83B1 TELETYPEWRITER SELECTIVE-CALLING SYSTEM

DESCRIPTION AND OPERATING PRINCIPLES

CONTENTS PAGE

1. GENERAL 1

2. BASIC FEATURES OF THE 83B1 SYSTEM 2

3. MESSAGE FORMAT 3

4. SUMMARY OF OPERATION 4

A. Automatic Stations 4

B. Manual Tape Relay Stations 8

C. KSR Stations 8

D. Automatic Relay Stations 9

E. Methods of Varying Polling Rates to Control the Flow of Traffic 9

F. Traffic Movement 10

G. Use of V Preceding the Lockout Code for Protection Against Garbled First CDC Letters 10

5. CHOICE OF TSCs AND CDCs 11

A. General 11

B. TSC Selection 11

C. CDC Selection 12

6. LAMPS, KEYS, AND ALARMS 13

A. Summary 13

B. Alarm Conditions Associated with the Transmitter Start Circuit 14

C. Alarm Conditions Associated with a Sending Station 15

7. DIFFERENCES IN DISCONNECT OPERATION 15

CONTENTS PAGE

8. EQUIPMENT ARRANGEMENTS 15

A. Station Assembly 15

B. Station Control Circuit 16

C. Transmitter Start Circuit 16

D. Key and Lamp Cabinets 16

E. Teletypewriter Apparatus 18

9. POWER SERVICES 19

10. MAINTENANCE FEATURES 22

11. LIST OF DRAWINGS 22

1. GENERAL

1.01 This section contains the description and operating principles of the 83B1 teletypewriter selective-calling system. The 83B1 system operates half duplex (HDX), and has provision for a maximum of 40 automatic sending and receiving or receiving only stations on any one line. One of these stations, designated the control station, controls the flow of traffic on the line. The station transmitters are polled for traffic in a set order by a transmitter start circuit in the control station. A station with a punched tape message properly set up for transmission will have its transmitter started when it is polled. This message will then be sent to any selected station or stations on the line. Provision is also made for automatic relay through reperforator-transmitters to stations on other lines.

1.02 This section has been reissued to bring it into agreement with the current design of the system. The changes are too extensive to permit the use of marginal arrows.

1.03 This system will be designed to use the 28ASR teletypewriter set at automatic sending and receiving stations. The selective-calling features will be provided by the 28 stunt-box. The 28ASR set is not available at the time of this writing. Until it becomes available, the 19ASR set with a 28 sequence selector (28SS) or supplementary receiving only (RO) 28 printer will be used in its place.

2. BASIC FEATURES OF THE 83B1 SYSTEM

2.01 Each line of the 83B1 system contains a transmitter start circuit, which may be located at any one of the stations on the line, this particular station then being designated the control station. The transmitter start circuit polls each transmitter on the line for traffic, thus eliminating conflicts between stations wishing to send simultaneously. The polling is effected by the use of two-letter transmitter start codes (TSCs) sent out by the transmitter start circuit, each station transmitter being assigned a TSC to which it alone will respond.

2.02 Each transmitter may direct its message to any other desired station or stations on the line by means of call-directing codes (CDCs) punched at the beginning of the message tape. These CDCs are two-letter codes and each station is assigned a CDC to which it alone will respond. To speed operation, group codes or broadcast codes may be used. A group code will call in a prearranged group of stations by the use of one CDC. A broadcast code will call in all stations on the line by the use of one CDC, and this code may be used to give notices of outage due to ribbon and paper changes. As an optional feature, CDCs may be sent by means of pushbuttons, eliminating the need of punching them into the tape.

2.03 There is a wide choice of teletypewriter apparatus that can be used with this system. Figures 1, 2, and 3 indicate by block diagram eight different classes of stations which may be connected to an 83B1 system line. The stations may operate at speeds of 60, 75, or 100 words per minute. The teletypewriter apparatus that may be used follows:

(a) 19ASR (contains 15 printer)*

(b) 28RO

(c) 28KSR

(d) 28ASR (when available)

(e) 14TD

(f) 14ROTR

(g) 15M Perforator (for off-line tape preparation)

*The 15 printer is not recommended for use at 100 words per minute.

2.04 A priority button (PR) is provided at each transmitter. By pushing this button, an attendant may obtain preference for her message over regular traffic.

2.05 In emergencies and for maintenance purposes the circuit can be controlled by keyboard from any sending station.

2.06 Station responses to CDCs and TSCs are used for assurance that the system is functioning properly. These responses are:

(a) No-traffic Response: When a station being polled does not have a message ready for transmission, or if it has a message ready for transmission on a regular basis, it sends a no-traffic response (the letter V) back to the control station.

(b) Answerback: When a station is selected by the receipt of its CDC it sends an answerback signal (the letter V) back to the sending station as an indication that it is ready to receive the message. On the broadcast code, the V answerback is sent from the control station only.

While both responses consist of the teletypewriter letter V, its purpose is entirely different in the two cases.

2.07 Station lamps and skip keys are provided at the control station, and individual transmitter controls and alarms are provided at each sending station.

2.08 Transmission may be from torn tape or continuous tape.

2.09 All codes are made up of standard teletypewriter characters and this permits making continuous transmission measurements on a circuit with normal test equipment.

2.10 Codes are such that interchange of traffic with 81-type switching systems is facilitated.

2.11 All interconnections between apparatus and equipment units are of the plug-in type for ease of installation and maintenance.

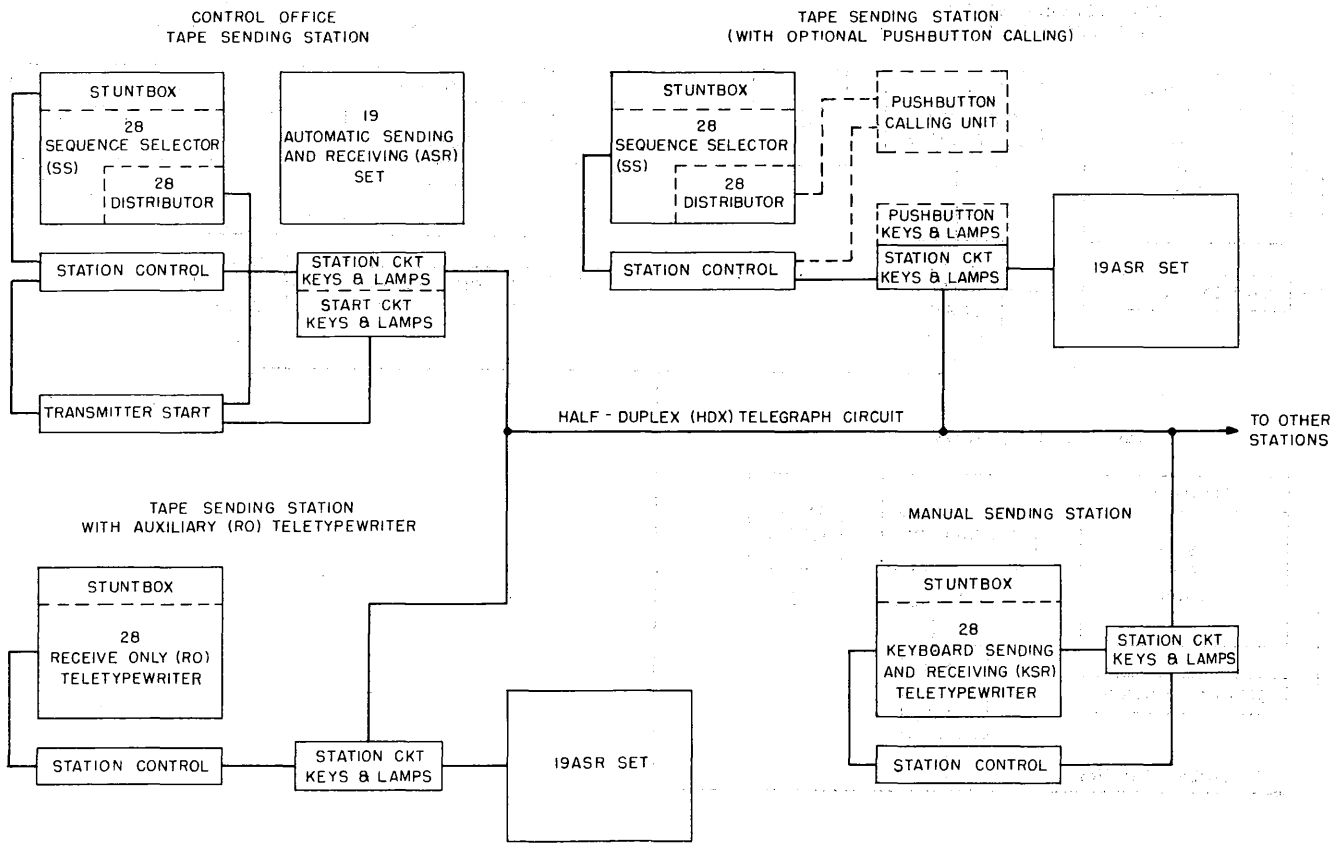

Figure 1 — Types of 83B1 System Stations

3. MESSAGE FORMAT

3.01 The basic message format is the same as that described in the section covering the 28 stuntbox, description and operating principles, except that in the 83B1 system the CDCs consist of two letters. The codes used are listed below:

(a) (CDC) LTRS	Individual, group, or broadcast CDC.
(b) CR LF LTRS	Lockout, or end-of-address code.
(c) FIGS H LTRS	Disconnect, or end-of-message code.

3.02 Examples of typical message formats are shown below. Words enclosed in parentheses identify the code, or describe the reason for the symbols, immediately preceding the parentheses. The marks (...) used below indicate repeated characters.

(a) Single-address message: LTRS ... LTRS (variable length tape tearing area) (CDC) LTRS CR LF LTRS (lockout code) (message) CR LF LTRS (positioning of type carriage for next message) LF... LF (if desired for separating successive messages) FIGS H LTRS (disconnect code) LTRS ... LTRS (variable length tape tearing area — at least 8 LTRS characters for torn tape operation).

Note: Operation can be improved if the tape is torn on the 9th LTRS character, leaving exactly 8 LTRS characters after FIGS H. This result can be obtained in punching if exactly 26 LTRS characters are punched following FIGS H and the tape is then torn off on the normal tearing edge. With this length of tape the 6th pin comes up just as the disconnect signal FIGS H LTRS is received. This avoids an alarm condition and a false start on the next poll.

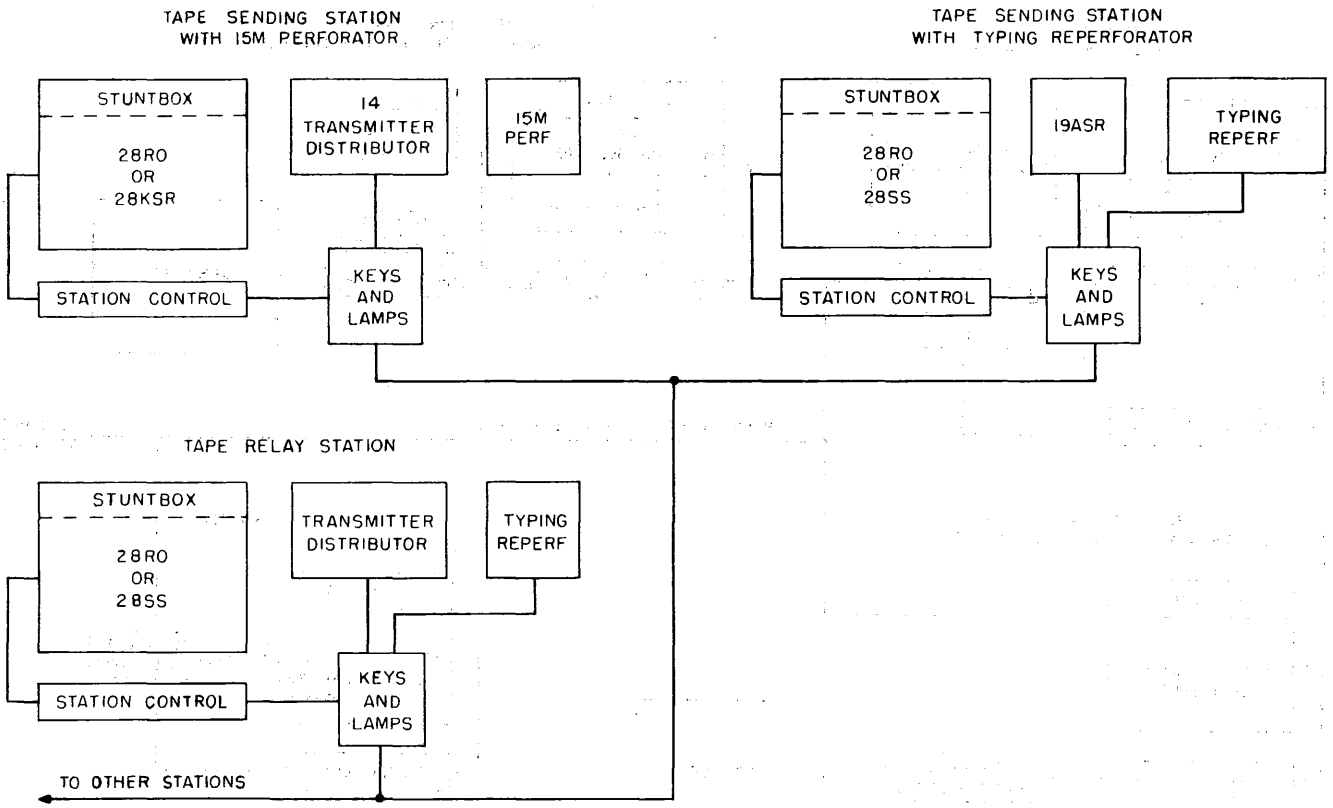

Figure 2 — Types of 83B1 System Stations

(b) Multiple-address message (3 stations): LTRS ... LTRS (1st CDC) LTRS (2nd CDC) LTRS (3rd CDC) LTRS CR LF LTRS (TEXT) CR LF LTRS LF ... LF FIGS H — LTRS ... LTRS

(c) Message for transmission on a second selective-calling circuit through a tape relay station, without the addition at the relay station of the second circuit CDCs: LTRS ... LTRS (CDC of reperforator at relay station) LTRS CR LF LTRS ... LTRS (variable length tape tearing area at reperforator) (CDC for station on second line) LTRS CR LF LTRS (TEXT) CR LF LTRS LF ... LF FIGS H LTRS ... LTRS.

3.03 When options such as auxiliary equipment control, horizontal tabulation, form feed-out, etc, are used in the system, the message format should include the required control codes.

4. SUMMARY OF OPERATION

A. Automatic Stations

CONTROL STATION

4.01 The transmitter start circuit generates and sends out in succession the transmitter start codes (TSCs) for the transmitters on the line.

4.02 If a polled station has no tape in its transmitter, a V no-traffic response is automatically returned to the control station, and the transmitter start circuit then polls the next station.

4.03 If a polled station has tape in its transmitter and is ready to send (except as described in 4.04), no V response is returned to the control station. Instead, the transmitter is started automatically. The transmitter first sends the desired CDCs punched in its tape, and a V answerback is received for each code. The

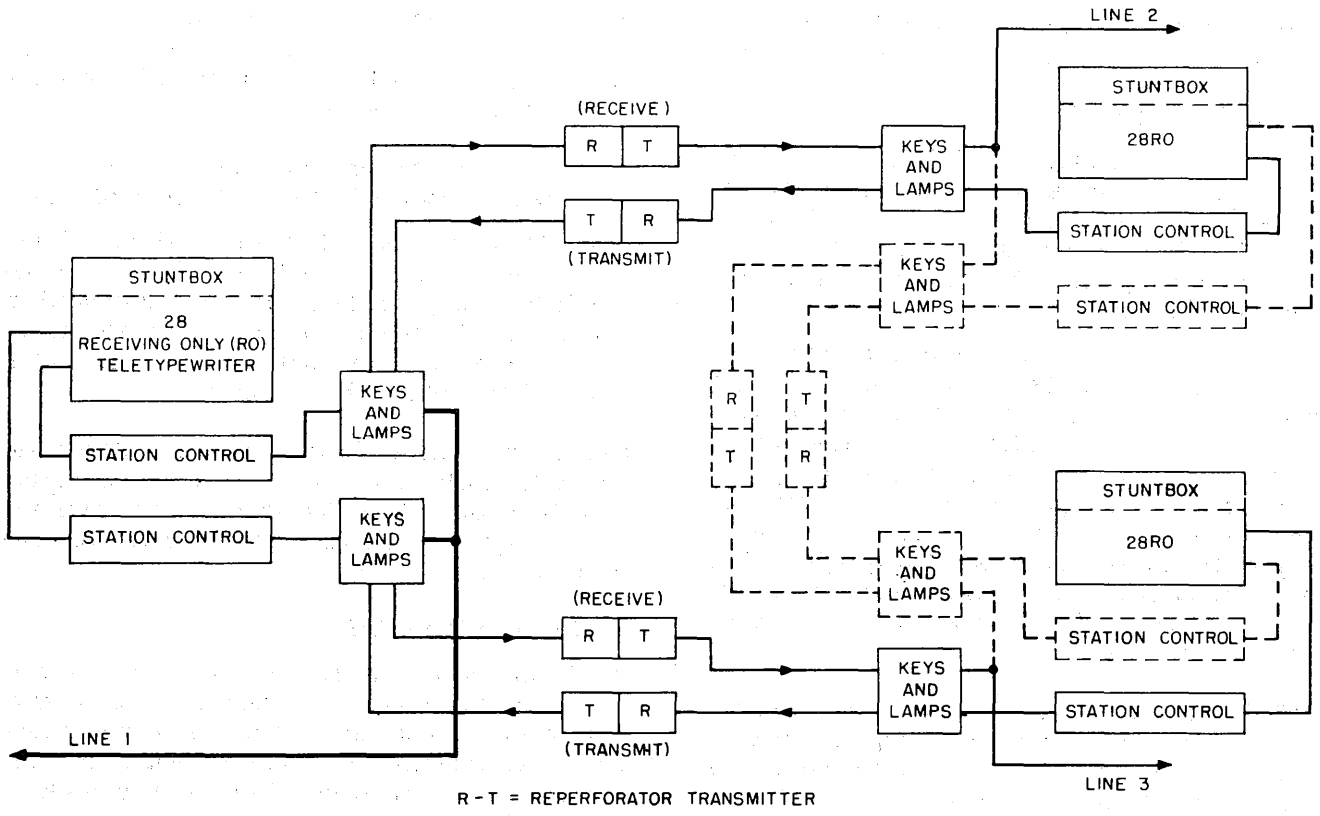

Figure 3 — Automatic Relay Station

CDCs and responses are followed by the end-of-address (lockout) code, the message, and the end-of-message (disconnect) code. The disconnect code stops the transmitter and signals the transmitter start circuit to resume polling.

4.04 To provide for priority traffic, each station has a priority button. An attendant with priority traffic pushes the button after she has put the tape in the transmitter. The priority feature is obtained by a provision for two rounds of polling of all stations. The first round is a search for priority traffic, the second a search for regular traffic. On the first round, if there is a station set for priority, its transmitter will start. If there is no station set for priority, no station will start on the first round. All stations with tape to send will, however, have been conditioned to start on the second round of polling.

4.05 After every message, either priority or regular, the procedure starts over again, ie, there is one complete round of search for priority traffic, followed by a second round of search for regular traffic. The preparatory relay operation on the first round is cancelled by each message sent so that for each new message priority traffic has the first chance to go.

4.06 For successful operation of the system as a whole, it is essential that the priority feature not be abused and that its use be limited to a small percentage of the traffic.

4.07 If priority operation will not be required, the extra polling time can be saved by disabling the priority feature.

4.08 The polling arrangements for this system are flexible. Ordinarily, each transmitter on the line is polled once in a prescribed order. After completion of one polling cycle the entire process is repeated. There is no waiting period between cycles. If desired, certain transmitters with anticipated heavier outgoing traffic may be polled two or more times during each cycle. Such possible cycling arrangements are discussed in 5. of this section.

4.09 The polling cycle can be stopped at any time by turning the VS (V test or stop) key at the control station panel to the SP (stop polling) position.

4.10 Factors affecting the selection of TSCs are discussed in 5. of this section.

SENDING STATIONS

4.11 An attendant, with traffic to send, punches a tape by means of the perforator associated with automatic stations. With a 19ASR set, since the 15 printer must be held ready to receive line copy when the station is selected, punching is blind.

4.12 If torn tape is used, the attendant tears off the tape at the LTRS character tearing area [see note following 3.02(a)] and inserts the tape in the transmitter. If the tape is correctly set in the transmitter (requiring the sixth, or end-of-tape pin, and the tight-tape stoparm both to be down) the BID (bid to send) lamp at the local control panel will light. This light indicates to the attendant that the transmitter is ready to send and will be started upon receipt of its TSC.

4.13 If continuous tape is used, the attendant lowers the tight-tape stoparm after a complete message, including disconnect, has been punched in the tape. This must be followed by at least 100 characters (LTRS characters or the first part of a succeeding message) so that the disconnect signal can feed into the transmitter when the message is sent.

4.14 If the message has a priority status, the attendant pushes the priority (PR) button at the local control panel.

4.15 In its proper turn, as determined by the transmitter start codes, the transmitter starts. The SEND lamp on the local control panel lights. The first letter of the CDC opens the start magnet circuit and stops the transmitter, but not before the second letter of the CDC and the following LTRS character have gone out. On the return of the V answerback, the start magnet circuit recloses and the transmitter starts again. If there are two or more CDCs, this process is repeated for each of them. After the last CDC and the lockout signal, CR LF LTRS, the message is sent. At the end of the message the disconnect signal stops the transmitter and releases the line. The SEND lamp goes out.

4.16 When continuous tape is used, unless a complete next message is ready to go, the attendant should lift the stoparm at the end of a message to prevent the transmitter from starting when next polled.

4.17 Any automatic sending station may be operated as a keyboard station by first removing the tape from the transmitter-distributor and then proceeding as follows:

(a) At a 19ASR station, push the KS (keyboard sending) button on the control panel.

(b) At a station when an auxiliary 28RO printer is provided in addition to the 19ASR set, push the KS button and then when the SEND lamp lights and the alarm sounds as a signal to send, throw the line test key on the 15 printer to the LINE position.

Operation is then identical with that described below for KSR sets except that when the station is polled, the LTRS character is sent from the transmitter-distributor instead of the LTRS generator.

EMERGENCY BREAK-IN

4.18 An emergency break-in procedure is provided so that any station with top priority traffic to be sent either from keyboard or tape can break into whatever is being sent on the line and start its own transmitter or use its keyboard. Contention may occur if two stations try to break in at the same time. The procedure is an undesirable one and should be limited to cases of extreme emergency.

4.19 The break-in procedure is different according to the nature of the material being transmitted on the line, which should be observed by monitoring before breaking. If TSCs or CDCs are being sent, the stations are in the select condition so that after the break, CDCs can be sent from tape or keyboard to call in the desired receiving station. If, however, message text is being sent, the stations are in the non-select condition and so cannot respond to CDCs. It is here necessary to send a disconnect signal to put all stations in the select condition. The disconnect signal, however, cancels the effect of the break and causes the transmitter start circuit to resume polling. Thus the break-in procedure has to be repeated before the emergency message is sent.

4.20 In case of doubt, or if the operator does not watch the copy to see what is going over the line, the double procedure, as if message text were being sent, can always be used.

4.21 One precaution is to be noted. After the disconnect signal is sent and the polling started, the station might be picked up quickly

on the first TSC. The operator should send the second break promptly before the lockout code from the tape puts the stations back into the nonselect condition.

4.22 The following description covers emergency operation from a station with a 19ASR set. Small differences in procedure when the station has an auxiliary 28RO printer are explained following that description.

4.23 For service in emergency conditions, keyboard or tape sending from a 19ASR set can be done by means of the following procedure: Operate the MR key to the MON position. The 15 printer will then show whether the circuit is sending transmitter start codes or message text.

(a) Operate the MS button. The SEND lamp will light and the audible signal will operate. Operate the AG key to the AGD position to silence the alarm.

(b) If the copy shows that transmitter start codes are being sent: operate the BREAK key on the 15 printer. The AL lamp will flash as long as the BREAK key is operated. When the BREAK key is released, the line closes, the AL lamp remains lit, the audible alarm operates, and the transmitter start circuit commences the 10-second time-out. During this interval keyboard or tape transmission can start, including the sending of CDCs, etc.

(1) For keyboard transmission: operate the AR button to put out the AL lamp, and operate the AG key to the AGD position to silence the alarm. The keyboard will continue to have control of the circuit provided a minimum of one character every 10 seconds is transmitted.

(2) For tape transmission after the tape is in the transmitter: operate the AR button to put out the AL lamp, operate the AG key to the AGD position to silence the alarm, and push the PR (priority) button to start the transmitter-distributor.

At the end of transmission, FIGS H LTRS should be sent either from the keyboard or from the tape. Polling is then resumed in the normal manner. The audible alarm reoperates and the SEND lamp goes out. The AG key is restored to the AGD position to silence the alarm and the AR button should be operated to put out the AL lamp.

(c) If the copy shows that message text is being sent: operate the BREAK key to stop the transmitter which is sending. Send FIGS H LTRS from the keyboard to clear the line. The transmitter start circuit will then resume polling. Proceed as in (a) and (b) above.

MANUAL CONTROL OF SENDING WHEN AUXILIARY RO PRINTER IS PROVIDED

4.24 If an auxiliary 28RO printer is provided at a station in addition to the 19ASR set, a slightly different procedure is required for manual control of the 15 keyboard. This is described below.

4.25 The basic reason for providing an auxiliary 28RO printer is so that the 15 printer may be used to make copy of the material being punched in the tape while the 28RO records line copy. The circuit is therefore arranged so that with the LINE TEST key of the 19 set in the TEST position, the keyboard and the 15 printer are in series in a local circuit. The transmitter-distributor is arranged as in a station without the 28RO, so that it is controlled by the station control circuit.

4.26 The keyboard can be connected for sending to the line by throwing the LINE TEST key to the LINE position. It is then made operative for use on the line by operation of the MS button (or the KS button if it is desired to wait for a normal poll). If the LINE TEST key is thrown to the LINE position before the MS button is pushed, the printer will run open as it is short-circuited by contacts on the transmitter start (TS) relay. As soon as the MS button is pushed, the printer runs closed and is ready to print whatever is on the line, including what is sent from the keyboard.

RECEIVING STATIONS

4.27 The receipt of its assigned CDC conditions the receiving printer to print; a V answerback is sent to indicate that the station is ready to receive copy. The V is printed on the copy of either the 15 or the 28 printer. The text of the message is then received. On the disconnect signal, printing stops and the station is ready to receive the next call.

Note: Where a 28 printer is used at a station, an optional set of parts is available to suppress the printing of all CDCs during selection. Printers so equipped will print only after receipt of the lockout code, CR LF LTRS.

SENDING STATIONS

4.28 At sending stations with 19ASR sets, the MR key allows three possible optional operations, as follows:

MR Key Position	Copy Printed
Middle	Home copy while sending, and incoming copy when station is selected.
RO	Incoming copy when station is selected.
MON	All line transmission (Monitor).

When a 28RO printer is used, it prints only when it is selected by its own CDC. It is not under the control of the MR key. However, the MR key must be turned to MON for the emergency break procedure.

B. Manual Tape Relay Stations

4.29 Any station may be used as a manual tape relay station for sending to stations on other lines. A typing reperforator, with or without an associated printer as desired, is arranged to be called in by a suitably assigned CDC. A V answerback is sent when the reperforator is connected. The message for off-line relay is then received on the tape.

4.30 CDCs for off-line stations should be non-valid for the line on which they originate. For this reason, different sets of CDCs should be used on lines interconnected by relay stations. In order to take full advantage of the answerback features of the original line, it is suggested that off-line codes be inserted at the beginning of the message following the lockout code and some LTRS characters for tearing. The off-line CDCs should then be followed by another lockout code. The first lockout code must be torn off at the relay station before the remaining tape is inserted in the transmitter of the next line to obtain proper operation on that line without premature lockout.

4.31 The transmitter at a manual tape relay point is included in the transmitter start polling, and is started in its proper turn by the transmitter start circuit.

C. KSR Stations

4.32 Manual keyboard stations normally have a 28KSR teletypewriter, equipped with a selective-calling stuntbox, so that a 28 sequence selector is not required.

4.33 When the attendant wishes to send, the KS button on the control panel is pushed, lighting the BID lamp. This is equivalent to placing tape in a transmitter at a tape sending station. When the station is polled the first time, providing the PR button has not been pushed, the station control circuit automatically transmits a V no-traffic response; and on the second polling a LTRS character will be returned, indicating to the transmitter start circuit that a message is going to be sent. If both the KS and PR buttons are operated initially, the station will return a LTRS character the first time it is polled. Also at the same time, the following actions take place:

(a) An audible signal is operated.

(b) The station SEND lamp is lighted. Both of these serve as indications to the attendant that transmission can start.

4.34 The attendant operates the AG key to the AGD position to silence the alarm and has a period of 10 seconds to start keyboard sending. Should the attendant fail to start sending within this period, the transmitter start circuit will time out, send FIGS H LTRS V and poll another station. Thus the attendant loses the turn to send.

4.35 For keyboard sending the format is modified to omit the LTRS character after the CDC on which answerback is required, for two reasons:

(1) To avoid garbled characters resulting from the simultaneous sending into the circuit of a V answerback and another character from the keyboard.

(2) To insure that the necessary V immediately precedes the lockout code, CR LF, so that the lockout mechanism will function properly.

4.36 Both of these reasons are a result of the fact that keyboard sending will often not be at line speed, combined with the fact that the timing of the system is designed for tape sending at line speed. With tape sending, the delay

in the sending of the answerback by a called station is just long enough so that the two-letter CDC, followed by the LTRS character, is transmitted without interference from the V. With keyboard sending, the operator cannot be sure of getting the LTRS character sent before the V is started, so that at least some of the time garbles are likely. To avoid this, the operator should wait, after sending the two letters of each CDC, until the V comes back, and omit the LTRS. The return of the V can be observed as it is printed on the copy.

4.37 In the case of the last CDC before the lockout code, the procedure above is necessary in order to insure that the sequence V CR LF is not interrupted by a LTRS character.

4.38 At the end of the message, the attendant sends the disconnect code, which reoperates the audible alarm, puts out the SEND lamp and lights the AL lamp. The AG key is then restored to the normal position to silence the alarm and the AL lamp is put out by the AR button.

D. Automatic Relay Stations

4.39 Any station may also function as an automatic tape relay station for the interchange of traffic between two or more lines. Figure 3 shows such a station in block schematic form. The equipment required for originating traffic is not shown. It is assumed that this will be a 19 ASR set.

4.40 A station control unit, key and lamp panel and two reperforator-transmitters (RT) are required for each connecting line, ie, lines 2 and 3 as shown in Figure 3. The stuntbox in the 28RO functions as a common control.

4.41 The RT (RECEIVE) on Figure 3 is arranged to be called in by a suitably assigned CDC. A V answerback is sent when the RT is connected. The message for the other line is then received on the tape. The transmitter portion of this RT will be started and the message sent when the assigned TSC for this transmitter is received, from TS control on line 2 or line 3.

4.42 The transmitter portion of the RT (TRANSMIT) on Figure 3 is included in the TSC pattern of line 1.

4.43 Codes assigned to stations on other lines will be nonvalid, as a general rule, for the line on which they were originated. Also, since a V answerback must immediately precede the lockout code, it is recommended that the following order of CDCs be used for interline traffic. Originating line CDCs, if required, RT (RECEIVE) CDC, other line CDCs, RT (RECEIVE) CDC followed by the lockout code, message text, and end-of-message code. The repetition of the RT (RECEIVE) CDC insures that a V answerback will immediately precede the lockout code. As an alternative, the CDC of the sending station might be used.

E. Methods of Varying Polling Rates to Control the Flow of Traffic

4.44 There are a number of ways provided with the 83B1 system by which the polling rates of stations may be varied to control the flow of traffic. These are:

(1) Use or nonuse of the priority feature.

(2) Use of two station lamps and skip keys for each station (polling pattern B for 10 stations, D for 20 stations).

(3) Combination of 1 and 2.

(4) Emergency break for highest priority.

USE OR NONUSE OF PRIORITY

4.45 The priority feature, described previously, gives each station the opportunity to determine the priority of each outgoing message. Where there is little or no demand for priority treatment, the line time occupied by the priority round of polling may not be justified. In this case the priority feature may be disabled and all traffic handled on a regular basis. For emergencies, recourse might be had to the emergency break.

PREFERENTIAL POLLING PATTERNS

4.46 The optional polling patterns described in 5. of this section make possible a considerable degree of flexibility in the handling of traffic from the various stations on a line, particularly if they are combined with the priority feature. The greater flexibility is offered by patterns B and D, each with two skip keys for each station polled. By the use of the skip keys to skip a station once, twice, or not at all, the operator at the control station can give extra chances to send to stations which need it.

4.47 If one or more stations are skipped once out of two possible polls in pattern B or D, their traffic is put on a deferred basis, ie, they will not be picked up until all of the traffic has been taken from the other stations. This is because the other stations will get two polls, and hence get started if they have tape to go, before any of the stations which are skipped once. However, the one-skip stations still retain their priority feature and so can send an important message ahead of the nonskipped stations. Thus the one-skip stations may be said to have the option of priority or deferred traffic, while the stations not skipped at all have the choice between priority and regular traffic.

4.48 If an interline switching point has more traffic than any other station, it might be the only one not skipped, while all the others would be skipped once. By suitable observation of the flow of traffic, the control office operator might regulate it from time to time during a business day to relieve overloads at any particular station, merely by changing the skip keys.

4.49 A possible arrangement which would give a large degree of flexibility would be one involving two separate sending stations in a single office. One of them might be skipped once in every two rounds of polling and the other not skipped at all. Thus one would be on a priority-regular basis and the other on a priority-deferred basis. The operator would choose between the two transmitters and use the priority buttons in accordance with the classification wanted.

F. Traffic Movement

4.50 Since the system operation is intended normally to be on a one-message per transmission basis, the movement of traffic is governed by several factors, chief of which are as follows:

(a) The number of stations on the circuit.

(b) The type of traffic, ie, average length of short messages, average length of long messages, etc.

(c) Per cent busy-hour load.

(d) The amount of priority traffic.

(e) The frequency with which any station TSC appears in one polling cycle.

(f) The number of keyboard sending stations on the circuit.

4.51 The approximate time required to poll and select stations at the various speeds is as follows:

	Time (in Seconds) per Station Poll	
Speed (WPM)	Poll and No-traffic Response	Poll and Start TD
60	0.73	0.47
75	0.58	0.40
100	0.45	0.32

Circuit propagation time is not included in these figures.

G. Use of V Preceding the Lockout Code for Protection Against Garbled First CDC Letters

4.52 As Figures 7 and 8 indicate, the sequential stuntbox mechanisms operating the lockout shift slide occupy three slots responding, respectively, to V, CR, and LF. Thus lockout does not take place unless a V answerback precedes the lockout code, CR LF, punched in the tape. This is to provide a degree of circuit assurance protection against the garbling of the first letter of a CDC.

4.53 For the following description of the operation, a single-address message is assumed with the first letter of the CDC changed to a letter nonvalid for the line, either by an operator error or by garbling in transmission. The nonvalid letter does not open the stuntbox contact to stop the transmitter so that the transmitter continues to send the material in the tape. When the lockout code is received, however, without the preceding V, the lockout mechanism does not operate. Transmission continues until there appears in the text either one of the two first CDC letters which are valid for the line. This operates the contact to open the transmitter start circuit (since the stuntbox machine is still in the select condition) and the transmitter stops. After 10 seconds, the circuit times out in the normal manner, polling resumes, and the sending station which was stopped is cut off, with its alarm lamp lighted. It cannot restart until an attendant releases the alarm.

4.54 In the case of a multiple-address message, the protection is only partial. If the first letter of a CDC (other than the last CDC before the lockout code) is garbled, the message will be lost so far as the station to be reached by the code which was garbled is concerned. It is necessary that the last CDC before the lockout code receive a V answerback for the circuit to perform without alarming. If the last CDC of a multiple-address string is garbled, the alarm will occur as described.

4.55 The operation described has to do only with the first letters of the CDCs. If the second letter is garbled so that an answerback is not received, the transmitter will already have been stopped by the first letter; it will not restart since there is no V answerback and the normal circuit time-out will give the alarm.

5. CHOICE OF TSCs AND CDCs

A. General

5.01 The circuits of this system have been designed to operate with two-letter combinations for transmitter start codes (TSCs) and call-directing codes (CDCs).

5.02 In the interest of economy and simplicity in control circuits, certain design limitations have been imposed on the choice of TSCs and CDCs. Although it would be technically possible to remove many of these limitations by rewiring the circuits, the expense of providing options for various possible wiring changes has been considered unjustified, in view of the estimated small demand for such changes. Should local conditions require different arrangements, the latest information should be obtained.

5.03 In general for selective calling, the letters T, O, M, and V are not recommended for TSCs or CDCs, particularly for the first letter. This is because, since each of these letters can be produced by a single properly timed open of the circuit, they might be produced falsely by hits on the line. In case of need, these letters could be used as the first letter of TSCs and CDCs with recognition of the possible hazards involved. However, while these characters are usually avoided for the first letter of a CDC, there appears to be no very compelling reason to avoid them for the second letter of a CDC, since the chance of error due to their use appears to be exceedingly small.

5.04 The use of V for no-traffic response and answerback is not felt to present a significant hazard. For a false V to upset the automatic operation of the circuit, it would have to occur within the limited periods when the circuit is in a condition to respond to it. In general, it would not cause any more trouble than any other circuit garble caused by a hit.

5.05 For example, if a false V no-traffic response should occur at exactly the right instant, the transmitter start circuit would resume polling at the same time that the outlying station transmitter started to send and the resultant garble would soon bring in an alarm requiring attention. In another possible situation, where a false V answerback indicated incorrectly that a station printer was arranged to print, there is a chance that a message might be sent "into the air." However, this would require a double fault, both failure of the station to condition itself to print when its CDC was sent and the return of the false V. The chances of these two false events occurring with an accuracy of timing such as to produce false operation would be extremely small.

5.06 The letter H is undesirable for a TSC or CDC since it is used in the disconnect code. The letter Y is arbitrarily omitted from use as a TSC.

5.07 As a result of the above, 20 letters are left available for coding purposes.

B. TSC Selection

5.08 With the present equipment, the first letter of all TSCs must be Q or X. These letters are generated by relay circuits. Both first and second letters are transmitted from the 28-type distributor, mounted on the base of the sequence selector or typing unit.

5.09 The use of Q and X with each of the 20 second letters, would result in 40 TSCs, since double-letter codes such as QQ and XX, can be used. However, with answerback operation, the first letter of a CDC cannot be used in the TSCs on the same circuit. Since there are two first CDC letters on a circuit, this reduces the possible number of TSC combinations by four, to a total of 36.

5.10 The reason why the first letter of a CDC cannot be used in a TSC is that when it is sent it opens the transmitter contacts in the

start-magnet circuits of all of the transmitters on the line. These contacts stay open until a V is received. If under such conditions a called transmitter had tape in it ready to start, no V would be sent and the circuit would be locked up until the end of the 10-second time-out, when it would be unlocked by the FIGS H LTRS V sent by the transmitter start circuit.

5.11 It would be possible to obtain the full capacity of 40 by using two of the letters T, O, or M as second TSC code letters in lieu of the two first letters selected for the CDCs. However, a maximum TSC capacity of 36 is expected to be sufficient for all but the rarest cases.

5.12 The second letters of the TSCs are generated by means of the stepping selector.

5.13 A TSC is not required for an RO station.

5.14 The following polling patterns can be obtained:

TABLE A

Polling Pattern	Maximum No. of Stations	Skip Keys and Station Lamps/ Station	No. of Pollings/ Rev of Selector
A	10	1	4
B (1)	10	2	4
C (2)	20	1	2
D (1, 2)	20	2	2
E (2)	40	1	1

(1) The use of two skip keys for each station allows greater flexibility in arranging the polling cycle.

(2) Because of conflict with the CDCs, only 18 of the possible 20 stations of patterns C and D, and only 36 of the possible 40 stations of pattern E, can normally be assigned. By using the letter Y as one of the first letters of the CDCs, the number of usable TSCs can be increased to 20 of 20 in patterns C and D and to 38 of 40 in pattern E.

5.15 The two first letters of the TSCs (Q and X) are generated by a relay circuit. The following table shows the second letter assignment as determined by the strapping of the stepping selector.

TABLE B

ARRANGEMENT OF SKIP KEYS, AND STATION LAMPS IN CONTROL PANELS FOR TRANSMITTER START

Key and Lamp Position No. *	Second TSC Letter	
	Polling Patterns A and B	Polling Patterns C, D, and E
1, 21	A	A
2, 22	C	C
3, 23	E	E
4, 24	I	I
5, 25	L	L
6, 26	N	N
7, 27	P	P
8, 28	R	R
9, 29	S	S
10, 30	Z	Z
11, 31	A	W
12, 32	C	K
13, 33	E	D
14, 34	I	U
15, 35	L	G
16, 36	N	X
17, 37	P	Q
18, 38	R	J
19, 39	S	F
20, 40	Z	B

*These positions are in two key and lamp panels. Positions 1-20 are in one panel. If required, positions 21-40 are in a second optional panel.

C. CDC Selection

5.16 On a particular circuit, all CDCs must have as a first letter one of two letters. The pairs can differ on different circuits. The following rules should be used in selecting CDC first letters:

(a) Select for the CDC first letters, letters which are not used for the TSC second letters.

(b) If, for example, on a 10-station line, the TSC second letters are in the sequence A-Z, choose the CDC first letters from those in the sequence W-B. (This pattern may be seen by referring to Table B.)

5.17 Q and X cannot be used as first letters of CDCs because of their use as first letters of TSCs. However, Q and X can be used as second letters for either TSCs or CDCs.

5.18 Although the letter Y is not used in TSCs, it is still available for use as a CDC first letter.

5.19 As stated previously, separate codes are required for stations on different circuits if there is traffic interchange between circuits.

5.20 Any CDC can be assigned for other than an individual station CDC; for example, for group or broadcast codes.

6. LAMPS, KEYS, AND ALARMS

A. Summary

6.01 Table C summarizes the functions of the keys, buttons, and lamps associated with the normal operation and alarm conditions of the 83B1 system.

TABLE C

Equipment	Key Position	Function
VS Key (V TEST & Stop)	VS	Activates stepping switch which transmits the TSCs.
	SP (Stop polling)	Stops the stepping switch after the next disconnect.
	V TST (V test)	Stops the stepping switch on the next round of polling at the station position from which no V response had been received on the previous poll.
ALT Lamp (Alarm Trans Start)		Lights momentarily as polling is resumed, after 2-second or 10-second time-out period, until next TSC has been sent. Remains permanently lit with VS key on V TST for a station not sending a V no-traffic response on the next polling.

TABLE C (Cont)

Equipment	Key Position	Function
ACO Lamp (Alarm cut-off		Lights when AG (alarm guard) key is turned to ACO position.
STA SK Key (Station Skip)	White line horizontal	Station TSC is sent out.
	White line vertical	Station TSC is not sent out.
STA Lamp (Station)		Lights during transmission of station TSC and remains lighted while that station is sending and until the next station is polled.
MR Key (Monitor and Receive 19ASR only)	MR	Typing unit receives incoming and outgoing messages.
	RO (Receive only)	Typing unit receives incoming messages only.
	MON (Monitor)	Typing unit receives all line transmission (even if not selected by CDC).
BID Lamp (Bid to Send)		Lights at tape sending station when tape is placed in TD and stop-arm is lowered. Lights at KSR station when KS button is pushed. (See below.)
KS Button (Keyboard Send)		Conditions the station for keyboard sending after receipt of TSC. When operated, lights the BID lamp.
SEND Lamp		Lights at tape sending stations during transmission. Lights at KSR station, which has bid for circuit, on receipt of TSC.

TABLE C (Cont)

Equipment	Key Position	Function
PR Button (Priority)		Operated for priority traffic.
PR Lamp (Priority)		Lights when PR button is pushed. Goes out when SEND lamp lights.
MS Button (Manual Send)		Operated to condition the station for local control of TD or keyboard sending. With MR key in MON position, SEND lamp lights when MS button is operated. Used for service or emergency operation when it is undesirable to wait until station is polled.
AG Key (Alarm Guard)	AG	Audible signal sounded under circuit alarm conditions.
	AGD (Alarm guard)	Silences audible signal until transmitter start circuit restores circuit. Sounds alarm when circuit is restored.
	ACO (Alarm cut-off)	Silences audible signal by opening circuit.
AL Lamp (Alarm)		Lights under circuit alarm conditions
AR Button (Alarm Release)		Operated to put out the AL lamp and remove the alarm condition at the station.

B. Alarm Conditions Associated with the Transmitter Start Circuit

6.02 If after a TSC has been sent out, neither a V no-traffic response nor the start of a message appears on the circuit, there is a time-out period of 2 seconds, followed by a momentary alarm at the control station and the resumption of polling with the next TSC.

6.03 The alarm is silenced by the next V no-traffic response or by the start of a message. Thus a short alarm, repeated every time a particular transmitter is polled, indicates trouble at that station. For positive identification, the VS key may be turned to the V TST (V test) position; then the polling will stop the next time around at the position of the station in trouble. The SKIP key for that station may then be turned to SKIP, and polling of the rest of the stations will go on without further interruption or alarm.

6.04 If a transmitter fails to send the disconnect signal at the end of a message, or if a KSR station attendant fails to start sending within 10 seconds after her turn comes, or if any station pauses 10 seconds during transmission, the transmitter start circuit will time out, send FIGS H LTRS V automatically, and resume polling. At the same time an audible alarm will sound, which will be silenced on the next V response or message transmission. Also the ALT lamp will light briefly. For these particular causes of time-out, the letter V does not perform a function.

6.05 If a circuit tie-up occurs because a receiving station being called fails to send a V answerback, the transmitter start magnet circuits at all stations, including the station sending the tape, will be held open by the action of the stuntbox contacts. The release of this condition and restoration of the operating cycle of the circuit requires the reception of the letter V, which recloses the stuntbox contacts in the start-magnet circuits. For this reason V is included in the time-out code at the end of the 10-second time-out.

6.06 The characters FIGS, H, LTRS, and V are located on steps 1, 2, 3, and 4, respectively, of the stepping selector of the transmitter start equipment. The selector is arranged to step around from the step on which the alarm condition occurred back to step 1 without sending the TSCs for the intermediate steps. After such a time-out cycle, polling always resumes at the station whose TSC is on step 6.

6.07 An open-line condition during a polling cycle will stop the polling. Polling will resume after the line has been closed for 10 seconds. No special alarm is provided for this condition of circuit failure but a momentary alarm will sound as described in 6.04. Line failures of short duration may not be noticed;

failures of long duration will be detected by the control station because, since polling has stopped, a station lamp will light steadily and longer than the average message time. Also a circuit failure of long duration will be detected at a keyboard sending station, or stations equipped with 28RO teletypewriters, where the machine will run open. Line failures during message transmission are alarmed, as described later in 6.09.

C. Alarm Conditions Associated with a Sending Station

6.08 If a V answerback is not received after a CDC, the transmitter will not restart. After 10 seconds the transmitter start circuit will time out and transmit FIGS H LTRS V, which will put out the SEND lamp and prevent any further sending from the station. The turn to send will have been lost. The alarm lamp (AL) will light and the buzzer will sound. The attendant should then reset the tape so that the CDCs will be resent on the next cycle. The transmitter will not start again until the attendant releases the alarm by pushing the Alarm Release (AR) button.

6.09 The AL lamp will flash during an open-line condition. When the line closes, if the AR button is pushed within 10 seconds, the transmitter will start again and the alarm will be silenced. If the AR button is not pushed within 10 seconds, the transmitter start circuit will time out and send FIGS H LTRS V.

6.10 The attendant should then reset the tape. The transmitter will not start again until the AR button is pushed to release the alarm.

6.11 If, while sending, the tight-tape arm rises or the tape is torn so that the sixth pin rises, the BID lamp will go out, the audible alarm will sound, and the transmitter will stop. The AL lamp will not light at this time. If the condition is rectified within 10 seconds and the PR button is pushed (causing the BID lamp to light), the audible alarm will stop and sending will be resumed. If the condition is not rectified within the 10-second period, the transmitter start circuit will time out and send FIGS H LTRS V; the local AL lamp will light, the SEND lamp will go out and the audible alarm will stop. The incorrect tape condition should be rectified and the AR button pushed to put out the AL lamp. Transmission will then take place on the next station poll.

7. DIFFERENCES IN DISCONNECT OPERATION

7.01 In the 83A1 and 83B1 selective-calling systems, FIGS H LTRS is specified uniformly for the disconnect code. So far as stuntbox operations are concerned, however, there are three different kinds, as follows:

(a) In the 83A1 system (AN stuntbox) the disconnect mechanism (the latch release bail) is operated by two pairs of sequential function lever mechanisms responding to the two characters FIGS and H. The LTRS character, important for timing and other reasons as described in the section covering the description and operating principles of the 28 stuntbox, is required but does not operate the latch release bail.

(b) In the design of the 83B1 system, the LTRS character was used for the operation of the latch release bail. As a result the stuntbox for the 28H typing unit used with the 83B1 system has pairs of function lever mechanisms which operate on the two characters UC H and LTRS.

(c) For the 28A sequence selector a further modification was necessary for the reason that its stuntbox does not distinguish between upper and lower case characters. To prevent a false disconnect on H LTRS, the disconnect mechanism is driven by two sets of three function lever mechanisms, each sequentially operated by FIGS H LTRS.

8. EQUIPMENT ARRANGEMENTS

A. Station Assembly

8.01 Block diagrams of typical station arrangements are shown in Figures 1, 2, and 3. The solid lines interconnecting the unit components at a station represent cabling with plug and socket connections. The dotted lines interconnecting the unit components represent connections to optional equipment. A typical control station arrangement equipped for push-button calling is shown in Figure 4.

8.02 At a control station a metal apparatus cabinet is used to mount all equipment, other than the standard teletypewriter equipment. The following table lists the cabinet requirements for the various control station assemblies:

TABLE D

Control Station Major Assembly Items	Apparatus Cabinet (Feet)	Station Control Unit Mounting Plate (Inches)
19ASR, 28SS, PB	4	23
19ASR, 28RO, PB	4	23
19ASR, 28SS	4	23
19ASR, 28RO	3	23

Note: PB means pushbutton station selector equipment.

8.03 The apparatus cabinet can be located in the operating room or in an adjacent room.

8.04 At an outlying station the station control unit is mounted on either a 23-inch or a 19-inch mounting plate. The 19-inch mounting plate is used when the station control unit and associated rectifiers are mounted in the 28-type cabinet which houses the teletypewriter apparatus. The following table lists the cabinet requirements for the various outlying station assemblies:

TABLE E

Outlying Station Major Assembly Items	Apparatus Cabinet (Feet)	Station Control Unit Mounting Plate (Inches)
19ASR, 28SS, PB	4	23
19ASR, 28RO, PB	3	23
19ASR, 28SS	3	23
28KSR, PB	3	23
Automatic Relay Station 28RO with 1 or 2 Station Control Units	2	23
Tape Relay Station:		
With 28SS	3	23
With 28RO	2	23
19ASR, 28RO	28B Cabinet	19
28KSR	28B Cabinet	19
15M Perforator, 14TD 28RO or 28KSR	28B Cabinet	19

B. Station Control Circuit

8.05 Two equipment arrangements are provided for the station control circuit:

(a) One arrangement occupies two 2-inch mounting spaces on a 23-inch relay rack. The circuit consists of two AF-type relays, one 280-type relay, two 293D relays (using all relay units), one 255A relay, B and C connectors and associated resistors, capacitors, etc. This arrangement provides inverse neutral operation from the 255A relay for auxiliary equipment (ROTR, etc) and answerback on all individual CDCs. The required 120-volt rectifier occupies two 2-inch mounting spaces.

(b) The other arrangement occupies three 2-inch mounting spaces on a 19-inch relay rack. The circuit consists of the same equipment as above with the omission of the 255A relay, two relay units (SC and RC) of one 293D relay, and the B and C connectors. This arrangement provides no means of connecting an auxiliary unit, such as an ROTR. Also, it cannot be used when pushbutton station selection or transmitter start is required. This arrangement can be located in a 28B cabinet together with the teletypewriter equipment, and an additional apparatus cabinet is not required. The 120-volt rectifier, if required, occupies two 2-inch mounting spaces.

C. Transmitter Start Circuit

8.06 The transmitter start circuit consists of thirteen AF-, AG-,or AJ-type relays, one 276J relay, one electron tube, one 8-bank 50-step stepping switch (selector), and associated resistors, capacitors, etc. This equipment occupies three 2-inch mounting spaces on a 23-inch relay rack. The required 48-volt rectifier occupies eight 2-inch mounting spaces.

D. Key and Lamp Cabinets

8.07 Figure 5 shows the station key and lamp cabinet which mounts on the teletypewriter table or on the 28-type cabinet. This cabinet forms a part of all outlying stations not requiring the pushbutton calling feature, and provides common controls and alarms.

8.08 Figure 6 illustrates a 2-module metal cabinet housing the transmitter start and pushbutton calling facilities, for the first 20 stations, at a control station. The cabinet is arranged to mount on the side of the 19 set table

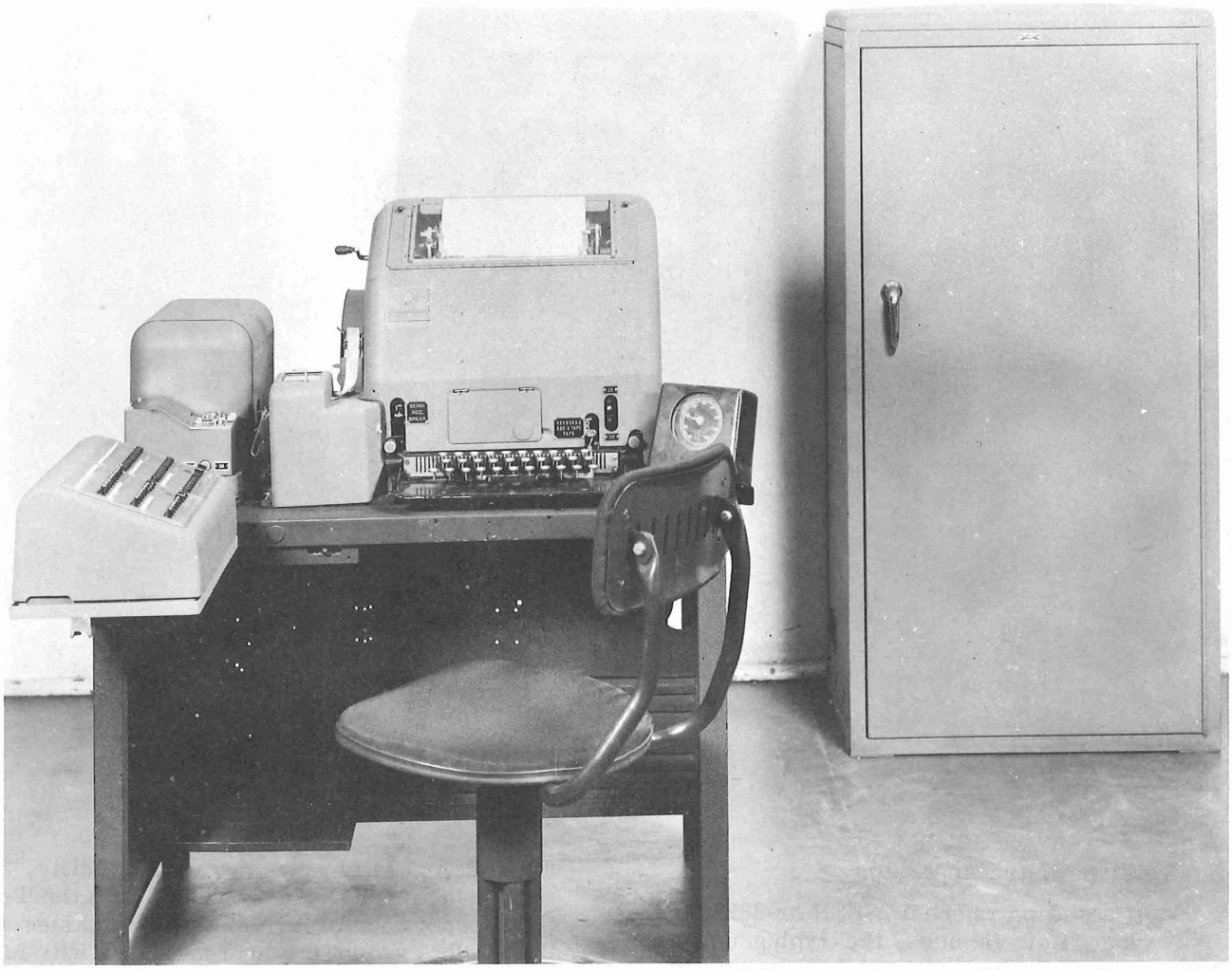

Figure 4 — Typical Control Station Equipped for Pushbutton Calling

or the 28KSR cabinet. Variations of these facilities are outlined below:

(a) The left-hand panel contains the transmitter start skip keys and lamps for the first 20 stations. If used without pushbuttons this panel would also contain the common control keys and lamps but, when used with pushbutton calling, the common control keys and lamps are mounted on the pushbutton calling panel. When transmitter start controls for more than 20 stations, up to a total of 40 stations, are required, the additional controls would be located on the right-hand panel of a 2-module cabinet similar to that shown in Figure 6.

(b) The right-hand panel in Figure 6 contains the pushbuttons and lamps for the pushbutton calling facilities up to a total of 20 stations, and also includes the common control keys and lamps. When facilities for more than 20 stations, up to a total of 40 stations, are required, the additional keys and lamps would be installed on another panel and the entire equipment housed in a 2-module cabinet similar to that shown in Figure 6. The two 2-module cabinets would be located on a furniture-type table furnished locally.

Figure 5 — Station Key and Lamp Cabinet

E. Teletypewriter Apparatus

8.09 At a station where a 28KSR or 28RO teletypewriter is used, the typing unit is a 28H. Figure 7 shows the slot and contact arrangement for the AED stuntbox used in a 28H typing unit. The TP153913 set of parts is available for use on this typing unit to suppress the printing of all CDCs during selection.

8.10 Figure 8 shows the slot and contact arrangement for the ADA stuntbox used in a 28A sequence selector.

USE OF UNIVERSAL FUNCTION BARS IN STUNTBOXES

8.11 Figures 7 and 8 show the letter assignments of a number of function bars in the slots which are required to respond to selective-calling control codes, TSCs or CDCs. The early models of the sequence selector and 28H typing unit were shipped with the bars here indicated. Before the machines are put into service, it is necessary to substitute the particular letter-coded bars required for the lines

8.12 For greater economy and flexibility, arrangements have been made with the Teletype Corporation to furnish these machines with these slots vacant (or in some cases with function bars needed for factory tests). With each machine is furnished a supply of the universal function bars (TP153440) which can be coded for any desired character by breaking off various tines, to fill the required slots. The slots involved are as follows:

Sequence Selector:	Slots 18, 19, 20, 21, 24, 25, 32, and 34
28H Typing Unit:	Slots 6, 7, 8, 9, 18, 19, 20, 21, 24, 25, 32, and 34

Note: This change will be made in factory production on all 28H typing units beginning with serial No. 51803 and on all 28A sequence selectors beginning with serial No. 376.

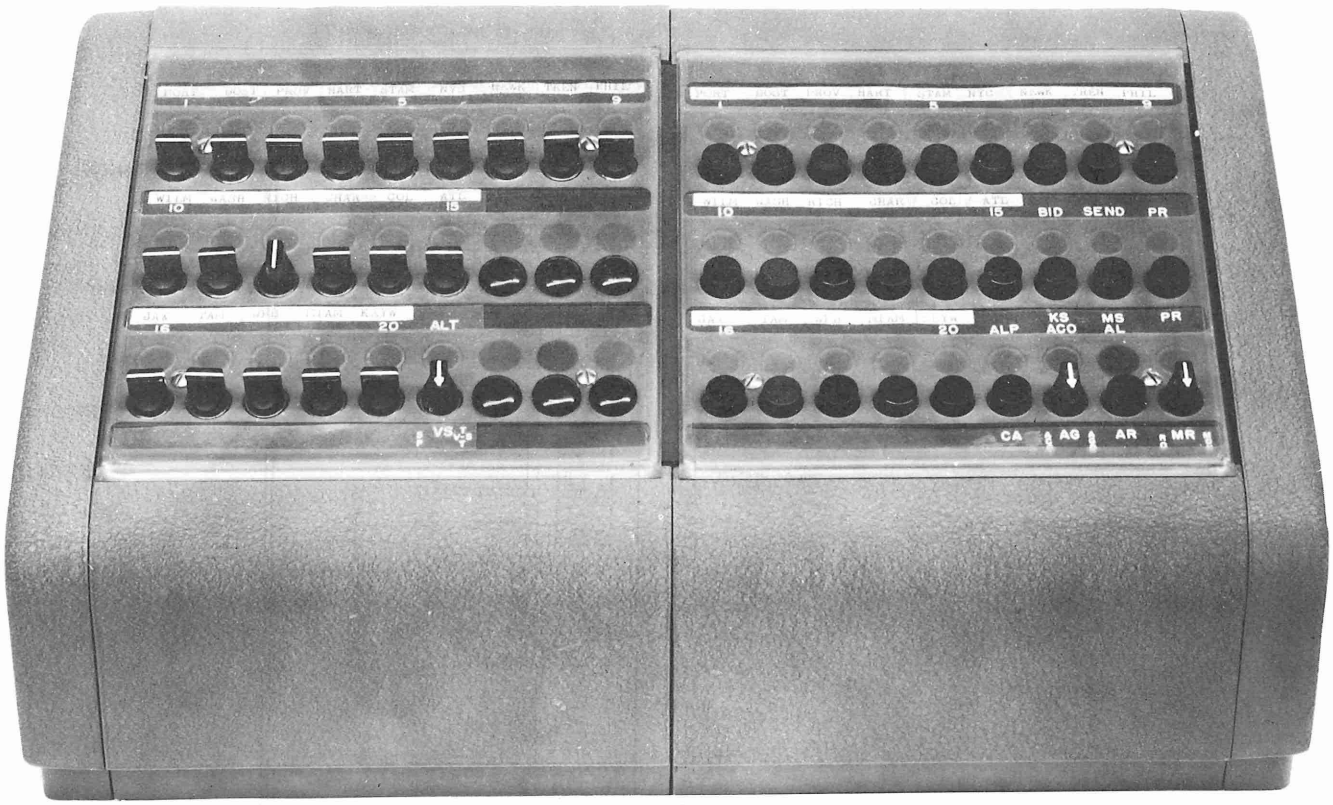

Figure 6 — Typical Two-module Key and Lamp Cabinet for Control Station Equipped for Pushbutton Calling

8.13 At a control station, a 28-type distributor is used to send the TSCs generated by the transmitter start circuit. This distributor is mounted on the base of the sequence selector or typing unit. It is a cam-operated distributor wired so that its five code-element contacts are coded for the desired characters in succession from the relay circuit and stepping selector of the transmitter start circuit. When a pushbutton circuit is added, the same distributor is switched, as required, to send the CDCs set up by the pushbuttons.

9. POWER SERVICES

9.01 It is assumed that the power required for an 83B1 station will be provided by the customer. What is required is one or more fused outlets of 120-volt, 60-cycle ac power from the ordinary light and power supply. The numbers of outlets required for stations will vary with the different combinations of equipment. Table F, Fusing for Power Services, indicates the recommended fusetron for the various separate services.

9.02 No arrangements are shown for switching the power supply at the stations. It is assumed that these will be engineered locally and provided as required, presumably by the customer. Use might be made of a wall-mounted switch controlling the entire station. For some cases a time clock might be provided by the customer in the way usual for station equipment.

9.03 It should especially be noted that a station must not be turned off by opening the toggle switch associated with the 15 printer on the 19 set. Under these conditions, while the printer cannot operate and receive incoming messages, the control portion of the station is still active. Therefore, on receipt of its assigned CDC the station would answer back indicating falsely that it was ready to receive a message. Under these conditions the message would go into the air.

9.04 If a station is to be turned off for changing ribbons or paper, or for maintenance work, the entire station should be turned off to prevent the loss of messages.

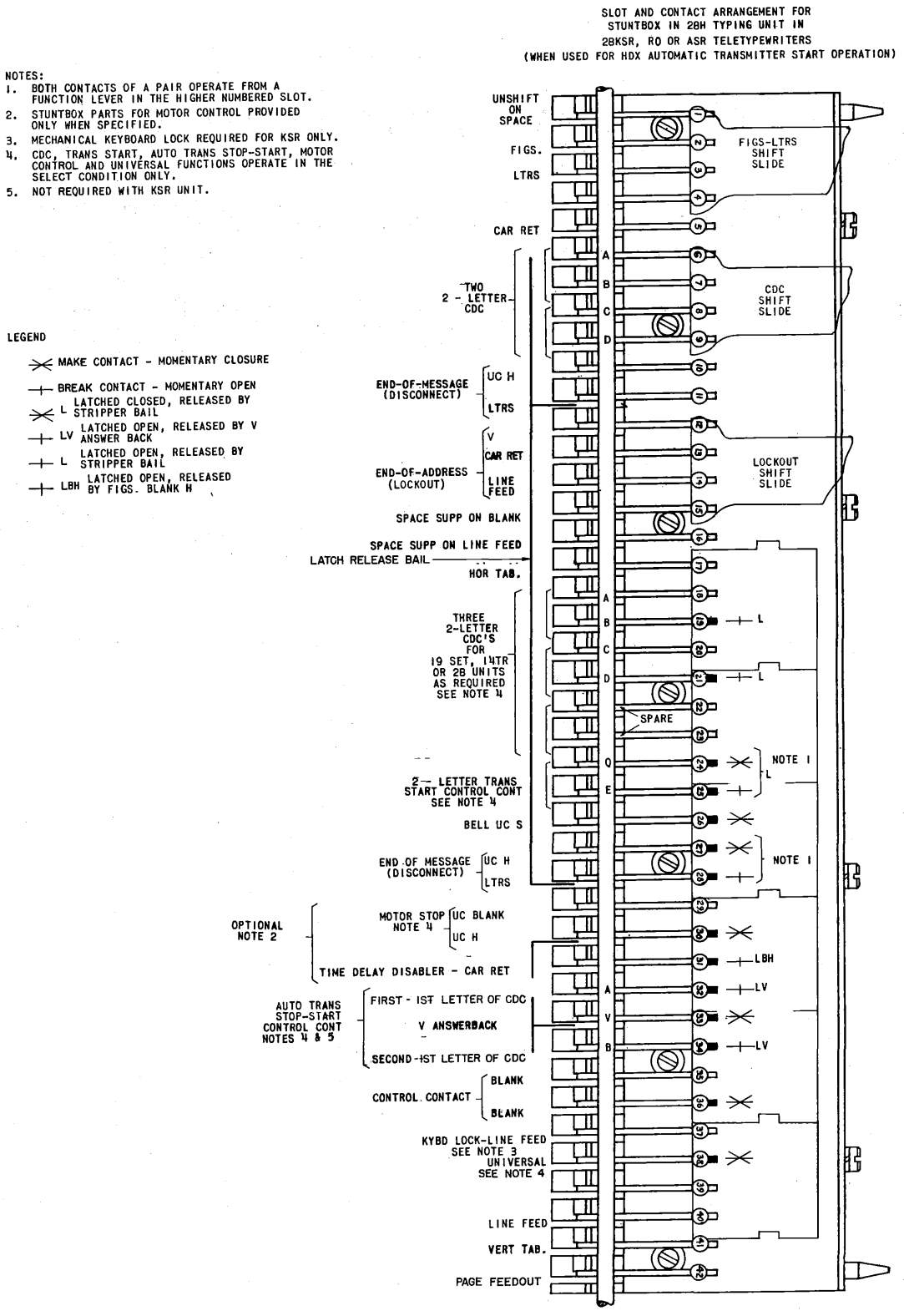

Figure 7 – Slot and Contact Arrangement
Stuntbox in 28H Typing Unit

SLOT AND CONTACT ARRANGEMENT FOR
STUNTBOX IN 28A SEQUENCE SELECTOR FOR SELECTIVE CALLING
(WITH HDX AUTOMATIC TRANSMITTER START OPERATION)

NOTES:

1. BOTH CONTACTS OF A PAIR OPERATE FROM A FUNCTION LEVER IN THE HIGHER NUMBERED SLOT.
2. CDC, TRANS-START, AUTO TRANS STOP-START, AND UNIVERSAL FUNCTIONS OPERATE IN THE SELECT CONDITION ONLY.

LEGEND

- MAKE CONTACT - MOMENTARY CLOSURE
- BREAK CONTACT - MOMENTARY OPEN
- L LATCHED CLOSED, RELEASED BY STRIPPER BAIL
- LV LATCHED OPEN, RELEASED BY V ANSWERBACK
- L LATCHED OPEN, RELEASED BY STRIPPER BAIL

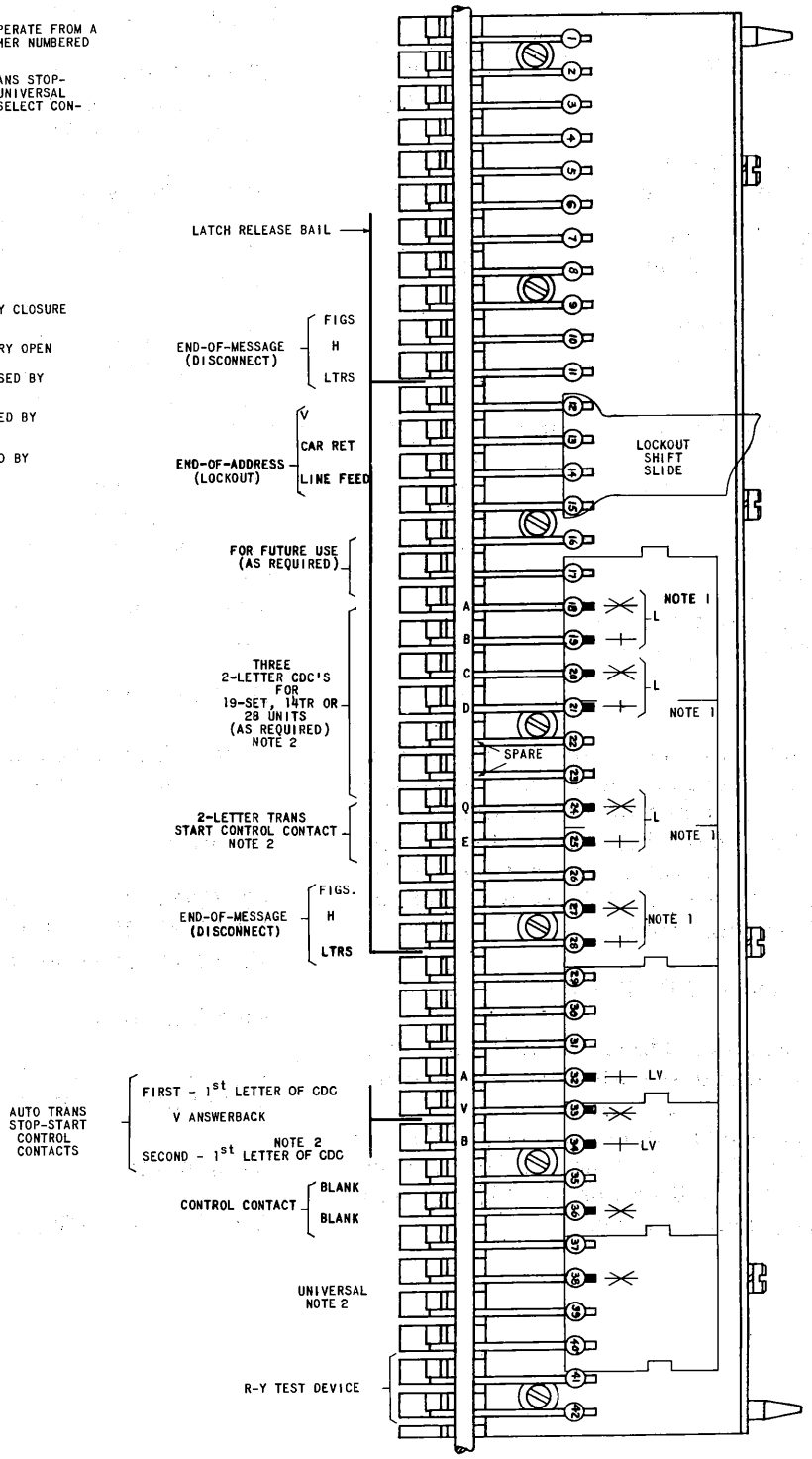

Figure 8 — Slot and Contact Arrangement
Stuntbox in 28A Sequence Selector

TABLE F

FUSING FOR POWER SERVICES

(See Note)

Power Supply For	Recommended Fusetron (ampere rating)
1. 83B1 Control Cabinet with Sequence Selector	
(a) At Control Station	15
(b) At Outlying Station	15
2. 83B1 Control Cabinet without Sequence Selector	
(a) At Control Station	5
(b) At Outlying Station	(See 28RO TTY)
3. 19ASR Set— All Stations	15
4. 28 Teletypewriter (RO or KSR)	
RO (including station control at outlying station)	15
KSR	15

Note: For information on the fusing of local branches of circuits, refer to the section covering the description of Fusetrons for teletypewriter apparatus. The fusing arrangements for rectifiers are covered in the sections dealing with rectifiers for teletypewriter station apparatus.

10. MAINTENANCE FEATURES

10.01 This part describes maintenance features associated with the 83B1 system.

10.02 The component units are assembled on a package basis, joined by connector-ended cables. Any unit can be quickly changed, thus simplifying maintenance.

10.03 63C1 loop switchboards are shown as an option on the drawings. Their use will simplify and facilitate maintenance. For example, with these switchboards, the 19 sets can be put in a local test condition.

10.04 The stuntbox and its associated cabling and connector are easily removed from the sequence selector or 28 typing unit.

10.05 The sequence selector has an R-Y test mechanism to test orientation limits or for error detection on the R-Y, R-R, and Y-Y sequences.

10.06 A test unit will be made available for testing and adjusting the selective-calling stuntbox in the sequence selector or typing unit.

10.07 No special testing features will be provided for the transmitter start circuit. The electron tube can be checked in the usual manner. Should the 276J relay test defective, it should be discarded and replaced with a new one.

11. LIST OF DRAWINGS

11.01 This lists the drawings, etc, pertinent to this system.

Circuits:

SD-70831-01 — Transmitter Start Circuit
SD-70832-01 — Station Control Circuit
SD-70835-01 — Pushbutton Calling Circuit

Specifications:

J70125 } — 83B1 Selective-calling System — HDX
AA286.040 }

Equipment:

ED-71176-01 — Station Equipment Arrangements