



PESA

USER GUIDE

quadbox

MINI-SWITCHER
4X4 COAXIAL OR FIBER
DIGITAL VIDEO ROUTERS



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Chapter 1 About This Manual

1.1 DOCUMENTATION AND SAFETY OVERVIEW


This manual provides instructions for the installation, operation, and maintenance of the Quadbox series video routing modules built by PESA.

It is the responsibility of all personnel involved in the installation, operation, and maintenance of the equipment to know all the applicable safety regulations for the areas they will be working in. ***Under no circumstances should any person perform any procedure or sequence in this manual if the procedural sequence will directly conflict with local Safe Practices. Local Safe Practices shall remain as the sole determining factor for performing any procedure or sequence outlined in this document.***


1.2 WARNINGS, CAUTIONS, AND NOTES

Throughout this document, you should notice various Warnings, Cautions, and Notes. These addendum statements supply necessary information pertaining to the text or topic they address. It is imperative that audiences read and understand the statements to avoid possible loss of life, personal injury, and/or destruction/damage to the equipment. These additional statements may also provide added information that could enhance the operating characteristics of the equipment (i.e., Notes). Examples of the graphic symbol used to identify each type of statement and the nature of the statement content are shown in the following paragraphs:


1.2.1 WARNING

	Warning statements identify conditions or practices that can result in loss of life or permanent personal injury if the instructions contained in the statement are not complied with.
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1.2.2 CAUTION

	Caution statements identify conditions or practices that can result in personal injury and/or damage to equipment if the instructions contained in the statement are not complied with.
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1.2.3 NOTE

	Notes are for information purposes only. However, they may contain invaluable information important to the correct installation, operation, and/or maintenance of the equipment.
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Chapter 2 Introduction

2.1 DESCRIPTION

PESA's Quadbox Mini-Switcher coaxial or fiber digital video router module provides a versatile, low cost four input by four output (4x4) routing switcher for HD-SDI video signals, up to 3Gbps. Coaxial modules provide eight full-size BNC connectors for signal I/O and fiber modules provide two duplex SFP fiber receiver modules for signal input and two duplex fiber transmitter modules for signal output. All fiber modules use LC type connectors and allow cable runs up to 10kM with singlemode fiber cable.

Mini-switcher modules may be used as standalone "bricks" or mounted in an optional 1 Rack Unit (RU) frame that holds up to 4 modules, and includes a power supply that powers all modules in the rack from a single input power source. Figure 2-1 shows rear panel view of a typical coaxial and fiber Quadbox mini-switcher module.



Figure 2-1 Quadbox Coaxial (Top) and Fiber Mini-Switcher Modules

Status monitoring and module configuration for Quadbox Mini-Switcher is done through graphical user interface (GUI) menu screens of PESA's Catrax controller application installed on a host PC running the Windows® 2000, XP, Vista or Windows 7 Operating System. Two versions of the application - Catrax and Catrax Cub - are available and the feature set for Quadbox Mini-Switcher varies between applications, as discussed in Chapter 5 of this manual.

Every mini-switcher module is equipped with both Ethernet and USB connectivity ports. Single modules may be connected individually to the host PC through the USB port. Status monitoring and set-up configuration may be performed on a single module over the direct USB connection using the supplied Catrax Cub controller application.

When modules are installed on an Ethernet network, the available Catrax controller application can be used as a real-time status monitor or to issue commands to any desired module. Each module may be assigned a unique identifier name, called its alias, for easy identification on a network installation, or any installation where multiple Quadbox modules are used.

2.2 QUADBOX MINI-SWITCHER FEATURES

- Four input and output ports per module
- 1310 nm optical laser outputs with fiber optic mini-switcher
- Fiber mini-switcher supports singlemode and multimode (62.5 micron and 50 micron) fiber optic cable
- Software setting for output reclocking or by-pass mode
- Can package up to four mini-switcher modules in a 1RU space
- Supports redundant power in the 1 RU frame
- Ethernet port for network capabilities
- USB for local setup and diagnostics
- Supports SMPTE 259M-C, 292M, 372M, and 424M
- Up to 2.97Gb/s per port
- 12VDC, 90-240VAC 60/50Hz power brick for standalone modules

2.3 QUADBOX MINI-SWITCHER MODULE

Each Quadbox Mini-Switcher module provides four input channels and four output channels, as pictorially illustrated by Figure 2-2.

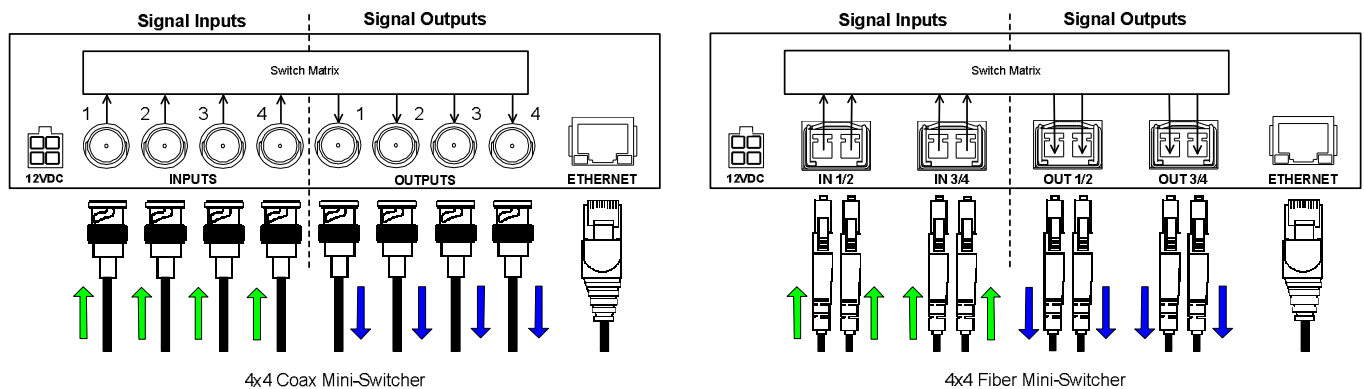


Figure 2-2 Quadbox Mini-Switcher Input/Output Connections

Rear panel connectors are illustrated in Figure 2-2. The function of each is discussed below:

- 12VDC** Operating power (12 VDC) from an external supply is attached to this connector. When the module is used standalone, power is derived from a furnished “wall-wart” type power supply. If the module is mounted in a rack frame, power for all modules in the frame, plus the frame cooling fans, is derived from a single power brick connected to the frame power distribution panel. A connecting cable connects between the frame power distribution panel and the module power input connector.
- BNC Connectors** (Coax Mini-Switcher Only) There are eight BNC connectors on the rear panel that provide four input and four output connection points for SDI signals.
- Fiber** (Fiber Mini-Switcher Only) There are two dual port LC type, SFP fiber modules for input signals and two for output signals located on the rear panel of the module.
- Ethernet (ENET)** This is a standard 10/100, base-T Ethernet network connector for CAT5E cable. When the Quadbox Mini-Switcher module is installed on the facility network, status and configuration operations may be performed at any time through PESA’s Catrax application running on a host PC.



Figure 2-3 Mini-Switcher Front Panel Layout

USB	The USB connector allows the module to communicate with a host PC over a standard USB bus. This connector is used when initially entering operational and set-up parameters to the module via the GUI application. It is not necessary to keep the module attached to the host PC during normal operation.
ACTIVE	There is a single LED, labeled ACTIVE, located on the module front panel. When lit, it indicates the Quadbox module is connected to a source of power and is in an operational state.

2.4 SPECIFICATIONS

Electrical

Input Type	
Coax Mini-Switcher	BNC - 75 Ohm
Fiber Mini-Switcher	Dual SFP receiver module, Type LC connector
Number of Inputs	4
Output Type	
Coax Mini-Switcher	BNC - 75 Ohm
Fiber Mini-Switcher	Dual SFP transmitter module, Type LC connector
Number of Outputs	4
Signal Formats	SMPTE 259M, 292M, 372M, 424M

Signal Specifications

Return Loss	>15dB 5MHz to 1.485MHz; >10dB 1.485 to 2.97MHz
Signal Amplitude	800mV (p-p)
DC offset	0.0V, +/- 0.5V
Rise/Fall Time	<135ps (20% - 80%)
Overshoot	< 10%
Jitter	<0.2UI (SMPTE 292M), <0.3UI (SMPTE 424M), compliant with SMPTE RP-184
Cable EQ	3G-SDI: Auto to 80m; HD-SDI: Auto to 100m, SDI (270Mbps): Auto to 300m

Signal Operations

Polarity	All Paths Non-Inverted
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Optical Specifications (Fiber Mini-Switcher Only)

Connector Type	SFP Module, LC Connector
Wavelength	1310nm
Mode	Singlemode
Module	Small Form Factor, Hot Pluggable
Compliance	ITU-T G.957
Data rates	270Mbps up to 2.97Gbs

The fiber optic modules used with the Quadbox fiber mini-switcher use a class 1 laser product compliant with FDA Radiation Performance Standards, 21 CFR Subchapter J. This component is also class 1 laser compliant according to International Safety Standard IEC-825-1.

Operating distance	9/125u - 10km (6.25 miles); 50/125u - 400m (1200ft), 62.5/125u - 200m (600ft)
--------------------	--

Operating distances are approximate, cable loss and other interconnects can affect total light loss between TX and RX extenders.

Receiver Sensitivity	
Signal Input Ports	Singlemode -20dBm min, -1dBm max.
Transmitter Power	
Signal Output Ports	Singlemode -9dBm min, -3dBm max.

Dimensions

Mini-Switcher Module	6.75 (171.45)W x 6.25 (158.75)D x .825 (20.96)H
Rack Mount Kit	19.00 (482.6)W x 6.25 (158.75)D x 1.75 (44.45)H
Weight	0.5 lbs/unit (Module)
Weight	1.6 lbs (Rack Mount with PS)
Weight	(four units in rack mount) 3.65 lbs

Environmental & Miscellaneous Specifications

Operating Temp	-20C to 60C
Storage Temp	-40C to 75C
Relative Humidity	9% to 95% non-condensing
MTBF	> 57,000 Hours
Power Source	90-240VAC, 50/60Hz source
Power to unit	12VDC
Power Consumption	4.5W Max per module
Cooling	Convection / Fans in 1RU frame
Rack Mount	yes, with optional 1RU rack frame

Control Specifications

Input connection	USB mini-connector / Ethernet RJ-45
Software Application	Windows based GUI with diagnostics, supports Windows NT, 2000, XP

Chapter 3 Basic Fiber Optic Tutorial

3.1 INTRODUCTION

Fiber optic technology is widely used in video and audio communication applications, and offers many advantages in speed, efficiency and reliability over conventional copper cable such as:

- Exceptional Bandwidth
- Immune to Electromagnetic Interference
- No Electromagnetic Emissions
- Light Weight

There are, however, many considerations that must be included when planning, installing or maintaining fiber optic devices in a facility. Many PESA users are familiar with optic devices, but for those who would like more information we have prepared this very basic tutorial section to help make your installation easier, and acquaint you with the type of fiber devices used in PESA's Quadbox.

Fiber-optic systems use light pulses to transmit information over fiber optic cables rather than electrical signals to transmit information over copper wires. The fiber communication link found in Quadbox is unidirectional, with the signal originating at a transmitter device, travelling over the fiber cable path to a receiver device. Just as with any transmission system, data integrity at the receiving end depends a great deal on the path the signal takes from transmitter to receiver.

3.2 FIBER OPTIC CABLE

Perhaps more than with any other link in the chain, signal losses and other degradations that often occur in the cable path can have a profound effect on the overall functionality of the system. The type of cable used, signal propagation, connectors, patch fields and any other elements in the path are all factors that can cause signal strength loss within the cable path.

Think of a fiber cable as a very long tube with a mirror coating on the inside. If we shine a light in one end we can see light come out at the far end - even if there is a bend in the tube. Light pulses travel through fiber optic cable because of a principle called total internal reflection. This principle states that when the angle of incidence exceeds a critical value, light cannot get out of the tube; instead, the light bounces back in. Since the angle of incidence is always equal to the angle of reflection the reflected light will again be reflected. The light continues this bouncing path down the length of the fiber optic cable. If light strikes the cable core at an angle less than the critical angle then it is attenuated very rapidly with propagation distance. Every type of fiber optic cable is subject to losses, primarily through dispersion and scattering of light within the cable itself. The faster the source light fluctuates, the greater the risk of dispersion.

A fiber optic cable is composed of two concentric layers - the core and the cladding; light is piped through the core. In addition to the two inner layers, there is an exterior coating called the jacket, as shown by Figure 3-1. The jacket protects the core and cladding from shocks that might affect their optical or physical properties, and also provides protection from abrasions, solvents and other contaminants. The jacket has no optical properties and does not affect propagation of light within the core. Fiber optic cables have extremely small diameters – typically ranging from 8 microns to approximately 100 microns. To get some appreciation of how small these sizes actually are, a typical human hair has a diameter of 100 microns. Fiber cable sizes are usually expressed by first giving the core size followed by the cladding size. For example, 8/125 indicates a core diameter of 8 microns and a cladding diameter of 125 microns, 100/140 indicates a core diameter of 100 microns and a cladding diameter of 140 microns, etc.

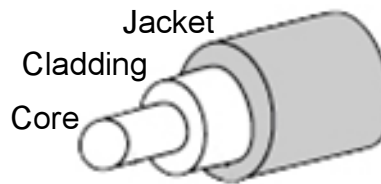


Figure 3-1 Fiber Optic Cable, Basic Cross Section

There are a variety of fiber cable types, but the two most common types you will encounter are called **multimode** and **singlemode**. Regardless of cable type, the construction of fiber cable is the same. Typical core sizes used with devices such as Quadbox are 8 -9 microns for singlemode and 50 - 62.5 microns for multimode.

Before we discuss the differences between these cable types – let's briefly introduce the term **mode** as it relates to fiber optic cables. In a previous paragraph we said that light travels through fiber by reflections off the coating. We know that when light enters the cable it can propagate in many different paths down the fiber - the larger the diameter of the fiber, the more potential paths for light to disperse. Wavelength of the light source also plays a factor in dispersion characteristics. Each path the light follows is called a **mode**, and different cable diameters and other characteristics determine the amount of potential modes that can occur within the fiber.

3.2.1 SINGLEMODE CABLE

Singlemode fiber optic cable is a single strand of glass fiber with a very narrow diameter of 8.3 to 10 microns through which only one mode will propagate. It offers higher bandwidth capacity than multimode fiber but requires a narrow light source; typically a light source with wavelength 1310 or 1550nm is used. Singlemode fiber has a much smaller core than multimode. The small core and single light-wave virtually eliminate any distortion that could result from overlapping light pulses, providing the least signal attenuation and the highest transmission lengths of any fiber cable type.

3.2.2 MULTIMODE CABLE

Multimode fiber optic cable is larger in diameter than singlemode, with typical core diameters of 50 or 62.5 microns. Multimode fiber provides high bandwidth at high speeds over medium distances. Light entering the core is dispersed into numerous paths, or modes, as they travel through the core. Typically a light source with a wavelength of 850 or 1300nm is used with multimode cable. In long cable run installations, multiple paths of light can cause signal distortion at the receiving end, resulting in data errors.

3.3 FIBER TRANSMITTER AND RECEIVER DEVICES

At the signal origination point, the transmitter device accepts a signal input and converts the electrical variations of the signal to variations of a light source. Usually the light source is either a LASER device or a LED, operating at extremely short wavelengths, typically in the 850 nanometer (nm) to 1,500 nm range; and over a specified output power level range, depending on the transmitter device used. Transmitter devices used with Quadbox modules contain a LASER light source. Light pulses from the transmitter are focused through a lens into the fiber-optic cable. At the signal destination point, the receiver device accepts an input of modulated light from the transmitter and converts it back to an electrical signal.

Both transmitter and receiver devices are typically specified for use with either singlemode or multimode cable, depending on the operating wavelength among other factors. Devices used in PESA Quadbox Modules are designed for use with singlemode cable; however, under most circumstances it is permissible to use multimode cable with Quadbox, refer to Paragraph 3.6.

Fiber transmit and receive modules are available in a number of different sizes and styles. Quadbox modules all use Small Form-Factor Pluggable (SFP) devices that install into metal sleeve carriers mounted to the module circuit card. Each module uses a type LC connector to interface with fiber cable.

3.4 OPTICAL POWER AND LOSS BUDGET

Every fiber receiver device is specified with a minimum and maximum input power level range that the device can receive in order to properly decode incoming data. With fiber devices proper power level is even more important than with some other systems in that not only can too little power cause serious degradation of the signal, but too MUCH power at the input causes receiver saturation, resulting in data degradation. Specified usable power range for receiver modules used in PESA devices varies between products, but an average range for our example purposes here would be a minimum input of -20dBm to a maximum of -1dBm.

On the transmitter side, devices are also specified with minimum and maximum output power levels. Power output levels can vary within the specified range between devices for a number of reasons; plus transmitter output levels degrade over time. Transmitter power range and degradation must be carefully considered during all phases of planning and installation. Specified power range for transmitter modules used in PESA devices varies between products, but a typical range for the following examples would be from a minimum output of -9dBm to a maximum of -3dBm; and PESA recommends that you should expect 2-3dB degradation in power output over time.

Careful planning and loss calculations must be conducted in order to ensure the most reliable signal transfer. When planning a fiber installation, the **optical loss budget** is critical – thankfully, in most installations, it's not a complicated parameter to calculate.

Many factors must be considered for potential signal loss. All fiber optic cable presents a certain amount of signal loss, dependent on length, cable type and other factors. Loss specifications for a particular cable are always available from the manufacturer. In addition to cable losses, typical cable paths have connectors on each end of each piece of cable, the path may be routed through connector panels, or the cable may be spliced in one or more locations along the path – each of these elements also introduce a certain amount of signal loss. By adding the loss value introduced by each element in the path, plus the loss introduced by the cable itself, we can arrive at the total loss value for the entire cable path.

Previously we said that the receiver device required a light input power level within a specified range in order to operate properly. In order to ensure the receiver gets the proper input power, we need to consider the specified output power of the transmitter device, time degradation of transmit output power, cable path losses, and the input power requirement for the receiver. If we take the input power requirement of the receiver and subtract that value from the output power of the transmitter, we have calculated the maximum loss that can exist in the path between the devices. This value is termed the **optical loss budget**, since it is the maximum amount of power loss that can be distributed over every element in the fiber cable path. Once we perform the loss calculations, it is possible that the input power to the receiver is too strong in which case we would need to consider inserting power attenuators in the cable path. Let's consider an example:

- A good rule of thumb is to use the *minimum* specified receiver input power and the *minimum* specified transmitter output power when performing your worst-case loss calculations. It is also good practice to add an additional 2-3dB **safety margin** to the calculated maximum loss value to compensate for degradation of transmitter output power and other possible losses over time.
- Using typical values specified for Quadbox devices, we can calculate the **worst-case** optical loss between transmitter and receiver
- Where Minimum XMTR output power is -9dBm (specified)
Minimum RCVR input power is -20dBm (specified)
$$[(-20\text{dBm}) - (-9\text{dBm})] = -11\text{dB}$$
or stated another way, 11dB would be the maximum permitted power loss between XMTR and RCVR at worst-case device performance
- Adding in a Safety Margin of an additional potential 3dB loss
$$[(-11\text{dB}) + (3\text{dB})] = -8\text{dB}$$
- -11dB being the maximum amount of acceptable power loss, plus our 3dB added safety margin yields an **Optical Loss Budget** of -8dB, or stated another way, 8dB would be the maximum permitted TOTAL loss between XMTR and RCVR assuming both transmit and receive devices are operating at the very minimum levels specified by the manufacturer.

Now, we must calculate the total loss introduced by the cable path. In order to do this we must obtain the loss factor for the cable we are using from the manufacturers specifications. This value is typically given as the amount of loss in dB for a given length of cable. We must also count the number of connectors, splices, jacks, and all other potential loss elements in the cable path since each of these elements has a specific loss value.

For best accuracy, it is a good idea to obtain loss value from data supplied by the manufacturer of each of the loss elements in the path; however, for quick reference Table 3-1 provides typical values often encountered in fiber installations.

Source Wavelength and Cable Type	Cable Size (Microns)	Cable Attenuation (Per kilometer)	Connector Attenuation (Per Connection)	Splice Attenuation (Per Splice)
850 nm/Multimode	62.5/125	3 dB	0.5 dB	0.1 dB
1300 nm/Multimode	62.5/125	1 dB	0.5 dB	0.1 dB
850 nm/Multimode	50/125	3 dB	0.5 dB	0.1 dB
1300 nm/Multimode	50/125	1 dB	0.5 dB	0.1 dB
1310 nm/Singlemode	9/125	0.3 dB	0.5 dB	0.1 dB
1550 nm/Singlemode	9/125	0.2 dB	0.5 dB	0.1 dB

Table 3-1 Average Fiber Optic Loss Values

Assume we are installing a fiber run of 9/125 singlemode cable over a total distance of 2.5 kilometers through a patch panel using two cables with a connector on each end of each cable. We are connecting this cable path to a transmitter device operating at a wavelength of 1310nm.

- Referring to Table 1 we see that 9/125 cable at 1310nm presents a loss of 0.3dB per km, so we can easily calculate cable loss for our run

$$2.5\text{km} \times 0.3\text{dB/km} = 0.75\text{dB cable loss}$$

- Calculate loss for the connectors

$$4 \text{ connectors} \times 0.5\text{dB/connector} = 2\text{dB connector loss}$$

- We can now calculate total cable path loss

$$0.75\text{dB cable loss} + 2\text{dB connector loss} = 2.75\text{dB total cable path loss}$$

Since our loss budget, with safety margin added, was 8dB, this path falls easily within that range and would offer a reliable fiber link between Quadbox modules even if the optical devices were operating at worst-case performance.

Calculating optical losses is really not complicated, but is vitally important when planning any fiber installation.

3.5 QUADBOX DEVICE POWER METERS

The Quadbox GUI Fiber Module Status screen provides direct readout of optical device operating power levels. The monitor screen for transmit modules provides a readout of actual output power from the transmitter device; and the screen for receive modules indicates power level of the light source present at the input of the device. In our example power loss calculation, we used the worst-case specified values for both XMTR and RCVR devices; typically, each device is going to perform well above specified minimum levels. You can use these meter displays to verify proper functionality of fiber links. If you are using these readings for calculating loss budget for a specific installation, remember to allow a safety margin for transmitter output fluctuations and degradation over time.

3.6 SINGLEMODE AND MULTIMODE CABLE CONSIDERATIONS

When using singlemode cable, there should be no problems with receiver saturation using Quadbox supplied transmit and receive modules. Even if the transmitter is operating at its upper specified output level of -3dBm, and the cable path presents a loss factor of no more 1dB, the power level reaching the receiver input would be -4dBm which is below the specified maximum input level.

In most circumstances it is permissible to use multimode cable with Quadbox optical devices. However, due to using a singlemode driver with multimode cable, there is a potential that the optical signal might arrive at the receiver input at a level that is too high, or too distorted to provide proper data decoding. Due to the nature of multimode cable, light can arrive at the receiver from multiple paths causing overload, or it can suffer from dispersion distortion. Overload problems usually manifest from short runs of multimode cable between XMTR and RCVR; and dispersion distortion typically occurs with long cable runs. If you are experiencing signal reliability issues with multimode cable due to overload, these can often be eliminated by using a signal attenuator between the end of the cable run and the input of the receiver module.

3.7 MIXED SINGLEMODE AND MULTIMODE CABLE TEST CASES

As discussed in paragraph 3.6, certain conditions can, and often do, occur that cause data errors when using multimode cable as the interconnect medium between TX and RX modules designed and intended for singlemode cable connection. Scenarios presented in the following paragraphs, and illustrated by Figure 3-2, provide results of tests conducted in an actual working environment intended to produce the most reliable data transmission using multimode cable. The test article used in these configurations is a PESA Cheetah V5 Generation 2 Media Extender fiber transmitter module; however, all PESA fiber devices should exhibit similar performance characteristics. Based on the results of these tests, PESA recommends that the interconnect solution presented in **Test Condition A** should be used with all multimode cable installations.

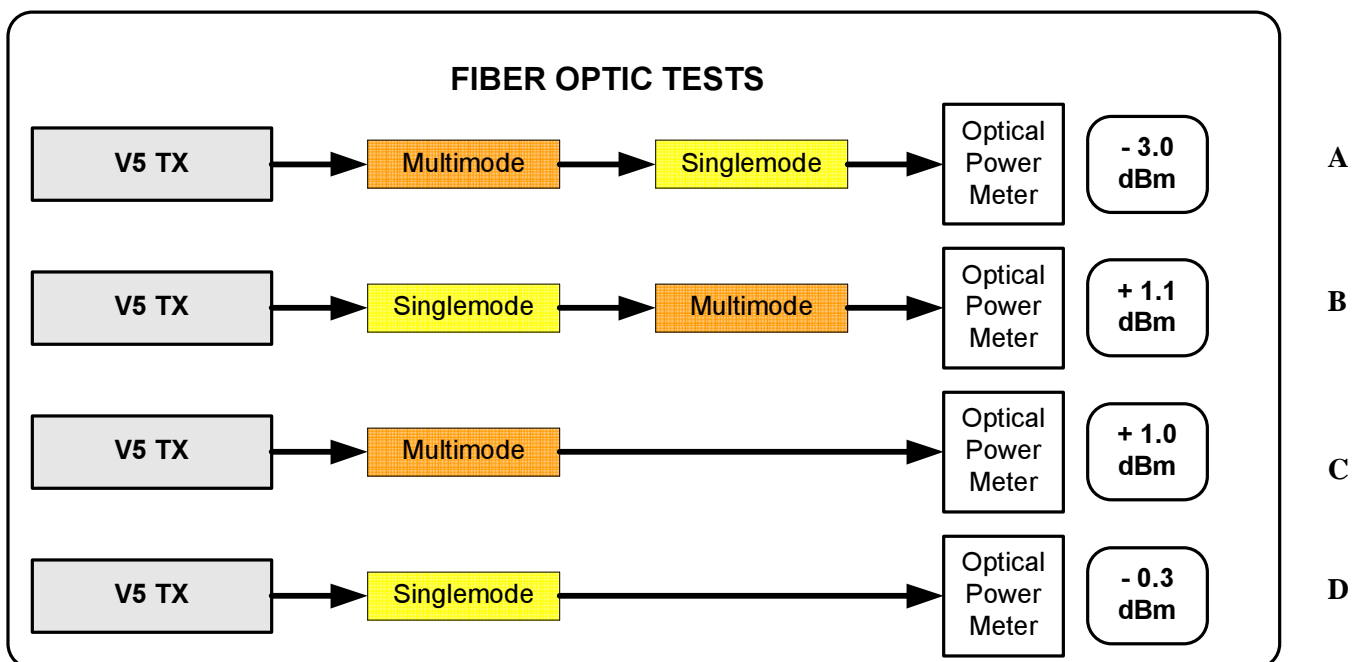


Figure 3-2 Test Case Scenarios and Power Level Results

Cheetah V5 Gen 2 with Cheetah 128 Fiber Router Field Test

A flight pack was interconnected to the routing switcher with multimode tactical fiber interconnect cable (FIBER MULT), with multiple individual fiber cables, transporting multiple fiber signals. The FIBER MULT is 100 meters in length. Because the router uses singlemode SFP fiber TX and RX modules, there was some question as to how the router and the flight pack should be interconnected with the multimode FIBER MULT. Testing revealed the V5 TX module in the flight pack was overdriving the SFP RX in the router when multimode fiber cable was used. Four different interconnect combinations were tried as depicted in Figure 3-2.

Test Condition A

The multimode FIBER MULT was connected directly to the V5 TX output and a singlemode fiber jumper (3 meters) was inserted at the opposite end (router input end) of the multimode FIBER MULT. The optical power was measured at about -3.0 dBm indicating the multimode FIBER MULT to singlemode interconnection introduced about -4.0 dB loss. The other end of the singlemode fiber jumper was connected to the router input. There were no CRC errors and the signal worked through the router using this interconnection as -3.0 dBm is well within the specified optical input range of the router SFP RX module of -20dBm to -1dBm.

Given the multimode FIBER MULT is the standard interconnect between the V5 TX and RX modules in the communications flight pack and the router I/O AND given the FIBER MULT is always 100 meters in length, it appears test condition A is the best option for this interconnection.

Test Condition B

The singlemode fiber jumper (3 meters) was inserted directly between the V5 TX output in the flight pack and the multimode FIBER MULT with the opposite end of the FIBER MULT connected directly to the router fiber input. The power level was measured at the router end of the multimode FIBER MULT at +1.1dBm.

Test Condition C

The multimode FIBER MULT was connected directly between the V5 TX output in the flight pack with the opposite end of the FIBER MULT connected directly to the router fiber input. The power level was measured at the router end of the multimode FIBER MULT at +1.0dBm which is apx. +2 dBm over the -1.0 limit.

There was only a nominal difference in measured optical signal level of test conditions B and C and the signal did not work through the router in either B or C test conditions. It was determined the router input was overdriven by about +2.0dBm in both B and C test cases. The GUI factory test mode also indicated multiple CRC errors.

Test Condition D

For comparison, a singlemode fiber optic jumper (3 meters) was connected directly to the output of the V5 TX and the other end connected directly to the power meter. The optical power into the meter measured -0.3 dBm or -1.3dBm less than the Multimode Only fiber optic cable jumper.

3.8 FIBER INSTALLATION AND MAINTENANCE CONSIDERATIONS

Fiber optic cable, like any other cable, is available in bulk spools of varying lengths without connectors attached. Be aware that some degree of specialized training, skill and equipment is required when installing connectors on the ends of fiber optic cable or splicing two cable ends together. In some installations it may be necessary, due to routing requirements or other constraints, to run bulk cable and attach connectors once the cable is in place. For easier and quicker installation, pre-assembled fiber optic cables, in various lengths, with connectors attached are readily available from a number of sources. PESA highly recommends that, unless you have training in working with optical cable and the necessary equipment, you purchase pre-assembled cables if at all possible for your installation. If using pre-assembled cabling is not feasible for your installation, consider procuring the services of a trained fiber technician, certified for fiber terminations, to install connectors and verify cable continuity before proceeding with Quadbox installation.

Another point you must consider when installing fiber cable is the minimum bend radius. This specification is provided by the manufacturer's data sheet for a particular cable and indicates the maximum amount the cable can be bent towards a 180 degree fold without damaging the cable or seriously degrading performance. Use extra care when pulling cable around corners, over-bending can cause breaks in the glass fiber.

One final point on dealing with optical cable - be sure that the optical connectors are clean and dust free. Each end of a fiber cable connection is normally fitted with a small lens to direct the light source. Remember that the core of even multimode cable is smaller in diameter than a human hair, and the core of a singlemode cable is considerably smaller than multimode. So you can see that dust and dirt, even small amounts, can greatly degrade performance of an optical data transmission system. Always keep dust caps on cable connector ends and optical receptacle connectors when cables are not attached. NEVER touch the end of the optical connector or receptacle with your bare skin. Any source of grease and dirt, even in minute amounts, can seriously degrade performance of the optics.

The core conductor of fiber optic cable is normally attached to a connector equipped with a fiber-end lens. This assembly mates to the optical transmit or receive device by inserting the connector end into its mating receptacle with very slight pressure. A snap latch secures the end into the receptacle. To remove cable-end connector from an optical device, gently press the latch tab and pull cable from receptacle. Immediately replace dust caps on the end of each fiber cable conductor and the optical module connector receptacle.



Dust, even small amounts, can greatly degrade performance of an optical data transmission system. Always keep the dust caps on the cable connector ends and the optical receptacle connectors when the cables are not attached. NEVER touch the end of the optical connector or receptacle with your bare skin. Grease and dirt, even minute amounts, can seriously degrade performance of the optics.

Chapter 4 Installation

4.1 GENERAL INSTALLATION CONSIDERATIONS

Quadbox modules are shipped from the factory pre-configured for the specified module type. In most installations, no further configuration should be required. There are very few restrictions on placement of modules. Locate each module for convenient access to video source signals or destination points. Ensure that a source of primary power is available and that each module has clearance for cooling air. If the installation has modules installed on a network, ensure that an Ethernet drop is convenient. It is not necessary that Quadbox modules be continuously connected to a network or host PC for operation. Network connection allows monitoring of modules and executing on-the-fly changes to internal routing or operational parameters. Monitoring and configuration functions may be performed on a single module over a USB connection to a host PC if the modules are not installed on a network.

4.2 INSTALLING QUADBOX MINI-SWITCHER MODULES

Install each mini-switcher module as follows:

- Connect video input signals to the BNC coaxial cable or fiber optic INPUT connectors
- Connect coaxial cable or fiber optic cable from output destinations to the OUTPUT connectors
- You may use singlemode or multimode fiber optic cable for fiber connections
- Connect the module to a facility network using CAT5E cable fitted with an RJ45 connector attached to the Ethernet port on the module
- Connect the power plug from the external power supply to the module power connector and connect the power supply to a source of primary power.

When power is applied to a mini-switcher module, the ACTIVE LED remains lit indicating the module is powered and operating.

Chapter 5 System Set-Up and Configuration

5.1 INTRODUCTION TO THE CATTRAX CONTROL APPLICATION

Set-up, configuration and monitoring functions for Quadbox mini-switcher modules are performed through graphical user interface (GUI) menu screens of PESA's Cattrax or Cattrax Cub controller application installed on a host Windows based PC. The feature set for Quadbox varies between applications as follows:

- **Cattrax Cub** – Cattrax Cub is supplied with your Quadbox mini-switcher modules and allows full status monitoring and configuration of any single module through a USB connection between the host PC and the device. While any module can be monitored or configured using Cattrax Cub, only one module can be connected to the PC at a time. Ethernet communication over a network is not supported with Cattrax Cub.
- **Cattrax** – Cattrax is a full-featured controller platform for PESA equipment that allows monitoring and control of multiple systems and modules from the host PC over an Ethernet network.

Cattrax and Cattrax Cub are both multi-system applications that can communicate with and control many different types of PESA equipment. Both versions incorporate data files for specific equipment into the software structure that contain equipment-specific interface screens, configuration parameters and control functions. In order for either version of Cattrax to “discover” and communicate with a Quadbox mini-switcher module, or any other piece of PESA equipment, the proper data file must be present in the version of Cattrax used.

In addition, the QFX USB driver file must be installed on the host PC in order for Cattrax Cub to communicate with PESA equipment over the USB port.

It is possible to have an installation of Cattrax and Cattrax Cub co-resident on the host PC – thus giving you the choice of local USB control of a single module (with Cattrax Cub) or network control (with Cattrax) of multiple modules or an entire system installation.

Both versions of Cattrax automatically search for PESA equipment through a process called “discovery.” When a piece of equipment is detected on the USB port of the host PC with Cattrax Cub, or connected to the facility network with Cattrax, the application establishes communication with the equipment and lists it as an active device in the Devices View window. With Cattrax Cub only one module may be connected at a time; Cattrax allows Ethernet control of multiple devices.

Quadbox mini-switcher modules are shipped from the factory with an auto-run CD that loads the Cattrax Cub controller application and QFX USB driver onto a host PC. Procedures for installing Cattrax Cub on the host PC are presented in Paragraph 5.4.

Cattrax is a separately purchased product. While both versions of Cattrax software allow full control and monitoring of Quadbox mini-switcher, Cattrax provides Ethernet network interface capability. If you are already a Cattrax user and are intending to operate your Quadbox mini-switcher modules with network control, you must be sure that you are using the latest software release. To determine the latest release, check the PESA website at www.pesa.com, or contact PESA Customer Service.

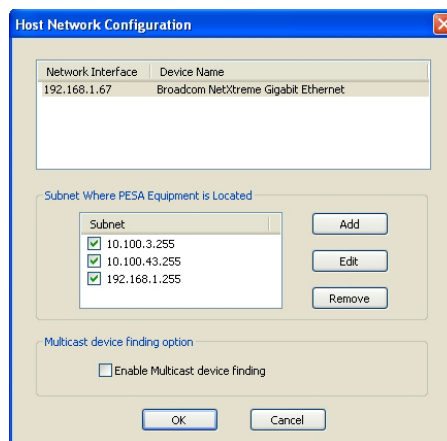
5.2 INITIAL SET-UP STEPS

Using either Cattrax or Cattrax Cub, the user can perform I/O switching, monitor and modify many functional attributes of a module, and review module identification data or network parameters. Quadbox-specific configuration and monitoring screens and control functions are identical with both Cattrax and Cattrax Cub. Procedures for connecting Quadbox mini-switcher to a network and modifying network communication parameters with Cattrax are discussed in Paragraph 5.3.

5.3 NETWORK CONFIGURATION WITH CATTRAX

In order for Cattrax to communicate with Quadbox mini-switcher modules and other PESA equipment on the facility network, the network interface device used by Cattrax must be actively connected to the subnet, or multiple subnets, containing equipment you wish to control. When communicating on a subnet containing PESA network controllable devices, Cattrax should immediately begin the discovery process for all devices configured for the same subnet. In many installations, Quadbox mini-switcher modules and other PESA devices may reside on subnets different from one another within the network. Cattrax allows you to easily select both the network interface device it uses and the subnets on which it communicates through the *Network Preferences* tab under the *Settings* menu.

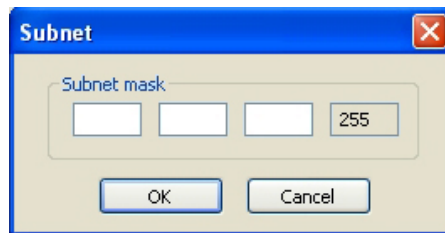
To view or modify current network communication parameters for Cattrax, click the Network Preferences tab under the Setting menu in the Cattrax menu bar to open the Host Network Configuration screen as shown here.



The upper window displays by IP address and name the network interface devices available to Cattrax. In many installations there may be only one entry in the window and by default this would be the device used by Cattrax. If there are multiple entries, as would be the case, for example, if the host PC contains both an Ethernet cable NIC and a wireless adapter, the device through which Cattrax is currently communicating is shown in bold type. You may select the network interface device you wish Cattrax to use by double-clicking the entry in the listing. Be sure that the network interface device you select is communicating over the subnet(s) containing all Quadbox mini-switcher or other PESA devices you wish to control.

Subnets currently available to Cattrax are listed in the second window under the Subnet column. A check in the box beside an entry indicates that Cattrax is actively communicating over that subnet and will automatically discover PESA devices on the subnet. If you wish to prevent Cattrax from communicating over a specific subnet, click the checkbox to remove the check. If you need to add additional subnets or modify address parameters of currently available subnets use the buttons to the right of the display window as follows:

- **Add** – allows you to add subnets to the list of those available. Clicking the Add button opens the screen shown here.



Enter the first three octets of the subnet address you wish to add. The fourth octet is by default entered as 255 to allow discovery of all possible PESA devices within the subnet. Click OK to enter the parameters. The new entry is added to the listing and the checkbox will be checked to activate the new subnet.

- **Edit** – allows you to modify address parameters of any entry in the listing. Highlight the entry you wish to modify and click the Edit button. The Subnet menu is displayed with current parameters for the entry listed. Make any changes you wish and enter OK to commit the changes.
- **Remove** – allows you to remove any subnet from the listing. Highlight the entry you wish to delete and click the Remove button. The entry is immediately removed from the listing.

Quadbox mini-switcher modules must be configured with a static IP address for communication on the facility network. In most installations, the network manager or IT administrator will assign IP addresses for use by PESA devices. Enter specific network parameters through the **IP Device Properties** window of Cattrax. Although Cattrax Cub does not support network communication, you may modify the network parameters on the Configurations menu screen using either Cattrax or Cattrax Cub.

If you will be using only network control and do not need to load Cattrax Cub continue to Paragraph 5.6.

5.4 INSTALL CATTRAX CUB AND QFX USB DRIVER ONTO THE HOST PC

Cattrax Cub is a graphical user interface (GUI) type software application for use on a standard PC running the Microsoft Windows® 2000, XP, Vista or Windows 7 Operating System. The PC must have a CD-ROM drive for installation of the software. A mouse with scroll-wheel is recommended for precise control of device parameter values using slider controls, and a monitor size of 19 inches or larger is also recommended.

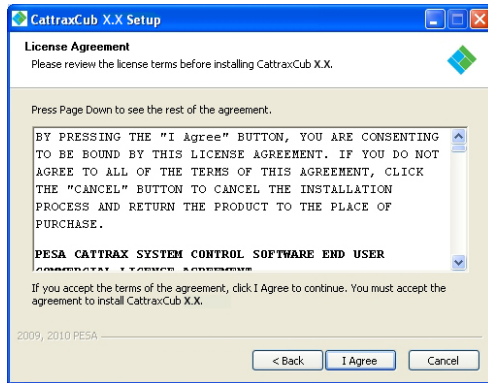
Cattrax Cub is supplied with Quadbox modules shipped from the factory. The latest release is also available from the PESA website at www.pesa.com. Cattrax Cub communicates with Quadbox modules, one at a time, using a USB port of the host PC.

If you have other USB compatible PESA equipment and already have Cattrax Cub running on a host PC, run the supplied CD to verify you have the most current revision of the application. Once the software is installed and running, simply connect any Quadbox mini-switcher unit to a USB port and allow Cattrax Cub to “discover” the module.

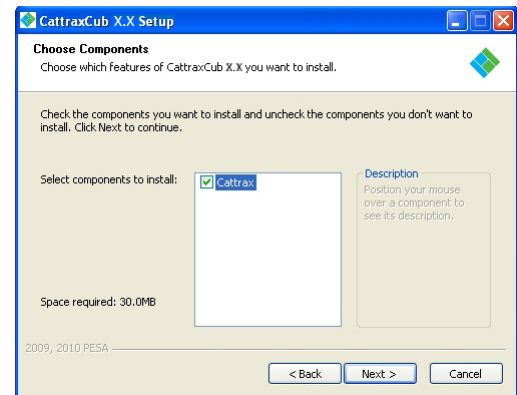
Notice the “X” used in place of actual values on each example screen presented here. During installation the release number of Cattrax Cub software you are installing is displayed. Install Cattrax Cub as follows:

1. Locate the installation CD included with your shipment, and place it in the drive of the host PC.
2. If the installation program does not automatically start, navigate to the directory of the install CD and double-click Setup.exe. The screen as shown to the right is displayed on the monitor.
3. If you have downloaded the application software from our website, or for some other reason are not using a CD for installation, load the software to a convenient location on the PC hard drive. Navigate to the folder containing the software application and double-click the Setup.exe file.

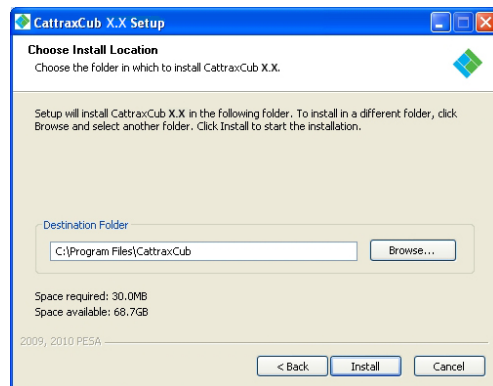




4. Read the displayed terms of the License Agreement, and click “I Agree” to continue installation.

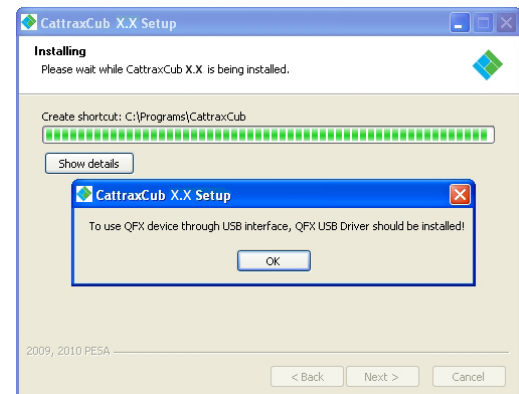


5. Verify that Cattrax is checked as the component to install from the list and click “Next” to continue installation.

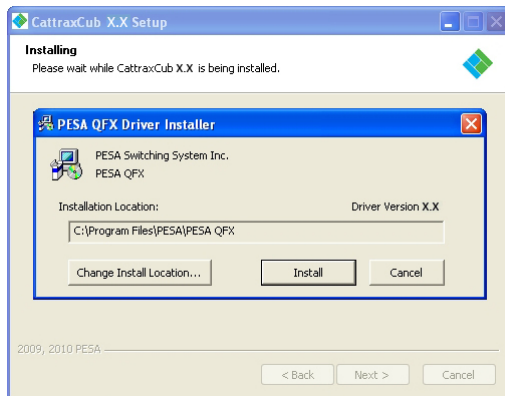


6. Modify the default Destination Folder, if you wish, by using the Browse function to select the desired directory for software installation. When the destination folder is correct, click the Next button to proceed with installation.

7. Once Cattrax Cub is installed, you will receive the prompt to install the QFX USB driver. Click “OK” to install the driver. If the QFX USB driver is not present on the host PC, Cattrax Cub will not be able to communicate with a connected device.



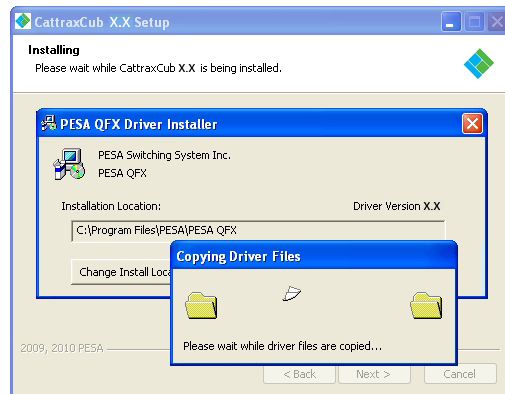
DO NOT connect a Quadbox mini-switcher module to the host PC until the USB driver is installed on the computer.



8. You may accept the default installation location or browse to another folder in which you wish to install the QFX USB driver. When the destination folder is correct, click the Install button to proceed with driver installation.

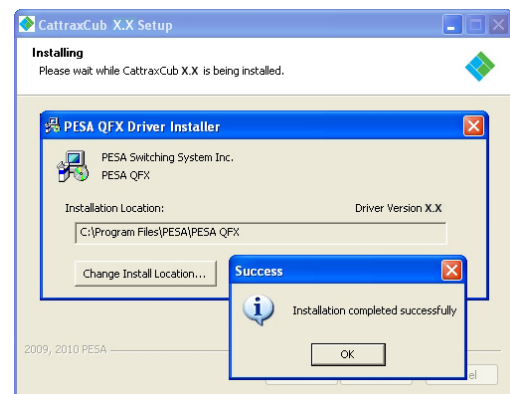


9. You will receive a message indicating that the software has not passed Windows Logo testing, as shown to the right. The USB driver files have been thoroughly validated. Click “Continue Anyway” to continue.



10. You will see the screen to the left as installation continues.

11. When driver installation is complete, you will receive a prompt as shown to the right. Click “OK” to continue.

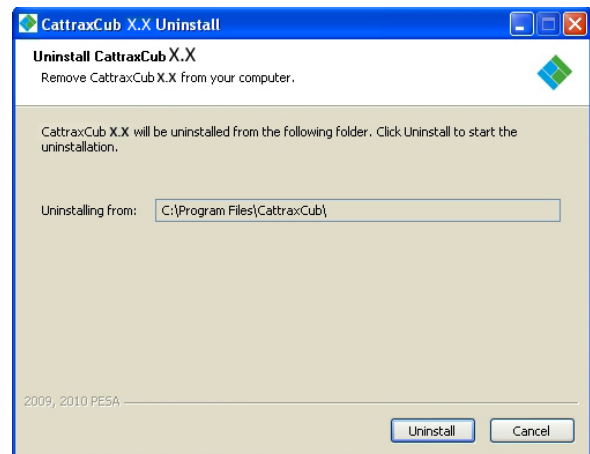




12. You will see the Completing Catrax Cub Setup Wizard prompt displayed. Click the “Finish” button to exit the installer program.

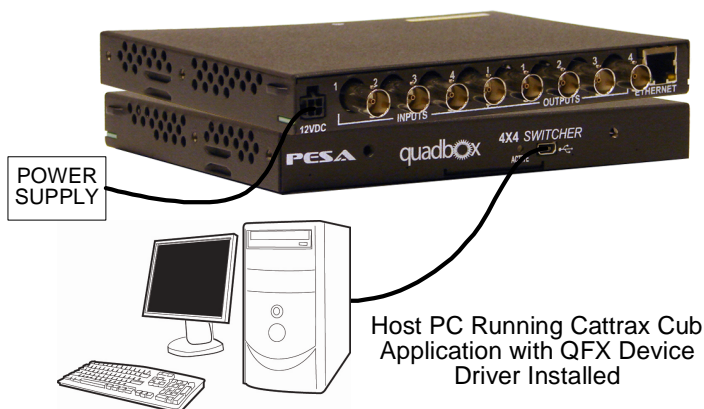
5.5 REMOVING CATRAX CUB INSTALLATION

Should it ever be necessary to remove Catrax Cub from the PC, the uninstall command is available through the Start menu of the Windows® operating system. A prompt window as shown to the right is displayed on the desktop. Click **Uninstall** to complete the command.



5.6 CONNECT A QUADBOX MINI-SWITCHER MODULE TO THE HOST PC THROUGH A USB PORT

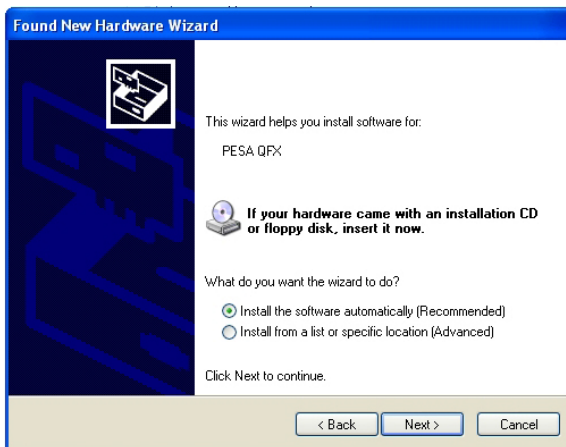
If you wish to control a Quadbox Mini-Switcher module over a USB connection using Catrax Cub, perform the following steps to allow “Plug and Play” capability of the Windows® operating system to interface Quadbox hardware to host PC.



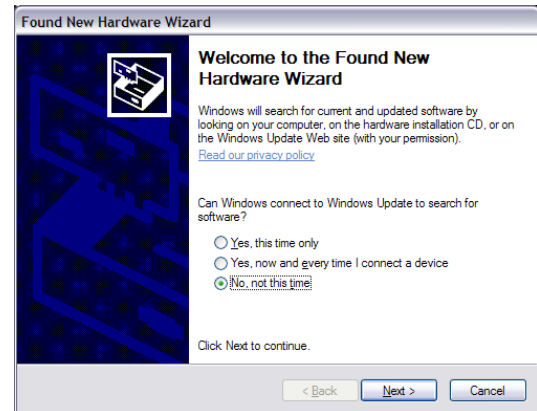
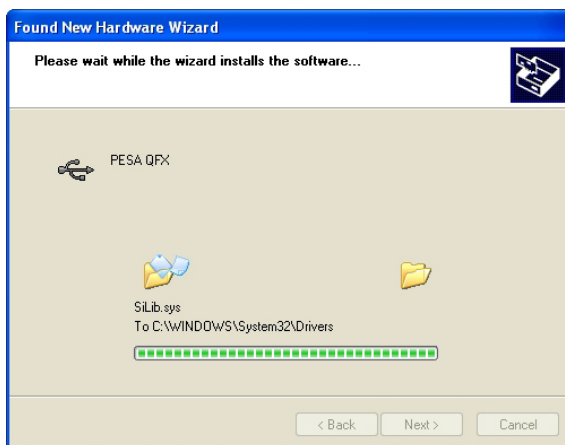
1. Apply power to the Quadbox module by connecting the external power supply to the module and to a source of primary power.
2. Connect the supplied USB cable first to the module and then into an open USB port on the host PC, as shown by the illustration to the left.
3. After a brief pop-up from the taskbar, the “Found New Hardware” window, as shown below, **may** appear on the monitor.



4. Select the “No, not this time” option button and then click Next to continue.



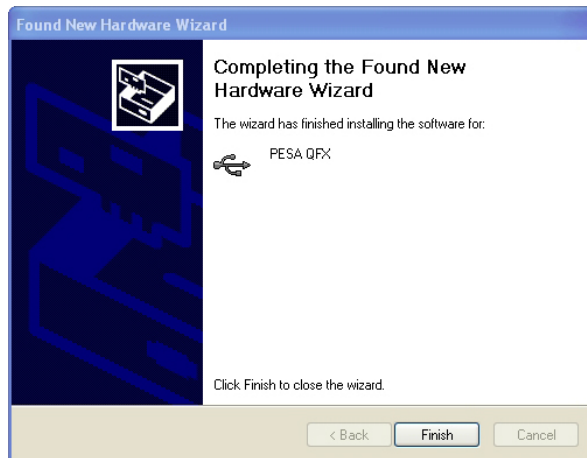
7. You will receive a message indicating that the software has not passed Windows Logo testing, as shown to the right. The USB driver files have been thoroughly validated. Click “Continue Anyway” to continue.



5. The Driver Installation screen, as shown to the left, prompts you for your choice of how to locate and install the hardware driver.
6. Select the first option, “Install the software automatically (recommended),” and click on the “next” button to continue.



8. During driver software installation, the prompt screen shown to the left is displayed. The progress bar monitors the installation procedure.



9. When hardware installation is complete, the completion screen, as shown to the left is displayed. Click the “Finish” button to exit the hardware installation wizard.
10. The Quadbox TX/RX module should now be communicating with the host PC.

5.7 START CATTRAX APPLICATION

During installation of either version, a Cattrax icon is placed on the PC desktop. You may start the application by clicking on the desktop icon, or by navigating to the folder containing the Cattrax or Cattrax Cub program files and clicking on the *Cattrax.exe* file.

When Cattrax (either version) is first started, the application interface as shown in Figure 5-1 is displayed on the PC monitor. If this is the first time Cattrax Cub has been started, the display windows will all be empty until a PESA device is connected to the USB port and “discovered” for control. If the application has been previously used, the Devices View window displays a list of inactive devices that have been discovered in previous sessions as shown in the example screen. Detailed operating instructions for the Cattrax and Cattrax Cub software application are contained in the Technical Manual for the specific product, but for purposes of this discussion there are two screen display areas we need to introduce.

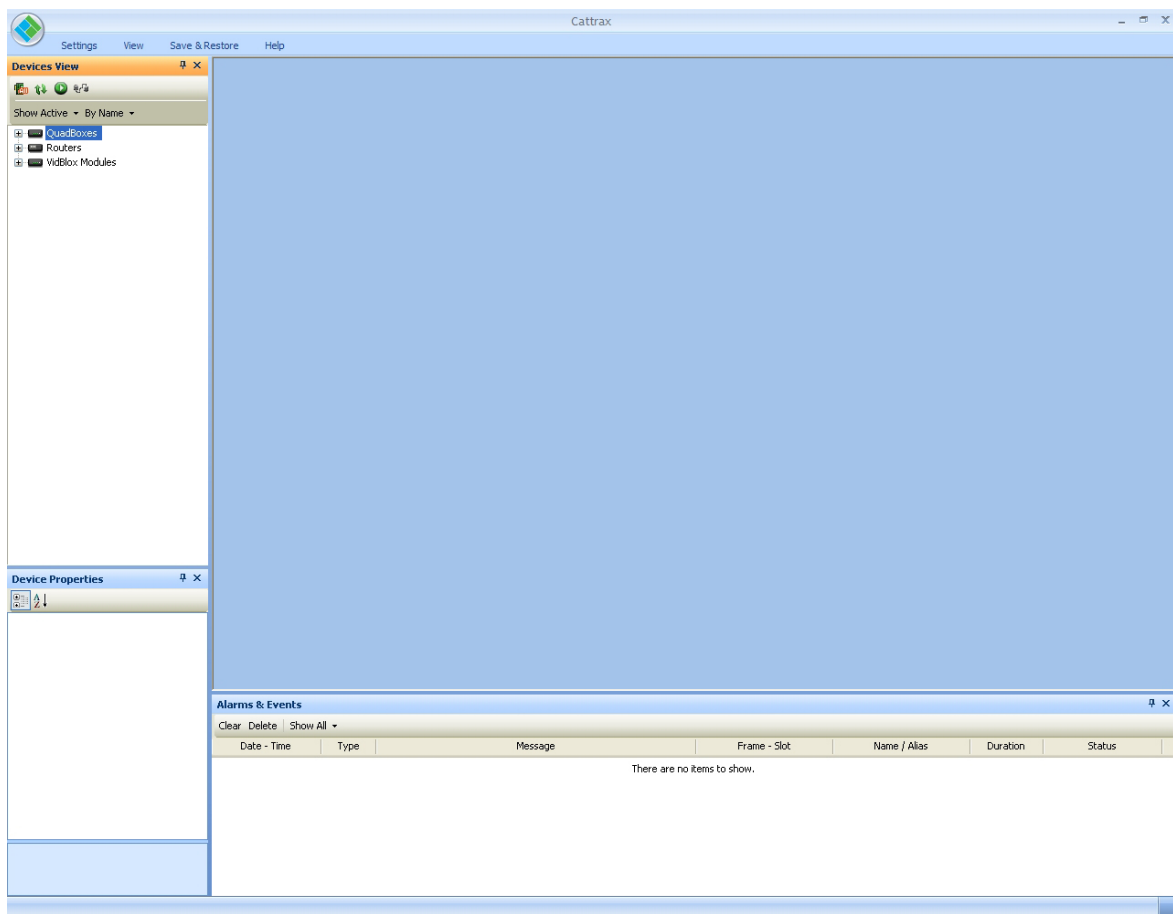


Figure 5-1 Cattrax Main Display Screen

5.7.1 DEVICES VIEW WINDOW

The Devices View window, Figure 5-2, identifies the device currently under active control of Cattrax and lists devices that have been previously connected to the application. Whenever a Quadbox module is connected to the host PC, and communication is established, the module identity is displayed as a branch of the menu tree in the Devices View in bold letters. Remember that Cattrax Cub can only control one device at a time over a USB port, therefore only one menu entry will be highlighted. If the device has been “discovered” previously but is not currently connected to the host PC, the device name appears in the menu tree in gray letters. Depending on the version of Cattrax used and the view mode selected, devices may be displayed by group as shown in the example. Notice that the heading *Quadboxes* appears in the menu tree with branches to individual modules that have been previously discovered or controlled by Cattrax. The purpose of this introduction is to differentiate between a bold and grayed entry in the tree, and to stress that previously accessed modules will still appear in the tree, until they are manually removed, even though the module may not be connected to the host PC. You may obtain more information on viewing modes and other operational features and functions of Cattrax Cub by referring to the Technical Manual for the software application.

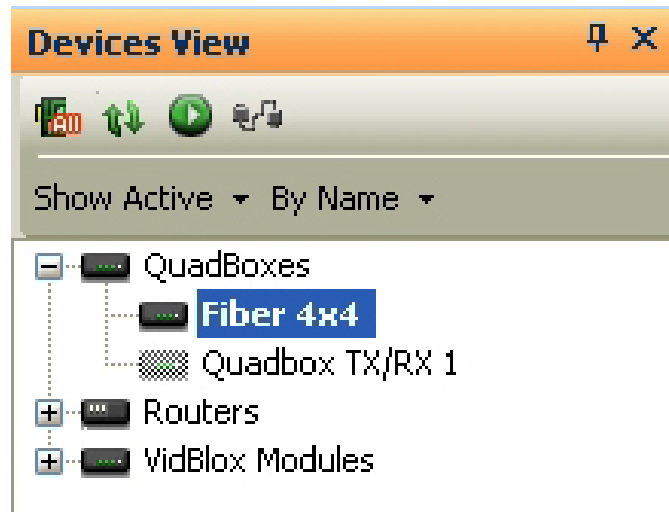


Figure 5-2 Example Devices View Screen

5.7.2 ALARMS AND EVENTS WINDOW

The Alarms and Events Window, Figure 5-3, displays flags when a defined alarm condition occurs or when a defined event occurs within the system. Notice from the example screen that when either version of Cattrax establishes connection with a Quadbox module, it is flagged as an event; as is disconnecting a module from the host PC USB port (Cattrax Cub) or the network (Cattrax full-feature). When a module is discovered and flagged as connected, its identity appears in the Devices View window in bold letters, and the information screen is displayed in the main display window.

Alarms & Events							
Clear Delete Show All ▾							
Date - Time	Type	Message	Type - Serial#	Name / Alias	Duration	Status	
Sep 25-17:02:44	Major	[QuadBox: RX-D09230018] is disconnected.	QuadBox: RX-D092...	QuadBox	4Days 22h 35...	<input type="checkbox"/> Acked	<input type="checkbox"/> Fixed
Sep 25-14:18:35	Major	SFP1 Channel 1 RX Power	QuadBox: RX-D092...	QuadBox	5Days 1h 19m	<input type="checkbox"/> Acked	<input type="checkbox"/> Fixed
Sep 25-14:18:35	Major	SFP1 Channel 2 RX Power	QuadBox: RX-D092...	QuadBox	5Days 1h 19m	<input type="checkbox"/> Acked	<input type="checkbox"/> Fixed
Sep 25-14:18:35	Event	[QuadBox: RX-D09230018] is connected.	QuadBox: RX-D0923...	QuadBox		<input checked="" type="checkbox"/> Acked	<input checked="" type="checkbox"/> Fixed

Figure 5-3 Example Alarms and Events Screen

5.8 MODULE CONFIGURATION SCREENS

When a Quadbox Mini-Switcher module is under control of either version of Cattrax, operator screens and functions presented in the following paragraphs are available.

Most screens for coaxial and fiber mini-switcher modules are identical in appearance, even though the data displayed may have different interpretation. In the paragraphs below, example screens for a 4 input by 4 output fiber mini-switcher module are used, except where noted. Paragraph text discusses any differences between data inputs and displays for coaxial and fiber modules.

With Cattrax communicating with Quadbox mini-switcher over a network, numerous modules may be identified as active in the Devices View Window. Click on any active device in the listing to access configuration screens for that module. Status and monitor information is updated for the selected module in real-time.

If a Quadbox mini-switcher is attached to the USB port of the host PC when Cattrax Cub is started, the application will automatically discover the module. When a module is discovered the identity of the connected module is displayed in bold letters in the Devices View window, and the information screen for that module opens in the main display window as shown in Figure 5-4.

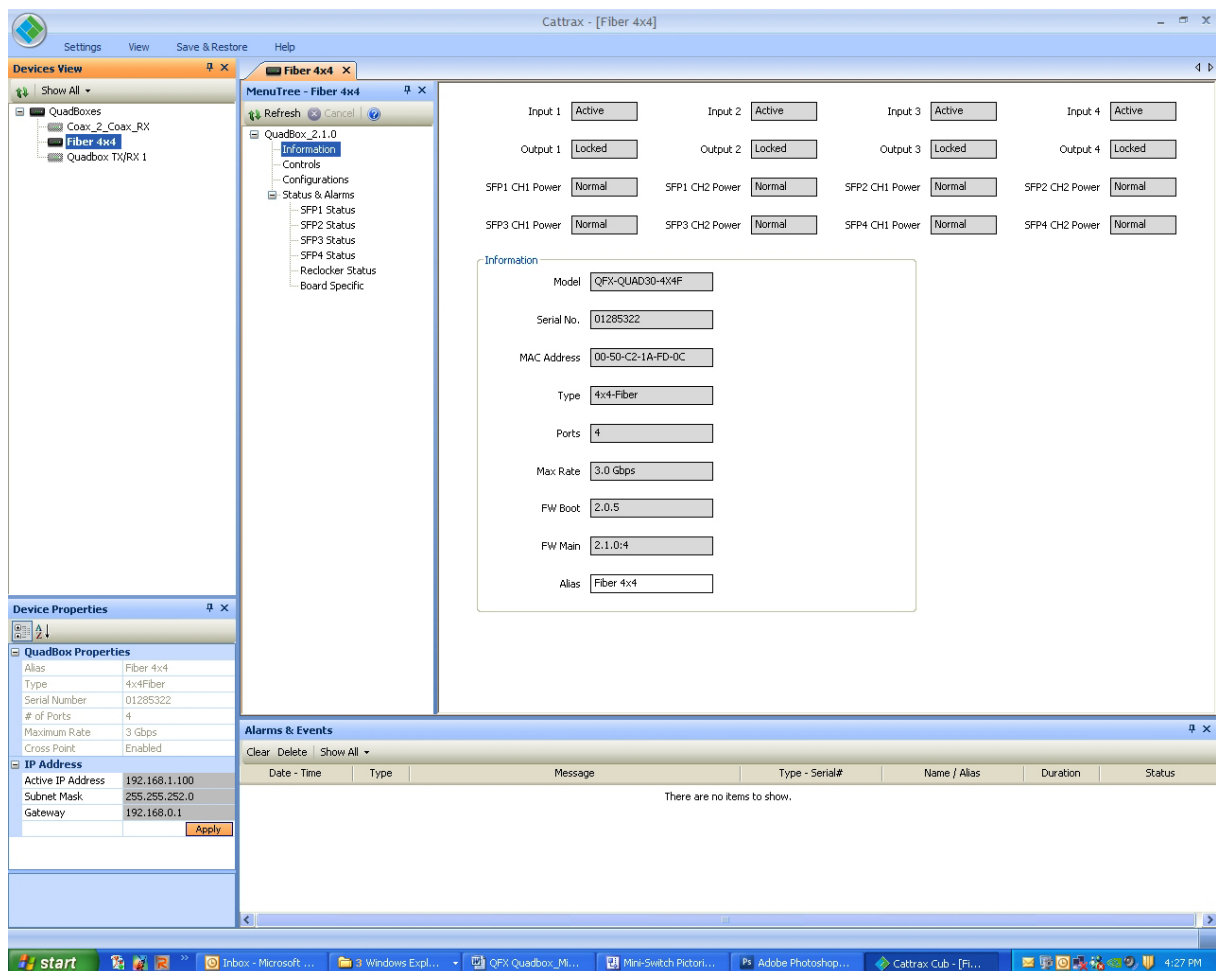


Figure 5-4 Example Quadbox Fiber Mini-Switcher Initial Display Screen

5.8.1 STATUS DISPLAY TEXT BOXES

Regardless of which menu selection you choose from the menu tree, the top portion of the main display window always displays the status monitor text boxes as shown in Figure 5-5. Display information is updated in real-time for the selected module. The following status data is provided by these text boxes:

Input – There are four text boxes for input channel status labeled Input 1 thru Input 4; each box indicates if the corresponding input port is currently active or inactive.

Output – The four text boxes for output channel status, labeled Output 1 thru Output 4, indicate if the associated output channel is currently locked to a standard data rate (Locked) or running in bypass mode (Not Locked).

SFP Power (Fiber Mini-Switcher Only) – These text boxes display status of the optical signal power level at each channel of the SFP modules. The possible readouts are Low, Normal and High, and indicate the current real-time status of each fiber optic channel. With input modules (SFP 1 and 2), status data indicates strength of the optical signal being received by the indicated SFP module channel. For output modules (SFP 3 and 4), status data indicates strength of the optical signal leaving the indicated SFP module channel.

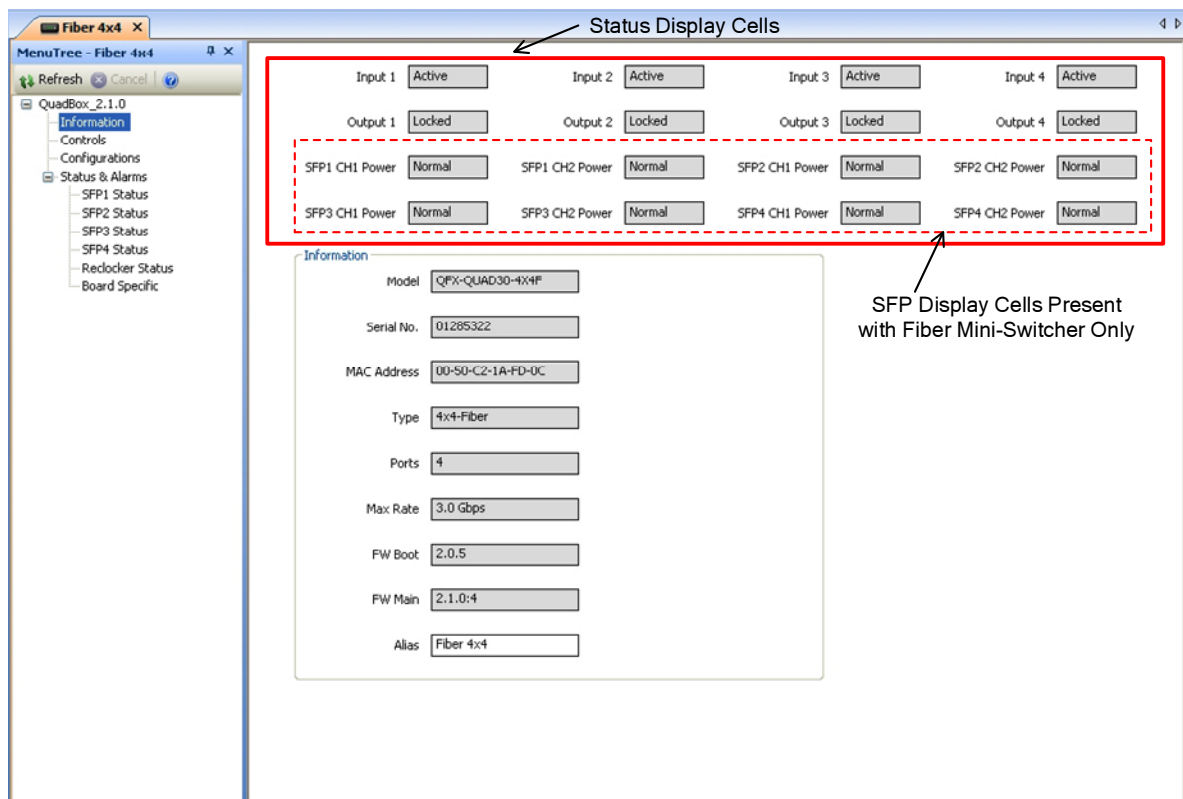
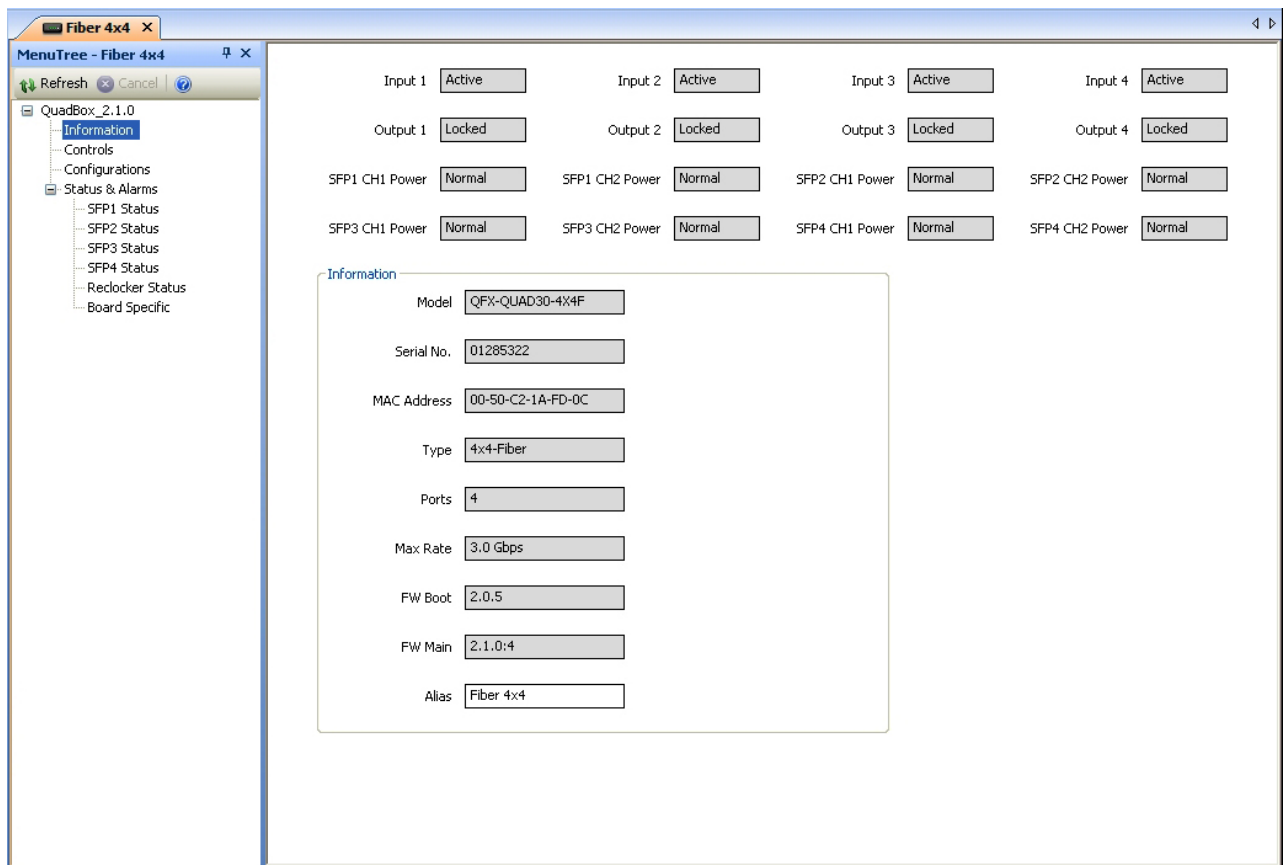


Figure 5-5 Status Display Text Boxes

5.8.2 INFORMATION MENU

When the Information menu entry is selected from the menu tree, the screen shown by Figure 5-6 is displayed. This screen provides the following configuration data for the selected Quadbox module:

- **Model Number and Serial Number** – Model and serial numbers of the selected module
- **MAC Address** – Identifies the assigned MAC address for the module
- **Type** – Identifies whether the module is a coaxial cable or fiber mini-switcher
- **Ports** – Indicates the number of I/O ports
- **Max Rate** – This display indicates the maximum data rate capability of the module
- **FW Boot and FW Main** – Indicate the revision levels of the boot code and main program firmware
- **Alias** – Alias is a name assigned to the selected module for identification on the network or within the system of Quadbox modules; and it will become the identifier for the module in the Devices View window. You may enter any name you wish to assign the module in the Alias text box. Press the Enter key to initiate the name change.



The screenshot shows a software interface for a 'Fiber 4x4' module. On the left is a 'MenuTree' with options: Refresh, Cancel, Information (selected), Controls, Configurations, Status & Alarms, SFP1 Status, SFP2 Status, SFP3 Status, SFP4 Status, Redlocker Status, and Board Specific. The main area displays status for four inputs (all 'Active') and four outputs (all 'Locked'). Below this is a table of SFP power levels for eight channels, all showing 'Normal'. An 'Information' section contains the following fields:

Model	QFX-QUAD30-4x4F
Serial No.	01285322
MAC Address	00-50-C2-1A-FD-0C
Type	4x4-Fiber
Ports	4
Max Rate	3.0 Gbps
FW Boot	2.0.5
FW Main	2.1.0:4
Alias	Fiber 4x4

Figure 5-6 Example Information Screen

5.8.3 CONTROLS MENU

Selecting the Controls menu entry from the menu tree displays the screen shown by Figure 5-7. This screen allows you to configure I/O routing for mini-switcher, and set data rates for the output signals on the selected module.

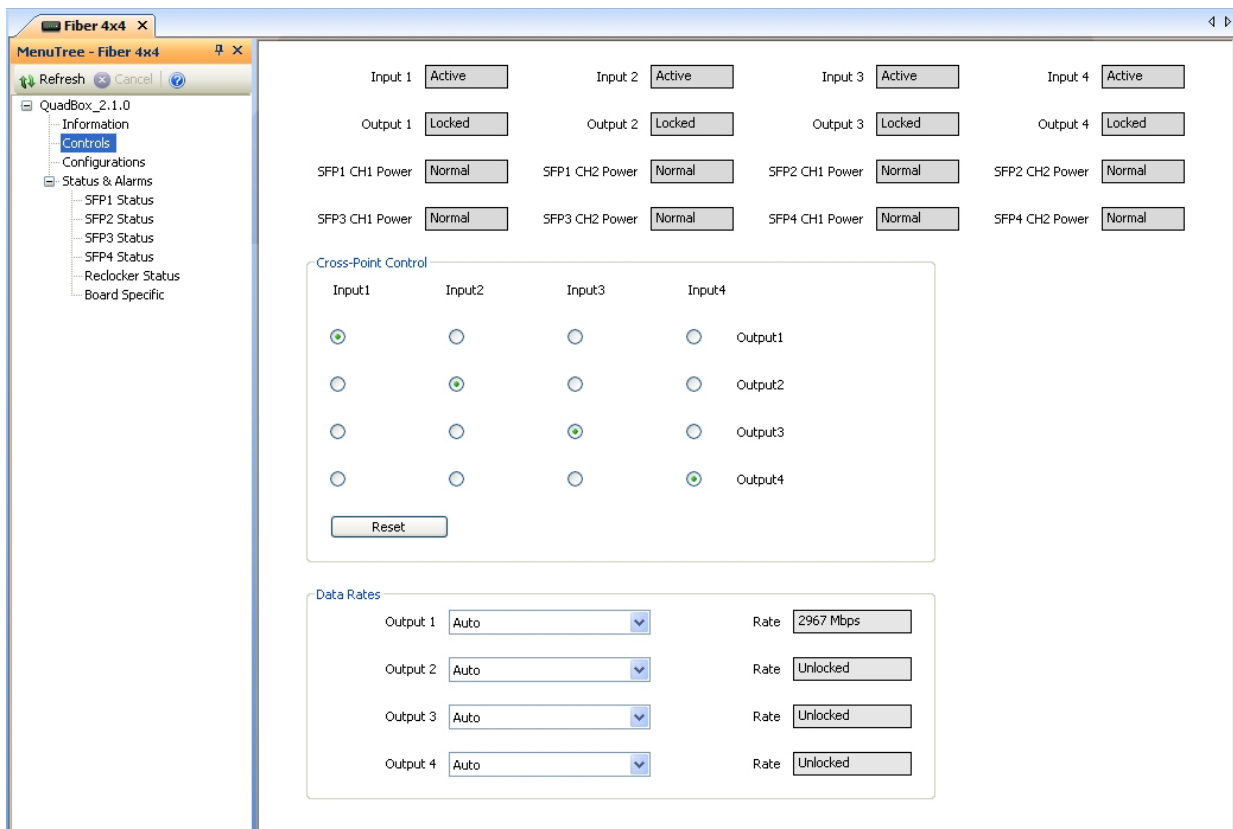


Figure 5-7 Example Controls Screen

Crosspoint Control

The control matrix displayed in the center of the screen allows you to configure I/O signal routing. Notice that each Output, 1 thru 4, is listed on a separate row and each Input, 1 thru 4, is listed in a dedicated column. To change signal routing, click the radio button corresponding to the desired input source for each output signal. The default routing scheme is shown in the figure where Input 1 is routed to Output 1, Input 2 to Output 2, etc. Clicking the Reset button returns the router to factory default.

Data Rates

A Data Rate pull-down box that selects the reclocking rate is listed for each module channel. The pull-down menu lists all valid data reclocking rates supported by Quadbox, plus the automatic (Auto) option. When Auto is selected, the output data rate is set the same as the input signal assigned to the output channel. If you wish to select a different data rate for the output, open the pull-down menu and select the desired value. When the Bypass option is selected, output video is not reclocked.

When configuring coaxial cable mini-switcher modules the data rate selection sets output rate for the indicated BNC (copper coaxial) output channel, and on fiber modules sets the output rate for the indicated fiber optic output channel. The following chart lists valid output data rate choices:

- Auto
- HD-SDI (1485/1483.5 MHz)
- SD-SDI / DVB-ASI (270 MHz)
- 2 x HD-SDI (2967/2970 MHz)
- 2 x SD-SDI (540 MHz)
- SD 16:9 (360 MHz)
- Composite NTSC (143 MHz)
- Composite PAL (177 MHz)
- Bypass

A text box labeled Rate is displayed to the right of each pull-down menu box. If the output signal is locked to a valid data rate, the actual data rate is displayed as a numeric value in the Rate box. If the reclocker stage is bypassed for the indicated output signal, the message Unlocked appears in the box.

5.8.4 CONFIGURATIONS MENU

Selecting the Configurations menu entry from the menu tree accesses the input Equalizer Controls when a **coaxial cable** mini-switcher module is selected, as shown by Figure 5-8. When this menu entry is selected with a **fiber** module connected, the screen shown in Figure 5-9 is displayed to indicate there are no active controls for the module. The window contains a listing of equalizer controls for each valid coaxial (BNC) input port with two radio buttons in each row. These controls allow you to select, by input channel, whether the input equalizer function is On or Bypassed. Click the button for the desired equalizer setting on each input. The input equalizer function applies only to BNC connector inputs fed by copper coaxial cable. Therefore, the Equalizer Controls window does not appear on the Configurations screen for fiber equipped mini-switcher modules

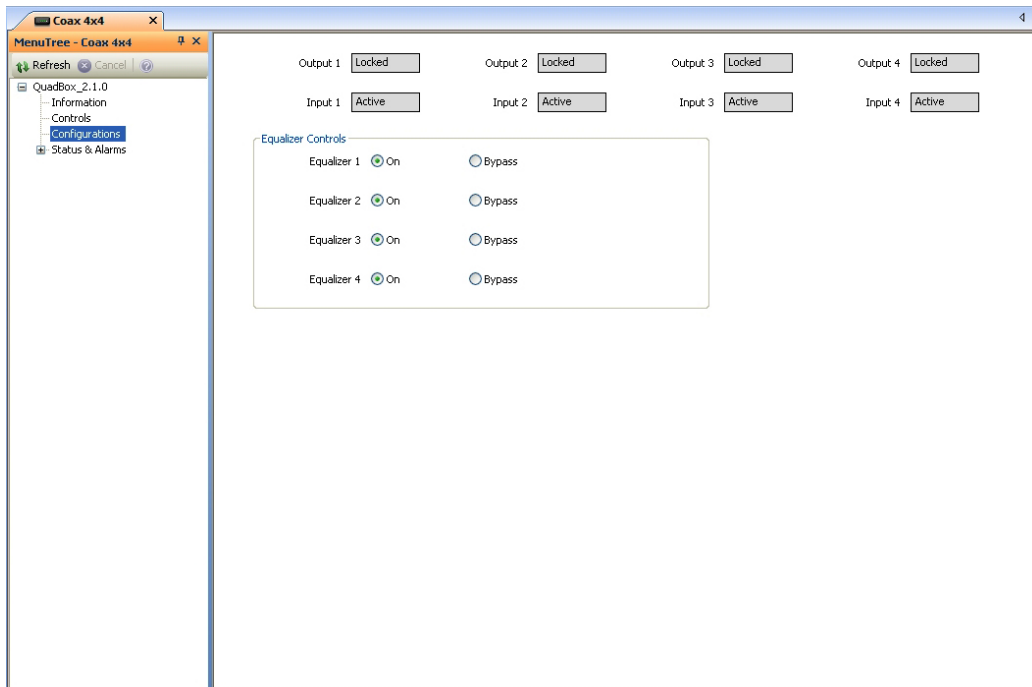


Figure 5-8 Example Coax Mini-Switcher Module Configurations Screen

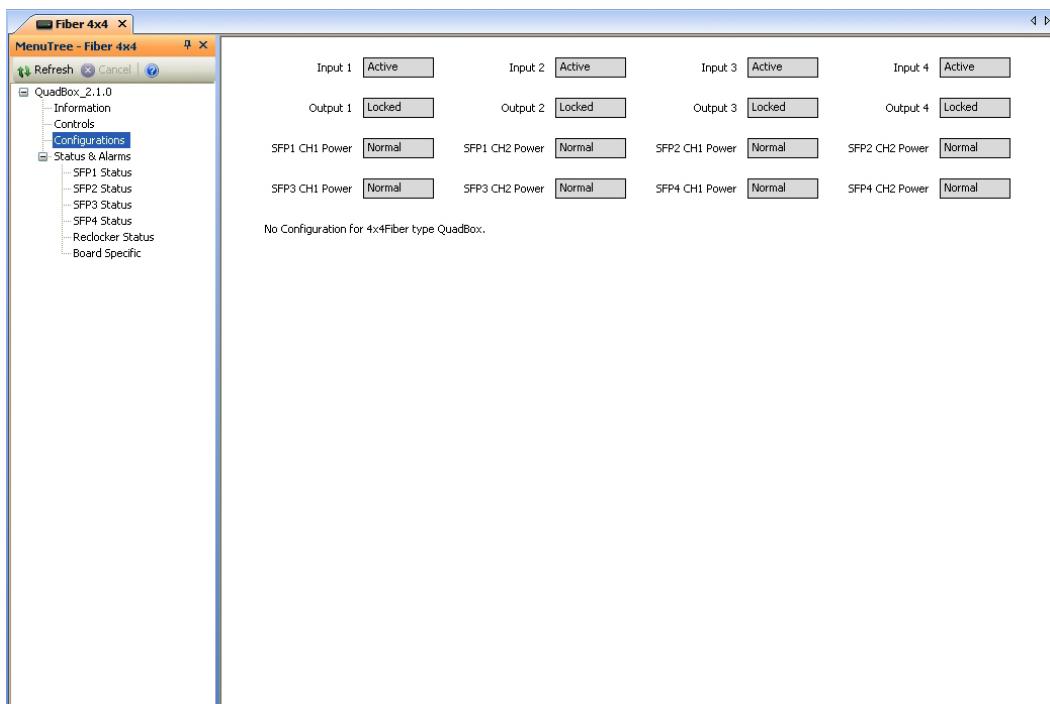


FIGURE 5-9 Example Fiber Mini-Switcher Module Configurations Screen

5.8.5 SFP STATUS MENUS (FIBER MINI-SWITCHER MODULES ONLY)

Menu entries SFP1 Status thru SFP4 Status access status screens for SFP Module 1 thru SFP Module 4, respectively. Each menu provides status monitoring data for each channel of the indicated SFP module. All are identical in layout and function, with the exception that the information and channel status areas are labeled with the SFP module reference number corresponding to the selected menu. An example screen for SFP1 is shown by Figure 5-10, and SFP1 is used for example only in the following text.

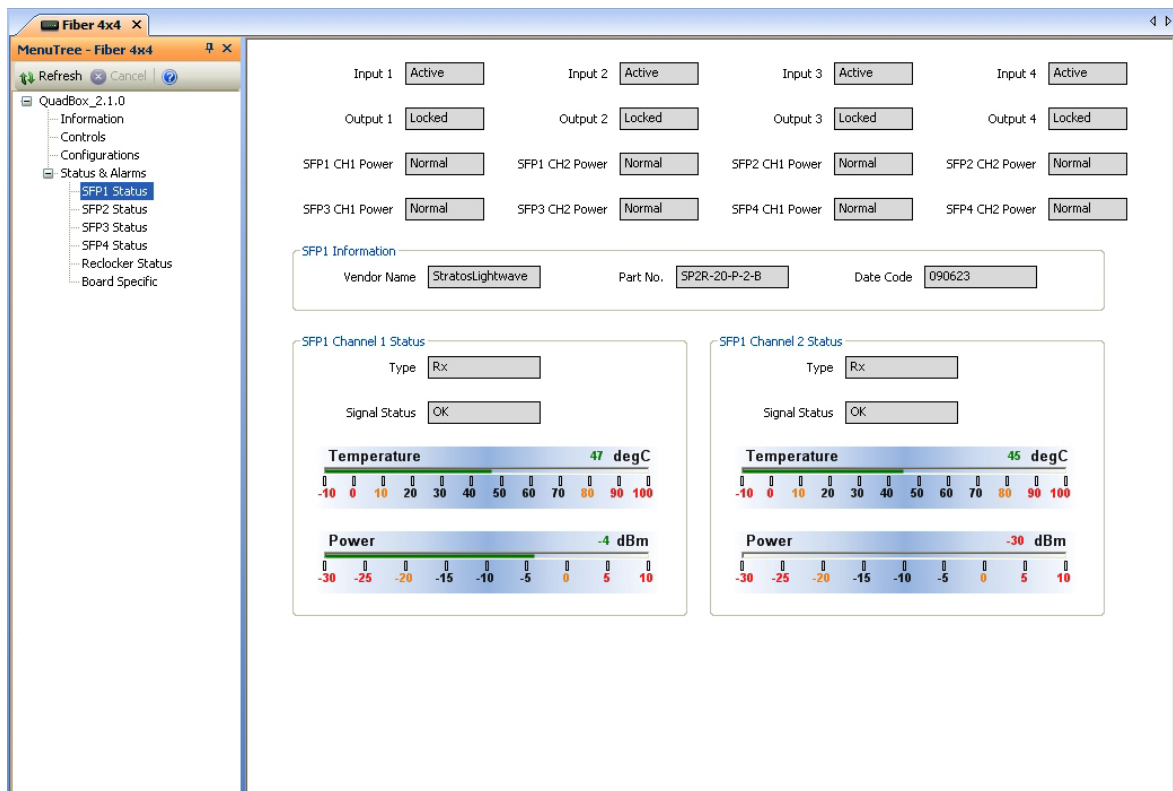


Figure 5-10 Example SFP Status Screen

SFP1 Information

There are three text boxes in the SFP information window that display the following characteristics of the indicated SFP module:

- **Vendor Name** – Identifies the manufacturer of the SFP module by name
- **Part No.** – Identifies the manufacturer's part number for the module
- **Date Code** – Displays the date of manufacture for the SFP module

SFP1 Channel 1 Status or SFP1 Channel 2 Status

There are two text boxes and two analog-type meter displays contained in the channel status window used to provide the following real-time status monitoring data for the two signal channels of the indicated SFP module:

- **Type** – Identifies the SFP module as a transmit (Tx) or receive (Rx) module
- **TXFault (Transmit Modules Only)** – Indicates if the optical transmit signal is present (OK) or absent (Error) at the indicated output channel on the SFP module
- **Signal Status (Receive Modules Only)** – Indicates if an optical input signal is present (OK) or absent (Error) at the indicated input channel on the SFP module
- **Temperature** – Provides a direct analog readout of the current operating temperature of the signal path device associated with the indicated channel of the SFP module
- **Power** – Provides a direct analog power readout in dBm of the optical output signal leaving the indicated channel of the SFP transmit module; or the optical input signal entering the indicated channel of the SFP receive module

5.8.6 RECLOCKER STATUS

Selecting the Reclocker Status menu entry from the menu tree displays the screen shown by Figure 5-11. This screen provides real-time status monitoring data for the output reclocker device on the selected Quadbox module.

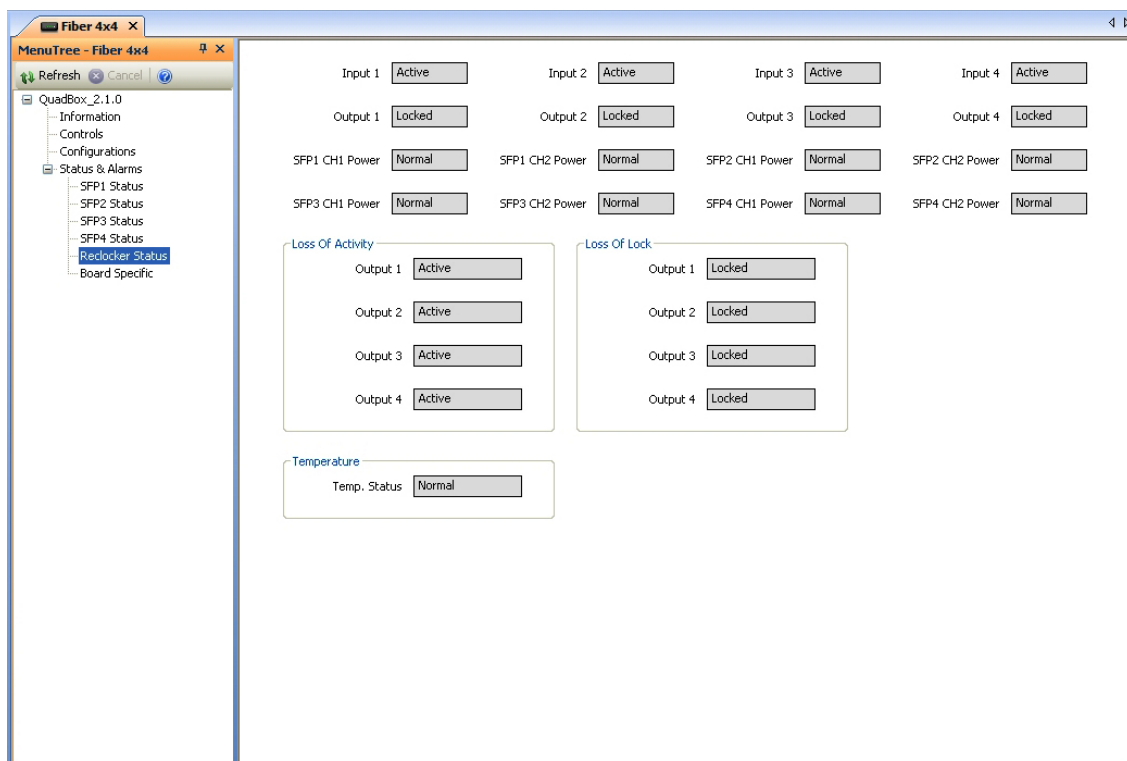


Figure 5-11 Example Reclocker Status Screen

Loss of Activity

Within the Loss of Activity window a status box is listed for each module output port, by channel number, which displays whether or not there is an *Active input* signal switched to the indicated output channel. If the box displays the message Inactive, there is no active video signal present at the input port routed to the indicated output channel.

Loss of Lock

The Loss of Lock window contains a list of each module output port by channel number that displays whether the reclocked output is locked to a standard data rate (Locked) or bypassing the reclocker (Not Locked.)

Temperature

The Temp. Status box indicates status of the reclocker device operating temperature.

5.8.7 BOARD SPECIFIC MENU

Selecting the Board Specific Menu entry opens a display screen with monitoring data pertaining to the circuit board of the selected Quadbox module. An example screen is shown by Figure 5-12.

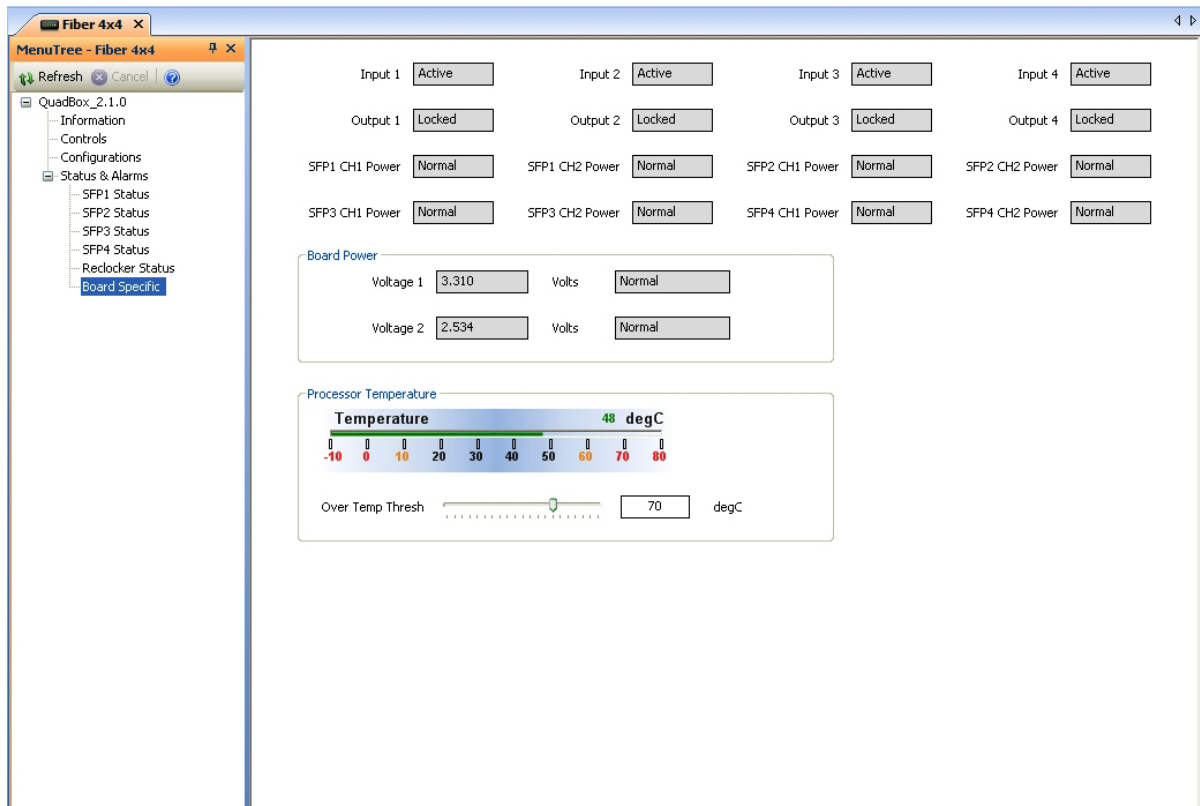


Figure 5-12 Example Board Specific Screen

Board Power

There are four text boxes in the Board Power information window arranged in two rows, each row indicates the voltage level and status for the main power supply rails on the circuit board. The left-hand box in each row provides a digital readout of the actual measured operating voltage for the indicated power rail. The right-hand box indicates the status of the power supply voltage as low, normal or high.

Processor Temperature

The analog-type meter display contained in the Processor Temperature window provides a direct analog readout of the current operating temperature of the processor device contained on the Quadbox circuit board.

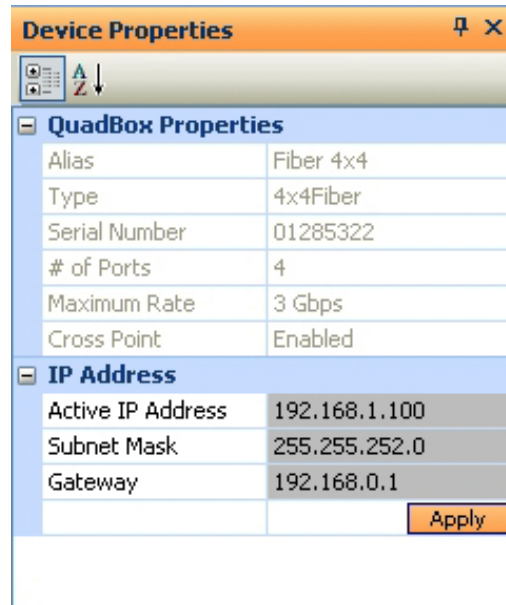
Over Temperature Threshold

Moving the Over Temp Thresh slider beneath the temperature readout display determines the temperature (in degrees Celsius) at which the Over Temp alarm triggers an alert in the Alarms and Events panel of either the Catrax or Catrax Cub control application. The selected threshold temperature is displayed in the box beside the slider.

5.9 CHANGING DEVICE NETWORK ADDRESSING PARAMETERS

Catrax allows users to change the IP address and other network addressing parameters of both active and inactive Quadbox modules from the *Device Properties* grid shown below in Figure 5-13. This feature is particularly useful for devices that are inactive due to an IP address conflict with other devices, or having a different network address. Catrax allows the user to correctly set the IP address of such devices directly without having to isolate the device from the network. Simply enter the new addressing data into the box on the Devices Properties menu and press Enter to initiate the change. If the new IP entered is the same as an existing IP address of another device, Catrax reports an error.

Although Catrax Cub does not support network communication, you may modify the network parameters using the Device Properties entries with either Catrax or Catrax Cub.



The screenshot shows a window titled "Device Properties" with a close button. It contains two expandable sections. The first section, "QuadBox Properties", is expanded and shows a table with the following data:

Alias	Fiber 4x4
Type	4x4Fiber
Serial Number	01285322
# of Ports	4
Maximum Rate	3 Gbps
Cross Point	Enabled

The second section, "IP Address", is also expanded and shows a table with the following data:

Active IP Address	192.168.1.100
Subnet Mask	255.255.252.0
Gateway	192.168.0.1

Below the IP Address table is an empty text input field and an "Apply" button.

Figure 5-13 Changing IP Address from Device Properties Panel

Chapter 6 Maintenance and Repair

6.1 PERIODIC MAINTENANCE


No periodic maintenance is required.

6.2 PESA CUSTOMER SERVICE

If you are experiencing any difficulty with a Quadbox module, please contact the PESA Customer Service Department. Skilled technicians are available to assist you 24 hours a day, seven days a week.

6.3 REPAIR

Before attempting to repair this equipment, please consult your warranty documents and the PESA Customer Service Department. Unauthorized repairs may void your warranty.

	<p>PC boards in this equipment contain Surface Mount Technology (SMT) components. Special tools are required to replace these components without causing damage to adjacent areas.</p> <p>Failure to consult with Customer Service before attempting to repair these boards may void your warranty.</p>
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6.4 REPLACEMENT PARTS

Only parts of the highest quality have been used in the design and manufacture of this equipment. If the inherent stability and reliability are to be maintained, replacement parts must be of the same high quality. Please consult our Customer Service Department before installing any parts not purchased from PESA.

6.5 FACTORY SERVICE

Before returning any equipment to our factory for service or repair, please contact our Customer Service Department for an RMA number.



PESA