

DATA SETS 101A AND 101B

USED WITH 3-ROW TWX

LOCATING TROUBLE AND TEST PROCEDURES

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TABLE C - MODULATOR UNIT TEST	31	1.01 This section is being reissued to add tests using 907A data test set and to make major changes in the text. This practice presents some of the methods that may be used to locate trouble at 3-row TWX stations using data set 101A or B. It does not cover all possible conditions but dis- cusses some typical troubles and presents a testing procedure to determine which section of the station or associated equip- ment is causing the trouble. The station is the teletypewriter (TTY), data set, and attendant set. The associated equipment is the line and central office equipment.	
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SECTION 591-012-300

1.02 Obvious TTY defects such as nonreversing ribbon, stiff keyboards, and broken copyholders are not included. These may be cleared by referring to the appropriate Bell System Practices.

1.03 It can be assumed that, where possible, central office equipment trouble has been located and cleared before dispatching to the station. On transmission problems, tests may require coordination between the station and central office or back up test center. The term back up test center designates the test center that is arranged to make tests beyond the capabilities of a local test center, automatic data test line (ADTL), and portable station test meter.

1.04 The following precautions should be observed when testing the data set.

(a) When making voltage readings on the test points (TPs) of data set units, measure to GRD on rectifier, unless otherwise indicated, using Northeast Electronics test set TTS-28 or equivalent.

(b) Never use a 1011-type handset or test picks in the TPs of data set except as specified, as the components of the units in the data set may be damaged.

(c) After operating or working on wire-spring relays and/or units check for:

- Improper position of contact springs.
- Broken units.
- Improper position or seating of units.

(d) When making any tests, data set should be in off-hook condition unless otherwise specified.

Caution: To prevent transistor damage in the KEYER unit of data set 101A or 101B, disconnect ac power to rectifier J87215A before performing the following operations.

- Removing or inserting KEYER unit, T connector, or J2 connector.
- Disconnecting TTY selector magnet circuit.

● Q1G (2N1312) transistor can be damaged by inductive discharge of the TTY selector magnet when above operations are performed with J87215A rectifier energized.

(e) Support rear of fiber printed wiring boards on data set cards when using inserter-extractor tool to strap wedge-lock terminals. Use only 24-gauge wire. (See Fig. 1 for HYBRID unit.)

(f) Data set should be restored to normal or on-hook condition following each complete test.

1.05 Output of rectifier should be measured before making any other tests. Output of rectifier should be $+20 \pm 3$ volts and -20 ± 3 volts. Disregarding the signs, the difference in numerical values shall not exceed 2 volts.

1.06 Regardless of the reason for visiting a station, a final check of the station should be made with ADTL.

1.07 When a 3-row TWX station is placed in test mode, certain transmission and performance tests can be made from the nearest back up station test center. The station can be placed in test mode by depressing the TST key in the attendant set after a call has been originated to the back up station test center.

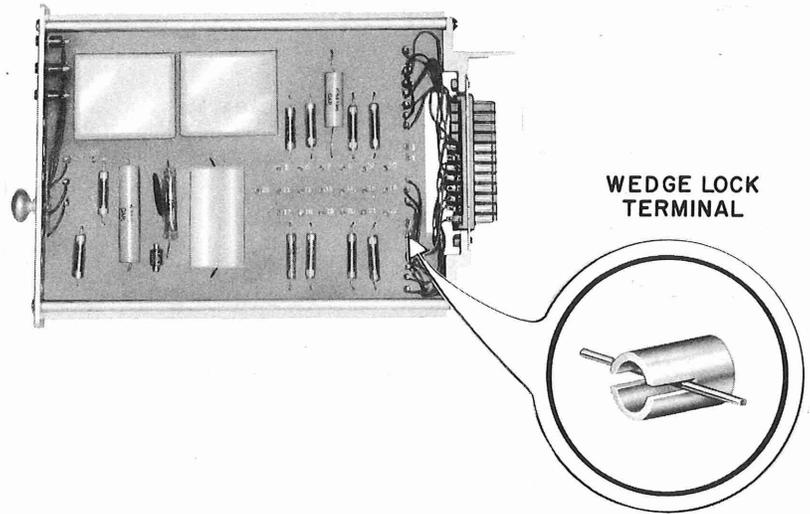
1.08 Do not attempt to repair data set units at station location. If trouble is traced to a unit, replace it except for potentiometer adjustments.

1.09 In order to cover as many troubles as possible, they have been grouped under the following headings:

(a) Trouble Originating Calls;

- No dial tone.
- Cannot break dial tone.
- Getting wrong numbers.
- TTY does not turn on.

Fig. 1 - Data Set HYBRID Unit



(b) Trouble Answering Calls;

- Bell does not ring.
- Cannot stop ringing.
- TTY does not turn on.
- Station disconnects (cutoffs).

(c) Trouble Sending;

- Most stations receive bad copy.
- One or two stations receive bad copy.
- Cannot send.
- Cannot break.

(d) Trouble Receiving;

- Receiving bad copy from all stations.
- Receiving bad copy from certain stations.
- Cannot receive.

(e) TTY Trouble;

- Troubles directly connected to the TTY, broken parts, ribbon trouble, line feed troubles, etc.

2. TEST EQUIPMENT

2.01 The following tools, meters, and spare units are necessary for maintenance of data set 101A or B.

- Teletypewriter Maintenance Tools
- 1011-Type Handset
- Northeast Electronics Test Set Model No. TTS-28
- 164C4 Transmission Measuring Set or Equivalent
- Inserter-Extractor (Wire) Tool, KS-19092, List 1
- Carrying Case for Data Set Units - B-133174
- Spare Set of Data Set Units
- Maintenance Test Card J70148AA, List 1A
- 907 Data Test Set, J79907A, List 1; Associated List 2 and 3 Connector Cords; and List 5 Test Card
- 6A Impulse Counter
- SD-71025-01 for Data Set J1D101A
- SD-3D006-01 for Data Set J1D101B

Note: Northeast Electronics Test Set Model No. TTS-28 must be in a vertical position to ensure accurate measurements.

3. TROUBLE ORIGINATING CALLS
(REFER TO FIG. 2 AND FLOW
CHART 1)

3.01 This category includes the troubles in completing a connection to another station. The following tests are checks to aid in locating the troubles of the major sections of the station.

No Dial Tone (NDT)

3.02 This trouble can be caused by malfunction of subscriber set, data set, or line.

(a) To sectionalize the trouble to the line or data set connect handset 1011 in TALK position to D34 and D35 on D terminal strip in data set.

- (1) Dial tone should be heard.
- (2) Failure to hear dial tone indicates loop trouble.
- (3) If dial tone is heard, trouble is in data set or subscriber set.

(b) To locate NDT trouble in data set or subscriber set, operate ANS key.

- (1) 2225 (f_{2m}) answer tone should be heard in listen-only handset.
- (2) If f_{2m} tone is heard, receive portion of HYBRID and LIMITER units and listen-only handset and cord are good. Therefore, trouble must be in data set control relay circuits, dial contacts, line winding of hybrid coil or associated wiring.

Cannot Break Dial Tone (CBDT)

3.03 This can be caused by central office trouble, line trouble, data set trouble, or subscriber set trouble. The following tests can be used to sectionalize the trouble between line and station equipment.

(a) To test line:

- (1) Remove loop from data set.

(2) Use 1011 handset and check the ability to dial.

(3) Reconnect line.

(b) To check subscriber and data sets:

- (1) Remove leads on D26 and D27.
- (2) Connect 1011 handset in TALK position to D26 and D27.
- (3) Operate ORIG key.
- (4) Listen for dial tone in 1011 handset. Check ability to dial.
- (5) If unable to dial at this point, check the data set wiring. If able to dial, check subscriber set dial and D50F-51 cord.

Getting Wrong Numbers

3.04 This trouble can be caused by a defective dial, improper dialing, line or central office equipment failure.

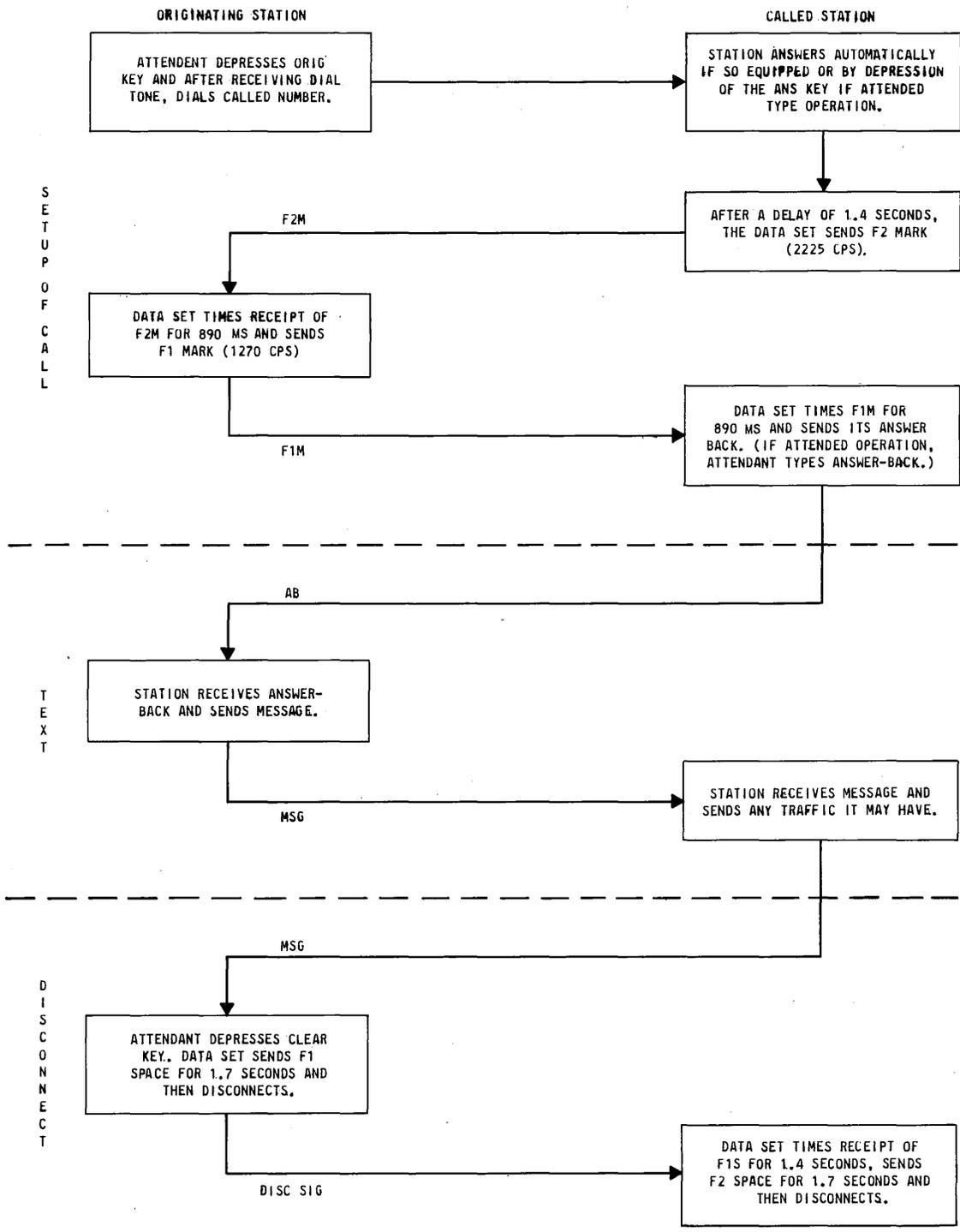
- (1) Make physical check of station dial.
- (2) To check line and central office equipment, bridge 1011 handset across line terminals and dial the speed test code.
 - (a) If test results are satisfactory, trouble is probably in station dial.
 - (b) If dial speed tests are unsatisfactory, refer the trouble to plant service center.

(3) Repeat dial speed test using station dial. Operate ORIG key and dial test number.

(4) Observe dialing procedure of customer if improper dialing is suspected.

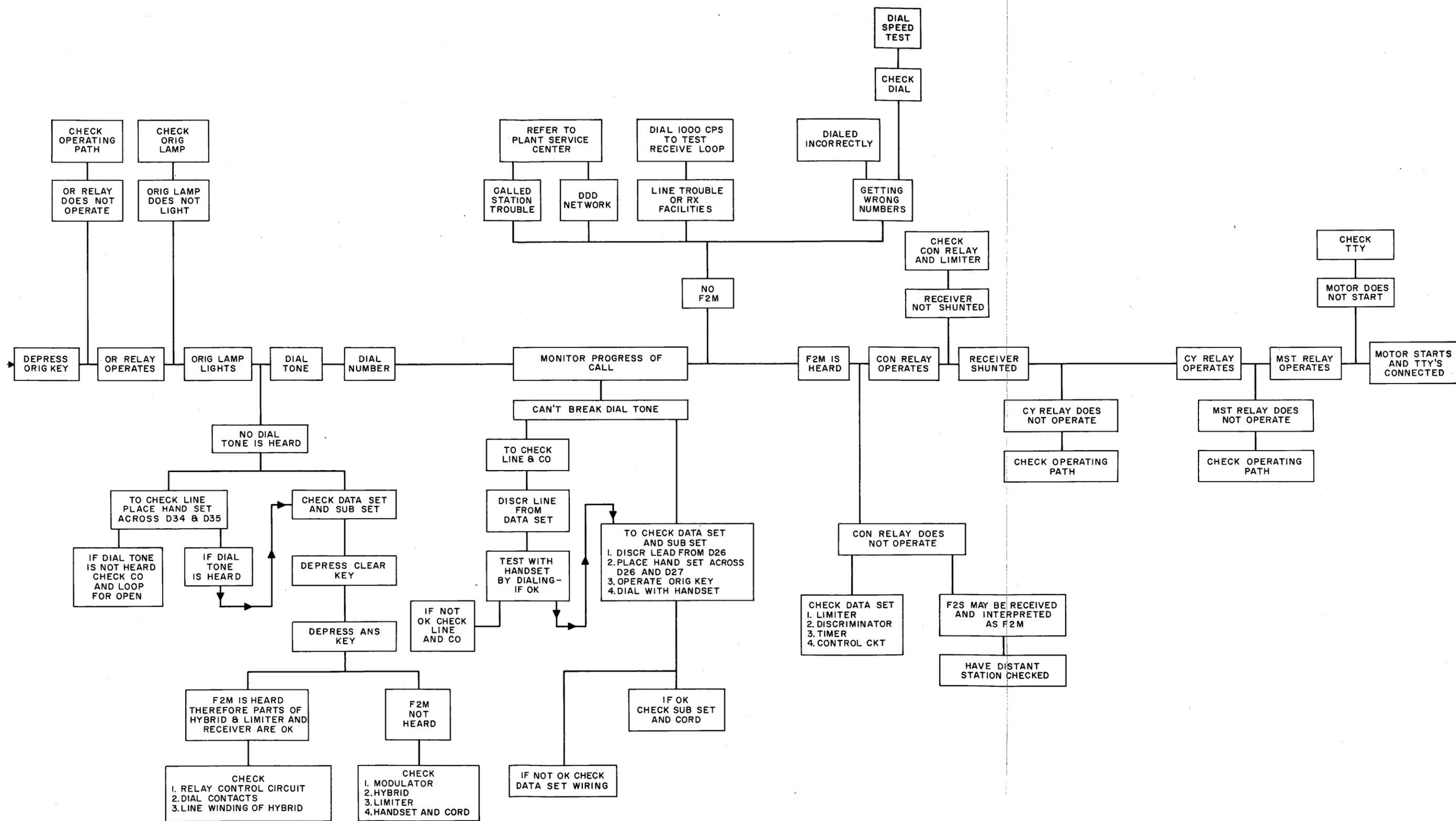
TTY Does Not Turn On After Dialing
(See Fig. 2)

3.05 If TTY does not turn on after dialing, the trouble can be caused by not receiving f_{2m} answer tone from the called station, the data set not responding to f_{2m} tone from called station, or TTY trouble.



NOTE:
 DATA SET FREQUENCIES:
 F1 MARK 1270 CYCLES
 SPACE 1070 CYCLES
 F2 MARK 2225 CYCLES
 SPACE 2025 CYCLES

Fig. 2 - Block Diagram of TWX Station to Station Call



Flow Chart 1 - Trouble Originating Calls

(a) To isolate the trouble between the TTY and data set:

- (1) Operate LOCAL key. TTY should turn on.
- (2) Operate ORIG key and dial ADTL. Monitor call for the following; ringing tone, stopping of ringing tone, and, 1 second later, receipt of f_{2m} tone. If TTY does not turn on, the trouble is in the data set. Operate CLEAR key.

(b) To test data set:

- (1) Operate ORIG key.
 - (2) Hold S relay released and connect TP3 of TIMER unit to GRD on rectifier. CON, CY, and MST relays should operate. If relays operate, control circuit between TIMER unit output and MST relay functions properly. Operate CLEAR key (line noise might prevent a disconnect).
 - (3) If above test is OK refer to 8. TEST PROCEDURES to test the receive portion of data set and loop loss.
- (c) If station tests OK, determine from customer if the trouble was experienced only when calling certain stations, and if the progress of the calls was heard on receive-only handset. Refer this information to plant service center.

4. TROUBLE ANSWERING CALLS (REFER TO FLOW CHARTS 2 AND 3)

4.01 This category includes the troubles that could occur when answering calls. The following tests are checks of the major sections of the station to aid in isolating typical troubles.

Bell Does Not Ring (BDR)

4.02 This condition may result from trouble in the line, station ringer, or data set wiring. To isolate BDR trouble:

- (1) Operate ORIG key and dial ringback code.

- (2) After connection has been completed, operate LOCAL key.
- (3) When ringing current is received, ANS lamp should flash.
- (4) If lamp flashes and bell does not ring, check station ringer.
- (5) If lamp does not flash, check to see that ringing current is on line by monitoring on D34 and D35 with a 1011 handset. If ringing current is heard, check data set circuitry.

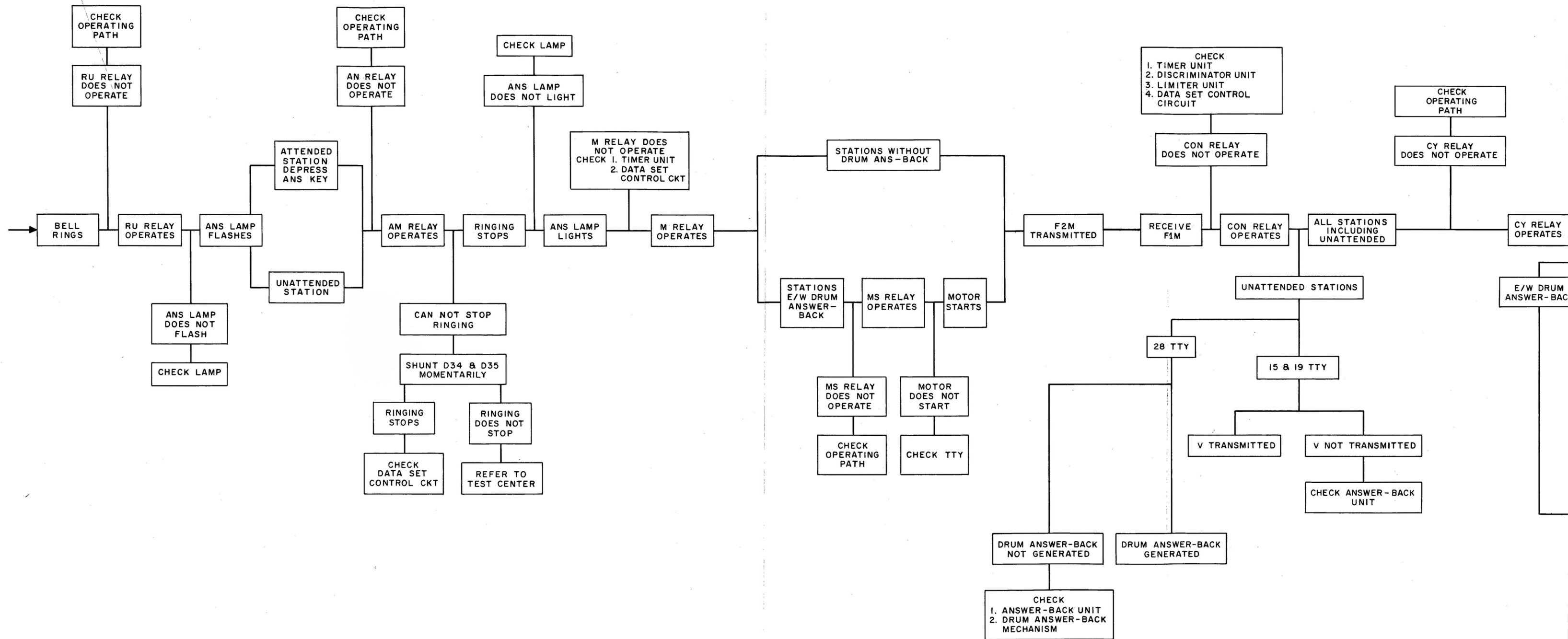
Cannot Stop Ringing

4.03 This trouble can be caused by station not giving an off-hook condition or central office not receiving or responding to the off-hook from the station. To check this operation:

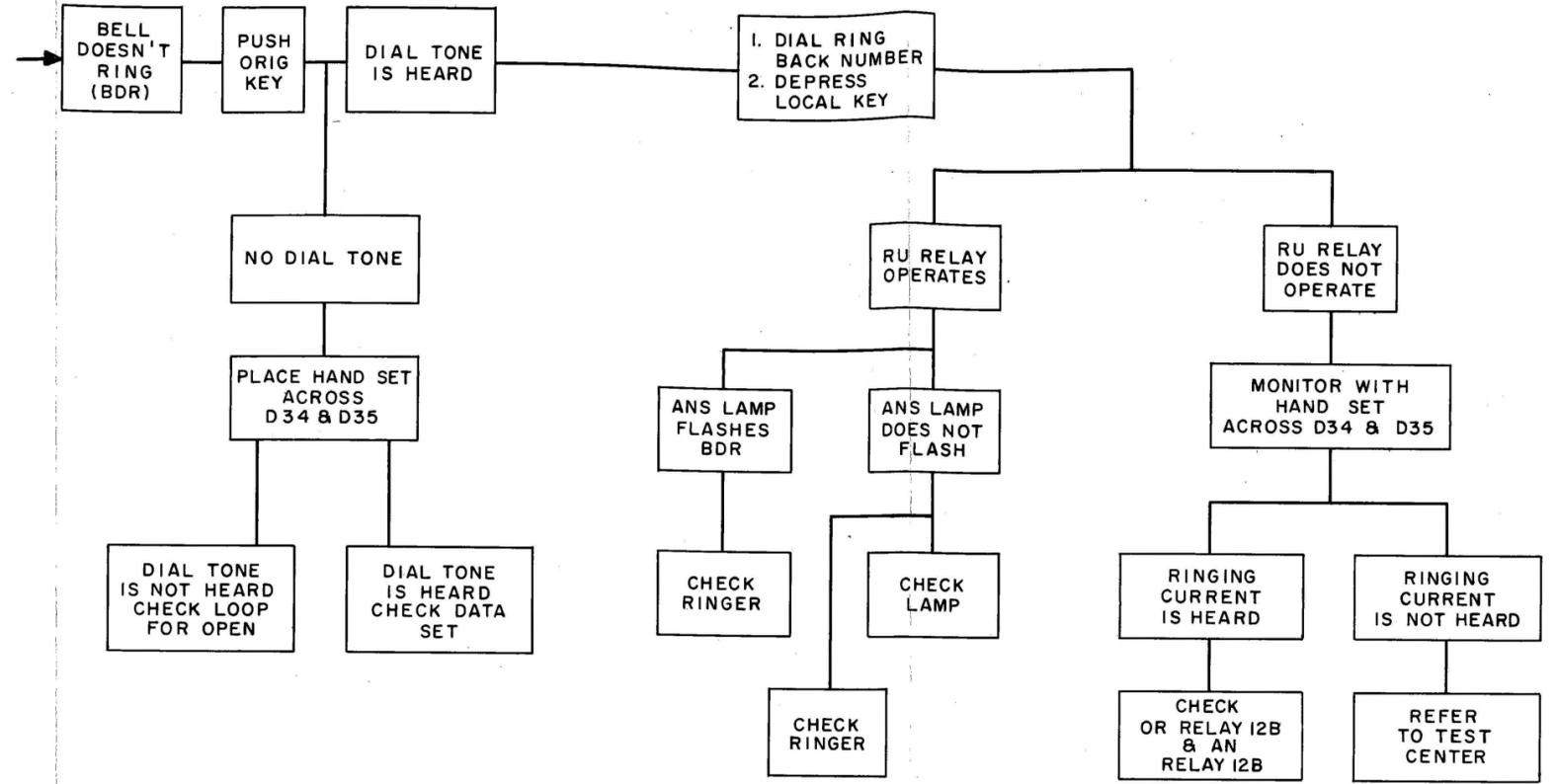
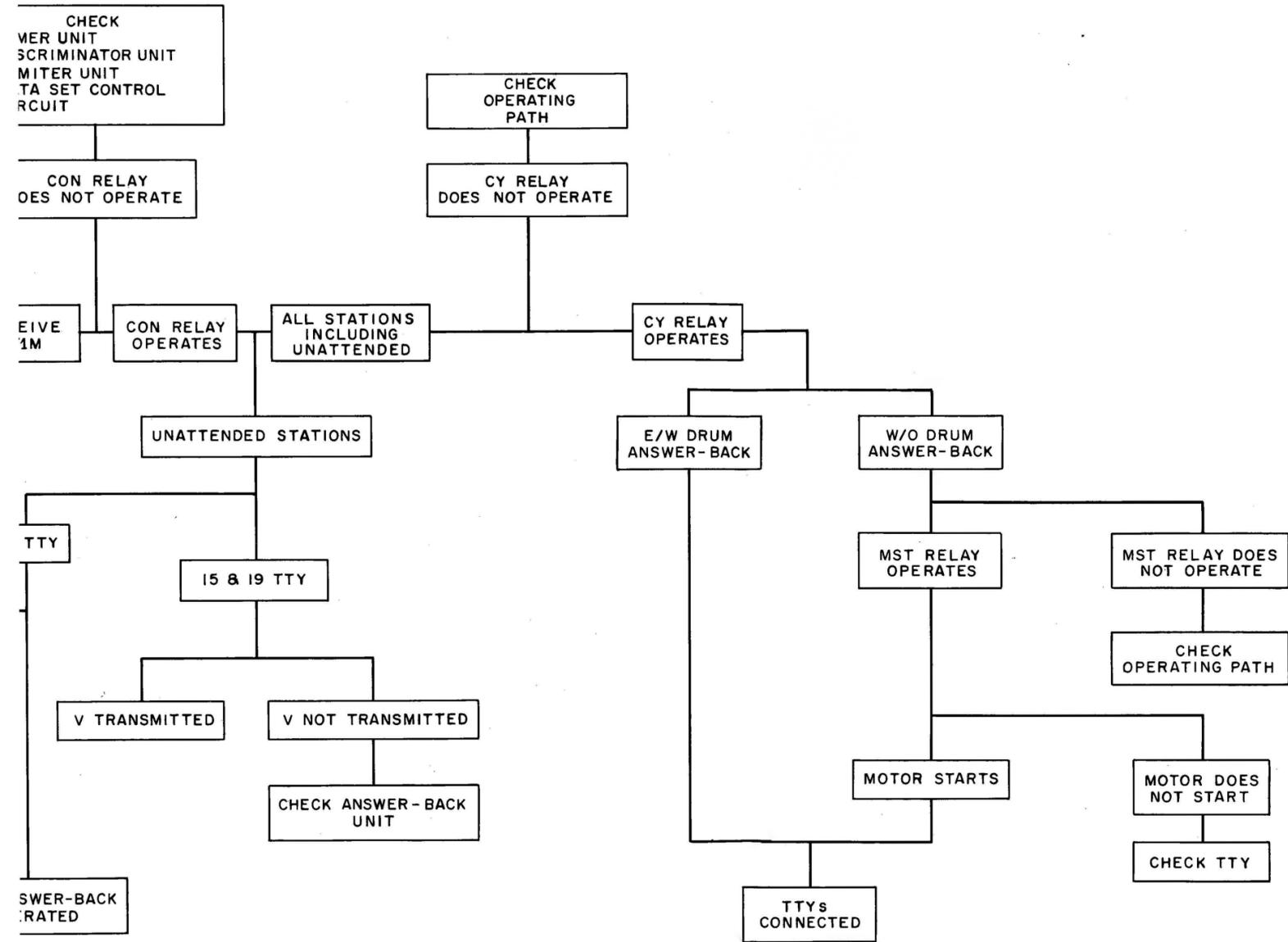
- (1) Operate ORIG key and dial ringback code. When connection is completed, operate CLEAR key.
- (2) When ringing starts, operate ANS key. ANS lamp should light indicating that AN relay operated.
- (3) If the ANS lamp does not light, check that AN relay has operated. (At unattended stations, verify that RU relay operates in response to ringing current and that AN relay follows.)
- (4) If AN relay operates but ringing does not stop, place a short across D34 and D35. If ringing stops, trouble is in data set control circuit. If ringing does not stop, trouble is in the line or central office equipment.

TTY Does Not Turn On When Answering

4.04 If an attended TTY does not respond properly, trouble may be due to a power condition, bad line, defective data set, TTY trouble, or a wrong number dialed by a telephone customer. Trouble in a defective data set could be a failure to generate f_{2m} tone properly or not responding to f_{1m} tone. To isolate trouble, use the following tests.



Flow Chart 2



Flow Chart 3

(a) Operate LOCAL key. TTY should turn on. If TTY turns on, power and TTY are OK. Operate CLEAR key.

(b) To check data set control circuits:

(1) Operate ANS key. ANS lamp should light, indicating that AN relay operated.

(2) Listen for f_{2m} tone in listen-only handset, indicating that M relay operated and that data set is generating f_{2m} tone.

(3) Hold S relay released and connect GRD on rectifier to TP3 of TIMER unit. CON, CY, and MST relays should operate. Remove ground and operate CLEAR key. (Line noise might prevent a disconnect.)

(4) Operate ORIG key and dial ADTL. Listen for f_{2m} tone. One second after tone is heard, CON relay should operate. It can be assumed that if f_{2m} tone is heard, HYBRID unit and line are working. Also, if CON relay operates, LIMITER, DISCRIM, and

TIMER units are functioning properly. (The units in the receive section of the data set operate the same in response to both tones.) A more critical check occurs during flip operation. If TTY turns off after flip operation check:

a. Loop loss with test set TTS-28 as outlined in 8.03. See Fig. 3.

b. Data set output with test meter TTS-28 as described in Table B.

c. Sensitivity test using maintenance test card or 907A test set as described in Table J or K. See Fig. 4 and 5 for maintenance card and 907A test set.

(c) If customer experiences no trouble answering calls from stations normally contacted, but occasionally gets a call which is not completed (TTY does not turn on when ANS key is operated), suspect that a telephone customer has dialed a TWX number.

TTY Disconnects (Cutoffs)

4.05 The trouble, turning off during transmission, is common to both originating and answering modes. This type of

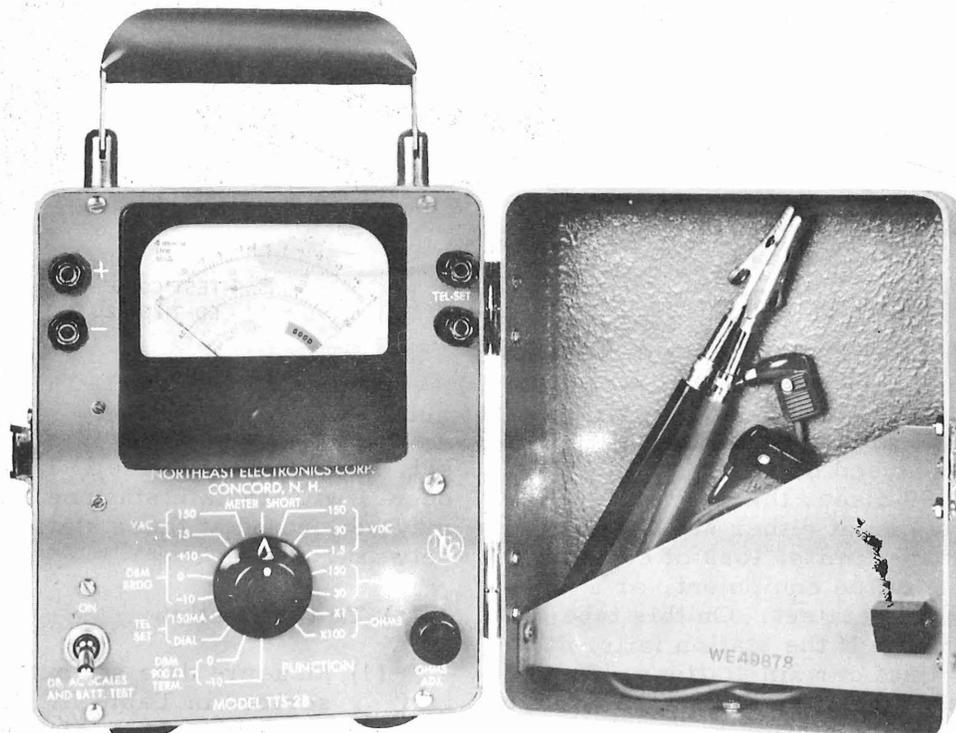


Fig. 3 - TTS-28 Meter, Front View

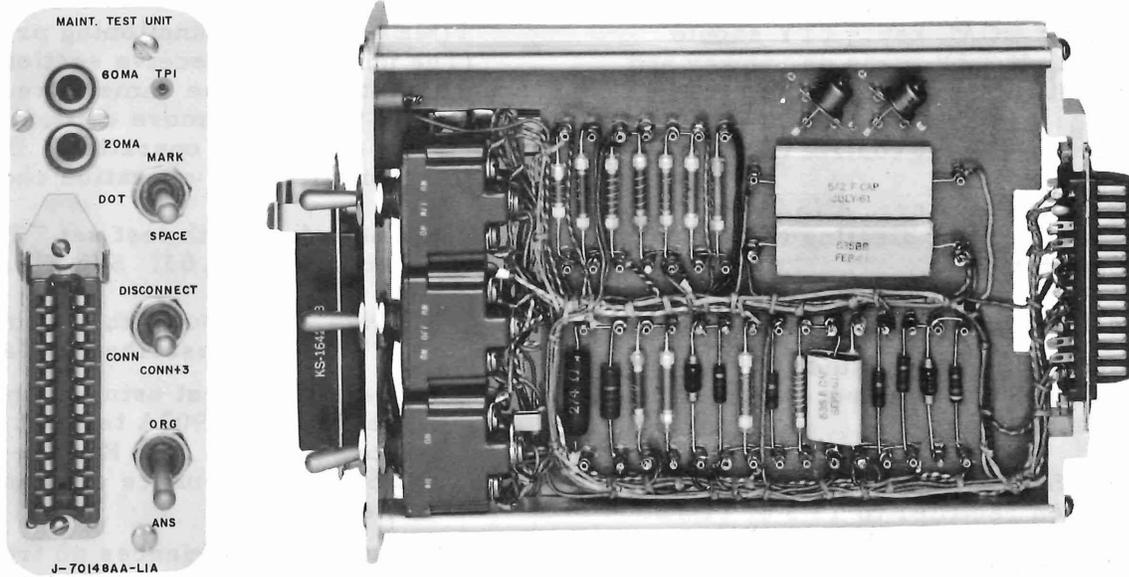


Fig. 4 - Maintenance Test Card, Front and Side View

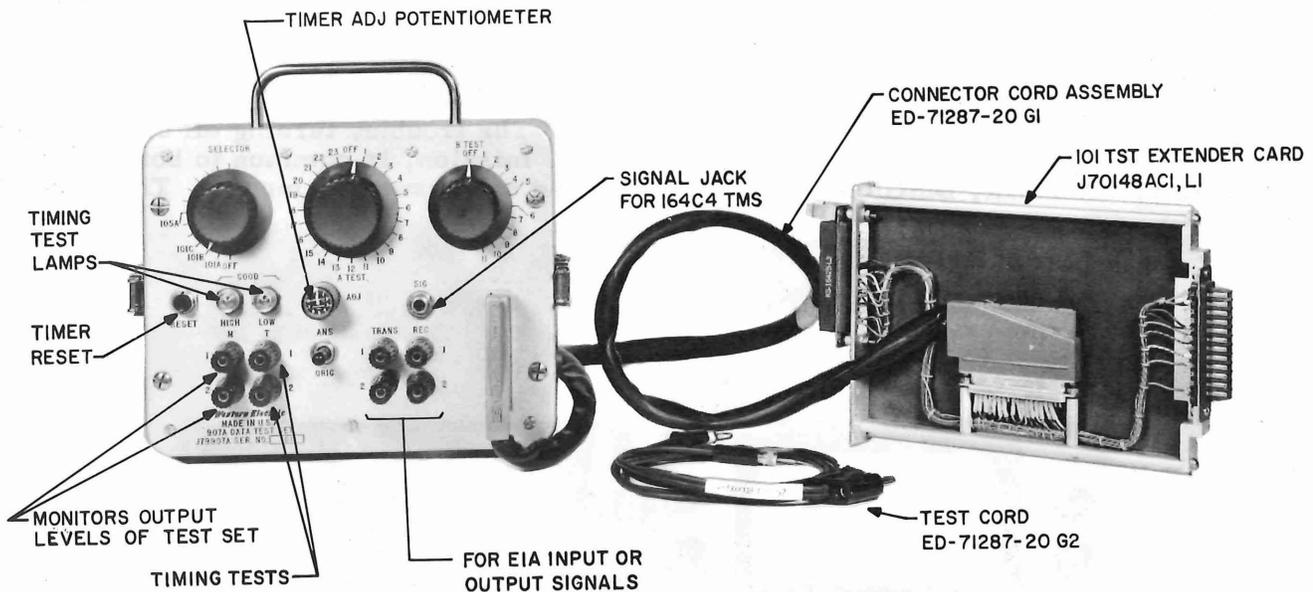


Fig. 5 - 907A Data Test Set and Test Extender Card

trouble can be caused by an open on the line of more than 800 msec, the receive level of the incoming signal at either station going below the working limits, loss of connections at central office equipment, or a malfunction of either data set. On this type of trouble, determine if the station fails with all stations or just certain stations. If trouble exists with all stations, then trouble must be in reporting station equipment (data

set, line, central office). If trouble only occurs with certain stations, then trouble may be located at those stations or in DDD network.

(a) To test station:

- (1) Measure data set output as described in Table B. Compare this reading with that on station record

Form E-4905. Any change will indicate a change in output of data set or impedance change in the line.

- (2) Make the receive sensitivity test of data set as described in Table J or K.
 - (3) Make loop loss measurement as described in 8.03 and compare with design values recorded on station record Form E-4905.
 - (4) Check monitor space timing interval of TIMER unit as described in Table T.
- (b) If intermittent line conditions are suspected:
- (1) Connect test set TTS-28 (+) and (-) terminals to D34 and D35 with test set TTS-28 switched to TEL-SET DIAL position and 1011 handset connected to TEL-SET terminals.
 - (2) Dial 900-ohm quiet termination.
 - (3) When connection is completed, operate test set TTS-28 switch to TEL-SET 150-ma scale.
 - (4) Observe for any current variations.
- (c) When trouble occurs only with certain stations, make a test with the ADTL to ensure that reporting station equipment is OK and then inform plant service center of the stations suspected of causing the trouble (see Flow Chart 6).

5. TROUBLE SENDING (REFER TO FLOW CHART 4)

5.01 This section refers to troubles occurring when sending to a station after the connection has been completed. The exchange of tones between stations necessary to complete the connection would indicate that the transmission levels are within over-all limits, control circuits of the data sets are functioning properly, and that central office connections are OK. Possible causes of sending troubles are: distortion or bias of signals from keyboard,

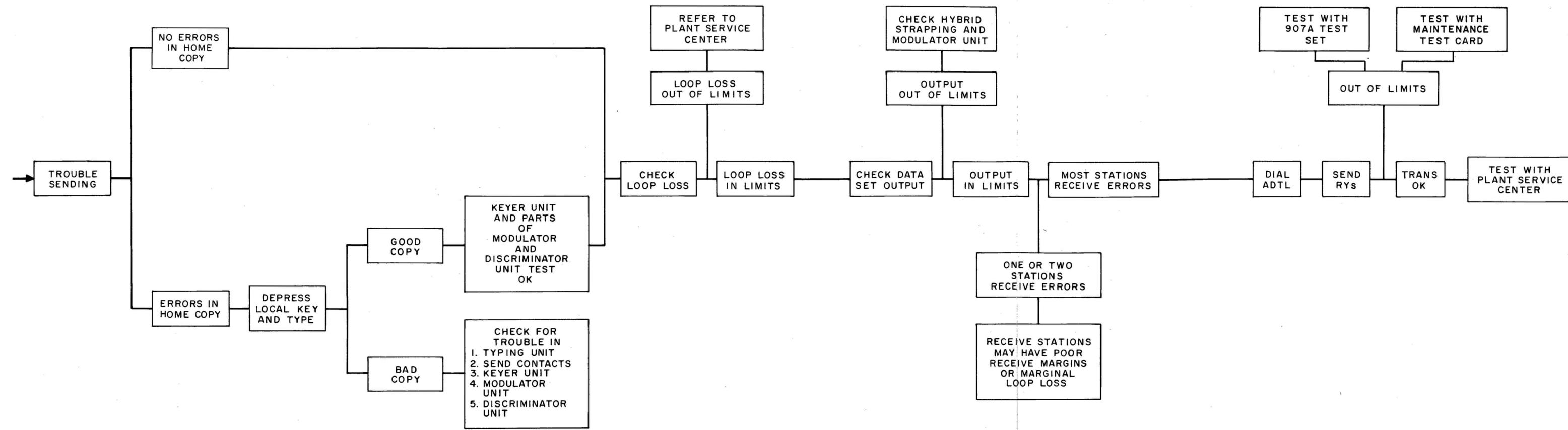
transmitter-distributor, or data set; hits on the loop or dialed up connections; or the wrong code combinations from keyboard.

Most Stations Receive Bad Copy

5.02 If customer experiences trouble sending to all stations after the connection has been completed it can be assumed that the trouble exists in the local station (machine, line, etc).

- (a) Test the station in local. Good copy will indicate that keyboard and transmitter-distributor are sending proper code combinations. This test will not aid in localizing bias or distortion troubles.
- (b) Operate ORIG key and dial ADTL number (see Fig. 6 for sample ADTL copy).
- (c) If ADTL replies OUT LIM after test copy has been sent, it can be assumed that the trouble is in keyboard, transmitter, MOD unit or loop transmission facilities in transmitting direction. Any of the following tests can be used to sectionalize the trouble.
 - (1) Measure bias of send contacts by making sending bias measurement tests with maintenance test card or 907A test set as described in Table R or S.
 - (2) Replace MOD unit and test with ADTL.
 - (3) Make transmission tests with backup test center to determine actual distortion and bias and to measure the loop around distortion of data set and loop.

a. To aid in performing these tests, a station can be placed in the test mode by originating a call to the backup station test center in a normal manner. When connection is established, operate the TST key upon instructions from the backup station test center. In this test mode the station will receive f_{2m} and f_{2s} signals from the backup station



Flow Chart 4 - Trouble Sending

test center. When requested by the back up station test center, a station can be flipped, ie, changed from originate to answer mode under control of the TST key. This can be accomplished in the following manner. While in the originate mode, depress the CLEAR key momentarily. The CLEAR lamp will light for about 1 second. During this interval, depress the ANS key and hold down until CLEAR lamp extinguishes and the ANS lamp lights. The station may now be placed in test mode by depressing TST key. In this test mode the station will receive f_{1m} and f_{1s} signals from the back up station test center. Depressing either the ORIG or ANS key will release the locking TST key. The station is restored to on-hook condition by operation of CLEAR key.

- (4) Arrange to have return loss measurements made on the loop.

One or Two Stations Receive Bad Copy

5.03 This can be caused by the receiving TTY having poor receive margins or a limiting transmission path between stations.

- (a) Measure loop loss in accordance with 8.03.
- (b) Make a transmission test with ADTL. If the test is within requirements, inform plant service center of the suspected condition of receiving station.

Cannot Send

5.04 This trouble, in almost all cases, would be in the local equipment because the connections could not have been completed without an exchange of tones. The following test should isolate the trouble.

- (a) Operate LOCAL key and print local copy to check TTY send contacts.
- (b) Operate BREAK key.

- (1) Machine should run open for about 1 second.
- (2) If machine does not run open, remove wire on D69; TTY should run open for about 1 second.
- (3) If machine does not run open, trouble is in MOD unit or wiring to unit.
- (c) To check oscillator portion of MOD unit, operate ANS key. When f_{2m} tone is heard on receive-only handset or loudspeaker, operate and release BREAK key and listen for modulated f_{2m} tone.

Cannot Break

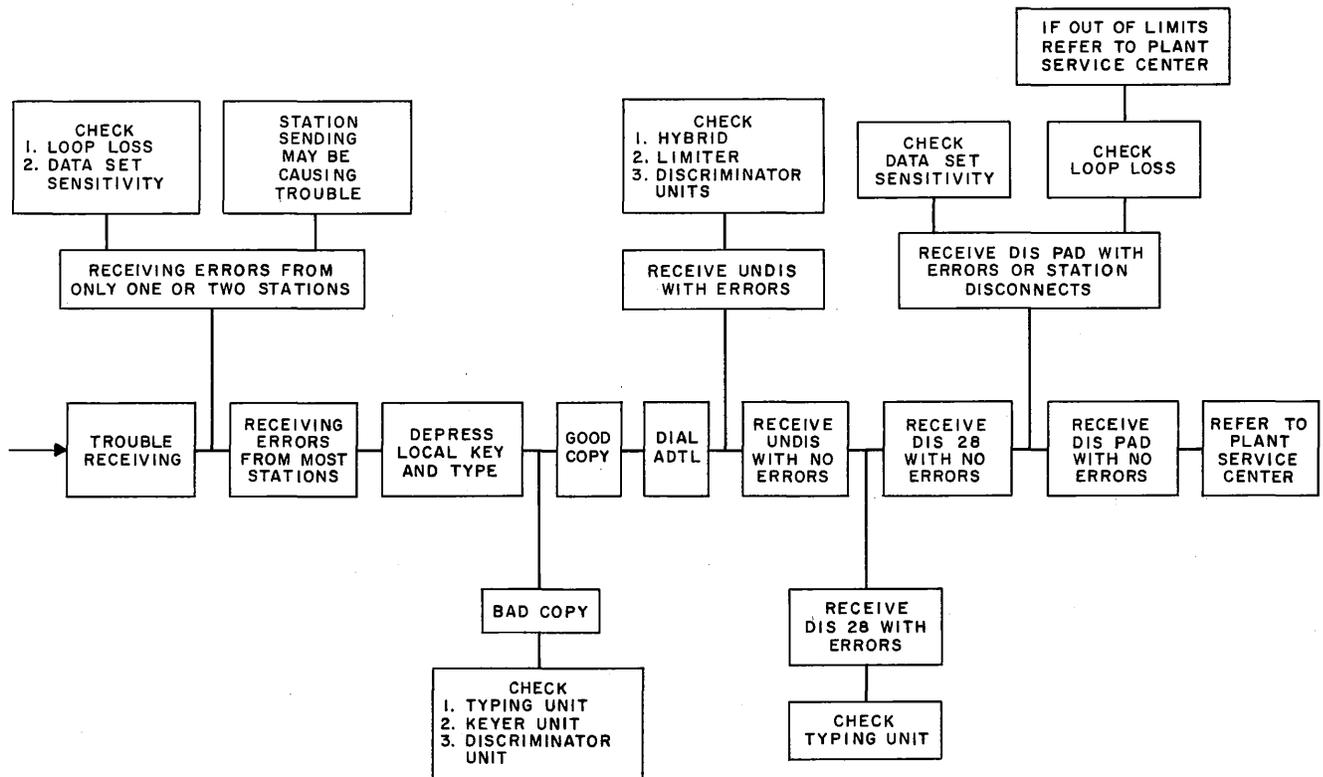
5.05 Inability to stop transmission from the sending station by sending a break can be caused by the trouble described in 5.04 or the break time interval not being long enough. To check station equipment:

- (a) If unable to break, check data set and TTY as described in Tables C and T.
- (b) Check break time interval as described in Table T.

6. TROUBLE RECEIVING - BAD COPY (REFER TO FLOW CHARTS 5 AND 6)

6.01 This section refers to troubles occurring when receiving from a distant station after the connection has been completed. This type of trouble can be caused by high distortion or bias from sending station, poor receive margins at receiving station, a bad line, a faulty connection at central office, or mechanical failure of receiving TTY. Discussing the report with customer can help in localizing this type of trouble. Checking the copy in which the errors occurred may indicate a mechanical failure of teletype machine.

- (a) When the copy shows a consistent pattern of loss or gain of one or more pulses or the error is always the same, the trouble most likely will be mechanical since a line trouble or data set trouble generally will not cause the error continuously.



Flow Chart 5 - Trouble Receiving

(b) Operating the TTY in the local mode and repeating the same sequence of letters or functions that caused the errors in customer's copy will quite often show the same errors if the trouble is mechanical.

Receiving Bad Copy From All Stations

6.02 The fact that subscriber is having trouble with all stations indicates that trouble must be in local station. Testing with ADTL can aid in localizing trouble.

(a) If TTY will not accept the UNDIS test sentences, trouble may be:

- Mechanical trouble in TTY.
- Margin trouble in TTY.
- In receive portion of data set.
- In the line.
- In central office equipment.

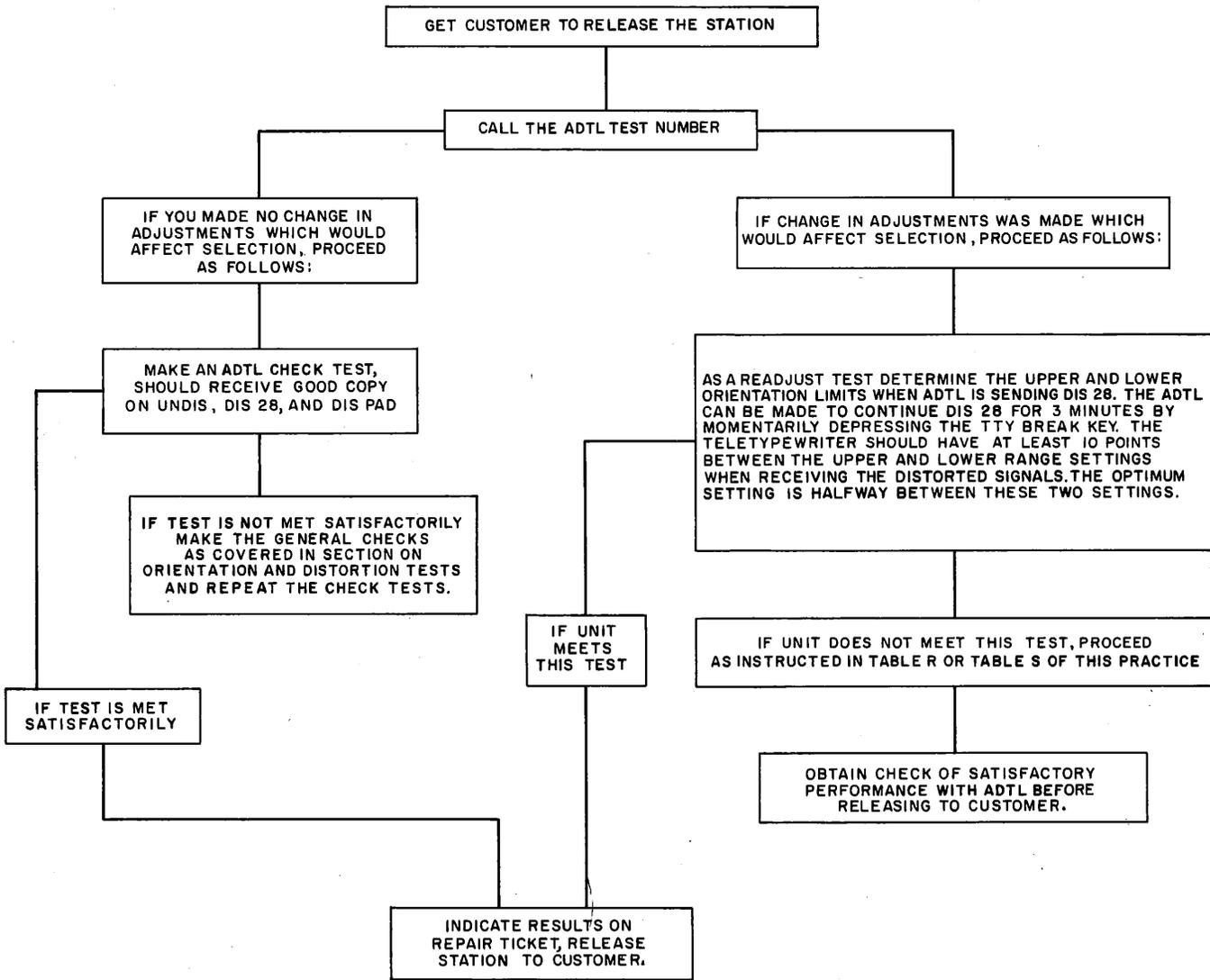
(b) If TTY accepts UNDIS test sentences but not DIS 28 test sentences:

- Assume that the line is OK.
- There may be margin trouble in TTY.
- There may be bias in DISCRIM unit.

(c) If TTY accepts UNDIS or DIS 28 test sentences but not DIS PAD (see Note):

- TTY is OK mechanically.
- Margins in TTY are OK.
- Receiver sensitivity may be poor.
- Loop loss may be out of limits.

Note: DIS PAD test results may not be usable due to the anticipated loss in DDD network. Local practices will govern.



Flow Chart 6 - Receiving Tolerance Tests

(d) If TTY accepts UNDIS, DIS 28, and DIS PAD test sentences in one mode and not the other, suspect data set. Results of transmission tests in both modes must be considered when analyzing results of ADTL test.

(e) In ORIG condition, the line goes through the dial contacts, a possible source of trouble. To test this, tap on dial while receiving from ADTL and note if copy is garbled.

(f) Loop conditions such as momentary short, open, or ground can cause garbling. If unable to prove or localize

trouble to a specific section of equipment or if loop conditions are suspected, use procedure described in 4.04.

(g) When line hits or dropouts are caused by troubles in DDD network, it will be difficult to isolate or prove. It may be desirable to request back up test center to monitor circuit.

(h) If ADTL tests indicate poor receive margins proceed as follows:

(1) Make receive margin tests in LOCAL position and make adjustments as needed.

- (2) Make receive distortion tests with maintenance test card or 907A as described in Table R or S.
- (3) Replace LIMITER and DISCRIM units and recheck margins with ADTL.

Receiving Bad Copy from Certain Stations

6.03 A trouble of this type may indicate poor signals from sending station. The station reporting the trouble should be tested with the ADTL and the results interpreted in the same manner as in 6.02.

- (a) If station equipment tests OK and transmission of distant station is suspected, report this to local plant service center.

Cannot Receive

6.04 In most cases the source of this trouble would be in data set or TTY. To locate trouble:



To prevent transistor damage in the KEYER unit of data set 101A or 101B, disconnect ac power to rectifier J87215A before performing the following operations:

- Removing or inserting KEYER unit, T connector, or J2 connector.
 - Disconnecting TTY selector magnet circuit.
- (a) Operate LOCAL key and type local copy. If copy is received, proceed to (b).
 - (b) If no copy is received, pull KEYER unit out far enough to disconnect. TTY should run open. If it does not, trouble is in TTY. Reinsert KEYER unit.
 - (b) Pull DISCRIM unit out far enough to disconnect. TTY should run open. If it does not, trouble is in KEYER unit. Reinsert DISCRIM unit.
 - (c) To check LIMITER unit use sensitivity test with maintenance test card or 907A test set as described in Table J or K.

- (d) If TTY runs open after the connection has been completed or in local condition, the trouble is in KEYER unit, TTY, or wiring of data set or TTY. To locate trouble:

- (1) Operate LOCAL key.
- (2) Using test set TTS-28 check KEYER unit as described in Table E.
- (3) If KEYER unit tests OK, check TTY and wiring.

7. TTY TROUBLE

7.01 This category includes the mechanical troubles that can occur to the TTY. Procedures for clearing can be found in other practices.

8. TEST PROCEDURES

8.01 This section describes, in detail, various tests and test tables that can be used to check the individual units and sections of the data set. If at any time a measured voltage or result deviates from the one indicated in the test, the trouble is likely to be in that part of the circuit being checked. The test tables are found at the end of this section:

Data Set Control Circuit

8.02 To test the data set control circuit:



Plug-in units where possible should be reinstalled in the same data set from which they are removed. Even though all plug-in units of the same code are completely interchangeable, the factory makes a final touchup adjustment of potentiometers on the LIMITER, DISCRIM, and MOD units, when provided. If plug-in units are not associated with the data set in which they were received, the advantage of this final factory adjustment will be lost.

- (1) Remove all units from data set (see READ in 6.04).
- (2) Operate ORIG key.

- (a) OR relay operates and locks.
 - (b) ORIG lamp lights.
 - (3) Operate CLEAR key.
 - (a) S relay operates and locks.
 - (b) CLEAR lamp lights and ORIG lamp extinguishes.
 - (4) Release OR relay by hand.
 - (a) S relay shall release.
 - (b) CLEAR lamp extinguishes.
 - (5) Operate ANS key.
 - (a) AN relay operates and locks.
 - (b) ANS lamp lights.
 - (6) Operate M relay by hand.
 - (a) M relay shall lock.
 - (7) Operate CLEAR key.
 - (a) S relay operates and locks.
 - (b) CLEAR lamp lights and ANS lamp extinguishes.
 - (8) Release AN relay by hand.
 - (a) S relay releases.
 - (b) M relay releases.
 - (c) CLEAR lamp extinguishes.
- Note: If results of preceding tests differ from those specified, remove connections to subscriber set and repeat tests by operating and releasing proper relays by hand. If trouble is in subscriber set or the connections, it can be located by making continuity tests with test set TTS-28.
- (9) Reinsert TIMER unit.
 - (10) Operate ORIG key.
 - (a) OR relay operates and locks.
 - (b) ORIG lamp lights.

- (11) Operate CLEAR key.
 - (a) S relay operates momentarily, releasing OR relay.
 - (b) ORIG lamp extinguishes.
 - (12) Operate ANS key.
 - (a) AN relay operates and locks.
 - (b) ANS lamp lights.
 - (c) After 1 second M relay operates.
 - (13) Operate CLEAR key.
 - (a) S relay operates momentarily, releasing AN and M relays.
 - (b) ANS lamp extinguishes.
- Note: If trouble is encountered in preceding tests (9) through (13), then apply ground to TP3 on TIMER unit. Operate ANS key. Relays AN, M, CON, CY, and S shall operate momentarily and release. In case of trouble, check chassis wiring.
- (14) Reinsert all units in data set. (See READ in 6.04).

Loop Loss Measurement

8.03 To check:

- (1) Connect line to (+) and (-) terminals on test set TTS-28.
- (2) Connect 1011 handset to TEL-SET terminal of test set TTS-28.
- (3) Switch test set TTS-28 to TEL-SET DIAL position.
- (4) Dial 1000-cycle 1-mw test number. The 4-wire test facilities will require 1000- and 2300-cycle test in both directions.
- (5) After connection is completed, switch test set TTS-28 to DBM 900 OHM TERM position.
- (6) Note reading on dial. This reading should be compared with those recorded on station record E-4905.

(7) If loop losses are not within limits of the EML (estimated measured loss) as indicated on station label, loop should be turned back to repair.

● Loop loss measurements may also be made with the 24A loop checker as described in Section 314-300-300.

● Permissible loop limits from EML are as follows:

Type of Loop	Limits (dbm)
Without Carrier or Repeater	±1
With E7 Repeater Only	±1
With All Other Repeaters and/or Carrier	±2

8.04 Power Ground Noise Test (Using 6A Impulse Counter)

- (1) Calibrate and line up 6A per Section 103-620-100.
- (2) Connect business machine ground to the top IN binding post of the 6A.
- (3) Connect data set ground to the bottom IN binding post of the 6A.



Do not ground 6A for this test.

- (4) Set WTG switch to VOICEBAND.

(5) Set REF LEV DBRN toggle switch to ADD 30.

(6) Set REF LEV DBRN rotary switch to 60.

(7) Reset counter to 0000 by use of RESET switch.

(8) Set MINUTES switch to 15. If any counts are registered in a 15-minute period, grounding arrangements must be improved.

Test Tables

8.05 In each of the test tables once the TTY connects on the first step, the step SHOULD NOT be disconnected until that particular test is completed. If TTY does disconnect, in most cases it is an abnormal indication.

8.06 Table T contains tests of timing functions of the data set using the 907A data test set. These are not a series of tests but individual timing checks and are not numbered. These tests are intended to be performed on a data set only where incorrect timing intervals are suspected. Any other data set trouble should be cleared before these tests are made.

TABLE A
 POSITION OF B TEST SWITCH
 TO CORRESPOND TO WEDGE LOCK TERMINAL STRAPPED VALUE ON LIMITER UNIT

Data Sets 101A, B Arrangement		907A Test Set				TTS 28			Atnd Set	Normal Indication and Procedure	Abnormal Indication and Procedure
Desensitizing Level	Wedge Lock Terminals Limiter	Selector	SW-A	SW-B	Orig-Ans	Function Switch	Probes				
							(+)	(-)			
0*	A-B	†	5	1	ORIG	-10 dbm BRDG	M-1 907A	M-2 907A	ORIG	-16.3 ±1.5 db	Check output of MOD per Table C and LIMITER per Table G or H.
0*	A-B	†	5	1	ANS	-10 dbm BRDG	M-1 907A	M-2 907A	ANS	-16.4 ±1.5 db	
4*	A-C	†	5	3	ORIG	-10 dbm BRDG	M-1 907A	M-2 907A	ORIG	-12.4 ±1.5 db	
4*	A-C	†	5	3	ANS	-10 dbm BRDG	M-1 907A	M-2 907A	ANS	-12.7 ±1.5 db	
8*	A-D	†	5	5	ORIG	0 dbm BRDG	M-1 907A	M-2 907A	ORIG	-8 ±1.5 db	
8*	A-D	†	5	5	ANS	0 dbm BRDG	M-1 907A	M-2 907A	ANS	-8.5 ±1.5 db	

Preparation:

1. Connect EXTENDER card to 907A using connecting cord assembly ED-71287-20 G1.
2. Remove HYBRID and MOD units.
3. Position EXTENDER card into HYBRID unit slot and carefully insert MOD into EXTENDER card.

*Check station record card E-4905.

†Set SELECTOR switch to data set 101A or 101B.

Table A

TABLE B
HYBRID UNIT TEST

Step	Preparation	TTS 28			Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Function Switch	Probes							
			(+)	(-)						
1	Disconnect line from D34 and D35. Remove TIMER and ANS-BACK units.	DBM 900 OHM TERM	TP1 HYBRID Unit	TP2 HYBRID Unit	ORIG	Manually operate CON relay.	Level of F_{1m} tone should equal send pad value strapped within -1.0 dbm to +1.5 dbm.	2	Check MOD unit per Table C. Check HYBRID strapping and send filters.	1
2						Manually operate S relay.	Level of F_{1s} tone should be the same as Step 1 ± 0.5 dbm.	3	Check MOD unit per Table C. Check HYBRID strapping and send filters.	1
3						Manually operate AN and CON relays.	Level of F_{2m} tone should equal send pad value strapped within -1.0 dbm to +1.5 dbm.	4	Check MOD unit per Table C. Check HYBRID strapping and send filters.	1
4						Manually operate S relay.	Level of F_{2s} tone should be the same as Step 3 ± 0.5 dbm.	5	Check MOD unit per Table C. Check HYBRID strapping and send filters.	1
5	Remove test probes and reinsert TIMER unit. Reconnect telephone line to D34 and D35.							6		
6	Remove TIMER unit.	0 dbm BRDG	TP3 HYBRID Unit	GRD	ORIG	(a) Dial 900-ohm quiet termination. (b) Manually operate CON relay.	F_{1m} tone should be more than -5 dbm.	7	Check MOD unit per Table C. Check facilities for a quiet 900-ohm termination.	1
7	Transhybrid loss should be checked with all four frequencies. Operate relays as shown in Action, Steps 2-4.	ODBM BRDG	TP3 HYBRID Unit	GRD			Level reading should be more than -5 dbm for F_1 and F_2 frequencies (see Note).	E N D O F T E S T	If readings obtained in Steps 6 and 7 do not meet requirements, it is an indication of loop impedance difficulty that should be corrected before proceeding with further tests. See station circuit layout and/or service order for facilities requirements.	1

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

TABLE C
MODULATOR UNIT TEST

Step	Preparation	TTS 28		Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step	
		Function Switch	Probes							
			(+)							(-)
1	To check break timer of modulator, operate LOCAL key and print local copy.	150 vdc	(+) Test on Rectifier	D69	LOCAL	Operate BREAK key.	Meter should swing from 40 vdc to 0 vdc.	2	Replace MOD unit.	1
2	Remove positive test probe.	30 vdc	GRD	D69	LOCAL	Send repeated R characters from keyboard.	Test set needle vibration should be centered at 6.5 \pm 1 vdc.	3	Replace MOD unit.	1
3	To check output of break timer: (a) Remove negative test probe. (b) Depress CLEAR key.	30 vdc	GRD	D74	LOCAL	Operate BREAK key.	Meter needle should swing from less than 2 vdc towards 20 vdc.	4	Replace MOD unit.	1
4	To check output of oscillator circuit. Remove TIMER and ANS-BACK units	0 DBM BRDG	TP3 MOD Unit	GRD	ORIG	Dial up 900-ohm quiet termination. Manually operate CON relay.	F _{1m} tone should be between -1.0 and +2.5 dbm.	5	Replace MOD unit.	1
5						Manually operate S relay.	F _{1s} tone should be same as Step 4.	6	Replace MOD unit.	1
6						Manually operate AN and CON relays.	F _{2m} tone should be between +2.0 and +5.5 dbm.	7	Replace MOD unit.	1
7	The list 4 modulator unit is equipped with an adjustable potentiometer (R20B) in Q1B emitter circuit. The addition of potentiometer R20B permits a uniform level adjustment of different MOD units with the level adjustment pads strapped out. POTENTIOMETER R20B IS FACTORY ADJUSTED AND NO SUBSEQUENT ADJUSTMENT SHOULD BE ATTEMPTED.					Manually operate S relay.	F _{2s} tone should be same as Step 6.	8	Replace MOD unit.	1

TABLE C (Cont)
MODULATOR UNIT TEST

Step	Preparation	TTS 28		Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step	
		Function Switch	Probes							
			(+)							(-)
8	To check output of MOD unit through the filter and send pads. HYBRID unit must be strapped for 0.0 dbm output to make this test. This can be done by strapping 1 to 2 and 3 to 4 disconnecting any other straps from these terminals, but leaving the original strapping in. Reinsert HYBRID unit. Momentarily insert TIMER unit for set to clear and then remove TIMER unit. Dial 900-ohm quiet termination.	+10 DBM BRDG	TP2 MOD Unit	GRD	ORIG	Manually operate relays as described in Steps 4-7 to generate the four frequencies F_{1m} , F_{1s} , F_{2m} , F_{2s} .	Readings for all four frequencies should be between -0.5 and +2.0 dbm.	9	Replace MOD unit. Check filters and HYBRID strapping.	1
9	Remove test probes and re-strap HYBRID unit per station record form E-4905. Reinsert HYBRID unit. Momentarily insert TIMER unit for set to clear and then remove TIMER unit.	30 vdc	GRD	TP1 MOD Unit	ORIG	Dial 900-ohm quiet termination. Manually operate CON relay.	Reading should be less than 0.5 vdc.	10	Replace MOD unit.	1
10		30 vdc	TP1 MOD Unit	GRD	ORIG	Manually operate S relay.	Reading should be more than 4.0 vdc.	11	Replace MOD unit.	1
11	Remove test probes. Manually operate AN and CON relays.	30 vdc	GRD	TP1 MOD Unit	ANS		Reading should be less than 0.5 vdc.	12	Replace MOD unit.	1
12		30 vdc	TP1 MOD Unit	GRD	ANS	Manually operate S relay.	Reading should be more than 4.0 vdc.	13	Replace MOD unit.	1
13	Reinsert TIMER and ANS-BACK units. Remove test probes.							14		
14	To measure the four data set frequencies, call BACK-UP test center.					When requested to loop back data set frequencies, depress the TEST button.	Data set frequencies check OK.	END OF TEST	Data set frequencies out of limits. Replace MOD unit.	1

Table C (Cont)

TABLE D
TIMER UNIT TEST

Step	Preparation	TTS 28		Atn Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step	
		Function Switch	Probes							
			(+)							(-)
1	The following tests will locate a complete failure within TIMER unit.	30 vdc	TP1 TIMER Unit	GRD		Reading should be more than 1.8 vdc.	2	If out of limits go to Step 3.	3	
2		30 vdc	D13 Terminal Strip	GRD		Reading should be more than 1.8 vdc.	3	Check MOD unit per Table C.	1	
3	Remove test probes.	30 vdc	GRD	CY Relay No. 1 Fixed Contact		Reading should be about 9 vdc.	4	Check DISCRIM unit per Table M or N.	1	
4	Remove HYBRID unit. Remove test probes.	30 vdc	TP1 TIMER Unit	(-) Test Point on Rectifier	ORIG	Reading should be less than 1.0 vdc.	5	Check DISCRIM unit per Table M or N. Replace TIMER unit.	1	
5		1.5 vdc	D13 Terminal Strip	(-) Test Point on Rectifier		Reading should be less than 1.0 vdc.	6	Check MOD unit per Table C. Replace TIMER unit.	6	
6	Remove test probes.	150 vdc	CY Relay No. 1 Fixed Contact	GRD	LOCAL	Operate BREAK key.	7	Check MOD unit per Table C. Check DISCRIM unit per Table M or N.	1	
7	Remove test probes.	1.5 vdc	TP2 TIMER Unit	(-) Test Point of Rectifier	ORIG	Reading should be less than 1.5 vdc.	8	Replace TIMER unit.	1	
8		1.5 vdc	TP3 TIMER Unit	(-) Test Point of Rectifier		Reading should be less than 1.0 vdc.	9	Check continuity between D16 and GRD. Replace TIMER unit.	1	
9	Remove test probes and depress CLEAR key. Block M relay released.	30 vdc	TP2 TIMER Unit	GRD	ANS	Reading should be more than 0.5 vdc and less than 3 vdc.	10	If reading is greater than 3 vdc, replace TIMER unit.	1	

Table D

TABLE D (Cont)
TIMER UNIT TEST

Step	Preparation	TTS 28			Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Function Switch	Probes							
			(+)	(-)						
10	Remove test probes.	1.5 vdc	GRD	TP3 TIMER Unit		Reading should be less than 0.2 vdc.	11	If reading is more than 3 vdc replace TIMER unit.	1	
11	Remove test probes and unblock M relay. Depress CLEAR key.	30 vdc	GRD	TP2 TIMER Unit		All Relays Released	12	Check wiring from control relays to TIMER unit.	1	
12		30 vdc	GRD	TP2 TIMER Unit	ORIG		13	Check wiring from control relays to TIMER unit.	1	
13	Hold OR relay operated and manually operate S relay.	30 vdc	GRD	TP2 TIMER Unit			14	Check wiring from control relays to TIMER unit.	1	
14	Release S relay. Block M relay released.	30 vdc	GRD	TP2 TIMER Unit	ANS		15	Check wiring from control relays to TIMER unit.	1	
15	Remove blocked M relay.	30 vdc	GRD	TP2 TIMER Unit			16			
16	Hold AN relay operated and manually operate S relay.	30 vdc	GRD	TP2 TIMER nit		END OF TEST	17			
17	Release AN relay and insert HYBRID unit.									

Table D (Cont)

TABLE E
KEYER UNIT TEST

Step	Preparation	TTS 28			Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Function Switch	Probes							
			(+)	(-)						
1	Operate LOCAL key. TTY motor should start and the TTY runs closed. If TTY runs open proceed to check KEYER unit by first checking input to KEYER unit in MARK condition as follows.	1.5 vdc	GRD	TP2 DISCRIM Unit			Reading should be less than 0.2 vdc.	2	If reading is more than 0.2 vdc check DISCRIM unit per Table M or N.	1
2	Remove test probes.	30 vdc	TP1 KEYER Unit	(-) Test Point on Rectifier			Reading should be more than 1.8 vdc.	3	Check DISCRIM unit per Table M or N.	1
3		30 vdc	TP2 KEYER Unit	(-) Test Point on Rectifier			Reading should be more than 2 vdc.	4	Replace KEYER unit.	1
4	Remove test probes.					Operate BREAK key on keyboard.	TTY should run open for a short interval.	5	If TTY fails to run open generate a continuous spacing condition per Step 5.	1
5	Remove spade lug on terminal D15.	30 vdc	TP2 DISCRIM Unit	(-) Test Point on Rectifier			Reading should be less than 2.5 vdc. TTY runs open.	6	Replace KEYER unit.	1
6	Remove test probes.	1.5 vdc	TP1 KEYER Unit	(-) Test Point on Rectifier			Reading should be less than 0.1 vdc.	7	Check DISCRIM unit per Table M or N.	1
7	Remove test probes.	30 vdc	(+) Test Point of Rectifier	TP2 KEYER Unit			Reading should be more than 1.5 vdc.	8	Replace KEYER unit.	1
8	Remove test probes. Depress CLEAR key.					Reconnect spade lug to terminal D15.	END OF TEST			

Table E

TABLE F
ANSWER-BACK UNIT TEST

Step	Preparation	TTS 28			Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Function Switch	Probes							
			(+)	(-)						
1	<u>Eight-Second Timing Circuit Test</u>				ANS		M relay operates and about 8 seconds later S relay should operate.	2	If S relay does not operate, go to Step 2.	2
2		1.5 vdc	(+) Test Point of Rectifier	TP1 ANS-BACK Unit		No relays operated.	Reading should be less than 1.0 vdc.	3	Replace ANS-BACK unit.	1
3	Remove test probes.	150 vdc	GRD	TP1 ANS-BACK Unit	ANS	Block S relay released.	After about 8 seconds, reading should be less than 0.5 vdc.	4	Replace ANS-BACK unit.	1
4	Remove test probes and unblock S relay.						END OF TEST			
1	<u>Drum Answer-Back Test</u>				LOCAL	Manually operate M and CON relays.	Drum should be triggered and answer-back should be printed on machine.	2	If answer-back drum does not operate, make the following tests in Step 2.	2
2	Depress CLEAR key.	30 vdc	(+) Test Point of Rectifier	D71 Terminal Strip	LOCAL	Manually operate M and CON relays.	Needle on TTS 28 should start to move toward 20 vdc. If this movement is noted, answer-back circuit is OK.	END OF TEST	Replace ANS-BACK unit. Check wiring to ANS-BACK drum.	1
1	<u>V Answer-Back Test</u> (See Note)				LOCAL	Manually operate M and CON relays.	Observe if the letter V is received.		If no V is received, make the following tests in Steps 2 and 3.	2
2		30 vdc	TP2 ANS-BACK Unit	(-) Test Point on Rectifier			Reading should be 0 vdc.	3	Replace ANS-BACK unit. Check MOD unit per Table C.	1
3		30 vdc	TP2 ANS-BACK Unit	(-) Test Point on Rectifier	LOCAL	Manually operate M and CON relays.	Needle on TTS 28 should start to move towards 20 vdc when M and CON relays are operated (about a 3-volt swing).	END OF TEST	Replace ANS-BACK unit. Check wiring from M and CON relays to ANS-BACK unit.	1

Note: V generator (0.042 to 0.047 second), Y option only. This is the length of the spacing signal transmitted by an automatic answering station using Y option in response to an incoming call. If the interval is too short, a nonprinting letter character may be transmitted instead of a V. If too long, an M may be transmitted.

TABLE G
LIMITER UNIT TEST
USING MAINTENANCE TEST CARD

Step	Preparation	MTC			TTS 28			Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Mark Dot Space	Disconn Conn +3	Orig Ans	Function Switch	Probes							
						(+)	(-)						
1	Remove HYBRID and MOD units. Insert MTC into HYBRID slot and insert MOD into MTC. This test checks the limiter operation under signal conditions.	MARK	CONN	ORIG	ODBM BRDG	GRD	TP1 LIMITER Unit	ORIG		TTY will connect. Reading should be less than -1 dbm. This indicates the limiter is clipping and receive level at station is -50 dbm or better.	3	TTY does not connect.	2
2		MARK	CONN +3	ORIG	ODBM BRDG	GRD	TP1 LIMITER Unit	ORIG		TTY will connect. Reading should be less than -1 dbm.	3	Set does not connect. Refer to sensitivity test per Table J or K.	1
3	Remove test probes.	MARK	CONN	ORIG	1.5 vdc	GRD	TP2 LIMITER Unit	ORIG		Readings should be less than 0.2 vdc. This indicates the space hold circuit is inactive when receiving a proper signal.	4	Readings more than 0.2 vdc replace LIMITER unit.	1
4	To check limiter for a weak signal operation, make the following test: Remove TIMER unit.	MARK	DISCONN	ORIG	ODBM BRDG	GRD	TP1 LIMITER Unit	ORIG		Reading should be more than -1 dbm. This indicates limiter is not receiving an acceptable signal. TTY runs operation.	5	Replace LIMITER unit.	1
5	Remove test probes.	MARK	DISCONN	ORIG	1.5 vdc	GRD	TP2 LIMITER Unit	ORIG		Reading should be more than 0.2 vdc. This indicates that space-hold (carrier fail) circuit is operating properly.	END OF TEST	Replace LIMITER unit.	1

Table G

TABLE H
LIMITER UNIT TEST
USING 907A DATA TEST SET

Step	Preparation	907A Test Set				TTS 28			Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Selector	SW-A	SW-B	Orig-Ans	Function Switch	Probes							
							(+)	(-)						
1	Connect EXTENDER card to 907A with connecting cord assembly ED-71287-20 G1. Remove HYBRID and MOD units. Slide EXTENDER card into hybrid slot and carefully insert MOD unit into EXTENDER card.	*	7	†	ORIG	ODBM BRDG	GRD	TP1 LIMITER Unit	ORIG		TTY will connect. Reading should be less than -1 dbm. This indicates the limiter is clipping and receive level at station is -50 dbm or better.	3	TTY does not connect.	2
2		*	6	†	ORIG	ODBM BRDG	GRD	TP1 LIMITER Unit	ORIG		Set will connect. Reading should be less than -1 dbm.	3	Set does not connect. Refer to sensitivity test per Table J or K.	1
3	Remove test probes.	*	7	†	ORIG	1.5 vdc	GRD	TP2 LIMITER Unit	ORIG		Reading should be less than 0.25 vdc. This indicates the space-hold circuit is inactive when receiving a proper signal.	4	Reading more than 0.25 vdc, replace LIMITER unit.	1
4	To check limiter for a weak signal operation make the following test: Remove TIMER unit.	*	4	†	ORIG	ODBM BRDG	GRD	TP1 LIMITER Unit	ORIG		Reading should be more than -1 dbm. This indicates limiter is not receiving an acceptable signal. TTY runs open.	5	Replace LIMITER unit.	1
5	Remove test probes.	*	4	†	ORIG	1.5 vdc	GRD	TP2 LIMITER Unit	ORIG		Reading should be more than 0.25 vdc. This indicates that space-hold (carrier fail) circuit is operating properly.	END OF TEST	Replace LIMITER unit.	1

* Set SELECTOR switch to data set 101A or 101B.

† Per Table A.

SENSITIVITY TESTS WITH MAINTENANCE TEST CARD

Data sets 101A and 101B contain a signal fail feature that permits a potentiometer adjustment of circuit sensitivity, determining the minimum signal level that will keep the station connected to the line. This is intended to be a factory adjustment. With wedge-lock terminals A and B on LIMITER unit strapped, it is initially set to require incoming signals above -51 dbm in filter bandpass for the connect sequence to be operative. After station has connected, the same adjustment will also detect a reduction of signal below -56 dbm producing a spacing signal to TIMER unit, which initiates disconnect sequence. This feature is included to ensure circuit continuity to the user during transmission of his message.

Some types of customer trouble reports might indicate changes in circuit sensitivity due to component changes. This section describes how the MAINTENANCE TEST CARD enables limiter and associated circuitry to be isolated from the line to determine whether the sensitivity is within acceptable limits.

When making sensitivity test with MAINTENANCE TEST CARD, MOD unit will send f_{1m} signals via MAINTENANCE TEST CARD to LIMITER unit. These signals are reduced by pads on MAINTENANCE TEST CARD to ac voltages that are equivalent to the required limiter

input test levels. Their value depends upon the position of the switches.

For a meaningful test, a MOD unit within ± 0.75 db of nominal output level is required.

The various switch settings of the MAINTENANCE TEST CARD, with ANS-ORIG switch in ANS position, provide equivalent signal levels, relative to power into 900 ohms across tip and ring, as indicated below. The SPACE position provides pure spacing signals that are useful for testing and trouble shooting. TST key may be depressed to prevent data set from disconnecting in SPACE position.

Position	Mark	Dot	Space
CONN	-51	-41	-41
CONN +3	-48	-38	-38
DISCONN	-58	-58	-58

All readings are in dbm.

Note: The dbm values in ORIG mode, F_{2m} band, are approximately 2 db higher.

TABLE J
SENSITIVITY TEST
USING MAINTENANCE TEST CARD

Step	Preparation	MTC			TTS 28			Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Mark Dot Space	Disconn Conn +3	Orig Ans	Function Switch	Probes							
						(+)	(-)						
1	Remove HYBRID and MOD units. Insert MTC into HYBRID unit slot. Plug MOD unit into MTC. Note wedge-lock terminal strapping on LIMITER unit and strap terminals A and B and remove any straps on terminals C and D.	MARK	CONN	ORIG				ORIG		OR, CON, and CY relays operate. TTY connects.	2	CON relay does not operate. Set does not connect.	3
2	Depress CLEAR key.	MARK	CONN	ANS				ANS		AN, CY, CON, and M relays operate. TTY connects.	4	CON relay does not operate. Set does not connect.	3
3		MARK	CONN +3	ANS				ANS		AN, M, CON, and CY relays operate. TTY connects. LIMITER unit potentiometer should be adjusted clockwise just enough to permit proper relay operation under conditions specified in Steps 1 and 2.	1	Set does not connect. Check LIMITER unit per Table G or H. Check DISCRIM unit per Table M or N. Check KEYSER unit per Table E.	1
4	To ensure data set is not overly sensitive.	DOT	CONN	ANS				ANS		TTY types meaningless copy.	5	Check LIMITER unit per Table G or H. Check DISCRIM unit per Table M or N. Check KEYSER unit per Table E.	1
5		DOT	DISCONN	ANS				ANS		S relay should now operate and data set will go to on-hook condition indicating LIMITER unit is not overly sensitive.	END OF TEST	S relay does not operate. Replace LIMITER unit.	1
6	Restore equipment to normal operating conditions. Restrap LIMITER unit per station record form E-4905.												

TABLE K
SENSITIVITY TEST
USING 907A DATA TEST SET

Step	Preparation	907A Test Set				TTS 28			Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Selector	SW-A	SW-B	Orig-Ans	Function Switch	Probes							
							(+)	(-)						
1	Connect EXTENDER card to 907A with connecting cord assembly ED-71287-20 G1. Remove HYBRID and MOD units. Slide EXTENDER card into hybrid slot and carefully insert MOD unit into EXTENDER card.	*	7	+	ORIG				ORIG	OR, CON, and CY relays operate. TTY connects.	2	CON relay does not operate. Set does not connect.	3	
2	Depress CLEAR key.	*	7	+	ANS				ANS	AN, CY, CON, and M relays operate. TTY connects.	4	CON relay does not operate. Set does not connect.	3	
3	Depress CLEAR key.	*	6	+	ANS				ANS	AN, M, CON, and CY relays operate. TTY connects. LIMITER unit potentiometer should be adjusted clockwise just enough to permit proper relay operation under conditions specified in Steps 1 and 2.	1	Set does not connect. Check LIMITER unit per Table G or H. Check DISCRIM unit per Table M or N. Check KEYER unit per Table E.	1	
4	To ensure that data set is not overly sensitive.	*	9	+	ANS				ANS	TTY types meaningless copy.	5	Check LIMITER unit per Table G or H. Check DISCRIM unit per Table M or N. Check KEYER unit per Table E.	1	
5		*	4	+	ANS				ANS	TTY will print some meaningless copy and data set will go to on-hook condition indicating LIMITER unit is not overly sensitive.	END OF TEST	Check LIMITER unit per Table G or H. Check DISCRIM unit per Table M or N. Check KEYER unit per Table E.	1	

* Set SELECTOR switch to data set 101A or 101B.

+ Per Table A.

TABLE L
BALANCING OF DISCRIMINATOR

Step	Preparation	TTS 28		Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step	
		Function Switch	Probes							
			(+)							(-)
	Potentiometer adjustment R4A is a means of balancing voltages in the discriminator circuit. It determines at what voltage level (from the discriminator coil) the keyer output changes from mark to space due to the regenerative circuit. A factory adjustment aligns the discriminator coils and the potentiometer so that the midfrequency of the mark and space frequencies provides an output voltage which is equal to this threshold voltage. Since the discriminator is a frequency-to-voltage converter, the potentiometer also adjusts the frequency characteristic of the receiver. Therefore, the balance potentiometer can also alter the received teletype signal bias measured at the output of the keyer. (See Note 1.)									
1	Remove LIMITER and TIMER units.	30 vdc	GRD	TP-2 DISCRIM-Unit	Manually operate AN and CON relays.	Adjust R4A to provide a reading of 10 \pm 1 vdc (See Note 2.)	2	Unable to balance discriminator, replace DISCRIM unit.	1	
2	Insert LIMITER and TIMER units.				END OF TEST					

Note 1: This adjustment shall be made if DISCRIM unit is replaced.

Note 2: This voltage may change from 0 to 20 volts with only a slight unbalance of the discriminator. A subsequent reading may differ greatly and does not necessarily indicate trouble with DISCRIM unit.

Table L

TABLE M

DISCRIMINATOR TEST
USING 907A DATA TEST SET

Step	Preparation	907A Test Set				TTS 28			Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Selector	SW-A	SW-B	Orig-Ans	Function Switch	Probes							
							(+)	(-)						
1	Check DISCRIM unit per Table L before starting test. Connect EXTENDER card to 907A with connecting cord assembly ED-71287-20 G1. Remove HYBRID and MOD units. Slide EXTENDER card into hybrid slot and carefully insert MOD unit into EXTENDER card.	*	6	‡	ORIG				ORIG	CON relay operates. TTY runs closed.	2	If CON relay does not operate make sensitivity tests per Table J or K. If machine runs open make voltage tests beginning with Step 4.	4	
2	Depress CLEAR key.	*	6	‡	ANS				ANS	When CON relay operates remove TIMER unit. TTY runs closed.	3	TTY runs open.	4+	
3		*	3	‡	ANS				ANS	TTY runs open.	4	TTY runs closed.	4+	
4	Reinsert TIMER unit.	*	6	‡	ORIG	30 vdc	TP1 DISCRIM Unit	GRD	ORIG	Reading should be more than 0.0 vdc.	5	Check LIMITER unit per Table G or H.	1	
5	Depress CLEAR key.	*	6	‡	ANS	30 vdc	TP1 DISCRIM Unit	GRD	ANS	When CON relay operates remove TIMER unit. Reading should be more than 0.0 vdc.	6	Check LIMITER unit per Table G or H.	1	
6	Remove test probes.	*	3	‡	ANS	30 vdc	GRD	TP1 DISCRIM Unit	ANS	Reading should be more than 2.6 vdc. TTY runs open.	7	Replace DISCRIM unit.	1	
7	Remove test probes.	*	6	‡	ANS	30 vdc	GRD	TP2 DISCRIM Unit	ANS	Reading should be less than 0.2 vdc. TTY runs closed.	8	Replace DISCRIM unit.	1	
8	Remove test probes.	*	3	‡	ANS	30 vdc	TP2 DISCRIM Unit	(-) Test Point on Rectifier	ANS	Reading should be less than 2.6 vdc. TTY runs open.	END OF TEST	Replace DISCRIM unit.	1	

* Set SELECTOR switch to data set 101A or 101B.

+ If all readings are correct but machine did not run as shown in Steps 2 and 3, check KEYSER unit per Table E.

‡ Per Table A.

TABLE N
DISCRIMINATOR TEST
USING MAINTENANCE TEST CARD

Step	Preparation	MTC			TTS 28			Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Mark Dot Space	Disconn Conn +3	Orig Ans	Function Switch	Probes							
						(+)	(-)						
1	Check DISCRIM unit per Table L before starting test. Remove HYBRID and MOD units. Insert MTC in the hybrid slot and plug modulator into MTC	MARK	CONN +3	ORIG				ORIG		CON relay operates. TTY runs closed.	2	If CON relay does not operate make sensitivity tests per Table J or K. If machine runs open, make voltage tests beginning with Step 4.	4
2	Depress CLEAR key.	MARK	CONN +3	ANS				ANS	When CON relay operates, remove TIMER unit.	TTY runs closed.	3	TTY runs open.	4*
3		SPACE	CONN +3	ANS				ANS		TTY runs open.	4	TTY runs closed.	4*
4	Reinsert TIMER unit.	MARK	CONN +3	ORIG	30 vdc	TP1 DISCRIM Unit	GRD	ORIG		Reading should be more than 0.0 vdc.	5	Check LIMITER unit per Table G or H.	1
5	Depress CLEAR key.	MARK	CONN +3	ANS	30 vdc	TP1 DISCRIM Unit	GRD	ANS	When CON relay operates, remove TIMER unit.	Reading should be more than 0.0 vdc.	6	Check LIMITER unit per Table G or H.	1
6	Remove test probes.	SPACE	CONN +3	ANS	30 vdc	GRD	TP1 DISCRIM Unit	ANS		Reading should be more than 2.6 vdc. TTY runs open.	7	Replace DISCRIM unit.	1
7	Remove test probes.	MARK	CONN +3	ANS	30 vdc	GRD	TP2 DISCRIM Unit	ANS		Reading should be less than 0.2 vdc. TTY runs closed.	8	Replace DISCRIM unit.	1
8	Remove test probes.	SPACE	CONN +3	ANS	30 vdc	TP2 DISCRIM Unit	(-) Test Point on Rectifier	ANS		Reading should be less than 2.6 vdc. TTY runs open.	END OF TEST	Replace DISCRIM unit.	1

* If all readings are correct but machine did not run as shown in Steps 2 and 3 check KEYER unit per Table E.

Table N

TABLE P
DISCRIMINATOR BIAS TEST
USING 907A DATA TEST SET

Step	Preparation	907A Test Set				TTS 28			Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Selector	SW-A	SW-B	Orig-Ans	Function Switch	Probes							
							(+)	(-)						
1	<u>DO NOT PERFORM BIAS TEST UNTIL DISCRIMINATOR BALANCE TESTS IN TABLE L ARE PERFORMED FIRST.</u> Connect EXTENDER card to 907A with connecting cord assembly ED-71287 G1. Remove HYBRID and MOD units. Slide EXTENDER card into hybrid slot and carefully insert modulator into EXTENDER card.	*	5	+	ORIG	150 vdc	M-1 907A	TP2 DISCRIM Unit	ORIG	Remove TIMER unit.	Reading should be 0-20 volts. TTY connects.	2	If set does not connect, refer to Table M or N. After checking Table M or N set does not connect, check KEYSER unit per Table E.	1
2		*	3	+	ORIG	1.5 vdc	M-1 907A	TP2 DISCRIM Unit	ORIG	Reverse meter leads if necessary to get an up-scale reading.	Reading should be 0.0 vdc. TTY runs open.	3	If TTY runs open, but reading of 0.0 vdc cannot be reached, check DISCRIM unit per Table M or N.	1
3	Remove test probes.	*	8	+	ORIG	1.5 vdc	M-1 907A	TP2 DISCRIM Unit	ORIG		Reading should be less than 1 vdc. 1 volt equals 5 per cent bias. TTY prints meaningless copy.	4	Higher voltage reading than 1 volt indicates that the DISCRIM unit should be checked per Table M or N.	1
4	Remove test probes. Reinsert TIMER unit and depress CLEAR key.	*	5	+	ANS	150 vdc	M-1 907A	TP2 DISCRIM Unit	ANS	Remove TIMER unit.	Reading should be 0-20 volts. TTY connects.	5	If set does not connect, refer to Table G or H. If LIMITER checks ok replace DISCRIM unit.	1

Table P

TABLE P (Cont)
 DISCRIMINATOR BIAS TEST
 USING 907A DATA TEST SET

Step	Preparation	907A Test Set				TTS 28			Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Selector	SW-A	SW-B	Orig-Ans	Function Switch	Probes							
							(+)	(-)						
5		*	3	+	ANS	1.5 vdc	M-1 907A	TP2 DISCRIM Unit	ANS	Reverse meter leads if necessary to get an up-scale reading.	Reading should be 0.0 vdc. TTY runs open.	6	If TTY runs open, but reading of 0.0 vdc cannot be reached, check DISCRIM unit per Table M or N.	1
6	Remove test probes.	*	8	+	ANS	1.5 vdc	M-1 907A	TP2 DISCRIM Unit	ANS		Reading should be less than 1 vdc. 1 volt equals 5 per cent bias. TTY prints meaningless copy.	7	Higher voltage reading than 1 volt indicates that the DISCRIM unit should be checked per Table M or N.	1
7	Remove test probes. Reinsert TIMER unit and depress CLEAR key.									END OF TEST				

* Set SELECTOR switch to data set 101A or 101B.

+ Per Table A.

Table P (Cont)

TABLE Q
DISCRIMINATOR BIAS TEST
USING MAINTENANCE TEST CARD

Step	Preparation	MTC			TTS 28			Atnd Set	Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Mark Dot Space	Disconn Conn +3	Orig- Ans	Function Switch	Probes							
						(+)	(-)						
1	DO NOT PERFORM BIAS TEST UNTIL DISCRIMINATOR BALANCE TESTS IN TABLE Q ARE PERFORMED FIRST. Remove HYBRID, MOD and ANS-BACK units. Insert MTC card into hybrid slot. Plug MOD unit into MTC.	MARK	CONN +3	ORIG	30 vdc	GRD	TP2 DISCRIM Unit	ORIG	Remove TIMER unit.	TTY connects.	2	If set does not connect, refer to Table M or N.	1
2		DOT	CONN +3	ORIG	30 vdc	GRD	TP2 DISCRIM Unit	ORIG	Reverse meter leads if necessary to get on up-scale reading	Reading should be 0-20 vdc. TTY runs open.	3	Check DISCRIM unit per Table M or N. Check LIMITER unit per Table G or H.	1
3		DOT	CONN +3	ORIG	30 vdc	TP2 DISCRIM Unit	TP1 Maintenance Test Card	ORIG	Reverse meter leads if necessary to get an up-scale reading	Reading should be less than 1 vdc. 1 volt equals 5 per cent bias. TTY prints meaningless copy.	4	Higher voltage reading than 1 volt indicates that the DISCRIM unit should be checked per Table M or N.	2
4	Remove test probes. Reinsert TIMER unit and depress CLEAR key.	MARK	CONN +3	ANS	30 vdc	GRD	TP2 DISCRIM Unit	ANS	Remove TIMER unit.	TTY connects.	5	If set does not connect, refer to Table G or H. If LIMITER checks OK replace DISCRIM unit.	1
5		DOT	CONN +3	ANS	30 vdc	GRD	TP2 DISCRIM Unit	ANS	Reverse meter leads if necessary to get an up-scale reading.	Reading should be 0-20 vdc. TTY connects.	6	Check DISCRIM unit per Table M or N. Check LIMITER unit per Table G or H.	1
6		DOT	CONN +3	ANS	30 vdc	TP2 DISCRIM Unit	TP1 Maintenance Test Card	ANS	Reverse meter leads if necessary to get an up-scale reading	Reading should be less than 1 vdc. 1 volt equals 5 per cent bias. TTY prints meaningless copy.	7	Higher voltage reading than 1 volt indicates that the DISCRIM unit should be checked per Table M or N.	1
7	Remove test probes. Reinsert TIMER unit and depress CLEAR key.								END OF TEST				

TABLE R
DISTORTION TEST
USING 907A DATA TEST SET

Step	Preparation	907A Test Set				164C4 TMS					Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Selector	SW-A	SW-B	Orig-Ans	Loop	Speed	Display	Code	Loop Input					
C A U T I O N 1	<p>To prevent transistor damage in the KEYER unit of data set 101A or 101B disconnect ac power to rectifier J87215A before performing the following operations:</p> <p>Removing or inserting KEYER unit, T connector, or J2 connector. Disconnecting TTY selector magnet circuit.</p> <p>Connect 907A to EXTENDER card using connecting cord assembly ED-71287-20 G1. Remove KEYER and ANS-BACK units. Insert EXTENDER card in keyer slot. This test checks the receive distortion at the discriminator output. Plug 164C4TMS in SIG jack of 907A.</p>	*	19	OFF	ORIG	20	60	PIP	5	NORMAL	Dial a source of telegraph signals over the telephone network. The ADTL signals should be undistorted and steady for a good reading.	Read distortion on 164C4. This reading is receive distortion. The reading shall be less than 7.5 per cent marking or spacing. TTY will run, but is blinded. Local copy will not be received and local copy cannot be typed.	2	If out of limits make adjustments as required. Check DIS-CRIM unit per Table M or N. If still out of limits, check loop facilities for any impedance difficulties.	1
2	<p>This test checks receive distortion at the keyer output. Plug KEYER unit into EXTENDER card. Plug 164C4 TMS in SIG jack of 907A</p>	*	20	OFF	ORIG	62.5	60	PIP	5	NORMAL	<p>Perform in sequence:</p> <p>(a) Dial a source of telegraph signals over the telephone network.</p> <p>(b) After set connects, remove TIMER unit.</p> <p>(c) Place a strap from TP2 of DIS-CRIM unit to TP1 of KEYER unit.</p>	Read distortion on 164C4. This reading is receive distortion at the KEYER unit output. Reading shall be less than 7.5 per cent marking or spacing.	3	If out of limits, replace KEYER unit.	1

* Set SELECTOR switch to data set 101A or 101B.

TABLE R (Cont)
 DISTORTION TESTS
 USING 907A DATA TEST SET

Step	Preparation	907A Test Set				164C4 TMS					Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Selector	SW-A	SW-B	Orig-Ans	Loop	Speed	Display	Code	Loop Input					
C A U T I O N	<p>Before performing the following tests on 15- and 19-type stations equipped with noise suppression unit J70148S, List 1, it will be necessary to disconnect red lead between noise suppression unit and Z15 on terminal strip Z of 15- or 19-type stations.</p> <p>This test checks send distortion of keyboard or transmitter distributor contacts. Remove EXTENDER card from keyer slot. Insert KEYER unit into keyer slot. Remove MOD unit and insert EXTENDER card into modulator slot. Plug 164C4 TMS in SIG jack of 907A. Remove strap from TP2 of DISCRIM unit to TP1 of KEYER unit.</p>	*	18	OFF	ORIG	20	60	PIP	5	NORMAL	Depress LOCAL key and type repeated R and Y characters or send R and Y characters with transmitter distribution.	Read distortion on 164C4. This reading is send distortion. Reading should be less than 5 per cent marking or spacing.	END OF TEST	If out of limits, make adjustments as required.	3

* Set SELECTOR switch to data set 101A or 101B.

Table R (Cont)

TABLE S
DISTORTION TESTS
USING MAINTENANCE TEST CARD

Step	Preparation	MTC			164C4 TMS					Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Mark Dot Space	Disconn Conn +3	Orig-Ans	Loop	Speed	Display	Code	Loop Input					
C A U T I O N 1	To prevent transistor damage in the KEYER unit of data set 101A or 101B disconnect ac power to rectifier J87215A before performing the following operations: Removing or inserting KEYER unit, T connector, or J2 connector. Disconnecting TTY selector magnet circuit. To check send distortion at DISCRIM unit output remove KEYER and ANS-BACK units. Insert MTC in KEYER slot.				20	60	PIP	5	NOR-MAL	Plug TMS into 20 MA jack of MTC. Depress LOCAL key and transmit R and Y characters. This checks distortion of send contacts at discriminator output.	Reading on 164C4 TMS should be less than 5 per cent marking or spacing.	2	If out of limits, make adjustments as required.	1
2	To check receive distortion at discriminator output.				20	60	PIP	5	NOR-MAL	Dial a source of telegraph signals over the telephone network The ADTL.	Read distortion on 164C4. This reading is receive distortion. The reading shall be less than 7.5 per cent marking or spacing. TTY will run but is blinded. No local copy received.	3	If out of limits, replace DISCRIM unit.	1
3	Depress CLEAR key. To check receive distortion at keyer output. Insert KEYER unit into MTC.				62.5	60	PIP	5	NOR-MAL	Plug TMS into 62.5 MA jack of MTC. Dial a source of telegraph signals over the telephone network The ADTL.	Read distortion on 164C4. This reading is receive distortion. at the KEYER unit output. Reading shall be less than 7.5 per cent marking or spacing.	4	If out of limits, replace KEYER unit.	1

TABLE S (Cont)
 DISTORTION TESTS
 USING MAINTENANCE TEST CARD

Step	Preparation	MTC			164C4 TMS					Action	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		Mark Dot Space	Disconn Conn +3	Orig-Ans	Loop	Speed	Display	Code	Loop Input					
C A U T I O N 4	<p>Before performing the following tests on 15- and 19-type stations equipped with noise suppression unit J70148S, List 1, it will be necessary to remove leads as indicated. Disconnect red lead between noise suppression unit and Z15 on terminal strip Z of 15- or 19-type stations. Depress CLEAR key. To check distortion of send contacts or transmitter distributor contacts. Remove MOD, DISCRIM and MTC units. Insert KEYER unit into keyer slot. Insert MTC into modulator slot. Plug TMS into 20 MA jack of MTC.</p>				20	60	PIP	5	NOR-MAL	<p>Patch TP2 of KEYER unit to (-) test point on rectifier. Depress LOCAL key. Transmit from the keyboard or transmitter distributor R and Y characters and observe distortion on TMS. TTY is blinded.</p>	<p>Reading should be less than 5 per cent marking or spacing.</p>	5	<p>If out of limits, make adjustments as required.</p>	1
5	Restore circuit to normal.									<p>Be sure to remove patch on TP2 of KEYER unit.</p>	END OF TEST			

Table S (Cont)

TIMING TESTS

The connect and disconnect sequences for the TWX system require that the data set be capable of timing several distinct intervals. While the permitted deviations for these intervals are quite large, it is essential that the ranges not be exceeded. Most trouble conditions in the timing circuit will result in complete failure rather than a shifting to time. Nevertheless, there must be a means of checking that the proper limits are being kept. A go, no go type of test may not be conclusive, because sets which are outside limits may still work perfectly with many stations and fail to perform properly when connected to one station.

TABLE T
TIMING TESTS
USING 907A TEST SET

Test Description	907A Test Set							Action	Normal Indication and Procedure	Abnormal Indication and Procedure
	Selector	SW-A	SW-B	Orig-Ans	ADJ	T1	T2			
Monitor Space (0.85 to 1.3 seconds): This is the minimum length of a received space signal which will disconnect the station. If the interval is too short, the set may disconnect on break signals. If too long, it may fail to disconnect on the reception of a clearing signal in the presence of noise.	*	14	9	ANS	820	TP2 TIMER Unit	TP3 TIMER Unit	1. Depress ANS key on attendant set. 2. After CON relay operates, depress and hold RESET button. 3. Operate the ANS-ORIG key of 907A to ORIG. 4. Wait 1 second then release RESET button.	GOOD lamps will light. TTY runs open for a second and then clears.	If either HIGH or LOW lamp does not light, replace TIMER unit.
Monitor Mark (0.70 to 1.0 second): This is the minimum length of a received mark signal which will connect the station. If the interval is too short, the station may connect on noise and any echo suppressor in the trunk may not be disabled. If too long, the set-up time is increased.	*	14	9	ORIG	690	TP2 TIMER Unit	TP3 TIMER Unit	1. Depress and hold RESET button on 907A. 2. Depress ORIG key on attendant set. 3. Release RESET button.	GOOD lamps will light. TTY runs closed.	If either HIGH or LOW lamp does not light, replace TIMER unit.
Send Space (1.3 to 2.0 seconds): This is the length of a space signal that any connected station puts on the line just before going on-hook. If the interval is too short, it may fail to effect a disconnect at the distant station. If too long, the call is held up longer than needed.	*	14	7	ORIG	680	TP2 TIMER Unit	D3 of Terminal Strip	1. Manually operate OR relay. 2. CON and CY relays operate. 3. Depress and hold RESET button. 4. Manually operate S relay and release RESET button.	GOOD lamps will light.	If either HIGH or LOW lamp does not light, replace TIMER unit.

Preparation: 1. Connect EXTENDER card to 907A with connecting cord assembly ED-71287-2061.
2. Remove HYBRID and MOD units.
3. Slide EXTENDER card into HYBRID unit slot and carefully insert MOD unit into EXTENDER card.

* Set SELECTOR switch to type of data set 101A or 101B.

† Send Break Timer Test

1. Connect EXTENDER card to 907A with connecting cord assembly ED-71287-2061.
2. Remove HYBRID unit.
3. Position EXTENDER card into HYBRID unit slot.

TABLE T (Cont)
TIMING TESTS
USING 907A TEST SET

Test Description	907A Test Set							Action	Normal Indication and Procedure	Abnormal Indication and Procedure
	Selector	SW-A	SW-B	Orig-Ans	ADJ	T1	T2			
SF Guard Interval (1.1 to 1.7 seconds): This is the interval from the time that the called station goes off-hook until a mark tone is transmitted. If the interval is too short, charging may not start and the connection will have a substantial additional loss. If too long, the setup time is increased.	*	14	7	ORIG	390	TP2 TIMER Unit	TP3 TIMER Unit	<ol style="list-style-type: none"> Depress and hold RESET button on 907A. Depress ANS key on attendant set. Release RESET button. 	Either the GOOD or HIGH lamps will light.	If either indication is wrong, replace the TIMER unit.
	*	14	7	ORIG	720				Either the GOOD or LOW lamps will light.	
† Send Break Timer (0.40 to 0.65 second): This is the length of the spacing signal transmitted in response to a long depression of the break key. If the interval is too short, breaking may not be achieved. If the interval is too long, the station may disconnect.	*	12	9	ANS	400	TP1 MOD Unit	TP2 DISCRIM Unit	<ol style="list-style-type: none"> Depress LOCAL key. Momentarily depress RESET button of 907A. Depress and hold BREAK key on TTY keyboard. 	GOOD lamps will light. TTY runs closed.	If either HIGH or lamps do not light, replace MOD unit.

Table T (Cont)

TABLE U

A SWITCH FUNCTIONS
907A DATA TEST SET

Position	Function
1	X
2	SPACE - 48 db
3	SPACE - 18 db
4	DOT - 58 db
5	MARK - 18 db
6	MARK - 48 db
7	MARK - 51 db
8	DOT - 38 db*
9	DOT - 38 db†
10	RESTRAINT - 20 db
11	RESTRAINT - 48 db
12	+ START (TIMER)
13	- START (TIMER)
14	RESET CONTROL
15	TIMER (SFG) CALL PROGRESS TONE - 18 db
16	X
17	X
18	20ma SEND
19	20ma RECEIVE
20	60ma RECEIVE
21	X
22	X
23	EIA

* 50 cps, 100 bps

† 22.5 cps, 45 bps

TABLE V

B SWITCH FUNCTIONS
907A DATA TEST SET

Position	Function
1	0 db
2	+2 db
3	+4 db
4	+6 db
5	+8 db
6	(+) INPUT 10%
7	(-) INPUT 10%
8	(+) INPUT 20%
9	(-) INPUT 20%
10	(+) INPUT
11	(-) INPUT