INSTRUCTION MANUAL

DVM-2200

DIGITAL VIDEO, AUDIO & DATA
FIBER OPTIC MULTIPLEXER
TRANSPORT SYSTEM

MULTIDYNE Electronics, Inc.

Innovations in Television Testing & distribution

1-(800)-4TV-TEST, 1-(800)-488-8378

191 FOREST AVENUE
LOCUST VALLEY, NY 11560-2132 USA
(516)-671-7278 FAX (516)-671-3362

This product was designed and manufactured in the
UNITED STATES of AMERICA

TABLE OF CONTENTS

INTRODUCTION 4

FEATURES AND OPERATION 4

VIDEO CHANNEL 4
TRANSMITTER, DVM-2200-FTX 5
RECEIVER, DVM-2200-FRX 5
AUDIO CHANNELS 5
DATA CHANNELS 5
SDI SETTINGS 6
SDI DATA RATE SETTINGS FOR THE MANUAL MODE ONLY: 6
ALARMS 6
OPTICAL OPTIONS 6
INSTALLATION 6
POWER REQUIREMENTS 7
CIRCUIT DESCRIPTION 7
DVM-2200-FTX TRANSMITTER DESCRIPTION 7
DVM-2000-FRX RECEIVER SECTION 8

SPECIFICATIONS 9

DRAWINGS 10

DVM-2200-FTX TRANSMITTER & DVM-2200-FRX RECEIVER D-TYPE CONNECTOR WIRING DIAGRAM 10
DVM-2200-FTX TRANSMITTER MECHANICAL DRAWING 11
DVM-2200-FRX RECEIVER MECHANICAL DRAWING 12
UTIL-200-DVM TRAY MECHANICAL DRAWING 13

INTRODUCTION

The DVM-2200 12 Bit Video and 24 Bit Audio Fiber Optic Transport offers state-of-the-art performance exceeding RS250C Short-haul and Broadcast Specifications with a Signal to Noise ration exceeding 75 dBs. The system will support one video, up to 6 audio and up to 3 data channels per optical wavelength. The user can (WDM) Wave Division Multiplex, permitting multiple optical sources to share a single fiber, multiplying the capacity of fiber optic cables by a factor of eight. Applications include links from studio to transmitter, studio to studio, studio to CATV head-end, distance learning and backhaul feeds from special events. 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 1000 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 and a 24 bit Audio A to D conversion. By using 12 bits we are able to achieve a Signal to Noise ration 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 8 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-2200-FTX

The transmitter unit, designated by model number DVM-2200-FTX, includes a **VIDEO IN** BNC connector, **J5,** in the rear of the UTIL-200-DVM Tray and a front edge equalizer monitoring BNC. The gain and equalizing flatness of the input video can be adjusted from the front edge and monitored from the front edge output. The **VIDEO** gain and video **EQU** controls can be found on the transmitter front edge. For optimal system performance the **VIDEO gain** and video **EQU** adjustments should be set for 100 IRE units and a flat frequency response, respectively. The transmitter front panel includes a **VIDEO PRES** LED to indicate the delivery of video to the A to D. The laser **FAIL** LED indicates a laser failure when RED. The audio level **OVF** LEDs indicate an audio level overflow in the audio A to D when RED. This typically occurs when the input level exceeds +18 dBm. The **SDI** Serial Digital Video input is **J1** on the rear of the Tray. When an SDI signal is present, it takes priority and is transported through the system. When no SDI is present, the analog video and audio signals are transported. The **POWER** LED indicates that power is ON the UTIL-200-DVM power supply units. The SDI input has a squelch circuit controlled by R51. The clock-wise position turns the squelch OFF. The squelch is set to prevent false SDI triggers due to noise.

RECEIVER, DVM-2200-FRX

The receiver unit, designated by model number DVM-2200-FRX, includes a **VIDEO OUT** BNC connector, **J5,** on the rear of the UTIL-200-DVM. The receiver front panel includes a **VIDEO PRESENT** LED, labeled **VIDEO**, to indicate the delivery of video to the A to D. The **NO LOCK/SDI** LED, labeled **NO LOCK**, indicates that the decoder multiplexer is not locked or that an SDI signal is present when RED. The **SDI** Serial Digital Video output is **J1** on the rear of the Tray. When an SDI signal is present, it takes priority and is transported through the system. The VIDEO GAIN is controlled by the potentiometer VID. The AUDIO GAIN is controlled for channels 1 through 6 via the potentiometers labeled 1 through 6. The **POWER** LED indicates that power is ON. The jumper J5 should be set in the SYNC mode with the jumper in the left most position. The jumper J4 should be in the upper position.

AUDIO CHANNELS

The fiber optic system includes 6 channels of high quality CD grade audio encoded in 24 bits. The balanced audio inputs are High impedance by default. When the optional –DVMAUDIO Screw Terminal Adapters are used, the input impedance is 600 Ohms by default. The 600-Ohm termination may be removed for high impedance operation. The balanced audio outputs have a source termination of 50 Ohms. The system is able to accommodate a maximum input and output level of +18 dBm with a 600-Ohm termination. The input level to the transmitter should not exceed +18 dBm. The **AUDIO OUTPUT LEVELS** on the receiver have a +/- 6 dBm gain adjustment for setting system audio levels, labeled **CH1** through **CH6**. The audio I/Os are brought to a 25-pin D-type connector on the rear of the UTIL-200-DVM Tray. When using the optional –DVMAUDIO adapter board, the audio I/O's are labeled **A1+, A1-** through **A6+, A6-** respectively. The terminal labeled **GND** is the audio ground connection.

DATA CHANNELS

The fiber optic system can accommodate up to 3 simplex RS-232 data channels. The 3 RS-232C data channel connections are labeled as **D0**, **D1** and **D2**. The terminal labeled **GND** is the data ground connection.

SDI SETTINGS

By default the SDI settings on the receiver are set for the SMPTE and Automatic modes. In most applications you will not need to change any of these settings. Jumper J6 should be set in the SMPTE mode which is the down of lower position. The Automatic/Manual jumper is located to the right of the oscillator Y1 and below transistor Q5. The upper position, AUTO is the automatic setting. **In the AUTO mode the jumpers J7, J8 and J9 should be in the OPEN state.** When a noisy SDI signal is present, it may be necessary to put the SDI re-clocker into manual mode. The MAN or manual mode is the lower position. In the manual mode it is necessary to set the desired SDI data rate using jumpers J7, J8 and J9. The chart below shows the settings. The logic 1 settings for J7 and J8 are the lower position with the upper position logic 0. The logic 1 setting for J9 is the left position with the right position logic 0.

SDI Data Rate Settings for the Manual Mode ONLY:

	J9	J8	J7
143 Mbps	**0**	**0**	**0**
177 Mbps	**0**	**0**	**1**
270 Mbps	**0**	**1**	**0**
360 Mbps	**0**	**1**	**1**
540 Mbps	**1**	**0**	**0**

ALARMS

The **VLOSS** alarm output indicates the loss of video signal when asserted LOW. The **ALARM** output indicates a laser failure in the transmitter unit or that the de-multiplexer has not locked when asserted low.

OPTICAL OPTIONS

The DVM-2200 Fiber Optic system is available in several different optical configurations. There are multi-mode systems available with 1310 nm wavelengths. 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. The 1310 nm single-mode laser system is available with -8 dBm, -3 dBm, 0 dBm and +3 dBm optical powers. The 1550 nm single-mode laser system is available in an optical power of +3 dBm. Please read the section **INSTALLATION and HANDLING** for further information.

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 –32 to +3 dBm with out over-load.

The DVM-2200-FRX Fiber Optic Receiver for Singlemode applications all has an optical window from the wavelength of 1100 to 1600 nm. If a Singlemode system is to be Wave Division Multiplexed with other optical wavelengths in the 1100 to 1600 nm range, the appropriate optical filters and wave division multiplexers should be used. The user may contact MULTIDYNE to purchase such devices.

POWER REQUIREMENTS

The UTIL-200-DVM-AC operates from 85 to 265 VAC with two dual redundant power supplies each with a separate line cord. The UTIL-200-DVM is available with a 48 VDC Telco Power supply. The **PWR 1** and **PWR2** LEDs glow green when the unit is powered up and operating properly. If the unit is plugged into an active outlet and the **POWER** LED does not glow, check the internal fuse.

NOTE
Use only a 2 Amp replacement fuse for the PS-200-DVM-AC and PS-200-DVM-48VDC power supplies
for the UTIL-200-DVM Series of Trays

CIRCUIT DESCRIPTION

The Multidyne DVM2200 is a highly linear low noise, low distortion fiber optic link. The circuitry in the transmitter processes and digitizes seven analogue and 3 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 seven digital to analogue converter that reconstruct the 7 analogue signals.

DVM-2200-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□. 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 +19bB. 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-2000-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	8 MHz
Luminance non-linearity	< 1 %
Ringing	< +/- 0.5 %
Tilt	< +/- 0.2 %
Video output & input impedance	75 Ohms

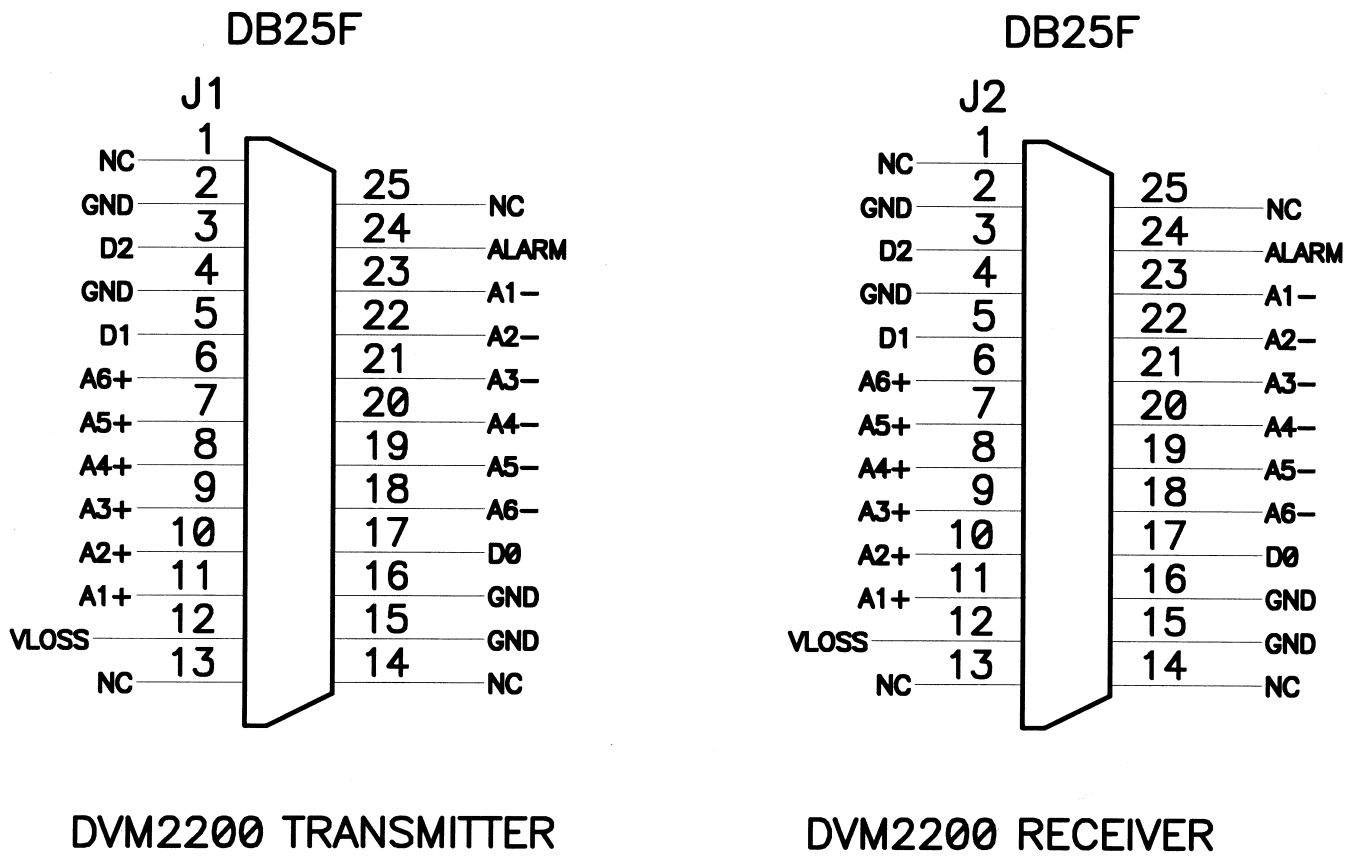
Audio Performance:

Signal to noise	> 90 dB
Frequency response to **20 Hz to 20 KHz**	< +/- 0.1 dB
Distortion	< 0.05 %
Audio output level, adjustable	Unity, +/- 6 dBm
Maximum input & output level, 600 Ohm termination	+18 dBm
Audio output impedance, balanced	50 Ohms
Audio input impedance, balanced (selectable)	600 Ohms or High
Data channels	RS-232C, RS-422, CMOS
Power dissipation	< 15 Watts, per unit
AC operation	110 or 220 VAC (optional 48VDC)
Operating temperature	0 to +50 ◘C
Portable and Wall-mount:	7” L x 5 ¾” W x 1 ¾” H
Triple Rack-mount Kit for 3 modules (Part number -RMT):	7” L x 19” W x 1 ¾” H

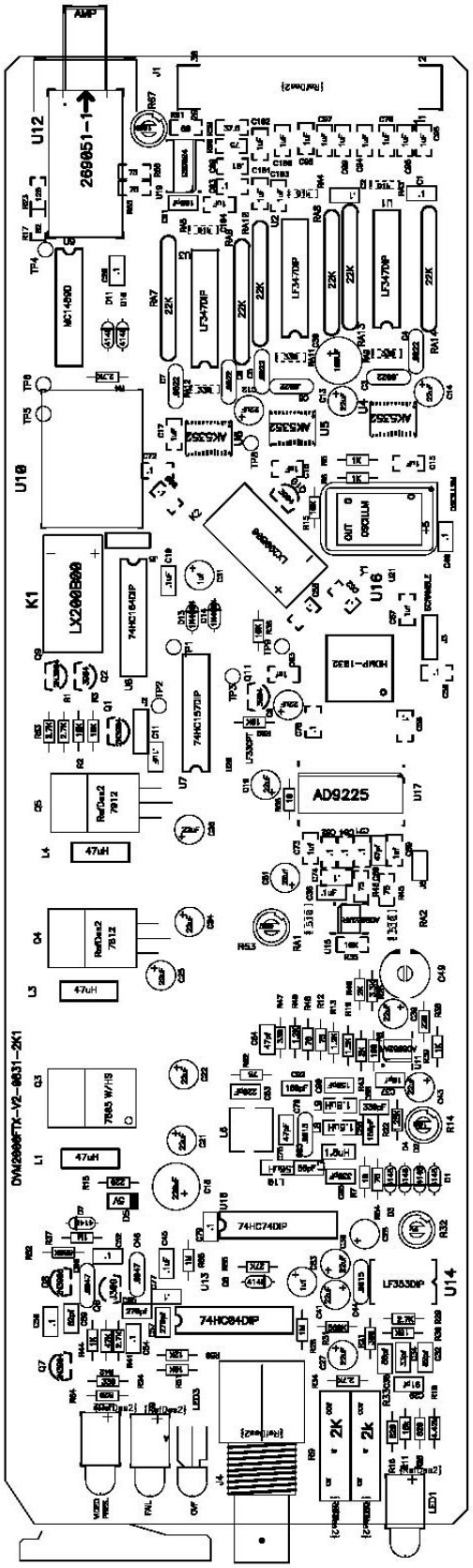
Specifications subject to change without notice.

DRAWINGS

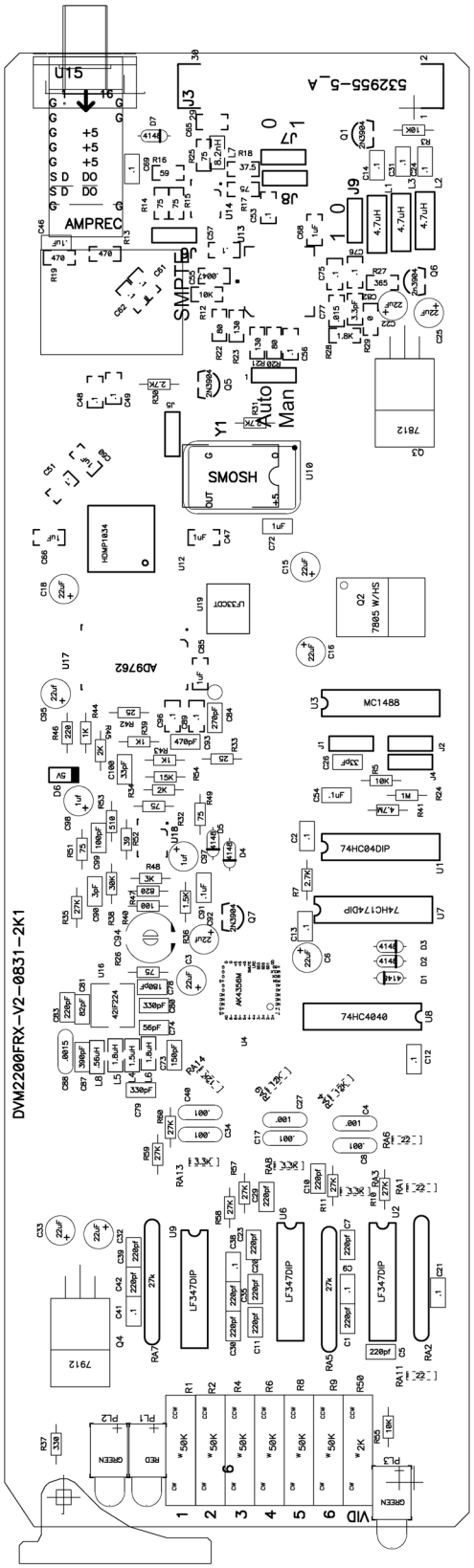
DVM-2200-FTX Transmitter & DVM-2200-FRX Receiver D-type Connector Wiring Diagram



DVM-2200-FTX Transmitter Mechanical Drawing



DVM-2200-FRX Receiver Mechanical Drawing



UTIL-200-DVM Tray Mechanical Drawing