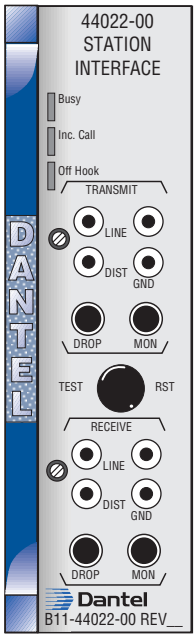
44022-00 SUBSCRIBER LINE INTERFACE MODULE



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About this Practice:

This document has been reissued to:

- Update Figs. 2 and 4.

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

UPDATED

Issue date: July 1998

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
B11-44022-00	Subscriber Line Interface
A11-44022-10	Subscriber Line Interface

GENERAL DESCRIPTION

The 44022 Subscriber Line Interface Module (44022) interfaces a subscriber telephone to a four-wire port. The 44022 also provides group or all-call capability for the Dantel 00330 DTSS3A Selective Signaling Order-Wire Terminal.

The 44022 comes with with two model options, the 44022-00 and the 44022-10. This practice covers only the 44022-00. The 44022-10 is covered in a separate practice. The 44022-00 is recommended for applications that do not require an external ringing generator. The 44022-10 should be used in all applications requiring an external ringing generator.

The 44022 is a plug-in printed circuit module that fits into any 400-type or similar equipment housing. The 44022 does not accept subassemblies.

The front panel includes:

- Operational status indicating LEDs
- Calibration test points
- Test jacks
- Level controls
- A test/reset switch

The 44022 operates on -21 to -56 VDC input power.

CIRCUIT DESCRIPTION

The Decoder Module circuitry consists of three sections: audio, signaling/control and power regulator. Fig. 1 shows the 44022 Subscriber Line Interface Module audio section functional schematic. Fig. 2 shows the 44022 Subscriber Line Interface Module signaling/control section functional schematic.

FIG. 1 - FUNCTIONAL SCHEMATIC, 44022 SUBSCRIBER LINE INTERFACE MODULE, AUDIO SECTION

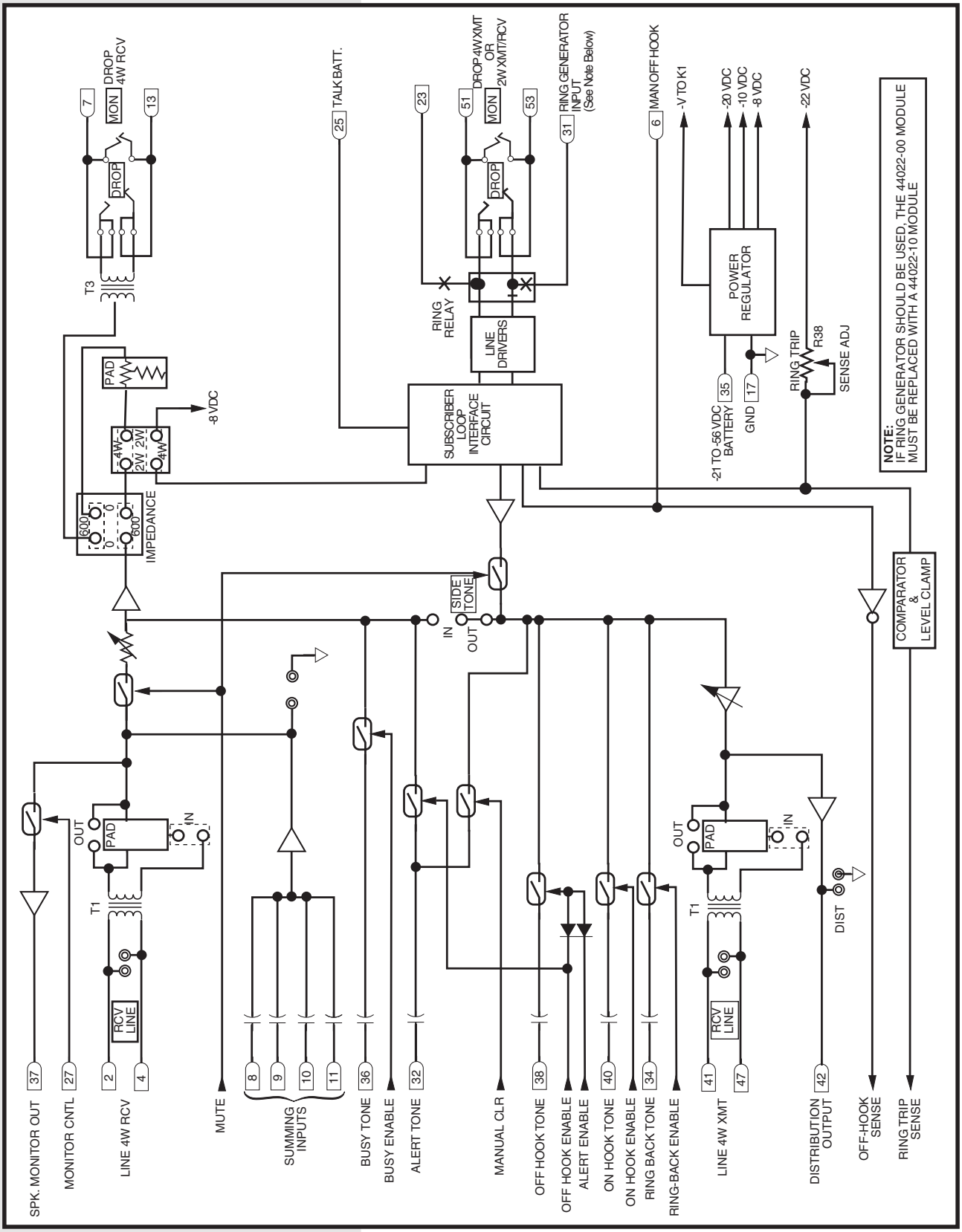
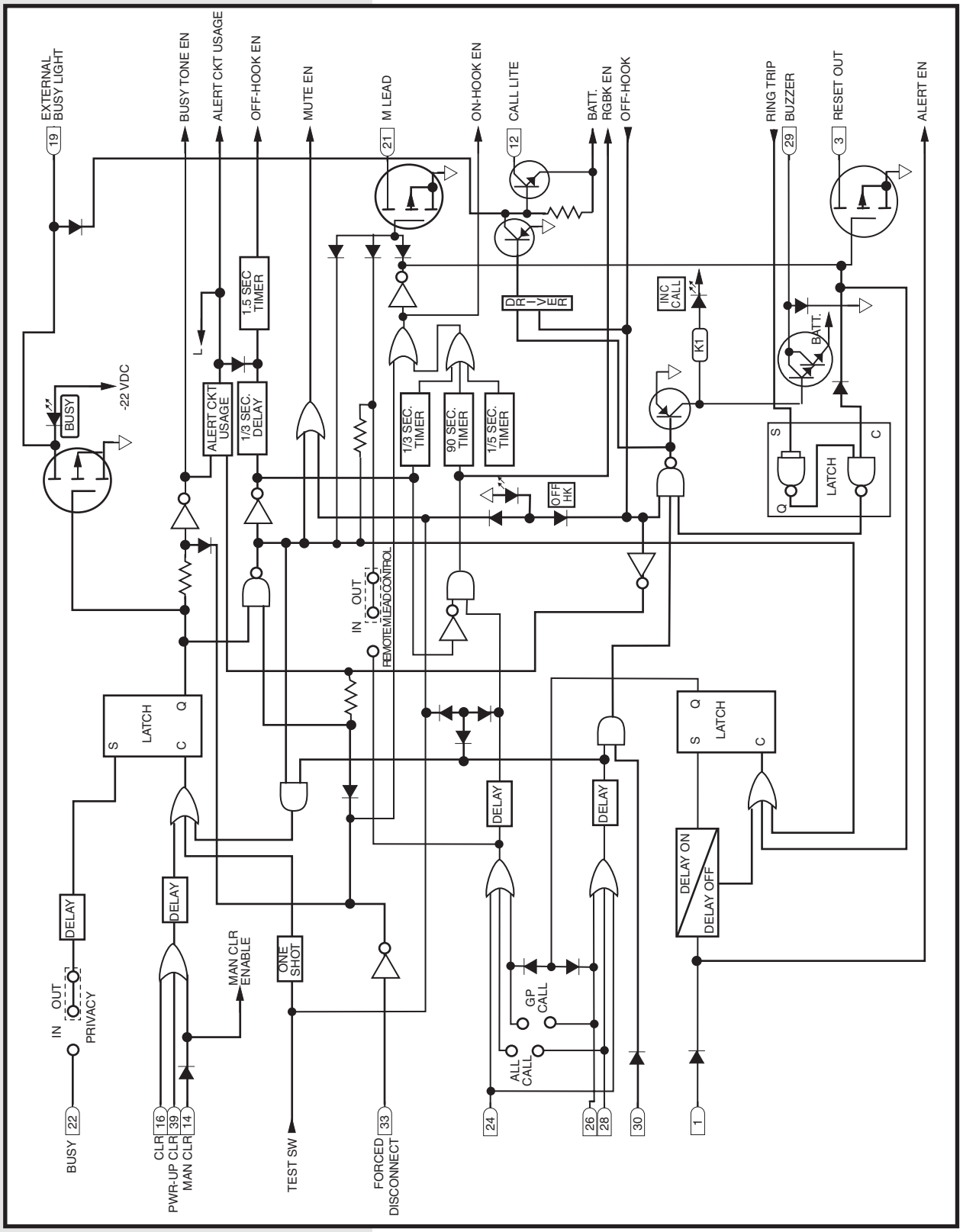


FIG. 2 - FUNCTIONAL SCHEMATIC, 44022 SUBSCRIBER LINE INTERFACE MODULE, SIGNALING/CONTROL SECTION



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CIRCUIT DESCRIPTION

AUDIO SECTION

The audio section consists of a receive circuit, an active hybrid integrated circuit, and a transmit circuit. Refer to Fig. 1.

Here is a brief description of each of the functional parts of the circuit:

Receive Circuit

An incoming signal enters at the four-wire line receive input (pins 2 and 4) or at one of the summing inputs (pins 8, 9, 10 or 11). Signals at the four-wire receive input couple through the transformer (T1), pass through a strappable 10 dB pad and then combine with signals from the summing inputs. The signals route to a monitor circuit and a mute FET.

NOTE: *Strap the **10** dB pad IN to prevent high level signals from falsely turning on the mute **FET**. Strap the **10** dB pad OUT only when incoming signal levels are too low to meet output level specifications. Pad strapping does not apply when you only use the summing inputs.*

The monitor circuit provides an output (pin 37) that drives a speaker amplifier. A ground at pin 27 enables the monitor output. The monitor output mutes when you remove the ground from pin 27.

The signal passing through the mute FET goes through a variable gain amplifier to an impedance strap option. If you strap the impedance for 0 ohms, the signal couples to the four-wire receive drop output (pins 7 and 13) through transformer T3 and the drop receive test jacks.

When you strap the impedance for 600 ohms, the signal routes to the two-wire/four-wire strap. The signal couples through transformer T3 to the four-wire drop receive output when the strap is in the four-wire position.

Active Hybrid Integrated Circuit

In the two-wire position, the signal routes to the solid state active hybrid integrated circuit (IC). This circuit provides two-wire receive/transmit signal combining and loop current sensing for the phone. The signal passes through line driver transistors, the closed ringing relay contacts (K1) and the drop transmit test jacks to pins 51 and 53.

Transmit Circuit

Voice input enters at the two-wire/four-wire drop transmit input (pins 51 and 53). The voice input passes through the drop transmit test jacks and the closed K1 contacts, and goes into the active hybrid IC.

The signal passes out the other side of the IC to an amplifier and a mute FET. At the other side of the FET, the signal splits between the side-tone feedback path and a variable-gain output amplifier. The side-tone feedback path has a strap option that allows side-tone defeat when you use a two-wire phone.

The output amplifier provides an output signal to both the four-wire line transmit output (pins 41 and 47) and the distribution output (pin 42). Signals at the four-wire transmit output pass through a strappable 10 dB pad and couple through transformer T3.

SIGNALING/CONTROL SECTION

The signaling/control section consists of a busy circuit, an incoming call circuit and a clear circuit. Refer to Fig. 2.

NOTE: *If an external ringing generator is to be used, refer to the **46022-10** documentation.*

Busy Circuit

The first stage of the incoming call procedure is circuit busy. A logic 1 (ground or 0 VDC) applies to the busy input (pin 22). If the privacy strap is in, the circuit BUSY LED lights up and the external busy light output (pin 19) turns on (ground). The lamp lead (pin 12) also turns on (battery).

A busy tone enable turns on the busy FET which connects the busy tone to the receive circuit so you hear it when you pick up the phone. The # busy circuit can also hold the mute FETs on and inhibits M lead (pin 21) operation. This capability is not normally used in the order wire circuit.

Incoming Call Circuit

Receive an incoming call by grounding the station-call (pin 24), the group call (pin 26), the all-call (pin 28) or the E lead (pin 1) input. Three actions occur as the result of an incoming call:

- Relay K1 operates.

  Relay K1 contacts connect an external ringing supply at pins 23 and 31 to the telephone at pins 51 and 53. The ISM is only used with a DTSS3A package. When used with a true ring circuit, the ring ON is 2 seconds and the ring OFF is 4 seconds.

  If you configure the DTSS3A system with a 44028 Common Order-Wire Module then you can strap relay K1 for an interrupt rate of one second on and two seconds on or two seconds on and one second off.

The front panel INC CALL LED follows the ringing cycle. The lamp lead and buzzer lead (pin 29) outputs also follow the ringing cycle. In the order-wire application, the 46022 uses the buzzer lead. Ringing is not applied.

- The ring-back tone enable operates.

  The ring-back tone enable operates an FET that allows the ring-back tone from the 49920 ISM connected at pin 34 applies to the transmit line. The ring-back tone also cycles by the interrupt signal.

- A 90 second timer starts.

  The 90-second timer resets the module and transmits an on-hook tone to the transmit circuit (back to the caller) if the phone is not answered. The on-hook tone appears at pin 40. The order-wire system does not use this capability.

The Ring Trip Sense Adjust compensates for situations where system resistance exceeds the maximum loop loss. Do not use an external ringing generator with the -00 option.

When an off-hook condition occurs during the ringing cycle, the 44022 detects the loop current, releases relay K1 and the front panel OFF HOOK LED lights up.

The 44022 generates an off-hook tone enable which applies an off-hook tone burst (100 milliseconds) to the transmit circuit (back to the caller). The off-hook tone does not transmit in the order-wire application.

The 44022 removes the ring-back and busy tone enables which:

- Turns off their respective FETs.
- Disables the 90 second timer.
- Grounds the M lead at pin 21.
- Establishes voice communication by flowing off-hook loop current.

Clear Circuit

The clear function occurs when:

- The phone hangs up.
- 90 seconds elapse during off-hook.
- The call terminates before the phone answers.

When the phone hangs up, a pulse at the reset output (pin 3) resets the 44020 DTMF Decoder Module and returns the circuit to its normal condition.

Terminate a call before the phone answers by applying a ground to the clear input (pin 16). Application of ground returns all functions to normal and outputs a reset pulse at pin 3. The tone decoder normally applies the clear input upon receipt of an on-hook tone.

CIRCUIT DESCRIPTION

You can use the front panel TEST/RST switch for card alignment. Pressing the button once causes an off-hook condition. Pressing the button again resets the 44022.

POWER REGULATOR SECTION

The power regulator provides -8 VDC, -10 VDC and -20 VDC to the 44022 from a -21 to -56 VDC battery supply. A separate -20 VDC output powers the relay coil K1 which eliminates the need for a voltage strap to the relay coil.

APPLICATION INFORMATION

The 44022 Subscriber Line Interface Module provides tele phone interface and signaling/control for:

- The 00330 DTSS3A Selective Signaling Order-Wire Terminal
- The 44028 Common Order-Wire Module

Fig. 3 shows a DTSS3A application.

FEATURES

The 44022-00 module offers features which can be made operational when the module is installed. Some features are selected by making wiring connections at the edge connector, while others are selected using mini-jumper strap options on the module itself. Refer to the ***Installation*** section.

Monitor Speaker

The monitor output at pin 37 drives a speaker amplifier to monitor system activity. This output monitors all signals at the line side input. It is not affected by grounding the monitor control input at pin 27. Open the control input circuit to mute.

External Busy

By providing a ground output, the external busy light output at pin 19 can drive a lamp or other indicator to show that the system is busy. The maximum rating at -56 VDC is 200 mA. This feature is not normally available when the 44022-00 is used in the order wire system.

Buzzer and Lamp Leads

These outputs are provided for operating the buzzer at pin 29 and lamp at pin 12 on the station phone. The lamp lead pulses with the ringing cycle and comes on steadily with off-hook conditions. The buzzer lead pulses with ringing. Outputs switch to negative battery through open collector transistors. The maximum current rating of the lamp lead is 50 mA, with 200 mA available at the buzzer lead.

Manual Off-Hook

A ground at pin 6 will activate all module off-hook functions. This input is used for special applications.

E and M Leads

The E and M leads are located at pins 1 and 21, respectively. Where a full-duplex radio is used for the communications system, the M lead operates the radio's CD (Carrier Detect) output.

All Call and Group Call

The all call input at pin 28 and group call input at pin 26 are connected to the 44020 Address Decoder through the backplane wiring. These functions are implemented by programming the address decoder and by strapping.

STRAPS

All Call and Group Call

The All Call and Group Call inputs can be optioned to defeat the ringback tone and the automatic time-out feature. Install the strap to enable these features. Remove the strap to disable these features.

Line Receive and Transmit Pads

It is recommended that the Receive Pad be strapped in unless the levels specified in Table B of the ***Installation*** section cannot be attained. Both pads attenuate the signal be 10 dB. A mini-jumper must be installed in either the IN or the OUT position.

Remote M Lead Control Strap

This strap can be installed to allow the M lead to be operated when a call is received. This function is necessary in two different applications:

- For full-duplex radios, this will key the return link transmitter so that the caller will hear the ringback tone.
- Where supervisory tones are not used, such as open-line systems without privacy, this enables M lead control.

Privacy Strap

The privacy feature may be defeated by strapping when an open-line conference system is selected. With the strap in the PRIVACY OUT position, the busy function and manual privacy are disabled. This is the proper strap position for use in the order wire system.

Two-Wire/Four-Wire Phone Strap

Two straps are provided for this option. Both mini-jumpers must be installed for the module to function. Install the jumpers horizontally for four-wire phones. Install both jumpers vertically for two-wire phones. Four-wire is recommended if the system is to be used for conferencing or for all call functions between more than five phones.

Sidetone Strap

Because a two-wire phone provides its own sidetone through the hybrid, the sidetone strap must be in the OUT position when a two-wire phone is used. With the four-wire phone, an external path must be provided to have sidetone. The sidetone strap is IN for four-wire phones, unless no sidetone is desired.

Four-Wire Drop Receive Impedence Strap

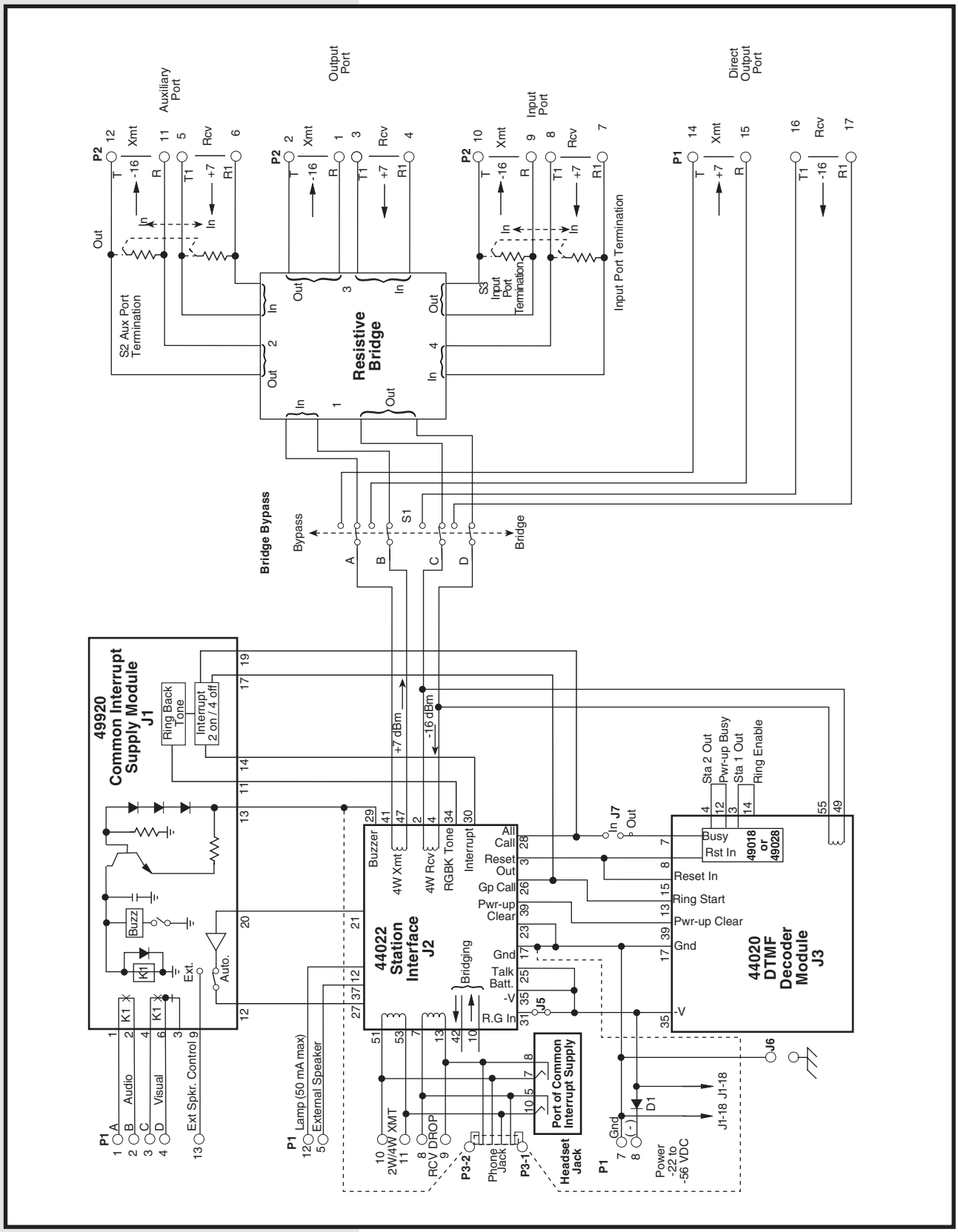
This strap is placed in the 600 ohm position when a telephone is connected to the drop. In special applications where the drop receive (output) port connects to a low impedence device or an amplifier input, the strap should be in the 0 ohm position.

Ring Generator

This strap is left in the OUT position in the order wire application.

APPLICATION INFORMATION

FIG. 3 - DTSS3A SELECTIVE SIGNALING ORDER WIRE APPLICATION BLOCK DIAGRAM



INSTALLATION

Installation consists of setting the straps, wiring the connector, mounting the module in the shelf and checking out the module.

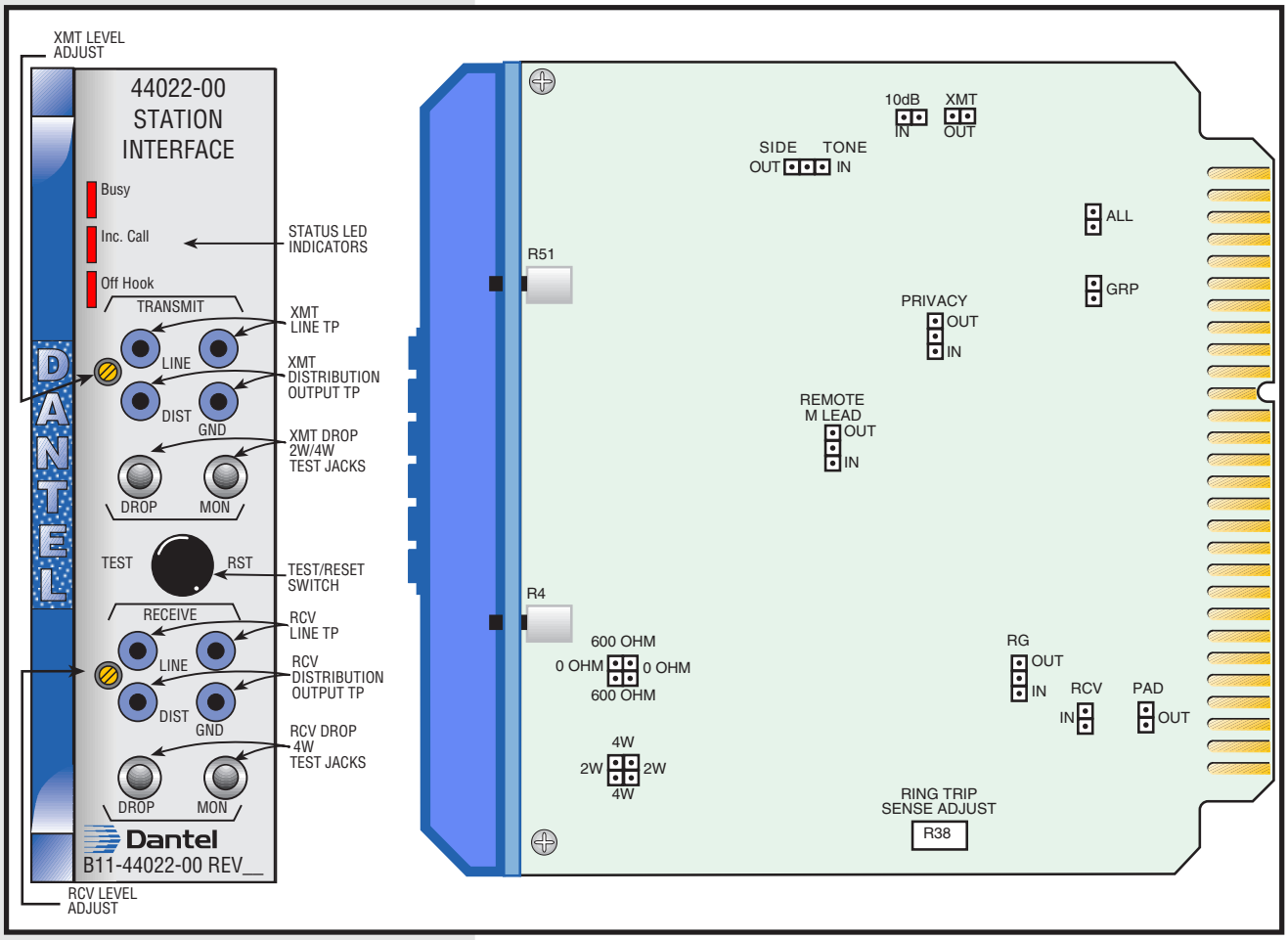
1. Install the proper strap options.

Refer to Table A and Fig. 4.

TABLE A - 44022 SUBSCRIBER LINE INTERFACE MODULE STRAP OPTIONS

STRAP	OPTION
ALL CALL AND GROUP CALL RINGBACK TONE	
Group Call	GP
All Call	ALL
LINE RECEIVE; 4-WIRE RCV LEVEL	
-3 dBm to +7 dBm	RCV PAD IN
-16 dBm to -3 dBm	RCV PAD OUT
LINE TRANSMIT; 4-WIRE XMT LEVEL	
-3 dBm to +7 dBm	XMT PAD OUT
-16 dBm to -3 dBm	XMT PAD IN
REMOTE M LEAD CONTROL	
By incoming call (with radios)	IN
By subscriber off-hook	OUT
PRIVACY	
Automatic or Manual Privacy	PRIVACY IN
No Privacy (normal for order wire applications)	PRIVACY OUT
2-WIRE/4-WIRE (DROP)	
2-Wire	2W (Straps vertical)
4-Wire	4W (Straps horizontal)
SIDETONE	
4-Wire; with sidetone	SIDETONE IN
4-Wire; without sidetone	SIDETONE OUT
2-Wire; all applications	SIDETONE OUT
4-WIRE DROP RCV IMPEDANCE	
600 ohms	600 OHMS (Straps horizontal)
0 ohms	0 OHMS (Straps vertical)
Ring Generator	OUT (always)

FIG. 4 - 44022 SUBSCRIBER LINE INTERFACE MODULE STRAP OPTION LOCATIONS



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2. Wire the connector.

If you wire the connector, refer to Fig. 5 for the module connector pin wiring assignments.

3. Mount the module in the equipment shelf.

Slide the module along the guide slots then firmly seat the edge connector in its receptacle.

NOTE:

You only need a test oscillator when you test the 44022 SLIM in an assembly that does not have a 44011 Line Interface Module. You can normally use the test oscillator built into the 44011 Line Interface Module.

4. Check out the module.

Refer to Table B for checkout procedures.

Use the following test equipment for module checkout:

- Level Meter (Weston Model 666, Hewlett-Packard 440EL or similar equipment, or you can use a Dantel 8002 Test Set)
- Test oscillator (Dantel 8002 Test Set or any 600 ohm audio oscillator)

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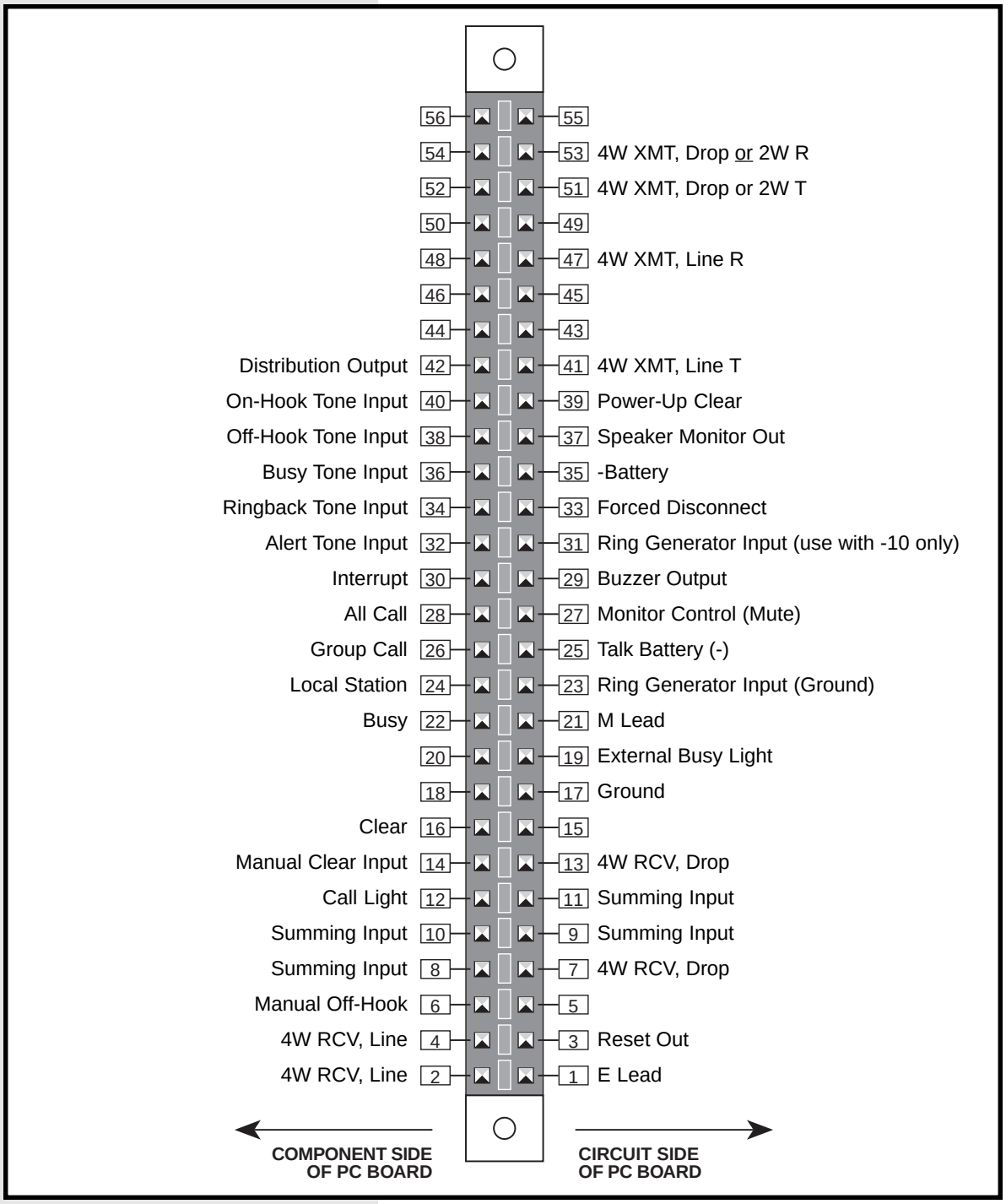
FIG. 5 - 44022 SUBSCRIBER LINE INTERFACE PIN DESIGNATIONS



NOTE:
When the 44022 is installed in a DTSS3A System, the common modules 49920, 44020, and 44028 or 49018 must be checked out before checking out the 44022.

The check-out procedure does not provide for testing the monitor output, buzzer lead, lamp lead, or busy-circuit light output. Any of these outputs used must be tested by connecting them to their appropriate devices and observing their operation. The all-call and group-call functions are tested as part of the system test procedure.

TABLE B - 44022-00 SUBSCRIBER LINE INTERFACE MODULE CHECK-OUT PROCEDURE

STEP	ACTION	RESULTS
1	Remove power from the shelf. Plug in the 44022-00 module. Apply power.	No LEDs should light. If the BUSY LED is on, press the TEST/RST button twice.
2	Insert a test tone or test oscillator at the 4W RCV input (pins 2 and 4) or at the LINE RECEIVE test points. Insert a level meter (unterminated) at the LINE RECEIVE test points. ***Note:*** *Any source device that loads down the input must be disconnected.*	Set the frequency to approximately 1 KHz. Set the level to system test-tone level (0 dBm).
3	For 2-wire phones: Move the level meter (600 ohm termination) to the DROP TRANSMIT jack. The phone will be disconnected when the plug is inserted. For 4-wire phones: Connect the level meter (600 ohm termination) to the DROP RECEIVE jack. When finished setting levels, press the TEST/RST button. The OFF HOOK LED goes off.	"OFF-HOOK" LED comes on. Read -4 dBm. Adjust the RECEIVE level control as required. Strap out the input pad if level cannot be attained. Read -13 dBm. Adjust the RECEIVE level control as required. Strap out the input pad as necessary.
4	Remove the meter and test oscillator connections.	
5	Insert the test oscillator at the DROP TRANSMIT jack. ***Note:*** *If the LED does not light, the oscillator is not providing a resistive path to ground. Place a* ***600*** *ohm load across the oscillator output.* Connect an unterminated level meter across the oscillator terminals.	"OFF-HOOK" LED lights. Set the level to 0 dBm
6	Connect the level meter (terminated) to the LINE TRANSMIT test points. ***Note:*** *Any source device that loads down the input must be disconnected.*	Read system test-tone level (0 dBm). Adjust TRANSMIT level control as required. Strap the output pad IN or OUT as required to attain the desired level.
7	Disconnect the meter and test oscillator.	

OPERATION

The 44022 Subscriber Line Interface Module operates when you apply power. Operation of the consists of observing the front panel LEDs:

- The BUSY LED indicates the system is busy.
- The INC CALL LED indicates an incoming call. The LED pulsates with the ringing signal.
- The OFF HOOK LED lights up when the subscriber phone is off hook.

The front panel TEST/RST switch tests and aligns the 44022 SLIM. Clear the off-hook condition by pressing the TEST/RST switch. The OFF HOOK LED goes dark.

TECHNICAL SPECIFICATIONS

DESCRIPTION	VALUE
Frequency Response	300 Hz to 3400 Hz ± 0.5 dB
Return Loss (Line and Drop)	>20 dB
Maximum Loop Loss	250 ohms @ -24 VDC, nominal 1000 ohms @ -48 VDC, nominal
Signal Levels	
Line Receive	-16 to +7 dBm
Line Transmit	-16 to +7 dBm
Summing Inputs	-10 dBm
Distribution Output	-10 dBm
Drop Receive (4-Wire)	-13 dBm, nominal
Drop Transmit (2- or 4-Wire)	0 dBm, nominal
Drop Receive (2-Wire)	-4 dBm, nominal
E Lead	Ground to operate. -56 VDC maximum input.
M Lead	Normally open (on-hook) Operated ground (off-hook) -56 VDC @ 50mA max. source
Tone Input Levels (Composite)	
Busy	-13 dBm
Off-Hook (#)	-13 dBm
On-Hook (*)	-13 dBm
Ringback	-16 dBm
Alert	-13 dBm
Clear Inputs (Clear, Manual Clear, Power-Up Clear)	Ground to clear. Manual clear diode protected to -56VDC.
Call Inputs (Station Call, Group Call, All Call)	Ground to call.
Busy Input	Ground to busy.
Interrupt Input	Ground to ring. Open to interrupt.
Forced Disconnect Input	Ground to disconnect. Diode protected to -56 VDC.
Manual Off-Hook	Ground for off-hook.
Monitor Control	Ground to mute monitor output. Diode protected to -56 VDC.
Reset Output	Pulse to ground. Open Emitter. -30 VDC @ 200mA max. source.
External Busy Light Output	Ground when busy. -56 VDC @ 50mA max. source.
Lamp Lead	Open collector to input battery supply; 50mA max.
Buzzer Lead Outputs	-56 VDC @ 200mA max.
Input Voltage Range	-21 VDC to -56 VDC
Input Power Requirements	
Idle	25mA
Full Load	120mA
Heat Dissipation	
Idle	4.8 BTU/Hr.
Full Load	23 BTU/Hr
Physical Dimensions	1.4" x 6.0" x 5.6"
Weight	9 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