



INSTRUCTION MANUAL

DVI-6000 Series

**DIGITAL VIDEO FIBER OPTIC
TRANSPORT SYSTEM FOR
DVI/RGB/HDTV**

Revision 5

MultiDyne

Video & Fiber Optic Systems

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

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INTRODUCTION

The DVI-6000-FTX/FRX Digital Video Fiber Optic Transport System for digital video is a single-fiber solution. It has been designed to increase the transmission distance limitations of high resolution RGB and DVI video and computer graphics. The system will transport virtually any VESA-compliant DVI or RGB signal from 640x480 VGA up to and including 1920 x1200 @ 60Hz Reduced Blanking WUXGA or, with the dual link option, 2560 x 1600 WQXGA, as well as HDTV formats from 480P up to and including 1080P with full clarity over a single fiber. A loop through port on the FTX allows connecting a local display monitor.

The DVI-6000-FTX/FRX also supports HDTV and non-RGB video formats such as YUV, YCrCb or YPrPb. The DVI-6000 has built in reclocking of the DVI signal to eliminate jitter. EDID data can be obtained from a local monitor connected to the loop thru port, a built in PROM, or, optionally, from a monitor connected to the FRX.

The DVI-6000-FTX/FRX also supports the optional transport of 2 audio channels (one stereo pair) and optional unidirectional or bidirectional RS232 or RS4xx type data (BDD option). The DVI-6000-FTX/FRX audio path is intended not only for line-level audio such as might be obtained from a computer sound card, but for professional 600 ohm balanced audio applications as well. No additional fibers are required for the audio or data options, although 2 fibers are required for bi-directional data and remote EDID options.

The DVI-6000 supports operation and setup by the front panel switches (hardware mode). Most functions are automatic and should not require front panel switch setup. Future firmware updates will provide control and setup of features via a GUI (GUI mode). The optional GUI will interface to a host PC using the front panel USB port of the DVI-6000. Firmware updates may also be applied via the USB port.

The DVI-6000 also has a SMPTE 348M option, whereby the data stream between the FTX and FRX is a 2.97GBPS SMPTE 348M SDTI-compliant stream (**3G** mode). In this mode the DVI video signal is packetized into a proprietary format and then transported via a 3G SMPTE envelope or physical layer signal. Instead of fiber transport, there is an optional 75 ohm coax cable transport feature for **3G** mode. (Some features not available in cable transport mode).

Applications include commodity and stock exchanges, medical and MRI displays, advertising, digital signage, air traffic control and military tactical displays, scoreboards and much more...

FEATURES and OPERATION

TRANSMITTER, DVI-6000-FTX

The transmitter module is designated by model number DVI-6000-FTX. The suffixes –50 and –52 designate singlemode operation for short or long distance, respectively. Suffix -2 denotes multimode. The suffix DL indicates dual link capability.

FTX REAR PANEL CONNECTIONS: Refer to Fig. 2. The rear panel connections are an **OPTICAL OUTPUT** connector for the optical fiber going to the **FRX**. **DVI/RGB INPUT** and **DVI/RGB LOOP OUT** DVI-I type connectors for the DVI or RGB input and local display monitor output, respectively. The DVI-I loopthru output is an active, buffered output for both DVI and RGB. The DVI-6000 normally accepts DVI type video, but can also accept, with a HD-15 to DVI-A adapter, VESA compliant analog RGB type video, and with a HDMI to DVI-D adapter, component HDMI (YUV or YPrPb) video, such as from a DVD or Blu Ray player, provided the video is not HDCP encrypted. (Audio embedded in the HDMI stream will not be transported. One must provide analog audio to the **FTX** audio inputs).

A 9-pin DIN connector (Fig. 1) is provided for balanced 600 ohm **AUDIO LINE IN** and RS 232/4xx **DATA I/O** and a 3.5mm line-level **STEREO AUDIO IN** jack is provided for unbalanced stereo audio. A screw terminal breakout board and cable is available for the DIN connector from MultiDyne for the balanced audio and data connections.

If the optional 75 ohm cable output is fitted, there will be a BNC for this output. There will be a matching cable input on the **FRX**. Note that the cable connection is one-way, from **FTX** to **FRX**. Thus, some features, such as bi-directional data and remote EDID capture, will not be available if this connection is used. This connection is intended for use with **3G** mode. A **9~24VDC** power input jack completes the rear panel.

FTX FRONT PANEL LEADS: Refer to Fig. 2. The front panel of the unit includes a **POWER LED** and 9 status LEADS. They are as follows:

An **EDID** led, which, if BDD is fitted, glows when valid EDID data is received from the monitor connected to the **FRX** when in remote EDID mode. It will blink if the EDID data received from the **FRX** is invalid. It will be dark when remote EDID mode is not asserted or BDD not fitted.

A **TXLOCK** LED which, when illuminated, indicates **FTX** health, and a **RXLOCK** LED to indicate return path health if BDD is fitted. The **RXLOCK** LED blinks if the return path has a problem. If BDD is not fitted, it remains dark. Both the **RXLOCK** and **TXLOCK** leds will be dark if there is a problem with the **FTX** itself.

There are 3 LEADS for **DVI**, **RGB**, and **DL** (dual link models only), which, when illuminated, show the presence of valid DVI or RGB input video and, if the source is outputting it, dual link DVI, respectively. The **DVI** or **RGB** LEDs will blink if video is present but the DVI-6000 does not recognize the video format presented to it, it exceeds the DVI-6000's capabilities, or if it is invalid.

Be sure the source is outputting a resolution that is less than or equal to the maximums listed in the Introduction, or refer to the formula in the Appendix to see if it can be transported.

There is an **USB** LED which indicates USB activity whenever a PC is connected to the unit via the front panel **USB** connector, either for control via a GUI or to perform a firmware update.

There is a **TXDATA** LED to indicate forward RS 232/42x data activity, and if BDD is fitted, a **RXDATA** LED to indicate return path data activity.

FTX FRONT PANEL SWITCH FUNCTIONS: Refer to Fig. 2. There are 7 switches labeled **A** thru **G**. The functions are as follows:

Switch A is used to assign priority between a DVI source and a RGB source if both are present at the input simultaneously. When up, it defaults to DVI, when down, RGB. If only one input type is present, it defaults to that type regardless of the switch setting.

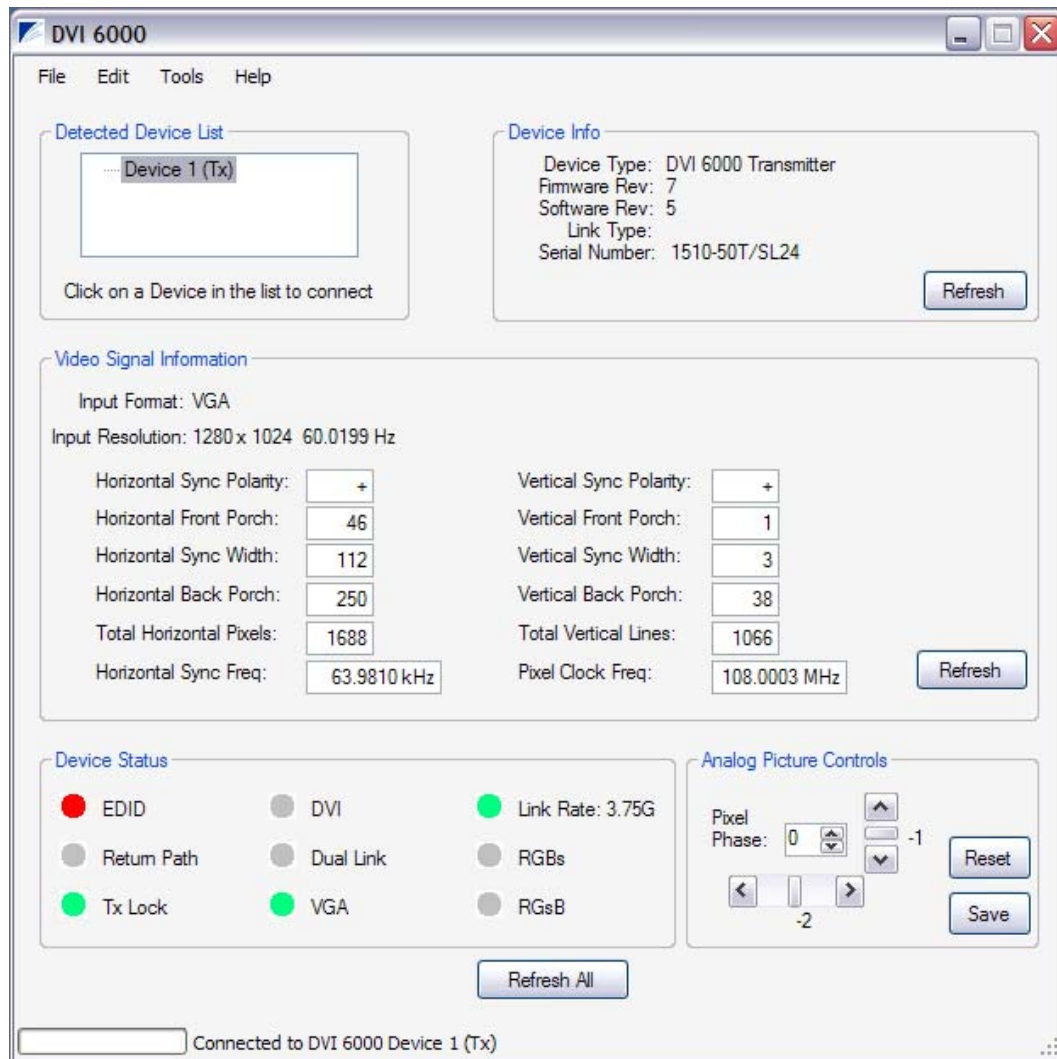
Switch B this switch is used to select the **3G** SMPTE option when down and the 3.75G transport options when up. If the optional cable connection is used, **3G** mode should be used.

Switch C is set to gather EDID information either from a monitor connected to the **DVI/RGB LOOP OUT** port, or from an internal prom that has stored in it a list of generic monitor types. If the bi-directional data option is fitted, the EDID information can be extracted from the monitor connected to the **FRX** (remote EDID mode), and written to the PROM. (Caution: enabling this mode will overwrite the factory defaults stored there). For best results, the loopthru monitor should be of the same type as that connected to the **FRX** as it is not possible for the source to output a signal that will be optimal for 2 different types of monitor at once. When there is no monitor connected to the loopthru, the prom or remote mode **MUST** be used, or the source will not output video at all. **Switch C** selects PROM/REMOTE mode EDID when up, LOCAL loopthru mode when down. (PROM vs. REMOTE is selected by a switch on the **FRX**).

Switch D attenuates the audio input by 12 db when down. Use for high level audio input.

Switches E, F, and G control the data protocols and termination. When switch **E** is down and switch **F** is up, RS4xx operation is selected. When **E** is up and **F** is down, RS232 is selected. Other combinations of **E** and **F** are not valid. **Switch G** when down places a 100 ohm termination across the data inputs for RS4xx operation.

Analog Picture Controls. The GUI provides controls to make adjustments to horizontal and vertical picture position, as well as the sampling phase, for analog RGB and RGBHV inputs.



Adjustments are made using the scroll bars. Once the picture is adjusted properly, click the Save button to store the settings in the unit. Settings for up to 25 different video resolutions can be saved within each Transmitter. Note that Firmware Revision 7 and Software Revision 5, or higher, are required for this feature.

RECEIVER, DVI-6000-FRX

The receiver module is designated by model number DVI-6000-FRX. The suffixes designate the operation mode as above.

FRX REAR PANEL CONNECTIONS: Refer to Fig. 3. The receiver rear panel connections are:
An **OPTICAL INPUT** connector for the optical fiber coming from the **FTX**.

Two DVI-I **DVI/RGB OUT** connectors for connecting up to 2 video displays. For best results, the 2 displays should be of the same type. Both DVI and analog RGB are available simultaneously from both connectors, as the DVI-6000 transcodes DVI into RGB and vice versa. Thus, the **FRX** can be used as a video DA and transcoder. One must use a DVI-A to HD-15 adapter or a DVI-D to HDMI adapter for displays having those types of inputs. Note that there will be no embedded audio supplied to the HDMI sink, as the DVI-6000 does not transport HDMI embedded audio. One must use the dedicated analog audio transport of the DVI-6000 to transport any audio associated with the HDMI program source.

An unbalanced line level **STEREO AUDIO OUT** 3.5mm connector and a 9-pin DIN connector (Fig. 1) for 600 ohm balanced **AUDIO LINE OUT** and RS 232/4xx **DATA I/O**. A screw terminal breakout board and cable is available from Multidyne for the DIN connector data and balanced audio connections.

If the optional 75 ohm cable input is fitted, there will be a BNC for this purpose. This connects to the BNC on the **FTX**. If this connection is used, certain features such as remote EDID and bi-directional data transport will be unavailable.

A **9~24VDC** power connector completes the rear panel.

FRX FRONT PANEL LEADS: Refer to Fig. 3. Like the **FTX**, the **FRX** front panel has a **POWER** LED and 9 status LEDs. They are as follows:

An **EDID** LED that indicates valid capture of EDID data from a monitor connected to either of the 2 video outputs. The **EDID** LED will blink if the EDID data is invalid. It will be dark if BDD is not fitted or EDID polling is not asserted.

There are **TXLOCK** and **RXLOCK** LEDs which indicate return path health and **FRX** health respectively when illuminated. They will both be dark if there is a problem with the **FRX** itself. The **TXLOCK** LED is only used if BDD is fitted. The **RXLOCK** LED will blink if there is a problem with the link or the **FTX**.

The **DVI**, **DL**, and **RGB** LEDs function as in the **FTX**. Note that the **RGB** and **DVI** LEDs will always both be active as the DVI-6000 always transcodes one type to the other.

The **RXDATA** led indicates incoming RS232/4xx data, and the **TXDATA** LED, which is only valid if BDD is fitted, indicates return path data activity.

As in the **FTX**, there is also an **USB** connector and activity LED on the front panel for GUI mode.

FRX FRONT PANEL SWITCH FUNCTIONS: Refer to Fig 3. As in the **FTX**, there are 7 switches labeled **A** thru **G**. Their functions are as follows:

Switch A is used when the optional cable input is fitted. If both cable and fiber inputs are active simultaneously, it is used to assign priority between the two. It chooses between the optical input (up) and cable input (down). When only one type of input is present, it chooses that input regardless of the switch position.

Switch B this switch is used to select the **3G** SMPTE option when down and the 3.75G transport options when up. If the optional cable connection is used, **3G** mode should be used.

Switch C is used to select which of the 2 DVI outputs will be used for EDID polling. Up is **OUT1**, down is **OUT2**. This switch is not used if BDD is not fitted.

Switch D, when down, enables polling of the chosen monitor for EDID. Caution: Enabling this mode will overwrite any contents of the EDID PROM in the **FTX**. This switch is not used if BDD is not fitted.

Switches E thru G are for data protocol setting and have the same functionality as in the **FTX**. **Switch G**, which enables 100 ohm termination across the data inputs, is only valid when BDD is fitted.

POWER REQUIREMENTS

The DVI-6000-FTX requires 9~24VDC @ TBDA and the DVI-6000-FRX requires 9~24VDC @ TBDA. These are provided by 12 VDC output, 100-240 VAC input power supply modules, included.

PHOTOS, DVI-6000



Image 1

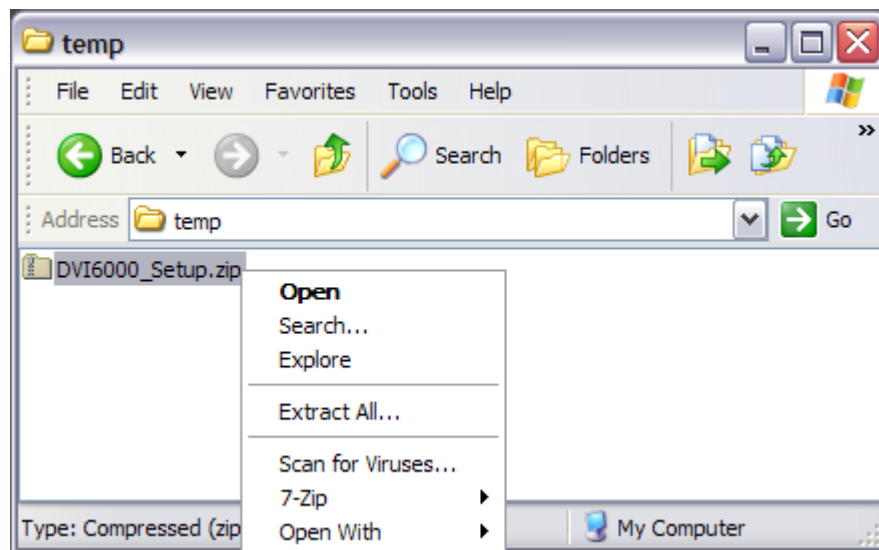
Front view of DVI-6000-FTX on the top and rear view of DVI-6000-FRX on the bottom.

The front view of DVI-6000-FRX is identical to the front of DVI-6000-FTX. The rear of the DVI-6000-FTX is identical to the rear of the DVI-6000-FRX except that the DVI Input is on the right and the DVI Loop Out is on the left. The audio I/Os are also inputs.

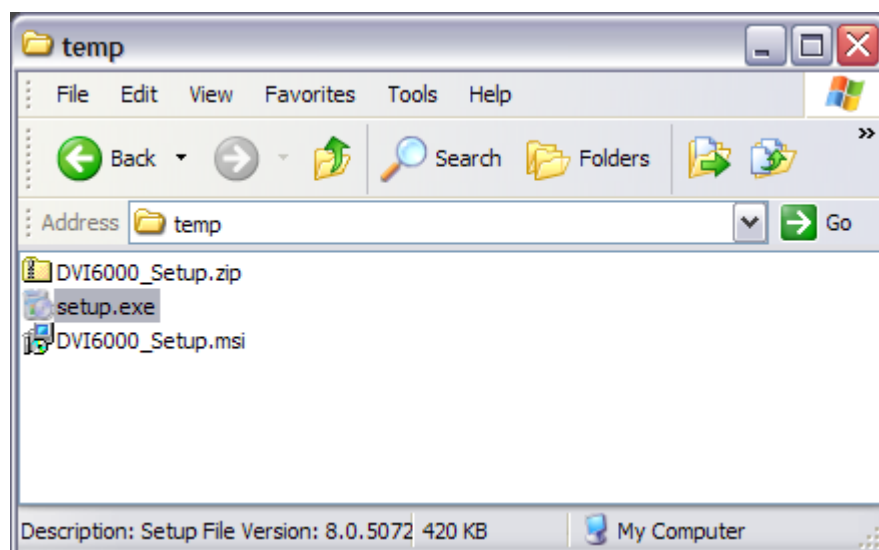
DVI6000 GUI Installation

NOTE: You must install the GUI software before plugging a DVI6000 into a USB Port in order for Windows to find the driver file that is required. Failure to do so may cause system corruption.

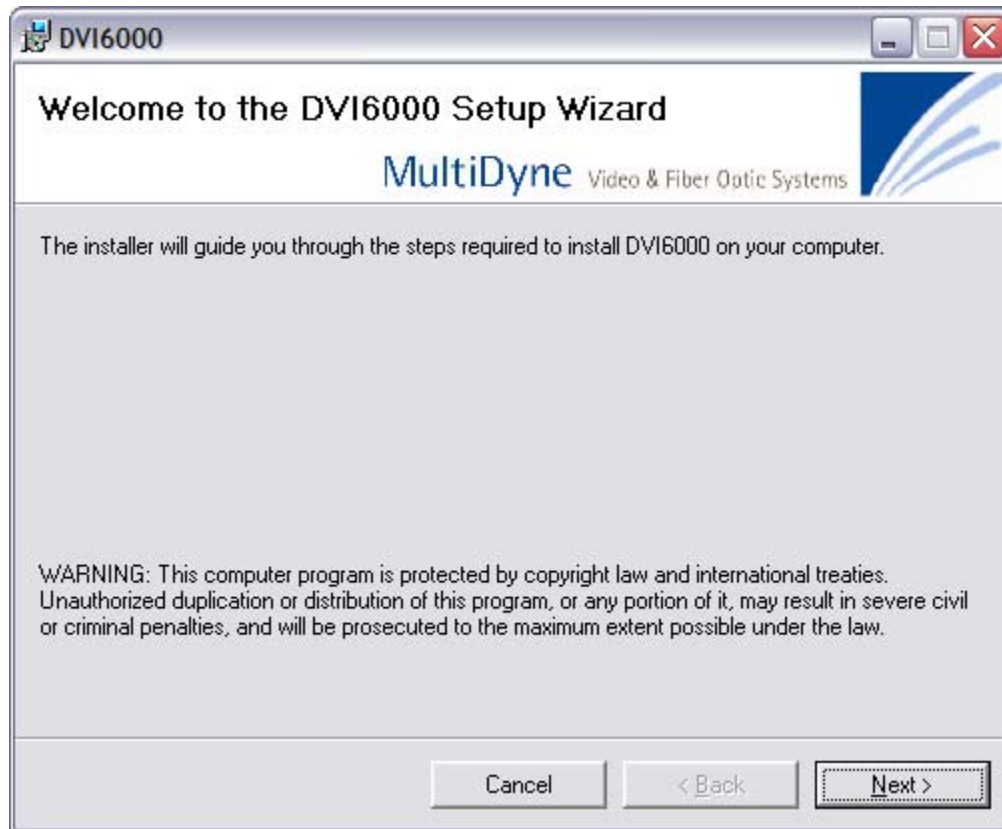
Browse to the location of the supplied DVI6000 Installation file.



Right-click on the **DVI6000_Setup.zip** file and choose Extract All...



Double-Click on **Setup.exe** to start the Setup Wizard.

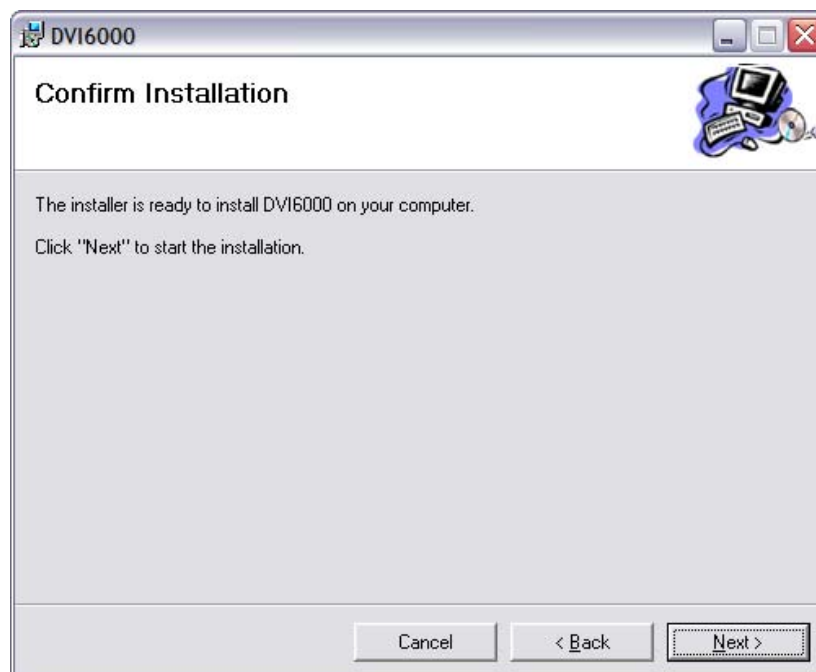


Click **Next**.

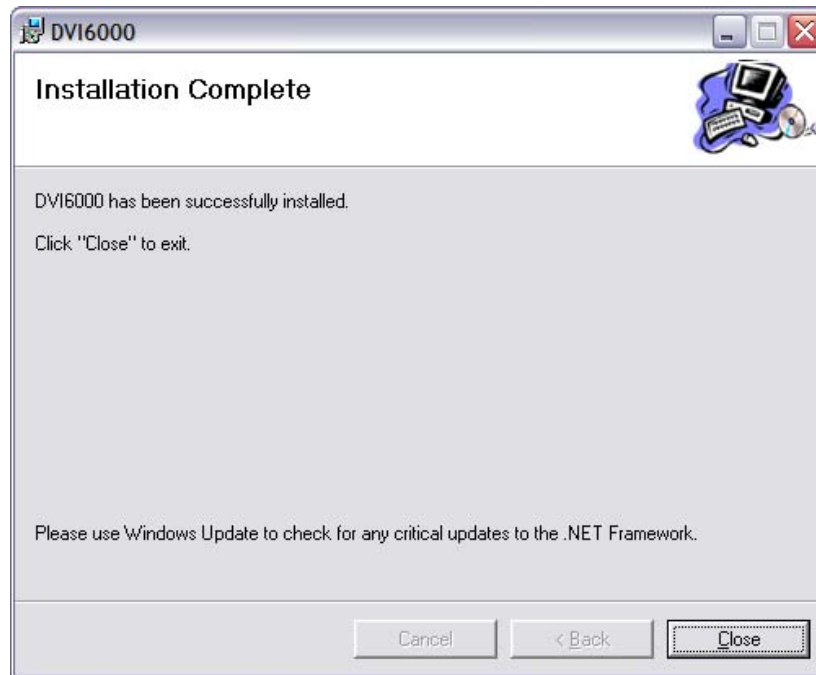
You will be asked to select a folder for the installation. It is highly recommended that you choose the default folder.



Click **Next**.



After a few moments, the installation process will complete:



Click **Close** to exit.

The software installation is now complete. Please note that the Microsoft .NET Framework must be installed on the PC in order for the GUI software to run. If the PC is current with Microsoft Service Packs and Updates, then the .NET Framework should already be installed. If not, it can be installed by running Windows Update and choosing to install the .NET Framework 2.0 (or higher).

Proceed to the **DVI6000 USB Driver Installation** to install the USB driver required to communicate with the DVI6000 devices.

DVI6000 USB Driver Installation

NOTE: You must install the GUI software before plugging a DVI6000 into a USB Port in order for Windows to find the driver file that is required. Failure to do so may cause system corruption.

Connect a DVI6000 to the PC using a USB Type “A to Mini-B” cable. Windows should now start its **Found New Hardware Wizard**.

Select “No, not at this time” when asked to connect to Windows Update to search for the USB driver software. The DVI6000 USB driver software was installed as part of the GUI installation.



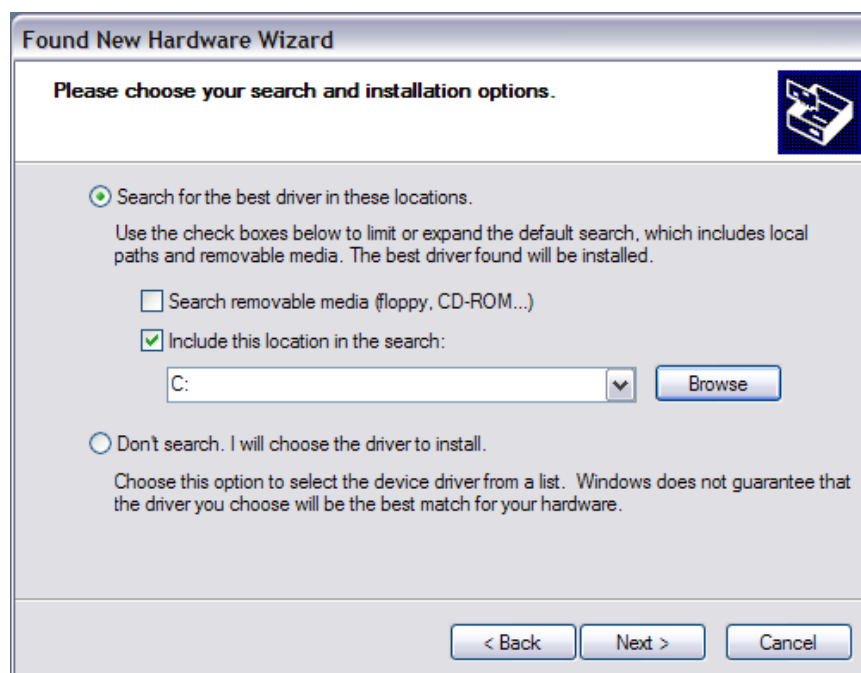
Click **Next**.

Select “Install from a list or specific location” at the next prompt:



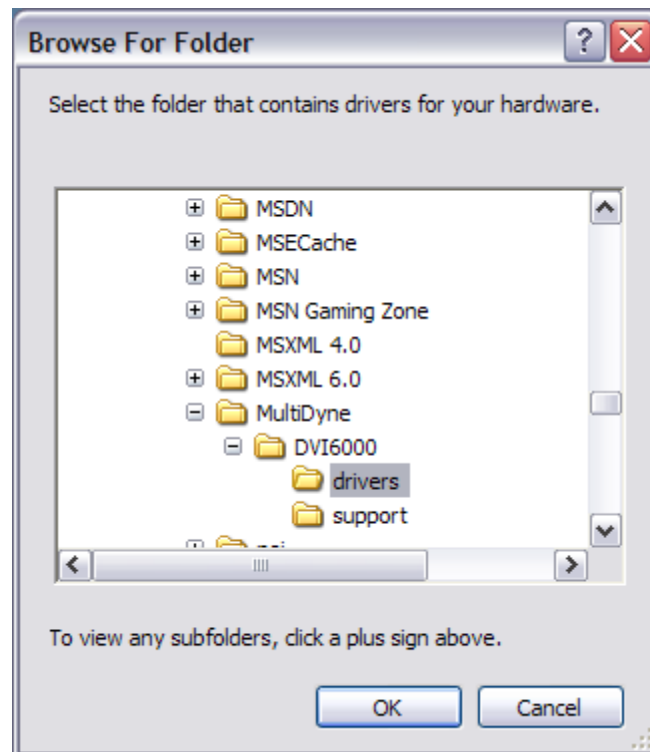
Click **Next**.

Select “Search for the best driver in these locations.” in the following prompt. Check the “Include this location in the search:” and click the **Browse** button:



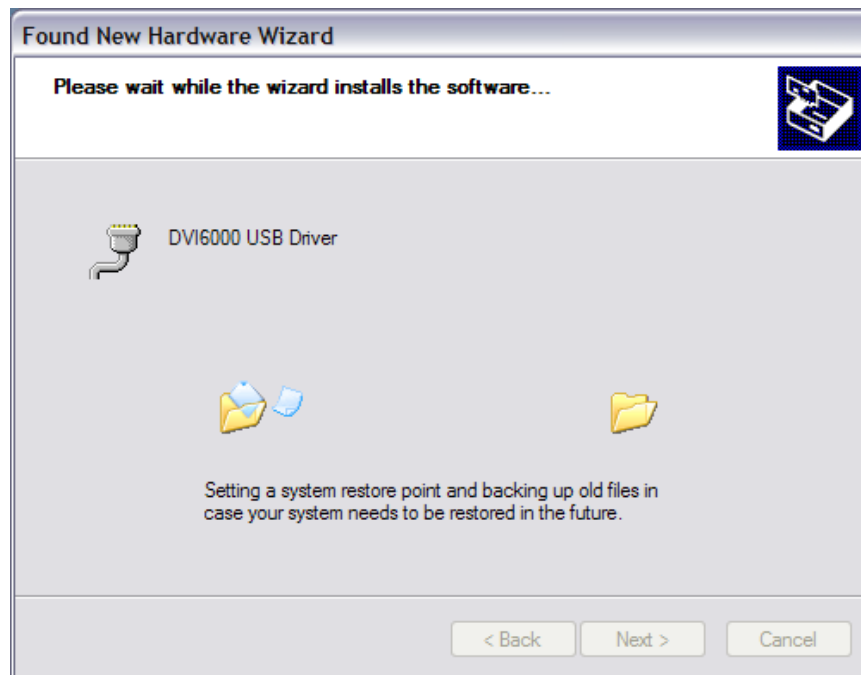
Use the Browse For Folder window that appears to select the location of the USB driver file. If the default location was chosen for the installation of the GUI, the location of the USB driver file should be:

C:\Program Files\MultiDyne\DVI6000\drivers



Select the folder that contains the USB driver and Click **OK**.

The wizard will now install the USB driver.



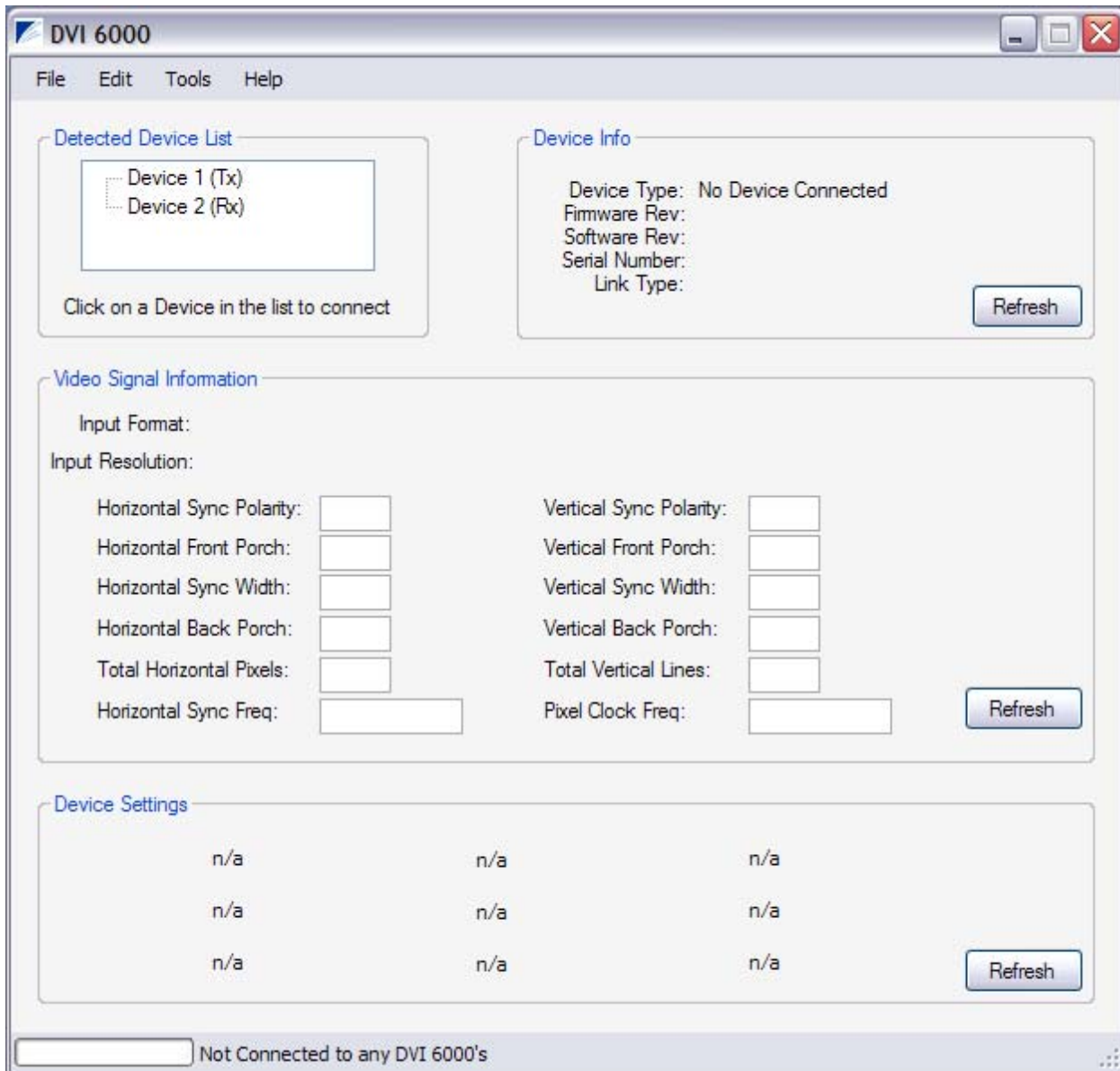
Click **Continue Anyway**.



Click **Finish** to complete the installation. The driver is now installed and you should see a message in the System Tray indicating that the hardware is now ready to use.

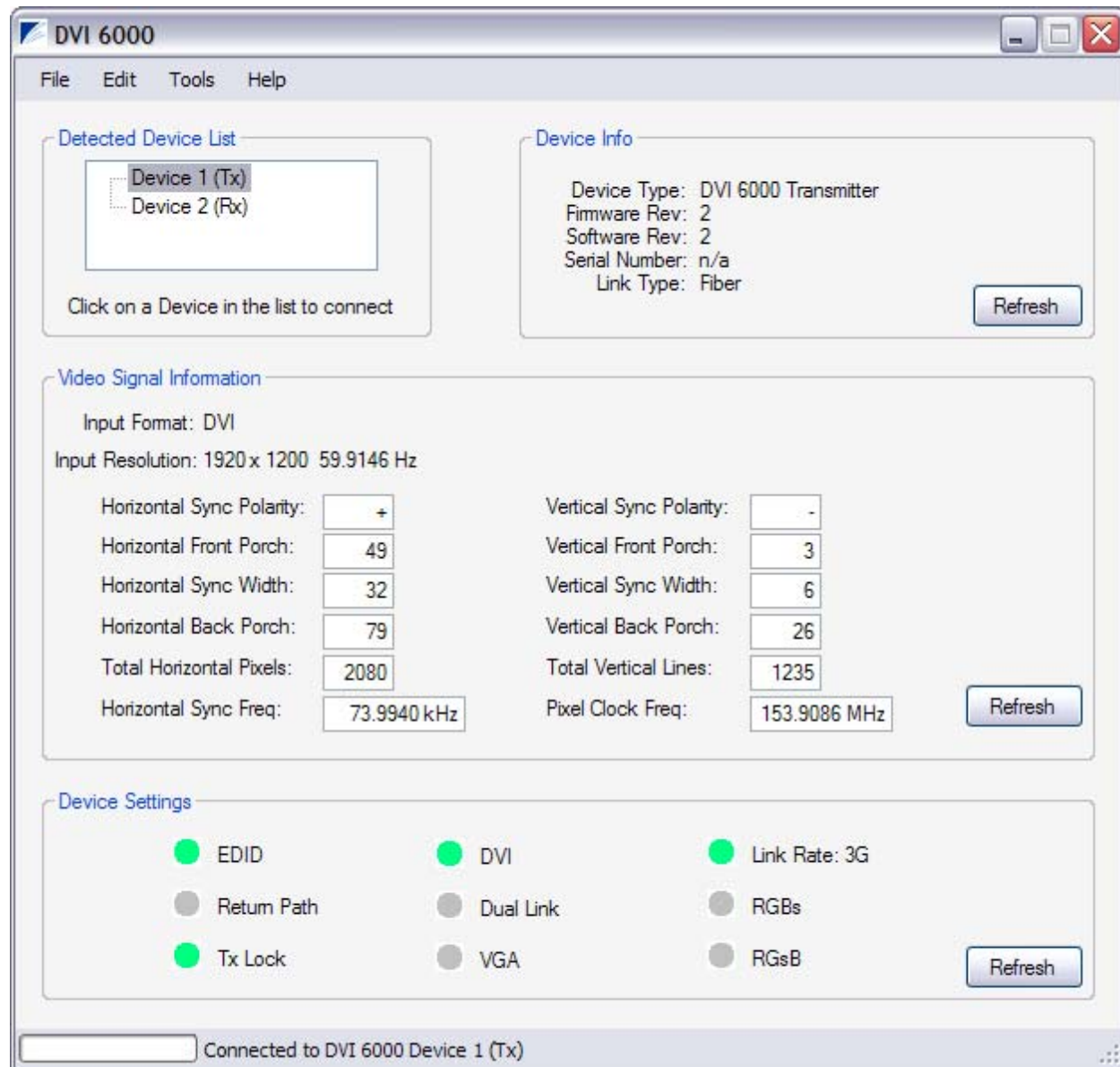
DVI6000 Firmware Update Instructions

Connect the DVI6000 unit(s) you wish to update to your PC using USB cable(s) and open the DVI6000 GUI. When the GUI first opens, it should appear similar to the image below.

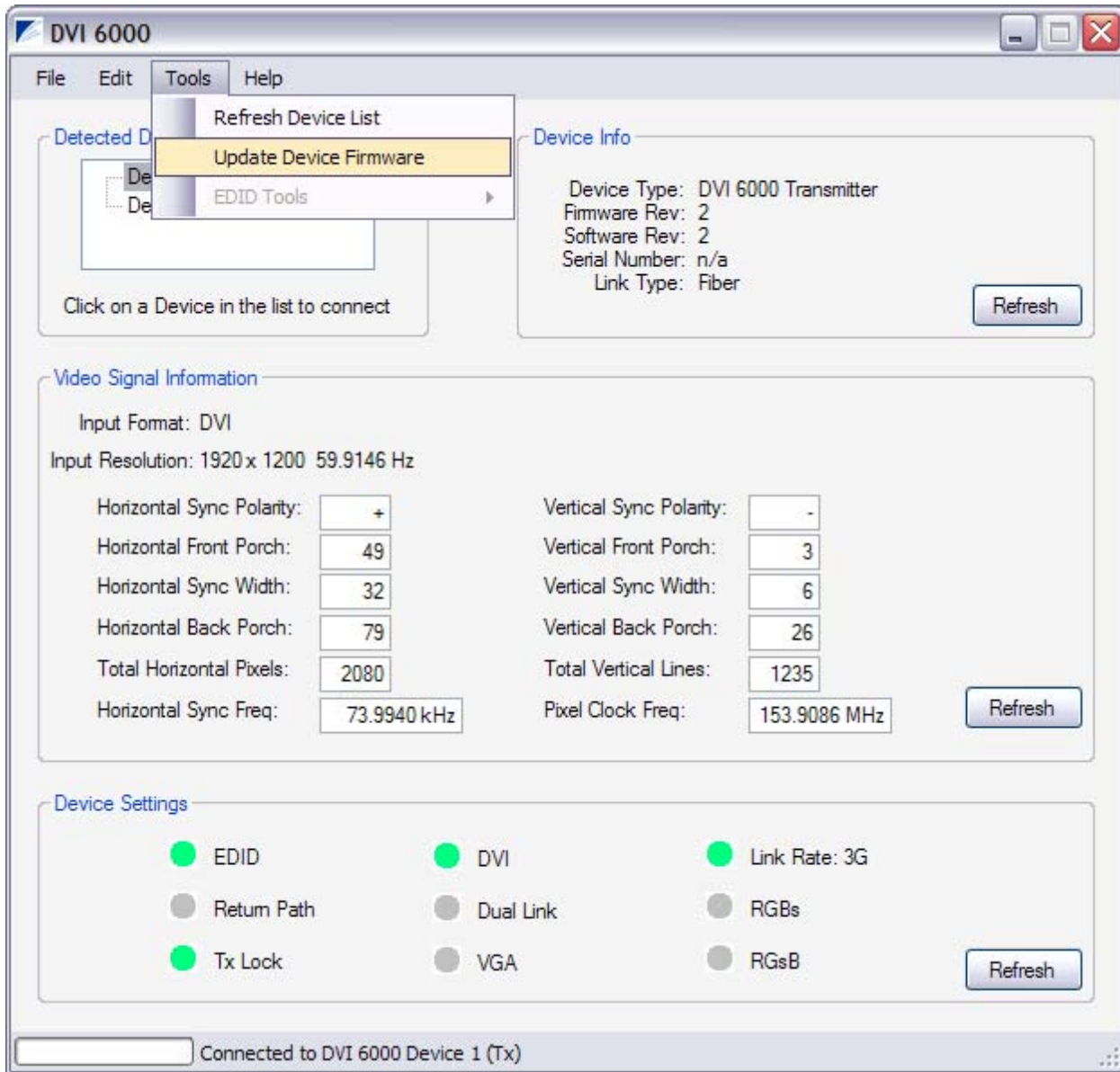


If there are no devices listed in the **Detected Devices List**, make sure the DVI6000's are powered up and connected via USB cables. Then go to the **Tools Menu** and select **Refresh Device List**.

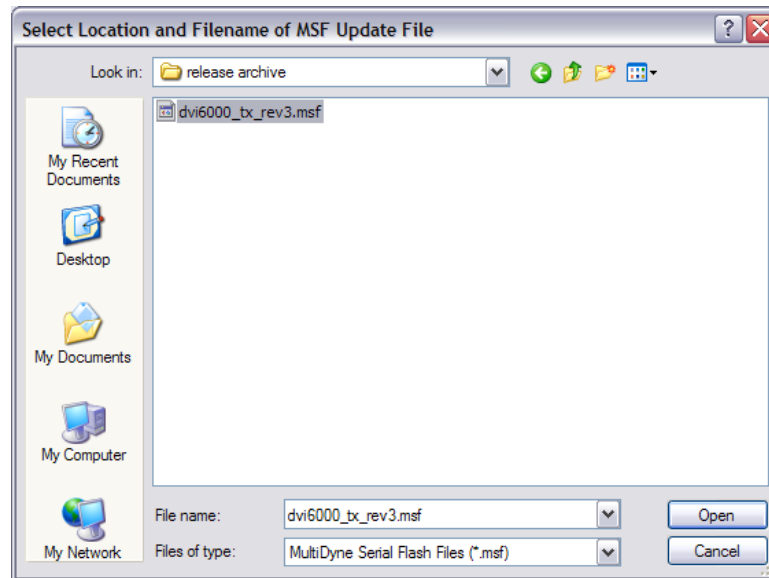
Click on the DVI6000 you wish to update in the **Detected Devices List** to connect to the device. The **Device Info Pane** will show information about the DVI6000 that is now selected. In the example below, a DVI6000 Transmitter has been selected (connected).



From the **Tools Menu**, select **Update Device Firmware**.

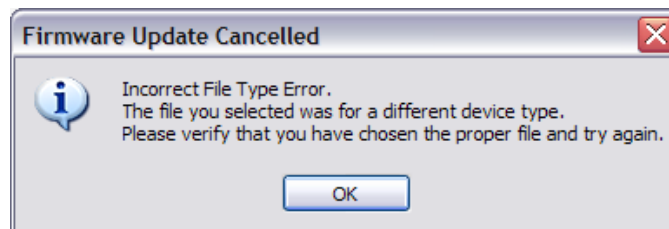


You will then be prompted to select the firmware update file. Browse to the folder location on the PC where the update file has been placed.

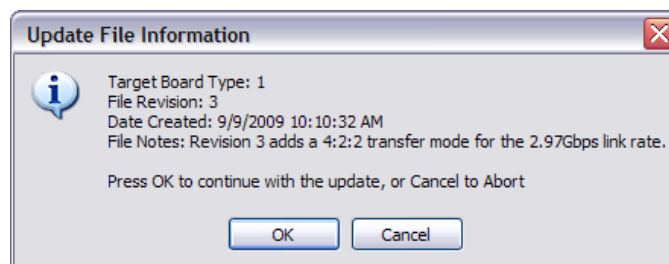


Select the firmware update file and click **Open**. The file will be checked to ensure that it is of the proper type for the DVI6000 device that is connected.

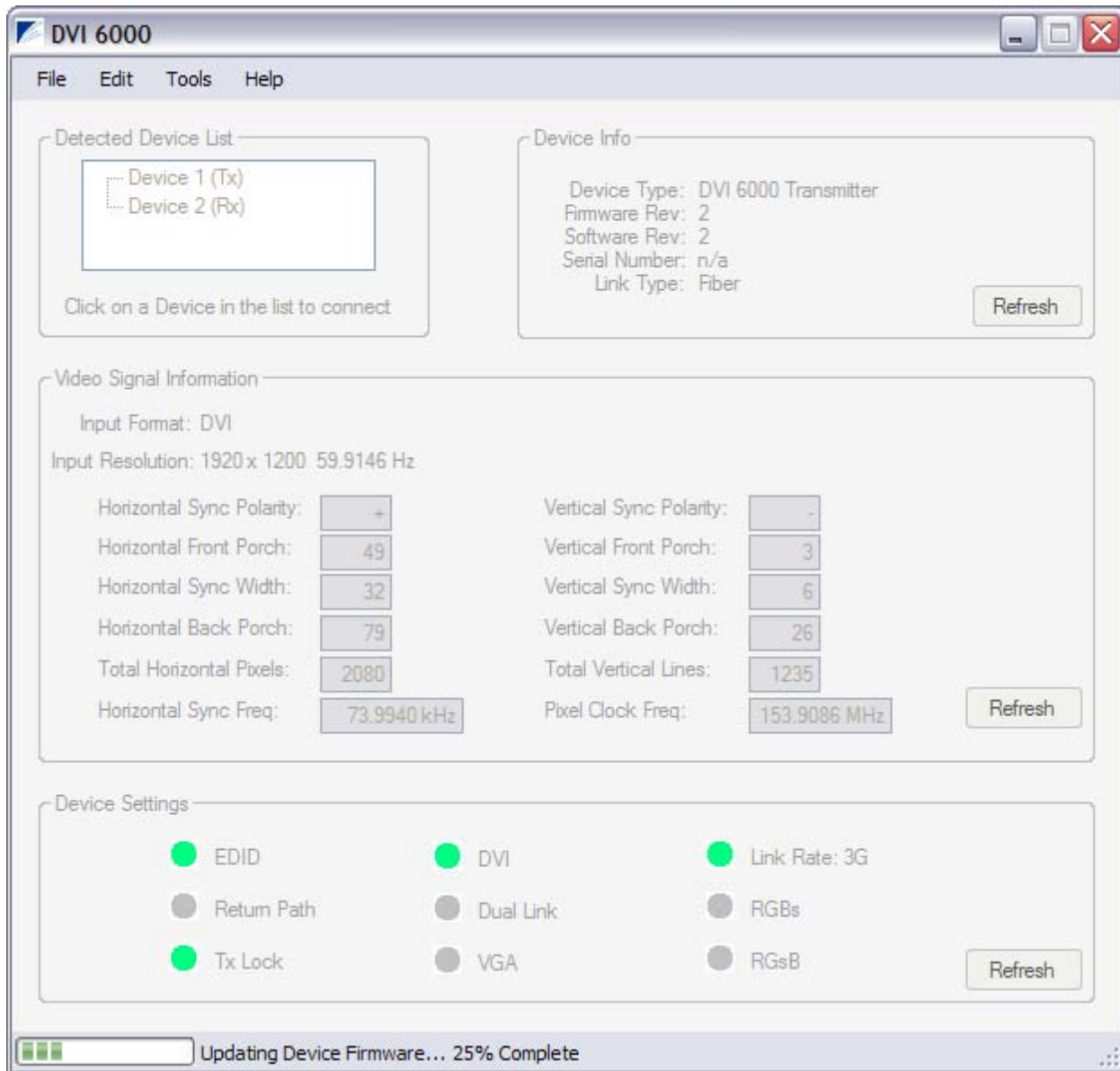
If the file is incorrect, if you selected a Receiver Update File for a Transmitter for example, you will receive a prompt similar to the one below and the update process will be cancelled. Start the update process again and select the proper file.



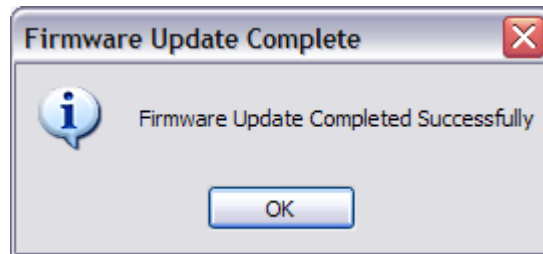
If the file is correct, you will be prompted to **Continue** or **Cancel**.



The update file will now be downloaded to the DVI6000. A progress bar at the bottom of the screen will indicate the status of the update process. All other DVI6000 functions will be greyed-out to prohibit their operation during the update process.



You will be prompted upon completion of the update process.



You must close the GUI and perform a power-cycle on the DVI6000 that has been updated in order for the new firmware to take effect.

SPECIFICATIONS

General:

Video Scan Rates:	As per VESA standards.
Video Standards supported:	DVI and RGB including VGA, SVGA, XGA, WXGA, SXGA, WSXGA, UXGA, WUXGA, HDMI 480P, 720P, 1080I or 1080P (not HDCP encrypted). See Appendix
Video Resolutions Supported:	Up to 2560x1600 (dual link model) or 1920x1200 (single link model)
Data Formats supported	Bidirectional or unidirectional RS 232, 42x, 485 up to TBD kbaud.(Optional)
Audio Signal to Noise Ratio:	TBD db
Fibers:	1 fiber standard, 8.3/125um Singlemode (-50/52) or 62.5/125um or 50/125um Multimode (-2), 1 or 2 fibers with BDD
Fiber Connector Type:	ST, FC, SC or LC
Wavelengths:	1310 SM or 850 MM standard; 1310/1550 SM or 850/1310 MM with BDD; CWDM wavelengths available.
Optical Budget:	8 dB (-50 SM), 13 dB (-52 SM), 6 dB (-2 MM),
Maximum Transmission Distance:	4KM (-50 SM), 10KM (-52 SM), up to 89m at 3G and 70m at 3.75G over 62.5/125um; up to 290m at 3G and 150m at 3.75G over 50/125um (-2 MM),
Operating Environment:	0 – 70 degrees C

Transmitter, DVI-6000-FTX-50/52:

Video Input/Output Connectors:	1 DVI-I plus 1 DVI-I loop thru for local monitor.
Video Input Impedance:	DVI: 100 ohms balanced; RGB: 75 ohms
Video Input Level:	DVI:800mv p-p TMDS; RGB: 700mv p-p
Audio Input Connectors :	3.5mm Stereo unbalanced, 9 pin DIN stereo balanced
Audio Input Level:	unbalanced, < +4dB, balanced, < +16dB
Audio Input Impedance:	>10k unbalanced, 600 ohms balanced
Optical Output Power:	-10 dBm (-50), -5 dBm (-52), -9 dBm (-2)
Power Requirement:	9~24VDC @ TBD A

Receiver, DVI-6000-FRX-50/52:

Optical Input Sensitivity:	-18 dBm (-50/52), -15 dBm (-2).
Video Output Connectors:	2 DVI-I.
Video Output Impedance:	DVI:100 ohms balanced; RGB: 75 ohms
Video Output Level:	DVI: 800mv p-p TMDS; RGB: 700mv p-p into 75R
Audio Output Connectors:	3.5mm Stereo unbalanced, 9 pin DIN stereo balanced
Audio Output Level:	Unity Gain with respect to 'FTX
Audio Output Impedance:	< 100 Ohms unbalanced, 600 ohms balanced
Power Requirement:	9~24 VDC @ TBD A

. Specifications subject to change without notice.

Pinout and Panel Drawings

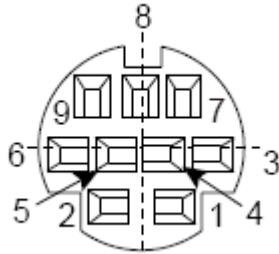
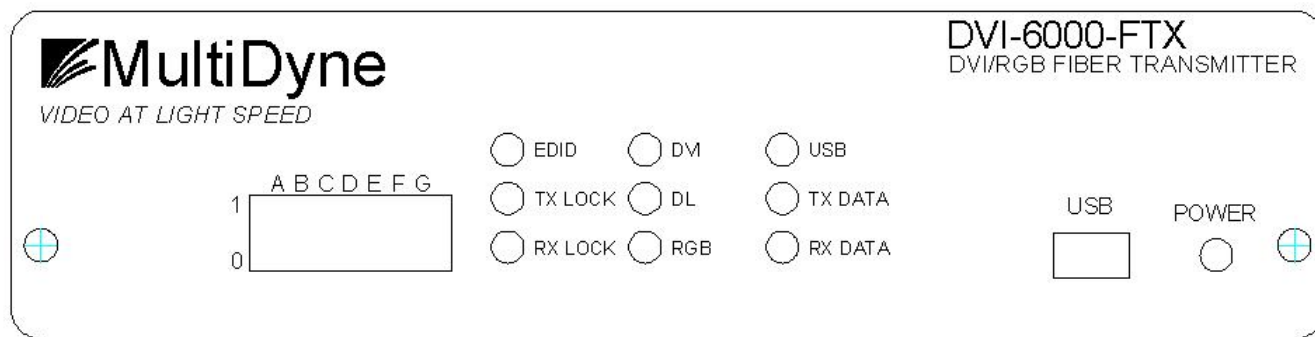


Fig. 1: DIN JACK WIRING FOR BALANCED AUDIO AND DATA

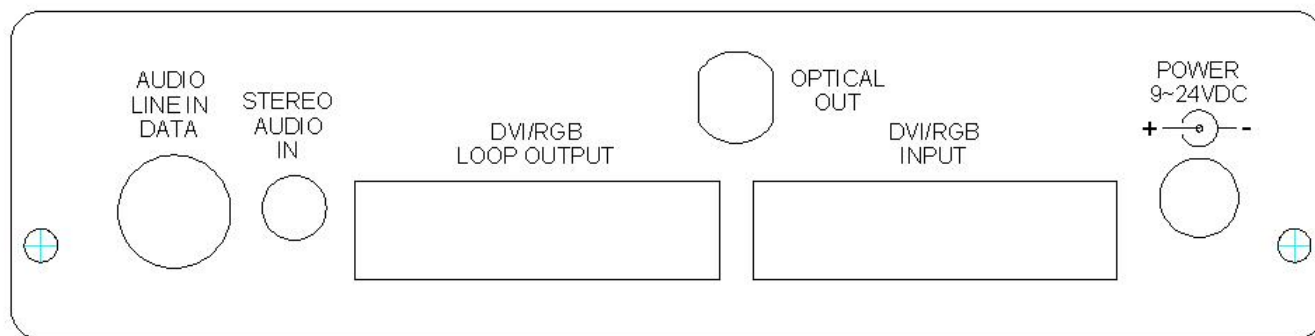
1. GROUND
2. RS4xx IN -, RS232 IN
3. RS4xx IN +
4. RS4xx OUT -, RS232 OUT
5. RS4xx OUT +
6. RIGHT +
7. RIGHT -
8. LEFT -
9. LEFT +

A Breakout Board with screw terminals with 6' cable and DIN plug is also available from Multidyne.

Fig 2: FTX Front and Rear Panels

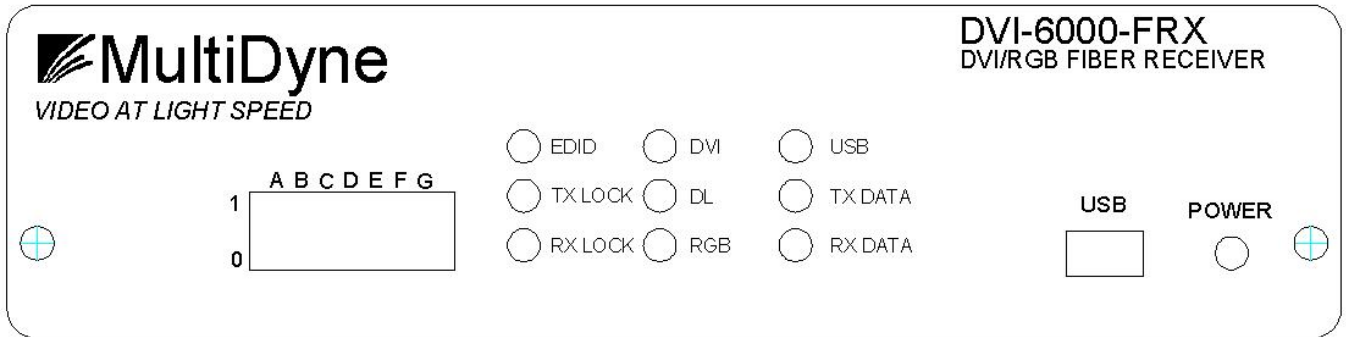


FRONT PANEL

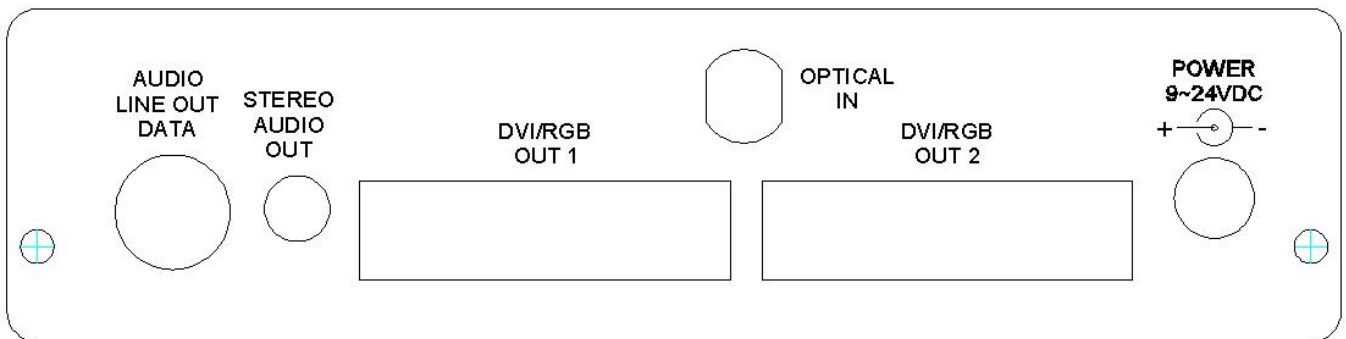


REAR PANEL

Fig. 3: FRX Front and Rear Panels



FRONT PANEL



REAR PANEL

Appendix:

How to calculate what video resolutions are supported.

The DVI-6000 can transport video having a pixel clock of up to 165 MHz in single link mode or up to 330 MHz in dual link mode. To determine if your video can be transported by the DVI-6000, if you are not sure of the pixel clock frequency, you can use the following formulae to estimate it. You need to know the resolution and the refresh rate. You can determine these from Windows Control Panel. Click on Display, then Settings.

If you are transporting analog RGB or DVI with normal blanking:

Pixel clock freq = Horizontal resolution x vertical resolution x refresh rate x 1.35

If you are transporting DVI, reduced blanking:

Pixel clock freq = Horizontal resolution x vertical resolution x refresh rate x 1.1

The results of these formulae must be less than the maximum pixel clock frequencies in order to be supported by the DVI-6000. If they are not, you will have to reduce the refresh rate, the resolution, or both.