



INSTRUCTION MANUAL

DVM-3000

**DIGITAL VIDEO, AUDIO & DATA
FIBER OPTIC MULTIPLEXER
TRANSPORT SYSTEM**

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Innovations in Television Testing & distribution

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INTRODUCTION

The DVM-3000 12 Bit Video, Data and Voice Fiber Optic Transport offers state-of-the-art performance exceeding RS250C Short-haul and Broadcast Specifications with a Signal to Noise ratio exceeding 75 dBs. The system will support one video, up to 8 bi-directional data and 2 voice channels. Applications include links from studio to transmitter, studio to studio, studio to CATV head-end, distance learning and backhaul feeds from special events, security, traffic surveillance, Intelligent Transportation Systems and military application. The transmit and receive units are available in portable and rack-mount packages making the system ideal for both field and studio applications. The transmit unit includes a 3000 feet post-equalizer for 8281 type cable.

FEATURES and OPERATION

!!!!!! DANGER !!!!!

INVISIBLE LASER RADIATION

AVOID DIRECT EXPOSURE TO BEAM

OUTPUT POWER MAX: 2 mW. WAVELENGTH: 1300/1550 NM. CLASS III b LASER

The optical laser transmitter may harm the human eye. Proper eye protection should be used at all times when working with laser. Please read the entire manual before operating the Fiber Optic devices.

WARNING

HIGH VOLTAGES INSIDE

**The unit should be only serviced or opened by qualified personnel.
There are no user serviceable parts or adjustments inside.**

VIDEO CHANNEL

The video performance of the fiber optic system exceeds RS-250C Short-haul specifications. The system uses state-of-the-art technology to offer a true 12 bit Video Analog to digital conversion. By using 12 bits we are able to achieve a Signal to Noise ratio of over 75 dBs. The system is ultra linear and distortion free giving differential gain and phase of less than 0.3 % and 0.3 degrees, respectively. The video input and output signals are back-porch clamped.

The system has a video bandwidth of 10 MHz. The transmission of NTSC, PAL, SECAM and video with diplexed audio carriers at 4.5 MHz, 5.8 MHz and 6.4 MHz are fully compatible with the fiber optic system.

TRANSMITTER, DVM-3000-FTX

The transmitter unit, designated by model number DVM-3000-FTX, includes a **VIDEO INPUT** BNC connector in the rear and a front panel equalizer monitoring BNC, labeled **VIDEO**. The gain and equalizing flatness of the input video can be adjusted from the front panel and monitored from the **VIDEO** output. The **GAIN** and **EQ** controls can be found on the transmitter front panel. For optimal system performance the **GAIN** and **EQ** adjustments should be set for 100 IRE units and a flat frequency response, respectively. The cable equalization is adjusted from 0 to 1500 feet using the **EQ** control. There is a fixed 1500-foot cable equalization boost. The 1500-foot equalization boost is activated by setting **DATA PROTOCOL switch # 5** to the **0** position. The transmitter front panel includes a **VIDEO PRESENT** LED to indicate the delivery of video to the A to D. The **LASER FAIL** LED indicates a laser failure when RED. The **VIDEO CLIPPING** LED indicates that the input A/D is clipping when RED. The **MUX LOCKED** LED indicates when GREEN that the out going internal multiplexer is locked. The **DATA FAIL** LED indicates that the return data receiver does not detect any data when RED.

There are 5 **DATA PROTOCOL** selector switches on the front panel. The first 2 switches on the left select the protocol for channels 1 through 4. Switch # 3 turns the RS-422 termination on in the logic 1 position. Switch # 4 is not used. The 5th switch turns on the 1500 foot fixed cable equalizer boost in the logic 0 position. The RS-422 port settings also support RS-485 signals. Please note the mode-setting chart below:

Protocol:

1	2	3	4	5	Switch Number
0	0	0	N/A	X	All Data Channels OFF
0	1	0	N/A	X	Data Channels 0 & 1=RS422 I/O, 2 & 3=RS232 I/O; No termination.
1	0	1	N/A	X	Data Ch. 0, 1 & 2=RS422 I/O, 3=RS422 In & RS232 Out; RS422 Termination ON.
1	1	0	N/A	X	Data Channels 0 thru 3=RS232 I/O; No termination.
X	X	X	N/A	0	1500 foot fixed EQ ON.
X	X	X	N/A	1	1500 foot fixed EQ OFF

RECEIVER, STAND-ALONE, DVM-3000-FRX

The receiver unit, designated by model number DVM-3000-FRX, includes a **VIDEO OUT** BNC connector on the rear panel. The video output for the Modular DVM-3000-FRX-MOD is BNC **J5** on the rear of the UTIL-200-DVM Tray. The front panel control **VIDEO LEVEL** is used to set the video output level. The receiver front panel includes a **REC. VIDEO** present LED to indicate the delivery of video. The **LASER FAIL** LED indicates a laser failure on the transmitter or loss of received optical signal when RED. The **POWER** LED indicates that power is ON. The **MUX UNLOCK** LED indicates when RED that the out going internal multiplexer is unlocked. The **DATA LINK** LED indicates that the data transmitter output is present when GREEN. The **CAMERA VIDEO** LED indicates that the transmitter does not detect camera video when RED. The **CAMERA PTZ** LED indicates that the transmitter unit does not detect camera PTZ data when RED. The **MUX UNLOCK** LED indicates the video receiver multiplexer is not locked when RED. The **CAMERA LASER** LED indicates RED when the transmitter laser has failed or if an optical disconnection has occurred.

There are 5 **DATA PROTOCOL** selector switches on the front panel. The first 2 switches on the left select the protocol for channels 1 through 4. Switches # 3 turns the RS-422 termination on in

the logic 1 position. Switches # 4 and 5 are not used. The RS-422 port settings also support RS-485 signals. Please note the mode-setting chart below:

Protocol:

1	2	3	4	5	Switch Number
0	0	0	N/A	N/A	All Data Channels OFF
0	1	0	N/A	N/A	Data Channels 0 & 1=RS422 I/O, 2 & 3=RS232 I/O; No termination.
1	0	1	N/A	N/A	Data Ch. 0, 1 & 2=RS422 I/O, 3=RS422 In & RS232 Out; RS422 Termination ON.
1	1	0	N/A	N/A	Data Channels 0 thru 3=RS232 I/O; No termination.

RECEIVER, MODULAR, DVM-3000-FRX-MOD

The DVM-3000-FRX-MOD Modular Fiber Optic Receiver is identical to the DVM-3000-FRX except that the data and video I/O's are located on the rear of the UTIL-200-DVM Tray. The video output for the Modular DVM-3000-FRX-MOD is BNC **J5** on the rear of the UTIL-200-DVM Tray. The audio and data connections are located on the 27 pin D-type connector on the rear of the UTIL-200-DVM Tray.

VOICE CHANNELS

The fiber optic system includes 2 channels of voice grade audio. The single-ended audio inputs are High impedance. The audio output impedance is 25 Ohms. Please see the enclosed drawings for the audio pin-out.

DATA CHANNELS

The fiber optic system can accommodate up to 8 bi-directional RS-232, RS-422 and RS-485 data channels. Please see the enclosed drawings for the data pin-out. There are 5 **DATA PROTOCOL** selector switches on the front panel. The first 2 switches on the left select the protocol for channels 1 through 4. Switches # 3 turns the RS-422 termination on in the logic 1 position. Switch # 4 is not used. The 5th switch, on the DVM3000-FTX transmitter, turns on the 1500 foot fixed cable equalizer boost in the logic 0 position. The RS-422 port settings also support RS-485 signals. Please note the mode-setting chart below:

Protocol:

1	2	3	4	5	Switch Number
0	0	0	N/A	X	All Data Channels OFF
0	1	0	N/A	X	Data Channels 0 & 1=RS422, 2 & 3=RS232 I/O; No termination.
1	0	1	N/A	X	Data Ch. 0, 1 & 2=RS422, 3=RS422 In & RS232 Out; RS422 Termination ON.
1	1	0	N/A	X	Data Channels 0 thru 3=RS232 I/O; No termination.
X	X	X	N/A	0	1500 foot fixed EQ ON (DVM3000-FTX only).
X	X	X	N/A	1	1500 foot fixed EQ OFF (DVM3000-FTX only).

OPTICAL OPTIONS

The DVM-3000 Fiber Optic system is available in several different optical configurations. There are multi-mode systems available with 850 and 1310 nm wavelengths using WDM technology.. The multi-mode systems are available with ST connectors. The Singlemode laser systems are available in 1310 nm and 1550 nm wavelengths with ST, SC or FC connectors using WDM technology. The 1310 nm single-mode laser system is available with 0 dBm optical power. There is also an option using 1310 and 1310nm using coupling technology. Please read the section **INSTALLATION and HANDLING** for further information.

SYSTEM ALARMS

There is an open collector ALARM output from both the transmitter and receiver units. The ALARM output indicates any alarm or error condition indicated on the front panel.

INSTALLATION

Extreme caution should be used when handling Laser equipment. Appropriate eye protection should be worn at all times. Direct exposure to the eyes and skin can be harmful. The video, audio, data and optical connections can be found in the sections above. There are no user serviceable parts or adjustments inside the system. The only user controls and interfaces are present on the front and rear panels. If service or calibration adjustments are necessary please return the system to the factory.

When installing a 1310 or 1550 nm Singlemode Laser system the launched optical power can vary from -8 dBm to +3 dBm depending on the model purchased. The receiver will compensate for variations in optical attenuation. The receiver unit will operate with an optical signal from -22 to -4 dBm with out over-load.

CIRCUIT DESCRIPTION

The Multidyne DVM3000 is a highly linear low noise, low distortion fiber optic link. The circuitry in the transmitter processes and digitizes 3 analogue and 8 digital signals and, through high speed time division multiplexing, serializes them into a single, self clocking bit stream that modulates the output of an LED or a laser. At the receiving end a high speed demultiplexer extracts the imbedded clock and then the data in a parallel format to be presented to 3 digital to analogue converter that reconstruct the 3 analogue signals.

DVM-3000-FTX TRANSMITTER DESCRIPTION

U22 is an AD8052 dual wide band operational amplifier. The first half is the input video buffer. It interfaces video to the anti-aliasing low pass filter after some processing. Diodes D10 to D13 suppress transients that could be harmful to the buffer. R60 adjusts the common mode

rejection of the buffer. Capacitors C89 to C92 together with resistors R65 to R68 form a 4 pole variable cable equalizer that restores the phase and amplitudes of certain video frequency components. LPF1 is an elliptical 11 pole low pass filter. It attenuates out of band signals that would produce aliasing products at the output of U23, the video analogue to digital converter. The second half of U22 is the video post amplifier that overcomes the filter losses and, through the adjustment of C68 trims the high frequency response of the input video channel. R48 is adjusted to 1VPP terminated in 75 Ω . Q1 is the video sync separator. Composite sync is present at Q1's collector. Q2 is a "box car" pulse former that generates a positive going pulse beginning with the second edge of horizontal sync and ending approximately with the end of color burst. The positive pulse is AC coupled to the gate of Q3 a junction NFET that abruptly conducts during burst time and dumps the average DC value plus any low frequency component into C57. U29, a very high gain amplifier, applies the DC error in phase opposition to the input buffer thus canceling its effects and clamping the video's back porch to the level set by R7. U20 is a high precision push-pull video driver. The analogue to digital converter wants to see video 4 volts (2 volts on each side) of push pull video centered on its +2V reference, U20 does just that. The video channel is adjusted using full level modulated stair step as follows. Adjust the video front panel controls for a well-equalized 1VPP at J9 then while monitoring video at the receiver's output adjust R70 for maximum gain and R7 to center the DC bias for not clipping of the chroma or sync. It is very helpful to monitor U23 pin 14 for no pulses during this adjustment. U23 makes a 12 bit measurement of the video at every tick of the clock supplied by a monolithic crystal oscillator Y1. U24 is the high-speed monolithic serializer. It accepts 16 bits plus system clock and serializes them into a single differential PECL bit stream that drives the laser or LED module.

The audio section interfaces a well balanced audio signal to the audio analogue to digital converters. U1, U5 and U9 are dual audio buffers. They convert balanced audio to single ended. U2, U3, U6, U7, U10 and U11 convert single ended audio to accurately balanced audio ready to be digitized by U4, U8 and U12 stereo analogue to digital converters. U4 is the master that supplies drive signals to U8 and U11. LEDs 1, 2 and 3 indicate overflow. U18 strobes the registers where this overflow signals are being stored. They glow when the input audio goes over +19dB. All measurements are performed at input level of +18dBm. U15 is a quadruple digital multiplexer. It inserts external asynchronous data into the digital audio user bit location. Normally only 2 channels are used for external data while the third one carries video presence indication from the transmitter to the receiver. Alarms are provided at the transmitter end for laser failure and for video loss. At the receiver end there are alarms for remote video loss and loss of optical input. The optical failure alarms on both sides are dry relay contacts grounding the external connection, the video loss failure are on both sides open collectors sinking 40mA positive DC to ground. U20 is an automatic reset generator.

DVM-3000-FRX RECEIVER SECTION

The data modulated light beam is transformed into a balanced PECL bit stream and presented to U15, a monolithic high-speed deserializer. The internal state machine of U1 driven asynchronously by Y1 a monolithic crystal oscillator, recombines the data into a 16 bit parallel bit stream. Internal phase lock loops regenerate the sending end sampling clock with an edge stability of a few pico-seconds. The first 12 bits of the reconstituted data are presented to U16, the video analogue to digital converter that reconstitutes the original video signal. R16, a front panel control varies the converter's DC reference thus adjusting the output gain. LPF1 is the reconstitution low pass filter that removes the clock components from the video. U17 provides

gain and flatness adjustments while interfacing the video to the outside world. The audio portion transforms the three audio bit stream again into audio. The associated operational amplifiers are 2 pole low pass filters and output drivers. U1 edge detects the audio channel pulse and triggers monostable multivibrator U3 that produces a strobe pulse occurring at the center of the digital audio's user bit location. The positive edge of U3's output strobes that location recovering external data and remote video presence indication. The whole audio system calibration relies just on 6, one per channel, output gains.

SPECIFICATIONS

Video Performance:

Exceeds the RS-250C Short-haul specification.

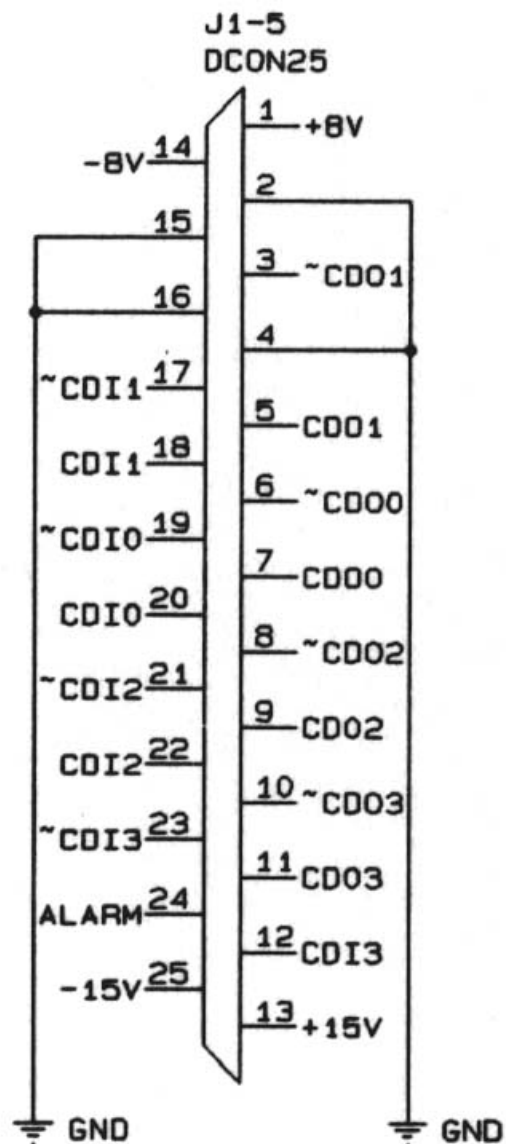
Signal to noise	> 75 dB
Differential gain.....	< +/- 0.3 %
Differential phase.....	< +/- 0.3 °
Chrominance to luminance gain	< +/- 1 %
Chrominance to luminance delay	< +/- 10 nsec.
Frequency response to 8 MHz.....	< +/- 0.1 dB
3 dB Bandwidth.....	10 MHz
Luminance non-linearity.....	< 1 %
Ringing	< +/- 0.5 %
Tilt.....	< +/- 0.2 %
Video output & input impedance.....	75 Ohms

Audio Performance:

Frequency response to 20 Hz to 50 KHz	< +/- 1 dB
Distortion	< 1 %
Audio output level, adjustable.....	Unity
Audio output impedance, single-ended	25 Ohms
Audio input impedance	High
Data channels	RS-232C, RS-422, RS485
Power dissipation	< 15 Watts, per unit
AC operation.....	110 or 220 VAC (optional 48VDC)
Operating temperature.....	-35 to +75 °C
Portable and Wall-mount:	7" L x 5 3/4" W x 1 3/4" H
Triple Rack-mount Kit for 3 modules (Part number -RMT):	7" L x 19" W x 1 3/4" H

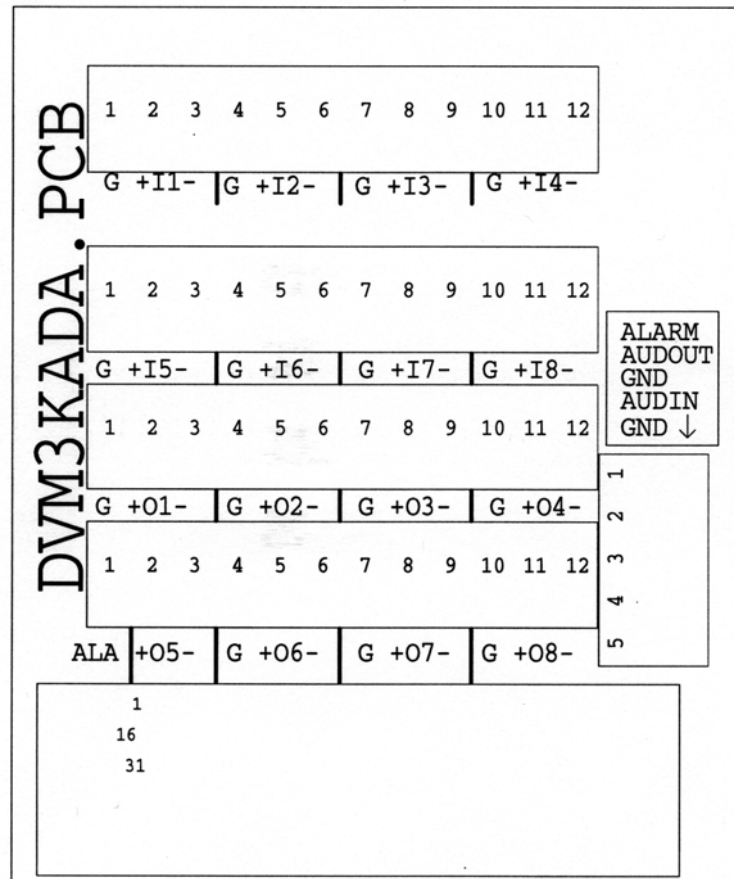
Specifications subject to change without notice.

DVM-3000-MOD Modular, Electrical Pin Out for Voice and Data Channels

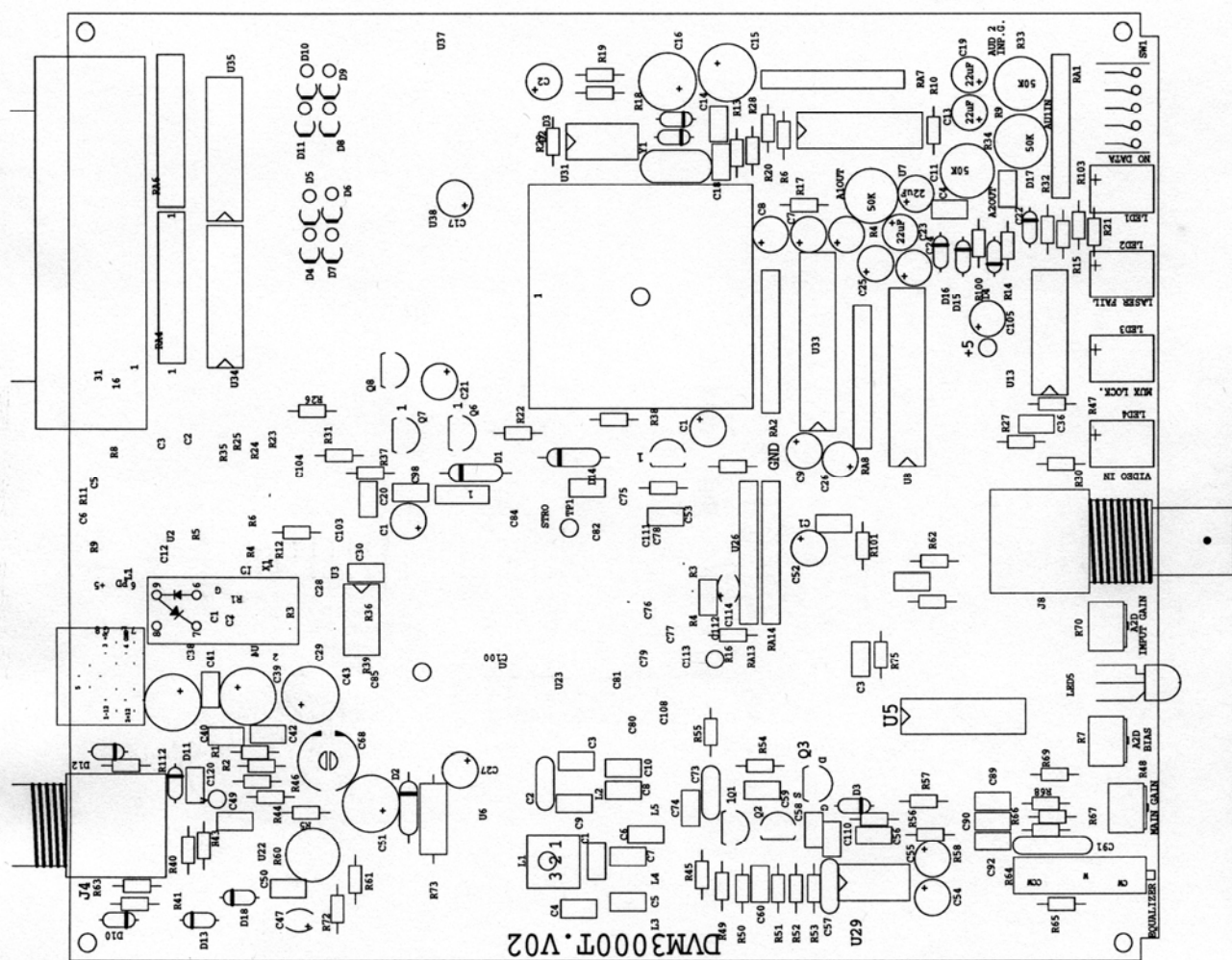


The tilde symbol, “~”, represents the negative, inverted and bar input or output.

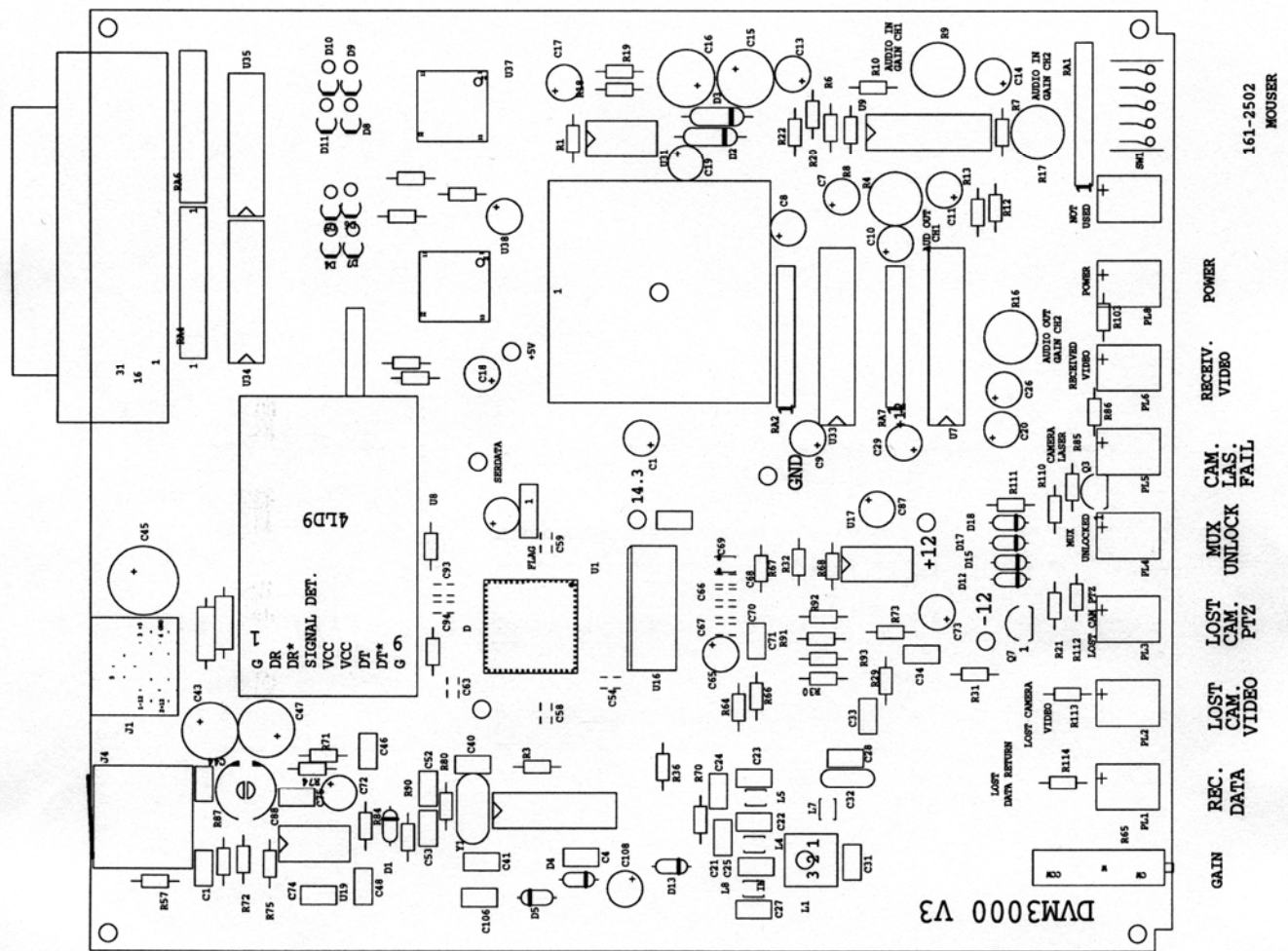
DVM-3000 Stand-alone, Break-out Board Pin Out



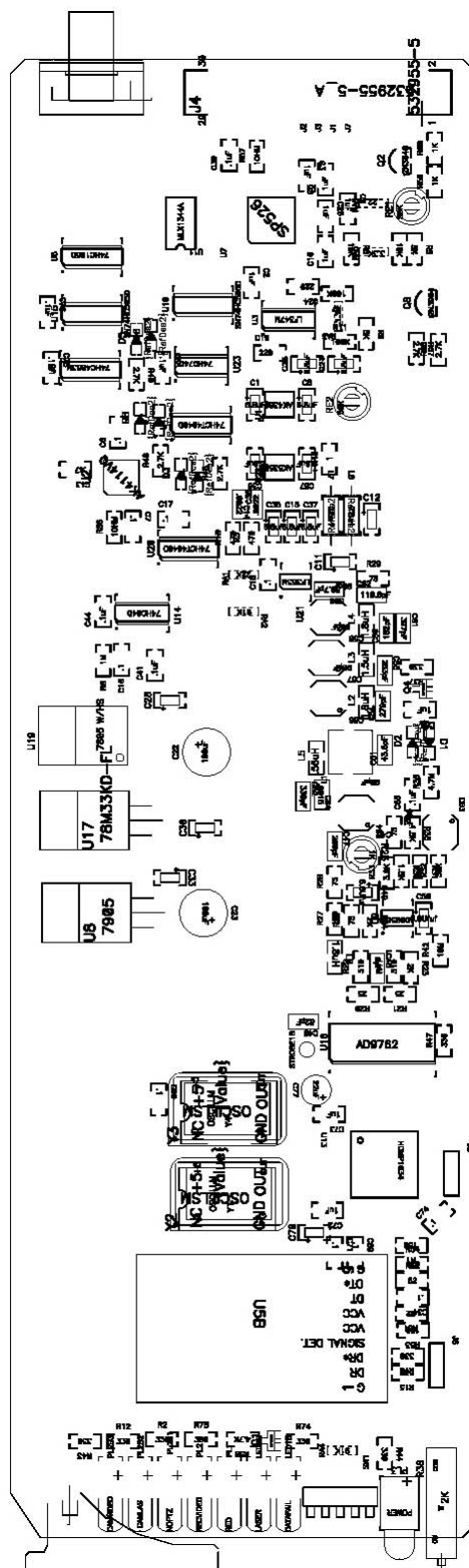
DVM-3000-FTX Stand-alone, Mechanical Drawing



DVM-3000-FRX Stand-alone, Mechanical Drawing



DVM-3000-FRX-MOD Modular, Mechanical Drawing



UTIL-200-DVM Modular Fiber Optic Tray, Mechanical Drawing

