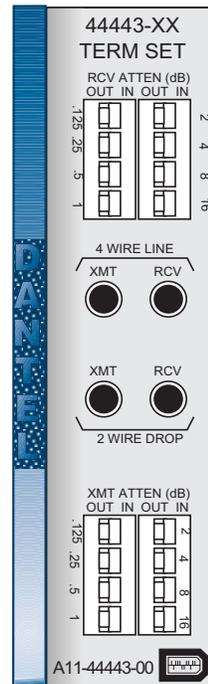


# 44443 FOUR-WIRE TERMINATION SET



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### About this Practice:

This document has been reissued to:

- Renumber figures.

**Reissued Practices:** Updated and new content can be identified by a banner in the right margin.

**Issue date: October 1998**

UPDATED

### CAUTION

- Install or remove modules from the shelf only when the power is off. If you install a module in the shelf with the power on, the internal circuitry may suffer damage and the product warranty will be void.
- Remove and install circuit boards only in a static-safe environment (use antistatic wrist straps, smocks, footwear, etc.).
- Keep circuit boards in their antistatic bags when they are not in use.
- Do not ship or store circuit boards near strong electrostatic, electromagnetic, magnetic, or radioactive fields.
- For more complete information on electrostatic discharge safety precautions, refer to Bellcore™ Technical Reference # TR-NWT-000870.

# ORDERING INFORMATION

**NOTE:** This section lists the different options available for this product. To order any of the available options, contact Dantel Inside Sales through our toll-free number, 1-800-432-6835.

OPTION NUMBER	FEATURES
A11-44443-00	Term Set, Basic
A11-44443-01	Term Set, w/Echo Suppression or ILT Relay

## GENERAL DESCRIPTION

The 44443-00 and 44443-01 Four-Wire Termination Sets (Term Set) provide a compromise impedance matching network for interfacing a 2-wire line to a 4-wire trunk or line. The -01 option features an Idle Line Termination or Echo Suppression override on the 4-wire transmit port.

The front panel includes dual inline (DIP) switches for setting the 4-wire transmit and receive port attenuation and Bantam jacks for test and calibration.

The Term Set normally functions with the Dantel 440 Communication Management System to interface 2-wire off-network lines or PABX trunks to the 4-wire port of the 44023 PABX Line Interface Module. The Dantel 44443 is also compatible with units from several manufacturers and can be used in general purpose termination set applications.

The 44443 Term Set is a plug-in printed circuit module that fits into any 400-type, or similar, equipment housing. The 44443-00 is a passive device which requires no supply voltage. The 44443-01, while still a passive device, contains a relay. This relay (refer to Fig. 1 in the *Installation* section) requires an external voltage source.

## CIRCUIT DESCRIPTION

The Dantel 44443 Four-Wire Termination Set functional schematic is shown in Fig. 1.

### 44443-00

The basic Term Set consists of a compromise hybrid network circuit with:

- ◆ A balance network and Network Build-Out (NBO) circuit.
- ◆ Switchable attenuator circuits for the 4-wire transmit (XMT) port and the 4-wire receive (RCV) port.
- ◆ Four (4) front panel test jack circuits.

CONTINUED . . .



# CIRCUIT DESCRIPTION

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## Compromise Hybrid Network Circuit

In the operation of the Term Set, audible frequencies must be received and transmitted between the 2-wire port and the appropriate 4-wire XMT port or 4-wire RCV port, while mutually excluding the inappropriate 4-wire port. This is accomplished using an impedance matching hybrid network consisting of two cross-connected bridging transformers coupled with a balance network and NBO circuit.

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### Transmit Mode

To transmit a signal from the 2-wire port to the 4-wire XMT port, a voice frequency enters from pins 41 and 47 (2-wire line) and flows through windings 2-3 and 4-5 of transformers T1 and T2. Capacitors C11 and C12 (when used) complete a speech signal path between the transformer windings and allow DC signaling to be placed on the 2-wire line A, B, and/or D. Leads A, B, D, F, and G are brought out to the 56 pin edge connector. The D lead is provided to allow an external signaling circuit to open and close the path between the B and D leads.

The incoming voice signal divides equally between the secondary of T1 and T2. The voice signal at the 4-wire RCV port is effectively blocked by the output amplifier in the associated equipment. The voice signal at the secondary of T2 is attenuated by a 600 ohm switchable pad and applied to pins 55 and 49 at the 4-wire XMT port.

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### Receive Mode

In the receive mode, a voice frequency entering pins 5 and 15 (4-wire RCV port) is coupled to windings 7-11 and 12-8 of T1 through a 600 ohm switchable pad. T1 and T2 are designed and connected in such a way that equal currents are inducted into the 2-3 windings, the 4-5 windings, and the balance network 6-1 windings of both transformers.

The balance network winding 6-1 of T2 is phased to cancel the magnetic flux in the core of T2. As a result of this phase cancellation (or trans-hybrid loss), no voice signal is induced in the secondary windings 12-8 and 7-11 of T2. Therefore, the 4-wire XMT port is effectively isolated from the 4-wire RCV port and 2-wire line.

To provide optimum trans-hybrid loss, the impedances terminating the 2-wire line and balance network must be equal. Half of the voice signal is dissipated in the balance network and NBO and the other half is applied to pins 41 and 47 (2-wire line).

Impedance matching for the Term Set network circuit may be set up to 600 or 900 ohms. Optimum trans-hybrid loss is achieved by selecting the appropriate capacitance combination of the NBO. Also, an external NBO circuit may be connected to the Term Set through pins 7 and 13. Refer to Table A, in the *Installation* section.

# CIRCUIT DESCRIPTION

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## RCV and XMT Attenuator Circuits

The attenuator circuits are made up of resistance T-pads. The pads are designed to be switched into the 4-wire RCV and XMT lines. Refer to Fig. 2, in the *Installation* section.

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## Front Panel Test Jack Circuits

The four front panel test jacks provide internal connections for test and calibration of the Term Set.

44443-01

This module includes the basic Term Set network circuits of the 44443-00, plus selectable strap connections for engaging an Idle Line Termination (ILT) branch or Echo Suppression Override (ES) branch across the 4-wire XMT port. Refer to Fig. 1.

The branch circuit selected in is controlled by relay K1. K1 is energized by an external battery supply (-21 VDC to -56 VDC) applied to pin 25 (-) and pin 29 (+). Relay K1 is protected from excessive current flow by transistor Q1. Using Q1 to limit current eliminates the need for a resistive voltage drop for -24 or -48 VDC supplies.

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## Idle Line Termination Circuit

When K1 is energized, the normally closed side of K1A opens and the 600 ohm ILT branch is disconnected. At the same time, the normally open side of K1A closes, establishing the transmission path to pin 49.

When K1 is released at the end of the call, the normally closed side of K1A closes, reconnecting the 600 ohm termination across the 4-wire XMT line. At the same time, the normally open side of K1A re-opens, isolating the 600 ohm termination branch.

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**NOTE:** *For the idle state to exist, the ILT bypass strap option should not be used. Refer to Fig. 1*

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## Echo Suppression Override Circuit

If K1 is energized, contact K1B is closed and connects a 50 ohm load resistor across the 4-wire XMT line. This allows an override to occur. If K1 is not energized, K1B remains open, disallowing an override response.

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**NOTE:** *Since the K1A (normally open) contact would normally open the XMT line, the ILT bypass strap must be installed to prevent interruption. Refer to Fig. 1*

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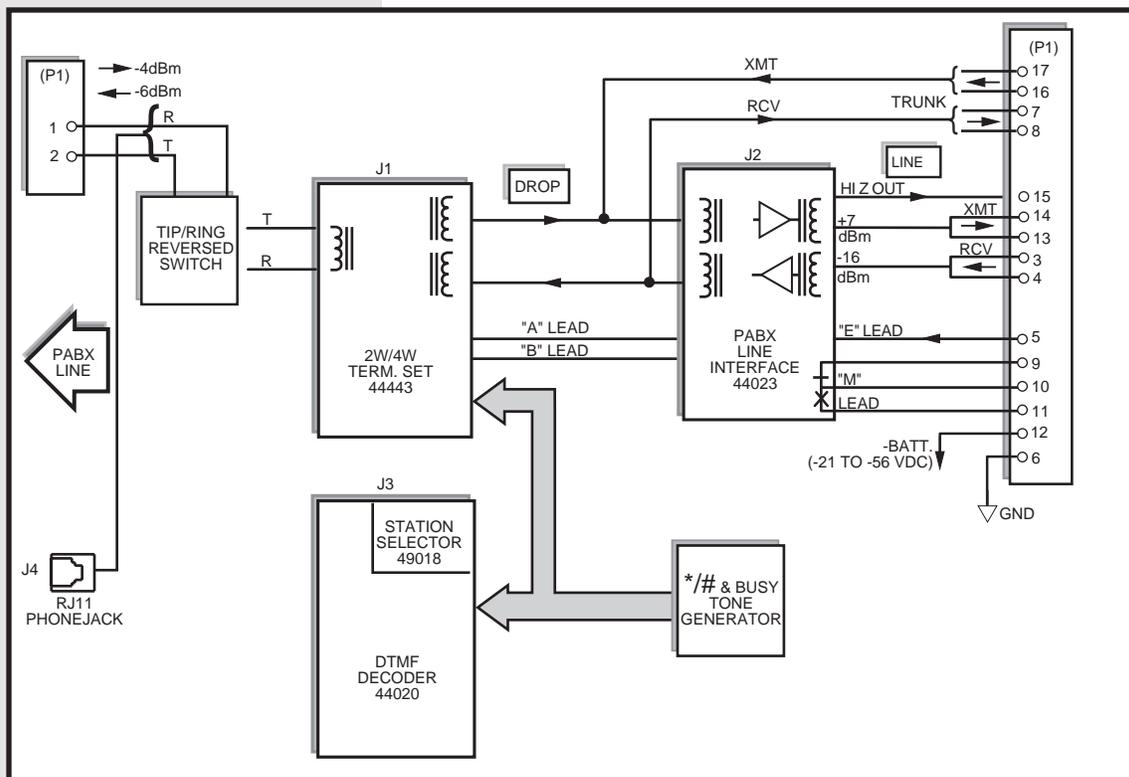
# APPLICATION INFORMATION

Fig. 2 shows a 44443 Term Set as part of a 00331 DTSS3ON Order Wire/PABX Interface. The 2-wire input of the Term Set may be connected to:

- ◆ A PABX.
- ◆ An outside line.
- ◆ Any other 2-wire communication line.

Impedance matching selection is provided with the balancing network to match either a 600 ohm or a 900 ohm 2-wire line.

FIG. 2 - 00331 DTSS3ON FUNCTIONAL BLOCK DIAGRAM



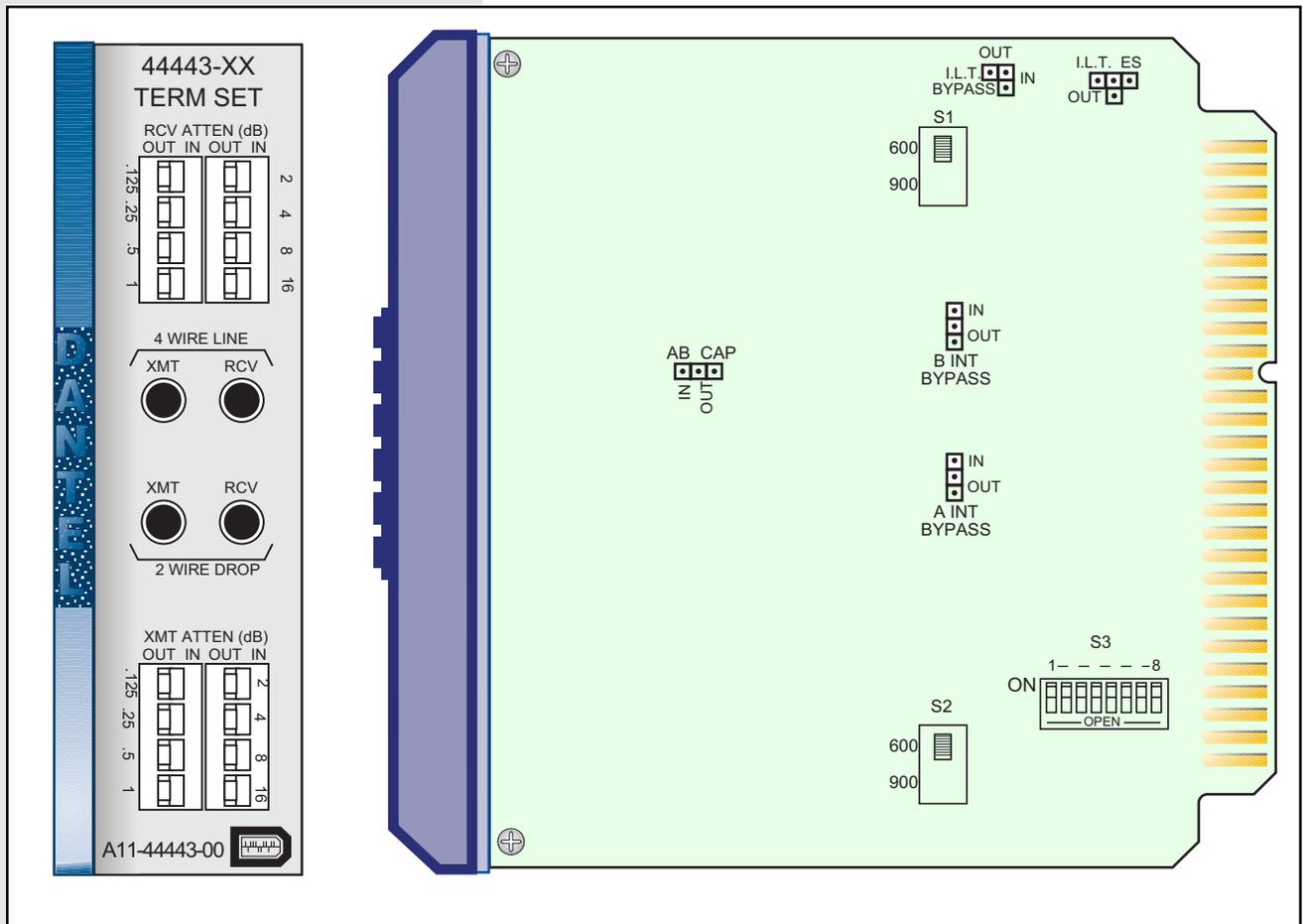
# INSTALLATION

Installation consists of settings the switches and straps, wiring the connectors (if necessary), mounting the module in the shelf, and checking out the module.

## Switch and Strap Options

Set the switches and straps using Fig. 3 and Table A.

**FIG. 3 - 44443 TERM SET SWITCH AND STRAP LOCATIONS**



# INSTALLATION

TABLE A - 44443 SWITCH AND STRAP OPTIONS

OPTION	SWITCH OR STRAP
Attenuation Receive Transmit	RCV ATTEN (front panel) XMT ATTEN (front panel)
NBO (capacitors add) 2.2 nFd 4.7 nFd 8.2 nFd 15 nFd 33 nFd 68 nFd 600 ohms 900 ohms	S3-1 S3-2 S3-3 S3-4 S3-5 S3-6 S3-8 (S2 on 600) S3-8 (S2 on 900)
Two-Wire Impedance 600 ohm 900 ohm	S1, S2 on 600 S1, S2 on 900
Idle Line Termination or Echo Suppression Override (-01 only) Idle Line Termination  Echo Suppression Override Only  Both Inactive	ILT Bypass OUT Load Strap to ILT  ILT Bypass IN Load Strap to ES  ILT Bypass IN Load Strap to OUT

## Wiring

Normally, the 44443 is used in a shelf that is pre-wired at the factory. Fig. 4 shows the edge connector pin designations if wiring is required.

## Module Mounting

Install the module in the proper slot in the equipment housing by sliding the module along the guide slots. Firmly seat the edge connector in the receptacle.

## Checkout

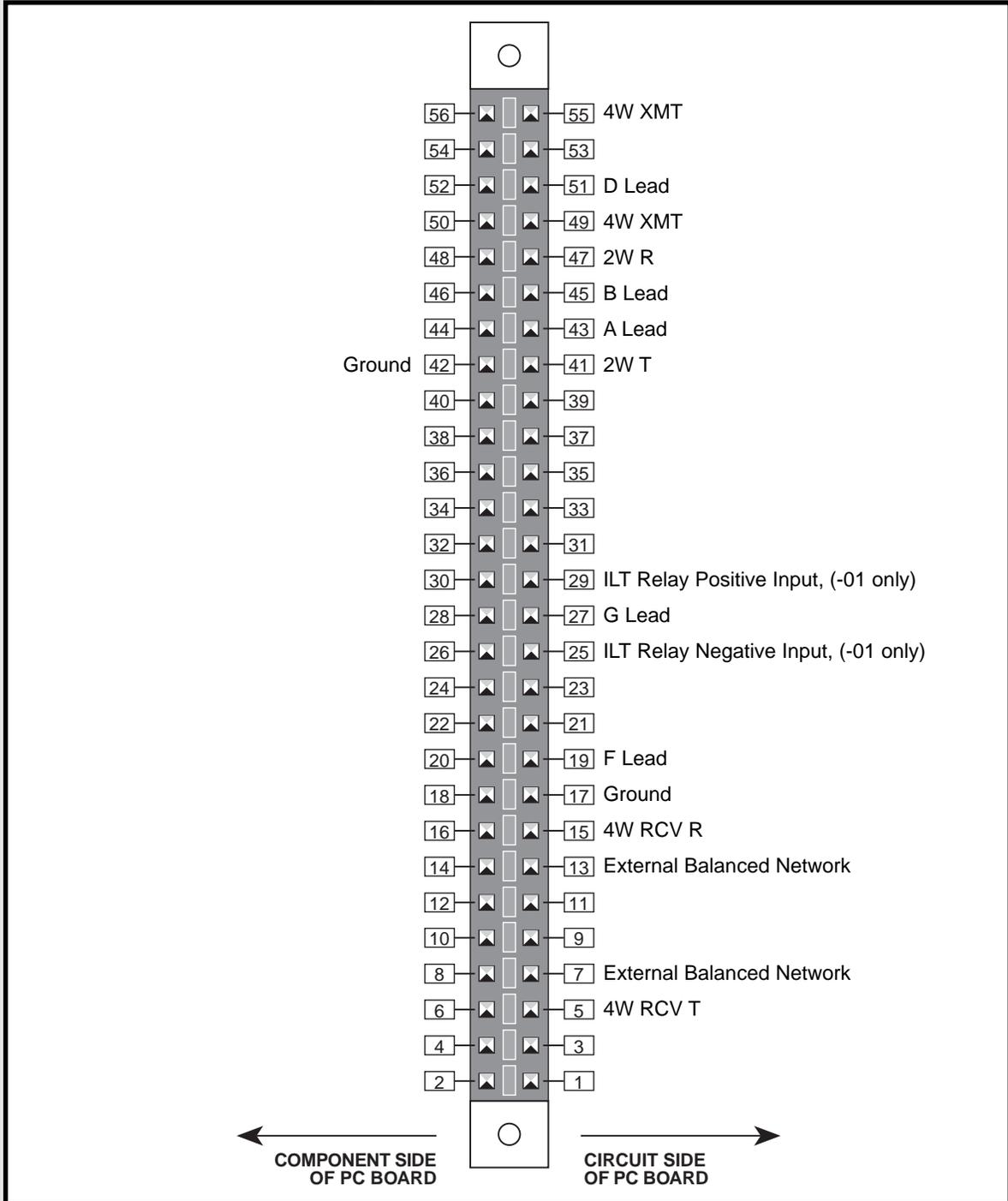
Table C provides check-out procedures for the 44443-00 and 44443-01 Four-Wire Termination Sets. Refer to Fig. 3 for a view of the front panel. Test equipment required for this procedure include:

- ◆ Audio Oscillator, 600 ohm.
- ◆ AC Voltmeter with decibel scale.
- ◆ Extender card, 400-type, 56-pin edge connector.

CONTINUED . . .

# INSTALLATION

FIG. 4 - 44443 TERM SET PIN DESIGNATIONS



# INSTALLATION

The procedure assumes the Term Set is switched to the 600 ohm, 2-wire line. For accurate readings, use fixed resistors for calibration loads in place of connecting lines or equipment. Set signal source levels across fixed resistors before connecting to the module.

**NOTE:** *If the Term Set is switched to the 900 ohm, 2-wire setting, substitute "900" for "600" when used in reference to the 2-wire line.*

Abbreviations:

- ◆ 600 T = Terminate in 600 ohm load.
- ◆ 600 B = Bridging Unloaded measurement using 600 ohm reference scale (dBm).

**TABLE B - 44443-00/-01 CHECK-OUT PROCEDURE**

STEP	ACTION	RESULTS
1	Remove Term Set and insert extender card in its place. Insert Term Set into extender card.	
2	When aligning -01, energize ILT relay. (Do not energize if strapped for Echo Suppression Override.)	
3	Use AC voltmeter (600 T) to set 1 KHz, 600 ohm tone source for 2-wire receive test tone level per system requirement (0 dBmO). Remove meter and insert source at 2W IN jack.	
4	Insert AC voltmeter (600 T) at 4W XMT jack.	Measure XMT tone level. Adjust XMT attenuator front panel switches for required level. (0 dBmO)
5	Remove source and AC voltmeter. Use AC voltmeter (600 T) to set source for 4W RCV test tone level per system requirement (0dBmO). Remove meter and insert source at 4W RCV jack.	
6	Insert AC voltmeter (600 T) at 2W IN jack.	Measure 2-wire transmit tone level. Adjust RCV attenuator front panel switches for required level. (0 dBmO)
7	Remove meter but leave source connected to 4W RCV jack.	
8	Insert AC voltmeter (600 T) at 4W XMT jack. (Be sure that 2-wire side is connected to system equipment or line.)	Measure minimum tone level. Adjust S3-1 thru S3-6 for minimum level.
9	Remove test equipment. Normalize the ILT relay and return the Term Set to normal configuration.	

# OPERATION

There are no specific operating instructions for the 44443-00 and 44443-01 Term Sets. The module starts operation when signal is applied.

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## 4-Wire RCV and XMT Line Attenuation

Attenuation of the 4-wire RCV and XMT lines is adjusted by the DIP switches on the front panel. The 4-wire RCV and XMT ports of the Term Set are designed to match a 600 ohm line. Attenuation from 0 to 31.875 dB is provided in 0.125 steps.

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## Front Panel Test Jacks

Four jacks are located on the front panel. Two jacks are provided for the 2-wire port:

- ◆ A normal-through (2W IN) interrupts the 2-wire line, allowing access to the Term Set input.
- ◆ A monitor jack (2W MON) bridges the 2-wire line.

The RCV and XMT ports have normal-through jacks:

- ◆ The 4-wire RCV jack interrupts the receive line and connects to the input of the Term Set.
- ◆ The 4-wire XMT jack interrupts the transmit line and connects to the output of the Term Set.

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## Echo Suppression Override / Idle Line Termination Applications

The 44443-01 features a relay activated echo suppression branch across the 4-wire XMT port. This circuit is used to override echo suppression when a dial tone has control of the off-net applications with the 440 Communications Management System. When activated, relay K1 places a 50 ohm load across the 4-wire XMT line, reducing the dial tone level. This allows the DTMF tones to take control of the echo suppression and, by breaking the dial tone, be received at the central office.

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**NOTE:** *The ILT bypass strap must be installed to prevent line interruption.*

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The -01 also includes an Idle Line Termination (ILT) branch circuit that can be strapped into the 4-wire XMT line when the echo suppression circuit is not required. Applications of the ILT branch to the 4-wire XMT line occurs when the K1 relay is released (not energized). Then the 4-wire XMT line is disconnected from the Term Set and the 4-wire XMT port is terminated in 600 ohms.

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**NOTE:** *The ILT bypass strap should not be used in this application.*

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# FCC REQUIRED INFORMATION

The following are requirements of Part 68 of FCC Rules:

1. The installer of this equipment is responsible for notifying the telephone company that it is being connected or disconnected.
2. This equipment is not to be connected to party lines or coin telephone service.
3. The telephone company has the right to temporarily discontinue service (Section 68.108) and to change facilities and services which may affect the operation of this equipment. Adequate written notice will be provided to the user to maintain uninterrupted service (Section 68.110B).
4. In case of trouble, contact the manufacturer's authorized agent.
5. When the installation of this device requires connection or changes to the internal wiring of registered telephones or other registered devices, such changes and connections can be made only by the registered grantee or authorized agents, equipment manufacturers, registered telephone refurbishers, telephone companies, and those qualified for the installation of KN and PN systems under Section 68.215 of the rules. The installer of this equipment is advised, in the interest of safety, that the host equipment be disconnected from all power sources and the telephone network when the installation is being made.
6. Installation of this equipment as an adjunct can be made only with permission of the owner of the host equipment.

FCC required information pertaining to this module:

Registration Number: **DPH62Z-14478-WP-T**

# TECHNICAL SPECIFICATIONS

DESCRIPTION	VALUE
Impedances 2-Wire 4-Wire	600 or 900 ohm in series with 2.15 uFd capacitor 600 ohm $\pm 5\%$
Insertion Loss 600 ohm, 2-Wire 900 ohm, 4-Wire	4.5 dB, nominal, mid-range 4.3 dB, nominal, mid-range
Frequency Response	250 Hz to 3400 Hz $\pm 0.3\%$
Return Loss, 2-Wire, 600 & 900 ohm 250 Hz to 500 Hz 500 Hz to 1000 Hz 1000 Hz to 2500 Hz 2500 Hz to 3400 Hz	Greater than 20 dB Greater than 30 dB Greater than 35 dB Greater than 30 dB
Trans-hybrid Loss	Greater than 45 dB, 250 Hz to 3400 Hz
A & B Lead Current	100 mA max. with no performance degradation
Test Jacks	0.177" Dia. ("Bantam" size); 4W XMT, 4W RCV, 2W MON, 2W IN
Input Voltage Range	-21 TO -56 VDC
Input Power Requirements (Option -01 ILT relay only)	15 mA max. @ -24 or -48 VDC, nominal (no current in idle state)
Heat Dissipation (during relay operation, -01 option only)	1.1 Btu/Hr
Physical Dimensions	1.4" x 6.0" x 5.6"
Weight -00 -01	1 lb. 4 oz. 1 lb. 5 oz.
Operating Temperature Range	0° to 60° C.

# WARRANTY

## LIMITED WARRANTY

The Seller warrants that the standard hardware products sold will be free from defects in material and workmanship and perform to the Seller's applicable published specifications for a period of 18 months for hardware, and 3 months for software, from the date of the original invoice. The liability of the Seller hereunder shall be limited to replacing or repairing, at its option, any defective products which are returned F.O.B. to the Seller's plant, (or, at the Seller's option, refunding the purchase price of such products). In no case are products to be returned without first obtaining permission and a customer return authorization number from the Seller. In no event shall the Seller be liable for any consequential or incidental damages.

Equipment or parts which have been subject to abuse, misuse, accident, alteration, neglect, unauthorized repair or installation are not covered by warranty. The Seller shall make the final determination as to the existence and cause of any alleged defect. No warranty is made with respect to custom equipment or products produced to the Buyer's specifications except as specifically stated in writing by the Seller in the contract for such custom equipment.

This warranty is the only warranty made by the Seller with respect to the goods delivered hereunder, and may be modified or amended only by a written instrument signed by a duly authorized officer of the Seller and accepted by the Buyer.

Warranty and remedies on products not manufactured by the Seller are in accordance with warranty of the respective manufacturer. **THE SELLER MAKES NO OTHER WARRANTY OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED; AND ALL IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEEDS THE AFORESAID OBLIGATIONS IS HEREBY DISCLAIMED BY THE SELLER.**

## IN CASE OF DIFFICULTY

If you experience difficulty with this equipment, check the following, as appropriate:

- 1. Switch settings**
- 2. Signal levels**
- 3. Software configuration**
- 4. Connections between Dantel's equipment and your equipment.**

If there is still a problem, substitute equipment that is known to be good. For additional assistance, call Dantel's Technical Field Service Department weekdays, 6 A.M. to 5 P.M. pacific time:

**1-800-4DANTEL (1-800-432-6835).**

If a thorough checkout shows a piece of equipment has malfunctioned, you may return it to the factory. For repairs and emergency replacements, obtain a Return Material Authorization (RMA) number from the Customer Service Representative at **1-800-4DANTEL (1-800-432-6835)**.

To ensure expedient processing of your order, provide a purchase order number and shipping and billing information when requesting an RMA number. Also, when the units are returned to Dantel, include a description of the failure symptoms for each unit returned. Send defective equipment to:

**Dantel, Inc. • 2991 North Argyle Avenue • Fresno, California 93727-1388**



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