

DATA AUXILIARY SET 829-TYPE
SUPPLEMENTARY FUNCTIONS FOR VOICEBAND PRIVATE LINE CHANNELS
(ALTERNATE VOICE AND DIAL BACKUP)
TEST PROCEDURES

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1. GENERAL	

maintenance periods to determine the operating performance of data auxiliary set (DAS) 829-type, and/or the 48A1 and 48B1 data units.

1.02 The DAS 829-type is a channel interface unit (CIU) which provides standard, prewired, tested station arrangements for terminating 4-wire private line (PL) voiceband data channels. For more descriptive information on the DAS 829-type, refer to Section 598-082-100.

1.03 The supplementary functions of alternate voice and dial backup are furnished by the 48A1 and 48B1 data units, respectively. Descriptive information on the 48A1 and 48B1 data units is given in Section 598-082-101. As noted in that section, dial backup service provided by use of the 48B1 data unit is intended for use with telco-provided data sets only.

1.04 The test procedures given in this section are performed prior to transmission tests. The CIU and the supplemental data units are considered to be part of the PL channel; and transmission tests, such as slope, envelope delay, noise, etc, should be made through them. These procedures do not replace the station-to-station, end-to-end, or station-to-serving test center lineup procedures. These tests serve to assure the installer that the station is operational.

2. TEST EQUIPMENT

2.01 The test equipment required at the station and used in testing the DAS 829-type and supplementary 48A1 and 48B1 data units is as follows:

- 1—Portable volt-ohm-milliammeter (VOM), KS-14510-L1 or equivalent

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- 1—Voiceband transmission test set, TTS-4B, or equivalent set with bridging measurement capability
- 2—2W6A patch cords (310 plug on one end and clip leads on the other end)
- 3—66E3-25 connecting blocks
- 1—B25A cable (length as required)
- 2—A25D cable (length as required)
- 2—284-1 Amphenol test apparatus connectors. (These connectors may be used as access to the 66E3-25 connector blocks.)

3. INSTALLATION TESTS

3.01 The checkout and test of the operating performance of the installed DAS 829-type with the supplementary 48A1 and 48B1 data units can be made by performing the following tests:

- (a) Comprehensive local test for single installation using a 45A1 data mounting
- (b) Comprehensive local test for multiple installation using 46-type data mounting
- (c) Tone activated loop-back test.

3.02 The comprehensive local test for single installations, provides a checkout of the DAS 829-type, and checkout of the 48A1 and/or 48B1 data unit installed in a 45A1 data mounting from the customer's location without the aid of a serving test center (STC) or remote station.

3.03 The alternate voice test provides for checkout of the 48A1 data unit and the functions of the associated key telephone set.

3.04 The dial backup test provides for checkout of the 48B1 data unit and the functions of the associated key telephone set.

3.05 The comprehensive local test for multiple installation provides a checkout of the DAS 829-type and the 48A1 data unit installed in 46-type data mountings.

3.06 The tone activated loop-back test provides a checkout of the DAS 829-type tone detection circuit from an STC. This test requires an application of a 2713-Hz tone to the DAS 829-type. Since the TTS-4B test set does not generate this frequency, the DAS 829-type tone detection circuit must be tested by the STC when bench-mark channel measurements are made.

A. Comprehensive Local Test for Single Installation Using a 45A1 Data Mounting

3.07 The following test procedures verify the data and loop-back transmission circuits by using a transmission test set (TTS) at the station. A Northeast Electronics TTS-4B (or equivalent) is used for this test. This test will also verify that the not-in-data circuit and the dial backup circuit gives the proper indication to the modem.

3.08 The procedures given in this test do not verify the operation of the 2713-Hz loop-back detection circuitry or replace the station-to-station, end-to-end, or station-to-serving test center (STC) lineup procedures. The results of these test procedures will indicate the operational status of the DAS 829-type, 48A1 and 48B1 data units to the installer.

3.09 The comprehensive local test is divided into three parts. The first part tests a DAS 829-type alone or along with either or both a 48A1 and 48B1 data unit installed in a 45A1 data mounting. The second part tests the 48A1 data unit that is used to furnish alternate voice service. The third part tests a 48B1 data unit that is used to furnish dial backup service.

3.10 The test procedures for the DAS 829-type are dependent upon the type of data mounting that is used. Installation tests for a DAS 829-type installed in a 45A1 data mounting are described in 3.11.

DAS 829-Type, 48A1 and/or 48B1 Data Unit Installed in a 45A1 Data Mounting

3.11 When a 45A1 data mounting is provided, perform the following procedures:

STEP	PROCEDURE
1	Verify that the modem is not connected to the 45A1 data mounting.
2	Verify that the 4-wire PL metallic facilities are not connected to the data mounting.
3	Verify that the dial backup lines are not connected to the data mounting.
4	Verify that the locally provided key for manual loop-back is not connected to the 45A1 data mounting.
5	Verify that locally provided power is connected to the 45A1 data mounting.
6	If required, verify that the 565HK or 2565HK key telephone set (modified as required) is connected to the 45A1 data mounting at J4.
7	Connect a B25A cable between P1 of the 45A1 data mounting and the 66E3-25 connecting block.
8	Place the TTS-4B close to the 45A1 data mounting and apply power.
9	Allow the TTS-4B to warm up and stabilize, then calibrate the TTS-4B using the instructions on the instrument case.
10	Connect DAS 829-type for a back-to-back condition (receive path connected to transmit path) by making the following temporary connection at the 66E3-25 connecting block: DR(terminal 5) to DR1(terminal 4) DT(terminal 30) to DT1(terminal 29)
11	Verify that the 48A1 and/or 48B1 data units are installed as required. The 48A1 data unit must be installed first and removed last.
12	Verify that DAS 829-type options are installed as specified on the service order or circuit layout record (CLR). Then, install the DAS 829-type.
13	Set the controls on the TTS-4B to the following positions: SEND FREQ to 1000 Hz SEND LEVEL to -40 dBm SEND IMP to 600 ohms FUNCTION to SEND + TALK + REC REC IMP to 600 ohms.
14	Connect the TTS-4B SEND 310 jack to terminals T and R located on the backplane of the 45A1 data mounting using a 2W6A cord.

STEP

PROCEDURE

- 15 Connect the TTS-4B REC 310 jack to terminals T1 and R1 located on the backplane of the 45A1 data mounting using a second 2W6A cord.
- 16 Adjust the SEND LEVEL on the TTS-4B to obtain a REC LEVEL reading of between -16 dBm and -25 dBm. Fig. 1 shows an example of the test setup. The circuit arrangement of the test is shown in Fig. 2.

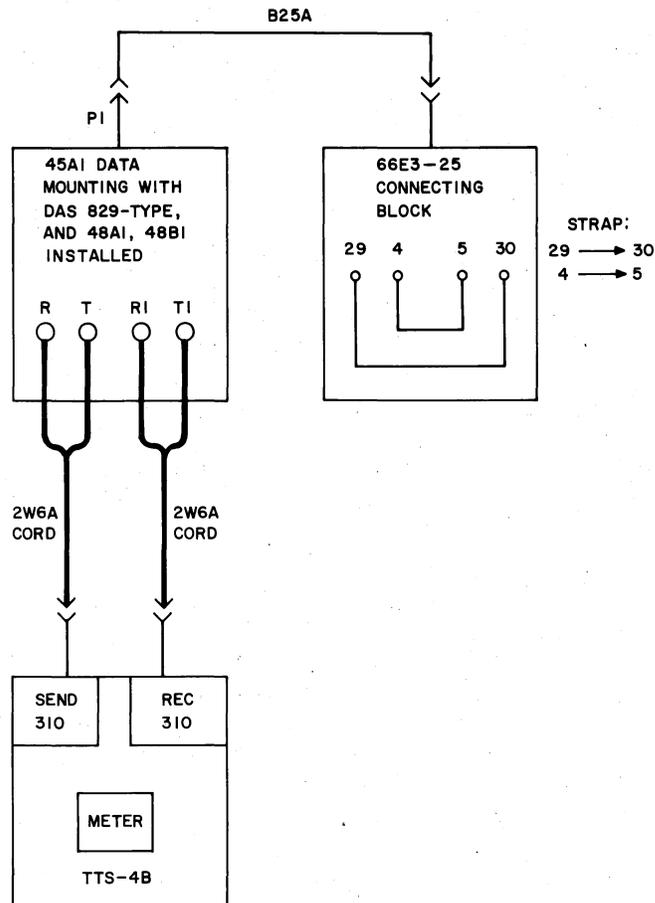


Fig. 1—Example of Test Arrangement for Testing DAS 829-Type, 48A1 and 48B1 Data Units

STEP

PROCEDURE

- 17 Observe and record the SEND LEVEL.
- 18 Use the following formula to verify the SEND LEVEL.

565HK OR 2565HK
KEY TEL SET
(MODIFIED AS
REQUIRED)

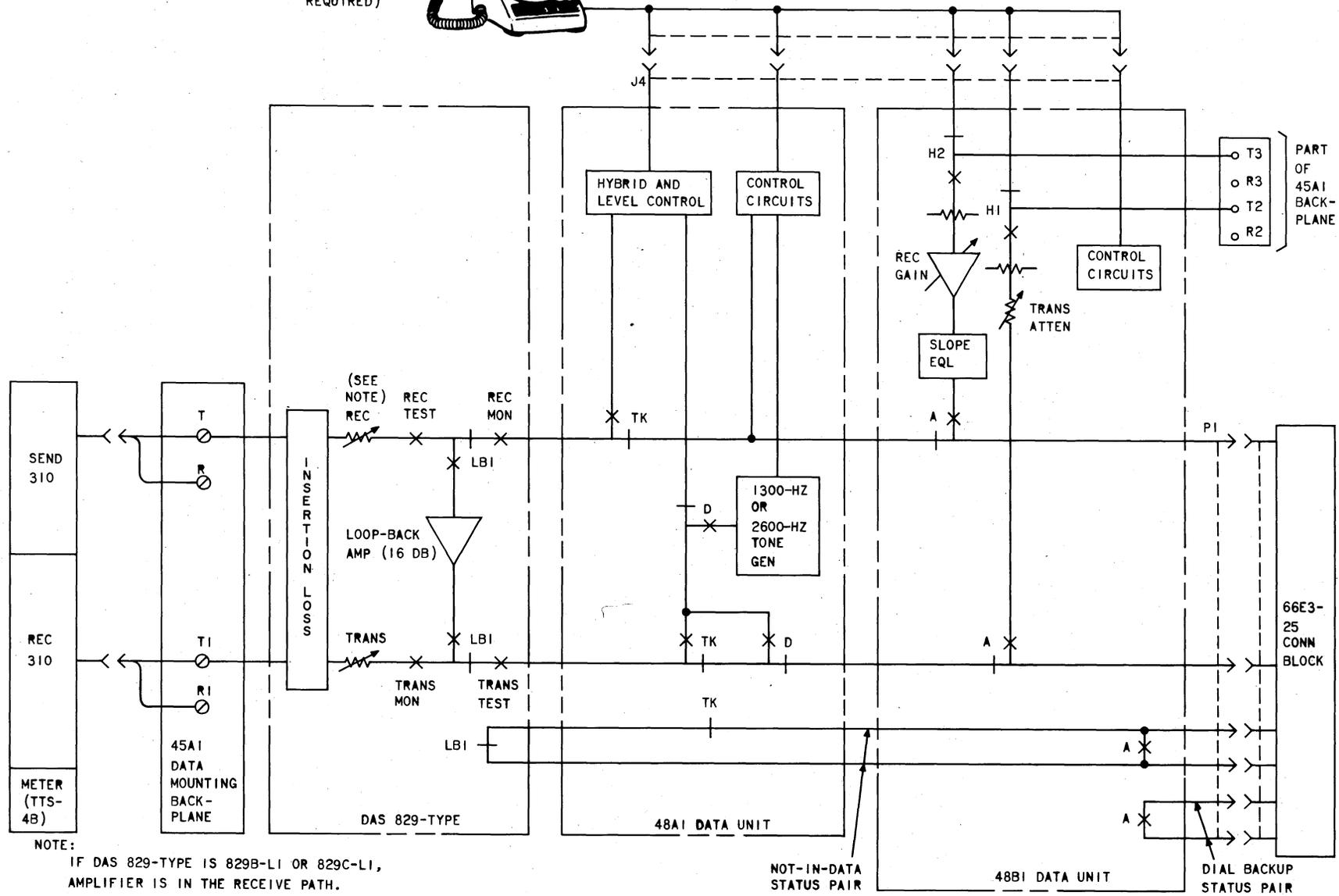


Fig. 2—Circuit Arrangement for Testing DAS and Data Units in 45A1 Data Mounting

STEP

PROCEDURE

SEND LEVEL = (+REC) or (-GAIN) + TRANS + INSERTION LOSS + REC LEVEL

REC = The loss of REC attenuator (DAS 829A-L1).

GAIN = The *gain of the amplifier in the receiver path (DAS 829B-L1 or DAS 829C-L1) measured between the REC IN and REC TST jacks.

*The amplifier gain may be a positive or a negative value (provides gain or loss).

TRANS = Refers to loss of TRANS attenuator on any DAS 829-type. INSERTION LOSS = The losses due to slope equalization circuitry and hazardous protection circuitry. These values are shown in Table A and correspond to the loss through DAS 829 measured as shown in Fig. 1 and 2. REC LEVEL = Reading between -16 dBm and -25 dBm on TTS-4B.

TABLE A
LOOP-BACK INSERTION
LOSS-600-OHM
TERMINATIONS

DAS 829-TYPE	OPTION	INSERTION LOSS
829A-L1	600	1.8
829A-L1	1200	2.6
829B-L1	150	4.8
829B-L1	600	1.0
829B-L1	1200	2.2
829C-L1	359A	9.0 to 12.0*
829C-L1	359K	7.7 to 10.7*

* Loss is dependent on equalizer strap options

Requirement: Send Level calculated = Send Level recorded in Step 17. An example of the use of the preceding formula is as follows:

A DAS 829B-L1 with a 600-ohm option is tested. Gain control R28 is adjusted to -5 dB between the REC IN and REC TST jacks in the receive path. In this example, the amplifier is providing a loss in the receive path.

Note: This adjustment was made previously during the installation and is given in Section 598-082-200.

The TRANS pad is adjusted for a loss of 8 dB (viewed number 8 appears on the TRANS pad).

GAIN = -5.0 dB gain as adjusted by R28 and receive level gain strap.

TRANS = 8.0 dB (adjusted on TRANS pad)

STEP

PROCEDURE

INSERTION LOSS = 1.0 dB (from Table A)

REC LEVEL = -24.0 dBm (reading on TTS)

SEND LEVEL = $-(-5 \text{ dB}) + 8.0 \text{ dB} + 1.0 \text{ dB} + (-24 \text{ dBm}) = -10.0 \text{ dBm}$

-10.0 dB would be the expected value for the SEND LEVEL reading on the TTS-4.

- 19 Connect a strap between terminals MLB and CG on the backplane of the 45A1 data mounting. This operates the loop-back relay. Readjust the TTS-4 SEND LEVEL for a REC INPUT reading of between -16 dBm to -25 dBm. Recalculate the SEND LEVEL with 16 dB of gain added by the loop-back amplifier to the REC LEVEL.

Requirement: The new SEND LEVEL should equal the REC LEVEL of Step 18 plus 16 dBm.

If this requirement is met, the test of the transmission and receive circuits in the first part of the comprehensive local test is complete.

- 20 If all readings meet the requirements, obtain a KS-14510 VOM (or equivalent) and perform a resistance check between terminals 3 and 28 of the 66E3-25 connecting block. The resistance checks verify the NOT-IN-DATA indication provided by the DAS 829-type. The reading should be infinity.

- 21 Remove the strap between terminals CG and MLB of the 45A1 data mounting.

- 22 Perform a resistance check between terminals 3 and 28 of the 66E3-25 connecting block. The reading should now be zero ohms.

The DAS 829-type part of the comprehensive test is now complete.

- 24 If the 48A1 data unit (alternate voice service) is provided, proceed to the alternate voice test given in 3.12. If not, proceed to Step 25.

- 25 Disconnect patch cords from the 45A1 data mounting and temporary connections at the 66E3-25 connecting block.

- 26 If the 48B1 data unit (dial backup service) is provided, proceed to the dial backup test given in 3.13. If not, proceed to Step 27.

- 27 Disconnect the 66E3-25 connecting block and key telephone set from the 45A1 data mounting.

- 28 Connect the 4-wire PL pairs to terminals T, R, T1, and R1 on the backplane of the 45A1 data mounting. When a locally provided loop-back key is provided, connect the loop-back key pair to terminals CG and MLB on the 45A1 data mounting. A view of the cable lead dress is shown in Fig. 3.

- 29 Install the front and rear covers on the 45A1 data mounting.

STEP

PROCEDURE

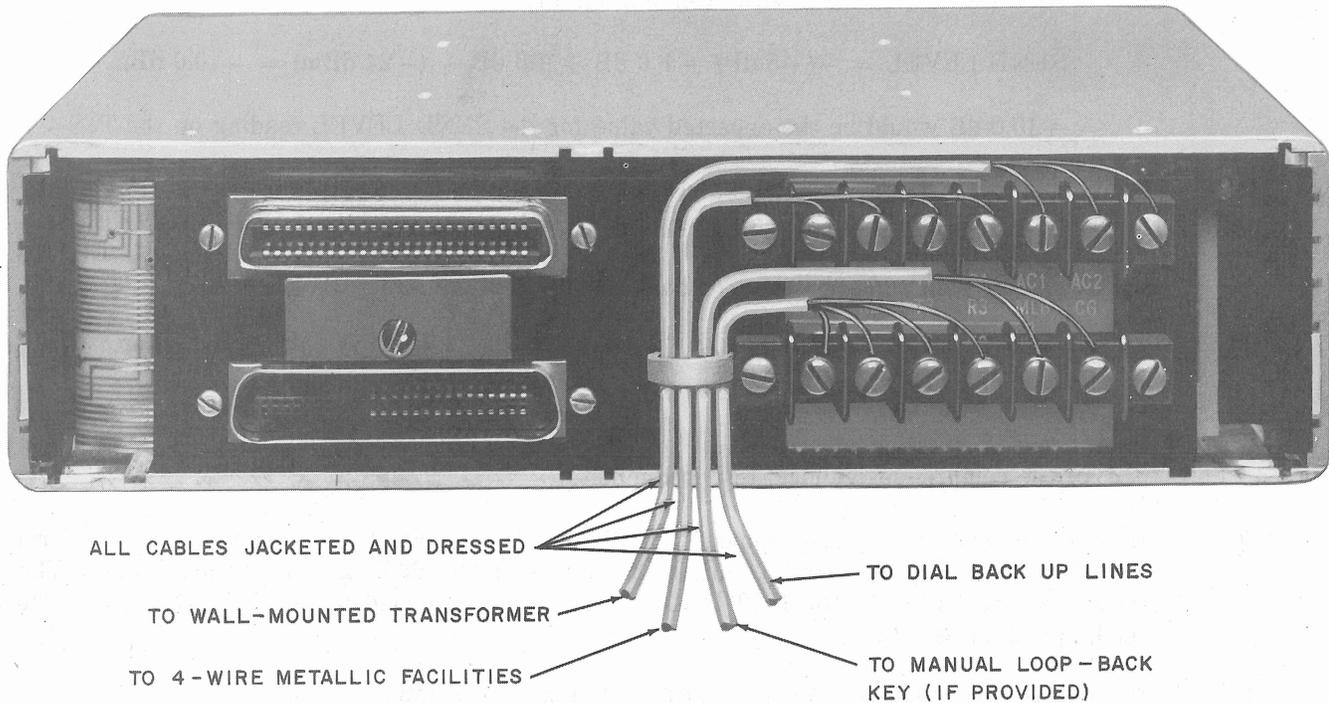


Fig. 3—Rear View of 45A1 Data Mounting Showing Dress of Cable Connections

- 30 Connect the modem cable to plug P1 on the backplane of the 45A1 data mounting.
- 31 Connect the key telephone set (if required) to connector jack J4 on the backplane of the 45A1 data mounting.

Alternate Voice Test (Using 45A1 Data Mounting)

using the 45A1 data mounting that include the 48A1 data unit (alternate voice circuit arrangement). The procedures are as follows:

3.12 This procedure is a continuation of the comprehensive local test in 3.11 for stations

STEP

PROCEDURE

- 1 Set the controls on the TTS-4B to the following positions:
SEND FREQ to 1000 Hz

STEP

PROCEDURE

SEND LEVEL to -40 dBm

SEND IMP to 600 ohms

FUNCTION to SEND + TALK + REC

REC IMP to 600 ohms.

- 2 Adjust the SEND LEVEL on the TTS-4B to obtain a REC LEVEL reading of between -16 dBm and -25 dBm.
- 3 Set the SEND FREQ control on the TTS-4B to 2600 Hz.

Requirement: Within a period of 10 seconds after switching to 2600 Hz, the telephone set buzzer will sound and the PL TALK key lamp will flash indicating the 2600-Hz signal has been detected.

- 4 When the telephone buzzer sounds, set the TTS-4B FUNCTION switch to REC + TALK.

Note: The telephone buzzer, the PL TALK key lamp, and the 1300-Hz ringback tone shall cycle on and off for approximately 30 seconds. The level of the 1300-Hz ringback tone can be measured by reading the test receive level on the TTS-4B meter. Each time the telephone buzzer sounds, the meter will indicate a level of signal. Read and record the peak value of the meter reading.

- 5 Verify the REC INPUT using the following formula:

$$\text{REC LEVEL} = -0.5 \text{ dB} - \text{TRANS} - \text{TRANSMIT INSERTION LOSS}$$

Where:

-0.5 dBm = the transmit level of the 48A1 data unit 1300- or 2600-Hz oscillator at the DAS 829-type interface (600-ohm termination)

TRANS = the loss of the TRANS attenuator on the DAS 829-type.

TRANSMIT INSERTION LOSS = the loss due to slope equalization circuitry and hazardous protection circuitry in the transmit pair. These values are given in Table B and correspond to the loss through the transmit pair of DAS 829-type as shown in Fig. 1 and 2.

Requirement: REC LEVEL calculated equals the REC LEVEL recorded in Step 4.

Example of REC LEVEL measurement:

A DAS 829B-L1 with a 600-ohm option is used.

The TRANS pad is adjusted for a loss of 8 dB (viewed number 8.0 appears on the TRANS pad).

STEP

PROCEDURE

TABLE B
TRANSMIT PATH INSERTION LOSS
600-OHM TERMINATIONS

DAS 829-TYPE	OPTION	INSERTION LOSS (dB)
829A-L1	600	0.8
829A-L1	1200	1.2
829B-L1	150	2.2
829B-L1	600	0.5
829B-L1	1200	1.1
829C-L1	359A	1.2
829C-L1	359K	0.8

TRANS = 8.0 dB

TRANSMIT INSERTION LOSS = 0.5 dB (Table B)

REC LEVEL = $-0.5 \text{ dBm} - 8.0 \text{ dB} - 0.5 \text{ dB}$

= -9.0 dBm .

The peak reading on the TTS-4B meter should equal -9.0 dBm .

- 6 Set the TTS-4B FUNCTION switch to SEND + REC + TALK position. When the telephone buzzer sounds, take the telephone receiver off-hook and depress the PL TALK key.

Requirement: The 2600-Hz tone shall be heard in the telephone receiver. The buzzer is silenced and the PL TALK key lamp is illuminated.

Note: This test checks for the presence of the ringdown (2600-Hz) signal. The frequency of the ringdown signal can be verified, if required, by the local STC or by calling the far end 48A1 data unit.

- 7 Set the TTS-4B FUNCTION switch to REC + TALK position. Depress and hold the RING key.

Requirement: The level reading on the TTS-4B meter should be the same as that calculated in Step 5.

STEP	PROCEDURE
8	Release the RING key. Requirement: The REC LEVEL reading on the TTS-4B meter shall decrease to a low reading indicating the removal of ringing tone. Note: Some signal from the telephone handset may cause a slight reading on the meter.
9	Whistle or blow into the telephone transmitter. Requirement: The TTS-4B meter should indicate some level as sound is made. A loud sound should produce a peak meter reading in the range of -10 to $+10$ dB. The level reading will be limited by the TRANS pad adjustment.
10	Perform a resistance check by measuring between terminals 3 and 28 on the 66E3-25 connecting block using a KS-14510-L1 VOM. This test checks the NOT-IN-DATA indication provided by the 48A1 data unit. Requirement: The resistance should measure infinity.
11	Depress and release the HOLD key. Requirement: The PL TALK key button releases and the lamp is extinguished.
12	Place the telephone handset on-hook. Depress the PL TALK key. Requirement: The PL TALK lamp remains extinguished.
13	If all requirements are met, the alternate voice test is complete. Proceed to Step 25 in 3.11 of this section.

Dial Backup Test (Using 45A1 Data Mounting)

3.13 For these tests, the switched network lines must be connected to the 45A1 data mounting. The modem should not be connected during these tests.

3.14 The switched network lines used for data transmission should meet Dataphone® requirements as given in Section 314-205-501. These

requirements should be checked with the 48B1 data unit in the circuit.

3.15 The test procedures are given in two parts. The first part provides the test of the control circuit functions while the second part provides the test of the transmission line circuit. For maintenance purposes, the tests can be performed separately or in sequence as required. For installation tests, perform the procedures given in both parts.

3.16 Control Circuit Test

STEP	PROCEDURE
1	Allow the TTS-4B to warm up and stabilize, then calibrate using the instructions on the instrument case.
2	Take the telephone handset off-hook and depress the DDD1 line key button. Requirement: The DDD1 line key lamp does not light. Dial tone should be heard in the telephone receiver.
3	Dial the directory number of the DDD2 line. Requirement: The telephone buzzes and the DDD2 line key lamp flashes in response to ringing signal.
4	After the telephone starts to buzz, depress the HOLD key and release it. Requirement: The DDD1 line key lamp lights and the DDD1 key releases on the up-stroke of the HOLD key. The telephone continues to buzz in response to the ringing signal.
5	Depress the DDD2 line key button. Requirement: Ringing is tripped and the DDD2 line lamp does not flash.
6	Depress the HOLD key and then release it. Requirement: The DDD2 line key lamp lights and the DDD2 key releases on the up-stroke of the HOLD key. The station arrangement is now in the dial backup mode.
7	Depress the REL key button then release it. Requirement: Both DDD1 and DDD2 line key lamps are extinguished.
8	Repeat Steps 2 through 6 by making a call from DDD2 line to DDD1 line.
9	Obtain and connect the KS-14510-L1 VOM (or equivalent) to terminals 1 and 26 on the 66E3-25 connecting block.
10	Perform a resistance check between terminals 1 and 26 on the 66E3-25 connecting block. Requirement: The ohmmeter reading should be zero ohms.
11	Depress the PL TALK (if 48A1 data unit is provided), or strap across terminals CG and MLB on the backplane of the 45A1 data mounting. Requirement: The PL TALK key lamp lights and remains on when the PL TALK key is depressed.
12	Perform a resistance check between terminals 3 and 28 on the 66E3-25 connecting block. Requirement: The ohmmeter reading should be zero ohms.

STEP	PROCEDURE
13	Depress the REL key button and then release it. Requirement: Both DDD1 and DDD2 line key lamps extinguish.
14	Perform a resistance check between terminals 1 and 26 on the 66E3-25 connecting block. Requirement: The ohmmeter reading should be infinity.
15	This test completes the check of the dial backup status indication of the 48B1 data unit.
16	Depress and release the HOLD key to release the PL TALK key button, or remove the strap from terminals CG and MLB on the 45A1 data mounting. Requirement: The PL TALK lamp is extinguished if the PL TALK key is released.
17	Perform a resistance check between terminals 3 and 28 on the 66E3-25 connecting block. Requirement: The ohmmeter reading should be zero ohms.
18	This test completes the test of the NOT-IN-DATA indication of the 48B1 data unit.
19	The test of the control circuits is now complete. If all requirements have been met, proceed to the step procedures given in 3.18.

3.17 The test procedures given in this second part of the dial backup test provides the test of the transmission line circuit. The circuitry of DDD1 line is used as the receive backup pair and provides an overall gain of 3.7 dB from the local central office (CO) to the modem interface.

The circuitry of DDD2 line is used as the transmit backup pair and provides attenuation to ensure that the modem signal will not exceed a signal level of -12 dBm at the local CO.

3.18 *Transmission Line Circuit Test*

STEP	PROCEDURE
1	Connect the TTS-4B REC 310 jack to terminals 29 and 4 on the 66E3-25 connecting block using a 2W6A cord as shown in Fig. 2.
2	Set the TTS-4B controls as follows: FUNCTION to REC + TALK REC IMP to 600Ω
3	Take the telephone handset off-hook and depress the DDD1 line key button.

STEP

PROCEDURE

Requirement: The DDD1 line key lamp does not light. Dial tone should be heard in the telephone receiver.

- 4 Dial the directory number of the milliwatt supply in the local CO. After call is connected, depress and then release the HOLD key.

Requirement: The DDD1 line key lamp lights and the DDD1 line key releases on the up-stroke of the HOLD key.

- 5 Depress the DDD2 line key button.

Requirement: The DDD2 line key lamp does not light. Dial tone should again be heard in the telephone receiver.

- 6 Dial the directory number of the 900-ohm quiet termination in the local CO. After call is connected, depress and then release the HOLD key.

Requirement: The DDD2 line key lamp lights and the DDD2 line key releases on the up-stroke of the HOLD key.

- 7 Place the telephone handset on-hook.

Requirement: The DDD1 and DDD2 line key lamps remain lighted.

- 8 Read and record the receive signal level from the milliwatt supply on the TTS-4B meter.

Requirement: The measured receive level should be between -12 and -13 dBm. If this requirement is not met, proceed to Step 10.

- 9 Take the telephone handset off-hook and depress the REL key and then release it.

Requirement: Both DDD1 and DDD2 line key lamps are extinguished.

- 10 If the requirement of Step 8 is not met, remove the 48B1 data unit from the 45A1 data mounting and set the transmit attenuator to provide the required attenuation. For example, if the measured receive level is 2 dB low, the 48B1 attenuator is set to provide 2 dB less attenuation. If the requirement of Step 8 is now met, proceed to Step 13.

- 11 Reinstall the 48B1 data unit in the 45A1 data mounting.

- 12 Repeat Steps 2 through 10.

- 13 Disconnect the TTS-4B meter leads from terminals 29 and 4 and connect to terminals 30 and 5 on the 66E3-25 connecting block. This changes the TTS-4B meter from the transmit pair to the receive pair.

- 14 With the telephone handset off-hook, depress the DDD2 line key button.

STEP	PROCEDURE
	Requirement: The DDD2 line key lamp does not light. Dial tone should be heard in the telephone receiver.
15	Dial the directory number of the milliwatt supply in the local CO. After a call is connected, depress and then release the HOLD key.
	Requirement: The DDD2 line key lamp lights and the DDD2 line key releases on the up-stroke of the HOLD key.
16	Repeat Steps 5, 6, and 7 using DDD1 line key.
17	Read the receive signal level on the TTS-4B meter.
	Requirement: Adjust R9 on the front of the 48B1 data unit to provide a receive signal level of +3.7 dBm if required.
	Note: The adjustment of R9 is made during installation using procedures given in Section 598-082-201, and should not require resetting.
18	Repeat Step 9.
19	The test of the transmission line circuits is now complete. If all requirements have been met, proceed to Step 27 in 3.11 of this section.

B. Comprehensive Local Test for Multiple Installation Using 46-Type Data Mountings

3.19 When a 46A1 and 46B1 data mounting are interconnected to provide up to a maximum of eight full data/alternate voice (FDAs) arrangement, the DAS 829-types (installed in the 46A1 data mounting) and the 48A1 data units (installed in a 46B1 data mounting) require testing on an individual channel basis. The test arrangement is shown in Fig. 4.

3.20 The DAS 829-types are installed in the 46A1 data mounting in positions 1 through 8 as viewed from left to right across the front of the data mounting. The DAS 829-type installed in the Nth position (1-8) provides a CIU for the Nth (1-8) 4-wire metallic facility.

3.21 The 48A1 data units are installed in the 46B1 data mounting in positions 1 through 8 as viewed from left to right across the front of the data mounting. The 48A1 data unit installed

in the Nth position (1-8) of the 46B1 data mounting interfaces with the DAS 829-type installed in the Nth position (1-8) of the 46A1 data mounting to provide alternate voice service for the Nth (1-8) 4-wire metallic facility.

3.22 The test procedures will test the termination for channels 1 through 8. Each channel must be tested individually. The circuit arrangement for the test is shown in Fig. 5. The test for the Nth (1-8) channel termination consists of two parts. The first part provides procedures for testing a DAS 829-type for the Nth channel, installed in a 46A1 data mounting. The second part provides procedures for testing a 48A1 data unit, for the Nth channel, installed in a 46B1 data mounting.

3.23 The first part of the comprehensive local test for multiple installation using 46-type data mountings consists of the following STEP PROCEDURE for testing a DAS 829-type installed in a 46A1 data mounting.

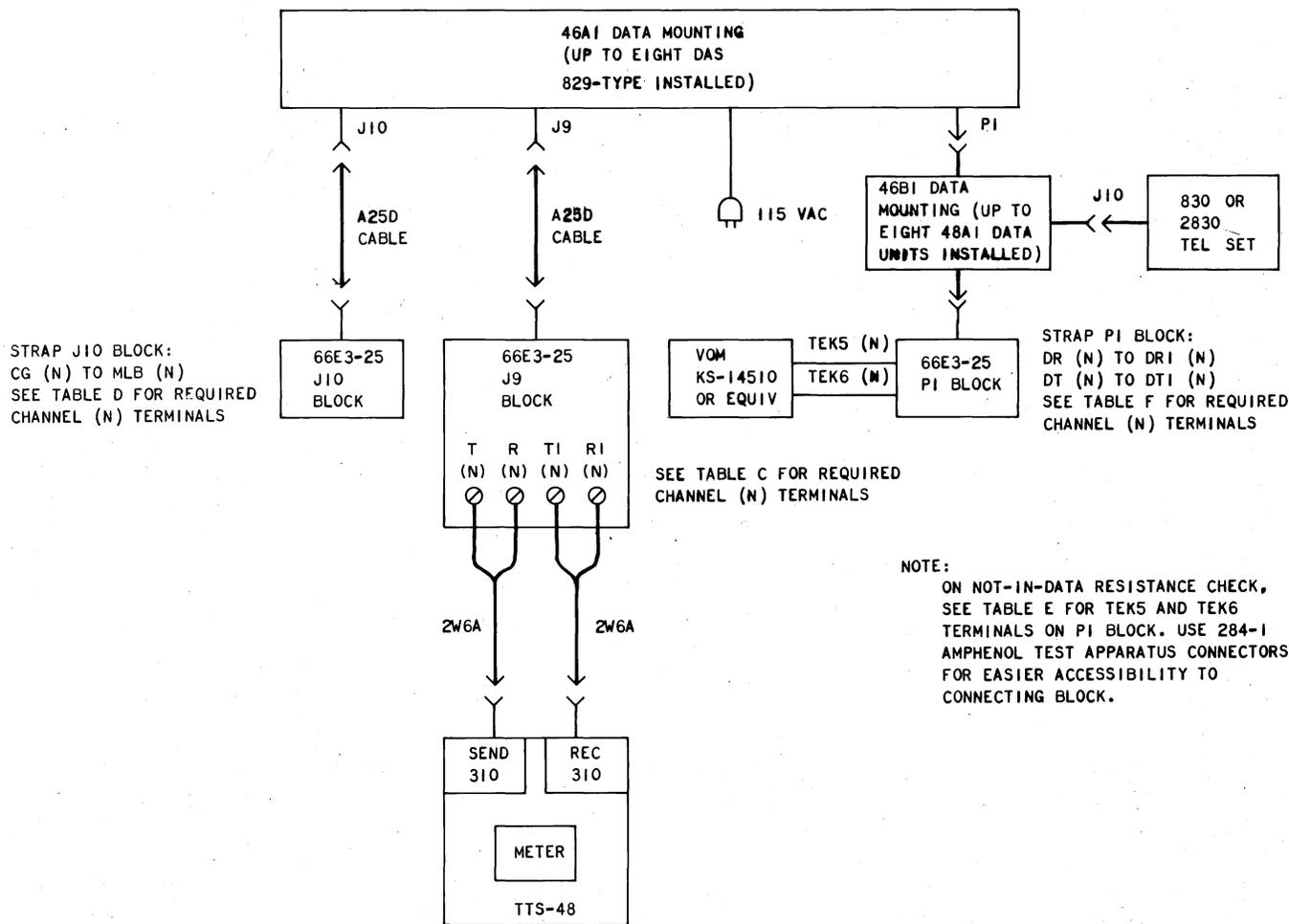


Fig. 4—Example of Test Arrangement for Testing Multiple Arrangement of DAS 829-Type and 48A1 Data Unit

Note: If only one DAS 829-type is to be tested while the rest of the DAS 829-types remain operational (in the same 46A1 data mounting), then the step refers only to the DAS 829-type to be tested. The access points

to J9, J10, or P1 would be made on the corresponding connecting block. If a connecting block is not convenient, a local test cannot be made on a single channel.

STEP	PROCEDURE
1	Verify that modems are not connected. (See note in 3.23.)
2	Verify that 4-wire PL metallic facilities are not connected. (See note in 3.23.)
3	Verify that locally provided loop-back keys are not connected. (See note in 3.23.)

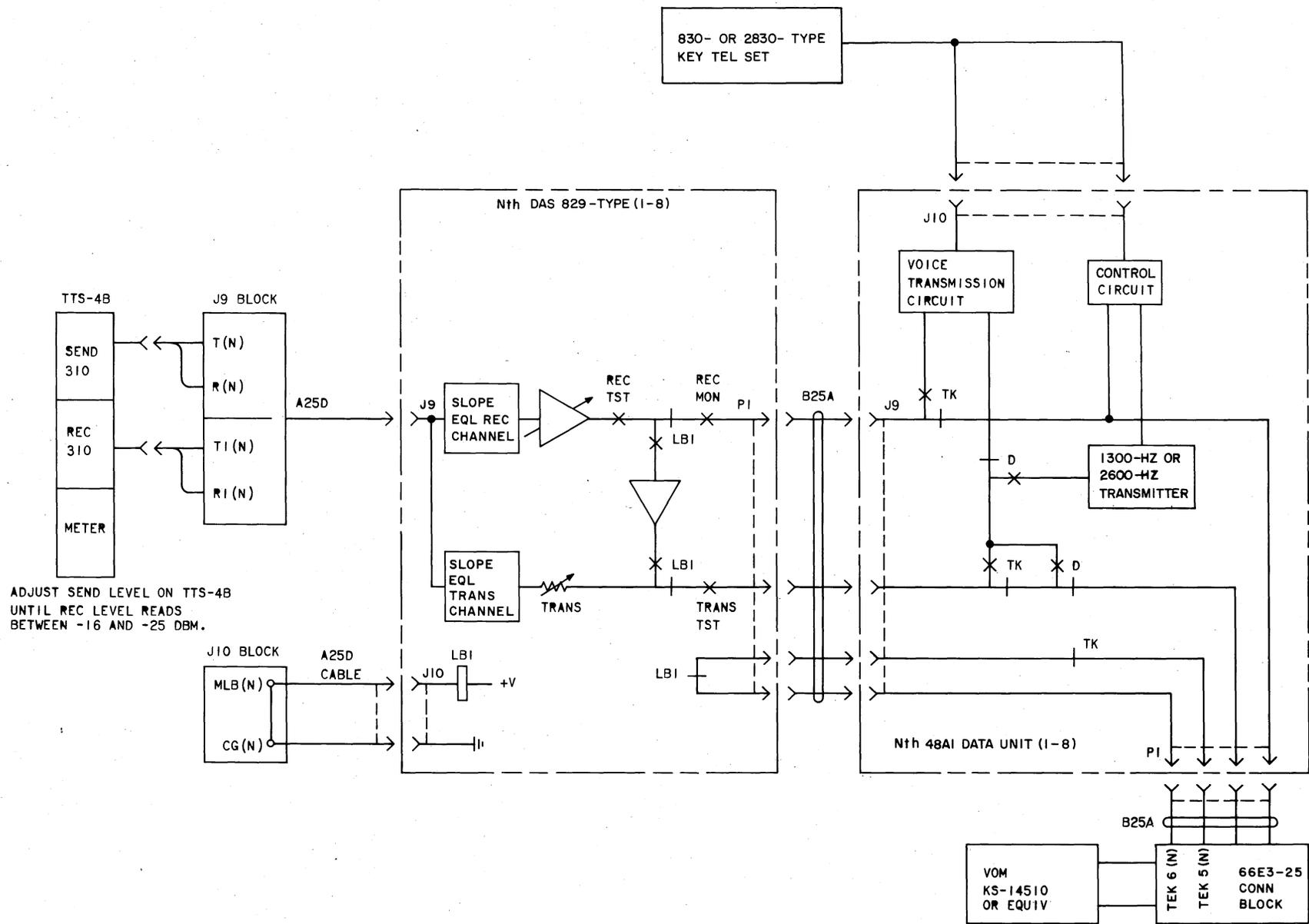


Fig. 5—Circuit Arrangement for Testing a DAS 829-Type in a 46A1 Data Mounting and a 48A1 Data Unit in a 48B1 Data Mounting

STEP	PROCEDURE
4	Verify that locally provided power is connected to the 46A1 data mounting.
5	Verify that locally provided power is connected to the 46B1 data mounting.
6	Place the TTS-4B close to the 46A1 data mounting and apply power.
7	Allow the TTS-4B to warm up and stabilize, then calibrate using instructions printed on the instrument case.
8	Set the TTS-4B controls as follows: SEND FREQ to 1000 Hz SEND LEVEL to -40 dBm SEND IMP to 600 ohms FUNCTION to SEND + TALK + REC REC IMP to 600 ohms.
9	Connect one A25D cable between J9 of the 46A1 data mounting and the 66E3-25 connecting block. This block is referred to as the J9 block. (See note in 3.23.)
10	Connect P1 of the 46A1 data mounting to J9 of the 46B1 data mounting using a B25A cable.
11	Connect a second A25D cable between J10 of the 46A1 data mounting and the 66E3-25 connecting block. This block is referred to as the J10 block.
12	Connect a B25A cable between P1 of the 46A1 data mounting and the 66E3-25 connecting block. This block is referred to as the P1 block.
13	Connect the 830- or 2830-type telephone set to J10 of the 46B1 data mounting.
14	Determine which DAS 829-type is to be tested. Assign this DAS 829-type a number (N) from 1 to 8. This number will correlate with the position of the DAS 829-type in the 46A1 data mounting. (Number 1 is inserted in the left-most position as viewed from the front.)
15	Verify that the DAS 829-type options are installed as specified on the service order or CLR.
16	Strap the P1 block (66E3-25 connecting block for a back-to-back condition) as follows: DR(N) to DR1(N) DT(N) to DT1(N)

STEP	PROCEDURE
	See Table C for the required terminals.
17	Connect the TTS-4B SEND 310 jack to terminals T(N) and R(N) on the J9 connector block using a 2W6A cord. See Table D for the terminal connections.
18	Connect the TTS-4B REC 310 plug to terminals T1(N) and R1(N) on the J9 connector block with 2W6A cord. See Table D for the terminal connections.
19	Adjust the SEND LEVEL on the TTS-4 to obtain a REC LEVEL reading of between -16 dB and -25 dB. Fig. 4 shows an example of the setup. The circuit arrangement of the test is shown in Fig. 5.
20	Observe and record the new SEND LEVEL.
21	Use the formula from Step 18 of 3.11 to verify the SEND LEVEL. There is an associated example for verification aid.

TABLE C
MODEM CONNECTIONS THROUGH P1

DAS 829-TYPE INSERTED IN POSITION DESIGNATED (N)	DR (N)	DT (N)	DR1 (N)	DT1 (N)
1	1	26	2	27
2	4	29	5	30
3	7	32	8	33
4	10	35	11	36
5	13	38	14	39
6	16	41	17	42
7	19	44	20	45
8	22	47	23	48

TABLE D
4-WIRE INPUT CONNECTIONS AT J9 CONNECTOR

DAS 829-TYPE INSERTED IN POSITION DESIGNATED (N)	J9 TERMINAL			
	R(N)	T(N)	R1(N)	T1(N)
1	1	26	2	27
2	4	29	5	30
3	7	32	8	33
4	10	35	11	36
5	13	38	14	39
6	16	41	17	42
7	19	44	20	45
8	22	47	23	48

STEP

PROCEDURE

- 22 Connect a strap between CG(N) and MLB(N) on the J10 block. This operates the loop-back relay. See Table E for the terminal connections. Readjust SEND LEVEL for REC LEVEL of -16 dB to -25 dB. Recalculate SEND LEVEL (with 16 dB added to the receive level) using the formula from Step 18 of 3.11. This completes the test of the DAS 829-type transmission and receive circuits in the first part of the comprehensive local test for multiple installations.

TABLE E
LOCATION OF LOOP-BACK PAIR FOR LOCAL
KEY OPERATION

DAS 829-TYPE INSERTED IN POSITION DESIGNATED (N)	J10 TERMINAL	
	MLB(N)	CG(N)
1	3	28
2	6	31
3	9	34
4	12	37
5	15	40
6	18	43
7	21	46
8	24	49

- 23 Obtain a KS-14510 VOM (or equivalent) and perform a resistance check between terminals TEK5(N) and TEK6(N) of P1 block. See Table F for the terminal connections. The reading should be infinity.

TABLE F
LOCATION OF NOT-IN-DATA PAIRS
AT TERMINAL P1

DAS 829-TYPE INSERTED IN POSITION DESIGNATED (N)	P1 TERMINAL	
	TEK5 (N)	TEK6 (N)
1	28	3
2	31	6
3	34	9
4	37	12
5	40	15
6	43	18
7	46	21
8	49	24

STEP	PROCEDURE
24	Remove the strap between CG(N) and MLB(N) on the J10 block that was installed in Step 22.
25	Perform a resistance check between terminals TEK5(N) and TEK6(N) of the P1 block. The reading should now be zero ohms.
26	The resistance checks in Steps 23 and 25 verify the NOT-IN-DATA indication provided by the (Nth) DAS 829-type.
27	If the 48A1 data unit for the Nth CIU (alternate voice service for the Nth 4-wire metallic facility) is provided, proceed to the step procedures given in 3.24. If not, proceed to Step 28.
28	Perform the test procedures on the remaining CIUs by repeating Steps 14 through 27. If all requirements are met for all (N) channels, the test is complete.
29	Disconnect all accessory test leads and patch cords to the 46A1 and 46B1 data mountings.
30	Connect the 4-wire metallic facilities plug to J9 of the 46A1 data mounting.
31	Connect the loop-back plug, if required, to J10 of the 46A1 data mounting.
32	Connect the modem connector to P1 of the 46B1 data mounting.

3.24 This procedure is a continuation of the comprehensive local test for multiple installation using 46-type data mountings. This test procedure is for stations that include the 48A1 data unit (alternate voice circuit arrangement). This is a test of the Nth 48A1 data unit interfacing with

the Nth DAS 829-type just tested. The number N will correspond with the position of the 48A1 data unit in the 46B1 data mounting. (Number 1 is inserted in the left-most position as viewed from the front.) The procedures are as follows:

STEP	PROCEDURE
1	Adjust the SEND LEVEL on the TTS-4 to obtain a REC LEVEL reading of between -16 dB and -25 dB.
2	Set the SEND FREQ control on the TTS-4B to 2600 Hz.
	Requirement: Within a period of 10 seconds after switching to 2600 Hz, the telephone set buzzer will sound and the PL TALK (N) key lamp will flash indicating the 2600-Hz signal has been detected.
3	When the telephone buzzer sounds, set the TTS-4B FUNCTION switch to REC + TALK. Read and record the peak value of the meter reading.

STEP	PROCEDURE
<p>Note: The telephone buzzer, the PL TALK (N) key lamp, and the 1300-Hz ringback tone shall cycle on and off for approximately 30 seconds. The level of the 1300-Hz ringback tone can be measured by reading the test receive level on the TTS-4B meter. Each time the telephone buzzer sounds, the meter will indicate a level of signal.</p>	
4	<p>Verify the REC LEVEL of the 1300-Hz oscillator in the 48A1 data unit using the following formula:</p>
	$\text{REC LEVEL} = -0.5 \text{ dBm} - \text{TRANS} - \text{TRANSMIT INSERTION LOSS}$
	<p>Where:</p>
	<p>-0.5 dBm = the transmit level of the 48A1 data unit 1300- or 2600-Hz oscillator at the DAS 829-type interface (600-ohm termination)</p>
	<p>TRANS = the loss of the TRANS attenuator on the DAS 829-type (mounted in the 46A1 data mounting).</p>
	<p>TRANSMIT INSERTION LOSS = the loss due to slope equalization circuitry and hazardous protection circuitry in the transmit pair. These values are given in Table B and correspond to the loss through the transmit pair of DAS 829-type.</p>
	<p>Requirement: REC LEVEL calculated equals the peak REC LEVEL recorded in Step 2.</p>
	<p>Example of REC LEVEL measurement:</p>
	<p>A DAS 829B-L1 with a 600-ohm option is used.</p>
	<p>The TRANS pad is adjusted for a loss of 8 dB (viewed number of 8.0 appears on the TRANS pad).</p>
	<p>TRANS = 8.0 dB</p>
	<p>TRANSMIT INSERTION LOSS = 0.5 dB (Table B)</p>
	<p>REC LEVEL = -0.5 dBm - 8.0 dB - 0.5 dB</p>
	<p>= -9.0 dBm.</p>
	<p>The peak reading on the TTS-4B meter should equal -9.0 dBm.</p>
5	<p>Set the TTS-4B FUNCTION switch to SEND + REC + TALK position. When the telephone buzzer sounds, take telephone off-hook and depress the PL TALK (N) key.</p>
	<p>Requirement: The 2600-Hz tone shall be heard in the telephone receiver. The buzzer is silenced and the PL TALK (N) key lamp is illuminated.</p>
6	<p>Set the TTS-4B FUNCTION switch to REC + TALK position. Depress and hold the RING key.</p>

STEP	PROCEDURE
	Requirement: The level reading on the TTS-4B meter should be the same as that calculated in Step 4.
7	Release the RING key.
	Requirement: The REC LEVEL reading on the TTS-4B meter shall decrease to a low reading indicating the removal of ringing tone.
	Note: Some signal from the telephone handset may cause a slight reading on the meter.
8	Whistle or blow into the telephone transmitter.
	Requirement: The TTS-4B meter should indicate some level as sound is made. A loud sound should produce a peak meter reading in the range of -10 to $+10$ dB. The level reading will be limited by the TRANS pad adjustment.
9	Perform a resistance check by measuring between terminals TEK 5(N) and TEK 6(N) on the P1 connecting block using a KS-14510-L1 VOM. See Table F for terminal connections.
	Requirement: The resistance should measure infinity.
10	This completes the test of the NOT-IN-DATA indication of the (Nth) 48A1 data unit.
11	Depress and release the HOLD key.
	Requirement: The PL TALK (N) key button releases and the lamp is extinguished.
12	Place the telephone handset on-hook. Depress the PL TALK (N) key.
	Requirement: The PL TALK (N) lamp remains extinguished.
13	If all requirements are met, the alternate voice test of the Nth position is complete.
14	Proceed to Step 28 of 3.23 of this section.

C. Tone Activated Loop-Back Test

3.25 The loop-back circuit in all DAS 829-types provides loop-back to the STC for testing. Any of the DAS 829-types may be looped back

either remotely by application of a 2713-Hz tone or locally by a key. Tone activated loop-back is recommended. A 406A tone generator (or equivalent) provides the tone required. Perform the following procedures for tone activated loop-back.

STEP	PROCEDURE
1	Verify that the 4-wire metallic facilities are connected.
2	Verify that local power is connected.

STEP	PROCEDURE
3	Request that the STC send 2713 Hz to the DAS 829-type. Loop-back relay LB1 will operate after tone has been applied to the DAS 829-type for a minimum of 5 seconds and then removed.
4	Request that STC send 1004 Hz to verify loop-back state.
5	Request that STC make desired measurements on loop-back.
6	If all measurements meet requirements, normal operation may be resumed by the STC again sending a tone of 2713 Hz. Relay LB1 will release upon detection of the 2713-Hz tone. To ensure release of LB1, the tone should remain on the receive pair for a minimum of 5 seconds.
7	Request that STC send 1004 Hz to verify release of loop-back condition.

4. TROUBLE ISOLATION TESTS

A. General

4.01 The tone detector loop-back circuit and monitor jacks of the DAS 829-types provide access for maintenance and should be used for isolating troubles at the station end.

4.02 The first test to be performed is the loop-back test by the STC. The STC personnel may compare actual measurements against bench-mark tests recorded at time of installation. Local policy should dictate policy of test performance before dispatching personnel to the station.

4.03 When station trouble is traced to DAS 829-type or the 48A1 and/or 48B1 data unit, the data signal levels or test signals should be monitored and compared to signals that have been previously recorded.

B. Isolation Tests for Single Installation Using a 45A1 Data Mounting

4.04 If the 48A1 and/or 48B1 data units do not pass any of the installation tests, the cause of trouble may be due to the failure of the low voltage ac power supply. For example; the 2600-Hz detector of the 48A1 data unit does not operate, or the ring detector of the 48B1 data unit does not work. The telephone company (telco) employee should verify that the DAS 829-type and/or the

48A1, 48B1 data units have the required voltage by performing the following steps.

(a) Using a KS-14510 VOM, or equivalent, measure for a nominal 24 Vac on terminals AC1 and AC2 of the 45A1 data mounting.

(b) If the voltage is present from the 24 Vac supply, disconnect the 4-wire PL metallic facilities and perform the installation tests outlined in 3.01.

(c) The rectifier in the 45A1 data mounting may be defective and not supplying dc voltages for the operation of the 48-type data units.

4.05 Another trouble symptom may be the DDD1 (or DDD2) key telephone lamp lights when the telephone is off-hook and the DDD1 (or DDD2) pickup key is depressed. This indicates the required key telephone set modifications have not been made. These wiring changes are given in Fig. 2 of Section 598-082-201.

4.06 Another trouble symptom may be the receive level of the dial backup line which is used for the receive channel cannot be adjusted to provide the required 3.7-dB gain. In this case, check to insure that the required slope equalization strap is installed (either 0 or 4-dB option as specified) on the 48B1 data unit. The dial-up pair may not meet the requirements given in Section 314-205-501. Release the line and re-dial the connection again.

If the required 3.7-dB gain cannot be achieved, replace the 48B1 data unit.

4.07 In general, signal loss through the 45A1 data mounting equipped with a DAS 829-type and a 48A1 and/or a 48B1 data unit can be isolated using the following procedures.

- (a) Ensure the DAS 829-type line impedance option or slope equalizer option is installed.
- (b) First, check for signal continuity with only the DAS 829-type installed. Signal continuity can be verified using the DAS 829-type test and monitor jacks, for both the DAS and the 45A1 data mounting.
- (c) Next, install the 48A1 data unit and repeat the signal continuity tests. If signal tests now fail, the 48A1 data unit is defective and should be replaced.
- (d) Then, install the 48B1 data unit and repeat the signal continuity tests. If the signal test now fails, the 48B1 data unit is defective and should be replaced.

4.08 Troubles involving internal wiring of the 45A1 data mounting should be cleared by replacing the data mounting.

C. Isolation Tests for Multiple Installation Using 46-Type Data Mountings

4.09 If installation test requirements are not met, the cause of trouble may be due to the failure of the low voltage ac power supply. The telco employee should verify that the DAS 829-type or the 48A1 data units have the required voltage by performing the following steps.

- (a) If a 46A1 data mounting is used, measure for a nominal 24 Vac between terminals AC1(1) and AC2(1) located on the backplane using a KS-14510 VOM, or equivalent.
- (b) If a 46B1 data mounting is used, measure for a nominal 24 Vac between terminals AC1

and AC2 located on the backplane using a KS-14510 VOM, or equivalent.

- (c) If a 46B1 data mounting is used, measure for a voltage reading of $+35 \pm 5$ Vdc across terminals RG [GRD] and RV (N) [+35V] located on the backplane using a KS-14510-L1 VOM, or equivalent.

Note: The data units must be installed in the data mounting for this measurement.

4.10 One trouble symptom may be that the 10-button key telephone buzzer does not sound regardless of which PL TALK lamp is flashing (indicating ringing). This problem may be caused by one of the following:

- (a) The INT option is not installed on the 46B1 data mounting.
- (b) The key telephone buzzer is defective.
- (c) The 46B1 data mounting is defective.

4.11 Loss of signal through a channel provided by the interconnection of the 46A1 and 46B1 data mountings can be traced as follows:

- (a) First, ensure the DAS 829-type line impedance option or slope equalizer option is properly installed as specified.
- (b) Second, check for signal continuity with only the DAS 829-type installed. By using the test and monitor jacks the signal continuity can be verified for both the 46A1 and 46B1 data mountings.
- (c) Third, install the 48A1 data units and repeat the signal continuity tests. If the tests fail, the 48A1 data unit is defective and should be replaced.

4.12 Troubles involving internal wiring of the 46-type data mountings should be cleared by replacing the data mounting.