DATA SETS 101A AND 101B
3-ROW TELETYPEWRITER STATION
ARRANGEMENT FOR TWX AND DATA SET 101A FOR
DATA-PHONE SERVICE
TESTS AND INSTALLATION METHODS

CONTENTS PAGE

1. GENERAL

1.01 This section covers the installation and tests of 3-row TWX and DATA-PHONE* stations using a Data Set 101A per SD-71025-01 or TWX stations using data set 101B per SD-3D006-01.

* Service Mark of American Telephone and Telegraph Company

1.02 This section is reissued to add test methods for 3-row DATA-PHONE stations. All paragraphs referring to TWX stations also apply to DATA-PHONE stations. Change arrows have been omitted.

1.03 Data Sets 101A and 101B are interchangeable in TWX service. DATA-PHONE stations require the use of Data Set 101A only.

1.04 The Data Set 101B was developed to provide a set which will function in the same manner and provide the same terminals as Data Set 101A. Only the Data Set 101B can be readily converted into Data Set 101C when required.

1.05 Relay RB (Receive Break), D terminal strip D76 to D85, and cabling necessary for modification are provided in Data Set 101B but not used at this time.

1.06 Fig. 1, 2, and 3 are illustrations of the Data Set and can be used to identify the following major components.

- Terminal strips
- Wire spring relays
- Filters
- Cords
- Electronic plug-in units or cards

J71048A L1—Discriminator

J71048B L1 or L4—Modulator

J71048C L1—Hybrid

J71048D L1—Limiter

J71048E L1—Timer

J71048F L1—Answer Back—Drum (28 TTY)

J71048F L2—Answer Back—"V" (15-19 TTYs)

J71048G L1—Keyer

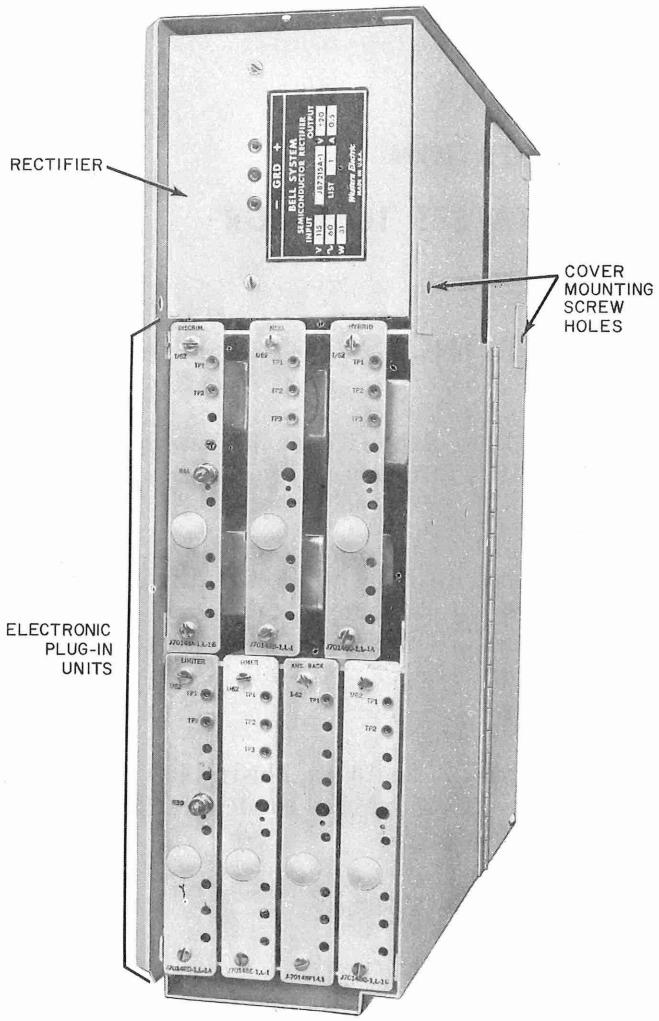


Fig. 1—Data Set 101A, Front View, Cover Removed

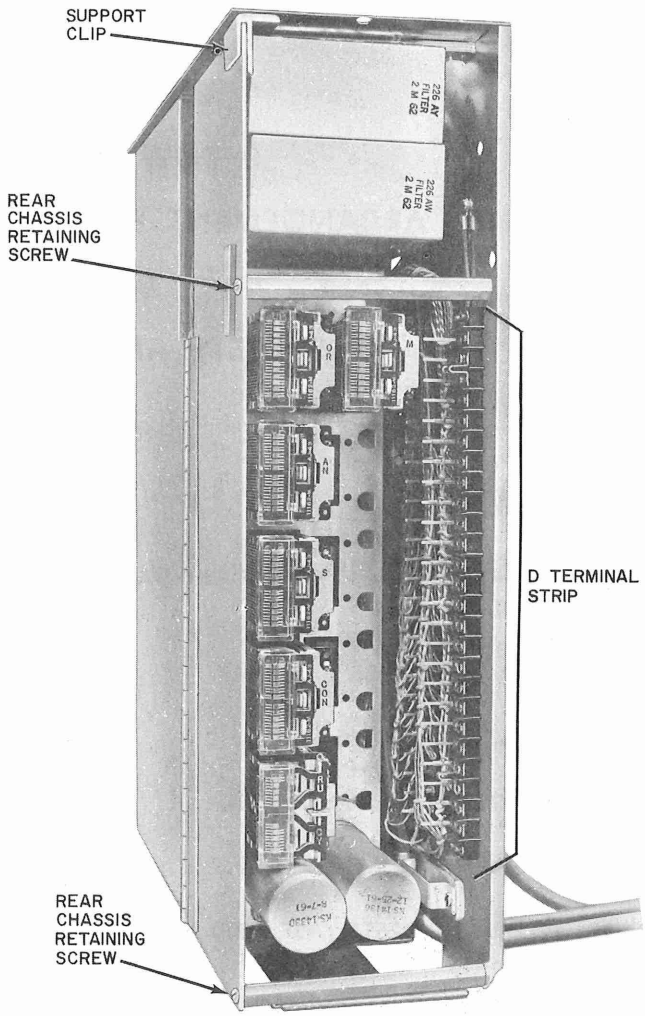


Fig. 2—Data Set 101A, Rear View, Cover Removed

- Rectifier: Data Sets 101A and 101B contain their own power supply. It is a semiconductor ferroresonant regulated-type rectifier and delivers both positive and negative 20 volts, 0.5 amp dc. TWX stations supplied with dc power will require a KS-15982 inverter to furnish power for the data set only. Rectifier number is J87215A L1 (SD-81536-01).

1.07 Fig. 4 is a block diagram of a typical TWX station.

1.08 Following is a list of tools required for placing a TWX station in service.

- 24A loop checker
- Teletypewriter maintenance tools
- Hand test set 1011B
- Northeast Electronics Test Set Model No. TTS-28
- 164C transmission test set or equivalent
- Inserter extractor (wire) tool, KS-19092 L1
- Carrying case for plug-in printed circuit cards
- Spare set of plug-in printed circuit cards

Test set TTS-28 should be in vertical position when used to prevent erroneous readings.

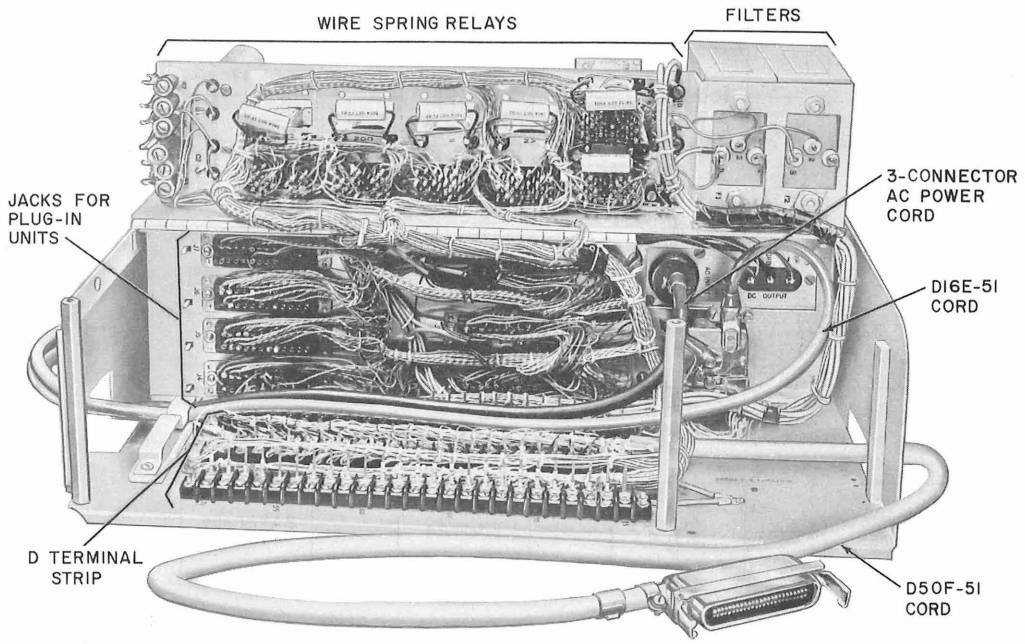


Fig. 3—Data Set 101A, Wiring and Terminal Strips, Rear Chassis Open

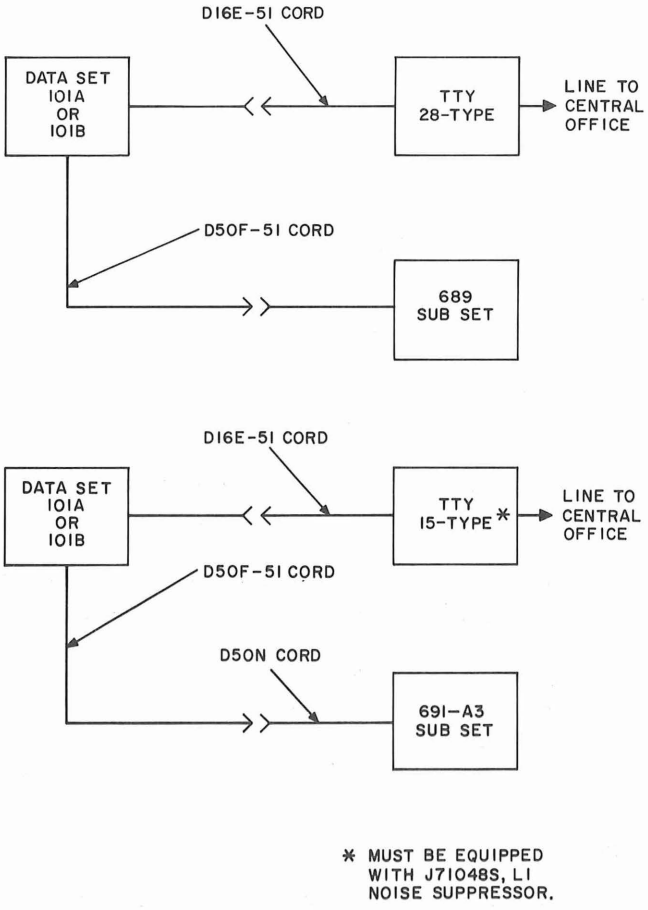


Fig. 4—Block Diagram Typical TWX Station

1.09 Fig. 5 is a simplified block diagram of Data Set 101A or 101B.

2. RECORDING STATION LOOP AND DATA SET INFORMATION

2.01 Form E-4905 (Fig. 6) has been provided for recording loop design values and data set information for future reference in maintaining the loop and station equipment.

2.02 When completed, form E-4905 should be placed in the upper left hand corner of the data set faceplate beneath the identifying stenciling.

2.03 Design information obtained from service order and/or station or circuit layout record card, as well as the data set information determined during the initial installation, should be recorded on the form as follows:

Data Set 101-Type: Enter letter "A" or "B" in blank space provided.

Circuit No.: Enter TWX directory number of the station as shown on service order or station layout card, or DATA-PHONE station number.

Divided Access Line Circuit: Check appropriate box if DALC is or is not provided.

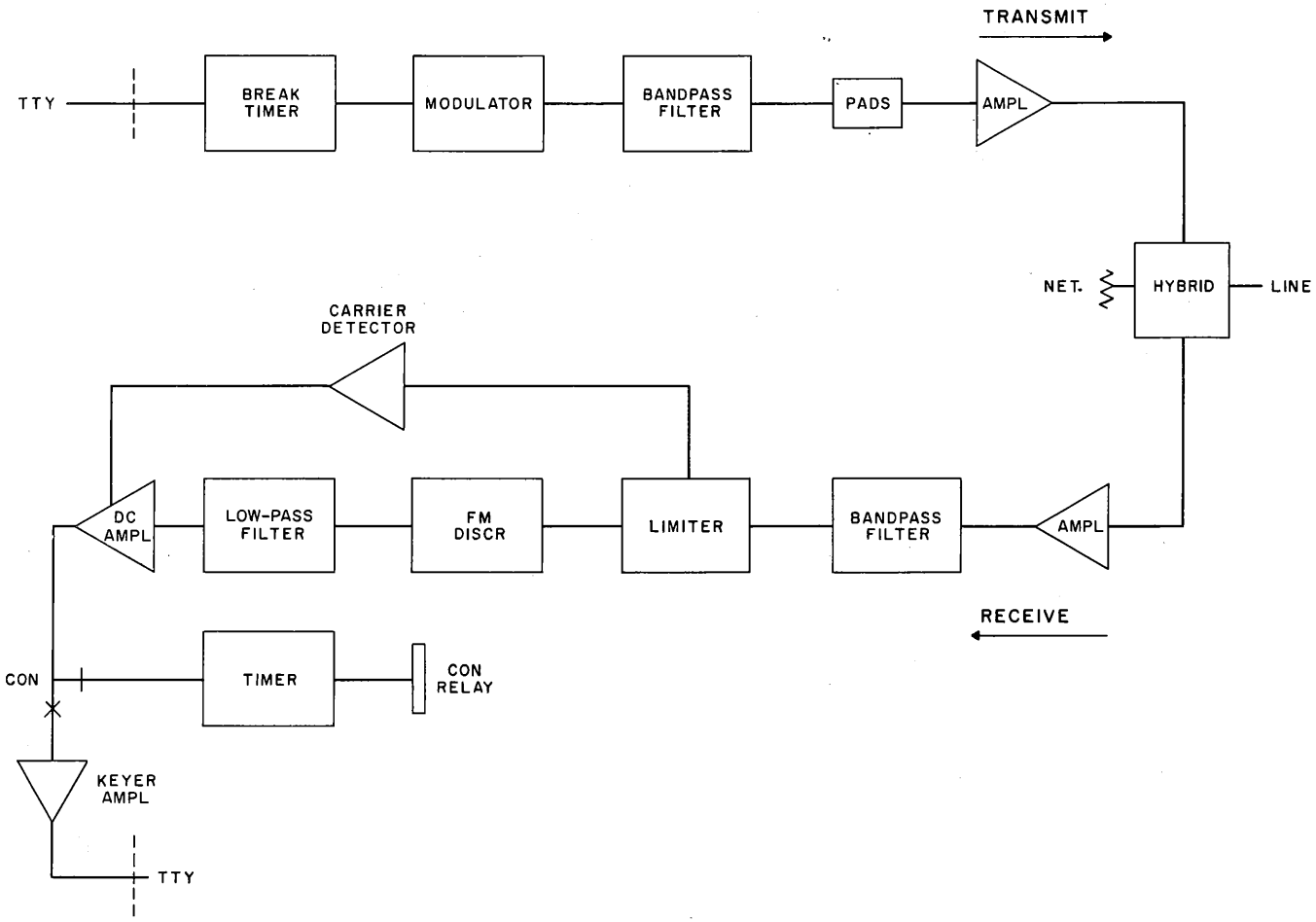


Fig. 5—Block Diagram of Data Sets 101A and 101B

Expected Measured Loss (EML): Enter loop design loss for 1000 and 2300 Hz as shown on station or circuit layout record card. Refer to Table A for loop limits and place check in appropriate block.

Data Set Send Pad: Enter, from station or circuit layout record card and/or service order, prescribed value of loss to be strapped into F1 and F2 pads.

Trip Ringing Feature: Check proper block to indicate option used. Wiring options are shown in Table B.

Installed By: Enter initials of person making installation tests.

Date: Enter date of initial installation and subsequent dates when any changes in entries on the form are made.

Hybrid Network: Check proper block to indicate whether hybrid network strapping is required, as indicated on station or circuit layout record card.

Desensitizing Network: Record the appropriate desensitizing network strapping.

Data Set Output Reference Measurement: Record results of tests described in 4.19.

Other Data Set Features: Indicate other data set features provided such as half-duplex operation (option X), full-duplex operation, etc. (See Table B.)

2.04 Table B shows the station function with associated wiring option and whether or not option was furnished by factory.

PRINTED IN U.S.A.

DATA SET 101 (1) TYPE
DATA SET AND LOOP DESIGN VALUES

E-4905
(3-63)

(2) CIRCUIT NO. _____

(3) DIVIDED ACCESS LINE CIRCUIT
YES ☐ NO ☐

(4) EXPECTED MEASURED LOSS (EML)
(SEE B.S.P. 314-300-300 FOR 4-WIRE EML MEASUREMENT)

1000 CPS _____ DBM
2300 CPS _____ DBM
LOOP LOSS LIMITS ☐ ±1DB ☐ ±2DB

(5) DATA SET SEND PAD
F1 PAD _____ DB
F2 PAD _____ DB

(6) TRIP RINGING FEATURE
(FORMERLY DIAL LONG LINE EXTENSION FEATURE)
☐ DURING SILENT AND RINGING INTERVAL (OPT. T)
☐ DURING SILENT INTERVAL ONLY (OPT. S)

(7) INSTALLED BY _____

(8) DATE _____

(9) HYBRID NETWORK
☐ NO STRAP ☐ STRAP 27-28

(10) DESENSITIZING NETWORK
(LIMITER) A TO _____
(SEND BREAK TIMER) G TO _____ } 101 C ONLY
J TO _____

(11) DATA SET OUTPUT REFERENCE MEASUREMENT
F1M (TP1-TP2) _____ DBM
F2M (TP1-TP2) _____ DBM

(12) OTHER DATA SET FEATURES
☐ HALF DUPLEX (OPT. X)
☐ FULL DUPLEX

Fig. 6—Form E-4905

3. INSTALLATION OF DATA SET

3.01 DATA-PHONE and TWX stations will be fully assembled at the distributing house prior to shipment.

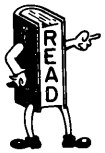
3.02 If it is necessary to move a TWX or DATA-PHONE station, do not lift or move by exerting upward force on the data set. Should the data set disengage from bottom mounting bracket its only support would be the top mounting screws. This would cause damage to either the teletypewriter cabinet or data set framework.

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

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

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

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



Do not ground 6A for this test.

(1) Connect one ground to J1.

(2) Connect other ground to J4.

(3) Set switch S1 to VOICEBAND.

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

(5) Set timer for 15 minutes.

(6) Reset counter to 0.

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

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

TABLE A

LOOP LIMITS

TYPE OF LOOP	AML LIMITS db
Without Repeaters or Carriers	EML ±1 db
With E7 Repeaters Only	EML ±1 db
With All Others Repeaters and/or Carriers	EML ±2 db

4. TESTS AND INSPECTIONS

4.01 The following tests and inspections should be performed sequentially as outlined in 4.09 through 4.20. All adjustments will be made at the factory prior to shipment. If test requirements cannot be met, refer to section entitled Data Sets 101A and 101B, Service Maintenance at Dial TWX Stations.

4.02 Send pads on the HYBRID card will have been strapped (1-2) and (3-4) to provide no attenuation in both the F1 and F2 frequency bands.

4.03 Desensitizing network of the LIMITER will have been strapped (A to B) for maximum sensitivity and hybrid balance resistor R9C (terminals 27 and 28 on HYBRID unit) should be strapped where making line-up tests, if required.

Potentiometers R3D (LIMITER), R4A (DISCRIMINATOR), and R20B (when provided on modulator unit of data set 101B) are factory set and are not to be adjusted unless specified. Where a DISCRIMINATOR or LIMITER card is changed, R3D and R4A may be checked as outlined in Section 591-012-300.

Note: If for some reason all plug-in units are removed from a data set, it is recommended that they be reinstalled in the same data set from which they were removed. Even though all plug-in units are completely interchangeable the factory makes a final touch-up adjustment on potentiometers in LIMITER and DISCRIMINATOR units. Unless these units stay with the same data set in which they were received, the advantage of factory adjustment is lost. Substitutions should be made ***only*** to replace defective units.

To prevent transistor damage in KEYER unit, disconnect ac power to rectifier J87215A before performing any of the following operations.

- Removing or inserting **KEYER** unit, or T connector.
- Opening any part of teletypewriter selector magnet circuit.

4.04 Measurement of loop loss—using test set TTS-28. Also verify loop loss with 24A LOOP CHECKER as described in Section 314-300-300.

(1) Position TTS-28 FUNCTION switch to TEL SET, DIAL.

Note: To assure accurate measurements, TTS-28 meter must be used in a vertical position.

(2) Connect incoming loop to terminals + and - of TTS-28.

TABLE B

FUNCTIONS AND ASSOCIATED WIRING

OPTIONS

FUNCTION	DATA SET	WIRING OPTION	FACTORY PROVIDED	D TERMINAL STRIP STRAPPING
Half Duplex	101A and 101B	X	Yes	73-74
Full Duplex		Remove X	No	
Connecting circuit arranged to trip ringing during silent and ringing intervals	101A and 101B	T*	Yes	53-54
Connecting circuit arranged to trip ringing only during silent period	101A	S*	No	51-52 55-56
	101B	S*	No	51-52

* Earlier models were factory furnished with T option, later models are factory furnished with S option

(3) Connect hand test set (1011B) to TTS-28 TEL terminals.

(4) Using 1011B, dial designated number for 1000-Hz (1 milliwatt) tone at originating central office.

(5) When 1000-Hz tone is received, position meter FUNCTION switch to DBM 900O TERM, 0 position. Meter reading is actual measured loss (AML) of loop at 1000 Hz.

(6) AML of loop at 2300 Hz should be made with test center at the originating central office.

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

4.06 If loop is within limits, remove connections from TTS-28 and proceed with tests and inspections as outlined. ***Do not connect loop to data set at this time.***

4.07 Make a visual inspection of data set for:

- Improper position of relay contact springs.
- Broken plug-in units.
- Improper position of plug-in units.

4.08 With all connections made between data set, subscriber set, and teletypewriter and all plug-in units firmly seated in their proper positions, proceed with the following tests.

4.09 Power Supply Voltage Measurement

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

4.10 Preliminary Station Test

STEP	ACTION	VERIFICATION
1	Check that all keys on subscriber set are released and station is in an on-hook condition.	
2	Position FUNCTION switch on TTS-28 to TEL SET, DIAL. Power switch off.	
3	Connect a 1011B hand set to TEL SET terminals of TTS-28.	
4	Connect TTS-28 terminals + and - to test jacks TP1 and TP2 on HYBRID unit.	
5	Depress nonlocking ORIG key.	OR relay operates and lamp on ORIG key lights.
6	Depress nonlocking CLEAR key.	S relay operates momentarily, releases OR relay, and extinguishes ORIG lamp without lighting lamp on CLEAR key.
7	Depress nonlocking ANS key.	AN relay operates, lamp on ANS key lights. After a delay of approximately 1 second, M relay operates. F2M tone is heard in 1011B hand set.
8	Depress CLEAR key.	S relay operates momentarily, releases AN and M relays. Lamp on ANS key extinguishes without lighting lamp on CLEAR key.

TABLE D
STRAPPING CHART

PAD VALUE dB		STRAP CONNECTIONS
f_2	f_1	
0	0	(1-2) (3-4)
0	2	(1-7) (2-6) (3-4) (5-23)
0	4	(1-8) (2-9) (3-4) (10-16)
0	6	(1-20) (2-21) (3-4) (16-22)
0	8	(1-20) (2-18) (3-4) (12-17) (16-22) (19-21)
0	10	(1-20) (2-9) (3-4) (8-21) (10-14) (16-22)
0	12	(1-20) (2-9) (3-4) (5-12) (6-8) (7-21) (10-14) (16-22)
0	14	(1-20) (2-9) (3-4) (5-12) (6-8) (7-18) (10-14) (16-22) (17-23) (19-21)
2	2	(1-2) (3-19) (4-18) (11-17)
2	4	(1-7) (2-6) (3-19) (4-18) (5-12) (11-17)
2	6	(1-8) (2-9) (3-19) (4-18) (10-16) (11-17)
2	8	(1-20) (2-21) (3-19) (4-18) (11-17) (16-22)
2	10	(1-20) (2-6) (3-19) (4-18) (5-12) (7-21) (11-17) (16-22)
2	12	(1-20) (2-9) (3-19) (4-18) (8-21) (10-14) (11-17) (16-22)
2	14	(1-20) (2-9) (3-19) (4-18) (5-12) (6-8) (7-21) (11-17) (10-14) (16-22)
4	4	(1-2) (3-8) (4-9) (10-15)
4	6	(1-7) (2-6) (3-8) (4-9) (5-12) (10-15)
4	8	(1-8) (2-9) (3-19) (4-6) (5-13) (7-18) (10-16) (11-17)
4	10	(1-20) (2-21) (3-8) (4-9) (10-15) (16-22)
4	12	(1-20) (2-6) (3-8) (4-9) (5-12) (7-21) (10-15) (16-22)
4	14	(1-20) (2-6) (3-8) (4-9) (5-12) (7-18) (10-15) (16-22) (17-23) (19-21)
6	6	(1-2) (3-20) (4-21) (15-22)
6	8	(1-7) (2-6) (3-20) (4-21) (5-12) (15-22)
6	10	(1-8) (2-9) (3-20) (4-21) (10-16) (15-22)

TABLE D — Cont

PAD VALUE dB		STRAP CONNECTIONS
f_2	f_1	
6	12	(1-8) (2-6) (3-20) (4-21) (5-12) (7-9) (10-16) (15-22)
6	14	(1-8) (2-6) (3-20) (4-21) (5-12) (7-18) (9-19) (10-16) (15-22) (17-23)
8	8	(1-2) (3-19) (4-21) (11-17) (15-22) (18-20)
8	10	(1-7) (2-6) (3-19) (4-21) (5-12) (11-17) (15-22) (18-20)
8	12	(1-8) (2-9) (3-19) (4-21) (10-16) (11-17) (15-22) (18-20)
8	14	(1-8) (2-6) (3-19) (4-21) (5-12) (7-9) (10-16) (11-17) (15-22) (18-20)
10	10	(1-2) (3-20) (4-9) (8-21) (10-13) (22-15)
10	12	(1-7) (2-6) (3-20) (4-9) (8-21) (10-13) (22-15) (23-5)
10	14	(1-7) (3-20) (4-9) (18-2) (8-21) (10-13) (22-15) (5-23) (19-6) (17-12)
12	12	(1-2) (5-11) (10-13) (22-15) (3-7) (6-8) (9-20) (21-4)
12	14	(1-19) (2-18) (3-7) (5-11) (6-8) (9-20) (10-13) (17-12) (21-4) (22-15)
14	14	(1-2) (3-19) (4-21) (5-12) (6-8) (7-18) (11-23) (15-22) (10-16) (9-20) (17-13)

TABLE E
DESENSITIZING PAD STRAPS

VALUE	STRAP CONNECTION ON LIMITER CARD
8 dB	A to D
4 dB	A to C
0 dB	A to B

4.21 A test call must be made to an automatic test line (ATL) on each installation or maintenance visit as a final test before leaving customer premises. For DATA-PHONE installations, the ATL must be accessible from the DDD network and preferably 100 speed. If only a 60 speed ATL is available, connecting tests may still be made but copy will be garbled. See section covering use of ATL.

5. 28-TYPE ASR INSTALLATION

5.01 ▶Vertical tabulation (if provided), horizontal tabulation, and form feed will be set up according to the customer's requirements. Unnumbered forms or blank paper shall be used for this purpose and for all other tests.

Note: If vertical tabulation (upper case H) is provided, it will be initiated by the sequence FIGS, CAR RET, H. This should not be confused with FIGS H which is a disconnect sequence. However, initiating the disconnect sequence will cause vertical tabulation.◀

5.02 ▶For 28 ASR installations, the installer will prepare a tape consisting of CAR RET, LINE FEED, LTRS, ABC TEST, FIGS F, LTRS, LTRS, CAR RET, LINE FEED, LTRS, FIGS H followed by a series of LTRS characters. This tape will be referred to as the test tape in subsequent paragraphs.

5.03 Perform all tests of Part 4. Check to make sure that the toggle switch under the rear cover to the left of the platen is in the NORMAL position. The switch is labeled NORMAL, REP ON LINE, TAPE COPY (NRT).◀

5.04 Tests of the DATA-PHONE features

STEP	ACTION	VERIFICATION
1	Check that the TD bat handle is in the RUN position, and the NRT switch is in the NORMAL position.	
2	Depress the REC key and insert the test tape into the TD. Depress LOCAL key.	Motor starts and LOCAL lamp and copy lights illuminate.
3	Depress SEND key.	Transmission of tape starts, page copy is received, tape is punched on the typing reperforator, and tape stops after the word TEST. TD RSTRT lamp lights. *Note:* Copy lights will blink when FIGS H is sent. This is a normal indication.
4	Type a few characters to see that proper copy is received from the keyboard.	Both page and tape copy are received from keyboard.
5	Depress TD RSTRT key.	TD RSTRT lamp extinguishes, machine carriage returns and line feeds, and tape runs out to end.
6	Operate NRT switch to the TAPE COPY position and depress REC key.	
7	Insert tape into the TD and depress SEND key.	A copy of the tape is punched on the typing reperforator, and no page copy is received on the typing unit.
8	Depress CLR key.	Station returns to idle condition.
9	Operate NRT switch to the REP ON LINE position, depress REC key, insert test tape into the TD, and call an ATL.	When station connects, both page and tape copy are received.
10	When instructed by the ATL to GA SEND, depress SEND key.	Tape runs through to the end without stopping and station disconnects.
11	Depress ORIG key.	Relay OR operates and lamp under ORIG key lights.
12	Operate the paper out switch.	Relay OR drops out and lamp under ORIG key goes out.
13	Release paper out switch and depress ORIG key.	Same as Step 11.
14	Operate paper jam switch simulating a paper jam condition.	Same as Step 12.