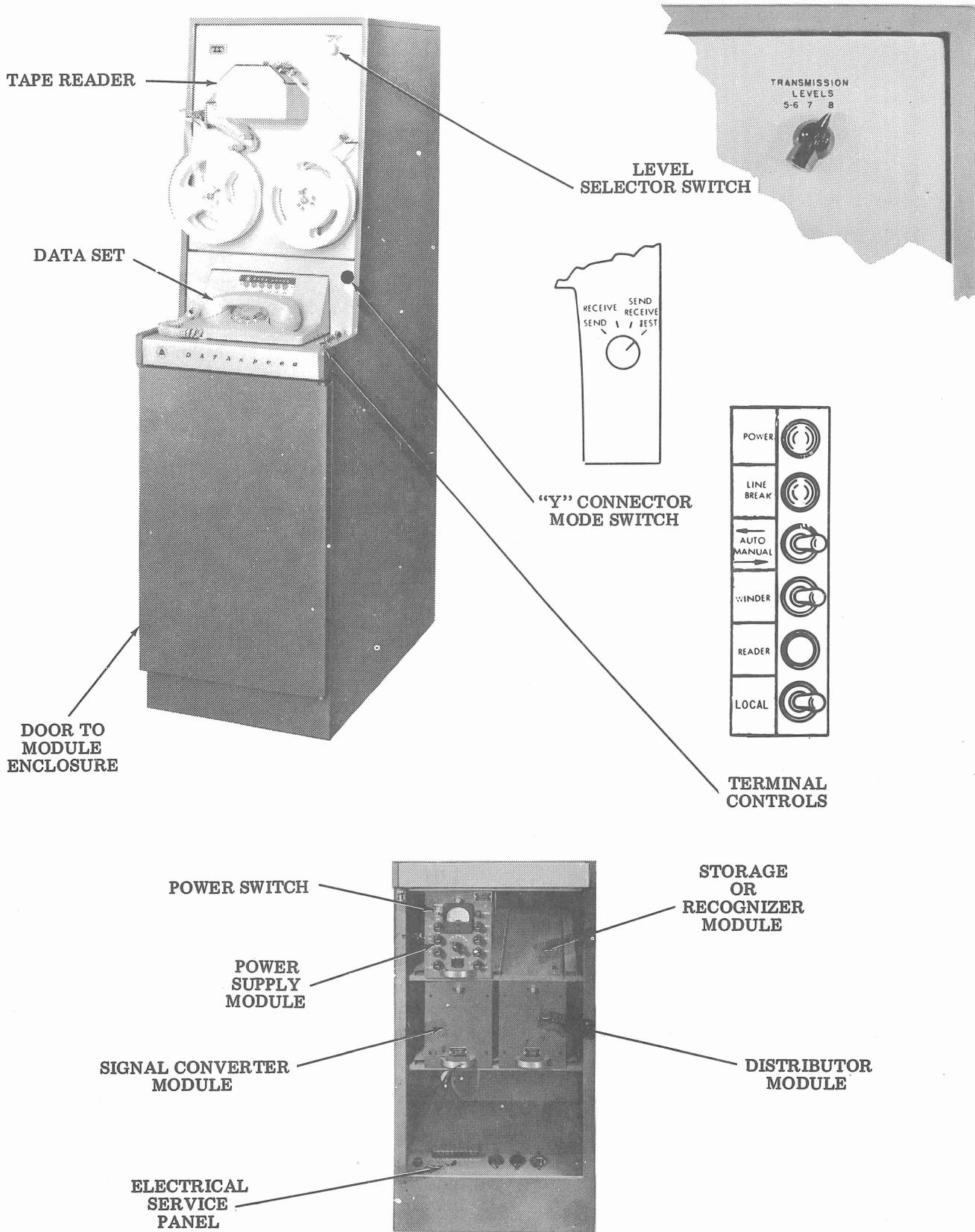


Figure 1 - Tape Sender Terminal

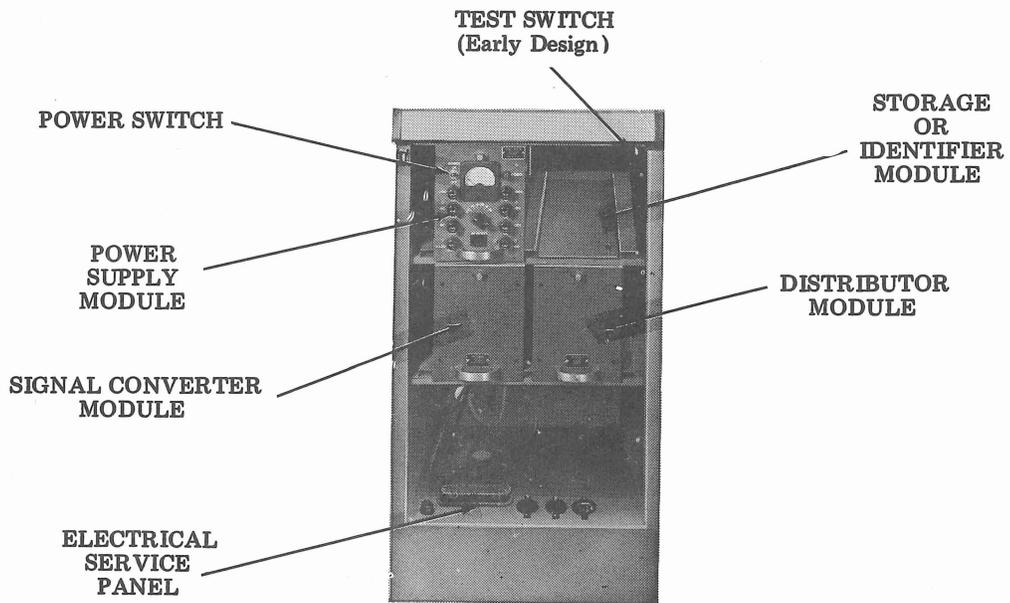
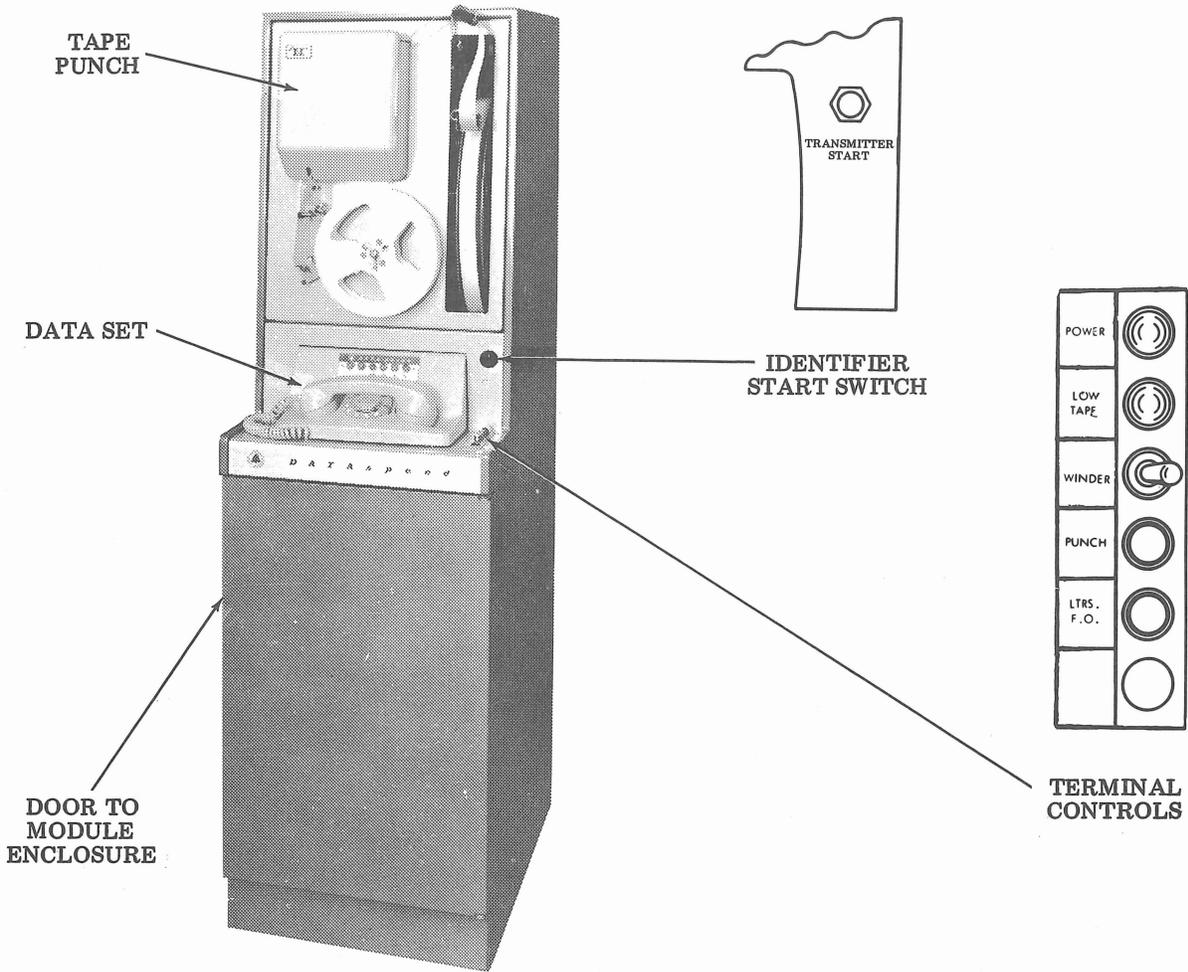


Figure 2 - Tape Receiver Terminal

## 2. GENERAL

2.01 The Tape Senders and Tape Receivers serve as the system input and output terminals, providing 105 characters per second (1050 words per minute) data communication when using switched or private telephone lines. Data, perforated in paper tape, is translated into electrical impulses by the Tape Sender. These impulses serve as the modulating signal for an associated data set. The modulated tone output of the data set is then applied to a two-wire telephone grade channel. At the Tape Receiver site, a data set demodulates the tone signal, translating it to electrical impulses. These impulses are used to activate a tape punch (reperforator) which then perforates a paper tape. This equipment is not code sensitive; that is, the particular scheme used to represent data by means of holes in paper tape may be chosen by the customer.

2.02 There are three types of sender and receiver equipment: type 1, type 2 universal and type 2 special. Type 1 equipment is designed for 5-level operation only. Type 2 universal equipment will accommodate 5, 6, 7, or 8-level tapes. The principle of operation is the same for both types. Additional levels are provided by the use of adjustable reader heads and tape punches, and additional mechanical and electrical components. Operation of a switch at type 2 universal stations allows transmission between it and a type 1 or type 2 special. Type 2 special is a 6-level only nonadjustable system with an advanced feed hole type tape for use in typesetting applications. On-line signals from these units are compatible with type 2 universal (positioned at 6-level).

2.03 The tape-to-tape system consists of a sender terminal for serial data transmission and a receiver terminal for serial data reception. The system includes data sets capable of data only service or alternate voice and data operation. The connection of a sender and a receiver to a single data set at one location, constitutes a send-receive station. The system provides for transmission and reception with either operator-controlled or unattended operation of a terminal. Either can be easily conditioned into a terminal when desired, through use of a data set having the reverse channel feature.

2.04 Other station arrangements available are point-to-point data gathering systems (many senders with few receivers) or data distribution systems (few senders and many

receivers). A station may also be an outlying point for exchanging data with a data processing terminal.

### TAPE SENDER

2.05 The sender terminal contains a tape reader, tape handling equipment, electronic modules, and a data set (Figure 1).

2.06 The type 1 sender transmits a serial signal in 7 unit code, composed of a start bit, 5 data bits, and a stop bit. The type 2 sender transmits a serial signal in 10 unit code, composed of a start bit, 8 data bits, and a stop bit. The 10 bit character format remains constant for any level of operation.

2.07 When variable code level operation is desired on a type 2 terminal, the three position level selector switch is set to the number (5-6, 7 or 8) of the code level to be used. The switch positioning causes undesired bits in a signal character not to be read from the tape. These bits are used in the line signal for required system timing.

2.08 The universal tape reader is set to sense 5, 6, 7 or 8 level tapes, either fully perforated or chadless, by turning the numbered level select dial located on the tape guideplate to the desired number.

2.09 The special tape reader for advanced feed hole tapes (6-level only) operates the same as a universal reader that is positioned to transmit 6-level tapes.

### RECEIVER

2.10 The receiver terminal contains a tape punch, tape handling equipment, electronic modules and a data set (Figure 2).

2.11 The type 1 tape punch operates on a serial signal of 7 unit code and will fully perforate 5-level (11/16 inch) tape.

2.12 The type 2 universal tape punch will fully perforate 5-, 6-, 7- or 8-level tapes. Three level selector switches are located at the top left of the punch. When in the OMIT position, each switch prevents its level from being punched.

2.13 The type 2 special tape punch will fully perforate 6-level (7/8 inch) tape. An advanced (.013 inch) feed hole is punched so that the leading edge of the feed hole and the leading edge of the code holes are in line.

### 3. DESCRIPTION

3.01 General: The necessary equipment for tape-to-tape operation is: A tape sender terminal and a tape receiver terminal. A Bell System 202C Data Set is required at each installation using the telephone network. A 202D Data Set is required for private line installation. The basic components of each terminal are shown in Figures 1 and 2.

3.02 Cabinets: The tape sender terminal and tape receiver terminal cabinets are similar in appearance, and identical in physical size. Although normally furnished in a two-tone gray color combination, two-tone beige or green color combinations are also available.

(a) Each cabinet is of sheet metal, steel reinforced construction. They are floor standing units, housing all the mechanical, electrical and electronic components necessary for operation. The basic cabinet shell is 16 inches wide, 54-1/4 inches high, and 24-3/8 inches deep. The tape sender weighs 160 lbs without the data set. The receiver weighs 176 lbs, again, without the data set.

(b) Operating controls are located on the shelf directly above the lower enclosure. Immediately left of the controls is the mounting area for a data set.

(c) A front sliding panel, located in the upper enclosure of the cabinet, provides mounting facilities for tape handling and mechanical signal generating or receiving equipment. The panel is supported by steel braces, and slides forward on nylon bearings to allow access to the equipment mounted behind the panel.

(d) The lower enclosure provides mounting facilities for three electronic modules, and space for either mounting a fourth electronic module (discrete calling option) or storing a test point signal monitor. The modules slide onto individual mounting trays supported by steel cross members. A lock is provided on each module to secure it in its mounting location. Each module slides forward on its mounting tray for inspection, minor repair, or testing purposes. A safety latch at the right rear corner of the module prevents it from being accidentally pulled off its tray. For access to the lower enclosure, the front door is provided with a self-releasing latch. Pushing in on the upper left corner of the door releases the latch and

allows the door to open. The door is latched by simply closing the door until the latch engages.

3.03 Mechanical components: The tape reader and tape punch mount on the sliding front panel of their respective cabinet along with their associated tape handling equipment. Detailed descriptions of the tape reader and tape punch mechanisms are found in Sections 592-801-100 and 592-802-100.

(a) The tape handling facilities for the sender and receiver terminals operate in basically the same manner. The difference between the terminals is that the tape supplied to the tape reader is a perforated "message tape," while the tape supplied to the tape punch is blank. In both, the tape is directed from a supply reel located on the right side of the front sliding panel. Movement of the supply reel is controlled by the tape feed mechanism of the mechanical unit, and by a friction type brake arm which rides the tape. In the tape receiver terminal, a low tape alarm is actuated by the brake arm when the tape supply is nearing depletion. If chad should back up the chad chute, an overload release on the chute (directly beneath the tape punch block) releases to prevent chad from fouling the punch mechanism.

(b) The perforated tape leaves the left side of the tape reader or punch and is routed through the winder mechanism to the tape winder (take-up) reel. The tape is wound on the take-up reel by an electric motor, mounted behind the sliding front panel. The operation of the motor is controlled by a mercury switch operated by the tape sensing arm. The position of the tape sensing arm determines whether the mercury switch contacts are open or closed; therefore, whether the motor is off or on.

### 4. PRINCIPLES OF OPERATION

4.01 The signal transmission path for operation of the system is established through data sets associated with the tape sender and tape receiver. A simplified block diagram of the system appears in Figure 3.

4.02 The system operates as follows: A prepunched message tape is placed in the tape reader, and the proper controls are operated. A telephone connection is established to the distant receive station. As tape feeds

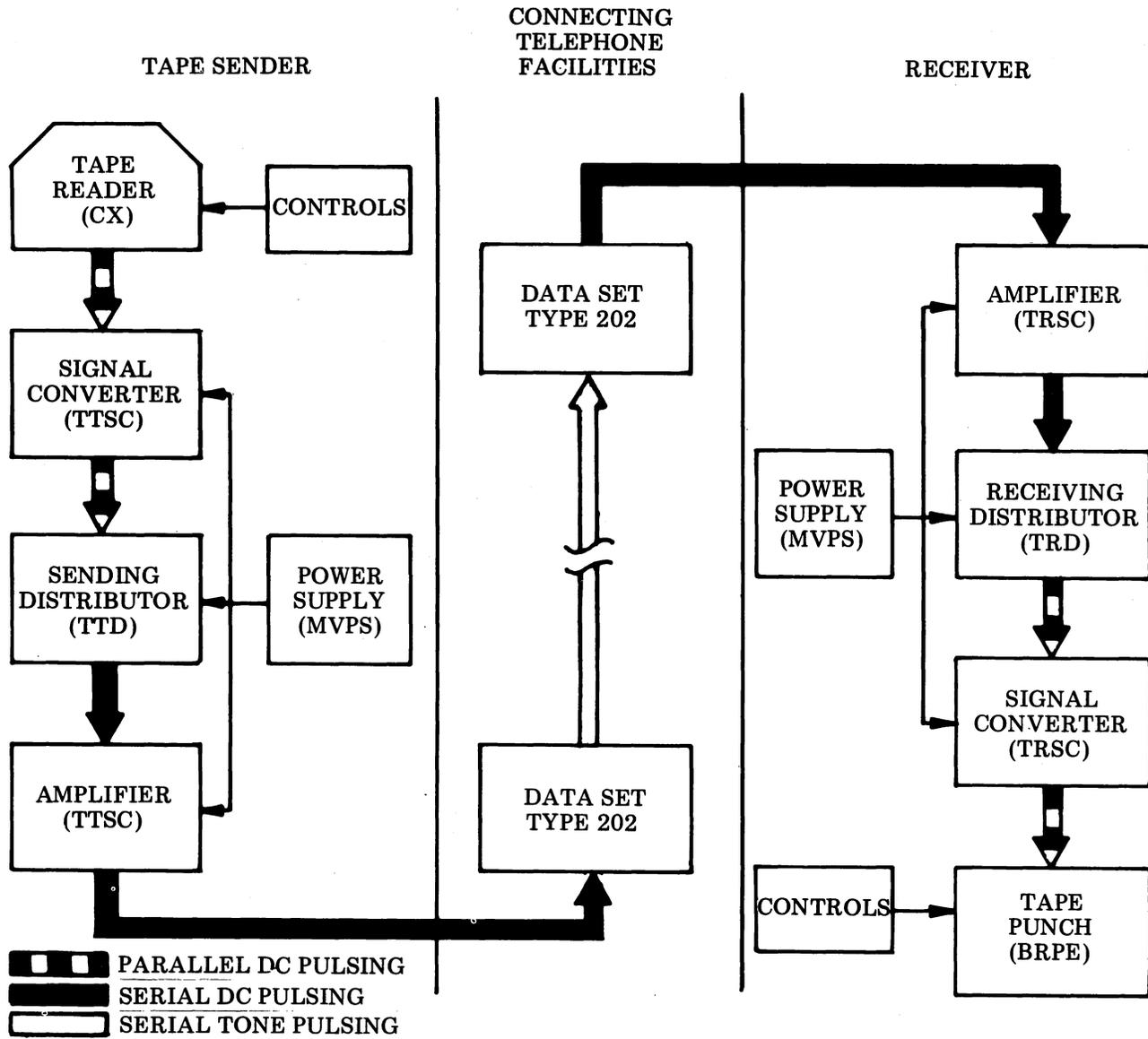


Figure 3 - System Block Diagram

through the reader, data bit signals, plus start-stop bit signals, are fed to the signal converter in parallel form. The signal converter reshapes the signals and passes them on to the sending distributor. The sending distributor converts the signals from parallel form into serial form. From here they are passed, a bit at a time, back through the signal converter to the data set in the form of positive and negative dc voltage signals. The data set converts the dc signals into voice-frequency tones. These tones are transmitted over the telephone circuit to the distant receive station.

4.03 At the receive station, voice-frequency tones received by the data set are converted to dc serial signals and passed through the signal converter to the receiving distributor. They are then converted into parallel bit signals

and routed back through the signal converter to the tape punch which punches the received message in paper tape.

## 5. CONTROLS

5.01 The controls for operating the sender (Table A) and receiver (Table B) are located on the horizontal shelf to the right of the data set (Figures 1 and 2) and on the reader and punch. POWER ON/OFF switches and POWER ON lamps are located in the module enclosure (Figures 1 and 2).

5.02 Optional Sender Controls: SEND-RECEIVE rotary switch to control modes of a send-receive station. LOCAL toggle switch for local testing of a send-receive station.

TABLE A  
CONTROLS OF TAPE SENDER TERMINAL

Designation	Type of Control	Function
POWER ON/OFF	Toggle switch	Controls ac power input
POWER ON	Lamp (orange — ON)	Indicates ac power switch on
POWER	Lamp (orange)	Indicates power on and -28 voltage verified
LINE BREAK	Lamp (red) and alarm bell	Indicates reverse channel not being received
AUTO/MANUAL	Toggle switch	Determines automatic or manual answering of incoming calls
WINDER	Pushbutton* or toggle switch**	Enables or disables winder motor
READER	Pushbutton*	Starts or stops reader motor
RUN STOP FREE	Lever	Controls tape motion at reader
5 6 7 8	Dial	Controls level selection at reader
TRANSMISSION LEVELS 5-6 7 8	Rotary switch	Controls level transmission

\*Nonlocking button (Button restores automatically after being depressed; contacts remain operated until button is again depressed and released.)

\*\*For units manufactured before the first quarter of 1964, not having a toggle switch (see 7.36).

TABLE B  
CONTROLS OF RECEIVER TERMINAL

Designation	Type of Control	Function
POWER ON/OFF	Toggle switch	Controls ac power input
POWER ON	Lamp (orange — ON)	Indicates ac power switch on
POWER	Lamp (orange)	Indicates power on and -28 voltage verified
LOW TAPE	Lamp (red)	Indicates tape near end of reel
WINDER	Pushbutton* or toggle switch***	Enables or disables winder motor
PUNCH	Pushbutton*	Starts or stops tape punch motor
LTRS FO	Pushbutton**	Feeds out tape (all levels punched)
0 6 7 OMIT	Slide switches	Control level selection at punch

\*Nonlocking button (Button restores automatically after being depressed; contacts remain operated until button is again depressed and released.)

\*\*Nonlocking button which must be held down during operation.

\*\*\*For units manufactured before the first quarter of 1964, not having a toggle switch (see 7.36).

5.03 **Optional Receiver Control:** TRANSMITTER START pushbutton switch to cause a discrete code to be transmitted (7.26).

5.04 To facilitate off-line testing of the control electronics, a test switch (located in the receiving distributor module) is provided. This switch, when in the TEST position, provides a spacing signal on the distributor input, causing the tape punch to feed out blank tape. It serves as a quick check of components — excluding the data set. With the switch in the TEST position, a Data Test Set 905B or 905A can be used to make local tests.

Note: In earlier receiver units a test switch is located directly below the terminal controls (Figure 2). This switch is rendered useless with the addition of the test switch in the receiving distributor module, and has been eliminated on subsequent units.

## 6. OPERATING PROCEDURES

### TAPE SENDER

6.01 Procedures for operating the tape sender terminal are as follows:

(a) Turn the ac power supply on (switch is located on power module), and check that the POWER lamp (orange) located on the control panel lights. Since the equipment is designed so that the power may be left on permanently, this operation will seldom be required.

(b) On type 2 standard terminals, select the appropriate transmitting code level by operating the level selector switch at the upper right corner of the cabinet (Figure 1). Rotate the level select dial on the tape reader (located at right front corner of reader) to match the level selector switch setting.

Note: The above step is not necessary on type 1 or type 2A (special) 6-level terminals.

(c) Thread the tape (Figures 4 and 5).

**CAUTION:** TAPE WINDER SWITCH MUST BE OFF BEFORE REPLACING TAPE REEL.

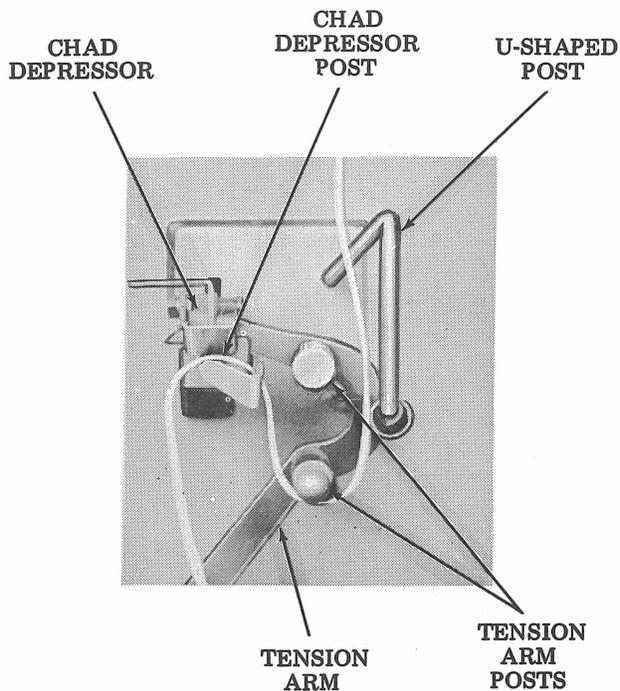


Figure 4 - Threading Tape on Sender

- (1) Place a roll of punched tape on the supply reel. Place the supply reel and the take-up reel on the right and left tape reel hubs, respectively. Engage the reel locks on the winder hubs. Chadless tape must be rewound before it is placed in the tape reader, since the reader cannot read chadless tape traveling in a reverse direction.
- (2) Thread the tape through the brake arm (approximately two feet of "LETTERS" (or "DELETE") tape is required to thread the reader and the winder mechanism).
- (3) Place the tape reader control lever in the FREE position. Thread tape through the reader gate.
- (4) Lift the chad depressor arm (Figure 4) and move the tape tension arm to the extreme left. Release the chad depressor to lock the tension arm in place.
- (5) Pass the tape between the stationary U-shaped post and the posts on the tension arm, and then upward between the chad depressor and its post.

(6) Hold tension on the free end of the tape, and lift the chad depressor arm while allowing the tension arm to rotate to the right.

(7) Place the end of the tape in the take-up reel. Manually rotate the reel counterclockwise two revolutions to secure the tape to the reel.

(8) Operate the WINDER switch to enable the winder motor. The winder will automatically wind any excess tape and turn off, indicating proper operation of the winder mechanism. During normal operation, the winder motor is controlled by a mercury switch attached to the tape tension arm mechanism, and operates intermittently as the arm travels up and down.

#### 6.02 Attended operation for terminals without optional features is as follows:

- (a) Check that AUTO-MANUAL switch is in the MANUAL position, that the reader RUN-STOP-FREE lever is in STOP, and that on terminals having a reverse channel feature data set, the OPR/TEST switch is at OPR. (On terminals without the reverse channel feature, set switch to TEST to simulate reverse channel.)
- (b) Depress the TALK pushbutton on the data set, and dial the distant receive station.
- (c) Request the operator at the receive station to select the proper operating level (type 2 units only), and to operate the WINDER and PUNCH switches.
- (d) Depress the READER button at the control panel.
- (e) Have the remote receiver operator depress the DATA button as soon as he is ready.
- (f) After hearing the end of a 2025 Hz high-pitched tone from the receiver, depress the DATA button on the sender data set. The DATA lamp shall light.

**CAUTION:** SINCE THE INCOMING LINE AT THE RECEIVE STATION IS OPEN UNTIL THE TRANSMITTER STARTS SENDING, NOISE TRANS-

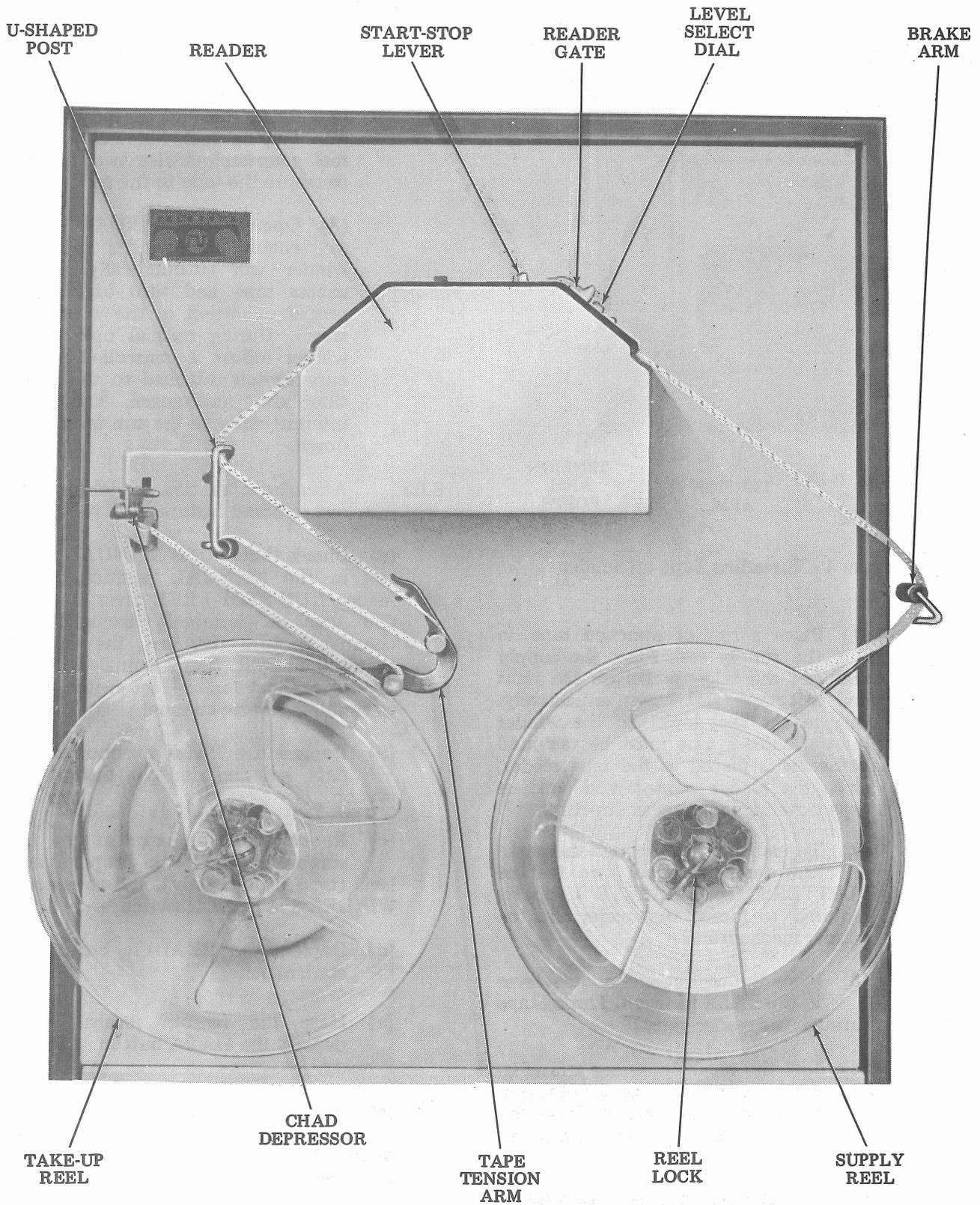


Figure 5 - Tape Path for Sender Terminal

MITTED ON THE LINE WILL CAUSE GARBLE TO BE PUNCHED IN THE TAPE. THE SENDER OPERATOR SHOULD COVER THE HANDSET MOUTHPIECE TO PREVENT NOISES (MOTOR SOUNDS, BREATHING, ETC) FROM PUNCHING GARBLE. A PUSH-TO-TALK HANDSET MAY BE PROVIDED TO ELIMINATE THIS CONDITION.

- (g) Move the reader control lever to the RUN position. Transmission will begin and the handset can be placed on its cradle.
- (h) To terminate the call:
  - (1) Move the reader control lever to the STOP position.
  - (2) Operate the READER and WINDER switches to stop the motors.
  - (3) Depress the TALK button on the data set, lift the handset, and then hang up.

6.03 A sender station can answer a call in almost the same manner as that of making a call. After the data set rings, the TALK pushbutton is depressed and the handset is lifted to answer the call. After a voice path is established with the receiving station operator, the procedure is the same as for originating a call (6.02, (c) through (h)), except that the sender operator goes into the DATA mode first.

6.04 Attended operation with circuit assurance and break feature are as follows:

- (a) The operating procedure is the same as described in 6.02 and 6.03. The break feature allows the remote receiving station operator to interrupt transmission for a trouble such as low or torn tape. When this is done data transmission will stop, the red LINE BREAK lamp will light, and a bell will sound at the sending station. Return to the talk mode by depressing the TALK pushbutton on the data set and find out the reason for the interruption.
- (b) To resume transmission the sending and receiving data sets are returned to the data mode by depressing the DATA buttons.
- (c) A trouble stop usually means some loss of data. When a stoppage occurs either all of a message should be re-sent or the message tape can be restarted ahead of the interruption.

6.05 Unattended operation requires a conditioning of the sender terminal to answer automatically. The procedure is as follows:

- (a) Turn POWER switch to ON.
- (b) Move AUTO/MANUAL switch to AUTO.
- (c) Place the message tape in the reader (thread tape on the take-up reel, if required).
- (d) Place reader control lever in RUN.
- (e) Depress AUTO pushbutton at data set.
 

Note: A data set option is available which makes step (e) unnecessary. The sending data set then answers all calls automatically, starts the reader and winder motors, then transmits the tape message and disconnects.
- (f) To restore the sender to attended service, depress the TALK pushbutton and move the AUTO/MANUAL switch to MANUAL.

6.06 Unattended operation with circuit assurance and break feature is as follows:

- (a) The procedure is the same as that given in 6.05, and the circuit assurance and break feature operate as in 6.04.
- (b) The loss of reverse channel will stop the sender and begin a thirty second timer: disconnect occurs if reverse channel does not come on again during the time out period.

6.07 Calling an unattended receiver is as follows:

- (a) The sending station can place a call to an unattended receiving station only if the automatic answer feature has been enabled at the receiver.
- (b) Normal call procedure can then be followed. The call is then answered automatically. The receiver will go immediately into the DATA mode and send a high-pitched tone. The message may then be sent.

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RECEIVER

6.08 Procedures for operating the tape receiver terminal are as follows:

(a) Turn the ac power supply on (switch is located on power module), and check that the POWER lamp (orange) located on the control panel lights. Since the equipment is designed so that the power may be left on permanently, this operation will seldom be required.

(b) To select the desired receiving code level (universal punches only):

- (1) Remove the punch cover.
- (2) Level selector switches are located on the punch at the upper left, visible with the cover removed.

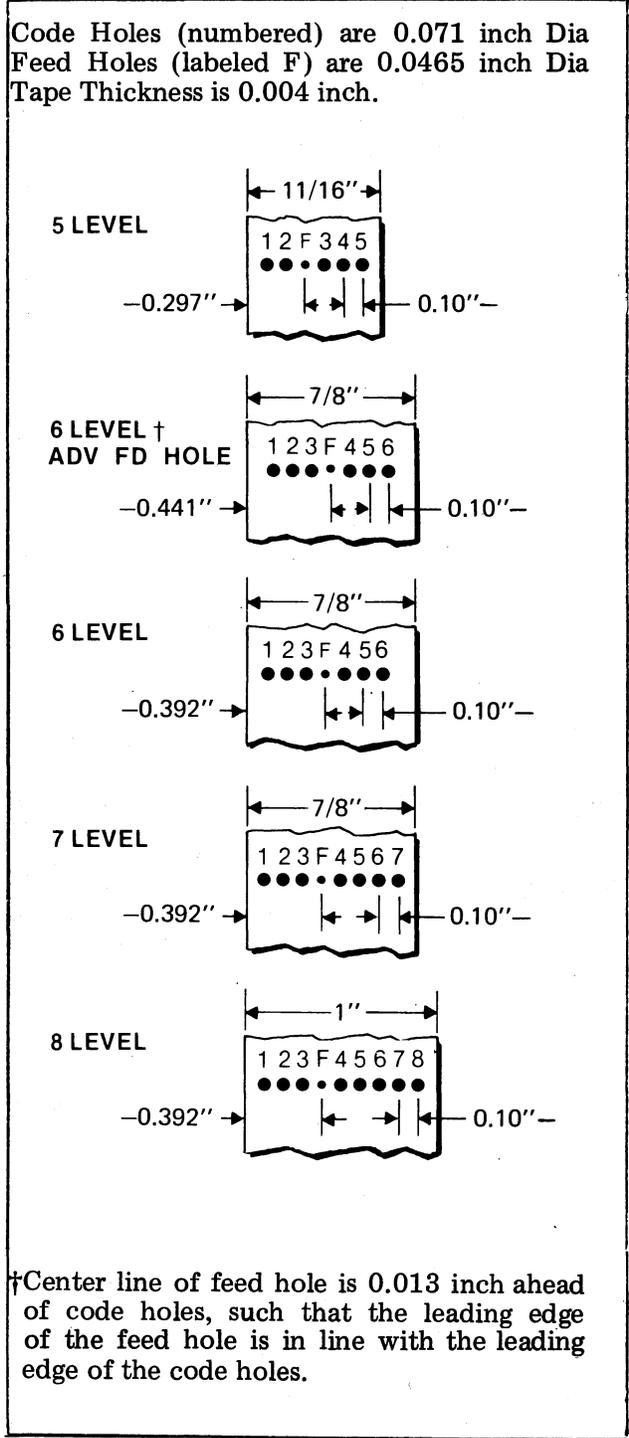
(3) To perforate 5 level — 11/16 inch tape (Figure 6), lift up on the control lever (located at the right side of the punch block) and allow it to move forward. Operate the level selector switches for the 0, 6, and 7 levels to their OMIT positions. Move the tape guide plate to its forward detented position.

(4) To perforate 5, 6, 7, or 8 level — 1 inch tape (Figure 6), push the control lever to the rear, while applying a slight downward pressure, until the control lever reaches its rear detent position. Operate the level selector switches for the 0, 6, or 7 code levels to their ON positions, depending upon the level of operation desired. Move the tape guide to its rear detented position.

(c) Thread tape (Figures 7 and 8).

(1) Arrange the tape supply reel retainers and latches to accept the tape width being used (Figure 9). Load a roll of tape (3000 feet) on the supply reel and place the reel on the bearing rail in the cabinet. The brake arm may be held out of the way by the upper roller while the supply reel is being put in place.

Note: Units manufactured after April, 1963, have a chad collection arrangement utilizing a cotton bag for storage of the chad pieces.



Note: Numbering indicates the sequence in which code bits are received, and this sequence in which they are transmitted.

Figure 6 - Tape Dimensions

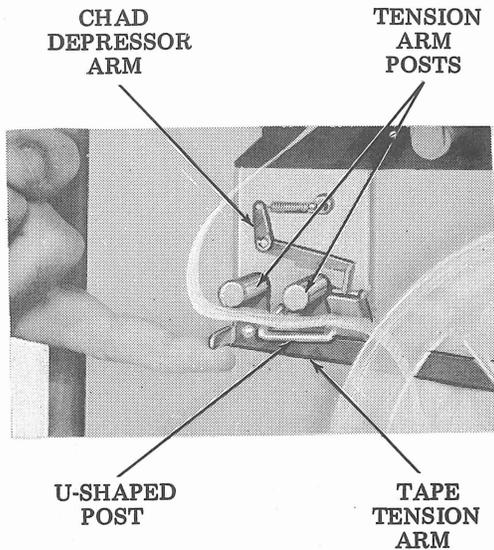


Figure 7 - Threading Tape on Receiver

**CAUTION:** EMPTY THE CHAD BAG OR BOX EACH TIME A REEL OF TAPE HAS RUN THROUGH THE TAPE PUNCH.

(2) Remove the tape punch cover. The cover is held in place by a magnetic lock at the top. It is removed by pulling it away from the cabinet and applying a slight downward pressure.

(3) Thread tape through brake arm and the rollers. A manual change must be made in the tape guide to accept 11/16 inch, 7/8 inch, or 1 inch tape. Then thread the tape through the punch block; approximately 2 inches of tape should extend beyond the punch block.

(4) Depress the PUNCH button, and then depress and hold the LTRS FO button while pulling rapidly on tape. This will start the tape through the tape punch. Release the LTRS FO button after approximately 3 feet of tape is fed out.

(5) Replace the tape punch cover.

(6) Lift the tape tension arm until it raises the chad depressor (Figure 7).

(7) Route the tape between the posts on the tension arm and the U-shaped stationary post from left to right.

(8) Release the tension arm. While holding the free end of the tape taut, release the chad depressor and allow the tension arm to return to its original position.

(9) Place the free end of the tape in the take-up reel, and put the reel on its hub. Engage the reel lock on the winder hub, and turn reel counter-clockwise to start the tape on the reel.

(10) Operate the WINDER switch to energize the winder motor. The winder will automatically wind any excess tape. As the tape tension arm nears its upper limit, the motor will cut off. During normal operation, the winder motor is controlled by a mercury switch attached to the tape tension arm, and operates intermittently as the arm travels up and down.

(11) Depress the LTRS FO button momentarily, and check the tape path for proper feeding.

(12) Depress the PUNCH button to stop the punch motor.

6.09 Attended operation without variable features is as follows:

(a) When the data set rings, lift handset and depress the TALK button on the data set, and establish a talking path to a send station in the normal telephone manner.

(b) Depress the PUNCH button. When the punch motor starts, advise the send station that the set is ready to receive data.

(c) Immediately depress the DATA button when the sender carrier tone is heard. The DATA lamp shall light. Transmission begins when the sender operator moves the reader control lever to the RUN position. The handset may now be placed in the cradle.

(d) When the end of message has been indicated, terminate the call as follows:

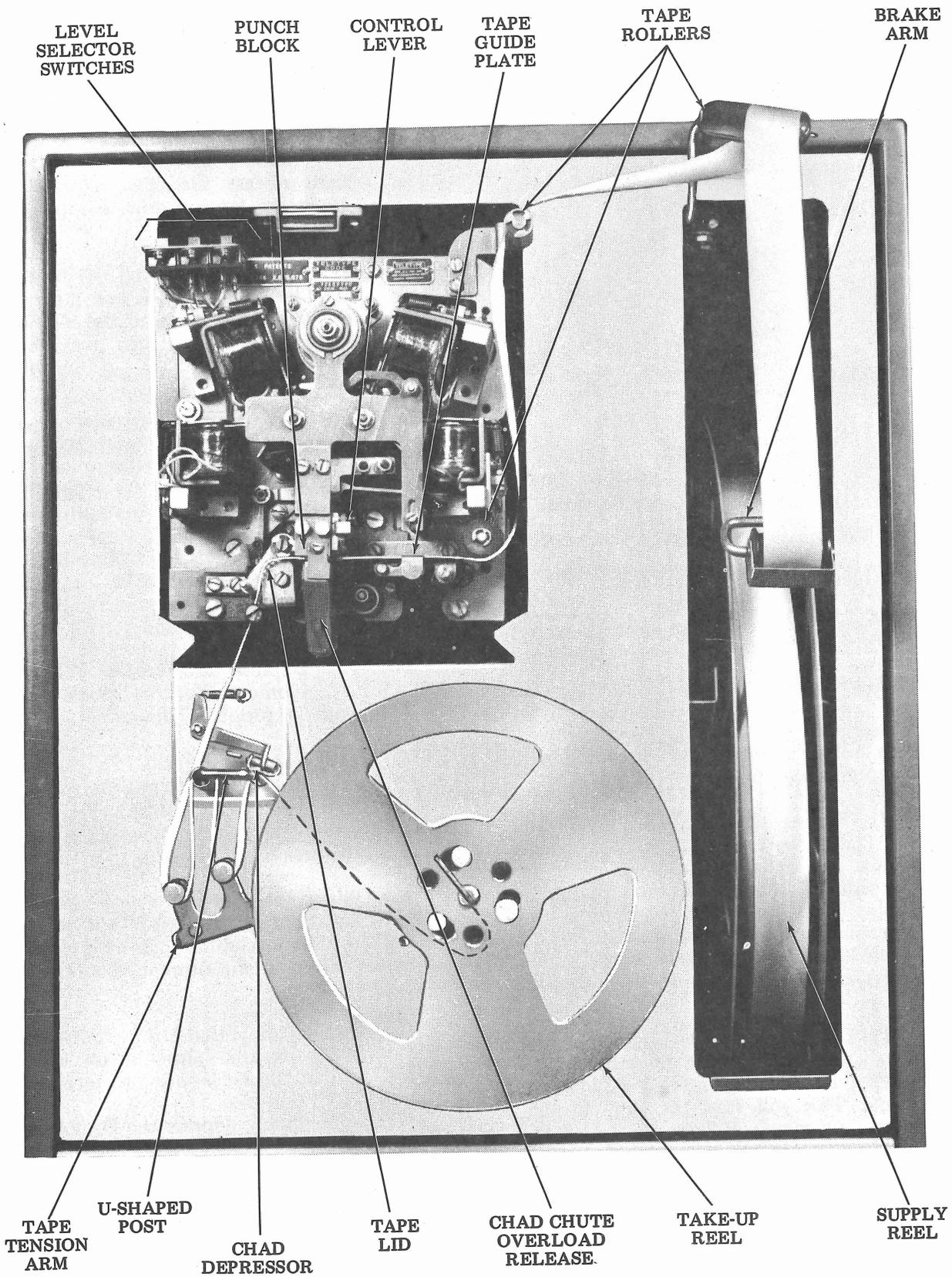
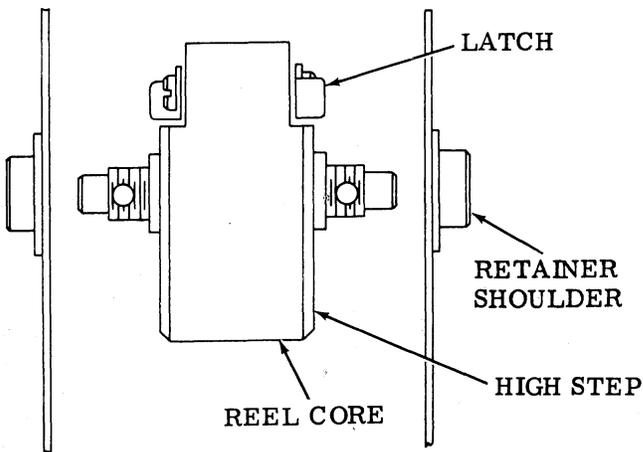


Figure 8 - Tape Path for Receiver Terminal

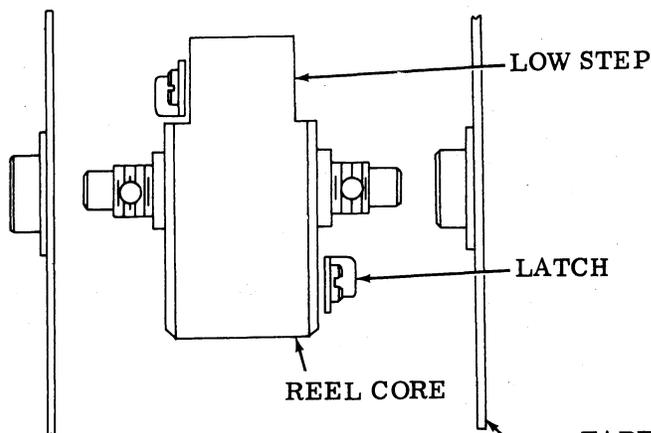
RECEIVER TAPE SUPPLY REEL ARRANGEMENTS

The Receiver tape supply reel can accommodate 11/16 inch, 7/8 inch, and 1 inch wide tape. To accept these various tape widths, however, the reel latches and retainers must be properly positioned.



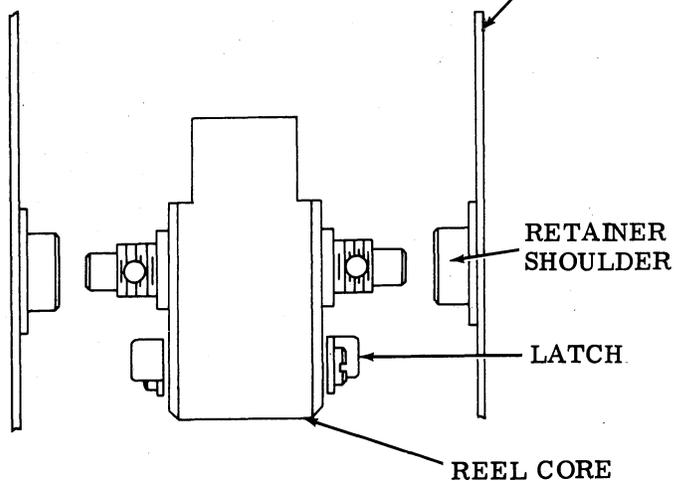
(A) 11/16 INCH TAPE

(A) 11/16 INCH TAPE: Both latches must be on the low steps of the reel core. The tape reel retainers are placed on their respective shafts so that the retainer shoulders are facing away from the core.



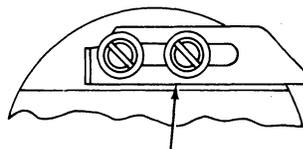
(B) 7/8 INCH TAPE

(B) 7/8 INCH TAPE: One latch must be on a low step of the reel core, and the other on the opposite high step of the reel core. Place the tape retainers on their shafts so that the retainer shoulder of one is facing toward the reel core (latch on high step), and the shoulder of the other is facing away from the core (latch on low step).



(C) 1 INCH TAPE

(C) 1 INCH TAPE: Both latches must be on the high steps of the reel core. The tape reel retainers are placed on their respective shafts so that the retainer shoulders are facing toward the reel core.



Note: Latches must be pushed forward to prevent the roll of tape from moving out of position.

Figure 9 - Receiver Terminal Tape Supply Reel Arrangements

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(1) Depress the TALK button on the data set; lift the handset, and then hang up.

(2) Operate the PUNCH and WINDER switches to stop the motors.

(e) An end of message (EOM) may be indicated to the receiver in either of the following ways:

(1) A prearranged pattern punched in the tape can be used to indicate end of transmission.

(2) A short pause in the transmission may be used. The talking path may be established again, if desired, or connection terminated.

6.10 A receiving station can originate a call by depressing the TALK pushbutton and dialing the distant sender number. After the sending station answers, the procedure is the same as in 6.09 (b) through (e). At the end-of-transmission, depress the TALK pushbutton, lift the handset for a moment, and hang up.

6.11 Attended operation with circuit assurance and break feature (reverse channel) is as follows:

(a) The operating procedure is the same as in 6.09 or 6.10.

(b) Circuit assurance is automatically provided by a continuous transmission of the reverse channel tone to the sender.

(c) The break feature allows the receiver operator to stop transmission for a trouble such as low or torn tape. A line break signal (interruption of reverse channel) is sent by lifting the handset and depressing the TALK pushbutton.

(d) After the trouble is eliminated, data transmission can be restarted by returning to the data mode.

(e) A trouble stop causes some loss of data which may require resending part or all of the message.

6.12 Unattended operation is as follows:

(a) The receiver is conditioned to answer automatically by the following procedure:

(1) Turn POWER switch ON.

(2) Check for adequate tape supply.

(3) Recheck tape routing.

(4) Depress AUTO pushbutton at data set.

Note: A data set option is available which makes step (4) unnecessary. The receiving station then automatically answers all calls, starts the punch and winder motors, punches tape and then disconnects.

(b) The receiver is restored to attended service by depressing the TALK pushbutton at the data set.

## 7. OPTIONAL FEATURES

### TAPE SENDER

#### A. Signal Converter With Rubout Delete

7.01 The signal converter (TTSC) with rubout delete prevents the transmission of an all MARK signal from a tape sender terminal to a tape receiver terminal.

7.02 The operator, while preparing a message tape, may insert errors into the tape. "Erasing" the errored characters is done by overpunching all levels (rubout) of the entire group of characters involved. The correct message is then repunched into the tape in a new location.

7.03 When the tape is transmitted, the receiving station would normally receive all information sensed by the tape reader at the sending station, including all MARK or rubout characters. If, however, a sending signal converter with the rubout delete feature is used at the sending station, the all MARK (rubout) signals will be suppressed. Only the valid characters will be punched at the tape receiver terminal.

7.04 The signal converter with rubout delete is a complete electronic module; the rubout delete feature alone is not available separately as a modification kit. No special manual procedures are necessary to operate terminals having a signal converter with rubout delete.

## B. Line Break and Automatic Answer

7.05 The transmitter line break and automatic answer kit (TP146527) provides unattended answering and data transmission for the sender terminal. It also provides a means for a receiver operator to stop transmission and/or start the transmitter whether the sender is in the manual or automatic answer condition, for the purpose of correcting a taut tape condition or similar malfunction.

7.06 The operator at the receive station does this by lifting the telephone handset and operating the TALK button on his data set. This causes the sender and receiver to stop operating and lights a LINE BREAK lamp and rings a bell at the sender station. When this condition is detected at the sender station, the operator should lift his handset and operate the data set TALK button. The voice path will then be established. The transmission is restarted by depressing the DATA button.

7.07 This line break feature requires a data set having reverse channel facilities: 202C2, 202C6, 202C8, 202C10, or 202C12 or equivalent 202D (private line only).

7.08 The line break and automatic answer kit (TP146527) is provided at all sender terminals and used with the interim unattended answer kit (see 7.10) or the discrete calling recognizer unit (see 7.11). It is held in an inactive state by its OPERATE/TEST switch. When used with data sets lacking reverse channel feature, the switch must be in the TEST position.

7.09 The automatic answer operation of the sender called from a receiver station is accomplished by the line break signal and the interlock signal derived from the data set. However, certain connections must exist at the following data set leads: ready, remote release, and remote control common. With these conditions satisfied, the unit will automatically answer a call and transmit a message. The receiver operator (calling station) places a call in the normal manner. The sender station (called) will signal the operator (2025 Hz tone) indicating the station has answered. The transmitter data set goes into the DATA mode automatically and the receiver operator starts the sender by depressing the DATA button.

## C. Interim Unattended Answer (Private Line)

7.10 Interim unattended answer kit TP148161 was made available for use in tape sender terminals equipped with the line

break and automatic answer kit mentioned in 7.05. This kit provides circuitry for automatically starting a sender terminal from a receiving terminal, without depending upon data set reverse channel. A limitation of this approach is that the unattended transmitter may be triggered into action by an unauthorized receiver, so this kit is usually used in private line applications. The discrete calling units for the sender and receiver locations (see 7.11 and 7.26) will supersede the early equipment.

## D. Discrete Calling Recognizer Unit

7.11 The recognizer unit (TP199551) is used in conjunction with a receiver identifier unit (TP199550) at receiver terminal. This feature prevents the unattended sender from transmitting data to an unauthorized receiver. A discrete calling code is generated by the attended receiving station and recognized by the unattended sending station before any data can be transmitted.

7.12 The protection feature is obtained by a coded start signal being generated by a slow moving disc at the remote receiving station on the command of the operator. This signal is then sent to the tape sender recognizer. The start signal is examined by the recognizer, bit by bit, and if the mechanism determines that the signal is identical with its assigned signal code, the data is put on the line. Thus, a receiver will not start a sender unless the receiver is properly authorized to receive the data. All character generating discs (14 codeable elements and a start signal) used in a customer's system must be coded identically.

7.13 The recognizer unit (TP199551) is also used to provide the automatic disconnect feature at a sending station. In certain areas, the central office does not send an on-hook signal to the called station. The automatic disconnect feature assures that the called unattended station will return to its on-hook condition after the call is terminated.

7.14 The automatic disconnect feature will place the data set of a send-only terminal or a send-receive terminal in the on-hook condition after a thirty second interval when there is an absence of the carrier detect signal from the data set. Thus a disconnect will be provided when; (a) the sender fails to detect a transmitter start signal (wrong number call) or (b) the end-of-transmission occurs.

7.15 This accessory is used with the TP199610 send-receive terminal kit to provide unattended operation of send-receive

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terminals. Reliable disconnect operation necessitates the use of type 202C and 202D data sets having the improved carrier detector.

### E. Sender Time Delay

7.16 A modification kit (TP315900) is available to provide operate time delay of the line break relay in the TP146527 line break and automatic answer assembly. The delayed operation keeps the line break relay de-energized during most short duration random noise on the telephone circuit. This noise may otherwise be recognized as a reverse channel signal causing premature start-up of the tape sender.

### F. Parity Failure Detector (SA120) Equipped With Parity Inserter

7.17 If even parity output is required from a 2A sender which will be sending non-parity or odd parity tapes, a SA120FA Parity Failure Detector (equipped with a TP322422 parity insert card) should be added as an accessory. Even parity transmission assures that all characters transmitted will have an even number of marking bits, allowing easy recognition of parity errors. Parity insertion can be provided for a sender output signal in the sixth, seventh, or eighth bit of each character. Depending on its programming the SA120 will accommodate 5-, 6-, or 7-level codes.

## TAPE RECEIVER

### A. Automatic Answer (Early Design)

7.18 Early systems may use this automatic answer kit (TP146528) at receiver terminals. This feature allows the receiver terminal to start automatically, perforate tape, and stop at the end of the message. The TP146528 kit is superseded by the TP199593 modification kit (see 7.23).

7.19 The receiver is prepared for automatic answer by depressing the AUTO button. At send-receive stations the 3-position switch of the transmit-receive ("Y" connector) kit should be in the RECEIVE position. An incoming call causes the data set to go into data mode and start the motors. An answer-back tone is sent back to the sender terminal, indicating that the receiver is ready to receive data. When the answer-back tone is heard by the sender operator, the following steps should be performed to start transmission:

- (a) Sender operator should cover the handset transmitter to prevent motor sounds, breathing, and other noises from punching garble in the received tape.

Note: A message marker at the beginning and end of the message is necessary.

- (b) Start the reader and winder motors by operating the READER and WINDER switches.
- (c) Depress the DATA button on the data set.
- (d) Move the reader RUN-STOP-FREE lever to the RUN position.

7.20 To terminate the call from the send station:

- (a) Move the RUN-STOP-FREE lever to the STOP position.
- (b) Operate the READER and WINDER switches to stop the motors.
- (c) Depress the TALK button on the data set; lift the handset, and then hang up.

### B. Resynchronizer Modification (Early Design)

7.21 A modification kit (TP148123) is used for 1B Tape Receivers not equipped with a resynchronizer. This circuit (furnished with 2B) guarantees resynchronization of a tape receiver terminal with the incoming signal when an error has occurred due to a noise burst on the line. Positive resynchronization is achieved when random code structures are received. No special manual procedures are necessary to operate units having this feature.

### C. Automatic Answer and Disconnect

7.22 The automatic answer kit (30 sec time out - TP199593) is arranged for use at unattended receiver locations to assure that the station will return to the on-hook condition at all times. The kit will automatically provide an unattended receiver (all type 1B and 2B) with a start and disconnect feature. This modification kit replaces the early design automatic answer kit TP146528.

7.23 This kit enables a 202 data set to answer a call automatically when it is in the AUTO mode. When the data set goes into the

DATA mode, the receiver tape punch motor and tape winder motor are started. The tape punch is blinded (allowed to idle) until the data is received.

7.24 The automatic disconnect feature will place a data set on-hook after a thirty second interval in which the carrier detect signal from the data set is absent. Reliable disconnect operation necessitates the use of type 202C and 202D data sets, which have an improved carrier detector circuit. Automatic disconnect procedure will occur on the following conditions: (a) wrong numbered calls, and (b) end of transmission.

7.25 For operating procedures to prepare receiver for unattended service see 6.12.

#### D. Discrete Calling Identifier Unit

7.26 The discrete calling identifier unit (TP199550) is used in conjunction with the remote sender recognizer unit (TP199551) described in 7.11. An identification signal is generated at the receiver location and transmitted to the unattended sender for a comparison with its generator output. The 14-bit character (discrete) signal is sensed by the sender and the tape reader is turned on when a valid identification signal is recognized. The identifier module (TP199552) for the receiver terminal produces a low speed, start-stop signal having discrete timing. A removable coding disc (TP199580) generates the discrete code by which all stations in the system will be identified. The discs are coded by cutting certain etched wiring patterns. All discs in a customer's system are to be coded identically.

#### E. Parity Failure Detector (SA110)

7.27 The parity detector (SA110) is an accessory for 2B receivers only. It regenerates an incoming signal bit by bit and monitors it for transmission errors. Error detection is accomplished ahead of the receiving terminal by checking each incoming character for parity. Eight-level codes provide a parity bit in addition to the seven information bits so that the total number of marking bits in each character is always even, for even parity, or odd, for odd parity. Characters received with incorrect parity are detected as errors. See BSP Section 570-308-100.

7.28 Parity errors may be indicated in one of the following manners.

- (a) Generates "break" signal on reverse channel lead.

- (b) By lighting an indicator lamp which flashes on each error or error burst.

- (c) By lighting an indicator lamp which lights on the first error and blinks off briefly on following errors until reset.

- (d) By lighting an indicator lamp which latches on with the first error until manually reset.

- (e) By advancing an error counter. The last four options are provided with a bypass switch and an indicator assembly.

#### F. Parity Failure Detector and Substitute Character Inserter (SA120)

7.29 This accessory is applicable to 2B receivers only, it regenerates each incoming character and monitors it for transmission errors. Error detection is accomplished by checking each character for parity as with the SA110 (7.27). A special character (programmable) is inserted in place of the error. Parity errors may also be indicated in the same manner as in 7.28 (a) — normally not used with the SA120; (b), (c), (d) or (e).

#### G. Item Selector (6-Level)

7.30 The 9160 item selector is an accessory for 2B special receivers. The 9160 selective calling arrangement consists of a TP342050 item selector and a TP342040 power supply assembly. The selector and power supply assembly are arranged to mount in the lower portion of the receiver cabinet. The item selector interfaces a 202D-type data set and a punch. A selector by-pass switch is included to permit driving the punch directly from the data set for testing or emergency restoral purposes. The item selector operates at 1050 bits per second and utilizes the 6-level, 10-unit, Teletypesetter coding scheme. The selector is capable of recognizing up to 200 selection codes and includes switches to permit manual programming by the customer for the desired selection codes. The selector is equipped with line status indicators and provides for motor control of the punch. See Specification 50724S.

#### SYSTEM BREAK FEATURES

7.31 The break feature enables a receiver location to interrupt the traffic in process when an alarm condition occurs (low, taut tape, etc) in addition to automatically stopping the sender when circuit continuity is

lost. Transmission is stopped by the receiver operator when the data set TALK button is depressed (as in 6.11). The signaling in the opposite direction is accomplished over a separate reverse channel frequency. The essential elements required to furnish the break feature have been incorporated within the tape senders and receivers. Data sets 202C2, 202C6, 202C8, 202C10, 202C12 and 202D2 etc provide the capabilities for the break feature. The break feature first became available with the advent of the 202C2 and 202D2 data sets, incorporating the reverse channel feature.

Note: Sending stations in systems arranged for the break feature can only transmit to receivers also equipped with this feature.

## SEND-RECEIVE TERMINAL FEATURES

### A. Early Design "Y" Connector

7.32 The transmit-receive terminal ("Y" connector) kit (TP146532) provides a means of connecting a tape sender terminal and a tape receiver terminal located at the same installation — to a common model 202A or 202B data set. Switching of the common data set from one terminal to the other terminal is facilitated by a three-position switch mounted on the front of the tape sender cabinet. Either terminal may be selected to operate with the data set. It is not possible, however, to operate both terminals at the same time. This kit has now been replaced with the TP199610 send-receive terminal kit, "Y" cable.

### B. Current Design "Y" Cable

7.33 The send-receive terminal "Y" cable kit (TP199610) provides send-receive service from a single data set for a station consisting of a sender and a receiver. This feature is used with either the 2A or 2B tape-to-tape system having either the 202C, or the 202D data sets. The send-receive "Y" cable operation requires that send-receive terminals also be equipped with the discrete calling units TP199550 and/or TP199551. The terminal connector kit consists of a "Y" cable, panels and a four-position switch located on the sender panel to interconnect the sender, the receiver and the data set. The switch is used to select the desired mode of operation for the data set. The rotary switch and the data set are located above the deck of the sender. The four positions of the control switch are as follows:

SEND — Manual or Discrete (Unattended) Transmitting  
RECEIVE — Manual or Unattended Receiving  
SEND/RECEIVE — Discrete Transmitting or Receiving  
TEST — Terminal Testing (two-wire transmission): Manual or Unattended Transmitting and Receiving (four-wire transmission).

7.34 With the station in SEND or RECEIVE it will operate as an individual station (see Part 6 OPERATING PROCEDURES). When in SEND/RECEIVE, the remote sender will be called in first (a recognizer code is then sent to start the sender). After the preset message is sent from the remote sender, that station automatically goes to the receive mode. A message may then be sent by the calling station.

### C. Local Control Cable

7.35 The local control cable TP326713 is for use with the TP199610 "Y" cable feature. The control cable allows a sender and receiver to operate back-to-back without placing an on-line call.

### D. Pushbutton Switch Replacement

7.36 Tape winder modification kits, TP146774 (sender) and TP146775 (receiver), provide an ON-OFF toggle switch to replace the tape winder pushbutton switch (50228S).

### E. Mode Switching

7.37 The mode switch modification kit, TP320296, provides the ability to control the send-receive mode of a station by turning reverse channel on and off. It is intended for use with the TP199551 discrete calling recognizer unit, the TP199610 "Y" cable and a reverse channel type data set. With this kit, a send-receive terminal has the ability to go automatically from the send mode to the receive mode and back again indefinitely under the control of a remote send-receive station (such as a computer). Without this kit, it is necessary to terminate the call to return a called station to the receive mode.

7.38 When a call is established between two send-receive terminals, the called station is initially in the receive mode. Should data traffic be detected on line, the called station remains in the receive mode copying data. If it is required that the called receiver station become a sender, the TRANSMITTER START button on the calling receiver is depressed. This turns on the

discrete calling generator which produces a low speed signal that starts the called stations recognizer. The generator signals are then compared in the TP199551 recognizer. If the signals are identical, a relay is energized and the "request to send" signal is applied to the data set of the called station. The called station is then in the send mode (see 50627S).

## 8. AUXILIARY EQUIPMENT

8.01 The following optional equipment is available for use with the sender or receiver terminals.

- (a) Data Test Set 905A and 905B (TSG801 and 800): Signal generators specifically designed for system testing. The 905A (TSG801) is a rack mounted model, and the 905B (TSG800) a portable unit.
- (b) Signal Monitor 9555S: An oscilloscope for use with tape senders or receivers. It stores on the upper right module rack in the lower enclosure of the cabinet, when a discrete calling module is not present.
- (c) Tape Winder TW17: Self-contained high speed tape winder. Capacity is 3000 feet of fully perforated and 2000 feet of chadless tape. Accepts 11/16 inch, 7/8 inch, and 1 inch tape. Operates at speeds up to 2000 wpm. TP148135 modification kit provides a cover for the TW17 (see 50171S).
- (d) Modification Kit TP146626: Converts a TW200 tape winder to accept a TP145911 plastic reel (see 50098S).
- (e) Tape Winder TW22 (formerly TP146821): Self-contained, spring driven tape winder. Reel capacity is 350 feet of fully perforated tape, and 170 feet of chadless tape. Accommodates 11/16 inch, 7/8 inch and 1 inch tape. Operates at speeds up to 1000 wpm (see 50098S).
- (f) Modification Kit TP146882: Converts spring driven tape winders TP115739, TP115753, TP115754 and TP123587 to accept a TP145911 plastic tape reel.

(g) Reel Adapter TP146698: To increase the diameter of a TP145911 plastic tape reel from 1-15/16 inches to 3-1/4 inches. For transfer of accumulated message tape to center unwind reel TUW201 (formerly TP146892).

(h) Reel Adapter TP146806: To increase the diameter of a TP145911 plastic tape reel from 1-15/16 inches to 4-1/2 inches. For transfer of accumulated message tape to business machine reels.

(i) Outside Unwinder TUW201 (formerly TP146892): Outside "pay-out" unwinder to feed any off-line equipment. Accepts TP145911 plastic tape reel (see 50182S).

(j) Center Unwinder TUW3 (formerly TP146815): Center unwind reel, designed for off-line usage of speeds up to 100 wpm. Capacity is 1800 feet of fully perforated, and 1000 feet of chadless tape. Accepts 11/16 inch, 7/8 inch and 1 inch tape (see 50312S).

(k) Tape Unwinder TP198640: A center-unwind unwinder which operates at up to 1050 wpm. Holds message tape to a length of 180 feet fully perforated or 100 feet of chadless, to be free fed to the reader (see 50221S).

(l) Tape Splicer 28A: For splicing unpunched tape.

(m) Tape Splicer 1A: For splicing chadless tape (see 5547S).

(n) Card Carrying Case TP146538: To provide means for transporting the etched circuit cards used to maintain the sender and receiver terminals. Capacity of 42 etched circuit cards plus one test extension card.

8.02 For detailed information on auxiliary equipment, request unit or modification kit specifications (example: see 5723S).