DATA SETS 105A AND B

TESTS AND INSTALLATION METHODS

1. INTRODUCTION

1.01 This section contains installation information and tests to be made on data set 105A.

1.02 This section is reissued to:

- Include information on Data Set 105B
- Include use of form E-4905-1
- Include use of 24A loop checker
- Change Table A and Fig. 8 (previously Table B)
- Change several line-up tests
- Change 6A test set connections.

1.03 Due to extensive changes, marginal arrows have been omitted.

2. GENERAL

2.01 Data sets 105A (SD-3D008-01) and 105B (SD-3D011-01) are intended for use with WADS and 4-row TWX services. A complete station includes:

- Data Set 105A or B
- Attendant Set (supplied with the teletypewriter as part of the call control unit)
- 33- or 35-type, 100-speed, 8-level teletypewriter (TTY).

2.02 Data sets 105A and B use either 6 or 7 electronic plug-in units (cards) depending on whether or not call progress tone detection, "X" option, is used. The cards are as follows:

- J1D105AA, Logic
- J1D105AB, Timer
- J1D105AC, Restrainer - Dial Tone Detection, (option "Z")
- J1D105AH, Restrainer (No Dial Tone Detection, option "Y")
- J1D105AD, Modulator
- J1D105AE, Filter
- J1D105AF, Demodulator
- J1D105AG, Call Progress Tone Detector (option "X")

2.03 Data set 105A contains its own power supply, either:

- J87240A (SD-81625-01) which provides +20 and -20 volts dc, 0.6 amp

or

- J87240B (SD-81640-01) which provides +20 and -20 volts dc, 0.525 amp.

2.04 Data Set 105B contains its own power supply:

- J87240B (SD-81640-01) which provides +20 and -20 volts dc, 0.525 amp.

2.05 Fig. 1 is a front view of data set 105A. It shows the locations of:

- Screw switches
- Rectifier
- Printed circuit cards
- Card retaining bail.

2.06 Fig. 2 is a side view of DEMODULATOR card. It shows the location of:

- D screw switches
- Key slot.

Each card is provided with a key slot. This prevents accidental interchange of cards.

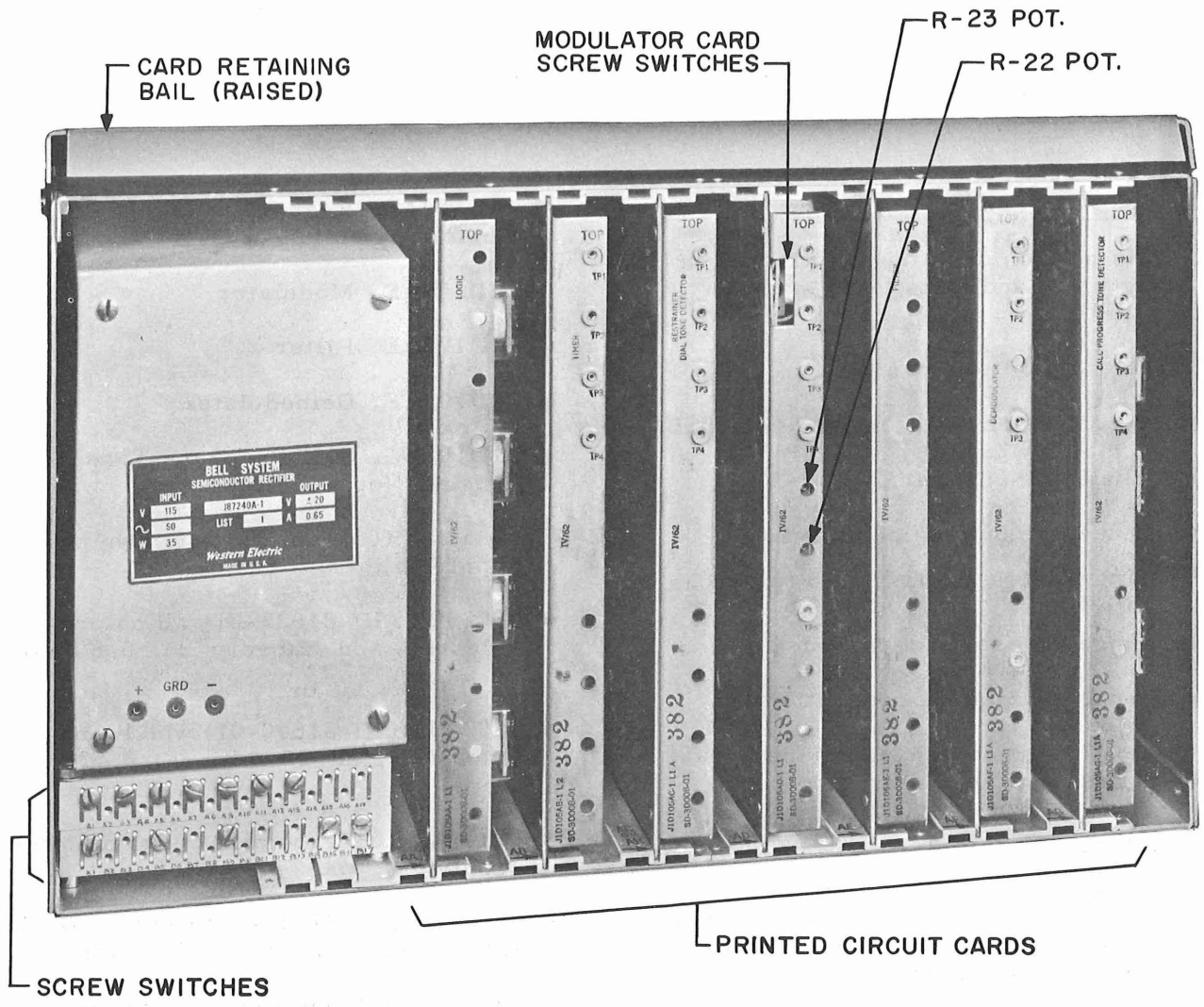


Fig. 1 - Data Set 105A, Front View

CAUTION: If card is forced into incorrect slot, coding bar may be damaged.

2.07 Fig. 3 is a rear view of data set 105A. It shows the location of:

- G and P connectors
- Printed circuit card receptacles
- AC INPUT plug
- DC OUTPUT terminals.

2.08 Fig. 4 is a block diagram of a typical WADS-D station with a controller. Fig. 5 is a block diagram of WADS-C or 4-row TWX service.

2.09 Fig. 6 is a block diagram of data set 105A and shows how the attendant circuit and TTY tie into the data set.

2.10 No routine maintenance is required for data sets 105A and B.

3. INSTALLATION

3.01 WADS and 4-row TWX stations will be fully assembled at the Distributing House or telephone service center prior to shipment.

3.02 Form E-4905-1, Fig. 7, should be filled out and attached to the data set at each installation. Form E-4905-1 should be placed below the type 105 data set on the top face of the support bracket.

Information is to be entered on the form as follows:

- Type 105 - Data Set: Enter letter in blank space denoting type of data set.
- Circuit No.: Enter TWX or WADS directory number of the station as shown on service order or station layout card.
- Expected Measured Loss (EML): Enter loop design loss for 1000 and 2300 cps as shown on station layout card. Refer to Table B for limits and place check in proper block.
- Data Set Specified Output Levels: Enter value of f_{1m} and f_{2m} tones as specified on station layout card or service order.

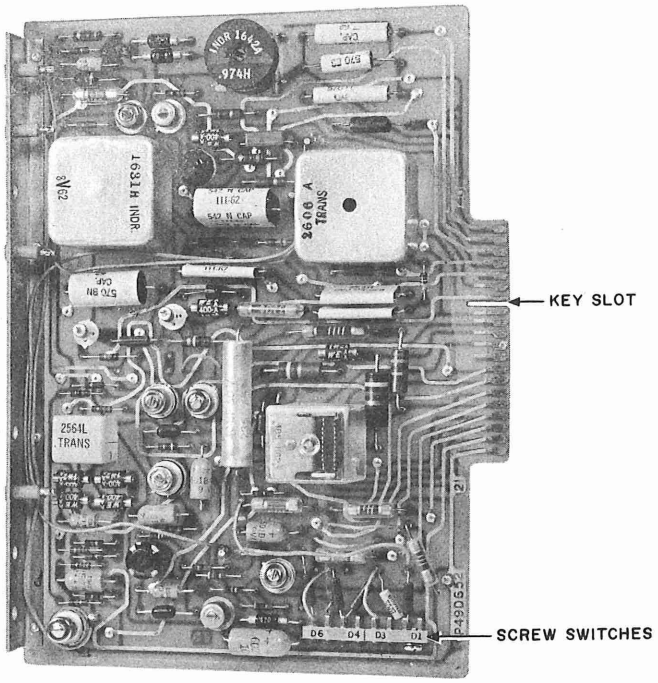


Fig. 2 - DEMODULATOR Card, Side View

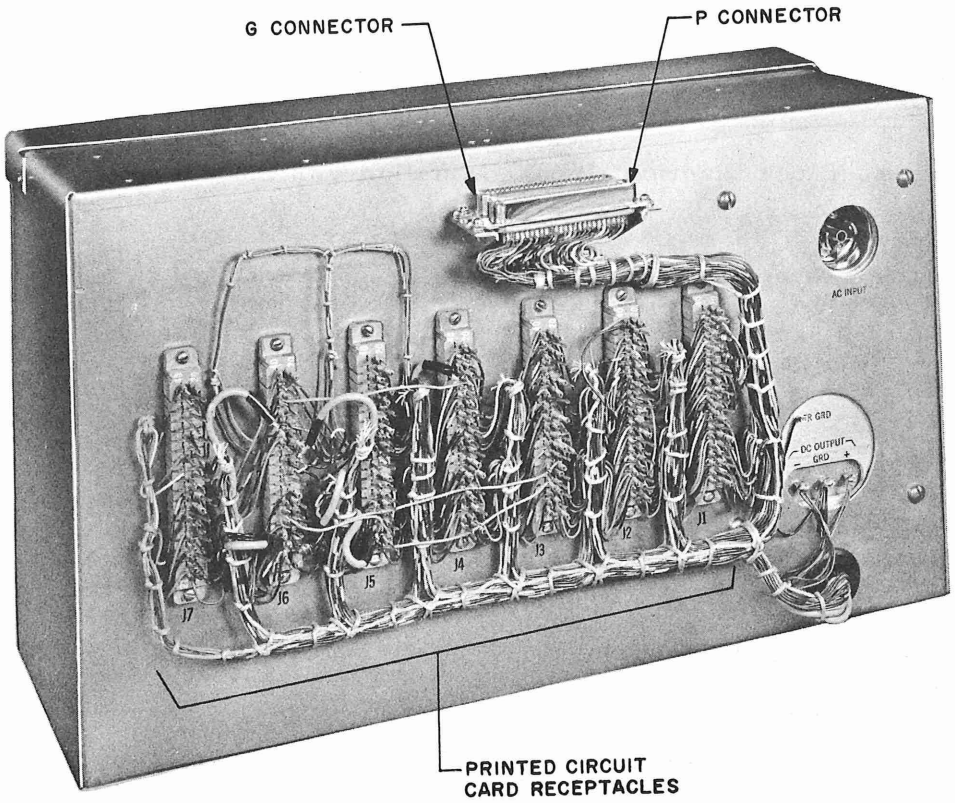


Fig. 3 - Data Set 105A, Rear View

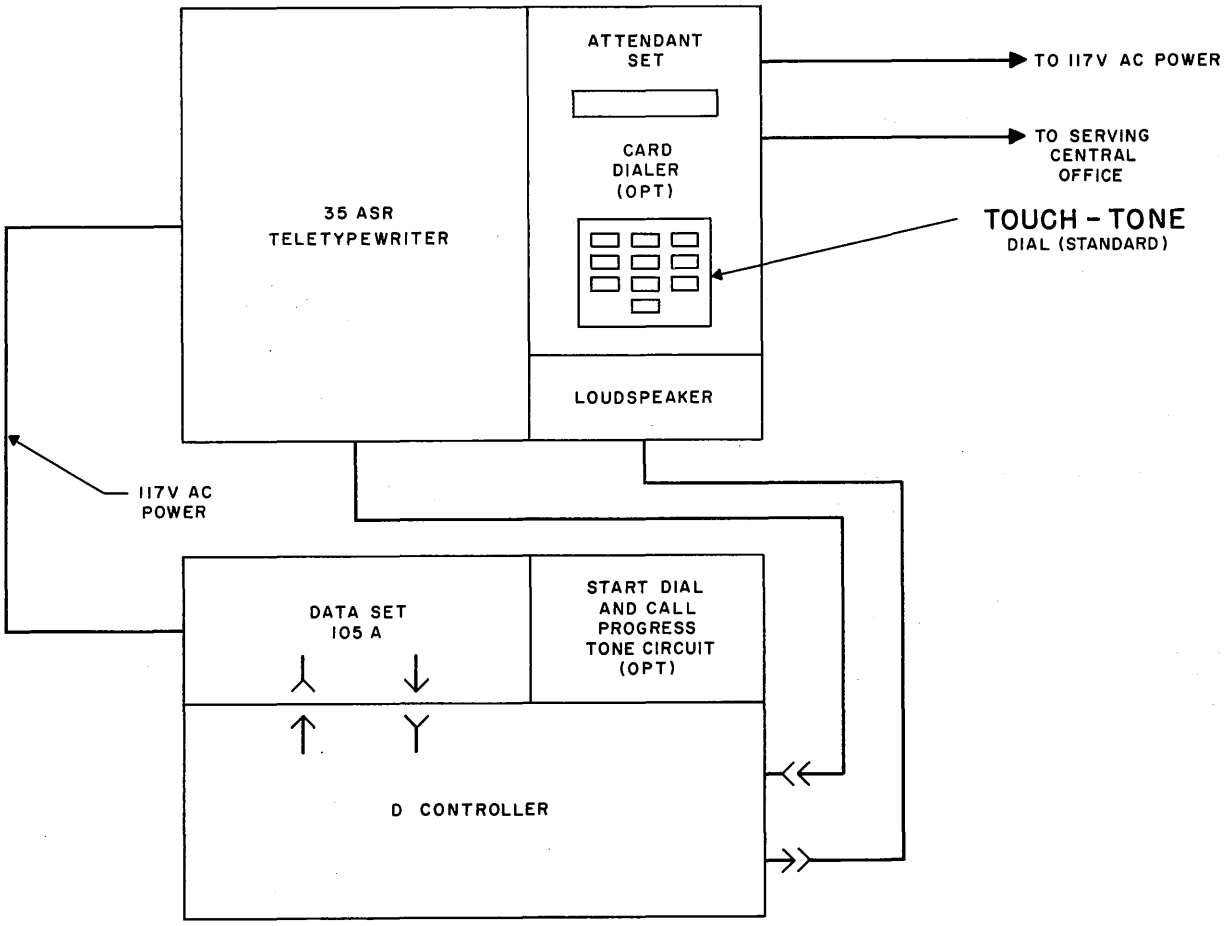


Fig. 4 - Block Diagram, WADS-D Station with Controller (Typical)

- Trip Ringing Feature: Check proper block to indicate feature used. Screw switch settings shown in Table A.
- Installed By: Initials of person making installation tests.
- Date: Enter date of initial installations and subsequent dates when any changes are made on entries of form.
- Hybrid Network: Check proper block to indicate screw switch setting on MODULATOR card as specified on station layout card. Check network resistance and associated screw switch settings shown in Table C.
- Desensitizing Network: Check block or blocks to indicate screw switch setting on DEMODULATOR card for desensitizing network. Fig. 8 shows screw switch setting for the gain reduction specified on the circuit layout card.
- Data Set Output Reference Measurements: Record results of test described in 4. 17, Steps 5 and 9.
- Other Data Set Features: Indicates other data set features. Screw switch settings are shown in Table A.

3. 03 To minimize inductive interference to data signals on the data line, station wire should not be carried in the same run as cables to other business machines or lines carrying other TTY service. Where this condition cannot be met, it will be necessary to use SK (shielded) station wire between data set and cable distribution terminal or building entrance.

TABLE A

DATA SET 105 FUNCTION AND SCREW SWITCH SETTING

Function		Screw Switch Setting	
		Open	Closed
Connecting Circuit Arranged to Trip Ringing	Only During the Silent Interval	B1	B3
	During the Silent and Ringing Intervals*	B3	B1
Half Duplex		B6	B5
Full Duplex		B5	B6
Normal Operation*			A1, A3, A5, A7, A9, A11, A13
Manual Answer		B9	
Automatic Answer*			B9

* Function provided at factory.

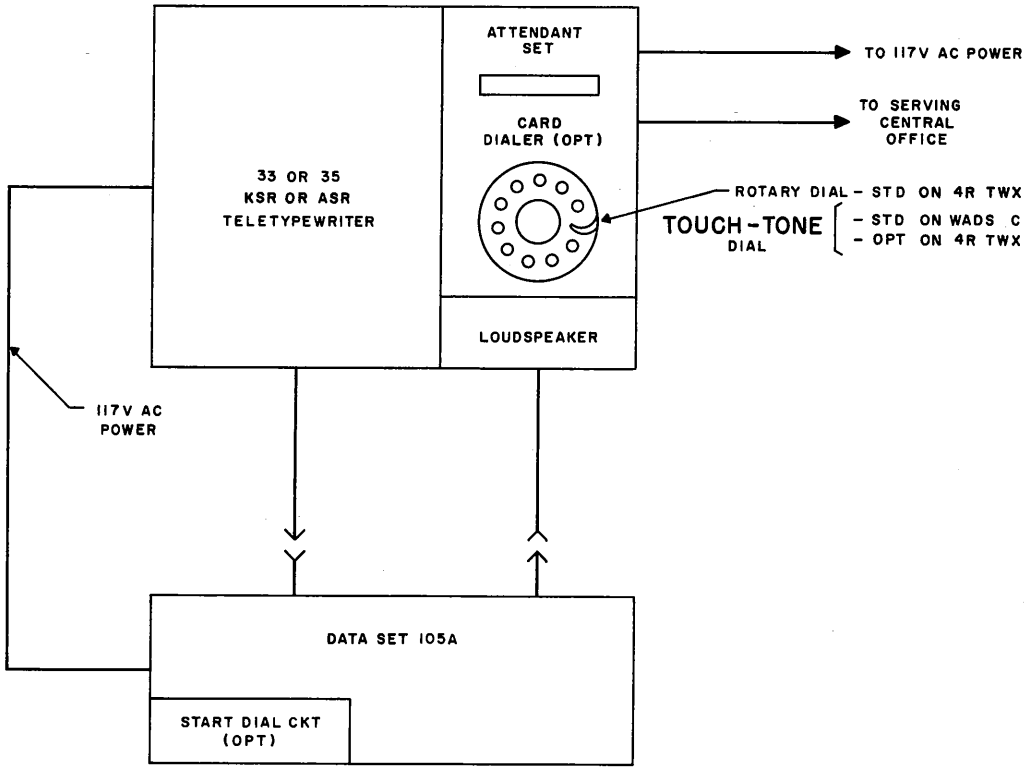


Fig. 5 - Block Diagram, WADS-C Station (4-Row TWX Service)

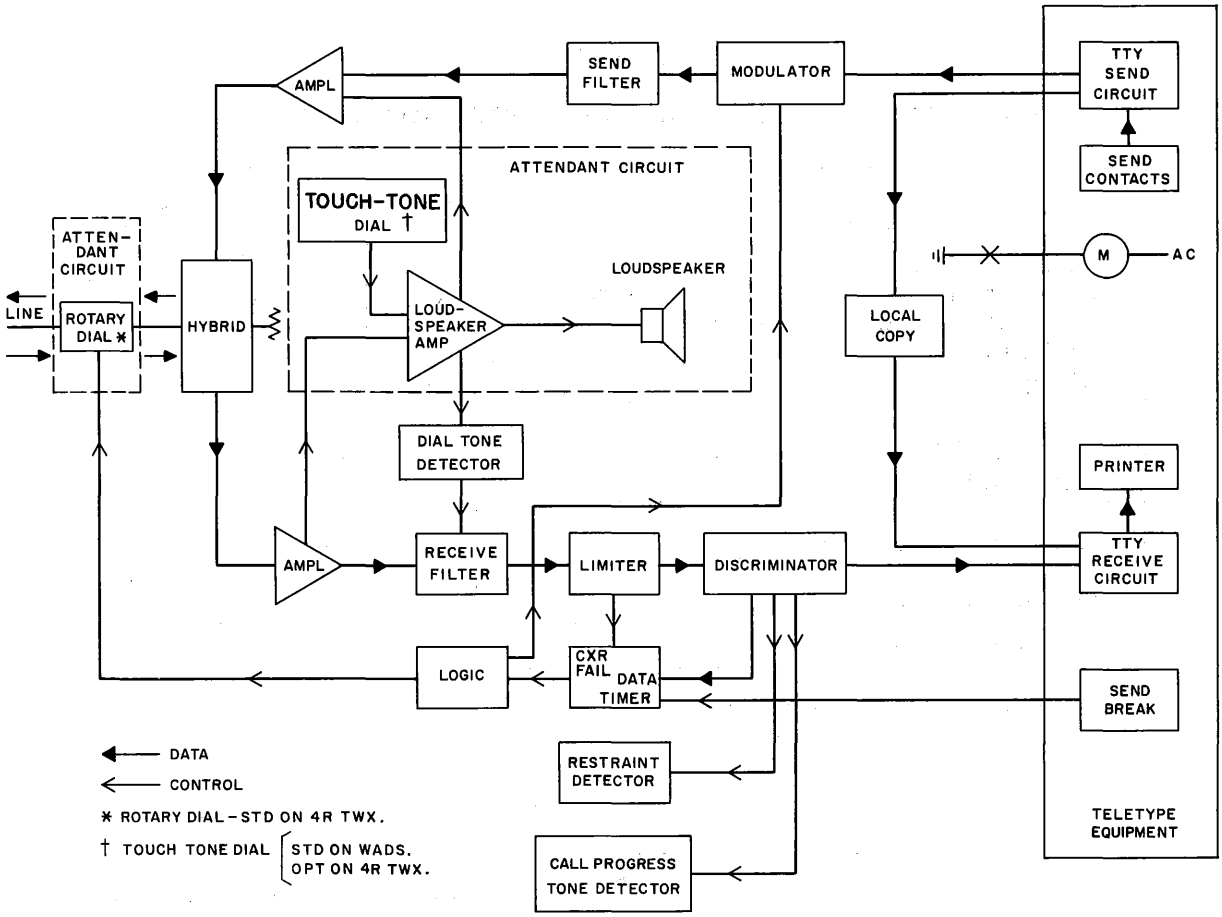
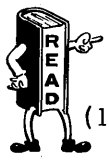


Fig. 6 - Block Diagram, Data Set 105A

3.04 A 3-conductor power cord is used to connect TTY to a 117-volt, 60-cycle ac power supply. Customer must furnish a 3-wire outlet, not under control of a switch.

3.05 A check of the ground should be made to verify that a good ground exists. This precaution is particularly necessary where other business machine equipment is located in the same room with TTY station. All 117-volt power sources in the same room should be served from the same ac service cabinet so that the same ground bus feeds each outlet. This measure is necessary to prevent introduction of noise potentials which might otherwise develop and cause data errors.

3.06 If a transient ground condition is suspected, the 6A impulse counter may be used to verify and isolate trouble. Connect 6A impulse counter and conduct test as follows:



Do not ground 6A for this test.

(1) Connect one ground to J2.

(2) Connect other ground to J3.

(3) Set switch S1 to VOICE-BAND.

(4) Set switches S2 and S3 to total 90 dbm.

(5) Set timer for 15 minutes.

(6) Reset counter to 0.

At the end of the 15-minute test period there should be no reading on counter. If there is a reading on the counter, grounding conditions must be improved.

3.07 Bonding grounds may eliminate trouble when a visual inspection does show that a multiple ground condition exists.

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E-4905-1
3-63

DATA SET-TYPE 105
DATA SET AND LOOP DESIGN VALUES

CIRCUIT NO. _____

EXPECTED MEASURED LOSS (EML)
(SEE BSP 314-300-300 FOR 4-WIRE EML MEASUREMENT)

1000 CPS _____ DBM ☐ ±1DB

LOOP LOSS LIMITS

2300 CPS _____ DBM ☐ ±2DB

DATA SET SPECIFIED OUTPUT LEVELS

F1M _____ DBM

F2M _____ DBM

TRIP RINGING FEATURE

☐ DURING SILENT AND RINGING INTERVAL (OPEN B3, CLOSE B1)

☐ DURING SILENT INTERVAL ONLY (OPEN B1, CLOSE B3)

INSTALLED BY _____

DATE _____

HYBRID NETWORK
(MOD CARD)

CLOSE ONLY

C1 ☐ C2 ☐ C3 ☐

DESENSITIZING NETWORK
(DEMOD CARD)
SEE SECTION 591-018-200, TABLE B

SCREW SWITCH CLOSED

☐ D1 (0 DB) ☐ D3 (2 DB) ☐ D4 (4 DB) ☐ D6 (6 DB) ☐ NONE (8 DB)

DATA SET OUTPUT REFERENCE MEASUREMENT

F1M (TP4-TP5) _____ DBM

F2M (TP4-TP5) _____ DBM

OTHER DATA SET FEATURES

☐ HALF DUPLEX

☐ FULL DUPLEX

☐ AUTOMATIC ANSWER

☐ MANUAL ANSWER

Fig. 7 - Form E-4905-1

4. TESTS AND INSPECTIONS

4.01 The following tests and inspections should be performed sequentially as outlined in 4.02 through 4.22. All adjustments will be made at the factory prior to shipment. If test requirements cannot be met, refer to Section 591-018-300.

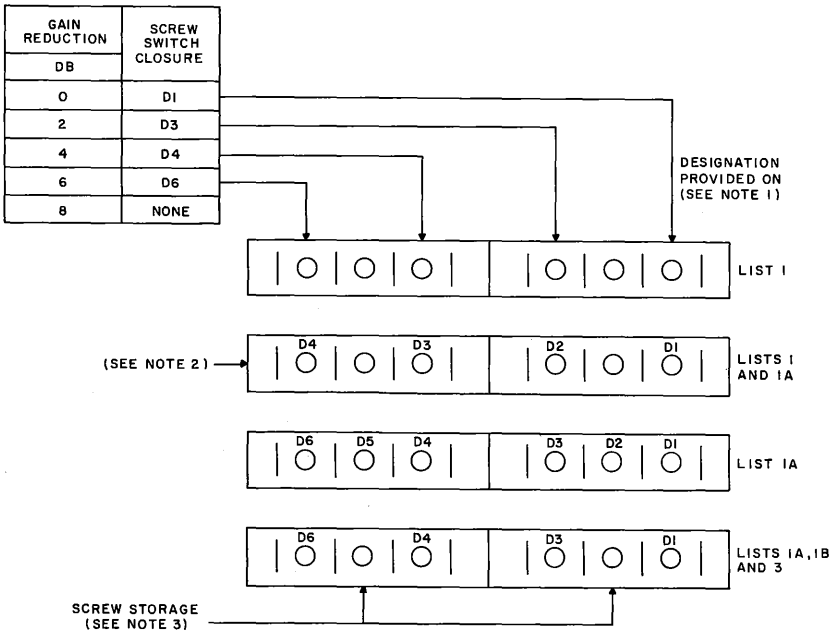
When testing a station, care should be used to prevent excessive use of customer TTY paper, especially the multiple copy form feed type.

4.02 Screw switch D1, on the DEMODULATOR card, will have been closed to provide maximum sensitivity (maximum gain of amplifier stage). The gain of the stage may be reduced in 2-db steps as shown in Fig. 8.

4.03 Screw switches should be set according to the service order or circuit layout card (4.13).

Caution: Extreme care should be used to avoid stripping threads in the plastic strip when tightening screws. Only specified switches should be operated.

WARNING: A potential exists on all screw switches. Although voltage is low, injury could result from contact with switches.



Note 1: Screw switches in J1D105AF, Lists 1, 1A, 1B, and three demodulator units may bear any one of the above designations. Regardless of the designation, closure of the screw switch in the location indicated by the arrows will provide the associated reduction in gain.

Note 2: These screw switch designations are incorrect, ie, D2, D3, and D4 should be D3, D4, and D6, respectively.

Note 3: It is intended that only one (or none for 8 db) switch be closed (operated) for a given reduction. Some units are equipped with two screws, one of which is a spare. Always store unused screws in the positions indicated above in an open (unoperated) condition.

Fig. 8 - Receiving Gain-Demodulator Unit

4.04 Measurement of Loop Loss on Non-Gain, Non-RX (Remote-Exchange) Loops Using 24A LOOP CHECKER and Test Set TTS-28

STEP	ACTION	RESULTS
1	Connect incoming line to the 24A LOOP CHECKER LINE terminals.	
2	Connect 1011-type hand set to TEL terminals of 24A LOOP CHECKER. TALK-MON switch should be in MON position.	
3	Set LENGTH dial, on loop checker, for length of loop in kilofeet (1000), if length of loop is between 2 and 18 kilofeet. For all loops greater than 18 kilofeet, set LENGTH dial to OVER 18. Switch coupled to the control should operate (click).	
4	Operate TALK-MON switch on 1011 hand set to TALK and dial 24B LOOP CHECKER generator test-line number at the originating central office. (Switch on 1011 hand set remains in TALK position during remainder of test.)	Sweep tone will be heard in hand set (1000 to 3000 cps).

STEP	ACTION	RESULTS
5	Hold ZERO SET button depressed and adjust ZERO SET dial until needle on meter is at ZERO (midscale).	

Note: If it is not possible to "zero" the meter, operate the REV (reversing) switch. This reverses the line connection to the test set and avoids reconnecting and redialing test number.

6	Release ZERO SET button.	
7	Depress MEAS button and observe meter indications. Loudness of tone heard in hand set is reduced while MEAS button is depressed.	Needle should remain in GN (green) portion of dial as frequency is swept through several sweeping cycles. If needle dips into YEL (yellow) portion of dial, the line does not meet transmission requirements. Refer to Section 314-300-300 for trouble investigation.
8	Release MEAS button and remove connections to 24A LOOP CHECKER.	
9	Position TTS-28 FUNCTION switch to TEL SET - DIAL.	
10	Connect incoming TEL LINE to terminals + and - of TTS-28.	
11	Connect hand test set (1011B) to TTS-28 TEL terminals.	
12	Using 1011B, dial designated number for 1000-cycle (1 milliwatt) tone at originating central office.	
13	When 1000-cycle tone is received position meter FUNCTION switch to DBM 900Ω TERM, 0.	Meter reading is actual measured loss (AML) of loop at 1000 cycles.

4.05 For RX loops or loops with gain devices, see Section 314-300-300 for loop loss measurement.

4.06 Expected measured loss (EML) shown on station layout card was calculated at the time of "prescription design." If AML is not within limits shown in Table B, loop should be turned back for repair.

TABLE B

LOOP LIMITS

Type of Loop	AML Limits
Without Repeaters or Carriers	EML ±1 db
With E7 Repeaters Only	EML ±1 db
With All Other Repeaters and/or Carrier	EML ±2 db

4.07 If loop is within limits, remove connections from TTS-28 and proceed with tests and inspections as outlined.

Do not connect loop to data set at this time.

4.08 Make a visual inspection of data set for:

- Broken plug-in units.
- Improper position of plug-in units.

4.09 With all connections made between data set, attendant set, and TTY and all plug-in units firmly seated in their proper positions, proceed with the following tests:

4.10 Power Supply Voltage Measurement

STEP	ACTION	RESULTS
1	Plug TTY and data set power cords into proper receptacles.	
2	With TTS-28 FUNCTION switch on OHMS, X1 position, test for continuity between GND test point on rectifier and data set frame.	Should read 0, short.
3	Position TTS-28 FUNCTION switch to VDC, 30.	
4	Measure between +20 and GND test points on rectifier.	Should read +20 ±3 volts.
5	Measure between -20 and GND test points on rectifier.	Should read -20 ±3 volts.
6	Compare voltages obtained in Step 4 and 5.	Positive and negative voltages should be nearly equal, the difference not to exceed 2 volts.

4.11 Preliminary Station Test

STEP	ACTION	RESULTS
1	Check that all keys on attendant set are released and station is in an on-hook condition.	
2	Position FUNCTION switch on TTS-28 to TEL SET, DIAL. Power switch off.	
3	Connect a 1011-type hand set to TEL SET terminals of TTS-28.	
4	Connect TTS-28 terminals + and - to test jacks TP4 and TP5 of MODULATOR unit.	
5	Depress nonlocking ANS key.	OH relay operates, lamp on ANS key lights, and TTY motor starts. After a delay of approximately 1 second, MR relay operates and MO relay releases; f_{2m} tone is heard in hand set.
6	Open screw switch A3 to prevent machine from timing out.	
7	Depress CLR key.	SR and RR relays operate momentarily, releasing OH and MR relays. Lamp on ANS key extinguishes, lighting lamp on CLR key. TTY motor stops and CLR lamp extinguishes.
8	Close screw switch A3.	
9	Depress nonlocking ORIG key.	OH and OR relays operate, lamp on ORIG key lights, and TTY motor starts.
10	Allow LOW PAPER switch to operate.	Buzzer sounds and lamp on BUZ-RLS key lights.
11	Depress locking BUZ-RLS key.	Buzzer silences and lamp remains lit.
12	Release LOW PAPER switch and depress CLR key.	Lamp on BUZ-RLS key goes out, BUZ-RLS key restores to normal, and machine turns off.
13	If station is equipped with PAPER OUT switch (form feed machines only), repeat Step 9, and perform Step 14.	
14	Allow PAPER OUT switch to operate.	Machine clears out.

Note: Station cannot answer or originate as long as PAPER OUT switch is operated.

STEP	ACTION	RESULTS
15	Release PAPER OUT switch.	
16	Open screw switch A1.	
17	Depress ANS key.	No tone is heard in hand set. TTY motor starts.
18	Close screw switch A1.	In hand set, f_{2m} tone is heard. Approximately 6 seconds after tone is heard station will time out and automatically restore to on-hook condition without lamp on CLR key lighting.
19	Depress locking LCL key.	Lamp on LCL key lights, CY relay operates, TTY motor starts, and machine runs closed. (No character will be printed.)
20	Type repeated characters on TTY keyboard. (On ASR machine, depress K or KT mode key.)	Local copy should be without errors.
21	Depress BREAK key on TTY keyboard.	Machine does not run open.
22	Depress nonlocking HERE IS key on TTY keyboard.	Drum answer-back is triggered. TTY types sequence of selected characters on local copy.
23	Depress CLR key.	CY relay releases and TTY motor stops. TTY selector magnet remains marking.

Data Set Level Adjustments

4.12 Terminals + and - of TTS-28 should remain connected to TP4 and TP5 of MODULATOR unit. Position TTS-28 FUNCTION switch to DBM 900Ω TERM, 0. Power switch ON.

STEP	ACTION	RESULTS
1	Open screw switch A3.	
2	Depress ANS key. Allow 1 second for MR relay to operate. Open screw switch A1.	TTY starts and runs closed. Lamp on ANS key lights. Meter reads f_{2m} tone (2225 cps).
3	Adjust potentiometer R22 (on MODULATOR card) for specified output level of f_{2m} tone.	
4	Open screw switch A5.	Meter reads f_{2s} tone (2025 cps).

Note: Difference in level between f_{2m} and f_{2s} tones shall not exceed 1.5 db.

STEP	ACTION	RESULTS
5	Close screw switches A1 and A5.	
6	Depress CLR key.	Machine clears out.
7	Depress ORIG key.	TTY turns on, ORIG and Dial lamps light.
8	If station is equipped with Dial Tone detection, depress any one of the TOUCH-TONE dial buttons.	Dial light will go out.
9	Open screw switch A13.	Meter reads f_{1m} tone (1270 cps)
10	Adjust potentiometer R23 (on MODULATOR card) for specified output level of f_{1m} tone.	
11	Open screw switch A5.	Meter reads f_{1s} tone (1070 cps).

Note: Difference in level between f_{1m} and f_{1s} tones shall not exceed 1.5 db.

12	Close screw switches A5 and A13.	No reading on TTS-28 meter.

Note: If station is equipped with a TOUCH-TONE dialer, perform Steps 13 and 14; otherwise, proceed to Step 16.

13	Simultaneously depress 4 and 5 of TOUCH-TONE dialer. (Tone will be heard in loudspeaker.)	Level read on TTS-28 should be between 0 and -1.5 db of reading in Step 11.
14	Simultaneously depress 6 and 9 of TOUCH-TONE dialer. (Tone will be heard in loudspeaker.)	Level read on TTS-28 should be between -0.5 and +1.5 db of reading in Step 13.
15	If requirements in Steps 13 and 14 cannot be met, refer to Section 591-018-300, 9.09.	
16	Close screw switch A3.	
17	Depress CLR key.	Lamp on ORIG key extinguishes and station goes to on-hook condition.
18	Remove connections between TTS-28 and MODULATOR unit.	

4.13 MODULATOR Card Screw Switch Setting and Test of Dial Tone Detection Circuit

1	Remove MODULATOR card.	
2	Set screw switches as specified on station layout card and/or service order (see Table C). For non-loaded loop with E7 repeater, proceed to Step 27.	

TABLE C

HYBRID NETWORK SCREW SWITCH SETTING
MODULATOR CARD

Network Resistor	Screw Switch Setting	
	Open	Closed
4110Ω	C1, C3	C2
1960Ω	C2, C3	C1
1025Ω	C2	C1, C3

Note: Screw switch setting for 4110 resistor provided by factory.

STEP	ACTION	RESULTS
3	Record screw switch settings on station record form E-4905-1.	
4	Reinsert MODULATOR card.	
5	Connect TEL LINE to station.	

Note: If dial tone detection circuit is used, perform Steps 6 through 13; otherwise, proceed to Step 14.

6	Depress ORIG key.	TTY turns on and ORIG lamp lights. Dial tone is heard in loudspeaker. DIAL lamp lights.
7	Pulse first digit of 900-ohm quiet termination number.	DIAL lamp goes out.
8	Connect 1011-type hand set across tip and ring of the line. (Set switch on hand set to TALK position.)	
9	Depress CLR key.	ORIG lamp extinguishes. Station goes to on-hook condition.
10	Depress ORIG key.	Lamp on ORIG key lights. No dial tone is heard in loudspeaker.
11	Remove 1011-type hand set from tip and ring.	DIAL lamp does not light. (This verifies that the dial tone detection circuit is operating properly and is not operating due to line noise.)
12	Depress CLR key.	ORIG lamp extinguishes and station goes to on-hook condition.

STEP	ACTION	RESULTS
13	Depress ORIG key.	TTY turns on and lamp on ORIG key lights.
14	Dial 900-ohm quiet termination number.	
15	When connection has been established, open screw switches A1 and A3.	
16	Set FUNCTION switch on TTS-28 to DBM BRIDGE, +10 position. Connect + and - terminals to TP4 and TP5 of MODULATOR card. TTS-28 power switch ON.	No reading should be obtained when TTS-28 FUNCTION switch is moved to the most sensitive scale (-10). This indicates that there are no high level signals present on loop to cause erroneous readings in the following tests.
17	Remove test leads from TP4 and TP5 of MODULATOR card.	
18	Close screw switch A1 and open screw switch A13.	
19	Set TTS-28 FUNCTION switch to DBM BRDG, 0 and connect terminals + and - between GND on the rectifier and TP2 on the MODULATOR card.	Level reading should not be more positive than -5.0 dbm for f_{1m} tone. (This checks the hybrid balance at 1270 cps.)

Note: If an F7 repeater is used in the loop, reading for f_{1m} should not be more positive than 0.0 dbm.

20	Remove connections between TTS-28 and data set.	
21	Flip the station from originate to answer mode by momentarily depressing the CLR key then immediately depressing and holding the ANS key until lamp on ANS key lights.	
22	Open screw switch A1.	
23	Reconnect TTS-28 as outlined in Step 19.	Level reading should not be more positive than -5.0 for f_{2m} tone. (This checks the hybrid balance for 2225 cps.)

Note: If an E7 repeater is used in the loop, reading for f_{2m} should not be more positive than 0.0 dbm.

24	Remove connections between MODULATOR card and TTS-28.	

STEPS	ACTION	RESULTS
25	If readings obtained in Steps 19 and 23 do not meet requirements, it is an indication of loop impedance difficulty that should be corrected before proceeding with further tests.	
26	Close screw switches A1, A3, and A13.	After approximately 6 seconds, machine times out. All relays should release. Station is now in the on-hook condition.
27	On nonloaded loops with E7 repeaters, close screw switch C1.	
28	Perform operations outlined in Steps 4 through 26.	
29	Note level reading taken in Step 23.	
30	Close screw switch C3.	
31	Perform operations outlined in Steps 4 through 26.	
32	Note level reading taken in Step 23.	
33	Select option which gave the lower of the two readings noted in Steps 29 and 32 and set screw switches accordingly.	
34	Record screw switch settings on station record form E-4905-1.	

4.14 Desensitizing Pad Strapping

STEPS	ACTION	RESULTS
1	Remove DEMODULATOR unit.	
2	Strap desensitizing pad as indicated on station layout card and/or service order.	Fig. 8 gives screw switch settings and associated pad values.
3	Record screw switch setting on form E-4905-1.	
4	Replace DEMODULATOR unit.	

4.15 Test of Receive Break and End of Transmission (EOT) Features

STEP	ACTION	RESULTS
1	Open screw switches A7, A9, and A11.	
2	Ground test point TP4 on DEMODULATOR card.	
3	Depress ANS key.	Machine turns on. Light on ANS key lights.
4	Depress LCL key.	Lamp on LCL key lights. Answer-back drum is triggered and machine types sequence of selected characters. Keyboard is unblinded. Lamp on ANS key remains lit.

Note: Presence of mark carrier frequency is simulated by opening the A11, grounding test point TP4, and operating CY relay when LCL key is operated.

5	Depress ANS key.	LCL key is released and lamp on LCL key goes out.
6	Depress BREAK key.	BRK-RLS lamp lights. Keyboard and transmitter distributor (TD) are blinded.
7	Depress BRK-RLS key.	BRK-RLS lamp goes out.
8	On KSR type TTYs.	Keyboard is unblinded, should be able to get local copy.
9	On ASR type TTYs	
	• Depress K (Keyboard) Key	• Keyboard is unblinded.
	• Depress KT (Keyboard-Tape)	• Keyboard and TD are unblinded.
10	Depress CONTROL and EOT keys.	Machine clears out and goes to on-hook condition.
11	Remove ground from TP4, close screw switches A7, A9, and A11.	

4.16 Carrier Fail Test

STEP	ACTION	RESULTS
1	Repeat Steps 1 through 5 in 4.15.	
2	Close screw switch A11.	Machine clears and goes to on-hook condition.
3	Remove ground from TP4, close screw switches A7 and A9.	

4.17 Data Set Output Reference Tests

STEPS	ACTION	RESULTS
1	Depress ORIG key.	TTY turns on and ORIG lamp lights. Dial tone should be heard in loudspeaker.
2	Dial 900-ohm quiet termination number at originating central office.	
3	After establishing connection, open screw switch A1.	Connection should hold.
4	Position FUNCTION switch on TTS-28 to DBM BRDG, 0. Connect TTS-28 terminals + and - to test jacks TP4 and TP5 on MODULATOR unit. Power switch ON.	
5	Open screw switch A13.	Meter reads f_{1m} tone. This reading may differ from the one taken in 4.12, Step 10.
6	Record f_{1m} level reading on form E-4905-1.	
7	Close screw switch A1.	
8	Flip station by momentarily depressing CLR key and then immediately depressing and holding ANS key until light on ANS key lights.	
9	Open screw switch A1 before 6-second time-out.	Meter reads f_{2m} tone. This reading may differ from the one taken in 4.12, Step 3.
10	Record f_{2m} level reading on form E-4905-1.	
11	Close screw switches A1 and A13 and remove connections between MODULATOR unit and TTS-28 meter.	Station times out and restores to on-hook condition.

Note: Subsequent readings on repair visits should be within ±1.0 db of readings obtained in Steps 6 and 10 and recorded on form E-4905-1.

4.18 Ringer Adjustment

- If office has ring back equipment:

STEP	ACTION	RESULTS
1	Depress ORIG key.	ORIG lamp lights, TTY turns on, and dial tone should be heard in loudspeaker.
2	Dial local ringback test number.	

STEP	ACTION	RESULTS
3	Depress LCL key.	Ringer will sound and can now be adjusted. ANS lamp will flash.
4	Depress ANS key. (CLR key is not used to go from local to answer mode since it is possible to disconnect falsely.)	Lamp on ANS lights. Since station receives no f_{lm} tone, it will disconnect in about 6 seconds and go to on-hook condition.
5	Depress CLR key.	Station goes to on-hook condition.

- If office does not have ringback equipment:

STEP	ACTION	RESULTS
1	Call back-up test center and request your station be called.	
2	Depress LCL key. While station is ringing adjust ringer to customer satisfaction.	LCL lamp will light. Bell will ring.
3	When completed, depress ANS key and then CLR key.	

4.19 Call Progress Tests

(For data set equipped with call progress tone detector and controller.) WADS CALL PROGRESS TESTS numbers (2025 cps to 2225 cps) should be dialed in the following tests.

STEP	ACTION	RESULTS
1	Open screw switch A3.	
2	Depress ORIG key.	Dial tone should be heard in loudspeaker and DIAL lamp should light.
3	Dial busy test number.	Busy tone should be heard in loudspeaker. Buzzer should sound and BUSY lamp should light.
4	Depress CLR key.	
5	Depress ORIG key.	Dial tone should be heard in loudspeaker and DIAL lamp should light.
6	Dial Reorder test number.	Reorder tone should be heard in loudspeaker. Buzzer should sound and BUSY lamp should light.
7	Depress CLR key	
8	Depress ORIG key.	Dial tone should be heard in loudspeaker and DIAL lamp should light.

STEP	ACTION	RESULTS
9	Dial audible ring test number.	Ringing should be heard in loudspeaker. NO lamp should light.
10	Depress CLR key.	
11	Depress ORIG key.	Dial tone should be heard in loudspeaker and DIAL lamp should light.
12	Dial intercept test number.	Intercept tone should be heard in loudspeaker. Buzzer should sound and INT lamp should light.
13	Depress CLR key. Close A3.	

4.20 A test call must be made to an automatic data test line (ADTL) on each installation or maintenance visit as a final test before leaving customer premises.

4.21 Either a "programmed" or "break-controlled" test can be made with an ADTL used for testing 8-level, 100-speed stations. However, the "break-controlled" test does not provide a test of the restrainer. Fig. 9 is an example of copy received from ADTL.

4.22 Programmed Test

STEP	ACTION	RESULTS
1	Depress ORIG key.	TTY turns on and dial tone is heard in loudspeaker.
2	Dial number of programmed ADTL.	ADTL will send six test sentences shown in Fig. 9 followed by instruction GA SEND.
3	Any random series of characters may be sent from the station. (See Note 2 of Fig. 9).	ADTL will check a minimum number of characters required for accurate measurement. A restraint signal followed by a break signal will then be transmitted to the station.
4	At the station, observe that the REST then BREAK lamps light.	After station stops sending, ADTL will transmit the distortion measurement followed by instruction FLIP. Distortion measurement should not exceed 15 per cent.
5	Flip station from call-originating mode to call-terminating mode by momentarily depressing the CLR key then immediately depressing the ANS key. Hold ANS key down until the CLR lamp goes out and ANS lamp lights.	Answer-back characters will be printed at station. ADTL will time just long enough for automatic answer-back to be transmitted from station.

THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 ## UNDIST
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 ## UNDIST
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 ## SW-DIS
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 ## SW-DIS
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 ## DISPAD
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 ## DISPAD

GA SEND
78IU 78IU 78IU 78IU 78IU 78IU 78IU 78IU 78IU
10%

FLIP

XXXXXXX (Station automatic answer-back characters)

THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 ## UNDIST
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 ## UNDIST
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 ## SW-DIS
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 ## SW-DIS
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 ## DISPAD
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 ## DISPAD

GA SEND
78IU 78IU 78IU 78IU 78IU 78IU 78IU 78IU 78IU
15%

END

Notes:

1. | | |
   |---|---|
   | CR NUL DELETE LF | Before Each Test Sentence |
   | CR CR LF LF | Before GA SEND |
   | CR LF | Before Per Cent Distortion |
   | CR LF | Before FLIP |
   | CR LF | Before END |
   | CR LF | After GA SEND |
   | LF | After Per Cent Distortion |
   | LF | After FLIP |

2. 78IU is suggested to accomplish the same test as RY in the 5-level code. This combination exercises the mechanical selecting mechanism and provides a good transmission test; however, the ADTL measures any series of characters.

3. The break-controlled trunk sends the following test sentence:

THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 ## (&$,.)

Fig. 9 - ADTL Programmed Trunk Test Sequence

STEP	ACTION	RESULTS
		ADTL will send six test sentences, as shown in Fig. 9 followed by instruction to GA SEND.
6	Repeat Step 3.	
7	At the station, observe that the REST then the BREAK lamps light.	After station stops sending, ADTL will transmit the distortion measurement, (which should not exceed 15 per cent) and then END followed by a clear signal. CLR lamp lights momentarily and station restores to on-hook condition.

4.23 The break-controlled test line may be used as follows:

STEP	ACTION	RESULTS
1	Depress ORIG key.	TTY turns on and dial tone is heard in loudspeaker.
2	Dial number of nonprogrammed ADTL (break-controlled test line).	Immediately after connection is established, the test line will send continuous undistorted "FOX" signals to the station.
3	Depress BREAK key at station.	Upon receipt of the first break signal, the ADTL will change from undistorted to switched bias (28 per cent) "FOX" signals.
4	Depress BREAK key at station.	Upon receipt of second break signal, the ADTL will change from switched lines to combination distortion (28 per cent) "FOX" signals.
5	Depress BREAK key at station.	Upon receipt of third break signal, ADTL will disconnect. A station may disconnect at any time by depressing CLR key.