

83B1 AND 83B2 TELETYPEWRITER SELECTIVE CALLING SYSTEMS

OPERATING TESTS

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INTERCEPT CIRCUIT — FOR 83B2 SYSTEM ONLY	8	1.01 This section gives the operating test pro- cedures for the stations of the 83B1 and the 83B2 teletypewriter selective calling sys- tems. These tests are intended to insure the proper operation of the system and are applicable to the following situations:	
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REPERFORATOR-TRANSMITTER (RT) CONTROL CIRCUIT — FOR 83B2 SYSTEM ONLY	9	(c) To a limited extent, the individual stations. (A section issued by the Long Lines De- partment covers the test center procedures applicable in this case. In these procedures, the test center simulates the system equipment by sending the control codes from a teletype- writer keyboard.)	
E. Nonvalid RT Cuton Code	9	1.02 This section is reissued to add the oper- ating test procedures for the 83B2 system, to revise the information for the 83B1 system, to change the title, and to make other minor changes to bring the section generally up to date.	
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Since this is a general revision, the arrows ordinarily used to indicate changes have been omitted.

1.03 The teletypewriter apparatus required for the 83B1 and 83B2 system test procedures are as follows:

- (a) In the 83B1 system, the teletypewriter sending and receiving apparatus at the station, either control or outlying, consists of a 19 automatic sending and receiving (ASR) set. However, some 83B1 lines have 28-type equipment.
- (b) In the 83B2 system, the teletypewriter receiving and sending apparatus consists of the 28-type equipment only.
- (c) On either the 83B1 or 83B2 lines, some stations may be equipped with an auxiliary 28 receiving only (RO) teletypewriter (this permits the typing unit of the 28 ASR to make copy while the tape is being perforated). The RO machine will be connected to the line at all times and will contain the selective-calling stuntbox. The stuntbox determines mechanically whether the receiving unit will be in a printing or nonprinting condition. The electrical control of printing from the station-control circuit, as used with the 19 ASR set, is not applicable here. The RO machine is only put into the print condition when its assigned CDC is received, and it is not subject to control (as in the 83B1 system) by the MR key.

Note: The intercept circuit, the reperforator-transmitter control circuit, and the power distribution circuit are unique to the 83B2 system. The tests and features of these circuits are not applicable to the 83B1 system.

1.04 At manual sending stations, equipped with a 28 keyboard sending and receiving (KSR) teletypewriter, some differences in test procedures are required. These differences are pointed out in this section.

1.05 Where reference is made in the section to the patching of various parts of the station circuit, it is assumed that the station is provided with 63C1 switchboards, as indicated on the system drawings. These switchboards are optional. If they are not provided, the patching called for cannot be done.

2. TELETYPEWRITER APPARATUS

2.01 The component teletypewriter apparatus should have been adjusted, lubricated, and tested in accordance with applicable Bell System Practices.

2.02 Particular care should be taken to assure that the start or clutch magnets of the transmitter-distributors have been properly adjusted, as the accurate release timing of these magnets is important in the operation of the station control circuit.

3. CIRCUIT OPERATION TESTS

Note: Unless specified herein, the circuit operation tests apply to both the 83B1 and the 83B2 systems.

TRANSMITTER-START CIRCUIT

Note: The following schedule of tests assumes that there is at least one outlying station on the circuit with the control station.

3.01 Set the 48-volt rectifier so that the voltage is -48 volts under no-load conditions.

3.02 Operate the SK (skip) key of all unassigned or inoperative stations to the skip (white line vertical) position, and make sure that no station has tape ready to start. Operate the VS (V test and stop) key to the normal VS position. The circuit should now start polling and continue to poll, lighting each STA (station) lamp in turn.

3.03 Return one of the SK keys of an unassigned station to the normal (white line horizontal) position. If there are no unassigned stations, make one of the stations inoperative by turning off its power. When this station is polled, the transmitter-start circuit should wait for a period of 2.0 seconds to 3.9 seconds before alarming, and then continue to poll. The alarm should be released when the V answer-back from the next assigned station is received.

3.04 Operate the VS key to the VTST position. When the unassigned or inoperative station is again polled, the alarm should sound and the station in trouble be identifiable, since polling will stop, and its STA lamp will remain lighted. Return this SK key to the skip (vertical) position and restore the VS key to the normal VS position, and polling should resume as before.

3.05 Arrange to have a tape with normal format inserted in the transmitter-distributor of one of the assigned stations. The normal format would be the 2-letter CDCs (for the operative stations only) each followed by LTRS, the lock-out code CR LF LTRS, the text, and FIGS H LTRS (the disconnect code), for example:

LTRS ... LTRS AD LTRS AE LTRS BE LTRS
BR LTRS CR LF LTRS (MESSAGE TEXT)
FIGS H LTRS

When this station starts sending, the transmitter-start circuit should cease polling and wait until FIGS H LTRS is received at the end of the message. The polling should then resume. The STA lamp (at the control station) associated with the transmitting station should remain lighted during transmission.

3.06 Arrange to have a tape without a disconnect code inserted in the transmitter-distributor of one of the assigned stations. When this tape runs out, the transmitter stops and the line goes idle, the transmitter-start circuit should wait for a period of 9.5 seconds to 15.3 seconds and then sound the buzzer, light the ALT (alarm transmitter start) lamp, and send FIGS H LTRS (see note). Polling should then continue, starting with the first station on the line. The alarm buzzer should stop and the ALT lamp should go out on the first V no-traffic response or start of transmission.

Note: When the transmitter-start circuit times out, it sends the following codes:

83B1 system — FIGS H LTRS V

83B2 system — FIGS H LTRS LTRS

3.07 While polling, send a break on the line by inserting a 165-type dummy plug in the loop switchboard. If no loop switchboard is available, the break may be sent as follows:

(a) 83B1 System: Turn the MR (monitor and receive) key to the MON (monitor) position, operate the MS (manual send) key, and then operate the SEND-RECEIVE-BREAK key of the 15 printer to the BREAK position.

(b) 83B2 System:

(1) For a 28 KSR, operate the MR key to the MON position, operate the PR and MS keys, send M from the keyboard, and then operate the BREAK key on the keyboard of the 28 printer.

(2) For a 28 ASR, operate the PR and MS keys, send M from the keyboard, and then operate the BREAK key on the keyboard of the 28 printer.

In either case the station should alarm as in 3.22. The transmitter-start circuit should recognize the break as a traffic condition and stop polling. When the line goes closed and idle, the transmitter-start circuit should time out, alarm, send FIGS H LTRS, and then resume polling as in 3.06.

3.08 Turn the VS key to the SP position. The transmitter-start circuit should immediately stop polling.

Note: When checking the alarm timings, both the -48 volt rectifier and the +120 volt rectifier should be set at their rated voltages.

STATION CONTROL CIRCUIT AT A CONTROL OR OUTLYING STATION

Note: The test procedure below assumes that a control station is present on the circuit. However, at several points in the procedure, it is indicated that the control codes, which would automatically be sent from the control station, could be sent from a keyboard.

3.09 Set the +120 volt rectifier so that the output is +120 volts under no-load conditions.

3.10 Arrange to poll the station under test either by having its (TSC) sent by the transmitter-start circuit or by sending the TSC from any keyboard on the line. When there is no tape in its transmitter-distributor, the station should respond to its TSC by sending a V no-traffic response. This can be observed on the 15 printer (for the 28 typing unit, see 6., B) by turning the MR key to the MON position. Send the TSC a second time if the priority feature is provided at the station under test; the station should again respond with a V no-traffic response.

A. Operation of the Station Transmitter

3.11 Insert a tape containing the normal format specified in 3.05 in the transmitter-distributor of the station under test. In the 19 ASR, the BID lamp should light when the stoparm is lowered. In the 28 ASR, the BID lamp should light when the start stoplever is in the RUN position, the SEND key of the keyboard is depressed, the tape is in the tape gate, and the tape keyboard-control knob is in the KT or T position.

(a) Nonpriority Message: Arrange to have the station polled as in 3.10. The station should respond with a V the first time it is polled; and when it is polled for the second time, the transmitter-distributor should start and the SEND lamp should light. The transmission of the V signals and the message sent by the transmitter-distributor can be observed on the 15 printer (for the 28 typing unit, see 6., B) by turning the MR key to the MON position.

(b) Priority Message: Push the PR (priority) button and note that the PR lamp lights. Arrange to have the station polled as in 3.10. The transmitter-distributor should start sending upon receipt of the first TSC and the SEND lamp should light. The transmission of the message sent by the transmitter-distributor can be observed on the 15 printer (for the 28 typing unit, see 6., B) by turning the MR key to the MON position.

3.12 When sending the signals in the tape, the transmitter-distributor should send each CDC and the following LTRS character, and then stop and wait for the V answer-back from each called station. However, if an RT cuton code is used for offline transmission, a V answer-back will be received after the transmission of the RT cuton code, but the transmission will proceed without an answer-back from the subsequent CDCs.

3.13 When the CDC for a broadcast message is sent, the receiving machines at all stations should cut on. The station control circuit at the control station should return a V answer-back, but no other station should do so. Consequently, as one part of this test, the control station should be disconnected to make sure that no outlying station is sending a V answer-back.

3.14 The above test can be made by sending the CDCs from a keyboard. In this method the LTRS character, normally following the CDCs, should be omitted to avoid garbling the V answer-back.

3.15 After the last CDC is sent from the tape, the CR LF in the tape should cause all the machines to shift to the nonselect (lockout) condition. This may be checked by stopping the transmitter-distributor at the station under test and again sending the CDC for each station on

the line from the keyboard, noting that each called station does not respond to its CDC with a V answer-back. If desired, an observer at a station may verify that the machine is in the lockout condition by making certain that the stuntbox-shift slide, which controls the select codebar, has shifted that codebar to the right-hand (as seen from the front of the machine), or the spacing position, and is latched there. On the sequence selector this can be readily seen on the top of the stuntbox; on the typing unit, the position of the codebar can be checked at its left end, at the codebar detent bracket. The codebar position is stamped O here.

Note: The end-of-address (EOA) code for the 83B1 system is V CAR RET LINE FEED. The V is an added feature for circuit assurance. The shift to the nonselect condition does not occur, unless the CR LF is immediately preceded by a V answer-back from the last station called in by a CDC. For the 83B2 system, the code is CAR RET LINE FEED and the V described above is not required.

3.16 FIGS H LTRS at the end of the message should cause all the machines to shift back to the select (disconnect) position. This may be checked by sending the CDC for each station on the line, either from a tape or a keyboard, and noting that each called station responds to its CDC with a V answer-back (see 3.12).

Note: If desired, an observer at a station may verify this by seeing whether the stuntbox-shift slide which controls the select codebar has been unlatched, and that the codebar has returned to the left-hand or the marking position.

3.17 With a perforated tape in the transmitter-distributor, and after transmission has started, lift the stoparm of the 14 TD in the 19 ASR or the tight-tape sensing bail of the 28 TD in the 28 ASR. The audible alarm should sound, the transmitter-distributor should stop, the SEND lamp should remain lighted, and the BID lamp should go out. In approximately 10 seconds, the transmitter-start circuit should send FIGS H LTRS (see note in 3.06) and resume sending start patterns. The SEND lamp at this station should then go out and the audible alarm should stop sounding. The AL (alarm) lamp should light. The transmitter-distributor at this station should not send again until the AL lamp has

been put out by momentary operation of the AR (alarm release) key. Before releasing the alarm, the operator should always reset the tape to the beginning of a message. If the stoparm of the 14 TD in the 19 ASR or the tight-tape sensing bail of the 28 TD in the 28 ASR is lowered within the 10-second period and the PR button is pushed (causing the BID lamp to light), the audible alarm should stop and the transmitter-distributor should resume sending.

3.18 Insert a tape having a nonvalid CDC. After this code has been sent, the transmitter-distributor should stop. In approximately 10 seconds (if intercept feature is not provided, see 3., D), the transmitter-start circuit should send FIGS H LTRS (see note in 3.06) and resume polling. The SEND lamp at this station should then go out, the audible alarm should sound momentarily, and the AL lamp should light. The transmitter-distributor cannot be restarted until the AL lamp is put out; this may be done by operating the AR key momentarily.

3.19 Insert a tape having a double blank in the transmitter-distributor. After this combination is sent, the SEND lamp should go out, the audible alarm should sound momentarily, and the AL lamp should light. The transmitter-distributor should stop. If the AR key is operated within 10 seconds, the AL lamp should go out, the audible alarm should stop sounding, and the transmitter-distributor should start again. If the AR key is not operated within 10 seconds, the transmitter-start circuit should send FIGS H LTRS (see note in 3.06), resume start patterns, and the audible alarm should stop sounding.

3.20 Send a break on the line while the station is sending from the tape as follows:

- (1) Operate the MR key to MON (for the 28 typing unit, see 6., B).
- (2) Operate the MS button.
- (3) Operate the BREAK key on the 28 ASR or the SEND-RECEIVE-BREAK key on the 15 printer to BREAK position. The AL lamp should flash as long as the break persists. The audible alarm should sound, but should be silenced if the tape stoparm of the TD in the 19 ASR or the start stoplever of the TD in the 28 ASR is lifted and the alarm guard AG (alarm guard) key is then operated to the AGD position. The alarm should resume sounding when the disconnect signal is sent.

3.21 If any condition causes the audible alarm to sound, it should be possible to silence the alarm by operating the AG key to the ACO (alarm cutoff) position. At the same time the ACO lamp should light.

Note: The lighting of the ACO lamp is intended to serve as a reminder that there will be no audible alarm as long as that lamp is lighted.

3.22 In the case of a KSR station, a bid to send should be registered by momentarily operating the KS (keyboard send) key. If the PR key is not operated, the station will automatically return V when it is polled the first time, and it will return LTRS and sound the audible alarm when it is polled the second time; if the PR key has been operated, the station will return LTRS and sound the audible alarm when it is polled the first time. To silence the alarm, operate the AG key to the AGD position. If the keyboard sending is not started within approximately 10 seconds, the transmitter-start circuit should time out, send FIGS H LTRS (see Note in 3.06), and resume polling. At the end of a message after FIGS H LTRS is sent, the alarm should sound again, the SEND lamp should go out, and the AL lamp should light. If the AG key is then restored to the normal position, the alarm should be silenced; and if the AR key is operated momentarily, the AL lamp should go out.

Pushbutton Calling Circuit

Note: The test procedure which follows assumes that there is on the circuit a control station and at least one outlying station. The pushbutton calling circuit may be located at any station or there may be pushbuttons at all the stations.

3.23 Set the 48-volt rectifier so that the output is -48 volts under no-load conditions.

3.24 When any pushbutton at the station is operated, its associated lamp should light; and when all the pushbuttons are operated, all the associated lamps should light. When the CA (cancel) key is operated, all of these lamps which are lighted should go out.

3.25 With the stoparm of the TD in the 19 ASR in the raised position or the start stoplever of the TD in the 28 ASR in the stop position, place in the transmitter-distributor a perforated tape having no CDCs, lockout code, or disconnect code. Operate the pushbuttons for

all the connected stations on the line and then lower the stoparm of the TD in the 19 ASR to light the BID lamp. With the 28 ASR, the BID lamp should light when the start stoplever is in the RUN position, the SEND key of the keyboard is depressed, the tape is in the tape gate, and the tape keyboard-control knob is in the KT or T position. When the station is polled the second time, the SEND lamp should light and the codes for all these stations should be sent by the pushbutton circuit. This can be verified by turning the MR key to MON and then observing on the 15 printer (for the 28 typing unit, see 6., B) that each outlying station sends back in turn its V answer-back. After this, when the lockout code is sent automatically from the pushbutton circuit, the station lamps should go out and the transmitter-distributor should start.

3.26 When the tape runs out, the BID lamp should go out and the audible alarm should operate. The pushbutton circuit should wait for a period of 2.0 seconds to 3.5 seconds and then send FIGS H LTRS. When the disconnect code is sent, the audible alarm should stop and the AL lamp should light. The AR button should be operated to put out the AL lamp.

3.27 Repeat the test in 3.25 using a perforated tape having no CDCs or lockout code, but containing the disconnect code, FIGS H LTRS. When the tape runs out, the pushbutton circuit should return to normal without waiting to send FIGS H LTRS.

3.28 If testing at a KSR station, operate the pushbuttons for all the assigned stations on the line, and then operate the KS key. The BID lamp should light. When this station is polled a second time, the audible alarm should sound, the SEND lamp should light, and the CDCs for all the assigned stations should be sent, followed by the lockout code. When the AG key is operated to the AGD position, the audible alarm should be silenced. The keyboard should remain blinded until after the lockout code is sent. If the keyboard sending is not started within 10 seconds after the lockout code is sent, the transmitter-start circuit should time out and send FIGS H LTRS (see Note in 3.06). If the keyboard sending is started within 10 seconds and the message is sent, followed by the disconnect code, the pushbutton circuit should restore to normal. The audible alarm should reoperate, the SEND lamp should go out, and the AL lamp should light. The AG key should be operated to the normal position to silence the audible alarm, and the AR button should be pushed back to put out the AL lamp.

3.29 If a pushbutton for an unassigned online code or for a station on the line which is temporarily out of service is pushed, then when the code is sent, the pushbutton circuit should time for approximately 2 seconds and repeat the code. If no V answer-back is received, the pushbutton circuit should time for approximately 2 more seconds (if intercept feature is not provided, see 3., D) and then cause the ALT lamp to light, the audible alarm to sound, and the STA lamp associated with the called station to flash. The keyboard at the pushbutton station should be momentarily unblinded, permitting the operator to release the alarm by typing a V. If this V is not sent within approximately 8 seconds, the transmitter-start circuit should time out and send FIGS H LTRS (see Note in 3.06). These transmitted signals can be observed on the 15 printer (for the 28 typing unit, see 6., B) by turning the MR key to the MON position.

B. Pushbutton Operation with the Reperator-Transmitter (RT) — For 83B2 System Only

Nonduplicate Code (See Figure 1)

3.30 It is assumed that the pushbuttons are arranged so that an RT cuton code, which includes the letter Y, is located at an intermediate point in the CDCs, so that the online codes precede the RT cuton codes, followed by the offline codes.

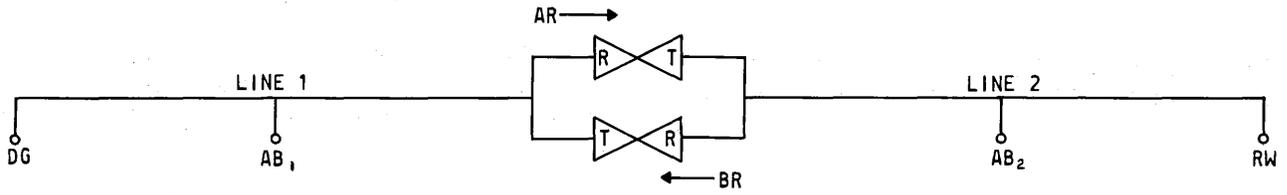
3.31 Push the button at an outlying station on line 1 for the RT cuton code, followed by the button for an offline CDC. Set up the ASR station for operation as in 3.27 or the KSR station for operation as in 3.28.

3.32 The RT cuton code will cut on the RT which will remain blinded. After the V answer-back, the reperator should be unblinded and the offline CDC should be punched in the reperator tape. When properly polled, the transmitter of the RT should start and deliver the message to the line 2 station designated by the offline CDC.

Duplicate Code (See Figure 1)

3.33 The standard pushbutton arrangement does not provide for the double-lockout code required.

DUPLICATE CODE CASE



STATION DG SENDING TO AB₂ ON LINE 2 AND BACK TO DG ON LINE 1

MESSAGE FORMAT IN ORIGINATING TAPE

VVVVVVVDGVARV<≡VAB₂VBRV<≡VDGV<≡V(TEXT)AHVVV.....(SEE NOTE 1)

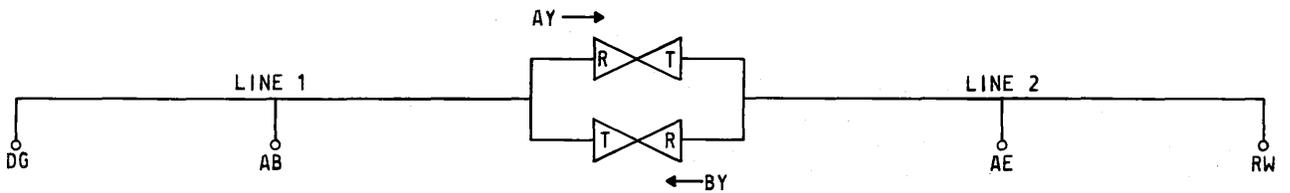
TRANSMITTED ON LINE 2

VAB₂VBRVV<≡VDGV<≡V(TEXT)AHV(SEE NOTE 1)

TRANSMITTED ON LINE 1 FROM LINE 2

DGVV<≡V(TEXT)AHV

NON-DUPLICATE CODE CASE



STATION DG SENDING TO AE ON LINE 2 AND BACK TO DG ON LINE 1

MESSAGE FORMAT IN ORIGINATING TAPE

VVVVVVVDGVAYVAEVBVVDGV<≡V(TEXT)AHVVV.....(SEE NOTE 1)

TRANSMITTED ON LINE 2

VAEVBVVDGV<≡V(TEXT)AHV(SEE NOTE 1)

TRANSMITTED ON LINE 1 FROM LINE 2

DGVV<≡V(TEXT)AHV

NOTE 1.

THREE LTRS CHARACTERS ARE REQUIRED BETWEEN SUCCESSIVE MESSAGES IN A SINGLE PIECE OF TAPE TO PREVENT THE IMPROPER TRANSMISSION OF A PART OF THE CDC FOR THE FOLLOWING MESSAGE. AT THE END OF A TORN TAPE, AT LEAST SEVEN LTRS SHOULD BE PUNCHED IN THE ORIGINATING TAPE; IF PRACTICABLE, TEAR THE TAPE ON EXACTLY THE SEVENTH LTRS.

Figure 1 — Duplicate and Nonduplicate Codes

INTERCEPT CIRCUIT — FOR 83B2 SYSTEM ONLY

C. Use of Intercept ROTR as a Local Outlet or as a Monitor ROTR Used as a Local Outlet

3.34 Prepare a test tape for online operation with the format containing all valid CDCs, including the CDC for the ROTR intercept machine. With the MR key (located on the intercept key and lamp panel of the 7-foot cabinet) in the normal position (arrow pointing vertically downward), the ROTR remains inoperative, except when the ROTR CDC is in the test tape. When the CDC is received and the ROTR is unblinded, check the ROTR tape for a perforated and printed V answer-back. The originating transmitter-distributor restarts and sends the message. At the end of the message, the disconnect code FIGS H LTRS should put all the stations, including the ROTR, in the blinded condition.

Intercept ROTR Used as a Monitor

3.35 To monitor the line continuously, operate the MR key to the MON position. This feature can be tested by preparing another test tape containing all the valid online CDCs. However, do not include in the test tape the CDC associated with the ROTR intercept machine. Note that the ROTR receives all the signals on the line. Restore the MR key to its normal position. The ROTR should be disconnected on the next disconnect signal.

3.36 To monitor an outgoing message (the term outgoing is with reference to the RT transmitter), operate the MR key to the MON S (monitor send) position. This feature can be tested by preparing a test tape containing a valid RT cuton code for transmission from line 1 to line 2, followed by the proper address format to deliver a message to a station on line 2. Send this tape from a station on line 1. The stored message in the RT should make a bid to send on line 2. With the receipt of the TSC and the transmitter started, the ROTR will be unblinded, will monitor the outgoing message, and the TR (tape release) lamp should light. The ROTR should continue to monitor the message until FIGS H LTRS is received.

D. Operation of the Intercept Circuit

Permanently Connected ROTR

3.37 Insert a test tape (for online operation) in the transmitter-distributor of an outlying station whose format has at least one nonvalid CDC. For example:

(at least 10 LTRS CHARACTERS) (VALID CDC) LTRS (NONVALID CDC) LTRS<≡ LTRS (TEXT) FIG H (AT LEAST 7 LTRS CHARACTERS)

3.38 When sending the signals from the tape, the transmitter-distributor should send each valid CDC, the following LTRS character, and then stop and wait for the V answer-back from each called station. However, on the nonvalid CDC, if a station called fails to answer-back within approximately 5 seconds after the transmission of the nonvalid CDC, the intercept circuit cuts on the ROTR, sends the V answer-back, which is required to restart the TD, and the TR lamp should light. Check that the ROTR thereafter receives the message sent by the sending station. At the end of transmission of the test message, the ROTR should cease operating and the polling should then resume.

Patched-in ROTR

3.39 If an ROTR intercept machine is not connected to the line at the end of the 5-second time-out, the IAL (intercept alarm) lamp should light, the buzzer should sound, and the CAB ALM lamp in the associated power distribution circuit should light.

3.40 Manually patch-in the ROTR to the ROTR LPG jack, the IAL lamp and the CAB ALM lamp should go out, the buzzer should stop sounding, and the TR lamp should light.

3.41 When an ROTR is not available, operate the TS (transmitter-start time-out control) key to the TO (time-out) position to permit the transmitter-start circuit to time out in 10 seconds, and send FIGS H LTRS LTRS. The polling should then resume.

3.42 If an ROTR is not available on a call for intercept, operate the TS key to the SPTO (stop polling time-out) position to prevent the transmitter-start circuit from timing out, to give the operator sufficient time to take the necessary action.

REPERFORATOR-TRANSMITTER (RT) CONTROL CIRCUIT — FOR 83B2 SYSTEM ONLY

3.43 Prepare a test tape for online or offline operation. The tape format contains only valid CDCs and two RT cuton codes for transmission from line 1 to line 2 and back to line 1 again. A typical format for the duplicate and nonduplicate codes is shown in Figure 1. A received copy of the message returned from line 2 to line 1 should verify that both RTs have functioned satisfactorily.

Note: Although the above procedure is not normally used, the intent here is to verify the prescribed test with a tape sent from an outlying station.

3.44 To simulate trouble conditions, prepare a number of test tapes, in which the format contains one of the following:

- (a) A nonvalid RT cuton code.
- (b) A valid RT cuton code, followed by a nonvalid CDC for the second line.
- (c) A workable format with a torn edge which will allow the sixth pin to come up.

3.45 Make sure that an ROTR intercept machine is permanently connected or patched-in.

E. Nonvalid RT Cuton Code

3.46 Place the tape containing a nonvalid RT cuton code in the transmitter-distributor of an outlying station. After this station starts sending, it should stop immediately after sending the nonvalid RT cuton code. The absence of the V answer-back (after a 5-second interval) should cut on the ROTR intercept machine, return the V answer-back, and the ROTR should accept the remaining portion of the message. Intervention of the ROTR intercept machine should light the TR (tape release) lamp. The TR lamp should remain lighted until the disconnect code is transmitted.

F. Nonvalid Offline Call-directing Code (CDC)

3.47 Place the tape containing a valid RT cuton code followed by a nonvalid offline CDC in the transmitter-distributor of an outlying station on line 1. After this station starts sending, the transmitted RT cuton code should cut on the reperforator of the RT. Upon receiving the V answer-back, the sending station should restart

and send the nonvalid offline CDC. This nonvalid offline CDC should be perforated in the tape of the reperforator. However, when the transmitter of the RT starts sending on line 2, it should wait for a V answer-back for each CDC sent. Since the CDC is nonvalid, a V answer-back will not be received from the called station. Within approximately 5 seconds, the ROTR intercept machine on line 2 should respond by sending a V answer-back (V answer-back is also printed on the ROTR tape) to restart the RT transmitter and thereafter receive the remaining portion of the message. Intervention of the ROTR intercept machine should light the TR lamp. The TR lamp should remain lighted until the disconnect code is transmitted.

G. RT Torn-tape Condition

3.48 Arrange to have an offline message sent via an RT from a station on line 1. However, before the message is initiated at the sending station, make a slight tear at the edge of the RT tape which slides over the sixth pin on the RT. Care should be taken to place the tear on that portion of the blank tape on which the incoming message will be perforated.

3.49 After the transmission has started from the sending station on line 1, the reperforator side of the RT should accept the torn tape without any alarm indication. In the process of transmitting on line 2, the transmitter of the RT should proceed until the tear in the tape is over the sixth pin. The sixth pin should come up through the torn tape and stop the transmitter and the alarm should sound. The RTR or RTL (reperforator-transmitter trouble) lamp on the RT cabinet should light, the CTO (common tape-out) lamp, and the CAB ALM (cabinet alarm) lamp in the 7-foot cabinet should light, and the alarm buzzer in the power distribution circuit should sound (see 3.61).

3.50 If the torn tape is not reset within 10 seconds, the transmitter-start circuit will time out and send FIGS H LTRS LTRS. Operate the HOLD key on the RT cabinet to the HOLD position. When the tape is reset, the bid to send will be restored by manually operating the TR key, restoring the HOLD key to normal, and then operating the BH RLS (bid-hold-release) key.

3.51 However, if the torn-tape condition can be corrected within 10 seconds of the alarm, reset the tape, manually operate the TR key, and the transmission will be resumed

H. RT Low-tape Condition

3.52 To test for the RT low-tape condition, remove the unperforated tape reel from the RT cabinet. A check for low-tape indication is verified by the lighted CMA (common-machine alarm) lamp on the 7-foot cabinet, the lighted RTR or RTL lamp on the RT cabinet, the lighted CAB ALM lamp on the power distribution panel, and the sounding of the alarm buzzer in the power distribution circuit (see 3.61).

3.53 The low-tape condition should be restored to normal by replacing the reel of unperforated tape in the RT and by operating the PA (prepare-to-patch) key, located on the 7-foot cabinet.

Note: The PA key is a 2-position key. Turning the key clockwise should first put out the CMA lamp, and turning the key counterclockwise (back to its normal position) should put out the RT lamp.

3.54 If the tape reel is not immediately (within 5 seconds of the alarm operation) replaced, the HOLD IN key (located on the RT cabinet) should be operated. The operated HOLD IN key is indicated by the lighted BRA (busy receive) lamp (located on the 7-foot cabinet).

I. RT Bypass Feature

3.55 If the RT bypass feature is provided, prepare and send a test tape containing a priority bypass code followed by a valid offline CDC in the transmitter-distributor of an outlying station. A lighted PBD (priority) lamp (located on the 7-foot cabinet) is an indication that a priority bid has been made to transmit an RT bypass message to line 2.

POWER DISTRIBUTION CIRCUIT — FOR 83B2 SYSTEM ONLY

Note: The following test procedures refer to the apparatus in the 7-foot cabinet.

J. Main AC Power Test

3.56 Move the AC power switch from the OFF to the ON position. Note that if the power switch is in the OFF position, the AC lamp will light, but when in the ON position, the AC lamp is out.

K. Cabinet Alarm Test

3.57 For all fail conditions, the CAB ALM (cabinet alarm) lamp lights and the alarm buzzer sounds (see 3.61). For the cabinet-alarm testing, see 3.39.

L. Rectifier Failure Test

3.58 To simulate an inoperative rectifier (either the -48 volt or +120 volt rectifier), remove the W cord or the U cord from their respective AC sockets. If, for example, the -48 volt rectifier is made inoperative (as a result of removing the W cord), the 48 FAIL and the CAB ALM lamps should light, and the alarm buzzer should sound. However, if the U cord was removed instead of the W cord, the 120 FAIL lamp should light instead of the 48 FAIL lamp.

3.59 To simulate an AC FAIL condition, make both the -48 and +120 volt rectifiers inoperative by removing the W and U cords from their AC sockets. The AC FAIL and CAB ALM lamps should light, and the alarm buzzer should sound (see 3.61).

M. Fuse Alarm Test

3.60 The fuse alarm test requires that one of the -48 volt or +120 volt fuses break down, thereby causing the operation of the FA relay. To simulate such a test, apply -48 volts to winding terminal 1L of the FA relay. The FA (fuse alarm) and CAB ALM lamps should light and the alarm buzzer should sound (see 3.61).

3.61 The alarm buzzer associated with the power distribution circuit can be silenced in all cases by the operation of the BR (buzzer release) key.

4. SIGNAL DISTORTION OF THE GENERATED V AND LTRS CHARACTERS

Note: For the procedures in this part, it is assumed that the station being tested is on a loop to a test center and that at the test center this station is patched off from the rest of the system and terminated in a dummy loop. A monitoring teletypewriter may be provided in the loop at the test center. The distortion may be measured at the test center; however, it may also be measured at the station if suitable equipment, such as a 164C type telegraph transmission measuring set, or equivalent, is available there.

4.01 The V generator is used at all the stations, while the LTRS generator is used only at the KSR stations. The distortion of the V and LTRS characters, sent from these generators in the station control circuit, should be within the limits given hereafter when measured as indicated.

4.02 In the operation of the system the V or LTRS character signals occur only when they are tripped off by the arrival of TSCs or CDCs. It is desirable that the distortion of these signals be measured when they are produced in the normal manner. Under no circumstances should the V or LTRS generators be adjusted by holding open the stuntbox contacts to send continuous V or LTRS characters, for this would result in an incorrect adjustment. The process of adjusting the distortion of the V or LTRS characters is, therefore, one of operating the VG or LG potentiometer to reduce the distortion caused by them to the point where it does not add to the distortion of the associated tripping signals (TSCs or CDCs).

4.03 The distortion of the source of the CDC or TSC should be low enough that it does not mask the effect of the V or LTRS. Therefore, the distortion of the signal from this source should be measured at the station or at the assigned test center following the principles of the section covering teletypewriter station tests, orientation and distortion tests. The actual distortion should be recorded for subsequent use.

4.04 The V generator should be tested either by sending from a tape the station CDC followed by LTRS, or by sending the CDC, omitting LTRS, from a keyboard, which may be the keyboard at the station being tested or at a distant station. (In the keyboard sending, the LTRS is omitted because with manual operation and timing it might interfere with the V.) To test the V answer-back from a KSR station, its CDC must be sent from another keyboard or a tape-sending station.

4.05 The distortion in the resulting combination of the CDC and the V signal should be measured at the test center or locally in accordance with the principles outlined in the section covering teletypewriter station tests, orientation and distortion tests using a 164C type telegraph transmission measuring set or equivalent. This distortion should then be adjusted by manipulating the potentiometers on

the panel of the station control circuit, until it is no greater than the distortion requirement specified in the section covering teletypewriter station tests, orientation and distortion tests for the source of the CDC. During this adjustment, it is important to observe the printed copy of the V and see that no character other than V is printed, for the range of adjustment is such that it is possible to generate the wrong character in some cases. Signals can be observed on a 15 printer by turning the MR key to MON (for the 28 typing unit, see 6., B).

Note: Also, in sending from the keyboard, the first letter of the CDC may be sent before resetting the 164C set to zero. This eliminates the possibility of distortion from the first CDC letter masking the distortion of the V.

4.06 Single V or LTRS characters can, however, be generated by momentarily shorting terminals 41 and 45 of the winding of relay VS. This shunts down relay VS which trips off the V or the LTRS generator to send one V or LTRS character. The distortion of these single V or LTRS signals may then be measured as above, without interference from the associated tripping signals (TSCs or CDCs) encountered in normal circuit operation.

4.07 The LTRS generator should be tested at the KSR stations as follows:

- (a) Operate the KS (keyboard sending) key and the PR (priority) key.
- (b) Send the CDC for the KSR station from either the KSR keyboard or from another keyboard to put the KSR printer in the print condition.
- (c) Send the TSC for the KSR station from either the KSR keyboard or from another keyboard.

4.08 The distortion in the resulting combination of the TSC and LTRS signal should be measured and adjusted similarly to the process described in 4.05, except that in this case it is important to observe that no character is printed, for the range of the potentiometer is such that at 100 wpm a V might be generated instead of LTRS. This can be checked on the KSR printer.

4.09 An alternate procedure for adjusting the V generator (for all types of stations) and

the LTRS generator (for 28 KSR and 28 ASR stations) is as follows:

Note: Where the station under test is not served by a test center, terminate the line side of the station control circuit in a 60-ma dummy loop.

(a) V Generator:

(1) At a 19 ASR Station: Operate the MR key to the MON position. If this is a control station, operate the VS key to the SP position. No tape should be in the transmitter-distributor.

(2) At a 28 KSR or 28 ASR Station: Patch the station keyboard or an auxiliary keyboard to the line side of the station control circuit. Send the station CDC to put the printer in the print condition.

(3) At a 28 RO Station: Patch an auxiliary keyboard machine to the line side of the station control circuit. Send the station CDC to put the printer in the print condition. Turn the VG potentiometer arm to its extreme counterclockwise position. Send FIGS H LTRS V (see Note in 3.06) and the TSC for this station from the keyboard and observe the printed copy. Continue sending the TSC and slowly turn the VG potentiometer arm clockwise until a V appears on the printed copy. Mark this position of the potentiometer. Continue sending the TSC and rotating the potentiometer arm clockwise until the V no longer appears on the printed copy (an M should appear at this position). Mark this position of the potentiometer. Set the potentiometer at the midpoint of the two marks.

(b) LTRS Generator (28 KSR and 28 ASR): Set the VG potentiometer as in (a). Send the TSC for this station. Turn the LG potentiometer arm to its extreme counterclockwise position. Send FIGS H LTRS and the CDC for this station and observe that the LTRS function lever in slot 3 of the stuntbox is selected. Mark this position of the potentiometer. Continue sending FIGS H LTRS and the CDC and rotating the potentiometer arm clockwise until the LTRS function lever no longer goes into selection (a V should appear at this position). Mark this position of the potentiometer. The approximate setting of the potentiometer, between these two marked positions, is given below:

Speed (WPM)	Approximate Potentiometer Arm Setting From Extreme CCW Marking Position
60	1/2 of way between the two marks
75	3/8 of way between the two marks
100	1/8 of way between the two marks

If possible, measure the distortion of V and LTRS after adjusting these generators.

5. PROCEDURE FOR MEASURING DISTORTION OF THE SIGNALS FROM 28-TYPE DISTRIBUTORS

5.01 The 28-type distributors may be used on the following three kinds of stations:

- (a) A control station, where the distributor sends the TSCs.
- (b) An outlying station, where the distributor sends the CDCs generated by the pushbutton circuit.
- (c) A control station with pushbuttons, where the distributor sends both the TSCs and CDCs.

5.02 For the procedures in this part, the measurements shall be made in accordance with the section covering teletypewriter station tests, orientation and distortion tests. The distortion may be measured at the station if suitable equipment, such as the 164C type telegraph transmission measuring set or equivalent is available there, or the distortion may be measured at the assigned test center.

A. Distributor at a Control Station

5.03 The distributor at a control station is used to send the TSCs. Each TSC is followed either by the return of the character V as a no-traffic response, or by the start of a message from a transmitter-distributor. In order to measure the distortion of the TSCs without the complicating factor of the returned V, it is necessary to patch off or disable the other stations. This will normally be accomplished when the control station is removed from the circuit. Where the station under test is not served by a

test center, terminate the line side of the station in a dummy loop. Under these conditions, the polling operation takes place continuously with one TSC being sent every 2 seconds, the ALT lamp remaining lighted and the buzzer sounding. The buzzer can be stopped by turning the AG key to ACO. The number of different TSCs which are sent can be controlled by the skip keys, so that one TSC can be sent repeatedly, or all of the TSCs can be sent in succession. This makes possible the measurement of a distributor distortion with the various combinations of characters; and that is desirable. The TSC characters sent should be observed on the 15 printer (for the 28 typing unit, see 6., B) at the station, by operating the MR key to MON. When the TSC for the control station under test is sent, the station should respond with a no-traffic response V. The measurement of the distortion of this character should be disregarded. The sending of this V may be prevented by placing this station on skip by means of the key provided, which should prevent the TSC for this station from being sent.

B. Distributor Sending Pushbutton CDCs From an Outlying Station or From a Control Station

5.04 The following procedure will cause the continuous sending of the CDCs from the pushbutton calling circuit. When the loop from the station is patched to a dummy loop at the assigned test center, the station under test will be the only station remaining on the line, thereby preventing the return of the V answer-back from the other stations after each CDC is sent. Where the station under test is not served by a test center, terminate the line side of the station in a dummy loop. Thus the distortion measurement will be of the pushbutton signals only. However, if the pushbutton for the station under test is pushed, or, if the station under test is a control station and the broadcast button is pushed, a V answer-back should be received. To avoid this complication, it is suggested that these buttons should not be pushed during the present test, unless the VG relay is blocked in its released position so that contacts 4 and 7 remain closed. The test procedure should be as follows:

- (1) Block the ALB relay of the pushbutton circuit in its released position.
- (2) Turn the MR key to MON (for the 28 typing unit, see 6., B).

- (3) If the station is a control station, stop the polling by turning the VS key to SP.
- (4) Push all the pushbuttons, for both online and offline codes. Their station lamps should light.
- (5) Push the MS key. The send lamp should light and the buzzer should sound. Stop the buzzer by turning the AG key to AGD.
- (6) The first pushbutton code will be sent repeatedly at 2-second intervals. Measure the distortion locally or have it measured at the assigned test center.
- (7) Change to the next code by sending a V from the keyboard of the station under test. Measure the distortion locally or have it measured at the assigned test center.

Note: The V can be sent only after a code has been sent twice. Neglect any distortion reading produced by the V.

- (8) Repeat (7) until the codes for all the buttons pushed have been sent and their distortion measured.

Note: If the pushbutton for any offline station has been pushed, its CDC will be sent only once, and the circuit will step to the next CDC without a V being sent from the keyboard.

- (9) After the last CDC has been sent, the pushbutton circuit should automatically send the lockout and disconnect codes. All the station lamps should go out. The SEND lamp should go out, the buzzer should sound, and the AL lamp should light.
- (10) Put out the AL lamp by operating the AR button, and silence the buzzer by turning the AG key to AGD.
- (11) Unlock the ALB relay.

6. MR (MONITOR AND RECEIVE) KEY

A. MR Key Used with 15 and 19 Teletypewriters

6.01 The MR key affects the type of station operation, as below, when the key is in the position indicated:

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

B. MR Key Used with 28 Teletypewriter

6.02 The MR key operates differently when the 28 teletypewriter is used.

6.03 The 28 teletypewriters can only be shifted into the print condition in response to the CDC for the station. In the case of sending stations, it is necessary to include in the format the CDC of the sending station if it is desired to obtain local copy. Similarly, in various of the preceding tests where observation of a local copy is desired, arrangements must be made for the CDC of the station to be sent.

6.04 A similar situation occurs in connection with the tests in 5. of this section for measuring distortion of the signals from the 28-type distributors, when a 28 RO printer is used at the station as a receiver, combined with a 19 teletypewriter set. Operating the MR key will not cause the 28 machine to print, and it will be necessary to send the station CDC to put the machine in print condition. If the assigned test center has a monitoring machine in the dummy loop, this machine could send the CDC from its keyboard. An alternate method, where 63C1 switchboards are provided for patching purposes at the station, would be to patch the 19 teletypewriter set into the line by a cord from the SET jack to one of the looping jacks in the line switchboard. The LINE-TEST key of the 19 teletypewriter set must then be thrown to the line position. Thereafter, the keyboard of the 19 teletypewriter set can be used to send the required CDC and also to send the Vs required to change the pushbutton codes in the tests in 5. of this section. After these distortion tests are completed, the patch should be removed and the LINE-TEST key restored to the TEST position.

7. ABBREVIATIONS

7.01 The following abbreviations are used in this section:

ASR	Automatic sending and receiving teletypewriter set
CDC	Call-directing code
EOA	End-of-address code
INCPT	Intercept
KSR	Keyboard sending and receiving teletypewriter
RO	Receiving-only teletypewriter
ROTR	Receiving-only typing reperforator
RT	Reperforator- Transmitter
TD	Transmitter-Distributor
TSC	Transmitter-start code

Keys and Buttons (Station Control)

AG	Alarm guard, normal, or alarm cutoff
AR	Alarm release
CA	In the pushbutton circuit, cancels the stations selected in error
KS	Teletypewriter keyboard sending
MR	Monitor, receive with home copy, or receive only
MS	Manual sending
PA	Prepare to patch
PB	In the pushbutton circuit, selects the desired CDC to be sent
PR	Priority traffic
SK	Skip key
STA SK	Station skip (omits the TSC of the station skipped)
TS	Transmitter-start time-out control
VS	Controls starting and stopping of polling patterns