DATA SETS 105A AND 105B

MAINTENANCE AND TROUBLE TEST

CONTENTS

1. GENERAL

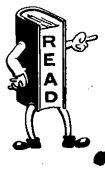
1.01 This section is being reissued to provide additional information in the test tables, replace Table D, and to make some rearrangements in the text.

1.02 This section presents some of the methods which may be used to locate trouble at WADS and 4-row TWX stations using the data set 105. It does not cover all possible conditions, but discusses some typical troubles and presents a testing procedure to determine which section of the station or associated equipment is causing the trouble. For the purpose of this section the basic section of a station is defined as the teletypewriter (TTY), the data set, and attendant set. The associated equipments are defined as line and related equipment and central office equipment.

1.03 Obvious TTY defects such as nonreversing ribbon, stiff keyboards, and broken copyholders are not included. These may be cleared by referring to the appropriate Plant Series sections.

1.04 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.

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



Remove card before opening or closing card-mounted screw switches.

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

- Set TTS-28 FUNCTION switch to voltage scale prescribed in the tables when making connections for tests. Lower voltage scales should be used

for more accurate reading after it has been determined that this will not cause needle on meter to go off scale or otherwise damage meter.

- Northeast Electronics test set model No. TTS-28 must be in a vertical position to ensure accurate measurements.

- Never use a 1011 -type hand set or test picks in the TPs of data set except as specified. Components of the card units in data set may be damaged.

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

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

1.06 Output of rectifier should be measured before making any other tests. Output of rectifier should be +20 ±3 volts and -20 ±3 volts. Disregarding the signs, the difference in numerical value shall not exceed 2 volts. All 20-volt references in this section shall be ±3 volts unless otherwise specified.

1.07 A test call must be made to an automatic data test line (ADTL) on each maintenance visit as a final test before leaving customer premises. The ADTL test call procedure is described in Section 591-018-200.

1.08 When a 4-row TWX or WADS station is placed in the 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. The term "back-up test center" designates the test center that is arranged to make tests beyond the capabilities of a local test center, ADTL, and portable station test meter.

1.09 Do not attempt to repair data set cards. If trouble is traced to a card, replace it.

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

- Trouble in local copy
  - (1) TTY does not turn on.
  - (2) Prints garbled copy.
  - (3) Machine runs open.
  - (4) Machine runs closed.
- Trouble originating calls
  - (1) TTY does not turn on.
  - (2) No dial tone.
  - (3) Cannot break dial tone.
  - (4) Getting wrong numbers.
  - (5) TTY does not unblind.
- Trouble answering calls
  - (1) Bell does not ring.
  - (2) Cannot stop ringing.
  - (3) TTY does not turn on.
  - (4) TTY does not unblind.
  - (5) Station disconnects (cutoffs).
- Trouble sending
  - (1) Most stations receive bad copy.
  - (2) One or two stations receive bad copy.
  - (3) Cannot send.
  - (4) Cannot break.
- Trouble receiving
  - (1) Receiving bad copy from all stations.
  - (2) Receiving bad copy from certain stations.

(3) Cannot receive.

- TTY trouble

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

2. TEST EQUIPMENT

2.01 The following tools, meter, and spare cards will be required to conduct tests and perform maintenance work as described in this section. Included is a list of SDs and CDs that furnish detailed wiring and circuit information.

- Teletypewriter Maintenance Tools
- Hand Test Set 1011 Type
- Northeast Electronics Test Set Model No. TTS-28
- 164C4 Transmission Measuring Set or 164C3 modified for the 100 wpm, 8-level code.
- Carrying case for data set cards
- Spare set of data set cards
- 907A Data Test Set, J-79907A, List 1, associated list 4 test card, and list 2 and list 3 connector cords.
- SD- and CD-3D009-01 (Attendant Set)
- SD- and CD-3D008-01 (Data Set)

3. TROUBLE ORIGINATING CALLS

3.01 This category includes trouble in local copy and trouble completing a connection to another station. The following tests are to aid in isolating to a major section of the station. For detailed tests of data set individual circuit operation, refer to test tables.

3.02 Trouble in Local Copy:

- TTY does not turn on when in local mode.

Step	Action	Results
1	Check power to TTY motor	
2	Check wiring between LCL key and TTY's MCR relay.	
• Machine runs open.		
1	Set TTS-28 FUNCTION switch to 30VDC position. Connect (+) probe to GRD, (-) probe to TP4 on DEMODULATOR card.	Reading should be less than 0.5 volts. If not, check wiring of logic circuitry.
2	With (+) probe to GRD and (-) probe to screw switch B-5 (B-5 closed)	Reading should be -20 volts. If not, check G connector wiring.
3	With (+) probe to GRD and (-) probe to J6-11	Reading should be -3.5 to -7.5 volts. If not, check selector magnet driver wiring.

- Machine runs closed.

Step	Action	Results
1	Set TTS-28 FUNCTION switch to 30 VDC position. Connect (+) probe to GRD and (-) probe to screw switch B-5 (B-5 closed). With meter reading -20 volts, type repeated "S" character.	Meter should fluctuate around approximately -5 volts. If not, check CY relay operating path.
2	With (+) probe to GRD and (-) probe to TP4 on DEMODULATOR card.	Reading should be less than 0.5 volt when typing random characters. If not, check wiring to logic circuitry.

3.03 TTY Does Not Turn On: If TTY does not turn on or ORIG lamp does not light when ORIG key is operated, trouble may be a power condition, defective data set or attendant set, or TTY trouble. To isolate trouble, use following tests.

- To check TTY motor control circuitry:

Step	Action	Results
1	Operate LCL Key	TTY motor should turn on. If not, trouble is in TTY.

- To check attendant set lamp:

Step	Action	Results
1	Operate ORIG Key	ORIG lamp should light. If not, make visual inspection of lamp and check that amplifier card is properly seated and that nothing is shorting circuit components.
2	Place short across CR1 of amplifier card.	If this clears trouble, replace amplifier.

Note: If a new amplifier card is not available the short may be left temporarily until card can be replaced. Station will be operative, the only abnormal effect being a partial powering of the amplifier and ORIG lamp lighting dimly when set is in ANS mode.

- To check operation of motor from data set:

Step	Action	Results
1	Operate ORIG Key	OH and OR relays operate and ORIG lamp lights.
2 If ORIG lamp lights but TTY motor does not start	Ground J1-3.	Motor should start, indicating trouble in data set wiring. If motor does not start, check wiring to TTY motor.

3.04 No Dial Tone (NDT): This trouble can be caused by malfunction of attendant set, data set, or line.

- To sectionalize the trouble to the line, attendant set, or data set:

Step	Action	Results
1	Connect 1011-type hand set to the loop, K-7 and K-8 (35-type TTY's) or TS1-7 and TS1-8 (33-type TTY's) of attendant circuit.	Dial tone should be heard indicating trouble in data set or attendant set. If dial tone is not heard trouble is in loop.

- To locate trouble in attendant set:

Step	Action	Results
1	Monitor across TS1-5 and TS1-6	If tone is heard, check loudspeaker and wiring. If tone is not heard, replace amplifier card.

Note: When using TOUCH-TONE dialing, if station disconnects while dialing or when holding a number depressed, TOUCH-TONE dialer or MODULATOR levels may be too high:

(1) Check levels per 9.09.

(2) Check CS relay contact and wiring to connector P30.

(3) Replace amplifier card.

- To locate trouble in data set:

Step	Action	Results
1	Operate and hold out-of-service switch to RESTORE position.	ORIG lamp lights.

Step	Action	Results
2	Operate ANS key.	ANS lamp lights (both lamps dim). F_{2m} tone should be heard in speaker. If f_{2m} tone is heard, receiver portion of MODULATOR card, DEMODULATOR card, and loudspeaker are good. Therefore, trouble must be in data set control relay circuits, dial contacts (rotary dial), line winding of hybrid coil, or associated wiring.

3.05 Cannot Break Dial Tone (CBDT): This can be caused by line trouble, data set trouble, or attendant set trouble. The following tests can be used to sectionalize the trouble between line and station equipment.

- To test line and dial:

Step	Action	Results
1	Remove loop from attendant set and connect 1011-type hand set to the loop. Check the ability to dial.	If dial tone still cannot be broken, trouble is in line or central office equipment. If dial tone is broken, trouble is in station.
2	To check station:	
	(a) For rotary dial equipped stations, check pulsing contact and associated wiring.	
	(b) For TOUCH-TONE equipped station, check wiring from dial, ability to hear in loudspeaker, and sending level (see 9.09). Otherwise, replace TOUCH-TONE dial.	
	(c) Reconnect line.	

3.06 Getting Wrong Numbers: This trouble can be caused by a defective dial, improper dialing, or central office equipment failure.

- To check line and central office equipment:

Step	Action	Results
1	Bridge 1011-type hand set across line terminal K-7 and K-8 (TS1-7 and TS1-8) and dial speed test code.	If tests are satisfactory, trouble is probably in station dial. If test is unsatisfactory, refer trouble to Plant Service Center.
2	Repeat dial speed test using station dial. Operate ORIG key, and dial test number.	

Note: Where TOUCH-TONE dialing is used consult practices covering tests of TOUCH-TONE dialers.

- Observe dialing procedure of customer if improper dialing is suspected.

3.07 TTY Does Not Unblind after Dialing: If TTY does not unblind after dialing, the trouble can be caused by not receiving $f2_m$ answer tone from the called station, the data set not responding to f_{2m} tone from called station, or TTY trouble.

- To isolate the trouble between the TTY and the data set:

Step	Action	Results
1	Operate LCL key	TTY should turn on.
2	Operate ORIG key and dial ADTL. Monitor call for the following: ringing tone, stopping of ringing tone, and one second later, receipt of f_{2m} tone.	TTY should unblind. If not, the trouble is in the data set.
3	Operate CLR key.	
4	Perform Connect tests as described in Table E.	

4. TROUBLE ANSWERING CALLS

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.

4.02 Bell Does Not Ring (BDR): This condition may result from trouble in the line, station ringer, or data set wiring.

• To isolate BDR trouble:

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.	
3	Depress LCL key.	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	Monitor across K-7 and K-8 with 1011-type hand set.	Audible ringing should be heard; if it is, check data set wiring.

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.	When ringing current is received, ANS lamp should flash.
3 If lamp flashes and bell does not ring	Check station ringer.	
4 If lamp does not flash	Monitor across K-7 and K-8 with 1011-type hand set.	Audible ringing should be heard; if it is, check data set wiring.

4.03 Cannot Stop Ringing: 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.

Step	Action	Results
• To check this operation:		
1	Operate ORIG key and dial RINGBACK code as outlined in 4.02. When connection is completed, operate CLR key.	ANS lamp lights or flashes.

Step	Action	Results
2 If ANS lamp does not light or flash	Check ring up circuit on FILTER card.	
3 If OH relay fails to operate when RU relay operates	Check operating path of OH relay.	
4 If RU and OH relays operate		TTY turns on, in 5 seconds times out, and then repeats cycle ringing is not being tripped.
5	Monitor across K-7 and K-8 with 101-type handset in TALK position.	If ringing is not tripped, trouble is in line or central office. If ringing is tripped, trouble is in wiring or MODULATOR card.

4.04 TTY Does Not Turn on When Answering: If TTY does not turn on when ANS key is operated, trouble may be a power condition, defective data set, or TTY trouble. To isolate trouble, use the following tests.

- To check TTY:

Step	Action	Results
1	Operate LCL key.	TTY should turn on, if not, trouble is in TTY.

- To check Data Set:

1	Operate ANS key.	OH relay operates, ANS lamp lights and TTY turns on.
2 If OH relay operates but TTY does not turn on	Ground J1-3.	If motor starts now it is an indication that trouble is in data set wiring. If motor does not start, check wiring to TTY.

4.05 TTY Does Not Unblind When Answering: When a station does not unblind when answering a call, trouble may be a 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 check data set control circuits:

Step	Action	Results
1	Operate ANS key.	ANS lamp lights. TTY turns on, this indicates OH and MCR relays operated.
2	Operate and hold out-of-service switch to RESTORE position.	Tone can be heard in speaker or on handset, indicating that the MR relay is operated and the data set is generating f_{2m} tone.
3	Operate ORIG key, dial ADTL, listen for f_{2m} tone.	Tone is heard, one second later, CR relay should operate.

• It can be assumed that if f_{2m} tone is heard and the CR relay operates, the MODULATOR and DEMODULATOR cards are functioning properly, and the line is ok. (Cards in the receive section operate identically in response to both tones.) A more critical check occurs during FLIP operation. If TTY turns off after FLIP operation check the following:

(a) Loop loss as described in 9.12.

(b) Data set output as described in 9.09.

(c) Data set sensitivity, using 907A data test set as described in Table H.

• If customer experiences no trouble answering calls from stations normally contacted, but occasionally gets a call which is not completed, suspect that a telephone customer has dialed a WADS number.

4.06 TTY Disconnects (Cuts off): This trouble, turning off during transmission, is common to both originating and answering modes. It can be caused by an open on the line of more than 150 milliseconds, 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 or WADS switching plans.

• To test station:

Step	Action	Results
1	Measure data set output as described in 9.09. Compare this reading with that on station record label. 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 H.	

Step	Action	Results
3	Make loop loss measurement as described in 9.12 and compare with design values recorded on station record label.	

- If intermittent line conditions are suspected:

Step	Action	Results
1	Set switch of TTS-28 to TEL-SET DIAL position with 1011-type hand set connected to TEL-SET terminals, place test probes on K-7 and K-8.	
2	Dial 900-ohm quiet termination.	
3	When connection is completed operate TTS-28 switch to TEL-SET 150MA scale.	Observe for any current variation.

- 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.

5. TROUBLE SENDING

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 and dialed-up connections, or the wrong code combinations from keyboard.

5.02 Most Stations Receive Bad Copy: 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). To check station:

Step	Action	Results
1	Test station in local mode.	Good copy indicates keyboard and transmitter-distributor are sending proper code combinations. This test will not aid in localizing bias or distortion troubles.
2	Operate ORIG key and dial ADTL.	
3	Test by sending from keyboard contacts. If out of limits, depress HERE-IS key which is now using ANSWER-BACK drum contacts.	

- If reply from ADTL indicates test copy sent was out of limits in both cases, trouble could be regenerator (if equipped), MODULATOR card, or loop transmission facilities in transmitting direction. Any of the following tests can be used to sectionalize the trouble.

Step	Action	Result
1	Measure bias of send contacts by making distortion measurement tests as outlined in Table K.	
2	Replace MODULATOR card and test with ADTL.	

- Make transmission tests with back-up test center to measure the "loop-back" distortion of data set and loop. To aid in performing these tests a station can be placed in the test mode by originating a call to the back-up station test center in a normal manner. When connection is established upon instructions from the back-up test center:

Step	Action	Result
1	Operate TST key.	Station will receive f_{2m} and f_{2s} signal.
2	When requested by test center station can be "flipped", that is changed from originate to answer mode under control of the TST key, in the following manner.	
3	While in originate mode, depress CLR key momentarily.	CLR lamp will light for about one second.
4	During this one second interval, depress the ANS key and hold down until CLR lamp goes out and ANS lamp lights.	
5	Depress TST key.	Station is now in test mode.

- 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 the CLR key.

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

5.03 One or Two Stations Receive Bad Copy: This condition can be caused by the receiving TTY having poor receive margins or a limiting transmission path between stations. Test as follows:

Step	Action	Results
1	Measure loop loss in accordance with 9.12.	
2	Make a transmission test with ADTL. If the test is within requirements, inform Plant Service Center of the suspected condition of receiving station.	

5.04 Cannot Send: This trouble in most cases will 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.

Step		Action	Results
1	To check TTY send contacts.	Operate LCL key and print local copy.	

- To check oscillator portion of MODULATOR card:

Step	Action	Results
1	Depress ANS key. Allow 1 second for MR relay to operate. Open screw switch A-1.	TTY starts and runs closed. Lamp on ANS key lights.
2	Operate and hold out-of-service switch to RESTORE position.	f_{2m} tone is heard in speaker.
3	When f_{2m} tone is heard, open and close screw switch A-5.	Modulated f_2 tone is heard in speaker. TTY should not run open.
4	Release out-of-service switch.	Should return to normal position.
5	Close all screw switches.	

5.05 Cannot Send Break: Inability to stop transmission from the sending station by sending a BREAK can be checked as described in 9.04, the timing tests Table L, or as follows:

Step	Action	Results
1	With data set connected operate BREAK key momentarily.	BRK-RLS lamp should light, if not replace TIMER unit (card). If trouble still exists replace LOGIC unit.

6. TROUBLE RECEIVING (BAD COPY)

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 in TTY.

- 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 a data set trouble will not generally cause the same error continuously.

- 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.

6.02 Receiving Bad Copy from All Stations: The fact that customer is having trouble with all stations indicates that the trouble must be in the local station. Testing with the ADTL can aid in localizing trouble.

- If TTY will not accept the UNDIS test sentences, the trouble may be:

  (1) Mechanical trouble in TTY.

  (2) Margin trouble in TTY.

  (3) In receive portion of data set.

  (4) In the line.

  (5) In central office equipment.

- If TTY accepts UNDIS test sentences but not SW-DIS test sentences:

  (1) Assume that the line is OK.

  (2) There may be margin trouble in TTY.

  (3) There may be bias in DEMODULATOR card.

- If TTY accepts UNDIS and SW-DIS test sentences but not DIS PAD:

  (1) TTY is OK mechanically.

  (2) Margins in TTY are OK.

  (3) Receiver sensitivity may be poor.

  (4) Loop loss may be out of limits.

- If TTY accepts UNDIS, SW-DIS, 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.

- 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 4.05.

- When line "hits" or "drop-outs" are caused by troubles in DDD or WADS

switching plan, it will be difficult to isolate or prove. It may be desirable to request back-up test center to monitor circuit.

- 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 margin tests with ADTL. When receiving SW-DIS test sentences a minimum range of 10 points is required. The non-programmed ADTL is the best source of signals to use for this test.

  (3) Replace DEMODULATOR card and recheck margins with ADTL.

6.03 Receiving Bad Copy from Certain Stations: 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. If station equipment tests OK and transmission of distant station is suspected, report this to local Plant Service Center.

6.04 Cannot Receive: In most cases the source of this trouble would be in data set or TTY. To locate trouble perform LOCAL test as described in 3.02.

7. TTY TROUBLE

7.01 This category includes all the mechanical troubles that can occur in the TTY. Procedures for clearing can be found in appropriate plant series sections.

8. TEST PROCEDURES

8.01 Test tables in this section describe in detail various tests that can be used to check the individual cards 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.

8.02 When the 907A data test set is required it shall be connected as follows:

Method A

- Remove MODULATOR unit (card).
- Plug 37-pin connector cord assembly from jack provided on test card to jack on data test set.
- Carefully insert test card into the MODULATOR slot plugging it into the MODULATOR jack.
- Plug MODULATOR unit (card) into test card.

Method B

- Remove CALL PROGRESS TONE unit (card) (if provided).
- Plug 37-pin connector cord from jack provided on test card to jack on data test set.
- Carefully insert test card into CALL PROGRESS TONE slot plugging it into CALL PROGRESS TONE jack.
- DO NOT plug CALL PROGRESS TONE unit (card) into test card.

8.03 Tables B and C describe the functions of the A TEST and B TEST switches.

8.04 Table M shall be referred to when a data set unit (card) is replaced. Any adjustments, if required, shall be made at this time prior to making final station tests and before turning service over to the customer.

8.05 Tests using the 907A data test set are in table form. Tables D through L give specific step by step testing instructions and are titled as follows:

Table	Title	Connect per Method
D	Preliminary setting for ADJ	A
E	Connect	A
F	Disconnect	A
G	Bias	A
H	Sensitivity	A
J	Restraint	A
K	Distortion (164C4)	See Table
L	Timing	A

9. TESTS

9.01 Described below are specific tests and test tables for adjusting and locating trouble in the data set and associated equipment.

9.02 Table D contains the calibrating information required to determine switch B and ADJ potentiometer setting to obtain an equivalent 0 dbm output from the MODULATOR card. The 105 arrangement information on the station layout label will contain screw switch setting information. Using appropriate line of the table, turn ADJ potentiometer until the designated reading in METER column is obtained on the TTS-28. Make a note of the switch B and ADJ potentiometer setting as this information is required when using other test tables contained in this section.

9.03 Table L contains tests of timing functions of the data set. These tests are not a series of tests, but rather, are individual timing tests and are not numbered. However the first test described in this table, the send break test, is a basic timing test and will test common timing elements on the TIMER unit (card). This test should be performed first whenever there is a timing trouble so as to establish immediately whether the common circuitry on the TIMER unit (card) or an individual timing circuit is at fault. In the latter case the circuit elements associated with the timing function in trouble may not be on the TIMER card. A test of the particular timing function involved may now isolate the trouble to the defective card or portion of the data set wiring. These tests are intended to be performed on a data set that is in good working condition and where only incorrect timing intervals are suspected; any other data set trouble should be cleared before these tests are used.

9.04 Test of Receive Break and End of Transmission (EOT) Features:

Step	Action	Results
1	Open screw switches A-7, A-9, and A-11.	
2	Ground test point TP 4 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 answer-back characters. Keyboard is unblinded. Lamp on ANS key remains lit.

Note: Presence of mark carrier frequency is simulated by opening screw switch A-11, grounding test point TP 4, and operating CY relay when LCL key is operated.

5	Depress ANS key.	LCL key is released and lamp on LCL key goes out.

Step	Action	Results
6	Depress BREAK key.	BRK-RLS lamp lights. Keyboard and transmitter distributer (TD) are blinded.
7	Depress BRK-RLS key.	BRK-RLS lamp goes out. Keyboard and TD are unblinded.
8	Depress K (keyboard) key. (K key on ASR's only.)	K lamp lights. Should be able to get local copy. (This will verify that keyboard is unblinded. TD may also be used.)
9	Depress CONTROL and EOT keys on TTY keyboard.	Machine clears and goes on-hook.
10	Remove ground from TP 4, close screw switches A-7, A-9, and A-11.	

9.05 TIMER Card: The following test procedure will locate a complete failure within TIMER card.

- With station in on-hook condition, input amplifier is in ON condition. Measure voltage at TP1 on TIMER card as follows:

Step	Action	Results
1	TTS-28 test set to 30 VDC position, (-) probe to TP1 of TIMER and (+) probe to GRD.	Reading will be less than 1.0 volts dc. (See Note.)
2	Strap TP2 of DEMODULATOR card to (-) terminal on rectifier.	Reading will rise to 20 volts dc.
3	Remove tests probes and strap.	
4	Connect (+) probe to GRD, (-) probe to TP2 of TIMER card.	Reading will be 20 volts dc.

Note: If trouble is encountered in reading at TP1, check input to TIMER as follows:

Step	Action	Results
1	TTS-28 to 30 VDC, connect (+) probe to GRD and (-) probe first to terminal 33 then to 37 on J2.	Reading on terminal 33 should be between 5 to 7 volts. Reading on terminal 37 should be less than 1.0 volt.
2	Strap TP2 of DEMODULATOR card to (-) terminal on rectifier.	Both readings in step 1 should now read less than 1.0 volt.

- Check of TIMER card in off-hook condition.

Step	Action	Results
1	Connect TP1 of TIMER card to GRD. Operate ORIG key.	
2	With TTS-28 in 30 VDC position, connect (+) probe to GRD and (-) probe to TP2 of TIMER card.	Reading should be between 1.5 to 4.0 volts.
3	Connect (-) probe to TP3 of TIMER card.	Reading should be 0 volt.
4	Remove GRD from TP1 of TIMER card.	Reading of TP3 should be 20 volts.
5	Operate CLR key and remove probes.	Lamp on ORIG key extinguishes and station goes to on-hook condition.

9.06 To check operation of RESTRAINER circuit using ADTL:

(1) Place a call to the ADTL programmed trunk.

(2) When "GA SEND" is received, begin transmission from the station.

(3) Upon receiving this transmission the ADTL will send a restraint signal followed by a break signal. Upon receipt of restraint signal, transmission is blocked and REST lamp is lit. The break signal when received will light the BRK-RLS lamp.

9.07 DEMODULATOR Card: To check sensitivity of data set refer to Table H, Sensitivity Tests with 907A data test set. The two basic modes of operation of the limiter portion of the circuit are signal and no or weak signal.

9.08 Clear or Loss of Carrier Test:

Step	Action	Results
1	Repeat Step 1 through 5 in 9.04.	
2	Close screw switches A-7, A-9, and A-11.	Machine clears and goes to on-hook condition.
3	Remove ground from TP4.	

9.09 MODULATOR Card: To check output of MODULATOR card and TOUCH-TONE dialer:

Step	Action	Results
1	With line disconnected, connect terminals (+) and (-) of TTS-28 to TP4 and TP5 MODULATOR card. Position TTS-28 FUNCTION switch to DBM 900 Ω TERM., 0. Power switch ON.	
2	Open screw switch A-3.	
3	Depress ANS key. Allow 1 second for MR relay to operate. Open screw switch A-1.	TTY starts and runs closed. Lamp on ANS key lights. Meter reads f_{2m} tone (2225 cps).
4	Note f_{2m} level reading.	
5	Open screw switch A-5.	Meter reads f_{2s} tone (2025 cps).
6	Close screw switches A-1 and A-5.	
7	Depress CLR key.	Machine clears out.
8	Depress ORIG key	TTY turns on.
9	Open screw switch A-13. Depress any one of the TOUCH-TONE dial buttons if station is equipped with DIAL TONE detection.	Meter reads f_{1m} tone (1270 cps). Machine runs open.
10	Note f_{1m} level reading.	
11	Open screw switch A-5.	Meter reads f_{1s} tone (1070 cps).
12	Close screw switch A-13.	No reading on TTS-28 meter.
13	Simultaneously depress 4 and 5 of TOUCH-TONE dialer. (Tone will be heard in loudspeaker.)	Level reading on TTS-28 should be between 0 and -0.5 db of reading in Step 9. If not, adjust PT potentiometer of TOUCH-TONE dialer. If this requirement cannot be met proceed to Step 15.

Note: PT potentiometer is located to the right side directly under TOUCH-TONE dialer. Adjustment MUST be as follows:
(1) Turn potentiometer to full counterclockwise position.
(2) Start adjustment by slowly turning potentiometer clockwise until required reading is obtained.

Step	Action	Results
14	Simultaneously depress 6 and 9 of TOUCH-TONE dialer. (Tone will be heard in loudspeaker.)	Level reading should be between -0.5 and +1.5 db of f_{lm} as measured in Step 9. If not, adjust PT potentiometer and recheck Step 13. Optimum setting may be desirable to meet both Step 13 and 14 requirements. If not, proceed to Step 15.
15	If requirements of Steps 13 and 14 are not met, replace amplifier card in attendant set. Recheck Steps 13 and 14.	Steps 13 and 14 requirements should be met. If not, proceed to Step 16.
16	Disconnect CT capacitor (connected on terminals 8 and 11 of TOUCH-TONE dialer terminal strip).	
17	Depress 4 and 5 on TOUCH-TONE dialer.	Note reading to TTS-28.
18	Depress 6 and 9 on TOUCH-TONE dialer.	If reading is 2 to 3 db higher than Step 17, change the capacitor; if not, replace TOUCH-TONE dialer.
19	Close screw switches A-3 and A-13.	
20	Depress CLR key.	Lamp on ORIG key extinguishes and station goes to on-hook condition.
21	Remove connections between TTS-28 and MODULATOR unit and reconnect line.	
	Note: Check station record form. Above readings should be the same as readings taken at time of installation. If not, readjust 4R22 and 4R23 per Section 591-018-200.	

9.10 Frequency Check: Measure the four data set frequencies f_{1m}, f_{1s}, f_{2m}, and f_{2s}, with the back-up test center. These frequencies should be within ±5 cycles of the nominal frequency.

9.11 Answer-Back Circuit:

- Six-second timing circuit test.

Step	Action	Results
1	Operate ANS key.	One second later MR relay shall operate. Six seconds ±3 seconds after MR relays operates, SR relay should operate. If not replace TIMER card.
2	If SR relay does not operate, GRD TP4 of TIMER card.	SR relay should operate. If not replace LOGIC card.

- Drum answer-back test

Step	Action	Results
1	Open screw switches A-7, A-9, and A-11.	
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 answer-back characters. Keyboard is unblinded. Lamp on ANS key remains lit.
5	Operate CLR key.	Station will go to on-hook condition.

9.12 Loop Loss Measurement:

(1) Connect line to terminals (+) and (-) on test set TTS-28.

(2) Connect hand set 1011 to TEL-SET terminal of test set TTS-28.

(3) Switch test set TTS-28 to TEL-SET DIAL position.

(4) Dial 1000-cycle test number.

(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.

(7) If loop losses are not within limits of the expected measured loss (EML) as indicated on station label, loop should be turned back to repair. Table A gives the permissible variations from EML.

TABLE A

PERMISSIBLE VARIATIONS FROM EML

Type of Loop	Variation
	db
Without Carrier or Repeater	±1
With E7 Repeater Only	±1
With All Other Repeaters and/or Carrier	±2

TABLE B

"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 TIMER (SFG)
15	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 C

"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

TABLE D

PRELIMINARY SETTING FOR ADJ
(This setting is used with Tables E, F, J, and K)

1. When performing tests in the ORIG mode the station record card f_{2m} MODULATOR output level should be used to locate proper line in table below.
2. When performing tests in the ANS mode the station record card f_{1m} MODULATOR output level should be used to locate proper line in table below.
3. In ORIG mode before measuring with TTS-28 operate ORIG key on attendant set and depress 9 on TOUCH-TONE dialer if provided.
4. In ANS mode before measuring with TTS-28 operate ANS key on attendant set.
5.

Data Set 105A Arrangement		907A Data Test Set					TTS-28				Action	Normal Indication and Procedure	Abnormal Indication and Procedure
Gain Reduction	Screw Switch Closed	A TEST Switch Position	Station Record Card Mod Level	B TEST Switch Position	ANS-ORIG Switch Position	ADJ	Function Switch Position	Probe Position +	Probe Position −	Reading			
0db	DEMODULATOR D-1	5	0db -2db -4db -6db -8db -10db -12db	1 2 2 3 4 5 5	ORIG or ANS	See Action Column	-10DBM BRDG	M-1 907A	M-2 907A	-17.5db	Turn ADJ pot. for required TTS-28 reading	Read -17.5db	Replace MODULATOR card.
2db	DEMODULATOR D-3	5	0db -2db -4db -6db -8db -10db -12db	2 * 3 4 4 5 5	ORIG or ANS	See Action Column	-10DBM BRDG	M-1 907A	M-2 907A	-15.5db	Turn ADJ pot. for required TTS-28 reading	Read -15.5db	Replace MODULATOR Card.
4db	DEMODULATOR D-4	5	0db -2db -4db -6db -8db -10db -12db	* 3 4 4 5 5 *	ORIG or ANS	See Action Column	-10DBM BRDG	M-1 907A	M-2 907A	-13.7db	Turn ADJ pot. for required TTS-28 reading	Read -13.7db	Replace MODULATOR card.
6db	DEMODULATOR D-6	5	0db -2db -4db -6db -8db -10db -12db	* 4 5 5 * * *	ORIG or ANS	See Action Column	-10DBM BRDG	M-1 907A	M-2 907A	-11.5db	Turn ADJ pot. for required TTS-28 reading	Read -11.5db	Replace MODULATOR card.

* Adjust MODULATOR as per Section 591-018-200 for an output level of -4db and proceed with test. Upon completion of tests restore MODULATOR setting to agree with station record card.

TABLE D (Cont)

Data Set 105A Arrangement		907A Data Test Set					TTS-28				Action	Normal Indication and Procedure	Abnormal Indication and Procedure
Gain Reduction	Screw Switch Closed	A TEST Switch Position	Station Record Card Mod Level	B TEST Switch Position	ANS-ORIG Switch Position	ADJ	Function Switch Position	Probe Position +	Probe Position -	Reading			
8db	DEMODULATOR None	5	0db -2db -4db -6db -8db -10db -12db	4 * 5 5 * * *	ORIG or ANS	See Action Column	-10DBM BRDG	M-1 907A	M-2 907A	-10.0db	Turn ADJ pot. for required TTS-28 reading	Read -10.0db	Replace MODULATOR card.

* Adjust MODULATOR as per Section 591-018-200 for an output level of -4db and proceed with test. Upon completion of tests restore MODULATOR setting to agree with station record card.

TABLE E

CONNECT TEST

Step	Action	907A Data Test Set				TTS-28			Atnd Set	Normal Indication and Procedure		Abnormal Indication and Procedure	
		SW-A Position	SW-B Position	ANS-ORIG Switch Position	ADJ	Function Switch Position	Probe Position +	Probe Position -			Next Step		Next Step
1		5	*	ANS See Note	*				ANS	Set will connect.	End of Test	Set will not connect.	2
2		5	*	ANS	*	O-DBM BRDG	TP 1 DEMOD card	GRD	ANS	Reading of -16db ±3db.	3	Out of limits	10
3	Disconnect test probes	5	*	ANS	*	15 VAC	TP 3 DEMOD card	GRD	ANS	Reading of 4 volts ac ±1 volt ac.	4	Replace DEMODULATOR card.	1
4	Disconnect test probes	5	*	ANS	*	30 VDC	GRD	TP 4 DEMOD card	ANS	Reading of less than 1,0 volt dc.	5	Replace DEMODULATOR card and check local wiring.	1
5		5	*	ANS	*	30 VDC	GRD	TP 2 DEMOD card	ANS	Reading between 0 and 15 volts dc.	6	Replace DEMODULATOR card.	1
6		5	*	ANS	*	30 VDC	GRD	TP 1 TIMER card	ANS	Reading of less than 3.0 volts dc.	7	Replace TIMER card and/or DEMODULATOR card.	1
7		5	*	ANS	*	30 VDC	J6-21	GRD	ANS	Reading of -5 volts dc ±2 volts dc, replace TIMER card.	8	Replace DEMODULATOR card.	1
8		5	*	ANS	*	30 VDC	T 2 TIMER card	-20 on rectifier	ANS	Reading of 18 volts dc ±2 volts dc.	9	Replace TIMER card	1
9		5	*	ANS	*	30 VDC	GRD	TP 3 TIMER card	ANS	Reading of 20 volts dc ±2 volts dc.	10	(a) Replace TIMER card. (b) Check timing circuit wiring. (c) Replace LOGIC card.	1
10	Disconnect test probes and disconnect power					X1 OHMS	J6-21 DEMOD card	GRD	ANS	Reading of less than 300 ohms. Replace DEMODULATOR card.	1	Check wiring from J6-21 through TOUCH-TONE dialer and loudspeaker. When trouble is cleared, recheck Step 1.	1

Note: To perform above tests in ORIG mode use ORIG key wherever ANS is specified. Depressing ORIG key on attendant set will present off-hook signal to 907. The 907 in turn will initiate SF guard interval followed by f_{2m} tone to complete connect sequence. A tone, a pause, and the f_{2m} will be audible on attendant set speaker. When data set is equipped with dial tone detection, depress 9 on TOUCH-TONE dialer immediately after depressing ORIG key.

* Set SW-B and ADJ of 907A as described in 9.02 and Table D.

TABLE F

DISCONNECT TEST

Step	Action	907A Data Test Set				TTS-28			Atnd Set	Normal Indication and Procedure		Abnormal Indication and Procedure	
		SW-A Position	SW-B Position	ANS-ORIG Switch Position	ADJ	Function Switch Position	Probe Position +	Probe Position -			Next Step		Next Step
1		5	*	ORIG See Note	*				ORIG	Set will connect.	2		
2		4	*	ORIG	*					Set will disconnect.	End of Test	Set does not disconnect.	3
3		4	*	ORIG	*	15 VAC	GRD	TP 3 DEMOD card	ORIG	Reading of 0 volts.	4	Replace DEMODULATOR card.	Repeat 1 and 2
4	Disconnect test probes	4	*	ORIG	*	15 VDC	GRD	TP 2 DEMOD card	ORIG	Reading of 0.5 volt dc.	5	Replace DEMODULATOR card.	Repeat 1 and 2
5	Disconnect test probes	4	*	ORIG	*	30 VDC	GRD	TP 1 TIMER card	ORIG	Reading of less than 3.0 volts dc.	6	Replace TIMER card.	Repeat 1 and 2
6	Disconnect test probes	4	*	ORIG	*	30 VDC	J6-21 DEMOD card	GRD	ORIG	Reading of 5 volts dc ±2 volts dc. Change TIMER card.	7	Replace TIMER card.	Repeat 1 and 2
7		4	*	ORIG	*	30 VDC	TP 2 TIMER card	-20 on rectifier	ORIG	Reading of 18 volts ±2 volts dc.	8	Check chassis wiring and replace TIMER card.	Repeat 1 and 2
8	Disconnect test probes	4	*	ORIG	*	30 VDC	GRD	TP 3 TIMER card	ORIG	Reading of less than 1.0 volt dc.		(a) Replace TIMER card. (b) Check timing circuit wiring. (c) Replace LOGIC card.	Repeat 1 and 2

Note: Depressing ORIG key on attendant set will present off-hook signal to 907. The 907 in turn will initiate SF guard interval followed by f_{2m} tone to complete connect sequence. A tone, a pause, and the f_{2m} will be audible on attendant set speaker. When data set is equipped with dial tone detection, depress 9 on TOUCH-TONE dialer immediately after depressing ORIG key.

* Position SW-B and ADJ per Table D.

TABLE G

BIAS TEST

Step	Action	907A Data Test Set				TTS-28			Atnd Set	Normal Indication and Procedure	Next Step	Abnormal Indication and Procedure	Next Step
		SW-A Position	SW-B Position	ANS-ORIG Switch Position	ADJ	Function Switch Position	Probe Position +	Probe Position -					
1	Remove CALL PROGRESS TONE card.	5	*	ORIG or ANS	*				ORIG or ANS	Set will connect	2	See Table E for connect test.	
2	Move switch A quickly; otherwise data set will clear out.	8	*	ORIG or ANS	*				ORIG or ANS	Printer will print meaningless copy.	3	Make "trouble in local copy" test per 3.02. Check wiring in local copy circuitry.	2
3		8	*	ORIG or ANS	*	30 VDC	M-1 907A	TP 4 DEMOD card	ORIG or ANS	Meter will read upscale (if not reverse meter probes) approx 1.0 volt dc.	4		
4	After satisfactory end of test, reinsert CALL PROGRESS TONE card.	8	*	ORIG or ANS	*	1.5 VDC	M-1 907A	TP 4 DEMOD card	ORIG or ANS	Reading must be less than 1.0 volt dc.		Replace DEMODULATOR card.	4

Note 1: Depressing ORIG key on attendant set will present off-hook signal to 907. The 907 in turn will initiate SF guard interval followed by f_{2m} tone to complete connect sequence. A tone, a pause, and the f_{2m} will be audible on attendant set speaker. When data set is equipped with dial tone detection, depress 9 on TOUCH-TONE dialer immediately after depressing ORIG key.

Note 2: If the power to the data set was removed before the test, it should be continuously applied for 15 minutes before the test is performed.

* Set SW-B and ADJ of 907A as described in 9.02 and Table D.

TABLE H

SENSITIVITY TEST

Step	Action	907A Data Test Set				Atnd Set	Normal Indication and Procedure		Abnormal Indication and Procedure	
		SW-A Position	SW-B Position	ANS-ORIG Switch Position	ADJ			Next Step		Next Step
1	Position both ADJ pot. and SW-B per Table D.	7	See Action Column	ORIG or ANS	See Action Column	ORIG or ANS	Set will connect if sufficiently sensitive.	3	Set does not connect.	2
2		6	Same as above	ORIG or ANS	Same as above	ORIG or ANS	Set will connect.	3	Replace DEMODULATOR card. If no improvement perform connect test per Table E.	1
3		4	Same as above	ORIG or ANS	Same as above	ORIG or ANS	TTY-may print some meaningless copy and then data set will clear out and go to 'on-hook' condition.	End of Test	Go to disconnect test per Table F.	

Note: Depressing ORIG key on attendant set will present off-hook signal to 907. The 907 in turn will initiate SF guard interval followed by f_{2m} tone to complete connect sequence. A tone, a pause, and the f_{2m} will be audible on attendant set speaker. When data set is equipped with dial tone detection, depress 9 on TOUCH-TONE dialer immediately after depressing ORIG key.

TABLE J
RESTRAINER TEST

Step	Action	907A Data Test Set				TTS-28				Normal Indication and Procedure		Abnormal Indication and Procedure	
		SW-A Position	SW-B Position	ANS-ORIG Switch Position	ADJ	Function Switch Position	Probe Position +	Probe Position -	Atnd Set		Next Step		Next Step
1	Position both ADJ pot. and SW-B per Table D.	5	See Action Column	ORIG or ANS	See Action Column				ORIG or ANS	Set connect.	2	See Table E for connect test.	
2		10	Same as above	ORIG or ANS	Same as above	30 VDC	TP 2 RESTR card	GRD		REST. lamp will light. Reading will be 0.45 volt dc to 0.85 volt dc.	3	Open screw switches A-1 and A-11, then readjust R-7 of RESTRAINER card for 0.65 volt dc. Check opposite mode and if necessary balance adjustment so that both ORIG and ANS modes are within 0.45 volt dc to 0.85 volt dc.	
3	Remove test probes. Depress BREAK key. Rotate SW-A step by step to position 5.	5	Same as above	ORIG or ANS	Same as above					BRK-RLS lamp will light and REST. lamp will remain lit until BRK-RLS button is depressed.		Check lamps and wiring of RESTRAINT circuit.	
4	Disconnect meter probes.	11	Same as above	ANS only	Same as above				ANS	REST lamp will continue to light.	End of Test	(a) Check REST. lamp and wiring. (b) Replace RESTRAINER card. (c) Replace DEMODULATOR card.	

Note: Depressing ORIG key on attendant set will present off-hook signal to 907. The 907 in turn will initiate SF guard interval followed by f_{2m} tone to complete connect sequence. A tone, a pause, and the f_{2m} will be audible on attendant set speaker. When data set is equipped with dial tone detection, depress 9 on TOUCH-TONE dialer immediately after depressing ORIG key.

TABLE K

DISTORTION TESTS USING 164C TMS

Receive Bias Test Procedure Using 164C TMS*	907A Data Test Set			Test Results
	SW-A Position	SW-B Position	Test Lead Connection	
1. Establish a connection to a source of unbiased telegraph signals via telephone network. 2. Remove CALL PROGRESS TONE card for this test. 3. Connect test extender card to 907A using connector cable and insert test extender card in CALL PROGRESS TONE card slot. 4. Open screw switch B-5 (machine will run open). 5. Insert plug of 164C TMS into SIG jack of 907A. 6. Arrange 164C TMS for 20MA and 8/100 operation.	19	OFF	M-1 to TP 4 of DEMOD card	Distortion shall not exceed 7.5%. When distortion is greater than 7.5% check DEMOD card using Table G. If trouble proves into TTY or local wiring refer to appropriate section covering the TTY.
Send Bias Test Procedure Using 164C TMS				
1. Remove MODULATOR card for this test. 2. Connect test card to 907A using connector cable and insert test card in MODULATOR card slot. 3. Insert plug of 164C TMS into SIG jack of 907A. 4. Arrange 164C TMS for 20MA and 8/100 operation. 5. Depress LOCAL key on attendant set and transmit from TTY.	18	OFF	None	Sending distortion shall not exceed 5% marking or spacing. When distortion is exceeded, trouble is in TTY or local wiring. Refer to appropriate section covering TTY.

* Use 164C4 or 164C3 modified for 8/100 operation.

TABLE L

TIMING TESTS

Test Description	907A Data Test Set					Action	Normal Indication and Procedure	Abnormal Indication and Procedure
	SW-A Position	SW-B Position	ANS-ORIG Switch Position	ADJ	Test Lead Connections			
SEND BREAK Basic timing test. See 9.03.	14	7	ORIG	099	T1 to TP 2 of TIMER card. T2 to TP 3 of TIMER card.	Depress ORIG key. After one second depress number 9 on TOUCH-TONE dialer. Allow data set to connect. Depress and hold RESET button of 907A. Momentarily depress BREAK key. BRK-RLS lamp shall not light. Release RESET button.	GOOD lamps on 907A and BRK-RLS lamp of attendant set will light.	Replace TIMER card.
SEND SPACE Can be performed in either ORIG or ANS mode.	14	7	ORIG or ANS	286	T1 to TP 2 of TIMER card. T2 to TP 3 of TIMER card.	Depress ORIG (or ANS) key on attendant set. When set connects; open screw switch A-1, depress CLR key and momentarily operate RESET button on 907A.	GOOD lamps on 907A will light. Close screw switch A-1.	If either HIGH or LOW lamps do not light, replace LOGIC card.
MONITOR MARK ORIG mode	14	7	ANS	199	T1 to TP 2 of TIMER card. T2 to TP 3 of TIMER card.	Open screw switch A-3. Depress and hold RESET button on 907A. Depress ANS key on attendant set. Release RESET button.	GOOD lamps will light on 907A. Close screw switch A-3.	If either HIGH or LOW lamps do not light, replace RESTRAINT card.
SF GUARD INTERVAL	14	7	ORIG	450	T1 to TP 2 of TIMER card. T2 to TP 3 of TIMER card.	Open screw switch A-5. Depress and hold RESET button on 907A. Depress ANS key on attendant set. Release RESET button.	GOOD lamps will light on 907A. Close screw switch A-5.	If either HIGH or LOW lamps do not light, replace MODULATOR card.
MONITOR MARK ANS mode	12	7	ORIG	090	T1 to TP 1 of TIMER card. T2 to TP 3 of TIMER card.	Open screw switch A-5, depress ORIG key on attendant set; depress any number on TOUCH-TONE dialer between 1-9, then open screw switch A-3. Depress RESET of 907A test set. Ground TP 1 of TIMER card. Note: This connection must be made quickly and firmly so there is no bounce or false pulse when contact is made.	GOOD lamps will light on 907A. Close screw switch A-3 and A-5.	If either HIGH or LOW lamps do not light, replace MODULATOR card.
MONITOR SPACE	12	7	ORIG	130	T1 to TP 1 of TIMER card. T2 to TP 3 of TIMER card.	Depress ORIG key on attendant set. Allow set to connect. Operate BREAK key and then depress (TST) key. Momentarily depress RESET button on 907A test set. Rapidly open screw switch A-5.	GOOD lamps will light on 907A. Close screw switch A-5.	If either HIGH or LOW lamps do not light, replace LOGIC card.
SEND MARK Can be performed in either ORIG or ANS mode	14	9	ORIG or ANS	030	T1 to TP 2 of TIMER card. T2 to TP 3 of TIMER card.	With screw switch B-5 out and B-6 in, depress ORIG key, allow set to connect; depress and hold RESET button on 907A. Send EOT from TTY keyboard, then release RESET button. Machine will not clear out until RESET button is released.	GOOD lamps on 907A will light. Restore switches to normal.	If either HIGH or LOW lamps do not light, replace LOGIC card.

TABLE L (Cont)

Test Description	907A Data Test Set					Action	Normal Indication and Procedure	Abnormal Indication and Procedure
	SW-A Position	SW-B Position	ANS-ORIG Switch Position	ADJ	Test Lead Connections			
MONITOR BREAK	12	7	ANS	045	T1 to TP 1 of TIMER card. T2 to TP 3 of TIMER card.	Depress ANS key on attendant set. When set connects depress TST key. Momentarily depress RESET on 907A. Open screw switch A-5 until TTY runs open.	(a) When GOOD lamps on 907A light, close switch A-5. (b) TTY will continue to run open. ANS and TEST lamps remain lit. Depress ANS key. Test lamp extinguishes, TTY will run closed.	If either NORMAL INDICATION fails, replace LOGIC card.
CALL PROGRESS TONE Tests						Open screw switch A-3. Depress and hold RESET button on 907A. Depress ORIG key. Hold RESET until end of SF guard interval (approx 2 sec). If station is equipped with dial tone detection depress number 9 on TOUCH-TONE dialer. Release RESET button. When warbling tone is heard momentarily depress RESET button. Note: The above instructions hold for all Call Progress Tone tests. The CLR key must be depressed at the conclusion of each test except AUD RING and when tests are completed restore set to normal condition.		If either NORMAL INDICATION fails, check DEMOD unit per Table G and/or replace CALL PROGRESS TONE unit.
AUD RING	15	7	ANS	950	None		Tone will recur. No lamps light.*	
REORDER	15	7	ORIG	080	None		Tone will recur. BY lamp lights.*	
BUSY TONE	15	7	ORIG	180	None		Tone will recur. BY lamp lights.*	
INTERCEPT	15	7	ORIG	610	None		Tone will recur. INCPT lamp lights.*	

* Disregard HIGH LOW lamps of data test set for this test.

TABLE M

TESTS TO BE PERFORMED WHEN REPLACING
CARDS IN DATA SET OR ATTENDANT SET

Card	Test	Reference	Adjustment (If Required)
LOGIC, J1D105 AA	ADTL	Section 591-018-200	None.
TIMER, J1D105 AB	1. Send Break Test.	1. Table L, Step 1.	None.
	2. ADTL	2. Section 591-018-200	
RESTRAINER, J1D105 AH	Restrainer Test.	Table J	Adjust 3R7 of RESTRAINER card.
RESTRAINER - DIAL TONE DETECTION, J1D105 AC	1. Restrainer Test	1. Table J	1. Adjust 8R7 of RESTRAINER card.
	2. Test of Dial Tone Ckt.	2. Section 591-018-200	2. None.
MODULATOR, J1D105 AD	1. Data Set Output Test (TOUCH-TONE Dialer - Data)	1. Section 591-018-200	1. (a) Adjust 4R22 and 4R23 of MODULATOR card. (b) Adjust PT potentiometer
	2. MODULATOR card Screw Switch Setting	2. Section 591-018-200	2. C-1, C-2, and C-3 Screw Switches
	3. ADTL	3. Section 591-018-200	3. None.
FILTER, J1D105 AE	1. Data Set Output Tests	1. Section 591-018-200	1. Adjust 4R22 and 4R23 of MODULATOR card.
	2. Bell Does Not Ring	2. See 4.02	2. None.
DEMODULATOR, J1D105 AF	1. Desensitizing Pad Strapping	1. Section 591-018-200	1. D1, D3, D4, and D6 Screw Switches
	2. Local Copy	2. None	2. None
	3. Restrainer Test	3. Table J	3. Adjust 3R7 or 8R7 of RESTRAINER card.
	4. Sensitivity Test	4. Table H	None.
	5. Bias Test	5. Table G	
	6. Call Progress Lamp Test	6. Dial CO test numbers	
CALL PROGRESS TONE, J1D105 AG	Call Progress Lamp Test	Dial CO test numbers	None.
AMPLIFIER Card TP-182750	1. Test of Dial Tone Detection Circuit	1. Section 591-018-200	1. None.
	2. Data Set Output Test (TOUCH-TONE Dial Only)	2. Section 591-018-200	2. Adjust PT potentiometer of attendant set.
	3. Listening Test	3. None	3. None.