82B1 TELETYPEWRITER SWITCHING SYSTEM MULTISTATION-LINE STATION PERFORMANCE TESTS

CONTENTS PARAGRAPH

1. GENERAL

1.01 *CAUTION: If the room temperature at the station exceeds 105° F, occasional erratic operation may result and test results will be unreliable. If the temperature exceeds 120° F, permanent damage may be done to the equipment components.*

1.02 This section provides a procedure for testing multistation-line stations. Option H applies to stations without customer equipment and option G to stations with customer equipment. In these stations a station control circuit per SD-70733-01 is used to control the sending and receiving teletypewriter sets at each station on a multistation line. The receiving set may be a page teletypewriter (28RO) or a typing reperforator (28ROTR), or both, in which case they are connected in series and receive the same copy when connected to the receiving line by the control circuit under option H or to the line via the customer equipment under option G. The sending set is an automatic send-receive set (28ASR) with a pivoted transmitter and optional fixed transmitter. This set is used for preparing and sending the messages. Transmission directly to the line (option H) or to the line via customer equipment (option G) is under direction of the switching center through the control circuit.

1.03 This section is reissued to include a test procedure for stations equipped with customer equipment.

1.04 This section covers a test procedure arranged in a step-by-step sequence covering the complete test of a station for routine maintenance tests or reported trouble tests. It is helpful to review each paragraph first before attempting to perform the tests. If care is exercised selected parts of the procedure may be followed in making specific partial tests. However, it will be necessary to establish the proper key and switch positions to obtain the test results specified since the section arrangement assumes a continuing sequence.

The test procedures are marked either G or H, depending on the station arrangement under test. The test procedure for option G stations cannot be performed unless the customer equipment or equivalent networks are connected to the station.

1.05 The copy to be checked on the typing unit should be as indicated in the examples shown and should appear in about the same general position as indicated in the sample copy.

1.06 The use of the station Director Test Set per J70138B (portable) is required at the time of installation of a station. Its use is also recommended for tests when failures (marginal in nature) in the station director are suspected.

1.07 For a station director with option F, it is very important that the character timer in the station director be readjusted each time the director is installed in a different location or if the ±22 volt rectifier is changed. For a station director with option E, no adjustment is necessary.

1.08 The following items of material are required in performing these tests.

(a) A blown fuse (70 type).

(b) A partially depleted roll of perforator tape approximately 2-1/2 inches in diameter.

(c) One plug (165C type).

(d) One DC voltmeter (capable of reading 25 volts and having a 3 per cent accuracy).

(e) One station Director Test Set per J70138B (portable).

(f) Test tapes locally perforated as follows:

Tape ONE: Punches ONE

ʅʅʅʅʅʅʅʅʅʅʅʅCZZCʅʅʅʅ∨≡>∨ʅʅʅʅ∨YYZ
ʅʅʅʅʅʅʅʅʅʅʅʅʅAUXRYRY....
<≡NNNNAUXRYRY...
<≡NNNN∨∨∨∨∨∨∨∨∨∨∨∨∨∨∨∨∨∨∨∨∨

Tape TWO: Punches TWO

ʅʅʅʅʅʅʅʅʅʅʅʅEE∨EEʅʅʅʅKTNTKʅʅʅʅCZZC
ʅʅʅʅʅʅʅʅʅʅʅʅʅAUX>PILOT>TAPE∨∨∨∨∨∨∨∨∨∨

Legend

ʅ Blank	< Carriage Return (CR)
Λ Figures (FIGS)	≡ Line Feed (LF)
∨ Letters (LTRS)	> Space (see Note)

The marks . . . used herein indicate repeated characters.

Note: A 28ROTR will print ■ instead of > as the functional symbol for a space.

The character combination (ʅʅCZZCʅʅʅʅ∨≡>∨ʅʅʅ ʅ∨YYZ) punches the pattern ONE in the tape.

The character combination (ʅʅEE∨EEʅʅʅKTNTK ʅʅʅCZZC) punches the pattern TWO in the tape.

2. PREPARATION OF STATION APPARATUS FOR TEST

2.01 Check that all connectors are connected.

2.02 Check that the receiving set or sets are connected to the control cabinet.

2.03 Check that the power cords are connected to the proper power receptacles.

2.04 Set the keys and switches as follows:

(a) On Control Panel of Cabinet:

Switch Designation	Position
POWER	OFF
TYPING UNITS	NORM
RECEIVING	EMG ALL LINE SIGS
NUMBER CHANGE	NORM
SOM-NBR	MAN
LOCAL TEST	ASR
REG XMTR HOLD	NORM
AUX XMTR HOLD	NORM
BUZZER	NORM
MAN XMTR START	NORM

(b) Inside Control Cabinet:

RO-ASR	ASR
XMTR PREC OPTN REG	ON
XMTR PREC OPTN AUX	ON
REC LP	(According to receive loop specification for the station)
TST STN	(Same as REC LP key)

Switch Designation	Position
(c) On 28ASR:	
POWER	OFF
K-KT-T	T
(d) G On LCEC:	
POWER	ON
TEST	TEST 2
(e) G On RO:	
POWER	ON

2.05 Remove tape (if any) from the auxiliary transmitter (AUX XMTR), move the pivoted head of the pivoted transmitter (REG XMTR) against the punch block, pull some blank tape through the punch, and insert it into the transmitter (REG XMTR).

3. LOCAL TESTS (NOT INVOLVING STATION DIRECTOR)

Note: When option G is used, the ZCZC, as shown in the following test procedure, will not appear on the typing unit of the 28ASR. A pause of approximately 20 seconds will follow the generation of the ZCZC.

3.01 Perform the following tests in the order specified.

3.02 Turn on the power switch on the control cabinet and on the 28ASR. The typing unit should run closed. The DC PWR lamp should light and the buzzer should sound. Operate the BUZZER key to OFF and restore it to NORM. The buzzer should be silenced. Ignore REC LINE TBL and MSDRCTD MSG alarm indications.

3.03 Operate the NUMBER CHANGE switch to HNDS, depress the SET button several times. The HNDS digit appearing in one of the windows marked MESSAGE NUMBER should increase by one each time the button is pressed. Set the number to indicate 2.

3.04 Operate the NUMBER CHANGE switch to TENS. Repeat as in 3.03 for the TENS digit.

3.05 Operate the NUMBER CHANGE switch to UNITS. Repeat as in 3.03 for the UNITS digit.

3.06 Operate NUMBER CHANGE switch to RESET. Depress SET button and observe that the indicated number changes to 001.

3.07 Type on the keyboard:

REGRYRY<≡NNN

Operate the MAN XMTR START key to ON. Neither of the transmitters nor the distributor should start transmitting.

3.08 Type the character N on the keyboard. The tape in the REG XMTR should be fully transmitted and the copy should appear on the typing unit of the 28ASR.

3.09 Operate the SOM-NBR switch to AUTO. Operate the REG XMTR HOLD key to HOLD. The REG XMTR HOLD lamp should light.

3.10 Type the following sequence on the keyboard:

REGRYRY...<≡NNNNREGRYRY...
<≡NNNNVVVVVVVVVV

No transmission should take place.

3.11 Operate the AUX XMTR HOLD key to HOLD. The AUX XMTR HOLD lamp should light.

3.12 Insert test tape ONE into the AUX XMTR with the first character A of the word AUX over the pins. No transmission should take place.

3.13 Set the channel number to 999. Operate NUMBER CHANGE switch to NORM. Restore key REG XMTR HOLD to NORM and immediately reoperate it to HOLD. One message from the REG XMTR should be transmitted and the following copy should appear on the typing unit of the 28ASR.

ZCZCABC999REGRYRY...
NNNN

Note 1: In the sequence ABC999 the first three characters are the channel designation, and the three numerals following are the message serial number.

Note 2: The three-letter station identification code for the station under test should appear in place of the characters ABC in this and all following examples.

3.14 Restore key AUX XMTR HOLD to NORM and immediately reoperate it to HOLD. One message from the AUX XMTR should be transmitted and the following copy should appear on the typing unit of the 28ASR.

ZCZCABCØØØUXRYRY...
NNNN

The character A of the word AUX should be missing and the proper change of channel number should occur.

3.15 Restore key MAN XMTR START to NORM, then restore keys REG XMTR HOLD and AUX XMTR HOLD to NORM. The REG XMTR and AUX XMTR HOLD lamps should go out. No transmission should take place.

3.16 Operate the MAN XMTR START key to ON. Transmission should take place first from the AUX, then from the REG transmitter. The following copy should appear on the typing unit of the 28ASR.

ZCZCABCØØ1AUXRYRY...
NNNNZCZCABCØØ2REGRYRY...
NNNN

The words AUX and REG should be complete in the copy. The sequence of the letter characters at the end of the message in the AUX XMTR should step through the transmitter (at reduced speed) without causing any operation of the typing unit. A similar effect at the end of the message in the REG XMTR should occur.

3.17 Operate the K-KT-T knob on the 28ASR to KT and type on the keyboard:

RYRYRY...

Local copy should be obtained on the typing unit of the 28ASR while typing and tape punching.

3.18 Open the tape lid of the regular transmitter, then type:

<≡NNNN

The start-of-message code and channel number should be sent automatically but without local copy. As soon as the indicated number changes to 004, the audible alarm should sound and the REG XMTR TAPE TBL lamp should light. Operate the BUZZER key momentarily to OFF to silence the alarm. Depress the ALM RLS button. The lamp should remain lit. Operate key REG XMTR HOLD to HOLD, then depress the ALM RLS button. The lamp should go out. Close the tape lid somewhere in the RYs and restore key REG XMTR HOLD to NORM. A new start-of-message and number should be transmitted, followed by the remaining perforated tape, without local copy.

3.19 Insert test tape TWO into the AUX XMTR with one of the first blanks over the pins. As the tape starts moving, quickly raise the tight tape arm and release within 2 seconds. The transmitter should have stopped and then resumed. As the sixth pin comes up at the end of the tape, the audible alarm should sound and the AUX XMTR TAPE TBL lamp should light. Operate the BUZZER key momentarily to OFF to silence the alarm. Depress the ALM RLS button. The lamp should remain lit. Open the lid of the AUX XMTR, then depress the ALM RLS button. The lamp should go out.

3.20 Insert test tape TWO into the AUX XMTR with one of the first blanks over the pins. As the tape starts moving, raise the tight tape arm. Hold raised for 5 seconds. The transmitter should stop. Release the tight tape arm. The transmitter should remain stopped. Open the lid of the AUX XMTR. As the sixth pin comes up, the audible alarm should sound and the AUX XMTR TAPE TBL lamp should light. Operate the BUZZER key momentarily to OFF to silence the alarm. Depress the ALM RLS button. The lamp should go out.

3.21 Operate K-KT-T knob to T. Insert a tape into the AUX XMTR and open the lid of the transmitter the moment typing commences on the typing unit of the 28ASR (that is, during the start-of-message). The copy should read:

ZCZCABCØØ6

An additional character may be printed after the message number. The audible alarm should sound and the AUX XMTR TAPE TBL lamp should light. Operate the BUZZER key momentarily to OFF to silence the alarm; then depress the ALM RLS button. The lamp should go out.

3.22 Operate SOM-NBR switch to MAN and restore MAN XMTR START key to NORM.

Type the following sequence on the keyboard:

REG<≡NNNNPILOT∧123V∧

It is important that the characters typed be exactly as specified. Operate the REG XMTR HOLD key to HOLD. Depress the PILOT TAPE button momentarily. The REG XMTR PILOT TAPE lamp should light. Restore the REG XMTR HOLD key to NORM. The REG XMTR PILOT TAPE lamp should go out. Operate the REG XMTR HOLD key to HOLD. Insert test tape ONE into the AUX XMTR. Depress the PILOT TAPE button momentarily. The REG XMTR PILOT TAPE lamp should not light. Remove the tape from the AUX XMTR and depress the PILOT TAPE button again. The REG XMTR PILOT TAPE lamp should light. Depress the ALM RLS button momentarily. The REG XMTR PILOT TAPE lamp should go out. Depress the PILOT TAPE button momentarily. Insert test tape ONE into the AUX XMTR with the character A of the first message over the pins. Restore the REG XMTR HOLD key to NORM. The REG XMTR PILOT TAPE lamp should remain lit. Operate the MAN XMTR START key momentarily to ON. One message should be transmitted from the REG XMTR and the following copy should be printed on the typing unit of the 28ASR.

REG
NNNN

The REG XMTR PILOT TAPE lamp should remain lit.

> ***Note:*** If the REG XMTR PILOT TAPE lamp does not remain lit, the unit may be wired according to option Z (manufacture of which is discontinued) instead of option Y (standard) shown on SD-70733-01, sheet B9, issue 7B, or higher. The wiring change from option Z to Y is as follows: If two green wires are connected to contact spring (9M) of relay SST, determine which one connects to contact spring (4F) of relay PA. Move this wire from relay SST (9M) to relay SST (9F). This latter terminal already has two wires connected to it, and the change should add a third.
>
> M — make contact F — fixed contact

3.23 Again operate momentarily the MAN XMTR START key to ON. The remaining tape should be transmitted from the REG XMTR and it should be followed by one message from the AUX XMTR. The REG XMTR PILOT TAPE lamp should go out as the AUX MTR starts transmitting. The following copy should be printed on the typing unit of the 28ASR.

PILOT123UXRYRY...
NNNN

The character A of the word AUX should be missing. Remove the tape from the AUX XMTR.

3.24 Operate the AUX XMTR HOLD key to HOLD. Depress the PILOT TAPE button. The AUX XMTR PILOT TAPE lamp should not light. Insert test tape ONE into the AUX XMTR, then momentarily depress the PILOT TAPE button. The AUX XMTR PILOT TAPE lamp should light. Depress momentarily the ALM RLS button. The AUX XMTR PILOT TAPE lamp should go out. Depress again momentarily the PILOT TAPE button. The AUX XMTR PILOT TAPE lamp should light. Restore the AUX XMTR HOLD key to NORM. The AUX XMTR PILOT TAPE lamp should remain lit. Remove the tape from the AUX XMTR. The AUX XMTR PILOT TAPE lamp should go out.

> ***Note:*** If the AUX XMTR PILOT TAPE lamp remains lit, the changes first shown on SD-70733-01, sheet B10, issue 8AR, may not have been incorporated in the unit. Check if contact (12M) of relay STA has wires connected to it. If not, connect this contact as shown on the corresponding wiring drawing.

3.25 Operate the AUX XMTR HOLD key to HOLD. Insert tape ONE into the AUX XMTR with the character A of the first message over the pins, then depress momentarily the PILOT TAPE button. The AUX XMTR PILOT TAPE lamp should light. Restore the AUX XMTR HOLD key and operate the MAN XMTR START key momentarily to ON. One message only should be transmitted from the AUX XMTR. As the transmitter stops, the AUX XMTR PILOT TAPE lamp should go out.

3.26 Operate the AUX XMTR HOLD key to HOLD. Remove test tape ONE from the AUX XMTR and insert test tape TWO with the character A over the pins. Depress momentarily the PILOT TAPE button. The AUX XMTR PILOT TAPE lamp should light. Restore the AUX XMTR HOLD key and operate the MAN XMTR START key momentarily to ON. The tape should be transmitted from the AUX XMTR.

When the transmitter stops at the end of the tape, remove the tape. No alarm indication should be given.

3.27 Operate REG XMTR HOLD key to HOLD. Depress momentarily the PILOT TAPE button. The REG XMTR PILOT TAPE lamp should not light. Restore REG XMTR HOLD key to NORM.

> ***Note:*** If the REG XMTR PILOT TAPE lamp lights, the changes first shown on SD-70733-01, sheet B10, issue 8AR, may not have been incorporated in the unit. Check if contact (5B) of relay (ASP) has wires connected to it. If not, connect this contact as shown on the corresponding wiring drawing.

3.28 Insert test tape ONE into the AUX XMTR with the character A over the pins. As the AUX XMTR starts transmitting again, the AUX XMTR PILOT TAPE lamp should go out. One message only should be transmitted. The copy on the typing unit of the 28ASR should read:

UX PILOT TAPEUXRYRY...
NNNN

Remove test tape from AUX XMTR. Operate RECEIVING switch to NORM.

3.29 ***Low Tape Alarm Test:*** Remove the roll of tape from the 28ASR. The audible alarm should sound and the LOW TAPE lamp should light. Insert a roll of tape 2-1/2 inches in diameter. The alarm should continue to sound. Momentarily operate the BUZZER key to OFF. The audible alarm should be silenced. Replace the original roll of tape. The lamp should go out.

3.30 Connect the receiving machine or machines. Operate TYPING UNITS switch to INTCHGD. Turn on the power switch on the receiving teletypewriter. Operate K-KT-T knob to KT. Type on the keyboard:

RYRY....<≡NNNN

Local copy should be obtained on the receiving machine. Operate K-KT-T knob to T and operate MAN XMTR START key momentarily to ON. As the message is transmitted, copy should appear on the receiving machine.

3.31 Operate the LOCAL TEST switch to COMP STA. The REC LINE TBL lamp should go out.

3.32 Operate RECEIVING switch to EMG ALL LINE SIGS. After a short interval (about 2 seconds), the REC LINE TBL lamp should light and the audible alarm should sound. Operate the BUZZER key to OFF and restore to NORM. The audible alarm should be silenced. Operate RECEIVING switch to NORM. The REC LINE TBL lamp should go out. Insert an open-circuit plug into the S jack. The receiving set should run open and, after a short interval, the REC LINE TBL lamp should light and the audible alarm should sound. Remove the open-circuit plug. The audible alarm should be silenced, the lamp should go out, and the receiving set should run closed.

3.33 ***Fuse Alarm Test:*** Operate LOCAL TEST switch to NORM. If the alarm is sounding, operate the BUZZER key momentarily to OFF. The DC PWR lamp should go out. Replace F2 fuse with a blown 70B fuse. The DC PWR lamp should light and the audible alarm should sound. Operate BUZZER key to OFF and restore to NORM. The audible alarm should be silenced. Replace F2 fuse. The DC PWR lamp should go out.

3.34 Operate LOCAL TEST switch to COMP STA. The DC PWR lamp should light and the audible alarm should sound. Operate RO-ASR key to RO. The DC PWR lamp should go out and the alarm should be silenced. Restore the RO-ASR key to ASR. The lamp should light and the alarm should sound. Operate the BUZZER key momentarily to OFF to silence the alarm.

4. LOCAL TESTS (INVOLVING STATION DIRECTOR)

4.01 Operate the following switches as indicated:

(a) On Control Panel of Cabinet:

Switch Designation	Position
TYPING UNITS	INTCHGD
RECEIVING	EMG ALL MSGS
SOM-NBR	AUTO
LOCAL TEST	COMP STA

(b) On 28ASR:

K-KT-T	K

Switch Designation	Position

(c) On Director Panel:

For a station director with option F:

SPD	Set to speed used
DECR	90
OSC STOP CUR	According to last entry on table attached to director.

For a station director with option E, there are no adjustments.

4.02 Turn off all power switches. Remove the transformer cover by removing two screws on the left side of transformer (T1). Set the tap on the input transformer of the ±22 volt rectifier as follows:

Connect the black wire to terminal 111 of TS1, except under either of the following conditions:

(a) If the ac power supply voltage is known not to drop below 117 volts during normal variations, use terminal 117.

(b) If the ac power supply voltage is known not to drop below 123 volts during normal variations, use terminal 123.

4.03 Replace transformer cover. Turn on power switches. To adjust the character timer, the 60, 75, or 100 knob has to be set according to which of the three speeds is used at the station. The appropriate control will subsequently be referred to as the timer control.

4.04 ***Character Timer Adjustment Test:*** For a station director with option E, no adjustment is necessary. For a station director with option F the following methods may be used.

(a) ***Meter Method:*** Connect the dc voltmeter, 12-volt scale, negative probe to GRD, positive probe to test point CT on the director. Send a repeated LETTERS from the keyboard. (A toothpick will lock down the repeat key.) Adjust the timer control as follows:

Start with a dial setting of 100. The meter reading will vibrate around 3 or 4 volts. Reduce the setting slowly until the meter drops suddenly and vibrates around a low reading (0.4 to 1.1 volts). Make a note of the dial setting (the high failure point) when this change occurs. Reduce the setting further and note the setting (the low failure point) at which the center point of the meter vibration suddenly goes up to about 2 volts. If this increase has not taken place when a dial setting of zero is reached, then there is no low failure point.

The correct final setting of the control should be calculated as follows:

(1) If minimum range (see Table A) is exceeded and both high and low failure points are obtained, set control in middle of this range.

(2) If minimum range (see Table A) is exceeded even though one end of the control is reached without failure, set control in middle of this range.

(3) If less than minimum range (see Table A) is obtained because one end of the control is reached, move the setting away from the failure point and into the working range by the amount shown as "Backoff."

TABLE A

Speed	Min. Range	Backoff
100	50 Points	25 Points
75	30 Points	15 Points
60	40 Points	20 Points

Record the correct setting on the card attached to the director under the proper heading (60, 75, or 100) together with date, and under the heading NAME show the actual location of the station.

(b) ***Typing Method:*** Find the highest and the lowest setting of the 60, 75, or 100 speed timer control while observing the typing unit of the 28ASR as follows: Start from a zero setting. Not too rapidly, send 4 or 5 I characters. Ignore the first character printed each time the setting is changed. If the remaining I's print correctly, note that failure was not obtained at zero; otherwise, raise the setting 5 points at a time until the I characters print correctly. Make a note of the low failure point (or zero if that was the case). Repeat the test at 10 point intervals, raising the setting until the printer becomes erratic and prints errors. Find the high failure point within 3 points. The correct final setting of the timer control should be calculated as for the Meter Method.

Note: It is absolutely essential to adjust the character timer by either of the above methods at installation. The factory setting as entered in the table is usually high. It is very important that the character timer is readjusted each time the director is installed in a different location or if the ±22 volt rectifier is changed.

4.05 ***Director Test Set:*** After completion of the character timer adjustment, turn off all power switches. Connect the portable station Director Test Set (J70138B) as follows: Remove the panel below the control panel by loosening the two screws. Disconnect the two-prong connector B of the station control cabinet. Connect socket B and plug B of the station control cabinet to plug B1 and socket B1, respectively, of the test set. Disconnect the six-prong connector E on the station coupling unit. Connect socket E and plug E of the station equipment to plug E1 and socket E1 of the test set.

Set the controls of the test set as follows:

Designation	Position
OVER-ALL TEST	NORM
MARGIN RANGE	OVER-ALL TEST
MARGIN DIAL	Not Used

On Control Panel of Cabinet:

Switch Designation	Position
TYPING UNITS	NORM
RECEIVING	NORM
POWER	ON
On 28ASR:	
POWER	ON
On 28RO:	
POWER	ON

Connect the voltmeter probes to pin jacks —22 and GRD on the test set. Adjust the VARIAC dial to obtain a reading of 19 volts on the voltmeter.

Note: With the VARIAC dial set to 117, the ratio of the transformer which supplies ac power to the equipment will be 1:1. At this setting the supplied voltage will only be 117 volts if the line voltage is 117.

4.06 Carry out the tests indicated in Table I for option H, Table II for option G and associated notes, taking into account the following considerations:

(a) The instructions are written for station A, considered to be connected on a line equipped with stations S, I, D, and R.

(b) If the code of the station under test is not A, interchange the character A in the table with the code character used in the sequence SIDR, and the character U with the associated precedence code. (See Note 3 accompanying Table I.)

For example, for station D:

In test I(b) use WSWIWAWR<<WDRYRY...

In test II(b) use WWWDW<<≡ in the test sequence.

In test II(c) use the test sequence.

WN (3/4 second pause) >BD

(c) At master stations, ascertain which cut-on codes (out of the characters A, S, I, D, and R) are not used on the multistation line. Be sure to substitute the unused character or characters in turn for the character W in test I(d).

(d) At nonmaster stations in carrying out test I(d), use character W and check that there is no copy on the receiving machine and no alarm indication. Omit tests I(c), I(f), I(g).

(e) In test I(c) and similar tests, the RECEIVING-ONLY COPY should lag one character behind the MONITORING COPY and the typing on the keyboard. When the fourth N is typed on the keyboard, the RECEIVING-ONLY COPY should "catch up" by printing two N characters.

(f) If the station is not equipped with a page receiving-only set but only with a receiving-only typing reperforator, its copy can be used to check against the text under the column RECEIVING-ONLY COPY in Table I, but functional symbols will of course appear on the tape in addition to the characters of the table.

(g) At nonmaster stations, the sequence (ZCZCABC123) option H or (ABC123) option G will not appear on the RECEIVING-ONLY COPY which in tests II, III, IV, and V starts with character A.

(h) At master stations, the sequence (ZCZCABC123) option H or (ABC123) option G appears on the RECEIVING-ONLY COPY as the receiver cuts on character Z as a misdirected message.

4.07 ***Test of Tape Feedout:*** Set K-KT-T knob to K. Type on keyboard:

<≡NNNNVA<≡NNNN (5 sec. or longer pause) VA<≡NNNN

If the station is equipped with an ROTR, there should be at least 12 LTRS characters perforated in the tape during the waiting period and after the last N typed. If the station is not equipped with an ROTR, check that relay TFO in the control cabinet operates and releases during the waiting period and after the last N typed.

> ***Note 1:*** If the LTRS feedout is not sufficient, it should be noted that substituting a 50 mf capacitor for capacitor C424 (25 mf) will double the timing of the timer controlling the number of LTRS feedout. Paralleling the 50 mf with the 25 mf capacitor will triple the LTRS feedout.
>
> ***Note 2:*** If, before feedout of a message is completed at a station, another message is sent over the receive line from the switching center or a transmitter polling cycle is sent, then the feedout of LTRS is terminated at the station. Should the LTRS feedout at the end of such a message be insufficient and should a complaint be received, refer the matter to the assigned test center and request that arrangements be made with the switching center to increase the time between messages.

4.08 Test of "Interchange," "Emergency All Messages," and "Letters Erase" Features: Set TYPING UNITS switch to INTCHGD, and RECEIVING switch to EMG ALL MSGS. Type on keyboard:

<≡NNNN<≡A123U (3/4 sec. pause)
>456W789V<≡NNNN

The following copy should appear on the typing unit of the 28ASR.

NNNN
123789
NNNN

The following copy should appear on the receiving set.

NNNN
123 456UIO
NNNN

If the station is equipped with an ROTR, observe that the tape feedout does not take place.

4.09 "Emergency All Line Signals" Feature: Set TYPING UNITS switch to NORM and RECEIVING switch to EMG ALL LINE SIGS. The buzzer should sound and the REC LINE TBL lamp should light. Operate the BUZZER key momentarily to OFF to silence the alarm.

Type on the keyboard:

<NNNN<RYRY.....<≡NNNN

Check that both the typing unit of the 28ASR and the receiving set print the copy and that the receiving set copy does not lag one character behind typing.

5. OVER-ALL TESTS

5.01 Connect the voltmeter probes to pin jacks —22 and GRD on the test set. Adjust the VARIAC dial to obtain a reading of 21 volts on the voltmeter.

5.02 Set POL switch on the test set to POS and OVER-ALL TEST switch to 5. Leave MARGIN RANGE switch on OVER-ALL TEST.

Repeat the following tests of Table I.

I (a), (b), (c)
II (a)
V (b), (c), (d), (e)
VI (e), (f)

5.03 Set POL switch on the test set to NEG and OVER-ALL TEST switch to 3. Repeat all tests of 5.02.

> ***Note:*** If the station control unit successfully passes the tests prescribed in Part 3 of these instructions but not Part 4 and/or Part 5, the electronic director should be suspected of being in trouble. A further check can be made of the station director by following the procedures covered in Part 6.

5.04 Turn off all power switches.

5.05 Remove the director test set by following the procedures covered in 4.05 in reverse.

6. BACK-TO-BACK TEST OF STATION WITH CUSTOMER EQUIPMENT

6.01 Carry out the tests indicated in Table III and its accompanying notes. Restore TEST key in LCEC to NORM when tests are completed.

7. STATION DIRECTOR TEST (SIMPLIFIED PROCEDURE)

7.01 The following simplified tests can be carried out at a station with a voltmeter at test points accessible from the outside of the electronic station director and are indicative of the proper operation of the electronic director.

7.02 These tests should be made only if director trouble is indicated by the tests covered in Part 4 or 5. They should not be undertaken until after the adjustments called for in Part 4 or 5 have been made.

7.03 Set keys and switches as follows:

(a) On Front Control Panel of Cabinet:

Switch Designation	Position
POWER	OFF
TYPING UNITS	INTCHGD
RECEIVING	NORM
NUMBER CHANGE	NORM
SOM-NBR	MAN
LOCAL TEST	COMPL STA
REG XMTR HOLD	NORM
AUX XMTR HOLD	NORM
BUZZER	OFF
MAN XMTR START	NORM

(b) On Director Panel:

For a station director with option F:

SPD	(According to speed specification for the station)
60 75 100 OSC STOP CUR DECR	(According to last entry on table attached to director)

For a station director with option E, there are no adjustments necessary.

(c) On 28 ASR:

POWER	OFF
K-KT-T	K

7.04 Turn on the power switch on the control cabinet and on the 28ASR.

7.05 ***Current Checks:*** For a station director with option E, no current checks are necessary. For a station director with option F, the following checks are required.

(a) Send one character from the keyboard, then check that the current in the OSC STOP CUR jack is 6.0 ± 1.0 milliampere.

(b) Send a repeated character from the keyboard; the reading should vibrate around about 1/4 milliampere.

(c) Send single characters from the keyboard; for each character the reading should dip once sharply and restore to its former value.

7.06 ***Voltage Checks:***

(a) Carry out the tests indicated in Table B by connecting a voltmeter, set to an appropriate scale, to the test pin jack indicated in the table, with the other voltmeter lead connected to ground. Each test procedure should be followed in the order given. To send repeated characters, use the repeat key feature.

(b) For a station director with option F, Table B provides the test requirements. For station directors with option E, step 2 OSC is omitted and step 3 (a)CT is to be substituted for step 3 CT.

TABLE B

Test Pin Jack	Preparation	Voltmeter Reading in Volts
1. IN	None	−15.0 ±2.0
	Send repeated ℓℓ	Vibrates around −2.0 ±1.0
	If REC relay provided is a 255A relay, move armature of REC relay to its spacing contact.	0
	If REC relay provided is a 314A relay — no test.	—
2. OSC	None	−4.4 ±1.5
3. CT	None	+9.0 ±2.0 Record this reading as Vct, for future reference
	Send repeated V characters	Vibrates around +0.7 ±0.5
	Speed check: Send repeated characters. Reading shall be made using same scale on voltmeter as was used for determining Vct above.	Reading shall be equal to (Vct times 0.124) minus 0.4, within ±0.2)
	Note: Before doing the speed check, the adjustment covered in 4.04 (character timer adjustment) must be performed.	
(a) CT	None	+9.0 ±2.0 Record this reading as Vct, for future reference
	Send repeated V characters	Vibrates around .35 ±0.25
	Speed check: Send repeated characters. Reading shall be made using same scale on voltmeter as was used for determining Vct above.	Reading shall be equal to (Vct times 0.62) minus 0.2, within ±0.1
4. SH-R	None	−12.0 ±2.0
	Send repeated ℓℓ	Vibrates around −2.8 ±1.0
	Send repeated R	Vibrates around −7.0 ±2.0
5. GP	None	−2.5 ±1.0
	Send single characters	−2.5 ±1.0 with very small upward deflection for each character
	Note: The pulse to be observed is of micro-seconds duration. If the pulse cannot be observed in 5, use pulse test circuit of director test set and a vacuum tube voltmeter if these items are available.	

TABLE B (Cont)

Test Pin Jack	Preparation	Voltmeter Reading in Volts
6. TS-EN	Send ⩛	−2.8 ±1.5
	Send ⩔ (3/4 sec. pause)	−12.5 ±2.0
	Send ⩛	−2.8 ±1.5
	Send ⩔> (without intervening pause)	No change from immediately preceding reading
	Send ⩔ (5 sec. or longer pause) >	No change from immediately preceding reading
7. BL	Send any character except ⩔	−9.8 ±2.0
	Send ⩔	−1.5 ±1.0
	Send any character except ⩔	−9.8 ±2.0
8. 1/4	None	−4.0 ±2.0
	Send ⩔	−4.0 ±2.0 with an upward deflection for about 1/3 second
	Send ⩔ followed immediately by any other character	Same as for preceding test except that upward deflection shall terminate immediately on character following the ⩔
9. 1-1/4	None	−2.8 ±2.0
	Send ⩔	−2.8 ±2.0 with an upward deflection after a short pause, the deflection lasting about 2 seconds
	Send ⩔ and when upward deflection of meter occurs, follow immediately by any character other than ⩔	Same as for preceding test except that upward deflection shall terminate immediately on character following the ⩔
10. PD	None	−2.5 ±1.0
	Send ≡NNNN (short pause) < repeated R	No change from immediately preceding reading
	Send ≡NNNN (short pause) ⩛ *repeated ⩔	Vibrates around −18.0 ±3.0
	Send repeated R	Vibrates around −13.0 ±2.5
	Send ≡NNNN (short pause) <	−2.5 ±1.0
	Send ≡NNNN (short pause)* repeated R	Vibrates around −13.0 ±2.5
	Note: The symbol (*) indicates station cut-on code for the station under test.	

TABLE B (Cont)

Test Pin Jack	Preparation	Voltmeter Reading in Volts
11. RC	Send ≡NNNN (short pause) ΨAΨSΨIΨDΨR	−13.5 ±2.5
	Note: Omit from the above sequence the cut-on code for the station under test, together with the Ψ preceding it. If a master station is being tested, also omit any cut-on codes not assigned to stations on the line, together with the Ψ characters preceding them.	
	Send ≡NNNN (short pause) Ψ*	−2.5 ±0.8
	Send ≡NNNN	−13.5 ±2.5
	Send *	−2.5 ±0.8
	Note: The symbol (*) indicates station cut-on code for the station under test.	
12. LTRS	Send Ψ	−2.0 ±1.0
	Send any character except Ψ	−9.5 ±2.0
	Send ≡NNNN	−2.0 ±1.0
	Send any character except Ψ	−9.5 ±2.0
13. ACT	Send <	−1.0 ±0.8
	Send ≡NNNN	−8.0 ±2.0
	Send any character except <	No change from immediately preceding reading
	Send <	−1.0 ±0.8
	Send ≡NNNN	−8.0 ±2.0
14. N3	Send ≡NN	−9.5 ±2.0
	Send N	−1.5 ±0.8
	Send any character	−9.5 ±2.0
15. N2	Send ≡N	−9.5 ±2.0
	Send N	−1.5 ±0.8
	Send any character	−9.5 ±2.0
16. N1	Send ≡	−9.5 ±2.0
	Send N	−1.5 ±0.8
	Send any character	−9.5 ±2.0
17. LF	Send any character	−9.5 ±2.0
	Send ≡	−1.5 ±0.8
	Send any character	−9.5 ±2.0

8. CIRCUIT LINE-UP TESTS

8.01 Connect the send and receive lines to the station control cabinet (option H) or to the LCEC (option G).

Note: If the receive line is incorrectly poled, the typing unit of the receiving set will run open when the RECEIVING switch is operated to EMG ALL LINE SIGS.

If the send line is incorrectly poled, the typing unit of the 28ASR will run open while transmitting a message with the K-KT-T knob on the 28ASR in the T position (option H).

8.02 Check that the wave shaper is connected as required.

8.03 Set the keys and switches as follows:
On Control Panel of Cabinet:

Switch Designation	Position
TYPING UNITS	NORM
RECEIVING	NORM
NUMBER CHANGE	NORM
SOM-NBR	AUTO
LOCAL TEST	NORM
REG XMTR HOLD	NORM
AUX XMTR HOLD	NORM
BUZZER	NORM
MAN XMTR START	NORM
POWER	ON
REG XMTR PREC OPTN	AS REQUIRED
AUX XMTR PREC OPTN	AS REQUIRED
RO-ASR	ASR, except at stations without sending facilities

8.04 Arrange with the test room for line-up tests.

Note: The following should be remembered during line-up tests: With RECEIVING switch set either to NORM or to EMG ALL MSGS, the receiving set is in an electronic loop and receives regenerated signals. With RECEIVING switch set to EMG ALL LINE SIGS, the receiving machine, under option H, is in a metallic loop and receives the signals on the receive line via a 255A relay without regeneration. Under option G, the receiving machine receives regenerated signals from the customer equipment via a 255A relay. By operating the TYPING UNIT switch to INTCHGD, the typing unit of the 28ASR can be put on the receive line for line-up tests in place of the typing unit of the receiving set.

9. ABBREVIATIONS

9.01 The following abbreviations are used in this section:

ACT	Activate
ALM	Alarm
ASR	Automatic send-receive teletypewriter set
AUX	Auxiliary
BL	Blank
COMP	Complete
CT	Character Timer
CUR	Current
DC	Direct Current
DECR	Decrement
DIR	Director
EMG	Emergency
FIGS	Figures (upper-case shift)
GP	Gate Pulse
GRD	Ground
HNDS	Hundreds
IN	Input
INTCHGD	Interchanged
K	Keyboard
KT	Keyboard-Tape
LCEC	Line Control Equipment Cabinet
LF	Line Feed
LP	Lamp
LTRS	Letters character (lower-case shift)
MAN	Manual
MSG	Message
MSGS	Messages
NEG	Negative
NORM	Normal
NBR	Number
N1	One N Count
N2	Two N Count
N3	Three N Count
OPTN	Option

OSC	Oscillator
PD	Printer Drive
POL	Polar
PWR	Power
PREC	Precedence
RC	Receiver Control
REC	Receiving
REG	Regular
RLS	Release
RO	Receive-Only
ROTR	Receiving-Only Typing Reperforator
SH-R	Shift Register
SIGS	Signals
SOM	Start-of-Message
SPD	Speed
STA	Station
STN	Station
T	Tape
TBL	Trouble
TS-EN	Transmitter Start Enable
TST	Test
V	Voltage
XMTR	Transmitter
1/4	1/4 Second Timer
1-1/4	1-1/4 Second Timer

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TYPICAL LOCAL TEST PROCEDURES OF STATION FUNCTIONS NORMALLY CONTROLLED FROM THE SWITCHING CENTER (2) (13)

FEATURE TESTED AND PROCEDURE	PREC KEYS	SWITCH K-KT-T	TEST SEQUENCE (1)	SIGNAL SOURCE	MONITORING COPY	RECEIVING-ONLY COPY	ALARMS
I. RECEIVER CUT-ON							
(a) Preparation		K	<V≡NNNN	KBD	NNNN	May or may not have copy	
(b) False Cut-on		K	VSVIVDVR<<≡VARYRY ...<≡NNNN (3)	KBD	SIDR (3) (4) ARYRY ... NNNN	No response of receiving machine	
(c) Cut-on		K	VAVSVIVDVR<<≡RYRY... ...<≡NNNN (3)	KBD	ASIDR (3) (4) RYRY ... NNNN	ASIDR (3) (4) RYRY ... NNNN	
(d) Nonvalid Cut-on (Master stations only)		K	VW<<≡RYRY...<≡NNNN (Repeat per Note 5)	KBD	W (4) (5) RYRY ... NNNN	W (4) (5) RYRY ... NNNN	MISD MSG LAMP and BUZZER (14)
(e) Nonvalid Cut-on (Master stations only)		K	W<<≡RYRY...<≡NNNN	KBD	W (4) RYRY ... NNNN	W (4) RYRY ... NNNN	MISD MSG LAMP and BUZZER (14)
(f) Nonvalid Cut-on		K	⇩W<<≡RYRY... <≡NNNN (17)	KBD	W (4) RYRY ... NNNN	W (4) RYRY ... NNNN	MISD MSG LAMP and BUZZER (14)
(g) Nonvalid Cut-on (Master stations only)		K	⇩PAUSE 2 seconds or longer W<<≡RYRY<≡NNNN	KBD	No copy	No copy	——
(h) Receiver blinding, letters erase, and emergency-all-messages features (21)		K	<≡ NNNN<⇧123 ⇩PAUSE 3/4 Sec. > 456V789V<≡NNNN	KBD	NNNN 123456UIO NNNN	NNNN 123789 NNNN	
II. TRANSMITTER START REG TRANSMITTER							
(a) H Response		K	V⇩PAUSE 3/4 Sec. >UFCBJASIDRV (6)	KBD and DISTR	UHFCBJAHSIDR (6)	No copy	
(b) Preparation of test tape		KT or T (7)	V V VAV<<≡REGRYRY... (3) <≡NNNNVVVVVV (Repeat once)	KBD	A (3) (4) (7) REGRYRY ... NNNN (Repeat once)	A (3) (4) (7) REGRYRY ... NNNN (Repeat once)	
(c) Simulated poll (With only nonprecedence traffic available)	REG XMTR PREC non-operated	K	V⇩PAUSE 3/4 Sec.>UA (8)	KBD and DISTR	UHA (ZCZCABC123) A (4) (8) (9) REGRYRY ... NNNN	(ZCZCABC123) A (9) (4) (8) REGRYRY ... NNNN	(9)
(d) LTRS discard (After each MSG in tape)		K	Transmitter steps through V signals until A is sensed	DISTR	No response of typing unit	No response of typing unit	
(e) Simulated poll with precedence traffic available	REG XMTR PREC operated	K	V⇩PAUSE 3/4 Sec.>U (8)		U (ZCZCABC123) A (4) (8) (9) REGRYRY ... NNNN	(ZCZCZBC123) A (9) (4) (8) REGRYRY ... NNNN	(9) (19)

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TYPICAL LOCAL TEST PROCEDURES OF STATION FUNCTIONS NORMALLY CONTROLLED FROM THE SWITCHING CENTER (2) (13)

FEATURE TESTED AND PROCEDURE	PREC KEYS	SWITCH K-KT-T	TEST SEQUENCE (1)	SIGNAL SOURCE	MONITORING COPY	RECEIVING-ONLY COPY	ALARMS
III. TRANSMITTER START AUXILIARY TRANSMITTER							
(a) Preparation of test tape (10)		KT or T (7)	VVVVVVVAV<<≡AUXRYRY... <≡NNNNVVVVVV (3) (Repeat at least 5 times, remove tape from REG transmitter and place in Aux transmitter) (11)	KBD	A (3) (4) (7) AUXRYRY... NNNN (Repeated)	A (3) (4) (7) AUXRYRY... NNNN (Repeated)	
(b) Simulated poll (Only nonprecedence traffic available)	AUX XMTR PREC operated	K	V\PAUSE 3/4 Sec.>UA (8)	KBD and DISTR	UHA(ZCZCABC123)A (4) (8) (9) AUXRYRY... NNNN	(ZCZCABC123)A (9) (4) (8) AUXRYRY... NNNN	(9)
(c) LTRS discard (After each MSG in tape)		K	Transmitter steps through V signals until A is sensed	DISTR	No response	No response	
(d) Simulated poll (Precedence traffic available)	AUX XMTR PREC non-operated	K	V\PAUSE 3/4 Sec.>U (8)	KBD and DISTR	U(ZCZCABC123)A (4) (8) (9) AUXRYRY... NNNN	(ZCZCABC123)A (9) (4) (8) AUXRYRY... NNNN	(9) (19)
IV. TRANSMITTER START BOTH TRANSMITTERS							
(a) Use Method II(b) to prepare additional tape in Reg transmitter							
(b) Simulated poll (Only nonprecedence traffic available)	Both REG and AUX XMTR PREC non-operated	K	V\PAUSE 3/4 Sec.>UA (8)	KBD, AUX XMTR DISTR	UHA(ZCZCABC123)A (4) (8) (9) AUXRYRY... NNNN	(ZCZCABC123)A (9) (4) (8) AUXRYRY... NNNN	(9)
(c) Repeat IV(b)	Same as above	K	Same as above	Same as above	Same as above	Same as above	
(d) Simulated poll (Precedence traffic available)	REG XMTR PREC operated, AUX XMTR non-operated	K	V\PAUSE 3/4 Sec.>U (8)	KBD, REG XMTR DISTR	U(ZCZCABC123)A (4) (8) (9) REGRYRY... NNNN	(ZCZCABC123)A (9) (4) (8) REGRYRY... NNNN	(9)
(e) Use Method IV(b) to simulate poll	Both REG and AUX XMTR PREC non-operated	K	Same as IV(b)	Same as IV(b)	Same as IV(b)	Same as IV(b)	(9)
(f) Use Method IV(d) to simulate poll and repeat until no tape is in Aux transmitter	AUX XMTR PREC OPTN operated to CONT. REG XMTR PREC operated	K	Same as IV(d)	KBD, AUX XMTR DISTR	U(ZCZCABC123)A (4) (8) (9) AUXRYRY... NNNN	(ZCZCABC123)A (9) (4) (8) AUXRYRY... NNNN	(9) (20)

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TYPICAL LOCAL TEST PROCEDURES OF STATION FUNCTIONS NORMALLY CONTROLLED FROM THE SWITCHING CENTER (2) (13)

FEATURE TESTED AND PROCEDURE	PREC KEYS	SWITCH K-KT-T	TEST SEQUENCE (1)	SIGNAL SOURCE	MONITORING COPY	RECEIVING-ONLY COPY	ALARMS
(g) Use Method IV(d) until no tape is available in Reg transmitter	Same as IV(f) REG XMTR PREC operated each time. Restore AUX XMTR PREC OPTN to ON at end of test	K	Same as IV(d)	Same as IV(d)	Same as IV(d)	Same as IV(d)	(9) (19)
V. WAIT INTERVAL (Q CONDITION)							
(a) Place station in Q condition		K	VΩPAUSE 3/4 Sec.>QV	KBD	Q	No copy	
(b) Preparation of test tape (One message only)		T	VVVVVAV <<≡REGRYRY... <≡NNNN		No copy	No copy	
(c) Place station in Q condition		K	VΩPAUSE 3/4 Sec.>UQV	KBD	UHQ (18)	No copy	
(d) Precedence request	REG XMTR PREC operated	K		DISTR	(4) HHHH...(H characters continue until Q TEST key is operated) (12)	(4) At Master Stations Only: HHHH...(H characters continue until Q TEST key is operated) (12) Otherwise no copy	MISD MSG LAMP and BUZZER (14)
(e) Hold Q TEST key operated and simulate poll		K	VΩPAUSE 3/4 Sec.> (Release Q TEST key) A (8)	KBD and DISTR	A(ZCZCABC123)A (4) (8) (9) (12) REGRYRY... NNNN	(ZCZCABC123)A (9) (4) (8) REGRYRY... NNNN	(9)
(f) Place station in Q condition		K	VΩPAUSE 3/4 Sec.>AQV	KBD	AHQ	No copy	
(g) Preparation of test tape (One message only)		T	Same as V(b)	DISTR	Same as V(d)	Same as V(d)	MISD MSG LAMP and BUZZER (14)
(h) Repeat V(e)		K	Same as V(e)	KBD and DISTR	Same as V(e)	Same as V(e)	
(i) Use Method V(f) to place station in Q condition		K	Same as V(f)	KBD	AHQ	No copy	
(j) Place tape prepared in III(a) in Aux transmitter		K		DISTR	HHHH... (H characters continue until Q TEST key is operated) (12)	At Master Stations Only: HHHH... (H characters continue until Q TEST key is operated) Otherwise no copy	MISD MSG LAMP and BUZZER (14)

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TYPICAL LOCAL TEST PROCEDURES OF STATION FUNCTIONS NORMALLY CONTROLLED FROM THE SWITCHING CENTER (2) (13)

FEATURE TESTED AND PROCEDURE	PREC KEYS	SWITCH K-KT-T	TEST SEQUENCE (1)	SIGNAL SOURCE	MONITORING COPY	RECEIVING-ONLY COPY	ALARMS
(k) Repeat V(e)		K	Same as V(e)	KBD and DISTR	A(ZCZCABC123)A (4) (8) (9) (12) AUXRYRY... NNNN	(9) (4) (8) (ZCZCABC123)A AUXRYRY... NNNN	(9)
VI. DOUBLE TRANSMISSION AND EMERGENCY STOP							
(a) Preparation: Tape with long text in Aux transmitter. Operate SOM-NBR key to MAN							
(b) Simulate double poll		K	Hold Q TEST key operated ₩\PAUSE 3/4 Sec.>A₩, ₩\PAUSE 3/4 Sec.>₩ (8) Release Q TEST key (Sequence shall be completed before Msg in Aux transmitter is finished)	KBD and DISTR	No copy	No copy	AUX XMTR EMG STOP LAMP and BUZZER (15)
(c) Remove tape from Aux transmitter. Use Method II(b) to make one message with long text available in Reg transmitter. (15) Operate SOM-NBR key to MAN							
(d) Simulate double poll		K	Same as VI(b)	KBD and DISTR	No copy	No copy	REG XMTR EMG STOP LAMP and BUZZER (16)
(e) Transmit one message from Reg transmitter by Method II(b), (c), (d)							
(f) When message has been transmitted, simulate emergency-stop poll		K	₩\PAUSE 3/4 Sec.>X₩	KBD	X	No response	REG XMTR EMG STOP LAMP and BUZZER (16)
(g) Transmit one message from Aux transmitter by Method III(a), (b), (c)							
(h) When message has been transmitted, simulate emergency-stop poll		K	₩\PAUSE 3/4 Sec.>X₩	KBD	X	No response	AUX XMTR EMG STOP LAMP and BUZZER (15)

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TYPICAL LOCAL TEST PROCEDURES OF STATION FUNCTIONS NORMALLY CONTROLLED FROM THE SWITCHING CENTER (2) (13)

FEATURE TESTED AND PROCEDURE	PREC KEYS	SWITCH K-KT-T	TEST SEQUENCE (1)	SIGNAL SOURCE	MONITORING COPY	RECEIVING-ONLY COPY	ALARMS
I. RECEIVER CUT-ON							
(a) Preparation		K	<V≡NNNN	KBD	NNNN	May or may not have copy	
(b) False Cut-on		K	VSVIVDVR<<≡VARYRY ...<≡NNNN (3)	KBD	SIDR ARYRY ... NNNN (3) (4)	No response of receiving machine	
(c) Cut-on		K	VAVSVIVDVR<<≡RYRY... ...<≡NNNN (3)	KBD	ASIDR RYRY ... NNNN (3) (4)	AIDR RYRY ... NNNN (3) (4)	
(d) Nonvalid Cut-on (Master stations only)		K	VW<<≡RYRY...<≡NNNN (Repeat per Note 5)	KBD	W RYRY ... NNNN (4) (5)	W RYRY ... NNNN (4) (5)	MISD MSG LAMP and BUZZER (14)
(e) Nonvalid Cut-on (Master stations only)		K	W<<≡RYRY...<≡NNNN	KBD	W RYRY ... NNNN (4)	W RYRY ... NNNN (4)	MISD MSG LAMP and BUZZER (14)
(f) Nonvalid Cut-on (Master stations only)		K	\W<<≡RYRY... <≡NNNN (17)	KBD	W RYRY ... NNNN (4)	W RYRY ... NNNN (4)	MISD MSG LAMP and BUZZER (14)
(g) Nonvalid Cut-on (Master stations only)		K	\PAUSE 2 seconds or longer W<<≡RYRY <≡NNNN	KBD	W RYRY ... NNNN (4)	No copy	
(h) Receiver blinding, letters erase, and emergency-all-messages features (21)		K	<≡ NNNN<∧123 \PAUSE 3/4 Sec. > 456V789<≡NNNN	KBD	NNNN 123456UIO NNNN	NNNN 123789 NNNN	
II. TRANSMITTER START REG TRANSMITTER							
(a) H Response		K	V\PAUSE 3/4 Sec. >UFCBJASIDR (22)	KBD	UFCBJASIDR (22)	No copy	
(b) Preparation of test tape		KT or T (7)	V V VAV<<≡REGRYRY... (3) <≡NNNNVVVVVV (Repeat once)	KBD	A REGRYRY ... NNNN (Repeat once) (3) (4) (7)	A REGRYRY ... NNNN (Repeat once) (3) (4) (7)	
(c) Simulated poll (With only nonprecedence traffic available)	REG XMTR PREC non-operated	K	V\PAUSE 3/4 Sec.>UAV	KBD and DISTR	UA (ABC123) A (22) REGRYRY ... NNNN (4) (8) (9)	(ABC123) A (9) (4) (8) REGRYRY ... NNNN	(9)
(d) "Letters" discard (After each MSG in tape)		K	Transmitter steps through V signals until A is sensed	DISTR	No response of typing unit	No response of typing unit	

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TYPICAL LOCAL TEST PROCEDURES OF STATION FUNCTIONS NORMALLY CONTROLLED FROM THE SWITCHING CENTER (2) (13)

FEATURE TESTED AND PROCEDURE	PREC KEYS	SWITCH K-KT-T	TEST SEQUENCE (1)	SIGNAL SOURCE	MONITORING COPY	RECEIVING-ONLY COPY	ALARMS
(e) Simulated poll with precedence traffic available	REG XMTR PREC operated	K	VVPAUSE 3/4 Sec.>UVV (8)		U(ABC123)A (4) (8) (9) REGRYRY . . . NNNN	(ABC123)A (9) (4) (8) REGRYRY . . . NNNN	(9) (19)
III. TRANSMITTER START AUXILIARY TRANSMITTER							
(a) Preparation of test tape (10)		KT or T (7)	VVVVVVVVAVV<<≡ AUXRYRY . . . (3) <≡NNNNVVVVVV (Repeat at least 5 times, remove tape from Reg transmitter and place in Aux transmitter) (11)	KBD	A (3) (4) (7) AUXRYRY . . . NNNN (Repeated)	A (3) (4) (7) AUXRYRY . . . NNNN (Repeated)	
(b) Simulated poll (Only nonprecedence traffic available)	AUX XMTR PREC non-operated	K	VVPAUSE 3/4 Sec.>UAVV (8)	KBD and DISTR	UA(ABC123)A (22) (4) (8) (9) AUXRYRY . . . NNNN	(ABC123)A (9) (9) (4) (8) AUXRYRY . . . NNNN	
(c) "Letters" discard (After each MSG in tape)		K	Transmitter steps through V signals until A is sensed	DISTR	No response	No response	
(d) Simulated poll (Precedence traffic available)	AUX MTR PREC operated	K	VVPAUSE 3/4 Sec.>UVV (8)	KBD and DISTR	U(ABC123)A (4) (8) (9) AUXRYRY . . . NNNN	(ABC123)A (9) (4) (8) AUXRYRY . . . NNNN	(9) (19)
IV. TRANSMITTER START BOTH TRANSMITTERS							
(a) Use Method II(b) to prepare additional tape in Reg transmitter							
(b) Simulated poll (Only nonprecedence traffic available)	Both REG and AUX XMTR PREC non-operated	K	VVPAUSE 3/4 Sec.>UAVV (8)	KBD, AUX XMTR, DISTR	UA(ABC123)A (22) (4) (8) (9) AUXRYRY . . . NNNN	(ABC123)A (9) (9) (4) (8) AUXRYRY . . . NNNN	(9)
(c) Repeat IV(b)	Same as above	K	Same as above	Same as above	Same as above	Same as above	
(d) Simulated poll (Precedence traffic available)	REG XMTR PREC operated, AUX XMTR non-operated	K	VVPAUSE 3/4 Sec.>UVV (8)	KBD, REG XMTR, DISTR	U(ABC123)A (4) (8) (9) REGRYRY . . . NNNN	(ABC123)A (9) (9) (4) (8) REGRYRY . . . NNNN	(9)
(e) Use Method IV(b) to simulate poll	Both REG and AUX XMTR PREC non-operated	K	Same as IV(b)	Same as IV(b)	Same as IV(b)	Same as IV(b)	(9)

TABLE II — Page 3

TYPICAL LOCAL TEST PROCEDURES OF STATION FUNCTIONS NORMALLY CONTROLLED FROM THE SWITCHING CENTER (2) (13)

FEATURE TESTED AND PROCEDURE	PREC KEYS	SWITCH K-KT-T	TEST SEQUENCE (1)	SOURCE SIGNAL	MONITORING COPY	RECEIVING-ONLY COPY	ALARMS
(f) Use Method IV(d) to simulate poll and repeat until no tape is in Aux transmitter	AUX XMTR PREC OPTN operated to CONT. REG XMTR PREC operated	K	Same as IV(d)	KBD, AUX XMTR, DISTR	U(ABC123)A (4) (8) (9) AUXRYRY . . . NNNN	(ABC123)A (9) (4) (8) AUXRYRY . . . NNNN	(9) (20)
(g) Use Method IV(d) until no tape is available in Reg transmitter	Same as IV(f) REG XMTR PREC operated each time. Restore AUX XMTR PREC OPTN to ON at end of test	K	Same as IV(d)	Same as IV(d)	Same as IV(d)	Same as IV(d)	(9) (19)
V. WAIT INTERVAL (Q CONDITION)							
(a) Place station in Q condition		K	V\PAUSE 3/4 Sec.>QV	KBD	Q		
(b) Preparation of test tape (One message only)		T	VVVVVAV <<=REGRYRY... <=NNNN		No copy No copy	No copy	
(c) Place station in Q condition		K	V\PAUSE 3/4 Sec.> UQV	KBD	UQ (18)	No copy	
(d) Precedence request	REG XMTR PREC operated	K		DISTR	No copy (23)	No copy	
(e) Simulate poll		K	V\PAUSE 3/4 Sec.> AV	KBD and (8) DISTR	A(ABC123)A (4) (8) (9) REGRYRY . . . NNNN	(ABC123)A (9) (4) (8) REGRYRY . . . NNNN	(9)
(f) Place station in Q condition		K	V\PAUSE 3/4 Sec.> AQV	KBD	AQ	No copy	
(g) Preparation of test tape (One message only)		T	Same as V(b)	DISTR	Same as V(d)	Same as V(d)	
(h) Repeat V(e)		K	Same as V(e)	KBD and DISTR	Same as V(e)	Same as V(e)	
(i) Use Method V(f) to place station in Q condition		K	Same as V(f)	KBD	AQ	No copy	
(j) Place tape prepared in III(a) in AUX transmitter		K		DISTR	No copy (23)	No copy	

TABLE II — Page 4

TYPICAL LOCAL TEST PROCEDURES OF STATION FUNCTIONS NORMALLY CONTROLLED FROM THE SWITCHING CENTER (2) (13)

FEATURE TESTED AND PROCEDURE	PREC KEYS	SWITCH K-KT-T	TEST SEQUENCE (1)	SIGNAL SOURCE	MONITORING COPY	RECEIVING-ONLY COPY	ALARMS
(k) Repeat V(e)		K	Same as V(e)	KBD and DISTR	A(ABC123)A (4) (8) (9) AUXRYRY . . . NNNN	(ABC123)A (9) (4) (8) AUXRYRY . . . NNNN	(9)
VI. DOUBLE TRANSMISSION AND EMERGENCY STOP							
(a) Preparation: Tape with long text in Aux transmitter. Operate SOM-NBR key to MAN							
(b) Simulate double poll		K	Hold Q TEST key operated V\PAUSE 3/4 Sec.>UAV, wait until Aux transmitter starts to step, V\PAUSE 3/4 Sec.>U (8) Release Q TEST key (Sequence shall be completed before Msg. in Aux. transmitter is finished)	KBD and DISTR	No copy	No copy	AUX XMTR EMG STOP LAMP and BUZZER (15)
(c) Remove tape from Aux transmitter. Use Method II(b) to make one message with long text available in Reg transmitter. (15) Operate SOM-NBR key to MAN							
(d) Simulate double poll		K	Same as VI(b)	KBD and DISTR	No copy	No copy	REG XMTR EMG STOP LAMP and BUZZER (16)
(e) (11) Transmit one message from Reg transmitter by Method II(b), (c), (d)							
(f) When message has been transmitted, simulate emergency-stop poll		K	V\PAUSE 3/4 Sec.>XV	KBD	X	No response	REG XMTR EMG STOP LAMP and BUZZER (16)
(g) Transmit one message from Aux. transmitter by Method III(a), (b), (c)							
(h) When message has been transmitted, simulate emergency-stop poll		K	V\PAUSE 3/4 Sec.>XV	KBD	X	No response	AUX XMTR EMG STOP LAMP and BUZZER (15)

NOTES FOR TABLES I AND II

Note

1 Table of Symbols Used

Symbol	TTY "Stunt" Function
⋔	Figures
⋁	Letters
<	Carriage Return
>	Space
≡	Line Feed
⫏	Blank

2 Switch and Key Positions for Tests On Control Panel of Cabinet

Switch or Key Desig.	Position
Local Test	COMPL STA (DC Power Alarm Operates)
K-KT-T	As Spec in Table
Typing Units	NORM
RECEIVING	NORM
SOM-NBR	AUTO or MAN See Note 9
REG XMTR PREC OPTN	ON
AUX XMTR PREC OPTN	Operated to ON, unless test specifies operation to CONT
REG XMTR PREC AUX XMTR PREC	Operated only when specified by test procedure
G on LCEC cabinet	
TEST	TEST 2

Note

3 The sequence shown assumes that station A is under test. At other stations, interchange the A character with the receiver cut-on code for the station under test. If some cut-on codes are not used on the particular multistation line, omit these codes and the preceding "letters" signal.

4 Characters from the preceding test will appear in same first line unless a local "carriage return" and "line feed" is provided.

5 Repeat the test substituting, in turn, each station cut-on code which is nonvalid for the line for the character W shown in the test sequence.

6 Pause after each station code to allow time for H response. At station A/U, the H signals will appear on monitor copy as shown. At other stations, the H characters will appear after the regular and priority polling code for the particular station.

7 With the K-KT-T switch in position KT, local copy will be obtained and the receiving-only machine will be cut on as indicated. If local copy is not needed, tape should be perforated with the K-KT-T switch in the T position. This will avoid cut-on of the receiving-only machine which is not significant during preparation of tape.

NOTES FOR TABLES I AND II – 2

8 The sequence shown assumes that station A/U is under test; at other stations substitute the regular and/or precedence transmitter-start codes, as required, for those shown. Pause between the precedence and the regular polling codes to allow time for the H response.

9 The portion of this sequence between the parentheses is typical of the start-of-message and channel number sequence which will appear on the monitoring copy if the SOM-NBR switch is in position AUTO. At a master station, the characters shown between parentheses will appear on the receiving-only copy, the receiver being cut on by the A character of the channel number group. If the first character of the channel number group is not A, the receiver will be cut on as a nonvalid cut-on code character and the MISD MSG alarm will be given. If the SOM-NBR switch is in the MAN position, the receiver will be cut on by the A character transmitted from the distributor.

At nonmaster stations with SOM-NBR switch in position AUTO, the portion of this sequence between parentheses will not appear on the RECEIVING-ONLY copy, which will start with character A. With SOM-NBR switch in position MAN, the RECEIVING-ONLY machine will have copy in tests II(c), III(b), IV(d), V(e), and V(k), and will have no copy in tests II(e), III(d), IV(b), IV(e), IV(f) and IV(g); that is, copy will be received only for the first message on a tape.

10 The preferred method of preparing tape for the auxiliary transmitter is to use a separate tape perforator. The method shown may be used if a separate perforator is not available.

11 After removing tape from the REG transmitter, perforate additional "letters" signals so that the pivoted sensing head may be pushed against the punch block and the lid plate reclosed. This restores the count of messages available in the REG transmitter to zero.

12 An extraneous character may appear on the monitor copy as the Q TEST key is operated or released.

13 Before operating any keys or switches in preparation for a local test, note the position of message number selectors and of all option switches such as REG and AUX XMTR PREC OPTN and SOM-NBR. When local tests are completed, restore the LOCAL TEST switch to normal and restore the option keys and switches to the normal operating position for the particular station, and reset the message number selectors to the original positions.

14 At a master station, clear misdirected message alarm by momentarily operating the BUZZER key and then operating the ALM RLS key.

15 Clear AUX XMTR EMG STOP alarm by removing tape from AUX transmitter and then momentarily operating BUZZER and ALM RLS keys.

16 Clear REG XMTR EMG STOP alarm by operating REG XMTR HOLD key and then momentarily operating BUZZER and ALM RLS keys. Then restore REG XMTR HOLD key to NORMAL.

17 Type the sequence ℸ W as fast as possible on the keyboard.

18 No further copy shall be printed until step V(d) is carried out.

19 The REG or AUX XMTR PREC lamp shall light when the associated key is operated, and shall extinguish after character U is typed.

20 The AUX XMTR PREC lamp shall light when key REG XMTR PREC OPTN is operated to CONT, and shall extinguish after the last message in AUX transmitter has been completely transmitted.

NOTES FOR TABLES I AND II—3

21 Set RECEIVING switch to EMG ALL MSGS. Restore this switch at the end of test I(H) to NORMAL.

22 Pause after each station code to allow time for H response. The H will not be printed but the DISTR B clutch magnet will be seen to operate momentarily after the priority and regular polling code for the particular station.

23 The DISTR B clutch magnet will pulse repeatedly until the VII of the next text is typed.

TABLE III

TYPICAL TEST PROCEDURES FOR BACK-TO-BACK OPERATION (1)

FEATURE TESTED AND PROCEDURE	TEST SEQUENCE	SIGNAL SOURCE	MONITORING COPY	RECEIVING-ONLY COPY
I. Complete transmission of message via send and receive customer equipment	VVVVVVVAV<<≡ RYRY . . . <<≡ NNNN (3)	DISTR A	(ABC123) A RYRY . . . NNNN (2)	*(ABC123) A RYRY . . . NNNN (2) (5)
II. Transmission of H response.	Operate relay HB by hand (4)	DISTR B		HHHHH . . .

NOTES FOR TABLE III

Note

1 Operate the following switches as indicated:

(a) On Control Panel of Cabinet:

Switch Designation	Position
TYPING UNITS	NORM
RECEIVING	EMG ALL MSGS
LOCAL TEST	NORM
MAN XMTR START	ON
HOLD KEYS	NORM
SOM-NBR	AUTO
POWER	ON

(b) ON 28ASR:

POWER	ON
K-KT-T	K

(c) ON 28RO:

POWER	ON

(d) ON LCEC:

POWER	ON
TEST	AS REQUIRED

2 The portion of this sequence between parentheses is typical of the start-of-message and channel number sequence which will appear on the monitoring and receiving-only copy.

3 TEST key in TSTI position.

4 TEST key in TSTII position. Patch from the SEND LP CUR jack in the LCEC to the R jack in the station control cabinet.

5 *The start-of-message and channel number sequence should be preceded by a series of garbled characters.