

8A1 DATA SELECTIVE CALLING SYSTEM
(HALF DUPLEX)

GENERAL DESCRIPTION AND OPERATION

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1. GENERAL

1.01 This section describes the half-duplex, 8A1 Data Selective Calling System and associated equipment used to implement the system. This section is reissued to add new sections to the BSP references, update several of the photographs, include Issue 2 addendum, and incorporate the latest engineering changes and additions. Since this is a general revision, marginal arrows are omitted.

1.02 The 8A1 Data Selective Calling System is used to automatically exchange data within a telegraphic network on a noncontention basis. The signal line is regulated by the system line controller to prevent conflicts between sending stations for transmission time. Data is transmitted at 100 words per minute using the 8-level, American National Standard Code for Information Interchange (ASCII).

1.03 The half duplex system consists of one 35A line controller (LINCO), a maximum of 25 send-receive sets, a number of receive-only sets, and suitable interconnecting signal lines. The number of receive-only sets is limited only by traffic load considerations. The available station sets are listed in Table 1.

SET	TAPE PUNCH UNIT		TYPING UNIT PLATEN	
	TYPING	NON-TYPING	FRICTION FEED	SPROCKET FEED
ASR (35BC)	X		X	
ASR (35BF)	X			X
ASR (35BP)		X	X	
ASR (35BR)		X		X
KSR (35BD)			X	
KSR (35BG)				X
RO (35BE)			X	
RO (35BH)				X

Table 1 - Available 8A1 Station Sets

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1.04 The system line controller selectively polls each transmitter in the system to eliminate conflicts between transmitters trying to send simultaneously. Each transmitter can, in turn, direct data to any receiver at any station in the system.

1.05 Each send-receive and receive-only set is equipped with a TP198400 station controller to interface a station with the controlled signal line. The terminal sets operate on dc signals and are compatible with standard 20 ma telegraphic loops. If telephone lines and switching centers are used as interconnecting ac signal lines, appropriate data sets or subsets are required to translate bi-polar voltages into tone modulated ac signals and vice versa. The station controller is contained in the station cabinet; limited cabinet space is available for modulator-demodulator equipment.

Note: Special 33 and 35 teletypewriter sets equipped with a 9140 Station Controller can also be used in the 8A1 Data Selective Calling System. For information regarding this equipment, refer to Sections 581-124-series listed in Part 6 of this section.

1.06 The 8A1 Data Selective Calling System is normally used in a single loop, 100 word per minute system (Figure 1). However, it may be expanded in a manner similar to that utilized by the 83B Selective Calling System. Expanded system configurations may include relay stations where data could be transferred to other low or high speed services on a torn tape basis. Or the system may be expanded with necessary equipment to automatically relay traffic to other high or low speed services.

2. CONTROL CODES

2.01 All signal line activity is monitored by the line controller and the member stations of the system. No member station can transmit any call directing codes and message text without first being selected by the line controller. When a station is polled, it must then conform to the message format which is programmed in the line controller detector.

2.02 System activity is initiated by the line controller with the transmission of a transmitter start code.

TRANSMITTER START CODES AND RESPONSES

2.03 The transmitter start code (TSC) is a two-character sequence; the first character is DC₀, and the second may be any one of

the 32 alpha block graphics (printing characters) in the ASCII. However, the second character is usually limited to one of the 26 alphabetic characters. When a TSC is generated by the line controller, all stations sense the code, but only the sending station to which the code is assigned will respond. Normal idle line time between station polls is limited to one second. One of five conditions may exist at the polled station.

- (1) Traffic to be sent from tape — After bid is placed, tape reader starts.
- (2) Traffic to be sent from keyboard — After bid is placed, SOM SOM automatically sent.
- (3) No traffic — \ACK automatically sent.
- (4) Maintenance condition — BELL BELL or \ACK automatically sent.
- (5) Unable to respond — Circuit or equipment failure (or station set in LCL mode).

2.04 If traffic is to be sent from tape, the polled station automatically starts its tape reader and responds with traffic, headed by DELETE leader, followed by a call directing code. Both the called station and the line controller recognize the call directing code. The line controller will tolerate up to 30 seconds of DELETE leader. The CDC must be two graphic characters, in sequence, followed by a DELETE code. A CDC must be completed within one second after the tape leader ends. If there is a deviation from this preamble, the line controller would send a line break, pause, then send an end-of-transmission (EOT) code. This line break, pause, EOT sequence stops any transmitter and places all receivers in the select, nonprint condition.

Note: Upon receipt of a line break both transmitting and selected receiving stations enter a BREAK alarm condition. ASR and KSR sets can be restored to normal by operating their BK RLS keys, and turning their twist keys first to the ALARM-QUIET position then back to the NORM position. RO sets are restored by operating their twist keys. The audible and visual alarm at the line controller can be reset by operating the RESET key.

The TSC generator upon receipt of an EOT steps to the next transmitting station in the polling cycle. If the next station was previously placed in a BK alarm condition, it cannot respond with traffic until its alarm is removed. Instead it will automatically respond with \ACK.

SELECTIVE CALLING CONTROL CODES

TSC - Transmitter Start Code. Originated from LINCO. Recognized by designated send-receive (ASR or KSR) set.

CDC - Call Directing Code. Originated from send-receive (ASR or KSR) set. Monitored by LINCO and recognized by selected ASR, KSR, or RO receiving units.

SIGNAL LINE LEGEND

———— 20 ma, dc line.

———— 110 Baud, ac line.

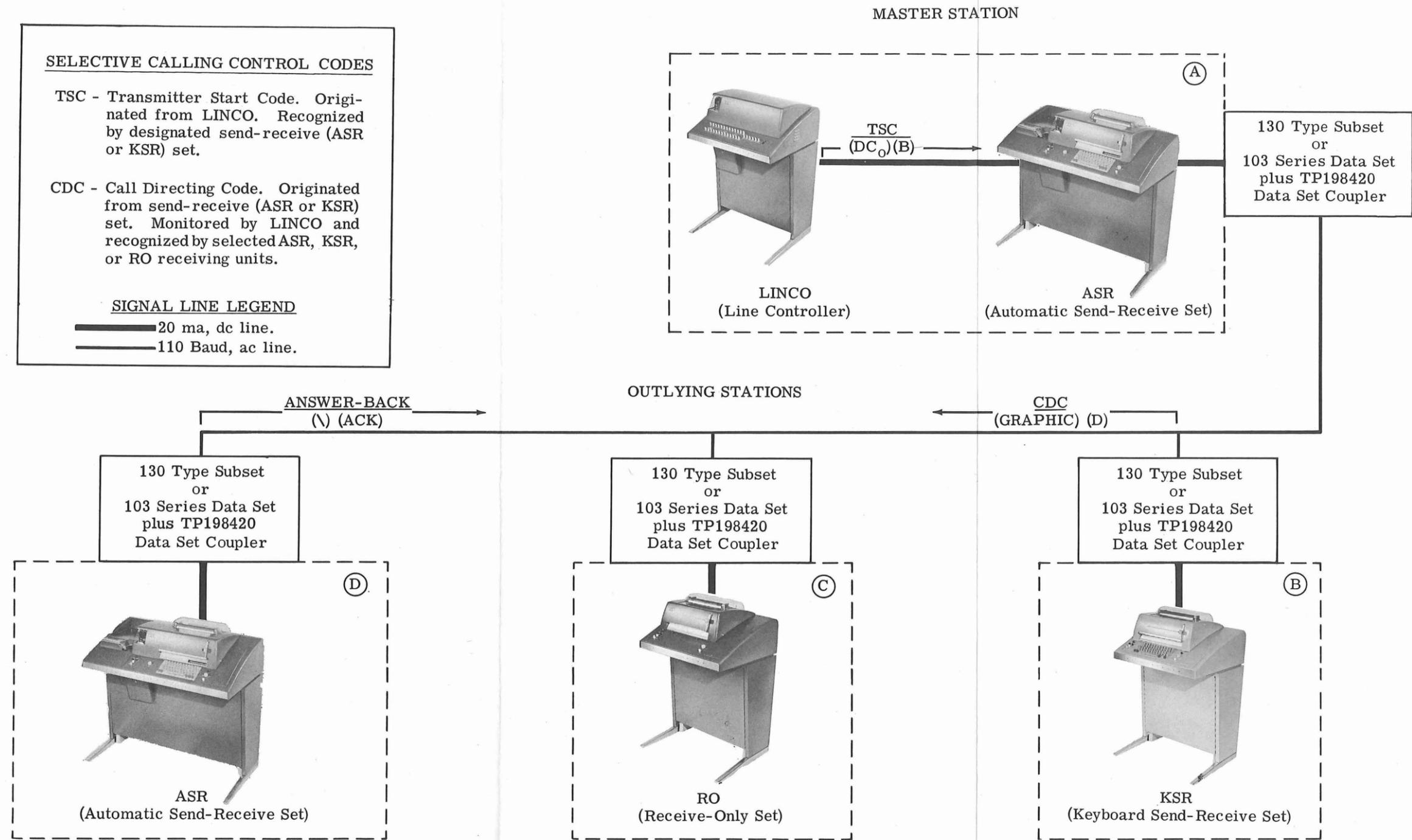


Figure 1 - Typical Station Arrangement
(Half Duplex 8A1 Data
Selective Calling System)

2.05 A keyboard entry from a polled station is signified by an automatic SOM SOM response to its TSC. The polled station has up to 30 seconds to send a character (or a DELETE). The SOM (start-of-message) sequence changes the idle line time mode at the line controller from 1.0 second to 30 seconds. In this time mode, the line controller will tolerate an idle line period of 30 seconds between each character transmitted. The amount of keyboard (manual) entry should be minimized as it hobbles the system with a slower operator speed. (Keyboard entry may be eliminated by an optional strap.)

2.06 If a polled station has no traffic to send, it will automatically respond with a \ ACK sequence. This response following a TSC is recognized by the line controller as a no-traffic available condition, causing the TSC generator to advance and poll the next station.

2.07 If a maintenance condition, such as low paper, exists at the polled station, the station will respond with a BELL BELL sequence. The line controller will recognize this condition with a flashing green MTC (maintenance) alarm on its control panel and proceed with the polling cycle. An audible alarm (buzzer) accompanies the visual (MTC) alarm. The line controller assumes that the maintenance condition will be corrected at the polled station before the next polling cycle; it does not permanently identify the polled station which caused the alarm. The alarm circuits at the line controller may be reset by operating the MTC key.

2.08 The four preceding conditions at a polled station provide line assurance between the line controller and the polled station. Should the polled station fail to respond within 1.0 second, a no-respond condition exists. The line controller will generate a BK-pause-EOT sequence and resume polling. The skip key on the LINCO control panel, associated with the station which was polled and failed to answer, is illuminated with a flashing green light, and the buzzer alarm is sounded. The buzzer can be suppressed by operating the alarm cutoff key. Both the flasher and buzzer can be reset by operating the RESET key. However, the alarm will occur again during the following polling cycle if the trouble has not been corrected.

CALL DIRECTING CODES AND RESPONSES

2.09 When traffic is to be sent from a polled station to one or more receivers in the system, the polled station responds to its TSC

with the first call directing code (CDC). The CDC is a two-character sequence composed of any combination of 32 alpha block graphics in the ASCII. However, the CDC's are usually limited to combinations of two alphabetic characters. The CDC is sensed by all receivers but is recognized only where a stunt box is coded with that specific combination.

2.10 Call directing codes are normally assigned to individual receiving units in the system. For example, the typing unit and reperforator in an ASR set can have separate call directing codes. A group CDC can be assigned to all receivers for receipt of a broadcast transmission. (The line controller intercept and the sending station reperforator — if so equipped — will not receive a broadcast transmission.) Recognition of call directing codes occurs in the stunt box mechanism mounted in each station typing unit. The line controller will receive and store a CDC for format verification. Should a called station fail to respond, the stored CDC will be released to the line controller intercept.

Note: When a group CDC is assigned, only one station can be permitted to provide the answer-back response. Therefore, the answer-back response must be suppressed at all other stations encoded with the group CDC.

2.11 A CDC, when transmitted by the polled station, requires a response from either the called station or the line controller intercept. One of two conditions may exist at the called station.

- (1) Station able to receive — sends \ ACK
- (2) Station disabled — cannot receive due to a maintenance condition, ie, low paper, disconnected, etc.

Note: There is no BELL BELL response to a CDC, as there is to a TSC for this condition. Instead, the intercept sends an * ACK and copies the message.

2.12 When a called station can receive, it will respond to its CDC with a \ ACK answer-back. The reverse slant is printed on the page copy at the sending (polled) station only, indicating that the called station is ready to copy. The remote receiver, whether it be a reperforator or typing unit, is placed in a ready-to-punch or print condition. The sending station may continue with other CDC's or issue a start-of-text (STX) code which places the

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called station(s) in a print or punch mode and all other stations in a nonprint or nonpunch mode.

2.13 If a called station cannot receive, eg, low paper, the called station will not give a response to its CDC. After recognizing an idle line condition of more than 1.0 second (following the second graphic in the CDC for keyboard transmission or following the DELETE character for tape transmission), the line controller will respond with an * ACK combination. The asterisk on the page copy at the sending station indicates that the intercept has been alerted to receive the message. Should the intercept be disabled, the line controller will generate a * ACK combination. The number sign on the page copy will indicate that the polled station must resend the message to the called station at a later time.

START-OF-TEXT CODE

2.14 After the CDC's and their acknowledgements have been transmitted, the sending station transmits the start-of-text (STX) code. All selected receivers will then be conditioned to allow printing or punching while unselected receivers will be locked out. A receiving station will copy no CDC's but only the text following an STX. The sending station, however, will copy all transmissions following its response to the TSC.

Note: The beginning of text should always be CR LF to insure that all carriages are at the left margin of a new line.

INHIBIT CODES

2.15 The line controller will accept certain code signals that will modify its timing pattern of message control. Any character in a group having bit 4 marking and bits 5, 6, and 7 spacing or a NULL character will effect a timing change and allow an idle line up to 3 seconds in duration. (Refer to the ASCII in Figure 19.)

2.16 The first characters are in a group known as form effectors. These include horizontal and vertical tabulation, form feed, etc. The line controller will accept these characters to change its timing pattern only during the text of a message. The timing change (from 1.0 second to 3 seconds maximum idle line) in the line controller allows

transmission to stop while these functions occur. Each form effector must be followed by a DELETE character. As soon as the transmitter is restarted at the end of a function, the line controller timing pattern returns to its original form.

2.17 The NULL character is intended for use by high-to-low converters. The line controller will accept this character from a station any time during its transmission. It must, therefore, be generated under controlled conditions. It has the same effect upon the line controller timing pattern as a form effector.

END-OF-TRANSMISSION CODE

2.18 The end-of-transmission (EOT) code is the system disconnect code. As with all other control codes, an EOT is recognized in the typing unit stunt box and the line controller electronic logic. The EOT will restore all logic in the system, except for alarms, to the normal (nonprint, select) condition.

2.19 In tape transmission, the character following the message text must be an EOT. Absence of a locally generated EOT when a reader stops sending is viewed as an alarm condition at the polled station. The line controller, which monitors traffic in the system, will recognize an idle line period exceeding 1.0 second and generate a BK-pause-EOT sequence to seize the line.

2.20 The absence of a locally generated EOT at the conclusion of a keyboard transmission will not sound an alarm. The line controller will generate a BK-pause-EOT sequence after an idle line period exceeds 30 seconds. The manual entry of EOT (control D) is recommended at the conclusion of each keyboard transmission to maximize line efficiency.

SYSTEM CODE SEQUENCE

2.21 The various sequences occurring in a 8A1 Data Selective Calling System are shown in Figure 2. The diagram illustrates the alternate sequences which can occur during polling, calling, and message transmission.

3. EQUIPMENT

3.01 Available station equipment for the 8A1 Data Selective Calling System includes the system line controller (LINCO),

automatic send-receive (ASR) set, keyboard send-receive (KSR) set, and receive-only (RO) set. The line controller should be combined with an automatic send-receive set to form a master or control station. The line controller has no tape reader facilities for retransmitting intercepted message tapes to their proper destinations on the signal line. Thus, the ASR station set can be utilized for retransmission

of messages captured by the intercept. The line controller may be connected to the ASR set by means of a 20 ma dc signal line loop.

SYSTEM LINE CONTROLLER

3.02 The system line controller contains the control logic for polling the send-receive stations, monitoring all traffic for conformity

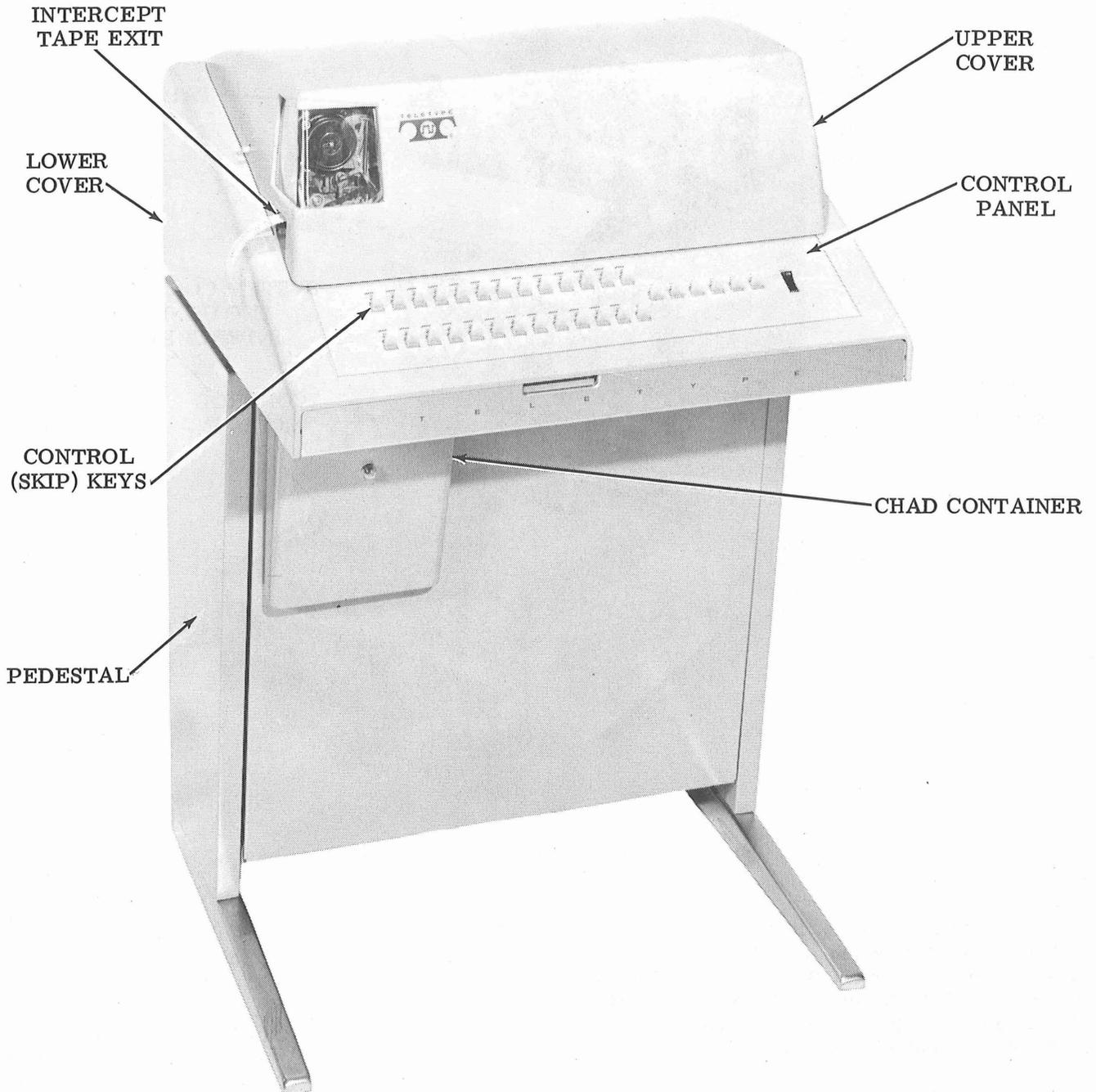


Figure 3 - System Line Controller (LINCO)

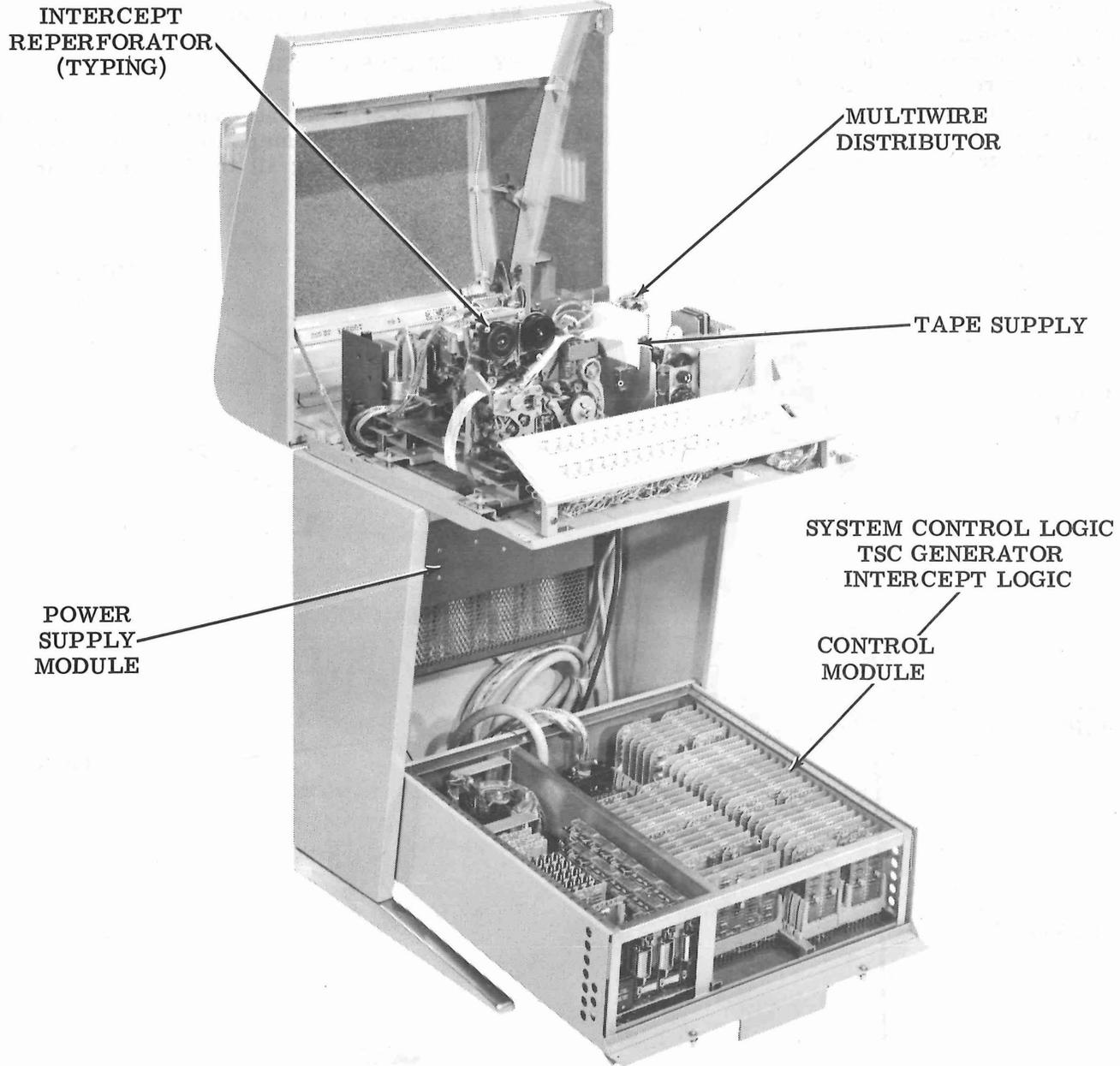


Figure 4 - Major Components of LINCO

with allowable message formats, and intercepting messages which cannot be received at called stations (Figure 3). The control panel at the front of the cabinet contains the indicator keys to indicate the status of the system and to perform line control functions.

3.03 As the line controller intercepts a message, punched tape emerges from the opening on the left side of the upper cover.

Chad (waste material resulting from tape perforation) is collected in the chad container attached to the front of the pedestal.

3.04 All major components are contained within a 35-type cabinet. The system control logic, transmitter start code (TSC) generator, and intercept logic are contained in the control module on the front panel (Figure 4). The power supply is suspended from a set

of rails attached to the bottom side of the cabinet pan. The cables from the incoming power and signal lines, power supply module, and control module are routed upward in the right rear corner of the pedestal.

3.05 The upper compartment of the cabinet contains an electrical service assembly, typing reperforator with motor, and multiwire distributor with motor. The reperforator serves as the copying device of the line controller intercept. A primary function of the distributor is to send all transmitter start codes and control codes in serial form. Both the reperforator and distributor respond to the logic and programming in the control module.

3.06 The control module is shown in Figure 5. The TSC program board is encoded by pushing individual pins for marking bits and pulling them for spacing bits. The program board has 25 columns representing the send-

receive stations in the system and seven rows representing:

- (1) bit levels 1 through 5 for selecting alpha characters,
- (2) bit level 8 for establishing even parity, and
- (3) a control level for electing multiple polling.

Note: Bits 6 and 7 are prewired with bit 6 always spacing and bit 7 always marking.

TELETYPEWRITER SETS

3.07 The automatic send-receive, keyboard send-receive, and receive-only teletypewriter sets are each equipped with a station controller and control panel. The typing

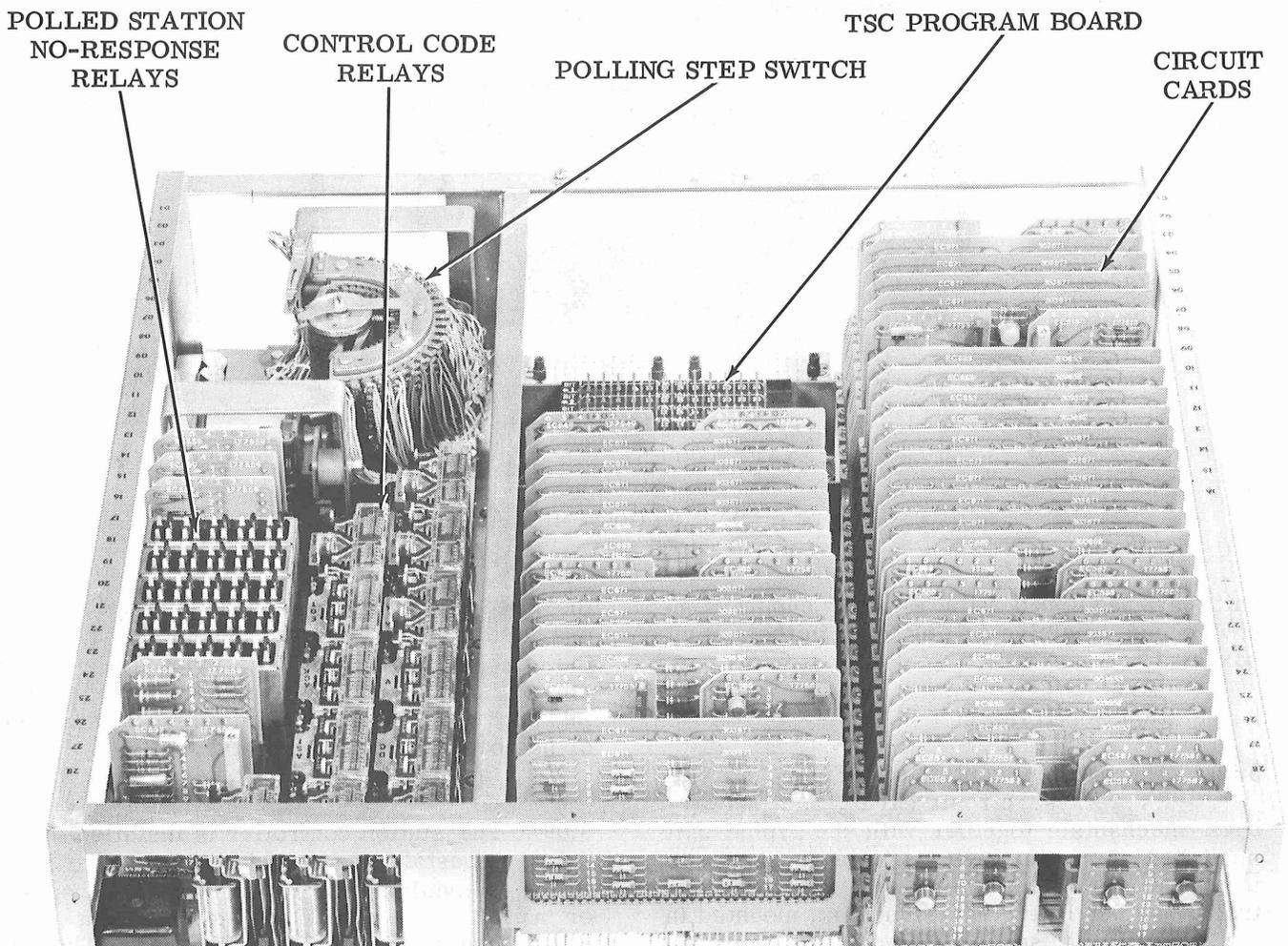


Figure 5 - LINCO Control Module

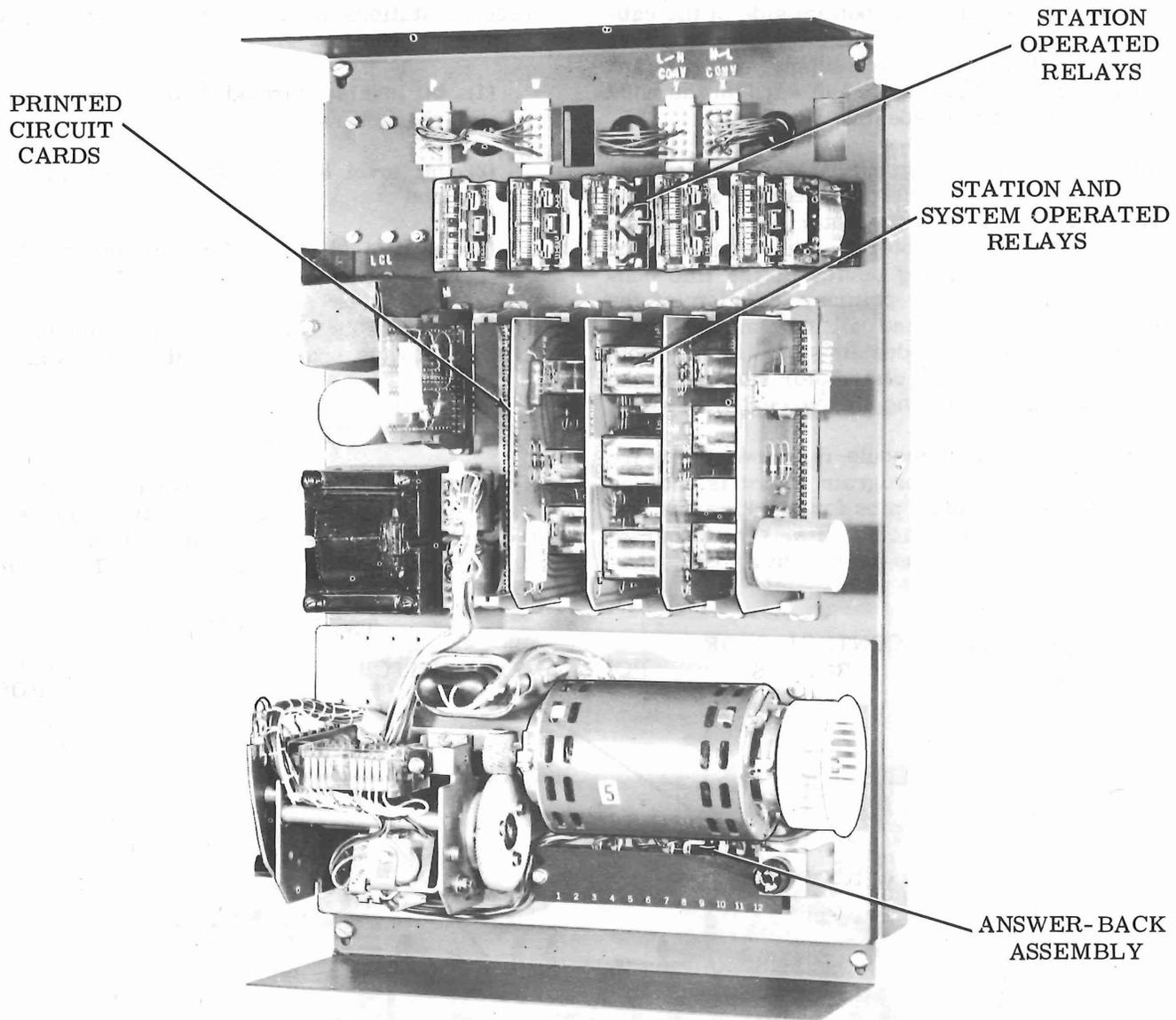


Figure 6 - Station Controller Assembly

units are equipped with a print suppression device and selective calling logic in their stunt boxes.

A. Station Controller

3.08 The station controller (Figure 6) with its relays, circuit cards, and answer-back mechanism together with the typing unit stunt box, form the logic package necessary to interface a teletypewriter set with the controlled signal line. The stunt box, mounted in the typing unit, senses all code combinations but recognizes pertinent control codes only. When a system control code is transmitted on

the line, a set of contacts in the stunt box are operated to energize its associated relay in the station controller. The print suppression mechanism prevents the typing unit from printing page copy unless the station is transmitting or has been selected to receive.

3.09 The station controller is installed in the pedestal of each teletypewriter set. Space is available for mounting a 130C1 subset or a 103 series data set to the right of the station controller on ASR sets only. The 103 series data set must be mounted external to a KSR or RO pedestal.

B. Automatic Send-Receive Set

3.10 The automatic send-receive (ASR) set provides the facilities for automatically sending messages on, or selectively receiving messages from, the signal line. Message tapes can be prepared off-line while the reader is sending and/or the printer is monitoring on-line. Or messages can be transmitted directly on-line from the keyboard.

3.11 An ASR set (Figure 7) can be linked with the line controller to form the master station or can be located at any outlying station where automatic sending is required.

3.12 The control panel (Figure 8) contains the indicator lights, keys, and switches for operating an ASR set in the system. When the rotary power switch, on the right side of the control panel, is placed in the LCL (local)

position, the system signal line is shunted, and the set will operate on an internal signal line. With the rotary power switch ON-LINE, the switch will connect all or selected units to the external signal line. The ASR mode switch, to the left of the keyboard, is used to facilitate three operational combinations. In the KT mode all units, ie, keyboard, tape reader, tape reperforator, and a typing unit, are on the signal line. In the T mode the tape reader and typing unit are on the signal line while the keyboard and tape reperforator are on a separate, internal, local circuit. In the K mode, only the keyboard and typing unit are on the signal line; the tape reader and tape reperforator are disabled.

3.13 The special controls on the left side of the keyboard apply to station entry on the signal line and to station alarm conditions, and are peculiar to the station controller. A BID for the signal line is entered by the

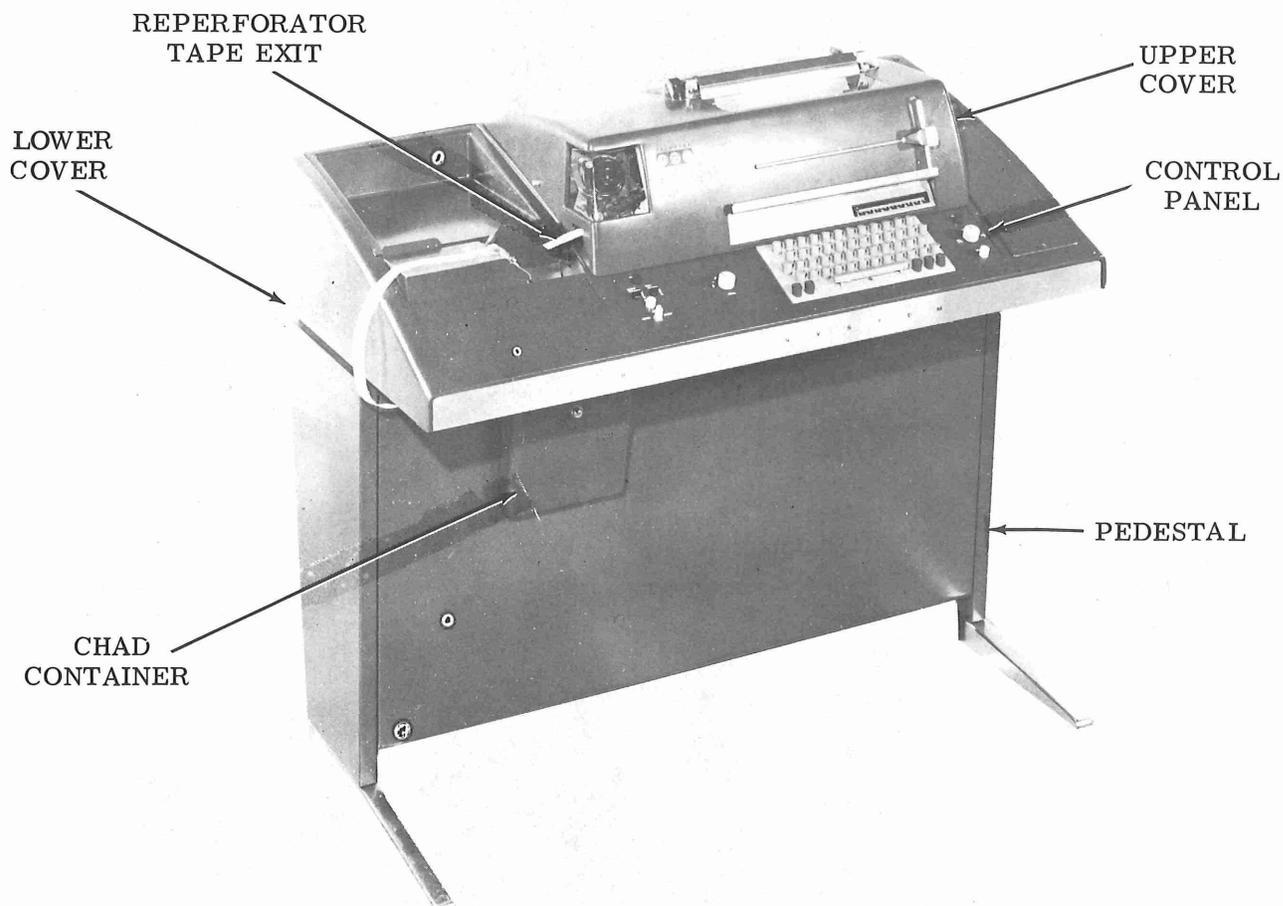
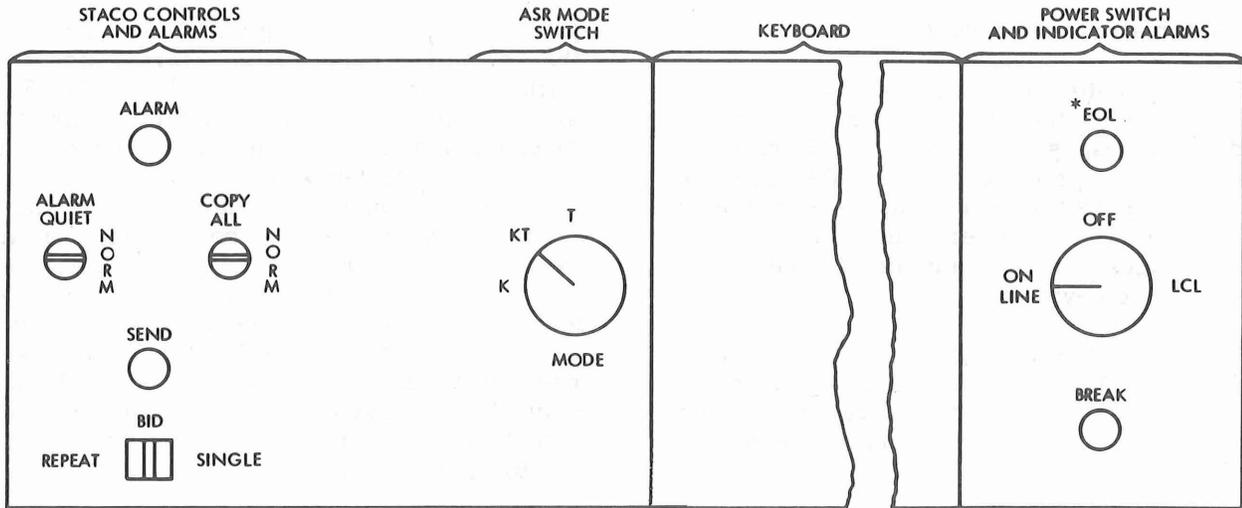


Figure 7 - Automatic Send-Receive Set



*Earlier design. EOL indicator on copyholder of later design cabinets.

Figure 8 - ASR Control Panel

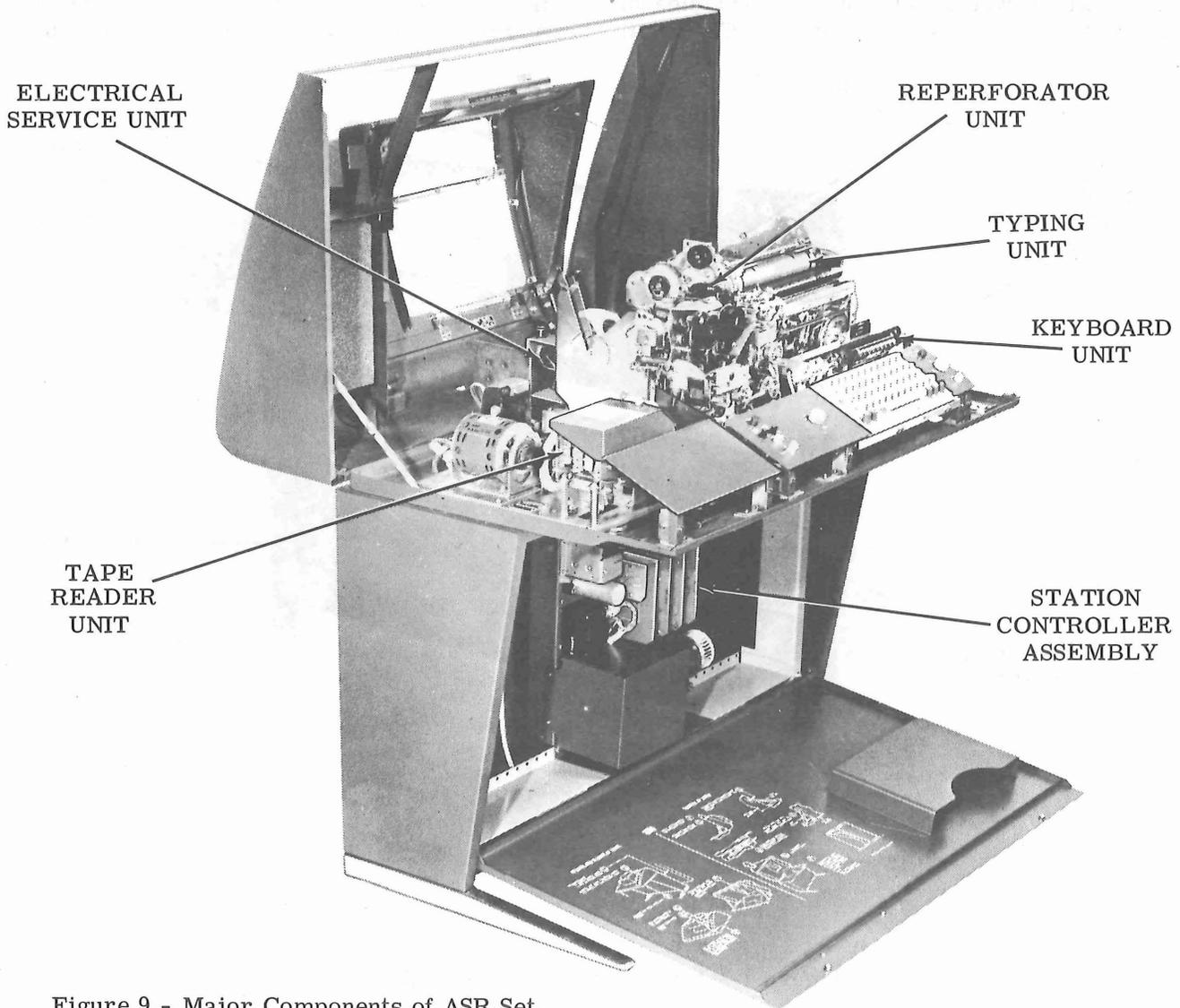


Figure 9 - Major Components of ASR Set

operator. The SEND lamp indicates when the station has control of the line for message transmission. The COPY ALL twist key allows the typing unit to print all graphics that are transmitted on the signal line. When operated, the COPY ALL key will disable the print suppression circuits. The key in the NORM position permits the typing unit to print only local transmissions and directed message text (after an STX) from remote transmitters.

3.14 The major components are contained in a 35-type cabinet (Figure 9). The station controller is mounted in the pedestal of the cabinet. The typing reperforator unit, typing unit, tape reader unit, keyboard unit, and sup-

porting electrical service unit are mounted on the upper compartment base.

C. Keyboard Send-Receive Set

3.15 The major components of the keyboard send-receive (KSR) set are contained in a 35 type cabinet (Figure 10). The keyboard unit, typing unit, and electrical service unit are mounted on the upper compartment base. The station controller is mounted in the pedestal. Additional space is available within the pedestal to mount a 130C1 subset when used, but its power supply must be mounted elsewhere. If a 103 series data set is used, it must be mounted external to the cabinet, and a

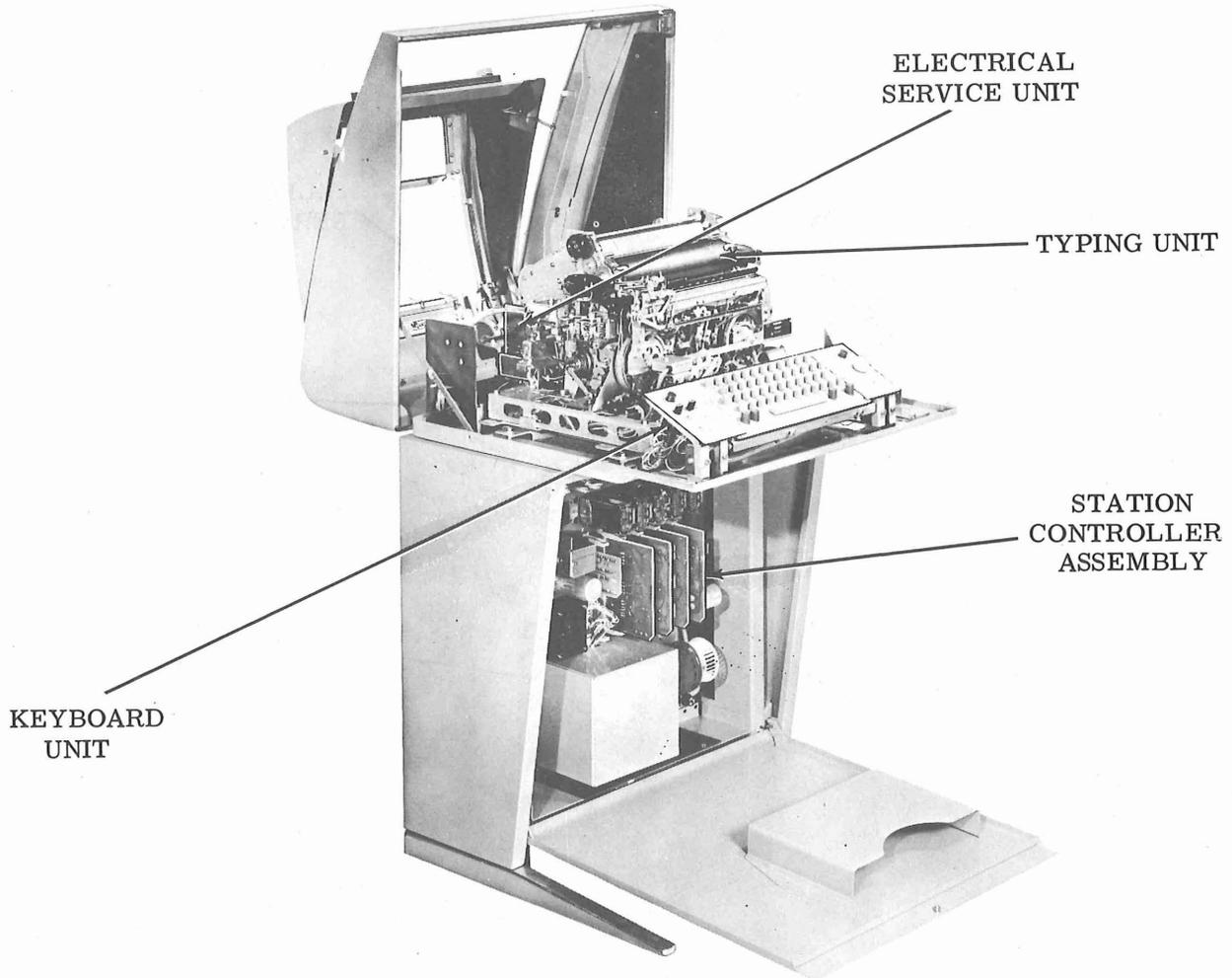
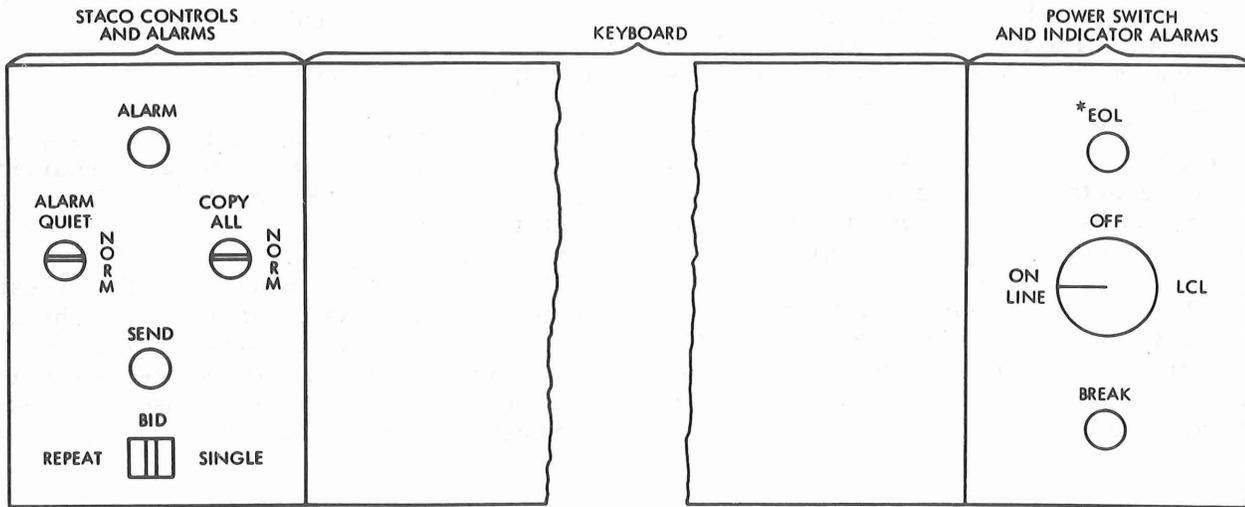


Figure 10 - Major Components of KSR Set



*Earlier design. EOL indicator on copyholder of later design cabinets.

Figure 11 - KSR Control Panel

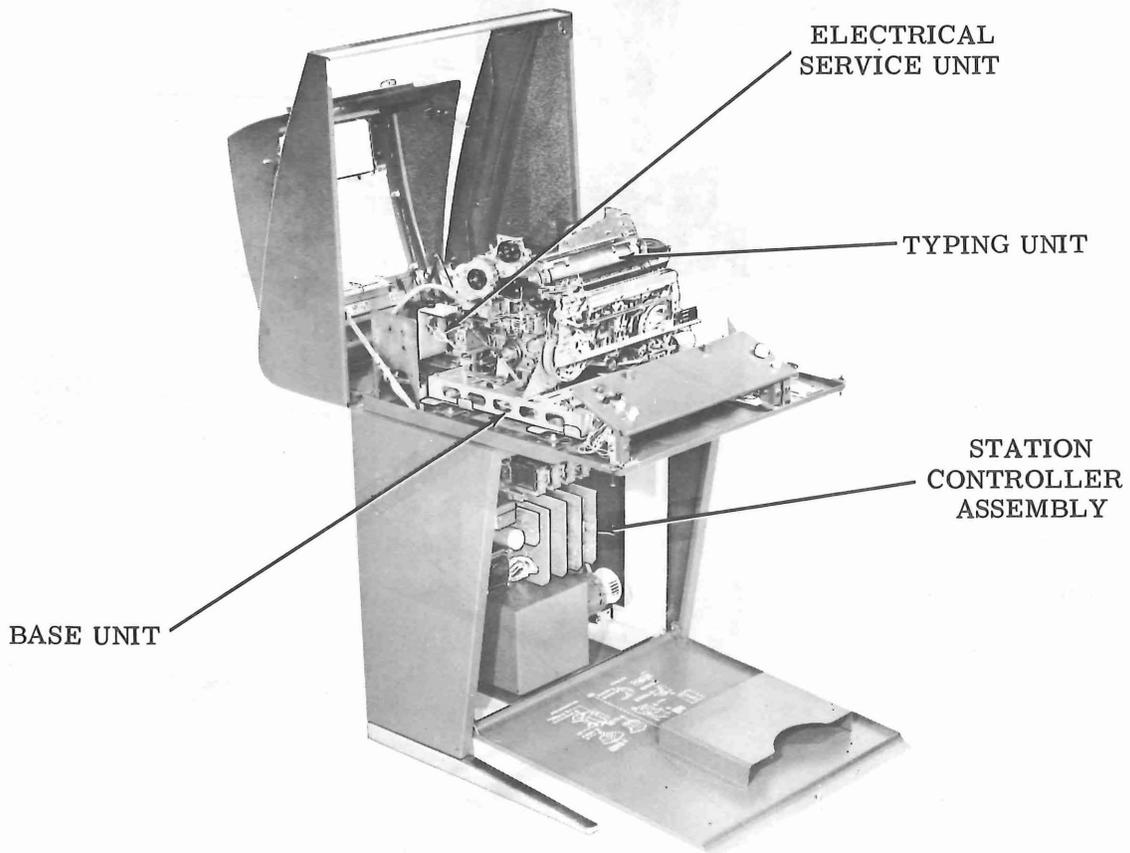


Figure 12 - Major Components of RO Set

TP198420 data set coupler is required to convert dc TTY signals to EIA bipolar voltage.

3.16 Although the basic KSR set has facilities for keyboarding messages only, the station controller and associated controls can accommodate a remote tape reader and reperforator. The KSR control panel is shown in Figure 11. The special controls are described in Paragraph 3.13.

D. Receive-Only Set

3.17 The receive-only (RO) set consists of a typing unit, electrical service unit, and station controller. The units are contained in a 35-type cabinet (Figure 12). A 130C1 subset, when used, can be mounted to the right of the station controller, but its power supply must be mounted elsewhere. If a 103 series data set is used, it must be mounted external to the cabinet; and a TP198420 data set coupler is required.

3.18 The controls for operating an RO station are located on the front panel of the set. The station controller permits the station to exercise control over a remote or auxiliary tape reader; therefore, transmission by tape is possible from a station with an RO set. Similarly, the station controller can exercise control over a tape reperforator allowing mes-

sages to be recorded on tape. The special controls (Figure 13) on the left are described in Paragraph 3.13.

4. OPERATION

4.01 The system, composed of up to 25 send-receive stations and an unlimited number of receive-only sets (except for transmission noise and traffic load considerations), is under control of one master line controller station. Each send-receive station must wait for its transmitter start code (TSC) before it can send to other receivers in the system. Individual station controls and required message formats are discussed in the paragraphs to follow.

SYSTEM LINE CONTROLLER

4.02 The control panel on the line controller contains indicator keys and audible and visual alarms to facilitate the following:

- (a) Automatically poll all stations.
- (b) Skip specific stations in the polling sequence.
- (c) Manual control of the polling sequence.
- (d) Indicate and reset alarm conditions.

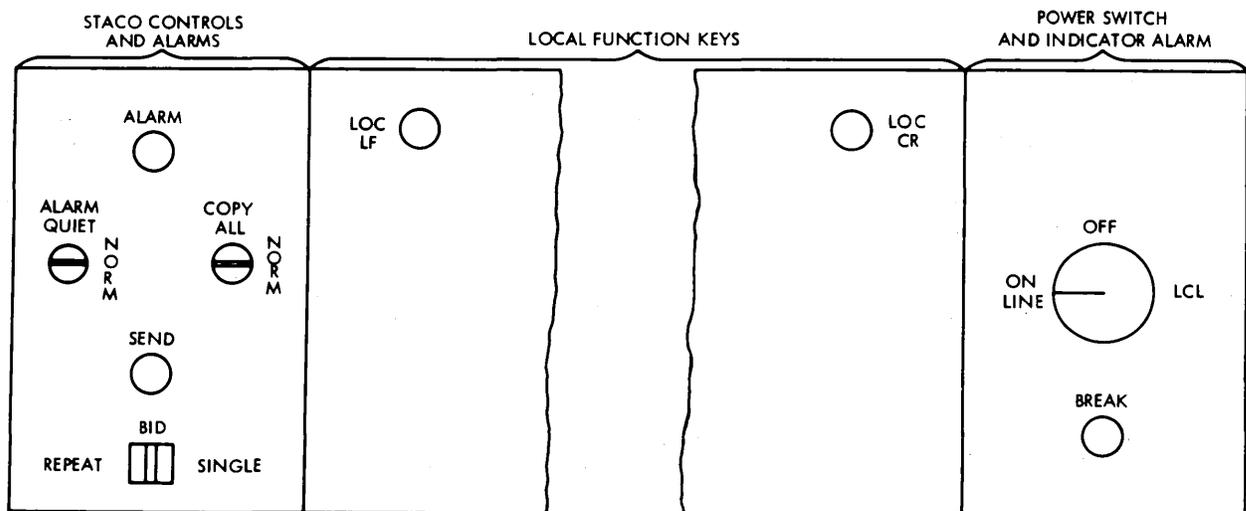


Figure 13 - RO Control Panel

(e) Suppress buzzer alarm.

(h) Indicate disabled intercept.

(f) Indicate an open line.

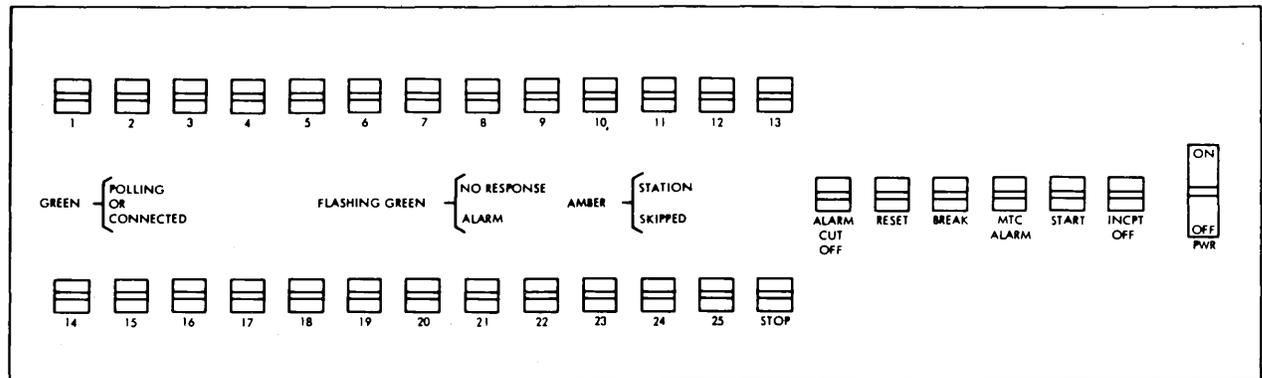
The control panel is shown in Figure 14; the functions and status of the control keys are listed in Table 2.

(g) Seize the line.

TABLE 2 - CONTROL KEYS FOR LINCO

KEY	TYPE	LEVER POSITION*	LAMP CONDITION	FUNCTION
Skip (per Station) 1 thru 25	Locking	N	Green when station is being polled or has line; flashing green when station fails to answer	Normal polling of station
		O	Amber	Skip polling of station
Stop	Locking	N	Green when polling is automatically stopped	Normal rest
		O	Amber	Stop polling
Alarm Cutoff	Locking	N	None	None
		O	Amber	Silence Alarm Buzzer
Reset	Non-Locking	N	None	None
		O	None	Resets all no response and maintenance alarms
Break	Non-Locking	N	Green on open line	None
		O	Flashing amber	Transmit "Line Break - EOT" Sequence
MTC Alarm	Non-Locking	N	Flashing green on maintenance alarm of a remote station	None (visual indication of open line).
		O	None	Resets maintenance alarm
Start	Non-Locking	N	None	None
		O	None	Starts polling or polls next station if stop key is in Operated position
INCP OFF	Non-Locking	N	Green - local maintenance alarm or equipment failure	None
		O	None	None

* N - Normal
O - Operated



Note: See Table 2 for full schedule of colors.

Figure 14 - LINCO Control Panel

A. Automatic Polling

4.03 With the power switch ON and the stop key in the normal position, the line controller is conditioned for automatic polling. Isolated conditions, such as no-response and maintenance alarms, intercept off, skip station keys operated, or alarm cutoff key operated, will not affect the automatic stepping of the transmitter start code generator (TSCG).

4.04 If certain sending stations are to be omitted from the polling cycle, the skip station keys can be operated. When operated, the keys are illuminated amber.

4.05 The status of the system can be determined by observing the condition of the control panel. As each station is being polled or has the line, its associated skip key will be illuminated with a steady green light. If a station fails to respond, its key will flash green until the alarm is corrected. A buzzer alarm accompanies a no-response flasher condition. If a station responds but is disabled due to a maintenance condition, the MTC ALARM key is illuminated, and the buzzer is sounded. The buzzer can be suppressed by operating the ALARM CUTOFF key; when operated, this key is illuminated amber. Both the maintenance and no-response alarms can be reset by operating the RESET key, or the maintenance alarm can be reset separately by operating the nonlocking MTC ALARM key.

4.06 At the end of a complete polling cycle in which no messages were transmitted, the line controller will automatically stop poll-

ing and enter a poll rest condition. The STOP key will then be illuminated green. Although polling has stopped, the line controller continues to monitor the line. An outlying station can activate the TSCG by transmitting a wake-up code. The wake-up code is automatically issued by an outlying station when a bid is entered and the signal line has been idle for approximately 60 seconds (8 seconds - optional) or longer. If desired, the TSCG can be reactivated from the line controller before the end of its normal rest period (approximately 8 minutes) by operating the START key. This key will function only during a poll rest condition and if the STOP key is in the normal position.

Note: Periodic (every 8 minutes) wake-up of the line controller also serves as a line assurance monitor during periods of low activity. The lack of a no traffic response from a polled station will cause an alarm at the line controller.

4.07 The line controller can be secured in a poll rest locked condition any time during a polling cycle or poll rest free condition. Operation of the STOP key will prevent the TSCG (Transmitter Start Code Generator) stepping switch from advancing. When operated, the STOP key is illuminated amber.

B. Manual Polling

4.08 Manual polling of specific sending stations in the system is possible by securing the line controller in the poll rest locked condition, ie, by operating the STOP key. Unwanted stations in a manual poll can be locked

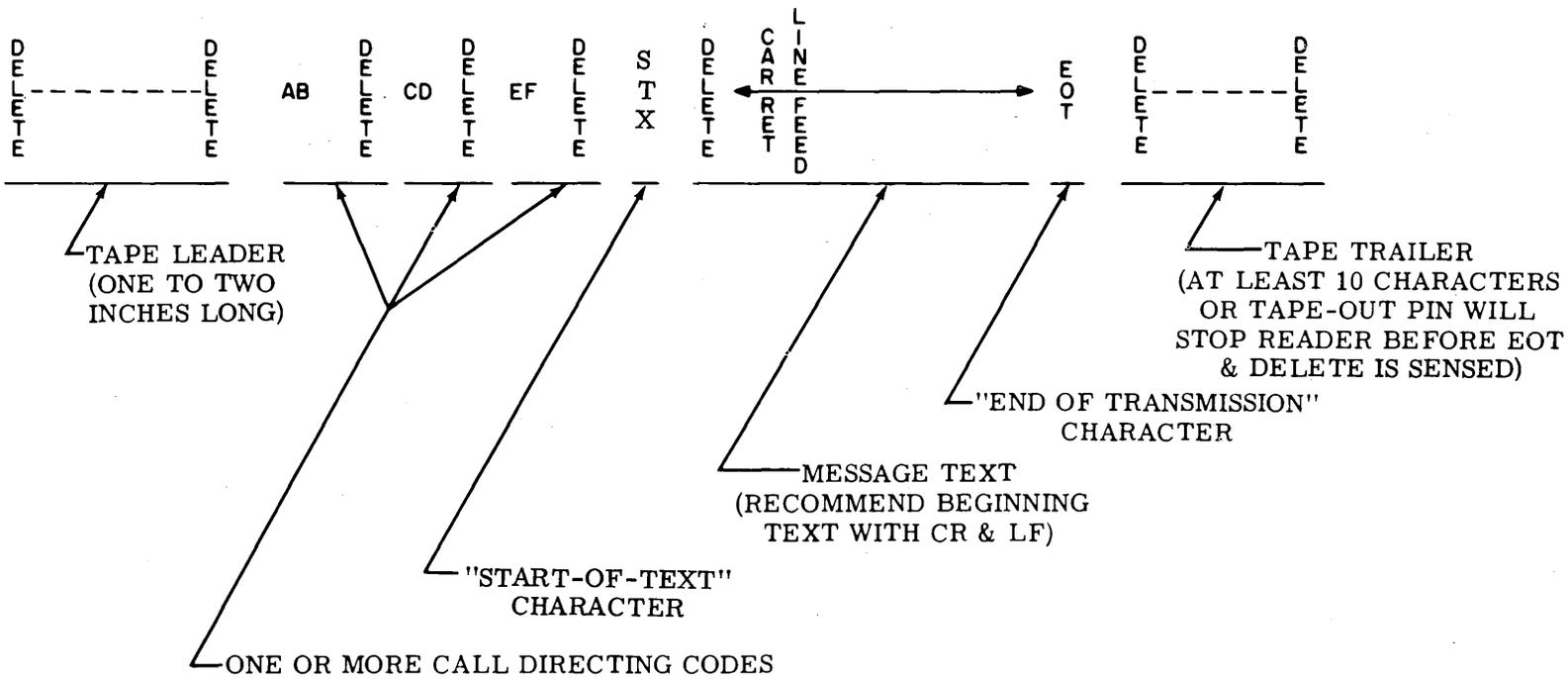


Figure 15 - Tape Message Format

out by operating their skip station keys. The TSCG step switch is advanced by operating the START key. Continual advancement is possible by holding the START key in the operated position. Otherwise the TSCG will return to the poll rest locked condition after each station is polled.

C. Seizing the Line

4.09 If, at any time, it is necessary to seize the line, the BREAK key (nonlocking) can be operated. The BREAK key (flashing amber when operated) causes the line controller to generate a repetitive BK-pause-EOT sequence as long as the key is held operated. When in its normal position, the key would be illuminated green only during a line break elsewhere on the line. The EOT (end-of-transmission) character places all receivers in the select, nonprint condition and disconnects any transmitters.

D. Multiple Polling

4.10 The line controller can be programmed to allow those stations in the polling sequence which must regularly or periodically transmit a larger than normal percentage of line traffic, to transmit multiple messages. A station so programmed, upon completion of its first message, will be repolled immediately. If another message is available, it may then be transmitted. This station will be polled until it has transmitted six messages or responds with a no-traffic response. If the line controller must seize the line during a transmission from a multipoll station, the station will not be repolled until the next polling cycle.

4.11 All 25 positions of the programmer should be used even though less than 25 transmitting stations are on the line. A flexibility and balance of line access time for each station to match its required average and peak loads can be obtained by:

- (1) programming these stations more than once during the polling cycle and/or,
- (2) using the multipoll feature.

SEND-RECEIVE SETS

4.12 Since all stations are equipped with a standard station controller (STACO), the associated special controls and alarms are identical at all types of stations. Messages

are transmitted on the line from tape (ASR) or from keyboard - (ASR or KSR) - equipped stations.

Note: An auxiliary tape reader may be connected to a KSR or RO set qualifying either station for automatic sending functions.

A. Tape Entry

4.13 When messages are prepared for tape transmission, their formats must agree with Figure 15. A tape leader, consisting of a continuous series of DELETE characters (not exceeding 300), is needed for positioning the tape in the reader. A DELETE character should follow each two character CDC to prevent preamble transmission garble.

4.14 Tape transmission is possible from either an ASR station or from any station equipped with an auxiliary tape reader. If entry is made from an ASR set, the ASR mode switch should be in the KT (or T - see Paragraph 4.17) position. The DELETE leader of the message tape is placed in the tape reader. With the tape lid closed the tape reader switch is placed in the RUN position.

4.15 A bid for the signal line is entered by operating the BID key on the control panel. A SINGLE or REPEAT bid may be entered. If a SINGLE bid is entered, the key must be operated after each message is transmitted. If the BID key is placed in the REPEAT position, the bid command will be in effect continually so that it need not be re-entered after each message is sent. The station with traffic will automatically respond with a single message during each poll by the line controller. When using the REPEAT bid, the operator should prepare a continuous (multimessage) tape. There may not be sufficient time to place a second torn tape message in the tape reader before being repolled. This is especially true if the station is programmed in the line controller for a multipoll.

4.16 The reader will start when the station senses its TSC (if there is tape in the reader and a bid entered). A CDC and DELETE will be transmitted from the tape. The reader will pause for an answer-back response, read more CDC's if the preamble contains multiple addresses (stopping after each CDC to await an answer-back), send the STX, text, EOT, and stop. The reader will restart when

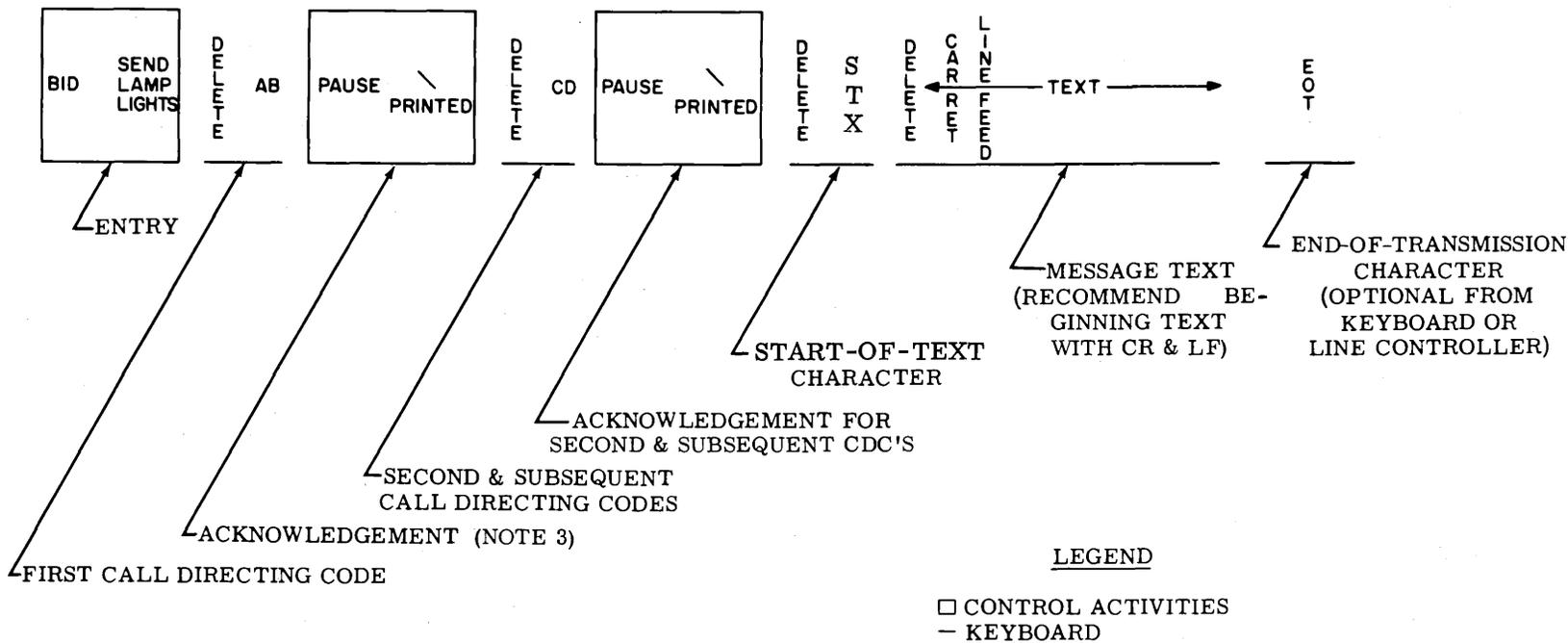


Figure 16 - Keyboard Message Format

NOTES

1. 30 SECOND (MAX) INTERVAL ALLOWED BEFORE INITIATING TRANSMISSION AND BETWEEN SUCCESSIVE CHARACTERS
2. PRINTED ACK FROM CALLED STATION \

 PRINTED ACK FROM LINE CONTROLLER INTERCEPT {*(RECEIVING)

 }#(NOT RECEIVING)
3. TRANSMISSION OF ACKNOWLEDGEMENT SEQUENCE, \ACK, MUST START WITHIN 1.0 SECONDS AFTER SECOND CHARACTER OF CDC. ACK CODE OPERATES STUNT BOX BUT DOES NOT PRINT.

again polled by the line controller if an additional message is on the same tape in the reader and if a REPEAT bid had been entered. When the last message is sent, the tape reader will stop after sensing an ECT. Should a REPEAT bid be entered with only DELETE trailer left, a TSC will cause the reader to operate until a tape-out condition occurs. The line controller, sensing an idle line, will generate a BK-pause-EOT sequence placing the transmitting station only, in a BREAK alarm condition. An alarm will also be indicated at the line controller.

4.17 If message tape is to be prepared on an ASR set, the mode switch can be placed in the T position. However, for certain applications, an ASR station can have two CDC's — one for receiving printed copy, and one for receiving punched tape. When the mode switch is in the T position, the reperforator is removed from the line and placed on a separate, internal, local circuit so that, during tape preparation (T mode), any transmissions to the reperforator would be temporarily received by the line controller intercept. Therefore, the mode switch should be returned to the KT position whenever tape is not being prepared.

B. Keyboard Entry

4.18 Keyboard transmission is possible from either an ASR or KSR station. When making a keyboard entry from an ASR station, the tape reader switch must be in the OFF position. A bid for the signal line is entered by operating the BID key. The answer-back mechanism in the station controller will automatically respond to its TSC with an SOM SOM sequence. When the SEND lamp is lit, key-

boarding can begin. The operator has up to 30 seconds to send the first character of a CDC. Thereafter, a maximum of 30 seconds is tolerated between characters.

4.19 The message format for keyboard transmission is similar to the format used in tape transmission, with minor exceptions. See Figure 16. The DELETE character between CDC's should not be sent until the reverse slant or alternate answer-back is printed on the page copy at the transmitting station since an answer-back response is automatically sent by the called station after receipt of the second character of its CDC. A DELETE is needed before a CDC to insure a division between multiple addresses. The absence of an EOT at the conclusion of a keyboard transmission is permissible since the line controller will, after 30 seconds, generate an EOT. For keyboard transmission this is not recognized as an alarm condition (in contrast to tape sending).

C. Keyboard Operation

4.20 When preparing a message tape offline or operating the keyboard online, it is recommended that the operator be trained to keyboard all messages according to Figure 17. The pause following a CDC is mandatory when keyboarding a message online. The tape reader, when operated online, will automatically pause after each CDC DELETE sequence.

D. Monitoring Traffic

4.21 At a transmitting station the typing unit will copy all local transmissions from a tape reader or keyboard. This includes all CDC's, acknowledgements, and message text.

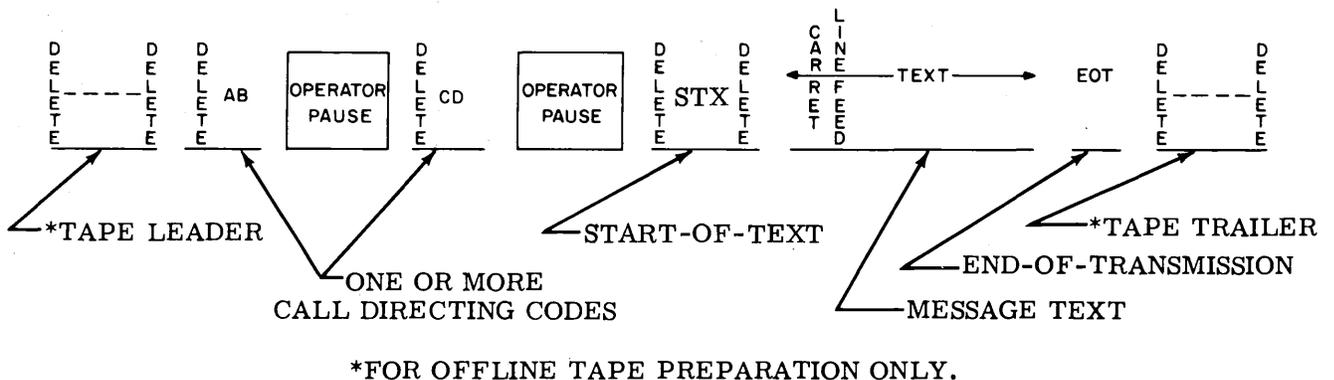


Figure 17 - Recommended Operator Format for Offline Tape Preparation or Online Keyboard Operation

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A tape reperfector will not monitor local ASR transmissions unless called in by its local CDC to do so.

4.22 Neither a typing unit nor a tape reperfector at a remote receiving station will start copying until an STX code is received. Other stations not called in with their CDC's will enter a nonprint, nonselect mode. This prevents a nonselected receiver from responding to a random two-character combination in the text of a message, which corresponds to the station's CDC. A COPY ALL twist key can be operated at any station to allow the typing unit to copy all transmissions on the signal line. This feature may be disabled if desired.

E. Station Alarms

4.23 Each station set is equipped with an audible and visual alarm. The lamp and buzzer will operate due to the following alarm conditions:

- (1) With tape reader switch in RUN position, a tight-tape, tape-out, or operation of the BID key while an ASR is in the K mode.
- (2) With tape reader switch in OFF position and ASR in T mode, operation of the BID key.
- (3) Low paper or forms in typing unit.
- (4) Low tape in reperfector tape supply. (Station is permitted to transmit in this condition.)
- (5) Line break while sending or receiving.

4.24 The audible alarm can be suppressed by turning the ALARM switch to the QUIET position. The alarm indication is then confined to the lamp only. The buzzer will be restored if the switch is returned to the NORM position

before the trouble is corrected. Correcting the trouble will not extinguish the lamp while the switch is in the QUIET position. To turn off the lamp after the trouble is corrected, the switch must be returned to NORM. This assures that the alarm buzzer is never left disabled.

FORMAT DEVIATIONS

4.25 The LINCO will generate a BK-pause-EOT sequence if a sending station deviates from the formats shown in Figures 18 and 19.

5. TECHNICAL DATA

Code Data

Type: American National Standard Code for Information Interchange (ASCII).

Transmission Rate: 110 baud (bits/sec) or 100 words/minute.

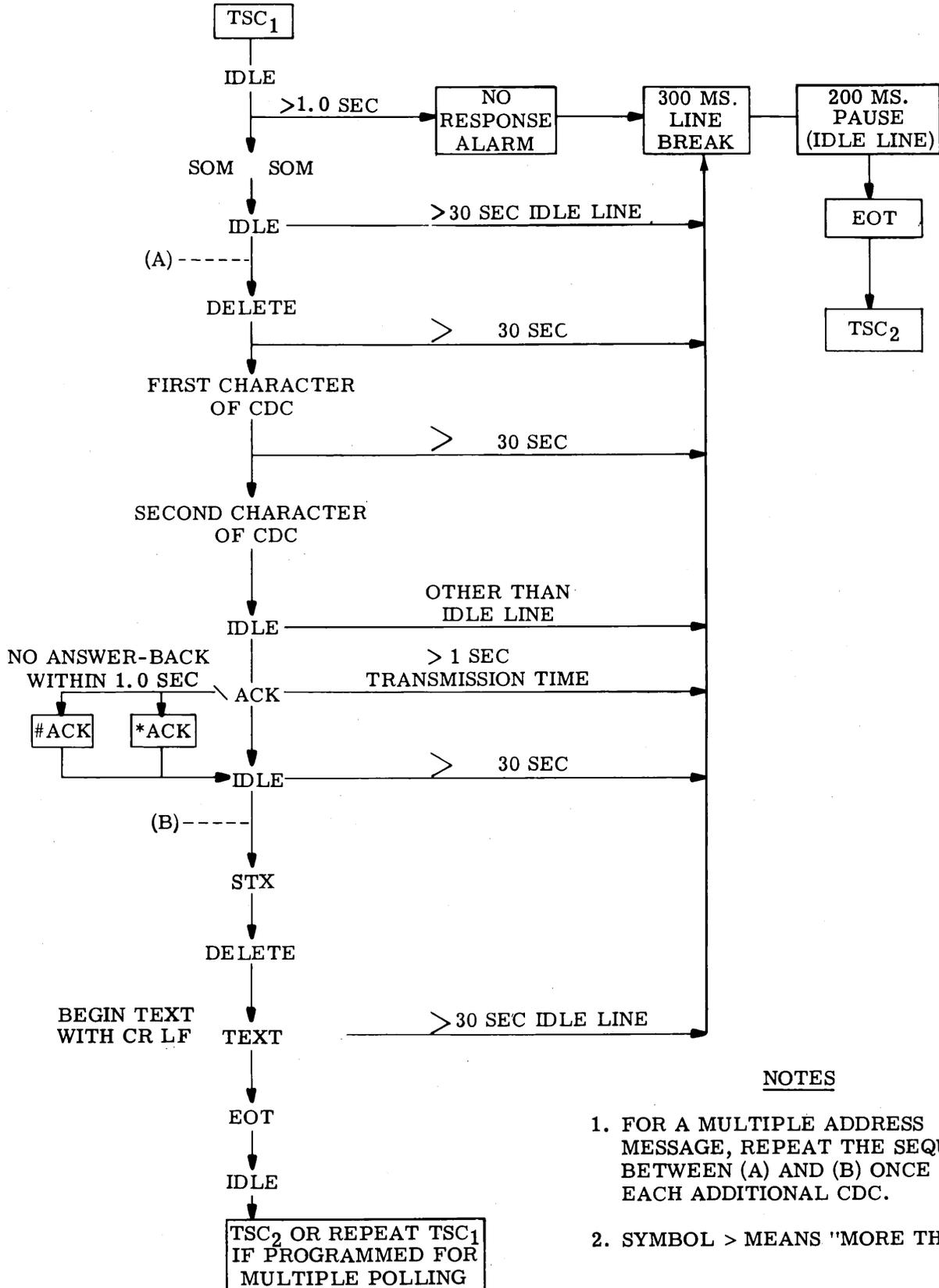
Code Units: 11 equal units; unit breakdown is as follows:

- (a) 1 unit — start bit always spacing
- (b) 7 units — 7 intelligence bits marking or spacing
- (c) 1 unit — parity bit . . . marking or spacing even parity
- (d) 2 units — stop bits . . . always marking

Wave Pattern: See Figure 20 for example.

Temperature Range —

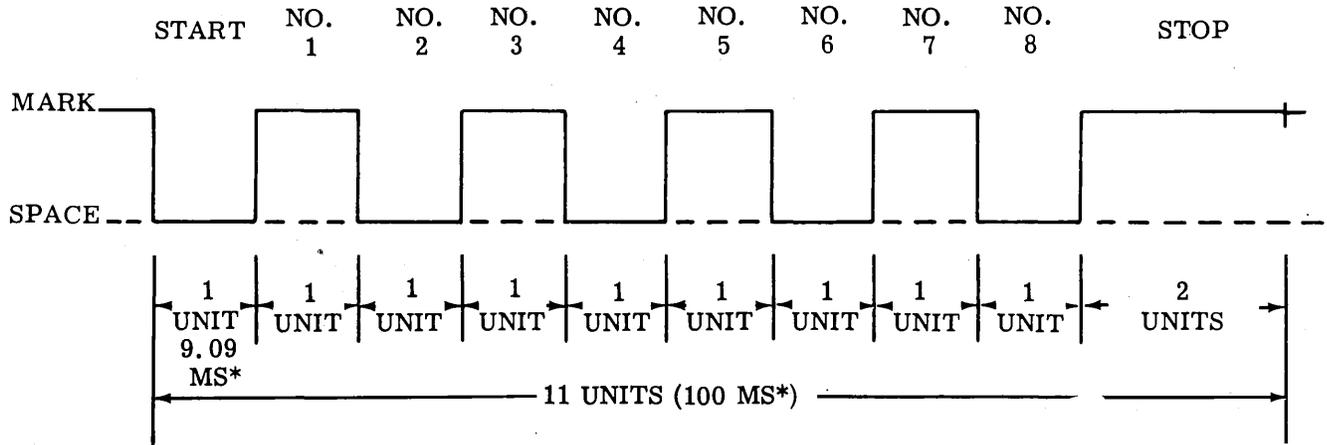
This equipment is intended to be operated in a room environment within the temperature range of 40°F. to 110°F. Serious damage to it could result if this range is exceeded. In this connection, particular caution should be exercised in using acoustical or other enclosures.



NOTES

1. FOR A MULTIPLE ADDRESS MESSAGE, REPEAT THE SEQUENCE BETWEEN (A) AND (B) ONCE FOR EACH ADDITIONAL CDC.
2. SYMBOL > MEANS "MORE THAN."

Figure 19 - Effects of Format Deviations During Keyboard Transmission



*Based on transmission rate of 100 words per minute.

Figure 20 - Wave Pattern for Letter 'U' (With Even Parity Bit)

RECOMMENDED TRANSMISSION FACILITIES FOR AC SIGNAL LINE

- (1) Modified 130C1 carrier telegraph terminal.
- (2) 103-type data set plus data set coupler such as TP198420.

TAPE DATA

- Information Levels: 8
- Feed Holes: In-line
- Width: 1 inch
- Characters per inch: 10

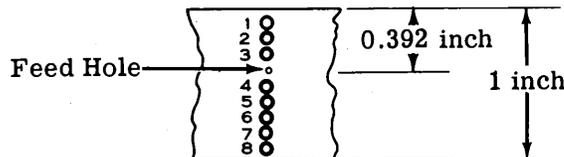


Figure 21 - Tape Data

AVAILABLE TYPING UNITS

- (1) Friction feed for page copy.
- (2) Sprocket feed for business forms.

POWER REQUIREMENTS

Set	Approximate Power Requirements*	Power Factor	Running Current
LINCO	275 watts	0.69	3.5 amps
ASR	215 watts	0.52	3.6 amps
KSR	140 watts	0.47	2.6 amps
RO	140 watts	0.47	2.6 amps

*All sets operate from a 115 v ac $\pm 10\%$, 60 cycle power line.

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6. BSP REFERENCES

SECTION	EQUIPMENT COVERED	CONTENTS*	LINCO	ASR					KSR		RO	
			35A	35BC	35BF	35BP	35BR	35BD	35BG	35BE	35BH	
581-121-100 -200 -400 -700 -701 -800	8A1 System Line Controller	D & PO I WD A L P	X X X X X X									
581-122-100 -200 -300 -400 -800	8A1 Station Sets	D & PO I & CO TS WD P		X X X X X								
581-124-100 -110 -200 -300	9140 Station Controller	GD & O D & PO I CO & TS										
570-220-100 -400 -700 -701 -702 -800	Motor Unit	D & PO WD A L D & R P	X X X X X X									
573-137-100 -700 -701 -800	28 & 35 Receiving Selector & Multiple Wire Distributor Base	D & PO A L P	X X X X									
574-220-100 -700 -701 -702 -800	35 Typing Unit	D & PO A L D & R P		X X X X X								
574-221-100 -700 -701 -702 -800	35 Keyboard and Base for KSR & RO	D & PO A L D & R P						X X X X	X X X X	X X X X	X X X X	
574-222-100 -700 -701 -702 -800	35 Keyboard for ASR	D & PO A L D & R P		X X X X X	X X X X X	X X X X X	X X X X X					
574-223-100 -700 -800	35 Tape Reader Base	D & PO A & L P		X X X	X X X	X X X	X X X					
574-224-100 -700 -701 -702 -800	35 Nontyping Reperforator	D & PO A L D & R P				X X X X	X X X X					
574-225-100 -700 -701 -702 -800	35 Transmitter Distributor	D & PO A L D & R P		X X X X X	X X X X X	X X X X X	X X X X X					
574-226-100 -800 -801	35 Electrical Service Unit	D & PO P P		X X	X X							

SECTION	EQUIPMENT COVERED	CONTENTS*	LINCO	ASR					KSR		RO	
			35A	35BC	35BF	35BP	35BR	35BD	35BG	35BE	35BH	
574-228-100	35 Cabinet for ASR	D & PO		X	X	X	X					
-700		A		X	X	X	X					
-701		L		X	X	X	X					
-800		P		X	X	X	X					
574-229-100	35 Cabinet for KSR & RO	D & PO						X	X	X	X	
-700		A						X	X	X	X	
-701		L						X	X	X	X	
-800		P						X	X	X	X	
574-232-100	35 Tape Printer Keyboard & ROTR Base	D & PO	X									
-401		AWD	X									
-700		A	X									
-701		L	X									
-702		D & R	X									
-800	P	X										
574-233-100	35 Typing Reperforator	D & PO	X	X	X							
-700		A	X	X	X							
-701		L	X	X	X							
-702		D & R	X	X	X							
-800		P	X	X	X							
574-235-100	35 Answer-Back	D & PO		X	X	X	X	X	X	X	X	
-700		A		X	X	X	X	X	X	X	X	
-701		L		X	X	X	X	X	X	X	X	
-702		D & R		X	X	X	X	X	X	X	X	
-800		P		X	X	X	X	X	X	X	X	
574-237-100	35 Multiple Wire Distributor	D & PO	X									
-400		AWD	X									
-700		A	X									
-701		L	X									
-800		P	X									
*A - Adjustments AWD - Actual Wiring Diagrams D & O - Description and Operation D & PO - Description and Principles of Operation D & R - Disassembly and Reassembly I - Installation			I & CO - Installation and Checkout L - Lubrication P - Parts TS - Trouble Shooting WD - Wiring Diagrams									