46105 DUAL VF 64-KILOBIT CHANNEL

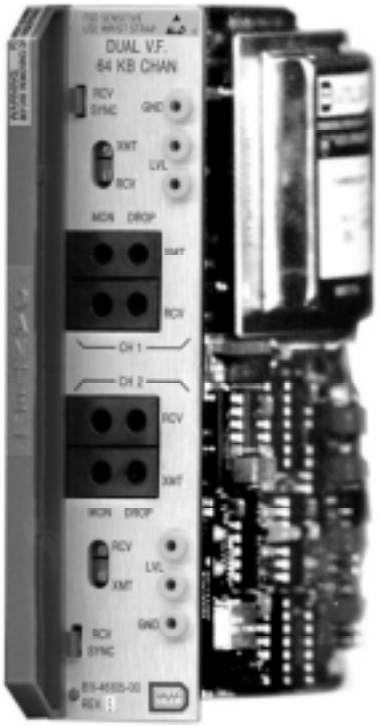


Table of Contents

This manual has been reissued:

- To update Fig. 1 in the Circuit Description section.

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

UPDATED

Issue date: August 1997

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 anti-static wrist straps, smocks, footwear, etc.).
- Keep circuit boards in their anti-static 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
B11-46105-00	64 KB Interface Module; without companders
B11-46105-01	64 KB Interface Module; with companders
Glossary Utility Disk	Defines the terms used in Dantel's product documentation.

GENERAL DESCRIPTION

The 46105 Dual Voice Frequency 64-Kilobit Channel module interfaces analog voice equipment to 64-kilobit digital service channel equipment.

The module has two channels. They can operate independently or they can be interconnected in a bridge configuration.

There are two options of the module:

OPTION NUMBER	FEATURES
46105-00	Without Companders
46105-01	With Companders

On the front panel of the module are test points, test jacks, signal level adjustments, and LEDs to show that data is being received on the digital side of the module.

The 46105 has a regulated power supply that uses –21 to –56 VDC input power.

CIRCUIT DESCRIPTION

The circuit consists of two channels, each with an analog section, a digital section, and, on the -01 option only, a compander. There also is a regulated power supply for the module.

Fig. 1 shows the functional schematic for the 46105 Dual Voice Frequency 64-Kilobit Channel module.

ANALOG SECTION

In the analog section of each channel, voice signals from external equipment are amplified or attenuated in the transmit path and sent to the codec (for COder-DECoder) for conversion into eight-bit digital words.

In the receive path, voice signals from the codec are amplified or attenuated and sent to external voice equipment.

When switch S1 is in the terminal position, the channels operate independently. When the switch is in the repeater position, the channels are interconnected in a bridge configuration.

Each channel also has a switch for looping transmit signals back to the same port's receive path for checking or setting audio levels.

Front panel jacks and test points are provided for monitoring or setting levels.

Each transmit and receive port on the 46105 has isolation transformers.

DIGITAL SECTION

Each digital channel of the module generates the proper timing sequences required to transmit and receive the data bit streams routed between the codec and external digital equipment.

The transmit and receive paths can be set for TTL or RS-422 operation.

An on-board 64-kilohertz clock is available to generate the transmit timing for either channel or an external clock may be connected to each channel. A transmit clock output for each channel matches that of the clock that is generating the transmit timing.

E and M signalling is available on both channels to control the transmission of data. Input to the M Lead is through an optical coupler and output from the E Lead is through a solid-state relay.

The M Lead also controls the operation of the MODE strap option when the strap is in the repeater position. When the M Lead is inactive (on-hook condition), digital signals are routed from one channel to the other, bypassing the analog circuitry. This reduces the amount of noise on the line that is caused by the digitizing process in the analog circuitry. When the M Lead

is active (off-hook condition), local analog voice signals are mixed with the analog signals derived from the incoming digital signals, converted back to digital, and transmitted.

Two green synchronization LEDs on the front panel, one for each channel, indicate if the respective channel is detecting the framing bit in the receive data bit stream.

COMPANDER (-01 OPTION ONLY)

Each channel has a compander (for COMpressor-exPANDER) for use where low-noise channels are needed.

Incoming analog signals are compressed to decrease the dynamic range of the signal and increase the signal-to-noise (SNR) ratio of the transmission through the channel. The compressed transmit signal is sent to the codec for conversion into digital words.

In the receive direction, voice signals from the codec are expanded to restore analog levels before being sent to the external voice equipment.

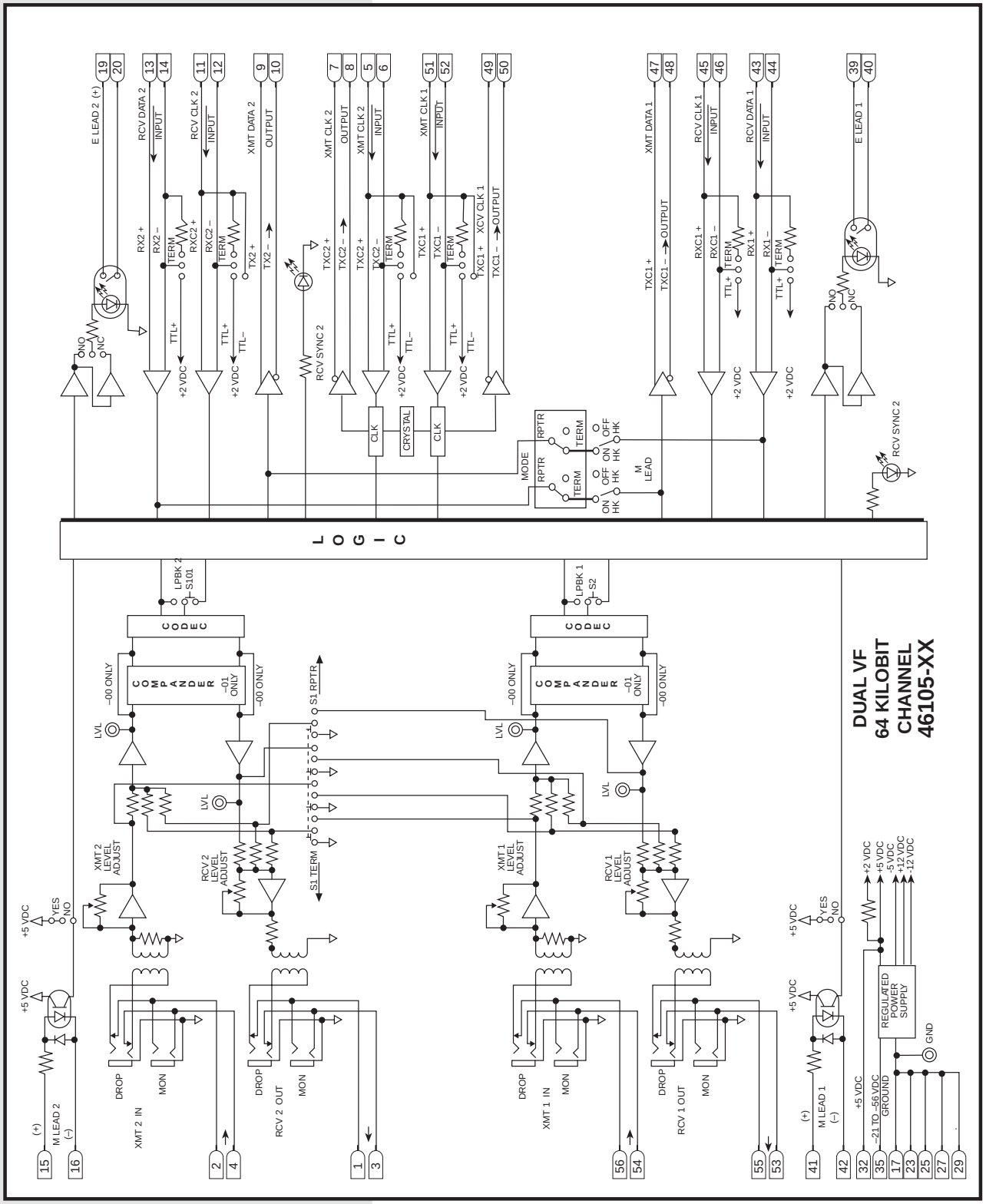
The compander uses a 2-to-1 gain (for expand) or attenuate (for compress) ratio. For example, if an input signal of -10 dB is received by the compander, an output of -5 dB would be obtained through the expander or -20 dB through the compressor.

REGULATED POWER SUPPLY

The regulated power supply uses -21 to -56 VDC input power to provide ±5 VDC, ±12 VDC and +2 VDC to the module's circuitry. The +5 VDC also is available at the board's edge connector.

CIRCUIT DESCRIPTION

FIG. 1 - FUNCTIONAL SCHEMATIC



UPDATED

APPLICATION

The 46105 can interface two separate 64-kilobit-per-second channels at a terminal site. Fig. 2 shows a terminal application.

Fig. 3 shows a repeater application. One module can interface one 64-kilobit-per-second channel in two directions at a repeater site. If the synchronization signal is lost, the unit automatically reverts back to terminal mode. When synchronization is re-established, repeater operations resume.

Use the M Lead in repeater applications.

The active M Lead (off-hook condition) converts digital signals from both repeater directions to analog signals. The analog signals mix with external voice equipment signals, convert to digital signals, and send in both repeater directions.

The inactive M Lead (on-hook condition) sends digital signals through digital paths in both repeater directions.

When you install many repeaters on one channel, and you do not need to transmit analog signals at the repeater drop, the M Lead reduces digital quantization noise.

FIG. 2 - TERMINAL SITE EXAMPLE APPLICATION

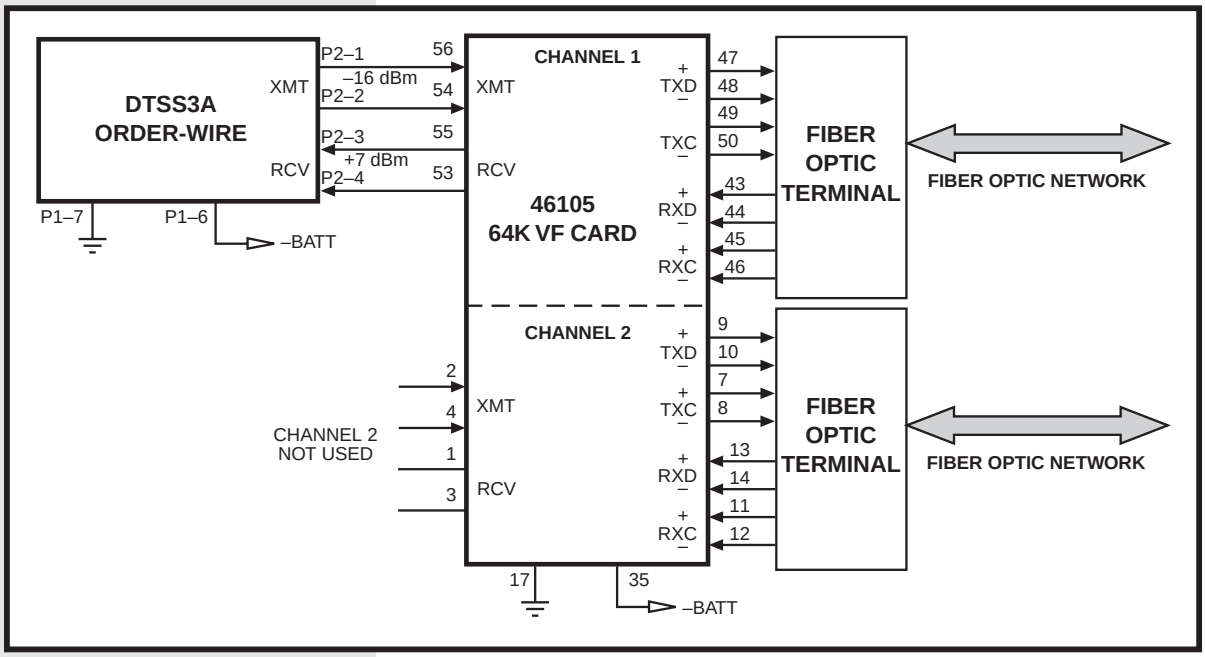
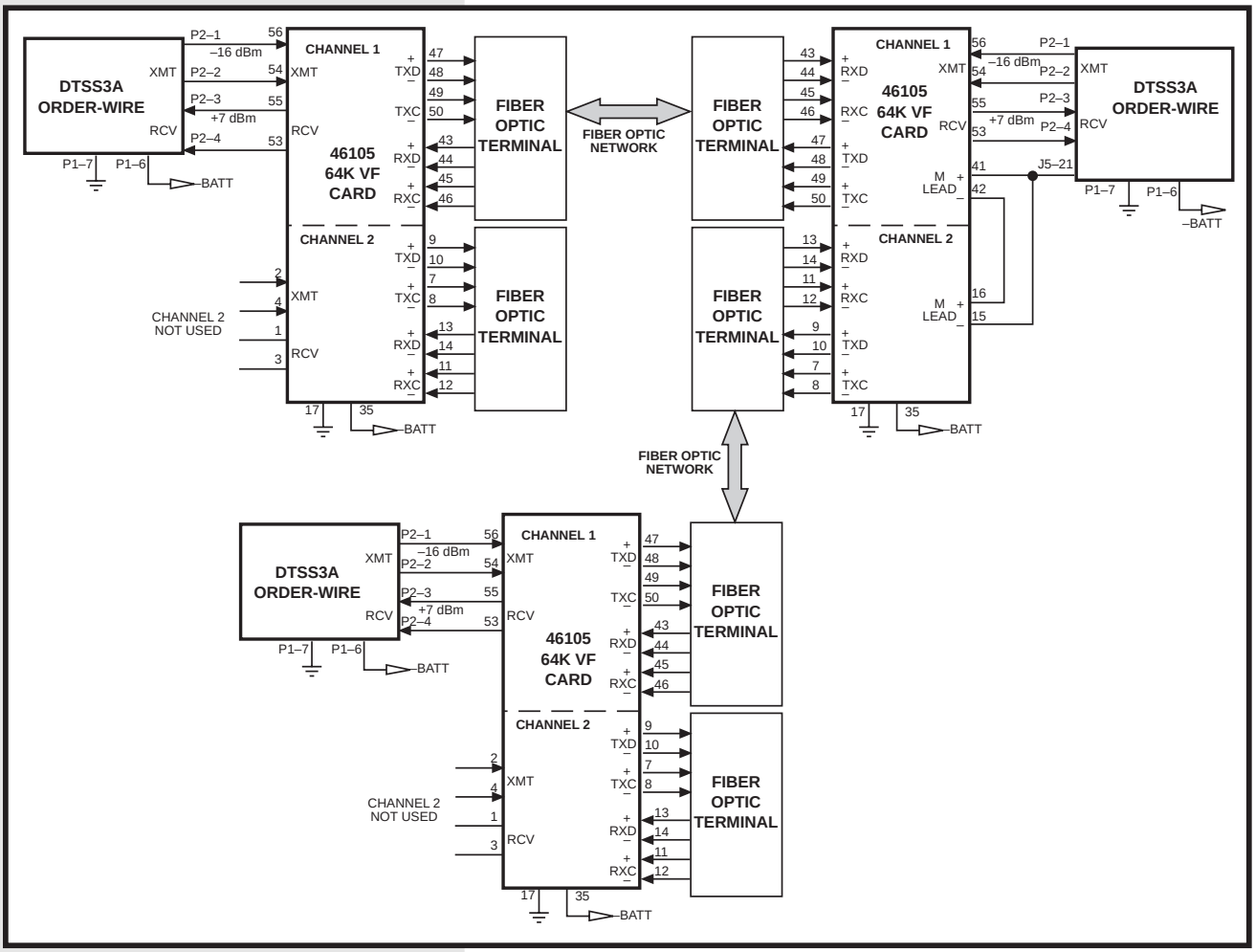


FIG. 3 - REPEATER SITE EXAMPLE APPLICATION



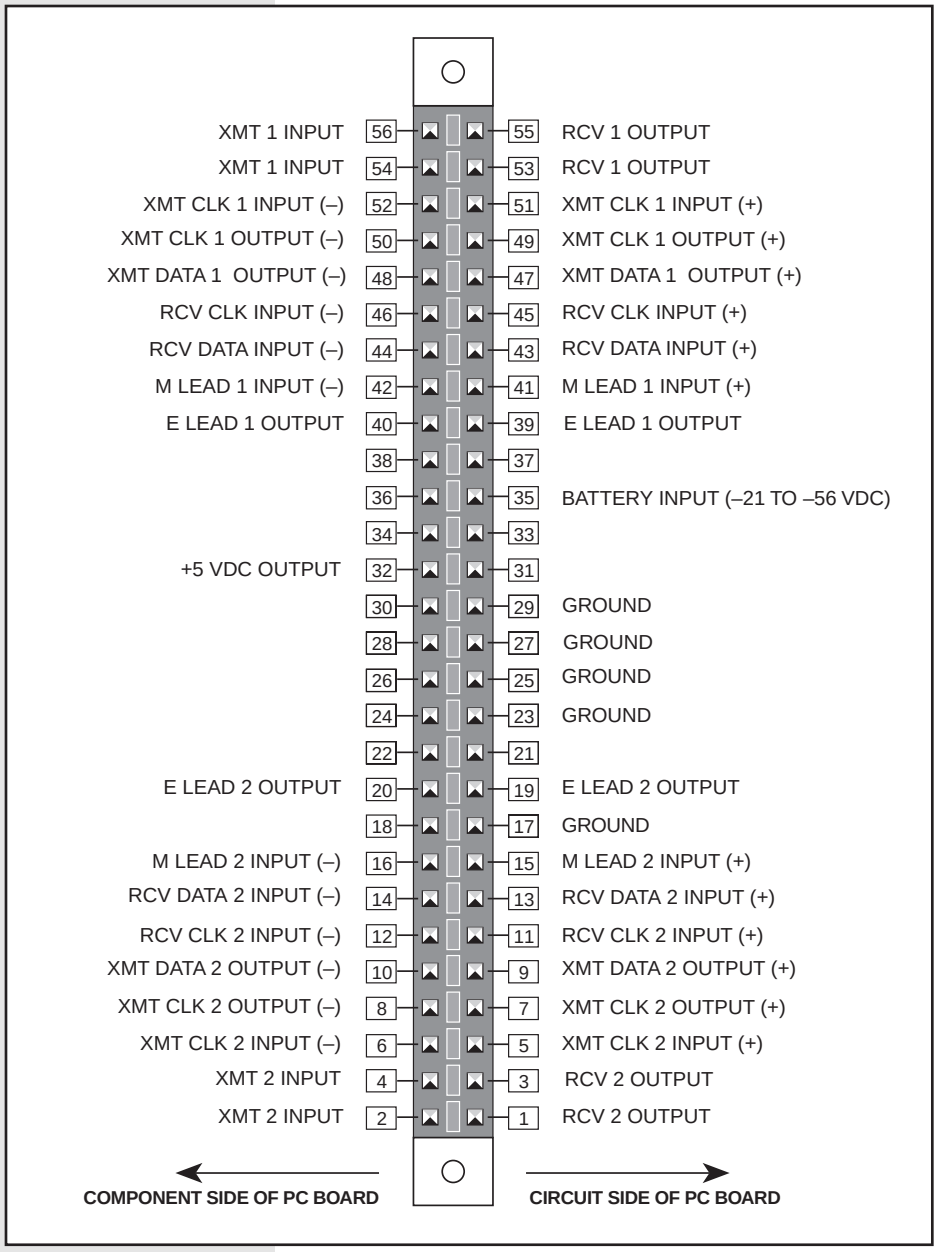
INSTALLATION

Installation consists of:

- Setting the straps and switches,
- Wiring the 46105 to the equipment, and
- Setting the audio levels.

Refer to Fig. 4 for edge connector pin designations.

Fig. 4 - Edge Connector Pin Assignments



1. Set the straps and switches.

Refer to Fig. 5 and Tables A and B.

Fig. 5 - Switch and Strap Locations

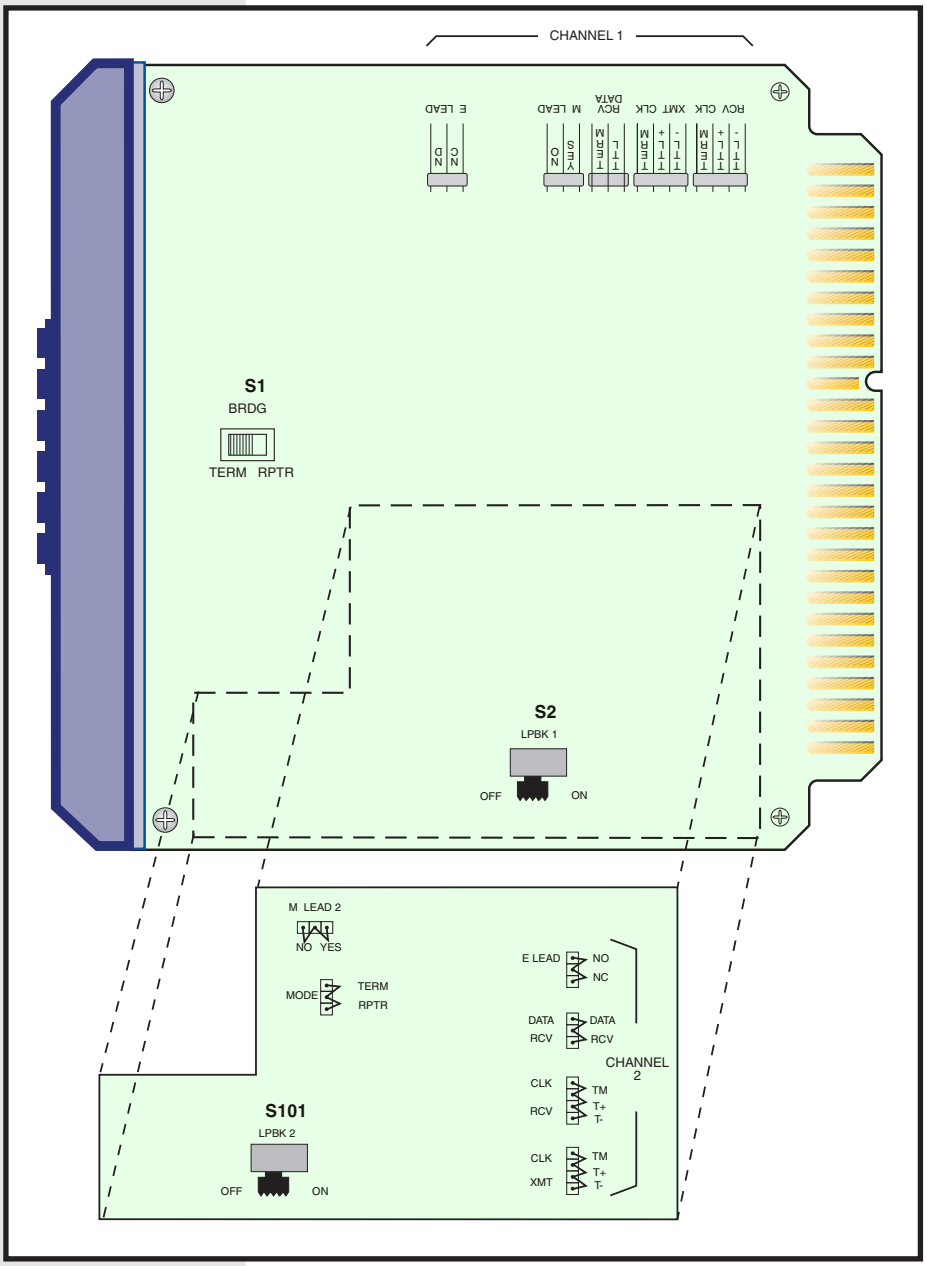


TABLE A - STRAP OPTIONS

STRAP	POSITION	DESCRIPTION
XMT CLK (see note below)	TERM	180-ohm termination across RS-422 inputs at pins 51 and 52
	TTL+	XMT CLK 1 pin 51 is TTL (+ edge) compatible; pin 52 is not used
	TTL–	XMT CLK 1 pin 52 is TTL (– edge) compatible; pin 51 is not used
RCV CLK 1	TERM	180-ohm termination across RS-422 inputs at pins 45 and 46
	TTL+	RCV CLK 1 pin 45 is TTL (+ edge) compatible; pin 46 is not used
	TTL–	RCV CLK 1 pin 46 is TTL (– edge) compatible; pin 45 is not used
RCV DATA 1	TERM	180-ohm termination across RS-422 inputs at pins 43 and 44
	TTL+	RCV DATA 1 pin 43 is TTL compatible; pin 44 is not used
XMT CLK 2 (see note below)	TERM	180-ohm termination across RS-422 inputs at pins 5 and 6
	TTL+	XMT CLK 2 pin 5 is TTL (+ edge) compatible; pin 6 is not used
	TTL–	XMT CLK 2 pin 6 is TTL (– edge) compatible; pin 5 is not used
RCV CLK 2	TERM	180-ohm termination across RS-422 inputs at pins 11 and 12
	TTL+	RCV CLK 2 pin 11 is TTL (+ edge) compatible; pin 12 is not used
	TTL–	RCV CLK 2 pin 12 is TTL (– edge) compatible; pin 11 is not used
RCV DATA 2	TERM	180-ohm termination across RS-422 inputs at pins 13 and 14
	TTL+	RCV DATA 2 pin 13 is TTL compatible; pin 14 is not used
E LEAD 1	NO	Relay at pins 39 and 40 is normally open when E Lead 1 is active
	NC	Relay at pins 39 and 40 is normally closed when E Lead 1 is inactive
E LEAD 2	NO	Relay at pins 19 and 20 is normally open when E Lead 2 is active
	NC	Relay at pins 19 and 20 is normally closed when E Lead 2 is inactive
M LEAD 1	YES	M Lead 1 input at pins 41 and 42 is used
	NO	M Lead 1 input at pins 41 and 42 is not used
M LEAD 2	YES	M Lead 2 input at pins 15 and 16 is used
	NO	M Lead 2 input at pins 15 and 16 is not used
MODE	TERM	Digital sections of channel 1 and 2 are not interconnected. Select this position when the channels will operate independently. BRDG switch also must be in the TERM position.
	RPTR	Digital sections of channel 1 and 2 are interconnected, bypassing the analog sections when they are not in use. Select this position when the channels are bridged together in the repeater mode. BRDG switch also must be in the RPTR position.

NOTE:

If an external clock is not used, strap XMT CLK 1 and XMT CLK 2 to TTL+.

TABLE B - SWITCH SETTINGS

SWITCH	SWITCH	SWITCH
BRDG	TERM	Channels 1 and 2 operate independently.
	RPTR	Channels 1 and 2 are bridged together.
LPBK 1	OFF	Analog signals for Channel 1 are not looped back.
	ON	Analog signals from the transmit input of Channel 1 are looped back to the receive output of Channel 1. Use to check or set audio levels.
LPBK 2	OFF	Analog signals for Channel 2 are not looped back.
	ON	Analog signals from the transmit input of Channel 2 are looped back to the receive output of Channel 2. Use to check or set audio levels.

2. Check the wiring.

Transmit Clock Output

The digital section of each channel has a transmit clock output. The data bits change on positive-going (rising) edges of the clock.

1. To connect the clock output to RS-422 equipment that requires positive-edge clock triggering, connect the leads as follows:

46105 MODULE	TO	RS-422 EQUIPMENT
Positive (+) output		Positive (+) intput
Negative (–) output		Negative (–) intput

2. To connect the clock output to RS-422 equipment that requires negative-edge clock triggering, connect the leads as follows:

46105 MODULE	TO	RS-422 EQUIPMENT
Positive (+) output		Negative (+) intput
Negative (–) output		Positive (–) intput

3. To connect the clock output to TTL equipment that requires positive-edge triggering, connect the leads as follows:

46105 MODULE	TO	TTL EQUIPMENT
Positive (+) output		Positive (+) intput
Negative (–) output		No Connection

4. To connect the clock output to TTL equipment that requires negative-edge clock triggering, connect the leads as follows:

46105 MODULE	TO	RS-422 EQUIPMENT
Positive (+) output		No Connection
Negative (–) output		Negative (–) intput

M Lead

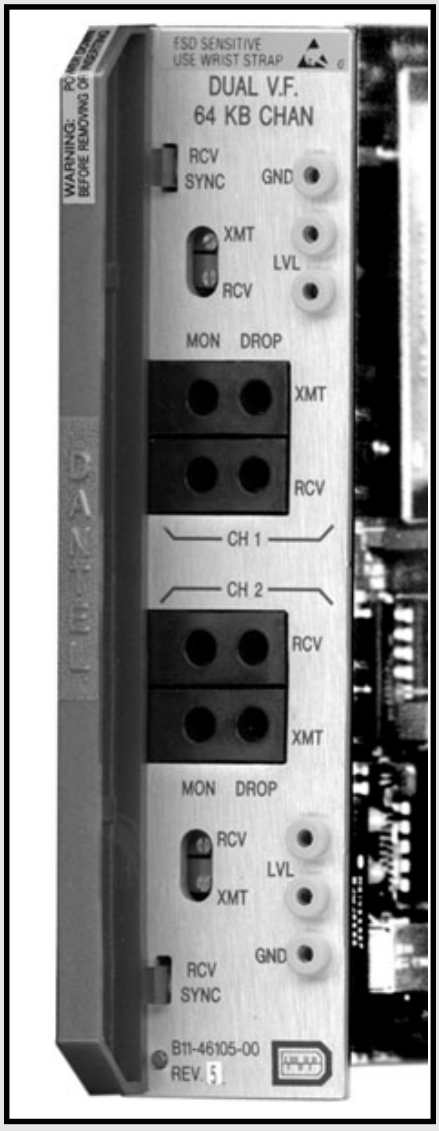
If the 46105 module will operate in the repeater mode, and there will be voice equipment connected to the module, the M Lead output from the voice equipment must be wired to both M Lead inputs on the 46105 module.

3. Check the audio port levels.

Note:
To check the Audio Port Levels, other parts of the system do not have to be functioning.

Note:
Refer to Fig. 6 for the location of front panel jacks, test points, and signal level adjustments.

Fig. 6 - Front Panel



- Set the loopback (LPBK) switches for both channels in the ON position.
- Install the module in the proper slot of the equipment shelf.
- Apply power to the module.
- Insert a -16 dBm, 600-ohm signal of 1 kHz into the DROP XMT jack for channel 1 on the front panel of the module.
- Using a 600-ohm, unterminated dB meter, read a level of 0 dB at the blue front panel XMT LVL test points for channel 1. If the level is not correct, adjust the front panel transmit potentiometer.
- Install a 600-ohm termination on the dB meter and connect the meter to the DROP RCV jack for channel 1 on the front panel. Verify a level of +7 dB. If the level is not correct, adjust the front panel receive potentiometer.
- Insert a -16 dBm, 600-ohm signal of 1 kHz into the DROP XMT jack for channel 2 on the front panel of the module.
- Using a 600-ohm, unterminated dB meter, read a level of 0 dB at the blue front panel XMT LVL test points for channel 2. If the level is not correct, adjust the front panel transmit potentiometer.
- Install a 600-ohm termination on the dB meter and connect the meter to the DROP RCV jack for channel 2 on the front panel. Verify a level of +7 dB. If the level is not correct, adjust the front panel receive potentiometer.
- Turn off the power.
- Remove the module and place the loopback switches in the OFF position.

4. Check the levels of the bridge.

- Verify that the BRDG switch is in the RPTR position.
- Reinstall the module and turn on power.
- Insert a -16 dBm, 600-ohm, 1 kHz signal in the channel 1 DROP XMT jack on the module's front panel.
- Verify with the dB meter (not terminated) a level of 0 dB at the front panel blue XMT LVL test points for both channels 1 and 2.
- Terminate the meter with 600 ohms and verify a level of +7 dB at the front panel RCV DROP jack of channel 2.
- With the meter still terminated, verify the level at the front panel RCV DROP jack of channel 1 is -40 dB or more negative.

CONTINUED . . .

- Move the input signal from the from the channel 1 XMT DROP jack to the channel 2 XMT DROP jack.
- Remove the termination from the dB meter and verify a level of 0 dB at the front panel blue XMT LVL test points for both channels 1 and 2.
- Terminate the meter with 600 ohms and verify a level of +7 dB at the front panel RCV DROP jack of channel 1.
- With the meter still terminated, verify the level at the front panel RCV DROP jack of channel 2 is -40 dB or more negative.
- Remove the signal generator and dB meter.

5. Check the operation of the module.

- Put the 46105 into service with the rest of the system.
- Talk through the system in both directions and verify the module works properly.
- Verify that the green LEDs on the front panel light steadily for the channel(s) that you are using. When a light is on, it means the framing bit is being detected by the digital section of that channel of the module, indicating synchronization of data transmitted to it.

OPERATION

Operation of the 46105 module consists of talking through the system in either direction. The front panel RCV SYNC LED for the channel that you are using lights steadily if the data being received is in synchronization with the transmitting unit.

Front panel test points, jacks, and potentiometers are available for checking and setting audio levels. Refer to the ***Installation*** chapter for information on checking and setting levels.

If the module is working in the repeater mode and the synchronization signal is lost in either direction, the unit automatically reverts to the terminal mode, allowing continued communications in the direction from which the synchronization is still being received. When synchronization is re-established, repeater operation resumes.

TECHNICAL SPECIFICATIONS

Description	Value	
Input Voltage	-21 to -56 VDC	
Input Current Range (+/-5%) TTL RS-422	@-21 VDC 102 mA 124 mA	@-56 VDC 62 mA 71 mA
Heat Dissipation (+/-5%) TTL RS-422	@-21 VDC 7.3 Btu/Hr 8.9 Btu/Hr	@-56 VDC 11.8 Btu/Hr 13.6 Btu/Hr
Audio Port Levels Transmit Port Input Level (Channels 1 and 2)	-16 dBm minimum to +7 dB maximum	
NOTE: This is the range of levels allowable into each transmit port to obtain a 0 dB level at the front panel blue XMT LVL test points by adjusting the front panel transmit potentiometer. Input frequency should be 1 Khz.		
Receive Port Output Level (Channels 1 and 2)	-16 dBm minimum to +7 dB maximum	
NOTE: This is the range of levels attainable out of each receive port by adjusting the front panel receive potentiometer when the level at the front panel blue RCV LVL test points is between +1 dB and -1 dB. The receive output port being measured must be terminated with 600 ohms.		
Frequency Response (relative to 1 Khz at 0 dBm) 300 to 3000 Hz 3400 Hz	-0.3 dB minimum to +0.3 dB maximum -2.0 dB minimum to 0 dB maximum	
NOTE: Frequency response is measured at the receive output port with the reference signal fed into the transmit input port.		
Digital Interface Levels TTL Levels Input Voltage Output Current RS-422 Receivers Differential Input Threshold Voltage Common Mode Input Voltage Drivers Differential Output Voltage Short Circuit Current Maximum Load Resistance E and M Signalling Ports E Lead Outputs (Solid-State Relay) Load Voltage Load Current On-State Resistance M Lead Inputs (Optical Coupler) Operate Voltage Off Voltage Input Current	 0 to 1.5 VDC = Low 2.5 to 5 VDC = High 20 mA source @ 2.5 VDC minimum output 20 mA sink @ 0.5 VDC maximum output +/-0.2 VDC (referenced to ground) +/-7 VDC maximum (referenced to ground) +/-4 VDC (no load) +/-2 VDC minimum (100-ohm load referenced at inverting output) 150 mA maximum 100 ohms 150 VDC maximum 50 mA maximum 50 ohms maximum 2.4 to 56 VDC 0 to 1 VDC or open 10 mA maximum @ 56 VDC	
Weight	12.5 oz.	
Physical Dimensions	1.4"W x 6.0"D x 5.6"H	

NOTES

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

Dantel

P.O. Box 55013 • Fresno, CA 93747-5013 Phone (209) 292-1111 Fax (209) 292-9355 http://www.dantel.com