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8B1 DATA SELECTIVE CALLING

STATION SETS

GENERAL DESCRIPTION AND PRINCIPLES OF OPERATION

1. GENERAL

1.001   This addendum, which supplements Section 581-122-101, Issue 1, is issued to add information pertaining to the reception and implementation of a group CDC. The group CDC is used to enable two or more data selective calling stations to receive a broadcast transmission.

1.002   Insert the attached pages in accordance with the filing instructions above. Arrows in the margins indicate changes and additions.

Attached:
Page 15 dated August 1966, revised
Page 16 dated August 1966, reissued
Page 21 dated August 1966, reissued
Page 22 dated August 1966, revised
Page 22.1 dated August 1966, added
Page 23 dated August 1966, reissued
Page 24 dated August 1966, reissued

8B1 DATA SELECTIVE CALLING

STATION SETS

GENERAL DESCRIPTION AND PRINCIPLES OF OPERATION

1. GENERAL

1.01 This section describes the station sets and control logic for 8B1 (Full Duplex) Data Selective Calling.

1.02 An Automatic Send-Receive (ASR) or Receive-Only (RO) Teletypewriter Set is available for installation at an 8B1 outlying station. Each station set is equipped with an 8B1 logic package to receive and interpret the control codes which facilitate automatic message transmission or selective message reception.

1.03 In full duplex operation the outlying station sets are interconnected by a two channel signal line. The line consists of a send leg and a receive leg. All control codes and incoming messages are handled on the receive leg; answer-back responses and outgoing messages are transmitted on the send leg.

2. DESCRIPTION

2.01 The Automatic Send-Receive and Receive-Only Teletypewriter Sets, available for the 8B1 full duplex application, are listed in Table 1. An ASR or RO set may be equipped with the friction feed or sprocket feed typing unit. Both typing and nontyping tape punch units are available.

TABLE 1 - AVAILABLE 8B1 TELETYPEWRITER SETS

Set	Typing Unit Platen		Tape Punch Unit	
	Friction Feed	Sprocket Feed	Typing	Non-Typing
ASR (35BC)	X		X	
ASR (35BF)		X	X	
ASR (35BP)	X			X
ASR (35BR)		X		X
RO (35BE)	X			
RO (35BH)		X		

TELETYPEWRITER SETS

A.   Automatic Send-Receive Set

2.02   A sprocket feed, Automatic Send-Receive Set is shown in Figure 1.   The cabinet provides an enclosure for all units including a 130-type subset or a TP198420 data set coupler for a 103-series data set.   Neither the subset nor the data set coupler (normally mounted in the pedestal) is shown in the figure.

2.03   The keyboard unit, attached to the upper compartment base, includes the keyboard mechanism, tape supply reel, and character counter mechanism; it provides mounting facilities for the typing unit, tape punch (reperforator) unit, and motor unit. The tape reader (transmitter distributor) base includes a separate motor unit for driving the tape reader (transmitter distributor) unit. The electrical service unit has individual selector magnet drivers for the typing unit and tape
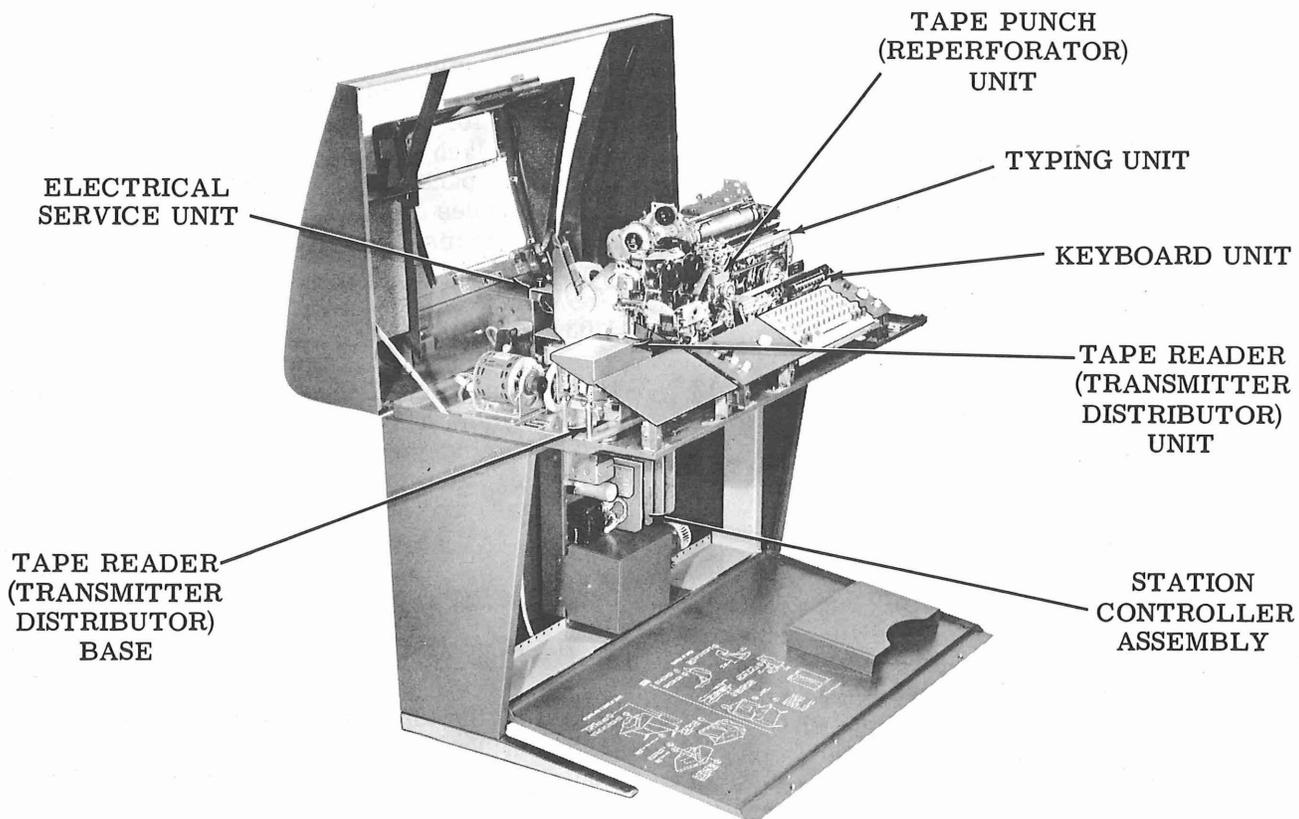

Figure 1 - Automatic Send-Receive Set (Covers Open)

punch unit, and is mounted to the rear of the keyboard unit. Refer to the appropriate literature for detailed information on these units.

2.04 The 8B1 logic package includes the station controller assembly, control panel, print suppression mechanism, and stunt box function bar elements. The station controller assembly is attached to a relay rack in the pedestal. The 8B1 station controls and indicator lamps are located on the left side of the control panel (Figure 2). The print suppression mechanism and stunt box function bar elements are mounted on the typing unit.

B. Receive-Only Set

2.05 A Receive-Only Set is shown in Figure 3. The cabinet provides an enclosure for all units making up the set. Space is available within the pedestal for mounting a 130-type subset or a TP198420 data set coupler for a 103-series data set. Neither the subset nor the data set coupler is shown. Limited space is available on the upper compartment base for mounting an auxiliary power supply, required in conjunction with a subset or data set. The subset or data set power supply might have to be mounted externally if its dimensions exceed the space available.

2.06 The base unit is mounted on the upper compartment base and provides mounting facilities for the typing unit and motor unit. The electrical service unit is located to the rear of the base unit. Detailed information on these units and the cabinet is given in the appropriate literature.

2.07 The station controller assembly is attached to a relay rack in the pedestal. The 8B1 station controls and indicator lamps are located on the left side of the control panel (Figure 4). The print suppression mechanism and stunt box function bar elements are mounted on the typing unit (Figure 6).

8B1 OPERATING FEATURES

A. Control Codes

2.08 Each 8B1 outlying station set is capable of responding to the following pertinent control codes, issued by a data communications processor.

(a) TSC (Transmitter Start Code) - Used to poll a sending station for message transmission. Consists of two characters; the first is always DC_0, and the second is any one of the 63 printing graphics.

(b) CDC (Call Directing Code) - Used to select one or more receiving units for message reception. Consists of any two alpha-block graphics with code level 6 always spacing and code level 7 always marking; 1024 combinations are possible.
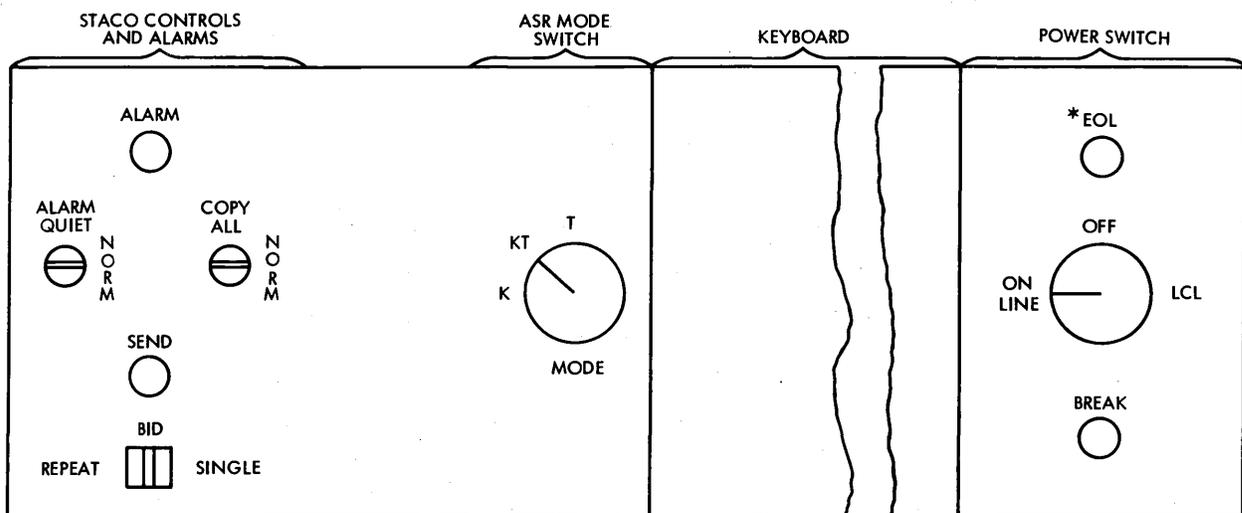
*Earlier design. EOL indicator on copyholder of later design cabinets.
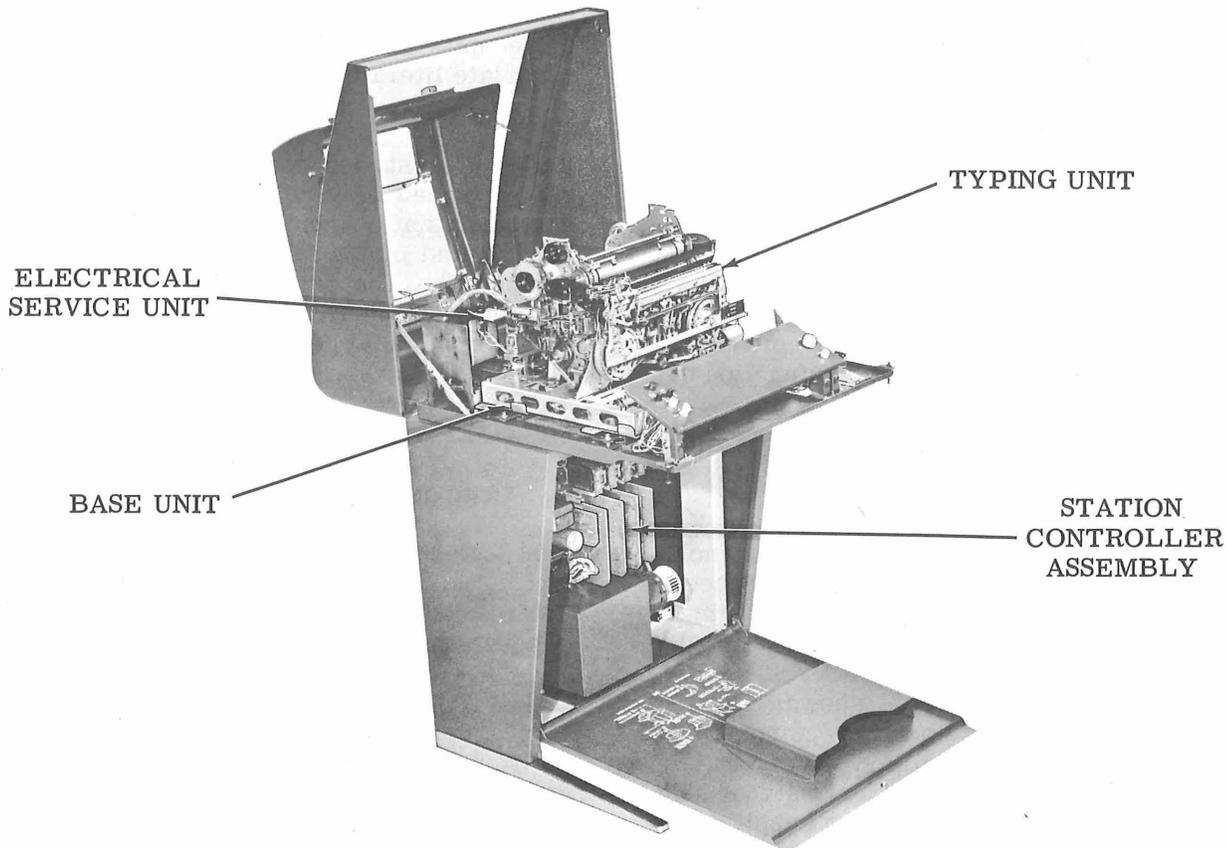
Figure 2 - ASR Control Panel

Figure 3 - Receive-Only Set (Covers Open)

(c) EOA (End-Of-Address) - Used to activate selected receiving units and a sending unit if being held during selective calling. Places unselected receiving units in the nonselect, nonprint condition.

(d) NULL - Used to temporarily disconnect a sending unit, selected receiving units or both sending and receiving units simultaneously, for the purpose of making the send leg, receive leg, or both legs idle. An EOA will reconnect the units.

(e) XOFF - Used to permanently disconnect a tape reader for the purpose of polling other readers. A TSC is required to restart the disconnected tape reader.

(f) EOT (End-Of-Transmission) - Used to disconnect one or more selected receiving units. Places all receivers in the select, nonprint condition.

B. 8B1 Logic Package

2.09 The 8B1 logic package includes the stunt box function bar elements, print suppression mechanism, station controller assembly, and associated control panel.

Stunt Box Mechanism

2.10 The stunt box mechanism (Figure 5) provides a mechanical means for recognizing control codes on the receive leg of the signal line. The signals are initially detected by, and arranged in, the typing unit selector mechanism. The mechanical arrangement of code bits, transferred to the codebar mechanism, is sensed by the stunt box mechanism. Typing of graphics will occur if the printing mechanism is not inhibited by the print suppression mechanism. Code reception and detection continues as long as the typing unit selector mechanism operates on the signal line.

2.11 If not inhibited by an adjacent function pawl or the codebar mechanism, a function bar will advance within the stunt box to

STACO CONTROLS AND ALARMS

LOCAL FUNCTION KEYS

POWER SWITCH

ALARM

ALARM QUIET — NORM

COPY ALL — NORM

SEND

BID

REPEAT — SINGLE

LOC LF

LOC CR

OFF

ON LINE — LCL

BREAK
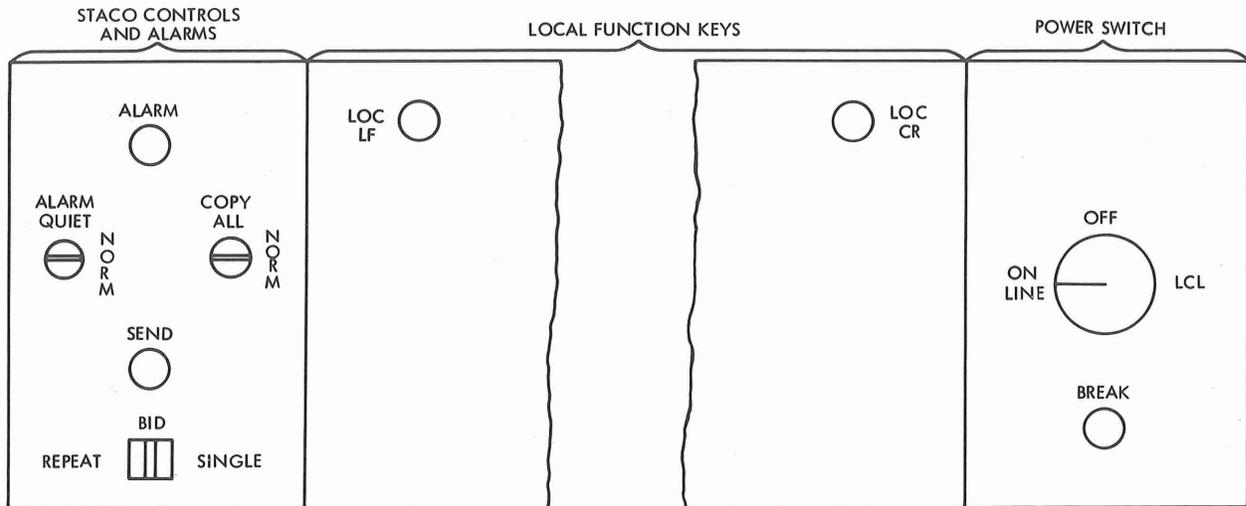
Figure 4 - RO Control Panel

FUNCTION LEVER

ELECTRICAL CONTACTS

SLOT FOR FUNCTION BAR AND PAWL

STRIPPER BLADE

Figure 5 - Stunt Box Mechanism (Rear View)

SOLENOID   OPERATING   SUPPRESSION
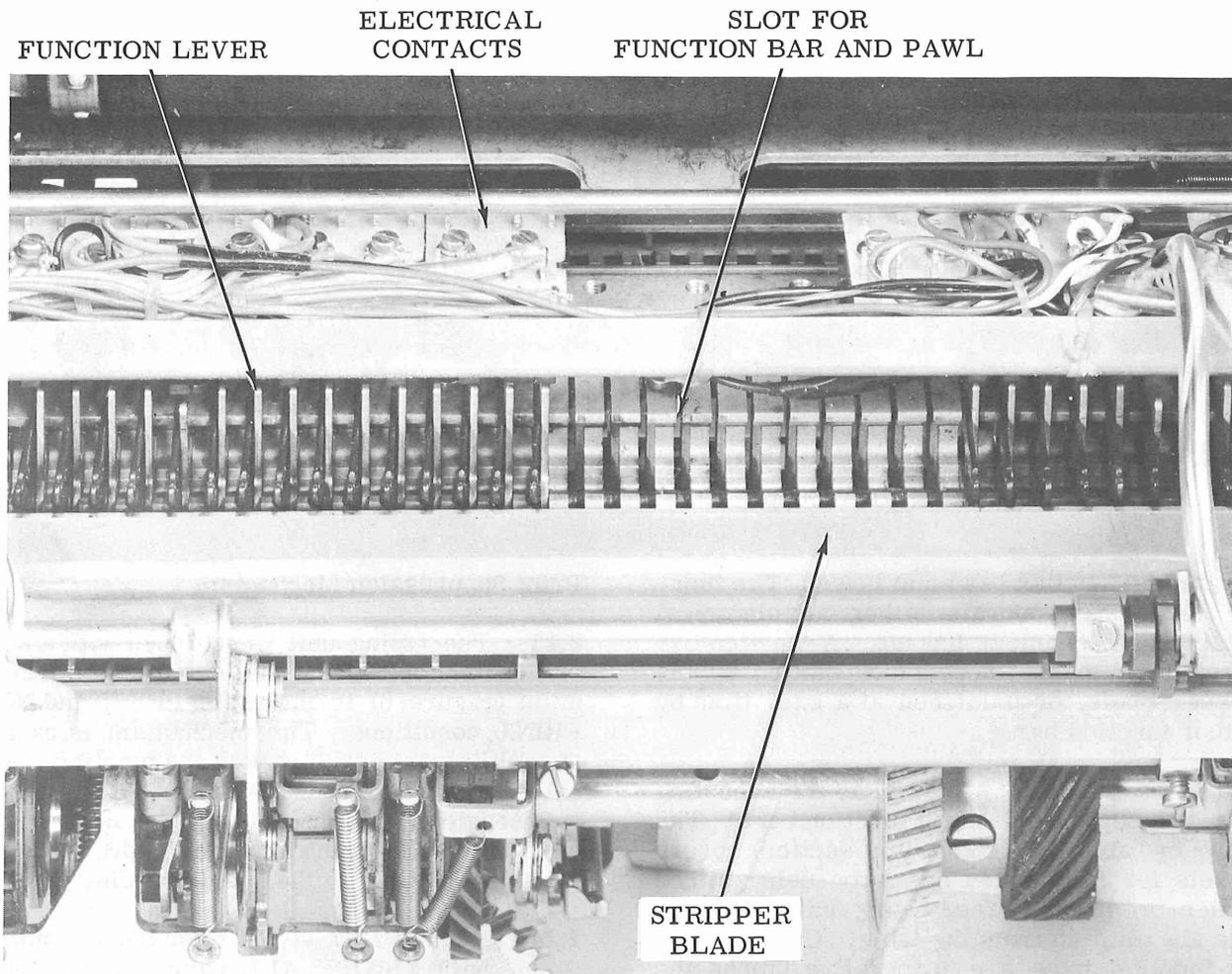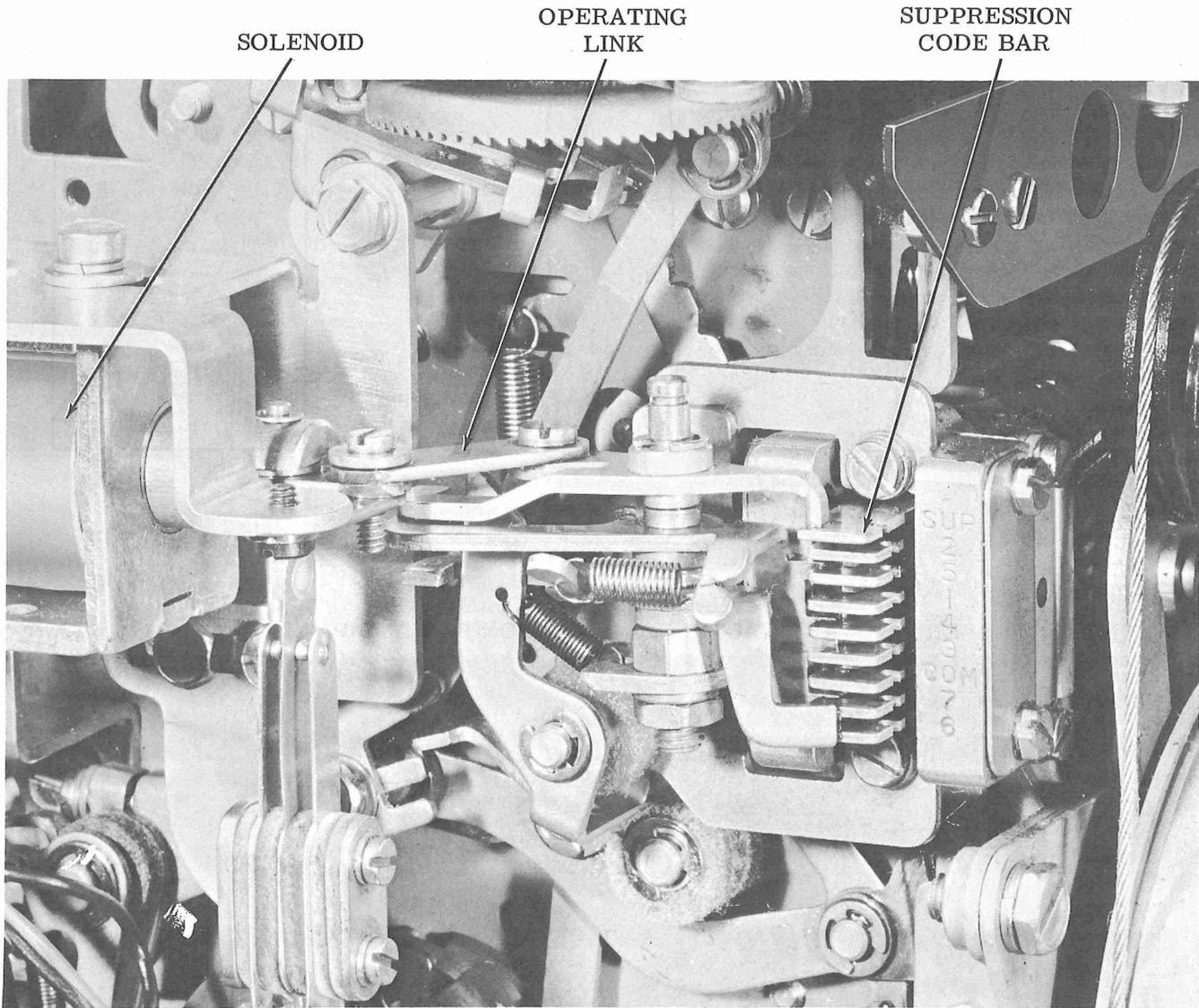   LINK   CODE BAR

Figure 6 - Print Suppression Mechanism Mounted on Typing Unit

operate its function pawl and lever. The function lever can operate either an electrical contact or mechanical linkage. A function bar is returned to its unoperated position by the stripper blade, or unlatched at a later time by another function bar.

2.12 The stunt box has 42 slots for accepting 42 separately coded function bars. The listing in Table 2 (at end of this section) covers all sets for full duplex operation using either friction or sprocket feed typing units. Unused slots are omitted from the table. Certain stunt box function bars are inoperative unless the suppression codebar is operated (spacing). This group includes carriage return, line feed, vertical tabulation, horizontal tabulation, etc.

Print Suppression Mechanism

2.13 The typing unit is equipped with a solenoid operated, print suppression mechanism (Figure 6) to facilitate PRINT and NON-PRINT conditions. The mechanism is capable of enabling or disabling both the printing mechanism and certain function bars by shifting the suppression codebar. When the solenoid is energized, the operating link shifts the suppression codebar to the spacing (print) position.

2.14 Each 8B1 Teletypewriter Set is equipped with a COPY ALL twist key, located on the control panel. When operated, the twist key allows the solenoid to be energized directly from a -48 volt dc source.

Station Controller Assembly

2.15   The station controller assembly (Figure 7) is mounted on a relay rack within the pedestal of an 8B1 Teletypewriter Set. The answer-back assembly is mounted near the bottom of the panel. The relays attached to the card assemblies respond to stunt box and station operated contacts. The relays mounted at the top of the panel respond to station operated contacts. The station alarm buzzer (not visible) is mounted on the rear of the panel.

2.16   The answer-back assembly consists of a base, motor, and answer-back mechanism. The drum in the answer-back mechanism is normally coded for three-cycle operation per revolution of the drum, with a \ ACK code sequence in each cycle. Character positions 1, 2, 5, 6, and 7 are suppressed in each 7-character cycle. Two multicontact relays (PFB and MM) modify the \ ACK sequence when a BELL BELL response is required.

2.17   The station controller relays are located and identified in Table 3 (at end of this section). The associated active contacts and terminals are listed in Tables 4 and 5 (at end of this section). The H wiring field is located on the rear of the panel, behind the answer-back mechanism.

8B1 Control Panel

2.18   The 8B1 controls are located on the left side of each control panel. Refer to Figures 2 and 4. The controls include an ALARM lamp, ALARM QUIET twist key, COPY ALL twist key, SEND lamp, and BID lever.

2.19   If an alarm condition occurs at a station, the ALARM lamp is illuminated red. An audible alarm (buzzer) accompanies the visual alarm. The ALARM QUIET twist key is used to reset the alarm relay circuit. It can also be used to temporarily suppress the buzzer. After the cause of an alarm has been corrected, the twist key is turned to the QUIET position then returned to the NORM position.

PANEL MOUNTED RELAYS

CARD ASSEMBLIES

TRANSFORMER
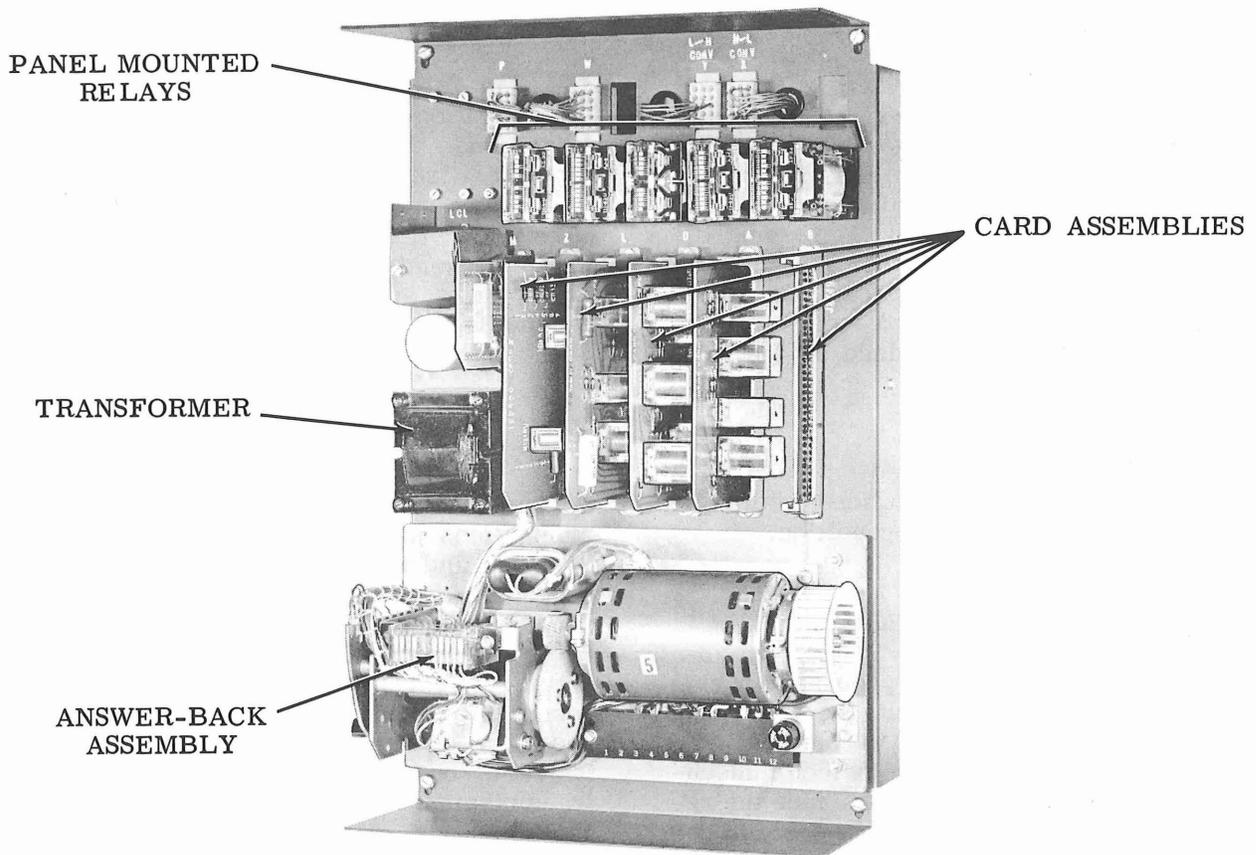
ANSWER-BACK ASSEMBLY

Figure 7 - Station Controller Assembly

In this sequence the condition is corrected, and the alarm is retired.

2.20 The COPY ALL twist key, when operated, supplies -48 volts dc to the print solenoid. In this position all graphics are printed and all applicable functions are performed. In the NORM position only selected message traffic will be received by the typing unit.

2.21 The BID lever is operated by the attendant when a SINGLE or REPEAT bid is entered for the send leg of the signal line. The lever is illuminated green for a SINGLE bid (nonlocking position) or amber for a REPEAT bid (locking position).

2.22 The SEND lamp is illuminated white after a station has secured the send leg for message transmission. The lamp is extinguished when the station is disconnected by an XOFF control code or when the tape has ended.

2.23 Function Keys: Each set is equipped with appropriate function keys to control local and remote station equipment. Certain functions can be performed to affect local station equipment only. Other functions are transmitted on the send leg to affect remote receiving units on the receive leg. When preparing tape from the keyboard of an 8B1 ASR set, a function is punched by depressing the CTRL (control) key and desired function key simultaneously. The code character associated with a function is received by a typing unit selector mechanism and recognized by the stunt box mechanism.

Note: Functions transmitted on the receive leg will occur only at stations where the typing unit is in the PRINT condition.

3. PRINCIPLES OF OPERATION

3.01 A data communications processor exerts operating control over the receiving units and tape reader units in the 8B1 full duplex system operation. The selector mechanisms of all station typing units ride the receive leg of the signal line continuously to deliver all appropriate control codes to their codebar mechanisms for subsequent recognition by the stunt box mechanisms.

3.02 The data communications processor generates and transmits all Transmitter Start Codes (TSC) on the receive leg for starting a tape reader on the send leg. The TSC is comprised of two characters; the first character is always DC_0, and the second character may be any one of the 63 printing characters of the American Standard Code for Information Interchange.

3.03 The data communications processor relays each message from a tape reader to the desired receiving units on the receive leg. Each message consists of a preamble and text. The preamble should contain one or more two-character Call Directing Codes (CDC) with a DELETE character following each CDC and an EOA DELETE following the last CDC. Each CDC consists of two alpha-block graphic characters. The sixth bit of each character is always spacing and the seventh bit is always marking. Thirty-two alpha-block graphics exist, permitting the use of 32^2 or 1024 different combinations.

LOGIC CONSIDERATIONS

3.04 In full duplex operation, each outlying station set is connected to a two-channel signal line. The signal line consists of a send leg and a receive leg. The sending devices, ie, answer-back assemblies and tape reader units, are linked in series (when ONLINE) along the send leg, and the receiving units, ie, typing units and tape punch units, are on the receive leg.

3.05 All control codes and messages are directed to outlying stations on the receive leg. Each station transmits messages or answer-back responses to the data communications processor on the send leg. Since the send and receive legs are electrically independent of each other, transmissions on the send leg from an outlying station do not directly interfere with transmissions on the receive leg from the data communications processor. However, control of both sending and receiving devices at outlying stations, depends in part, on interrupting local reception or transmission. In order to facilitate polling and selective calling functions, either an operating tape reader and/or any number of previously selected receiving units must be stopped to render both legs idle.

3.06 A tape reader, operated from the logic elements in the station controller assembly, responds to a TSC generated by the data communications processor on the receive leg. Once the reader is started, transmission will continue until the tape clears the reading head and the tape-out pin rises, indicating the end of tape. A NULL or XOFF control code received on the receive leg will temporarily hold or disconnect the reader.

3.07 A tape reader, when started, is not required to stop unless the send leg is needed for other traffic. Since the data communications processor is the sole receiving device on the send leg, there is no requirement for stopping the reader for an answerback response. No local send leg monitor (typing unit) is contemplated; therefore, it is unnecessary to stop the reader on horizontal tab, vertical tab, and form feed codes in order to permit a typing unit additional time (more than a single character length) to perform the function. The reader disregards but transmits an EOT. The station controller only responds to an EOT code appearing on the receive leg.

3.08 When a message is available for transmission to one or more receiving devices, the data communications processor will transmit each CDC on the receive leg and wait as the station controller generates an answerback code sequence on the send leg. It is necessary, therefore, to stop a reader, if sending, before a CDC is received so an answer-back response can be transmitted without conflicting with reader message transmission. A NULL DELETE code sequence received before a CDC will stop a station reader making the send leg idle. (The NULL DELETE is a customer implemented option.) An EOA code following the last CDC will restore reader operation and place the selected receivers in the PRINT or PUNCH condition. All unselected receivers enter the NONPRINT or NONPUNCH condition.

3.09 If transmission from a reader is terminated, the data communications processor may be required to interrupt the receive leg traffic in order to start another reader, particularly if the receive traffic is lengthy. The decision is determined by customer programming of the data communications processor since it may be more efficient to wait for the receive leg to go idle before starting another reader. However, the data communications processor may interrupt receive leg traffic with a NULL DELETE TSC sequence in order to start a reader. The NULL DELETE places the selected receiving units in a hold condition; the two-character TSC polls a station reader.

Note: The NULL DELETE codes will not appear on page copy. However, they will appear in tape copy where a tape punch is a selected receiving unit.

If no traffic is available, the station controller will respond with a \ ACK sequence. The DCP then advances to the next station reader by sending a subsequent TSC on the receive leg. If traffic is available, the reader will start an immediate, uninterrupted transmission of message preamble and text to the data communications processor on the send leg. The data communications processor then generates an EOA to reactivate the holding receivers, and resumes message transmission to the selected receivers.

3.10 A tape reader may be stopped at any time so that a TSC will be required to restart it. This is accomplished by a NULL DELETE XOFF sequence. This action would be necessary only if a reader monopolized the send leg with a long tape filled with a series of messages. The NULL DELETE places the operating reader and, if the receive leg is busy, selected receiving units in the hold condition. The XOFF will disconnect the reader. Following the XOFF, a TSC would start another reader and a subsequent EOA would reactivate the selected receiving units.

3.11 If either a typing unit is low on paper or a tape punch is low on tape, a station alarm will occur. Should a receiving unit be in an alarm condition when called by the data communications processor for message reception on the receive leg, the station controller will respond with a BELL BELL code sequence on the send leg.

OPERATIONAL MODES

A. Power Switch

3.12 Each 8B1 Station Teletypewriter Set is equipped with an ONLINE - OFF - LOCAL rotary power switch.

3.13 When the power switch is rotated to the ONLINE position, the transmitting and receiving devices associated with each set are placed on the external send and receive legs of

the signal line. The line-local relay in the electrical service unit, is energized to separate the sending devices from the receiving devices and to remove the shunt from the external signal line legs. The local relay in the station controller assembly, is energized to condition the logic relays for external control. All motor units are turned on, and all other electrical components are activated.

3.14 When the power switch is placed in the OFF position, power is removed from all electrical components except convenience receptacles and selector magnet drivers. The send and receive legs of the signal line are shunted by the de-energized line-local relay.

3.15 By rotating the power switch to the LO-CAL position, the set can be operated on an internal signal line. The external signal line remains shunted by the de-energized line-local relay. All motor units are turned on; the local sending units are capable of operating the local receiving units only.

B. ASR Mode Switch

3.16 With the power switch rotated to the ON-LINE position, the sending devices are separated from the receiving devices, and the keyboard signal generator is disabled; consequently, the ASR mode switch will facilitate only two operational modes. When the power switch is rotated to the LOCAL position, the sending and receiving devices are returned to a single internal circuit; their collective operation is modified by the K-KT-T mode switch.

Note: Refer to detached contact type schematic 6471WD, sheet B6, in the section entitled, 8A1 and 8B1 Data Selective Calling, Station Sets, Wiring Diagrams.

ONLINE Operation

3.17 K (Keyboard) Mode: In full duplex operation transmission from the keyboard is not permitted. Therefore, the keyboard signal generator is diasbled; only the answer-back distributor is active on the send leg of the signal line. The K mode should not be considered an operational mode for full duplex service. However, for general information, the external circuit enters from the positive side of the send leg, through a line-local relay contact, disabled tape reader signal generator contact (clutch magnets cannot operate in the K mode), K contact 1-2, 3SD relay contact, local relay contact,

6TM relay contact, K contact 7-1, answer-back distributor, line-local relay contact, and returns to the negative side of the signal line. For receiving the external circuit enters from the positive side of the receive leg, through a line-local relay contact, K contact 1-3, typing unit selector magnet driver, line-local relay contact, and returns to the negative side of the receive leg.

3.18 KT (Keyboard-Tape) Mode: This mode places the answer-back distributor and tape reader signal generator on the send leg of the external signal line. The keyboard signal generator is disabled. The tape punch selector magnet driver is available to, and the typing unit selector magnet driver is on, the receive leg. For sending, the external circuit enters from the positive side of the send leg, through a line-local relay contact, tape reader signal generator contact, KT contact 2-2; the leg separates to pass through either 3SD and local relay contacts or 12TDR relay contact; the leg rejoins and continues through 6TM relay contact, KT contact 8-1, answer-back distributor, line-local relay contact, and returns to the negative side of the send leg. For receiving, the external circuit enters from the positive side of the receive leg, through a line-local contact, KT contact 2-3; the leg separates to pass through either local, 2TM, and 6RCR relay contacts or the tape punch selector magnet driver; the leg rejoins and continues through the typing unit selector magnet driver, line-local relay contact, and returns to the negative side of the signal line.

3.19 T (Tape) Mode: The T mode offers two circuits of operation, ie, line and auxiliary local. The tape reader signal generator and answer-back distributor are in series on the send leg, while the typing unit selector magnet driver is on the receive leg. The keyboard signal generator and tape punch selector magnet driver are in series on the auxiliary local circuit. The station is capable of automatic transmission as a new tape is being prepared from the keyboard.

Note: Should the tape punch CDC be received during tape preparation, the station alarm will be tripped. Therefore, to avoid unnecessary alarms, the mode switch should be returned to the KT position whenever tape is not being prepared.

For sending, the external circuit enters from the positive side of the send leg, through a line-local relay contact, tape reader signal generator contact, T contact 3-2, answer-back distributor, line-local relay contact, and returns to the negative side of the send leg. For receiving, the external circuit enters from the positive side of the receive leg, through a line-local relay contact, T contact 3-3, typing unit selector magnet driver, line-local relay contact, and returns to the negative side of the receive leg. The auxiliary local circuit extends for the keyboard signal generator contact, T contact 9-1, tape punch selector magnet driver, auxiliary power supply, T contact 9-2, and back to the keyboard signal generator contact.

LOCAL Operation

3.20 With the external send and receive legs shunted the sending and receiving devices are potentially linked together on a single internal circuit. In the K mode, only the keyboard and typing unit are active; the tape reader and tape punch are disabled. In the KT mode all units, ie, keyboard, tape reader, tape punch, and typing unit, are active on the internal circuit. In the T mode the tape reader and typing unit are on the internal circuit while the keyboard and tape punch are on an auxiliary local circuit.

MESSAGE TRANSMISSION

3.21 All messages directed to the data communications processor are transmitted on the send leg upon receipt of the station Transmitter Start Code (TSC). The TSC is detected on the receive leg. The typing unit on the receive leg does not, in turn, monitor station transmissions.

A. Station Preconditioning

3.22 A message tape should be prepared conforming with the required format for full duplex operation. The tape should include a DELETE leader, one or more two-character CDC's, EOA, text, EOT, and DELETE trailer. A DELETE character should follow each two-character CDC, EOA, and EOT. If form effectors, such as horizontal tab, vertical tab, and form feed codes, appear in the message text, buffer (DELETE) characters need not be inserted in the tape; however, the data communications processor, upon relaying the message

to a receiving unit on a receive leg, must pause as the function is being performed.

3.23 The station controls should be placed in their normal operating positions. The power switch should be in the ONLINE position, and the mode switch for an ASR set should be in the KT or T position.

Note: The T mode is an alternate mode for local tape preparation. When in the tape mode, the TM relay is energized placing the tape punch and keyboard on an auxiliary local circuit.

3.24 When prepared tape is inserted in the tape reader head and the tape lid is closed, the tape-out pin is depressed causing the tape-out contact to assume its normal condition. The combined bat-handle switch and tight-tape contact is closed when the bat-handle lever is placed in the RUN position. Closure of this contact causes the BHS relay to energize (Figure 8).

3.25 With the station prepared for automatic tape transmission, a bid can be entered for the signal line. When a SINGLE bid is entered, the BID lever is operated momentarily toward the nonlocking position. A continual bid can be entered by operating the bid lever toward the repeat (locking) position. Momentary operation of the BID lever is adequate for energizing the BD relay. Contact 1BD holds the BD relay circuit closed. Contact 2BD illuminates the BID lamp. Either a tight-tape or tape-out condition will remove a SINGLE bid or temporarily cancel a REPEAT bid. The tight-tape contact is opened by either a tight-tape condition or turning the bat-handle switch off.

B. Receipt of a TSC

3.26 The typing unit selector mechanism continuously monitors the receive leg for control codes and messages which originate from the data communications processor. If the receive leg had been idle before receipt of the TSC, the TSC need not be preceded by a NULL code. If the receive leg is busy, a NULL must precede the TSC to hold the receiving units until polling is complete. In either case, the reader must respond instantly. This notifies the data communications processor that there is traffic to be sent; no further polling is required at this time.

Receive Leg Idle

3.27 Upon receipt of the appropriate TSC, momentary closure of the TSC stunt box contact will pulse the SD relay. Contact 1SD holds the SD relay circuit closed. Contact 11SD extinguishes the BID lamp and illuminates the SEND lamp.

3.28 Contact 8SD causes the TDR relay to energize. Contact 12TDR blinds an ASR keyboard when the mode switch is in the KT position. If the mode switch were in the T position, the keyboard signal generator would be coupled with the tape punch on an auxiliary local circuit.

3.29 Contact 8SD also closes in the tape reader clutch magnet circuit. Assuming that a NULL had not preceded the TSC, the clutch magnets will energize causing the tape reader to operate. Normal tape reader operation will continue until a tape-out condition occurs or until a NULL control code is received from the data communications processor. The NULL will open contact 2NU.

Receive Leg Busy

3.30 In order to render the receive leg idle for subsequent polling, the processor must send a NULL control code. The NULL stunt box contact closes and latches in the NU relay circuit. Only an EOA or EOT will unlatch the contact.

3.31 Contact 2NU opens in the tape reader clutch magnet circuit and closes in the RS relay circuit. Upon receipt of the station TSC, the SD relay and RS relay energize simultaneously. Contact 8SD and 2RS are closed in the tape reader clutch magnet circuit, thereby enabling the tape reader.

C. Interrupting Tape Transmission

3.32 A sending station will stop the tape reader upon receipt of a NULL control code. The NULL code is detected on the receive leg by the typing unit stunt box mechanism. When operated, the NULL stunt box contact is latched closed until a subsequent EOA or EOT code unlatches the contact.

3.33 The NULL stunt box contact closes in the NU relay circuit. The energized NU relay causes the 2NU contact to open in the

tape reader clutch magnet circuit. The tape reader stops until commanded to start by an EOA. The EOA unlatches the NULL stunt box contact, canceling the hold and restoring the tape reader to its operating condition. Or the reader can be disconnected by an XOFF control code.

D. Disconnecting a Tape Reader

3.34 Normally, a tape reader might be disconnected if it tended to monopolize the send leg by transmitting a long series of messages. If the receive leg is busy, the data communications processor must send a NULL code to hold the receiving devices while disconnecting one sending station and polling another.

Receive Leg Idle

3.35 If the receive leg is idle, the XOFF code need not be preceded by a NULL code. Upon receipt of an XOFF control code, the XOFF stunt box contact will break momentarily. The XOFF stunt box contact opens in the SD relay circuit, causing the SD relay to de-energize. The TDR relay and tape reader clutch magnets are de-energized, in turn, by contact 8SD. The SEND lamp is extinguished and BID lamp is reilluminated. (A BID is not canceled unless the tight-tape and bat-handle switch contact or tape-out contact is opened.) The tape reader is disconnected; only the station TSC can restart it.

Receive Leg Busy

3.36 If the receive leg is busy, the XOFF disconnect code must be preceded by a NULL code to render the receive leg idle for subsequent control activity. The NULL stunt box contact is latched closed, causing the NU relay to energize. Contact 2NU opens in the tape reader clutch magnet circuit. The tape reader stops when the clutch magnets are de-energized.

3.37 A subsequent XOFF control code will cause its stunt box contact to open momentarily. The SD relay will de-energize, extinguishing the SEND lamp and reilluminating the BID lamp. The TDR relay is de-energized by contact 8SD.
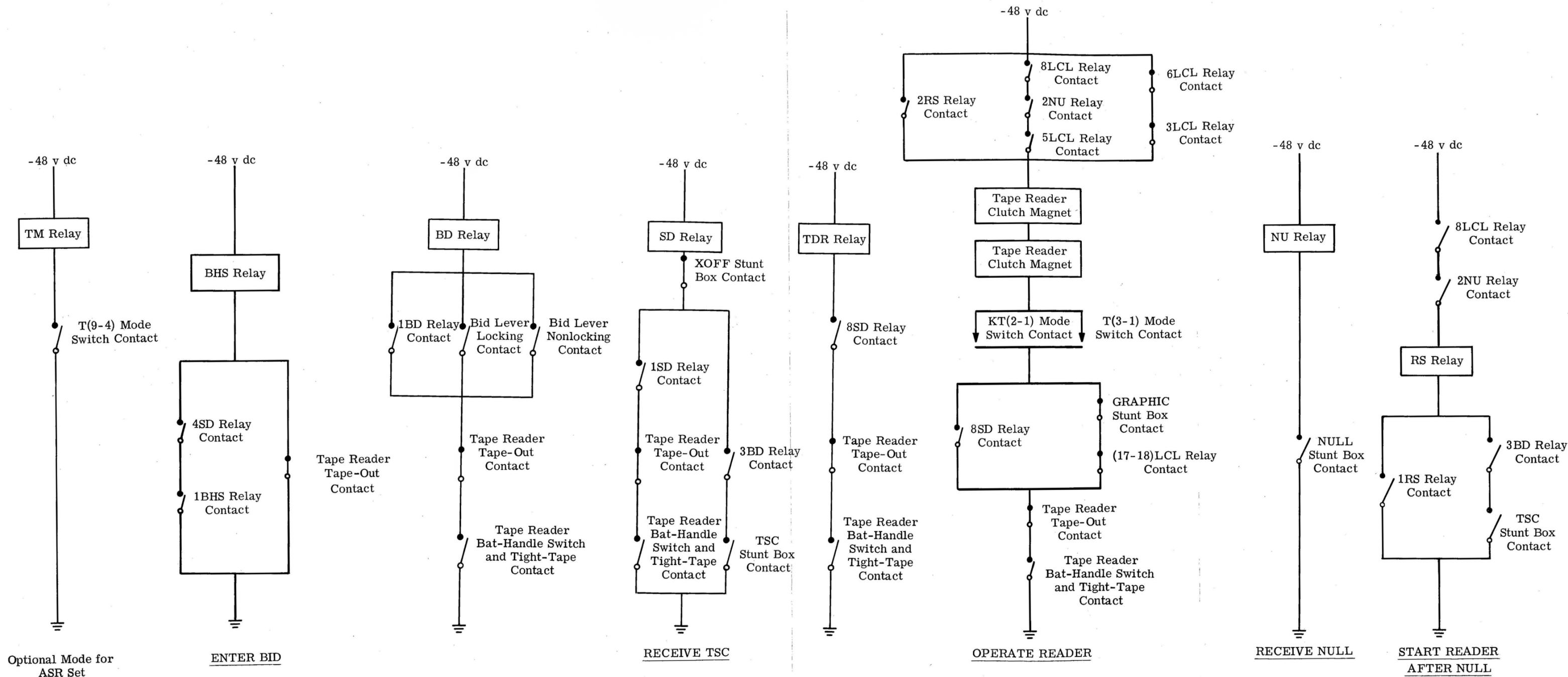
Figure 8 - Control Circuit Elements for Tape Reader

E. No Traffic Response

3.38   If a sending station has no traffic to send, either tape is missing from the reader and/or the bat-handle switch is off. A bid cannot be entered if either condition exists. Upon receipt of the station TSC, the TSC stunt box contact closes momentarily to pulse the answer-back clutch magnet (Figure 9). The answer-back mechanism distributes the \ACK sequence on the send leg, indicating a no-traffic condition.

MESSAGE RECEPTION

3.39   All messages and control codes are transmitted from the data communications processor to the receivers on the receive leg. Answer-back responses are transmitted to the processor on the send leg. If the send leg is busy, a NULL control code must precede a message in order to stop a tape reader and make the send leg idle (Figure 8).

A. Selecting a Receiving Unit

3.40   The typing unit stunt box contains the mechanical and electrical elements to provide momentary contact closure whenever a typing unit or punch CDC is received. The stunt box is designed to respond to two distinct and separate CDC codes, one each for the typing unit and tape punch; however, both units can be enabled by one CDC by rearranging the stunt box wiring. Additional slots are vacant in the stunt box for adding a broadcast CDC, if desired.

3.41   The logic is similar for selecting either a tape punch or typing unit (Figure 10). Receipt of the appropriate CDC will cause its stunt box contact to close momentarily. A group CDC stunt box contact, when used, could be wired in parallel with the individual receiving unit CDC stunt box contact. Upon receipt of the group CDC or individual receiving unit CDC, the associated stunt box contact would close momentarily. Relay PTR (Printer) or PUN (Punch) is pulsed to permit either relay to remain energized through contact 3PTR or 2PUN. Contact 4PTR or 4PUN causes the PL (Printer Latch) or RL (Reperforator Latch) relay to energize.

B. Answer-Back Response

3.42   A receiving station is required to give an answer-back response to its CDC. Upon receipt of a CDC the answer-back clutch magnet is energized by either contact 1PTR or 5PUN. When the clutch magnet attracts its armature, the answer-back off-normal contact is closed, energizing relay ABP.
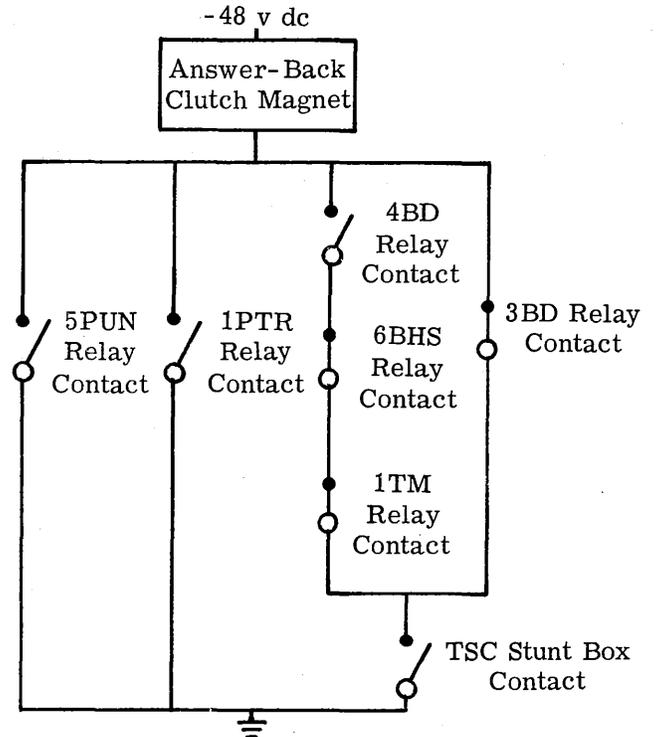

Figure 9 - Active Circuit Element for No-Traffic Response

Note: For a group CDC, only one station can be permitted to respond; the answer-back response must be suppressed at all other stations. At stations where the response is to be suppressed, additional stunt box transfer contacts, operated by the group CDC, can be used to prevent both the answer-back clutch magnet and ABP relay from energizing.

Contact 3ABP is opened, de-energizing the PTR or PUN relay. This terminates the energizing pulse for the answer-back clutch magnet; contact 1PTR or 5PUN is opened. Relay ABP is also de-energized by contact 1PTR or 5PUN.

3.43   When tripped, the answer-back mechanism distributes a \ACK sequence on the send leg. The data communications processor will then advance to the next CDC in the message preamble.

3.44   If a receiving unit is low on paper or low on tape, its respective low paper or low tape contact will close to energize the PFA and PFB relays (Figure 11). Relays MM and AL are energized through contacts 3PFA and 3PFB, respectively. The station alarm is tripped to notify the attendant that a maintenance condition exists. Contacts 1MM, 1PFB, 2PFB, 9MM, 7MM, 5MM, 3MM, and 2MM will alter the answer-back code sequence

from \ ACK to BELL BELL only if the particular receiving unit is called. Should one unit be in a maintenance condition when the other unit is called, relays PFA, PFB, and MM will be de-energized, preventing an improper answer-back response to the CDC. However, the station alarm is retained until the condition is corrected.

3.45 A maintenance response will not prevent a receiving unit from entering the PRINT or PUNCH condition; it is assumed that enough paper or tape is available to copy the message text.

C.. PRINT or PUNCH Condition

3.46 As mentioned in 3.41, when either the PTR or PUN relay energizes, contact 4PTR or 4PUN causes the PL or RL relay to energize. Subsequent answer-back response cancels all logic relays except the PL and RL relay. Only an EOT can cause relay PL or RL to de-energize.

3.47 An EOA code will place the typing unit or tape punch in the PRINT or PUNCH condition so that monitoring will begin at the receiving station. The EOA closes the stunt box contact in slot 33. The next code following an EOA (any code) will latch open the EOA-UNIVERSAL stunt box contact in slot 33. In this manner a gate, one character long, permits current to flow energizing the print solenoid or RCR relay. The solenoid is latched to -48 volts dc through contact 1PL and its own solenoid contact. Similarly, relay RCR latches through contact 5RCR when energized for a one character period by the EOA-UNIVERSAL contact. Therefore, the EOA code places the typing unit in a nonselect, print condition or enables the tape punch by removing the blind from the tape punch selector magnet driver (contact 6RCR).

D. Interrupting a Receiving Unit

3.48 In full duplex operation, the data communications processor might have to interrupt message traffic on the receive leg in order to poll the tape readers for traffic on the send leg. A typing unit or tape punch unit can be placed in a NONPRINT or NONPUNCH condition upon receipt of a NULL code.

3.49 A NULL code will cause the NU relay to energize. (Only an EOA or EOT can unlatch the NULL stunt box contact.) Contact 2NU will open in the print solenoid or RCR

relay circuit, placing the typing unit or tape punch in the NONPRINT or NONPUNCH condition. Upon receipt of an EOA code, the NULL stunt box contact will unlatch, and the typing unit or tape punch unit will be restored to the PUNCH or PRINT condition (3.47).

E. Disconnect Receiver

3.50 A receiving unit is disconnected when an EOT code is detected. The EOT code causes the EOT stunt box contact to operate momentarily. Consequently, the PL or RL relay circuit is opened, permitting either or both relays to de-energize. Contact 1PL or 4RL is opened, causing the print solenoid or RCR relay to de-energize. The EOT code places the typing unit in the select, nonprint condition and/or restores the blind to the tape punch unit.

STATION ALARMS

3.51 The station controller assembly is equipped with relays and contacts to detect abnormal conditions in the station logic (Figure 12). A visual (lamp) and audible (buzzer) alarm will operate when the following station conditions exist.

    (a) Incorrect position for ASR mode switch.

    (b) Low paper or tape supply.

    (c) Tape-out or tight-tape.

A. ASR Mode Switch

3.52 The normal position of the ASR mode switch is the KT position. The mode switch must be in either the T or KT position for automatic tape transmission. Should the mode switch be in the K position with tape in the reader and the bat-handle switch in the RUN position, the alarm will trip as a bid is entered. Or if the T mode and the bat-handle switch is OFF, the alarm will trip as a bid is entered. When receive leg traffic is intended for the tape punch, the mode switch must be in the KT position; otherwise, an alarm will be given when the punch CDC energizes the PUN and RL relays.

B. Maintenance

3.53 If low paper (or forms) exist in the typing unit, the PFA and PFB relays will energize. Contact 3PFB closes in the alarm relay circuit, causing the AL relay to energize. Both the lamp and buzzer operate as contact 1AL closes. A low paper alarm occurs whenever the condition exists; it will
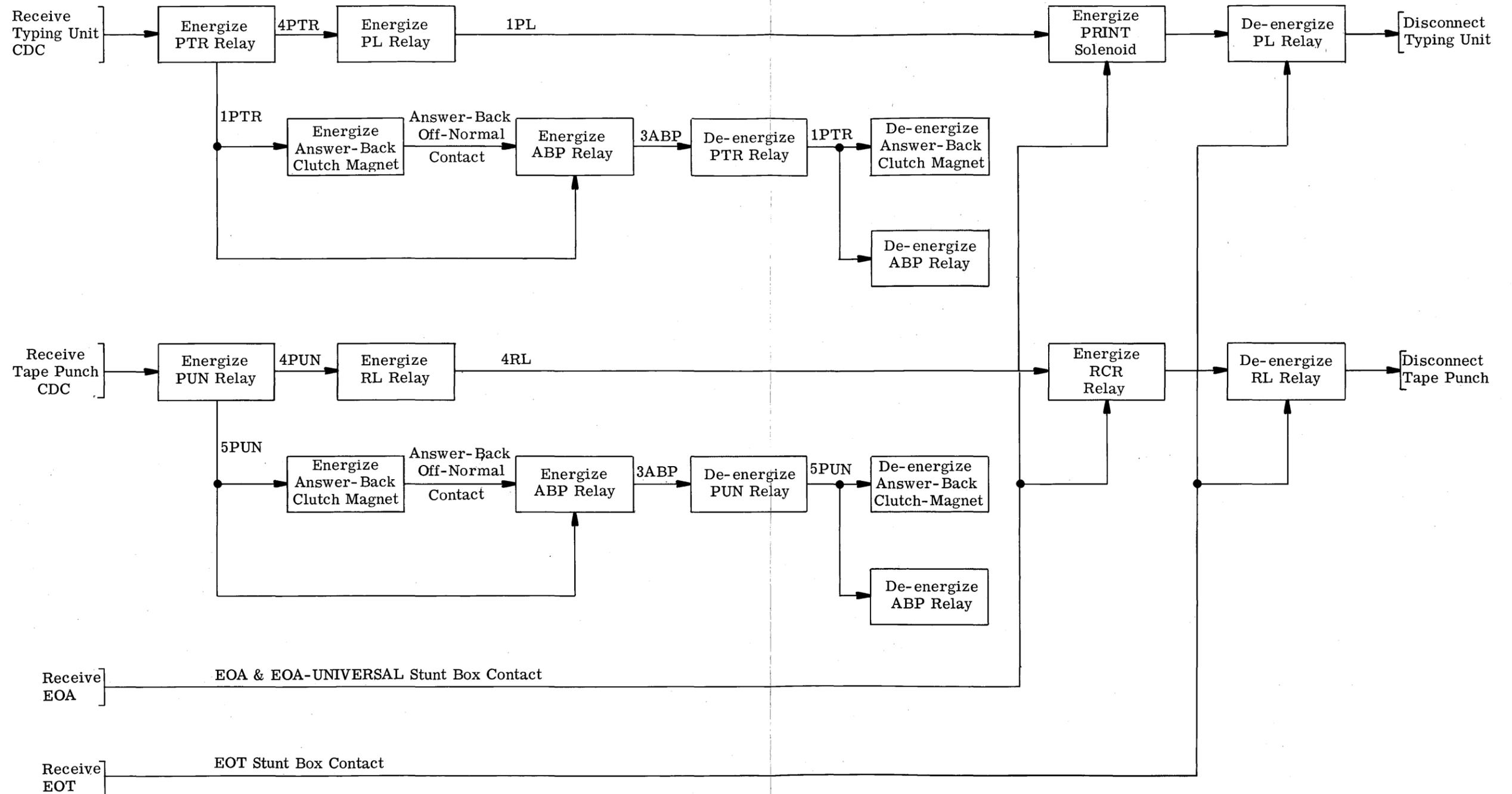
Figure 10 - Selecting the Receiving Units
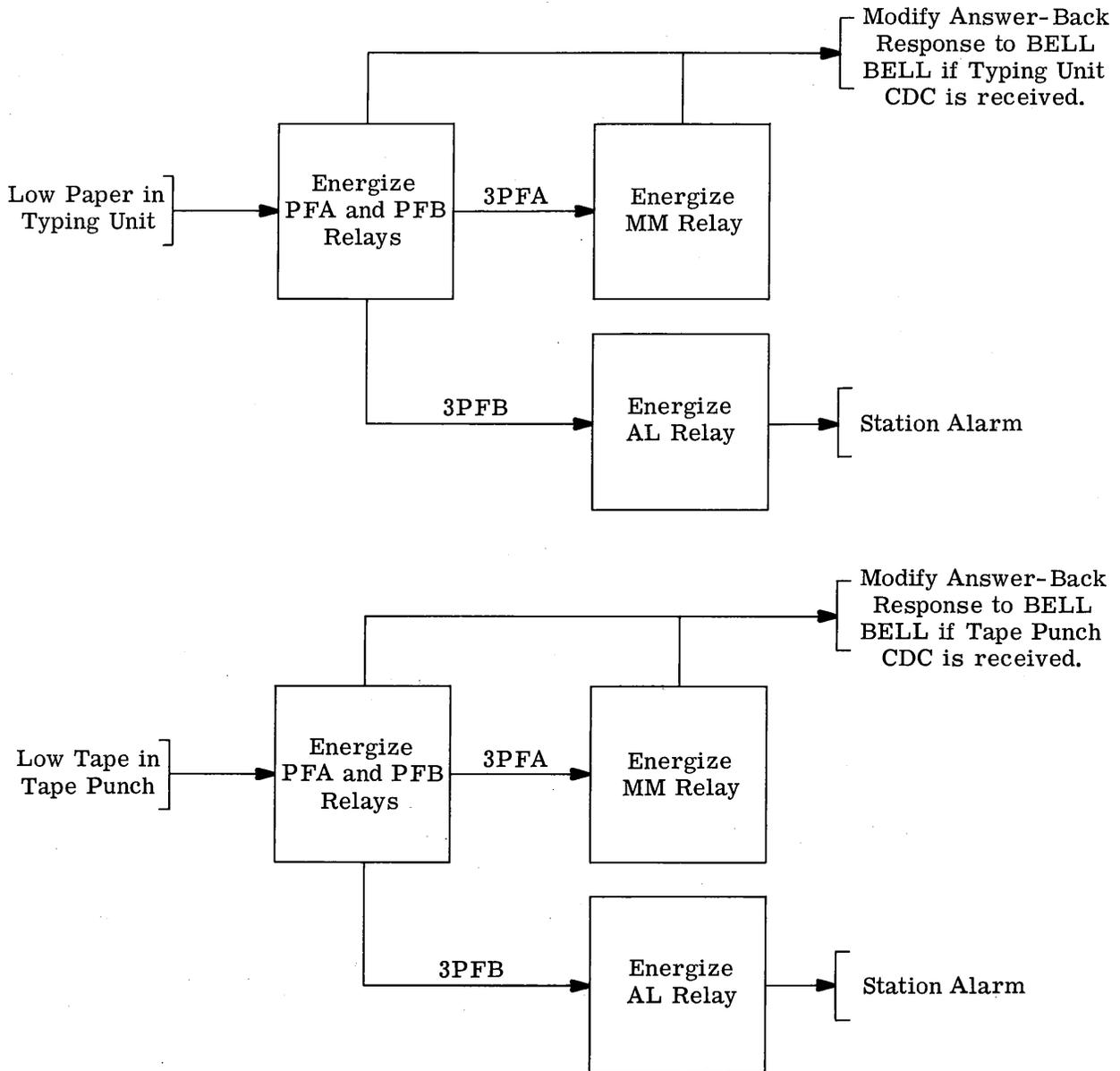
Figure 11 - Maintenance Response

hold until the paper is replenished. A low paper alarm will not, however, inhibit a selected typing unit from copying message text after an EOA is received. Normally, enough paper reserve should exist to monitor the message.

3.54 Low tape in the punch tape supply will cause the PFA and PFB relays to energize. Contact 3PFB causes the AL relay to energize. Contact 1AL operates the alarm lamp and buzzer. As in the case of low paper, low tape will not prevent the tape punch, if se-

lected, from entering the PUNCH condition when an EOA is received.

C. Tape Failure

3.55 The tight-tape contact is opened when the bat-handle switch is in the OFF position or a tight-tape condition occurs. The tape-out contact will operate when either the tape ends or is broken. When either contact is operated, the tape reader clutch magnets de-energize, the station is disconnected from the send leg, and the station alarm is tripped.

-48 volts dc

5.5 volts ac

Alarm
Relay

Alarm
Quiet
Switch
Contact

3KM Relay
Contact

4TM Relay
Contact

4TM Relay
Contact

3KM Relay
Contact

Tape Reader
Tape-Out
Contact

Alarm
Lamp

Alarm
Buzzer

3PFB Relay
Contact

5BHS Relay
Contact

5BHS Relay
Contact

Alarm
Quiet
Switch
Contact

2AL Relay
Contact

10BD Relay
Contact

10BD Relay
Contact

4RL Relay
Contact

4RL Relay
Contact

1AL Relay
Contact

Alarm
Quiet
Switch
Contact

Figure 12 - Station Alarm Circuit Elements
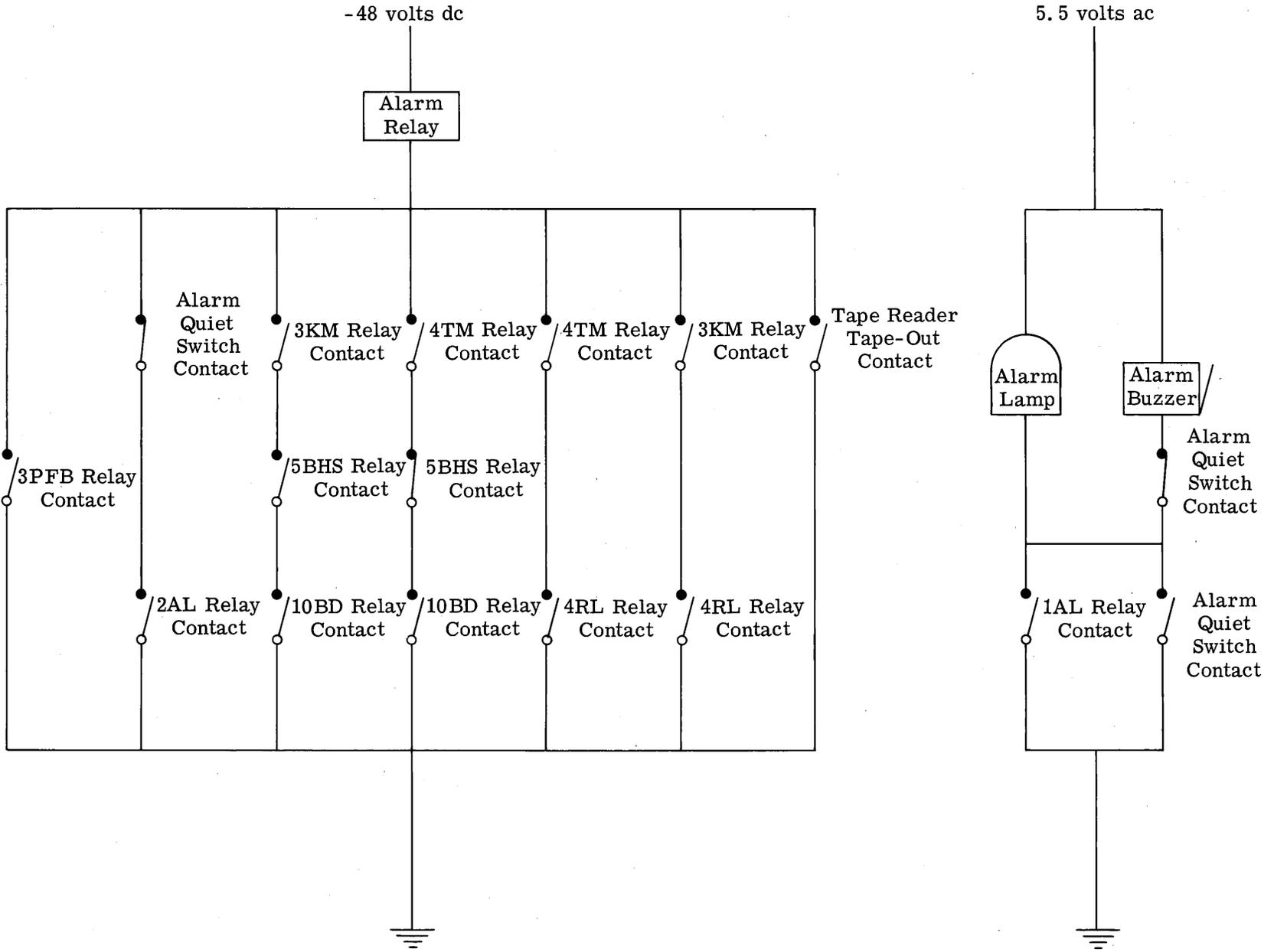
TABLE 2 - STUNT BOX CODING (CONT)

Slot	Code Character	Contact Type	Function
33 34	EOA EOA-UNIV.	Make (Mom. for 1 ch. duration) Break (Latch)	An EOA of EOA-UNIVERSAL sequence will latch EOA contact in Slot 33 closed for one character's duration. The UNIVERSAL code will strip EOA memory in Slot 33 and latch contact open in Slot 34. Action of contacts in Slots 33 and 34 serve as a gate to energize either solenoid or relay RCR placing receiver in NONSELECT, PRINT mode.
35	NULL	-	Mechanical open-line (break) detector.
36	NULL	-	Mechanical open-line (break) detector.
*37 *38	H. & V. Tab Form Feed	- Break (Mom.)	Sprocket feed printers only. Horizontal tab, vertical tab, and form feed pre-sense contact is latched open for duration of function.
40	LF	-	Mechanical line feed.
*41	V. Tab	-	Sprocket feed printers only. Mechanical vertical tab.
*42	Form Feed	-	Sprocket feed printers only. Mechanical form feed.

*Items are on sprocket feed printers only.
**See Table 2A for stunt box parts required.

TABLE 2A - STUNT BOX PARTS REQUIRED FOR GROUP CDC

Station Answer-Back	Call In	Quantity of Parts Required			
		TP153440	TP153915	TP153916	TP172581
Suppressed	Tape Punch	4	2	2	1
	Typing Unit	4	2	2	1
	Tape Punch & Typing Unit	8	4	4	2
Not Suppressed	Tape Punch	2	1	1	1
	Typing Unit	2	1	1	1
	Tape Punch & Typing Unit	4	2	2	1

TP153440 - universal function bar.
TP153915 - modification kit to provide sequential function lever operation in first slot.
TP153916 - modification kit to provide sequential function lever operation in second slot.
TP172581 - contact switch assembly.

TABLE 3 - LOCATION OF CIRCUIT CARDS, WIRING FIELD,
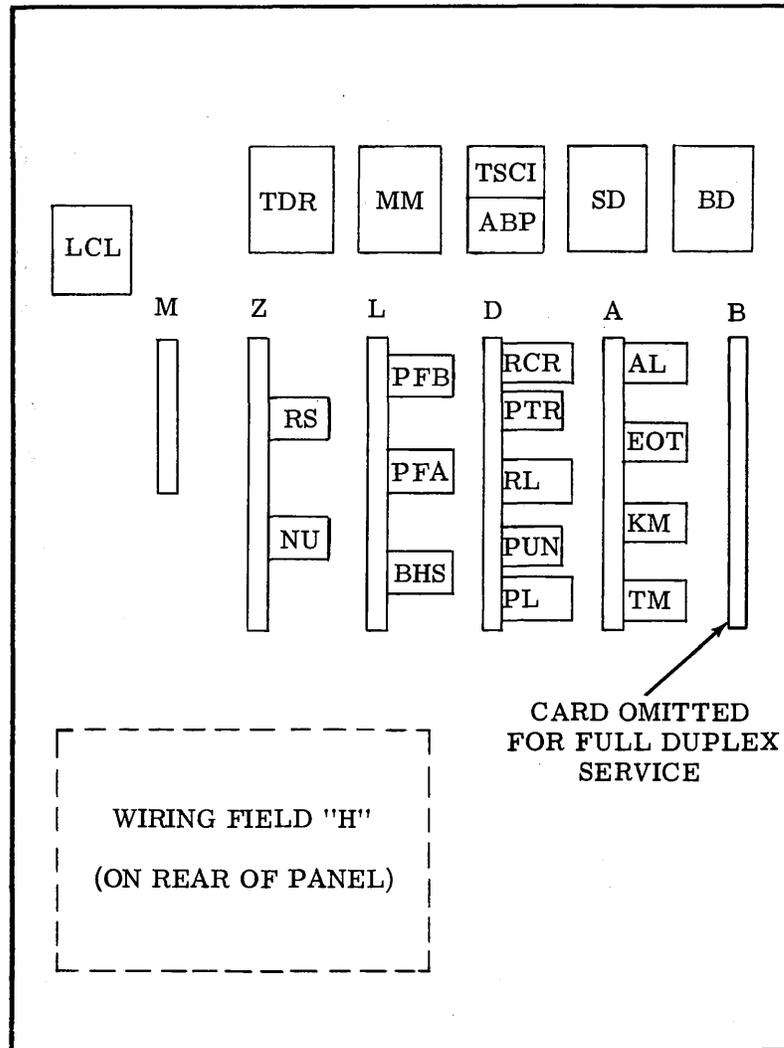AND MULTICONTACT RELAYS

TABLE 4 - CARD MOUNTED RELAYS IN STATION CONTROLLER ASSEMBLY

Relay		Active Contacts and Terminals		
Code	Name and Card Data	Type	Function	WD Location*
AL	Alarm Card A TP198448	1U; 1L 1M 2M 4B	Energizing terminals of AL relay. Provides ground for Staco alarm circuit. AL relay holding contact. Breaks in BID circuit (not used for full duplex).	5-F7 1-E5 5-D8 3-C6
BHS	Bat-Handle Switch Card L TP198447	1U; 1L 1M 2B 5M; 5B 6B	Energizing terminals of BHS relay. Provides alternate ground for BHS relay when SD relay is energized. Breaks in alternate ground of MM relay circuit (not used for full duplex). Transfers in ground paths of AL relay. Breaks in keyboard entry ground path of answer-back clutch magnet.	2-B6 2-B5 3-D1 5-D8 3-B4
EOT	End-of-Transmission Card A TP198448	1U; 1L 6B	Energizing terminals of EOT relay. Ground leg of BD relay circuit. Breaks to de-energize BD relay (not used for full duplex).	5-F6 3-E7
KM	Keyboard Mode Card A TP198448	1U; 1L 1B 3M	Energizing terminals of KM relay. Breaks in ground leg of PUN relay circuit. Makes in ground leg of AL relay.	2-B7 5-C2 5-F8
NU	Null Card Z TP198490	1U; 1L 2M; 2B	Energizing terminals of NU relay. Transfers in RS relay circuit.	5-C3 {2-B3 3-A5 5-C4}
PFA	Paper Failure "A" Card L TP198447	1U; 1L 2M 3M 4M	Energizing terminals of PFA relay. Makes in maintenance response ground path of answer-back clutch magnet (not used for full duplex). Provides ground for MM relay. Makes in ground leg of PFA and PFB relays.	3-D3 3-C4 3-D1 3-D2
PFB	Paper Failure "B" Card L TP198447	1U; 1L 1M 2M 3M	Energizing terminals of PFB relay. Provides marking pulse for code level 2 in answer-back cycle. Provides marking pulse for code level 3 in answer-back cycle. Provides ground leg for AL relay.	3-D2 4-B4 4-B4 5-E8
PL	Printer Latch Card D TP198446	1U; 1L 1M 3M 5B 6B	Energizing terminals of PL relay. Holds ground in printer solenoid circuit. PL relay holding contact. Breaks in PUN relay circuit. Activates signal line break switch (not used for full duplex).	5-F4 5-C5 5-F4 5-E1 6-E6(ASR) 7-E8(RO)

*See wiring diagrams 6471WD-B1 through 6471WD-B10 in the appropriate section. The digit to the left of the hyphen refers to the sheet number, eg, 2 means 6471WD-B2; the letter and digit to the right of the hyphen refers to the coordinate location on the sheet.

TABLE 4 - CARD MOUNTED RELAYS IN STATION CONTROLLER ASSEMBLY (CONT)

Relay		Active Contacts and Terminals		
Code	Name and Card Data	Type	Function	WD Location*
PUN	Punch Card D TP198446	1U; 1L 2M 4M 5M	Energizing terminals of PUN relay. PUN relay holding contact. Provides ground for RL relay. Provides ground for answer-back clutch magnet.	5-B2 5-B2 5-F4 3-B2
PTR	Printer Card D TP198446	1U; 1L 1M 3M 4M	Energizing terminals of PTR relay. Provides ground for answer-back clutch magnet. PTR relay holding (to ground) contact. Provides ground for PL relay.	5-B3 3-B2 5-B2 5-F4
RCR	Reperforator Control Relay Card D TP198446	1U; 1L 1B 5M 6B	Energizing terminals of RCR relay. Activates an auxiliary tape punch selector magnet driver (message relay station). RCR relay holding (to voltage source) contact. Activates local tape punch selector magnet driver.	5-B7 4-F2 5-B6 4-D5
RL	Reperforator Latch Card D TP198446	1U; 1L 1B 2M 4M 5M 6B	Energizing terminals of RL relay. Activates signal line break switch (not used for full duplex). RL relay holding contact. Provides ground leg for RCR and AL relays. Provides ground leg for remote solenoid. Opens ground leg of paper failure circuit.	5-F4 6-E6(ASR) 7-E8(RO) 5-F4 5-B7 5-B8 3-D4
RS	Reader Start Card Z TP198490	1U; 1L 1M 2M 4B	Energizing terminals of RS relay. RS relay holding (to ground) contact. Provides voltage for reader clutch magnets. Breaks voltage source for MM, PFA, and PFB relays.	3-B5 3-B4 2-A1 3-C2
TM	Tape Mode Card A TP198448	1U; 1L 1B 2B 4M 5B 6B	Energizing terminals of TM relay. Breaks in keyboard entry leg of answer-back clutch magnet. Activates tape punch selector magnets. Conditions AL relay ground leg. Breaks in ground leg of PUN relay. Removes shunt from keyboard sending contact.	2-B7 3-B5 4-D5 5-F7 5-C2 4-D6

*See wiring diagrams 6471WD-B1 through 6471WD-B10 in the appropriate section. The digit to the left of the hyphen refers to the sheet number, eg, 2 means 6471WD-B2; the letter and digit to the right of the hyphen refers to the coordinate location on the sheet.

TABLE 5 - PANEL MOUNTED RELAYS IN STATION CONTROLLER ASSEMBLY

Relay		Active Contacts and Terminals		
Code	Name	Type	Function	WD Location*
ABP	Answer-Back Pulsing	1L; 2L 2B	Energizing terminals of ABP relay. Breaks in answer-back clutch magnet circuit.	3-B2 3-B2

TABLE 5 - PANEL MOUNTED RELAYS IN STATION CONTROLLER ASSEMBLY (CONT)

Relay			Active Contacts and Terminals	
Code	Name	Type	Function	WD Location*
BD	Bid	1U; 1L	Energizing terminals of BD relay.	3-B6
		2M	Makes to light BID lamp.	1-E3
		3M; 3B	Transfers in ground leg of send circuit.	3-B5
		4M	Makes in answer-back clutch magnet circuit.	3-B4
		5M	Makes in answer-back pulsing circuit.	3-B2
		8M	Makes in manual entry circuit (not used for full duplex).	3-D1
		10M	Makes in alarm circuit.	5-D8
LCL	Local	1; 2	Energizing terminals of LCL relay.	1-C5
		3B; 4; 5M	Transfers in tape reader clutch magnet circuit.	2-B2
		6B; 7; 8M	Transfers in tape reader clutch magnet, solenoid, RCR relay, TSCI relay, PTR relay, PUN relay, and PP relay circuits.	3-A4 5-C4
		13-14M	Makes in signal line circuit.	4-D6
		15-16M	Makes in signal line circuit.	4-D5
		17-18B	Breaks in tape reader magnet circuit.	2-F3
MM	Manual - Maintenance	1U; 1L	Energizing terminals of MM relay.	3-D1
		1M	Provides marking pulse for code level 1.	4-A6
		2M	Provides marking pulse for code level 8.	4-C6
		3B	Breaks for code level 7.	4-C5
		4M	Makes in MM relay circuit.	3-D1
		5B	Breaks for code level 6.	4-B5
		6B	Breaks for code level 3.	4-B5
		7B	Breaks for code level 5.	4-B5
		9B	Breaks for code level 4.	4-B5
		12B	Breaks for code level 2.	4-B5
SD	Send	1U; 1L	Energizing terminals of SD relay.	3-E6
		1M	Provides ground for SD relay.	3-D6
		2M	In data set coupler "Request to Send" circuit.	4-C2
		3B	Enables TDR contact leg of shunt to keyboard sending contact.	4-D6
		4M	Makes in BHS relay circuit.	2-B5
		6M	Makes in data set coupler "Originate" leg.	4-D3
		8M	Makes in transmitter-distributor clutch magnet circuit.	2-F4
		10M	Makes in EOT relay circuit.	5-E6
		11B; 11M	Transfers from BID lamp to SEND lamp circuit.	1-E3
		12M	Energizes solenoid in print suppression solenoid circuit.	5-C5
TDR	Transmitter- Distributor Running	1U; 1L	Energizing terminals of TDR relay.	2-F6
		11M	To H/L converter relay station (EOT output).	5-F5
		12M	Makes in shunt to keyboard sending contact.	4-D6

*See wiring diagrams 6471WD-B1 through 6471WD-B10 in the appropriate section. The digit to the left of the hyphen refers to the sheet number, eg, 2 means 6471WD-B2; the letter and digit to the right of the hyphen refers to the coordinate location on the sheet.

TABLE 5 - PANEL MOUNTED RELAYS IN STATION CONTROLLER ASSEMBLY (CONT)

Relay			Active Contacts and Terminals	
Code	Name	Type	Function	WD Location*
TSCI	Transmitter Start Code Inhibit	1U; 2U 12M	Energizing terminals of TSCI relay. Makes in ground leg of send circuit (not used for full duplex).	5-B3 3-C5

*See wiring diagrams 6471WD-B1 through 6471WD-B10 in the appropriate section. The digit to the left of the hyphen refers to the sheet number, eg, 2 means 6471WD-B2; the letter and digit to the right of the hyphen refers to the coordinate location on the sheet.

TABLE 6 - INTERFACE RECEPTACLE X FOR HIGH-TO-LOW CONVERTER

Function	Connector Terminal
Signal Line	10(-) & 11(+)
Traffic Available (BID)	12, 13, & 5
EOT "make" Output	3
EOT "break" Output	4
Reader Send Command	1, 6 & 2 (circuit ground)
Frame Ground	15
Circuit Ground	7 (circuit ground)

TABLE 7 - INTERFACE RECEPTACLE Y FOR LOW-TO-HIGH CONVERTER

Function	Connector Terminal
Signal Line	9(-) and 8(+)
Low Tape "make"	14
Low Tape "break"	6
Low Tape Swinger	7 (circuit ground)
Low Paper "break"	5
Frame Ground	15

TABLE 8 - INTERFACE RECEPTACLE W FOR DATA SET COUPLER

Function	Connector Terminal
Send	5
Receive	15
-20 v	9
Request to Send	3
+20 v	1
Local	4
Motor Control	6
Optional Relay	10
Originate	11
117 v ac	13 & 14
Clear to Send	12 & 2
Frame Ground	7 & 8